



FCC CFR47 PART 15 SUBPART C

DTS Wireless LAN(802.11ax)

CERTIFICATION TEST REPORT

FOR

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

MODEL NUMBER : SM-G973F/DS, SM-G973F, SM-G973X

FCC ID: A3LSMG973F

REPORT NUMBER: 4788725460-E3V2

ISSUE DATE: DEC 24, 2018

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Testing
Laboratory

TL-637

Revision History

| <u>Rev.</u> | <u>Issue Date</u> | <u>Revisions</u> | <u>Revised By</u> |
|-------------|-------------------|--|-------------------|
| V1 | 12/20/18 | Initial issue | Hoonpyo Lee |
| V2 | 12/24/18 | Updated to address about the TCB's request | Hoonpyo Lee |

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: SAMSUNG ELECTRONICS CO., LTD.
EUT DESCRIPTION: GSM/WCDMA/LTE Phone + BT/BLE, DTS/UNII a/b/g/n/ac/ax, ANT+, NFC and WPT
MODEL NUMBER: SM-G973F/DS, SM-G973F, SM-G973X
SERIAL NUMBER: R38KA0BE04H,R38KA0BE5CF (RADIATED); R38KA0BCW8E (CONDUCTED)
DATE TESTED: NOV 09, 2018 - DEC 24, 2018

| APPLICABLE STANDARDS | |
|--------------------------|--------------|
| STANDARD | TEST RESULTS |
| CFR 47 Part 15 Subpart C | 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.

Approved & Released For
UL Korea, Ltd. By:

Tested By:



SungGil Park
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2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with following methods.

1. FCC CFR 47 Part 2.
2. FCC CFR 47 Part 15.
3. KDB 558074 D01 15.247 Meas Guidance v05.
4. ANSI C63.10-2013.
5. KDB 662911 D01 v02r01

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 218 Maeyeong-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16675, Korea. Line conducted emissions are measured only at the 218 address. The following table identifies which facilities were utilized for radiated emission measurements documented in this report. Specific facilities are also identified in the test results sections.

| 218 Maeyeong-ro | |
|-------------------------------------|-----------|
| <input checked="" type="checkbox"/> | Chamber 1 |
| <input checked="" type="checkbox"/> | Chamber 2 |
| <input type="checkbox"/> | Chamber 3 |

UL Korea, Ltd. is accredited by IAS, Laboratory Code TL-637. The full scope of accreditation can be viewed at <http://www.iasonline.org/PDF/TL/TL-637.pdf>.

4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

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

4.2. SAMPLE CALCULATION

Where relevant, the following sample calculation is provided:

$$\begin{aligned} \text{Field Strength (dBuV/m)} &= \text{Measured Voltage (dBuV)} + \text{Antenna Factor (dB/m)} + \\ &\text{Cable Loss (dB)} - \text{Preamp Gain (dB)} \\ 36.5 \text{ dBuV} + 18.7 \text{ dB/m} + 0.6 \text{ dB} - 26.9 \text{ dB} &= 28.9 \text{ dBuV/m} \end{aligned}$$

4.3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

| PARAMETER | UNCERTAINTY |
|---------------------------------------|-------------|
| Conducted Disturbance, 0.15 to 30 MHz | 2.32 dB |
| Radiated Disturbance, Below 1GHz | 3.86 dB |
| Radiated Disturbance, Above 1 GHz | 5.97 dB |

Uncertainty figures are valid to a confidence level of 95%.

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is a GSM/WCDMA/LTE Phone + BT/BLE, DTS/UNII a/b/g/n/ac/ax, ANT+, NFC and WPT. This test report addresses the DTS (WLAN) operational mode.

WiFi MIMO Condition

| Frequency | Mode | Antenna 1 | Antenna 2 |
|-----------|---------------|-----------|-----------|
| 2.4 GHz | 802.11g | TX / RX | TX / RX |
| | 802.11g MIMO | TX / RX | TX / RX |
| | 802.11n | TX / RX | TX / RX |
| | 802.11n MIMO | TX / RX | TX / RX |
| | 802.11ax | TX / RX | TX / RX |
| | 802.11ax MIMO | TX / RX | TX / RX |
| 5 GHz | 802.11a | TX / RX | TX / RX |
| | 802.11a MIMO | TX / RX | TX / RX |
| | 802.11n | TX / RX | TX / RX |
| | 802.11n MIMO | TX / RX | TX / RX |
| | 802.11ac | TX / RX | TX / RX |
| | 802.11ac MIMO | TX / RX | TX / RX |
| | 802.11ax | TX / RX | TX / RX |
| | 802.11ax MIMO | TX / RX | TX / RX |

Simultaneous TX Condition (RSDB)

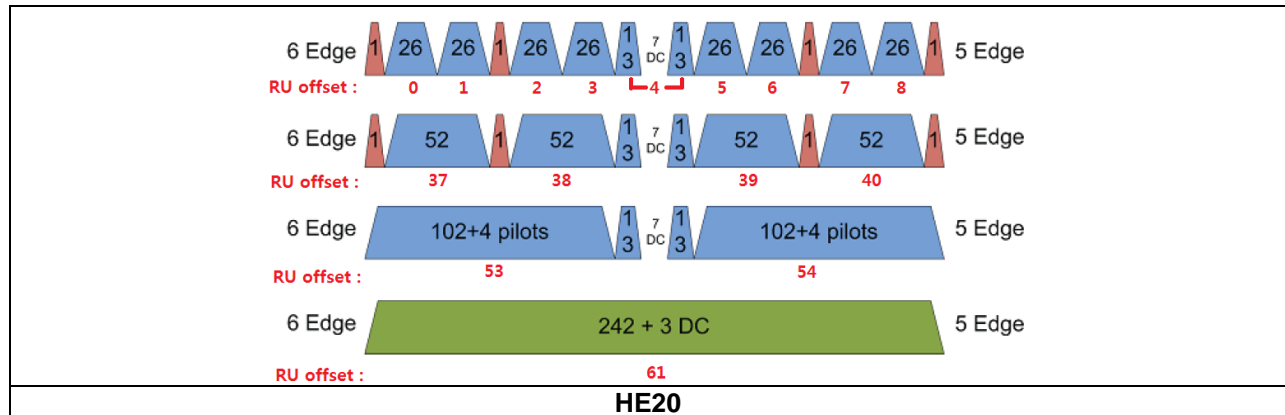
| | # TX | 5GHz WIFI [dBm] | | 2.4GHz WIFI [dBm] | |
|-----------------------------|------|-----------------|------|-------------------|------|
| | | Ant1 | Ant2 | Ant1 | Ant2 |
| 2.4 GHz + 5 GHz RSDB Only | 2 | A | - | - | B |
| | 2 | - | A | B | - |
| | 2 | A | - | B | - |
| | 2 | - | A | - | B |
| 2.4 GHz + 5 GHz RSDB & MIMO | 3 | A | A | B | - |
| | 3 | A | A | - | B |
| | 3 | A | - | B | B |
| | 3 | - | A | B | B |
| 2.4 GHz + 5 GHz RSDB MIMO | 4 | A | A | B | B |

Simultaneous TX Condition Bluetooth with 5GHz WIFI (Not RSDB)

| | # TX | 5GHz WIFI | | 2.4GHz BT |
|--------------------------------|------|-----------|------|-----------|
| | | ANT1 | ANT2 | ANT1 |
| 2.4GHz BT+5GHz WIFI (Not RSDB) | 2 | A | - | B |
| | 2 | - | A | B |
| | 3 | A | A | B |

Spurious Emissions for Simultaneous Transmission were reported on the UNII test report(4788725460-E4) section 11.5.

802.11ax RU allocations



Test RU offset for tones

| Mode | Tones number in RU | RU offset |
|------|-----------------------------|-----------|
| HE20 | 26T | 0 |
| | | 4 |
| | | 8 |
| | 52T | 37 |
| | | 38 |
| | | 40 |
| | 106T | 53 |
| | | 54 |
| | 242T / SU ^{Note 1} | 61 / - |

Note 1: Full RU(Resource Unit) 242T mode and SU(Single Unit) mode have no difference in physical waveform. This report has been reported the Full RU 242T mode with highest output power in SISO and the SU mode with highest output power in MIMO. For MIMO, the Tx power in each antenna is 3 dB back-off except for SU mode.

5.2. MAXIMUM OUTPUT POWER

The transmitter has a maximum total conducted average output power as follows:

| Frequency Range [MHz] | Mode | Output Power [dBm] | | Output Power [mW] | |
|-----------------------|--------------------|--------------------|----------|-------------------|----------|
| | | Antenna1 | Antenna2 | Antenna1 | Antenna2 |
| 2412 - 2472 | 802.11ax HE20 SISO | 15.60 | 15.20 | 36.31 | 33.11 |
| | 802.11ax HE20 MIMO | 18.73 | | 74.64 | |

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes internal antenna, with antenna1's maximum gain of -5.0 dBi and antenna2's maximum gain of -5.7 dBi .

5.4. LIST OF TEST REDUCTION AND MODES

The output power on covered modes is equal to or less than one referenced.

| Frequency Range (MHz) | Mode | Covered by |
|-----------------------|--|--------------------------------|
| 2412 - 2472 | 802.11ax HE20 SU mode 1TX | 802.11ax HE20 RU 242T mode 1TX |
| | 802.11ax HE20 RU 242T mode 2TX SDM/STBC | 802.11ax HE20 SU mode 2TX CDD |

5.5. TESTED CHANNELS LIST

| RU mode (for partial) | CHANNEL | Frequency (MHz) |
|-----------------------|---------|-----------------|
| LOW | 1 | 2412 |
| MID | 6 | 2437 |
| HIGH | 11 | 2462 |
| REDUCTION HIGH 1 | 12 | 2467 |
| REDUCTION HIGH 2 | 13 | 2472 |

| SU and 242T mode | CHANNEL | Frequency (MHz) |
|------------------|---------|-----------------|
| LOW | 1 | 2412 |
| MID | 6 | 2437 |
| HIGH | 10 | 2457 |
| REDUCTION HIGH 1 | 11 | 2462 |
| REDUCTION HIGH 2 | 12 | 2467 |
| REDUCTION HIGH 3 | 13 | 2472 |

5.6. WORST-CASE CONFIGURATION AND MODE

Radiated emission below 1GHz and power line conducted emission were performed with the EUT set to transmit at the channel with highest output power as worst-case scenario.

Radiated emission above 1GHz was performed with the EUT set to transmit low/mid/high channels.

For SISO, the fundamental of the EUT was investigated in three orthogonal orientations X, Y and Z it was determined that X orientation was worst-case orientation; therefore, all final radiated testing was performed with the EUT in X orientation.

For MIMO, the fundamental of the EUT was investigated in three orthogonal orientations X, Y and Z it was determined that Y orientation was worst-case orientation; therefore, all final radiated testing was performed with the EUT in Y orientation.

Based on the baseline scan, the worst-case data rates were:

802.11ax HE20 mode: MCS0

Note : : Some radiated test results performed on the 1Tx antenna condition is worst, so test report described all radiated test results.(Antenna 1-1Tx, Antenna 2-1Tx, Antenna ALL 2Tx CDD)

Worst-case selection criteria for test items :

- For the band-edge test, it was tested at RU allocations adjacent to band-edge for each RU Tones. As a result of checking each RU allocations by conduction, the RU allocations adjacent to band-edge was worst.
- For the spurious emissions, it was tested at the RU allocation with actual highest power and RU allocation with actual highest PSD for channel.
- For the 6dB Bandwidth, it was tested at the RU allocation with lowest tones number for each bandwidth.
- For the PSD, it was tested at the Low/Mid/High with worst target power.

5.7. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

| Support Equipment List | | | | |
|------------------------|--------------|-------------|----------------|--------|
| Description | Manufacturer | Model | Serial Number | FCC ID |
| Charger | SAMSUNG | EP-TA200 | R37KB5B03T1SE3 | N/A |
| Data Cable | SAMSUNG | EP-DG970BBE | N/A | N/A |
| Earphone | SAMSUNG | EO-IG955 | N/A | N/A |

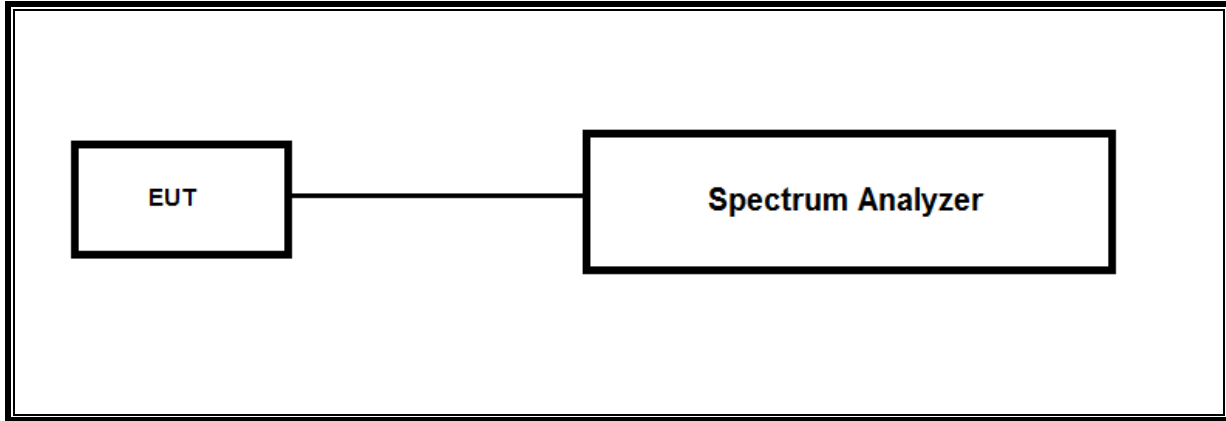
I/O CABLE

| I/O Cable List | | | | | | |
|----------------|----------|----------------------|----------------|------------|------------------|---------|
| Cable No | Port | # of identical ports | Connector Type | Cable Type | Cable Length (m) | Remarks |
| 1 | DC Power | 1 | C Type | Shielded | 1.1m | N/A |
| 2 | Audio | 2 | Mini-Jack | Unshielded | 1.2m | N/A |

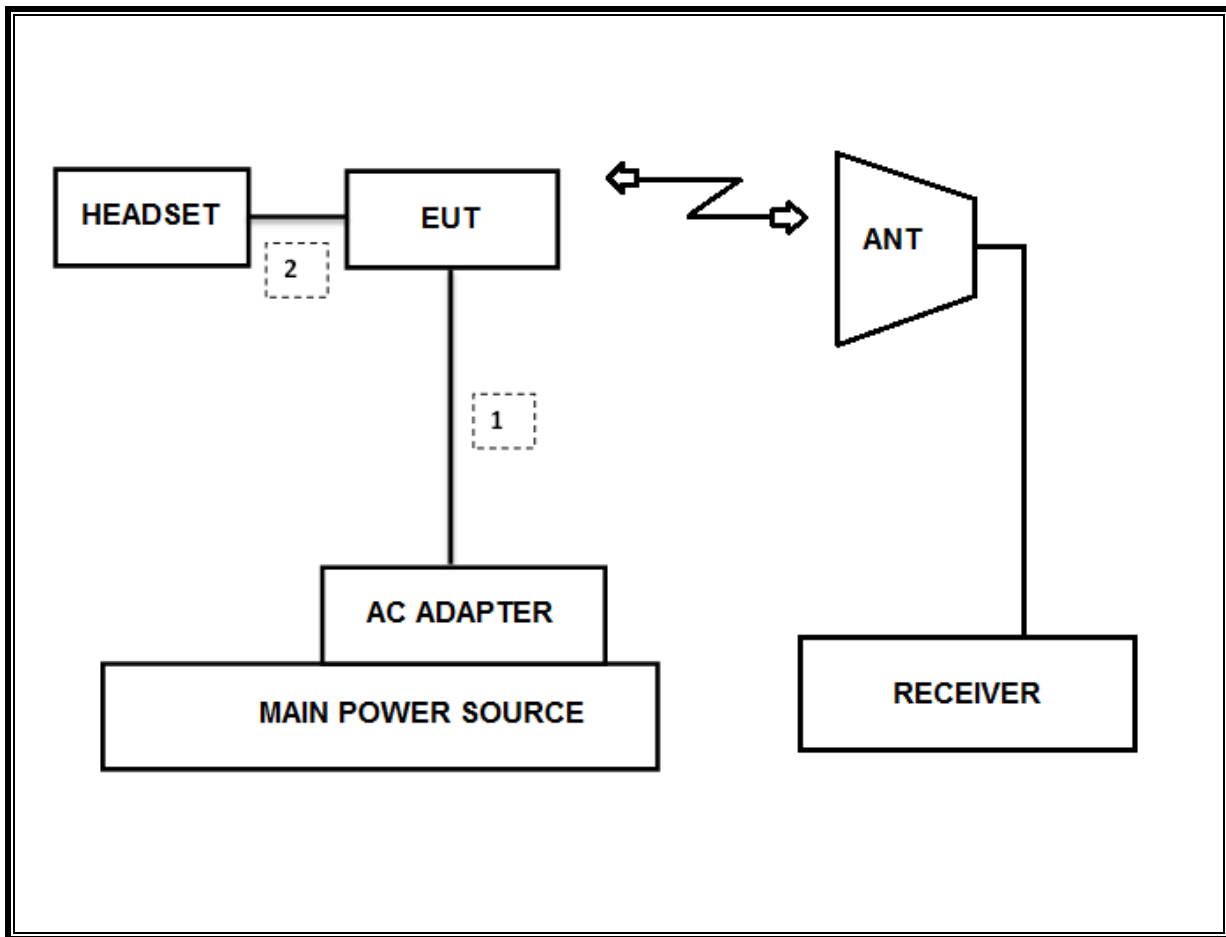
TEST SETUP

The EUT is a stand-alone unit during the tests.
 Test software exercised the EUT to enable DTS mode.

SETUP DIAGRAM FOR TESTS (CONDUCTED TEST SETUP)



SETUP DIAGRAM FOR TESTS (RADIATED TEST SETUP)



6. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

| Test Equipment List | | | | |
|-----------------------------|---------------|------------------------|------------|----------|
| Description | Manufacturer | Model | S/N | Cal Due |
| Antenna, Bilog, 30MHz-1GHz | SCHWARZBECK | VULB9163 | 750 | 08-04-20 |
| Antenna, Bilog, 30MHz-1GHz | SCHWARZBECK | VULB9163 | 749 | 08-04-20 |
| Antenna, Bilog, 30MHz-1GHz | SCHWARZBECK | VULB9163 | 845 | 08-04-20 |
| Antenna, Loop, 9kHz-30MHz | R&S | HFH2-Z2 | 100418 | 10-26-19 |
| Antenna, Horn, 18 GHz | ETS | 3115 | 00167211 | 08-04-20 |
| Antenna, Horn, 18 GHz | ETS | 3115 | 00161451 | 08-04-20 |
| Antenna, Horn, 18 GHz | ETS | 3117 | 00168724 | 08-04-20 |
| Antenna, Horn, 18 GHz | ETS | 3117 | 00168717 | 08-04-20 |
| Antenna, Horn, 18 GHz | ETS | 3117 | 00205959 | 08-04-20 |
| Antenna, Horn, 40 GHz | ETS | 3116C | 00166155 | 12-04-19 |
| Antenna, Horn, 40 GHz | ETS | 3116C | 00168645 | 12-04-19 |
| Antenna, Horn, 40 GHz | ETS | 3116C-PA | 00168841 | 08-09-19 |
| Preamplifier, 1000 MHz | Sonoma | 310N | 341282 | 08-07-19 |
| Preamplifier, 1000 MHz | Sonoma | 310N | 351741 | 08-07-19 |
| Preamplifier, 1000 MHz | Sonoma | 310N | 370599 | 08-06-19 |
| Preamplifier, 18 GHz | Miteq | AFS42-00101800-25-S-42 | 1876511 | 08-07-19 |
| Preamplifier, 18 GHz | Miteq | AFS42-00101800-25-S-42 | 1896138 | 08-07-19 |
| Preamplifier, 18 GHz | Miteq | AFS42-00101800-25-S-42 | 2029169 | 08-07-19 |
| Spectrum Analyzer, 44 GHz | Agilent / HP | N9030A | MY54170614 | 08-07-19 |
| Spectrum Analyzer, 44 GHz | Agilent / HP | N9030A | MY54490312 | 08-06-19 |
| Spectrum Analyzer, 43.5 GHz | R&S | FSW43 | 104089 | 08-06-19 |
| Average Power Sensor | Agilent / HP | U2000 | MY54270007 | 08-07-19 |
| Attenuator | PASTERNAK | PE7087-10 | A001 | 08-08-19 |
| Attenuator | PASTERNAK | PE7087-10 | A008 | 08-08-19 |
| Attenuator | PASTERNAK | PE7004-10 | 2 | 08-07-19 |
| Attenuator | PASTERNAK | PE7087-10 | A009 | 08-08-19 |
| EMI Test Receive, 40 GHz | R&S | ESU40 | 100439 | 08-06-19 |
| EMI Test Receive, 40 GHz | R&S | ESU40 | 100457 | 08-06-19 |
| EMI Test Receive, 44 GHz | R&S | ESW44 | 101590 | 08-06-19 |
| EMI Test Receive, 3 GHz | R&S | ESR3 | 101832 | 08-06-19 |
| Low Pass Filter 5GHz | Micro-Tronics | LPS17541 | 009 | 08-07-19 |
| Low Pass Filter 5GHz | Micro-Tronics | LPS17541 | 015 | 08-07-19 |
| Low Pass Filter 5GHz | Micro-Tronics | LPS17541 | 020 | 08-06-19 |
| High Pass Filter 3GHz | Micro-Tronics | HPM17543 | 010 | 08-07-19 |
| High Pass Filter 3GHz | Micro-Tronics | HPM17543 | 015 | 08-07-19 |
| High Pass Filter 3GHz | Micro-Tronics | HPM17543 | 020 | 08-06-19 |
| High Pass Filter 6GHz | Micro-Tronics | HPS17542 | 009 | 08-07-19 |
| High Pass Filter 6GHz | Micro-Tronics | HPS17542 | 016 | 08-07-19 |
| High Pass Filter 6GHz | Micro-Tronics | HPS17542 | 021 | 08-06-19 |
| LISN | R&S | ENV-216 | 101837 | 08-09-19 |
| UL Software | | | | |
| Description | Manufacturer | Model | Version | |
| Radiated software | UL | UL EMC | Ver 9.5 | |
| AC Line Conducted software | UL | UL EMC | Ver 9.5 | |

7. REFERENCE MEASUREMENT RESULTS

7.1. ON TIME AND DUTY CYCLE RESULTS

| Mode | | ANT | Tone | On Time [mS] | Period [mS] | Duty Cycle X [linear] | Duty Cycle X [%] | Duty Cycle Correction Factor [dB] | 1/T Minimum VBW [kHz] |
|----------|------|------|------|--------------|-------------|-----------------------|------------------|-----------------------------------|-----------------------|
| 802.11ax | HE20 | SISO | 26T | 4.798 | 5.373 | 0.89 | 89.30 | 0.49 | 0.208 |
| | | | 52T | 4.960 | 5.537 | 0.90 | 89.58 | 0.48 | 0.202 |
| | | | 106T | 5.237 | 5.815 | 0.90 | 90.06 | 0.45 | 0.191 |
| | | | 242T | 5.462 | 6.038 | 0.90 | 90.46 | 0.44 | 0.183 |
| | | MIMO | SU | 3.873 | 3.972 | 0.98 | 97.51 | 0.11 | 0.258 |
| | | | 26T | 5.175 | 5.753 | 0.90 | 89.95 | 0.46 | 0.193 |
| | | | 52T | 5.256 | 5.833 | 0.90 | 90.11 | 0.45 | 0.190 |
| | | | 106T | 5.387 | 5.964 | 0.90 | 90.33 | 0.44 | 0.186 |
| | | | 242T | 5.631 | 6.207 | 0.91 | 90.72 | 0.42 | 0.178 |
| | | | SU | 1.972 | 2.072 | 0.95 | 95.17 | 0.21 | 0.507 |

LIMITS

None; for reporting purposes only.

DUTY CYCLE PLOTS

Please refer to the Appendix B.

8. MEASUREMENT METHODS

6 dB BW : KDB 558074 D01 v05, Section 8.2.

OUTPUT POWER : KDB 558074 D01 v05, Section 8.3.2.3.

POWER SPECTRAL DENSITY : KDB 558074 D01 v05, Section 8.4.

Out-of-band EMISSIONS (Conducted) : KDB 558074 D01 v05, Section 8.5, 8.7.

Out-of-band EMISSIONS IN NON-RESTRICTED BANDS: KDB 558074 D01 v05, Section 8.5.

Out-of-band EMISSIONS IN RESTRICTED BANDS : KDB 558074 D01 v05, Section 8.6.

AC Power Line Conducted Emission : ANSI C63.10-2013, Section 6.2.

9. SUMMARY TABLE

| FCC Part Section | Test Description | Test Limit | Test Condition | Test Result |
|--------------------|---|------------|----------------------|-------------|
| 15.247 (a)(2) | Occupied Band width (6dB) | >500KHz | Conducted | Pass |
| 2.1051, 15.247 (d) | Band Edge / Conducted Spurious Emission | -30dBc | | Pass |
| 15.247 (b)(3) | TX conducted output power | <30dBm | | Pass |
| 15.247 (e) | PSD | <8dBm | | Pass |
| 15.207 (a) | AC Power Line conducted emissions | Section 10 | Power Line conducted | Pass |
| 15.205, 15.209 | Radiated Spurious Emission | < 54dBuV/m | Radiated | Pass |

10. ANTENNA PORT TEST RESULTS

10.1. 6 dB BANDWIDTH

LIMITS

FCC §15.247 (a) (2)

The minimum 6 dB bandwidth shall be at least 500 kHz.

TEST PROCEDURE

Reference to KDB 558074 D01 15.247 Meas Guidance v05: The transmitter output is connected to a spectrum analyzer with the RBW set to 100KHz, the VBW $\geq 3 \times$ RBW, peak detector and max hold.

RESULTS

10.1.1. 802.11ax HE20 MODE IN THE 2.4 GHz BAND

| Channel | Center Freq.(MHz) | Tones | RU offset | 6 dB BW (MHz) | | Minimum Limit (MHz) |
|----------------------------|-------------------|-------|-----------|---------------|-------|---------------------|
| | | | | ANT1 | ANT2 | |
| Low | 2412 | 26T | 0 | 2.070 | 2.039 | 0.5 |
| Mid | 2437 | 26T | 0 | 2.045 | 2.073 | 0.5 |
| High | 2457 | 26T | 0 | 2.078 | 2.083 | 0.5 |
| REDUTION HIGH 1 | 2462 | 26T | 0 | 2.063 | 2.076 | 0.5 |
| REDUTION HIGH 2 | 2467 | 26T | 0 | 2.002 | 2.077 | 0.5 |
| REDUTION HIGH 3 | 2472 | 26T | 0 | 2.069 | 2.071 | 0.5 |
| Mnimum 6dB BW (MHz) | | | | 2.002 | 2.039 | 0.5 |

6 dB BANDWIDTH PLOTS

Please refer to the Appendix B.

10.2. OUTPUT POWER

LIMITS

FCC §15.247

For systems using digital modulation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands: 1 Watt, based on the use of antennas with directional gains that do not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

TEST PROCEDURE

The transmitter output is connected to a power meter.

The cable assembly insertion loss was entered as an offset in the power meter to allow for direct reading of power.

Output power measurement was performed utilizing the 8.3.2.3 under KDB558074 D01 15.247 Meas Guidance v05.

Duty cycle correction factor is already added to the average output power results for duty cycle factor < 98%.

DIRECTIONAL ANTENNA GAIN

The TX chains are correlated and the antenna gain is unequal among the chains.
The directional gain is:

2.4GHz

| Frequency Band [MHz] | Antenna1 Gain [dBi] | Antenna2 Gain [dBi] | Correlated Chains Directional Gain [dBi] |
|-------------------------|---------------------------|---------------------------|---|
| 2400 ~ 2483.5 | -5.00 | -5.70 | -2.33 |

RESULTS

10.2.1. 802.11ax HE20 1TX MODE IN THE 2.4 GHZ BAND

Limits

| Frequency Range [MHz] | Directional Gain ANTENNA1 [dBi] | Directional Gain ANTENNA2 [dBi] | FCC Power Limit [dBm] | Max Power [dBm] |
|-----------------------|---------------------------------|---------------------------------|-----------------------|-----------------|
| 2412 - 2472 | -5.00 | -5.70 | 30.00 | 30 |

Output Power Results

| Channel | Frequency [MHz] | Tones | RU offset | Antenna 1 Meas Power [dBm] | Antenna 2 Meas Power [dBm] | Antenna 1 Corr'd Power [dBm] | Antenna 2 Corr'd Power [dBm] | Power Limit [dBm] | Power Margin [dB] |
|---------|-----------------|-------|-----------|----------------------------|----------------------------|------------------------------|------------------------------|-------------------|-------------------|
| Low | 2412 | 26T | 0 | 11.38 | 11.20 | 11.38 | 11.20 | 30.00 | -18.62 |
| | | | 4 | 11.58 | 11.53 | 11.58 | 11.53 | 30.00 | -18.42 |
| | | | 8 | 11.64 | 11.48 | 11.64 | 11.48 | 30.00 | -18.36 |
| | | 52T | 37 | 12.42 | 12.12 | 12.42 | 12.12 | 30.00 | -17.58 |
| | | | 38 | 12.32 | 12.62 | 12.32 | 12.62 | 30.00 | -17.38 |
| | | | 40 | 12.69 | 12.65 | 12.69 | 12.65 | 30.00 | -17.31 |
| | | 106T | 53 | 13.48 | 13.41 | 13.48 | 13.41 | 30.00 | -16.52 |
| | | | 54 | 13.60 | 13.45 | 13.60 | 13.45 | 30.00 | -16.40 |
| | | | | | | | | | |
| Mid | 2437 | 26T | 0 | 11.63 | 11.60 | 11.63 | 11.60 | 30.00 | -18.37 |
| | | | 4 | 11.96 | 11.67 | 11.96 | 11.67 | 30.00 | -18.04 |
| | | | 8 | 11.25 | 11.42 | 11.25 | 11.42 | 30.00 | -18.58 |
| | | 52T | 37 | 12.70 | 12.84 | 12.70 | 12.84 | 30.00 | -17.16 |
| | | | 38 | 12.79 | 12.72 | 12.79 | 12.72 | 30.00 | -17.21 |
| | | | 40 | 12.01 | 12.57 | 12.01 | 12.57 | 30.00 | -17.43 |
| | | 106T | 53 | 13.58 | 13.44 | 13.58 | 13.44 | 30.00 | -16.42 |
| | | | 54 | 13.35 | 13.28 | 13.35 | 13.28 | 30.00 | -16.65 |
| | | | | | | | | | |
| High | 2462 | 26T | 0 | 11.31 | 11.55 | 11.31 | 11.55 | 30.00 | -18.45 |
| | | | 4 | 11.94 | 11.84 | 11.94 | 11.84 | 30.00 | -18.06 |
| | | | 8 | 11.17 | 11.46 | 11.17 | 11.46 | 30.00 | -18.54 |
| | | 52T | 37 | 12.50 | 12.17 | 12.50 | 12.17 | 30.00 | -17.50 |
| | | | 38 | 11.93 | 12.58 | 11.93 | 12.58 | 30.00 | -17.42 |
| | | | 40 | 11.83 | 12.62 | 11.83 | 12.62 | 30.00 | -17.38 |
| | | 106T | 53 | 13.15 | 13.06 | 13.15 | 13.06 | 30.00 | -16.85 |
| | | | 54 | 13.66 | 13.24 | 13.66 | 13.24 | 30.00 | -16.34 |
| | | | | | | | | | |

| Channel | Frequency [MHz] | Tones | RU offset | Antenna 1 Meas Power [dBm] | Antenna 2 Meas Power [dBm] | Antenna 1 Corr'd Power [dBm] | Antenna 2 Corr'd Power [dBm] | Power Limit [dBm] | Power Margin [dB] |
|---------|--------------------|-------|--------------|-------------------------------------|-------------------------------------|---------------------------------------|---------------------------------------|-------------------------|-------------------------|
| 12 | 2467 | 26T | 0 | 2.51 | 2.70 | 2.51 | 2.70 | 30.00 | -27.30 |
| | | | 4 | 2.95 | 3.22 | 2.95 | 3.22 | 30.00 | -26.78 |
| | | | 8 | 2.23 | 2.39 | 2.23 | 2.39 | 30.00 | -27.61 |
| | | 52T | 37 | 2.70 | 2.90 | 2.70 | 2.90 | 30.00 | -27.10 |
| | | | 38 | 2.96 | 3.10 | 2.96 | 3.10 | 30.00 | -26.90 |
| | | | 40 | 2.55 | 2.69 | 2.55 | 2.69 | 30.00 | -27.31 |
| | | 106T | 53 | 2.94 | 2.94 | 2.94 | 2.94 | 30.00 | -27.06 |
| | | | 54 | 2.46 | 2.88 | 2.46 | 2.88 | 30.00 | -27.12 |
| | | 13 | 2472 | 26T | 0 | 0.83 | 0.70 | 0.83 | 0.70 |
| 4 | 0.74 | | | | 0.68 | 0.74 | 0.68 | 30.00 | -29.26 |
| 8 | 0.86 | | | | 0.46 | 0.86 | 0.46 | 30.00 | -29.14 |
| 52T | 37 | | | 0.99 | 0.97 | 0.99 | 0.97 | 30.00 | -29.01 |
| | 38 | | | 0.82 | 0.91 | 0.82 | 0.91 | 30.00 | -29.09 |
| | 40 | | | 0.40 | 0.79 | 0.40 | 0.79 | 30.00 | -29.21 |
| 106T | 53 | | | 0.69 | 1.29 | 0.69 | 1.29 | 30.00 | -28.71 |
| | 54 | | | 0.45 | 0.52 | 0.45 | 0.52 | 30.00 | -29.48 |

Output Power Results

| Channel | Frequency [MHz] | Tones | RU offset | Antenna 1 Meas Power [dBm] | Antenna 2 Meas Power [dBm] | Antenna 1 Corr'd Power [dBm] | Antenna 2 Corr'd Power [dBm] | Power Limit [dBm] | Power Margin [dB] |
|---------|--------------------|-------|--------------|-------------------------------------|-------------------------------------|---------------------------------------|---------------------------------------|-------------------------|-------------------------|
| Low | 2412 | 242T | 61 | 15.30 | 15.20 | 15.30 | 15.20 | 30.00 | -14.70 |
| Mid | 2437 | 242T | 61 | 15.60 | 15.13 | 15.60 | 15.13 | 30.00 | -14.40 |
| High | 2457 | 242T | 61 | 15.15 | 15.14 | 15.15 | 15.14 | 30.00 | -14.85 |
| 11 | 2462 | 242T | 61 | 13.26 | 12.98 | 13.26 | 12.98 | 30.00 | -16.74 |
| 12 | 2467 | 242T | 61 | 2.38 | 2.88 | 2.38 | 2.88 | 30.00 | -27.12 |
| 13 | 2472 | 242T | 61 | 0.76 | 1.03 | 0.76 | 1.03 | 30.00 | -28.97 |

10.2.2. 802.11ax HE20 2TX CDD MODE IN THE 2.4 GHz BAND

Limits

| Frequency Range [MHz] | Correlated Chains Directional Gain [dBI] | FCC Power Limit [dBm] | Max Power [dBm] |
|--------------------------|---|--------------------------|--------------------|
| 2412 - 2472 | -2.33 | 30.00 | 30 |

Output Power Results

| Channel | Frequency [MHz] | Tones | RU offset | Antenna 1 Meas Power [dBm] | Antenna 2 Meas Power [dBm] | Total Corr'd Power [dBm] | Power Limit [dBm] | Power Margin [dB] |
|---------|--------------------|-------|-----------|-------------------------------|-------------------------------|-----------------------------|----------------------|----------------------|
| Low | 2412 | 26T | 0 | 8.62 | 7.68 | 11.19 | 30.00 | -18.81 |
| | | | 4 | 8.79 | 8.37 | 11.60 | 30.00 | -18.40 |
| | | | 8 | 8.58 | 8.93 | 11.77 | 30.00 | -18.23 |
| | | 52T | 37 | 9.25 | 8.79 | 12.04 | 30.00 | -17.96 |
| | | | 38 | 9.27 | 9.12 | 12.21 | 30.00 | -17.79 |
| | | | 40 | 9.74 | 9.91 | 12.84 | 30.00 | -17.16 |
| | | 106T | 53 | 10.51 | 10.26 | 13.40 | 30.00 | -16.60 |
| | | | 54 | 10.53 | 10.80 | 13.68 | 30.00 | -16.32 |
| | | | | | | | | |
| Mid | 2437 | 26T | 0 | 8.68 | 8.90 | 11.80 | 30.00 | -18.20 |
| | | | 4 | 8.70 | 8.41 | 11.57 | 30.00 | -18.43 |
| | | | 8 | 8.35 | 7.80 | 11.09 | 30.00 | -18.91 |
| | | 52T | 37 | 9.67 | 9.81 | 12.75 | 30.00 | -17.25 |
| | | | 38 | 9.48 | 9.36 | 12.43 | 30.00 | -17.57 |
| | | | 40 | 9.50 | 9.11 | 12.32 | 30.00 | -17.68 |
| | | 106T | 53 | 10.19 | 10.76 | 13.49 | 30.00 | -16.51 |
| | | | 54 | 10.32 | 10.16 | 13.25 | 30.00 | -16.75 |
| | | | | | | | | |
| High | 2462 | 26T | 0 | 8.43 | 8.09 | 11.27 | 30.00 | -18.73 |
| | | | 4 | 8.36 | 8.37 | 11.38 | 30.00 | -18.62 |
| | | | 8 | 8.59 | 8.65 | 11.63 | 30.00 | -18.37 |
| | | 52T | 37 | 9.30 | 9.25 | 12.29 | 30.00 | -17.71 |
| | | | 38 | 9.10 | 9.33 | 12.23 | 30.00 | -17.77 |
| | | | 40 | 9.66 | 9.69 | 12.69 | 30.00 | -17.31 |
| | | 106T | 53 | 10.20 | 10.01 | 13.12 | 30.00 | -16.88 |
| | | | 54 | 10.15 | 10.39 | 13.28 | 30.00 | -16.72 |
| | | | | | | | | |

| Channel | Frequency [MHz] | Tones | RU offset | Antenna 1 Meas Power [dBm] | Antenna 2 Meas Power [dBm] | Total Corr'd Power [dBm] | Power Limit [dBm] | Power Margin [dB] |
|---------|--------------------|-------|--------------|-------------------------------------|-------------------------------------|-----------------------------------|-------------------------|-------------------------|
| 12 | 2467 | 26T | 0 | -0.46 | 0.04 | 2.81 | 30.00 | -27.19 |
| | | | 4 | -0.40 | -0.10 | 2.76 | 30.00 | -27.24 |
| | | | 8 | -0.51 | -0.66 | 2.43 | 30.00 | -27.57 |
| | | 52T | 37 | 0.02 | 0.08 | 3.06 | 30.00 | -26.94 |
| | | | 38 | -0.13 | -0.13 | 2.88 | 30.00 | -27.12 |
| | | | 40 | -0.38 | -0.68 | 2.48 | 30.00 | -27.52 |
| | | 106T | 53 | 0.13 | -0.10 | 3.03 | 30.00 | -26.97 |
| | | | 54 | -0.68 | 0.02 | 2.69 | 30.00 | -27.31 |
| | | | | | | | | |
| 13 | 2472 | 26T | 0 | -2.36 | -1.78 | 0.95 | 30.00 | -29.05 |
| | | | 4 | -2.63 | -2.48 | 0.46 | 30.00 | -29.54 |
| | | | 8 | -2.26 | -2.34 | 0.71 | 30.00 | -29.29 |
| | | 52T | 37 | -2.12 | -1.60 | 1.16 | 30.00 | -28.84 |
| | | | 38 | -2.62 | -2.16 | 0.63 | 30.00 | -29.37 |
| | | | 40 | -2.97 | -2.45 | 0.31 | 30.00 | -29.69 |
| | | 106T | 53 | -2.03 | -1.93 | 1.03 | 30.00 | -28.97 |
| | | | 54 | -2.48 | -2.56 | 0.49 | 30.00 | -29.51 |
| | | | | | | | | |

Output Power Results

| Channel | Frequency [MHz] | Tones | RU offset | Antenna 1 Meas Power [dBm] | Antenna 2 Meas Power [dBm] | Total Corr'd Power [dBm] | Power Limit [dBm] | Power Margin [dB] |
|---------|--------------------|-------|--------------|-------------------------------------|-------------------------------------|-----------------------------------|-------------------------|-------------------------|
| Low | 2412 | SU | - | 15.89 | 15.55 | 18.73 | 30.00 | -11.27 |
| Mid | 2437 | SU | - | 15.73 | 15.52 | 18.64 | 30.00 | -11.36 |
| High | 2457 | SU | - | 15.65 | 15.38 | 18.53 | 30.00 | -11.47 |
| 11 | 2462 | SU | - | 13.66 | 13.14 | 16.42 | 30.00 | -13.58 |
| 12 | 2467 | SU | - | 2.68 | 3.04 | 5.87 | 30.00 | -24.13 |
| 13 | 2472 | SU | - | 0.70 | 0.44 | 3.58 | 30.00 | -26.42 |

10.3. PSD

LIMITS

FCC §15.247

The power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

TEST PROCEDURE

Power Spectral Density was performed utilizing the section 8.4 under KDB558074 D01 15.247 Meas Guidance v05

RESULTS

10.3.1. 802.11ax HE20 1TX MODE IN THE 2.4 GHZ BAND

Calculation of PPSD result

- Corr'd PPSD [dBm] = Meas PPSD [dBm] + Duty Cycle CF [dB] + Corr'd factor [dB]

| Actual RBW | Ref. Bandwidth | Corr'd factor |
|------------|----------------|---------------|
| 3 kHz | 3 kHz | 0.00 dB |

PPSD Results

| Channel | Frequency [MHz] | Tones | RU offset | Antenna 1 | Antenna 2 | Antenna 1 | Antenna 2 | PSD Limit [dBm] | Power Margin [dB] | | |
|---------|--------------------|--------|--------------|-----------------------|-----------------------|-------------------------|-------------------------|-----------------------|-------------------------|---------------|--------|
| | | | | Meas PPSD [dBm] | Meas PPSD [dBm] | Corr'd PPSD [dBm] | Corr'd PPSD [dBm] | | | | |
| Low | 2412 | 26T | 0 | -14.74 | -15.79 | -14.25 | -15.30 | 11.00 | -25.25 | | |
| | | | 4 | -14.88 | -15.02 | -14.39 | -14.53 | 11.00 | -25.39 | | |
| | | | 8 | -14.56 | -14.49 | -14.07 | -14.00 | 11.00 | -25.00 | | |
| | | 52T | 37 | -16.84 | -15.78 | -16.36 | -15.30 | 11.00 | -26.30 | | |
| | | | 38 | -15.76 | -15.26 | -15.28 | -14.78 | 11.00 | -25.78 | | |
| | | | 40 | -15.51 | -14.54 | -15.03 | -14.06 | 11.00 | -25.06 | | |
| | | 106T | 53 | -17.92 | -18.04 | -17.47 | -17.59 | 11.00 | -28.47 | | |
| | | | 54 | -18.23 | -18.57 | -17.78 | -18.12 | 11.00 | -28.78 | | |
| | | | Mid | 2437 | 26T | 0 | -14.78 | -14.23 | -14.29 | -13.74 | 11.00 |
| | | 4 | | | | -14.41 | -14.26 | -13.92 | -13.77 | 11.00 | -24.77 |
| | | 8 | | | | -14.83 | -14.31 | -14.34 | -13.82 | 11.00 | -24.82 |
| | | 52T | | | 37 | -15.33 | -14.47 | -14.85 | -13.99 | 11.00 | -24.99 |
| 38 | -15.06 | | | | -15.01 | -14.58 | -14.53 | 11.00 | -25.53 | | |
| 40 | -15.02 | | | | -14.92 | -14.54 | -14.44 | 11.00 | -25.44 | | |
| 106T | 53 | -18.06 | -18.88 | -17.61 | -18.43 | 11.00 | -28.61 | | | | |
| | 54 | -18.42 | -18.83 | -17.97 | -18.38 | 11.00 | -28.97 | | | | |
| | High | 2462 | 26T | 0 | -14.88 | -14.97 | -14.39 | -14.48 | 11.00 | -25.39 | |
| 4 | | | | -14.47 | -14.15 | -13.98 | -13.66 | 11.00 | -24.66 | | |
| 8 | | | | -15.29 | -14.78 | -14.80 | -14.29 | 11.00 | -25.29 | | |
| 52T | | | 37 | -14.77 | -15.27 | -14.29 | -14.79 | 11.00 | -25.29 | | |
| | | | 38 | -15.26 | -15.03 | -14.78 | -14.55 | 11.00 | -25.55 | | |
| | | | 40 | -15.52 | -15.04 | -15.04 | -14.56 | 11.00 | -25.56 | | |
| 106T | | | 53 | -17.92 | -18.74 | -17.47 | -18.29 | 11.00 | -28.47 | | |
| | | | 54 | -18.23 | -18.58 | -17.78 | -18.13 | 11.00 | -28.78 | | |

PPSD Results

| Channel | Frequency [MHz] | Tones | RU offset | Antenna 1 Meas PPSD [dBm] | Antenna 2 Meas PPSD [dBm] | Antenna 1 Corr'd PPSD [dBm] | Antenna 2 Corr'd PPSD [dBm] | PSD Limit [dBm] | Power Margin [dB] |
|---------|--------------------|-------|--------------|------------------------------------|------------------------------------|--------------------------------------|--------------------------------------|-----------------------|-------------------------|
| Low | 2412 | 242T | 61 | -20.03 | -19.87 | -19.59 | -19.43 | 11.00 | -30.43 |
| Mid | 2437 | 242T | 61 | -19.07 | -19.31 | -18.62 | -18.86 | 11.00 | -29.62 |
| High | 2457 | 242T | 61 | -20.24 | -20.33 | -19.79 | -19.88 | 11.00 | -30.79 |

10.3.2. 802.11ax HE20 2TX CDD MODE IN THE 2.4 GHz BAND

Calculation of PPSD result

- Sum Power [mW] = Ant1_Meas Power [mW] + Ant1_Meas Power [mW]
- Total Corr'd Power [dBm] = Sum Power [dBm] + Duty Cycle CF [dB] + Corr'd factor [dB]

| Actual RBW | Ref. Bandwidth | Corr'd factor |
|------------|----------------|---------------|
| 3 kHz | 3 kHz | 0.00 dB |

PPSD Results

| Channel | Frequency [MHz] | Tones | RU offset | Antenna 1 Meas PPSD [dBm] | Antenna 2 Meas PPSD [dBm] | Total Corr'd PPSD [dBm] | PSD Limit [dBm] | Power Margin [dB] |
|---------|--------------------|-------|--------------|------------------------------------|------------------------------------|----------------------------------|-----------------------|-------------------------|
| Low | 2412 | 26T | 0 | -18.99 | -18.68 | -15.36 | 11.00 | -26.36 |
| | | | 4 | -17.45 | -17.11 | -13.81 | 11.00 | -24.81 |
| | | | 8 | -16.59 | -16.71 | -13.18 | 11.00 | -24.18 |
| | | 52T | 37 | -19.92 | -19.71 | -16.35 | 11.00 | -27.35 |
| | | | 38 | -19.81 | -18.29 | -15.52 | 11.00 | -26.52 |
| | | | 40 | -19.17 | -17.66 | -14.89 | 11.00 | -25.89 |
| | | 106T | 53 | -22.12 | -21.42 | -18.31 | 11.00 | -29.31 |
| | | | 54 | -20.81 | -21.37 | -17.63 | 11.00 | -28.63 |
| | | | | | | | | |
| Mid | 2437 | 26T | 0 | -17.66 | -17.01 | -13.85 | 11.00 | -24.85 |
| | | | 4 | -17.78 | -16.93 | -13.86 | 11.00 | -24.86 |
| | | | 8 | -17.76 | -18.13 | -14.47 | 11.00 | -25.47 |
| | | 52T | 37 | -19.34 | -19.02 | -15.72 | 11.00 | -26.72 |
| | | | 38 | -19.43 | -18.83 | -15.66 | 11.00 | -26.66 |
| | | | 40 | -19.52 | -19.57 | -16.08 | 11.00 | -27.08 |
| | | 106T | 53 | -21.46 | -21.42 | -17.99 | 11.00 | -28.99 |
| | | | 54 | -22.15 | -22.22 | -18.73 | 11.00 | -29.73 |
| | | | | | | | | |
| High | 2462 | 26T | 0 | -17.69 | -17.71 | -14.23 | 11.00 | -25.23 |
| | | | 4 | -18.10 | -17.47 | -14.30 | 11.00 | -25.30 |
| | | | 8 | -17.38 | -17.08 | -13.76 | 11.00 | -24.76 |
| | | 52T | 37 | -19.31 | -19.31 | -15.85 | 11.00 | -26.85 |
| | | | 38 | -19.46 | -19.36 | -15.95 | 11.00 | -26.95 |
| | | | 40 | -19.48 | -18.41 | -15.45 | 11.00 | -26.45 |
| | | 106T | 53 | -21.69 | -21.41 | -18.10 | 11.00 | -29.10 |
| | | | 54 | -21.48 | -21.33 | -17.96 | 11.00 | -28.96 |
| | | | | | | | | |

PPSD Results

| Channel | Frequency [MHz] | Tones | RU offset | Antenna 1 Meas PPSD [dBm] | Antenna 2 Meas PPSD [dBm] | Total Corr'd PPSD [dBm] | PSD Limit [dBm] | Power Margin [dB] |
|---------|--------------------|-------|--------------|------------------------------------|------------------------------------|----------------------------------|-----------------------|-------------------------|
| Low | 2412 | SU | - | -19.20 | -19.57 | -16.16 | 11.00 | -27.16 |
| Mid | 2437 | SU | - | -18.69 | -18.75 | -15.50 | 11.00 | -26.50 |
| High | 2457 | SU | - | -19.59 | -20.28 | -16.70 | 11.00 | -27.70 |

PSD PLOTS

Please refer to the Appendix C.

10.4. OUT-OF-BAND EMISSIONS

LIMITS

FCC §15.247 (d)

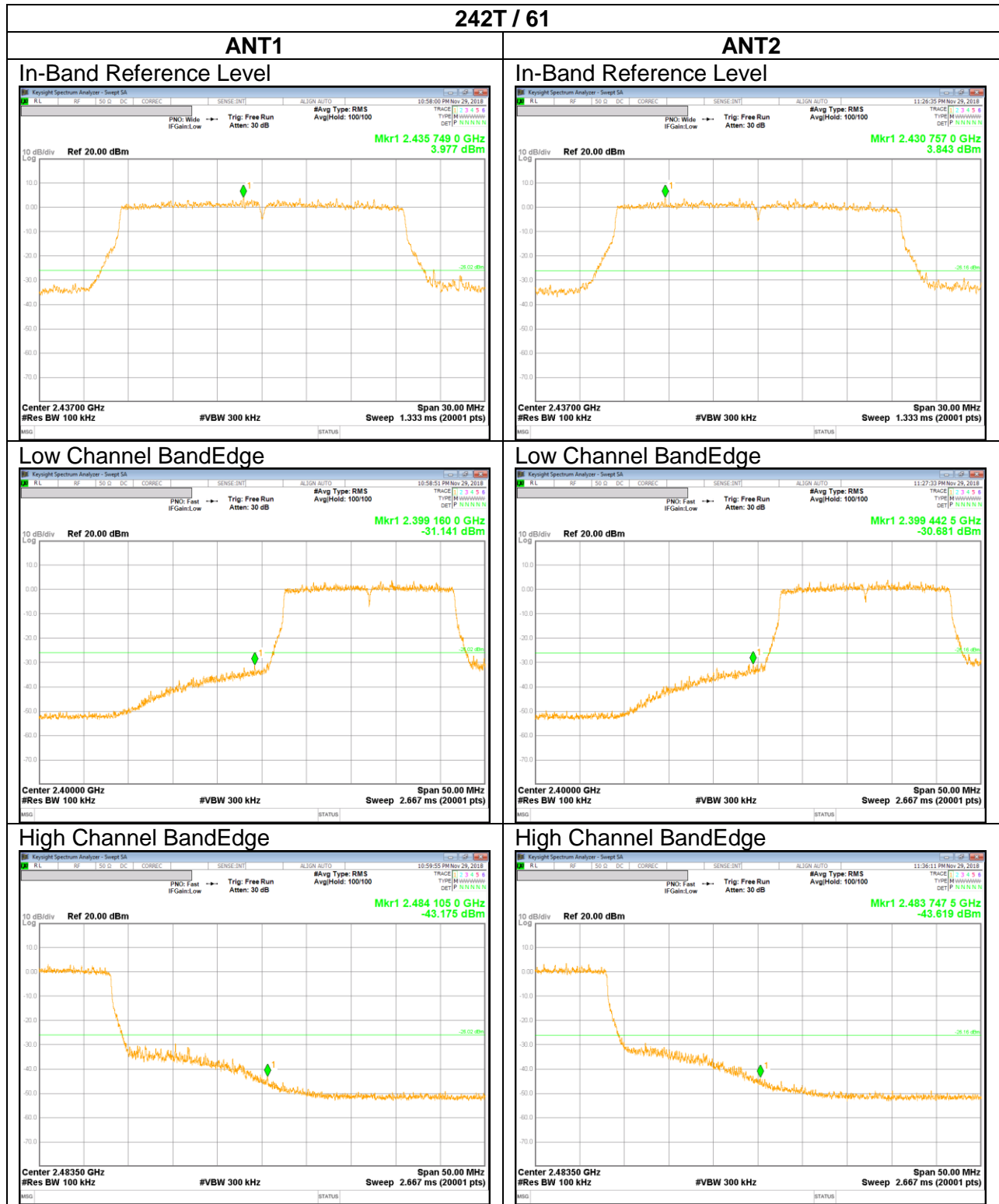
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required.

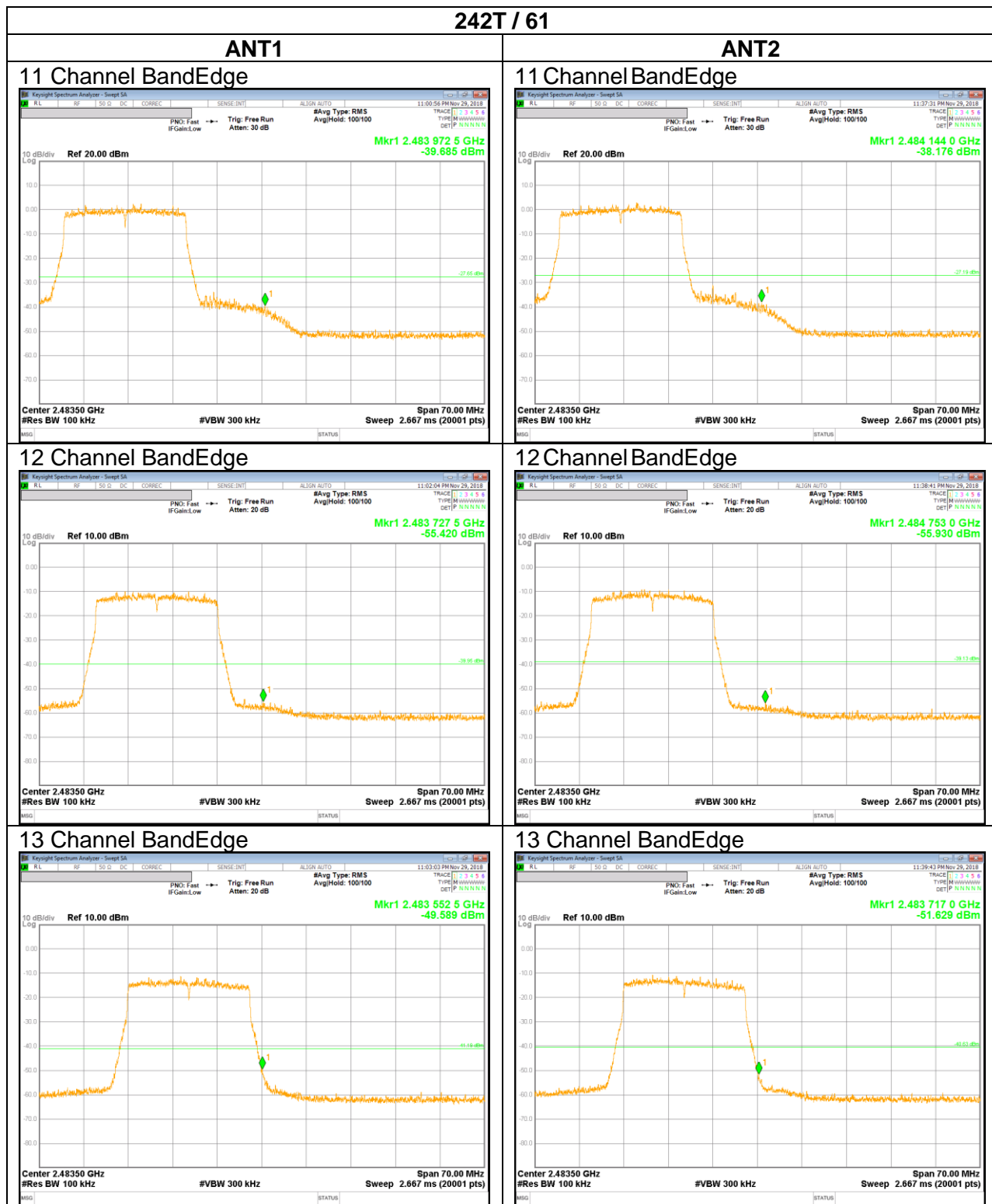
TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer with RBW = 100 kHz, VBW = 300 kHz, peak detector, and max hold. Measurements utilizing these settings are made of the in-band reference level, bandedge (where measurements to the general radiated limits will not be made) and out-of-band emissions.

RESULTS

10.4.1. 802.11ax HE20 1TX MODE IN THE 2.4 GHz BAND

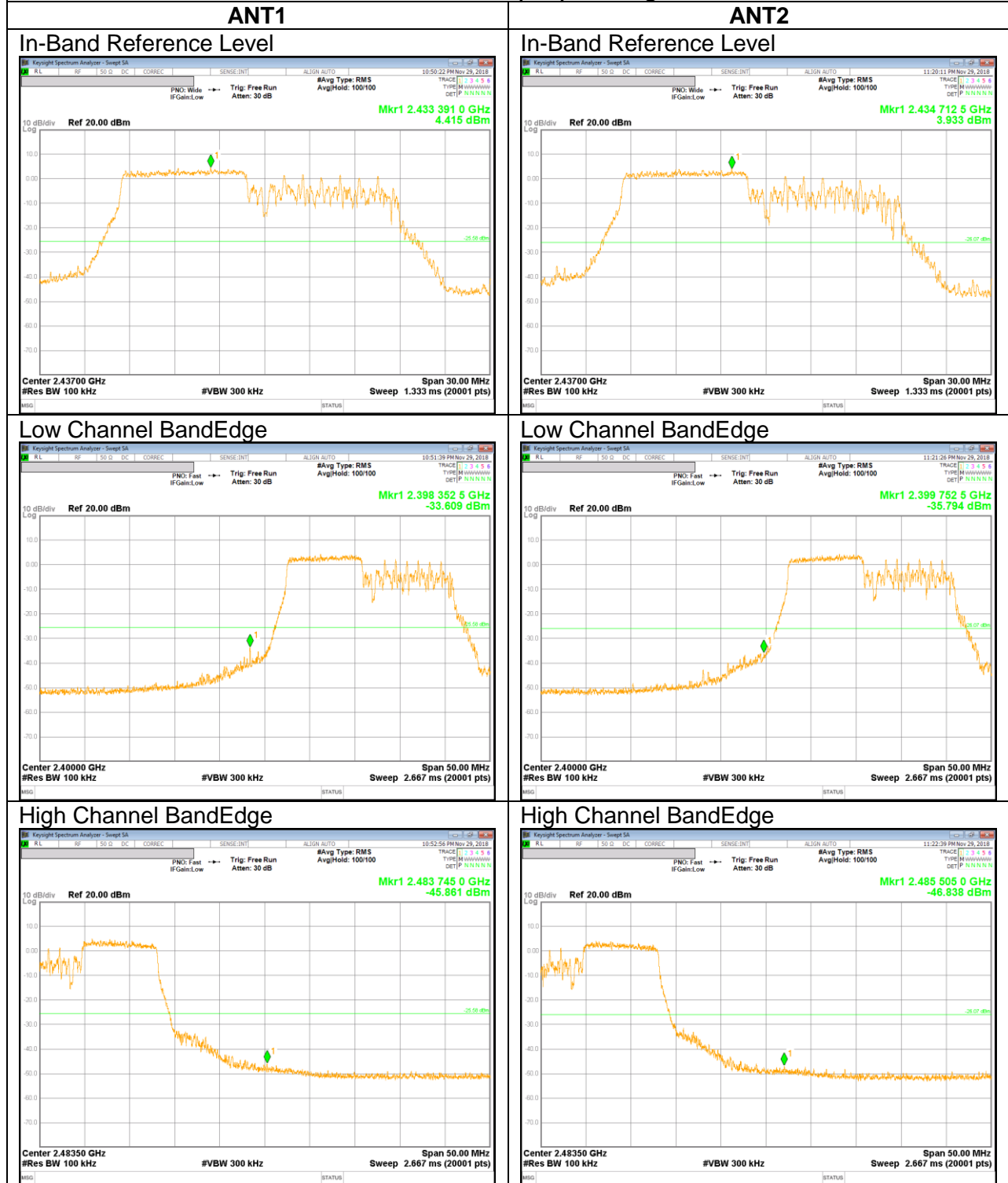




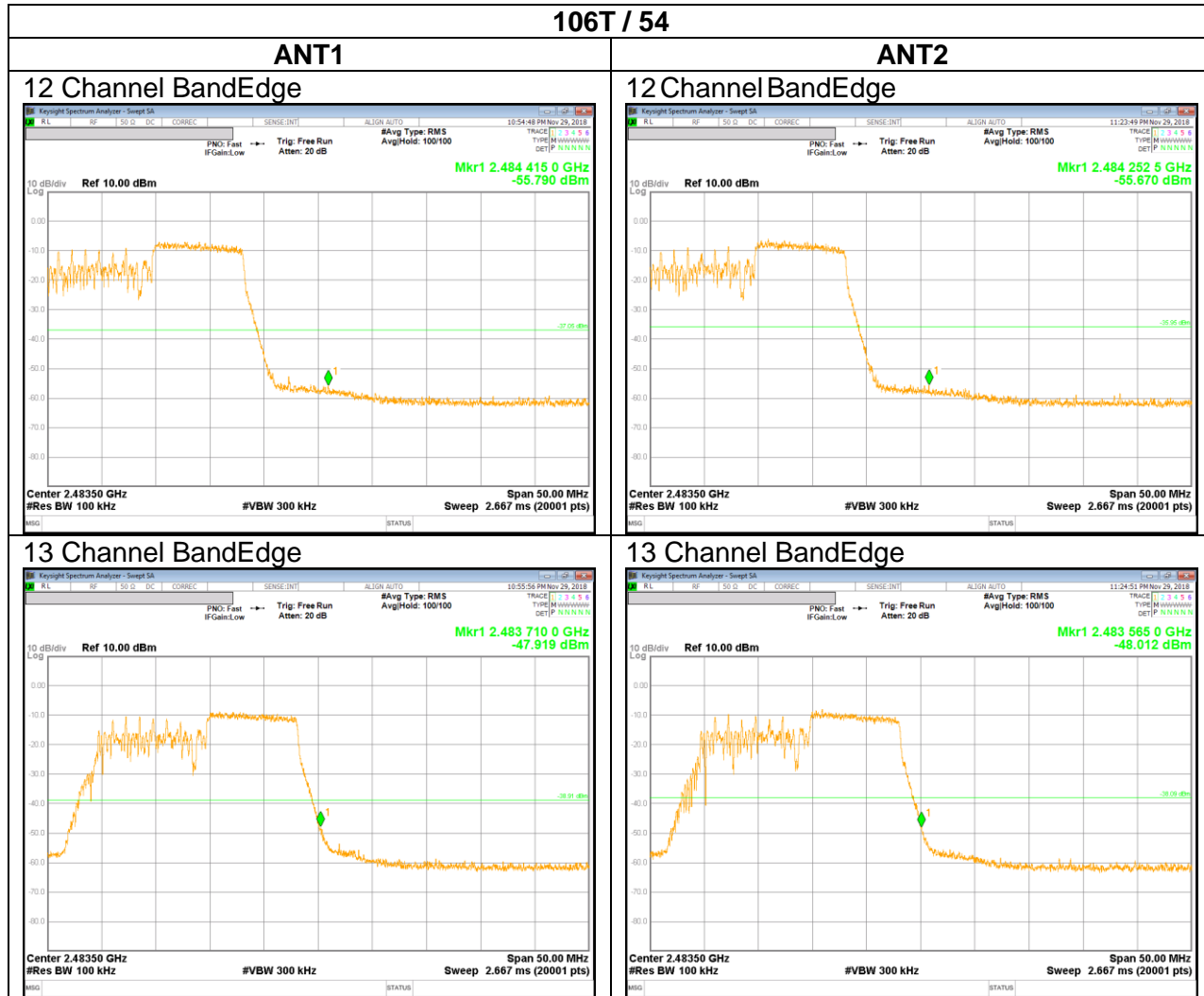
242T / 61



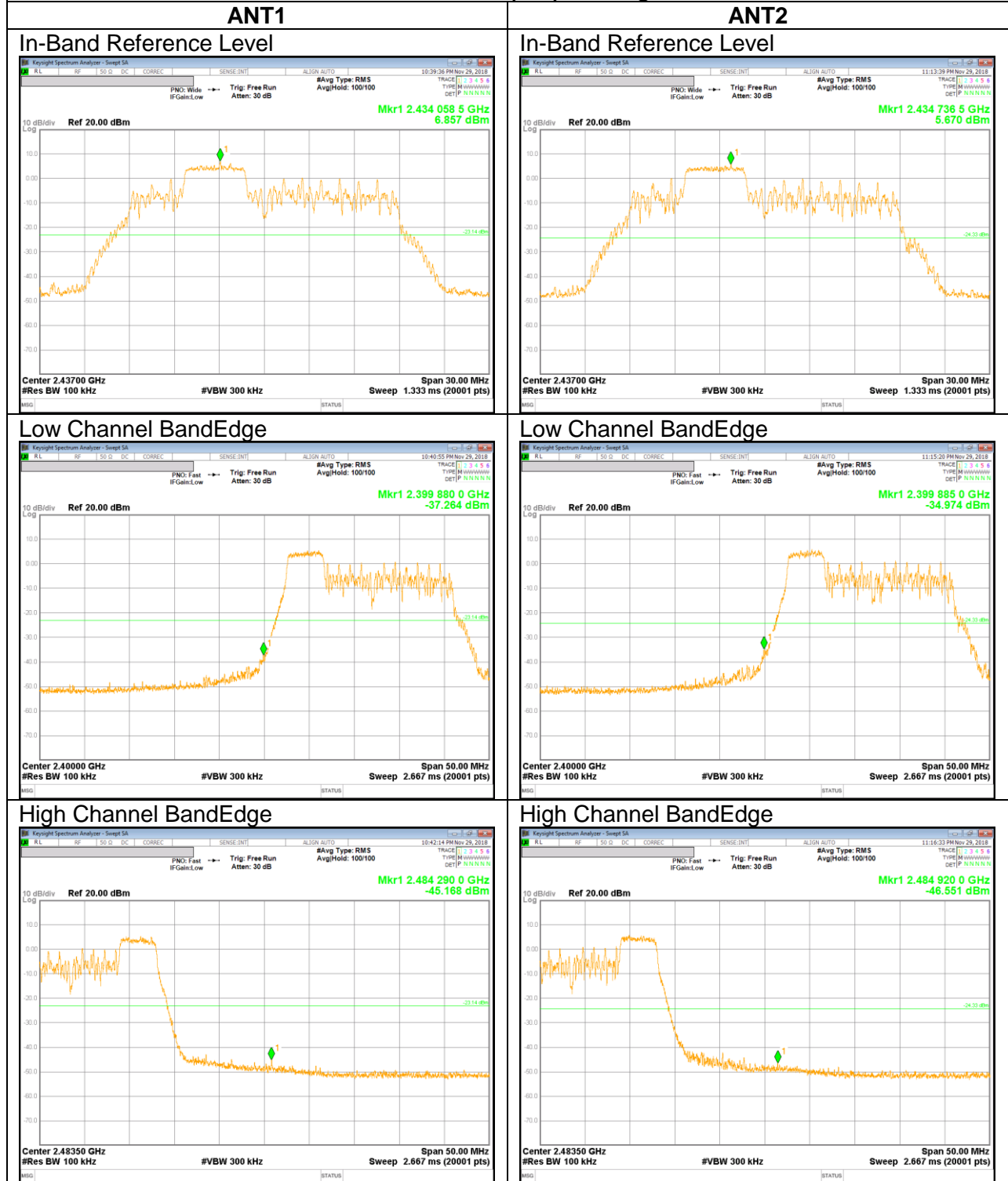
106T / Low: 53, Mid(Ref): 38, High: 54



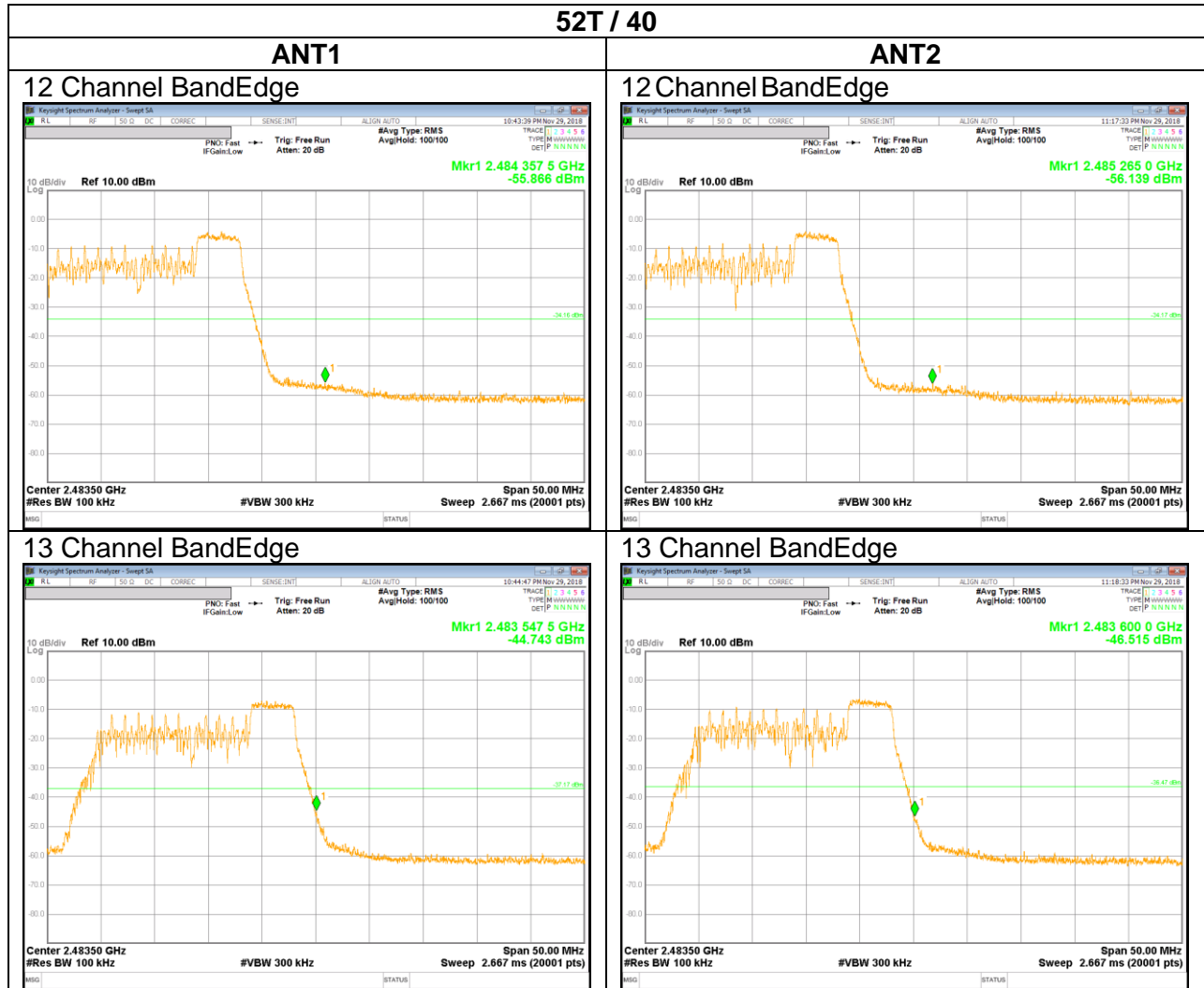
106T / 54



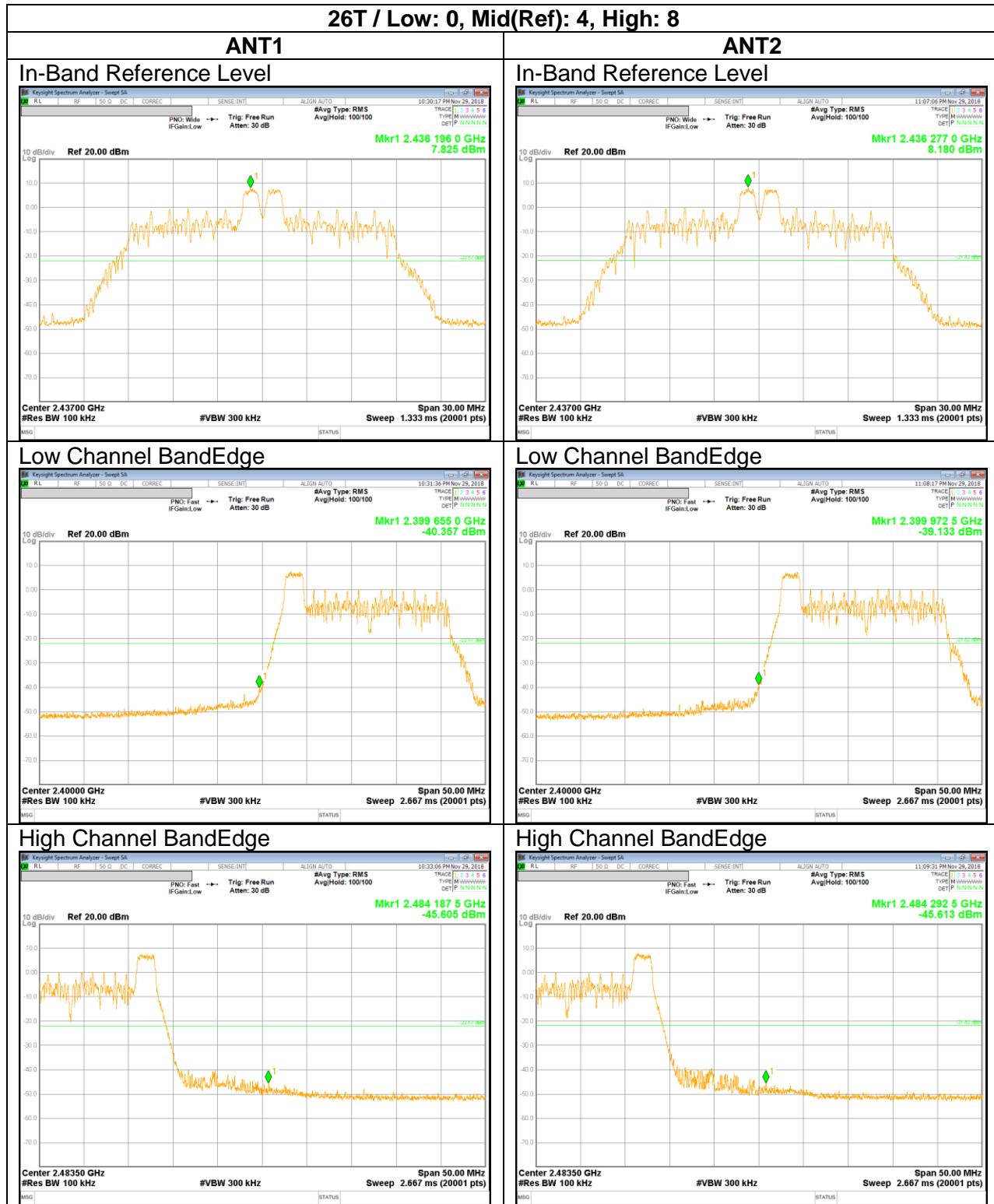
52T / Low: 37, Mid(Ref): 38, High: 40



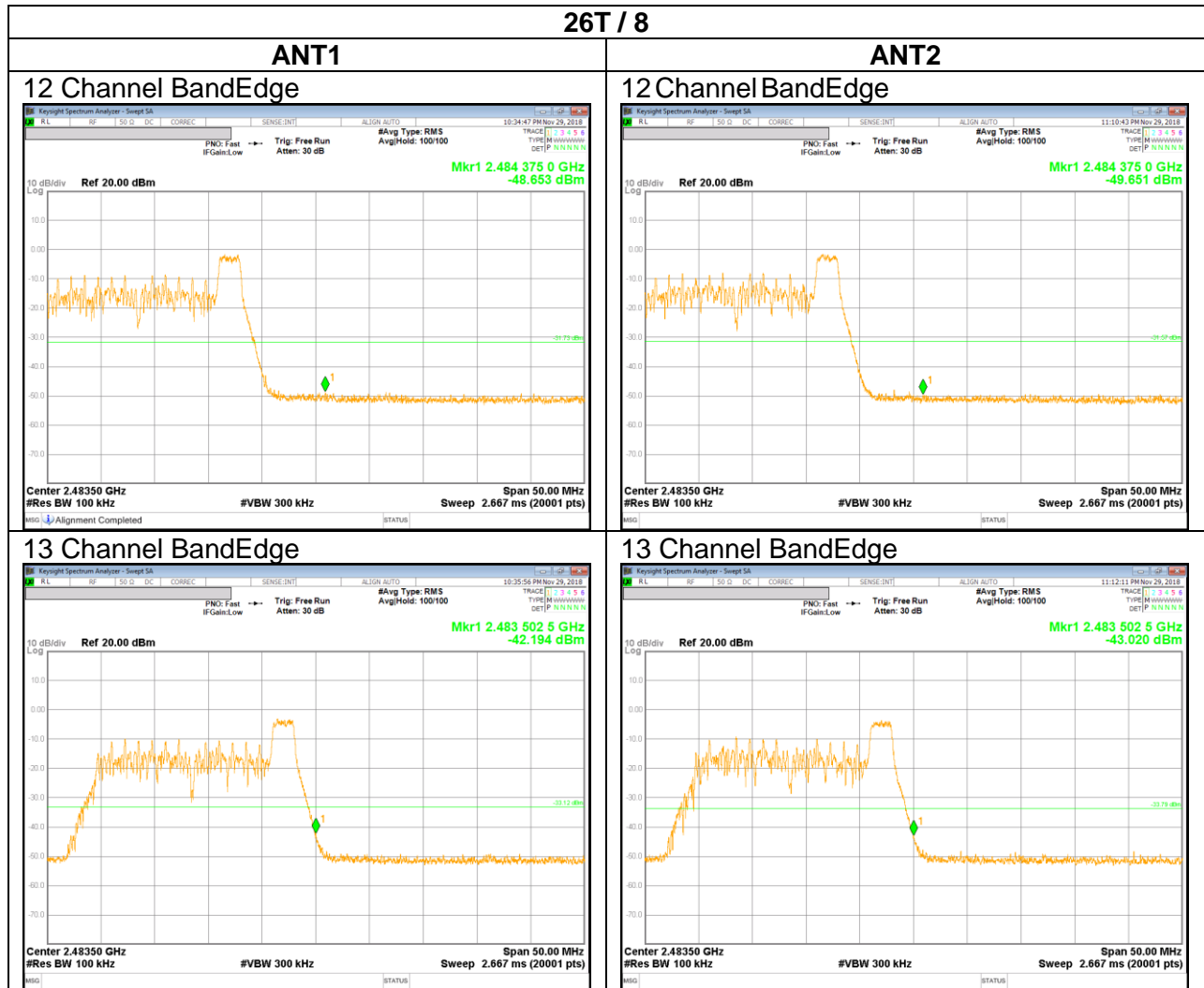
52T / 40



26T / Low: 0, Mid(Ref): 4, High: 8



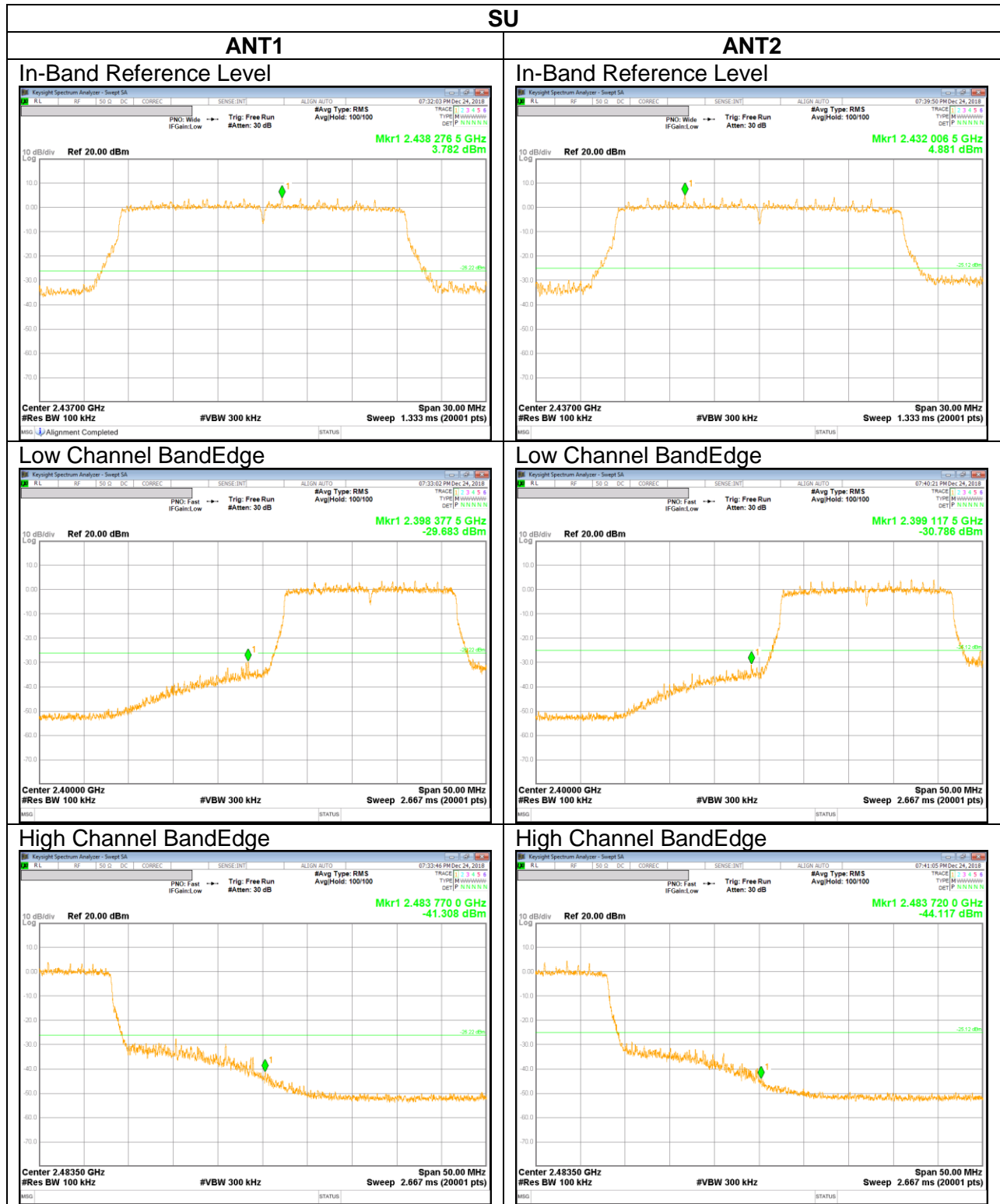
26T / 8



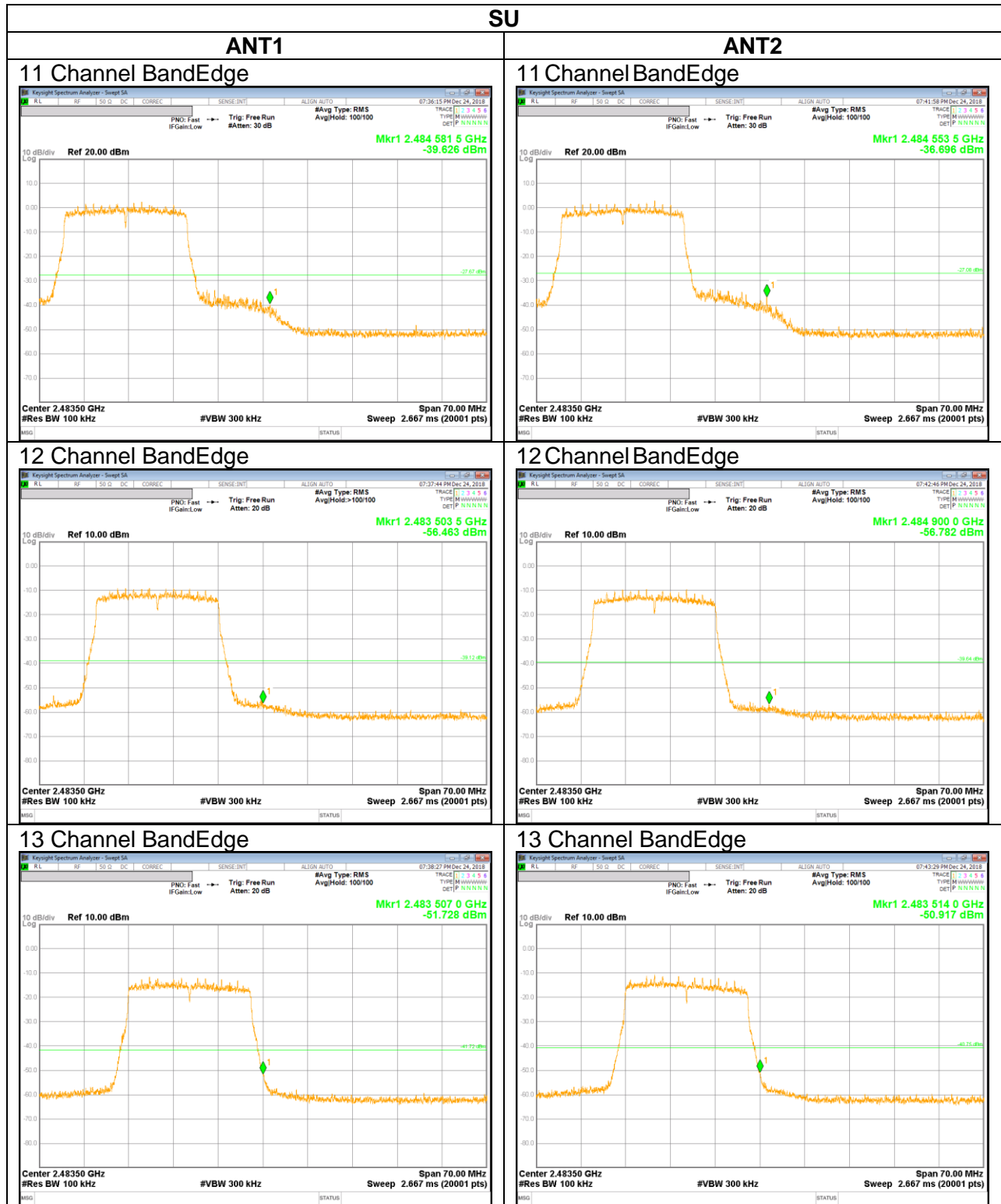
26T / ANT1(Low: 8, Mid: 4 High: 4), ANT2(Low: 8, Mid: 0 High: 4)



10.4.1. 802.11ax HE20 2TX CDD MODE IN THE 2.4 GHz BAND



SU





11. RADIATED TEST RESULTS

LIMITS

FCC §15.205 and §15.209

| Limits for radiated disturbance of an intentional radiator | | |
|--|-----------------|--------------------------|
| Frequency range (MHz) | Limits (µV/m) | Measurement Distance (m) |
| 0.009 – 0.490 | 2400 / F (kHz) | 300 |
| 0.490 – 1.705 | 24000 / F (kHz) | 30 |
| 1.705 – 30.0 | 30 | 30 |
| 30 – 88 | 100** | 3 |
| 88 - 216 | 150** | 3 |
| 216 – 960 | 200** | 3 |
| Above 960 | 500 | 3 |

** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this part, e.g. §§ 15.231 and 15.241.

TEST PROCEDURE

The EUT is placed on a non-conducting table 80 cm above the ground plane for below 1GHz and 150 cm for above 1GHz. The antenna to EUT distance is 3 meters. The EUT is configured in accordance with ANSI C63.10. The EUT is set to transmit in a continuous mode.

For measurements below 1 GHz the resolution bandwidth is set to 100 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

For measurements above 1 GHz the resolution bandwidth is set to 1 MHz; the video bandwidth is set to 3 MHz for peak measurements and add duty cycle factor for average measurements. (Restricted bandedge, Final detection of spurious harmonic emissions)

Pre-scans to detect harmonic and spurious emissions, the resolution bandwidth is set to 1 MHz; the video bandwidth is set to 30 KHz for peak measurements.

The spectrum from 1 GHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in each applicable band.
(From 30MHz to 1GHz, test was performed with the EUT set to transmit at the channel with highest output power)

The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized in both the vertical and the horizontal positions.

Note : Emission was pre-scanned from 9KHz to 30MHz; No emissions were detected which was at least 20dB below the specification limit (consider distance correction factor).
Per FCC part 15.31(o), test results were not reported.

Although these tests were performed other than open area test site, adequate comparison measurements were confirmed against 30 m open are test site.
Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the one of tests made in an open field based on KDB 414788.

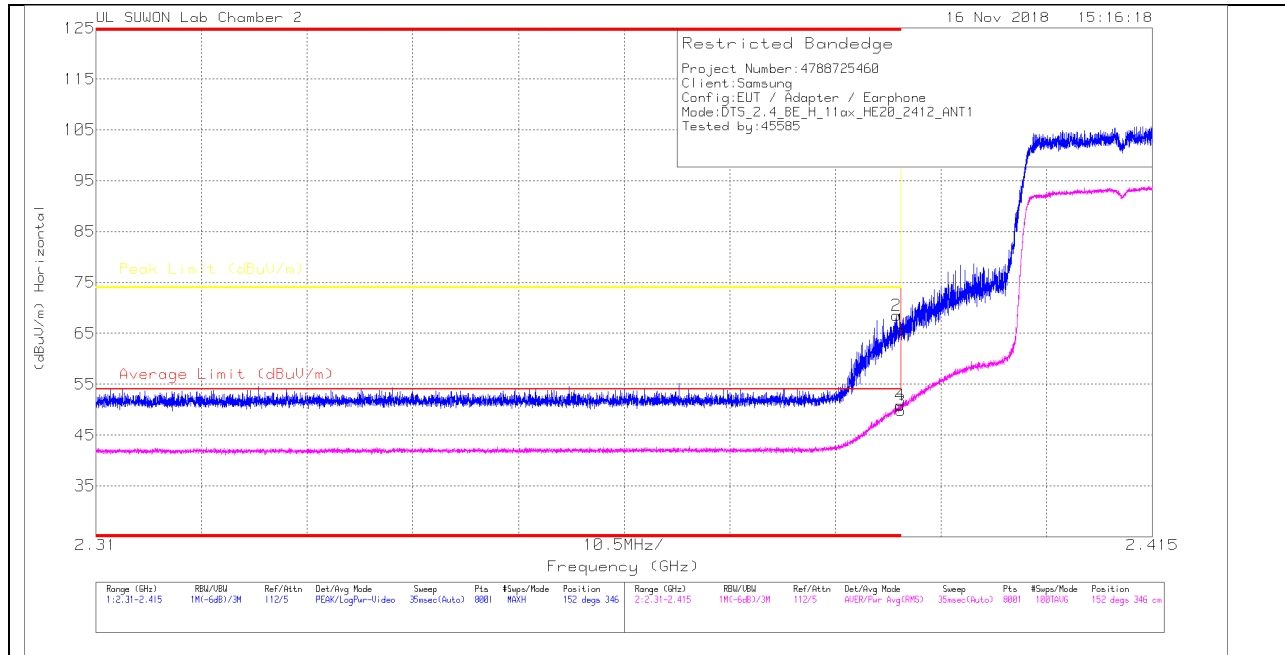
11.1. TRANSMITTER ABOVE 1 GHz_1TX

11.1.1. TX ABOVE 1 GHz 802.11ax HE20 MODE IN THE 2.4 GHz BAND

RESTRICTED BANDEDGE (LOW CHANNEL)

242T RU mode (ANT_1 / RU offset 61)

HORIZONTAL PEAK AND AVERAGE PLOT



HORIZONTAL DATA

Trace Markers

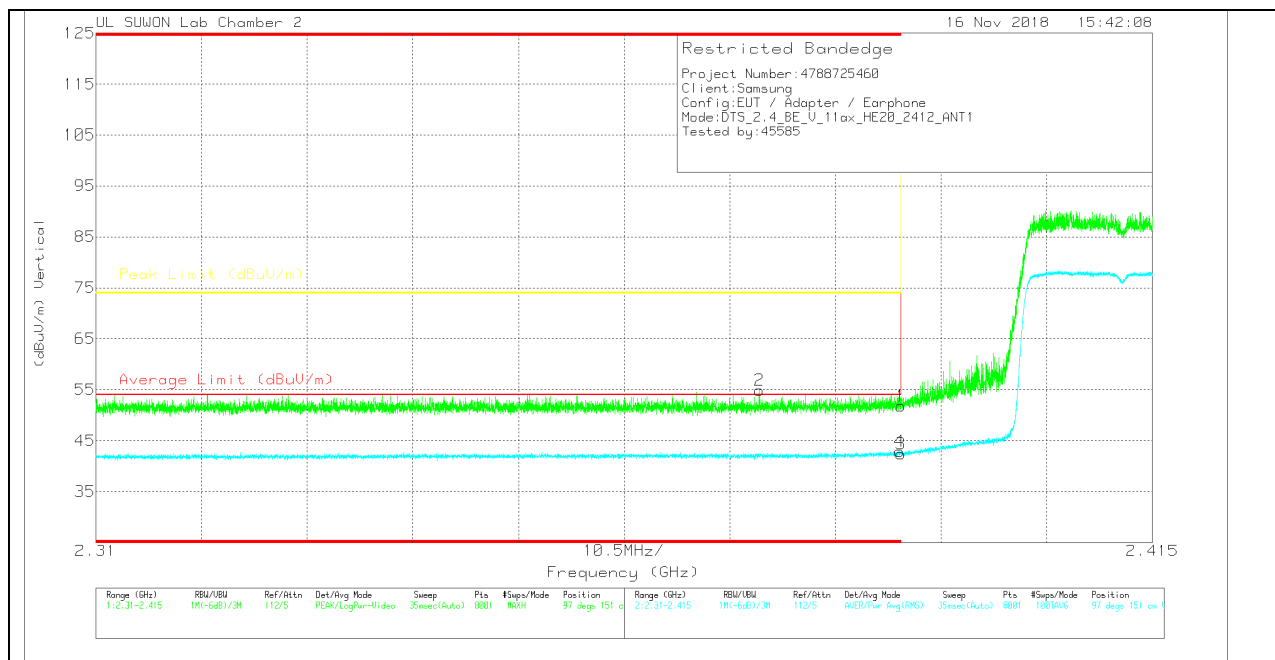
| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | 3117_00168724 | 10dB(dB) | DC Corr (dB) | Corrected Reading (dBuV/m) | Average Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|--------|-----------------|----------------------|-----|---------------|----------|--------------|----------------------------|------------------------|-------------|---------------------|----------------|----------------|-------------|----------|
| 1 | * 2.39 | 54.86 | Pk | 31.6 | -20.8 | 0 | 65.66 | - | - | 74 | -8.34 | 152 | 346 | H |
| 2 | * 2.39 | 57.72 | Pk | 31.6 | -20.8 | 0 | 68.52 | - | - | 74 | -8.48 | 152 | 346 | H |
| 3 | * 2.39 | 38.64 | RMS | 31.6 | -20.8 | .44 | 49.88 | 54 | -4.12 | - | - | 152 | 346 | H |
| 4 | * 2.39 | 39.62 | RMS | 31.6 | -20.8 | .44 | 50.86 | 54 | -3.14 | - | - | 152 | 346 | H |

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

RMS - RMS detection

VERTICAL PEAK AND AVERAGE PLOT



VERTICAL DATA

Trace Markers

| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | 3117_00168724 | 10dB[dB] | DC Corr (dB) | Corrected Reading (dBuV/m) | Average Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | Pk Margin (dB) | Altitude (Degs) | Height (cm) | Polarity |
|--------|-----------------|----------------------|-----|---------------|----------|--------------|----------------------------|------------------------|-------------|---------------------|----------------|-----------------|-------------|----------|
| 1 | * 2.39 | 40.97 | Pk | 31.6 | -20.8 | 0 | 51.77 | - | - | 74 | -22.23 | 97 | 151 | V |
| 2 | * 2.376 | 44.15 | Pk | 31.6 | -20.8 | 0 | 54.95 | - | - | 74 | -19.05 | 97 | 151 | V |
| 3 | * 2.39 | 31.16 | RMS | 31.6 | -20.8 | .44 | 42.4 | 54 | -11.6 | - | - | 97 | 151 | V |
| 4 | * 2.39 | 31.66 | RMS | 31.6 | -20.8 | .44 | 42.9 | 54 | -11.1 | - | - | 97 | 151 | V |

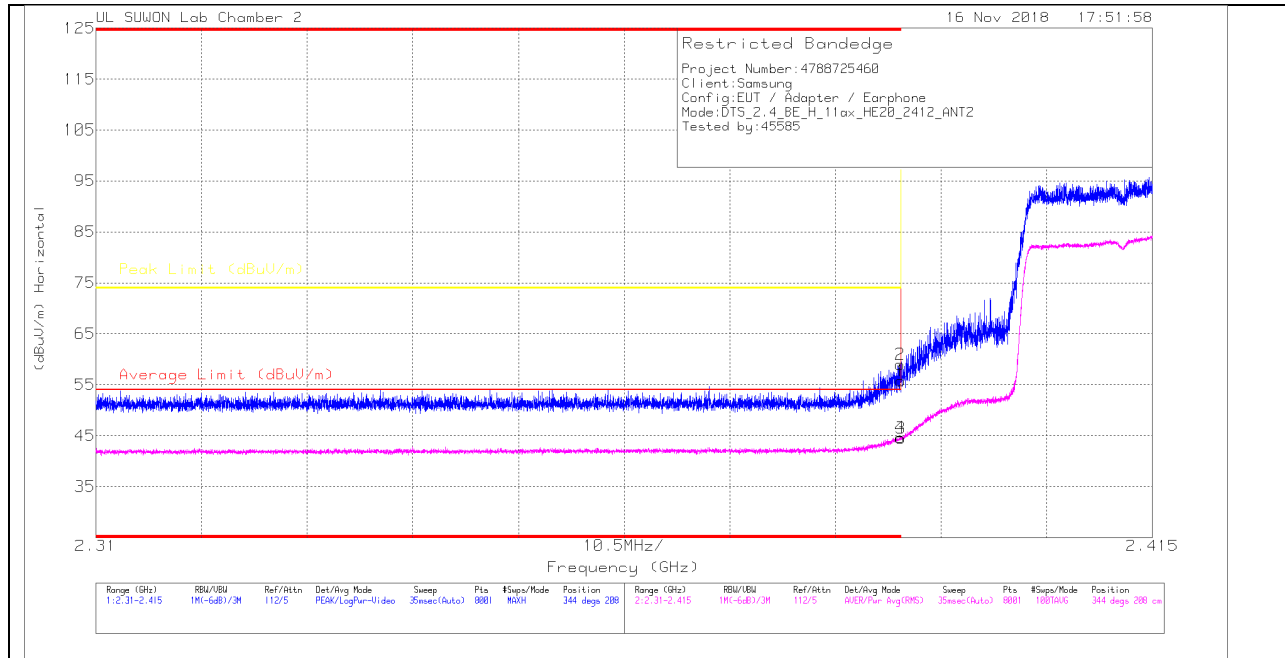
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

RMS - RMS detection

242T RU mode (ANT_2 / RU offset 61)

HORIZONTAL PEAK AND AVERAGE PLOT



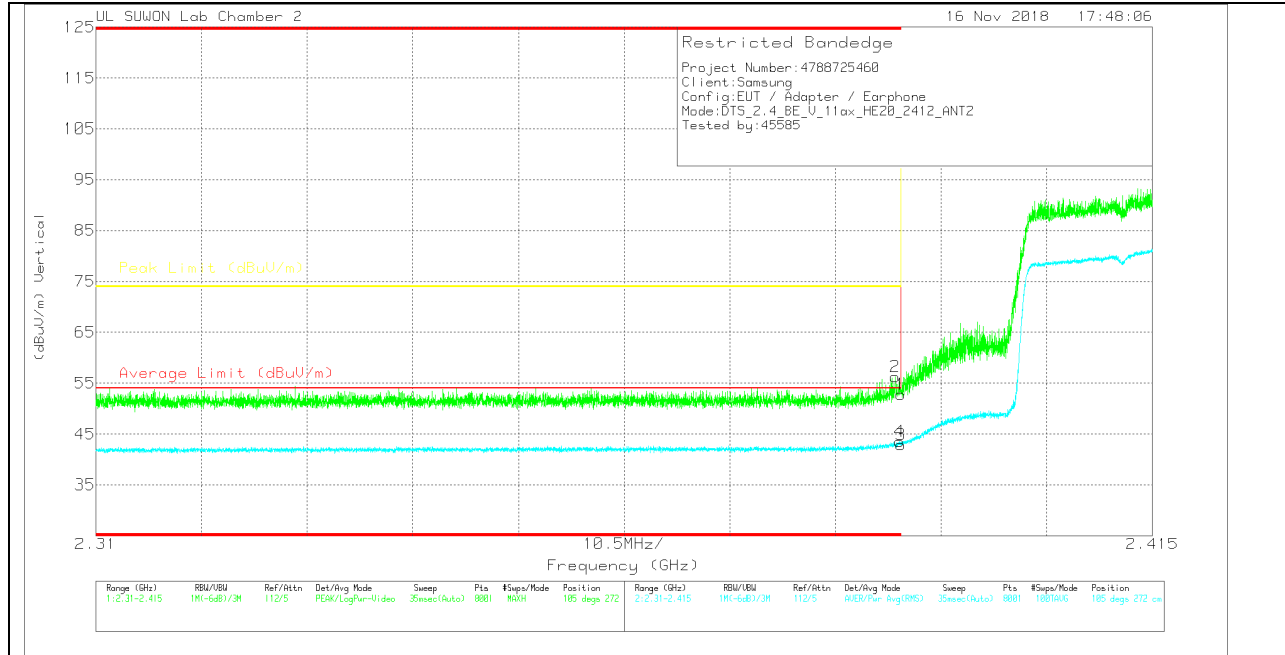
HORIZONTAL DATA

Trace Markers

| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | 3117_00168724 | 10dB(dB) | DC Corr (dB) | Corrected Reading (dBuV/m) | Average Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|--------|-----------------|----------------------|-----|---------------|----------|--------------|----------------------------|------------------------|-------------|---------------------|----------------|----------------|-------------|----------|
| 1 | * 2.39 | 44.92 | PK | 31.6 | -20.8 | 0 | 55.72 | - | - | 74 | -18.28 | 344 | 208 | H |
| 2 | * 2.39 | 48.21 | PK | 31.6 | -20.8 | 0 | 59.01 | - | - | 74 | -14.99 | 344 | 208 | H |
| 3 | * 2.39 | 33.22 | RMS | 31.6 | -20.8 | .44 | 44.46 | 54 | -9.54 | - | - | 344 | 208 | H |
| 4 | * 2.39 | 33.36 | RMS | 31.6 | -20.8 | .44 | 44.6 | 54 | -9.4 | - | - | 344 | 208 | H |

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
 Pk - Peak detector
 RMS - RMS detection

VERTICAL PEAK AND AVERAGE PLOT



VERTICAL DATA

Trace Markers

| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | 3117_00168724 | 10dB(dB) | DC Corr (dB) | Corrected Reading (dBuV/m) | Average Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|--------|-----------------|----------------------|-----|---------------|----------|--------------|----------------------------|------------------------|-------------|---------------------|----------------|----------------|-------------|----------|
| 1 | * 2.39 | 42.05 | Pk | 31.6 | -20.8 | 0 | 52.85 | - | - | 74 | -21.15 | 105 | 272 | V |
| 2 | * 2.389 | 45.52 | Pk | 31.6 | -20.8 | 0 | 56.32 | - | - | 74 | -17.68 | 105 | 272 | V |
| 3 | * 2.39 | 31.62 | RMS | 31.6 | -20.8 | .44 | 42.86 | 54 | -11.14 | - | - | 105 | 272 | V |
| 4 | * 2.39 | 32.24 | RMS | 31.6 | -20.8 | .44 | 43.48 | 54 | -10.52 | - | - | 105 | 272 | V |

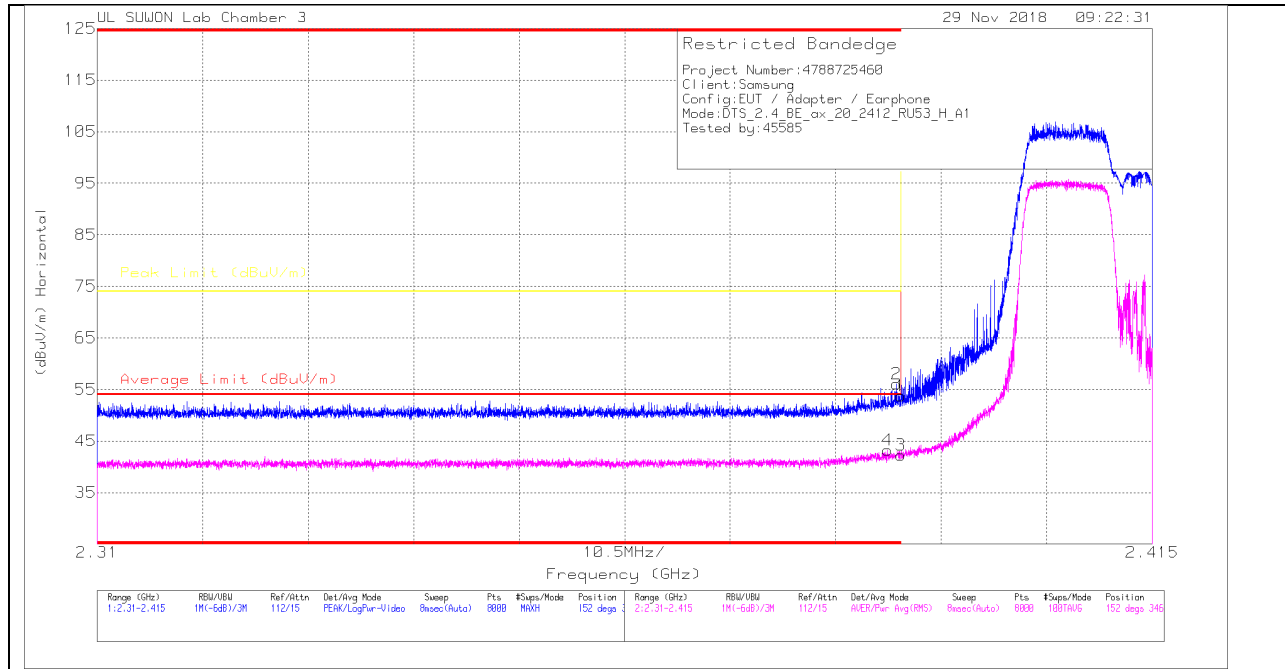
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

RMS - RMS detection

106T RU mode (ANT_1 / RU offset 53)

HORIZONTAL PEAK AND AVERAGE PLOT



HORIZONTAL DATA

Trace Markers

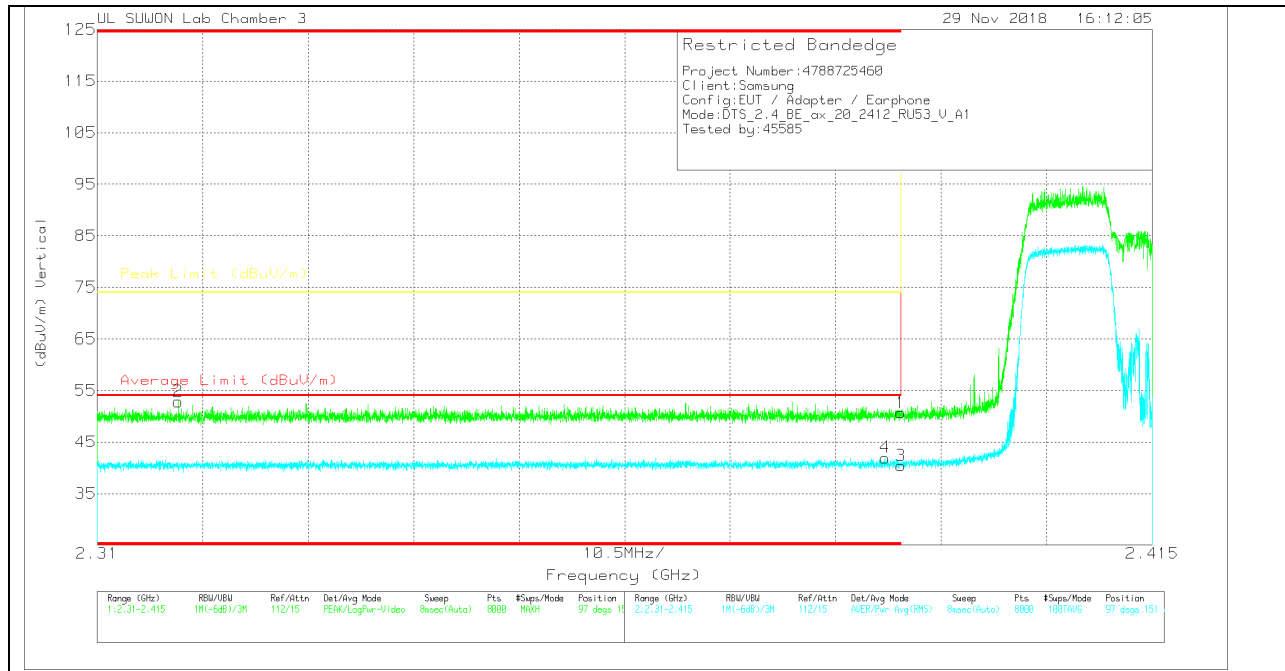
| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | 3117_0020959 | 10dB(dB) | DC Corr (dB) | Corrected Reading (dBuV/m) | Average Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | PK Margin (dB) | Asmuth (Degs) | Height (cm) | Polarity |
|--------|-----------------|----------------------|-----|--------------|----------|--------------|----------------------------|------------------------|-------------|---------------------|----------------|---------------|-------------|----------|
| 1 | * 2.39 | 45.43 | Pk | 31.7 | -23.4 | 0 | 53.73 | - | - | 74 | -20.27 | 152 | 346 | H |
| 2 | * 2.39 | 47.76 | Pk | 31.7 | -23.4 | 0 | 56.06 | - | - | 74 | -17.94 | 152 | 346 | H |
| 3 | * 2.39 | 33.5 | RMS | 31.7 | -23.4 | -45 | 42.25 | 54 | -11.75 | - | - | 152 | 346 | H |
| 4 | * 2.389 | 34.47 | RMS | 31.7 | -23.4 | -45 | 43.22 | 54 | -10.78 | - | - | 152 | 346 | H |

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

RMS - RMS detection

VERTICAL PEAK AND AVERAGE PLOT



VERTICAL DATA

Trace Markers

| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | 3117_0020959 | 10dB(dB) | DC Corr (dB) | Corrected Reading (dBuV/m) | Average Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | PK Margin (dB) | Asimuth (Degs) | Height (cm) | Polarity |
|--------|-----------------|----------------------|-----|--------------|----------|--------------|----------------------------|------------------------|-------------|---------------------|----------------|----------------|-------------|----------|
| 1 | * 2.39 | 42.38 | Pk | | -23.4 | 0 | 50.68 | - | - | 74 | -23.32 | 97 | 151 | V |
| 2 | * 2.318 | 44.74 | Pk | | -23.4 | 0 | 52.84 | - | - | 74 | -21.16 | 97 | 151 | V |
| 3 | * 2.39 | 31.65 | RMS | | -23.4 | -45 | 40.4 | 54 | -13.6 | - | - | 97 | 151 | V |
| 4 | * 2.388 | 33.2 | RMS | | -23.4 | -45 | 41.95 | 54 | -12.05 | - | - | 97 | 151 | V |

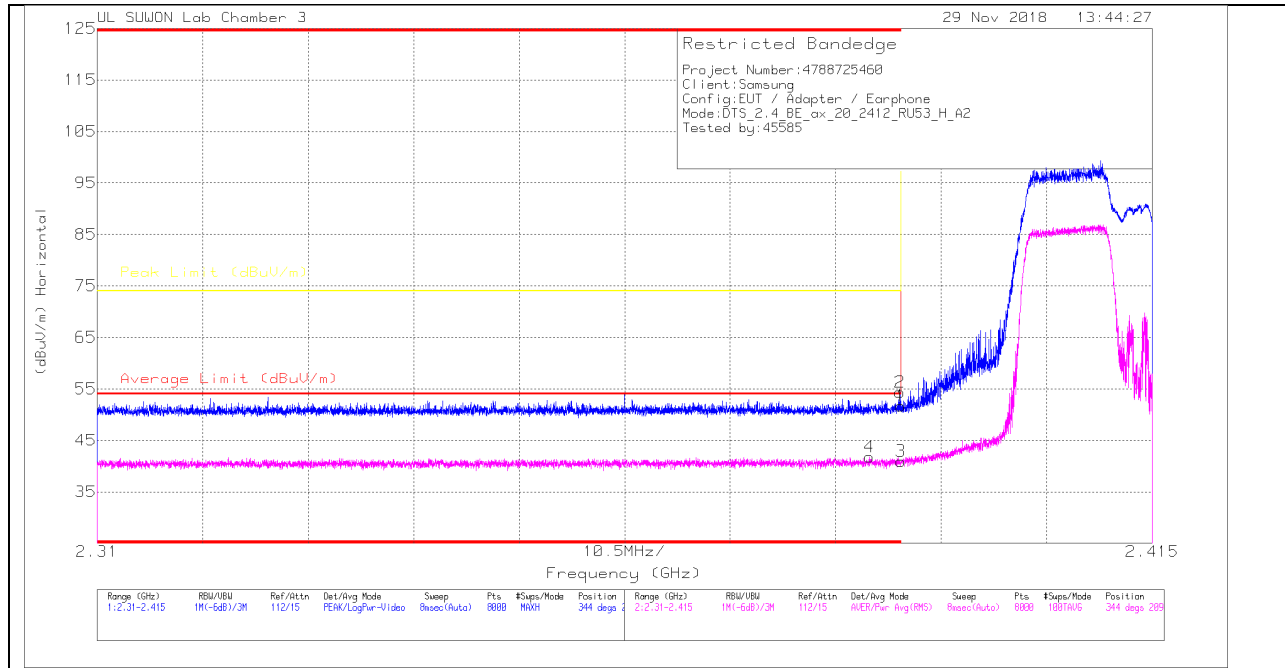
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

RMS - RMS detection

106T RU mode (ANT_2 / RU offset 53)

HORIZONTAL PEAK AND AVERAGE PLOT



HORIZONTAL DATA

Trace Markers

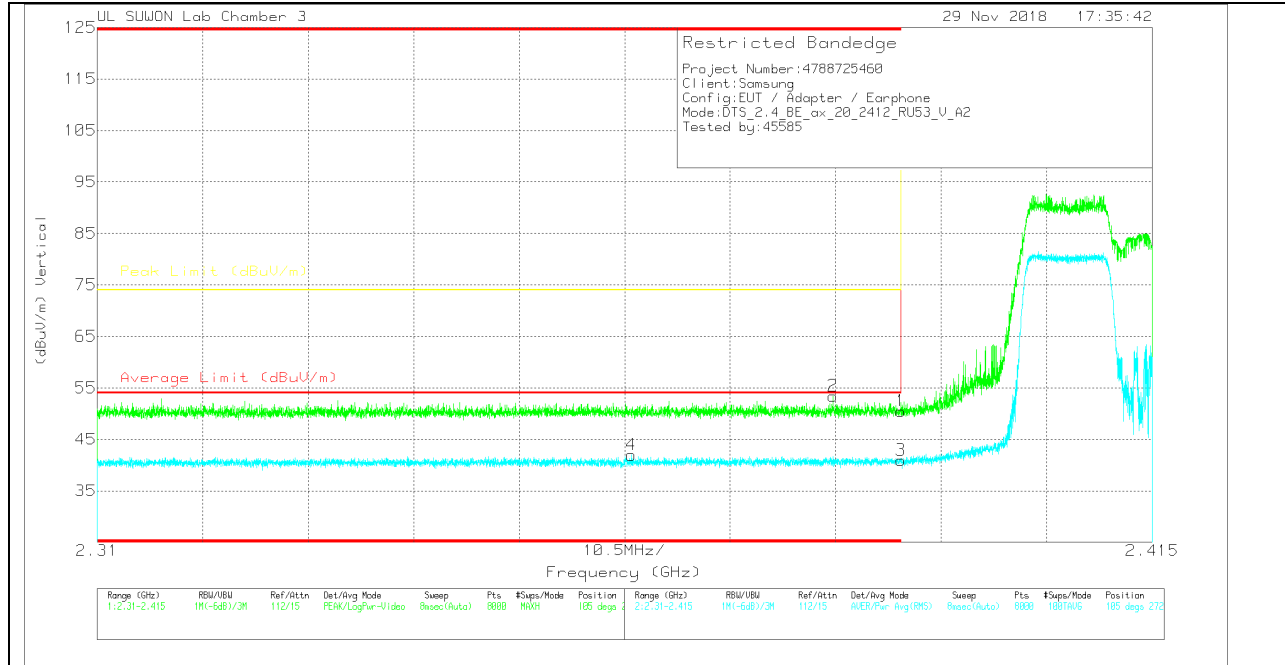
| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | 3117_00205959 | 10dB[dB] | DC Corr (dB) | Corrected Reading (dBuV/m) | Average Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|--------|-----------------|----------------------|-----|---------------|----------|--------------|----------------------------|------------------------|-------------|---------------------|----------------|----------------|-------------|----------|
| 1 | * 2.39 | 43.39 | Pk | 31.7 | -23.4 | 0 | 51.69 | - | - | 74 | -22.31 | 344 | 209 | H |
| 2 | * 2.39 | 46.05 | Pk | 31.7 | -23.4 | 0 | 54.35 | - | - | 74 | -19.65 | 344 | 209 | H |
| 3 | * 2.39 | 32.19 | RMS | 31.7 | -23.4 | .45 | 40.94 | 54 | -13.06 | - | - | 344 | 209 | H |
| 4 | * 2.387 | 33 | RMS | 31.7 | -23.4 | .45 | 41.75 | 54 | -12.25 | - | - | 344 | 209 | H |

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

RMS - RMS detection

VERTICAL PEAK AND AVERAGE PLOT



VERTICAL DATA

Trace Markers

| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | 3117_00209559 | 10dB(dB) | DC Corr (dB) | Corrected Reading (dBuV/m) | Average Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|--------|-----------------|----------------------|-----|---------------|----------|--------------|----------------------------|------------------------|-------------|---------------------|----------------|----------------|-------------|----------|
| 1 | * 2.39 | 42.21 | Pk | 31.7 | -23.4 | 0 | 50.51 | - | - | 74 | -23.49 | 105 | 272 | V |
| 2 | * 2.383 | 45.13 | Pk | 31.7 | -23.4 | 0 | 53.43 | - | - | 74 | -20.57 | 105 | 272 | V |
| 3 | * 2.39 | 32.2 | RMS | 31.7 | -23.4 | .45 | 40.95 | 54 | -13.05 | - | - | 105 | 272 | V |
| 4 | * 2.363 | 33.32 | RMS | 31.6 | -23.4 | .45 | 41.97 | 54 | -12.03 | - | - | 105 | 272 | V |

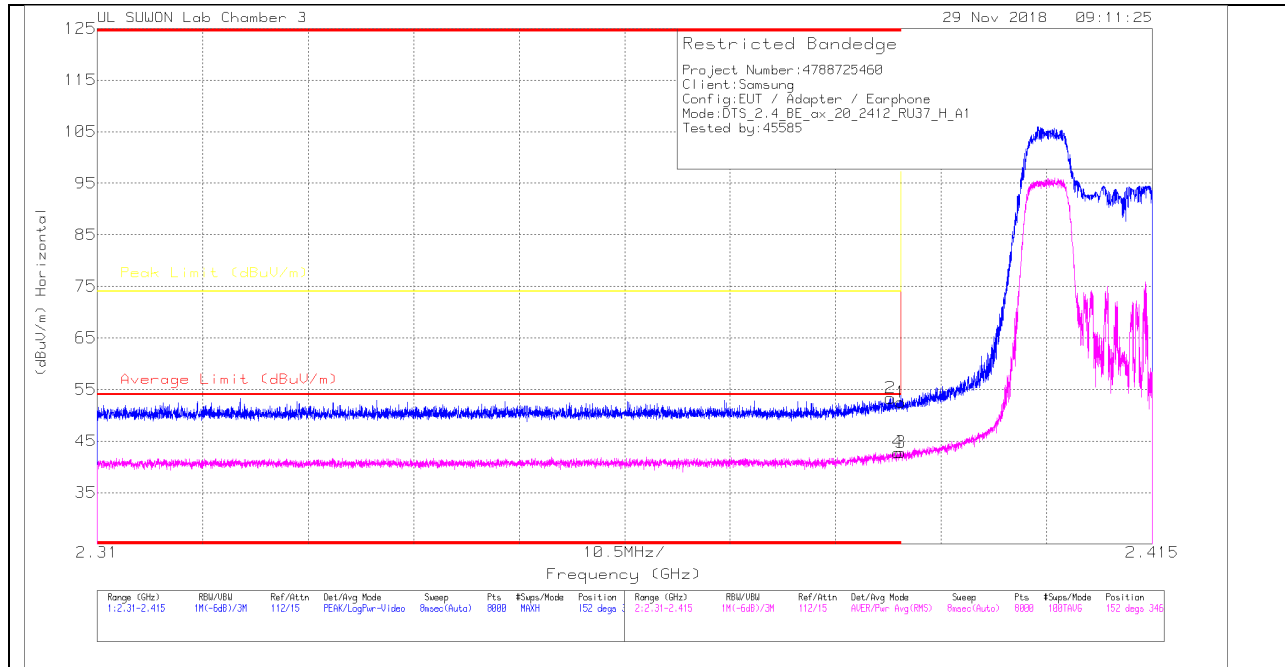
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

RMS - RMS detection

52T RU mode (ANT_1 / RU offset 37)

HORIZONTAL PEAK AND AVERAGE PLOT



HORIZONTAL DATA

Trace Markers

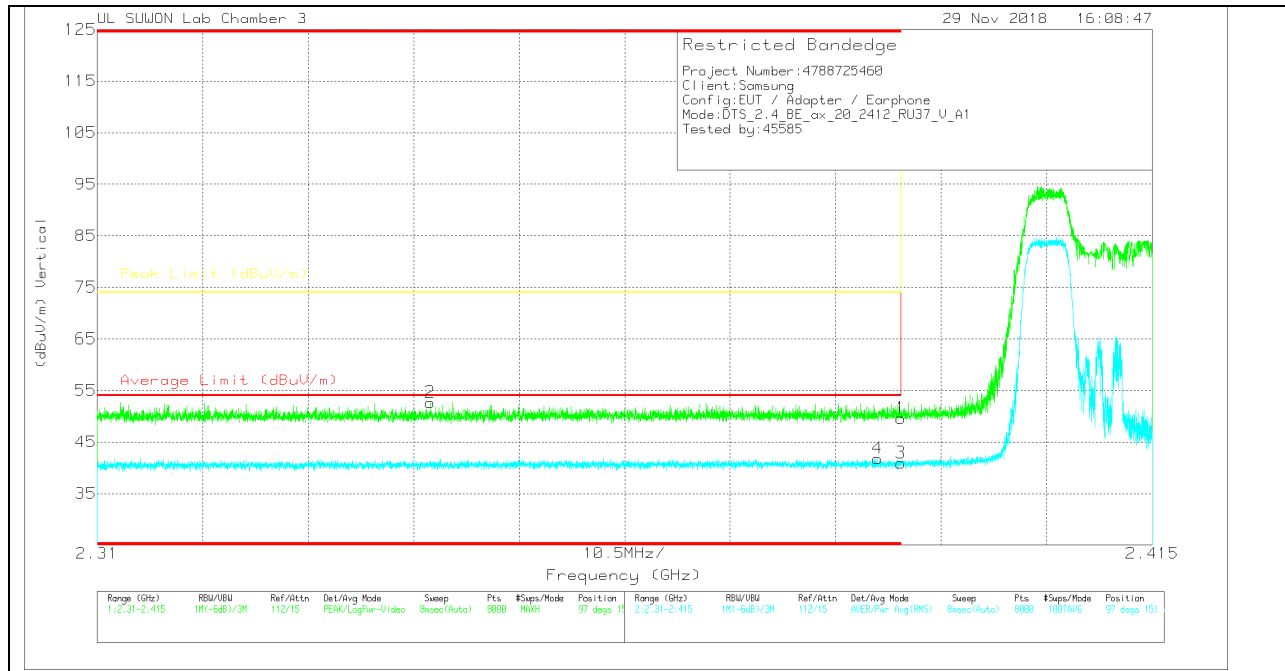
| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | 3117_00209959 | 10dB(dB) | DC Corr (dB) | Corrected Reading (dBuV/m) | Average Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|--------|-----------------|----------------------|-----|---------------|----------|--------------|----------------------------|------------------------|-------------|---------------------|----------------|----------------|-------------|----------|
| 1 | * 2.39 | 44.2 | Pk | 31.7 | -23.4 | 0 | 52.5 | - | - | 74 | -21.5 | 152 | 346 | H |
| 2 | * 2.389 | 45.03 | Pk | 31.7 | -23.4 | 0 | 53.33 | - | - | 74 | -20.67 | 152 | 346 | H |
| 3 | * 2.39 | 34.01 | RMS | 31.7 | -23.4 | .48 | 42.79 | 54 | -11.21 | - | - | 152 | 346 | H |
| 4 | * 2.39 | 34.03 | RMS | 31.7 | -23.4 | .48 | 42.81 | 54 | -11.19 | - | - | 152 | 346 | H |

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

RMS - RMS detection

VERTICAL PEAK AND AVERAGE PLOT



VERTICAL DATA

Trace Markers

| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | 3117_0020959 | 10dB(dB) | DC Corr (dB) | Corrected Reading (dBuV/m) | Average Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|--------|-----------------|----------------------|-----|--------------|----------|--------------|----------------------------|------------------------|-------------|---------------------|----------------|----------------|-------------|----------|
| 1 | * 2.39 | 41.32 | Pk | 31.7 | -23.4 | 0 | 49.62 | - | - | 74 | -24.38 | 97 | 151 | V |
| 2 | * 2.343 | 44.47 | Pk | 31.6 | -23.4 | 0 | 52.67 | - | - | 74 | -21.33 | 97 | 151 | V |
| 3 | * 2.39 | 32.17 | RMS | 31.7 | -23.4 | -48 | 40.95 | 54 | -13.05 | - | - | 97 | 151 | V |
| 4 | * 2.388 | 33.06 | RMS | 31.7 | -23.4 | -48 | 41.84 | 54 | -12.16 | - | - | 97 | 151 | V |

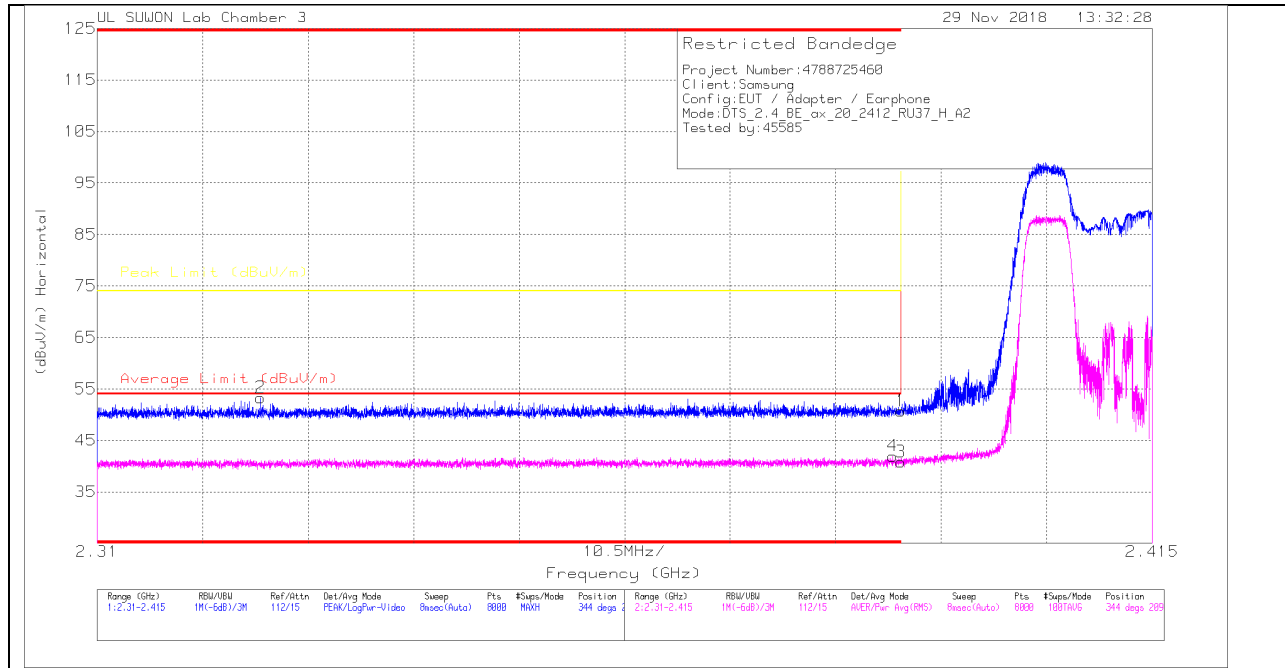
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

RMS - RMS detection

52T RU mode (ANT_2 / RU offset 37)

HORIZONTAL PEAK AND AVERAGE PLOT



HORIZONTAL DATA

Trace Markers

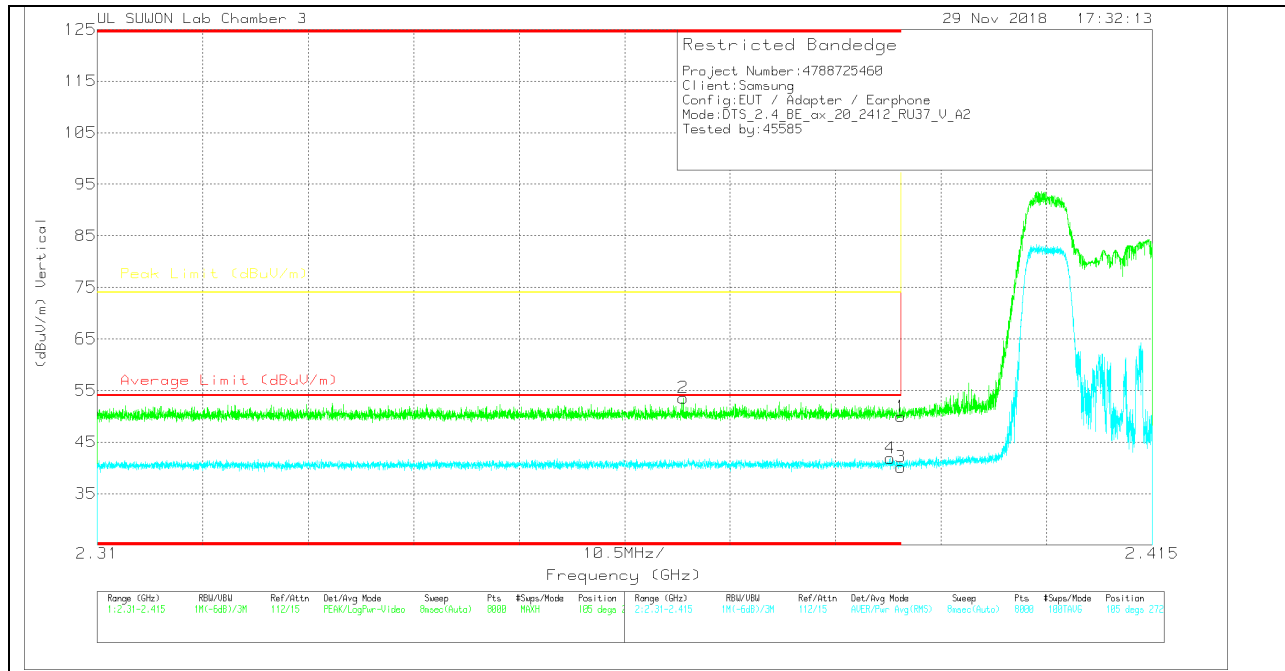
| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | 3117_00205959 | 10dB[dB] | DC Corr (dB) | Corrected Reading (dBuV/m) | Average Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|--------|-----------------|----------------------|-----|---------------|----------|--------------|----------------------------|------------------------|-------------|---------------------|----------------|----------------|-------------|----------|
| 1 | * 2.39 | 42.43 | Pk | 31.7 | -23.4 | 0 | 50.73 | - | - | 74 | -23.27 | 344 | 209 | H |
| 2 | * 2.326 | 45.19 | Pk | 31.5 | -23.4 | 0 | 53.29 | - | - | 74 | -20.71 | 344 | 209 | H |
| 3 | * 2.39 | 32.04 | RMS | 31.7 | -23.4 | .48 | 40.82 | 54 | -13.18 | - | - | 344 | 209 | H |
| 4 | * 2.389 | 33.18 | RMS | 31.7 | -23.4 | .48 | 41.96 | 54 | -12.04 | - | - | 344 | 209 | H |

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

RMS - RMS detection

VERTICAL PEAK AND AVERAGE PLOT



VERTICAL DATA

Trace Markers

| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | 3117_0020959 | 10dB(dB) | DC Corr (dB) | Corrected Reading (dBuV/m) | Average Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|--------|-----------------|----------------------|-----|--------------|----------|--------------|----------------------------|------------------------|-------------|---------------------|----------------|----------------|-------------|----------|
| 1 | * 2.39 | 41.66 | Pk | 31.7 | -23.4 | 0 | 49.96 | - | - | 74 | -24.04 | 105 | 272 | V |
| 2 | * 2.368 | 45.37 | Pk | 31.6 | -23.4 | 0 | 53.57 | - | - | 74 | -20.43 | 105 | 272 | V |
| 3 | * 2.39 | 31.36 | RMS | 31.7 | -23.4 | -48 | 40.14 | 54 | -13.86 | - | - | 105 | 272 | V |
| 4 | * 2.389 | 33.08 | RMS | 31.7 | -23.4 | -48 | 41.86 | 54 | -12.14 | - | - | 105 | 272 | V |

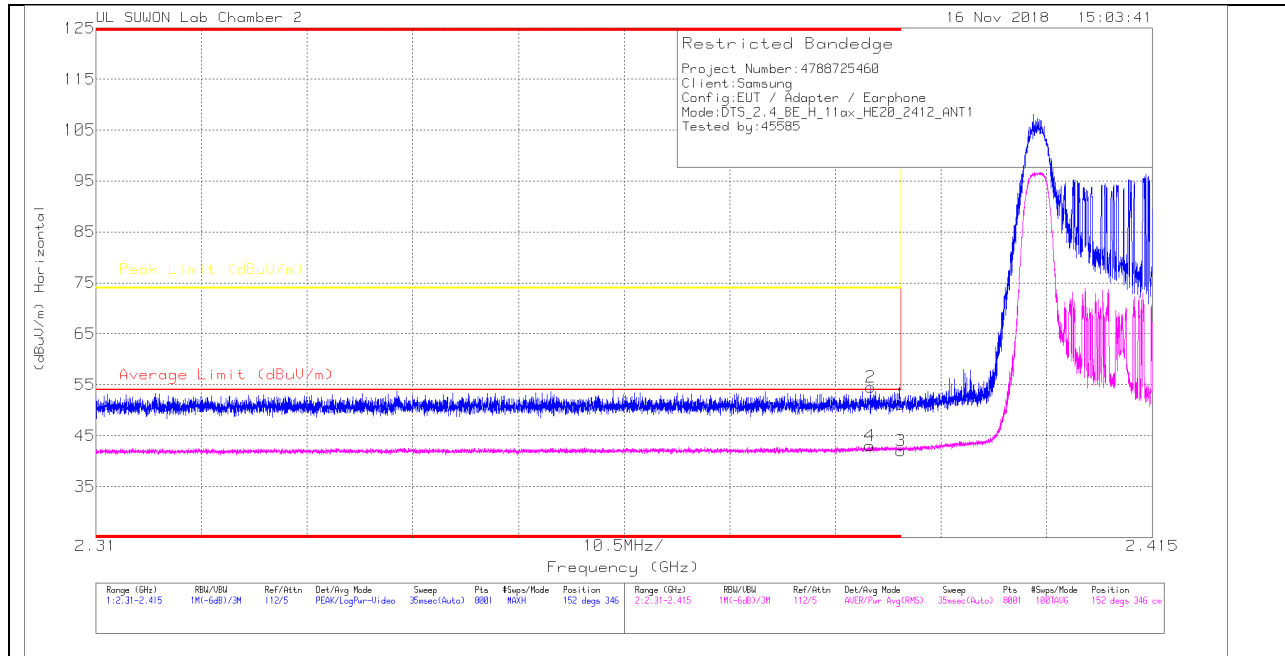
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

RMS - RMS detection

26T RU mode (ANT_1 / RU offset 0)

HORIZONTAL PEAK AND AVERAGE PLOT



HORIZONTAL DATA

Trace Markers

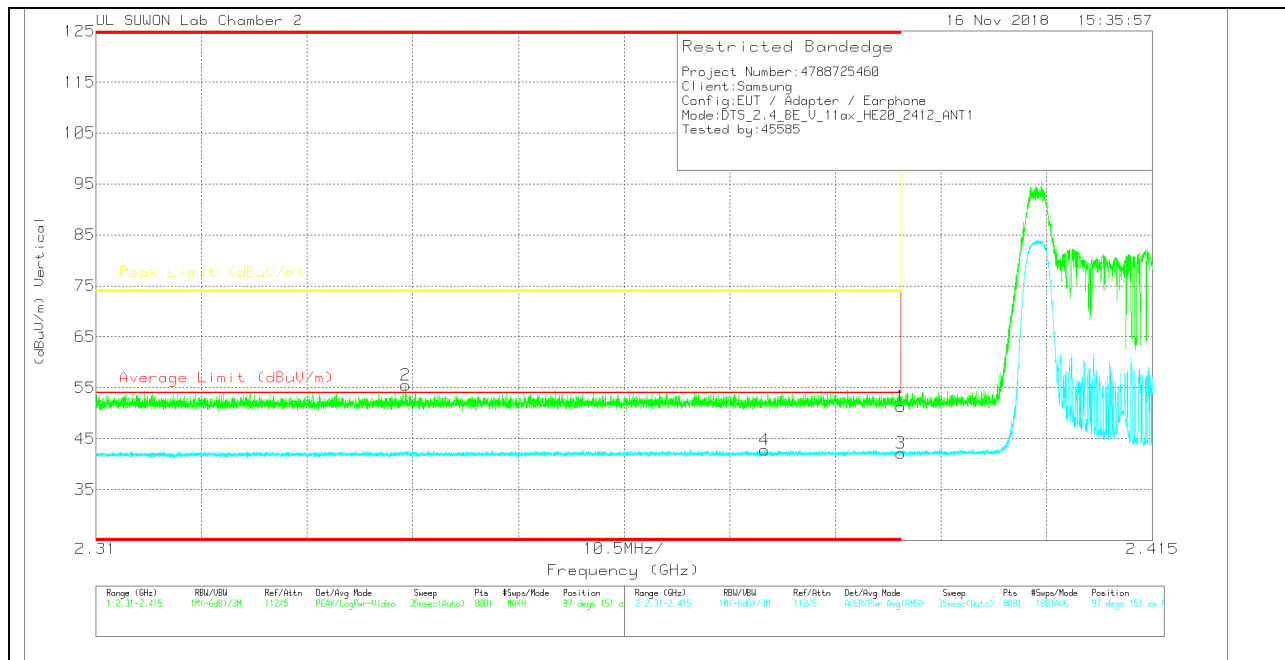
| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | 3117_00168724 | 10dB(dB) | DC Corr (dB) | Corrected Reading (dBuV/m) | Average Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|--------|-----------------|----------------------|-----|---------------|----------|--------------|----------------------------|------------------------|-------------|---------------------|----------------|----------------|-------------|----------|
| 1 | * 2.39 | 40.45 | Pk | 31.6 | -20.8 | 0 | 51.25 | - | - | 74 | -22.75 | 152 | 346 | H |
| 2 | * 2.387 | 43.72 | Pk | 31.6 | -20.8 | 0 | 54.52 | - | - | 74 | -19.48 | 152 | 346 | H |
| 3 | * 2.39 | 30.79 | RMS | 31.6 | -20.8 | .49 | 42.08 | 54 | -11.92 | - | - | 152 | 346 | H |
| 4 | * 2.387 | 31.76 | RMS | 31.6 | -20.8 | .49 | 43.05 | 54 | -10.95 | - | - | 152 | 346 | H |

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

RMS - RMS detection

VERTICAL PEAK AND AVERAGE PLOT



VERTICAL DATA

Trace Markers

| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | 3117_00168724 | 10dB(dB) | DC Corr (dB) | Corrected Reading (dBuV/m) | Average Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|--------|-----------------|----------------------|-----|---------------|----------|--------------|----------------------------|------------------------|-------------|---------------------|----------------|----------------|-------------|----------|
| 1 | * 2.39 | 40.52 | PK | 31.6 | -20.8 | 0 | 51.32 | - | - | 74 | -22.68 | 97 | 151 | V |
| 2 | * 2.341 | 44.78 | PK | 31.5 | -20.8 | 0 | 55.48 | - | - | 74 | -18.52 | 97 | 151 | V |
| 3 | * 2.39 | 30.87 | RMS | 31.6 | -20.8 | .49 | 42.16 | 54 | -11.84 | - | - | 97 | 151 | V |
| 4 | * 2.376 | 31.49 | RMS | 31.6 | -20.8 | .49 | 42.78 | 54 | -11.22 | - | - | 97 | 151 | V |

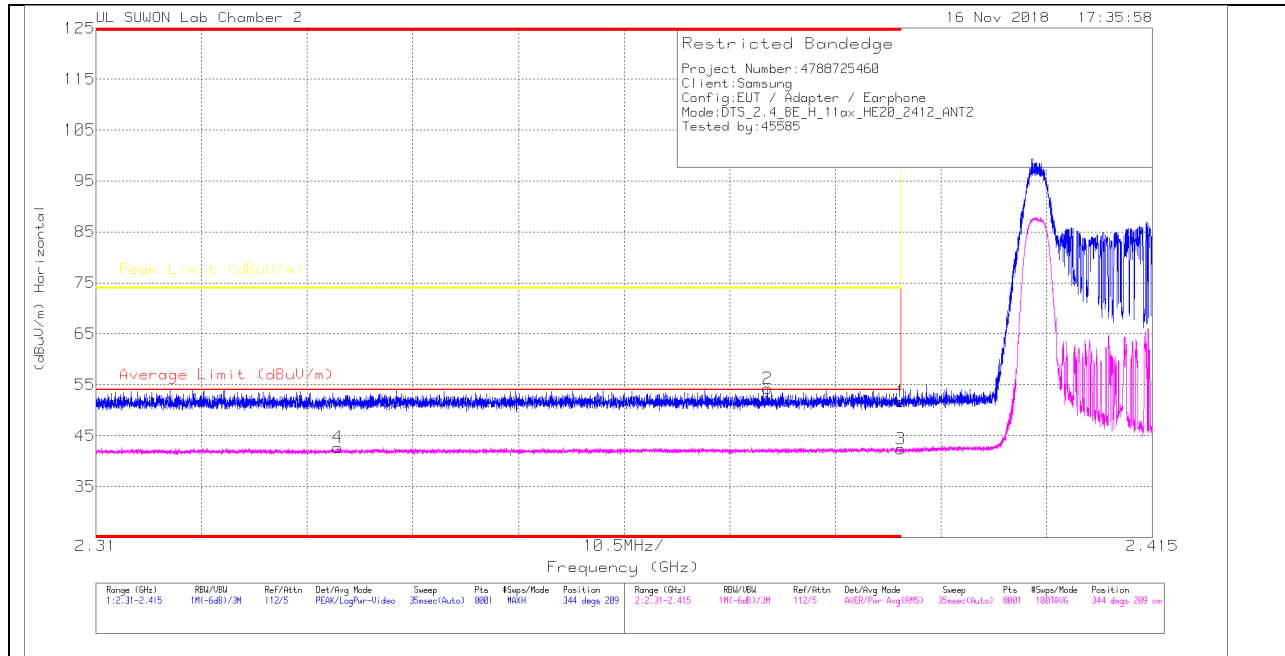
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

PK - Peak detector

RMS - RMS detection

26T RU mode (ANT_2 / RU offset 0)

HORIZONTAL PEAK AND AVERAGE PLOT



HORIZONTAL DATA

Trace Markers

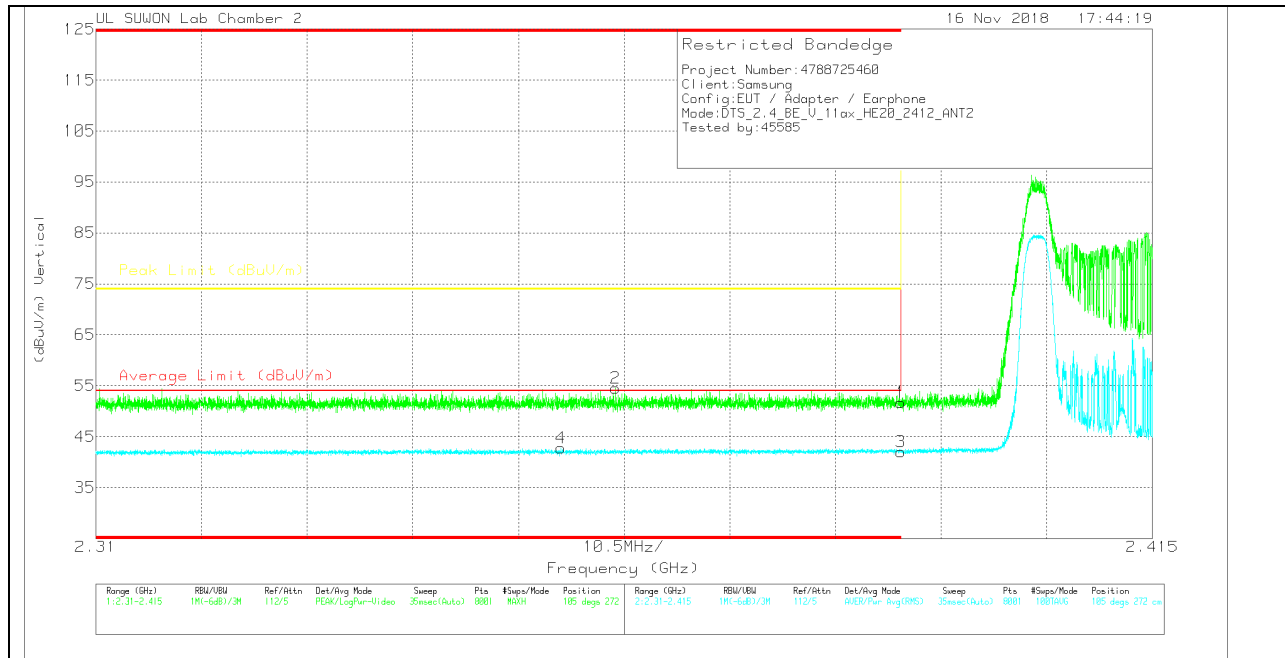
| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | 3117_00168724 | 10dB(dB) | DC Corr (dB) | Corrected Reading (dBuV/m) | Average Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|--------|-----------------|----------------------|-----|---------------|----------|--------------|----------------------------|------------------------|-------------|---------------------|----------------|----------------|-------------|----------|
| 1 | * 2.39 | 40.9 | PK | 31.6 | -20.8 | 0 | 51.7 | - | - | 74 | -22.3 | 344 | 209 | H |
| 2 | * 2.377 | 43.45 | PK | 31.6 | -20.8 | 0 | 54.25 | - | - | 74 | -19.75 | 344 | 209 | H |
| 3 | * 2.39 | 31.07 | RMS | 31.6 | -20.8 | .49 | 42.36 | 54 | -11.64 | - | - | 344 | 209 | H |
| 4 | * 2.334 | 31.53 | RMS | 31.5 | -20.8 | .49 | 42.72 | 54 | -11.28 | - | - | 344 | 209 | H |

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

PK - Peak detector

RMS - RMS detection

VERTICAL PEAK AND AVERAGE PLOT



VERTICAL DATA

Trace Markers

| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | 3117_00168724 | 10dB(dB) | DC Corr (dB) | Corrected Reading (dBuV/m) | Average Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|--------|-----------------|----------------------|-----|---------------|----------|--------------|----------------------------|------------------------|-------------|---------------------|----------------|----------------|-------------|----------|
| 1 | * 2.39 | 40.9 | Pk | 31.6 | -20.8 | 0 | 51.7 | - | - | 74 | -22.3 | 105 | 272 | V |
| 2 | * 2.362 | 43.69 | Pk | 31.6 | -20.8 | 0 | 54.49 | - | - | 74 | -19.51 | 105 | 272 | V |
| 3 | * 2.39 | 30.78 | RMS | 31.6 | -20.8 | .49 | 42.07 | 54 | -11.93 | - | - | 105 | 272 | V |
| 4 | * 2.356 | 31.47 | RMS | 31.6 | -20.8 | .49 | 42.76 | 54 | -11.24 | - | - | 105 | 272 | V |

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

RMS - RMS detection