



ELEMENT MATERIALS TECHNOLOGY

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SAR EVALUATION REPORT

Applicant Name:
Apple Inc.
One Apple Park Way
Cupertino, CA 95014 USA

Date of Testing:
07/10/2022
Test Report Issue Date:
06/07/2023
Test Site/Location:
Element Morgan Hill, CA, USA
Document Serial No.:
1C2305090017-02.BCG

FCC ID: BCGA2435
APPLICANT: APPLE, INC.

DUT Type: Tablet Device
Application Type: Class II Permissive Change
FCC Rule Part(s): CFR §2.1093
Models: A2435
Permissive Change(s): See FCC Change Document
Date of Original Certification: 10/18/22

Equipment Class	Band & Mode	Tx Frequency	SAR
			1g Body (W/kg)
CBE	NR Band n48	3555.0 - 3694.98 MHz	0.95

Only operations relevant to this permissive change were evaluated for compliance. Please see the original compliance evaluation in RF Exposure Technical Report S/N 1C2205090025-26.BCG (Rev2) for complete evaluation of all other operating modes. The operational description includes a description of all changed items.

This wireless portable device has been shown to be capable of compliance for localized specific absorption rate (SAR) for uncontrolled environment/general population exposure limits specified in ANSI/IEEE C95.1-1992 and has been tested in accordance with the measurement procedures specified in Section 1.8 of this report; for North American frequency bands only.

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

RJ Ortanez
Executive Vice President



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1 DEVICE UNDER TEST

1.1 Device Overview

Band & Mode	Operating Modes	Tx Frequency
UMTS 850	Data	826.40 - 846.60 MHz
UMTS 1750	Data	1712.4 - 1752.6 MHz
UMTS 1900	Data	1852.4 - 1907.6 MHz
LTE Band 71	Voice/Data	665.5 - 695.5 MHz
LTE Band 12	Voice/Data	699.7 - 715.3 MHz
LTE Band 17	Voice/Data	706.5 - 713.5 MHz
LTE Band 13	Voice/Data	779.5 - 784.5 MHz
LTE Band 14	Voice/Data	790.5 - 795.5 MHz
LTE Band 26 (Cell)	Voice/Data	814.7 - 848.3 MHz
LTE Band 5 (Cell)	Voice/Data	824.7 - 848.3 MHz
LTE Band 66 (AWS)	Voice/Data	1710.7 - 1779.3 MHz
LTE Band 4 (AWS)	Voice/Data	1710.7 - 1754.3 MHz
LTE Band 25 (PCS)	Voice/Data	1850.7 - 1914.3 MHz
LTE Band 2 (PCS)	Voice/Data	1850.7 - 1909.3 MHz
LTE Band 30	Voice/Data	2307.5 - 2312.5 MHz
LTE Band 7	Voice/Data	2502.5 - 2567.5 MHz
LTE Band 41	Voice/Data	2498.5 - 2687.5 MHz
LTE Band 48	Voice/Data	3552.5 - 3697.5 MHz
NR Band n71	Data	665.5 - 695.5 MHz
NR Band n12	Data	701.5 - 713.5 MHz
NR Band n14	Data	790.5 - 795.5 MHz
NR Band n26 (Cell)	Data	816.5 - 846.5 MHz
NR Band n5 (Cell)	Data	826.5 - 846.5 MHz
NR Band n70	Data	1697.5 - 1707.5 MHz
NR Band n66 (AWS)	Data	1712.5 - 1777.5 MHz
NR Band n25 (PCS)	Data	1852.5 - 1912.5 MHz
NR Band n2 (PCS)	Data	1852.5 - 1907.5 MHz
NR Band n30	Data	2307.5 - 2312.5 MHz
NR Band n7	Data	2502.5 - 2567.5 MHz
NR Band n41	Data	2506.02 - 2679.99 MHz
NR Band n48	Data	3555.00 - 3694.98 MHz
NR Band n77 DoD	Data	3455.01 - 3544.98 MHz
NR Band n77 C	Data	3705.00 - 3975.00 MHz
2.4 GHz WLAN	Voice/Data	2412 - 2472 MHz
U-NII-1	Voice/Data	5180 - 5240 MHz
U-NII-2A	Voice/Data	5260 - 5320 MHz
U-NII-2C	Voice/Data	5500 - 5720 MHz
U-NII-3	Voice/Data	5745 - 5825 MHz
U-NII-5	Voice/Data	5955 - 6415 MHz
U-NII-6	Voice/Data	6435 - 6515 MHz
U-NII-7	Voice/Data	6535 - 6875 MHz
U-NII-8	Voice/Data	6895 - 7115 MHz
Bluetooth	Data	2402 - 2480 MHz
NB UNII-1	Data	5162 - 5245 MHz
NB UNII-3	Data	5733 - 5844 MHz
NR Band n258	Data	24250 - 24450 MHz 24750 - 25250 MHz
NR Band n260	Data	37000 - 40000 MHz
NR Band n261	Data	27500 - 28350 MHz

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1.2 Time-Averaging Algorithm for RF Exposure Compliance

This device is enabled with the Qualcomm® Smart Transmit feature. This feature performs time averaging algorithm in real time to control and manage transmitting power and ensure the time-averaged RF exposure is in compliance with FCC requirements all the time. Refer to Compliance Summary document for detailed description of Qualcomm® Smart Transmit feature (report SN could be found in Section 1.10 – Bibliography).

Note that WLAN operations are not enabled with Smart Transmit.

The Smart Transmit algorithm maintains the time-averaged transmit power, in turn, time-averaged RF exposure of SAR design target, below the predefined time-averaged power limit (i.e., P_{limit} for sub-6 radio), for each characterized technology and band (see RF Exposure Part 0 Test Report, report SN could be found in Section 1.10 - Bibliography).

Exposure Scenario:	Ant 1 Body	Ant 1 Maximum Tune up Output Power*	Ant 2a/2b Body	Ant 2a/2b Maximum Tune up Output Power*	Ant 3 Body	Ant 3 Maximum Tune up Output Power*	Ant 4b Body	Ant 4b Maximum Tune up Output Power*	Manufacturer's Smart Transmit Uncertainty (dB)	Plimit target and UHB Pmax Tolerance (dB)
Averaging Volume:	1g		1g		1g		1g			
Spacing:	0 mm		0 mm		0 mm		0 mm			
DSI:	1		1		1		1			
Technology/Band	Plimit corresponding to 0.8 W/kg	Pmax	Plimit corresponding to 0.8 W/kg	Pmax	Plimit corresponding to 0.8 W/kg	Pmax	Plimit corresponding to 0.8 W/kg	Pmax		
NR Band n48	11.00	22.20	10.50	19.20	11.20	21.00	10.30	22.60	+/- 1.0	+/- 1.0

Smart Transmit 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} EFS settings and maximum tune up output power P_{max} configured for this EUT for various transmit conditions (Device State Index DSI). Note that the device uncertainty for sub-6GHz WWAN is +1.0/-1.0 dB for this EUT.

*Maximum tune up output power Pmax is used to configure EUT during RF tune up procedure. The maximum allowed output power is equal to maximum Tune up output power +0.7/-1.0 dB tolerance and for UHB +/-1.0 dB tolerance

*Note all P_{limit} EFS and maximum tune up output power P_{max} levels entered in above Table correspond to average power levels after accounting for duty cycle in the case of TDD modulation schemes (for e.g., LTE TDD).

The maximum time-averaged output power (dBm) for any 5G WWAN technology, band, and DSI = minimum of "Plimit EFS" and "Maximum tune up output power Pmax" +1.0/-1.0 dB device uncertainty. SAR values in this report were scaled to this maximum time-averaged output power to determine compliance per KDB Publication 447498 D01v06.

The purpose of this report (Part 1 test) is to demonstrate that the EUT meets FCC SAR limits when transmitting in static transmission scenario at maximum allowable time-averaged power levels.

Measurement Condition: All conducted power and SAR measurements in this report (Part 1 test) were performed by setting Reserve power margin (Smart Transmit EFS entry) to 0 dB.

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1.3 Power Reduction for SAR

This device additionally utilizes a power reduction mechanism for Bluetooth and WLAN operations. When WLAN/Bluetooth is operating simultaneously with certain combinations of 3G/4G/5G and 5 GHz WLAN antennas, the output power of is permanently reduced.. SAR evaluations were additionally performed at the maximum allowed output power for these scenarios to evaluate simultaneous transmission compliance.

Additionally, this device uses an independent mechanism that limits WIFI powers to a time-averaged output power. For the purposes of this test report, all SAR measurements were performed with the algorithm disabled at the maximum time-averaged output power level. See the original filing for all other operations that were not evaluated in this permissive change.

1.4 Nominal and Maximum Output Power Specifications

This device operates using the following maximum and nominal output power specifications. SAR values were scaled to the maximum allowed power to determine compliance per KDB Publication 447498 D01v06.

Only operations relevant to this permissive change were evaluated for compliance. No other target changes have been made. Targets for all other bands/exposure conditions can be found in the original filing.

1.4.1 5G Output Power for Portable Use Conditions

**Table 1-1
NR Bands**

Mode / Band		Modulated Average Output Power (in dBm)			
		Ant 1	Ant 2a	Ant 3	Ant 4b
NR TDD Band n48 [Burst Averaged]	Max allowed power	12.00	11.50	12.20	11.30
	Nominal	11.00	10.50	11.20	10.30

Note: For NR TDD, the above powers listed are TDD burst average and framed average values.

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1.4.2 Maximum WLAN Time-Averaged Output Power

Only operations relevant to this permissive change were evaluated for compliance. No other target changes have been made. Targets for all other bands/exposure conditions can be found in the original filing.

1.4.3 Reduced WLAN Time-Averaged Output Power

Only operations relevant to this permissive change were evaluated for compliance. No other target changes have been made. Targets for all other bands/exposure conditions can be found in the original filing.

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1.5 DUT Antenna Locations

The overall diagonal dimension of the device is > 200 mm. A diagram showing the location of the device antennas can be found in Appendix E. Exact antenna dimensions and separation distances are shown in the Technical Descriptions in the FCC filings.

Note: See the original filing for all other operations that were not evaluated in this permissive change.

Table 1-2
Device Edges/Sides for SAR Testing

Mode	Back	Front	Top	Bottom	Right	Left
NR Band n48 Antenna 1	Yes	No	No	Yes	No	Yes
NR Band n48 Antenna 2a	Yes	No	No	Yes	Yes	No
NR Band n48 Antenna 3	Yes	No	Yes	No	Yes	No
NR Band n48 Antenna 4b	Yes	No	Yes	No	No	No

Note: Per FCC KDB Publication 616217 D04v01r01, particular edges were not required to be evaluated for SAR based on the SAR exclusion threshold in KDB 447498 D01V06. Additional edges may have been evaluated for simultaneous transmission analysis.

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1.6 Simultaneous Transmission Capabilities

According to FCC KDB Publication 447498 D01v06, transmitters are considered to be operating simultaneously when there is overlapping transmission, with the exception of transmissions during network hand-offs with maximum hand-off duration less than 30 seconds.

This device contains multiple transmitters that may operate simultaneously, and therefore requires a simultaneous transmission analysis according to FCC KDB Publication 447498 D01v06 4.3.2 procedures.

Table 1-3
Simultaneous Transmission Scenarios

No.	Capable Transmit Configuration	Body
1	Cellular Band + 2.4 GHz WIFI	Yes
2	Cellular Band + 5/6 GHz WIFI	Yes
3	Cellular Band + 2.4 GHz Bluetooth	Yes
4	Cellular Band+ 2.4 GHz WIFI MIMO	Yes
5	Cellular Band+ 5/6 GHz WIFI MIMO	Yes
6	Cellular Band + 2.4 GHz Bluetooth + 5/6 GHz WIFI	Yes
7	Cellular Band + 2.4 GHz Bluetooth + 5/6 GHz WIFI MIMO	Yes
8	2.4 GHz Bluetooth + 5/6 GHz WIFI	Yes
9	2.4 GHz Bluetooth + 5/6 GHz WIFI MIMO	Yes
10	Cellular Band + 2.4 GHz Bluetooth(TXBF) + 5/6 GHz WIFI	Yes
11	Cellular Band + 2.4 GHz Bluetooth(TXBF) + 5/6 GHz WIFI MIMO	Yes
12	2.4 GHz Bluetooth(TXBF) + 5/6 GHz WIFI	Yes
13	2.4 GHz Bluetooth (TXBF) + 5/6 GHz WIFI MIMO	Yes
14	Cellular Band + NB UNII	Yes
15	Cellular Band + NB UNII + 2.4 GHz WIFI	Yes
16	Cellular Band + NB UNII + 2.4 GHz WIFI MIMO	Yes
17	NB UNII + 2.4 GHz WIFI	Yes
18	NB UNII + 2.4 GHz WIFI MIMO	Yes
19	Cellular Band + NB UNII(TXBF) + 2.4 GHz WIFI	Yes
20	Cellular Band + NB UNII(TXBF) + 2.4 GHz WIFI MIMO	Yes
21	Cellular Band + NB UNII(TXBF)	Yes
22	Cellular Band + 2.4 GHz Bluetooth(TXBF)	Yes
23	NB UNII(TXBF) + 2.4 GHz WIFI	Yes
24	NB UNII(TXBF) + 2.4 GHz WIFI MIMO	Yes
25	2.4 GHz WIFI + 2.4 GHz Bluetooth	Yes
26	Cellular Band + 2.4 GHz WIFI + 2.4 GHz Bluetooth	Yes

Table 1-4
Simultaneous Transmission Scenarios of Inter-Band ULCA

No.	Capable Transmit Configuration	Body	Notes
1	Cellular Ant 1 LB + Cellular Ant 3 MB/HB	Yes	LTE Bands transmitting from Ant 1 LB: LTE B5/12/13/14 LTE Bands transmitting from Ant 3 MB/HB: LTE B2/4/7/66/30
2	Cellular Ant 1 LB + Cellular Ant 2b MB/HB	Yes	LTE Bands transmitting from Ant 1 LB: LTE B5/12/13/14 LTE Bands transmitting from Ant 2b MB/HB: LTE B2/4/7/66/30
3	Cellular Ant 1 LB + Cellular Ant 4b MB/HB	Yes	LTE Bands transmitting from Ant 1 LB: LTE B5/12/13/14 LTE Bands transmitting from Ant 4b MB/HB: LTE B2/4/7/66/30
4	Cellular Ant 3 LB + Cellular Ant 1 MB/HB	Yes	LTE Bands transmitting from Ant 3 LB: LTE B5/12/13/14 LTE Bands transmitting from Ant 1 MB/HB: LTE B2/4/7/66/30
5	Cellular Ant 3 LB + Cellular Ant 2b MB/HB	Yes	LTE Bands transmitting from Ant 3 LB: LTE B5/12/13/14 LTE Bands transmitting from Ant 2b MB/HB: LTE B2/4/7/66/30
6	Cellular Ant 3 LB + Cellular Ant 4b MB/HB	Yes	LTE Bands transmitting from Ant 3 LB: LTE B5/12/13/14 LTE Bands transmitting from Ant 4b MB/HB: LTE B2/4/7/66/30

Note: The technical description includes all the possible Inter-band ULCA combinations.

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Table 1-5
Simultaneous Transmission Scenarios with Inter-Band ULCA Active

No.	Capable Transmit Configuration	Body
1	LTE Inter-Band ULCA + 2.4 GHz WI-FI	Yes
2	LTE Inter-Band ULCA + 5/6 GHz WI-FI	Yes
3	LTE Inter-Band ULCA + 2.4 GHz Bluetooth	Yes
4	LTE Inter-Band ULCA + 2.4 GHz WI-FI MIMO	Yes
5	LTE Inter-Band ULCA + 5/6 GHz WI-FI MIMO	Yes
6	LTE Inter-Band ULCA + 2.4 GHz Bluetooth + 5/6 GHz WI-FI	Yes
7	LTE Inter-Band ULCA + 2.4 GHz Bluetooth + 5/6 GHz WI-FI MIMO	Yes
8	LTE Inter-Band ULCA + 2.4 GHz Bluetooth(TXBF) + 5/6 GHz WI-FI	Yes
9	LTE Inter-Band ULCA + 2.4 GHz Bluetooth(TXBF) + 5/6 GHz WI-FI MIMO	Yes
10	LTE Inter-Band ULCA + NB UNII	Yes
11	LTE Inter-Band ULCA + UNII NB + 2.4 GHz WI-FI	Yes
12	LTE Inter-Band ULCA + UNII NB + 2.4 GHz WI-FI MIMO	Yes
13	LTE Inter-Band ULCA + UNII NB(TXBF) + 2.4 GHz WI-FI	Yes
14	LTE Inter-Band ULCA + UNII NB(TXBF) + 2.4 GHz WI-FI MIMO	Yes
15	LTE Inter-Band ULCA + UNII NB(TXBF)	Yes
16	LTE Inter-Band ULCA + 2.4 GHz Bluetooth(TXBF)	Yes
17	LTE Inter-Band ULCA + 2.4 GHz WI-FI + 2.4 GHz Bluetooth	Yes

Note: LTE inter-band ULCA can operate in any of the combinations in Table 1-9

1. There are no limitations in the above listed simultaneous transmission scenarios between cellular antennas and BT/WI-FI antennas.
2. Wi-Fi 2.4GHz and Bluetooth 2.4 GHz can transmit simultaneously on separate antennas. 2.4 GHz WLAN Antenna 4a can only transmit simultaneously with 2.4GHz Bluetooth Antenna 2a. In this scenario Wi-Fi max power will not exceed minimum of (13.5dBm, SAR max cap, Reg max cap) power.
3. This device supports 2x2 MIMO Tx for WLAN 802.11a/g/n/ac/ax. 802.11a/g/n/ac/ax supports CDD and STBC and 802.11n/ac/ax additionally supports SDM. Each WLAN antenna can transmit independently or together when operating with MIMO.
4. EN-DC operation is supported with LTE + 5G NR FR1 scenarios. The LTE anchor bands are shown in the NR FR1 checklist.
5. This device supports VoWIFI.
6. This device supports VoLTE.
7. 5G NR FR2 n258, n260, and n261 cannot transmit simultaneously.
8. LTE + 5G NR FR2 Scenarios are limited to EN-DC combinations with anchor bands as shown in the NR FR2 checklist.

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1.7 Miscellaneous SAR Test Considerations

(A) WIFI/BT

There were no changes made to the WIFI and BT operations within this device. Please see original filing for complete evaluation of these operating modes.

(B) Licensed Transmitter(s)

NR implementation supports SA and NSA mode. In EN-DC mode, NR operates with the LTE Bands shown in the NR FR1 checklist acting as anchor bands. Per FCC guidance, SAR tests for NR Bands and LTE Anchors Bands were performed separately due to limitations in SAR probe calibration factors.

This device supports LTE/NR capabilities with overlapping transmission frequency ranges. When the supported frequency range of an LTE/NR Band falls completely within an LTE/NR band with a larger transmission frequency range, both LTE/NR bands have the same target power (or the band with the larger transmission frequency range has a higher target power), and both LTE/NR bands share the same transmission path and signal characteristics, SAR was only assessed for the band with the larger transmission frequency range.

Only operations relevant to this permissive change were evaluated for compliance. Please see original filing for complete evaluation for all other operating modes. The operational description includes a description of all changed items.

1.8 Guidance Applied

- FCC KDB Publication 447498 D01v06 (General SAR Guidance)
- FCC KDB Publication 865664 D01v01r04, D02v01r02 (SAR Measurements up to 6 GHz)
- FCC KDB Publication 616217 D04v01r02 (Tablet)

1.9 Device Serial Numbers

Several samples with identical hardware were used to support SAR testing. The manufacturer has confirmed that the device(s) tested have the same physical, mechanical and thermal characteristics and are within operational tolerances expected for production units. The serial numbers used for each test are indicated alongside the results in Section 10.

1.10 Bibliography

Report Type	Report Serial Number
RF Exposure Part 0 Test Report	1C2305090017-03.BCG
Original RF Exposure Part 1 Test Report	Original Filing

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2 LTE INFORMATION

LTE Information				
Form Factor	Tablet Device			
Frequency Range of each LTE transmission band	LTE Band 71 (665.5 - 695.5 MHz)			
	LTE Band 12 (698.7 - 715.3 MHz)			
	LTE Band 17 (706.5 - 713.5 MHz)			
	LTE Band 13 (779.5 - 784.5 MHz)			
	LTE Band 14 (790.5 - 795.5 MHz)			
	LTE Band 26 (Cell) (814.7 - 848.3 MHz)			
	LTE Band 5 (Cell) (824.7 - 848.3 MHz)			
	LTE Band 66 (AWS) (1710.7 - 1779.3 MHz)			
	LTE Band 4 (AWS) (1710.7 - 1754.3 MHz)			
	LTE Band 25 (PCS) (1850.7 - 1914.3 MHz)			
	LTE Band 2 (PCS) (1850.7 - 1909.3 MHz)			
	LTE Band 30 (2307.5 - 2312.5 MHz)			
	LTE Band 7 (2502.5 - 2567.5 MHz)			
	LTE Band 41 (2498.5 - 2687.5 MHz)			
	LTE Band 48 (3552.5 - 3697.5 MHz)			
Channel Bandwidths	LTE Band 71: 5 MHz, 10 MHz, 15 MHz, 20 MHz			
	LTE Band 12: 1.4 MHz, 3 MHz, 5 MHz, 10 MHz			
	LTE Band 17: 5 MHz, 10 MHz			
	LTE Band 13: 5 MHz, 10 MHz			
	LTE Band 14: 5 MHz, 10 MHz			
	LTE Band 26 (Cell): 1.4 MHz, 3 MHz, 5 MHz, 10 MHz			
	LTE Band 5 (Cell): 1.4 MHz, 3 MHz, 5 MHz, 10 MHz			
	LTE Band 66 (AWS): 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz, 20 MHz			
	LTE Band 4 (AWS): 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz, 20 MHz			
	LTE Band 25 (PCS): 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz, 20 MHz			
	LTE Band 2 (PCS): 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz, 20 MHz			
	LTE Band 30: 5 MHz, 10 MHz			
	LTE Band 7: 5 MHz, 10 MHz, 15 MHz, 20 MHz			
	LTE Band 41: 5 MHz, 10 MHz, 15 MHz, 20 MHz			
	LTE Band 48: 5 MHz, 10 MHz, 15 MHz, 20 MHz			
Channel Numbers and Frequencies (MHz)	Low	Low-Mid	Mid	Mid-High
LTE Band 71: 5 MHz	665.5 (133147)	680.5 (133297)	695.5 (133447)	
LTE Band 71: 10 MHz	668 (133172)	680.5 (133297)	693 (133422)	
LTE Band 71: 15 MHz	670.5 (133197)	680.5 (133297)	690.5 (133397)	
LTE Band 71: 20 MHz	673 (133222)	680.5 (133297)	688 (133372)	
LTE Band 12: 1.4 MHz	699.7 (23017)	707.5 (23095)	715.3 (23173)	
LTE Band 12: 3 MHz	705.5 (23029)	707.5 (23095)	714.5 (23165)	
LTE Band 12: 5 MHz	704 (23069)	707.5 (23095)	713.5 (23155)	
LTE Band 12: 10 MHz	704 (23069)	707.5 (23095)	711 (23139)	
LTE Band 17: 5 MHz	706.5 (23755)	710 (23790)	713.5 (23825)	
LTE Band 17: 10 MHz	709 (23780)	710 (23790)	711 (23800)	
LTE Band 13: 5 MHz	779.5 (23205)	782 (23230)	784.5 (23255)	
LTE Band 13: 10 MHz	N/A	782 (23230)	N/A	
LTE Band 14: 5 MHz	790.5 (23305)	793 (23330)	795.5 (23355)	
LTE Band 14: 10 MHz	N/A	793 (23330)	N/A	
LTE Band 26 (Cell): 1.4 MHz	814.7 (26997)	831.5 (26865)	848.3 (27033)	
LTE Band 26 (Cell): 3 MHz	815.5 (26705)	831.5 (26865)	847.5 (27025)	
LTE Band 26 (Cell): 5 MHz	816.5 (26715)	831.5 (26865)	846.5 (27015)	
LTE Band 26 (Cell): 10 MHz	819 (26740)	831.5 (26865)	844 (26990)	
LTE Band 5 (Cell): 1.4 MHz	824.7 (20407)	836.5 (20525)	848.3 (20643)	
LTE Band 5 (Cell): 3 MHz	825.5 (20415)	836.5 (20525)	847.5 (20635)	
LTE Band 5 (Cell): 5 MHz	826.5 (20425)	836.5 (20525)	846.5 (20625)	
LTE Band 5 (Cell): 10 MHz	829 (20450)	836.5 (20525)	844 (20600)	
LTE Band 66 (AWS): 1.4 MHz	1710.7 (131979)	1745 (132322)	1779.3 (132665)	
LTE Band 66 (AWS): 3 MHz	1711.5 (131987)	1745 (132322)	1778.5 (132657)	
LTE Band 66 (AWS): 5 MHz	1712.5 (131997)	1745 (132322)	1777.5 (132647)	
LTE Band 66 (AWS): 10 MHz	1715 (132022)	1745 (132322)	1775 (132622)	
LTE Band 66 (AWS): 15 MHz	1717.5 (132047)	1745 (132322)	1772.5 (132597)	
LTE Band 66 (AWS): 20 MHz	1720 (132072)	1745 (132322)	1770 (132572)	
LTE Band 4 (AWS): 1.4 MHz	1710.7 (19957)	1732.5 (20175)	1754.3 (20393)	
LTE Band 4 (AWS): 3 MHz	1711.5 (19965)	1732.5 (20175)	1753.5 (20385)	
LTE Band 4 (AWS): 5 MHz	1712.5 (19975)	1732.5 (20175)	1752.5 (20375)	
LTE Band 4 (AWS): 10 MHz	1715 (20000)	1732.5 (20175)	1750 (20350)	
LTE Band 4 (AWS): 15 MHz	1717.5 (20025)	1732.5 (20175)	1747.5 (20325)	
LTE Band 4 (AWS): 20 MHz	1720 (20050)	1732.5 (20175)	1745 (20300)	
LTE Band 25 (PCS): 1.4 MHz	1850.7 (26047)	1882.5 (26365)	1914.3 (26683)	
LTE Band 25 (PCS): 3 MHz	1851.5 (26055)	1882.5 (26365)	1913.5 (26675)	
LTE Band 25 (PCS): 5 MHz	1852.5 (26065)	1882.5 (26365)	1912.5 (26665)	
LTE Band 25 (PCS): 10 MHz	1855 (26090)	1882.5 (26365)	1910 (26640)	
LTE Band 25 (PCS): 15 MHz	1857.5 (26115)	1882.5 (26365)	1907.5 (26615)	
LTE Band 25 (PCS): 20 MHz	1860 (26140)	1882.5 (26365)	1905 (26590)	
LTE Band 2 (PCS): 1.4 MHz	1850.7 (18607)	1880 (18900)	1909.3 (19193)	
LTE Band 2 (PCS): 3 MHz	1851.5 (18615)	1880 (18900)	1908.5 (19185)	
LTE Band 2 (PCS): 5 MHz	1852.5 (18625)	1880 (18900)	1907.5 (19175)	
LTE Band 2 (PCS): 10 MHz	1855 (18650)	1880 (18900)	1905 (19150)	
LTE Band 2 (PCS): 15 MHz	1857.5 (18675)	1880 (18900)	1902.5 (19125)	
LTE Band 2 (PCS): 20 MHz	1860 (18700)	1880 (18900)	1900 (19100)	
LTE Band 30: 5 MHz	2307.5 (27895)	2310 (27710)	2312.5 (27735)	
LTE Band 30: 10 MHz	N/A	2310 (27710)	N/A	
LTE Band 7: 5 MHz	2502.5 (20775)	2535 (21100)	2567.5 (21425)	
LTE Band 7: 10 MHz	2505 (20800)	2535 (21100)	2565 (21400)	
LTE Band 7: 15 MHz	2507.5 (20825)	2535 (21100)	2562.5 (21375)	
LTE Band 7: 20 MHz	2510 (20850)	2535 (21100)	2560 (21350)	
LTE Band 41: 5 MHz	2506 (39750)	2549.5 (40185)	2593 (40620)	2636.5 (41055)
LTE Band 41: 10 MHz	2506 (39750)	2549.5 (40185)	2593 (40620)	2636.5 (41055)
LTE Band 41: 15 MHz	2506 (39750)	2549.5 (40185)	2593 (40620)	2636.5 (41055)
LTE Band 41: 20 MHz	2506 (39750)	2549.5 (40185)	2593 (40620)	2636.5 (41055)
LTE Band 48: 5 MHz	3552.5 (55265)	3600.8 (55748)	N/A	3649.2 (56232)
LTE Band 48: 10 MHz	3555 (55290)	3601.7 (55757)	N/A	3648.3 (56223)
LTE Band 48: 15 MHz	3557.5 (55315)	3602.5 (55769)	N/A	3647.5 (56215)
LTE Band 48: 20 MHz	3560 (55340)	3603.3 (55773)	N/A	3646.7 (56207)
UE Category	DL UE Cat 20 (QPSK, 16QAM, 64QAM, 256 QAM), UL UE Cat 18 (QPSK, 16QAM, 64QAM, 256QAM)			
Modulations Supported in UL	QPSK, 16QAM, 64QAM, 256QAM			
LTE MPR Permanently implemented per 3GPP TS 36.101 section 6.2.3-6.2.5? (manufacturer attestation to be provided)	YES			
A-MPR (Additional MPR) disabled for SAR Testing?	YES			
LTE Carrier Aggregation Possible Combinations	The technical description includes all the possible carrier aggregation combinations			
LTE Additional Information	This device does not support full CA features on 3GPP Release 15. All uplink communications are identical to the Release 8 Specifications. Uplink communications are done on the PCC. The following LTE Release 15 Features are not supported: Relay, HetNet, Enhanced MIMO, eICIC, WiFi Offloading, eMBMS, Cross-Carrier Scheduling, Enhanced SC-FDMA.			

FCC ID: BCGA2435	SAR EVALUATION REPORT		Approved by: Technical Manager
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Form Factor		NR Information			
Frequency	Range of each NR transmission band	Table			
		NR Band n71 (665.5 - 695.5 MHz)			
Channel Bandwidths	NR Band n12 (701.5 - 713.5 MHz)				
	NR Band n14 (750.5 - 756.5 MHz)				
	NR Band n26 (Cell) (816.5 - 846.5 MHz)				
	NR Band n5 (Cell) (826.5 - 846.5 MHz)				
	NR Band n70 (1497.5-1707.5 MHz)				
	NR Band n66 (AWS) (1712.5 - 1777.5 MHz)				
	NR Band n25 (PCS) (1852.5 - 1912.5 MHz)				
	NR Band n2 (PCS) (1852.5 - 1907.5 MHz)				
	NR Band n26 (AWS) (2070.5 - 2122.5 MHz)				
	NR Band n7 (2502.5 - 2587.5 MHz)				
	NR Band n41 (2506.02 - 2679.99 MHz)				
	NR Band n68 (2555.01 - 2644.99 MHz)				
	NR Band n77 C (2705.0 - 3075.0 MHz)				
	NR Band n71, 5 MHz, 10 MHz, 15 MHz, 20 MHz				
	NR Band n12, 5 MHz, 10 MHz, 15 MHz				
	NR Band n14, 5 MHz, 10 MHz				
	NR Band n26 (Cell), 5 MHz, 10 MHz, 15 MHz, 20 MHz				
	NR Band n70, 5 MHz, 10 MHz, 15 MHz, 20 MHz, 40 MHz				
	NR Band n66 (AWS), 5 MHz, 10 MHz, 15 MHz, 20 MHz, 25 MHz, 30 MHz, 40 MHz				
	NR Band n25 (PCS), 5 MHz, 10 MHz, 15 MHz, 20 MHz, 25 MHz, 30 MHz, 40 MHz				
NR Band n2 (PCS), 5 MHz, 10 MHz, 15 MHz, 20 MHz					
NR Band n7, 5 MHz, 10 MHz, 15 MHz, 20 MHz, 25 MHz, 30 MHz, 40 MHz					
NR Band n41, 20 MHz, 30 MHz, 40 MHz, 50 MHz, 60 MHz, 70 MHz, 80 MHz, 90 MHz, 100 MHz					
NR Band n68, 10 MHz, 20 MHz, 40 MHz					
NR Band n77 D4d, 10 MHz, 15 MHz, 20 MHz, 30 MHz, 40 MHz, 50 MHz, 60 MHz, 70 MHz, 80 MHz, 90 MHz, 100 MHz					
Channel Numbers and Frequencies (MHz)	Low	Low Mid	Mid	Mid+High	High
NR Band n71, 5 MHz	665.5 (136100)	680.5 (136100)	695.5 (136100)	695.5 (136100)	
NR Band n71, 10 MHz	666 (136100)	680.5 (136100)	691 (136100)	691 (136100)	
NR Band n71, 15 MHz	670.5 (134100)	685.5 (134100)	695.5 (134100)	695.5 (134100)	
NR Band n71, 20 MHz	673 (134600)	680.5 (136100)	688 (137600)	688 (137600)	
NR Band n12, 5 MHz	701.5 (140300)	707.5 (141300)	713.5 (142700)	713.5 (142700)	
NR Band n12, 10 MHz	704 (140800)	707.5 (141300)	711 (142200)	711 (142200)	
NR Band n12, 15 MHz	706.5 (141300)	707.5 (141300)	708.5 (141700)	708.5 (141700)	
NR Band n14, 5 MHz	780.5 (158100)	789 (158600)	795.5 (159100)	795.5 (159100)	
NR Band n14, 10 MHz	N/A	N/A	N/A	N/A	
NR Band n26 (Cell), 5 MHz	816.5 (163300)	831.5 (163800)	846.5 (164300)	846.5 (164300)	
NR Band n26 (Cell), 10 MHz	819 (163800)	831.5 (163800)	844 (163800)	844 (163800)	
NR Band n5 (Cell), 5 MHz	826.5 (165300)	836.5 (167300)	846.5 (168300)	846.5 (168300)	
NR Band n5 (Cell), 10 MHz	829 (165800)	836.5 (167300)	844 (168800)	844 (168800)	
NR Band n5 (Cell), 15 MHz	831.5 (166300)	836.5 (167300)	841.5 (168300)	841.5 (168300)	
NR Band n5 (Cell), 20 MHz	834 (166800)	836.5 (167300)	839 (167800)	839 (167800)	
NR Band n70, 5 MHz	1497.5 (239500)	1702.5 (249500)	1717.5 (241500)	1717.5 (241500)	
NR Band n70, 10 MHz	1700 (240000)	1702.5 (249500)	1708 (241000)	1708 (241000)	
NR Band n70, 15 MHz	N/A	N/A	N/A	N/A	
NR Band n66 (AWS), 5 MHz	1712.5 (242500)	1745 (249500)	1777.5 (250500)	1777.5 (250500)	
NR Band n66 (AWS), 10 MHz	1715 (243000)	1745 (249500)	1775 (250000)	1775 (250000)	
NR Band n66 (AWS), 15 MHz	1717.5 (243500)	1745 (249500)	1772.5 (250500)	1772.5 (250500)	
NR Band n66 (AWS), 20 MHz	1720 (244000)	1745 (249500)	1770 (250000)	1770 (250000)	
NR Band n66 (AWS), 30 MHz	1725 (245000)	1745 (249500)	1765 (250000)	1765 (250000)	
NR Band n66 (AWS), 40 MHz	1730 (246000)	1745 (249500)	1760 (250000)	1760 (250000)	
NR Band n25 (PCS), 5 MHz	1852.5 (270500)	1852.5 (270500)	1912.5 (282500)	1912.5 (282500)	
NR Band n25 (PCS), 10 MHz	1855 (271000)	1852.5 (270500)	1910 (282000)	1910 (282000)	
NR Band n25 (PCS), 15 MHz	1857.5 (271500)	1852.5 (270500)	1907.5 (281500)	1907.5 (281500)	
NR Band n25 (PCS), 20 MHz	1860 (272000)	1852.5 (270500)	1905 (281000)	1905 (281000)	
NR Band n25 (PCS), 25 MHz	1862.5 (272500)	1852.5 (270500)	1902.5 (280500)	1902.5 (280500)	
NR Band n25 (PCS), 30 MHz	1865 (273000)	1852.5 (270500)	1900 (280000)	1900 (280000)	
NR Band n25 (PCS), 40 MHz	1870 (274000)	1852.5 (270500)	1895 (279000)	1895 (279000)	
NR Band n2 (PCS), 5 MHz	1882.5 (270500)	1880 (270000)	1907.5 (281500)	1907.5 (281500)	
NR Band n2 (PCS), 10 MHz	1885 (271000)	1880 (270000)	1905 (281000)	1905 (281000)	
NR Band n2 (PCS), 15 MHz	1887.5 (271500)	1880 (270000)	1902.5 (280500)	1902.5 (280500)	
NR Band n2 (PCS), 20 MHz	1890 (272000)	1880 (270000)	1900 (280000)	1900 (280000)	
NR Band n30, 5 MHz	2307.5 (461500)	2310 (462000)	2312.5 (462500)	2312.5 (462500)	
NR Band n30, 10 MHz	N/A	N/A	N/A	N/A	
NR Band n7, 5 MHz	2502.5 (500500)	2535 (507500)	2567.5 (513500)	2567.5 (513500)	
NR Band n7, 10 MHz	2505 (501000)	2535 (507500)	2565 (513000)	2565 (513000)	
NR Band n7, 15 MHz	2507.5 (501500)	2535 (507500)	2562.5 (512500)	2562.5 (512500)	
NR Band n7, 20 MHz	2510 (502000)	2535 (507500)	2560 (512000)	2560 (512000)	
NR Band n7, 25 MHz	2512.5 (502500)	2535 (507500)	2557.5 (511500)	2557.5 (511500)	
NR Band n7, 30 MHz	2515 (503000)	2535 (507500)	2555 (511000)	2555 (511000)	
NR Band n7, 40 MHz	2520 (504000)	2535 (507500)	2550 (510000)	2550 (510000)	
NR Band n41, 20 MHz	2506.02 (501204)	2543.49 (508998)	2579.99 (530998)	2579.99 (530998)	
NR Band n41, 30 MHz	2511 (502000)	2552.01 (510402)	2634 (526800)	2674.98 (534998)	
NR Band n41, 40 MHz	2516.01 (503200)	2561.34 (513498)	2639 (528100)	2670 (534000)	
NR Band n41, 50 MHz	2521.02 (504504)	2562.99 (513598)	2644.99 (532998)	2644.99 (532998)	
NR Band n41, 60 MHz	2526 (505200)	2562.99 (513598)	2639.98 (531998)	2639.98 (531998)	
NR Band n41, 70 MHz	2531.01 (506500)	2562.99 (513598)	2635 (531000)	2635 (531000)	
NR Band n41, 80 MHz	2536.02 (507704)	2562.99 (513598)	2630.99 (529998)	2630.99 (529998)	
NR Band n41, 90 MHz	2541 (508500)	2562.99 (513598)	2624.98 (528998)	2624.98 (528998)	
NR Band n41, 100 MHz	2546.01 (509700)	2562.99 (513598)	2620 (528000)	2620 (528000)	
NR Band n48, 10 MHz	3555 (637000)	3601.68 (640112)	N/A	3648.33 (642222)	3694.98 (646332)
NR Band n48, 20 MHz	3560.01 (637334)	3603.33 (640222)	N/A	3646.68 (641112)	3690 (646000)
NR Band n71 D4d, 10 MHz	3570 (638000)	N/A	3634.99 (641466)	N/A	3674.98 (643332)
NR Band n71 D4d, 15 MHz	3580.01 (638334)	N/A	3500.01 (633334)	N/A	3644.98 (638332)
NR Band n71 D4d, 20 MHz	3587.5 (638500)	N/A	3500.01 (633334)	N/A	3642.49 (638166)
NR Band n71 D4d, 25 MHz	3592 (638666)	N/A	3500.01 (633334)	N/A	3641 (638000)
NR Band n71 D4d, 30 MHz	3595 (639000)	N/A	3500.01 (633334)	N/A	3639.99 (638666)
NR Band n71 D4d, 40 MHz	3597.01 (639334)	N/A	3500.01 (633334)	N/A	3638.98 (638332)
NR Band n71 D4d, 50 MHz	3597.02 (639666)	N/A	3500.01 (633334)	N/A	3638.98 (638000)
NR Band n71 D4d, 60 MHz	N/A	N/A	3500.01 (633334)	N/A	N/A
NR Band n71 D4d, 70 MHz	N/A	N/A	3500.01 (633334)	N/A	N/A
NR Band n71 D4d, 80 MHz	N/A	N/A	3500.01 (633334)	N/A	N/A
NR Band n71 D4d, 90 MHz	N/A	N/A	3500.01 (633334)	N/A	N/A
NR Band n71 D4d, 100 MHz	N/A	N/A	3500.01 (633334)	N/A	N/A
NR Band n71 C, 10 MHz	3705 (640000)	3719 (650000)	3813 (655000)	3821 (657000)	3921 (661400)
NR Band n71 C, 15 MHz	3717 (641666)	3765 (656000)	3813.53 (655245)	3876.49 (657766)	3915 (661300)
NR Band n71 C, 20 MHz	3718.01 (641734)	3762 (656000)	3813.99 (655290)	3886.01 (657734)	3918 (661200)
NR Band n71 C, 25 MHz	3719 (641766)	3765 (656000)	3814 (655400)	3886.99 (657666)	3919.98 (661233)
NR Band n71 C, 30 MHz	3720 (641800)	3768 (656100)	3815 (655400)	3814 (657600)	3921 (660000)
NR Band n71 C, 40 MHz	3723.01 (641834)	3782.49 (652466)	3840 (655000)	N/A	3924.99 (656666)
NR Band n71 C, 50 MHz	3725 (641900)	3804.99 (653566)	N/A	N/A	3926.98 (656332)
NR Band n71 C, 60 MHz	3726 (641933)	3804.99 (653566)	N/A	N/A	3926.98 (656332)
NR Band n71 C, 70 MHz	3726.01 (641933)	3804.99 (653566)	N/A	N/A	3926.98 (656332)
NR Band n71 C, 80 MHz	3726.01 (641933)	3804.99 (653566)	N/A	N/A	3926.98 (656332)
NR Band n71 C, 90 MHz	3726.01 (641933)	3804.99 (653566)	N/A	N/A	3926.98 (656332)
NR Band n71 C, 100 MHz	3726.01 (641933)	3804.99 (653566)	N/A	N/A	3926.98 (656332)
NR Band n71 C, 110 MHz	3726.01 (641933)	3804.99 (653566)	N/A	N/A	3926.98 (656332)
NR Band n71 C, 120 MHz	3726.01 (641933)	3804.99 (653566)	N/A	N/A	3926.98 (656332)
NR Band n71 C, 130 MHz	3726.01 (641933)	3804.99 (653566)	N/A	N/A	3926.98 (656332)
NR Band n71 C, 140 MHz	3726.01 (641933)	3804.99 (653566)	N/A	N/A	3926.98 (656332)
NR Band n71 C, 150 MHz	3726.01 (641933)	3804.99 (653566)	N/A	N/A	3926.98 (656332)
NR Band n71 C, 160 MHz	3726.01 (641933)	3804.99 (653566)	N/A	N/A	3926.98 (656332)
NR Band n71 C, 170 MHz	3726.01 (641933)	3804.99 (653566)	N/A	N/A	3926.98 (656332)
NR Band n71 C, 180 MHz	3726.01 (641933)	3804.99 (653566)	N/A	N/A	3926.98 (656332)
NR Band n71 C, 190 MHz	3726.01 (641933)	3804.99 (653566)	N/A	N/A	3926.98 (656332)
NR Band n71 C, 200 MHz	3726.01 (641933)	3804.99 (653566)	N/A	N/A	3926.98 (656332)
NR Band n71 C, 210 MHz	3726.01 (641933)	3804.99 (653566)	N/A	N/A	3926.98 (656332)
NR Band n71 C, 220 MHz	3726.01 (641933)	3804.99 (653566)	N/A	N/A	3926.98 (656332)
NR Band n71 C, 230 MHz	3726.01 (641933)	3804.99 (653566)	N/A	N/A	3926.98 (656332)
NR Band n71 C, 240 MHz	3726.01 (641933)	3804.99 (653566)	N/A	N/A	3926.98 (656332)
NR Band n71 C, 250 MHz	3726.01 (641933)	3804.99 (653566)	N/A	N/A	3926.98 (656332)
NR Band n71 C, 260 MHz	3726.01 (641933)	3804.99 (653566)	N/A	N/A	3926.98 (656332)
NR Band n71 C, 270 MHz	3726.01 (641933)	3804.99 (653566)	N/A	N/A	3926.98 (656332)
NR Band n71 C, 280 MHz	3726.01 (641933)	3804.99 (653566)	N/A	N/A	3926.98 (656332)
NR Band n71 C, 290 MHz	3726.01 (641933)	3804.99 (653566)	N/A	N/A	3926.98 (656332)
NR Band n71 C, 300 MHz	3726.01 (641933)	3804.99 (653566)	N/A	N/A	3926.98 (656332)
NR Band n71 C, 310 MHz	3726.01 (641933)	3804.99 (653566)	N/A	N/A	3926.98 (656332)
NR Band n71 C, 320 MHz	3726.01 (641933)	3804.99 (653566)	N/A	N/A	3926.98 (656332)
NR Band n71 C, 330 MHz	3726.01 (641933)	3804.99 (653566)	N/A	N/A	3926.98 (656332)
NR Band n71 C, 340 MHz	3726.01 (641933)	3804.99 (653566)	N/A	N/A	3926.98 (656332)
NR Band n71 C, 350 MHz	3726.01 (641933)	3804.99 (653566)	N/A	N/A	3926.98 (656332)
NR Band n71 C, 360 MHz	3726.01 (641933)	3804.99 (653566)	N/A	N/A	3926.98 (656332)
NR Band n71 C, 370 MHz	3726.01 (641933)	3804.99 (653566)	N/A	N/A	3926.98 (656332)
NR Band n71 C, 380 MHz	3726.01 (641933)	3804.99 (653566)	N/A	N/A	3926.98 (656332)
NR Band n71 C, 390 MHz	3726.01 (641933)	3804.99 (653566)	N/A	N/A	3926.98 (656332)
NR Band n71 C, 400 MHz	3726.01 (641933)	3804.99 (653566)	N/A	N/A	3926.98 (656332)
NR Band n71 C, 410 MHz	3726.01 (641933)	3804.99 (653566)	N/A	N/A	3926.98 (656332)
NR Band n71 C, 420 MHz	3726.01 (641933)	3804.99 (653566)	N/A	N/A	3926.98 (656332)
NR Band n71 C, 430 MHz	3726.01 (641933)	3804.99 (653566)	N/A	N/A	3926.98 (656332)
NR Band n71 C, 440 MHz	3726.01 (641933)	3804.99 (653566)	N/A	N/A	3926.98 (656332)
NR Band n71 C, 450 MHz	3726.01 (641933)	3804.99 (653566)	N/A	N/A	3926.98 (656332)
NR Band n71 C, 460 MHz	3726.01 (641933)	3804.99 (653566)	N/A	N/A	3926.98 (656332)
NR Band n71 C, 470 MHz	3726.01 (641933)	3804.99 (653566)	N/A	N/A	3926.98 (656332)
NR Band n71 C, 480 MHz	3726.01 (641933)	3804.99 (653566)	N/A	N/A	3926.98 (656332)
NR Band n71 C, 490 MHz	3726.01 (641933)	3804.99 (653566)	N/A	N/A	3926.98 (656332)
NR Band n71 C, 500 MHz	3726.01 (641933)	3804.99 (653566)	N/A	N/A	3926.98 (656332)
NR Band n71 C, 510 MHz	3726.01 (641933)	3804.99 (653566)	N/A	N/A	3926.98 (656332)
NR Band n71 C, 520 MHz	3726.01 (641933)	3804.99 (653566)	N/A	N/A	3926.98 (656332)
NR Band n71 C, 530 MHz	3726.01 (641933)	3804.99 (653566)	N/A	N/A	3926.98 (656332)
NR Band n71 C, 540 MHz	3726.01 (641933)	3804.99 (653566)	N/A	N	

3 INTRODUCTION

The FCC and Innovation, Science, and Economic Development Canada have adopted the guidelines for evaluating the environmental effects of radio frequency (RF) radiation in ET Docket 93-62 on Aug. 6, 1996 and Health Canada Safety Code 6 to protect the public and workers from the potential hazards of RF emissions due to FCC-regulated portable devices. [1]

The safety limits used for the environmental evaluation measurements are based on the criteria published by the American National Standards Institute (ANSI) for localized specific absorption rate (SAR) in IEEE/ANSI C95.1-1992 Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz [3] and Health Canada RF Exposure Guidelines Safety Code 6 [22]. The measurement procedure described in IEEE/ANSI C95.3-2002 Recommended Practice for the Measurement of Potentially Hazardous Electromagnetic Fields - RF and Microwave [4] is used for guidance in measuring the Specific Absorption Rate (SAR) due to the RF radiation exposure from the Equipment Under Test (EUT). These criteria for SAR evaluation are similar to those recommended by the International Committee for Non-Ionizing Radiation Protection (ICNIRP) in Biological Effects and Exposure Criteria for Radiofrequency Electromagnetic Fields,” Report No. Vol 74. SAR is a measure of the rate of energy absorption due to exposure to an RF transmitting source. SAR values have been related to threshold levels for potential biological hazards.

3.1 SAR Definition

Specific Absorption Rate is defined as the time derivative (rate) of the incremental energy (dU) absorbed by (dissipated in) an incremental mass (dm) contained in a volume element (dV) of a given density (ρ). It is also defined as the rate of RF energy absorption per unit mass at a point in an absorbing body (see Equation 3-1).

Equation 3-1
SAR Mathematical Equation

$$SAR = \frac{d}{dt} \left(\frac{dU}{dm} \right) = \frac{d}{dt} \left(\frac{dU}{\rho dv} \right)$$

SAR is expressed in units of Watts per Kilogram (W/kg).

$$SAR = \frac{\sigma \cdot E^2}{\rho}$$

where:

- σ = conductivity of the tissue-simulating material (S/m)
- ρ = mass density of the tissue-simulating material (kg/m³)
- E = Total RMS electric field strength (V/m)

NOTE: The primary factors that control rate of energy absorption were found to be the wavelength of the incident field in relation to the dimensions and geometry of the irradiated organism, the orientation of the organism in relation to the polarity of field vectors, the presence of reflecting surfaces, and whether conductive contact is made by the organism with a ground plane.[6]

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4 DOSIMETRIC ASSESSMENT

4.1 Measurement Procedure

The evaluation was performed using the following procedure compliant to FCC KDB Publication 865664 D01v01r04 and IEEE 1528-2013:

1. The SAR distribution at the exposed side of the head or body was measured at a distance no greater than 5.0 mm from the inner surface of the shell. The area covered the entire dimension of the device-head and body interface and the horizontal grid resolution was determined per FCC KDB Publication 865664 D01v01r04 (See Table 4-1) and IEEE 1528-2013.
2. The point SAR measurement was taken at the maximum SAR region determined from Step 1 to enable the monitoring of SAR fluctuations/drifts during the 1g/10g cube evaluation. SAR at this fixed point was measured and used as a reference value.
3. Based on the area scan data, the peak of the region with maximum SAR was determined by spline interpolation. Around this point, a volume was assessed according to the measurement resolution and volume size requirements of FCC KDB Publication 865664 D01v01r04 (See Table 4-1) and IEEE 1528-2013. On the basis of this data set, the spatial peak SAR value was evaluated with the following procedure (see references or the DASY manual online for more details):
 - a. SAR values at the inner surface of the phantom are extrapolated from the measured values along the line away from the surface with spacing no greater than that in Table 4-1. The extrapolation was based on a least-squares algorithm. A polynomial of the fourth order was calculated through the points in the z-axis (normal to the phantom shell).
 - b. After the maximum interpolated values were calculated between the points in the cube, the SAR was averaged over the spatial volume (1g or 10g) using a 3D-Spline interpolation algorithm. The 3D-spline is composed of three one-dimensional splines with the “Not a knot” condition (in x, y, and z directions). The volume was then integrated with the trapezoidal algorithm. One thousand points (10 x 10 x 10) were obtained through interpolation, in order to calculate the averaged SAR.
 - c. All neighboring volumes were evaluated until no neighboring volume with a higher average value was found.
4. The SAR reference value, at the same location as step 2, was re-measured after the zoom scan was complete to calculate the SAR drift. If the drift deviated by more than 5%, the SAR test and drift measurements were repeated.

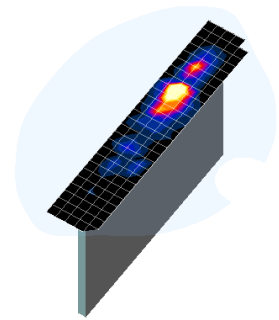


Figure 4-1
Sample SAR Area
Scan

Table 4-1
Area and Zoom Scan Resolutions per FCC KDB Publication 865664 D01v01r04*

Frequency	Maximum Area Scan Resolution (mm) ($\Delta x_{\text{area}}, \Delta y_{\text{area}}$)	Maximum Zoom Scan Resolution (mm) ($\Delta x_{\text{zoom}}, \Delta y_{\text{zoom}}$)	Maximum Zoom Scan Spatial Resolution (mm)			Minimum Zoom Scan Volume (mm) (x,y,z)
			Uniform Grid	Graded Grid		
				$\Delta z_{\text{zoom}}(n)$	$\Delta z_{\text{zoom}}(1)^*$	
≤ 2 GHz	≤ 15	≤ 8	≤ 5	≤ 4	$\leq 1.5^* \Delta z_{\text{zoom}}(n-1)$	≥ 30
2-3 GHz	≤ 12	≤ 5	≤ 5	≤ 4	$\leq 1.5^* \Delta z_{\text{zoom}}(n-1)$	≥ 30
3-4 GHz	≤ 12	≤ 5	≤ 4	≤ 3	$\leq 1.5^* \Delta z_{\text{zoom}}(n-1)$	≥ 28
4-5 GHz	≤ 10	≤ 4	≤ 3	≤ 2.5	$\leq 1.5^* \Delta z_{\text{zoom}}(n-1)$	≥ 25
5-6 GHz	≤ 10	≤ 4	≤ 2	≤ 2	$\leq 1.5^* \Delta z_{\text{zoom}}(n-1)$	≥ 22

*Also compliant to IEEE 1528-2013 Table 6

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5 TEST CONFIGURATION POSITIONS

5.1 Device Holder

The device holder is made out of low-loss POM material having the following dielectric parameters: relative permittivity $\epsilon = 3$ and loss tangent $\delta = 0.02$.

5.2 SAR Testing for Tablet per KDB Publication 616217 D04v01r02

Per FCC KDB Publication 616217 D04v01r02, the back surface and edges of the tablet should be tested for SAR compliance with the tablet touching the phantom. The SAR Exclusion Threshold in KDB 447498 D01v06 can be applied to determine SAR test exclusion for adjacent edge configurations. The closest distance from the antenna to an adjacent tablet edge is used to determine if SAR testing is required for the adjacent edges, with the adjacent edge positioned against the phantom and the edge containing the antenna positioned perpendicular to the phantom.

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6 RF EXPOSURE LIMITS

6.1 Uncontrolled Environment

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

6.2 Controlled Environment

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

Table 6-1
SAR Human Exposure Specified in ANSI/IEEE C95.1-1992 and Health Canada Safety Code 6

HUMAN EXPOSURE LIMITS		
	UNCONTROLLED ENVIRONMENT <i>General Population</i> (W/kg) or (mW/g)	CONTROLLED ENVIRONMENT <i>Occupational</i> (W/kg) or (mW/g)
Peak Spatial Average SAR Head	1.6	8.0
Whole Body SAR	0.08	0.4
Peak Spatial Average SAR Hands, Feet, Ankle, Wrists, etc.	4.0	20

1. The Spatial Peak value of the SAR averaged over any 1 gram of tissue (defined as a tissue volume in the shape of a cube) and over the appropriate averaging time.
2. The Spatial Average value of the SAR averaged over the whole body.
3. The Spatial Peak value of the SAR averaged over any 10 grams of tissue (defined as a tissue volume in the shape of a cube) and over the appropriate averaging time.

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7 FCC MEASUREMENT PROCEDURES

7.1 Measured and Reported SAR

Per FCC KDB Publication 447498 D01v06, when SAR is not measured at the maximum power level allowed for production units, the results must be scaled to the maximum tune-up tolerance limit according to the power applied to the individual channels tested to determine compliance. For simultaneous transmission, the measured aggregate SAR must be scaled according to the sum of the differences between the maximum tune-up tolerance and actual power used to test each transmitter. When SAR is measured at or scaled to the maximum tune-up tolerance limit, the results are referred to as *reported* SAR. The highest *reported* SAR results are identified on the grant of equipment authorization according to procedures in KDB 690783 D01v01r03.

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8 RF CONDUCTED POWERS

All conducted power measurements for 5G Sub6 WWAN technologies and bands in this section were performed by setting Reserve power margin (Qualcomm® Smart Transmit EFS entry) to 0dB, so that the EUT transmits continuously at minimum (Plimit, maximum tune up output power Pmax).

Note: Lower bandwidth conducted powers for all NR bands can be found in NR Lower Bandwidth RF Conducted Powers Appendix.

Notes: Per October 2020 TCB Workshop Guidance, NR FR1 SAR evaluations are being generally based on adapting the existing LTE SAR procedures (FCC KDB Publication 941225 D05v02r05). Therefore, NR SAR for the lower bandwidths was not required for testing based on the measured output power and the reported NR SAR for the highest bandwidth. Lower bandwidth conducted powers for all NR bands can be found in NR Lower Bandwidths RF Conducted Powers Appendix. Some bands do not support non-overlapping channels. Per FCC Guidance, 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.

8.1 NR Band n48

Table 8-1
NR Band n48 Measured P_{Limit} Antenna 1 - 40 MHz Bandwidth

NR Band n48 40 MHz Bandwidth							
			Channel			MPR Allowed per 3GPP [dB]	MPR [dB]
Modulation	RB Size	RB Offset	638000 (3570 MHz)	641666 (3624.99 MHz)	645332 (3679.98 MHz)		
			Conducted Power [dBm]				
DFT-s-OFDM $\pi/2$ BPSK	1	1	11.59	11.05	11.32	0	0.0
	1	53	11.05	11.07	11.37		0.0
	1	104	11.12	11.10	11.26		0.0
	50	0	11.05	11.05	11.35	0-0.5	0.0
	50	28	11.01	10.98	11.28	0	0.0
	50	56	10.98	10.96	11.16	0-0.5	0.0
	100	0	11.02	11.02	11.24		0.0
DFT-s-OFDM QPSK	1	1	11.58	11.10	11.40	0	0.0
	1	53	11.04	10.96	11.34		0.0
	1	104	11.14	11.18	11.22		0.0
	50	0	10.98	11.01	11.36	0-1	0.0
	50	28	11.00	10.99	11.27	0	0.0
	50	56	10.97	11.00	11.18	0-1	0.0
	100	0	11.00	11.01	11.29		0.0
DFT-s-OFDM 16QAM	1	1	11.74	11.41	11.51	0-1	0.0
CP-OFDM QPSK	1	1	11.49	10.98	11.25	0-1.5	0.0

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8.1.1

NR Band n48

Table 8-2
NR Band n48 Measured P_{Limit} Antenna 2a - 40 MHz Bandwidth

NR Band n48 40 MHz Bandwidth							
			Channel			MPR Allowed per 3GPP [dB]	MPR [dB]
Modulation	RB Size	RB Offset	638000 (3570 MHz)	641666 (3624.99 MHz)	645332 (3679.98 MHz)		
			Conducted Power [dBm]				
DFT-s-OFDM $\pi/2$ BPSK	1	1	10.72	10.65	10.61	0	0.0
	1	53	10.66	10.48	10.52		0.0
	1	104	10.71	10.59	10.50		0.0
	50	0	10.67	10.49	10.48	0-0.5	0.0
	50	28	10.64	10.44	10.43	0	0.0
	50	56	10.62	10.37	10.37	0-0.5	0.0
	100	0	10.67	10.47	10.52		0.0
DFT-s-OFDM QPSK	1	1	10.73	10.62	10.77	0	0.0
	1	53	10.76	10.57	10.52		0.0
	1	104	10.97	10.84	10.50		0.0
	50	0	10.89	10.71	10.71	0-1	0.0
	50	28	10.63	10.42	10.44	0	0.0
	50	56	10.60	10.40	10.40	0-1	0.0
	100	0	10.65	10.45	10.50		0.0
DFT-s-OFDM 16QAM	1	1	10.95	10.86	10.75	0-1	0.0
FD-M SK	1	1	10.65	10.57	10.48	0-1.5	0.0

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8.1.2

NR Band n48

Table 8-3
NR Band n48 Measured P_{Limit} Antenna 3 - 40 MHz Bandwidth

NR Band n48 40 MHz Bandwidth							
			Channel			MPR Allowed per 3GPP [dB]	MPR [dB]
Modulation	RB Size	RB Offset	638000 (3570 MHz)	641666 (3624.99 MHz)	645332 (3679.98 MHz)		
			Conducted Power [dBm]				
DFT-s-OFDM $\pi/2$ BPSK	1	1	11.13	11.25	11.31	0	0.0
	1	53	11.11	11.19	11.22		0.0
	1	104	11.29	11.24	11.16		0.0
	50	0	11.12	11.23	11.25	0-0.5	0.0
	50	28	11.07	11.17	11.14	0	0.0
	50	56	11.13	11.13	11.04	0-0.5	0.0
	100	0	11.14	11.21	11.13		0.0
DFT-s-OFDM QPSK	1	1	11.16	11.43	11.54	0	0.0
	1	53	11.21	11.20	11.16		0.0
	1	104	11.40	11.26	11.17		0.0
	50	0	11.25	11.32	11.44	0-1	0.0
	50	28	11.11	11.17	11.14	0	0.0
	50	56	11.13	11.11	11.05	0-1	0.0
	100	0	11.08	11.19	11.37		0.0
DFT-s-OFDM 16QAM	1	1	11.33	11.48	11.54	0-1	0.0
CP-OFDM QPSK	1	1	11.10	11.21	11.46	0-1.5	0.0

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8.1.3

NR Band n48

Table 8-4
NR Band n48 Measured P_{Limit} Antenna 4b - 40 MHz Bandwidth

NR Band n48 40 MHz Bandwidth							
			Channel			MPR Allowed per 3GPP [dB]	MPR [dB]
Modulation	RB Size	RB Offset	638000 (3570 MHz)	641666 (3624.99 MHz)	645332 (3679.98 MHz)		
			Conducted Power [dBm]				
DFT-s-OFDM $\pi/2$ BPSK	1	1	10.65	10.48	10.52	0	0.0
	1	53	10.40	10.29	10.65		0.0
	1	104	10.50	10.33	10.53		0.0
	50	0	10.28	10.29	10.59	0-0.5	0.0
	50	28	10.33	10.24	10.60	0	0.0
	50	56	10.36	10.25	10.52	0-0.5	0.0
	100	0	10.30	10.29	10.60		0.0
DFT-s-OFDM QPSK	1	1	10.70	10.44	10.53	0	0.0
	1	53	10.37	10.32	10.65		0.0
	1	104	10.46	10.50	10.55		0.0
	50	0	10.35	10.28	10.65	0-1	0.0
	50	28	10.28	10.24	10.60	0	0.0
	50	56	10.31	10.26	10.52	0-1	0.0
	100	0	10.31	10.31	10.56		0.0
DFT-s-OFDM 16QAM	1	1	10.92	10.65	10.74	0-1	0.0
CP-OFDM QPSK	1	1	10.61	10.29	10.42	0-1.5	0.0

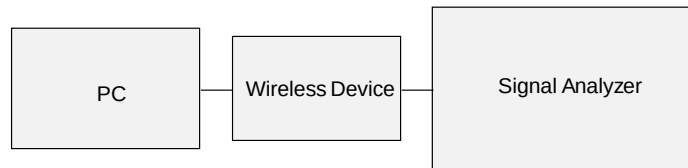


Figure 8-1
Power Measurement Setup

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9 SYSTEM VERIFICATION

9.1 Tissue Verification

Table 9-1
Measured Tissue Properties

Calibrated for Tests Performed on	Tissue Type	Tissue Temp During Calibration (°C)	Measured Frequency (MHz)	Measured Conductivity, σ (S/m)	Measured Dielectric Constant, ϵ	Target Conductivity, σ (S/M)	Target Dielectric Constant, ϵ	% dev σ	% dev ϵ
07/10/2022	3600 Head	21.4	3300	2.760	36.732	2.708	38.157	1.92%	-3.73%
			3350	2.801	36.679	2.759	38.100	1.52%	-3.73%
			3450	2.874	36.566	2.861	37.986	0.45%	-3.74%
			3500	2.910	36.480	2.913	37.929	-0.10%	-3.82%
			3550	2.947	36.443	2.964	37.871	-0.57%	-3.77%
			3560	2.954	36.421	2.974	37.860	-0.67%	-3.80%
			3600	2.985	36.372	3.015	37.814	-1.00%	-3.81%
			3650	3.023	36.294	3.066	37.757	-1.40%	-3.87%
			3690	3.053	36.251	3.107	37.711	-1.74%	-3.87%
			3700	3.062	36.235	3.117	37.700	-1.76%	-3.89%
			3750	3.102	36.184	3.169	37.643	-2.11%	-3.88%
			3900	3.225	36.003	3.323	37.471	-2.95%	-3.92%
			3930	3.257	35.959	3.353	37.437	-2.86%	-3.95%
			4100	3.399	35.772	3.528	37.243	-3.66%	-3.95%
			4150	3.444	35.728	3.579	37.186	-3.77%	-3.92%

The above measured tissue parameters were used in the DASY software. The DASY software was used to perform interpolation to determine the dielectric parameters at the SAR test device frequencies (per KDB Publication 865664 D01v01r04 and IEEE 1528-2013 6.6.1.2). The tissue parameters listed in the SAR test plots may slightly differ from the table above due to significant digit rounding in the software.

Note: Per April 2019 TCB Workshop Notes, single head-tissue simulating liquid specified in IEC 62209-1 is permitted to use for all SAR tests.

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9.2 Test System Verification

Prior to SAR assessment, the system is verified to $\pm 10\%$ of the SAR measurement on the reference dipole at the time of calibration by the calibration facility. Full system validation status and result summary can be found in the System Validation Appendix.

Table 9-2
System Verification Results – 1g

System Verification TARGET & MEASURED												
SAR System	Tissue Frequency (MHz)	Tissue Type	Date	Amb. Temp. (C)	Liquid Temp. (C)	Input Power (W)	Source SN	Probe SN	Measured SAR1g (W/kg)	1W Target SAR1g (W/kg)	1W Normalized SAR 1g (W/kg)	Deviation1g (%)
AM1	3500	HEAD	07/10/2022	21.6	20.6	0.10	1055	7639	6.840	67.80	68.400	0.88%
AM1	3700	HEAD	07/10/2022	21.6	20.6	0.10	1002	7639	6.730	68.80	67.300	-2.18%

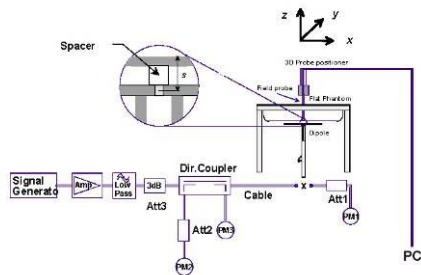


Figure 9-1 System Verification Setup Diagram



Figure 9-2
System Verification Setup Photo

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10 SAR DATA SUMMARY

10.1 Standalone SAR Data

Table 10-1
NR Band n48 Ant 1 Body SAR

MEASUREMENT RESULTS																						
FREQUENCY		Site	Spacing	Mode	Antenna Config	Serial Number	Bandwidth (MHz)	Waveform	Modulation	RB Size	RB Offset	Maximum Allowed Power (dBm)	Conducted Power (dBm)	MPE (dB)	Power Dens. (dB)	Duty Cycle	SAR (dB)		Reported SAR (dB)	SAR (W/kg)	Reported SAR (W/kg)	Pass/Fail
Mhz	Ch																(W/kg)	Scaling Factor				
3570.00	838003	Low	back	0 mm	NR Band n48	Ant 1	QLW5530N0L	40	DTT-G-OFDM	QPSK	1	1	12.00	11.58	0	-0.06	1.1	0.633	1.002	0.633	0.633	0.633
3524.00	841600	Mid	back	0 mm	NR Band n48	Ant 1	QLW5530N0L	40	DTT-G-OFDM	QPSK	1	104	12.00	11.18	0	-0.80	1.1	0.635	1.208	0.761	0.761	0.842
3579.00	845332	High	back	0 mm	NR Band n48	Ant 1	QLW5530N0L	40	DTT-G-OFDM	QPSK	1	1	12.00	11.40	0	-0.60	1.1	0.650	1.146	0.746	0.746	0.817
3570.00	838003	Low	back	0 mm	NR Band n48	Ant 1	QLW5530N0L	40	DTT-G-OFDM	QPSK	50	28	12.00	11.40	0	-0.05	1.1	0.606	1.259	0.763	0.763	0.817
3524.00	841600	Mid	back	0 mm	NR Band n48	Ant 1	QLW5530N0L	40	DTT-G-OFDM	QPSK	50	0	12.00	11.01	0	-0.99	1.1	0.666	1.266	0.826	0.826	0.845
3579.00	845332	High	back	0 mm	NR Band n48	Ant 1	QLW5530N0L	40	DTT-G-OFDM	QPSK	50	0	12.00	11.36	0	0.01	1.1	0.653	1.159	0.841	0.841	0.847
3579.00	845332	High	back	0 mm	NR Band n48	Ant 1	QLW5530N0L	40	DTT-G-OFDM	QPSK	100	0	12.00	11.29	0	-0.62	1.1	0.612	1.178	0.721	0.721	0.836
3570.00	838003	Low	back	0 mm	NR Band n48	Ant 1	QLW5530N0L	40	CP-OFDM	QPSK	1	1	12.00	11.49	0	0.11	1.1	0.638	1.125	0.707	0.707	0.849
3570.00	838003	Low	top	0 mm	NR Band n48	Ant 1	QLW5530N0L	40	DTT-G-OFDM	QPSK	1	1	12.00	11.58	0	0.03	1.1	0.660	1.102	0.660	0.660	0.850
3579.00	845332	High	top	0 mm	NR Band n48	Ant 1	QLW5530N0L	40	DTT-G-OFDM	QPSK	50	0	12.00	11.36	0	0.64	1.1	0.666	1.159	0.800	0.800	0.850
3570.00	838003	Low	bottom	0 mm	NR Band n48	Ant 1	QLW5530N0L	40	DTT-G-OFDM	QPSK	1	1	12.00	11.58	0	-0.07	1.1	0.646	1.102	0.602	0.602	0.842
3524.00	841600	Mid	bottom	0 mm	NR Band n48	Ant 1	QLW5530N0L	40	DTT-G-OFDM	QPSK	1	104	12.00	11.18	0	0.02	1.1	0.611	1.208	0.817	0.817	0.845
3579.00	845332	High	bottom	0 mm	NR Band n48	Ant 1	QLW5530N0L	40	DTT-G-OFDM	QPSK	1	1	12.00	11.40	0	0.02	1.1	0.635	1.146	0.814	0.814	0.845
3570.00	838003	Low	bottom	0 mm	NR Band n48	Ant 1	QLW5530N0L	40	DTT-G-OFDM	QPSK	50	28	12.00	11.00	0	0.06	1.1	0.480	1.259	0.804	0.804	0.841
3524.00	841600	Mid	bottom	0 mm	NR Band n48	Ant 1	QLW5530N0L	40	DTT-G-OFDM	QPSK	50	0	12.00	11.01	0	-0.99	1.1	0.666	1.266	0.826	0.826	0.847
3579.00	845332	High	bottom	0 mm	NR Band n48	Ant 1	QLW5530N0L	40	DTT-G-OFDM	QPSK	50	0	12.00	11.36	0	0.04	1.1	0.626	1.159	0.807	0.807	0.842
3579.00	845332	High	bottom	0 mm	NR Band n48	Ant 1	QLW5530N0L	40	DTT-G-OFDM	QPSK	100	0	12.00	11.29	0	-0.60	1.1	0.598	1.178	0.598	0.598	0.850
3570.00	838003	Low	right	0 mm	NR Band n48	Ant 1	QLW5530N0L	40	DTT-G-OFDM	QPSK	1	1	12.00	11.58	0	0.00	1.1	0.660	1.102	0.660	0.660	0.850
3579.00	845332	High	right	0 mm	NR Band n48	Ant 1	QLW5530N0L	40	DTT-G-OFDM	QPSK	50	0	12.00	11.36	0	0.02	1.1	0.606	1.159	0.606	0.606	0.850
3570.00	838003	Low	left	0 mm	NR Band n48	Ant 1	QLW5530N0L	40	DTT-G-OFDM	QPSK	1	1	12.00	11.58	0	-0.90	1.1	0.708	1.102	0.708	0.708	0.850
3579.00	845332	High	left	0 mm	NR Band n48	Ant 1	QLW5530N0L	40	DTT-G-OFDM	QPSK	50	0	12.00	11.36	0	-0.90	1.1	0.708	1.159	0.708	0.708	0.850
AND / IEEE C95.1-1982 - SAR KEY										Body												
Spatial Peak										1.6 W/kg (avg)												
Uncontrolled Exposure/General Population										averaged over 1 gram												

Table 10-2
NR Band n48 Ant 2a Body SAR

MEASUREMENT RESULTS																					
FREQUENCY		Site	Spacing	Mode	Antenna Config	Serial Number	Bandwidth (MHz)	Waveform	Modulation	RB Size	RB Offset	Maximum Allowed Power (dBm)	Conducted Power (dBm)	MPE (dB)	Power Dens. (dB)	Duty Cycle	SAR (dB)		Reported SAR (dB)	Pass/Fail	
Mhz	Ch																(W/kg)	Scaling Factor			(W/kg)
3570.00	838003	Low	back	0 mm	NR Band n48	Ant 2a	QLW5530N0L	40	DTT-G-OFDM	QPSK	1	104	11.50	10.97	0	0.01	1.1	0.767	1.130	0.916	Pass
3524.00	841600	Mid	back	0 mm	NR Band n48	Ant 2a	QLW5530N0L	40	DTT-G-OFDM	QPSK	1	104	11.50	10.84	0	0.00	1.1	0.753	1.164	0.913	Pass
3579.00	845332	High	back	0 mm	NR Band n48	Ant 2a	QLW5530N0L	40	DTT-G-OFDM	QPSK	1	2	11.50	10.77	0	0.04	1.1	0.759	1.183	0.916	Pass
3570.00	838003	Low	back	0 mm	NR Band n48	Ant 2a	QLW5530N0L	40	DTT-G-OFDM	QPSK	50	0	11.50	10.69	0	0.08	1.1	0.748	1.151	0.881	Pass
3524.00	841600	Mid	back	0 mm	NR Band n48	Ant 2a	QLW5530N0L	40	DTT-G-OFDM	QPSK	50	0	11.50	10.71	0	-0.01	1.1	0.738	1.189	0.885	Pass
3579.00	845332	High	back	0 mm	NR Band n48	Ant 2a	QLW5530N0L	40	DTT-G-OFDM	QPSK	50	0	11.50	10.71	0	0.00	1.1	0.682	1.189	0.810	Pass
3570.00	838003	Low	back	0 mm	NR Band n48	Ant 2a	QLW5530N0L	40	DTT-G-OFDM	QPSK	100	0	11.50	10.65	0	0.00	1.1	0.764	1.216	0.929	Pass
3570.00	838003	Low	top	0 mm	NR Band n48	Ant 2a	QLW5530N0L	40	DTT-G-OFDM	QPSK	1	104	11.50	10.97	0	-0.14	1.1	0.695	1.130	0.695	Pass
3570.00	838003	Low	top	0 mm	NR Band n48	Ant 2a	QLW5530N0L	40	DTT-G-OFDM	QPSK	50	0	11.50	10.69	0	0.06	1.1	0.696	1.151	0.697	Pass
3570.00	838003	Low	bottom	0 mm	NR Band n48	Ant 2a	QLW5530N0L	40	DTT-G-OFDM	QPSK	1	104	11.50	10.97	0	-0.01	1.1	0.764	1.130	0.768	Pass
3570.00	838003	Low	bottom	0 mm	NR Band n48	Ant 2a	QLW5530N0L	40	DTT-G-OFDM	QPSK	50	0	11.50	10.69	0	-0.02	1.1	0.762	1.151	0.762	Pass
3570.00	838003	Low	right	0 mm	NR Band n48	Ant 2a	QLW5530N0L	40	DTT-G-OFDM	QPSK	1	104	11.50	10.97	0	0.01	1.1	0.804	1.130	0.809	Pass
3524.00	841600	Mid	right	0 mm	NR Band n48	Ant 2a	QLW5530N0L	40	DTT-G-OFDM	QPSK	1	104	11.50	10.84	0	0.01	1.1	0.788	1.164	0.915	Pass
3579.00	845332	High	right	0 mm	NR Band n48	Ant 2a	QLW5530N0L	40	DTT-G-OFDM	QPSK	1	2	11.50	10.77	0	0.01	1.1	0.788	1.183	0.916	Pass
3570.00	838003	Low	right	0 mm	NR Band n48	Ant 2a	QLW5530N0L	40	DTT-G-OFDM	QPSK	50	0	11.50	10.69	0	0.01	1.1	0.762	1.151	0.812	Pass
3524.00	841600	Mid	right	0 mm	NR Band n48	Ant 2a	QLW5530N0L	40	DTT-G-OFDM	QPSK	50	0	11.50	10.71	0	-0.02	1.1	0.740	1.199	0.887	Pass
3579.00	845332	High	right	0 mm	NR Band n48	Ant 2a	QLW5530N0L	40	DTT-G-OFDM	QPSK	50	0	11.50	10.71	0	0.01	1.1	0.772	1.209	0.917	Pass
3570.00	838003	Low	right	0 mm	NR Band n48	Ant 2a	QLW5530N0L	40	DTT-G-OFDM	QPSK	100	0	11.50	10.65	0	-0.02	1.1	0.777	1.216	0.916	Pass
3570.00	838003	Low	right	0 mm	NR Band n48	Ant 2a	QLW5530N0L	40	CP-OFDM	QPSK	1	1	11.50	10.65	0	-0.03	1.1	0.759	1.216	0.886	Pass
3570.00	838003	Low	left	0 mm	NR Band n48	Ant 2a	QLW5530N0L	40	DTT-G-OFDM	QPSK	1	104	11.50	10.97	0	0.00	1.1	0.690	1.130	0.690	Pass
3570.00	838003	Low	left	0 mm	NR Band n48	Ant 2a	QLW5530N0L	40	DTT-G-OFDM	QPSK	50	0	11.50	10.69	0	0.04	1.1	0.690	1.151	0.690	Pass
3570.00	838003	Low	right	0 mm	NR Band n48	Ant 2a	QLW5530N0L	40	DTT-G-OFDM	QPSK	1	104	11.50	10.97	0	0.04	1.1	0.750	1.130	0.846	Pass
AND / IEEE C95.1-1992 - SAFETY LIMIT										Body											
Spatial Peak										1.6 W/kg (avg)											
Uncontrolled Exposure/General Population										averaged over 1 gram											

Note: Blue entry represents variability measurement.

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Table 10-3
NR Band n48 Ant 3 Body SAR

MEASUREMENT RESULTS																						
FREQUENCY		Site	Spacing	Mode	Antenna Config	Serial Number	Bandwidth (MHz)	Waveform	Modulation	RB Size	RB Offset	Maximum Allowed Power (dBm)	Conducted Power (dBm)	MPE (dB)	Power Dens. (mW/kg)	Duty Cycle	SAR (dB)	Scaling Factor	Reported SAR (dB)	SAR (dB)	Reported SAR (dB)	Pass
Min	Ch																					
3570.00	838000	Low	back	0 mm	NR Band n48	Ant 3	FT06330VYK	40	DTT-G-OFDM	QPSK	1	104	12.20	12.40	0.00	0.00	1.1	0.671	1.202	0.807	0.171	0.206
3524.09	841605	Mid	back	0 mm	NR Band n48	Ant 3	FT06330VYK	40	DTT-G-OFDM	QPSK	1	1	12.20	12.43	0.00	0.08	1.1	0.679	1.184	0.810	0.172	0.205
3579.98	845332	High	back	0 mm	NR Band n48	Ant 3	FT06330VYK	40	DTT-G-OFDM	QPSK	1	1	12.20	12.54	0.00	-0.03	1.1	0.713	1.184	0.810	0.178	0.207
3570.00	838000	Low	back	0 mm	NR Band n48	Ant 3	FT06330VYK	40	DTT-G-OFDM	QPSK	50	0	12.20	12.25	0.00	0.06	1.1	0.630	1.249	0.786	0.161	0.200
3524.09	841605	Mid	back	0 mm	NR Band n48	Ant 3	FT06330VYK	40	DTT-G-OFDM	QPSK	50	0	12.20	12.32	0.00	-0.02	1.1	0.670	1.225	0.821	0.169	0.207
3579.98	845332	High	back	0 mm	NR Band n48	Ant 3	FT06330VYK	40	DTT-G-OFDM	QPSK	50	0	12.20	12.48	0.00	-0.07	1.1	0.686	1.181	0.829	0.174	0.207
3579.98	845332	High	back	0 mm	NR Band n48	Ant 3	FT06330VYK	40	DTT-G-OFDM	QPSK	100	0	12.20	12.37	0.00	0.01	1.1	0.771	1.211	0.814	0.180	0.210
3579.98	845332	High	back	0 mm	NR Band n48	Ant 3	FT06330VYK	40	CP-OFDM	QPSK	1	1	12.20	12.46	0.00	-0.05	1.1	0.712	1.188	0.844	0.177	0.210
3570.00	838000	Low	top	0 mm	NR Band n48	Ant 3	FT06330VYK	40	DTT-G-OFDM	QPSK	1	104	12.20	12.40	0.00	-0.04	1.1	0.685	1.202	0.809	0.158	0.154
3524.09	841605	Mid	top	0 mm	NR Band n48	Ant 3	FT06330VYK	40	DTT-G-OFDM	QPSK	1	1	12.20	12.43	0.00	-0.02	1.1	0.652	1.194	0.840	0.123	0.147
3579.98	845332	High	top	0 mm	NR Band n48	Ant 3	FT06330VYK	40	DTT-G-OFDM	QPSK	1	1	12.20	12.54	0.00	-0.13	1.1	0.538	1.184	0.804	0.140	0.163
3570.00	838000	Low	top	0 mm	NR Band n48	Ant 3	FT06330VYK	40	DTT-G-OFDM	QPSK	50	0	12.20	12.25	0.00	-0.05	1.1	0.680	1.245	0.860	0.123	0.152
3524.09	841605	Mid	top	0 mm	NR Band n48	Ant 3	FT06330VYK	40	DTT-G-OFDM	QPSK	50	0	12.20	12.35	0.00	-0.05	1.1	0.677	1.225	0.884	0.126	0.158
3579.98	845332	High	top	0 mm	NR Band n48	Ant 3	FT06330VYK	40	DTT-G-OFDM	QPSK	50	0	12.20	12.44	0.00	0.07	1.1	0.524	1.201	0.824	0.140	0.167
3579.98	845332	High	top	0 mm	NR Band n48	Ant 3	FT06330VYK	40	DTT-G-OFDM	QPSK	100	0	12.20	12.37	0.00	-0.02	1.1	0.600	1.211	0.868	0.127	0.166
3579.98	845332	High	bottom	0 mm	NR Band n48	Ant 3	QLW05330VYK	40	DTT-G-OFDM	QPSK	1	1	12.20	12.54	0.00	0.07	1.1	0.580	1.184	0.900	0.090	0.090
3579.98	845332	High	bottom	0 mm	NR Band n48	Ant 3	QLW05330VYK	40	DTT-G-OFDM	QPSK	50	0	12.20	12.44	0.00	0.06	1.1	0.580	1.181	0.910	0.090	0.090
3579.98	845332	High	high	0 mm	NR Band n48	Ant 3	FT06330VYK	40	DTT-G-OFDM	QPSK	1	1	12.20	12.54	0.00	-0.15	1.1	0.527	1.184	0.811	0.089	0.010
3579.98	845332	High	high	0 mm	NR Band n48	Ant 3	FT06330VYK	40	DTT-G-OFDM	QPSK	50	0	12.20	12.44	0.00	-0.18	1.1	0.527	1.181	0.832	0.088	0.010
3579.98	845332	High	left	0 mm	NR Band n48	Ant 3	QLW05330VYK	40	DTT-G-OFDM	QPSK	1	1	12.20	12.54	0.00	-0.04	1.1	0.616	1.184	0.819	0.063	0.063
3579.98	845332	High	left	0 mm	NR Band n48	Ant 3	QLW05330VYK	40	DTT-G-OFDM	QPSK	50	0	12.20	12.44	0.00	-0.03	1.1	0.613	1.181	0.815	0.062	0.062
AND / IEEE C61.1002 - SAFETY LIMIT										Body												
Spatial Peak										1.6 W/kg (mW/kg)												
Uncontrolled Exposure/General Population										averaged over 1 gram												

Table 10-4
NR Band n48 Ant 4b Body SAR

MEASUREMENT RESULTS																					
FREQUENCY		Site	Spacing	Mode	Antenna Config	Serial Number	Bandwidth (MHz)	Waveform	Modulation	RB Size	RB Offset	Maximum Allowed Power (dBm)	Conducted Power (dBm)	MPE (dB)	Power Dens. (mW/kg)	Duty Cycle	SAR (dB)	Scaling Factor	Reported SAR (dB)	SAR (dB)	Reported SAR (dB)
Min	Ch																				
3570.00	838000	Low	back	0 mm	NR Band n48	Ant 4b	QLW05330VYK	40	DTT-G-OFDM	QPSK	1	1	11.30	10.70	0.00	-0.00	1.1	0.485	1.148	0.524	0.130
3579.98	845332	High	back	0 mm	NR Band n48	Ant 4b	QLW05330VYK	40	DTT-G-OFDM	QPSK	50	0	11.30	10.85	0.00	0.02	1.1	0.515	1.181	0.588	0.145
3570.00	838000	Low	top	0 mm	NR Band n48	Ant 4b	QLW05330VYK	40	DTT-G-OFDM	QPSK	1	1	11.30	10.70	0.00	0.04	1.1	0.628	1.148	0.721	0.177
3524.09	841605	Mid	top	0 mm	NR Band n48	Ant 4b	QLW05330VYK	40	DTT-G-OFDM	QPSK	1	104	11.30	10.00	0.00	-0.13	1.1	0.680	1.202	0.840	0.161
3579.98	845332	High	top	0 mm	NR Band n48	Ant 4b	QLW05330VYK	40	DTT-G-OFDM	QPSK	1	53	11.30	10.85	0.00	0.04	1.1	0.740	1.181	0.860	0.208
3570.00	838000	Low	top	0 mm	NR Band n48	Ant 4b	QLW05330VYK	40	DTT-G-OFDM	QPSK	50	0	11.30	10.35	0.00	0.06	1.1	0.630	1.245	0.784	0.176
3524.09	841605	Mid	top	0 mm	NR Band n48	Ant 4b	QLW05330VYK	40	DTT-G-OFDM	QPSK	50	0	11.30	10.38	0.00	-0.21	1.1	0.638	1.205	0.808	0.178
3579.98	845332	High	top	0 mm	NR Band n48	Ant 4b	QLW05330VYK	40	DTT-G-OFDM	QPSK	50	0	11.30	10.85	0.00	-0.13	1.1	0.723	1.181	0.828	0.199
3579.98	845332	High	top	0 mm	NR Band n48	Ant 4b	QLW05330VYK	40	DTT-G-OFDM	QPSK	100	0	11.30	10.58	0.00	0.01	1.1	0.680	1.188	0.818	0.183
3570.00	838000	Low	top	0 mm	NR Band n48	Ant 4b	QLW05330VYK	40	CP-OFDM	QPSK	1	1	11.30	10.61	0.00	0.02	1.1	0.634	1.172	0.743	0.177
3570.00	838000	Low	bottom	0 mm	NR Band n48	Ant 4b	QLW05330VYK	40	DTT-G-OFDM	QPSK	1	1	11.30	10.70	0.00	0.02	1.1	0.680	1.148	0.600	0.090
3579.98	845332	High	bottom	0 mm	NR Band n48	Ant 4b	QLW05330VYK	40	DTT-G-OFDM	QPSK	50	0	11.30	10.85	0.00	0.08	1.1	0.680	1.181	0.600	0.090
3570.00	838000	Low	high	0 mm	NR Band n48	Ant 4b	QLW05330VYK	40	DTT-G-OFDM	QPSK	1	1	11.30	10.70	0.00	0.04	1.1	0.688	1.148	0.699	0.091
3579.98	845332	High	high	0 mm	NR Band n48	Ant 4b	QLW05330VYK	40	DTT-G-OFDM	QPSK	50	0	11.30	10.35	0.00	0.02	1.1	0.680	1.181	0.697	0.090
3570.00	838000	Low	left	0 mm	NR Band n48	Ant 4b	QLW05330VYK	40	DTT-G-OFDM	QPSK	1	1	11.30	10.70	0.00	0.00	1.1	0.616	1.148	0.621	0.064
3579.98	845332	High	left	0 mm	NR Band n48	Ant 4b	QLW05330VYK	40	DTT-G-OFDM	QPSK	50	0	11.30	10.85	0.00	0.07	1.1	0.613	1.181	0.615	0.061
AND / IEEE C61.1002 - SAFETY LIMIT										Body											
Spatial Peak										1.6 W/kg (mW/kg)											
Uncontrolled Exposure/General Population										averaged over 1 gram											

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10.2 SAR Test Notes

General Notes:

1. The test data reported are the worst-case SAR values according to test procedures specified in FCC KDB Publication 616217 D04v01r02, and FCC KDB Publication 447498 D01v06.
2. Batteries are fully charged at the beginning of the SAR measurements.
3. Liquid tissue depth was at least 15.0 cm for all frequencies.
4. The manufacturer has confirmed that the device(s) tested have the same physical, mechanical and thermal characteristics and are within operational tolerances expected for production units.
5. SAR results were scaled to the maximum allowed power to demonstrate compliance per FCC KDB Publication 447498 D01v06.
6. Per FCC KDB 865664 D01v01r04, variability SAR tests were performed when the measured SAR results for a frequency band were greater than or equal to 0.8 W/kg. Repeated SAR measurements are highlighted in the tables above for clarity. Please see Section 12 for variability analysis
7. FCC KDB Publication 616217 D04v01r02 Section 4.3, SAR tests are required for the back surface and edges of the tablet with the tablet touching the phantom. The SAR Exclusion Threshold in FCC KDB 447498 D01v06 was applied to determine SAR test exclusion for adjacent edge configurations.
8. This device uses Smart Transmit for 5G operations to control and manage transmitting power in real time to ensure RF Exposure compliance. Per FCC Guidance, compliance for was assessed at the minimum of the time averaged power and the maximum output power for each band/mode/exposure condition (DSI).
9. The orange highlights throughout the report represents the highest scaled SAR per Equipment Class.
10. See the original filing for all other operations that were not evaluated in this permissive change.

NR Notes:

1. NR implementation supports SA and NSA modes. NR implementation in EN-DC mode operates with the LTE Bands shown in the NR FR1 checklist acting as anchor bands. Per FCC guidance, SAR tests for NR Bands and LTE Anchors Bands were performed separately due to limitations in SAR probe calibration factors.
2. Due to test setup limitations, SAR testing for NR was performed using test mode software to establish the connection.
3. This device additionally supports some EN-DC conditions where additional LTE carriers are added on the downlink only.
4. Per FCC Guidance, NR modulations and RB Sizes/Offsets were selected for testing such that configurations with the highest output power were evaluated for SAR tests.

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11 FCC MULTI-TX AND ANTENNA SAR CONSIDERATIONS

11.1 Introduction

The following procedures adopted from FCC KDB Publication 447498 D01v06 are applicable to devices with built-in unlicensed transmitters such as 802.11 and Bluetooth devices which may simultaneously transmit with the licensed transmitter.

11.2 Simultaneous Transmission Procedures

This device contains transmitters that may operate simultaneously. Therefore, simultaneous transmission analysis is required. Per FCC KDB Publication 447498 D01v06 4.3.2 and IEEE 1528-2013 Section 6.3.4.1.2, simultaneous transmission SAR test exclusion may be applied when the sum of the 1g SAR for all the simultaneous transmitting antennas in a specific physical test configuration is ≤ 1.6 W/kg. The different test positions in an exposure condition may be considered collectively to determine SAR test exclusion according to the sum of 1g or 10g SAR.

Note:

The standalone reported SAR in the original filing was used to determine simultaneous transmission compliance as it is more conservative. Please see the original filing for complete evaluation of simultaneous transmission analysis.

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12 SAR MEASUREMENT VARIABILITY

12.1 Measurement Variability

Per FCC KDB Publication 865664 D01v01r04, SAR measurement variability was assessed for each frequency band, which was determined by the SAR probe calibration point and tissue-equivalent medium used for the device measurements. When both head and body tissue-equivalent media were required for SAR measurements in a frequency band, the variability measurement procedures were applied to the tissue medium with the highest measured SAR, using the highest measured SAR configuration for that tissue-equivalent medium. These additional measurements were repeated after the completion of all measurements requiring the same head or body tissue-equivalent medium in a frequency band. The test device was returned to ambient conditions (normal room temperature) with the battery fully charged before it was re-mounted on the device holder for the repeated measurement(s) to minimize any unexpected variations in the repeated results.

SAR Measurement Variability was assessed using the following procedures for each frequency band:

- 1) When the original highest measured SAR is ≥ 0.80 W/kg, the measurement was repeated once.
- 2) A second repeated measurement was performed only if the ratio of largest to smallest SAR for the original and first repeated measurements was > 1.20 or when the original or repeated measurement was ≥ 1.45 W/kg (~ 10% from the 1g SAR limit).
- 3) A third repeated measurement was performed only if the original, first or second repeated measurement was ≥ 1.5 W/kg and the ratio of largest to smallest SAR for the original, first and second repeated measurements is > 1.20 .
- 4) Repeated measurements are not required when the original highest measured SAR is < 0.80 W/kg
- 5) When 10g SAR measurement is considered, a factor of 2.5 is applied to the thresholds above.

Table 12-1
Body SAR Measurement Variability Results

BODY VARIABILITY RESULTS															
Band	FREQUENCY		Mode	Waveform	Service	Ant	Side	Spacing	Measured SAR (1g)	1st Repeated SAR (1g)	Ratio	2nd Repeated SAR (1g)	Ratio	3rd Repeated SAR (1g)	Ratio
	MHz	Ch.							(W/kg)	(W/kg)		(W/kg)		(W/kg)	
3500	3570.00	638000	NR Band n48, 40 MHz Bandwidth	DFT-S-OFDM	QPSK, 1 RB, 104 RB Offset	Ant 2a	right	0 mm	0.804	0.750	1.07	N/A	N/A	N/A	N/A
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population									Body 1.6 W/kg (mW/g) averaged over 1 gram						

12.2 Measurement Uncertainty

The measured SAR was <1.5 W/kg for 1g and <3.75 W/kg for 10g for all frequency bands. Therefore, per KDB Publication 865664 D01v01r04, the extended measurement uncertainty analysis per IEEE 1528-2013 was not required.

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13 EQUIPMENT LIST

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
Agilent	E4404B	Spectrum Analyzer	N/A	N/A	N/A	MY45113242
Agilent	E4438C	ESG Vector Signal Generator	3/24/2022	Annual	3/24/2023	MY45093678
Agilent	E4438C	ESG Vector Signal Generator	3/22/2022	Annual	3/22/2023	US41460739
Agilent	N5182A	MXG Vector Signal Generator	1/12/2022	Annual	1/12/2023	MY47420837
Agilent	N5182A	MXG Vector Signal Generator	11/17/2021	Annual	11/17/2022	US46240505
Agilent	8753ES	S-Parameter Vector Network Analyzer	6/14/2022	Annual	6/14/2023	US39170118
Agilent	8753ES	S-Parameter Vector Network Analyzer	2/11/2022	Annual	2/11/2023	MY40003841
Amplifier Research	15S1G6	Amplifier	CBT	N/A	CBT	343972
Amplifier Research	15S1G6	Amplifier	CBT	N/A	CBT	343971
Anritsu	MA24106A	USB Power Sensor	3/28/2022	Annual	3/28/2023	1520503
Anritsu	MA24106A	USB Power Sensor	3/28/2022	Annual	3/28/2023	1520501
Control Company	4353	Long Stem Thermometer	10/28/2020	Biennial	10/28/2022	200670623
Control Company	4353	Long Stem Thermometer	10/28/2020	Biennial	10/28/2022	200670633
Control Company	4353	Long Stem Thermometer	10/28/2020	Biennial	10/28/2022	200670635
Control Company	4040	Therm./ Clock/ Humidity Monitor	1/21/2022	Annual	1/21/2023	160574418
Mitutoyo	500-196-30	CD-6"ASX 6lnch Digital Caliper	2/16/2022	Triennial	2/16/2025	A20238413
Keysight Technologies	N6705B	DC Power Analyzer	5/5/2021	Triennial	5/5/2024	MY53004059
Keysight Technologies	N9020A	MXA Signal Analyzer	4/14/2022	Annual	4/14/2023	MY48010233
MCL	BW-N6W5+	6dB Attenuator	CBT	N/A	CBT	1139
Mini-Circuits	VLF-6000+	Low Pass Filter DC to 6000 MHz	CBT	N/A	CBT	N/A
Mini-Circuits	BW-N20W5+	DC to 18 GHz Precision Fixed 20 dB Attenuator	CBT	N/A	CBT	N/A
Mini-Circuits	NLP-1200+	Low Pass Filter DC to 1000 MHz	CBT	N/A	CBT	N/A
Mini-Circuits	NLP-2950+	Low Pass Filter DC to 2700 MHz	CBT	N/A	CBT	N/A
Mini-Circuits	BW-N20W5	Power Attenuator	CBT	N/A	CBT	1226
Mini-Circuits	ZUDC10-83-S+	Directional Coupler	9/15/2021	Annual	9/15/2022	2111
Narda	4772-3	Attenuator (3dB)	CBT	N/A	CBT	9406
Narda	BW-S3W2	Attenuator (3dB)	CBT	N/A	CBT	120
Seekonk	TSF-100	Torque Wrench	7/8/2021	Annual	7/8/2022	47639-29
SPEAG	DAK-3.5	Dielectric Assessment Kit	5/12/2022	Annual	5/12/2023	1070
SPEAG	DAKS-3.5	Portable Dielectric Assessment Kit	10/7/2021	Annual	10/7/2022	1045
SPEAG	MAIA	Modulation and Audio Interference Analyzer	N/A	N/A	N/A	1237
SPEAG	DAK-12	Dielectric Assessment Kit (10MHz - 3GHz)	11/16/2021	Annual	11/16/2022	1121
SPEAG	D3500V2	3500 MHz SAR Dipole	8/16/2019	Triennial	8/16/2022	1055
SPEAG	D3700V2	3700 MHz SAR Dipole	10/17/2019	Triennial	10/17/2022	1002
SPEAG	DAE4	Dasy Data Acquisition Electronics	11/11/2021	Annual	11/11/2022	1646
SPEAG	EX3DV4	SAR Probe	11/16/2021	Annual	11/16/2022	7639

*All equipment was used solely within its respective calibration period

Note: CBT (Calibrated Before Testing). Prior to testing, the measurement paths containing a cable, amplifier, attenuator, coupler or filter were connected to a calibrated source (i.e. a signal generator) to determine the losses of the measurement path. The power meter offset was then adjusted to compensate for the measurement system losses. This level offset is stored within the power meter before measurements are made. This calibration verification procedure applies to the system verification and output power measurements. The calibrated reading is then taken directly from the power meter after compensation of the losses for all final power measurements.

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14 MEASUREMENT UNCERTAINTIES

a	b	c	d	e = f(d,k)	f	g	h = c x f/e	i = c x g/e	k
Uncertainty Component	IEEE 1528 Sec.	Tol. (± %)	Prob. Dist.	Div.	c _i 1gm	c _i 10 gms	1gm u _i (± %)	10gms u _i (± %)	v _i
Measurement System									
Probe Calibration	E.2.1	7	N	1	1	1	7.0	7.0	∞
Axial Isotropy	E.2.2	0.25	N	1	0.7	0.7	0.2	0.2	∞
Hemishperical Isotropy	E.2.2	1.3	N	1	0.7	0.7	0.9	0.9	∞
Boundary Effect	E.2.3	2	R	1.73	1	1	1.2	1.2	∞
Linearity	E.2.4	0.3	N	1	1	1	0.3	0.3	∞
System Detection Limits	E.2.4	0.25	R	1.73	1	1	0.1	0.1	∞
Modulation Response	E.2.5	4.8	R	1.73	1	1	2.8	2.8	∞
Readout Electronics	E.2.6	0.3	N	1	1	1	0.3	0.3	∞
Response Time	E.2.7	0.8	R	1.73	1	1	0.5	0.5	∞
Integration Time	E.2.8	2.6	R	1.73	1	1	1.5	1.5	∞
RF Ambient Conditions - Noise	E.6.1	3	R	1.73	1	1	1.7	1.7	∞
RF Ambient Conditions - Reflections	E.6.1	3	R	1.73	1	1	1.7	1.7	∞
Probe Positioner Mechanical Tolerance	E.6.2	0.8	R	1.73	1	1	0.5	0.5	∞
Probe Positioning w/ respect to Phantom	E.6.3	6.7	R	1.73	1	1	3.9	3.9	∞
Extrapolation, Interpolation & Integration algorithms for Max. SAR Evaluation	E.5	4	R	1.73	1	1	2.3	2.3	∞
Test Sample Related									
Test Sample Positioning	E.4.2	3.12	N	1	1	1	3.1	3.1	35
Device Holder Uncertainty	E.4.1	1.67	N	1	1	1	1.7	1.7	5
Output Power Variation - SAR drift measurement	E.2.9	5	R	1.73	1	1	2.9	2.9	∞
SAR Scaling	E.6.5	0	R	1.73	1	1	0.0	0.0	∞
Phantom & Tissue Parameters									
Phantom Uncertainty (Shape & Thickness tolerances)	E.3.1	7.6	R	1.73	1.0	1.0	4.4	4.4	∞
Liquid Conductivity - measurement uncertainty	E.3.3	4.3	N	1	0.78	0.71	3.3	3.0	76
Liquid Permittivity - measurement uncertainty	E.3.3	4.2	N	1	0.23	0.26	1.0	1.1	75
Liquid Conductivity - Temperature Uncertainty	E.3.4	3.4	R	1.73	0.78	0.71	1.5	1.4	∞
Liquid Permittivity - Temperature Uncertainty	E.3.4	0.6	R	1.73	0.23	0.26	0.1	0.1	∞
Liquid Conductivity - deviation from target values	E.3.2	5.0	R	1.73	0.64	0.43	1.8	1.2	∞
Liquid Permittivity - deviation from target values	E.3.2	5.0	R	1.73	0.60	0.49	1.7	1.4	∞
Combined Standard Uncertainty (k=1)							RSS	12.2	12.0
Expanded Uncertainty (95% CONFIDENCE LEVEL)							k=2	24.4	24.0

The above measurement uncertainties are according to IEEE Std. 1528-2013

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15 CONCLUSION

15.1 Measurement Conclusion

The SAR evaluation indicates that the EUT complies with the RF radiation exposure limits of the FCC and Innovation, Science, and Economic Development Canada, with respect to all parameters subject to this test. These measurements were taken to simulate the RF effects of RF exposure under worst-case conditions. Precise laboratory measures were taken to assure repeatability of the tests. The results and statements relate only to the item(s) tested.

Please note that the absorption and distribution of electromagnetic energy in the body are very complex phenomena that depend on the mass, shape, and size of the body, the orientation of the body with respect to the field vectors, and the electrical properties of both the body and the environment. Other variables that may play a substantial role in possible biological effects are those that characterize the environment (e.g. ambient temperature, air velocity, relative humidity, and body insulation) and those that characterize the individual (e.g. age, gender, activity level, debilitation, or disease). Because various factors may interact with one another to vary the specific biological outcome of an exposure to electromagnetic fields, any protection guide should consider maximal amplification of biological effects as a result of field-body interactions, environmental conditions, and physiological variables. [3]

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