FCC CFR47 Part 15 Subpart C
IC RSS-247
Certification Test Report

For the

Product	**: Bluetooth Low Energy Module**
Model	**: RMBLE-M5**
FCC ID	**: 2AISERMBLEM5**
IC	**: 21613-RMBLEM5**
Applicant	**: Honeywell Analytics Asia Pacific Co., Ltd.**
FCC Rule	**: CFR 47 Part 15 Subpart C**
IC Rule	**: IC RSS-247 Issue 2**

We hereby certify that the above product has been tested by us with the listed rules and found in compliance with the regulation. The test data and results are issued on the test report no. **TR-W1708-008**

Signature

Choi, Yeong-min / Technical Manager

Date: 2017-08-19

Test Laboratory: ENG Co., Ltd.

FCC/IC CERTIFICATION TEST REPORT

Project Number	**: EA1703Q-153**
Test Report Number	**: TR-W1708-008**
Type of Equipment	**: Bluetooth Low Energy Module**
Model Name	**: RMBLE-M5**
FCC ID	**: 2AISERMBLEM5**
ISED Cert. Number	**: IC: 21613-RMBLEM5**
Multiple Model Name	**: N/A**
Applicant	**: Honeywell Analytics Asia Pacific Co., Ltd.**
Address	**: 7F SangAm IT Tower, 434 Worldcup Buk-ro, Mapo-gu, Seoul 03922, South Korea**
Manufacturer	**: RAE Systems by Honeywell**
Address	**: No.990E. Hwujwang Road, JIADING DISTRICT, Shanghai 201815, China**
Regulation	**: FCC Part 15 Subpart C Section 15.247, IC RSS-247 Issue 2**
Total page of Report	**: 31 Pages**
Date of Receipt	**: 2017-07-04**
Date of Issue	**: 2017-08-19**
Test Result	**: PASS**

This test report only contains the result of a single test of the sample supplied for the examination.
It is not a generally valid assessment of the features of the respective products of the mass-production.

Prepared by Song, In-young / Senior Engineer _____ (Signature) 2017-08-19 (Date)

Reviewed by Choi, Yeong-min / Technical Manager _____ (Signature) 2017-08-19 (Date)

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Release Control Record

Issue Report No.	Issued Date	Revisions	Effect Section
TR-W1708-008	2017-08-19	Initial Release	All

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1. TEST SUMMARY

1.1 Regulations and results

The sample submitted for evaluation (Referred to below as the EUT) has been tested in accordance with the following regulations or standards.

FCC Reference Section	IC Reference Section	Description	P (Pass)	F (Fail)	N.T. (Not Tested)	Note
15.247(a)(2)	RSS-247 5.2(1)	6 dB Bandwidth Occupied Bandwidth	P		N.T	Note1
15.247(b)(3)	RSS-247 5.4(4)	Maximum peak output power	P			
15.247(e)	RSS-247 5.2(2)	Power spectral density	P		N.T	Note1
15.247(d)	RSS-247 5.5	Band Edge Conducted spurious emission	P			
15.205(a) 15.209(a)	RSS 247 5.5 RSS-GEN 8.9	Radiated spurious emissions	P			
15.207(a)	RSS GEN 8.8	AC power line conducted emissions	P			

Note1. Test was performed by modular transmitter (FCC ID: 2AISERMBLEM5, ISED Certification Number: IC: 21613-RMBLEM5, Test Report no. 16-11355707-FCC1 issued on November.02, 2016 by UL Korea Ltd.), so the test was not performed.

Note2: In case of Bluetooth LE (2.4 GHz), The tests are not significantly different between the two versions of RSS-247. RSS-247 Issue1 covers Issue2 and limits are same. It is judged that the EUT complies with RSS-247 issue2 without the additional test.

1.2 Test Methodology

The tests mentioned in clause 1.1 in this test report were performed according to FCC CFR 47 Part 2, CFR 47 Part 15 and ANSI C63.10-2013, and RSS-Gen Issue 4,
KDB 558074 D01DTS Meas Guidance v04: Measurement Procedure PK is used for power.

1.3 Additions, deviations, exclusions from standards

No additions, deviations or exclusions have been made from standard.

1.4 Purpose of the test

The EUT, Model: RMBLE-M5, Bluetooth Low Energy Module shall be inserted into Gas detectors mentioned on clause 2.2 in this test report, so the test was performed to determine whether the equipment under test fulfills the requirements of the regulation stated in FCC Part 15 Subpart C Section 15.247, RGG-Gen and RSS-247.

1.5 Test Facility

The measurement facilities are located at 135-60 Gyeongchung-daero, Gonjiam-eup, Gwangju-si, Gyeonggi-do 12813, Korea. Description details of test facilities were submitted to the ISED, Canada, accredited as a Conformity Assessment Body (CAB) by the FCC, designated by the RRA (Radio Research Agency), and accredited by KOLAS (Korea Laboratory Accreditation Scheme) in Korea according to the requirement of ISO 17025.

Agency Name	Registration No.	Mark
FCC	KR0160	
Industry Canada (IC)	IC 12721A-1	
RRA	KR0160	
Korean Agency for Technology and Standards	KT733	

2. EUT (Equipment Under Test) INFORMATION

2.1 General Description

The EUT, Model: RMBLE-M5 is a Bluetooth Low Energy Module, The product specification described herein was obtained from product data sheet or user's manual.

Description of equipment	Bluetooth Low Energy Module
Model Name	RMBLE-M5
Host Model Name (Gas Detector)	SPLI AA BAX B C NZZ
Application Purpose	FCC C2PC (Add Host to the LMA)
Serial Number	N/A
Equipment Type	Radio and ancillary equipment for portable or handheld use, Stand alone / Self contained single unit
Operating Frequency	2 402 MHz to 2 480 MHz
Max. RF Output Power	Max. -14.0 dBm
Modulation Type(s)	GFSK
Number of Channels	40 Channels
Channel Bandwidth	2 MHz
Generated or used Freq. in EUT	37.768 kHz, 38.4 MHz
Type of Antenna	■ Integrated Type(PCB Pattern antenna) □ Dedicated Type
Antenna Gain	Max. : - 1.50 dBi
Operating Temperature	-40 ℃ ~ 60 ℃
Electrical Rating	DC 3.30 V

2.2 Description of host model name (Gas Detector)

Model name	Description of designation	
SPLI AA BAX B C NZZ	AA(Gas)	1) O1:O_2 2) C1:CO 3) H1:H_2S(L) 4) H2:H_2S(H) 5) G1:H_2 6) N1:NO_2 7) F6:CH_4(CAT) 8) FR:CH_4(IR)
	B (Color)	C: Charcoal Y: Yellow
	C (Entry)	N: ¾ NPT M: M20

3. TEST CONDITION

3.1 Equipment Used During Test

The following peripheral devices and/or interface cables were connected during the measurement:

Description	Model No.	Manufacturer.	Comments
Bluetooth Low Energy Module (EUT)	RMBLE-M5	RAE Systems by Honeywell.	-
Gas Detector (AE)	SPLIO1BMXCMNZZ	Honeywell Analytics Asia Pacific Co., Ltd.	Only Radiated Spurious Emission Tested (Contain RMBLE-M5)
Gas Detector (AE)	SPLIF6BMXCMNZZ	Honeywell Analytics Asia Pacific Co., Ltd.	Only Radiated Spurious Emission Tested (Contain RMBLE-M5)
Gas Detector (AE)	SPLIFRBMXCMNZZ	Honeywell Analytics Asia Pacific Co., Ltd.	Only Radiated Spurious Emission Tested (Contain RMBLE-M5)
Notebook PC (AE)	Latitude E5470	Dell Inc.	-

Note1. EUT=Equipment Under Test, AE=Auxiliary/Associated Equipment

Note2: Please refer to the 'Letter of EMC&RF Test Sample (Sensepoint XRL)' document for the basis of selection of the representative host models.

3.2 Mode of operation during the test

Signal from the RF module was generated continuously for the representative channels (Low, Mid, High) by the test program incorporated For finding worst case configuration and operating mode, preliminary testing was performed and radiated emission was performed with the EUT set to transmit at the channel with the highest output power as worst case scenario.

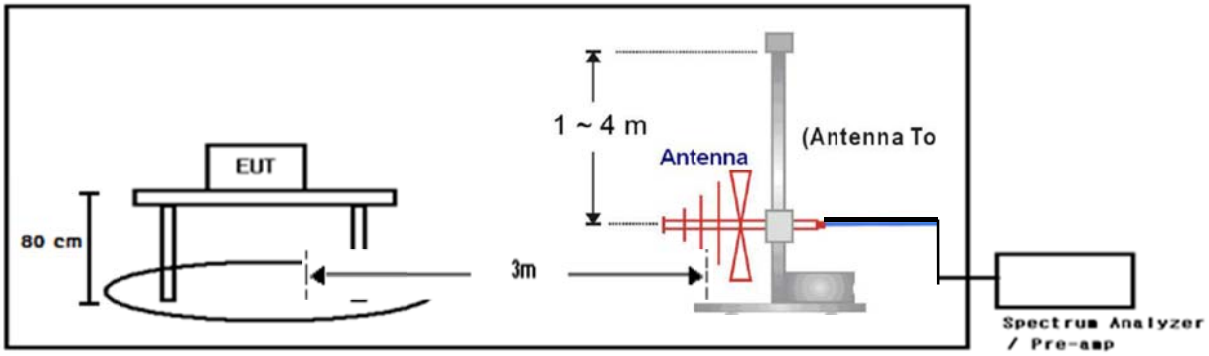
Based on preliminary testing following operating modes were selected for the final test as listed below.

3.2.1 Radiated Emission Test Mode

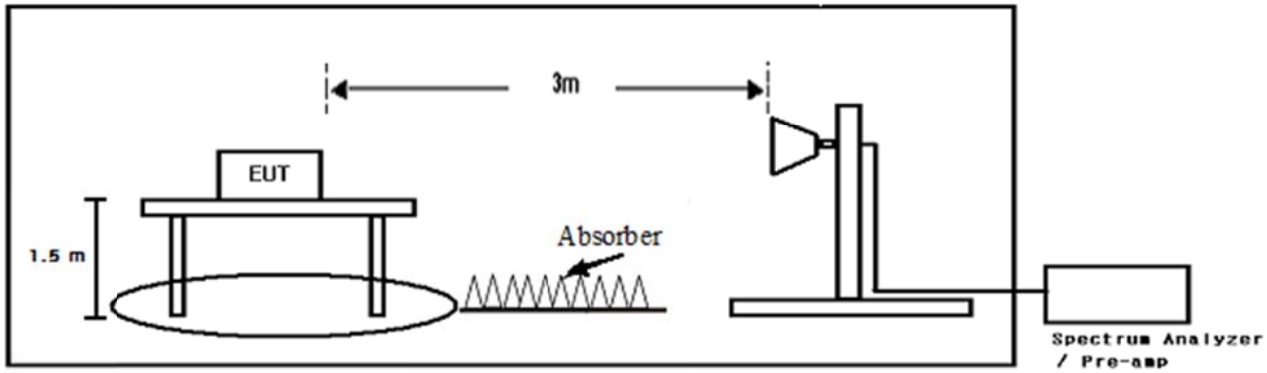
Operating Mode	Channel	Frequency (MHz)	Output Power (dBm)
BLE	Low	2402	-21.07
	Middle	2440	-24.55
	High	2480	-21.76

3.3 Test Setup Drawing

(Radiated Test below 1 GHz)



(Radiated Test above 1 GHz)



3.4 EUT Modifications

- None.

4. ANTENNA REQUIREMENT

According to FCC CFR 47 Part 15 section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. 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 provision of this section.

4.1 Antenna Description

Frequency Band (GHz)	Max Peak Gain (dBi)
2.402 – 2.480	-1.50

Note. The used antenna is same with original certified equipment, so the EUT met the requirement.

5. TEST RESULT

5.1 Maximum Peak Output Power

5.1.1 Limit

Acc. To section 15.247, For system using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt, based on the use of antennas with directional gains that do not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

5.1.2 Method of Measurement

Reference to KDB 558074 D01 DTS Meas Guidance v04: 9.1.1 RBW ≥ DTS bandwidth.

Antenna-port conducted tests can't be performed on the EUT, so the tests were performed by radiated compliance measurements.

5.1.3 Test Data for Output Power

Date of Test	2017-07-05	Temperature	21.1 °C
		Relative humidity	46.3 % R.H.
Test Result	***PASS***	Tested by	Inyong Song

Channel	Frequency (MHz)	Measured Value (dBuV/m)	EIRP (dBm)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2 402	72.69	-22.57	-21.07	30	51.07
Middle	2 440	69.21	-26.05	-24.55		54.55
High	2 480	72.00	-23.26	-21.76		51.76

Note: The test result is derived by using radiated method.

The measurement distance(D) is 3m.

EIRP (dBm) = E (dBuV/m) + 20 log(D) – 104.8

Output Power (dBm) = EIRP – Antenna gain (-1.5 dBi)

5.2 Radiated Emission

5.2.1 Limit

Acc. To section 15.205 and 15.209, following table shall be applied.

Frequency Range (MHz)	Field Strength Limit (uV/m) at 3 m	Field Strength Limit (dBuV/m) at 3 m
30 – 88	100	40
88 – 216	150	43.5
216 – 960	200	46
Above 960	500	24

5.2.2 Method of Measurement

Reference to KDB 558074 D01 DTS Meas Guidance v04: 12.1 Radiated emission measurements.

The radiated emissions measurements were on 3 m, semi-anechoic chamber. The EUT and other support equipment were placed on a non-conductive table 80 cm for below 1 GHz and 1.5 m for above 1 GHz above the ground plane. The interconnecting cables from outside test site were inserted into ferrite clamps at the point where the cables reach the turntable.

The frequency spectrum from 30 MHz to 26.5 GHz was scanned and emission levels maximized at each frequency recorded. The system was rotated 360°, and the antenna was varied in height between 1.0 m and 4.0 m in order to determine the maximum emission levels. This procedure was performed for both horizontal and vertical polarization of the receiving antenna.

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

For measurements above 1 GHz the resolution bandwidth is set to 1 MHz; the video bandwidth is set to 3 MHz
The spectrum from 30 MHz to 40 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in each applicable band.

Used Software for measurement is manufactured by TSJ.

5.2.3 Radiated Test Site Requirement for KDB 414788 D01

Acc. to KDB 414788 D01 Radiated Test Site v01, Semi Anechoic Chamber (SAC) shall be verified test results below 30 MHz with Open Area Test Site (OATS), so we compared test results between the measurements from our SAC and an OATS and found test results almost same, so we declare test result for below 30 MHz from our SAC is valid and met the requirement acc. to KDB 414788 D01 Radiated Test Site v01.

5.2.4 Measurement Uncertainty

Measurement uncertainties were not taken into account and following uncertainty levels have been estimated for tests performed on the apparatus. The measurement uncertainties are given with at least 95 % confidence.

Frequency Range	Uncertainty	Frequency Range	Uncertainty
9 kHz ~ 30 MHz	± 3.2 dB	30 MHz ~ 1 GHz	± 3.8 dB
1 GHz ~ 18 GHz	± 4.9 dB	18 GHz ~ 40 GHz	± 5.1 dB

5.2.5 Sample Calculated Example

At 80 MHz Limit = 40.0 dBuV/m

Result =Receiver reading value + Antenna Factor + Cable Loss – Pre-amplifier gain = 30 dBuV/m

Margin = Limit – Result = 40 – 30 = 10 so the EUT has 10.0 dB margin at 80 MHz

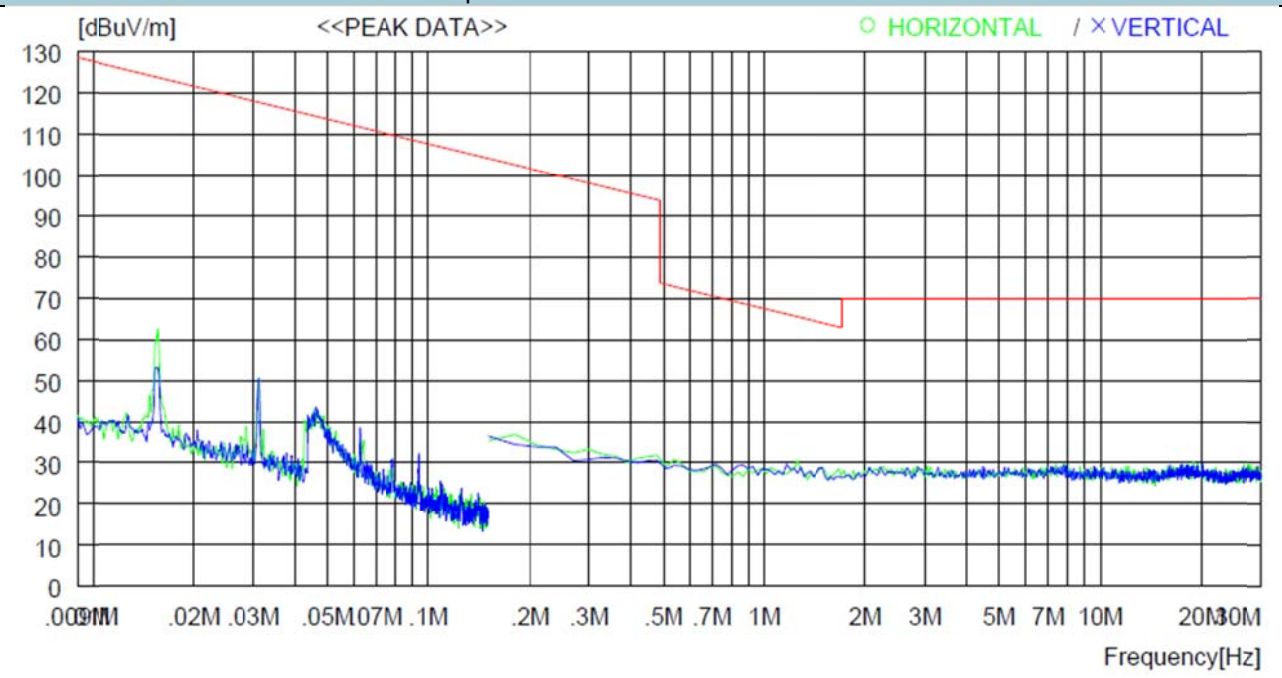
5.2.6 Test Data – Host Model Name: SPLIO1BMXCMNZZ

Date of Test	2017-07-05	Temperature	21.1 °C
		Relative humidity	46.3 % R.H.
Measurement Frequency Range		9 kHz ~ 26 GHz	
Test Result	***PASS***	Tested By	In-yong Song

Frequency range	Detector Mode	Resolution BW	Video BW	Video Filtering	Measurement distance
Below 30 MHz	Peak or Q.P.	9 kHz	100 kHz	-	3 m
30 MHz ~ 1 000 MHz	Peak or Q.P.	100 kHz	300 kHz	-	3 m

5.2.6.1 Test Data below 30 MHz

Graphical Test Data – Below 30 MHz



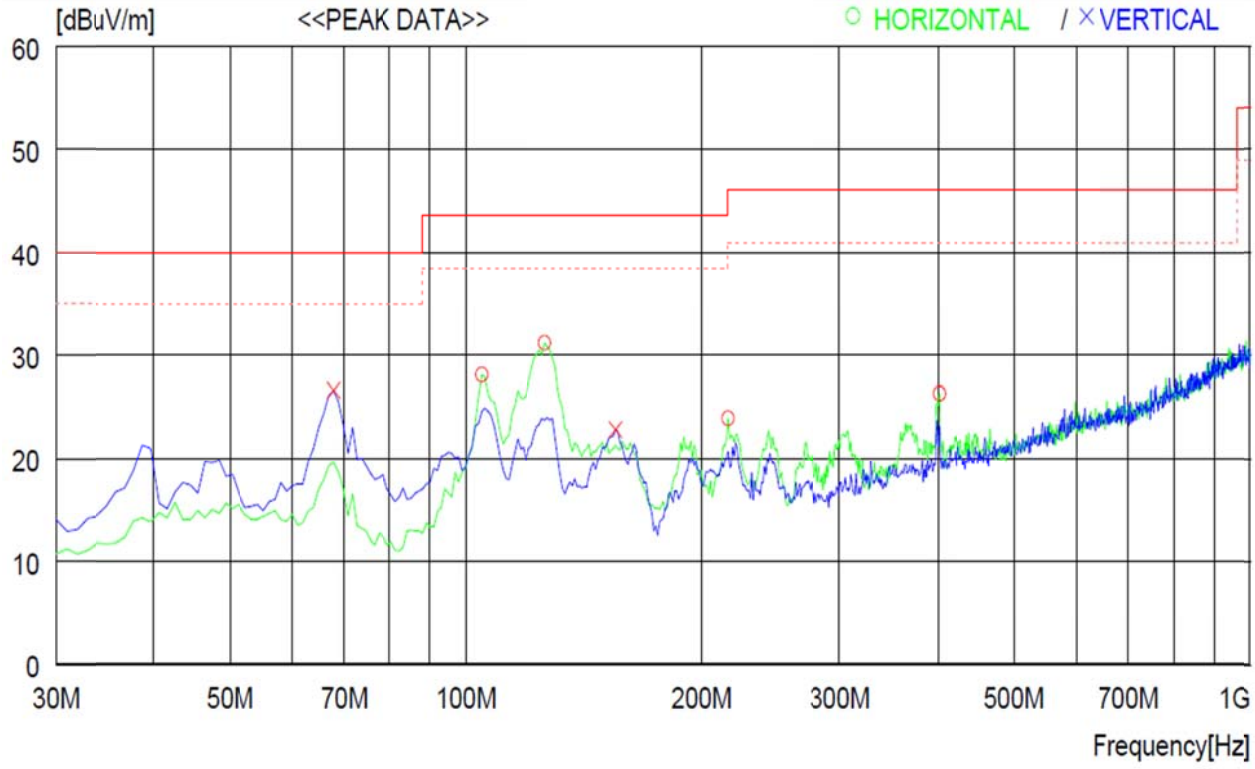
Tabulated Test Data – Low / Middle / High Channel

Frequency (MHz)	Receiver Reading (dBuV)	Detector Mode	Pol.	Ant. Factor (dB/m)	Corr. Factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Azimuth (Degree)
* Spurious emissions that 20 dB below the limits didn't be recorded										

Note: The test results below 30 MHz in our SAC (Semi Anechoic Chamber) was compared with other OATS (Open Area Test Site) and found the result was almost same with OATS.

5.2.6.2 Test Data from 30 MHz to 1 GHz

Graphical Test Data



Tabulated Test Data

Frequency (MHz)	Pol.	Detect Mode	Reading (dBµV/m)	Factor* (dB)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)
47.46	V	Peak	40.1	-12.5	27.6	40.0	12.4
67.83	V	Peak	41.7	-15.7	26.0	40.0	14.0
71.71	V	Peak	50.8	-16.7	34.1	40.0	5.9
88.20	V	Peak	39.5	-15.8	23.7	43.5	19.8
127.00	H	Peak	36.4	-15.9	20.5	43.5	23.0
217.21	H	Peak	32.7	-11.5	21.2	46.0	24.8

Note: “H” means Horizontal polarity, “V” means Vertical polarity.

GFSK lowest channel is worst case configuration.

The worst case is y-axis and reported.

Corr. Factor = AF + CL + AG (AF : Antenna factor, CL : Cable loss, AG: Pre-Amp gain)

Level = Reading + Corr. Factor (Factor = AF + CL + AG)

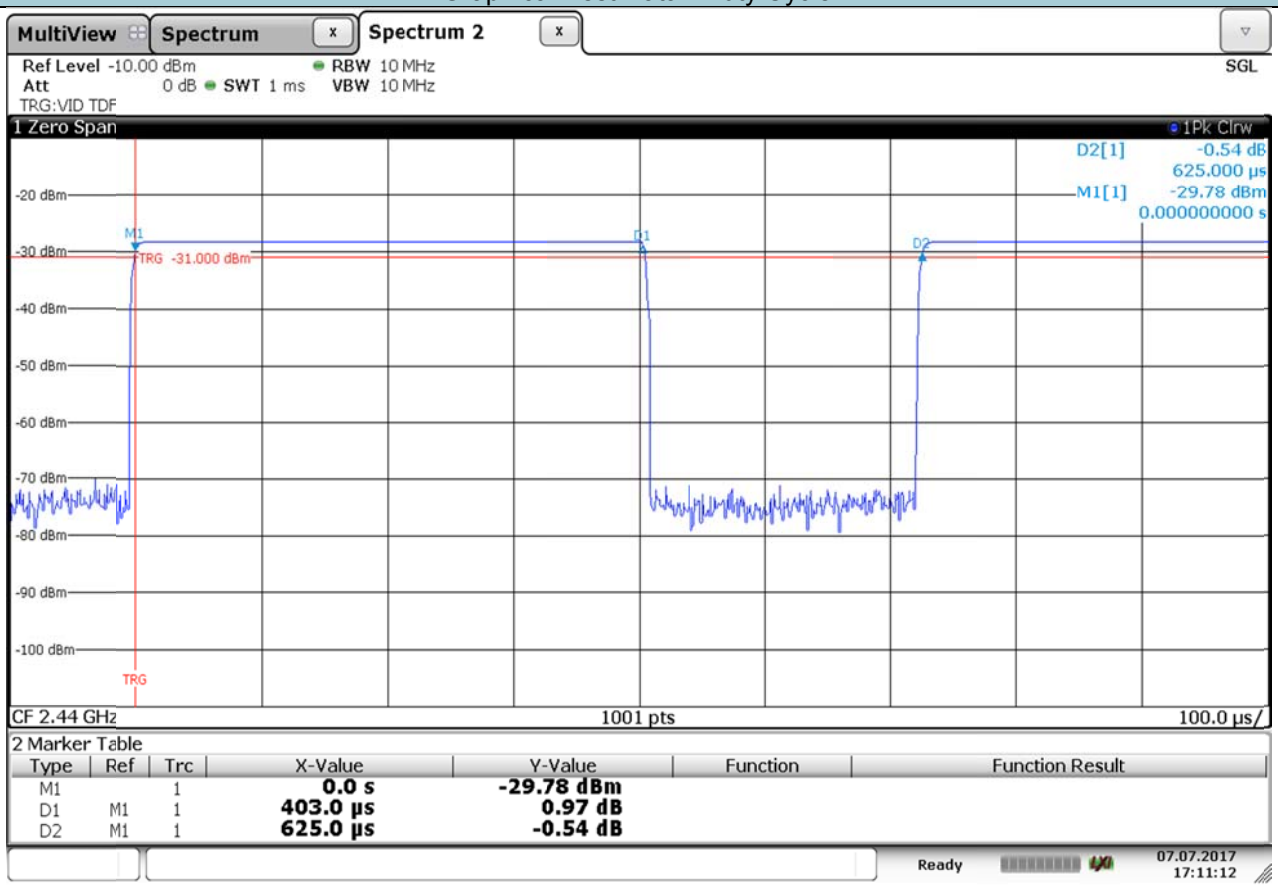
Margin = Limit (dBuV/m) - Level (dBuV/m)

Quasi-peak measurements are omitted because the peak data meets the limit.

5.2.6.3Test Data above 1 GHz

5.2.6.3.1 Duty Cycle

Graphical Test Data - Duty Cycle



Tabulated Test Data

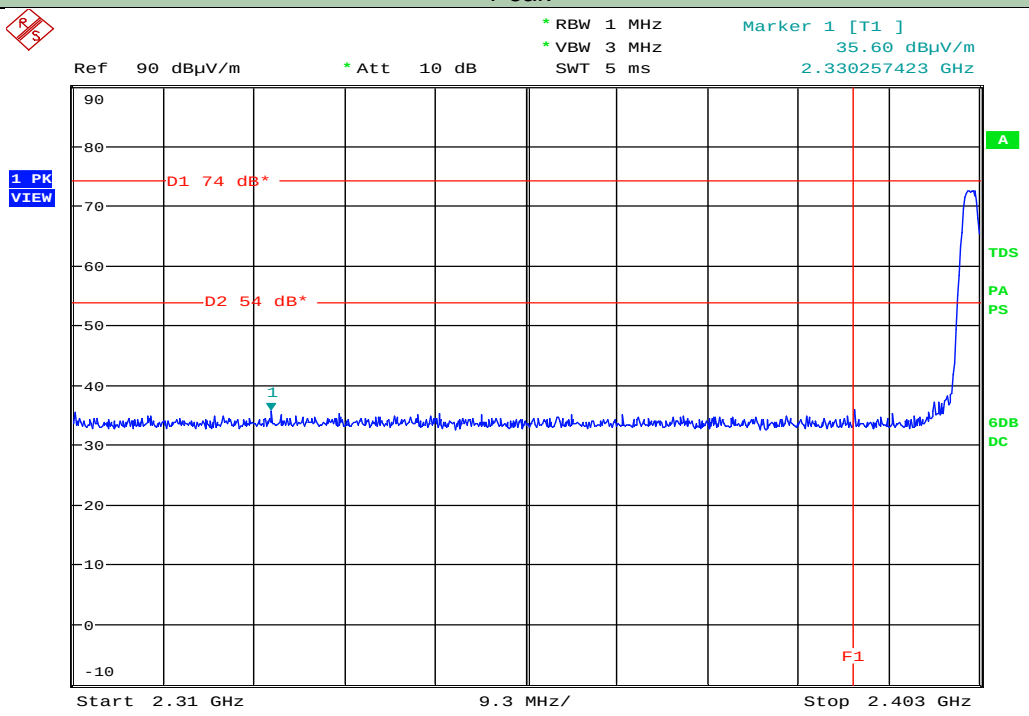
Operating Mode	On Time (ms)	On + Off Time (ms)	Duty Cycle (%)	Duty Factor (dB)
BLE	0.403 30	0.625 00	64.53	1.90

Detector Mode	Resolution BW	Video BW	Sweep Time	Measurement distance
PEAK	1 MHz	3 MHz	Auto	3 m
RMS	1 MHz	3 MHz	Auto	3 m

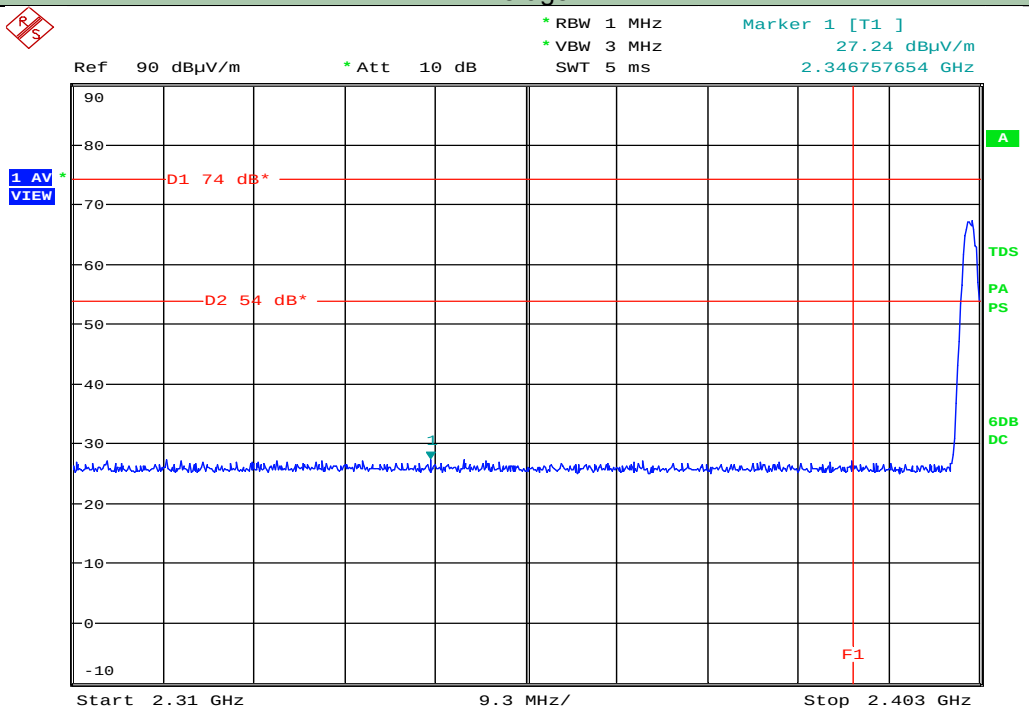
5.2.6.3.2 Test Data for Band edge (Restricted band)

Graphical Test Data – Low Channel

Peak

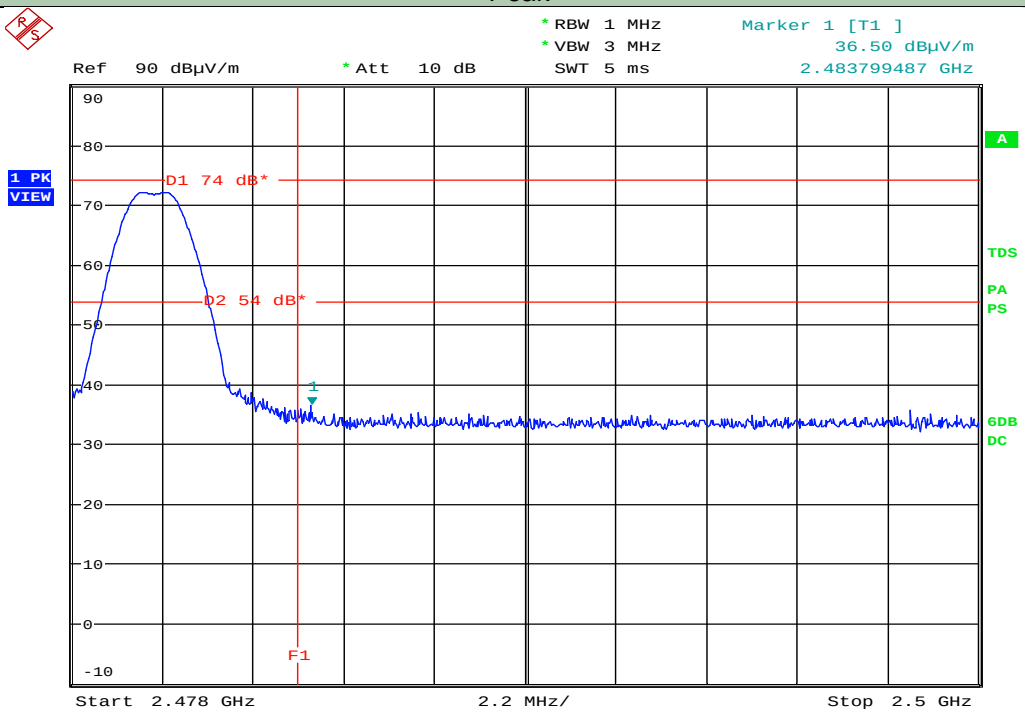


Average

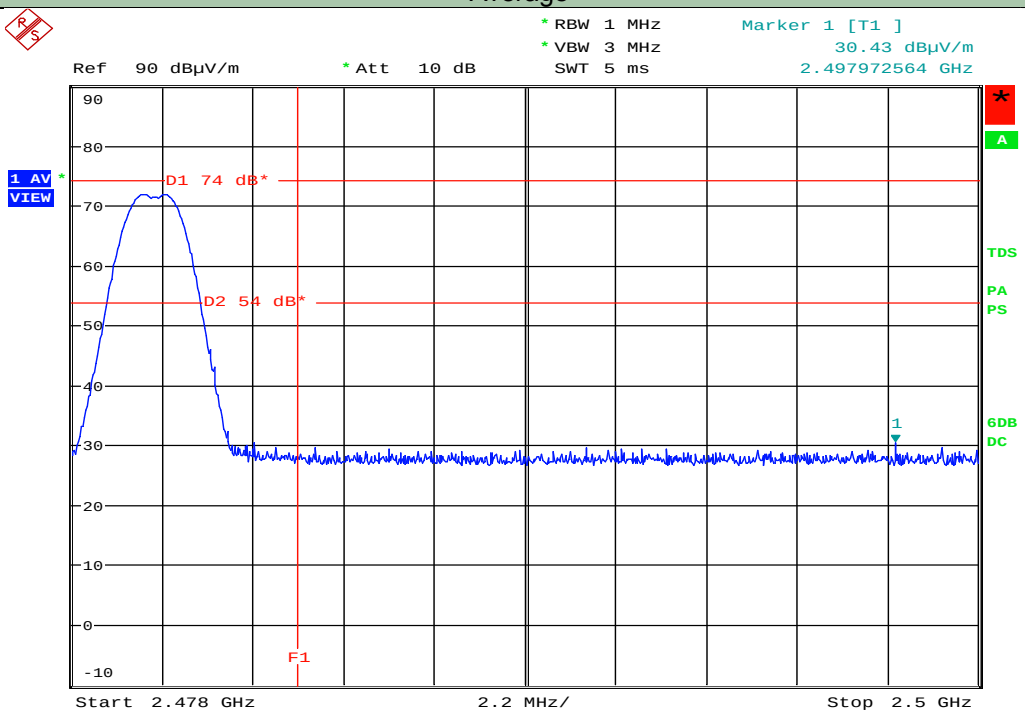


Graphical Test Data – High Channel

Peak



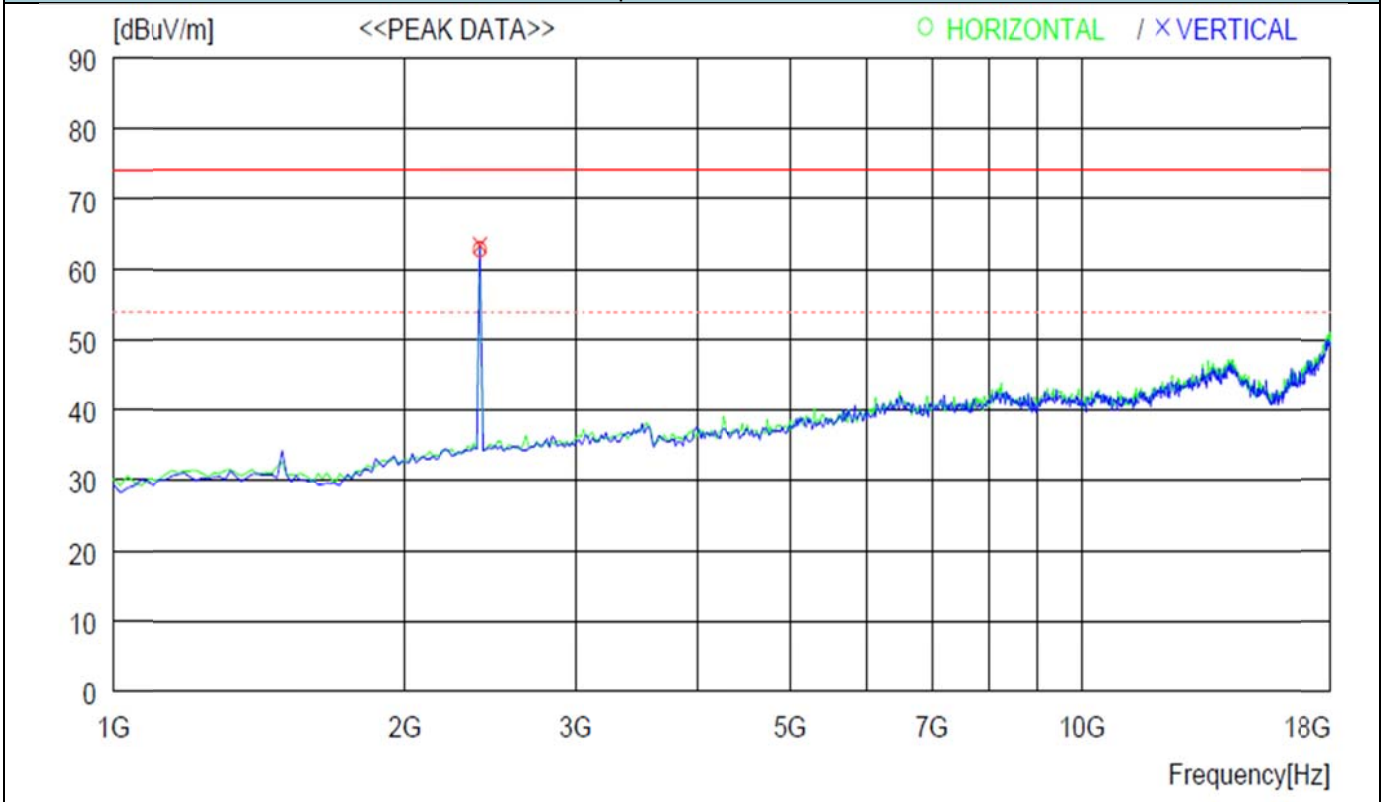
Average



5.2.6.3.3 Test Data for Harmonic & Spurious emission

5.2.6.3.3.1 Low Channel

Graphical Test Data



Tabulated Test Data – Low Channel

Frequency (MHz)	Pol.	Detect Mode	Reading (dBμV/m)	Factor* (dB)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)
7205.00	H	Peak	50.1	-1.3	48.8	74.0	25.2
7205.00	H	Average	39.4	0.6	40.0	54.0	14.0
7205.00	V	Peak	57.5	-1.3	56.2	74.0	17.8
7205.00	V	Average	45.0	0.6	45.6	54.0	8.4

Note. “H” means Horizontal polarity, “V” means Vertical polarity.

Emission was scanned up to 26 GHz; No emissions were detected above the noise floor which was at least 20 dB below the specification limit.

No other spurious and harmonic emissions were found greater than listed emissions on above table.

The worst case is y-axis and reported.

* Factor (Peak) = AF + CL + AG (AF: Antenna factor, CL: Cable loss, AG: Pre-Amp gain)

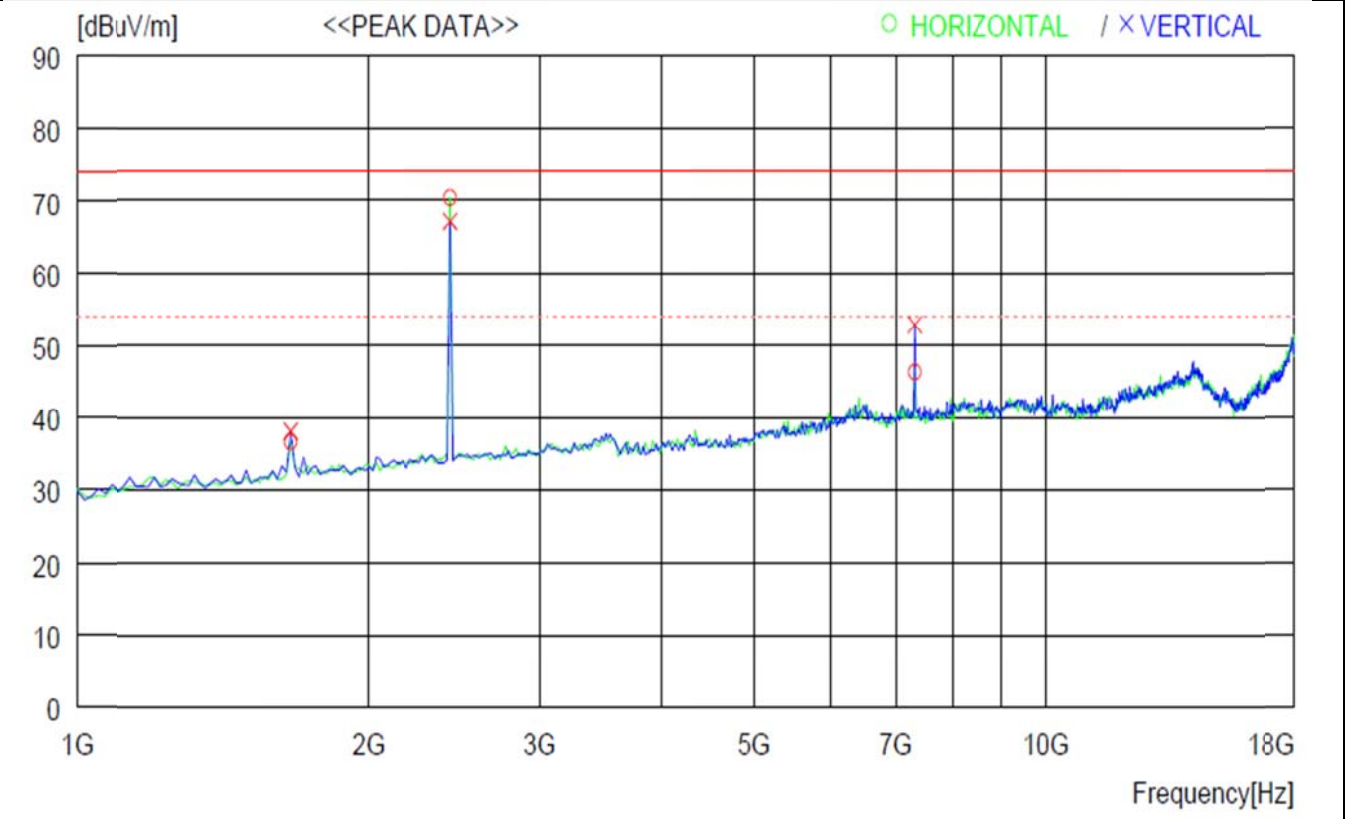
* Factor (Average) = AF + CL + AG + Duty factor (AF: Antenna factor, CL: Cable loss, AG: Pre-Amp gain)

Level = Reading + Factor (Factor = AF + CL + AG)

Margin = Limit (dBuV/m) - Level (dBuV/m)

5.2.6.3.3.2 Middle Channel

Graphical Test Data



Tabulated Test Data – Middle Channel

Frequency (MHz)	Pol.	Detect Mode	Reading (dBµV/m)	Factor* (dB)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)
7324.00	H	Peak	50.4	-1.3	46.2	74.0	27.8
7324.00	H	Average	38.2	0.6	37.2	54.0	16.8
7324.00	V	Peak	48.1	-1.3	52.8	74.0	21.2
7324.00	V	Average	37.0	0.6	43.6	54.0	10.4

Note. “H” means Horizontal polarity, “V” means Vertical polarity.

Emission was scanned up to 26 GHz; No emissions were detected above the noise floor which was at least 20 dB below the specification limit.

No other spurious and harmonic emissions were found greater than listed emissions on above table.

The worst case is y-axis and reported.

* Factor(Peak) = AF + CL + AG (AF: Antenna factor, CL: Cable loss, AG: Pre-Amp gain)

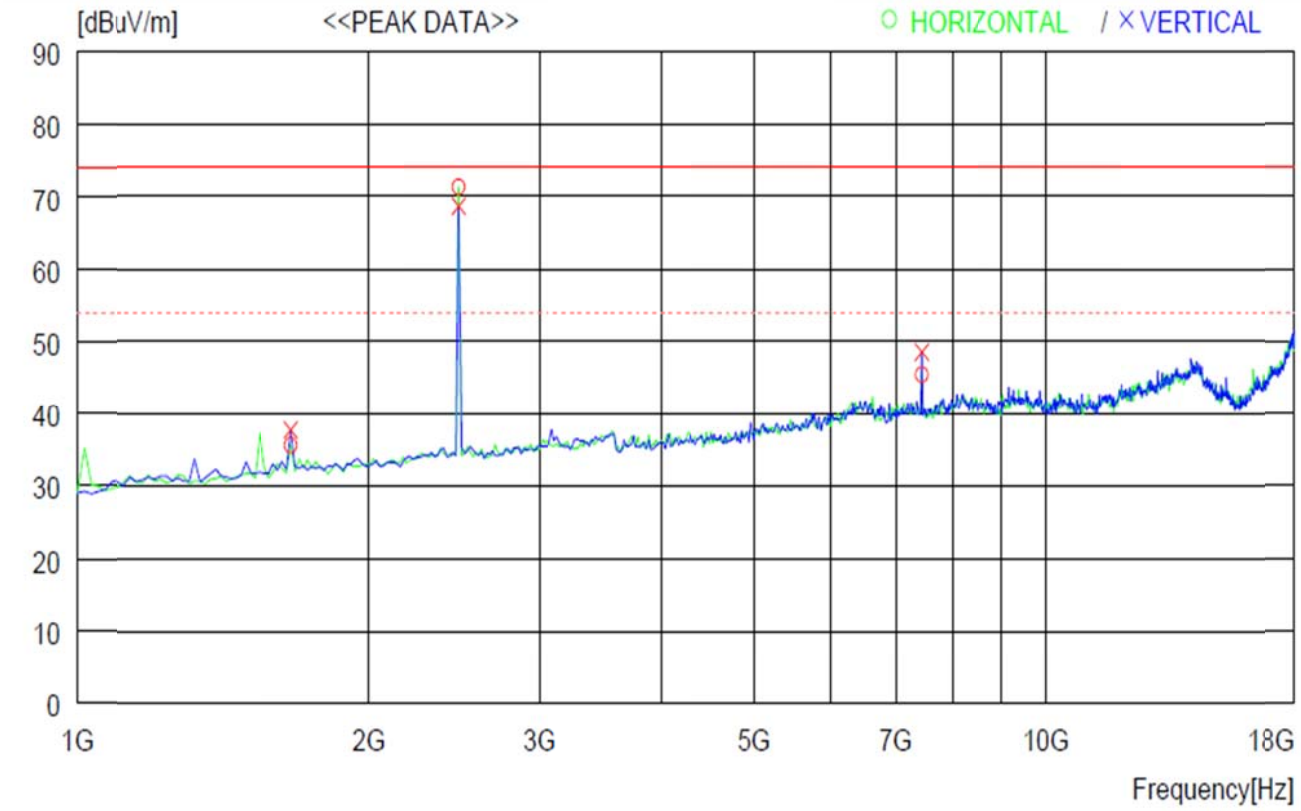
* Factor(Average) = AF + CL + AG + Duty factor (AF: Antenna factor, CL: Cable loss, AG: Pre-Amp gain)

Level = Reading + Factor (Factor = AF + CL + AG)

Margin = Limit (dBuV/m) - Level (dBuV/m)

5.2.6.3.3.3 High Channel

Graphical Test Data



Tabulated Test Data – High Channel

Frequency (MHz)	Pol.	Detect Mode	Reading (dBµV/m)	Factor* (dB)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)
7443.00	H	Peak	46.5	-1.2	45.3	74.0	28.7
7443.00	H	Average	36.1	0.7	36.8	54.0	17.2
7443.00	V	Peak	49.6	-1.2	48.4	74.0	25.6
7443.00	V	Average	38.4	0.7	39.1	54.0	14.9

Note. “H” means Horizontal polarity, “V” means Vertical polarity.

Emission was scanned up to 26 GHz; No emissions were detected above the noise floor which was at least 20 dB below the specification limit.

No other spurious and harmonic emissions were found greater than listed emissions on above table.

The worst case is y-axis and reported.

* Factor(Peak) = AF + CL + AG (AF: Antenna factor, CL: Cable loss, AG: Pre-Amp gain)

* Factor(Average) = AF + CL + AG + Duty factor (AF: Antenna factor, CL: Cable loss, AG: Pre-Amp gain)

Level = Reading + Factor (Factor = AF + CL + AG)

Margin = Limit (dBuV/m) - Level (dBuV/m)

5.2.7 Test Data – Host Model Name: SPLIF6BMXCMNZZ

5.2.7.1 Test Data from 30 MHz to 1 GHz

Tabulated Test Data – Low Channel							
Frequency (MHz)	Pol.	Detect Mode	Reading (dBμV/m)	Factor* (dB)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)
47.46	H	Peak	40.8	-12.5	28.3	40.0	11.7
58.13	H	Peak	39.1	-13.1	26.0	40.0	14.0
71.71	H	Peak	48.6	-16.7	31.9	40.0	8.1
88.20	H	Peak	38.9	-15.8	23.1	43.5	20.4
131.85	V	Peak	36.4	-16.2	20.2	43.5	23.3
217.21	V	Peak	33.3	-11.5	21.8	46.0	24.2

Note: “H” means Horizontal polarity, “V” means Vertical polarity.

GFSK lowest channel is worst case configuration.

The worst case is y-axis and reported.

Corr. Factor = AF + CL + AG (AF : Antenna factor, CL : Cable loss, AG: Pre-Amp gain)

Level = Reading + Corr. Factor (Factor = AF + CL + AG)

Margin = Limit (dBuV/m) - Level (dBuV/m)

Quasi-peak measurements are omitted because the peak data meets the limit.

5.2.7.2 Test Data above 1 GHz

5.2.7.2.1 Low Channel

Tabulated Test Data – Low Channel							
Frequency (MHz)	Pol.	Detect Mode	Reading (dBμV/m)	Factor* (dB)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)
7205.00	H	Peak	51.3	-1.3	50.0	74.0	24.0
7205.00	H	Average	39.1	0.6	39.7	54.0	14.3
7205.00	V	Peak	57.1	-1.3	55.8	74.0	18.2
7205.00	V	Average	44.9	0.6	45.5	54.0	8.5

5.2.7.2.2 Middle Channel

Tabulated Test Data – Middle Channel							
Frequency (MHz)	Pol.	Detect Mode	Reading (dBμV/m)	Factor* (dB)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)
7324.00	H	Peak	47.3	-1.3	46.0	74.0	28.0
7324.00	H	Average	36.4	0.6	37.0	54.0	17.0
7324.00	V	Peak	53.8	-1.3	52.5	74.0	21.5
7324.00	V	Average	42.3	0.6	42.9	54.0	11.1

5.2.7.2.3 High Channel

Tabulated Test Data – High Channel							
Frequency (MHz)	Pol.	Detect Mode	Reading (dBμV/m)	Factor* (dB)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)
7443.00	H	Peak	46.9	-1.2	45.7	74.0	28.3
7443.00	H	Average	35.9	0.7	36.6	54.0	17.4
7443.00	V	Peak	49.5	-1.2	48.3	74.0	25.7
7443.00	V	Average	38.3	0.7	39.0	54.0	15.0

Note. “H” means Horizontal polarity, “V” means Vertical polarity.

Emission was scanned up to 26 GHz; No emissions were detected above the noise floor which was at least 20 dB below the specification limit.

No other spurious and harmonic emissions were found greater than listed emissions on above table.

The worst case is y-axis and reported.

5.2.8 Test Data – Host Model Name: SPLIFRBMXCMNZZ

5.2.8.1 Test Data from 30 MHz to 1 GHz

Tabulated Test Data – Low Channel							
Frequency (MHz)	Pol.	Detect Mode	Reading (dBµV/m)	Factor* (dB)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)
47.46	V	Peak	40.6	-12.5	28.1	40.0	11.9
58.13	V	Peak	39.8	-13.1	26.7	40.0	13.3
71.71	V	Peak	49.5	-16.7	32.8	40.0	7.2
125.06	H	Peak	35.8	-15.9	19.9	43.5	23.6
132.82	H	Peak	37.5	-16.3	21.2	43.5	22.3
222.06	H	Peak	30.8	-11.3	19.5	46.0	26.5

Note: “H” means Horizontal polarity, “V” means Vertical polarity.

GFSK lowest channel is worst case configuration.

The worst case is y-axis and reported.

Corr. Factor = AF + CL + AG (AF : Antenna factor, CL : Cable loss, AG: Pre-Amp gain)

Level = Reading + Corr. Factor (Factor = AF + CL + AG)

Margin = Limit (dBuV/m) - Level (dBuV/m)

Quasi-peak measurements are omitted because the peak data meets the limit.

5.2.8.2 Test Data above 1 GHz

5.2.8.2.1 Low Channel

Tabulated Test Data – Low Channel							
Frequency (MHz)	Pol.	Detect Mode	Reading (dBμV/m)	Factor* (dB)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)
7205.00	H	Peak	50.8	-1.3	49.5	74.0	24.5
7205.00	H	Average	39.8	0.6	40.4	54.0	13.6
7205.00	V	Peak	57.2	-1.3	55.9	74.0	18.1
7205.00	V	Average	45.7	0.6	46.3	54.0	7.7

5.2.8.2.2 Middle Channel

Tabulated Test Data – Middle Channel							
Frequency (MHz)	Pol.	Detect Mode	Reading (dBμV/m)	Factor* (dB)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)
7324.00	H	Peak	48.1	-1.3	46.8	74.0	27.2
7324.00	H	Average	37.4	0.6	38.0	54.0	16.0
7324.00	V	Peak	54.3	-1.3	53.0	74.0	21.0
7324.00	V	Average	42.8	0.6	43.4	54.0	10.6

5.2.8.2.3 High Channel

Tabulated Test Data – High Channel							
Frequency (MHz)	Pol.	Detect Mode	Reading (dBμV/m)	Factor* (dB)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)
7443.00	H	Peak	46.7	-1.2	45.5	74.0	28.5
7443.00	H	Average	35.8	0.7	36.5	54.0	17.5
7443.00	V	Peak	49.1	-1.2	47.9	74.0	26.1
7443.00	V	Average	38.0	0.7	38.7	54.0	15.3

Note. “H” means Horizontal polarity, “V” means Vertical polarity.

Emission was scanned up to 26 GHz; No emissions were detected above the noise floor which was at least 20 dB below the specification limit.

No other spurious and harmonic emissions were found greater than listed emissions on above table.

The worst case is y-axis and reported.

5.3 AC Power Line Conducted Emission

5.3.1 Limit

Acc. to section 15.207 (a), following table shall be applied.

Frequency Range (MHz)	Quasi-Peak (dBuV)	Average (dBuV)
0.15 - 0.5	66 to 56	56 to 46
0.5 - 5	56	46
5 -30	60	50

5.3.2 Method of Measurement

The EUT was placed on a wooden table, 0.8 m height above the horizontal ground plane and 40 cm from the vertical ground plane. Power was fed to the EUT through a 50 Ω / 50 μH + 5 Ω Artificial Mains Network (AMN). The ground plane was electrically bonded to the reference ground system and all power lines were filtered from ambient.

The receiver is set to a resolution bandwidth of 9 kHz. Peak detection is used unless otherwise noted as quasi-peak or average.

The test was performed for both Neutral and Hot lines.

5.3.3 Measurement Uncertainty

Measurement uncertainties were not taken into account and following uncertainty levels have been estimated for tests performed on the apparatus. The measurement uncertainties are given with at least 95 % confidence.

Frequency Range	Uncertainty	Frequency Range	Uncertainty
9 kHz ~ 150 kHz	± 2.05 dB	150 kHz ~ 30 MHz	± 2.05 dB

5.3.4 Sample Calculated Example

At 5.31 MHz QP Limit = 60.0 dBuV

Correction Factor (C. Factor) of LISN, Pulse Limiter and cable loss at 5.31 MHz = 9.7 dB

Q.P Reading from the Test receiver = 20.8 dBuV

(Calculated value for system losses by software EMC32 manufactured by Rohde & Schwarz)

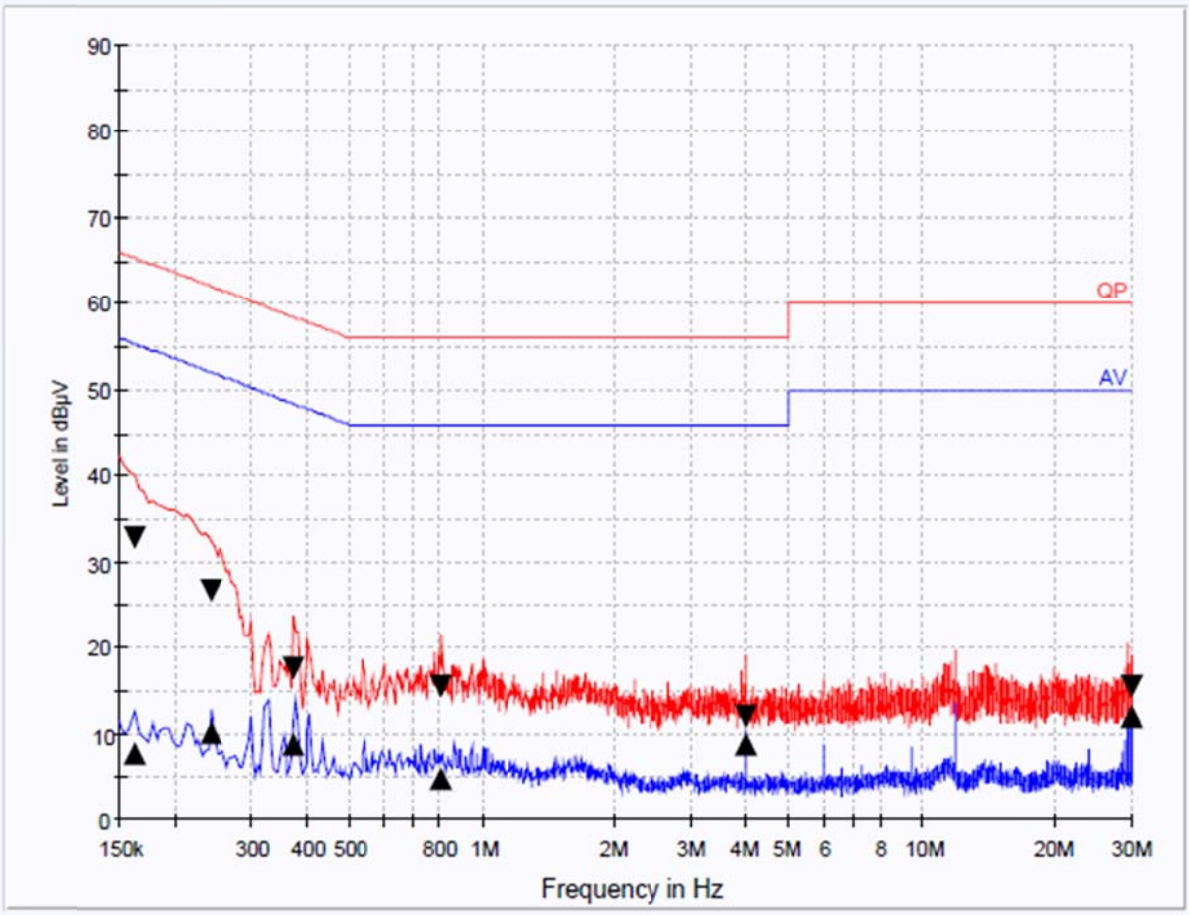
Therefore Q.P Margin = 60 - 20.8 = 39.2 so the EUT has 39.2 dB margin at 5.31 MHz

5.3.5 Worst Case Test Data

Date of Test	2017-07-07	Temperature	23.0 °C
		Relative humidity	46.1 % R.H.
Measurement Frequency Range		9 kHz ~ 30 MHz	
Test Result	***PASS***	Tested By	In-yong Song

5.3.5.1 Host Model Name: SPLIO1BMXCMNZZ

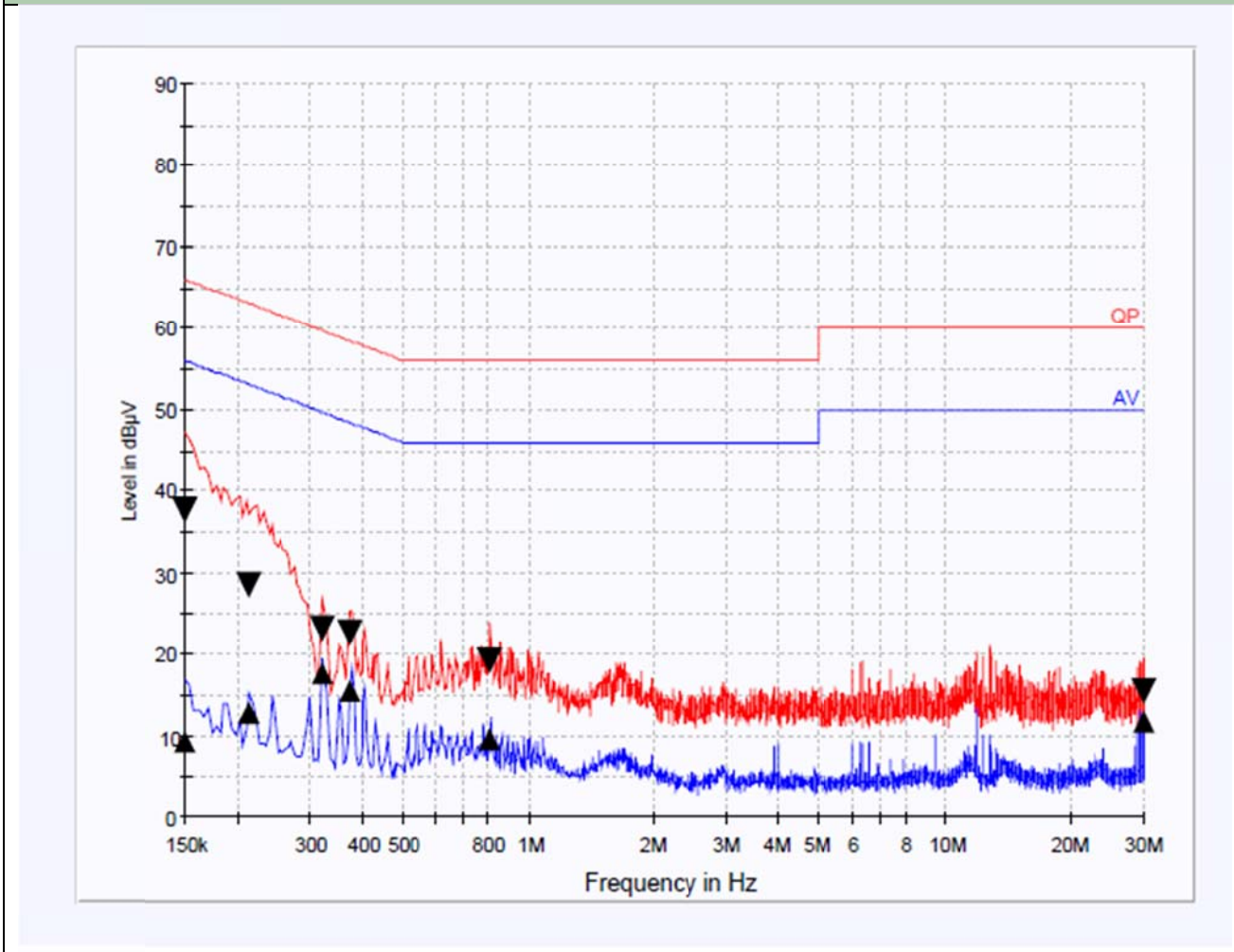
Hot Line



Limit and Margin1

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBµV)	Margin - CAV (dB)	Limit - CAV (dBµV)
0.162000	33.0	7.8	9.000	L1	9.6	32.4	65.4	47.6	55.4
0.242000	26.7	10.1	9.000	L1	9.6	35.4	62.0	41.9	52.0
0.374000	17.7	8.7	9.000	L1	9.6	40.7	58.4	39.7	48.4
0.806000	15.5	4.9	9.000	L1	9.6	40.5	56.0	41.1	46.0
3.986000	12.1	8.8	9.000	L1	9.7	43.9	56.0	37.2	46.0
29.906000	15.6	12.0	9.000	L1	10.1	44.4	60.0	38.0	50.0

Neutral Line

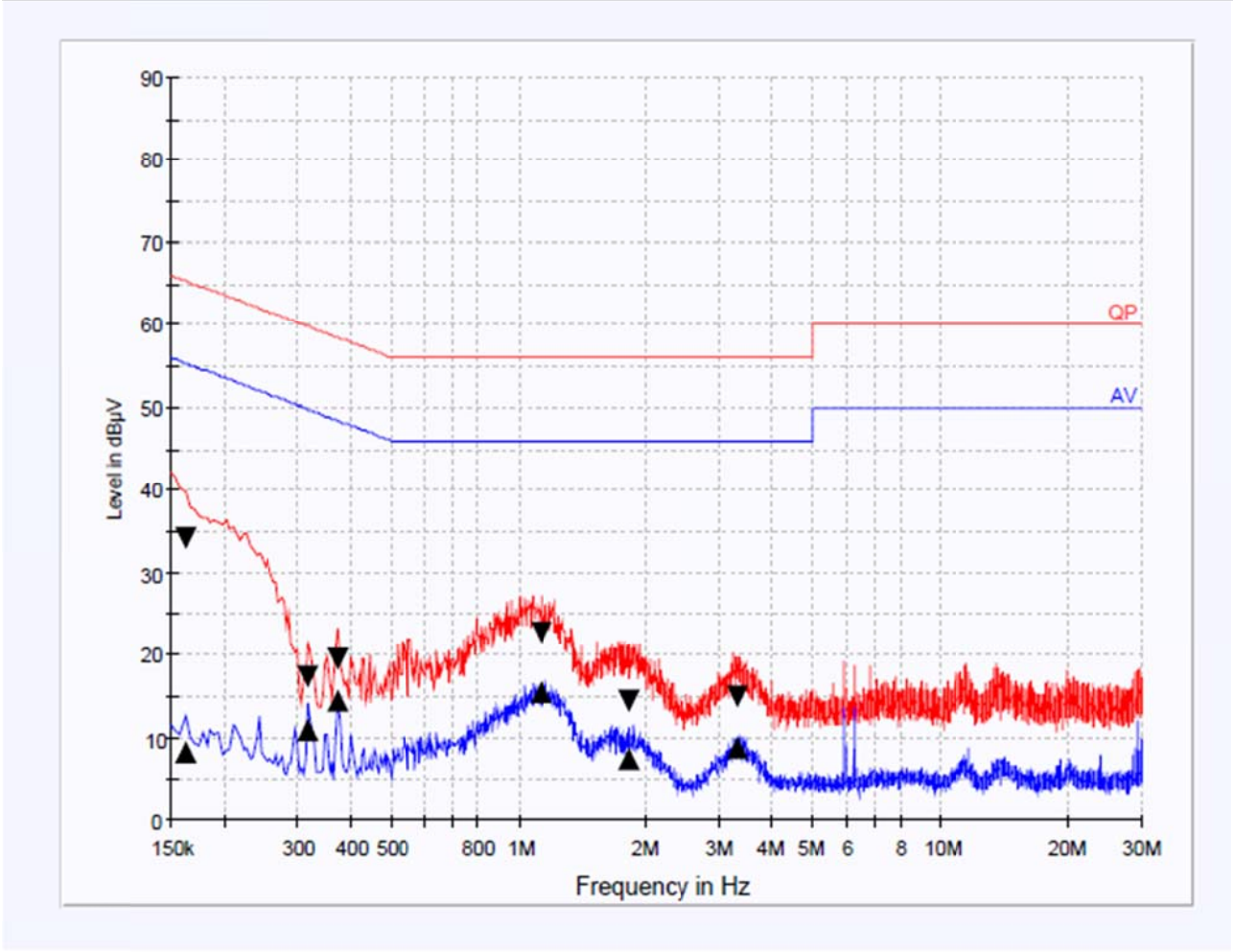


Limit and Margin1

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBµV)	Margin - CAV (dB)	Limit - CAV (dBµV)
0.150000	37.6	9.4	9.000	N	9.6	28.4	66.0	46.6	56.0
0.214000	28.5	12.9	9.000	N	9.6	34.5	63.0	40.1	53.0
0.322000	23.2	17.5	9.000	N	9.6	36.4	59.7	32.1	49.7
0.374000	22.6	15.5	9.000	N	9.6	35.8	58.4	33.0	48.4
0.806000	19.2	9.6	9.000	N	9.6	36.8	56.0	36.4	46.0
29.906000	15.4	11.8	9.000	N	10.2	44.6	60.0	38.2	50.0

5.3.5.2 Host Model Name: SPLIF6BMXCMNZZ

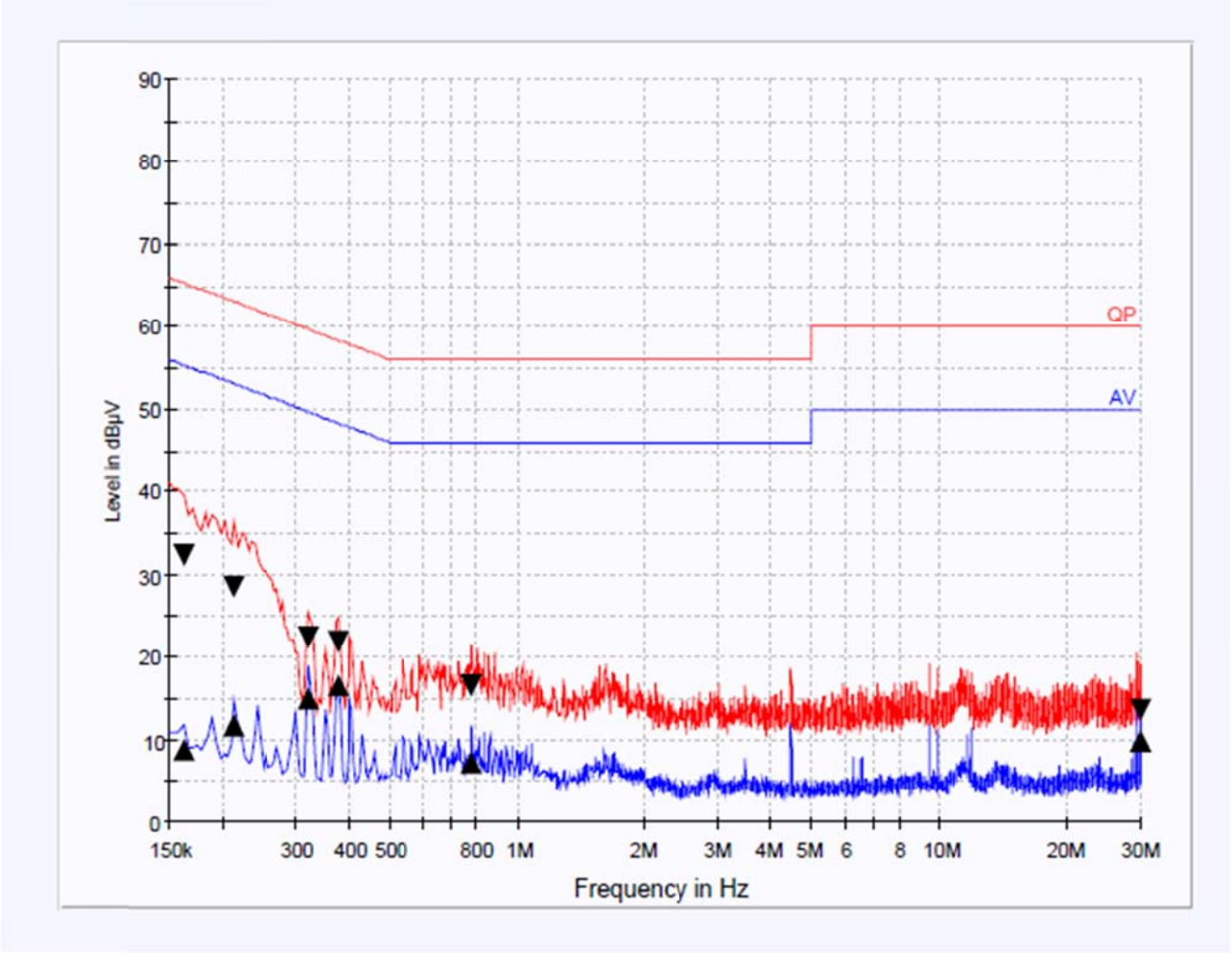
Hot Line



Limit and Margin1

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBµV)	Margin - CAV (dB)	Limit - CAV (dBµV)
0.162000	34.1	8.2	9.000	L1	9.6	31.3	65.4	47.2	55.4
0.318000	17.3	11.0	9.000	L1	9.6	42.4	59.8	38.8	49.8
0.374000	19.5	14.3	9.000	L1	9.6	38.9	58.4	34.1	48.4
1.126000	22.7	15.5	9.000	L1	9.6	33.3	56.0	30.5	46.0
1.826000	14.4	7.6	9.000	L1	9.7	41.6	56.0	38.4	46.0
3.314000	15.0	8.9	9.000	L1	9.7	41.0	56.0	37.1	46.0

Neutral Line

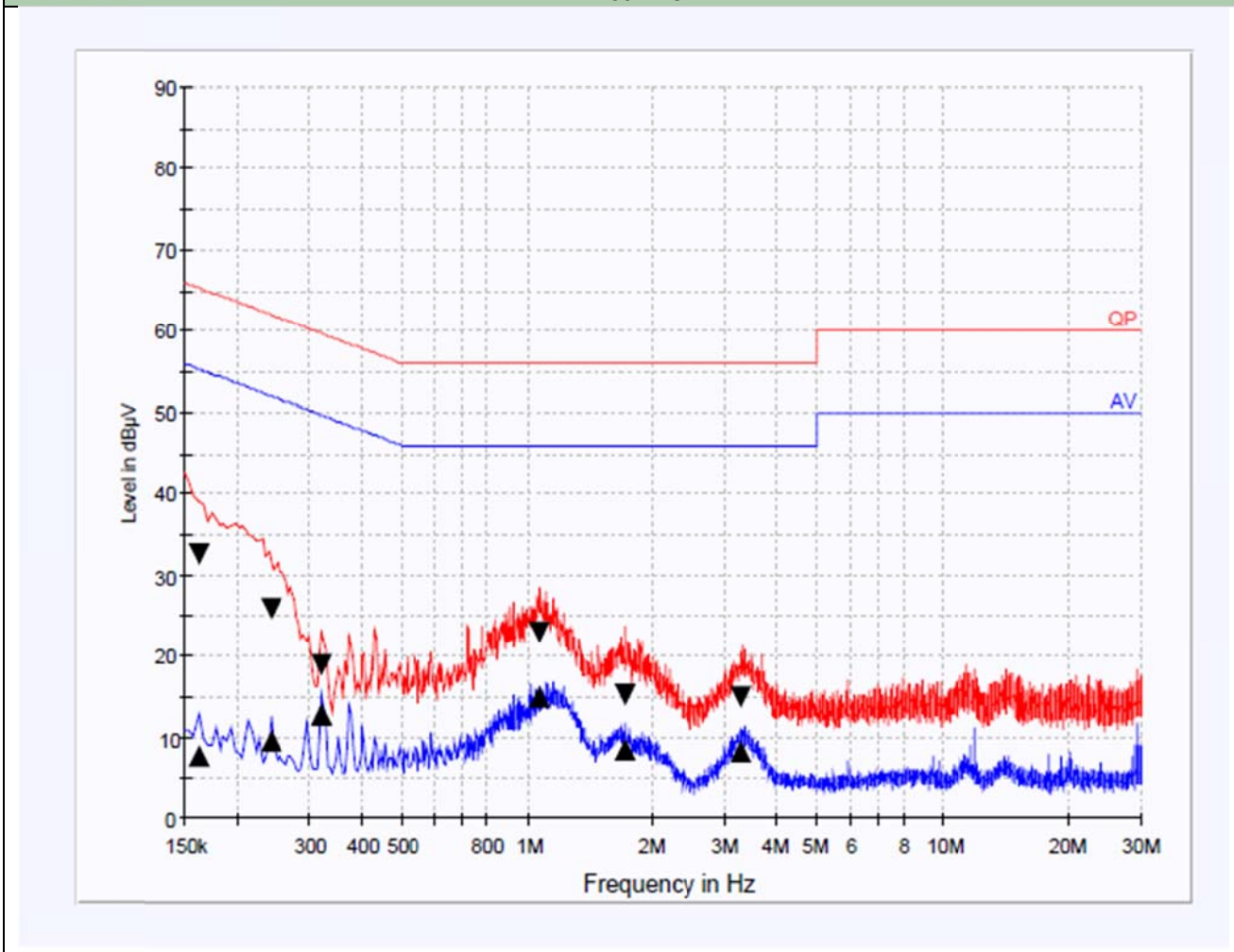


Limit and Margin1

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBµV)	Margin - CAV (dB)	Limit - CAV (dBµV)
0.162000	32.4	8.8	9.000	N	9.6	33.0	65.4	46.6	55.4
0.214000	28.7	11.7	9.000	N	9.6	34.4	63.0	41.3	53.0
0.322000	22.5	15.0	9.000	N	9.6	37.2	59.7	34.7	49.7
0.378000	22.0	16.6	9.000	N	9.6	36.3	58.3	31.7	48.3
0.782000	16.5	7.2	9.000	N	9.6	39.5	56.0	38.8	46.0
29.906000	13.7	9.9	9.000	N	10.2	46.3	60.0	40.1	50.0

5.3.5.3 Host Model Name: SPLIFRBMXCMNZZ

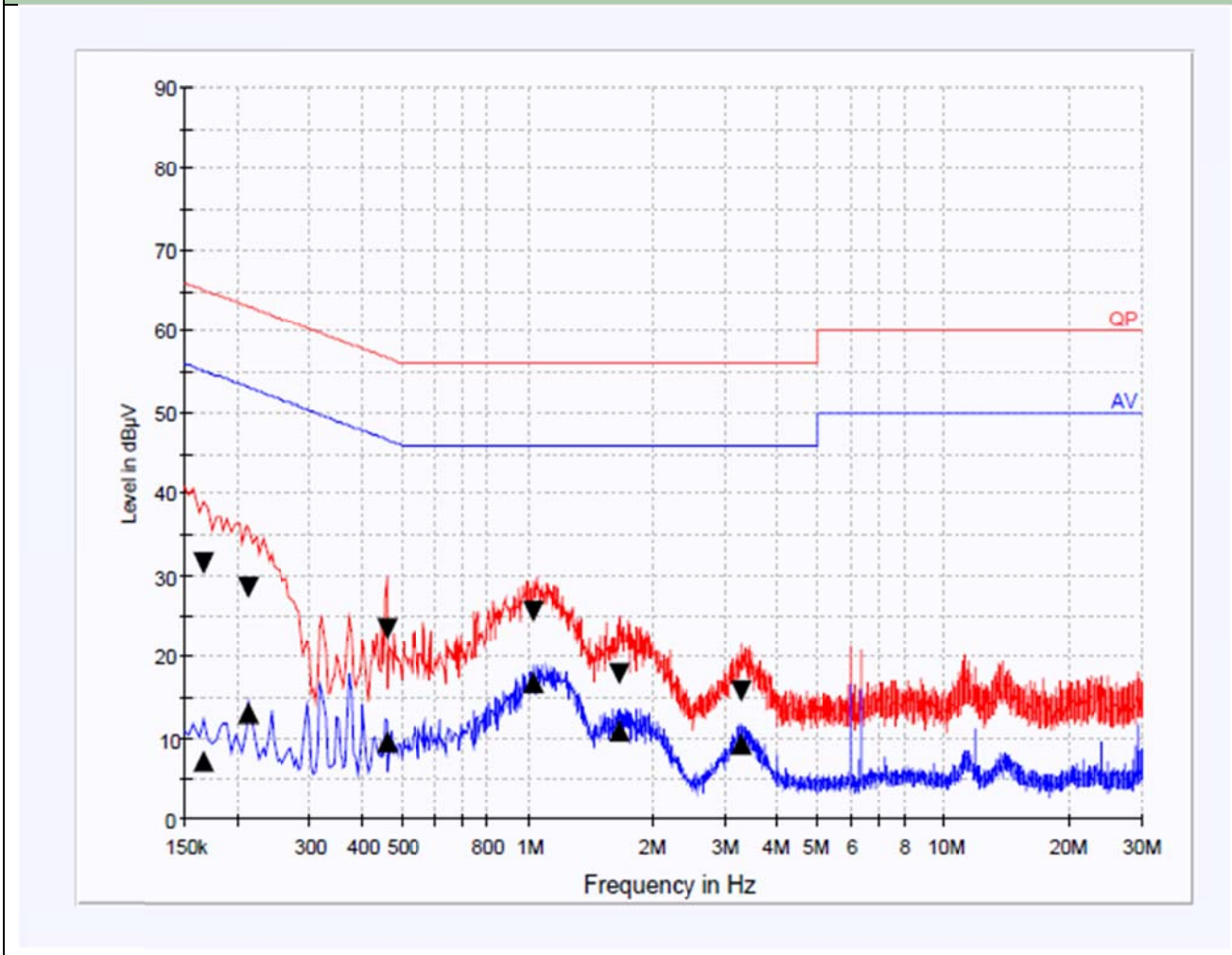
Hot Line



Limit and Margin1

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBµV)	Margin - CAV (dB)	Limit - CAV (dBµV)
0.162000	32.7	7.6	9.000	L1	9.6	32.7	65.4	47.7	55.4
0.242000	25.9	9.5	9.000	L1	9.6	36.1	62.0	42.5	52.0
0.322000	18.8	12.8	9.000	L1	9.6	40.8	59.7	36.8	49.7
1.070000	22.8	14.9	9.000	L1	9.6	33.2	56.0	31.1	46.0
1.722000	15.3	8.6	9.000	L1	9.7	40.7	56.0	37.4	46.0
3.282000	15.0	8.3	9.000	L1	9.7	41.0	56.0	37.7	46.0

Neutral Line



Limit and Margin1

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBµV)	Margin - CAV (dB)	Limit - CAV (dBµV)
0.166000	31.5	7.2	9.000	N	9.6	33.7	65.2	48.0	55.2
0.214000	28.5	13.0	9.000	N	9.6	34.5	63.0	40.1	53.0
0.458000	23.5	9.6	9.000	N	9.6	33.3	56.7	37.1	46.7
1.034000	25.7	16.9	9.000	N	9.6	30.3	56.0	29.1	46.0
1.666000	17.9	10.9	9.000	N	9.7	38.1	56.0	35.1	46.0
3.282000	15.6	9.4	9.000	N	9.7	40.4	56.0	36.6	46.0

Appendix I – Test Instrumentation

Description	Model No.	Serial No.	Manufacturer.	Due for Cal Date
TS8997 System				
Signal & Spectrum Analyzer	FSW 43	100578	Rohde & Schwarz	2018-05-04
Power Module	OSP 120	101389	Rohde & Schwarz	2018-01-19
Signal Generator	SMF100A	101441	Rohde & Schwarz	2018-01-19
Vector Signal Generator	SMBV100A	257560	Rohde & Schwarz	2018-01-19
DC Power Supply	U8001A	MY51080019	AGILENT	2017-07-28
Slidacs	DSD-1005	M06-117	Digitek Power	-
Attenuator	56-10	58769	WEINSCHIEL	2018-01-19
Attenuator	10dB	N/A	Rohde & Schwarz	2018-01-19
Temperature & Humidity Chamber	PR-3KP	14004209	Espec	2017-07-29
Test Receiver	ESU 26	100303	Rohde & Schwarz	2018-01-19
Loop Antenna	HFH2-Z2	100341	Rohde & Schwarz	2019-04-21
TRILOG Broadband Antenna	VULB9163	9163.770	Schwarzbeck	2019-02-13
Horn Antenna	HF 907	102426	Rohde & Schwarz	2019-01-06
Horn Antenna	BBHA9170	BBHA9170440	Schwarzbeck	2018-11-28
Attenuator	6dB	272.4110.50	Rohde & Schwarz	2018-01-19
Pre-Amplifier	310N	344015	Sonoma Instrument	2018-01-19
Pre-Amplifier	SCU 18D	19006450	Rohde & Schwarz	2018-04-24
Pre-Amplifier	CBL18265035	28706	CERNEX	2018-03-29
Turn Table	DT3000-3t	1310814	INNCO SYSTEM	-
Antenna Master	MA4000-EP	4600814	INNCO SYSTEM	-
Camera Controller	HDCon4102	6531445048	PONTIS	-
CO3000 Controller	Co3000-4Port	CO3000/806/ 34130814/L	INNCO SYSTEM	-
EMI Test Receiver	ESCI 7	100722	Rohde & Schwarz	2018-01-19
LISN	ENV216	100110	Rohde & Schwarz	2017-07-29
LISN	LS16C	16011403310	AFJ	2017-07-28

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