# FCC Test Report

| | | |
|---|---|---|
| **FCC ID** | : | **2ATD8-MN-01** |
| **Equipment** | : | **Mesh Node** |
| **Brand Name** | : | **Scandinavian Reach Technologies AS** |
| **Model Name** | : | **SRT MN-01** |
| **Applicant** | : | **Scandinavian Reach Technologies AS<br>Skjenet 11, 5354 Straume, Norway** |
| **Manufacturer** | : | **Topro Industri AS<br>Rambekkvegen 1, 2816 Gjøvik, Norway** |
| **Standard** | : | **47 CFR FCC Part 15.247** |

**The product was received on Sep. 10, 2019, and testing was started from Sep. 13, 2019 and completed on Oct. 14, 2019. We, SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory, would like to declare that the tested sample has been evaluated in accordance with the procedures given in ANSI C63.10-2013 and shown compliance with the applicable technical standards.**

**The report must not be used by the client to claim product certification, approval, or endorsement by TAF or any agency of government.**

**The test results in this report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory, the test report shall not be reproduced except in full.**

**Approved by: Allen Lin**

***SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory***

*No. 52, Huaya 1st Rd., Guishan Dist., Taoyuan City, Taiwan (R.O.C.)*

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**PHOTOGRAPHS OF EUT V01**

# History of this test report

| Report No. | Version | Description | Issued Date |
|---|---|---|---|
| FR990210AC | 01 | Initial issue of report | Dec. 16, 2019 |
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# Summary of Test Result

| Report Clause | Ref. Std. Clause | Test Items | Result (PASS/FAIL) | Remark |
|---|---|---|---|---|
| 1.1.3 | 15.203 | Antenna Requirement | PASS | - |
| 3.1 | 15.207 | AC Power-line Conducted Emissions | PASS | - |
| 3.2 | 15.247(a) | DTS Bandwidth | PASS | - |
| 3.3 | 15.247(b) | Maximum Conducted Output Power | PASS | - |
| 3.4 | 15.247(e) | Power Spectral Density | PASS | - |
| 3.5 | 15.247(d) | Emissions in Non-restricted Frequency Bands | PASS | - |
| 3.6 | 15.247(d) | Emissions in Restricted Frequency Bands | PASS | - |

| **Declaration of Conformity:** |
|---|
| The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers. |
| **Comments and explanations:** |
| None |

**Reviewed by: Jackson Tsai**

**Report Producer: Jenny Yang**

# 1 General Description

## 1.1 Information

### 1.1.1 Abbreviation

EUT: Unit under test

BW: Bandwidth

BWch: Bandwidth per channel

### 1.1.2 RF General Information

| Frequency Range (MHz) | Modulation | Channel Frequency (MHz) | Channel Spacing (MHz) | Channel Number |
|---|---|---|---|---|
| 2400-2483.5 | QPSK-DSSS | 2405-2475 | 5 | 0-14 [15] |

| Band | Mode | BWch (MHz) | Nant |
|---|---|---|---|
| 2.4-2.4835GHz | 2.4GHz Prop | 5 | 1TX |

Note:
- 2.4GHz Prop mode uses a combination of QPSK-DSSS modulation.
- BWch is the nominal channel bandwidth.
- Nant is the number of outputs.

### 1.1.3 Antenna Information

| Antenna | Brand | Model Name | Antenna Type | Connector |
|---|---|---|---|---|
| 1 | Texas Instruments | DN007 | PCB | N/A |
| 2 | Texas Instruments | DN007 | PCB | N/A |
| 3 | Texas Instruments | DN038 | PCB | N/A |
| 4 | pulselarsen | W5017 | Dipole | I-Pex |

| Antenna | Port | Gain (dBi) | | |
|---|---|---|---|---|
| | | 2.4G Prop | BT | Sub-1GHz |
| 1 | 1 | - | 3.3 | - |
| 2 | 1 | 3.3 | - | - |
| 3 | 1 | - | - | 0.01 |
| 4 | 2 | - | - | 0.9 |

Note 1: The EUT has four antennas.

**For 2.4GHz Prop function:**

For 2.4GHz Prop mode (1TX/1RX)

Ant. 2 (port 1) can be used as transmitting/receiving antenna.

**For BT function:**

For IEEE 802.15.1 Bluetooth mode (1TX/1RX)

Ant. 1 (port 1) can be used as transmitting/receiving antenna.

**For Sub-1GHz function:**

For Sub-1GHz mode (1TX/1RX)

Ant. 3 (port 1) or Ant. 4 (port 2) can be used as transmitting/receiving antenna.

### 1.1.4 EUT Information

| Operational Condition | | | | |
|---|---|---|---|---|
| **EUT Power Type** | From AC Adapter / Form Battery / Form Host system | | | |
| **EUT Function** | ☒ | Point-to-multipoint | ☐ | Point-to-point |
| **Beamforming Function** | ☐ | With beamforming | ☒ | Without beamforming |

| Type of EUT | | |
|---|---|---|
| ☒ | Stand-alone | |
| ☐ | Combined (EUT where the radio part is fully integrated within another device) | |
| | Combined Equipment - Brand Name / Model No.: | … |
| ☐ | Plug-in radio (EUT intended for a variety of host systems) | |
| | Host System - Brand Name / Model No.: | … |
| ☐ | Other: | |

### 1.1.5 Mode Test Duty Cycle

| Mode | Duty Cycle | Duty Cycle Factor (dB) | T(s) | VBW(Hz) ≥ 1/T |
|---|---|---|---|---|
| 2.4GHz Prop | 1 | 0 | n/a (Duty Cycle >=0.98) | n/a (Duty Cycle >=0.98) |

Note. If Duty Cycle < 0.98, the Duty Cycle Factor was added while measuring Output power and PSD.

## 1.2 Testing Applied Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- 47 CFR FCC Part 15
- ANSI C63.10-2013
- KDB 558074 D01 v05r02
- KDB 414788 D01 v01r01

## 1.3 Testing Location Information

| Testing Location | | | | | |
|---|---|---|---|---|---|
| ☒ | HWA YA | ADD : | No. 52, Huaya 1st Rd., Guishan Dist., Taoyuan City, Taiwan (R.O.C.) | | |
| | | TEL : | 886-3-327-3456 | FAX : | 886-3-327-0973 |
| Test site Designation No. TW1190 with FCC. | | | | | |
| ☐ | JHUBEI | ADD : | No.8, Ln. 724, Bo'ai St., Zhubei City, Hsinchu County, Taiwan (R.O.C.) | | |
| | | TEL : | 886-3-656-9065 | FAX : | 886-3-656-9085 |
| Test site Designation No. TW0006 with FCC. | | | | | |

| Test Condition | Test Site No. | Test Engineer | Test Environment | Test Date |
|---|---|---|---|---|
| AC Conduction | CO04-HY | Edward Wang | 22.3~23.8°C / 64.3~66.2% | 13/Sep/2019 |
| RF Conducted | TH06-HY | Gary Wang | 23.1~26°C / 61~67% | 19/Sep/2019~ 01/Oct/2019 |
| Radiated | 03CH02-HY | Edward Wang | 22.3~23.7°C / 65.3~69.2% | 13/Sep/2019~ 14/Oct/2019 |

## 1.4 Measurement Uncertainty

ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report. The measurement uncertainties given below are based on a 95% confidence level (based on a coverage factor (k=2)

| Test Items | Uncertainty | Remark |
|---|---|---|
| Conducted Emission (150kHz ~ 30MHz) | 3.54 dB | Confidence levels of 95% |
| Radiated Emission (9kHz ~ 30MHz) | 1.6 dB | Confidence levels of 95% |
| Radiated Emission (30MHz ~ 1,000MHz) | 4.3 dB | Confidence levels of 95% |
| Radiated Emission (1GHz ~ 18GHz) | 3.9 dB | Confidence levels of 95% |
| Radiated Emission (18GHz ~ 40GHz) | 3.5 dB | Confidence levels of 95% |
| Conducted Emission | 1.3 dB | Confidence levels of 95% |
| Temperature | 0.7 ℃ | Confidence levels of 95% |
| Humidity | 4 % | Confidence levels of 95% |

# 2 Test Configuration of EUT

## 2.1 Test Condition

| RF Conducted | Abbreviation | Remark |
|---|---|---|
| TnomVnom | Tnom | 20°C |
| - | Vnom | 3.6V |

## 2.2 Test Channel Mode

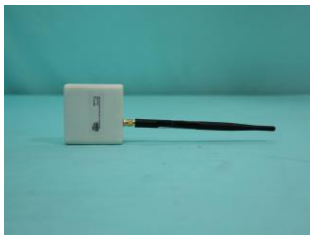
| Test Software | Command |
|---|---|

| Mode | Power Setting |
|---|---|
| 2.4GHz Prop | - |
| 2405MHz | default |
| 2440MHz | default |
| 2475MHz | default |

## 2.3 The Worst Case Measurement Configuration

| The Worst Case Mode for Following Conformance Tests | |
|---|---|
| **Tests Item** | AC power-line conducted emissions |
| **Condition** | AC power-line conducted measurement for line and neutral |
| **Operating Mode** | CTX |
| 1 | Adapter mode |

| The Worst Case Mode for Following Conformance Tests | |
|---|---|
| **Tests Item** | DTS Bandwidth<br>Maximum Conducted Output Power<br>Power Spectral Density<br>Emissions in Non-restricted Frequency Bands |
| **Test Condition** | Conducted measurement at transmit chains |

| The Worst Case Mode for Following Conformance Tests | | | |
|---|---|---|---|
| **Tests Item** | Emissions in Restricted Frequency Bands | | |
| **Test Condition** | Radiated measurement<br>If EUT consist of multiple antenna assembly (multiple antenna are used in EUT regardless of spatial multiplexing MIMO configuration), the radiated test should be performed with highest antenna gain of each antenna type. | | |
| **Operating Mode < 1GHz** | CTX/CRX | | |
| 1 | Adapter mode | | |
| **Operating Mode > 1GHz** | CTX/CRX | | |
| **Orthogonal Planes of EUT** | **X Plane** | **Y Plane** | **Z Plane** |
| |  | | |
| **Worst Planes of EUT** | V | | |

| The Worst Case Mode for Following Conformance Tests | |
|---|---|
| **Tests Item** | Simultaneous Transmission Analysis |
| **Operating Mode** | CTX |
| 1 | Sub-1GHz + 2.4G Prop + Bluetooth |
| Refer to Sporton Test Report No.: FA990210 for Co-location RF Exposure Evaluation. | |

## 2.4 Accessories and Support Equipment

| Support Equipment – AC Conduction | | | | |
|---|---|---|---|---|
| **No.** | **Equipment** | **Brand Name** | **Model Name** | **FCC ID** |
| 1 | AC adapter | ARTESYN | DA10-050EU | - |

Note: Support equipment No.1 was provided by customer.

| Support Equipment – RF Conducted | | | | |
|---|---|---|---|---|
| **No.** | **Equipment** | **Brand Name** | **Model Name** | **FCC ID** |
| 1 | Laptop | HP | EliteBook 820 | - |
| 2 | Adapter for Laptop | HP | HSTNN-DA40 | - |

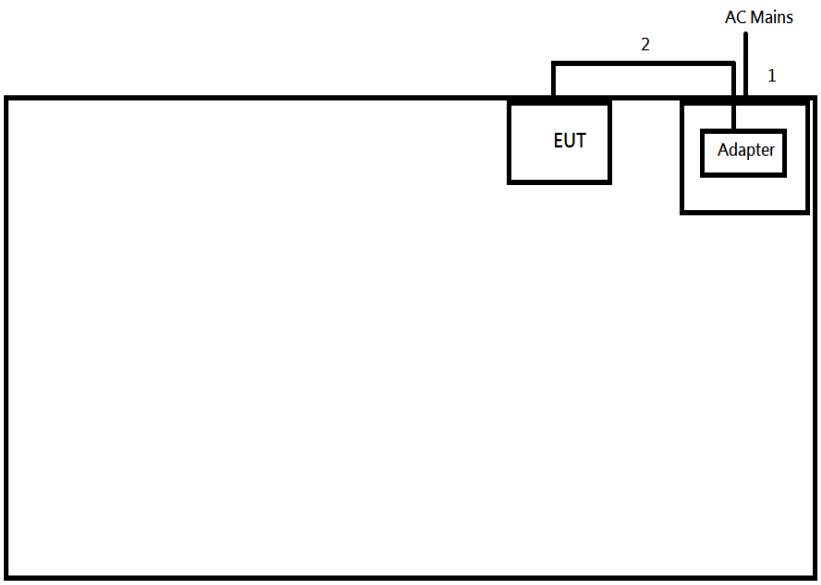
Note: Support equipment No.1 & 2 were provided by customer.

| Support Equipment – Radiated Emission | | | | |
|---|---|---|---|---|
| **No.** | **Equipment** | **Brand Name** | **Model Name** | **FCC ID** |
| 1 | AC adapter | ARTESYN | DA10-050EU | - |

Note: Support equipment No.1 was provided by customer.

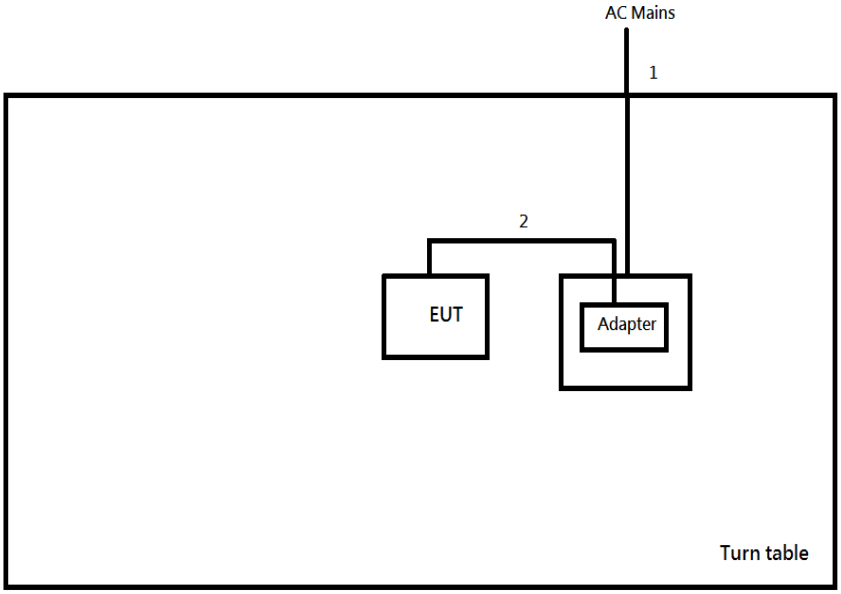
## 2.5 Test Setup Diagram

**Test Setup Diagram – AC Line Conducted Emission Test**




| Item | Connection | Shielded | Length(m) | Remark |
|---|---|---|---|---|
| 1 | AC Power Cable | No | 1.8 | - |
| 2 | USB Cable | No | 1.0 | - |

## Test Setup Diagram - Radiated Test




| Item | Connection | Shielded | Length(m) | Remark |
|---|---|---|---|---|
| 1 | AC Power Cable | No | 1.8 | - |
| 2 | USB Cable | No | 1.0 | - |

# 3 Transmitter Test Result

## 3.1 AC Power-line Conducted Emissions

### 3.1.1 AC Power-line Conducted Emissions Limit

| AC Power-line Conducted Emissions Limit | | |
|---|---|---|
| **Frequency Emission (MHz)** | **Quasi-Peak** | **Average** |
| 0.15-0.5 | 66 - 56 * | 56 - 46 * |
| 0.5-5 | 56 | 46 |
| 5-30 | 60 | 50 |
| Note 1: * Decreases with the logarithm of the frequency. | | |

### 3.1.2 Measuring Instruments

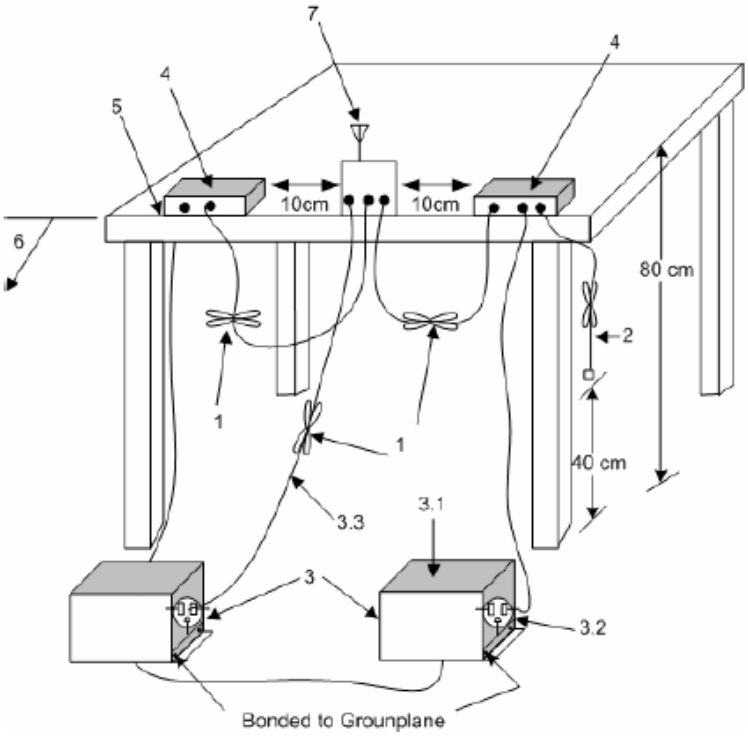
Refer a test equipment and calibration data table in this test report.

### 3.1.3 Test Procedures

| Test Method |
|---|
| ☒ Refer as ANSI C63.10-2013, clause 6.2 for AC power-line conducted emissions. |

### 3.1.4 Test Setup

**AC Power-line Conducted Emissions**




1—Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 cm to 40 cm long.
2—The I/O cables that are not connected to an accessory shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.
3—EUT connected to one LISN. Unused LISN measuring port connectors shall be terminated in 50Ω loads. LISN may be placed on top of, or immediately beneath, reference ground plane.
3.1—All other equipment powered from additional LISN(s).
3.2—A multiple-outlet strip may be used for multiple power cords of non-EUT equipment.
3.3—LISN at least 80 cm from nearest part of EUT chassis.
4—Non-EUT components of EUT system being tested.
5—Rear of EUT, including peripherals, shall all be aligned and flush with edge of tabletop.
6—Edge of tabletop shall be 40 cm removed from a vertical conducting plane that is bonded to the ground plane.
7—Antenna can be integral or detachable. If detachable, then the antenna shall be attached for this test.

### 3.1.5 Test Result of AC Power-line Conducted Emissions

Refer as Appendix A

## 3.2 DTS Bandwidth

### 3.2.1 6dB Bandwidth Limit

| 6dB Bandwidth Limit |
|---|
| **Systems using digital modulation techniques:** |
| ▪ 6 dB bandwidth ≥ 500 kHz. |

### 3.2.2 Measuring Instruments

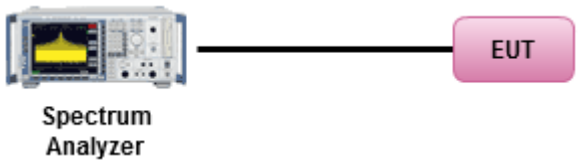
Refer a test equipment and calibration data table in this test report.

### 3.2.3 Test Procedures

| Test Method | |
|---|---|
| ▪ For the emission bandwidth shall be measured using one of the options below: | |
| | ☒ Refer as KDB 558074. clause 8.2 (11.8 of ANSI C63.10) DTS bandwidth measurement. |
| | ☐ Refer as RSS-Gen, clause 6.7 for occupied bandwidth testing. |
| | ☐ Refer as ANSI C63.10, clause 6.9.3 for occupied bandwidth testing. |

### 3.2.4 Test Setup

**Emission Bandwidth**




### 3.2.5 Test Result of Emission Bandwidth

Refer as Appendix B

## 3.3 Maximum Conducted Output Power

### 3.3.1 Maximum Conducted Output Power Limit

| | | |
|---|---|---|
| **Maximum Conducted Output Power Limit** | | |
| | ▪ If $G_{TX} \leq 6$ dBi, then $P_{Out} \leq 30$ dBm (1 W) | |
| | ▪ Point-to-multipoint systems (P2M): If $G_{TX} > 6$ dBi, then $P_{Out} = 30 – (G_{TX} – 6)$ dBm | |
| | ▪ Point-to-point systems (P2P): If $G_{TX} > 6$ dBi, then $P_{Out} = 30 – (G_{TX} – 6)/3$ dBm | |
| | ▪ Smart antenna system (SAS): | |
| | | - Single beam: If $G_{TX} > 6$ dBi, then $P_{Out} = 30 – (G_{TX} – 6)/3$ dBm |
| | | - Overlap beam: If $G_{TX} > 6$ dBi, then $P_{Out} = 30 – (G_{TX} – 6)/3$ dBm |
| | | - Aggregate power on all beams: If $G_{TX} > 6$ dBi, then $P_{Out} = 30 – (G_{TX} – 6)/3 + 8$dB dBm |
| **e.i.r.p. Power Limit:** | | |
| ▪ 2400-2483.5 MHz Band | | |
| | ▪ Point-to-multipoint systems (P2M): $P_{eirp} \leq 36$ dBm (4 W) | |
| | ▪ Point-to-point systems (P2P): $P_{eirp} \leq MAX(36, [P_{Out} + G_{TX}])$ dBm | |
| | ▪ Smart antenna system (SAS) | |
| | | - Single beam: $P_{eirp} \leq MAX(36, P_{Out} + G_{TX})$ dBm |
| | | - Overlap beam: $P_{eirp} \leq MAX(36, P_{Out} + G_{TX})$ dBm |
| | | - Aggregate power on all beams: $P_{eirp} \leq MAX(36, [P_{Out} + G_{TX} + 8])$ dBm |
| **$P_{Out}$** = maximum peak conducted output power or maximum conducted output power in dBm,<br>**$G_{TX}$** = the maximum transmitting antenna directional gain in dBi. | | |

### 3.3.2 Measuring Instruments

Refer a test equipment and calibration data table in this test report.

### 3.3.3 Test Procedures

| Test Method | |
|---|---|
| ▪ Maximum Peak Conducted Output Power | |
| | ☐ Refer as KDB 558074, clause 8.3.1.1 (11.9.1.1 of ANSI C63.10) RBW ≥ EBW method. |
| | ☐ Refer as KDB 558074, clause 8.3.1.2 (11.9.1.2 of ANSI C63.10) integrated band power method. |
| | ☐ Refer as KDB 558074, clause 8.3.1.3 (11.9.1.3 of ANSI C63.10) peak power meter. |
| ▪ Maximum Average Conducted Output Power | |
| | ☐ Refer as KDB 558074, clause 8.3.2.2 (11.9.2.2 of ANSI C63.10) using a spectrum analyzer. |
| | ☒ Refer as KDB 558074, clause 8.3.2.3 (11.9.2.3 of ANSI C63.10) using a power meter. |
| ▪ For conducted measurement. | |
| | ▪ If the EUT supports multiple transmit chains using options given below:<br>Refer as KDB 662911, In-band power measurements. Using the measure-and-sum approach, measured all transmit ports individually. Sum the power (in linear power units e.g., mW) of all ports for each individual sample and save them. |
| | ▪ If multiple transmit chains, EIRP calculation could be following as methods:<br>$P_{total} = P_1 + P_2 + \ldots + P_n$<br>(calculated in linear unit [mW] and transfer to log unit [dBm])<br>$EIRP_{total} = P_{total} + DG$ |

### 3.3.4 Test Setup

| Maximum Conducted Output Power (Power Meter) |
|---|
| |

### 3.3.5 Test Result of Maximum Conducted Output Power

Refer as Appendix C

# 3.4 Power Spectral Density

## 3.4.1 Power Spectral Density Limit

| Power Spectral Density Limit |
|---|
| ▪ Power Spectral Density (PSD) ≤ 8 dBm/3kHz |

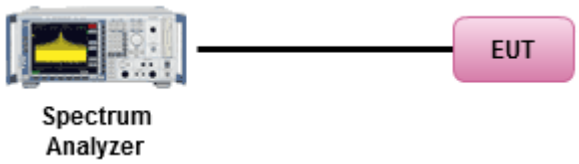
## 3.4.2 Measuring Instruments

Refer a test equipment and calibration data table in this test report.

## 3.4.3 Test Procedures

| Test Method | | |
|---|---|---|
| ▪ Peak power spectral density procedures that the same method as used to determine the conducted output power. If maximum peak conducted output power was measured to demonstrate compliance to the output power limit, then the peak PSD procedure below (Method PKPSD) shall be used. If maximum conducted output power was measured to demonstrate compliance to the output power limit, then one of the average PSD procedures shall be used, as applicable based on the following criteria (the peak PSD procedure is also an acceptable option). | | |
| | ☒ Refer as KDB 558074, clause 8.4 (11.10 of ANSI C63.10) Method PKPSD. | |
| ▪ For conducted measurement. | | |
| | ▪ If The EUT supports multiple transmit chains using options given below: | |
| | | ▪ Measure and sum the spectra across the outputs. Refer as KDB 662911, In-band power spectral density (PSD). Sample all transmit ports simultaneously using a spectrum analyzer for each transmit port. Where the trace bin-by-bin of each transmit port summing can be performed. (i.e., in the first spectral bin of output 1 is summed with that in the first spectral bin of output 2 and that from the first spectral bin of output 3, and so on up to the NTX output to obtain the value for the first frequency bin of the summed spectrum.). Add up the amplitude (power) values for the different transmit chains and use this as the new data trace. |

## 3.4.4 Test Setup

| Power Spectral Density |
|---|
|   |

## 3.4.5 Test Result of Power Spectral Density

Refer as Appendix D

# 3.5 Emissions in Non-restricted Frequency Bands

## 3.5.1 Emissions in Non-restricted Frequency Bands Limit

| Un-restricted Band Emissions Limit | |
|---|---|
| **RF output power procedure** | **Limit (dB)** |
| Peak output power procedure | 20 |
| Average output power procedure | 30 |

Note 1: If the peak output power procedure is used to measure the fundamental emission power to demonstrate compliance to requirements, then the peak conducted output power measured within any 100 kHz outside the authorized frequency band shall be attenuated by at least 20 dB relative to the maximum measured in-band peak level.

Note 2: If the average output power procedure is used to measure the fundamental emission power to demonstrate compliance to requirements, then the power in any 100 kHz outside of the authorized frequency band shall be attenuated by at least 30 dB relative to the maximum measured in-band average level.

## 3.5.2 Measuring Instruments

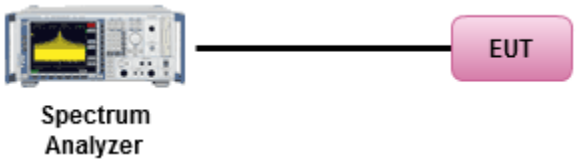
Refer a test equipment and calibration data table in this test report.

## 3.5.3 Test Procedures

| Test Method |
|---|
| ▪ Refer as KDB 558074, clause 8.5 (11.11 of ANSI C63.10) for non-restricted frequency bands. |

## 3.5.4 Test Setup

**Emissions in Non-restricted Frequency Bands**




## 3.5.5 Test Result of Emissions in Non-restricted Frequency Bands

Refer as Appendix E

## 3.6 Emissions in Restricted Frequency Bands

### 3.6.1 Emissions in Restricted Frequency Bands Limit

| Restricted Band Emissions Limit | | | |
|---|---|---|---|
| **Frequency Range (MHz)** | **Field Strength (uV/m)** | **Field Strength (dBuV/m)** | **Measure Distance (m)** |
| 0.009~0.490 | 2400/F(kHz) | 48.5 - 13.8 | 300 |
| 0.490~1.705 | 24000/F(kHz) | 33.8 - 23 | 30 |
| 1.705~30.0 | 30 | 29 | 30 |
| 30~88 | 100 | 40 | 3 |
| 88~216 | 150 | 43.5 | 3 |
| 216~960 | 200 | 46 | 3 |
| Above 960 | 500 | 54 | 3 |

Note 1: Test distance for frequencies at or above 30 MHz, measurements may be performed at a distance other than the limit distance provided they are not performed in the near field and the emissions to be measured can be detected by the measurement equipment. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade (inverse of linear distance for field-strength measurements, inverse of linear distance-squared for power-density measurements).

Note 2: Test distance for frequencies at below 30 MHz, measurements may be performed at a distance closer than the EUT limit distance; however, an attempt should be made to avoid making measurements in the near field. When performing measurements below 30 MHz at a closer distance than the limit distance, the results shall be extrapolated to the specified distance by either making measurements at a minimum of two or more distances on at least one radial to determine the proper extrapolation factor or by using the square of an inverse linear distance extrapolation factor (40 dB/decade). The test report shall specify the extrapolation method used to determine compliance of the EUT.

Note 3: Using the distance of 1m during the test for above 18 GHz, and the test value to correct for the distance factor at 3m.

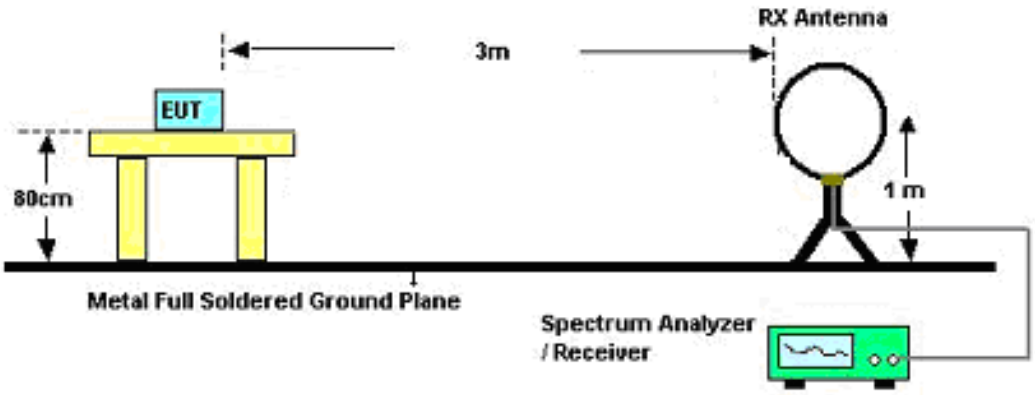
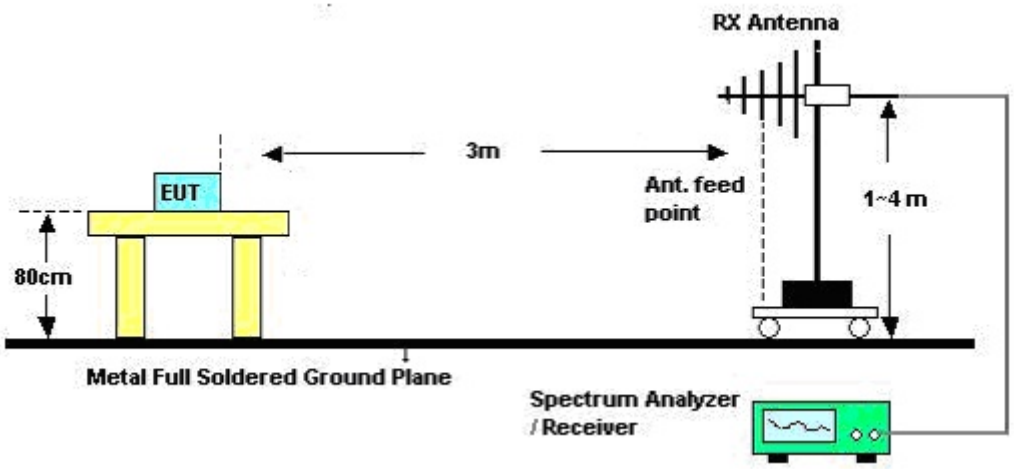
### 3.6.2 Measuring Instruments

Refer a test equipment and calibration data table in this test report.

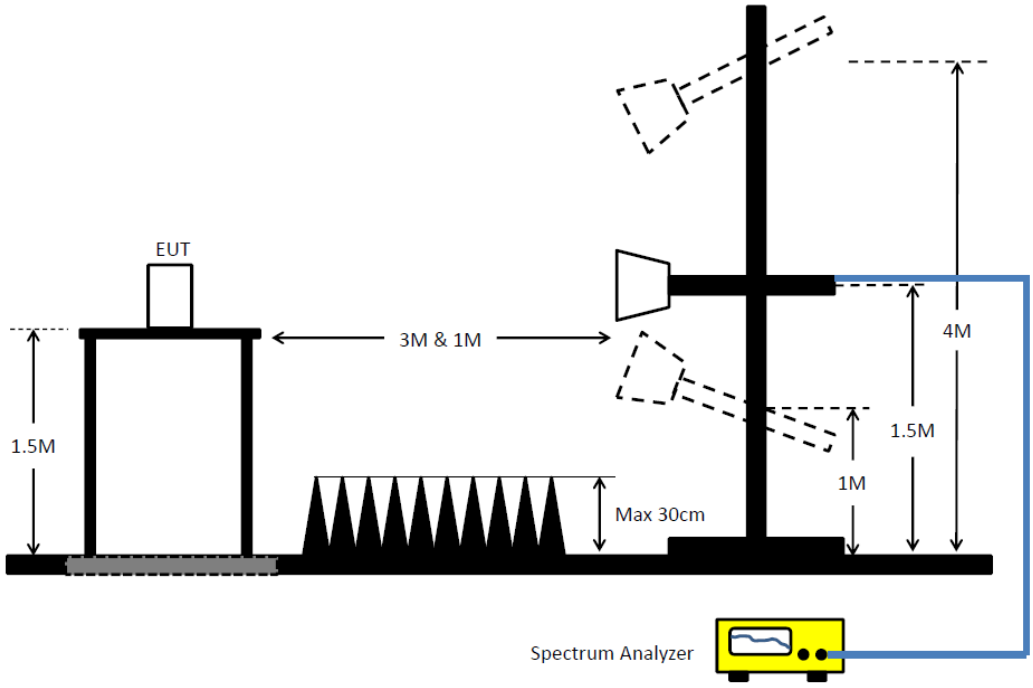
### 3.6.3 Test Procedures

| Test Method | |
|---|---|
| ▪ The average emission levels shall be measured in [duty cycle ≥ 98 or duty factor]. | |
| ▪ Refer as ANSI C63.10, clause 6.10.3 band-edge testing shall be performed at the lowest frequency channel and highest frequency channel within the allowed operating band. | |
| ▪ For the transmitter unwanted emissions shall be measured using following options below: | |
| | ▪ Refer as KDB 558074, clause 8.6 (11.12 of ANSI C63.10) for restricted frequency bands. |
| ▪ For the transmitter band-edge emissions shall be measured using following options below: | |
| | ▪ Refer as KDB 558074 clause 8.7.1, When the performing peak or average radiated measurements, emissions within 2 MHz of the authorized band edge may be measured using the marker-delta method described below. |
| | ▪ Refer as KDB 558074, clause 8.7.2 (6.10.6 of ANSI C63.10) for marker-delta method for band-edge measurements. |
| | ▪ Refer as KDB 558074, clause 8.7.3 for narrower resolution bandwidth (100kHz) using the band power and summing the spectral levels. |
| ▪ Use the following spectrum analyzer settings: | |
| | ▪ Set RBW=100 kHz for f < 1 GHz; VBW=3 * RBW; Sweep = auto; Detector function = peak; Trace = max hold. |
| | ▪ Set RBW = 1 MHz, VBW= 3MHz for f ≥ 1 GHz for peak measurement. For average measurement, refer as 1.1.4. |
| ▪ KDB 414788 Open-Field Test Sites and Chamber Correlation Justification. | |
| | ▪ Based on FCC 15.31 (f) (2): measurements may be performed at a distance closer than that specified in regulations; however, an attempt should be made to avoid making measurements in the near field. |
| | ▪ Open-field site and chamber correlation testing had been performed and chamber measured test result is the worst case test result. |

### 3.6.4 Test Setup

| Emissions in Restricted Frequency Bands |
|---|
| 9kHz ~30MHz |
|  |
| 30MHz~1GHz |
|  |

**Above 1GHz**




### 3.6.5 Test Result of Emissions in Restricted Frequency Bands (Below 30MHz)

The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

### 3.6.6 Test Result of Emissions in Restricted Frequency Bands

Refer as Appendix F

# 4 Test Equipment and Calibration Data

**Instrument for AC Conduction**

| Instrument | Manufacturer | Model No. | Serial No. | Spec. | Calibration Date | Calibration Due Date |
|---|---|---|---|---|---|---|
| EMC Receiver | R&S | ESR3 | 102052 | 9kHz ~ 3.6GHz | 09/Apr/2019 | 08/Apr/2020 |
| LISN | R&S | ENV216 | 101295 | 9kHz ~ 30MHz | 08/Nov/2018 | 07/Nov/2019 |
| RF Cable-CON | MTJ | RG142 | CB002-CO | 9kHz ~ 200MHz | 17/Sep/2018 | 16/Sep/2019 |
| AC POWER | APC | AFC-11005G | F310050055 | 47Hz~63Hz 5~300V | NCR | NCR |
| Impuls Begrenzer Pulse Limiter | SCHWARZBECK | VTSD 9561-F | 9561-F041 | 9 kHz ~ 30 MHz | 12/Oct/2018 | 11/Oct/2019 |

**NCR : Non-Calibration Require**

**Instrument for Conducted Test**

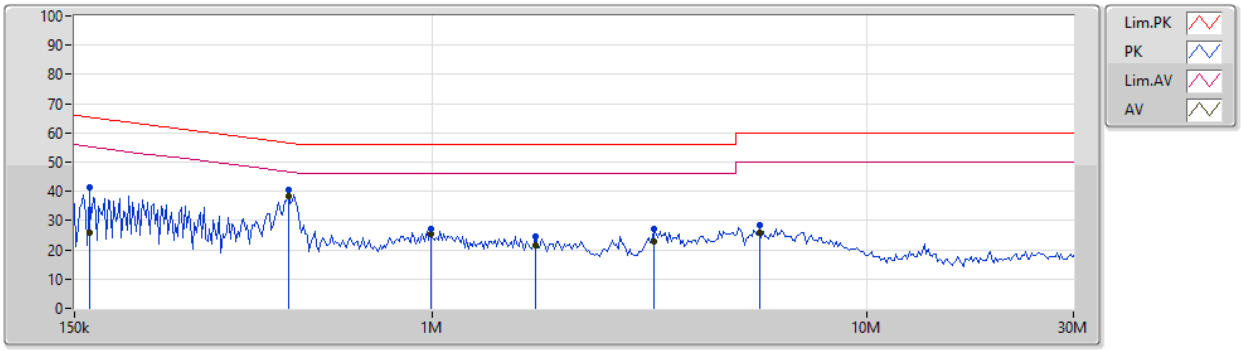
| Instrument | Manufacturer | Model No. | Serial No. | Spec. | Calibration Date | Calibration Due Date |
|---|---|---|---|---|---|---|
| Spectrum Analyzer | R&S | FSV 40 | 101013 | 10Hz~40GHz | 13/Mar/2019 | 12/Mar/2020 |
| Power Sensor | Anritsu | MA2411B | 0917017 | 300MHz ~ 40GHz | 19/Feb/2019 | 18/Feb/2020 |
| Power Meter | Anritsu | ML2495A | 0949003 | 300MHz ~ 40GHz | 19/Feb/2019 | 18/Feb/2020 |
| Cable 0.2m | HUBER | MY10710/4 | RF Cable - 01 | 30MHz ~18G | 10/Jan/2019 | 09/Jan/2020 |
| Cable 0.2m | HUBER | MY10711/4 | RF Cable - 02 | 30MHz ~18G | 10/Jan/2019 | 09/Jan/2020 |
| Cable 0.5m | HUBER | MY10714/4 | RF Cable – 05 | 30MHz~1G | 10/Jan/2019 | 09/Jan/2020 |
| SMB100A Signal Generator | R&S | SMB100A03 | 181147 | 100kHz~40GHz | 12/Nov/2018 | 10/Nov/2020 |

## Instrument for Radiated Test

| Instrument | Manufacturer | Model No. | Serial No. | Spec. | Calibration Date | Calibration Due Date |
|---|---|---|---|---|---|---|
| 3m Semi Anechoic Chamber | SIDT FRANKONIA | SAC-3M | 03CH02-HY | 30MHz ~ 1GHz 3m | 19/Oct/2018 | 18/Oct/2019 |
| 3m Semi Anechoic Chamber | SIDT FRANKONIA | SAC-3M | 03CH02-HY | 1GHz ~ 18GHz 3m | 17/Oct/2018 | 16/Oct/2019 |
| Amplifier | Agilent | 8447D | 2944A11149 | 100kHz ~ 1.3GHz | 02Jul/2019 | 01/Jul/2020 |
| Microwave Preamplifier | Agilent | 8449B | 3008A02373 | 1GHz ~ 26.5GHz | 23/Oct/2018 | 22/Oct/2019 |
| Spectrum Analyzer | Rohde & Schwarz | FSP40 | 100593 | 9KHz - 40GHz | 27/Dec/2018 | 26/Dec/2019 |
| EMI Test Receiver | R&S | ESR3 | 102052 | 9kHz ~ 3.6GHz | 09/Apr/2019 | 08/Apr/2020 |
| RF Cable-R03m | Jye Bao | RG142 | CB017 | 9kHz ~ 1GHz | 26/Mar/2019 | 25/Mar/2020 |
| RF Cable-high 6m | SUHNER | SUCOFLEX104 | 10567868 / SN805193/4 | 1GHz~40GHz | 09/Apr/2019 | 08/Apr/2020 |
| RF Cable-high 7m | SUHNER | SUCOFLEX104 | 10567868 / SN805192/4 | 1GHz~40GHz | 09/Apr/2019 | 08/Apr/2020 |
| Bilog Antenna & 5dB Attenuator | SCHAFFNER / MTJ | CBL 6112B / MTJ6102-05 | 2723 / 2 | 30MHz ~ 1GHz | 08/Sep/2019 | 07/Sep/2020 |
| Broadband Horn Antenna | SCHWARZBECK | BBHA 9170 | BBHA 9170221 | 15GHz ~ 40GHz | 22/Mar2019 | 21/Mar2020 |
| Preamplifier | MITEQ | TTA1840-35-HG | 1864481 | 18GHz ~ 40GHz | 05/Aug/2019 | 04/Aug/2020 |
| Loop Antenna | TESEQ | HLA 6120 | 31244 | 9k-30MHz | 15/Mar/2019 | 14/Mar/2020 |
| Double Ridged Guide Horn Antenna | SCHWARZBECK | BBHA 9120 D | BBHA 9120 D 01543 | 1GHz ~ 18GHz | 03/Jun/2019 | 02/Jun/2020 |

| AC Power-line Conducted Emissions Result | | | |
|---|---|---|---|
| **Operating Mode** | 1 | **Power Phase** | Neutral |
| **Operating Function** | Adapter mode | | |

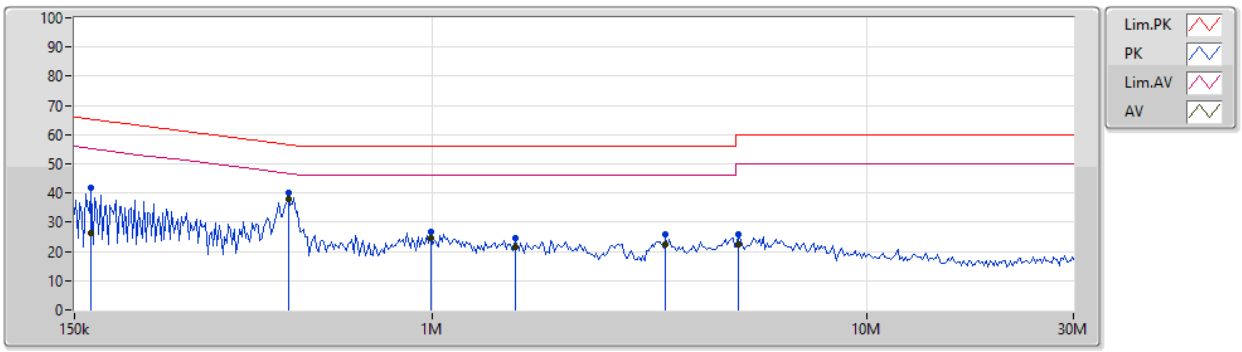
13/09/2019




| Type | Freq | Level | Limit | Margin | Factor | Condition | Comment | Raw | LISN | CL | AT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | (Hz) | (dBuV) | (dBuV) | (dB) | (dB) | | | (dBuV) | (dB) | (dB) | (dB) |
| QP | 162.429k | 41.46 | 65.33 | -23.87 | 19.48 | Neutral | - | 21.98 | 9.60 | 0.01 | 9.87 |
| AV | 162.429k | 25.98 | 55.33 | -29.35 | 19.48 | Neutral | - | 6.50 | 9.60 | 0.01 | 9.87 |
| QP | 466.367k | 40.51 | 56.57 | -16.06 | 19.48 | Neutral | - | 21.03 | 9.59 | 0.01 | 9.88 |
| AV | 466.367k | 38.38 | 46.57 | -8.19 | 19.48 | Neutral | "Worst" | 18.90 | 9.59 | 0.01 | 9.88 |
| QP | 993.464k | 27.23 | 56.00 | -28.77 | 19.49 | Neutral | - | 7.74 | 9.59 | 0.02 | 9.88 |
| AV | 993.464k | 25.27 | 46.00 | -20.73 | 19.49 | Neutral | - | 5.78 | 9.59 | 0.02 | 9.88 |
| QP | 1.734M | 24.36 | 56.00 | -31.64 | 19.53 | Neutral | - | 4.83 | 9.61 | 0.03 | 9.89 |
| AV | 1.734M | 21.37 | 46.00 | -24.63 | 19.53 | Neutral | - | 1.84 | 9.61 | 0.03 | 9.89 |
| QP | 3.246M | 27.27 | 56.00 | -28.73 | 19.54 | Neutral | - | 7.73 | 9.61 | 0.04 | 9.89 |
| AV | 3.246M | 23.01 | 46.00 | -22.99 | 19.54 | Neutral | - | 3.47 | 9.61 | 0.04 | 9.89 |
| QP | 5.668M | 28.55 | 60.00 | -31.45 | 19.57 | Neutral | - | 8.98 | 9.63 | 0.05 | 9.89 |
| AV | 5.668M | 25.69 | 50.00 | -24.31 | 19.57 | Neutral | - | 6.12 | 9.63 | 0.05 | 9.89 |

| AC Power-line Conducted Emissions Result | | | |
|---|---|---|---|
| **Operating Mode** | 1 | **Power Phase** | Line |
| **Operating Function** | Adapter mode | | |

13/09/2019




| Type | Freq | Level | Limit | Margin | Factor | Condition | Comment | Raw | LISN | CL | AT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | (Hz) | (dBuV) | (dBuV) | (dB) | (dB) | | | (dBuV) | (dB) | (dB) | (dB) |
| QP | 164.053k | 41.77 | 65.25 | -23.48 | 19.48 | Line | - | 22.29 | 9.60 | 0.01 | 9.87 |
| AV | 164.053k | 26.29 | 55.25 | -28.96 | 19.48 | Line | - | 6.81 | 9.60 | 0.01 | 9.87 |
| QP | 466.367k | 40.01 | 56.57 | -16.56 | 19.48 | Line | - | 20.53 | 9.59 | 0.01 | 9.88 |
| AV | 466.367k | 37.72 | 46.57 | -8.85 | 19.48 | Line | "Worst" | 18.24 | 9.59 | 0.01 | 9.88 |
| QP | 993.464k | 26.66 | 56.00 | -29.34 | 19.50 | Line | - | 7.16 | 9.60 | 0.02 | 9.88 |
| AV | 993.464k | 24.68 | 46.00 | -21.32 | 19.50 | Line | - | 5.18 | 9.60 | 0.02 | 9.88 |
| QP | 1.555M | 24.44 | 56.00 | -31.56 | 19.53 | Line | - | 4.91 | 9.61 | 0.03 | 9.89 |
| AV | 1.555M | 21.44 | 46.00 | -24.56 | 19.53 | Line | - | 1.91 | 9.61 | 0.03 | 9.89 |
| QP | 3.446M | 26.05 | 56.00 | -29.95 | 19.56 | Line | - | 6.49 | 9.63 | 0.04 | 9.89 |
| AV | 3.446M | 22.20 | 46.00 | -23.80 | 19.56 | Line | - | 2.64 | 9.63 | 0.04 | 9.89 |
| QP | 5.08M | 25.67 | 60.00 | -34.33 | 19.58 | Line | - | 6.09 | 9.64 | 0.05 | 9.89 |
| AV | 5.08M | 22.62 | 50.00 | -27.38 | 19.58 | Line | - | 3.04 | 9.64 | 0.05 | 9.89 |

## Summary

| Mode | Max-N dB (Hz) | Max-OBW (Hz) | ITU-Code | Min-N dB (Hz) | Min-OBW (Hz) |
|---|---|---|---|---|---|
| 2.4-2.4835GHz | - | - | - | - | - |
| 2.4GHz Prop | 1.588M | 2.592M | 2M59G1D | 1.563M | 2.549M |

**Max-N dB** = Maximum 6dB down bandwidth; **Max-OBW** = Maximum 99% occupied bandwidth;
**Min-N dB** = Minimum 6dB down bandwidth; **Min-OBW** = Minimum 99% occupied bandwidth;

## Result

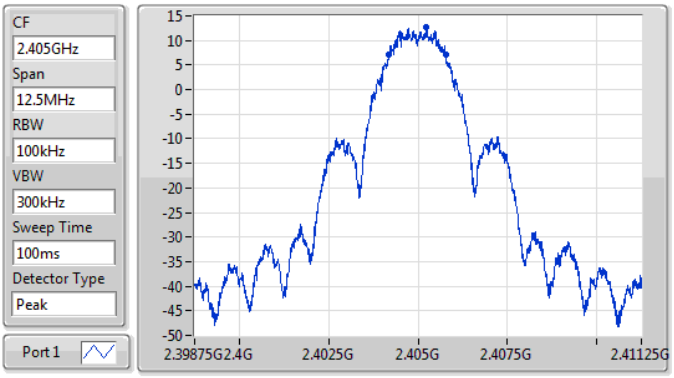
| Mode | Result | Limit (Hz) | Port 1-N dB (Hz) | Port 1-OBW (Hz) |
|---|---|---|---|---|
| 2.4GHz Prop | - | - | - | - |
| 2405MHz_TnomVnom | Pass | 500k | 1.588M | 2.592M |
| 2440MHz_TnomVnom | Pass | 500k | 1.563M | 2.567M |
| 2475MHz_TnomVnom | Pass | 500k | 1.569M | 2.549M |

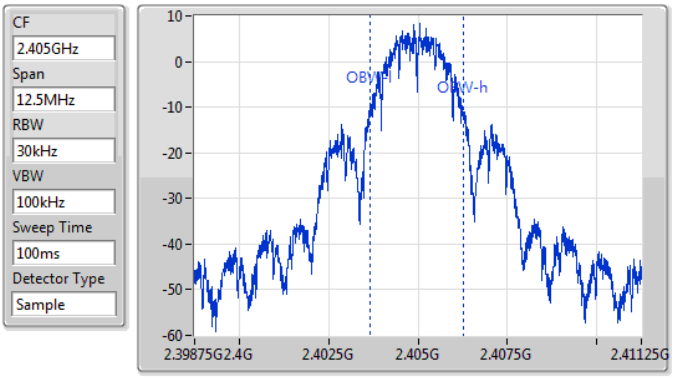
**Port X-N dB** = Port **X** 6dB down bandwidth; **Port X-OBW** = Port **X** 99% occupied bandwidth;

## 2.4GHz Prop EBW

## 2405MHz

27/09/2019



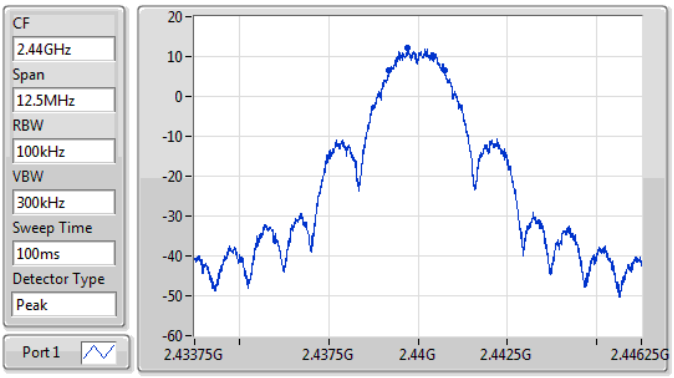



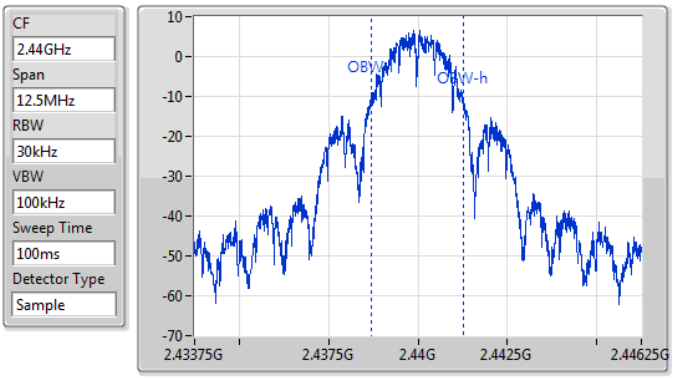

| 6dB(Hz) | Fl-6dB(Hz) | Fh-6dB(Hz) | OBW(Hz) | Fl-OBW(Hz) | Fh-OBW(Hz) | Limit(Hz) | Port |
|---|---|---|---|---|---|---|---|
| 1.588M | 2.404181G | 2.405769G | 2.592M | 2.403676G | 2.406268G | 500k | 1 |

## 2.4GHz Prop EBW

## 2440MHz

27/09/2019



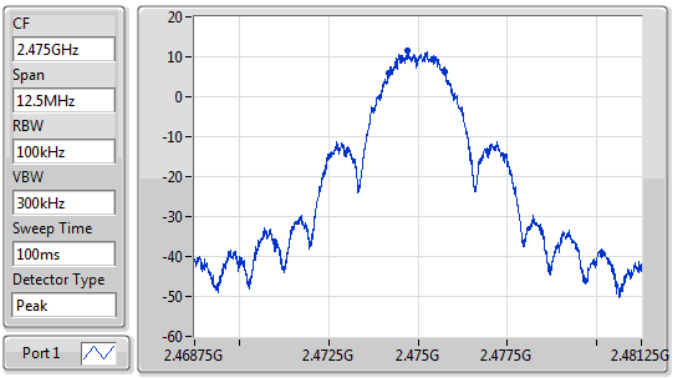



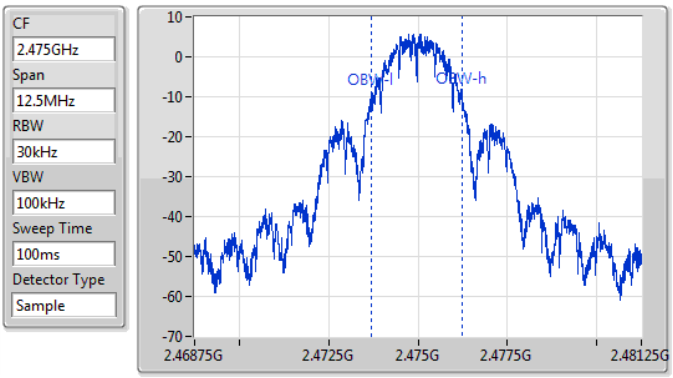

| 6dB(Hz) | Fl-6dB(Hz) | Fh-6dB(Hz) | OBW(Hz) | Fl-OBW(Hz) | Fh-OBW(Hz) | Limit(Hz) | Port |
|---|---|---|---|---|---|---|---|
| 1.563M | 2.439188G | 2.44075G | 2.567M | 2.438688G | 2.441256G | 500k | 1 |

**2.4GHz Prop** **EBW**

**2475MHz**

27/09/2019




| 6dB(Hz) | Fl-6dB(Hz) | Fh-6dB(Hz) | OBW(Hz) | Fl-OBW(Hz) | Fh-OBW(Hz) | Limit(Hz) | Port |
|---|---|---|---|---|---|---|---|
| 1.569M | 2.474181G | 2.47575G | 2.549M | 2.473694G | 2.476243G | 500k | 1 |

## Summary

| Mode | Total Power (dBm) | Total Power (W) |
|---|---|---|
| 2.4-2.4835GHz | - | - |
| 2.4GHz Prop | 16.00 | 0.03981 |

## Result

| Mode | Result | DG (dBi) | Port 1 (dBm) | Total Power (dBm) | Power Limit (dBm) |
|---|---|---|---|---|---|
| 2.4GHz Prop | - | - | - | - | - |
| 2405MHz_TnomVnom | Pass | 3.30 | 16.00 | 16.00 | 30.00 |
| 2440MHz_TnomVnom | Pass | 3.30 | 15.43 | 15.43 | 30.00 |
| 2475MHz_TnomVnom | Pass | 3.30 | 15.03 | 15.03 | 30.00 |

**DG** = Directional Gain; **Port X** = Port X output power

## Summary

| Mode | PD (dBm/RBW) |
|---|---|
| 2.4-2.4835GHz | - |
| 2.4GHz Prop | -0.32 |

RBW=3 kHz.

## Result

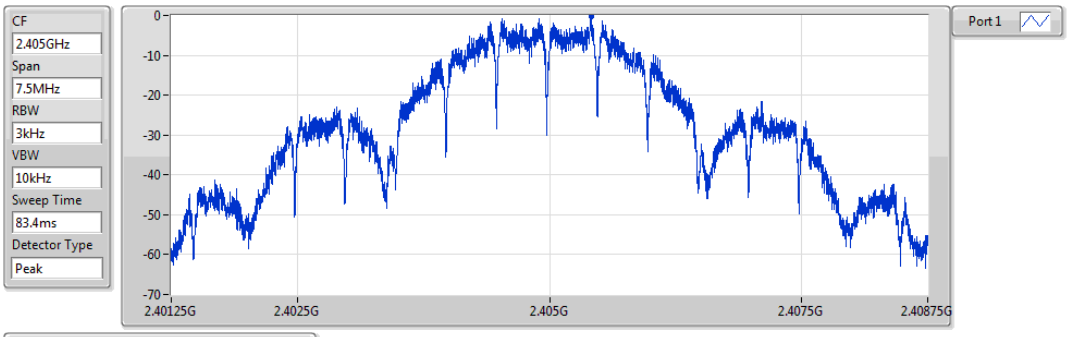
| Mode | Result | DG (dBi) | Port 1 (dBm/RBW) | PD (dBm/RBW) | PD Limit (dBm/RBW) |
|---|---|---|---|---|---|
| 2.4GHz Prop | - | - | - | - | - |
| 2405MHz_TnomVnom | Pass | 3.30 | -0.32 | -0.32 | 8.00 |
| 2440MHz_TnomVnom | Pass | 3.30 | -0.61 | -0.61 | 8.00 |
| 2475MHz_TnomVnom | Pass | 3.30 | -0.73 | -0.73 | 8.00 |

**DG** = Directional Gain; RBW=3 kHz;
**PD** = trace bin-by-bin of each transmits port summing can be performed maximum power density; **Port X** = Port X power density;

## 2.4GHz Prop PSD

### 2405MHz

27/09/2019

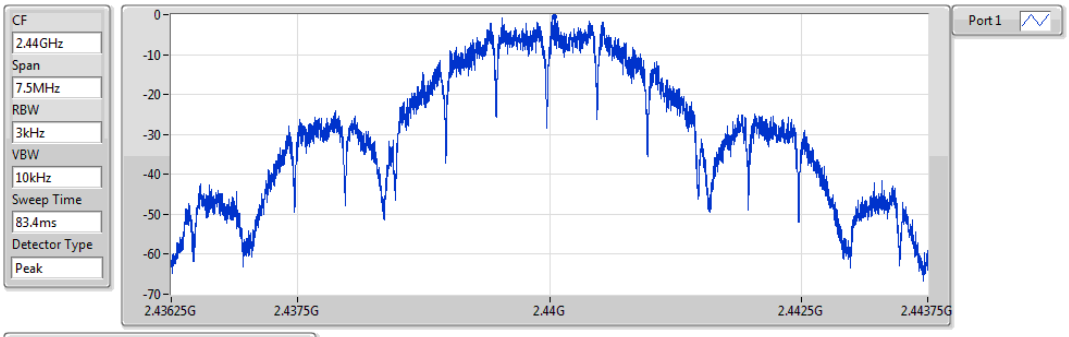



| Sum | PD | Port 1 |
|---|---|---|
| (dBm/RBW) | (dBm/RBW) | (dBm/RBW) |
| -0.32 | -0.32 | -0.32 |

## 2.4GHz Prop PSD

### 2440MHz

27/09/2019

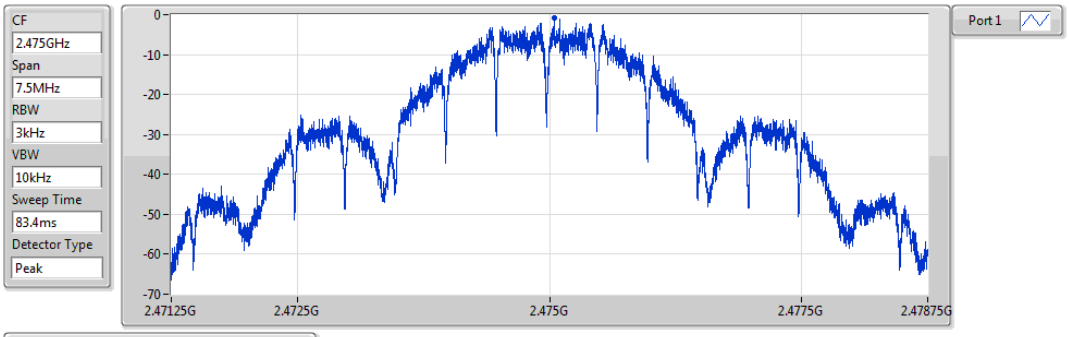



| Sum | PD | Port 1 |
|---|---|---|
| (dBm/RBW) | (dBm/RBW) | (dBm/RBW) |
| -0.61 | -0.61 | -0.61 |

## 2.4GHz Prop PSD

### 2475MHz

27/09/2019




| Sum | PD | Port 1 |
|---|---|---|
| (dBm/RBW) | (dBm/RBW) | (dBm/RBW) |
| -0.73 | -0.73 | -0.73 |

## Summary

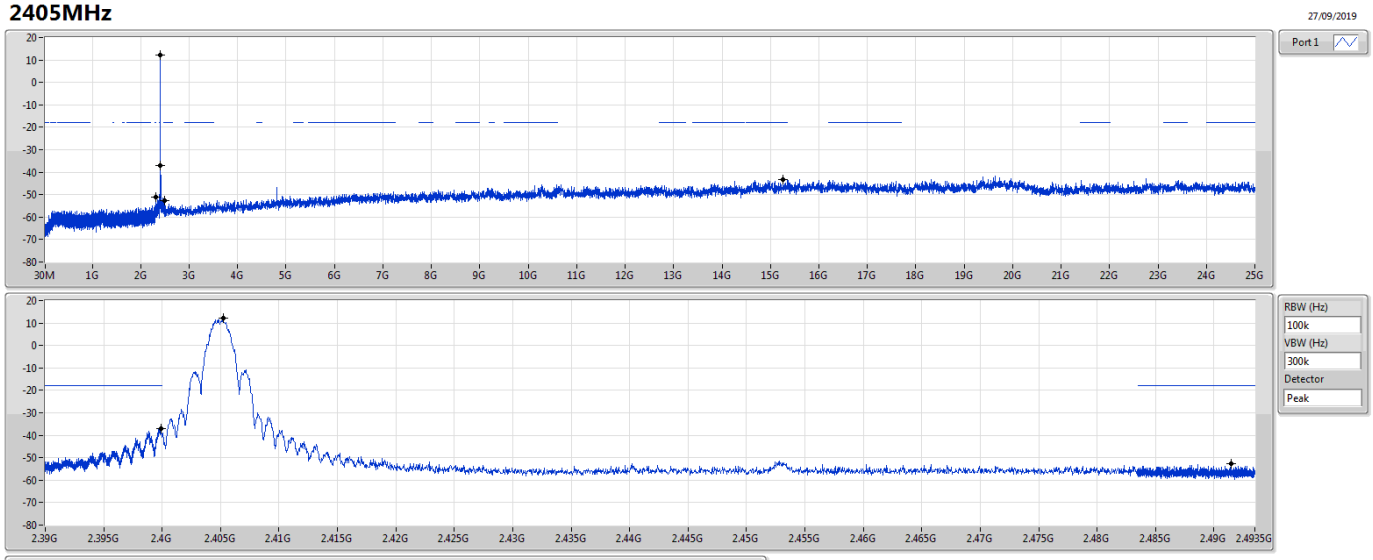
| Mode | Result | Ref (Hz) | Ref (dBm) | Limit (dBm) | Freq (Hz) | Level (dBm) | Freq (Hz) | Level (dBm) | Freq (Hz) | Level (dBm) | Freq (Hz) | Level (dBm) | Port |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2.4-2.4835GHz | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 2.4GHz Prop | Pass | 2.40522G | 12.00 | -18.00 | 2.30976G | -50.91 | 2.3999G | -37.12 | 2.49147G | -52.54 | 15.2575G | -43.29 | 1 |

## Result

| Mode | Result | Ref (Hz) | Ref (dBm) | Limit (dBm) | Freq (Hz) | Level (dBm) | Freq (Hz) | Level (dBm) | Freq (Hz) | Level (dBm) | Freq (Hz) | Level (dBm) | Port |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2.4GHz Prop | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 2405MHz_TnomVnom | Pass | 2.40522G | 12.00 | -18.00 | 2.30976G | -50.91 | 2.3999G | -37.12 | 2.49147G | -52.54 | 15.2575G | -43.29 | 1 |
| 2440MHz_TnomVnom | Pass | 2.40522G | 12.00 | -18.00 | 1.95429G | -55.83 | 2.3919G | -49.87 | 2.48818G | -50.01 | 23.35703G | -42.88 | 1 |
| 2475MHz_TnomVnom | Pass | 2.40522G | 12.00 | -18.00 | 514.39M | -55.73 | 2.39799G | -52.68 | 2.48408G | -46.48 | 16.72886G | -42.72 | 1 |

**2.4GHz Prop** **CSE NdB**

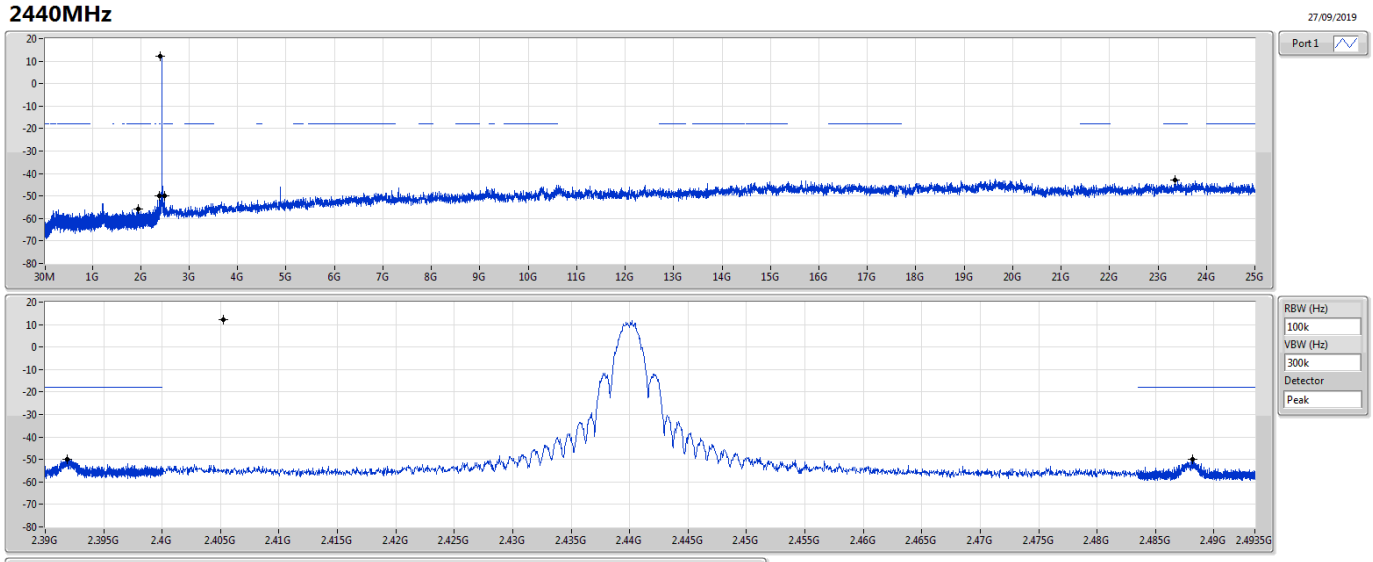
**2405MHz**




| Ref(Hz) | Ref(dBm) | Limit(dBm) | Freq(Hz) | Level(dBm) | Freq(Hz) | Level(dBm) | Freq(Hz) | Level(dBm) | Freq(Hz) | Level(dBm) | Port |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2.40522G | 12.00 | -18.00 | 2.30976G | -50.91 | 2.3999G | -37.12 | 2.49147G | -52.54 | 15.2575G | -43.29 | 1 |

**2.4GHz Prop** **CSE NdB**

**2440MHz**

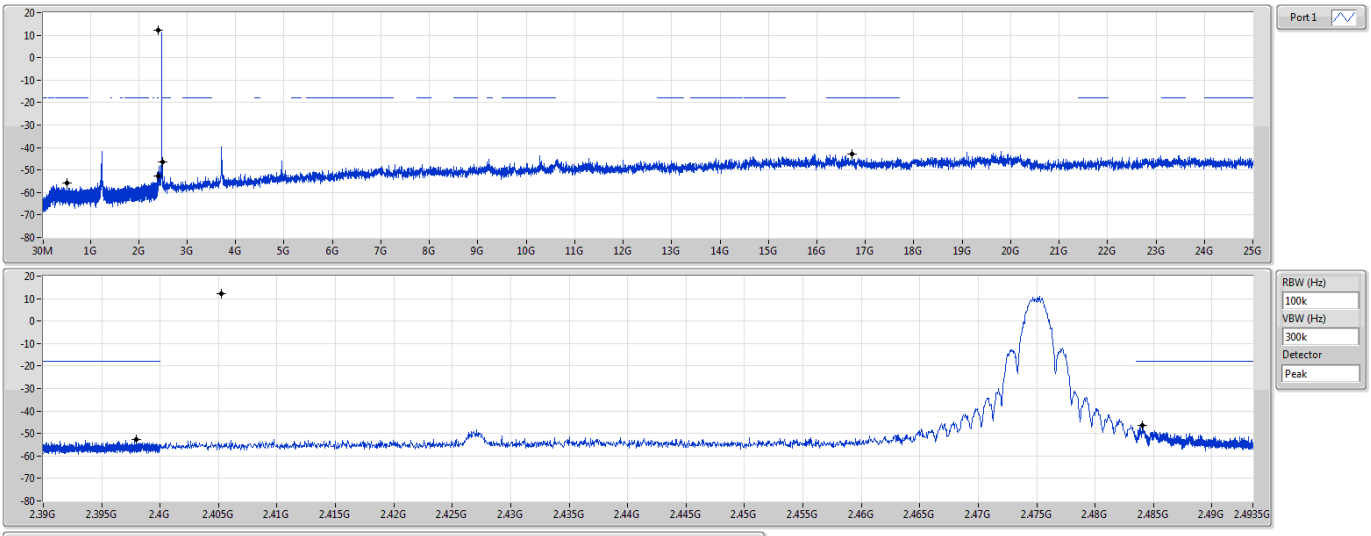



| Ref(Hz) | Ref(dBm) | Limit(dBm) | Freq(Hz) | Level(dBm) | Freq(Hz) | Level(dBm) | Freq(Hz) | Level(dBm) | Freq(Hz) | Level(dBm) | Port |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2.40522G | 12.00 | -18.00 | 1.95429G | -55.83 | 2.3919G | -49.87 | 2.48818G | -50.01 | 23.35703G | -42.88 | 1 |

**2.4GHz Prop** **CSE NdB**

**2475MHz**

27/09/2019




| Ref(Hz) | Ref(dBm) | Limit(dBm) | Freq(Hz) | Level(dBm) | Freq(Hz) | Level(dBm) | Freq(Hz) | Level(dBm) | Freq(Hz) | Level(dBm) | Port |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2.40522G | 12.00 | -18.00 | 514.39M | -55.73 | 2.39799G | -52.68 | 2.48408G | -46.48 | 16.72886G | -42.72 | 1 |

## Summary

| Mode | Result | Type | Freq (Hz) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Dist (m) | Condition | Azimuth (°) | Height (m) | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2.4-2.4835GHz | - | - | - | - | - | - | - | - | - | - | - |
| 2.4GHz Prop | Pass | PK | 934.04M | 36.92 | 46.00 | -9.08 | 3 | Vertical | 0 | 1.00 | - |

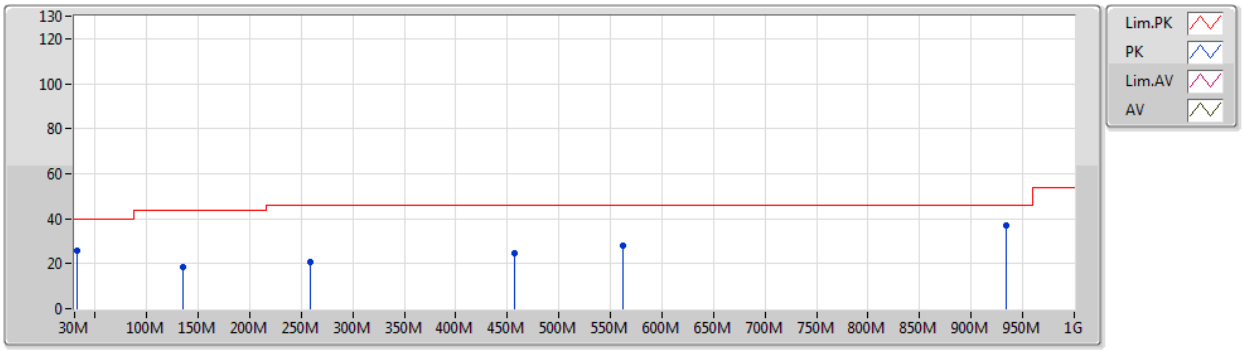
## Result

| Mode | Result | Type | Freq (Hz) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Dist (m) | Condition | Azimuth (°) | Height (m) | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2.4GHz Prop | - | - | - | - | - | - | - | - | - | - | - |
| 2440MHz | Pass | PK | 31.94M | 25.66 | 40.00 | -14.34 | 3 | Vertical | 0 | 1.00 | - |
| 2440MHz | Pass | PK | 134.76M | 18.66 | 43.50 | -24.84 | 3 | Vertical | 0 | 1.00 | - |
| 2440MHz | Pass | PK | 258.92M | 20.67 | 46.00 | -25.33 | 3 | Vertical | 0 | 1.00 | - |
| 2440MHz | Pass | PK | 456.8M | 24.56 | 46.00 | -21.44 | 3 | Vertical | 0 | 1.00 | - |
| 2440MHz | Pass | PK | 561.56M | 27.90 | 46.00 | -18.10 | 3 | Vertical | 0 | 1.00 | - |
| 2440MHz | Pass | PK | 934.04M | 36.92 | 46.00 | -9.08 | 3 | Vertical | 0 | 1.00 | - |
| 2440MHz | Pass | PK | 30M | 22.54 | 40.00 | -17.46 | 3 | Horizontal | 360 | 1.00 | - |
| 2440MHz | Pass | PK | 134.76M | 19.54 | 43.50 | -23.96 | 3 | Horizontal | 360 | 1.00 | - |
| 2440MHz | Pass | PK | 272.5M | 22.30 | 46.00 | -23.70 | 3 | Horizontal | 360 | 1.00 | - |
| 2440MHz | Pass | PK | 478.14M | 26.02 | 46.00 | -19.98 | 3 | Horizontal | 360 | 1.00 | - |
| 2440MHz | Pass | PK | 769.14M | 30.55 | 46.00 | -15.45 | 3 | Horizontal | 360 | 1.00 | - |
| 2440MHz | Pass | PK | 926.28M | 36.04 | 46.00 | -9.96 | 3 | Horizontal | 360 | 1.00 | - |

## 2.4GHz Prop

## 2440MHz_Adapter

14/10/2019

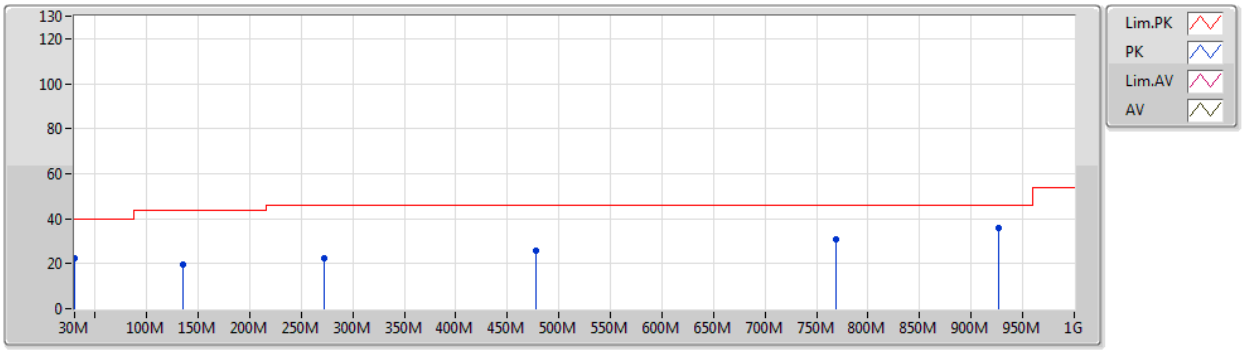



| Type | Freq | Level | Limit | Margin | Factor | Dist | Condition | Azimuth | Height | Comment | Raw | AF | CL | PA |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | (Hz) | (dBuV/m) | (dBuV/m) | (dB) | (dB) | (m) | | (°) | (m) | | (dBuV) | (dB) | (dB) | (dB) |
| PK | 31.94M | 25.66 | 40.00 | -14.34 | -5.43 | 3 | Vertical | 0 | 1.00 | - | 31.09 | 21.90 | 0.36 | 27.69 |
| PK | 134.76M | 18.66 | 43.50 | -24.84 | -9.38 | 3 | Vertical | 0 | 1.00 | - | 28.04 | 16.57 | 1.74 | 27.69 |
| PK | 258.92M | 20.67 | 46.00 | -25.33 | -5.85 | 3 | Vertical | 0 | 1.00 | - | 26.52 | 18.57 | 2.76 | 27.18 |
| PK | 456.8M | 24.56 | 46.00 | -21.44 | -2.99 | 3 | Vertical | 0 | 1.00 | - | 27.55 | 22.09 | 3.24 | 28.32 |
| PK | 561.56M | 27.90 | 46.00 | -18.10 | -1.13 | 3 | Vertical | 0 | 1.00 | - | 29.03 | 23.87 | 3.61 | 28.61 |
| PK | 934.04M | 36.92 | 46.00 | -9.08 | 2.95 | 3 | Vertical | 0 | 1.00 | - | 33.97 | 25.89 | 4.70 | 27.64 |

## 2.4GHz Prop

## 2440MHz_Adapter

14/10/2019




| Type | Freq | Level | Limit | Margin | Factor | Dist | Condition | Azimuth | Height | Comment | Raw | AF | CL | PA |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | (Hz) | (dBuV/m) | (dBuV/m) | (dB) | (dB) | (m) | | (°) | (m) | | (dBuV) | (dB) | (dB) | (dB) |
| PK | 30M | 22.54 | 40.00 | -17.46 | -4.40 | 3 | Horizontal | 360 | 1.00 | - | 26.94 | 23.01 | 0.29 | 27.70 |
| PK | 134.76M | 19.54 | 43.50 | -23.96 | -9.38 | 3 | Horizontal | 360 | 1.00 | - | 28.92 | 16.57 | 1.74 | 27.69 |
| PK | 272.5M | 22.30 | 46.00 | -23.70 | -6.12 | 3 | Horizontal | 360 | 1.00 | - | 28.42 | 18.24 | 2.82 | 27.18 |
| PK | 478.14M | 26.02 | 46.00 | -19.98 | -2.49 | 3 | Horizontal | 360 | 1.00 | - | 28.51 | 22.60 | 3.28 | 28.37 |
| PK | 769.14M | 30.55 | 46.00 | -15.45 | 0.93 | 3 | Horizontal | 360 | 1.00 | - | 29.62 | 25.05 | 4.14 | 28.26 |
| PK | 926.28M | 36.04 | 46.00 | -9.96 | 2.81 | 3 | Horizontal | 360 | 1.00 | - | 33.23 | 25.84 | 4.62 | 27.65 |

## Summary

| Mode | Result | Type | Freq (Hz) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Dist (m) | Condition | Azimuth (°) | Height (m) | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2.4-2.4835GHz | - | - | - | - | - | - | - | - | - | - | - |
| 2.4GHz Prop | Pass | AV | 4.95094G | 48.53 | 54.00 | -5.47 | 3 | Vertical | 332 | 2.54 | - |

## Result

| Mode | Result | Type | Freq (Hz) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Dist (m) | Condition | Azimuth (°) | Height (m) | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2.4GHz Prop | - | - | - | - | - | - | - | - | - | - | - |
| 2405MHz | Pass | AV | 2.355G | 45.50 | 54.00 | -8.50 | 3 | Vertical | 298 | 1.06 | - |
| 2405MHz | Pass | AV | 2.405G | 100.42 | Inf | -Inf | 3 | Vertical | 298 | 1.06 | - |
| 2405MHz | Pass | PK | 2.3708G | 57.38 | 74.00 | -16.62 | 3 | Vertical | 298 | 1.06 | - |
| 2405MHz | Pass | PK | 2.4044G | 104.80 | Inf | -Inf | 3 | Vertical | 298 | 1.06 | - |
| 2405MHz | Pass | AV | 2.3628G | 44.40 | 54.00 | -9.60 | 3 | Horizontal | 353 | 1.00 | - |
| 2405MHz | Pass | AV | 2.405G | 96.80 | Inf | -Inf | 3 | Horizontal | 353 | 1.00 | - |
| 2405MHz | Pass | PK | 2.3636G | 56.72 | 74.00 | -17.28 | 3 | Horizontal | 353 | 1.00 | - |
| 2405MHz | Pass | PK | 2.4054G | 101.17 | Inf | -Inf | 3 | Horizontal | 353 | 1.00 | - |
| 2405MHz | Pass | AV | 4.80892G | 46.20 | 54.00 | -7.80 | 3 | Vertical | 328 | 2.27 | - |
| 2405MHz | Pass | PK | 4.80899G | 54.38 | 74.00 | -19.62 | 3 | Vertical | 328 | 2.27 | - |
| 2405MHz | Pass | AV | 4.80895G | 40.56 | 54.00 | -13.44 | 3 | Horizontal | 6 | 1.21 | - |
| 2405MHz | Pass | PK | 4.80891G | 49.89 | 74.00 | -24.11 | 3 | Horizontal | 6 | 1.21 | - |
| 2440MHz | Pass | AV | 2.3436G | 44.86 | 54.00 | -9.14 | 3 | Vertical | 305 | 1.21 | - |
| 2440MHz | Pass | AV | 2.44G | 95.34 | Inf | -Inf | 3 | Vertical | 305 | 1.21 | - |
| 2440MHz | Pass | AV | 2.4992G | 44.42 | 54.00 | -9.58 | 3 | Vertical | 305 | 1.21 | - |
| 2440MHz | Pass | PK | 2.3732G | 57.20 | 74.00 | -16.80 | 3 | Vertical | 305 | 1.21 | - |
| 2440MHz | Pass | PK | 2.4396G | 99.79 | Inf | -Inf | 3 | Vertical | 305 | 1.21 | - |
| 2440MHz | Pass | PK | 2.494G | 56.27 | 74.00 | -17.73 | 3 | Vertical | 305 | 1.21 | - |
| 2440MHz | Pass | AV | 2.366G | 44.01 | 54.00 | -9.99 | 3 | Horizontal | 23 | 1.25 | - |
| 2440MHz | Pass | AV | 2.44G | 94.14 | Inf | -Inf | 3 | Horizontal | 23 | 1.25 | - |
| 2440MHz | Pass | AV | 2.4984G | 44.43 | 54.00 | -9.57 | 3 | Horizontal | 23 | 1.25 | - |
| 2440MHz | Pass | PK | 2.3588G | 55.99 | 74.00 | -18.01 | 3 | Horizontal | 23 | 1.25 | - |
| 2440MHz | Pass | PK | 2.4396G | 98.50 | Inf | -Inf | 3 | Horizontal | 23 | 1.25 | - |
| 2440MHz | Pass | PK | 2.4852G | 55.88 | 74.00 | -18.12 | 3 | Horizontal | 23 | 1.25 | - |
| 2440MHz | Pass | AV | 4.88094G | 45.79 | 54.00 | -8.21 | 3 | Vertical | 298 | 1.20 | - |
| 2440MHz | Pass | AV | 7.3187G | 45.54 | 54.00 | -8.46 | 3 | Vertical | 270 | 2.15 | - |
| 2440MHz | Pass | PK | 4.88086G | 54.08 | 74.00 | -19.92 | 3 | Vertical | 298 | 1.20 | - |
| 2440MHz | Pass | PK | 7.3184G | 56.29 | 74.00 | -17.71 | 3 | Vertical | 270 | 2.15 | - |
| 2440MHz | Pass | AV | 4.87893G | 47.03 | 54.00 | -6.97 | 3 | Horizontal | 0 | 1.18 | - |
| 2440MHz | Pass | AV | 7.31864G | 43.31 | 54.00 | -10.69 | 3 | Horizontal | 160 | 1.10 | - |
| 2440MHz | Pass | PK | 4.87898G | 55.17 | 74.00 | -18.83 | 3 | Horizontal | 0 | 1.18 | - |
| 2440MHz | Pass | PK | 7.31858G | 54.52 | 74.00 | -19.48 | 3 | Horizontal | 160 | 1.10 | - |
| 2475MHz | Pass | AV | 2.475G | 89.98 | Inf | -Inf | 3 | Vertical | 122 | 1.23 | - |
| 2475MHz | Pass | AV | 2.4835G | 44.45 | 54.00 | -9.55 | 3 | Vertical | 122 | 1.23 | - |
| 2475MHz | Pass | PK | 2.4754G | 94.34 | Inf | -Inf | 3 | Vertical | 122 | 1.23 | - |
| 2475MHz | Pass | PK | 2.4948G | 56.23 | 74.00 | -17.77 | 3 | Vertical | 122 | 1.23 | - |
| 2475MHz | Pass | AV | 2.475G | 93.35 | Inf | -Inf | 3 | Horizontal | 26 | 2.96 | - |
| 2475MHz | Pass | AV | 2.4835G | 44.47 | 54.00 | -9.53 | 3 | Horizontal | 26 | 2.96 | - |
| 2475MHz | Pass | PK | 2.4744G | 97.74 | Inf | -Inf | 3 | Horizontal | 26 | 2.96 | - |
| 2475MHz | Pass | PK | 2.4842G | 57.53 | 74.00 | -16.47 | 3 | Horizontal | 26 | 2.96 | - |
| 2475MHz | Pass | AV | 4.95094G | 48.53 | 54.00 | -5.47 | 3 | Vertical | 332 | 2.54 | - |
| 2475MHz | Pass | AV | 7.42361G | 45.23 | 54.00 | -8.77 | 3 | Vertical | 15 | 1.00 | - |
| 2475MHz | Pass | PK | 4.94894G | 56.64 | 74.00 | -17.36 | 3 | Vertical | 332 | 2.54 | - |
| 2475MHz | Pass | PK | 7.42635G | 56.64 | 74.00 | -17.36 | 3 | Vertical | 15 | 1.00 | - |
| 2475MHz | Pass | AV | 4.94893G | 45.37 | 54.00 | -8.63 | 3 | Horizontal | 26 | 1.29 | - |
| 2475MHz | Pass | AV | 7.42621G | 41.61 | 54.00 | -12.39 | 3 | Horizontal | 0 | 1.90 | - |
| 2475MHz | Pass | PK | 4.94895G | 53.80 | 74.00 | -20.20 | 3 | Horizontal | 26 | 1.29 | - |

Remark :



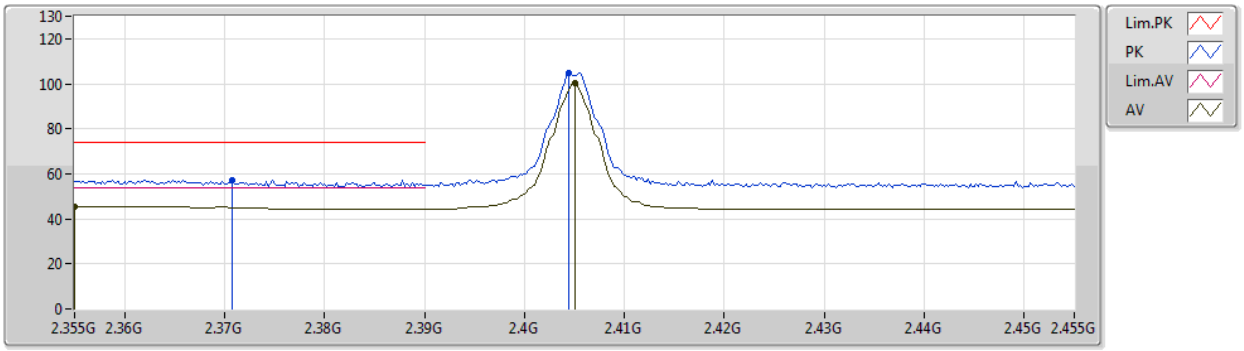
Level (dBuV/m) = Raw(Read Level) + AF(Antenna Factor) + CL(Cable Loss) - PA( Preamp Factor)

| Mode | Result | Type | Freq (Hz) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Dist (m) | Condition | Azimuth (°) | Height (m) | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2475MHz | Pass | PK | 7.42642G | 53.60 | 74.00 | -20.40 | 3 | Horizontal | 0 | 1.90 | - |

## 2.4GHz Prop

## 2405MHz_TX

14/10/2019

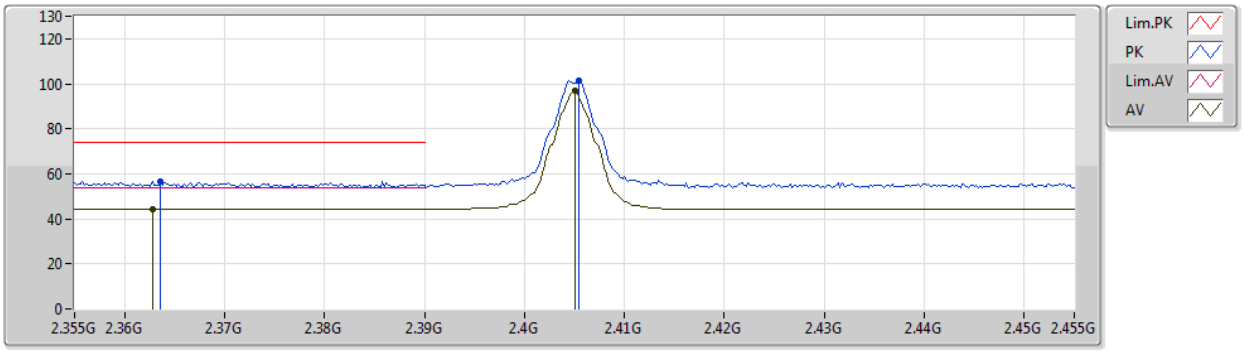



| Type | Freq | Level | Limit | Margin | Factor | Dist | Condition | Azimuth | Height | Comment | Raw | AF | CL | PA |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | (Hz) | (dBuV/m) | (dBuV/m) | (dB) | (dB) | (m) | | (°) | (m) | | (dBuV) | (dB) | (dB) | (dB) |
| AV | 2.355G | 45.50 | 54.00 | -8.50 | 31.95 | 3 | Vertical | 298 | 1.06 | - | 13.55 | 27.27 | 4.68 | - |
| AV | 2.405G | 100.42 | Inf | -Inf | 32.15 | 3 | Vertical | 298 | 1.06 | - | 68.27 | 27.41 | 4.74 | - |
| PK | 2.3708G | 57.38 | 74.00 | -16.62 | 32.01 | 3 | Vertical | 298 | 1.06 | - | 25.37 | 27.31 | 4.70 | - |
| PK | 2.4044G | 104.80 | Inf | -Inf | 32.15 | 3 | Vertical | 298 | 1.06 | - | 72.65 | 27.41 | 4.74 | - |

## 2.4GHz Prop

## 2405MHz_TX

14/10/2019

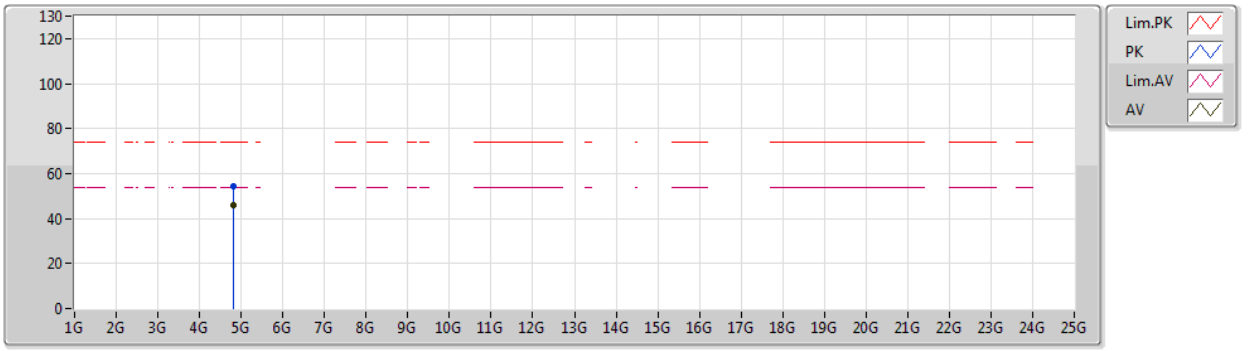



| Type | Freq | Level | Limit | Margin | Factor | Dist | Condition | Azimuth | Height | Comment | Raw | AF | CL | PA |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | (Hz) | (dBuV/m) | (dBuV/m) | (dB) | (dB) | (m) | | (°) | (m) | | (dBuV) | (dB) | (dB) | (dB) |
| AV | 2.3628G | 44.40 | 54.00 | -9.60 | 31.98 | 3 | Horizontal | 353 | 1.00 | - | 12.42 | 27.29 | 4.69 | - |
| AV | 2.405G | 96.80 | Inf | -Inf | 32.15 | 3 | Horizontal | 353 | 1.00 | - | 64.65 | 27.41 | 4.74 | - |
| PK | 2.3636G | 56.72 | 74.00 | -17.28 | 31.98 | 3 | Horizontal | 353 | 1.00 | - | 24.74 | 27.29 | 4.69 | - |
| PK | 2.4054G | 101.17 | Inf | -Inf | 32.16 | 3 | Horizontal | 353 | 1.00 | - | 69.01 | 27.42 | 4.74 | - |

## 2.4GHz Prop_Nss1_1TX

## 2405MHz_TX

14/10/2019

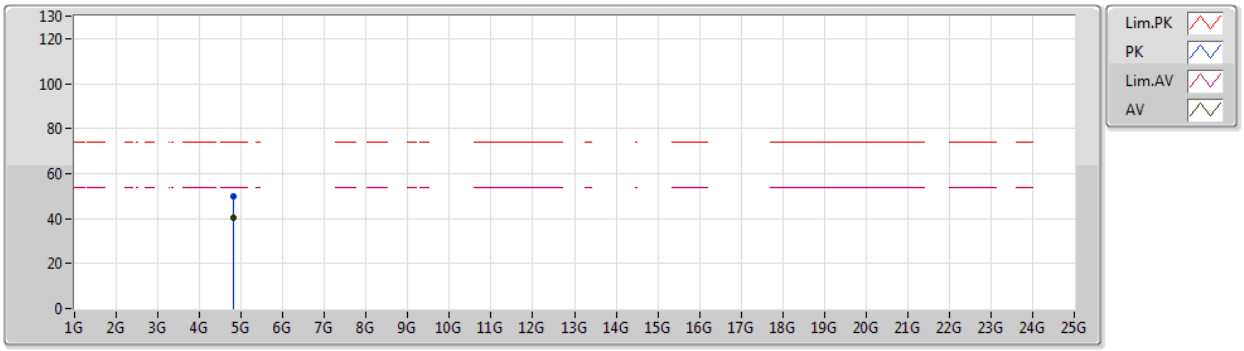



| Type | Freq | Level | Limit | Margin | Factor | Dist | Condition | Azimuth | Height | Comment | Raw | AF | CL | PA |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | (Hz) | (dBuV/m) | (dBuV/m) | (dB) | (dB) | (m) | | (°) | (m) | | (dBuV) | (dB) | (dB) | (dB) |
| AV | 4.80892G | 46.20 | 54.00 | -7.80 | 3.66 | 3 | Vertical | 328 | 2.27 | - | 42.54 | 31.36 | 6.79 | 34.49 |
| PK | 4.80899G | 54.38 | 74.00 | -19.62 | 3.66 | 3 | Vertical | 328 | 2.27 | - | 50.72 | 31.36 | 6.79 | 34.49 |

## 2.4GHz Prop

## 2405MHz_TX

14/10/2019

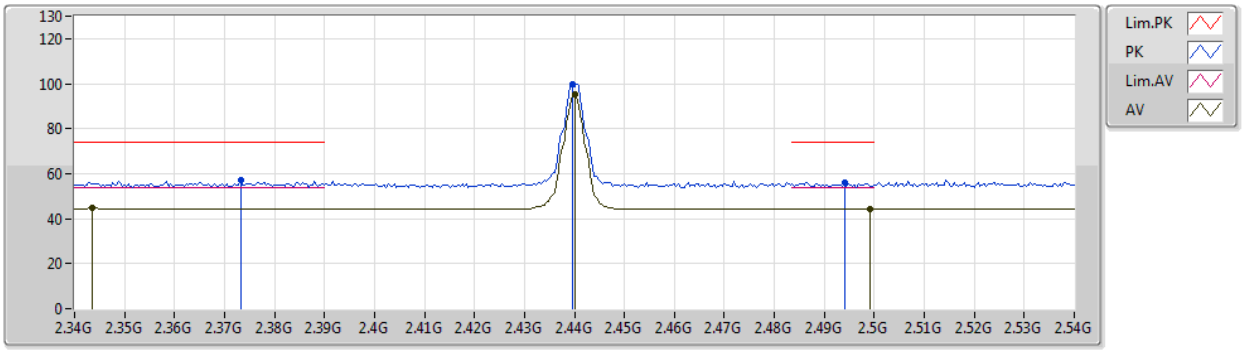



| Type | Freq | Level | Limit | Margin | Factor | Dist | Condition | Azimuth | Height | Comment | Raw | AF | CL | PA |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | (Hz) | (dBuV/m) | (dBuV/m) | (dB) | (dB) | (m) | | (°) | (m) | | (dBuV) | (dB) | (dB) | (dB) |
| AV | 4.80895G | 40.56 | 54.00 | -13.44 | 3.66 | 3 | Horizontal | 6 | 1.21 | - | 36.90 | 31.36 | 6.79 | 34.49 |
| PK | 4.80891G | 49.89 | 74.00 | -24.11 | 3.66 | 3 | Horizontal | 6 | 1.21 | - | 46.23 | 31.36 | 6.79 | 34.49 |

## 2.4GHz Prop

## 2440MHz_TX

14/10/2019

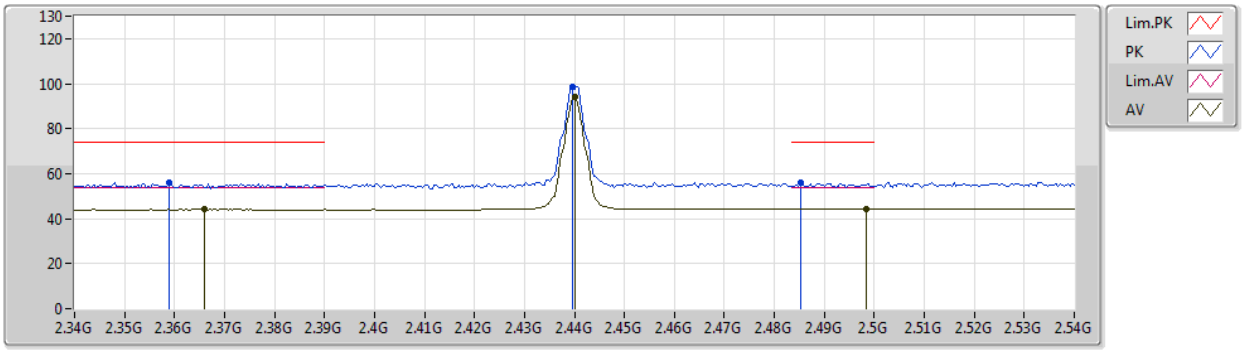



| Type | Freq | Level | Limit | Margin | Factor | Dist | Condition | Azimuth | Height | Comment | Raw | AF | CL | PA |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | (Hz) | (dBuV/m) | (dBuV/m) | (dB) | (dB) | (m) | | (°) | (m) | | (dBuV) | (dB) | (dB) | (dB) |
| AV | 2.3436G | 44.86 | 54.00 | -9.14 | 31.89 | 3 | Vertical | 305 | 1.21 | - | 12.97 | 27.23 | 4.66 | - |
| AV | 2.44G | 95.34 | Inf | -Inf | 32.30 | 3 | Vertical | 305 | 1.21 | - | 63.04 | 27.52 | 4.78 | - |
| AV | 2.4992G | 44.42 | 54.00 | -9.58 | 32.55 | 3 | Vertical | 305 | 1.21 | - | 11.87 | 27.70 | 4.85 | - |
| PK | 2.3732G | 57.20 | 74.00 | -16.80 | 32.02 | 3 | Vertical | 305 | 1.21 | - | 25.18 | 27.32 | 4.70 | - |
| PK | 2.4396G | 99.79 | Inf | -Inf | 32.30 | 3 | Vertical | 305 | 1.21 | - | 67.49 | 27.52 | 4.78 | - |
| PK | 2.494G | 56.27 | 74.00 | -17.73 | 32.52 | 3 | Vertical | 305 | 1.21 | - | 23.75 | 27.68 | 4.84 | - |

## 2.4GHz Prop

## 2440MHz_TX

14/10/2019

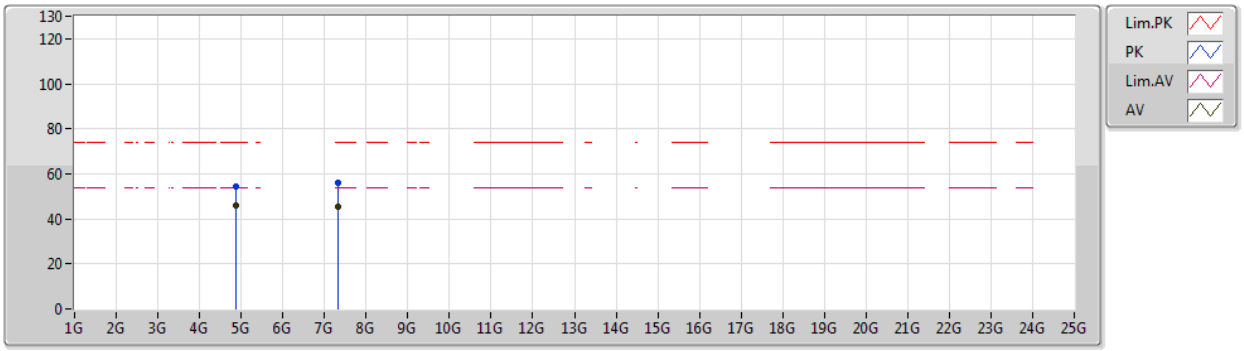



| Type | Freq | Level | Limit | Margin | Factor | Dist | Condition | Azimuth | Height | Comment | Raw | AF | CL | PA |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | (Hz) | (dBuV/m) | (dBuV/m) | (dB) | (dB) | (m) | | (°) | (m) | | (dBuV) | (dB) | (dB) | (dB) |
| AV | 2.366G | 44.01 | 54.00 | -9.99 | 31.99 | 3 | Horizontal | 23 | 1.25 | - | 12.02 | 27.30 | 4.69 | - |
| AV | 2.44G | 94.14 | Inf | -Inf | 32.30 | 3 | Horizontal | 23 | 1.25 | - | 61.84 | 27.52 | 4.78 | - |
| AV | 2.4984G | 44.43 | 54.00 | -9.57 | 32.55 | 3 | Horizontal | 23 | 1.25 | - | 11.88 | 27.70 | 4.85 | - |
| PK | 2.3588G | 55.99 | 74.00 | -18.01 | 31.96 | 3 | Horizontal | 23 | 1.25 | - | 24.03 | 27.28 | 4.68 | - |
| PK | 2.4396G | 98.50 | Inf | -Inf | 32.30 | 3 | Horizontal | 23 | 1.25 | - | 66.20 | 27.52 | 4.78 | - |
| PK | 2.4852G | 55.88 | 74.00 | -18.12 | 32.49 | 3 | Horizontal | 23 | 1.25 | - | 23.39 | 27.66 | 4.83 | - |

## 2.4GHz Prop

## 2440MHz_TX

14/10/2019




| Type | Freq | Level | Limit | Margin | Factor | Dist | Condition | Azimuth | Height | Comment | Raw | AF | CL | PA |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | (Hz) | (dBuV/m) | (dBuV/m) | (dB) | (dB) | (m) | | (°) | (m) | | (dBuV) | (dB) | (dB) | (dB) |
| AV | 4.88094G | 45.79 | 54.00 | -8.21 | 3.83 | 3 | Vertical | 298 | 1.20 | - | 41.96 | 31.49 | 6.81 | 34.47 |
| AV | 7.3187G | 45.54 | 54.00 | -8.46 | 9.90 | 3 | Vertical | 270 | 2.15 | - | 35.64 | 36.03 | 8.62 | 34.75 |
| PK | 4.88086G | 54.08 | 74.00 | -19.92 | 3.83 | 3 | Vertical | 298 | 1.20 | - | 50.25 | 31.49 | 6.81 | 34.47 |
| PK | 7.3184G | 56.29 | 74.00 | -17.71 | 9.90 | 3 | Vertical | 270 | 2.15 | - | 46.39 | 36.03 | 8.62 | 34.75 |

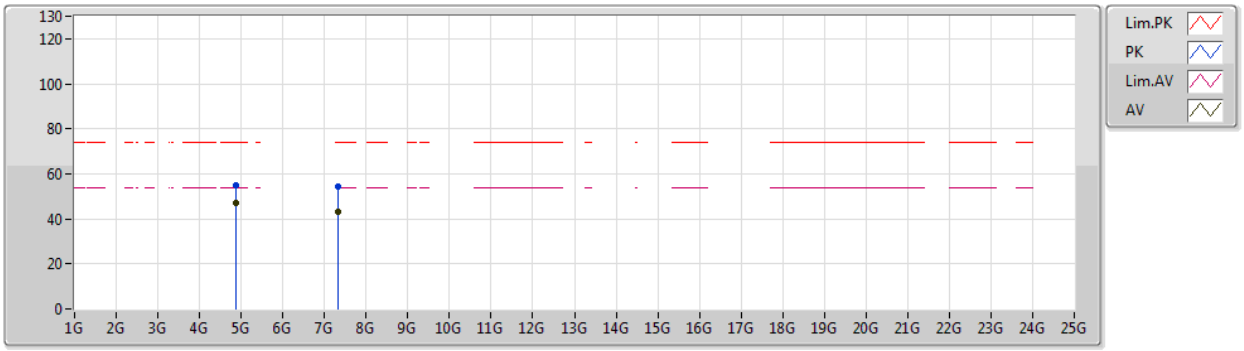


Level (dBuV/m) = Raw(Read Level) + AF(Antenna Factor) + CL(Cable Loss) - PA( Preamp Factor)

## 2.4GHz Prop

## 2440MHz_TX

14/10/2019

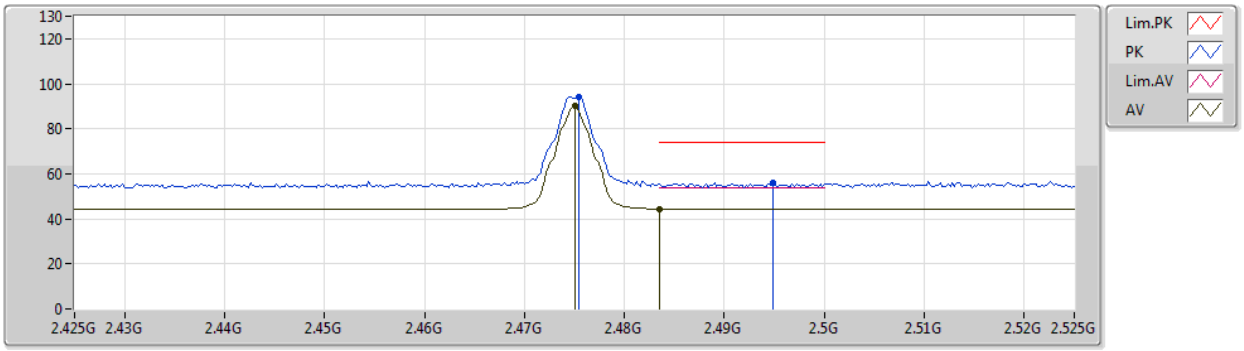



| Type | Freq | Level | Limit | Margin | Factor | Dist | Condition | Azimuth | Height | Comment | Raw | AF | CL | PA |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | (Hz) | (dBuV/m) | (dBuV/m) | (dB) | (dB) | (m) | | (°) | (m) | | (dBuV) | (dB) | (dB) | (dB) |
| AV | 4.87893G | 47.03 | 54.00 | -6.97 | 3.82 | 3 | Horizontal | 0 | 1.18 | - | 43.21 | 31.48 | 6.81 | 34.47 |
| AV | 7.31864G | 43.31 | 54.00 | -10.69 | 9.90 | 3 | Horizontal | 160 | 1.10 | - | 33.41 | 36.03 | 8.62 | 34.75 |
| PK | 4.87898G | 55.17 | 74.00 | -18.83 | 3.82 | 3 | Horizontal | 0 | 1.18 | - | 51.35 | 31.48 | 6.81 | 34.47 |
| PK | 7.31858G | 54.52 | 74.00 | -19.48 | 9.90 | 3 | Horizontal | 160 | 1.10 | - | 44.62 | 36.03 | 8.62 | 34.75 |

## 2.4GHz Prop

## 2475MHz_TX

14/10/2019

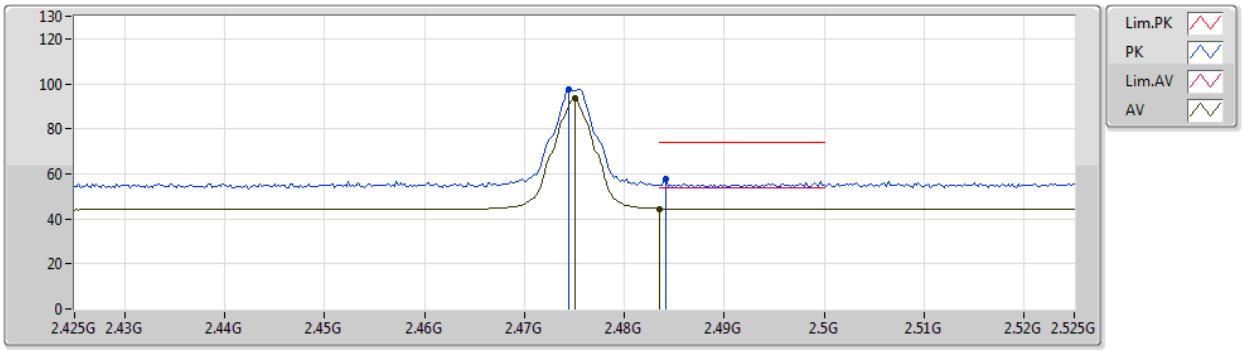



| Type | Freq | Level | Limit | Margin | Factor | Dist | Condition | Azimuth | Height | Comment | Raw | AF | CL | PA |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | (Hz) | (dBuV/m) | (dBuV/m) | (dB) | (dB) | (m) | | (°) | (m) | | (dBuV) | (dB) | (dB) | (dB) |
| AV | 2.475G | 89.98 | Inf | -Inf | 32.44 | 3 | Vertical | 122 | 1.23 | - | 57.54 | 27.62 | 4.82 | - |
| AV | 2.4835G | 44.45 | 54.00 | -9.55 | 32.48 | 3 | Vertical | 122 | 1.23 | - | 11.97 | 27.65 | 4.83 | - |
| PK | 2.4754G | 94.34 | Inf | -Inf | 32.45 | 3 | Vertical | 122 | 1.23 | - | 61.89 | 27.63 | 4.82 | - |
| PK | 2.4948G | 56.23 | 74.00 | -17.77 | 32.52 | 3 | Vertical | 122 | 1.23 | - | 23.71 | 27.68 | 4.84 | - |

## 2.4GHz Prop

## 2475MHz_TX

14/10/2019

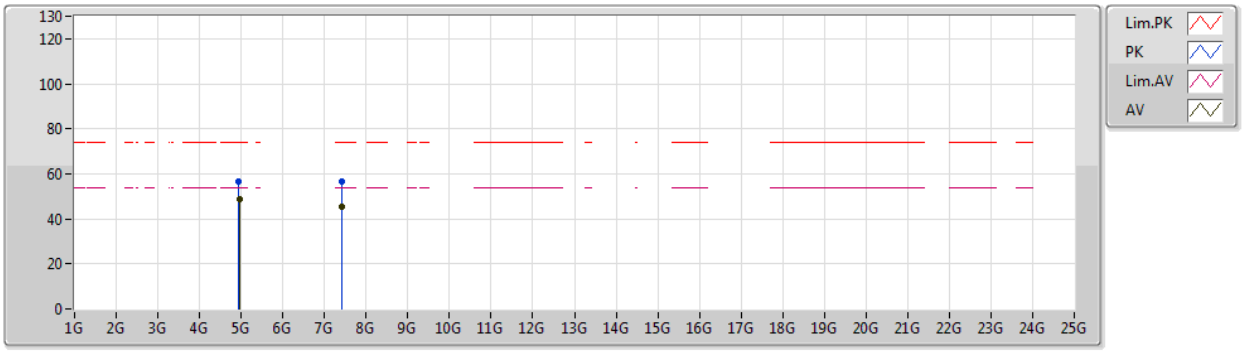



| Type | Freq | Level | Limit | Margin | Factor | Dist | Condition | Azimuth | Height | Comment | Raw | AF | CL | PA |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | (Hz) | (dBuV/m) | (dBuV/m) | (dB) | (dB) | (m) | | (°) | (m) | | (dBuV) | (dB) | (dB) | (dB) |
| AV | 2.475G | 93.35 | Inf | -Inf | 32.44 | 3 | Horizontal | 26 | 2.96 | - | 60.91 | 27.62 | 4.82 | - |
| AV | 2.4835G | 44.47 | 54.00 | -9.53 | 32.48 | 3 | Horizontal | 26 | 2.96 | - | 11.99 | 27.65 | 4.83 | - |
| PK | 2.4744G | 97.74 | Inf | -Inf | 32.44 | 3 | Horizontal | 26 | 2.96 | - | 65.30 | 27.62 | 4.82 | - |
| PK | 2.4842G | 57.53 | 74.00 | -16.47 | 32.48 | 3 | Horizontal | 26 | 2.96 | - | 25.05 | 27.65 | 4.83 | - |

## 2.4GHz Prop

## 2475MHz_TX

14/10/2019

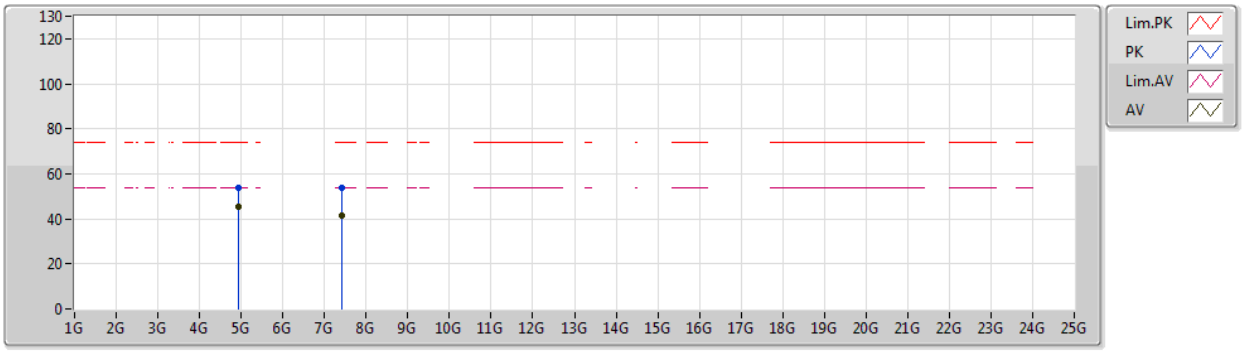



| Type | Freq | Level | Limit | Margin | Factor | Dist | Condition | Azimuth | Height | Comment | Raw | AF | CL | PA |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | (Hz) | (dBuV/m) | (dBuV/m) | (dB) | (dB) | (m) | | (°) | (m) | | (dBuV) | (dB) | (dB) | (dB) |
| AV | 4.95094G | 48.53 | 54.00 | -5.47 | 4.00 | 3 | Vertical | 332 | 2.54 | - | 44.53 | 31.61 | 6.83 | 34.44 |
| AV | 7.42361G | 45.23 | 54.00 | -8.77 | 10.19 | 3 | Vertical | 15 | 1.00 | - | 35.04 | 36.30 | 8.67 | 34.78 |
| PK | 4.94894G | 56.64 | 74.00 | -17.36 | 3.99 | 3 | Vertical | 332 | 2.54 | - | 52.65 | 31.61 | 6.83 | 34.45 |
| PK | 7.42635G | 56.64 | 74.00 | -17.36 | 10.20 | 3 | Vertical | 15 | 1.00 | - | 46.44 | 36.31 | 8.67 | 34.78 |

## 2.4GHz Prop

## 2475MHz_TX

14/10/2019




| Type | Freq | Level | Limit | Margin | Factor | Dist | Condition | Azimuth | Height | Comment | Raw | AF | CL | PA |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | (Hz) | (dBuV/m) | (dBuV/m) | (dB) | (dB) | (m) | | (°) | (m) | | (dBuV) | (dB) | (dB) | (dB) |
| AV | 4.94893G | 45.37 | 54.00 | -8.63 | 3.99 | 3 | Horizontal | 26 | 1.29 | - | 41.38 | 31.61 | 6.83 | 34.45 |
| AV | 7.42621G | 41.61 | 54.00 | -12.39 | 10.20 | 3 | Horizontal | 0 | 1.90 | - | 31.41 | 36.31 | 8.67 | 34.78 |
| PK | 4.94895G | 53.80 | 74.00 | -20.20 | 3.99 | 3 | Horizontal | 26 | 1.29 | - | 49.81 | 31.61 | 6.83 | 34.45 |
| PK | 7.42642G | 53.60 | 74.00 | -20.40 | 10.20 | 3 | Horizontal | 0 | 1.90 | - | 43.40 | 36.31 | 8.67 | 34.78 |