FCC 47 CFR § 2.1093
IEC/IEEE Std 63195-1: 2022

POWER DENSITY EVALUATION REPORT
(Part 1 : Test in Static Transmission Condition)

FOR

GSM/WCDMA/LTE/5G NR Phone + BT/BLE, DTS/UNII a/b/g/n/ac/ax, NFC, WPT and UWB

MODEL NUMBER: SM-F956U, SM-F956U1

FCC ID: A3LSMF956U

REPORT NUMBER: 4791196575-S3V2

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TL-637

Revision History

Rev.	Date	Revisions	Revised By
V1	4/24/2024	Initial Issue	--
V2	5/2/2024	Revised Description in Sec.7.5	Jeongyeon Won

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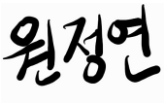
1. Attestation of Test Results

Applicant Name	SAMSUNG ELECTRONICS CO.,LTD.	
FCC ID	A3LSMF956U	
Model Name	SM-F956U, SM-F956U1	
Applicable Standards	FCC 47 CFR § 2.1093 IEC/IEEE Std 63195-1: 2022	
Exposure Category	Power Density Limit (mW/cm^2)	
General population / Uncontrolled exposure	1.0	
RF exposure Conditions	Power Density Results (mW/cm^2)	
	Measured psPD	Reported psPD
NR Band n258	*0.44*	*0.89*
NR Band n261	*0.76*	*0.89*
NR Band n260	*0.51*	*0.89*
TER (Total Exposure Ratio)	*0.99*	
Date Tested	4/1/2024 to 4/24/2024	
Test Results	Pass	

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

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

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

2. Introduction

The equipment under test (EUT) is a Phone, model SM-S956U, SM-S956U1 (FCC ID: A3LSMF956U), it contains Qualcomm modems supporting 2G/3G/4/5G technologies and WLAN bands(with BT). These WWAN and WLAN(with BT) modems enable Qualcomm Smart Transmit features with algorithms to control and manage transmitting power in real time and to ensure at all times the time-averaged RF exposure from WWAN and WLAN(with BT) is in compliance with FCC requirements.

The purpose of this Part 1 report is to demonstrate that this EUT complies with FCC RF exposure limits at maximum time-averaged transmit power limits for WWAN/WLAN/BT/NFC/UWB technologies.

- Power density (PD) compliance for all WWAN/WLAN/BT/NFC/UWB radios is assessed based on maximum time-averaged transmit power (static transmission condition). Relevant FCC KDBs and exclusion criteria are applied on a time-average power basis for All technologies. The maximum time-averaged transmit power limits for supported WWAN/WLAN/BT technologies, bands, and antennas in this report are derived in SAR Part 0 report. And NFC and UWB technologies, bands, and antennas in this report are derived in SAR Part 1 report.
- The validation of the Qualcomm Smart Transmit time-averaging algorithm and compliance under the Tx varying transmission scenario for WWAN and WLAN(with BT) technologies are reported in Part 2 report.
- Demonstrate compliance in simultaneous transmission scenarios involving both WWAN and WLAN(with BT) transmissions, where WWAN and WLAN(with BT) exposure is assessed based on time-averaged transmit power limits in Part 2, and UWB and NFC exposure are assessed separately in Part.1.

By following the above steps, this report demonstrates that this EUT complies with FCC RF exposure limits for FCC equipment authorization of FCC ID: A3LSMF956U.

The *input.power.limit* used in this report are determined and listed in PD Part 0 report.

Refer to compliance Summary report for product description and terminology used in this report.

3. Measurement setup and General Information

The SAR measurement are recorded in UL FCC Report_SAR_Part.1 (Report No. 4791196575-S1). This section provides the detail of the test setup used for PD measurement.

3.1. Power density measurement system

The power density measurement system is constructed based on the DASY6 platform by SPEAG. The DASY6 with EummWV2 and 5G software module can measure the RF exposure (power density) up to 110GHz as close as 2mm from any transmitter.

3.1.1. Power density probe

The EummWV2 probe is used in the power density measurement. It is designed for precise near-field measurements in the mm-wave range by Schmid & Partner Engineering AG of Zurich, Switzerland. The specifications are:

- Frequency range: 0.75 ~ 110 GHz
- Dynamic range: <50 – 3000 V/m (up to 10000 V/m with additional PRE-10 voltage divider)
- Linearity: < ±0.2 dB
- Supports sensor model calibration (SMC)
- ISO 17025 accredited calibration

3.1.2. Power density measurement system verification

The power density system verification is performed using the SPEAG verification device. It consists of a ka-band horn antenna with a corresponding gun oscillator packaged within a cube-shaped housing.

The specification of the verification device is:

- Calibrated frequency: 30GHz at 10 mm from the case surface
- Frequency accuracy: ± 100MHz
- E-field polarization: linear
- Harmonics: -20 dBc (typ)
- Total radiated power: 14 dBm (typ)
- Power stability: 0.05 dB
- Power consumption: 5 W (max)
- Size: 100 x 100 x 100 mm
- Weight: 1kg

Table 2-1 shows the verification test results. The measured power density (PD) value is within 10% of target level. Note that the uncertainty of 5G verification source is 1.4dB (k=2).

3.2. Test Specification, Methods and Procedures

Test Specification, Methods and Procedures

The tests documented in this report were performed in accordance with FCC 47 CFR § 2.1093, IEC/IEEE 63195-1:2022 the following FCC Published RF exposure KDB procedures:

- 447498 D04 Interim General RF Exposure Guidance v01

In addition to the above, TCB workshop information was used.

- TCB workshop November, 2017; Page 19 - 25, RF Exposure Procedures (Power Density Evaluation)
- TCB workshop October, 2018; Page 3 - 5, RF Exposure Procedures (Millimeter Wave guidance)
- TCB workshop April, 2019; Page 3, RF Exposure Procedures (Millimeter Wave RF Exposure Evaluation)
- TCB workshop November, 2019; Page 14, RF Exposure Procedures (Millimeter Wave Scan Requirements)
- SPEAG, DASY6/8 Module mmWave Manual, April 2023

3.3. Test Specification, Methods and Procedures

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

Suwon
SAR 1
SAR 9

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

4. Test Condition, Configuration, and Assessment

4.1. Qualcomm Smart Transmit parameters

The input parameters described are required for functionality of Qualcomm Smart Transmit algorithm.

These parameters are entered through the *Embedded File System* (EFS) and cannot be accessed by the end-user.

Part 0 report documents determination of P_{limit} for sub-6 WWAN bands, and *input.power.limit* for 5G mmW NR bands using the below design targets and device related uncertainty:

- SAR_design_target of 1.0 W/kg for 1g SAR and sub-6 device design related uncertainty of 1.0 dB.
- PD_design_target of 0.724 mW/cm^2 and mmW device design related uncertainty of 1.4 dB.

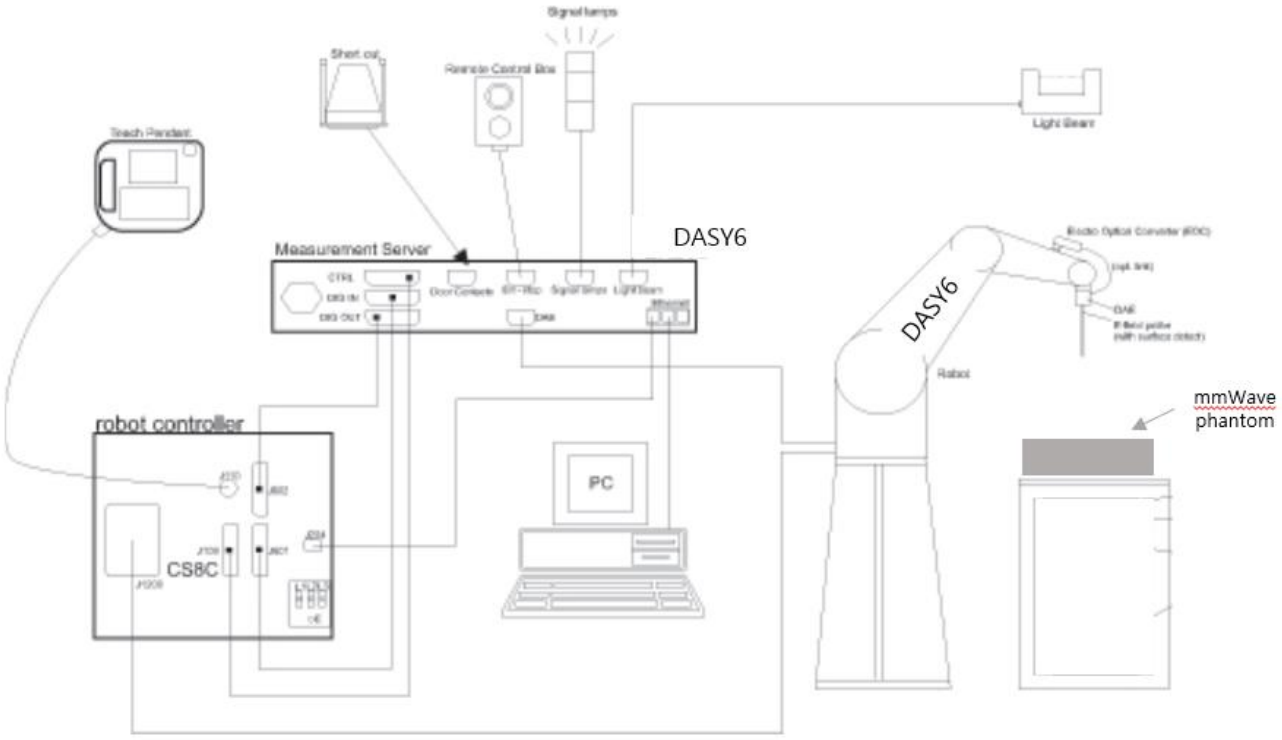
4.2. Qualcomm Smart Transmit parameters for the 5G mmW NR

The input.power.limit parameter for 5G mmW NR radio determined in Section 7.5 of this report are populated via EFS entry into the EUT.

5. Measurement System & Test Equipment

5.1. Measurement System

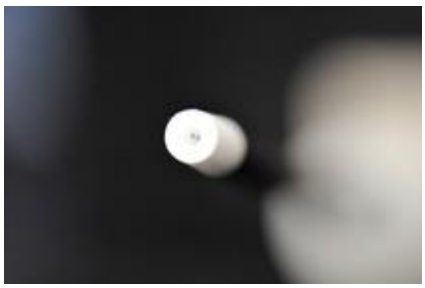
The DASY6 & 8 system used for performing compliance tests consists of the following items:



- A standard high precision 6-axis robot with controller, teach pendant and software. An arm extension for accommodating the data acquisition electronics (DAE).
- The EUmmWVx probe is based on the pseudo-vector probe design, which not only measures the field magnitude but also derives its polarization ellipse.
- A data acquisition electronics (DAE) which performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.
- The Electro-optical converter (EOC) performs the conversion from optical to electrical signals for the digital communication to the DAE. To use optical surface detection, a special version of the EOC is required. The EOC signal is transmitted to the measurement server.
- The function of the measurement server is to perform the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.
- The Light Beam used is for probe alignment. This improves the (absolute) accuracy of the probe positioning.
- A computer running Win10 and the DASY6 software.
- Remote control and teach pendant as well as additional circuitry for robot safety such as warning lamps, etc.
- The phantom which is specialized for 5G other accessories according to the targeted measurement.

5.2. EUmmWVx / 5G Probe

E-Field mm-Wave Probe for General Near-Field Measurements



Two dipoles optimally arranged to obtain pseudo-vector information
Minimum 3 measurements/point, 120º rotated around probe axis
Sensors (0.8mm length) printed on glass substrate protected by high density foam
Low perturbation of the measured field
Requires positioner which can do accurate probe rotation

Frequency Range	750 MHz – 110 GHz
Dynamic Range	< 20 V/m - 10'000 V/m with PRE-10 (min < 50 V/m - 3000 V/m)
Position Precision	< 0.2 mm (DASY6)
Dimensions	Overall length: 337 mm (tip: 20 mm) Tip diameter: encapsulation 8 mm (internal sensor < 1mm) Distance from probe tip to dipole centers: < 2 mm Sensor displacement to probe's calibration point: < 0.3 mm
Applications	E-field measurements of 5G devices and other mm-wave transmitters operating above 10GHz in < 2 mm distance from device (free-space) Power density, H-field and far-field analysis using total field reconstruction (cDASY6 5G or ICEy-mmW module required)
Compatibility	cDASY6 + 5G-Module SW1.0 and higher

5.3. Data Acquisition Electronics(DAE)

Serial optical link for communication with DASY4/5 embedded system (fully remote controlled) Two-step probe touch detector for mechanical surface detection and emergency robsot stop

Measurement Range	−100 – +300 mV (16 bit resolution and two range settings: 4 mV, 400 mV)
Input Offset Voltage	<5 µV (with auto zero)
Input Resistance	200 Mohm
Input Bias Current	<50 fA
Battery Power	>10 hours of operation (with two 9.6 V NiMH batteries)
Dimensions (L × W × H)	60 × 60 × 68 mm

6. Measurement Procedures

6.1. System Verification/DUT Scan Procedures

cDASY6/8 5G Module supports “5G Scan”, a fine resolution scan performed on two different planes which is used to reconstruct the E- and H-fields as well as the power density; the average power density is derived from this measurement.

Step 1: Power Reference Measurement
The Power Reference Measurement and Power Drift Measurements are for monitoring the power drift of the device under test in the batch process. The minimum distance of probe sensors to surface determines the closest measurement point to devise under test.

Step 2: 5G Scan
The steps in the X, Y, and Z directions are specified in terms of fractions of the signal wavelength ,lambda.
Area Scan Parameters extracted from SPEAG, 5G Module Application Note.

Recommended settings for measurement of verification sources

Frequency [GHz]	Grid step	Grid extent X/Y [mm]	Measurement points
10	0.125 ($\frac{\lambda}{8}$)	60/60	18 × 18
30	0.25 ($\frac{\lambda}{4}$)	60/60	26 × 26
45	0.25 ($\frac{\lambda}{4}$)	42/42	28 × 28
60	0.25 ($\frac{\lambda}{4}$)	32.5/32.5	28 × 28
90	0.25 ($\frac{\lambda}{4}$)	30/30	38 × 38

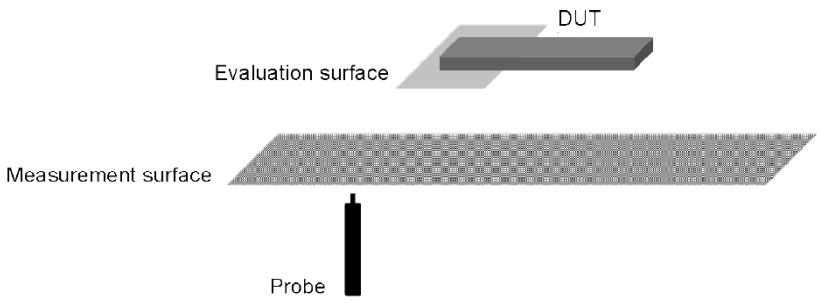
The minimum distance of probe sensors to verification source surface, horn antenna, is 10 mm.
In other case, distance is determined as λ / 5, details are shown in section 6.2.

Step 3: Power drift measurement

The Power Drift Measurement measures the field at the same location as the most recent power reference measurement within the same procedure, and with the same settings. The Power Drift Measurement gives the field difference in dB from the reading conducted within the last Power Reference Measurement. This allows a user to monitor the power drift of the device under test within a batch process. The measurement procedure is the same as Step 1. When the drift is larger than ± 5 %, test is repeated from step1.

6.2. Total Field and Power Flux Density Reconstruction(measurement distance)

Reconstruction algorithms are used to project or transform the measured fields from the measurement surface to the evaluation surface (below fig) in order to determine power density or to compute spatial-average and/or local power density with known uncertainty. Manufacture has developed a reconstruction approach based on the Gerchberg-Saxton algorithm, which benefits from the availability of the E-field polarization ellipse information obtained with the EUmmWVx probe. This reconstruction algorithm, together with the ability of the probe to measure extremely close to the source without perturbing the field, permits reconstruction of the E- and H-fields, as well as of the power density, on measurement planes located as near as λ / 5 away.



6.3.Test Equipment

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

System Check

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
5G probe	SPEAG	EummWV4	9493	1-16-2025
Data Acquisitiopn Electronics	SPEAG	DAE4	1671	5-25-2024
Data Acquisitiopn Electronics	SPEAG	DAE4	1667	3-14-2025
Verification kit	SPEAG	5G verification source_30GHz	1047	1-17-2025
Thermometer	Lutron	MHB-382SD	AH.91463	1-4-2025

6.4. Measurement Uncertainty

Measurement Uncertainty for cDASY6 Module mmWave

Error Description	Uncertainty value (±dB)	Probe Dist.	Divisor	(Ci)	Std. Unc. (±dB)	(Vi)
Uncertainty terms dependent on the measurement system						
Calibration	**0.49**	Normal	1	1	0.49	Infinity
Probe correction	**0.00**	Rectangular	1.73	1	0.00	Infinity
Frequency response (BW =< 1 GHz)	**0.20**	Rectangular	1.73	1	0.12	Infinity
Sensor cross coupling	**0.00**	Rectangular	1.73	1	0.00	Infinity
Isotropy	**0.50**	Rectangular	1.73	1	0.29	Infinity
Linearity	**0.20**	Rectangular	1.73	1	0.12	Infinity
Probe scattering	**0.00**	Rectangular	1.73	1	0.00	Infinity
Probe positioning offset	**0.30**	Rectangular	1.73	1	0.17	Infinity
Probe positioning repeatability	**0.04**	Rectangular	1.73	1	0.02	Infinity
Sensor mechanical offset	**0.00**	Rectangular	1.73	1	0.00	Infinity
Probe spatial resolution	**0.00**	Rectangular	1.73	1	0.00	Infinity
Field impedance dependance	**0.00**	Rectangular	1.73	1	0.00	Infinity
Measurement drift	**0.05**	Rectangular	1.73	1	0.03	Infinity
Amplitude and phase noise	**0.04**	Rectangular	1.73	1	0.02	Infinity
Measurement area truncation	**0.10**	Rectangular	1.73	1	0.06	Infinity
Data acquisition	**0.03**	Normal	1.00	1	0.03	Infinity
Sampling	**0.00**	Rectangular	1.73	1	0.00	Infinity
Field reconstruction	**0.60**	Rectangular	1.73	1	0.35	Infinity
Signal-to-Noise Ratio	**0.00**	Rectangular	1.73	1	0.00	Infinity
FTE/MEO	**0.00**	Rectangular	1.73	1	0.00	Infinity
Power density scaling	**0.00**	Rectangular	1.73	1	0.00	Infinity
Spatial averaging	**0.10**	Rectangular	1.73	1	0.06	Infinity
Uncertainty terms dependent on the DUT and environmental factors						
Probe coupling with DUT	**0.00**	Rectangular	1.73	1	0.00	Infinity
Modulation response	**0.40**	Rectangular	1.73	1	0.23	Infinity
Integration time	**0.00**	Rectangular	1.73	1	0.00	Infinity
Response time	**0.00**	Rectangular	1.73	1	0.00	Infinity
Device holder influence	**0.10**	Rectangular	1.73	1	0.06	Infinity
DUT alignment	**0.00**	Rectangular	1.73	1	0.00	Infinity
RF ambient conditions	**0.04**	Rectangular	1.73	1	0.02	Infinity
Laboratory Temperature	**0.05**	Rectangular	1.73	1	0.03	Infinity
Laboratory Reflections	**0.04**	Rectangular	1.73	1	0.02	Infinity
Immunity / secondary reception	**0.00**	Rectangular	1.73	1	0.00	Infinity
Drift of the DUT	**0.20**	Rectangular	1.73	1	0.12	Infinity
Combined Std. Uncertainty					0.76	
Expanded Standard Uncertainty (95%)					**1.53**	

6.5. DECISION RULE

Measurement Uncertainty is not applied when providing statements of conformity in accordance with IEC Guide 115:2023, 4.3.3.

7. DUT Information

7.1. DUT Description

Device Dimension	Refer to Appendix A.		
Back Cover	The Back Cover is not removable		
Battery Options	The rechargeable battery is not user accessible.		
Test sample information	**No.**	**S/N**	**Notes**
	1	R3CX309P5LV	mmWave Radiated
	2	R3CX309P5XD	mmWave Radiated

7.2. Wireless Technologies

Wireless technologies	Frequency bands	Operating mode	Duty Cycle used for SAR testing
5G NR mmW	NR Band n258 NR Band n261 NR Band n260	DFT-s-ODFM : QPSK, 16QAM, 64QAM CP-ODFM : QPSK, 16QAM, 64QAM	100%

7.3. 5G NR mmWave PD Test and Reporting Considerations

Item	Description		
Frequency range, Channel Bandwidth, Numbers and Frequencies	Band 258	Frequency range: 24250 – 24450 MHz, 24750 – 25250 MHz	
		Channel Bandwidth	
		100MHz	50MHz
		MHz / Channel	MHz / Channel
	Low	24350.04 / 2018333	24350.04 / 2018333
	Mid	24800.04 / 2025833	24800.04 / 2025833
	High	25200.00 / 2032499	25224.96 / 2032915
	Band 261	Frequency range: 27500 – 28350 MHz	
		Channel Bandwidth	
		100MHz	50MHz
		MHz / Channel	MHz / Channel
	Low	27550.08 / 2071677	27525.00 / 2071249
	Mid	27924.96 / 2077915	27924.96 / 2077915
	High	28299.96 / 2084165	28324.92 / 2084581
	Band 260	Frequency range: 37000 – 40000 MHz	
		Channel Bandwidth	
		100MHz	50MHz
		MHz / Channel	MHz / Channel
	Low	37050.00 / 2229999	37026.00 / 2229599
	Mid	38499.96 / 2254165	38499.96 / 2254165
	High	39949.92 / 2278331	39975.00 / 2278749
Sub carrier Spacing	120 kHz		
Total Number of Supported Uplink CCs (SISO)	4		
Total Number of Supported Uplink CCs (MIMO)	4		
Total Number of Supported DL CCs	8		
LTE Anchor Bands	n258:2/5/12/66/71, n261:2/5/12/13/48/66, n260:2/5/12/13/14/30/48/66		
NR FR1 Anchor Bands	n258:2/12/25/41/66/77, n261:2/5/25/41/48/66/77, n260:2/5/12/25/30/41/48/66/77		
Duplex Type (mmWave)	TDD		

7.4. Time-Averaging Algorithm for RF Exposure Compliance

The equipment under test(EUT) are supporting 2G/3G/4G/5G NR and WLAN(with BT) technologies through Qualcomm@ modem. Qualcomm@ modem is enabled with Qualcomm@ Smart Transmit feature. This feature performs time averaging algorithm in real time to control and manage transmitting power and ensure the time-averaged RF exposure is in compliance with FCC requirements all the time. Refer to Compliance Summary document for detailed description of Qualcomm@ Smart Transmit feature.

The Smart Transmit algorithm maintains the time-averaged transmit power, in turn, time-averaged RF exposure of *SAR_design_target* or *PD_design_target*, below the predefined time-averaged power limit (i.e., P_{limit} for sub-6 radio, and *input.power.limit* for 5G mmW NR), for each characterized technology and band. Smart Transmit allows the device to transmit at higher power instantaneously when needed. but manages power limiting to maintain time-averaged transmit power to *input.power.limit* listed in Section 7.5.

The purpose of this report (Part 1 test) is to demonstrate that the EUT meets FCC PD limits when transmitting in static transmission scenario at maximum allowable time-averaged power level given by *input.power.limit.*

7.5. Input Power Limit

All power density measurements for this device were performed at the *input.power.limit* given in below tables. Input power is per antenna element and polarization for each antenna module.

5G NR mmW M Patch Input Power Limit

Antenna	NR Band n258			NR Band n261			NR Band n260		
	Beam ID_1	Beam ID_2	input.power.limit (dBm)	Beam ID_1	Beam ID_2	input.power.limit (dBm)	Beam ID_1	Beam ID_2	input.power.limit (dBm)
Ant.J (Patch J)	0		**11.0**	0		**12.7**	0		**12.7**
	1		**11.3**	1		**12.7**	1		**12.1**
	2		**11.2**	2		**12.8**	2		**11.4**
	3		**11.4**	3		**12.8**	3		**12.3**
	4		**11.1**	4		**13.2**	4		**12.4**
	5		**9.5**	5		**11.7**	5		**9.5**
	6		**6.7**	6		**8.6**	6		**9.1**
	7		**6.6**	7		**9.9**	7		**8.2**
	8		**6.7**	8		**10.6**	8		**10.2**
	9		**7.2**	9		**8.8**	9		**10.3**
	10		**6.7**	10		**8.8**	10		**8.1**
	11		**7.8**	11		**11.0**	11		**9.0**
	12		**4.6**	12		**8.6**	12		**5.4**
	13		**3.2**	13		**5.3**	13		**5.5**
	14		**3.3**	14		**4.6**	14		**4.7**
	15		**3.4**	15		**5.3**	15		**4.7**
	16		**3.8**	16		**7.1**	16		**5.3**
	17		**3.9**	17		**6.2**	17		**6.8**
	18		**3.0**	18		**4.9**	18		**4.6**
	19		**3.0**	19		**4.8**	19		**5.0**
	20		**3.5**	20		**6.1**	20		**5.0**
		256	**10.1**		**256**	**11.9**		**256**	**12.7**
		257	**10.0**		**257**	**11.9**		**257**	**12.7**
		258	**10.3**		**258**	**12.0**		**258**	**12.1**
		259	**10.2**		**259**	**11.8**		**259**	**12.8**
		260	**10.3**		**260**	**12.0**		**260**	**12.2**
		261	**7.1**		**261**	**10.5**		**261**	**9.6**
		262	**6.0**		**262**	**8.0**		**262**	**8.5**
		263	**6.2**		**263**	**7.9**		**263**	**10.2**
		264	**7.2**		**264**	**10.0**		**264**	**9.8**
		265	**6.1**		**265**	**8.3**		**265**	**9.6**
		266	**5.9**		**266**	**7.8**		**266**	**9.4**
		267	**6.2**		**267**	**9.7**		**267**	**9.9**
		268	**2.1**		**268**	**4.5**		**268**	**6.6**
		269	**2.2**		**269**	**4.3**		**269**	**5.1**
		270	**2.3**		**270**	**4.1**		**270**	**4.8**
		271	**2.2**		**271**	**4.0**		**271**	**7.3**
		272	**2.4**		**272**	**5.4**		**272**	**6.7**
		273	**2.1**		**273**	**4.3**		**273**	**6.7**
		274	**2.3**		**274**	**4.0**		**274**	**4.7**
		275	**2.2**		**275**	**4.2**		**275**	**5.7**
		276	**2.2**		**276**	**4.6**		**276**	**6.9**
	0	256	**7.1**	0	256	**9.4**	0	256	**9.2**
	1	257	**7.3**	1	257	**9.3**	1	257	**9.0**
	2	258	**7.5**	2	258	**9.4**	2	258	**8.5**
	3	259	**7.4**	3	259	**9.1**	3	259	**9.1**
	4	260	**7.4**	4	260	**9.4**	4	260	**9.0**
	5	261	**4.2**	5	261	**7.8**	5	261	**5.7**
	6	262	**3.0**	6	262	**5.6**	6	262	**5.4**
	7	263	**3.1**	7	263	**6.3**	7	263	**5.0**
	8	264	**3.5**	8	264	**7.1**	8	264	**5.9**
	9	265	**3.0**	9	265	**5.5**	9	265	**6.6**
	10	266	**3.1**	10	266	**5.7**	10	266	**5.8**
	11	267	**3.4**	11	267	**7.0**	11	267	**5.2**
	12	268	**-0.8**	12	268	**2.8**	12	268	**1.9**
	13	269	**-0.7**	13	269	**1.8**	13	269	**1.6**
	14	270	**-0.4**	14	270	**1.5**	14	270	**1.1**
	15	271	**-0.6**	15	271	**1.6**	15	271	**1.1**
	16	272	**-0.6**	16	272	**2.8**	16	272	**1.9**
	17	273	**-0.8**	17	273	**2.1**	17	273	**2.1**
	18	274	**-0.5**	18	274	**1.5**	18	274	**1.3**
	19	275	**-0.6**	19	275	**1.6**	19	275	**1.3**
	20	276	**-0.7**	20	276	**2.1**	20	276	**1.4**

8. RF Exposure Conditions (Test Configurations)

8.1. Operating mode(s)

5G NR mmW band were tested Power density through FTM(Factory Test Mode) provided by manufacturer.

8.2. Test position Configurations

Power density evaluated at worst-surfaces according to test results of Power density Part.0 report.

Closed

Band	Antenna	Back Rear	Front	Top	Bottom	Right	Left
n258	Ant.J (Patch J)	Yes	No	No	No	Yes	No
n261	Ant.J (Patch J)	Yes	No	No	No	Yes	No
n260	Ant.J (Patch J)	Yes	No	No	No	Yes	No

Open

Band	Antenna	Back Rear	Front	Top	Bottom	Right	Left
n258	Ant.J (Patch J)	Yes	Yes	No	No	Yes	No
n261	Ant.J (Patch J)	Yes	Yes	No	No	Yes	No
n260	Ant.J (Patch J)	Yes	Yes	No	No	Yes	No

Please refer to Appendix A for Antenna’s location.

9. Dielectric Property & System Check

9.1. Dielectric Property

Media is air so Relative Permittivity (εr) and Conductivity (σ) is 1.

9.2. System Check

Per Nov 2017,TCB Workshop note,
System Check should be verified with 24 hours before DUT's PD test.
System check is verified using 5G verification source provide by the equipment manufacturer.

- the same spatial resolution and measurement region used in the waveguide calibration should be applied to system check
- 4 cm^2 spatial averaging have been used according to FCC requirement.
- power density distribution should also be verified, both spatially (shape) and numerically (level) through visual inspection for noticeable differences.
- the measured results should be within 10% of the calibrated target.

SAR 1 Room

SAR Lab	Date	Sorce SN	Sorce Cal. Due Data	Measured Total psPD for 4cm^2 (W/m2)	**Target (Ref. Value)** (W/m2)	**Delta ±10 %**	visual inspection	Plot No.
SAR 1	4-1-2024	1047	1-17-2025	79.3	76.2	4.07	confirmed	
SAR 1	4-2-2024	1047	1-17-2025	78.4	76.2	2.89	confirmed	
SAR 1	4-4-2024	1047	1-17-2025	78.4	76.2	2.89	confirmed	
SAR 1	4-5-2024	1047	1-17-2025	78.7	76.2	3.28	confirmed	
SAR 1	4-8-2024	1047	1-17-2025	78.1	76.2	2.49	confirmed	
SAR 1	4-9-2024	1047	1-17-2025	78.8	76.2	3.41	confirmed	
SAR 1	4-10-2024	1047	1-17-2025	78.7	76.2	3.28	confirmed	
SAR 1	4-11-2024	1047	1-17-2025	78.7	76.2	3.28	confirmed	
SAR 1	4-12-2024	1047	1-17-2025	79.3	76.2	4.07	confirmed	
SAR 1	4-14-2024	1047	1-17-2025	79.8	76.2	4.72	confirmed	
SAR 1	4-16-2024	1047	1-17-2025	79.6	76.2	4.46	confirmed	
SAR 1	4-23-2024	1047	1-17-2025	80.9	76.2	6.17	confirmed	1
SAR 1	4-24-2024	1047	1-17-2025	80.8	76.2	6.04	confirmed	

Note(s):
psPD value used the pS_{tot} avg value of test result plot.

10. Measured Power Density Results

Both Normal psPD and Total psPD are record in test results according to TCB workshop October 2018 note . But Only Total psPD level are considered according to FCC requirement.

10.1. NR Band n258 Test Results

Closed

Antenna	Dist. (mm)	Test Position	Freq. (MHz)	Ch.	Beam ID1	Beam ID2	input.power. limit (dBm)	Tested Power (dBm)	Tested Signal	Duty Cycle	Power Drift	Normal psPD (mW/cm^2)	Total psPD (mW/cm^2)	Plot No.
					V	H						Meas.	Meas.	
J patch	2 mm	Back	25200.00	High	16		3.8	4.3	CW	100.0%	-0.07	0.139	0.184	
	2 mm	Right	25200.00	High	13		3.2	3.7	CW	100.0%	-0.03	0.267	0.372	1
	2 mm	Back	24350.04	Low		273	2.1	2.6	CW	100.0%	0.00	0.183	0.253	
	2 mm	Right	24350.04	Low		271	2.2	2.7	CW	100.0%	-0.14	0.181	0.241	
	2 mm	Back	24800.04	Mid	12	268	-0.8	-0.3	CW	100.0%	0.00	0.103	0.134	
	2 mm	Right	25200.00	High	12	268	-0.8	-0.3	CW	100.0%	0.05	0.140	0.181	

(10 W/m^2 = 1.0 mW/cm^2)

Open

Antenna	Dist. (mm)	Test Position	Freq. (MHz)	Ch.	Beam ID1	Beam ID2	input.power. limit (dBm)	Tested Power (dBm)	Tested Signal	Duty Cycle	Power Drift	Normal psPD (mW/cm^2)	Total psPD (mW/cm^2)	Plot No.
					V	H						Meas.	Meas.	
J patch	2 mm	Back	25200.00	High	19		3.0	3.5	CW	100.0%	-0.01	0.174	0.202	
	2 mm	Front	25200.00	High	19		3.0	3.0	CW	100.0%	0.05	0.138	0.207	
	2 mm	Right	25200.00	High	19		3.0	3.5	CW	100.0%	0.06	0.332	0.435	2
	2 mm	Back	24350.04	Low		273	2.1	2.6	CW	100.0%	-0.10	0.189	0.258	
	2 mm	Front	25200.00	High		268	2.1	2.7	CW	100.0%	0.00	0.025	0.034	
	2 mm	Right	24350.04	Low		273	2.1	2.6	CW	100.0%	0.12	0.160	0.234	
	2 mm	Back	25200.00	High	12	268	-0.8	-0.3	CW	100.0%	0.10	0.162	0.211	
	2 mm	Front	25200.00	High	12	268	-0.8	-0.3	CW	100.0%	0.00	0.038	0.052	
	2 mm	Right	25200.00	High	12	268	-0.8	-0.3	CW	100.0%	0.09	0.139	0.188	

(10 W/m^2 = 1.0 mW/cm^2)

Note(s):

1. *PD_design_target* of 0.724 mW/cm^2 was used with mmW device design related uncertainty of 1.4 dB.
2. *Input.power.limit* parameter for 5G mmW NR radio was calculated in RF Exposure Part 0 test report.
3. The measurement was tested by setting it to a higher Tested Power than *Input.power.limit*.
4. The device was configured to transmit CW wave signal for testing. Additional testing was not evaluated for different modulations, RB configurations, component carriers, channel configurations since the smart transmit algorithm monitors powers on a per symbol basis, which is independent of these signal characteristics.

10.2. NR Band n261 Test Results

Closed

Antenna	Dist. (mm)	Test Position	Freq. (MHz)	Ch.	Beam ID1	Beam ID2	input.power. limit (dBm)	Tested Power (dBm)	Tested Signal	Duty Cycle	Power Drift	Normal psPD (mW/cm^2)	Total psPD (mW/cm^2)	Plot No.
					V	H						Meas.	Meas.	
J patch	2 mm	Back	27924.96	Mid	14		4.6	5.6	CW	100.0%	-0.01	0.431	0.491	
	2 mm	Right	28299.96	High	14		4.6	5.6	CW	100.0%	0.02	0.412	0.530	
	2 mm	Back	27924.96	Mid		273	4.3	5.3	CW	100.0%	-0.06	0.450	0.616	
	2 mm	Right	27924.96	Mid		271	4.0	5.1	CW	100.0%	-0.06	0.485	0.591	
	2 mm	Back	28299.96	High	17	273	2.1	3.1	CW	100.0%	0.07	0.363	0.462	
	2 mm	Right	28299.96	High	14	270	1.5	2.0	CW	100.0%	-0.04	0.635	0.757	3

(10 W/m^2 = 1.0 mW/cm^2)

Open

Antenna	Dist. (mm)	Test Position	Freq. (MHz)	Ch.	Beam ID1	Beam ID2	input.power. limit (dBm)	Tested Power (dBm)	Tested Signal	Duty Cycle	Power Drift	Normal psPD (mW/cm^2)	Total psPD (mW/cm^2)	Plot No.
					V	H						Meas.	Meas.	
J patch	2 mm	Back	28299.96	High	14		4.6	4.6	CW	100.0%	0.00	0.348	0.383	
	2 mm	Front	28299.96	High	14		4.6	5.1	CW	100.0%	-0.04	0.202	0.315	
	2 mm	Right	28299.96	High	14		4.6	5.1	CW	100.0%	-0.11	0.460	0.558	
	2 mm	Back	27550.08	Low		273	4.3	4.3	CW	100.0%	-0.14	0.328	0.457	
	2 mm	Front	27924.96	Mid		268	4.5	5.0	CW	100.0%	-0.19	0.081	0.093	
	2 mm	Right	27924.96	Mid		273	4.3	4.8	CW	100.0%	-0.03	0.379	0.676	4
	2 mm	Back	28299.96	High	18	274	1.5	1.5	CW	100.0%	0.02\	0.371	0.438	
	2 mm	Front	28299.96	High	18	274	1.5	2.5	CW	100.0%	-0.10	0.240	0.382	
	2 mm	Right	28299.96	High	15	271	1.6	2.2	CW	100.0%	-0.06	0.478	0.629	

(10 W/m^2 = 1.0 mW/cm^2)

Note(s):

1. *PD_design_target* of 0.724 mW/cm^2 was used with mmW device design related uncertainty of 1.4 dB.
2. *Input.power.limit* parameter for 5G mmW NR radio was calculated in RF Exposure Part 0 test report.
3. The measurement was tested by setting it to a higher Tested Power than *Input.power.limit*.
4. The device was configured to transmit CW wave signal for testing. Additional testing was not evaluated for different modulations, RB configurations, component carriers, channel configurations since the smart transmit algorithm monitors powers on a per symbol basis, which is independent of these signal characteristics.

10.3. NR Band n260 Test Results

Closed

Antenna	Dist. (mm)	Test Position	Freq. (MHz)	Ch.	Beam ID1	Beam ID2	input.power. limit (dBm)	Tested Power (dBm)	Tested Signal	Duty Cycle	Power Drift	Normal psPD (mW/cm^2)	Total psPD (mW/cm^2)	Plot No.
					V	H						Meas.	Meas.	
J patch	2 mm	Back	37050.00	Low	12		5.4	6.1	CW	100.0%	0.09	0.305	0.388	
	2 mm	Right	38499.96	Mid	18		4.6	5.3	CW	100.0%	0.02	0.379	0.416	
	2 mm	Back	37050.00	Low		274	4.7	5.4	CW	100.0%	0.06	0.118	0.163	
	2 mm	Right	37050.00	Low		274	4.7	5.4	CW	100.0%	-0.18	0.431	0.505	5
	2 mm	Back	39949.92	High	20	276	1.3	2.1	CW	100.0%	0.03	0.171	0.213	
	2 mm	Right	38499.96	Mid	15	271	1.1	1.7	CW	100.0%	0.00	0.180	0.247	

(10 W/m^2 = 1.0 mW/cm^2)

Open

Antenna	Dist. (mm)	Test Position	Freq. (MHz)	Ch.	Beam ID1	Beam ID2	input.power. limit (dBm)	Tested Power (dBm)	Tested Signal	Duty Cycle	Power Drift	Normal psPD (mW/cm^2)	Total psPD (mW/cm^2)	Plot No.
					V	H						Meas.	Meas.	
J patch	2 mm	Back	39949.92	High	15		4.7	5.2	CW	100.0%	-0.10	0.240	0.325	
	2 mm	Front	38499.96	Mid	18		4.6	4.7	CW	100.0%	0.12	0.093	0.114	
	2 mm	Right	39949.92	High	15		4.7	5.2	CW	100.0%	0.09	0.268	0.325	
	2 mm	Back	37050.00	Low		274	4.7	5.2	CW	100.0%	-0.06	0.110	0.177	
	2 mm	Front	37050.00	Low		274	4.7	4.7	CW	100.0%	0.03	0.156	0.291	
	2 mm	Right	37050.00	Low		274	4.7	5.2	CW	100.0%	-0.03	0.422	0.476	6
	2 mm	Back	37050.00	Low	14	270	1.1	1.7	CW	100.0%	-0.04	0.368	0.394	
	2 mm	Front	38499.96	Mid	18	274	1.3	1.4	CW	100.0%	0.02	0.137	0.218	
	2 mm	Right	39949.92	High	19	275	1.3	1.4	CW	100.0%	0.02	0.222	0.302	

(10 W/m^2 = 1.0 mW/cm^2)

Note(s):

1. *PD_design_target* of 0.724 mW/cm^2 was used with mmW device design related uncertainty of 1.4 dB.
2. *Input.power.limit* parameter for 5G mmW NR radio was calculated in RF Exposure Part 0 test report.
3. The measurement was tested by setting it to a higher Tested Power than *Input.power.limit*.
4. The device was configured to transmit CW wave signal for testing. Additional testing was not evaluated for different modulations, RB configurations, component carriers, channel configurations since the smart transmit algorithm monitors powers on a per symbol basis, which is independent of these signal characteristics.

11. TER(Total Exposure Ratio) Conditions

Exposure scaling for mmW radios

i. On the worst-case surface/position (dominant): PD exposure should correspond to reported input.power.limit, i.e., PD exposure should be equal to *Reported_psPD* = (PD_design_target + device uncertainty) if at least one beam has input.power.limit ≤ NV setting Pmax, PD exposure should be equal to PD design target.

ii. For all other surfaces/positions (non-dominant): it is exposure ratio (of evaluated surface/position to worst-case surface/position for a given Tx Power) multiplied by scaled PD exposure on the worst-case surface as computed above.

Note: If manufacturer applies Permanent back-off, it is reflected in *Reported psPD* (PD design_target + device uncertainty). The formula is as follows;

$$Reported\_psPD = (PD\_design\_target + device\ uncertainty) \times 10^{(-Permanent\ back\text{-}off\ in\ dB/10)}$$

Permanent back-off is mentioned in the PD Part.0 report.

PD(*Reported_psPD*) ER for TER analysis

Antenna	NR Band	Surface	Evaluation Distance (mm)	Adjustment Factor due to Simulation	Adjusted Reported psPD (mW/cm2)	Measured psPD (mW/cm2)	Final Reported psPD (mW/cm2)
Closed	n258	Rear	2	0.946	0.843	0.253	0.843
	n258	Front	2	0.471	0.420	-	0.420
	n258	Top	2	0.405	0.361	-	0.361
	n258	R/Right	2	0.138	0.123	-	0.123
	n258	Bottome	2	0.019	0.017	-	0.017
	n258	R/Left	2	1.000	0.891	0.371	**0.891**
	n261	Rear	2	0.978	0.871	0.616	0.871
	n261	Front	2	0.417	0.371	-	0.371
	n261	Top	2	0.615	0.548	-	0.548
	n261	R/Right	2	0.100	0.089	-	0.089
	n261	Bottome	2	0.038	0.034	-	0.034
	n261	R/Left	2	1.000	0.891	0.757	**0.891**
	n260	Rear	2	1.000	0.891	0.388	**0.891**
	n260	Front	2	0.300	0.267	-	0.267
	n260	Top	2	0.821	0.731	-	0.731
	n260	R/Right	2	0.075	0.067	-	0.067
	n260	Bottome	2	0.033	0.029	-	0.029
	n260	R/Left	2	1.000	0.891	0.505	**0.891**
Open	n258	Rear	2	0.532	0.474	0.258	0.474
	n258	Front	2	0.870	0.775	0.207	0.775
	n258	Top	2	0.302	0.269	-	0.269
	n258	R/Right	2	0.008	0.007	-	0.007
	n258	Bottome	2	0.012	0.011	-	0.011
	n258	R/Left	2	1.000	0.891	0.435	**0.891**
	n261	Rear	2	0.524	0.467	0.457	0.467
	n261	Front	2	0.859	0.765	0.382	0.765
	n261	Top	2	0.459	0.409	-	0.409
	n261	R/Right	2	0.005	0.004	-	0.004
	n261	Bottome	2	0.022	0.020	-	0.020
	n261	R/Left	2	1.000	0.891	0.676	**0.891**
	n260	Rear	2	0.630	0.561	0.394	0.561
	n260	Front	2	0.957	0.852	0.291	0.852
	n260	Top	2	0.785	0.699	-	0.699
	n260	R/Right	2	0.005	0.004	-	0.004
	n260	Bottome	2	0.003	0.003	-	0.003
	n260	R/Left	2	1.000	0.891	0.476	**0.891**

PD ER for TER analysis

Antenna	NR Band	Surface	Evaluation Distance (mm)	Adjustment Factor due to Simulation	Adjusted Reported psPD (mW/cm2)	Measured psPD (mW/cm2)	Final Reported psPD (mW/cm2)
Closed	n258	Rear	10	0.529	0.471	-	0.471
	n258	Front	10	0.236	0.210	-	0.210
	n258	Top	10	0.248	0.221	-	0.221
	n258	R/Right	10	0.116	0.103	-	0.103
	n258	Bottome	10	0.016	0.014	-	0.014
	n258	R/Left	10	0.681	0.607	-	**0.607**
	n261	Rear	10	0.523	0.466	-	0.466
	n261	Front	10	0.234	0.208	-	0.208
	n261	Top	10	0.383	0.341	-	0.341
	n261	R/Right	10	0.081	0.072	-	0.072
	n261	Bottome	10	0.036	0.032	-	0.032
	n261	R/Left	10	0.708	0.631	-	**0.631**
	n260	Rear	10	0.515	0.459	-	0.459
	n260	Front	10	0.184	0.164	-	0.164
	n260	Top	10	0.540	0.481	-	0.481
	n260	R/Right	10	0.056	0.050	-	0.050
	n260	Bottome	10	0.031	0.028	-	0.028
	n260	R/Left	10	0.764	0.681	-	**0.681**
Open	n258	Rear	10	0.297	0.265	-	0.265
	n258	Front	10	0.390	0.347	-	0.347
	n258	Top	10	0.178	0.159	-	0.159
	n258	R/Right	10	0.008	0.007	-	0.007
	n258	Bottome	10	0.011	0.010	-	0.010
	n258	R/Left	10	0.624	0.556	-	**0.556**
	n261	Rear	10	0.280	0.249	-	0.249
	n261	Front	10	0.382	0.340	-	0.340
	n261	Top	10	0.273	0.243	-	0.243
	n261	R/Right	10	0.004	0.004	-	0.004
	n261	Bottome	10	0.019	0.017	-	0.017
	n261	R/Left	10	0.639	0.569	-	**0.569**
	n260	Rear	10	0.294	0.262	-	0.262
	n260	Front	10	0.480	0.428	-	0.428
	n260	Top	10	0.487	0.434	-	0.434
	n260	R/Right	10	0.005	0.004	-	0.004
	n260	Bottome	10	0.028	0.025	-	0.025
	n260	R/Left	10	0.634	0.565	-	**0.565**

Note(s):

PD TER calculation performed with Sub6 antennas of each Antenna groups in SAR part.1 report.
So please refer to section.12 in SAR part.1 report.

Appendixes

Refer to separated files for the following appendixes.

4791196575-S3 FCC Report PD_App A_Setup Photos

4791196575-S3 FCC Report PD_App B_System Check Plots

4791196575-S3 FCC Report PD_App C_Highest Test Plots

4791196575-S3 FCC Report PD_App D_Probe Calibration Certificates

4791196575-S3 FCC Report PD_App E_Verification source Calibration Certificates

END OF REPORT