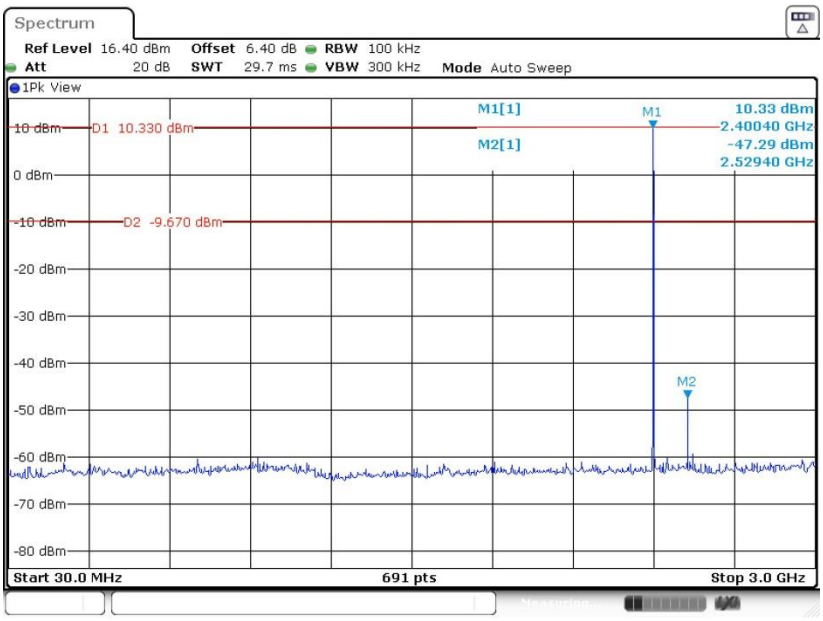
## 3.7.5 Test Result of Conducted Spurious Emission

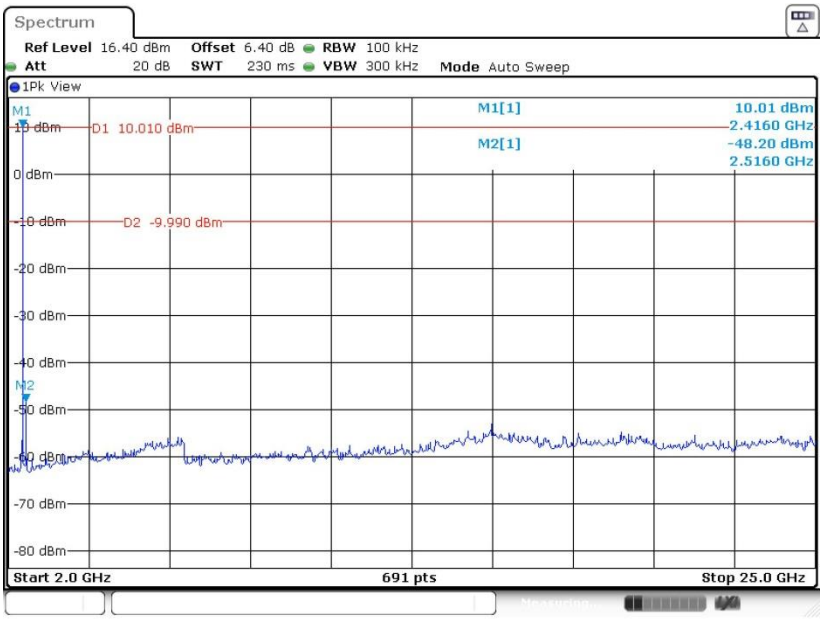
**<1Mbps>**

**CSE Plot on Ch 00 between 30MHz ~ 3 GHz**



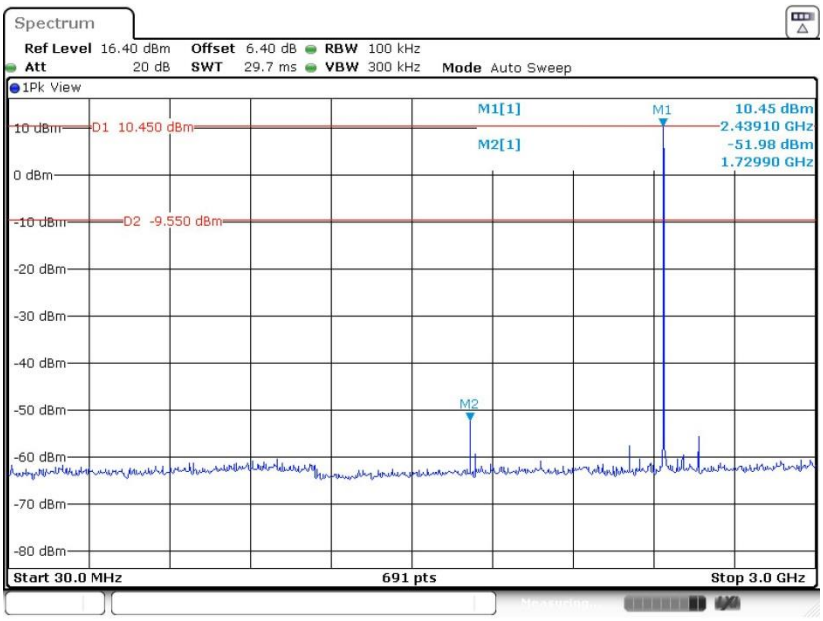

Date: 24.OCT.2019 16:00:15

**1Mbps CSE Plot on Ch 00 between 2 GHz ~ 25 GHz**



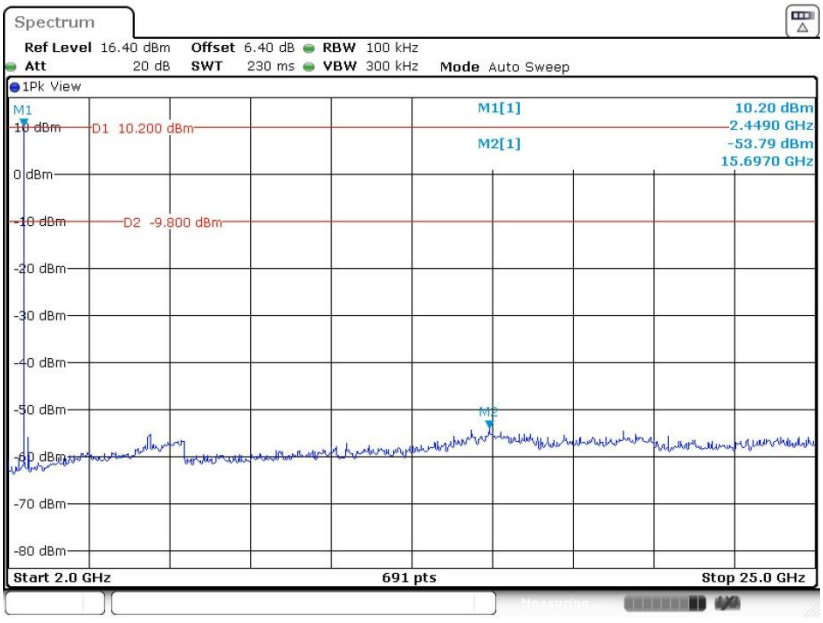

Date: 24.OCT.2019 16:00:45

**CSE Plot on Ch 39 between 30MHz ~ 3 GHz**



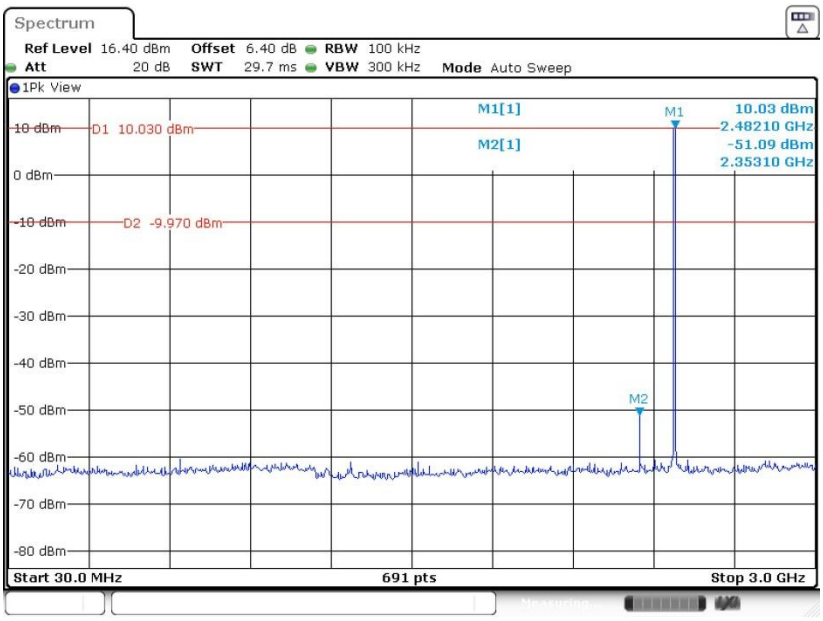

Date: 24.OCT.2019 16:43:29

**CSE Plot on Ch 39 between 2 GHz ~ 25 GHz**



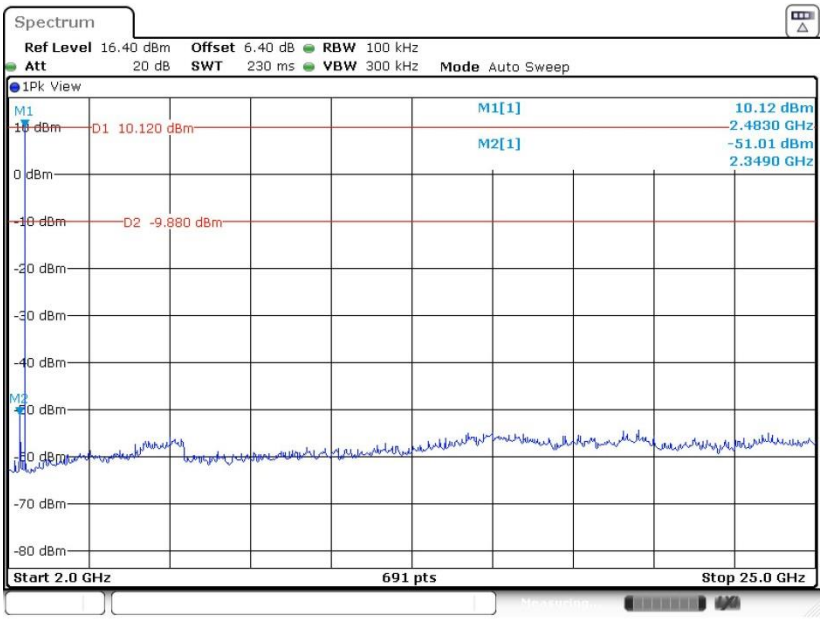

Date: 24.OCT.2019 16:43:56

### CSE Plot on Ch 78 between 30MHz ~ 3 GHz




Date: 24.OCT.2019 16:51:16

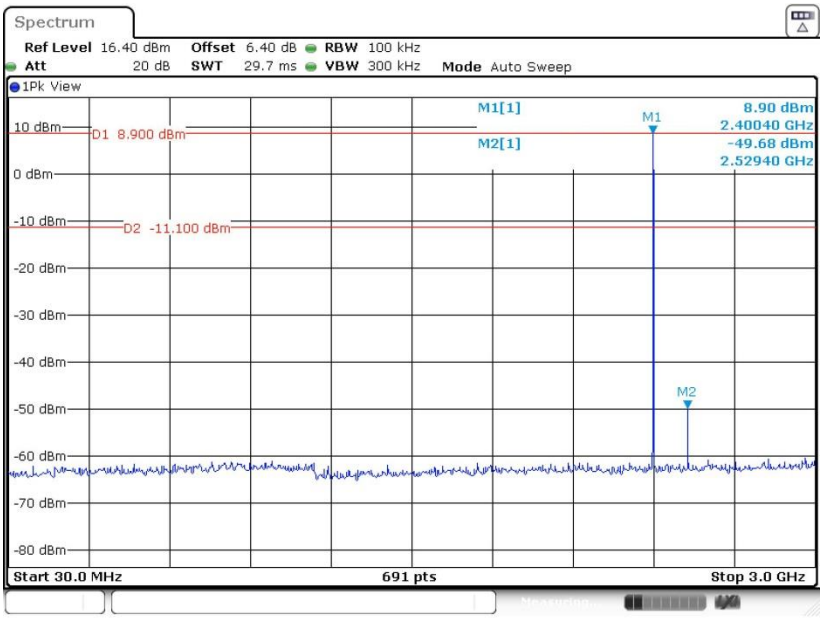
### CSE Plot on Ch 78 between 2 GHz ~ 25 GHz




Date: 24.OCT.2019 16:51:47

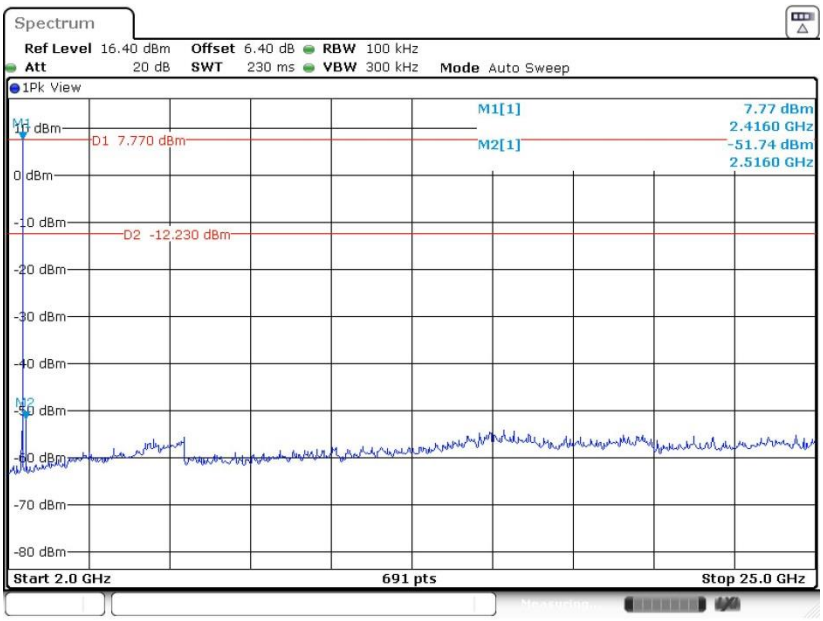
**<2Mbps>**

**CSE Plot on Ch 00 between 30MHz ~ 3 GHz**



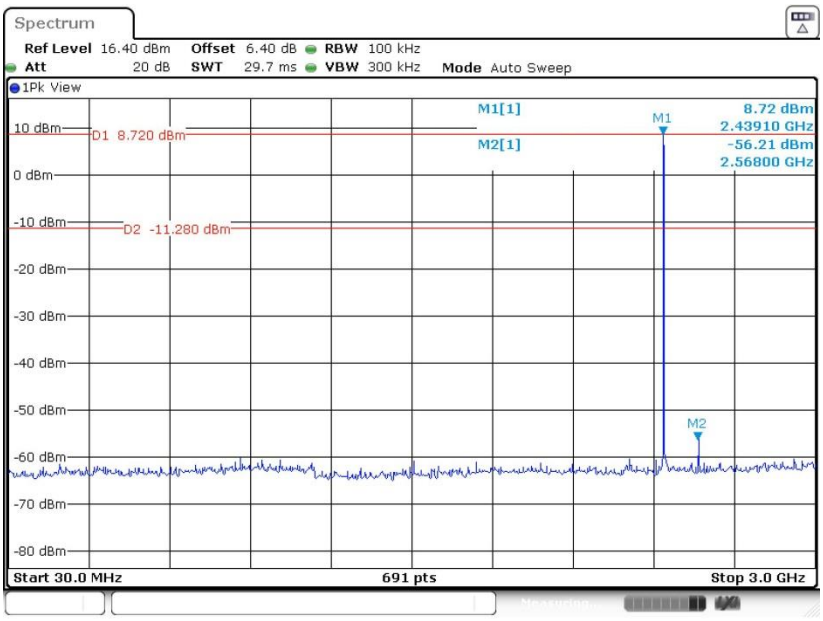

Date: 24.OCT.2019 16:12:21

**CSE Plot on Ch 00 between 2 GHz ~ 25 GHz**



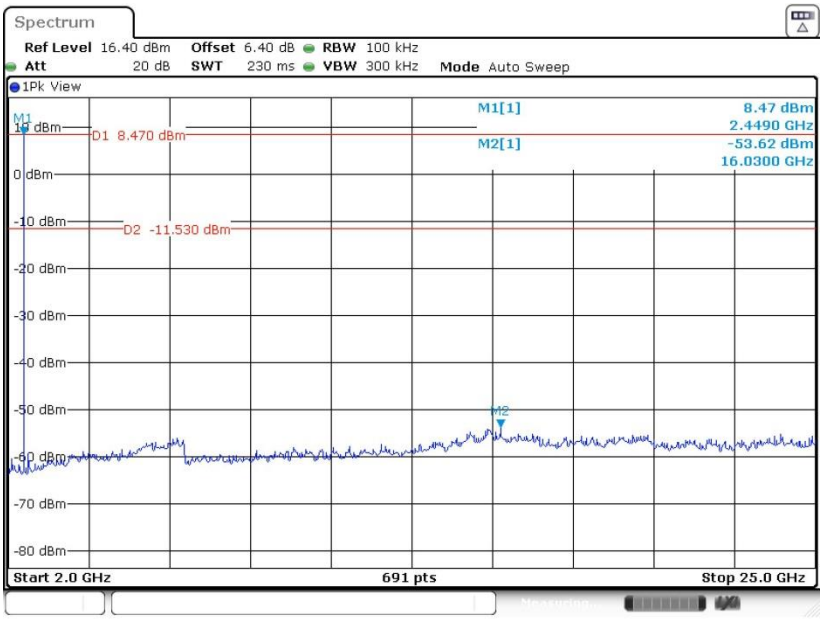

Date: 24.OCT.2019 16:12:48

### CSE Plot on Ch 39 between 30MHz ~ 3 GHz



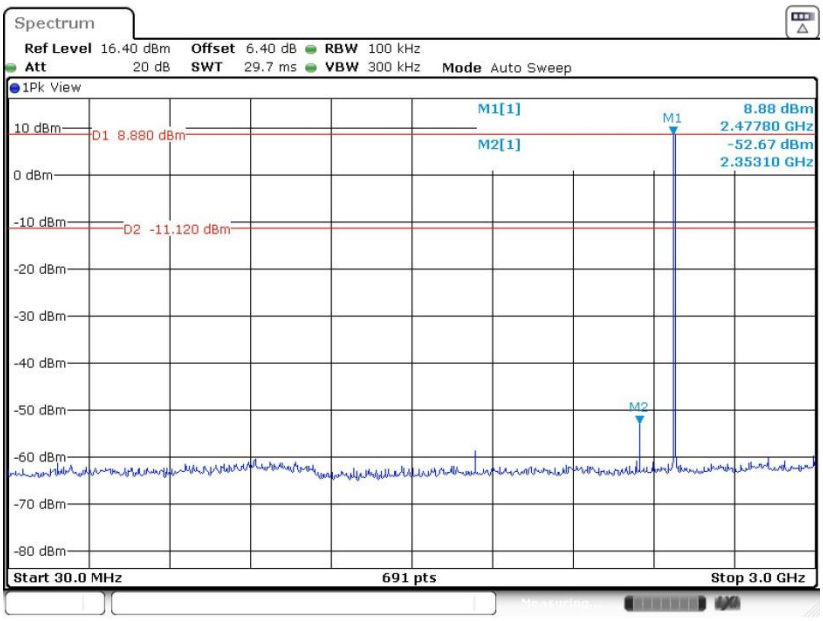

Date: 24.OCT.2019 16:35:58

### CSE Plot on Ch 39 between 2 GHz ~ 25 GHz



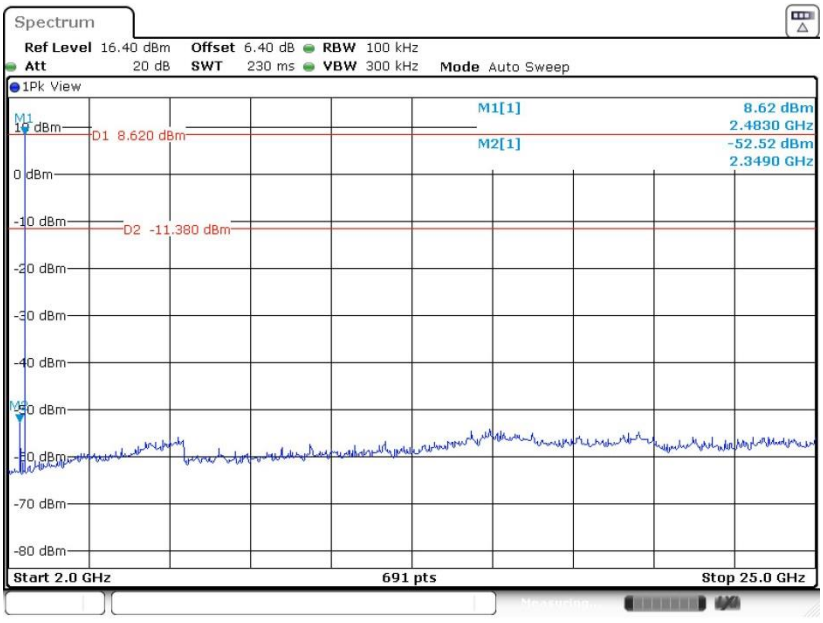

Date: 24.OCT.2019 16:36:29

**CSE Plot on Ch 78 between 30MHz ~ 3 GHz**




Date: 24.OCT.2019 16:57:11

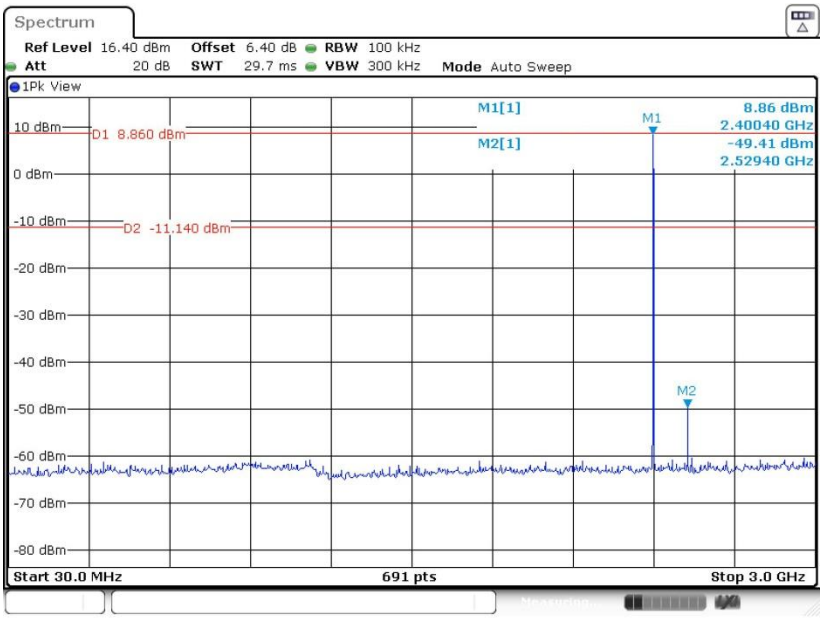
**CSE Plot on Ch 78 between 2 GHz ~ 25 GHz**




Date: 24.OCT.2019 16:57:45

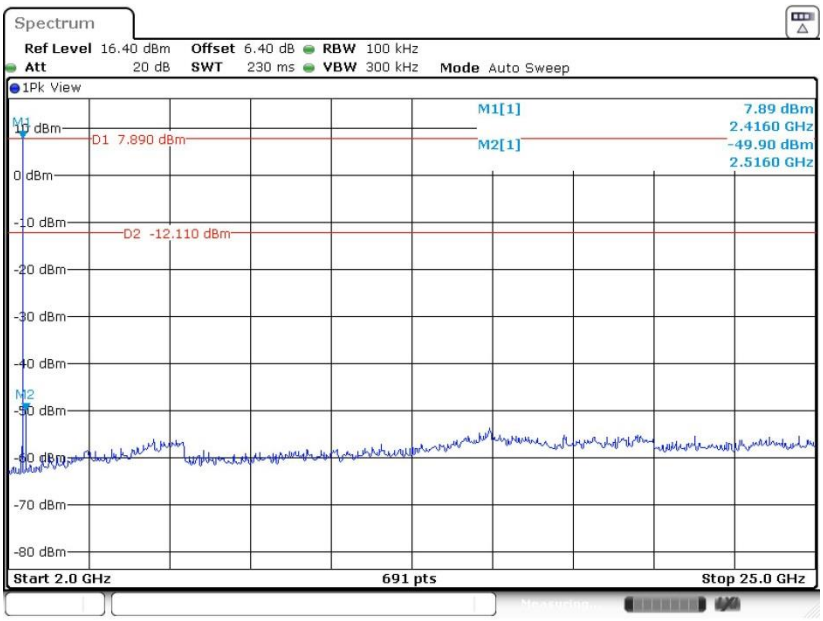
**<3Mbps>**

**CSE Plot on Ch 00 between 30MHz ~ 3 GHz**



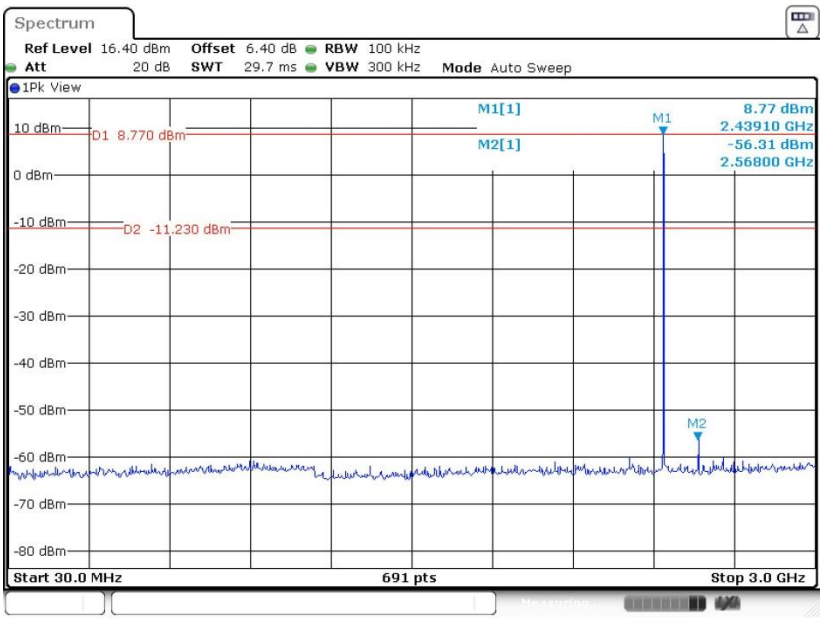

Date: 24.OCT.2019 16:19:14

**CSE Plot on Ch 00 between 2 GHz ~ 25 GHz**



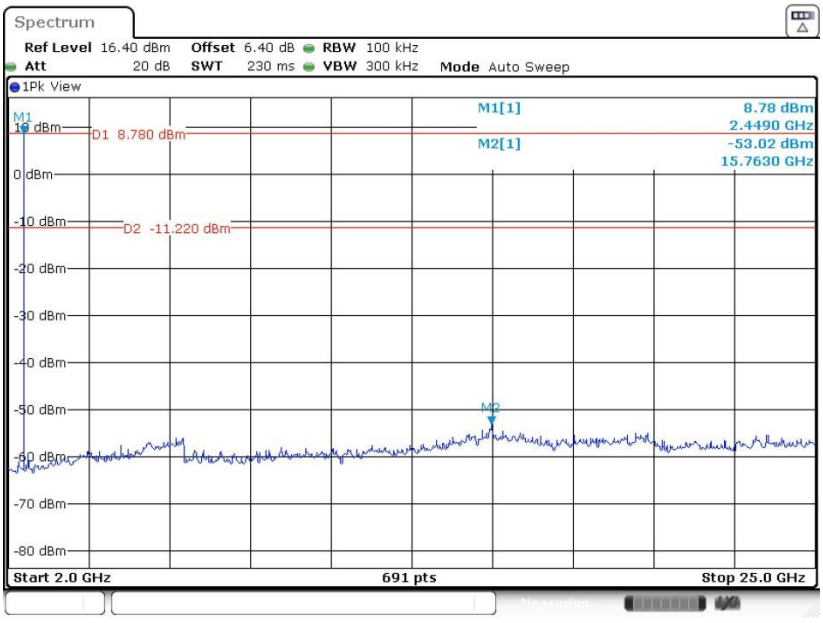

Date: 24.OCT.2019 16:19:47

### CSE Plot on Ch 39 between 30MHz ~ 3 GHz



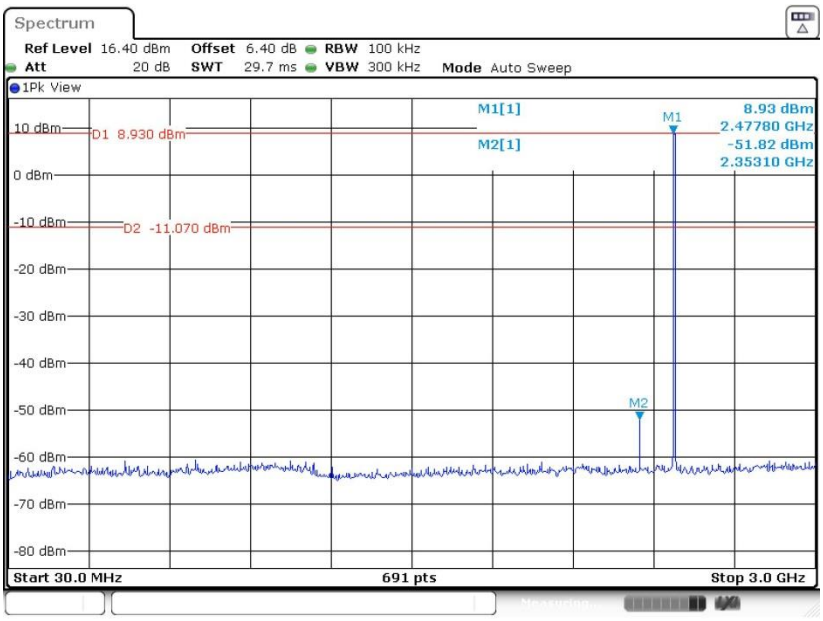

Date: 24.OCT.2019 16:28:07

### CSE Plot on Ch 39 between 2 GHz ~ 25 GHz



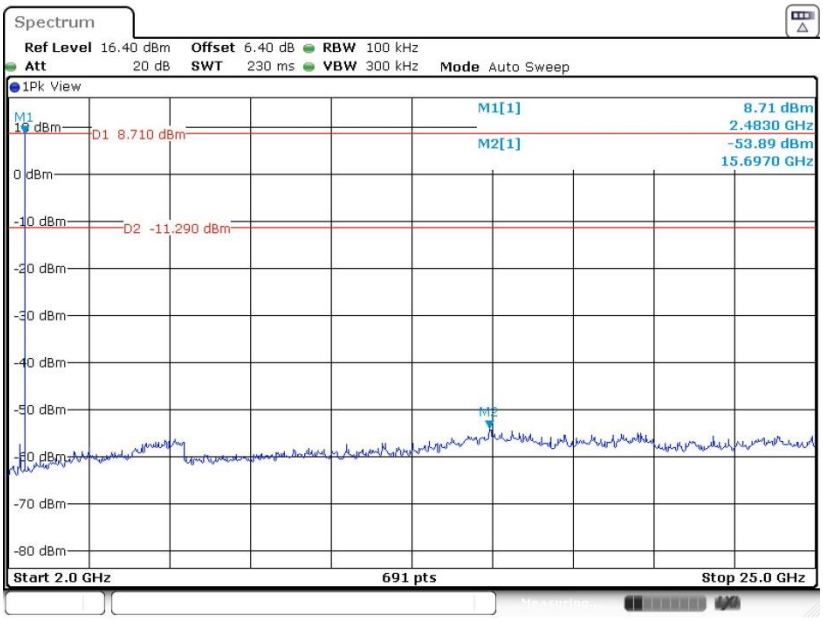

Date: 24.OCT.2019 16:28:36

### CSE Plot on Ch 78 between 30MHz ~ 3 GHz




Date: 24.OCT.2019 17:02:45

### CSE Plot on Ch 78 between 2 GHz ~ 25 GHz




Date: 24.OCT.2019 17:03:14

# 3.8 Radiated Band Edges and Spurious Emission Measurement

## 3.8.1 Limit of Radiated Band Edges and Spurious Emission

In any 100 kHz bandwidth outside the intentional radiator frequency band, all harmonics/spurious must be at least 20 dB below the highest emission level within the authorized band. In addition, radiated emissions which fall in the restricted bands must also comply with the limits as below.

| Frequency (MHz) | Field Strength (microvolts/meter) | Measurement Distance (meters) |
|---|---|---|
| 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 |

## 3.8.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

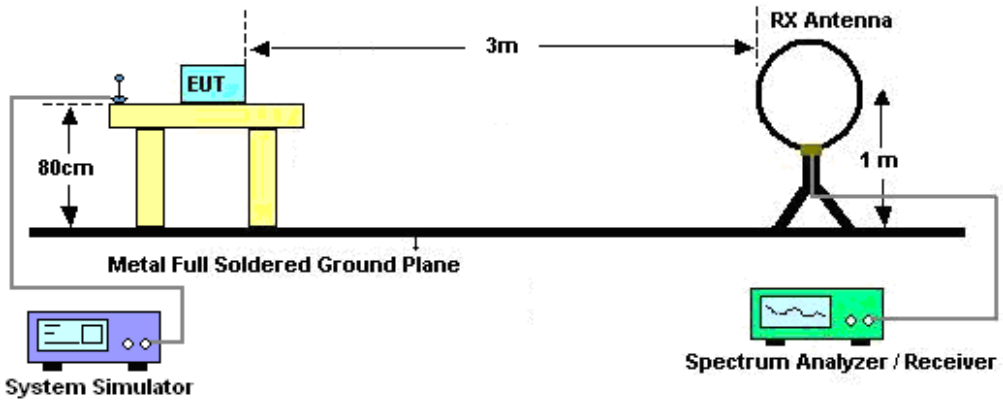
### 3.8.3 Test Procedures

1. The EUT was placed on a turntable with 0.8 meter for frequency below 1GHz and 1.5 meter for frequency above 1GHz respectively above ground.
2. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
3. For each suspected emission, the EUT was arranged to its worst case and then tune the Antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level to comply with the guidelines.
4. Set to the maximum power setting and enable the EUT transmit continuously.
5. Use the following spectrum analyzer settings:
   (1) Span shall wide enough to fully capture the emission being measured;
   (2) Set RBW=100 kHz for f < 1 GHz, RBW=1MHz for f>1GHz ; VBW ≥ RBW; Sweep = auto; Detector function = peak; Trace = max hold for peak
   (3) For average measurement: use duty cycle correction factor method per 15.35(c).
   Duty cycle = On time/100 milliseconds
   On time = $N_1*L_1+N_2*L_2+...+N_{n-1}*LN_{n-1}+N_n*L_n$
   Where $N_1$ is number of type 1 pulses, $L_1$ is length of type 1 pulses, etc.
   Average Emission Level = Peak Emission Level + 20*log(Duty cycle)
6. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level
7. For testing below 1GHz, if the emission level of the EUT in peak mode was 3 dB lower than the limit specified, then peak values of EUT will be reported, otherwise, the emissions will be repeated one by one using the CISPR quasi-peak method and reported.
8. For testing above 1GHz, the emission level of the EUT in peak mode was 20dB lower than average limit (that means the emission level in average mode also complies with the limit in average mode), then peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.

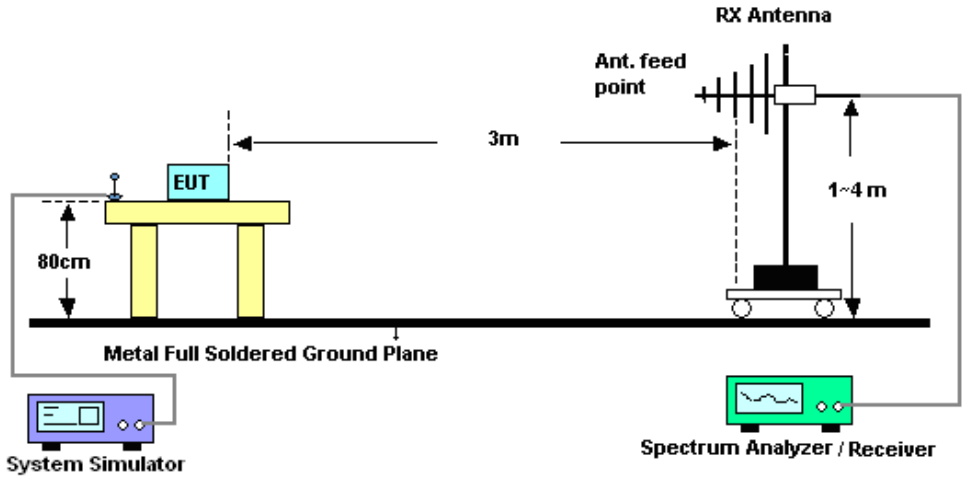
Note: The average levels were calculated from the peak level corrected with duty cycle correction factor (-24.76dB) derived from 20log (dwell time/100ms). This correction is only for signals that hop with the fundamental signal, such as band-edge and harmonic. Other spurious signals that are independent of the hopping signal would not use this correction.

## 3.8.4 Test Setup

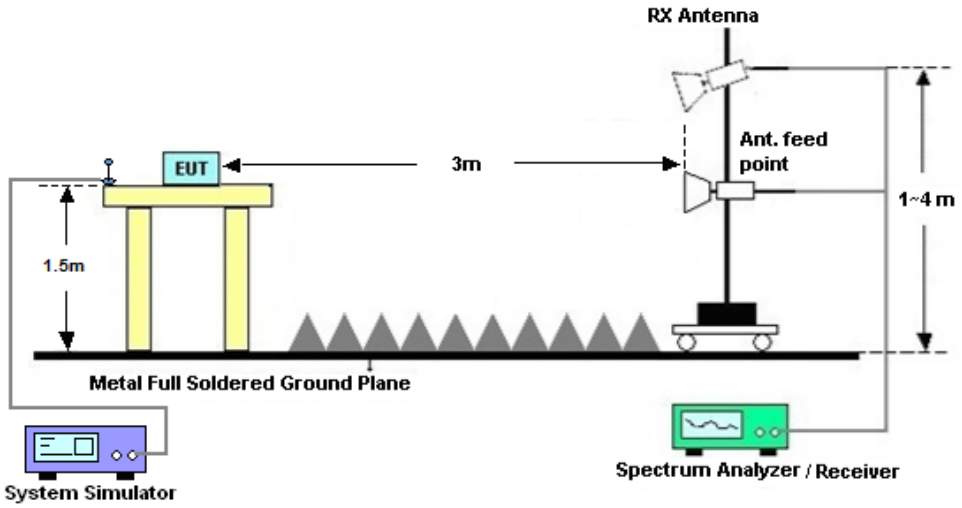
**For radiated emissions below 30MHz**




**For radiated emissions from 30MHz to 1GHz**




**For radiated emissions above 1GHz**



### 3.8.5 Test Results of Radiated Spurious Emissions (9 kHz ~ 30 MHz)

The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line was not reported.

There is a comparison data of both open-field test site and semi-Anechoic chamber, and the result came out very similar.

### 3.8.6 Test Result of Radiated Spurious at Band Edges

Please refer to Appendix C.

### 3.8.7 Test Result of Radiated Spurious Emission (30MHz ~ 10$^{th}$ Harmonic)

Please refer to Appendix C.

### 3.8.8 Duty cycle correction factor for average measurement

Please refer to Appendix D.

# 3.9 AC Conducted Emission Measurement

## 3.9.1 Limit of AC Conducted Emission

For equipment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table.

| Frequency of emission (MHz) | Conducted limit (dBμV) | |
|---|---|---|
| | Quasi-peak | Average |
| 0.15-0.5 | 66 to 56* | 56 to 46* |
| 0.5-5 | 56 | 46 |
| 5-30 | 60 | 50 |

*Decreases with the logarithm of the frequency.

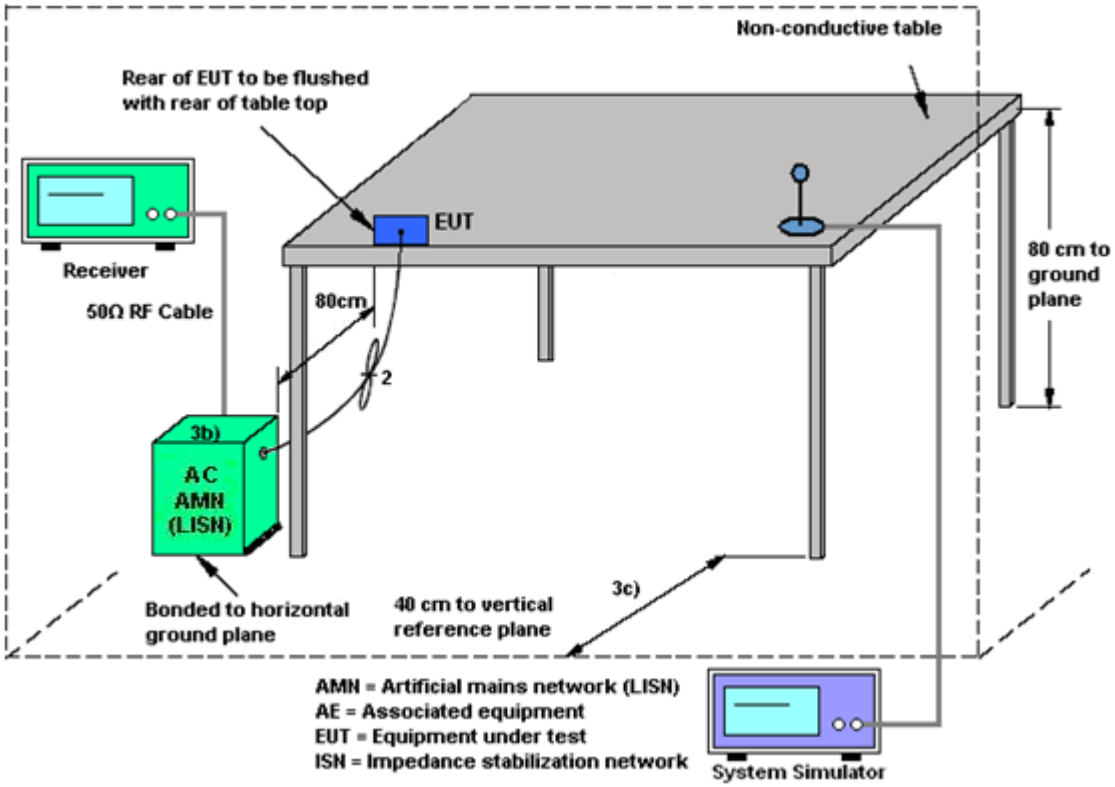
## 3.9.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

## 3.9.3 Test Procedures

1. The EUT was placed 0.4 meter from the conducting wall of the shielding room was kept at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connecting to the other LISN.
4. The LISN provides 50 ohm coupling impedance for the measuring instrument.
5. The FCC states that a 50 ohm, 50 microhenry LISN should be used.
6. Both sides of AC line were checked for maximum conducted interference.
7. The frequency range from 150 kHz to 30 MHz was searched.
8. Set the test-receiver system to Peak Detect Function and specified bandwidth (IF Bandwidth = 9kHz) with Maximum Hold Mode. Then measurement is also conducted by Average Detector and Quasi-Peak Detector Function respectively.

### 3.9.4 Test Setup




### 3.9.5 Test Result of AC Conducted Emission

Please refer to Appendix B.

# 3.10 Antenna Requirements

## 3.10.1 Standard Applicable

If directional gain of transmitting antennas is greater than 6dBi, the power shall be reduced by the same level in dB comparing to gain minus 6dBi. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the rule.

## 3.10.2 Antenna Anti-Replacement Construction

An embedded-in antenna design is used.

## 3.10.3 Antenna Gain

The antenna peak gain of EUT is less than 6 dBi. Therefore, it is not necessary to reduce maximum peak output power limit.

# 4 List of Measuring Equipment

| Instrument | Manufacturer | Model No. | Serial No. | Characteristics | Calibration Date | Test Date | Due Date | Remark |
|---|---|---|---|---|---|---|---|---|
| Spectrum Analyzer | R&S | FSV30 | 101338 | 10Hz~30GHz | Apr. 16, 2019 | Oct. 24, 2019 | Apr. 15, 2020 | Conducted (TH01-KS) |
| Pulse Power Senor | Anritsu | MA2411B | 0917070 | 300MHz~40GHz | Jan. 14, 2019 | Oct. 24, 2019 | Jan. 13, 2020 | Conducted (TH01-KS) |
| Power Meter | Anritsu | ML2495A | 1005002 | 50MHz Bandwidth | Jan. 14, 2019 | Oct. 24, 2019 | Jan. 13, 2020 | Conducted (TH01-KS) |
| EMI Test Receiver | Keysight | N9038A | MY57290151 | 3Hz~8.5GHz;Max 30dBm | Jul. 18, 2019 | Nov. 13, 2019 | Jul. 17, 2020 | Radiation (03CH05-KS) |
| EXA Spectrum Analyzer | Keysight | N9010A | MY55150244 | 10Hz-44G,MAX 30dB | Apr. 16, 2019 | Nov. 13, 2019 | Apr. 15, 2020 | Radiation (03CH05-KS) |
| Loop Antenna | R&S | HFH2-Z2 | 100321 | 9kHz~30MHz | Nov. 10, 2019 | Nov. 13, 2019 | Nov. 09, 2020 | Radiation (03CH05-KS) |
| Bilog Antenna | TeseQ | CBL6111D | 49922 | 30MHz-1GHz | May 30, 2019 | Nov. 13, 2019 | May 29, 2020 | Radiation (03CH05-KS) |
| Double Ridge Horn Antenna | ETS-Lindgren | 3117 | 75959 | 1GHz~18GHz | Jan. 27, 2019 | Nov. 13, 2019 | Jan. 26, 2020 | Radiation (03CH05-KS) |
| SHF-EHF Horn | Com-power | AH-840 | 101070 | 18GHz~40GHz | Jan. 05, 2019 | Nov. 13, 2019 | Jan. 04, 2020 | Radiation (03CH05-KS) |
| Amplifier | SONOMA | 310N | 187289 | 9KHz-1GHz | Aug. 06, 2019 | Nov. 13, 2019 | Aug. 05, 2020 | Radiation (03CH05-KS) |
| Amplifier | MITEQ | TTA1840-35-HG | 2014749 | 18~40GHz | Jan. 14, 2019 | Nov. 13, 2019 | Jan. 13, 2020 | Radiation (03CH05-KS) |
| high gain Amplifier | MITEQ | AMF-7D-00101800-30-10P | 2025788 | 1Ghz-18Ghz | Aug. 17, 2019 | Nov. 13, 2019 | Aug. 16, 2020 | Radiation (03CH05-KS) |
| Amplifier | Keysight | 83017A | MY53270316 | 500MHz~26.5GHz | Oct. 18, 2019 | Nov. 13, 2019 | Oct. 17, 2020 | Radiation (03CH05-KS) |
| AC Power Source | Chroma | 61601 | F104090004 | N/A | NCR | Nov. 13, 2019 | NCR | Radiation (03CH05-KS) |
| Turn Table | ChamPro | EM 1000-T | 060762-T | 0~360 degree | NCR | Nov. 13, 2019 | NCR | Radiation (03CH05-KS) |
| Antenna Mast | ChamPro | EM 1000-A | 060762-A | 1 m~4 m | NCR | Nov. 13, 2019 | NCR | Radiation (03CH05-KS) |
| EMI Receiver | R&S | ESCI7 | 100768 | 9kHz~7GHz; | Apr. 16, 2019 | Oct. 31, 2019 | Apr. 15, 2020 | Conduction (CO01-KS) |
| AC LISN | MessTec | AN3016 | 060103 | 9kHz~30MHz | Oct. 11, 2019 | Oct. 31, 2019 | Oct. 10, 2020 | Conduction (CO01-KS) |
| AC LISN (for auxiliary equipment) | MessTec | AN3016 | 060105 | 9kHz~30MHz | Oct. 28, 2019 | Oct. 31, 2019 | Oct. 27, 2020 | Conduction (CO01-KS) |
| AC Power Source | Chroma | 61602 | ABP000000811 | AC 0V~300V, 45Hz~1000Hz | Oct. 11, 2019 | Oct. 31, 2019 | Oct. 10, 2020 | Conduction (CO01-KS) |

NCR: No Calibration Required.

# 5 Uncertainty of Evaluation

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI 63.10-2013. All the measurement uncertainty value were shown with a coverage K=2 to indicate 95% level of confidence. The measurement data show herein meets or exceeds the CISPR measurement uncertainty values specified in CISPR 16-4-2 and can be compared directly to specified limit to determine compliance.

**Uncertainty of Conducted Emission Measurement (150 kHz ~ 30 MHz)**

| | |
|---|---|
| **Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))** | **2.9dB** |

**Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)**

| | |
|---|---|
| **Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))** | **5.0dB** |

**Uncertainty of Radiated Emission Measurement (1000 MHz ~ 18000 MHz)**

| | |
|---|---|
| **Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))** | **5.0dB** |

**Uncertainty of Radiated Emission Measurement (18000 MHz ~ 40000 MHz)**

| | |
|---|---|
| **Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))** | **5.0dB** |

# Appendix A. Conducted Test Results

Report Number : FR950807A

## Bluetooth

| Test Engineer: | Asa Cheng | Temperature: | 20~26 | °C |
|---|---|---|---|---|
| Test Date: | 2019/10/24 | Relative Humidity: | 50-55 | % |

### TEST RESULTS DATA
### 20dB and 99% Occupied Bandwidth and Hopping Channel Separation

| Mod. | Data Rate | NTX | CH. | Freq. (MHz) | 20db BW (MHz) | 99% Bandwidth (MHz) | Hopping Channel Separation Measurement (kHz) | Hopping Channel Separation Measurement Limit (MHz) | Pass/Fail |
|---|---|---|---|---|---|---|---|---|---|
| DH | 1Mbps | 1 | 0 | 2402 | 0.990 | 0.906 | 998.600 | 0.6599 | Pass |
| DH | 1Mbps | 1 | 39 | 2441 | 0.984 | 0.909 | 998.600 | 0.6560 | Pass |
| DH | 1Mbps | 1 | 78 | 2480 | 0.981 | 0.906 | 998.600 | 0.6540 | Pass |
| 2DH | 2Mbps | 1 | 0 | 2402 | 1.259 | 1.164 | 1002.900 | 0.8393 | Pass |
| 2DH | 2Mbps | 1 | 39 | 2441 | 1.263 | 1.164 | 1154.800 | 0.8423 | Pass |
| 2DH | 2Mbps | 1 | 78 | 2480 | 1.224 | 1.158 | 994.200 | 0.8160 | Pass |
| 3DH | 3Mbps | 1 | 0 | 2402 | 1.229 | 1.146 | 1042.000 | 0.8191 | Pass |
| 3DH | 3Mbps | 1 | 39 | 2441 | 1.229 | 1.143 | 1011.600 | 0.8191 | Pass |
| 3DH | 3Mbps | 1 | 78 | 2480 | 1.229 | 1.143 | 1007.200 | 0.8191 | Pass |

### TEST RESULTS DATA
### Dwell Time

| Mod. | Hopping Channel Number Rate | Hops Over Occupancy Time(hops) | Package Transfer Time (msec) | Dwell Time (sec) | Limits (sec) | Pass/Fail |
|---|---|---|---|---|---|---|
| Nomal | 79 | 106.67 | 2.9043 | 0.31 | 0.4 | Pass |
| AFH | 20 | 53.33 | 2.9043 | 0.15 | 0.4 | Pass |

### TEST RESULTS DATA
### Peak Power Table

| DH | CH. | NTX | Peak Power (dBm) | Power Limit (dBm) | Test Result |
|---|---|---|---|---|---|
| DH1 | 0 | 1 | 10.96 | 20.97 | Pass |
| | 39 | 1 | **10.97** | 20.97 | Pass |
| | 78 | 1 | 10.94 | 20.97 | Pass |

| 2DH | CH. | NTX | Peak Power (dBm) | Power Limit (dBm) | Test Result |
|---|---|---|---|---|---|
| 2DH1 | 0 | 1 | 11.03 | 20.97 | Pass |
| | 39 | 1 | 11.02 | 20.97 | Pass |
| | 78 | 1 | **11.04** | 20.97 | Pass |

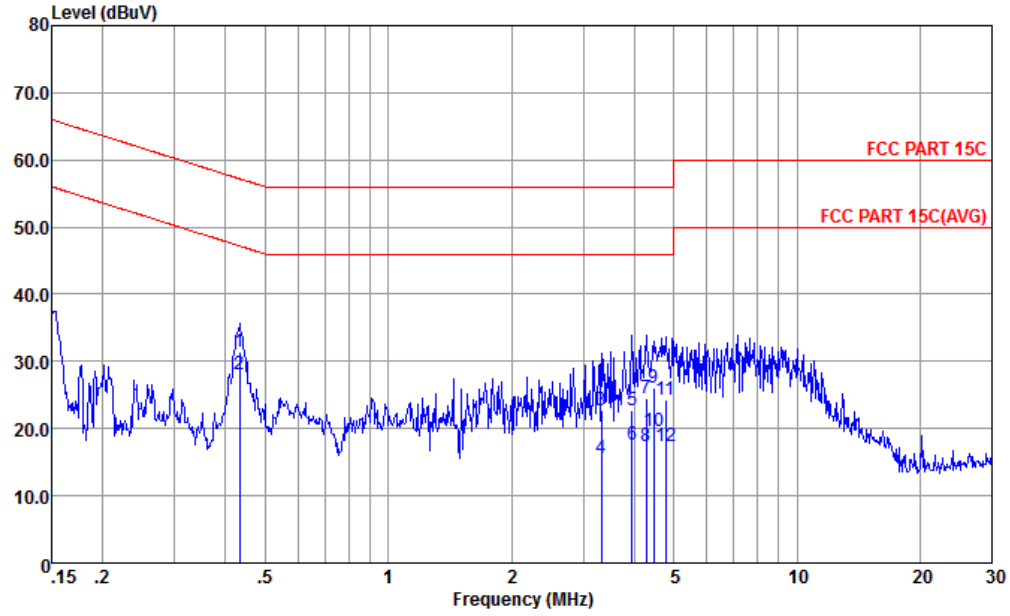
| 3DH | CH. | NTX | Peak Power (dBm) | Power Limit (dBm) | Test Result |
|---|---|---|---|---|---|
| 3DH1 | 0 | 1 | **11.39** | 20.97 | Pass |
| | 39 | 1 | 11.38 | 20.97 | Pass |
| | 78 | 1 | 11.34 | 20.97 | Pass |

### TEST RESULTS DATA
### Number of Hopping Frequency

| Number of Hopping (Channel) | Adaptive Frequency Hopping (Channel) | Limits (Channel) | Pass/Fail |
|---|---|---|---|
| 79 | 79 | > 15 | Pass |

# Appendix B. AC Conducted Emission Test Results

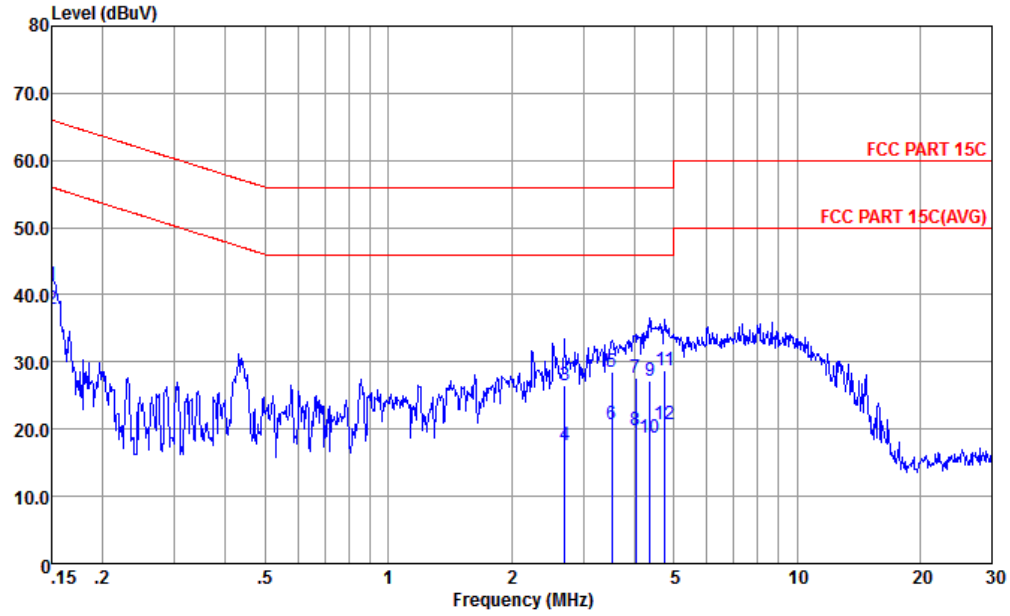
| | | | |
|---|---|---|---|
| **Test Engineer :** | Amos Zhang | **Temperature :** | 25.3~26.2℃ |
| | | **Relative Humidity :** | 38~40% |
| **Test Voltage :** | 120Vac / 60Hz | **Phase :** | Line |




Site : CO01-KS
Condition : FCC PART 15C LISN-L-181119-060105 LINE

| | | Freq | Level | Over Limit | Limit Line | Read Level | LISN Factor | Cable Loss | Remark |
|---|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV | dB | dBuV | dBuV | dB | dB | |
| 1 | | 0.433 | 31.52 | -25.68 | 57.20 | 21.10 | 0.16 | 10.26 | QP |
| 2 | * | 0.433 | 28.02 | -19.18 | 47.20 | 17.60 | 0.16 | 10.26 | Average |
| 3 | | 3.328 | 22.78 | -33.22 | 56.00 | 12.29 | 0.24 | 10.25 | QP |
| 4 | | 3.328 | 15.68 | -30.32 | 46.00 | 5.19 | 0.24 | 10.25 | Average |
| 5 | | 3.943 | 22.69 | -33.31 | 56.00 | 12.20 | 0.24 | 10.25 | QP |
| 6 | | 3.943 | 17.59 | -28.41 | 46.00 | 7.10 | 0.24 | 10.25 | Average |
| 7 | | 4.269 | 24.40 | -31.60 | 56.00 | 13.90 | 0.24 | 10.26 | QP |
| 8 | | 4.269 | 17.30 | -28.70 | 46.00 | 6.80 | 0.24 | 10.26 | Average |
| 9 | | 4.454 | 26.01 | -29.99 | 56.00 | 15.50 | 0.25 | 10.26 | QP |
| 10 | | 4.454 | 19.71 | -26.29 | 46.00 | 9.20 | 0.25 | 10.26 | Average |
| 11 | | 4.772 | 24.32 | -31.68 | 56.00 | 13.80 | 0.25 | 10.27 | QP |
| 12 | | 4.772 | 17.42 | -28.58 | 46.00 | 6.90 | 0.25 | 10.27 | Average |

| Test Engineer : | Amos Zhang | Temperature : | 25.3~26.2℃ |
|---|---|---|---|
| | | Relative Humidity : | 38~40% |
| Test Voltage : | 120Vac / 60Hz | Phase : | Neutral |




Site : CO01-KS
Condition : FCC PART 15C LISN-N-181119-060105 NEUTRAL

| | Freq | Level | Over Limit | Limit Line | Read Level | LISN Factor | Cable Loss | Remark |
|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV | dB | dBuV | dBuV | dB | dB | |
| 1 | 0.150 | 41.56 | -24.44 | 66.00 | 30.90 | 0.18 | 10.48 | QP |
| 2 * | 0.150 | 37.96 | -18.04 | 56.00 | 27.30 | 0.18 | 10.48 | Average |
| 3 | 2.707 | 26.50 | -29.50 | 56.00 | 16.10 | 0.16 | 10.24 | QP |
| 4 | 2.707 | 17.70 | -28.30 | 46.00 | 7.30 | 0.16 | 10.24 | Average |
| 5 | 3.528 | 28.62 | -27.38 | 56.00 | 18.20 | 0.17 | 10.25 | QP |
| 6 | 3.528 | 20.62 | -25.38 | 46.00 | 10.20 | 0.17 | 10.25 | Average |
| 7 | 4.027 | 27.62 | -28.38 | 56.00 | 17.20 | 0.17 | 10.25 | QP |
| 8 | 4.027 | 19.72 | -26.28 | 46.00 | 9.30 | 0.17 | 10.25 | Average |
| 9 | 4.361 | 27.23 | -28.77 | 56.00 | 16.79 | 0.18 | 10.26 | QP |
| 10 | 4.361 | 18.73 | -27.27 | 46.00 | 8.29 | 0.18 | 10.26 | Average |
| 11 | 4.746 | 28.65 | -27.35 | 56.00 | 18.20 | 0.18 | 10.27 | QP |
| 12 | 4.746 | 20.75 | -25.25 | 46.00 | 10.30 | 0.18 | 10.27 | Average |

Note:

1. Level(dBμV) = Read Level(dBμV) + LISN Factor(dB) + Cable Loss(dB)
2. Over Limit(dB) = Level(dBμV) – Limit Line(dBμV)

# Appendix C. Radiated Spurious Emission

**2.4GHz 2400~2483.5MHz**

**BT (Band Edge @ 3m)**

| BT | Note | Frequency | Level | Over Limit | Limit Line | Read Level | Antenna Factor | Cable Loss | Preamp Factor | Ant Pos | Table Pos | Peak Avg. | Pol. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | ( MHz ) | ( dBµV/m ) | ( dB ) | ( dBµV/m ) | ( dBµV ) | ( dB/m ) | ( dB ) | ( dB ) | ( cm ) | ( deg ) | (P/A) | (H/V) |
| BT CH00 2402MHz | | 2359.79 | 52.47 | -21.53 | 74 | 48.38 | 31.21 | 5.43 | 32.55 | 297 | 67 | P | H |
| | * | 2359.79 | 27.71 | -26.29 | 54 | - | - | - | - | - | - | A | H |
| | | 2402 | 106.19 | - | - | 101.94 | 31.3 | 5.48 | 32.53 | 297 | 67 | P | H |
| | | 2402 | 81.43 | - | - | - | - | - | - | - | - | A | H |
| | | 2376.43 | 51.81 | -22.19 | 74 | 47.68 | 31.25 | 5.43 | 32.55 | 266 | 107 | P | V |
| | * | 2376.43 | 27.05 | -26.95 | 54 | - | - | - | - | - | - | A | V |
| | | 2402 | 100.27 | - | - | 96.02 | 31.3 | 5.48 | 32.53 | 266 | 107 | P | V |
| | | 2402 | 75.51 | - | - | - | - | - | - | - | - | A | V |
| BT CH 78 2480MHz | * | 2480 | 104.11 | - | - | 99.28 | 31.59 | 5.55 | 32.31 | 165 | 37 | P | H |
| | | 2480 | 79.35 | - | - | - | - | - | - | - | - | A | H |
| | | 2483.62 | 57.27 | -16.73 | 74 | 52.44 | 31.59 | 5.55 | 32.31 | 165 | 37 | P | H |
| | | 2483.62 | 32.51 | -21.49 | 54 | - | - | - | - | - | - | A | H |
| | * | 2480 | 98.30 | - | - | 93.47 | 31.59 | 5.55 | 32.31 | 303 | 51 | P | V |
| | | 2480 | 73.54 | - | - | - | - | - | - | - | - | A | V |
| | | 2489.02 | 52.41 | -21.59 | 74 | 47.53 | 31.64 | 5.55 | 32.31 | 303 | 51 | P | V |
| | | 2489.02 | 27.65 | -26.35 | 54 | - | - | - | - | - | - | A | V |
| **Remark** | 1. No other spurious found.<br>2. All results are PASS against Peak and Average limit line. | | | | | | | | | | | | |

## 2.4GHz 2400~2483.5MHz

## BT (Harmonic @ 3m)

| BT | Note | Frequency ( MHz ) | Level ( dBμV/m ) | Over Limit ( dB ) | Limit Line ( dBμV/m ) | Read Level ( dBμV ) | Antenna Factor ( dB/m ) | Cable Loss ( dB ) | Preamp Factor ( dB ) | Ant Pos ( cm ) | Table Pos ( deg ) | Peak Avg. (P/A) | Pol. (H/V) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BT CH 00 2402MHz | | 4806 | 42.45 | -31.55 | 74 | 61.6 | 34.88 | 8.1 | 62.13 | 150 | 360 | P | H |
| | | 4806 | 40.65 | -33.35 | 74 | 59.8 | 34.88 | 8.1 | 62.13 | 150 | 360 | P | V |
| BT CH 39 2441MHz | | 4884 | 40.05 | -33.95 | 74 | 59.17 | 34.92 | 8.07 | 62.11 | 100 | 360 | P | H |
| | | 7320 | 41.63 | -32.37 | 74 | 59.35 | 35.3 | 9.75 | 62.77 | 100 | 360 | P | H |
| | | 4884 | 40.22 | -33.78 | 74 | 59.34 | 34.92 | 8.07 | 62.11 | 100 | 360 | P | V |
| | | 7320 | 41.93 | -32.07 | 74 | 59.65 | 35.3 | 9.75 | 62.77 | 100 | 360 | P | V |
| BT CH 78 2480MHz | | 4962 | 39.64 | -34.36 | 74 | 58.7 | 34.97 | 8.05 | 62.08 | 150 | 360 | P | H |
| | | 7440 | 40.49 | -33.51 | 74 | 58.06 | 35.37 | 9.84 | 62.78 | 150 | 360 | P | H |
| | | 4962 | 39.55 | -34.45 | 74 | 58.61 | 34.97 | 8.05 | 62.08 | 150 | 360 | P | V |
| | | 7440 | 42.37 | -31.63 | 74 | 59.94 | 35.37 | 9.84 | 62.78 | 150 | 360 | P | V |
| **Remark** | 1. No other spurious found.<br>2. All results are PASS against Peak and Average limit line. | | | | | | | | | | | | |

## Emission below 1GHz

### 2.4GHz BT (LF)

| BT | Note | Frequency | Level | Over | Limit | Read | Antenna | Cable | Preamp | Ant | Table | Peak | Pol. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Limit | Line | Level | Factor | Loss | Factor | Pos | Pos | Avg. | |
| | | ( MHz ) | ( dBμV/m ) | ( dB ) | ( dBμV/m ) | (dBμV) | ( dB/m ) | ( dB ) | ( dB ) | ( cm ) | ( deg ) | (P/A) | (H/V) |
| 2.4GHz BT LF | | 49.4 | 19.36 | -20.64 | 40 | 36.48 | 15.17 | 0.81 | 33.1 | - | - | P | H |
| | | 75.59 | 26.85 | -13.15 | 40 | 45.7 | 13.2 | 0.97 | 33.02 | 120 | 30 | P | H |
| | | 108.57 | 27.06 | -16.44 | 43.5 | 41.88 | 17.1 | 1.16 | 33.08 | - | - | P | H |
| | | 145.43 | 28.21 | -15.29 | 43.5 | 42.51 | 17.38 | 1.33 | 33.01 | - | - | P | H |
| | | 217.21 | 31.68 | -14.32 | 46 | 47.55 | 15.37 | 1.63 | 32.87 | - | - | P | H |
| | | 256.98 | 29.32 | -16.68 | 46 | 40.59 | 19.75 | 1.77 | 32.79 | - | - | P | H |
| | | 45.52 | 24.35 | -15.65 | 40 | 40.04 | 16.63 | 0.78 | 33.1 | - | - | P | V |
| | | 49.4 | 22.97 | -17.03 | 40 | 40.09 | 15.17 | 0.81 | 33.1 | - | - | P | V |
| | | 96.93 | 25.77 | -17.73 | 43.5 | 41.82 | 15.84 | 1.09 | 32.98 | - | - | P | V |
| | | 116.33 | 27.02 | -16.48 | 43.5 | 41.38 | 17.52 | 1.19 | 33.07 | - | - | P | V |
| | | 201.69 | 27.68 | -15.82 | 43.5 | 43.86 | 15.14 | 1.58 | 32.9 | - | - | P | V |
| | | 262.8 | 30.73 | -15.27 | 46 | 41.81 | 19.9 | 1.79 | 32.77 | 100 | 13 | P | V |
| **Remark** | 1. No other spurious found.<br>2. All results are PASS against limit line. | | | | | | | | | | | | |

**Note symbol**

| | |
|---|---|
| * | **Fundamental Frequency** which can be ignored. However, the level of any unwanted emissions shall not exceed the level of the fundamental frequency. |
| ! | Test result is **over limit** line. |
| P/A | **P**eak or **A**verage |
| H/V | **H**orizontal or **V**ertical |

## A calculation example for radiated spurious emission is shown as below:

| WIFI | Note | Frequency | Level | Over | Limit | Read | Antenna | Cable | Preamp | Ant | Table | Peak | Pol. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ant. | | | | Limit | Line | Level | Factor | Loss | Factor | Pos | Pos | Avg. | |
| 1+2 | | ( MHz ) | ( dBμV/m ) | ( dB ) | ( dBμV/m ) | ( dBμV ) | ( dB/m ) | ( dB ) | ( dB ) | ( cm ) | ( deg ) | (P/A) | (H/V) |
| 802.11b CH 01 2412MHz | | 2390 | 55.45 | -18.55 | 74 | 54.51 | 32.22 | 4.58 | 35.86 | 103 | 308 | P | H |
| | | 2390 | 43.54 | -10.46 | 54 | 42.6 | 32.22 | 4.58 | 35.86 | 103 | 308 | A | H |

1. Level(dBμV/m) =

Antenna Factor(dB/m) + Cable Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)

2. Over Limit(dB) = Level(dBμV/m) – Limit Line(dBμV/m)

**For Peak Limit @ 2390MHz:**

1. Level(dBμV/m)

= Antenna Factor(dB/m) + Cable Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)

= 32.22(dB/m) + 4.58(dB) + 54.51(dBμV) – 35.86 (dB)

= 55.45 (dBμV/m)

2. Over Limit(dB)

= Level(dBμV/m) – Limit Line(dBμV/m)

= 55.45(dBμV/m) – 74(dBμV/m)

= -18.55(dB)

**For Average Limit @ 2390MHz:**

1. Level(dBμV/m)

= Antenna Factor(dB/m) + Cable Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)

= 32.22(dB/m) + 4.58(dB) + 42.6(dBμV) – 35.86 (dB)

= 43.54 (dBμV/m)

2. Over Limit(dB)

= Level(dBμV/m) – Limit Line(dBμV/m)

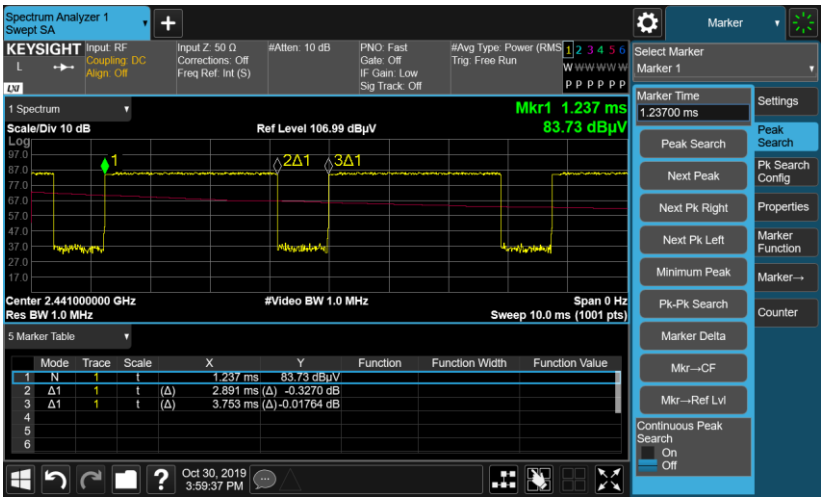
= 43.54(dBμV/m) – 54(dBμV/m)

= -10.46(dB)

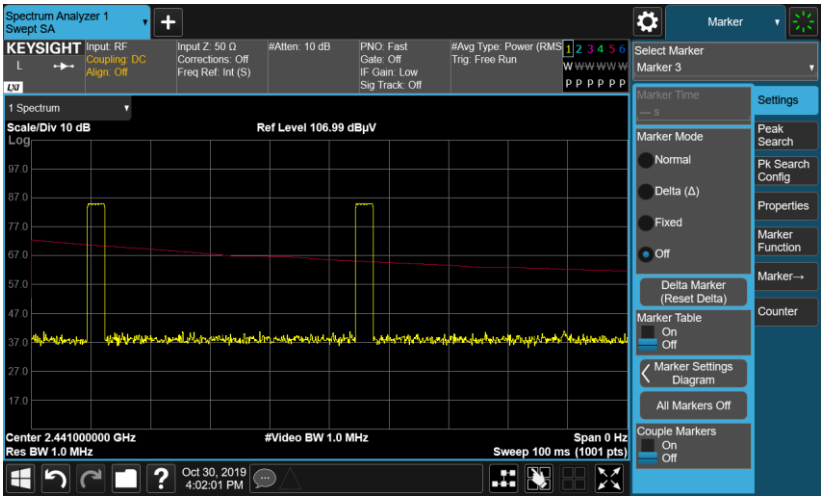
**Both peak and average measured complies with the limit line, so test result is “PASS”.**

# Appendix D. Duty Cycle Plots

## 3DH5 on time (One Pulse) Plot on Channel 39




## 3DH5 on time (Count Pulses) Plot on Channel 39




**Note:**

1. Worst case Duty cycle = on time/100 milliseconds = 2 * 2.89 / 100 = 5.78 %
2. Worst case Duty cycle correction factor = 20*log(Duty cycle) = -24.76 dB
3. 3DH5 has the highest duty cycle worst case and is reported.