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TAS VALIDATION REPORT

Applicant Name: Apple, Inc. One Apple Park Way Cupertino, CA, 95014, USA (Excluding State of Alaska)	**Date of Testing:** 07/15/2025 – 8/12/2025 **Test Site/Location:** Element, Morgan Hill, CA, USA **Document Serial No.:** 1C2503270032-25.BCG-R1

FCC ID:	**BCG-A3335**
APPLICANT:	**APPLE INC.**

DUT Type:	Watch
Application Type:	Certification
FCC Rule Part(s):	CFR §2.1093
Model(s):	A3335, A3452
Device Serial Numbers:	Pre-Production Samples [7VXQP, 27H6Y, K7D07]

Note: This revised Test Report supersedes and replaces the previously issued test report on the same subject device for the same type of testing as indicated. Please discard or destroy the previously issued test report(s) and dispose of it accordingly.

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

ACCREDITED
CERT #2041.02

T A B L E   O F   C O N T E N T S

1 DEVICE UNDER TEST

1.1 Device Overview

Band & Mode	Operating Modes	Tx Frequency
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 7	Voice/Data	2502.5 - 2567.5 MHz
LTE Band 41	Voice/Data	2498.5 - 2687.5 MHz
NR Band n71	Voice/Data	665.5 - 695.5 MHz
NR Band n12	Voice/Data	701.5 - 713.5 MHz
NR Band n14	Voice/Data	790.5 - 795.5 MHz
NR Band n26 (Cell)	Voice/Data	816.5 - 846.5 MHz
NR Band n5 (Cell)	Voice/Data	826.5 - 846.5 MHz
NR Band n66 (AWS)	Voice/Data	1712.5 - 1777.5 MHz
NR Band n25 (PCS)	Voice/Data	1852.5 - 1912.5 MHz
NR Band n2 (PCS)	Voice/Data	1852.5 - 1907.5 MHz
NR Band n7	Voice/Data	2502.5 - 2567.5 MHz
NR Band n41	Voice/Data	2501.01 - 2685.0 MHz
2.4 GHz WLAN	Voice/Data	2412 - 2472 MHz
5 GHz WIFI	Voice/Data	U-NII-1: 5180 - 5240 MHz U-NII-2A: 5260 - 5320 MHz U-NII-2C: 5500 - 5720 MHz U-NII-3: 5745 - 5825 MHz
Bluetooth	Data	2402 - 2480 MHz
802.15.4 ab-NB	Data	5728.75 - 5846.25 MHz
NFC	Data	13.56 MHz
UWB	Data	6489.6 - 7987.2 MHz

1.2 Time-Averaging Algorithm for RF Exposure Compliance

Per FCC regulations, compliance with radio frequency (RF) exposure safety limits may be demonstrated using time-averaged RF transmission power. Since RF exposure levels are directly associated with the transmitted (Tx) power, i.e., lower Tx power generally results in lower RF exposure, transmission power can be dynamically controlled to satisfy regulatory thresholds. Specifically, for transmission frequencies below 6 GHz (f < 6 GHz, or Sub6), compliance is evaluated based on the Specific Absorption Rate (SAR).

To address these requirements, the Time-Averaged Specific Absorption Rate (TA-SAR) algorithm has been developed to regulate Tx power such that the time-averaged RF exposure remains within the SAR limits defined by FCC.

This document outlines the validation of the TA-SAR algorithm for this device through comprehensive test planning, measurement procedures, measurement setup, and measurement results. TA-SAR algorithm validation was conducted for LTE and NR FR1 technologies, based on various test scenarios incorporating different combinations of operating parameters as detailed in Table 1-1.

Table 1-1 TA-SAR Operating Parameters

Operating Parameters	Description
P_{sub6_limit} (dBm)	The time-averaged maximum power level limit for each Sub6 band
$P_{LowThresh\_offset}$ (dBm)	To calculate $P_{LowThresh}$ • $P_{LowThresh} = P_{sub6\_limit} - P_{LowThresh\_offset}$
$P_{UE\_backoff\_offset}$ (dBm)	To calculate $P_{UE\_backoff}$ • $P_{UE\_backoff} = P_{sub6\_limit} - P_{UE\_backoff\_offset}$
$P_{UE\_\max\ \_cust\_offset}$ (dBm)	To calculate $P_{UE\_\max\ \_cust}$. $P_{UE\_\max}$ is maximum Tx power at which a UE can possibly transmit in Sub6. • $P_{UE\_\max\ \_cust} = \min\left(P_{EU\_max}, P_{sub6\_limit} + P_{UE\_\max\ \_cust\_offset}\right)$

The table below shows Final Plimit settings and maximum tune-up output power Pmax configured for this DUT for various transmit conditions (Exposure Condition Index ECI for MediaTek). Note that the device uncertainty for Sub6 WWAN is shown below:

Table 1-2

SAR_Design_target_Calculation						
Mode/ Band	1g SAR [W/kg]			10g SAR [W/kg]		
	Smart Tx Uncertainty	SAR_design_target	SAR_regulatory_limit	Smart Tx Uncertainty	SAR_design_target	SAR_regulatory_limit
LTE FDD Band 7	1.70	0.81	1.6 W/kg	1.20	2.27	4 W/kg
NR FDD Band n7	1.70	0.81		1.20	2.27	
All other Modes/ Bands	1.20	0.91		1.20	2.27	

The maximum time-averaged output power (dBm) for any WWAN Sub6 Technology, band, and ECI is the minimum of (“Plimit” and “Maximum tune-up output power Pmax”) + corresponding device uncertainty on the table above. SAR values in this report were scaled to this maximum time-averaged output power to determine compliance per KDB Publication 447498 D04v01.

1.3 Bibliography

Report Type	Report Serial Number
RF Exposure Part 0 Test Report	1C2503270032-23.BCG
RF Exposure Part 1 Test Report	1C2503270032-24.BCG
RF Exposure Compliance Summary Report	1C2503270032-26.BCG

2 RF EXPOSURE LIMITS

2.1 Uncontrolled Environments

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, a wireless transmitter exposes persons in its vicinity.

2.2 Controlled Environments

CONTROLLED ENVIRONMENTS are defined as locations where exposure may be incurred by persons who are aware of the potential for exposure, (i.e. as a result of employment or occupation). Controlled, or occupational, exposure limits are applicable to situations in which persons who have been made fully aware of the potential for exposure are exposed as a consequence of their employment 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 intentional means.

2.3 RF Exposure Limits for Frequencies Below 6 GHz

Table 2-1
SAR Human Exposure Specified in ANSI/IEEE C95.1-1992 and Health Canada Safety Code 6

HUMAN EXPOSURE LIMITS		
	UNCONTROLLED ENVIRONMENT *General Population* (W/kg) or (mW/g)	CONTROLLED ENVIRONMENT *Occupational* (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.

2.4 Time Averaging Windows for FCC Compliance

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

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

3 TA-SAR VALIDATION TEST CASES

To validate the time-averaging feature and demonstrate compliance under varying transmission conditions, the following transmission scenarios are evaluated as part of the TA-SAR testing:

- **Scenario 1**: Test under different TA-SAR parameters to verify that the TA-SAR algorithm meets compliance requirements with different combinations of operating parameters.
- **Scenario 2**: Test under time-varying Tx power to verify that the TA-SAR algorithm ensures SAR compliance through dynamic Tx power.
- **Scenario 3**: Test under call drop and re-establishment conditions to ensure the TA-SAR algorithm control continuity and SAR compliance.
- **Scenario 4**: Test under RAT/band handover to ensure the TA-SAR algorithm control continuity and correctness.
- **Scenario 5**: Test under different ECIs (Exposure Condition Index) to ensure the TA-SAR algorithm control behaves as expected during ECI switching from one ECI to another. (e.g., extremity to head)
- **Scenario 6**: Test under different transmission antennas to ensure the TA-SAR algorithm control works correctly during antenna switching from one antenna to another.

To add confidence in the feature validation, SAR measurements are also performed but only performed for transmission scenario 2 to avoid the complexity in SAR measurement (such as, for scenario 4 requiring change in SAR probe calibration file to accommodate different bands and/or tissue simulating liquid).

4 TA-SAR TEST SCENARIOS AND TEST PROCEDURES

To demonstrate that the TA-SAR algorithm performs as intended under a range of operating scenarios, Table 4-1 outlines the corresponding test scenarios along with the expected test sequences used for validation. Test sequences 0, 1, and 2 are defined in Section 4.1.

Table 4-1
Test Scenario List of TA-SAR Validation

Test Scenario		Test Sequences #	Description
1	Range of TA-SAR Parameters	0	Adjust parameters
2	Time-Varying Tx Power	1 and 2	Test under time-varying Tx power
3	Call Disconnection and Re-Establishment	0	Test call drop and re-establishment
4	Band Handover	0	Test band change
5	ECI (Exposure Condition Index) Change	0	Test under ECI transition (e.g., extremity to head)
6	Antenna Switch	0	Change antenna

4.1 Test Sequence Determination for Validation

Three predefined test sequences involving potentially time-varying Tx power are used for TA-SAR validation:

- Test sequence 0: DUT's Tx power is requested to be maximum.
- Test sequence 1: DUT's Tx power is requested to be at power less than $P_{LowThresh}$ for 300s, then at maximum power for 200s, and finally at $P_{LowThresh}$ -2dB for the remaining time.
- Test sequence 2: DUT's Tx power to vary with time. This sequence is generated relative to 12 measured P_{UE_max}, measured P_{sub6_limit} and calculated $P_{UE\_backoff}$ (= measured P_{sub6_limit} in dBm - $P_{UE\_backoff\_offset}$ in dBm) of DUT based on measured P_{sub6_limit}.

Test sequence is generated based on below parameters of the DUT:

A. Measured maximum power (P_{UE_max})
B. Measured Tx_power_at_*SAR_design_limit* (P_{sub6_limit})
C. Threshold of dynamic power reduction status determination: reserve hysteresis margin for instantaneous power ($P_{LowThresh}$)
D. *SAR_time_window* (FCC: 100s for $f < 3GHz$, 60s for $3GHz < f < 6GHz$)

The details for generating test sequences are described in Appendix E.

4.2 Test Configuration Selection Criteria for TA-SAR

4.2.1 Scenario 1: Range of TA-SAR Parameters via Conducted Power Measurements

This test is performed by changing the parameters ($P_{LowThresh\_offset}$, $P_{UE\_backoff\_offset}$, $PU_{E\_max\_cust\_offset}$) for the selected RAT (Radio Access Technology) and frequency band. Since the MediaTek TA algorithm operation is independent of RATs/bands/channels, any one RAT having the lowest P_{sub6_limit} can be selected for this test. In principle, two sets of the parameters are selected for this test (if applicable). If the parameters of the DUT are fixed (without the support of dynamic change), only the set of the default parameters needs to be tested.

4.2.2 Scenario 2: Time-Varying Tx Power via Conducted Power Measurements

Since MediaTek TA-SAR operation is independent of bands and channels for a given RAT, selecting one band per RAT is sufficient to validate this feature. Two bands per RAT are proposed for this test. The criteria for band selection for each RAT is based on the P_{sub6_limit} values (corresponding to *SAR_design_limit*) and is described below:

Select two bands among those whose P_{sub6_limit} values are below P_{UE_max} which correspond to lowest and highest P_{sub6_limit} values respectively.

- Only one band needs to be tested if all the bands have the same P_{sub6_limit}.
- Only one band needs to be tested if only the band has Psub6_limit below P_{UE_max}.
- If the same lowest P_{sub6_limit} applies to multiple bands, select the band with the highest measured 1gSAR at P_{sub6_limit}.
- If P_{sub6_limit} values of all bands are all over P_{UE_max} (i.e., the TA-SAR feature is not enabled), there is no need to test this RAT.

4.2.3 Scenario 3: Call Disconnection and Re-establishment via Conducted Power Measurements

For call disconnection measurement, the test configuration selection criteria are:

- Select the RAT/band with lowest P_{sub6_limit} among all supported RATs/bands.
- If multiple RATs/bands have same least P_{sub6_limit}, select the RAT/band having the highest measured 1gSAR at P_{sub6_limit}.
- Select the radio configuration in this RAT/band that corresponds to the highest measured 1gSAR at P_{sub6_limit}.

4.2.4 Scenario 4: Band Handover via Conducted Power Measurements

For a given Tx antenna, select the RAT/band with the lowest P_{sub6_limit} and another RAT/band with the highest P_{sub6_limit} . Both should have have P_{sub6_limit} values less than P_{UE_max} values if possible.

- If multiple RATs/bands have the same lowest P_{sub6_limit} , select the RAT/band having the highest measured 1gSAR at P_{sub6_limit}.
- If multiple RATs/bands have the same highest P_{sub6_limit}, select the RAT/band having the lowest measured 1gSAR at P_{sub6_limit}.

4.2.5 Scenario 5: Exposure Condition Index (ECI) Change via Conducted Power

Select any one RAT/band, which has at least two ECIs whose P_{sub6_limit} values are below P_{UE_max}.

4.2.6 Scenario 6: Antenna Switch via Conducted Power Measurements

Among RATs/bands supporting Tx antenna switches, select the RAT/band with the highest P_{sub6_limit} difference between a pair of supported Tx antennas.

- If multiple RATs/bands have the same P_{sub6_limit} difference between the supported Tx antennas, select the RAT/band having the highest measured 1gSAR at P_{sub6_limit}.
- Antenna selection order:
  - Select the configuration with two antennas having P_{sub6_limit} values less than P_{UE_max}.
  - If the previous configuration does not exist, select the configuration with one antenna having P_{sub6_limit} value less than P_{UE_max}.
  - If the above two criteria do not exist, select a configuration with the two antennas having the least difference between their P_{sub6_limit} and P_{UE_max} (i.e., P_{sub6_limit} can be greater than P_{UE_max}).

4.2.7 Scenario 7: Time Window Switching via Conducted Power Measurements

Select one RAT/band with 60s-time averaging window and the other RAT/band with 100s-time averaging window. Both should have P_{sub6_limit} values less than P_{UE_max} values if possible.

- Select at least one of the selected RAT/bands has its P_{sub6_limit} less than P_{UE_max}.

4.2.8 Scenario 8: SAR Exposure Switch via Conducted Power Measurements

If supported, SAR exposure switch with two active radios having the *same and different time averaging windows* should be covered in this test. The MediaTek TA algorithm operation is independent of the source of SAR exposure (e.g., LTE vs. NR FR1) and ensures total time-averaged RF exposure compliance for SAR exposure among the scenarios of radio 1 only, radio 1 + radio 2, and radio 2 only.

- Select any two $< 6GHz$ RATs/bands that the DUT supports for simultaneous transmission (e.g., LTE+NR FR1).
- The selection order among all supported simultaneous transmission configurations is
  - Select one configuration with P_{sub6_limit} values of radio1 and radio2 less than their corresponding P_{UE_max}, and their P_{sub6_limit} values are different if possible.
  - If the previous configuration does not exist, at least one radio has its P_{sub6_limit} less than P_{UE_max}.
  - If the above two cannot be found, select one configuration that has P_{sub6_limit} of radio1 and radio2 with the least difference between P_{sub6_limit} and P_{UE_max} (i.e., P_{sub6_limit} can be greater than P_{UE_max}).
- One test with two active radios in any two different time windows is sufficient to cover this scenario.
- One SAR switching is sufficient because the TA algorithm operation is the same.

4.2.9 Scenario 2: Time-Varying Tx Power via SAR Measurements

Sections 4.2.1 to 4.2.8 focus on MediaTek 's TA feature compliance validation via conducted Tx power measurements. This section further provides a SAR measurement procedure for time-varying Tx power scenario described in section 4.2.2 Hence, this section follows the test configuration of section 4.2.2 and uses test sequences 1 and 2 defined in section 4.1.

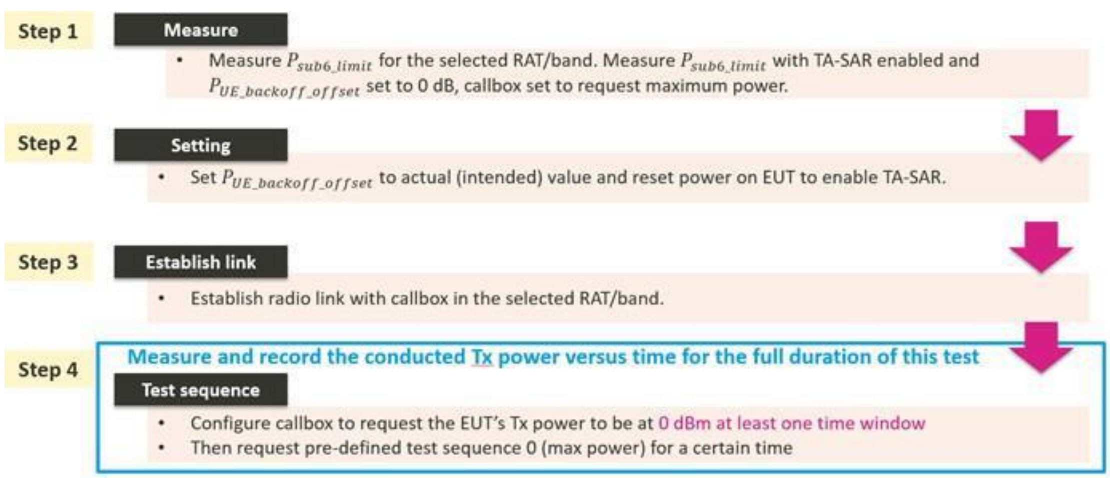
4.3 Test Procedures for TA-SAR

This section provides general conducted power measurement procedures to perform compliance tests under the dynamic transmission scenarios described in Section 3. In practice, adjustments may be made in these procedures with justification provided.

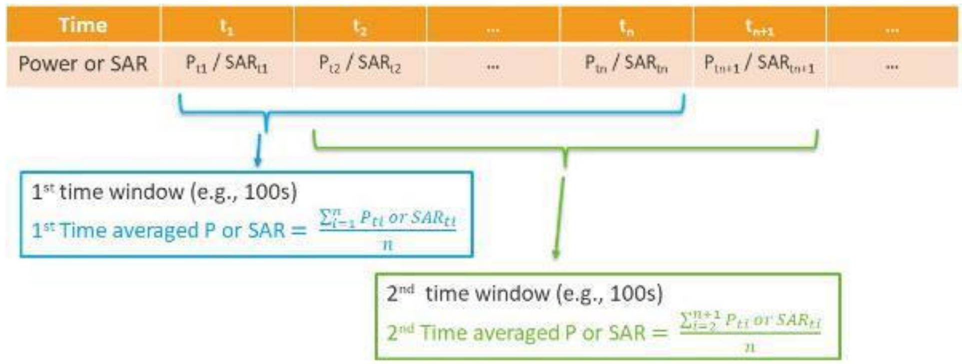
4.3.1 Scenario 1: Range of TA-SAR Parameters via Conducted Power Measurements

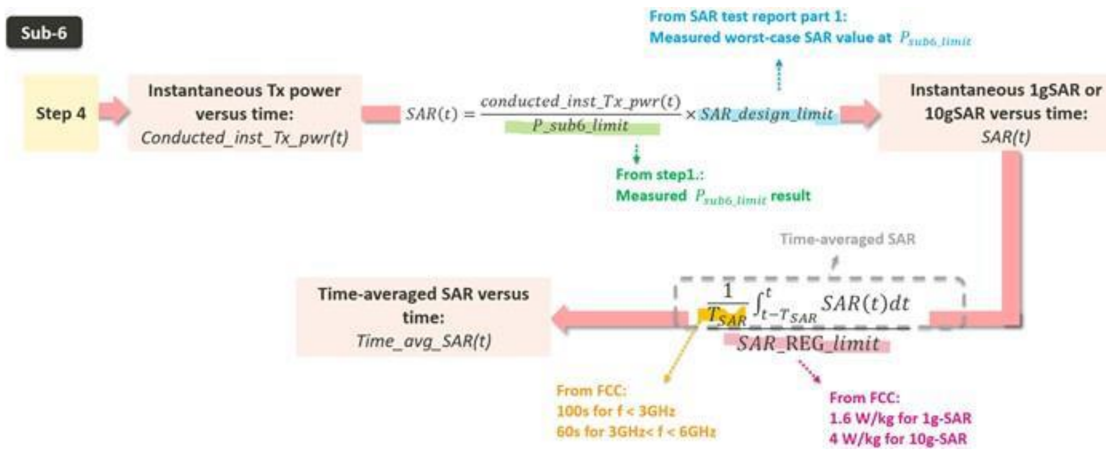
Tx power is measured, recorded, and processed via the following steps:

- Steps 1-4: Measure and record Tx power versus time for Scenario 1.



- Step 5: Convert the measured conducted Tx power from step 4 into the 1gSAR or 10gSAR value then to the time-averaged value as follows.



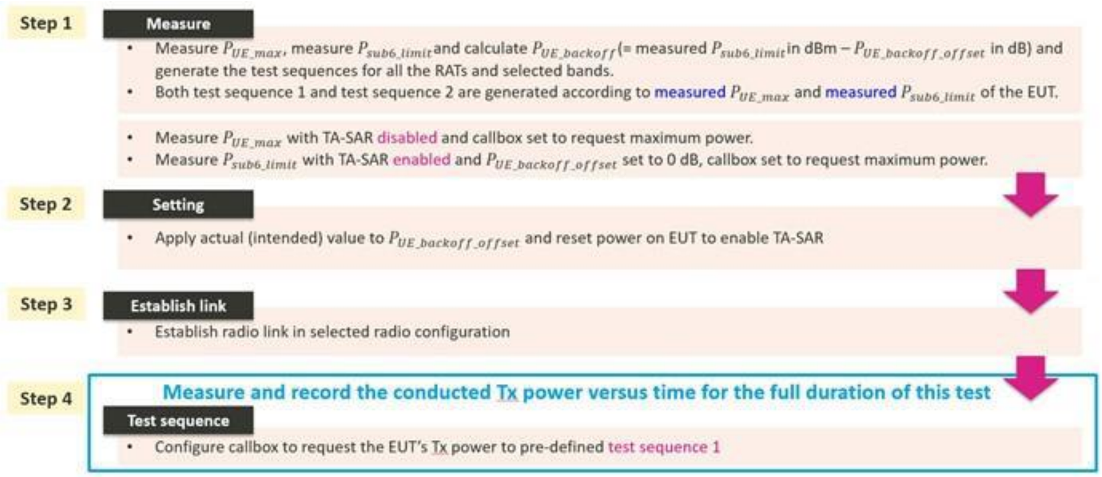


- Step 6: Plot the results.
  - Make one power perspective plot containing:
    - Instantaneous Tx power
    - Requested power
    - Calculated time-averaged power
    - Calculated time-averaged power limits
  - Make one SAR perspective plot containing
    - Calculated time-averaged 1gSAR or 10gSAR
    - FCC limit of 1.6 W/kg (1gSAR) or 4.0 W/kg (10gSAR)

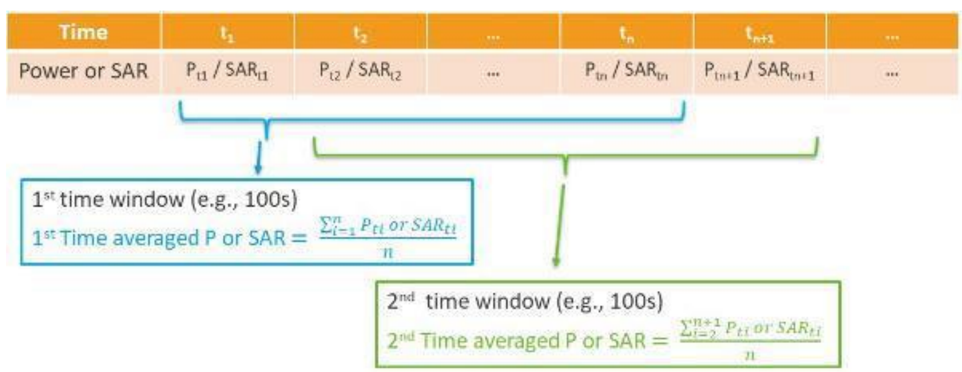
4.3.2 Scenario 2: Time-Varying Tx Power via Conducted Power Measurements

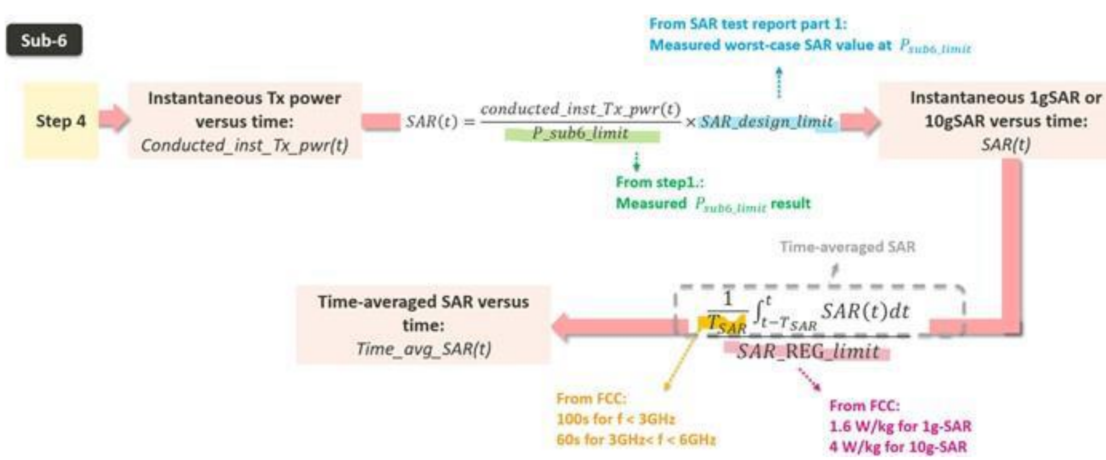
Tx power is measured, recorded, and processed via the following steps:

- Steps 1-4: Measure and record SAR versus time for Scenario 2.



- Step 5: Convert the measured SAR from step 4 into the 1gSAR or 10gSAR value then to the time-averaged value as follows.



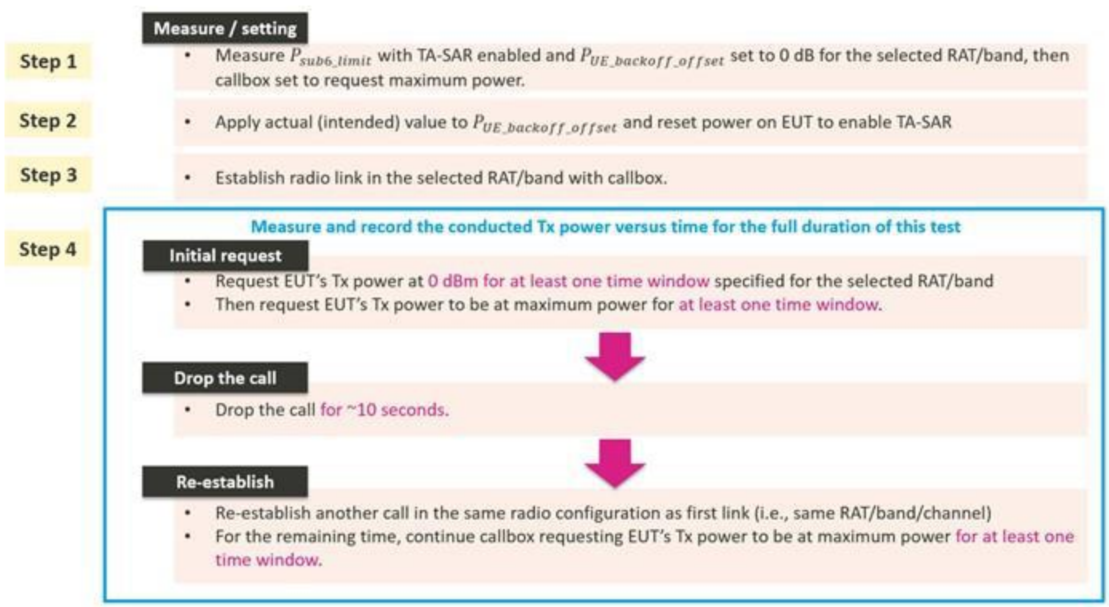


- Step 6: Plot the results.
  - Make one power perspective plot containing:
    - Instantaneous Tx power.
    - Requested power (test sequence 1)
    - Calculated time-averaged power
    - Calculated time-averaged power limits
  - Make one SAR perspective plot containing
    - Calculated time-averaged 1gSAR or 10gSAR
    - FCC limit of 1.6 W/kg (1gSAR) or 4.0 W/kg (10gSAR)
- Step 7: Repeat steps 2-6 for test sequence 2.
  - Repeat steps 2-6 for pre-defined test sequence 2 and replace test sequence 1 in step 4 with test sequence 2.
- Step 8: Repeat steps 2-7 for the next band.

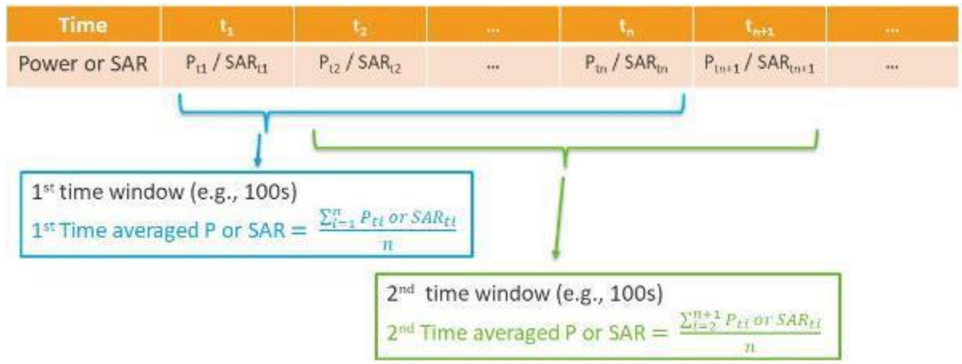
4.3.3 Scenario 3: Call Disconnection and Re-establishment via Conducted Power Measurements

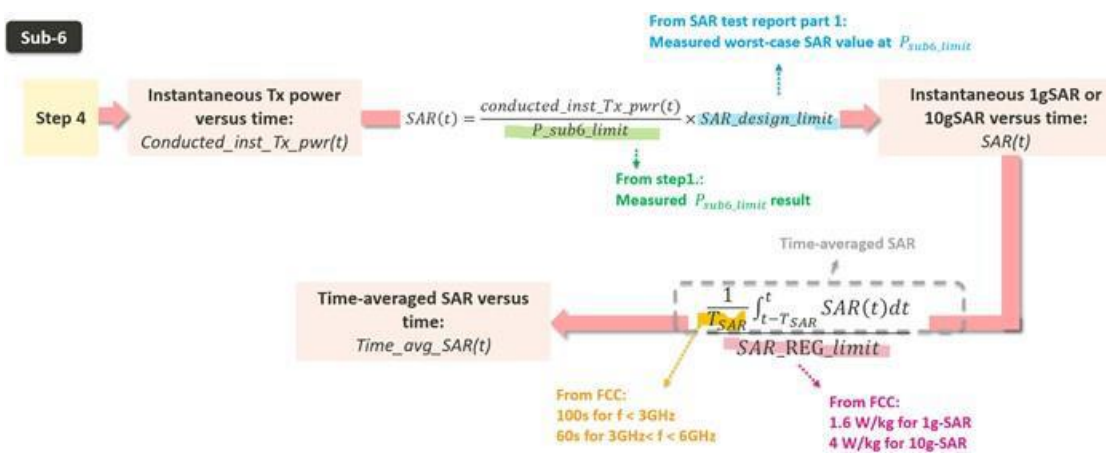
Tx power is measured, recorded, and processed via the following steps:

- Steps 1-4: Measure and record SAR versus time for Scenario 3.



- Step 5: Convert the measured SAR from step 4 into the 1gSAR or 10gSAR value then to the time-averaged value as follows.



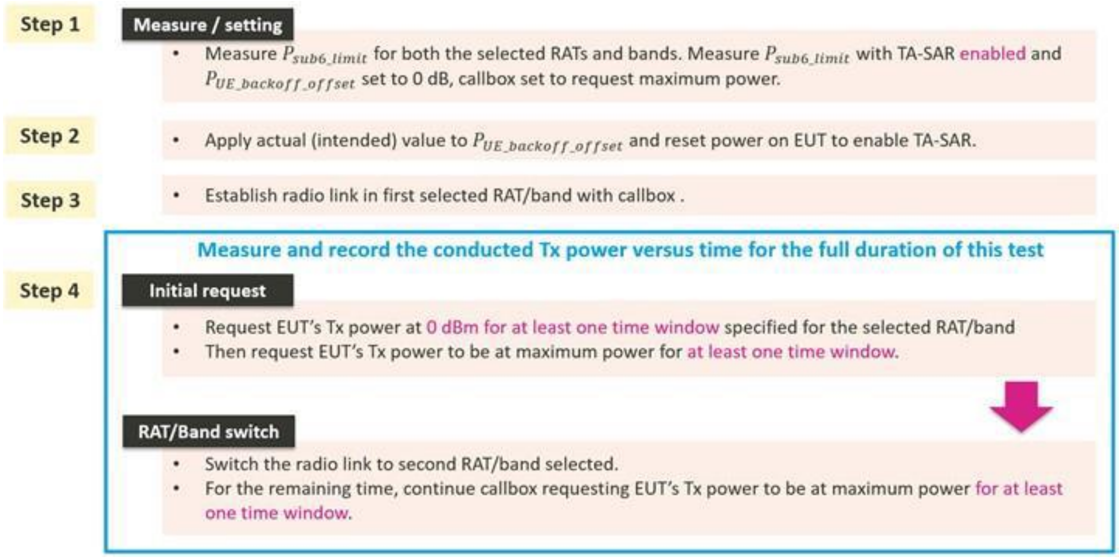


- Step 6: Plot the results.
  - Make one power perspective plot containing:
    - Instantaneous Tx power
    - Requested power
    - Calculated time-averaged power
    - Calculated time-averaged power limits
  - Make one SAR perspective plot containing
    - Calculated time-averaged 1gSAR or 10gSAR
    - FCC limit of 1.6 W/kg (1gSAR) or 4.0 W/kg (10gSAR)

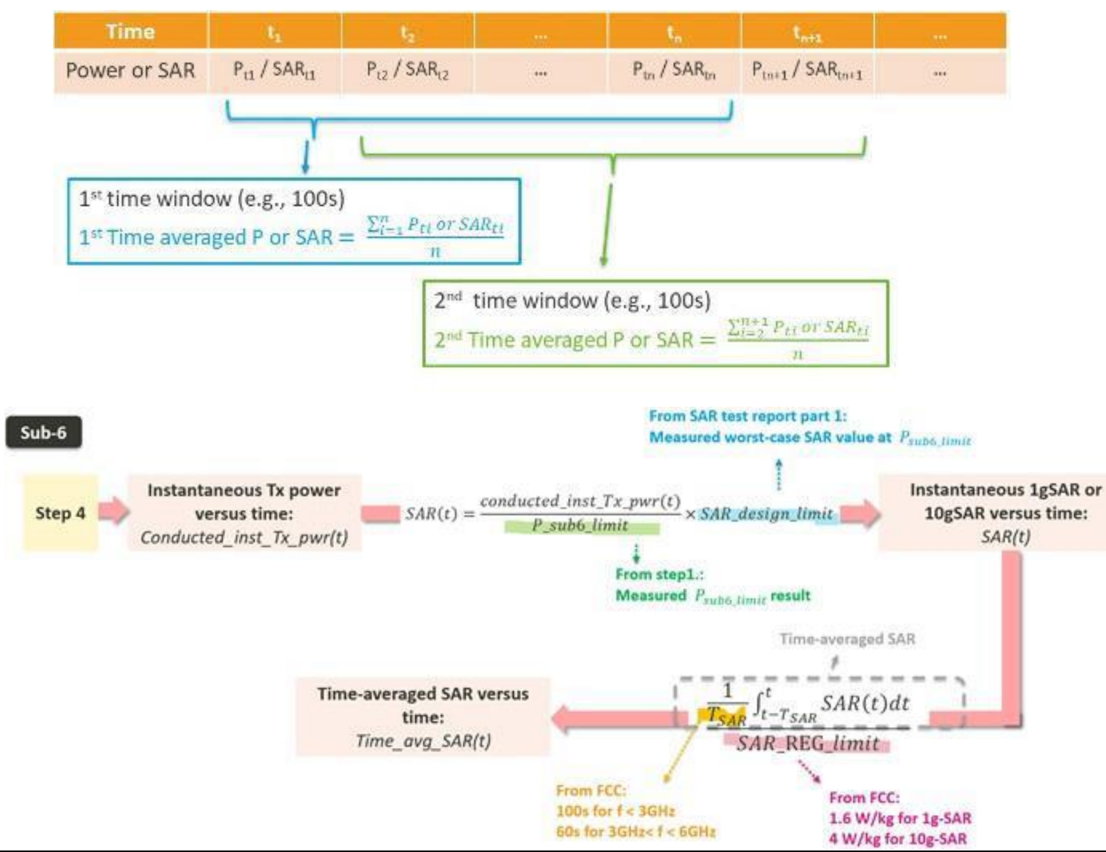
4.3.4 Scenario 4: Band Handover via Conducted Power Measurements

Tx power is measured, recorded, and processed via the following steps:

- Steps 1-4: Measure and record SAR versus time for Scenario 4.



- Step 5: Convert the measured conducted Tx power from step 4 into the 1gSAR or 10gSAR value then to the time-averaged value as follows.



- Step 6: Plot the results.
  - Make one power perspective plot containing:
    - Instantaneous Tx power
    - Requested power
    - Calculated time-averaged power
    - Calculated time-averaged power limits
  - Make one SAR perspective plot containing
    - Calculated time-averaged 1gSAR or 10gSAR
    - FCC limit of 1.6 W/kg (1gSAR) or 4.0 W/kg (10gSAR)

4.3.5 Scenario 5: Exposure Condition Index (ECI) Change via Conducted Power

The test procedure for Scenario 5 is identical to section 4.3.4 except for that “band switch” is replaced with “ECI switch”.

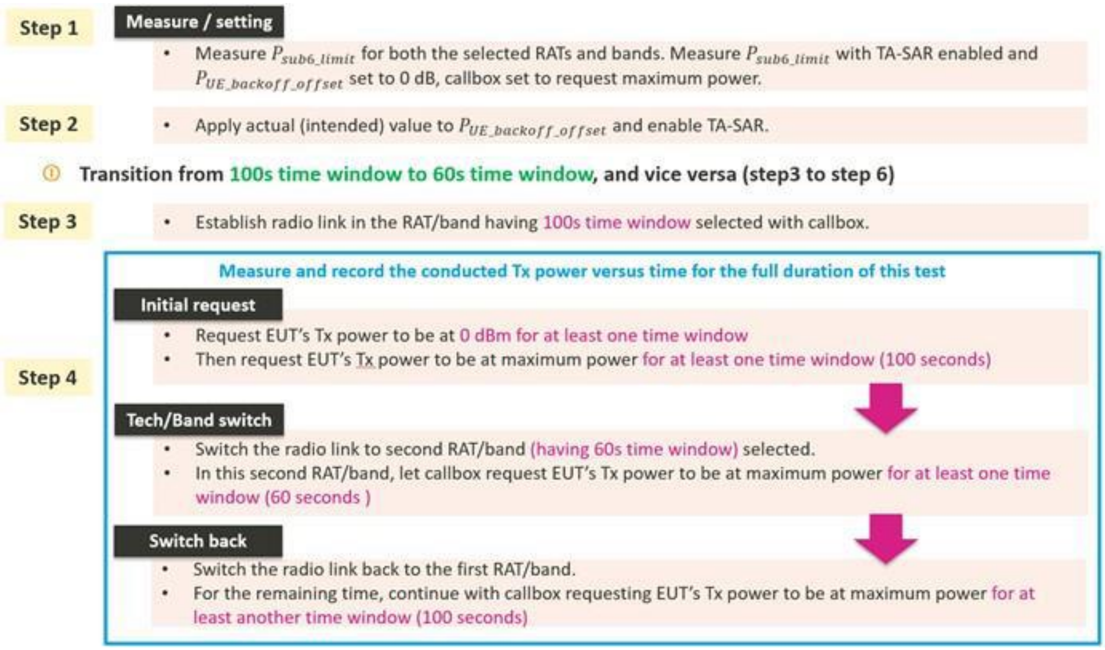
4.3.6 Scenario 6: Antenna Switch via Conducted Power Measurements

The test procedure is identical to section 4.3.4 except that “band switch” is replaced with “antenna switch”.

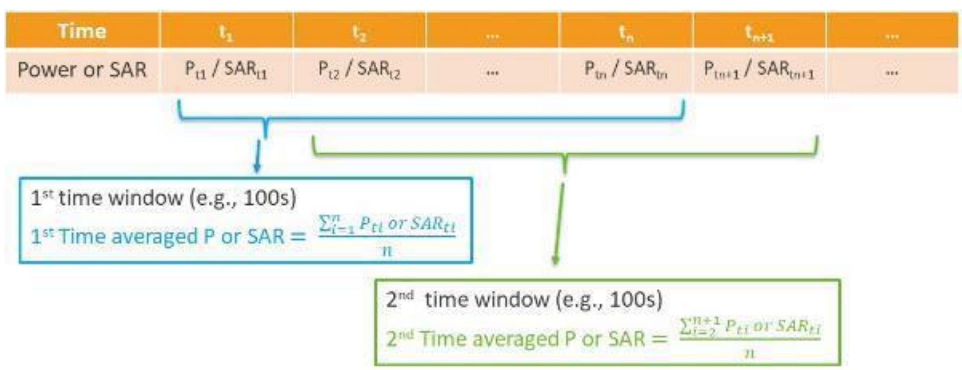
4.3.7 Scenario 7: Time Window Switch via Conducted Power Measurements

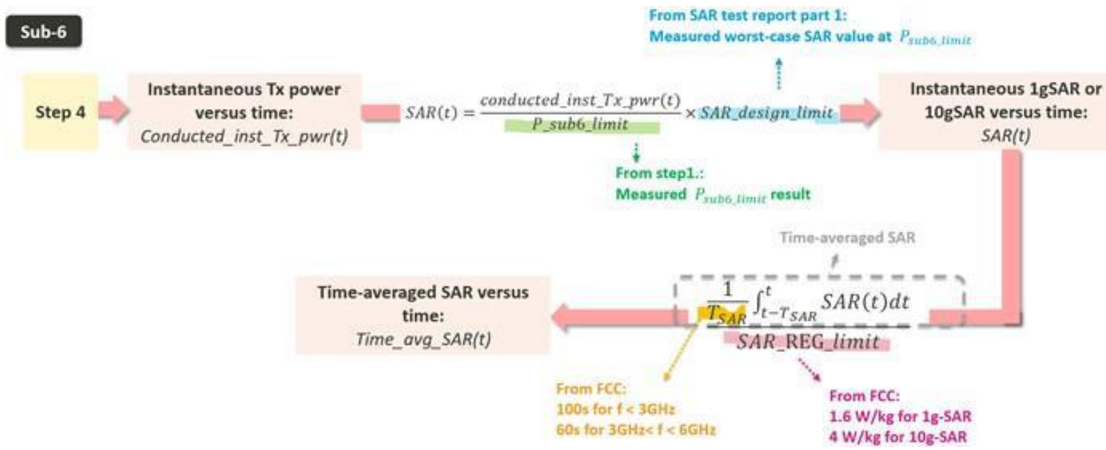
Tx power is measured, recorded, and processed according to the following steps:

- Steps 1-4: Measure and record Tx power versus time for test scenario 7.



- Step 5: Convert the measured conducted Tx power from step 4 into the 1gSAR or 10gSAR value then to the time-averaged value as follows.

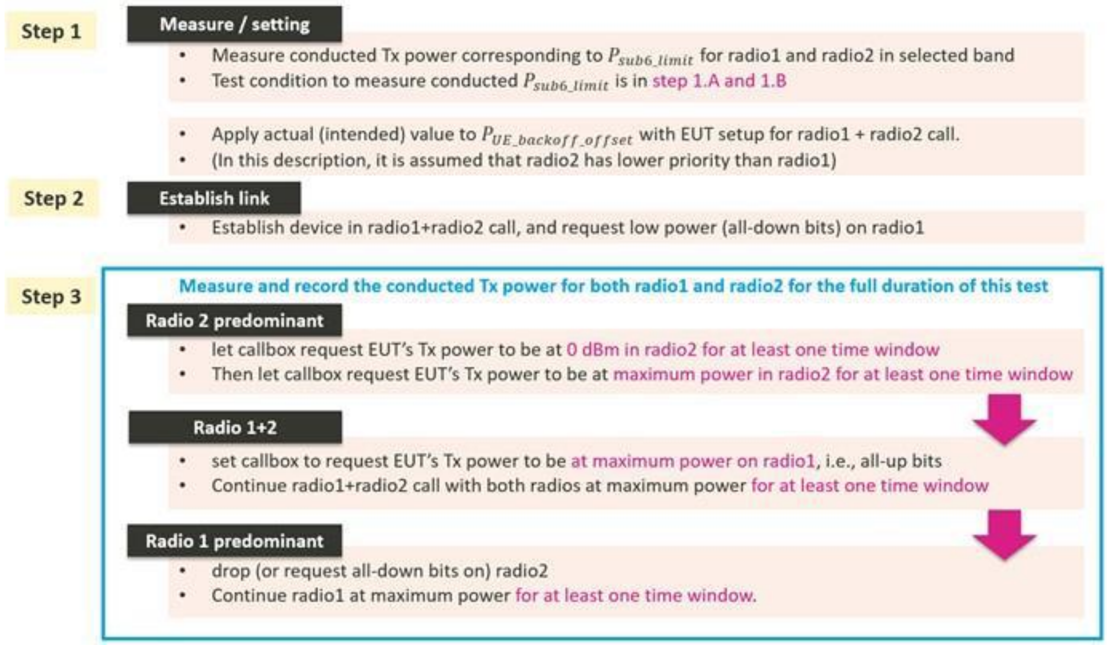




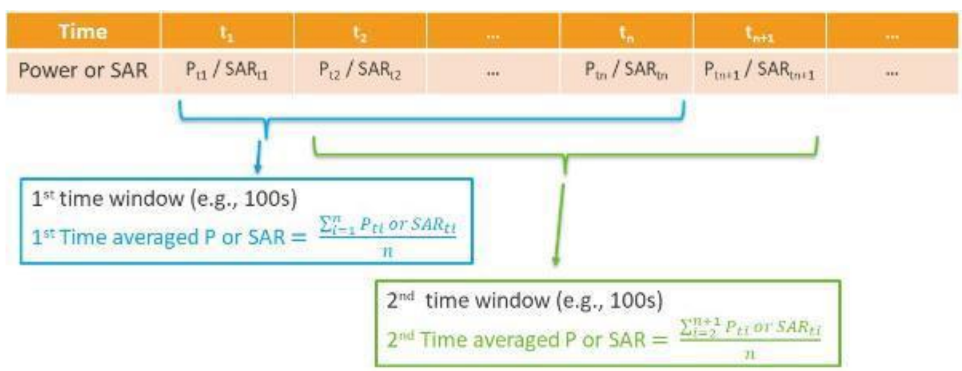
- Step 6: Plot the results.
  - Make one power perspective plot containing:
    - Instantaneous Tx power
    - Requested power
    - Calculated time-averaged power
    - Calculated time-averaged power limits
  - Make one SAR perspective plot containing
    - Calculated time-averaged 1gSAR or 10gSAR.
    - FCC limit of 1.6 W/kg (1gSAR) or 4.0 W/kg (10gSAR)
    - Normalized time-averaged 1gSAR/1.6 or 10gSAR/4.0

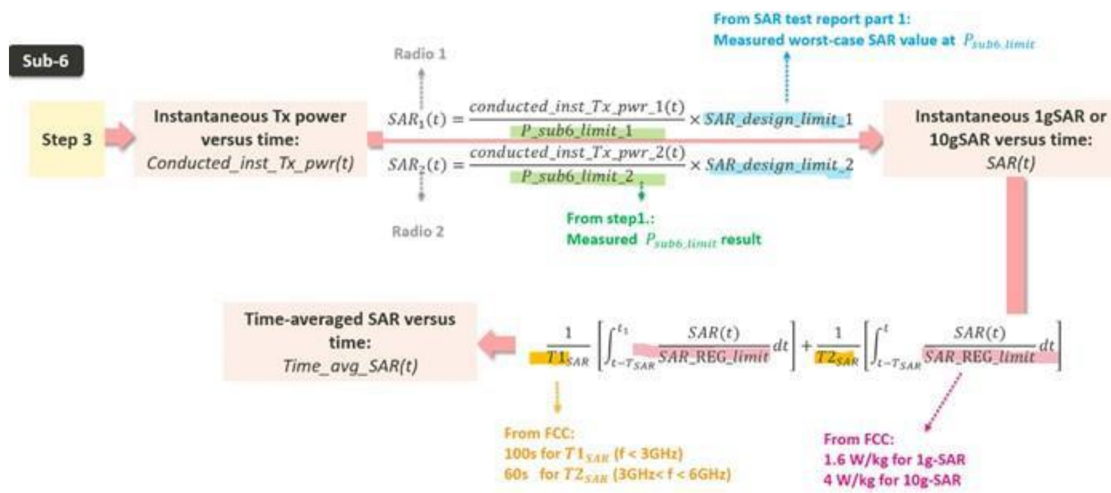
4.3.8 Scenario 8: SAR Exposure Switching via Conducted Power Measurements

- Steps 1-3: Measure and record Tx power versus time for test scenario 8.
  - Measure conducted Tx power corresponding to radio1 P_{sub6_limit}:
    - Establish radio1 band connection.
    - With the callbox requesting maximum power, measure Tx power for radio1 with TA_SAR enabled and $P_{EU\_backoff\_offset}$ set to 0 dBm.
  - Measure conducted Tx power corresponding to radio2 P_{sub6_limit}
    - Repeat the above step to measure conducted Tx power corresponding to radio2 P_{sub6_limit}.
    - If radio2 is dependent on radio1 (e.g., NR FR1 non-standalone mode requiring LTE radio1 as an anchor), establish a radio1 + radio2 connection and request all down bits for radio1 LTE. In this scenario, with the callbox requesting maximum power from radio2 NR FR1, measured conducted Tx power corresponds to radio2 P_{sub6_limit} (as radio1 LTE is at all-down bits).



- Step 4: Convert the measured conducted Tx power from step 4 into the 1gSAR or 10gSAR value then to the time-averaged value as follows.



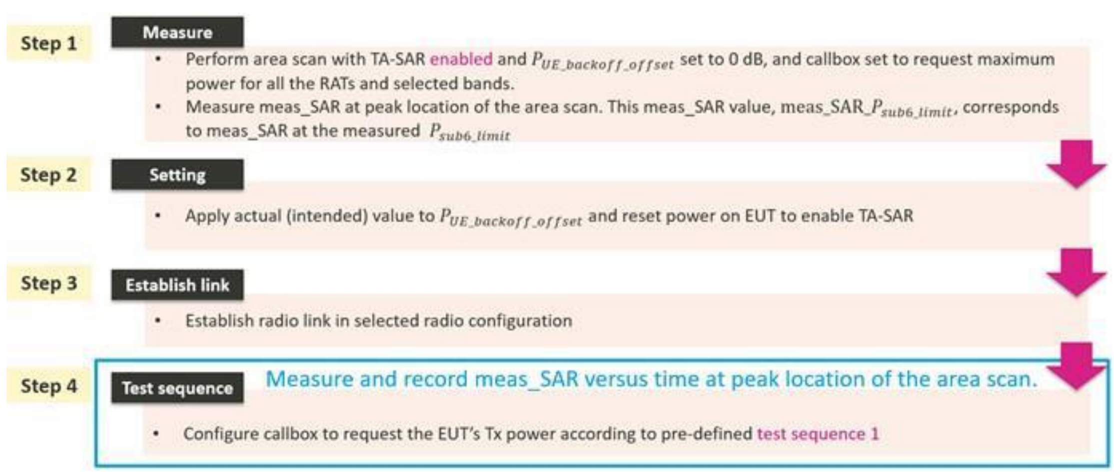


- Step 5: Plot the results.
  - Make one power perspective plot containing:
    - Instantaneous Tx power
    - Requested power
    - Calculated time-averaged power
    - Calculated time-averaged power limits
  - Make one SAR perspective plot containing
    - Calculated time-averaged 1gSAR or 10gSAR
    - FCC limit of 1.6 W/kg (1gSAR) or 4.0 W/kg (10gSAR)
    - Normalized time-averaged 1gSAR/1.6 or 10gSAR/4.0

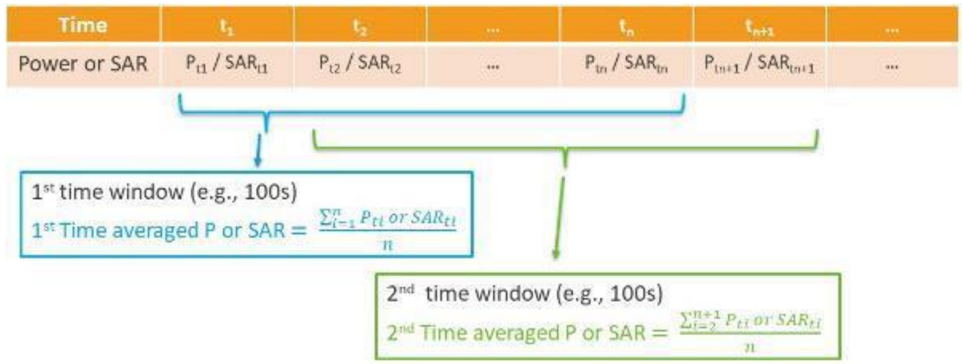
4.3.9 Scenario 2: Time-Varying Tx Power via SAR Measurements

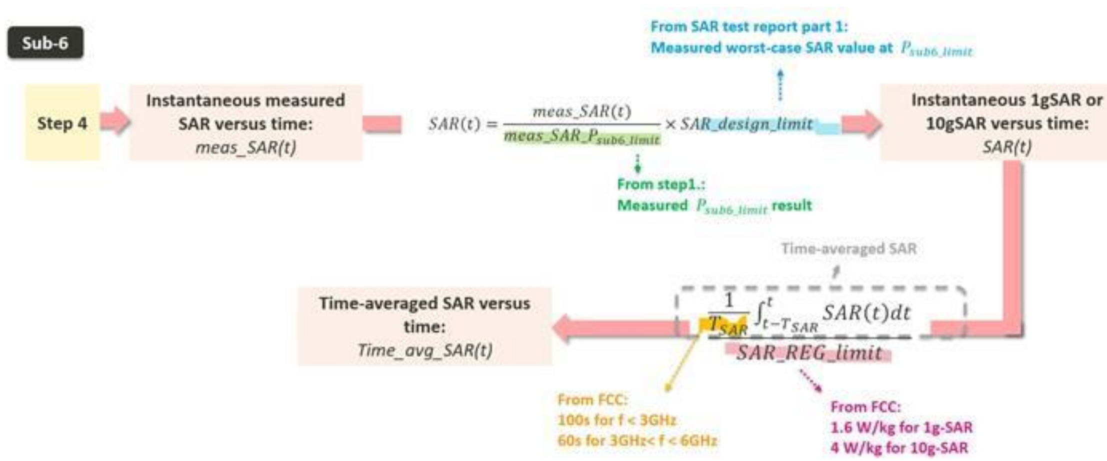
SAR is measured, recorded, and processed according to the following steps:

- Steps 1-4: Measure and record Tx power versus time for test scenario 5.1.



- Step 5: Convert the measured SAR from step 4 into the 1gSAR or 10gSAR value then to the time-averaged value as follows.





where, $meas\_SAR\_P_{sub6\_limit}$ is the value determined in step 1, and *meas_SAR(t)* is the instantaneous measured SAR measured in step 4.

- Step 6: Plot results
  - Calculated time-averaged 1gSAR or 10gSAR.
  - FCC limit of 1.6 W/kg (1gSAR) or 4.0 W/kg (10gSAR).
- Step 7: Repeat steps 2-6 for pre-defined test sequence 2, replacing test sequence 1 in step 4 with test sequence 2.
- Step 8: Repeat steps 2-7 for all the selected bands

The validation criteria are: At all times, the time-averaged 1gSAR or 10gSAR versus time shall not exceed FCC limit of 1.6 W/kg for 1gSAR or 4.0 W/kg for 10gSAR.

5 POWER LIMIT AND TEST CONFIGURATIONS

5.1 Sub6 Power Limit Table

The P_{sub6_limit} values in Table 5-1 correspond to the *SAR_design_limit* values of 0.81 W/kg for LTE Band 7 and NR SA Band n7 for 1gSAR, 0.91 W/kg for all other modes and bands for 1gSAR, and 2.27 W/kg for 10gSAR for all technologies and bands supported by the DUT.

The *SAR_design_limit* is determined by factoring in a 1.7 dBm device uncertainty margin for LTE Band 7 and NR SA Band n7, and a 1.2 dBm device uncertainty margin for all other supported LTE and NR SA bands. It is important to note that for TDD bands with transmit duty cycles less than or equal to 100%, the measured power limit reflects the burst-average power level and does not account for the Tx duty cycle.

Table 5-1
P_{sub6_limit} for supported RATs

Exposure Scenario:	Maximum Tune-up Output Power*	Head	Extremity
Averaging Volume:		1g	10g
Spacing:		10 mm	0 mm
ECI:		1	0
Technology/Band	Pmax		
LTE Band 71	24.50	51.10	35.00
LTE Band 12	24.50	48.80	33.50
LTE Band 17	24.50	N/A	N/A
LTE Band 13	24.50	45.70	35.40
LTE Band 14	24.50	47.50	35.40
LTE Band 26	24.50	50.50	34.90
LTE Band 5	24.50	51.10	35.50
LTE Band 4	24.00	N/A	N/A
LTE Band 66	24.00	31.40	38.60
LTE Band 2	24.00	N/A	N/A
LTE Band 25	24.00	29.80	36.50
LTE Band 7	24.00	23.00	34.80
LTE Band 41	22.00	23.30	33.90
NR Band n71	24.50	45.30	37.50
NR Band n12	24.50	49.50	34.50
NR Band n14	24.50	47.20	32.40
NR Band n26	24.50	51.20	34.10
NR Band n5	24.50	49.30	34.90
NR Band n66	24.00	30.80	38.00
NR Band n2	24.00	N/A	N/A
NR Band n25	24.00	29.00	34.40
NR Band n7	24.00	22.20	33.20
NR Band n41	24.00	24.20	33.60

Table 5-2
ECI and Corresponding Exposure Scenarios

Scenario	Description	SAR Test Cases
Extremity–Back Side (ECI=0)	▪ Device is evaluated for wrist exposure ▪ 0 mm distance from a flat phantom ▪ Back Side	*Wristwatch and wrist-worn transmitter SAR per KDB Publication 447498 D04*
Head–Front Side (ECI=1)	▪ Device is evaluated for next-to-mouth use in front of device ▪ 10 mm distance from a flat phantom to measure Head SAR ▪ Front Side	*Wristwatch and wrist-worn transmitter SAR per KDB Publication 447498 D04*

5.2 Test Configurations

Table 5-3 lists the radio configurations used in TA-SAR validation testing, including technologies, bands, ECIs, antennas, and worst-case measured 1g/10g SAR under P_{sub6_limit}.

Table 5-3
Test cases selected for Time-averaged SAR Validation

Test Case	Test Scenario	Technology	Antenna	ECI	Band	Channel	Frequency (MHz)	Test Configurations	SAR Exposure Scenario	Worst Case Measured SAR at Plim [W/kg]	Plimit [dBm]	Tune-up Pmax [dBm]	Measured Plimit [dBm]	Measured Pmax [dBm]
1	Range of TA-SAR Parameter	LTE	FCM	1	7	21100	2535	QPSK 1/0/20 MHz BW	Front, 10mm	0.818	23	24	23.21	23.31
2	Time Varying Tx Power	LTE	FCM	1	7	21100	2535	QPSK 1/0/20 MHz BW	Front, 10mm	0.818	23	24	23.21 23.21	23.31 23.31
3		NR	FCM	1	n7	507000	2535	DFT-S-OFDM, QPSK 1/1/20 MHz BW	Front, 10mm	1.15	22.2	24	21.88	23.42
4	Call Disconnection and Re-establishment	LTE	FCM	1	7	21100	2535	QPSK 1/0/20 MHz BW	Front, 10mm	0.818	23	24	23.21	23.31
5	Band Handover	NR	FCM	1	n7	507000	2535	DFT-S-OFDM, QPSK 1/1/20 MHz BW	Front, 10mm	1.15	22.2	24	21.88	23.42
		LTE	FCM	1	41 PC3	40620	2593	QPSK 1/0/20 MHz BW	Front, 10mm	0.62	22	24	21.52	23.49
6	Exposure Condition Index (ECI) Change	LTE	FCM	0	7	21100	2535	QPSK 1/0/20 MHz BW	Back, 0mm	0.198	24	24	23.21	23.31
				1	7	21100	2535	QPSK 1/0/20 MHz BW	Front, 10mm	0.818	23	24	23.21	23.31
7	Antenna Switch	LTE	BCM	1	71	133297	680.5	QPSK 1/0/20 MHz BW	Front, 10mm	0.002	24.5	24.5	23.77	24.06
		LTE	FCM	1	7	21100	2535	QPSK 1/0/20 MHz BW	Front, 10mm	0.818	23	24	22.07	23.31

Note: Per the manufacturer, the upper limit for conducted power tolerance of Plim is +1.7 dBm for LTE Band 7 and NR SA Band n7, and it is +1.2 dBm for all other supported LTE and NR SA bands.

Note: Per the manufacturer, the upper limit for conducted power tolerance of Pmax is +1.2 dBm.

Based on the selection criteria described in Section 4.2, the radio configurations for the Tx varying transmission test cases listed in Section 3 are:

1. Scenario 1: Range of TA-SAR Parameter: Based on the selection criteria given in Section 4.2.1, for Test Case 1, LTE Band 7 (Antenna FCM, ECI=1) was selected for conducted power measurement.
2. Scenario 2: Time-Varying Tx Power: Based on the selection criteria given in Section 4.2.2, for test cases 2 and 3, LTE Band 7 (Antenna FCM, ECI=1) and NR SA Band n7 (Antenna FCM, ECI=1) were selected for conducted power and single-point SAR measurement.
3. Scenario 3: Call Disconnection and Re-establishment: Based on the selection criteria given in Section 4.2.3, for test case 4, LTE Band 7 (Antenna FCM, ECI=1) was selected for conducted power measurement.
4. Scenario 4: Band Handover: Based on the selection criteria given in Section 4.2.4, for test case 5, NR SA Band n7 (Antenna FCM, ECI=1) and LTE Band 41, PC3, (Antenna FCM, ECI=1) were selected conducted power measurement.
5. Scenario 5: Exposure Condition Index Change: Based on the selection criteria given in Section 4.2.5, for test case 6, LTE Band 7 (Antenna FCM, ECI=0) and LTE Band 7 (Antenna FCM, ECI=1) were selected for conducted power measurement.
6. Scenario 6: Antenna Switch: Based on the selection criteria given in Section 4.2.6, for test case 7, LTE Band 71 (Antenna BCM, ECI=1) and LTE Band 7 (Antenna FCM, ECI=1) were selected for conducted power measurement.

6 CONDUCTED POWER MEASUREMENT FOR TA-SAR

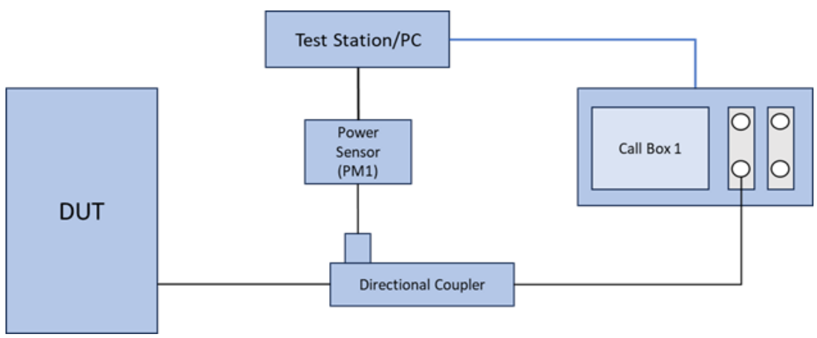
6.1 Conducted Power Measurement Setup

LTE test setup:

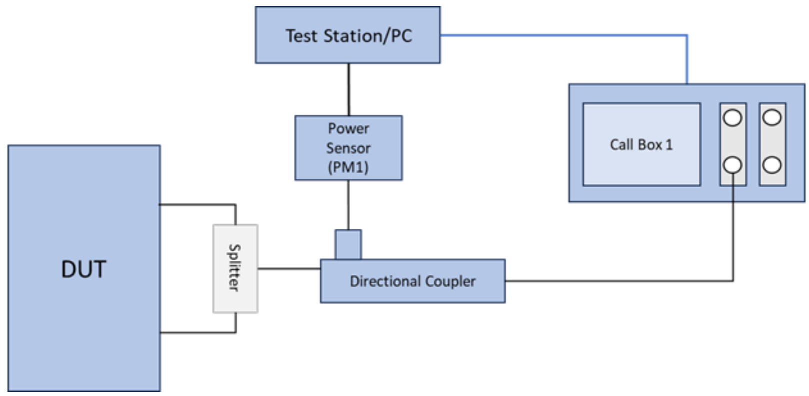
The Rohde & Schwarz CMW500 callbox was used for these tests. The test setup schematic is shown in Figure 6-1(a) (Appendix D – Test Setup Photos 1) for measurements using a single antenna on the DUT and in Figure 6-1(b) (Appendix D – Test Setup Photo 2) for measurements involving antenna switch. For single antenna measurement, one port (RF1 COM) on the callbox was connected to the RF port on the DUT using a directional coupler. For antenna switch measurements, one port (RF1 COM) on the callbox used for signaling two different technologies was connected to a directional coupler. The other end of the directional coupler was connected to a splitter which was then connected to the two RF ports of the DUT corresponding to the two antennas under test.

Sub6 NR test setup:

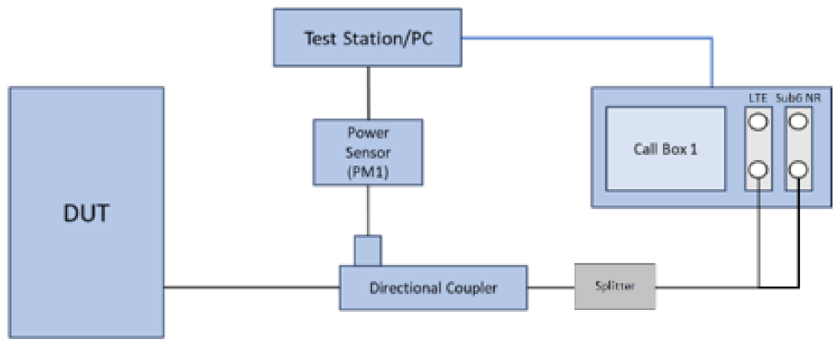
The Keysight UXM 5G callbox was used for these tests. For measurements using a single antenna on the DUT, the test setup schematic is the same as the test setup shown in Figure 6-1(a) (Appendix D – Test Setup Photo 3). One RF port of the callbox is connected to the RF port of the DUT using a directional coupler. For technology/band switch measurement, the LTE RF port and the Sub6 NR port on the callbox are separate; however, LTE and Sub6 NR SA share the same conducted measurement port on the DUT; therefore, the LTE and Sub6 NR signals for conducted power measurement were performed on separate paths as shown below in Figure 6-1(c) (Appendix D – Test Setup Photo 4). One RF port on the DUT used for signaling two different technologies is connected to a directional coupler. The other end of the directional coupler is connected to a splitter to connect to two RF ports of the UXM corresponding to the two technologies under test. In the setup, the power meter is used to tap the directional coupler for measuring the conducted output power of the DUT.



(a) Appendix D – Test Setup Photos 1 and 3



(b) Appendix D – Test Setup Photos 2



(c) Appendix D – Test Setup Photo 4

Figure 6-1 Conducted Power Measurement Setup

The callbox and power meter were connected to the testing PC using GPIB cables. Custom test scripts were used for automation. For each test, all path losses from the DUT RF port(s) to the callbox RF port(s) and to the power meter were calibrated and set as offsets in the callbox and power meter via the testing scripts sent through the PC used to control the callbox and power meter.

For time-varying Tx power measurement, the PC sent commands requesting specific Tx powers from the DUT for set durations of time according to Test Sequences 1 and 2 described in Section 4.1. The PC simultaneously recorded power meter readings periodically every 100 ms. A running average of this measured Tx power over 100 seconds was performed in post-processing to determine the 100s-time averaged power.

For Range of TA-SAR Parameter, Call Disconnection and Re-establishment, Technology/ Frequency Band/ Antenna Switch, and ECI Change, the PC sent commands requesting maximum power for the duration of the tests according to Test Sequence 0 described in Section 4.1.

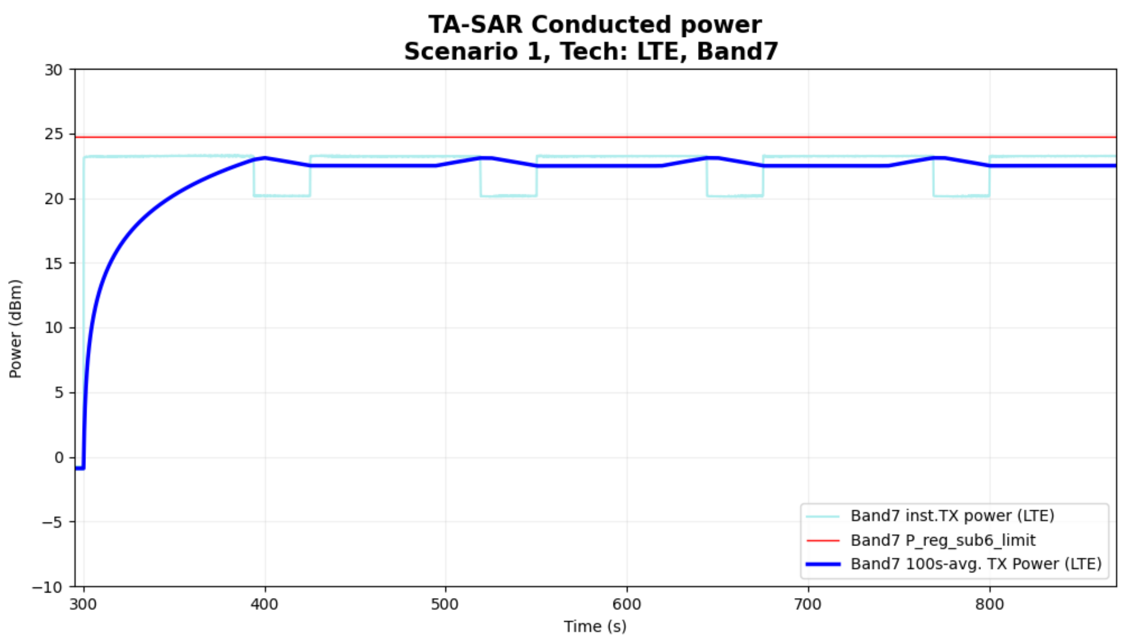
6.2 Scenario 1: Range of TA-SAR Parameter, Test Case 1

The following section provides a detailed, case-by-case analysis of the algorithm's behavior under different parameter configurations. For each test case, two figures are presented. The first illustrates the DUT's instantaneous conducted transmit power, the time-averaged conducted Tx power over time, and the applicable power limit (*Preg_sub6_limit* = *Psub6_limit* + device uncertainty). The second figure shows the corresponding time-averaged SAR over time, calculated using the equation given in Section 4.3.1. Across all test cases, the time-averaged SAR remains below the FCC regulatory limit.

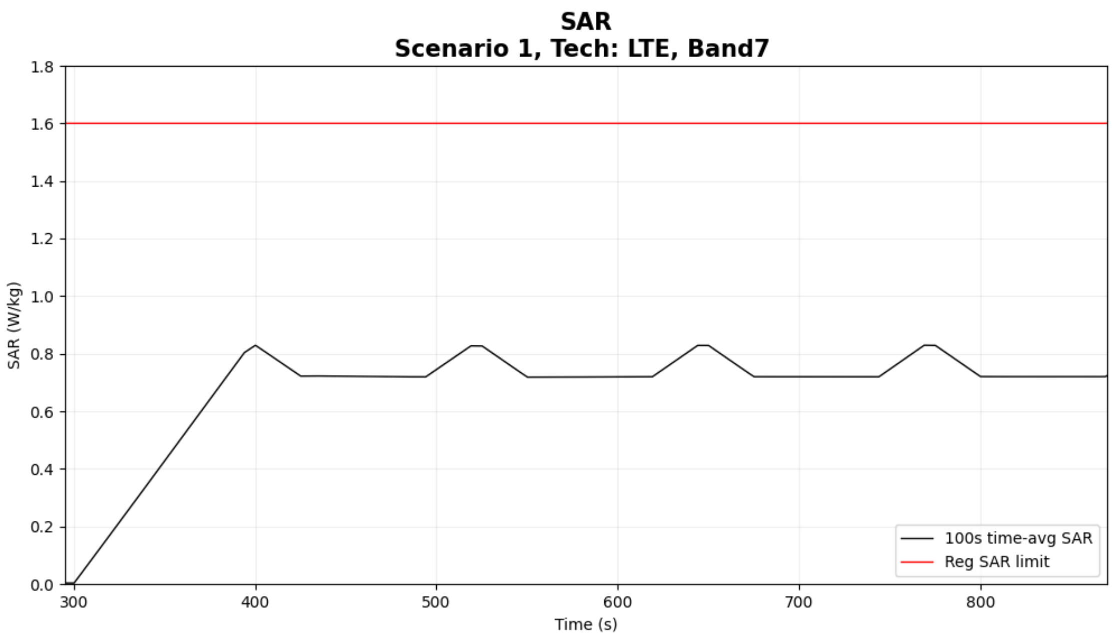
In this scenario, two TA-SAR parameters were varied to validate the performance of MediaTek's TA-SAR algorithm. The corresponding parameter sets are summarized in Table 6-1, and the test procedure is conducted in accordance with Section 4.3.1. The measurement setup is illustrated in Figure 6-1. A high-level summary of the final validation results is presented in the last column of Table 6-1, demonstrating that MediaTek's TA-SAR algorithm consistently ensures that the time-averaged SAR remains below the FCC limit across all test conditions.

Table 6-1 TA-SAR parameters for Scenario 1

Test Case	RAT	Test Band	Test Sequence	ECI	Max Power (dBm)	P_{sub6_limit} (dBm)	$P_{LowThresh}$ (dBm)	$P_{UE\_backoff}$ (dBm)	$P_{UE\_max\_cust}$ (dBm)	Pass/ Fail SAR Limit
1	LTE	7	0	1	25.2	23	22	20	23	Pass



Time-averaged conducted Tx power is converted into time-averaged 1gSAR and plotted below to demonstrate that the time-averaged 1gSAR versus time does not exceed the FCC limit of 1.6 W/kg for 1gSAR:



	(W/kg)
FCC 1gSAR limit	1.6
Max 100s-time averaged 1gSAR (black curve)	0.829
Validated: Pass	

6.3 Scenario 2: Time-Varying Tx Power, Test Cases 2-3

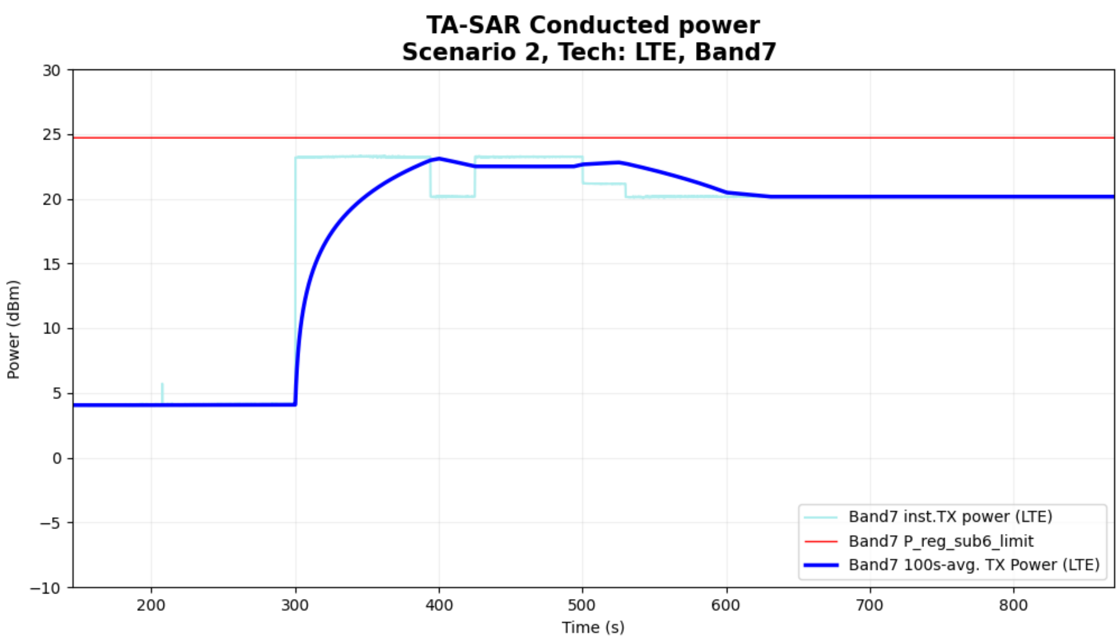
In this scenario, MediaTek's TA-SAR algorithm is evaluated under dynamic power sequences. Test Sequence 1 and Test Sequence 2 are described in Section 4.1. The corresponding test cases are summarized in Table 6-2. The tests follow the procedures outlined in Section 4.3.2. The measurement setup is depicted in Figure 6-1. A high-level summary of the results is provided in the last column of table 6-2, confirming that MediaTek's TA-SAR algorithm maintains TA-SAR below FCC regulatory limits consistently across all test cases. The following sections demonstrate MediaTek TA-SAR algorithm performance across different radio access technologies (RATs).

Table 6-2 TA-SAR parameters for Scenario 2

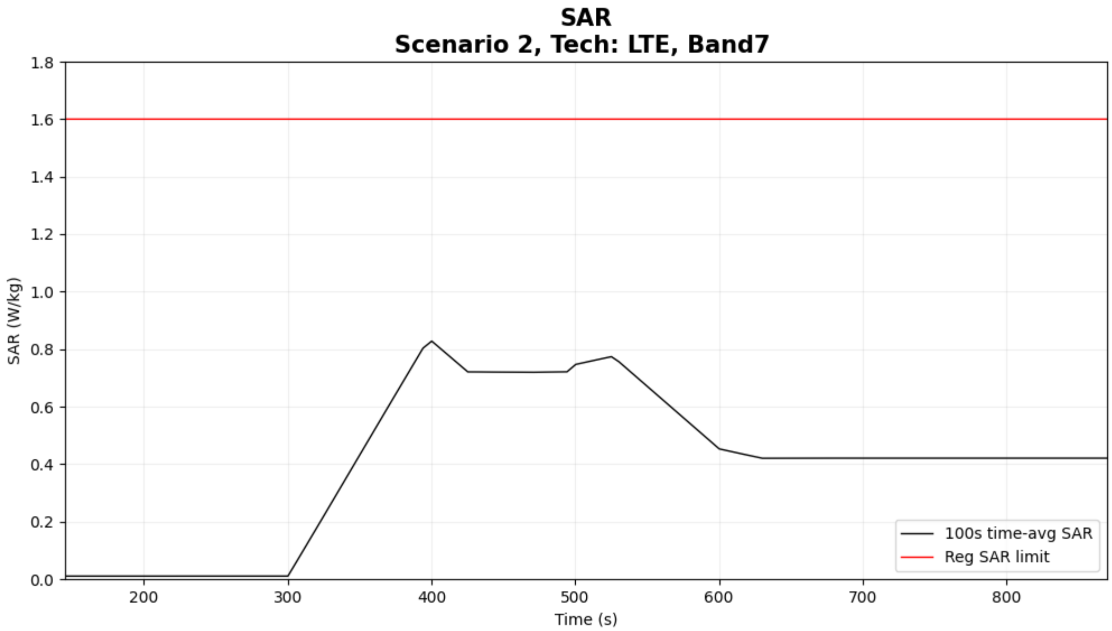
Test Case	RAT	Test Band	Test Sequence	ECI	Max Power (dBm)	P_{sub6_limit} (dBm)	$P_{LowThresh}$ (dBm)	PUE_backoff (dBm)	PUE_max_cust (dBm)	Pass/ Fail SAR Limit
2	LTE	7	1	1	25.2	23	22	20	23	Pass
2	LTE	7	2	1	25.2	23	22	20	23	Pass
3	NR SA	n7	1	1	25.2	22.2	21.2	19.2	22.2	Pass
3	NR SA	n7	2	1	25.2	22.2	21.2	19.2	22.2	Pass

6.3.1 Test Case 2: LTE Band 7 (Antenna FCM, ECI=1)

<u>Test Sequence 1 Result:</u>

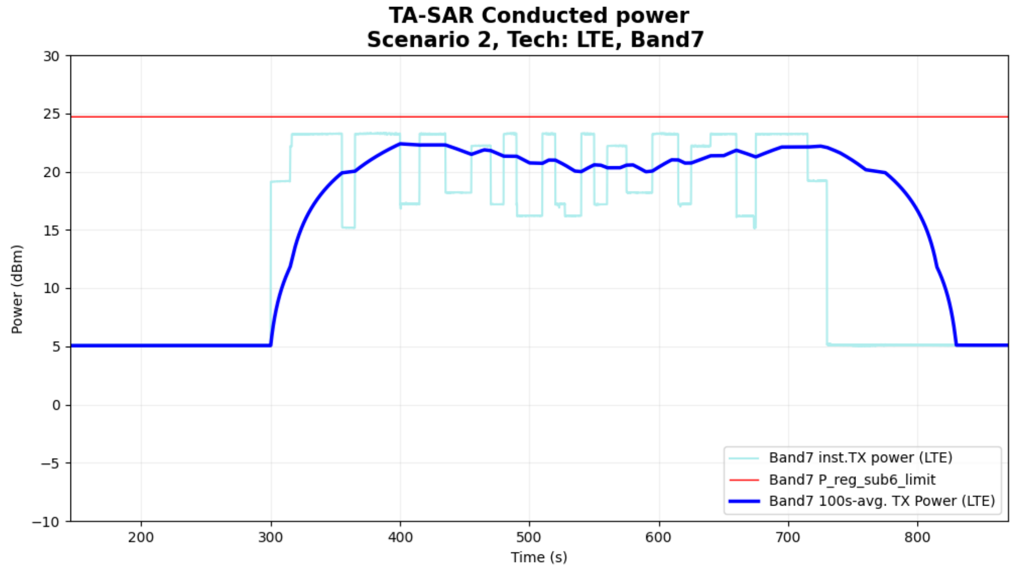


Time-averaged conducted Tx power is converted into time-averaged 1gSAR using and plotted below to demonstrate that the time-averaged 1gSAR versus time does not exceed the FCC limit of 1.6 W/kg for 1gSAR:

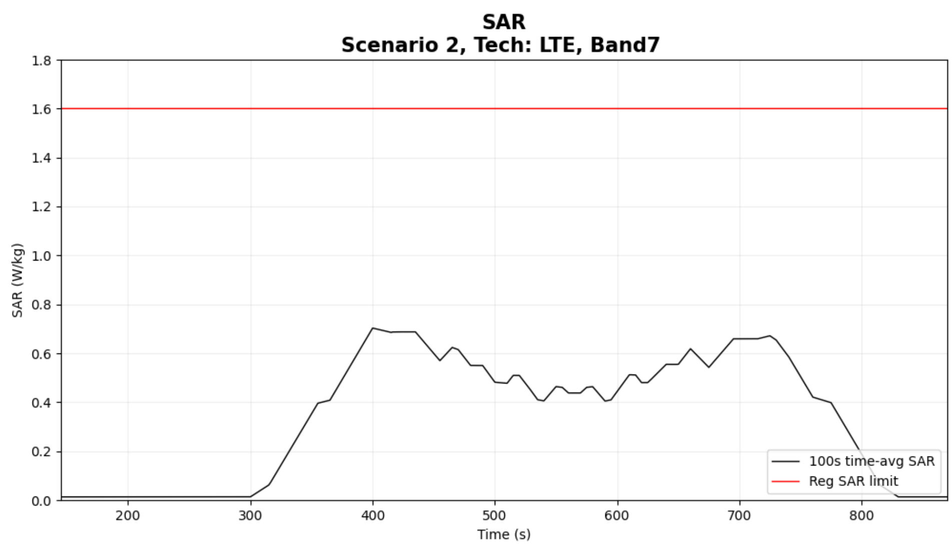


	(W/kg)
FCC 1gSAR limit	1.6
Max 100s-time averaged 1gSAR (black curve)	0.828
Validated: Pass	

Test Sequence 2 Result:



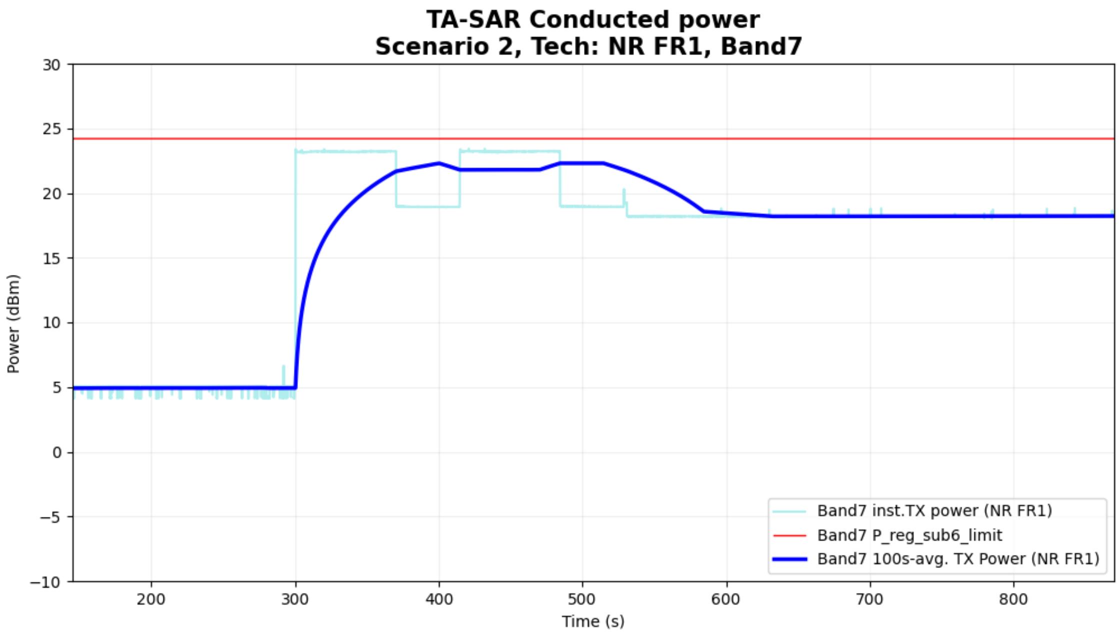
Time-averaged conducted Tx power is converted/calculated into time-averaged 1gSAR using and plotted below to demonstrate that the time-averaged 1gSAR versus time does not exceed the FCC limit of 1.6 W/kg for 1gSAR:



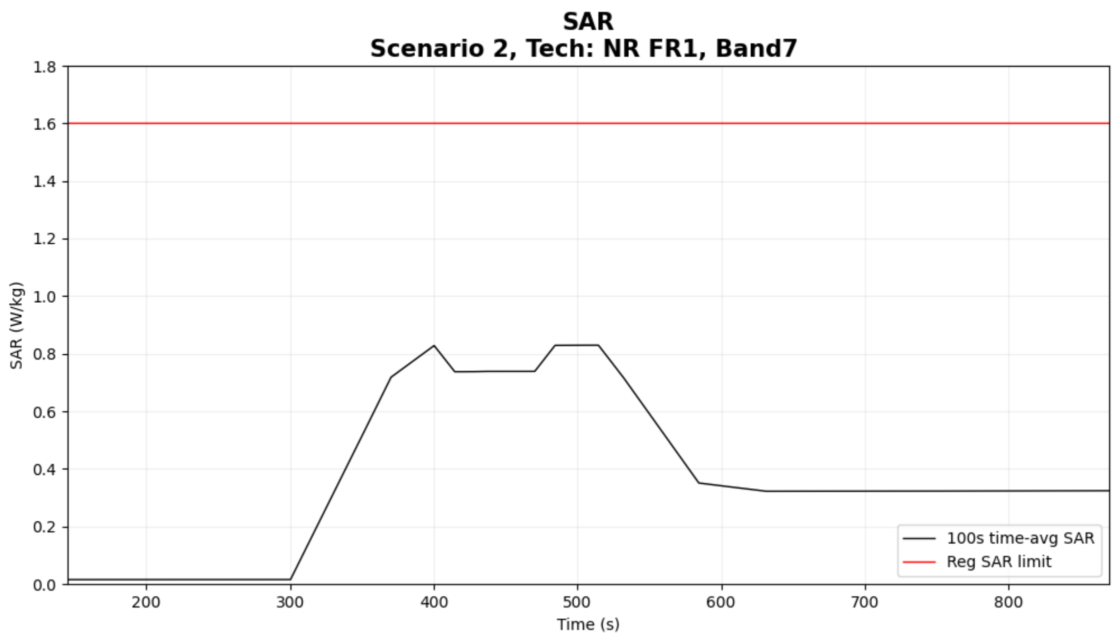
	(W/kg)
FCC 1gSAR limit	1.6
Max 100s-time averaged 1gSAR (black curve)	0.703
Validated: Pass	

6.3.2 Test Case 3: NR SA Band n7 (Antenna FCM, ECI=1)

Test Sequence 1 Result:

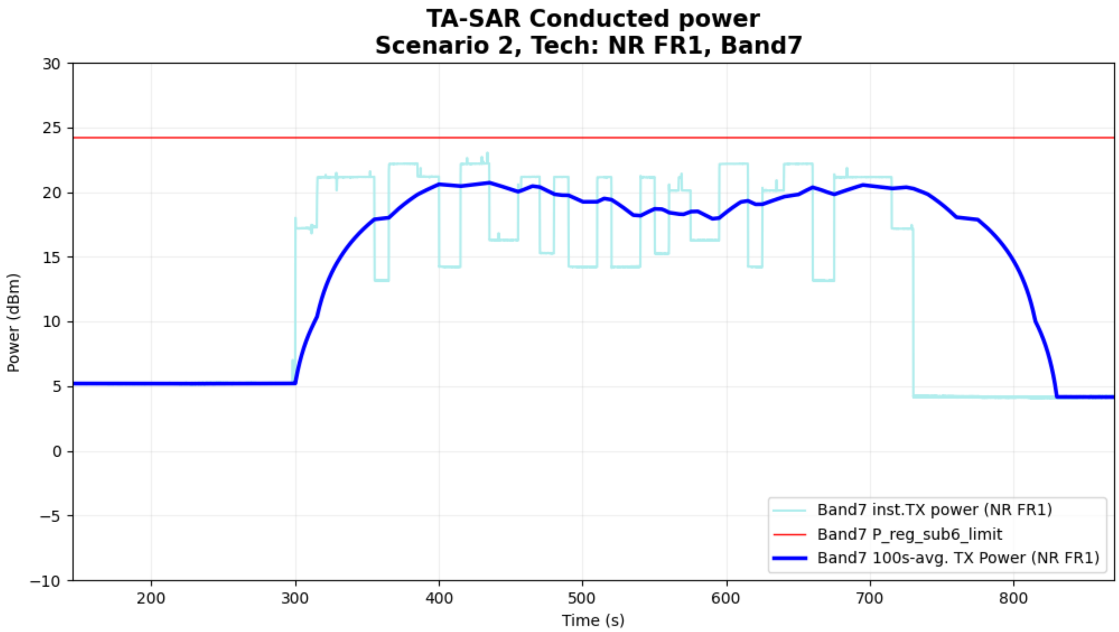


Time-averaged conducted Tx power is converted/calculated into time-averaged 1gSAR using and plotted below to demonstrate that the time-averaged 1gSAR versus time does not exceed the FCC limit of 1.6 W/kg for 1gSAR:

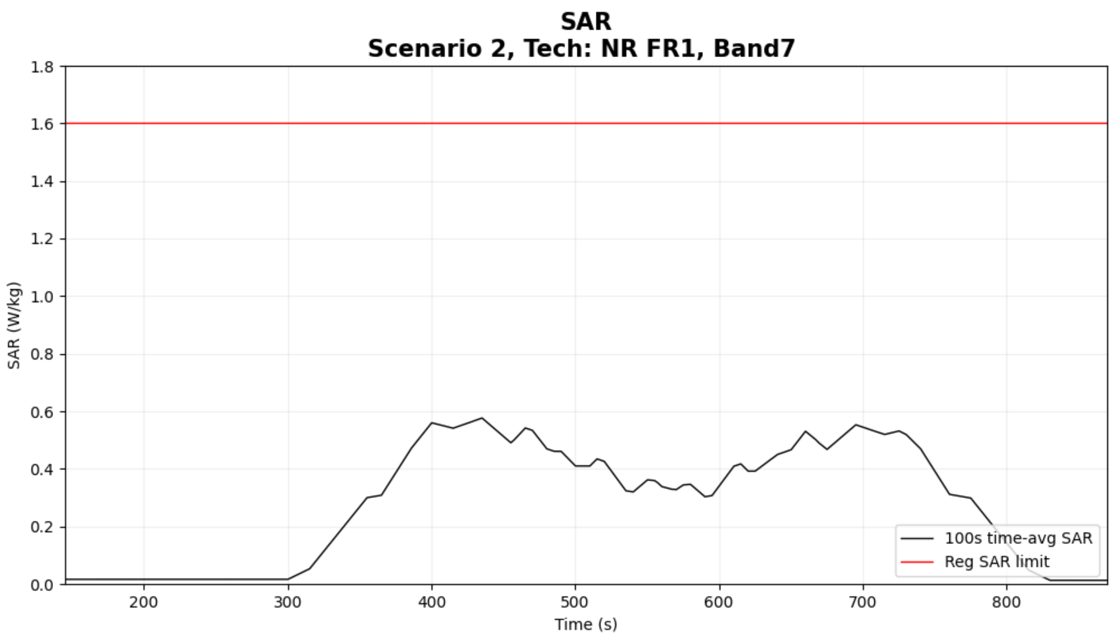


	(W/kg)
FCC 1gSAR limit	1.6
Max 100s-time averaged 1gSAR (black curve)	0.829
Validated: Pass	

Test Sequence 2 Result:



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



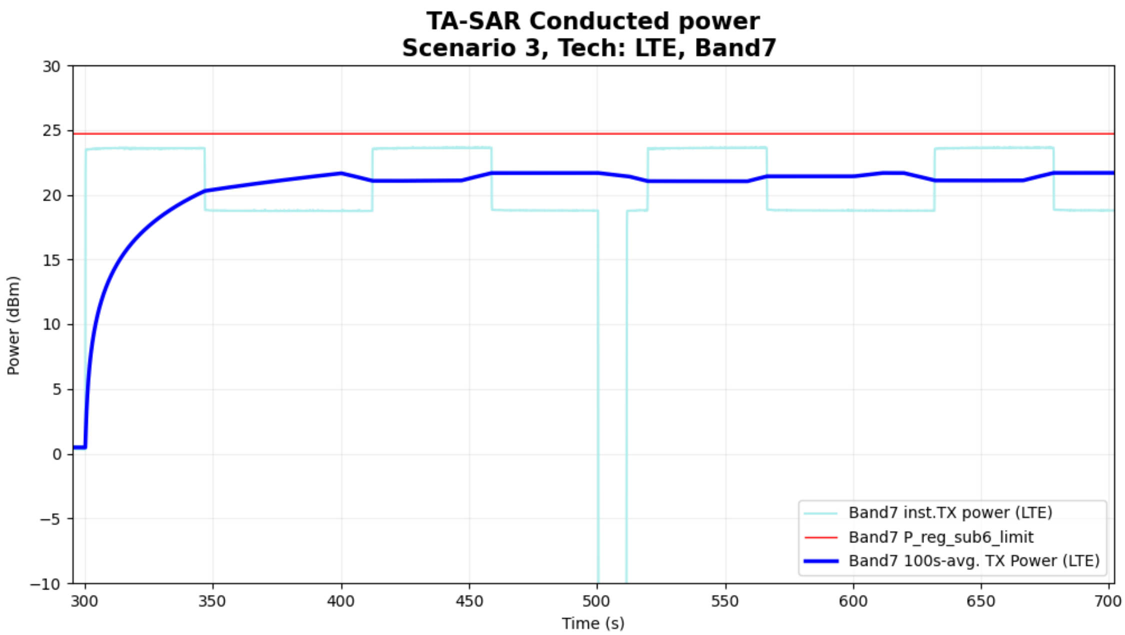
	(W/kg)
FCC 1gSAR limit	1.6
Max 100s-time averaged 1gSAR (black curve)	0.576
Validated: Pass	

6.4 Scenario 3: Call Disconnection and Re-establishment, Test Case 4

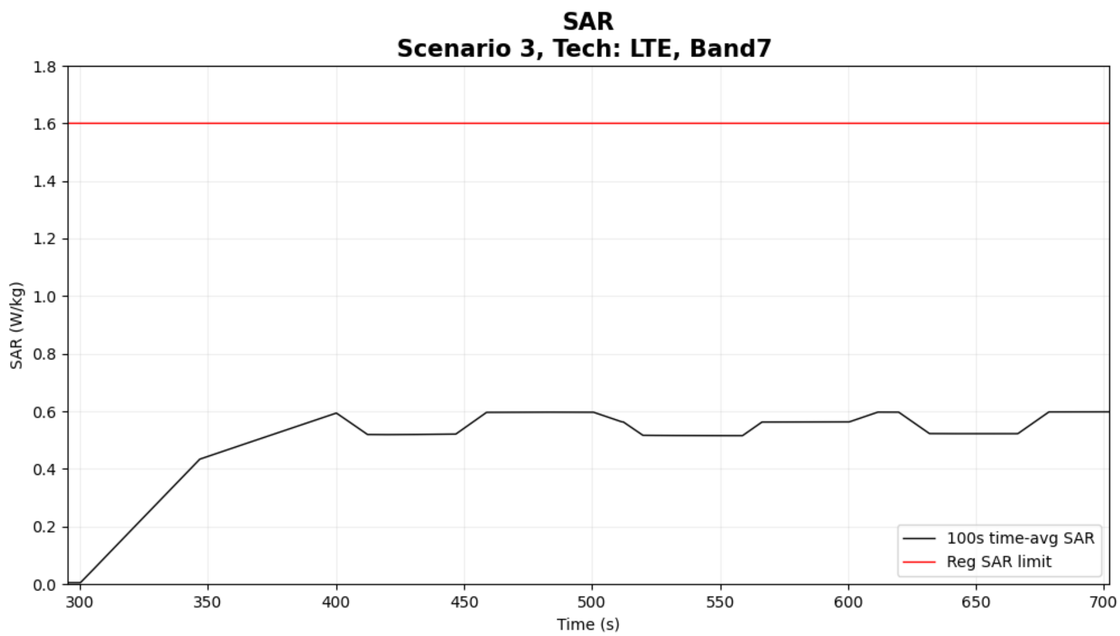
In this scenario, the call box requests maximum Tx power before the call is dropped for a duration set in the testing script and then re-established. The parameters tested for this scenario were selected according to the criteria outlined in Section 4.2.3, and they are given below in Table 6-3. The detailed test procedure is given in Section 4.3.3, and the measurement setup is illustrated in Figure 6-1. A high-level summary of the final validation results is provided in the last column of Table 6-3, demonstrating that MediaTek's TA-SAR algorithm consistently ensures that time-averaged SAR remains below the FCC regulatory limit.

Tale 6-3 TA-SAR parameters for Scenario 3

Test Case	RAT	Test Band	Test Sequence	ECI	Max Power (dBm)	P_{sub6_limit} (dBm)	$P_{LowThresh}$ (dBm)	PUE_backoff (dBm)	PUE_max_cust (dBm)	Pass/ Fail SAR Limit
4	LTE	7	0	1	25.2	23	22	20	23	Pass



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



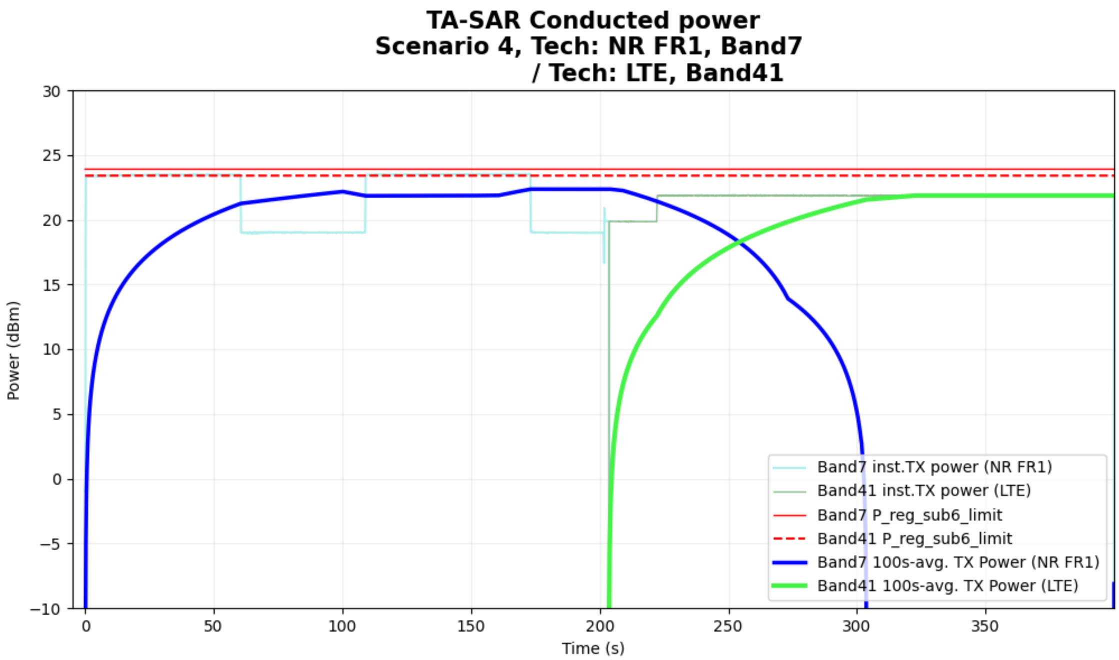
	(W/kg)
FCC 1gSAR limit	1.6
Max 100s-time averaged 1gSAR (black curve)	0.598
Validated: Pass	

6.5 Scenario 4: Band Handover, Test Case 5

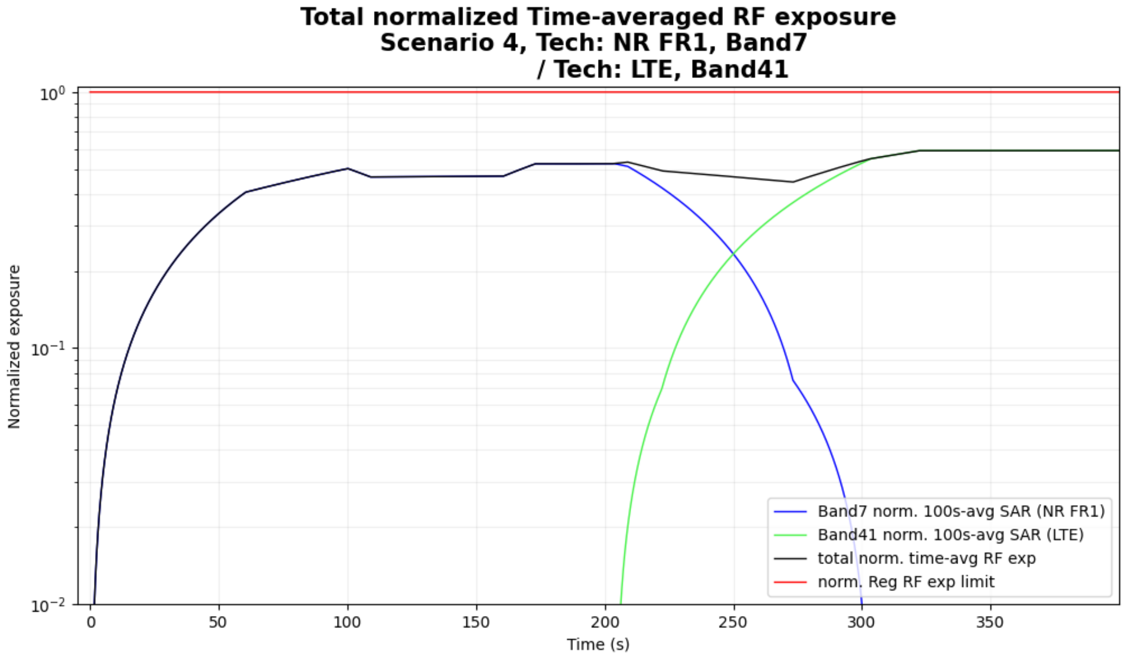
This scenario follows Test Sequence 0, in which the call box requests maximum Tx power for each RAT. The handover is triggered at a predefined instance to evaluate the algorithm's performance during transitions. This test case comprehensively covers handover scenarios between different RATs. This test case is summarized in Table 6-4, and the test procedure is described in Section 4.3.4. The measurement setup is illustrated in Figure 6-1. A high-level summary of the final validation result is provided in the last column of the table, confirming that MediaTek's TA-SAR algorithm consistently maintains time-averaged SAR below FCC regulatory limit across handover conditions.

Table 6-4 TA-SAR parameters for Scenario 4

Test Case	RAT	Test Band	Test Sequence	ECI	Max Power (dBm)	P_{sub6_limit} (dBm)	$P_{LowThresh}$ (dBm)	$P_{UE\_backoff}$ (dBm)	$P_{UE\_max\_cust}$ (dBm)	Pass/ Fail SAR Limit
5	NR SA	n7	0	1	25.2	22.2	21.2	19.2	22.2	Pass
	LTE	41 PC3	0	1	25.2	22	21	19	22	



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



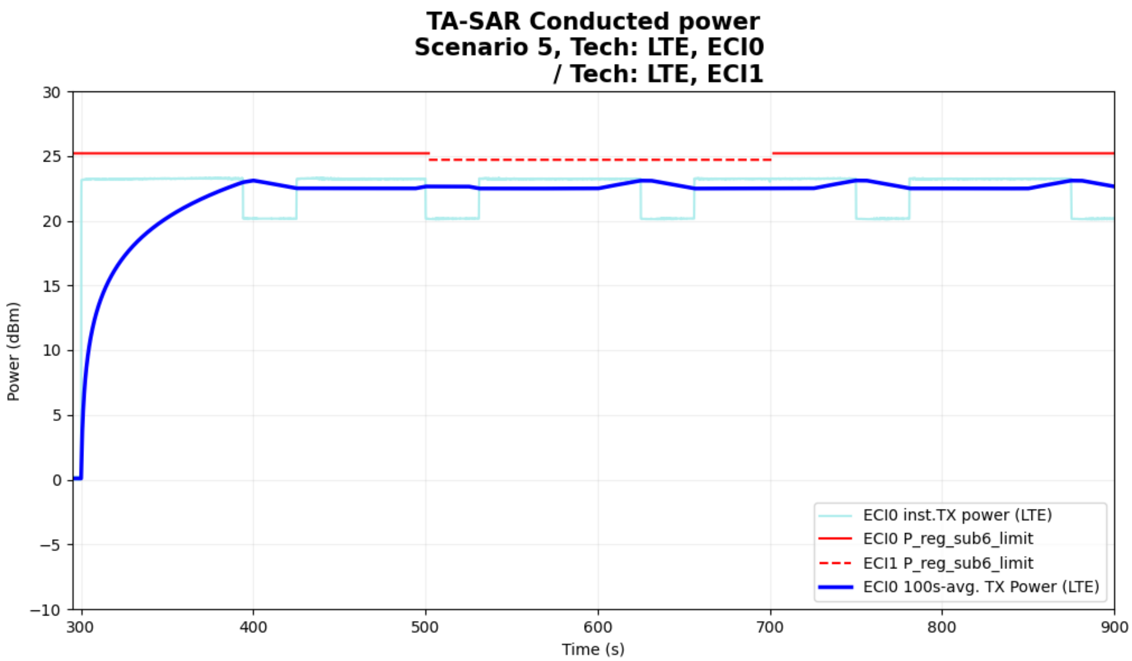
	(W/kg)
FCC normalized SAR limit	1.0
Max normalized 100s-time averaged SAR (black curve)	0.591
Validated: Pass	

6.6 Scenario 5: ECI Change, Test Case 6

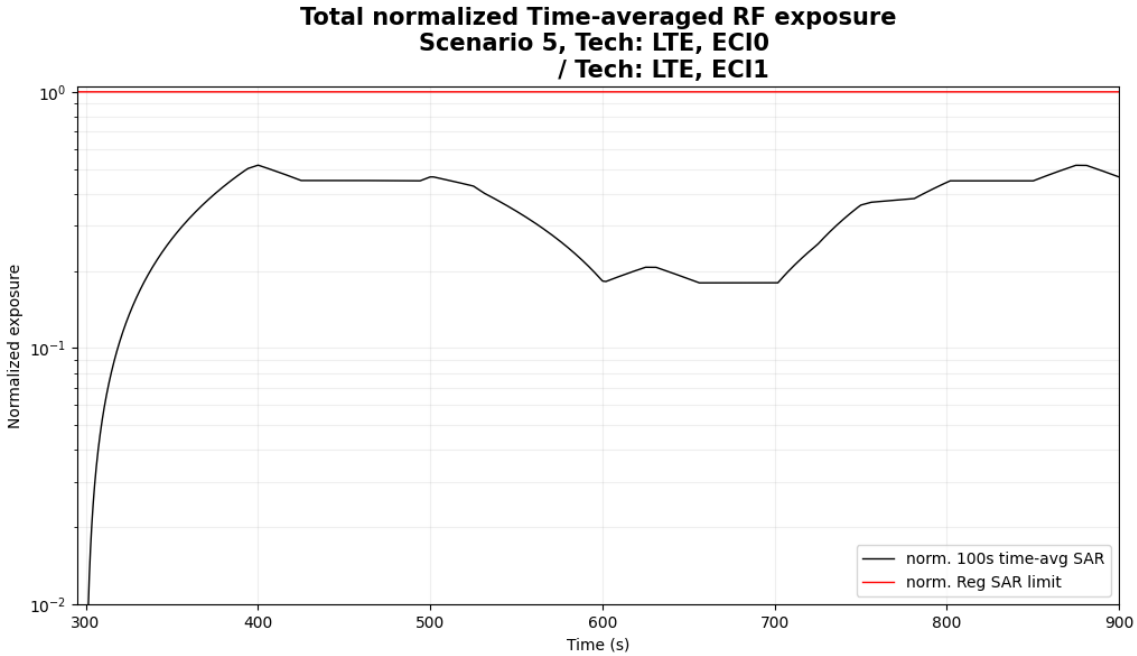
In this scenario, Test Sequence 0 is applied, in which the call box requests maximum Tx power for each RAT. An ECI change is triggered at a predefined instance to evaluate the TA-SAR algorithm's response. This test case covers ECI switching scenarios between two different ECIs. This test case is summarized in Table 6-5, and the test procedure follows the methodology described in Section 4.3.5. The measurement setup is shown in Figure 6-1. A high-level summary of the final validation results is presented in the last column of the table, confirming that MediaTek's TA-SAR algorithm consistently ensures that time-averaged SAR remains below the FCC regulatory limit.

Table 6-5 TA-SAR parameters or Scenario 5

Test Case	RAT	Test Band	Test Sequence	ECI	Max Power (dBm)	P_{sub6_limit} (dBm)	$P_{LowThresh}$ (dBm)	$PUE_{backoff}$ (dBm)	PUE_{max_cust} (dBm)	Pass/ Fail SAR Limit
6	LTE	7	0	0	25.2	24	23	21	24	Pass
	LTE	7	0	1	25.2	23	22	20	23	



The conducted Tx power measurement results were converted into time-averaged normalized SAR values to demonstrate that the time-averaged normalized SAR versus time does not exceed the FCC limit of 1 unit.



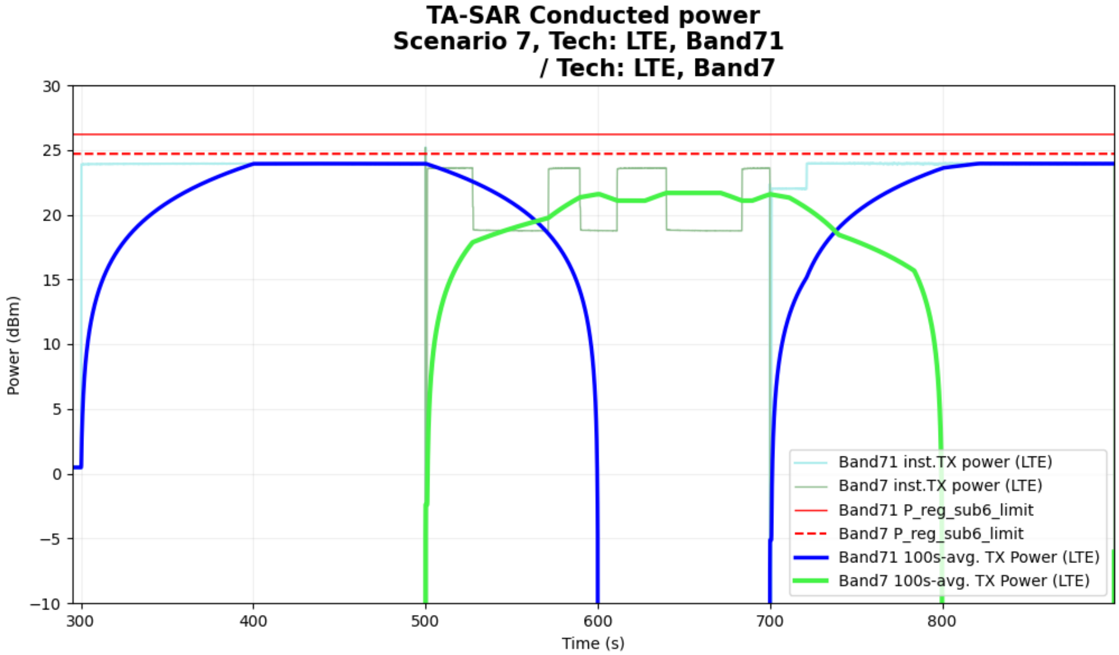
	(W/kg)
FCC normalized SAR limit	1.0
Max normalized 100s-time averaged SAR (black curve)	0.518
Validated: Pass	

6.7 Scenario 6: Antenna Switching, Test Case 7

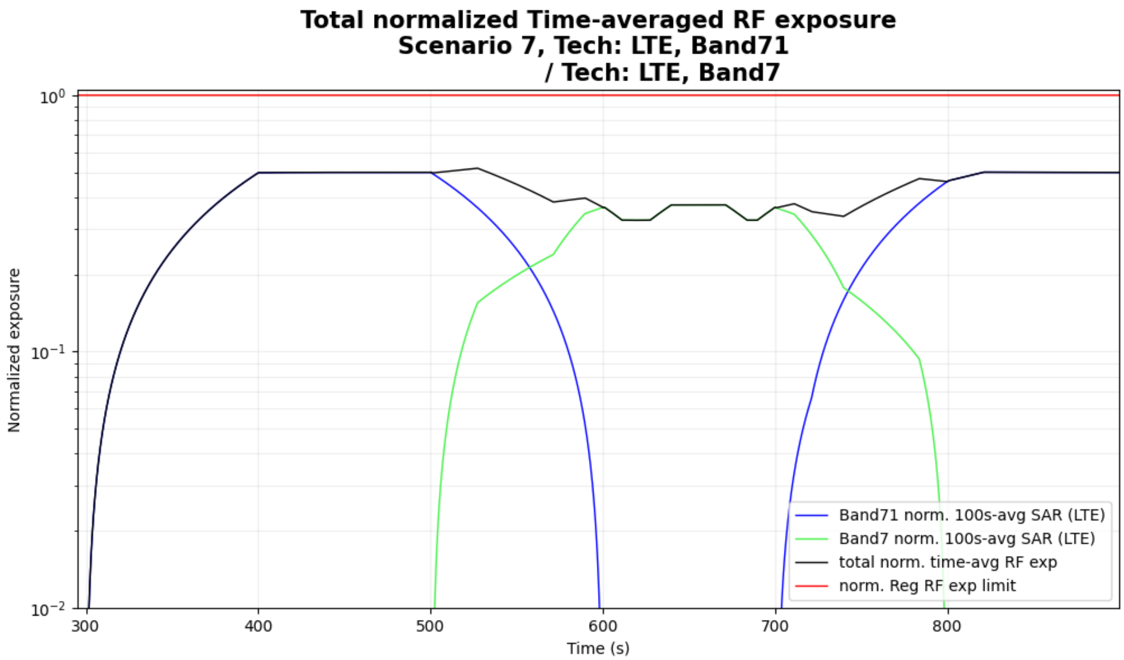
In this scenario, Test Sequence 0 is applied, in which the call box requests maximum Tx power for each RAT. An antenna change is triggered a specified instance to evaluate the TA-SAR algorithm's response. The test case associated with this scenario is summarized in Table 6-6, and the test procedure is described in Section 4.3.6. The measurement setup is illustrated in Figure 6-1. A high-level summary of the validation result is provided in the last column of Table 6-6, confirming that MediaTek's TA-SAR algorithm consistently ensures the time-averaged SAR remains below the FCC regulatory limit.

Table 6-6 TA-SAR parameters for Scenario 6

Test Case	RAT	Test Band	Test Sequence	ECI	Max Power (dBm)	P_{sub6_limit} (dBm)	$P_{LowThresh}$ (dBm)	$P_{UE\_backoff}$ (dBm)	$P_{UE\_max\_cust}$ (dBm)	Pass/ Fail SAR Limit
7	LTE	71	0	1	25.2	24.5	23.5	21.5	24.5	Pass
	LTE	7	0	1	25.2	23	22	20	23	



The conducted Tx power measurement results were converted into time-averaged normalized SAR values to demonstrate that the time-averaged normalized SAR versus time does not exceed the FCC limit of 1 unit.



	(W/kg)
FCC normalized SAR limit	1.0
Max normalized 100s-time averaged 1gSAR (black curve)	0.519
Validated: Pass	

7 SYSTEM VERIFICATION (FREQ< 6 GHZ)

7.1 Tissue Verification

Table 7-1
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
7/25/2025	2450 Head	22	2300	1.680	38.406	1.670	39.500	0.60%	-2.77%
			2310	1.687	38.394	1.679	39.480	0.48%	-2.75%
			2320	1.695	38.384	1.687	39.460	0.47%	-2.73%
			2400	1.754	38.295	1.756	39.289	-0.11%	-2.53%
			2450	1.794	38.241	1.800	39.200	-0.33%	-2.45%
			2480	1.817	38.194	1.833	39.162	-0.87%	-2.47%
			2500	1.833	38.162	1.855	39.136	-1.19%	-2.49%
			2510	1.841	38.147	1.866	39.123	-1.34%	-2.49%
			2535	1.861	38.113	1.893	39.092	-1.69%	-2.50%
			2550	1.873	38.092	1.909	39.073	-1.89%	-2.51%
			2560	1.882	38.076	1.920	39.060	-1.98%	-2.52%
			2600	1.914	38.011	1.964	39.009	-2.55%	-2.56%
			2650	1.955	37.925	2.018	38.945	-3.12%	-2.62%
			2680	1.980	37.870	2.051	38.907	-3.46%	-2.67%
			2700	1.996	37.835	2.073	38.882	-3.71%	-2.69%
8/4/2025	2450 Head	20	2300	1.685	38.480	1.670	39.500	0.90%	-2.58%
			2310	1.693	38.471	1.679	39.480	0.83%	-2.56%
			2320	1.700	38.465	1.687	39.460	0.77%	-2.52%
			2400	1.757	38.333	1.756	39.289	0.06%	-2.43%
			2450	1.793	38.282	1.800	39.200	-0.39%	-2.34%
			2480	1.813	38.221	1.833	39.162	-1.09%	-2.40%
			2500	1.829	38.180	1.855	39.136	-1.40%	-2.44%
			2510	1.838	38.166	1.866	39.123	-1.50%	-2.45%
			2535	1.858	38.148	1.893	39.092	-1.85%	-2.41%
			2550	1.869	38.133	1.909	39.073	-2.10%	-2.41%
			2560	1.876	38.121	1.920	39.060	-2.29%	-2.40%
			2600	1.906	38.029	1.964	39.009	-2.95%	-2.51%
			2650	1.949	37.960	2.018	38.945	-3.42%	-2.53%
			2680	1.970	37.915	2.051	38.907	-3.95%	-2.55%
			2700	1.984	37.870	2.073	38.882	-4.29%	-2.60%
8/11/2025	2450 Head	21	2300	1.707	38.924	1.670	39.500	2.22%	-1.46%
			2310	1.715	38.911	1.679	39.480	2.14%	-1.44%
			2320	1.723	38.900	1.687	39.460	2.13%	-1.42%
			2400	1.778	38.775	1.756	39.289	1.25%	-1.31%
			2450	1.816	38.724	1.800	39.200	0.89%	-1.21%
			2480	1.835	38.665	1.833	39.162	0.11%	-1.27%
			2500	1.850	38.625	1.855	39.136	-0.27%	-1.31%
			2510	1.858	38.608	1.866	39.123	-0.43%	-1.32%
			2535	1.880	38.578	1.893	39.092	-0.69%	-1.31%
			2550	1.892	38.564	1.909	39.073	-0.89%	-1.30%
			2560	1.899	38.555	1.920	39.060	-1.09%	-1.29%
			2600	1.928	38.478	1.964	39.009	-1.83%	-1.36%
			2650	1.972	38.401	2.018	38.945	-2.28%	-1.40%
			2680	1.993	38.363	2.051	38.907	-2.83%	-1.40%
			2700	2.008	38.317	2.073	38.882	-3.14%	-1.45%

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 differ slightly from the table above due to significant digit rounding in the software.

7.2 Test System Verification

Prior to SAR assessment, the system is verified to ±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 Appendix C.

Table 7-2
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	DAE	Measured SAR_{1g} (W/kg)	1 W Target SAR_{1g} (W/kg)	1 W Normalized SAR_{1g} (W/kg)	$Deviation_{1g}$ (%)
AM4	2450	Head	7/25/2025	21.8	22.1	0.10	750	7360	534	5.210	53.300	52.100	-2.25%
AM4	2450	Head	8/4/2025	22.3	21.0	0.10	750	7360	534	5.090	53.300	50.900	-4.50%
AM3	2450	Head	8/11/2025	23.2	21.3	0.10	750	7552	1676	4.960	53.300	49.600	-6.94%
AM4	2600	Head	7/25/2025	21.8	22.1	0.10	1042	7360	534	5.820	54.900	58.200	6.01%
AM4	2600	Head	8/4/2025	22.3	21.0	0.10	1042	7360	534	5.190	54.900	51.900	-5.46%
AM3	2600	Head	8/11/2025	23.2	21.3	0.10	1042	7552	1676	5.430	54.900	54.300	-1.09%

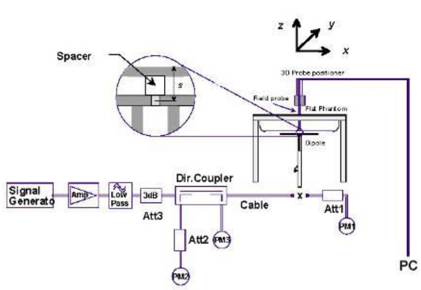


Figure 7-1
System Verification Setup Diagram

Figure 7-2
System Verification Setup Photo

8 SAR MEASUREMENT FOR TA-SAR

8.1 SAR Measurement Setup

The TA-SAR measurement setup is similar to the SAR measurement setup described in the Part 1 Test Report. The TA-SAR measurement setup differs from the Part 1 SAR measurement setup in that callbox signaling is set to closed loop rather than being set to request max power, and the callbox is connected to the testing PC using GPIB cables to send commands from the testing PC to control the callbox. The same test script used in the conducted setup for time-varying Tx power measurements is also used to run the test sequences performed for SAR measurements, and the recorded values from the disconnected power meter are discarded.

Section 4.3.9 details the test procedure for SAR measurements. To allow the DUT to follow the TPC commands sent wirelessly from the callbox, the path loss between the callbox antenna and the DUT is calibrated for each frequency band under test. As the SAR measurement chamber is in uncontrolled environment, precautions are taken to minimize environmental influences on path loss. For TA-SAR measurement, the DUT is placed in the worst-case position according to Table 5-3, as shown in Appendix D – Test Setup Photo 5.

8.2 Scenario 2: Time-Varying Tx Power, Test Cases 1-2

In this scenario, MediaTek's TA-SAR algorithm is evaluated under dynamic power test sequences. Test Sequences 1 and 2 are described in Section 4.1. Corresponding test cases are summarized in Table 6-2, and the test procedure follows the methodology outlined in Section 4.3.9. measurements were conducted using the DASY6 system. A high-level summary of the validation results is provided in the last column of Table 8-1, confirming that MediaTek's TA-SAR algorithm consistently maintains time-averaged SAR below the FCC regulatory limit across all test cases. The following sections present a case-by-case analysis illustrating the algorithm's performance across different radio access technologies (RATs).

SAR probe integration times depend on the communication signal being tested as defined in the probe calibration parameters.

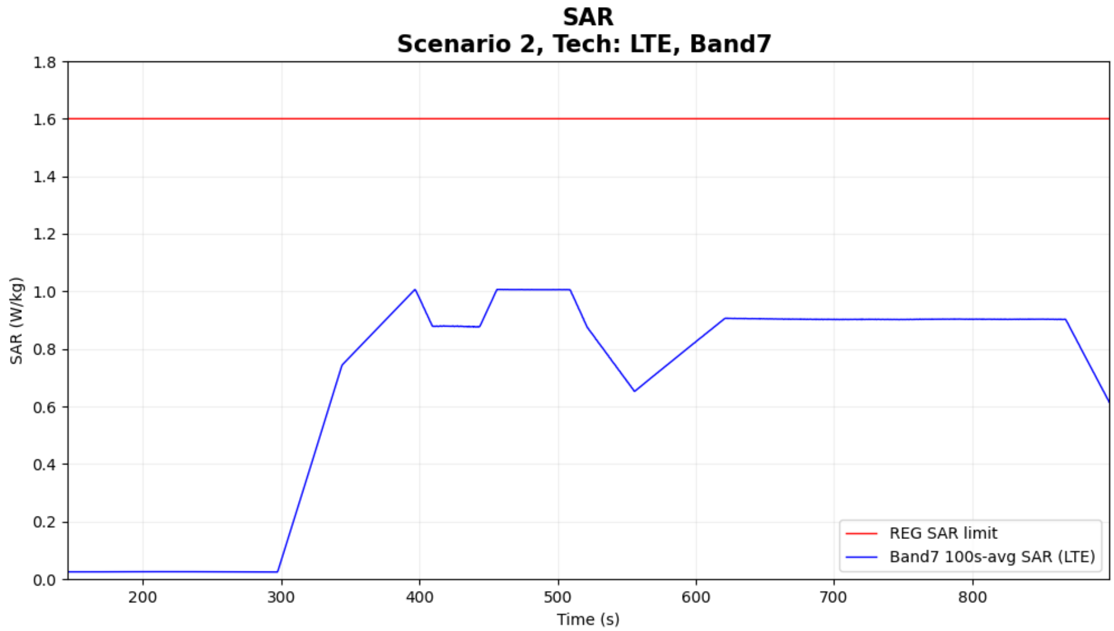
Table 8-1 TA-SAR parameters setting for Scenario 2

Test Case	RAT	Test Band	Test Sequence	ECI	Max Power (dBm)	P_{sub6_limit} (dBm)	$P_{LowThresh}$ (dBm)	$P_{UE\_backoff}$ (dBm)	$P_{UE\_max\_cust}$ (dBm)	Pass/ Fail SAR Limit
2	LTE	7	1	1	25.2	23	22	20	23	Pass
2	LTE	7	2	1	25.2	23	22	20	23	Pass
3	NR SA	n7	1	1	25.2	22.2	21.2	19.2	22.2	Pass
3	NR SA	n7	2	1	25.2	22.2	21.2	19.2	22.2	Pass

8.2.1 Test Case 1: LTE Band 7 (Antenna FCM, ECI=1)

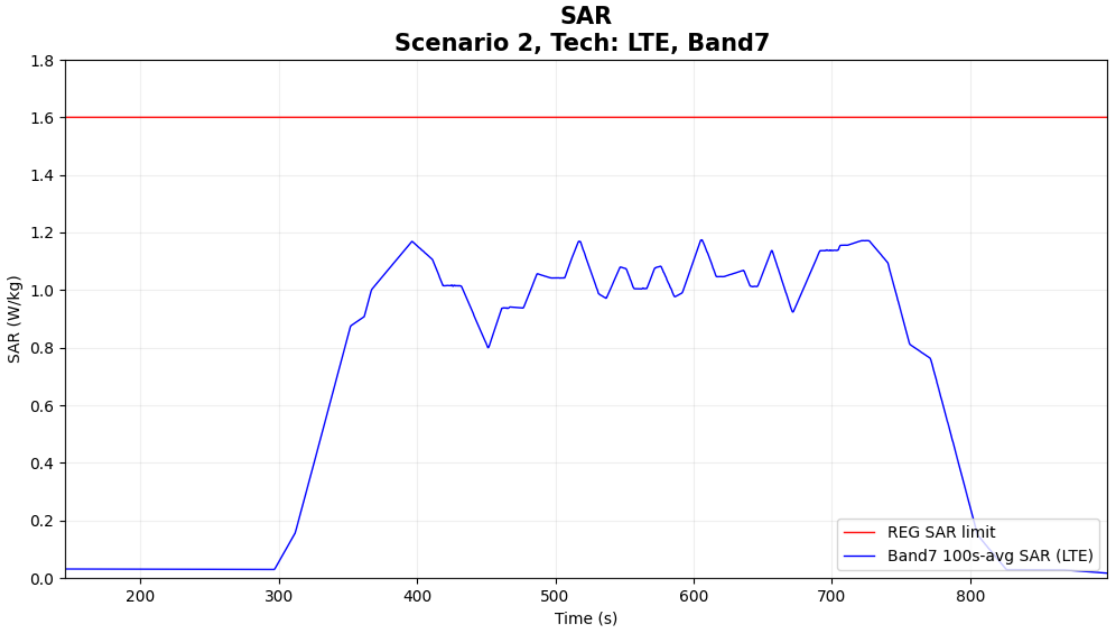
The test procedure for the following tests is detailed in Section 4.3.9. For each test case, the provided figure illustrates TA-SAR over time and the applicable power limit with device uncertainty to demonstrate that time-averaged SAR remains below the FCC regulatory limit.

Test Sequence 1 Result:



	(W/kg)
FCC 1gSAR limit	1.6
Max 100s-time averaged 1gSAR (blue curve)	1.006
Validated: Pass	

Test Sequence 2 Result:

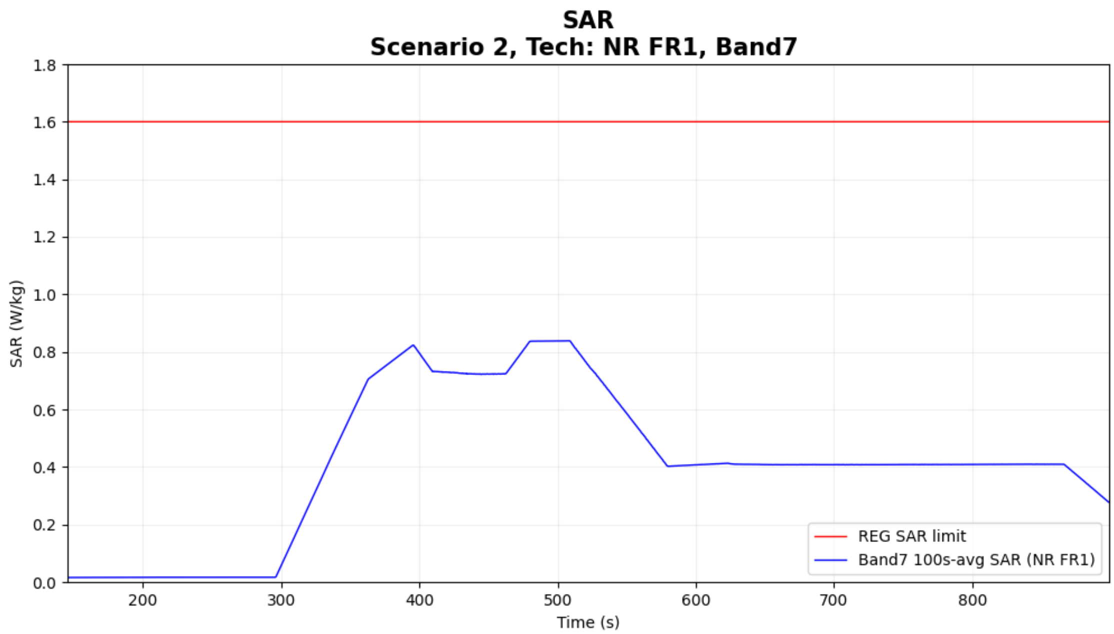


	(W/kg)
FCC 1gSAR limit	1.6
Max 100s-time averaged 1gSAR (blue curve)	1.174
Validated: Pass	

8.2.2 Test Case 2: NR n7 SA (Antenna FCM, ECI=1)

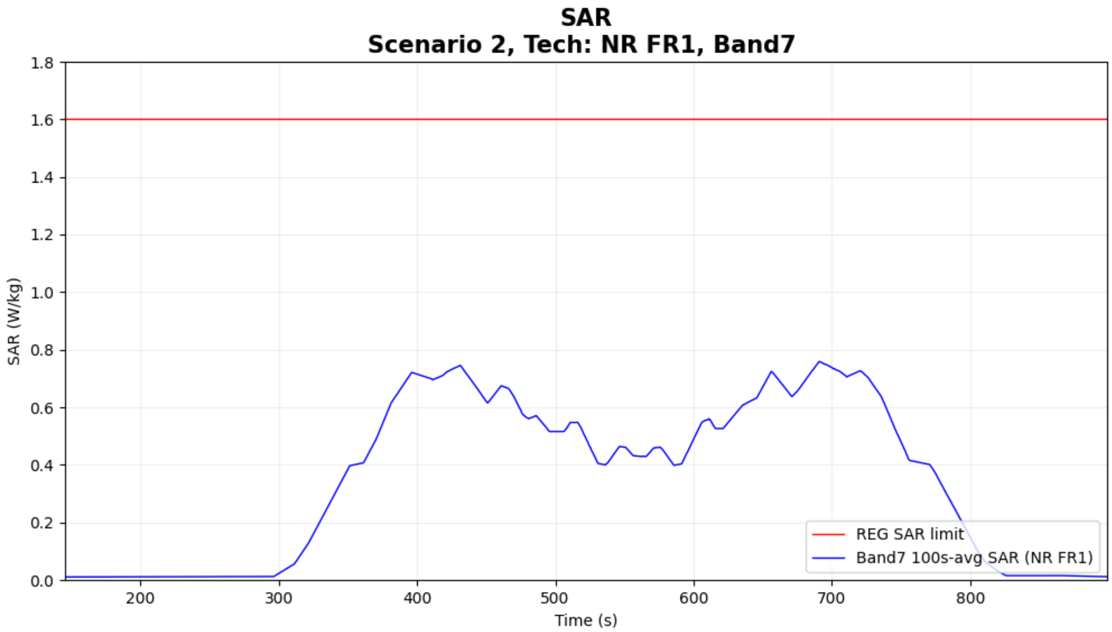
The test procedure for the following tests is detailed in Section 4.3.9. For each test case, the provided figure illustrates TA-SAR over time and the applicable power limit with device uncertainty to demonstrate that time-averaged SAR remains below the FCC regulatory limit.

<u>Test Sequence 1 Result:</u>



	(W/kg)
FCC 1gSAR limit	1.6
Max 100s-time averaged 1gSAR (blue curve)	0.838
Validated: Pass	

Test Sequence 2 Result:



	(W/kg)
FCC 1gSAR limit	1.6
Max 100s-time averaged 1gSAR (blue curve)	0.758
Validated: Pass	

9 EQUIPMENT LIST

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
Agilent	8594A	(9kHz-2.9GHz) Spectrum Analyzer	N/A	N/A	N/A	3051A00187
Agilent	N9020A	MXA Signal Analyzer	10/27/2024	Annual	10/27/2025	MY51240479
Agilent	N5182A	MXG Vector Signal Generator	12/5/2024	Annual	12/5/2025	US46240505
Agilent	8753ES	S-Parameter Network Analyzer	9/25/2024	Annual	9/25/2025	MY40003841
Agilent	E4438C	ESG Vector Signal Generator	11/15/2024	Annual	11/15/2025	MY45092078
Agilent	E4438C	ESG Vector Signal Generator	12/8/2024	Annual	12/8/2025	MY42081752
Agilent	E4438C	ESG Vector Signal Generator	10/23/2024	Annual	10/23/2025	MY45093852
Agilent	8753ES	S-Parameter Vector Network Analyzer	9/25/2024	Annual	9/25/2025	US39170118
Amplifier Research	15S1G6	Amplifier	CBT	N/A	CBT	433972
Amplifier Research	15S1G6	Amplifier	CBT	N/A	CBT	433974
Anritsu	ML2496A	Power Meter	2/10/2025	Annual	2/10/2026	1351001
Anritsu	MA24106A	USB Power Sensor	9/23/2024	Annual	9/23/2025	1827526
Anritsu	MA24106A	USB Power Sensor	9/27/2024	Annual	9/27/2025	2018527
Anritsu	MA2411B	Pulse Power Sensor	2/10/2025	Annual	2/10/2026	1315051
Anritsu	MA2411B	Pulse Power Sensor	10/21/2024	Annual	10/21/2025	1027293
Thermco Products Inc	4052	Long Stem Thermometer	2/27/2024	Biennial	2/27/2026	127064
Thermco Products Inc	4052	Long Stem Thermometer	2/27/2024	Biennial	2/27/2026	240171060
Control Company	S66279	Therm./ Clock/ Humidity Monitor	2/16/2024	Annual	2/16/2025	240140006
Keysight Technologies	E7515B	UXM 5G Wireless Test Platform	6/13/2025	Annual	6/13/2026	MY60192562
MCL	BW-N6W5+	6dB Attenuator	CBT	N/A	CBT	1139
Pasternack	PE2088	Power Divider	N/A	N/A	N/A	N/A
Mini-Circuits	BW-N20W5+	DC to 18 GHz Precision Fixed 20 dB Attenuator	CBT	N/A	CBT	N/A
Mini-Circuits	VLF-6000+	Low Pass Filter DC to 6000 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	NLP-1200+	Low Pass Filter DC to 1000 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	N/A	N/A	N/A	2437
Mini-Circuits	ZUDC10-83-S+	Directional Coupler	N/A	N/A	N/A	2408
Narda	BW-S3W2	Attenuator	CBT	N/A	CBT	0120
Narda	4014C-6	4 - 8 GHz SMA 6 dB Directional Coupler	CBT	N/A	CBT	N/A
Rhode & Schwarz	CMW 500	Wideband Radio Communication Tester	4/30/2025	Biennial	4/30/2027	170387
Rhode & Schwarz	CMW 500	Wideband Radio Communication Tester	4/7/2025	Annual	4/7/2026	167284
Rohde & Schwarz	NRP8S	3 Path Dipole Power Sensor	2/24/2025	Annual	2/24/2026	109961
Rohde & Schwarz	NRP8S	3-Path Dipole Power Sensor	10/28/2024	Annual	10/28/2025	109956
Rohde & Schwarz	NRP8S	3-Path Dipole Power Sensor	10/28/2024	Annual	10/28/2025	109957
Rohde & Schwarz	NRP50S	3-Path Dipole Power Sensor	2/19/2025	Annual	2/19/2026	101339
Rohde & Schwarz	NRX	Power Meter	1/30/2025	Annual	1/30/2026	102583
SPEAG	DAK-3.5	Dielectric Assessment Kit	5/12/2025	Annual	5/12/2026	1070
SPEAG	DAK-3.5	Dielectric Assessment Kit	5/12/2025	Annual	5/12/2026	1323
SPEAG	D2450V2	2450 MHz SAR Dipole	5/13/2025	Annual	5/13/2026	750
SPEAG	D2600V2	2600 MHz SAR Dipole	5/7/2025	Annual	5/7/2026	1042
SPEAG	DAE4	Dasy Data Acquisition Electronics	3/11/2025	Annual	3/11/2026	534
SPEAG	DAE4	Dasy Data Acquisition Electronics	5/13/2025	Annual	5/13/2026	1676
SPEAG	EX3DV4	SAR Probe	5/14/2025	Annual	5/14/2026	7552
SPEAG	EX3DV4	SAR Probe	3/7/2025	Annual	3/7/2026	7360

Notes:

1. 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.
2. Each equipment item is used solely within its respective calibration period.

10 MEASUREMENT UNCERTAINTIES

Applicable for SAR Measurements < 6 GHz:

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	1.732	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	1.732	1	1	0.1	0.1	∞
Modulation Response	E.2.5	4.8	R	1.732	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	1.732	1	1	0.5	0.5	∞
Integration Time	E.2.8	2.6	R	1.732	1	1	1.5	1.5	∞
RF Ambient Conditions - Noise	E.6.1	3	R	1.732	1	1	1.7	1.7	∞
RF Ambient Conditions - Reflections	E.6.1	3	R	1.732	1	1	1.7	1.7	∞
Probe Positioner Mechanical Tolerance	E.6.2	0.8	R	1.732	1	1	0.5	0.5	∞
Probe Positioning w/ respect to Phantom	E.6.3	6.7	R	1.732	1	1	3.9	3.9	∞
Extrapolation, Interpolation & Integration algorithms for Max. SAR Evaluation	E.5	4	R	1.732	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	1.732	1	1	2.9	2.9	∞
SAR Scaling	E.6.5	0	R	1.732	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	1.732	0.78	0.71	1.5	1.4	∞
Liquid Permittivity - Temperature Unceritainty	E.3.4	0.6	R	1.732	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	191
Expanded Uncertainty (95% CONFIDENCE LEVEL)			k=2				24.4	24.0	

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

11 CONCLUSION

11.1 Measurement Conclusion

The SAR evaluation indicates that the DUT 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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