



TEST REPORT

For LTE Cat NB

Report No. : **CHTEW22090082**

Project No...... : **SHT2103098305EW**

Applicant : **HARDWARIO a.s.**

Address..... : **U Jezu 525/4, 460 01 Liberec, CZECHIA**

Product Name : **CHESTER**

Trade Mark : **-**

Model No. : **CHESTER**

Listed Model(s) : **-**

Standard : **ETSI EN 301 908-1 V13.1.1 (2019-11)**
ETSI EN 301 908-13 V13.1.1 (2019-11)

Date of receipt of test sample..... : **Jun. 29, 2022**

Date of testing..... : **Jun. 30, 2022- Sep. 20, 2022**

Date of issue..... : **Sep. 21, 2022**

Result..... : **PASS**



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

Address..... : **1/F, Bldg 3, Hongfa Hi-tech Industrial Park, Genyu Road,
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The test report merely correspond to the test sample.

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1. TEST STANDARDS AND REPORT VERSION

1.1. Test Standards

The tests were performed according to following standards:

[ETSI EN 301 908-1 V13.1.1\(2019-11\)](#)–IMT cellular networks;Harmonised Standard for access to radio spectrum;Part 1: Introduction and common requirements

[ETSI EN 301 908-13 V13.1.1 \(2019-11\)](#)–IMT cellular networks;Harmonised Standard for access to radio spectrum;Part 13: Evolved Universal Terrestrial Radio Access (E-UTRA) User Equipment (UE)

[ETSI TS 136 521-1 V16.6.0 \(2020-12\)](#)–LTE;Evolved Universal Terrestrial Radio Access (E-UTRA);User Equipment (UE) conformance specification;Radio transmission and reception;Part 1: Conformance testing (3GPP TS 36.521-1 version 16.6.0 Release 16)

[ETSI TS 136 508 V16.6.0 \(2020-11\)](#)- LTE;Evolved Universal Terrestrial Radio Access (E-UTRA) and Evolved Packet Core (EPC);Common test environments for User Equipment (UE) conformance testing (3GPP TS 36.508 version 16.6.0 Release 16)

1.2. Report version information

Revision No.	Date of issue	Description
N/A	2022-09-21	Original

2. TEST DESCRIPTION

Radio Spectrum Matter (RSM) Part of Transmitter			
Test Item	Test require	Result #1	Test Engineer
Radiated emissions (UE)	EN 301 908-1 Section 4.2.2	Pass	Pan Xie
Control and monitoring functions (UE)	EN 301 908-1 Section 4.2.4	Pass*	N/A
Transmitter Maximum Output Power	EN 301 908-13 Section 4.2.2	Pass*	N/A
Transmitter Spectrum emission mask	EN 301 908-13 Section 4.2.3	Pass*	N/A
Transmitter Spurious Emissions	EN 301 908-13 Section 4.2.4	Pass*	N/A
Transmitter Minimum Output Power	EN 301 908-13 Section 4.2.5	Pass*	N/A
Transmitter Adjacent Channel Leakage Power Ratio	EN 301 908-13 Section 4.2.11	Pass*	N/A
Radio Spectrum Matter (RSM) Part of Receiver			
Test Item	Test require	Result #1	Test Engineer
Receiver Adjacent Channel Selectivity	EN 301 908-13 Section 4.2.6	Pass*	N/A
Receiver Blocking Characteristics	EN 301 908-13 Section 4.2.7	Pass*	N/A
Receiver Spurious Response	EN 301 908-13 Section 4.2.8	Pass*	N/A
Receiver Intermodulation Characteristics	EN 301 908-13 Section 4.2.9	Pass*	N/A
Receiver Spurious Emissions	EN 301 908-13 Section 4.2.10	Pass*	N/A
Receiver Reference Sensitivity Level	EN 301 908-13 Section 4.2.12	Pass*	N/A

Note:

- 1) #1: The test result does not include measurement uncertainty value
- 2) *1: Refer to the module report which report No. is 64610REM.002A2,
*2: Refer to the module report which report No. is 64610REM.001A1,
- 3) This device has installed the certified modular which model number is nRF9160, so these conducted test data directly reference the modular's data.
- 4) In this device, NB IoT only use B1,B3,B8,B20.B28,other bands are shielded by software.

3. SUMMARY

3.1. Client Information

Applicant:	HARDWARIO a.s.
Address:	U Jezu 525/4, 460 01 Liberec, CZECHIA
Manufacturer:	HARDWARIO a.s.
Address:	U Jezu 525/4, 460 01 Liberec, CZECHIA

3.2. Product Description

Main unit information:	
Product Name:	CHESTER
Trade Mark:	-
Model No.:	CHESTER
Listed Model(s):	-
Power supply:	DC 3.6V
Hardware version:	R3.2
Software version:	v1.0.0

3.3. Radio Specification Description

Support LTE type:	<input checked="" type="checkbox"/> Cat NB1
Support Operating Band:	<input checked="" type="checkbox"/> FDD Band 1 <input checked="" type="checkbox"/> FDD Band 3 <input checked="" type="checkbox"/> FDD Band 8 <input checked="" type="checkbox"/> FDD Band 20 <input checked="" type="checkbox"/> FDD Band 28
Operating Frequency Range:	Please refer to note #2
Channel bandwidth:	200kHz
Subcarrier Spacing:	<input checked="" type="checkbox"/> 3.75kHz <input checked="" type="checkbox"/> 15kHz
Uplink Modulation type:	<input checked="" type="checkbox"/> BPSK <input checked="" type="checkbox"/> QPSK
Downlink Modulation type:	<input checked="" type="checkbox"/> BPSK <input checked="" type="checkbox"/> QPSK
Power Class:	<input type="checkbox"/> Class 1 <input type="checkbox"/> Class 2 <input checked="" type="checkbox"/> Class 3 <input type="checkbox"/> Class 4
Antenna type:	PCB antenna
Antenna gain ^{#3} :	3.5 dBi

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 1	1920 ~ 1980 MHz	2110 ~ 2170 MHz
FDD Band 3	1710 ~ 1785 MHz	1805 ~ 1880 MHz
FDD Band 8	880 ~ 915 MHz	925 ~ 960 MHz
FDD Band 20	832 ~ 862 MHz	791 ~ 821 MHz
FDD Band 28	703 ~ 748 MHz	758 ~ 803 MHz

- #3: 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:	Tel: 86-755-26715499 E-mail: cs@szhtw.com.cn http://www.szhtw.com.cn

4. TEST CONFIGURATION

4.1. Test frequency list

FDD Band 1	Test Frequency ID	N_{UL}	M_{UL}	Frequency of Uplink [MHz]	N_{DL}	M_{DL}	Frequency of Downlink [MHz]
	Low Range	18001	0	1920.1	1	-0.5	2110.1
	Mid Range	18300	0	1950.0	300	-0.5	2140.0
	High Range	18599	0	1979.9	599	-0.5	2169.9
	NOTE 1: Applicable to either 3.75 kHz or 15 kHz NB-IoT UL subcarrier spacing						
FDD Band 3	Test Frequency ID	N_{UL}	M_{UL}	Frequency of Uplink [MHz]	N_{DL}	M_{DL}	Frequency of Downlink [MHz]
	Low Range	19201	0	1710.1	1201	-0.5	1805.1
	Mid Range	19575	0	1747.5	1575	-0.5	1842.5
	High Range	19949	0	1784.9	1949	-0.5	1879.9
	NOTE 1: Applicable to either 3.75 kHz or 15 kHz NB-IoT UL subcarrier spacing						
FDD Band 8	Test Frequency ID	N_{UL}	M_{UL}	Frequency of Uplink [MHz]	N_{DL}	M_{DL}	Frequency of Downlink [MHz]
	Low Range	21451	0	880.1	3451	-0.5	925.1
	Mid Range	21625	0	897.5	3625	-0.5	942.5
	High Range	21799	0	914.9	3799	-0.5	959.9
	NOTE 1: Applicable to either 3.75 kHz or 15 kHz NB-IoT UL subcarrier spacing						
FDD Band 20	Test Frequency ID	N_{UL}	M_{UL}	Frequency of Uplink [MHz]	N_{DL}	M_{DL}	Frequency of Downlink [MHz]
	Low Range	24151	0	832.1	6151	-0.5	791.1
	Mid Range	24300	0	847.0	6300	-0.5	806.0
	High Range	24449	0	861.9	6449	-0.5	820.9
	NOTE 1: Applicable to either 3.75 kHz or 15 kHz NB-IoT UL subcarrier spacing						
FDD Band 28	Test Frequency ID	N_{UL}	M_{UL}	Frequency of Uplink [MHz]	N_{DL}	M_{DL}	Frequency of Downlink [MHz]
	Low Range	27211	0	703.1	9211	-0.5	758.1
	Mid Range	27435	0	725.5	9435	-0.5	780.5
	High Range	27659	0	747.9	9659	-0.5	802.9
	NOTE 1: Applicable to either 3.75 kHz or 15 kHz NB-IoT UL subcarrier spacing						

4.2. Descriptions of Test mode

The EUT has been tested under typical operating condition.

4.3. Support unit used in test configuration and system

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

Whether support unit is used?				
✓ No				
Item	Equipment	Trade Name	Model No.	Other
1				
2				

4.4. Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

Normal Conditon	V _N =Nominal Voltage	DC 3.60V
	T _N =Normal Temperature	25 °C
Extreme Conditon	V _L =Lower Voltage	DC 3.24V
	T _L =Lower Temperature	-20 °C
	V _H =Higher Voltage	DC 3.96V
	T _H =Higher Temperature	40 °C

4.5. Statement of the measurement uncertainty

Test Items	Measurement Uncertainty
Radio frequency	<1GHz: 0.022ppm >1GHz: 0.64ppm
Conducted output power	0.65 dB
Conducted spurious emission	0.65 dB
Radiated spurious emission	<1GHz: 2.85dB >1GHz: 3.66dB

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

4.6. 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	C11121	2018/09/27	2023/09/26
●	Spectrum Analyzer	R&S	HTWE0098	FSP40	100597	2022/08/25	2023/08/24
●	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	HTWE0119-05	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
●	EMI Test Software	Audix	N/A	E3	N/A	N/A	N/A

5. TEST CONDITIONS AND RESULTS

5.1. ETSI EN301908-1 Requirement

5.1.1. Radiated emissions (UE)

LIMIT

ETSI EN 301 908-1 Sub-clause 4.2.2.2

The frequency boundary and reference bandwidths for the detailed transitions of the limits between the requirements for out-of-band emissions and spurious emissions are based on ITU-R Recommendations SM.329-10 [3] and SM.1539-1 [4].

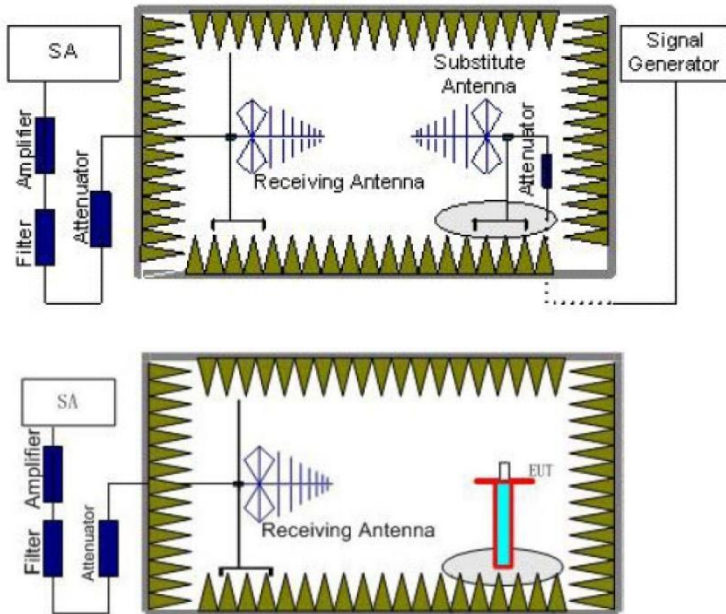
The requirements shown in table 4.2.2.2-1 are only applicable for frequencies in the spurious domain.

Table 4.2.2.2-1: Radiated spurious emissions requirements (UE)

Frequency	Minimum requirement (e.r.p./ reference bandwidth idle mode)	Minimum requirement (e.r.p./ reference bandwidth traffic mode)	Applicability
$30 \text{ MHz} \leq f < 1\,000 \text{ MHz}$	-57 dBm/100 kHz	-36 dBm/100 kHz	All
$1 \text{ GHz} \leq f < 12.75 \text{ GHz}$	-47 dBm/1 MHz	-30 dBm/1 MHz	All
$f_c - 2.5 \times 5 \text{ MHz} < f < f_c + 2.5 \times 5 \text{ MHz}$		Not defined	UTRA FDD, UTRA TDD, 3,84 Mcps option, cdma2000, spreading rate 3
$f_c - 2.5 \times BW_{\text{Channel}} \text{ MHz} < f < f_c + 2.5 \times BW_{\text{Channel}} \text{ MHz}$		Not defined	E-UTRA FDD, E-UTRA TDD, Mobile WiMAX, UMB
$f_c - 2.5 \times 10 \text{ MHz} < f < f_c + 2.5 \times 10 \text{ MHz}$		Not defined	UTRA TDD, 7,68 Mcps option
$f_c - 4 \text{ MHz} < f < f_c + 4 \text{ MHz}$		Not defined	UTRA TDD, 1,28 Mcps option cdma2000, spreading rate 1
$f_c - 500 \text{ kHz} < f < f_c + 500 \text{ kHz}$		Not defined	UWC 136, 200 kHz option
$f_c - 250 \text{ kHz} < f < f_c + 250 \text{ kHz}$		Not defined	UWC 136, 30 kHz option

NOTE: f_c is the UE transmit centre frequency.

TEST CONFIGURATION



TEST PROCEDURE

1. The test conditions.

Normal condition Extreme conditions

2. Please refer to ETSI EN301908-1 Sub-clause 5.3.1 for the measurement method.

TEST MODE:

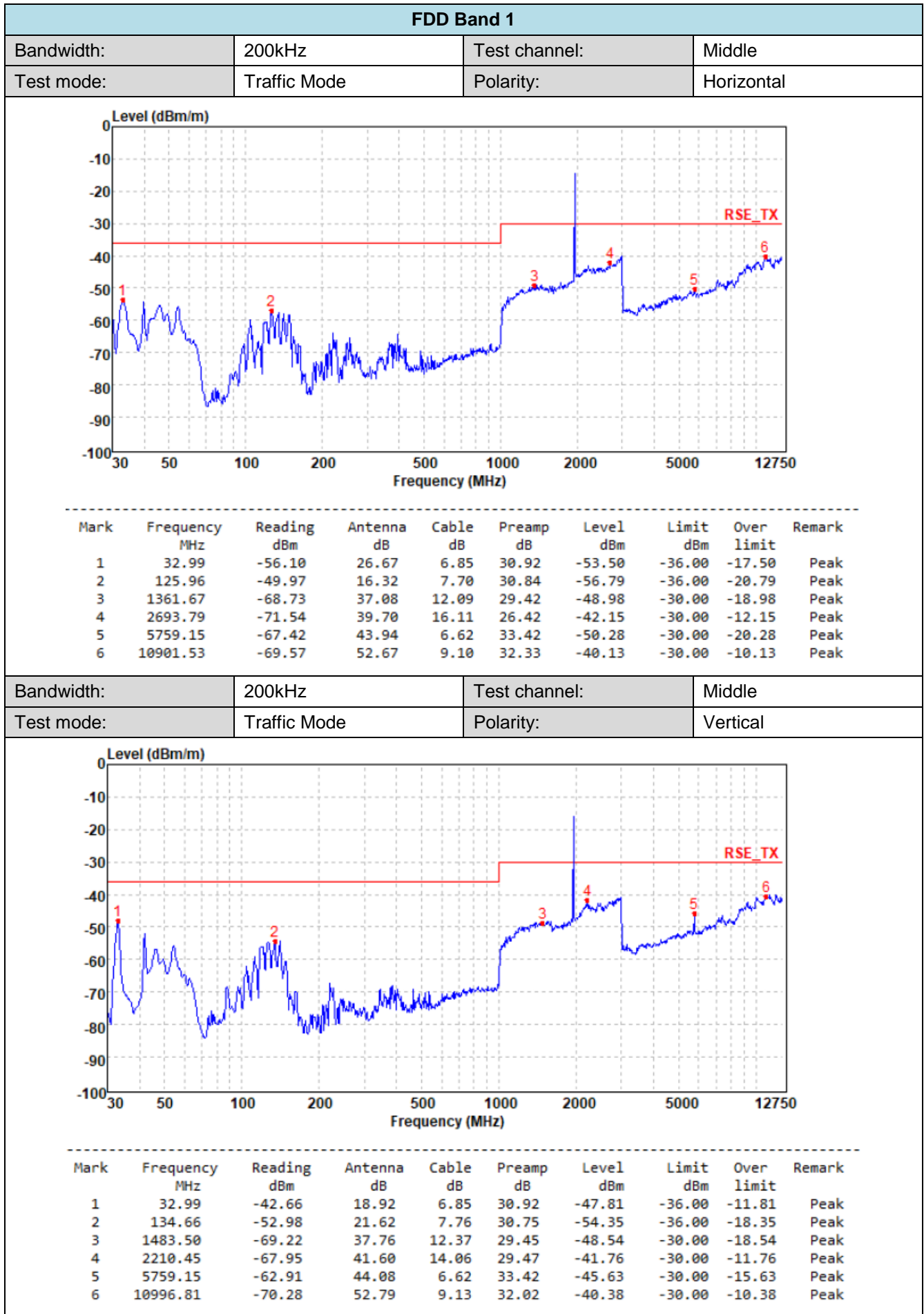
ETSI EN301908-1 Sub-clause 5.3.1

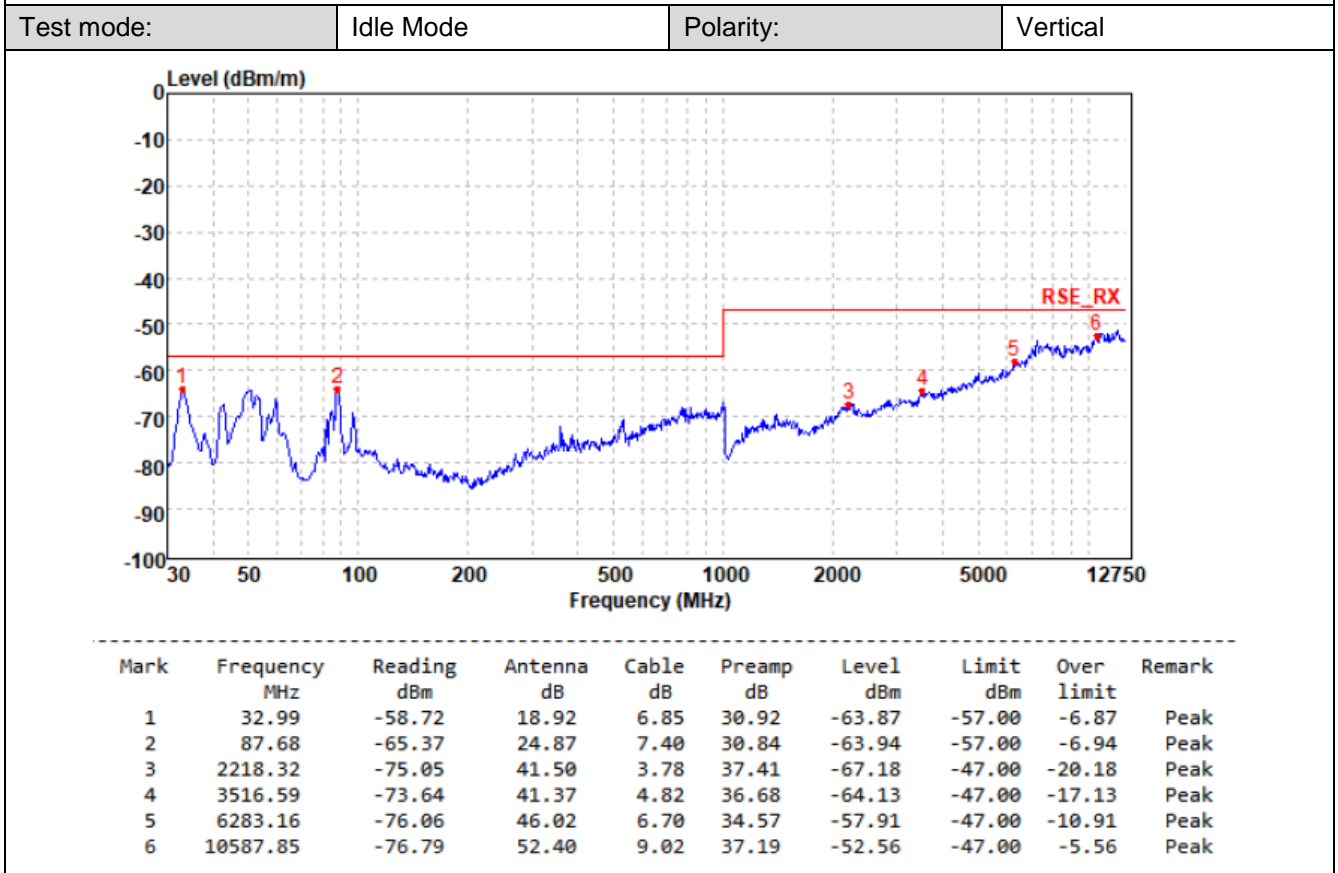
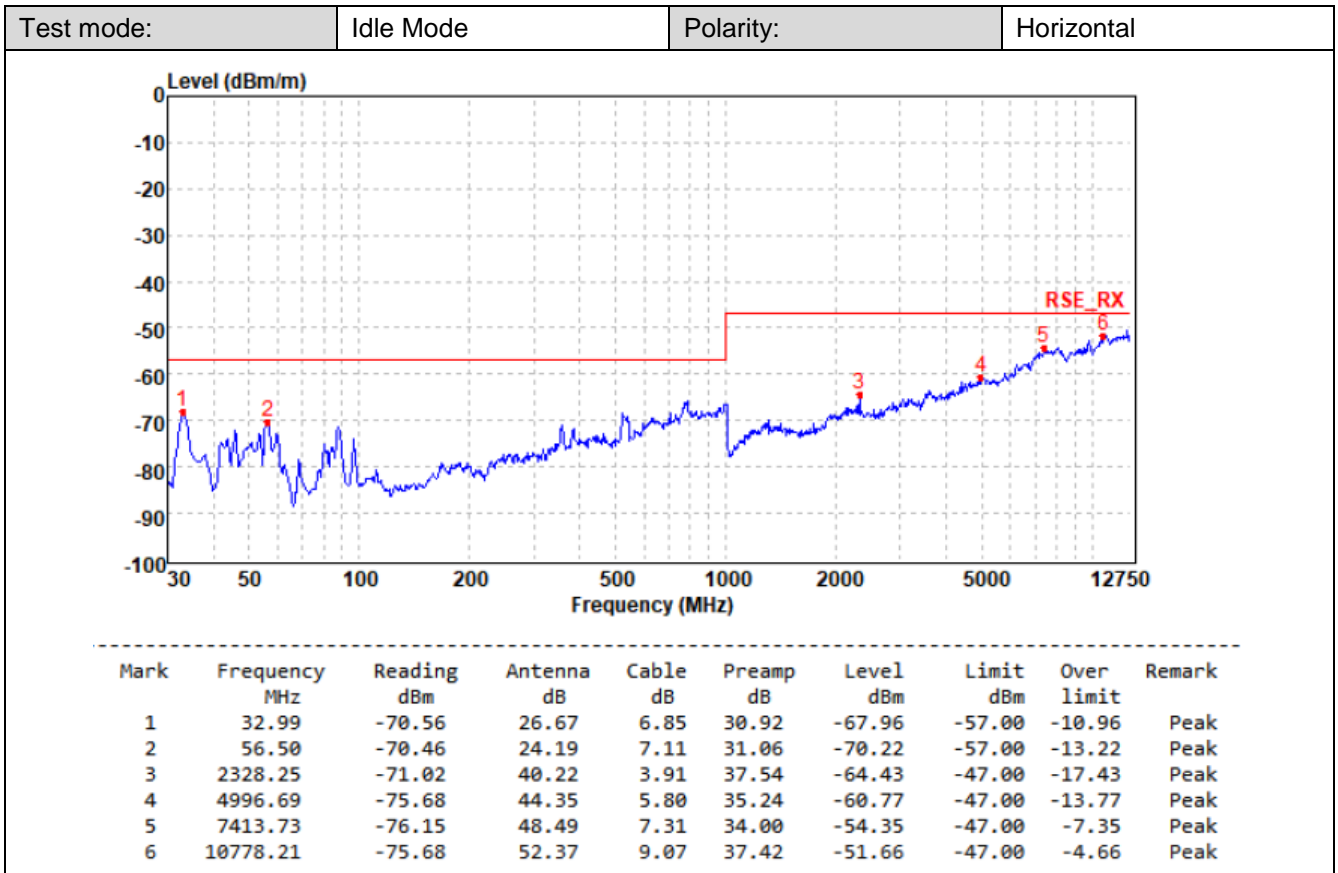
Traffic mode, Idle mode

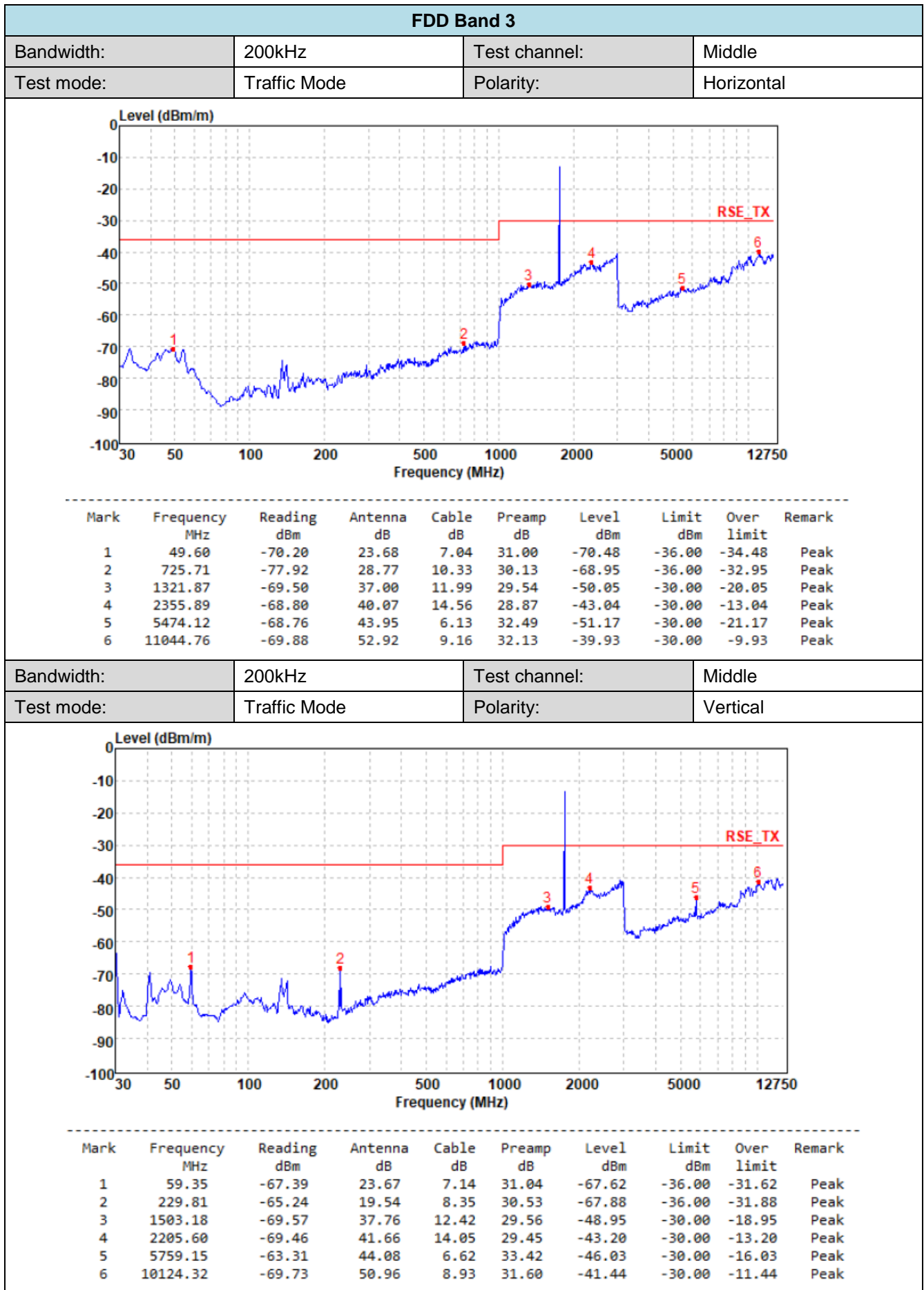
TEST RESULTS

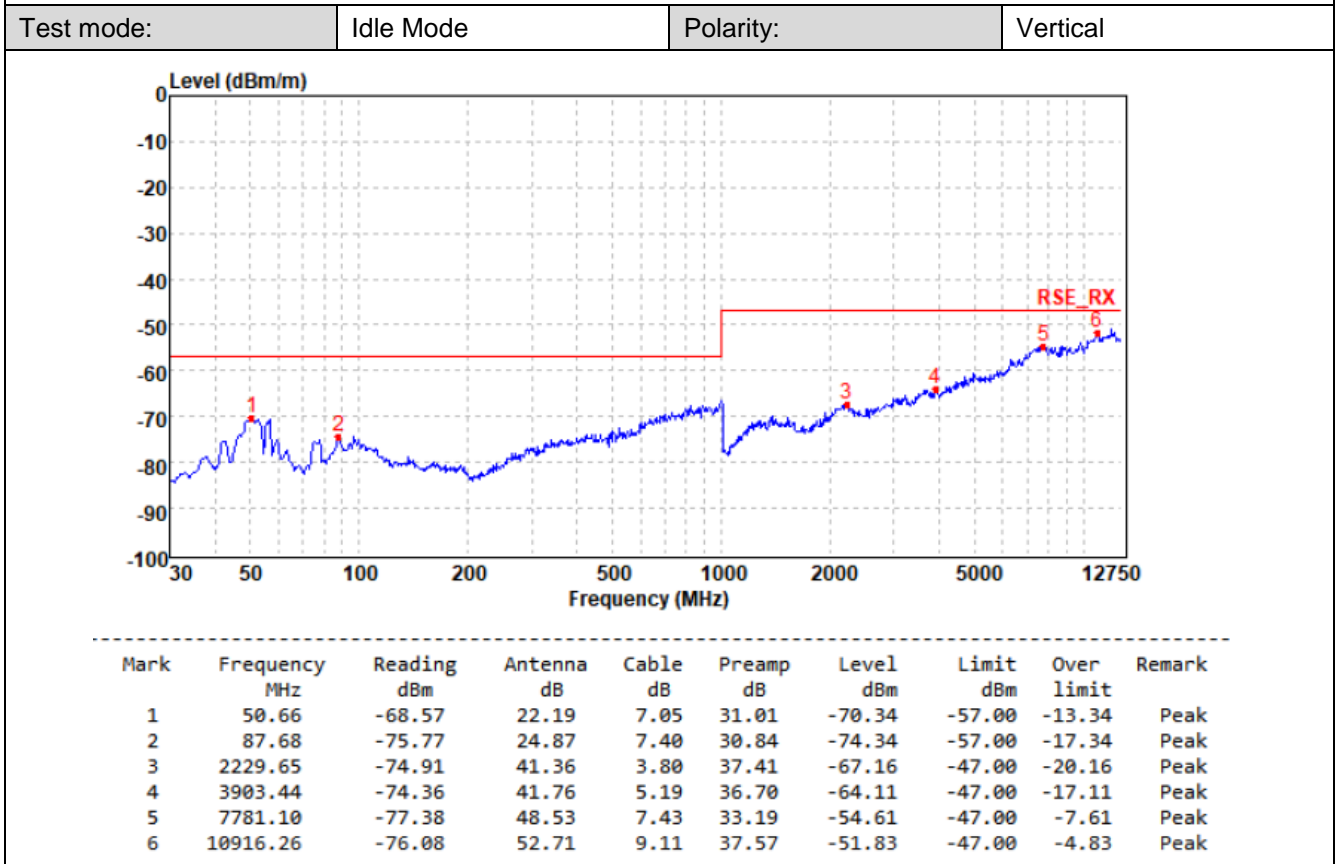
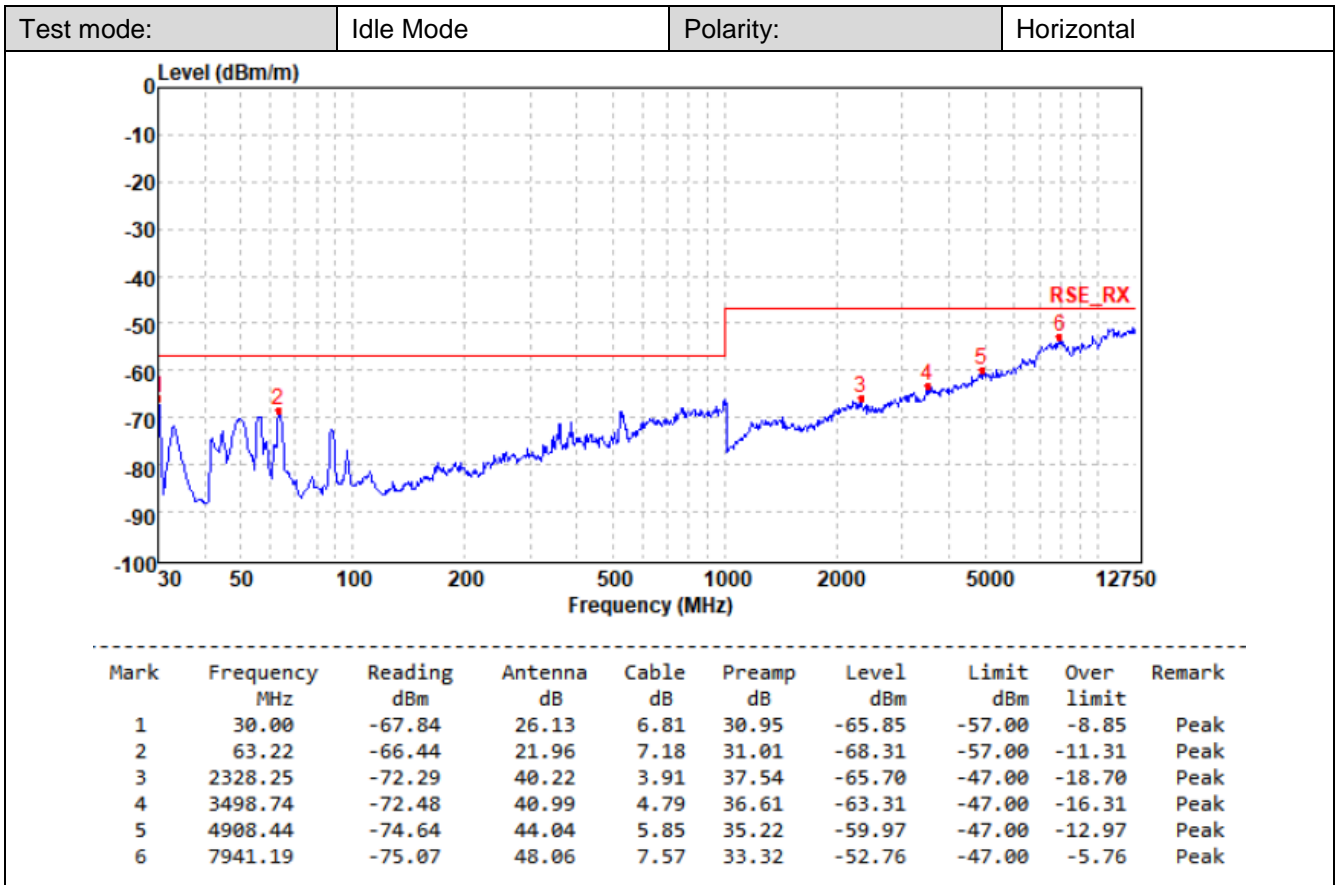
Passed Not Applicable

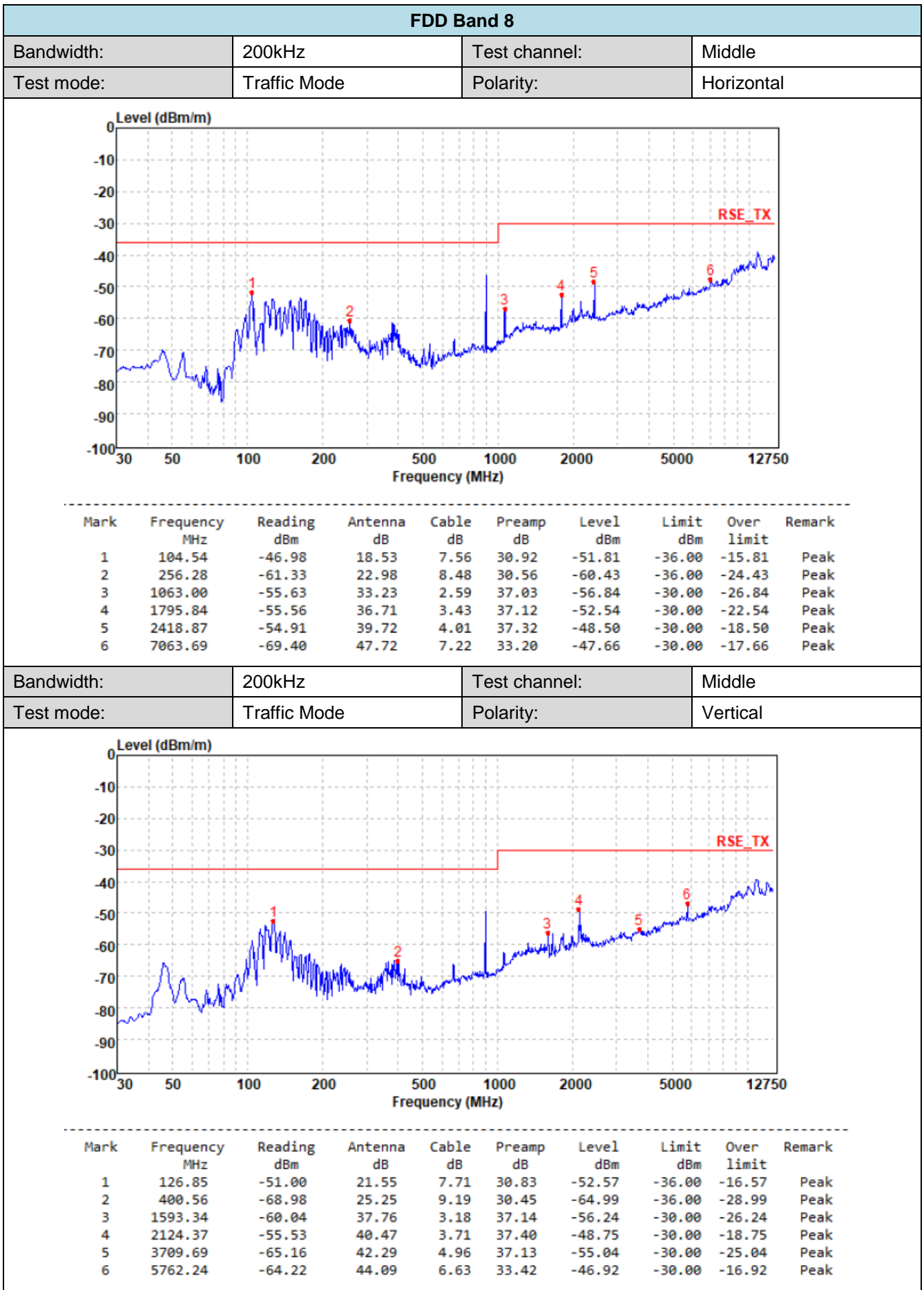
Note: Pre-scan all kinds of modulation and channel, but only show the worst test data on the report.



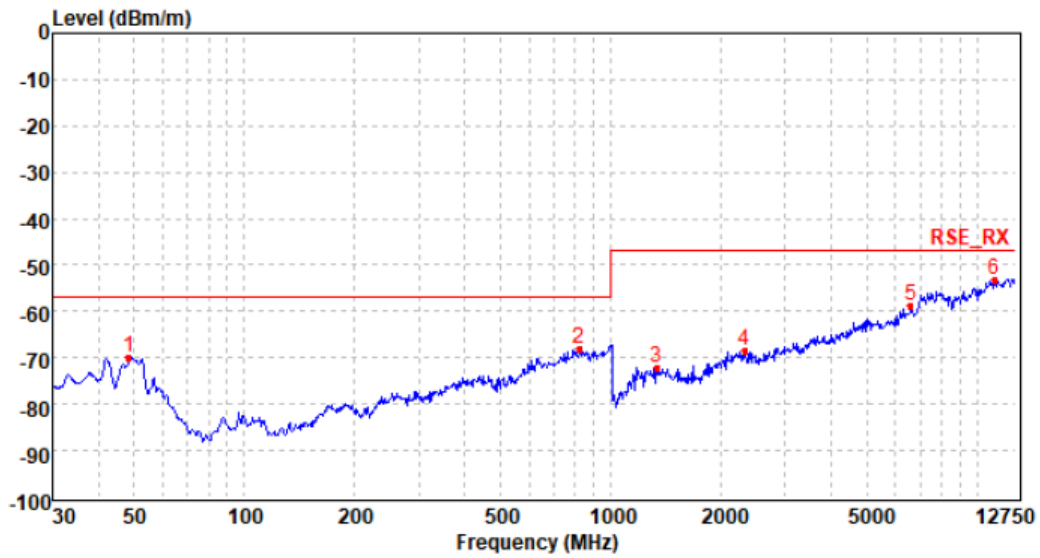






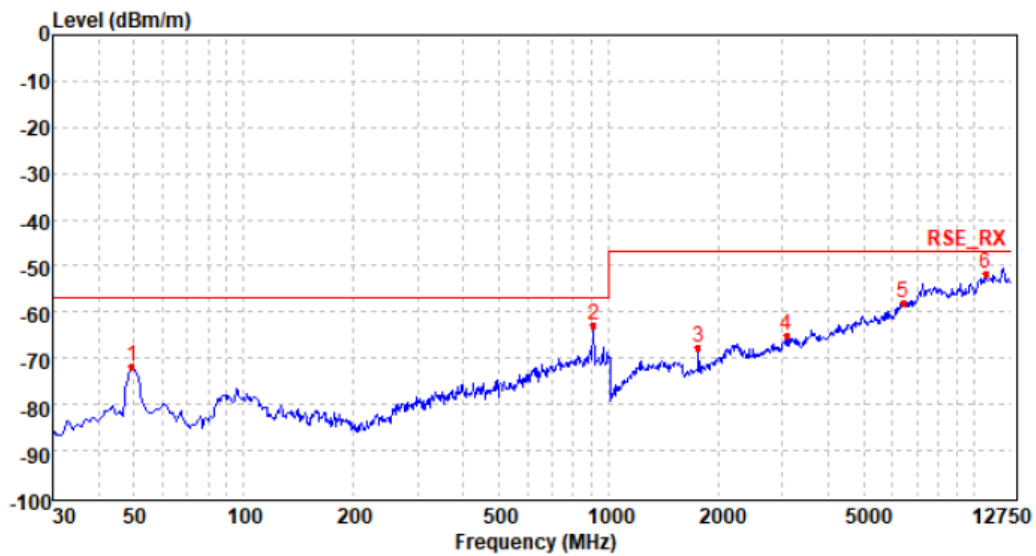


Test mode:	Idle Mode	Polarity:	Horizontal
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Mark	Frequency MHz	Reading dBm	Antenna dB	Cable dB	Preamp dB	Level dBm	Limit dBm	Over limit	Remark
1	48.57	-69.95	24.08	7.03	30.98	-69.82	-57.00	-12.82	Peak
2	823.65	-78.65	29.93	10.65	29.94	-68.01	-57.00	-11.01	Peak
3	1336.68	-75.75	37.03	2.92	36.39	-72.19	-47.00	-25.19	Peak
4	2322.33	-74.83	40.25	3.91	37.55	-68.22	-47.00	-21.22	Peak
5	6594.52	-77.47	46.47	6.93	34.60	-58.67	-47.00	-11.67	Peak
6	11140.85	-77.68	52.93	9.22	37.58	-53.11	-47.00	-6.11	Peak

Test mode:	Idle Mode	Polarity:	Vertical
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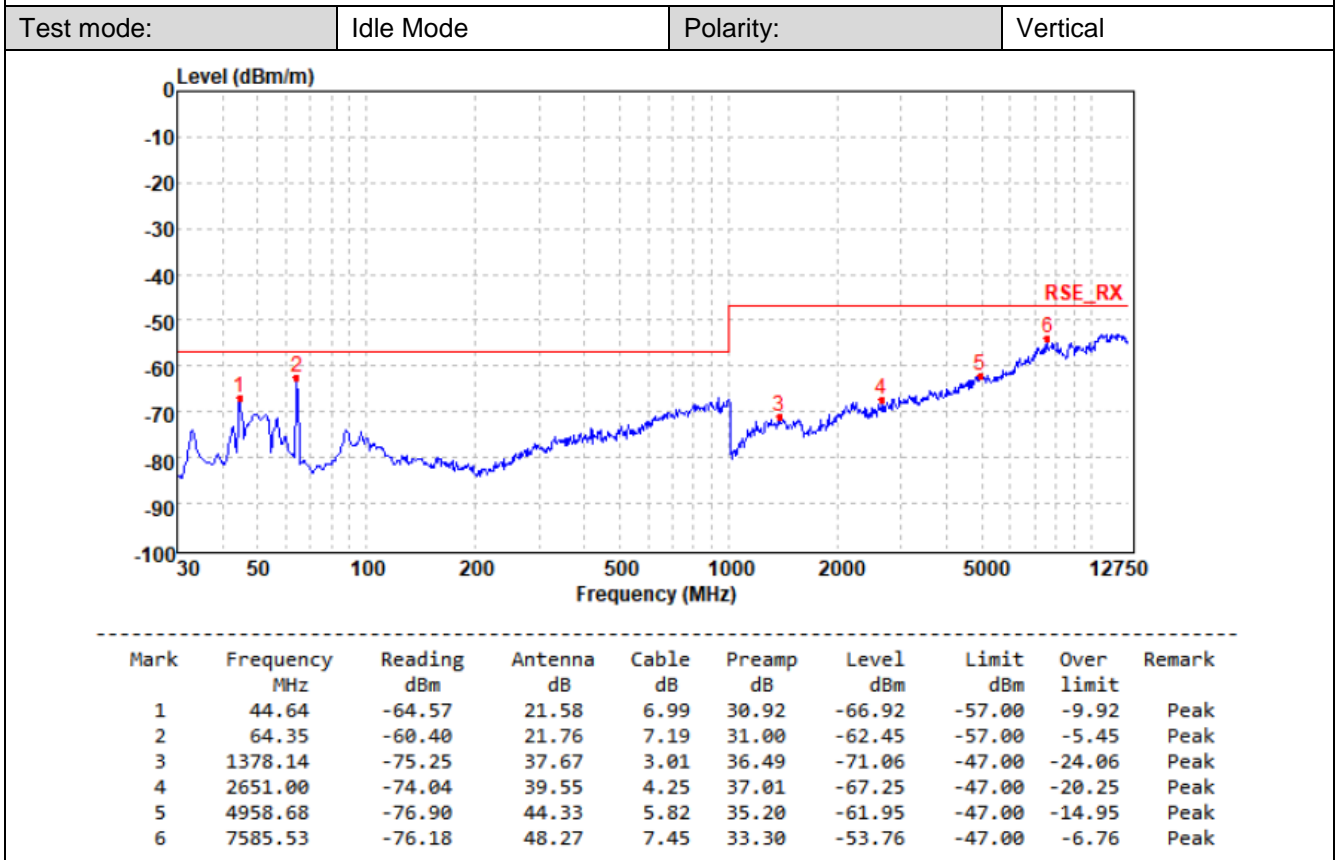
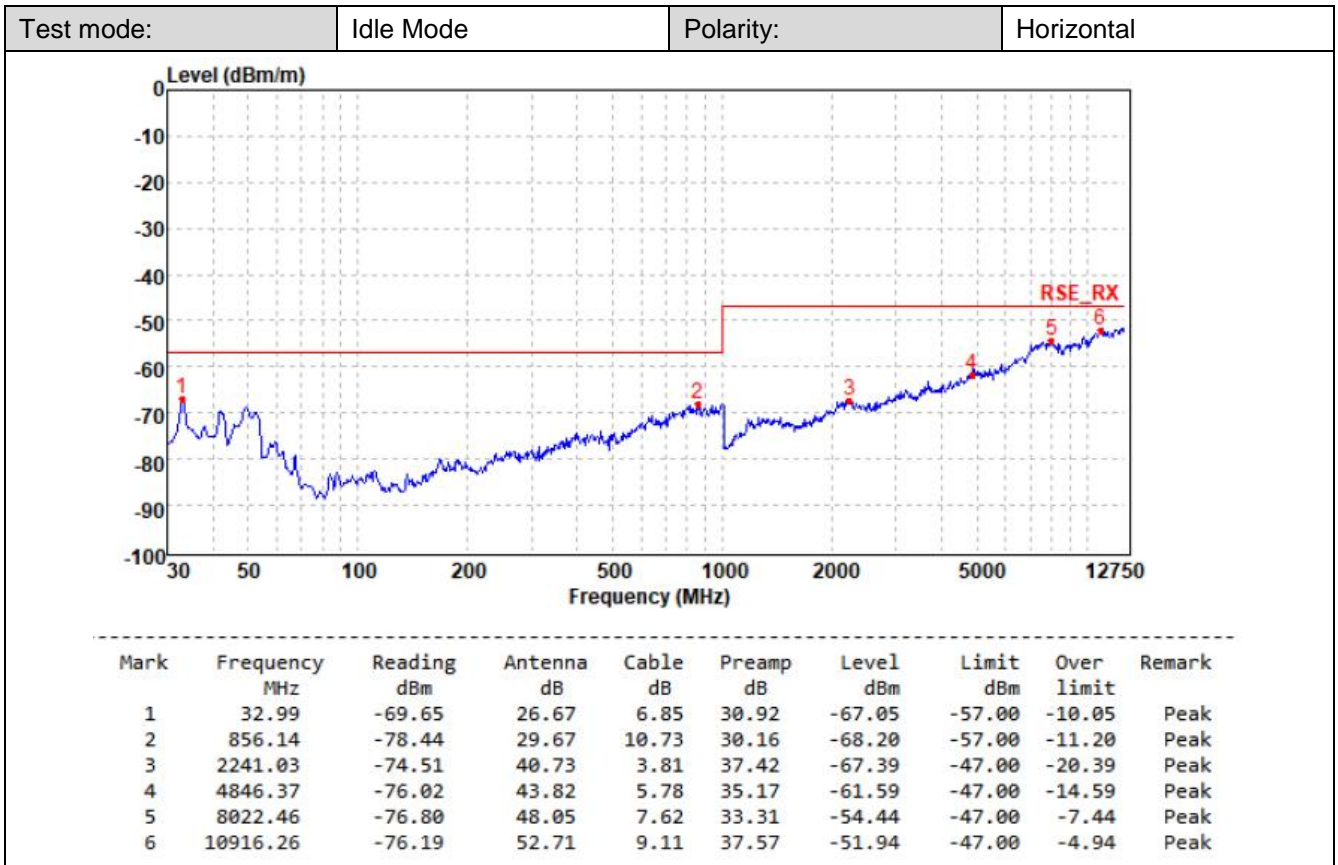
Mark	Frequency MHz	Reading dBm	Antenna dB	Cable dB	Preamp dB	Level dBm	Limit dBm	Over limit	Remark
1	49.60	-69.81	22.04	7.04	31.00	-71.73	-57.00	-14.73	Peak
2	908.88	-73.54	29.82	10.88	29.92	-62.76	-57.00	-5.76	Peak
3	1764.12	-70.24	36.39	3.38	37.10	-67.57	-47.00	-20.57	Peak
4	3080.60	-73.49	41.21	4.55	37.49	-65.22	-47.00	-18.22	Peak
5	6412.43	-76.90	46.73	6.87	34.68	-57.98	-47.00	-10.98	Peak
6	10833.22	-75.90	52.64	9.08	37.48	-51.66	-47.00	-4.66	Peak

FDD Band 20			
Bandwidth:	200kHz	Test channel:	Middle
Test mode:	Traffic Mode	Polarity:	Horizontal

Mark	Frequency MHz	Reading dBm	Antenna dB	Cable dB	Preamp dB	Level dBm	Limit dBm	Over limit	Remark
1	163.39	-52.37	19.94	7.96	30.60	-55.07	-36.00	-19.07	Peak
2	388.08	-66.46	25.17	9.12	30.43	-62.60	-36.00	-26.60	Peak
3	1693.72	-50.93	36.33	3.27	37.19	-48.52	-30.00	-18.52	Peak
4	2124.37	-55.09	40.29	3.71	37.40	-48.49	-30.00	-18.49	Peak
5	4366.07	-67.09	42.82	5.46	35.88	-54.69	-30.00	-24.69	Peak
6	10860.83	-67.06	52.57	9.09	32.46	-37.86	-30.00	-7.86	Peak

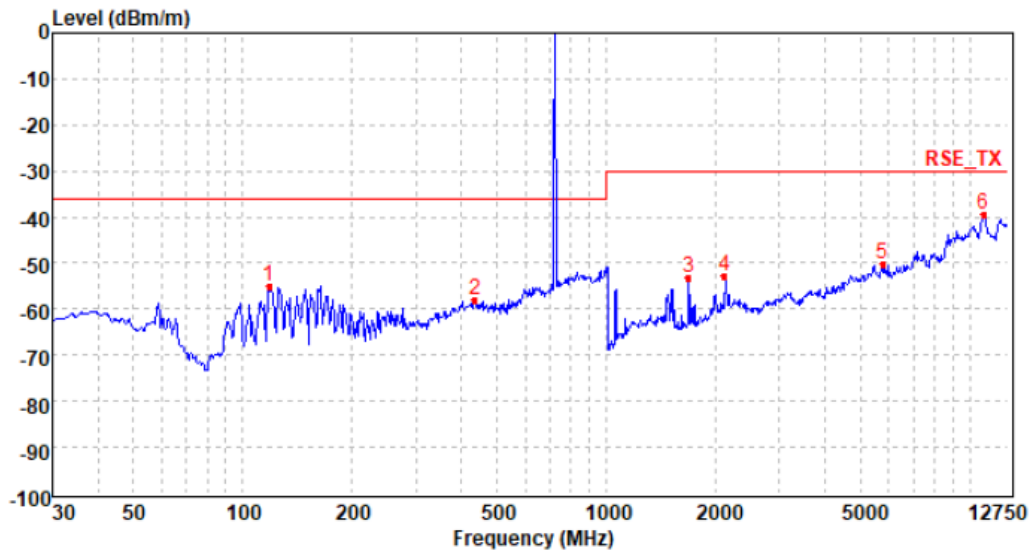
Bandwidth:	200kHz	Test channel:	Middle
Test mode:	Traffic Mode	Polarity:	Vertical

Mark	Frequency MHz	Reading dBm	Antenna dB	Cable dB	Preamp dB	Level dBm	Limit dBm	Over limit	Remark
1	52.47	-46.19	22.52	7.07	31.04	-47.64	-36.00	-11.64	Peak
2	125.96	-53.20	21.62	7.70	30.84	-54.72	-36.00	-18.72	Peak
3	1378.14	-53.66	37.67	3.01	36.46	-49.44	-30.00	-19.44	Peak
4	1541.48	-47.77	37.76	3.16	36.92	-43.77	-30.00	-13.77	Peak
5	2124.37	-57.90	40.47	3.71	37.40	-51.12	-30.00	-21.12	Peak
6	5762.24	-62.81	44.09	6.63	33.42	-45.51	-30.00	-15.51	Peak



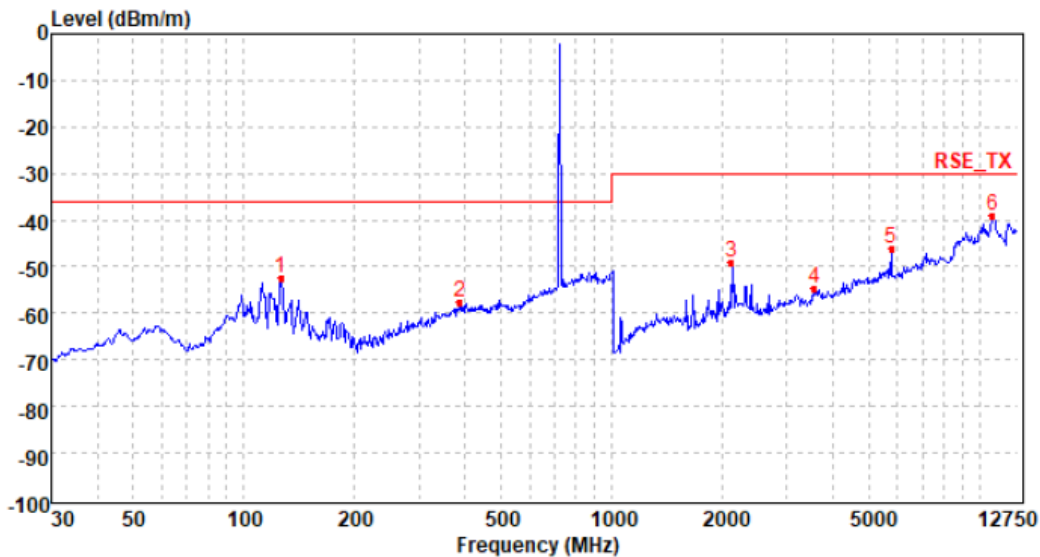
FDD Band 28

Bandwidth:	200kHz	Test channel:	Middle
Test mode:	Traffic Mode	Polarity:	Horizontal

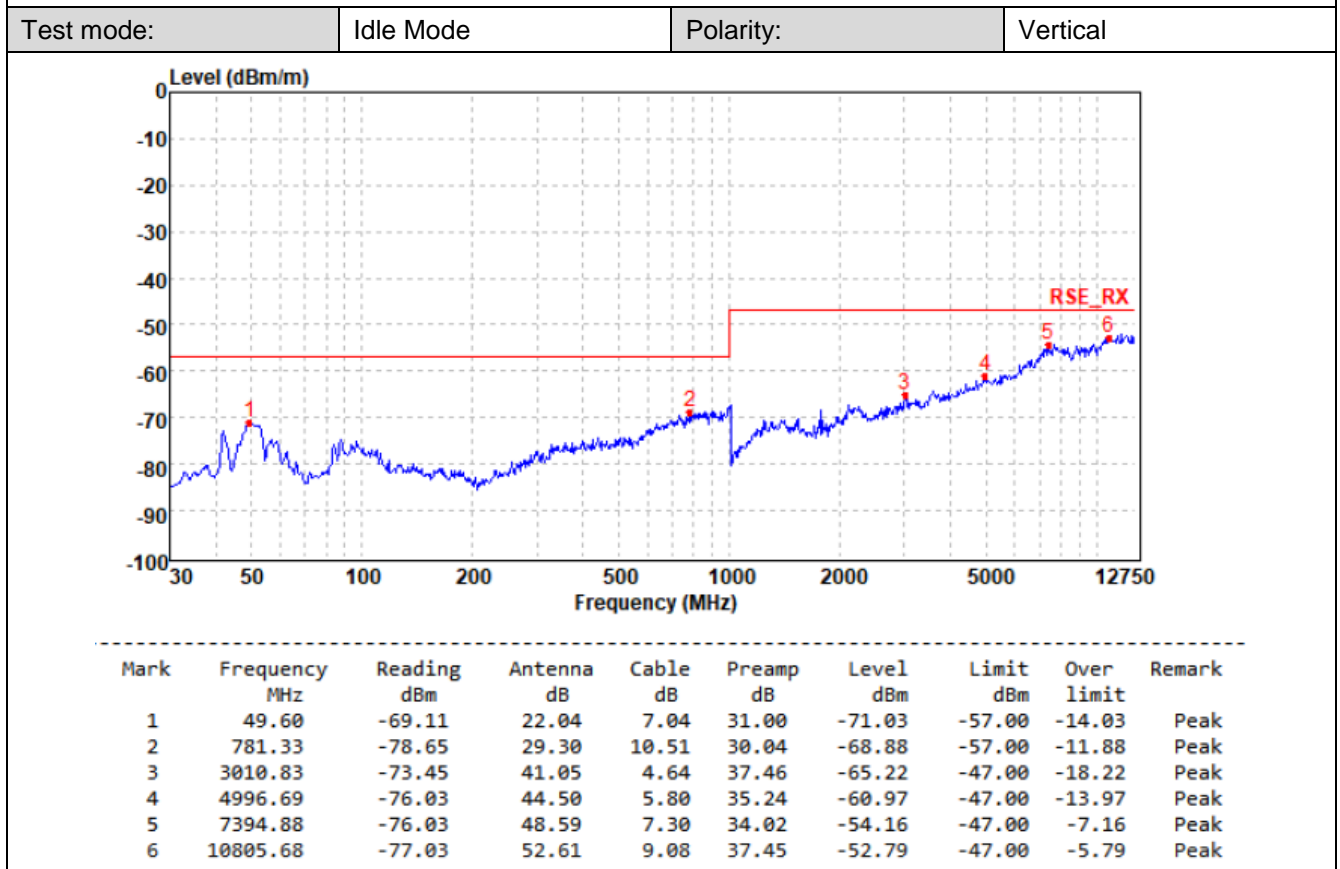
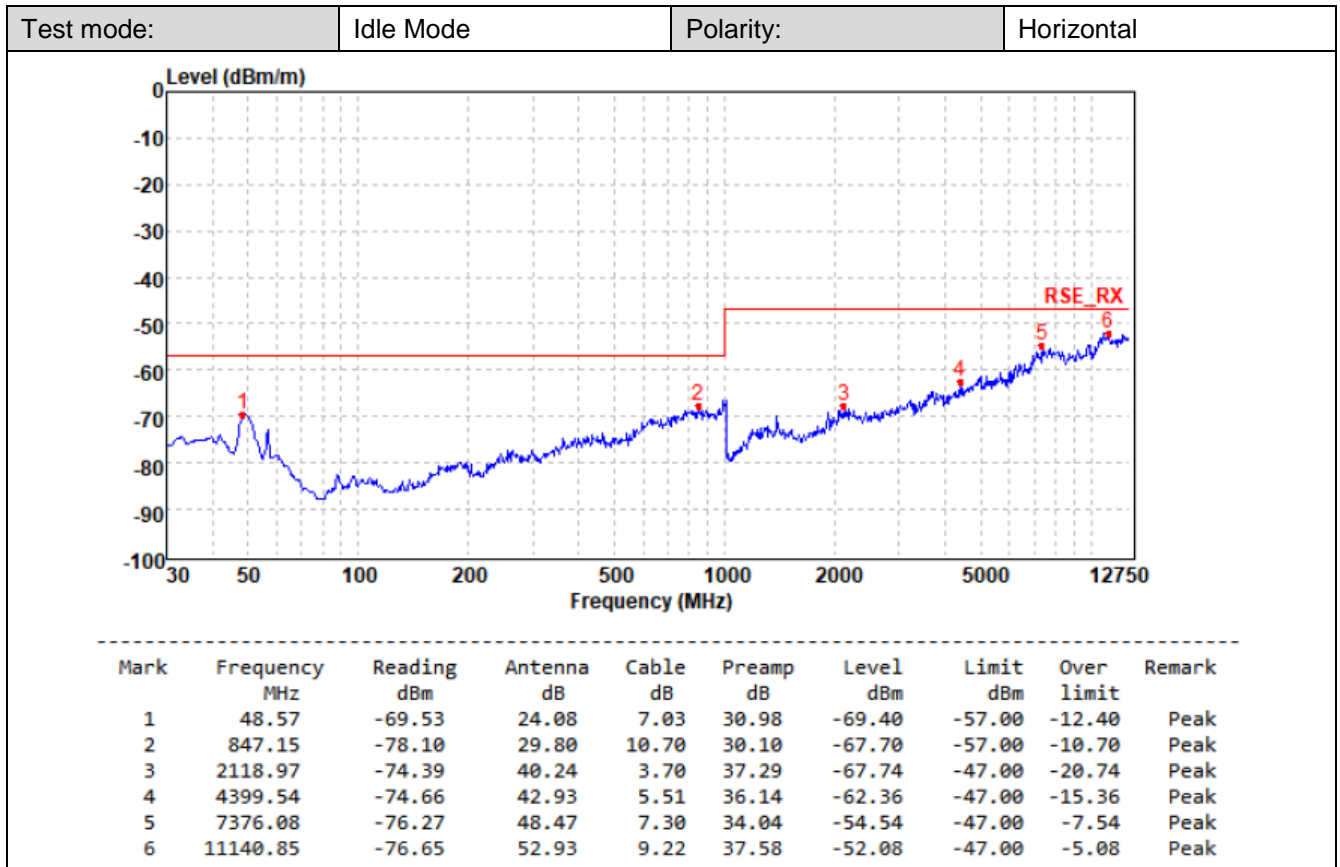


Mark	Frequency MHz	Reading dBm	Antenna dB	Cable dB	Preamp dB	Level dBm	Limit dBm	Over limit	Remark
1	118.23	-79.41	16.87	7.65	0.00	-54.89	-36.00	-18.89	Peak
2	437.37	-93.17	26.03	9.32	0.00	-57.82	-36.00	-21.82	Peak
3	1685.12	-55.64	36.29	3.27	37.15	-53.23	-30.00	-23.23	Peak
4	2124.37	-59.29	40.29	3.71	37.40	-52.69	-30.00	-22.69	Peak
5	5762.24	-67.35	43.95	6.63	33.42	-50.19	-30.00	-20.19	Peak
6	10916.26	-69.06	52.71	9.11	32.28	-39.52	-30.00	-9.52	Peak

Bandwidth:	200kHz	Test channel:	Middle
Test mode:	Traffic Mode	Polarity:	Vertical



Mark	Frequency MHz	Reading dBm	Antenna dB	Cable dB	Preamp dB	Level dBm	Limit dBm	Over limit	Remark
1	125.96	-81.59	21.62	7.70	0.00	-52.27	-36.00	-16.27	Peak
2	388.08	-91.81	25.00	9.12	0.00	-57.69	-36.00	-21.69	Peak
3	2124.37	-55.77	40.47	3.71	37.40	-48.99	-30.00	-18.99	Peak
4	3561.64	-64.73	42.05	4.88	36.99	-54.79	-30.00	-24.79	Peak
5	5762.24	-63.52	44.09	6.63	33.42	-46.22	-30.00	-16.22	Peak
6	10860.83	-68.29	52.66	9.09	32.46	-39.00	-30.00	-9.00	Peak



6. TEST SETUP PHOTOS OF THE EUT



7. EXTERNAL AND INTERNAL PHOTOS OF THE EUT

Refer to the test report No.: CHTEW22090081

-----End of Report-----