

EMC

TEST REPORT

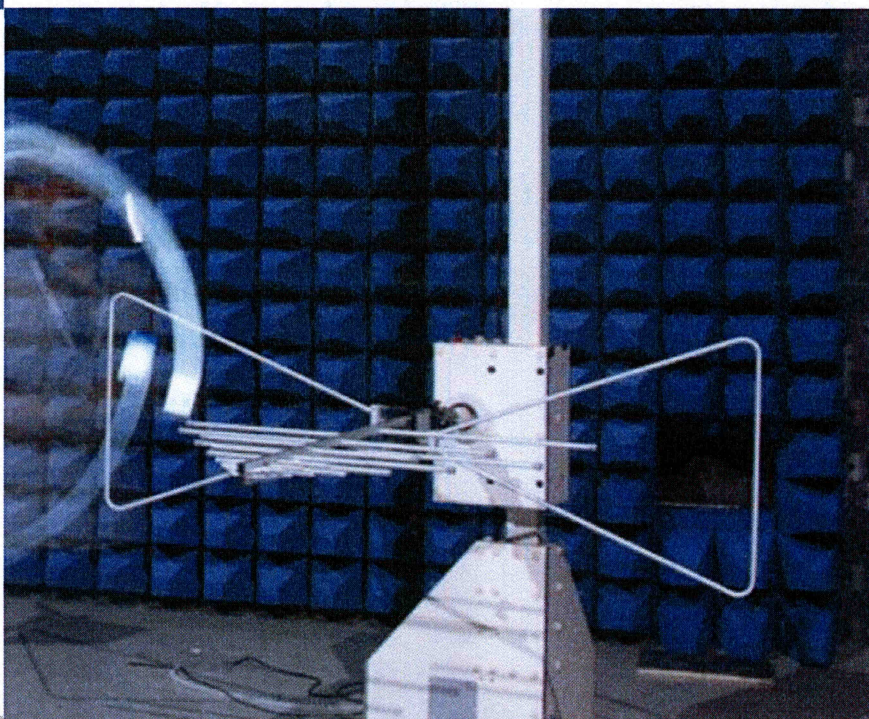
ISSUED BY
Shenzhen BALUN Technology Co., Ltd.



FOR
Communication board

ISSUED TO
TT Electronics Sweden AB

Gullfossgratan 3, 164 40 Kista, Sweden



Tested by: Xiong Chong
Xiong Chong

Date Jun-21, 2021

Approved by: Wei Yanquan
Wei Yanquan
(Chief Engineer)

Date Jun-21, 2021

Report No.: BL-SZ2140098-402
EUT Name: Communication board
Model Name: S-2CONNECT Creo SOM
Brand Name: TT Electronics Sweden AB
Test Standard: 47 CFR Part 2
RSS-Gen Issue 5
(Others refer to chapter 3.1)
FCC ID: 2AZF4-S19Y01
ISED Number: 27105-S19Y01
Test Conclusion: Pass
Test Date: Apr. 19, 2021 ~ Jun. 02, 2021
Date of Issue: Jun. 21, 2021

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Revision History

Version	Issue Date	Revisions Content
<u>Rev. 01</u>	<u>Jun. 08, 2021</u>	<u>Initial Issue</u>
<u>Rev. 02</u>	<u>Jun. 21, 2021</u>	<u>Add the FCC ID and ISED Number on the home page</u>

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1 ADMINISTRATIVE DATA (GENERAL INFORMATION)

1.1 Identification of the Testing Laboratory

Company Name	Shenzhen BALUN Technology Co., Ltd.
Address	Block B, 1st FL, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China.
Phone Number	+86 755 6685 0100

1.2 Identification of the Responsible Testing Location

Test Location	Shenzhen BALUN Technology Co., Ltd.
Address	Block B, 1st FL, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China.
Accreditation Certificate	The laboratory has been listed by Industry Canada to perform electromagnetic emission measurements. The recognition numbers of test site are 11524A-1. The laboratory is a testing organization accredited by FCC as a accredited testing laboratory. The designation number is CN1196.
Description	All measurement facilities used to collect the measurement data are located at Block B, FL 1, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China 518055

1.3 Laboratory Condition

Ambient Temperature	20 °C to 25 °C
Ambient Relative Humidity	45 % to 55 %
Ambient Pressure	100 kPa to 102 kPa

1.4 Announce

- (1) The test report reference to the report template version V1.1.
- (2) The test report is invalid if not marked with the signatures of the persons responsible for preparing and approving the test report.
- (3) The test report is invalid if there is any evidence and/or falsification.
- (4) The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein.
- (5) This document may not be altered or revised in any way unless done so by BALUN and all revisions are duly noted in the revisions section.
- (6) Content of the test report, in part or in full, cannot be used for publicity and/or promotional purposes without prior written approval from the laboratory.
- (7) The laboratory is only responsible for the data released by the laboratory, except for the part provided by the applicant.

2 PRODUCT INFORMATION

2.1 Applicant Information

Applicant	TT Electronics Sweden AB
Address	Gullfossgatan 3, 164 40 Kista, Sweden

2.2 Manufacturer Information

Manufacturer	TT Electronics Sweden AB
Address	Gullfossgatan 3, 164 40 Kista, Sweden

2.3 Factory Information

Factory	N/A
Address	N/A

2.4 General Description for Equipment under Test (EUT)

EUT Name	Communication board
Model Name Under Test	S-2CONNECT Creo SOM
Series Model Name	N/A
Description of Model name differentiation	N/A
Hardware Version	S19Y01-SOM004
Software Version	0.1.0.certification
Dimensions (Approx.)	N/A
Weight (Approx.)	N/A

2.5 Ancillary Equipment

Ancillary Equipment 1	2/4G Antenna
Ancillary Equipment 2	GPS Antenna

2.6 Technical Information

Note: The information provided by the applicant.

All Network and Wireless connectivity for EUT	2G Network GPRS/EGPRS 850/ 1900 MHz 4G Network FDD LTE-M1 Band 2/4/5/12/13/25/26/66/85 FDD NB-IoT Band 2/4/5/12/13/25/66/85 Bluetooth (BLE) GPS, GLONASS, BDS, Galileo
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The requirement for the following technical information of the EUT was tested in this report:

Operating Bands	GPRS/EGPRS 850/1900 MHz FDD LTE CAT M1 Band 4/12/13 FDD LTE NB IOT Band 66/85
Multislot Class	GPRS/EGPRS: 33
Antenna Type	New (Pulse) Antenna

Modulation Technology	DTS
Modulation Type	GFSK
Product Type	☒ Mobile ☐ Portable ☐ Fix Location
Transfer Rate	1 Mbps
Frequency Range	The frequency range used is 2400 MHz to 2483.5 MHz.
Number of Channel	40 (at intervals of 2 MHz)
Tested Channel	0 (2402 MHz)
Antenna Type	Ceramic Antenna
Antenna Gain	1.8 dBi (In test items related to antenna gain, the final results reflect this figure. This value is provided by the applicant.)
Antenna Impedance	50Ω
Antenna System (MIMO Smart Antenna)	N/A

According to client's requirement, only follow configurations be tested.

Configurations	GSM 850 + BLE, GSM 1900 MHz + BLE, LTE CAT M1 Band 4 + BLE, LTE CAT M1 Band 12+ BLE, LTE CAT M1 Band 12 + BLE, LTE CAT M1 Band 13 + BLE, LTE NB IOT Band 66 + BLE, LTE NB IOT Band 85 + BLE
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Note 1: The EUT information are declared by manufacturer. For more detailed features description, please refer to the manufacturer's specifications or user's manual.

3 SUMMARY OF TEST RESULTS

3.1 Test Standards

No.	Identity	Document Title
1	47 CFR Part 2	Frequency Allocations and Radio Treaty Matters; General Rules and Regulations
2	47 CFR Part 22 Subpart H	Cellular Radiotelephone Service
3	47 CFR Part 24 Subpart E	Broadband PCS
4	47 CFR Part 27	Miscellaneous Wireless Communications Services
5	47 CFR Part 90 Subpart S	Regulations Governing Licensing and Use of Frequencies in the 806-824, 851-869, 896-901, and 935-940 MHz Bands
6	47 CFR Part 90 Subpart R	Regulations Governing Licensing and Use of Frequencies in the 758-775 and 788-805 MHz Bands
7	47 CFR Part 15, Subpart C	Miscellaneous Wireless Communications Services
8	RSS-Gen Issue5	General Requirements and Information for the Certification of Radio Apparatus
9	RSS-130 Issue2	Equipment Operating in the Frequency Bands 617-652 MHz, 663-698 MHz, 698-756 MHz and 777-787 MHz
10	RSS-132 Issue3	Cellular Telephone Systems Operating in the Bands 824-849 MHz and 869-894 MHz
11	RSS-133 Issue6	2 GHz Personal Communications Services
12	RSS-139 Issue3	Advanced Wireless Services (AWS) Equipment Operating in the Bands 1710-1780 MHz and 2110-2180 MHz
13	RSS-199 Issue3 (December 2016)	Broadband Radio Service (BRS) Equipment Operating in the Band 2500-2690 MHz
14	RSS-140 Issue1	Equipment Operating in the Public Safety Broadband Frequency Bands 758-768 MHz and 788-798 MHz
15	RSS-247 (Issue 2, February 2017)	Digital Transmission Systems (DTSS), Frequency Hopping Systems(FHSS) and Licence-Exemp Local Area Network (LE-LAN) Devices
16	ANSI/TIA-603-E-2016	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards
17	ANSI C63.10-2013	American National Standard for Testing Unlicensed Wireless Devices
18	KDB 971168 D01 v03	Measurement Guidance for Certification of Licensed Digital Transmitters
19	KDB 558074 D01 15.247 Meas Guidance v05r02	Guidance for compliance measurements on digital transmission system, frequency hopping spread spectrum system, and hybrid system devices operating under section 15.247 of the FCC rules

3.2 Test Verdict

No.	Description	FCC Part No.	ISED Part No.	Test Result	Verdict
1	Radiated Spurious Emission	2.1053	RSS-Gen 6.13	ANNEX A.1	Pass
		22.917	RSS-130 4.7		
		24.238	RSS-132 5.5		
		27.53	RSS-133 6.5		
		90.691	RSS-139 6.6		
		90.543	RSS-199 4.5		
		15.209	RSS-140 4.4		
		15.247(d)	RSS-247 5.5		
Note 1: This report only evaluates and reflects the Radiated spurious emission requirements of Multi-radio equipment, and other requirements can be found in other assessment reports.					

3.3 Test Uncertainty

The following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

Measurement	Value
Radiated spurious emissions	4.55 dB

4 GENERAL TEST CONFIGURATIONS

4.1 Test Environments

Environment Parameter	Selected Values During Tests			
	Temperature	Voltage	Relative Humidity	Ambient Pressure
Normal Temperature, Normal Voltage (NTNV)	23°C to 25°C	DC 18 V	50% to 55%	100 kPa to 102 kPa

4.2 Test Equipment List

Radiated suprious Emission Test						
Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due	Use
Test Antenna-Bi-Log	Schwarzbeck	VULB 9163	9163-624	2019.07.02	2021.07.01	☒
Test Antenna-Horn	Schwarzbeck	BBHA 9120D	9120D-1148	2019.07.02	2021.07.01	☒
Test Antenna-Horn (18-40 GHz)	A-INFO	LB-180400KF	J211060273	2021.01.05	2023.01.04	☒
Anechoic Chamber	YIHENG	9m*6m*6m	#3	2018.07.18	2021.07.17	☒
EMI Receiver	KEYSIGHT	N9038A	MY53220118	2020.09.18	2021.09.17	☒
Spectrum Analyzer	ROHDE&SCHWARZ	FSV-40	101544	2021.04.01	2022.03.31	☒
Wideband Radio Communication Tester	R&S	CMW 500	127794	2020.06.08	2021.06.07	☒
CMW500	R&S	CMW500	138884	2020.06.08	2021.06.07	☒

4.3 Test Enclosure list

Description	Manufacturer	Model	Serial No.	Length	Description	Use
Adapter	N/A	N/A	N/A	N/A	N/A	☒
Placode	N/A	N/A	N/A	N/A	N/A	☒

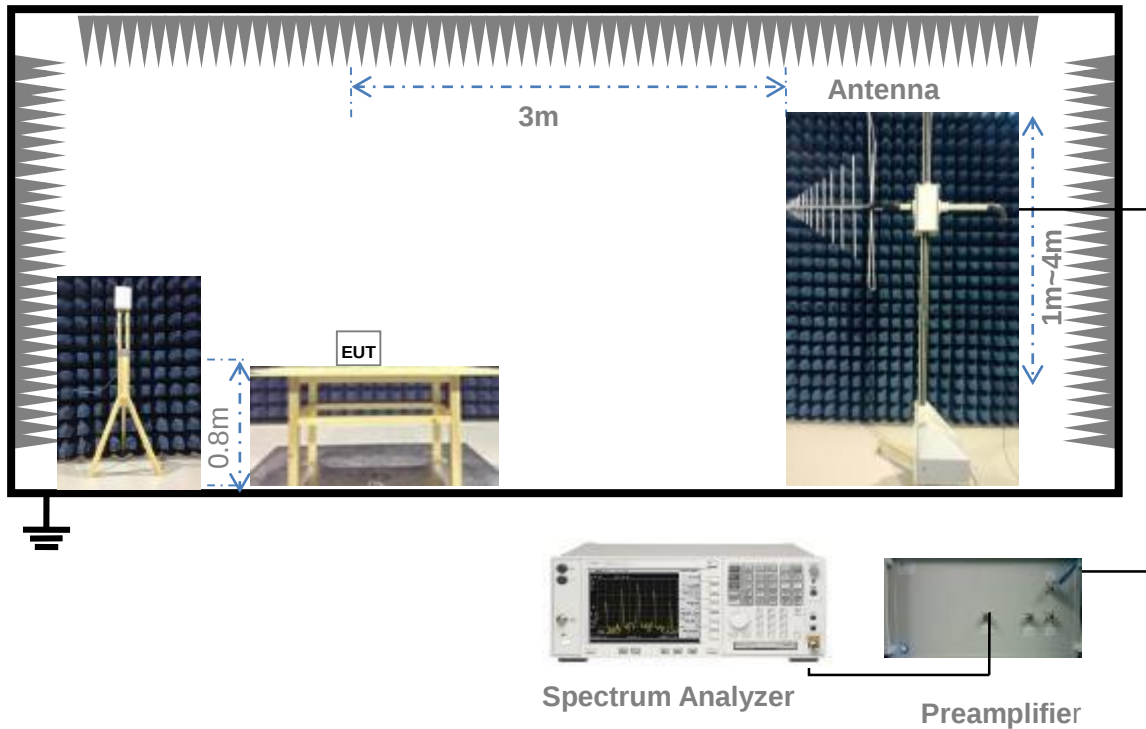
4.4 Test Configurations

Test Configurations (TC) No.	Description
Combination Test Mode	
TC01	<u>The GPRS 850 MHz Test Mode</u> EUT + 2/4G Antenna + Adapter + Placode + GPRS 850 Link + BT Link
TC02	<u>The GPRS 1900 MHz Test Mode</u> EUT + 2/4G Antenna + Adapter + Placode + GPRS 1900 Link + BT Link
TC03	<u>The FDD LTE-M1 Band 4 Test Mode</u> EUT + 2/4G Antenna + Adapter + Placode + LTE-M1 Band 4 Link + BT Link
TC04	<u>The FDD LTE-M1 Band 12 Test Mode</u> EUT + 2/4G Antenna + Adapter + Placode + LTE-M1 Band 12 Link + BT Link
TC05	<u>The FDD LTE-M1 Band 13 Test Mode</u> EUT + 2/4G Antenna + Adapter + Placode + LTE-M1 Band 13 Link + BT Link
TC06	<u>The FDD LTE NB-IoT Band 66 Test Mode</u> EUT + 2/4G Antenna + Adapter + Placode + LTE NB-IoT Band 66 Link + BT Link
TC07	<u>The FDD LTE NB-IoT Band 85 Test Mode</u> EUT + 2/4G Antenna + Adapter + Placode + LTE NB-IoT Band 85 Link + BT Link

4.5 Test Setup

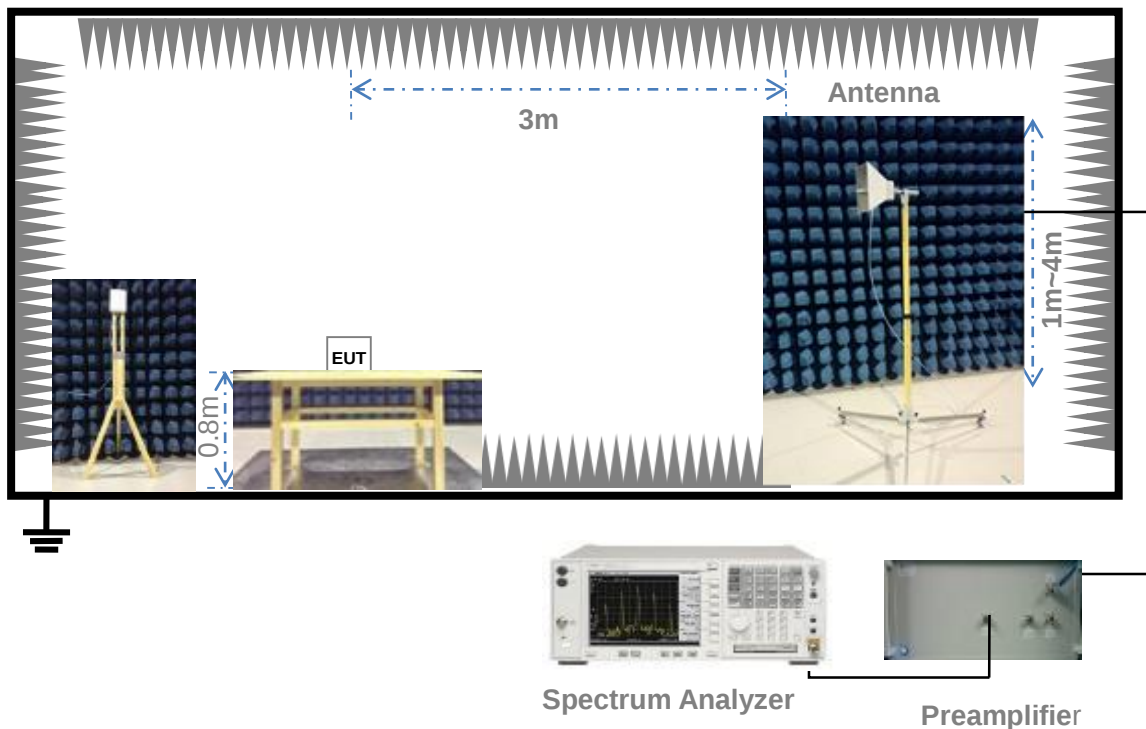
Power:

4.5.1 For Radiated Test (30 MHz ~ 1 GHz)



(Diagram 1)

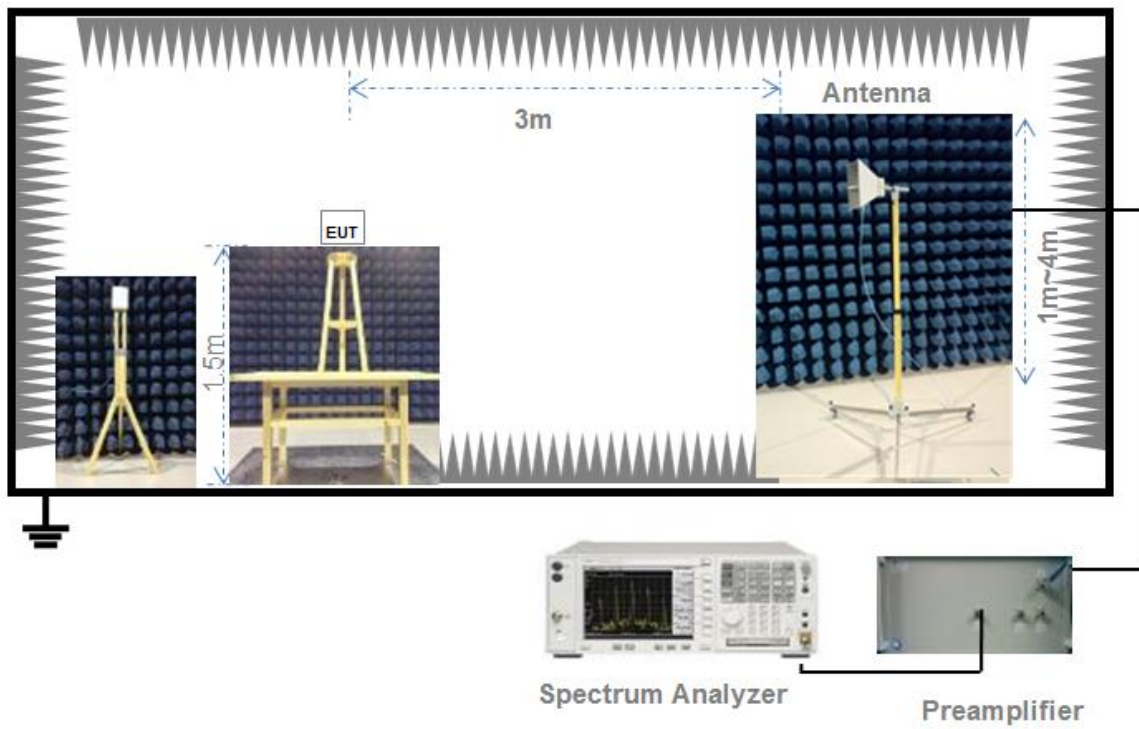
4.5.2 For Radiated Test (Above 1 GHz)



(Diagram 2)

Field strength:

4.5.3 For Radiated Test



(Diagram 3)

5 TEST ITEMS

5.1 Spurious Radiation

5.1.1 Limit

FCC § 22.917(a) & 24.238(a) & RSS-132 § 5.5 & RSS-133 § 6.5

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43+10\log(P)$ dB. This is calculated to be -13 dBm.

FCC § 27.53(c)

For operations in the 746–758 MHz band and the 776–788 MHz band, the power of any emission outside the licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, in accordance with the following:

- (1) On any frequency outside the 746–758 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least $43 + 10 \log (P)$ dB;
- (2) On any frequency outside the 776–788 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least $43 + 10 \log (P)$ dB;
- (3) On all frequencies between 763–775 MHz and 793–805 MHz, by a factor not less than $76 + 10 \log (P)$ dB in a 6.25 kHz band segment, for base and fixed stations;
- (4) On all frequencies between 763–775 MHz and 793–805 MHz, by a factor not less than $65 + 10 \log (P)$ dB in a 6.25 kHz band segment, for mobile and portable stations;
- (5) Compliance with the provisions of paragraphs (c)(1) and (c)(2) of this section is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater.

However, in the 100 kHz bands immediately outside and adjacent to the frequency block, a resolution bandwidth of at least 30 kHz may be employed;

- (6) Compliance with the provisions of paragraphs (c)(3) and (c)(4) of this section is based on the use of measurement instrumentation such that the reading taken with any resolution bandwidth setting should be adjusted to indicate spectral energy in a 6.25 kHz segment.

FCC § 27.53(f)

For operations in the 746–758 MHz, 775–788 MHz, and 805–806 MHz bands, emissions in the band 1559–1610 MHz shall be limited to - 70 dBW/MHz equivalent isotropically radiated power (EIRP) for wideband signals, and - 80 dBW EIRP for discrete emissions of less than 700 Hz bandwidth. For the purpose of equipment authorization, a transmitter shall be tested with an antenna that is representative of the type that will be used with the equipment in normal operation.

FCC § 27.53(g)

For operations in the 600MHz band and the 698-746MHz band, the power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least $43+10\log(P)$ dB. Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz bands immediately outside and adjacent to a licensee's frequency block, a resolution bandwidth of at least 30 kHz may be employed.

FCC § 27.53(h) (1) & RSS-139 § 6.6

Except as otherwise specified below, for operations in the 1695-1710 MHz, 1710-1755 MHz, 1755-1780 MHz, 1915-1920 MHz, 1995-2000 MHz, 2000-2020 MHz, 2110-2155 MHz, 2155-2180 MHz, and 2180-2200 bands, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) in watts by at least $43 + 10 \log_{10}(P)$ dB.

FCC § 27.53(m) (4) & RSS-199 § 4.5

For mobile digital stations (BRS and EBS stations), the attenuation factor shall be not less than:

- $40 + 10 \log P$ dB (–10 dBm, 100 nW) on all frequencies between the channel edge and 5 MHz from the channel edge.
- $43 + 10 \log P$ dB (–13 dBm, 50 nW) on all frequencies between 5 MHz and X MHz from the channel edge,
- $55 + 10 \log P$ dB (–25 dBm, 3 nW) on all frequencies more than X MHz from the channel edge, where X is the greater of 6 MHz or the actual emission bandwidth (26 dB).

In addition, the attenuation factor shall not be less than $43 + 10 \log(P)$ dB on all frequencies between 2490.5 MHz and 2496 MHz and $55 + 10 \log(P)$ dB at or below 2490.5 MHz. Mobile Satellite Service licensees operating on frequencies below 2495 MHz may also submit a documented interference complaint against BRS licensees operating on channel BRS Channel 1 on the same terms and conditions as adjacent channel BRS or EBS licensees.

FCC § 90.691

(a) Out-of-band emission requirement shall apply only to the “outer” channels included in an EA license and to spectrum adjacent to interior channels used by incumbent licensees. The emission limits are as follows:

(1) For any frequency removed from the EA licensee's frequency block by up to and including 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least $116 \log_{10}(f/6.1)$ decibels or $50 + 10 \log_{10}(P)$ decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 12.5 kHz.

(2) For any frequency removed from the EA licensee's frequency block greater than 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least $43 + 10 \log_{10}(P)$ decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 37.5 kHz.

(b) When an emission outside of the authorized bandwidth causes harmful interference, the Commission may, at its discretion, require greater attenuation than specified in this section.

FCC § 90.543

(e) For operations in the 758–768 MHz and the 788–798 MHz bands, the power of any emission outside the licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, in accordance with the following:

(1) On all frequencies between 769–775 MHz and 799–805 MHz, by a factor not less than $76 + 10 \log(P)$ dB in a 6.25 kHz band segment, for base and fixed stations.

(2) On all frequencies between 769–775 MHz and 799–805 MHz, by a factor not less than $65 + 10 \log(P)$ dB in a 6.25 kHz band segment, for mobile and portable stations.

(3) On any frequency between 775–788 MHz, above 805 MHz, and below 758 MHz, by at least $43 + 10 \log(P)$ dB.

(4) Compliance with the provisions of paragraphs (e)(1) and (2) of this section is based on the use of measurement instrumentation such that the reading taken with any resolution bandwidth setting should be adjusted to indicate spectral energy in a 6.25 kHz segment.

(f) For operations in the 758–775 MHz and 788–805 MHz bands, all emissions including harmonics in the band 1559–1610 MHz shall be limited to -70 dBW/ MHz equivalent isotropically radiated power (EIRP) for wideband signals, and -80 dBW EIRP for discrete emissions of less than 700 Hz bandwidth. For the purpose of equipment authorization, a transmitter shall be tested with an antenna that is representative of the type that will be used with the equipment in normal operation.

RSS-130 § 4.7

The unwanted emissions in any 100 kHz bandwidth on any frequency outside the low frequency edge and the high frequency edge of each frequency block range(s), shall be attenuated below the transmitter power, P (dBW), by at least $43 + 10\log_{10}(P)$ (watts), dB. However, in the 100 kHz band immediately outside of the equipment's frequency block range, a resolution bandwidth of 30 kHz may be employed.

In addition to the limit outlined above, equipment operating in the frequency bands 746-756 MHz and 777-787 MHz shall also comply with the following restrictions:

(a) The power of any unwanted emissions in any 6.25 kHz bandwidth for all frequencies between 763-775 MHz and 793-806 MHz shall be attenuated below the transmitter power, P (dBW), by at least:

(i) $76 + 10 \log_{10} p$ (watts), dB, for base and fixed equipment and

(ii) $65 + 10 \log_{10} p$ (watts), dB, for mobile and portable equipment

(b) The e.i.r.p. in the band 1559-1610 MHz shall not exceed -70 dBW/MHz for wideband signal and -80 dBW for discrete emission with bandwidth less than 700 Hz.

RSS-140 § 4.4

The power of any unwanted emission outside the bands 758-768 MHz and 788-798 MHz shall be attenuated below the transmitter output power P in dBW as follows, where p is the transmitter output power in watts:

For any frequency between 769-775 MHz and 799-806 MHz:

$76 + 10 \log (p)$, dB in a 6.25 kHz band for fixed and base station equipment

$65 + 10 \log (p)$, dB in a 6.25 kHz band for mobile and portable/hand-held equipment

For any frequency between 775-788 MHz, above 806 MHz, and below 758 MHz: $43 + 10 \log (p)$, dB in a bandwidth of 100 kHz or greater. However, in the 100 kHz bands immediately outside and adjacent to the frequency bands 758-768 MHz and 788-798 MHz, a resolution bandwidth of 30 kHz may be employed.

In addition, the equivalent isotropically radiated power (e.i.r.p.) of all emissions, including harmonics in the band 1559-1610 MHz, shall not exceed -70 dBW/MHz for wideband emissions, and -80 dBW/kHz for discrete emissions of less than 700 Hz bandwidth.

FCC §15.209&15.247(d); RSS-GEN, 8.9; RSS-247, 5.5

Radiated emission outside the frequency band attenuation below the general limits specified in FCC section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in FCC section 15.205(a), must also comply with the radiated emission limits specified in FCC section 15.209(a).

According to FCC section 15.209 (a), except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength ($\mu\text{V/m}$)	Measurement Distance (m)
0.009 - 0.490	2400/F(kHz)	300
0.490 - 1.705	24000/F(kHz)	30
1.705 - 30.0	30	30
30 - 88	100	3
88 - 216	150	3
216 - 960	200	3
Above 960	500	3

Note:

1. Field Strength (dB $\mu\text{V/m}$) = $20 \cdot \log[\text{Field Strength } (\mu\text{V/m})]$.
2. In the emission tables above, the tighter limit applies at the band edges.
3. For Above 1000 MHz, the emission limit in this paragraph is based on measurement instrumentation employing an average detector, measurement using instrumentation with a peak detector function, corresponding to 20dB above the maximum permitted average limit.
4. For above 1000 MHz, limit field strength of harmonics: 54dB $\mu\text{V/m}$ @3m (AV) and 74dB $\mu\text{V/m}$ @3m (PK).

5.1.2 Test Setup

The section 4.5.1 and 4.5.2 (Diagram 1, 2) test setup description was used for this test. The photo of test setup please refer to ANNEX B.

5.1.3 Test Procedure

For Power test:

1. On a test site, the EUT shall be placed at 80cm height on a turn table, and in the position close to normal use as declared by the applicant.
2. The test antenna shall be oriented initially for vertical polarization located 3 m from EUT to correspond to the fundamental frequency of the transmitter.
3. The output of the test antenna shall be connected to the measuring receiver and the peak detector is used for the measurement.
4. During the measurement of the EUT, the resolution bandwidth was to 1 MHz and the average bandwidth was set to 1 MHz.

5. The transmitter shall be switched on; the measuring receiver shall be tuned to the frequency of the transmitter under test.
6. The test antenna shall be raised and lowered through the specified range of height until the maximum signal level is detected by the measuring receiver.
7. The transmitter shall be rotated through 360° in the horizontal plane, until the maximum signal level is detected by the measuring receiver.
8. The test antenna shall be raised and lowered again through the specified range of height until the maximum signal level is detected by the measuring receiver.
9. The maximum signal level detected by the measuring receiver shall be noted.
10. The EUT was replaced by half-wave dipole (824 ~ 849 MHz) or horn antenna (1 850 ~ 1 910 MHz) connected to a signal generator.
11. In necessary, the input attenuator setting on the measuring receiver shall be adjusted in order to increase the sensitivity of the measuring receiver.
12. The test antenna shall be raised and lowered through the specified range of height to ensure that the maximum signal is received.
13. The input signal to the substitution antenna shall be adjusted to the level that produces a level detected by the measuring receiver, which is equal to the level noted while the transmitter radiated power was measured, corrected for the change of input attenuator setting of the measuring receiver.
14. The input level to the substitution antenna shall be recorded as power level in dBm, corrected for any change of input attenuator setting of the measuring receiver.
15. The measurement shall be repeated with the test antenna and the substitution antenna orientated for horizontal polarization.

Final measurement calculation as below:

The relevant equation for determining the ERP/EIRP from the radiated RF output power is:

$$\text{ERP/EIRP (dBm)} = \text{SA Read Value (dBm)} + \text{Correction Factor (dB)}$$

where:

ERP/EIRP = effective or equivalent radiated power, in dBm;

SA Read Value = measured transmitter power received by EMI receiver or spectrum analyzer, in dBm;

Correction Factor = total correction factor including cable loss, in dB;

During the test, the data of Correction Factor (dB) is added in the EMI receiver or spectrum analyzer, so SA Read Value (dBm) is the final values which contains the data of Correction Factor (dB).

For example:

In the ERP test, when SA read value for GSM850 is 21dBm, and correction factor is 8dB, then final ERP value

for GSM850 is:

$$\text{ERP (dBm)} = 21\text{dBm} + 8\text{dB} = 29\text{dBm}$$

For Field strength test:

An additional consideration when performing conducted measurements of restricted band emissions is that unwanted emissions radiating from the EUT cabinet, control circuits, power leads, or intermediate circuit elements will likely go undetected in a conducted measurement configuration. To address this concern, a radiated test shall be performed to ensure that emissions emanating from the EUT cabinet (rather than the antenna port) also comply with the applicable limits.

For these cabinet radiated spurious emission measurements the EUT transmit antenna may be replaced with a termination matching the nominal impedance of the antenna. Procedures for performing radiated measurements are specified in ANSI C63.10. All detected emissions shall comply with the applicable limits.

The measurement frequency range is from 30MHz to the 10th harmonic of the fundamental frequency. The Turn Table is actuated to turn from 0° to 360°, and both horizontal and vertical polarizations of the Test Antenna are used to find the maximum radiated power. Mid channels on all channel bandwidth verified. Only the worst RB size/offset presented.

The power of the EUT transmitting frequency should be ignored.

All Spurious Emission tests were performed in X, Y, Z axis direction. And only the worst axis test condition was recorded in this test report.

Use the following spectrum analyzer settings:

Span = wide enough to fully capture the emission being measured

RBW = 1 MHz for $f \geq 1$ GHz, 100 kHz for $f < 1$ GHz

VBW $\geq$ RBW

Sweep = auto

Detector function = peak

Trace = max hold

5.1.4 Test Result

Please refer to ANNEX A.1.

ANNEX A TEST RESULTS

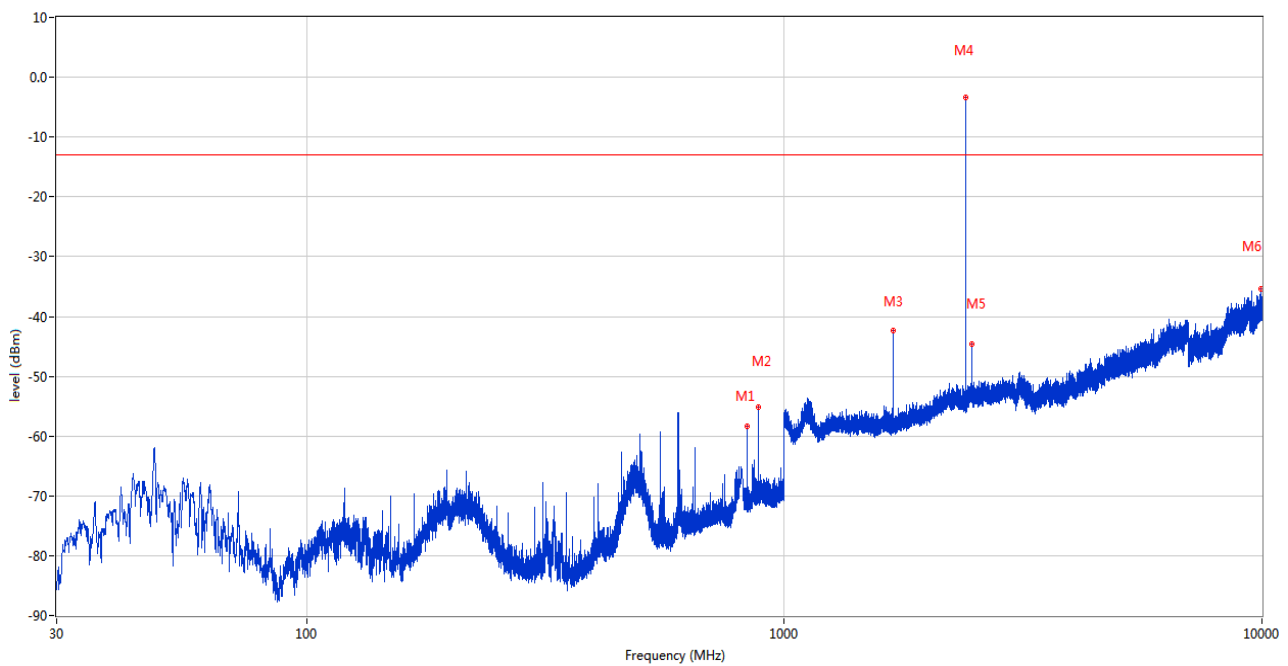
A.1 Spurious Emission

Note 1: The symbol of "--" in the table which means not application.

Note 2: This frequency which near 850 MHz, 1900MHz, 2134MHz, 753MHz, 2145MHz, 706MHz with circle should be ignored because they are MS and SS carrier frequency, the marked spikes near 2400 MHz with circle should be ignored because they are Bluetooth carrier frequency.

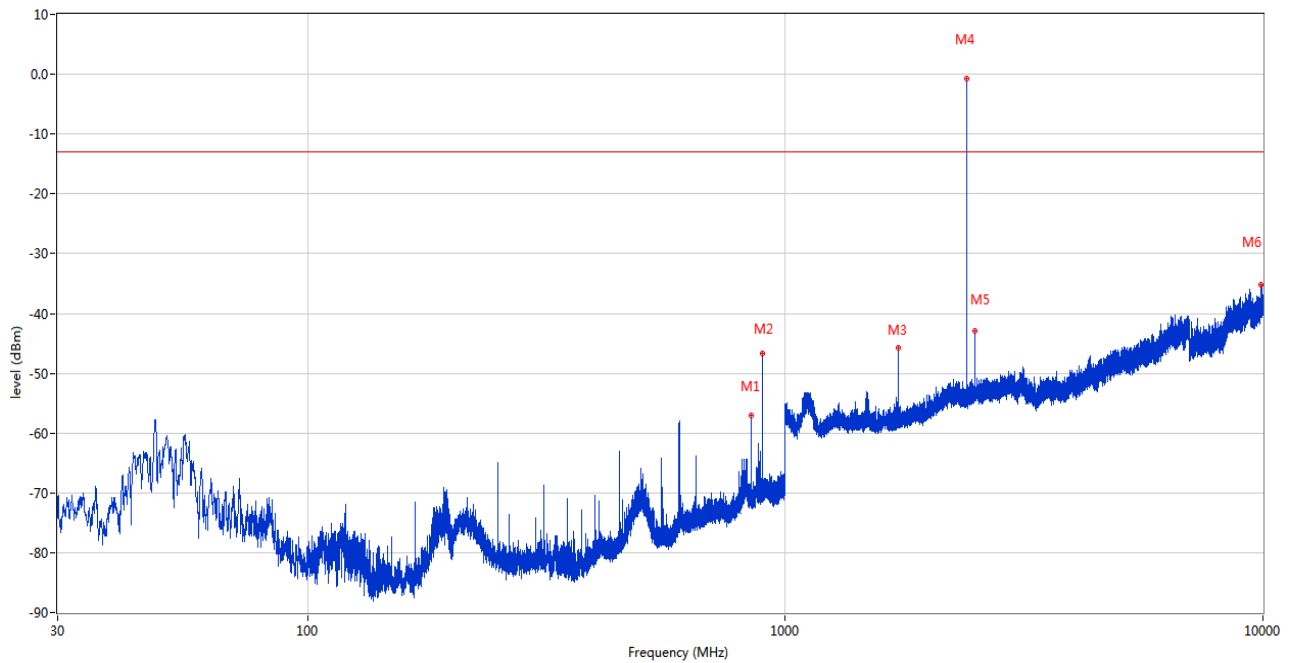
POWER:

A.1.1 Multi-radio Co-location Antenna Horizontal (GPRS 850 + BLE; 30 MHz – 10 GHz)



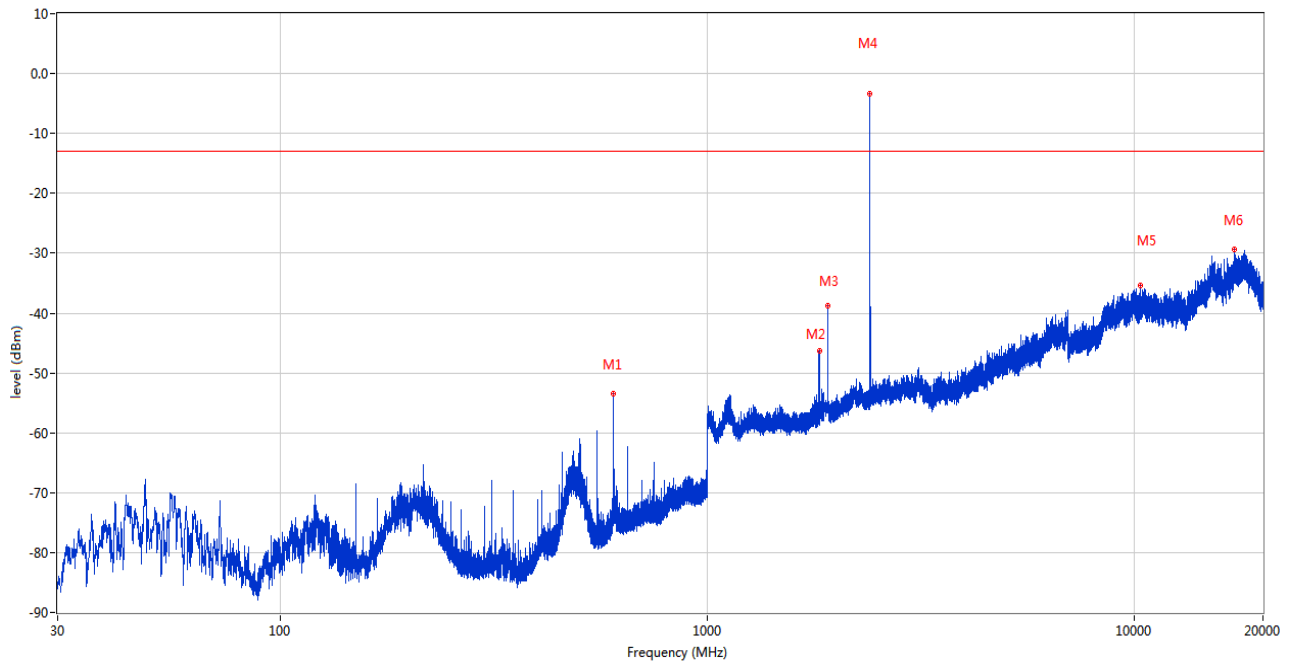
Frequency (MHz)	Result (dBm)	Factor (dB)	PK Limit (dBm)	Over Limit (dB)	Table (o)	ANT	EUT	Verdict
836.656	-58.02	0.52	-13.0	-45.02	336.00	Horizontal	Horizontal	N/A
881.412	-55.13	0.65	-13.0	-42.13	241.00	Horizontal	Horizontal	N/A
1673.120	-42.05	-0.84	-13.0	-29.05	13.00	Horizontal	Horizontal	Pass
2401.700	-3.42	3.74	-13.0	9.58	210.00	Horizontal	Horizontal	N/A
2510.100	-44.37	6.02	-13.0	-31.37	37.00	Horizontal	Horizontal	Pass
9928.750	-35.33	39.96	-13.0	-22.33	238.00	Horizontal	Horizontal	Pass

A.1.2 Multi-radio Co-location Antenna Vertical (GPRS 850 + BLE; 30 MHz – 10 GHz)



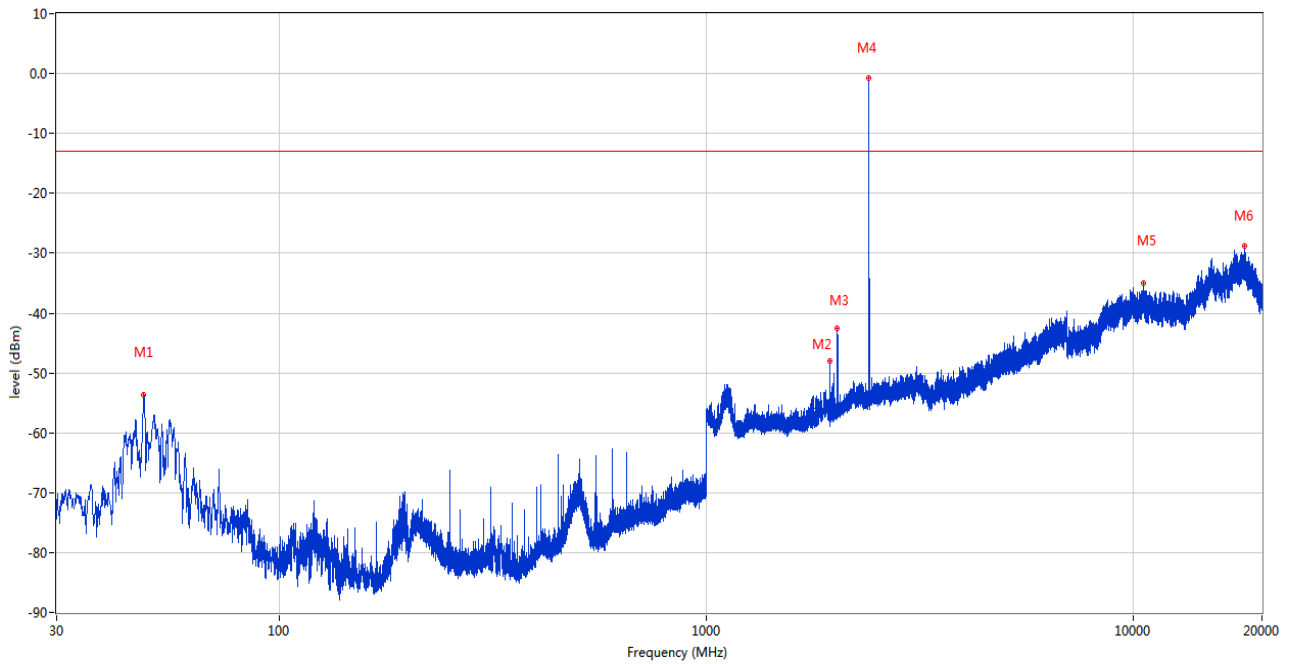
Frequency (MHz)	Result (dBm)	Factor (dB)	PK Limit (dBm)	Over Limit (dB)	Table (o)	ANT	EUT	Verdict
836.516	-57.30	0.52	-13.0	-44.30	112.00	Vertical	Horizontal	N/A
881.610	-46.25	0.65	-13.0	-33.25	123.00	Vertical	Horizontal	N/A
1673.200	-45.38	-0.84	-13.0	32.38	360.00	Vertical	Horizontal	Pass
2402.100	-0.81	3.76	-13.0	12.19	185.00	Vertical	Horizontal	N/A
2510.000	-42.10	6.02	-13.0	-29.10	329.00	Vertical	Horizontal	Pass
9924.850	-35.20	39.97	-13.0	-22.20	227.00	Vertical	Horizontal	Pass

A.1.3 Multi-radio Co-location Antenna Horizontal (GPRS 1900 + BLE; 30 MHz – 20 GHz)



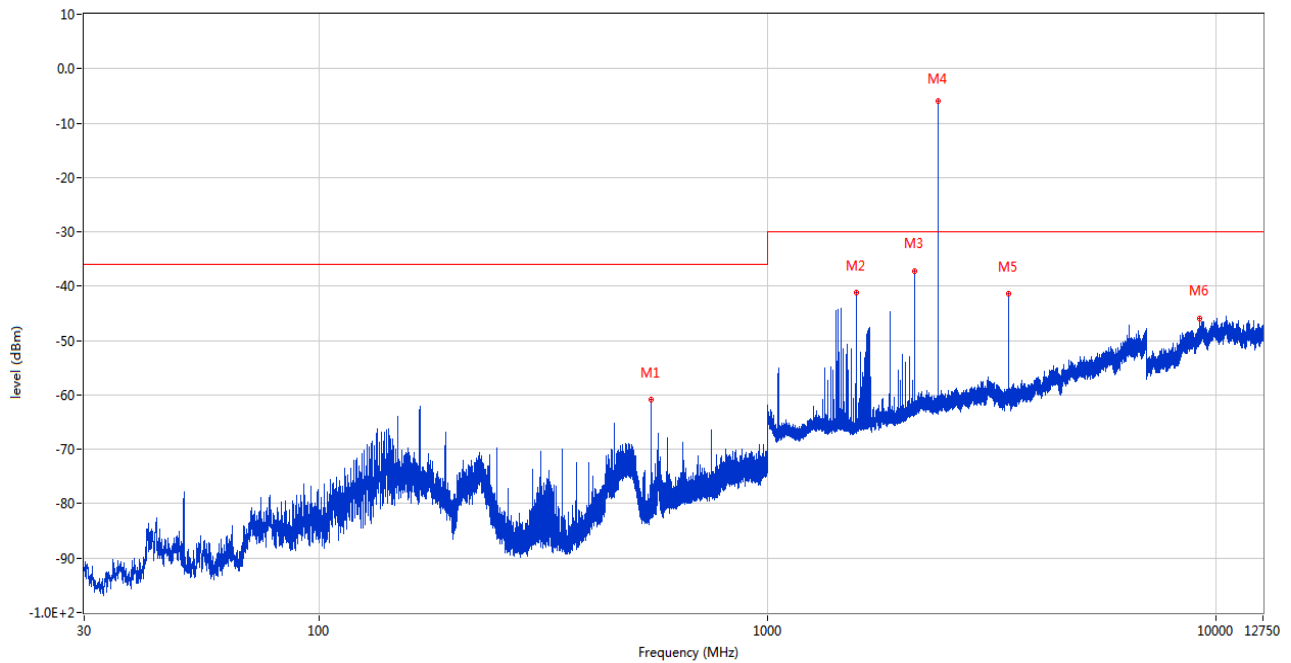
Frequency (MHz)	Result (dBm)	Factor (dB)	PK Limit (dBm)	Over Limit (dB)	Table (o)	ANT	EUT	Verdict
599.972	-53.53	-4.43	-13.0	-40.53	146.00	Horizontal	Horizontal	Pass
1880.100	-46.02	2.69	-13.0	-33.02	86.00	Horizontal	Horizontal	N/A
1960.120	-38.34	1.11	-13.0	-25.34	176.00	Horizontal	Horizontal	N/A
2401.700	-3.37	3.60	-13.0	9.63	196.00	Horizontal	Horizontal	N/A
10328.963	-35.36	40.05	-13.0	-22.36	43.00	Horizontal	Horizontal	Pass
17115.588	-29.30	43.96	-13.0	-16.30	44.00	Horizontal	Horizontal	Pass

A.1.4 Multi-radio Co-location Antenna Vertical (GPRS 1900 + BLE; 30 MHz – 20 GHz)



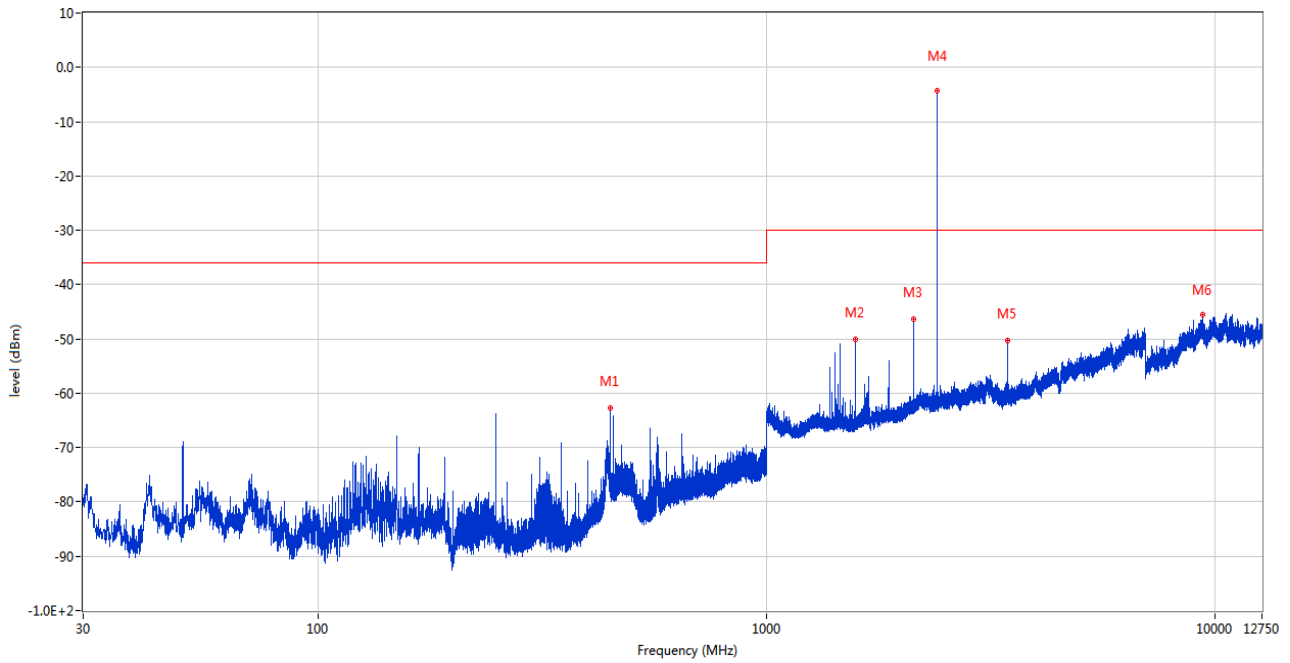
Frequency (MHz)	Result (dBm)	Factor (dB)	PK Limit (dBm)	Over Limit (dB)	Table (o)	ANT	EUT	Verdict
48.042	-53.65	-15.37	-13.0	-40.65	79.00	Vertical	Horizontal	Pass
1879.700	-47.34	2.68	-13.0	-34.34	325.00	Vertical	Horizontal	N/A
1959.900	-42.76	1.10	-13.0	-29.76	128.00	Vertical	Horizontal	N/A
2401.700	-0.74	3.60	-13.0	12.26	172.00	Vertical	Horizontal	N/A
10549.188	-35.08	40.71	-13.0	-22.08	362.00	Vertical	Horizontal	Pass
18253.838	-28.74	44.84	-13.0	-15.74	107.00	Vertical	Horizontal	Pass

A.1.5 Multi-radio Co-location Antenna Horizontal (LTE-M1 Band 4 + BLE; 30 MHz – 12.75 GHz)



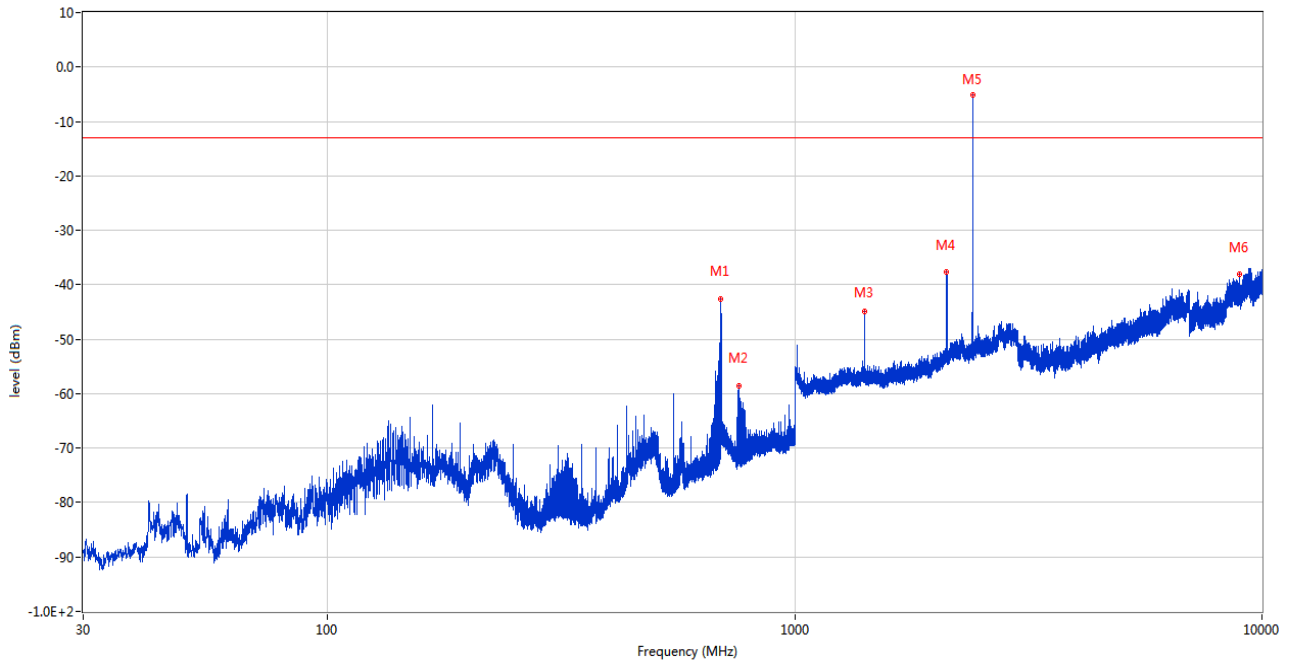
Frequency (MHz)	Result (dBm)	Factor (dB)	PK Limit (dBm)	Over Limit (dB)	Table (o)	ANT	EUT	Verdict
549.969	-60.79	-7.15	-36.0	-24.79	323.00	Horizontal	Horizontal	Pass
1579.900	-41.15	-1.08	-30.0	-11.15	88.00	Horizontal	Horizontal	Pass
2134.600	-37.14	2.76	-30.0	-7.14	161.00	Horizontal	Horizontal	N/A
2402.000	-5.89	3.60	-30.0	24.11	213.00	Horizontal	Horizontal	N/A
3461.000	-41.46	7.00	-30.0	-11.46	325.00	Horizontal	Horizontal	Pass
9209.725	-45.83	38.77	-30.0	-15.83	50.00	Horizontal	Horizontal	Pass

A.1.6 Multi-radio Co-location Antenna Vertical (LTE-M1 Band 4 + BLE; 30 MHz – 12.75 GHz)



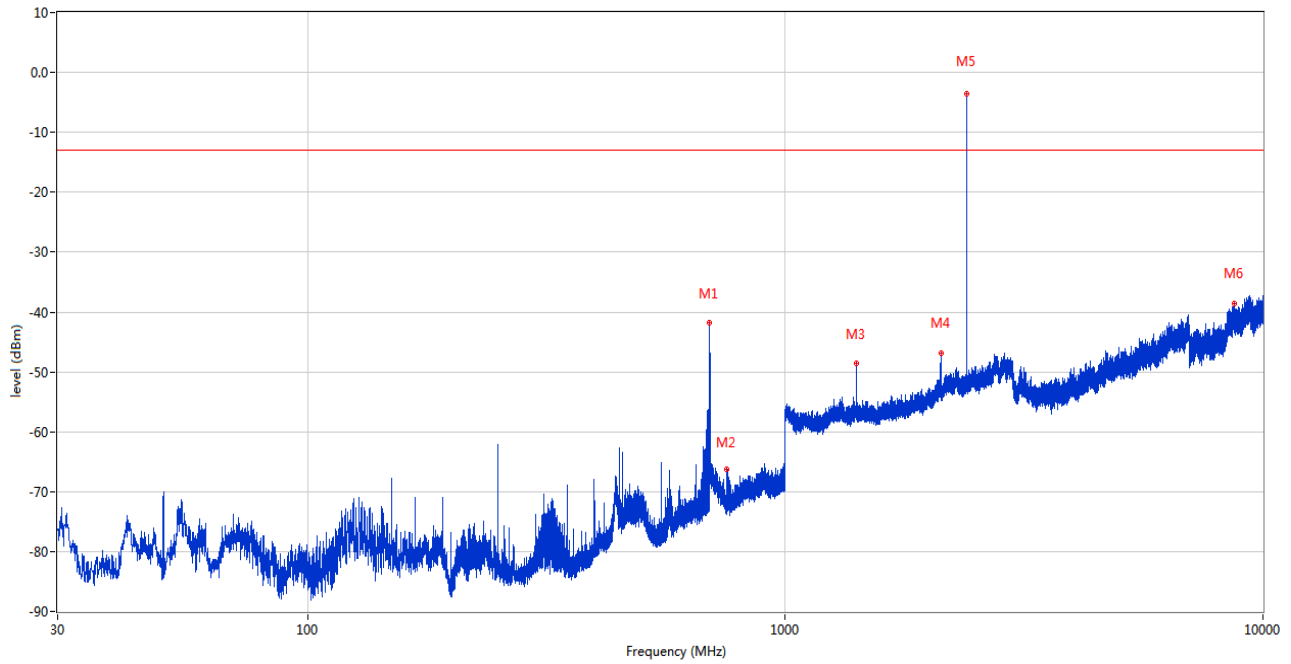
Frequency (MHz)	Result (dBm)	Factor (dB)	PK Limit (dBm)	Over Limit (dB)	Table (o)	ANT	EUT	Verdict
450.010	-62.67	-8.06	-36.0	-26.67	234.00	Vertical	Horizontal	Pass
1579.900	-50.12	-1.08	-30.0	-20.12	108.00	Vertical	Horizontal	Pass
2134.300	-46.42	2.78	-30.0	-16.42	333.00	Vertical	Horizontal	N/A
2401.700	-4.34	3.59	-30.0	25.66	280.00	Vertical	Horizontal	N/A
3461.000	-50.25	7.00	-30.0	-20.25	200.00	Vertical	Horizontal	Pass
9387.688	-45.61	39.94	-30.0	-15.61	232.00	Vertical	Horizontal	Pass

A.1.7 Multi-radio Co-location Antenna Horizontal (LTE-M1 Band 12 + BLE; 30 MHz – 10 GHz)



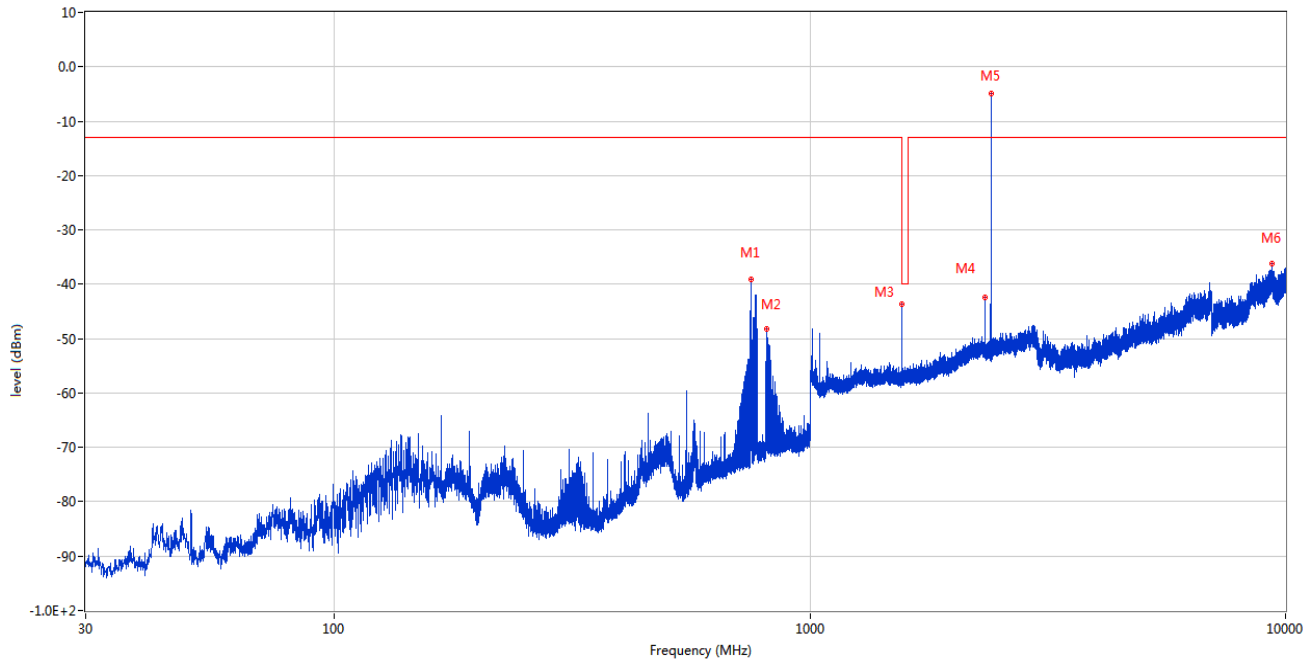
Frequency (MHz)	Result (dBm)	Factor (dB)	PK Limit (dBm)	Over Limit (dB)	Table (o)	ANT	EUT	Verdict
694.547	-42.60	3.34	-13.0	-29.60	297.00	Horizontal	Horizontal	Pass
761.041	-58.56	-0.87	-13.0	-45.56	232.00	Horizontal	Horizontal	Pass
1410.500	-44.88	1.47	-13.0	-31.88	75.00	Horizontal	Horizontal	Pass
2116.000	-37.62	4.92	-13.0	-24.62	252.00	Horizontal	Horizontal	Pass
2401.700	-5.15	6.22	-13.0	7.85	216.00	Horizontal	Horizontal	N/A
8937.099	-38.14	38.88	-13.0	-25.14	296.00	Horizontal	Horizontal	Pass

A.1.8 Multi-radio Co-location Antenna Vertical (LTE-M1 Band 12 + BLE; 30 MHz – 10 GHz)



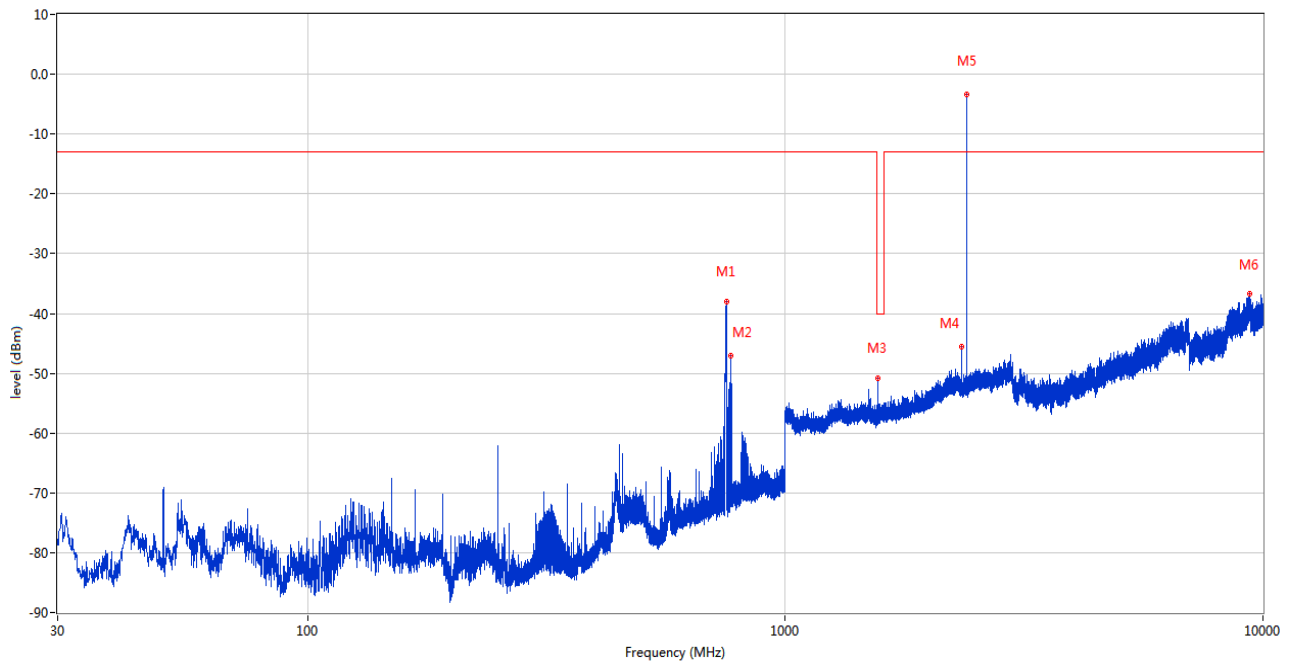
Frequency (MHz)	Result (dBm)	Factor (dB)	PK Limit (dBm)	Over Limit (dB)	Table (o)	ANT	EUT	Verdict
695.081	-41.78	4.34	-13.0	-28.78	172.00	Vertical	Horizontal	Pass
755.899	-66.25	-1.05	-13.0	-53.25	215.00	Vertical	Horizontal	Pass
1410.700	-48.59	1.47	-13.0	-35.59	249.00	Vertical	Horizontal	Pass
2115.900	-46.87	4.93	-13.0	-33.87	144.00	Vertical	Horizontal	Pass
2401.700	-3.62	6.22	-13.0	9.38	185.00	Vertical	Horizontal	N/A
8696.500	-38.64	39.01	-13.0	-25.64	336.00	Vertical	Horizontal	Pass

A.1.9 Multi-radio Co-location Antenna Horizontal (LTE-M1 Band 13 + BLE; 30 MHz – 10 GHz)



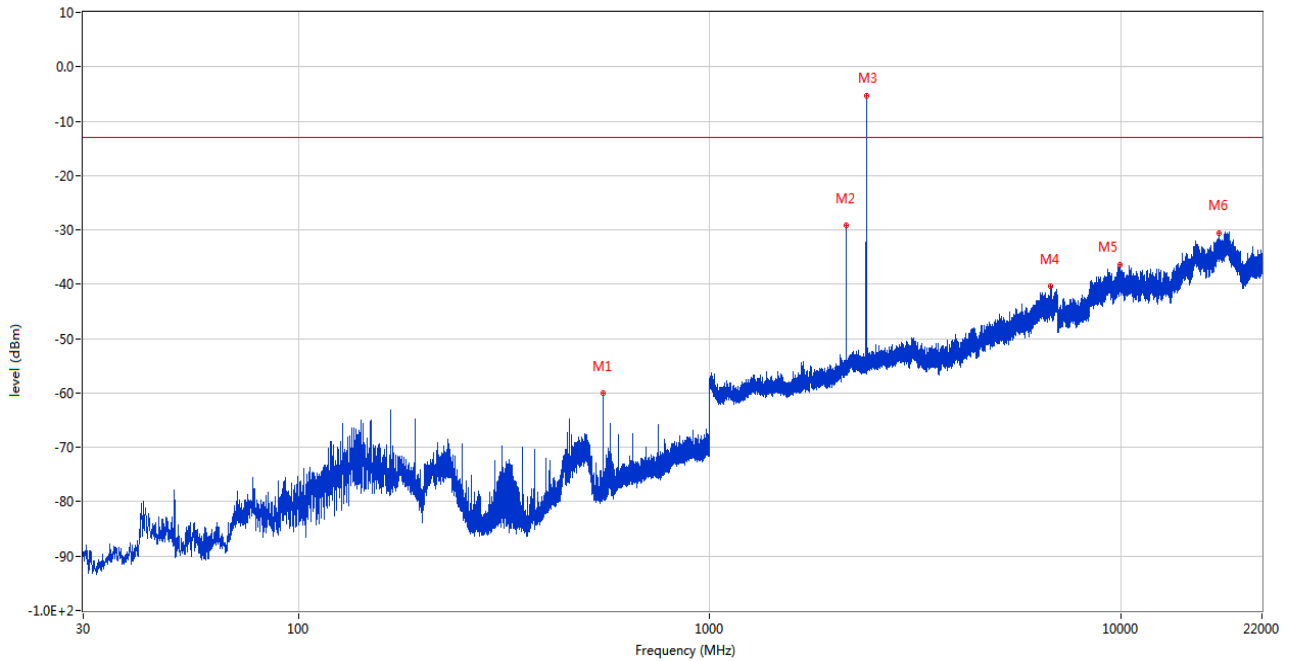
Frequency (MHz)	Result (dBm)	Factor (dB)	PK Limit (dBm)	Over Limit (dB)	Table (o)	ANT	EUT	Verdict
753.183	-39.01	-1.32	-13.0	-26.01	167.00	Horizontal	Horizontal	N/A
812.063	-48.19	1.50	-13.0	-35.19	288.00	Horizontal	Horizontal	Pass
1559.600	-43.73	0.75	-40.0	-3.73	77.00	Horizontal	Horizontal	Pass
2339.400	-42.37	5.95	-13.0	-29.37	281.00	Horizontal	Horizontal	Pass
2401.700	-5.00	5.84	-13.0	8.00	211.00	Horizontal	Horizontal	N/A
9344.201	-36.14	39.73	-13.0	-23.14	209.00	Horizontal	Horizontal	Pass

A.1.10 Multi-radio Co-location Antenna Vertical (LTE-M1 Band 13 + BLE; 30 MHz – 10 GHz)



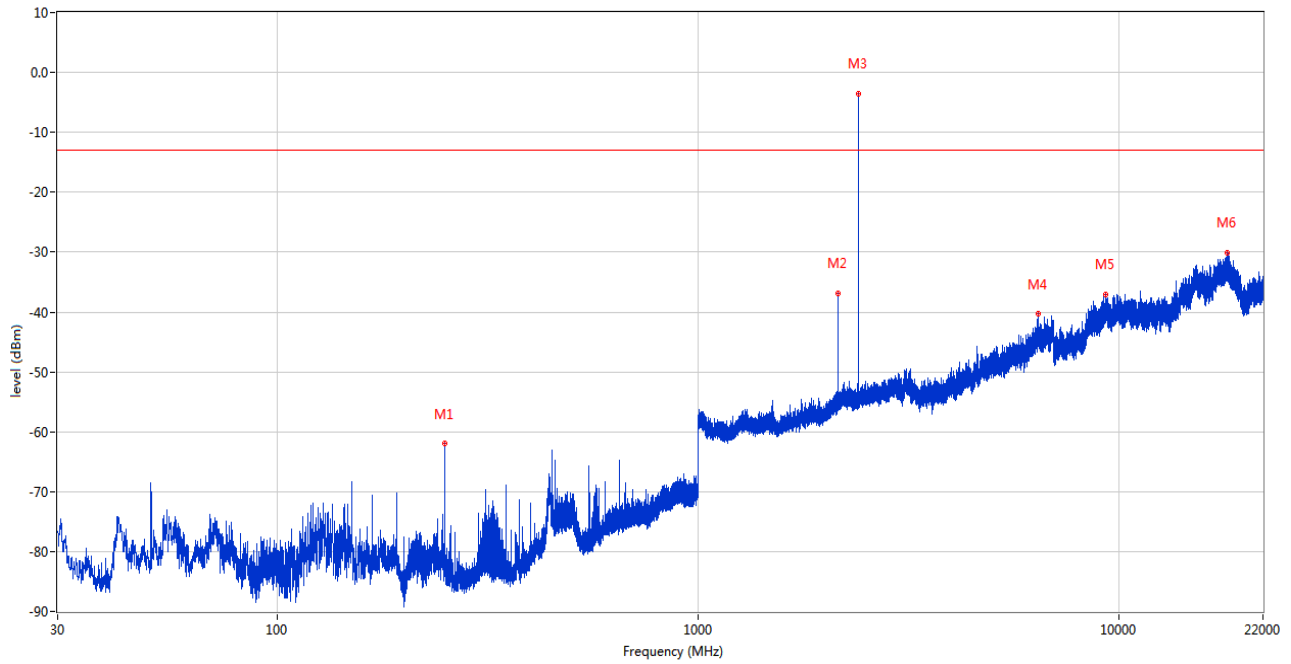
Frequency (MHz)	Result (dBm)	Factor (dB)	PK Limit (dBm)	Over Limit (dB)	Table (o)	ANT	EUT	Verdict
752.795	-37.94	-1.31	-13.0	-24.94	100.00	Vertical	Horizontal	N/A
770.450	-46.99	0.08	-13.0	-33.99	212.00	Vertical	Horizontal	Pass
1559.500	-50.90	0.75	-40.0	-10.90	158.00	Vertical	Horizontal	Pass
2339.400	-45.55	5.95	-13.0	-32.55	112.00	Vertical	Horizontal	Pass
2401.700	-3.42	5.84	-13.0	9.58	179.00	Vertical	Horizontal	N/A
9391.600	-36.74	39.97	-13.0	-23.74	362.00	Vertical	Horizontal	Pass

A.1.11 Multi-radio Co-location Antenna Horizontal (LTE NB-IoT Band 66 + BLE; 30 MHz – 22 GHz)



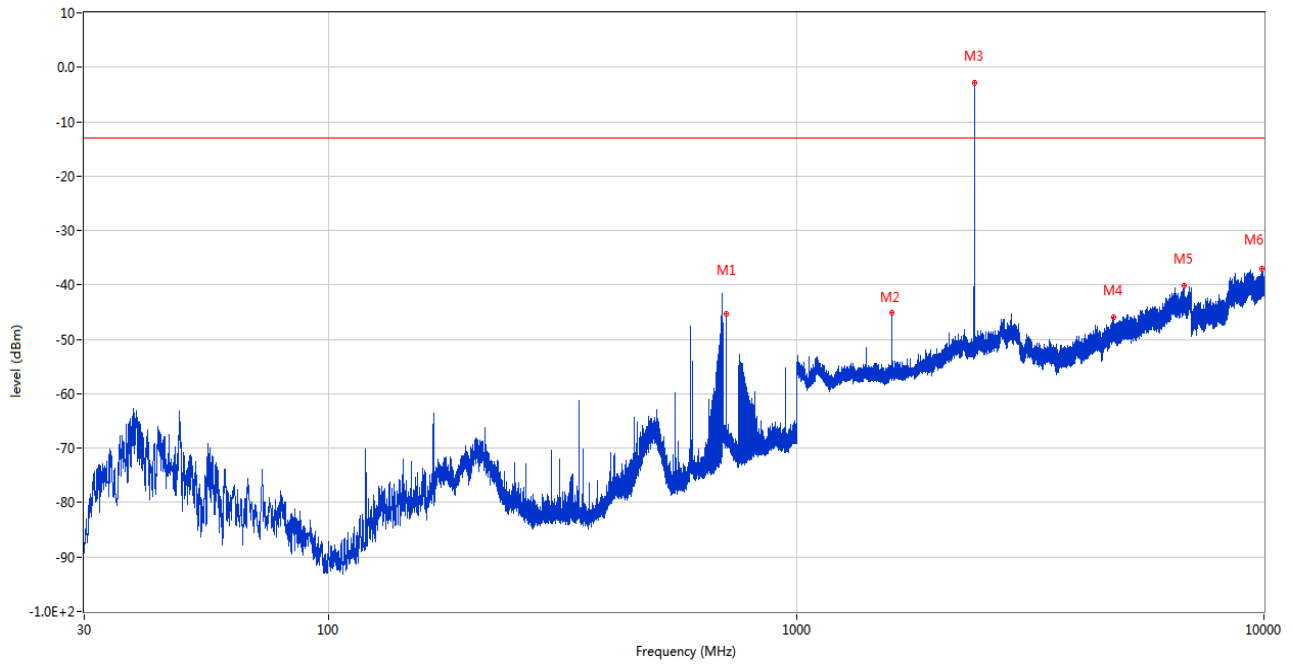
Frequency (MHz)	Result (dBm)	Factor (dB)	PK Limit (dBm)	Over Limit (dB)	Table (o)	ANT	EUT	Verdict
549.969	-60.08	-7.15	-13.0	-47.08	329.00	Horizontal	Horizontal	Pass
2144.900	-29.22	2.76	-13.0	-16.22	231.00	Horizontal	Horizontal	N/A
2401.700	-5.26	3.59	-13.0	7.74	211.00	Horizontal	Horizontal	N/A
6756.000	-40.34	19.41	-13.0	-27.34	247.00	Horizontal	Horizontal	Pass
9966.137	-36.50	39.84	-13.0	-23.50	361.00	Horizontal	Horizontal	Pass
17273.250	-30.70	44.16	-13.0	-17.70	221.00	Horizontal	Horizontal	Pass

A.1.12 Multi-radio Co-location Antenna Vertical (LTE NB-IoT Band 66 + BLE; 30 MHz – 22 GHz)



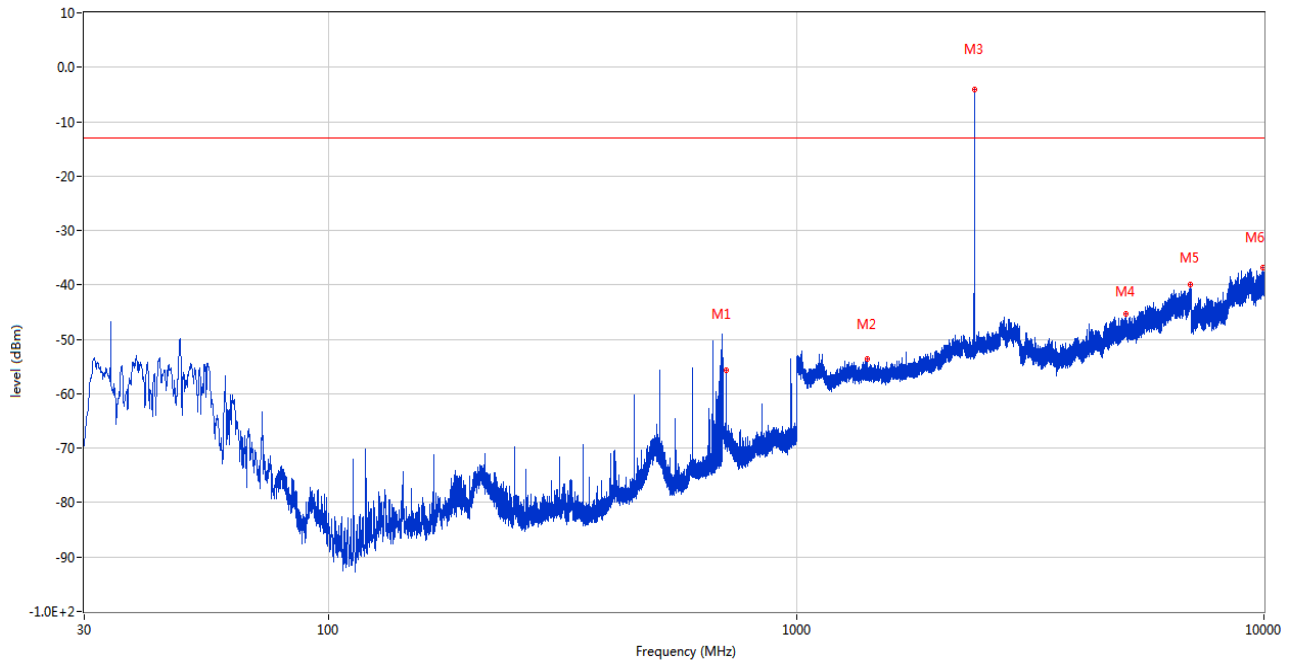
Frequency (MHz)	Result (dBm)	Factor (dB)	PK Limit (dBm)	Over Limit (dB)	Table (o)	ANT	EUT	Verdict
249.996	-61.95	-15.39	-13.0	-48.95	139.00	Vertical	Horizontal	Pass
2144.900	-36.86	2.76	-13.0	-23.86	301.00	Vertical	Horizontal	N/A
2401.700	-3.62	3.59	-13.0	9.38	276.00	Vertical	Horizontal	N/A
6427.000	-40.36	18.33	-13.0	-27.36	47.00	Vertical	Horizontal	Pass
9308.625	-37.13	39.62	-13.0	-24.13	84.00	Vertical	Horizontal	Pass
18058.113	-30.19	44.88	-13.0	-17.19	274.00	Vertical	Horizontal	Pass

A.1.13 Multi-radio Co-location Antenna Horizontal (LTE NB-IoT Band 85 + BLE; 30 MHz – 10 GHz)



Frequency (MHz)	Result (dBm)	Factor (dB)	PK Limit (dBm)	Over Limit (dB)	Table (o)	ANT	EUT	Verdict
706.914	-45.26	3.51	-13.0	-32.26	245.00	Horizontal	Horizontal	N/A
1601.400	-45.17	1.35	-13.0	-32.17	70.00	Horizontal	Horizontal	Pass
2401.700	-2.84	6.22	-13.0	10.16	190.00	Horizontal	Horizontal	N/A
4769.400	-45.89	10.83	-13.0	-32.89	58.00	Horizontal	Horizontal	Pass
6757.800	-40.05	19.29	-13.0	-27.05	247.00	Horizontal	Horizontal	Pass
9917.950	-37.07	39.98	-13.0	-24.07	218.00	Horizontal	Horizontal	Pass

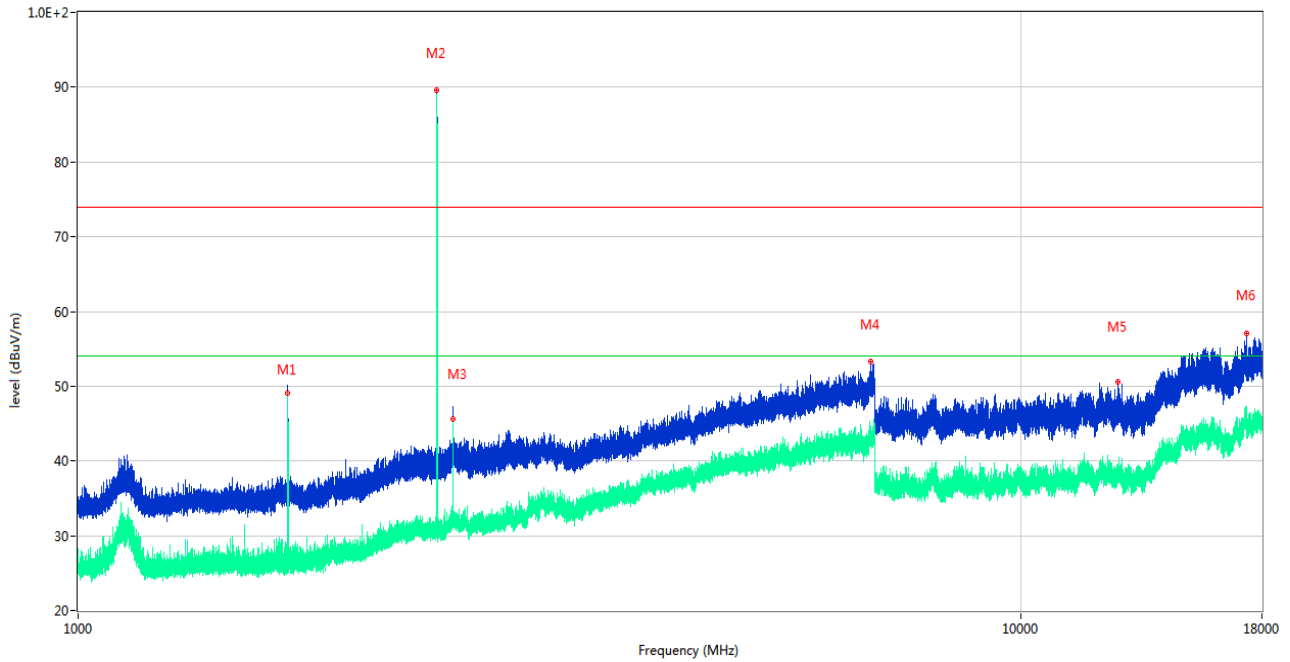
A.1.14 Multi-radio Co-location Antenna Vertical (LTE NB-IoT Band 85 + BLE; 30 MHz – 10 GHz)



Frequency (MHz)	Result (dBm)	Factor (dB)	PK Limit (dBm)	Over Limit (dB)	Table (o)	ANT	EUT	Verdict
706.914	-55.69	3.51	-13.0	-42.69	167.00	Vertical	Horizontal	N/A
1418.100	-53.69	1.61	-13.0	-40.69	48.00	Vertical	Horizontal	Pass
2401.600	-4.14	6.22	-13.0	8.86	154.00	Vertical	Horizontal	N/A
5070.200	-45.36	12.82	-13.0	-32.36	360.00	Vertical	Horizontal	Pass
6952.200	-39.93	19.12	-13.0	-26.93	124.00	Vertical	Horizontal	Pass
9953.500	-36.91	39.87	-13.0	-23.91	180.00	Vertical	Horizontal	Pass

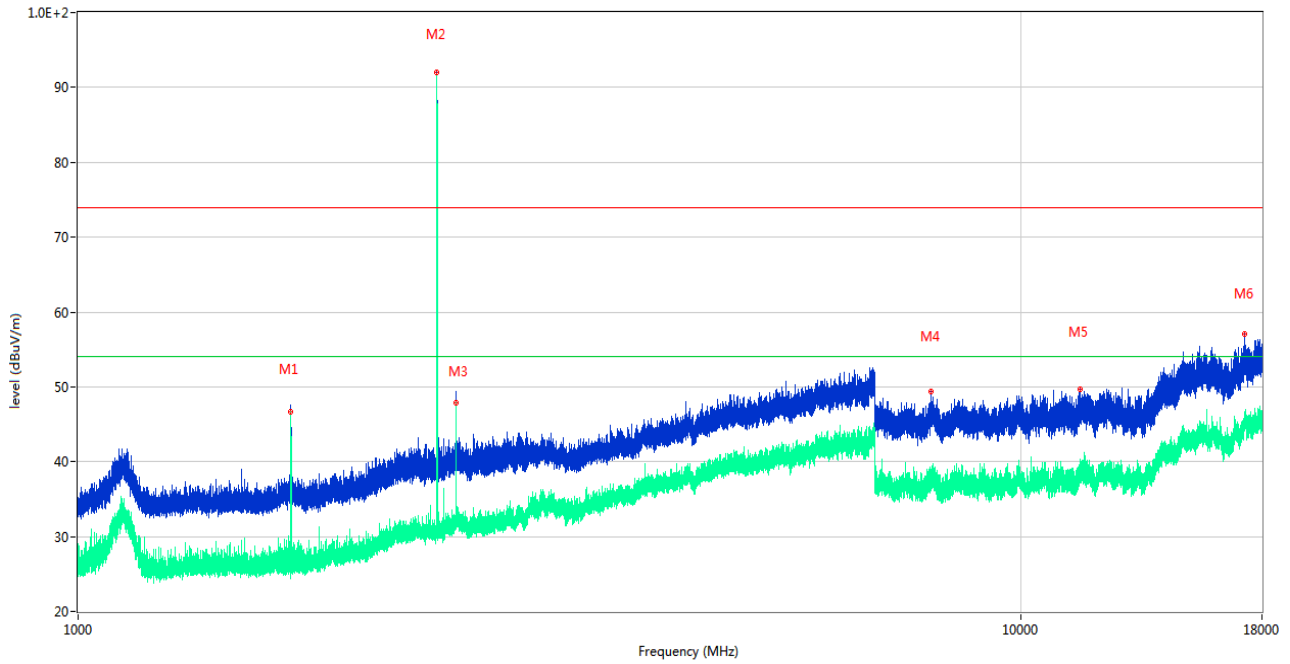
Field strength:

A.1.15 Multi-radio Co-location Antenna Horizontal (GPRS 850 + BLE; 1 GHz – 18 GHz)



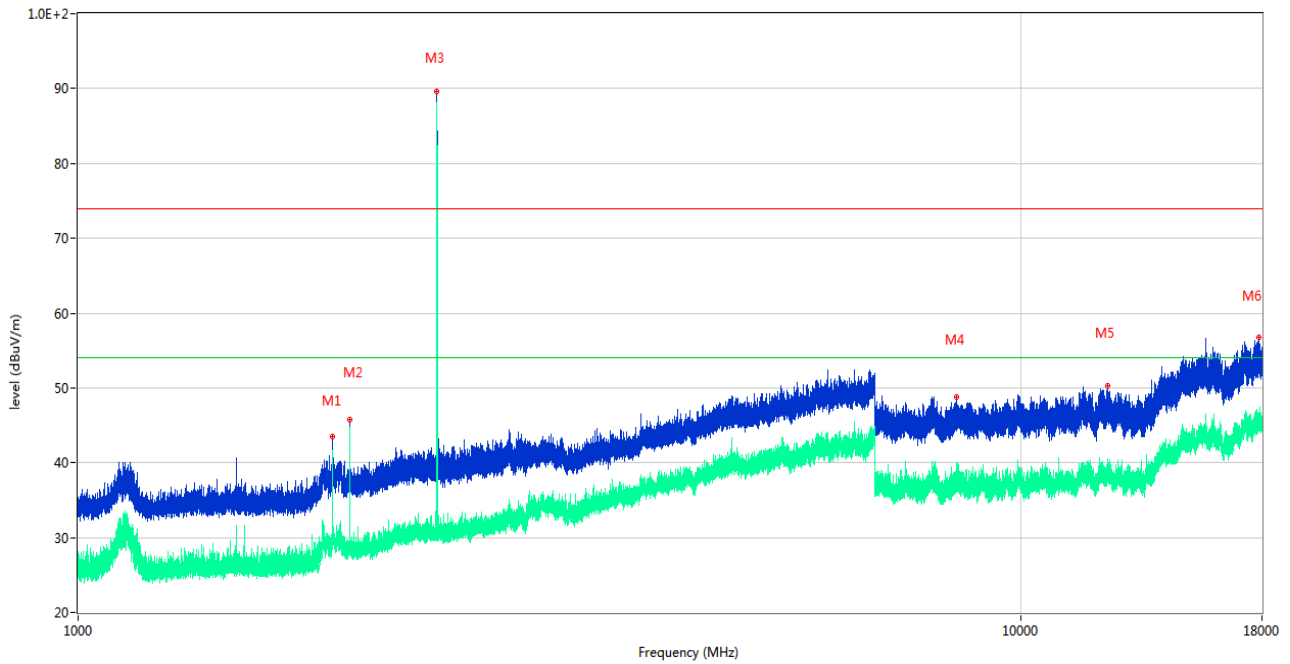
No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1673.300	50.00	-14.69	74.0	-24.00	Peak	9.00	150	Horizontal	Pass
1**	1673.300	49.87	-14.69	54.0	-4.13	AV	9.00	150	Horizontal	Pass
2	2401.800	89.57	-10.75	74.0	15.57	Peak	213.00	150	Horizontal	N/A
2**	2401.800	87.25	-10.75	54.0	33.25	AV	213.00	150	Horizontal	N/A
3	2510.000	47.02	-8.69	74.0	-26.98	Peak	49.00	150	Horizontal	Pass
3**	2510.000	45.82	-8.69	54.0	-8.18	AV	49.00	150	Horizontal	Pass
4	6917.800	53.26	4.62	74.0	-20.74	Peak	200.00	150	Horizontal	Pass
4**	6917.800	42.11	4.62	54.0	-11.89	AV	200.00	150	Horizontal	Pass
5	12664.901	50.53	19.06	74.0	-23.47	Peak	-1.00	150	Horizontal	Pass
5**	12664.901	39.05	19.06	54.0	-14.95	AV	-1.00	150	Horizontal	Pass
6	17332.199	57.12	24.09	74.0	-16.88	Peak	130.00	150	Horizontal	Pass
6**	17332.199	44.07	24.09	54.0	-9.93	AV	130.00	150	Horizontal	Pass

A.1.16 Multi-radio Co-location Antenna Vertical (GPRS 850 + BLE; 1 GHz – 18 GHz)



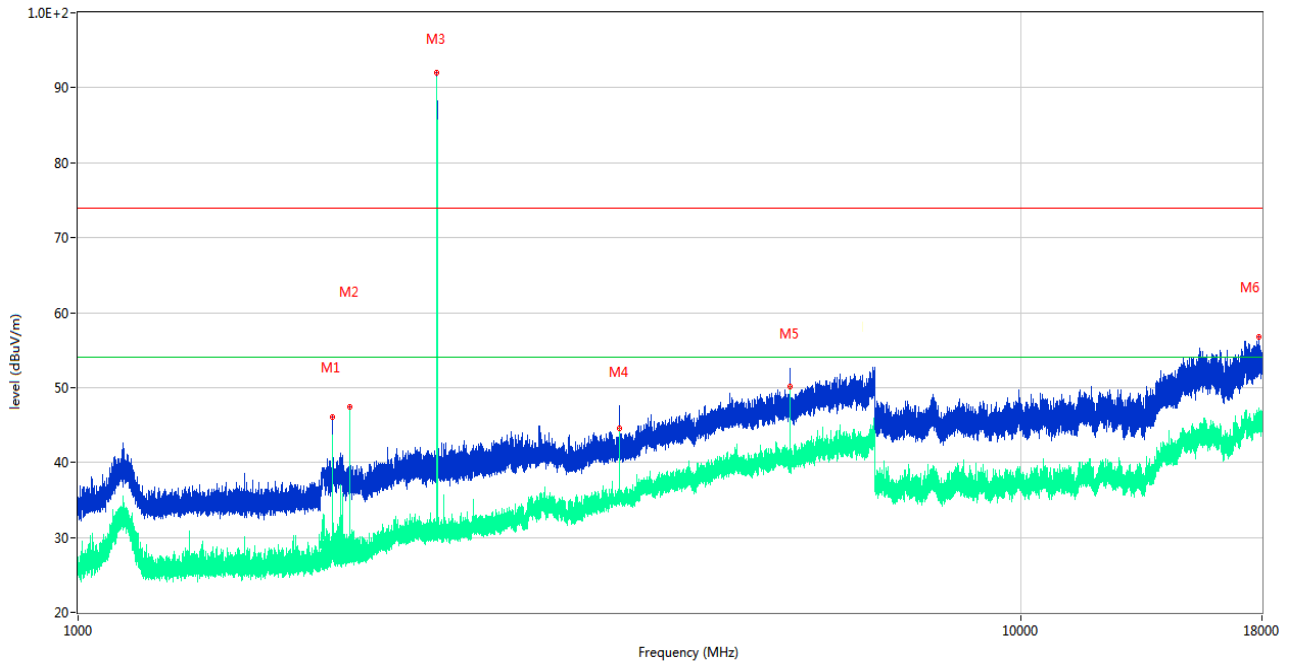
No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1673.300	47.32	-14.69	74.0	-26.68	Peak	360.00	150	Vertical	Pass
1**	1673.300	46.67	-14.69	54.0	-7.33	AV	360.00	150	Vertical	Pass
2	2402.300	92.08	-10.73	74.0	18.08	Peak	190.00	150	Vertical	N/A
2**	2402.300	90.44	-10.73	54.0	36.44	AV	190.00	150	Vertical	N/A
3	2509.800	49.67	-8.69	74.0	-24.33	Peak	346.00	150	Vertical	Pass
3**	2509.800	47.10	-8.69	54.0	-6.90	AV	346.00	150	Vertical	Pass
4	8032.125	49.31	18.23	74.0	-24.69	Peak	31.00	150	Vertical	Pass
4**	8032.125	38.05	18.23	54.0	-15.95	AV	31.00	150	Vertical	Pass
5	11547.963	49.74	19.69	74.0	-24.26	Peak	209.00	150	Vertical	Pass
5**	11547.963	39.11	19.69	54.0	-14.89	AV	209.00	150	Vertical	Pass
6	17240.588	57.14	24.21	74.0	-16.86	Peak	-2.00	150	Vertical	Pass
6**	17240.588	44.40	24.21	54.0	-9.60	AV	-2.00	150	Vertical	Pass

A.1.17 Multi-radio Co-location Antenna Horizontal (GPRS 1900 + BLE; 1 GHz – 18 GHz)



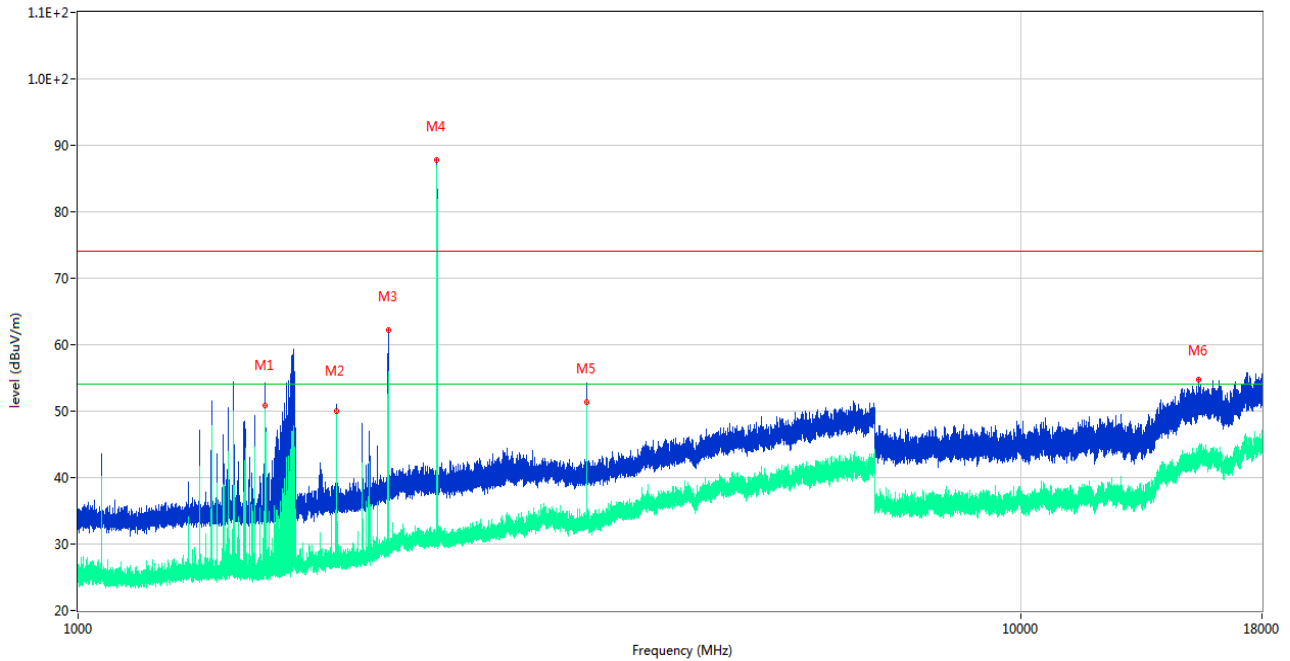
No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1880.000	43.65	-11.29	74.0	-30.35	Peak	70.00	150	Horizontal	N/A
1**	1880.000	42.20	-11.29	54.0	-11.80	AV	70.00	150	Horizontal	N/A
2	1960.100	45.89	-12.62	74.0	-28.11	Peak	166.00	150	Horizontal	N/A
2**	1960.100	45.35	-12.62	54.0	-8.65	AV	166.00	150	Horizontal	N/A
3	2401.700	89.55	-10.75	74.0	15.55	Peak	208.00	150	Horizontal	N/A
3**	2401.700	86.64	-10.75	54.0	32.64	AV	208.00	150	Horizontal	N/A
4	8536.688	48.73	18.19	74.0	-25.27	Peak	-1.00	150	Horizontal	Pass
4**	8536.688	37.36	18.19	54.0	-16.64	AV	-1.00	150	Horizontal	Pass
5	12364.750	50.25	19.58	74.0	-23.75	Peak	108.00	150	Horizontal	Pass
5**	12364.750	39.02	19.58	54.0	-14.98	AV	108.00	150	Horizontal	Pass
6	17852.738	56.77	24.14	74.0	-17.23	Peak	-2.00	150	Horizontal	Pass
6**	17852.738	45.22	24.14	54.0	-8.78	AV	-2.00	150	Horizontal	Pass

A.1.18 Multi-radio Co-location Antenna Vertical (GPRS 1900 + BLE; 1 GHz – 18 GHz)



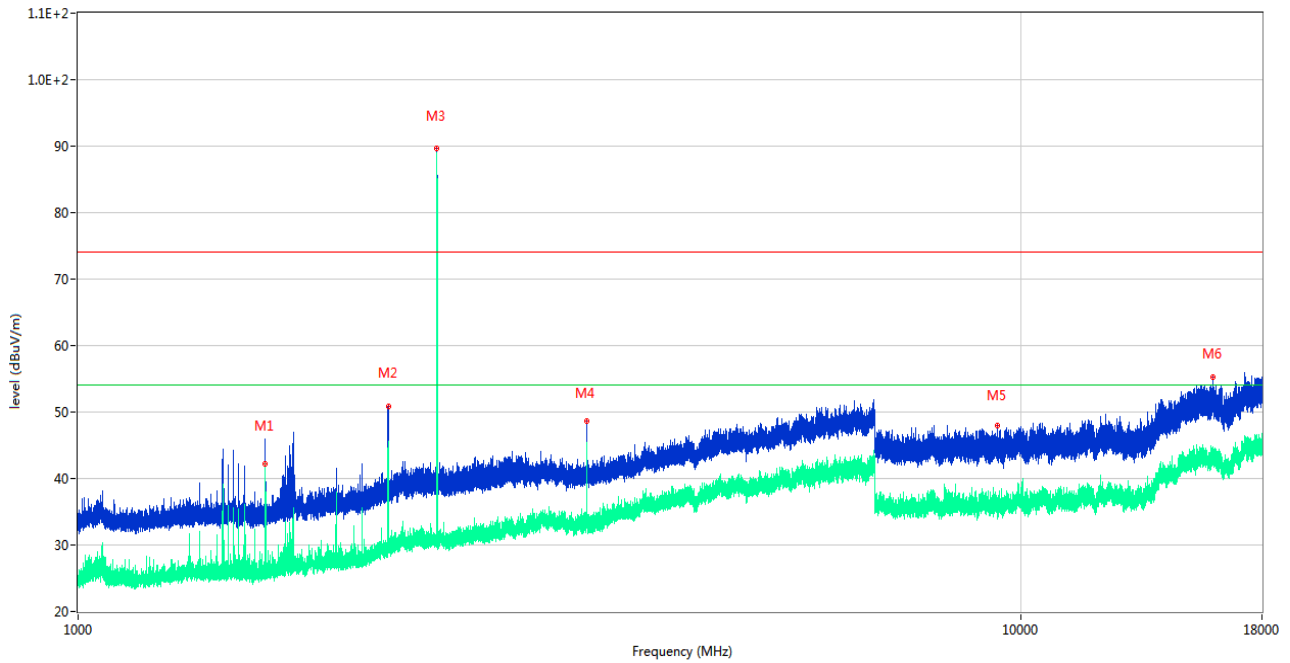
No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1880.100	45.62	-11.29	74.0	-28.38	Peak	361.00	150	Vertical	N/A
1**	1880.100	43.11	-11.29	54.0	-10.89	AV	361.00	150	Vertical	N/A
2	1959.900	46.98	-12.63	74.0	-27.02	Peak	118.00	150	Vertical	N/A
2**	1959.900	46.76	-12.63	54.0	-7.24	AV	118.00	150	Vertical	N/A
3	2401.700	92.06	-10.75	74.0	18.06	Peak	176.00	150	Vertical	N/A
3**	2401.700	89.95	-10.75	54.0	35.95	AV	176.00	150	Vertical	N/A
4	3760.000	47.12	-4.47	74.0	-26.88	Peak	283.00	150	Vertical	Pass
4**	3760.000	44.01	-4.47	54.0	-9.99	AV	283.00	150	Vertical	Pass
5	5640.200	52.86	0.08	74.0	-21.14	Peak	167.00	150	Vertical	Pass
5**	5640.200	50.02	0.08	54.0	-3.98	AV	167.00	150	Vertical	Pass
6	17874.000	56.77	24.37	74.0	-17.23	Peak	110.00	150	Vertical	Pass
6**	17874.000	45.90	24.37	54.0	-8.10	AV	110.00	150	Vertical	Pass

A.1.19 Multi-radio Co-location Antenna Horizontal (LTE-M1 Band 4 + BLE; 1 GHz – 18 GHz)



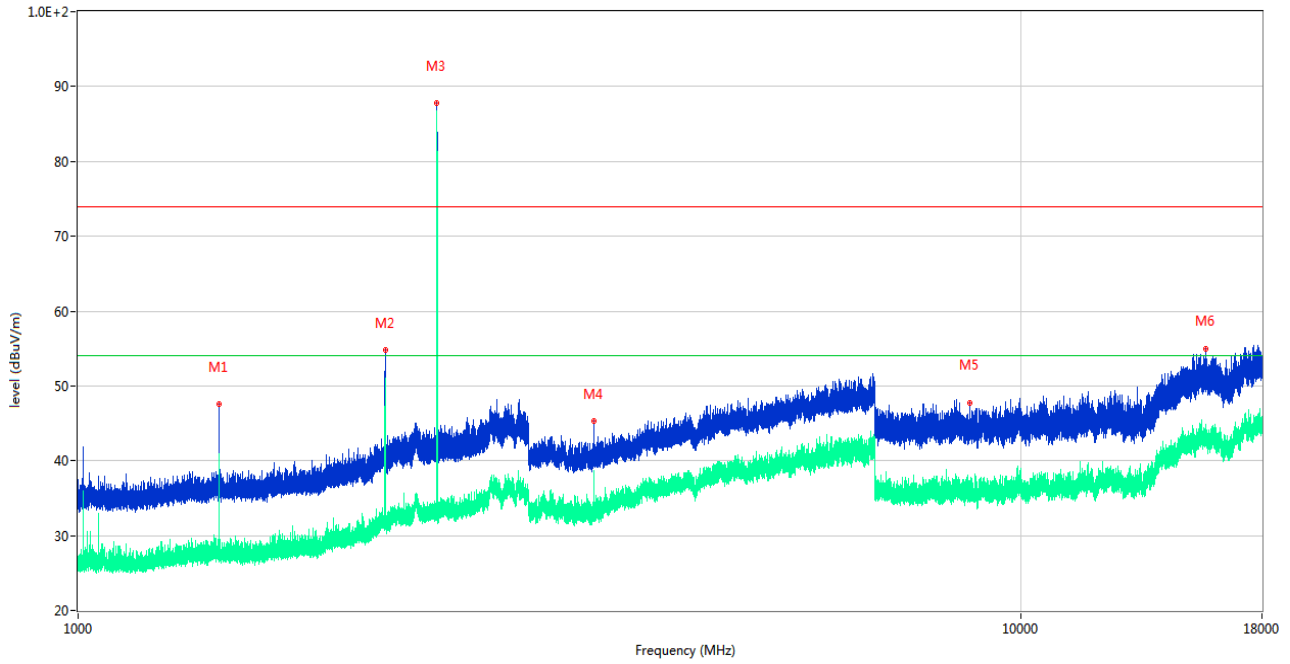
No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1579.800	53.29	-14.90	74.0	-20.71	Peak	82.00	150	Horizontal	Pass
1**	1579.800	50.80	-14.90	54.0	-3.20	AV	82.00	150	Horizontal	Pass
2	1880.600	50.17	-13.64	74.0	-23.83	Peak	241.00	150	Horizontal	Pass
2**	1880.600	47.28	-13.64	54.0	-6.72	AV	241.00	150	Horizontal	Pass
3	2134.100	62.18	-11.20	74.0	-11.82	Peak	158.00	150	Horizontal	N/A
3**	2134.100	51.23	-11.20	54.0	-2.77	AV	158.00	150	Horizontal	N/A
4	2401.700	87.87	-10.36	74.0	13.87	Peak	209.00	150	Horizontal	N/A
4**	2401.700	85.41	-10.36	54.0	31.41	AV	209.00	150	Horizontal	N/A
5	3460.800	52.72	-6.51	74.0	-21.28	Peak	51.00	150	Horizontal	Pass
5**	3460.800	51.29	-6.51	54.0	-3.02	AV	51.00	150	Horizontal	Pass
6	15412.275	54.79	23.02	74.0	-19.21	Peak	76.00	150	Horizontal	Pass
6**	15412.275	42.42	23.02	54.0	-11.58	AV	76.00	150	Horizontal	Pass

A.1.20 Multi-radio Co-location Antenna Vertical (LTE-M1 Band 4 + BLE; 1 GHz – 18 GHz)



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1580.000	45.96	-14.90	74.0	-28.04	Peak	139.00	150	Vertical	Pass
1**	1580.000	42.20	-14.90	54.0	-11.80	AV	139.00	150	Vertical	Pass
2	2134.800	50.90	-11.24	74.0	-23.10	Peak	220.00	150	Vertical	N/A
2**	2134.800	41.01	-11.24	54.0	-12.99	AV	220.00	150	Vertical	N/A
3	2402.200	89.58	-10.35	74.0	15.58	Peak	270.00	150	Vertical	N/A
3**	2402.200	88.22	-10.35	54.0	34.22	AV	270.00	150	Vertical	N/A
4	3460.400	48.63	-6.51	74.0	-25.37	Peak	208.00	150	Vertical	Pass
4**	3460.400	38.94	-6.51	54.0	-15.06	AV	208.00	150	Vertical	Pass
5	9437.712	47.92	17.44	74.0	-26.08	Peak	240.00	150	Vertical	Pass
5**	9437.712	34.57	17.44	54.0	-19.43	AV	240.00	150	Vertical	Pass
6	15960.901	55.32	23.99	74.0	-18.68	Peak	199.00	150	Vertical	Pass
6**	15960.901	43.35	23.99	54.0	-10.65	AV	199.00	150	Vertical	Pass

A.1.21 Multi-radio Co-location Antenna Horizontal (LTE-M1 Band 12 + BLE; 1 GHz – 18 GHz)



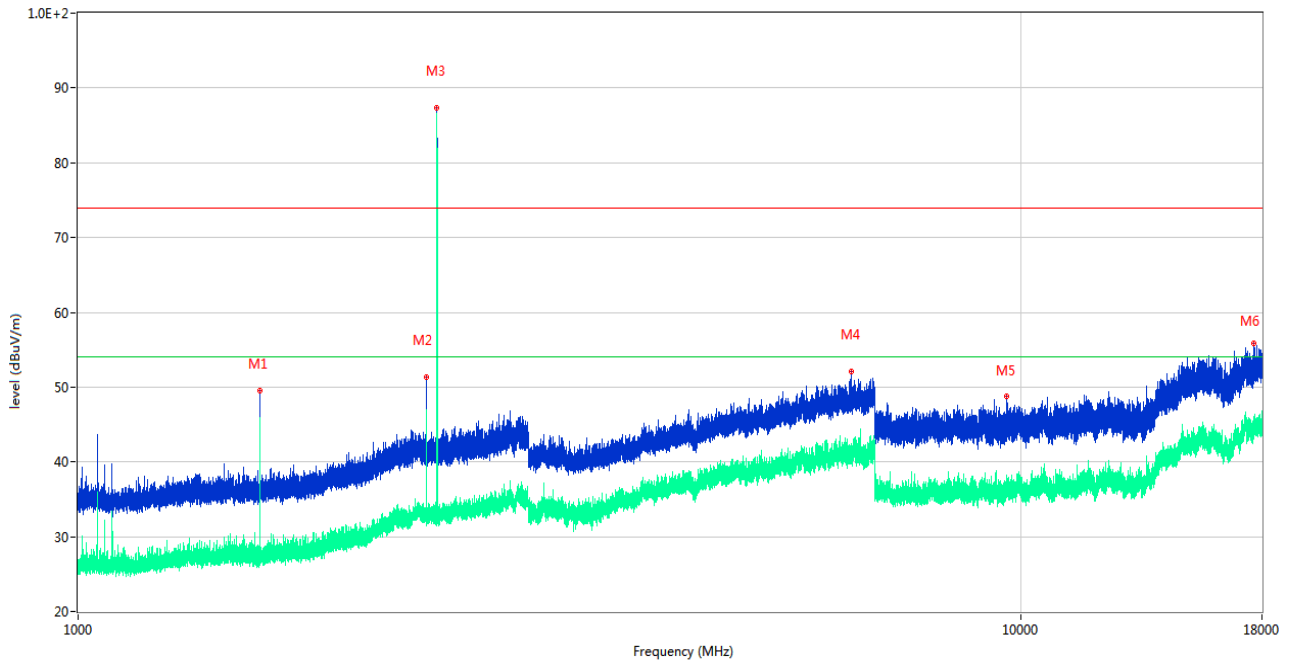
No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1410.500	47.56	-12.61	74.0	-26.44	Peak	99.00	150	Horizontal	Pass
1**	1410.500	39.14	-12.61	54.0	-14.86	AV	99.00	150	Horizontal	Pass
2	2115.900	54.76	-9.13	74.0	-19.24	Peak	105.00	150	Horizontal	Pass
2**	2115.900	48.99	-9.13	54.0	-5.01	AV	105.00	150	Horizontal	Pass
3	2401.700	87.73	-7.73	74.0	13.73	Peak	210.00	150	Horizontal	N/A
3**	2401.700	86.23	-7.73	54.0	32.23	AV	210.00	150	Horizontal	N/A
4	3526.600	45.32	-6.39	74.0	-28.68	Peak	339.00	150	Horizontal	Pass
4**	3526.600	35.57	-6.39	54.0	-18.43	AV	339.00	150	Horizontal	Pass
5	8823.900	47.74	17.33	74.0	-26.26	Peak	110.00	150	Horizontal	Pass
5**	8823.900	35.71	17.33	54.0	-18.29	AV	110.00	150	Horizontal	Pass
6	15687.900	54.97	23.58	74.0	-19.03	Peak	83.00	150	Horizontal	Pass
6**	15687.900	43.40	23.58	54.0	-10.60	AV	83.00	150	Horizontal	Pass

A.1.22 Multi-radio Co-location Antenna Vertical (LTE-M1 Band 12 + BLE; 1 GHz – 18 GHz)



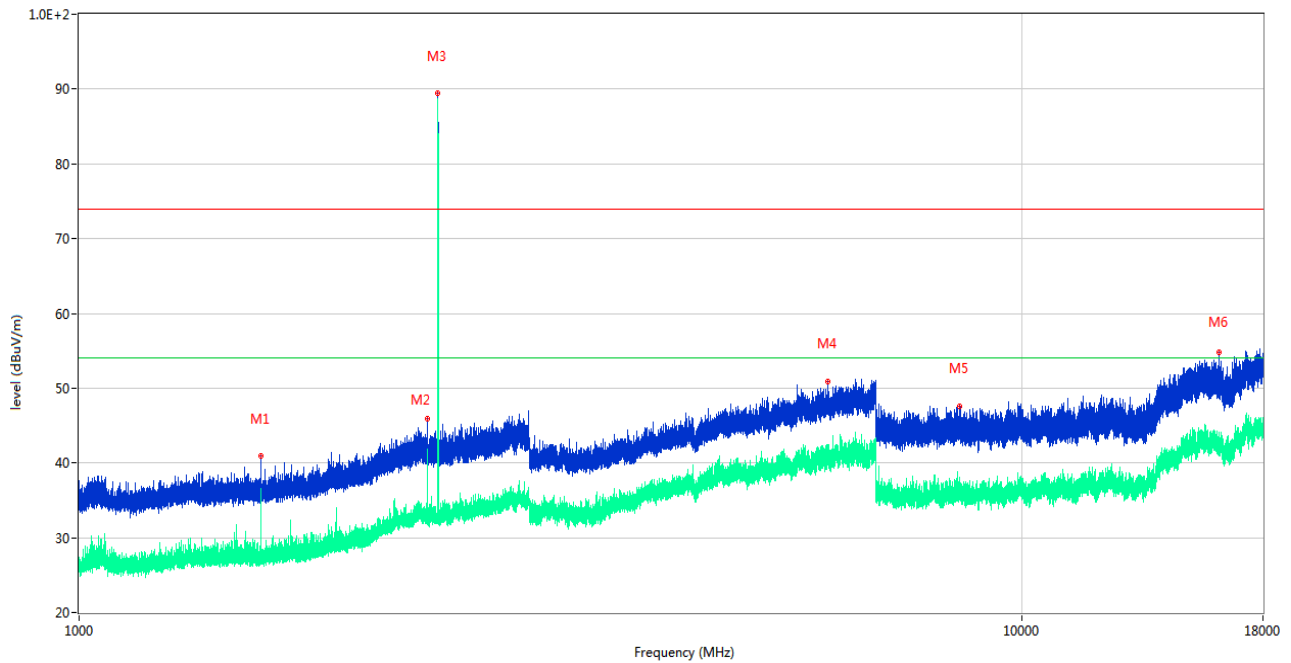
No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1410.400	43.09	-12.61	74.0	-30.91	Peak	35.00	150	Vertical	Pass
1**	1410.400	34.36	-12.61	54.0	-19.64	AV	35.00	150	Vertical	Pass
2	2115.800	46.37	-9.12	74.0	-27.63	Peak	93.00	150	Vertical	Pass
2**	2115.800	38.46	-9.12	54.0	-15.54	AV	93.00	150	Vertical	Pass
3	2401.800	89.41	-7.73	74.0	15.41	Peak	272.00	150	Vertical	N/A
3**	2401.800	87.78	-7.73	54.0	33.78	AV	272.00	150	Vertical	N/A
4	5791.400	50.71	0.96	74.0	-23.29	Peak	61.00	150	Vertical	Pass
4**	5791.400	40.46	0.96	54.0	-13.54	AV	61.00	150	Vertical	Pass
5	9070.287	47.88	18.17	74.0	-26.12	Peak	-2.00	150	Vertical	Pass
5**	9070.287	36.38	18.17	54.0	-17.62	AV	-2.00	150	Vertical	Pass
6	15701.026	54.02	23.57	74.0	-19.98	Peak	200.00	150	Vertical	Pass
6**	15701.026	42.44	23.57	54.0	-11.56	AV	200.00	150	Vertical	Pass

A.1.23 Multi-radio Co-location Antenna Horizontal (LTE-M1 Band 13 + BLE; 1 GHz – 18 GHz)



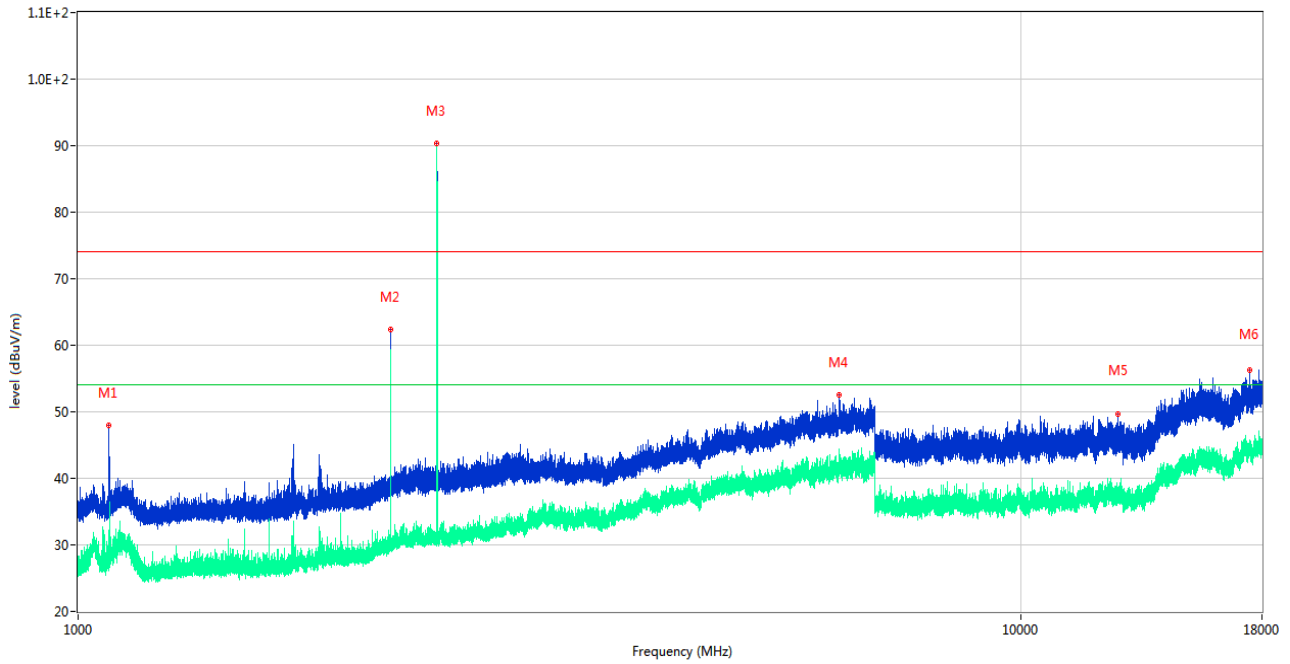
No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1559.800	49.56	-12.95	74.0	-24.44	Peak	72.00	100	Horizontal	Pass
1**	1559.800	45.26	-12.95	54.0	-8.74	AV	72.00	100	Horizontal	Pass
2	2339.500	51.26	-7.83	74.0	-22.74	Peak	98.00	100	Horizontal	Pass
2**	2339.500	46.87	-7.83	54.0	-7.13	AV	98.00	100	Horizontal	Pass
3	2401.700	87.41	-8.11	74.0	13.41	Peak	208.00	100	Horizontal	N/A
3**	2401.700	85.51	-8.11	54.0	31.51	AV	208.00	100	Horizontal	N/A
4	6611.000	52.09	3.63	74.0	-21.91	Peak	0.00	100	Horizontal	Pass
4**	6611.000	40.21	3.63	54.0	-13.79	AV	0.00	100	Horizontal	Pass
5	9638.963	48.71	18.94	74.0	-25.29	Peak	214.00	100	Horizontal	Pass
5**	9638.963	35.42	18.94	54.0	-18.58	AV	214.00	100	Horizontal	Pass
6	17664.262	55.81	24.28	74.0	-18.19	Peak	270.00	100	Horizontal	Pass
6**	17664.262	44.79	24.28	54.0	-9.21	AV	270.00	100	Horizontal	Pass

A.1.24 Multi-radio Co-location Antenna Vertical (LTE-M1 Band 13 + BLE; 1 GHz – 18 GHz)



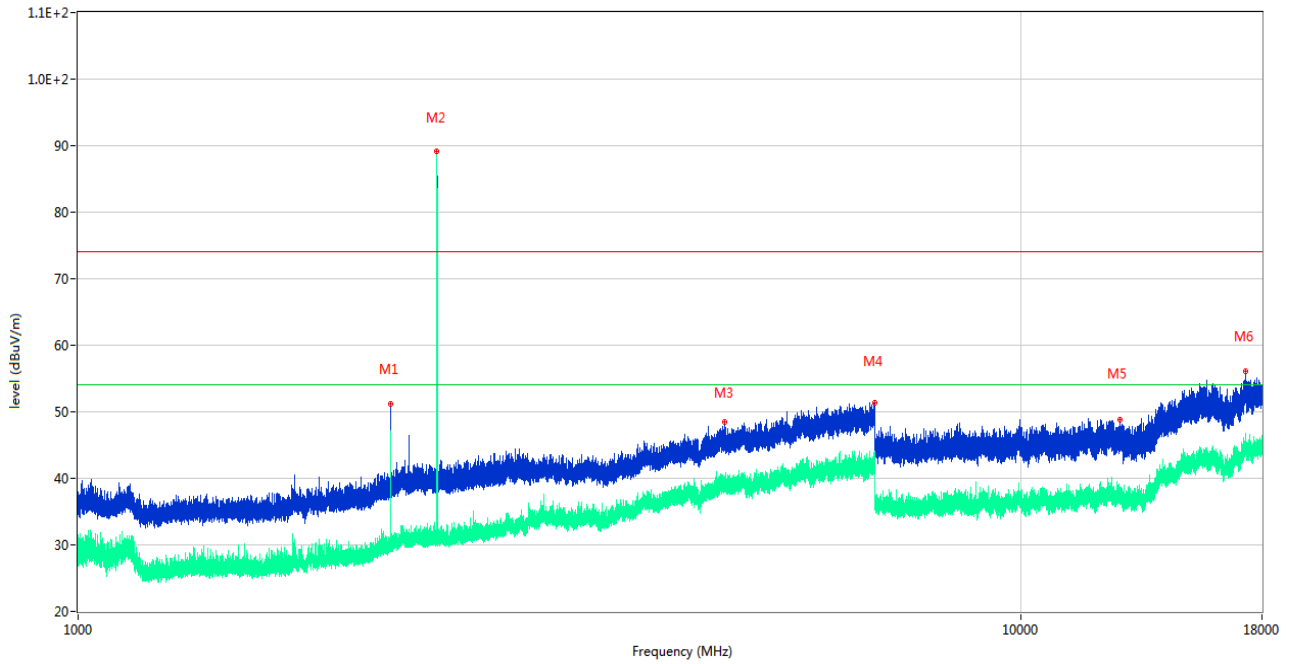
No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1559.700	40.94	-12.95	74.0	-33.06	Peak	320.00	150	Vertical	Pass
1**	1559.700	35.39	-12.95	54.0	-18.61	AV	320.00	150	Vertical	Pass
2	2339.600	45.98	-7.83	74.0	-28.02	Peak	102.00	150	Vertical	Pass
2**	2339.600	41.09	-7.83	54.0	-12.91	AV	102.00	150	Vertical	Pass
3	2402.200	89.41	-8.09	74.0	15.41	Peak	275.00	150	Vertical	N/A
3**	2402.200	88.29	-8.09	54.0	34.29	AV	275.00	150	Vertical	N/A
4	6222.600	50.96	3.30	74.0	-23.04	Peak	159.00	150	Vertical	Pass
4**	6222.600	40.39	3.30	54.0	-13.61	AV	159.00	150	Vertical	Pass
5	8577.800	47.52	18.32	74.0	-26.48	Peak	31.00	150	Vertical	Pass
5**	8577.800	36.35	18.32	54.0	-17.65	AV	31.00	150	Vertical	Pass
6	16161.974	54.77	23.83	74.0	-19.23	Peak	238.00	150	Vertical	Pass
6**	16161.974	41.40	23.83	54.0	-12.60	AV	238.00	150	Vertical	Pass

A.1.25 Multi-radio Co-location Antenna Horizontal (LTE NB-IoT Band 66 + BLE; 1 GHz – 18 GHz)



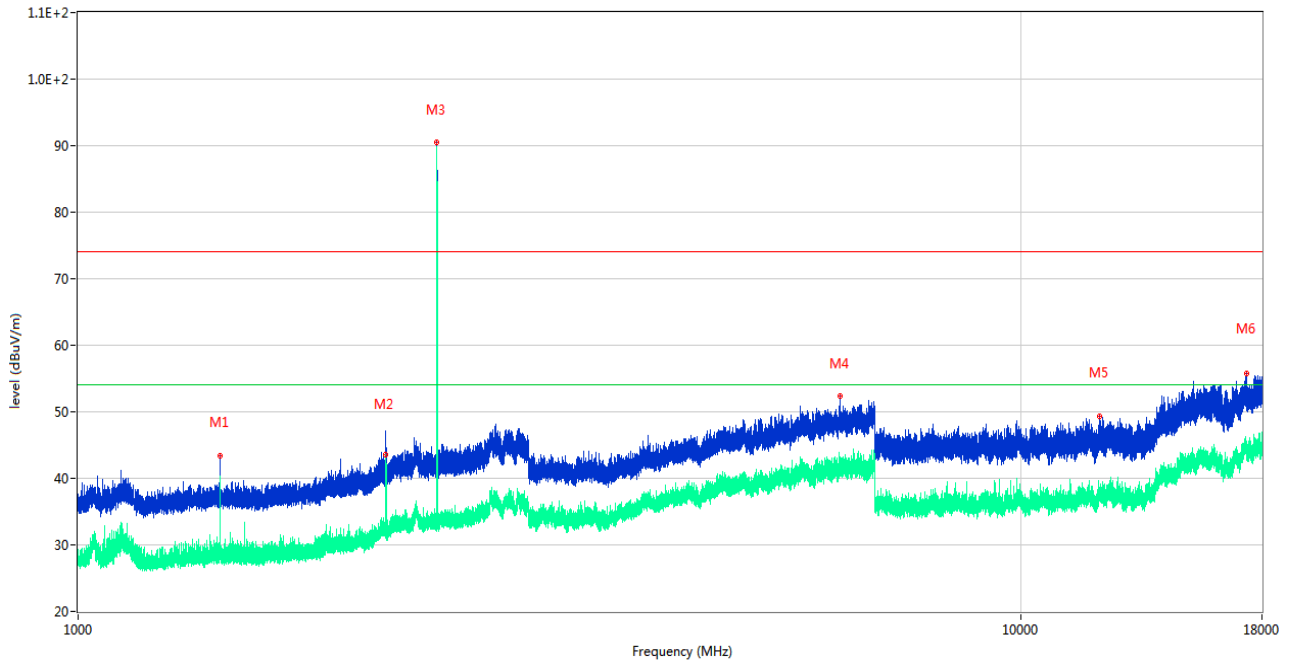
No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1079.000	48.02	-14.65	74.0	-25.98	Peak	222.00	150	Horizontal	Pass
1**	1079.000	27.95	-14.65	54.0	-26.05	AV	222.00	150	Horizontal	Pass
2	2145.000	62.34	-11.19	74.0	-11.66	Peak	116.00	150	Horizontal	N/A
2**	2145.000	58.57	-11.19	54.0	4.57	AV	116.00	150	Horizontal	N/A
3	2402.200	90.31	-10.35	74.0	16.31	Peak	194.00	150	Horizontal	N/A
3**	2402.200	89.25	-10.35	54.0	35.25	AV	194.00	150	Horizontal	N/A
4	6415.800	52.62	4.00	74.0	-21.38	Peak	318.00	150	Horizontal	Pass
4**	6415.800	42.01	4.00	54.0	-11.99	AV	318.00	150	Horizontal	Pass
5	12654.550	49.73	19.06	74.0	-24.27	Peak	191.00	150	Horizontal	Pass
5**	12654.550	36.74	19.06	54.0	-17.26	AV	191.00	150	Horizontal	Pass
6	17480.249	56.31	23.97	74.0	-17.69	Peak	85.00	150	Horizontal	Pass
6**	17480.249	44.71	23.97	54.0	-9.29	AV	85.00	150	Horizontal	Pass

A.1.26 Multi-radio Co-location Antenna Vertical (LTE NB-IoT Band 66 + BLE; 1 GHz – 18 GHz)



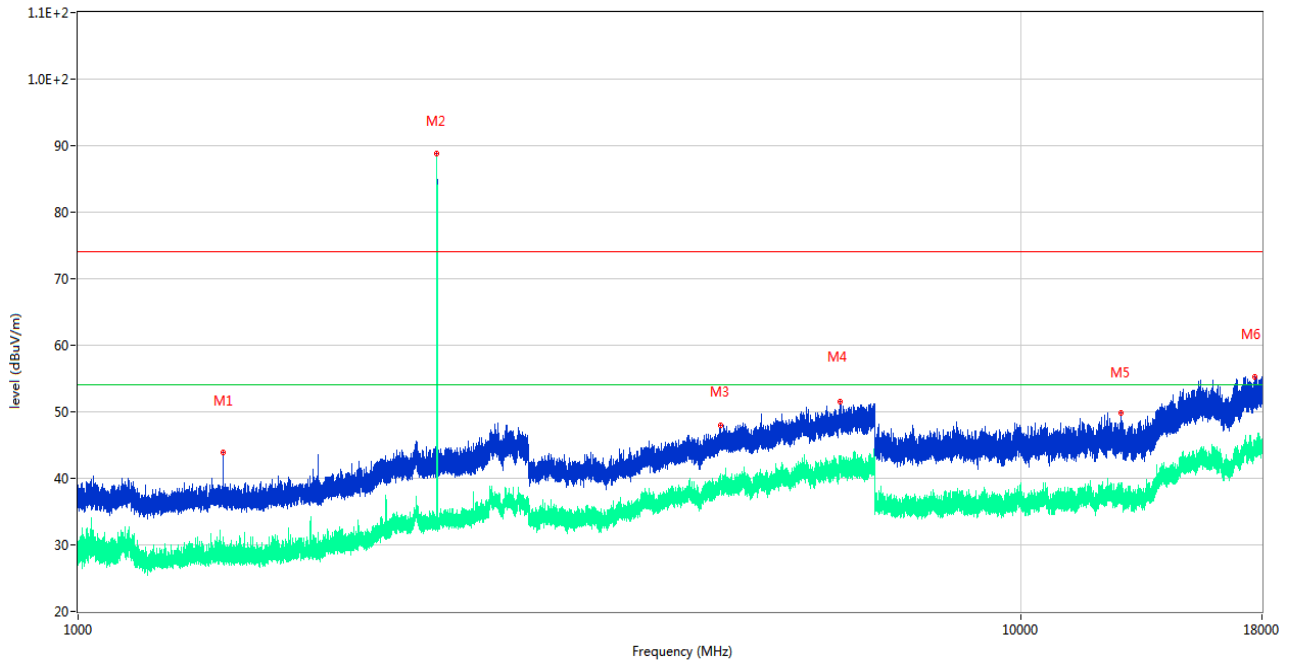
No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	2145.100	51.11	-11.19	74.0	-22.89	Peak	206.00	150	Vertical	Pass
1**	2145.100	45.92	-11.19	54.0	-8.08	AV	206.00	150	Vertical	Pass
2	2401.700	89.20	-10.36	74.0	15.20	Peak	164.00	150	Vertical	N/A
2**	2401.700	86.97	-10.36	54.0	32.97	AV	164.00	150	Vertical	N/A
3	4850.400	48.50	-1.32	74.0	-25.50	Peak	43.00	150	Vertical	Pass
3**	4850.400	38.19	-1.32	54.0	-15.81	AV	43.00	150	Vertical	Pass
4	6990.800	51.37	4.47	74.0	-22.63	Peak	134.00	150	Vertical	Pass
4**	6990.800	42.82	4.47	54.0	-11.18	AV	134.00	150	Vertical	Pass
5	12740.513	48.81	18.90	74.0	-25.19	Peak	-1.00	150	Vertical	Pass
5**	12740.513	37.57	18.90	54.0	-16.43	AV	-1.00	150	Vertical	Pass
6	17282.589	56.18	24.51	74.0	-17.82	Peak	177.00	150	Vertical	Pass
6**	17282.589	43.76	24.51	54.0	-10.24	AV	177.00	150	Vertical	Pass

A.1.27 Multi-radio Co-location Antenna Horizontal (LTE NB-IoT Band 85 + BLE; 1 GHz – 18 GHz)



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1413.700	43.31	-12.44	74.0	-30.69	Peak	81.00	150	Horizontal	Pass
1**	1413.700	38.65	-12.44	54.0	-15.35	AV	81.00	150	Horizontal	Pass
2	2120.700	47.18	-9.21	74.0	-26.82	Peak	100.00	150	Horizontal	Pass
2**	2120.700	43.48	-9.21	54.0	-10.52	AV	100.00	150	Horizontal	Pass
3	2402.300	90.42	-7.73	74.0	16.42	Peak	201.00	150	Horizontal	N/A
3**	2402.300	87.96	-7.73	54.0	33.96	AV	201.00	150	Horizontal	N/A
4	6426.600	52.30	3.49	74.0	-21.70	Peak	98.00	150	Horizontal	Pass
4**	6426.600	41.63	3.49	54.0	-12.37	AV	98.00	150	Horizontal	Pass
5	12120.662	49.40	19.64	74.0	-24.60	Peak	143.00	150	Horizontal	Pass
5**	12120.662	36.88	19.64	54.0	-17.12	AV	143.00	150	Horizontal	Pass
6	17320.651	55.79	24.31	74.0	-18.21	Peak	181.00	150	Horizontal	Pass
6**	17320.651	43.99	24.31	54.0	-10.01	AV	181.00	150	Horizontal	Pass

A.1.28 Multi-radio Co-location Antenna Vertical (LTE NB-IoT Band 85 + BLE; 1 GHz – 18 GHz)



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1424.200	43.91	-12.59	74.0	-30.09	Peak	202.00	150	Vertical	Pass
1**	1424.200	31.14	-12.59	54.0	-22.86	AV	202.00	150	Vertical	Pass
2	2401.700	88.77	-7.73	74.0	14.77	Peak	163.00	150	Vertical	N/A
2**	2401.700	87.32	-7.73	54.0	33.32	AV	163.00	150	Vertical	N/A
3	4794.400	47.98	-1.54	74.0	-26.02	Peak	360.00	150	Vertical	Pass
3**	4794.400	39.10	-1.54	54.0	-14.90	AV	360.00	150	Vertical	Pass
4	6422.000	51.51	3.85	74.0	-22.49	Peak	68.00	150	Vertical	Pass
4**	6422.000	42.12	3.85	54.0	-11.88	AV	68.00	150	Vertical	Pass
5	12772.050	49.80	18.94	74.0	-24.20	Peak	318.00	150	Vertical	Pass
5**	12772.050	36.42	18.94	54.0	-17.58	AV	318.00	150	Vertical	Pass
6	17674.238	55.19	24.39	74.0	-18.81	Peak	121.00	150	Vertical	Pass
6**	17674.238	44.97	24.39	54.0	-9.03	AV	121.00	150	Vertical	Pass

ANNEX B TEST SETUP PHOTOS

Please refer to the document “BL-SZ2140098-AE-2.PDF”.

ANNEX C EUT EXTERNAL PHOTOS

Please refer to the document “BL-SZ2140098-AW-2.PDF”.

ANNEX D EUT INTERNAL PHOTOS

Please refer to the document “BL-SZ2140098-AI-2.PDF”.

--END OF REPORT--