

FCC REPORT

For LTE Cat M

Report No.	CHTEW22050122	Report Verification:  Reported: CHTEW22050122
Project No.	SHT2204062801EW	
FCC ID.	2A3JW-SAPPHIRE	
Applicant	Eitan Medical Ltd.	
Address.....	29 Yad Haruzim St. P.O. Box 8639 Netanya 4250529, Israel	
Product Name	SappireConnect	
Trade Mark	Sapphire Connect	
Model No.	SappireConnect	
Listed Model(s)	-	
Standard	FCC CFR Title 47 Part 2 FCC CFR Title 47 Part 24 FCC CFR Title 47 Part 27	
Date of receipt of test sample.....	Apr. 22, 2022	
Date of testing.....	Apr. 23, 2022- May. 19, 2022	
Date of issue.....	May. 20, 2022	
Result.....	Pass	

Compiled by
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Supervised by
(position+printedname+signature): Project Engineer Aaron Fang



Approved by
(position+printedname+signature): Manager Hans Hu



Testing Laboratory Name : **Shenzhen Huatongwei International Inspection Co., Ltd.**

Address.....: 1/F, Bldg 3, Hongfa Hi-tech Industrial Park, Genyu Road, Tianliao, Gongming, Shenzhen, China

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The test report merely correspond to the test sample.

Contents

<u>1. TEST STANDARDS AND REPORT VERSION</u>	<u>3</u>
1.1. Applicable Standards	3
1.2. Report version information	3
<u>2. TEST DESCRIPTION</u>	<u>4</u>
<u>3. SUMMARY</u>	<u>5</u>
3.1. Client Information	5
3.2. Product Description	5
3.3. Radio Specification Description	5
3.4. Testing Laboratory Information	7
<u>4. TEST CONFIGURATION</u>	<u>8</u>
4.1. Test frequency list	8
4.2. Descriptions of Test mode	9
4.3. Test sample information	10
4.4. Support unit used in test configuration and system	10
4.5. Testing environmental condition	10
4.6. Statement of the measurement uncertainty	11
4.7. Equipments Used during the Test	12
<u>5. TEST CONDITIONS AND RESULTS</u>	<u>13</u>
5.1. Radiated Spurious Emission	13
<u>6. TEST SETUP PHOTOS OF THE EUT</u>	<u>24</u>
<u>7. EXTERNAL AND INTERNAL PHOTOS OF THE EUT</u>	<u>24</u>

1. **TEST STANDARDS AND REPORT VERSION**

1.1. **Applicable Standards**

The tests were performed according to following standards:

[FCC Rules Part 2](#): FREQUENCY ALLOCATIONS AND RADIO TREATY MATTERS; GENERAL RULES AND REGULATIONS

[FCC Rules Part 24](#): PERSONAL COMMUNICATIONS SERVICES

[FCC Rules Part 27](#): MISCELLANEOUS WIRELESS COMMUNICATIONS SERVICES

[ANSI C63.26: 2015](#): American National Standard for Compliance Testing of Transmitters Used in Licensed Radio Services

[KDB 971168 D01 Power Meas License Digital Systems v03](#): MEASUREMENT GUIDANCE FOR CERTIFICATION OF LICENSED DIGITAL TRANSMITTERS

1.2. **Report version information**

Revision No.	Date of issue	Description
N/A	2022-05-20	Original

2. TEST DESCRIPTION

Section	Test Item	Section in CFR 47	Result ^{#1}	Test Engineer
	Conducted Output Power	Part 2.1046 Part 24.232(c) Part 27.50	Pass*	N/A
	Peak-to-Average Ratio	Part 24.232 Part 27.50	Pass*	N/A
	99% Occupied Bandwidth & 26 dB Bandwidth	Part 2.1049 Part 24.238(b) Part 27.53	Pass*	N/A
	Band Edge	Part 2.1051 Part 24.238 Part 27.53	Pass*	N/A
	Conducted Spurious Emissions	Part 2.1051 Part 24.238 Part 27.53	Pass*	N/A
	Frequency stability vs temperature	Part 2.1055(a)(1)(b) Part 24.235 Part 27.54	Pass*	N/A
	Frequency stability vs voltage	Part 2.1055(d)(1)(2) Part 24.235 Part 27.54	Pass*	N/A
	ERP and EIRP	Part 24.232(b) Part 27.50	Pass*	Pan Xie
5.1	Radiated Spurious Emissions	Part 2.1053 Part 24.238 Part 27.53	Pass	Pan Xie

Note:

- 1) #1: The test result does not include measurement uncertainty value
- 2) *: Refer to the module report which report No. is R2005A0283-R2V1 and R2005A0283-R4V1.
- 3) This device has installed a certified modular which FCC ID is XMR202005BG95M5, so these conducted test data directly reference the modular's data.
- 4) In this device, LTE Cat M band 5, 13, 25, 26, 66, 85 are shielded by software, only use band 2, 4, 12.

3. SUMMARY

3.1. Client Information

Applicant:	Eitan Medical Ltd.
Address:	29 Yad Haruzim St. P.O. Box 8639 Netanya 4250529, Israel
Manufacturer:	Eitan Medical Ltd.
Address:	29 Yad Haruzim St. P.O. Box 8639 Netanya 4250529, Israel

3.2. Product Description

Main unit information:	
Product Name:	SappireConnect
Trade Mark:	SappireConnect
Model No.:	SappireConnect
Listed Model(s):	-
Power supply:	DC 3.7V from Battery
Hardware version:	1
Software version:	16
Accessory unit information:	
Battery information:	3.7Vdc, 850mAh
Adapter information:	Model: FW8000M/05 Input: AC100-240V, 50/60Hz, 300-150mA Output: 5.0Vdc, 2200mA

3.3. Radio Specification Description

Support LTE type:	<input checked="" type="checkbox"/> Cat M1 <input type="checkbox"/> Cat M2							
Support Operating Band:	<input checked="" type="checkbox"/> FDD Band 2			<input checked="" type="checkbox"/> FDD Band 4		<input checked="" type="checkbox"/> FDD Band 12		
Operating Frequency Range:	Please refer to note #2							
Channel bandwidth:	Please refer to note #3							
Maximum RB:	Cat M1							
	1.4MHz	3MHz	5MHz	10MHz	15MHz	20MHz		
	6	6	6	6	6	6		
Cat M2								
	1.4MHz	3MHz	5MHz	10MHz	15MHz	20MHz		
	6	12	24	24	24	24		
Uplink Modulation type:	<input checked="" type="checkbox"/> QPSK <input checked="" type="checkbox"/> 16QAM <input type="checkbox"/> 64QAM <input type="checkbox"/> 256QAM							
Downlink Modulation type:	<input checked="" type="checkbox"/> QPSK <input checked="" type="checkbox"/> 16QAM <input type="checkbox"/> 64QAM <input type="checkbox"/> 256QAM							

Antenna type:	SMD Antenna
Antenna gain ^{#4} :	Band 2:3.5dBi; Band 4:3.5dBi; Band 12:0.4dBi;

Note:

- : means that this feature is supported; : means that this feature is not supported
- #2: Operating frequency range is as follow:

LTE Band	Uplink frequency	Downlink frequency
FDD Band 2	1850.7 – 1909.3 MHz	1930.7 – 1989.3 MHz
FDD Band 4	1710.7 – 1754.3 MHz	2110.7 – 2154.3 MHz
FDD Band 12	699.7 – 715.3 MHz	729.7 – 745.3 MHz

- Supported channel bandwidth is as follow:

LTE Band	1.4MHz	3MHz	5MHz	10MHz	15MHz	20MHz
FDD Band 2	√	√	√	√	√	√
FDD Band 4	√	√	√	√	√	√
FDD Band 12	√	√	√	√	-	-

√: means that this feature is supported; -: means that this feature is not supported

- #4: The antenna gain is provided by the applicant, and the applicant should be responsible for its authenticity, HTW lab has not verified the authenticity of its information

3.4. Testing Laboratory Information

Laboratory Name	Shenzhen Huatongwei International Inspection Co., Ltd.	
Laboratory Location	1/F, Bldg 3, Hongfa Hi-tech Industrial Park, Genyu Road, Tianliao, Gongming, Shenzhen, China	
Connect information:	<p>Tel: 86-755-26715499 E-mail: cs@szhtw.com.cn http://www.szhtw.com.cn</p>	
Qualifications	Type	Accreditation Number
	FCC	762235

4. TEST CONFIGURATION

4.1. Test frequency list

FDD Band 2	Test Frequency ID	Bandwidth [MHz]	N _{UL}	Frequency of Uplink [MHz]	N _{DL}	Frequency of Downlink [MHz]
	1.4	18607	1850.7	607	1930.7	
	3	18615	1851.5	615	1931.5	
	5	18625	1852.5	625	1932.5	
	10	18650	1855	650	1935	
	15 ^[1]	18675	1857.5	675	1937.5	
	20 ^[1]	18700	1860	700	1940	
	1.4/3/5/10 15 ^[1] /20 ^[1]	18900	1880	900	1960	
	1.4	19193	1909.3	1193	1989.3	
	3	19185	1908.5	1185	1988.5	
	5	19175	1907.5	1175	1987.5	
	10	19150	1905	1150	1985	
	15 ^[1]	19125	1902.5	1125	1982.5	
	20 ^[1]	19100	1900	1100	1980	
NOTE 1: Bandwidth for which a relaxation of the specified UE receiver sensitivity requirement (TS 36.101 [27] Clause 7.3) is allowed.						
FDD Band 4	Test Frequency ID	Bandwidth [MHz]	N _{UL}	Frequency of Uplink [MHz]	N _{DL}	Frequency of Downlink [MHz]
	1.4	19957	1710.7	1957	2110.7	
	3	19965	1711.5	1965	2111.5	
	5	19975	1712.5	1975	2112.5	
	10	20000	1715	2000	2115	
	15	20025	1717.5	2025	2117.5	
	20	20050	1720	2050	2120	
	1.4/3/5/10/15/20	20175	1732.5	2175	2132.5	
	1.4	20393	1754.3	2393	2154.3	
	3	20385	1753.5	2385	2153.5	
FDD Band 12	5	20375	1752.5	2375	2152.5	
	10	20350	1750	2350	2150	
	15	20325	1747.5	2325	2147.5	
	20	20300	1745	2300	2145	
	Table 4.3.1.1.12-1: Test frequencies for E-UTRA channel bandwidth for operating band 12					
	Test Frequency ID	Bandwidth [MHz]	N _{UL}	Frequency of Uplink [MHz]	N _{DL}	Frequency of Downlink [MHz]
	1.4	23017	699.7	5017	729.7	
	3	23025	700.5	5025	730.5	
	5 ^[1]	23035	701.5	5035	731.5	
	10 ^[1]	23060	704	5060	734	
	1.4/3 5 ^[1] /10 ^[1]	23095	707.5	5095	737.5	
	1.4	23173	715.3	5173	745.3	
	3	23165	714.5	5165	744.5	
	5 ^[1]	23155	713.5	5155	743.5	
	10 ^[1]	23130	711	5130	741	
NOTE 1: Bandwidth for which a relaxation of the specified UE receiver sensitivity requirement (TS 36.101 [27] Clause 7.3) is allowed.						

4.2. Descriptions of Test mode

Antenna port conducted and radiated test items were performed according to KDB 971168 D01 Power Meas. License Digital Systems and ANSI C63.26 with maximum output power.

Radiated measurements were performed with rotating EUT in different three orthogonal test planes to find the maximum emission.

Test configuration is as follow:

Test Items	Bandwidth	Modulation	RB #		
			1	Half	Full
Conducted Output Power	#5	#6	○	○	○
Peak-to-Average Ratio	#5	#6	○	-	○
99% Occupied Bandwidth & 26 dB Bandwidth	#5	#6	-	-	○
Band Edge	#5	#6	○	-	○
Conducted Spurious Emission	#5	#6	○	-	-
Frequency Stability	#5	#6	-	-	○
ERP and EIRP	#5	#6	○	○	○
Radiated Spurious Emission	#5	#6	○	-	-

Note:

- #5: Test all kind of bandwidth in section 3.3
- #6: Test all kind of uplink modulation in section 3.3
- ○: means that this configuration is chosen for testing
- -: means that this configuration is not test.
- The device is investigated from 30MHz to 10 times off fundamental signal for radiated spurious emission test under different bandwidth, modulations and RB size/offset in exploratory test. Subsequently, only the worst case emissions (highest bandwidth, QPSK, and 1RB0) are reported.

4.3. Test sample information

Test item	HTW sample no.
Radiated test items	YPHT22040628004

Note:

Radiated test items: ERP and EIRP, Radiated Spurious Emission

4.4. Support unit used in test configuration and system

The EUT has been associated with peripherals and configuration operated in a manner tended to maximize its emission characteristics in a typical application.

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

Whether support unit is used?				
<input checked="" type="checkbox"/> No				
Item	Equipment	Trade Name	Model No.	Other
1				
2				

4.5. Testing environmental condition

Voltage	VN=Nominal Voltage	DC 3.7V
	VL=Lower Voltage	DC 3.33V
	VH=Higher Voltage	DC 4.07V
Temperature	TN=Normal Temperature	25 °C
	Extreme Temperature	From -30°C to + 50°C
Humidity	30~60 %	
Air Pressure	950-1050 hPa	

4.6. Statement of the measurement uncertainty

Test Items	Measurement Uncertainty
Radio frequency	<1GHz: 0.022ppm >1GHz: 0.64ppm
Conducted output power	0.65 dB
ERP and EIRP	0.65 dB
Conducted spurious emission	0.65 dB
Radiated spurious emission	<1GHz: 2.85dB >1GHz: 3.66dB
99% Occupied Bandwidth & 26 dB Bandwidth	<1GHz: 0.022ppm >1GHz: 0.64ppm

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k=1.96$.

4.7. Equipments Used during the Test

● Radiated Spurious Emission							
Used	Test Equipment	Manufacturer	Equipment No.	Model No.	Serial No.	Last Cal. Date (YY-MM-DD)	Next Cal. Date (YY-MM-DD)
●	Semi-Anechoic Chamber	Albatross projects	HTWE0122	SAC-3m-01	N/A	2018/09/27	2022/09/26
●	Spectrum Analyzer	R&S	HTWE0098	FSP40	100597	2021/09/13	2022/09/12
●	Loop Antenna	R&S	HTWE0170	HFH2-Z2	100020	2021/04/06	2024/04/05
●	Broadband Horn Antenna	SCHWARZBECK	HTWE0103	BBHA9170	BBHA9170472	2020/04/27	2023/04/26
●	Ultra-Broadband Antenna	SCHWARZBECK	HTWE0123	VULB9163	538	2021/04/06	2024/04/05
●	Horn Antenna	SCHWARZBECK	HTWE0126	9120D	1011	2020/04/01	2023/03/31
●	Pre-amplifier	CD	HTWE0071	PAP-0102	12004	2021/11/05	2022/11/04
●	Broadband Preamplifier	SCHWARZBECK	HTWE0201	BBV 9718	9718-248	2022/02/28	2023/02/27
●	RF Connection Cable	HUBER+SUHNER	HTWE0120-01	6m 18GHz S Serisa	N/A	2022/02/25	2023/02/24
●	RF Connection Cable	HUBER+SUHNER	HTWE0120-02	6m 3GHz RG Serisa	N/A	2022/02/25	2023/02/24
●	RF Connection Cable	HUBER+SUHNER	HTWE0120-03	6m 3GHz RG Serisa	N/A	2022/02/25	2023/02/24
●	RF Connection Cable	HUBER+SUHNER	HTWE0120-04	6m 3GHz RG Serisa	N/A	2022/02/25	2023/02/24
●	RF Connection Cable	HUBER+SUHNER	HTWE0121-01	6m 18GHz S Serisa	N/A	2022/02/25	2023/02/24
●	EMI Test Software	Audix	N/A	E3	N/A	N/A	N/A

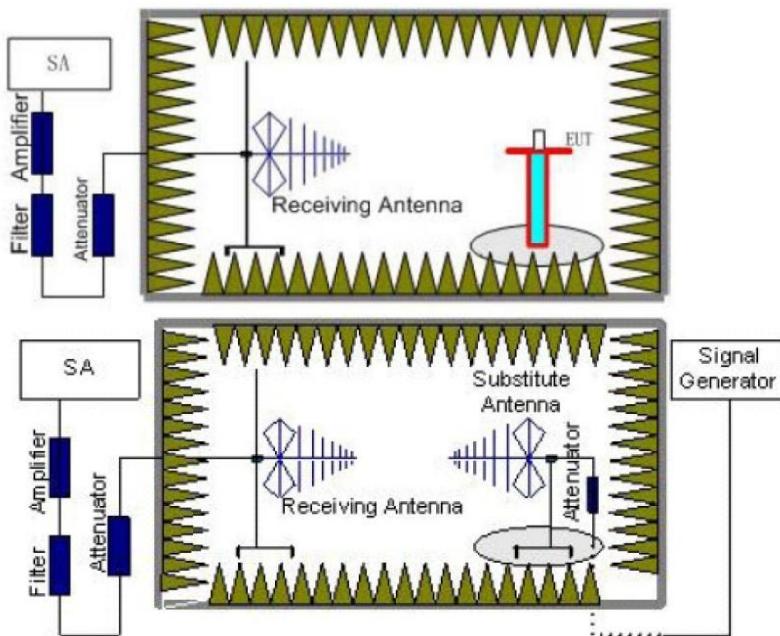
5. TEST CONDITIONS AND RESULTS

5.1. Radiated Spurious Emission

LIMIT

LTE Band 2/4/12: -13dBm

TEST CONFIGURATION



TEST PROCEDURE

1. Place the EUT in the center of the turntable.
 - a) For radiated emissions measurements performed at frequencies less than or equal to 1 GHz, the EUT shall be placed on a RF-transparent table at a nominal height of 80 cm above the reference ground plane
 - b) For radiated measurements performed at frequencies above 1 GHz, the EUT shall be placed on an RF transparent table at a nominal height of 1.5 m above the ground plane.
2. Unless the EUT uses an integral antenna, the EUT shall be terminated with a non-radiating transmitter load. In cases where the EUT uses an adjustable antenna, the antenna shall be adjusted through typical positions and lengths to maximize emissions levels.
3. The EUT shall be tested while operating on the frequency per manufacturer specification. Set the transmitter to operate in continuous transmit mode.
4. Receiver or Spectrum set as follow:

Below 1GHz, RBW=100kHz, VBW=300kHz, Detector=Peak, Sweep time=Auto

Above 1GHz, RBW=1MHz, VBW=3MHz, Detector=Peak, Sweep time=Auto
5. Each emission under consideration shall be evaluated:
 - a) Raise and lower the measurement antenna from 1 m to 4 m, as necessary to enable detection of the maximum emission amplitude relative to measurement antenna height.
 - b) Rotate the EUT through 360° to determine the maximum emission level relative to the axial position.
 - c) Return the turntable to the azimuth where the highest emission amplitude level was observed.
 - d) Vary the measurement antenna height again through 1 m to 4 m again to find the height associated with the maximum emission amplitude.
 - e) Record the measured emission amplitude level and frequency

6. Repeat step 5 for each emission frequency with the measurement antenna oriented in both the horizontal and vertical polarizations to determine the orientation that gives the maximum emissions amplitude.
7. Set-up the substitution measurement with the reference point of the substitution antenna located as near as possible to where the center of the EUT radiating element was located during the initial EUT measurement.
8. Maintain the previous measurement instrument settings and test set-up, with the exception that the EUT is removed and replaced by the substitution antenna.
9. Connect a signal generator to the substitution antenna; locate the signal generator so as to minimize any potential influences on the measurement results. Set the signal generator to the frequency where emissions are detected, and set an output power level such that the radiated signal can be detected by the measurement instrument, with sufficient dynamic range relative to the noise floor.
10. For each emission that was detected and measured in the initial test
 - a) Vary the measurement antenna height between 1 m to 4 m to maximize the received (measured) signal amplitude.
 - b) Adjust the signal generator output power level until the amplitude detected by the measurement instrument equals the amplitude level of the emission previously measured directly in step 5 and step 6.
 - c) Record the output power level of the signal generator when equivalence is achieved in step b).
11. Repeat step 8 through step 10 with the measurement antenna oriented in the opposite polarization.
12. Calculate the emission power in dBm referenced to a half-wave dipole using the following equation:
$$Pe = Ps(dBm) - \text{cable loss (dB)} + \text{antenna gain (dBd)}$$
where
 Pe = equivalent emission power in dBm
 Ps = source (signal generator) power in dBm
NOTE—dBd refers to the measured antenna gain in decibels relative to a half-wave dipole.
13. Correct the antenna gain of the substitution antenna if necessary to reference the emission power to a half-wave dipole. When using measurement antennas with the gain specified in dBi, the equivalent dipole-referenced gain can be determined from:
$$\text{gain (dBd)} = \text{gain (dBi)} - 2.15 \text{ dB}.$$
If necessary, the antenna gain can be calculated from calibrated antenna factor information
14. Provide the complete measurement results as a part of the test report.

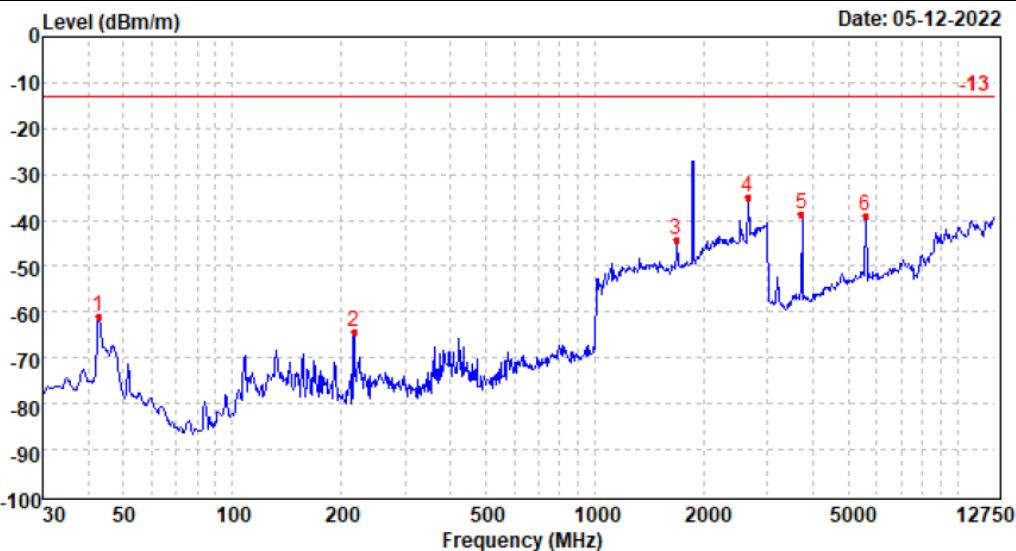
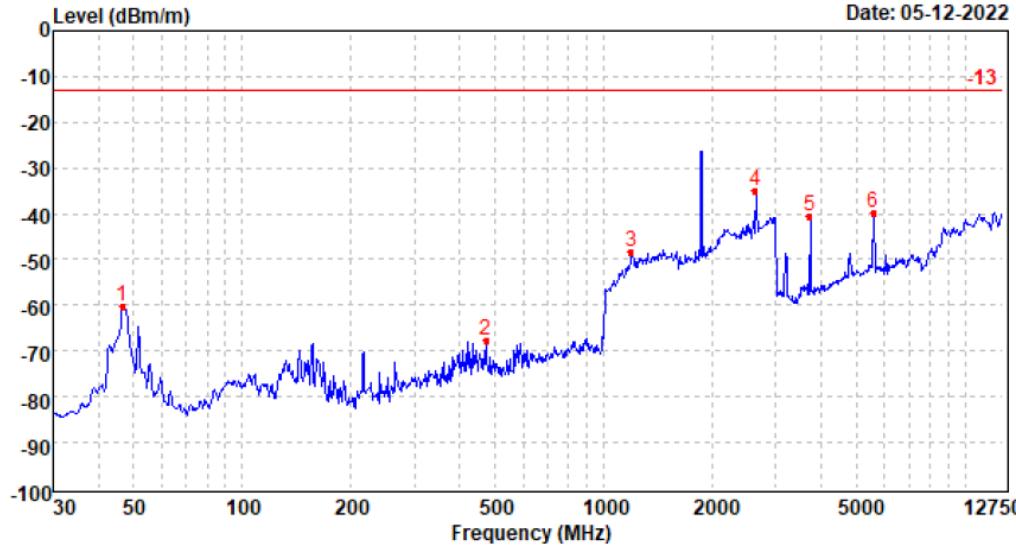
TEST MODE:

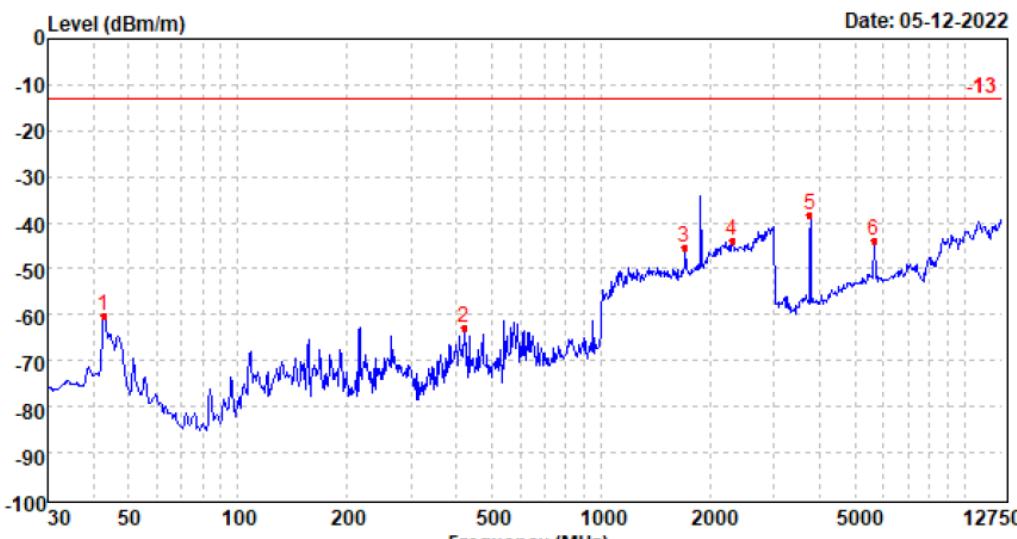
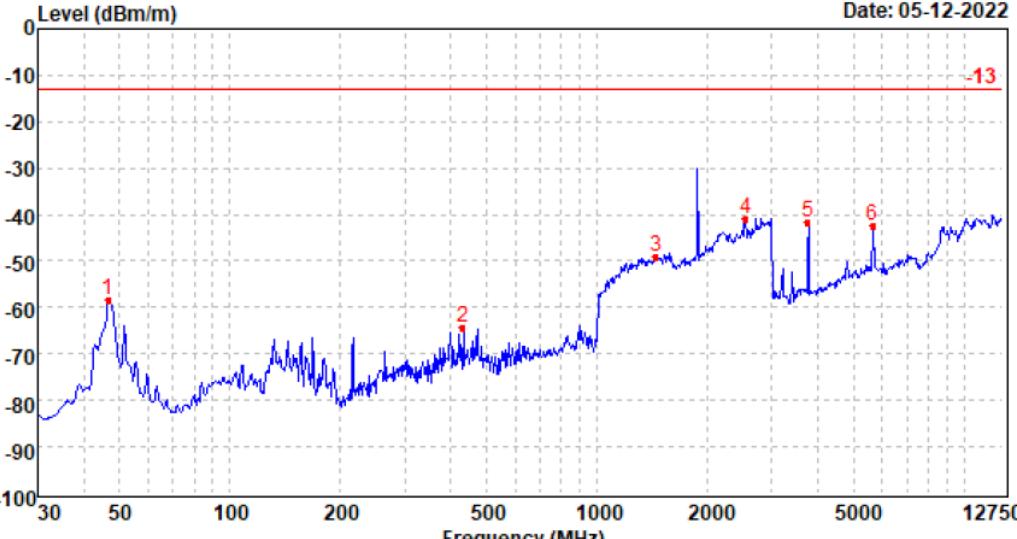
Please refer to the clause 4.2

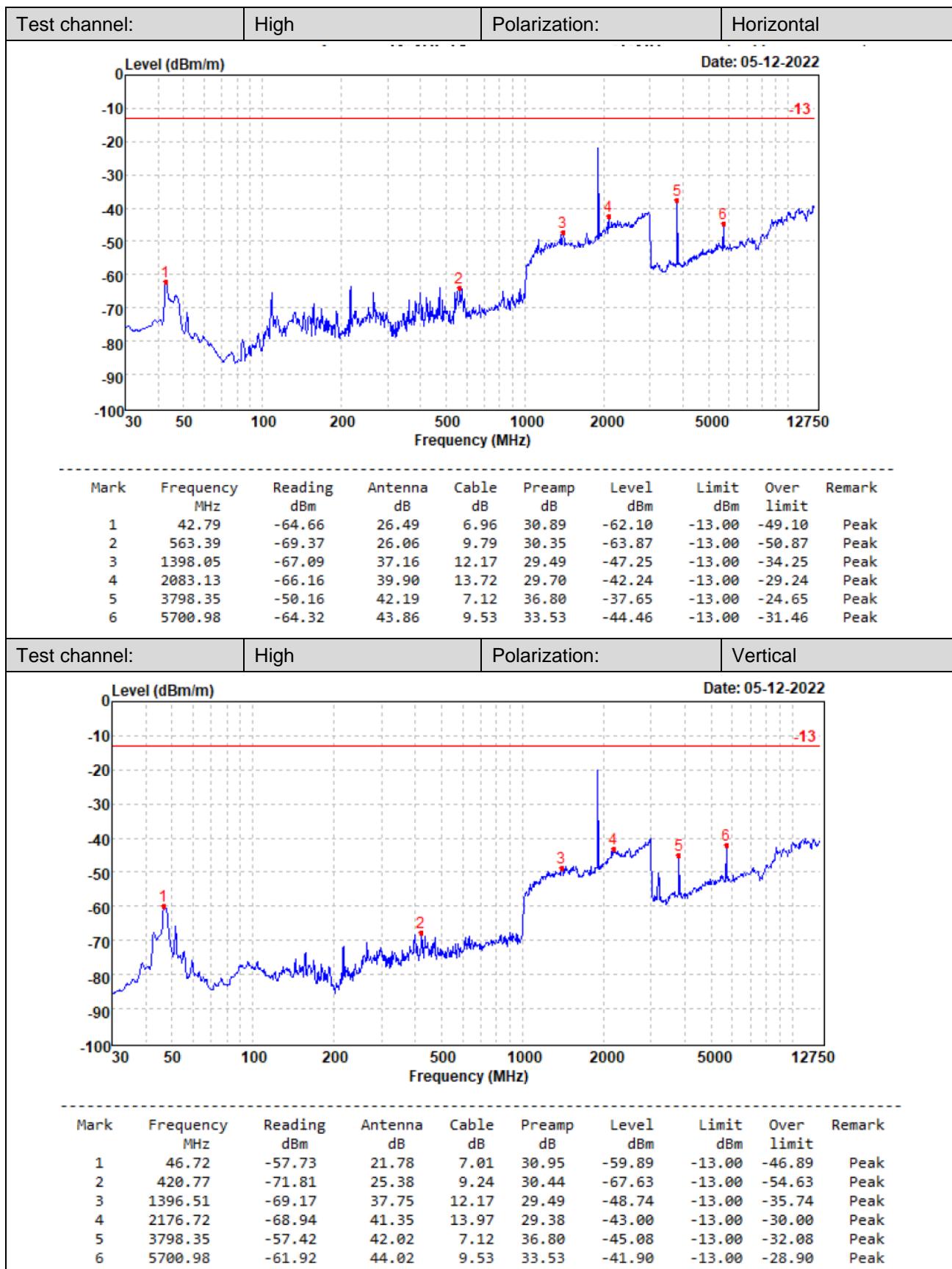
TEST RESULTS

Passed Not Applicable

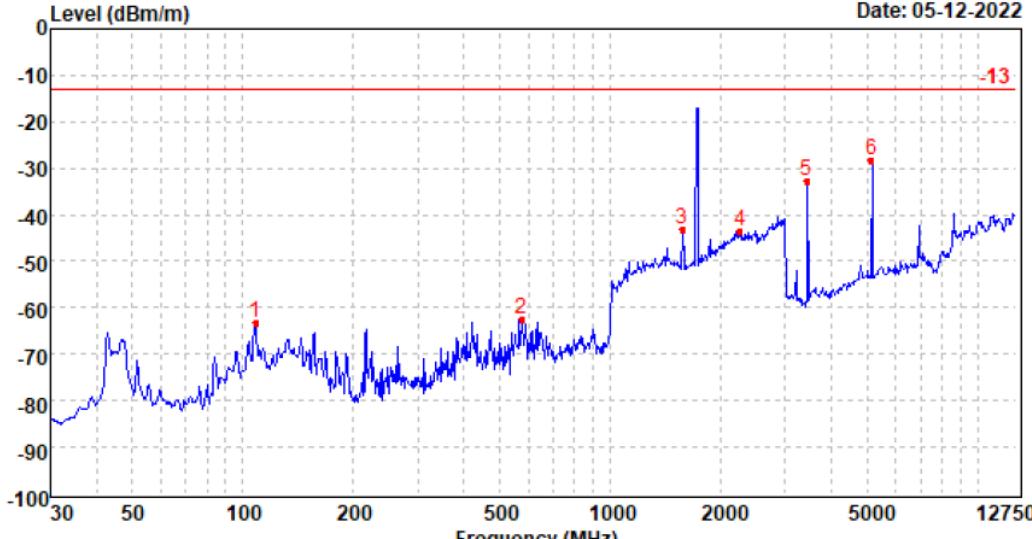
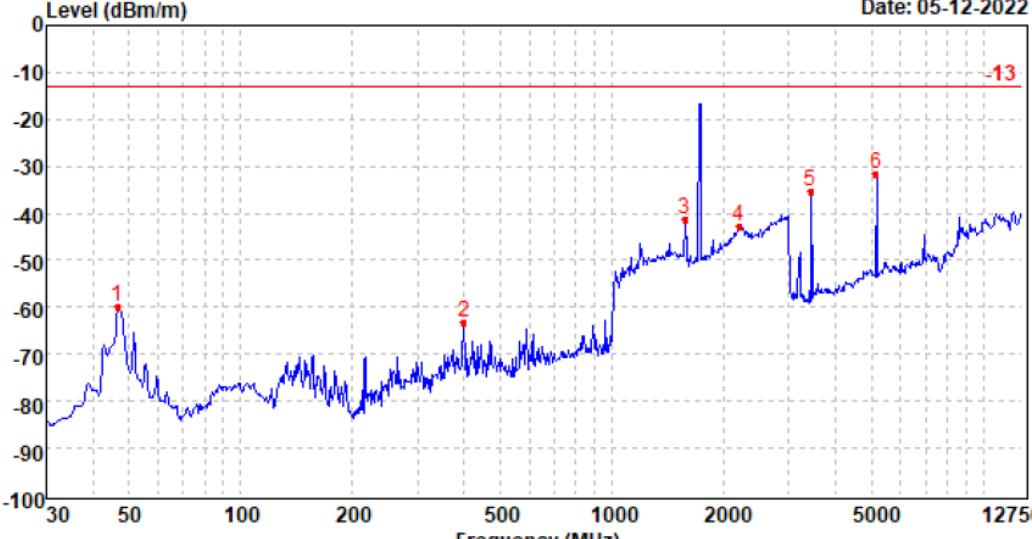
LTE-M Band 2

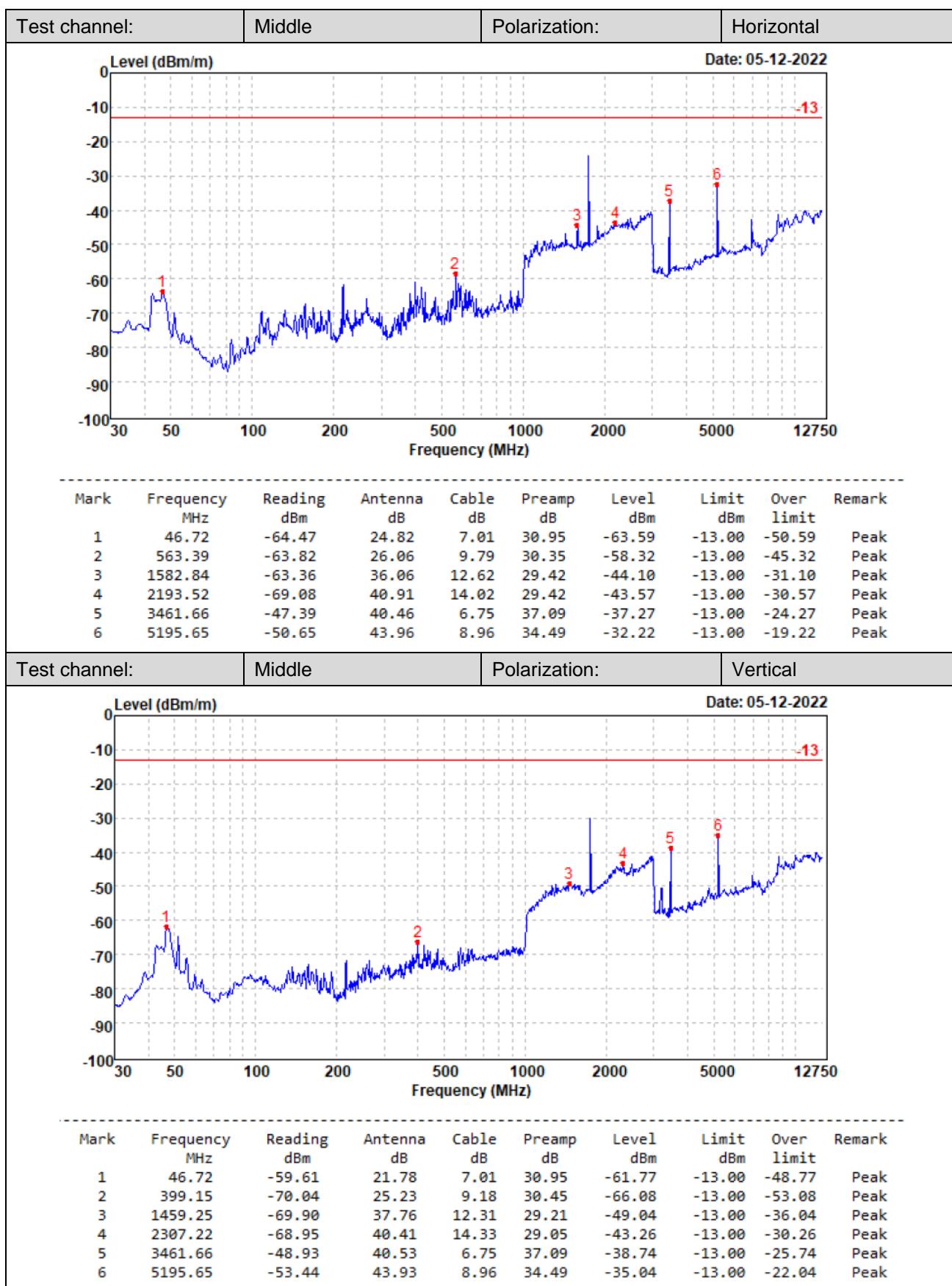
Test channel:	Low	Polarization:	Horizontal																																																																						
Date: 05-12-2022																																																																									
																																																																									
<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Mark</th><th>Frequency MHz</th><th>Reading dBm</th><th>Antenna dB</th><th>Cable dB</th><th>Preamp dB</th><th>Level dBm</th><th>Limit dBm</th><th>Over limit</th><th>Remark</th></tr> </thead> <tbody> <tr> <td>1</td><td>42.79</td><td>-63.70</td><td>26.49</td><td>6.96</td><td>30.89</td><td>-61.14</td><td>-13.00</td><td>-48.14</td><td>Peak</td></tr> <tr> <td>2</td><td>216.48</td><td>-61.51</td><td>19.48</td><td>8.27</td><td>30.50</td><td>-64.26</td><td>-13.00</td><td>-51.26</td><td>Peak</td></tr> <tr> <td>3</td><td>1683.28</td><td>-64.07</td><td>36.29</td><td>12.84</td><td>29.38</td><td>-44.32</td><td>-13.00</td><td>-31.32</td><td>Peak</td></tr> <tr> <td>4</td><td>2652.67</td><td>-63.54</td><td>39.29</td><td>15.87</td><td>26.72</td><td>-35.10</td><td>-13.00</td><td>-22.10</td><td>Peak</td></tr> <tr> <td>5</td><td>3716.61</td><td>-50.75</td><td>42.27</td><td>7.03</td><td>37.12</td><td>-38.57</td><td>-13.00</td><td>-25.57</td><td>Peak</td></tr> <tr> <td>6</td><td>5578.30</td><td>-59.14</td><td>43.76</td><td>9.41</td><td>33.14</td><td>-39.11</td><td>-13.00</td><td>-26.11</td><td>Peak</td></tr> </tbody> </table>				Mark	Frequency MHz	Reading dBm	Antenna dB	Cable dB	Preamp dB	Level dBm	Limit dBm	Over limit	Remark	1	42.79	-63.70	26.49	6.96	30.89	-61.14	-13.00	-48.14	Peak	2	216.48	-61.51	19.48	8.27	30.50	-64.26	-13.00	-51.26	Peak	3	1683.28	-64.07	36.29	12.84	29.38	-44.32	-13.00	-31.32	Peak	4	2652.67	-63.54	39.29	15.87	26.72	-35.10	-13.00	-22.10	Peak	5	3716.61	-50.75	42.27	7.03	37.12	-38.57	-13.00	-25.57	Peak	6	5578.30	-59.14	43.76	9.41	33.14	-39.11	-13.00	-26.11	Peak
Mark	Frequency MHz	Reading dBm	Antenna dB	Cable dB	Preamp dB	Level dBm	Limit dBm	Over limit	Remark																																																																
1	42.79	-63.70	26.49	6.96	30.89	-61.14	-13.00	-48.14	Peak																																																																
2	216.48	-61.51	19.48	8.27	30.50	-64.26	-13.00	-51.26	Peak																																																																
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5	3716.61	-50.75	42.27	7.03	37.12	-38.57	-13.00	-25.57	Peak																																																																
6	5578.30	-59.14	43.76	9.41	33.14	-39.11	-13.00	-26.11	Peak																																																																
Test channel:	Low	Polarization:	Vertical																																																																						
																																																																									
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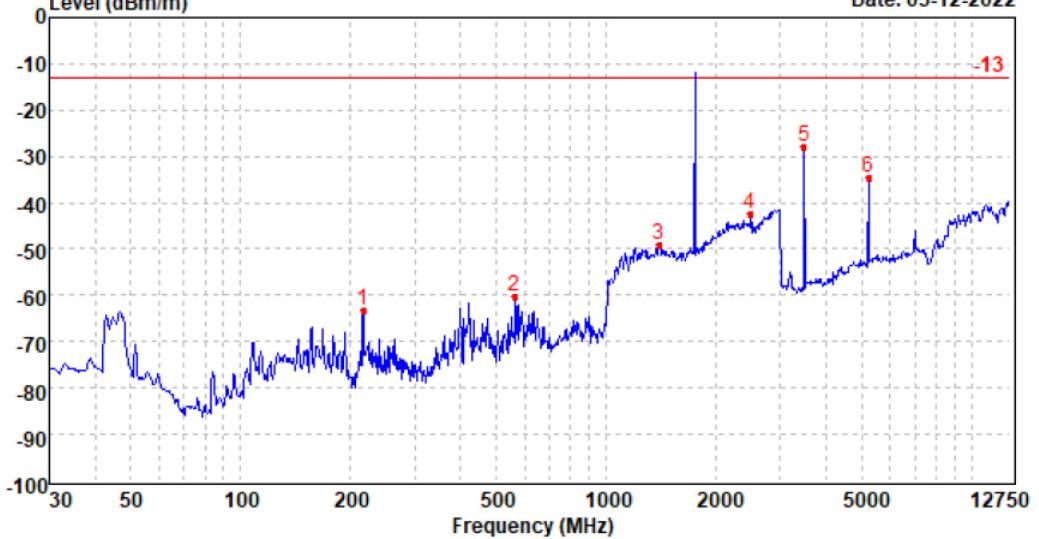
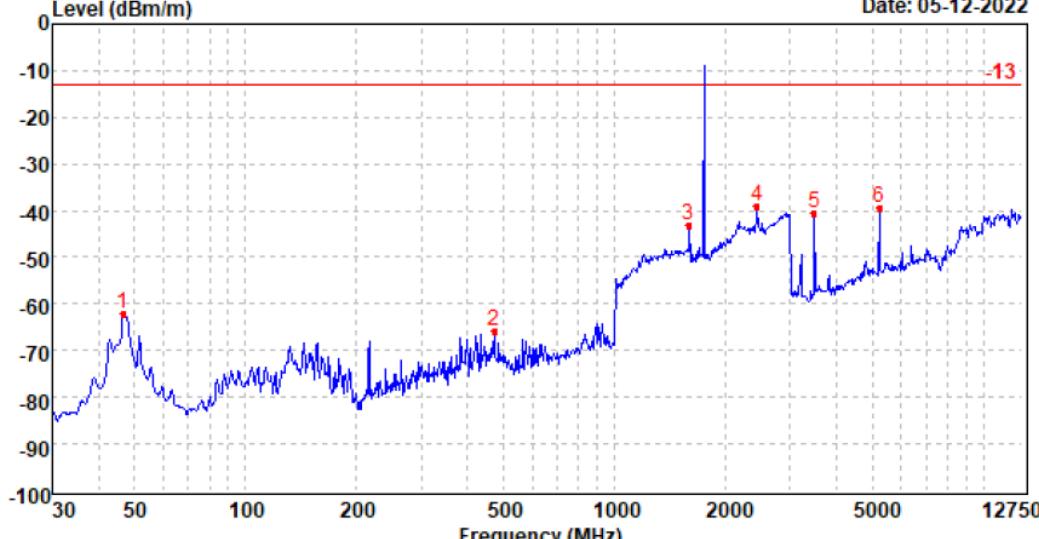
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Mark	Frequency MHz	Reading dBm	Antenna dB	Cable dB	Preamp dB	Level dBm	Limit dBm	Over limit	Remark																																																																			
1	42.79	-62.61	26.49	6.96	30.89	-60.05	-13.00	-47.05	Peak																																																																			
2	420.77	-67.77	25.98	9.24	30.44	-62.99	-13.00	-49.99	Peak																																																																			
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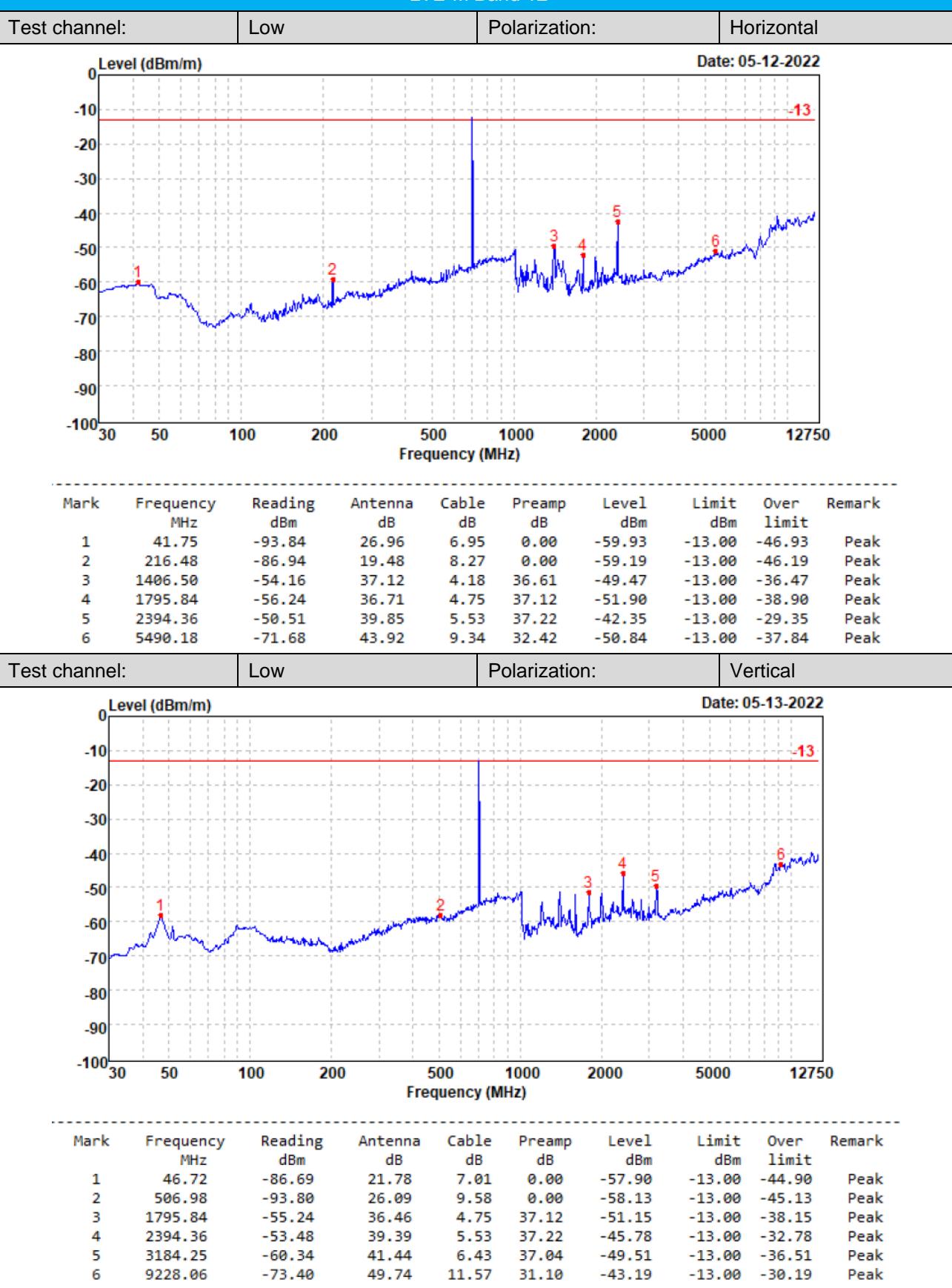
LTE-M Band 4

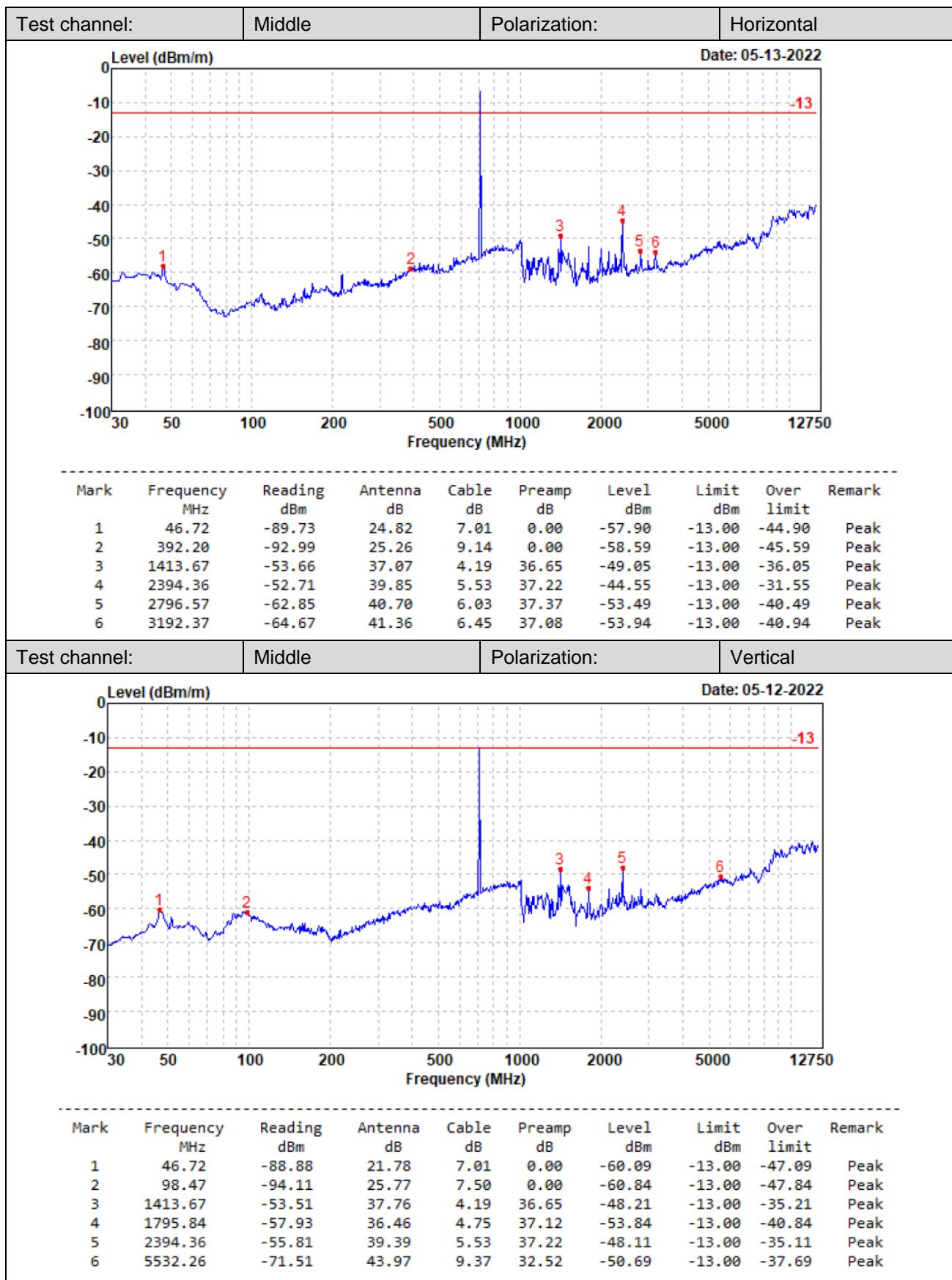
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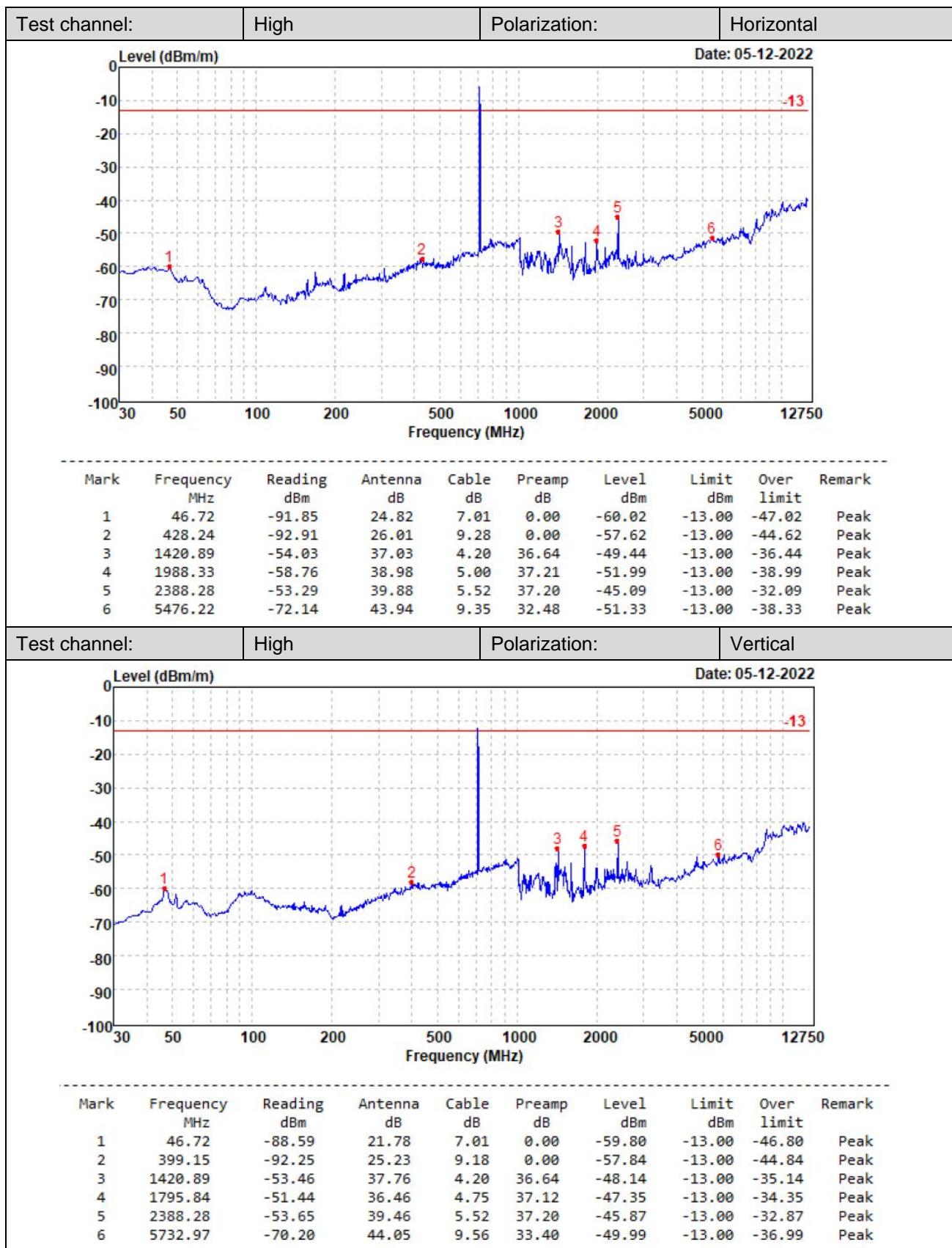


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2	563.39	-65.68	26.06	9.79	30.35	-60.18	-13.00	-47.18	Peak
3	1398.05	-68.79	37.16	12.17	29.49	-48.95	-13.00	-35.95	Peak
4	2480.73	-69.00	39.38	15.15	28.01	-42.48	-13.00	-29.48	Peak
5	3486.86	-38.53	40.82	6.78	37.09	-28.02	-13.00	-15.02	Peak
6	5233.46	-53.20	43.97	9.12	34.35	-34.46	-13.00	-21.46	Peak
Test channel:		High	Polarization:		Vertical				
Level (dBm/m)						Date: 05-12-2022			
									
Mark	Frequency MHz	Reading dBm	Antenna dB	Cable dB	Preamp dB	Level dBm	Limit dBm	Over limit	Remark
1	46.72	-59.87	21.78	7.01	30.95	-62.03	-13.00	-49.03	Peak
2	474.21	-70.37	25.51	9.47	30.45	-65.84	-13.00	-52.84	Peak
3	1593.31	-63.97	37.76	12.64	29.43	-43.00	-13.00	-30.00	Peak
4	2437.50	-64.89	39.29	14.98	28.31	-38.93	-13.00	-25.93	Peak
5	3486.86	-51.05	40.92	6.78	37.09	-40.44	-13.00	-27.44	Peak
6	5233.46	-57.99	43.95	9.12	34.35	-39.27	-13.00	-26.27	Peak

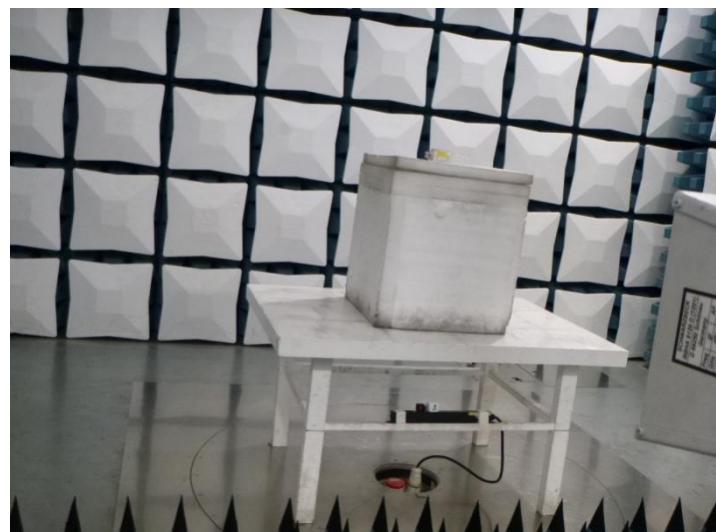
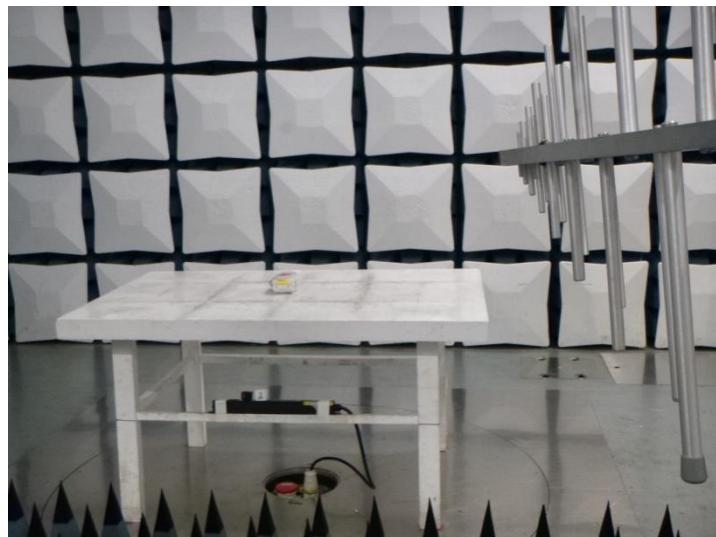
LTE-M Band 12







6. TEST SETUP PHOTOS OF THE EUT



7. EXTERNAL AND INTERNAL PHOTOS OF THE EUT

Refer to the test report No.: CHTEW22050122

-----END OF REPORT-----