FCC RADIO TEST REPORT
FCC ID: 2ADPCS650

Product：	Wireless high precision GNSS positionning terminal
Trade Name：	SOUTH
Model Name：	S650
Serial Model：	S660
Report No.：	BCTC-20141203281F

Prepared for

Guangzhou SOUTH Surveying & Mapping Instrument Co., Ltd.

Room 301 South Building, No.24-26 Keyun Road, Tian He District, Guangzhou, China

Prepared by

Shenzhen BCTC Technology Co., Ltd.

A.Floor 3, 44 Building, Tanglang Industrial Park B, Taoyuan Street, Nanshan District, Shenzhen, China

TEST RESULT CERTIFICATION

Applicant's name	:	Guangzhou SOUTH Surveying & Mapping Instrument Co., Ltd.
Address	:	Room 301 South Building, No.24-26 Keyun Road, Tian He District, Guangzhou, China
Manufacture's Name	:	Guangzhou SOUTH Surveying & Mapping Instrument Co., Ltd.
Address	:	Room 301 South Building, No.24-26 Keyun Road, Tian He District, Guangzhou, China

Product description

Product name	:	Wireless high precision GNSS positionning terminal
Model and/or type reference	:	S650
Serial Model：		S660
Standards	:	FCC Part15.247
Test procedure		ANSI C63.4-2003

This device described above has been tested by BCTC, and the test results show that the equipment under test (EUT) is in compliance with the FCC requirements. And it is applicable only to the tested sample identified in the report.

This report shall not be reproduced except in full, without the written approval of BCTC, this document may be altered or revised by BCTC, personal only, and shall be noted in the revision of the document.

Date of Test	:	
Date (s) of performance of tests	:	21 Nov. 2014 ~29 Nov. 2014
Date of Issue	:	01 Dec. 2014
Test Result	:	**Pass**

Testing Engineer : Lynn Chen

(Lynn Chen)

Technical Manager : Carlen

(Carlen Liu)

Authorized Signatory : Tommy Zhang

(Tommy Zhang)

Table of Contents

Page

Table of Contents

1. SUMMARY OF TEST RESULTS

Test procedures according to the technical standards:

FCC Part15 (15.247) , Subpart C			
Standard Section	Test Item	Judgment	Remark
15.207	Conducted Emission	PASS	
15.247(a)(1)	Hopping Channel Separation	PASS	
15.247(b)(1)	Peak Output Power	PASS	
15.247(c)	Radiated Spurious Emission	PASS	
15.247(a)(iii)	Number of Hopping Frequency	PASS	
15.247(a)(iii)	Dwell Time	PASS	
15.247(a)(1)	Bandwidth	PASS	
15.205	Band Edge Emission	PASS	
15.203	Antenna Requirement	PASS	

NOTE:

(1)” N/A” denotes test is not applicable in this Test Report

1.1 TEST FACILITY

BZT Testing Technology Co., Ltd.
Add.:1/F, Building E, Fenda Science Park, Sanwei Community, Xixiang Street, Bao'an District, Shenzhen P.R. China.
FCC Registered No.: 701733

1.2 MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement **y ± U**，where expended uncertainty **U** is based on a standard uncertainty multiplied by a coverage factor of **k=2**，providing a level of confidence of approximately **95** %。

No.	Item	Uncertainty
1	Conducted Emission Test	±1.38dB
2	RF power,conducted	±0.16dB
3	Spurious emissions,conducted	±0.21dB
4	All emissions,radiated(<1G)	±4.68dB
5	All emissions,radiated(>1G)	±4.89dB
6	Temperature	±0.5°C
7	Humidity	±2%

2. GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

<table>
<tr><td>Equipment</td><td>Wireless high precision GNSS positionning terminal</td></tr>
<tr><td>Trade Name</td><td>SOUTH</td></tr>
<tr><td>Model Name</td><td>S650</td></tr>
<tr><td>Serial Model</td><td>S660</td></tr>
<tr><td>Model Difference</td><td>These two models are the same, just have different in the shape and model name.
Model S650 is square and model S660 is circle.</td></tr>
<tr><td>Product Description</td><td>The EUT is a Wireless high precision GNSS positionning terminal
<table>
<tr><td>Operation Frequency:</td><td>2402~2480 MHz</td></tr>
<tr><td>Modulation Type:</td><td>BT(1Mbps): GFSK
BT EDR(2Mbps):∏/4-DQPSK
BT EDR(3Mbps): 8-DPSK</td></tr>
<tr><td>Bit Rate of Transmitter</td><td>1Mbps/2Mbps/3Mbps</td></tr>
<tr><td>Number Of Channel</td><td>79 CH</td></tr>
<tr><td>Antenna Designation:</td><td>Please see Note 3.</td></tr>
<tr><td>Output Power(Conducted):</td><td>BT(1Mbps): -0.334dBm
BT EDR(2Mbps): 1.064dBm
BT EDR(3Mbps): 0.791dBm</td></tr>
</table>
Based on the application, features, or specification exhibited in User's Manual, the EUT is considered as an ITE/Computing Device. More details of EUT technical specification, please refer to the User's Manual.</td></tr>
<tr><td>Channel List</td><td>Please refer to the Note 2.</td></tr>
<tr><td>Adapter</td><td>N/A</td></tr>
<tr><td>Battery</td><td>N/A</td></tr>
<tr><td>Connecting I/O Port(s)</td><td>Please refer to the User's Manual</td></tr>
</table>

Note:

1. For a more detailed features description, please refer to the manufacturer’s specifications or the User's Manual.

2.

Channel List					
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
00	2402	27	2429	54	2456
01	2403	28	2430	55	2457
02	2404	29	2431	56	2458
03	2405	30	2432	57	2459
04	2406	31	2433	58	2460
05	2407	32	2434	59	2461
06	2408	33	2435	60	2462
07	2409	34	2436	61	2463
08	2410	35	2437	62	2464
09	2411	36	2438	63	2465
10	2412	37	2439	64	2466
11	2413	38	2440	65	2467
12	2414	39	2441	66	2468
13	2415	40	2442	67	2469
14	2416	41	2443	68	2470
15	2417	42	2444	69	2471
16	2418	43	2445	70	2472
17	2419	44	2446	71	2473
18	2420	45	2447	72	2474
19	2421	46	2448	73	2475
20	2422	47	2449	74	2476
21	2423	48	2450	75	2477
22	2424	49	2451	76	2478
23	2425	50	2452	77	2479
24	2426	51	2453	78	2480
25	2427	52	2454		
26	2428	53	2455		

3.

Table for Filed Antenna

Ant.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)	NOTE
1	N/A	N/A	Chip Antenna	NA	0	BT Antenna

2.2 DESCRIPTION OF TEST MODES

To investigate the maximum EMI emission characteristics generates from EUT, the test system was pre-scanning tested base on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively.

Pretest Mode	Description
Mode 1	CH00
Mode 2	CH39
Mode 3	CH78
Mode 4	BT Link

For Conducted Emission	
Final Test Mode	Description
Mode 4	BT Link

For Radiated Emission	
Final Test Mode	Description
Mode 1	CH00
Mode 2	CH39
Mode 3	CH78
Mode 4	BT Link

Note:

(1) The measurements are performed at the highest, middle, lowest available channels.

(2) The EUT use new battery.

(3)The data rate was set in 1Mbps for radiated emission due to the highest RF output power.

2.3 TABLE OF PARAMETERS OF TEXT SOFTWARE SETTING

During testing channel & power controlling software provided by the customer was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output power expected by the customer and is going to be fixed on the firmware of the final end product power parameters of FHSS

Test software Version	Test program: Broadcom		
Frequency	2402 MHz	2441 MHz	2480 MHz
Parameters(1/2/3Mbps)	DEF	DEF	DEF

2.4 BLOCK DIGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED

2.5 DESCRIPTION OF SUPPORT UNITS(CONDUCTED MODE)

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

Item	Equipment	Mfr/Brand	Model/Type No.	Series No.	Note
E-1	Wireless high precision GNSS positionning terminal	SOUTH	S650	N/A	EUT
E-2	Adapter	N/A	PSAI10R-050Q		

Item	Shielded Type	Ferrite Core	Length	Note
C-1	NO	NO	1.5m	

Note:

(1) The support equipment was authorized by Declaration of Confirmation.
(2) For detachable type I/O cable should be specified the length in cm in『Length』column.
(3) “YES” is means “shielded” “with core”; “NO” is means “unshielded” “without core”.

2.6 EQUIPMENTS LIST FOR ALL TEST ITEMS

Radiation Test equipment

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until	Calibration period
1	Spectrum Analyzer	Agilent	E4407B	MY45108040	2014.07.06	2015.07.05	1 year
2	Test Receiver	R&S	ESPI	101318	2014.06.07	2015.06.06	1 year
3	Bilog Antenna	TESEQ	CBL6111D	31216	2014.07.06	2015.07.05	1 year
4	50Ω Coaxial Switch	Anritsu	MP59B	6200264416	2014.06.07	2015.06.06	1 year
5	Spectrum Analyzer	ADVANTEST	R3132	150900201	2014.06.07	2015.06.06	1 year
6	Horn Antenna	EM	EM-AH-10180	2011071402	2014.07.06	2015.07.05	1 year
7	Horn Ant	Schwarzbeck	BBHA 9170	9170-181	2014.07.06	2015.07.05	1 year
8	Amplifier	EM	EM-30180	060538	2014.12.22	2015.12.21	1 year
9	Loop Antenna	ARA	PLA-1030/B	1029	2014.06.08	2015.06.07	1 year
10	Power Meter	R&S	NRVS	100696	2014.07.06	2015.07.05	1 year
11	Power Sensor	R&S	URV5-Z4	0395.1619.05	2014.07.06	2015.07.05	1 year

Conduction Test equipment

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until	Calibration period
1	Test Receiver	R&S	ESCI	101160	2014.06.06	2015.06.05	1 year
2	LISN	R&S	ENV216	101313	2014.08.24	2015.08.23	1 year
3	LISN	EMCO	3816/2	00042990	2014.08.24	2015.08.23	1 year
4	50Ω Coaxial Switch	Anritsu	MP59B	6200264417	2014.06.07	2015.06.06	1 year
5	Passive Voltage Probe	R&S	ESH2-Z3	100196	2014.06.07	2015.06.06	1 year
6	Absorbing clamp	R&S	MOS-21	100423	2014.06.08	2015.06.07	1 year

3. EMC EMISSION TEST

3.1 CONDUCTED EMISSION MEASUREMENT

3.1.1 POWER LINE CONDUCTED EMISSION Limits (Frequency Range 150KHz-30MHz)

FREQUENCY (MHz)	Class A (dBuV)		Class B (dBuV)		Standard
	Quasi-peak	Average	Quasi-peak	Average	
0.15 -0.5	79.00	66.00	66 - 56 *	56 - 46 *	CISPR
0.50 -5.0	73.00	60.00	56.00	46.00	CISPR
5.0 -30.0	73.00	60.00	60.00	50.00	CISPR

0.15 -0.5	79.00	66.00	66 - 56 *	56 - 46 *	FCC
0.50 -5.0	73.00	60.00	56.00	46.00	FCC
5.0 -30.0	73.00	60.00	60.00	50.00	FCC

Note:

(1) The tighter limit applies at the band edges.

(2) The limit of " * " marked band means the limitation decreases linearly with the logarithm of the frequency in the range.

The following table is the setting of the receiver

Receiver Parameters	Setting
Attenuation	10 dB
Start Frequency	0.15 MHz
Stop Frequency	30 MHz
IF Bandwidth	9 kHz

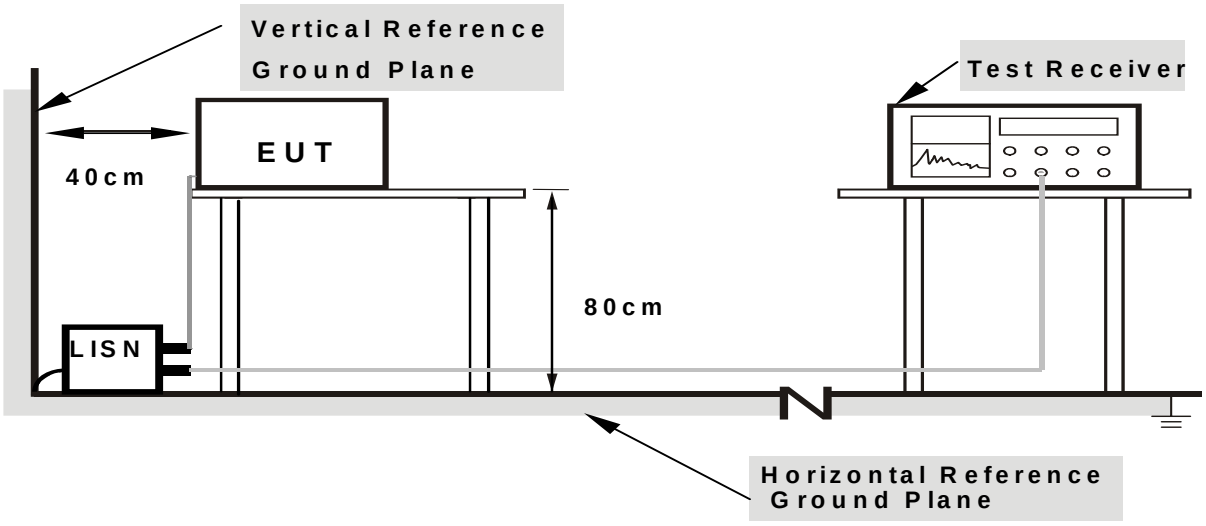
3.1.2 TEST PROCEDURE

a. The EUT was placed 0.4 meters from the horizontal ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipments powered from additional LISN(s). The LISN provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.
b. Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.
c. I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.
d. LISN at least 80 cm from nearest part of EUT chassis.
e. For the actual test configuration, please refer to the related Item –EUT Test Photos.

3.1.3 DEVIATION FROM TEST STANDARD

No deviation

3.1.4 TEST SETUP



Note: 1.Support units were connected to second LISN.
2.Both of LISNs (AMN) are 80 cm from EUT and at least 80 from other units and other metal planes

3.1.5 EUT OPERATING CONDITIONS

The EUT was configured for testing in a typical fashion (as a customer would normally use it). The EUT has been programmed to continuously transmit during test. This operating condition was tested and used to collect the included data.

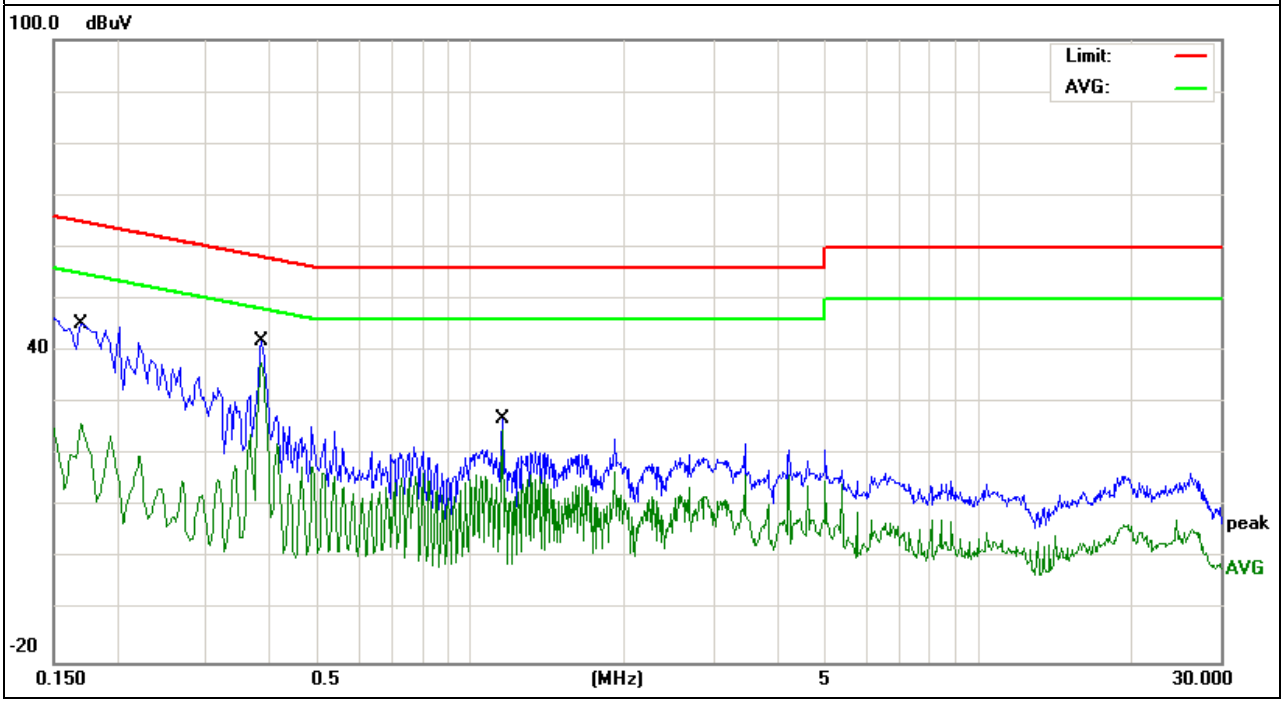
3.1.6 TEST RESULTS

EUT：	Wireless high precision GNSS positionning terminal	Model Name ：	S650
Temperature：	26 ℃	Relative Humidity：	54%
Pressure：	1010hPa	Phase：	L
Test Voltage ：	AC 120V/60Hz	Test Mode：	Mode 1

Frequency (MHz)	Reading Level (dBμV)	Correct Factor (dB)	Measure-ment (dBμV)	Limits (dBμV)	Margin (dB)	Detector Type
0.1700	45.60	0.75	46.35	64.96	-18.61	QP
0.1700	25.37	0.75	26.12	54.96	-28.84	AVG
0.3860	41.44	0.48	41.92	58.15	-16.23	QP
0.3860	37.21	0.48	37.69	48.15	-10.46	AVG
1.1539	26.54	0.35	26.89	56.00	-29.11	QP
1.1539	24.46	0.35	24.81	46.00	-21.19	AVG

Remark:

1. All readings are Quasi-Peak and Average values.
2. Factor = Insertion Loss + Cable Loss.

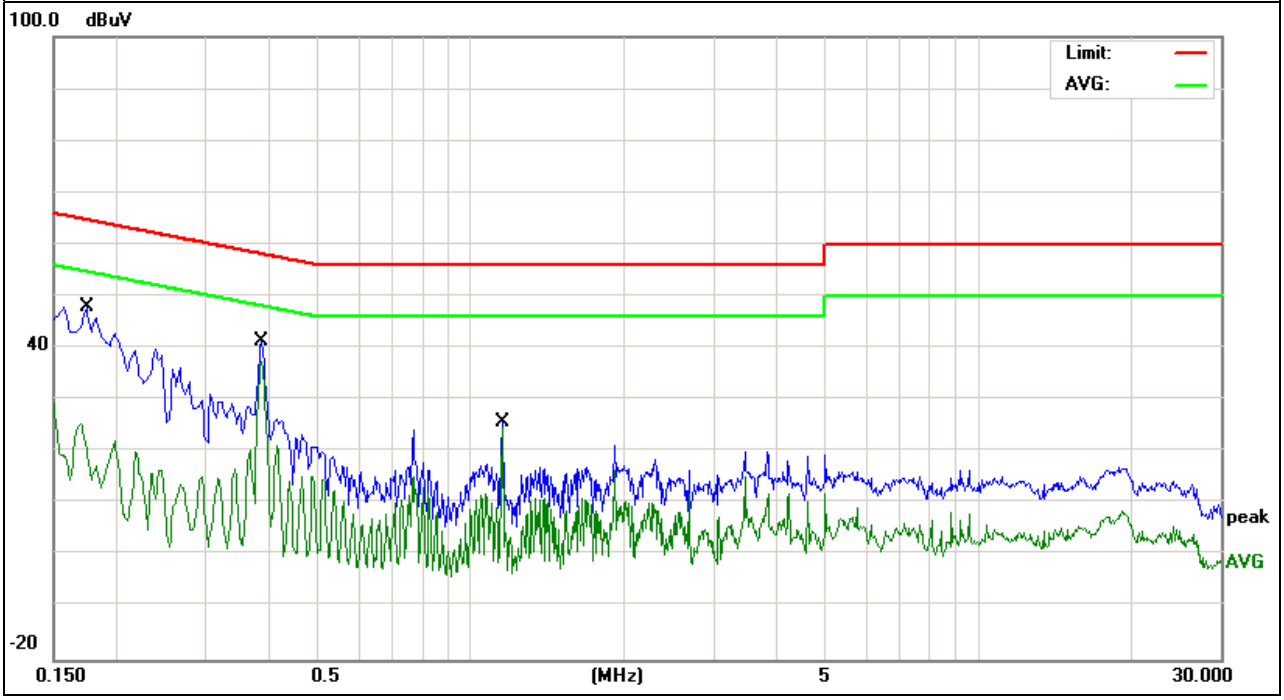


EUT：	Wireless high precision GNSS positionning terminal	Model Name ：	S650
Temperature：	26 ℃	Relative Humidity：	54%
Pressure：	1010hPa	Phase：	N
Test Voltage ：	AC 120V/60Hz	Test Mode：	Mode 1

Frequency	Reading Level	Correct Factor	Measure-ment	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV)	(dBμV)	(dB)	
0.1740	28.81	0.69	29.50	54.76	-25.26	AVG
0.1740	47.27	0.69	47.96	64.76	-16.80	QP
0.3860	40.83	0.48	41.31	58.15	-16.84	QP
0.3860	36.98	0.48	37.46	48.15	-10.69	AVG
1.1539	25.31	0.35	25.66	56.00	-30.34	QP
1.1539	24.28	0.35	24.63	46.00	-21.37	AVG

Remark:

1. All readings are Quasi-Peak and Average values.
2. Factor = Insertion Loss + Cable Loss.



3.2 RADIATED EMISSION MEASUREMENT

3.2.1 RADIATED EMISSION LIMITS (Frequency Range 9kHz-1000MHz)

20dBc in any 100 kHz bandwidth outside the operating frequency band. In case the emission fall within the restricted band specified on 15.205(a), then the 15.209(a) limit in the table below has to be followed.

Frequencies (MHz)	Field Strength (micorvolts/meter)	Measurement Distance (meters)
0.009~0.490	2400/F(KHz)	300
0.490~1.705	24000/F(KHz)	30
1.705~30.0	30	30
30~88	100	3
88~216	150	3
216~960	200	3
Above 960	500	3

LIMITS OF RADIATED EMISSION MEASUREMENT (Above 1000MHz)

FREQUENCY (MHz)	Class A (dBuV/m) (at 3M)		Class B (dBuV/m) (at 3M)	
	PEAK	AVERAGE	PEAK	AVERAGE
Above 1000	80	60	74	54

Notes:

(1) The limit for radiated test was performed according to FCC PART 15C.

(2) The tighter limit applies at the band edges.

(3) Emission level (dBuV/m)=20log Emission level (uV/m).

FREQUENCY RANGE OF RADIATED MEASUREMENT (For unintentional radiators)

Highest frequency generated or Upper frequency of measurement used in the device or on which the device operates or tunes (MHz)	Range (MHz)
Below 1.705	30
1.705 – 108	1000
108 – 500	2000
500 – 1000	5000
Above 1000	5th harmonic of the highest frequency or 40 GHz, whichever is lower

Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	10th carrier harmonic
RB / VB (emission in restricted band)	1 MHz / 1 MHz for Peak, 1 MHz / 10Hz for Average

Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RB 200Hz for QP
Start ~ Stop Frequency	150kHz~30MHz / RB 9kHz for QP
Start ~ Stop Frequency	30MHz~1000MHz / RB 120kHz for QP

3.2.2 TEST PROCEDURE

a. The measuring distance of at 3 m shall be used for measurements at frequency up to 1GHz. For frequencies above 1GHz, any suitable measuring distance may be used.
b. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter open area test site. The table was rotated 360 degrees to determine the position of the highest radiation.
c. The height of the equipment or of the substitution antenna shall be 0.8 m; the height of the test antenna shall vary between 1 m to 4 m. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
d. The initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured.
e. If the Peak Mode measured value compliance with and lower than Quasi Peak Mode Limit, the EUT shall be deemed to meet QP Limits and then no additional QP Mode measurement performed.
f. For the actual test configuration, please refer to the related Item –EUT Test Photos.

Note:

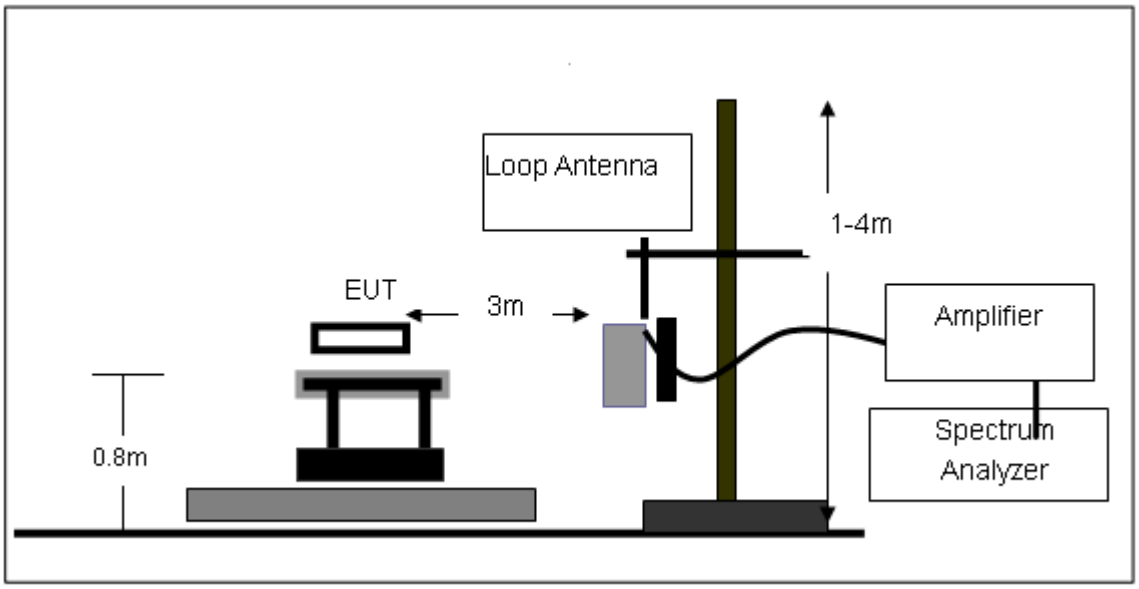
Both horizontal and vertical antenna polarities were tested
and performed pretest to three orthogonal axis. The worst case emissions were reported

3.2.3 DEVIATION FROM TEST STANDARD

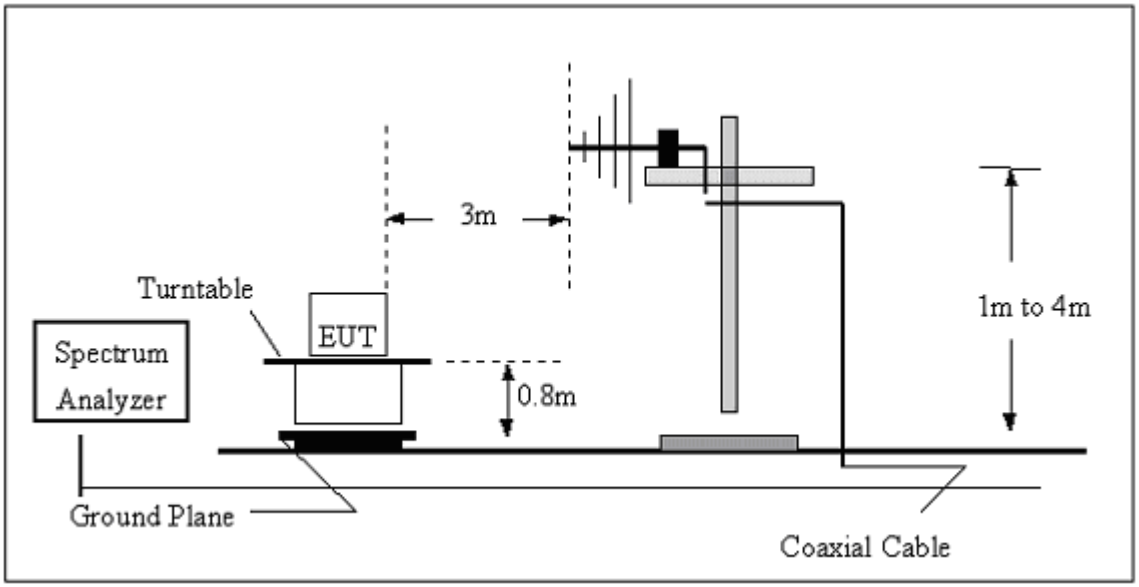
No deviation

3.2.4 TEST SETUP

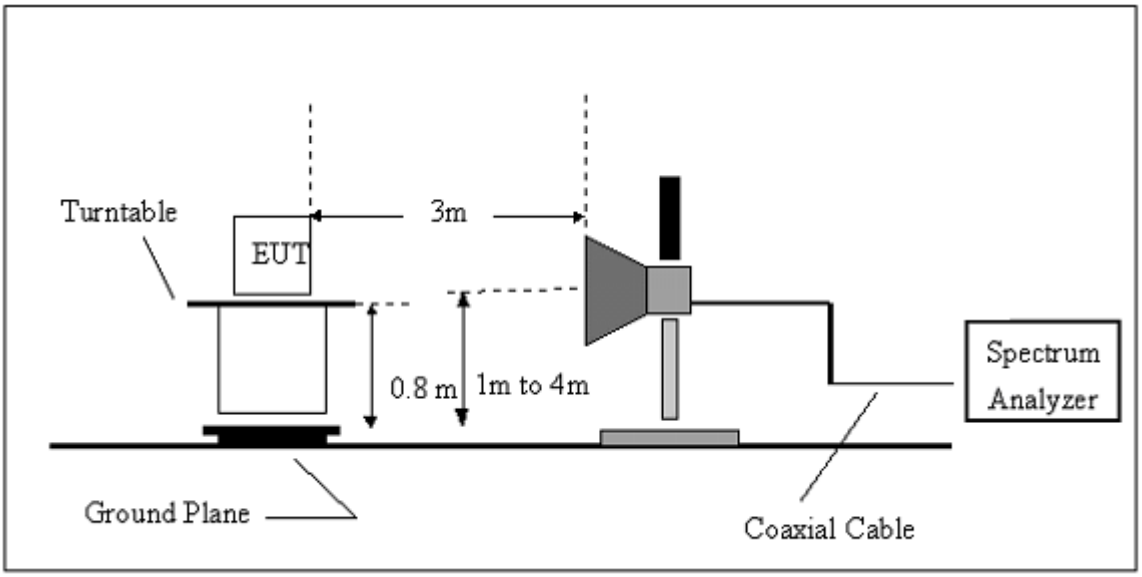
（A）Radiated Emission Test-Up Frequency Below 30MHz



（B）Radiated Emission Test-Up Frequency 30MHz~1GHz



（C）Radiated Emission Test-Up Frequency Above 1GHz



3.2.5 EUT OPERATING CONDITIONS

The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.

3.2.6 TEST RESULTS (BELOW 30 MHZ)

EUT：	Wireless high precision GNSS positionning terminal	Model Name ：	S650
Temperature：	20 ℃	Relative Humidity：	48%
Pressure：	1010 hPa	Test Voltage ：	---
Test Mode ：	TX	Polarization :	---

Freq.	Reading	Limit	Margin	State
(MHz)	(dBuV/m)	(dBuV/m)	(dB)	P/F
--	--	--	--	PASS
--	--	--	--	PASS

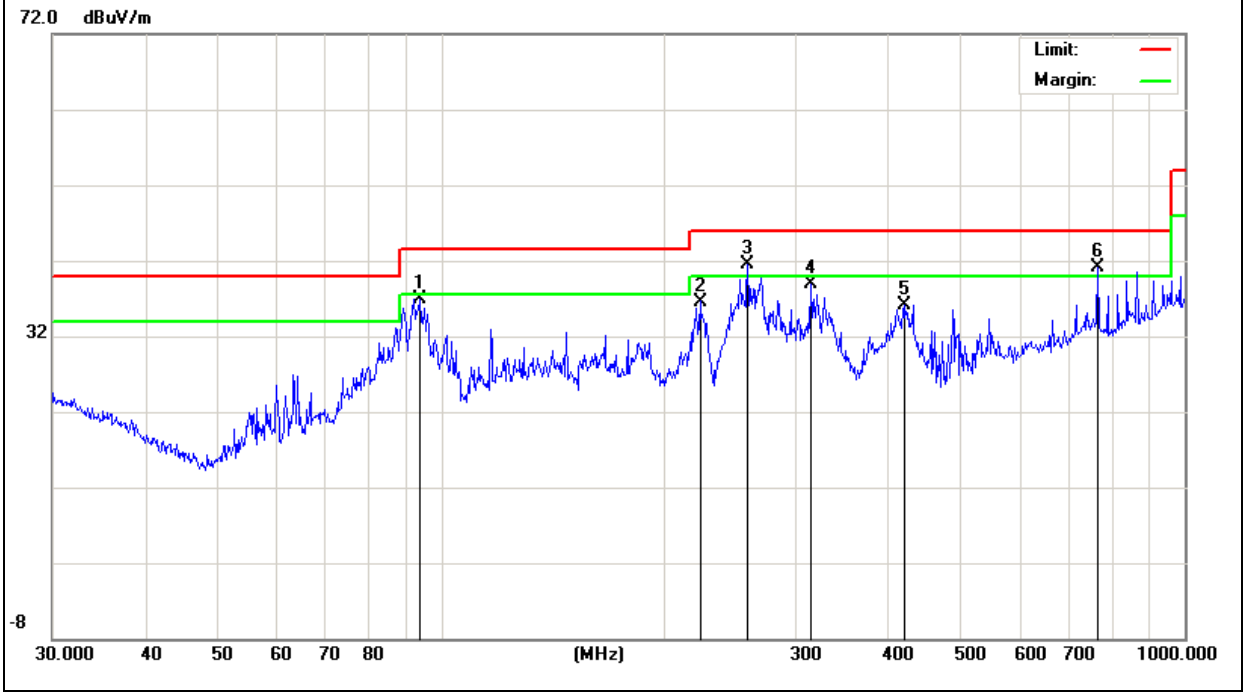
NOTE:
The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.
Distance extrapolation factor =20 log (specific distance/test distance)(dB);
Limit line = specific limits(dBuv) + distance extrapolation factor.

3.2.7 TEST RESULTS (BETWEEN 30M – 1000 MHZ)

EUT：	Wireless high precision GNSS positionning terminal	Model Name ：	S650
Temperature：	20 ℃	Relative Humidity：	48%
Pressure：	1010 hPa	Test Voltage ：	AC 120V/60Hz
Test Mode ：	TX	Polarization：	Horizontal

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
93.4402	26.98	9.98	36.96	43.50	-6.54	QP
222.9502	26.02	10.58	36.60	46.00	-9.40	QP
258.3264	26.77	14.71	41.48	46.00	-4.52	QP
314.3765	23.73	15.21	38.94	46.00	-7.06	QP
420.5803	17.07	19.02	36.09	46.00	-9.91	QP
763.3757	14.68	26.33	41.01	46.00	-4.99	QP

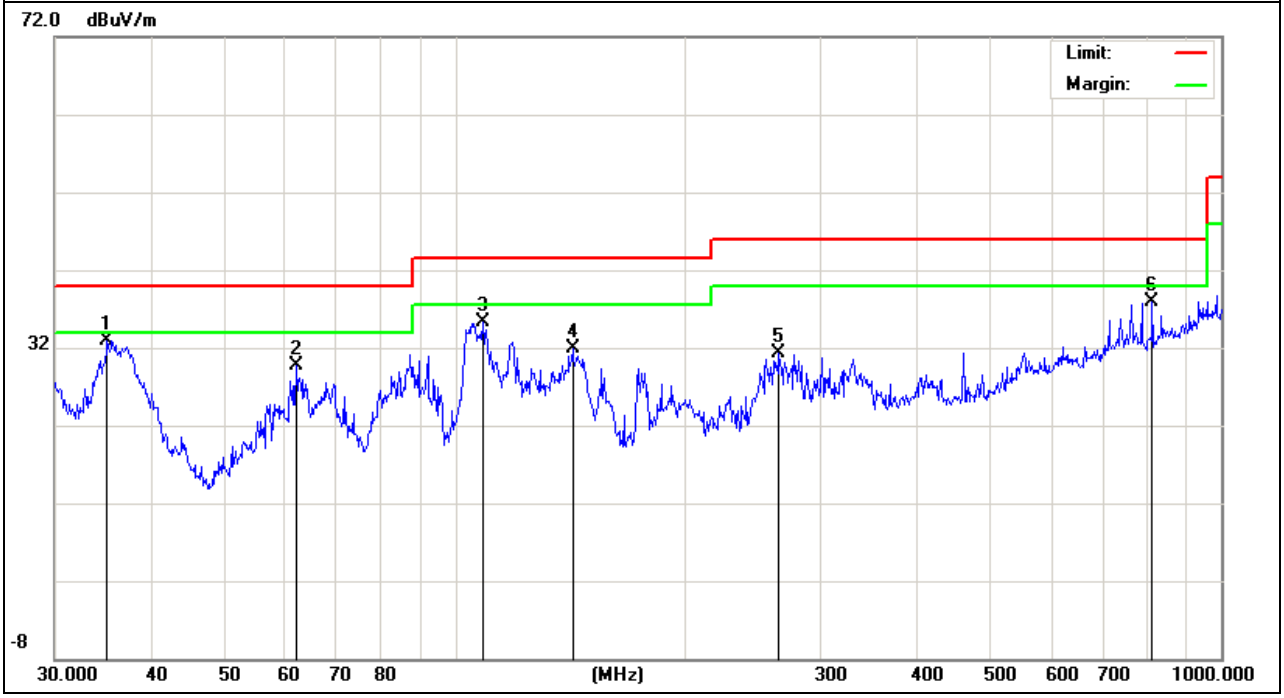
Remark:
Factor = Antenna Factor + Cable Loss – Pre-amplifier.



EUT：	Wireless high precision GNSS positionning terminal	Model Name ：	S650
Temperature：	20 ℃	Relative Humidity：	48%
Pressure：	1010 hPa	Test Voltage ：	AC 120V/60Hz
Test Mode ：	TX	Polarization：	Vertical

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
35.1278	17.17	15.81	32.98	40.00	-7.02	QP
61.9951	24.42	5.31	29.73	40.00	-10.27	QP
108.6470	23.91	11.47	35.38	43.50	-8.12	QP
142.3243	19.77	12.10	31.87	43.50	-11.63	QP
264.7456	16.73	14.53	31.26	46.00	-14.74	QP
813.1115	11.47	26.35	37.82	46.00	-8.18	QP

Remark:
Factor = Antenna Factor + Cable Loss – Pre-amplifier.

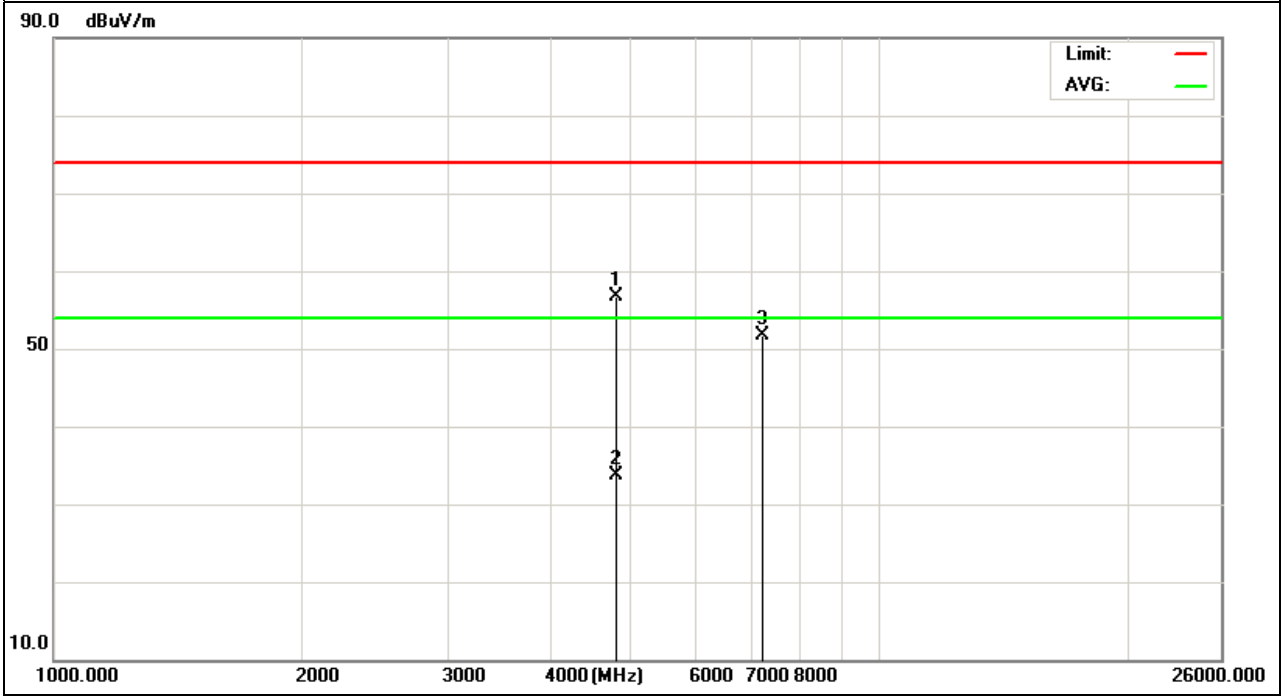


3.2.8 TEST RESULTS (ABOVE 1000 MHZ)

EUT：	Wireless high precision GNSS positionning terminal	Model Name ：	S650
Temperature：	20 ℃	Relative Humidity：	48%
Pressure：	1010 hPa	Test Voltage ：	AC 120V/60Hz
Test Mode ：	TX 2402MHz – CH 00(1Mbps)	Polarization：	Horizontal

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
4803.945	46.37	10.40	56.77	74.00	-17.23	peak
4803.945	23.25	10.40	33.65	54.00	-20.35	AVG
7206.007	39.37	12.39	51.76	74.00	-22.24	peak

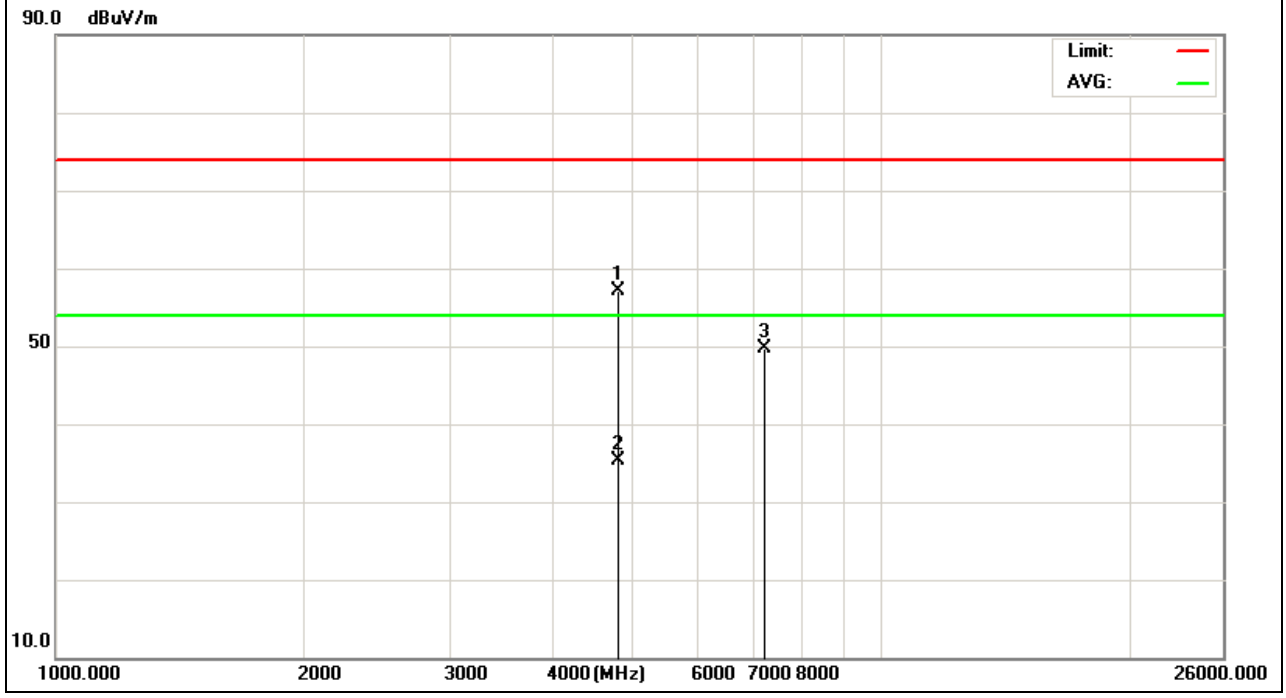
Remark:
Factor = Antenna Factor + Cable Loss – Pre-amplifier.
No emission detected above 18GHz



EUT：	Wireless high precision GNSS positionning terminal	Model Name ：	S650
Temperature：	20 ℃	Relative Humidity：	48%
Pressure：	1010 hPa	Test Voltage ：	AC 120V/60Hz
Test Mode ：	TX 2402MHz – CH 00(1Mbps)	Polarization :	Vertical

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
4804.211	46.65	10.40	57.05	74.00	-16.95	peak
4804.211	24.95	10.40	35.35	54.00	-18.65	AVG
7207.192	37.26	12.39	49.65	74.00	-24.35	peak

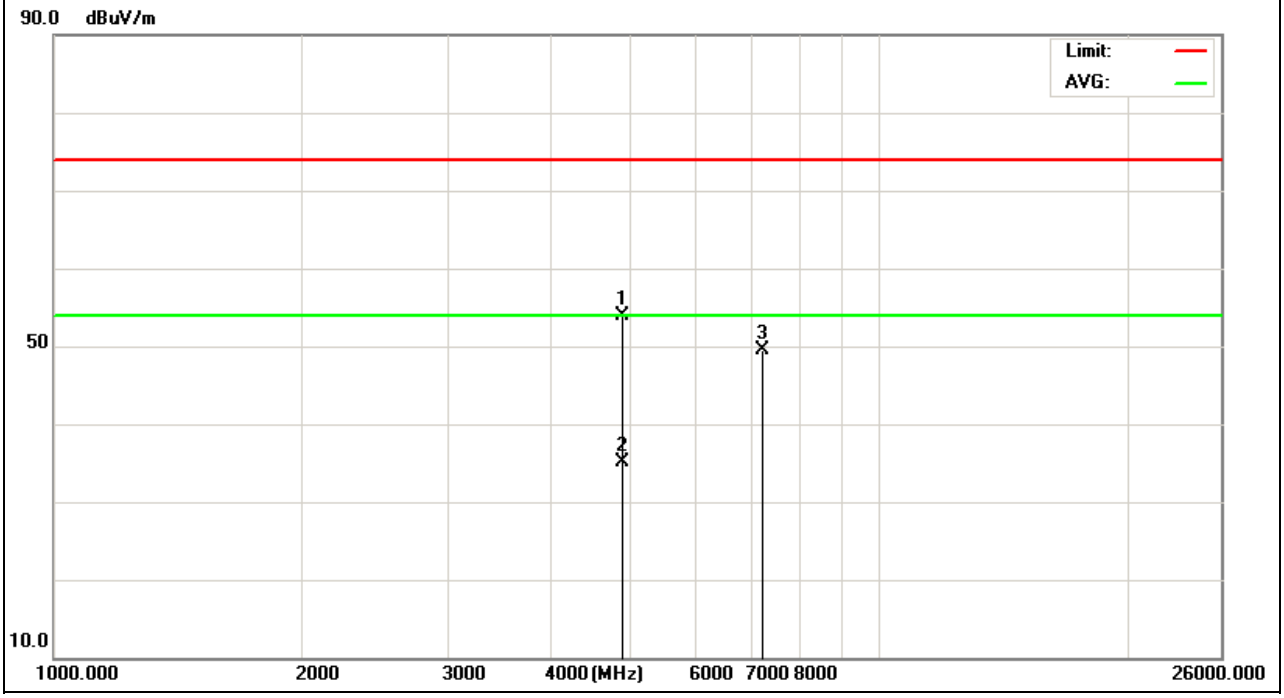
Remark:
Factor = Antenna Factor + Cable Loss – Pre-amplifier.
No emission detected above 18GHz



EUT：	Wireless high precision GNSS positionning terminal	Model Name ：	S650
Temperature：	20 ℃	Relative Humidity：	48%
Pressure：	1010 hPa	Test Voltage ：	AC 120V/60Hz
Test Mode ：	TX 2441MHz – CH 39(1Mbps)	Polarization：	Vertical

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
4883.578	43.51	10.35	53.86	74.00	-20.14	peak
4883.578	24.80	10.35	35.15	54.00	-18.85	AVG
7223.384	37.01	12.40	49.41	74.00	-24.59	peak

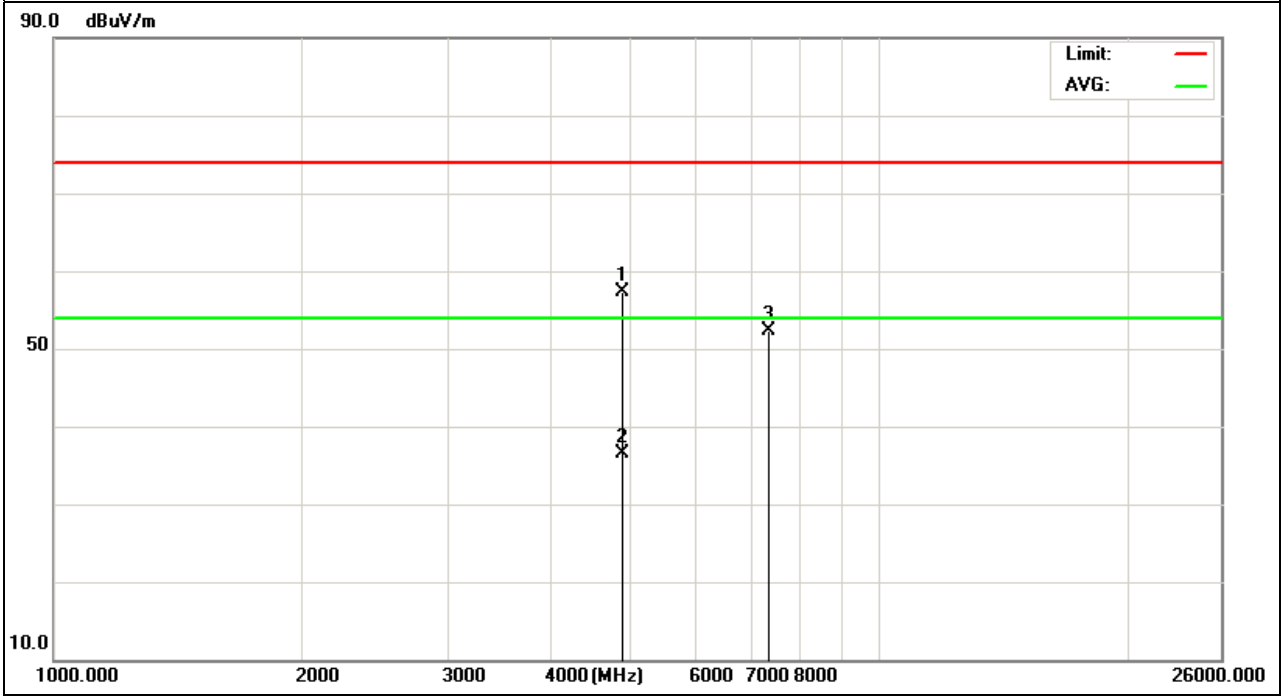
Remark:
Factor = Antenna Factor + Cable Loss – Pre-amplifier.
No emission detected above 18GHz



EUT：	Wireless high precision GNSS positionning terminal	Model Name ：	S650
Temperature：	20 ℃	Relative Humidity：	48%
Pressure：	1010 hPa	Test Voltage ：	AC 120V/60Hz
Test Mode ：	TX 2441MHz – CH 39(1Mbps)	Polarization：	Horizontal

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
4882.221	46.87	10.36	57.23	74.00	-16.77	peak
4882.221	26.22	10.36	36.58	54.00	-17.42	AVG
7322.165	39.63	12.76	52.39	74.00	-21.61	peak

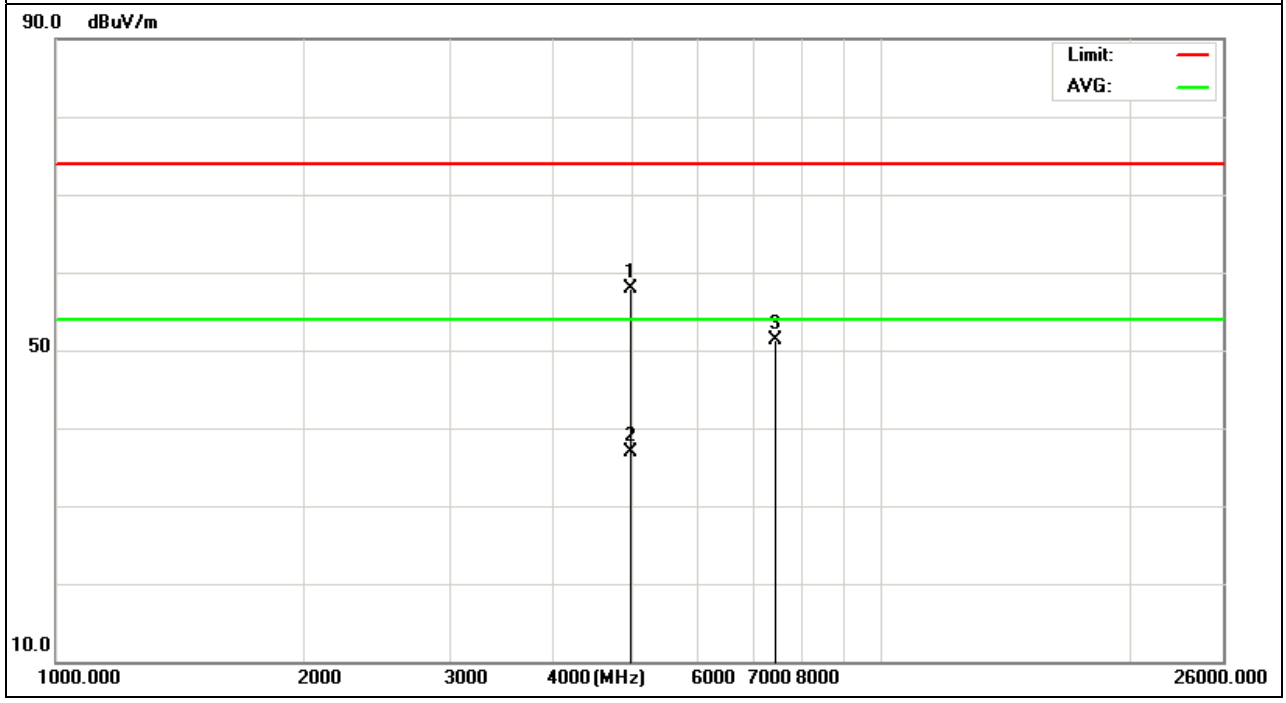
Remark:
Factor = Antenna Factor + Cable Loss – Pre-amplifier.
No emission detected above 18GHz



EUT：	Wireless high precision GNSS positionning terminal	Model Name ：	S650
Temperature：	20 ℃	Relative Humidity：	48%
Pressure：	1010 hPa	Test Voltage ：	AC 120V/60Hz
Test Mode ：	TX 2480MHz – CH 78(1Mbps)	Polarization：	Horizontal

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
4960.916	47.51	10.45	57.96	74.00	-16.04	peak
4960.916	26.49	10.45	36.94	54.00	-17.06	AVG
7441.456	38.16	13.16	51.32	74.00	-22.68	peak

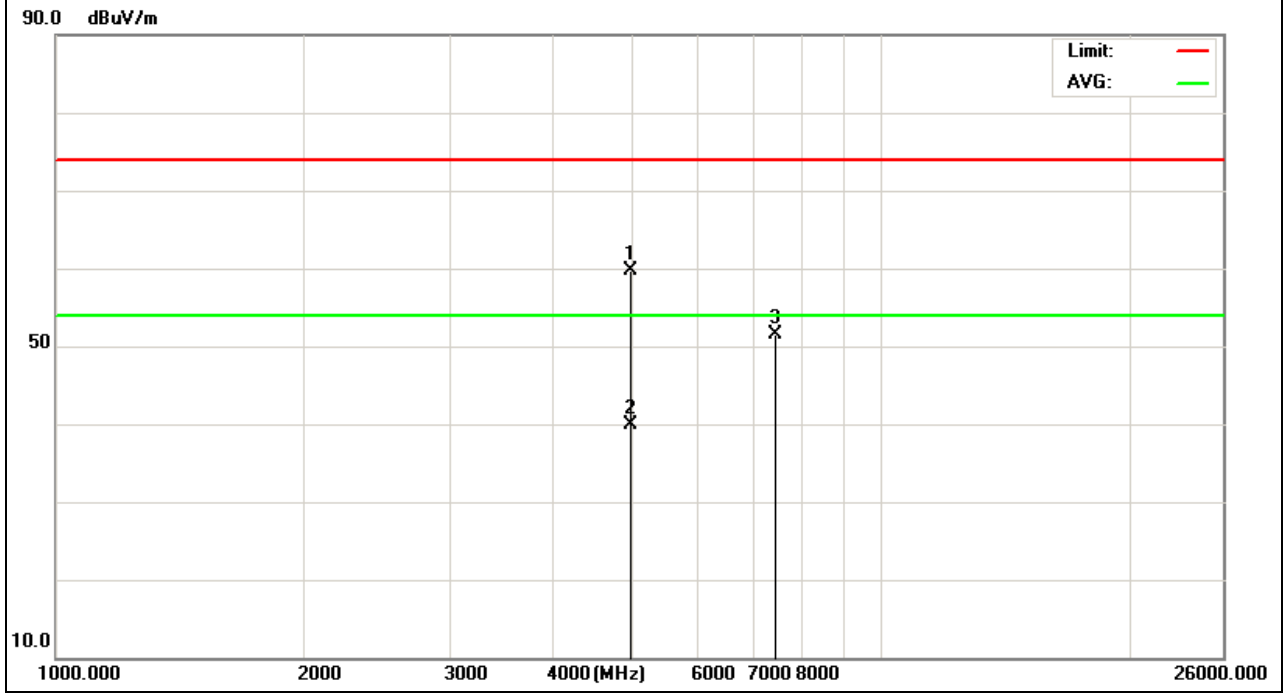
Remark:
Factor = Antenna Factor + Cable Loss – Pre-amplifier.
No emission detected above 18GHz



EUT：	Wireless high precision GNSS positionning terminal	Model Name ：	S650
Temperature：	20 ℃	Relative Humidity：	48%
Pressure：	1010 hPa	Test Voltage ：	AC 120V/60Hz
Test Mode ：	TX 2480MHz – CH 78(1Mbps)	Polarization :	Vertical

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
4961.671	49.20	10.45	59.65	74.00	-14.35	peak
4961.671	29.55	10.45	40.00	54.00	-14.00	AVG
7440.494	38.44	13.14	51.58	74.00	-22.42	peak

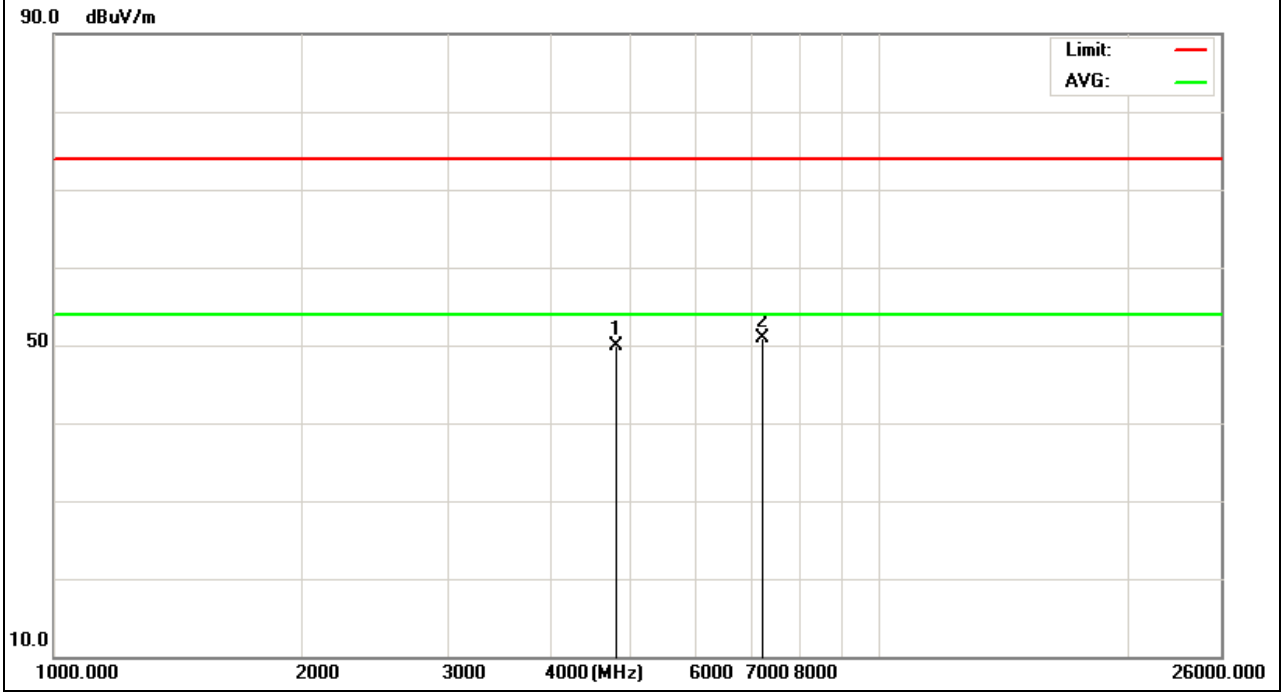
Remark:
Factor = Antenna Factor + Cable Loss – Pre-amplifier.
No emission detected above 18GHz



EUT：	Wireless high precision GNSS positionning terminal	Model Name ：	S650
Temperature：	20 ℃	Relative Humidity：	48%
Pressure：	1010 hPa	Test Voltage ：	AC 120V/60Hz
Test Mode ：	TX 2402MHz – CH 00(2Mbps)	Polarization：	Horizontal

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
4803.617	39.52	10.40	49.92	74.00	-24.08	peak
7206.313	38.47	12.39	50.86	74.00	-23.14	peak

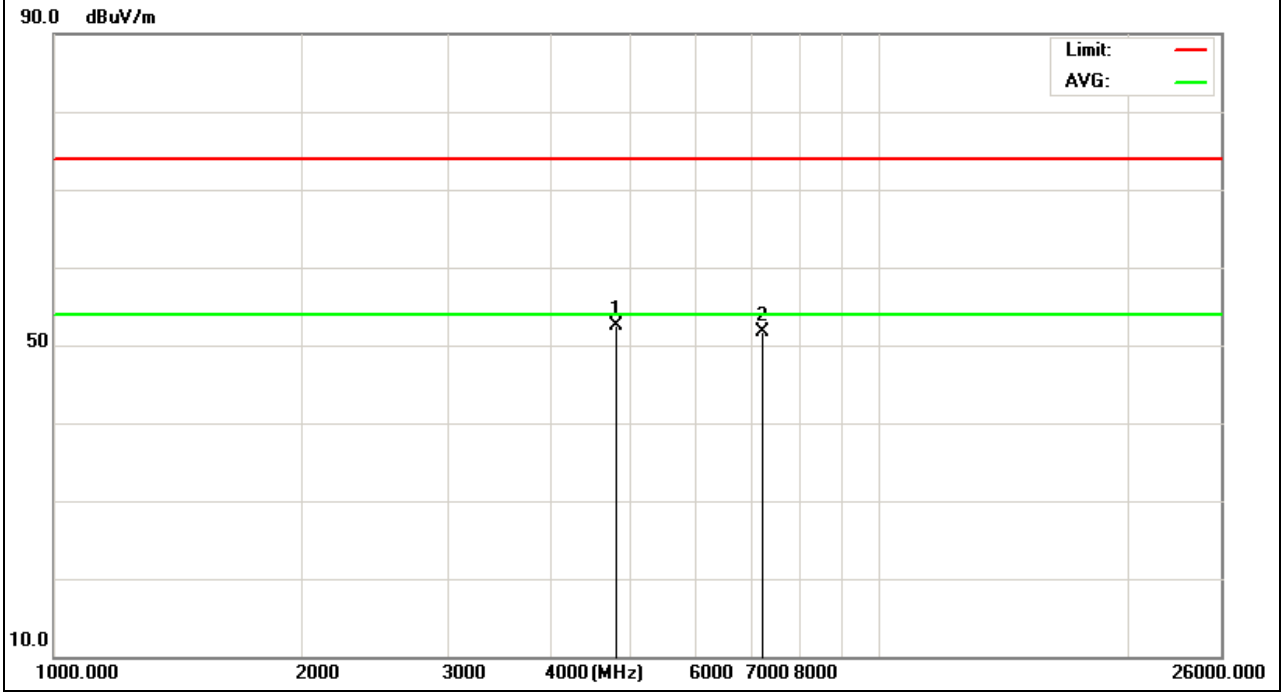
Remark:
Factor = Antenna Factor + Cable Loss – Pre-amplifier.
No emission detected above 18GHz



EUT：	Wireless high precision GNSS positionning terminal	Model Name ：	S650
Temperature：	20 ℃	Relative Humidity：	48%
Pressure：	1010 hPa	Test Voltage ：	AC 120V/60Hz
Test Mode ：	TX 2402MHz – CH 00(2Mbps)	Polarization：	Vertical

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
4804.736	42.07	10.40	52.47	74.00	-21.53	peak
7205.942	39.23	12.39	51.62	74.00	-22.38	peak

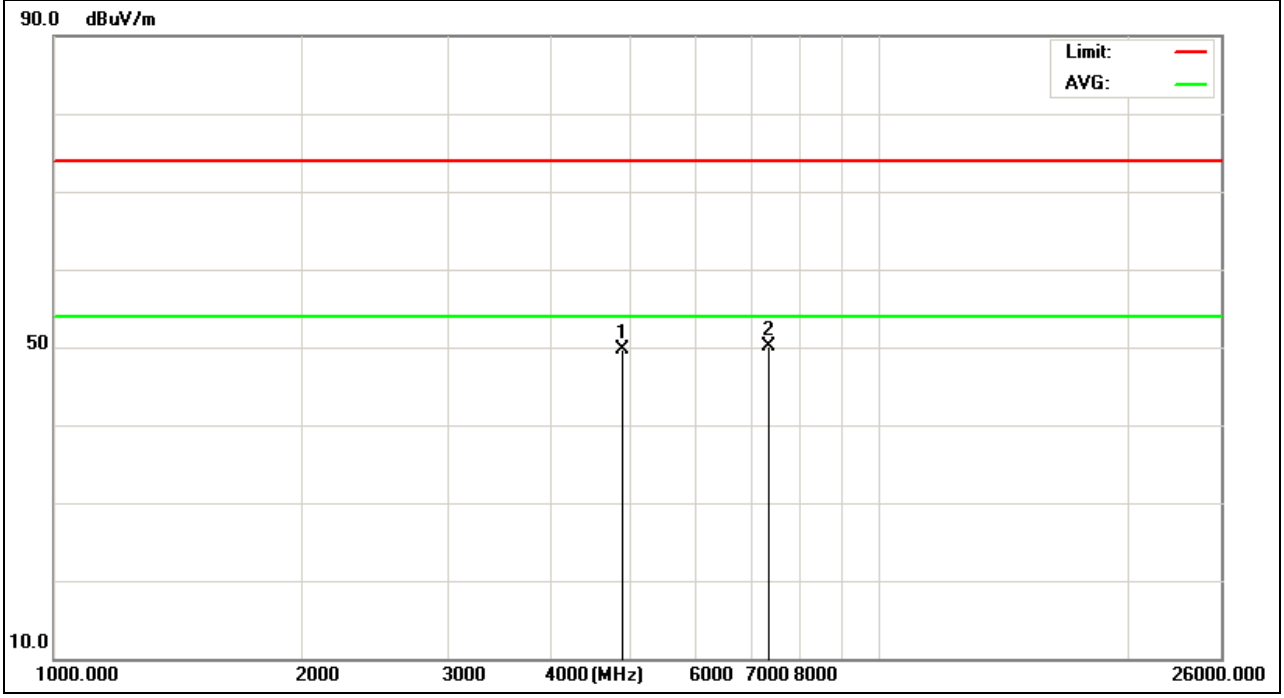
Remark:
Factor = Antenna Factor + Cable Loss – Pre-amplifier.
No emission detected above 18GHz



EUT：	Wireless high precision GNSS positionning terminal	Model Name ：	S650
Temperature：	20 ℃	Relative Humidity：	48%
Pressure：	1010 hPa	Test Voltage ：	AC 120V/60Hz
Test Mode ：	TX 2441MHz – CH 39(2Mbps)	Polarization：	Horizontal

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
4883.149	39.36	10.35	49.71	74.00	-24.29	peak
7322.284	37.42	12.76	50.18	74.00	-23.82	peak

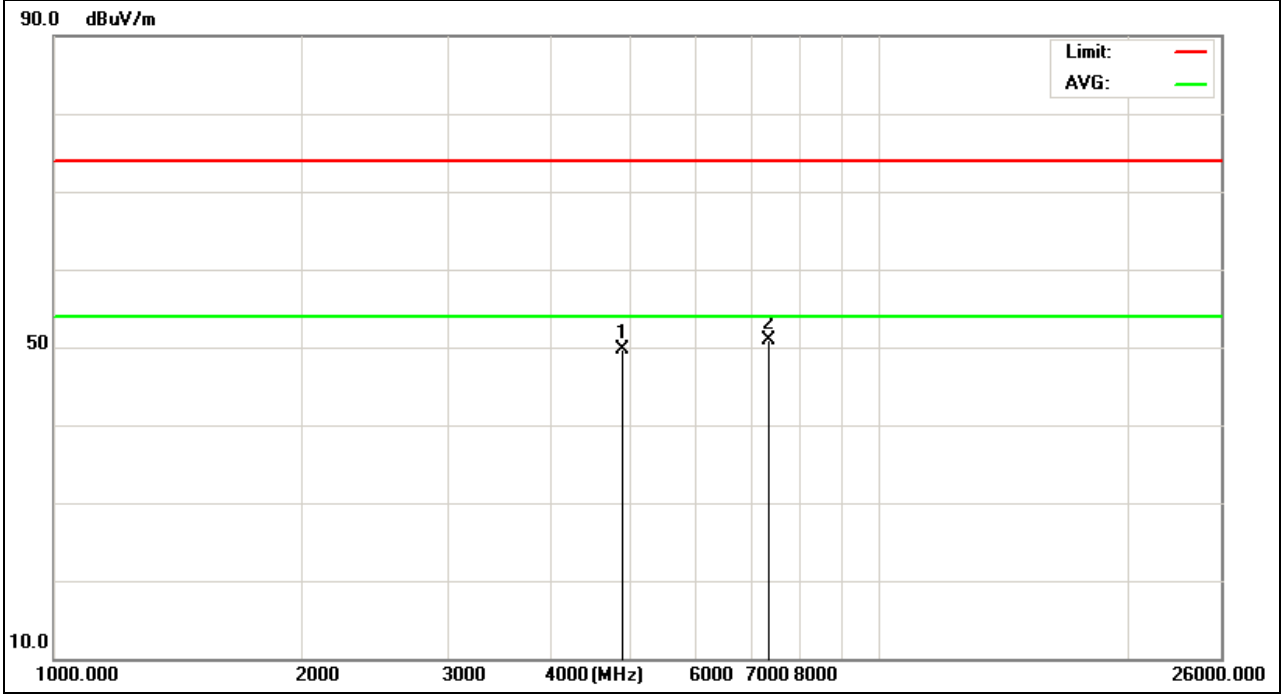
Remark:
Factor = Antenna Factor + Cable Loss – Pre-amplifier.
No emission detected above 18GHz



EUT：	Wireless high precision GNSS positionning terminal	Model Name ：	S650
Temperature：	20 ℃	Relative Humidity：	48%
Pressure：	1010 hPa	Test Voltage ：	AC 120V/60Hz
Test Mode ：	TX 2441MHz – CH 39(2Mbps)	Polarization：	Vertical

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
4882.031	39.30	10.36	49.66	74.00	-24.34	peak
7323.264	38.11	12.77	50.88	74.00	-23.12	peak

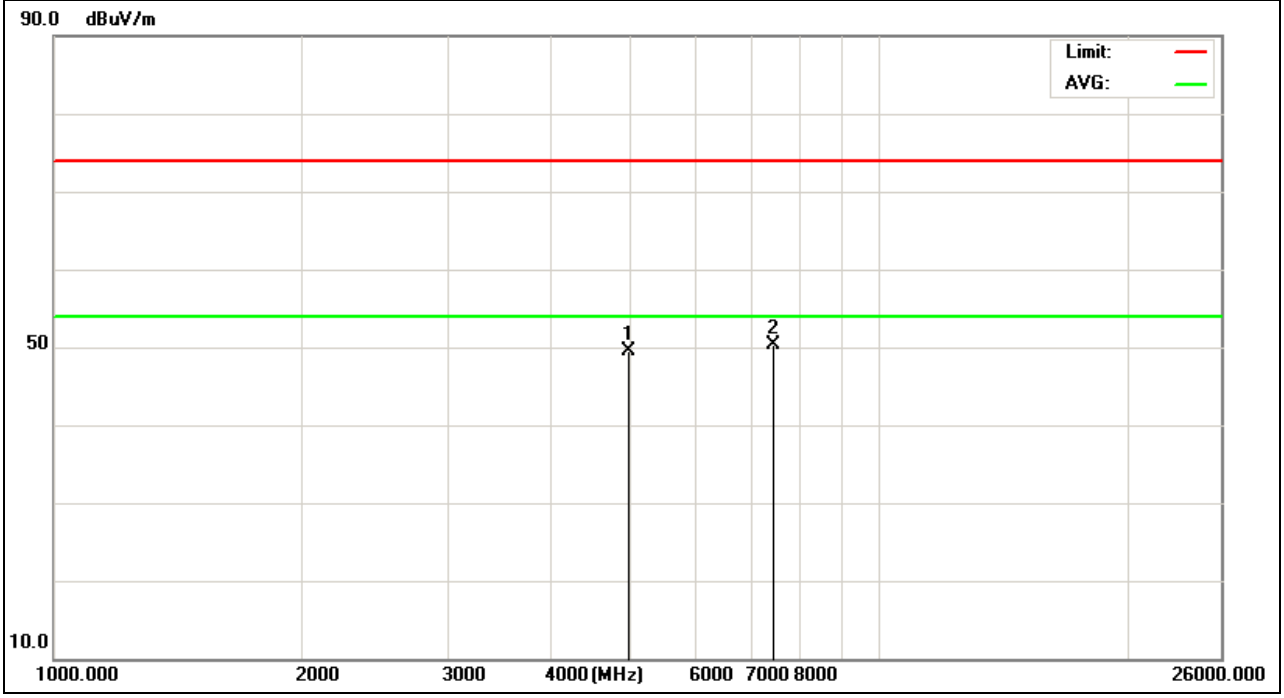
Remark:
Factor = Antenna Factor + Cable Loss – Pre-amplifier.
No emission detected above 18GHz



EUT：	Wireless high precision GNSS positionning terminal	Model Name ：	S650
Temperature：	20 ℃	Relative Humidity：	48%
Pressure：	1010 hPa	Test Voltage ：	AC 120V/60Hz
Test Mode ：	TX 2480MHz – CH 78(2Mbps)	Polarization：	Horizontal

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
4960.386	38.96	10.46	49.42	74.00	-24.58	peak
7441.351	37.09	13.16	50.25	74.00	-23.75	peak

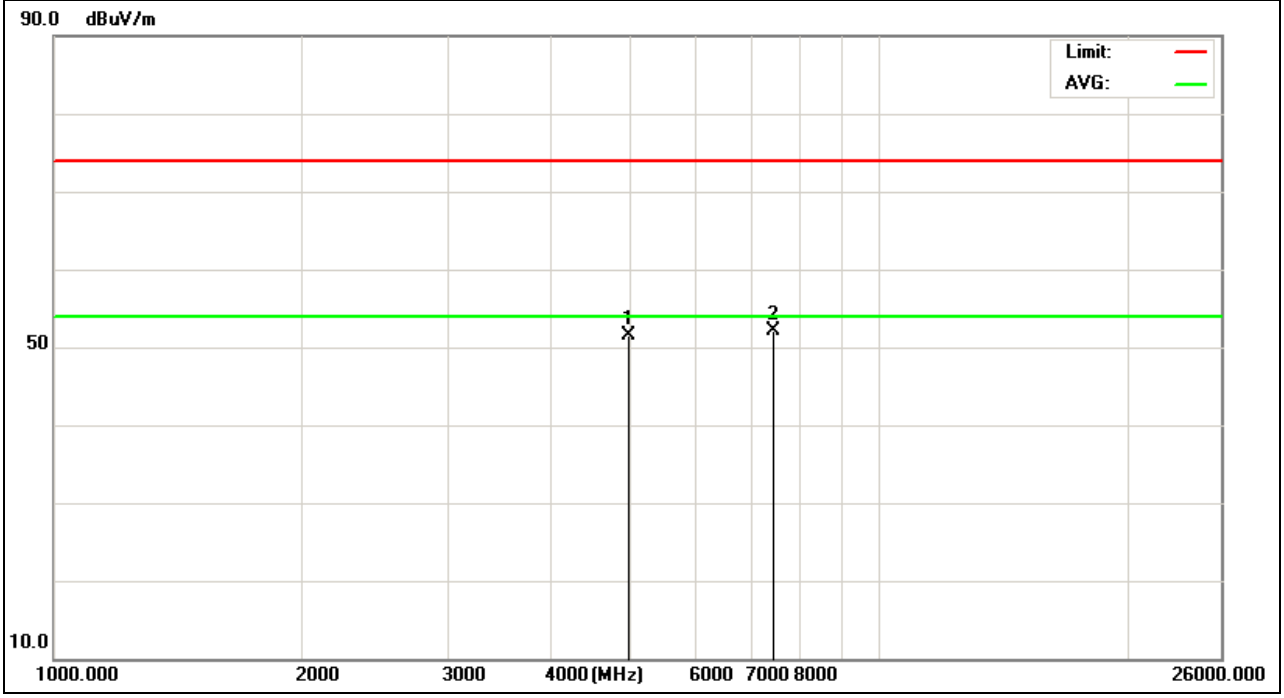
Remark:
Factor = Antenna Factor + Cable Loss – Pre-amplifier.
No emission detected above 18GHz



EUT：	Wireless high precision GNSS positionning terminal	Model Name ：	S650
Temperature：	20 ℃	Relative Humidity：	48%
Pressure：	1010 hPa	Test Voltage ：	AC 120V/60Hz
Test Mode ：	TX 2480MHz – CH 78(2Mbps)	Polarization：	Vertical

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
4960.257	40.95	10.46	51.41	74.00	-22.59	peak
7439.261	38.91	13.13	52.04	74.00	-21.96	peak

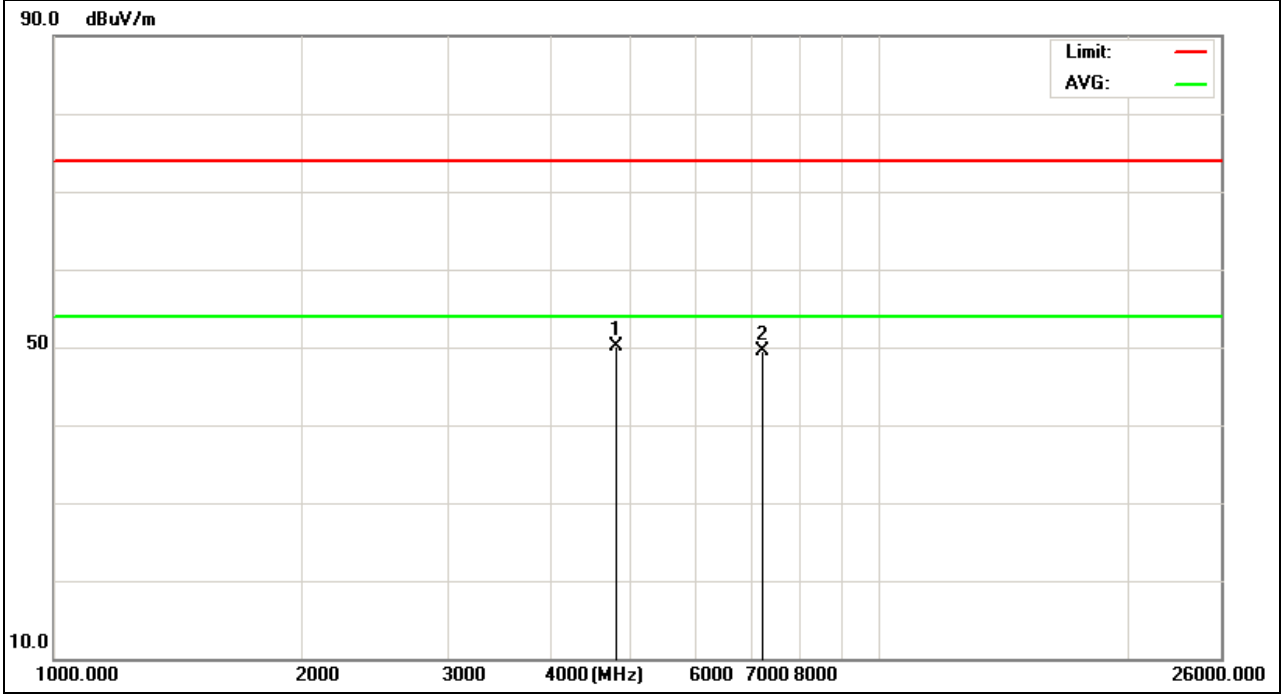
Remark:
Factor = Antenna Factor + Cable Loss – Pre-amplifier.
No emission detected above 18GHz



EUT：	Wireless high precision GNSS positionning terminal	Model Name ：	S650
Temperature：	20 ℃	Relative Humidity：	48%
Pressure：	1010 hPa	Test Voltage ：	AC 120V/60Hz
Test Mode ：	TX 2402MHz –CH 00(3Mbps)	Polarization：	Horizontal

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
4804.924	39.63	10.40	50.03	74.00	-23.97	peak
7205.858	37.02	12.39	49.41	74.00	-24.59	peak

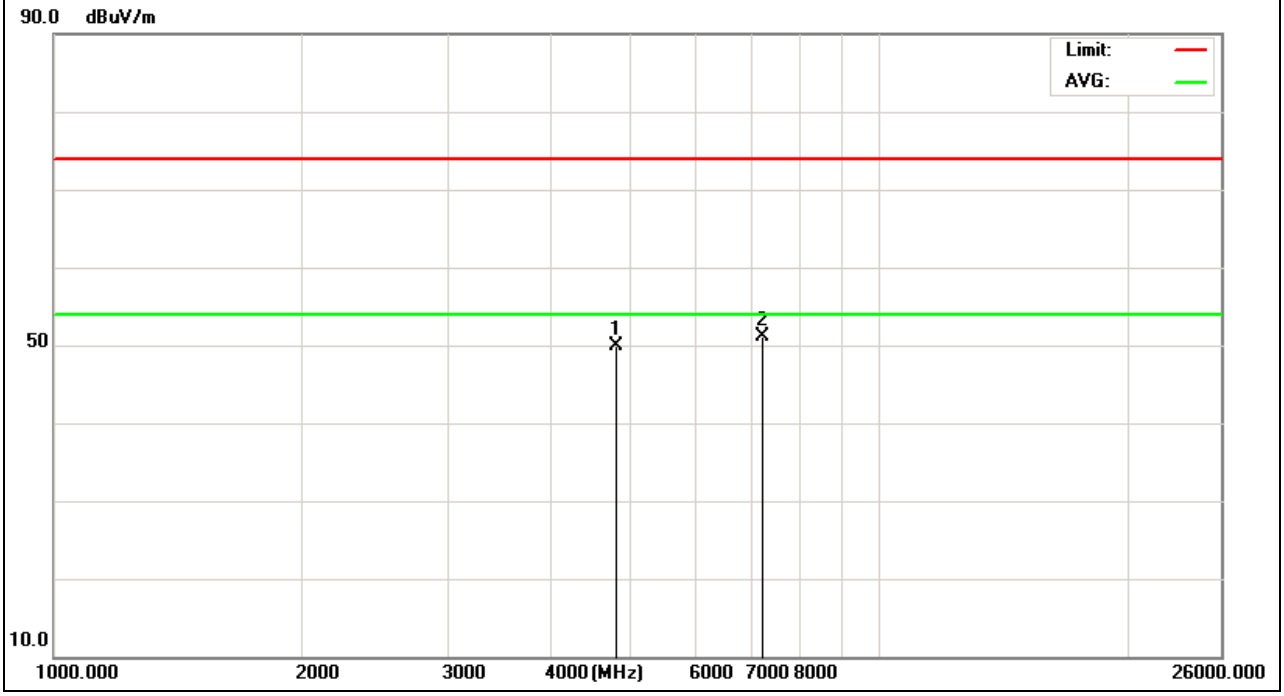
Remark:
Factor = Antenna Factor + Cable Loss – Pre-amplifier.
No emission detected above 18GHz



EUT：	Wireless high precision GNSS positionning terminal	Model Name ：	S650
Temperature：	20 ℃	Relative Humidity：	48%
Pressure：	1010 hPa	Test Voltage ：	AC 120V/60Hz
Test Mode ：	TX 2402MHz – CH 00(3Mbps)	Polarization：	Vertical

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
4803.196	39.49	10.39	49.88	74.00	-24.12	peak
7206.651	38.73	12.39	51.12	74.00	-22.88	peak

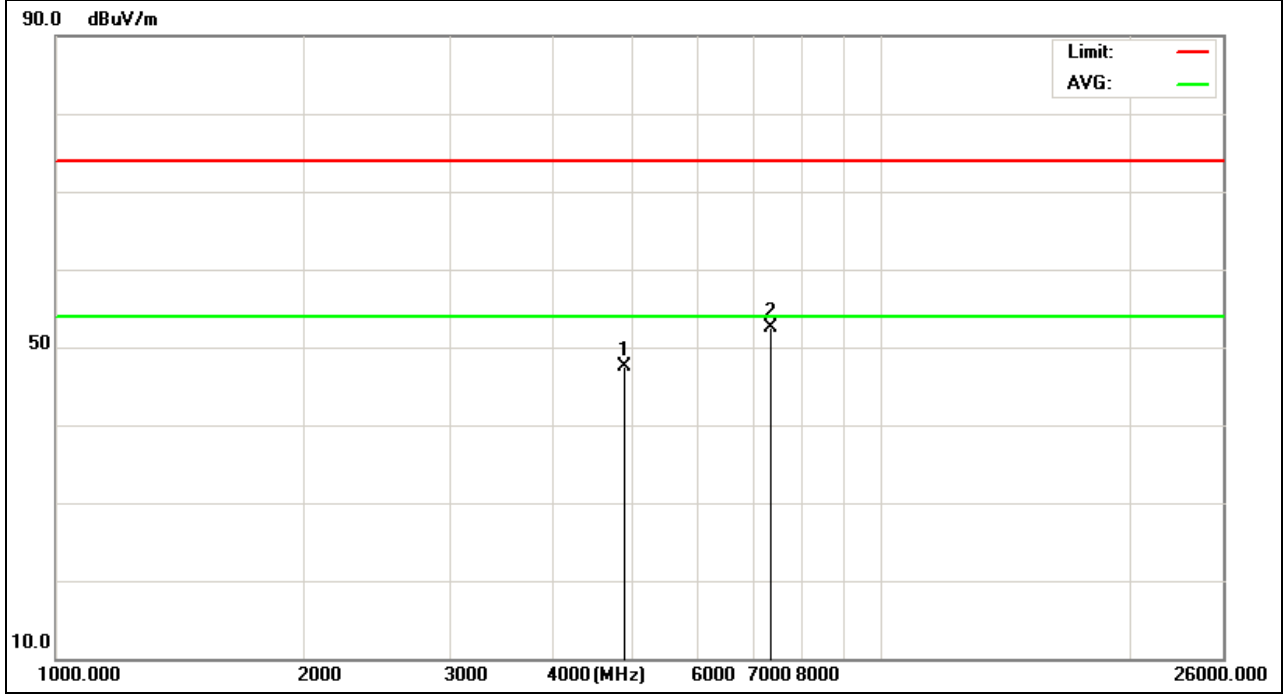
Remark:
Factor = Antenna Factor + Cable Loss – Pre-amplifier.
No emission detected above 18GHz



EUT：	Wireless high precision GNSS positionning terminal	Model Name ：	S650
Temperature：	20 ℃	Relative Humidity：	48%
Pressure：	1010 hPa	Test Voltage ：	AC 120V/60Hz
Test Mode ：	TX 2441MHz – CH39(3Mbps)	Polarization：	Horizontal

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
4881.493	37.19	10.36	47.55	74.00	-26.45	peak
7322.694	39.67	12.76	52.43	74.00	-21.57	peak

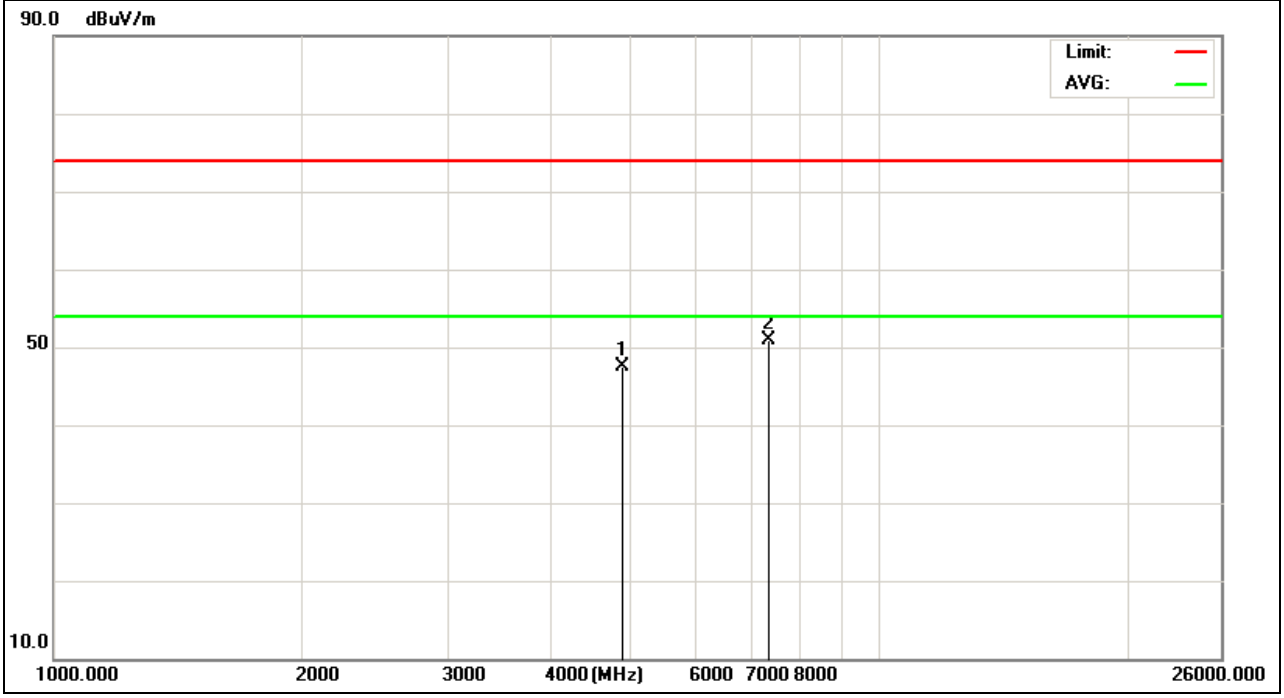
Remark:
Factor = Antenna Factor + Cable Loss – Pre-amplifier.
No emission detected above 18GHz



EUT：	Wireless high precision GNSS positionning terminal	Model Name ：	S650
Temperature：	20 ℃	Relative Humidity：	48%
Pressure：	1010 hPa	Test Voltage ：	AC 120V/60Hz
Test Mode ：	TX 2441MHz – CH39 (3Mbps)	Polarization：	Vertical

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
4883.941	37.23	10.35	47.58	74.00	-26.42	peak
7334.206	38.16	12.79	50.95	74.00	-23.05	peak

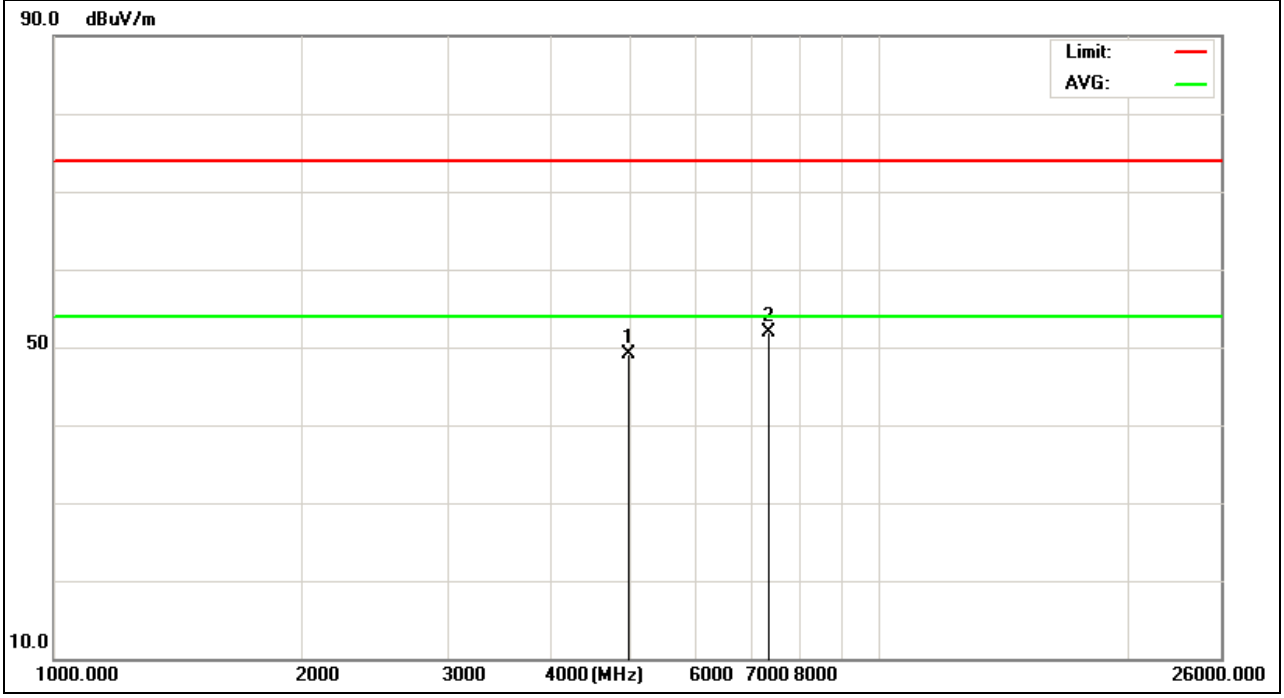
Remark:
Factor = Antenna Factor + Cable Loss – Pre-amplifier.
No emission detected above 18GHz



EUT：	Wireless high precision GNSS positionning terminal	Model Name ：	S650
Temperature：	20 ℃	Relative Humidity：	48%
Pressure：	1010 hPa	Test Voltage ：	AC 120V/60Hz
Test Mode ：	TX 2480MHz – CH78 (3Mbps)	Polarization：	Horizontal

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
4960.199	38.61	10.46	49.07	74.00	-24.93	peak
7340.557	39.13	12.79	51.92	74.00	-22.08	peak

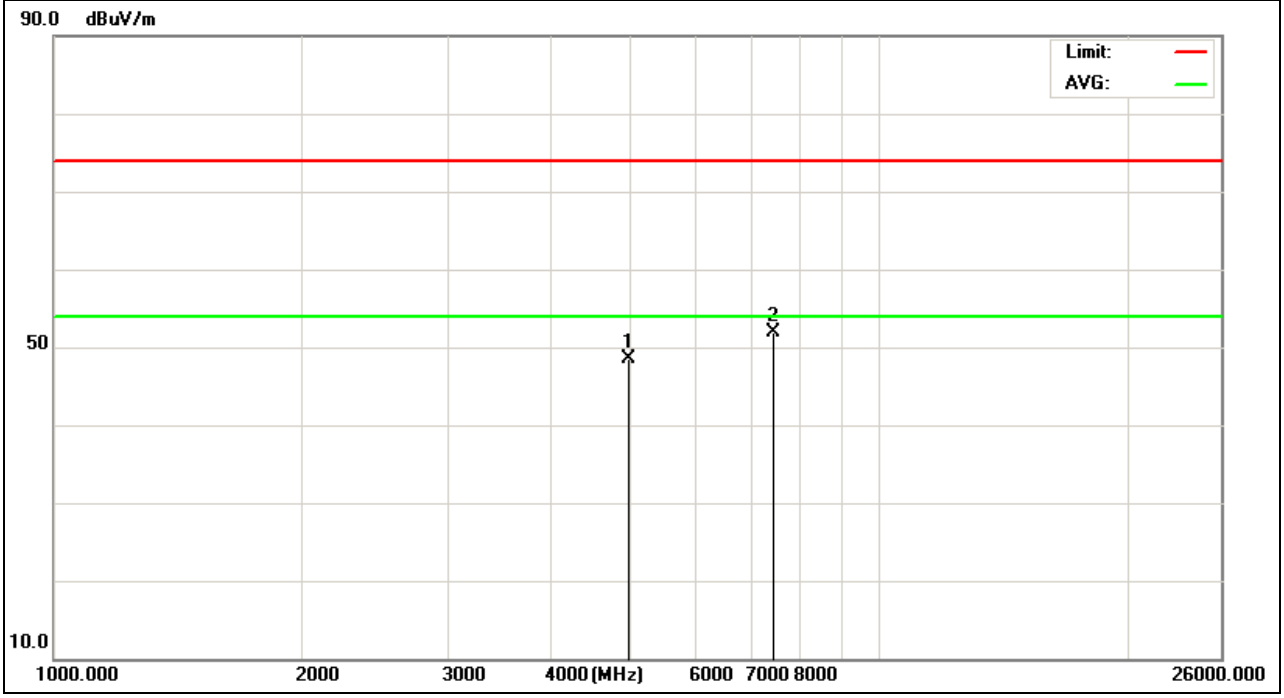
Remark:
Factor = Antenna Factor + Cable Loss – Pre-amplifier.
No emission detected above 18GHz



EUT：	Wireless high precision GNSS positionning terminal	Model Name ：	S650
Temperature：	20 ℃	Relative Humidity：	48%
Pressure：	1010 hPa	Test Voltage ：	AC 120V/60Hz
Test Mode ：	TX 2480MHz – CH78 (3Mbps)	Polarization：	Vertical

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
4960.274	38.12	10.46	48.58	74.00	-25.42	peak
7441.227	38.78	13.16	51.94	74.00	-22.06	peak

Remark:
Factor = Antenna Factor + Cable Loss – Pre-amplifier.
No emission detected above 18GHz

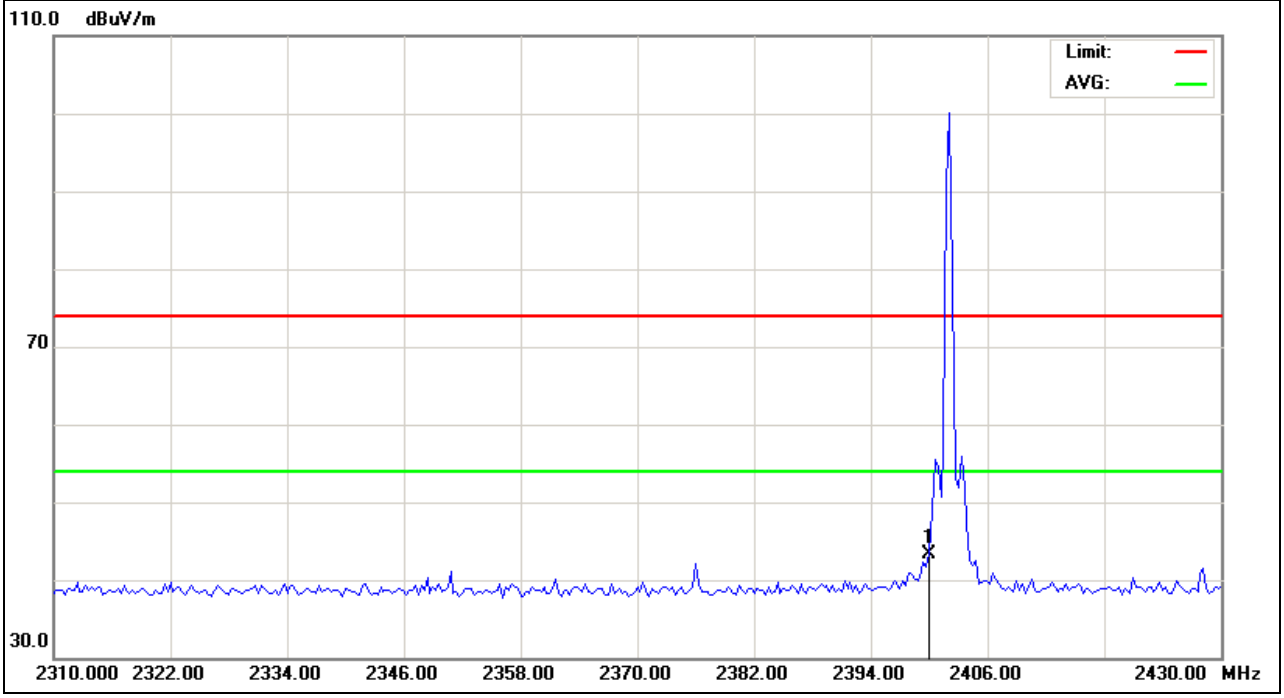


3.2.9 TEST RESULTS (RESTRICTED BANDS REQUIREMENTS)

EUT：	Wireless high precision GNSS positionning terminal	Model Name ：	S650
Temperature：	20 ℃	Relative Humidity：	48%
Pressure：	1010 hPa	Test Voltage ：	AC 120V/60Hz
Test Mode ：	TX /2402MHz-1Mbps	Polarization：	Vertical

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2400.000	56.31	-12.99	43.32	74.00	-30.68	peak

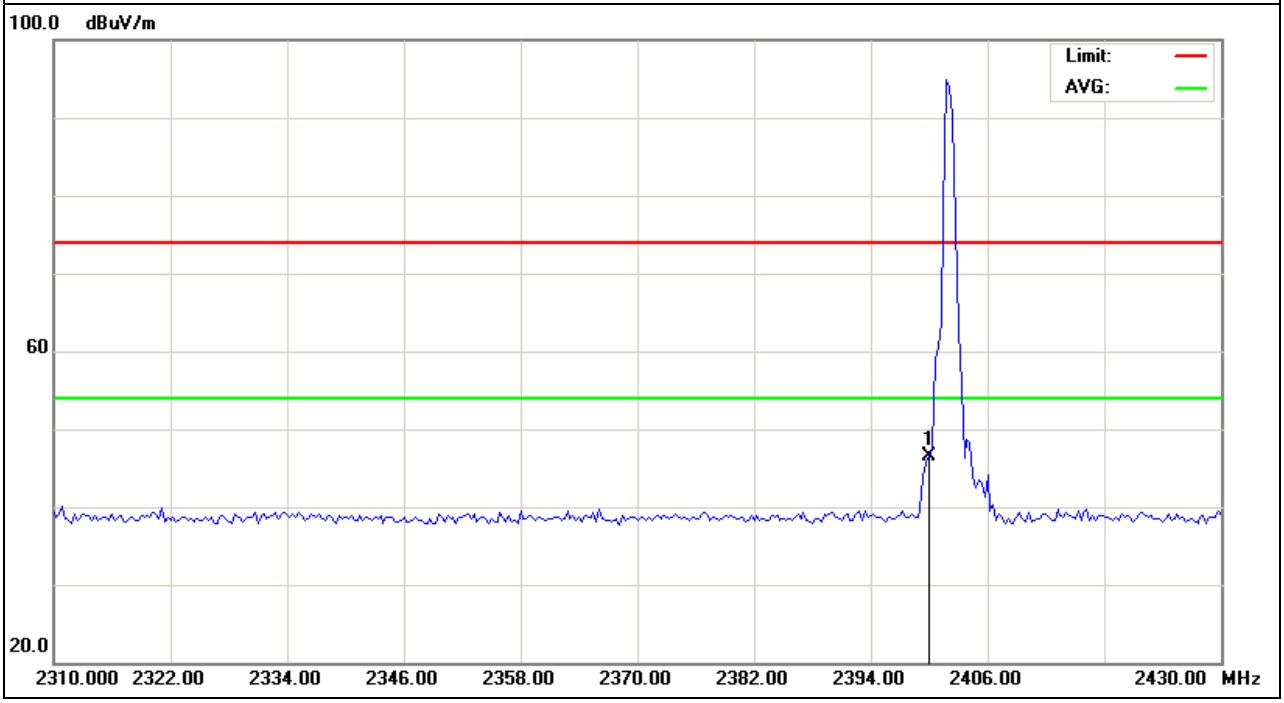
Remark:
Factor = Antenna Factor + Cable Loss – Pre-amplifier.



EUT：	Wireless high precision GNSS positionning terminal	Model Name ：	S650
Temperature：	20 ℃	Relative Humidity：	48%
Pressure：	1010 hPa	Test Voltage ：	AC 120V/60Hz
Test Mode ：	TX /2402MHz-1Mbps	Polarization：	Horizontal

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2400.000	59.47	-12.99	46.48	74.00	-27.52	peak

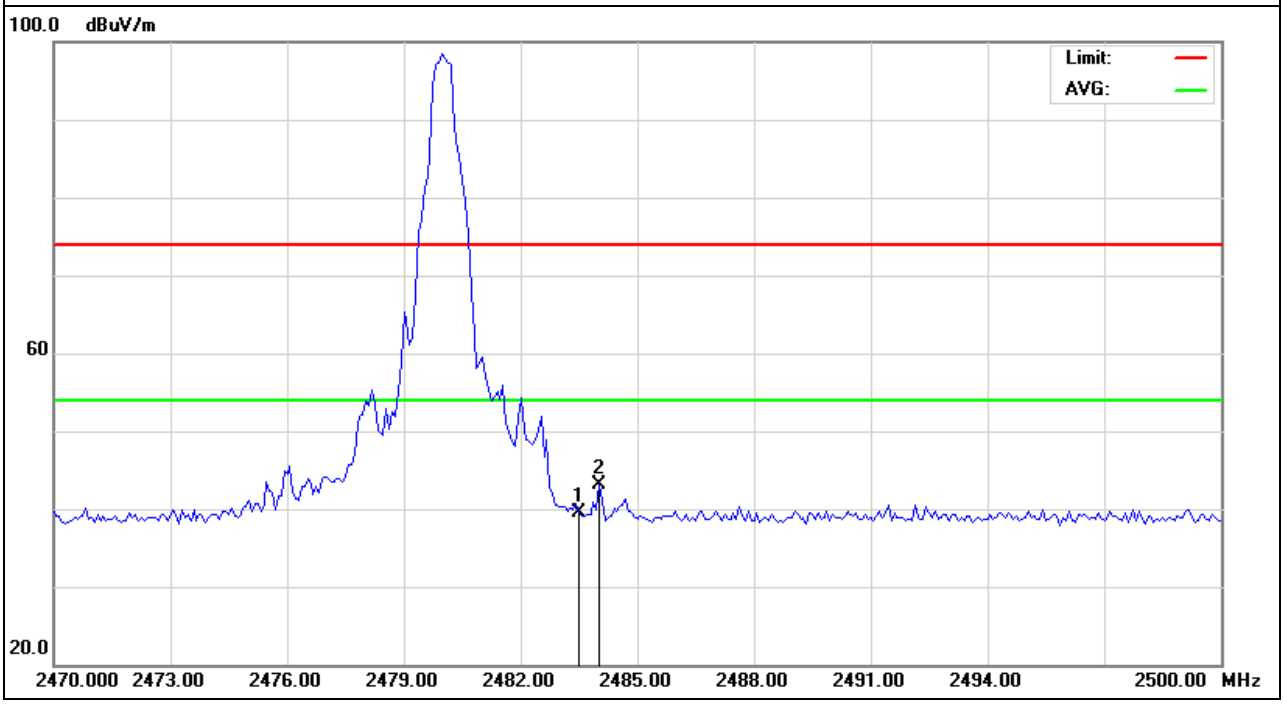
Remark:
Factor = Antenna Factor + Cable Loss – Pre-amplifier.



EUT：	Wireless high precision GNSS positionning terminal	Model Name ：	S650
Temperature：	20 ℃	Relative Humidity：	48%
Pressure：	1010 hPa	Test Voltage ：	AC 120V/60Hz
Test Mode ：	TX /2480MHz-1Mbps	Polarization：	Vertical

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2483.500	52.30	-12.78	39.52	74.00	-34.48	peak
2484.025	55.92	-12.78	43.14	74.00	-30.86	peak

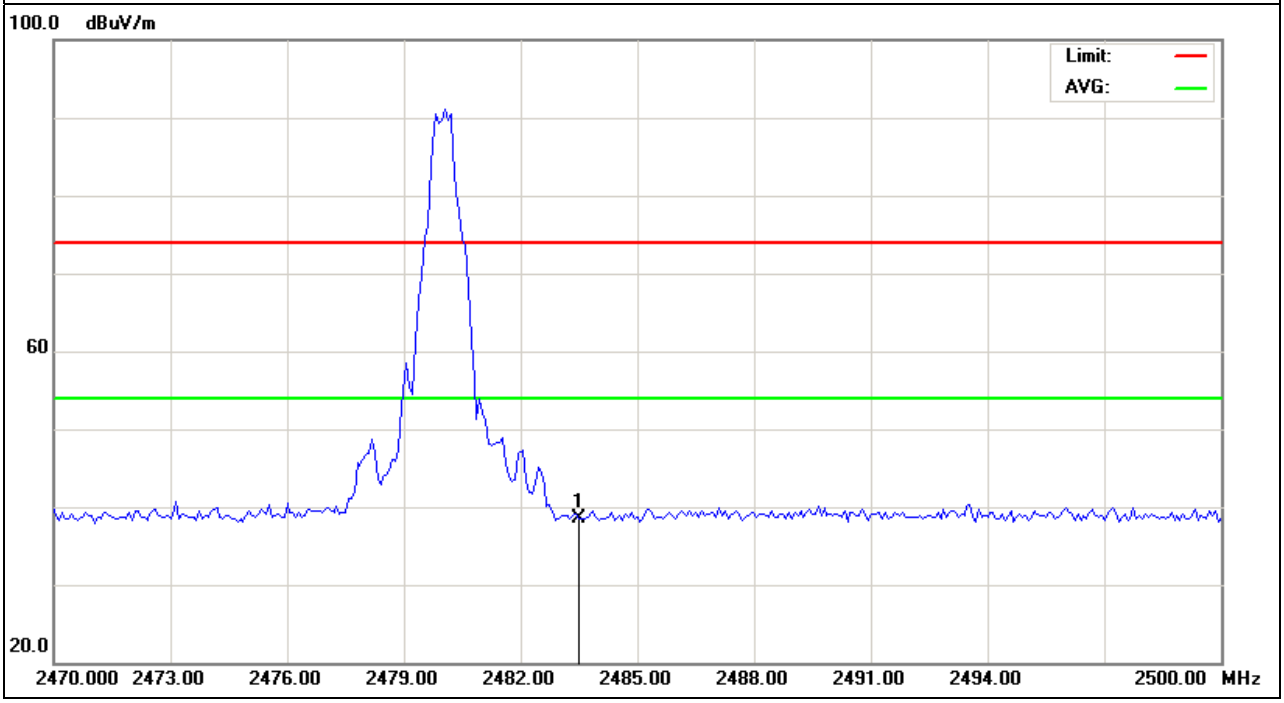
Remark:
Factor = Antenna Factor + Cable Loss – Pre-amplifier.



EUT：	Wireless high precision GNSS positionning terminal	Model Name ：	S650
Temperature：	20 ℃	Relative Humidity：	48%
Pressure：	1010 hPa	Test Voltage ：	AC 120V/60Hz
Test Mode ：	TX /2480MHz-1Mbps	Polarization：	Horizontal

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
2483.500	51.21	-12.78	38.43	74.00	-35.57	peak

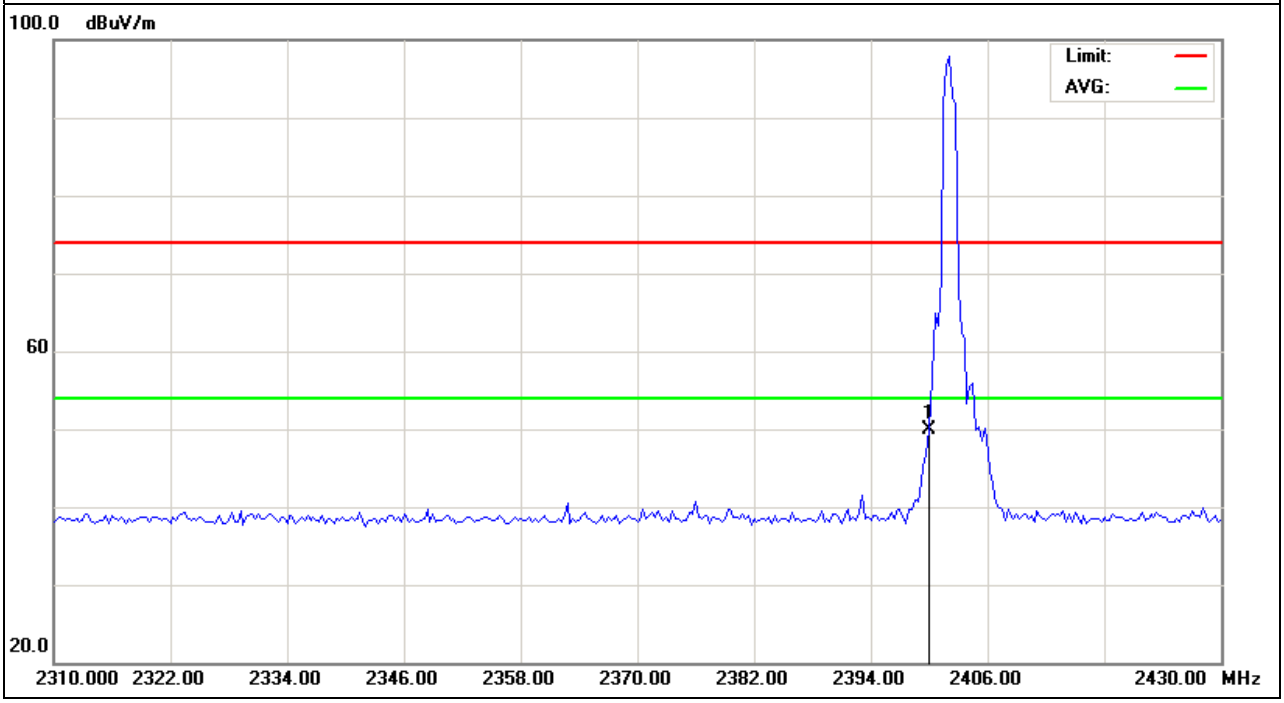
Remark:
Factor = Antenna Factor + Cable Loss – Pre-amplifier.



EUT：	Wireless high precision GNSS positionning terminal	Model Name ：	S650
Temperature：	20 ℃	Relative Humidity：	48%
Pressure：	1010 hPa	Test Voltage ：	AC 120V/60Hz
Test Mode ：	TX /2402MHz-2Mbps	Polarization：	Vertical

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2400.000	62.89	-12.99	49.90	74.00	-24.10	peak

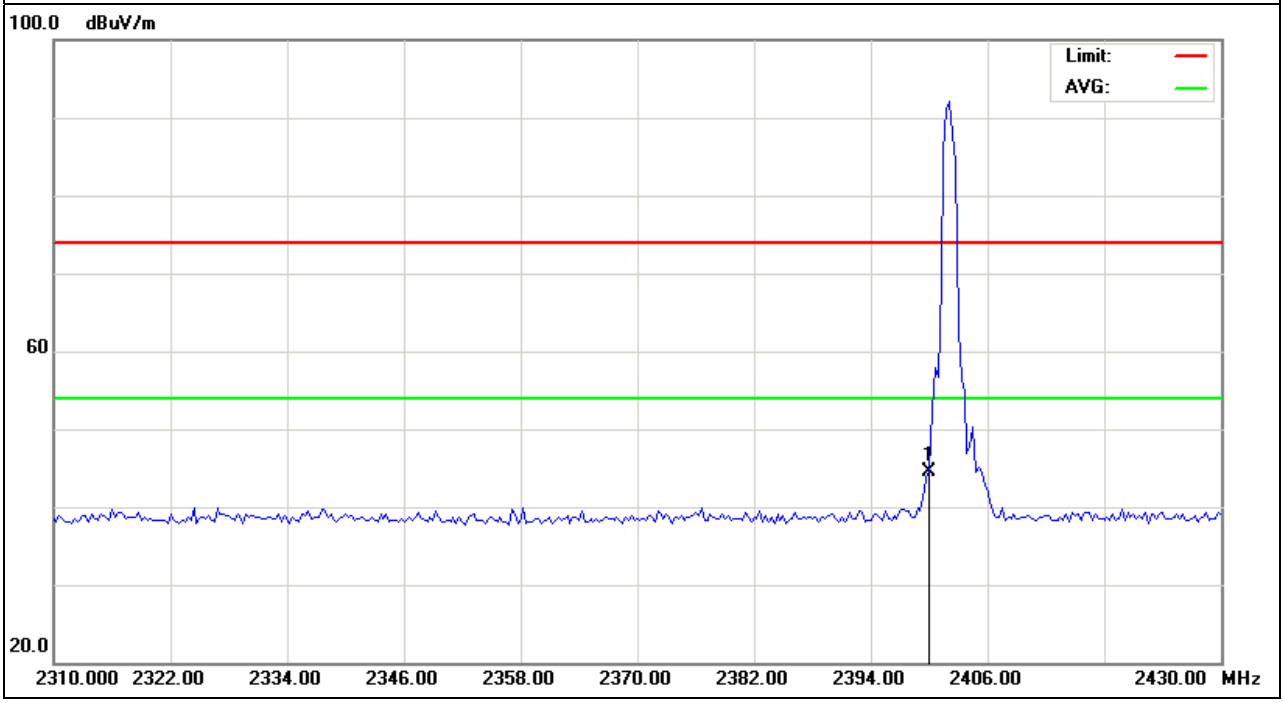
Remark:
Factor = Antenna Factor + Cable Loss – Pre-amplifier.



EUT：	Wireless high precision GNSS positionning terminal	Model Name ：	S650
Temperature：	20 ℃	Relative Humidity：	48%
Pressure：	1010 hPa	Test Voltage ：	AC 120V/60Hz
Test Mode ：	TX /2402MHz-2Mbps	Polarization：	Horizontal

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
2400.000	57.54	-12.99	44.55	74.00	-29.45	peak

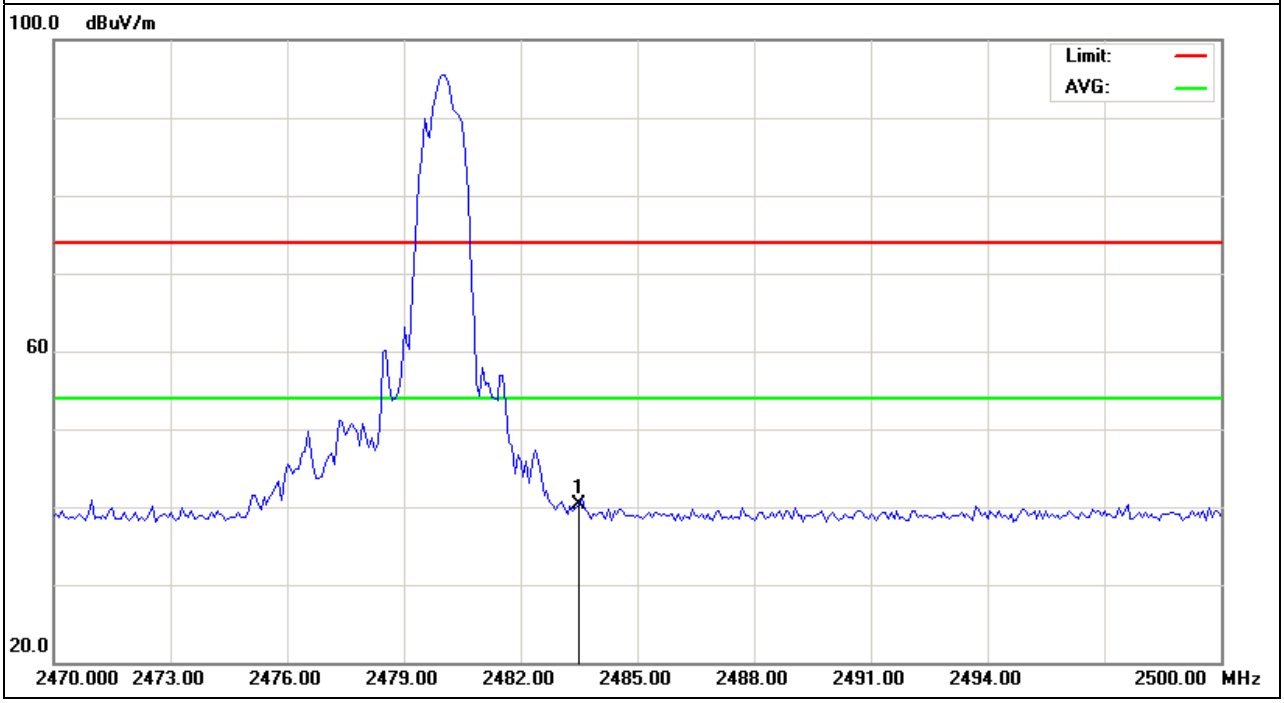
Remark:
Factor = Antenna Factor + Cable Loss – Pre-amplifier.



EUT：	Wireless high precision GNSS positionning terminal	Model Name ：	S650
Temperature：	20 ℃	Relative Humidity：	48%
Pressure：	1010 hPa	Test Voltage ：	AC 120V/60Hz
Test Mode ：	TX /2480MHz-2Mbps	Polarization：	Vertical

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2483.500	53.13	-12.78	40.35	74.00	-33.65	peak

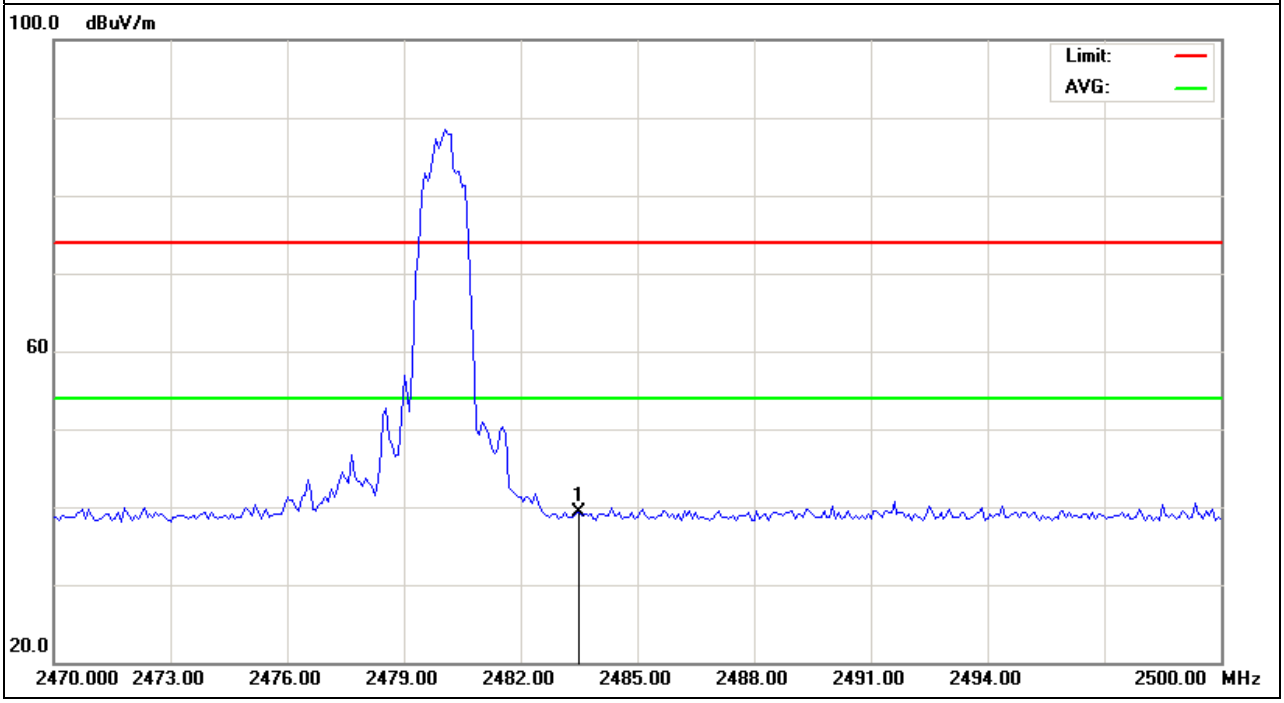
Remark:
Factor = Antenna Factor + Cable Loss – Pre-amplifier.



EUT：	Wireless high precision GNSS positionning terminal	Model Name ：	S650
Temperature：	20 ℃	Relative Humidity：	48%
Pressure：	1010 hPa	Test Voltage ：	AC 120V/60Hz
Test Mode ：	TX /2480MHz-2Mbps	Polarization：	Horizontal

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2483.500	52.04	-12.78	39.26	74.00	-34.74	peak

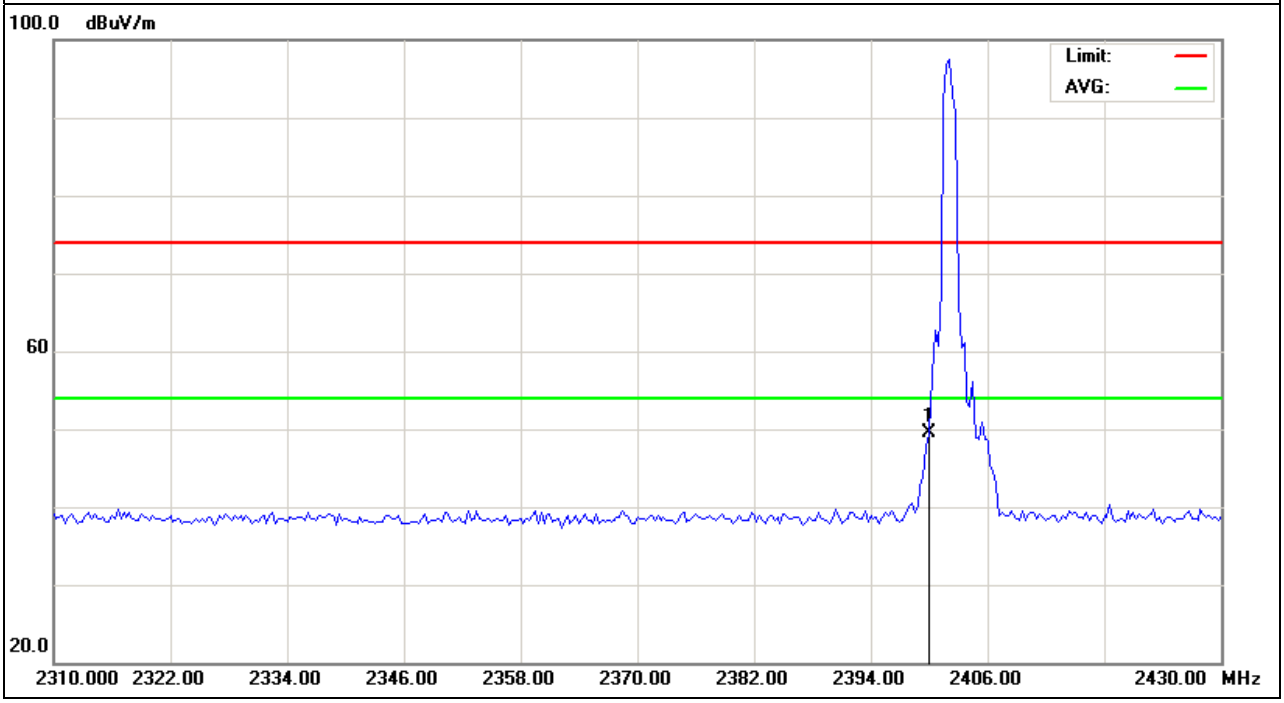
Remark:
Factor = Antenna Factor + Cable Loss – Pre-amplifier.



EUT：	Wireless high precision GNSS positionning terminal	Model Name ：	S650
Temperature：	20 ℃	Relative Humidity：	48%
Pressure：	1010 hPa	Test Voltage ：	AC 120V/60Hz
Test Mode ：	TX /2402MHz-3Mbps	Polarization：	Vertical

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2400.000	62.47	-12.99	49.48	74.00	-24.52	peak

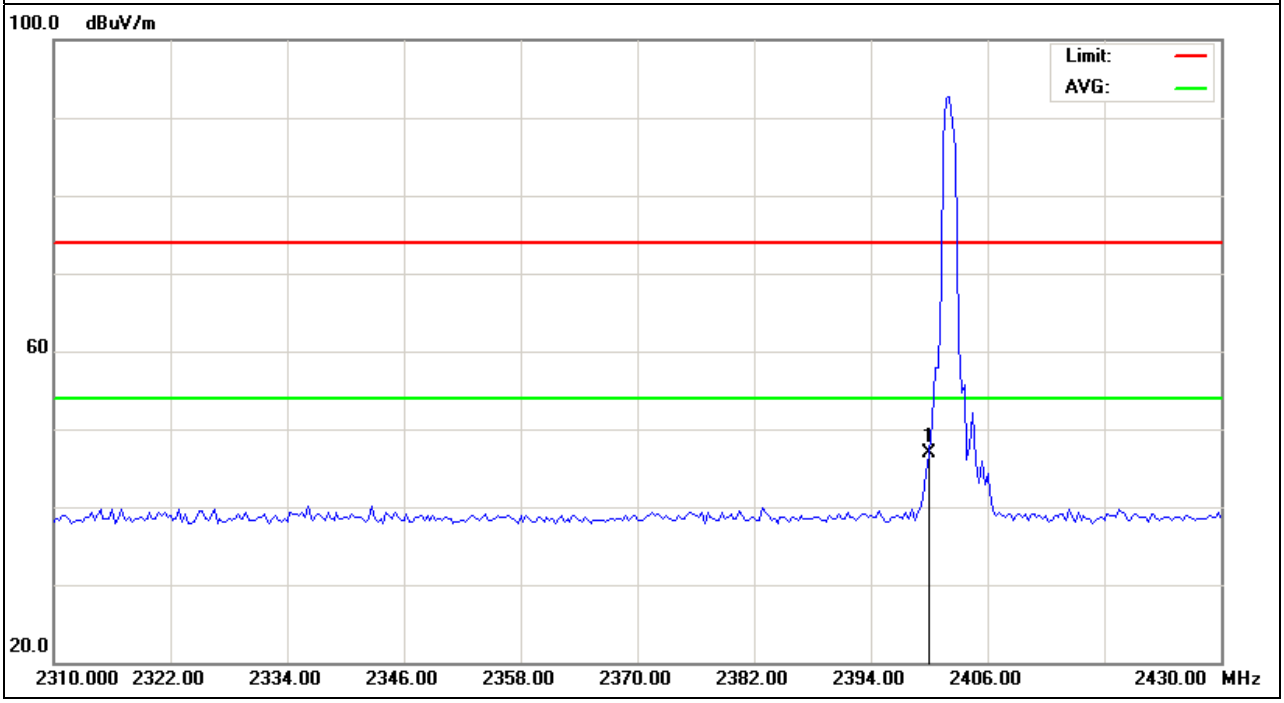
Remark:
Factor = Antenna Factor + Cable Loss – Pre-amplifier.



EUT：	Wireless high precision GNSS positionning terminal	Model Name ：	S650
Temperature：	20 ℃	Relative Humidity：	48%
Pressure：	1010 hPa	Test Voltage ：	AC 120V/60Hz
Test Mode ：	TX /2402MHz-3Mbps	Polarization：	Horizontal

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2400.000	59.96	-12.99	46.97	74.00	-27.03	peak

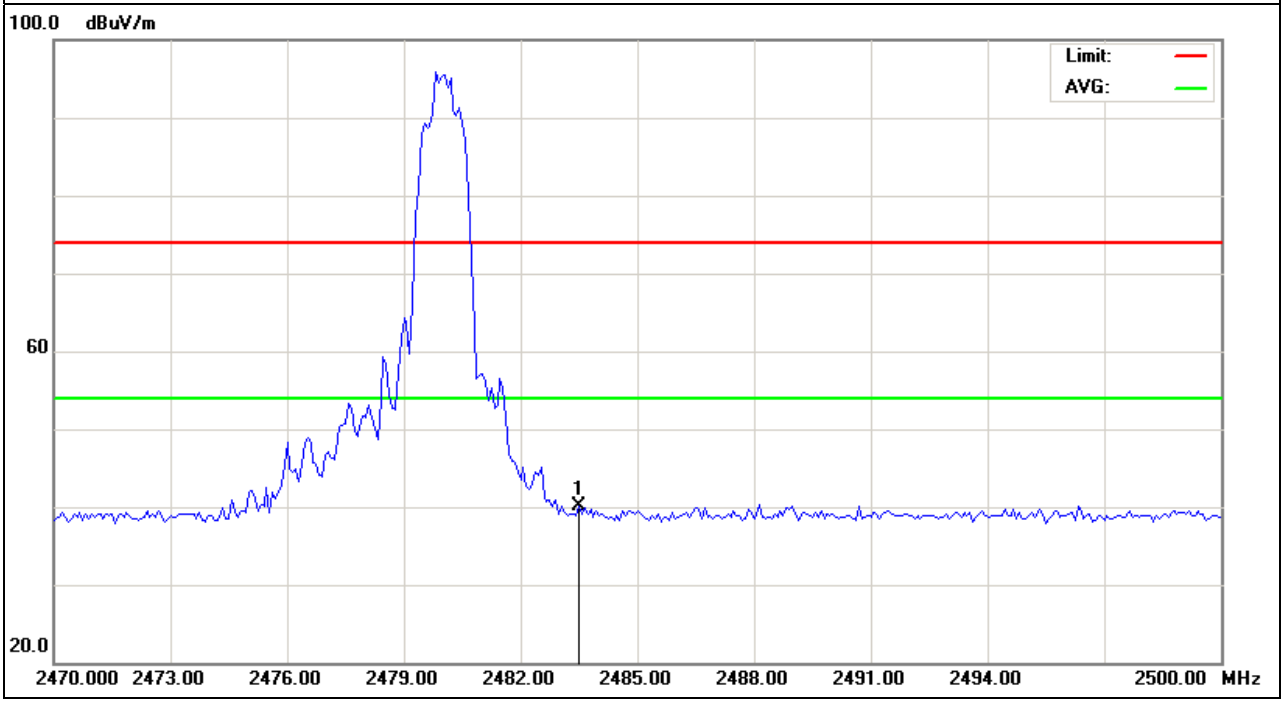
Remark:
Factor = Antenna Factor + Cable Loss – Pre-amplifier.



EUT：	Wireless high precision GNSS positionning terminal	Model Name ：	S650
Temperature：	20 ℃	Relative Humidity：	48%
Pressure：	1010 hPa	Test Voltage ：	AC 120V/60Hz
Test Mode ：	TX /2480MHz-3Mbps	Polarization：	Vertical

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2483.500	52.92	-12.78	40.14	74.00	-33.86	peak

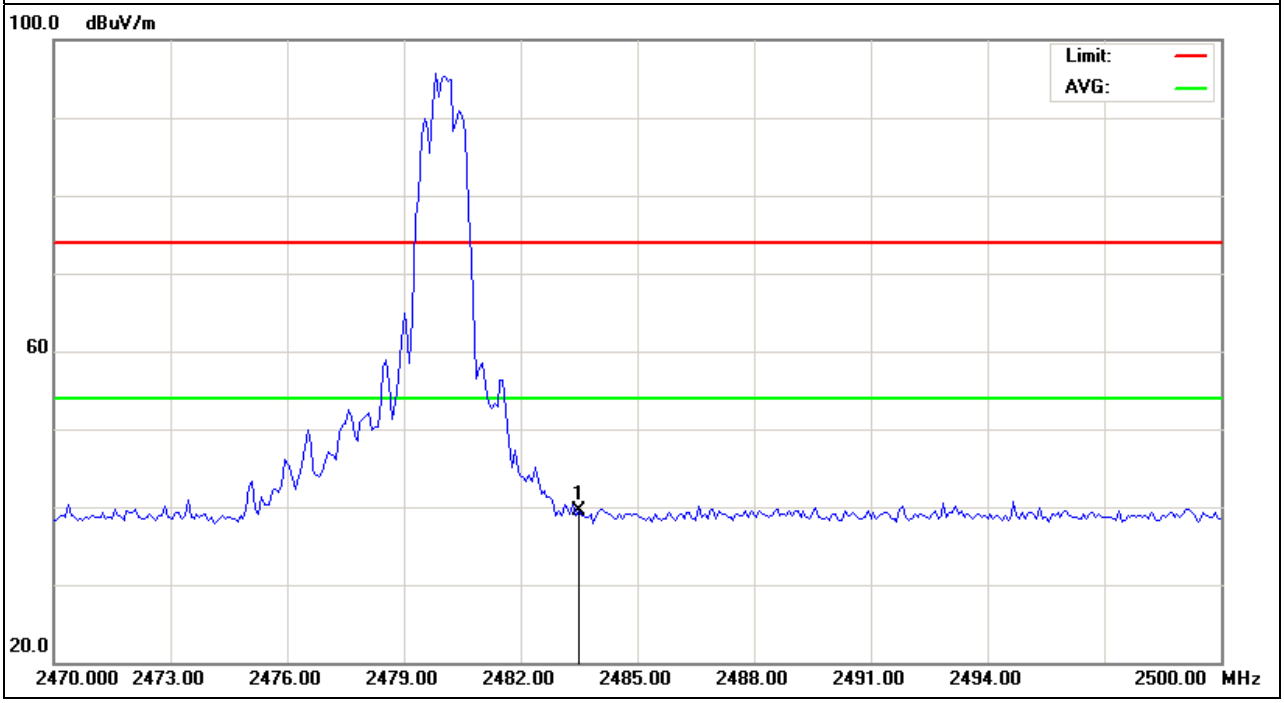
Remark:
Factor = Antenna Factor + Cable Loss – Pre-amplifier.



EUT：	Wireless high precision GNSS positionning terminal	Model Name ：	S650
Temperature：	20 ℃	Relative Humidity：	48%
Pressure：	1010 hPa	Test Voltage ：	AC 120V/60Hz
Test Mode ：	TX /2480MHz-3Mbps	Polarization：	Horizontal

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
2483.500	52.27	-12.78	39.49	74.00	-34.51	peak

Remark:
Factor = Antenna Factor + Cable Loss – Pre-amplifier.



4. NUMBER OF HOPPING CHANNEL

4.1 APPLIED PROCEDURES / LIMIT

FCC Part15 (15.247) , Subpart C				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247 (a)(1)(iii)	Number of Hopping Channel	≥15	2400-2483.5	PASS

Spectrum Parameters	Setting
Attenuation	Auto
Span Frequency	= the frequency band of operation
RB	RBW ≥ 1% of the span
VB	VBW ≥ RBW
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

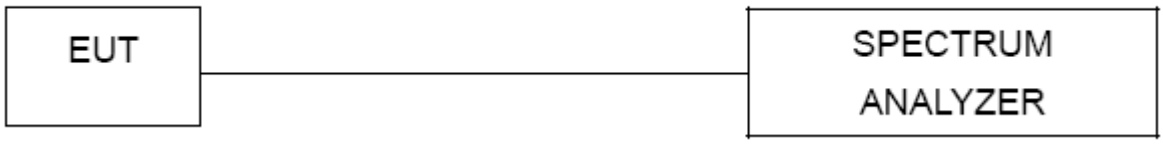
4.1.1 TEST PROCEDURE

a. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below,
b. Spectrum Setting : RBW= 1MHz, VBW=3MHz, Sweep time = Auto.

4.1.2 DEVIATION FROM STANDARD

No deviation.

4.1.3 TEST SETUP



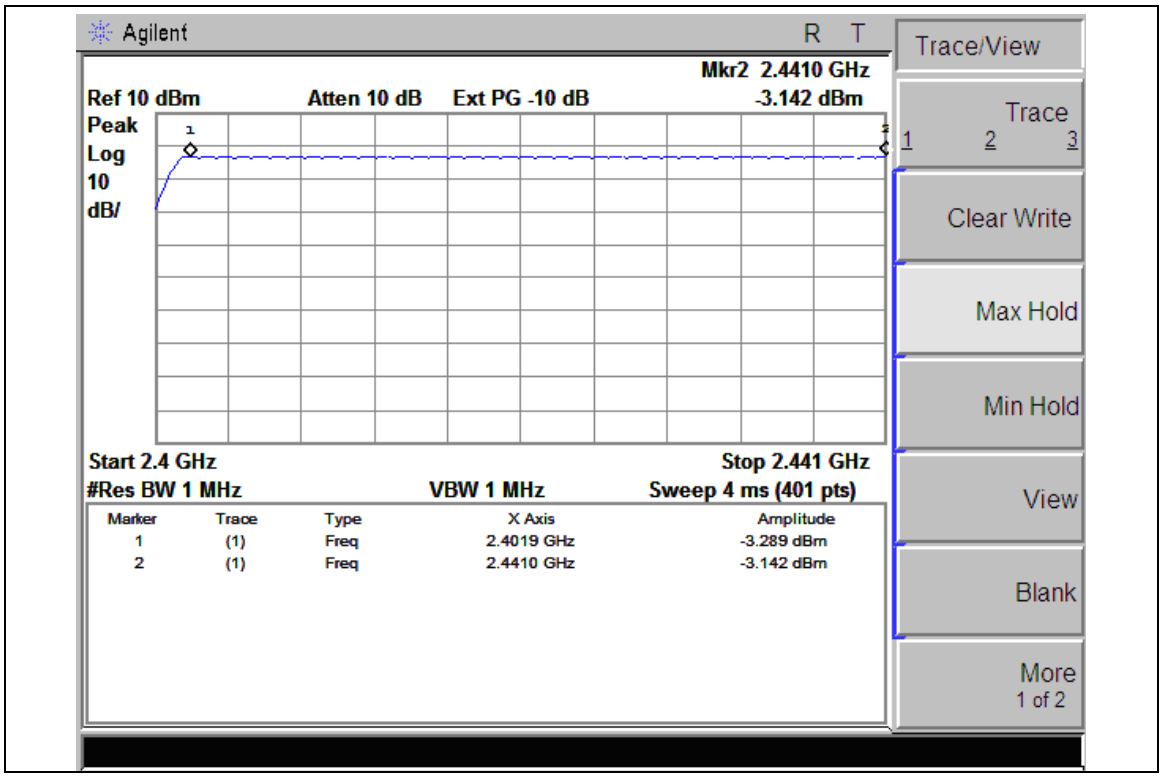
4.1.4 EUT OPERATION CONDITIONS

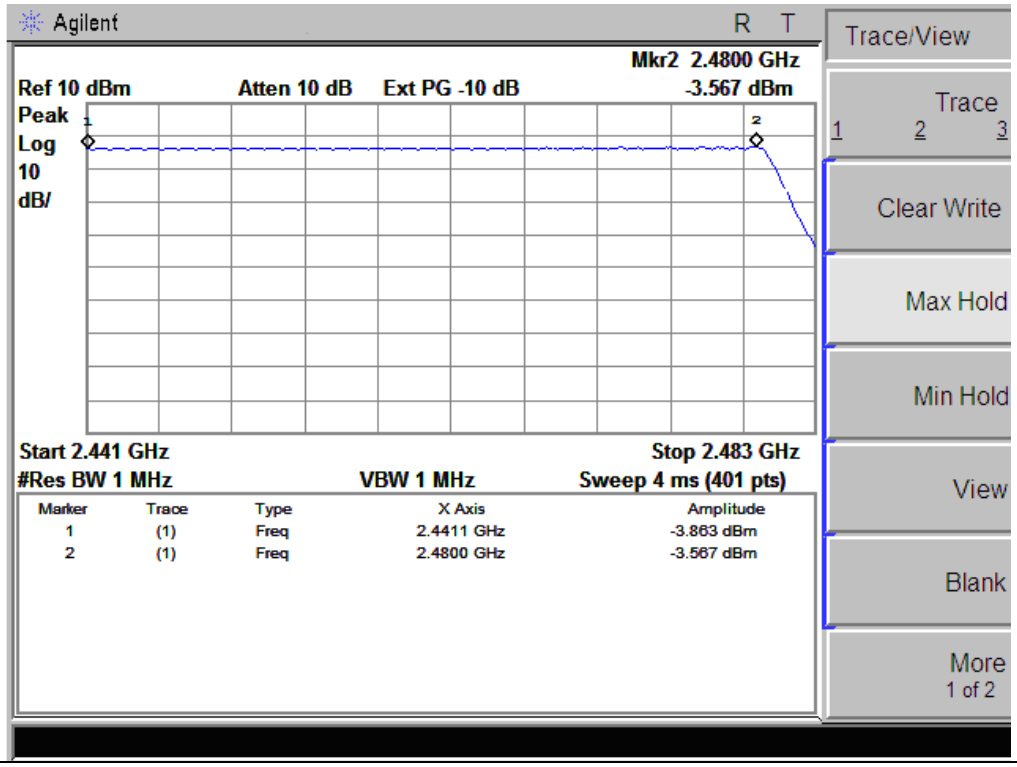
The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.

4.1.5 TEST RESULTS

EUT：	Wireless high precision GNSS positionning terminal	Model Name ：	S650
Temperature：	25 ℃	Relative Humidity：	60%
Pressure：	1015 hPa	Test Voltage ：	AC 120V/60Hz
Test Mode ：	Hopping Mode		

Number of Hopping Channel	79




Agilent
R T
Mkr2 2.4800 GHz
Ref 10 dBm
Atten 10 dB
Ext PG -10 dB
-3.567 dBm
Peak
Log
10
dB/
Start 2.441 GHz
#Res BW 1 MHz
VBW 1 MHz
Stop 2.483 GHz
Sweep 4 ms (401 pts)
Marker Trace Type X Axis Amplitude
1 (1) Freq 2.4411 GHz -3.863 dBm
2 (1) Freq 2.4800 GHz -3.567 dBm
Trace/View
Trace
1 2 3
Clear Write
Max Hold
Min Hold
View
Blank
More
1 of 2

5. AVERAGE TIME OF OCCUPANCY

5.1 APPLIED PROCEDURES / LIMIT

FCC Part15 (15.247) , Subpart C				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247 (a)(1)(iii)	Average Time of Occupancy	0.4sec	2400-2483.5	PASS

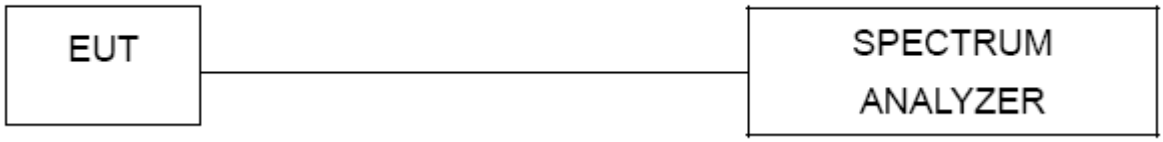
5.1.1 TEST PROCEDURE

a. The transmitter output (antenna port) was connected to the spectrum analyzer
b. Set RBW of spectrum analyzer to 1MHz and VBW to 1MHz.
c. Use a video trigger with the trigger level set to enable triggering only on full pulses.
d. Sweep Time is more than once pulse time.
e. Set the center frequency on any frequency would be measure and set the frequency span to zero span.
f. Measure the maximum time duration of one single pulse.
g. Set the EUT for DH5, DH3 and DH1 packet transmitting.
h. Measure the maximum time duration of one single pulse.
i. A Period Time = (channel number)*0.4
DH1 Time Slot: Reading * (1600/2)*31.6/(channel number)
DH3 Time Slot: Reading * (1600/4)*31.6/(channel number)
DH5 Time Slot: Reading * (1600/6)*31.6/(channel number)

5.1.2 DEVIATION FROM STANDARD

No deviation.

5.1.3 TEST SETUP



5.1.4 EUT OPERATION CONDITIONS

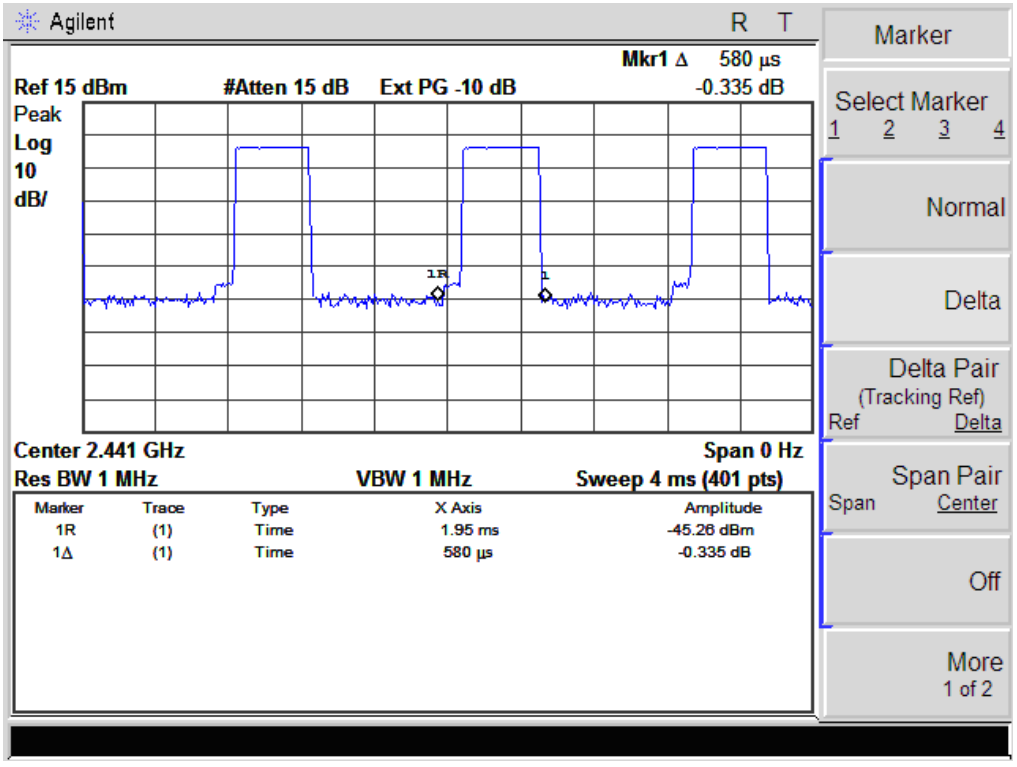
The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.

5.1.5 TEST RESULTS

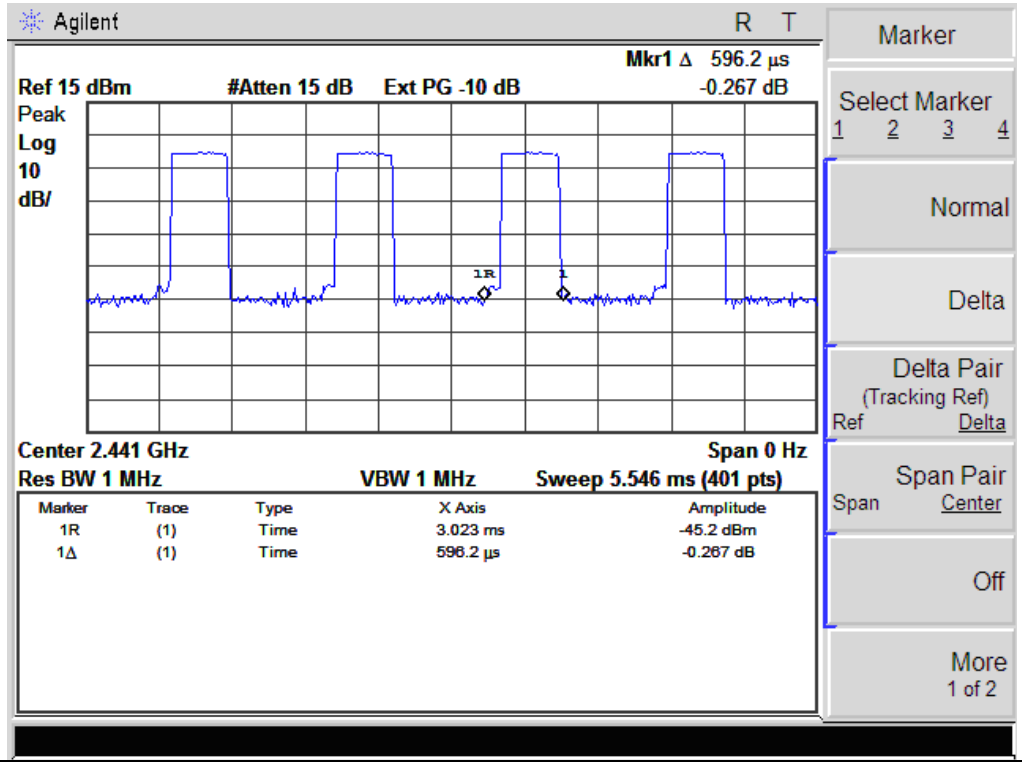
EUT：	Wireless high precision GNSS positionning terminal	Model Name ：	S650
Temperature：	25 ℃	Relative Humidity：	60%
Pressure：	1012 hPa	Test Voltage ：	AC 120V/60Hz
Test Mode ：	CH39-DH1,2DH1,3DH1		

Data Packet	Frequency	Pulse Duration (ms)	Dwell Time (s)	Limits (s)
DH1	2441MHz	0.58	0.19	0.40
2DH1	2441MHz	0.60	0.19	0.40
3DH1	2441MHz	0.57	0.18	0.40

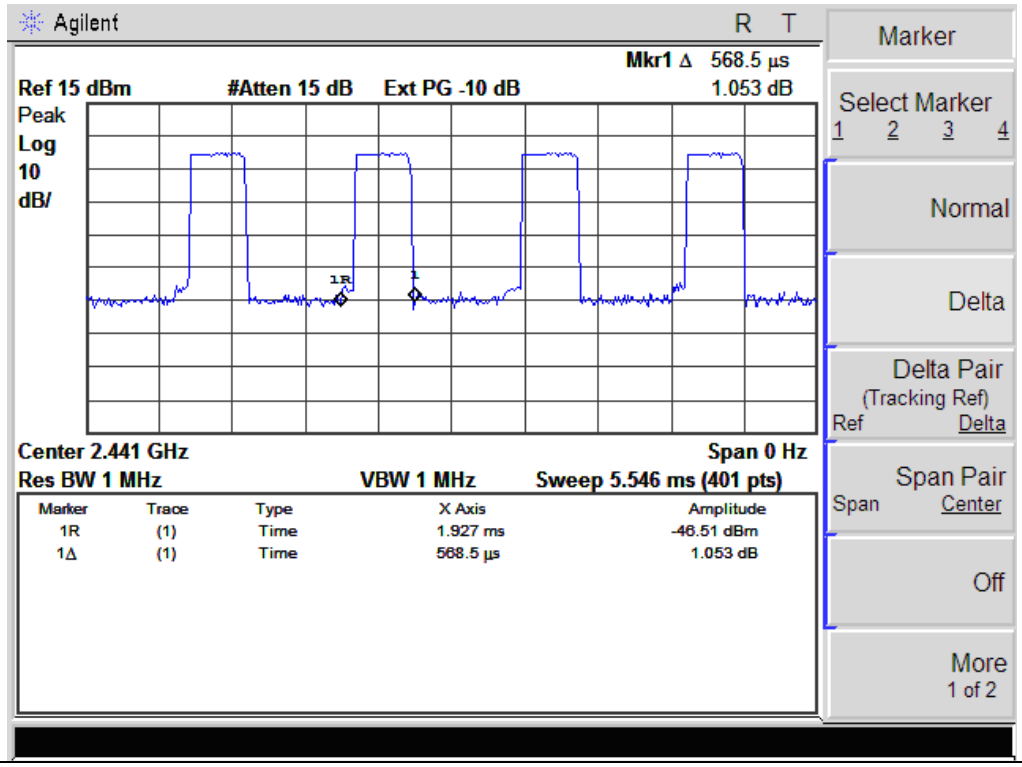
CH39-DH1



CH39-2DH1



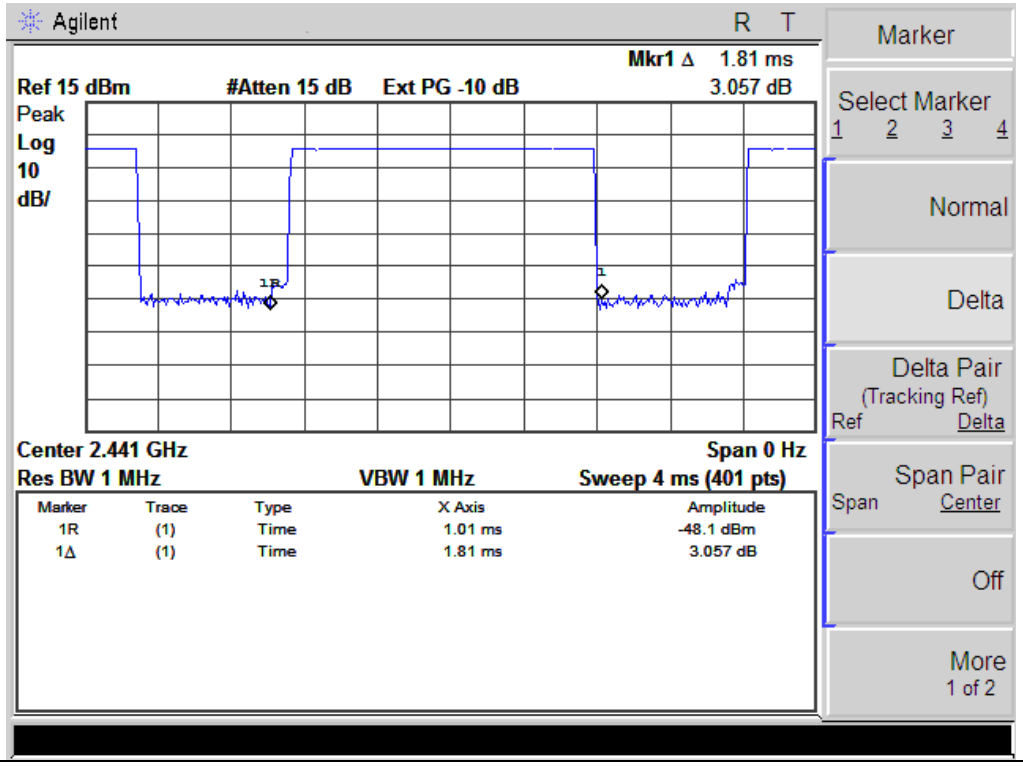
CH39-3DH1



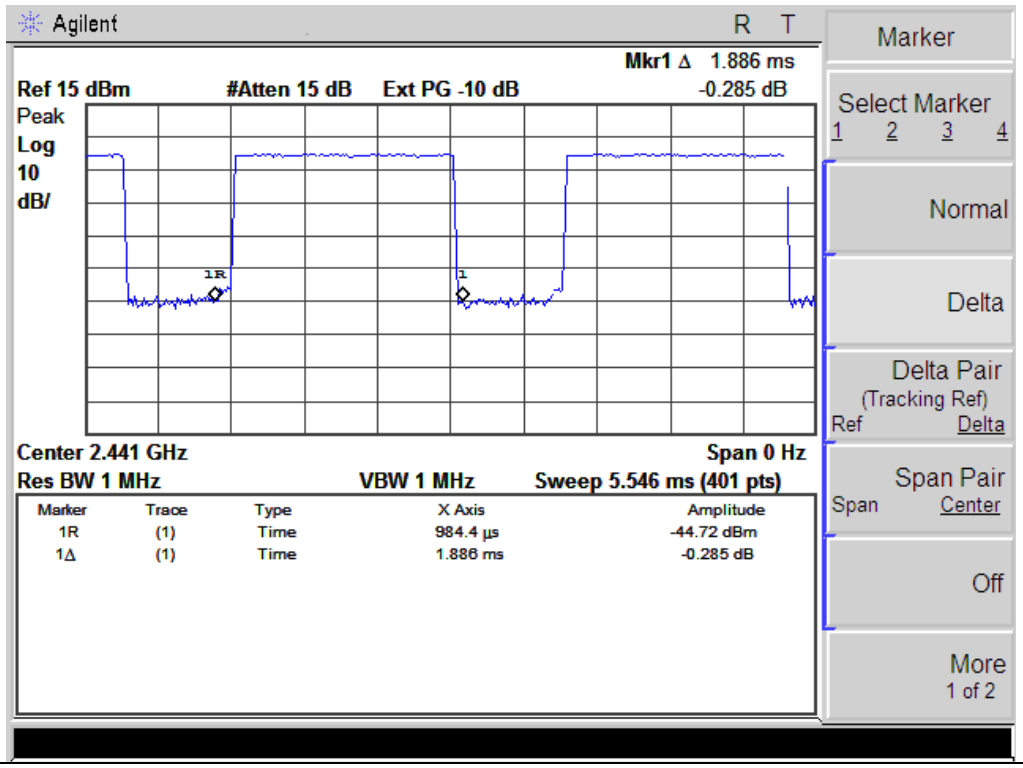
EUT：	Wireless high precision GNSS positionning terminal	Model Name ：	S650
Temperature：	25 ℃	Relative Humidity：	60%
Pressure：	1012 hPa	Test Voltage ：	AC 120V/60Hz
Test Mode ：	CH39-DH3,2DH3,3DH3		

Data Packet	Frequency	Pulse Duration (ms)	Dwell Time (s)	Limits (s)
DH3	2441MHz	1.81	0.29	0.40
2DH3	2441MHz	1.89	0.30	0.40
3DH3	2441MHz	1.84	0.30	0.40

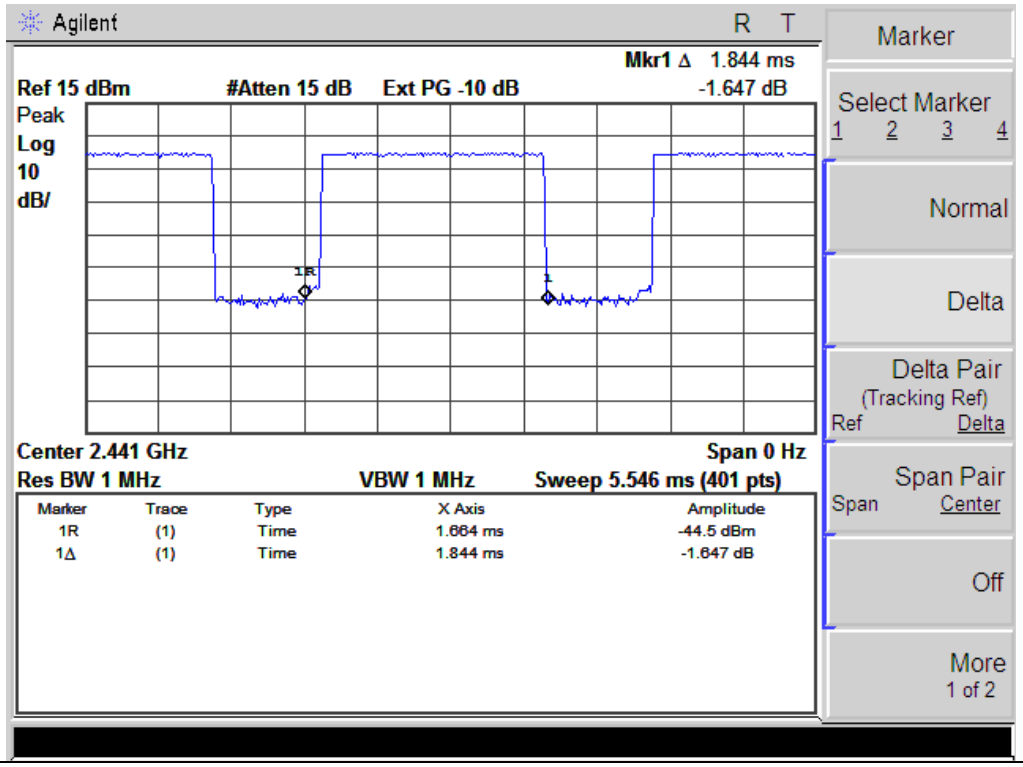
CH39-DH3



CH39-2DH3



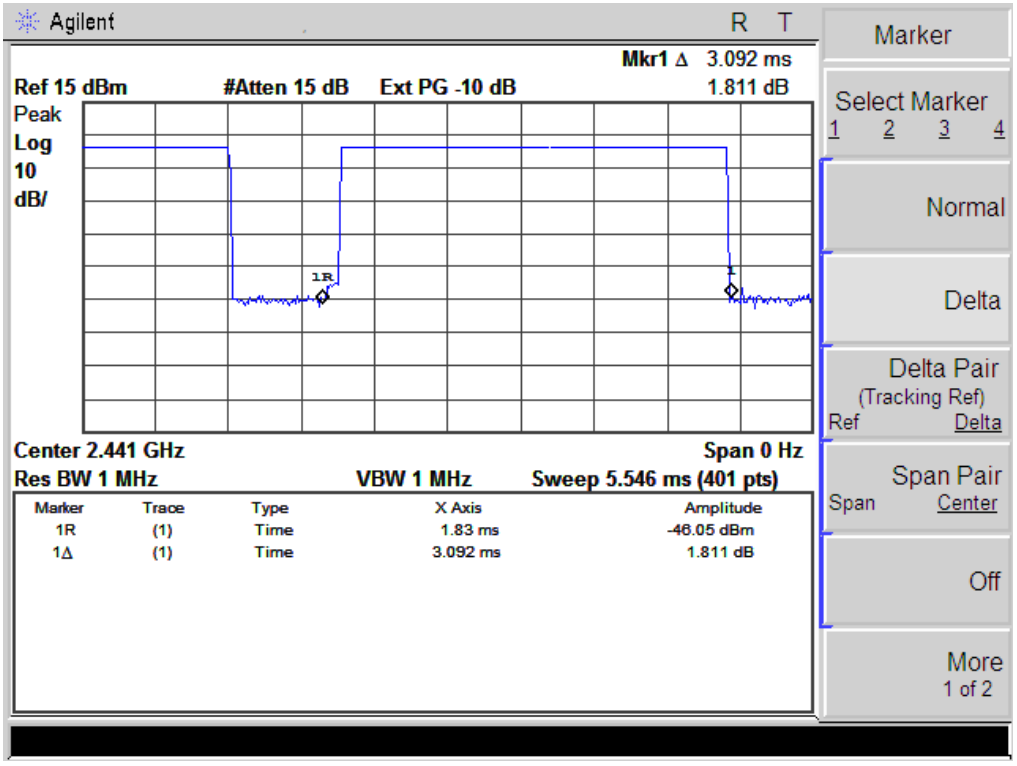
CH39-3DH3



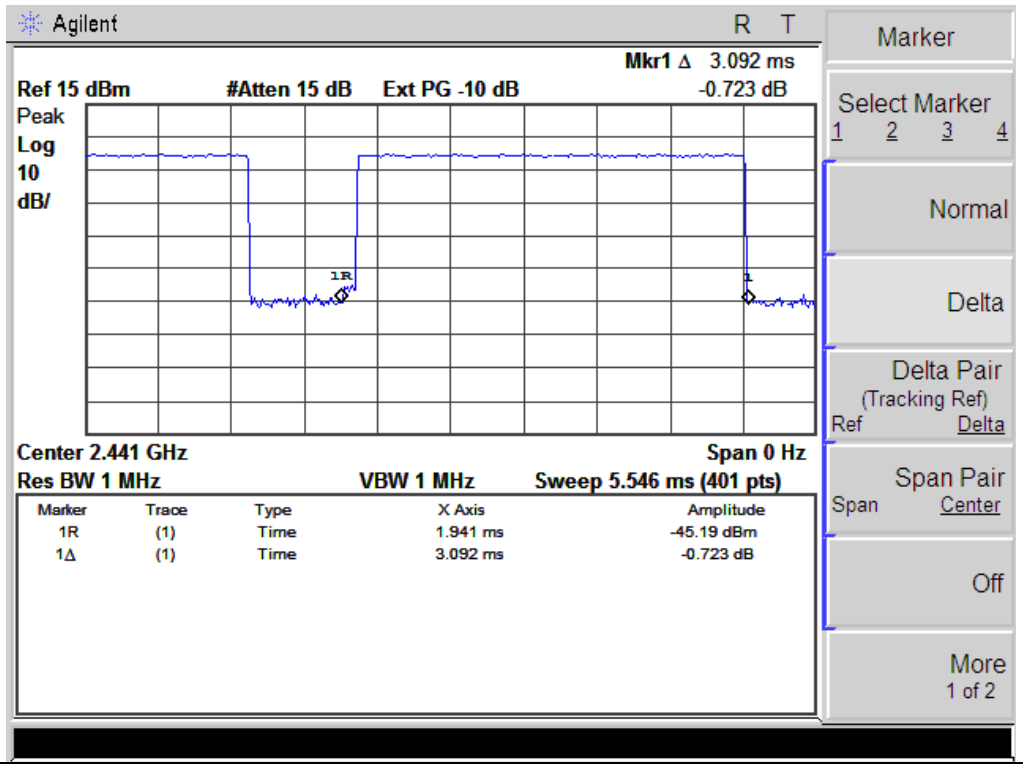
EUT：	Wireless high precision GNSS positionning terminal	Model Name ：	S650
Temperature：	25 ℃	Relative Humidity：	60%
Pressure：	1012 hPa	Test Voltage ：	AC 120V/60Hz
Test Mode ：	CH39-DH5,2DH5,3DH5		

Data Packet	Frequency	Pulse Duration (ms)	Dwell Time (s)	Limits (s)
DH5	2441MHz	3.09	0.33	0.40
2DH5	2441MHz	3.09	0.33	0.40
3DH5	2441MHz	3.10	0.33	0.40

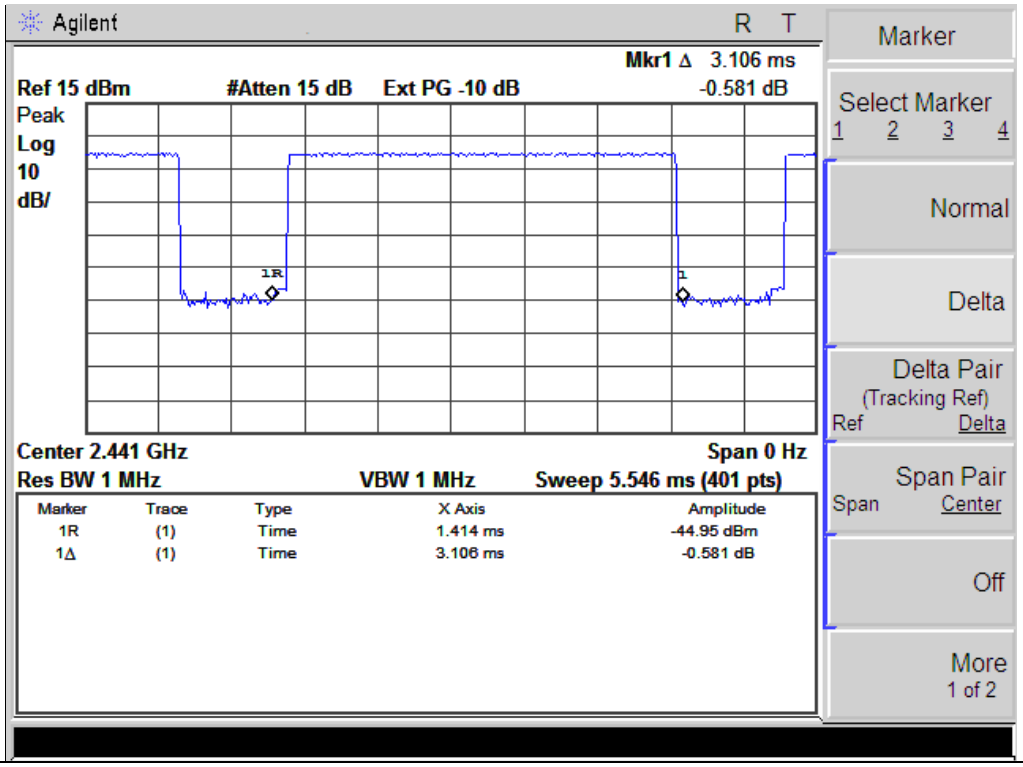
CH39-DH5



CH39-2DH5



CH39-3DH5



6. HOPPING CHANNEL SEPARATION MEASUREMENT

6.1 APPLIED PROCEDURES / LIMIT

Frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater.

Spectrum Parameter	Setting
Attenuation	Auto
Span Frequency	> Measurement Bandwidth or Channel Separation
RB	100 kHz (Channel Separation)
VB	300 kHz (Channel Separation)
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

6.1.1 TEST PROCEDURE

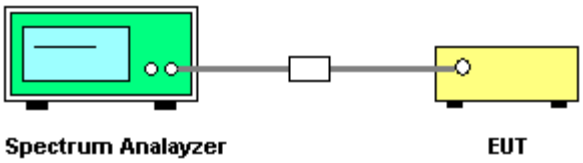
a. The transmitter output (antenna port) was connected to the spectrum analyser in peak hold mode.

b. The resolution bandwidth of 100 kHz and the video bandwidth of 300 kHz were utilised for channel separation measurement.

6.1.2 DEVIATION FROM STANDARD

No deviation.

6.1.3 TEST SETUP



6.1.4 EUT OPERATION CONDITIONS

The EUT was programmed to be in continuously transmitting mode.

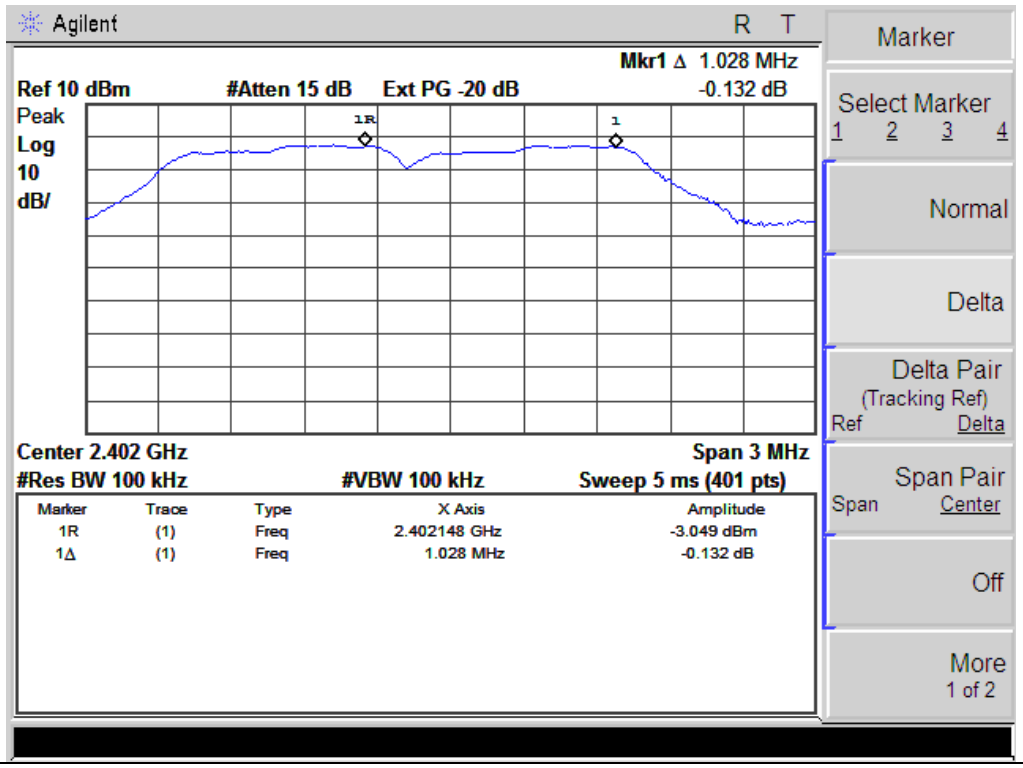
6.1.5 TEST RESULTS

EUT：	Wireless high precision GNSS positionning terminal	Model Name ：	S650
Temperature：	25 ℃	Relative Humidity：	60%
Pressure：	1012 hPa	Test Voltage ：	AC 120V/60Hz
Test Mode ：	CH00/ CH39 /CH78 (1Mbps Mode)		

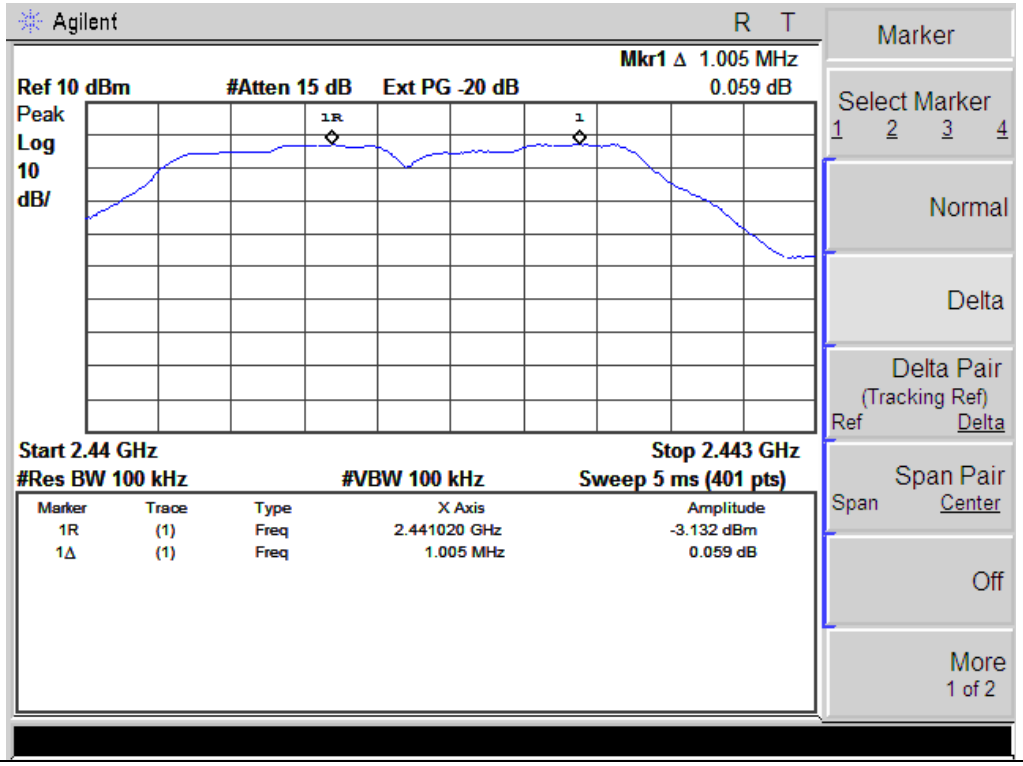
Frequency	Ch. Separation (MHz)	Result
2402 MHz	1.028	**Complies**
2441 MHz	1.005	**Complies**
2480 MHz	1.013	**Complies**

Ch. Separation Limits: >20dB bandwidth

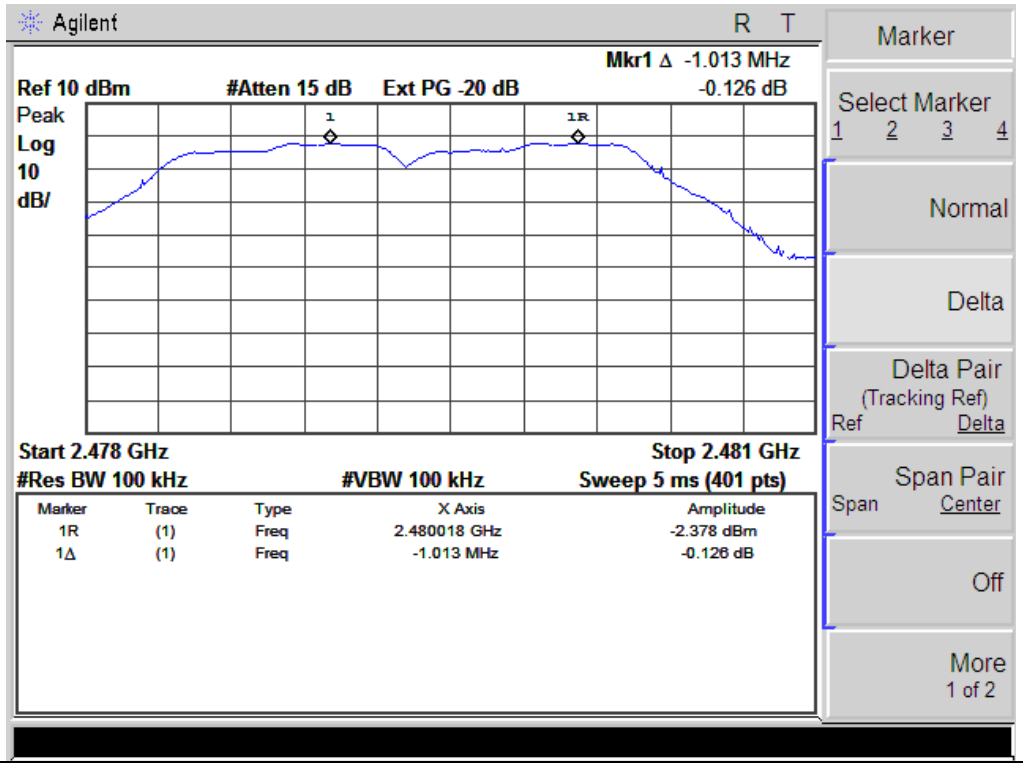
CH00-1Mbps



CH39 -1Mbps



CH78 -1Mbps

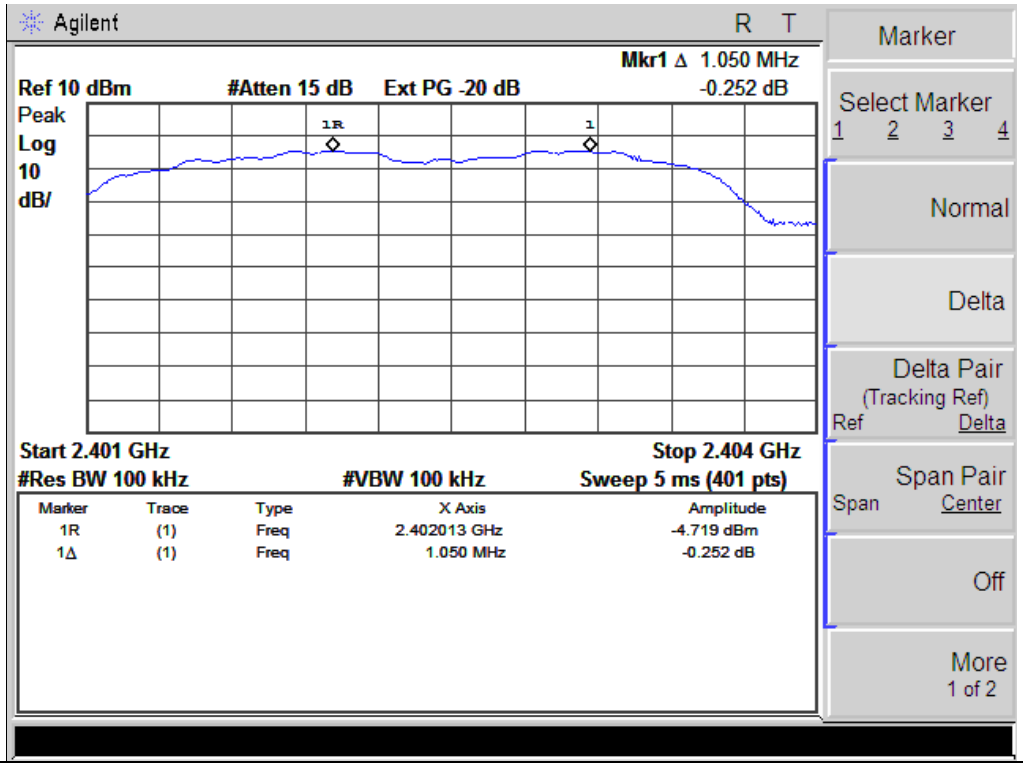


EUT：	Wireless high precision GNSS positionning terminal	Model Name ：	S650
Temperature：	25 ℃	Relative Humidity：	60%
Pressure：	1012 hPa	Test Voltage ：	AC 120V/60Hz
Test Mode ：	CH00/ CH39 /CH78 (2Mbps Mode)		

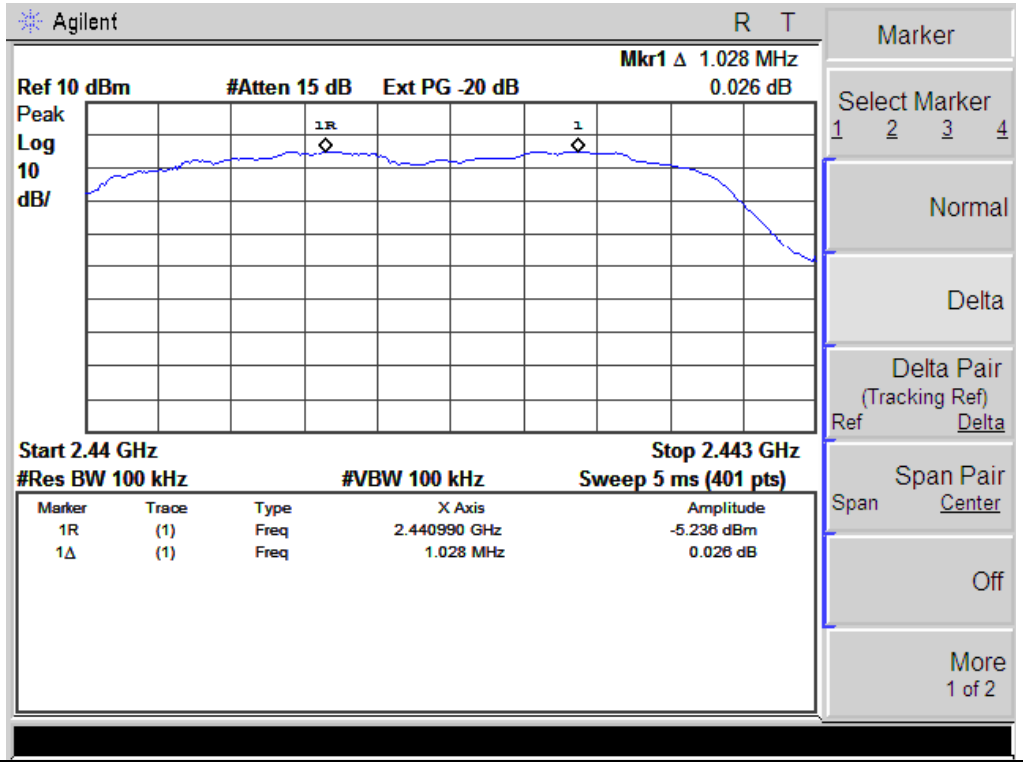
Frequency	Ch. Separation (MHz)	Result
2402 MHz	1.050	**Complies**
2441 MHz	1.028	**Complies**
2480 MHz	1.013	**Complies**

Ch. Separation Limits: >2/3 of 20dB bandwidth

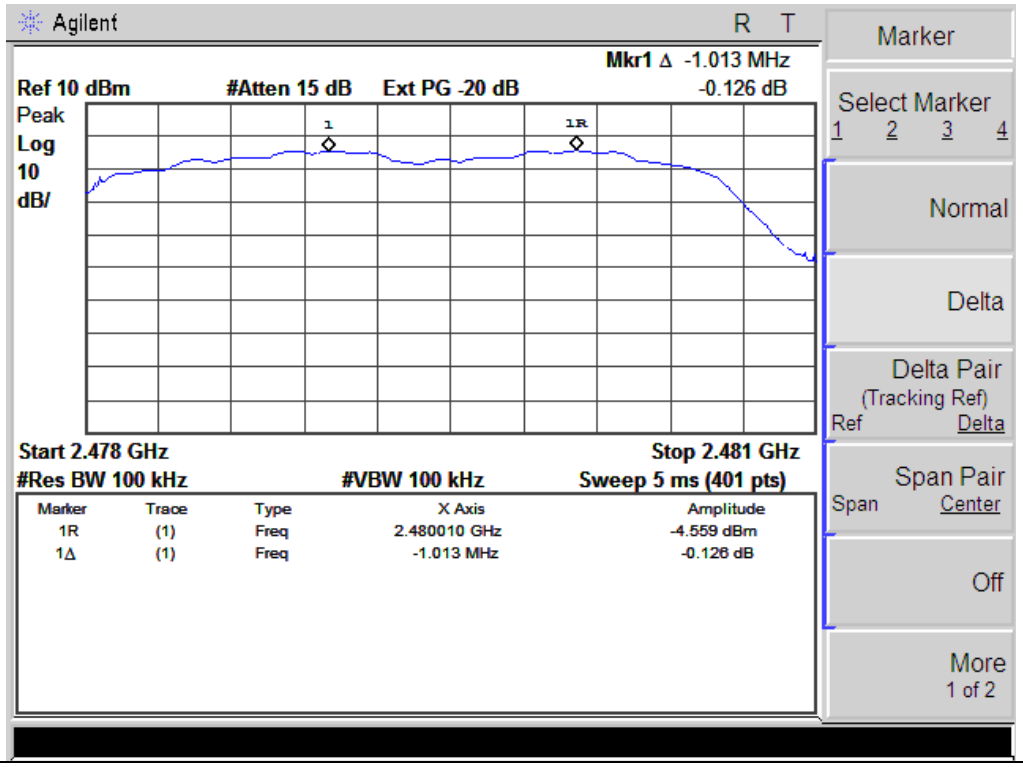
CH00-2Mbps



CH39 -2Mbps



CH78 -2Mbps

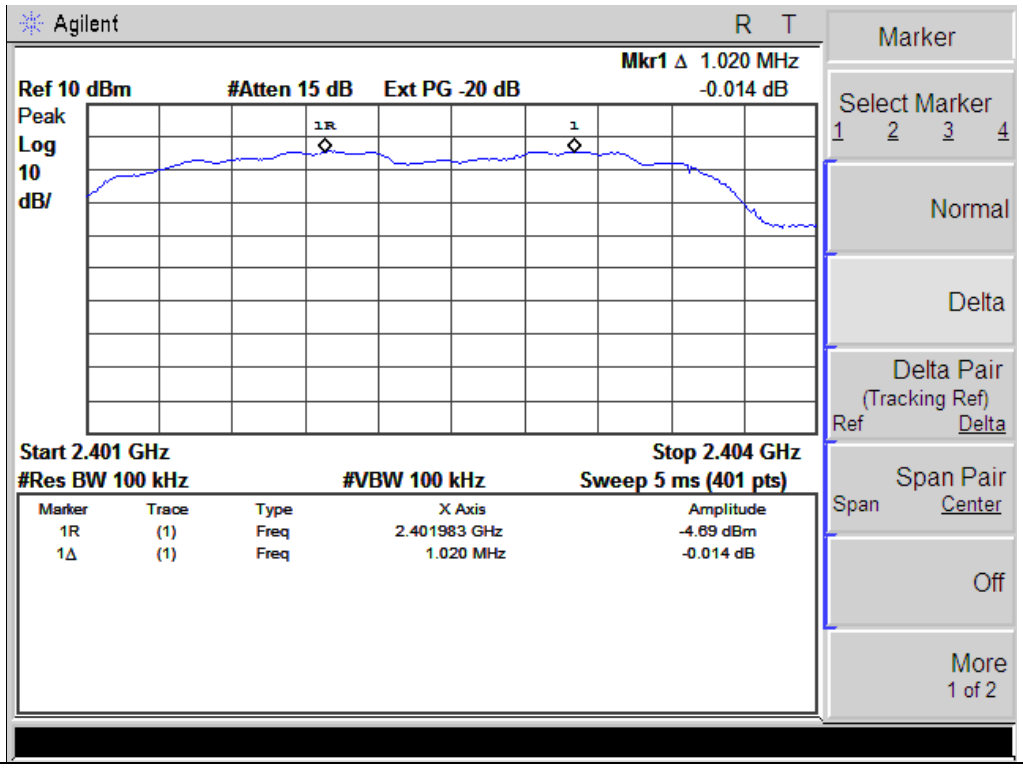


EUT：	Wireless high precision GNSS positionning terminal	Model Name ：	S650
Temperature：	25 ℃	Relative Humidity：	60%
Pressure：	1012 hPa	Test Voltage ：	AC 120V/60Hz
Test Mode ：	CH00/ CH39 /CH78 (3Mbps Mode)		

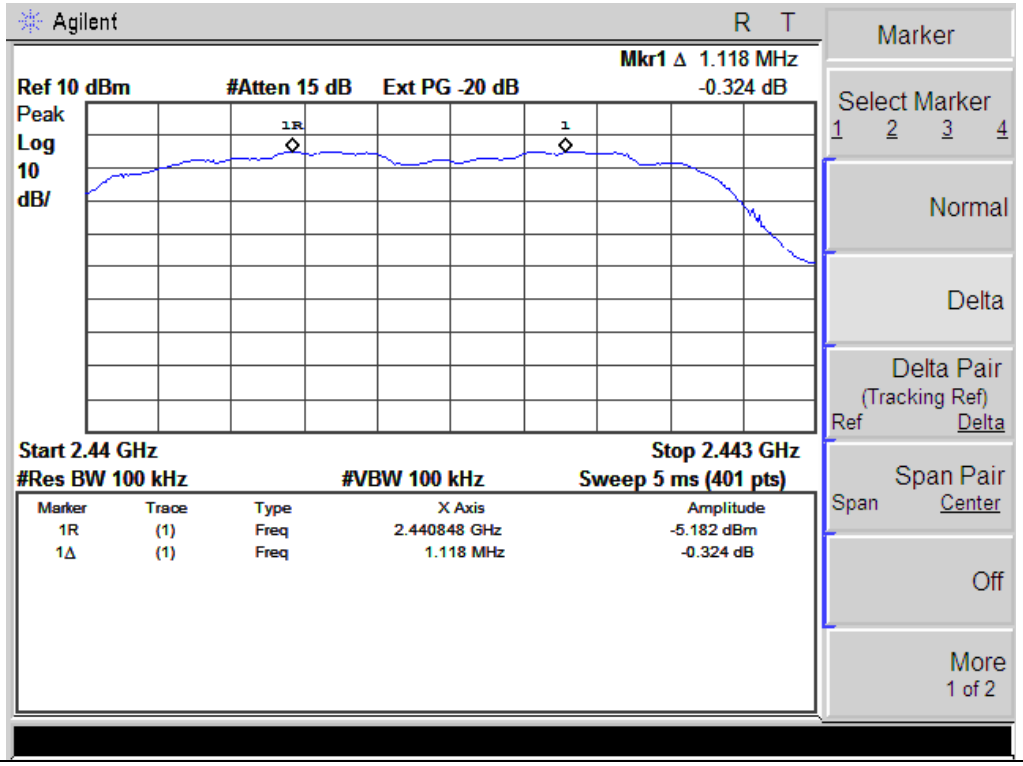
Frequency	Ch. Separation (MHz)	Result
2402 MHz	1.020	**Complies**
2441 MHz	1.118	**Complies**
2480 MHz	1.148	**Complies**

Ch. Separation Limits: >2/3 of 20dB bandwidth

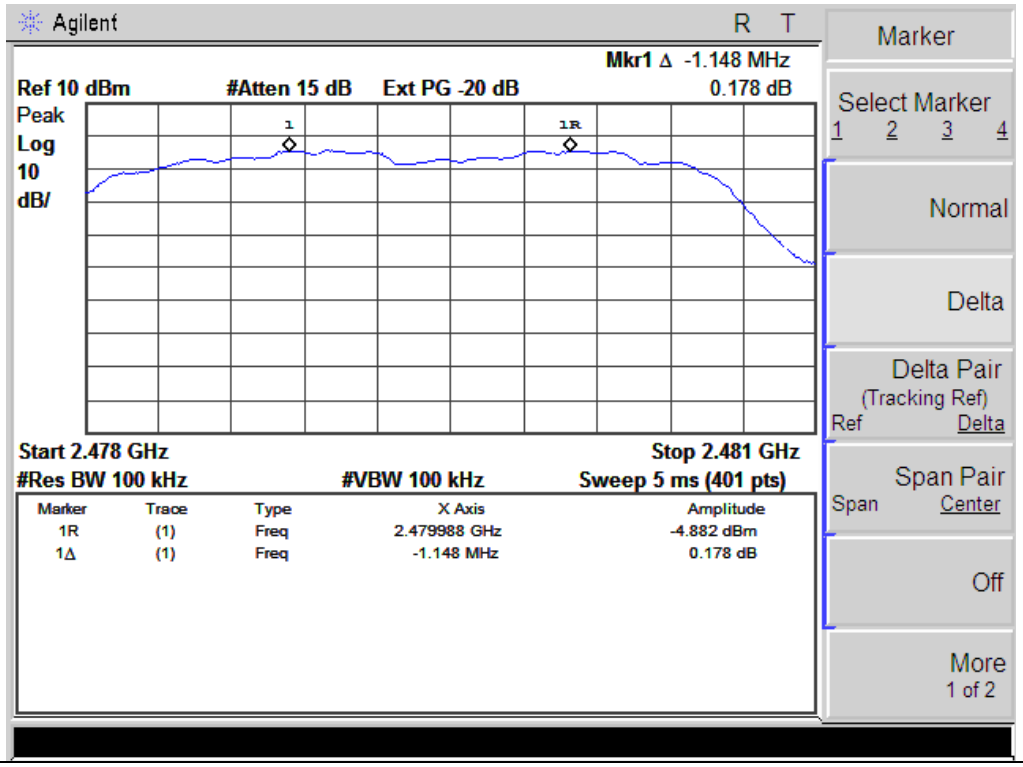
CH00-3Mbps



CH39 -3Mbps



CH78 -3Mbps



7. BANDWIDTH TEST

7.1 APPLIED PROCEDURES / LIMIT

FCC Part15 (15.247) , Subpart C				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247 (a)(1)	Bandwidth	(20dB bandwidth)	2400-2483.5	PASS

Spectrum Parameter	Setting
Attenuation	Auto
Span Frequency	> Measurement Bandwidth or Channel Separation
RB	30 kHz
VB	100 kHz
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

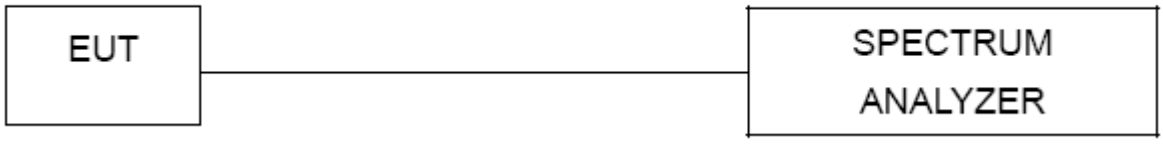
7.1.1 TEST PROCEDURE

a. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below,
b. Spectrum Setting : RBW= 30KHz, VBW=100KHz, Sweep time = Auto.

7.1.2 DEVIATION FROM STANDARD

No deviation.

7.1.3 TEST SETUP



7.1.4 EUT OPERATION CONDITIONS

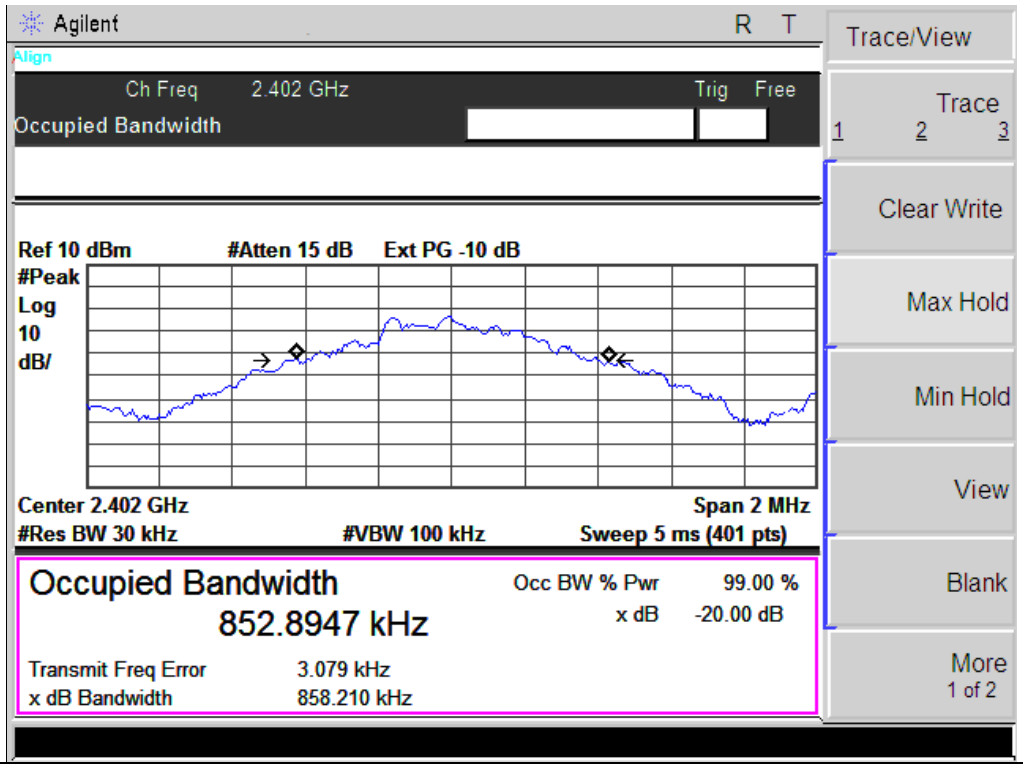
The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.

7.1.5 TEST RESULTS

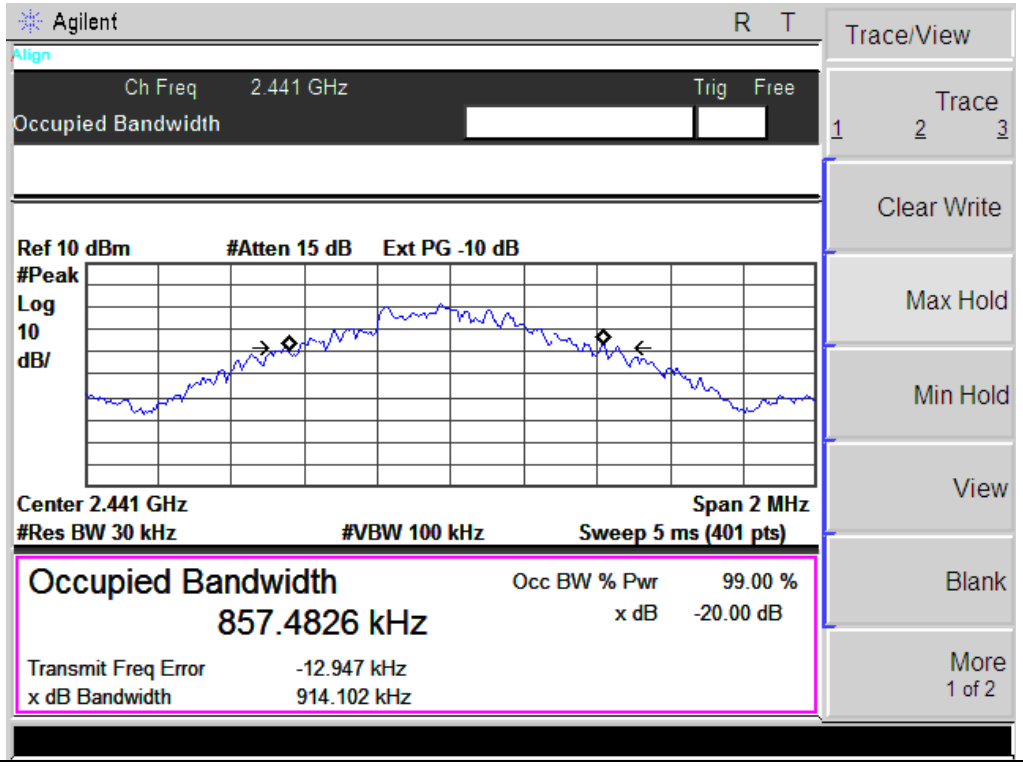
EUT：	Wireless high precision GNSS positionning terminal	Model Name ：	S650
Temperature：	25 ℃	Relative Humidity：	60%
Pressure：	1012 hPa	Test Voltage ：	AC 120V/60Hz
Test Mode ：	CH00/ CH39 /C78**(1Mbps)**		

Channel	Channel Frequency (MHz)	20dB Bandwidth (MHz)	99% Bandwidth (MHz)	Result
Low Channel	2402	858.210	852.894	PASS
Mid Channel	2441	914.102	857.482	PASS
High Channel	2480	836.397	847.957	PASS

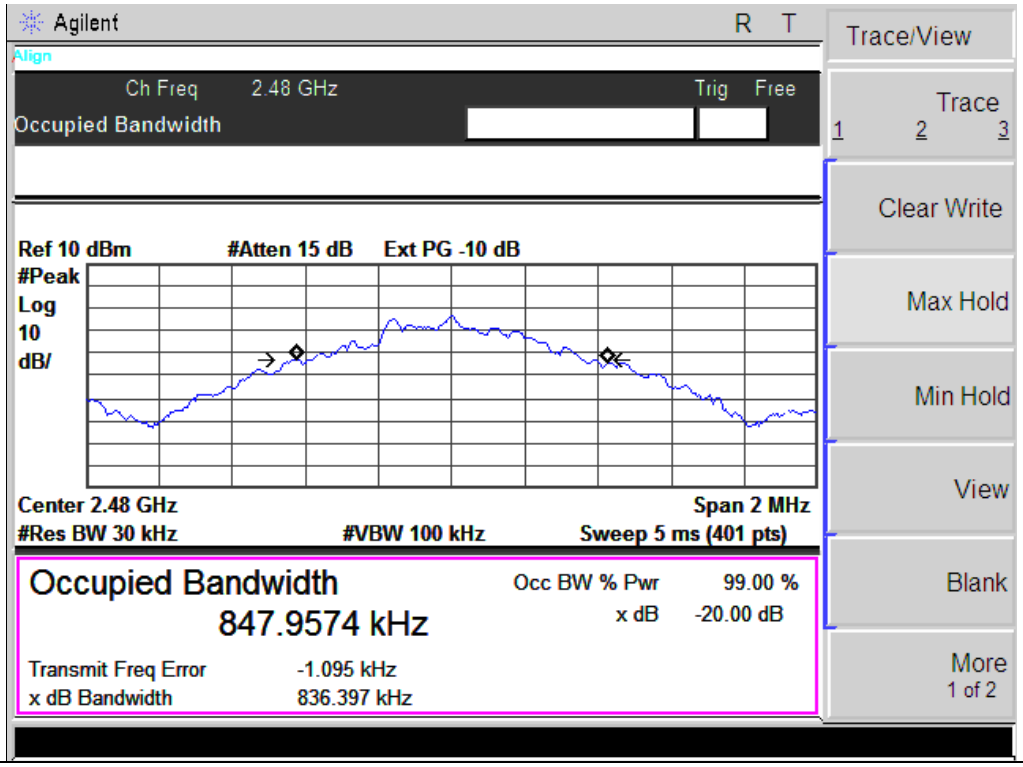
CH00-1Mbps



CH39 -1Mbps



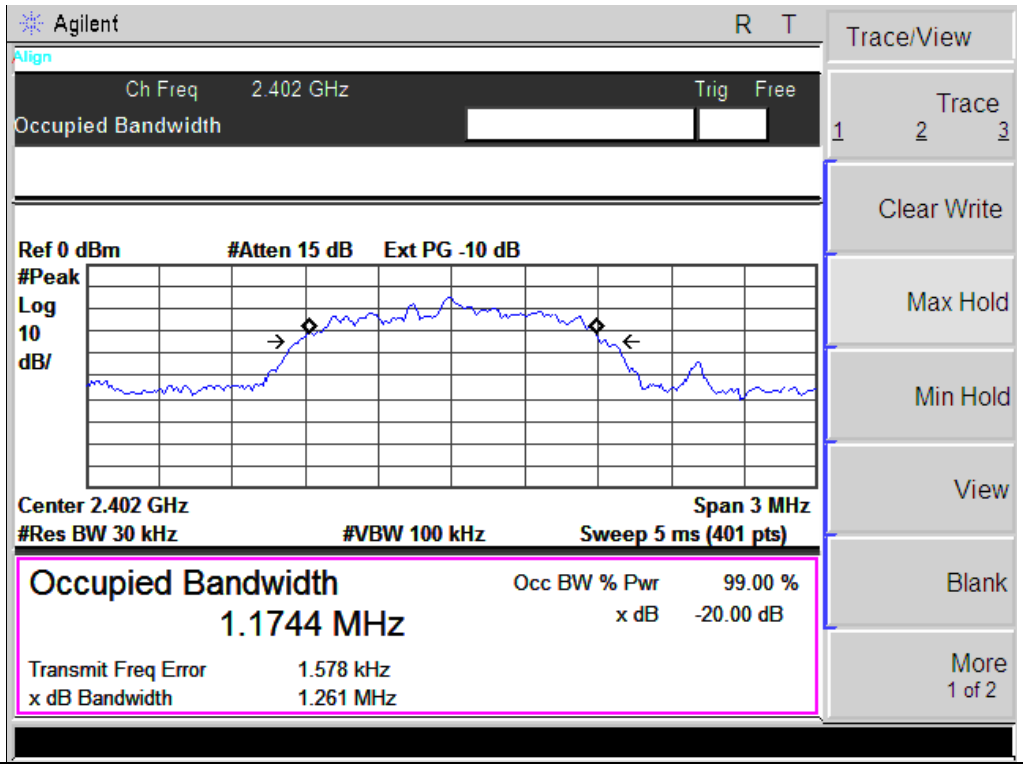
CH78 -1Mbps



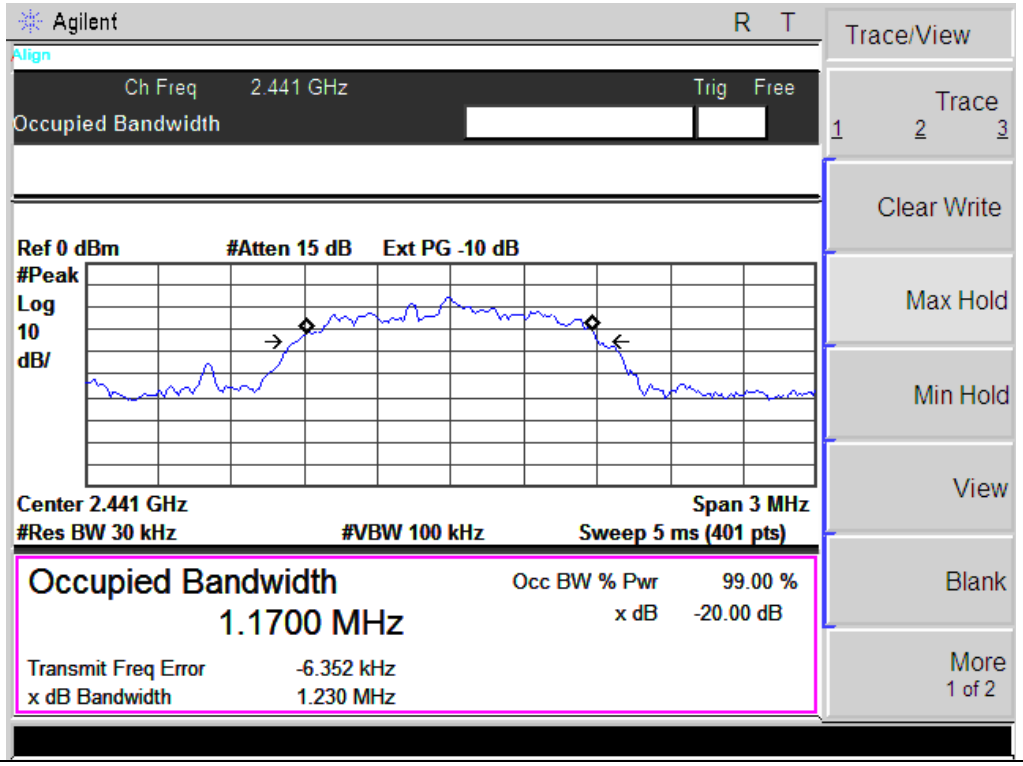
EUT：	Wireless high precision GNSS positionning terminal	Model Name ：	S650
Temperature：	25 ℃	Relative Humidity：	60%
Pressure：	1012 hPa	Test Voltage ：	AC 120V/60Hz
Test Mode ：	CH00/ CH39 /C78**(2Mbps)**		

Channel	Channel Frequency (MHz)	20dB Bandwidth (MHz)	99% Bandwidth (MHz)	Result
Low Channel	2402	1.261	1.174	PASS
Mid Channel	2441	1.230	1.170	PASS
High Channel	2480	1.225	1.164	PASS

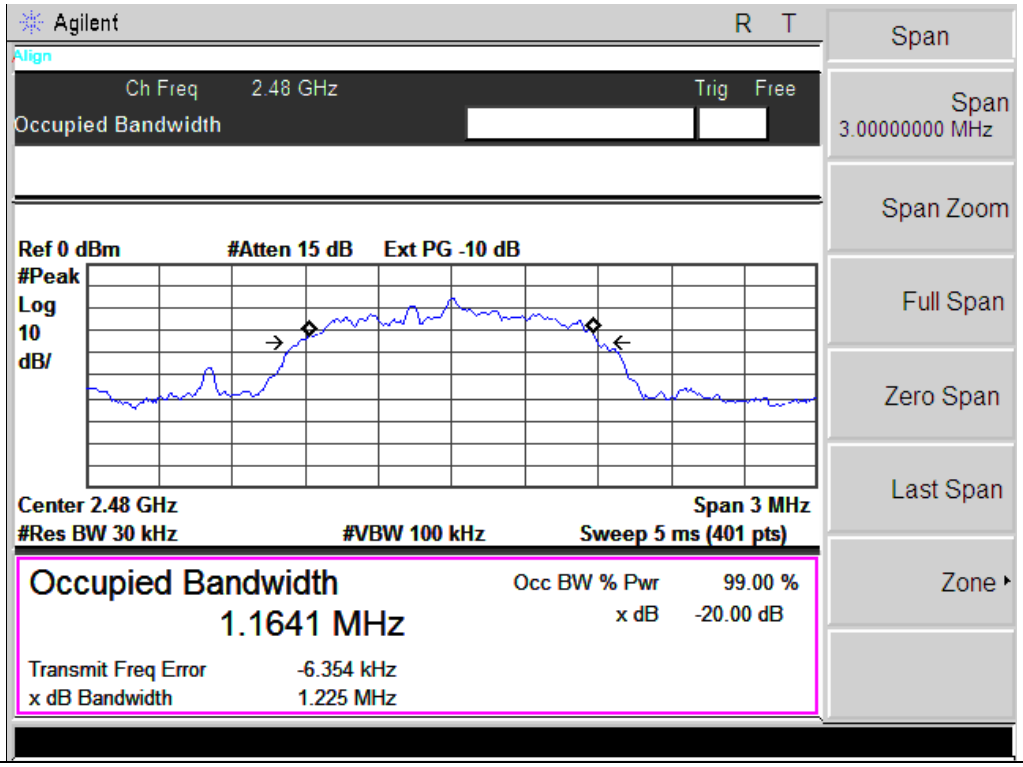
CH00-2Mbps



CH39 -2Mbps



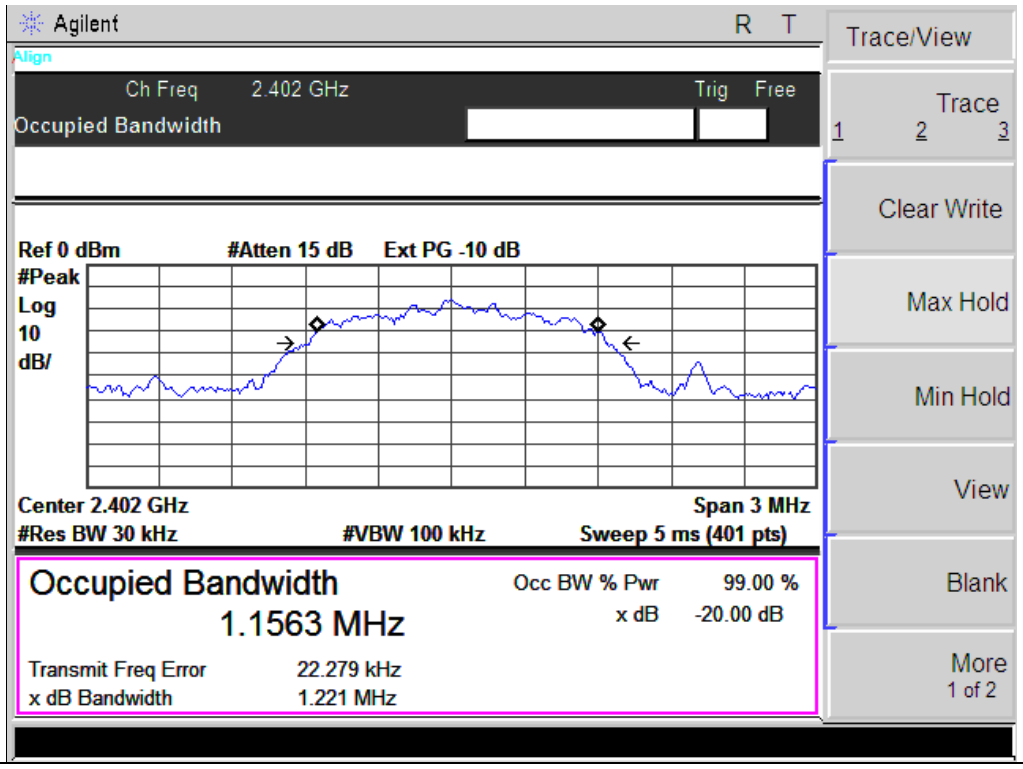
CH78 -2Mbps



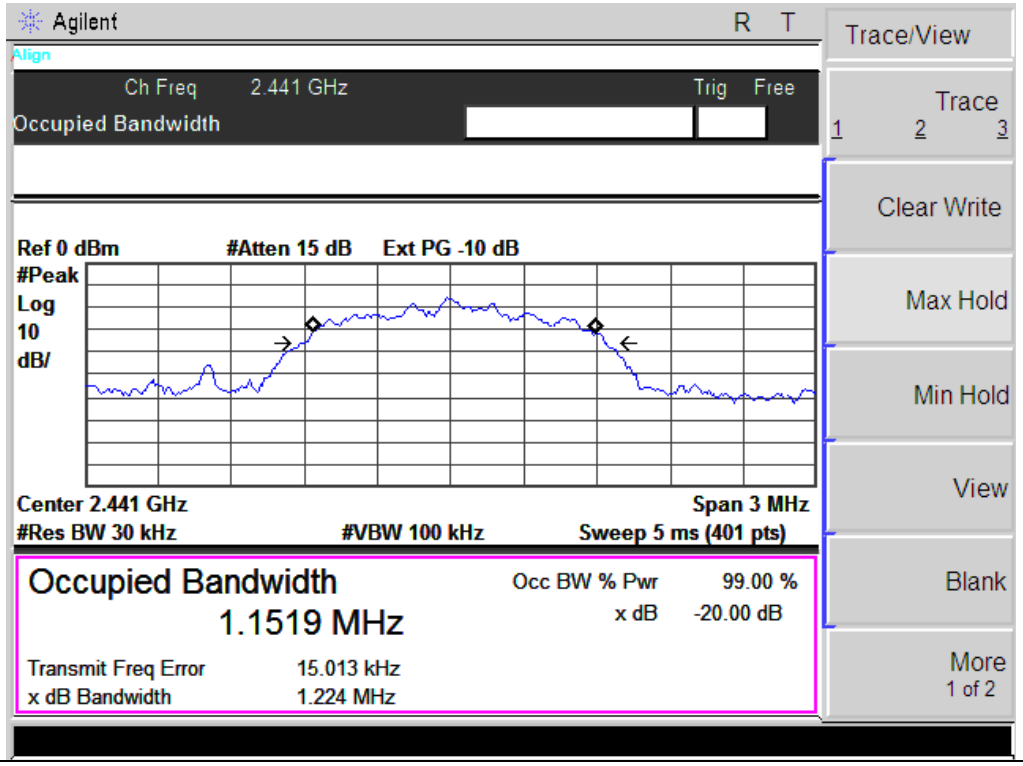
EUT：	Wireless high precision GNSS positionning terminal	Model Name ：	S650
Temperature：	25 ℃	Relative Humidity：	60%
Pressure：	1012 hPa	Test Voltage ：	AC 120V/60Hz
Test Mode ：	CH00/ CH39 /C78**(3Mbps)**		

Channel	Channel Frequency (MHz)	20dB Bandwidth (MHz)	99% Bandwidth (MHz)	Result
Low Channel	2402	1.220	1.156	PASS
Mid Channel	2441	1.224	1.151	PASS
High Channel	2480	1.210	1.144	PASS

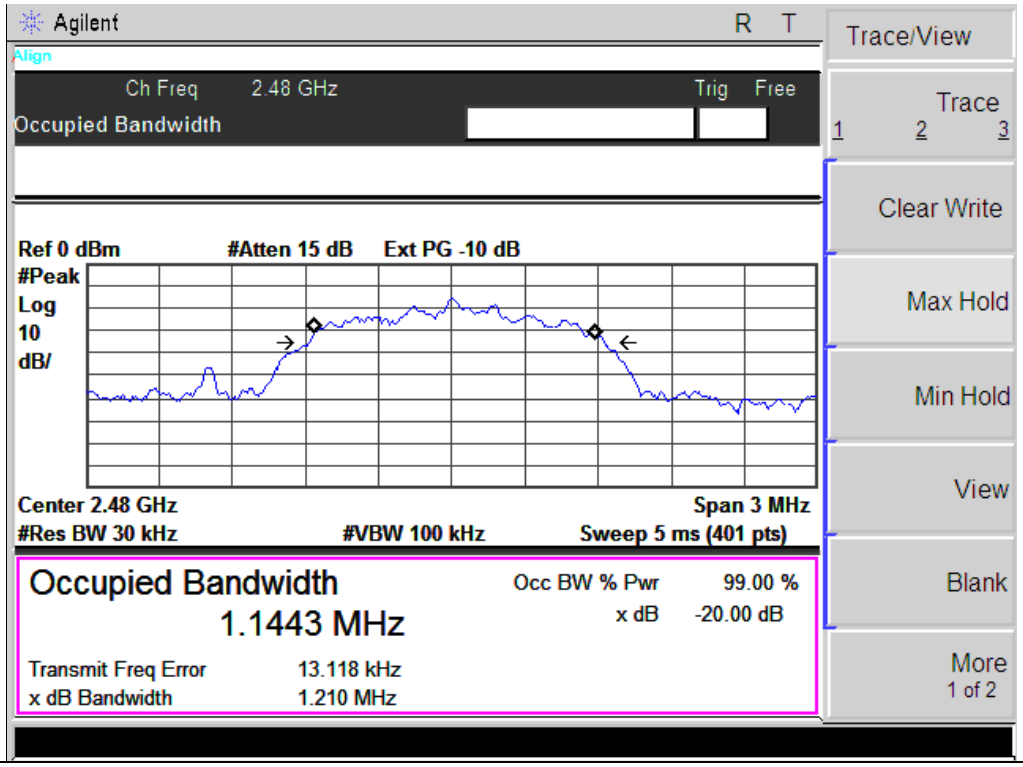
CH00-3Mbps



CH39 -3Mbps



CH78 -3Mbps



8. PEAK OUTPUT POWER TEST

8.1 APPLIED PROCEDURES / LIMIT

FCC Part15 (15.247) , Subpart C				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247 (b)(i)	Peak Output Power	0.125 w or 20.96dBm	2400-2483.5	PASS

8.1.1 TEST PROCEDURE

a. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below,

b. Spectrum Setting : RBW > the 20 dB bandwidth of the emission being measured

Span = approximately 5 times the 20 dB bandwidth, centered on a hopping channel

VBW ≥ RBW

Sweep = auto

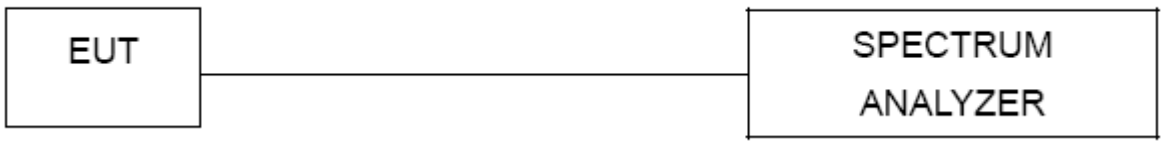
Detector function = peak

Trace = max hold

8.1.2 DEVIATION FROM STANDARD

No deviation.

8.1.3 TEST SETUP



8.1.4 EUT OPERATION CONDITIONS

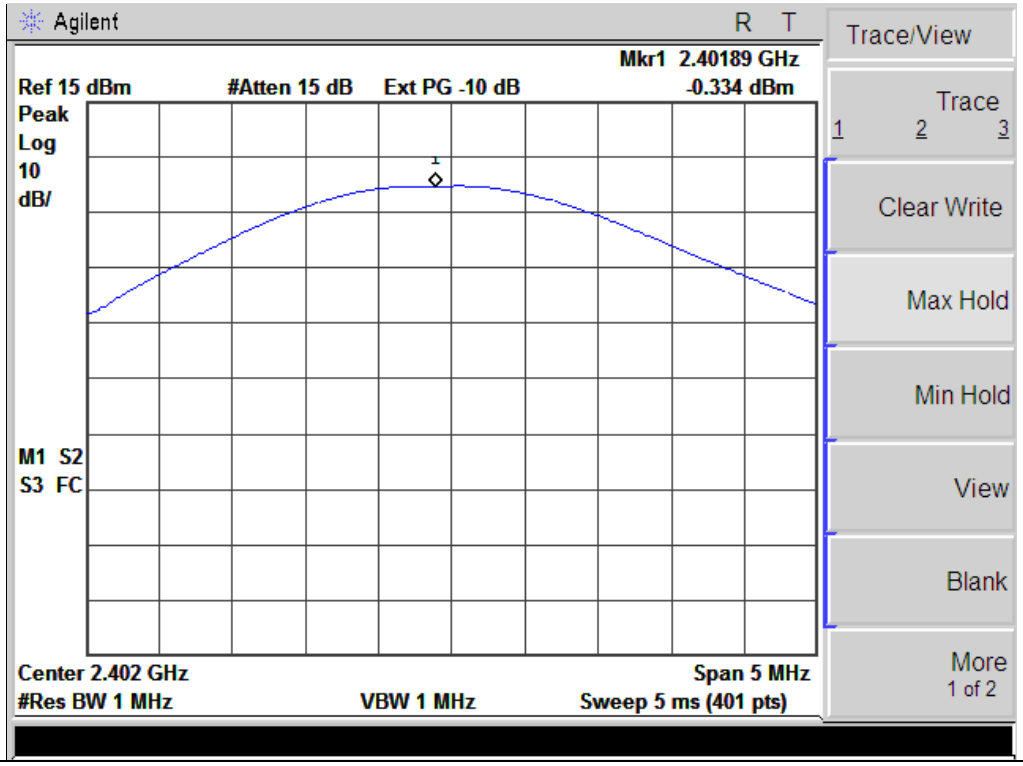
The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.

8.1.5 TEST RESULTS

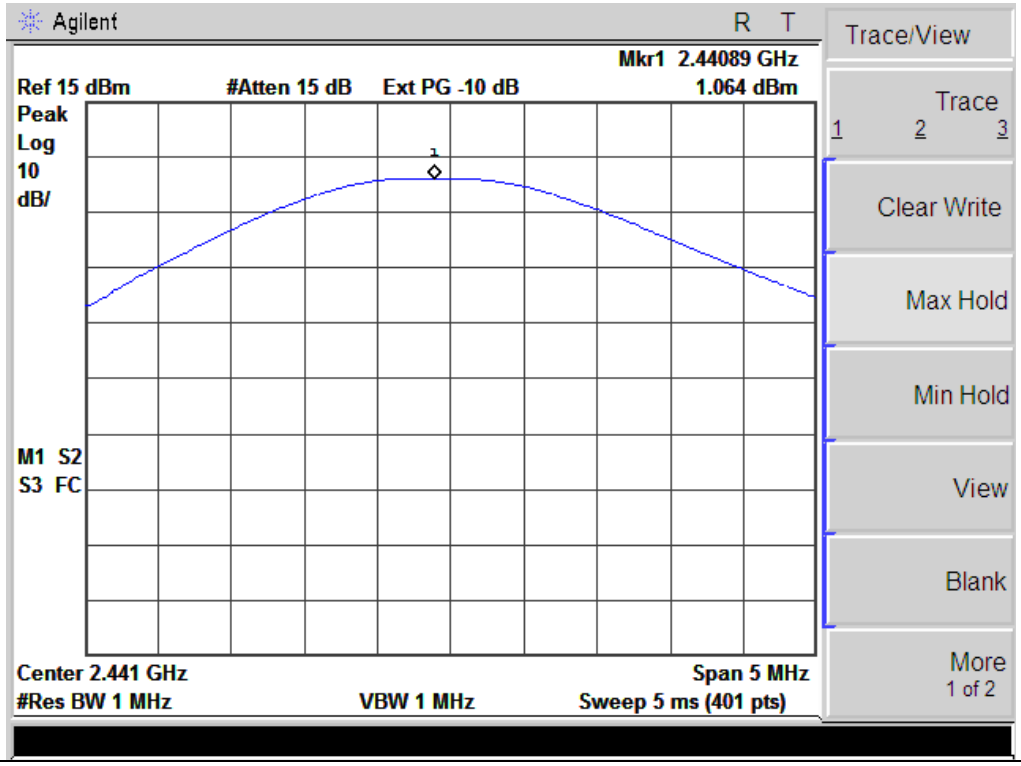
EUT：	Wireless high precision GNSS positionning terminal	Model Name ：	S650
Temperature：	25 ℃	Relative Humidity：	60%
Pressure：	1012 hPa	Test Voltage ：	AC 120V/60Hz
Test Mode ：	CH00/ CH39 /CH78 (1M/2M/3Mbps Mode)		

Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)
BDR mode (GFSK)			
Low	2402	-0.334	20.96
Middle	2441	1.064	20.96
High	2480	0.791	20.96
EDR Mode (π/4-DQPSK)			
Low	2402	-0.999	20.96
Middle	2441	-1.195	20.96
High	2480	-1.804	20.96
EDR Mode (8 DPSK)			
Low	2402	-0.754	20.96
Middle	2441	-0.856	20.96
High	2480	-1.465	20.96

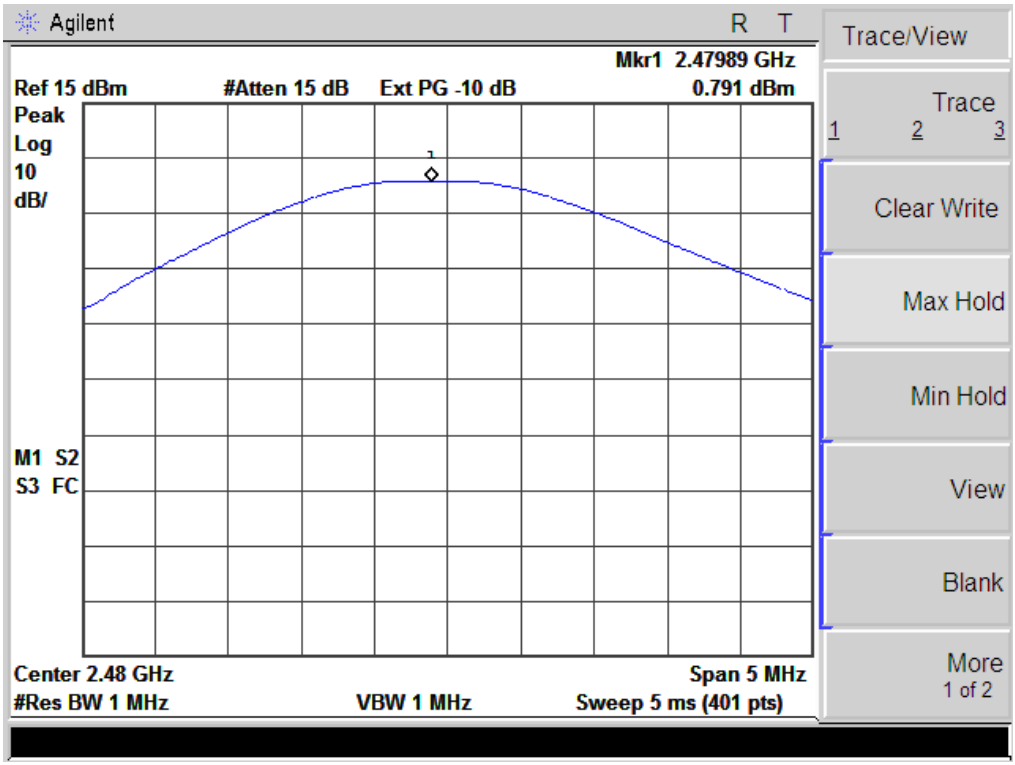
CH00-1Mbps



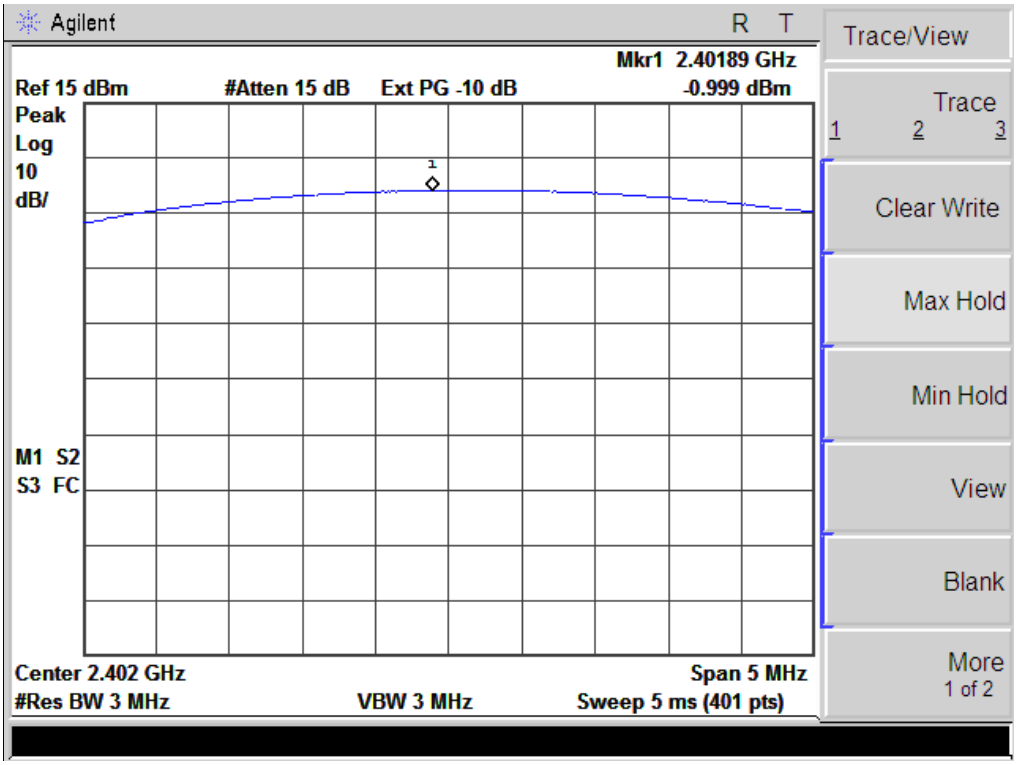
CH39 -1Mbps



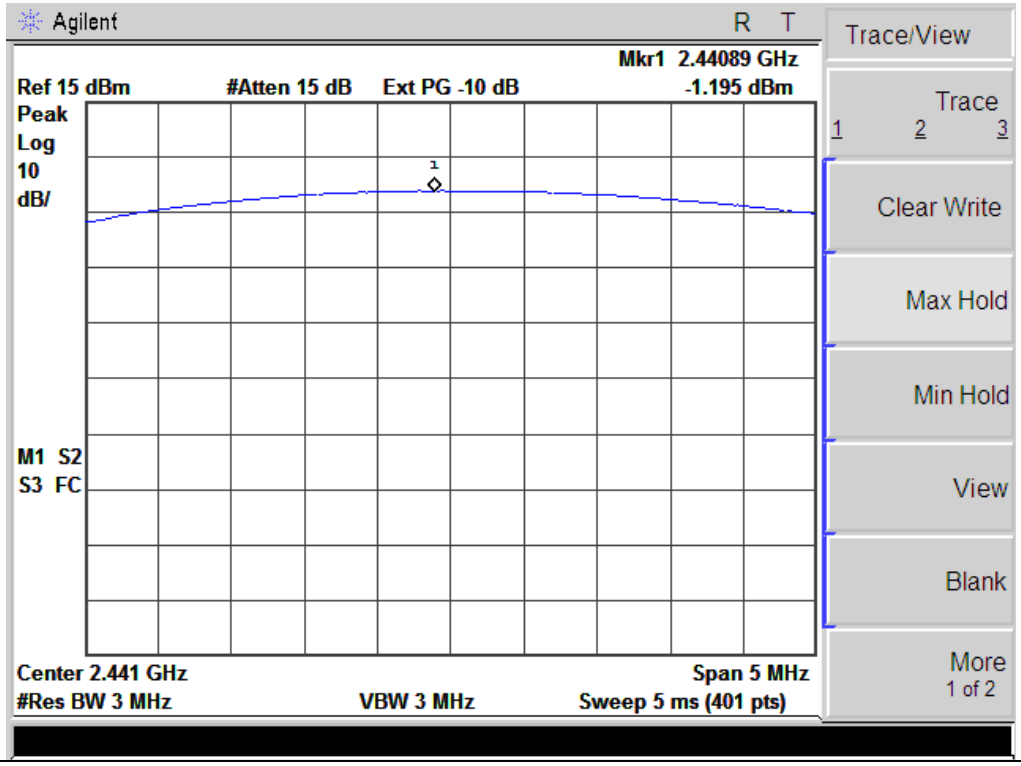
CH78 -1Mbps



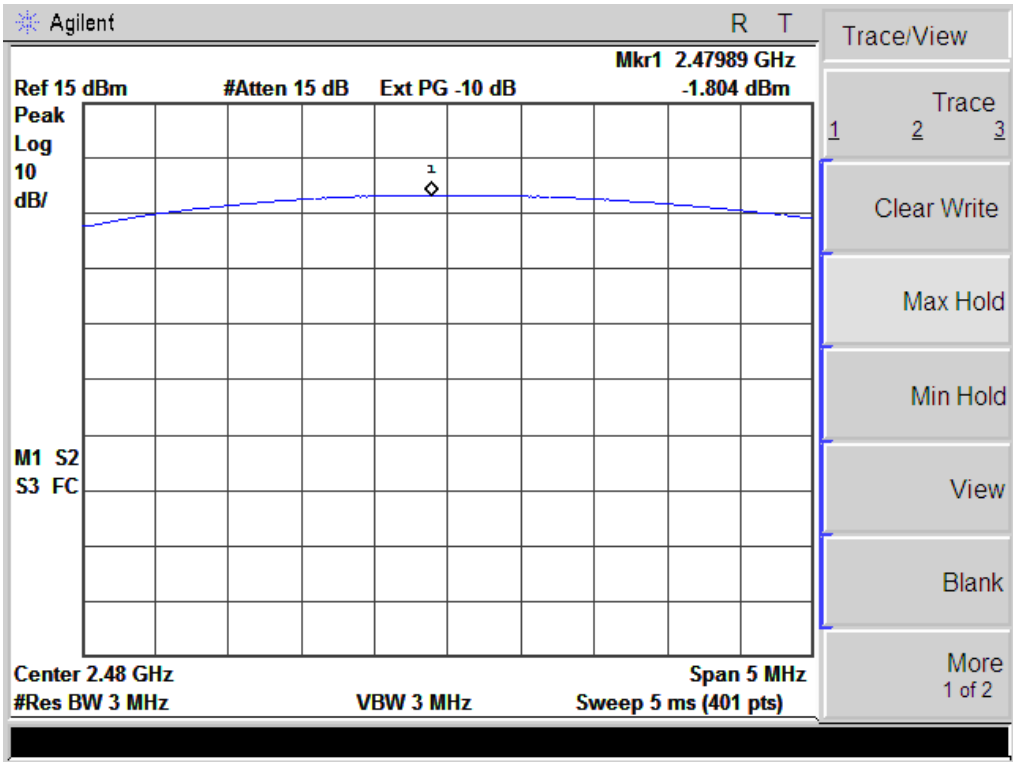
CH00-2Mbps


Agilent
R T
Mkr1 2.40189 GHz
Ref 15 dBm
#Atten 15 dB
Ext PG -10 dB
-0.999 dBm
Peak
Log
10
dB/
M1 S2
S3 FC
Center 2.402 GHz
#Res BW 3 MHz
VBW 3 MHz
Span 5 MHz
Sweep 5 ms (401 pts)
Trace/View
Trace
1 2 3
Clear Write
Max Hold
Min Hold
View
Blank
More
1 of 2

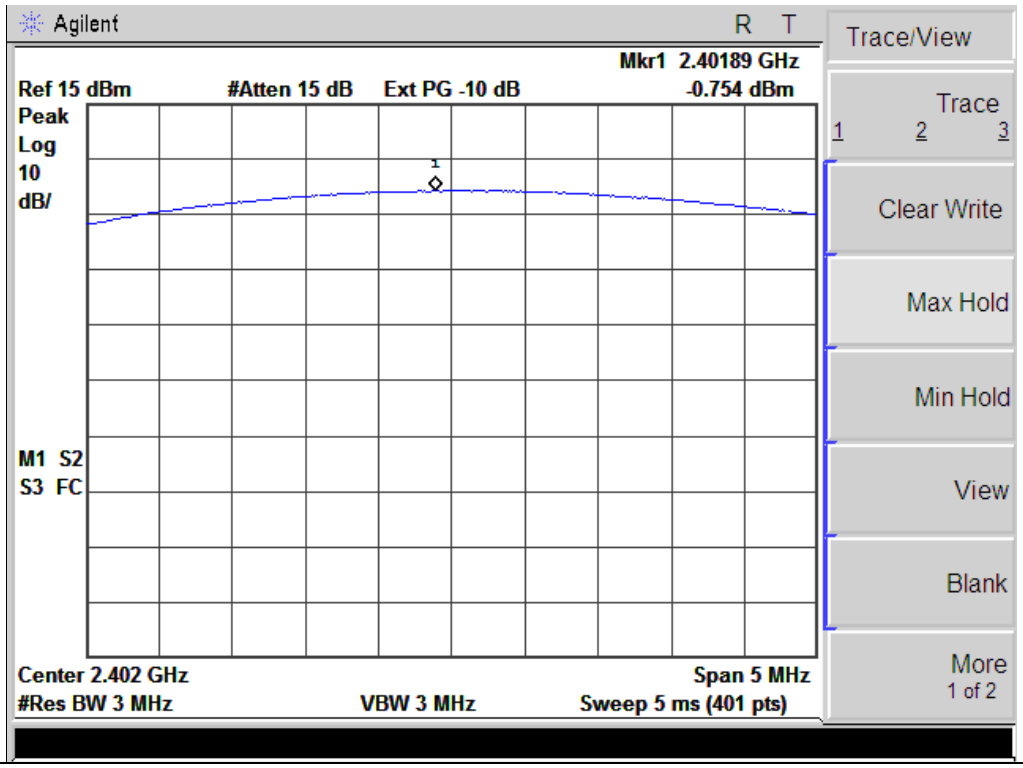
CH39 -2Mbps



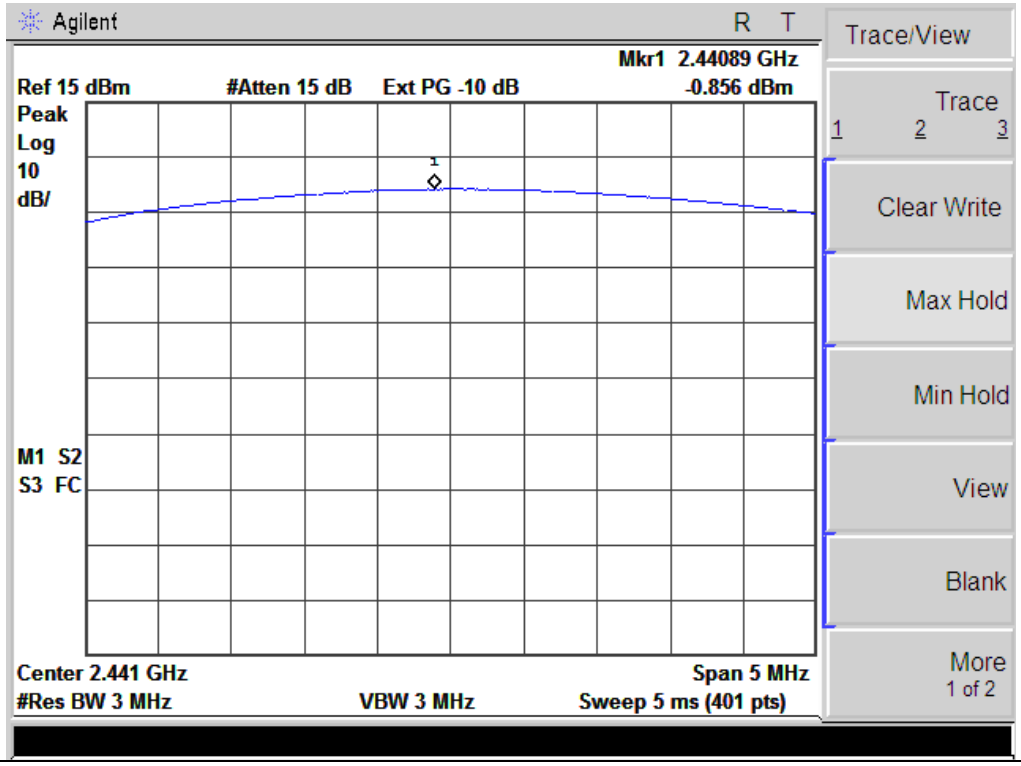
CH78 -2Mbps



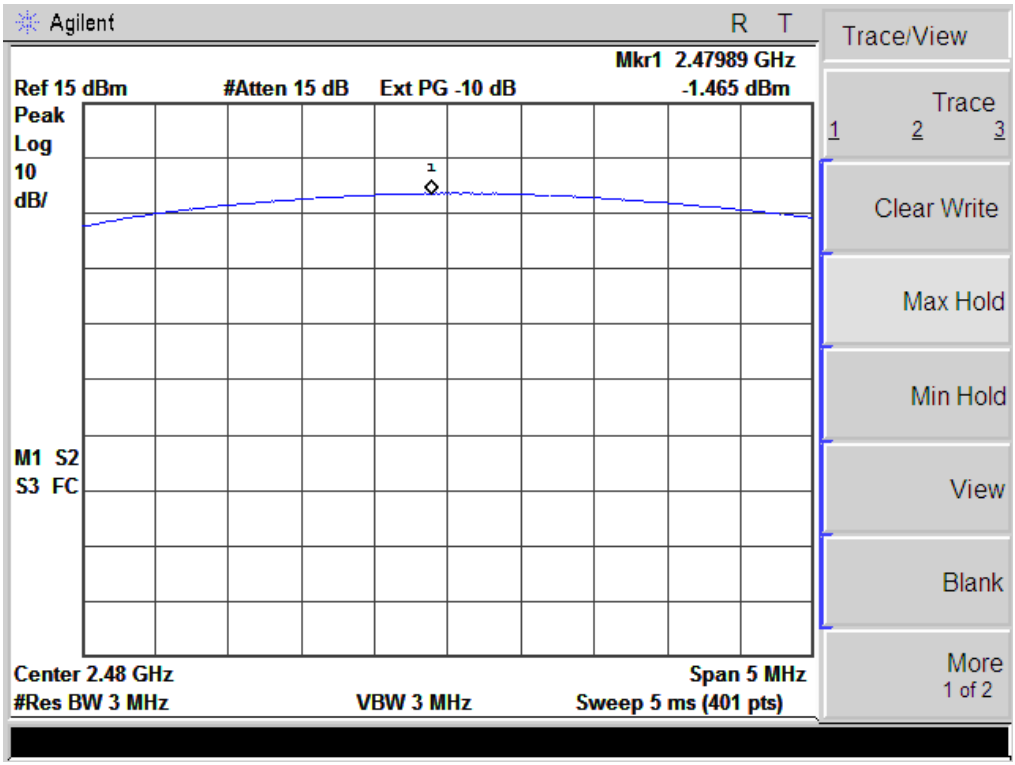
CH00-3Mbps


Agilent
R T
Mkr1 2.40189 GHz
Ref 15 dBm
#Atten 15 dB
Ext PG -10 dB
-0.754 dBm
Peak
Log
10
dB/
M1 S2
S3 FC
Center 2.402 GHz
#Res BW 3 MHz
VBW 3 MHz
Span 5 MHz
Sweep 5 ms (401 pts)
Trace/View
Trace
1 2 3
Clear Write
Max Hold
Min Hold
View
Blank
More
1 of 2

CH39 -3Mbps



CH78 -3Mbps



9. ANTENNA REQUIREMENT

9.1 STANDARD REQUIREMENT

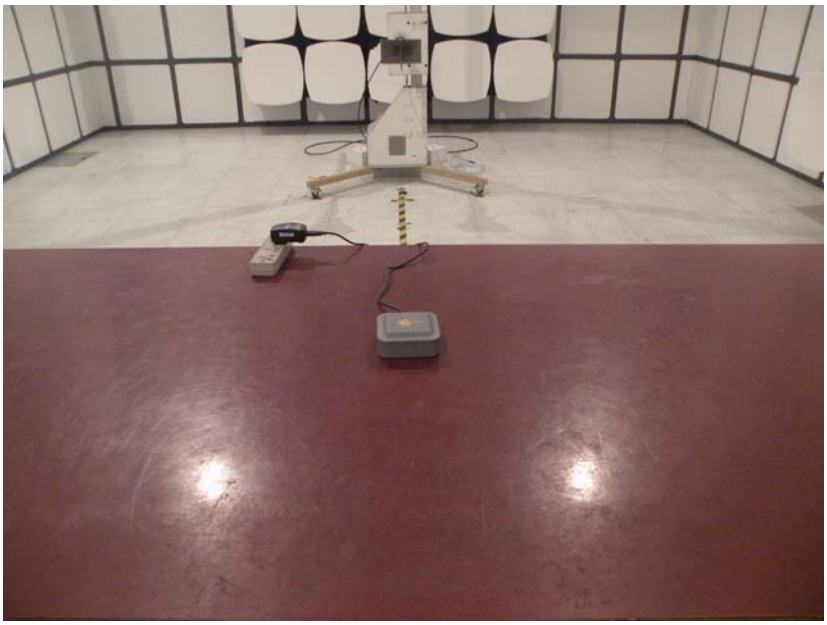
15.203 requirement: For intentional device, according to 15.203: an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

9.2 EUT ANTENNA

The EUT antenna is Integrated(Chip) antenna. It comply with the standard requirement.

10. EUT TEST PHOTO

Radiated Measurement Photos



Conducted Emission Photos