FCC 47 CFR § 2.1093
IEEE Std 1528-2013

SAR EVALUATION REPORT
(Class II permissive change)

FOR

WCDMA/LTE/5G NR Tablet + BT/BLE, DTS/UNII a/b/g/n/ac/ax

MODEL NUMBER: SM-X518U

FCC ID: A3LSMX518U

REPORT NUMBER: 4790982779-S1V2

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Prepared for
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IAS ACCREDITED

Testing Laboratory

TL-637

Revision History

Rev.	Date	Revisions	Revised By
V1	8/29/2023	Initial Issue	--
V2	9/5/2023	Revised n78 frequency in Sec 6.2	Jeongyeon Won

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1. Attestation of Test Results

Applicant Name	SAMSUNG ELECTRONICS CO.,LTD.			
FCC ID	A3LSMX518U			
Model Number	SM-X518U			
Applicable Standards	FCC 47 CFR § 2.1093 IEEE Std 1528-2013 Published RF exposure KDB procedures			
Exposure Category	SAR Limits (W/Kg)			
	Peak spatial-average (1g of tissue)			
General population / Uncontrolled exposure	1.6			
RF Exposure Conditions	Equipment Class - The Highest Reported SAR (W/kg)			
	PCB	DTS	NII	DSS
Standalone	0.06	0.77	0.87	<0.01
Simultaneous TX	0.94	0.83	0.94	0.94
Date Tested	8/28/2023 to 8/28/2023			
Test Results	Pass			

This report is a report due to the addition of an additional separation distance to Sub.4 ant.
All other matters are the same as the original Report 4790841154-S1V3 FCC Report SAR.

UL Korea, Ltd. tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by UL Korea, Ltd. based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL Korea, Ltd. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Korea, Ltd. will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by IAS, any agency of the Federal Government, or any agency of any government.

Approved & Released By:	Prepared By:
	원정연
Justin Park Operations Leader UL Korea, Ltd. Suwon Laboratory	Jeongyeon Won Laboratory Engineer UL Korea, Ltd. Suwon Laboratory

1. Test Specification, Methods and Procedures

The tests documented in this report were performed in accordance with FCC 47 CFR § 2.1093, IEEE STD 1528-2013, ANSI C63.26-2015 the following FCC Published RF exposure KDB procedures:

- 447498 D04 Interim General RF Exposure Guidance v01
- 616217 D04 SAR for laptop and tablets v01r02
- 690783 D01 SAR Listings on Grants v01r03
- 865664 D01 SAR measurement 100 MHz to 6 GHz v01r04
- 865664 D02 RF Exposure Reporting v01r02
- 941225 D06 Hotspot Mode v02r01
- 971168 D01 Power Meas License Digital System v03r01

In addition to the above, the following information was used:

- TCB workshop October, 2016; RF Exposure Procedures (DUT Holder Perturbations)
- TCB workshop April, 2019; RF Exposure Procedures (Tissue Simulating Liquids (TSL))
- TCB workshop November, 2019 Page 5, RF Exposure Procedures (SPLSR Hotspot Combination)
- TCB workshop April, 2022; RF Exposure Procedures (5G NR FR1 Measurement)

2. Facilities and Accreditation

The test sites and measurement facilities used to collect data are located at

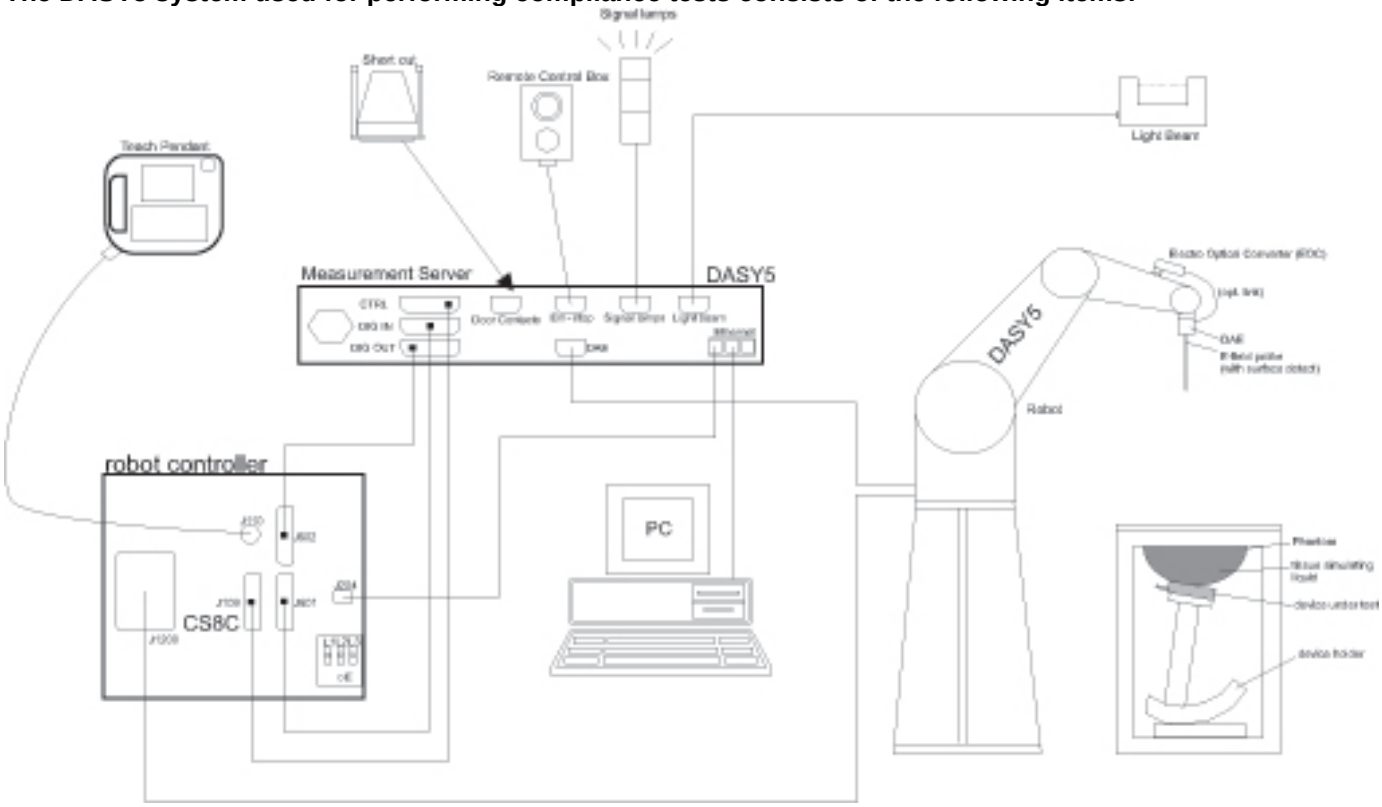
Suwon
SAR 2 Room

UL Korea, Ltd. is accredited by IAS, Laboratory Code TL-637.
The full scope of accreditation can be viewed at https://www.iasonline.org/wp-content/uploads/2017/05/TL-637-cert-New.pdf.

3. SAR Measurement System & Test Equipment

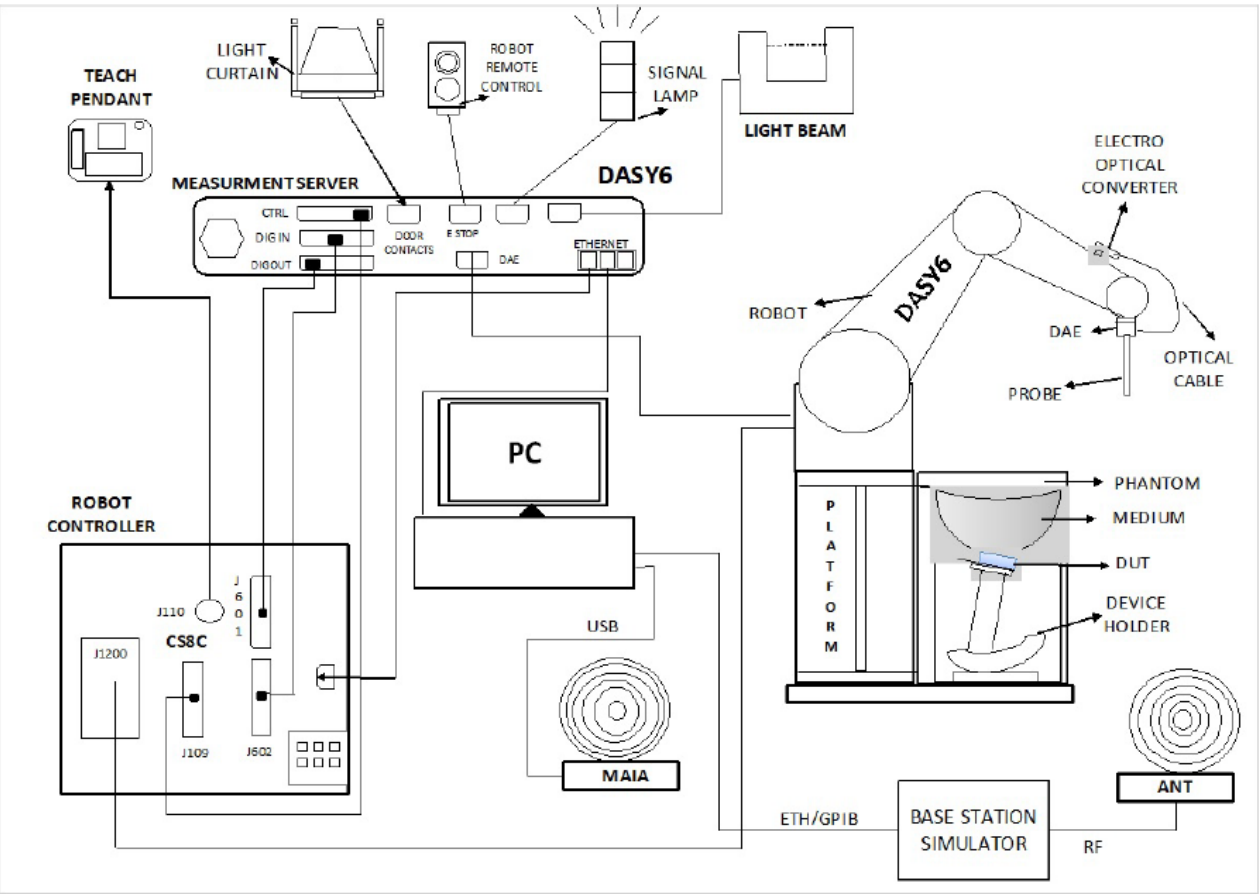
3.1. SAR Measurement System

The DASY5 system used for performing compliance tests consists of the following items:



- A standard high precision 6-axis robot with controller, teach pendant and software. An arm extension for accommodating the data acquisition electronics (DAE).
- An isotropic Field probe optimized and calibrated for the targeted measurement.
- A data acquisition electronics (DAE) which performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.
- The Electro-optical converter (EOC) performs the conversion from optical to electrical signals for the digital communication to the DAE. To use optical surface detection, a special version of the EOC is required. The EOC signal is transmitted to the measurement server.
- The function of the measurement server is to perform the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.
- The Light Beam used is for probe alignment. This improves the (absolute) accuracy of the probe positioning.
- A computer running WinXP or Win7 and the DASY5 software.
- Remote control and teach pendant as well as additional circuitry for robot safety such as warning lamps, etc.
- The phantom, the device holder and other accessories according to the targeted measurement.

The DASY6 & 8 system used for performing compliance tests consists of the following items:



- A standard high precision 6-axis robot with controller, teach pendant and software. An arm extension for accommodating the data acquisition electronics (DAE).
- An isotropic Field probe optimized and calibrated for the targeted measurement.
- A data acquisition electronics (DAE) which performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.
- The Electro-optical converter (EOC) performs the conversion from optical to electrical signals for the digital communication to the DAE. To use optical surface detection, a special version of the EOC is required. The EOC signal is transmitted to the measurement server.
- The function of the measurement server is to perform the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.
- The Light Beam used is for probe alignment. This improves the (absolute) accuracy of the probe positioning.
- A computer running Win10 and the DASY6 or 8 software.
- Remote control and teach pendant as well as additional circuitry for robot safety such as warning lamps, etc.
- The phantom, the device holder and other accessories according to the targeted measurement.

3.2. SAR Scan Procedures

Step 1: Power Reference Measurement

The Power Reference Measurement and Power Drift Measurements are for monitoring the power drift of the device under test in the batch process. The minimum distance of probe sensors to surface determines the closest measurement point to phantom surface. The minimum distance of probe sensors to surface is 2.1 mm. This distance cannot be smaller than the distance of sensor calibration points to probe tip as defined in the probe properties.

Step 2: Area Scan

The Area Scan is used as a fast scan in two dimensions to find the area of high field values, before doing a fine measurement around the hot spot. The sophisticated interpolation routines implemented in DASY software can find the maximum locations even in relatively coarse grids. When an Area Scan has measured all reachable points, it computes the field maximal found in the scanned area, within a range of the global maximum. The range (in dB) is specified in the standards for compliance testing. For example, a 2 dB range is required in IEEE Standard 1528 and IEC 62209 standards, whereby 3 dB is a requirement when compliance is assessed in accordance with the ARIB standard (Japan). If only one Zoom Scan follows the Area Scan, then only the absolute maximum will be taken as reference. For cases where multiple maximums are detected, the number of Zoom Scans has to be increased accordingly.

Area Scan Parameters extracted from KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz

	≤ 3 GHz	> 3 GHz
Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface	5 ± 1 mm	½·δ·ln(2) ± 0.5 mm
Maximum probe angle from probe axis to phantom surface normal at the measurement location	30° ± 1°	20° ± 1°
Maximum area scan spatial resolution: Δx_{Area}, Δy_{Area}	≤ 2 GHz: ≤ 15 mm 2 – 3 GHz: ≤ 12 mm	3 – 4 GHz: ≤ 12 mm 4 – 6 GHz: ≤ 10 mm
	When the x or y dimension of the test device, in the measurement plane orientation, is smaller than the above, the measurement resolution must be ≤ the corresponding x or y dimension of the test device with at least one measurement point on the test device.	

Step 3: Zoom Scan

Zoom Scans are used to assess the peak spatial SAR values within a cubic averaging volume containing 1 g and 10 g of simulated tissue. The Zoom Scan measures points (refer to table below) within a cube whose base faces are centered on the maxima found in a preceding area scan job within the same procedure. When the measurement is done, the Zoom Scan evaluates the averaged SAR for 1 g and 10 g and displays these values next to the job's label.

Zoom Scan Parameters extracted from KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz

			≤ 3 GHz	> 3 GHz
Maximum zoom scan spatial resolution: Δx_{Zoom}, Δy_{Zoom}			≤ 2 GHz: ≤ 8 mm 2 – 3 GHz: ≤ 5 mm*	3 – 4 GHz: ≤ 5 mm* 4 – 6 GHz: ≤ 4 mm*
Maximum zoom scan spatial resolution, normal to phantom surface	uniform grid: $\Delta z_{Zoom}(n)$		≤ 5 mm	3 – 4 GHz: ≤ 4 mm 4 – 5 GHz: ≤ 3 mm 5 – 6 GHz: ≤ 2 mm
	graded grid	$\Delta z_{Zoom}(1)$: between 1st two points closest to phantom surface	≤ 4 mm	3 – 4 GHz: ≤ 3 mm 4 – 5 GHz: ≤ 2.5 mm 5 – 6 GHz: ≤ 2 mm
		$\Delta z_{Zoom}(n>1)$: between subsequent points	≤ 1.5·$\Delta z_{Zoom}(n-1)$	
Minimum zoom scan volume	x, y, z		≥ 30 mm	3 – 4 GHz: ≥ 28 mm 4 – 5 GHz: ≥ 25 mm 5 – 6 GHz: ≥ 22 mm

Note: δ is the penetration depth of a plane-wave at normal incidence to the tissue medium; see draft standard IEEE P1528-2011 for details.

* When zoom scan is required and the *reported* SAR from the *area scan based 1-g SAR estimation* procedures of KDB 447498 is ≤ 1.4 W/kg, ≤ 8 mm, ≤ 7 mm and ≤ 5 mm zoom scan resolution may be applied, respectively, for 2 GHz to 3 GHz, 3 GHz to 4 GHz and 4 GHz to 6 GHz.

Step 4: Power drift measurement

The Power Drift Measurement measures the field at the same location as the most recent power reference measurement within the same procedure, and with the same settings. The Power Drift Measurement gives the field difference in dB from the reading conducted within the last Power Reference Measurement. This allows a user to monitor the power drift of the device under test within a batch process. The measurement procedure is the same as Step 1.

3.3. Test Equipment

The measuring equipment used to perform the tests documented in this report has been calibrated in accordance with the manufacturers' recommendations, and is traceable to recognized national standards.

Dielectric Property Measurements

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
Network Analyzer	Agilent	E5071C	MY46522054	7-24-2024
Dielectric Assessment Kit	SPEAG	DAK-3.5	1196	7-17-2024
Shorting block	SPEAG	DAK-3.5 Short	SM DAK 200 BA	N/A
Thermometer	LKM	DTM3000	3851	7-25-2024

System Check

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
MXG Analog Signal Generator	Aglient	N5181A	MY50145882	7-26-2024
Power Sensor	KEYSIGHT	U2000A	MY61200006	1-5-2024
Power Sensor	KEYSIGHT	U2000A	MY61010010	7-25-2024
Power Amplifier	EXODUS	AMP2027	1410025-AMP2027-10003	11-2-2023
Directional Coupler	Aglient	772D	MY52180193	7-25-2024
Low Pass Filter	MICROLAB	LA-60N	3942	7-25-2024
Attenuator	KEYSIGHT	8491B/003	MY39272277	7-24-2024
Attenuator	KEYSIGHT	8491B/010	MY39271981	7-24-2024
Attenuator	KEYSIGHT	8491B/020	MY39272302	7-24-2024
E-Field Probe	SPEAG	EX3DV4	7645	11-15-2023
Data Acquisition Electronics	SPEAG	DAE4	1591	3-22-2024
System Validation Dipole	SPEAG	D3700V2	1036	5-19-2024
System Validation Dipole	SPEAG	D3500V2	1121	4-20-2024
System Validation Dipole	SPEAG	D3900V2	1069	4-21-2024
Thermometer	Lutron	MHB-382SD	AH.50215	1-9-2024

Note(s):

1. For System Validation Dipole, Calibration interval applied every 2 years according to referencing KDB 865664 guidance.
2. All equipments were used until Cal.Due data.

4. Measurement Uncertainty

Measurement Uncertainty of 100MHz to 6GHz

Per KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz, when the highest measured 1-g SAR within a frequency band is < 1.5 W/kg and the measured 10-g SAR within a frequency band is < 3.75 W/kg. The expanded SAR measurement uncertainty must be ≤ 30%, for a confidence interval of k = 2. If these conditions are met, extensive SAR measurement uncertainty analysis described in IEEE Std 1528-2013 is not required in SAR reports submitted for equipment approval.

4.1. DECISION RULE

Decision rule for statement(s) of conformity is based on Procedure 2, Clause 4.4.3 in IEC Guide 115:2021.

5. Device Under Test (DUT) Information

5.1. DUT Description

Device Dimension	Refer to Appendix A.				
Back Cover	☒ The Back Cover is not removable.				
Battery Options	☒ The rechargeable battery is not user accessible				
Accessory	Keyboard				
Wireless Router (Hotspot)	Wi-Fi Hotspot mode permits the device to share its cellular data connection with other Wi-Fi-enabled devices. ☒ Mobile Hotspot (Wi-Fi 2.4 GHz) ☒ Mobile Hotspot (Wi-Fi 5.8 GHz)				
Wi-Fi Direct	Wi-Fi Direct enabled devices transfer data directly between each other ☒ Wi-Fi Direct (Wi-Fi 2.4 GHz) ☒ Wi-Fi Direct (Wi-Fi 5.2 GHz_UNII-1, Wi-Fi 5.8 GHz_UNII-3)				
Test Sample Information	**No.**	**S/N**	**Notes**	**No.**	**S/N**	**Notes**
	1	R32W500QS8H	SAR			

5.2. Wireless Technologies

Wireless technologies	Frequency bands	Operating mode	Duty Cycle used for SAR testing
W-CDMA (UMTS)	Band II Band IV Band V	UMTS Rel. 99 (Voice & Data) HSDPA (Category 24) HSUPA (Category 6) DC-HSDPA (Category 24) HSPA+ (DL only)	100%
LTE	FDD Band 2 FDD Band 4 FDD Band 5 FDD Band 7 FDD Band 12 FDD Band 13 FDD Band 14 FDD Band 25 FDD Band 26 FDD Band 30 TDD Band 41 – Power Class 2 TDD Band 41 – Power Class 3 FDD Band 66 FDD Band 71 **Uplink intra-band-contiguous Carrier_Aggregation(2CC)** CA_5B/ 41C/ 66B/ 66C	QPSK 16QAM 64QAM 256QAM Rel. 16 Carrier Aggregation (2 Uplinks and 4 Downlinks)	100% (FDD) 63.3% (TDD) Power Class 3 43.3% (TDD) Power Class 2
	Does this device support SV-LTE (1xRTT-LTE)? ☐ Yes ☒ No		
NR (Sub 6)	FDD Band n2 FDD Band n5 FDD Band n12 FDD Band n25 FDD Band n30 FDD Band n66 FDD Band n71 TDD Band n41– Power Class 2 TDD Band n41– Power Class 3 TDD Band n77– Power Class 2 TDD Band n77– Power Class 3 TDD Band n78	DFT-s-ODFM: ■ π/2 BPSK, QPSK, 16QAM, 64QAM, 256QAM CP-ODFM: ■QPSK, 16QAM, 64QAM, 256QAM	100% (FDD Bands) 100% (TDD Bands)
Wi-Fi	2.4 GHz	802.11b, 802.11g 802.11n (HT20), 802.11ax	SISO : 98.7% (802.11b) MIMO : 98.9% (802.11b)
	5 GHz	802.11a 802.11n (HT20) & (HT40) 802.11ac (VHT20) & (VHT40) & (VHT80) 802.11ax (HE20) & (HE40) & (HE80)	SISO : 96.9% (802.11a), 94.9% (802.11ac (VHT80 MIMO 97.1% (802.11a) 91.1% (802.11ac (VHT80
	Does this device support bands 5.60 ~ 5.65 GHz? ☒ Yes ☐ No		
	Does this device support Band gap channel(s)? ☒ Yes ☐ No		
Bluetooth	2.4 GHz	Version 5.3 LE	76.9% (BDR DH5) 77.1% (EDR DH5)

Notes

1. The Bluetooth protocol is considered source-based averaging. Bluetooth Max power GFSK (DH5) was verified to have the highest duty cycle of 76.9% and Reduce power EDR (DH5) was verified to have the highest duty cycle of 77.1% was considered and used for SAR Testing.
2. Measured duty cycle plots are in Section.9.
3. This device supports Power Class 2(HPUE) and Power Class 3 for LTE Band 41 & NR Band n41 & NR Band n77
4. NR TDD Band n41 and n77/n78 has support SRS(0,1,2,3) modes.
5. This device supports LTE UL CA intra-band Contiguous.

5.3. Time-Averaging feature

The equipment under test (EUT) contains the Samsung S.LSI chipset supporting 4G technologies and 5G NR bands Sub.6. these chipset is enabled with TAS (Time Average SAR) algorithm to control and manage transmitting power in real time and to ensure at all times the time-averaged RF exposure is in compliance with the FCC requirement.

The TAS (Time Average SAR) algorithm maintains the time-averaged transmit power, in turn, time-averaged RF exposure of *SAR_design_target*, below the predefined time-average power limit, for each characterized technology and band.

TAS (Time Average SAR) algorithm allows the device to transmit at higher power instantaneously as high as P_{max}, when needed, but enforces power limiting to maintain time-averaged transmit power to P_{Limit}. Below table shows P_{Limit} NV settings and maximum tune up output power P_{max} configured for this EUT for various transmit conditions (RSI=Radio SAR Index).

The purpose of this SAR report is to demonstrate that the EUT meets FCC SAR limits when transmitting in static transmission scenario at maximum allowable time-averaged power levels.

Exposure condition		Standalone with Sensor Off	Standalone with Sensor On	Pmax (dBm)
Spatial-average		1g	1g	
Test distance (mm)		Refer to sec.6.3 in Part.0 report.		
RSI:		0	1	
RF Air Interface	Antenna	Plimit corresponding to 1.0 W/kg		
WCDMA 2	Main.1	25.91	13.50	23.50
WCDMA 4	Main.1	26.29	12.50	24.00
WCDMA 5	Main.1	24.99	16.50	23.50
LTE B5	Main.1	26.05	14.00	24.00
LTE B7	Main.1	28.00	12.00	24.00
LTE B7	Sub.2	27.96	9.50	23.00
LTE B12	Main.1	29.29	15.50	24.00
LTE B13	Main.1	26.12	15.50	24.00
LTE B14	Main.1	26.33	15.50	24.00
LTE B25(2)	Main.1	26.48	12.50	24.00
LTE B25(2)	Sub.2	27.64	10.00	23.00
LTE B26	Main.1	26.20	14.00	24.00
LTE B30	Main.1	28.10	12.50	22.00
LTE B41(PC3)	Main.1	29.34	12.00	22.00
LTE B41(PC2)	Main.1	33.13	10.40	22.40
LTE B66(4)	Main.1	25.99	12.00	23.50
LTE B66(4)	Sub.2	27.36	10.00	23.00
LTE B71	Main.1	32.22	19.00	24.00
NR Band n5	Main.1	26.37	14.00	24.00
NR Band n12	Main.1	29.02	15.50	24.00
NR Band n25(2)	Main.1	26.57	12.50	24.00
NR Band n30	Main.1	28.55	12.50	22.50
NR Band n66	Main.1	25.97	12.00	24.00
NR Band n71	Main.1	30.48	19.00	24.00
NR Band n41-(PC2/PC3)	Main.1	20.50 / 18.00	13.00	26.50 / 24.00
NR Band n41 SRS1-(PC2/PC3)	Sub.2	19.00 / 16.50	13.00	25.00 / 22.50
NR Band n41 SRS2-(PC2/PC3)	Sub.4	19.00 / 17.00	13.00	25.00 / 23.00
NR Band n41 SRS3-(PC2/PC3)	Sub.1	16.50	13.00	21.00 / 21.00
NR Band n77-(PC2/PC3)	Main.2	21.00 / 18.00	9.00	27.00 / 24.00
NR Band n77 SRS1-(PC2/PC3)	Sub.2	21.00 / 17.50	9.00	27.00 / 23.50
NR Band n77 SRS2-(PC2/PC3)	Sub.4	18.00	9.00	24.00 / 24.00
NR Band n77 SRS3-(PC2/PC3)	Sub.3	17.00 / 16.50	7.00	21.50 / 21.00
NR Band n78	Main.2	18.00	9.00	24.00
NR Band n78 SRS1	Sub.2	17.00	9.00	23.00
NR Band n78 SRS2	Sub.4	15.50	9.00	21.50
NR Band n78 SRS3	Sub.3	13.50	7.00	19.50

Notes:

1. If Plimit is higher than Pmax for some modes/bands, The modes/bands will operate at a power level up to Pmax.
2. Pmax (Maximum tune-up power) is specified in tune-up document. The maximum allowed power is equal to maximum tune up power + 1 dB device design uncertainty.
3. All Plimit NV and maximum tune up output Pmax levels entered in above Table correspond to average power levels after accounting for duty cycle in the case of LTE TDD modulation schemes.
4. For NR FR1 TDD Bands, Plimit listed averaged power level, and Pmax listed burst power level.
5. For PC2/PC3 of NR Band n41/n77, PC2 Plimit is higher than PC3 Plimit in RSI=0. So Plimit calculation is based on PC2's Plimit. So PC3' Plimit is always within SAR design target.
6. NR Band n78's Plimit is same or lower than NR Band n77's Plimit in All RSI's scenarios. Therefore, NR Band n77 was tested as a representative.

5.4. Maximum Allowed Output Power

Maximum allowed output power means that Pmax or PLimit + 1dB device uncertainty for each RSI.

RF Air interface	Antenna	Mode	Maximum allowed output power (dBm)		
			Pmax	RSI = 0 (Proximity sensor Off)	RSI = 1 (Proximity sensor On)
NR Band n77-SRS2	Sub.4 Ant.	SRS CW	**25.00**	**19.00**	**10.00**
NR Band n78-SRS2	Sub.4 Ant.	SRS CW	**22.50**	**16.50**	**10.00**

Note(s):

1. Detail of RSI(Radio SAR Index) conditions, please refer to Sec.6.5.
2. NR Bands support SA and NSA mode as same target power.

5.5. RSI (Radio SAR Index) Scenarios

This device supports multiple RSI Scenarios and Each RSIs operate to each RF exposure Conditions.

Please below table;

RF exposure Conditions	Technologuies Supported	RSI conditions	Description
Standalone	All WWAN bands	RSI = 0	1. free 2. Hand use conditions for Handset and proximity sensor is not active.
Standalone	All WWAN bands	RSI = 1	1. Hand use conditions for Handset and proximity sensor is active.

Note(s):

RSI Scenarios priority: RSI=1 → RSI=0

5.6. NR (Sub 6GHz) SAR Test and Reporting Considerations

NR (Sub 6GHz) SAR Test and Reporting Considerations

Item	Description													
Frequency range, Channel Bandwidth, Numbers and Frequencues	Band n77(n78) -DoD-	Frequency range: 3450 - 3550 MHz												
		Channel Bandwidth												
		100 MHz	90 MHz	80 MHz	70 MHz	60 MHz	50 MHz	40 MHz	30 MHz	25 MHz	20 MHz	15 MHz	10 MHz	5 MHz
	Low						631668/ 3475.02	631334/ 3470.01	631000/ 3465	630866/ 3462.99	630668/ 3460.02	630500/ 3457.5	630334/ 3455.01	
	Mid	633334 /3500.01	633334 /3500.01	633334 /3500.01	633334 /3500.01	633334 /3500.01			633334 /3500.01	633334 /3500.01	633334 /3500.01	633334 /3500.01	633334 /3500.01	
	High						635000/ 3525	635332/ 3529.98	635666/ 3534.99	635800 3537	636000/ 3540	636166/ 3542.49	636332/ 3544.98	
	Band n77(n78) -DoD-	Frequency range: 3700 - 3980 MHz												
		Channel Bandwidth												
		100 MHz	90 MHz	80 MHz	70 MHz	60 MHz	50 MHz	40 MHz	30 MHz	25 MHz	20 MHz	15 MHz	10 MHz	5 MHz
	Low	650000 /3750	649668 /3745.02	649334 /3740.01	649000/ 3735	648668 /3730.02	648334 /3725.01	648000 /3720	647668/ 3715.02	647500/ 3712.5	647334 /3710.01	647168/ 3707.52	647000/ 3705	
	Low-Mid				653666/ 3804.99	653556 /3803.34	652166 /3782.49	651200 /3768	651000/ 3765	650900/ 3763.5	650800 /3762	650700/ 3760.5	650600/ 3759	
	Mid-A		656000 /3840	656000 /3840			656000 /3840	654400 /3816	654334/ 3815.01	654300/ 3814.5	654266 /3813.99	654234/ 3813.51	654200/ 3813	
	Mid-B							657600 /3864	657666/ 3864.99	657700/ 3814.5	657734 /3866.01	657766/ 3866.49	657800/ 3867	
	Mid-High	662000 /3930	662332 /3934.98	662666 /3939.99	658334/ 3875.01	658444 /3876.66	659834 /3897.51	660800 /3912	661000/ 3915	661100/ 3916.5	661200 /3918	661300/ 3919.5	661400/ 3921	
	High				663000/ 3945	663332 /3949.98	663666 /3954.99	664000 /3960	664332/ 3964.98	664500/ 3967.5	664666 /3969.99	664832/ 3972.48	665000/ 3975	
SCS	NR FDD Bands : 15 kHz, NR TDD Bands : 30kHz													
Modulations Supported in UL	DFT-s-OFDM: π/2 BPSK, QPSK, 16QAM, 64QAM, 256QAM & CP-OFDM: QPSK, 16QAM, 64QAM, 256QAM													
A-MPR (Additional MPR) disabled for SAR Testing?	Yes													
EN-DC Carrier Aggregation Possible Combinations														
LTE Anchor Bands for NR Band n77	LTE Band 2/5/7/12/13/14/30/66													
LTE Anchor Bands for NR Band n78	LTE Band 2/4/5/7/12/13/66/71													

Notes:

1. SAR test for NR bands and LTE anchor Bands were performed separately due to limitations in SAR probe calibration factors. And, Due to test setup limitations, SAR testing for NR was performed using test mode software to establish the connection.
2. NR configurations of SAR test were determined according to Section 5.2 of KDB 941225 D05.

6. RF Exposure Conditions (Test Configurations)

Refer to Appendix A for the specific details of the antenna-to-antenna and antenna-to-edge(s) distances.

6.1. Standalone SAR Test Exclusion Considerations

Tablet device's each positions (Rear/Edge1/Edge2/Edge3/Edge4) consider SAR test exclusion according to Appendix B.4 of KDB 447498 D04 Interim General RF exposure guide.
If Each antenna operate to between 0.3GHz to 6GHz, and Antenna to DUT surface's distance are within 0.5 cm to 40cm, then below Formula can use for SAR test exclusion;

$$P_{\text{th}}\,(\text{mW}) = ERP_{20\,\text{cm}}\,(\text{mW}) = \begin{cases} 2040f & 0.3\ \text{GHz} \le f < 1.5\ \text{GHz} \\ 3060 & 1.5\ \text{GHz} \le f \le 6\ \text{GHz} \end{cases} \quad \text{(B.1)}$$

$$P_{\text{th}}\,(\text{mW}) = \begin{cases} ERP_{20\,\text{cm}}(d/20\ \text{cm})^{x} & d \le 20\ \text{cm} \\ ERP_{20\,\text{cm}} & 20\ \text{cm} < d \le 40\ \text{cm} \end{cases} \quad \text{(B.2)}$$

where

$$x = -\log_{10}\left(\frac{60}{ERP_{20\,\text{cm}}\sqrt{f}}\right)$$

and f is in GHz, d is the separation distance (cm), and $ERP_{20\text{cm}}$ is per Formula (B.1).
The example values shown in Table B.2 are for illustration only.

6.2. Estimated SAR

When an antenna qualifies for test exemption in single transmitter/antenna mode of each test positions, its actual SAR value may not be available, because it was not required to be measured. In this case, the SAR contribution of that antenna to simultaneous transmission must be estimated relative to the SAR based exemption criteria, by multiplying the corresponding ratio by the SAR limit of 1.6 W/kg for 1-g SAR. This is referred to as estimated SAR.
For instance, a given antenna may qualify for a SAR-based exemption according to Appendix B.4 of KDB 447498 D04, with $P_{ant} < P_{th}$, where P_{ant} is maximum time-averaged power, and P_{th} is defined in Section 7.1. Then, per the preceding paragraph, the estimated SAR is computed as $SAR_{est} = 1.6 * P_{ant} / P_{th}$ [W/kg].

SAR Test Exclusion Calculation for WWAN

Antenna	Tx Interface	Frequency (MHz)	Output Power		Separation Distances (mm)					Estimated 1-g SAR Value (W/kg)				
			dBm	mW	Rear	Top	R_Left	Bottom	R_Right	Rear	Top	R_Left	Bottom	R_Right
Full Power, Proximity Sensor Off. A sensor triggering of 20 mm is included for Rear, Left, Right and Bottom. 23mm is included for Top.														
Sub 4	NR Band n77 SRS2	3980	25.00	316	19	250.33	0	19	0	-Measure-	0.105	-Measure-	-Measure-	-Measure-
Sub 4	NR Band n78 SRS2	3800	25.00	316	19	250.33	0	19	0	-Measure-	0.106	-Measure-	-Measure-	-Measure-
Power Back-off, Proximity Sensor On														
Sub 4	NR Band n77 SRS2	3980	10.00	10	0		0	0	0	-Measure-		-Measure-	-Measure-	-Measure-
Sub 4	NR Band n78 SRS2	3800	14.50	28	0		0	0	0	-Measure-		-Measure-	-Measure-	-Measure-

Note(s):

When some device surfaces has Standalone SAR test Exclusion according to Section 7.1, Estimated SAR were calculated to the surfaces according to Section 7.2.

6.3. Required Test configurations

The table below identifies the standalone test configurations required for this device accordant to the findings in SAR Test Exclusion Calculation table.

Antenna	Tx Interface	Proximity sensor (On/Off)	Rear	Top	R/Left	Bottom	R/Right
Sub.4	SRS mode	OFF	Yes	No	Yes	Yes	Yes
		ON	Yes	N/A	N/A	Yes	N/A

Note(s):

1. Yes = Testing is required. No = Testing is not required.
2. N/A = Power back-off is not implemented in certain position using proximity sensor active.
3. The laptop configuration with the accessory keyboard connected was not evaluated as this was considered to be covered by the R/Right tests.

7. Dielectric Property Measurements & System Check

7.1. Dielectric Property Measurements

The temperature of the tissue-equivalent medium used during measurement must also be within 18°C to 25°C and within ± 2°C of the temperature when the tissue parameters are characterized.
The dielectric parameters must be measured before the tissue-equivalent medium is used in a series of SAR measurements. The Tissue Dielectric parameters (100MHz to 6GHz) should be re-measured after each 3 – 4 days of use; or earlier if the dielectric parameters can become out of tolerance; for example, when the parameters are marginal at the beginning of the measurement series.
Tissue dielectric parameters were measured at the low, middle and high frequency of each operating frequency range of the test device.
For The Tissue Dielectric parameters (4MHz to 30MHz). The parameters must be measured before 24 hours.

1. Tissue Dielectric Parameters (100MHz to 6GHz)
FCC KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz

Target Frequency (MHz)	Head		Body	
	ε_r	σ (S/m)	ε_r	σ (S/m)
150	52.3	0.76	61.9	0.80
300	45.3	0.87	58.2	0.92
450	43.5	0.87	56.7	0.94
835	41.5	0.90	55.2	0.97
900	41.5	0.97	55.0	1.05
915	41.5	0.98	55.0	1.06
1450	40.5	1.20	54.0	1.30
1610	40.3	1.29	53.8	1.40
1800 – 2000	40.0	1.40	53.3	1.52
2450	39.2	1.80	52.7	1.95
3000	38.5	2.40	52.0	2.73
5000	36.2	4.45	49.3	5.07
5100	36.1	4.55	49.1	5.18
5200	36.0	4.66	49.0	5.30
5300	35.9	4.76	48.9	5.42
5400	35.8	4.86	48.7	5.53
5500	35.6	4.96	48.6	5.65
5600	35.5	5.07	48.5	5.77
5700	35.4	5.17	48.3	5.88
5800	35.3	5.27	48.2	6.00

SAR test were performed in All RF exposure conditions using Head tissue according to TCB workshop note of April. 2019.

IEEE Std 1528-2013
Refer to Table 3 within the IEEE Std 1528-2013

Dielectric Property Measurements Results:

SAR 2 Room

Date	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
2023-08-28	Head 3500	e'	39.5500	Relative Permittivity (ϵ_r):	39.55	37.93	4.27	5
		e''	14.9500	Conductivity (σ):	2.91	2.91	-0.07	5
	Head 3600	e'	39.4000	Relative Permittivity (ϵ_r):	39.40	37.82	4.19	5
		e''	15.0500	Conductivity (σ):	3.01	3.01	-0.04	5
	Head 3700	e'	39.2200	Relative Permittivity (ϵ_r):	39.22	37.70	4.03	5
		e''	15.1500	Conductivity (σ):	3.12	3.12	0.02	5
	Head 3800	e'	39.0400	Relative Permittivity (ϵ_r):	39.04	37.59	3.86	5
		e''	15.2500	Conductivity (σ):	3.22	3.22	0.11	5
	Head 3900	e'	38.8600	Relative Permittivity (ϵ_r):	38.86	37.47	3.70	5
		e''	15.3500	Conductivity (σ):	3.33	3.32	0.24	5
	Head 3980	e'	38.7000	Relative Permittivity (ϵ_r):	38.70	37.38	3.53	5
		e''	15.4300	Conductivity (σ):	3.41	3.40	0.35	5

7.2. System Check

SAR system verification is required to confirm measurement accuracy, according to the tissue dielectric media, probe calibration points and other system operating parameters required for measuring the SAR of a test device. The system verification must be performed for each frequency band and within the valid range of each probe calibration point required for testing the device. The same SAR probe(s) and tissue-equivalent media combinations used with each specific SAR system for system verification must be used for device testing. When multiple probe calibration points are required to cover substantially large transmission bands, independent system verifications are required for each probe calibration point. A system verification must be performed before each series of SAR measurements using the same probe calibration point and tissue-equivalent medium. Additional system verification of 100MHZ to 6GHz frequency range should be considered according to the conditions of the tissue-equivalent medium and measured tissue dielectric parameters, typically every three to four days when the liquid parameters are re-measured or sooner when marginal liquid parameters are used at the beginning of a series of measurements. For The System verification of 4MHz to 30MHz frequency range, The System verification must be performed before 24 hours.

System Performance Check Measurement Conditions (100MHz to 6GHz):

- The measurements were performed in the flat section of the TWIN SAM or ELI phantom, shell thickness: 2.0 ±0.2 mm (bottom plate) filled with Body or Head simulating liquid of the following parameters.
- The depth of tissue-equivalent liquid in a phantom must be ≥ 15.0 cm for SAR measurements ≤ 3 GHz and ≥ 10.0 cm for measurements > 3 GHz.
- The DASY system with an E-Field Probe was used for the measurements.
- The dipole was mounted on the small tripod so that the dipole feed point was positioned below the center marking of the flat phantom section and the dipole was oriented parallel to the body axis (the long side of the phantom). The standard measuring distance was 10 mm (above 1 GHz) and 15 mm (below 1 GHz) from dipole center to the simulating liquid surface.
- The coarse grid with a grid spacing of 15 mm was aligned with the dipole.
  For 5 GHz band - The coarse grid with a grid spacing of 10 mm was aligned with the dipole.
- Special 7x7x7 (below 3 GHz) and/or 8x8x7 (above 3 GHz) fine cube was chosen for the cube.
- Distance between probe sensors and phantom surface was set to 2.5 mm.
  For 5 GHz band - Distance between probe sensors and phantom surface was set to 1.4 mm
- The dipole input power (forward power) was 100 mW.
- The results are normalized to 1 W input power.

System Performance Check Measurement Conditions (4MHz to 30MHz):

- The measurements were performed in the flat section of the TWIN SAM or ELI phantom, shell thickness: 2.0 ±0.2 mm (bottom plate) filled with Body or Head simulating liquid of the following parameters.
- The depth of tissue-equivalent liquid in a phantom must be ≥ 15.0 cm for SAR measurements
- The DASY system with an E-Field Probe was used for the measurements.
- The CLA(Confined Loop Antennas) was mounted on the small tripod so that the CLA feed point was positioned below the center marking of the flat phantom section and the CLA was oriented parallel to the body axis (the long side of the phantom). The standard measuring distance was 0 mm separation distance from CLA center to the Phantom surface.
- The CLA input power (forward power) was 100 mW.
- The results are normalized to 1 W input power.

Reference Target SAR Values

The reference SAR values can be obtained from the calibration certificate of system validation dipoles.

System Dipole	Serial No.	Cal. Date	Cal. Due Date	Target SAR Values (W/kg)	
				1g/10g	Head
D3500V2	1075	5-19-2023	5-19-2025	1g	65.50
				10g	24.70
D3700V2	1036	5-19-2023	5-19-2025	1g	67.80
				10g	24.50
D3900V2	1069	4-21-2023	4-21-2025	1g	69.40
				10g	24.00

Note(s):

1. For System Validation Dipole, Calibration interval applied every 2 years according to referencing KDB 865664 guidance.
2. All equipments were used until Cal.Due data.

System Check Results

The 1-g and 10-g SAR measured with a reference dipole, using the required tissue-equivalent medium at the test frequency, must be within 10% of the manufacturer calibrated dipole SAR target.

SAR 2 Room

Date Tested	System Dipole		T.S. Liquid		Measured Results		Target (Ref. Value)	Delta ±10 %	Plot No.
	Type	Serial #			Zoom Scan to 100 mW	Normalize to 1 W			
2023-08-28	D3500V2	1121	Head	1g	7.13	71.3	66.60	7.06	1
				10g	2.70	27.0	25.10	7.57	
2023-08-28	D3700V2	1036	Head	1g	6.31	63.1	67.80	-6.93	
				10g	2.30	23.0	24.50	-6.12	
2023-08-28	D3900V2	1069	Head	1g	6.83	68.3	69.40	-1.59	
				10g	2.42	24.2	24.00	0.83	

8. Conducted Output Power Measurements

8.1. NR (Sub 6GHz)

The following tests were conducted according to the test requirements outlined in section 6.2 of the 3GPP TS 138.521-1 specification.

UE Power Class: 3 (23 +/- 2dBm). The allowed Maximum Power Reduction (MPR) for the maximum output power due to higher order modulation and transmit bandwidth configuration (resource blocks) is specified in Table 6.2.3-1 of the 3GPP TS138.521-1.

Table 6.2.2.3-1: Maximum Power Reduction (MPR) for Power 3

Modulation	MPR (dB)		
	Edge RB allocations	Outer RB allocations	Inner RB allocations
DFT-s-OFDM PI/2 BPSK	≤ 3.5[1]	≤ 1.2[1]	≤ 0.2[1]
	≤ 0.5[2]		0[2]
DFT-s-OFDM QPSK	≤ 1		0
DFT-s-OFDM 16 QAM	≤ 2		≤ 1
DFT-s-OFDM 64 QAM	≤ 2.5		
DFT-s-OFDM 256 QAM	≤ 4.5		
CP-OFDM QPSK	≤ 3		≤ 1.5
CP-OFDM 16 QAM	≤ 3		≤ 2
CP-OFDM 64 QAM	≤ 3.5		
CP-OFDM 256 QAM	≤ 6.5		
NOTE 1: Applicable for UE operating in TDD mode with PI/2 BPSK modulation and UE indicates support for UE capability *powerBoosting-pi2BPSK* and if the IE *powerBoostPi2BPSK* is set to 1 and 40 % or less slots in radio frame are used for UL transmission for bands n40, n41, n77, n78 and n79. The reference power of 0dB MPR is 26dBm.			
NOTE 2: Applicable for UE operating in FDD mode, or in TDD mode in bands other than n40, n41, n77, n78 and n79 and if the IE *powerBoostPi2BPSK* is set to 0 and if more than 40% of slots in radio frame are used for UL transmission for bands n40, n41, n77, n78 and n79.			

The allowed A-MPR values specified below in Table 6.2.3.3.1-1 of 3GPP TS138.521-1 are in addition to the allowed MPR requirements. All the measurements below were performed with A-MPR disabled, by using Network Signaling Value of “NS_01”

Table 6.2.3.3.1-1: Additional maximum power reduction (A-MPR)

Network Signalling label	Requirements (subclause)	NR Band	Channel bandwidth (MHz)	Resources Blocks (N_{RB})	A-MPR (dB)
NS_01		Table 5.2-1	5, 10, 15, 20, 25, 30, 40, 50, 60, 80, 90, 100	Table 5.3.2-1	N/A

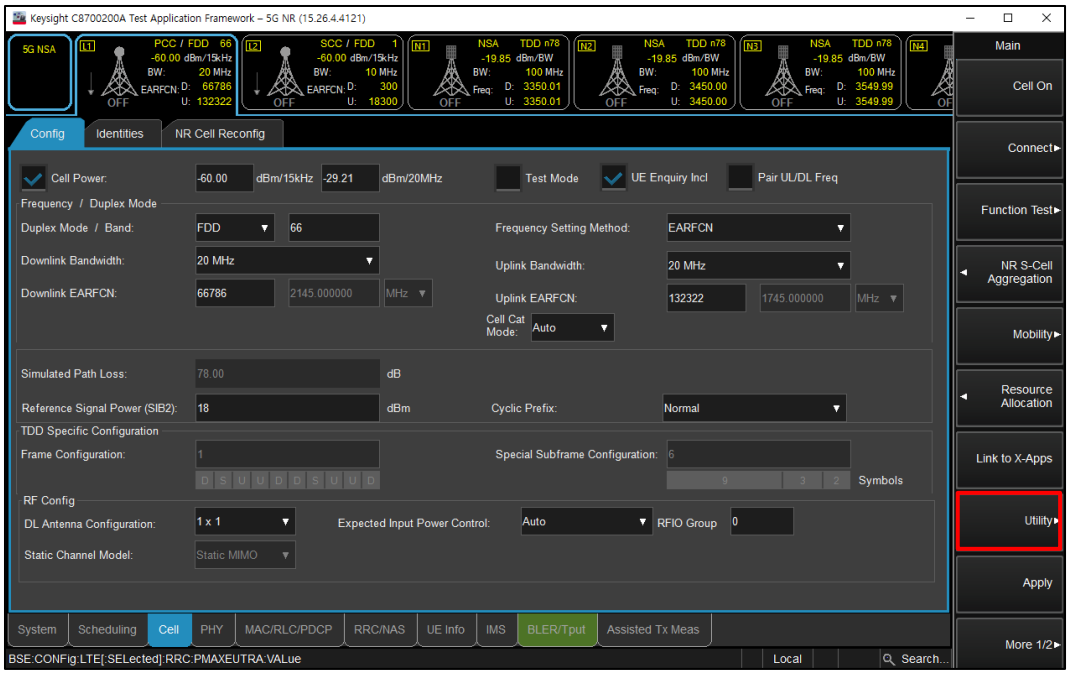
Uplink RB allocations were used to Table 6.1-1 of the 3GPP TS 138.521-1.

Channel Bandwidth	SCS(kHz)	OFDM	RB allocation							
			Edge_Full_Left	Edge_Full_Right	Edge_1RB_Left	Edge_1RB_Right	Outer_Full	Inner_Full	Inner_1RB_Left	Inner_1RB_Right
5MHz	15	DFT-s	2@0	2@23	1@0	1@24	25@0	12@6	1@1	1@23
		CP	2@0	2@23	1@0	1@24	25@0	13@6	1@1	1@23
	30	DFT-s	2@0	2@9	1@0	1@10	10@0	5@2[1]	1@1	1@9
		CP	2@0	2@9	1@0	1@10	11@0	5@2[1]	1@1	1@9
	60	DFT-s	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		CP	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10MHz	15	DFT-s	2@0	2@50	1@0	1@51	50@0	25@12	1@1	1@50
		CP	2@0	2@50	1@0	1@51	52@0	26@13	1@1	1@50
	30	DFT-s	2@0	2@22	1@0	1@23	24@0	12@6	1@1	1@22
		CP	2@0	2@22	1@0	1@23	24@0	12@6	1@1	1@22
	60	DFT-s	2@0	2@9	1@0	1@10	10@0	5@2[1]	1@1	1@9
		CP	2@0	2@9	1@0	1@10	11@0	5@2[1]	1@1	1@9
15MHz	15	DFT-s	2@0	2@77	1@0	1@78	75@0	36@18	1@1	1@77
		CP	2@0	2@77	1@0	1@78	79@0	39@19[1]	1@1	1@77
	30	DFT-s	2@0	2@36	1@0	1@37	36@0	18@9	1@1	1@36
		CP	2@0	2@36	1@0	1@37	38@0	19@9	1@1	1@36
	60	DFT-s	2@0	2@16	1@0	1@17	18@0	9@4	1@1	1@16
		CP	2@0	2@16	1@0	1@17	18@0	9@4	1@1	1@16
20MHz	15	DFT-s	2@0	2@104	1@0	1@105	100@0	50@25	1@1	1@104
		CP	2@0	2@104	1@0	1@105	106@0	53@26	1@1	1@104
	30	DFT-s	2@0	2@49	1@0	1@50	50@0	25@12	1@1	1@49
		CP	2@0	2@49	1@0	1@50	51@0	25@12[1]	1@1	1@49
	60	DFT-s	2@0	2@22	1@0	1@23	24@0	12@6	1@1	1@22
		CP	2@0	2@22	1@0	1@23	24@0	12@6	1@1	1@22

Procedures used to establish power measurement for NR Bands

Switching to NSA mode or SA mode

- Click the “Utility” button in the right of Test application screen
- Select “5G NR NSA” in the “TA Mode Switch” for NSA mode
- Select “5G NR Standalone” in the “TA Mode Switch” for SA mode

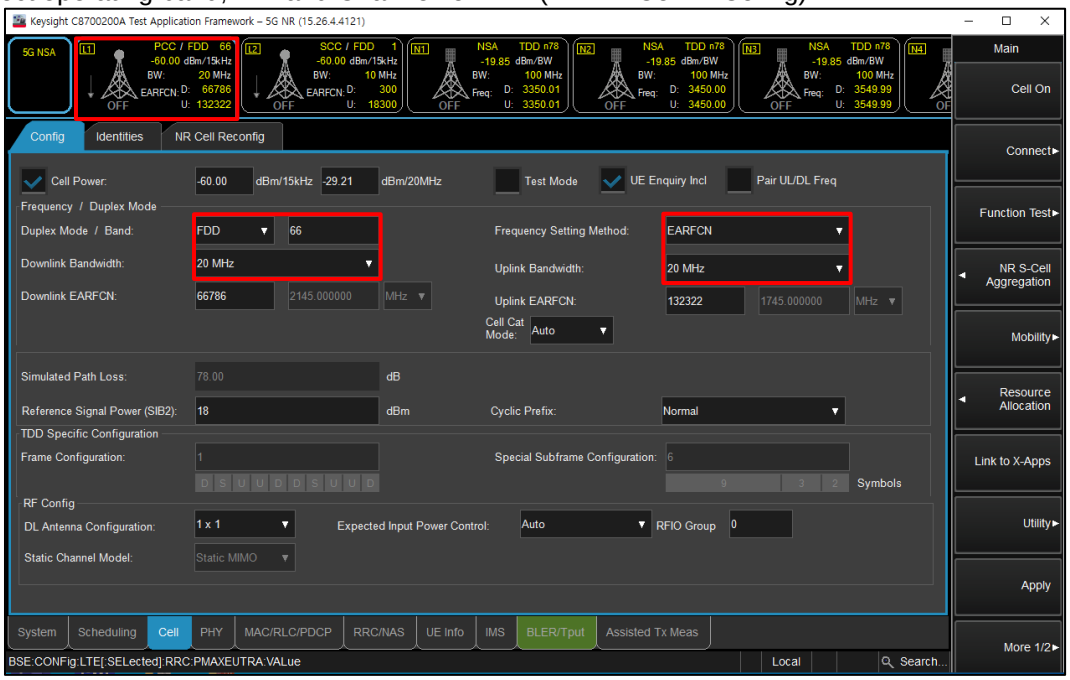


(Figure 1-1)

(Figure 1-2)

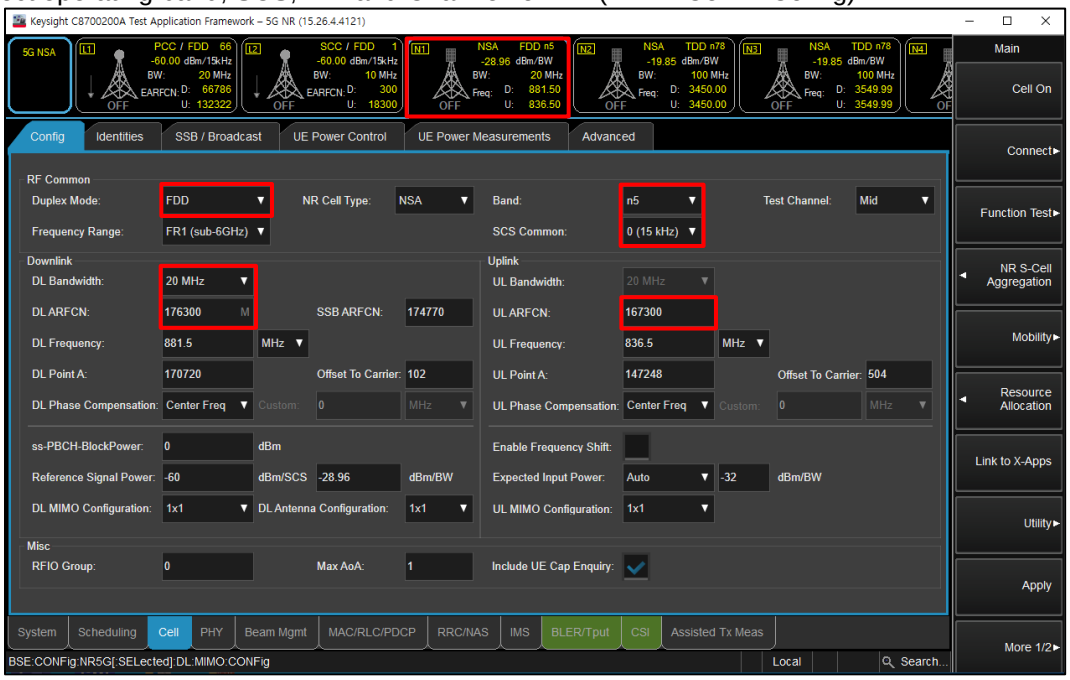
NSA Mode

- Select operating band, BW and Channel for LTE (LTE -> Cell -> Config)



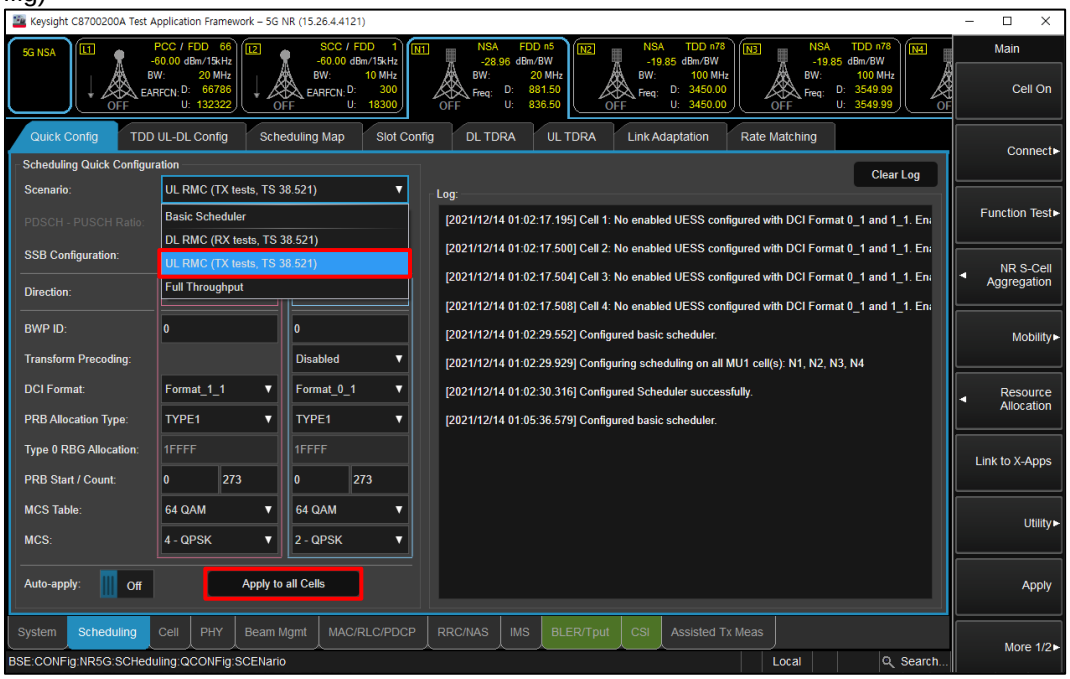
(Figure 2-1)

- Select operating band, SCS, BW and Channel for NR (NR -> Cell -> Config)



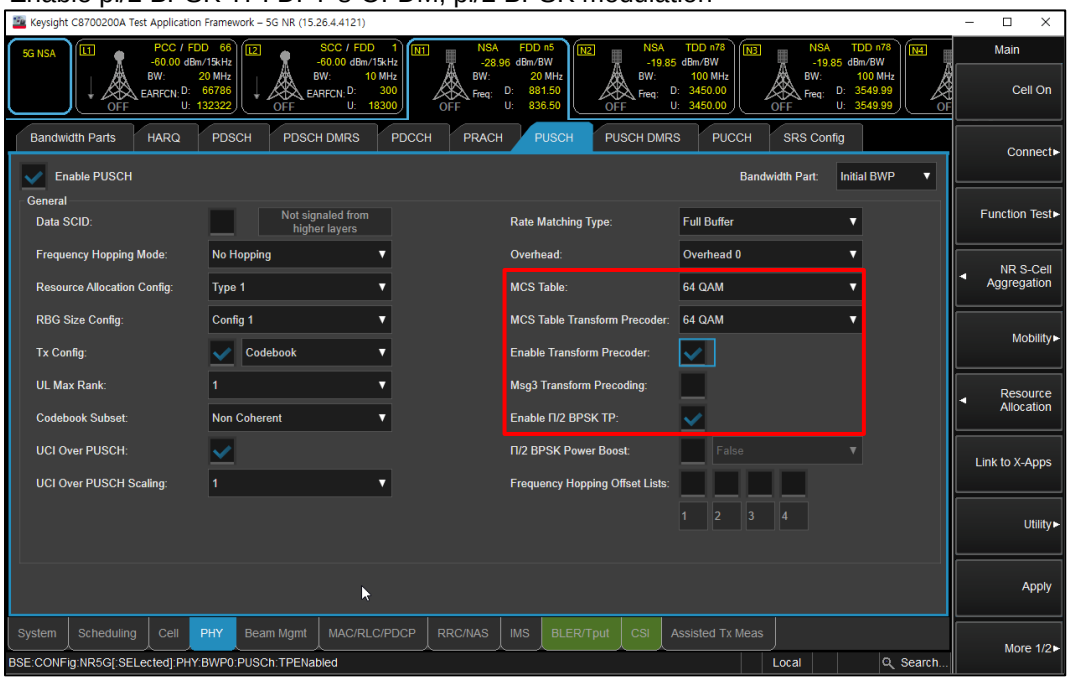
(Figure 2-2)

- Select “UL RMC (TX tests, TS 38.521)” for maximum power RB scheduling (NR -> Scheduling -> Quick Config)



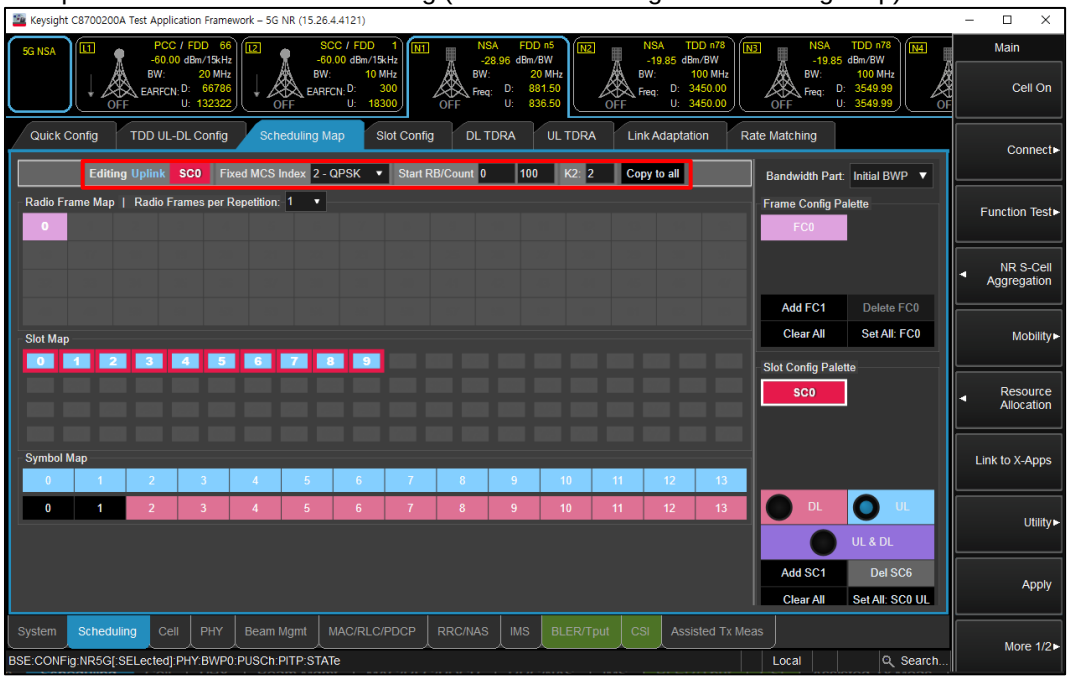
(Figure 2-3)

- To set waveform for NR Band (NR -> PHY -> PUSCH)
  - Select highest modulation in the MCS Table and MCS Table Transform Precoder
  - Enable Transform Precoder: DFT-s-OFDM / disable for CP-OFDM
  - Enable pi/2 BPSK TP: DFT-s-OFDM, pi/2 BPSK modulation



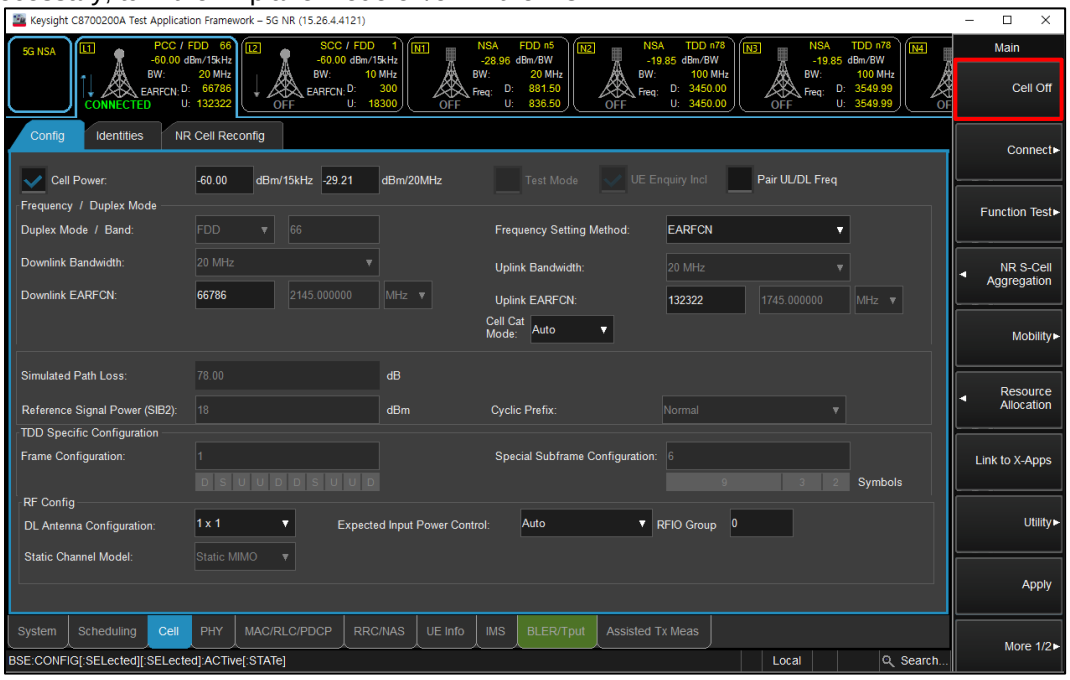
(Figure 2-4)

- Select Uplink Modulation and RB setting (NR -> Scheduling -> Scheduling Map)



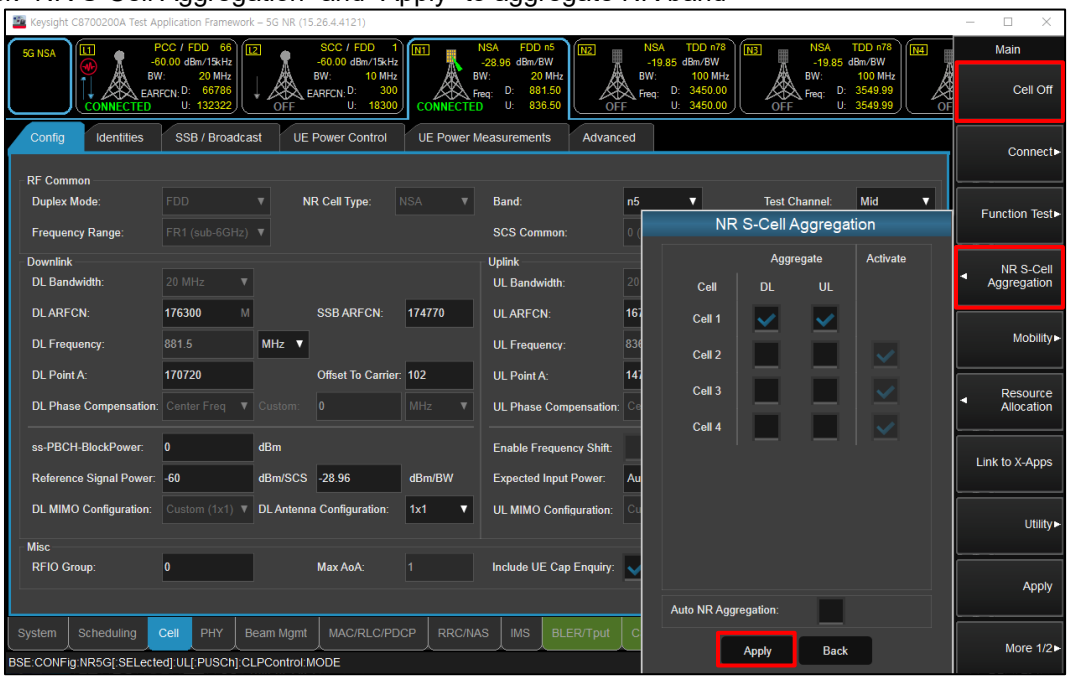
(Figure 2-5)

- Click “Cell On” button in the right of Test application screen in the LTE tab
- If necessary, turn the Airplane Mode on/off in the DUT



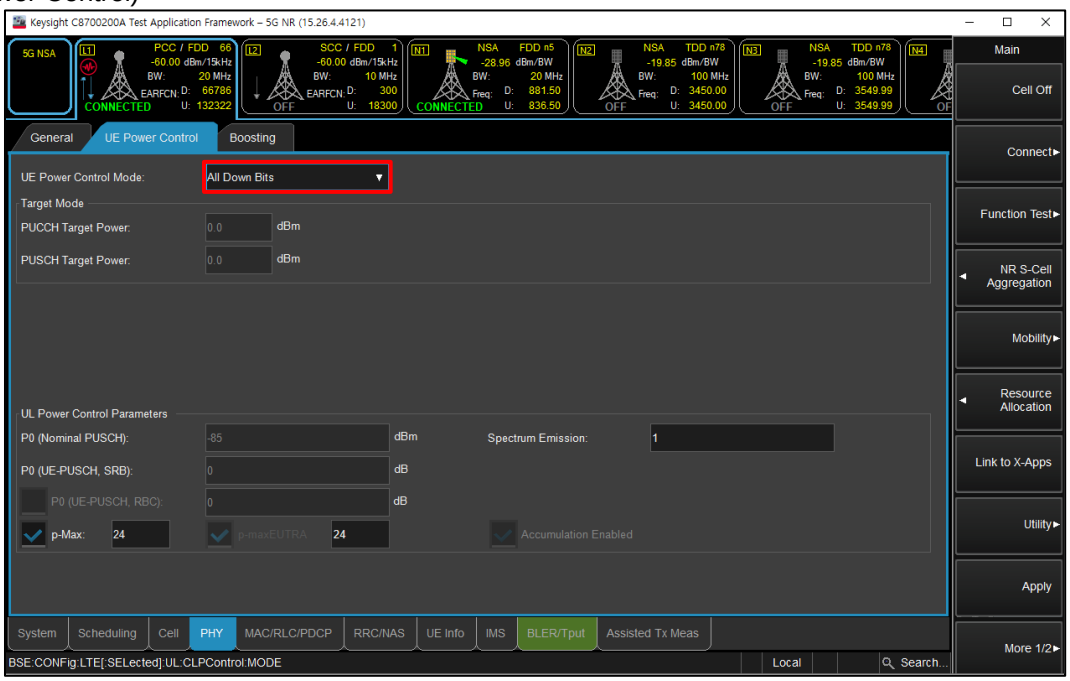
(Figure 2-6)

- Click “Cell On” button in the right of Test application screen in the NR tab
- Click “NR S-Cell Aggregation” and “Apply” to aggregate NR band



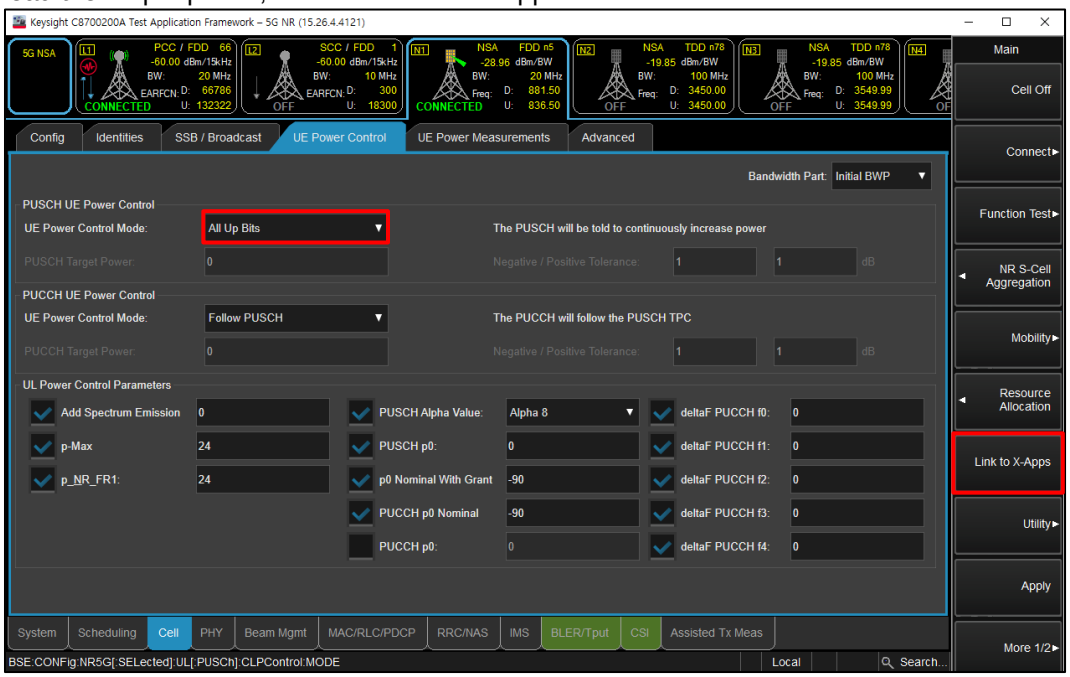
(Figure 2-7)

- Select “All Down Bits” of UL Power control Mode in LTE tab for NR maximum power (LTE -> PHY -> UE Power Control)



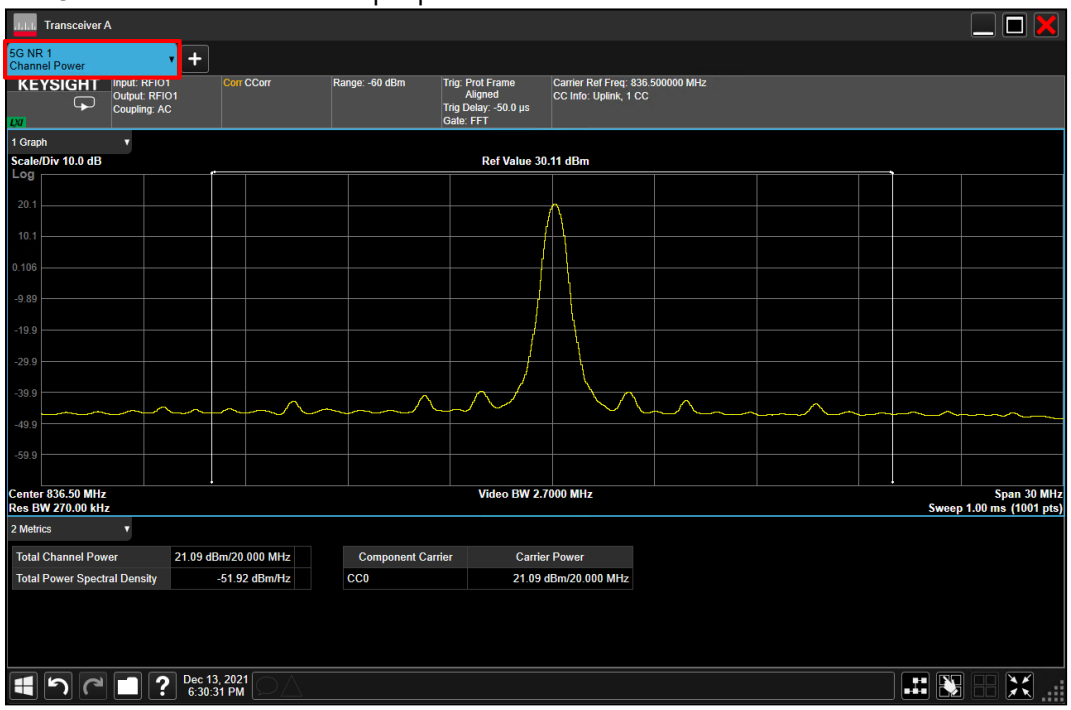
(Figure 2-8)

- Select “All Up Bits” of UL Power control Mode in NR tab for NR maximum power (NR -> Cell -> UE Power Control)
- To read the output power, click the “Link to X-Apps”



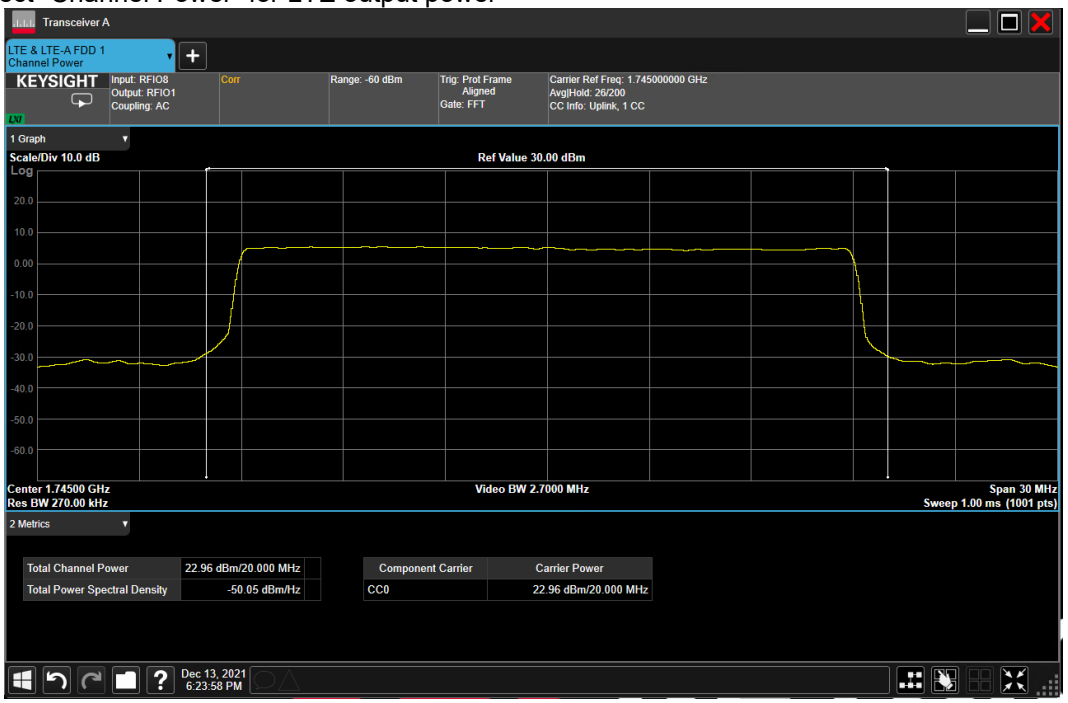
(Figure 2-9)

- Select “Channel Power” for NR output power



(Figure 2-10)

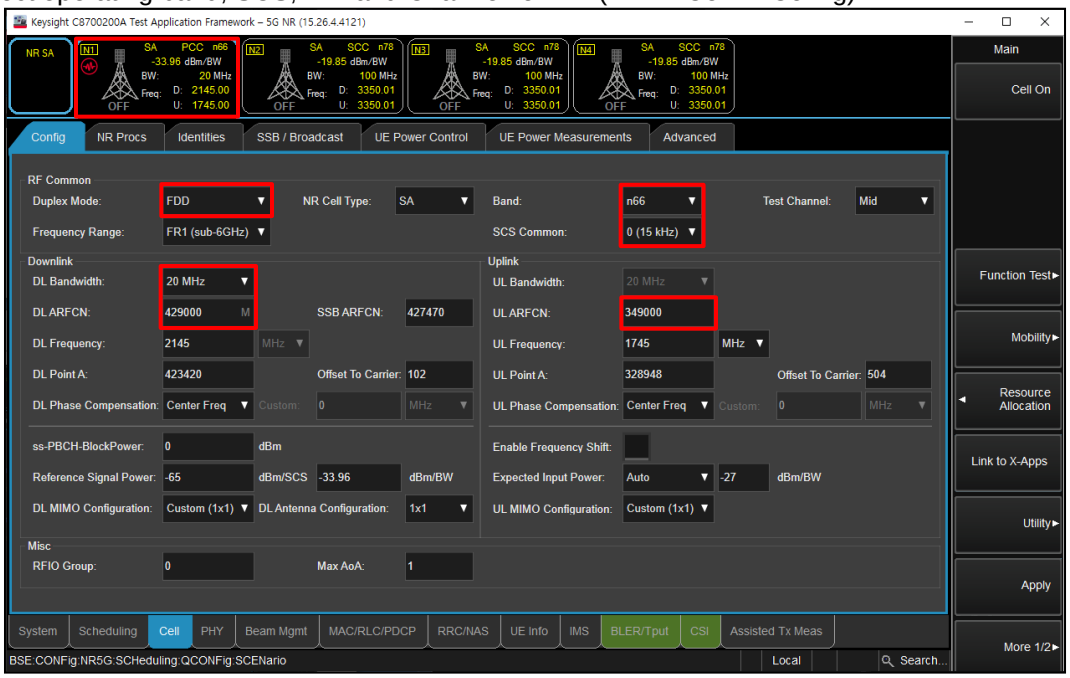
- Select “Channel Power” for LTE output power



(Figure 2-11)

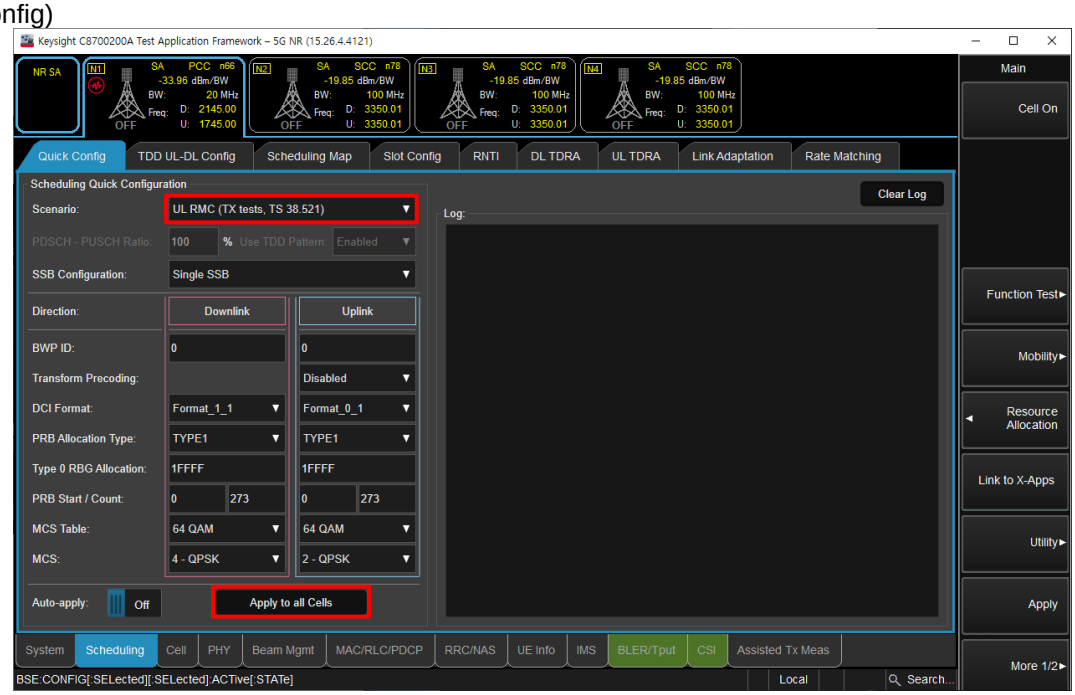
SA Mode

- Select operating band, SCS, BW and Channel for NR (NR -> Cell -> Config)



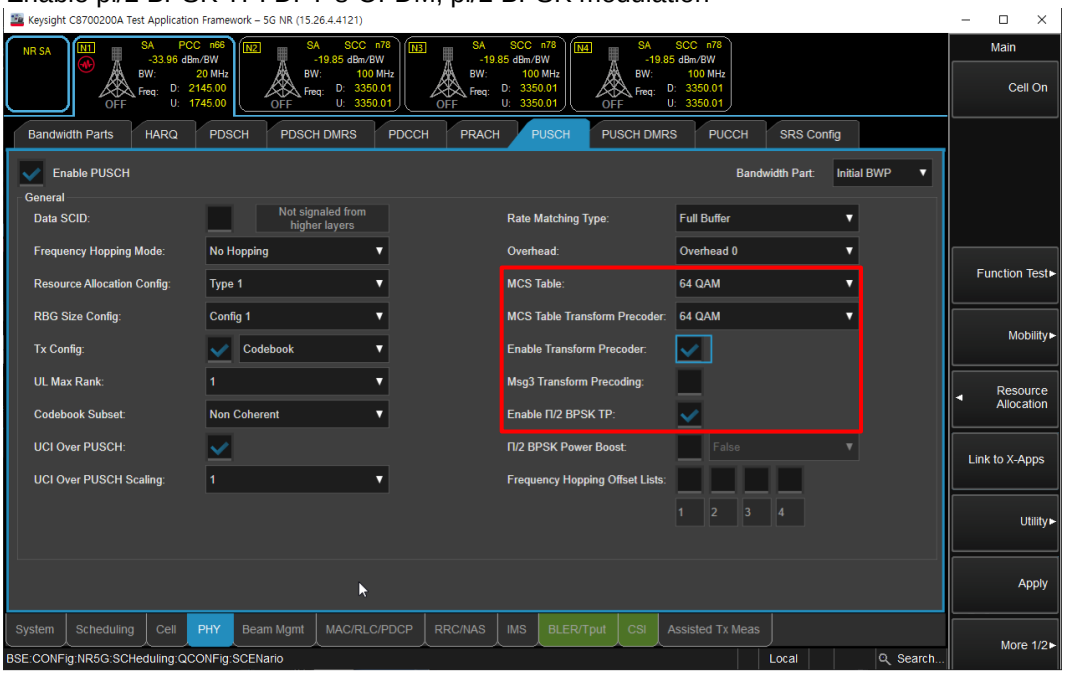
(Figure 3-1)

- Select “UL RMC (TX tests, TS 38.521)” for maximum power RB scheduling (NR -> Scheduling -> Quick Config)



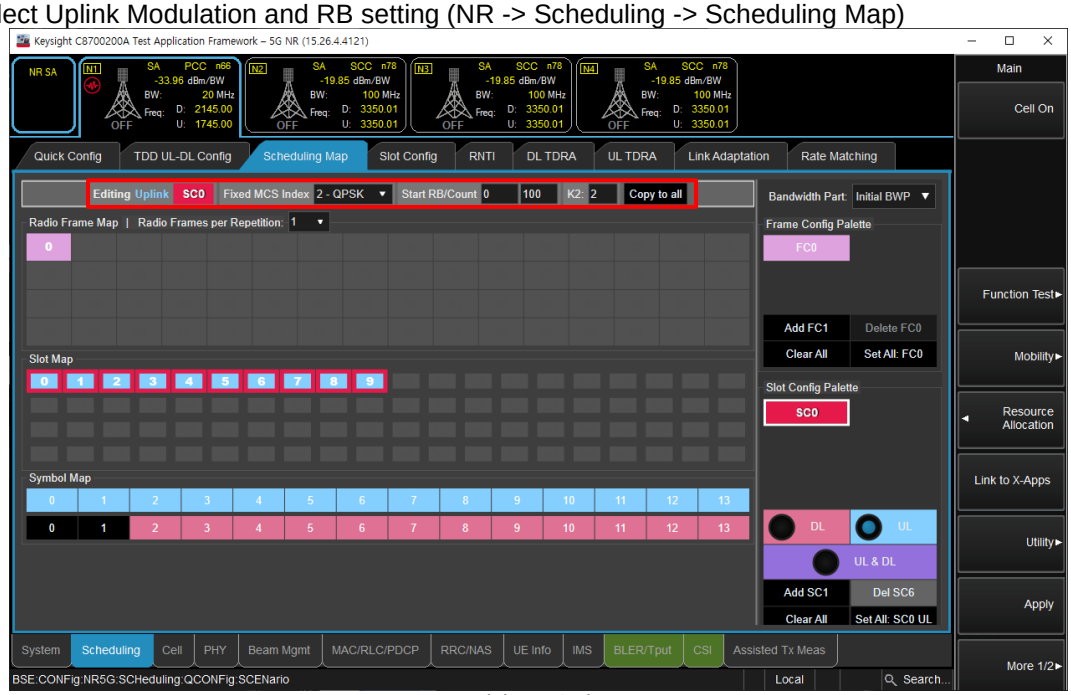
(Figure 3-2)

- To set waveform for NR Band (NR -> PHY -> PUSCH)
  - Select highest modulation in the MCS Table and MCS Table Transform Precoder
  - Enable Transform Precoder: DFT-s-OFDM / disable for CP-OFDM
  - Enable pi/2 BPSK TP: DFT-s-OFDM, pi/2 BPSK modulation



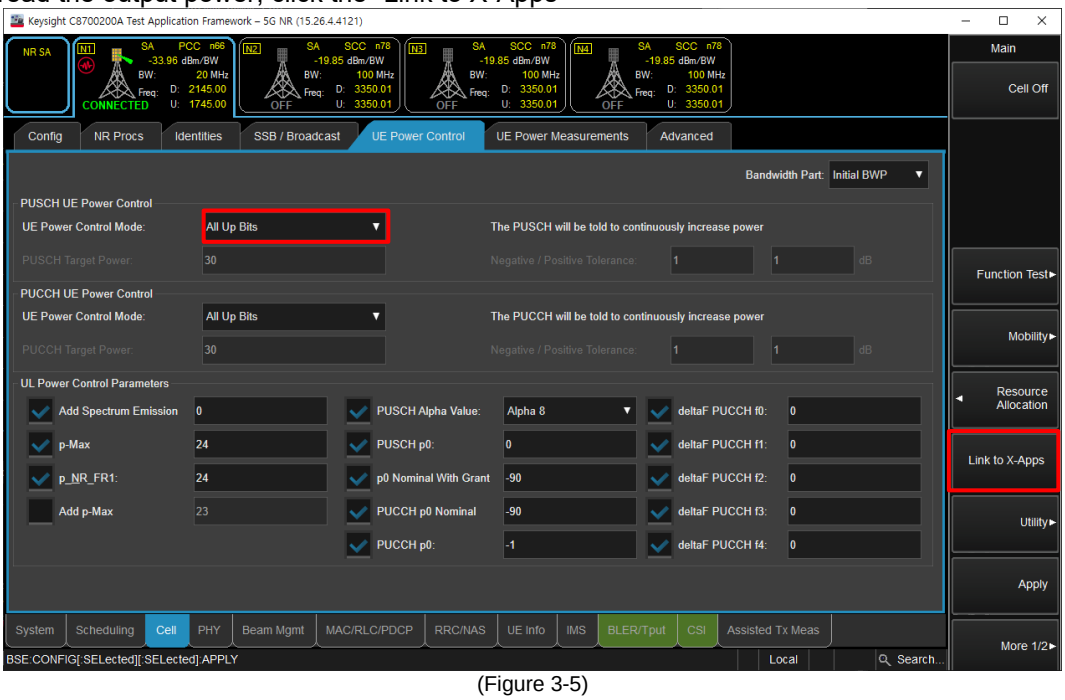
(Figure 3-3)

- Select Uplink Modulation and RB setting (NR -> Scheduling -> Scheduling Map)



(Figure 3-4)

- Click “Cell On” button in the right of Test application screen
- If necessary, turn the Airplane Mode on/off in the DUT
- Select “All Up Bits” of UL Power control Mode (Cell -> UE Power Control)
- To read the output power, click the “Link to X-Apps”



(Figure 3-5)

- Select “Channel Power”

(Figure 3-6)

NR Band n77 (Sub.4 SRS2) - Lower Band- Measured Results

BW (MHz)	Mode	Maximum Allowed Average Power (dBm)									
		DSI =0					DSI =1				
		Measured Pwr (dBm)			MPR	Tune-up Limit	Measured Pwr (dBm)			MPR	Tune-up Limit
			633334					633334			
			3500.01 MHz					3500.01 MHz			
100 MHz	SRS CW		18.8		0.0	19.0		9.8		0.0	10.0
BW (MHz)	Mode	Measured Pwr (dBm)			MPR	Tune-up Limit	Measured Pwr (dBm)			MPR	Tune-up Limit
		633000	633334	633666			633000	633334	633666		
		3495 MHz	3500.01 MHz	3504.99 MHz			3495 MHz	3500.01 MHz	3504.99 MHz		
90 MHz	SRS CW		18.7		0.0	19.0		9.6		0.0	10.0
BW (MHz)	Mode	Measured Pwr (dBm)			MPR	Tune-up Limit	Measured Pwr (dBm)			MPR	Tune-up Limit
		632668	633334	634000			632668	633334	634000		
		3490.02 MHz	3500.01 MHz	3510 MHz			3490.02 MHz	3500.01 MHz	3510 MHz		
80 MHz	SRS CW		18.6		0.0	19.0		9.6		0.0	10.0
BW (MHz)	Mode	Measured Pwr (dBm)			MPR	Tune-up Limit	Measured Pwr (dBm)			MPR	Tune-up Limit
		632334	633334	634332			632334	633334	634332		
		3485.01 MHz	3500.01 MHz	3514.98 MHz			3485.01 MHz	3500.01 MHz	3514.98 MHz		
70 MHz	SRS CW		18.7		0.0	19.0		9.4		0.0	10.0
BW (MHz)	Mode	Measured Pwr (dBm)			MPR	Tune-up Limit	Measured Pwr (dBm)			MPR	Tune-up Limit
		632000	633334	634666			632000	633334	634666		
		3480 MHz	3500.01 MHz	3519.99 MHz			3480 MHz	3500.01 MHz	3519.99 MHz		
60 MHz	SRS CW		18.5		0.0	19.0		9.4		0.0	10.0
BW (MHz)	Mode	Measured Pwr (dBm)			MPR	Tune-up Limit	Measured Pwr (dBm)			MPR	Tune-up Limit
		631668	633334	635000			631668	633334	635000		
		3475.02 MHz	3500.01 MHz	3525 MHz			3475.02 MHz	3500.01 MHz	3525 MHz		
50 MHz	SRS CW	18.7		18.8	0.0	19.0	9.3		9.8	0.0	10.0
BW (MHz)	Mode	Measured Pwr (dBm)			MPR	Tune-up Limit	Measured Pwr (dBm)			MPR	Tune-up Limit
		631334	633334	635332			631334	633334	635332		
		3470.01 MHz	3500.01 MHz	3529.98 MHz			3470.01 MHz	3500.01 MHz	3529.98 MHz		
40 MHz	SRS CW	18.2		18.5	0.0	19.0	9.2		9.9	0.0	10.0
BW (MHz)	Mode	Measured Pwr (dBm)			MPR	Tune-up Limit	Measured Pwr (dBm)			MPR	Tune-up Limit
		631000	633334	635666			631000	633334	635666		
		3465 MHz	3500.01 MHz	3534.99 MHz			3465 MHz	3500.01 MHz	3534.99 MHz		
30 MHz	SRS CW	18.1	18.4	18.7	0.0	19.0	9.2	9.3	9.9	0.0	10.0
BW (MHz)	Mode	Measured Pwr (dBm)			MPR	Tune-up Limit	Measured Pwr (dBm)			MPR	Tune-up Limit
		630668	633334	636000			630668	633334	636000		
		3460.02 MHz	3500.01 MHz	3540 MHz			3460.02 MHz	3500.01 MHz	3540 MHz		
25 MHz	SRS CW	17.9	18.5	18.9	0.0	19.0	9.8	9.6	9.9	0.0	10.0
BW (MHz)	Mode	Measured Pwr (dBm)			MPR	Tune-up Limit	Measured Pwr (dBm)			MPR	Tune-up Limit
		630668	633334	636000			630668	633334	636000		
		3460.02 MHz	3500.01 MHz	3540 MHz			3460.02 MHz	3500.01 MHz	3540 MHz		
20 MHz	SRS CW	17.4	17.6	17.9	0.0	19.0	9.4	9.6	9.9	0.0	10.0
BW (MHz)	Mode	Measured Pwr (dBm)			MPR	Tune-up Limit	Measured Pwr (dBm)			MPR	Tune-up Limit
		630500	633334	636166			630500	633334	636166		
		3457.5 MHz	3500.01 MHz	3542.49 MHz			3457.5 MHz	3500.01 MHz	3542.49 MHz		
15 MHz	SRS CW	17.1	17.2	17.7	0.0	19.0	9.4	9.6	9.9	0.0	10.0
BW (MHz)	Mode	Measured Pwr (dBm)			MPR	Tune-up Limit	Measured Pwr (dBm)			MPR	Tune-up Limit
		630334	633334	636332			630334	633334	636332		
		3455.01 MHz	3500.01 MHz	3544.98 MHz			3455.01 MHz	3500.01 MHz	3544.98 MHz		
10 MHz	SRS CW	17.1	17.2	17.8	0.0	19.0	9.4	9.6	9.9	0.0	10.0

Notes:

NR Band n77 (SRS2) were measured output power through FTM mode provided by manufacturer.

NR Band n77 (Sub.4 SRS2) - Upper Band- Measured Results

BW (MHz)	Mode	Maximum Allowed Average Power (dBm)																	
		DSI =0								DSI =1									
		Measured Pwr (dBm)						MPR	Tune-up Limit	Measured Pwr (dBm)						MPR	Tune-up Limit
		650000		656000		662000				650000		656000		662000			
		3750 MHz		3840 MHz		3930 MHz				3750 MHz		3840 MHz		3930 MHz			
100 MHz	SRS CW	18.5				18.9		0.0	19.0	8.6				8.8		0.0	10.0
BW (MHz)	Mode	Measured Pwr (dBm)						MPR	Tune-up Limit	Measured Pwr (dBm)						MPR	Tune-up Limit
		649668		656000		662332				649668		656000		662332			
		3745.02 MHz		3840 MHz		3934.98 MHz				3745.02 MHz		3840 MHz		3934.98 MHz			
90 MHz	SRS CW	18.9		18.8		18.9		0.0	19.0	8.7		8.0		8.6		0.0	10.0
BW (MHz)	Mode	Measured Pwr (dBm)						MPR	Tune-up Limit	Measured Pwr (dBm)						MPR	Tune-up Limit
		649334		656000		662666				649334		656000		662666			
		3740.01 MHz		3840 MHz		3939.99 MHz				3740.01 MHz		3840 MHz		3939.99 MHz			
80 MHz	SRS CW	18.9		18.7		18.8		0.0	19.0	8.9		8.0		8.7		0.0	10.0
BW (MHz)	Mode	Measured Pwr (dBm)						MPR	Tune-up Limit	Measured Pwr (dBm)						MPR	Tune-up Limit
		649000	653666			658334	663000			649000	653666			658334	663000		
		3735 MHz	3804.99 MHz			3875.01 MHz	3945 MHz			3735 MHz	3804.99 MHz			3875.01 MHz	3945 MHz		
70 MHz	SRS CW	19.0	18.8			18.8	18.9	0.0	19.0	9.0	7.9			8.3	8.6	0.0	10.0
BW (MHz)	Mode	Measured Pwr (dBm)						MPR	Tune-up Limit	Measured Pwr (dBm)						MPR	Tune-up Limit
		648668	653556			658444	663332			648668	653556			658444	663332		
		3730.02 MHz	3803.34 MHz			3876.66 MHz	3949.98 MHz			3730.02 MHz	3803.34 MHz			3876.66 MHz	3949.98 MHz		
60 MHz	SRS CW	18.9	18.7			18.9	18.9	0.0	19.0	9.1	7.8			8.4	8.7	0.0	10.0
BW (MHz)	Mode	Measured Pwr (dBm)						MPR	Tune-up Limit	Measured Pwr (dBm)						MPR	Tune-up Limit
		648334	652166	656000		659834	663666			648334	652166	656000		659834	663666		
		3725.01 MHz	3782.49 MHz	3840 MHz		3897.51 MHz	3954.99 MHz			3725.01 MHz	3782.49 MHz	3840 MHz		3897.51 MHz	3954.99 MHz		
50 MHz	SRS CW	18.8	18.8	18.7		18.7	18.8	0.0	19.0	9.0	7.8	8.0		8.3	8.6	0.0	10.0
BW (MHz)	Mode	Measured Pwr (dBm)						MPR	Tune-up Limit	Measured Pwr (dBm)						MPR	Tune-up Limit
		648000	651200	654400	657600	660800	664000			648000	651200	654400	657600	660800	664000		
		3720 MHz	3768 MHz	3816 MHz	3864 MHz	3912 MHz	3960 MHz			3720 MHz	3768 MHz	3816 MHz	3864 MHz	3912 MHz	3960 MHz		
40 MHz	SRS CW	18.5	18.8	18.6	18.9	19.0	18.9	0.0	19.0	7.7	8.0	7.7	8.2	8.3	8.5	0.0	10.0
BW (MHz)	Mode	Measured Pwr (dBm)						MPR	Tune-up Limit	Measured Pwr (dBm)						MPR	Tune-up Limit
		647668	651000	654334	657666	661000	664332			647668	651000	654334	657666	661000	664332		
		3715.02 MHz	3765 MHz	3815.01 MHz	3864.99 MHz	3915 MHz	3964.98 MHz			3715.02 MHz	3765 MHz	3815.01 MHz	3864.99 MHz	3915 MHz	3964.98 MHz		
30 MHz	SRS CW	18.5	18.6	18.4	18.9	18.7	18.9	0.0	19.0	7.7	8.0	7.7	8.2	8.3	8.5	0.0	10.0
BW (MHz)	Mode	Measured Pwr (dBm)						MPR	Tune-up Limit	Measured Pwr (dBm)						MPR	Tune-up Limit
		647334	650800	654266	657734	661200	664666			647334	650800	654266	657734	661200	664666		
		3710.01 MHz	3762 MHz	3813.99 MHz	3866.01 MHz	3918 MHz	3969.99 MHz			3710.01 MHz	3762 MHz	3813.99 MHz	3866.01 MHz	3918 MHz	3969.99 MHz		
25 MHz	SRS CW	18.5	18.6	16.6	18.9	18.8	18.9	0.0	19.0	9.2	8.1	8.1	8.1	8.6	8.7	0.0	10.0
BW (MHz)	Mode	Measured Pwr (dBm)						MPR	Tune-up Limit	Measured Pwr (dBm)						MPR	Tune-up Limit
		647334	650800	654266	657734	661200	664666			647334	650800	654266	657734	661200	664666		
		3710.01 MHz	3762 MHz	3813.99 MHz	3866.01 MHz	3918 MHz	3969.99 MHz			3710.01 MHz	3762 MHz	3813.99 MHz	3866.01 MHz	3918 MHz	3969.99 MHz		
20 MHz	SRS CW	18.5	18.6	18.6	19.0	18.8	18.9	0.0	19.0	9.2	8.1	8.1	8.1	8.6	8.6	0.0	10.0
BW (MHz)	Mode	Measured Pwr (dBm)						MPR	Tune-up Limit	Measured Pwr (dBm)						MPR	Tune-up Limit
		647168	650700	654234	657766	661300	664832			647168	650700	654234	657766	661300	664832		
		3707.52 MHz	3760.5 MHz	3813.51 MHz	3866.49 MHz	3919.5 MHz	3972.48 MHz			3707.52 MHz	3760.5 MHz	3813.51 MHz	3866.49 MHz	3919.5 MHz	3972.48 MHz		
15 MHz	SRS CW	18.3	18.3	18.2	18.6	18.4	18.6	0.0	19.0	9.2	8.2	8.1	8.1	8.6	8.6	0.0	10.0
BW (MHz)	Mode	Measured Pwr (dBm)						MPR	Tune-up Limit	Measured Pwr (dBm)						MPR	Tune-up Limit
		647000	650600	654200	657800	661400	665000			647000	650600	654200	657800	661400	665000		
		3705 MHz	3759 MHz	3813 MHz	3867 MHz	3921 MHz	3975 MHz			3705 MHz	3759 MHz	3813 MHz	3867 MHz	3921 MHz	3975 MHz		
10 MHz	SRS CW	18.2	18.5	18.5	18.8	18.5	18.6	0.0	19.0	9.2	8.1	8.1	8.1	8.6	8.6	0.0	10.0

Notes:

NR Band n77 (SRS2) were measured output power through FTM mode provided by manufacturer

9. Measured and Reported (Scaled) SAR Results

SAR Test Reduction criteria are as follows:

- Reported SAR(W/kg) for WWAN= Measured SAR *Tune-up Scaling Factor
- Reported SAR(W/kg) for Wi-Fi and Bluetooth= Measured SAR * Tune-up scaling factor * Duty Cycle scaling factor
- Duty Cycle scaling factor = 1 / Duty cycle (%)

KDB 447498 D01 General RF Exposure Guidance:

Testing of other required channels within the operating mode of a frequency band is not required when the reported 1-g or 10-g SAR for the mid-band or highest output power channel is:

- ≤ 0.8 W/kg or 2.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≤ 100 MHz
- ≤ 0.6 W/kg or 1.5 W/kg, for 1-g or 10-g respectively, when the transmission band is between 100 MHz and 200 MHz
- ≤ 0.4 W/kg or 1.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≥ 200 MHz

KDB 648474 D04 Handset SAR:

With headset attached, when the reported SAR for body-worn accessory, measured without a headset connected to the handset, is > 1.2 W/kg, the highest reported SAR configuration for that wireless mode and frequency band should be repeated for that body-worn accessory with a headset attached to the handset.

KDB 648474 D04 Handset SAR (Phablet Only):

For smart phones, with a display diagonal dimension > 15.0 cm or an overall diagonal dimension > 16.0 cm.
When hotspot mode does not apply, 10-g extremity SAR is required for all surfaces and edges with an antenna located at ≤ 25mm
From that surface or edge in direct contact with a flat phantom, to address interactive hand use exposure conditions. When hotspot mode applies, 10-g extremity SAR is required only for the surfaces and edges with hotspot mode 1-g reported SAR > 1.2 W/kg;
However, when power reduction applies to hotspot mode the measured SAR must be scaled to the maximum output power, Including tolerance, allowed for phablet modes to compare with the 1.2 W/kg SAR test reduction threshold.

Additional 1-g SAR testing at 5 mm is not required when hotspot mode 10-g extremity SAR is not required for the surfaces and edges; since all 1-g reported SAR < 1.2 W/kg.

KDB 941225 D01 SAR test for 3G devices:

When the maximum output power and tune-up tolerance specified for production units in a secondary mode is ≤ ¼ dB higher than the primary mode or when the highest reported SAR of the primary mode is scaled by the ratio of specified maximum output power and tune-up tolerance of secondary to primary mode and the adjusted SAR is ≤ 1.2 W/kg, SAR measurement is not required for the secondary mode.

KDB 941225 D05 SAR for LTE Devices:

SAR test reduction is applied using the following criteria:

- Start with the largest channel bandwidth and measure SAR for QPSK with 1 RB, and 50% RB allocation, using the RB offset and required test channel combination with the highest maximum output power among RB offsets at the upper edge, middle and lower edge of each required test channel.
- When the reported SAR is > 0.8 W/kg, testing for other Channels is performed at the highest output power level for 1RB, and 50% RB configuration for that channel.
- Testing for 100% RB configuration is performed at the highest output power level for 100% RB configuration across the Low, Mid and High Channel when the highest reported SAR for 1 RB and 50% RB are > 0.8 W/kg. Testing for the remaining required channels is not needed because the reported SAR for 100% RB Allocation < 1.45 W/kg.
- Testing for 16-QAM modulation is not required because the reported SAR for QPSK is < 1.45 W/Kg and its output power is not more than 0.5 dB higher than that of QPSK.
- Testing for the other channel bandwidths is not required because the reported SAR for the highest channel bandwidth is < 1.45 W/Kg and its output power is not more than 0.5 dB higher than that of the highest channel bandwidth.
- For LTE bands that do not support at least three non-overlapping channels in certain channel bandwidths, test the available non-overlapping channels instead. When a device supports overlapping channel assignment in a channel bandwidth configuration, the middle channel of the group of overlapping channels should be selected for testing; therefore, the requirement for H, M and L channels may not fully apply.

KDB 248227 D01 SAR meas for 802.11:

SAR test reduction for 802.11 Wi-Fi transmission mode configurations are considered separately for DSSS and OFDM. An initial test position is determined to reduce the number of tests required for certain exposure configurations with multiple test positions. An initial test configuration is determined for each frequency band and aggregated band according to maximum output power, channel bandwidth, wireless mode configurations and other operating parameters to streamline the measurement requirements. For 2.4 GHz DSSS, either the initial test position or DSSS procedure is applied to reduce the number of SAR tests; these are mutually exclusive. For OFDM, an initial test position is only applicable to next to the ear, UMPC mini-tablet and hotspot mode configurations, which is tested using the initial test configuration to facilitate test reduction. For other exposure conditions with a fixed test position, SAR test reduction is determined using only the initial test configuration.

The multiple test positions require SAR measurements in head, hotspot mode or UMPC mini-tablet configurations may be reduced according to the highest reported SAR determined using the *initial test position(s)* by applying the DSSS or OFDM SAR measurement procedures in the required wireless mode test configuration(s). The *initial test position(s)* is measured using the highest measured maximum output power channel in the required wireless mode test configuration(s). When the *reported* SAR for the *initial test position* is:

- ≤ 0.4 W/kg, further SAR measurement is not required for the other test positions in that exposure configuration and wireless mode combination within the frequency band or aggregated band. DSSS and OFDM configurations are considered separately according to the required SAR procedures.
- > 0.4 W/kg, SAR is repeated using the same wireless mode test configuration tested in the *initial test position* to measure the subsequent next closet/smallest test separation distance and maximum coupling test position, on the highest maximum output power channel, until the *reported* SAR is ≤ 0.8 W/kg or all required test positions are tested.
  - For subsequent test positions with equivalent test separation distance or when exposure is dominated by coupling conditions, the position for maximum coupling condition should be tested.
  - When it is unclear, all equivalent conditions must be tested.
- For all positions/configurations tested using the *initial test position* and subsequent test positions, when the *reported* SAR is > 0.8 W/kg, measure the SAR for these positions/configurations on the subsequent next highest measured output power channel(s) until the *reported* SAR is ≤ 1.2 W/kg or all required test channels are considered.
  - The additional power measurements required for this step should be limited to those necessary for identifying subsequent highest output power channels to apply the test reduction.
- When the specified maximum output power is the same for both UNII 1 and UNII 2A, begin SAR measurements in UNII 2A with the channel with the highest measured output power. If the reported SAR for UNII 2A is ≤ 1.2 W/kg, SAR is not required for UNII 1; otherwise treat the remaining bands separately and test them independently for SAR.
- When the specified maximum output power is different between UNII 1 and UNII 2A, begin SAR with the band that has the higher specified maximum output. If the highest reported SAR for the band with the highest specified power is ≤ 1.2 W/kg, testing for the band with the lower specified output power is not required; otherwise test the remaining bands independently for SAR.

To determine the *initial test position*, Area Scans were performed to determine the position with the *Maximum Value of SAR (measured)*. The position that produced the highest *Maximum Value of SAR* is considered the worst case position; thus used as the *initial test position*.

9.1. NR Band n77(SRS2) (100MHz Bandwidth)

Antenna	RF Exposure Conditions	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.
							Tune-up limit	Meas.	Meas.	Scaled	
Sub.4 -SRS2-	Standalone	SRS CW	19	R/Right	662000	3930.0	19.00	18.94	0.014	0.014	
	Standalone		0	R/Right	662000	3930.0	10.00	8.81	0.047	0.062	1

Note(s):

1. NR Band n77 (SRS2) tested using FTM mode.

10. SAR Measurement Variability

In accordance with published RF Exposure KDB 865664 D01 SAR measurement 100 MHz to 6 GHz. These additional measurements are repeated after the completion of all measurements requiring the same head or body tissue-equivalent medium in a frequency band. The test device should be returned to ambient conditions (normal room temperature) with the battery fully charged before it is re-mounted on the device holder for the repeated measurement(s) to minimize any unexpected variations in the repeated results.

1) Repeated measurement is not required when the original highest measured SAR is <0.8 or 2 W/kg (1-g or 10-g respectively); steps 2) through 4) do not apply.
2) When the original highest measured SAR is ≥ 0.8 or 2 W/kg (1-g or 10-g respectively), repeat that measurement once.
3) Perform a second repeated measurement only if the ratio of largest to smallest SAR for the original and first repeated measurements is > 1.20 or when the original or repeated measurement is ≥ 1.45 or 3.6 W/kg (~ 10% from the 1-g or 10-g respective SAR limit).
4) Perform a third repeated measurement only if the original, first, or second repeated measurement is ≥ 1.5 or 3.75 W/kg (1-g or 10-g respectively) and the ratio of largest to smallest SAR for the original, first and second repeated measurements is > 1.20.

Peak spatial-average (1g of tissue)

Frequency Band (MHz)	Air Interface	RF Exposure Conditions	Test Position	Repeated SAR (Yes/No)	Highest Measured SAR (W/kg)	Repeated Measured SAR (W/kg)	Largest to Smallest SAR Ratio
3700	NR Band n77	Standalone	R/Right	No	0.047	N/A	N/A

Note(s):

1. In above table, Only some bands above 0.8 or 2.0 W/kg (1-g or 10-g Measured SAR) were listed.

2. Second Repeated Measurement is not required since the ratio of the largest to smallest SAR for the original and first repeated measurement is not > 1.20.

11. Simultaneous Transmission SAR Analysis

Simultaneous Transmission Condition

RF Exposure Condition	Item	Capable Transmit Configurations				
Standalone	1	WWAN (3G/LTE/NR)	+	DTS Ant.1		
	2	WWAN (3G/LTE/NR)	+	DTS MIMO		
	3	WWAN (3G/LTE/NR)	+	UNII Ant.2		
	4	WWAN (3G/LTE/NR)	+	UNII MIMO		
	5	WWAN (3G/LTE/NR)	+	BT Ant.1		
	6	WWAN (3G/LTE/NR)	+	UNII Ant.2	+	BT Ant.1
	7	WWAN (3G/LTE/NR)	+	UNII MIMO	+	BT Ant.1
	8	ENDC(LTE+NR)	+	DTS Ant.1		
	9	ENDC(LTE+NR)	+	DTS MIMO		
	10	ENDC(LTE+NR)	+	UNII Ant.2		
	11	ENDC(LTE+NR)	+	UNII MIMO		
	12	ENDC(LTE+NR)	+	BT Ant.1		
	13	ENDC(LTE+NR)	+	UNII Ant.2	+	BT Ant.1
	14	ENDC(LTE+NR)	+	UNII MIMO	+	BT Ant.1

Notes:

1. DTS supports Wi-Fi Direct, Hotspot and VoIP.
2. U-NII supports Wi-Fi Direct, Hotspot and VoIP.
3. W-CDMA, LTE, NR supports Hotspot and VoIP
4. U-NII Radio can transmit simultaneously with Bluetooth Radio in certain scenario
5. NR Radio support to both SA and NSA(ENDC) Radio.

Note(s):

For EN-DC mode, LSI TAS algorithm in WWAN adds directly the time-averaged RF exposure from 4G(LTE) and time-averaged RF exposure from 5G NR. LSI TAS algorithm controls the total RF exposure from both 4G and 5G NR to not exceed the RF exposure from each 4G or 5G individually. Therefore, simultaneous transmission compliance between 4G+5G NR operation is demonstrated in the TAS validation Report during algorithm validation. In this SAR Report, simultaneous transmission compliance was evaluated individually with other Radios (WLAN or BT) using one of 4G or 5G NR.

Simultaneous transmission SAR test exclusion considerations

KDB 447498 D01 General RF Exposure Guidance provides two procedures for determining simultaneous transmission SAR test exclusion: Sum of SAR and SAR to Peak Location Ratio (SPLSR)

Sum of SAR

To qualify for simultaneous transmission SAR test exclusion based upon Sum of SAR the sum of the reported standalone SARs for all simultaneously transmitting antennas shall be below the applicable standalone SAR limit. If the sum of the SARs is above the applicable limit then simultaneous transmission SAR test exclusion may still apply if the requirements of the SAR to Peak Location Ratio (SPLSR) evaluation are met.

SAR to Peak Location Separation Ratio (SPLSR)

KDB 447498 D01 General RF Exposure Guidance explains how to calculate the SAR to Peak Location Ratio (SPLSR) between pairs of simultaneously transmitting antennas:

$$SPLSR = (SAR_1 + SAR_2)^{1.5} / Ri$$

Where:

SAR_1 is the highest reported or estimated SAR for the first of a pair of simultaneous transmitting antennas, in a specific test operating mode and exposure condition

SAR_2 is the highest reported or estimated SAR for the second of a pair of simultaneous transmitting antennas, in the same test operating mode and exposure condition as the first

Ri is the separation distance between the pair of simultaneous transmitting antennas. When the SAR is measured, for both antennas in the pair, it is determined by the actual x, y and z coordinates in the 1-g SAR for each SAR peak location, based on the extrapolated and interpolated result in the zoom scan measurement, using the formula of

$$[(x_1-x_2)^2 + (y_1-y_2)^2 + (z_1-z_2)^2]$$

In order for a pair of simultaneous transmitting antennas with the sum of 1-g SAR > 1.6 W/kg to qualify for exemption from Simultaneous Transmission SAR measurements, it has to satisfy the condition of:

$$(SAR_1 + SAR_2)^{1.5} / Ri \leq 0.04$$

When an individual antenna transmits at on two bands simultaneously, the sum of the highest *reported* SAR for the frequency bands should be used to determine SAR_1.or SAR_2. When SPLSR is necessary, the smallest distance between the peak SAR locations for the antenna pair with respect to the peaks from each antenna should be used.

The antennas in all antenna pairs that do not qualify for simultaneous transmission SAR test exclusion must be tested for SAR compliance, according to the enlarged zoom scan and volume scan post-processing procedures in KDB Publication 865664 D01

The antennas for the unlicensed transmitters are closely situated. As a result, the associated SAR hotspots are also closely situated. Some of the sum of SAR calculations yielded results over 1.6 W/kg. The SPSLR calculations for these situations were performed by treating the unlicensed SAR values as a single transmitter. The most conservative distance between all the unlicensed hotspots to the licensed hotspot was used for the value of *d* in the SPSLR calculation.

Simultaneous transmission SAR measurement

When simultaneous transmission SAR measurements are required in different frequency bands not covered by a single probe calibration point then separate tests for each frequency band are performed. The tests are performed using enlarged zoom scans which are processed, by means of superposition, using the DASY5 volume scan postprocessing procedures to determine the 1-g SAR for the aggregate SAR distribution.

The spatial resolution used for all enlarged zoom scans is the same as used for the most stringent zoom scans. I.E. the scan parameters required for the highest frequency assessed are used for all enlarged zoom scans. The scans cover the complete area of the device to ensure all transmitting antennas and radiating structures are assessed.

DASY5 provides the ability to perform Multiband Evaluations according to the latest standards using the Volume Scan job as well as appropriate routines for the Post-processing.

In order to extract and process measurements within different frequency bands, the SEMCAD X Post-processor performs the combination and subsequent superposition of these measurement data via DASY5= Combined MultiBand Averaged SAR.

Combined Multi Band Averaged SAR allows - in addition to the data extraction - an evaluation of the 1 g, 10 g and/or arbitrary averaged mass SAR.
Power Scaling Factor is used to allow the volume scans to be scaled by a value other than "1", this is important when the results need to be scaled to different maximum power levels. The Power Scaling Factor is applied to each individual point of the scan. When power scaling is used in multi-band combinations the scaling factor is applied to each individual point of the first scan, the second factor is then applied to each individual point of the second scan and so on. The scans are then combined.

SPLSR Hotspot Combination

Per November 2019 TCB Workshop Notes, SPLSR Hotspot Combination procedure can be applied to evaluate to simultaneous transmission SAR analysis.
Hybrid SPLSR and enlarged zoom scan (Volume scan) can be applied when Simultaneous transmission SAR is over 1.6 or 4.0 W/kg (1-g or 10-g respectively), it does not meet SPLSR criteria, and antenna pair is co-located. Antenna co-location means that SAR distributions overlap because the antennas are not significantly spatially separated.

Test procedure

Step.1 Perform enlarged zoom scan (Volume scan) on the co-located antenna pair to determine 1g/10g aggregate SAR.

Step.2 Apply SPLSR procedure for the spatially separated antenna and aggregate SAR distribution of the co-located antenna pair.

Sum to Peak Location Separation Ratio

Instead of doing a small volume scan over a co-located antenna pair (Hybrid SPLSR guide), Simultaneous transmission SAR test exclusion may algebraically sum the SAR values of the co-located pair and use that value in SPLSR calculation;

-In the calculation Separation distance must use the minimum distance between the spatially separated antenna and the closest antenna of the co-located antenna pair to be conservative.

11.1. Sum of the SAR for WWAN(Standalone) & Wi-Fi & BT in (R/Right) position

RF Exposure	Test Position	WWAN Bands	Antenna	Standalone SAR(W/kg)						Sum of SAR(W/kg)						
				WWAN	WiFi & BT					WWAN + DTS Ant.1	WWAN + DTS MIMO	WWAN + UNII Ant.2	WWAN + UNII MIMO	WWAN + BT Ant.1	WWAN + UNII Ant.2 + BT Ant.1	WWAN + UNII MIMO + BT Ant.1
					DTS Ant.1	DTS MIMO	UNII Ant.2	UNII MIMO	BT Ant.1							
				1-1	2	3	4	5	6	1+2	1+3	1+4	1+5	1+6	1+4+6	1+5+6
Standalone	R/Right	NR Band n77-SRS2	Sub.4 Ant.	0.062	0.143	0.772	0.873	0.753	0.003	0.205	0.834	0.935	0.815	0.065	0.938	0.818

Note(s):

1. All Sum results are below FCC limit (1.6 W/kg). So additional evaluation are not required.
2. Green value is estimated SAR according to calculate of KDB 447498 D04. Please refer to Section.7.
3. WiFi&BT data refer to Original model(4790841154-S1V3 FCC Report SAR).

Appendixes

Refer to separated files for the following appendixes.

4790982779-S1 FCC Report SAR_App A_Photos & Ant. Locations

4790982779-S1 FCC Report SAR_App B_Highest SAR Test Plots

4790982779-S1 FCC Report SAR_App C_System Check Plots

4790982779-S1 FCC Report SAR_App D_SAR Tissue Ingredients

4790982779-S1 FCC Report SAR_App E_Probe Cal. Certificates

4790982779-S1 FCC Report SAR_App F_Dipole Cal. Certificates

4790982779-S1 FCC Report SAR_App G_Proximity Sensor feature

END OF REPORT