

TEST REPORT

Application No.: KSCR2509001991AT
FCC ID: XMR202401AF68E
Applicant: Quectel Wireless Solutions Co., Ltd.
Address of Applicant: Building 5, Shanghai Business Park Phase III (Area B), No.1016 Tianlin Road, Minhang District, Shanghai, China 200233
Manufacturer: Quectel Wireless Solutions Co., Ltd.
Address of Manufacturer: Building 5, Shanghai Business Park Phase III (Area B), No.1016 Tianlin Road, Minhang District, Shanghai, China 200233
Equipment Under Test (EUT):
EUT Name: Wi-Fi & Bluetooth Module
Model No.: AF68E
Trade Mark: QUECTEL
Standard(s) : 47 CFR Part 15, Subpart C 15.247
Date of Receipt: 2025-08-31
Date of Test: 2025-09-01 to 2025-09-04
Date of Issue: 2025-09-12

Test Result:	Pass*
---------------------	--------------

* In the configuration tested, the EUT complied with the standards specified above.

This document is issued by the Company subject to its General Conditions of Service printed overleaf, available on request or accessible at <http://www.sgs.com/en/Terms-and-Conditions> and, for electronic format documents, subject to Terms and Conditions for Electronic Documents at <http://www.sgs.com/en/Terms-and-Conditions/Terms-e-Document>. Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein.

Any holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents. This document cannot be reproduced except in full, without prior written approval of the Company. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law.

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 30 days only.



Revision Record			
Version	Description	Date	Remark
00	Add a new antenna	2025-09-12	Based on KSCR240200030901

Authorized for issue by:			
Tested By		maker Qi	
		Maker_Qi/Project Engineer	
Approved By		Terry Hou	
		Terry Hou /Reviewer	

2 Test Summary

Radio Spectrum Technical Requirement					
Item	Standard	Method	Requirement	Result	Test Lab*
Antenna Requirement	47 CFR Part 15, Subpart C 15.247	N/A	47 CFR Part 15, Subpart C 15.203 & 15.247(b)(4)	Customer Declaration	N/A

Radio Spectrum Matter Part					
Item	Standard	Method	Requirement	Result	Test Lab*
Conducted Emissions at AC Power Line (150kHz-30MHz)	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 6.2	47 CFR Part 15, Subpart C 15.207	Pass	B
Conducted Peak Output Power		ANSI C63.10 (2013) Section 11.9.1	47 CFR Part 15, Subpart C 15.247(b)(3)	Pass (Note1)	A
Minimum 6dB Bandwidth		ANSI C63.10 (2013) Section 11.8.1	47 CFR Part 15, Subpart C 15.247a(2)	Pass (Note1)	A
Power Spectrum Density		ANSI C63.10 (2013) Section 11.10.2	47 CFR Part 15, Subpart C 15.247(e)	Pass (Note1)	A
Conducted Band Edges Measurement		ANSI C63.10 (2013) Section 11.13.3.2	47 CFR Part 15, Subpart C 15.247(d)	Pass (Note1)	A
Conducted Spurious Emissions		ANSI C63.10 (2013) Section 11.11	47 CFR Part 15, Subpart C 15.247(d)	Pass (Note1)	A
Radiated Emissions which fall in the restricted bands		ANSI C63.10 (2013) Section 6.10.5	47 CFR Part 15, Subpart C 15.205 & 15.209	Pass	B
Radiated Spurious Emissions Below 1GHz		ANSI C63.10 (2013) Section 6.4,6.5	47 CFR Part 15, Subpart C 15.205 & 15.209	Pass	B
Radiated Spurious Emissions Above 1GHz		ANSI C63.10 (2013) Section 6.6	47 CFR Part 15, Subpart C 15.205 & 15.209	Pass	B

Note1: This report was an additional report copied from the report KSCR240200030901, new report add a new antenna and test items for Conducted Emissions at AC Power Line (150kHz-30MHz), Radiated Spurious Emissions Below 1GHz, Radiated Spurious Emissions Above 1GHz and Radiated Emissions which fall in the restricted bands. And other test items data refer to original report KSCR240200030901.



3 Contents

	Page
1 COVER PAGE	1
2 Test Summary	3
3 Contents.....	4
4 General Information.....	5
4.1 Details of E.U.T.	5
4.2 Power level setting using in test:.....	5
4.3 Description of Support Units	5
4.4 Measurement Uncertainty	6
4.5 Test Location.....	7
4.6 Test Facility	7
4.7 Deviation from Standards.....	7
4.8 Abnormalities from Standard Conditions.....	7
5 Equipment List	8
6 Radio Spectrum Technical Requirement.....	9
6.1 Antenna Requirement	9
7 Radio Spectrum Matter Test Results	10
7.1 Conducted Emissions at AC Power Line (150kHz-30MHz).....	10
7.2 Radiated Emissions which fall in the restricted bands	14
7.3 Radiated Spurious Emissions Below 1GHz	32
7.4 Radiated Spurious Emissions Above 1GHz.....	38
8 Co-location*.....	52
9 Test Setup Photo	56
10 EUT Constructional Details (EUT Photos).....	56

4 General Information

4.1 Details of E.U.T.

Power supply:	DC 3.3-4.8V,Typ: 3.85V
Operation Frequency:	2402MHz to 2480MHz
Modulation Type:	GFSK
Number of Channels:	40
Channel Spacing:	2MHz
Antenna Type:	External antenna
Antenna Gain:	2.5dBi(Provided by the manufacturer)

4.2 Power level setting using in test:

Channel	BLE	BLE	S8	S2
	1M	2M	125K	500K
00	Default	Default	Default	Default
19	Default	Default	Default	Default
39	Default	Default	Default	Default

4.3 Description of Support Units

Description	Manufacturer	Model No.	Serial No.
Router	Smauwave Technology Co.,Ltd	SRT 421	SUWI-04-34-01
Computer	Lenovo	T14	SUWI-03-33-04
Mouse	Lenovo	3D optical Mouse	SUWI-03-33-05
Adaptor	Huawei	HW-050200C02	SUWI-03-33-06
Mouse	Lenovo	3D optical Mouse	SUWI-03-33-05
Bluetooth earphone	Lenovo	Thinplus BH3	SUWI-03-48-01

4.4 Measurement Uncertainty

No.	Item	Measurement Uncertainty
1	Radio Frequency	8.4×10^{-8}
2	Timeout	2s
3	Duty Cycle	0.37%
4	Occupied Bandwidth	3%
5	RF Conducted Power	0.6dB
6	RF Power Density	2.9dB
7	Conducted Spurious Emissions	0.75dB
8	RF Radiated Power	5.2dB (Below 1GHz)
		5.9dB (Above 1GHz)
9	Radiated Spurious Emission Test	4.2dB (Below 30MHz)
		4.5dB (30MHz-1GHz)
		5.1dB (1GHz-18GHz)
		5.4dB (Above 18GHz)
10	Temperature Test	1°C
11	Humidity Test	3%
12	Supply Voltages	1.5%
13	Time	3%
Note: The measurement uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.		

4.5 Test Location

Lab A:

Compliance Certification Services (Kunshan) Inc.

No.10 Weiye Rd, Innovation park, Eco&Tec, Development Zone, Kunshan City, Jiangsu, China.

Tel: +86 512 5735 5888 Fax: +86 512 5737 0818

No tests were sub-contracted.

Lab B:

Conducted Emissions at AC Power Line (150kHz-30MHz), Radiated Spurious Emissions Below 1GHz, Radiated Spurious Emissions Above 1GHz and Radiated Emissions which fall in the restricted bands test at:

SGS-CSTC Standards Technical Services (Suzhou) Co., Ltd.

No.2, Tongsheng Road, Wuzhong District, Suzhou, Jiangsu, China

Tel: +86 512 5735 5888 Fax: +86 512 5737 0818

4.6 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

Lab A:**• A2LA**

Compliance Certification Services (Kunshan) Inc. is accredited by the American Association for Laboratory Accreditation (A2LA). Certificate No. 2541.01.

• FCC

Compliance Certification Services (Kunshan) Inc. has been recognized as an accredited testing laboratory. Designation Number: CN1172.

• ISED

Compliance Certification Services (Kunshan) Inc. has been recognized by Innovation, Science and Economic Development Canada (ISED) as an accredited testing laboratory. Company Number: 2324E

• VCCI

The 3m and 10m Semi-anechoic chamber and Shielded Room of Compliance Certification Services (Kunshan) Inc. has been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: R-20134, R-11600, C-11707, T-11499, G-10216 respectively.

Lab B:**• A2LA (Certificate No. 6336.01)**

SGS-CSTC STANDARDS TECHNICAL SERVICES (SUZHOU) CO., LTD. is accredited by the American Association for Laboratory Accreditation (A2LA). Certificate No. 6336.01.

• Innovation, Science and Economic Development Canada

SGS-CSTC STANDARDS TECHNICAL SERVICES (SUZHOU) CO., LTD. has been recognized by ISED as an accredited testing laboratory.

CAB identifier: CN0120.

IC#: 27594.

• FCC –Designation Number: CN1312

SGS-CSTC STANDARDS TECHNICAL SERVICES (SUZHOU) CO., LTD. has been recognized as an accredited testing laboratory.

Designation Number: CN1312.

Test Firm Registration Number: 717327

4.7 Deviation from Standards

None

4.8 Abnormalities from Standard Conditions

None

5 Equipment List

Lab B:

Item	Equipment	Manufacturer	Model	Inventory No	Cal Date	Cal. Due Date
Conducted Emission at Mains Terminals						
1	EMI Test Receive	R&S	ESR7	SUWI-01-10-01	1/15/2025	1/14/2026
2	LISN	R&S	ENV216	SUWI-01-19-03	5/8/2025	5/7/2026
3	LISN	Schwarzbeck	ENV216	SUWI-01-19-04	5/8/2025	5/7/2026
4	Test Software	Tonscend	JS32-CE 4.0.0.2	SUWI-02-09-05	N.C.R	N.C.R
RF Radiated Test						
1	Semi-Anechoic Chamber	Brilliant-emc	N/A	SUWI-04-02-01	6/3/2023	6/2/2026
2	Signal Analyzer	ROHDE&SCHWARZ	FSW43	SUWI-01-02-04	1/20/2025	1/19/2026
3	Signal Analyzer	KEYSIGHT	N9020A	SUWI-01-02-09	11/21/2024	11/20/2025
4	Test receiver	ROHDE&SCHWARZ	ESR7	SUWI-01-10-01	1/15/2025	1/14/2026
5	Signal Generator	ROHDE&SCHWARZ	SMW100A	SUWI-01-18-01	1/16/2025	1/15/2026
6	Receiving antenna	SCHWRZBECK MESS- ELEKTRONIK	VULB 9168	SUWI-01-11-04	8/22/2024	8/21/2026
7	Receiving antenna	SCHWRZBECK MESS- ELEKTRONIK	BBHA 9120D	SUWI-01-11-02	5/7/2025	5/6/2027
8	Receiving antenna	SCHWRZBECK MESS- ELEKTRONIK	BBHA 9170	SUWI-01-11-03	5/7/2025	5/6/2027
9	Active Loop Antenna	SCHWRZBECK MESS- ELEKTRONIK	FMZB 1519B	SUWI-01-21-01	5/7/2025	5/6/2027
10	Amplifier	Tonscend	TAP9K3G40	SUWI-01-14-01	1/16/2025	1/15/2026
11	Amplifier	Tonscend	TAP01018050	SUWI-01-14-02	1/16/2025	1/15/2026
12	Amplifier	Tonscend	TAP18040048	SUWI-01-14-03	1/20/2025	1/19/2026
13	Wideband Radio Communication Tester	Anritsu	MT8820C	SUWI-01-26-01	9/10/2024	9/9/2025
14	Wideband Radio Communication Tester	Anritsu	MT8821C	SUWI-01-26-03	11/19/2024	11/18/2025
15	Wideband Radio Communication Tester	ROHDE&SCHWARZ	CMW500	SUWI-01-16-09	9/10/2024	9/9/2025
16	Radio Communication Analyzer	StarPoint	SP9500E	SUWI-01-28-02	11/19/2024	11/18/2025
17	Signal Generator	ROHDE&SCHWARZ	SMB100A	SUWI-01-08-01	1/16/2025	1/15/2026
18	DC Power Supply	HYELEC	HY3005B	SUWI-01-18-01	1/15/2025	1/14/2026
19	Temperature and humidity meter	MingGao	TH101B	SUWI-01-01-05	2/13/2025	2/12/2026
20	Measurement Software	Tonscend	JS32-RE 4.0.0.0	SUWI-02-09-06	NCR	NCR

6 Radio Spectrum Technical Requirement

6.1 Antenna Requirement

6.1.1 Test Requirement:

47 CFR Part 15, Subpart C 15.203 & 15.247(b)(4)

6.1.2 Conclusion

Standard Requirement:

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, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

15.247(b) (4) requirement:

The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

EUT Antenna:

The antenna is External antenna and no consideration of replacement. The best case gain of the antenna is 2.5dBi.

Antenna location: Refer to internal photo.

7 Radio Spectrum Matter Test Results

7.1 Conducted Emissions at AC Power Line (150kHz-30MHz)

Test Requirement 47 CFR Part 15, Subpart C 15.207

Test Method: ANSI C63.10 (2013) Section 6.2

Limit:

Frequency of emission(MHz)	Conducted limit(dBμV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50
*Decreases with the logarithm of the frequency.		
Detector: Peak for pre-scan (9kHz resolution bandwidth) 0.15M to 30MHz		

7.1.1 E.U.T. Operation

Operating Environment:

Temperature: 22 °C

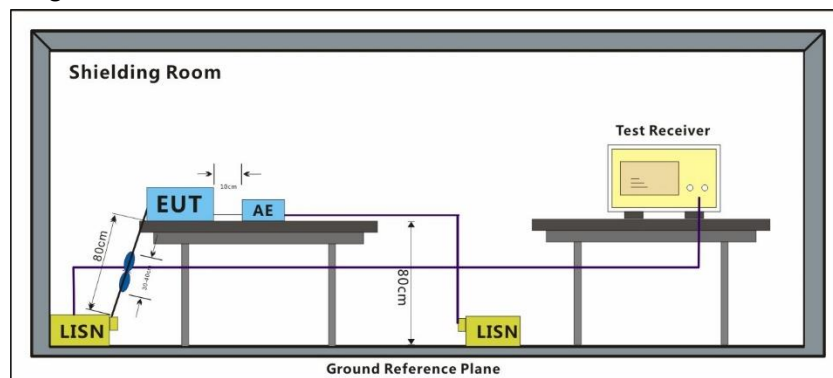
Humidity: 48 % RH

Atmospheric Pressure: 1010 mbar

7.1.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	08	TX mode(1Mbps)_Keep the EUT in continuously transmitting mode with GFSK modulation.

7.1.3 Test Setup Diagram



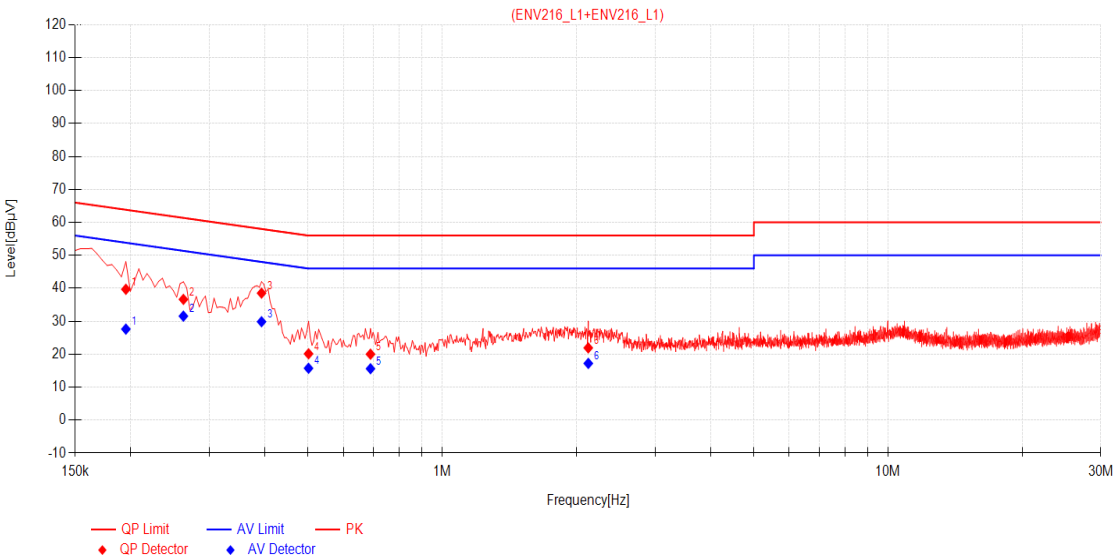
7.1.4 Measurement Procedure and Data

- 1) The mains terminal disturbance voltage test was conducted in a shielded room.
- 2) The EUT was connected to AC power source through a LISN 1 (Line Impedance Stabilization Network) which provides a 50ohm/50μH + 5ohm linear impedance. The power cables of all other units of the EUT were connected to a second LISN 2, which was bonded to the ground reference plane in the same way as the LISN 1 for the unit being measured. A multiple socket outlet strip was used to connect multiple power cables to a single LISN provided the rating of the LISN was not exceeded.
- 3) The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane.
- 4) The test was performed with a vertical ground reference plane. The rear of the EUT shall be 0.4 m from the vertical ground reference plane. The vertical ground reference plane was bonded to the horizontal ground reference plane. The LISN 1 was placed 0.8 m from the boundary of the unit under test and bonded to a ground reference plane for LISNs mounted on top of the ground reference plane. This distance was between the closest points of the LISN 1 and the EUT. All other units of the EUT and associated equipment was at least 0.8 m from the LISN 2.
- 5) In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10 on conducted measurement.

Remark: Level=Read Level+ Cable Loss+ LISN Factor

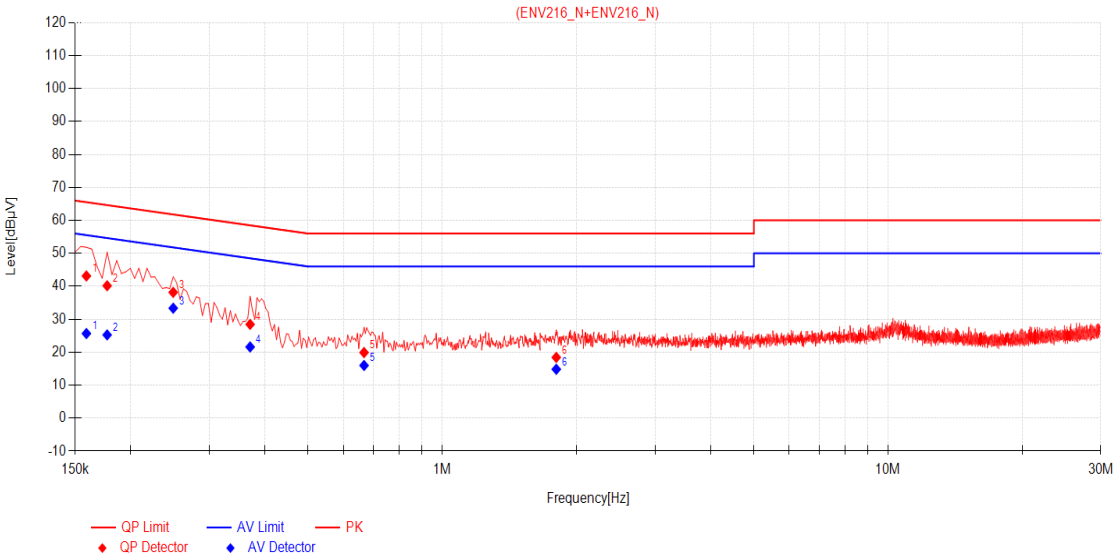


Test Mode: 08; Line: Live line



Final Data List											
NO.	Frequency [MHz]	Factor [dB]	QP Reading [dBμV]	QP Value [dBμV]	QP Limit [dBμV]	QP Margin [dB]	AV Reading [dBμV]	AV Value [dBμV]	AV Limit [dBμV]	AV Margin [dB]	Verdict
1	0.1950	9.97	29.72	39.69	63.82	24.13	17.64	27.61	53.82	26.21	PASS
2	0.2625	9.97	26.66	36.63	61.35	24.72	21.58	31.55	51.35	19.80	PASS
3	0.3930	9.95	28.57	38.52	58.00	19.48	19.91	29.86	48.00	18.14	PASS
4	0.5010	9.94	10.18	20.12	56.00	35.88	5.79	15.73	46.00	30.27	PASS
5	0.6900	9.92	10.09	20.01	56.00	35.99	5.68	15.60	46.00	30.40	PASS
6	2.1255	9.88	12.04	21.92	56.00	34.08	7.33	17.21	46.00	28.79	PASS

Test Mode: 08; Line: Neutral Line



Final Data List											
NO.	Frequency [MHz]	Factor [dB]	QP Reading [dBμV]	QP Value [dBμV]	QP Limit [dBμV]	QP Margin [dB]	AV Reading [dBμV]	AV Value [dBμV]	AV Limit [dBμV]	AV Margin [dB]	Verdict
1	0.1590	9.95	33.18	43.13	65.52	22.39	15.71	25.66	55.52	29.86	PASS
2	0.1770	9.94	30.22	40.16	64.63	24.47	15.31	25.25	54.63	29.38	PASS
3	0.2490	9.97	28.19	38.16	61.79	23.63	23.38	33.35	51.79	18.44	PASS
4	0.3705	9.96	18.49	28.45	58.49	30.04	11.64	21.60	48.49	26.89	PASS
5	0.6675	9.94	9.96	19.90	56.00	36.10	6.04	15.98	46.00	30.02	PASS
6	1.8015	9.92	8.50	18.42	56.00	37.58	4.91	14.83	46.00	31.17	PASS

7.2 Radiated Emissions which fall in the restricted bands

Test Requirement 47 CFR Part 15, Subpart C 15.205 & 15.209

Test Method: ANSI C63.10 (2013) Section 6.10.5

Measurement Distance: 3m

Limit:

Frequency(MHz)	Field strength(microvolts/meter)	Measurement distance(meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Remark: The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90kHz, 110-490kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.

7.2.1 E.U.T. Operation

Operating Environment:

Temperature: 20.5 °C

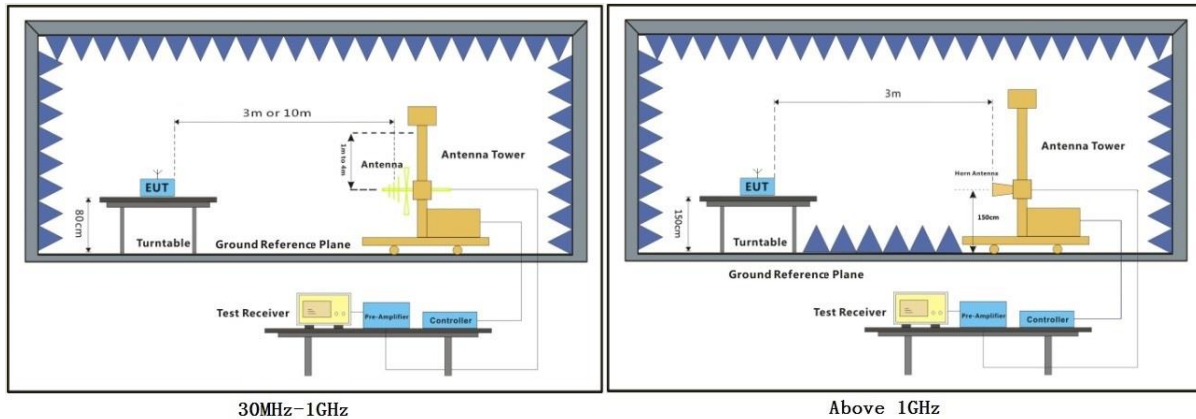
Humidity: 51.3 % RH

Atmospheric Pressure: 1010 mbar

7.2.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	08	TX mode(1Mbps)_Keep the EUT in continuously transmitting mode with GFSK modulation.
Final test	09	TX mode(2Mbps)_Keep the EUT in continuously transmitting mode with GFSK modulation.
Final test	10	TX mode(125kbps)_Keep the EUT in continuously transmitting mode with GFSK modulation.
Final test	11	TX mode(500kbps)_Keep the EUT in continuously transmitting mode with GFSK modulation.

7.2.3 Test Setup Diagram



7.2.4 Measurement Procedure and Data

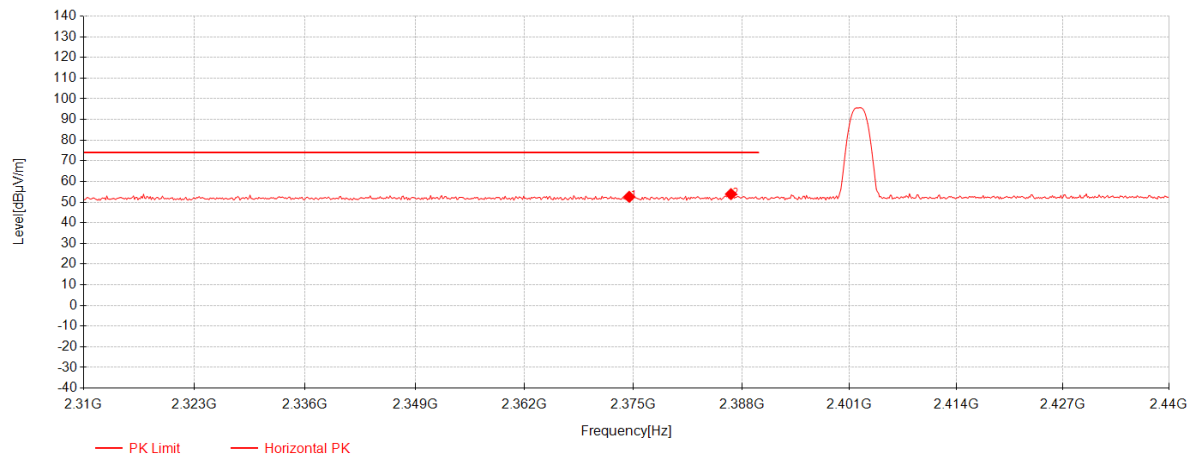
- For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter fully-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- The EUT was set 3 or 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.
- Test the EUT in the lowest channel, the middle channel, the Highest channel.
- The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.
- Repeat above procedures until all frequencies measured was complete.

Remark 1: Level= Read Level+ Cable Loss+ Antenna Factor- Preamp Factor

Remark 2: For frequencies above 1GHz, the field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. For the emissions whose peak level is lower than the average limit, only the peak measurement is shown in the report.

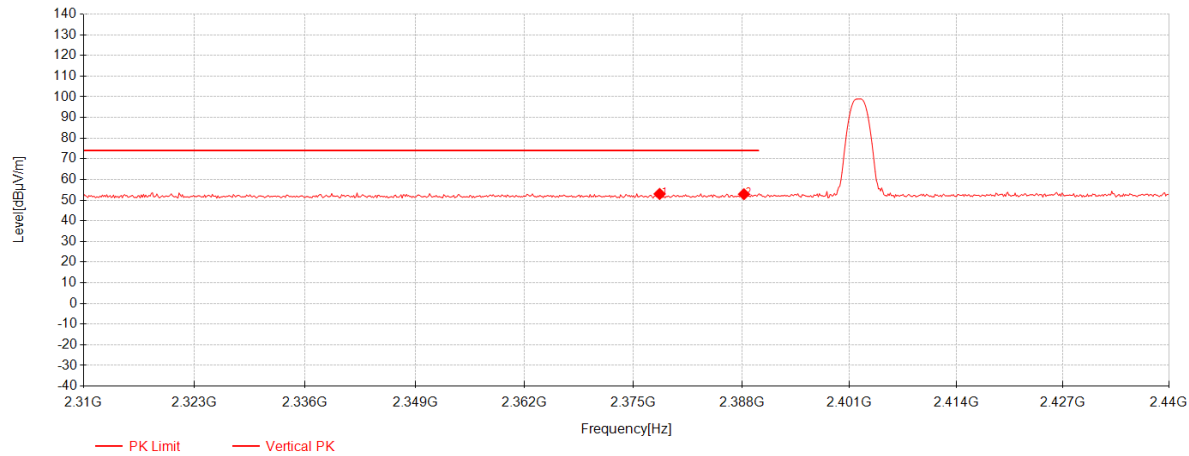


BLE 1M_Channel 00



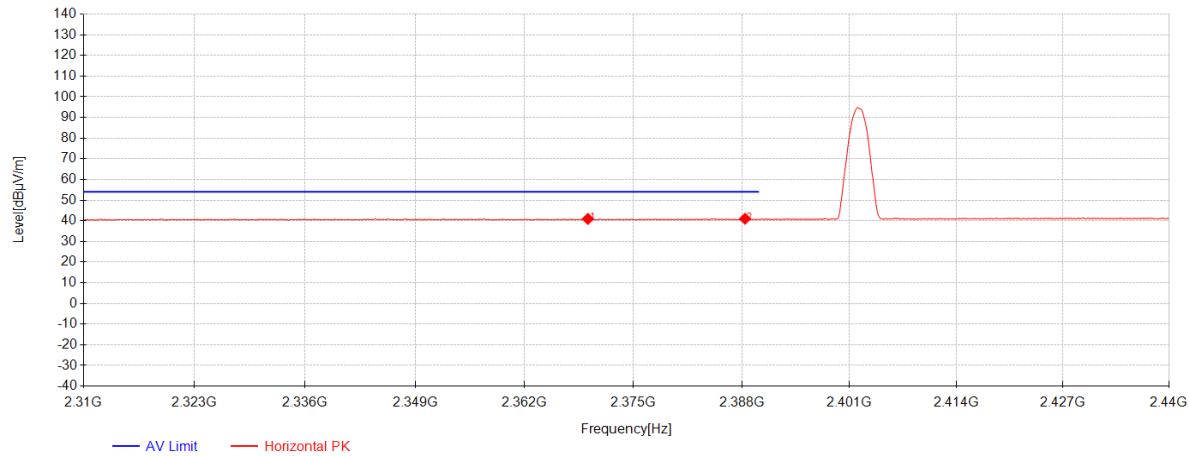
Data List								
NO.	Frequency [MHz]	Reading [dBµV]	AF [dB/m]	Factor [dB]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Polarity
1	2374.48	48.74	27.12	-23.30	52.56	74.00	21.44	Horizontal
2	2386.7	50.03	27.15	-23.31	53.87	74.00	20.13	Horizontal

BLE 1M_Channel 00



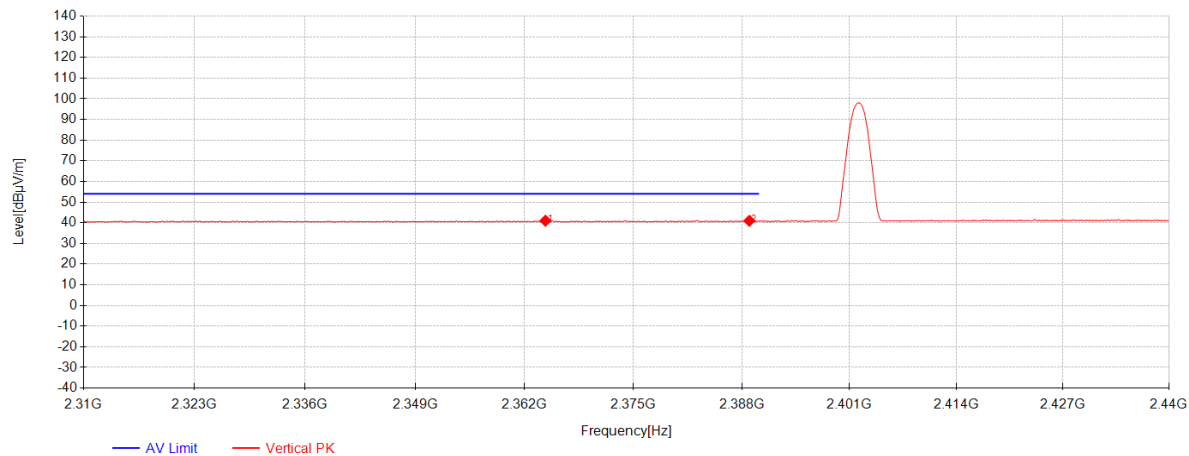
Data List								
NO.	Frequency [MHz]	Reading [dBμV]	AF [dB/m]	Factor [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Polarity
1	2378.12	49.16	27.13	-23.30	52.99	74.00	21.01	Vertical
2	2388.26	49.03	27.15	-23.31	52.87	74.00	21.13	Vertical

BLE 1M_Channel 00



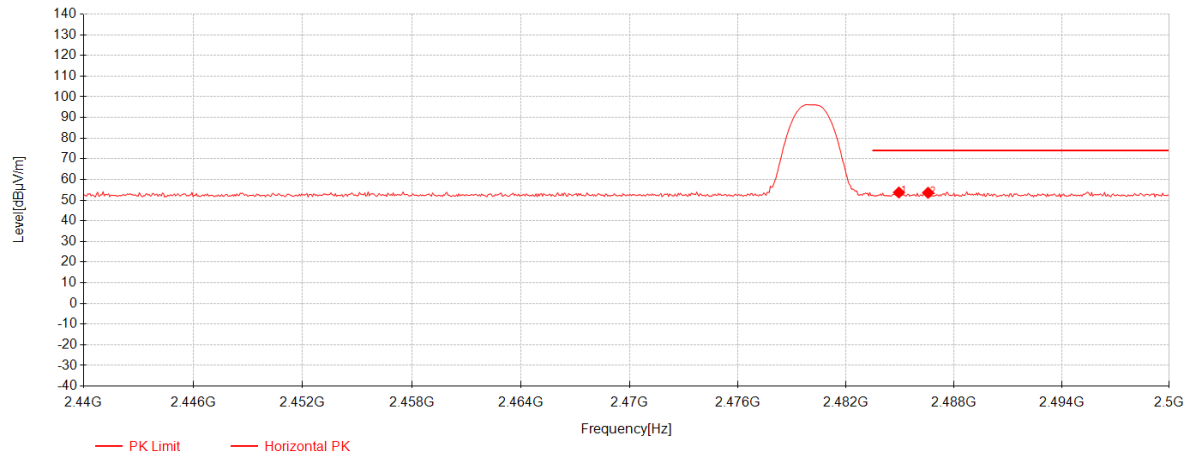
Data List								
NO.	Frequency [MHz]	Reading [dBµV]	AF [dB/m]	Factor [dB]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Polarity
1	2369.54	37.11	27.11	-23.30	40.92	54.00	13.08	Horizontal
2	2388.39	37.16	27.15	-23.31	41.00	54.00	13.00	Horizontal

BLE 1M_Channel 00



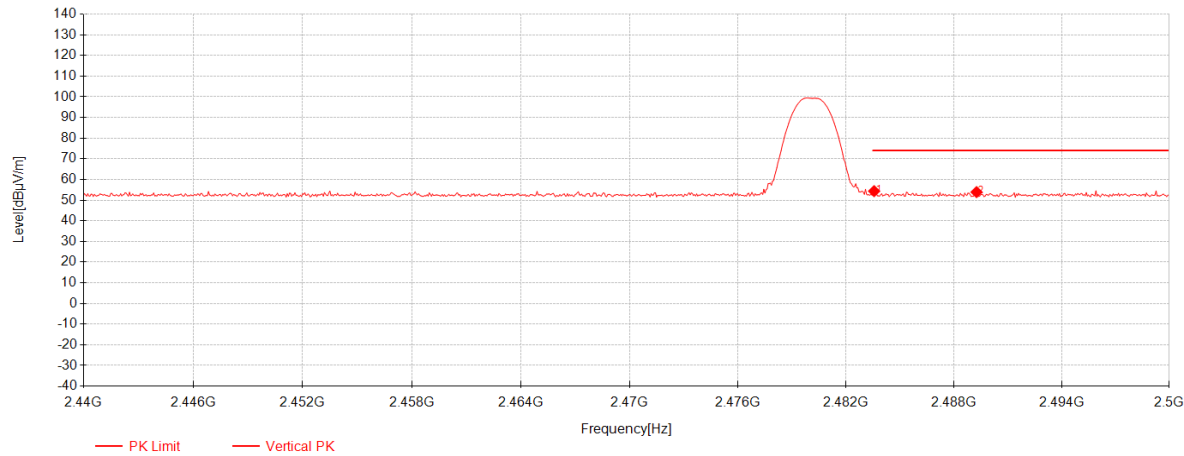
Data List								
NO.	Frequency [MHz]	Reading [dBµV]	AF [dB/m]	Factor [dB]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Polarity
1	2364.47	37.18	27.10	-23.30	40.99	54.00	13.01	Vertical
2	2388.91	37.12	27.16	-23.31	40.96	54.00	13.04	Vertical

BLE 1M_Channel 39



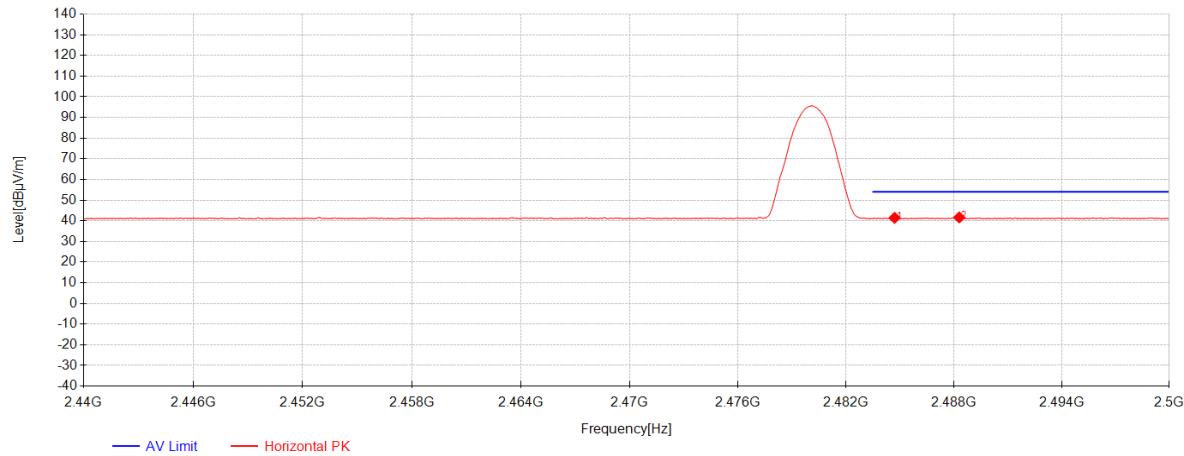
Data List								
NO.	Frequency [MHz]	Reading [dBµV]	AF [dB/m]	Factor [dB]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Polarity
1	2484.94	49.60	27.37	-23.27	53.70	74.00	20.30	Horizontal
2	2486.56	49.46	27.37	-23.27	53.56	74.00	20.44	Horizontal

BLE 1M_Channel 39



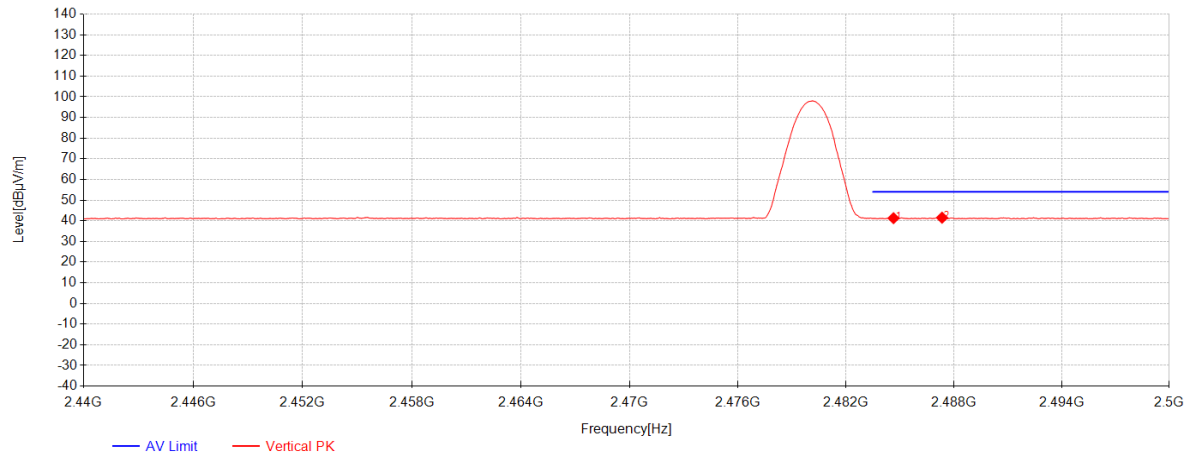
Data List								
NO.	Frequency [MHz]	Reading [dBµV]	AF [dB/m]	Factor [dB]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Polarity
1	2483.56	50.27	27.36	-23.27	54.36	74.00	19.64	Vertical
2	2489.26	49.78	27.38	-23.27	53.89	74.00	20.11	Vertical

BLE 1M_Channel 39



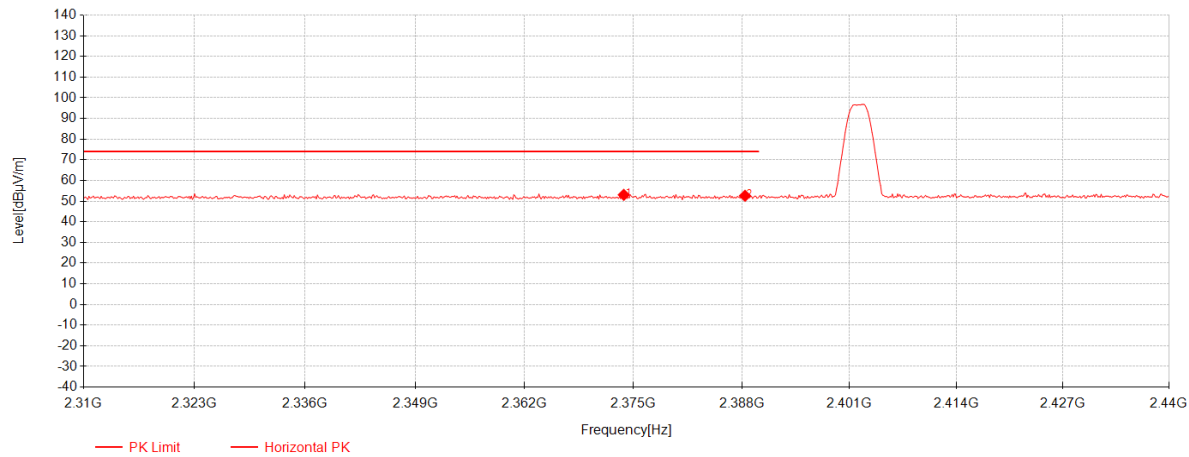
Data List								
NO.	Frequency [MHz]	Reading [dBμV]	AF [dB/m]	Factor [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Polarity
1	2484.7	37.34	27.37	-23.27	41.44	54.00	12.56	Horizontal
2	2488.3	37.53	27.37	-23.27	41.64	54.00	12.36	Horizontal

BLE 1M_Channel 39



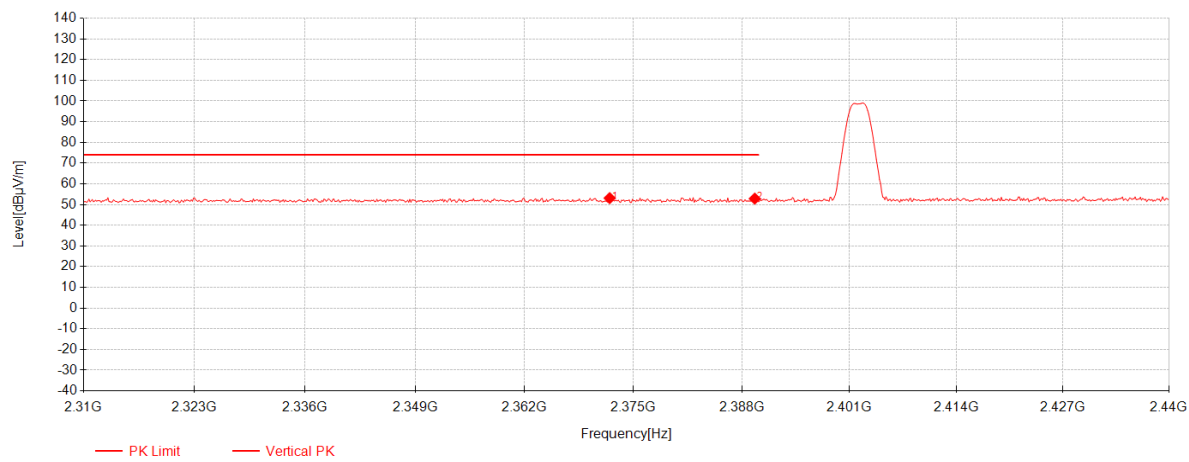
Data List								
NO.	Frequency [MHz]	Reading [dBμV]	AF [dB/m]	Factor [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Polarity
1	2484.64	37.17	27.37	-23.27	41.27	54.00	12.73	Vertical
2	2487.34	37.41	27.37	-23.27	41.51	54.00	12.49	Vertical

BLE 2M_Channel 00



Data List								
NO.	Frequency [MHz]	Reading [dBµV]	AF [dB/m]	Factor [dB]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Polarity
1	2373.83	49.22	27.12	-23.30	53.04	74.00	20.96	Horizontal
2	2388.39	48.76	27.15	-23.31	52.60	74.00	21.40	Horizontal

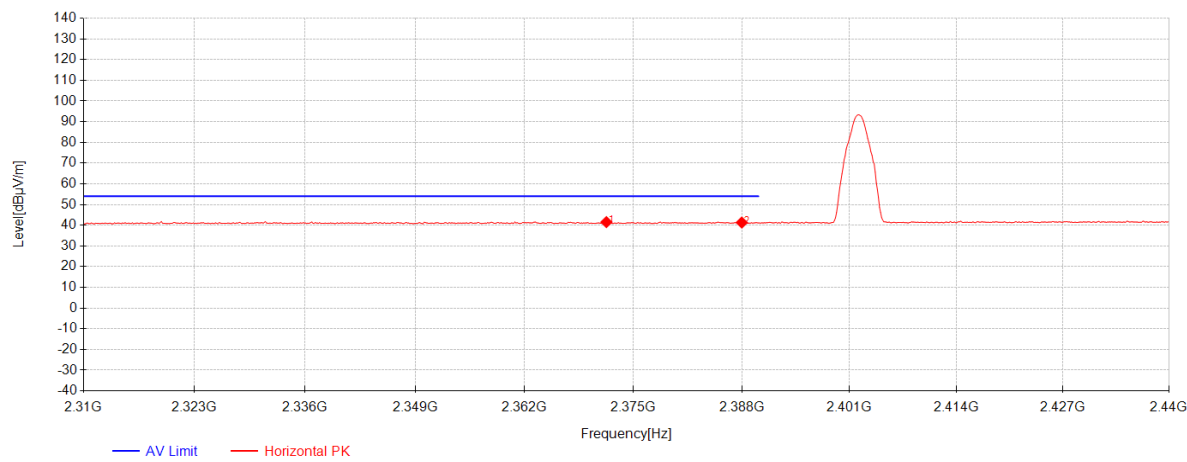
BLE 2M_Channel 00



Data List								
NO.	Frequency [MHz]	Reading [dBµV]	AF [dB/m]	Factor [dB]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Polarity
1	2372.14	49.29	27.12	-23.30	53.11	74.00	20.89	Vertical
2	2389.56	49.02	27.16	-23.31	52.86	74.00	21.14	Vertical

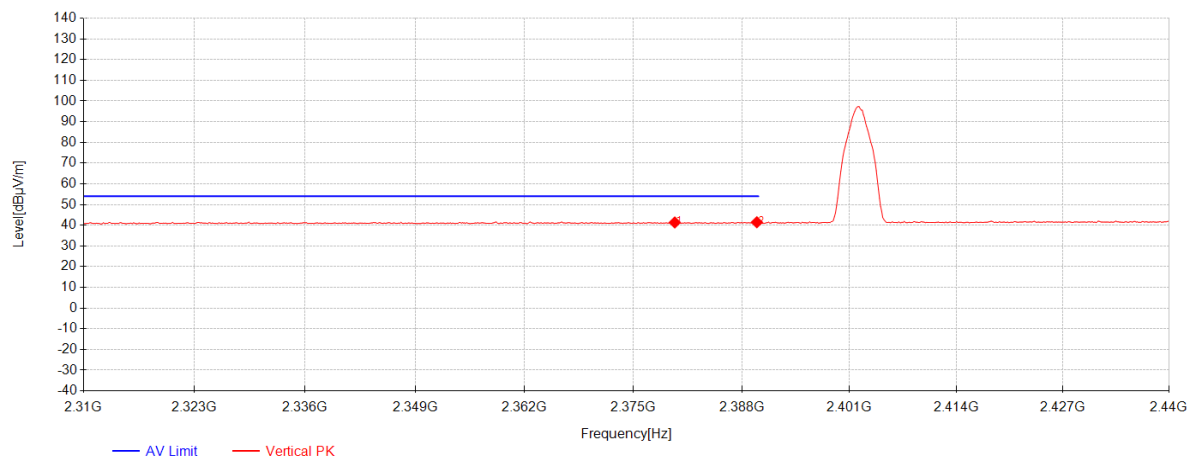


BLE 2M_Channel 00



Data List								
NO.	Frequency [MHz]	Reading [dBµV]	AF [dB/m]	Factor [dB]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Polarity
1	2371.75	37.71	27.12	-23.30	41.53	54.00	12.47	Horizontal
2	2388	37.47	27.15	-23.31	41.31	54.00	12.69	Horizontal

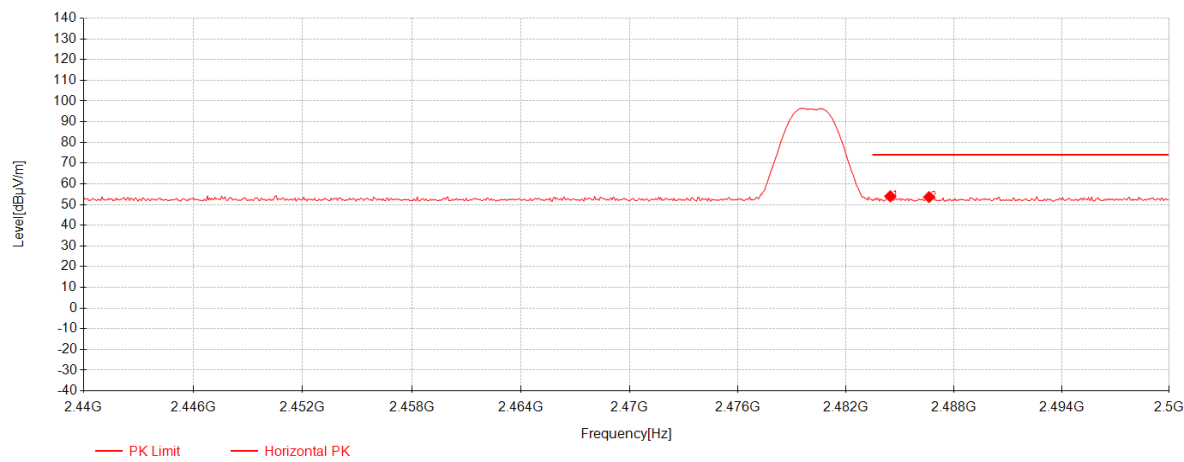
BLE 2M_Channel 00



Data List								
NO.	Frequency [MHz]	Reading [dBµV]	AF [dB/m]	Factor [dB]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Polarity
1	2379.94	37.51	27.14	-23.31	41.34	54.00	12.66	Vertical
2	2389.82	37.61	27.16	-23.31	41.45	54.00	12.55	Vertical



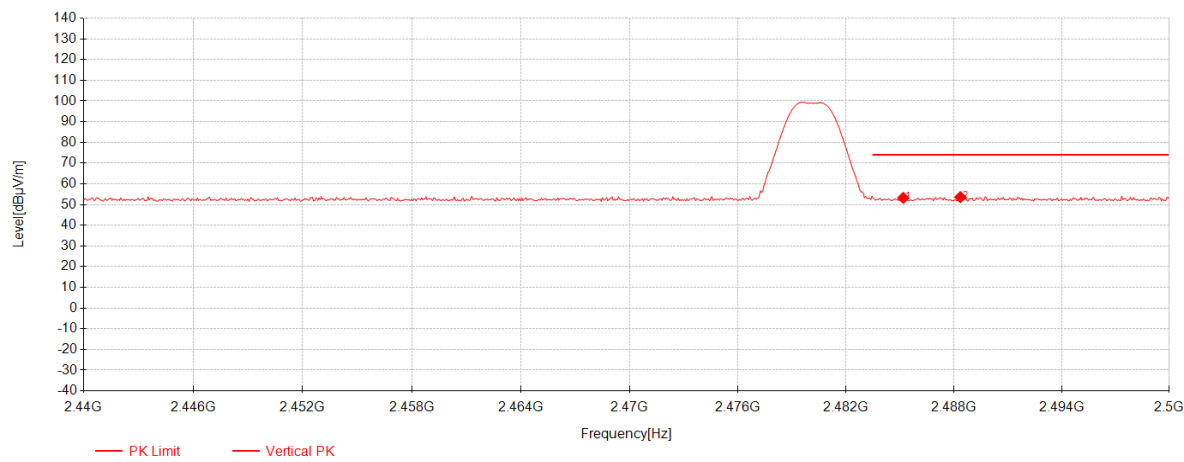
BLE 2M_Channel 39



Data List								
NO.	Frequency [MHz]	Reading [dBµV]	AF [dB/m]	Factor [dB]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Polarity
1	2484.46	49.89	27.37	-23.27	53.99	74.00	20.01	Horizontal
2	2486.62	49.53	27.37	-23.27	53.63	74.00	20.37	Horizontal



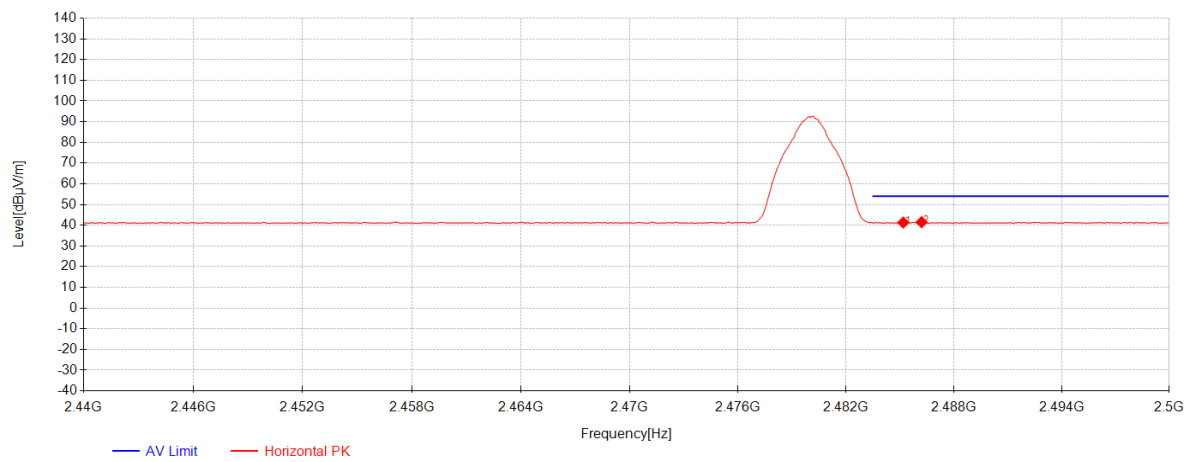
BLE 2M_Channel 39



Data List								
NO.	Frequency [MHz]	Reading [dBµV]	AF [dB/m]	Factor [dB]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Polarity
1	2485.18	49.13	27.37	-23.27	53.23	74.00	20.77	Vertical
2	2488.36	49.47	27.37	-23.27	53.58	74.00	20.42	Vertical



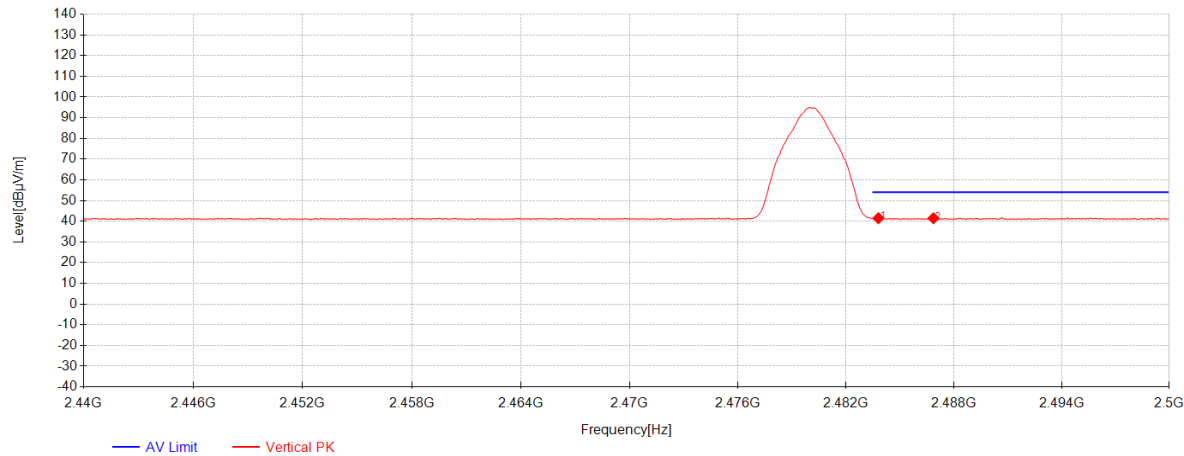
BLE 2M_Channel 39



Data List								
NO.	Frequency [MHz]	Reading [dBµV]	AF [dB/m]	Factor [dB]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Polarity
1	2485.18	37.21	27.37	-23.27	41.31	54.00	12.69	Horizontal
2	2486.2	37.41	27.37	-23.27	41.51	54.00	12.49	Horizontal



BLE 2M_Channel 39



Data List								
NO.	Frequency [MHz]	Reading [dBμV]	AF [dB/m]	Factor [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Polarity
1	2483.8	37.40	27.36	-23.27	41.49	54.00	12.51	Vertical
2	2486.86	37.34	27.37	-23.27	41.44	54.00	12.56	Vertical

7.3 Radiated Spurious Emissions Below 1GHz

Test Requirement 47 CFR Part 15, Subpart C 15.205 & 15.209

Test Method: ANSI C63.10 (2013) Section 6.4,6.5

Measurement Distance: 3m

Limit:

Frequency(MHz)	Field strength(microvolts/meter)	Measurement distance(meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
960-1000	500	3

7.3.1 E.U.T. Operation

Operating Environment:

Temperature: 20.5 °C

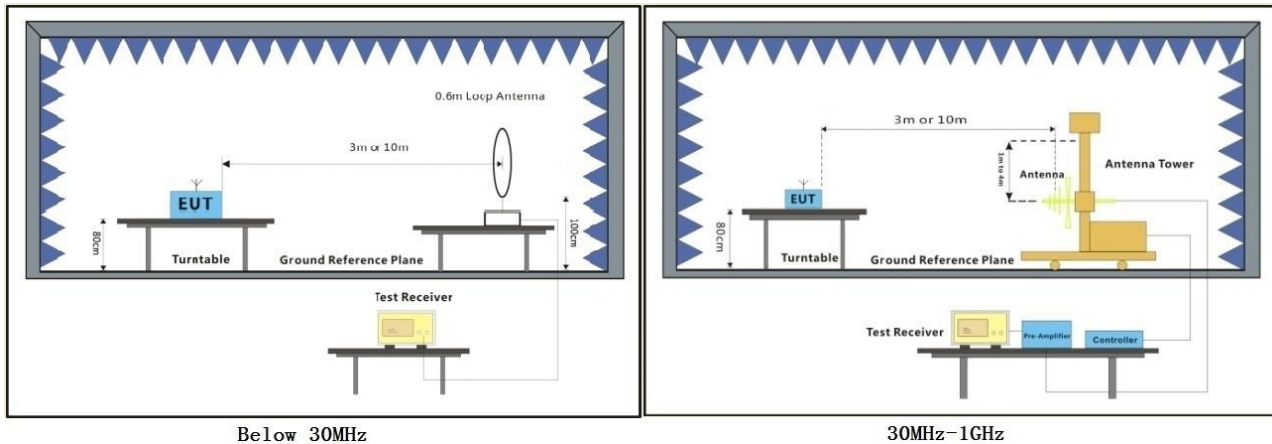
Humidity: 51.3 % RH

Atmospheric Pressure: 1010 mbar

7.3.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	08	TX mode(1Mbps)_Keep the EUT in continuously transmitting mode with GFSK modulation.

7.3.3 Test Setup Diagram



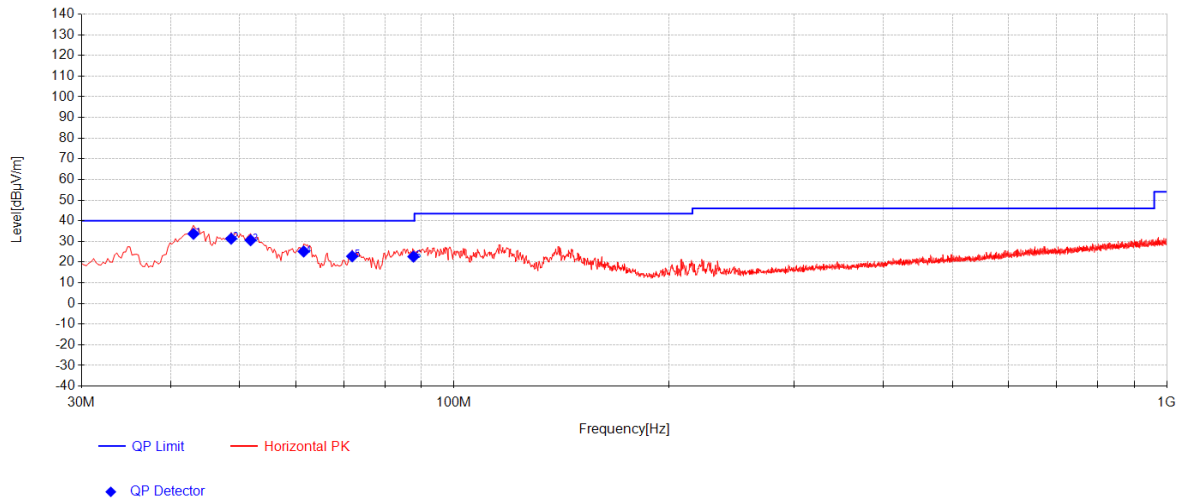
7.3.4 Measurement Procedure and Data

- For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- The EUT was set 3 or 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using quasi-peak method as specified and then reported in a data sheet.
- Test the EUT in the lowest channel, the middle channel, the Highest channel.
- The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.
- Repeat above procedures until all frequencies measured was complete.

Remark:

- Level= Read Level+ Cable Loss+ Antenna Factor- Preamp Factor
- Scan from 9kHz to 30MHz, the disturbance below 30MHz was very low. The points marked on above plots are the highest emissions could be found when testing, so only above points had been displayed. The amplitude of spurious emissions from the radiator which are attenuated more than 20dB below the limit need not be reported.

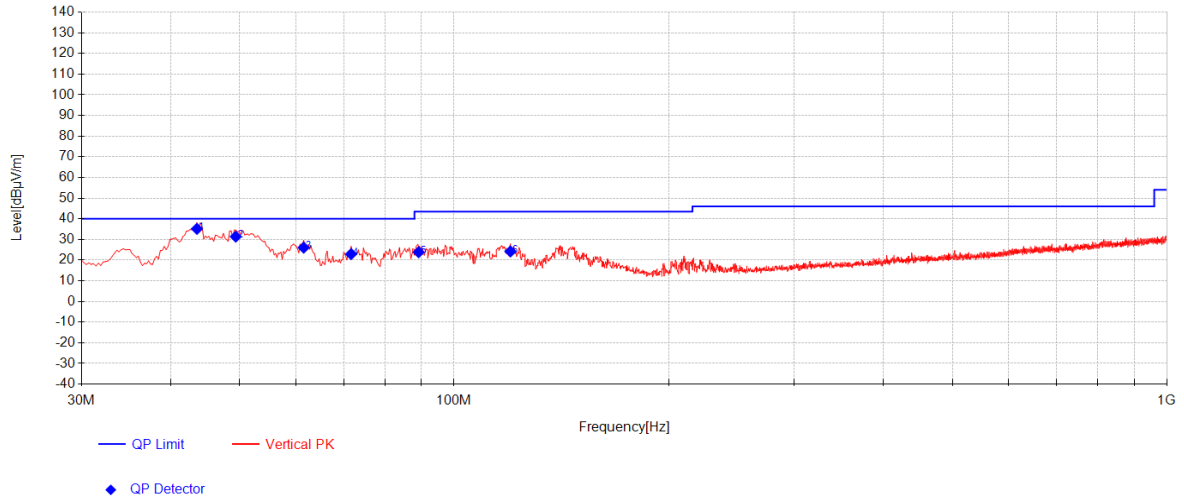
BLE 1M_Channel 39



Final Data List

NO.	Frequency [MHz]	Reading [dBμV]	Factor [dB]	AF [dB/m]	QP Value [dBμV/m]	QP Limit [dBμV/m]	QP Margin [dB]	Polarity
1	43.095	48.68	-33.81	18.80	33.67	40.00	6.33	Horizontal
2	48.6725	46.24	-33.71	18.80	31.33	40.00	8.67	Horizontal
3	51.825	45.85	-33.67	18.42	30.60	40.00	9.40	Horizontal
4	61.525	41.23	-33.53	17.45	25.14	40.00	14.86	Horizontal
5	71.9525	40.03	-33.40	16.20	22.82	40.00	17.18	Horizontal
6	87.715	41.36	-33.28	14.60	22.68	40.00	17.32	Horizontal

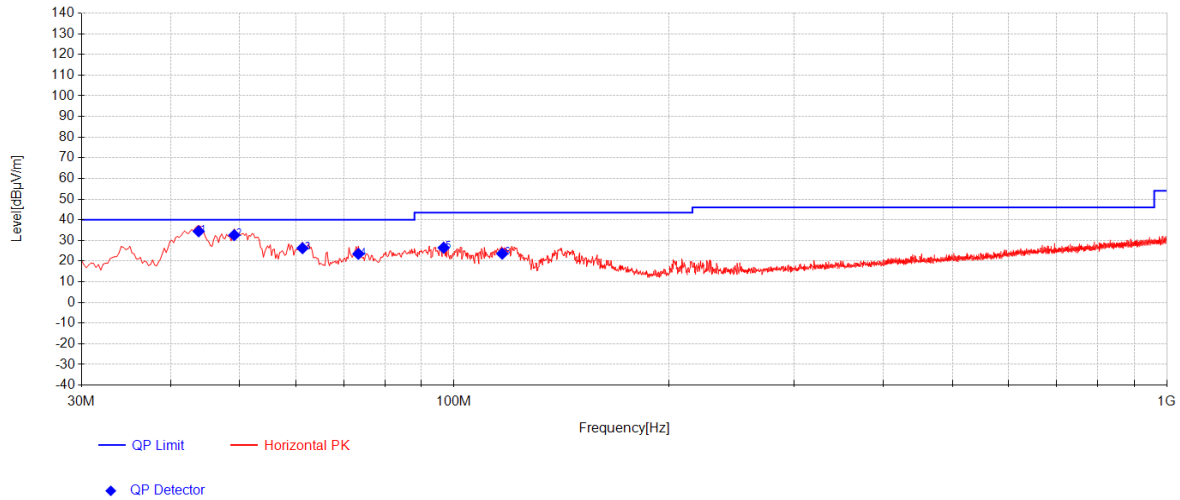
BLE 1M_Channel 39



Final Data List

NO.	Frequency [MHz]	Reading [dBμV]	Factor [dB]	AF [dB/m]	QP Value [dBμV/m]	QP Limit [dBμV/m]	QP Margin [dB]	Polarity
1	43.58	50.14	-33.80	18.80	35.14	40.00	4.86	Vertical
2	49.4	46.35	-33.70	18.72	31.37	40.00	8.63	Vertical
3	61.525	42.16	-33.53	17.45	26.07	40.00	13.93	Vertical
4	71.71	40.16	-33.41	16.17	22.92	40.00	17.08	Vertical
5	89.17	42.58	-33.27	14.53	23.85	43.50	19.65	Vertical
6	119.9675	40.32	-32.92	16.79	24.20	43.50	19.30	Vertical

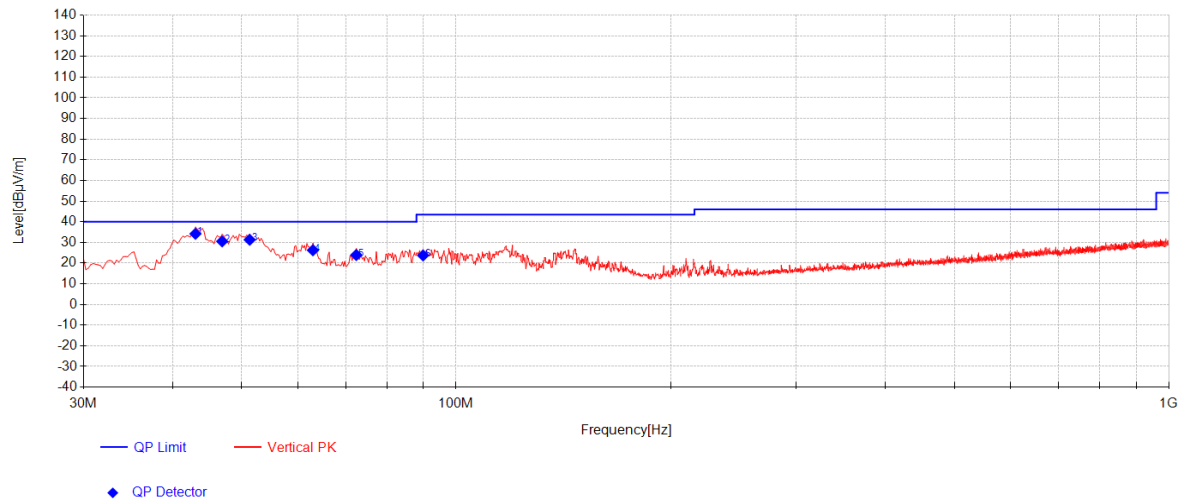
BLE 2M_Channel 39



Final Data List

NO.	Frequency [MHz]	Reading [dBμV]	Factor [dB]	AF [dB/m]	QP Value [dBμV/m]	QP Limit [dBμV/m]	QP Margin [dB]	Polarity
1	43.8225	49.42	-33.80	18.80	34.42	40.00	5.58	Horizontal
2	49.1575	47.52	-33.70	18.77	32.58	40.00	7.42	Horizontal
3	61.2825	42.32	-33.54	17.47	26.25	40.00	13.75	Horizontal
4	73.4075	41.05	-33.39	15.86	23.52	40.00	16.48	Horizontal
5	96.6875	45.36	-33.17	14.27	26.46	43.50	17.04	Horizontal
6	116.815	40.24	-32.94	16.30	23.60	43.50	19.90	Horizontal

BLE 2M_Channel 39



Final Data List

NO.	Frequency [MHz]	Reading [dBµV]	Factor [dB]	AF [dB/m]	QP Value [dBµV/m]	QP Limit [dBµV/m]	QP Margin [dB]	Polarity
1	43.095	49.21	-33.81	18.80	34.20	40.00	5.80	Vertical
2	46.975	45.36	-33.74	18.91	30.52	40.00	9.48	Vertical
3	51.34	46.52	-33.67	18.47	31.31	40.00	8.69	Vertical
4	62.98	42.16	-33.51	17.60	26.24	40.00	13.76	Vertical
5	72.4375	41.26	-33.40	16.07	23.93	40.00	16.07	Vertical
6	89.8975	42.32	-33.26	14.68	23.74	43.50	19.76	Vertical

7.4 Radiated Spurious Emissions Above 1GHz

Test Requirement 47 CFR Part 15, Subpart C 15.205 & 15.209

Test Method: ANSI C63.10 (2013) Section 6.6

Measurement Distance: 3m

Limit:

Frequency(MHz)	Field strength(microvolts/meter)	Measurement distance(meters)
Above 1000	500	3

7.4.1 E.U.T. Operation

Operating Environment:

Temperature: 20.5 °C

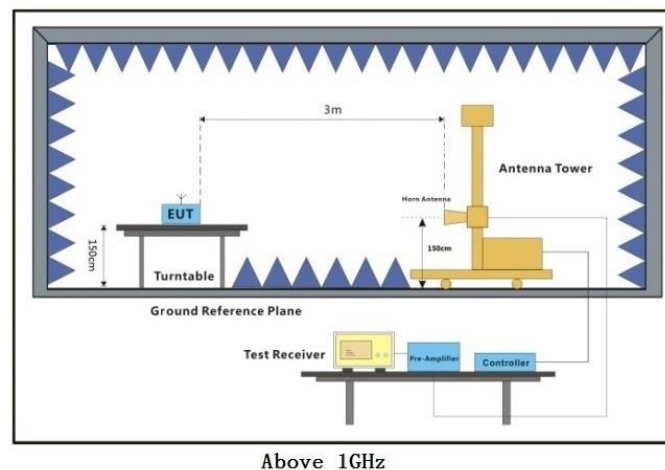
Humidity: 51.3 % RH

Atmospheric Pressure: 1010 mbar

7.4.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	08	TX mode(1Mbps)_Keep the EUT in continuously transmitting mode with GFSK modulation.
Final test	09	TX mode(2Mbps)_Keep the EUT in continuously transmitting mode with GFSK modulation.
Final test	10	TX mode(125kbps)_Keep the EUT in continuously transmitting mode with GFSK modulation.
Final test	11	TX mode(500kbps)_Keep the EUT in continuously transmitting mode with GFSK modulation.

7.4.3 Test Setup Diagram



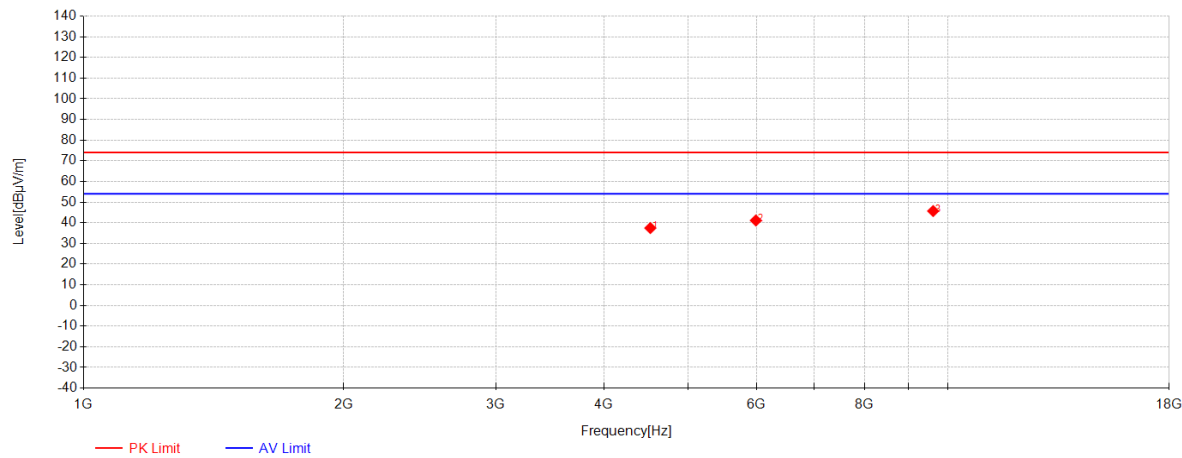
7.4.4 Measurement Procedure and Data

- a. For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter fully-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- f. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak or average method as specified and then reported in a data sheet.
- g. Test the EUT in the lowest channel, the middle channel, the Highest channel.
- h. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.
- i. Repeat above procedures until all frequencies measured was complete.

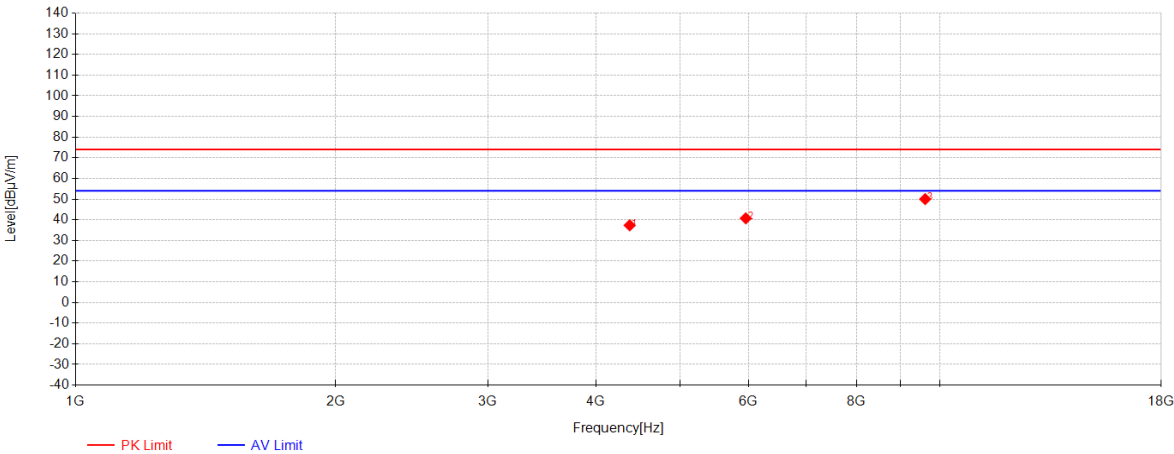
Remark:

1. $\text{Level} = \text{Read Level} + \text{Cable Loss} + \text{Antenna Factor} - \text{Preamp Factor}$
2. Scan from 1GHz to 25GHz, the disturbance above 18GHz was very low. The points marked on above plots are the highest emissions could be found when testing, so only above points had been displayed. The amplitude of spurious emissions from the radiator which are attenuated more than 20dB below the limit need not be reported.
3. As shown in this section, for frequencies above 1GHz, the field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. For the emissions whose peak level is lower than the average limit, only the peak measurement is shown in the report.

BLE 1M_Channel 00

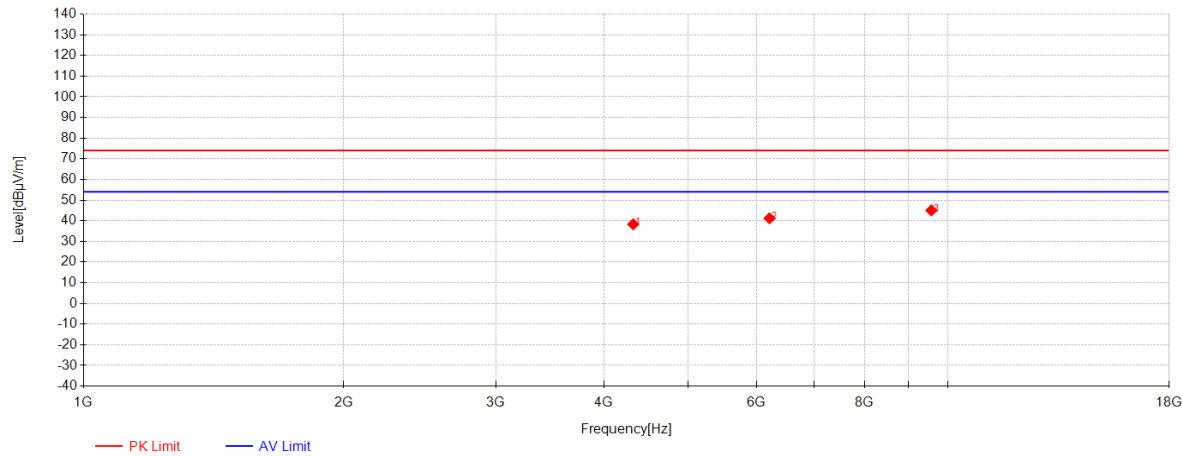


Data List								
NO.	Frequency [MHz]	Reading [dBµV]	AF [dB/m]	Factor [dB]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Polarity
1	4525.125	47.24	32.16	-41.93	37.46	74.00	36.54	Horizontal
2	5993.25	46.63	34.78	-40.27	41.13	74.00	32.87	Horizontal
3	9608.25	41.36	37.78	-33.45	45.69	74.00	28.31	Horizontal

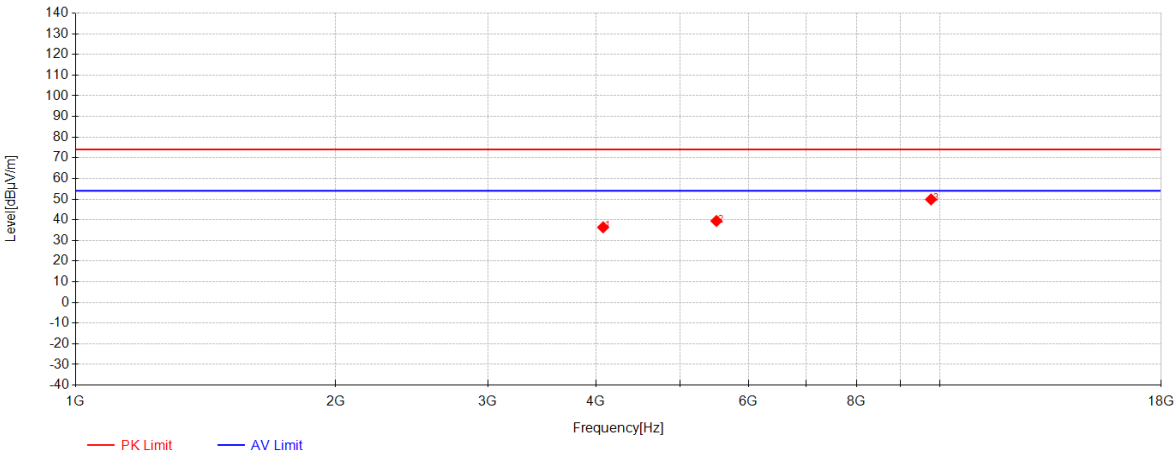


Data List								
NO.	Frequency [MHz]	Reading [dBμV]	AF [dB/m]	Factor [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Polarity
1	4375.125	47.56	31.90	-42.12	37.34	74.00	36.66	Vertical
2	5959.875	46.29	34.66	-40.24	40.71	74.00	33.29	Vertical
3	9608.25	45.68	37.78	-33.45	50.01	74.00	23.99	Vertical

BLE 1M_Channel 19

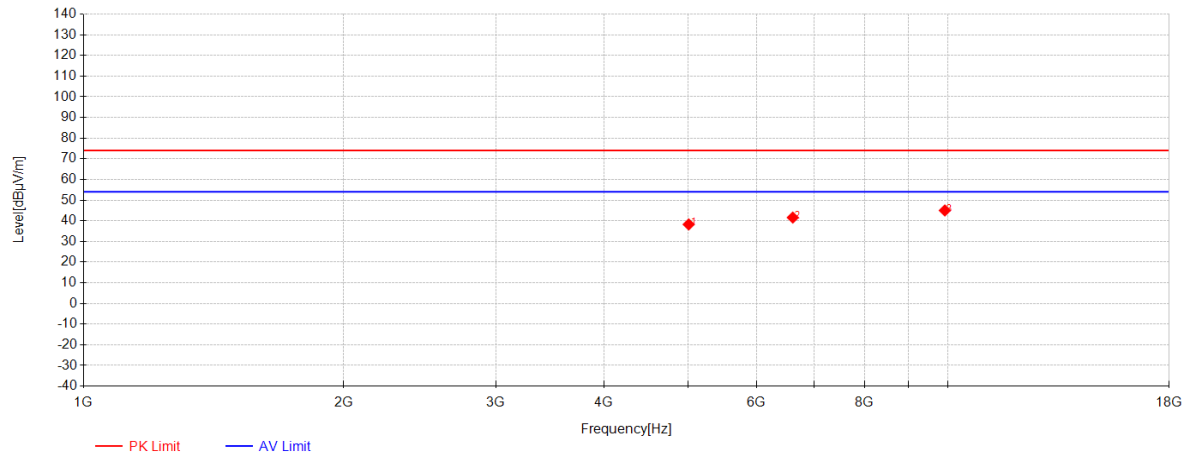


Data List								
NO.	Frequency [MHz]	Reading [dBµV]	AF [dB/m]	Factor [dB]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Polarity
1	4323.375	48.55	31.82	-42.06	38.31	74.00	35.69	Horizontal
2	6215.25	45.56	35.23	-39.59	41.20	74.00	32.80	Horizontal
3	9562.5	40.91	37.77	-33.64	45.04	74.00	28.96	Horizontal

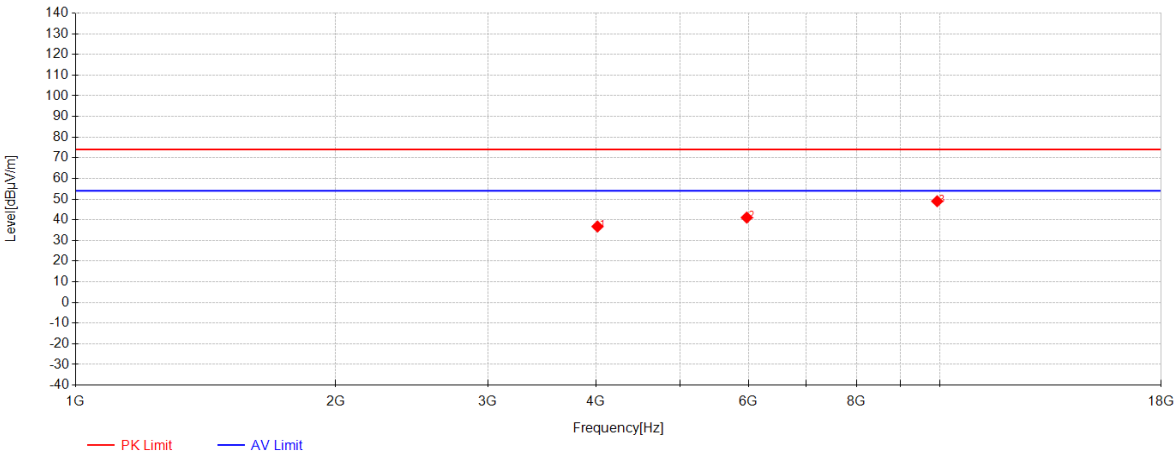


Data List								
NO.	Frequency [MHz]	Reading [dBμV]	AF [dB/m]	Factor [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Polarity
1	4076.625	47.44	31.42	-42.50	36.36	74.00	37.64	Vertical
2	5512.125	46.89	33.14	-40.62	39.41	74.00	34.59	Vertical
3	9760.5	45.09	37.83	-33.07	49.85	74.00	24.15	Vertical

BLE 1M_Channel 39



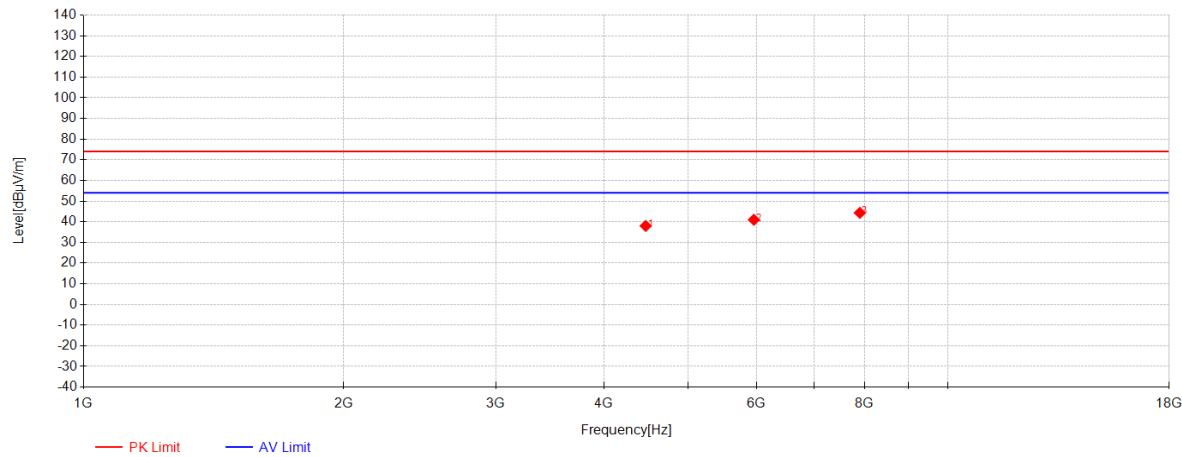
Data List								
NO.	Frequency [MHz]	Reading [dBµV]	AF [dB/m]	Factor [dB]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Polarity
1	5011.875	46.51	33.20	-41.45	38.26	74.00	35.74	Horizontal
2	6612	44.68	35.84	-38.96	41.56	74.00	32.44	Horizontal
3	9911.625	39.69	37.87	-32.56	45.00	74.00	29.00	Horizontal



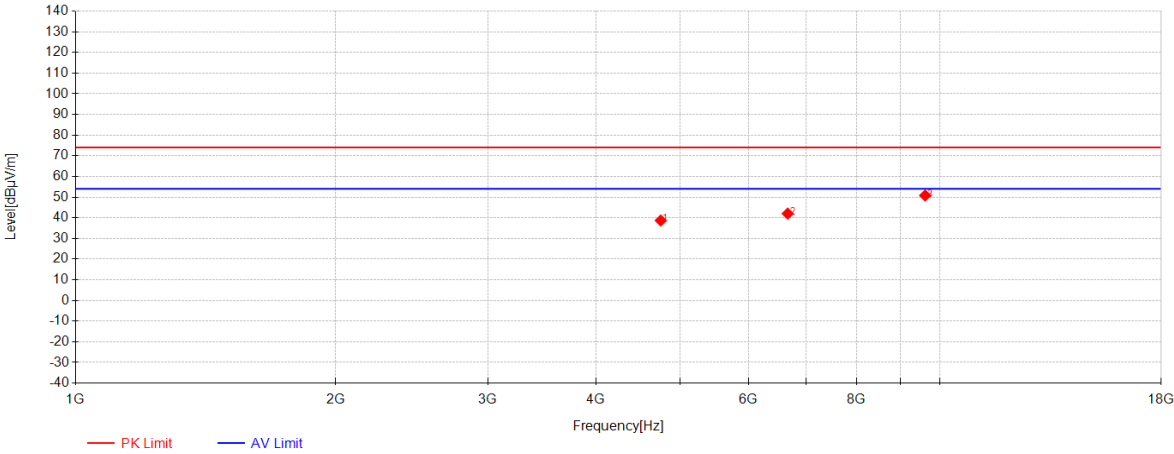
Data List								
NO.	Frequency [MHz]	Reading [dBμV]	AF [dB/m]	Factor [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Polarity
1	4015.875	48.11	31.33	-42.70	36.74	74.00	37.26	Vertical
2	5975.25	46.61	34.72	-40.26	41.07	74.00	32.93	Vertical
3	9920.625	43.66	37.88	-32.54	48.99	74.00	25.01	Vertical



BLE 2M_Channel 00

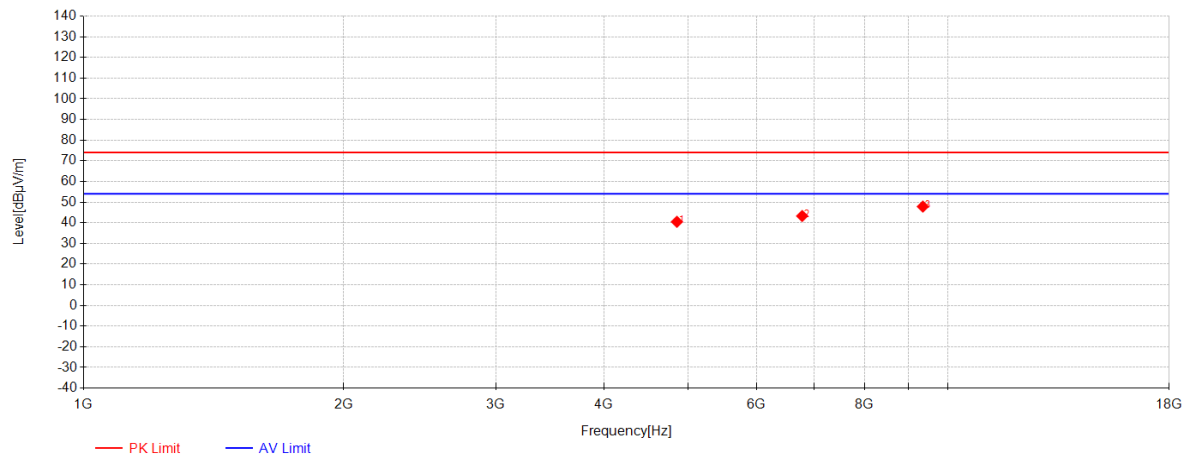


Data List								
NO.	Frequency [MHz]	Reading [dBµV]	AF [dB/m]	Factor [dB]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Polarity
1	4468.875	48.02	32.05	-42.07	38.00	74.00	36.00	Horizontal
2	5960.625	46.55	34.67	-40.24	40.98	74.00	33.02	Horizontal
3	7904.25	43.99	37.00	-36.65	44.34	74.00	29.66	Horizontal

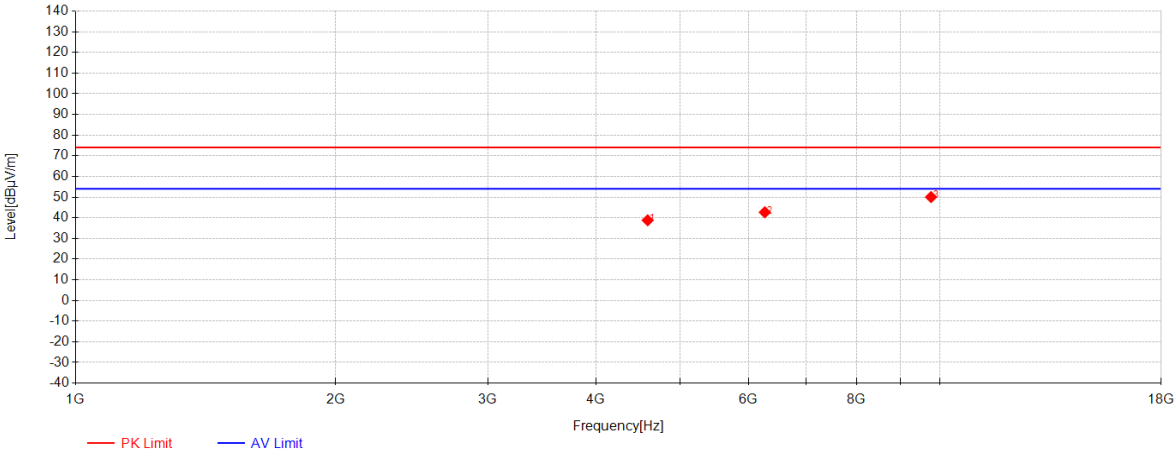


Data List								
NO.	Frequency [MHz]	Reading [dBµV]	AF [dB/m]	Factor [dB]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Polarity
1	4752.75	47.56	32.66	-41.50	38.71	74.00	35.29	Vertical
2	6663.75	45.01	35.87	-38.85	42.03	74.00	31.97	Vertical
3	9608.25	46.46	37.78	-33.45	50.79	74.00	23.21	Vertical

BLE 2M_Channel 19

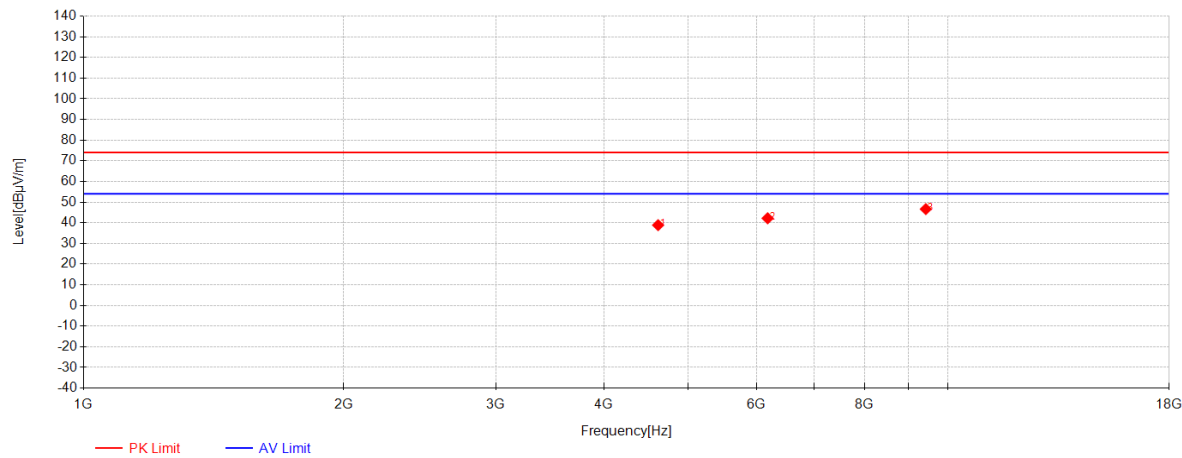


Data List								
NO.	Frequency [MHz]	Reading [dBµV]	AF [dB/m]	Factor [dB]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Polarity
1	4857	48.93	32.89	-41.33	40.49	74.00	33.51	Horizontal
2	6779.625	45.91	35.91	-38.52	43.30	74.00	30.70	Horizontal
3	9348.375	44.11	37.70	-33.96	47.85	74.00	26.15	Horizontal

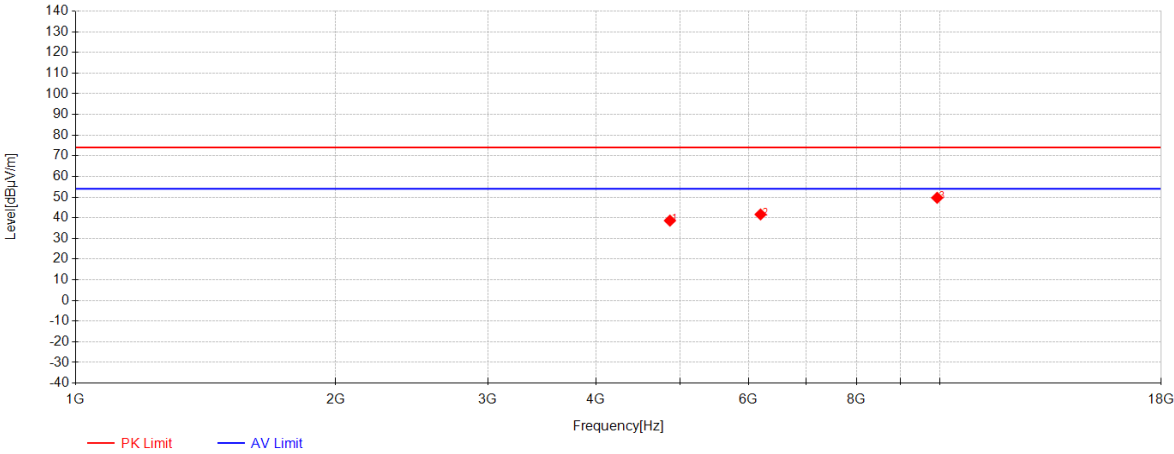


Data List								
NO.	Frequency [MHz]	Reading [dBμV]	AF [dB/m]	Factor [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Polarity
1	4589.625	48.16	32.30	-41.65	38.80	74.00	35.20	Vertical
2	6269.625	46.90	35.34	-39.57	42.67	74.00	31.33	Vertical
3	9760.125	45.28	37.83	-33.07	50.04	74.00	23.96	Vertical

BLE 2M_Channel 39



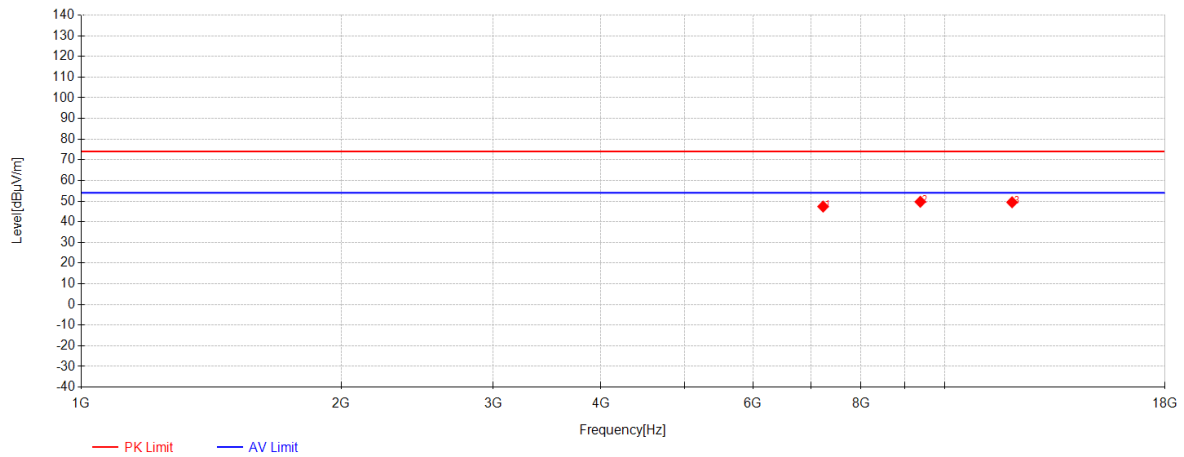
Data List								
NO.	Frequency [MHz]	Reading [dBμV]	AF [dB/m]	Factor [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Polarity
1	4619.625	48.08	32.36	-41.59	38.85	74.00	35.15	Horizontal
2	6183.75	46.67	35.17	-39.65	42.19	74.00	31.81	Horizontal
3	9422.625	42.68	37.73	-33.78	46.63	74.00	27.37	Horizontal



Data List								
NO.	Frequency [MHz]	Reading [dBμV]	AF [dB/m]	Factor [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Polarity
1	4870.125	47.02	32.91	-41.29	38.64	74.00	35.36	Vertical
2	6198.75	46.04	35.20	-39.60	41.63	74.00	32.37	Vertical
3	9920.625	44.34	37.88	-32.54	49.67	74.00	24.33	Vertical

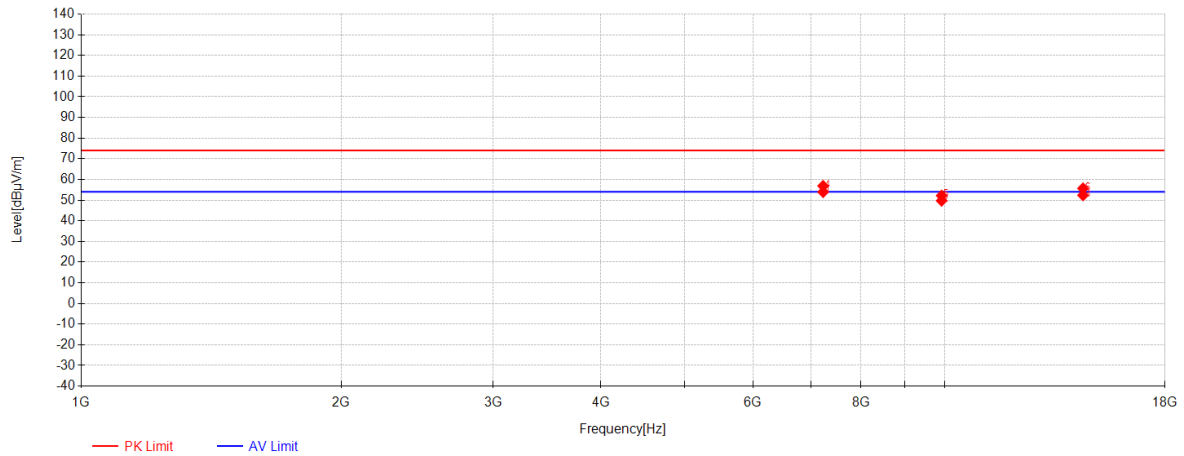
8 Co-location*

802.BLE 1M CH39+GFSK CH78+LTE B48



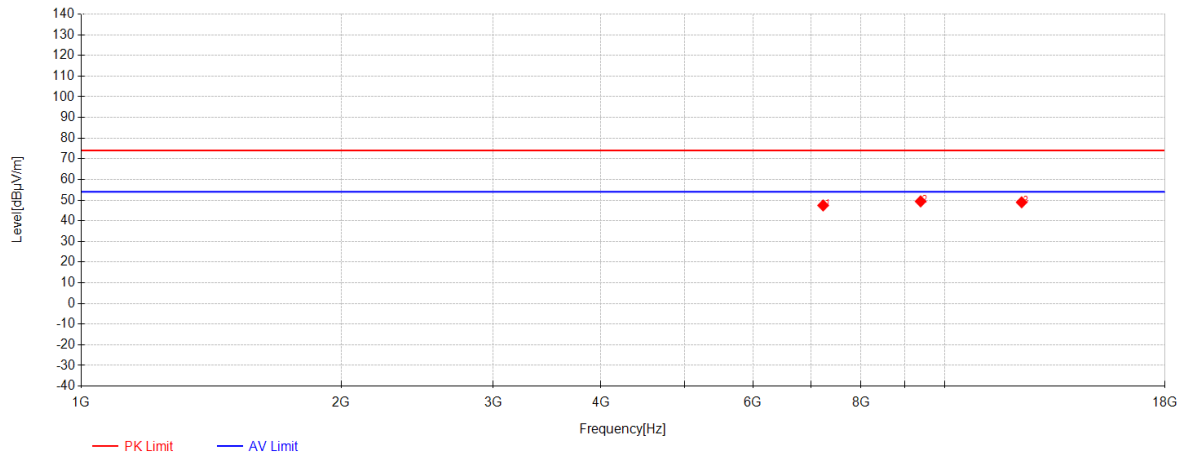
Data List								
NO.	Frequency [MHz]	Reading [dBμV]	AF [dB/m]	Factor [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Polarity
1	7232.0625	53.45	36.28	-42.35	47.37	74.00	26.63	Horizontal
2	9372.4875	50.77	37.71	-38.80	49.68	74.00	24.32	Horizontal
3	11970.9	46.70	38.40	-35.66	49.44	74.00	24.56	Horizontal

802.BLE 1M CH39+GFSK CH78+LTE B48



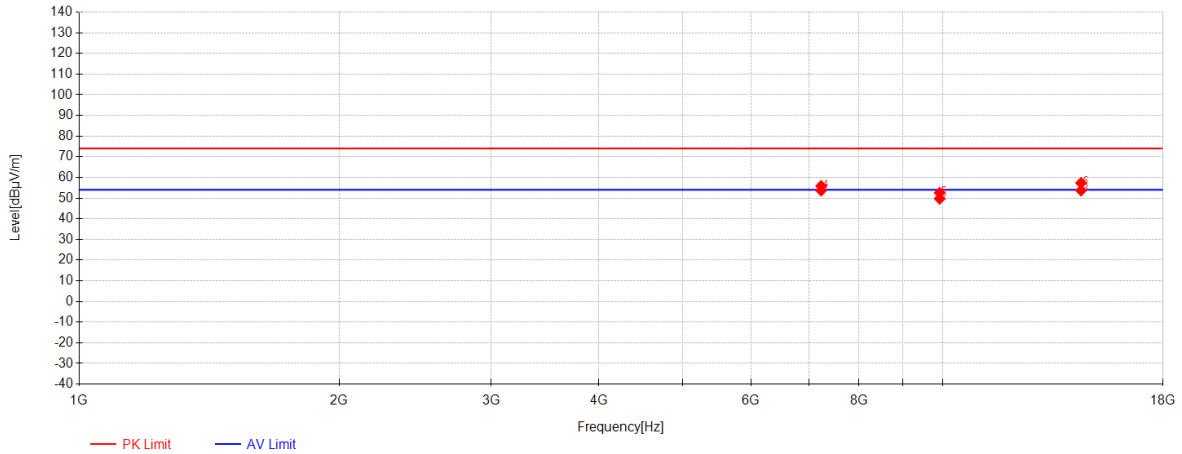
Data List								
NO.	Frequency [MHz]	Reading [dBμV]	AF [dB/m]	Factor [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Polarity
1	7232.4	60.01	36.28	-42.35	53.94	54.00	0.06	Vertical
2	9920.25	49.73	37.88	-37.87	49.74	54.00	4.26	Vertical
3	14464.6875	47.08	40.21	-34.91	52.37	54.00	1.63	Vertical
4	7232.0625	62.96	36.28	-42.35	56.88	74.00	17.12	Vertical
5	9920.25	52.16	37.88	-37.87	52.17	74.00	21.83	Vertical
6	14464.0125	50.37	40.21	-34.91	55.67	74.00	18.33	Vertical

802.2.4GWIFI 11n20 CH01+BLE CH39+LTE B48



Data List								
NO.	Frequency [MHz]	Reading [dBμV]	AF [dB/m]	Factor [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Polarity
1	7232.4	53.50	36.28	-42.35	47.43	74.00	26.57	Horizontal
2	9380.5875	50.42	37.71	-38.73	49.40	74.00	24.60	Horizontal
3	12279.375	45.13	38.74	-34.91	48.96	74.00	25.04	Horizontal

802.2.4GWIFI 11n20 CH01+BLE CH39+LTE B48



Data List								
NO.	Frequency [MHz]	Reading [dBμV]	AF [dB/m]	Factor [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Polarity
1	7232.4	59.77	36.28	-42.35	53.70	54.00	0.30	Vertical
2	9920.25	49.72	37.88	-37.87	49.73	54.00	4.27	Vertical
3	14464.6875	48.42	40.21	-34.91	53.71	54.00	0.29	Vertical
4	7232.0625	61.96	36.28	-42.35	55.88	74.00	18.12	Vertical
5	9919.9125	52.55	37.88	-37.87	52.56	74.00	21.44	Vertical
6	14464.35	52.04	40.21	-34.91	57.33	74.00	16.67	Vertical

Note: * AF68E is a Wi-Fi & Bluetooth Module that only supports Wi-Fi and Bluetooth functions, and needs to be tested with a PCBA board. This PCBA board integrates a WWAN module AG555Q-GL. In this Co-location test, both AF68E and AG555Q-GL have been included in the scope of evaluation and testing.



Report No.: KSCR250900199101

Page: 56 of 56

9 Test Setup Photo

Refer to Appendix - Test Setup Photo for KSCR2509001991AT

10 EUT Constructional Details (EUT Photos)

Refer to Appendix - Photographs of EUT Constructional Details for KSCR2509001991AT

- End of the Report -