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PART 2 : RF Exposure Compliance Test Report

Applicant Name: **SAMSUNG Electronics Co., Ltd.** 129, Samsung-ro, Yeongtong-gu, Suwon-Si, Gyeonggi-do, 16677 Rep. of Korea	**Date of Issue:** Mar. 03, 2021 **Test Report No.:** HCT-SR-2102-FC013-R1 **Test Site: HCT CO., LTD.**

FCC ID:	**A3LSMA526U**

Equipment Type:	**Mobile Phone**
Application Type:	**Certification**
FCC Rule Part(s):	**CFR §2.1093**
Model name:	**SM-A5261U**
Additional Model Name:	**SM-A526U1**
Date of Test:	**Feb.22, 2021~ Feb.26, 2021**
Results:	**Pass**

I attest to the accuracy of data. All measurements reported herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

Tested By	Reviewed By
Jee-ILL, Lee Test Engineer SAR Team Certification Division	Yun-jeang, Heo Technical Manager SAR Team Certification Division

REVISION HISTORY

The revision history for this test report is shown in table.

Revision No.	Date of Issue	Description
0	Feb.26, 2021	Initial Release
1	Mar.03, 2021	Revised Table 6-1,6-2,Sec 7.2 ,Page 56 ,77 and added Plot 7,20

This test results were applied only to the test methods required by the standard.

The above Test Report is not related to the accredited test result by (KS Q) ISO/IEC 17025 and KOLAS(Korea Laboratory Accreditation Scheme), which signed the ILAC-MRA.

Table of Contents

1. RF Exposure Limits 4

2. Test Location 6

3. Information of the DUT 7

4. Tx Varying Transmission Test Cases and Test Proposal 10

5. SAR Time Averageing Validation Test Procedures 13

6. Test Configurations 24

7. Time-varying Tx power measurement for below 6GHz frequency 27

8. SAR Test Results for Sub-6 Smart Transmit Feature Validation 55

9. Equipment List 64

10. Measurement Uncertainties 66

11. Conclusion 68

Appendix A: Test Sequences 69

Appendix B:Test Procedures for sub6 NR + LTE Radio 71

Appendix C: Verification plot 73

Appendix D: Calibration documents 78

Appendix E: TEST SETUP PHOTOGRAPHS

1. RF Exposure Limits

1.1RF Exposure Limits for Frequencies < 6 GHz

HUMAN EXPOSURE	UNCONTROLLED ENVIRONMENT General Population (W/kg) or (mW/g)	CONTROLLED ENVIRONMENT Occupational (W/kg) or (mW/g)
SPATIAL PEAK SAR * (Partial Body)	1.6	8.0
SPATIAL AVERAGE SAR ** (Whole Body)	0.08	0.4
SPATIAL PEAK SAR *** (Hands / Feet / Ankle / Wrist)	4.0	20.0

NOTES:

* The Spatial Peak value of the SAR averaged over any 1 g of tissue (defined as a tissue volume in the shape of a cube) and over the appropriate averaging time.

** The Spatial Average value of the SAR averaged over the whole-body.

******* The Spatial Peak value of the SAR averaged over any 10 g of tissue (defined as a tissue volume in the shape of a cube) and over the appropriate averaging time.

Uncontrolled Environments are defined as locations where there is the exposure of individuals who have no knowledge or control of their exposure. The general population/uncontrolled exposure limits are applicable to situations in which the general public may be exposed or in which persons who are exposed as a consequence of their employment may not be mad fully aware of the potential for exposure or cannot exercise control over their exposure. Members of the general public would come under this category when exposure is not employment-related; for example, in the case of a wireless transmitter that exposes persons in its vicinity.

Controlled Environments are defined as locations where there is exposure that may be incurred by persons who are aware of the potential for exposure, (i.e.as a result of employment or occupation). In general, occupational/controlled exposure limits are applicable to situations in which persons are exposed as a consequence of their employment, who have been made fully aware of the potential for exposure and can exercise control over their exposure. This exposure category is also applicable when the exposure is of a transient nature due to incidental passage through a location where the exposure levels may be higher than the general population/uncontrolled limits, but the exposed person is fully aware of the potential for exposure and can exercise control over his or her exposure by leaving the area or by some other appropriate means.

1.2 Interim Guidance for Time Averaging

Per October 2018 TCB Workshop Notes, the below time-averaging windows can be used for assessing time-averaged exposures for devices that are capable of actively monitoring and adjusting power output over time to
comply with exposure limits.

Interim Guidance	Frequency (GHz)	Maximum Averaging Time (sec)
SAR	< 3	100
	3 – 6	60
MPE	6 - 10	30
	10 - 16	14
	16 – 24	8
	24 – 42	4
	42 – 95	2

2. Test Location

2.1 Test Laboratory

Company Name	HCT Co., Ltd.
Address	74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si,Gyeonggi-do, 17383 KOREA
Telephone	031-645-6300
Fax.	031-645-6401

2.2 Test Facilities

Our laboratories are accredited and approved by the following approval agencies according to ISO/IEC 17025.

Korea	National Radio Research Agency (Designation No. KR0032)
	KOLAS (Testing No. KT197)

3. Information of the DUT

Model Name	SM-A5261U
Additional Model name	SM-A5261U1
Equipment Type	Mobile Phone
FCC ID	A3LSMA526U
Application Type	Certification
Applicant	SAMSUNG Electronics Co., Ltd.

Band & Mode	Operating Mode	Tx Frequency
CDMA/EVDO BC10	Voice / Data	817.90 MHz~ 823.10 MHz
CDMA/EVDO BC0	Voice / Data	824.70 MHz~ 848.31 MHz
CDMA/EVDO BC1	Voice / Data	1 851.25 MHz~ 1 908.75 MHz
GSM850	Voice / Data	824.2 MHz~ 848.8 MHz
GSM1900	Voice / Data	1 850.2 MHz~ 1 909.8 MHz
UMTS 850	Voice / Data	826.4 MHz~ 846.6 MHz
UMTS 1700	Voice / Data	1 712.4 MHz~ 1 752.6 MHz
UMTS 1900	Voice / Data	1 852.4 MHz~ 1 907.6 MHz
LTE Band 2 (PCS)	Voice / Data	1 850.7 MHz~ 1 909.3 MHz
LTE Band 4 (AWS)	Voice / Data	1 710.7 MHz~ 1 754.3 MHz
LTE Band 5 (Cell)	Voice / Data	824.7 MHz~ 848.3 MHz
LTE Band 7	Voice / Data	2 502.5 MHz~ 2 567.5 MHz
LTE Band 12	Voice / Data	699.7 MHz~ 715.3 MHz
LTE Band 13	Voice / Data	779.5 MHz~ 784.5 MHz
LTE Band 14	Voice / Data	790.5 MHz~ 795.5 MHz
LTE Band 25	Voice / Data	1 850.7 MHz~ 1 914.3 MHz
LTE Band 26	Voice / Data	814.7 MHz~ 848.3 MHz
LTE Band 30	Voice / Data	2 307.5 MHz ~ 2 312.5 MHz
LTE TDD Band 38	Voice / Data	2 572.5 MHz ~ 2 617.5 MHz
LTE TDD Band 40	Voice / Data	2 302.5 MHz ~ 2 397.5 MHz
LTE TDD Band 41	Voice / Data	2 498.5 MHz~ 2 687.5 MHz
LTE TDD Band 48	Voice / Data	3 552.5 MHz~ 3697.5 MHz
LTE Band 66 (AWS)	Voice / Data	1 710.7 MHz ~ 1 779.3 MHz
LTE Band 71	Voice / Data	665.5 MHz~ 695.5 MHz
NR Band n2 (PCS)	Data	1 852.5 MHz~ 1 907.5 MHz
NR Band n5 (Cell)	Data	826.5 MHz~ 846.5 MHz
NR Band n12	Data	701.5 MHz~ 713.5 MHz
NR Band n25	Data	1852.5 MHz ~ 1912.5 MHz
NR Band n25	Data	1852.5 MHz ~ 1912.5 MHz
NR Band n41	Data	2 506.02 MHz~ 2 679.99 MHz
NR Band n66	Data	1 712.5 MHz~ 1 777.5 MHz
NR Band n71	Data	665.5 MHz - 695.5 MHz
NR Band n77	Data	3 710 MHz~ 3 969.99 MHz
U-NII-1	Voice / Data	5 180 MHz ~ 5 240 MHz
U-NII-2A	Voice / Data	5 260 MHz ~ 5 320 MHz
U-NII-2C	Voice / Data	5 500 MHz ~ 5 720 MHz
U-NII-3	Voice / Data	5 745 MHz ~ 5 825 MHz
2.4 GHz WLAN	Voice / Data	2 412 MHz ~ 2 462 MHz
Bluetooth / LE 5.0	Data	2 402 MHz ~ 2 480 MHz
NFC	Data	13.56 MHz

	Mode	Serial Number
Device Serial Numbers	2G/3G/4G	UAB1032M, UAE0513M
	5G Sub 6 NR	UAB1032M, UAE0513M
	The manufacturer has confirmed that the devices tested have the same physical, mechanical and thermal characteristics are within operational tolerances expected for production units.	

Measurement Plot Summery Table

Test Case#	Test Scenario	Tech	Band	DSI	Channel	Frequency	Conducted Plot No.	SAR Plot No.
1	Time-varying Tx. power transmission (Conducted Power, SAR)	LTE	B25	2	26140	1860	1	14
2			B48	1	56640	3690	2	15
3		UMTS	B2	2	9400	1880	3	16
4		GPRS	1900	2	661	1880	4	17
5		EVDO	1900	2	600	1880	5	18
6		Sub6 NR	n66	2	349000	1745	6	19
		Sub6 NR	n77	1	650000	3750	7	20
7	Change in Call	LTE	B25	2	26140	1860	8	
8	Tech/Band Switch	LTE	B25	2	26140	1860	9	
		UMTS	B2	2	9400	1880		
10	Antenna Switch	LTE	B25	2	26140	1860	10,11	
			B48	1	56640	3690		
11	SAR1 vs SAR2	LTE	12	2	23095	707.5	12	
		sub6 NR	66	2	349000	1745		
		LTE	66	1	132322	1745	13	
		sub6 NR	77	1	650000	3750		

3.2 Dynamic Transmission Condition for RF Exposure Compliance

The device under test (DUT) contains:
* Qualcomm® smart Transmit Feature.for 2G/3G/4G/5G WWAN technologies.

This featureperforms time averaging algorithm in real time to control and manage transmitting power and ens ure the time-averaged RF exposure is in compliance with FCC requirements all the time.
The Smart Transmit algorithm maintains the time-averaged transmit power, in turn, time-averaged RFexposure of SAR_design_targetfor sub 6 radio below the predefined time averaged power limit for each characterized technology and band.

Smart Transmit allows the device to transmit at higher power instantaneously, as high as Pmax, when needed, but enforces power limiting to maintain time-averaged transmit power to Plimit for frequencies < 6 GHz .
Note that the device uncertainty for sub-6GHz WWAN is 1.0dB for this DUT and the reserve power margin is 3 dB.

This purpose of the Part 2 report is to demonstrate the DUT complies with FCC RF exposure requirement under Tx varying transmission scenarios, thereby validity of Qualcomm® Smart Transmit feature implementation in this device. It serves to compliment the Part 0 and Part 1 Test Reports to justify compliance per FCC.

All Part 2 tests of this device were conducted according to the guidelines of the Qualcomm document 80-W2112-5 Rev.N.

◈ Regulatory body configuration:
Based on regulatory requirement for each countries/regions, FCC time window/limits and/or ICNIRP 1998 time window/limits can be selected and/or combined. Additionally, Time-Averaged Exposure mode or Peak Exposure mode can be selected based on MCC for Smart Transmit to operate. In Time-Averaged Exposure mode, as described in Section 2.2, the wireless device can instantaneously transmit at high transmit powers and exceed the Plimit for a short duration before limiting the power to maintain the time-averaged transmit power under the Plimit; while in Peak Exposure mode, the maximum instantaneous transmit power is limited to Plimit. Depending on EFS version, regulatory body configuration is different. Please refer to corresponding user guide for details.

The EFS Version of A3LSMA526U is GEN 1
◈force peak for Tx transmitting frequency < 6 GHz
The Smart Transmit feature applies time-averaging windows when the device detects an MCC that matches Time-Averaged Exposure MCCs list. For each of the MCCs under Time-Averaged Exposure MCCs list, the Smart Transmit feature can limit either maximum peak power or maximum time-average power to Plimit per tech/band/antenna/DSI. If force peak is set to '1' for a given tech/band/antenna/DSI in the EFS, then the Smart Transmit feature limits the maximum Tx power to Plimit for the selected tech/band/antenna/DSI. In other words, with force peak set to '1', under static condition (i.e., fixedtech/band/antenna/DSI) and in single active Tx scenario, Smart Transmit can guarantee Tx power level of Plimit at all times.

4. Tx Varying Transmission Test Cases and Test Proposal

To validate time averaging feature and demonstrate the compliance in Tx varying transmission conditions, the following transmission scenarios are covered in Part 2 test:

1. During a time-varying Tx power transmission: To prove that the Smart Transmit feature accounts for Tx power variations in time accurately.

2. During a call disconnect and re-establish scenario: To prove that the Smart Transmit feature accounts for history of past Tx power transmissions accurately.

3. During technology/band handover: To prove that the Smart Transmit feature functions correctly during transitions in technology/band.

4. During DSI (Device State Index) change: To prove that the Smart Transmit feature functions correctly during transition from one device state (DSI) toanother.

5. During antenna (or beam) switch: To prove that the Smart Transmit feature functions correctly during transitions in antenna (such as AsDiv scenario) or beams (different antenna array configurations).

   ◈ This device does not support FR2 mmWave and only supports Smart transmit in the frequency band of less than 6GHz.

6. SAR vs. PD exposure switching during sub-6+mmW transmission: To prove that the Smart Transmit feature functions correctly and ensures total RF exposure compliance during transitions in SAR dominant exposure, SAR+PD exposure, and PD dominant exposure scenarios.

   ◈This device does not support FR2 mmWave and only supports Smart transmit in the frequency band of less than 6GHz.

7. During time window switch: To prove that the Smart Transmit feature correctly handles the transition from one time window to another specified by FCC, and maintains the normalized time-averaged RF exposure to be less than normalized FCC limit of 1.0 at all times.

8. SAR exposure switching between two active radios (radio1 and radio2): To prove that the Smart Transmit feature functions correctly and ensures total RF exposure compliance when exposure varies among SAR_radio1 only, SAR_radio1 + SAR_radio2, and SAR_radio2 only scenarios.

As described in Part 0 report, the RF exposure is proportional to the Tx power for a SAR characterized wireless device. Thus, feature validation in Part 2 can be effectively performed through conducted (for f < 6GHz) power measurement. Therefore, the compliance demonstration under dynamic transmission conditions and feature validation are done in conducted power measurement setup for transmission scenario 1 through 8.

To add confidence in the feature validation, the time-averaged SAR measurements are also performed but only performed for transmission scenario 1 to avoid the complexity in SAR measurement (such as, for scenario 3 requiring change in SAR probe calibration file to accommodate different bands and/or tissue simulating liquid).

The strategy for testing in Tx varying transmission condition is outlined as follows:

Demonstrate the total RF exposure averaged over FCC defined time windows does not exceed FCC's SAR and PD limits, through time-averaged powe rmeasurements

Measure conducted Tx power (for *f* < 6GHz) versus time.
Convert it into RF exposure and divide by respective FCC limits to get normalized exposure versus time.
Perform running time-averaging over FCC defined time windows.
Demonstrate that the total normalized time-averaged RF exposure is less than 1 for all transmission scenarios (i.e., transmission scenarios 1, 2, 3, 4, 5, 6, 7, and 8) at all times.

Mathematical expression:

– For sub-6 transmissions only:

$$1g\_or\_10gSAR(t) = \frac{conducted\_Tx\_power(t)}{conducted\_Tx\_power\_P_{limit}} * 1g\_or\_10gSAR\_P_{limit} \qquad (1a)$$

$$\frac{\frac{1}{T_{SAR}}\int_{t-T_{SAR}}^{t} 1g\_or\_10gSAR(t)dt}{FCC\ SAR\ limit} \leq 1 \qquad (1b)$$

where, $conducted\_Tx\_power(t)$, $conducted\_Tx\_power\_P_{limit}$, and $1g\_or\_10gSAR\_P_{limit}$ correspond to the measured instantaneous conducted Tx power, measured conducted Tx power at Plimit, and measured 1gSAR or 10gSAR values at Plimit corresponding to sub-6 transmission. The Plimit are the parameters pre-defined in Part 0 and loaded via Embedded File System (EFS) onto the EUT. T_{SAR} is the FCC defined time window for sub-6 radio.

Demonstrate the total RF exposure averaged over FCC defined time windows does not exceed FCC's SAR limits, through time-averaged SAR measurements.
Note as mentioned earlier, this measurement is performed for transmission scenario 1 only.

For sub-6 transmissions only, measure instantaneous SAR versus time; for LTE+sub6 NR transmission, request low power (or all-down bits) on LTE so that measured SAR predominantly corresponds to sub6NR.

Convert it into RF exposure and divide by respective FCC limits to obtain normalized exposure versus time.
Perform time averaging over FCC defined time window.
Demonstrate that the total normalized time-averaged RF exposure is less than 1 for transmission scenario 1 at all times.

Mathematical expression:

- For sub-6 transmission only:

$$1g\_or\_10gSAR(t) = \frac{pointSAR(t)}{pointSAR\_P_{limit}} * 1g\_or\_10gSAR(t)\_P_{limit} \qquad (3a)$$

$$\frac{\frac{1}{T_{SAR}}\int_{t-T_{SAR}}^{t} 1g\_or\_10gSAR(t)dt}{FCC\ SAR\ limit} \leq 1 \qquad (3b)$$

where,pointSAR(t),PointSAR_Plimit and 1g_or_10gSAR_ Plimit correspond to the measured instantaneous point SAR, measured.
point SAR at *Plimit*, and measured*1gSAR* or 10gSAR values at *Plimit* corresponding to sub-6transmission.

5. SAR Time Averageing Validation Test Procedures

This chapter provides the test plan and test procedure for validating Qualcomm Smart Transmit feature for sub-6 transmissions. The 100 seconds time window for operating *f* < 3GHz is used as an example to detail the test procedures in this chapter. The same test plan and test procedures described in this chapter apply to 60 seconds time window for operating *f* ≥ 3GHz.

5.1 Test sequence determination for validation

Following the FCC recommendation, two test sequences having time-variation in Tx power are predefined for sub-6 (*f* < 6 GHz) validation:

Test sequence 1: request EUT's Tx power to be at maximum power, measured *Pmax*†, for 80s, then requesting for half of the maximum power, i.e., measured *Pmax*/2, for the rest of the time.
Test sequence 2: request EUT's Tx power to vary with time. This sequence is generated relative to measured *Pmax*, measured *Plimit* and calculated *Preserve* (= measured *Plimit* in dBm - *Reserve_power_margin*in dB) of EUT based on measured*Plimit*.

The details for generating these two test sequences is described and listed in Appendix A.

NOTE: For test sequence generation, "measured *Plimit*" and "measured *Pmax*" are used instead of the "*Plimit*" specified in EFS entry and "*Pmax*" specified for the device, because Smart Transmit feature operates against the actual power level of the "*Plimit*" that was calibrated for the EUT. The "measured *Plimit*" accurately reflects what the feature is referencing to, therefore, it should be used during feature validation testing. The RF tune up and device- to-device variation are already considered in Part 0 report prior to determining *Plimit*.

5.2 Test configuration selection criteria for validating Smart Transmit feature

For validating Smart Transmit feature, this section provides a general guidance to select test cases. In practice, an adjustment can be made in test case selection. The justification/clarification may be provided.

5.2.1 Test configuration selection for time-varying Tx power transmission

The Smart Transmit time averaging feature operation is independent of bands, modes, and channels for a given technology. Hence, validation of Smart Transmit in one band/mode/channel
per technology is sufficient. Two bands per technology are proposed and selected for this testing to provide high confidence in this validation.
The criteria for the selection are based on the *Plimit* values determined in Part 0 report. Select two bands* in each supported technology that correspond to least** and highest*** *Plimit* values that are less than *Pmax* for validating Smart Transmit.

*If one *Plimit* level applies to all the bands within a technology, then only one band needs to be tested. In this case, within the bands having the same *Plimit*, the radio configuration (e.g., # of RBs, channel#) and device position that correspond to the highest *measured* 1gSAR at *Plimit* shown in Part 1 report is selected.

** In case of multiple bands having the same least *Plimit* within the technology, then select the band having the highest *measured* 1gSAR at *Plimit*.

*** The band having a higher *Plimit* needs to be properly selected so that the power limiting enforced by Smart Transmit can be validated using the pre-defined test sequences. If the highest *Plimit* in a technology is too high where the power limiting enforcement is not needed when testing with the pre-defined test sequences, then the next highest level is checked. This process is continued within the technology until the second band for validation testing is determined.

5.2.2 Test configuration selection for change in call

The criteria to select a test configuration for call-drop measurement is:

Select technology/band with least *Plimit* among all supported technologies/bands, and select the radio configuration (e.g., # of RBs, channel#) in this technology/band that corresponds to the highest *measured* 1gSAR at *Plimit* listed in Part 1report.

In case of multiple bands having same least *Plimit*, then select the band having the highest *measured* 1gSAR at *Plimit* in Part 1 report.

This test is performed with the EUT's Tx power requested to be at maximum power, the above band selection will result in Tx power enforcement (i.e., EUT forced to have Tx power at *Preserve*) for longest duration in one FCC defined time window. The call change (call drop/reestablish) is performed during the Tx power enforcement duration (i.e., during the time when EUT is forced to have Tx power at *Preserve*). One test is sufficient as the feature operation is independent of technology and band.

5.2.3 Test configuration selection for change in technology/band

The selection criteria for this measurement is, for a given antenna, to have EUT switch from a technology/band with lowest *Plimit* within the technology group (in case of multiple bands having the same *Plimit*, then select the band with highest *measured* 1gSAR at *Plimit*) to a technology/band with highest *Plimit* within the technology group, in case of multiple bands having the same *Plimit*, then select the band with lowest *measured* 1gSAR at *Plimit* in Part 1 report, or vice versa.

This test is performed with the EUT's Tx power requested to be at maximum power, the technology/band switch is performed during Tx power enforcement duration (i.e., during the time when EUT is forced to have Tx power at *Preserve*).

5.2.4 Test configuration selection for change in antenna

The criteria to select a test configuration for antenna switch measurement is:
Whenever possible and supported by the EUT, first select antenna switch configuration within the same technology/band (i.e., same technology and band combination).

Then, select any technology/band that supports multiple Tx antennas, and has the highest difference in *Plimit* among all supported antennas.

In case of multiple bands having same difference in *Plimit* among supported antennas, then select the band having the highest *measured* 1gSAR at *Plimit* in Part 1 report.

This test is performed with the EUT's Tx power requested to be at maximum power in selected technology/band, and antenna change is conducted during Tx power enforcement duration (i.e., during the time when EUT is forced to have Tx power at *Preserve*).

5.2.5 Test configuration selection for change in DSI

The criteria to select a test configuration for DSI change test is
Select a technology/band having the Plimit <Pmax within any technology and DSI group, and for the same technology/band having a different Plimit in any other DSI group. Note that the selected DSI transition need to be supported by the device

This test is performed with the EUT's Tx power requested to be at maximum power in selected technology/band, and DSI change is conducted during Tx power enforcement duration (i.e., during the time when EUT is forced to have Tx power at *Preserve*).

5.2.6 Test configuration selection for change in time window

FCC specifies different time window for time averaging based on operation frequency. The criteria to select a test configuration for validating Smart Transmit feature and demonstrating the compliance during the change in time window is

Select any technology/band that has operation frequency classified in one time window defined by FCC (such as 100-seconds time window), and its corresponding *Plimit* is less than *Pmax* if possible.

Select the 2nd technology/band that has operation frequency classified in a different time window defined by FCC (such as 60-seconds time window), and its corresponding *Plimit* is less than *Pmax* if possible.

Note it is preferred both *Plimit* values of two selected technologies/band less than corresponding Pmax, but if not possible, at least one of technologies/bands has its Plimit less than Pmax.
This test is performed with the EUT's Tx power requested to be at maximum power in selected technology/band.
Test for one pair of time windows selected is sufficient as the feature operation is the same.

5.2.7 Test configuration selection for SAR exposure switching

If supported, the test configuration for SAR exposure switching should cover

1. SAR exposure switch when two active radios are in the same time window
2. SAR exposure switch when two active radios are in different time windows.

One test with two active radios in any two different time windows is sufficient as Smart Transmit operation is the same for RF exposure switch in any combination of two different time windows.

The Smart Transmit time averaging operation is independent of the source of SAR exposure (for example, LTE vs. Sub6 NR) and ensures total time-averaged RF exposure compliance. Hence, validation of Smart Transmit in any one simultaneous SAR transmission scenario (i.e., one combination for LTE + Sub6 NR transmission) is sufficient, where the SAR exposure varies among SARradio1 only, SARradio1 + SARradio2, and SARradio2 only scenarios.

The criteria to select a test configuration for validating Smart Transmit feature during SAR exposure switching scenarios is

* Select any two < 6GHz technologies/bands that the EUT supports simultaneous transmission. (for example, LTE+Sub6NR).
* Among all supported simultaneous transmission configurations, the selection order is
  1. Select one configuration where both *Plimit* of radio1 and radio2 is less than their corresponding *Pmax*, preferably, with different *Plimits*. If this configuration is not available, then,
  2. Select one configuration that has *Plimit* less than its *Pmax* for at least one radio. If this cannot be found, then,
  3. Select one configuration that has *Plimit* of radio1 and radio2 greater than *Pmax* but with least (*Plimit* – *Pmax*) delta.

Test for one simultaneous transmission scenario is sufficient as the feature operation is the same.

5.3 Test procedures for conducted power measurements

This section provides general conducted power measurement procedures to perform compliance test under dynamic transmission scenarios described in Section 4. In practice, an adjustment can be made in these procedures. The justification/clarification may be provided.

5.3.1 Time-varying Tx power transmission scenario

This test is performed with the two pre-defined test sequences described in Section 5.1 for all the technologies and bands selected in Section 5.2.1. The purpose of the test is to demonstrate the effectiveness of power limiting enforcement and that the time-averaged SAR (corresponding time-averaged Tx power) does not exceed the FCC limit at all times (see Eq. (1a) and (1b)).

Test procedure

1. Measure Pmax, measure Plimit and calculate Preserve (= measured Plimit in dBm – Reserve_power_margin in dB) and follow Section 5.1 to generate the test sequences for all the technologies and bands selected in Section 5.2.1. Both test sequence 1 and test sequence 2 are created based on measured Pmax and measured Plimit of the EUT. Test condition to measure Pmax and Plimit is:

▣ Measure *Pmax* with Smart Transmit disabled and callbox set to request maximumpower.
▣ Measure *Plimit* with Smart Transmit enabled and *Reserve_power_margin*set to 0 dB, callbox set to request maximum power.

2. Set *Reserve_power_margin*to actual (intended) value (3dB for this EUT based on Part 1 report) and reset power on EUT to enable Smart Transmit, establish radio link in desired radio configuration, with callbox requesting the EUT's Tx power to be at pre-defined test sequence 1, measure and record Tx power versus time, and then convert the conducted Tx power into 1gSAR or 10gSAR value (see Eq. (1a)) using measured *Plimit* from above Step 1. Perform running time average to determine time-averaged power and 1gSAR or 10gSAR versus time as illustrated in Figure 5-1 where using 100-seconds time window as an example.

NOTE: In Eq.(1a), instantaneous Tx power is converted into instantaneous 1gSAR or 10gSAR value by applying the measured worst-case 1gSAR or 10gSAR value at *Plimit* for the corresponding technology/band/antenna/DSI reported in Part 1 report.

NOTE: For an easier computation of the running time average, 0 dBm can be added at the beginning of the test sequences the length of the responding time window, for example, add 0dBm for 100-seconds so the running time average can be directly performed starting with the first 100-seconds data using excel spreadsheet. This technique applies to all tests performed in this Part 2 report for easier time-averaged computation using excel spreadsheet.

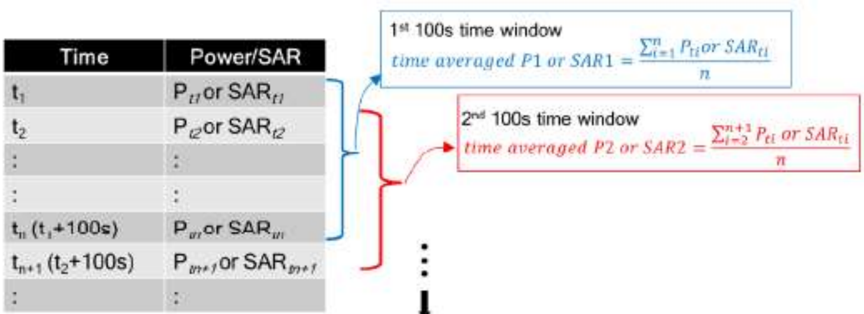


Figure 5-1 100s running average illustration

3.Make one plot containing:

a. Instantaneous Tx power versus time measured in Step2,
b. Requested Tx power used in Step 2 (test sequence1),
c. Computed time-averaged power versus time determined in Step2,
d. Time-averaged power limit (corresponding to FCC SAR limit of 1.6 W/kg for 1gSAR or 4.0W/kg for 10gSAR) given by

$$Time\ avearged\ power\ limit = meas.P_{limit} + 10 \times \log(\frac{FCC\ SAR\ limit}{meas.SAR\_Plimit}) \qquad (5a)$$

where $meas.\ Plimit$ and $meas.\ SAR\_Plimit$ correspond to measured power at Plimit and measured SAR at Plimit.

4. Make another plot containing:
a. Computed time-averaged 1gSAR or 10gSAR versus time determined in Step2
b. FCC *1gSARlimit* of 1.6W/kg or FCC *10gSARlimit* of 4.0W/kg.

5. Repeat Steps 2 ~ 4 for pre-defined test sequence 2 and replace the requested Tx power (test sequence 1) in Step 2 with test sequence2.

6. Repeat Steps 2 ~ 5 for all the selected technologies and bands.

The validation criteria are, at all times, the time-averaged power versus time shown in Step 3 plot shall not exceed the time-averaged power limit (defined in Eq. (5a)), in turn, the time-averaged 1gSAR or 10gSAR versus time shown in Step 4 plot shall not exceed the FCC limit of 1.6 W/kg for 1gSAR or 4.0 W/kg for 10gSAR (i.e., Eq. (1b)).

5.3.2 Change in call scenario

This test is to demonstrate that Smart Transmit feature accurately accounts for the past Tx powers during time-averaging when a new call is established.
The call disconnects and re-establishment needs to be performed during power limit enforcement, i.e., when the EUT's Tx power is at *Preserve* level, to demonstrate the continuity of RF exposure management and limiting in call change scenario. In other words, the RF exposure averaged over any FCC defined time window (including the time windows containing the call change) doesn't exceed FCC limit of 1.6 W/kg for 1gSAR or 4.0 W/kg for 10gSAR.

Test procedure

1. Measure *Plimit* for the technology/band selected in Section 5.2.2. Measure *Plimit* with Smart Transmit enabled and *Reserve_power_margin*set to 0 dB, callbox set to request maximum power.
2. Set *Reserve_power_margin*to actual (intended) value and reset power on EUT to enable Smart Transmit.
3. Establish radio link with callbox in the selected technology/band.
4. Request EUT's Tx power at 0 dBm for at least one time window specified for the selected technology/band, followed by requesting EUT's Tx power to be at maximum power for about ~60 seconds, and then drop the call for ~10 seconds. Afterwards, re-establish another call in the same radio configuration (i.e., same technology/band/channel) and continue callbox requesting EUT's Tx power to be at maximum power for the remaining time of at least another full duration of the specified time window. Measure and record Tx power versus time. Once the measurement is done, extract instantaneous Tx power versus time, convert the measured conducted Tx power into 1gSAR or 10gSAR value using Eq. (1a), and then perform the running time average to determine time-averaged power and 1gSAR or 10gSAR versus time.

NOTE: In Eq.(1a), instantaneous Tx power is converted into instantaneous 1gSAR or 10gSAR value by applying the measured worst-case 1gSAR or 10gSAR value at *Plimit* for the corresponding technology/band/antenna/DSI reported in Part 1 report.

5. Make one plot containing: (a) instantaneous Tx power versus time, (b) requested power, (c) computed time-averaged power, (d) time-averaged power limit calculated using Eq.(5a).
6. Make another plot containing: (a) computed time-averaged 1gSAR or 10gSAR versus time, and (b) FCC limit of 1.6 W/kg for 1gSAR or 4.0 W/kg for10gSAR.

The validation criteria are, at all times, the time-averaged power versus time shall not exceed the time-averaged power limit (defined in Eq.(5a)), in turn, the time-averaged 1gSAR or 10gSAR versus time shall not exceed the FCC limit of 1.6 W/kg for 1gSAR or 4.0 W/kg for 10gSAR (i.e., Eq. (1b)).

5.3.3. Change in technology and band

This test is to demonstrate the correct power control by Smart Transmit during technology switches and/or band handovers.
Similar to the change in call test in Section 5.3.2, to validate the continuity of RF exposure limiting during the transition, the technology and band handover needs to be performed when EUT's Tx power is at *Preserve* level (i.e., during Tx power enforcement) to make sure that the EUT's Tx power from previous *Preserve* level to the new *Preserve* level (corresponding to new technology/band). Since the *Plimit* could vary with technology and band, Eq. (1a) can be written as follows to convert the instantaneous Tx power in 1gSAR or 10gSAR exposure for the two given radios, respectively:

$$1g\_or\_10gSAR_1(t) = \frac{conducted\_Tx\_power\_1(t)}{conducted\_Tx\_power\_P_{limit\_1}} * 1g\_or\_10gSAR\_P_{limit\_1} \qquad (6a)$$

$$1g\_or\_10gSAR_2(t) = \frac{conducted\_Tx\_power\_2(t)}{conducted\_Tx\_power\_P_{limit\_2}} * 1g\_or\_10gSAR\_P_{limit\_2} \qquad (6b)$$

$$\frac{1}{T_{SAR}}\left[\int_{t-T_{SAR}}^{t_1} \frac{1g\_or\_10gSAR_1(t)}{FCC\ SAR\ limit}dt + \int_{t-T_{SAR}}^{t} \frac{1g\_or\_10gSAR_2(t)}{FCC\ SAR\ limit}dt\right] \leq 1 \qquad (6c)$$

where, *conducted_Tx_power_1(t)*, *conducted_Tx_power_Plimit_1*, and *1g_or_10gSAR_Plimit_1* correspond to the measured instantaneous conducted Tx power, measured conducted Tx power at *Plimit*, and measured *1gSAR* or *10gSAR* value at *Plimit* of technology1/band1; *conducted_Tx_power_2(t)*, *conducted_Tx_power_Plimit_2(t)*, and *1g_or_10gSAR_Plimit_2* correspond to the measured instantaneous conducted Tx power, measured conducted Tx power at *Plimit*, and measured *1gSAR* or *10gSAR* value at *Plimit* of technology2/band2. Transition from technology1/band1 to the technology2/band2 happens at time-instant '*t1*'.

Test procedure

1. Measure *Plimit* for both the technologies and bands selected in Section 5.2.3. Measure *Plimit* with Smart Transmit enabled and *Reserve_power_margin*set to 0 dB, callbox set to request maximum power.
2. Set *Reserve_power_margin*to actual (intended) value and reset power on EUT to enable Smart Transmit
3. Establish radio link with callbox in first technology/band selected.
4. Request EUT's Tx power at 0 dBm for at least one time window specified for the selected technology/band, followed by requesting EUT's Tx power to be at maximum power for about ~60 seconds, and then switch to second technology/band selected. Continue with callbox requesting EUT's Tx power to be at maximum power for the remaining time of at least another full duration of the specified time window. Measure and record Tx power versus time for the full duration of the test.
5. Once the measurement is done, extract instantaneous Tx power versus time, and convert the conducted Tx power into 1gSAR or 10gSAR value using Eq. (6a) and (6b) and corresponding measured *Plimit* values from Step 1 of this section. Perform the running time average to determine time-averaged power and 1gSAR or 10gSAR versus time.

   NOTE: In Eq.(6a) & (6b), instantaneous Tx power is converted into instantaneous 1gSAR or 10gSAR value by applying the measured worst-case 1gSAR or 10gSAR value at *Plimit* for the corresponding technology/band/antenna/DSI reported in Part 1 report.

6. Make one plot containing: (a) instantaneous Tx power versus time, (b) requested power, (c) computed time-averaged power, (d) time-averaged power limit calculated using Eq.(5a).
7. Make another plot containing: (a) computed time-averaged 1gSAR or 10gSAR versus time, and (b) FCC limit of 1.6 W/kg for 1gSAR or 4.0 W/kg for10gSAR.

The validation criteria are, at all times, the time-averaged 1gSAR or 10gSAR versus time shall not exceed the FCC limit of 1.6 W/kg for 1gSAR or 4.0 W/kg for 10gSAR (i.e., Eq. (6c)).

5.3.4 Change in antenna

This test is to demonstrate the correct power control by Smart Transmit during antenna switches from one antenna to another. The test procedure is identical to Section 5.3.3, by replacing technology/band switch operation with antenna switch. The validation criteria are, at all times, the time-averaged 1gSAR or 10gSAR versus time shall not exceed FCC limit of 1.6 W/kg for 1gSAR or 4.0 W/kg for 10gSAR.

5.3.5 Change in DSI

This test is to demonstrate the correct power control by Smart Transmit during DSI switches from one DSI to another. The test procedure is identical to Section 5.3.3, by replacing technology/band switch operation with DSI switch. The validation criteria are, at all times, the time-averaged 1gSAR or 10gSAR versus time shall not exceed FCC limit of 1.6 W/kg for 1gSAR or 4.0 W/kg for 10gSAR.

5.3.6 Change in time window

This test is to demonstrate the correct power control by Smart Transmit during the change in averaging time window when a specific band handover occurs. FCC specifies time-averaging windows of 100s for Tx frequency < 3GHz, and 60s for Tx frequency between 3GHz and 6GHz.

To validate the continuity of RF exposure limiting during the transition, the band handover test needs to be performed when EUT handovers from operation band less than 3GHz to greater than 3GHz and vice versa. The equations (3a) and (3b) in Section 4 can be written as follows for transmission scenario having change in time window,

$$1gSAR_1(t) = \frac{conducted\_Tx\_power\_1(t)}{conducted\_Tx\_power\_P_{limit\_1}} * 1g\_or\ 10g\_SAR\_P_{limit\_1} \qquad (7a)$$

$$1gSAR_2(t) = \frac{conducted\_Tx\_power\_2(t)}{conducted\_Tx\_power\_P_{limit\_2}} * 1g\_or\ 10g\_SAR\_P_{limit\_2} \qquad (7b)$$

$$\frac{1}{T1_{SAR}}\left[\int_{t-T1_{SAR}}^{t_1} \frac{1g\_or\ 10g\_SAR_1(t)}{FCC\ SAR\ limit} dt\right] + \frac{1}{T2_{SAR}}\left[\int_{t-T2_{SAR}}^{t} \frac{1g_{or} 10g\_SAR_2(t)}{FCC\ SAR\ limit} dt\right] \leq 1 \qquad (7c)$$

where, *conducted_Tx_power_1(t)*, *conducted_Tx_power_Plimit_1*, and *1g_ or 10g_SAR_Plimit_1* correspond to the instantaneous Tx power, conducted Tx power at *Plimit*, and compliance *1g_ or 10g_SAR* values at *Plimit_1* of band1 with time-averaging window '*T1SAR*'; *conducted_Tx_power_2(t)*, *conducted_Tx_power_Plimit_2*, and *1g_ or 10g_SAR_Plimit_2* correspond to the instantaneous Tx power, conducted Tx power at *Plimit*, and compliance *1g_or 10g_SAR* values at *Plimit_2* of band2 with time-averaging window '*T2SAR*'. One of the two bands is less than 3GHz, another is greater than 3GHz. Transition from first band with time-averaging window '*T1SAR*' to the second band with time-averaging window '*T2SAR*' happens at time-instant '*t1*'.

Test procedure

1. Measure *Plimit* for both the technologies and bands selected in Section 5.2.6. Measure *Plimit* with Smart Transmit enabled and *Reserve_power_margin*set to 0 dB, callbox set to request maximum power.
2. Set *Reserve_power_margin*to actual (intended) value and enable Smart Transmit

Transition from 100s time window to 60s time window, and vice versa

3. Establish radio link with callbox in the technology/band having 100s time window selected in Section 5.2.6.
4. Request EUT's Tx power to be at 0 dBm for at least 100 seconds, followed by requesting EUT's Tx power to be at maximum power for about ~140 seconds, and then switch to second technology/band (having 60s time window) selected in Section 5.2.6. Continue with callbox requesting EUT's Tx power to be at maximum power for about ~60s in this second technology/band, and then switch back to the first technology/band. Continue with callbox requesting EUT's Tx power to be at maximum power for at least another 100s. Measure and record Tx power versus time for the entire duration of thetest.
5. Once the measurement is done, extract instantaneous Tx power versus time, and convert the conducted Tx power into 1gSAR or 10gSAR value (see Eq. (7a) and (7b)) using corresponding technology/band Step 1 result, and then perform 100s running average to determine time-averaged 1gSAR or 10gSAR versus time. Note that in Eq.(7a) & (7b), instantaneous Tx power is converted into instantaneous 1gSAR or 10gSAR value by applying the worst-case 1gSAR or 10gSAR value tested in Part 1 for the selected technologies/bands at*Plimit*.
6. Make one plot containing: (a) instantaneous Tx power versus time measured in Step4.
7. Make another plot containing: (a) instantaneous 1gSAR versus time determined in Step 5, (b) computed time-averaged 1gSAR versus time determined in Step 5, and (c) corresponding regulatory *1gSARlimit* of 1.6W/kg or *10gSARlimit* of 4.0W/kg.

Transition from 60s time window to 100s time window, and vice versa

8. Establish radio link with callbox in the technology/band having 60s time window selected in Section 5.2.6.
9. Request EUT's Tx power to be at 0 dBm for at least 60 seconds, followed by requesting EUT's Tx power to be at maximum power for about ~80 seconds, and then switch to second technology/band (having 100s time window) selected in Section 5.2.6. Continue with callbox requesting EUT's Tx power to be at maximum power for about ~100s in this second technology/band, and then switch back to the first technology/band. Continue with callbox requesting EUT's Tx power to be at maximum power for the remaining time for a total test time of 500 seconds. Measure and record Tx power versus time for the entire duration of the test.
10. Repeat above Step 5~7 to generate the plots

The validation criteria is, at all times, the time-averaged 1gSAR or 10gSAR versus time shall not exceed the regulatory *1gSARlimit* of 1.6W/kg or *10gSARlimit* of 4.0W/kg.

5.3.7 SAR exposure switching

This test is to demonstrate that Smart Transmit feature is accurately accounts for switching in exposures among SAR from radio1 only, SAR from both radio1 and radio2, and SAR from radio2 only scenarios, and ensures total time-averaged RF exposure complies with the FCC limit. The detailed test procedure for SAR exposure switching in the case of LTE+Sub6 NR non- standalone mode transmission scenario is provided in Appendix B.2.

Test procedure:

1. Measure conducted Tx power corresponding to *Plimit* for radio1 and radio2 in selected band. Test condition to measure conducted *Plimit*is:

◈ Establish device in call with the callbox for radio1 technology/band. Measure conducted Tx power corresponding to radio1 *Plimit* with Smart Transmit enabled and*Reserve_power_margin*set to 0 dB, callbox set to request maximum power.

◈ Repeat above step to measure conducted Tx power corresponding to radio2 *Plimit*. If radio2 is dependent on radio1 (for example, non-standalone mode of Sub6 NR requiring radio1 LTE as anchor), then establish radio1 + radio2 call with callbox, and request all down bits for radio1 LTE. In this scenario, with callbox requesting maximum power from radio2 Sub6 NR, measured conducted Tx power corresponds to radio2 *Plimit* (as radio1 LTE is at all-down bits)

2. Set *Reserve_power_margin*to actual (intended) value, with EUT setup for radio1 + radio2 call. In this description, it is assumed that radio2 has lower priority than radio1. Establish device in radio1+radio2 call, and request all-down bits or low power on radio1, with callbox requesting EUT's Tx power to be at maximum power in radio2 for at least one time window. After one time window, set callbox to request EUT's Tx power to be at maximum power on radio1, i.e., all-up bits. Continue radio1+radio2 call with both radios at maximum power for at least one time window, and drop (or request all-down bits on) radio2. Continue radio1 at maximum power for at least one time window. Record the conducted Tx power for both radio1 and radio2 for the entire duration of this test.

3. Once the measurement is done, extract instantaneous Tx power versus time for both radio1 and radio2 links. Convert the conducted Tx power for both these radios into 1gSAR or 10gSAR value (see Eq. (6a) and (6b)) using corresponding technology/band *Plimit* measured in Step 1, and then perform the running time average to determine time-averaged 1gSAR or 10gSAR versustime.

4. Make one plot containing: (a) instantaneous Tx power versus time measured in Step2.

5. Make another plot containing: (a) instantaneous 1gSAR versus time determined in Step 3, (b) computed time-averaged 1gSAR versus time determined in Step 3, and (c) corresponding regulatory *1gSARlimit* of 1.6W/kg or *10gSARlimit* of4.0W/kg.

The validation criteria is, at all times, the time-averaged 1gSAR or 10gSAR versus time shall not exceed the regulatory *1gSARlimit* of 1.6W/kg or *10gSARlimit* of 4.0W/kg.

5.4 Test procedure for time-varying SAR measurements

This section provides general time-varying SAR measurement procedures to perform compliance test under dynamic transmission scenarios described in Section 4. In practice, an adjustment can be made in these procedures. The justification/clarification may be provided.

To perform the validation through SAR measurement for transmission scenario 1 described in Section 4, the “path loss” between callbox antenna and EUT needs to be calibrated to ensure that the EUT Tx power reacts to the requested power from callbox in a radiated call. It should be noted that when signaling in closed loop mode, protocol-level power control is in play, resulting in EUT not solely following callbox TPC (Tx power control) commands. In other words, EUT response has many dependencies (RSSI, quality of signal, path loss variation, fading, etc.,) other than just TPC commands. These dependencies have less impact in conducted setup (as it is a controlled environment and the path loss can be very well calibrated) but have significant impact on radiated testing in an uncontrolled environment, such as SAR test setup. Therefore, the deviation in EUT Tx power from callbox requested power is expected, however the time- averaged SAR should not exceed FCC SAR requirement at all times as Smart Transmit controls Tx power at EUT.

The following steps are for time averaging feature validation through SAR measurement:

1. “Path Loss” calibration: Place the EUT against the phantom in the worst-case position determined based on Section 5.2.1. For each band selected, prior to SAR measurement, perform “path loss” calibration between callbox antenna and EUT. Since the SAR test environment is not controlled and well calibrated for OTA (Over the Air) test, extreme care needs to be taken to avoid the influence from reflections. The test setup is described in Section 6.1.

2. Time averaging featurevalidation:

i For a given radio configuration (technology/band) selected in Section 5.2.1, enable Smart Transmit and set *Reserve_power_margin*to 0 dB, with callbox to request maximum power, perform area scan, conduct pointSAR measurement at peak location of the area scan. This point SAR value, *pointSAR_Plimit*, corresponds to point SAR at the measured *Plimit* (i.e., measured *Plimit* from the EUT in Step 1 of Section5.3.1).

ii Set*Reserve_power_margin*to actual (intended) value and reset power on EUT to enable Smart Transmit. Note, if *Reserve_power_margin*cannot be set wirelessly, care must be taken to re-position the EUT in the exact same position relative to the SAM phantom as in above Step 2.i. Establish radio link in desired radio configuration, with callbox requesting the EUT’s Tx power at power levels described by test sequence 1 generated in Step 1 of Section 5.3.1, conduct point SAR measurement versus time at peak location of the area scan determined in Step 2.i of this section. Once the measurement is done, extract instantaneous point SAR vs time data, *pointSAR(t)*, and convert it into instantaneous 1gSAR or 10gSAR vs. time using Eq. (3a), re-writtenbelow:

$$1g\_or\_10gSAR(t) = \frac{pointSAR(t)}{pointSAR\_P_{limit}} * 1g\_or\_10gSAR\_P_{limit}$$

where, pointSAR_Plimit is the value determined in Step 2.i, and pointSAR(t) is theinstantaneous point SAR measured in Step 2.ii,1g-or10gSAR_Plimitisthe measured1gSAR or 10gSAR value listed in Part 1 report.

iii. Perform 100s running average to determine time-averaged 1gSAR or 10gSAR versus time.

iv. Make one plot containing: (a) time-averaged 1gSAR or 10gSAR versus time determined in Step 2.iii of this section, (b) FCC limit of 1.6 W/kg for 1gSAR or 4.0 W/kg for 10gSAR.

v Repeat 2.ii ~ 2.iv for test sequence 2 generated in Step 1 of Section 5.3.1.

vi. Repeat 2.i ~ 2.v for all the technologies and bands selected in Section5.2.1.

The time-averaging validation criteria for SAR measurement is that, at all times, the time- averaged 1gSAR or 10gSAR versus time shall not exceed FCC limit of 1.6 W/kg for 1gSAR or 4.0 W/kg for 10gSAR (i.e., Eq. (3b)).

6. Test Configurations

6.1 WWAN (sub-6) transmission.

The *Plimit* values, corresponding to 1.0 W/kg (1gSAR) and 2.5 W/kg (10gSAR) of *SAR_design_target*, for technologies and bands supported by EUT are derived in Part 0 report and summarized in Table 6-1. Note all *Plimit* power levels entered in Table 6-1 correspond to average power levels after accounting for duty cycle in the case of TDD modulation schemes (for e.g., GSM, LTE TDD & Sub6 NR TDD).

SAR Exposure Configurations			Body-Worn / Phablet	Head	Hotspot	Ear jack	Phablet	Burst Average Power [dBm]	Frame Averaged Power [dBm]	UL:DL Ratio	Max reduction [dBm]
Averaging volume			1g / 10g	1g	1g	10g	10g				
Spacing (mm)			15 mm / 9,11,5mm	0 mm	10 mm	0 mm	0 mm				
DSI			0	1	2	3	4				
Mode	Band	Antenna	Plimt					Pmax			
CDMA	BC10	Main#1	25.0	25.0	25.0	25.0	25.0	25.0	FDD	100%	N/A
CDMA	BC0	Main#1	24.5	24.5	24.5	24.5	24.5	24.5	FDD	100%	N/A
CDMA	PCS	Main#2	24.0	24.0	22.5	24.0	22.5	24.0	FDD	100%	1.5
GSM 1-slot	850	Main#1	26.0	26.0	26.0	26.0	26.0	33.0	24.0	12.5%	N/A
GSM 2-slot	850	Main#1						32.0	26.0	25.0%	N/A
GSM 3-slot	850	Main#1						29.0	24.7	37.5%	N/A
GSM 4-slot	850	Main#1						27.5	24.5	50.0%	N/A
GSM 1-slot	1900	Main#2	23.0	23.0	20.5	23.0	20.5	30.0	21.0	12.5%	0.5
GSM 2-slot	1900	Main#2						29.0	23.0	25.0%	2.5
GSM 3-slot	1900	Main#2						26.5	22.2	37.5%	1.7
GSM 4-slot	1900	Main#2						25.0	22.0	50.0%	1.5
UMTS	5	Main#1	24.0	24.0	24.0	24.0	24.0	24.0	FDD	100%	N/A
UMTS	4	Main#2	24.5	24.5	22.5	24.5	22.5	24.5	FDD	100%	2.0
UMTS	2	Main#2	24.0	24.0	22.5	24.0	22.5	24.0	FDD	100%	1.5
LTE FDD	12	Main#1	23.5	23.5	23.5	23.5	23.5	23.5	FDD	100%	N/A
LTE FDD	13	Main#1	24.8	24.8	24.8	24.8	24.8	24.8	FDD	100%	N/A
LTE FDD	14	Main#1	24.3	24.3	24.3	24.3	24.3	24.3	FDD	100%	N/A
LTE FDD	26	Main#1	24.5	24.5	24.5	24.5	24.5	24.5	FDD	100%	N/A
LTE FDD	5	Main#1	24.5	24.5	24.5	24.5	24.5	24.5	FDD	100%	N/A
LTE FDD	66	Main#2	24.5	24.5	22.0	24.5	22.0	24.5	FDD	100%	2.5
LTE FDD	4	Main#2	24.5	24.5	22.0	24.5	22.0	24.5	FDD	100%	2.5
LTE FDD	2	Main#2	24.5	24.5	22.0	24.5	22.0	24.5	FDD	100%	2.5
LTE FDD	25	Main#2	24.5	24.5	22.0	24.5	22.0	24.5	FDD	100%	2.5
LTE FDD	71	Main#1	24.5	24.5	24.5	24.5	24.5	24.5	FDD	100%	N/A
LTE FDD	7	Main#2	23.5	23.5	22.0	23.5	22.0	23.5	FDD	100%	1.5
LTE FDD	30	Main#2	23.5	23.5	22.0	23.5	22.0	23.5	FDD	100%	1.5
LTE TDD	40	Main#2	9.5	9.5	9.5	9.5	9.5	11.5	9.5	63.3%	N/A
LTE TDD	48	Sub#3	19.5	17.0	19.5	19.5	19.5	21.5	19.5	63.3%	2.5
LTE TDD PC3	41	Main#2	22.0	22.0	22.0	22.0	22.0	24.0	22.0	63.3%	N/A
LTE TDD PC2	41	Main#2	22.9	22.9	22.9	22.9	22.9	26.5	22.9	43.3%	N/A
LTE TDD	38	Main#2	21.5	21.5	21.5	21.5	21.5	23.5	21.5	63.3%	N/A
NR FDD	5	Main#1	23.5	23.5	23.5	23.5	23.5	23.5	FDD	100%	N/A
NR FDD	12	Main#1	24.8	24.8	24.8	24.8	24.8	24.8	FDD	100%	N/A
NR FDD	71	Main#1	23.5	23.5	23.5	23.5	23.5	23.5	FDD	100%	N/A
NR FDD	66	Main#2	24.5	24.5	23.0	24.5	23.0	24.5	FDD	100%	1.5
NR FDD	2	Main#2	23.5	23.5	22.5	23.5	22.5	23.5	FDD	100%	1.0
NR FDD	25	Main#2	23.5	23.5	22.5	23.5	22.5	23.5	FDD	100%	1.0
NR TDD	77	Sub#3	18.2	14.2	18.2	18.2	18.2	24.2	18.2	25%	4.0
NR TDD (PC3)	41	Sub#2	18.0	16.0	18.0	18.0	18.0	24.0	18.0	25%	2.0
NR TDD (PC2)	41	Sub#2	19.0	16.0	19.0	19.0	19.0	25.0	19.0	25%	3.0
NR TDD (PC3)	41	Main#2	17.0	17.0	17.0	17.0	17.0	23.0	17.0	25%	N/A
NR TDD (PC2)	41	Main#2	20.5	20.5	20.5	20.5	20.5	26.5	20.5	25%	N/A

Table 6-1: *Plimit* for supported technologies and bands (*Plimit* in EFS file)

* Maximum tune up target power, *Pmax*, is configured in NV settings in EUT to limit maximum transmitting power. This power is converted into peak power in NV settings for TDD schemes. The EUT maximum allowed

output power is equal to *Pmax* + 1dB device uncertainty.
Based on selection criteria described in Section 5.2.1, the selected technologies/bands for testing time-varying test sequences are highlighted in yellow in Table 6-1. As per Part 1 report, the *Reserve_power_margin*(dB) for Samsung Mobile Phone (FCC ID: A3LSMA526U) is set to 3dB in EFS, and is used in Part 2 test.
The radio configurations used in Part 2 test for selected technologies, bands, DSIs and antennas are listed in Table 6-2. The corresponding worst-case radio configuration 1gSAR or 10gSAR values for selected technology/band/DSI are extracted from Part 1 report and are listed in the last column of Table 6-2.

Based on equations (1a), (2a), (3a) and (4a), it is clear that Part 2 testing outcome is normalized quantity, which implies that it can be applied to any radio configuration within a selected technology/band/DSI. Thus, as long as applying the worst-case SAR obtained from the worst radio configuration in Part 1 testing to calculate time-varying SAR exposure in equations (1a), (2a), (3a) and (4a), the accuracy in compliance demonstration remains the same.

Table 6-2: Radio configurations selected for Part 2 test

Test Case #	Test Scenario	Tech	Band	Antenna	DSI	Channel	Frequency [MHz]	RB/RB Offset/Bandwidth (MHz)	Mode	SAR Exposure Scenario	Part 1 Worst Case Measured SAR at Plimit (W/kg)
1	Time-varying Tx power transmission	LTE	25	Main2 Ant	2	26140	1860	50/49/20 MHz BW	QPSK	Hotspot, Front, 10mm	0.386
2			48	Sub3 Ant	1	56640	3690	50/25/20 MHz BW	QPSK	RCV, Right Touch, 0mm	0.437
3		UMTS	2	Main2 Ant	2	9400	1880	-	RMC	Hotspot, Bottom edge, 10mm	0.302
4		GPRS	1900	Main2 Ant	2	661	1880	-	GRPS, 2 Tx	Hotspot, Rear, 10mm	0.249
5		CDMA	BC1	Main2 Ant	2	600	1880	-	EVDO	Hotspot, Front, 10mm	0.445
6		Sub6 NR	66	Main2 Ant	2	349000	1745	1/1/40 MHz BW	DFT-s QPSK	Hotspot, Rear, 10mm	0.474
			77	Sub3 Ant	1	650000	3750	1/1/100 MHz BW	DFT-s QPSK	RCV, Right Touch, 0mm	0.280
7	Change in Call	LTE	25	Main2 Ant	2	26140	1860	50/49/20 MHz BW	QPSK	Hotspot, Front, 10mm	0.386
8	Tech/Band Switch	LTE	25	Main2 Ant	2	26140	1860	50/49/20 MHz BW	QPSK	Hotspot, Front, 10mm	0.386
		UMTS	2	Main2 Ant	2	9400	1880	-	RMC	Hotspot, Bottom edge, 10mm	0.302
9	DSI Switch	-	-	-	-	-	-	-	-	-	-
				-	-	-	-	-	-	-	-
10	Time Windwon/ Antenna Switch	LTE	25	Main2 Ant	2	26140	1860	50/49/20 MHz BW	QPSK	Hotspot, Front, 10mm	0.386
			48	Sub3 Ant	1	56640	3690	50/25/20 MHz BW	QPSK	RCV, Right Touch, 0mm	0.437
11	SAR1 vs SAR2	LTE	12	Main1 Ant	2	23095	707.5	1/0/15 MHz BW	QPSK	Hotspot, Rear, 10mm	0.250
		sub6 NR	66	Main2 Ant	2	349000	1745	1/1/40 MHz BW	DFT-s QPSK		0.474
		LTE	66	Main2 Ant	1	132322	1745	1/0/20 MHz BW	QPSK	RCV, Right Cheek, 0mm	0.244
		sub6 NR	77	Sub3 Ant	1	650000	3750	1/1/100 MHz BW	DFT-s QPSK		0.280

Note : that the EUT has a proximity sensor to manage extremity exposure, which is represented using DSI = 4; the head exposure can be distinguished through audio receiver mode, represented as DSI = 1; similarly, the hotspot exposure is distinguished via hotspot mode, represented as DSI= 2; the exposure for headset jack active scenario is represented using DSI = 3 and is managed as the same exposure condition as extremity exposure at 0 mm; DSI = 0 represents all other exposures which cannot be distinguished, thus, in this case, the maximum 1gSAR and/or 10gSARamong all remaining exposure scenarios or the minimum *Plimit* among all remaining exposure scenarios (i.e., body worn 1gSAR evaluation at 15mm spacing, phablet 10gSAR extremity evaluation at 5~11mm spacing, phablet 10gSAR extremity evaluation at 0mm spacing for left and right ,Top surfaces) is used in Smart Transmit feature for time averaging operation.

1. Technologies and bands for time-varying Tx power transmission: The test case 1~6 listed in Table 6-2 are selected to test with the test sequences defined in Section 6.1 in both time- varying conducted power measurement and time-varying SAR measurement.
Note that only one GSM/CDMA band were selected as the second band for these technologies has *Plimit* greater than *Pmax*, requiring no Tx power limitation.
Only one UMTS band was selected as the second band has same Plimit, So, the band was selected based on the SAR result of the Part 1 report.

2. Technology and band for change in call test: LTE B25 band (test case 7 in Table 6-2) is selected for performing the call drop test in conducted power setup.

3. Technologies and bands for change in technology/band test: Following the guidelines in Section 5.2.3 and 5.2.4, test case 8 in Table 6-2 is selected for handover test from a technology/band/antenna with highest *Plimit* within one technology group (LTE B25, DSI=2 Hotspot mode), to a technology/band in the same DSI with lowest *Plimit* within another technology group (UMTS B2, DSI=2) in conducted power setup.

4. Technologies and bands for change in time-window/antenna: Based on selection criteria in Section 5.3.6, for a given DSI=1(RCV ON), DSI=2(Hotspot mode) test case 10 in Table 6-2 is selected for time window switch between 60s window (LTE 48, Sub3 Ant) and 100s window (LTE B25, Main2 Ant) in conducted power setup.

5. Change in DSI: Based on selection criteria in Section 5.3.5, This test item was omitted because there were no bands with different groups of Plimit according to DSI.

6. Technologies and bands for switch in SAR exposure: Based on selection criteria in Section 5.2.7 Scenario 1, test case 11 in Table 6-2 is selected for SAR exposure switching test in one of the supported simultaneous WWAN transmission scenario, i.e., LTE + Sub6 NR active in the same 100s time window, in conducted power setup.

7. Time-varying Tx power measurement for below 6GHz frequency

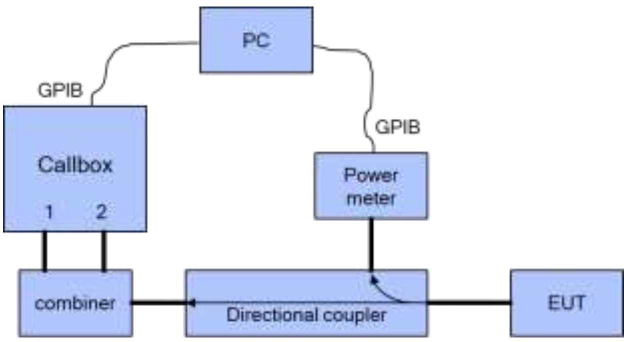
7.1 Conducted Measurement Test setup

Legacy Test Setup

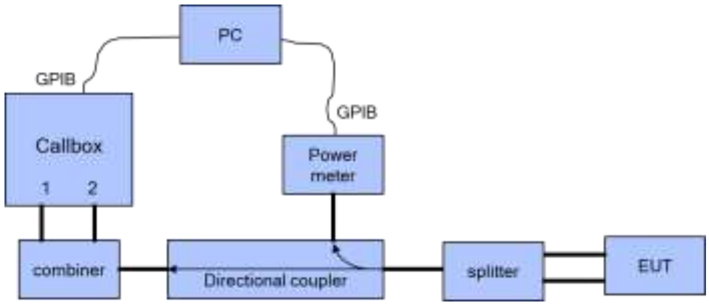
The Rohde & Schwarz CMW500 callbox is used in this test. The test setup picture and schematic are shown in Figures 7-1afor measurements with a single antenna of EUT (see Appendix E –The test Setup Photo 1).and in Figures 7-1b for measurements involving antenna switch (see Appendix E The test Setup Photo 2).
For single antenna measurement, one port (RF1 COM) of the callbox is connected to the RF port of the EUT using a directional coupler. For antenna & technology switch measurement, two ports (RF1 COM and RF4 COM) of the callbox used for signaling two different technologies are connected to a combiner, which is in turn connected to a directional coupler. The other end of the directional coupler is connected to a splitter to connect to two RF ports of the EUT corresponding to the two antennas of interest. In both the setups, power meter is used to tap the directional coupler for measuring the conducted output power of the EUT. For time averaging validation test (Section 5.3.1), call drop test (Section 5.3.2), and DSI switch test (Section 5.3.4), only RF1 COM port of the callbox is used to communicate with the EUT. For technology/band switch measurement (Section. 5.3.3), both RF1 COM and RF4 COM port of callbox are used to switch from one technology communicating on RF1 COM port to another technology communicating on RF4 COM port. All the path losses from RF port of EUT to the callbox RF COM port and to the power meter are calibrated and automatically entered as offsets in the callbox and the power meter via test scripts on the PC used to control callbox and power meter.

LTE+Sub6 NR test setup:

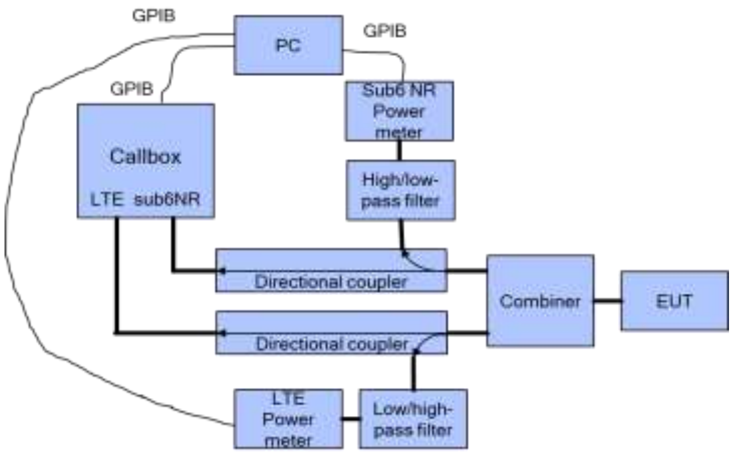
If LTE conducted port and Sub6 NR conducted port are same on this EUT (i.e., they share the same antenna), then low-/high-pass filter is used to separate LTE and Sub6 NR signals for power meter measurement via directional couplers, as shown in below Figures 7-1(c) (see Appendix E - Test setup photo-3)



7-1a



7-1b



7-1c

Figure 7-1 Conducted power measurement setup

Both the callbox and power meter are connected to the PC using GPIB cables. Two test scripts are custom made for automation, and the test duration set in the test scripts is 600 seconds.
For time-varying Tx power measurement, the PC runs the 1st test script to send GPIB commands to control the callbox's requested power versus time, while at the same time to record the conducted power measured at EUT RF port using the power meter. The commands sent to the callbox to request power are:

-0dBm for 100 seconds
- test sequence 1 or test sequence 2 (defined in Section 5.1 and generated in Section 5.5.1), for 360 seconds
- stay at the last power level of test sequence 1 or test sequence 2 for the remaining time.

Power meter readings are periodically recorded every 100ms. A running average of this measured Tx power over 100 seconds is performed in the post-data processing to determine the 100s-time averaged power.
For call drop, technology/band/antenna switch, and DSI switch tests, after the call is established, the callbox is set to request the EUT's Tx power at 0dBm for 100 seconds while simultaneously starting the 2nd test script runs at the same time to start recording the Tx power measured at EUT RF port using the power meter. After the initial 100 seconds since starting the Tx power recording, the callbox is set to request maximum power from the EUT for the rest of the test.
Note that the call drop/re-establish, or technology/band/antenna switch or DSI switch is manually performed when the Tx power of EUT is at *Preserve* level. See Section 5.3 for detailed test procedure of call drop test, technology/band/antenna switch test and DSI switch test.

7.2 P*limit* and P*max* measurement Results

The measured *Plimit* for all the selected radio configurations given in Table 6-2 are listed in below Table 7-1. *Pmax* was also measured for radio configurations selected for testing time-varying Tx power transmission scenarios in order to generate test sequences following the test procedures in Section 5.1.

Table 7-1: Measured *Plimit* and *Pmax* of selected radio configuration

Test Scenario	Tech	Band	Antenna	DSI	Channel	Frequency [MHz]	RB/RB Offset/Bandwidth (MHz)	Mode	SAR Exposure Scenario	Plimit EFS Setting[dBm]	Tune Up Target Power Pmax[dBm]	Measured *Plimit* [dBm]	Measured *Pmax* [dBm]	Part 1 Worst Case Measured SAR at Plimit (W/kg)
Time-varying Tx power transmission	LTE	25	Main2 Ant	2	26140	1860	50/49/20 MHz BW	QPSK	Hotspot, Front, 10mm	22	23.5	22.64	23.67	0.386
		48	Sub3 Ant	1	56640	3690	50/25/20 MHz BW	QPSK	RCV, Right Touch, 0mm	17	18.5	16.51	18.50	0.437
	UMTS	2	Main2 Ant	2	9400	1880	-	RMC	Hotspot, Bottom edge, 10mm	22.5	24	22.89	24.35	0.302
	GPRS	1900	Main2 Ant	2	661	1880	-	GRPS, 2 Tx	Hotspot, Rear, 10mm	20.5	23	21.02	22.33	0.249
	CDMA	BC1	Main2 Ant	2	600	1880	-	EVDO	Hotspot, Front, 10mm	22.5	24	22.27	23.28	0.445
	Sub6 NR	66	Main2 Ant	2	349000	1745	1/1/40 MHz BW	DFT-s QPSK	Hotspot, Rear, 10mm	23	24.5	22.97	24.67	0.474
		77	Sub3 Ant	1	650000	3750	1/1/100 MHz BW	DFT-s QPSK	RCV, Right Touch, 0mm	14.2	18.2	15.01	19.02	0.280
Change in Call	LTE	25	Main2 Ant	2	26140	1860	50/49/20 MHz BW	QPSK	Hotspot, Front, 10mm	22	23.5	22.64	23.67	0.386
Tech/Band Switch	LTE	25	Main2 Ant	2	26140	1860	50/49/20 MHz BW	QPSK	Hotspot, Front, 10mm	22	23.5	22.64	23.67	0.386
	UMTS	2	Main2 Ant	2	9400	1880	-	RMC	Hotspot, Bottom edge, 10mm	22.5	24	22.89	24.35	0.302
DSI Switch	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			-	-	-	-	-	-	-	-	-	-	-	-
Time Window/Antenna Switch	LTE	25	Main2 Ant	2	26140	1860	50/49/20 MHz BW	QPSK	Hotspot, Front, 10mm	22	23.5	22.64	23.67	0.386
		48	Sub3 Ant	1	56640	3690	50/25/20 MHz BW	QPSK	RCV, Right Touch, 0mm	17	18.5	16.51	18.50	0.437
SAR1 vs SAR2	LTE	12	Main1 Ant	2	23095	707.5	1/0/15 MHz BW	QPSK	Hotspot, Rear, 10mm	23.5	23.5	23.34	23.4	0.25
	sub6 NR	66	Main2 Ant	2	349000	1745	1/1/40 MHz BW	DFT-s QPSK		23	24.5	22.97	24.67	0.474
	LTE	66	Main2 Ant	1	132322	1745	1/0/20 MHz BW	QPSK	RCV, Right Cheek, 0mm	24.5	24.5	24.8	24.8	0.244
	sub6 NR	77	Sub3 Ant	1	650000	3750	1/1/100 MHz BW	DFT-s QPSK		14.2	18.2	15.01	19.02	0.280

Note:

1. The device uncertainty of *Pmax* is +1dB/-1.5dB as provided by manufacturer.
2. The above Pmax /Plimitvalue for GPRS1900 is Frame Averaged Power for 2Tx Slots
3. The above Pmax /Plimitvalue for TDD bands LTE48, NR 77 are time average power values

7.3Time-varying Tx power measurement results

The measurement setup is shown in Figures 7-1(a), 7-1(b)and 7-1(c). The purpose of the time-varying Tx power measurement is to demonstrate the effectiveness of power limiting enforcement and that the time-averaged Tx power when represented in time-averaged 1gSAR or 10gSAR values does not exceed FCC limit as shown in Eq. (1a) and (1b), rewritten below:

$$1g\_or\_10gSAR(t) = \frac{conducted\_Tx\_power(t)}{conducted\_Tx\_power\_P_{limit}} * 1g\_or\_10gSAR\_P_{limit} \qquad (1a)$$

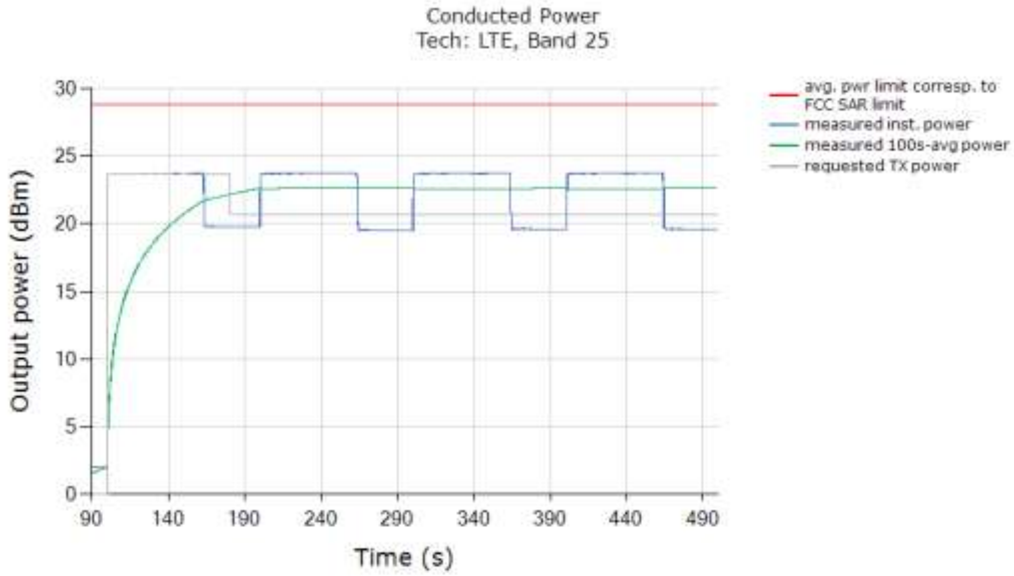
$$\frac{\frac{1}{T_{SAR}}\int_{t-T_{SAR}}^{t} 1g\_or\_10gSAR(t)dt}{FCC\ SAR\ limit} \leq 1 \qquad (1b)$$

where, *conducted_Tx_Power(t)*, *conducted_Tx_Plimit*, and 1g_or_10g SAR_P*limit* 1g_or_10gSAR_Plimit correspond to the measured instantaneous conducted Tx power, measured conducted Tx power at *Plimit*, and measured *1gSAR* and *10gSAR* values at *Plimit* reported in Part 1 test (listed in Table6-2 of this report as well).
Following the test procedure in Section 5.3, the conducted Tx power measurement for all selected configurations are reported in this section. In all the conducted Tx power plots, the dotted line represents the requested power by callbox (test sequence 1 or test sequence 2), the blue curve represents the instantaneous conducted Tx power measured using power meter, the green curve represents time-averaged power and red line represents the conducted power limit that corresponds to FCC limit of 1.6 W/kg for 1gSAR or 4.0 W/kg for 10gSAR.
Similarly, in all the 1g or 10gSAR plots (when converted using Eq. (1a)), the green curve represents the 100s time averaged 1gSAR or 10gSAR value calculated based on instantaneous 1gSAR or 10gSAR; and the red line limit represents the FCC limit of 1.6 W/kg for 1gSAR or 4.0 W/kg for 10gSAR.
Time-varying Tx power measurements were conducted on test cases #1 ~ #5 in Table 6-2, by generating test sequence 1 and test sequence 2 given in Appendix A using measured *Plimit* and measured *Pmax* for each of these test cases. Measurement results for test cases #1 ~ #5 are given in Sections 8.3.1 - 8.3.5.

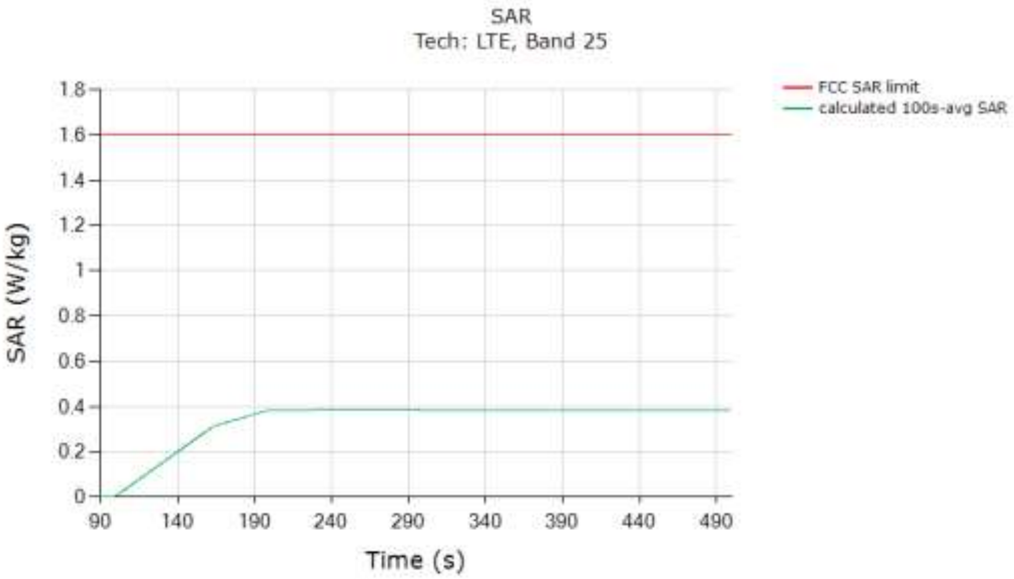
7.3.1 LTE Band 25 (test case 1 in Table 6-2)

Conducted Plot No. 1

Test result for test sequence 1:

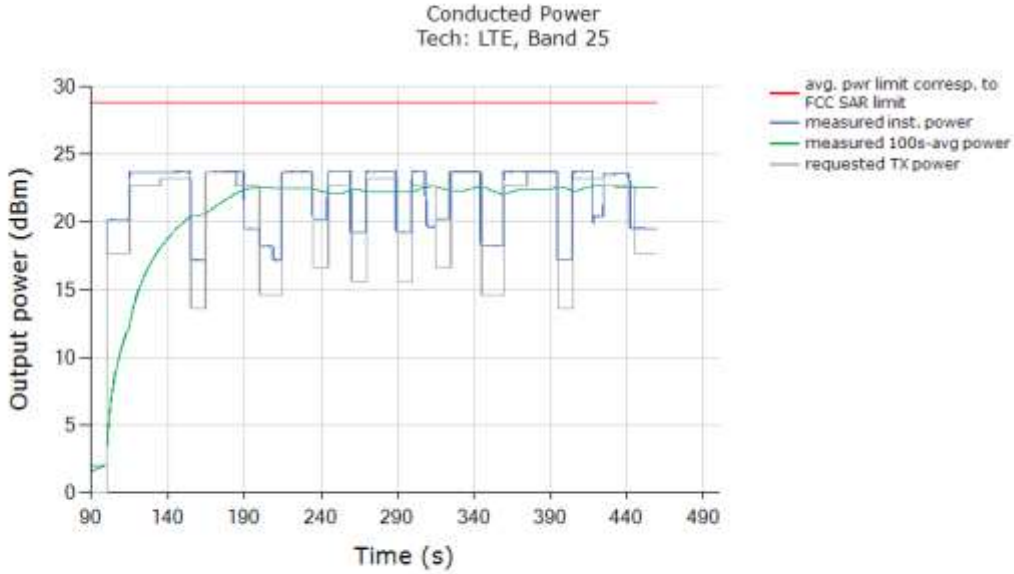


Above time-averaged conducted Tx power is converted/calculated into time-averaged 1gSAR using Equation (1a) and plotted below to demonstrate that the time-averaged 10gSAR versus time does not exceed the FCC limit of 1.6 W/kg for 1gSAR:

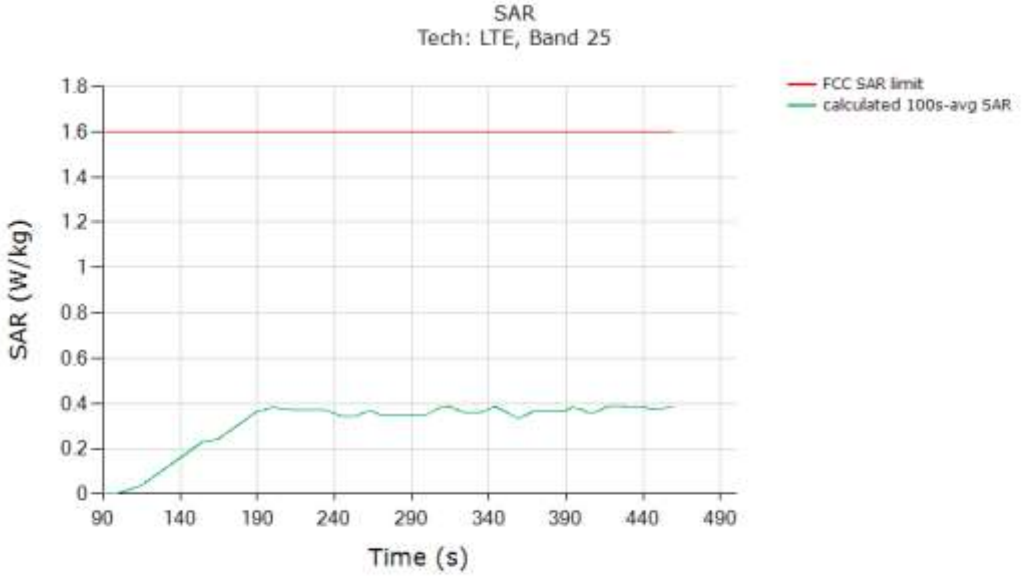


FCC 1g SAR Limit [W/kg]	1.6 W/kg
Max 100s-time averaged 1gSAR (green curve)	0.389 W/kg
Validated: Max time averaged SAR (green curve) is within 1dB device uncertainty of measured SAR at *Plimit* (last column in Table 6-2).	

Test result for test sequence 2:



Above time-averaged conducted Tx power is converted/calculated into time-averaged 1gSAR using Equation (1a) and plotted below to demonstrate that the time-averaged 1gSAR versus time does not exceed the FCC limit of 1.6 W/kg for 1gSAR:

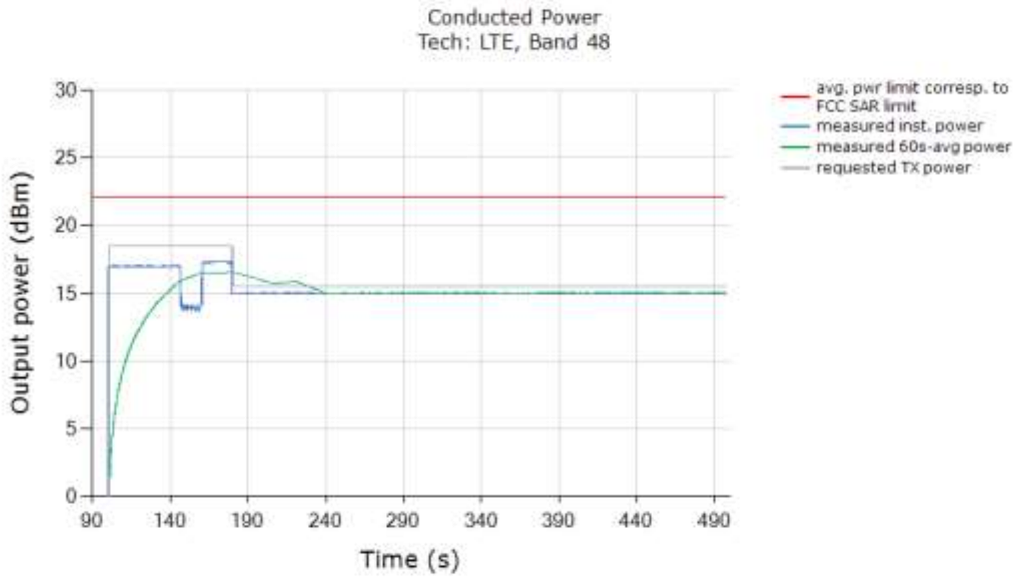


FCC 1g SAR Limit [W/kg]	1.6 W/kg
Max 100s-time averaged 1gSAR (green curve)	0.386 W/kg
Validated: Max time averaged SAR (green curve) is within 1dB device uncertainty of measured SAR at *Plimit* (last column in Table 6-2).	

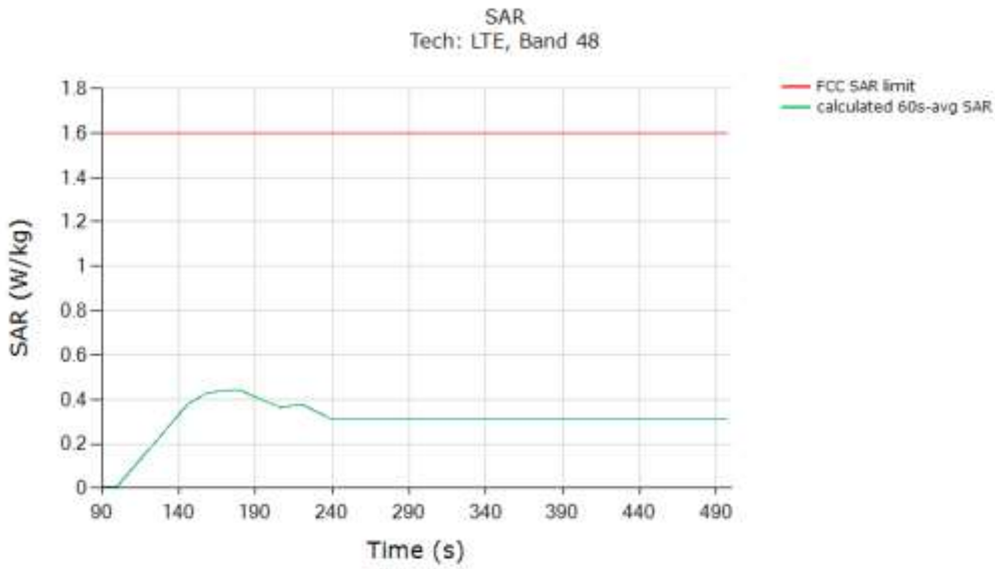
7.3.2 LTE Band 48 (test case 2 in Table 6-2)

Conducted Plot No. 2

Test result for test sequence 1:

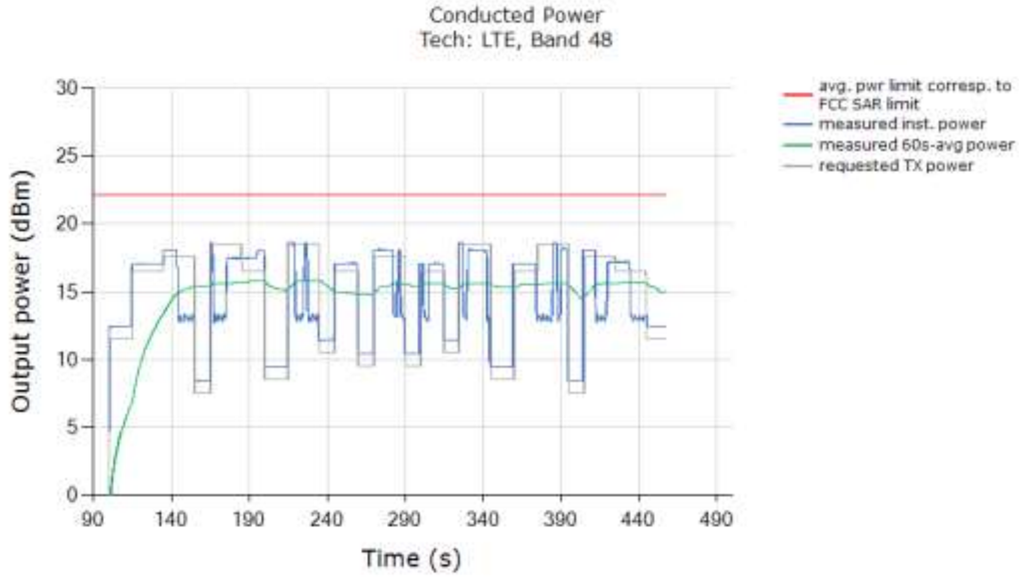


Above time-averaged conducted Tx power is converted/calculated into time-averaged 1gSAR using Equation (1a) and plotted below to demonstrate that the time-averaged 1gSAR versus time does not exceed the FCC limit of 1.6 W/kg for 1gSAR:

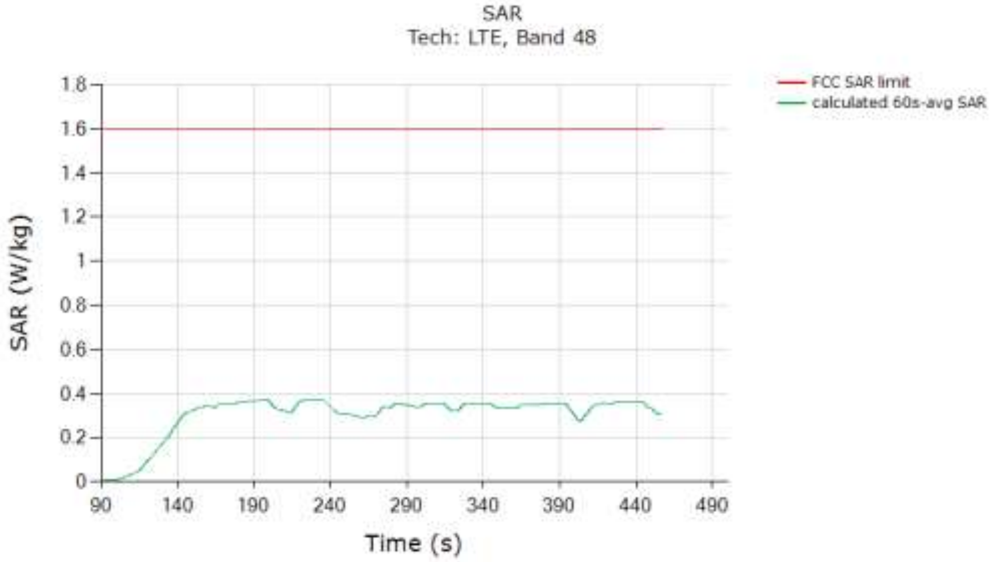


FCC 1g SAR Limit [W/kg]	1.6 W/kg
Max 60s-time averaged 10gSAR (green curve)	0.443 W/kg
Validated: Max time averaged SAR (green curve) is within 1dB device uncertainty of measured SAR at *Plimit* (last column in Table 6-2).	

Test result for test sequence 2:



Above time-averaged conducted Tx power is converted/calculated into time-averaged 10gSAR using Equation (1a) and plotted below to demonstrate that the time-averaged 1gSAR versus time does not exceed the FCC limit of 1.6 W/kg for 10gSAR:

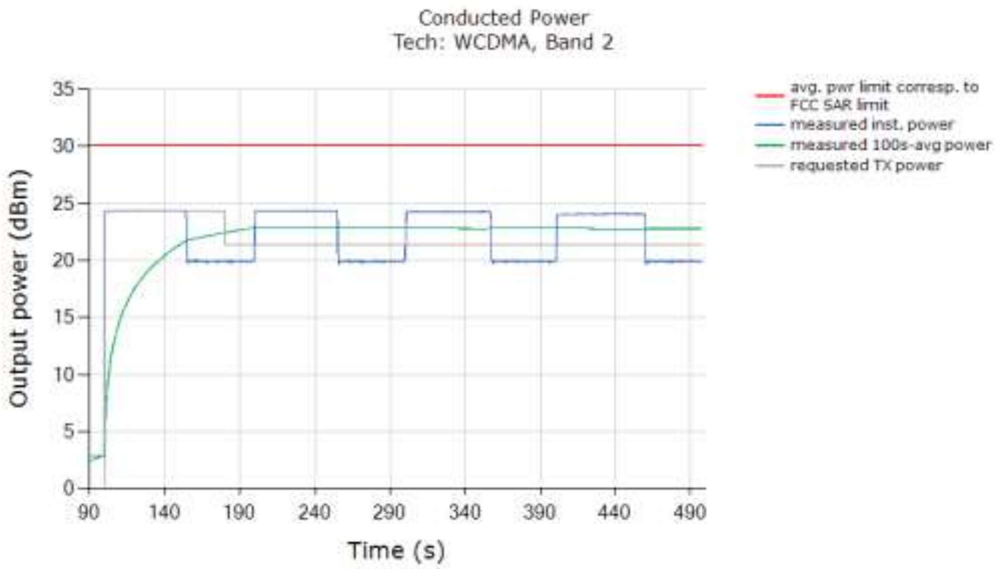


FCC 1g SAR Limit [W/kg]	1.6 W/kg
Max 60s-time averaged 10gSAR (green curve)	0.373W/kg
Validated: Max time averaged SAR (green curve) is within 1dB device uncertainty of measured SAR at *Plimit* (last column in Table 6-2).	

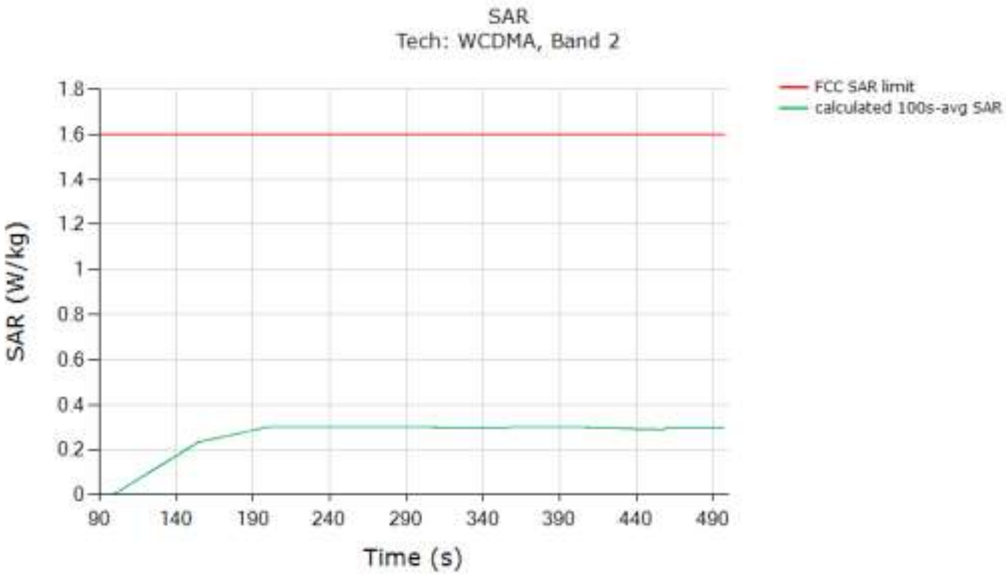
7.3.3 UMTS Band 2 (test case 3 in Table 6-2)

Conducted Plot No. 3

Test result for test sequence 1

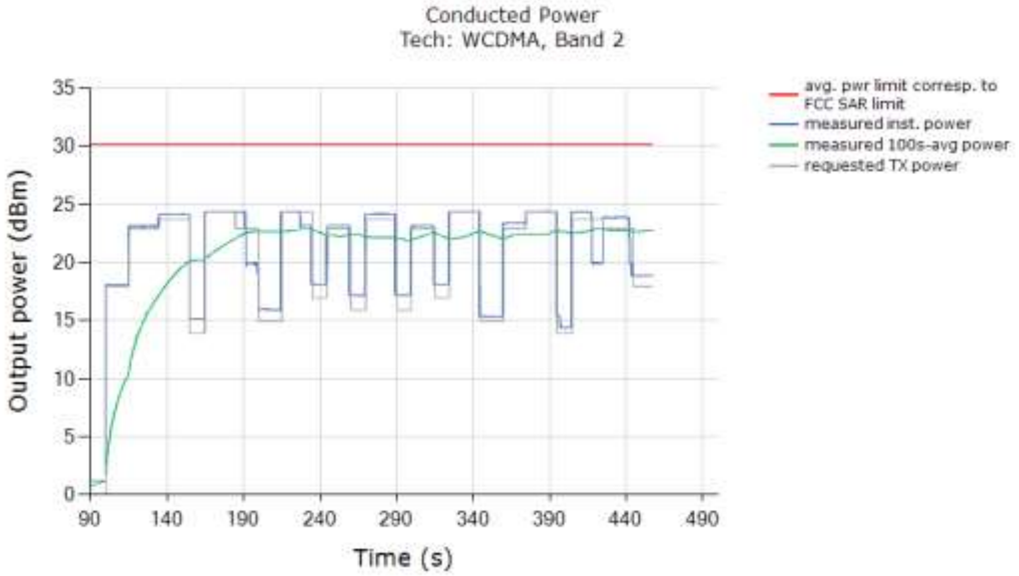


Above time-averaged conducted Tx power is converted/calculated into time-averaged 1gSAR using Equation (1a) and plotted below to demonstrate that the time-averaged 1gSAR versus time does not exceed the FCC limit of 1.6 W/kg for 1gSAR:

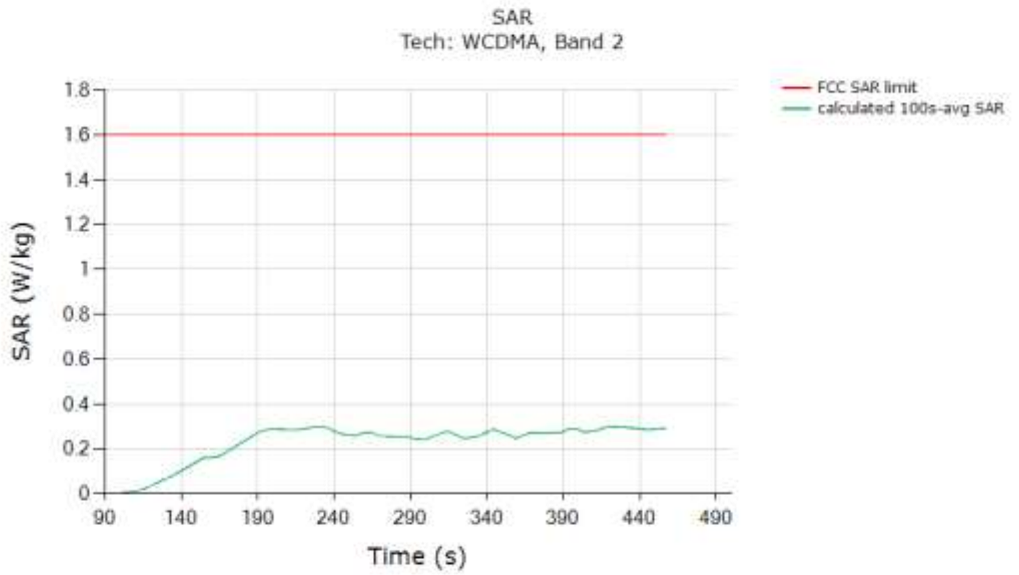


FCC 1g SAR Limit [W/kg]	1.6 W/kg
Max 100s-time averaged 1gSAR (green curve)	0.299 W/kg
Validated: Max time averaged SAR (green curve) is within 1dB device uncertainty of measured SAR at *Plimit* (last column in Table 6-2).	

Test result for test sequence 2:



Above time-averaged conducted Tx power is converted/calculated into time-averaged 1gSAR using Equation (1a) and plotted below to demonstrate that the time-averaged 1gSAR versus time does not exceed the FCC limit of 1.6 W/kg for 1gSAR:

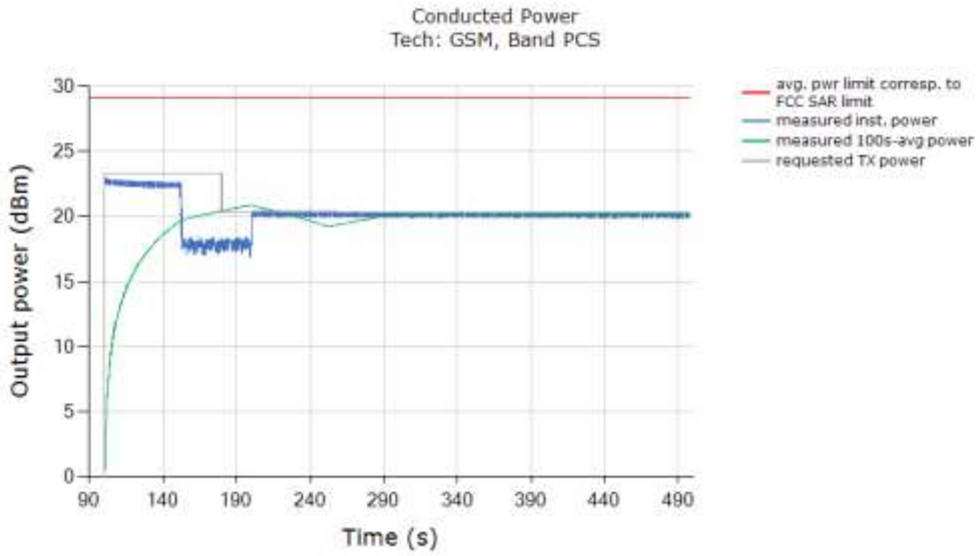


FCC 1g SAR Limit [W/kg]	1.6 W/kg
Max 100s-time averaged 1gSAR (green curve)	0.298 W/kg
Validated: Max time averaged SAR (green curve) is within 1dB device uncertainty of measured SAR at *Plimit* (last column in Table 6-2).	

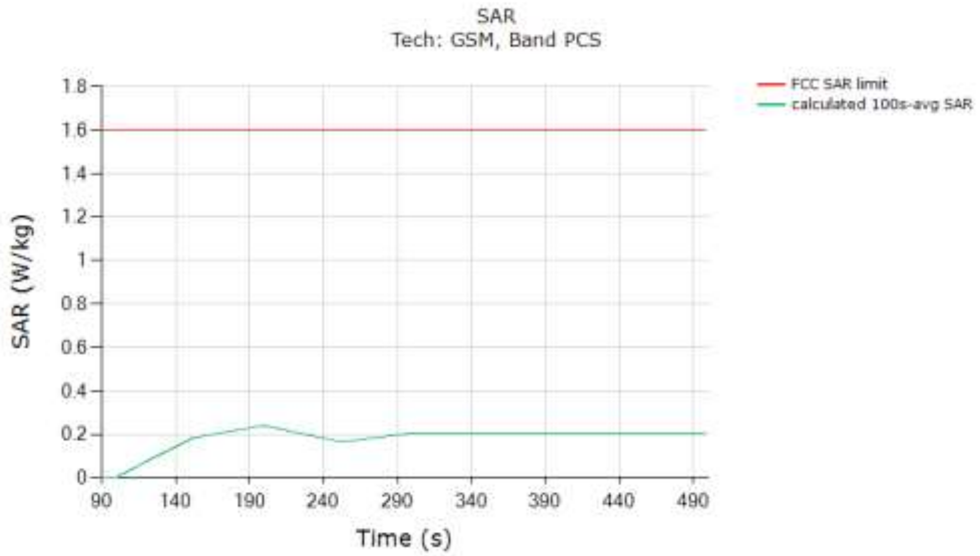
7.3.4 GSM/GPRS/EDGE/1900 (test case 4 in Table 6-2)

Conducted Plot No. 4

Test result for test sequence 1

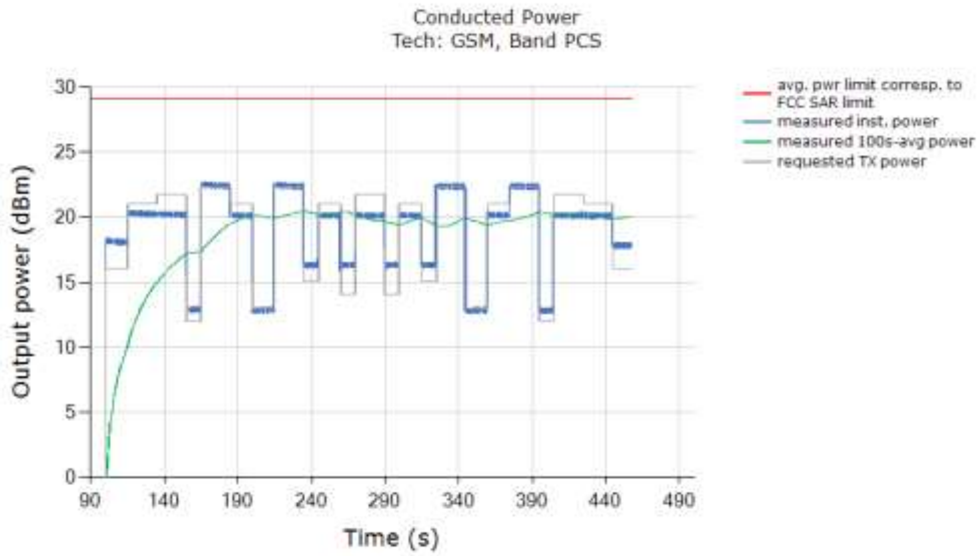


Above time-averaged conducted Tx power is converted/calculated into time-averaged 1gSAR using Equation (1a) and plotted below to demonstrate that the time-averaged 1gSAR versus time does not exceed the FCC limit of 1.6 W/kg for 1gSAR:

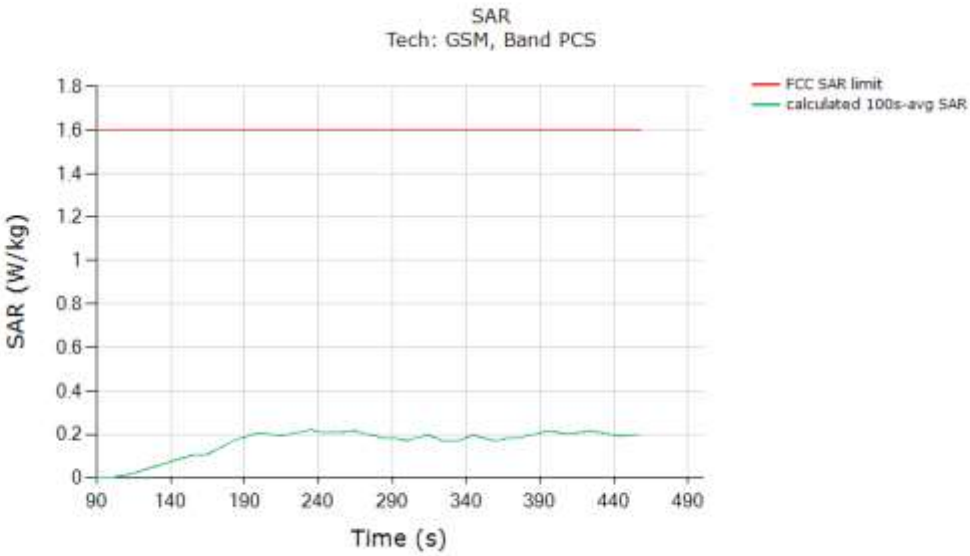


FCC 1g SAR Limit [W/kg]	1.6 W/kg
	0.240 W/kg
Validated: Max time averaged SAR (green curve) is within 1dB device uncertainty of measured SAR at *Plimit* (last column in Table 6-2).	

Test result for test sequence 2:



Above time-averaged conducted Tx power is converted/calculated into time-averaged 1gSAR using Equation (1a) and plotted below to demonstrate that the time-averaged 1gSAR versus time does not exceed the FCC limit of 1.6 W/kg for 1gSAR:

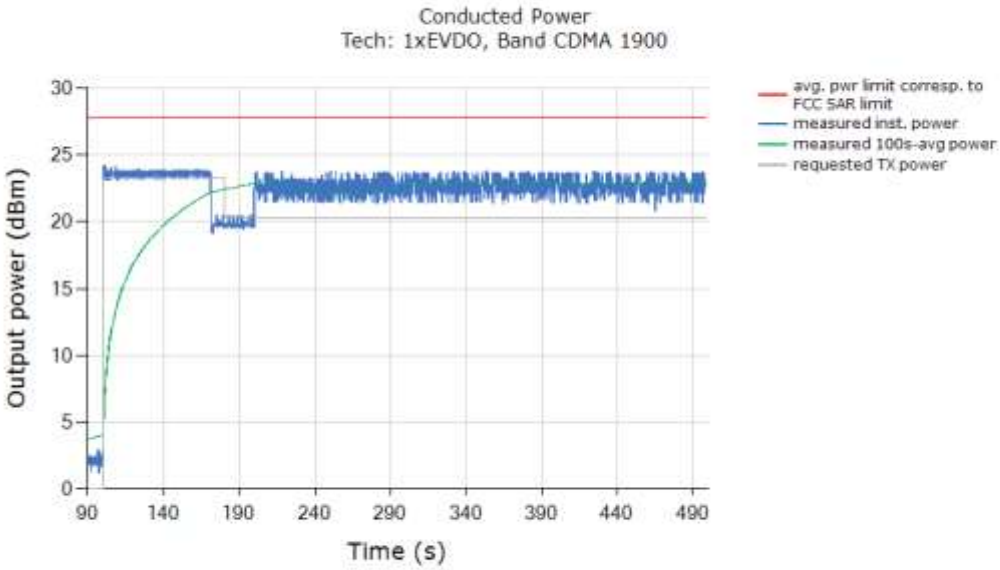


FCC 1g SAR Limit [W/kg]	1.6 W/kg
Max 100s-time averaged 1gSAR (green curve)	0.219 W/kg
Validated: Max time averaged SAR (green curve) is within 1dB device uncertainty of measured SAR at *Plimit* (last column in Table 6-2).	

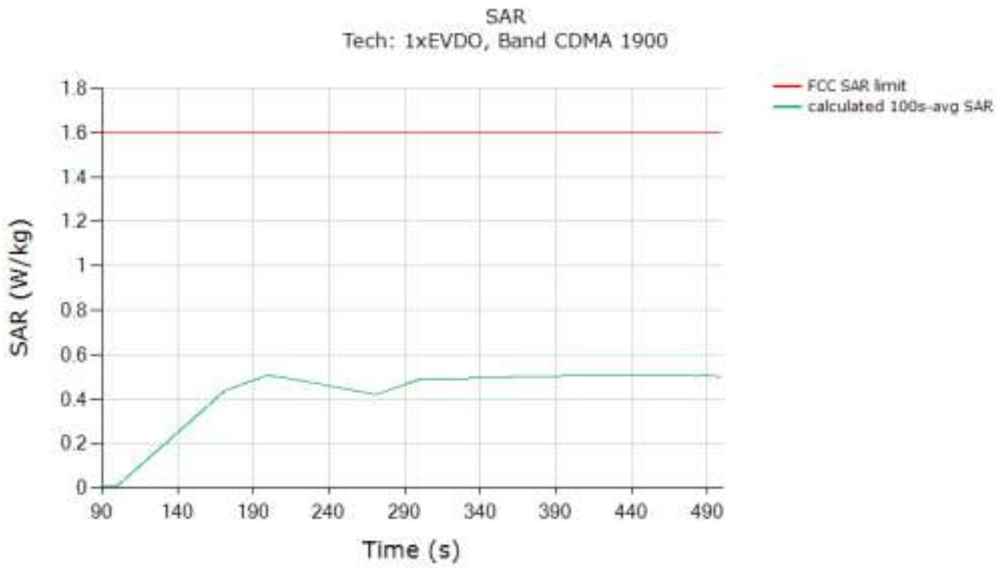
7.3.5 PCS CDMA EVDO (test case 5 in Table 6-2)

Conducted Plot No. 5

Test result for test sequence 1

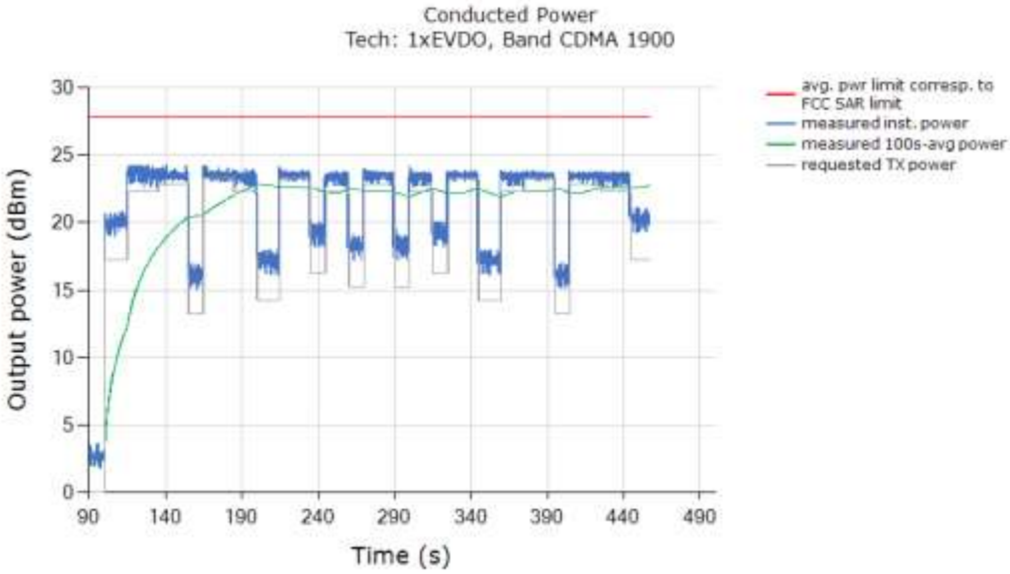


Above time-averaged conducted Tx power is converted/calculated into time-averaged 1gSAR using Equation (1a) and plotted below to demonstrate that the time-averaged 1gSAR versus time does not exceed the FCC limit of 1.6 W/kg for 1gSAR:

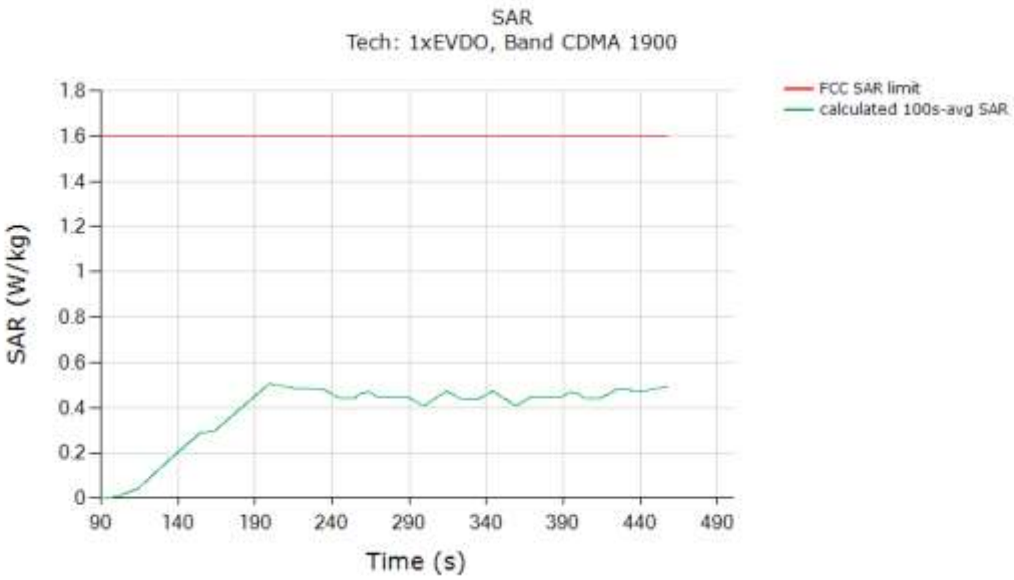


FCC 1g SAR Limit [W/kg]	1.6 W/kg
Max 100s-time averaged 1gSAR (green curve)	0.508 W/kg
Validated: Max time averaged SAR (green curve) is within 1dB device uncertainty of measured SAR at *Plimit* (last column in Table 6-2).	

Test result for test sequence 2:



Above time-averaged conducted Tx power is converted/calculated into time-averaged 1gSAR using Equation (1a) and plotted below to demonstrate that the time-averaged 10gSAR versus time does not exceed the FCC limit of 1.6 W/kg for 1gSAR:

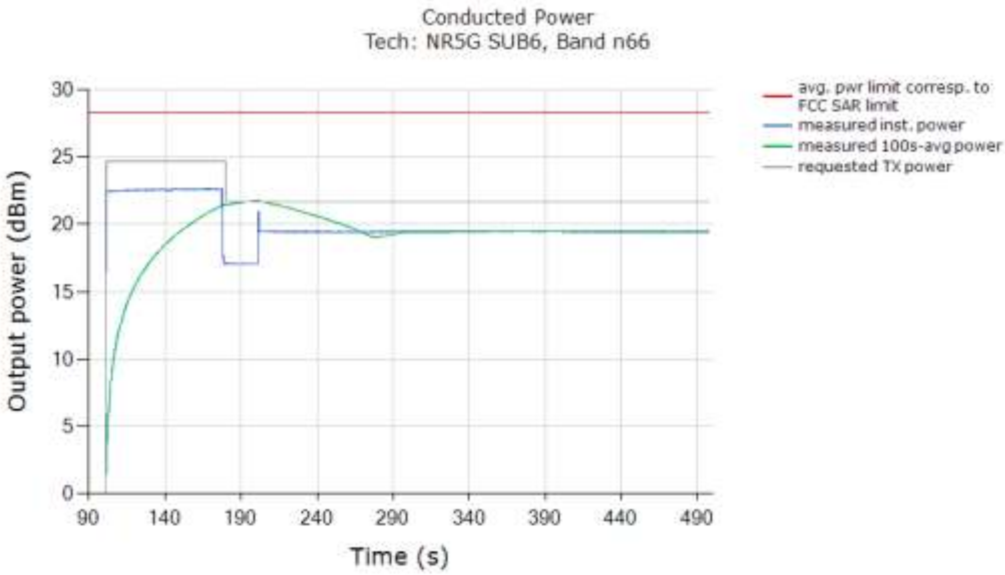


FCC 1g SAR Limit [W/kg]	1.6 W/kg
Max 100s-time averaged 1gSAR (green curve)	0.505 W/kg
Validated: Max time averaged SAR (green curve) is within 1dB device uncertainty of measured SAR at *Plimit* (last column in Table 6-2).	

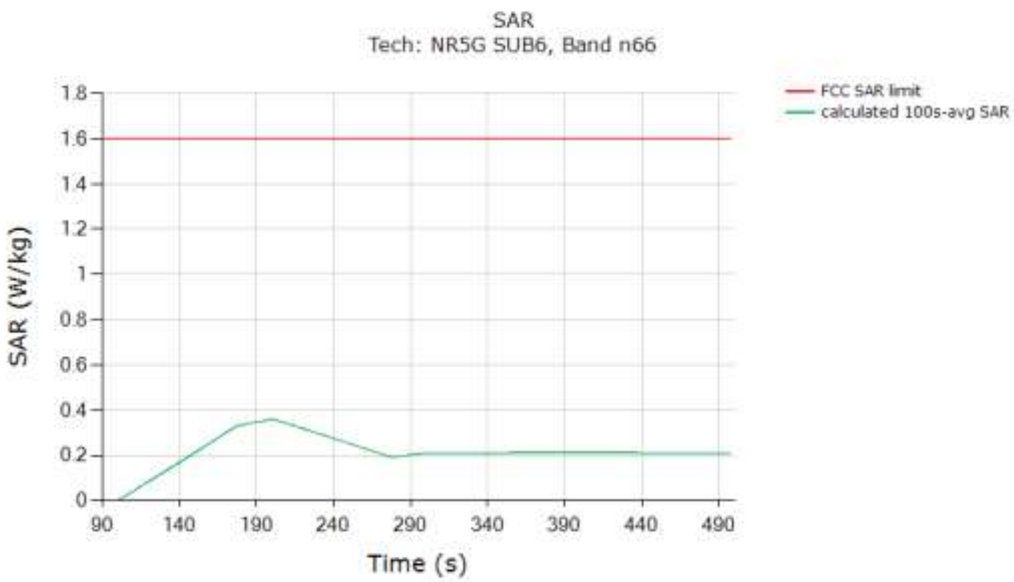
8.3.6Sub6 NR n66 (test case 6 in Table 6-2)

Conducted Plot No. 6

Test result for test sequence 1

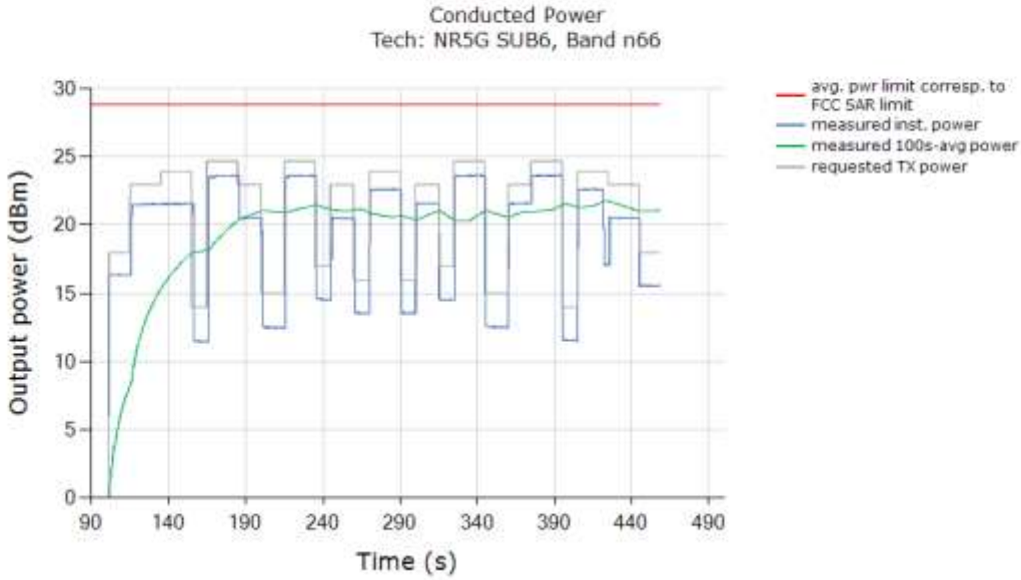


Above time-averaged conducted Tx power is converted/calculated into time-averaged 1gSAR using Equation (1a) and plotted below to demonstrate that the time-averaged 1gSAR versus time does not exceed the FCC limit of 1.6 W/kg for 1gSAR:

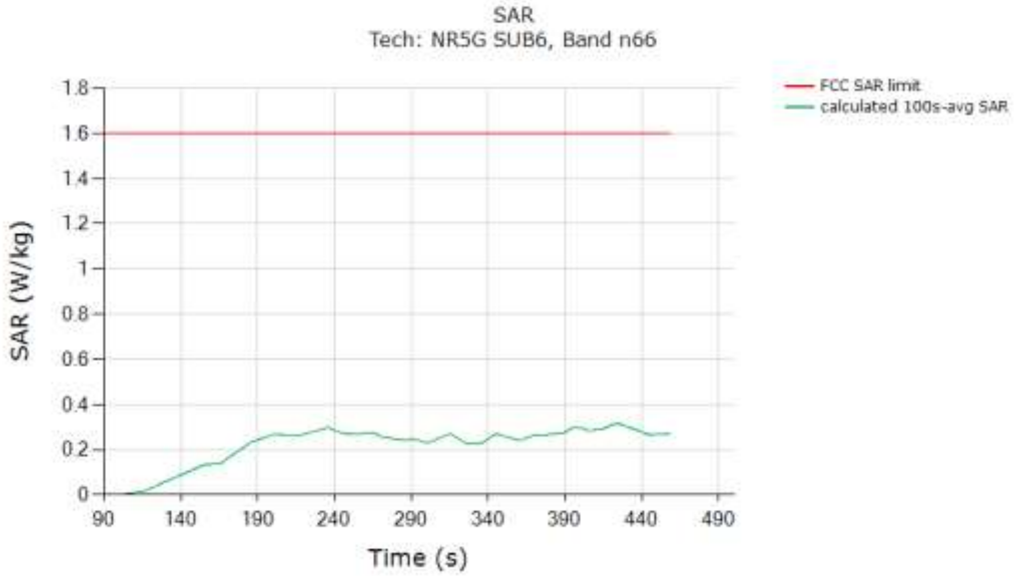


FCC 1g SAR Limit [W/kg]	1.6 W/kg
Max 100s-time averaged 1g SAR (green curve)	0.358 W/kg
Validated: Max time averaged SAR (green curve) is within 1dB device uncertainty of measured SAR at *Plimit* (last column in Table 6-2).	

Test result for test sequence 2:



Above time-averaged conducted Tx power is converted/calculated into time-averaged 1gSAR using Equation (1a) and plotted below to demonstrate that the time-averaged 1gSAR versus time does not exceed the FCC limit of 1.6 W/kg for 1gSAR:

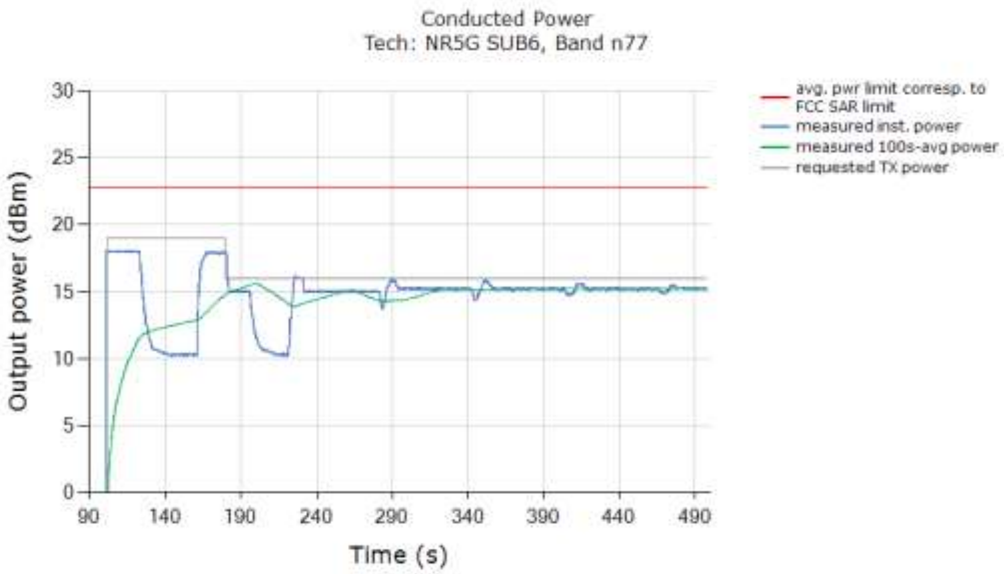


FCC 1g SAR Limit [W/kg]	1.6 W/kg
Max 100s-time averaged 1gSAR (green curve)	0.314 W/kg
Validated: Max time averaged SAR (green curve) is within 1dB device uncertainty of measured SAR at *Plimit* (last column in Table 6-2).	

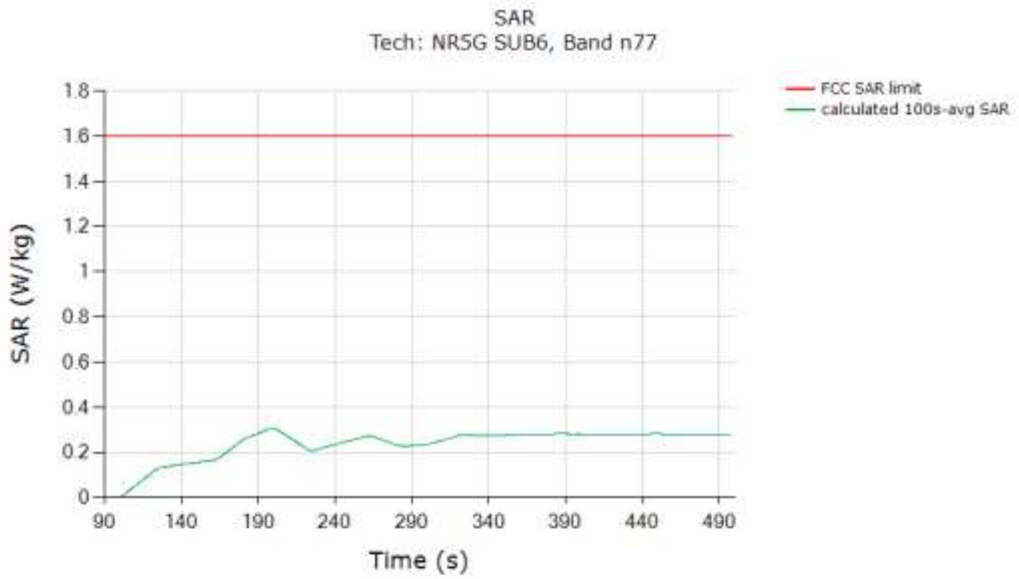
8.3.7Sub6 NR n77 (test case 6 in Table 6-2)

Conducted Plot No. 7

Test result for test sequence 1

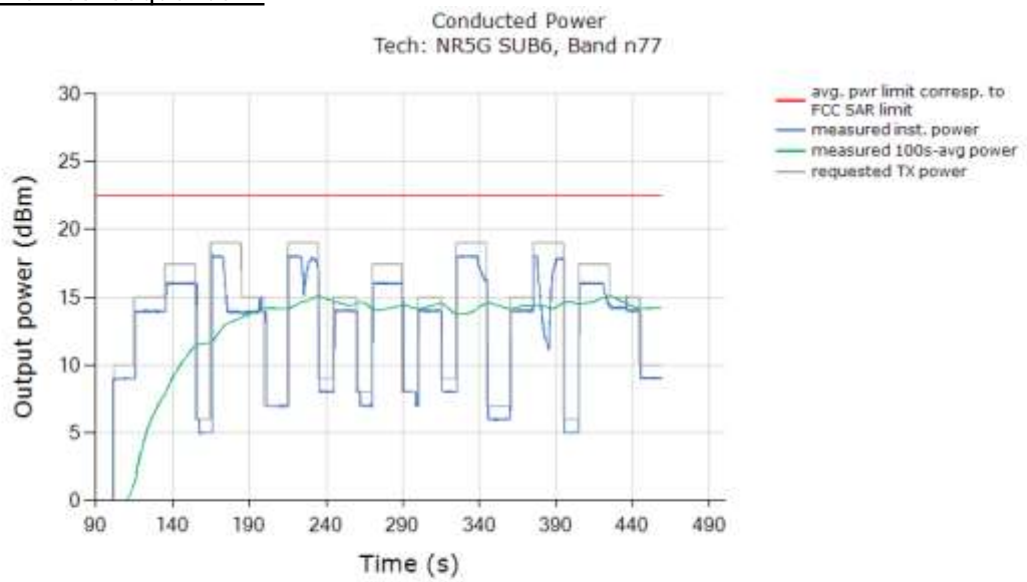


Above time-averaged conducted Tx power is converted/calculated into time-averaged 1gSAR using Equation (1a) and plotted below to demonstrate that the time-averaged 1gSAR versus time does not exceed the FCC limit of 1.6 W/kg for 1gSAR:

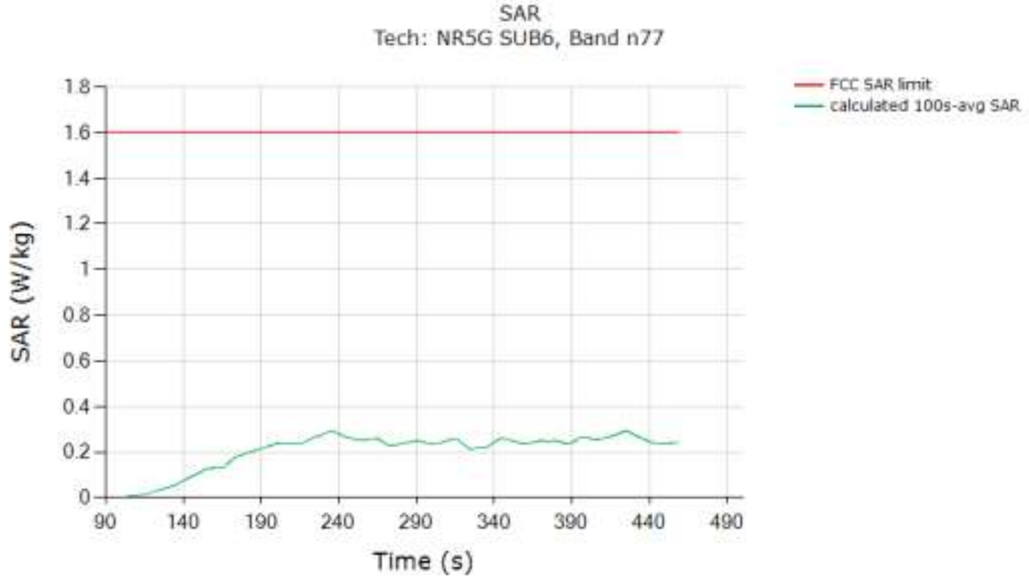


FCC 1g SAR Limit [W/kg]	1.6 W/kg
Max 100s-time averaged 1g SAR (green curve)	0.307 W/kg
Validated: Max time averaged SAR (green curve) is within 1dB device uncertainty of measured SAR at *Plimit* (last column in Table 6-2).	

Test result for test sequence 2:



Above time-averaged conducted Tx power is converted/calculated into time-averaged 1gSAR using Equation (1a) and plotted below to demonstrate that the time-averaged 1gSAR versus time does not exceed the FCC limit of 1.6 W/kg for 1gSAR:



FCC 1g SAR Limit [W/kg]	1.6 W/kg
Max 100s-time averaged 1gSAR (green curve)	0.293 W/kg
Validated: Max time averaged SAR (green curve) is within 1dB device uncertainty of measured SAR at *Plimit* (last column in Table 6-2).	

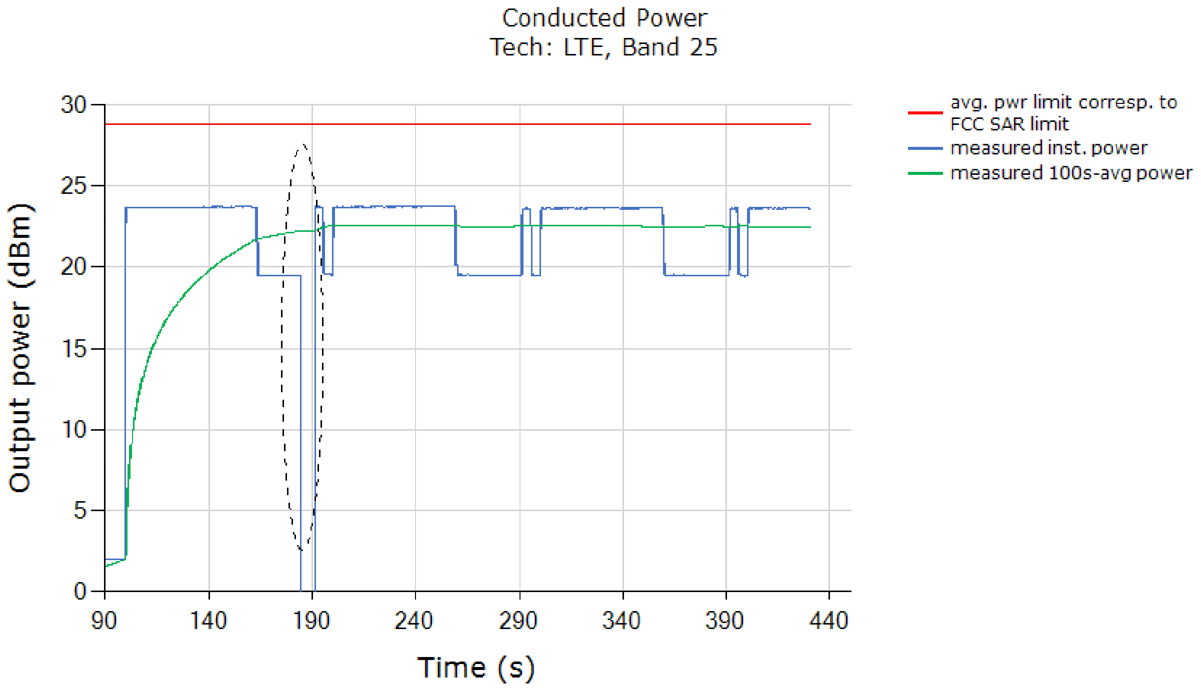
7.4 Change in Call Test results (test case 7 in Table 6-2)

This test was measured with LTE B25, DSI=2, and with callbox requesting maximum power. The call drop was manually performed when the EUT is transmitting at *Preserve* level as shown in the plot below (dotted black region). The measurement setup is shown in Figure 7-1(a) and (c). The detailed test procedure is described in Section 5.3.2.

Conducted Plot No. 8

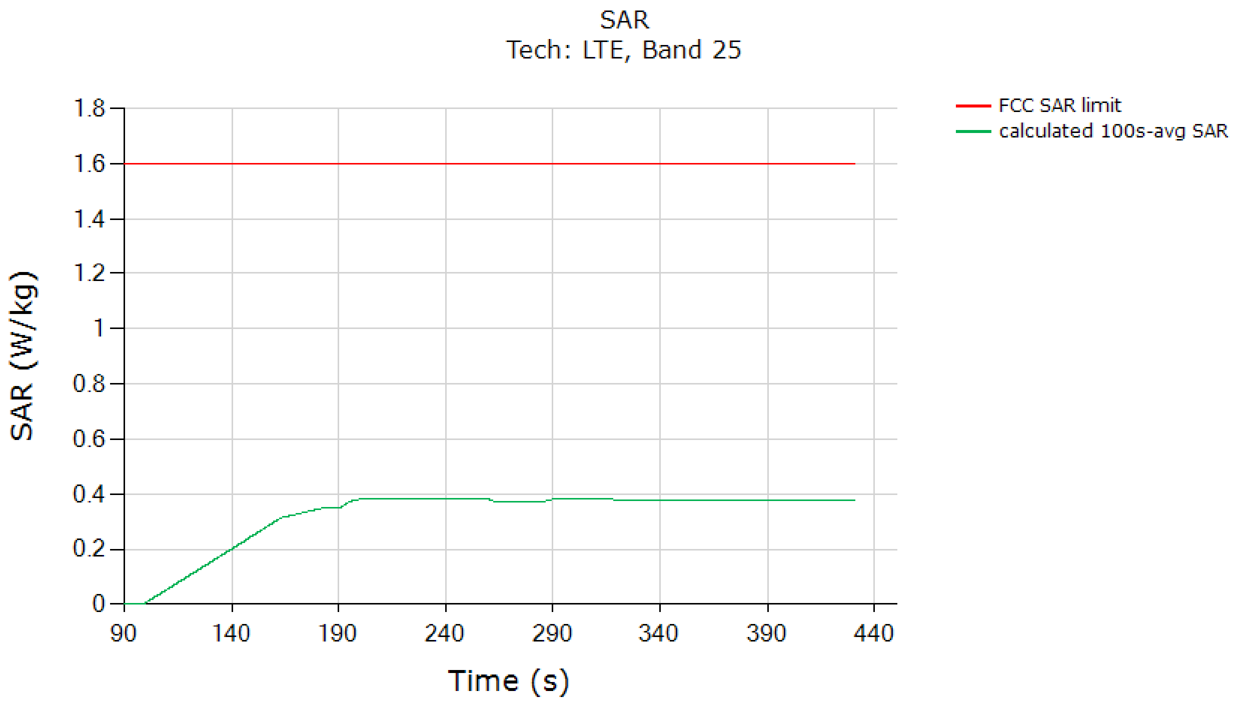
Call drop test result:

Plot 1: Measured Tx power (dBm) versus time shows that the transmitting power kept the same *Preserve* level of LTE B25 after the call was re-established:



Note: The power level after the change in call kept the same *Preserve* level of LTE B25. The conducted power plot shows expected Tx transition.

Plot 2: Above time-averaged conducted Tx power is converted/calculated into time-averaged 1gSAR using Equation (1a) and plotted below to demonstrate that the time-averaged 1gSAR versus time does not exceed the FCC limit of 1.6 W/kg for 1gSAR:



FCC 1g SAR Limit [W/kg]	1.6 W/kg
Max 100s-time averaged 1gSAR (green curve)	0.382 W/kg
Validated: Max time averaged SAR (green curve) is within 1dB device uncertainty of measured SAR at *Plimit* (last column in Table 6-2).	

The test result validated the continuity of power limiting in call change scenario.

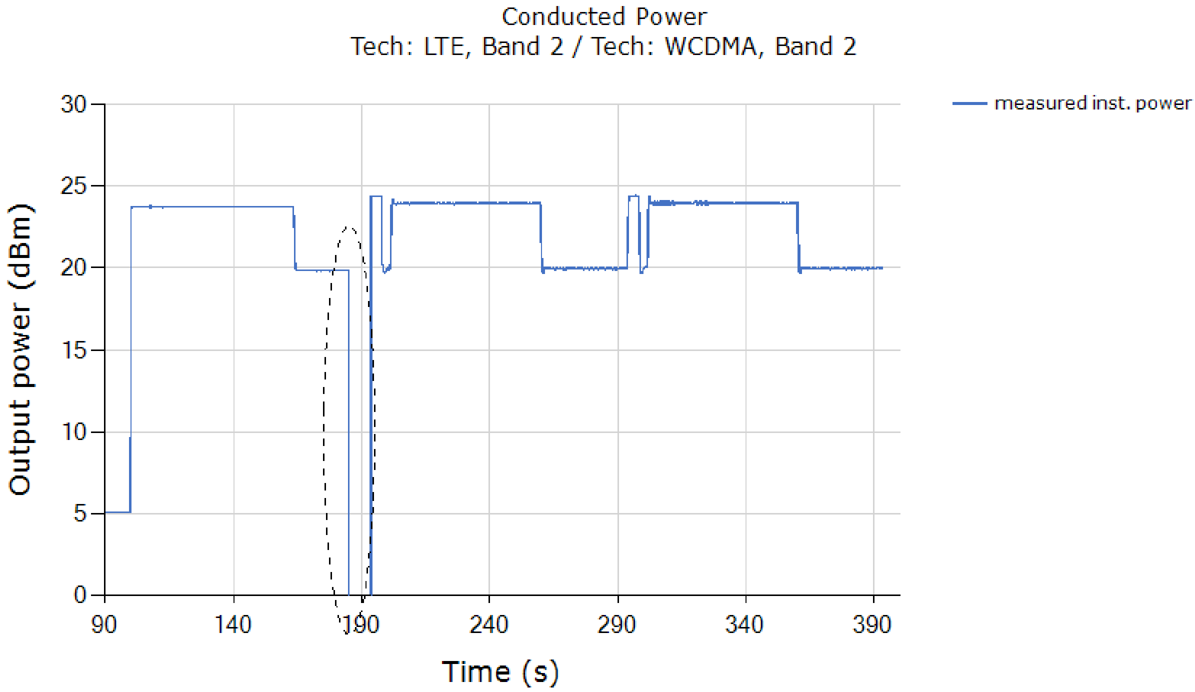
7.5 Change in technology/band test results (test case 8 in Table 6-2)

This test was conducted with callbox requesting maximum power, and with technology switch from LTE B25, DSI = 2 (Hotspot) to UMTS B2, DSI =2 (Hotspot). Following procedure detailed in Section 5.3.3, and using the measurement setup shown in Figure 7-1(a) the technology/band switch was performed when the EUT is transmitting at *Preserve* level as shown in the plot below (dotted black region).

Conducted Plot No. 9

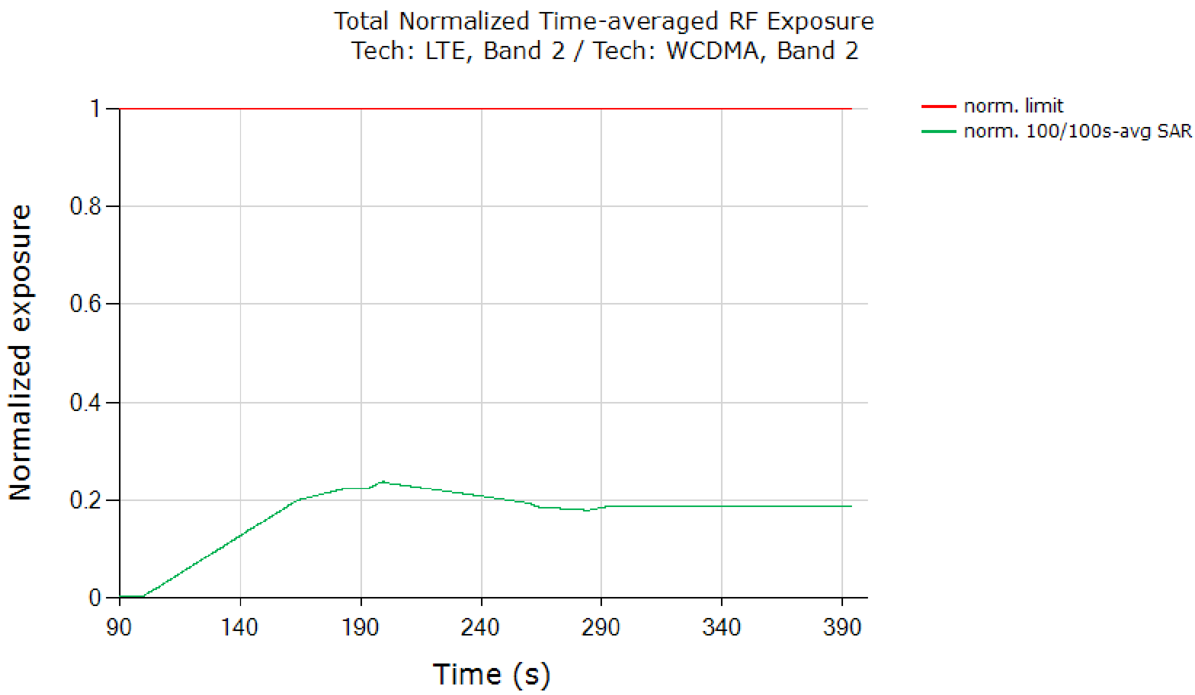
Test result for change in technology/band:

Plot 1: Measured Tx power (dBm) versus time shows that the transmitting power changed from LTE B25, DSI =2*Preserve* level to UMTS B2, DSI = 2*Preserve* level (within 1dB device uncertainty):



Note: As per Part 1 report, *Reserve_power_margin*= 3dB. Based on Table 6-1, EFS *Plimit* = 22 dBm for LTE B25 (DSI=2), and EFS *Plimit* = 22.5 dBm for UMTS B2 (DSI=2), it can be seen from above plot that the difference in *Preserve* (= *Plimit – 3dB Reserve_power_margin*) power level corresponds to the expected difference in *Plimit* levels of 1dB (within 1dB of sub6 radio design related uncertainty). Therefore, the conducted power plot shows expected transition in Tx power.

Plot 2: All the time-averaged conducted Tx power measurement results were converted into time-averaged normalized SAR values using Equation (6a), (6b) and (6c), and plotted below to demonstrate that the time-averaged normalized SAR versus time does not exceed the normalized FCC limit of 1.0:



FCC normalized SAR limit	1.0
Max 100s-time averaged normalized SAR(green curve)	0.238
Validated:	

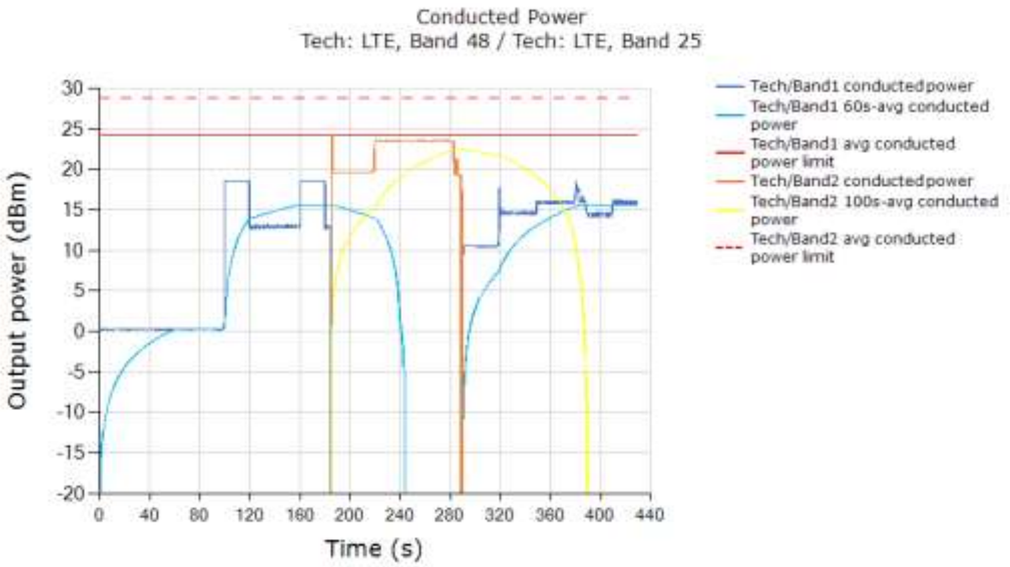
The test result validated the continuity of power limiting in technology/band switch scenario.

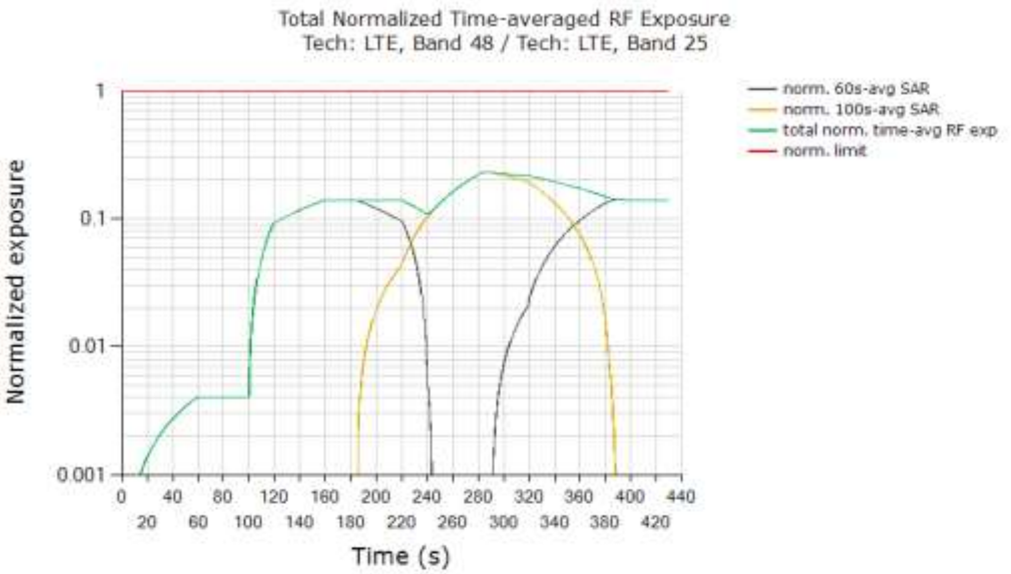
7.6 Change in antenna switch test results (test case 10 in Table 6-2)

This test was conducted with callbox requesting maximum power, and with antenna switch between LTE B48, AntennaSub3 Antenna(60s), DSI = 1and LTE B25, Main2 Antenna(100s), DSI = 2. Following procedure detailed in Section 5.3.6, and using the measurement setup shown in Figure 7-1(b) the tech/band/antenna switch was performed when the EUT is transmitting at *Preserve* level.

7.6.1 Test case 1 : transition from LTE B48 to LTE B25 (i.e 60s to 100s) then back to LTE B48

Conducted Plot No.10

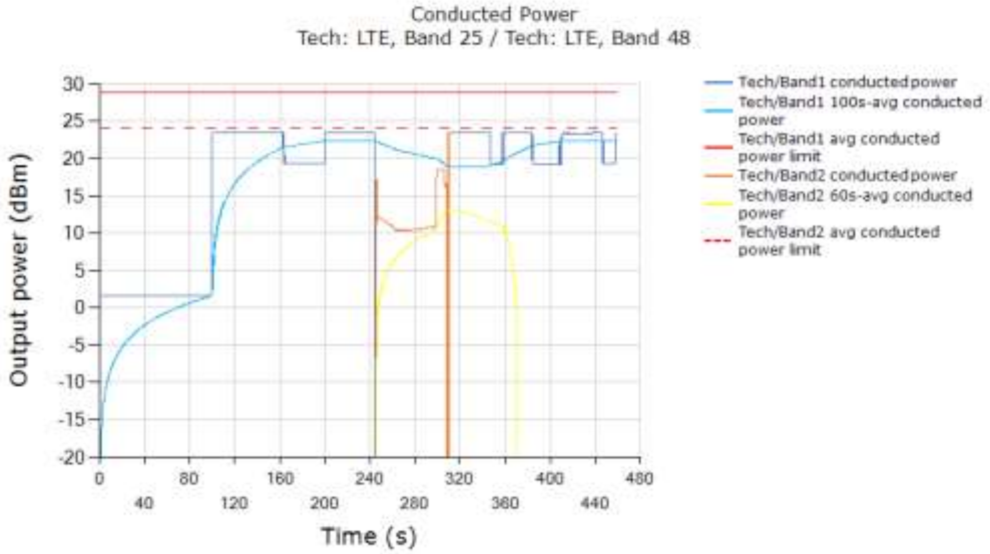


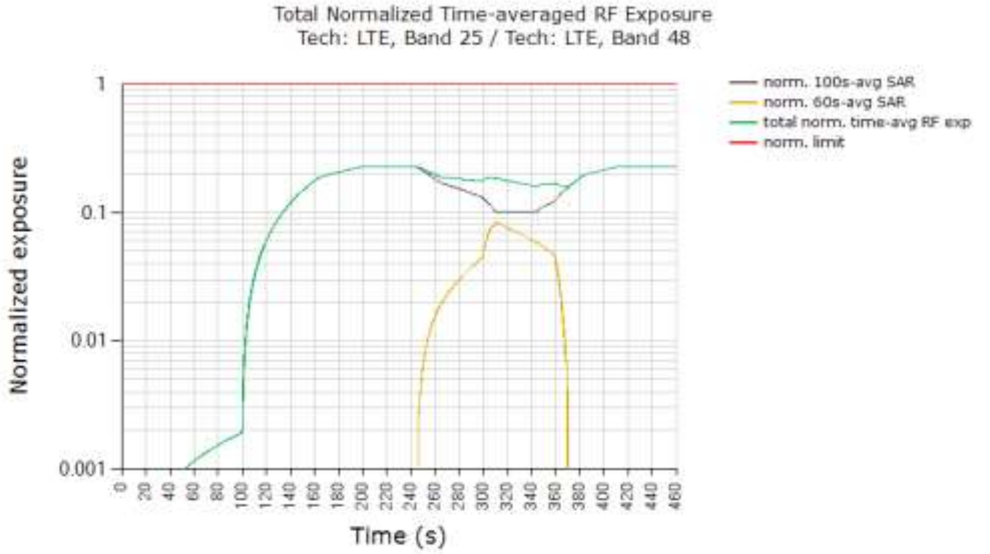


FCC normalized total exposure limit	1.0
Max Norm. Total time-avg. SAR (green curve) (green curve)	0.233
Validated:	

7.6.2Test case 2 : transition from LTE B25 to LTE B48 (i.e 100s to 60s) then back to LTE B25

Conducted Plot No.11



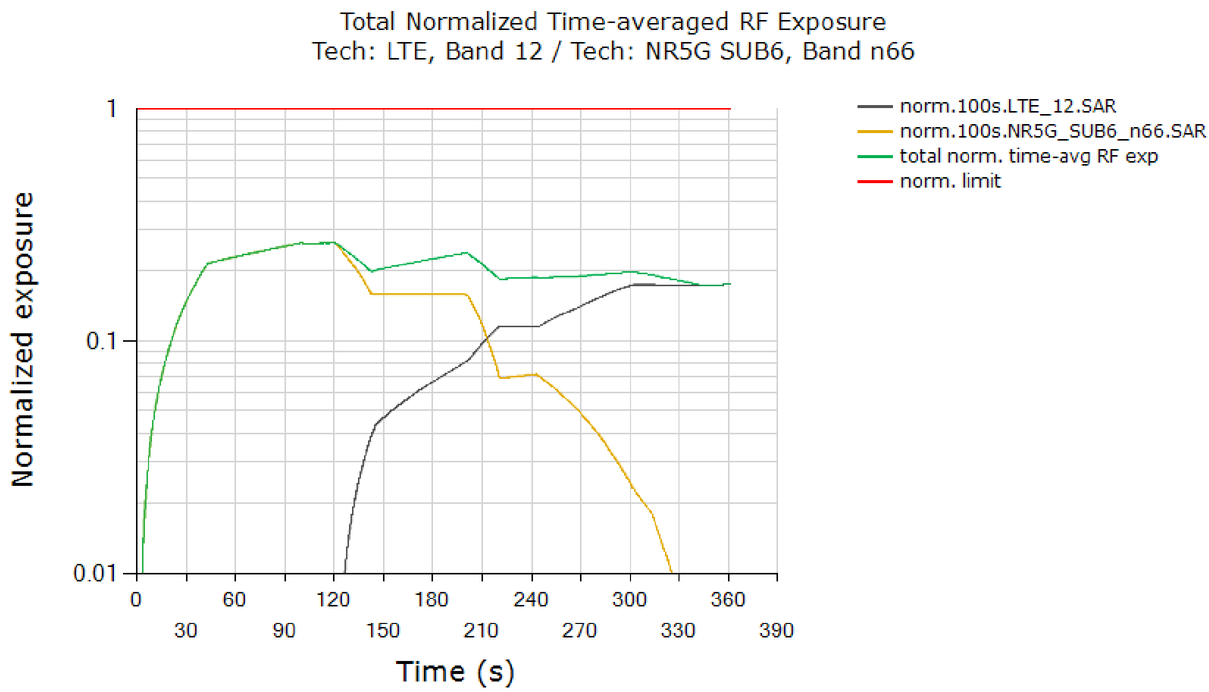


FCC normalized total exposure limit	1.0
Max Norm. Total time-avg. SAR (green curve) (green curve)	0.228
Validated:	

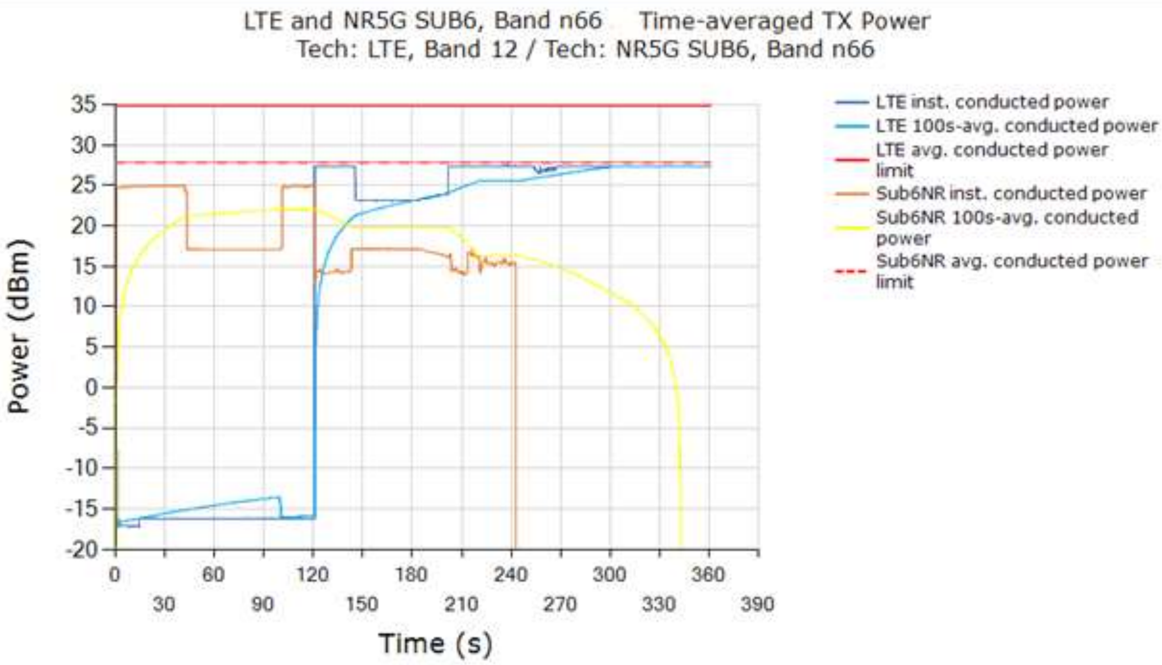
7.7.1 Switch in SAR exposure test results (test case 11 in Table 6-2)

This test was conducted with callbox requesting maximum power, and with the EUT in LTE B12 + Sub6 NR Band n66 call. Here, LTE B12, DSI = 2 (100s window, EFS *Plimit* = 23.5 dBm, *Pmax* = 23.5 dBm, measured *Plimit* = 23.34 dBm), and Sub6 NR Band n66, DSI = 2 (100s window, *Plimit* = 23.0 dBm in EFS setting, EUT's average *Pmax* = 24.5 dBm, measured *Plimit* = 22.97dBm). Following procedure detailed in Section 5.3.7 and Appendix B.2, and using the measurement setup shown in Figure 6-1(c) since LTE and Sub6 NR are sharing the same antenna port. The SAR exposure switch measurement is performed with the EUT in various SAR exposure scenarios, i.e., in SAR_{sub6NR} only scenario (t =10s ~125s), SAR_{su6NR} + SAR_{LTE} scenario (t =125s ~ 245s) and SAR_{LTE} only scenario (t >245s).

Conducted Plot No.12



Plot 2: All the conducted Tx power measurement results were converted into time-averaged normalized SAR values using Equation (7a), (7b) and (7c), and plotted below to demonstrate that the time-averaged normalized SAR versus time does not exceed the FCC limit of 1 unit. Equation (7a) is used to convert the LTE Tx power of device to obtain 100s-averaged normalized SAR in LTE B12 as shown in black curve. Similarly, equation (7b) is used to obtain 100s-averaged normalized SAR in Sub6 NR n66 as shown in orange curve. Equation (7c) is used to obtain total time-averaged normalized SAR as shown in green curve (i.e., sum of black and orange curves).



FCC normalized total exposure limit	1.0
Max Norm. Total time-avg. SAR (green curve) (green curve)	0.264
Validated:	

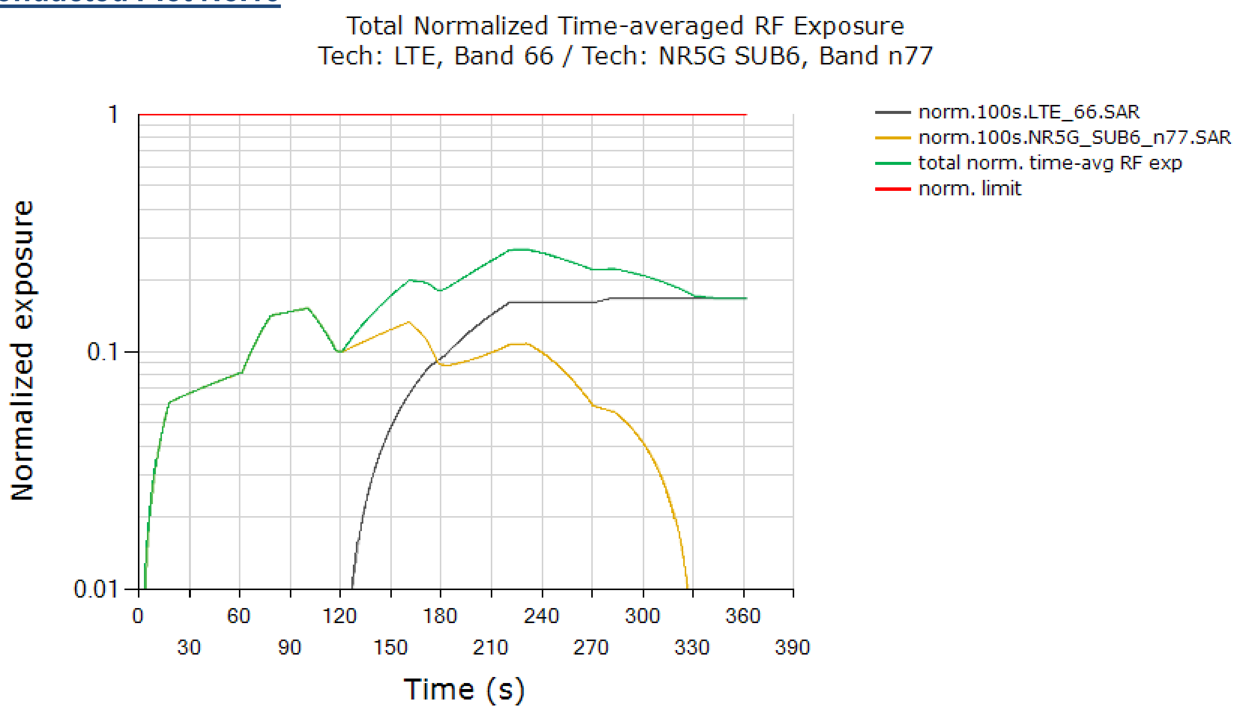
Plot Notes:

Device starts predominantly in Sub6 NR SAR exposure scenario between 5s and 125s, and in LTE SAR + Sub6 NR SAR exposure scenario between 125s and 245s, and in predominantly in LTE SAR exposure scenario after t=245s. Here, Smart Transmit allocates a maximum of 75% of exposure margin (based on 3dB reserve margin setting) for Sub6 NR. This corresponds to a normalized 1gSAR exposure value = 75% * 0.474W/kg measured SAR at Sub6 NR *Plimit* / 1.6W/kg limit = 0.222± 1dB device related uncertainty (see orange curve between 5s~125s). For predominantly LTE SAR exposure scenario, maximum normalized 1gSAR exposure should correspond to 100% exposure margin = 0.250 W/kg measured SAR at LTE *Plimit* / 1.6W/kg limit = 0.156 ± 1dB device related uncertainty (see black curve after t =245s).
Additionally, in SAR exposure switch test, at all times the total time-averaged normalized RF exposure (green curve) should not exceed normalized SAR_design_target + 1dB device uncertainty. In this test, with a maximum normalized SAR of 0.264 being ≤ 0.79 (= 1/1.6 + 1dB device uncertainty), the above test result validated the continuity of power limiting in SAR exposure switch scenario.

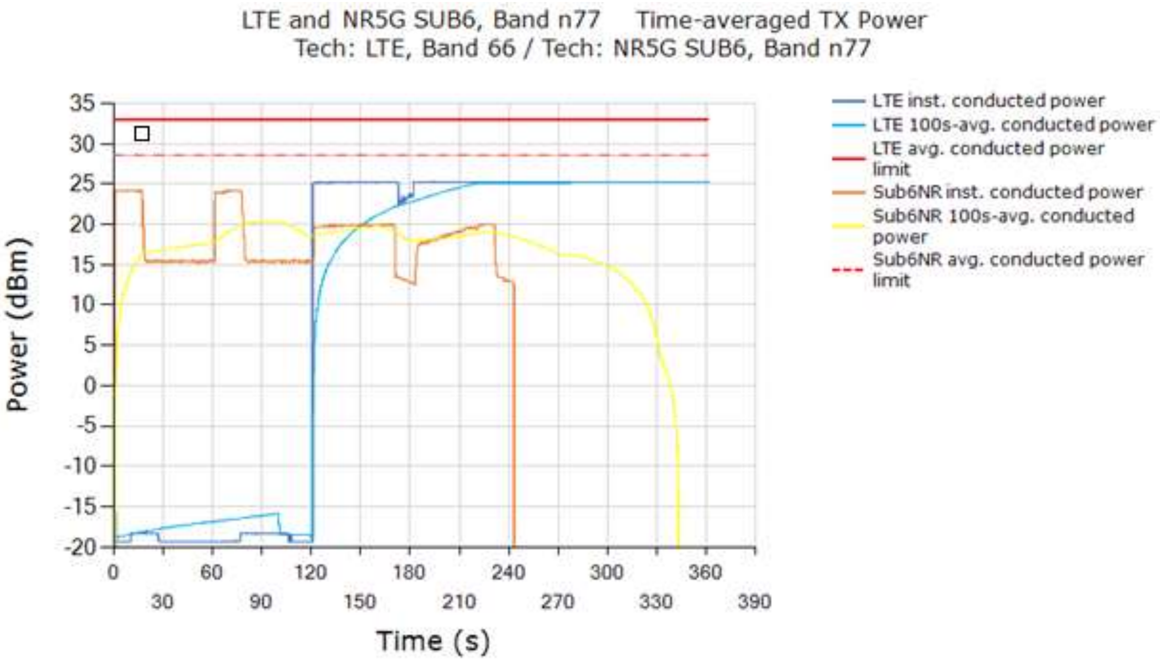
7.7.2 Switch in SAR exposure test results (test case 11 in Table 6-2)

This test was conducted with callbox requesting maximum power, and with the EUT in LTE B66 + Sub6 NR Band n77 call. Here, LTE B66, DSI = 1 (100s window, EFS *Plimit* = 24.5 dBm, *Pmax* = 24.5 dBm, measured *Plimit* = 24.8 dBm), and Sub6 NR Band n77, DSI = 1 (100s window, *Plimit* = 14.2 dBm in EFS setting, EUT's average *Pmax* = 18.51 dBm, measured *Plimit* = 15.01 dBm). Following procedure detailed in Section 5.3.7 and Appendix B.2, and using the measurement setup shown in Figure 6-1(c) since LTE and Sub6 NR are sharing the same antenna port. The SAR exposure switch measurement is performed with the EUT in various SAR exposure scenarios, i.e., in SAR_{sub6NR} only scenario (t =10s ~125s), SAR_{su6NR} + SAR_{LTE} scenario (t =125s ~ 245s) and SAR_{LTE} only scenario (t >245s).

Conducted Plot No.13



Plot 2: All the conducted Tx power measurement results were converted into time-averaged normalized SAR values using Equation (7a), (7b) and (7c), and plotted below to demonstrate that the time-averaged normalized SAR versus time does not exceed the FCC limit of 1 unit. Equation (7a) is used to convert the LTE Tx power of device to obtain 100s-averaged normalized SAR in LTE B66 as shown in black curve. Similarly, equation (7b) is used to obtain 100s-averaged normalized SAR in Sub6 NR n77 as shown in orange curve. Equation (7c) is used to obtain total time-averaged normalized SAR as shown in green curve (i.e., sum of black and orange curves).



FCC normalized total exposure limit	1.0
Max Norm. Total time-avg. SAR (green curve) (green curve)	0.270
Validated:	

Plot Notes:

Device starts predominantly in Sub6 NR SAR exposure scenario between 5s and 125s, and in LTE SAR + Sub6 NR SAR exposure scenario between 125s and 245s, and in predominantly in LTE SAR exposure scenario after t=245s. Here, Smart Transmit allocates a maximum of 75% of exposure margin (based on 3dB reserve margin setting) for Sub6 NR. This corresponds to a normalized 1gSAR exposure value = 75% * 0.28W/kg measured SAR at Sub6 NR *Plimit* / 1.6W/kg limit = 0.131± 1dB device related uncertainty (see orange curve between 5s~125s). For predominantly LTE SAR exposure scenario, maximum normalized 1gSAR exposure should correspond to 100% exposure margin = 0.244W/kg measured SAR at LTE *Plimit* / 1.6W/kg limit =- 0.152 ± 1dB device related uncertainty (see black curve after t =245s).
Additionally, in SAR exposure switch test, at all times the total time-averaged normalized RF exposure (green curve) should not exceed normalized SAR_design_target + 1dB device uncertainty. In this test, with a maximum normalized SAR of 0.270 being ≤ 0.79 (= 1.0/1.6 + 1dB device uncertainty), the above test result validated the continuity of power limiting in SAR exposure switch scenario.

8. SAR Test Results for Sub-6 Smart Transmit Feature Validation

8.1Measurementsetup

The measurement setup in Figure 8-1 is similar to normal SAR measurements (see Appendix E for Test setup photo-4). The difference in SAR measurement setup for time averaging feature validation is that the callbox is signaling in close loop power control mode (instead of requesting maximum power in open loop control mode) and callbox is connected to the PC using GPIB so that the test script executed on PC can send GPIB commands to control the callbox's requested power over time (test sequence). The same test script used in conducted setup for time-varying Tx power measurements is also used in this section for running the test sequences during SAR measurements, and the recorded values from the disconnected power meter by the test script were discarded.
As mentioned in Section 5.4, for EUT to follow TPC command sent from the callbox wirelessly, the "path loss" between callbox antenna and the EUT needs to be very well calibrated. Since the SAR chamber is in uncontrolled environment, precautions must be taken to minimize the environmental influences on "path loss". Similarly, in the case of time-varying SAR measurements in Sub6 NR (with LTE as anchor), "path loss" between callbox antenna and the EUT needs to be carefully calibrated for both LTE link as well as for Sub6 NR link.

The EUT is placed in worst-case position according to Table 6-2.

See the Appendix E: Test setup photo 4

Figure 8-1 SAR measurement setup

Tissue Verification

Table for Head Tissue Verification									
Date of Tests	Tissue Temp. (°C)	Tissue Type	Freq. (MHz)	Measured Conductivity σ (S/m)	Measured Dielectric Constant, ε_r	Target Conductivity σ (S/m)	Target Dielectric Constant, ε_r	% dev σ	% dev ε
02/25/2021	21.5	1800H	1710	1.334	42.037	1.348	40.144	-1.04	4.72
			1750	1.376	41.886	1.371	40.080	0.36	4.51
			1800	1.432	41.663	1.400	40.000	2.29	4.16
02/22/2021	21.0	1900H	1850	1.381	40.561	1.400	40.000	-1.36	1.40
			1900	1.450	40.300	1.400	40.000	3.57	0.75
			1910	1.445	40.318	1.400	40.000	3.21	0.79
02/23/2021	22.0	3700H	3500	2.964	38.072	2.913	37.930	1.75	0.37
			3550	2.933	37.329	2.964	37.870	-1.05	-1.43
			3650	3.082	37.516	3.066	37.760	0.52	-0.65
			3700	3.140	37.500	3.118	37.700	0.71	-0.53
02/26/2021	21.8	3700H	3500	2.976	38.098	2.913	37.930	2.16	0.44
			3550	2.943	37.288	2.964	37.870	-0.71	-1.54
			3650	3.083	37.575	3.066	37.760	0.55	-0.49
			3700	3.140	37.500	3.118	37.700	0.71	-0.53

System Verification

Input Power: 50 mW

Freq. [MHz]	Date	Probe (S/N)	Dipole (S/N)	Liquid	Amb. Temp. [°C]	Liquid Temp. [°C]	1 W Target SAR_{1g} (SPEAG) [W/kg]	50mW Measured SAR_{1g} [W/kg]	1 W Normalized SAR_{1g} [W/kg]	Deviation [%]	Limit [%]	Plot No.
1 800	02/25/2021	3968	2d007	Head	21.6	21.5	38.1	1.81	36.2	- 4.99	± 10	1
1 900	02/22/2021	3968	5d032	Head	21.1	21.0	40.0	1.99	39.8	- 0.50	± 10	2
3 700	02/23/2021	3968	1066	Head	22.2	22.0	66.4	3.55	71.0	+ 6.93	± 10	3
3 700	02/26/2021	3968	1066	Head	22.0	21.8	66.4	3.42	68.4	+ 3.01	± 10	4

8.2 SAR measurement results for time-varying Tx power transmission scenario

Following Section 5.4 procedure, time-averaged SAR measurements are conducted using EX3DV4 probe at peak location of area scan over 600 seconds. cDASY6 system validation for SAR measurement is provided in Appendix C, and the associated SPEAG certificates are attached in Appendix D.

SAR probe integration times depend on the communication signal being tested. Integration times used by SPEAG for their probe calibrations can be downloaded from here (integration time is listed on the bottom of the first page for each tech):

https://www.speag.com/assets/downloads/services/cs/UIDSummary171205.pdf

Since the sampling rate used by cDASY6 for pointSAR measurements is not in user control, the number of points in 100s or 60s interval is determined from the scan duration setting in cDASY6 time-average pointSAR measurement by (100s or 60s / cDASY6_scan_duration * total number of pointSAR values recorded). Running average is performed over these number of points in excel spreadsheet to obtain 100s-/60s-averaged pointSAR.

Following Section 5.4, for each of selected technology/band (listed in Table 6-2):

1. With *Reserve_power_margin*set to 0 dB, area scan is performed at P_{limit}, and time-averaged pointSAR measurements are conducted to determine the pointSAR at P_{limit} at peak location, denoted as*point*SAR$_{Plimit}$.

2. With *Reserve_power_margin*set to actual (intended) value, two more time-averaged pointSAR measurements are performed at the same peak location for test sequences 1 and2.

To demonstrate compliance, all the pointSAR measurements results were converted into 1gSAR or 10gSAR values by using Equation (3a), rewritten below:

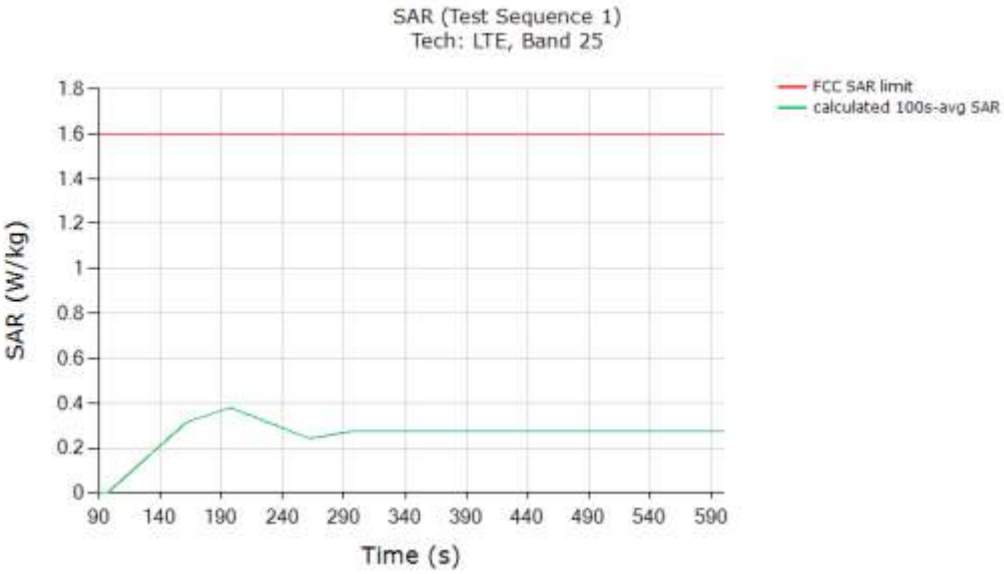
$$1g\_or\_10gSAR(t) = \frac{pointSAR(t)}{pointSAR\_P_{limit}} * 1g\_or\_10gSAR\_P_{limit} \qquad (3a)$$

where, $pointSAR(t)$, $pointSAR\_Plimit$, and $1g\_or\_10gSAR\_Plimit$ correspond to the measured
correspond to the measured instantaneous point SAR, measured point SAR at *Plimit* from above step 1 and 2, and measured *1gSAR* or 10gSAR values at *Plimit* obtained from Part 1 report and listed in Table 6-2 in Section 6.1 of this report.

8.2.1 LTE Band 25 SAR test results (test case 1 in Table 6-2)

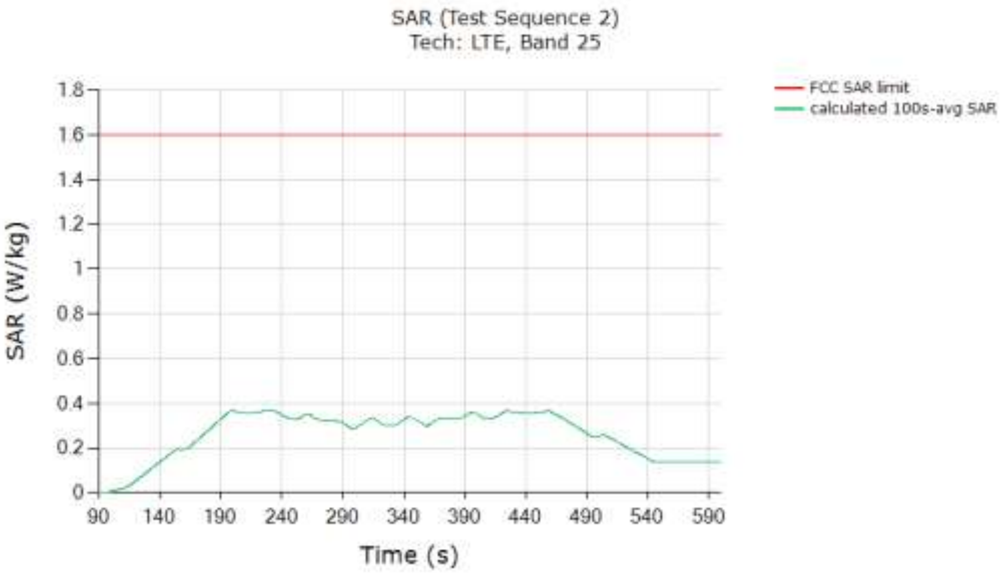
SAR Plot No.14

SAR test results for test sequence 1:



FCC 1g SAR Limit [W/kg]	1.6 W/kg
Max 100s-time averaged 1gSAR (green curve)	0.380 W/kg
Validated: Max time averaged SAR (green curve) is within 1dB device uncertainty of measured SAR at *Plimit* (last column in Table 6-2).	

SAR test results for test sequence 2:

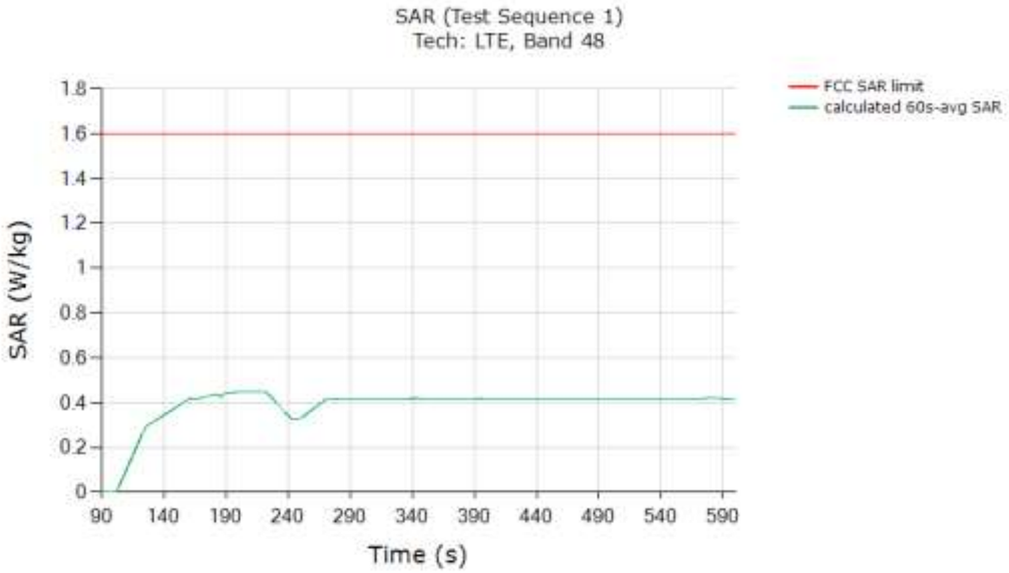


FCC 1g SAR Limit [W/kg]	1.6 W/kg
Max 100s-time averaged 1gSAR (green curve)	0.368 W/kg
Validated: Max time averaged SAR (green curve) is within 1dB device uncertainty of measured SAR at *Plimit* (last column in Table 6-2).	

8.2.2 LTE Band 48 SAR test results (test case 2 in Table 6-2)

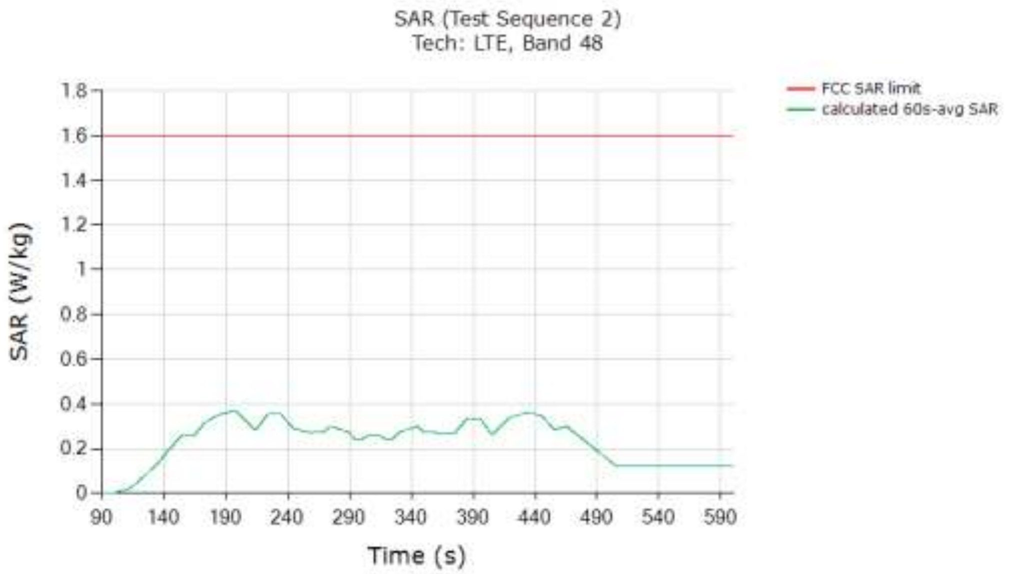
SAR Plot No.15

SAR test results for test sequence 1:



FCC 10g SAR Limit [W/kg]	1.6 W/kg
Max 60s-time averaged 10gSAR (green curve)	0.445 W/kg
Validated: Max time averaged SAR (green curve) is within 1dB device uncertainty of measured SAR at *Plimit* (last column in Table 6-2).	

SAR test results for test sequence 2:

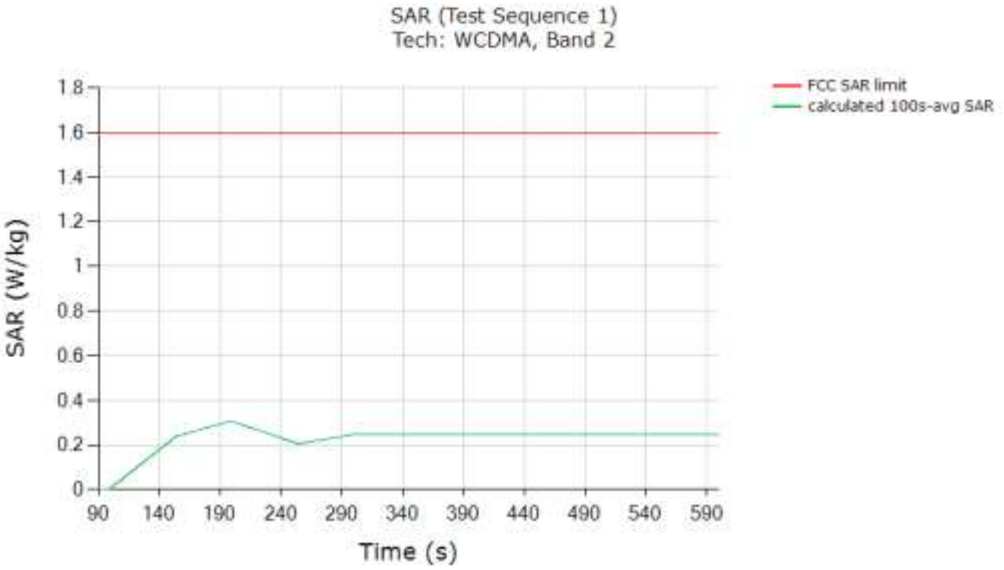


FCC 10g SAR Limit [W/kg]	1.6 W/kg
Max 60s-time averaged 10gSAR (green curve)	0.363 W/kg
Validated: Max time averaged SAR (green curve) is within 1dB device uncertainty of measured SAR at *Plimit* (last column in Table 6-2).	

8.2.3 UMTS Band 2 SAR test results (test case 3 in Table 6-2)

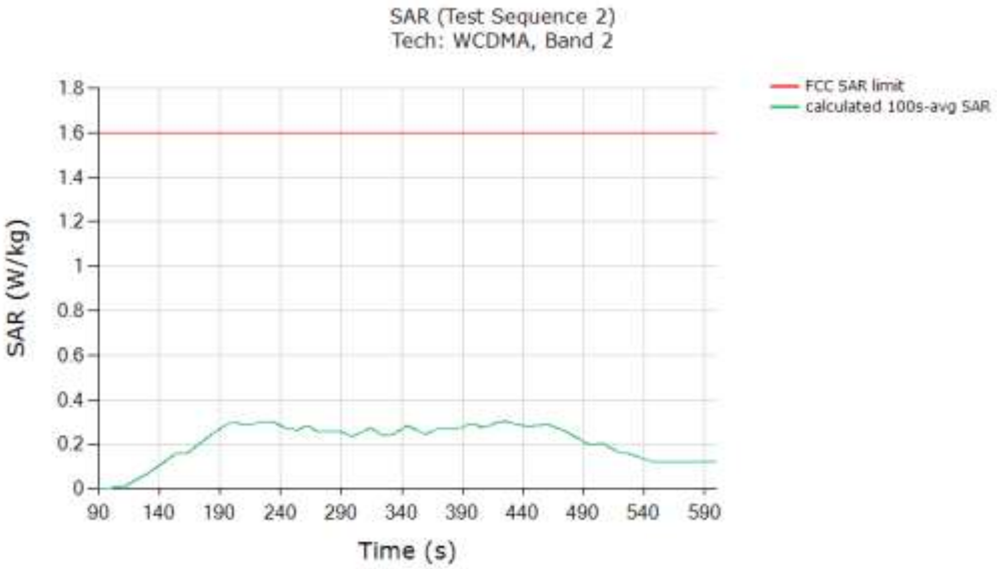
SAR Plot No.16

SAR test results for test sequence 1:



FCC 1g SAR Limit [W/kg]	1.6 W/kg
Max 100s-time averaged 1gSAR (green curve)	0.307 W/kg
Validated: Max time averaged SAR (green curve) is within 1dB device uncertainty of measured SAR at *Plimit* (last column in Table 6-2).	

SAR test results for test sequence 2:

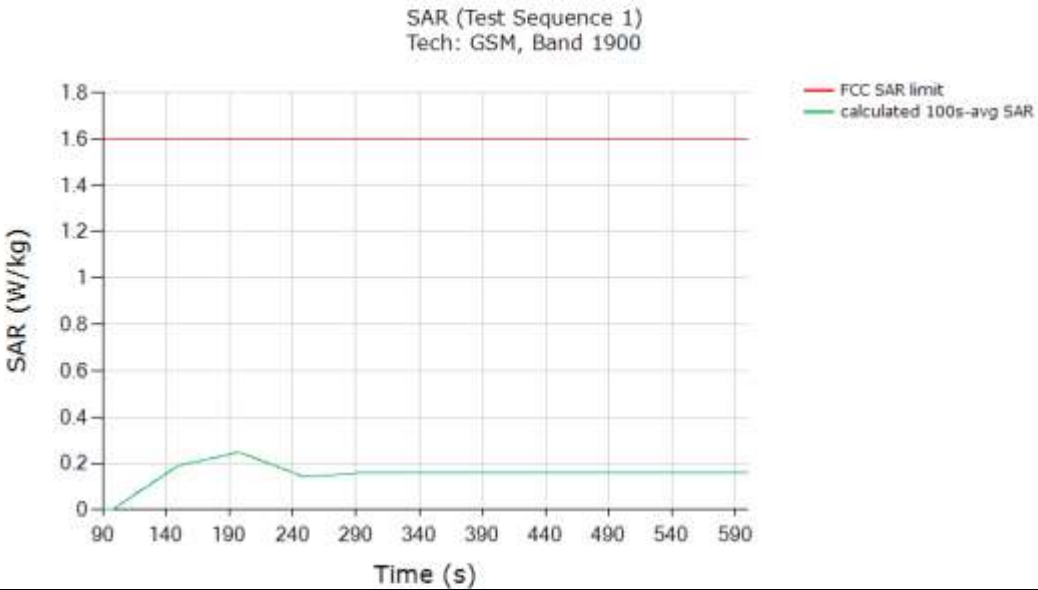


FCC 1g SAR Limit [W/kg]	1.6 W/kg
Max 100s-time averaged 1gSAR (green curve)	0.304 W/kg
Validated: Max time averaged SAR (green curve) is within 1dB device uncertainty of measured SAR at *Plimit* (last column in Table 6-2).	

8.2.4 GSM/GPRS/EDGE 1900 SAR test results (test case 4 in Table 6-2)

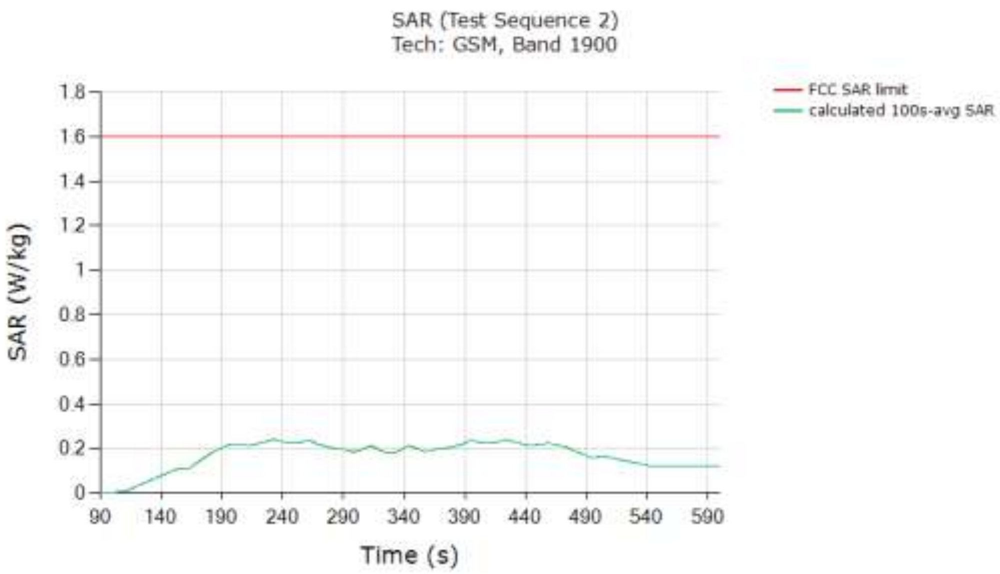
SAR Plot No.17

SAR test results for test sequence 1:



FCC 1g SAR Limit [W/kg]	1.6 W/kg
Max 100s-time averaged 1gSAR (green curve)	0.247 W/kg
Validated: Max time averaged SAR (green curve) is within 1dB device uncertainty of measured SAR at *Plimit* (last column in Table 6-2).	

SAR test results for test sequence 2:

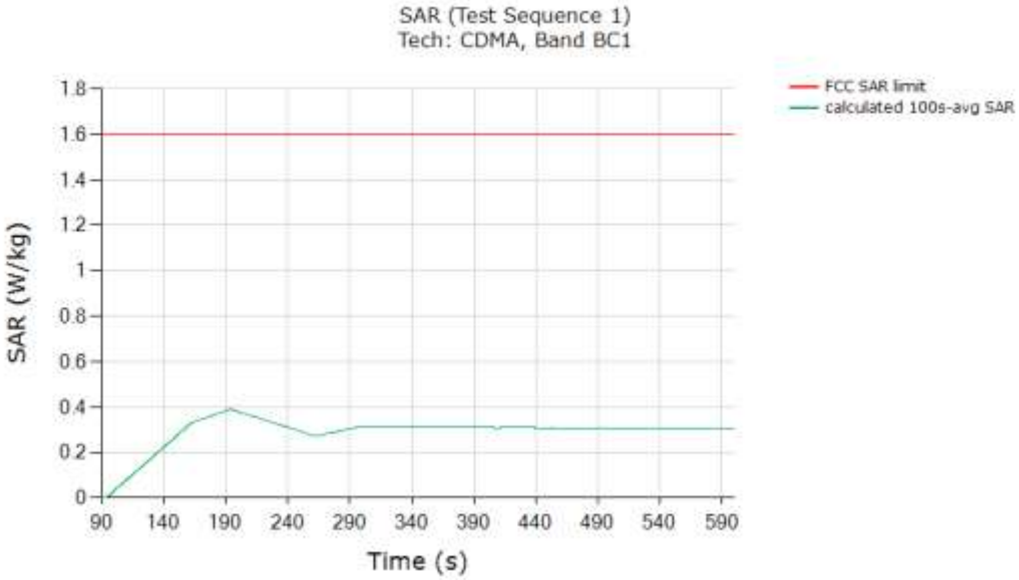


FCC 1g SAR Limit [W/kg]	1.6 W/kg
Max 100s-time averaged 1gSAR (green curve)	0.240 W/kg
Validated: Max time averaged SAR (green curve) is within 1dB device uncertainty of measured SAR at *Plimit* (last column in Table 6-2).	

8.2.5 PCS CDMA EVDO SAR test results(test case 5 in Table 6-2)

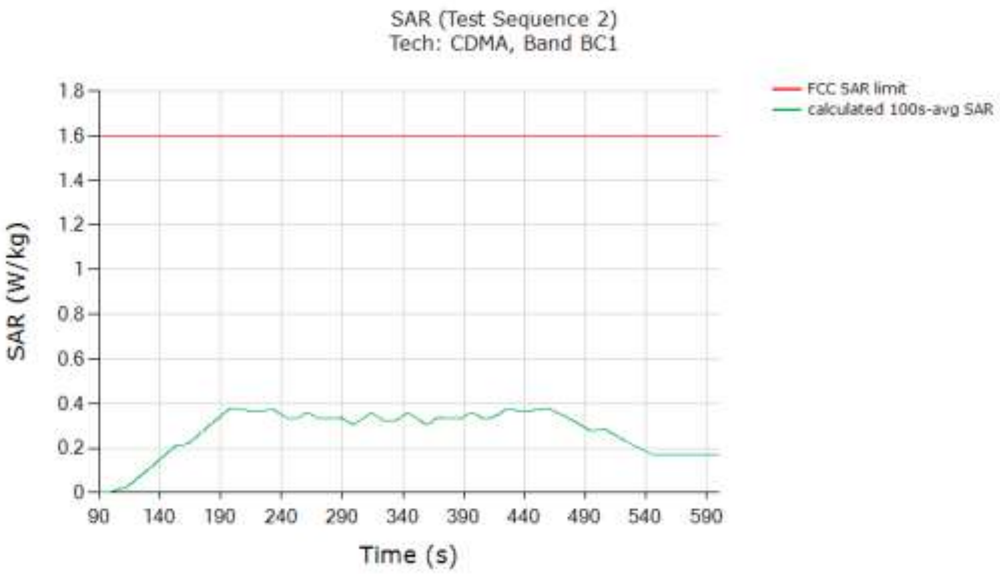
SAR Plot No.18

SAR test results for test sequence 1:



FCC 1g SAR Limit [W/kg]	1.6 W/kg
Max 100s-time averaged 1gSAR (green curve)	0.391 W/kg
Validated: Max time averaged SAR (green curve) is within 1dB device uncertainty of measured SAR at *Plimit* (last column in Table 6-2).	

SAR test results for test sequence 2:

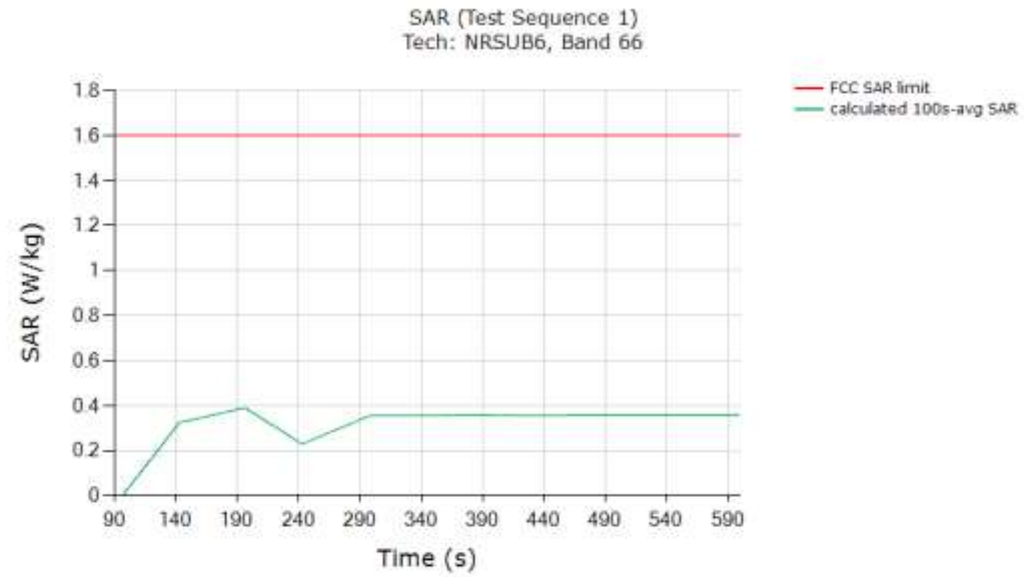


FCC 1g SAR Limit [W/kg]	1.6 W/kg
Max 100s-time averaged 1gSAR (green curve)	0.379 W/kg
Validated: Max time averaged SAR (green curve) is within 1dB device uncertainty of measured SAR at *Plimit* (last column in Table 6-2).	

8.2.6 Sub 6 NR n66 SAR test results(test case 6 in Table 6-2)

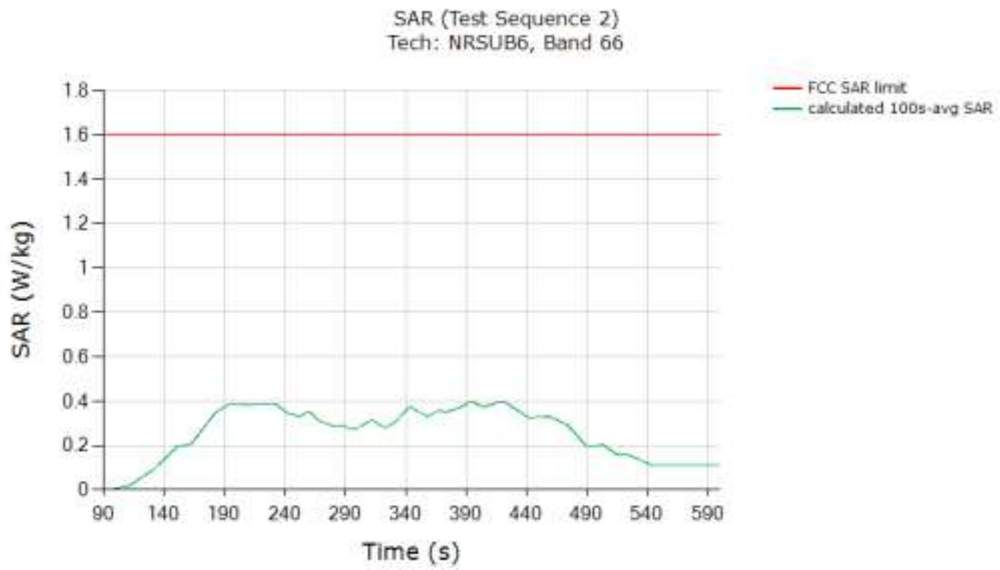
SAR Plot No.19

SAR test results for test sequence 1:



FCC 1g SAR Limit [W/kg]	1.6 W/kg
Max 100s-time averaged 1gSAR (green curve)	0.390 W/kg
Validated: Max time averaged SAR (green curve) is within 1dB device uncertainty of measured SAR at *Plimit* (last column in Table 6-2).	

SAR test results for test sequence 2:

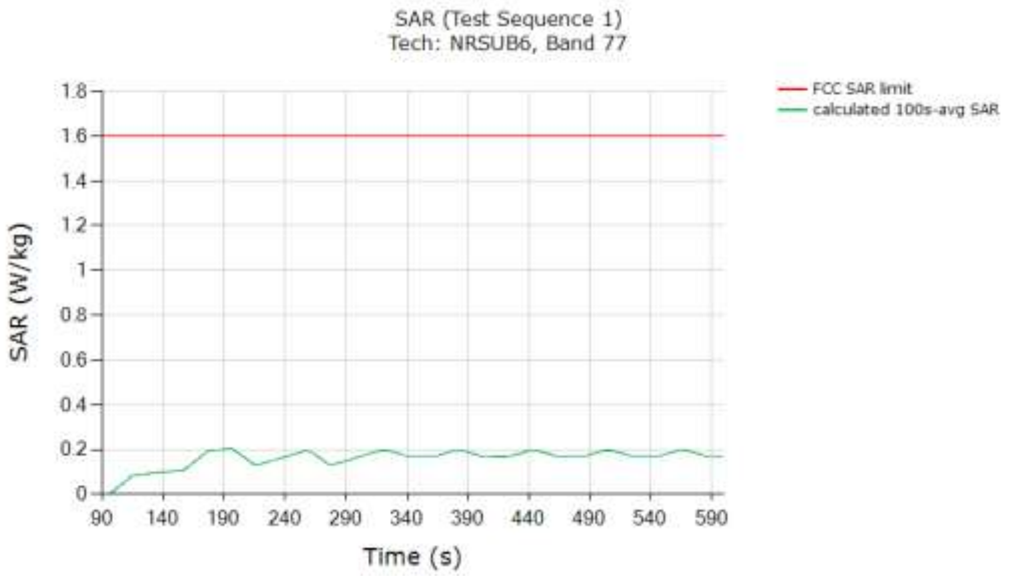


FCC 1g SAR Limit [W/kg]	1.6 W/kg
Max 100s-time averaged 1gSAR (green curve)	0.394 W/kg
Validated: Max time averaged SAR (green curve) is within 1dB device uncertainty of measured SAR at *Plimit* (last column in Table 6-2).	

8.2.7 Sub 6 NR n77 SAR test results(test case 6 in Table 6-2)

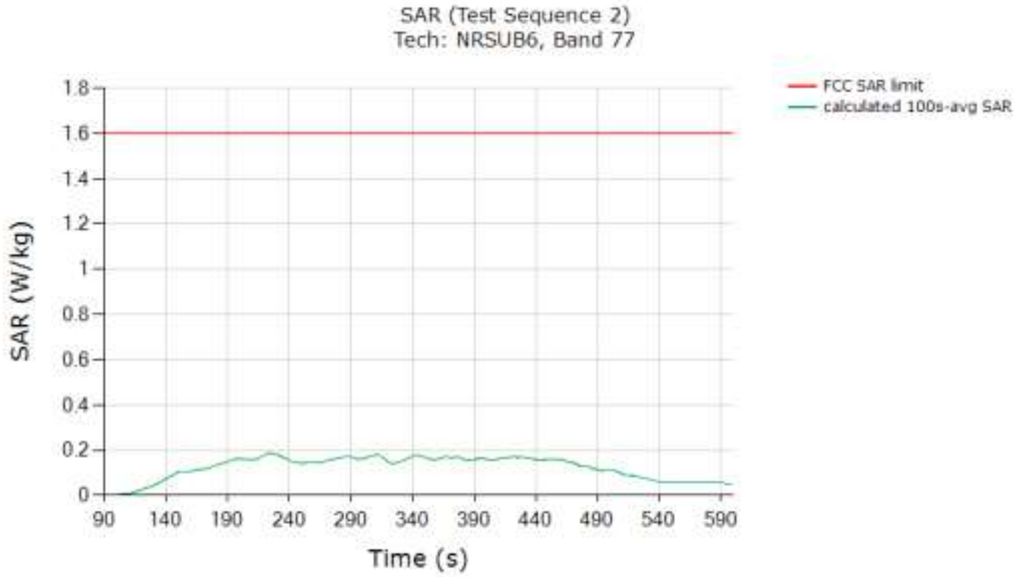
SAR Plot No.20

SAR test results for test sequence 1:



FCC 1g SAR Limit [W/kg]	1.6 W/kg
Max 100s-time averaged 1gSAR (green curve)	0.204 W/kg
Validated: Max time averaged SAR (green curve) is within 1dB device uncertainty of measured SAR at *Plimit* (last column in Table 6-2).	

SAR test results for test sequence 2:



FCC 1g SAR Limit [W/kg]	1.6 W/kg
Max 100s-time averaged 1gSAR (green curve)	0.186 W/kg
Validated: Max time averaged SAR (green curve) is within 1dB device uncertainty of measured SAR at *Plimit* (last column in Table 6-2).	

9. Equipment List

Manufacturer	Type / Model	S/N	Calib. Date	Calib.Interval	Calib.Due
SPEAG	SAM Phantom	-	N/A	N/A	N/A
HP	SAR System Control PC	-	N/A	N/A	N/A
Staubli	Robot TX90 XLspeag	F17/ 59RAA1/ A/ 01	N/A	N/A	N/A
Staubli	Robot Controller CS8Cspeag-TX90	F17/ 59RAA1/ C/ 01	N/A	N/A	N/A
Staubli	Joystick D21142606B	011578	N/A	N/A	N/A
SPEAG	DAE4	868	09/29/2020	Annual	09/29/2021
SPEAG	E-Field Probe EX3DV4	3968	01/28/2021	Annual	01/28/2022
SPEAG	Dipole D1800V2	2d007	08/26/2020	Annual	08/26/2021
SPEAG	Dipole D1900V2	5d032	01/28/2021	Annual	01/28/2022
SPEAG	Dipole D3700V2	1066	11/19/2020	Annual	11/19/2021
Keysight Technologies	UXM 5G Wireless Test Platform	E7515B	05/28/2020	Annual	05/28/2021
R&S	3-PATH DIODE Power Sensor	108076	04/22/2020	Annual	04/22/2021
R&S	3-PATH DIODE Power Sensor	101278	04/22/2020	Annual	04/22/2021
Narda	Directional Coupler	03096	04/14/2020	Annual	04/14/2021
Narda	Directional Coupler	03089	04/13/2020	Annual	04/13/2021
Mini-circuits	Power Splitter	ZN2PD2-63-S+	04/17/2020	Annual	04/17/2021
Agilent	Power Meter E4419B	MY41291386	10/23/2020	Annual	10/23/2021
Agilent	Power Meter N1911A	MY45101406	08/31/2020	Annual	08/31/2021
EM POWER	RF Power Amplifier	1011	07/30/2020	Annual	07/30/2021
EM POWER	RF Power Amplifier	1084	07/01/2020	Annual	07/01/2021
Agilent	Power Sensor N1921A	MY55220026	08/31/2020	Annual	08/31/2021
Agilent	Power Sensor 8481A	MY41090873	10/05/2020	Annual	10/05/2021
Agilent	Power Sensor 8481A	SG1091286	10/05/2020	Annual	10/05/2021
SPEAG	DAKS 3.5	1038	03/24/2020	Annual	03/24/2021
SPEAG	DAKS_VNA R140	0141013	04/06/2020	Annual	04/06/2021
Agilent	Directional Bridge 86205A	3140A03878	06/09/2020	Annual	06/09/2021
Agilent	Signal Generator N5182A	MY47070230	05/06/2020	Annual	05/06/2021
Agilent	MXA Signal Analyzer N9020A	MY50510407	10/23/2020	Annual	10/23/2021
R&S	Wireless Communication Test Set CMW500	115733	05/14/2020	Annual	05/14/2021
Apitech	Attenuator (3dB) 8693B	MY39260298	09/17/2020	Annual	09/17/2021
HP	Attenuator (20dB) 33340C	18128	03/05/2020	Annual	03/05/2021
TESTO	175-H1/Thermometer	40331922309	01/26/2021	Annual	01/26/2022

10. Measurement Uncertainties

For SAR Measurements

Measurement Uncertainty for DUT SAR test According to IEC 62209-2 (0.3 - 6 GHz range)									
a	b	c	d	e	f	g	h = c x f / e	i = c x g / e	k
Source of uncertainty	Description	Uncertainty ± %	Probability distribution	Div.	ci (1 g)	ci (10 g)	Standard Uncertainty ± % (1 g)	Standard Uncertainty ± % (10 g)	vi or veff
Measurement system									
Probe calibration	7.2.2.1	6.65	N	1	1	1	6.65	6.65	∞
Axial isotropy	7.2.2.2	4.70	R	1.73	0.71	0.71	1.92	1.92	∞
Hemispherical isotropy	7.2.2.2	9.60	R	1.73	0.71	0.71	3.92	3.92	∞
Boundary effect	7.2.2.6	2.00	R	1.73	1	1	1.15	1.15	∞
Linearity	7.2.2.3	4.70	R	1.73	1	1	2.71	2.71	∞
Detection limits	7.2.2.5	1.00	R	1.73	1	1	0.58	0.58	∞
Modulation response	7.2.2.4	2.40	R	1.73	1	1	1.39	1.39	∞
Readout electronics	7.2.2.7	0.30	N	1	1	1	0.30	0.30	∞
Response time	7.2.2.8	0.80	R	1.73	1	1	0.46	0.46	∞
Integration time	7.2.2.9	2.60	R	1.73	1	1	1.50	1.50	∞
RF ambient conditions - noise	7.2.4.5	3.00	R	1.73	1	1	1.73	1.73	∞
RF ambient conditions - reflections	7.2.4.5	3.00	R	1.73	1	1	1.73	1.73	∞
Probe positioner mechanical tolerance	7.2.3.1	0.80	R	1.73	1	1	0.46	0.46	∞
Probe positioning with respect to phantom shell	7.2.3.3	6.70	R	1.73	1	1	3.87	3.87	∞
Post-processing	7.2.5	4.00	R	1.73	1	1	2.31	2.31	∞
Test sample related									
Test sample positioning	7.2.3.4.3	5.51	N	1	1	1	5.51	5.51	47
Device holder uncertainity	7.2.3.4.2	2.99	N	1	1	1	2.99	2.99	5
SAR drift measurement	7.2.2.10	5.00	R	1.73	1	1	2.89	2.89	∞
SAR scaling	L.3	0.00	R	1.73	1	1	0.00	0.00	∞
Phantom and set-up									
Phantom uncertainty (shape and thickness uncertainty)	7.2.3.2	7.60	R	1.73	1	1	4.39	4.39	∞
Uncertainty in SAR correction for deviations in permittivity and conductivity	7.2.4.3	1.90	N	1	1	0.84	1.90	1.60	∞
Liquid conductivity (temperature uncertainty)	7.2.4.4	2.93	R	1.73	0.78	0.71	1.32	1.20	1
Liquid conductivity (measured)	7.2.4.3	1.54	N	1	0.78	0.71	1.20	1.09	9
Liquid permittivity (temperature uncertainty)	7.2.4.4	0.95	R	1.73	0.23	0.26	0.13	0.14	1
Liquid permittivity (measured)	7.2.4.3	1.17	N	1	0.23	0.26	0.27	0.30	9
Combined standard uncertainty			RSS				13.31	13.25	∞
Expanded uncertainty (95% confidence interval)			*k = 2*				**26.62**	**26.50**	

For PD Measurement

Measurement Uncertainty for CDASY6 mmWave module						
a	*b*	*c*	*d*	*e*	*f = b x e / d*	*g*
Source of uncertainty	Uncertainty Value (± dB)	Probability distribution	Div.	*ci*	Standard Uncertainty (± dB)	*vi*
Probe calibration	0.49	N	1	1	0.49	∞
Probe correction	0.00	R	1.73	1	0.00	∞
Frequency Response(BW≤ 1GHz)	0.20	R	1.73	1	0.12	∞
Sensor cross coupling	0.00	R	1.73	1	0.00	∞
Istropy	0.50	R	1.73	1	0.29	∞
Linearity	0.20	R	1.73	1	0.12	∞
Probe scattering	0.00	R	1.73	1	0.00	∞
Probe positioning offset	0.30	R	1.73	1	0.17	∞
Probe positioning Repeatability	0.04	R	1.73	1	0.02	∞
Probe spatial Resolution	0.00	R	1.73	1	0.00	∞
Field Impedence Dependence	0.00	R	1.73	1	0.00	∞
Sensor Mechanical Offset	0.00	R	1.73	1	0.00	∞
Amplitude and Phase drift	0.00	R	1.73	1	0.00	∞
Amplitude and Phase noise	0.04	R	1.73	1	0.02	∞
Measurement area truncation	0.00	R	1.73	1	0.00	∞
System Detection Limit	0.04	R	1.73	1	0.02	∞
Data acquisition	0.03	N	1	1	0.03	∞
Field Reconstruction	0.60	R	1.73	1	0.35	∞
Forward Transformation	0.00	R	1.73	1	0.00	∞
Power density Scailing	0.00	R	1.73	1	0.00	∞
Spatial Averaging	0.10	R	1.73	1	0.06	∞
Test sample and Environmental Factors						
Probe coupling with DUT	0.00	R	1.73	1	0.00	∞
Modulation Response	0.40	R	1.73	1	0.23	∞
Integration time	0.00	R	1.73	1	0.00	∞
Response time	0.00	R	1.73	1	0.00	∞
Device holder influence	0.10	R	1.73	1	0.06	∞
DUT alignment	0.00	R	1.73	1	0.00	∞
RF Ambient Conditions	0.04	R	1.73	1	0.02	∞
RF ambient - reflections	0.04	R	1.73	1	0.02	∞
Immunity/Secondary Reception	0.00	R	1.73	1	0.00	∞
Power Drif of DUT	0.22	R	1.73	1	0.13	∞
Combined standard uncertainty (k = 1)		RSS			0.76	∞
Expanded uncertainty (95% confidence level)		*k = 2*			**1.52**	

11. Conclusion

Qualcomm Smart Transmit feature employed in Samsung mobile phone (FCC A3LSMA526U) has been validated through the conducted power measurement (asdemonstrated in Chapters 7), as well as SAR measurement (as demonstrated in Chapters 8).
As demonstrated in this report, the power limiting enforcement is effective and the total normalized time-averaged RF exposure does not exceed 1.0 for all the transmission scenarios described in Section 1.

Therefore, the EUT complies with FCC RF exposure requirement.

Appendix A: Test Sequences

1. Test sequence is generated based on below parameters of the EUT:

   a. Measured maximum power (P_{max})

   b. Measured Tx_power_at_SAR_design_target (P_{limit})

   c. Reserve_power_margin (dB)

      $P_{reserve}$ (dBm) = measured P_{limit}(dBm) – Reserve_power_margin (dB)

   d. *SAR_time_window* (100s for FCC)

2. Test Sequence 1 Waveform:
Based on the parameters above, the Test Sequence 1 is generated with one transition between high and low Tx powers. Here, high power = P_{max}; low power = P_{max}/2, and the transition occurs after 80 seconds at high power P_{max}. As long as the power enforcement is taking into effective during one 100s/60s time window, the validation test with this defined test sequence 1 is valid, otherwise, select other radio configuration (band/DSI within the same technology group) having lower P_{limit} for this test. The Test sequence 1 waveform is shown below:

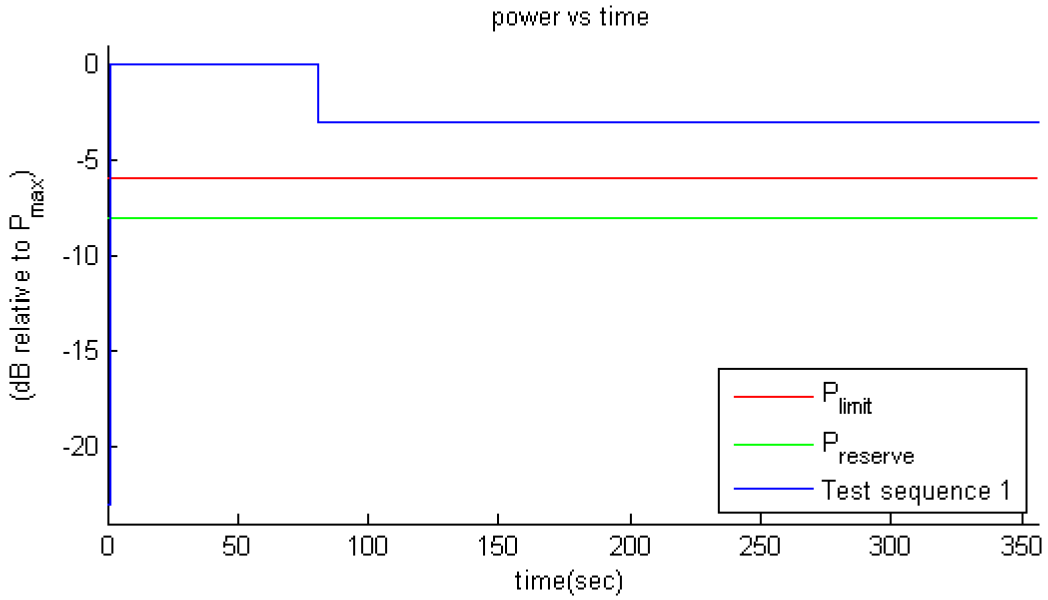


Figure 1 Test sequence 1 waveform

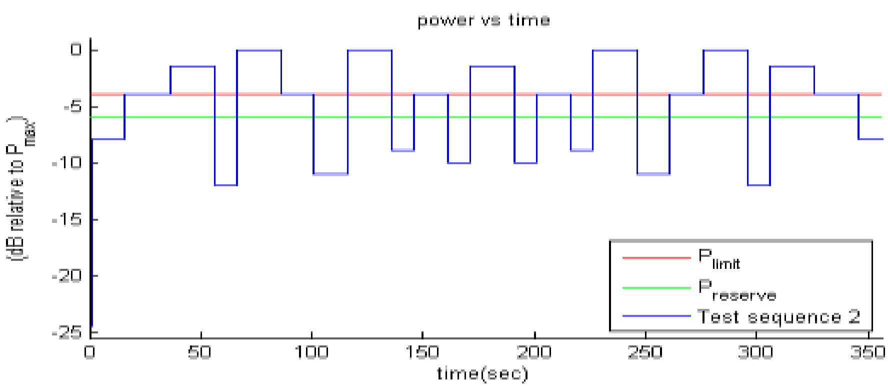
3. Test Sequence 2 Waveform:

Based on the parameters in A-1, the Test Sequence 2 is generated as described in Table A-1, which contains two 170 second-long sequences (yellow and green highlighted rows) that are mirrored around the center row of 20s, resulting in a total duration of 360 seconds:

Table -1 Test Sequence 2

Time duration (seconds)	dB relative to P_{limit} or $P_{reserve}$
15	$P_{reserve}$ – 2
20	P_{limit}
20	(P_{limit} + P_{max})/2 averaged in mW and rounded to nearest 0.1 dB step
10	$P_{reserve}$ – 6
20	P_{max}
15	P_{limit}
15	$P_{reserve}$ – 5
20	P_{max}
10	$P_{reserve}$ – 3
15	P_{limit}
10	$P_{reserve}$ – 4
20	(P_{limit} + P_{max})/2 averaged in mW and rounded to nearest 0.1 dB step
10	$P_{reserve}$ – 4
15	P_{limit}
10	$P_{reserve}$ – 3
20	P_{max}
15	$P_{reserve}$ – 5
15	P_{limit}
20	P_{max}
10	$P_{reserve}$ – 6
20	(P_{limit} + P_{max})/2 averaged in mW and rounded to nearest 0.1 dB step
20	P_{limit}
15	$P_{reserve}$ – 2

The Test Sequence 2 waveform is shown in Figure A-2



Appendix B:Test Procedures for sub6 NR + LTE Radio

Appendix B provides the test procedures for validating Qualcomm Smart Transmit feature for LTE + Sub6 NR non-standalone (NSA) mode transmission scenario, where sub-6GHz LTE link acts as an anchor.

B.1 Time-varying Tx power test for sub6 NR in NSA mode

Follows Section 5.2.1 to select test configurations for time-varying test. This test is performed with two pre-defined test sequences (described in Section 5.1) applied to Sub6 NR (with LTE on all-down bits or low power for the entire test after establishing the LTE+Sub6 NR call with the callbox). Follow the test procedures described in Section 5.3.1 to demonstrate the effectiveness of power limiting enforcement and that the time averaged Tx power of Sub6 NR when converted into 1gSAR values does not exceed the regulatory limit at all times (see Eq. (1a) and (1b)). Sub6 NR response to test sequence1 and test sequence2 will be similar to other technologies (say, LTE), and are shown in Sections 8.3.7 and 8.3.8.

B.2 Switch in SAR exposure between LTE vs. Sub6 NR during transmission

This test is to demonstrate that Smart Transmit feature accurately accounts for switching in exposures among SAR for LTE radio only, SAR from both LTE radio and sub6 NR, and SAR from sub6 NR only scenarios, and ensures total time-averaged RF exposure compliance with FCC limit.

Test procedure:

1. Measure conducted Tx power corresponding to P_{limit} for LTE and sub6 NR in selected band. Test condition to measure conducted P_{limit} is:

- Establish device in call with the callbox for LTE in desired band. Measure conducted Tx power corresponding to LTE P_{limit} with Smart Transmit enabled and *Reserve_power_margin* set to 0 dB, callbox set to request maximum power.
- Repeat above step to measure conducted Tx power corresponding to Sub6 NR P_{limit}. If testing LTE+Sub6 NR in non-standalone mode, then establish LTE+Sub6 NR call with callbox and request all down bits for radio1 LTE. In this scenario, with callbox requesting maximum power from Sub6 NR, measured conducted Tx power corresponds to radio2 P_{limit} (as radio1 LTE is at all-down bits)

2. Set *Reserve_power_margin* to actual (intended) value with EUT setup for LTE + Sub6 NR call. First, establish LTE connection in all-up bits with the callbox, and then Sub6 NR connection is added with callbox requesting UE to transmit at maximum power in Sub6 NR. As soon as the Sub6 NR connection is established, request all-down bits on LTE link (otherwise, Sub6 NR will not have sufficient RF exposure margin to sustain the call with LTE in all-up bits). Continue LTE (all-down bits)+Sub6 NR transmission for more than one time-window duration to test predominantly Sub6 NR SAR exposure scenario (as SAR exposure is negligible from all-down bits in LTE). After at least one time-window, request LTE to go all-up bits to test LTE SAR and Sub6 NR SAR exposure scenario. After at least one more time-window, drop (or request all-down bits) Sub6 NR transmission to test predominantly LTE SAR exposure scenario. Continue the test for at least one more time-window. Record the conducted Tx powers for both LTE and Sub6 NR for the entire duration of this test.

3. Once the measurement is done, extract instantaneous Tx power versus time for both LTE and Sub6 NR links. Similar to technology/band switch test in Section 5.3.3, convert the conducted Tx power for both these radios into 1gSAR value (see Eq. (6a) and (6b)) using corresponding technology/band P_{limit} measured in Step 1, and then perform 100s running average to determine time-averaged 1gSAR versus time as illustrated in Figure 3-1. Note that here it is assumed both radios have Tx frequencies < 3GHz, otherwise, 60s running average should be performed for radios having Tx frequency between 3GHz and 6GHz.

4. Make one plot containing: (a) instantaneous Tx power versus time measured in Step 2.

5. Make another plot containing: (a) instantaneous 1gSAR versus time determined in Step 3, (b) computed time-averaged 1gSAR versus time determined in Step 3, and (c) corresponding regulatory $1gSAR_{limit}$ of 1.6W/kg. The validation criteria is, at all times, the time-averaged 1gSAR versus time shall not exceed the regulatory $1gSAR_{limit}$ of 1.6W/kg.

Appendix C: Verification plot

■Verification Data (1800 ㎒ Head)

Test Laboratory: HCT CO., LTD
EUT Type: Mobile Phone
Test Date: 02/25/2021
Plot No.: 1

Measurement Report for Device , CW, Channel 0 (1800.0 MHz)

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Band	Group, UID	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity
Flat, HSL	,		, 0--	1800.0, 0	8.56	1.43	41.7

Hardware Setup

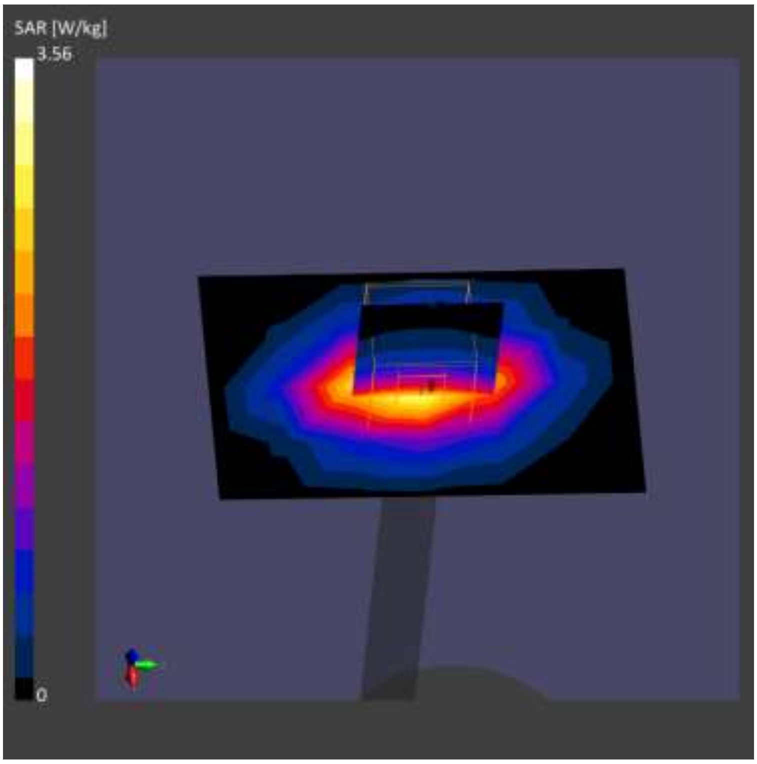
Probe, Calibration Date	DAE, Calibration Date
EX3DV4 - SN3968, 2020-09-28	DAE4 Sn868, 2020-09-29

Scans Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	60.0 x 90.0	30.0 x 30.0 x 30.0
Grid Steps [mm]	15.0 x 15.0	6.0 x 6.0 x 1.

Measurement Results

	Area Scan	Zoom Scan
psSAR1g [W/Kg]	1.80	1.81
psSAR10g [W/Kg]	0.942	0.937
Power Drift [dB]	-0.01	-0.01



■**Verification Data (1900 ㎒ Head)**

Test Laboratory: HCT CO., LTD
EUT Type: Mobile Phone
Test Date: 02/22/2021
Plot No.: 2

Measurement Report for Device, CW, Channel 0 (1900.0 MHz)

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Band	Group, UID	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity
Flat, HSL	10		0--	1900.0, 0	8.19	1.45	40.3

Hardware Setup

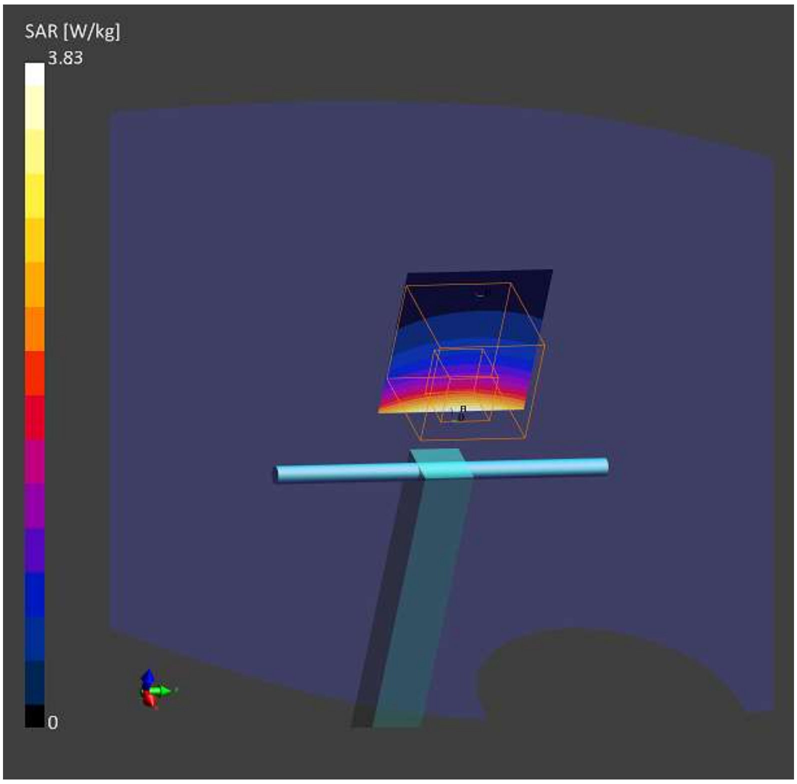
Probe, Calibration Date	DAE, Calibration Date
EX3DV4 - SN3968, 2020-09-28	DAE4 Sn868, 2020-09-29

Scans Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	60.0 x 90.0	30.0 x 30.0 x 30.0
Grid Steps [mm]	15.0 x 15.0	6.0 x 6.0 x 1.5

Measurement Results

	Area Scan	Zoom Scan
psSAR1g [W/Kg]	1.98	1.99
psSAR10g [W/Kg]	1.02	1.02
Power Drift [dB]	0.01	0.01



■Verification Data (3700 ㎒ Head)

Test Laboratory:	HCT CO., LTD
EUT Type:	Mobile Phone
Test Date:	02/23/2021
Plot No.:	3

Measurement Report for Device, CW, Channel 0 (3700.0 MHz)

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Band	Group, UID	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity
Flat, HSL	10		0--	3700.0, 0	6.77	3.14	37.5

Hardware Setup

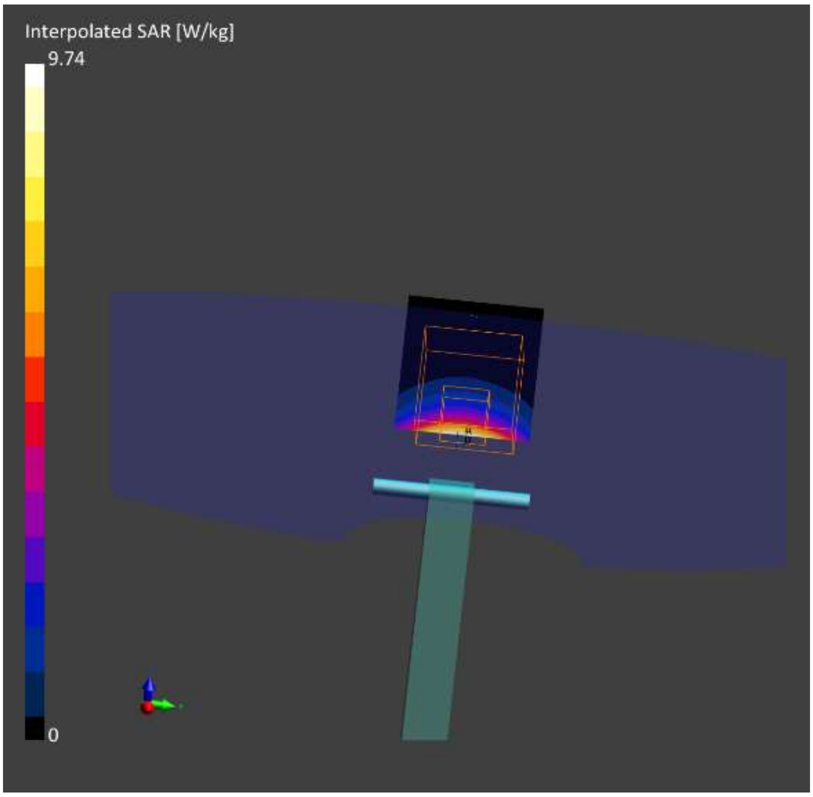
Probe, Calibration Date	DAE, Calibration Date
EX3DV4 - SN3968, 2020-09-28	DAE4 Sn868, 2020-09-29

Scans Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	40.0 x 80.0	28.0 x 28.0 x 28.0
Grid Steps [mm]	10.0 x 10.0	5.0 x 5.0 x 1.4

Measurement Results

	Area Scan	Zoom Scan
psSAR1g [W/Kg]	3.44	3.55
psSAR10g [W/Kg]	1.28	1.32
Power Drift [dB]	0.01	0.01



■Verification Data (3700 ㎒ Head)

Test Laboratory: HCT CO., LTD
EUT Type: Mobile Phone
Test Date: 02/26/2021
Plot No.: 4

Measurement Report for Device, CW, Channel 0 (3700.0 MHz)

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Band	Group, UID	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity
Flat, HSL	10		0--	3700.0, 0	6.77	3.14	37.5

Hardware Setup

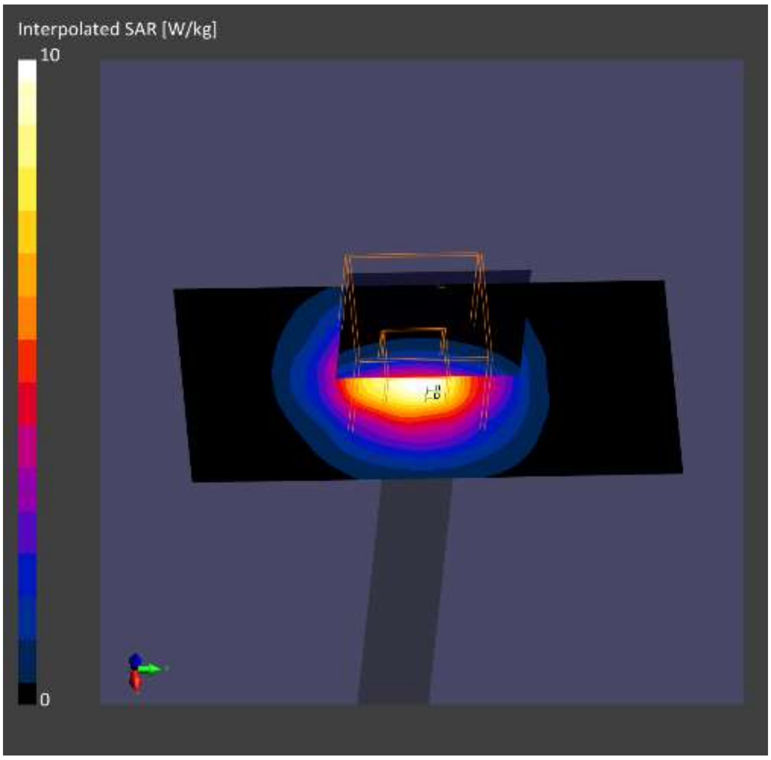
Probe, Calibration Date	DAE, Calibration Date
EX3DV4 - SN3968, 2020-09-28	DAE4 Sn868, 2020-09-29

Scans Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	40.0 x 80.0	28.0 x 28.0 x 28.0
Grid Steps [mm]	10.0 x 10.0	5.0 x 5.0 x 1.4

Measurement Results

	Area Scan	Zoom Scan
psSAR1g [W/Kg]	3.48	3.42
psSAR10g [W/Kg]	1.24	1.25
Power Drift [dB]	0.01	0.01



Appendix D: Calibration documents

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Accredited by the Swiss Accreditation Service (SAS)
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Accreditation No.: **SCS 0108**

Client **HCT (Dymstec)** Certificate No: **D1800V2-2d007_Aug20**

CALIBRATION CERTIFICATE

결재	담당자	확인자
	[signature]	[signature]
부서/성명	SW / [illegible]	[illegible] / [illegible]
일자	2020 / 10. 6	2020 / 10. 6

Object	D1800V2 - SN:2d007
Calibration procedure(s)	QA CAL-05.v11 Calibration Procedure for SAR Validation Sources between 0.7-3 GHz
Calibration date:	August 26, 2020

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	01-Apr-20 (No. 217-03100/03101)	Apr-21
Power sensor NRP-Z91	SN: 103244	01-Apr-20 (No. 217-03100)	Apr-21
Power sensor NRP-Z91	SN: 103245	01-Apr-20 (No. 217-03101)	Apr-21
Reference 20 dB Attenuator	SN: BH9394 (20k)	31-Mar-20 (No. 217-03106)	Apr-21
Type-N mismatch combination	SN: 310982 / 06327	31-Mar-20 (No. 217-03104)	Apr-21
Reference Probe EX3DV4	SN: 7349	29-Jun-20 (No. EX3-7349_Jun20)	Jun-21
DAE4	SN: 601	27-Dec-19 (No. DAE4-601_Dec19)	Dec-20

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter E4419B	SN: GB39512475	30-Oct-14 (in house check Feb-19)	In house check: Oct-20
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (in house check Oct-18)	In house check: Oct-20
Power sensor HP 8481A	SN: MY41092317	07-Oct-15 (in house check Oct-18)	In house check: Oct-20
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Oct-18)	In house check: Oct-20
Network Analyzer Agilent E8358A	SN: US41080477	31-Mar-14 (in house check Oct-19)	In house check: Oct-20

	Name	Function	Signature
Calibrated by:	Leif Klysner	Laboratory Technician	[signature]
Approved by:	Katja Pokovic	Technical Manager	[signature]

Issued: August 27, 2020

Certificate No: D1800V2-2d007_Aug20 Page 1 of 6

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Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 0108**

Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORM x,y,z
N/A	not applicable or not measured

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
b) IEC 62209-1, "Measurement procedure for the assessment of Specific Absorption Rate (SAR) from hand-held and body-mounted devices used next to the ear (frequency range of 300 MHz to 6 GHz)", July 2016
c) IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
d) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

e) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- *Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- *Antenna Parameters with TSL:* The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- *Feed Point Impedance and Return Loss:* These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- *Electrical Delay:* One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- *SAR measured:* SAR measured at the stated antenna input power.
- *SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- *SAR for nominal TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY5	V52.10.4
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	1800 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	40.0	1.40 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	40.4 ± 6 %	1.38 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	9.43 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**38.1 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	4.90 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**19.7 W/kg ± 16.5 % (k=2)**

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	46.2 Ω - 7.7 jΩ
Return Loss	- 21.0 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.204 ns

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG

DASY5 Validation Report for Head TSL

Date: 26.08.2020

Test Laboratory: SPEAG, Zurich, Switzerland

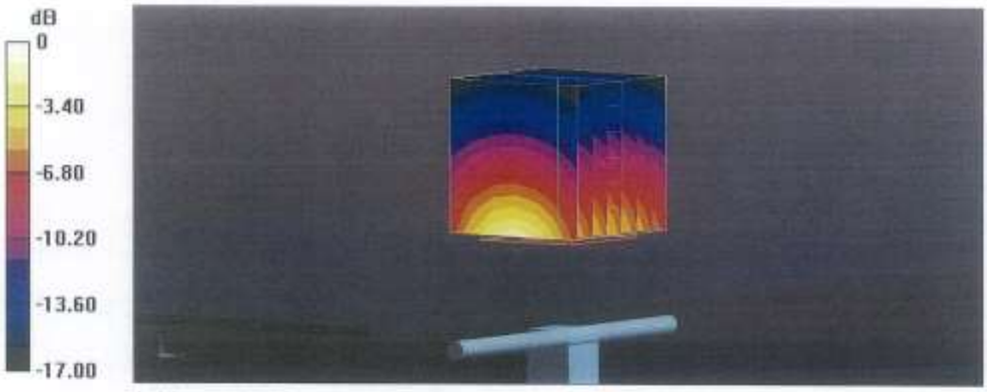
DUT: Dipole 1800 MHz; Type: D1800V2; Serial: D1800V2 - SN:2d007

Communication System: UID 0 - CW; Frequency: 1800 MHz
Medium parameters used: f = 1800 MHz; σ = 1.38 S/m; ε_r = 40.4; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(8.38, 8.38, 8.38) @ 1800 MHz; Calibrated: 29.06.2020
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 27.12.2019
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

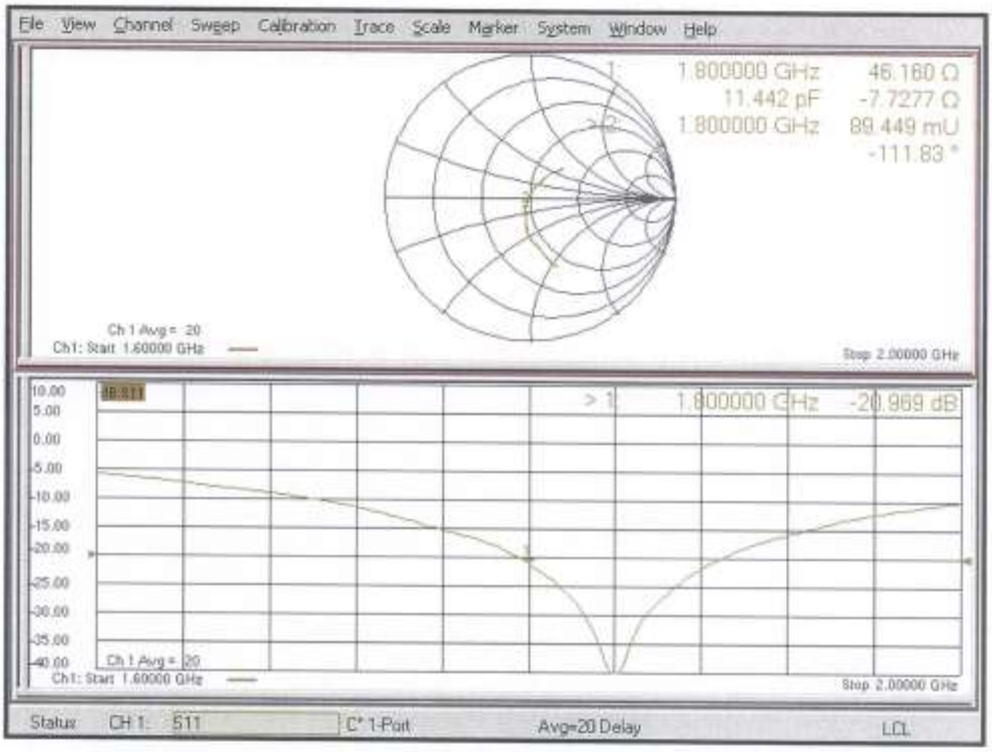
Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 106.8 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 17.7 W/kg
SAR(1 g) = 9.43 W/kg; SAR(10 g) = 4.9 W/kg
Smallest distance from peaks to all points 3 dB below = 10 mm
Ratio of SAR at M2 to SAR at M1 = 53.8%
Maximum value of SAR (measured) = 14.7 W/kg



0 dB = 14.7 W/kg = 11.68 dBW/kg

Certificate No: D1800V2-2d007_Aug20 Page 5 of 6

Impedance Measurement Plot for Head TSL



Certificate No: D1800V2-2d007_Aug20 Page 6 of 6

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Accreditation No.: **SCS 0108**

Client **HCT (Dymstec)**

Certificate No: **D1900V2-5d032_Jan21**

CALIBRATION CERTIFICATE

결재	담 당 자	확 인 자
	2021. 02. 26	2021. 02. 08

Object	D1900V2 - SN:5d032
Calibration procedure(s)	QA CAL-05.v11 Calibration Procedure for SAR Validation Sources between 0.7-3 GHz
Calibration date:	January 28, 2021

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	01-Apr-20 (No. 217-03100/03101)	Apr-21
Power sensor NRP-Z91	SN: 103244	01-Apr-20 (No. 217-03100)	Apr-21
Power sensor NRP-Z91	SN: 103245	01-Apr-20 (No. 217-03101)	Apr-21
Reference 20 dB Attenuator	SN: BH9394 (20k)	31-Mar-20 (No. 217-03106)	Apr-21
Type-N mismatch combination	SN: 310982 / 06327	31-Mar-20 (No. 217-03104)	Apr-21
Reference Probe EX3DV4	SN: 7349	28-Dec-20 (No. EX3-7349_Dec20)	Dec-21
DAE4	SN: 601	02-Nov-20 (No. DAE4-601_Nov20)	Nov-21

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter E4419B	SN: GB39512475	30-Oct-14 (in house check Oct-20)	In house check: Oct-22
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (in house check Oct-20)	In house check: Oct-22
Power sensor HP 8481A	SN: MY41092317	07-Oct-15 (in house check Oct-20)	In house check: Oct-22
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Oct-20)	In house check: Oct-22
Network Analyzer Agilent E8358A	SN: US41080477	31-Mar-14 (in house check Oct-20)	In house check: Oct-21

	Name	Function	Signature
Calibrated by:	Claudio Leubler	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: January 28, 2021

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.

Certificate No: D1900V2-5d032_Jan21 Page 1 of 6

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Accreditation No.: **SCS 0108**

Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORM x,y,z
N/A	not applicable or not measured

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
b) IEC 62209-1, "Measurement procedure for the assessment of Specific Absorption Rate (SAR) from hand-held and body-mounted devices used next to the ear (frequency range of 300 MHz to 6 GHz)", July 2016
c) IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
d) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

e) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- *Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- *Antenna Parameters with TSL:* The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- *Feed Point Impedance and Return Loss:* These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- *Electrical Delay:* One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- *SAR measured:* SAR measured at the stated antenna input power.
- *SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- *SAR for nominal TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY5	V52.10.4
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	1900 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	40.0	1.40 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	41.2 ± 6 %	1.39 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	9.89 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**40.0 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	5.17 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**20.8 W/kg ± 16.5 % (k=2)**

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	51.4 Ω + 7.4 jΩ
Return Loss	- 22.6 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.203 ns

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG

DASY5 Validation Report for Head TSL

Date: 28.01.2021

Test Laboratory: SPEAG, Zurich, Switzerland

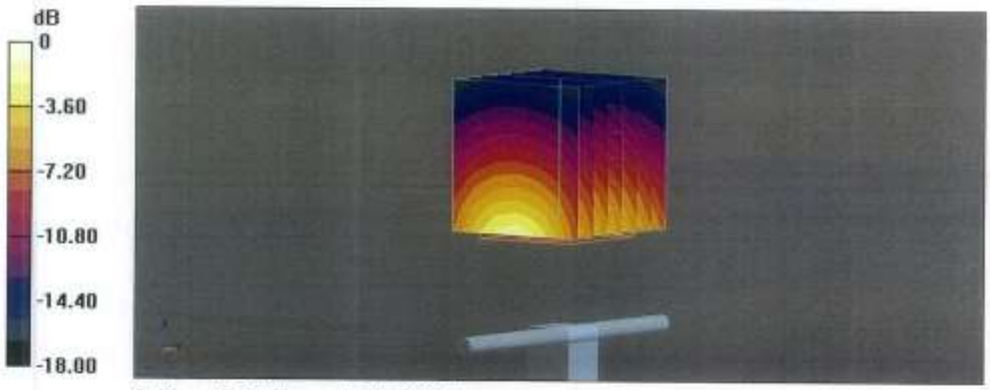
DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:5d032

Communication System: UID 0 - CW; Frequency: 1900 MHz
Medium parameters used: f = 1900 MHz; σ = 1.39 S/m; ε_r = 41.2; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(8.43, 8.43, 8.43) @ 1900 MHz; Calibrated: 28.12.2020
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 02.11.2020
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

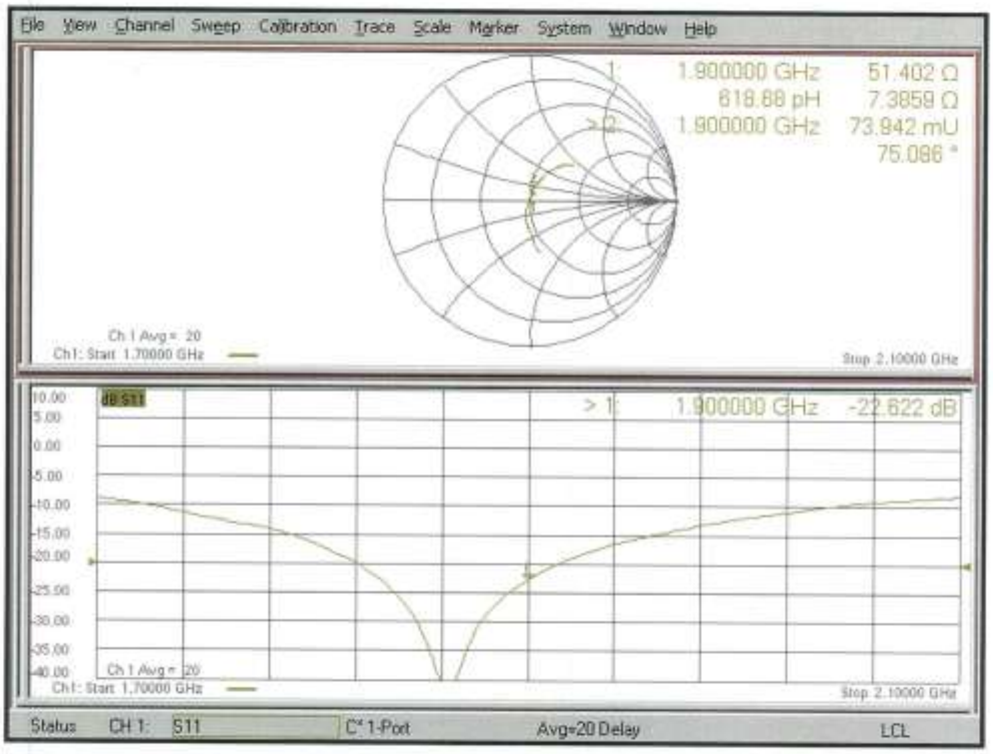
Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 109.8 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 18.2 W/kg
SAR(1 g) = 9.89 W/kg; SAR(10 g) = 5.17 W/kg
Smallest distance from peaks to all points 3 dB below = 9.5 mm
Ratio of SAR at M2 to SAR at M1 = 54.9%
Maximum value of SAR (measured) = 15.3 W/kg



0 dB = 15.3 W/kg = 11.85 dBW/kg

Certificate No: D1900V2-5d032_Jan21 Page 5 of 6

Impedance Measurement Plot for Head TSL



Certificate No: D1900V2-5d032_Jan21 Page 6 of 6

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Accreditation No.: **SCS 0108**

Client **HCT (Dymstec)**

Certificate No: **D3700V2-1066_Nov20**

CALIBRATION CERTIFICATE

결재	담당자	확인자
직급/성명	SW / 박권형	ECT / 최유라
일자	2020 / 12.09	2020 / 12.9

Object	D3700V2 - SN:1066
Calibration procedure(s)	QA CAL-22.v5 Calibration Procedure for SAR Validation Sources between 3-10 GHz
Calibration date:	November 19, 2020

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI). The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	01-Apr-20 (No. 217-03100/03101)	Apr-21
Power sensor NRP-Z91	SN: 103244	01-Apr-20 (No. 217-03100)	Apr-21
Power sensor NRP-Z91	SN: 103245	01-Apr-20 (No. 217-03101)	Apr-21
Reference 20 dB Attenuator	SN: BH9394 (20k)	31-Mar-20 (No. 217-03106)	Apr-21
Type-N mismatch combination	SN: 310982 / 06327	31-Mar-20 (No. 217-03104)	Apr-21
Reference Probe EX3DV4	SN: 3503	31-Dec-19 (No. EX3-3503_Dec19)	Dec-20
DAE4	SN: 601	02-Nov-20 (No. DAE4-601_Nov20)	Nov-21

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter E4419B	SN: GB39512475	30-Oct-14 (in house check Oct-20)	In house check: Oct-22
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (in house check Oct-20)	In house check: Oct-22
Power sensor HP 8481A	SN: MY41092317	07-Oct-15 (in house check Oct-20)	In house check: Oct-22
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Oct-20)	In house check: Oct-22
Network Analyzer Agilent E8358A	SN: US41080477	31-Mar-14 (in house check Oct-20)	In house check: Oct-21

	Name	Function	Signature
Calibrated by:	Michael Weber	Laboratory Technician	M.Weber
Approved by:	Katja Pokovic	Technical Manager	[signature]

Issued: November 19, 2020

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Certificate No: D3700V2-1066_Nov20 Page 1 of 6

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Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 0108**

Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORM x,y,z
N/A	not applicable or not measured

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
b) IEC 62209-1, "Measurement procedure for the assessment of Specific Absorption Rate (SAR) from hand-held and body-mounted devices used next to the ear (frequency range of 300 MHz to 6 GHz)", July 2016
c) IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
d) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

e) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- *Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- *Antenna Parameters with TSL:* The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- *Feed Point Impedance and Return Loss:* These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- *Electrical Delay:* One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- *SAR measured:* SAR measured at the stated antenna input power.
- *SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- *SAR for nominal TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY5	V52.10.4
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy = 4 mm, dz = 1.4 mm	Graded Ratio = 1.4 (Z direction)
Frequency	3700 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	37.7	3.12 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	38.4 ± 6 %	3.09 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	6.61 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**66.4 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.39 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**24.0 W/kg ± 19.5 % (k=2)**

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	48.0 Ω + 0.4 jΩ
Return Loss	- 33.7 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.137 ns

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG

DASY5 Validation Report for Head TSL

Date: 19.11.2020

Test Laboratory: SPEAG, Zurich, Switzerland

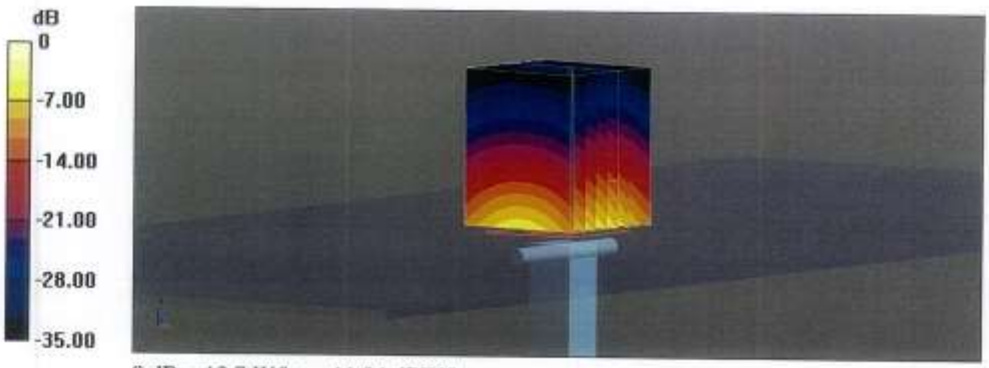
DUT: Dipole 3700 MHz; Type: D3700V2; Serial: D3700V2 - SN:1066

Communication System: UID 0 - CW; Frequency: 3700 MHz
Medium parameters used: f = 3700 MHz; σ = 3.09 S/m; ε_r = 38.4; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

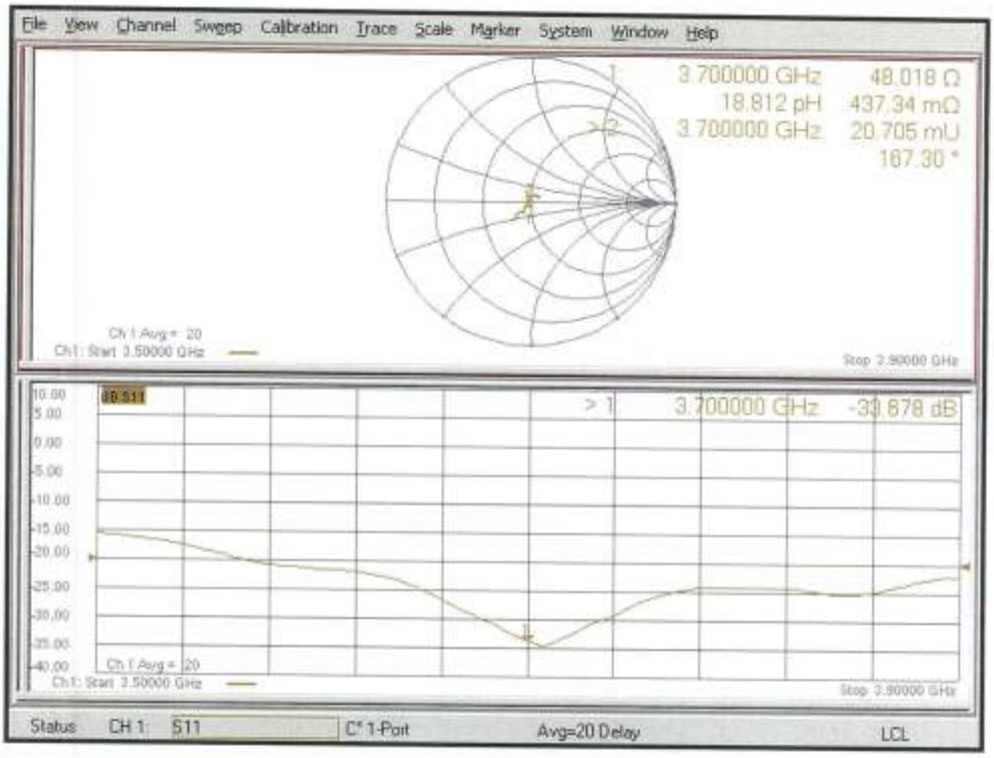
- Probe: EX3DV4 - SN3503; ConvF(7.73, 7.73, 7.73) @ 3700 MHz; Calibrated: 31.12.2019
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 02.11.2020
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

Dipole Calibration for Head Tissue/Pin=100 mW, d=10mm, f=3700MHz/Zoom Scan, dist=1.4mm (8x8x8)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 70.37 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 18.6 W/kg
SAR(1 g) = 6.61 W/kg; SAR(10 g) = 2.39 W/kg
Smallest distance from peaks to all points 3 dB below = 8 mm
Ratio of SAR at M2 to SAR at M1 = 74.2%
Maximum value of SAR (measured) = 12.7 W/kg



0 dB = 12.7 W/kg = 11.04 dBW/kg

Impedance Measurement Plot for Head TSL



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Accreditation No.: **SCS 0108**

Client **HCT (Dymstec)**

Certificate No: **EX3-3968_Sep20/2**

CALIBRATION CERTIFICATE (Replacement of No: EX3-3968_Sep20)

Object	EX3DV4 - SN:3968
Calibration procedure(s)	QA CAL-01.v9, QA CAL-14.v6, QA CAL-23.v5, QA CAL-25.v7 Calibration procedure for dosimetric E-field probes
Calibration date:	September 28, 2020

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	01-Apr-20 (No. 217-03100/03101)	Apr-21
Power sensor NRP-Z91	SN: 103244	01-Apr-20 (No. 217-03100)	Apr-21
Power sensor NRP-Z91	SN: 103245	01-Apr-20 (No. 217-03101)	Apr-21
Reference 20 dB Attenuator	SN: CC2552 (20x)	31-Mar-20 (No. 217-03106)	Apr-21
DAE4	SN: 660	27-Dec-19 (No. DAE4-660_Dec19)	Dec-20
Reference Probe ES3DV2	SN: 3013	31-Dec-19 (No. ES3-3013_Dec19)	Dec-20
Secondary Standards	ID	Check Date (in house)	Scheduled Check
Power meter E4419B	SN: GB41293874	06-Apr-16 (in house check Jun-20)	In house check: Jun-22
Power sensor E4412A	SN: MY41498087	06-Apr-16 (in house check Jun-20)	In house check: Jun-22
Power sensor E4412A	SN: 000110210	06-Apr-16 (in house check Jun-20)	In house check: Jun-22
RF generator HP 8648C	SN: US3642U01700	04-Aug-99 (in house check Jun-20)	In house check: Jun-22
Network Analyzer E8358A	SN: US41080477	31-Mar-14 (in house check Oct-19)	In house check: Oct-20

	Name	Function	Signature
Calibrated by:	Jeton Kastrati	Laboratory Technician	(signature)
Approved by:	Katja Pokovic	Technical Manager	(signature)

Issued: October 15, 2020

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Certificate No: EX3-3968_Sep20/2 Page 1 of 23

결재	담당자	확인자
	(signature)	(signature)
직위/성명	SW / 박서현	GJ / 서장식
일자	2020 / 10.28	2020 / 10.28

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Accreditation No.: **SCS 0108**

Glossary:

TSL	tissue simulating liquid
NORMx,y,z	sensitivity in free space
ConvF	sensitivity in TSL / NORMx,y,z
DCP	diode compression point
CF	crest factor (1/duty_cycle) of the RF signal
A, B, C, D	modulation dependent linearization parameters
Polarization φ	φ rotation around probe axis
Polarization ϑ	ϑ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., ϑ = 0 is normal to probe axis
Connector Angle	information used in DASY system to align probe sensor X to the robot coordinate system

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
b) IEC 62209-1, ", "Measurement procedure for the assessment of Specific Absorption Rate (SAR) from hand-held and body-mounted devices used next to the ear (frequency range of 300 MHz to 6 GHz)", July 2016
c) IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
d) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Methods Applied and Interpretation of Parameters:

- *NORMx,y,z:* Assessed for E-field polarization ϑ = 0 (f ≤ 900 MHz in TEM-cell; f > 1800 MHz: R22 waveguide). NORMx,y,z are only intermediate values, i.e., the uncertainties of NORMx,y,z does not affect the E^2-field uncertainty inside TSL (see below *ConvF*).
- *NORM(f)x,y,z = NORMx,y,z * frequency_response* (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of *ConvF*.
- *DCPx,y,z:* DCP are numerical linearization parameters assessed based on the data of power sweep with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- *PAR:* PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics
- *Ax,y,z; Bx,y,z; Cx,y,z; Dx,y,z; VRx,y,z: A, B, C, D* are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. *VR* is the maximum calibration range expressed in RMS voltage across the diode.
- *ConvF and Boundary Effect Parameters:* Assessed in flat phantom using E-field (or Temperature Transfer Standard for f ≤ 800 MHz) and inside waveguide using analytical field distributions based on power measurements for f > 800 MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to *NORMx,y,z * ConvF* whereby the uncertainty corresponds to that given for *ConvF*. A frequency dependent *ConvF* is used in DASY version 4.4 and higher which allows extending the validity from ± 50 MHz to ± 100 MHz.
- *Spherical isotropy (3D deviation from isotropy)*: in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- *Sensor Offset:* The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.
- *Connector Angle:* The angle is assessed using the information gained by determining the *NORMx* (no uncertainty required).

Certificate No: EX3-3968_Sep20/2 Page 2 of 23

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3968

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm (µV/(V/m)^2)[A]	0.56	0.57	0.57	± 10.1 %
DCP (mV)[B]	98.6	98.6	99.2	

Calibration Results for Modulation Response

UID	Communication System Name		A dB	B dB√µV	C	D dB	VR mV	Max dev.	Max Unc[E] (k=2)
0	CW	X	0.00	0.00	1.00	0.00	174.3	± 3.3 %	± 4.7 %
		Y	0.00	0.00	1.00		182.8		
		Z	0.00	0.00	1.00		179.9		
10352-AAA	Pulse Waveform (200Hz, 10%)	X	20.00	88.74	18.67	10.00	60.0	± 4.1 %	± 9.6 %
		Y	20.00	96.29	23.48		60.0		
		Z	20.00	89.53	19.27		60.0		
10353-AAA	Pulse Waveform (200Hz, 20%)	X	20.00	90.22	18.40	6.99	80.0	± 2.7 %	± 9.6 %
		Y	20.00	103.81	26.22		80.0		
		Z	20.00	90.79	18.93		80.0		
10354-AAA	Pulse Waveform (200Hz, 40%)	X	20.00	95.34	19.78	3.98	95.0	± 1.4 %	± 9.6 %
		Y	20.00	118.85	31.98		95.0		
		Z	20.00	96.16	20.40		95.0		
10355-AAA	Pulse Waveform (200Hz, 60%)	X	20.00	109.84	25.52	2.22	120.0	± 1.2 %	± 9.6 %
		Y	20.00	136.65	38.53		120.0		
		Z	20.00	100.81	21.57		120.0		
10387-AAA	QPSK Waveform, 1 MHz	X	2.01	68.81	16.97	1.00	150.0	± 1.7 %	± 9.6 %
		Y	1.82	66.73	15.81		150.0		
		Z	1.86	67.00	15.75		150.0		
10388-AAA	QPSK Waveform, 10 MHz	X	2.71	71.15	17.68	0.00	150.0	± 1.1 %	± 9.6 %
		Y	2.57	69.91	16.89		150.0		
		Z	2.48	69.24	16.46		150.0		
10396-AAA	64-QAM Waveform, 100 kHz	X	2.94	71.20	19.67	3.01	150.0	± 0.8 %	± 9.6 %
		Y	3.36	73.23	20.50		150.0		
		Z	2.68	68.63	18.07		150.0		
10399-AAA	64-QAM Waveform, 40 MHz	X	3.69	67.93	16.49	0.00	150.0	± 1.1 %	± 9.6 %
		Y	3.64	67.49	16.15		150.0		
		Z	3.58	67.18	15.92		150.0		
10414-AAA	WLAN CCDF, 64-QAM, 40MHz	X	4.96	65.85	15.84	0.00	150.0	± 1.6 %	± 9.6 %
		Y	4.98	65.74	15.72		150.0		
		Z	4.93	65.60	15.58		150.0		

Note: For details on UID parameters see Appendix

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

[A] The uncertainties of Norm X,Y,Z do not affect the E^2-field uncertainty inside TSL (see Pages 5 and 6).
[B] Numerical linearization parameter: uncertainty not required.
[E] Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3968

Sensor Model Parameters

	C1 fF	C2 fF	α V^{-1}	T1 $ms.V^{-2}$	T2 $ms.V^{-1}$	T3 ms	T4 V^{-2}	T5 V^{-1}	T6
X	48.5	361.00	35.60	11.77	0.00	5.00	0.84	0.23	1.01
Y	51.2	383.64	35.93	12.55	0.00	5.10	1.80	0.15	1.01
Z	49.5	369.52	35.51	13.83	0.00	5.02	0.17	0.36	1.00

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	-99.6
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	9 mm
Tip Diameter	2.5 mm
Probe Tip to Sensor X Calibration Point	1 mm
Probe Tip to Sensor Y Calibration Point	1 mm
Probe Tip to Sensor Z Calibration Point	1 mm
Recommended Measurement Distance from Surface	1.4 mm

Note: Measurement distance from surface can be increased to 3-4 mm for an *Area Scan* job.

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3968

Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha [G]	Depth [G] (mm)	Unc (k=2)
750	41.9	0.89	9.94	9.94	9.94	0.40	0.92	± 12.0 %
835	41.5	0.90	9.55	9.55	9.55	0.35	0.96	± 12.0 %
900	41.5	0.97	9.33	9.33	9.33	0.44	0.83	± 12.0 %
1750	40.1	1.37	8.56	8.56	8.56	0.30	0.86	± 12.0 %
1900	40.0	1.40	8.19	8.19	8.19	0.34	0.86	± 12.0 %
2000	40.0	1.40	8.05	8.05	8.05	0.28	0.90	± 12.0 %
2300	39.5	1.67	7.64	7.64	7.64	0.28	0.90	± 12.0 %
2450	39.2	1.80	7.47	7.47	7.47	0.33	0.90	± 12.0 %
2600	39.0	1.96	7.34	7.34	7.34	0.35	0.90	± 12.0 %
3300	38.2	2.71	6.90	6.90	6.90	0.30	1.35	± 13.1 %
3500	37.9	2.91	6.87	6.87	6.87	0.30	1.35	± 13.1 %
3700	37.7	3.12	6.77	6.77	6.77	0.30	1.35	± 13.1 %
3900	37.5	3.32	6.50	6.50	6.50	0.35	1.50	± 13.1 %
4100	37.2	3.53	6.46	6.46	6.46	0.35	1.50	± 13.1 %
4400	36.9	3.84	6.32	6.32	6.32	0.35	1.60	± 13.1 %
4600	36.7	4.04	6.24	6.24	6.24	0.35	1.60	± 13.1 %
4800	36.4	4.25	6.02	6.02	6.02	0.40	1.80	± 13.1 %
4950	36.3	4.40	5.80	5.80	5.80	0.40	1.80	± 13.1 %
5250	35.9	4.71	5.45	5.45	5.45	0.40	1.80	± 13.1 %
5600	35.5	5.07	4.78	4.78	4.78	0.40	1.80	± 13.1 %
5750	35.4	5.22	4.94	4.94	4.94	0.40	1.80	± 13.1 %

[C] Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Validity of ConvF assessed at 6 MHz is 4-9 MHz, and ConvF assessed at 13 MHz is 9-19 MHz. Above 5 GHz frequency validity can be extended to ± 110 MHz.
[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.
[G] Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3968

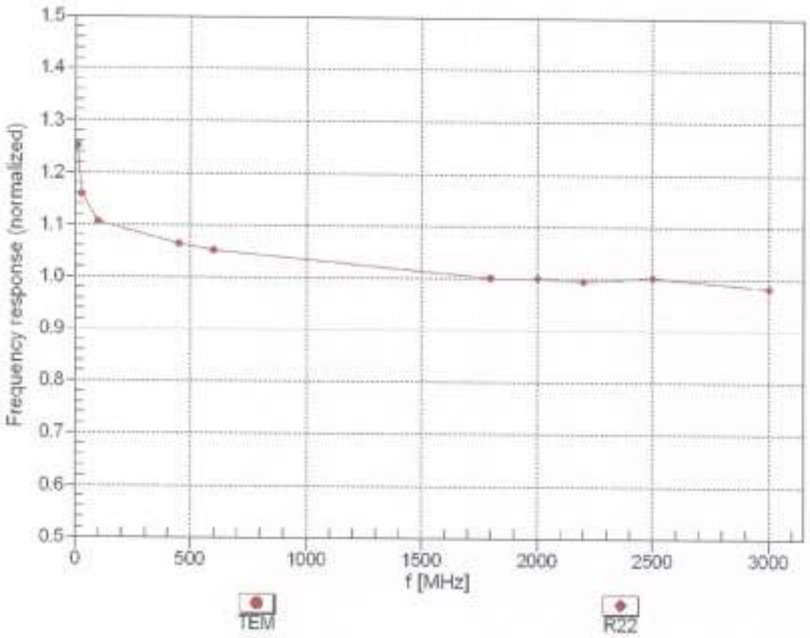
Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha [G]	Depth [G] (mm)	Unc (k=2)
6500	34.5	6.07	5.70	5.70	5.70	0.20	2.50	± 18.6 %

[C] Calibration procedure for frequencies above 6 GHz is pending accreditation. Frequency validity above 6GHz is ± 700 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.
[F] At frequencies 6-10 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.
[G] Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz; below ± 2% for frequencies between 3-6 GHz; and below ± 4% for frequencies between 6-10 GHz at any distance larger than half the probe tip diameter from the boundary.

Frequency Response of E-Field

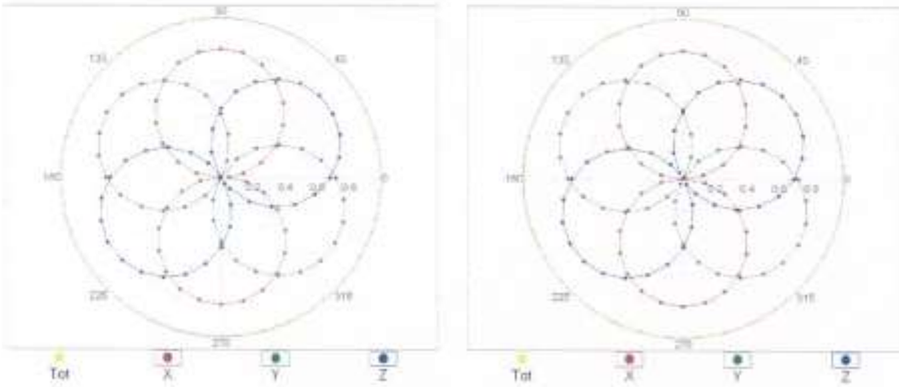
(TEM-Cell:ifi110 EXX, Waveguide: R22)

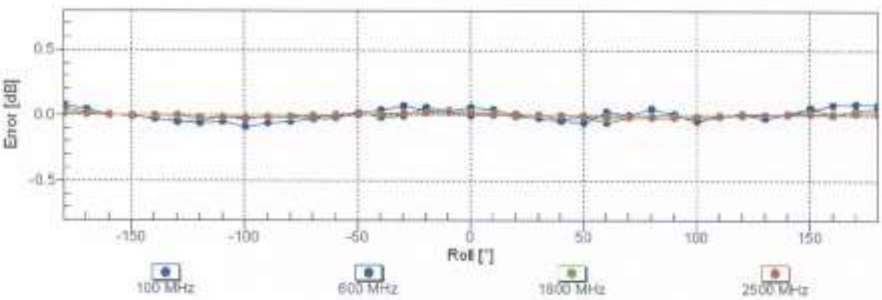


Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

Receiving Pattern (φ), ϑ = 0°

f=600 MHz,TEM f=1800 MHz,R22

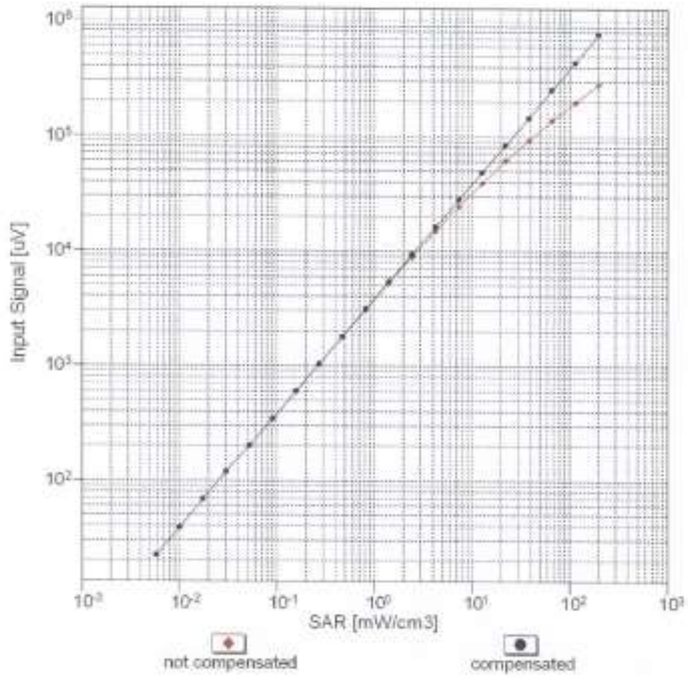


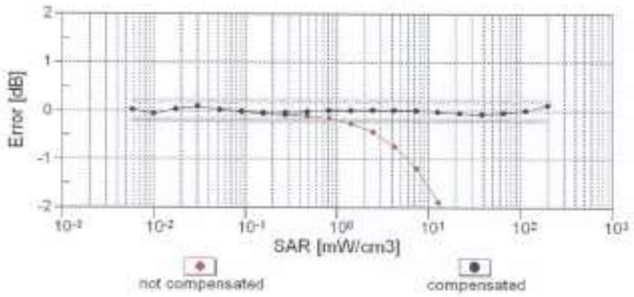


Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

Dynamic Range f(SAR$_{head}$)

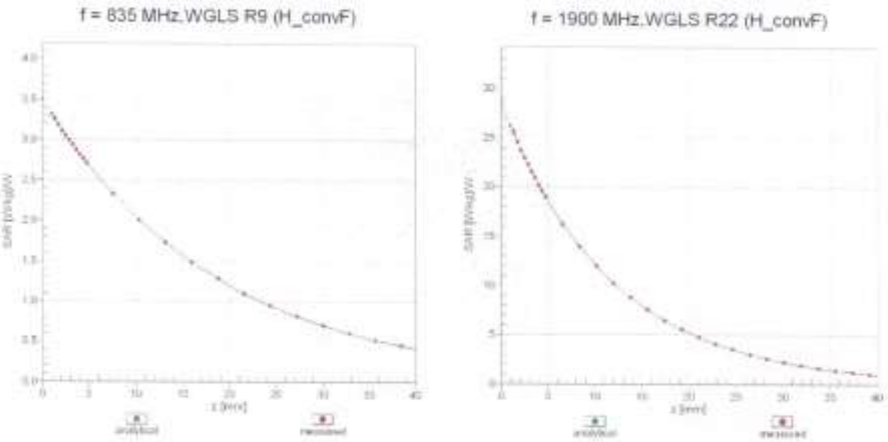
(TEM cell , f_{eval}= 1900 MHz)





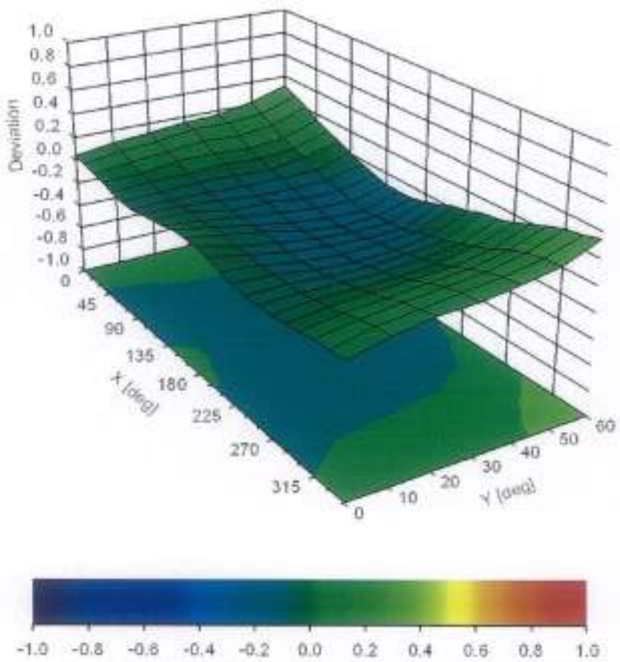
Uncertainty of Linearity Assessment: ± 0.6% (k=2)

Conversion Factor Assessment



Deviation from Isotropy in Liquid

Error (ϕ, ϑ), f = 900 MHz



Uncertainty of Spherical Isotropy Assessment: ± 2.6% (k=2)

EX3DV4– SN:3968 September 28, 2020

Appendix: Modulation Calibration Parameters

UID	Rev	Communication System Name	Group	PAR (dB)	Unc[E] (k=2)
0		CW	CW	0.00	± 4.7 %
10010	CAA	SAR Validation (Square, 100ms, 10ms)	Test	10.00	± 9.6 %
10011	CAB	UMTS-FDD (WCDMA)	WCDMA	2.91	± 9.6 %
10012	CAB	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps)	WLAN	1.87	± 9.6 %
10013	CAB	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps)	WLAN	9.46	± 9.6 %
10021	DAC	GSM-FDD (TDMA, GMSK)	GSM	9.39	± 9.6 %
10023	DAC	GPRS-FDD (TDMA, GMSK, TN 0)	GSM	9.57	± 9.6 %
10024	DAC	GPRS-FDD (TDMA, GMSK, TN 0-1)	GSM	6.56	± 9.6 %
10025	DAC	EDGE-FDD (TDMA, 8PSK, TN 0)	GSM	12.62	± 9.6 %
10026	DAC	EDGE-FDD (TDMA, 8PSK, TN 0-1)	GSM	9.55	± 9.6 %
10027	DAC	GPRS-FDD (TDMA, GMSK, TN 0-1-2)	GSM	4.80	± 9.6 %
10028	DAC	GPRS-FDD (TDMA, GMSK, TN 0-1-2-3)	GSM	3.55	± 9.6 %
10029	DAC	EDGE-FDD (TDMA, 8PSK, TN 0-1-2)	GSM	7.78	± 9.6 %
10030	CAA	IEEE 802.15.1 Bluetooth (GFSK, DH1)	Bluetooth	5.30	± 9.6 %
10031	CAA	IEEE 802.15.1 Bluetooth (GFSK, DH3)	Bluetooth	1.87	± 9.6 %
10032	CAA	IEEE 802.15.1 Bluetooth (GFSK, DH5)	Bluetooth	1.16	± 9.6 %
10033	CAA	IEEE 802.15.1 Bluetooth (PI/4-DQPSK, DH1)	Bluetooth	7.74	± 9.6 %
10034	CAA	IEEE 802.15.1 Bluetooth (PI/4-DQPSK, DH3)	Bluetooth	4.53	± 9.6 %
10035	CAA	IEEE 802.15.1 Bluetooth (PI/4-DQPSK, DH5)	Bluetooth	3.83	± 9.6 %
10036	CAA	IEEE 802.15.1 Bluetooth (8-DPSK, DH1)	Bluetooth	8.01	± 9.6 %
10037	CAA	IEEE 802.15.1 Bluetooth (8-DPSK, DH3)	Bluetooth	4.77	± 9.6 %
10038	CAA	IEEE 802.15.1 Bluetooth (8-DPSK, DH5)	Bluetooth	4.10	± 9.6 %
10039	CAB	CDMA2000 (1xRTT, RC1)	CDMA2000	4.57	± 9.6 %
10042	CAB	IS-54 / IS-136 FDD (TDMA/FDM, PI/4-DQPSK, Halfrate)	AMPS	7.78	± 9.6 %
10044	CAA	IS-91/EIA/TIA-553 FDD (FDMA, FM)	AMPS	0.00	± 9.6 %
10048	CAA	DECT (TDD, TDMA/FDM, GFSK, Full Slot, 24)	DECT	13.80	± 9.6 %
10049	CAA	DECT (TDD, TDMA/FDM, GFSK, Double Slot, 12)	DECT	10.79	± 9.6 %
10056	CAA	UMTS-TDD (TD-SCDMA, 1.28 Mcps)	TD-SCDMA	11.01	± 9.6 %
10058	DAC	EDGE-FDD (TDMA, 8PSK, TN 0-1-2-3)	GSM	6.52	± 9.6 %
10059	CAB	IEEE 802.11b WiFi 2.4 GHz (DSSS, 2 Mbps)	WLAN	2.12	± 9.6 %
10060	CAB	IEEE 802.11b WiFi 2.4 GHz (DSSS, 5.5 Mbps)	WLAN	2.83	± 9.6 %
10061	CAB	IEEE 802.11b WiFi 2.4 GHz (DSSS, 11 Mbps)	WLAN	3.60	± 9.6 %
10062	CAD	IEEE 802.11a/h WiFi 5 GHz (OFDM, 6 Mbps)	WLAN	8.68	± 9.6 %
10063	CAD	IEEE 802.11a/h WiFi 5 GHz (OFDM, 9 Mbps)	WLAN	8.63	± 9.6 %
10064	CAD	IEEE 802.11a/h WiFi 5 GHz (OFDM, 12 Mbps)	WLAN	9.09	± 9.6 %
10065	CAD	IEEE 802.11a/h WiFi 5 GHz (OFDM, 18 Mbps)	WLAN	9.00	± 9.6 %
10066	CAD	IEEE 802.11a/h WiFi 5 GHz (OFDM, 24 Mbps)	WLAN	9.38	± 9.6 %
10067	CAD	IEEE 802.11a/h WiFi 5 GHz (OFDM, 36 Mbps)	WLAN	10.12	± 9.6 %
10068	CAD	IEEE 802.11a/h WiFi 5 GHz (OFDM, 48 Mbps)	WLAN	10.24	± 9.6 %
10069	CAD	IEEE 802.11a/h WiFi 5 GHz (OFDM, 54 Mbps)	WLAN	10.56	± 9.6 %
10071	CAB	IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 9 Mbps)	WLAN	9.83	± 9.6 %
10072	CAB	IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 12 Mbps)	WLAN	9.62	± 9.6 %
10073	CAB	IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 18 Mbps)	WLAN	9.94	± 9.6 %
10074	CAB	IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 24 Mbps)	WLAN	10.30	± 9.6 %
10075	CAB	IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 36 Mbps)	WLAN	10.77	± 9.6 %
10076	CAB	IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 48 Mbps)	WLAN	10.94	± 9.6 %
10077	CAB	IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 54 Mbps)	WLAN	11.00	± 9.6 %
10081	CAB	CDMA2000 (1xRTT, RC3)	CDMA2000	3.97	± 9.6 %
10082	CAB	IS-54 / IS-136 FDD (TDMA/FDM, PI/4-DQPSK, Fullrate)	AMPS	4.77	± 9.6 %
10090	DAC	GPRS-FDD (TDMA, GMSK, TN 0-4)	GSM	6.56	± 9.6 %
10097	CAC	UMTS-FDD (HSDPA)	WCDMA	3.98	± 9.6 %
10098	DAC	UMTS-FDD (HSUPA, Subtest 2)	WCDMA	3.98	± 9.6 %

Certificate No: EX3-3968_Sep20/2 Page 11 of 23

EX3DV4– SN:3968 September 28, 2020

10099	CAC	EDGE-FDD (TDMA, 8PSK, TN 0-4)	GSM	9.55	± 9.6 %
10100	CAC	LTE-FDD (SC-FDMA, 100% RB, 20 MHz, QPSK)	LTE-FDD	5.67	± 9.6 %
10101	CAB	LTE-FDD (SC-FDMA, 100% RB, 20 MHz, 16-QAM)	LTE-FDD	6.42	± 9.6 %
10102	CAB	LTE-FDD (SC-FDMA, 100% RB, 20 MHz, 64-QAM)	LTE-FDD	6.60	± 9.6 %
10103	DAC	LTE-TDD (SC-FDMA, 100% RB, 20 MHz, QPSK)	LTE-TDD	9.29	± 9.6 %
10104	CAE	LTE-TDD (SC-FDMA, 100% RB, 20 MHz, 16-QAM)	LTE-TDD	9.97	± 9.6 %
10105	CAE	LTE-TDD (SC-FDMA, 100% RB, 20 MHz, 64-QAM)	LTE-TDD	10.01	± 9.6 %
10108	CAE	LTE-FDD (SC-FDMA, 100% RB, 10 MHz, QPSK)	LTE-FDD	5.80	± 9.6 %
10109	CAG	LTE-FDD (SC-FDMA, 100% RB, 10 MHz, 16-QAM)	LTE-FDD	6.43	± 9.6 %
10110	CAG	LTE-FDD (SC-FDMA, 100% RB, 5 MHz, QPSK)	LTE-FDD	5.75	± 9.6 %
10111	CAG	LTE-FDD (SC-FDMA, 100% RB, 5 MHz, 16-QAM)	LTE-FDD	6.44	± 9.6 %
10112	CAG	LTE-FDD (SC-FDMA, 100% RB, 10 MHz, 64-QAM)	LTE-FDD	6.59	± 9.6 %
10113	CAG	LTE-FDD (SC-FDMA, 100% RB, 5 MHz, 64-QAM)	LTE-FDD	6.62	± 9.6 %
10114	CAG	IEEE 802.11n (HT Greenfield, 13.5 Mbps, BPSK)	WLAN	8.10	± 9.6 %
10115	CAG	IEEE 802.11n (HT Greenfield, 81 Mbps, 16-QAM)	WLAN	8.46	± 9.6 %
10116	CAG	IEEE 802.11n (HT Greenfield, 135 Mbps, 64-QAM)	WLAN	8.15	± 9.6 %
10117	CAG	IEEE 802.11n (HT Mixed, 13.5 Mbps, BPSK)	WLAN	8.07	± 9.6 %
10118	CAD	IEEE 802.11n (HT Mixed, 81 Mbps, 16-QAM)	WLAN	8.59	± 9.6 %
10119	CAD	IEEE 802.11n (HT Mixed, 135 Mbps, 64-QAM)	WLAN	8.13	± 9.6 %
10140	CAD	LTE-FDD (SC-FDMA, 100% RB, 15 MHz, 16-QAM)	LTE-FDD	6.49	± 9.6 %
10141	CAD	LTE-FDD (SC-FDMA, 100% RB, 15 MHz, 64-QAM)	LTE-FDD	6.53	± 9.6 %
10142	CAD	LTE-FDD (SC-FDMA, 100% RB, 3 MHz, QPSK)	LTE-FDD	5.73	± 9.6 %
10143	CAD	LTE-FDD (SC-FDMA, 100% RB, 3 MHz, 16-QAM)	LTE-FDD	6.35	± 9.6 %
10144	CAC	LTE-FDD (SC-FDMA, 100% RB, 3 MHz, 64-QAM)	LTE-FDD	6.65	± 9.6 %
10145	CAC	LTE-FDD (SC-FDMA, 100% RB, 1.4 MHz, QPSK)	LTE-FDD	5.76	± 9.6 %
10146	CAC	LTE-FDD (SC-FDMA, 100% RB, 1.4 MHz, 16-QAM)	LTE-FDD	6.41	± 9.6 %
10147	CAC	LTE-FDD (SC-FDMA, 100% RB, 1.4 MHz, 64-QAM)	LTE-FDD	6.72	± 9.6 %
10149	CAE	LTE-FDD (SC-FDMA, 50% RB, 20 MHz, 16-QAM)	LTE-FDD	6.42	± 9.6 %
10150	CAE	LTE-FDD (SC-FDMA, 50% RB, 20 MHz, 64-QAM)	LTE-FDD	6.60	± 9.6 %
10151	CAE	LTE-TDD (SC-FDMA, 50% RB, 20 MHz, QPSK)	LTE-TDD	9.28	± 9.6 %
10152	CAE	LTE-TDD (SC-FDMA, 50% RB, 20 MHz, 16-QAM)	LTE-TDD	9.92	± 9.6 %
10153	CAE	LTE-TDD (SC-FDMA, 50% RB, 20 MHz, 64-QAM)	LTE-TDD	10.05	± 9.6 %
10154	CAF	LTE-FDD (SC-FDMA, 50% RB, 10 MHz, QPSK)	LTE-FDD	5.75	± 9.6 %
10155	CAF	LTE-FDD (SC-FDMA, 50% RB, 10 MHz, 16-QAM)	LTE-FDD	6.43	± 9.6 %
10156	CAF	LTE-FDD (SC-FDMA, 50% RB, 5 MHz, QPSK)	LTE-FDD	5.79	± 9.6 %
10157	CAE	LTE-FDD (SC-FDMA, 50% RB, 5 MHz, 16-QAM)	LTE-FDD	6.49	± 9.6 %
10158	CAE	LTE-FDD (SC-FDMA, 50% RB, 10 MHz, 64-QAM)	LTE-FDD	6.62	± 9.6 %
10159	CAG	LTE-FDD (SC-FDMA, 50% RB, 5 MHz, 64-QAM)	LTE-FDD	6.56	± 9.6 %
10160	CAG	LTE-FDD (SC-FDMA, 50% RB, 15 MHz, QPSK)	LTE-FDD	5.82	± 9.6 %
10161	CAG	LTE-FDD (SC-FDMA, 50% RB, 15 MHz, 16-QAM)	LTE-FDD	6.43	± 9.6 %
10162	CAG	LTE-FDD (SC-FDMA, 50% RB, 15 MHz, 64-QAM)	LTE-FDD	6.58	± 9.6 %
10166	CAG	LTE-FDD (SC-FDMA, 50% RB, 1.4 MHz, QPSK)	LTE-FDD	5.46	± 9.6 %
10167	CAG	LTE-FDD (SC-FDMA, 50% RB, 1.4 MHz, 16-QAM)	LTE-FDD	6.21	± 9.6 %
10168	CAG	LTE-FDD (SC-FDMA, 50% RB, 1.4 MHz, 64-QAM)	LTE-FDD	6.79	± 9.6 %
10169	CAG	LTE-FDD (SC-FDMA, 1 RB, 20 MHz, QPSK)	LTE-FDD	5.73	± 9.6 %
10170	CAG	LTE-FDD (SC-FDMA, 1 RB, 20 MHz, 16-QAM)	LTE-FDD	6.52	± 9.6 %
10171	CAE	LTE-FDD (SC-FDMA, 1 RB, 20 MHz, 64-QAM)	LTE-FDD	6.49	± 9.6 %
10172	CAE	LTE-TDD (SC-FDMA, 1 RB, 20 MHz, QPSK)	LTE-TDD	9.21	± 9.6 %
10173	CAE	LTE-TDD (SC-FDMA, 1 RB, 20 MHz, 16-QAM)	LTE-TDD	9.48	± 9.6 %
10174	CAF	LTE-TDD (SC-FDMA, 1 RB, 20 MHz, 64-QAM)	LTE-TDD	10.25	± 9.6 %
10175	CAF	LTE-FDD (SC-FDMA, 1 RB, 10 MHz, QPSK)	LTE-FDD	5.72	± 9.6 %
10176	CAF	LTE-FDD (SC-FDMA, 1 RB, 10 MHz, 16-QAM)	LTE-FDD	6.52	± 9.6 %
10177	CAE	LTE-FDD (SC-FDMA, 1 RB, 5 MHz, QPSK)	LTE-FDD	5.73	± 9.6 %
10178	CAE	LTE-FDD (SC-FDMA, 1 RB, 5 MHz, 16-QAM)	LTE-FDD	6.52	± 9.6 %
10179	AAE	LTE-FDD (SC-FDMA, 1 RB, 10 MHz, 64-QAM)	LTE-FDD	6.50	± 9.6 %
10180	CAG	LTE-FDD (SC-FDMA, 1 RB, 5 MHz, 64-QAM)	LTE-FDD	6.50	± 9.6 %

Certificate No: EX3-3968_Sep20/2 Page 12 of 23

EX3DV4– SN:3968 September 28, 2020

10181	CAG	LTE-FDD (SC-FDMA, 1 RB, 15 MHz, QPSK)	LTE-FDD	5.72	± 9.6 %
10182	CAG	LTE-FDD (SC-FDMA, 1 RB, 15 MHz, 16-QAM)	LTE-FDD	6.52	± 9.6 %
10183	CAG	LTE-FDD (SC-FDMA, 1 RB, 15 MHz, 64-QAM)	LTE-FDD	6.50	± 9.6 %
10184	CAG	LTE-FDD (SC-FDMA, 1 RB, 3 MHz, QPSK)	LTE-FDD	5.73	± 9.6 %
10185	CAI	LTE-FDD (SC-FDMA, 1 RB, 3 MHz, 16-QAM)	LTE-FDD	6.51	± 9.6 %
10186	CAG	LTE-FDD (SC-FDMA, 1 RB, 3 MHz, 64-QAM)	LTE-FDD	6.50	± 9.6 %
10187	CAG	LTE-FDD (SC-FDMA, 1 RB, 1.4 MHz, QPSK)	LTE-FDD	5.73	± 9.6 %
10188	CAG	LTE-FDD (SC-FDMA, 1 RB, 1.4 MHz, 16-QAM)	LTE-FDD	6.52	± 9.6 %
10189	CAE	LTE-FDD (SC-FDMA, 1 RB, 1.4 MHz, 64-QAM)	LTE-FDD	6.50	± 9.6 %
10193	CAE	IEEE 802.11n (HT Greenfield, 6.5 Mbps, BPSK)	WLAN	8.09	± 9.6 %
10194	AAD	IEEE 802.11n (HT Greenfield, 39 Mbps, 16-QAM)	WLAN	8.12	± 9.6 %
10195	CAE	IEEE 802.11n (HT Greenfield, 65 Mbps, 64-QAM)	WLAN	8.21	± 9.6 %
10196	CAE	IEEE 802.11n (HT Mixed, 6.5 Mbps, BPSK)	WLAN	8.10	± 9.6 %
10197	AAE	IEEE 802.11n (HT Mixed, 39 Mbps, 16-QAM)	WLAN	8.13	± 9.6 %
10198	CAF	IEEE 802.11n (HT Mixed, 65 Mbps, 64-QAM)	WLAN	8.27	± 9.6 %
10219	CAF	IEEE 802.11n (HT Mixed, 7.2 Mbps, BPSK)	WLAN	8.03	± 9.6 %
10220	AAF	IEEE 802.11n (HT Mixed, 43.3 Mbps, 16-QAM)	WLAN	8.13	± 9.6 %
10221	CAC	IEEE 802.11n (HT Mixed, 72.2 Mbps, 64-QAM)	WLAN	8.27	± 9.6 %
10222	CAC	IEEE 802.11n (HT Mixed, 15 Mbps, BPSK)	WLAN	8.06	± 9.6 %
10223	CAD	IEEE 802.11n (HT Mixed, 90 Mbps, 16-QAM)	WLAN	8.48	± 9.6 %
10224	CAD	IEEE 802.11n (HT Mixed, 150 Mbps, 64-QAM)	WLAN	8.08	± 9.6 %
10225	CAD	UMTS-FDD (HSPA+)	WCDMA	5.97	± 9.6 %
10226	CAD	LTE-TDD (SC-FDMA, 1 RB, 1.4 MHz, 16-QAM)	LTE-TDD	9.49	± 9.6 %
10227	CAD	LTE-TDD (SC-FDMA, 1 RB, 1.4 MHz, 64-QAM)	LTE-TDD	10.26	± 9.6 %
10228	CAD	LTE-TDD (SC-FDMA, 1 RB, 1.4 MHz, QPSK)	LTE-TDD	9.22	± 9.6 %
10229	DAC	LTE-TDD (SC-FDMA, 1 RB, 3 MHz, 16-QAM)	LTE-TDD	9.48	± 9.6 %
10230	CAC	LTE-TDD (SC-FDMA, 1 RB, 3 MHz, 64-QAM)	LTE-TDD	10.25	± 9.6 %
10231	CAC	LTE-TDD (SC-FDMA, 1 RB, 3 MHz, QPSK)	LTE-TDD	9.19	± 9.6 %
10232	CAD	LTE-TDD (SC-FDMA, 1 RB, 5 MHz, 16-QAM)	LTE-TDD	9.48	± 9.6 %
10233	CAD	LTE-TDD (SC-FDMA, 1 RB, 5 MHz, 64-QAM)	LTE-TDD	10.25	± 9.6 %
10234	CAD	LTE-TDD (SC-FDMA, 1 RB, 5 MHz, QPSK)	LTE-TDD	9.21	± 9.6 %
10235	CAD	LTE-TDD (SC-FDMA, 1 RB, 10 MHz, 16-QAM)	LTE-TDD	9.48	± 9.6 %
10236	CAD	LTE-TDD (SC-FDMA, 1 RB, 10 MHz, 64-QAM)	LTE-TDD	10.25	± 9.6 %
10237	CAD	LTE-TDD (SC-FDMA, 1 RB, 10 MHz, QPSK)	LTE-TDD	9.21	± 9.6 %
10238	CAB	LTE-TDD (SC-FDMA, 1 RB, 15 MHz, 16-QAM)	LTE-TDD	9.48	± 9.6 %
10239	CAB	LTE-TDD (SC-FDMA, 1 RB, 15 MHz, 64-QAM)	LTE-TDD	10.25	± 9.6 %
10240	CAB	LTE-TDD (SC-FDMA, 1 RB, 15 MHz, QPSK)	LTE-TDD	9.21	± 9.6 %
10241	CAB	LTE-TDD (SC-FDMA, 50% RB, 1.4 MHz, 16-QAM)	LTE-TDD	9.82	± 9.6 %
10242	CAD	LTE-TDD (SC-FDMA, 50% RB, 1.4 MHz, 64-QAM)	LTE-TDD	9.86	± 9.6 %
10243	CAD	LTE-TDD (SC-FDMA, 50% RB, 1.4 MHz, QPSK)	LTE-TDD	9.46	± 9.6 %
10244	CAD	LTE-TDD (SC-FDMA, 50% RB, 3 MHz, 16-QAM)	LTE-TDD	10.06	± 9.6 %
10245	CAG	LTE-TDD (SC-FDMA, 50% RB, 3 MHz, 64-QAM)	LTE-TDD	10.06	± 9.6 %
10246	CAG	LTE-TDD (SC-FDMA, 50% RB, 3 MHz, QPSK)	LTE-TDD	9.30	± 9.6 %
10247	CAG	LTE-TDD (SC-FDMA, 50% RB, 5 MHz, 16-QAM)	LTE-TDD	9.91	± 9.6 %
10248	CAG	LTE-TDD (SC-FDMA, 50% RB, 5 MHz, 64-QAM)	LTE-TDD	10.09	± 9.6 %
10249	CAG	LTE-TDD (SC-FDMA, 50% RB, 5 MHz, QPSK)	LTE-TDD	9.29	± 9.6 %
10250	CAG	LTE-TDD (SC-FDMA, 50% RB, 10 MHz, 16-QAM)	LTE-TDD	9.81	± 9.6 %
10251	CAF	LTE-TDD (SC-FDMA, 50% RB, 10 MHz, 64-QAM)	LTE-TDD	10.17	± 9.6 %
10252	CAF	LTE-TDD (SC-FDMA, 50% RB, 10 MHz, QPSK)	LTE-TDD	9.24	± 9.6 %
10253	CAF	LTE-TDD (SC-FDMA, 50% RB, 15 MHz, 16-QAM)	LTE-TDD	9.90	± 9.6 %
10254	CAB	LTE-TDD (SC-FDMA, 50% RB, 15 MHz, 64-QAM)	LTE-TDD	10.14	± 9.6 %
10255	CAB	LTE-TDD (SC-FDMA, 50% RB, 15 MHz, QPSK)	LTE-TDD	9.20	± 9.6 %
10256	CAB	LTE-TDD (SC-FDMA, 100% RB, 1.4 MHz, 16-QAM)	LTE-TDD	9.96	± 9.6 %
10257	CAD	LTE-TDD (SC-FDMA, 100% RB, 1.4 MHz, 64-QAM)	LTE-TDD	10.08	± 9.6 %
10258	CAD	LTE-TDD (SC-FDMA, 100% RB, 1.4 MHz, QPSK)	LTE-TDD	9.34	± 9.6 %
10259	CAD	LTE-TDD (SC-FDMA, 100% RB, 3 MHz, 16-QAM)	LTE-TDD	9.98	± 9.6 %

Certificate No: EX3-3968_Sep20/2 Page 13 of 23

EX3DV4– SN:3968 September 28, 2020

10260	CAG	LTE-TDD (SC-FDMA, 100% RB, 3 MHz, 64-QAM)	LTE-TDD	9.97	± 9.6 %
10261	CAG	LTE-TDD (SC-FDMA, 100% RB, 3 MHz, QPSK)	LTE-TDD	9.24	± 9.6 %
10262	CAG	LTE-TDD (SC-FDMA, 100% RB, 5 MHz, 16-QAM)	LTE-TDD	9.83	± 9.6 %
10263	CAG	LTE-TDD (SC-FDMA, 100% RB, 5 MHz, 64-QAM)	LTE-TDD	10.16	± 9.6 %
10264	CAG	LTE-TDD (SC-FDMA, 100% RB, 5 MHz, QPSK)	LTE-TDD	9.23	± 9.6 %
10265	CAG	LTE-TDD (SC-FDMA, 100% RB, 10 MHz, 16-QAM)	LTE-TDD	9.92	± 9.6 %
10266	CAF	LTE-TDD (SC-FDMA, 100% RB, 10 MHz, 64-QAM)	LTE-TDD	10.07	± 9.6 %
10267	CAF	LTE-TDD (SC-FDMA, 100% RB, 10 MHz, QPSK)	LTE-TDD	9.30	± 9.6 %
10268	CAF	LTE-TDD (SC-FDMA, 100% RB, 15 MHz, 16-QAM)	LTE-TDD	10.06	± 9.6 %
10269	CAB	LTE-TDD (SC-FDMA, 100% RB, 15 MHz, 64-QAM)	LTE-TDD	10.13	± 9.6 %
10270	CAB	LTE-TDD (SC-FDMA, 100% RB, 15 MHz, QPSK)	LTE-TDD	9.58	± 9.6 %
10274	CAB	UMTS-FDD (HSUPA, Subtest 5, 3GPP Rel8.10)	WCDMA	4.87	± 9.6 %
10275	CAD	UMTS-FDD (HSUPA, Subtest 5, 3GPP Rel8.4)	WCDMA	3.96	± 9.6 %
10277	CAD	PHS (QPSK)	PHS	11.81	± 9.6 %
10278	CAD	PHS (QPSK, BW 884MHz, Rolloff 0.5)	PHS	11.81	± 9.6 %
10279	CAG	PHS (QPSK, BW 884MHz, Rolloff 0.38)	PHS	12.18	± 9.6 %
10290	CAG	CDMA2000, RC1, SO55, Full Rate	CDMA2000	3.91	± 9.6 %
10291	CAG	CDMA2000, RC3, SO55, Full Rate	CDMA2000	3.46	± 9.6 %
10292	CAG	CDMA2000, RC3, SO32, Full Rate	CDMA2000	3.39	± 9.6 %
10293	CAG	CDMA2000, RC3, SO3, Full Rate	CDMA2000	3.50	± 9.6 %
10295	CAG	CDMA2000, RC1, SO3, 1/8th Rate 25 fr.	CDMA2000	12.49	± 9.6 %
10297	CAF	LTE-FDD (SC-FDMA, 50% RB, 20 MHz, QPSK)	LTE-FDD	5.81	± 9.6 %
10298	CAF	LTE-FDD (SC-FDMA, 50% RB, 3 MHz, QPSK)	LTE-FDD	5.72	± 9.6 %
10299	CAF	LTE-FDD (SC-FDMA, 50% RB, 3 MHz, 16-QAM)	LTE-FDD	6.39	± 9.6 %
10300	CAC	LTE-FDD (SC-FDMA, 50% RB, 3 MHz, 64-QAM)	LTE-FDD	6.60	± 9.6 %
10301	CAC	IEEE 802.16e WiMAX (29:18, 5ms, 10MHz, QPSK, PUSC)	WiMAX	12.03	± 9.6 %
10302	CAB	IEEE 802.16e WiMAX (29:18, 5ms, 10MHz, QPSK, PUSC, 3CTRL)	WiMAX	12.57	± 9.6 %
10303	CAB	IEEE 802.16e WiMAX (31:15, 5ms, 10MHz, 64QAM, PUSC)	WiMAX	12.52	± 9.6 %
10304	CAA	IEEE 802.16e WiMAX (29:18, 5ms, 10MHz, 64QAM, PUSC)	WiMAX	11.86	± 9.6 %
10305	CAA	IEEE 802.16e WiMAX (31:15, 10ms, 10MHz, 64QAM, PUSC)	WiMAX	15.24	± 9.6 %
10306	CAA	IEEE 802.16e WiMAX (29:18, 10ms, 10MHz, 64QAM, PUSC)	WiMAX	14.67	± 9.6 %
10307	AAB	IEEE 802.16e WiMAX (29:18, 10ms, 10MHz, QPSK, PUSC)	WiMAX	14.49	± 9.6 %
10308	AAB	IEEE 802.16e WiMAX (29:18, 10ms, 10MHz, 16QAM, PUSC)	WiMAX	14.46	± 9.6 %
10309	AAB	IEEE 802.16e WiMAX (29:18, 10ms, 10MHz, 16QAM,AMC 2x3)	WiMAX	14.58	± 9.6 %
10310	AAB	IEEE 802.16e WiMAX (29:18, 10ms, 10MHz, QPSK, AMC 2x3	WiMAX	14.57	± 9.6 %
10311	AAB	LTE-FDD (SC-FDMA, 100% RB, 15 MHz, QPSK)	LTE-FDD	6.06	± 9.6 %
10313	AAD	iDEN 1:3	iDEN	10.51	± 9.6 %
10314	AAD	iDEN 1:6	iDEN	13.48	± 9.6 %
10315	AAD	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps, 96pc dc)	WLAN	1.71	± 9.6 %
10316	AAD	IEEE 802.11g WiFi 2.4 GHz (ERP-OFDM, 6 Mbps, 96pc dc)	WLAN	8.36	± 9.6 %
10317	AAA	IEEE 802.11a WiFi 5 GHz (OFDM, 6 Mbps, 96pc dc)	WLAN	8.36	± 9.6 %
10352	AAA	Pulse Waveform (200Hz, 10%)	Generic	10.00	± 9.6 %
10353	AAA	Pulse Waveform (200Hz, 20%)	Generic	6.99	± 9.6 %
10354	AAA	Pulse Waveform (200Hz, 40%)	Generic	3.98	± 9.6 %
10355	AAA	Pulse Waveform (200Hz, 60%)	Generic	2.22	± 9.6 %
10356	AAA	Pulse Waveform (200Hz, 80%)	Generic	0.97	± 9.6 %
10387	AAA	QPSK Waveform, 1 MHz	Generic	5.10	± 9.6 %
10388	AAA	QPSK Waveform, 10 MHz	Generic	5.22	± 9.6 %
10396	AAA	64-QAM Waveform, 100 kHz	Generic	6.27	± 9.6 %
10399	AAA	64-QAM Waveform, 40 MHz	Generic	6.27	± 9.6 %
10400	AAD	IEEE 802.11ac WiFi (20MHz, 64-QAM, 99pc dc)	WLAN	8.37	± 9.6 %
10401	AAA	IEEE 802.11ac WiFi (40MHz, 64-QAM, 99pc dc)	WLAN	8.60	± 9.6 %
10402	AAA	IEEE 802.11ac WiFi (80MHz, 64-QAM, 99pc dc)	WLAN	8.53	± 9.6 %
10403	AAB	CDMA2000 (1xEV-DO, Rev. 0)	CDMA2000	3.76	± 9.6 %
10404	AAB	CDMA2000 (1xEV-DO, Rev. A)	CDMA2000	3.77	± 9.6 %
10406	AAD	CDMA2000, RC3, SO32, SCH0, Full Rate	CDMA2000	5.22	± 9.6 %

Certificate No: EX3-3968_Sep20/2 Page 14 of 23

EX3DV4– SN:3968 September 28, 2020

10410	AAA	LTE-TDD (SC-FDMA, 1 RB, 10 MHz, QPSK, UL Sub=2,3,4,7,8,9)	LTE-TDD	7.82	± 9.6 %
10414	AAA	WLAN CCDF, 64-QAM, 40MHz	Generic	8.54	± 9.6 %
10415	AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps, 99pc dc)	WLAN	1.54	± 9.6 %
10416	AAA	IEEE 802.11g WiFi 2.4 GHz (ERP-OFDM, 6 Mbps, 99pc dc)	WLAN	8.23	± 9.6 %
10417	AAA	IEEE 802.11a/h WiFi 5 GHz (OFDM, 6 Mbps, 99pc dc)	WLAN	8.23	± 9.6 %
10418	AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps, 99pc, Long)	WLAN	8.14	± 9.6 %
10419	AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps, 99pc, Short)	WLAN	8.19	± 9.6 %
10422	AAA	IEEE 802.11n (HT Greenfield, 7.2 Mbps, BPSK)	WLAN	8.32	± 9.6 %
10423	AAA	IEEE 802.11n (HT Greenfield, 43.3 Mbps, 16-QAM)	WLAN	8.47	± 9.6 %
10424	AAE	IEEE 802.11n (HT Greenfield, 72.2 Mbps, 64-QAM)	WLAN	8.40	± 9.6 %
10425	AAE	IEEE 802.11n (HT Greenfield, 15 Mbps, BPSK)	WLAN	8.41	± 9.6 %
10426	AAE	IEEE 802.11n (HT Greenfield, 90 Mbps, 16-QAM)	WLAN	8.45	± 9.6 %
10427	AAB	IEEE 802.11n (HT Greenfield, 150 Mbps, 64-QAM)	WLAN	8.41	± 9.6 %
10430	AAB	LTE-FDD (OFDMA, 5 MHz, E-TM 3.1)	LTE-FDD	8.28	± 9.6 %
10431	AAC	LTE-FDD (OFDMA, 10 MHz, E-TM 3.1)	LTE-FDD	8.38	± 9.6 %
10432	AAB	LTE-FDD (OFDMA, 15 MHz, E-TM 3.1)	LTE-FDD	8.34	± 9.6 %
10433	AAC	LTE-FDD (OFDMA, 20 MHz, E-TM 3.1)	LTE-FDD	8.34	± 9.6 %
10434	AAG	W-CDMA (BS Test Model 1, 64 DPCH)	WCDMA	8.60	± 9.6 %
10435	AAA	LTE-TDD (SC-FDMA, 1 RB, 20 MHz, QPSK, UL Sub)	LTE-TDD	7.82	± 9.6 %
10447	AAA	LTE-FDD (OFDMA, 5 MHz, E-TM 3.1, Clipping 44%)	LTE-FDD	7.56	± 9.6 %
10448	AAA	LTE-FDD (OFDMA, 10 MHz, E-TM 3.1, Clippin 44%)	LTE-FDD	7.53	± 9.6 %
10449	AAC	LTE-FDD (OFDMA, 15 MHz, E-TM 3.1, Cliping 44%)	LTE-FDD	7.51	± 9.6 %
10450	AAA	LTE-FDD (OFDMA, 20 MHz, E-TM 3.1, Clipping 44%)	LTE-FDD	7.48	± 9.6 %
10451	AAA	W-CDMA (BS Test Model 1, 64 DPCH, Clipping 44%)	WCDMA	7.59	± 9.6 %
10453	AAC	Validation (Square, 10ms, 1ms)	Test	10.00	± 9.6 %
10456	AAC	IEEE 802.11ac WiFi (160MHz, 64-QAM, 99pc dc)	WLAN	8.63	± 9.6 %
10457	AAC	UMTS-FDD (DC-HSDPA)	WCDMA	6.62	± 9.6 %
10458	AAC	CDMA2000 (1xEV-DO, Rev. B, 2 carriers)	CDMA2000	6.55	± 9.6 %
10459	AAC	CDMA2000 (1xEV-DO, Rev. B, 3 carriers)	CDMA2000	8.25	± 9.6 %
10460	AAC	UMTS-FDD (WCDMA, AMR)	WCDMA	2.39	± 9.6 %
10461	AAC	LTE-TDD (SC-FDMA, 1 RB, 1.4 MHz, QPSK, UL Sub)	LTE-TDD	7.82	± 9.6 %
10462	AAC	LTE-TDD (SC-FDMA, 1 RB, 1.4 MHz, 16-QAM, UL Sub)	LTE-TDD	8.30	± 9.6 %
10463	AAD	LTE-TDD (SC-FDMA, 1 RB, 1.4 MHz, 64-QAM, UL Sub)	LTE-TDD	8.56	± 9.6 %
10464	AAD	LTE-TDD (SC-FDMA, 1 RB, 3 MHz, QPSK, UL Sub)	LTE-TDD	7.82	± 9.6 %
10465	AAC	LTE-TDD (SC-FDMA, 1 RB, 3 MHz, 16-QAM, UL Sub)	LTE-TDD	8.32	± 9.6 %
10466	AAC	LTE-TDD (SC-FDMA, 1 RB, 3 MHz, 64-QAM, UL Sub)	LTE-TDD	8.57	± 9.6 %
10467	AAA	LTE-TDD (SC-FDMA, 1 RB, 5 MHz, QPSK, UL Sub)	LTE-TDD	7.82	± 9.6 %
10468	AAF	LTE-TDD (SC-FDMA, 1 RB, 5 MHz, 16-QAM, UL Sub)	LTE-TDD	8.32	± 9.6 %
10469	AAD	LTE-TDD (SC-FDMA, 1 RB, 5 MHz, 64-QAM, UL Sub)	LTE-TDD	8.56	± 9.6 %
10470	AAD	LTE-TDD (SC-FDMA, 1 RB, 10 MHz, QPSK, UL Sub)	LTE-TDD	7.82	± 9.6 %
10471	AAC	LTE-TDD (SC-FDMA, 1 RB, 10 MHz, 16-QAM, UL Sub)	LTE-TDD	8.32	± 9.6 %
10472	AAC	LTE-TDD (SC-FDMA, 1 RB, 10 MHz, 64-QAM, UL Sub)	LTE-TDD	8.57	± 9.6 %
10473	AAA	LTE-TDD (SC-FDMA, 1 RB, 15 MHz, QPSK, UL Sub)	LTE-TDD	7.82	± 9.6 %
10474	AAC	LTE-TDD (SC-FDMA, 1 RB, 15 MHz, 16-QAM, UL Sub)	LTE-TDD	8.32	± 9.6 %
10475	AAD	LTE-TDD (SC-FDMA, 1 RB, 15 MHz, 64-QAM, UL Sub)	LTE-TDD	8.57	± 9.6 %
10477	AAC	LTE-TDD (SC-FDMA, 1 RB, 20 MHz, 16-QAM, UL Sub)	LTE-TDD	8.32	± 9.6 %
10478	AAC	LTE-TDD (SC-FDMA, 1 RB, 20 MHz, 64-QAM, UL Sub)	LTE-TDD	8.57	± 9.6 %
10479	AAC	LTE-TDD (SC-FDMA, 50% RB, 1.4 MHz, QPSK, UL Sub)	LTE-TDD	7.74	± 9.6 %
10480	AAA	LTE-TDD (SC-FDMA, 50% RB, 1.4 MHz, 16-QAM, UL Sub)	LTE-TDD	8.18	± 9.6 %
10481	AAA	LTE-TDD (SC-FDMA, 50% RB, 1.4 MHz, 64-QAM, UL Sub)	LTE-TDD	8.45	± 9.6 %
10482	AAA	LTE-TDD (SC-FDMA, 50% RB, 3 MHz, QPSK, UL Sub)	LTE-TDD	7.71	± 9.6 %
10483	AAA	LTE-TDD (SC-FDMA, 50% RB, 3 MHz, 16-QAM, Sub)	LTE-TDD	8.39	± 9.6 %
10484	AAB	LTE-TDD (SC-FDMA, 50% RB, 3 MHz, 64-QAM, UL Sub)	LTE-TDD	8.47	± 9.6 %
10485	AAB	LTE-TDD (SC-FDMA, 50% RB, 5 MHz, QPSK, UL Sub)	LTE-TDD	7.59	± 9.6 %
10486	AAB	LTE-TDD (SC-FDMA, 50% RB, 5 MHz, 16-QAM, UL Sub)	LTE-TDD	8.38	± 9.6 %
10487	AAC	LTE-TDD (SC-FDMA, 50% RB, 5 MHz, 64-QAM, UL Sub)	LTE-TDD	8.60	± 9.6 %

EX3DV4– SN:3968 September 28, 2020

10488	AAC	LTE-TDD (SC-FDMA, 50% RB, 10 MHz, QPSK, UL Sub)	LTE-TDD	7.70	± 9.6 %
10489	AAC	LTE-TDD (SC-FDMA, 50% RB, 10 MHz, 16-QAM, UL Sub)	LTE-TDD	8.31	± 9.6 %
10490	AAF	LTE-TDD (SC-FDMA, 50% RB, 10 MHz, 64-QAM, UL Sub)	LTE-TDD	8.54	± 9.6 %
10491	AAF	LTE-TDD (SC-FDMA, 50% RB, 15 MHz, QPSK, UL Sub)	LTE-TDD	7.74	± 9.6 %
10492	AAF	LTE-TDD (SC-FDMA, 50% RB, 15 MHz, 16-QAM, UL Sub)	LTE-TDD	8.41	± 9.6 %
10493	AAF	LTE-TDD (SC-FDMA, 50% RB, 15 MHz, 64-QAM, UL Sub)	LTE-TDD	8.55	± 9.6 %
10494	AAF	LTE-TDD (SC-FDMA, 50% RB, 20 MHz, QPSK, UL Sub)	LTE-TDD	7.74	± 9.6 %
10495	AAF	LTE-TDD (SC-FDMA, 50% RB, 20 MHz, 16-QAM, UL Sub)	LTE-TDD	8.37	± 9.6 %
10496	AAE	LTE-TDD (SC-FDMA, 50% RB, 20 MHz, 64-QAM, UL Sub)	LTE-TDD	8.54	± 9.6 %
10497	AAE	LTE-TDD (SC-FDMA, 100% RB, 1.4 MHz, QPSK, UL Sub)	LTE-TDD	7.67	± 9.6 %
10498	AAE	LTE-TDD (SC-FDMA, 100% RB, 1.4 MHz, 16-QAM, UL Sub)	LTE-TDD	8.40	± 9.6 %
10499	AAC	LTE-TDD (SC-FDMA, 100% RB, 1.4 MHz, 64-QAM, UL Sub)	LTE-TDD	8.68	± 9.6 %
10500	AAF	LTE-TDD (SC-FDMA, 100% RB, 3 MHz, QPSK, UL Sub)	LTE-TDD	7.67	± 9.6 %
10501	AAF	LTE-TDD (SC-FDMA, 100% RB, 3 MHz, 16-QAM, UL Sub)	LTE-TDD	8.44	± 9.6 %
10502	AAB	LTE-TDD (SC-FDMA, 100% RB, 3 MHz, 64-QAM, UL Sub)	LTE-TDD	8.52	± 9.6 %
10503	AAB	LTE-TDD (SC-FDMA, 100% RB, 5 MHz, QPSK, UL Sub)	LTE-TDD	7.72	± 9.6 %
10504	AAB	LTE-TDD (SC-FDMA, 100% RB, 5 MHz, 16-QAM, UL Sub)	LTE-TDD	8.31	± 9.6 %
10505	AAC	LTE-TDD (SC-FDMA, 100% RB, 5 MHz, 64-QAM, UL Sub)	LTE-TDD	8.54	± 9.6 %
10506	AAC	LTE-TDD (SC-FDMA, 100% RB, 10 MHz, QPSK, UL Sub)	LTE-TDD	7.74	± 9.6 %
10507	AAC	LTE-TDD (SC-FDMA, 100% RB, 10 MHz, 16-QAM, UL Sub)	LTE-TDD	8.36	± 9.6 %
10508	AAF	LTE-TDD (SC-FDMA, 100% RB, 10 MHz, 64-QAM, UL Sub)	LTE-TDD	8.55	± 9.6 %
10509	AAF	LTE-TDD (SC-FDMA, 100% RB, 15 MHz, QPSK, UL Sub)	LTE-TDD	7.99	± 9.6 %
10510	AAF	LTE-TDD (SC-FDMA, 100% RB, 15 MHz, 16-QAM, UL Sub)	LTE-TDD	8.49	± 9.6 %
10511	AAF	LTE-TDD (SC-FDMA, 100% RB, 15 MHz, 64-QAM, UL Sub)	LTE-TDD	8.51	± 9.6 %
10512	AAF	LTE-TDD (SC-FDMA, 100% RB, 20 MHz, QPSK, UL Sub)	LTE-TDD	7.74	± 9.6 %
10513	AAF	LTE-TDD (SC-FDMA, 100% RB, 20 MHz, 16-QAM, UL Sub)	LTE-TDD	8.42	± 9.6 %
10514	AAE	LTE-TDD (SC-FDMA, 100% RB, 20 MHz, 64-QAM, UL Sub)	LTE-TDD	8.45	± 9.6 %
10515	AAE	IEEE 802.11b WiFi 2.4 GHz (DSSS, 2 Mbps, 99pc dc)	WLAN	1.58	± 9.6 %
10516	AAE	IEEE 802.11b WiFi 2.4 GHz (DSSS, 5.5 Mbps, 99pc dc)	WLAN	1.57	± 9.6 %
10517	AAF	IEEE 802.11b WiFi 2.4 GHz (DSSS, 11 Mbps, 99pc dc)	WLAN	1.58	± 9.6 %
10518	AAF	IEEE 802.11a/h WiFi 5 GHz (OFDM, 9 Mbps, 99pc dc)	WLAN	8.23	± 9.6 %
10519	AAF	IEEE 802.11a/h WiFi 5 GHz (OFDM, 12 Mbps, 99pc dc)	WLAN	8.39	± 9.6 %
10520	AAB	IEEE 802.11a/h WiFi 5 GHz (OFDM, 18 Mbps, 99pc dc)	WLAN	8.12	± 9.6 %
10521	AAB	IEEE 802.11a/h WiFi 5 GHz (OFDM, 24 Mbps, 99pc dc)	WLAN	7.97	± 9.6 %
10522	AAB	IEEE 802.11a/h WiFi 5 GHz (OFDM, 36 Mbps, 99pc dc)	WLAN	8.45	± 9.6 %
10523	AAC	IEEE 802.11a/h WiFi 5 GHz (OFDM, 48 Mbps, 99pc dc)	WLAN	8.08	± 9.6 %
10524	AAC	IEEE 802.11a/h WiFi 5 GHz (OFDM, 54 Mbps, 99pc dc)	WLAN	8.27	± 9.6 %
10525	AAC	IEEE 802.11ac WiFi (20MHz, MCS0, 99pc dc)	WLAN	8.36	± 9.6 %
10526	AAF	IEEE 802.11ac WiFi (20MHz, MCS1, 99pc dc)	WLAN	8.42	± 9.6 %
10527	AAF	IEEE 802.11ac WiFi (20MHz, MCS2, 99pc dc)	WLAN	8.21	± 9.6 %
10528	AAF	IEEE 802.11ac WiFi (20MHz, MCS3, 99pc dc)	WLAN	8.36	± 9.6 %
10529	AAF	IEEE 802.11ac WiFi (20MHz, MCS4, 99pc dc)	WLAN	8.36	± 9.6 %
10531	AAF	IEEE 802.11ac WiFi (20MHz, MCS6, 99pc dc)	WLAN	8.43	± 9.6 %
10532	AAF	IEEE 802.11ac WiFi (20MHz, MCS7, 99pc dc)	WLAN	8.29	± 9.6 %
10533	AAE	IEEE 802.11ac WiFi (20MHz, MCS8, 99pc dc)	WLAN	8.38	± 9.6 %
10534	AAE	IEEE 802.11ac WiFi (40MHz, MCS0, 99pc dc)	WLAN	8.45	± 9.6 %
10535	AAE	IEEE 802.11ac WiFi (40MHz, MCS1, 99pc dc)	WLAN	8.45	± 9.6 %
10536	AAF	IEEE 802.11ac WiFi (40MHz, MCS2, 99pc dc)	WLAN	8.32	± 9.6 %
10537	AAF	IEEE 802.11ac WiFi (40MHz, MCS3, 99pc dc)	WLAN	8.44	± 9.6 %
10538	AAF	IEEE 802.11ac WiFi (40MHz, MCS4, 99pc dc)	WLAN	8.54	± 9.6 %
10540	AAA	IEEE 802.11ac WiFi (40MHz, MCS6, 99pc dc)	WLAN	8.39	± 9.6 %
10541	AAA	IEEE 802.11ac WiFi (40MHz, MCS7, 99pc dc)	WLAN	8.46	± 9.6 %
10542	AAA	IEEE 802.11ac WiFi (40MHz, MCS8, 99pc dc)	WLAN	8.65	± 9.6 %
10543	AAC	IEEE 802.11ac WiFi (40MHz, MCS9, 99pc dc)	WLAN	8.65	± 9.6 %
10544	AAC	IEEE 802.11ac WiFi (80MHz, MCS0, 99pc dc)	WLAN	8.47	± 9.6 %
10545	AAC	IEEE 802.11ac WiFi (80MHz, MCS1, 99pc dc)	WLAN	8.55	± 9.6 %

Certificate No: EX3-3968_Sep20/2 Page 16 of 23

10546	AAC	IEEE 802.11ac WiFi (80MHz, MCS2, 99pc dc)	WLAN	8.35	± 9.6 %
10547	AAC	IEEE 802.11ac WiFi (80MHz, MCS3, 99pc dc)	WLAN	8.49	± 9.6 %
10548	AAC	IEEE 802.11ac WiFi (80MHz, MCS4, 99pc dc)	WLAN	8.37	± 9.6 %
10550	AAC	IEEE 802.11ac WiFi (80MHz, MCS6, 99pc dc)	WLAN	8.38	± 9.6 %
10551	AAC	IEEE 802.11ac WiFi (80MHz, MCS7, 99pc dc)	WLAN	8.50	± 9.6 %
10552	AAC	IEEE 802.11ac WiFi (80MHz, MCS8, 99pc dc)	WLAN	8.42	± 9.6 %
10553	AAC	IEEE 802.11ac WiFi (80MHz, MCS9, 99pc dc)	WLAN	8.45	± 9.6 %
10554	AAC	IEEE 802.11ac WiFi (160MHz, MCS0, 99pc dc)	WLAN	8.48	± 9.6 %
10555	AAC	IEEE 802.11ac WiFi (160MHz, MCS1, 99pc dc)	WLAN	8.47	± 9.6 %
10556	AAC	IEEE 802.11ac WiFi (160MHz, MCS2, 99pc dc)	WLAN	8.50	± 9.6 %
10557	AAC	IEEE 802.11ac WiFi (160MHz, MCS3, 99pc dc)	WLAN	8.52	± 9.6 %
10558	AAC	IEEE 802.11ac WiFi (160MHz, MCS4, 99pc dc)	WLAN	8.61	± 9.6 %
10560	AAC	IEEE 802.11ac WiFi (160MHz, MCS6, 99pc dc)	WLAN	8.73	± 9.6 %
10561	AAC	IEEE 802.11ac WiFi (160MHz, MCS7, 99pc dc)	WLAN	8.56	± 9.6 %
10562	AAC	IEEE 802.11ac WiFi (160MHz, MCS8, 99pc dc)	WLAN	8.69	± 9.6 %
10563	AAC	IEEE 802.11ac WiFi (160MHz, MCS9, 99pc dc)	WLAN	8.77	± 9.6 %
10564	AAC	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 9 Mbps, 99pc dc)	WLAN	8.25	± 9.6 %
10565	AAC	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 12 Mbps, 99pc dc)	WLAN	8.45	± 9.6 %
10566	AAC	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 18 Mbps, 99pc dc)	WLAN	8.13	± 9.6 %
10567	AAC	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 24 Mbps, 99pc dc)	WLAN	8.00	± 9.6 %
10568	AAC	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 36 Mbps, 99pc dc)	WLAN	8.37	± 9.6 %
10569	AAC	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 48 Mbps, 99pc dc)	WLAN	8.10	± 9.6 %
10570	AAC	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 54 Mbps, 99pc dc)	WLAN	8.30	± 9.6 %
10571	AAC	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps, 90pc dc)	WLAN	1.99	± 9.6 %
10572	AAC	IEEE 802.11b WiFi 2.4 GHz (DSSS, 2 Mbps, 90pc dc)	WLAN	1.99	± 9.6 %
10573	AAC	IEEE 802.11b WiFi 2.4 GHz (DSSS, 5.5 Mbps, 90pc dc)	WLAN	1.98	± 9.6 %
10574	AAC	IEEE 802.11b WiFi 2.4 GHz (DSSS, 11 Mbps, 90pc dc)	WLAN	1.98	± 9.6 %
10575	AAC	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps, 90pc dc)	WLAN	8.59	± 9.6 %
10576	AAC	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 9 Mbps, 90pc dc)	WLAN	8.60	± 9.6 %
10577	AAC	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 12 Mbps, 90pc dc)	WLAN	8.70	± 9.6 %
10578	AAD	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 18 Mbps, 90pc dc)	WLAN	8.49	± 9.6 %
10579	AAD	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 24 Mbps, 90pc dc)	WLAN	8.36	± 9.6 %
10580	AAD	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 36 Mbps, 90pc dc)	WLAN	8.76	± 9.6 %
10581	AAD	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 48 Mbps, 90pc dc)	WLAN	8.35	± 9.6 %
10582	AAD	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 54 Mbps, 90pc dc)	WLAN	8.67	± 9.6 %
10583	AAD	IEEE 802.11a/h WiFi 5 GHz (OFDM, 6 Mbps, 90pc dc)	WLAN	8.59	± 9.6 %
10584	AAD	IEEE 802.11a/h WiFi 5 GHz (OFDM, 9 Mbps, 90pc dc)	WLAN	8.60	± 9.6 %
10585	AAD	IEEE 802.11a/h WiFi 5 GHz (OFDM, 12 Mbps, 90pc dc)	WLAN	8.70	± 9.6 %
10586	AAD	IEEE 802.11a/h WiFi 5 GHz (OFDM, 18 Mbps, 90pc dc)	WLAN	8.49	± 9.6 %
10587	AAA	IEEE 802.11a/h WiFi 5 GHz (OFDM, 24 Mbps, 90pc dc)	WLAN	8.36	± 9.6 %
10588	AAA	IEEE 802.11a/h WiFi 5 GHz (OFDM, 36 Mbps, 90pc dc)	WLAN	8.76	± 9.6 %
10589	AAA	IEEE 802.11a/h WiFi 5 GHz (OFDM, 48 Mbps, 90pc dc)	WLAN	8.35	± 9.6 %
10590	AAA	IEEE 802.11a/h WiFi 5 GHz (OFDM, 54 Mbps, 90pc dc)	WLAN	8.67	± 9.6 %
10591	AAA	IEEE 802.11n (HT Mixed, 20MHz, MCS0, 90pc dc)	WLAN	8.63	± 9.6 %
10592	AAA	IEEE 802.11n (HT Mixed, 20MHz, MCS1, 90pc dc)	WLAN	8.79	± 9.6 %
10593	AAA	IEEE 802.11n (HT Mixed, 20MHz, MCS2, 90pc dc)	WLAN	8.64	± 9.6 %
10594	AAA	IEEE 802.11n (HT Mixed, 20MHz, MCS3, 90pc dc)	WLAN	8.74	± 9.6 %
10595	AAA	IEEE 802.11n (HT Mixed, 20MHz, MCS4, 90pc dc)	WLAN	8.74	± 9.6 %
10596	AAA	IEEE 802.11n (HT Mixed, 20MHz, MCS5, 90pc dc)	WLAN	8.71	± 9.6 %
10597	AAA	IEEE 802.11n (HT Mixed, 20MHz, MCS6, 90pc dc)	WLAN	8.72	± 9.6 %
10598	AAA	IEEE 802.11n (HT Mixed, 20MHz, MCS7, 90pc dc)	WLAN	8.50	± 9.6 %
10599	AAA	IEEE 802.11n (HT Mixed, 40MHz, MCS0, 90pc dc)	WLAN	8.79	± 9.6 %
10600	AAA	IEEE 802.11n (HT Mixed, 40MHz, MCS1, 90pc dc)	WLAN	8.88	± 9.6 %
10601	AAA	IEEE 802.11n (HT Mixed, 40MHz, MCS2, 90pc dc)	WLAN	8.82	± 9.6 %
10602	AAA	IEEE 802.11n (HT Mixed, 40MHz, MCS3, 90pc dc)	WLAN	8.94	± 9.6 %
10603	AAA	IEEE 802.11n (HT Mixed, 40MHz, MCS4, 90pc dc)	WLAN	9.03	± 9.6 %

10604	AAA	IEEE 802.11n (HT Mixed, 40MHz, MCS5, 90pc dc)	WLAN	8.76	± 9.6 %
10605	AAA	IEEE 802.11n (HT Mixed, 40MHz, MCS6, 90pc dc)	WLAN	8.97	± 9.6 %
10606	AAC	IEEE 802.11n (HT Mixed, 40MHz, MCS7, 90pc dc)	WLAN	8.82	± 9.6 %
10607	AAC	IEEE 802.11ac WiFi (20MHz, MCS0, 90pc dc)	WLAN	8.64	± 9.6 %
10608	AAC	IEEE 802.11ac WiFi (20MHz, MCS1, 90pc dc)	WLAN	8.77	± 9.6 %
10609	AAC	IEEE 802.11ac WiFi (20MHz, MCS2, 90pc dc)	WLAN	8.57	± 9.6 %
10610	AAC	IEEE 802.11ac WiFi (20MHz, MCS3, 90pc dc)	WLAN	8.78	± 9.6 %
10611	AAC	IEEE 802.11ac WiFi (20MHz, MCS4, 90pc dc)	WLAN	8.70	± 9.6 %
10612	AAC	IEEE 802.11ac WiFi (20MHz, MCS5, 90pc dc)	WLAN	8.77	± 9.6 %
10613	AAC	IEEE 802.11ac WiFi (20MHz, MCS6, 90pc dc)	WLAN	8.94	± 9.6 %
10614	AAC	IEEE 802.11ac WiFi (20MHz, MCS7, 90pc dc)	WLAN	8.59	± 9.6 %
10615	AAC	IEEE 802.11ac WiFi (20MHz, MCS8, 90pc dc)	WLAN	8.82	± 9.6 %
10616	AAC	IEEE 802.11ac WiFi (40MHz, MCS0, 90pc dc)	WLAN	8.82	± 9.6 %
10617	AAC	IEEE 802.11ac WiFi (40MHz, MCS1, 90pc dc)	WLAN	8.81	± 9.6 %
10618	AAC	IEEE 802.11ac WiFi (40MHz, MCS2, 90pc dc)	WLAN	8.58	± 9.6 %
10619	AAC	IEEE 802.11ac WiFi (40MHz, MCS3, 90pc dc)	WLAN	8.86	± 9.6 %
10620	AAC	IEEE 802.11ac WiFi (40MHz, MCS4, 90pc dc)	WLAN	8.87	± 9.6 %
10621	AAC	IEEE 802.11ac WiFi (40MHz, MCS5, 90pc dc)	WLAN	8.77	± 9.6 %
10622	AAC	IEEE 802.11ac WiFi (40MHz, MCS6, 90pc dc)	WLAN	8.68	± 9.6 %
10623	AAC	IEEE 802.11ac WiFi (40MHz, MCS7, 90pc dc)	WLAN	8.82	± 9.6 %
10624	AAC	IEEE 802.11ac WiFi (40MHz, MCS8, 90pc dc)	WLAN	8.96	± 9.6 %
10625	AAC	IEEE 802.11ac WiFi (40MHz, MCS9, 90pc dc)	WLAN	8.96	± 9.6 %
10626	AAC	IEEE 802.11ac WiFi (80MHz, MCS0, 90pc dc)	WLAN	8.83	± 9.6 %
10627	AAC	IEEE 802.11ac WiFi (80MHz, MCS1, 90pc dc)	WLAN	8.88	± 9.6 %
10628	AAC	IEEE 802.11ac WiFi (80MHz, MCS2, 90pc dc)	WLAN	8.71	± 9.6 %
10629	AAC	IEEE 802.11ac WiFi (80MHz, MCS3, 90pc dc)	WLAN	8.85	± 9.6 %
10630	AAC	IEEE 802.11ac WiFi (80MHz, MCS4, 90pc dc)	WLAN	8.72	± 9.6 %
10631	AAC	IEEE 802.11ac WiFi (80MHz, MCS5, 90pc dc)	WLAN	8.81	± 9.6 %
10632	AAC	IEEE 802.11ac WiFi (80MHz, MCS6, 90pc dc)	WLAN	8.74	± 9.6 %
10633	AAC	IEEE 802.11ac WiFi (80MHz, MCS7, 90pc dc)	WLAN	8.83	± 9.6 %
10634	AAC	IEEE 802.11ac WiFi (80MHz, MCS8, 90pc dc)	WLAN	8.80	± 9.6 %
10635	AAC	IEEE 802.11ac WiFi (80MHz, MCS9, 90pc dc)	WLAN	8.81	± 9.6 %
10636	AAC	IEEE 802.11ac WiFi (160MHz, MCS0, 90pc dc)	WLAN	8.83	± 9.6 %
10637	AAC	IEEE 802.11ac WiFi (160MHz, MCS1, 90pc dc)	WLAN	8.79	± 9.6 %
10638	AAC	IEEE 802.11ac WiFi (160MHz, MCS2, 90pc dc)	WLAN	8.86	± 9.6 %
10639	AAC	IEEE 802.11ac WiFi (160MHz, MCS3, 90pc dc)	WLAN	8.85	± 9.6 %
10640	AAC	IEEE 802.11ac WiFi (160MHz, MCS4, 90pc dc)	WLAN	8.98	± 9.6 %
10641	AAC	IEEE 802.11ac WiFi (160MHz, MCS5, 90pc dc)	WLAN	9.06	± 9.6 %
10642	AAC	IEEE 802.11ac WiFi (160MHz, MCS6, 90pc dc)	WLAN	9.06	± 9.6 %
10643	AAC	IEEE 802.11ac WiFi (160MHz, MCS7, 90pc dc)	WLAN	8.89	± 9.6 %
10644	AAC	IEEE 802.11ac WiFi (160MHz, MCS8, 90pc dc)	WLAN	9.05	± 9.6 %
10645	AAC	IEEE 802.11ac WiFi (160MHz, MCS9, 90pc dc)	WLAN	9.11	± 9.6 %
10646	AAC	LTE-TDD (SC-FDMA, 1 RB, 5 MHz, QPSK, UL Sub=2,7)	LTE-TDD	11.96	± 9.6 %
10647	AAC	LTE-TDD (SC-FDMA, 1 RB, 20 MHz, QPSK, UL Sub=2,7)	LTE-TDD	11.96	± 9.6 %
10648	AAC	CDMA2000 (1x Advanced)	CDMA2000	3.45	± 9.6 %
10652	AAC	LTE-TDD (OFDMA, 5 MHz, E-TM 3.1, Clipping 44%)	LTE-TDD	6.91	± 9.6 %
10653	AAC	LTE-TDD (OFDMA, 10 MHz, E-TM 3.1, Clipping 44%)	LTE-TDD	7.42	± 9.6 %
10654	AAC	LTE-TDD (OFDMA, 15 MHz, E-TM 3.1, Clipping 44%)	LTE-TDD	6.96	± 9.6 %
10655	AAC	LTE-TDD (OFDMA, 20 MHz, E-TM 3.1, Clipping 44%)	LTE-TDD	7.21	± 9.6 %
10658	AAC	Pulse Waveform (200Hz, 10%)	Test	10.00	± 9.6 %
10659	AAC	Pulse Waveform (200Hz, 20%)	Test	6.99	± 9.6 %
10660	AAC	Pulse Waveform (200Hz, 40%)	Test	3.98	± 9.6 %
10661	AAC	Pulse Waveform (200Hz, 60%)	Test	2.22	± 9.6 %
10662	AAC	Pulse Waveform (200Hz, 80%)	Test	0.97	± 9.6 %
10670	AAC	Bluetooth Low Energy	Bluetooth	2.19	± 9.6 %
10671	AAD	IEEE 802.11ax (20MHz, MCS0, 90pc dc)	WLAN	9.09	± 9.6 %

EX3DV4– SN:3968 September 28, 2020

10672	AAD	IEEE 802.11ax (20MHz, MCS1, 90pc dc)	WLAN	8.57	± 9.6 %
10673	AAD	IEEE 802.11ax (20MHz, MCS2, 90pc dc)	WLAN	8.78	± 9.6 %
10674	AAD	IEEE 802.11ax (20MHz, MCS3, 90pc dc)	WLAN	8.74	± 9.6 %
10675	AAD	IEEE 802.11ax (20MHz, MCS4, 90pc dc)	WLAN	8.90	± 9.6 %
10676	AAD	IEEE 802.11ax (20MHz, MCS5, 90pc dc)	WLAN	8.77	± 9.6 %
10677	AAD	IEEE 802.11ax (20MHz, MCS6, 90pc dc)	WLAN	8.73	± 9.6 %
10678	AAD	IEEE 802.11ax (20MHz, MCS7, 90pc dc)	WLAN	8.78	± 9.6 %
10679	AAD	IEEE 802.11ax (20MHz, MCS8, 90pc dc)	WLAN	8.89	± 9.6 %
10680	AAD	IEEE 802.11ax (20MHz, MCS9, 90pc dc)	WLAN	8.80	± 9.6 %
10681	AAG	IEEE 802.11ax (20MHz, MCS10, 90pc dc)	WLAN	8.62	± 9.6 %
10682	AAF	IEEE 802.11ax (20MHz, MCS11, 90pc dc)	WLAN	8.83	± 9.6 %
10683	AAA	IEEE 802.11ax (20MHz, MCS0, 99pc dc)	WLAN	8.42	± 9.6 %
10684	AAC	IEEE 802.11ax (20MHz, MCS1, 99pc dc)	WLAN	8.26	± 9.6 %
10685	AAC	IEEE 802.11ax (20MHz, MCS2, 99pc dc)	WLAN	8.33	± 9.6 %
10686	AAC	IEEE 802.11ax (20MHz, MCS3, 99pc dc)	WLAN	8.28	± 9.6 %
10687	AAE	IEEE 802.11ax (20MHz, MCS4, 99pc dc)	WLAN	8.45	± 9.6 %
10688	AAE	IEEE 802.11ax (20MHz, MCS5, 99pc dc)	WLAN	8.29	± 9.6 %
10689	AAD	IEEE 802.11ax (20MHz, MCS6, 99pc dc)	WLAN	8.55	± 9.6 %
10690	AAE	IEEE 802.11ax (20MHz, MCS7, 99pc dc)	WLAN	8.29	± 9.6 %
10691	AAB	IEEE 802.11ax (20MHz, MCS8, 99pc dc)	WLAN	8.25	± 9.6 %
10692	AAA	IEEE 802.11ax (20MHz, MCS9, 99pc dc)	WLAN	8.29	± 9.6 %
10693	AAA	IEEE 802.11ax (20MHz, MCS10, 99pc dc)	WLAN	8.25	± 9.6 %
10694	AAA	IEEE 802.11ax (20MHz, MCS11, 99pc dc)	WLAN	8.57	± 9.6 %
10695	AAA	IEEE 802.11ax (40MHz, MCS0, 90pc dc)	WLAN	8.78	± 9.6 %
10696	AAA	IEEE 802.11ax (40MHz, MCS1, 90pc dc)	WLAN	8.91	± 9.6 %
10697	AAA	IEEE 802.11ax (40MHz, MCS2, 90pc dc)	WLAN	8.61	± 9.6 %
10698	AAA	IEEE 802.11ax (40MHz, MCS3, 90pc dc)	WLAN	8.89	± 9.6 %
10699	AAA	IEEE 802.11ax (40MHz, MCS4, 90pc dc)	WLAN	8.82	± 9.6 %
10700	AAA	IEEE 802.11ax (40MHz, MCS5, 90pc dc)	WLAN	8.73	± 9.6 %
10701	AAA	IEEE 802.11ax (40MHz, MCS6, 90pc dc)	WLAN	8.86	± 9.6 %
10702	AAA	IEEE 802.11ax (40MHz, MCS7, 90pc dc)	WLAN	8.70	± 9.6 %
10703	AAA	IEEE 802.11ax (40MHz, MCS8, 90pc dc)	WLAN	8.82	± 9.6 %
10704	AAA	IEEE 802.11ax (40MHz, MCS9, 90pc dc)	WLAN	8.56	± 9.6 %
10705	AAA	IEEE 802.11ax (40MHz, MCS10, 90pc dc)	WLAN	8.69	± 9.6 %
10706	AAC	IEEE 802.11ax (40MHz, MCS11, 90pc dc)	WLAN	8.66	± 9.6 %
10707	AAC	IEEE 802.11ax (40MHz, MCS0, 99pc dc)	WLAN	8.32	± 9.6 %
10708	AAC	IEEE 802.11ax (40MHz, MCS1, 99pc dc)	WLAN	8.55	± 9.6 %
10709	AAC	IEEE 802.11ax (40MHz, MCS2, 99pc dc)	WLAN	8.33	± 9.6 %
10710	AAC	IEEE 802.11ax (40MHz, MCS3, 99pc dc)	WLAN	8.29	± 9.6 %
10711	AAC	IEEE 802.11ax (40MHz, MCS4, 99pc dc)	WLAN	8.39	± 9.6 %
10712	AAC	IEEE 802.11ax (40MHz, MCS5, 99pc dc)	WLAN	8.67	± 9.6 %
10713	AAC	IEEE 802.11ax (40MHz, MCS6, 99pc dc)	WLAN	8.33	± 9.6 %
10714	AAC	IEEE 802.11ax (40MHz, MCS7, 99pc dc)	WLAN	8.26	± 9.6 %
10715	AAC	IEEE 802.11ax (40MHz, MCS8, 99pc dc)	WLAN	8.45	± 9.6 %
10716	AAC	IEEE 802.11ax (40MHz, MCS9, 99pc dc)	WLAN	8.30	± 9.6 %
10717	AAC	IEEE 802.11ax (40MHz, MCS10, 99pc dc)	WLAN	8.48	± 9.6 %
10718	AAC	IEEE 802.11ax (40MHz, MCS11, 99pc dc)	WLAN	8.24	± 9.6 %
10719	AAC	IEEE 802.11ax (80MHz, MCS0, 90pc dc)	WLAN	8.81	± 9.6 %
10720	AAC	IEEE 802.11ax (80MHz, MCS1, 90pc dc)	WLAN	8.87	± 9.6 %
10721	AAC	IEEE 802.11ax (80MHz, MCS2, 90pc dc)	WLAN	8.76	± 9.6 %
10722	AAC	IEEE 802.11ax (80MHz, MCS3, 90pc dc)	WLAN	8.55	± 9.6 %
10723	AAC	IEEE 802.11ax (80MHz, MCS4, 90pc dc)	WLAN	8.70	± 9.6 %
10724	AAC	IEEE 802.11ax (80MHz, MCS5, 90pc dc)	WLAN	8.90	± 9.6 %
10725	AAC	IEEE 802.11ax (80MHz, MCS6, 90pc dc)	WLAN	8.74	± 9.6 %
10726	AAC	IEEE 802.11ax (80MHz, MCS7, 90pc dc)	WLAN	8.72	± 9.6 %
10727	AAC	IEEE 802.11ax (80MHz, MCS8, 90pc dc)	WLAN	8.66	± 9.6 %

EX3DV4– SN:3968 September 28, 2020

10728	AAC	IEEE 802.11ax (80MHz, MCS9, 90pc dc)	WLAN	8.65	± 9.6 %
10729	AAC	IEEE 802.11ax (80MHz, MCS10, 90pc dc)	WLAN	8.64	± 9.6 %
10730	AAC	IEEE 802.11ax (80MHz, MCS11, 90pc dc)	WLAN	8.67	± 9.6 %
10731	AAC	IEEE 802.11ax (80MHz, MCS0, 99pc dc)	WLAN	8.42	± 9.6 %
10732	AAC	IEEE 802.11ax (80MHz, MCS1, 99pc dc)	WLAN	8.46	± 9.6 %
10733	AAC	IEEE 802.11ax (80MHz, MCS2, 99pc dc)	WLAN	8.40	± 9.6 %
10734	AAC	IEEE 802.11ax (80MHz, MCS3, 99pc dc)	WLAN	8.25	± 9.6 %
10735	AAC	IEEE 802.11ax (80MHz, MCS4, 99pc dc)	WLAN	8.33	± 9.6 %
10736	AAC	IEEE 802.11ax (80MHz, MCS5, 99pc dc)	WLAN	8.27	± 9.6 %
10737	AAC	IEEE 802.11ax (80MHz, MCS6, 99pc dc)	WLAN	8.36	± 9.6 %
10738	AAC	IEEE 802.11ax (80MHz, MCS7, 99pc dc)	WLAN	8.42	± 9.6 %
10739	AAC	IEEE 802.11ax (80MHz, MCS8, 99pc dc)	WLAN	8.29	± 9.6 %
10740	AAC	IEEE 802.11ax (80MHz, MCS9, 99pc dc)	WLAN	8.48	± 9.6 %
10741	AAC	IEEE 802.11ax (80MHz, MCS10, 99pc dc)	WLAN	8.40	± 9.6 %
10742	AAC	IEEE 802.11ax (80MHz, MCS11, 99pc dc)	WLAN	8.43	± 9.6 %
10743	AAC	IEEE 802.11ax (160MHz, MCS0, 90pc dc)	WLAN	8.94	± 9.6 %
10744	AAC	IEEE 802.11ax (160MHz, MCS1, 90pc dc)	WLAN	9.16	± 9.6 %
10745	AAC	IEEE 802.11ax (160MHz, MCS2, 90pc dc)	WLAN	8.93	± 9.6 %
10746	AAC	IEEE 802.11ax (160MHz, MCS3, 90pc dc)	WLAN	9.11	± 9.6 %
10747	AAC	IEEE 802.11ax (160MHz, MCS4, 90pc dc)	WLAN	9.04	± 9.6 %
10748	AAC	IEEE 802.11ax (160MHz, MCS5, 90pc dc)	WLAN	8.93	± 9.6 %
10749	AAC	IEEE 802.11ax (160MHz, MCS6, 90pc dc)	WLAN	8.90	± 9.6 %
10750	AAC	IEEE 802.11ax (160MHz, MCS7, 90pc dc)	WLAN	8.79	± 9.6 %
10751	AAC	IEEE 802.11ax (160MHz, MCS8, 90pc dc)	WLAN	8.82	± 9.6 %
10752	AAC	IEEE 802.11ax (160MHz, MCS9, 90pc dc)	WLAN	8.81	± 9.6 %
10753	AAC	IEEE 802.11ax (160MHz, MCS10, 90pc dc)	WLAN	9.00	± 9.6 %
10754	AAC	IEEE 802.11ax (160MHz, MCS11, 90pc dc)	WLAN	8.94	± 9.6 %
10755	AAC	IEEE 802.11ax (160MHz, MCS0, 99pc dc)	WLAN	8.64	± 9.6 %
10756	AAC	IEEE 802.11ax (160MHz, MCS1, 99pc dc)	WLAN	8.77	± 9.6 %
10757	AAC	IEEE 802.11ax (160MHz, MCS2, 99pc dc)	WLAN	8.77	± 9.6 %
10758	AAC	IEEE 802.11ax (160MHz, MCS3, 99pc dc)	WLAN	8.69	± 9.6 %
10759	AAC	IEEE 802.11ax (160MHz, MCS4, 99pc dc)	WLAN	8.58	± 9.6 %
10760	AAC	IEEE 802.11ax (160MHz, MCS5, 99pc dc)	WLAN	8.49	± 9.6 %
10761	AAC	IEEE 802.11ax (160MHz, MCS6, 99pc dc)	WLAN	8.58	± 9.6 %
10762	AAC	IEEE 802.11ax (160MHz, MCS7, 99pc dc)	WLAN	8.49	± 9.6 %
10763	AAC	IEEE 802.11ax (160MHz, MCS8, 99pc dc)	WLAN	8.53	± 9.6 %
10764	AAC	IEEE 802.11ax (160MHz, MCS9, 99pc dc)	WLAN	8.54	± 9.6 %
10765	AAC	IEEE 802.11ax (160MHz, MCS10, 99pc dc)	WLAN	8.54	± 9.6 %
10766	AAC	IEEE 802.11ax (160MHz, MCS11, 99pc dc)	WLAN	8.51	± 9.6 %
10767	AAC	5G NR (CP-OFDM, 1 RB, 5 MHz, QPSK, 15 kHz)	5G NR FR1 TDD	7.99	± 9.6 %
10768	AAC	5G NR (CP-OFDM, 1 RB, 10 MHz, QPSK, 15 kHz)	5G NR FR1 TDD	8.01	± 9.6 %
10769	AAC	5G NR (CP-OFDM, 1 RB, 15 MHz, QPSK, 15 kHz)	5G NR FR1 TDD	8.01	± 9.6 %
10770	AAC	5G NR (CP-OFDM, 1 RB, 20 MHz, QPSK, 15 kHz)	5G NR FR1 TDD	8.02	± 9.6 %
10771	AAC	5G NR (CP-OFDM, 1 RB, 25 MHz, QPSK, 15 kHz)	5G NR FR1 TDD	8.02	± 9.6 %
10772	AAC	5G NR (CP-OFDM, 1 RB, 30 MHz, QPSK, 15 kHz)	5G NR FR1 TDD	8.23	± 9.6 %
10773	AAC	5G NR (CP-OFDM, 1 RB, 40 MHz, QPSK, 15 kHz)	5G NR FR1 TDD	8.03	± 9.6 %
10774	AAC	5G NR (CP-OFDM, 1 RB, 50 MHz, QPSK, 15 kHz)	5G NR FR1 TDD	8.02	± 9.6 %
10775	AAC	5G NR (CP-OFDM, 50% RB, 5 MHz, QPSK, 15 kHz)	5G NR FR1 TDD	8.31	± 9.6 %
10776	AAC	5G NR (CP-OFDM, 50% RB, 10 MHz, QPSK, 15 kHz)	5G NR FR1 TDD	8.30	± 9.6 %
10777	AAC	5G NR (CP-OFDM, 50% RB, 15 MHz, QPSK, 15 kHz)	5G NR FR1 TDD	8.30	± 9.6 %
10778	AAC	5G NR (CP-OFDM, 50% RB, 20 MHz, QPSK, 15 kHz)	5G NR FR1 TDD	8.34	± 9.6 %
10779	AAC	5G NR (CP-OFDM, 50% RB, 25 MHz, QPSK, 15 kHz)	5G NR FR1 TDD	8.42	± 9.6 %
10780	AAC	5G NR (CP-OFDM, 50% RB, 30 MHz, QPSK, 15 kHz)	5G NR FR1 TDD	8.38	± 9.6 %
10781	AAC	5G NR (CP-OFDM, 50% RB, 40 MHz, QPSK, 15 kHz)	5G NR FR1 TDD	8.38	± 9.6 %
10782	AAC	5G NR (CP-OFDM, 50% RB, 50 MHz, QPSK, 15 kHz)	5G NR FR1 TDD	8.43	± 9.6 %
10783	AAC	5G NR (CP-OFDM, 100% RB, 5 MHz, QPSK, 15 kHz)	5G NR FR1 TDD	8.31	± 9.6 %

Certificate No: EX3-3968_Sep20/2 Page 20 of 23

EX3DV4– SN:3968 September 28, 2020

10784	AAC	5G NR (CP-OFDM, 100% RB, 10 MHz, QPSK, 15 kHz)	5G NR FR1 TDD	8.29	± 9.6 %
10785	AAC	5G NR (CP-OFDM, 100% RB, 15 MHz, QPSK, 15 kHz)	5G NR FR1 TDD	8.40	± 9.6 %
10786	AAC	5G NR (CP-OFDM, 100% RB, 20 MHz, QPSK, 15 kHz)	5G NR FR1 TDD	8.35	± 9.6 %
10787	AAC	5G NR (CP-OFDM, 100% RB, 25 MHz, QPSK, 15 kHz)	5G NR FR1 TDD	8.44	± 9.6 %
10788	AAC	5G NR (CP-OFDM, 100% RB, 30 MHz, QPSK, 15 kHz)	5G NR FR1 TDD	8.39	± 9.6 %
10789	AAC	5G NR (CP-OFDM, 100% RB, 40 MHz, QPSK, 15 kHz)	5G NR FR1 TDD	8.37	± 9.6 %
10790	AAC	5G NR (CP-OFDM, 100% RB, 50 MHz, QPSK, 15 kHz)	5G NR FR1 TDD	8.39	± 9.6 %
10791	AAC	5G NR (CP-OFDM, 1 RB, 5 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	7.83	± 9.6 %
10792	AAC	5G NR (CP-OFDM, 1 RB, 10 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	7.92	± 9.6 %
10793	AAC	5G NR (CP-OFDM, 1 RB, 15 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	7.95	± 9.6 %
10794	AAC	5G NR (CP-OFDM, 1 RB, 20 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	7.82	± 9.6 %
10795	AAC	5G NR (CP-OFDM, 1 RB, 25 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	7.84	± 9.6 %
10796	AAC	5G NR (CP-OFDM, 1 RB, 30 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	7.82	± 9.6 %
10797	AAC	5G NR (CP-OFDM, 1 RB, 40 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	8.01	± 9.6 %
10798	AAC	5G NR (CP-OFDM, 1 RB, 50 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	7.89	± 9.6 %
10799	AAC	5G NR (CP-OFDM, 1 RB, 60 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	7.93	± 9.6 %
10801	AAC	5G NR (CP-OFDM, 1 RB, 80 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	7.89	± 9.6 %
10802	AAC	5G NR (CP-OFDM, 1 RB, 90 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	7.87	± 9.6 %
10803	AAE	5G NR (CP-OFDM, 1 RB, 100 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	7.93	± 9.6 %
10805	AAD	5G NR (CP-OFDM, 50% RB, 10 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	8.34	± 9.6 %
10806	AAD	5G NR (CP-OFDM, 50% RB, 15 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	8.37	± 9.6 %
10809	AAD	5G NR (CP-OFDM, 50% RB, 30 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	8.34	± 9.6 %
10810	AAD	5G NR (CP-OFDM, 50% RB, 40 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	8.34	± 9.6 %
10812	AAD	5G NR (CP-OFDM, 50% RB, 60 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	8.35	± 9.6 %
10817	AAD	5G NR (CP-OFDM, 100% RB, 5 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	8.35	± 9.6 %
10818	AAD	5G NR (CP-OFDM, 100% RB, 10 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	8.34	± 9.6 %
10819	AAD	5G NR (CP-OFDM, 100% RB, 15 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	8.33	± 9.6 %
10820	AAD	5G NR (CP-OFDM, 100% RB, 20 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	8.30	± 9.6 %
10821	AAC	5G NR (CP-OFDM, 100% RB, 25 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	8.41	± 9.6 %
10822	AAD	5G NR (CP-OFDM, 100% RB, 30 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	8.41	± 9.6 %
10823	AAC	5G NR (CP-OFDM, 100% RB, 40 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	8.36	± 9.6 %
10824	AAD	5G NR (CP-OFDM, 100% RB, 50 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	8.39	± 9.6 %
10825	AAD	5G NR (CP-OFDM, 100% RB, 60 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	8.41	± 9.6 %
10827	AAD	5G NR (CP-OFDM, 100% RB, 80 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	8.42	± 9.6 %
10828	AAE	5G NR (CP-OFDM, 100% RB, 90 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	8.43	± 9.6 %
10829	AAD	5G NR (CP-OFDM, 100% RB, 100 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	8.40	± 9.6 %
10830	AAD	5G NR (CP-OFDM, 1 RB, 10 MHz, QPSK, 60 kHz)	5G NR FR1 TDD	7.63	± 9.6 %
10831	AAD	5G NR (CP-OFDM, 1 RB, 15 MHz, QPSK, 60 kHz)	5G NR FR1 TDD	7.73	± 9.6 %
10832	AAD	5G NR (CP-OFDM, 1 RB, 20 MHz, QPSK, 60 kHz)	5G NR FR1 TDD	7.74	± 9.6 %
10833	AAD	5G NR (CP-OFDM, 1 RB, 25 MHz, QPSK, 60 kHz)	5G NR FR1 TDD	7.70	± 9.6 %
10834	AAD	5G NR (CP-OFDM, 1 RB, 30 MHz, QPSK, 60 kHz)	5G NR FR1 TDD	7.75	± 9.6 %
10835	AAD	5G NR (CP-OFDM, 1 RB, 40 MHz, QPSK, 60 kHz)	5G NR FR1 TDD	7.70	± 9.6 %
10836	AAE	5G NR (CP-OFDM, 1 RB, 50 MHz, QPSK, 60 kHz)	5G NR FR1 TDD	7.66	± 9.6 %
10837	AAD	5G NR (CP-OFDM, 1 RB, 60 MHz, QPSK, 60 kHz)	5G NR FR1 TDD	7.68	± 9.6 %
10839	AAD	5G NR (CP-OFDM, 1 RB, 80 MHz, QPSK, 60 kHz)	5G NR FR1 TDD	7.70	± 9.6 %
10840	AAD	5G NR (CP-OFDM, 1 RB, 90 MHz, QPSK, 60 kHz)	5G NR FR1 TDD	7.67	± 9.6 %
10841	AAD	5G NR (CP-OFDM, 1 RB, 100 MHz, QPSK, 60 kHz)	5G NR FR1 TDD	7.71	± 9.6 %
10843	AAD	5G NR (CP-OFDM, 50% RB, 15 MHz, QPSK, 60 kHz)	5G NR FR1 TDD	8.49	± 9.6 %
10844	AAD	5G NR (CP-OFDM, 50% RB, 20 MHz, QPSK, 60 kHz)	5G NR FR1 TDD	8.34	± 9.6 %
10846	AAD	5G NR (CP-OFDM, 50% RB, 30 MHz, QPSK, 60 kHz)	5G NR FR1 TDD	8.41	± 9.6 %
10854	AAD	5G NR (CP-OFDM, 100% RB, 10 MHz, QPSK, 60 kHz)	5G NR FR1 TDD	8.34	± 9.6 %
10855	AAD	5G NR (CP-OFDM, 100% RB, 15 MHz, QPSK, 60 kHz)	5G NR FR1 TDD	8.36	± 9.6 %
10856	AAD	5G NR (CP-OFDM, 100% RB, 20 MHz, QPSK, 60 kHz)	5G NR FR1 TDD	8.37	± 9.6 %
10857	AAD	5G NR (CP-OFDM, 100% RB, 25 MHz, QPSK, 60 kHz)	5G NR FR1 TDD	8.35	± 9.6 %
10858	AAD	5G NR (CP-OFDM, 100% RB, 30 MHz, QPSK, 60 kHz)	5G NR FR1 TDD	8.36	± 9.6 %
10859	AAD	5G NR (CP-OFDM, 100% RB, 40 MHz, QPSK, 60 kHz)	5G NR FR1 TDD	8.34	± 9.6 %

Certificate No: EX3-3968_Sep20/2 Page 21 of 23

EX3DV4– SN:3968 September 28, 2020

10860	AAD	5G NR (CP-OFDM, 100% RB, 50 MHz, QPSK, 60 kHz)	5G NR FR1 TDD	8.41	± 9.6 %
10861	AAD	5G NR (CP-OFDM, 100% RB, 60 MHz, QPSK, 60 kHz)	5G NR FR1 TDD	8.40	± 9.6 %
10863	AAD	5G NR (CP-OFDM, 100% RB, 80 MHz, QPSK, 60 kHz)	5G NR FR1 TDD	8.41	± 9.6 %
10864	AAE	5G NR (CP-OFDM, 100% RB, 90 MHz, QPSK, 60 kHz)	5G NR FR1 TDD	8.37	± 9.6 %
10865	AAD	5G NR (CP-OFDM, 100% RB, 100 MHz, QPSK, 60 kHz)	5G NR FR1 TDD	8.41	± 9.6 %
10866	AAD	5G NR (DFT-s-OFDM, 1 RB, 100 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	5.68	± 9.6 %
10868	AAD	5G NR (DFT-s-OFDM, 100% RB, 100 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	5.89	± 9.6 %
10869	AAD	5G NR (DFT-s-OFDM, 1 RB, 100 MHz, QPSK, 120 kHz)	5G NR FR2 TDD	5.75	± 9.6 %
10870	AAD	5G NR (DFT-s-OFDM, 100% RB, 100 MHz, QPSK, 120 kHz)	5G NR FR2 TDD	5.86	± 9.6 %
10871	AAD	5G NR (DFT-s-OFDM, 1 RB, 100 MHz, 16QAM, 120 kHz)	5G NR FR2 TDD	5.75	± 9.6 %
10872	AAD	5G NR (DFT-s-OFDM, 100% RB, 100 MHz, 16QAM, 120 kHz)	5G NR FR2 TDD	6.52	± 9.6 %
10873	AAD	5G NR (DFT-s-OFDM, 1 RB, 100 MHz, 64QAM, 120 kHz)	5G NR FR2 TDD	6.61	± 9.6 %
10874	AAD	5G NR (DFT-s-OFDM, 100% RB, 100 MHz, 64QAM, 120 kHz)	5G NR FR2 TDD	6.65	± 9.6 %
10875	AAD	5G NR (CP-OFDM, 1 RB, 100 MHz, QPSK, 120 kHz)	5G NR FR2 TDD	7.78	± 9.6 %
10876	AAD	5G NR (CP-OFDM, 100% RB, 100 MHz, QPSK, 120 kHz)	5G NR FR2 TDD	8.39	± 9.6 %
10877	AAD	5G NR (CP-OFDM, 1 RB, 100 MHz, 16QAM, 120 kHz)	5G NR FR2 TDD	7.95	± 9.6 %
10878	AAD	5G NR (CP-OFDM, 100% RB, 100 MHz, 16QAM, 120 kHz)	5G NR FR2 TDD	8.41	± 9.6 %
10879	AAD	5G NR (CP-OFDM, 1 RB, 100 MHz, 64QAM, 120 kHz)	5G NR FR2 TDD	8.12	± 9.6 %
10880	AAD	5G NR (CP-OFDM, 100% RB, 100 MHz, 64QAM, 120 kHz)	5G NR FR2 TDD	8.38	± 9.6 %
10881	AAD	5G NR (DFT-s-OFDM, 1 RB, 50 MHz, QPSK, 120 kHz)	5G NR FR2 TDD	5.75	± 9.6 %
10882	AAD	5G NR (DFT-s-OFDM, 100% RB, 50 MHz, QPSK, 120 kHz)	5G NR FR2 TDD	5.96	± 9.6 %
10883	AAD	5G NR (DFT-s-OFDM, 1 RB, 50 MHz, 16QAM, 120 kHz)	5G NR FR2 TDD	6.57	± 9.6 %
10884	AAD	5G NR (DFT-s-OFDM, 100% RB, 50 MHz, 16QAM, 120 kHz)	5G NR FR2 TDD	6.53	± 9.6 %
10885	AAD	5G NR (DFT-s-OFDM, 1 RB, 50 MHz, 64QAM, 120 kHz)	5G NR FR2 TDD	6.61	± 9.6 %
10886	AAD	5G NR (DFT-s-OFDM, 100% RB, 50 MHz, 64QAM, 120 kHz)	5G NR FR2 TDD	6.65	± 9.6 %
10887	AAD	5G NR (CP-OFDM, 1 RB, 50 MHz, QPSK, 120 kHz)	5G NR FR2 TDD	7.78	± 9.6 %
10888	AAD	5G NR (CP-OFDM, 100% RB, 50 MHz, QPSK, 120 kHz)	5G NR FR2 TDD	8.35	± 9.6 %
10889	AAD	5G NR (CP-OFDM, 1 RB, 50 MHz, 16QAM, 120 kHz)	5G NR FR2 TDD	8.02	± 9.6 %
10890	AAD	5G NR (CP-OFDM, 100% RB, 50 MHz, 16QAM, 120 kHz)	5G NR FR2 TDD	8.40	± 9.6 %
10891	AAD	5G NR (CP-OFDM, 1 RB, 50 MHz, 64QAM, 120 kHz)	5G NR FR2 TDD	8.13	± 9.6 %
10892	AAD	5G NR (CP-OFDM, 100% RB, 50 MHz, 64QAM, 120 kHz)	5G NR FR2 TDD	8.41	± 9.6 %
10897	AAD	5G NR (DFT-s-OFDM, 1 RB, 5 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	5.66	± 9.6 %
10898	AAD	5G NR (DFT-s-OFDM, 1 RB, 10 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	5.67	± 9.6 %
10899	AAD	5G NR (DFT-s-OFDM, 1 RB, 15 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	5.67	± 9.6 %
10900	AAD	5G NR (DFT-s-OFDM, 1 RB, 20 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	5.68	± 9.6 %
10901	AAD	5G NR (DFT-s-OFDM, 1 RB, 25 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	5.68	± 9.6 %
10902	AAD	5G NR (DFT-s-OFDM, 1 RB, 30 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	5.68	± 9.6 %
10903	AAD	5G NR (DFT-s-OFDM, 1 RB, 40 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	5.68	± 9.6 %
10904	AAD	5G NR (DFT-s-OFDM, 1 RB, 50 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	5.68	± 9.6 %
10905	AAD	5G NR (DFT-s-OFDM, 1 RB, 60 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	5.68	± 9.6 %
10906	AAD	5G NR (DFT-s-OFDM, 1 RB, 80 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	5.68	± 9.6 %
10907	AAD	5G NR (DFT-s-OFDM, 50% RB, 5 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	5.78	± 9.6 %
10908	AAD	5G NR (DFT-s-OFDM, 50% RB, 10 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	5.93	± 9.6 %
10909	AAD	5G NR (DFT-s-OFDM, 50% RB, 15 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	5.96	± 9.6 %
10910	AAD	5G NR (DFT-s-OFDM, 50% RB, 20 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	5.83	± 9.6 %
10911	AAD	5G NR (DFT-s-OFDM, 50% RB, 25 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	5.93	± 9.6 %
10912	AAD	5G NR (DFT-s-OFDM, 50% RB, 30 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	5.84	± 9.6 %
10913	AAD	5G NR (DFT-s-OFDM, 50% RB, 40 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	5.84	± 9.6 %
10914	AAD	5G NR (DFT-s-OFDM, 50% RB, 50 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	5.85	± 9.6 %
10915	AAD	5G NR (DFT-s-OFDM, 50% RB, 60 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	5.83	± 9.6 %
10916	AAD	5G NR (DFT-s-OFDM, 50% RB, 80 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	5.87	± 9.6 %
10917	AAD	5G NR (DFT-s-OFDM, 50% RB, 100 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	5.94	± 9.6 %
10918	AAD	5G NR (DFT-s-OFDM, 100% RB, 5 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	5.86	± 9.6 %
10919	AAD	5G NR (DFT-s-OFDM, 100% RB, 10 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	5.86	± 9.6 %
10920	AAD	5G NR (DFT-s-OFDM, 100% RB, 15 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	5.87	± 9.6 %
10921	AAD	5G NR (DFT-s-OFDM, 100% RB, 20 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	5.84	± 9.6 %

EX3DV4– SN:3968 September 28, 2020

10922	AAD	5G NR (DFT-s-OFDM, 100% RB, 25 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	5.82	± 9.6 %
10923	AAD	5G NR (DFT-s-OFDM, 100% RB, 30 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	5.84	± 9.6 %
10924	AAD	5G NR (DFT-s-OFDM, 100% RB, 40 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	5.84	± 9.6 %
10925	AAD	5G NR (DFT-s-OFDM, 100% RB, 50 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	5.95	± 9.6 %
10926	AAD	5G NR (DFT-s-OFDM, 100% RB, 60 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	5.84	± 9.6 %
10927	AAD	5G NR (DFT-s-OFDM, 100% RB, 80 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	5.94	± 9.6 %
10928	AAD	5G NR (DFT-s-OFDM, 1 RB, 5 MHz, QPSK, 15 kHz)	5G NR FR1 FDD	5.52	± 9.6 %
10929	AAD	5G NR (DFT-s-OFDM, 1 RB, 10 MHz, QPSK, 15 kHz)	5G NR FR1 FDD	5.52	± 9.6 %
10930	AAD	5G NR (DFT-s-OFDM, 1 RB, 15 MHz, QPSK, 15 kHz)	5G NR FR1 FDD	5.52	± 9.6 %
10931	AAD	5G NR (DFT-s-OFDM, 1 RB, 20 MHz, QPSK, 15 kHz)	5G NR FR1 FDD	5.51	± 9.6 %
10932	AAB	5G NR (DFT-s-OFDM, 1 RB, 25 MHz, QPSK, 15 kHz)	5G NR FR1 FDD	5.51	± 9.6 %
10933	AAA	5G NR (DFT-s-OFDM, 1 RB, 30 MHz, QPSK, 15 kHz)	5G NR FR1 FDD	5.51	± 9.6 %
10934	AAA	5G NR (DFT-s-OFDM, 1 RB, 40 MHz, QPSK, 15 kHz)	5G NR FR1 FDD	5.51	± 9.6 %
10935	AAA	5G NR (DFT-s-OFDM, 1 RB, 50 MHz, QPSK, 15 kHz)	5G NR FR1 FDD	5.51	± 9.6 %
10936	AAC	5G NR (DFT-s-OFDM, 50% RB, 5 MHz, QPSK, 15 kHz)	5G NR FR1 FDD	5.90	± 9.6 %
10937	AAB	5G NR (DFT-s-OFDM, 50% RB, 10 MHz, QPSK, 15 kHz)	5G NR FR1 FDD	5.77	± 9.6 %
10938	AAB	5G NR (DFT-s-OFDM, 50% RB, 15 MHz, QPSK, 15 kHz)	5G NR FR1 FDD	5.90	± 9.6 %
10939	AAB	5G NR (DFT-s-OFDM, 50% RB, 20 MHz, QPSK, 15 kHz)	5G NR FR1 FDD	5.82	± 9.6 %
10940	AAB	5G NR (DFT-s-OFDM, 50% RB, 25 MHz, QPSK, 15 kHz)	5G NR FR1 FDD	5.89	± 9.6 %
10941	AAB	5G NR (DFT-s-OFDM, 50% RB, 30 MHz, QPSK, 15 kHz)	5G NR FR1 FDD	5.83	± 9.6 %
10942	AAB	5G NR (DFT-s-OFDM, 50% RB, 40 MHz, QPSK, 15 kHz)	5G NR FR1 FDD	5.85	± 9.6 %
10943	AAB	5G NR (DFT-s-OFDM, 50% RB, 50 MHz, QPSK, 15 kHz)	5G NR FR1 FDD	5.95	± 9.6 %
10944	AAB	5G NR (DFT-s-OFDM, 100% RB, 5 MHz, QPSK, 15 kHz)	5G NR FR1 FDD	5.81	± 9.6 %
10945	AAB	5G NR (DFT-s-OFDM, 100% RB, 10 MHz, QPSK, 15 kHz)	5G NR FR1 FDD	5.85	± 9.6 %
10946	AAC	5G NR (DFT-s-OFDM, 100% RB, 15 MHz, QPSK, 15 kHz)	5G NR FR1 FDD	5.83	± 9.6 %
10947	AAB	5G NR (DFT-s-OFDM, 100% RB, 20 MHz, QPSK, 15 kHz)	5G NR FR1 FDD	5.87	± 9.6 %
10948	AAB	5G NR (DFT-s-OFDM, 100% RB, 25 MHz, QPSK, 15 kHz)	5G NR FR1 FDD	5.94	± 9.6 %
10949	AAB	5G NR (DFT-s-OFDM, 100% RB, 30 MHz, QPSK, 15 kHz)	5G NR FR1 FDD	5.87	± 9.6 %
10950	AAB	5G NR (DFT-s-OFDM, 100% RB, 40 MHz, QPSK, 15 kHz)	5G NR FR1 FDD	5.94	± 9.6 %
10951	AAB	5G NR (DFT-s-OFDM, 100% RB, 50 MHz, QPSK, 15 kHz)	5G NR FR1 FDD	5.92	± 9.6 %
10952	AAB	5G NR DL (CP-OFDM, TM 3.1, 5 MHz, 64-QAM, 15 kHz)	5G NR FR1 FDD	8.25	± 9.6 %
10953	AAB	5G NR DL (CP-OFDM, TM 3.1, 10 MHz, 64-QAM, 15 kHz)	5G NR FR1 FDD	8.15	± 9.6 %
10954	AAB	5G NR DL (CP-OFDM, TM 3.1, 15 MHz, 64-QAM, 15 kHz)	5G NR FR1 FDD	8.23	± 9.6 %
10955	AAB	5G NR DL (CP-OFDM, TM 3.1, 20 MHz, 64-QAM, 15 kHz)	5G NR FR1 FDD	8.42	± 9.6 %
10956	AAB	5G NR DL (CP-OFDM, TM 3.1, 5 MHz, 64-QAM, 30 kHz)	5G NR FR1 FDD	8.14	± 9.6 %
10957	AAC	5G NR DL (CP-OFDM, TM 3.1, 10 MHz, 64-QAM, 30 kHz)	5G NR FR1 FDD	8.31	± 9.6 %
10958	AAB	5G NR DL (CP-OFDM, TM 3.1, 15 MHz, 64-QAM, 30 kHz)	5G NR FR1 FDD	8.61	± 9.6 %
10959	AAB	5G NR DL (CP-OFDM, TM 3.1, 20 MHz, 64-QAM, 30 kHz)	5G NR FR1 FDD	8.33	± 9.6 %
10960	AAB	5G NR DL (CP-OFDM, TM 3.1, 5 MHz, 64-QAM, 15 kHz)	5G NR FR1 TDD	9.32	± 9.6 %
10961	AAB	5G NR DL (CP-OFDM, TM 3.1, 10 MHz, 64-QAM, 15 kHz)	5G NR FR1 TDD	9.36	± 9.6 %
10962	AAB	5G NR DL (CP-OFDM, TM 3.1, 15 MHz, 64-QAM, 15 kHz)	5G NR FR1 TDD	9.40	± 9.6 %
10963	AAB	5G NR DL (CP-OFDM, TM 3.1, 20 MHz, 64-QAM, 15 kHz)	5G NR FR1 TDD	9.55	± 9.6 %
10964	AAB	5G NR DL (CP-OFDM, TM 3.1, 5 MHz, 64-QAM, 30 kHz)	5G NR FR1 TDD	9.29	± 9.6 %
10965	AAB	5G NR DL (CP-OFDM, TM 3.1, 10 MHz, 64-QAM, 30 kHz)	5G NR FR1 TDD	9.37	± 9.6 %
10966	AAB	5G NR DL (CP-OFDM, TM 3.1, 15 MHz, 64-QAM, 30 kHz)	5G NR FR1 TDD	9.55	± 9.6 %
10967	AAB	5G NR DL (CP-OFDM, TM 3.1, 20 MHz, 64-QAM, 30 kHz)	5G NR FR1 TDD	9.42	± 9.6 %
10968	AAB	5G NR DL (CP-OFDM, TM 3.1, 100 MHz, 64-QAM, 30 kHz)	5G NR FR1 TDD	9.49	± 9.6 %
10972	AAB	5G NR (CP-OFDM, 1 RB, 20 MHz, QPSK, 15 kHz)	5G NR FR1 TDD	11.59	± 9.6 %
10973	AAB	5G NR (DFT-s-OFDM, 1 RB, 100 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	9.06	± 9.6 %
10974	AAB	5G NR (CP-OFDM, 100% RB, 100 MHz, 256-QAM, 30 kHz)	5G NR FR1 TDD	10.28	± 9.6 %

^E Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

Certificate No: EX3-3968_Sep20/2 Page 23 of 23

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868

IMPORTANT NOTICE

USAGE OF THE DAE4

The DAE unit is a delicate, high precision instrument and requires careful treatment by the user. There are no serviceable parts inside the DAE. Special attention shall be given to the following points:

Battery Exchange: The battery cover of the DAE4 unit is fixed using a screw, over tightening the screw may cause the threads inside the DAE to wear out.

Shipping of the DAE: Before shipping the DAE to SPEAG for calibration, remove the batteries and pack the DAE in an antistatic bag. This antistatic bag shall then be packed into a larger box or container which protects the DAE from impacts during transportation. The package shall be marked to indicate that a fragile instrument is inside.

E-Stop Failures: Touch detection may be malfunctioning due to broken magnets in the E-stop. Rough handling of the E-stop may lead to damage of these magnets. Touch and collision errors are often caused by dust and dirt accumulated in the E-stop. To prevent E-stop failure, the customer shall always mount the probe to the DAE carefully and keep the DAE unit in a non-dusty environment if not used for measurements.

Repair: Minor repairs are performed at no extra cost during the annual calibration. However, SPEAG reserves the right to charge for any repair especially if rough unprofessional handling caused the defect.

DASY Configuration Files: Since the exact values of the DAE input resistances, as measured during the calibration procedure of a DAE unit, are not used by the DASY software, a nominal value of 200 MOhm is given in the corresponding configuration file.

Important Note:
Warranty and calibration is void if the DAE unit is disassembled partly or fully by the Customer.

Important Note:
Never attempt to grease or oil the E-stop assembly. Cleaning and readjusting of the E-stop assembly is allowed by certified SPEAG personnel only and is part of the annual calibration procedure.

Important Note:
To prevent damage of the DAE probe connector pins, use great care when installing the probe to the DAE. Carefully connect the probe with the connector notch oriented in the mating position. Avoid any rotational movement of the probe body versus the DAE while turning the locking nut of the connector. The same care shall be used when disconnecting the probe from the DAE.

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일자	2020 / 10.13	2020 / 10.13

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The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 0108**

Client **HCT (Dymstec)**

Certificate No: **DAE4-868_Sep20**

CALIBRATION CERTIFICATE

Object	DAE4 - SD 000 D04 BN - SN: 868
Calibration procedure(s)	QA CAL-06.v30 Calibration procedure for the data acquisition electronics (DAE)
Calibration date:	September 29, 2020

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI). The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Keithley Multimeter Type 2001	SN: 0810278	07-Sep-20 (No:28647)	Sep-21
Secondary Standards	**ID #**	**Check Date (in house)**	**Scheduled Check**
Auto DAE Calibration Unit	SE UWS 053 AA 1001	09-Jan-20 (in house check)	In house check: Jan-21
Calibrator Box V2.1	SE UMS 006 AA 1002	09-Jan-20 (in house check)	In house check: Jan-21

	Name	Function	Signature
Calibrated by:	Adrian Gehring	Laboratory Technician	[signature]
Approved by:	Sven Kühn	Deputy Manager	[signature]

Issued: September 29, 2020

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Accreditation No.: **SCS 0108**

Glossary

DAE	data acquisition electronics
Connector angle	information used in DASY system to align probe sensor X to the robot coordinate system.

Methods Applied and Interpretation of Parameters

- *DC Voltage Measurement:* Calibration Factor assessed for use in DASY system by comparison with a calibrated instrument traceable to national standards. The figure given corresponds to the full scale range of the voltmeter in the respective range.
- *Connector angle*: The angle of the connector is assessed measuring the angle mechanically by a tool inserted. Uncertainty is not required.
- The following parameters as documented in the Appendix contain technical information as a result from the performance test and require no uncertainty.
  - *DC Voltage Measurement Linearity:* Verification of the Linearity at +10% and -10% of the nominal calibration voltage. Influence of offset voltage is included in this measurement.
  - *Common mode sensitivity:* Influence of a positive or negative common mode voltage on the differential measurement.
  - *Channel separation:* Influence of a voltage on the neighbor channels not subject to an input voltage.
  - *AD Converter Values with inputs shorted:* Values on the internal AD converter corresponding to zero input voltage
  - *Input Offset Measurement*: Output voltage and statistical results over a large number of zero voltage measurements.
  - *Input Offset Current:* Typical value for information; Maximum channel input offset current, not considering the input resistance.
  - *Input resistance:* Typical value for information: DAE input resistance at the connector, during internal auto-zeroing and during measurement.
  - *Low Battery Alarm Voltage:* Typical value for information. Below this voltage, a battery alarm signal is generated.
  - *Power consumption:* Typical value for information. Supply currents in various operating modes.

DC Voltage Measurement

A/D - Converter Resolution nominal

High Range: 1LSB = 6.1μV , full range = -100...+300 mV

Low Range: 1LSB = 61nV , full range = -1.......+3mV

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

Calibration Factors	X	Y	Z
High Range	405.085 ± 0.02% (k=2)	405.330 ± 0.02% (k=2)	405.298 ± 0.02% (k=2)
Low Range	3.97870 ± 1.50% (k=2)	3.99097 ± 1.50% (k=2)	4.00439 ± 1.50% (k=2)

Connector Angle

Connector Angle to be used in DASY system	53.0 ° ± 1 °

Appendix (Additional assessments outside the scope of SCS0108)

1. DC Voltage Linearity

High Range		Reading (μV)	Difference (μV)	Error (%)
Channel X	+ Input	199994.56	-1.78	-0.00
Channel X	+ Input	20002.21	0.08	0.00
Channel X	- Input	-19999.83	1.74	-0.01
Channel Y	+ Input	199994.52	-1.52	-0.00
Channel Y	+ Input	20001.35	-0.65	-0.00
Channel Y	- Input	-20000.94	0.74	-0.00
Channel Z	+ Input	199996.29	0.74	0.00
Channel Z	+ Input	20001.23	-0.77	-0.00
Channel Z	- Input	-20001.02	0.61	-0.00

Low Range		Reading (μV)	Difference (μV)	Error (%)
Channel X	+ Input	2000.63	-0.53	-0.03
Channel X	+ Input	201.66	0.16	0.08
Channel X	- Input	-198.55	-0.22	0.11
Channel Y	+ Input	2000.94	-0.15	-0.01
Channel Y	+ Input	200.96	-0.50	-0.25
Channel Y	- Input	-198.91	-0.47	0.23
Channel Z	+ Input	2000.57	-0.47	-0.02
Channel Z	+ Input	200.14	-1.25	-0.62
Channel Z	- Input	-199.52	-1.04	0.52

2. Common mode sensitivity

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

	Common mode Input Voltage (mV)	High Range Average Reading (μV)	Low Range Average Reading (μV)
Channel X	200	7.16	5.79
	- 200	-5.57	-7.11
Channel Y	200	-13.91	-14.30
	- 200	13.67	13.45
Channel Z	200	14.85	14.80
	- 200	-17.75	-17.36

3. Channel separation

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

	Input Voltage (mV)	Channel X (μV)	Channel Y (μV)	Channel Z (μV)
Channel X	200	-	2.08	-3.67
Channel Y	200	8.65	-	4.23
Channel Z	200	9.96	7.19	-

4. AD-Converter Values with inputs shorted

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

	High Range (LSB)	Low Range (LSB)
Channel X	16010	15771
Channel Y	16120	16583
Channel Z	15799	15818

5. Input Offset Measurement

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec
Input 10MΩ

	Average (μV)	min. Offset (μV)	max. Offset (μV)	Std. Deviation (μV)
Channel X	-0.08	-1.74	1.42	0.62
Channel Y	-0.06	-1.01	0.74	0.41
Channel Z	0.07	-1.04	1.04	0.39

6. Input Offset Current

Nominal Input circuitry offset current on all channels: <25fA

7. Input Resistance (Typical values for information)

	Zeroing (kOhm)	Measuring (MOhm)
Channel X	200	200
Channel Y	200	200
Channel Z	200	200

8. Low Battery Alarm Voltage (Typical values for information)

Typical values	Alarm Level (VDC)
Supply (+ Vcc)	+7.9
Supply (- Vcc)	-7.6

9. Power Consumption (Typical values for information)

Typical values	Switched off (mA)	Stand by (mA)	Transmitting (mA)
Supply (+ Vcc)	+0.01	+6	+14
Supply (- Vcc)	−0.01	-8	-9