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# Time-Averaging Algorithm Validation Report

| | |
|---|---|
| **FCC ID:** | **A3LSMS741U** |
| Model (s): | SM-S741U, SM-S741U1 |
| Device Type: | Portable Handset |
| Report Issue Date: | June 28, 2026 |

| |
|---|
| **Samsung Electronics, Co., Ltd.** |
| 129, Samsung-ro, Yeongtong-gu, Suwon-si Gyeonggi-do, 16677, Rep. of Korea |
| Certification |

The measurement evaluations presented in this report are based on the maximum performance of the tested device(s), which has been shown to be capable of compliance for localized specific absorption rate (SAR) for uncontrolled environment/ general population exposure federal limits in 47CFR § 1.1310 and has been tested in accordance with the measurement procedures specified within this report.

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**Steve Liu**
President

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# 1. DUT Specifics

## 1.1. Time-Averaging Algorithm Verification

This report demonstrates that the DUT, enabled with S.LSI feature for WWAN and Combined-TAS (TAS) time-averaged SAR algorithms and Qualcomm® FastConnect feature for WLAN time-averaged SAR algorithms, is compliant under Tx varying transmission scenarios per S.LSI's and Qualcomm's recommended test plans for WWAN and C-TAS and WLAN respectively. Part 0 and Part 1 test reports complimenting this Time-Averaging Algorithm Validation Report are necessary for a comprehensive RF Exposure evaluation.

## 1.2. Device under Test

The manufacturer has confirmed that the device is within operational tolerances expected for production units and has the same physical, mechanical, and thermal characteristics expected for production units. The serial number of the device used for each test is indicated alongside the results.

## 1.3. Time-Averaging Algorithm for RF Exposure Compliance

This device is enabled with the S.LSI and FastConnect feature. This feature implements a 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.

Note that Bluetooth and NFC operations are not enabled with any time averaging algorithms for this device.

The time-averaging algorithms maintain the time-averaged transmit power, in turn, time-averaged RF exposure of SAR_design_target, below the predefined time-averaged power limit (i.e., Plimit for sub-6 radio), for each characterized technology and band. Characterization is achieved by determining Plimit for WWAN sub-6/WLAN that corresponds to the exposure design targets after accounting for all device design related uncertainties. The SAR characterization is denoted as SAR Char in this report.

The time-averaging algorithms allow the device to transmit at higher power instantaneously, as high as Pmax, when needed, but enforces power limiting to maintain time-averaged transmit power to Plimit. Below table shows Plimit settings and maximum tune up output power Pmax configured for this EUT for various transmit conditions (Device State Index DSI & RSI).

Table 1-1
SAR Design Calculations

| SAR_*design_target* | | | |
|---|---|---|---|
| $SAR_design_target < SAR_regulatory_limit \times 10^{\frac{-Total\ Uncertainty}{10}}$ | | | |
| 1g SAR | | 10g SAR | |
| *Total Uncertainty* | 1.0 dB | *Total Uncertainty* | 1.0 dB |
| *SAR_regulatory_limit* | 1.6 W/kg | *SAR_regulatory_limit* | 4.0 W/kg |
| *SAR_design_target* | 1.0 W/kg | *SAR_design_target* | 2.5 W/kg |

Table 1-2
DSI & RSI Descriptions

| Scenario | Description | SAR Test Cases |
|---|---|---|
| Head<br>(DSI = 1) for FastConnect<br>(RSI =1) for S.LSI | _ Device positioned next to ear<br>_ Receiver Active | *Head SAR per KDB Publication 648474 D04* |
| Body-worn<br>(DSI = 0 ) for FastConnect<br>(RSI = 0) for S.LSI | _ Device being used with a body-worn accessory | *Body-worn SAR per KDB Publication 648474 D04* |
| Hotspot<br>(DSI = 0 ) for FastConnect<br>(RSI = 0) for S.LSI | _ Device transmits in hotspot mode near body<br>_ Hotspot Mode Active | *Hotspot SAR per KDB Publication 941225 D06* |
| Phablet<br>(DSI = 0 ) for FastConnect<br>(RSI = 0) for S.LSI | _ Device is held to hand | *Phablet SAR per KDB Publication 648474 D04 & KDB Publication 616217 D04* |

## 1.4. Time-Averaging Algorithm

Technical description includes detailed information regarding the implementation of the time-averaging algorithm and parameters used for this device.

## 1.5. Time-Averaging Algorithm Implementation

For this device, all WWAN technologies are enabled with S.LSI and WLAN technology is enabled with Qualcomm® FastConnect time-averaging algorithm. The Combined Time Averaged SAR (C-TAS) algorithm controls the simultaneous output power of WWAN and WLAN while maintaining compliance with Total Exposure Ratio (TER). NFC and Bluetooth technologies are not controlled by any time-averaging algorithms.

Tables showing the Plimit implemented for this device are found in the Part 0 SAR Report.

## 1.6. Antenna Groups

The Samsung S.LSI C-TAS operates based on pre-defined Sub-6 GHz antenna groups (AG). The tx antennas in the device are grouped based on spatial variation of RF exposure distributions, where the RF exposure distributions of one AG may be spatially decoupled from those of another AG through R-Matrix-based decoupling assessment.

An antenna group (AG) is defined as a set of antennas that are located in the same physical region of the device, radiate into the same or highly overlapping SAR hotspot, and cannot be spatially separated for SAR evaluation purposes. Antennas within the same AG are assumed to be fully coupled and are represented by the maximum reported SAR among all antennas in that group.

The R-Matrix off-diagonal elements are defined as 0 (decoupled) or 1 (coupled). Once AGO and AG1 are demonstrated to be spatially decoupled (off-diagonal = 0), simultaneous transmission evaluation may be performed independently for each AG consistent with the R-Matrix decoupling assessment. The justification for the decoupling of the AG for this device is included in the Part 1 SAR/RF Exposure Report.

$$\text{R-matrix for AG0 and AG1} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$$

## 1.7. Test Guidance Applied

- IEEE 1528-2013
- FCC KDB Publication 941225 D01v03r01, D05v02r05, D05Av01r02, D06v02r01 (2G/3G/4G and Hotspot)
- FCC KDB Publication 248227 D01v02r02 (SAR Considerations for 802.11 Devices)
- FCC KDB Publication 447498 D04v01 (General SAR Guidance)
- FCC KDB Publication 865664 D01v01r04, D02v01r02 (SAR Measurements up to 6 GHz)

# 2. TAS Evaluation Test Cases

## 2.1. Part 2 Test Plan

### Table 2-1
### Part 2 Test Plan -S.LSI Test Cases

| Test Case | LSI TC | Test Scenario (Sub 6) | Tech | Band/Config | Antenna | Part 1 Measured Conducted Power [dBm] | Part 1 Measured SAR [W/kg] | Exposure Condition | Position, Distance | Averaged Pmax [dBm] | Averaged Plimit [dBm] | RSI/DSI | Measured Pmax [dBm] | Measured Plimit [dBm] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | F_TC01, F_TC02 | Time-Varying Tx Power Case #1, #2 | GSM Band #1, Test Seq A | GPRS 1900, 2 Tx Slots | A | 15.93 | 0.555 | Body-Worn | Back Side, 5 mm | 20.32 | 16.32 | 0 | 20.273 | 15.69 |
| 2 | | | GSM Band #1, Test Seq B | GPRS 1900, 2 Tx Slots | A | 15.93 | 0.555 | Body-Worn | Back Side, 5 mm | 20.32 | 16.32 | 0 | 20.273 | 15.69 |
| 3 | | | UMTS Band #1, Test Seq A | UMTS B5 | E | 19.62 | 0.601 | Body-Worn/Hotspot | Back Side, 5 mm | 23 | 19.5 | 0 | 23.208 | 19.122 |
| 4 | | | UMTS Band #1, Test Seq B | UMTS B5 | E | 19.62 | 0.601 | Body-Worn/Hotspot | Back Side, 5 mm | 23 | 19.5 | 0 | 23.208 | 19.122 |
| 5 | | | LTE Band #1, Test Seq A | LTE Band 30 | B | 17.36 | 0.416 | Body-Worn/Hotspot | Back Side, 5 mm | 23 | 16.5 | 0 | 22.438 | 17.007 |
| 6 | | | LTE Band #1, Test Seq B | LTE Band 30 | B | 17.36 | 0.416 | Body-Worn/Hotspot | Back Side, 5 mm | 23 | 16.5 | 0 | 22.438 | 17.007 |
| 7 | | | sub6 NR SA Band #1, Test Seq A | NR Sub6 n66 | A | 15.17 | 0.615 | Body-Worn/Hotspot | Back Side, 5 mm | 24 | 16 | 0 | 24.042 | 16.32 |
| 8 | | | sub6 NR SA Band #1, Test Seq B | NR Sub6 n66 | A | 15.17 | 0.615 | Body-Worn/Hotspot | Back Side, 5 mm | 24 | 16 | 0 | 24.042 | 16.32 |
| 9 | F_TC03 | Change in Call | LTE | LTE Band 66 | A | 16.94 | 0.773 | Body-Worn/Hotspot | Back Side, 5 mm | 24 | 16 | 0 | 23.945 | 15.976 |
| 10 | F_TC04 | RSI change | UMTS | UMTS B2 | A | 21.42 | 0.098 | Head | Left Cheek, 0 mm | 24 | 21 | 1 | 24.824 | 20.945 |
| | | | UMTS | UMTS B2 | A | 16.58 | 0.503 | Body-Worn/Hotspot | Back Side, 5 mm | 24 | 16 | 0 | 24.824 | 16.048 |
| 11 | F_TC05 | Re-selection in call | LTE | LTE Band 12 | A | 21.84 | 0.613 | Body-Worn/Hotspot | Back Side, 5 mm | 24.5 | 21.5 | 0 | 23.921 | 21.153 |
| | | | sub6 NR SA Band | NR Sub6 n66 | A | 15.17 | 0.615 | Body-Worn/Hotspot | Back Side, 5 mm | 24 | 16 | 0 | 24.121 | 15.578 |
| 12 | F_TC06 | Antenna/Band Switching | LTE | LTE Band 30 | B | 17.36 | 0.416 | Body-Worn/Hotspot | Back Side, 5 mm | 23 | 16.5 | 0 | 22.908 | 17.07 |
| | | | LTE | LTE Band 25 | A | 16.65 | 0.537 | Body-Worn/Hotspot | Back Side, 5 mm | 24 | 16.5 | 0 | 23.825 | 16.005 |
| 13 | F_TC07 | Intra-band ULCA | LTE Intra-band ULCA | LTE B48 | F | 14.28 | 0.289 | Body-Worn/Hotspot | Back Side, 5 mm | 20.51 | 14.01 | 0 | 19.839 | 14.72 |
| | | | | LTE B48 | F | 14.28 | 0.289 | Body-Worn/Hotspot | Back Side, 5 mm | 20.51 | 14.01 | 0 | 19.839 | 14.737 |
| 14 | F_TC10 | ENDC SAR exposure Switching | ENDC NSA (LTE+Sub6 NR) | LTE B71 | A | 22.33 | 0.588 | Body-Worn/Hotspot | Back Side, 5 mm | 24.5 | 21.5 | 0 | 24.57 | 21.915 |
| | | | | NR n30 | B | 17.49 | 0.459 | Body-Worn/Hotspot | Back Side, 5 mm | 23 | 16.5 | 0 | 22.91 | 17.079 |
| 15 | F_TC11 | ENDC NSA Antenna Switching | ENDC NSA (LTE + Sub6 NR) | LTE B71 | A | 22.33 | 0.588 | Body-Worn/Hotspot | Back Side, 5 mm | 24.5 | 21.5 | 0 | 24.57 | 21.683 |
| | | | | NR n41 | B | 16.61 | 0.374 | Body-Worn/Hotspot | Back Side, 5 mm | 26.5 | 16 | 0 | 26.72 | 15.842 |
| | | | | NR n77 | F | 14.72 | 0.596 | Body-Worn/Hotspot | Back Side, 5 mm | 26.5 | 14 | 0 | 26.12 | 14.482 |
| 16 | F_TC08 | Inter-band ULCA | FR1 Interband ULCA (FR1 + FR1) | NR n71 | A | 21.56 | 0.496 | Body-Worn/Hotspot | Back Side, 5 mm | 24.5 | 21.5 | 0 | 23.976 | 22.274 |
| | | | | NR n30 | B | 17.49 | 0.459 | Body-Worn/Hotspot | Back Side, 5 mm | 23 | 16.5 | 0 | 23.091 | 17.22 |

### Table 2-2
### Part 2 Test Plan -FastConnect Test Cases

| Test Case | Test Scenario (Sub 6) | Tech | Band/Config | Antenna | Part 1 Measured Conducted Power [dBm] | Part 1 Measured SAR [W/kg] | Exposure Condition | Position, Distance | Averaged Pmax [dBm] | Averaged Plimit [dBm] | RSI/DSI | Measured Pmax [dBm] | Measured Plimit [dBm] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 17 | Time-varying Tx power transmission | WLAN Band #1, Test Seq | 2.4 GHz WLAN 802.11n | J | 15.72 | 0.178 | Body-Worn/Hotspot | Back Side, 5 mm | 18 | 15 | 0 | 17.337 | 14.702 |
| 18 | | WLAN Band #1, Test Seq | 5 GHz WLAN 802.11ac 20 MHz (UNII1) | E | 13.3 | 0.409 | Body-Worn | Back Side, 5 mm | 17 | 13 | 0 | 16.916 | 12.6 |
| 19 | WLAN - DSI Change | WLAN Band | 2.4 GHz WLAN 802.11n 20 MHz | J | 15.72 | 0.178 | Body-Worn/Hotspot | Back Side, 5 mm | 18 | 15 | 0 | 17.29 | 14.52 |
| | | WLAN Band | 2.4 GHz WLAN 802.11n 20 MHz | J | 12.71 | 0.199 | Head | Left Cheek, 0 mm | 18 | 12.5 | 1 | 17.29 | 12.06 |
| 20 | WLAN - Call Drop | WLAN Band | 2.4 GHz WLAN 802.11ac | J | 15.72 | 0.178 | Body-Worn/Hotspot | Back Side, 5 mm | 16 | 15 | 0 | 16.939 | 14.702 |
| 21 | WLAN - Band/Ant Change | WLAN Band #1 | 2.4 GHz WLAN 802.11n 20 MHz | J | 15.72 | 0.178 | Body-Worn/Hotspot | Back Side, 5 mm | 18 | 15 | 0 | 17.29 | 15.33 |
| | | WLAN Band #2 | 5 GHz WLAN 802.11n 20 MHz (UNII1) | E | 13.3 | 0.409 | Body-Worn | Back Side, 5 mm | 17 | 13 | 0 | 16.916 | 13.7 |
| 22 | WLAN SAR Exposure Switch - DBS Test | 2.4 GHz WLAN + 5 GHz WLAN | 2.4 GHz WLAN 802.11n 20 MHz | J | 15.72 | 0.178 | Body-Worn/Hotspot | Back Side, 5 mm | 18 | 15 | 0 | 17.298 | 14.414 |
| | | | 5 GHz WLAN 802.11ac 20 MHz (UNII1) | E | 13.3 | 0.409 | Body-Worn | Back Side, 5 mm | 17 | 13 | 0 | 16.651 | 12.632 |

### Table 2-3
### Part 2 Test Plan - C-TAS Test Case

| Test Case | Test Scenario (Sub 6) | Tech | Band/Config | Antenna | Part 1 Measured Conducted Power [dBm] | Part 1 Measured SAR [W/kg] | Exposure Condition | Position, Distance | Averaged Pmax [dBm] | Averaged Plimit [dBm] | RSI/DSI | Measured Pmax [dBm] | Measured Plimit [dBm] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 23 | C - TAS | LTE + WLAN + BT | LTE Band 7 | F | 16.74 | 0.506 | Body-Worn/Hotspot | Back Side, 5 mm | 24 | 16.5 | 0 | 23.256 | 16.74 |
| | | | 5 GHz WLAN 802.11ac 20 MHz Ch 153 (UNII3) | E | 13.3 | 0.409 | Body-Worn | Back Side, 5 mm | 18 | 13 | 0 | 16.917 | 13.86 |
| | | | Bluetooth | H | 13.94 | 0.26 | Body-Worn/Hotspot | Back Side, 5 mm | 14 | 14 | 0 | 10.52 | 10.52 |

Part 1 Measured Conducted Powers were converted to frame average powers for the TDD modes.

## 2.2. TAS Test Cases and Notes:

1. Time-varying Tx power transmission: Test cases 1-8 listed in Table 2-1 and test cases 17-18 in Table 2-2 above are selected to test with test sequences.
2. Change in call: Test case 9 in Table 2-1 and test case 20 in Table 2-2 are selected for change in call or call drop test cases.
3. RSI/DSI Switch: Test case 10 in Table 2-1 and test case 19 in Table 2-2 are selected for RSI/DSI switch.
4. Reselection in a call: Test case 11 in Table 2-1 is selected to represent technology switching from LTE to NR.
5. Antenna/Band Switch: Test case 12 in Table 2-1 and test case 21 in Table 2-2 are selected for handover test from an antenna/band within one technology group to another antenna/band in the same RSI/DSI.
6. Intraband ULCA: Test case 13 in Table 2-1 is selected for LTE Intraband ULCA test case (LTE B48 + LTE B48, Ant F, RSI =0).
7. Interband ULCA: Test case 16 in Table 2-1 is selected for FR1 Interband ULCA test case (Sub6 NR n71+ Sub6 NR n30, Ant A + Ant B, RSI =0).
8. ENDC SAR Exposure Switching: Test case 14 is selected for SAR exposure switching test in one of the supported simultaneous WWAN transmission scenario (LTE B71 + Sub6 NR n30).
9. ENDC NSA Antenna Switching: Test case 15 is selected for ENDC NR handover test from one NR antenna (NR n41, Ant B, RSI=0) to another NR antenna in the different antenna group (NR n41, Ant F, RSI=0) while LTE remains connected on the same antenna (LTE B71, Ant A, RSI = 0).
10. Dual Band Simultaneous (DBS): Test Case 22 in Table 202 is selected for dual band simultaneous transmission test case for 2.4GHz WLAN and 5GHz WLAN.
11. C-TAS (WWAN – WLAN – BT) : Test Case 23 in Table 2-3 is selected for C-TAS test case with LTE B7 + 5 GHz WLAN + BT technologies.
12. All switching, EN-DC, and C-TAS compliance continuity test cases are selected to be performed within the same antenna group.
13. LTE Inter-band ULCA and FR1 UL MIMO are not supported by the DUT.

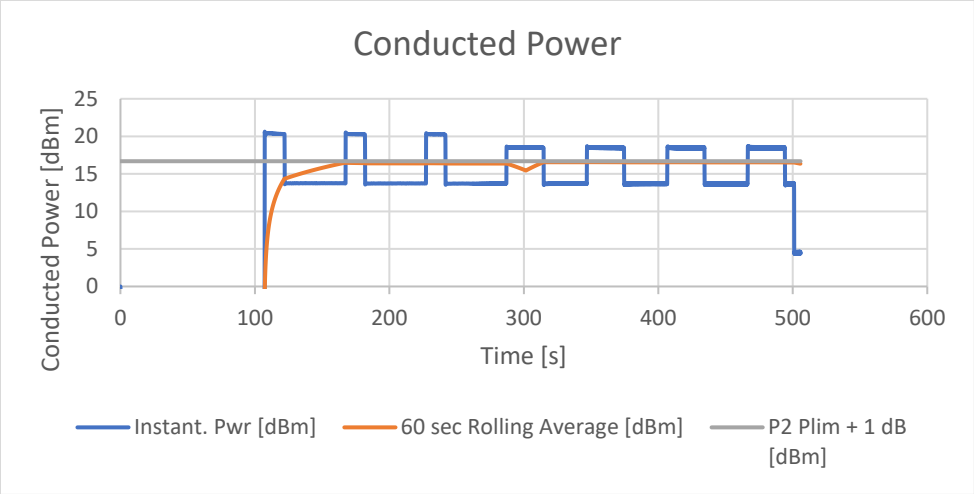
# 3. Part 2 S.LSI Test Results

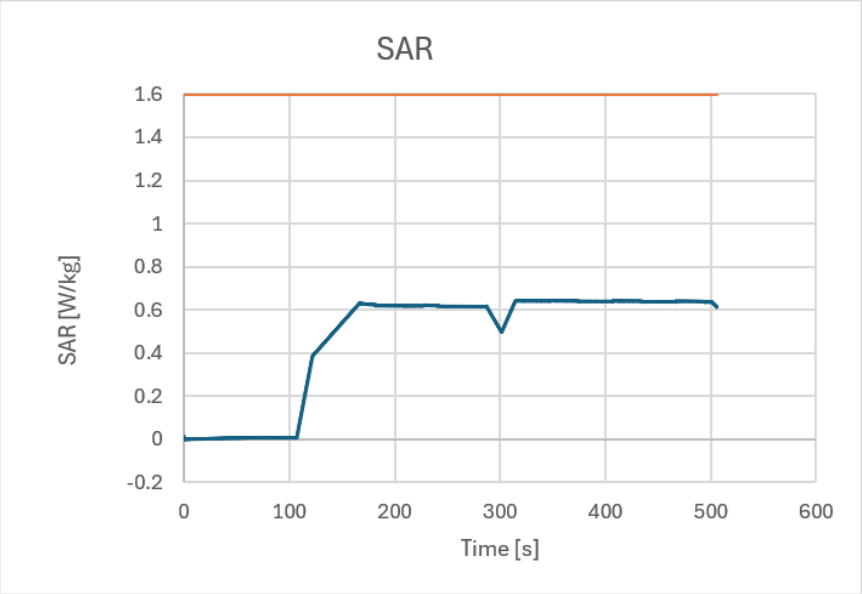
## 3.1. Conducted Tx Cases (Freq < 6 GHz)

Time-averaged conducted tx power is converted into time-averaged 1g SAR in the figures below. Please see below for time-averaged 1g SAR and SAR limit that the test result complies. Section 3 contains detailed information regarding the test configurations.

### 3.1.1. GPRS 1900

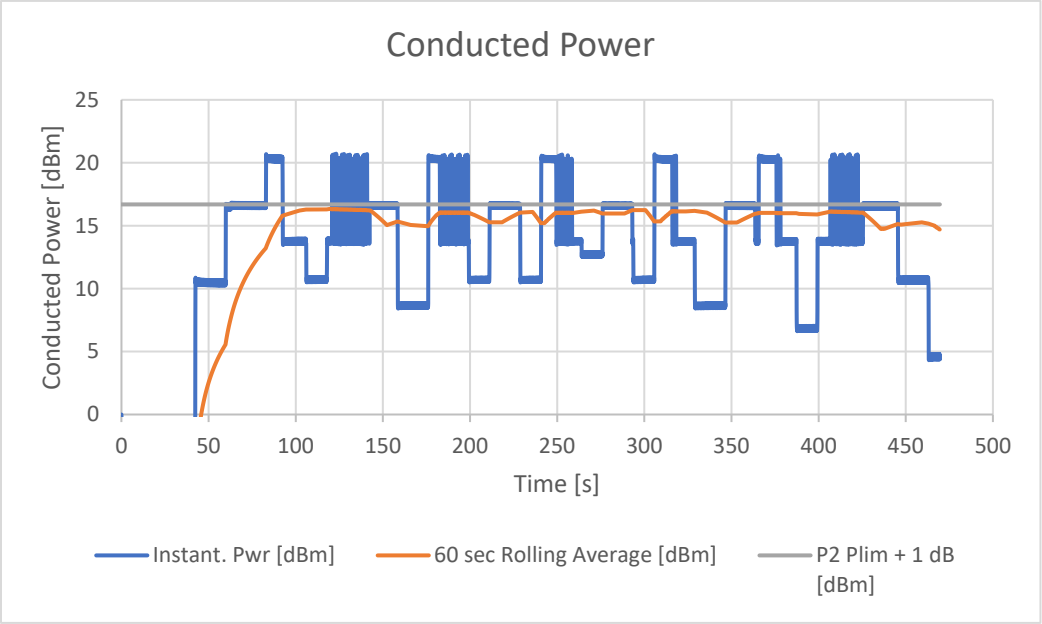
Test Sequence A

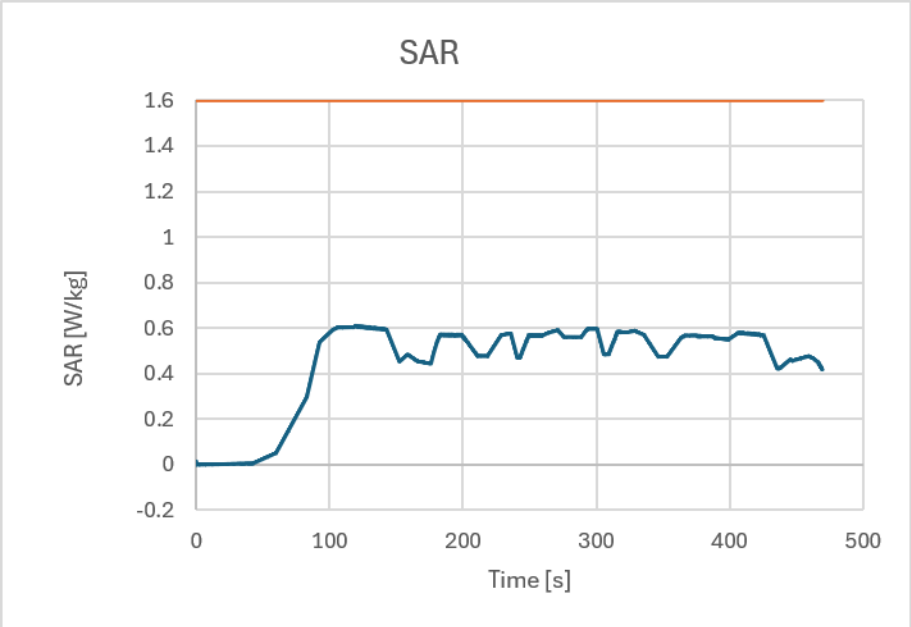



| | W/kg |
|---|---|
| FCC SAR Limit | 1.6 |
| Max 60 sec time-averaged 1g SAR | 0.643 |
| Validated: Max time-averaged SAR is within device uncertainty of measured SAR at Plimit | |

## Test Sequence B

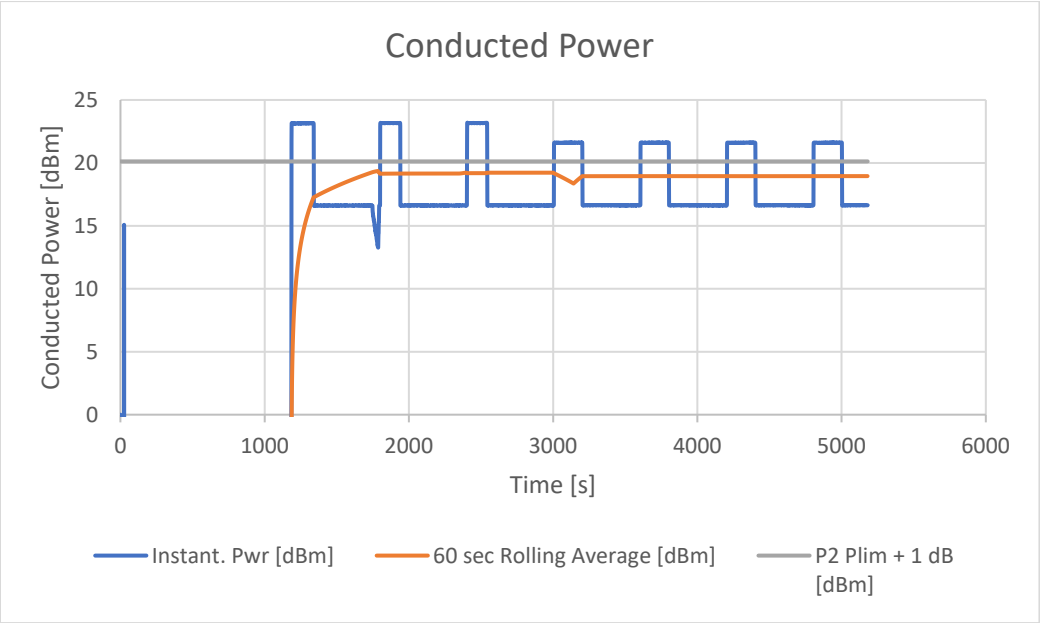


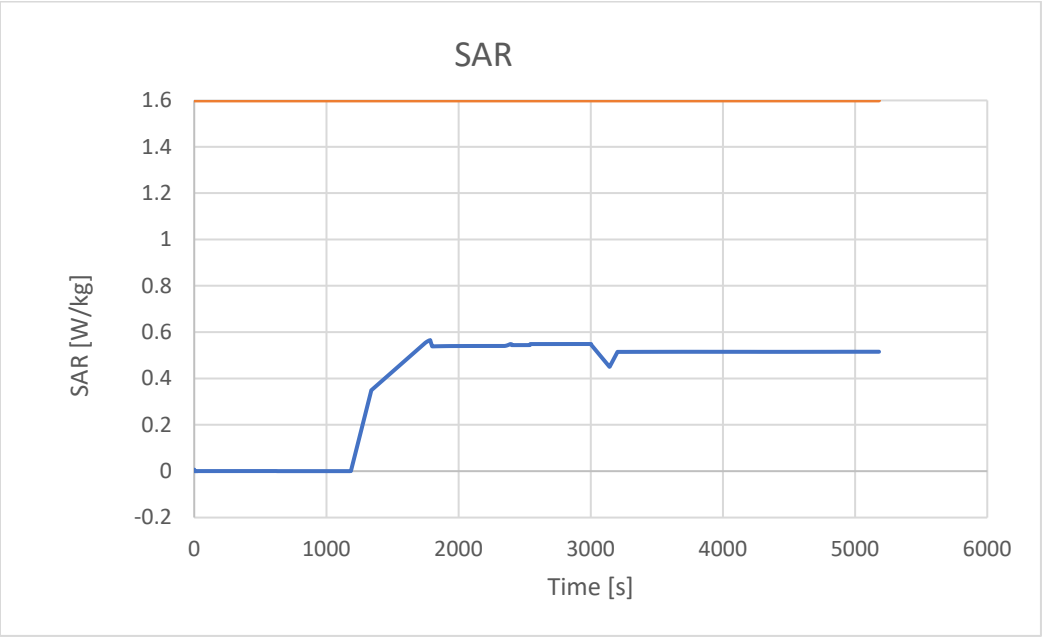




| | W/kg |
|---|---|
| FCC SAR Limit | 1.6 |
| Max 60 sec time-averaged 1g SAR | 0.609 |
| Validated: Max time-averaged SAR is within device uncertainty of measured SAR at Plimit | |

### 3.1.2. UMTS B5

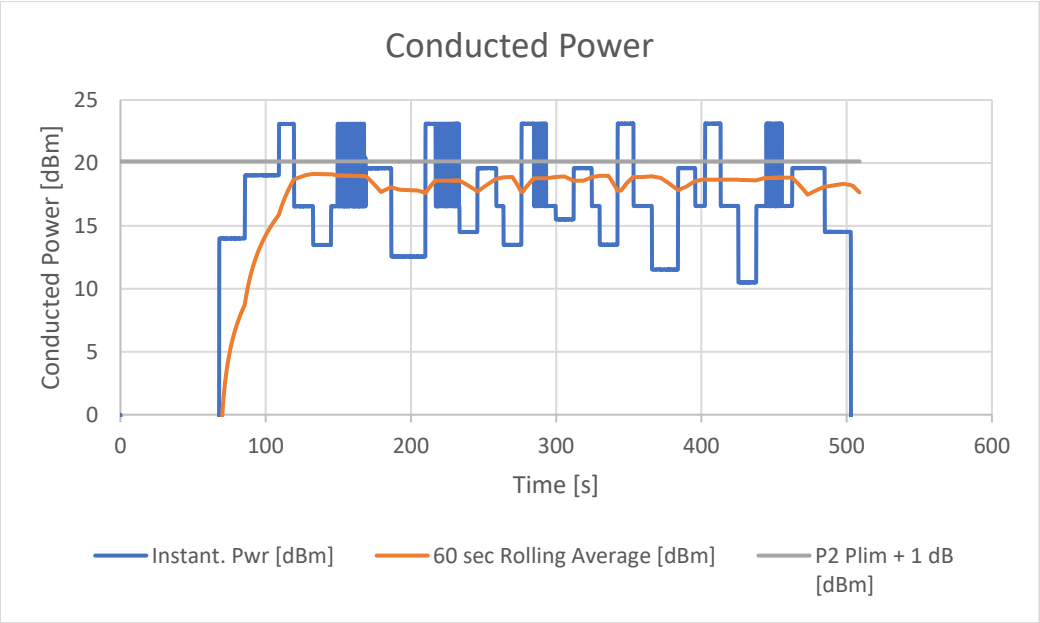
Test Sequence A

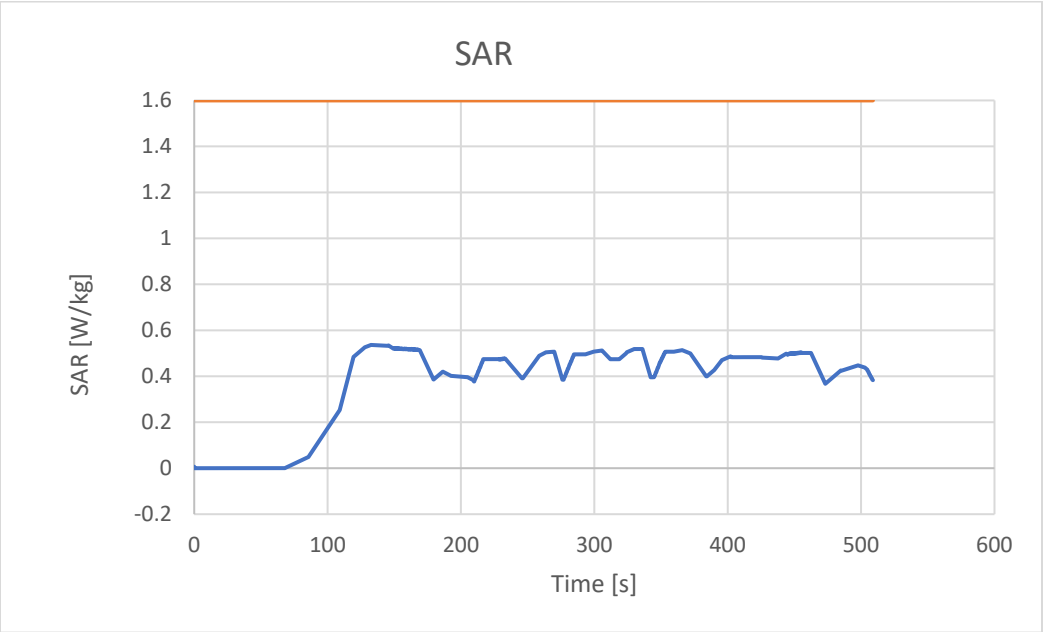



| | W/kg |
|---|---|
| FCC SAR Limit | 1.6 |
| Max 60 sec time-averaged 1g SAR | 0.566 |
| Validated: Max time-averaged SAR is within device uncertainty of measured SAR at Plimit | |

## Test Sequence B

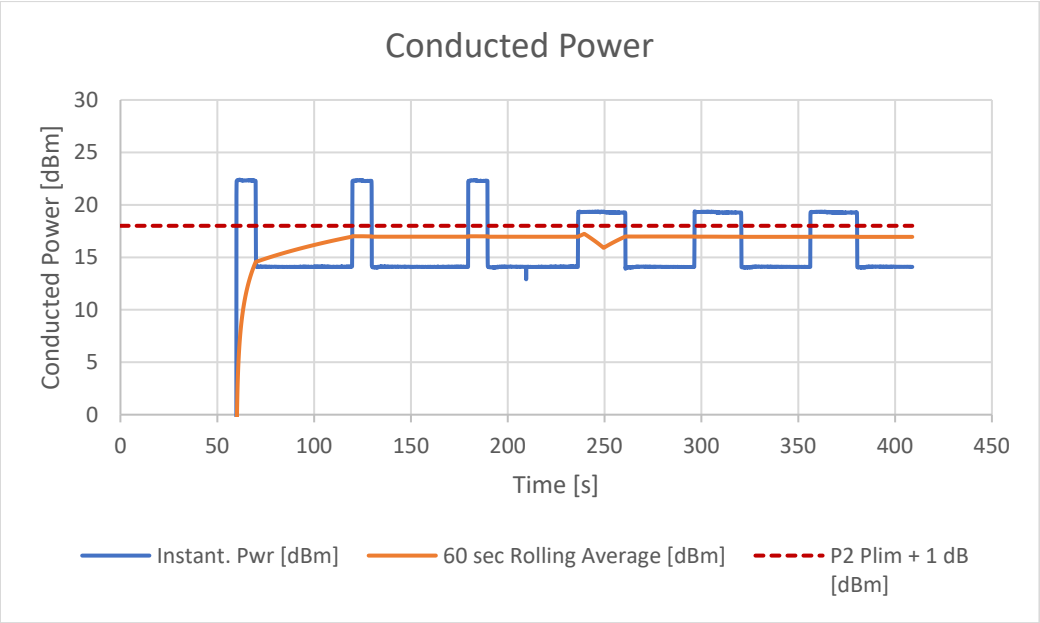


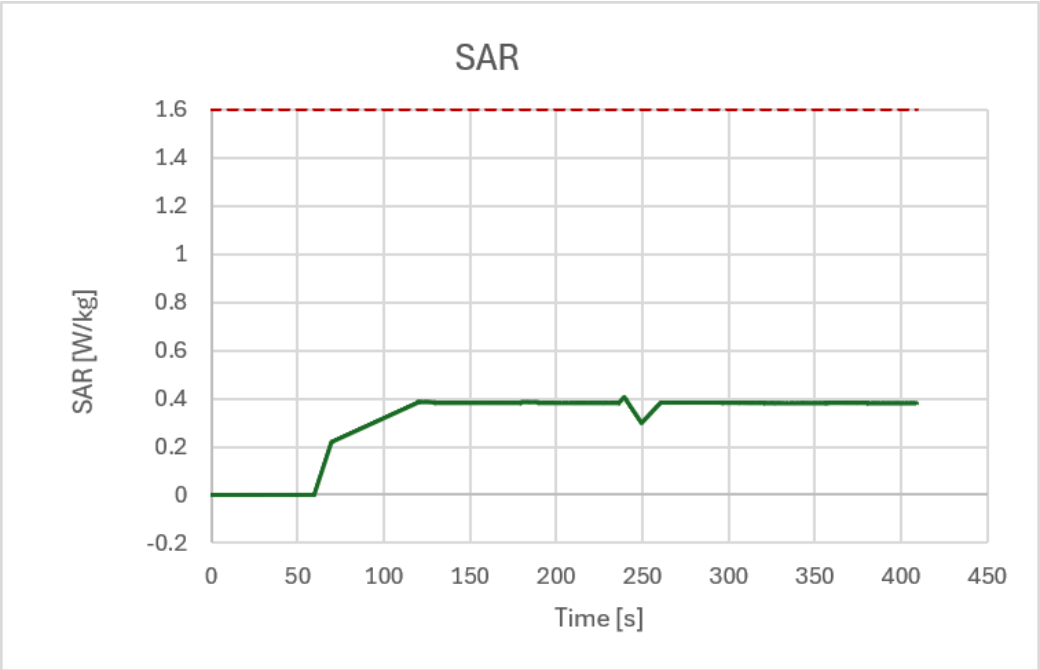




| | W/kg |
|---|---|
| FCC SAR Limit | 1.6 |
| Max 60 sec time-averaged 1g SAR | 0.536 |
| Validated: Max time-averaged SAR is within device uncertainty of measured SAR at Plimit | |

### 3.1.3. LTE B30

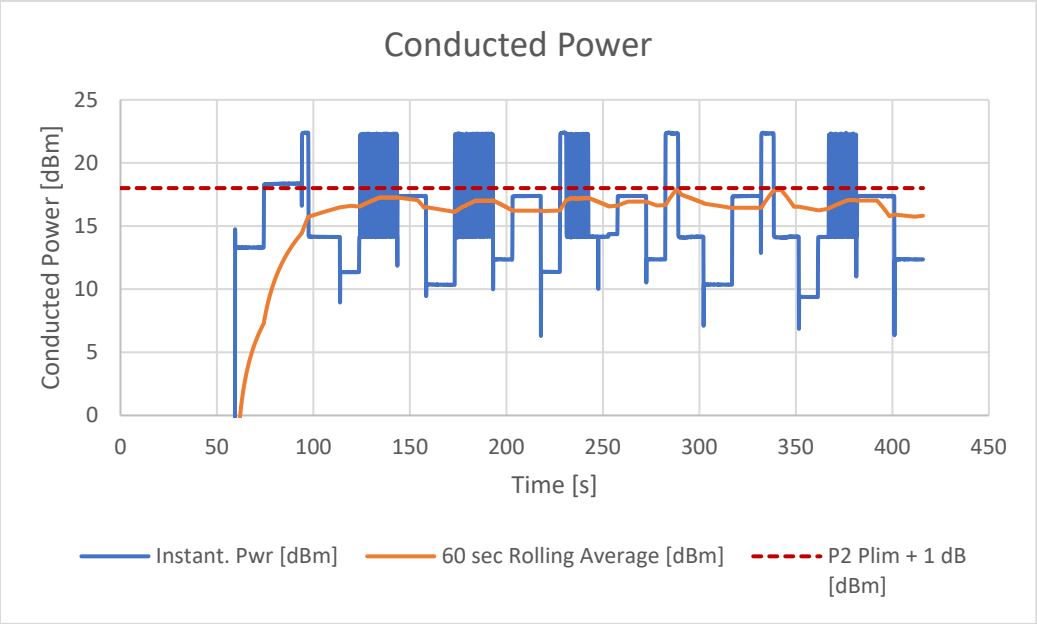
Test Sequence A

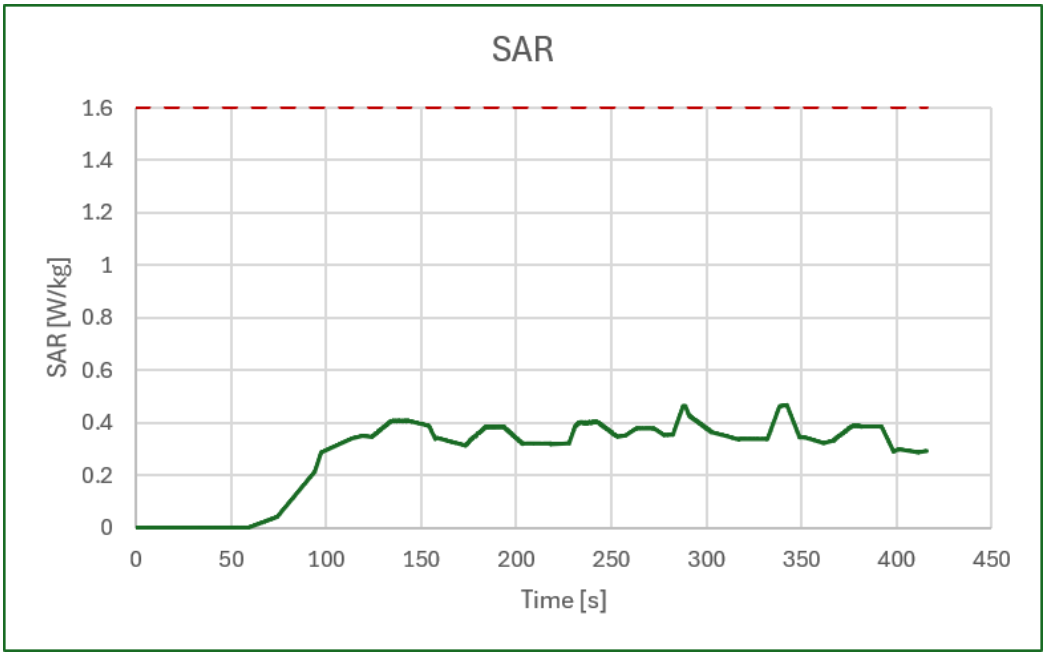



| | W/kg |
|---|---|
| FCC SAR Limit | 1.6 |
| Max 60 sec time-averaged 1g SAR | 0.405 |
| Validated: Max time-averaged SAR is within device uncertainty of measured SAR at Plimit | |

## Test Sequence B

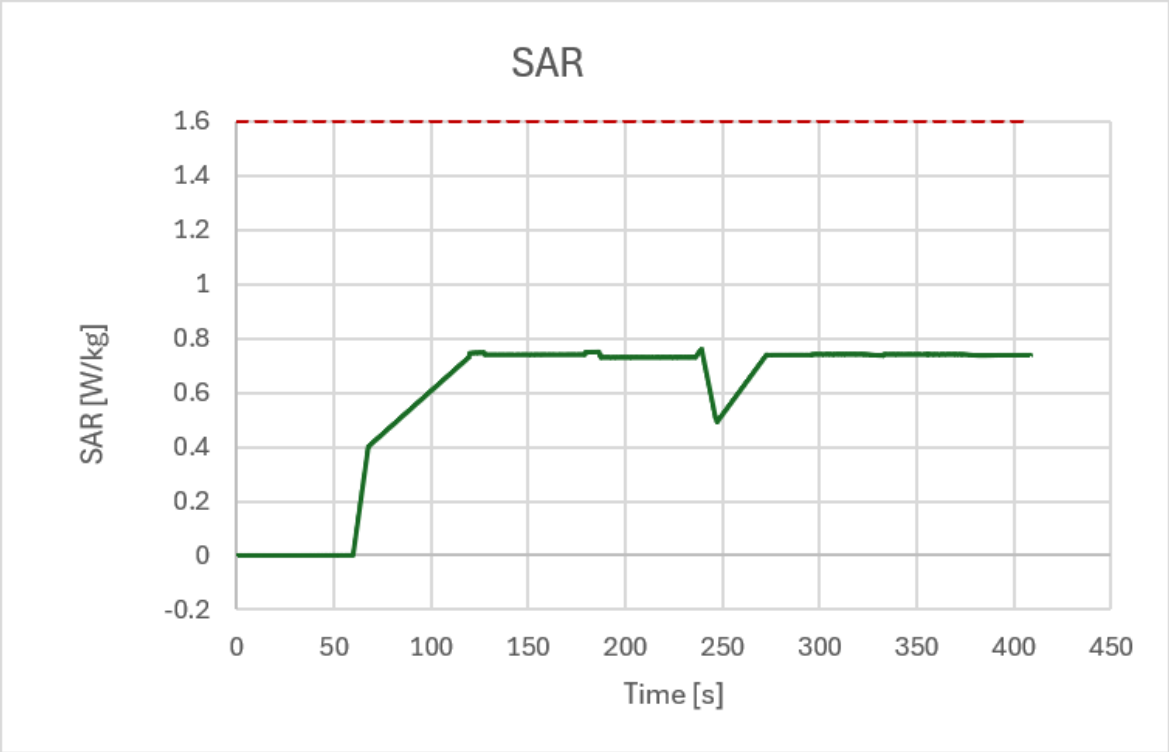



| | W/kg |
|---|---|
| FCC SAR Limit | 1.6 |
| Max 60 sec time-averaged 1g SAR | 0.466 |
| Validated: Max time-averaged SAR is within device uncertainty of measured SAR at Plimit | |

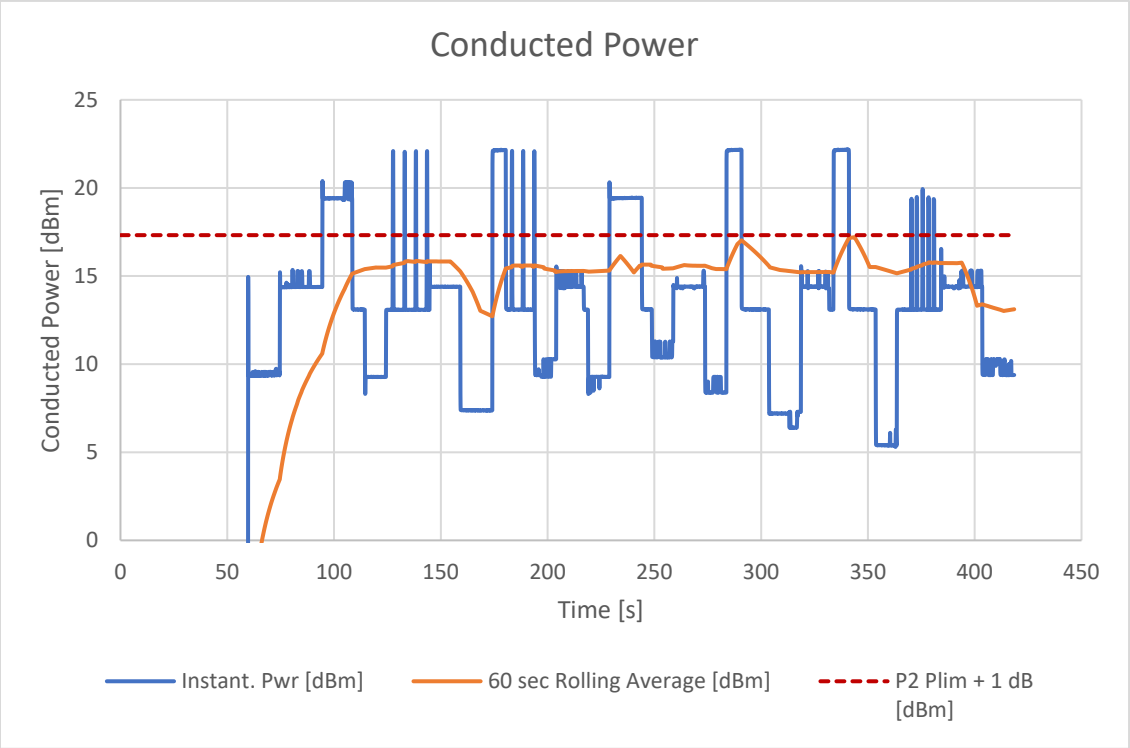
### 3.1.4. Sub6 NR n66

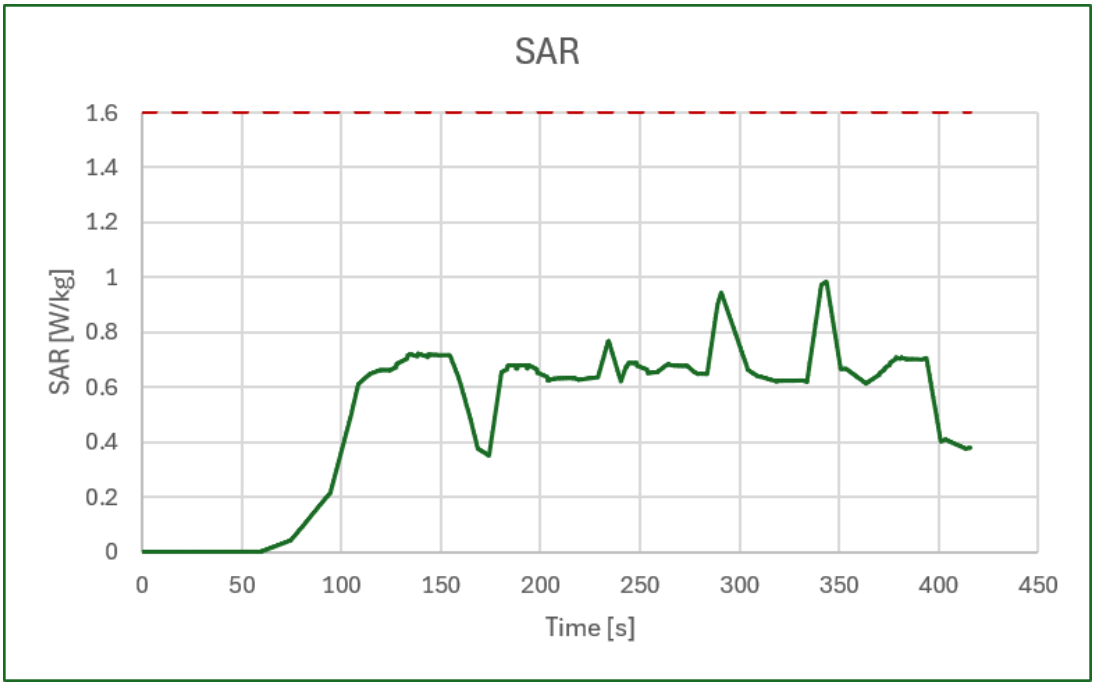
Test Sequence A




| | W/kg |
|---|---|
| FCC SAR Limit | 1.6 |
| Max 60 sec time-averaged 1g SAR | 0.758 |
| Validated: Max time-averaged SAR is within device uncertainty of measured SAR at Plimit | |

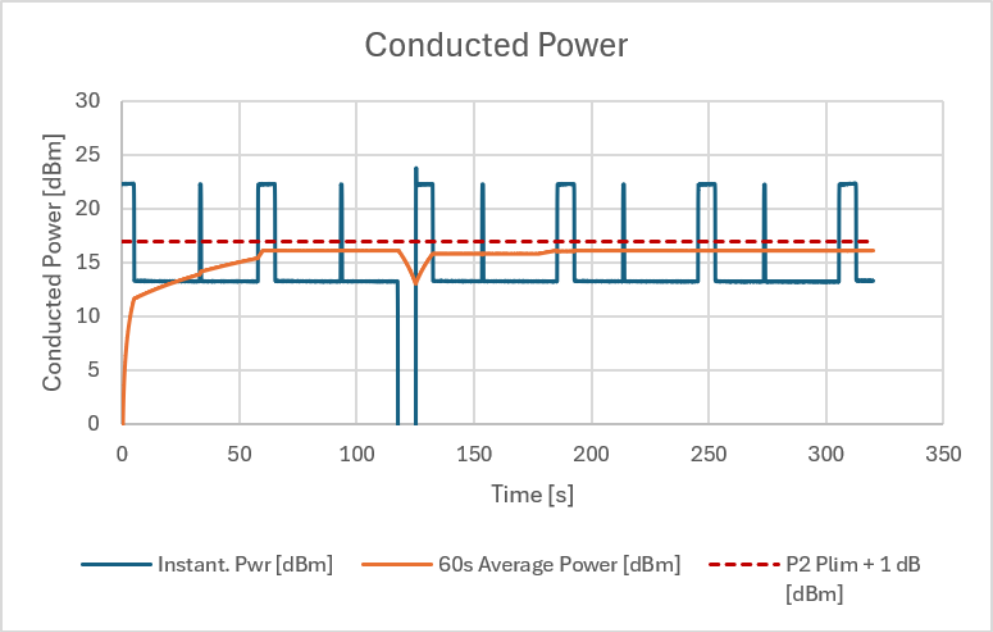
## Test Sequence B

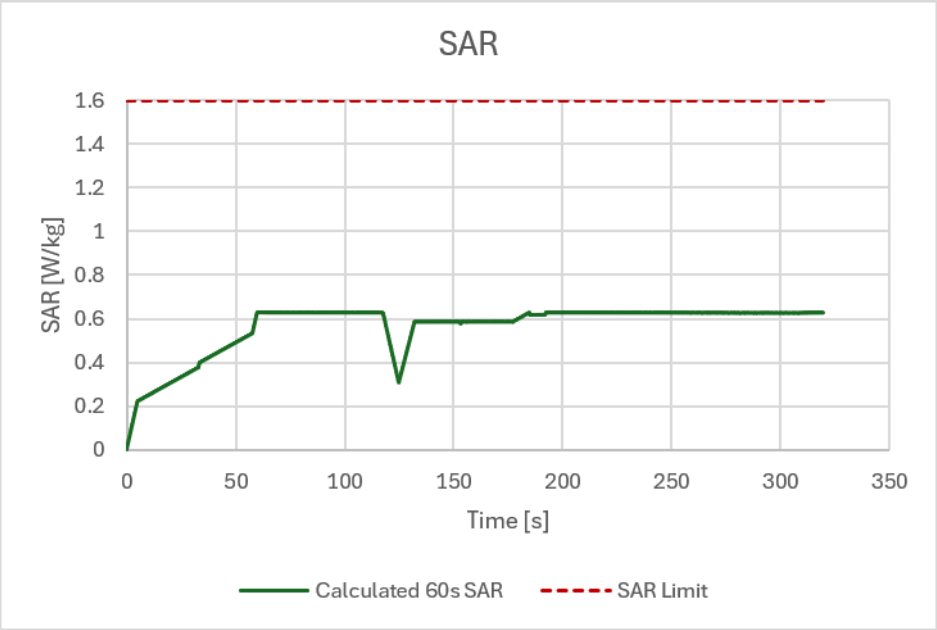



| | W/kg |
|---|---|
| FCC SAR Limit | 1.6 |
| Max 60 sec time-averaged 1g SAR | 0.983 |
| Validated: Max time-averaged SAR is within device uncertainty of measured SAR at Plimit | |

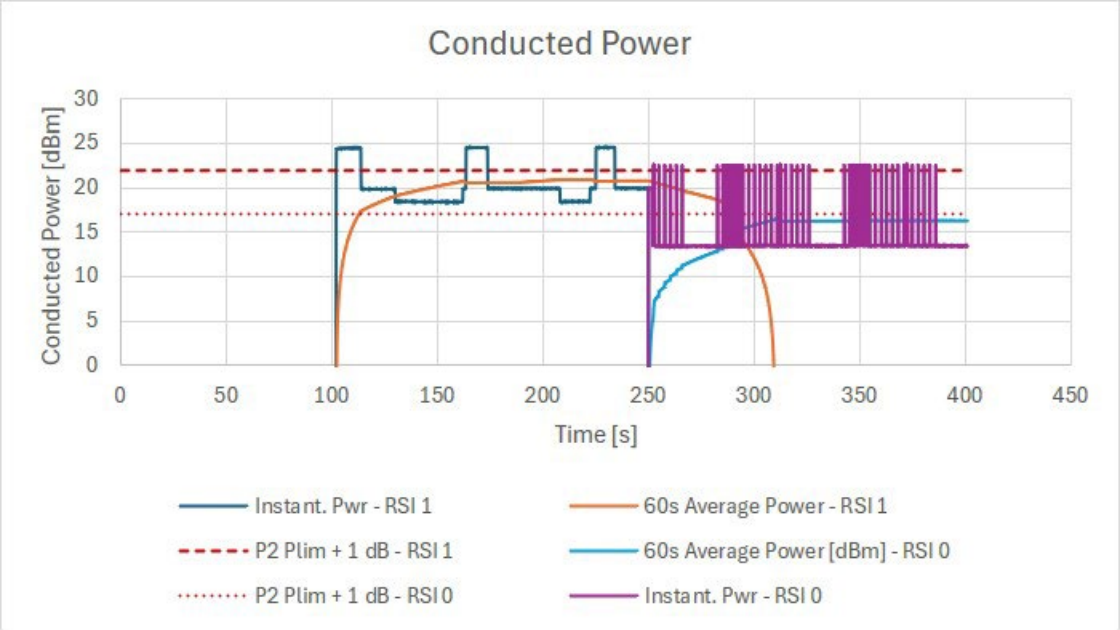
### 3.1.5. Call Drop

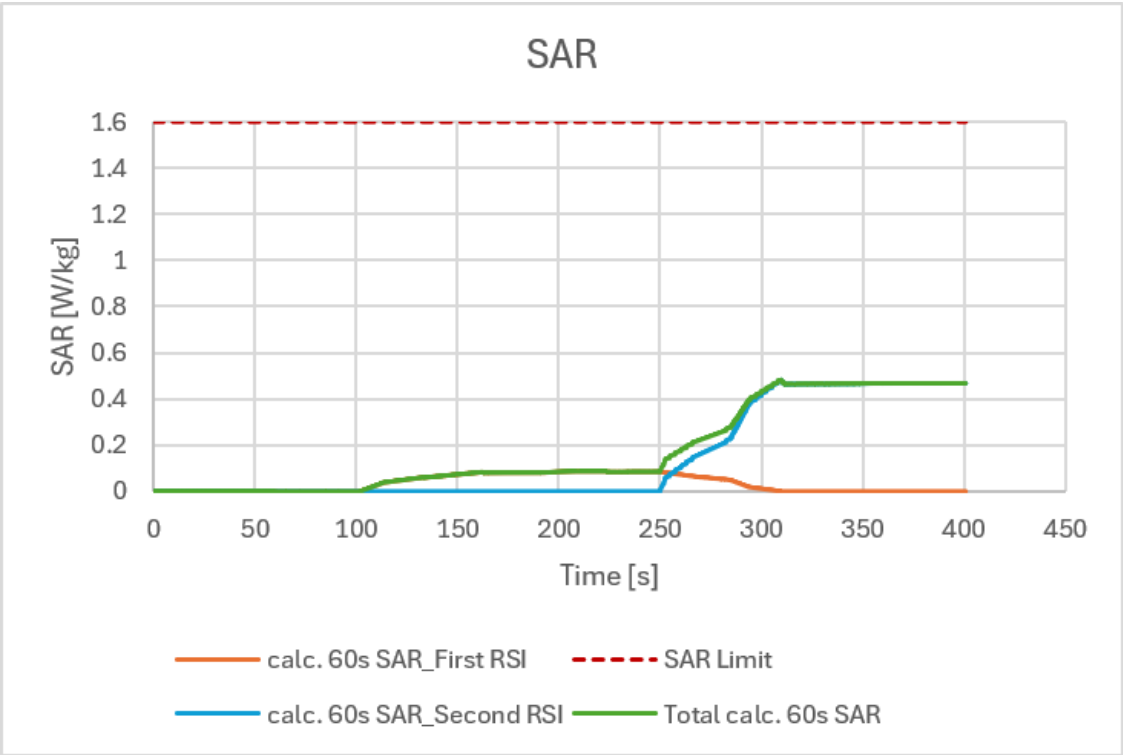



| | W/kg |
|---|---|
| FCC SAR Limit | 1.6 |
| Max 60 sec time-averaged 1g SAR | 0.631 |
| Validated: Max time-averaged SAR is within device uncertainty of measured SAR at Plimit | |

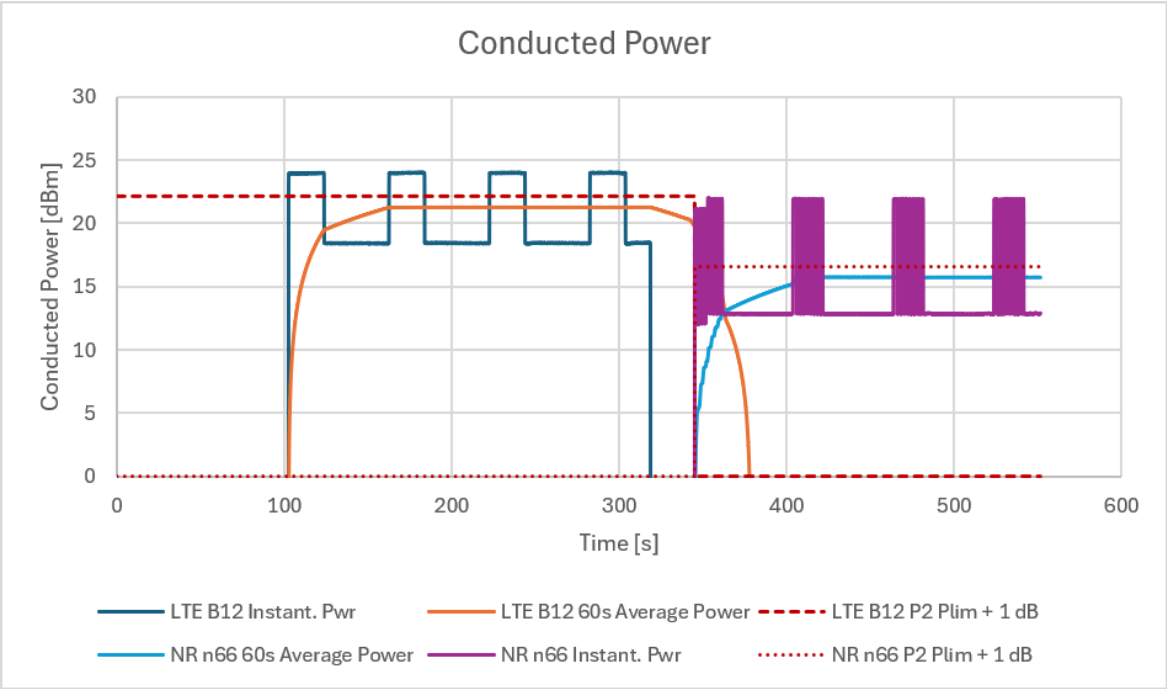
### 3.1.6. RSI Switch

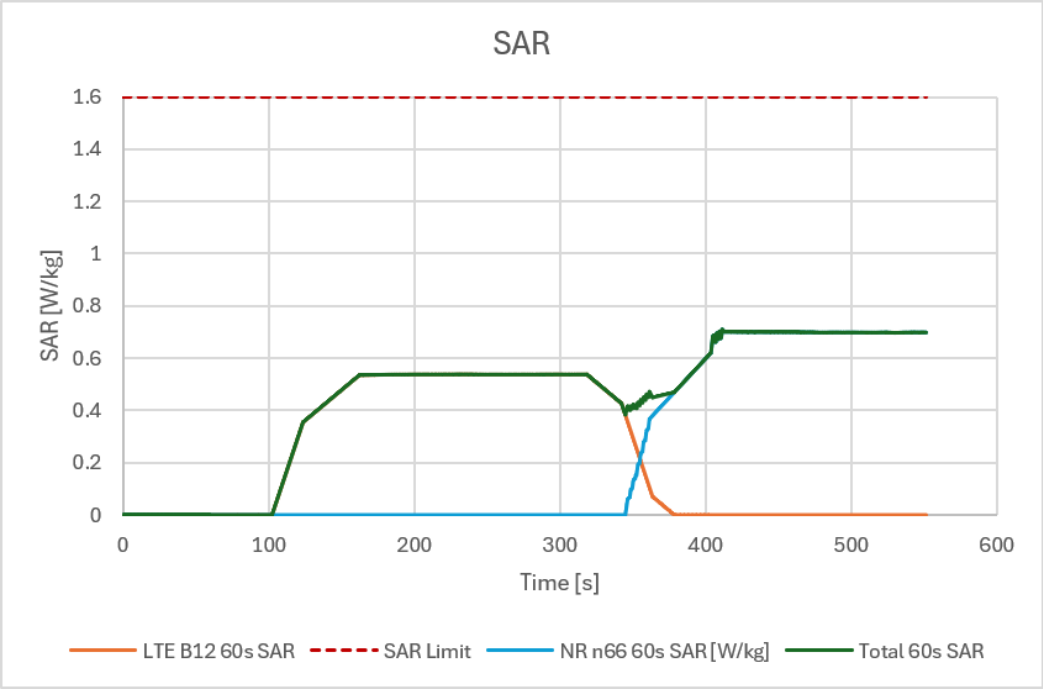



| | W/kg |
|---|---|
| FCC SAR Limit | 1.6 |
| Max 60 sec time-averaged SAR | 0.482 |
| Validated: Max time-averaged SAR is within device uncertainty of measured SAR at Plimit | |

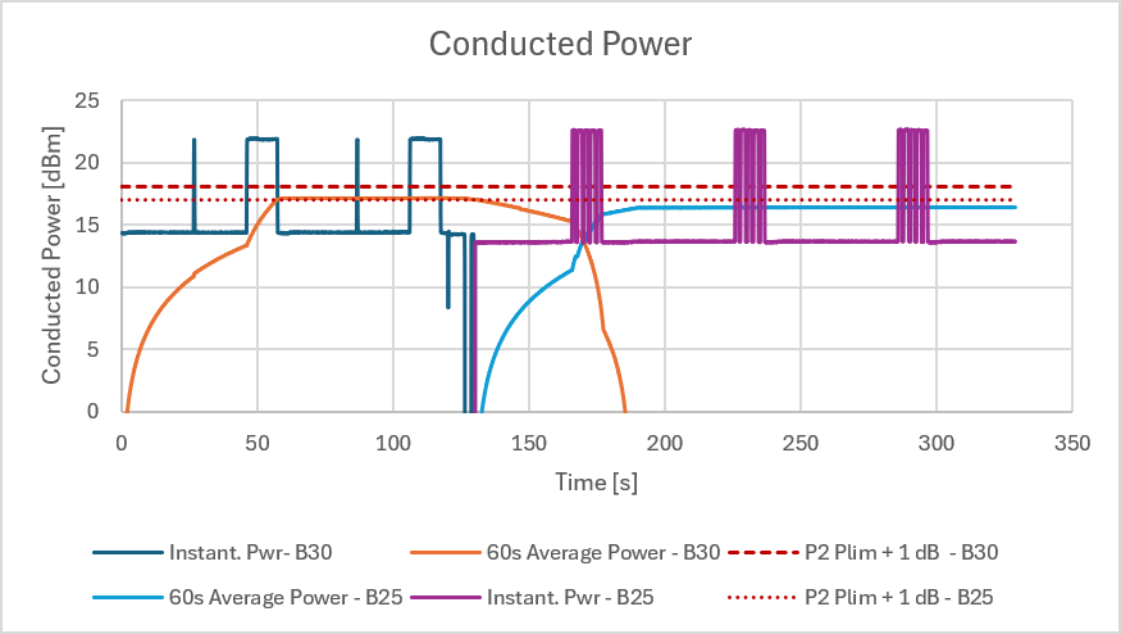
### 3.1.7. Tech/Band Switch

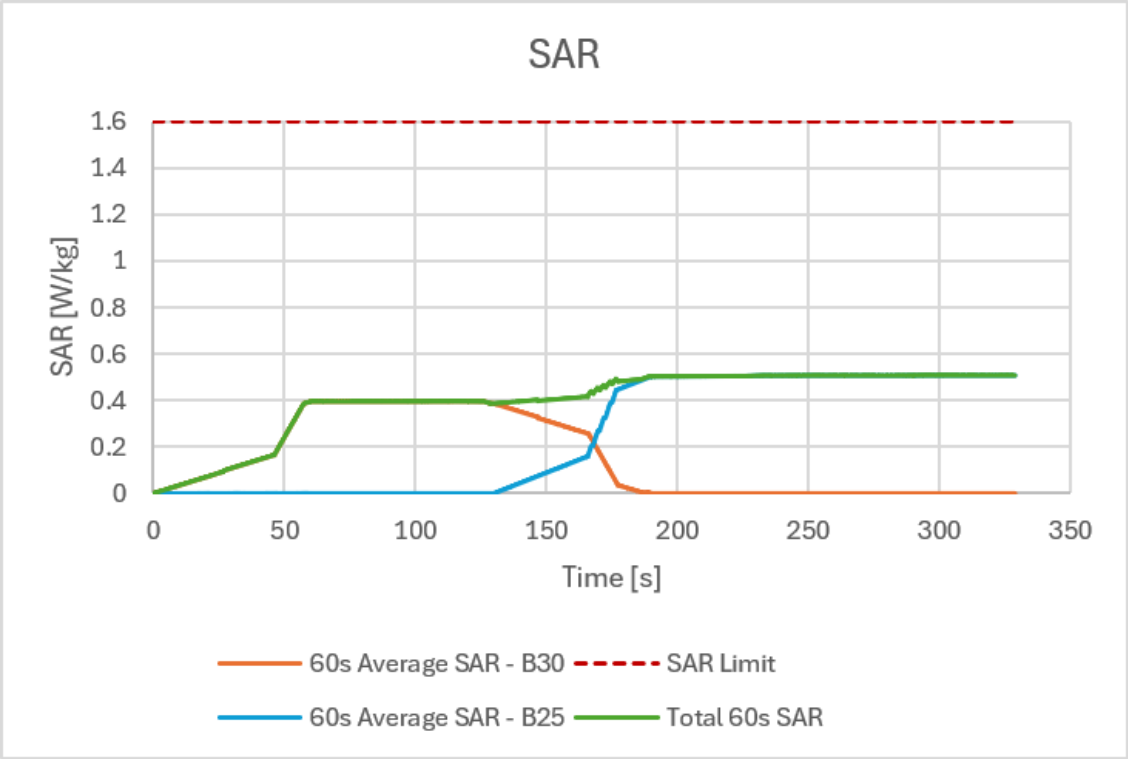



| | W/kg |
|---|---|
| FCC SAR Limit | 1.6 |
| Max 60 sec time-averaged SAR | 0.710 |
| Validated: Max time-averaged SAR is within device uncertainty of measured SAR at Plimit | |

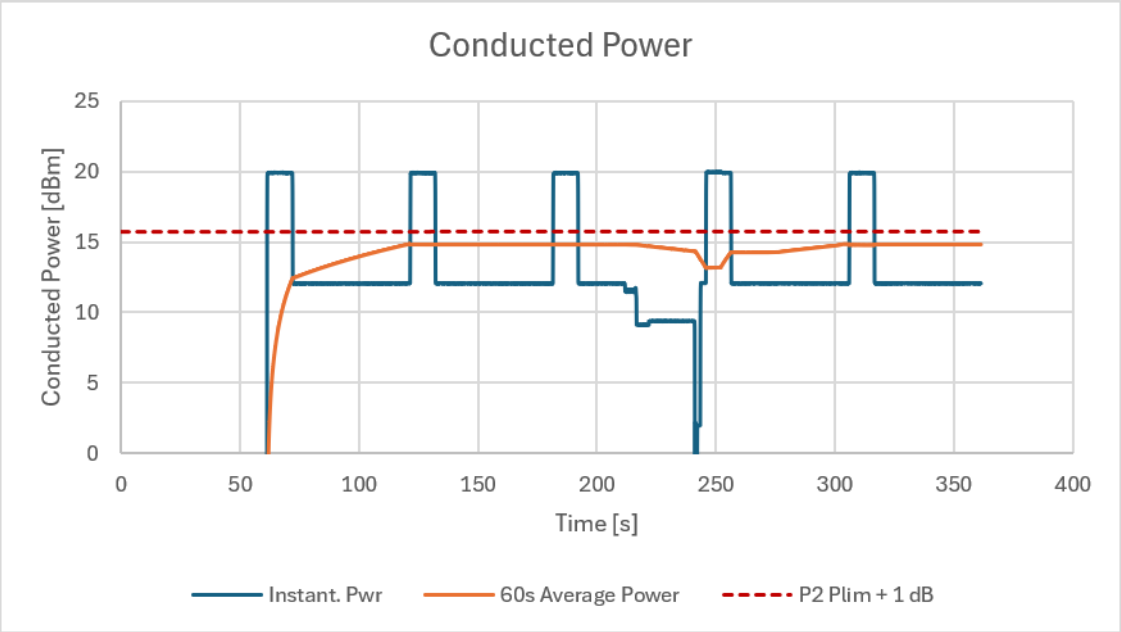
### 3.1.8. Band/Antenna Switch

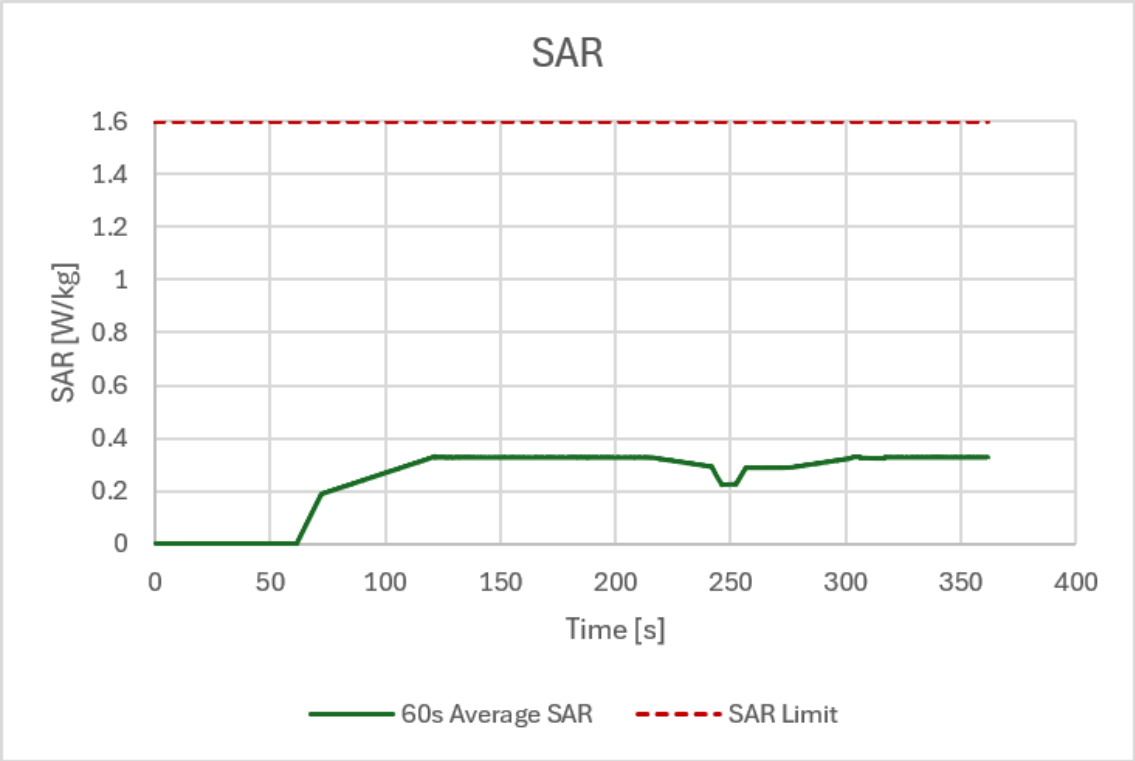



| | W/kg |
|---|---|
| FCC SAR Limit | 1.6 |
| Max 60 sec time-averaged SAR | 0.507 |
| Validated: Max time-averaged SAR is within device uncertainty of measured SAR at Plimit | |

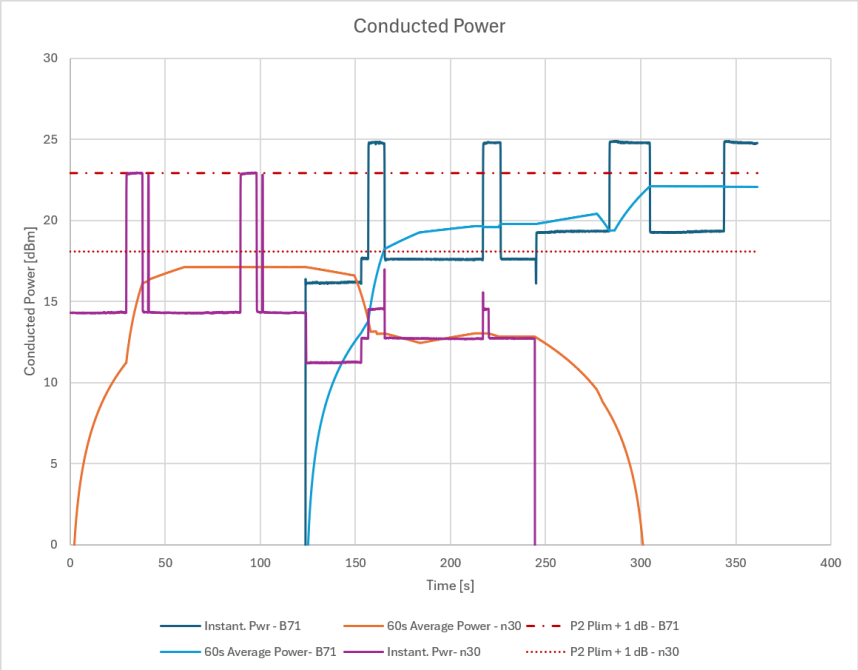
### 3.1.9. LTE Intraband ULCA

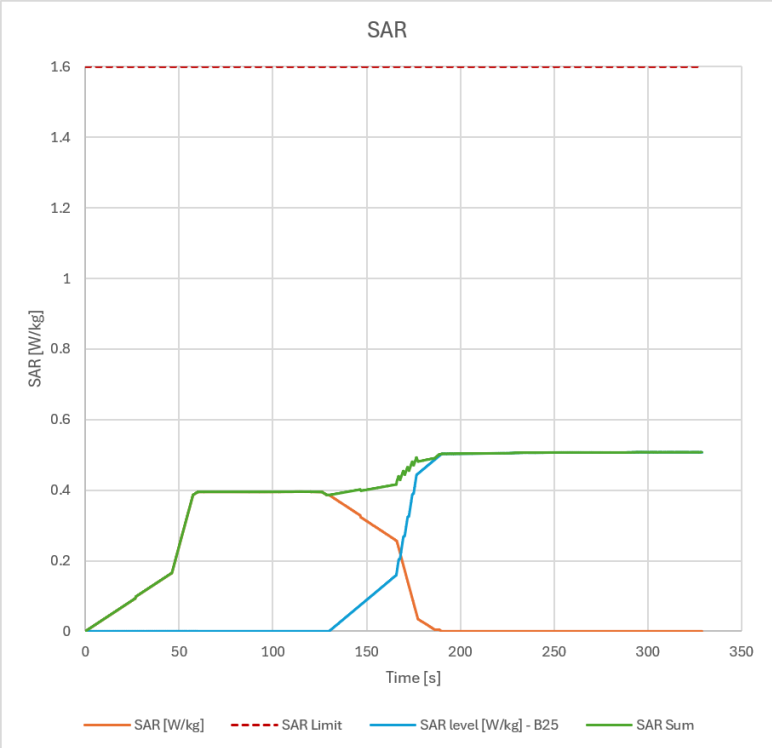



| | W/kg |
|---|---|
| FCC SAR Limit | 1.6 |
| Max 60 sec time-averaged SAR | 0.330 |
| Validated: Max time-averaged SAR is within device uncertainty of measured SAR at Plimit | |

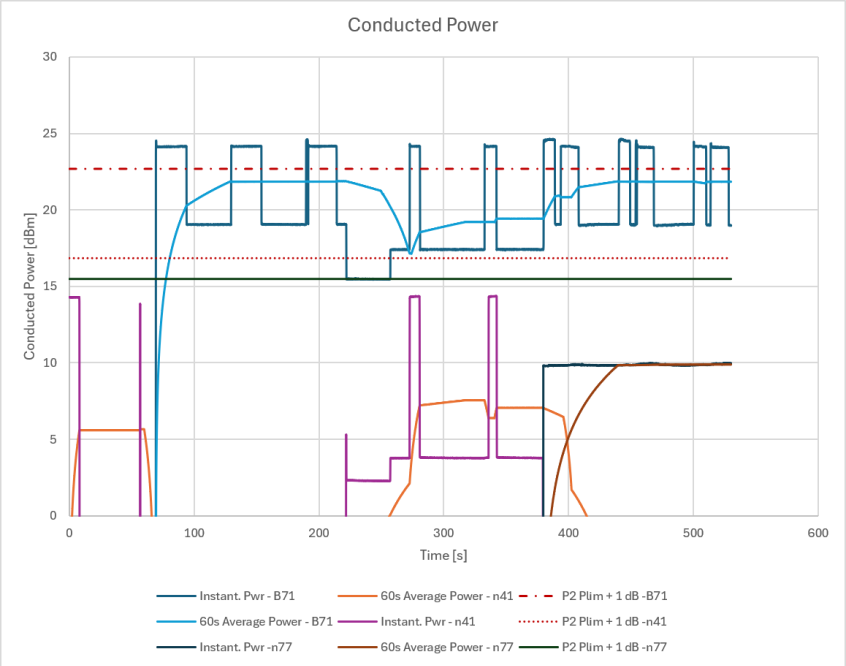
### 3.1.10. SAR Exposure Switch – ENDC

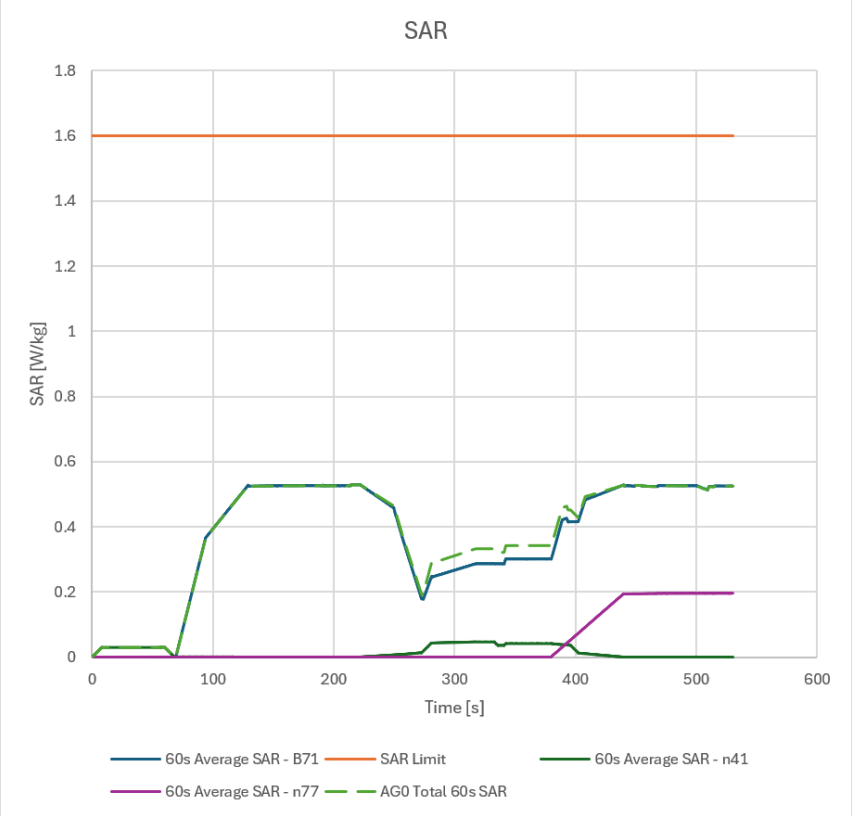



| | W/kg |
|---|---|
| FCC SAR Limit | 1.6 |
| Max time-averaged 60 sec SAR | 0.558 |
| Validated: Max time-averaged SAR is within device uncertainty of measured SAR at Plimit | |

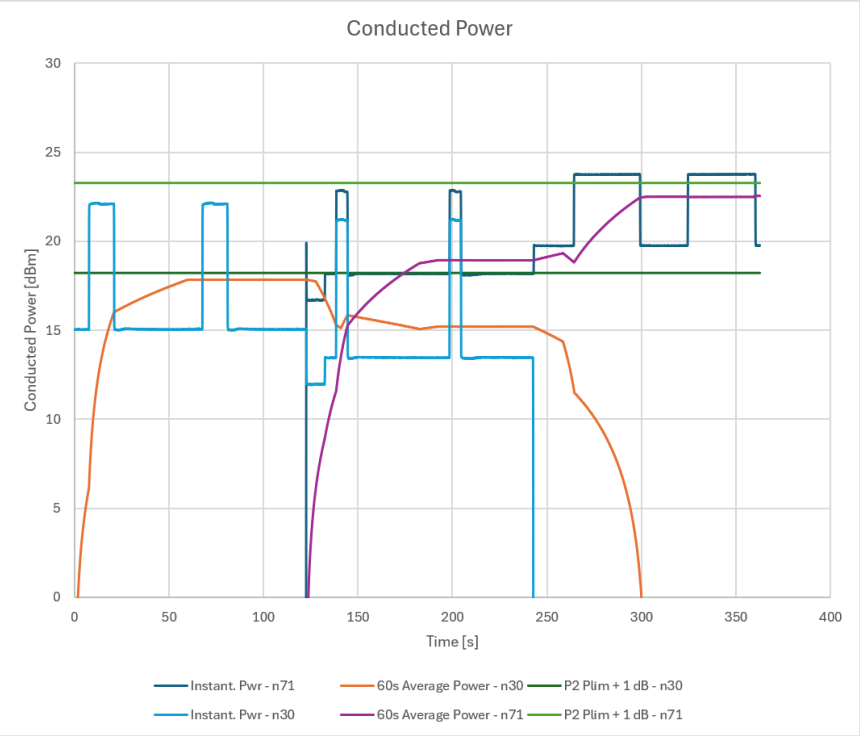
### 3.1.11. SAR Exposure Switch - ENDC (NR Antenna Switching)

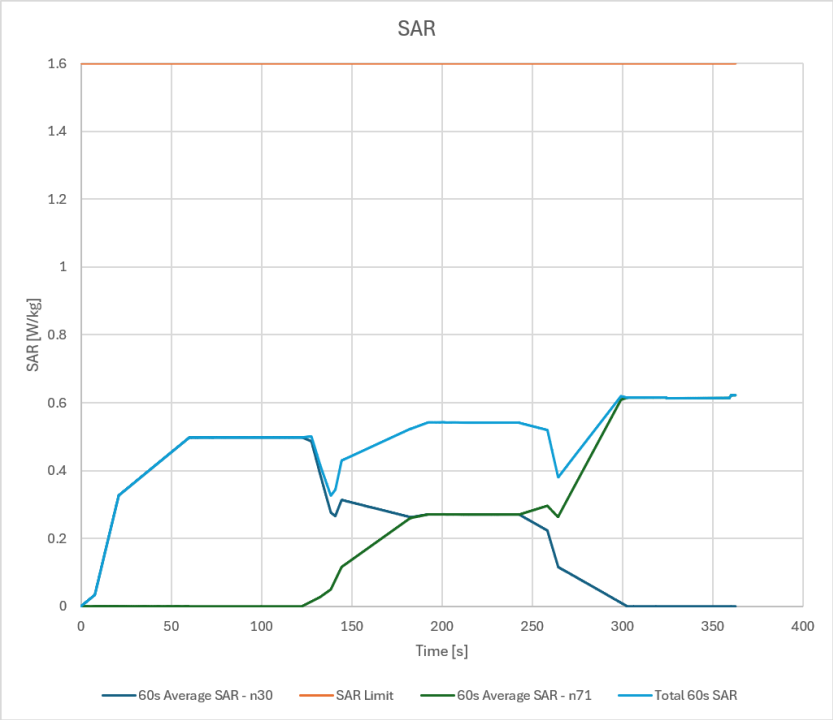



| | W/kg |
|---|---|
| FCC SAR Limit | 1.6 |
| Max time-averaged 60 sec SAR | 0.529 |
| Validated: Max time-averaged SAR is within device uncertainty of measured SAR at Plimit | |

### 3.1.12. FR1 NR Inter-band ULCA




| | W/kg |
|---|---|
| FCC SAR Limit | 1.6 |
| Max time-averaged 60 sec SAR | 0.622 |
| Validated: Max time-averaged SAR is within device uncertainty of measured SAR at Plimit | |

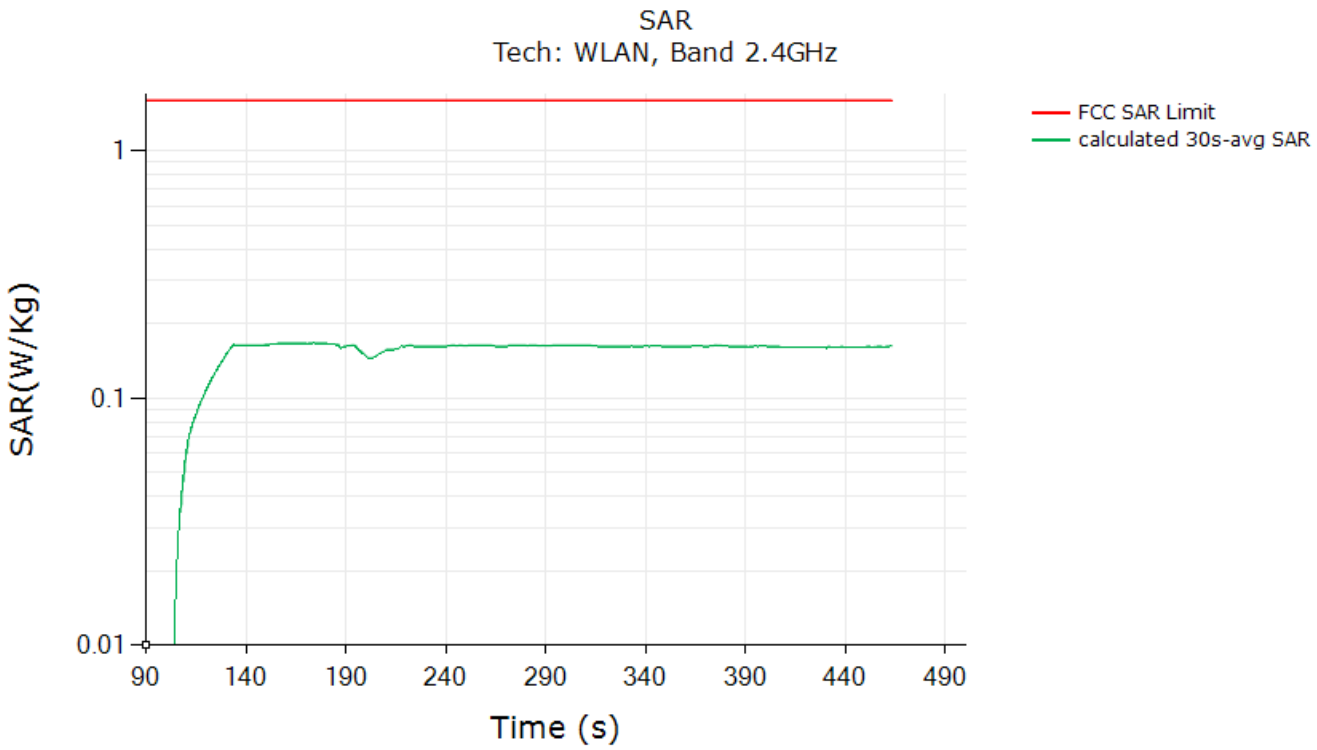
# 4. Qualcomm FastConnect Part 2 Test Results

## 4.1. Conducted Tx Cases (Freq < 6 GHz)

Time-averaged conducted Tx power is converted into time-averaged 1g SAR in the figures below. Please see below for time-averaged 1g SAR and SAR limit that the test result complies. Section 3 contains detailed information regarding the test configurations.

### 4.1.1. 2.4 GHz WLAN 802.11n

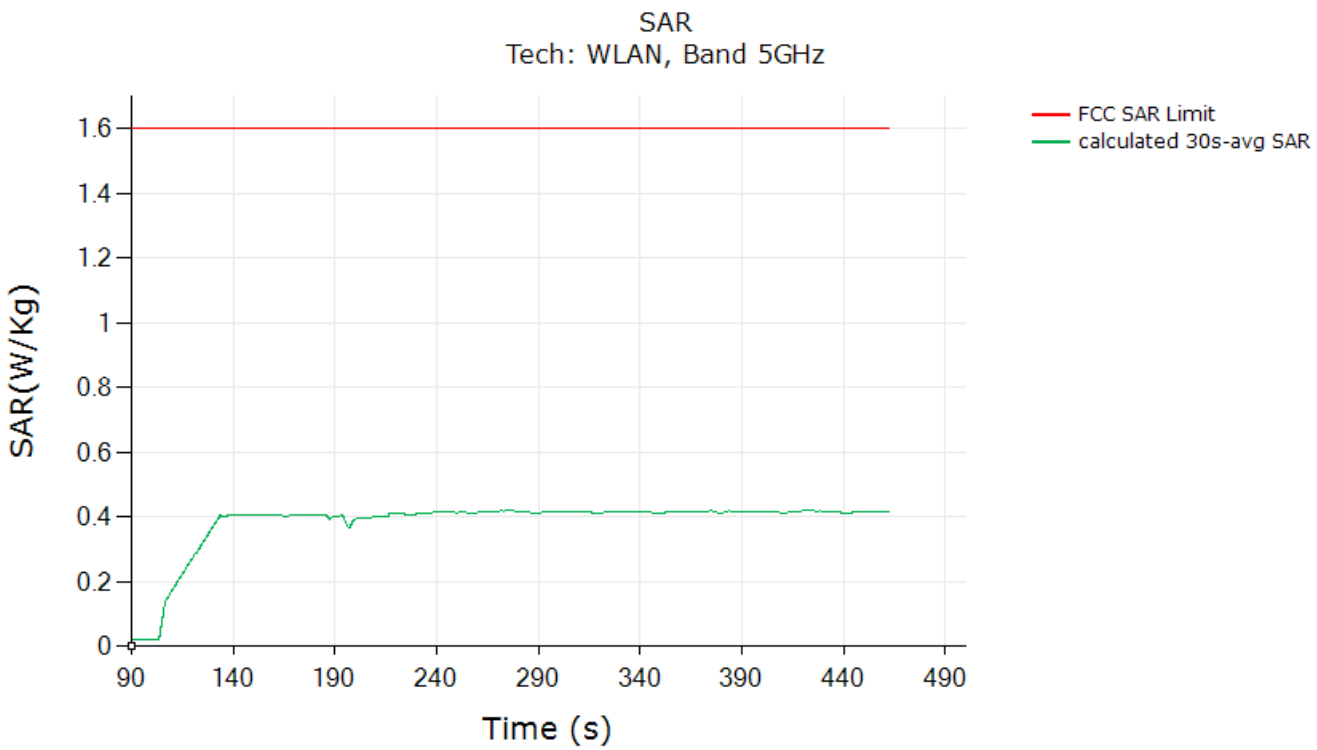
Test Sequence A




| | W/kg |
|---|---|
| FCC SAR Limit | 1.6 |
| Max 30 sec time-averaged 1g SAR | 0.167 |
| Validated: Max time-averaged SAR is within device uncertainty of measured SAR at Plimit | |

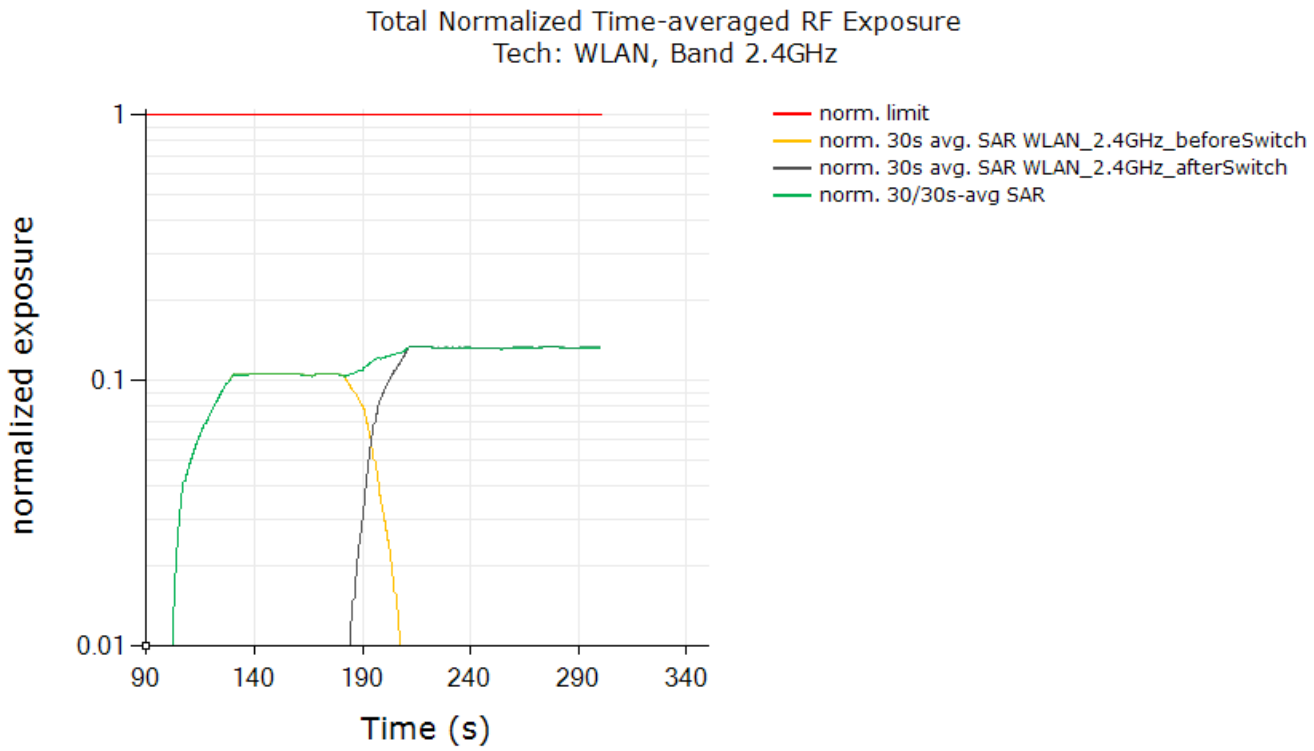
### 4.1.2. 5 GHz WLAN 802.11ac

Test Sequence A



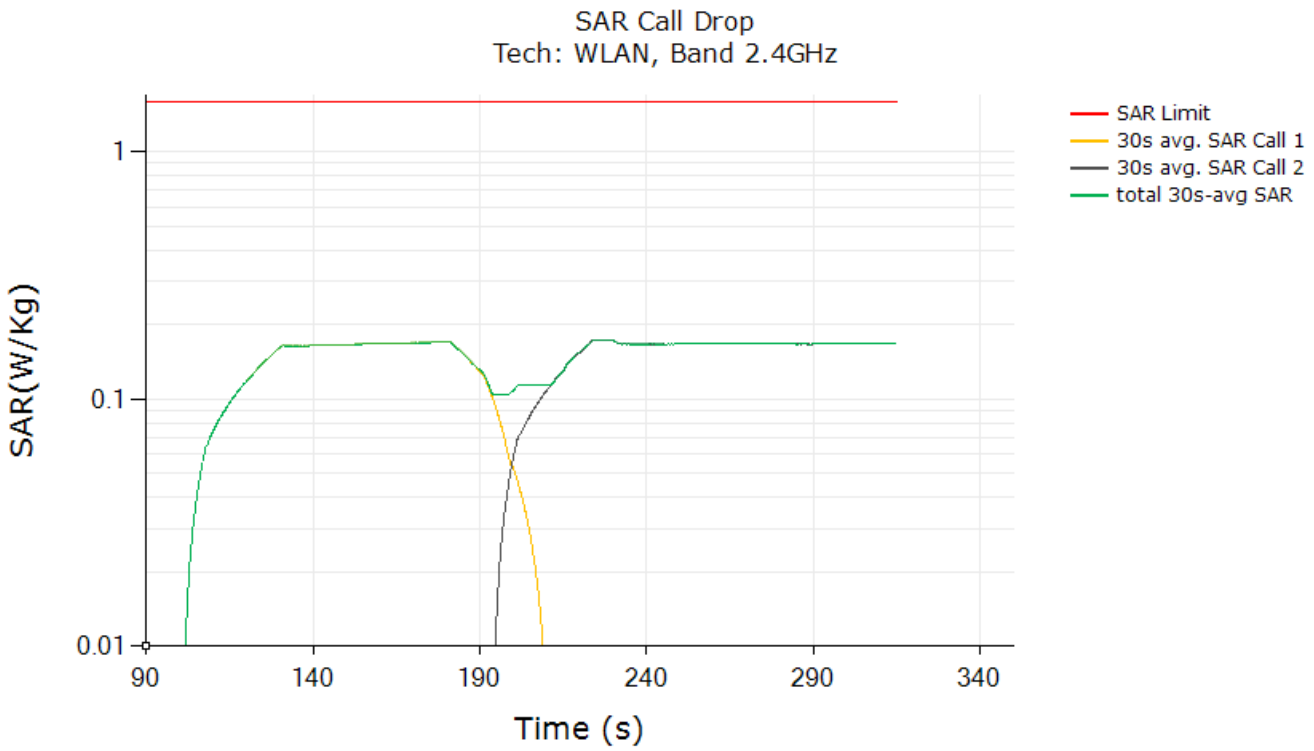

| | W/kg |
|---|---|
| FCC SAR Limit | 1.6 |
| Max 30 sec time-averaged 1g SAR | 0.420 |
| Validated: Max time-averaged SAR is within device uncertainty of measured SAR at Plimit | |

### 4.1.3. WLAN DSI Change



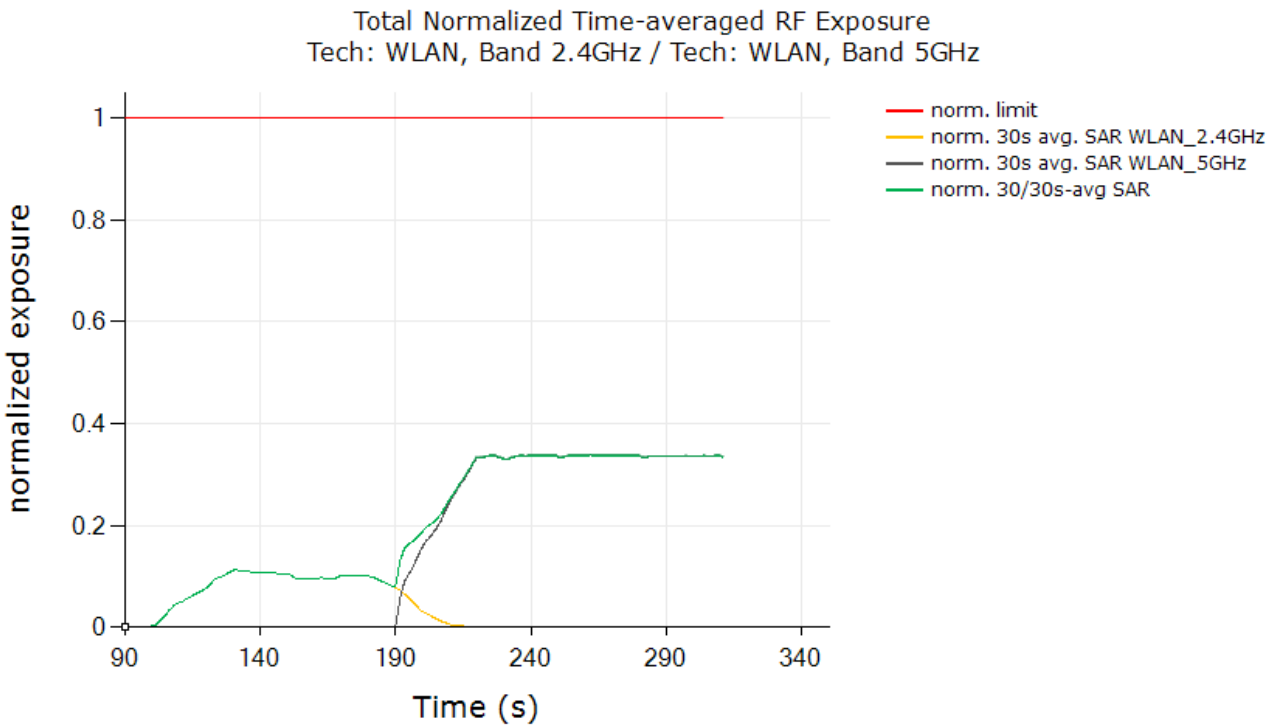

| | W/kg |
|---|---|
| Normalized SAR Limit | 1.0 |
| Max time-averaged Normalized SAR | 0.134 |
| Validated: Max time-averaged SAR is within device uncertainty of measured SAR at Plimit | |

### 4.1.4. WLAN Call Drop Change



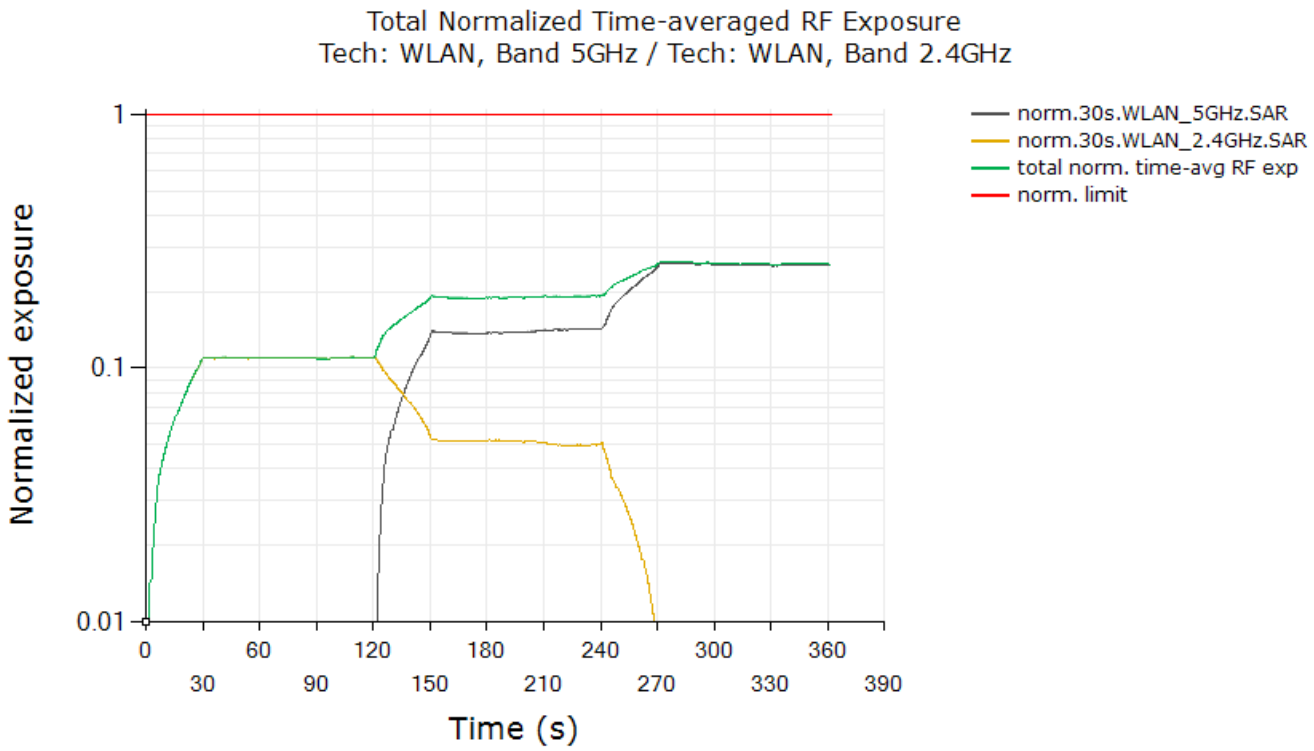

| | W/kg |
|---|---|
| FCC SAR Limit | 1.6 |
| Max 30 sec time-averaged 1g SAR | 0.174 |
| Validated: Max time-averaged SAR is within device uncertainty of measured SAR at Plimit | |

### 4.1.5. WLAN Band/Antenna Change




| | W/kg |
|---|---|
| Normalized SAR Limit | 1.0 |
| Max time-averaged Normalized SAR | 0.338 |
| Validated: Max time-averaged SAR is within device uncertainty of measured SAR at Plimit | |

### 4.1.6. WLAN Dual Band Simultaneous (DBS)

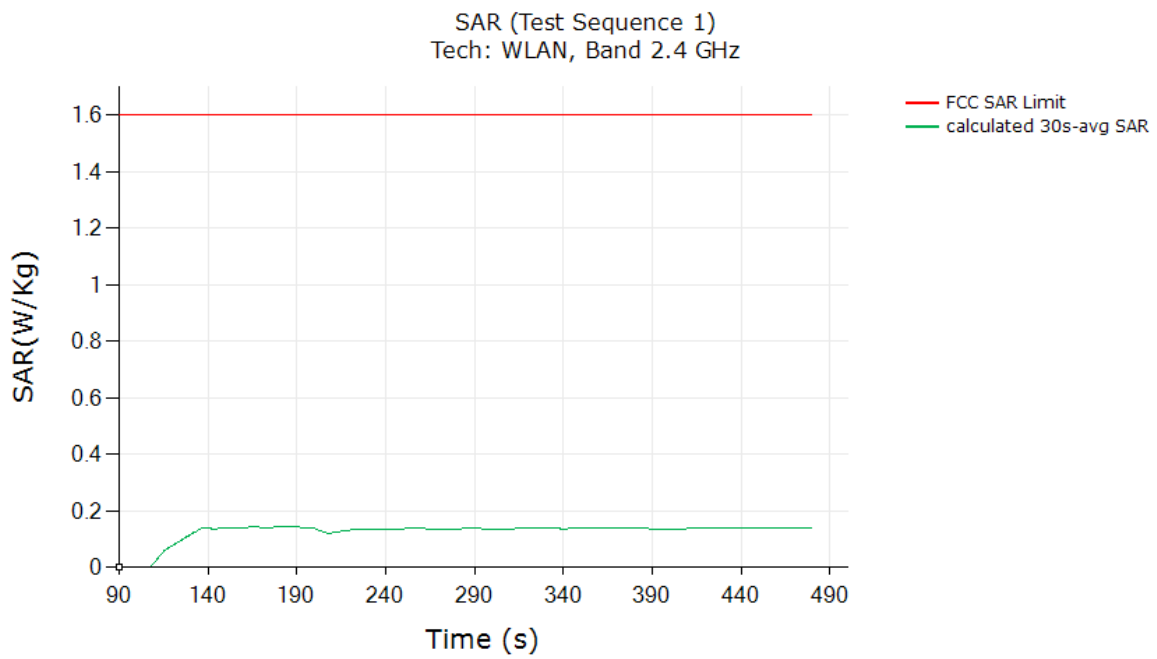



| | W/kg |
|---|---|
| Normalized SAR Limit | 1.0 |
| Max time-averaged Normalized SAR | 0.263 |
| Validated: Max time-averaged SAR is within device uncertainty of measured SAR at Plimit | |

## 4.2. Radiated SAR Cases (Freq < 6 GHz)

### 4.2.1. 2.4 GHz WLAN 802.11n

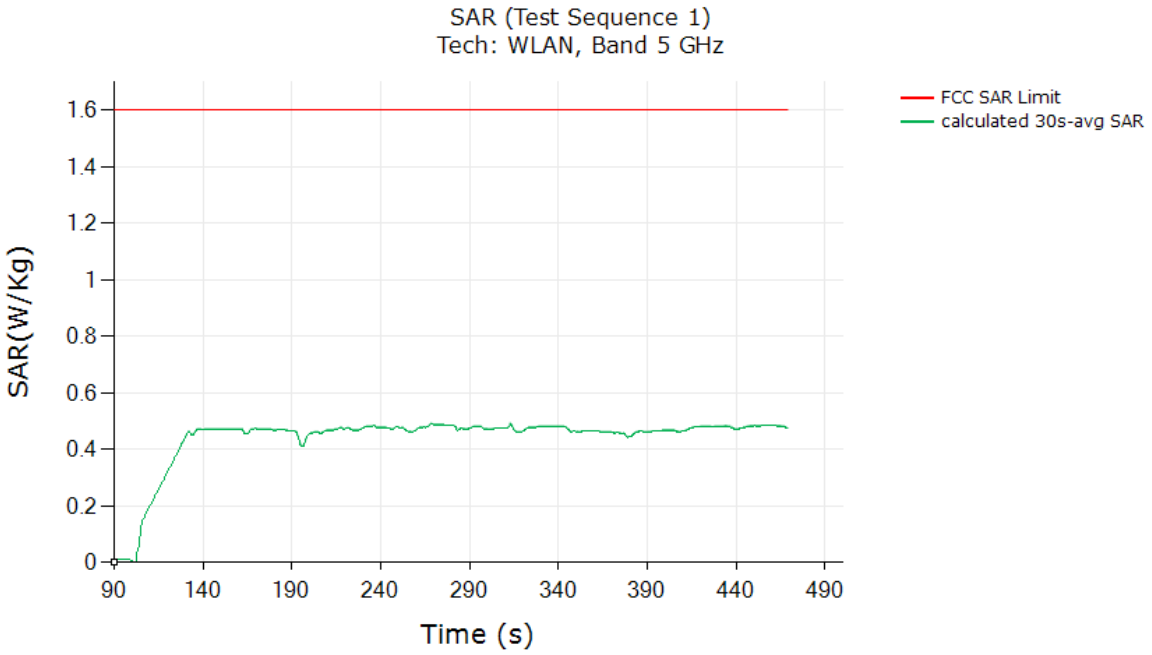
Test Sequence A




| | W/kg |
|---|---|
| FCC SAR Limit | 1.6 |
| Max 30 sec time-averaged 1g SAR | 0.144 |
| Validated: Max time-averaged SAR is within device uncertainty of measured SAR at Plimit | |

### 4.2.2. 5 GHz WLAN 802.11ac

Test Sequence A



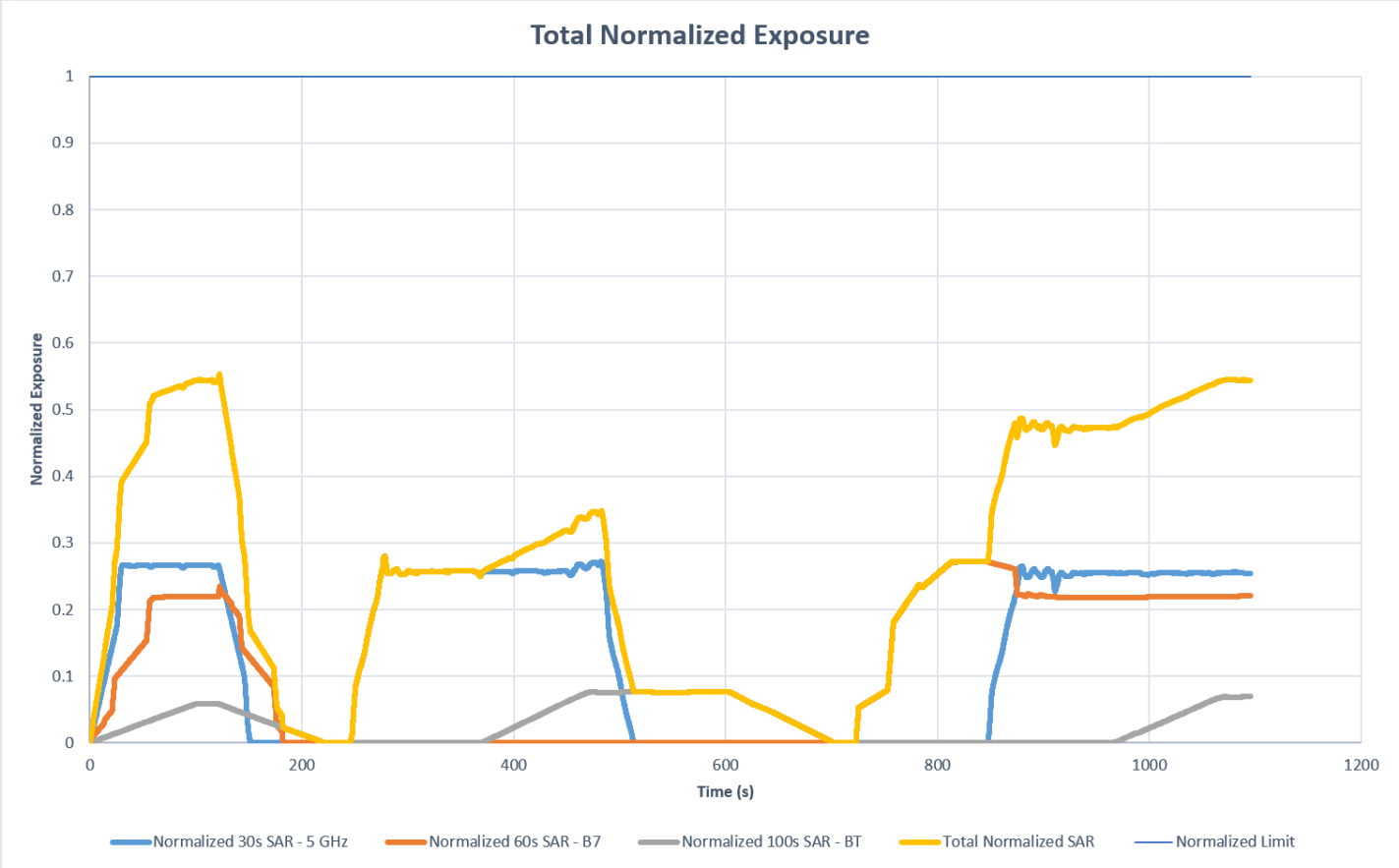

| | W/kg |
|---|---|
| FCC SAR Limit | 1.6 |
| Max 30 sec time-averaged 1g SAR | 0.493 |
| Validated: Max time-averaged SAR is within device uncertainty of measured SAR at Plimit | |

# 5. S.LSI and Qualcomm FastConnect Part 2 Test Results

## 5.1. Conducted Tx Cases (Freq < 6 GHz)

Time-averaged conducted tx power is converted into time-averaged 1g SAR in the figures below. Please see below for time-averaged 1g SAR and SAR limit that the test result complies. Section 3 contains detailed information regarding the test configurations.

### 5.1.1. C-TAS (LTE – WLAN – BT)




| | W/kg |
|---|---|
| Normalized SAR Limit | 1.0 |
| Max time-averaged Normalized SAR | 0.553 |
| Validated: Max time-averaged SAR is within device uncertainty of measured SAR at Plimit | |

# 6. Background on Radiofrequency (RF) Exposure Limits

## 6.1. Controlled Environment

**Controlled environments** are defined as locations where the RF field intensities have been adequately characterized by means of measurement or calculation and exposure is incurred by persons who are: aware of the potential for RF field exposure, cognizant of the intensity of the RF fields in their environment, aware of the potential health risks associated with RF field exposure and able to control their risk using mitigation strategies. 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.

## 6.2. Uncontrolled Environment

**Uncontrolled environments** are defined as locations where either insufficient assessment of RF fields have been conducted or where persons who are allowed access to these areas have not received proper RF field awareness/safety training and have no means to assess or, if required, to mitigate their exposure to RF fields. The general population/uncontrolled exposure limits are applicable to situations in which the general public may be exposed, or in which persons who may not be made fully aware of the potential for exposure, or cannot exercise control over their exposure. Members of the general public would fall under this category when exposure is not employment-related; for example, in the case of a wireless transmitter that exposes persons in its vicinity.

## 6.3. RF Exposure Limits for 100kHz – 6 GHz

Per FCC 47 CFR §1.1310, the SAR limits are applied for frequencies 100kHz ~ 6 GHz as shown below.

Table 6-1
Human Exposure to RF Radiation Limits FCC 47 CFR §1.1310 - SAR Basic Restrictions

| Environment | Condition | **SAR** | Averaging volume |
|---|---|---|---|
| Uncontrolled / General Population | Head, Neck Trunk | **1.6 W/kg** | 1g cube |
| | Extremity | **4.0 W/kg** | 10g cube |
| Controlled | Head/Trunk | **8 W/kg** | 1g cube |
| | Extremity / Limbs | **20 W/kg** | 10g cube |

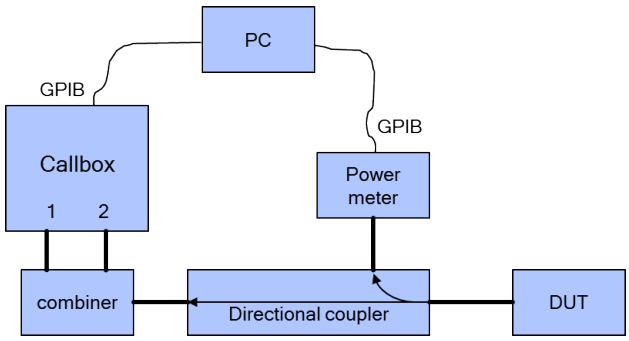
# 7. Technology Specific Test Setup Requirements

## 7.1. Measured and Reported SAR

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.

## 7.2. Conducted Power Measurement Test Setup

Callbox and power meter are connected to the test PC and test scripts are custom made for automation. Power meter readings are periodically recorded every 0.1s for sub6 technologies. A running average of this measured Tx power over the time-averaging window is performed in the post-data processing to determine the time-averaged power.




To demonstrate compliance, all the conducted tx power measurement results were converted into 1g_or_10gSAR values by using the equation listed below:

$$1g_or_10gSAR\ (t) = \frac{conducted_Tx_power(t)}{conducted_Tx_power_Plimit} * 1g_or_10gSAR_Plimit$$

$$\frac{\frac{1}{T_{SAR}}\int_{t-T_{SAR}}^{t} 1g_or_10gSAR(t)dt}{FCC\ SAR_{limit}} \leq 1$$

## 7.3. Test Procedures for Conducted Power Measurements (WWAN)

This section provides general conducted power measurement procedures to perform compliance test under dynamic transmission scenarios. The below figure provides an illustration of how the time-averaged power is calculated to determine the rolling average.

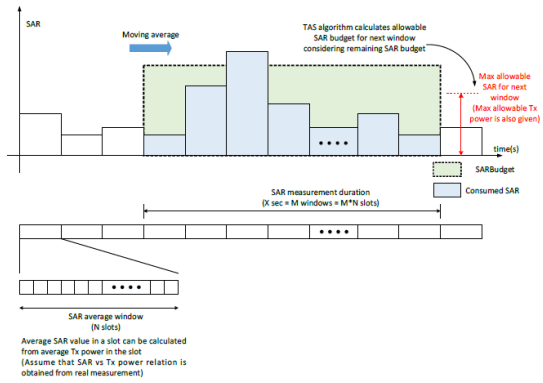



Figure 7-1
Time-averaging illustration

The RF exposure is proportional to transmit (Tx) power for SAR characterization. Accordingly, SAR feature validation can be effectively performed using conducted measurements, since SAR can be derived from transmit power levels. As a result, compliance demonstration under dynamic transmission conditions and TAS feature validation are conducted using a conducted power measurement setup for the defined transmission scenarios.

To provide additional confidence in this approach, the linear relationship between measured SAR and Tx power is demonstrated in the SAR Part 1 report.

1. **Measurement of Transmit Power:**
   - Measure the conducted transmit power over time, denoted as *TxPower(t)*.
   - All measurements are referenced to the UE antenna planes.
   - Convert the measured powers to RF exposure values using a linear relationship:

$$SAR_{inst}(t) = TxPower(t) / P_{limit} \times \text{SAR_design_target}$$

Here, $P_{limit}$ and are the *measured powers* at which the corresponding technology meets the SAR_design_target.

2. **Calculate the Total RF Exposure:**
   - Calculate the total RF exposure over the most recent measurement durations for each RAT:
   - The total exposure within a measurement duration is obtained by summing the instantaneous SAR values across all relevant RATs and bands for all time instances *u* within the respective intervals: $[t - T_{SAR}, t]$.

## 7.4. WWAN and C-TAS Test cases

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

1. **Time-varying transmit power:** Verification that the TAS feature accurately accounts for transmit (Tx) power variations over time.
2. **Call disconnected and re-establishment:** Verification that the TAS feature correctly accounts for historical Tx power following call termination and subsequent re-establishment.
3. **RSI (Radio SAR Index) change:** Verification that the TAS feature operates correctly and maintains compliance limits across RSI changes.
4. **Technology/band/antenna handover:** Verification that the TAS feature correctly maintains and applies Tx power history across band and RAT transitions.
5. **Uplink Carrier Aggregation (UL CA):** Verification that the TAS feature correctly handles component carrier (CC) addition and removal, supporting both single-CC and CA operation.
6. **SAR exposure switching:** Verification that the TAS feature supports multi-RAT transmission with transitions in operating modes.
7. **NSA with antenna switching:** Verification that the TAS feature correctly handle the change of NSA antenna switching with both active RATs operating simultaneously.
8. **Spatial TAS operation:** Verification of TAS operation with uncoupled antennas under dual-transmitter scenarios. Note that, for scenarios involving two simultaneous transmitters, coupling cases shall be evaluated to demonstrate compliance with SAR regulatory requirements, while uncoupling cases may be evaluated on an *optional basis*.
9. **WWAN + WLAN + BT:** To demonstrate the time averaged RF exposure compliance continuity during technology transition in both single-radio and multi-radio transmission scenarios and under both modes (i.e., ON and airplane).

### 7.4.1. Time-varying Tx power scenario

Two predefined time-varying transmit (Tx) power sequences are applied for all RAT cases, as described below:

1. **Test Sequence A:** This sequence consists of two power levels. One level is the maximum transmit power, *Pmax*, which is applied for at least 150 seconds. The other level is set to the target power level plus 2 dB (*Plimit*(dBm) + 2 dB) and is applied for at least 200 seconds.
2. **Test Sequence B:** This sequence consists of multiple transmit power levels. The specific power levels are defined in Table 7-2 as functions of *Pmax* and *Plimit*.

Table 7-2
Test Sequence B

| Time [Sec] | Definition |
|---|---|
| 15 | Plimit - 5 |
| 20 | Plimit |
| 20 | Plimit +5 |
| 10 | Plimit - 6 |
| 20 | Pmax |
| 15 | Plimit |
| 15 | Plimit - 7 |
| 20 | Pmax |
| 10 | Plimit - 5 |
| 15 | Plimit |
| 10 | Plimit - 6 |
| 20 | Plimit +5 |
| 10 | Plimit - 4 |
| 15 | Plimit |
| 10 | Plimit - 6 |
| 20 | Pmax |
| 15 | Plimit -8 |
| 15 | Plimit |
| 20 | Pmax |
| 10 | Plimit - 9 |
| 20 | Plimit +5 |
| 20 | Plimit |
| 15 | Plimit - 5 |

The Samsung S.LSI TAS algorithm operates independently of band, mode, or channel for a given technology. Accordingly, validation can be performed using one or two representative band/mode/channel combinations per technology. The selection of these combinations is based on the relative values of Plimit and Pmax.

Specifically, the selected combination must satisfy Plimit < Pmax so that the TAS algorithm actively enforces transmit power restrictions.

This test is performed using the two predefined test sequences for all sub-6 GHz technologies, including GSM, WCDMA, LTE, and NR FR1. The purpose of the test is to demonstrate enforcement of maximum transmit power limits and to verify that the time-averaged SAR always remains below the FCC limit.

**Test procedure**

1. Using Pmax and Plimit, generate the power level test sequences for each selected technology and band. Both Test Sequences A and B are generated. Maximum power may be adjusted based on DUT test results.
2. Connect the DUT to the call box in the selected RAT. Configure the call box to request DUT transmit power according to the sequences generated in Step 1. Set an initial transmit power of 0 dBm for 60 seconds prior to starting the test sequence to facilitate post-processing of the time-averaged values with the first sequence value.
3. After completion of the sequence, release the connection.
4. Plot Instantaneous and Averaged Power
    - Instantaneous transmit power versus time (measured in Step 2)
    - Requested transmit power versus time (from Step 2)
    - Time-averaged power over 60 seconds using instantaneous values from Step 2
    - $P_{limit}$ determined to meet the SAR design target
5. Plot Time-Averaged SAR
    - Computed time-averaged 1 g SAR versus time (from Step 2)
    - FCC 1 g SAR limit of 1.6 W/kg

### 7.4.2. Change in Call Scenario

The criterion for selecting the technology and band for call setup and call drop transition testing is to choose the band with the lowest Plimit among all supported bands. The test is performed with the DUT requesting transmission at Pmax so that the Samsung S.LSI TAS feature enforces transmit power restriction for the longest possible duration. The call transition is initiated while the DUT is operating under power-restricted conditions.

A single test is sufficient, as the TAS behavior is independent of band or technology. For the purpose of demonstrating TAS algorithm performance in this report, only the low Plimit case is considered.

This test is designed to demonstrate that the Samsung S.LSI TAS feature correctly accounts for historical transmit power values during time averaging when a new call is established. The call transition is performed while the DUT is operating under active power-limit enforcement.

**Test procedure**

1. Connect the DUT to the call box.
2. Configure the call box to set DUT transmit power to a low value below 0 dBm for 60 seconds.
3. Configure the call box to send "ALL UP" power control commands.
4. Continue transmission from the DUT to achieve the maximum power Pmax.
5. After 150 seconds of transmission at Pmax, release the call from the call box.
6. After 10 seconds, re-establish the LTE connection from the call box to the DUT.
7. Repeat sending "ALL UP" power control commands to bring transmit power to Pmax and continue transmission for 140 seconds.
8. Release the LTE connection at the end of the sequence.
9. Plot Instantaneous and Averaged Power
    - Instantaneous transmit power versus time (measured in Step 2)
    - Requested transmit power versus time (from Step 2)
    - Time-averaged power over 60 seconds using instantaneous values from Step 2
    - $P_{limit}$ determined to meet the SAR design target
10. Plot Time-Averaged SAR
    - Computed time-averaged 1 g SAR versus time (from Step 2)
    - FCC 1 g SAR limit of 1.6 W/kg

The current TAS algorithm software enables the UE to accurately estimate transmit power and time-averaged SAR, even during call drop and call re-establishment events. The UE records the time when it enters sleep mode and uses this information upon wake-up to calculate the durations of transmit power on and off periods

### 7.4.3. Change in Technology and Band and Antenna

FCC specifies different measurement durations for time averaging based on the operating frequency. The criterion for selecting test cases to demonstrate compliance is to choose a technology, band, and antenna group for which Plimit < Pmax, ensuring that the TAS algorithm actively enforces transmit power restrictions.

For the purpose of demonstrating TAS algorithm performance in this report, only the low Plimit case is considered.

This test is designed to demonstrate that the Samsung S.LSI TAS feature can correctly handle changes in technology, band, and antenna when a new event occurs. Since both Plimit and the antenna can vary across bands, separate equations are used to convert transmit power to SAR, and combined SAR exposure criteria are applied as follows:

$$SAR_1(t) = TxPower_1(t) / P_{limit,1,FR1} \times SAR_{design\ target1}$$

$$SAR_2(t) = TxPower_2(t) / P_{limit,2,FR1} \times SAR_{design\ target2}$$

Here:

- $P_{limit,1,FR1}$ corresponds to the measured power at which the first technology/band meets the measured SAR level of $SAR_{design\ target1}$, with a time-averaging duration of $T_{1,SAR}$.
- $P_{limit,2,FR1}$, $SAR_{design\ target2}$, and $T_{2,SAR}$ are similarly defined for the second technology/band/antenna combination.
- In this report, a 60-second time-averaging duration is applied for all sub-6 GHz bands, including those below 3 GHz.

**Test procedure**

1. Establish radio connection of DUT with call box.
2. Configure call box to set DUT Tx power to a low value below 0 dBm for 60s.
3. Configure call box to send "ALL UP" power control commands and continue transmission from DUT so that maximum power of Pmax is achieved Continue the transmission for 150s.
4. Change the technology/band/antenna to 2nd technology/band/antenna and continue the transmission for another 150s.
5. Release the connection.
6. Plot Instantaneous and Averaged Power
    - Instantaneous transmit power versus time (measured in Step 2)
    - Requested transmit power versus time (from Step 2)
    - Time-averaged power over 60 seconds using instantaneous values from Step 2
    - $P_{limit}$ determined to meet the SAR design target
7. Plot Time-Averaged SAR
    - Computed time-averaged 1 g SAR versus time (from Step 2)
    - FCC 1 g SAR limit of 1.6 W/kg

It is required to check if power limiting enforcement is operated as expected when tech/band/antenna change occurs in between.

### 7.4.4. Change in RSI

The criterion for selecting a test case to demonstrate compliance across an RSI change within a radio is to choose a technology and band for which Plimit < Pmax in both RSI states. This ensures that the TAS algorithm actively enforces transmit power restrictions in each state.

For the purposes of demonstrating TAS algorithm performance in this report, only the low Plimit case is considered.

This test is designed to demonstrate that the Samsung S.LSI TAS feature can correctly handle changes in the RSI resulting from different SAR index states detected by the host platform software. The test involves modifying

**Test procedure**

1. Establish radio connection of DUT with call box.

2. Configure call box to set DUT Tx power to a low value below 0 dBm for 60s and set the RSI index for 1st RSI.

3. Configure call box to send "ALL UP" power control commands and continue transmission from DUT so that maximum power of Pmax is achieved Continue the transmission for 150s.

4. Change the RSI index to 2nd RSI and continue the transmission for another 150s.

5. Release the connection.

6. Plot Instantaneous and Averaged Power

    - Instantaneous transmit power versus time (measured in Step 2)

    - Requested transmit power versus time (from Step 2)

    - Time-averaged power over 60 seconds using instantaneous values from Step 2

    - $P_{limit}$ determined to meet the SAR design target

7. Plot Time-Averaged SAR

- Computed time-averaged 1 g SAR versus time (from Step 2)
- FCC 1 g SAR limit of 1.6 W/kg

It is required to check if power limiting enforcement is operated as expected when RSI index is changed during the test.

### 7.4.5. Uplink CA

The criterion for selecting this test case is to demonstrate TAS algorithm compliance during LTE/NR transmission with multiple component carriers (CCs). This test verifies that TAS algorithm compliance is independent of the transmission scenario, whether operating with a single CC or with carrier aggregation (CA).

This test is designed to demonstrate that the Samsung S.LSI TAS feature can correctly manage SAR exposure during LTE/NR transmission when additional intra-band or inter-band LTE/NR component carriers (CCs) are added or removed.

**Test procedure**

1. Establish radio connection of DUT with call box over cell 1.
2. Configure call box to set DUT Tx power to a low value below 0 dBm for 60s.
3. Configure call box to send "ALL UP" power control commands and continue transmission from DUT so that maximum power of Pmax is achieved Continue the transmission for 150s.
4. Establish connection of DUT with call box over Cell 2, other cell of the band Combo CA and continue the transmission for another 150s.
5. Release the connection.
6. Plot Instantaneous and Averaged Power
    - Instantaneous transmit power versus time (measured in Step 2)
    - Requested transmit power versus time (from Step 2)
    - Time-averaged power over 60 seconds using instantaneous values from Step 2
    - $P_{limit}$ determined to meet the SAR design target
7. Plot Time-Averaged SAR
    - Computed time-averaged 1 g SAR versus time (from Step 2)
    - FCC 1 g SAR limit of 1.6 W/kg

It is required to check if power limiting enforcement is operated as expected when intra-band or inter-band change occurs.

### 7.4.6. SAR Exposure Switching

The criterion for selecting this test case is to choose one LTE band and one NR band for which Plimit < Pmax in each case. The test is performed with both RATs operating simultaneously in an EN-DC scenario.

These tests are designed to demonstrate that the Samsung S.LSI TAS feature can correctly handle changes in the dominant SAR-contributing radio when two RATs are active simultaneously. The test involves adjusting the required transmit power of both radios so that either one or both RATs become the dominant contributor to the total exposure ratio at different times during the test.

**Test procedure:**

1. Connect the DUT to both LTE and NR call boxes in an NSA.
2. Configure both LTE and NR call boxes to set DUT transmit power to a low value of 0 dBm for 60 seconds.
3. Configure the NR call box to send "ALL UP" power control commands.
4. Continue DUT transmission until NR reaches maximum Pmax and maintain for 150 seconds.
5. Configure the LTE call box to send "ALL UP" power control commands, resulting in both LTE and NR requesting maximum power from the DUT.
6. Continue transmission for 150 seconds.
7. Configure the NR call box to send "ALL DOWN" power control commands so that LTE becomes the dominant SAR-contributing radio.
8. Continue transmission for 150 seconds.
9. Release both LTE and NR connections.
10. Plot Instantaneous and Averaged Power
    - Instantaneous transmit power versus time (measured in Step 2)
    - Requested transmit power versus time (from Step 2)
    - Time-averaged power over 60 seconds using instantaneous values from Step 2
    - $P_{limit}$ determined to meet the SAR design target
11. Plot Time-Averaged SAR
    - Computed time-averaged 1 g SAR versus time (from Step 2)
    - FCC 1 g SAR limit of 1.6 W/kg

It is required to check if power limiting enforcement is operated as expected when dominant power is changed in ENDC.

### 7.4.7. NSA Antenna Switching

The criterion for selecting this test case is to choose one LTE band and one NR band for which Plimit < Pmax in each case. The tests are performed with both RATs operating simultaneously, either in an EN-DC scenario or in a dual-SIM scenario with various power-sharing (pre-saving) configurations.

This test is designed to demonstrate that the Samsung S.LSI TAS feature can correctly handle antenna switching in an NSA configuration with two simultaneous active RATs. The test involves changing the transmit antennas of both radios so that either one or both RATs become the dominant contributor to the total exposure ratio at different times during the test.

**Test procedure:**

1. Connect the DUT to both LTE and NR call boxes in an NSA configuration.
2. Configure both LTE and NR call boxes to set DUT transmit power to a low value of 0 dBm for 60 seconds.
3. Configure the LTE call box to send "ALL UP" power control commands. Continue DUT transmission until LTE reaches maximum power Pmax and maintain for 150 seconds.
4. Configure the NR call box to send "ALL UP" power control commands, resulting in maximum power requests from the DUT for both LTE and NR. Continue transmission for 150 seconds.
5. Change NR from 1st antenna to 2nd antenna. Configure the NR call box to send "ALL UP" power control commands and continue transmission for 150 seconds.
6. Release both LTE and NR connections.
7. Plot Instantaneous and Averaged Power
    - Instantaneous transmit power versus time (measured in Step 2)
    - Requested transmit power versus time (from Step 2)
    - Time-averaged power over 60 seconds using instantaneous values from Step 2
    - $P_{limit}$ determined to meet the SAR design target
8. Plot Time-Averaged SAR
    - Computed time-averaged 1 g SAR versus time (from Step 2)
    - FCC 1 g SAR limit of 1.6 W/kg

It is required to check if power limiting enforcement is operated as expected when Tx antenna is changed in ENDC.

### 7.4.8. C-TAS - WWAN + WLAN + BT

Below is the test flow outline of the C-TAS. The test contains 9 sections and 8 transitions:

1. Airplane Mode OFF : CP ON ,WLAN ON ,BT ON
2. Airplane Mode ON : CP OFF, WLAN OFF, BT : OFF
3. Airplane Mode ON : WLAN ON , CP OFF, BT,OFF
4. Airplane Mode ON : WLAN ON , BT ON , CP OFF
5. Airplane Mode ON : WLAN OFF , BT ON , CP OFF
6. Airplane Mode ON : WLAN OFF , BT OFF, CP OFF
7. Airplane Mode OFF : CP ON, BT OFF, WLAN OFF
8. Airplane Mode OFF : CP ON, WLAN ON , BT OFF
9. Airplane Mode OFF : CP ON ,WLAN ON ,BT ON

Plot Time-Averaged SAR

- RF Exposure of External Radio represents the worst-case measured SAR of non-TAS radios reported in the RF Exposure Part 1 Report (e.g., WPT, NFC, etc.) is 0.021 W/kg.
- Computed time-averaged 1g SAR versus time, FCC 1 g SAR limit of 1.6 W/kg.
- Computed normalized time-averaged 1g SAR versus time, FCC normalized SAR limit of 1.0.

**Note:** WWAN Mode = CP

Through this technology switching compliance test, the CP (WWAN Mode), WLAN, and BT modes were evaluated under simultaneous transmission conditions with each technology actively transmitting together. During the simultaneous transmission state of each technology mode on the DUT, the output power is monitored and controlled by the C-TAS algorithm. The results confirm that the DUT complies with the applicable FCC regulatory exposure limits.

## 7.5. Test Procedures for Conducted Power Measurements (WLAN)

Since RF exposure is proportional to the Tx power for a SAR wireless device, time-averaging algorithm validation can be effectively performed through conducted power measurements outlined below.

**Time-Varying Test Sequence:** This test proves the FastConnect TAS accounts for Tx power variations in time accurately. In addition, this test is performed to capture the maximum time-averaged results in at least two time-averaging windows duration.

1. **Change in antenna (applicable when the software supports SISO diversity operation):** This test is to prove that FastConnect functions correctly during transitions in Plim (at different antennas) within the same WLAN band and same Antenna Group. If device supports SISO and transmission diversity between an Antenna to another antenna, then this test is applicable. If WLAN MIMO CDD is implemented, then device is always under MIMO transmission, in this case, this test is NOT applicable.
2. **Change in device state (DSI) (applicable when the device supports multiple DSI):** This is to prove that FastConnect TAS performs power enforcements to maintain compliance during transitions in the device state.
3. **Change in WLAN band:** This is to prove that the FastConnect TAS functions correctly during transitions in radios and bands.
4. **Simultaneous Transmission:** This is to prove that the FastConnect TAS functions in transition from 1st standalone WLAN radio to simultaneous WLAN radios and back to 2nd standalone WLAN radio.

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

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

- Demonstrate the total RF exposure averaged over FCC defined time windows does not exceed FCC's SAR limits, through <u>time-averaged power</u> measurements:
    - Measure conducted power.
    - Convert it into RF exposure and divide by respective limits to get normalized exposure use equation as described in this section.
    - Perform time-averaging over predefined time windows.
    - Demonstrate that the total normalized time-averaged RF exposure is <1 for all transmission scenarios.
- Demonstrate the total RF exposure averaged over FCC defined time windows does not exceed FCC's SAR limits, through time-averaged SAR measurements. Note as mentioned earlier, this measurement is performed for transmission scenario 1 only.
    - Choose worst case EUT orientation of SAR measurement per according to Static SAR test report and perform pointSAR measurement

- Measure instantaneous SAR versus time and demonstrate total normalized time-averaged exposure is <1.0 at all times

### 7.5.1. Time-Varying Test Sequence

Select one representative test channel from all the available radio configurations (band/ant(s)/DSI) that has Pmax > Plim + device uncertainty.

1. If the device supports SISO, then SISO is preferred over MIMO due to simplified test setup.
2. After determining SISO vs. MIMO configuration, then select the configuration that has largest (Pmax dBm – Plim dBm) dB delta.

- If Pmax < Plim + device uncertainty for all radio configurations, then select radio configuration with largest (Pmax dBm – Plim dBm) value.
- Test to be performed at two bands for Time-Varying Test sequence test.
- If only one band within a configuration has Pmax > Plim in all other configurations, then only one band needs to be tested.
- Test is not required if Plim > Pmax for all radio configurations.

**NOTE:** The same selection criteria are applicable for both conducted & radiated tests.

### 7.5.2. Change in Antenna

This test scenario does not apply if SISO mode diversity is not supported. (e.g. CDD is enabled and always use MIMO).

The criteria to select test configuration for Change in Antenna measurement is:

- The antennas selected for this test should be in the same antenna group.
- Whenever possible and supported by the EUT, first select antenna switch configuration within the same band/DSI (i.e., same band and DSI combination), and having different Plim, and having both Pmax > Plim + device uncertainty where possible. Otherwise, select at least one antenna having Pmax > Plim + device uncertainty.
    - If multiple radio configurations (band/DSI) meet Pmax > Plim + device uncertainty, then select the configuration that has largest (Pmax dBm – Plim dBm) dB delta.
    - If Pmax < Plim + device uncertainty for all radio configurations, then select radio configuration with largest (Pmax dBm – Plim dBm) value.
    - If the EUT does not support antenna switch within the same band but has multiple transmitting antennas to support different frequency bands, then antenna switch test should be performed in combination with Change in WLAN band test scenario.
- Test for Change in Antenna is not required if Plim > Pmax for all radio configurations.

### 7.5.3. Change in Device State Index (DSI)

This test scenario does not apply if multiple DSIs is not supported in the device. The criteria to select test configuration for Change in DSI measurement is:

- Select a band/antenna having the Pmax > Plim + device uncertainty within any DSI, and for the same band/antenna(s) having a different Plim in any other DSI. Both the selected DSIs should have Pmax > Plim + device uncertainty where possible. Otherwise, select at least one DSI having Pmax > Plim + device uncertainty.
- If Pmax < Plim + device uncertainty for all band/antenna(s), then select radio configuration with largest (Pmax dBm – Plim dBm) value.
- If Pmax > Plim + device uncertainty for more than one radio configuration, then order of preference is given by:
    - If multiple radio configurations (band/ant(s)/DSI) meet this criteria and if device support SISO. Then SISO is preferred over MIMO due to simplified test setup.
    - After determining SISO vs. MIMO configuration, then select the configuration that has largest (Pmax dBm – Plim dBm) dB delta.

Test for Change in DSI is not required if all Plim > Pmax for all radio configurations.

### 7.5.4. Change in WLAN Band

The criteria to select test configuration for Change in WLAN band measurement is:

- First select both bands in a DSI having Pmax > Plim + device uncertainty where possible. Otherwise, select at least one band having Pmax > Plim + device uncertainty.
- If Pmax < Plim + device uncertainty for all radio configurations, then select radio configuration with largest (Pmax dBm – Plim dBm) value.
- If Pmax > Plim + device uncertainty for more than one radio configuration. Then, order of preference is given by:
    - If multiple radio configurations (band/ant(s)/DSI) meet this criteria and if device support SISO. Then SISO is preferred over MIMO due to simplified test setup.
    - After determining SISO vs. MIMO configuration, then select the configuration that has largest (Pmax dBm – Plim dBm) dB delta.
- The antennas corresponding to the selected bands should be in the same antenna group.
- Test for Change in WLAN band is not required if all Plim > Pmax for all radio configurations.

### 7.5.5. Simultaneous Transmission (DBS)

This test scenario does not apply if simultaneous transmission within WLAN bands is not supported in the device. The criteria to select test configuration for Simultaneous Transmission measurement is:

- The bands must be selected from supported Simultaneous Transmission configuration. (e.g., WLAN DBS and/or HBS)
- First select both bands in a DSI having Pmax > Plim + device uncertainty where possible. Otherwise, select at least one band having Pmax > Plim + device uncertainty.
- If Pmax < Plim + device uncertainty for all radio configurations, then select radio configuration with largest (Pmax dBm – Plim dBm) value.
- If Pmax > Plim + device uncertainty for more than one radio configuration. Then, order of preference is given by:
    - If multiple radio configurations (band/ant(s)/DSI) meet this criteria and if device support SISO. Then SISO is preferred over MIMO due to simplified test setup.
    - After determining SISO vs. MIMO configuration, then select the configuration that has largest (Pmax dBm – Plim dBm) dB delta.
- The antennas corresponding to the selected bands should be in the same antenna group.
- Even if a device has Plim > Pmax for all radio configurations, then "Simultaneous Transmission" test scenario should still be performed for validation of FastConnect TAS device.

# 8. Equipment List

| Manufacturer | Model | Description | Serial Number | Calibration Date | Calibration Due | CBT |
|---|---|---|---|---|---|---|
| Amplifier Research | 5S1G4 | RF Broadband Amplifier (800 MHz - 4.2 GHz) | 331258 | - | - | ✓ |
| Rohde & Schwarz | SMCV100B | R&S SMCV100B Vector Signal Generator (VSG) | 103882 | 12/30/25 | 12/30/27 | - |
| SPEAG | Powersource1 | Signal Generator | 4341 | 1/6/26 | 1/6/27 | - |
| Anritsu | MA24118A | Microwave USB Power Sensor (10MHz - 18 GHz) | 2123431 | 1/22/26 | 1/22/27 | - |
| Anritsu | MA24118A | Microwave USB Power Sensor (10MHz - 18 GHz) | 2123500 | 1/22/26 | 1/22/27 | - |
| Rohde & Schwarz | NRP8S | Power Sensor 10 MHz - 8 GHz | 114184 | 3/12/26 | 3/12/27 | - |
| Rohde & Schwarz | NRP8S | Power Sensor 10 MHz - 8 GHz | 114183 | 3/12/26 | 3/12/27 | - |
| Rohde & Schwarz | NRP8S | Power Sensor 10 MHz - 8 GHz | 114343 | 4/1/26 | 4/1/27 | - |
| Anritsu | S820E | Vector Network Analyzer | 2348026 | 1/13/26 | 1/13/28 | - |
| Control Company | 4040 | Ambient Thermometer | 250440190 | 7/17/25 | 7/17/27 | - |
| Control Company | 4040 | Ambient Thermometer | 250440191 | 7/17/25 | 7/17/27 | - |
| Control Company | 4040 | Ambient Thermometer | 250440199 | 7/17/25 | 7/17/27 | - |
| Control Company | 4352 | Long Stem Liquid Thermometer | 250257657 | 4/23/25 | 4/23/27 | - |
| Control Company | 4352 | Long Stem Liquid Thermometer | 250257660 | 4/23/25 | 4/23/27 | - |
| Control Company | 4352 | Long Stem Liquid Thermometer | 250257665 | 4/23/25 | 4/23/27 | - |
| Micro-Coax | UFB205A-0-0240-30x30 | SMA M-F RF test Cable (DC - 18 GHz) | - | - | - | ✓ |
| Mini-Circuits | BW-N20W20+ | 20dB RF Fixed Attenuator (DC - 18 GHz) | - | - | - | ✓ |
| Mini-Circuits | BW-N20W20+ | 20dB RF Fixed Attenuator (DC - 18 GHz) | - | - | - | ✓ |
| Mini-Circuits | BW-S3W2+ | 3dB RF Fixed Attenuator (DC - 18 GHz) | - | - | - | ✓ |
| Mini-Circuits | BW-S3W2+ | 3dB RF Fixed Attenuator (DC - 18 GHz) | - | - | - | ✓ |
| Mini-Circuits | CBL-6FT-SMNM+ | Precision Test Cable SMA/N (DC - 18 GHz) | 3318 | - | - | ✓ |
| Mini-Circuits | CBL-6FT-SMNM+ | Precision Test Cable SMA/N (DC - 18 GHz) | 3335 | - | - | ✓ |
| Mini-Circuits | CBL-6FT-SMNM+ | Precision Test Cable SMA/N (DC - 18 GHz) | 3329 | - | - | ✓ |
| Mini-Circuits | NF-SF50+ | RF Adapter N Male to SMA Female (DC - 18 GHz) | - | - | - | ✓ |
| Mini-Circuits | VLF-3000+ | Coaxial Low Pass Filter (DC - 3 GHz) | - | - | - | ✓ |
| Narda | 24785-20 | 20 dB SMA Fixed Attenuator (DC - 4.0 GHz) | - | - | - | ✓ |
| Narda | 4226-20 (26733) | 20 dB SMA Directional Coupler (0.5 - 18 GHz) | 201 | - | - | ✓ |
| Mitutoyo | CD-4"AX | Digital Caliper | B23243217 | 8/28/25 | 8/28/27 | - |
| SPEAG | DAK-12 | DAK-12 Dielectric Probe | 1194 | 10/10/25 | 10/10/26 | - |
| SPEAG | DAK-3.5 | DAK-3.5 Dielectric Probe | 1349 | 8/5/25 | 8/5/26 | - |
| Speag | D2450V2 | D2450V2 System Validation Dipole | 1112 | 11/15/24 | 11/15/26 | - |
| SPEAG | DAE4ip | Data Acquisition Electronics with Integ. Power | 1838 | 12/4/25 | 12/4/26 | - |
| SPEAG | DAE4ip | Data Acquisition Electronics with Integ. Power | 1843 | 7/30/25 | 7/30/26 | - |
| SPEAG | DAE4ip | Data Acquisition Electronics with Integ. Power | 1839 | 6/9/26 | 6/9/27 | - |
| SPEAG | EX3DV4 | SAR Measurement Probe | 7857 | 12/9/25 | 12/9/26 | - |
| SPEAG | EX3DV4 | SAR Measurement Probe | 7872 | 8/8/25 | 8/8/26 | - |
| SPEAG | SE UMS 171 E | MAIA Modulation and Interference Analyzer | 1814 | - | - | - |
| SPEAG | SE UMS 171 E | MAIA Modulation and Interference Analyzer | 1817 | - | - | - |
| SPEAG | SE UMS 176 C | ANT Wideband Communication Antenna | 1579 | - | - | - |
| SPEAG | SE UMS 176 C | ANT Wideband Communication Antenna | 1601 | - | - | - |
| SPEAG | D5GHzV2 | 5GHz System Validation Dipole | 1396 | 11/15/2024 | 11/15/2026 | |
| Rohde & Schwarz | CMW500 | CMW500 Radio Communication Test Station | 165091 | 1/28/26 | 1/28/28 | |
| Rohde & Schwarz | CMX500 | Radio Communication Test Station | 101329 | 4/7/26 | 4/7/28 | |

* Components calibrated before testing. Prior to testing, the measurement paths containing a cable, attenuator, coupler or filter were connected to a calibrated source (i.e. a signal generator, power sensor, or VNA) 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.

# 9. Conclusion

The SAR evaluation indicates that the DUT is capable of compliance with the RF radiation exposure limits of the FCC, 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.