PART 0 SAR Characterization Report

Test Report No. :	:	13760834H-A-R1
Applicant	:	Panasonic Corporation of North America
Type of EUT	:	Radio Module (Tested inside of Panasonic Personal Computer FZ-G2)
Model number of EUT	:	WW21A
FCC ID	:	ACJ9TGWW21A

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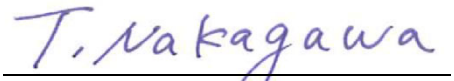
The information provided from the customer for this report is identified.
This test report is out of scope of any accreditation(s).
This report is a revised version of 13760834H-A. 13760834H-A is replaced with this report.

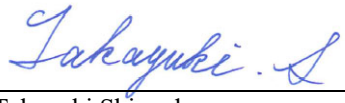
Date of test(s): May 26, 2021 and June 9, 2021

Representative test operator:



Tomohisa Nakagawa
Engineer

Approved by:



Takayuki Shimada
Leader

UL Japan, Inc.
Ise EMC Lab.
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN
Telephone: +81 596 24 8999
Facsimile: +81 596 24 8124

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1 Introduction

This device uses Qualcomm® Smart Transmit feature and cannot operate without specific absorption ratio (SAR) and power density(PD) characterization at the device level, beforehand. The parameters obtained from SAR and PD characterization (char) is used as input for Smart Transmit. Both SAR char and PD char will be entered via the Embedded File System (EFS) to enable the Smart Transmit feature.

Part 0 report describes the results for the SAR char and PD char generation and evaluates them on the 5G milli wave (mmW) new radio (NR) enabled equipment under test (EUT).

This description is an overview for STx and test results may not include both sub6 (SAR) and mmW (PD).

2 Customer information

Company Name	:	Panasonic Corporation of North America
Address	:	Two Riverfront Plaza, 9th Floor Newark, NEW JERSEY, 07102-5940, USA
Telephone Number	:	+1-201-348-7760
Facsimile Number	:	+1-201-348-7760
Contact Person	:	Ben Botros

The information provided from the customer is as follows.
- Applicant, Type of Equipment, Model No. FCC ID on the cover and other relevant pages
- Operating / Test Mode(s) (Mode(s)) on all the relevant pages
- SECTION 1: Customer information
- SECTION 2: Equipment under test (EUT) other than the receipt date
- SECTION 8: SAR device uncertainty, SAR design target, SAR char generation (P_{limit} and P_{max} (Tune up limit))

* The laboratory is exempted from liability of any test results affected from the above information in section 3.

3 Equipment under test (EUT)

3.1 Identification of EUT

Type	:	Radio Module
Model Number	:	WW21A
Serial number	:	0LTSA00730 *1) 0LTSA00731 *2) 0LTSA00732 *3)
Rating	:	DC 3.0 V to 3.6 V
Receipt Date	:	March 30, 2021
Condition	:	Production prototype (Not for Sale: This sample is equivalent to mass-produced items.)
Modification	:	No Modification by the test lab.

*1) Used for the test on 1 GHz to 2 GHz band
*2) Used for the test above 2.5 GHz (except Band 7)
*3) Used for the test below 1 GHz

3.2 Product description

Model: WW21A (referred to as the EUT in this report) is a Radio Module.

Wireless technologies	Dup.	Band	Mode
WCDMA	FDD	2	UMTS Rel. 99 (Data) HSDPA (Rel. 5)
	FDD	4	HSUPA (Rel. 6), HSPA+ (Rel. 7), DC-HSDPA (Rel. 8)
	FDD	5	
LTE	FDD	2	QPSK, 16QAM, 64AQM, 256QAM
	FDD	4	
	FDD	5	Downlink MIMO Support: Yes(2x2, 4x4)
*B42: not used in US (FCC)	FDD	7	Supported band : B2, B4, B7, B25, B38, B41, B42, B48, B66
	FDD	12	
*B48: not used in	FDD	13	Uplink MIMO Support: No
Canada(ISED)	FDD	14	Uplink transmission is limited to a single output stream.
	FDD	17	
	FDD	25	
	FDD	26	
	FDD(RX only)	29	
	TDD	38	
	TDD	41	
	TDD	42	
	TDD(Rx only)	46	
	TDD	48	
	FDD	66	
	FDD	71	
LTE CA	Downlink		Uplink *B42: not used in US (FCC) / B48: not used in Canada(ISED)
	Maximum 7 carriers		Maximum 2 carriers Supported combination: <Inrta-band contiguous> 7C, 41C, 42C, 48C <Inter-band> Not supported

5G NR (FR1)	FDD	15 kHz	n2	Pi/2 BPSK (DFT-s-OFDM),
	FDD	15 kHz	n5	QPSK (CP-OFDM/DFT-s-OFDM),
*n77, n78: not used in US	TDD	15 kHz	n41	16QAM (CP-OFDM/DFT-s-OFDM),
(FCC)	FDD	15 kHz	n66	64QAM (CP-OFDM/DFT-s-OFDM),
	FDD	15 kHz	n71	256QAM (CP-OFDM/DFT-s-OFDM)
	TDD	30 kHz	n77	Downlink MIMO Support: Yes(2x2, 4x4)
	TDD	30 kHz	n78	Supported band : n2, n41, n66, n77, n78
	-	-	-	Uplink MIMO Support: No
	-	-	-	Uplink transmission is limited to a single output stream.

EN-DC(LTE-FR1 Sub6)	Supported combination	*n77, n78: not used in US (FCC)
(NSA mode only)	LTE Anchor Bands for NR band n2	LTE Band 5/12/13
	LTE Anchor Bands for NR band n5	LTE Band 2/7/66
	LTE Anchor Bands for NR band n41	LTE Band 2/25/26/66
	LTE Anchor Bands for NR band n66	LTE Band 5/12/13/14/71
	LTE Anchor Bands for NR band n71	LTE Band 2/7/66
	LTE Anchor Bands for NR band n77*	LTE Band 41
	LTE Anchor Bands for NR band n78*	LTE Band 2/5/7/12/38/66

Wireless module (Tested inside of Panasonic Tablet PC FZ-G2) Model : WL20B (FCC ID ACJ9TGWL20B / ISED certification Number 216H-CFWL20B)				
Wireless technologies	Dup.	Band		Mode
WLAN	TDD	2.4GHz	2412-2472 for US 2412-2462 for Canada	802.11b 802.11g 802.11n(20,40) 802.11ax(20,40)
	TDD	5GHz	5180-5240 5260-5320 5500-5720 5745-5825	802.11a 802.11n(20,40) 802.11ac(20,40.80.160) 802.11ax(20,40.80.160)
Bluetooth	TDD	2.4GHz	2402-2480	BR/EDR/LE

4 Location

UL Japan, Inc. Ise EMC Lab.
Shielded room for SAR testings
FCC Test Firm Registration Number: 884919 / ISED SAR Lab Company Number: 2973C
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN
Telephone: +81 596 24 8999
Facsimile: +81 596 24 8124

5 References

Federal Communications Commission. (October 23, 2015). *447498 D01 General RF Exposure Guidance v06.*
International Electrotechnical Commission. (2018). *IEC TR 63170:2018.*
SPEAG. (August 2018). *5G Module V1.2 Application Note: 5G Compliance Testing.*

6 Time averaging for SAR and PD

The Qualcomm® Smart Transmit algorithm controls and manages the instantaneous Tx power to maintain the time-averaged Tx power (in turn, time-averaged RF exposure) is in compliance with regulatory limits.

7 Definitions, symbols, and abbreviations

7.1 Definitions

SAR_design_target : Target value to use STx and also this shall be less than regulatory SAR limit (i.e., 1gSAR limit for FCC) after accounting for all device design related uncertainties.

SAR_design_target_extremity : SAR_design_target for limbs

Tx_power_at_SAR_design_target : Transmit level that matches SAR_design_target

Δ min : housing material influence

PD_design_target : The design target for PD compliance. It should be less than regulatory power density limit to account for all device design related uncertainties

input.power.limit : For a PD characterized wireless device, the input power level at antenna port(s) for each beam corresponding to PD_design_target.

PD char : The table that contains input.power.limit fed to antenna port(s) for all supported beams.

N beams : The mmW device supports total N beams, where M out of N are single beams and the rest of (N-M) are beam pairs (where 2 single beams are excited at the same time).

power density (PD) or S_{av} : Energy per unit time and unit area crossing a surface of area A characterized by the normal unit vector $\hat{}\mathbf{n}$ and averaging time.

$$S_{av} = \frac{1}{AT}\int\int(\mathbf{E}\times\mathbf{H})\cdot\hat{\boldsymbol{n}}\,dA\,dT$$

Specific Absorption Rate (SAR): : The time derivative (rate) of the incremental energy (dW) absorbed by (dissipated in) an incremental mass (dm) contained in a volume element (dV) of a given density (ρ), as shown in the following equation:

$$\mathrm{SAR} = \frac{d}{dt}\left(\frac{dW}{dm}\right) = \frac{d}{dt}\left(\frac{dW}{\rho dV}\right)$$

7.2 Symbols

Symbol	Quantity	Unit	Dimensions
E	Electric field	volt per meter	V / m
f	Frequency	hertz	Hz
H	Magnetic field	ampere per meter	A / m
λ	Wavelength	meter	m
S	Local power density	watt per square meter	W / m^2
PD or S_{av}	Spatial-average power density	watt per square meter	W / m^2 (mW / cm^2)
SAR	Specific Absorption Rate	watt per kilo gram	W / kg

7.3 Abbreviations

DSI : device state index
KDB : knowledge data base from Federal communication committee (FCC)
BS or BSE : base station or base station emulator
CW : continuous wave
DUT : device under test
NR : new radio
PD : power density
RF : radio frequency
TER : total exposure ratio
S_n : surface number
S_{tot} or S_{total} : total propagating power flux density into the phantom
S_n or S_{norm} : surface normal propagating power flux density into the phantom or in normed vector space
Ant : antenna
nG : n generation (e.g. 3G,4G and 5G)
☒ : applicable.
☐ : NOT applicable.

8 SAR char generation

8.1 Usage scenarios in SAR evaluation and DSI determination

applicable	Scenario	Description	Position example
☐	Head	Device positioned next to head	$SAR_{head} = max\{SAR_{LC}, SAR_{LT}, SAR_{RC}, SAR_{RT}\}$
☒	Body	Device positioned next to body with or without a body-worn accessory	$SAR_{body}\ max\{SAR_{s1}, SAR_{s2}, SAR_{s3}, SAR_{s4}, SAR_{s5}, SAR_{s6}\}$
☐	Hotspot mode	Device transmitting in hotspot mode and assumed to be located next to human body	$SAR_{hotspot} = max\{SAR_{s1}, SAR_{s2}, SAR_{s3}, SAR_{s4}, SAR_{s5}, SAR_{s6}\}$
☐	Extremity SAR (10g)	10gSAR is evaluated for all applicable surfaces of the device against the flat phantom with 0 mm separation distance	$10gSAR_{extremity} = max\{10gSAR_{s1}, 10gSAR_{s2}, 10gSAR_{s3}, 10gSAR_{s4}, 10gSAR_{s5}, 10gSAR_{s6}\}$

L/R: Left/Right, C/T: Cheek/Tilt, S: Surface

Table 8-1 summary of Usage/Exposure Scenario for this EUT

DSI	State
0	Proximity sensor off or disable
1	Proximity sensor on

8.2 SAR device uncertainty

Table 8-2 device uncertainty

Item	Uncertainty dB
Total uncertainty	2.0

8.3 SAR design target

To account for the total uncertainty, *SAR_design_target* needs to:

$$SAR\_design\_target \ < \ SAR_{regulaory\_limit} \times 10^{\frac{-\ total\ uncertainty}{10}}$$

the *SAR_design_target* for the EUT is determined as: < 1.009 W / kg

FCC

DSI	*SAR design target* [W / kg]
0	1.0 other than n41 0.8 NR band n41
1	0.7 all band

8.4 SAR char generation

P_{limit} is calculated from max power transmission level by linear scaling in the usage / exposure scenario for this EUT.
Measurement procedure is KDB 447498.

Table 8-3 summary of SAR char and *SAR design target FCC*

		DSI=0		DSI=1		
RAT	Band	$SAR_{\_design\_target}$ [W/kg]	P_{limit} [dBm]	$SAR_{\_design\_target}$ [W/kg]	P_{limit} [dBm]	P_{max} (Tune up limit) (Burst power Average) [dBm] +/-1dB
WCDMA	2	1.0	23.5	0.7	16.4	23.5
WCDMA	4	1.0	22.7	0.7	16.7	22.7
WCDMA	5	1.0	23.5	0.7	16.1	23.5
LTE	2	1.0	23.0	0.7	16.6	23.0
LTE	4	1.0	23.0	0.7	17.2	23.0
LTE	5	1.0	23.0	0.7	16.1	23.0
LTE	7	1.0	23.0	0.7	16.6	23.0
LTE	12	1.0	23.0	0.7	18.4	23.0
LTE	13	1.0	23.0	0.7	17.0	23.0
LTE	14	1.0	23.0	0.7	17.0	23.0
LTE	17	1.0	23.0	0.7	17.8	23.0
LTE	25	1.0	23.0	0.7	16.5	23.0
LTE	26	1.0	23.0	0.7	16.3	23.0
LTE	38	1.0	23.0	0.7	18.8	23.0
LTE	41	1.0	23.0	0.7	19.7	23.0
LTE	48*	1.0	9.9	0.7	9.9	9.9
LTE	66	1.0	23.0	0.7	17.2	23.0
LTE	71	1.0	23.0	0.7	17.8	23.0
NR	n2	1.0	23.5	0.7	16.4	23.5
NR	n5	1.0	23.5	0.7	16.3	23.5
NR	n41	0.8	20.5	0.7	13.1	20.5
NR	n66	1.0	22.5	0.7	17.1	22.5
NR	n71	1.0	23.5	0.7	18.7	23.5

Powers are specified as burst average.

Note(s):
If $P_{max} < P_{limit}$ then,
The EUT operates at P_{max} for static SAR measurement
else EUT transmit at P_{limit} for static SAR measurement
end if

For LTE B48

Uplink Downlink config (UDC)	Special sub frame (SSF)	Burst ave tune up DSI=1 [dBm]	Pmax burst ave [dBm]	Time ave DSI=1/0 [dBm]
0	0 to 7	9.9	9.9	7.5
1	0 to 7	11.3	11.3	7.5
2	0 to 7	14.2	14.2	7.5
3	0 to 7	12.8	12.8	7.5
4	0 to 7	14.4	14.4	7.5
5	0 to 7	17.3	17.3	7.5
6	0 to 7	10.4	10.4	7.5

LTE band 48 doesn't have a same burst tune up for UDC/SSF but has same time average tune up limit.

Appendix A SAR result

A.1 DSI 0 SAR value FCC

RAT	Band #	Ch.	Freq.[MHz]	Mode	OFDM	Tested pos.	Dis.[mm]	BW[MHz]	RB #	RB pos.#	SAR_{1g}	Meas.Power	SAR Target	Calc. Power	P_{limit}
LTE	12	23095	707.5	QPSK	N/A	Rear edge1	0	10	1	49	0.326	22.8	1.0	27.67	27.6
LTE	12	23095	707.5	QPSK	N/A	Rear edge4	9	10	1	49	0.329	22.8	1.0	27.63	
LTE	13	23230	782	QPSK	N/A	Rear edge1	0	10	1	0	0.477	22.42	1.0	25.63	25.6
LTE	13	23230	782	QPSK	N/A	Rear edge4	9	10	1	0	0.440	22.42	1.0	25.99	
LTE	14	23340	793	QPSK	N/A	Rear edge1	0	10	1	0	0.517	22.37	1.0	25.24	25.2
LTE	14	23340	793	QPSK	N/A	Rear edge4	9	10	1	0	0.478	22.37	1.0	25.58	
LTE	17	23790	710	QPSK	N/A	Rear edge1	0	10	1	49	0.331	22.87	1.0	27.67	27.7
LTE	17	23790	710	QPSK	N/A	Rear edge4	9	10	1	49	0.326	22.87	1.0	27.74	
LTE	26	26765	821.5	QPSK	N/A	Rear edge1	0	15	1	0	0.631	22.86	1.0	24.86	24.4
LTE	26	26865	831.5	QPSK	N/A	Rear edge1	0	15	1	0	0.622	22.76	1.0	24.82	
LTE	26	26965	841.5	QPSK	N/A	Rear edge1	0	15	1	0	0.581	22.64	1.0	25.00	
LTE	26	26765	821.5	QPSK	N/A	Rear edge4	9	15	1	0	0.657	22.86	1.0	24.68	
LTE	26	26865	831.5	QPSK	N/A	Rear edge4	9	15	1	0	0.686	22.76	1.0	24.40	
LTE	26	26965	841.5	QPSK	N/A	Rear edge4	9	15	1	0	0.625	22.64	1.0	24.68	
LTE	5	20450	829	QPSK	N/A	Rear edge1	0	10	1	0	0.627	22.87	1.0	24.90	24.3
LTE	5	20525	836.5	QPSK	N/A	Rear edge1	0	10	1	0	0.596	22.76	1.0	25.01	
LTE	5	20600	844	QPSK	N/A	Rear edge1	0	10	1	0	0.559	22.65	1.0	25.18	
LTE	5	20450	829	QPSK	N/A	Rear edge4	9	10	1	0	0.723	22.87	1.0	24.28	
LTE	5	20525	836.5	QPSK	N/A	Rear edge4	9	10	1	0	0.640	22.76	1.0	24.70	
LTE	5	20600	844	QPSK	N/A	Rear edge4	9	10	1	0	0.615	22.65	1.0	24.76	
NR	n5	167300	836.5	BPSK	DFT-s-OFDM	Rear edge1	0	20	1	1	0.676	22.83	1.0	24.53	24.4
NR	n5	167300	836.5	BPSK	DFT-s-OFDM	Rear edge4	9	20	1	1	0.689	22.83	1.0	24.45	
LTE	25	26140	1860	QPSK	N/A	Rear edge1	0	20	1	0	0.573	22.78	1.0	25.20	25.0
LTE	25	26365	1882.5	QPSK	N/A	Rear edge1	0	20	1	0	0.575	22.64	1.0	25.04	
LTE	25	26590	1905	QPSK	N/A	Rear edge1	0	20	1	0	0.561	22.56	1.0	25.07	
LTE	25	26140	1860	QPSK	N/A	Rear edge4	9	20	1	0	0.531	22.78	1.0	25.53	
LTE	25	26365	1882.5	QPSK	N/A	Rear edge4	9	20	1	0	0.489	22.64	1.0	25.75	
LTE	25	26590	1905	QPSK	N/A	Rear edge4	9	20	1	0	0.519	22.56	1.0	25.41	
LTE	2	18700	1860	QPSK	N/A	Rear edge1	0	20	1	0	0.572	22.72	1.0	25.15	25.1
LTE	2	18900	1880	QPSK	N/A	Rear edge1	0	20	1	99	0.543	22.63	1.0	25.28	
LTE	2	19100	1900	QPSK	N/A	Rear edge1	0	20	1	0	0.547	22.51	1.0	25.13	
LTE	2	18700	1860	QPSK	N/A	Rear edge4	9	20	1	0	0.542	22.72	1.0	25.38	
LTE	2	18900	1880	QPSK	N/A	Rear edge4	9	20	1	99	0.522	22.63	1.0	25.45	
LTE	2	19100	1900	QPSK	N/A	Rear edge4	9	20	1	0	0.517	22.51	1.0	25.38	
NR	n2	372000	1860	BPSK	DFT-s-OFDM	Rear edge1	0	20	1	52	0.606	22.99	1.0	25.17	24.8
NR	n2	376000	1880	BPSK	DFT-s-OFDM	Rear edge1	0	20	1	1	0.643	22.84	1.0	24.76	
NR	n2	380000	1900	BPSK	DFT-s-OFDM	Rear edge1	0	20	1	1	0.600	22.64	1.0	24.86	
NR	n2	372000	1860	BPSK	DFT-s-OFDM	Rear edge4	9	20	1	52	0.581	22.99	1.0	25.35	
NR	n2	376000	1880	BPSK	DFT-s-OFDM	Rear edge4	9	20	1	1	0.570	22.84	1.0	25.28	
NR	n2	380000	1900	BPSK	DFT-s-OFDM	Rear edge4	9	20	1	1	0.562	22.64	1.0	25.14	
WCDMA	V	4132	826.4	QPSK	N/A	Rear edge1	0	N/A	N/A	N/A	0.757	23.52	1.0	24.73	24.6
WCDMA	V	4183	836.6	QPSK	N/A	Rear edge1	0	N/A	N/A	N/A	0.721	23.3	1.0	24.72	
WCDMA	V	4233	846.6	QPSK	N/A	Rear edge1	0	N/A	N/A	N/A	0.654	23.21	1.0	25.05	
WCDMA	V	4132	826.4	QPSK	N/A	Rear edge4	9	N/A	N/A	N/A	0.751	23.52	1.0	24.76	
WCDMA	V	4183	836.6	QPSK	N/A	Rear edge4	9	N/A	N/A	N/A	0.736	23.3	1.0	24.63	
WCDMA	V	4233	846.6	QPSK	N/A	Rear edge4	9	N/A	N/A	N/A	0.702	23.21	1.0	24.75	
WCDMA	IV	1312	1712.4	QPSK	N/A	Rear edge1	0	N/A	N/A	N/A	0.693	23.1	1.0	24.69	23.3
WCDMA	IV	1413	1732.6	QPSK	N/A	Rear edge1	0	N/A	N/A	N/A	0.798	23.15	1.0	24.13	
WCDMA	IV	1512	1752.6	QPSK	N/A	Rear edge1	0	N/A	N/A	N/A	0.786	23.13	1.0	24.18	
WCDMA	IV	1312	1712.4	QPSK	N/A	Rear edge4	9	N/A	N/A	N/A	0.946	23.1	1.0	23.34	
WCDMA	IV	1413	1732.6	QPSK	N/A	Rear edge4	9	N/A	N/A	N/A	0.867	23.15	1.0	23.77	
WCDMA	IV	1512	1752.6	QPSK	N/A	Rear edge4	9	N/A	N/A	N/A	0.645	23.13	1.0	25.03	
WCDMA	II	9262	1852.4	QPSK	N/A	Rear edge1	0	N/A	N/A	N/A	0.717	23.54	1.0	24.98	24.9
WCDMA	II	9400	1880	QPSK	N/A	Rear edge1	0	N/A	N/A	N/A	0.696	23.51	1.0	25.08	
WCDMA	II	9538	1907.5	QPSK	N/A	Rear edge1	0	N/A	N/A	N/A	0.681	23.27	1.0	24.94	
WCDMA	II	9262	1852.4	QPSK	N/A	Rear edge4	9	N/A	N/A	N/A	0.624	23.54	1.0	25.59	
WCDMA	II	9400	1880	QPSK	N/A	Rear edge4	9	N/A	N/A	N/A	0.615	23.51	1.0	25.62	
WCDMA	II	9538	1907.5	QPSK	N/A	Rear edge4	9	N/A	N/A	N/A	0.616	23.27	1.0	25.37	
LTE	4	20050	1720	QPSK	N/A	Rear edge1	0	20	1	99	0.689	22.69	1.0	24.31	23.4
LTE	4	20175	1732.5	QPSK	N/A	Rear edge1	0	20	1	99	0.692	22.74	1.0	24.34	
LTE	4	20300	1745	QPSK	N/A	Rear edge1	0	20	1	99	0.673	22.64	1.0	24.36	
LTE	4	20050	1720	QPSK	N/A	Rear edge4	9	20	1	99	0.849	22.69	1.0	23.40	
LTE	4	20175	1732.5	QPSK	N/A	Rear edge4	9	20	1	99	0.834	22.74	1.0	23.53	
LTE	4	20300	1745	QPSK	N/A	Rear edge4	9	20	1	99	0.797	22.64	1.0	23.63	

LTE	66	132072	1720	QPSK	N/A	Rear edge1	0	20	1	99	0.686	22.75	1.0	24.39	23.5
LTE	66	132322	1745	QPSK	N/A	Rear edge1	0	20	1	99	0.690	22.69	1.0	24.30	
LTE	66	132572	1770	QPSK	N/A	Rear edge1	0	20	1	0	0.701	22.75	1.0	24.29	
LTE	66	132072	1720	QPSK	N/A	Rear edge4	9	20	1	99	0.844	22.75	1.0	23.49	
LTE	66	132322	1745	QPSK	N/A	Rear edge4	9	20	1	99	0.814	22.69	1.0	23.58	
LTE	66	132572	1770	QPSK	N/A	Rear edge4	9	20	1	0	0.772	22.75	1.0	23.87	
NR	n66	344000	1720	BPSK	DFT-s-OFDM	Rear edge1	0	20	1	104	0.696	22.94	1.0	24.51	23.2
NR	n66	349000	1745	BPSK	DFT-s-OFDM	Rear edge1	0	20	1	104	0.718	22.91	1.0	24.35	
NR	n66	354000	1770	BPSK	DFT-s-OFDM	Rear edge1	0	20	1	104	0.692	22.92	1.0	24.52	
NR	n66	344000	1720	BPSK	DFT-s-OFDM	Rear edge4	9	20	1	104	0.936	22.94	1.0	23.23	
NR	n66	349000	1745	BPSK	DFT-s-OFDM	Rear edge4	9	20	1	104	0.924	22.91	1.0	23.25	
NR	n66	354000	1770	BPSK	DFT-s-OFDM	Rear edge4	9	20	1	104	0.776	22.92	1.0	24.02	
LTE	71	133297	680.5	QPSK	N/A	Rear edge1	0	20	1	99	0.362	22.58	1.0	26.99	26.0
LTE	71	133297	680.5	QPSK	N/A	Rear edge4	9	20	1	99	0.452	22.58	1.0	26.03	
NR	n71	136100	680.5	BPSK	DFT-s-OFDM	Rear edge1	0	20	1	1	0.380	22.78	1.0	26.98	26.2
NR	n71	136100	680.5	BPSK	DFT-s-OFDM	Rear edge4	9	20	1	1	0.454	22.78	1.0	26.21	
LTE	41	39750	2506	QPSK	N/A	Rear edge1	0	20	1	99	0.339	23.68	1.0	28.38	27.2
LTE	41	40185	2549.5	QPSK	N/A	Rear edge1	0	20	1	0	0.358	23.83	1.0	28.29	
LTE	41	40620	2593	QPSK	N/A	Rear edge1	0	20	1	99	0.373	24.00	1.0	28.28	
LTE	41	41055	2636.5	QPSK	N/A	Rear edge1	0	20	1	0	0.286	23.77	1.0	29.21	
LTE	41	41490	2680	QPSK	N/A	Rear edge1	0	20	1	99	0.240	23.71	1.0	29.91	
LTE	41	39750	2506	QPSK	N/A	Rear edge4	9	20	1	99	0.351	23.68	1.0	28.23	
LTE	41	40185	2549.5	QPSK	N/A	Rear edge4	9	20	1	0	0.395	23.83	1.0	27.86	
LTE	41	40620	2593	QPSK	N/A	Rear edge4	9	20	1	99	0.463	24.00	1.0	27.34	
LTE	41	41055	2636.5	QPSK	N/A	Rear edge4	9	20	1	0	0.456	23.77	1.0	27.18	
LTE	41	41490	2680	QPSK	N/A	Rear edge4	9	20	1	99	0.374	23.71	1.0	27.98	
NR	n41	518600	2593	BPSK	DFT-s-OFDM	edge2 15mm	0	20	1	136	0.500	22.49	0.8	24.53	20.5
NR	n41	518600	2593	BPSK	DFT-s-OFDM	Rear edge1	0	20	1	136	1.100	22.49	0.8	21.11	
NR	n41	518600	2593	BPSK	DFT-s-OFDM	Rear edge2	9	20	1	136	1.270	22.49	0.8	20.48	
LTE	7	20850	2510	QPSK	N/A	Rear edge1	0	20	1	99	0.622	22.93	1.0	24.99	24.2
LTE	7	21100	2535	QPSK	N/A	Rear edge1	0	20	1	0	0.623	22.85	1.0	24.91	
LTE	7	21350	2560	QPSK	N/A	Rear edge1	0	20	1	99	0.602	22.85	1.0	25.05	
LTE	7	20850	2510	QPSK	N/A	Rear edge4	9	20	1	99	0.474	22.93	1.0	26.17	
LTE	7	21100	2535	QPSK	N/A	Rear edge4	9	20	1	0	0.699	22.85	1.0	24.41	
LTE	7	21350	2560	QPSK	N/A	Rear edge4	9	20	1	99	0.733	22.85	1.0	24.20	
LTE	38	37850	2580	QPSK	N/A	Rear edge1	0	20	1	99	0.314	22.65	1.0	27.68	26.2
LTE	38	38000	2595	QPSK	N/A	Rear edge1	0	20	1	99	0.300	22.9	1.0	28.13	
LTE	38	38150	2610	QPSK	N/A	Rear edge1	0	20	1	99	0.288	22.72	1.0	28.13	
LTE	38	37850	2580	QPSK	N/A	Rear edge4	9	20	1	99	0.445	22.65	1.0	26.17	
LTE	38	38000	2595	QPSK	N/A	Rear edge4	9	20	1	99	0.448	22.9	1.0	26.39	
LTE	38	38150	2610	QPSK	N/A	Rear edge4	9	20	1	99	0.439	22.72	1.0	26.30	
LTE	48	55340	3560	QPSK	N/A	edge 4 19mm	0	20	1	0	0.933	22.77	1.0	23.07	22.2
LTE	48	55773	3603.3	QPSK	N/A	edge 4 19mm	0	20	1	0	0.882	22.39	1.0	22.94	
LTE	48	56207	3646.7	QPSK	N/A	edge 4 19mm	0	20	1	0	1.050	22.41	1.0	22.20	
LTE	48	56640	3690	QPSK	N/A	edge 4 19mm	0	20	1	0	1.020	22.49	1.0	22.40	
LTE	48	55340	3560	QPSK	N/A	Rear edge4	9	20	1	0	0.803	22.77	1.0	23.72	
LTE	48	55773	3603.3	QPSK	N/A	Rear edge4	9	20	1	0	0.787	22.39	1.0	23.43	
LTE	48	56207	3646.7	QPSK	N/A	Rear edge4	9	20	1	0	0.865	22.41	1.0	23.04	
LTE	48	56640	3690	QPSK	N/A	Rear edge4	9	20	1	0	0.896	22.49	1.0	22.97	

A.2 DSI 1 SAR value FCC

RAT	Band #	Ch.	Freq.[MHz]	Mode	OFDM	Tested pos.	Dis.[mm]	BW[MHz]	RB #	RB pos.#	SAR_{1g}	Meas.Power	SAR Target	Calc. Power	P_{limit}
LTE	12	23095	707.5	QPSK	N/A	Edge4	0	10	1	49	1.93	22.8	0.7	18.40	18.4
LTE	13	23230	782	QPSK	N/A	Edge4	0	10	1	0	2.43	22.42	0.7	17.01	17.0
LTE	14	23340	793	QPSK	N/A	Edge4	0	10	1	0	2.43	22.37	0.7	16.96	17.0
LTE	17	23790	710	QPSK	N/A	Edge4	0	10	1	49	2.24	22.87	0.7	17.82	17.8
LTE	26	26765	821.5	QPSK	N/A	Edge4	0	15	1	0	2.92	22.86	0.7	16.66	16.3
LTE	26	26865	831.5	QPSK	N/A	Edge4	0	15	1	0	3.09	22.76	0.7	16.31	
LTE	26	26965	841.5	QPSK	N/A	Edge4	0	15	1	0	2.98	22.64	0.7	16.35	
LTE	5	20450	829	QPSK	N/A	Edge4	0	10	1	0	3.11	22.87	0.7	16.39	16.1
LTE	5	20525	836.5	QPSK	N/A	Edge4	0	10	1	0	3.04	22.76	0.7	16.38	
LTE	5	20600	844	QPSK	N/A	Edge4	0	10	1	0	3.19	22.65	0.7	16.06	
NR	n5	167300	836.5	BPSK	DFT-s-OFDM	Edge4	0	20	1	1	3.14	22.83	0.7	16.31	16.3
LTE	25	26140	1860	QPSK	N/A	Edge4	0	20	1	0	2.84	22.78	0.7	16.70	16.5
LTE	25	26365	1882.5	QPSK	N/A	Edge4	0	20	1	0	2.76	22.64	0.7	16.68	
LTE	25	26590	1905	QPSK	N/A	Edge4	0	20	1	0	2.85	22.56	0.7	16.46	
LTE	2	18700	1860	QPSK	N/A	Edge4	0	20	1	0	2.8	22.72	0.7	16.70	16.6
LTE	2	18900	1880	QPSK	N/A	Edge4	0	20	1	99	2.77	22.63	0.7	16.66	
LTE	2	19100	1900	QPSK	N/A	Edge4	0	20	1	0	2.74	22.51	0.7	16.58	
NR	n2	372000	1860	BPSK	DFT-s-OFDM	Edge4	0	20	1	52	2.99	22.99	0.7	16.68	16.4
NR	n2	376000	1880	BPSK	DFT-s-OFDM	Edge4	0	20	1	1	2.94	22.84	0.7	16.61	
NR	n2	380000	1900	BPSK	DFT-s-OFDM	Edge4	0	20	1	1	2.92	22.64	0.7	16.44	
WCDMA	V	4132	826.4	QPSK	N/A	Edge4	0	N/A	N/A	N/A	3.59	23.52	0.7	16.42	16.1
WCDMA	V	4183	836.6	QPSK	N/A	Edge4	0	N/A	N/A	N/A	3.67	23.3	0.7	16.10	
WCDMA	V	4233	846.6	QPSK	N/A	Edge4	0	N/A	N/A	N/A	3.61	23.21	0.7	16.09	
WCDMA	IV	1312	1712.4	QPSK	N/A	Edge4	0	N/A	N/A	N/A	2.33	23.1	0.7	17.88	16.7
WCDMA	IV	1413	1732.6	QPSK	N/A	Edge4	0	N/A	N/A	N/A	2.95	23.15	0.7	16.90	
WCDMA	IV	1512	1752.6	QPSK	N/A	Edge4	0	N/A	N/A	N/A	3.07	23.13	0.7	16.71	
WCDMA	II	9262	1852.4	QPSK	N/A	Edge4	0	N/A	N/A	N/A	3.37	23.54	0.7	16.71	16.4
WCDMA	II	9400	1880	QPSK	N/A	Edge4	0	N/A	N/A	N/A	3.41	23.51	0.7	16.63	
WCDMA	II	9538	1907.5	QPSK	N/A	Edge4	0	N/A	N/A	N/A	3.4	23.27	0.7	16.41	
LTE	4	20050	1720	QPSK	N/A	Edge4	0	20	1	99	2.31	22.69	0.7	17.50	17.2
LTE	4	20175	1732.5	QPSK	N/A	Edge4	0	20	1	99	2.35	22.74	0.7	17.48	
LTE	4	20300	1745	QPSK	N/A	Edge4	0	20	1	99	2.44	22.64	0.7	17.22	
LTE	66	132072	1720	QPSK	N/A	Edge4	0	20	1	99	2.3	22.75	0.7	17.58	17.2
LTE	66	132322	1745	QPSK	N/A	Edge4	0	20	1	99	2.48	22.69	0.7	17.20	
LTE	66	132572	1770	QPSK	N/A	Edge4	0	20	1	0	2.54	22.75	0.7	17.15	
NR	n66	344000	1720	BPSK	DFT-s-OFDM	Edge4	0	20	1	104	2.54	22.94	0.7	17.34	17.1
NR	n66	349000	1745	BPSK	DFT-s-OFDM	Edge4	0	20	1	104	2.63	22.91	0.7	17.16	
NR	n66	354000	1770	BPSK	DFT-s-OFDM	Edge4	0	20	1	104	2.69	22.92	0.7	17.07	
LTE	71	133297	680.5	QPSK	N/A	Edge4	0	20	1	99	2.1	22.58	0.7	17.81	17.8
NR	n71	136100	680.5	BPSK	DFT-s-OFDM	Edge4	0	20	1	1	1.79	22.78	0.7	18.70	18.7
LTE	41	39750	2506	QPSK	N/A	Edge4	0	20	1	99	1.71	23.68	0.7	19.80	19.7
LTE	41	40185	2549.5	QPSK	N/A	Edge4	0	20	1	0	1.79	23.82	0.7	19.74	
LTE	41	40620	2593	QPSK	N/A	Edge4	0	20	1	99	1.78	24	0.7	19.95	
LTE	41	41055	2636.5	QPSK	N/A	Edge4	0	20	1	0	1.72	23.77	0.7	19.87	
LTE	41	41490	2680	QPSK	N/A	Edge4	0	20	1	99	1.64	23.71	0.7	20.01	
NR	n41	518600	2593	BPSK	DFT-s-OFDM	Edge2	0	20	1	136	6.08	22.49	0.7	13.10	13.1
LTE	7	20850	2510	QPSK	N/A	Edge4	0	20	1	99	2.83	22.93	0.7	16.86	16.6
LTE	7	21100	2535	QPSK	N/A	Edge4	0	20	1	0	2.96	22.85	0.7	16.59	
LTE	7	21350	2560	QPSK	N/A	Edge4	0	20	1	99	2.74	22.85	0.7	16.92	
LTE	38	37850	2580	QPSK	N/A	Edge4	0	20	1	99	1.70	22.65	0.7	18.80	18.8
LTE	38	38000	2595	QPSK	N/A	Edge4	0	20	1	99	1.74	22.9	0.7	18.95	
LTE	38	38150	2610	QPSK	N/A	Edge4	0	20	1	99	1.69	22.72	0.7	18.89	
LTE	48	55340	3560	QPSK	N/A	Edge4	0	20	1	0	10.00	22.77	0.7	11.22	9.9
LTE	48	55773	3603.3	QPSK	N/A	Edge4	0	20	1	0	9.53	22.39	0.7	11.05	
LTE	48	56207	3646.7	QPSK	N/A	Edge4	0	20	1	0	10.90	22.41	0.7	10.49	
LTE	48	56640	3690	QPSK	N/A	Edge4	0	20	1	0	12.60	22.49	0.7	9.94	

Appendix B Measurement uncertainty

B.1 SAR measurement uncertainty

Error Description	Uncert. value	Prob. Dist.	Div.	(ci) 1g	(ci) 10g	Std. Unc. (1g)	Std.Unc. (10g)
Measurement System Errors							
Probe Calibration	± 14.00 %	N	2	1	1	±7.0%	±7.00%
Probe Calibration Drift	± 1.7 %	R	√3	1	1	±1.0%	±1.0%
Probe Linearity	± 4.7 %	R	√3	1	1	±2.7%	±2.7%
Broadband Signal	± 2.6 %	R	√3	1	1	±1.5%	±1.5%
Probe Isotropy	± 7.6 %	R	√3	1	1	±4.4%	±4.4%
Data Acquisition	± 0.3 %	N	1	1	1	±0.3%	±0.3%
RF Ambient	± 1.8 %	N	1	1	1	±1.8%	±1.8%
Probe Positioning	± 0.2 %	N	1	0.33	0.33	±0.1%	±0.1%
Data Processing	± 2.3 %	N	1	1	1	±2.3%	±2.3%
Phantom and Device Errors							
Conductivity (meas.)DAK	± 10.0 %	N	1	0.78	0.71	±7.8%	±7.1%
Conductivity (temp.)BB	± 3.4 %	R	√3	0.78	0.71	±1.5%	±1.4%
Phantom Permittivity	± 14.0 %	R	√3	0.25	0.25	±2.0%	±2.0%
Distance DUT - TSL	± 2.0 %	N	1	2	2	±4.0%	±4.0%
Device Positioning (+/- 0.5mm)	± 1.0 %	N	1	1	1	±1.0%	±1.0%
Device Holder	± 3.6 %	N	1	1	1	±3.6%	±3.6%
DUT Modulationm	± 2.4 %	R	√3	1	1	±1.4%	±1.4%
Time-average SAR	± 2.6 %	R	√3	1	1	±1.5%	±1.5%
DUT drift	± 2.5 %	N	1	1	1	±2.5%	±2.5%
Val Antenna Unc.val	± 0.0 %	N	1	1	1	±0.0%	±0.0%
Unc. Input Powerval	± 0.0 %	N	1	1	1	±0.0%	±0.0%
Correction to the SAR results							
Deviation to Target	± 1.9 %	N	1	1	0.84	±1.9%	±1.6%
SAR scalingp	± 0.0 %	R	√3	1	1	±0.0%	±0.0%
Combined Std. Uncertainty						±14.1%	±13.7%
Expanded STD Uncertainty (κ =2)						±28.2%	±27.4%

Appendix C Revision History

Original Test Report No.: 13760834H-A

Revision	Test report No.	Date	Revision details
- (Original)	13760834H-A	October 29, 2021	-
1	13760834H-A-R1	December 16, 2021	**Section 8.4** Corrected value of P_{limit} for DSI=0 in Table 8-3
			Section 8.4 Added note at bottom of Table 8-3: "Powers are specified as burst average."

End of Report