Radio Test Report

FCC ID: UFOOPN2002I

This report concerns (check one) : ☒ **Original Grant** ☐ **Class II Change**

Issued Date : Oct. 05, 2012
Project No. : 1207180
Equipment : Laser Data Collector
Model Name : OPN-2002i

Applicant : OPTOELECTRONICS CO., LTD.
Address : 4-12-17, Tsukagoshi, Warabi-Shi, Saitama-ken, 335-0002, Japan.

Tested by: Neutron Engineering Inc. EMC Laboratory
Date of Receipt: Jul. 30, 2012
Date of Test: Jul. 30, 2012 ~ Sep. 20, 2012

Testing Engineer : Rush Kao
(Rush Kao)

Technical Manager :
(Jeff Yang)

Authorized Signatory :
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TEL: +886-2-2657-3299
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Testing Laboratory
0659

Declaration

Neutron represents to the client that testing is done in accordance with standard procedures as applicable and that test instruments used has been calibrated with the standards traceable to National Measurement Laboratory (**NML**) of **R.O.C**., or National Institute of Standards and Technology (**NIST**) of **U.S.A.**

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Neutron's laboratory quality assurance procedures are in compliance with the **ISO Guide 17025** requirements, and accredited by the conformity assessment authorities listed in this test report.

Limitation

For the use of the authority's logo is limited unless the Test Standard(s)/Scope(s)/Item(s) mentioned in this test report is (are) included in the conformity assessment authorities acceptance respective.

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REPORT ISSUED HISTORY

Revised Version No.	Description	Issued Date
-	Initial Issue.	Oct. 05, 2012

1 CERTIFICATION

Equipment	:	Laser Data Collector
Brand Name	:	OPTICON
Model Name	:	OPN-2002i
Applicant	:	OPTOELECTRONICS CO., LTD.
Date of Test	:	Jul. 30, 2012 ~ Sep. 20, 2012
Standards	:	FCC Part 15, Subpart C: 2010 ANSI C63.4: 2009

The above equipment has been tested and found compliance with the requirement of the relative standards by Neutron Engineering Inc. EMC Laboratory.
The test data, data evaluation, and equipment configuration contained in our test report (Ref No. NEI-FCCP-1-1207180) were obtained utilizing the test procedures, test instruments, test sites that has been accredited by the Authority of NVLAP and TAF according to the ISO-17025 quality assessment standard and technical standard(s).

2. SUMMARY OF TEST RESULTS

Standard Clause	Test Item	Result
15.207	Conducted Emission	**PASS**
15.247 (c)	Antenna conducted Spurious Emission	**PASS**
15.247 (a)(1)	Hopping Channel Separation	**PASS**
15.247 (b)	Maximum Peak Conducted Output Power	**PASS**
15.247 (c)	Radiated Spurious Emission	**PASS**
15.247 (b)(1)	Number of Hopping Frequency	**PASS**
15.247 (a)(1)	Average time of occupancy	**PASS**
15.205	Restricted Bands	**PASS**
15.203	Antenna Requirement	**PASS**
1.1307 1.1310 2.1091 2.1093	RF Exposure Compliance	**PASS**

NOTE:

1. **N/A**: denotes test is not applicable in this Test Report
2. Portable device; SAR report is required.

2.1 TEST FACILITY

The test facilities used to collect the test data in this report:

Conducted emission Test:

C03: B1, No. 37, Lane 365, YangGuang St., NeiHu District 114, Taipei, Taiwan.

Radiated emission Test (Below 1 GHz):

CB08: (FCC RN: 614388; FCC DN: TW1054; IC Assigned Code: 4428C-1)
1F., No. 61, Ln. 77, Sing-ai Rd., Neihu Dist., Taipei City 114, Taiwan (R.O.C.)

Radiated emission Test (Above 1 GHz):

CB08: (VCCI RN: G-91; FCC RN: 614388; FCC DN: TW1054; IC Assigned Code: 4428C-1)
1F., No. 61, Ln. 77, Sing-ai Rd., Neihu Dist., Taipei City 114, Taiwan (R.O.C.)

2.2 MEASUREMENT UNCERTAINTY

The measurement uncertainty is not specified by FCC/Industry Canada rules and for reference only.

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**%.

The measurement instrumentation uncertainty considerations contained in CISPR 16-4-2.

A. Conducted emission test:

Test Site	Measurement Frequency Range	U，(dB)	NOTE
C03	150 kHz ~ 30 MHz	1.94	

B. Radiated emission test:

Test Site	Item	Measurement Frequency Range		Uncertainty	NOTE
CB08	Radiated emission at 3m	Horizontal Polarization	30 - 200MHz	3.35 dB	
			200 - 1000MHz	3.11 dB	
			1 - 18GHz	3.97 dB	
			18 - 40GHz	4.01 dB	
		Vertical Polarization	30 - 200MHz	3.22 dB	
			200 - 1000MHz	3.24 dB	
			1 - 18GHz	4.05 dB	
			18 - 40GHz	4.04 dB	

Our calculated Measurement Instrumentation Uncertainty is shown in the tables above. These are our U_{lab} values in CISPR 16-4-2 terminology.

Since Table 1 of CISPR 16-4-2 has values of measurement instrumentation uncertainty, called U_{CISPR}, as follows:

Conducted Disturbance (mains port) – 150 kHz – 30 MHz : 3.6 dB

Radiated Disturbance (electric field strength on an open area test site or alternative test site) – 30 MHz – 1000 MHz : 5.2 dB

It can be seen that our U_{lab} values are smaller than U_{CISPR}.

3 GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT

<table>
<tr><td>Equipment</td><td>Laser Data Collector</td></tr>
<tr><td>Brand Name</td><td>OPTICON</td></tr>
<tr><td>Model Name</td><td>OPN-2002i</td></tr>
<tr><td>OEM Brand/Model Name</td><td>N/A</td></tr>
<tr><td>Model Difference</td><td>N/A</td></tr>
<tr><td>Product Description</td><td>The EUT is a Laser Data Collector.
<table>
<tr><td>Operation Frequency</td><td>2402~ 2480</td></tr>
<tr><td>Modulation Type</td><td>FHSS(GFSK)</td></tr>
<tr><td>Bit Rate of Transmitter</td><td>1/3 Mbps</td></tr>
<tr><td>Number Of Channel</td><td>Please refer to the Note 2.</td></tr>
<tr><td>Antenna Designation</td><td>Please refer to the Note 3.</td></tr>
<tr><td>Antenna Gain(Peak)</td><td>Please refer to the Note 3.</td></tr>
<tr><td>Maximum Peak Conducted Output Power:</td><td>1 Mbps: -1.74dBm
3 Mbps: 0.40dBm</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>Power Source</td><td>Battery supplied.</td></tr>
<tr><td>Power Rating</td><td>I/P: DC 3.7V</td></tr>
<tr><td>Connecting I/O Port(s)</td><td>Please refer to the User's Manual</td></tr>
<tr><td>Products Covered</td><td>N/A</td></tr>
<tr><td>EUT Modification(s)</td><td>N/A</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)
1	Panasonic	EBMGH5A	CHIP	Soldered	0.5

3.2 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.

Test Items	Mode	Data Rate	Tested Channel/Mode
Conducted Emission	FHSS(GFSK)	1 Mbps	2441
Antenna conducted Spurious Emission	FHSS(GFSK)	1 Mbps	2402, 2441, 2480
		3 Mbps	
Hopping Channel Separation	FHSS(GFSK)	1 Mbps	2402, 2441, 2480
		3 Mbps	
Maximum Peak Conducted Output Power	FHSS(GFSK)	1 Mbps	2402, 2441, 2480
		3 Mbps	
Radiated Spurious Emission (30 MHz to 1 GHz)	FHSS(GFSK)	1 Mbps	2441
Radiated Spurious Emission (above 1 GHz)	FHSS(GFSK)	1 Mbps	2402, 2441, 2480
		3 Mbps	
Number of Hopping Frequency	FHSS(GFSK)	1 Mbps	2402, 2441, 2480
		3 Mbps	
Average time of occupancy	FHSS(GFSK)	1 Mbps	2402, 2441, 2480
		3 Mbps	
Restricted Bands	FHSS(GFSK)	1 Mbps	2402, 2441, 2480
		3 Mbps	
Antenna Requirement	FHSS(GFSK)	---	---
RF Exposure Compliance	FHSS(GFSK)	---	---

NOTE: The measurements are performed at the highest, middle, lowest available channels.

3.3 TABLE OF PARAMETERS OF TEXT SOFTWARE SETTING

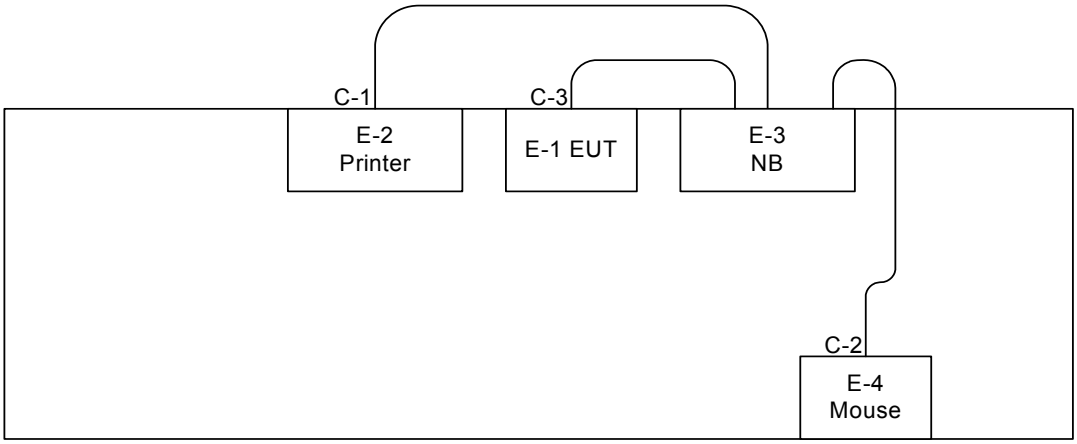
During testing channel & power controlling software provided by the customer was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output power expected by the customer and is going to be fixed on the firmware of the final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

Data Rate	1 Mbps		
Test software Version	Barcode		
Frequency	2402	2441	2480
Parameter	PMAX	PMAX	PMAX

Data Rate	3 Mbps		
Test software Version	Barcode		
Frequency	2402	2441	2480
Parameter	PMAX	PMAX	PMAX

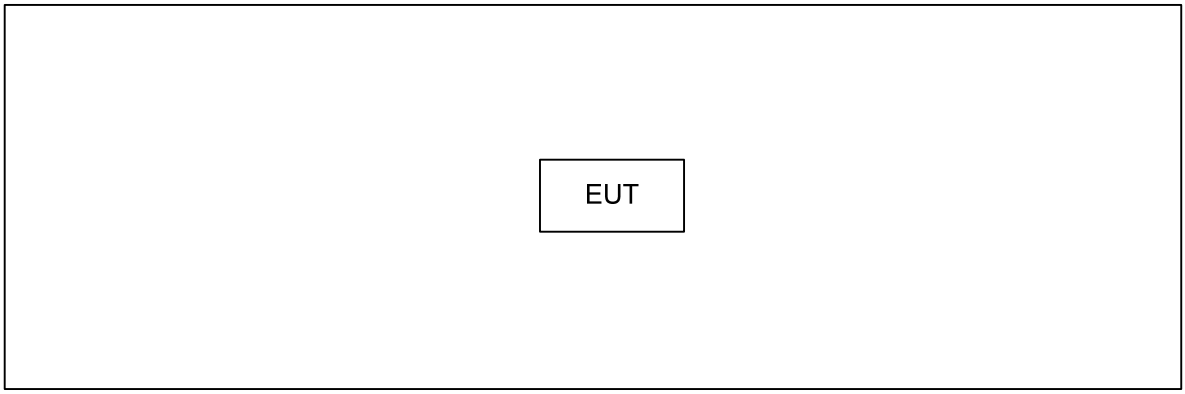
3.4 BLOCK DIAGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED

Conducted Emission



C-1 USB Cable
C-2 USB Cable
C-3 USB Cable

Radiated Spurious Emission



3.5 DESCRIPTION OF SUPPORT UNITS

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.	FCC ID/IC ID	Series No.	Note
E-1	Laser Data Collector	OPTICON	OPN-2002i	UFOOPN2002I	N/A	EUT
E-2	Printer	HP	VCVRA-1004	DOC	CN17511HHK	
E-3	Notebook PC	ASUS	F9E	DOC	F92PET5MDD -LCQCCD	
E-4	USB Mouse	DELL	MS111-L	DOC	CN-09RRC7-44 7 51-17J-OH1F	

Item	Shielded Type	Ferrite Core	Length	Note
C-1	YES	NO	1.7M	
C-2	YES	NO	1.8M	
C-3	YES	NO	1M	

NOTE: The support equipment was authorized by Declaration of Conformity (DOC).

4 CONDUCTED EMISSION

4.1 LIMIT

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

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.
3. The test result calculated as following:
   Measurement Value = Reading Level + Correct Factor
   Correct Factor = Insertion Loss + Cable Loss + Attenuator Factor(if use)
   Margin Level = Measurement Value – Limit Value

4.2 MEASUREMENT INSTRUMENTS LIST

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	TWO-LINE V-NETWORK	R&S	ENV216	101084	Oct. 05, 2012
2	Test Cable	TIMES	LMR-400	SR03_C_01&02	Aug. 17, 2013
3	EMI Test Receiver	R&S	ESCI	100080	Mar. 13, 2013
4	50Ω BNC TYPE Terminator	N/A	N/A	01	Jun. 02, 2013
5	50Ω BNC TYPE Terminator	N/A	N/A	03	Jun. 02, 2013
6	LISN	EMCO	3825/2	9605-2539	Sep. 07, 2013
7	Measurement Software	EZ	EZ_EMC (Version NB-03A)	N/A	N/A

NOTE: **N/A**: denotes No Model Name, No Serial No. or No Calibration specified.

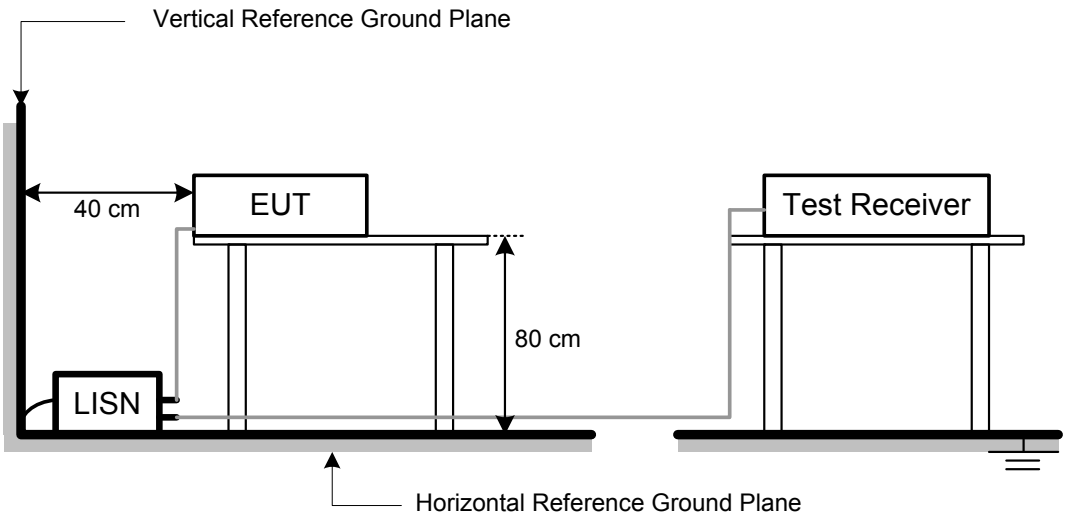
4.3 TEST PROCEDURES

a. The EUT was placed 0.8 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.

NOTE:

a. Reading in which marked as Peak, QP or AVG means measurements by using are Quasi-Peak or Average Mode with Detector BW=9 kHz (6 dB Bandwidth).
b. All readings are Peak Mode value unless otherwise stated QP or AVG in column of Note. If the Peak or QP Mode Measured value compliance with the QP Limits and lower than AVG Limits, the EUT shall be deemed to meet both QP & AVG Limits and then only Peak or QP Mode was measured, but AVG Mode didn‘t perform.

4.4 TEST SETUP LAYOUT



4.5 DEVIATION FROM TEST STANDARD

No deviation

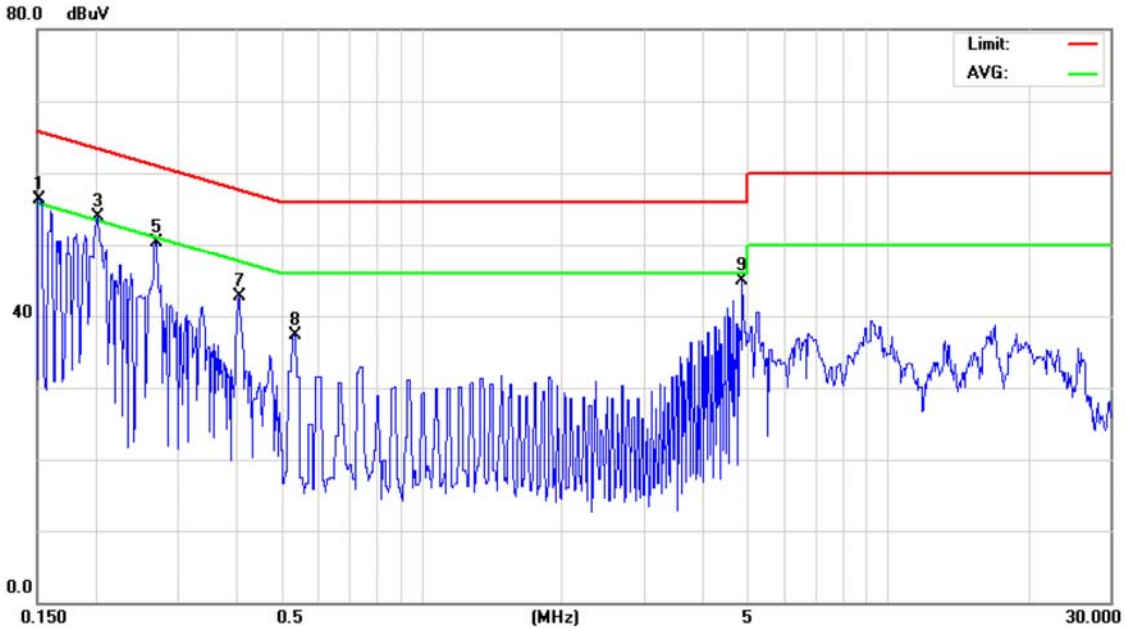
4.6 EUT OPERATING CONDITIONS

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.

4.7 TEST RESULTS

E.U.T	Laser Data Collector	Model Name	OPN-2002i
Temperature	24°C	Relative Humidity	48%
Test Voltage	AC 120V/60Hz		
Test Mode	Bluetooth/1 Mbps/2441		

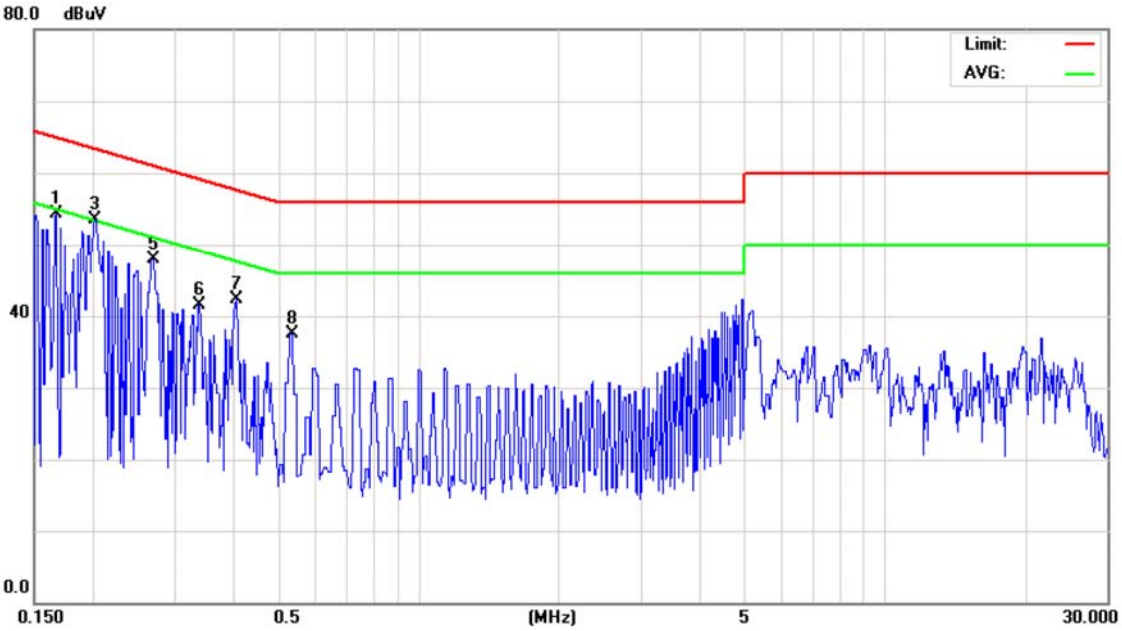
Phase: Line



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.1514	46.73	9.63	56.36	65.92	-9.56	peak	
2		0.1514	11.60	9.63	21.23	55.92	-34.69	AVG	
3		0.2017	44.32	9.63	53.95	63.54	-9.59	peak	
4	*	0.2017	35.60	9.63	45.23	53.54	-8.31	AVG	
5		0.2690	40.65	9.63	50.28	61.15	-10.87	peak	
6		0.2690	29.70	9.63	39.33	51.15	-11.82	AVG	
7		0.4055	33.12	9.62	42.74	57.74	-15.00	peak	
8		0.5360	27.78	9.61	37.39	56.00	-18.61	peak	
9		4.8649	35.16	9.78	44.94	56.00	-11.06	peak	
10		4.8649	22.30	9.78	32.08	46.00	-13.92	AVG	

E.U.T	Laser Data Collector	Model Name	OPN-2002i
Temperature	24°C	Relative Humidity	48%
Test Voltage	AC 120V/60Hz		
Test Mode	Bluetooth/1 Mbps/2441		

Phase: Neutral



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.1668	44.67	9.67	54.34	65.11	-10.77	peak	
2		0.1668	11.50	9.67	21.17	55.11	-33.94	AVG	
3		0.2025	43.88	9.67	53.55	63.50	-9.95	peak	
4	*	0.2025	35.70	9.67	45.37	53.50	-8.13	AVG	
5		0.2690	38.14	9.67	47.81	61.15	-13.34	peak	
6		0.3376	31.82	9.65	41.47	59.26	-17.79	peak	
7		0.4048	32.57	9.65	42.22	57.75	-15.53	peak	
8		0.5360	27.78	9.64	37.42	56.00	-18.58	peak	

5 ANTENNA CONDUCTED SPURIOUS EMISSION

5.1 LIMIT

Test Item	Frequency Range (MHz)	Limit
Antenna conducted Spurious Emission	30-25000	20 dB less than the peak value of fundamental frequency

5.2 MEASUREMENT INSTRUMENTS LIST

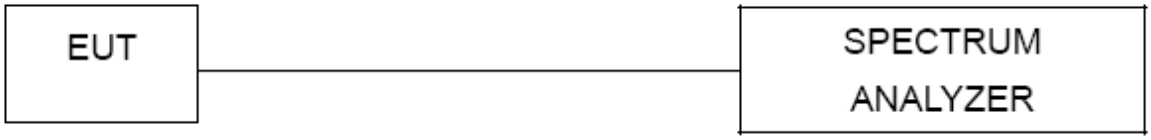
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	FSP-40	100129	Oct. 06, 2012

NOTE: **N/A**: denotes No Model Name, No Serial No. or No Calibration specified.

5.3 TEST PROCEDURES

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= 100KHz, VBW=100KHz, Sweep time = Auto.

5.4 TEST SETUP LAYOUT



5.5 DEVIATION FROM TEST STANDARD

No deviation

5.6 EUT OPERATING CONDITIONS

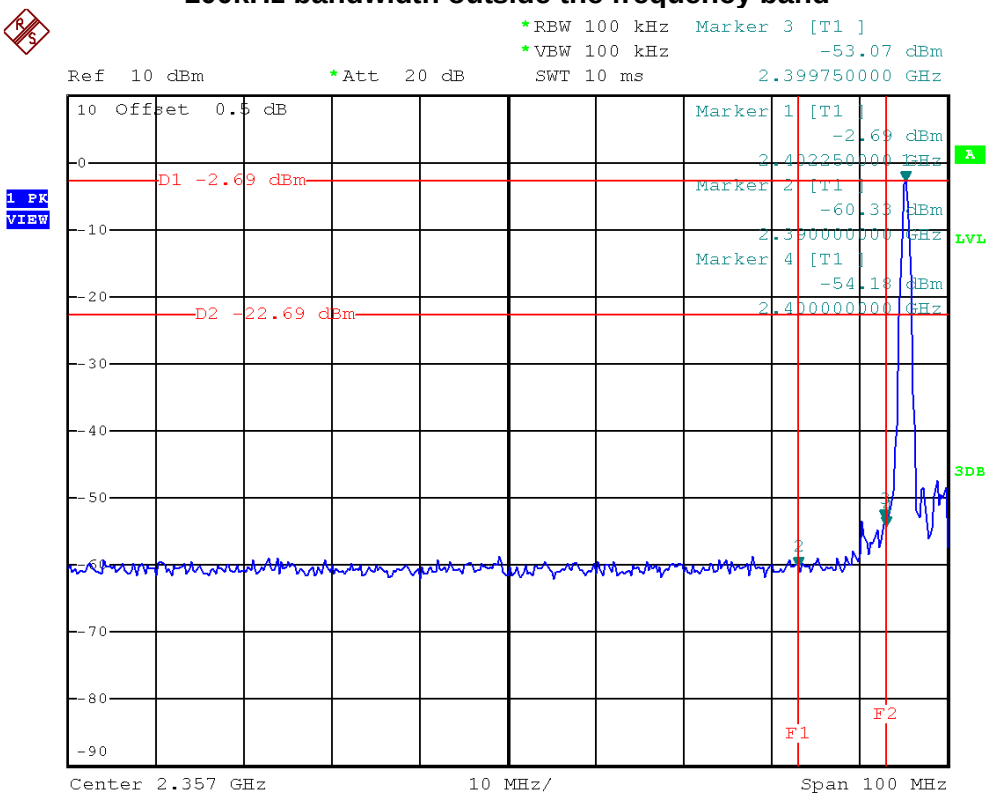
The EUT tested system was configured as the statements of **4.6** Unless otherwise a special operating condition is specified in the follows during the testing.

5.7 TEST RESULTS

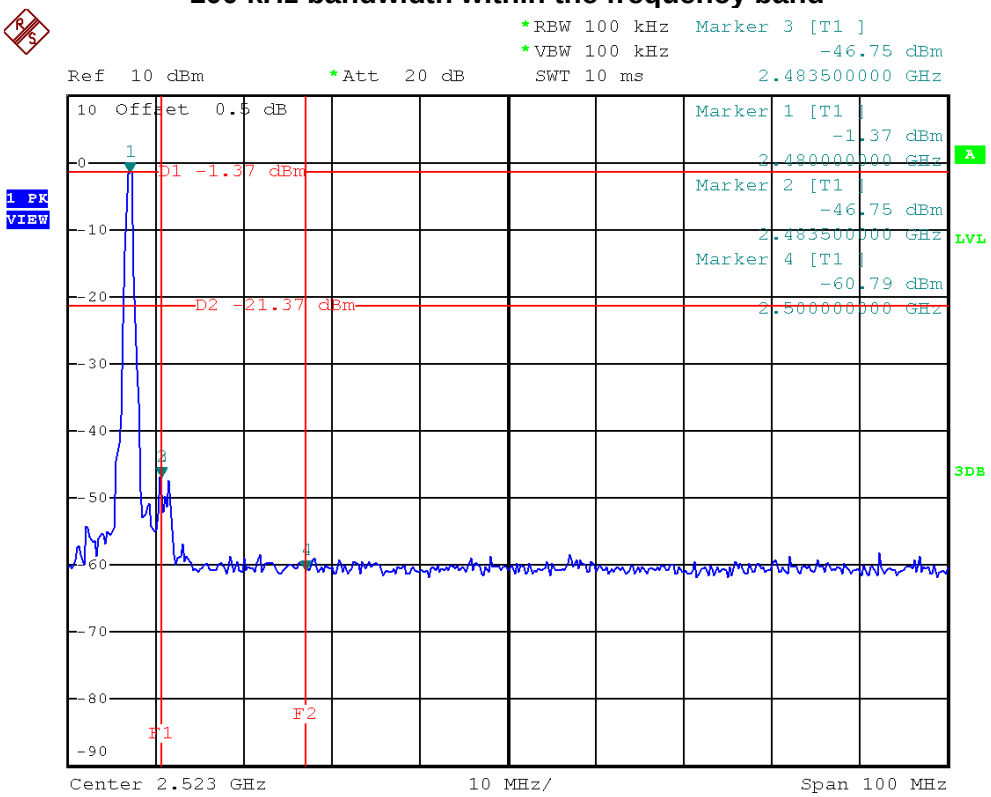
E.U.T	Laser Data Collector	Model Name	OPN-2002i
Temperature	26°C	Relative Humidity	46%
Test Voltage	DC 3.7V		
Test Mode	Bluetooth/1 Mbps		

Channel of Worst Data			
The max. radio frequency power in any 100kHz bandwidth outside the frequency band		The max. radio frequency power in any 100 kHz bandwidth within the frequency band.	
FREQUENCY(MHz)	POWER(dBm)	FREQUENCY(MHz)	POWER(dBm)
2399.75	-53.07	2483.50	-46.75
Result			
In any 100kHz bandwidth outside the frequency band, the radio frequency power is at least 20dB below that in the 100kHz bandwidth within the band that contains the highest lever of the desired power.			

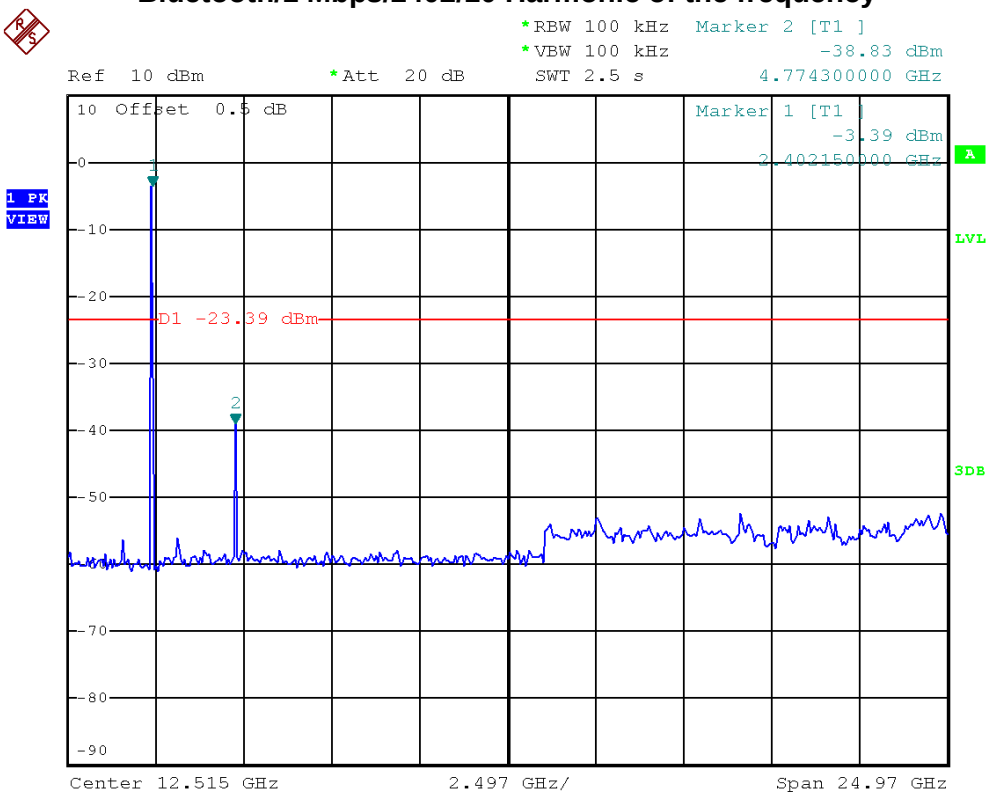
Bluetooth/1 Mbps/The max. radio frequency power in any 100kHz bandwidth outside the frequency band



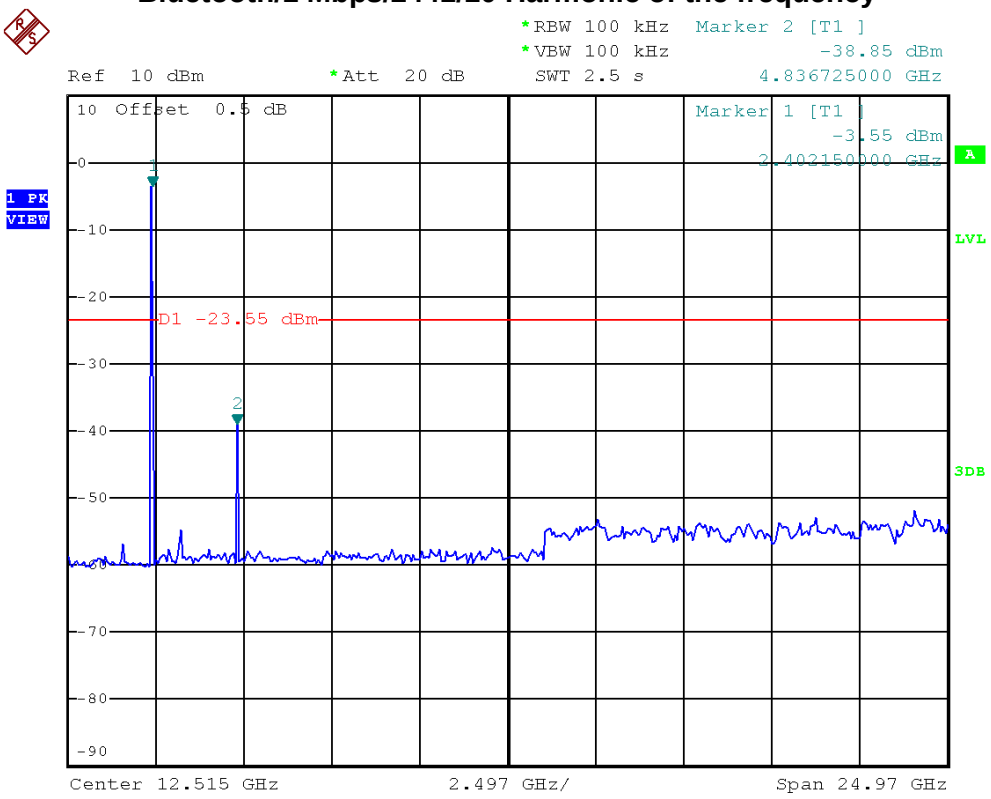
Bluetooth/1 Mbps/The max. radio frequency power in any 100 kHz bandwidth within the frequency band



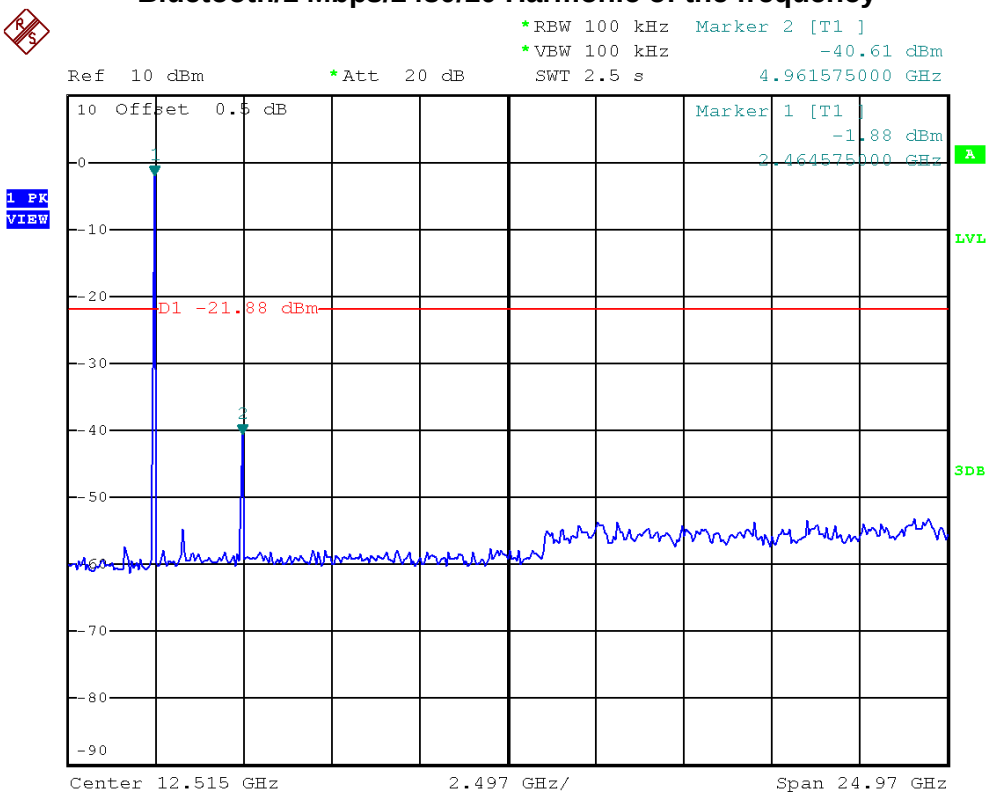
Bluetooth/1 Mbps/2402/10 Harmonic of the frequency



Bluetooth/1 Mbps/2441/10 Harmonic of the frequency



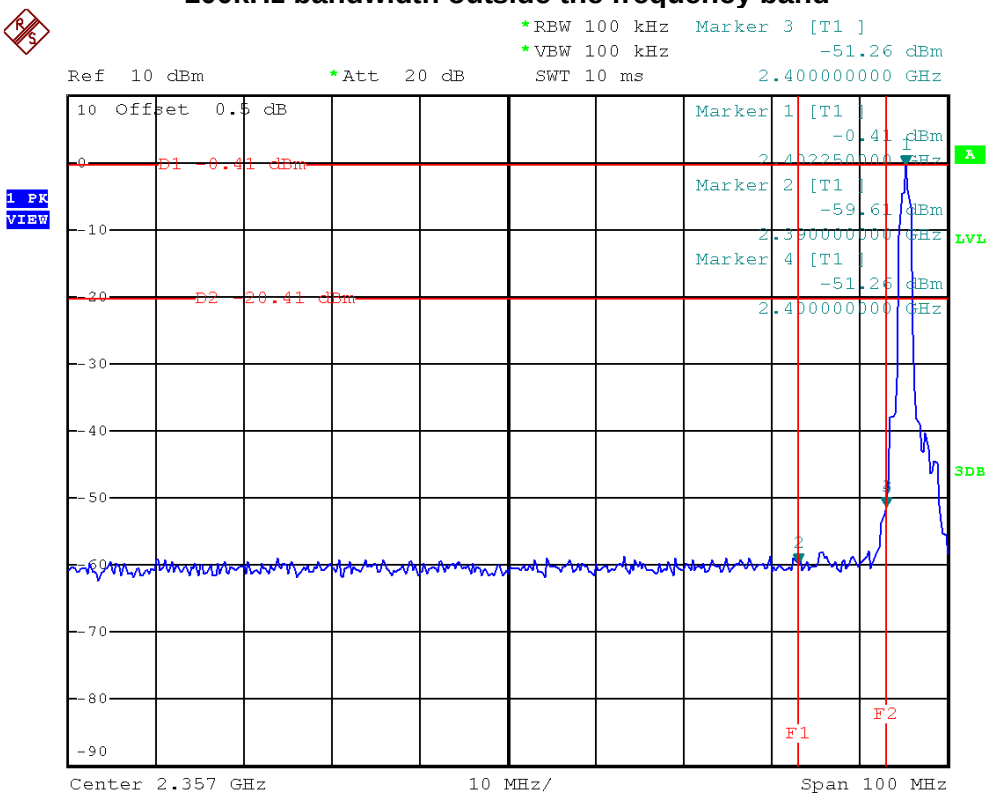
Bluetooth/1 Mbps/2480/10 Harmonic of the frequency



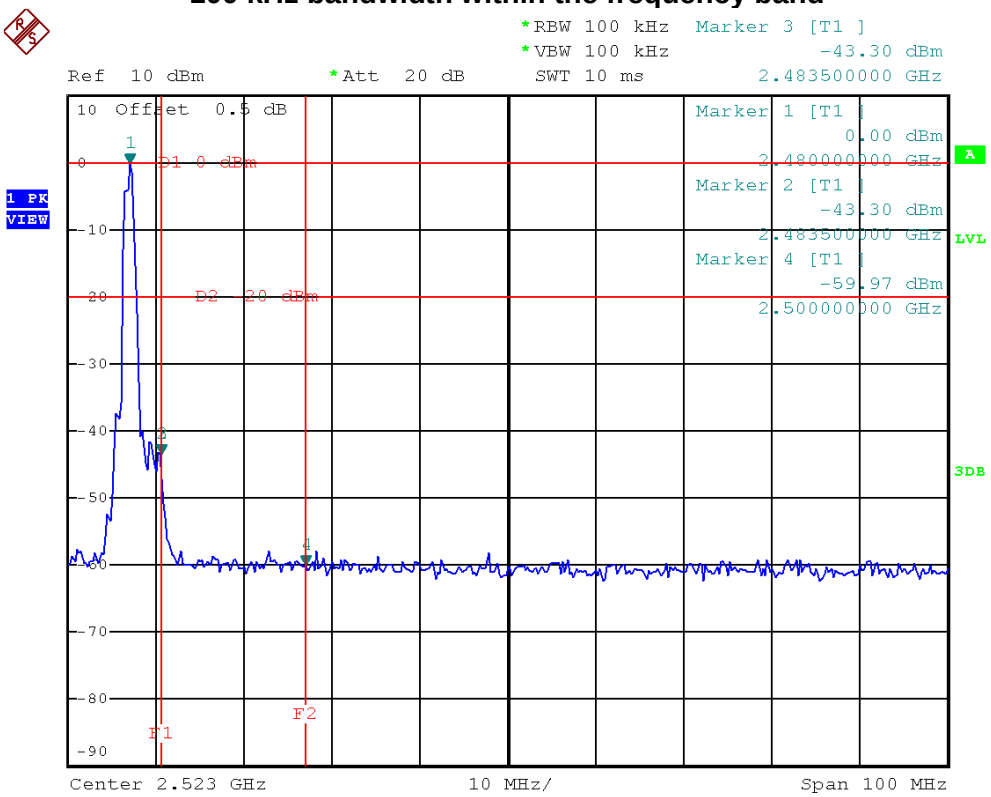
E.U.T	Laser Data Collector	Model Name	OPN-2002i
Temperature	26°C	Relative Humidity	46%
Test Voltage	DC 3.7V		
Test Mode	Bluetooth/3 Mbps		

Channel of Worst Data			
The max. radio frequency power in any 100kHz bandwidth outside the frequency band		The max. radio frequency power in any 100 kHz bandwidth within the frequency band.	
FREQUENCY(MHz)	POWER(dBm)	FREQUENCY(MHz)	POWER(dBm)
2400.00	-51.26	2483.5	-43.30
Result			
In any 100kHz bandwidth outside the frequency band, the radio frequency power is at least 20dB below that in the 100kHz bandwidth within the band that contains the highest lever of the desired power.			

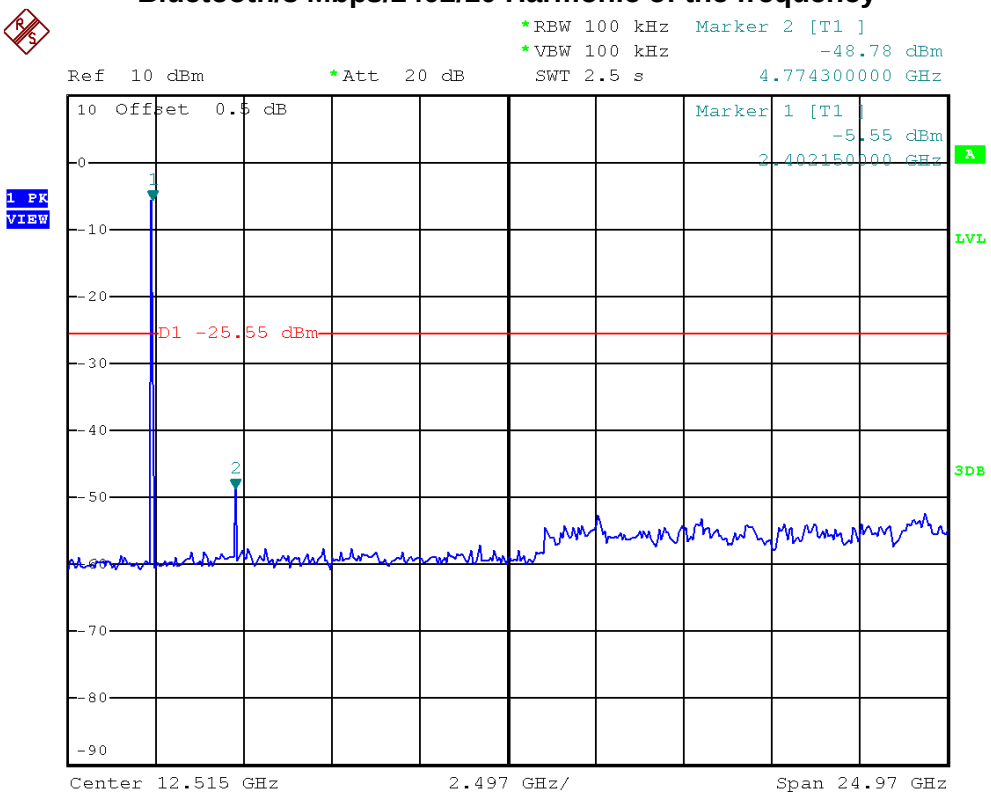
Bluetooth/3 Mbps/The max. radio frequency power in any 100kHz bandwidth outside the frequency band



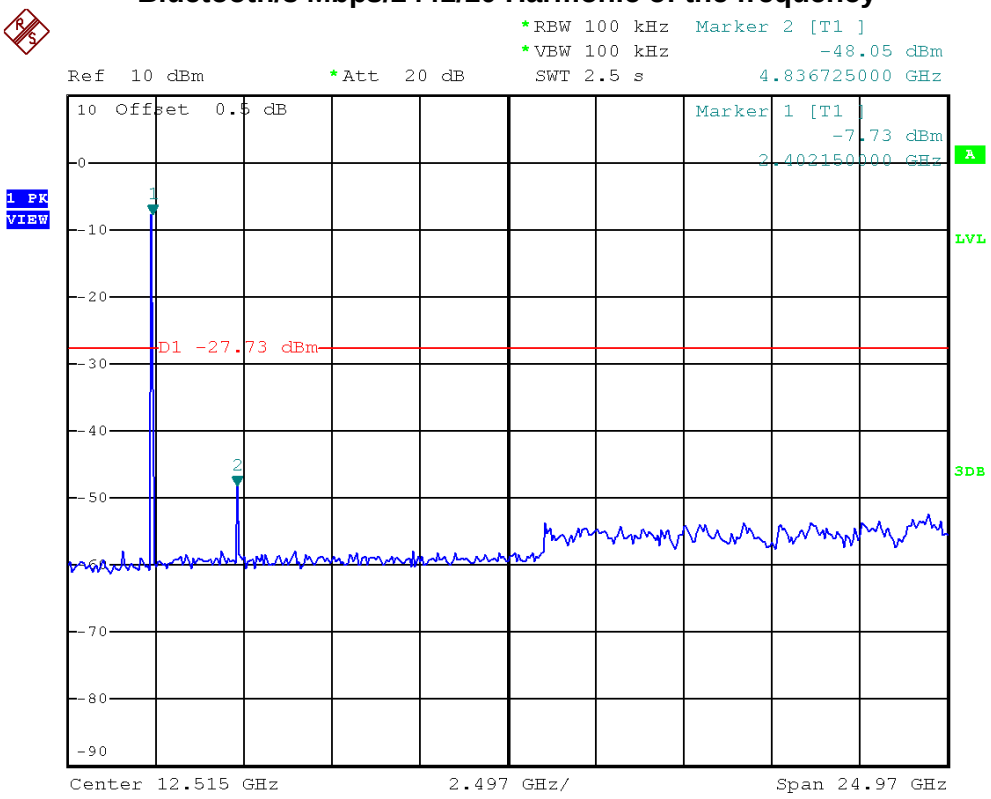
Bluetooth/3 Mbps/The max. radio frequency power in any 100 kHz bandwidth within the frequency band



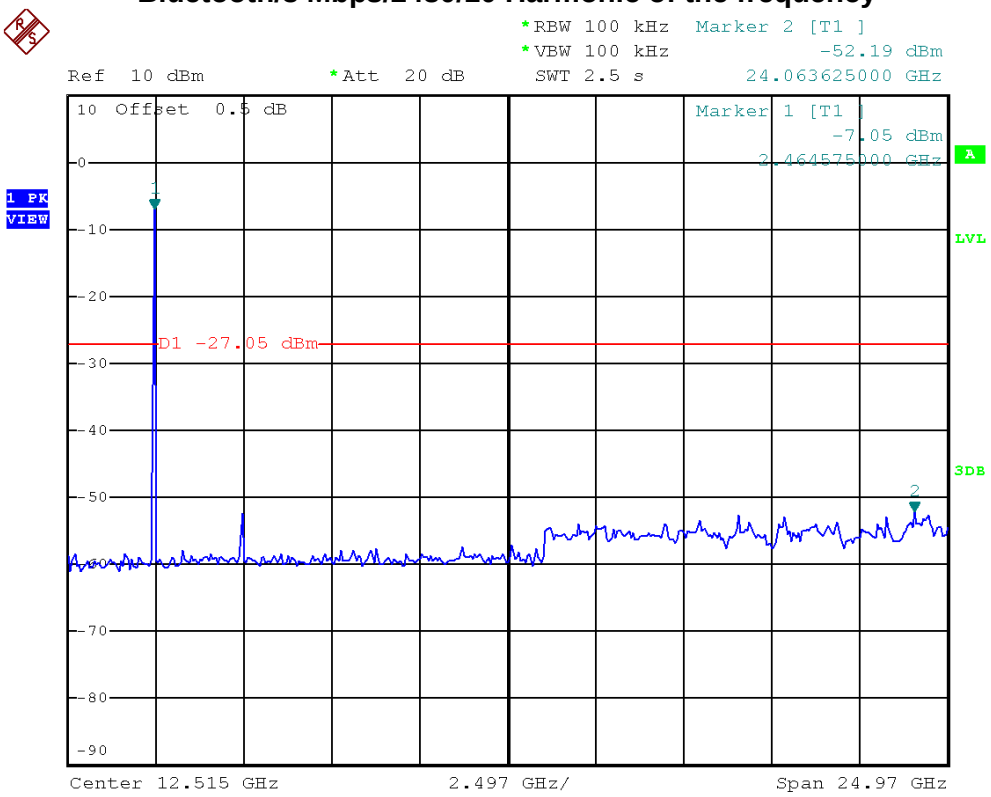
Bluetooth/3 Mbps/2402/10 Harmonic of the frequency



Bluetooth/3 Mbps/2441/10 Harmonic of the frequency



Bluetooth/3 Mbps/2480/10 Harmonic of the frequency



6 HOPPING CHANNEL SEPARATION

6.1 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.

6.2 MEASUREMENT INSTRUMENTS LIST

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	FSP-40	100129	Oct. 06, 2012

NOTE: **N/A**: denotes No Model Name, No Serial No. or No Calibration specified.

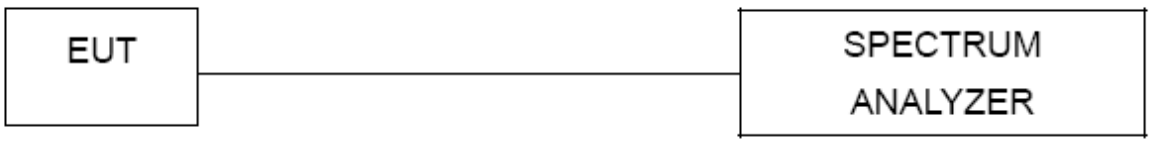
6.3 MEASURING INSTRUMENTS SETTING

EMI Test Receiver	Parameter Setting
Attenuation	Auto
Span Frequency	> Measurement Bandwidth or Channel Separation
RB	30 kHz (20dB Bandwidth) / 100 kHz (Channel Separation)
VB	100 kHz (20dB Bandwidth) / 300 kHz (Channel Separation)
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

6.4 TEST PROCEDURES

a. The transmitter output (antenna port) was connected to the spectrum analyser in peak hold mode.
b. The resolution bandwidth of 30 kHz and the video bandwidth of 100 kHz were utilised for 20 dB bandwidth measurement.
c. The resolution bandwidth of 100 kHz and the video bandwidth of 300 kHz were utilised for channel separation measurement.

6.5 TEST SETUP LAYOUT



6.6 DEVIATION FROM TEST STANDARD

No deviation

6.7 EUT OPERATING CONDITIONS

The EUT tested system was configured as the statements of **4.6** Unless otherwise a special operating condition is specified in the follows during the testing.

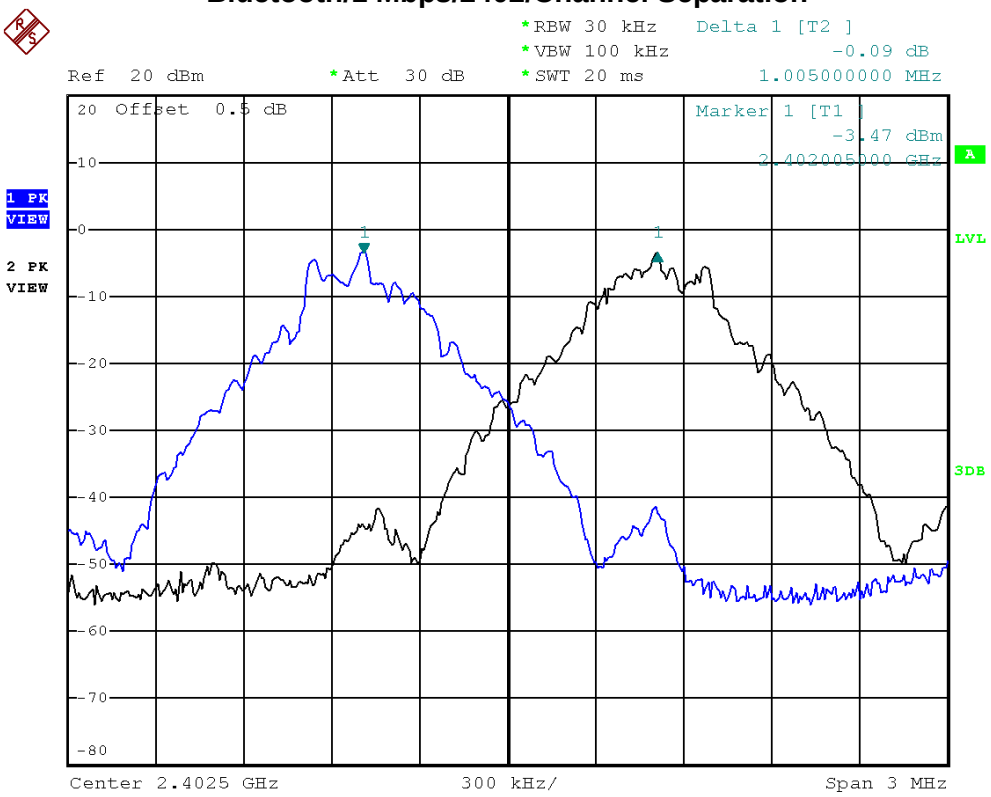
6.8 TEST RESULTS

E.U.T	Laser Data Collector	Model Name	OPN-2002i
Temperature	26°C	Relative Humidity	46%
Test Voltage	DC 3.7V		
Test Mode	Bluetooth/1 Mbps/2402, 2441, 2480		

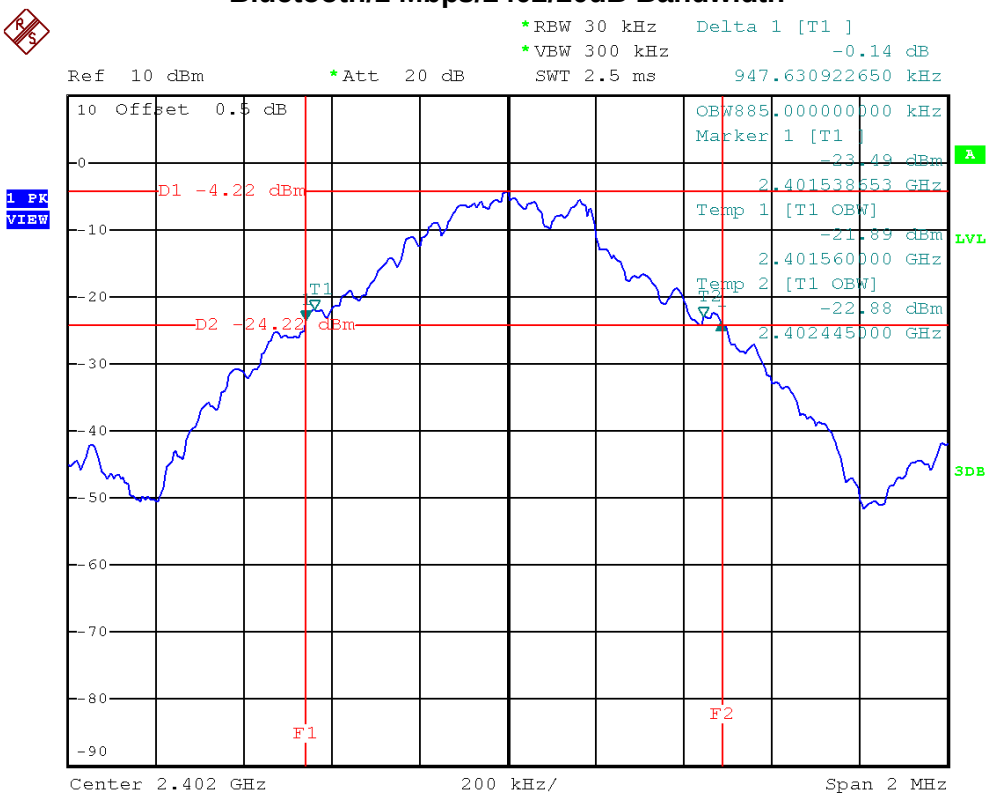
Frequency	Channel Separation (MHz)	20 dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	Two-thirds of the 20 dB Bandwidth (MHz)	Result
2402	1.01	0.948	0.885	0.632	PASS
2441	1.00	0.948	0.875	0.632	PASS
2480	1.01	0.948	0.880	0.632	PASS

NOTE: Ch. Separation Limits: >25 KHz or >2/3 of 20dB bandwidth

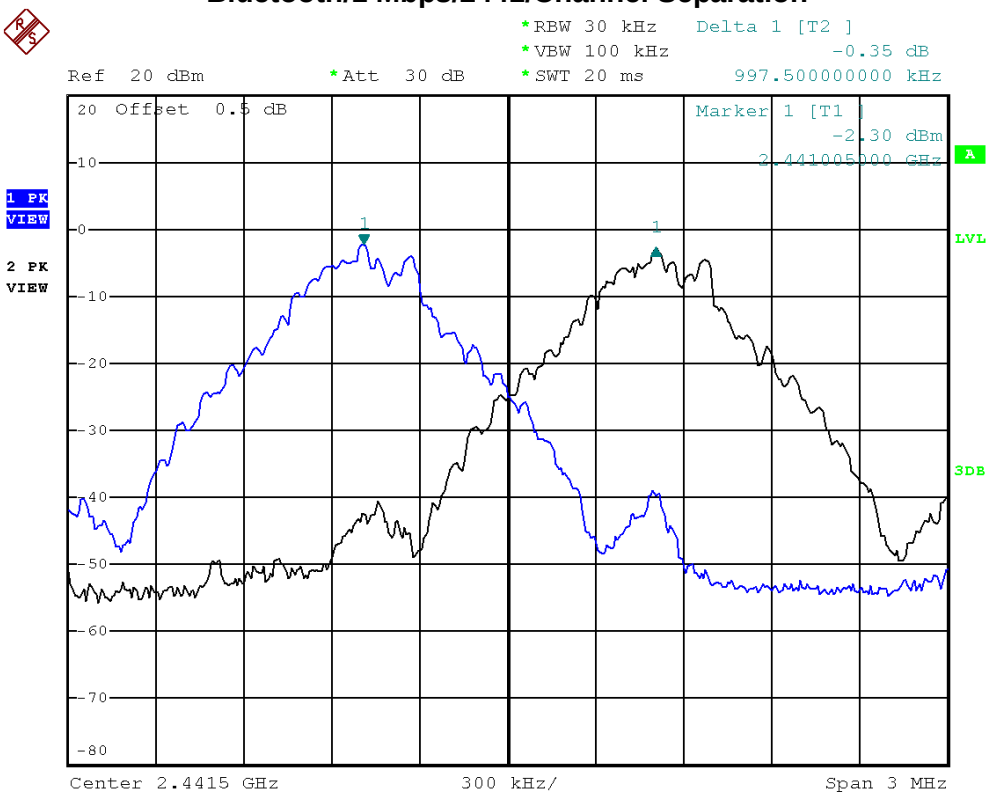
Bluetooth/1 Mbps/2402/Channel Separation



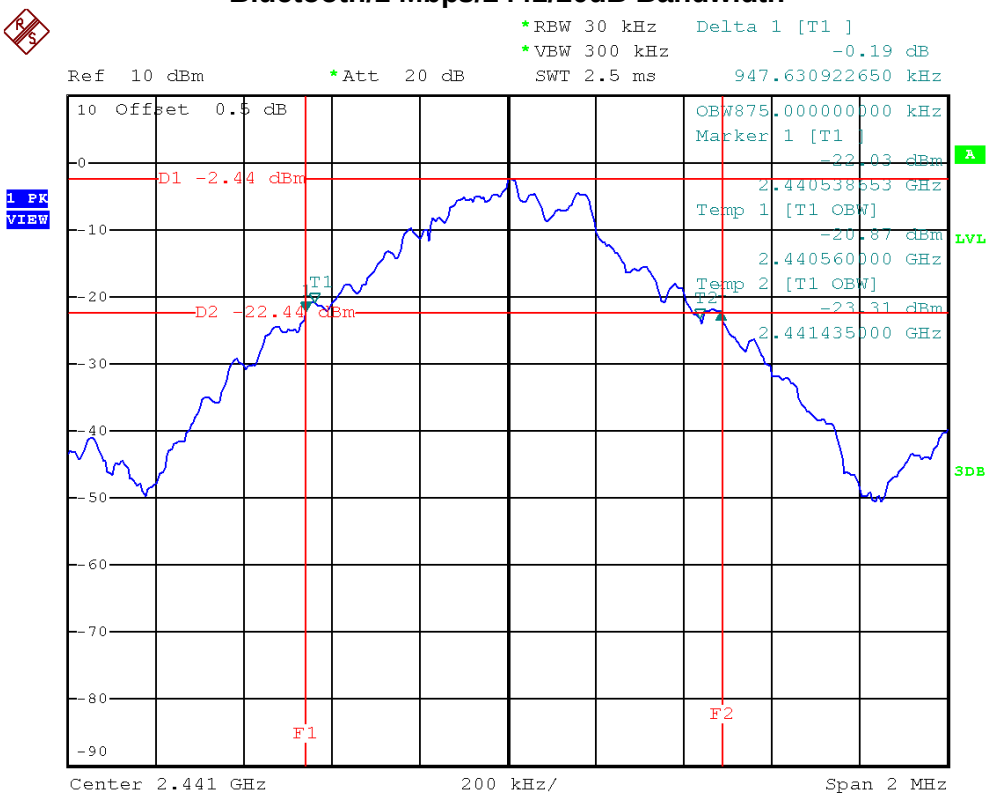
Bluetooth/1 Mbps/2402/20dB Bandwidth



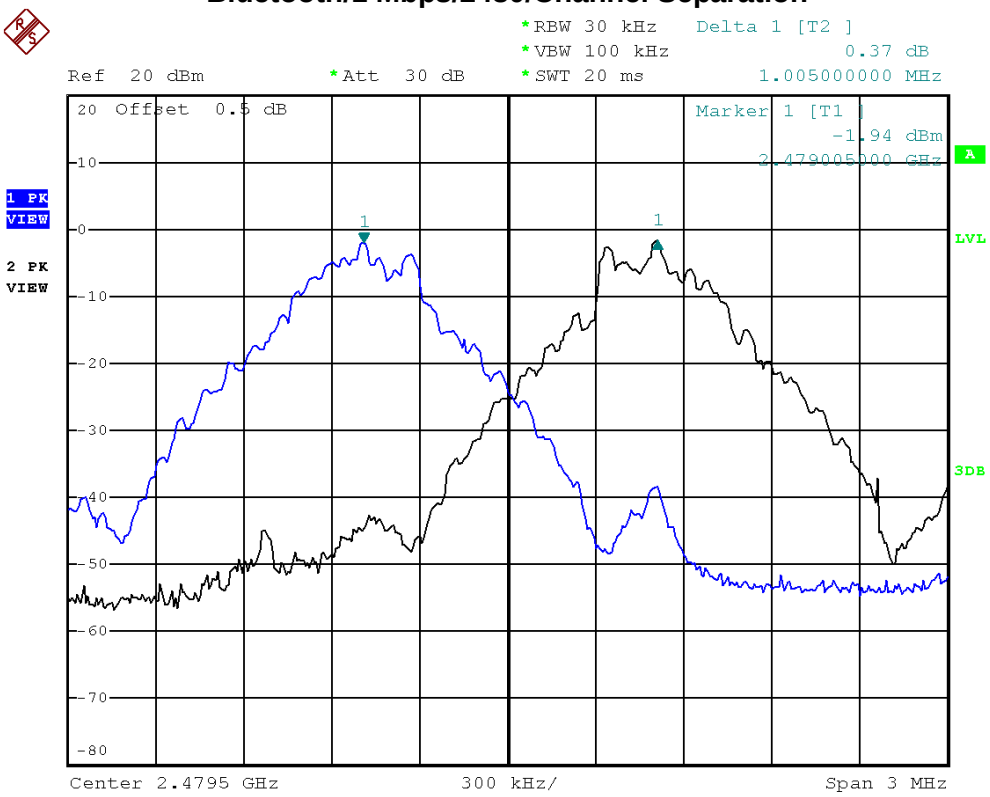
Bluetooth/1 Mbps/2441/Channel Separation



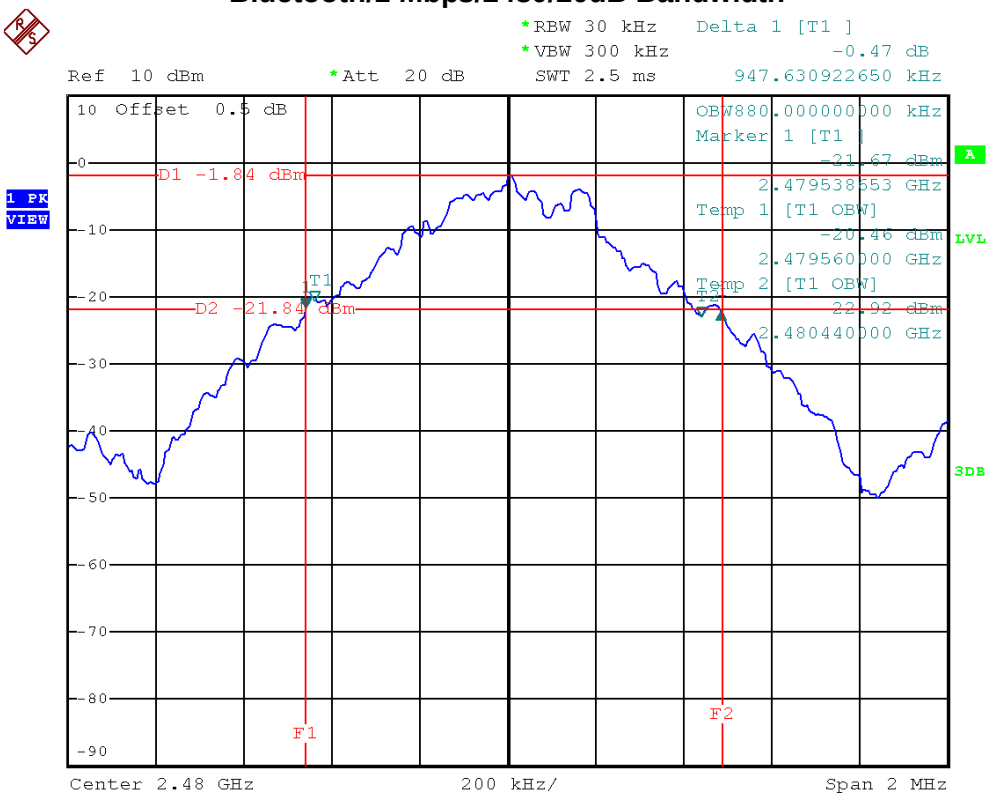
Bluetooth/1 Mbps/2441/20dB Bandwidth



Bluetooth/1 Mbps/2480/Channel Separation



Bluetooth/1 Mbps/2480/20dB Bandwidth

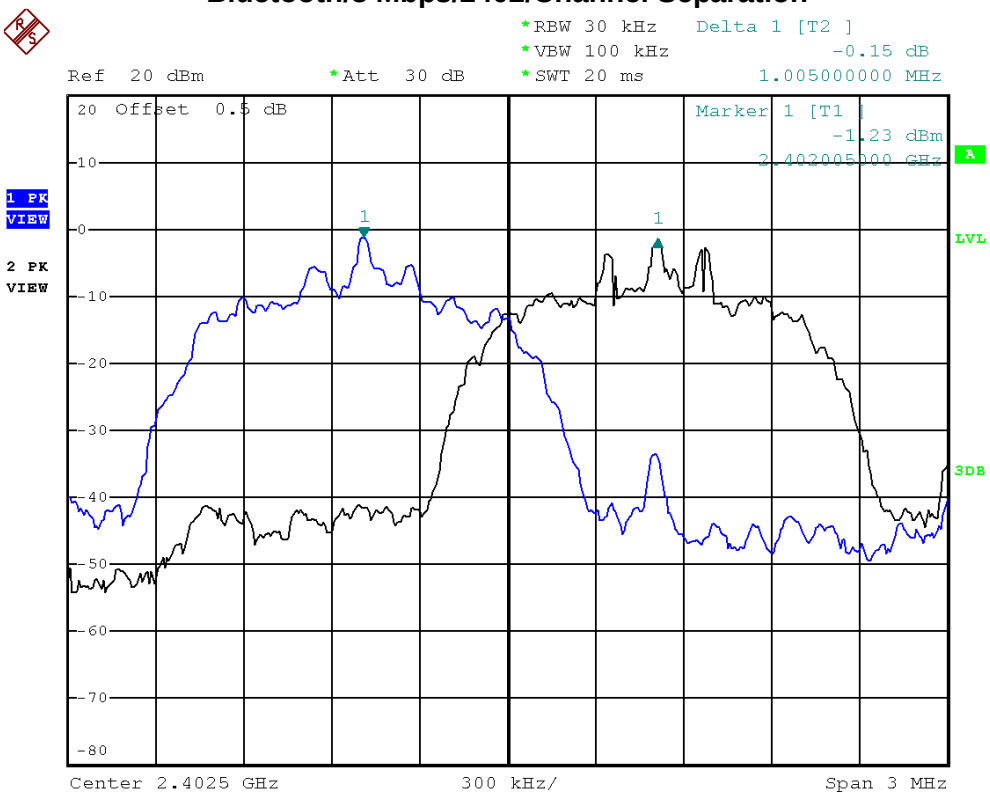


E.U.T	Laser Data Collector	Model Name	OPN-2002i
Temperature	26°C	Relative Humidity	46%
Test Voltage	DC 3.7V		
Test Mode	Bluetooth/3 Mbps/2402, 2441, 2480		

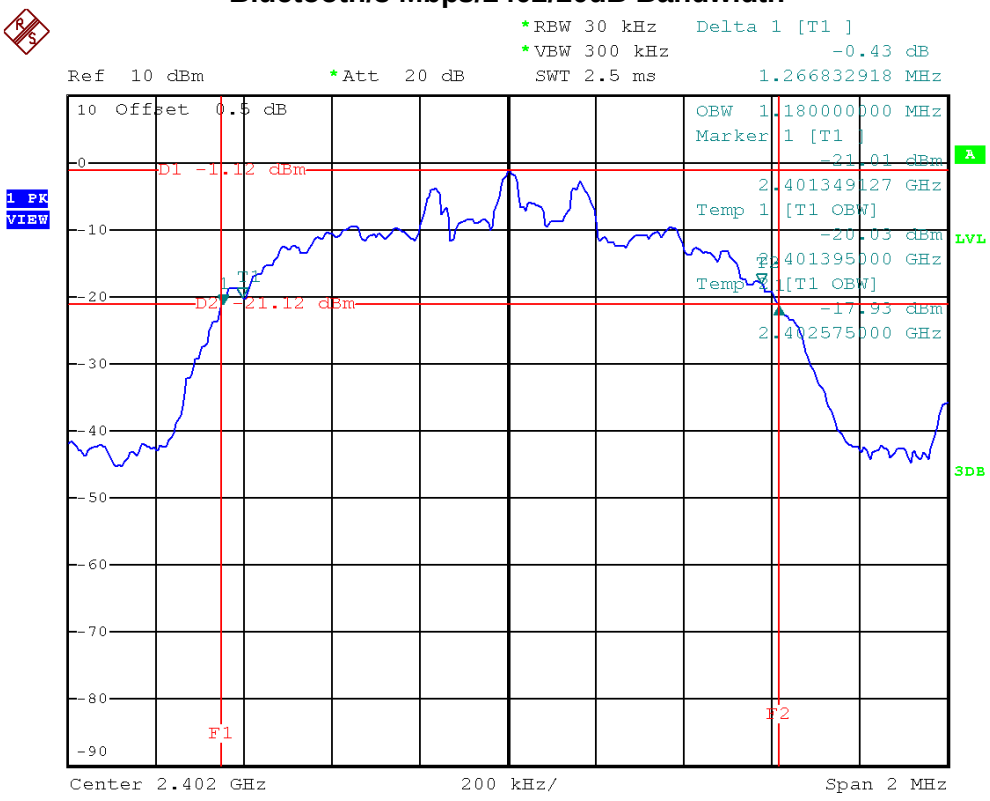
Frequency	Channel Separation (MHz)	20 dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	Two-thirds of the 20 dB Bandwidth (MHz)	Result
2402	1.01	1.267	1.180	0.845	PASS
2441	1.01	1.262	1.175	0.841	PASS
2480	1.01	1.312	1.190	0.874	PASS

NOTE: Ch. Separation Limits: >25 KHz or >2/3 of 20dB bandwidth

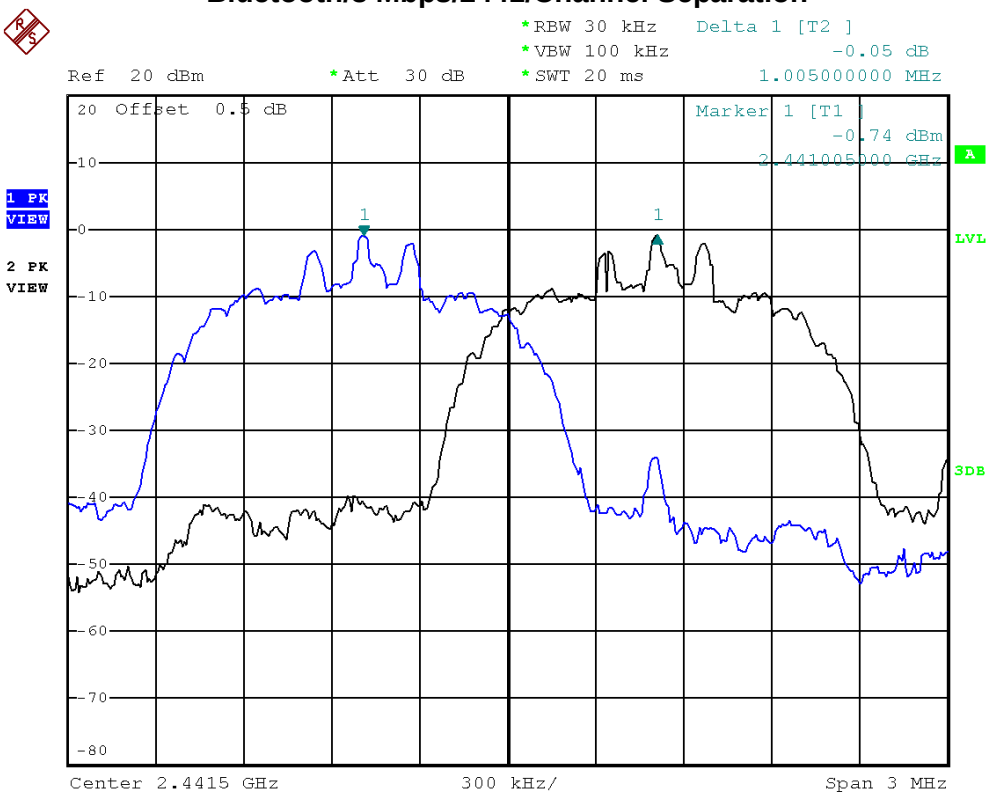
Bluetooth/3 Mbps/2402/Channel Separation



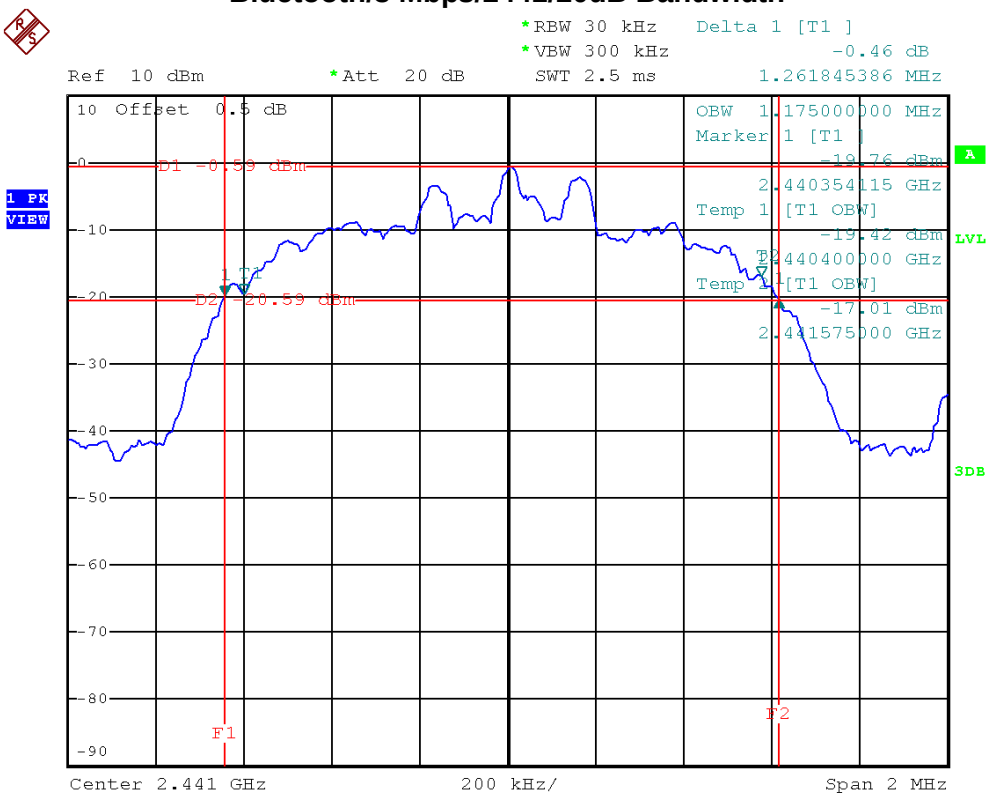
Bluetooth/3 Mbps/2402/20dB Bandwidth



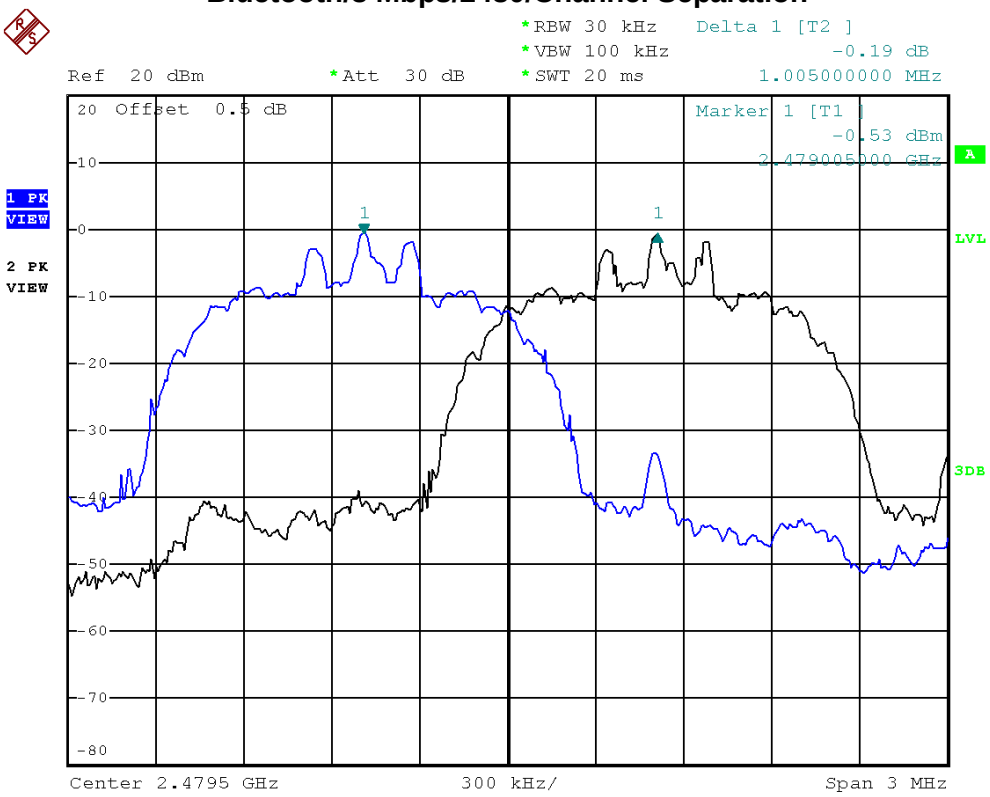
Bluetooth/3 Mbps/2441/Channel Separation



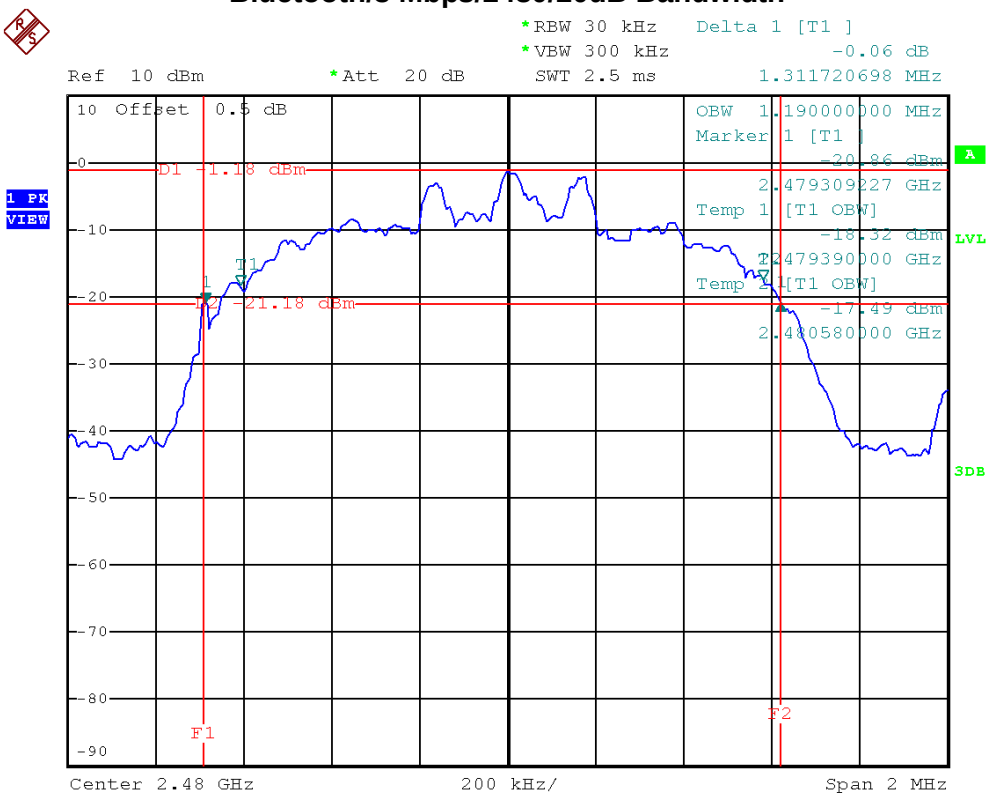
Bluetooth/3 Mbps/2441/20dB Bandwidth



Bluetooth/3 Mbps/2480/Channel Separation



Bluetooth/3 Mbps/2480/20dB Bandwidth



7 MAXIMUM PEAK CONDUCTED OUTPUT POWER

7.1 LIMIT

Test Item	Frequency Range (MHz)	Limit
Maximum Peak Conducted Output Power	2400-2483.5	1 watt or 30 dBm

7.2 MEASUREMENT INSTRUMENTS LIST

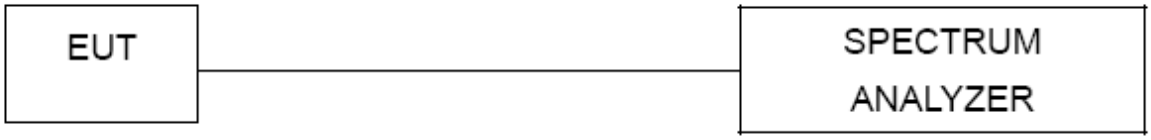
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	FSP-40	100129	Oct. 06, 2012

NOTE: **N/A**: denotes No Model Name, No Serial No. or No Calibration specified.

7.3 TEST PROCEDURES

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= 3 MHz, VBW= 3 MHz, Sweep time = Auto.

7.4 TEST SETUP LAYOUT



7.5 DEVIATION FROM TEST STANDARD

No deviation

7.6 EUT OPERATING CONDITIONS

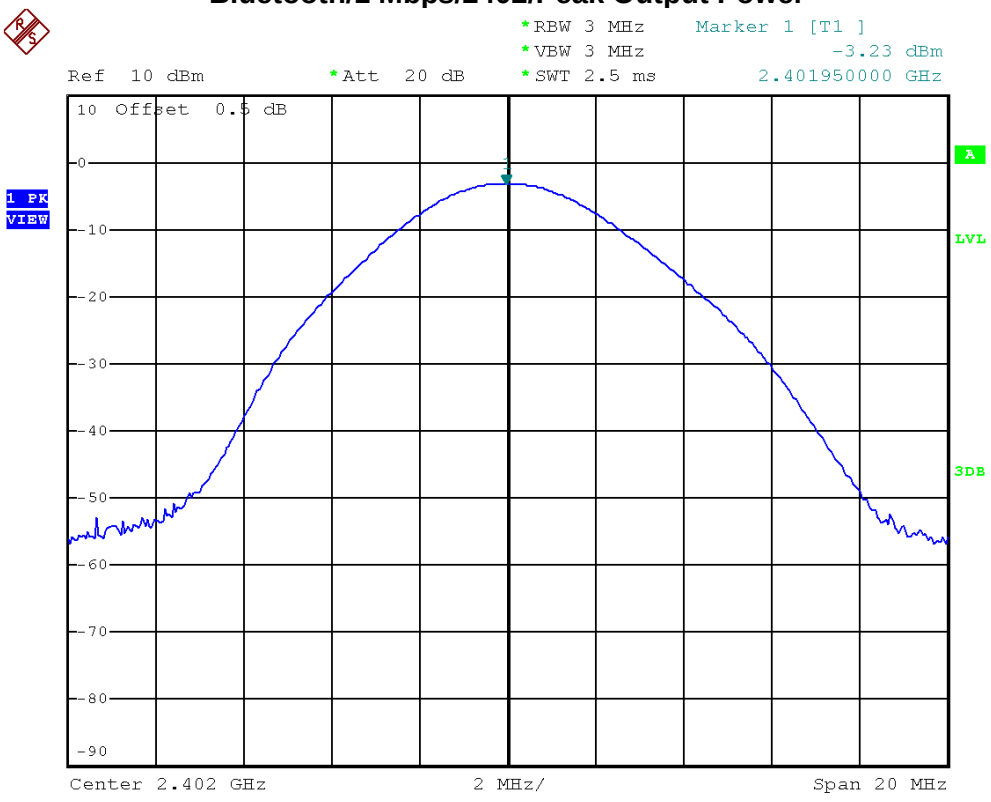
The EUT tested system was configured as the statements of **4.6** Unless otherwise a special operating condition is specified in the follows during the testing.

7.7 TEST RESULTS

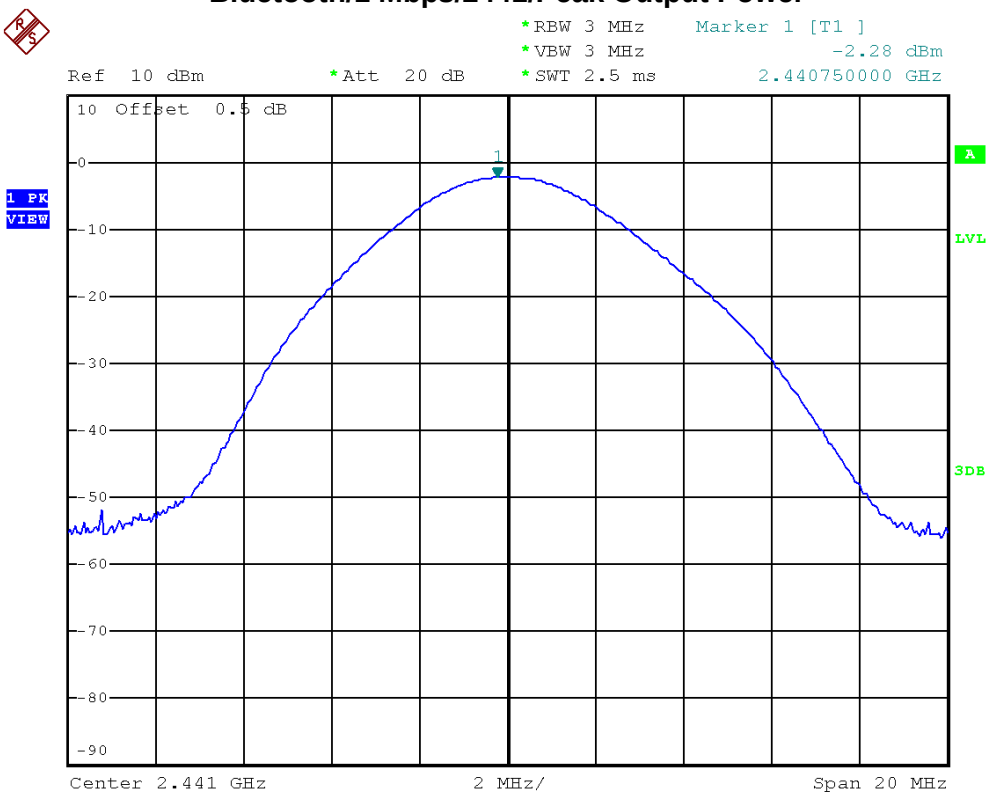
E.U.T	Laser Data Collector	Model Name	OPN-2002i
Temperature	26°C	Relative Humidity	46%
Test Voltage	DC 3.7V		
Test Mode	Bluetooth/1 Mbps/2402, 2441, 2480		

Frequency	Peak Output Power (dBm)	LIMIT (dBm)	Result
2402	-3.23	30	PASS
2441	-2.28	30	PASS
2480	-1.74	30	PASS

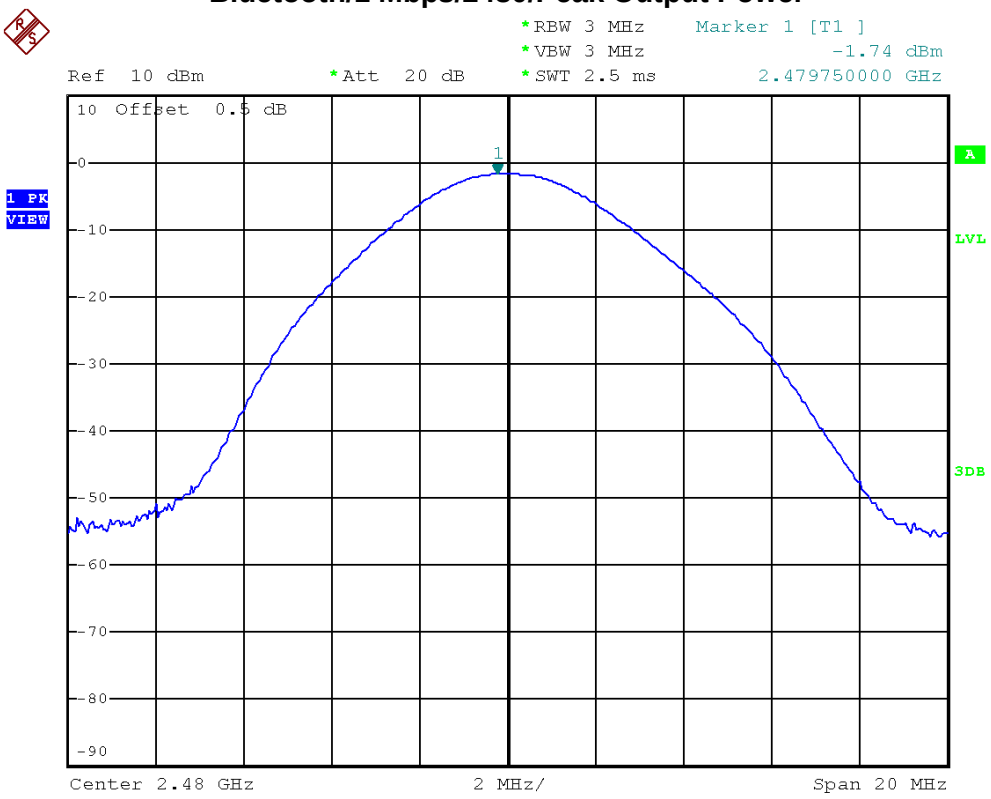
Bluetooth/1 Mbps/2402/Peak Output Power



Bluetooth/1 Mbps/2441/Peak Output Power



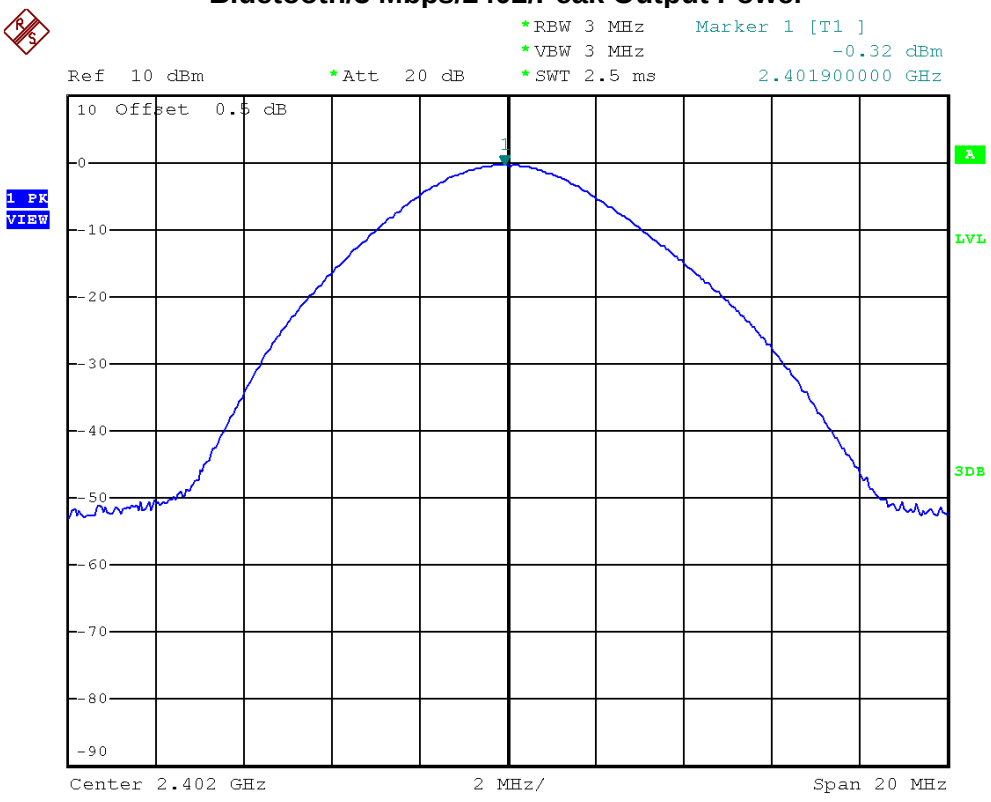
Bluetooth/1 Mbps/2480/Peak Output Power



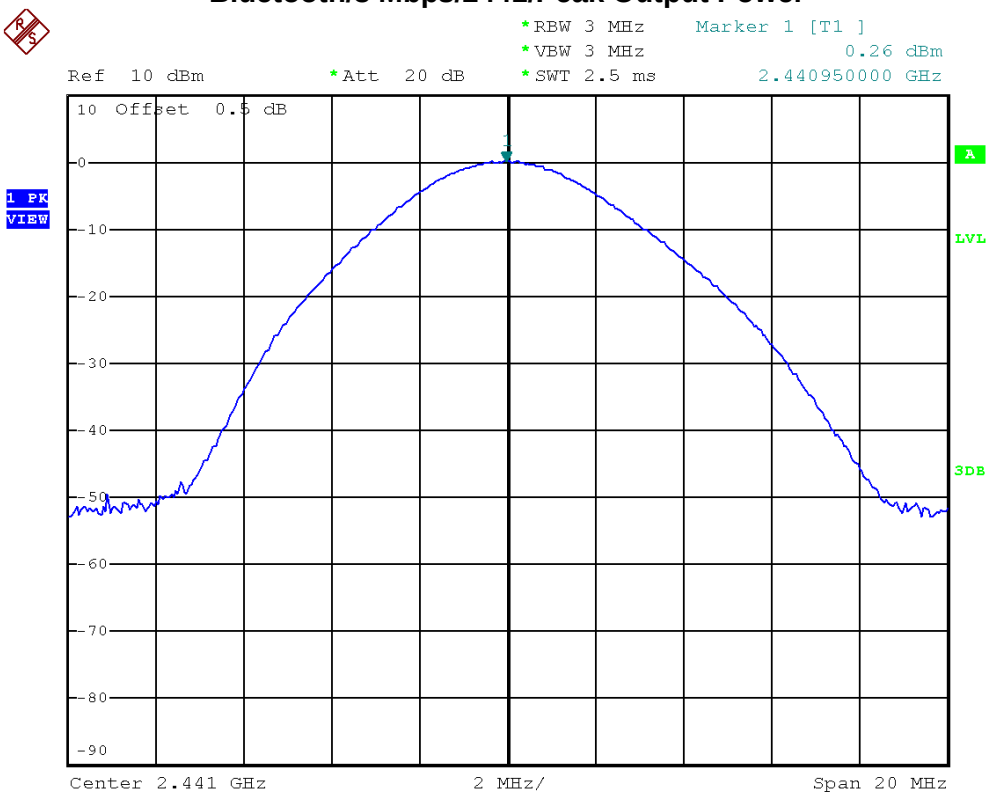
E.U.T	Laser Data Collector	Model Name	OPN-2002i
Temperature	26°C	Relative Humidity	46%
Test Voltage	DC 3.7V		
Test Mode	Bluetooth/3 Mbps/2402, 2441, 2480		

Frequency	Peak Output Power (dBm)	LIMIT (dBm)	Result
2402	-0.32	30	PASS
2441	0.26	30	PASS
2480	0.40	30	PASS

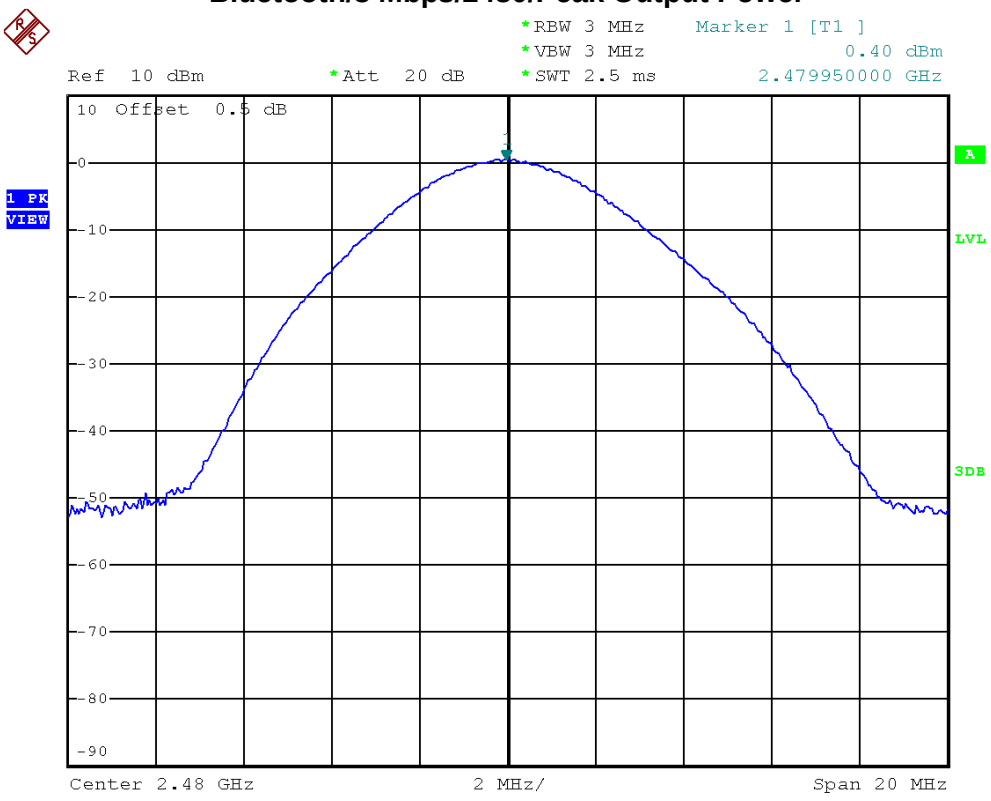
Bluetooth/3 Mbps/2402/Peak Output Power



Bluetooth/3 Mbps/2441/Peak Output Power



Bluetooth/3 Mbps/2480/Peak Output Power



8 RADIATED SPURIOUS EMISSION (9 KHZ TO 1 GHZ)

8.1 LIMIT

20 dB 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.

Frequency Range: 9 kHz to 1 GHz		
FREQUENCY (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

Frequency Range: above 1 GHz				
FREQUENCY (MHz)	Class A (dBuV/m) (at 3m)		Class B (dBuV/m) (at 3m)	
	PEAK	AVERAGE	PEAK	AVERAGE
above 1 GHz	80	60	74	54

NOTE:

(1) The limit for radiated test was performed according to FCC PART 15B.
(2) The tighter limit applies at the band edges.
(3) Emission level (dBuV/m)=20log Emission level (uV/m).
(4) The test result calculated as following:
Measurement Value = Reading Level + Correct Factor
Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain(if use)
Margin Level = Measurement Value – Limit Value

8.2 MEASUREMENT INSTRUMENTS LIST

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	FSP-40	100129	Oct. 06, 2012
2	Horn Antenna	Schwarzbeck	BBHA 9120	D-325	Apr. 16, 2013
3	Microwave Pre_amplifier	Agilent	8449B	3008A01714	Apr. 17, 2013
4	Microflex Cable	N/A	N/A	1m	Apr. 14, 2013
5	Microflex Cable	AISI	S104-SMAP-1	10m	Apr. 14, 2013
6	Microflex Cable	N/A	N/A	3m	Apr. 14, 2013
7	Test Cable	N/A	LMR-400	966_12m	May. 15, 2013
8	Test Cable	N/A	LMR-400	966_3m	May. 15, 2013
9	Pre-Amplifier	EMC	EMC-330	980001	Jul. 12, 2013
10	Log-Bicon Antenna	Schwarzbeck	VULB9168-352	9168-352	Jun. 12, 2013
11	Horn Antenna	Schwarzbeck	BBHA 9170	187	Dec. 18, 2012

Remark: “N/A” denotes No Model Name, No Serial No. or No Calibration specified.

8.3 MEASURING INSTRUMENTS SETTING

EMI Test 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

8.4 TEST PROCEDURES

a. The measuring distance of at 3 m shall be used for measurements at frequency up to 1 GHz. For frequencies above 1 GHz, 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 3m Semi-anechoic chamber. 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.
g. The testing follows the guidelines in ANSI C63.4 and FCC Public Notice DA 00-705 Measurement Guidelines. In case the emission is fail due to the used RBW/VBW is too wide, marker-delta method of FCC Public Notice DA 00-705 will be followed.

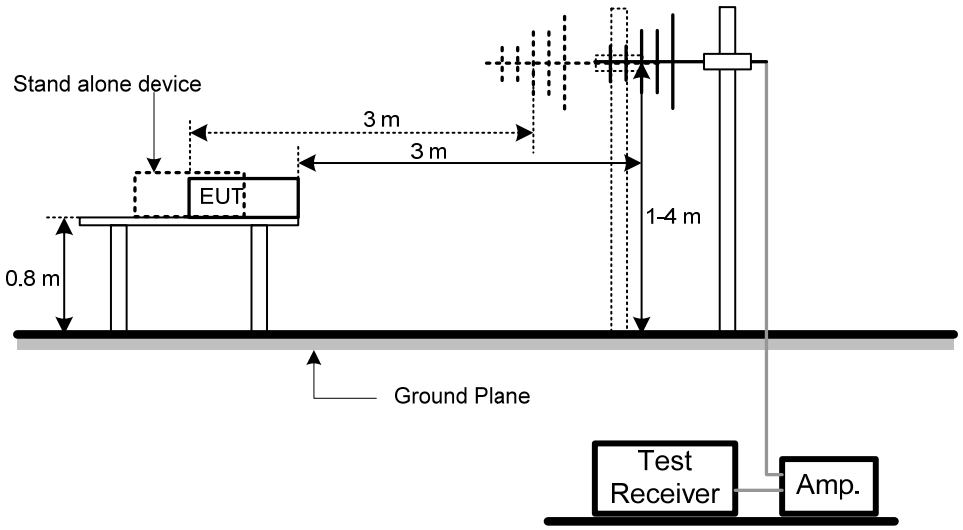
NOTE:

a. Reading in which marked as QP or Peak means measurements by using are Quasi-Peak Mode with Detector BW=120 kHz; SPA setting in RBW=100 kHz, VBW =100 kHz, Swp. Time = 0.3 sec./ MHz.
b. All readings are Peak unless otherwise stated QP in column of Note. Peak denotes that the Peak reading compliance with the QP Limits and then QP Mode measurement didn‘t perform.

8.5 DEVIATION FROM TEST STANDARD

No deviation

8.6 TEST SETUP LAYOUT



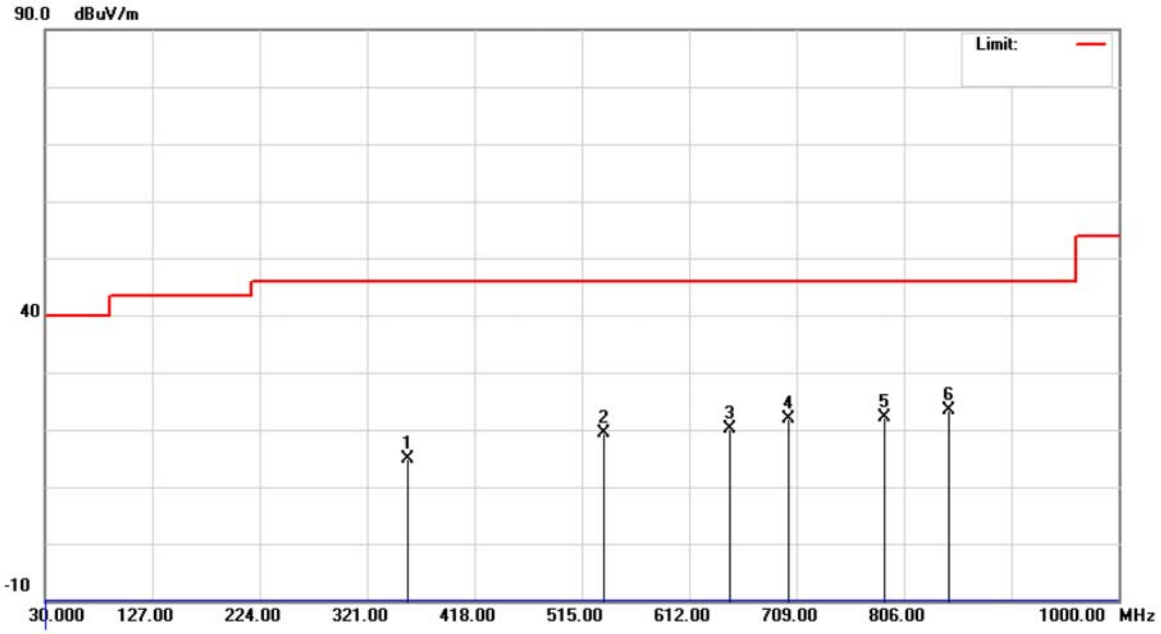
8.7 EUT OPERATING CONDITIONS

The EUT tested system was configured as the statements of **4.6** Unless otherwise a special operating condition is specified in the follows during the testing.

8.8 TEST RESULTS

E.U.T	Laser Data Collector	Model Name	OPN-2002i
Temperature	26°C	Relative Humidity	60%
Test Voltage	DC 3.7V		
Test Mode	Bluetooth/1 Mbps/2441		

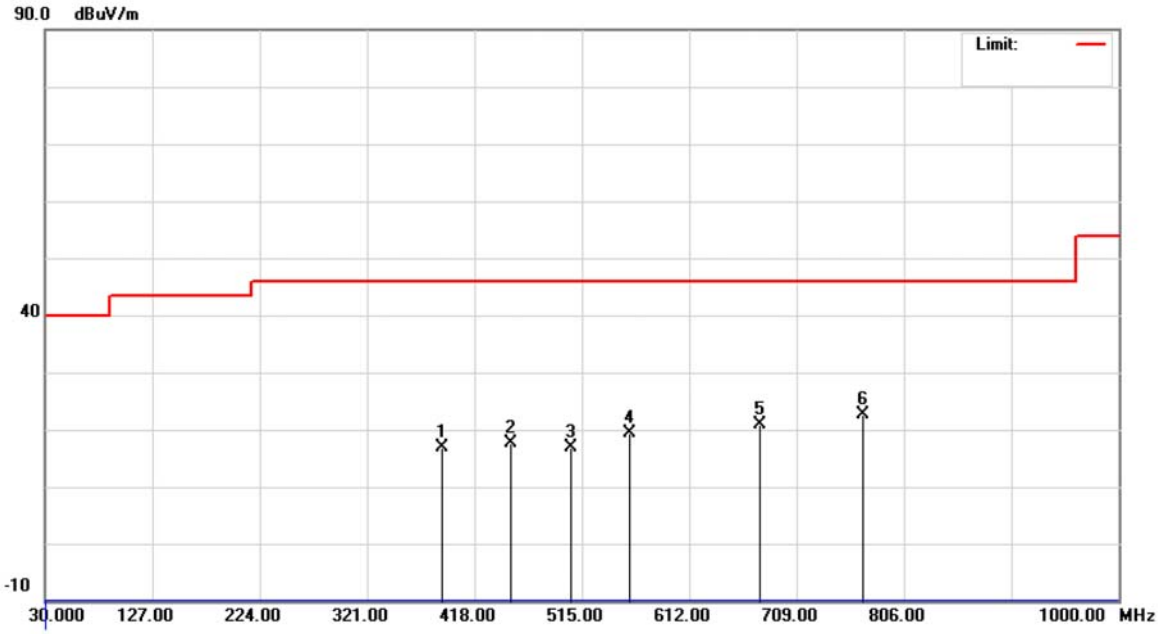
Polarization: Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		357.8598	31.62	-16.64	14.98	46.00	-31.02	peak	
2		534.4000	32.31	-12.98	19.33	46.00	-26.67	peak	
3		648.8599	30.43	-10.30	20.13	46.00	-25.87	peak	
4		701.2399	31.57	-9.63	21.94	46.00	-24.06	peak	
5		788.5399	30.24	-8.07	22.17	46.00	-23.83	peak	
6	*	846.7399	30.88	-7.40	23.48	46.00	-22.52	peak	

E.U.T	Laser Data Collector	Model Name	OPN-2002i
Temperature	26°C	Relative Humidity	60%
Test Voltage	DC 3.7V		
Test Mode	Bluetooth/1 Mbps/2441		

Polarization: Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		388.8999	32.60	-15.76	16.84	46.00	-29.16	peak	
2		450.9800	31.45	-13.94	17.51	46.00	-28.49	peak	
3		505.2998	30.73	-13.90	16.83	46.00	-29.17	peak	
4		557.6798	31.51	-12.21	19.30	46.00	-26.70	peak	
5		676.0200	30.85	-9.96	20.89	46.00	-25.11	peak	
6	*	769.1400	30.84	-8.27	22.57	46.00	-23.43	peak	

9 RADIATED SPURIOUS EMISSION (ABOVE 1 GHZ)

9.1 LIMIT

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.

Frequency Range: 9 kHz to 1 GHz		
FREQUENCY (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

Frequency Range: above 1 GHz				
FREQUENCY (MHz)	Class A (dBuV/m) (at 3m)		Class B (dBuV/m) (at 3m)	
	PEAK	AVERAGE	PEAK	AVERAGE
above 1 GHz	80	60	74	54

NOTE:

(1) The limit for radiated test was performed according to FCC PART 15B.
(2) The tighter limit applies at the band edges.
(3) Emission level (dBuV/m)=20log Emission level (uV/m).
(4) The test result calculated as following:
Measurement Value = Reading Level + Correct Factor
Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain(if use)
Margin Level = Measurement Value – Limit Value

9.2 MEASUREMENT INSTRUMENTS LIST

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	FSP-40	100129	Oct. 06, 2012
2	Horn Antenna	Schwarzbeck	BBHA 9120	D-325	Apr. 16, 2013
3	Microwave Pre_amplifier	Agilent	8449B	3008A01714	Apr. 17, 2013
4	Microflex Cable	N/A	N/A	1m	Apr. 14, 2013
5	Microflex Cable	AISI	S104-SMAP-1	10m	Apr. 14, 2013
6	Microflex Cable	N/A	N/A	3m	Apr. 14, 2013
7	Test Cable	N/A	LMR-400	966_12m	May. 15, 2013
8	Test Cable	N/A	LMR-400	966_3m	May. 15, 2013
9	Pre-Amplifier	EMC	EMC-330	980001	Jul. 12, 2013
10	Log-Bicon Antenna	Schwarzbeck	VULB9168-352	9168-352	Jun. 12, 2013
11	Horn Antenna	Schwarzbeck	BBHA 9170	187	Dec. 18, 2012

Remark: “N/A” denotes No Model Name, No Serial No. or No Calibration specified.

9.3 MEASURING INSTRUMENTS SETTING

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

9.4 TEST PROCEDURES

a. The measuring distance of at 3 m shall be used for measurements at frequency up to 1 GHz. For frequencies above 1 GHz, 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 3m Semi-anechoic chamber. 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.
g. The testing follows the guidelines in ANSI C63.4 and FCC Public Notice DA 00-705 Measurement Guidelines. In case the emission is fail due to the used RBW/VBW is too wide, marker-delta method of FCC Public Notice DA 00-705 will be followed.

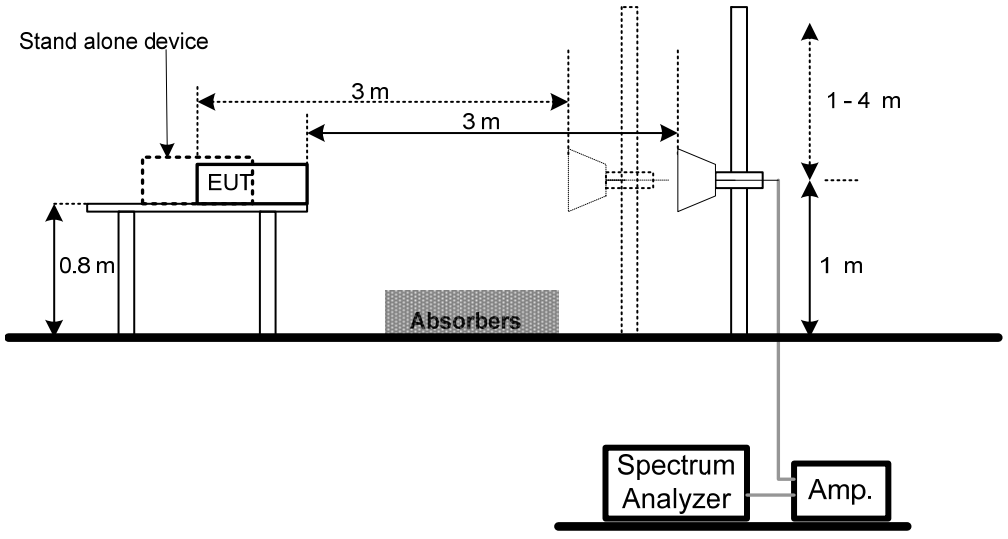
NOTE:

a. Reading in which marked as Peak means measurements by using are Peak Mode with instrument setting in RBW= 1 MHz, VBW= 1 MHz, Swp. Time = Auto.
Reading in which marked as AV means measurements by using are Average Mode with instrument setting in RBW= 1 MHz, VBW= 10 Hz, Swp. Time = Auto.
b. All readings are Peak Mode value unless otherwise stated AVG in column of Note. If the Peak Mode Measured value compliance with the Peak Limits and lower than AVG Limits, the EUT shall be deemed to meet both Peak & AVG Limits and then only Peak Mode was measured, but AVG Mode didn‘t perform.

9.5 DEVIATION FROM TEST STANDARD

No deviation

9.6 TEST SETUP LAYOUT



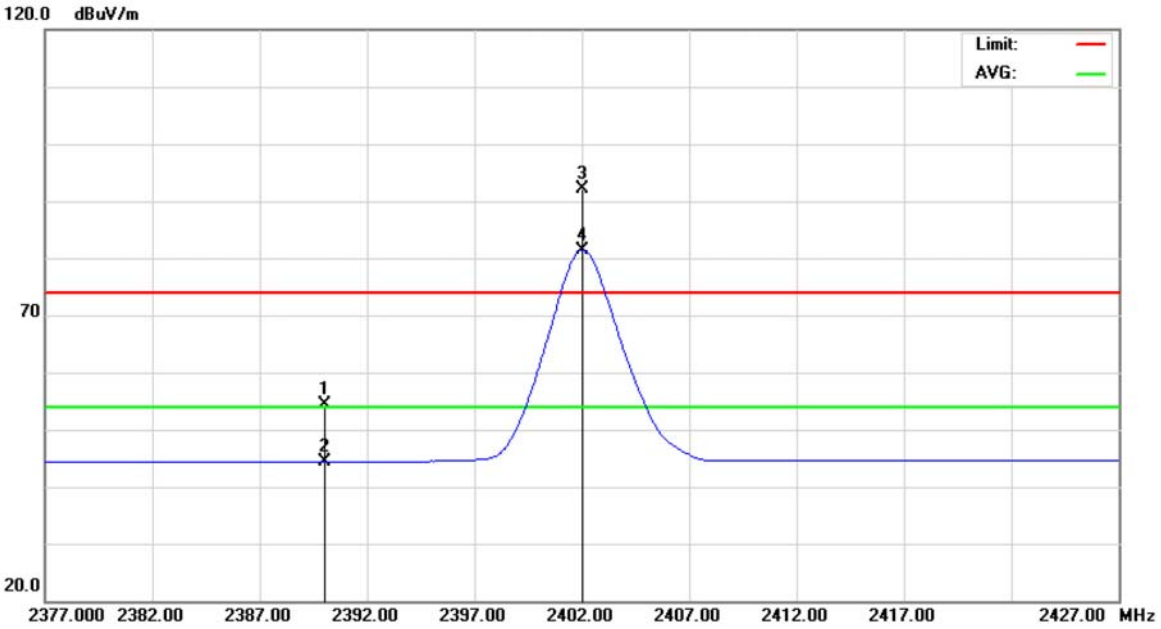
9.7 EUT OPERATING CONDITIONS

The EUT tested system was configured as the statements of **4.6** Unless otherwise a special operating condition is specified in the follows during the testing.

9.8 TEST RESULTS

E.U.T	Laser Data Collector	Model Name	OPN-2002i
Temperature	26°C	Relative Humidity	60%
Test Voltage	DC 3.7V		
Test Mode	Bluetooth/1 Mbps/2402		

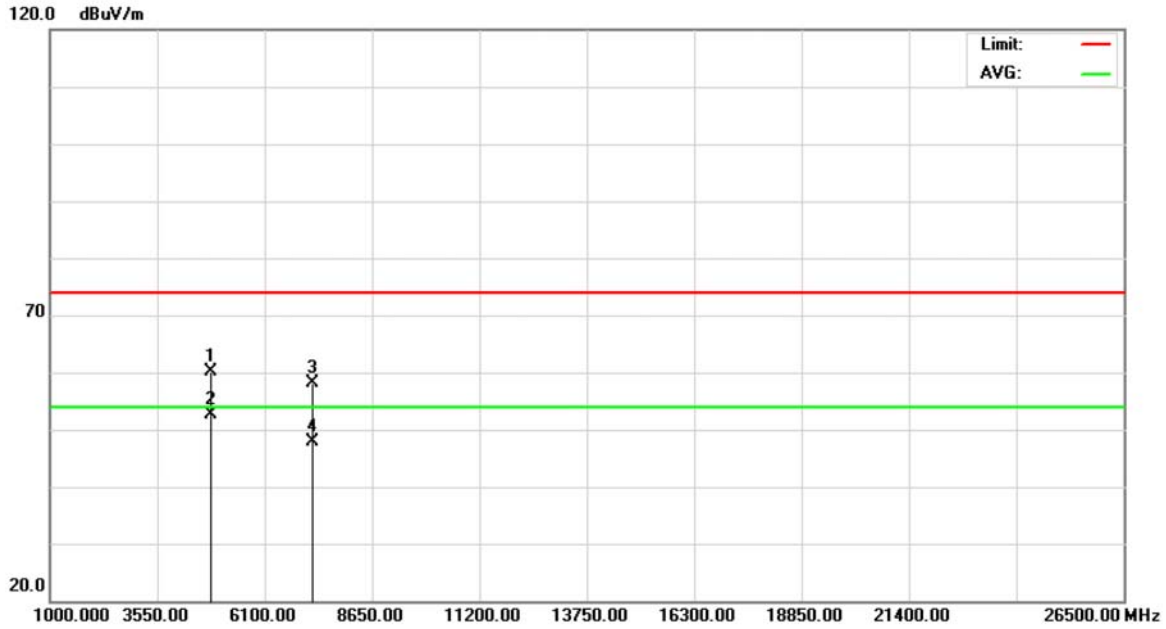
Polarization: Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		2390.000	21.46	32.99	54.45	74.00	-19.55	peak	
2		2390.000	11.43	32.99	44.42	54.00	-9.58	AVG	
3	X	2402.000	59.03	33.06	92.09	74.00	18.09	peak	
4	*	2402.000	48.41	33.06	81.47	54.00	27.47	AVG	

E.U.T	Laser Data Collector	Model Name	OPN-2002i
Temperature	26°C	Relative Humidity	60%
Test Voltage	DC 3.7V		
Test Mode	Bluetooth/1 Mbps/2402		

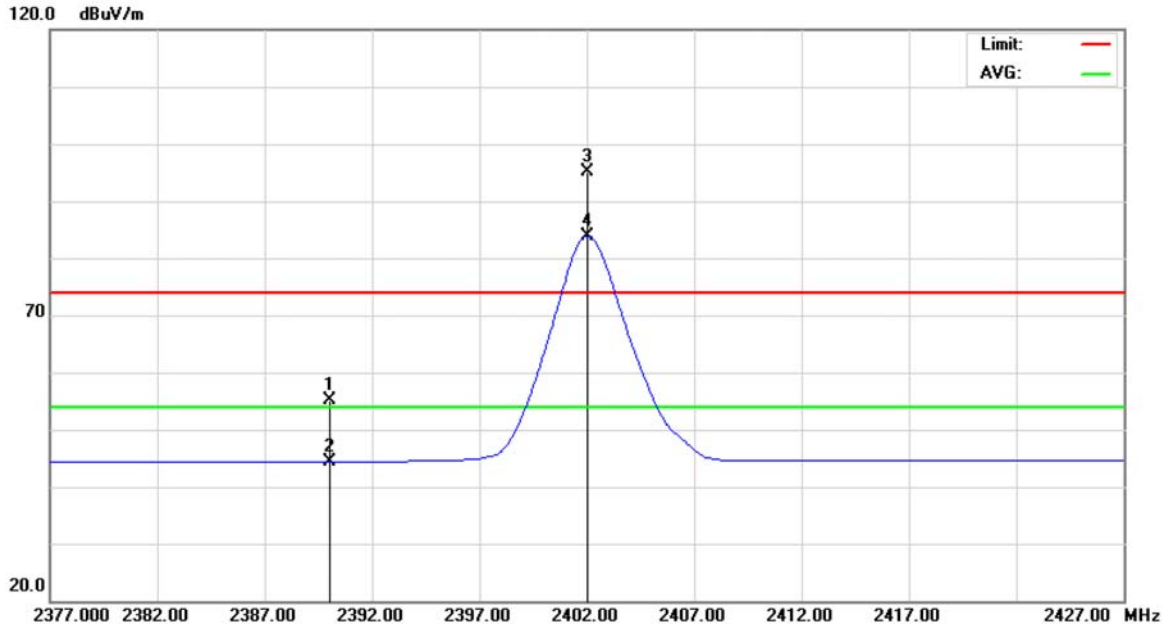
Polarization: Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		4804.000	52.73	7.41	60.14	74.00	-13.86	peak	
2	*	4804.000	45.27	7.41	52.68	54.00	-1.32	AVG	
3		7206.040	43.32	14.79	58.11	74.00	-15.89	peak	
4		7206.040	33.16	14.79	47.95	54.00	-6.05	AVG	

E.U.T	Laser Data Collector	Model Name	OPN-2002i
Temperature	26°C	Relative Humidity	60%
Test Voltage	DC 3.7V		
Test Mode	Bluetooth/1 Mbps/2402		

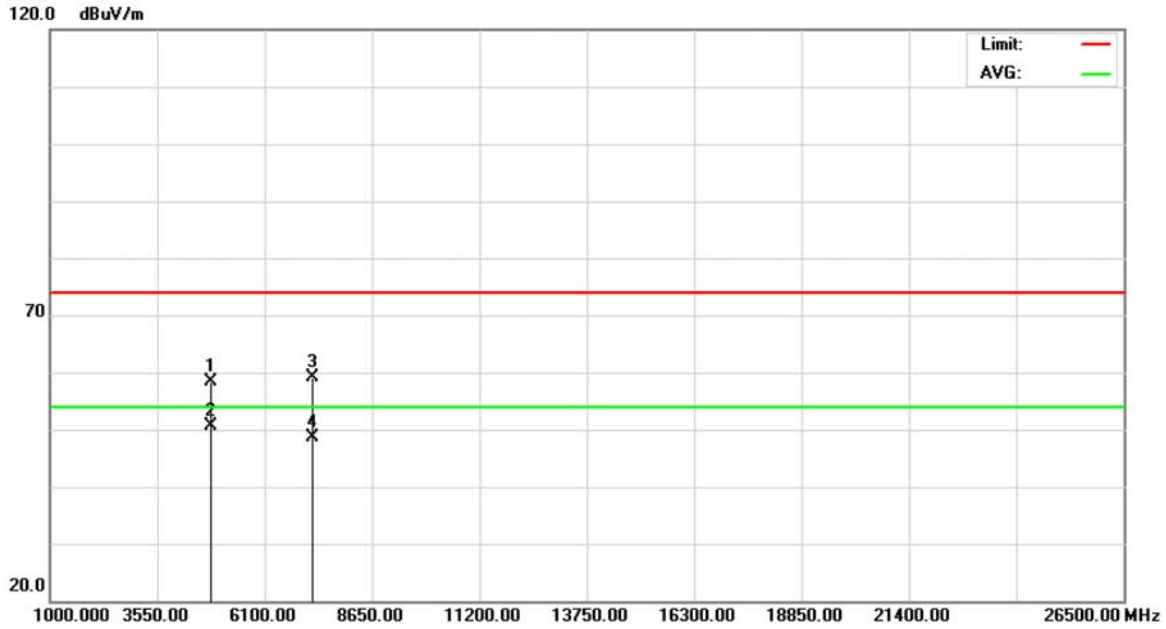
Polarization: Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		2390.000	22.10	32.99	55.09	74.00	-18.91	peak	
2		2390.000	11.45	32.99	44.44	54.00	-9.56	AVG	
3	X	2402.000	61.95	33.06	95.01	74.00	21.01	peak	
4	*	2402.000	50.84	33.06	83.90	54.00	29.90	AVG	

E.U.T	Laser Data Collector	Model Name	OPN-2002i
Temperature	26°C	Relative Humidity	60%
Test Voltage	DC 3.7V		
Test Mode	Bluetooth/1 Mbps/2402		

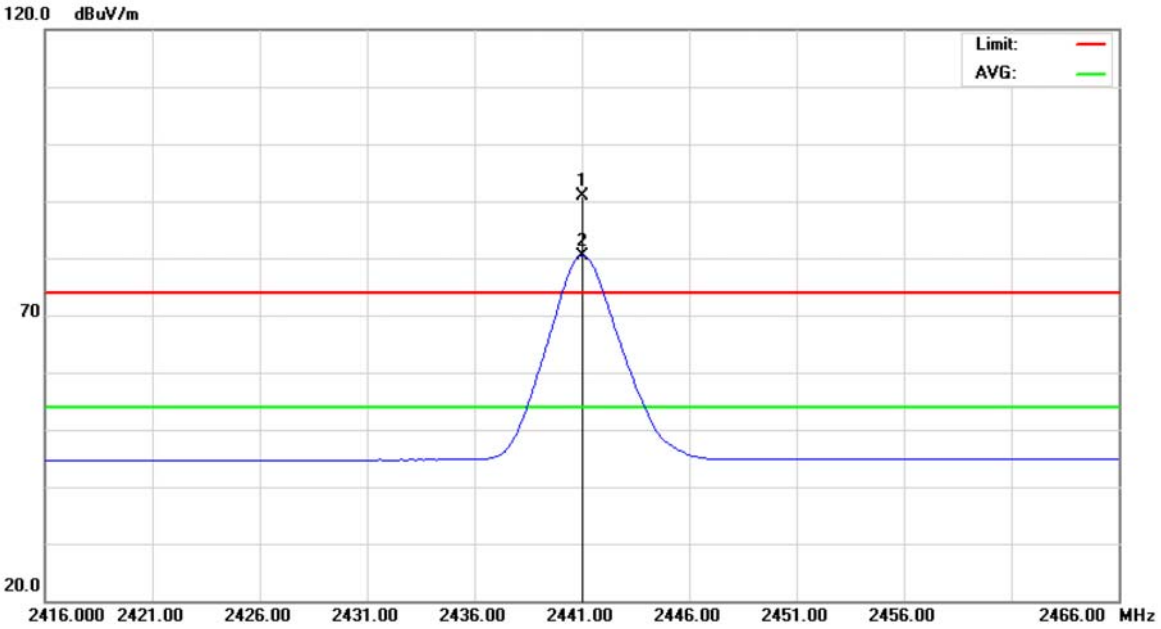
Polarization: Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		4803.980	50.90	7.41	58.31	74.00	-15.69	peak	
2	*	4803.980	43.17	7.41	50.58	54.00	-3.42	AVG	
3		7206.200	44.22	14.79	59.01	74.00	-14.99	peak	
4		7206.200	33.77	14.79	48.56	54.00	-5.44	AVG	

E.U.T	Laser Data Collector	Model Name	OPN-2002i
Temperature	26°C	Relative Humidity	60%
Test Voltage	DC 3.7V		
Test Mode	Bluetooth/1 Mbps/2441		

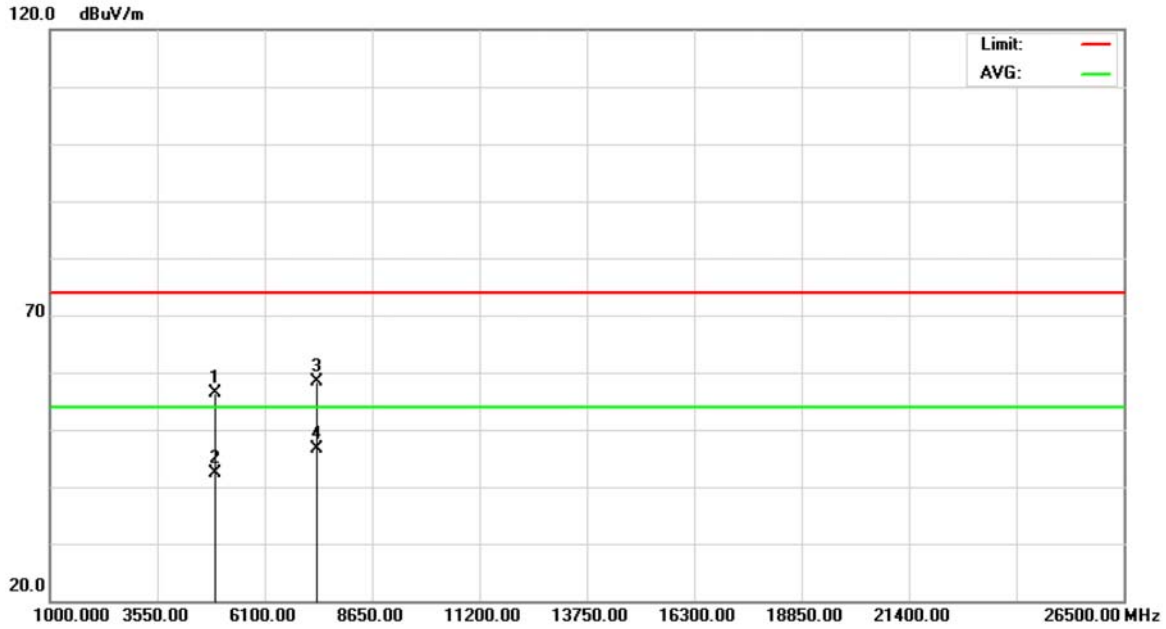
Polarization: Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	X	2441.000	57.58	33.27	90.85	74.00	16.85	peak	
2	*	2441.000	47.19	33.27	80.46	54.00	26.46	AVG	

E.U.T	Laser Data Collector	Model Name	OPN-2002i
Temperature	26°C	Relative Humidity	60%
Test Voltage	DC 3.7V		
Test Mode	Bluetooth/1 Mbps/2441		

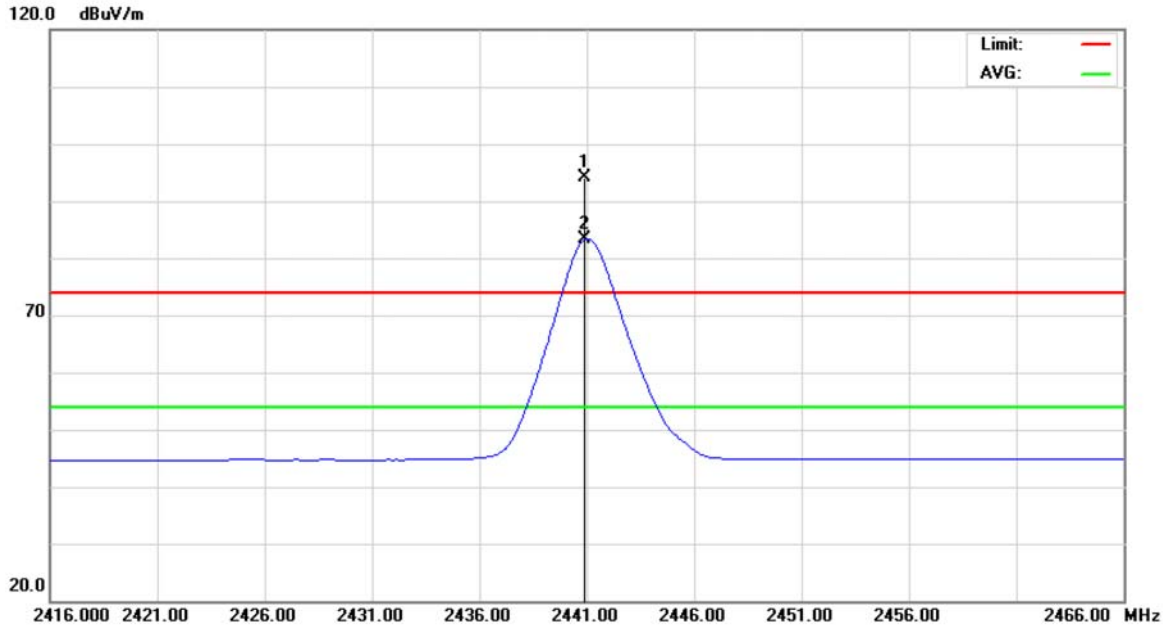
Polarization: Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		4882.020	48.62	7.70	56.32	74.00	-17.68	peak	
2		4882.020	34.58	7.70	42.28	54.00	-11.72	AVG	
3		7323.000	43.26	15.10	58.36	74.00	-15.64	peak	
4	*	7323.000	31.48	15.10	46.58	54.00	-7.42	AVG	

E.U.T	Laser Data Collector	Model Name	OPN-2002i
Temperature	26°C	Relative Humidity	60%
Test Voltage	DC 3.7V		
Test Mode	Bluetooth/1 Mbps/2441		

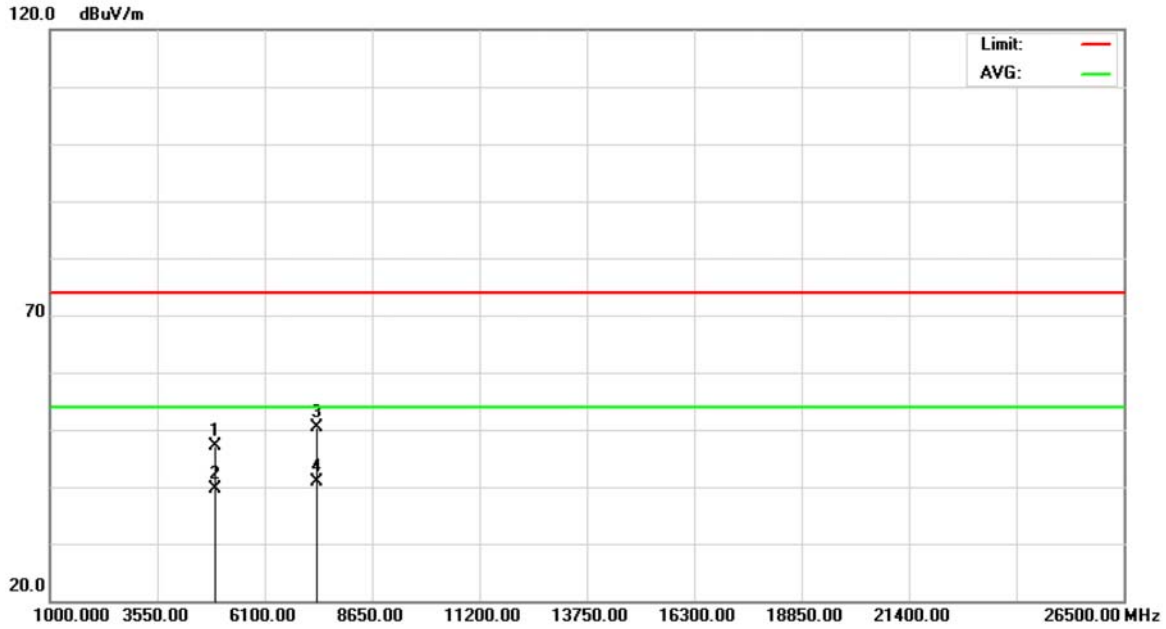
Polarization: Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	X	2440.900	60.91	33.27	94.18	74.00	20.18	peak	
2	*	2440.900	50.02	33.27	83.29	54.00	29.29	AVG	

E.U.T	Laser Data Collector	Model Name	OPN-2002i
Temperature	26°C	Relative Humidity	60%
Test Voltage	DC 3.7V		
Test Mode	Bluetooth/1 Mbps/2441		

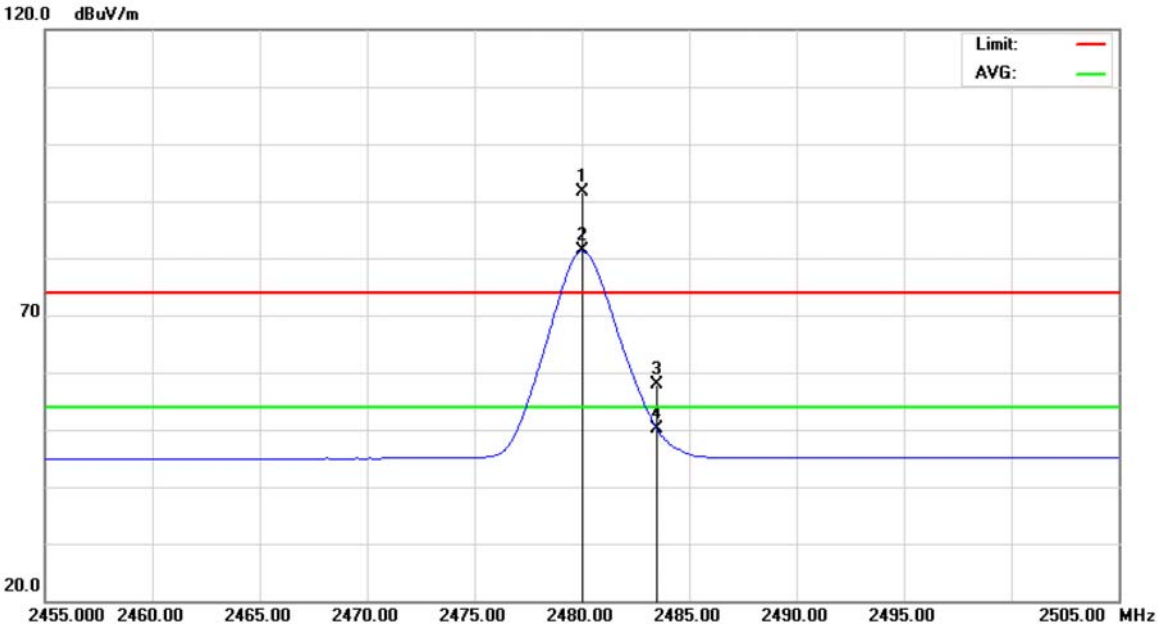
Polarization: Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		4882.040	49.18	-2.07	47.11	74.00	-26.89	peak	
2		4882.040	41.66	-2.07	39.59	54.00	-14.41	AVG	
3		7323.020	47.38	3.03	50.41	74.00	-23.59	peak	
4	*	7323.020	37.82	3.03	40.85	54.00	-13.15	AVG	

E.U.T	Laser Data Collector	Model Name	OPN-2002i
Temperature	26°C	Relative Humidity	60%
Test Voltage	DC 3.7V		
Test Mode	Bluetooth/1 Mbps/2480		

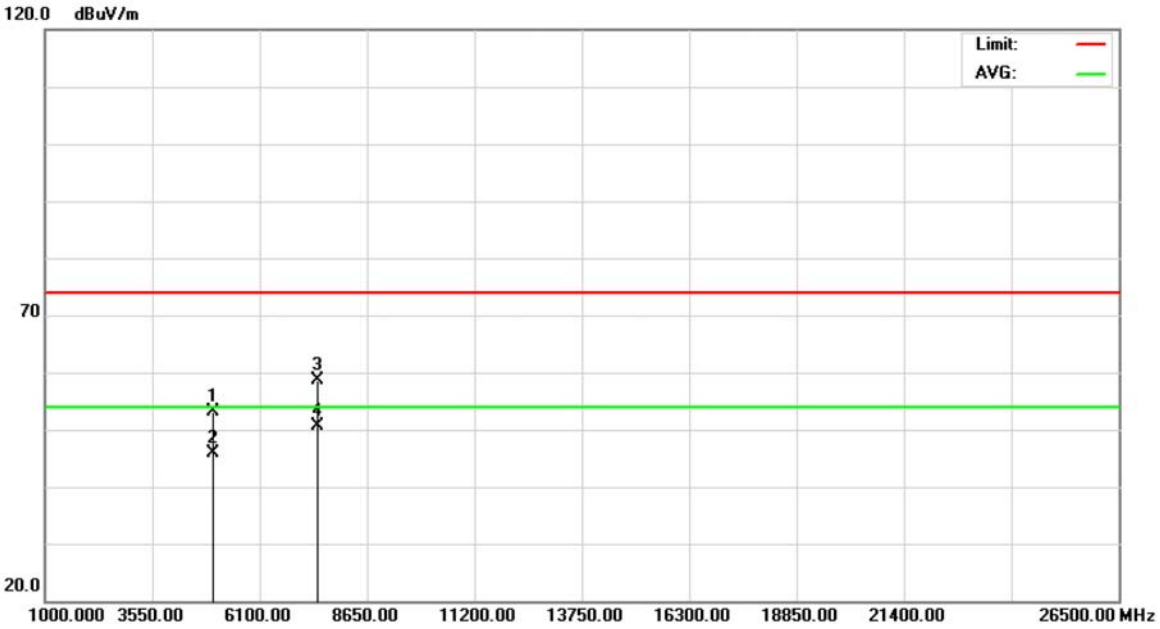
Polarization: Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	X	2480.000	58.03	33.48	91.51	74.00	17.51	peak	
2	*	2480.000	47.78	33.48	81.26	54.00	27.26	AVG	
3		2483.500	24.30	33.50	57.80	74.00	-16.20	peak	
4		2483.500	16.67	33.50	50.17	54.00	-3.83	AVG	

E.U.T	Laser Data Collector	Model Name	OPN-2002i
Temperature	26°C	Relative Humidity	60%
Test Voltage	DC 3.7V		
Test Mode	Bluetooth/1 Mbps/2480		

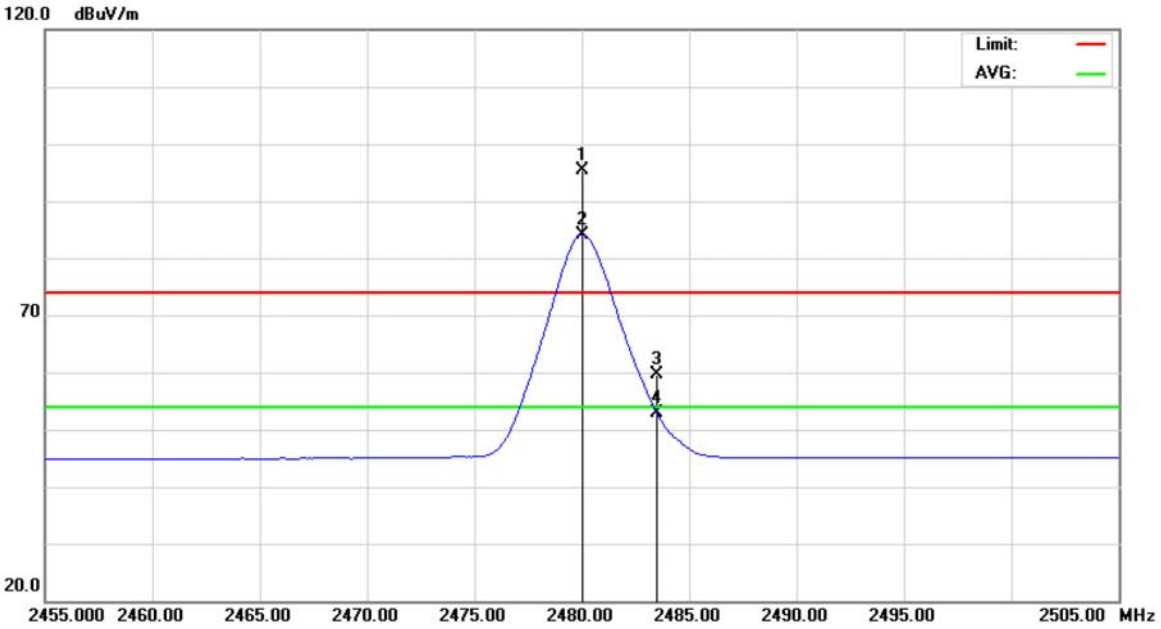
Polarization: Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		4960.000	45.22	7.98	53.20	74.00	-20.80	peak	
2		4960.000	37.96	7.98	45.94	54.00	-8.06	AVG	
3		7440.000	43.26	15.40	58.66	74.00	-15.34	peak	
4	*	7440.000	35.22	15.40	50.62	54.00	-3.38	AVG	

E.U.T	Laser Data Collector	Model Name	OPN-2002i
Temperature	26°C	Relative Humidity	60%
Test Voltage	DC 3.7V		
Test Mode	Bluetooth/1 Mbps/2480		

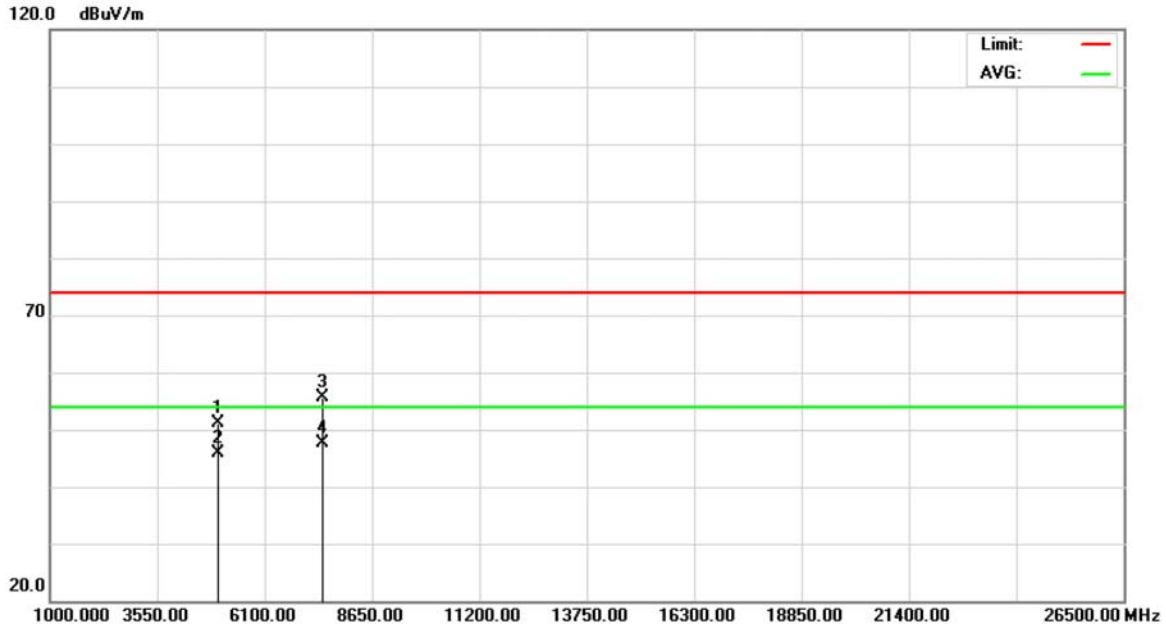
Polarization: Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	X	2480.000	61.93	33.48	95.41	74.00	21.41	peak	
2	*	2480.000	50.64	33.48	84.12	54.00	30.12	AVG	
3		2483.500	26.05	33.50	59.55	74.00	-14.45	peak	
4		2483.500	19.36	33.50	52.86	54.00	-1.14	AVG	

E.U.T	Laser Data Collector	Model Name	OPN-2002i
Temperature	26°C	Relative Humidity	60%
Test Voltage	DC 3.7V		
Test Mode	Bluetooth/1 Mbps/2480		

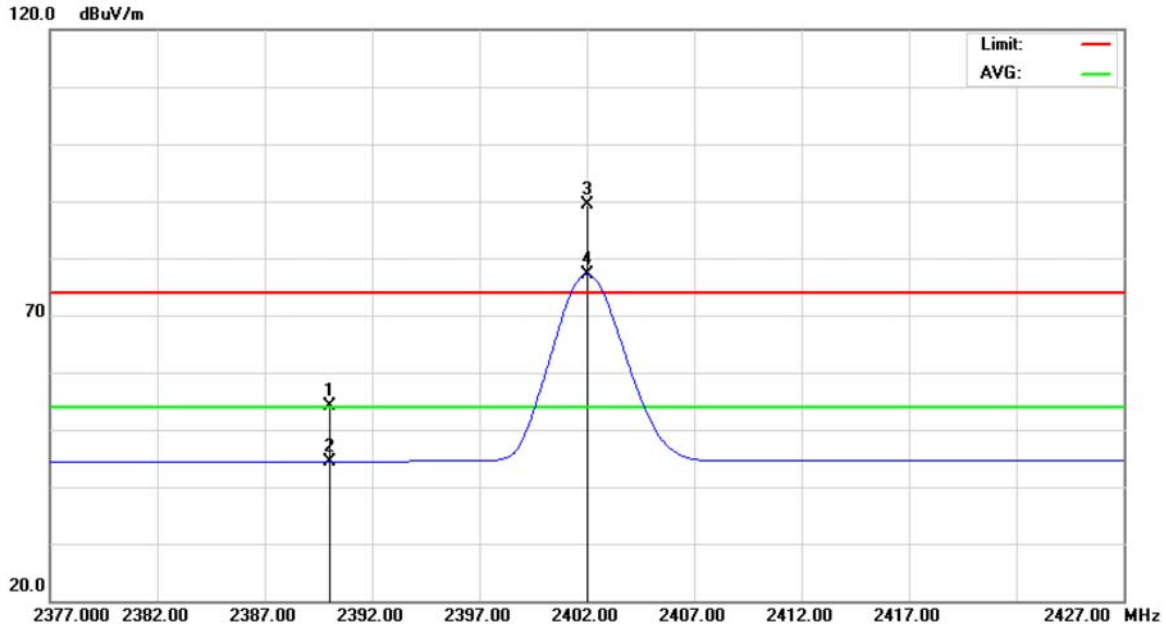
Polarization: Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		4960.040	43.26	7.98	51.24	74.00	-22.76	peak	
2		4960.040	37.88	7.98	45.86	54.00	-8.14	AVG	
3		7440.000	40.25	15.40	55.65	74.00	-18.35	peak	
4	*	7440.000	32.11	15.40	47.51	54.00	-6.49	AVG	

E.U.T	Laser Data Collector	Model Name	OPN-2002i
Temperature	26°C	Relative Humidity	60%
Test Voltage	DC 3.7V		
Test Mode	Bluetooth/3 Mbps/2402		

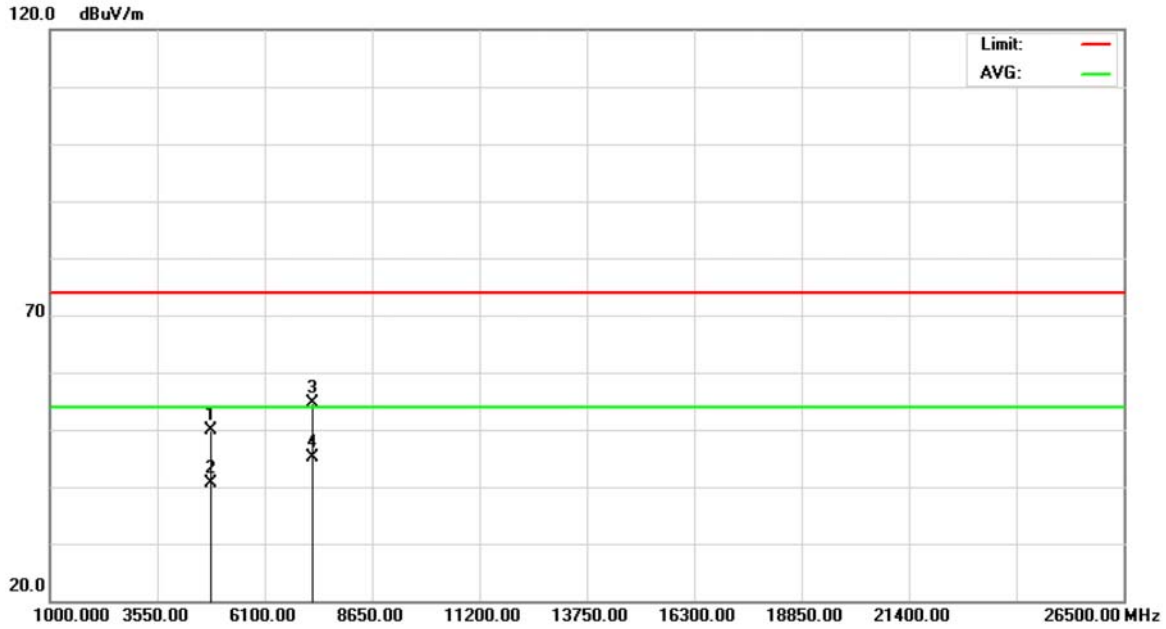
Polarization: Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		2390.000	21.17	32.99	54.16	74.00	-19.84	peak	
2		2390.000	11.46	32.99	44.45	54.00	-9.55	AVG	
3	X	2402.000	56.37	33.06	89.43	74.00	15.43	peak	
4	*	2402.000	44.03	33.06	77.09	54.00	23.09	AVG	

E.U.T	Laser Data Collector	Model Name	OPN-2002i
Temperature	26°C	Relative Humidity	60%
Test Voltage	DC 3.7V		
Test Mode	Bluetooth/3 Mbps/2402		

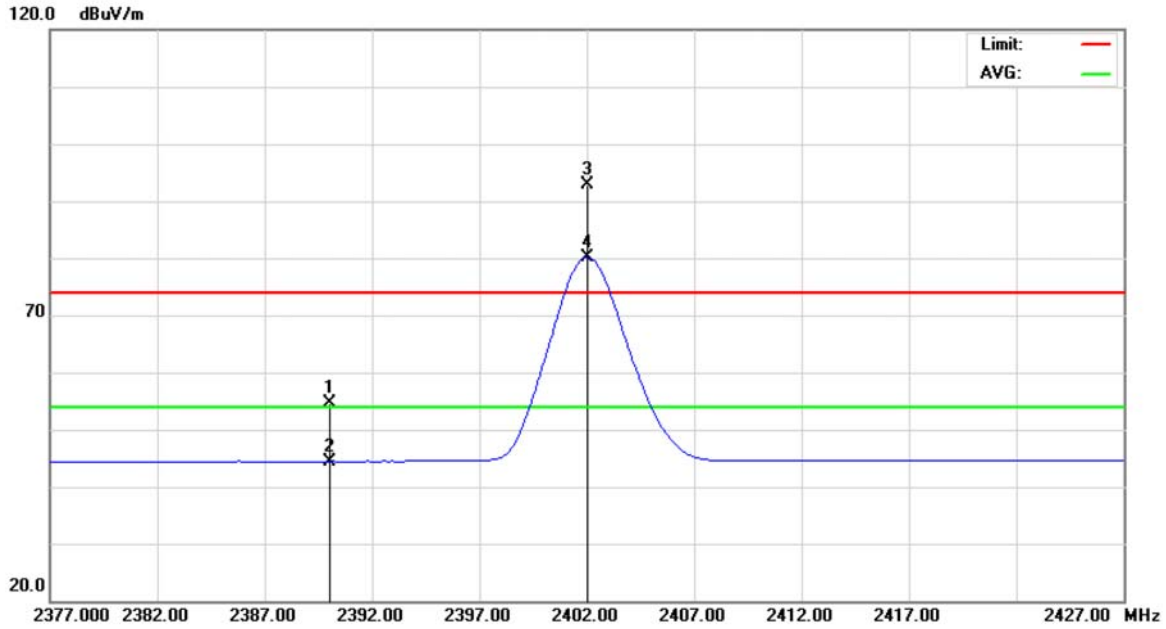
Polarization: Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		4804.000	42.36	7.41	49.77	74.00	-24.23	peak	
2		4804.000	33.20	7.41	40.61	54.00	-13.39	AVG	
3		7206.000	39.88	14.79	54.67	74.00	-19.33	peak	
4	*	7206.000	30.25	14.79	45.04	54.00	-8.96	AVG	

E.U.T	Laser Data Collector	Model Name	OPN-2002i
Temperature	26°C	Relative Humidity	60%
Test Voltage	DC 3.7V		
Test Mode	Bluetooth/3 Mbps/2402		

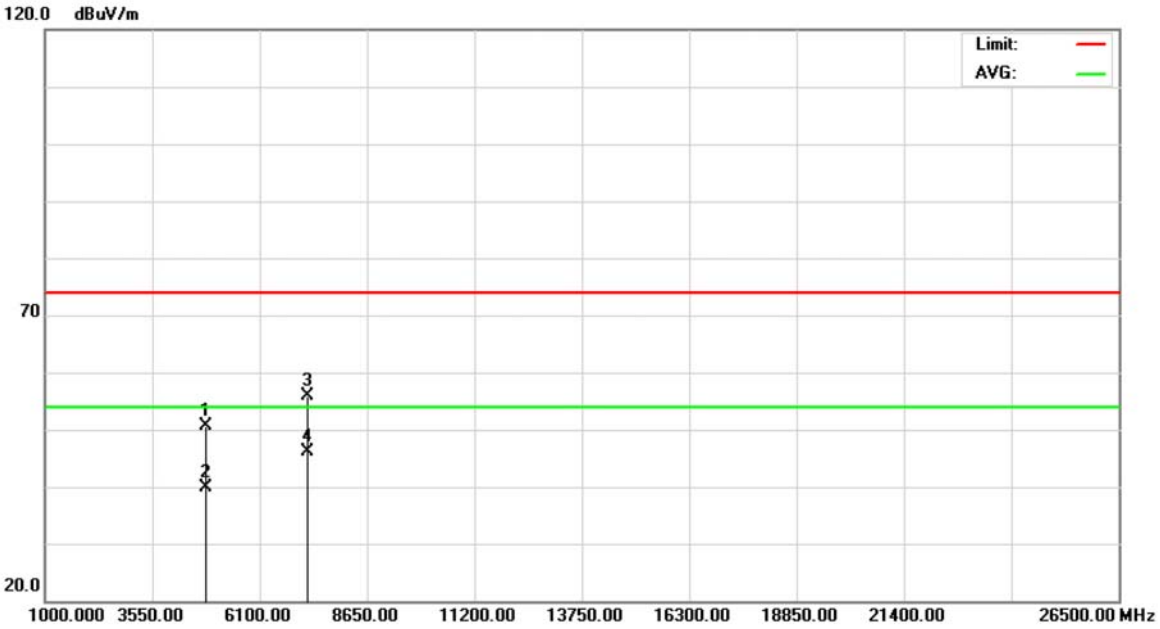
Polarization: Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		2390.000	21.68	32.99	54.67	74.00	-19.33	peak	
2		2390.000	11.49	32.99	44.48	54.00	-9.52	AVG	
3	X	2402.000	59.87	33.06	92.93	74.00	18.93	peak	
4	*	2402.000	46.97	33.06	80.03	54.00	26.03	AVG	

E.U.T	Laser Data Collector	Model Name	OPN-2002i
Temperature	26°C	Relative Humidity	60%
Test Voltage	DC 3.7V		
Test Mode	Bluetooth/3 Mbps/2402		

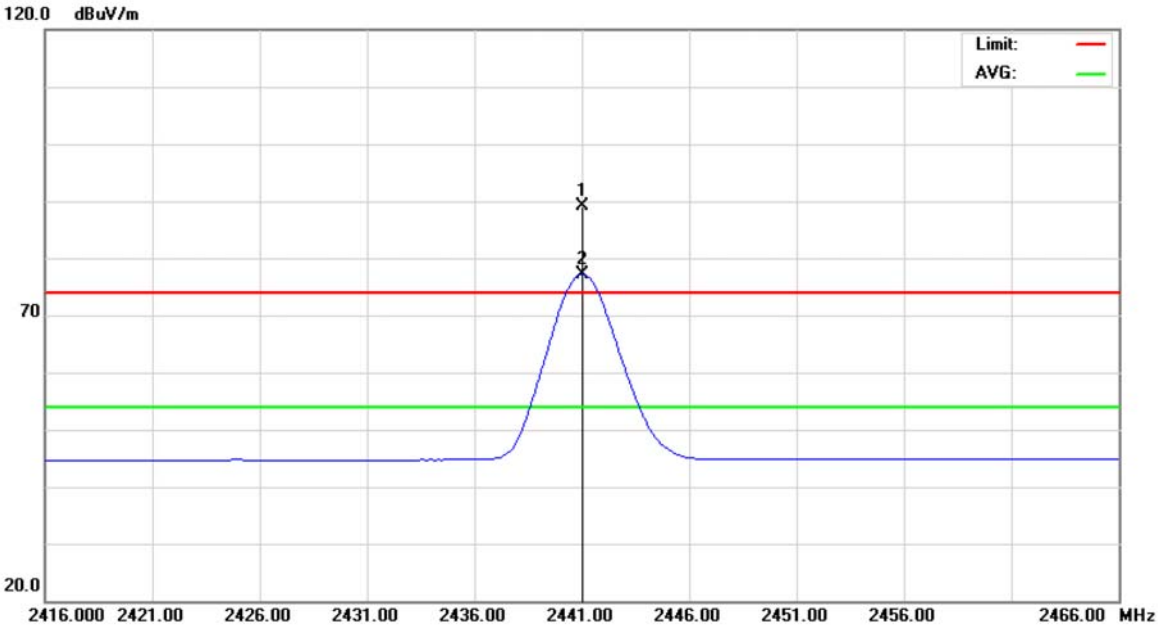
Polarization: Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		4804.000	43.16	7.41	50.57	74.00	-23.43	peak	
2		4804.000	32.36	7.41	39.77	54.00	-14.23	AVG	
3		7206.000	41.02	14.79	55.81	74.00	-18.19	peak	
4	*	7206.000	31.26	14.79	46.05	54.00	-7.95	AVG	

E.U.T	Laser Data Collector	Model Name	OPN-2002i
Temperature	26°C	Relative Humidity	60%
Test Voltage	DC 3.7V		
Test Mode	Bluetooth/3 Mbps/2441		

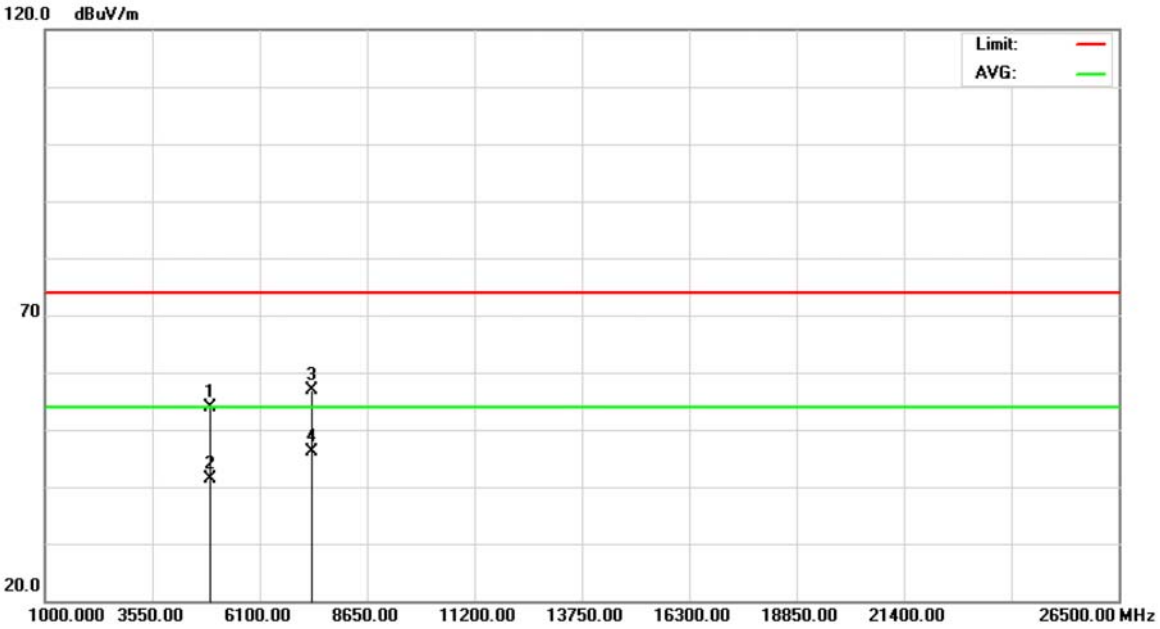
Polarization: Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	X	2441.000	55.94	33.27	89.21	74.00	15.21	peak	
2	*	2441.000	43.86	33.27	77.13	54.00	23.13	AVG	

E.U.T	Laser Data Collector	Model Name	OPN-2002i
Temperature	26°C	Relative Humidity	60%
Test Voltage	DC 3.7V		
Test Mode	Bluetooth/3 Mbps/2441		

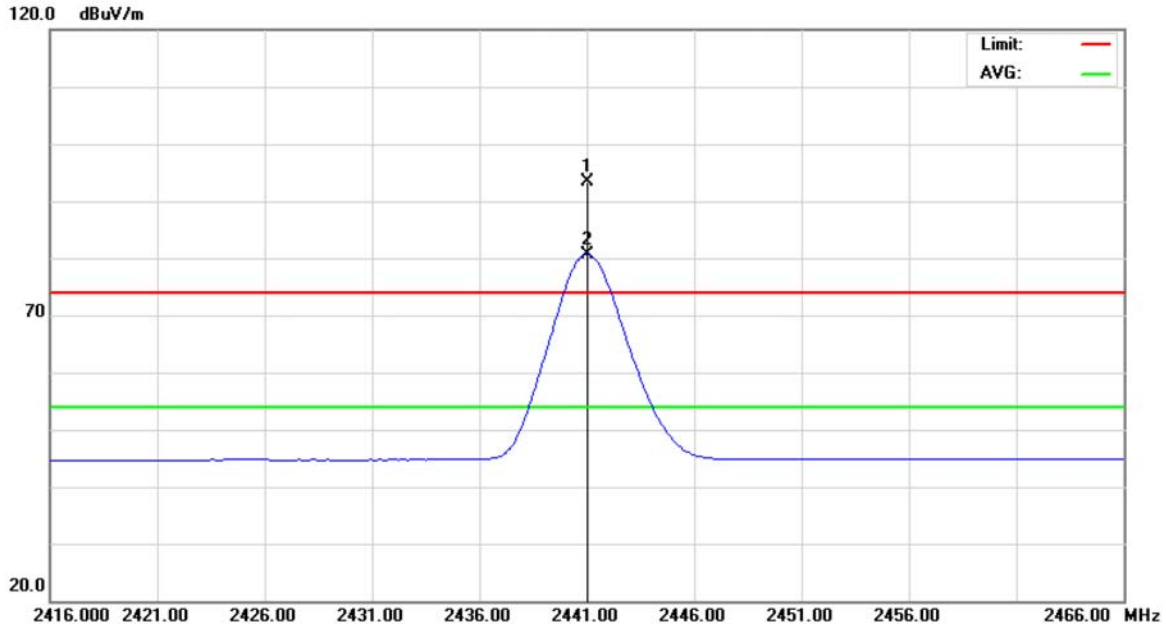
Polarization: Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		4881.640	46.10	7.69	53.79	74.00	-20.21	peak	
2		4881.840	33.66	7.69	41.35	54.00	-12.65	AVG	
3		7323.080	41.68	15.10	56.78	74.00	-17.22	peak	
4	*	7323.080	30.91	15.10	46.01	54.00	-7.99	AVG	

E.U.T	Laser Data Collector	Model Name	OPN-2002i
Temperature	26°C	Relative Humidity	60%
Test Voltage	DC 3.7V		
Test Mode	Bluetooth/3 Mbps/2441		

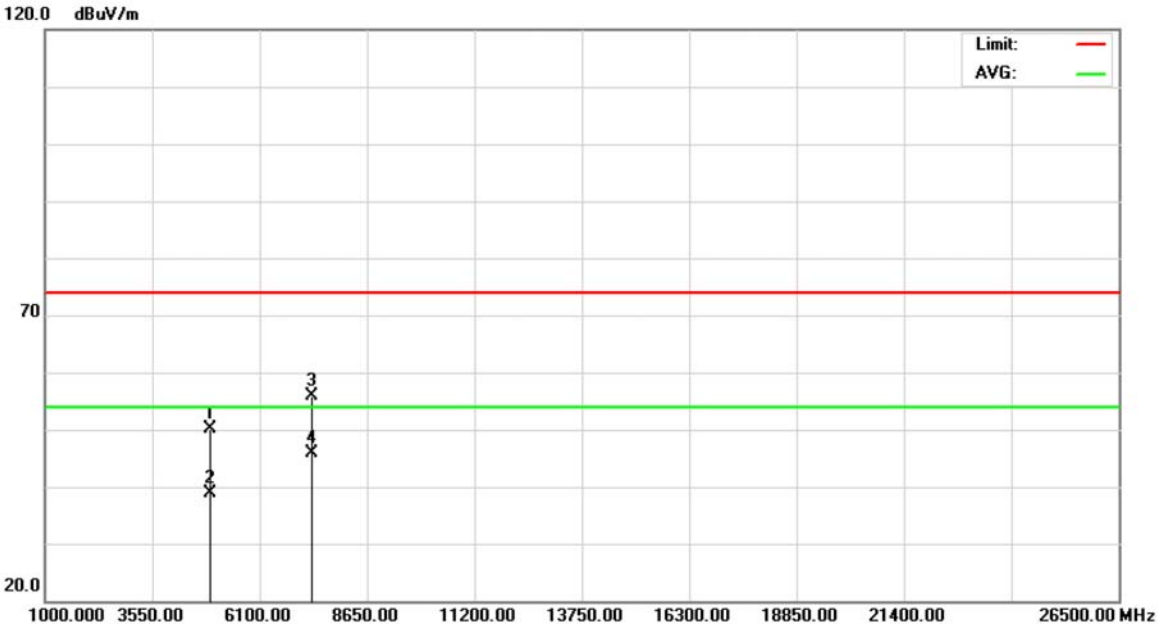
Polarization: Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	X	2441.000	60.17	33.27	93.44	74.00	19.44	peak	
2	*	2441.000	47.30	33.27	80.57	54.00	26.57	AVG	

E.U.T	Laser Data Collector	Model Name	OPN-2002i
Temperature	26°C	Relative Humidity	60%
Test Voltage	DC 3.7V		
Test Mode	Bluetooth/3 Mbps/2441		

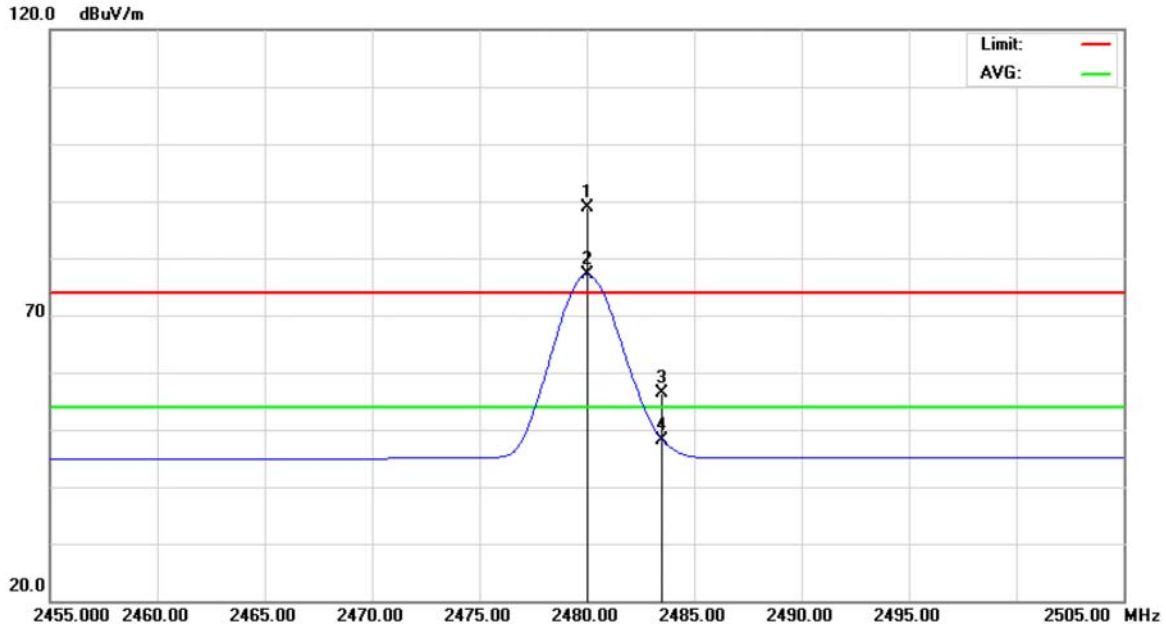
Polarization: Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		4882.060	42.42	7.70	50.12	74.00	-23.88	peak	
2		4882.060	31.29	7.70	38.99	54.00	-15.01	AVG	
3		7323.080	40.77	15.10	55.87	74.00	-18.13	peak	
4	*	7323.080	30.67	15.10	45.77	54.00	-8.23	AVG	

E.U.T	Laser Data Collector	Model Name	OPN-2002i
Temperature	26°C	Relative Humidity	60%
Test Voltage	DC 3.7V		
Test Mode	Bluetooth/3 Mbps/2480		

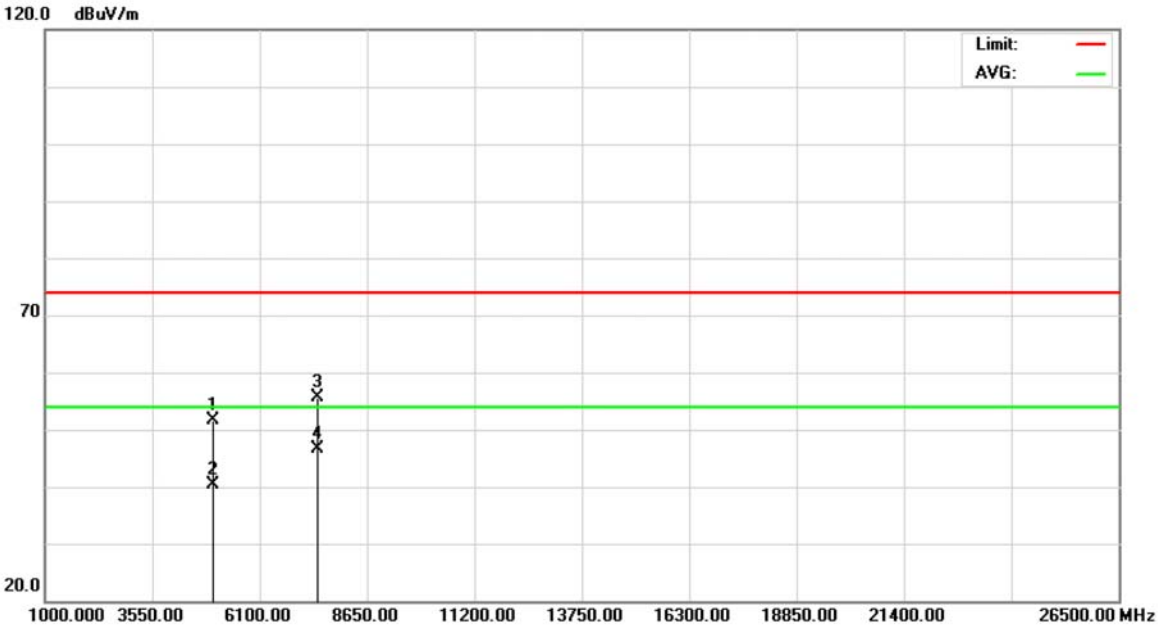
Polarization: Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	X	2480.000	55.52	33.48	89.00	74.00	15.00	peak	
2	*	2480.000	43.56	33.48	77.04	54.00	23.04	AVG	
3		2483.500	22.91	33.50	56.41	74.00	-17.59	peak	
4		2483.500	14.69	33.50	48.19	54.00	-5.81	AVG	

E.U.T	Laser Data Collector	Model Name	OPN-2002i
Temperature	26°C	Relative Humidity	60%
Test Voltage	DC 3.7V		
Test Mode	Bluetooth/3 Mbps/2480		

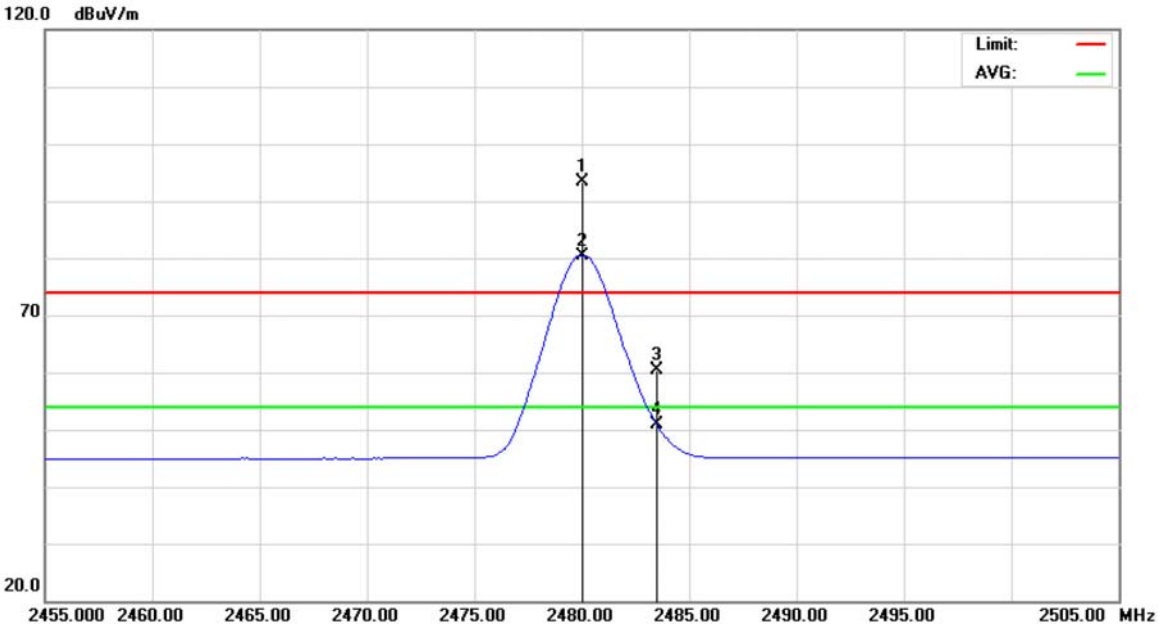
Polarization: Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		4960.000	43.67	7.98	51.65	74.00	-22.35	peak	
2		4960.000	32.47	7.98	40.45	54.00	-13.55	AVG	
3		7440.200	40.23	15.40	55.63	74.00	-18.37	peak	
4	*	7440.200	31.22	15.40	46.62	54.00	-7.38	AVG	

E.U.T	Laser Data Collector	Model Name	OPN-2002i
Temperature	26°C	Relative Humidity	60%
Test Voltage	DC 3.7V		
Test Mode	Bluetooth/3 Mbps/2480		

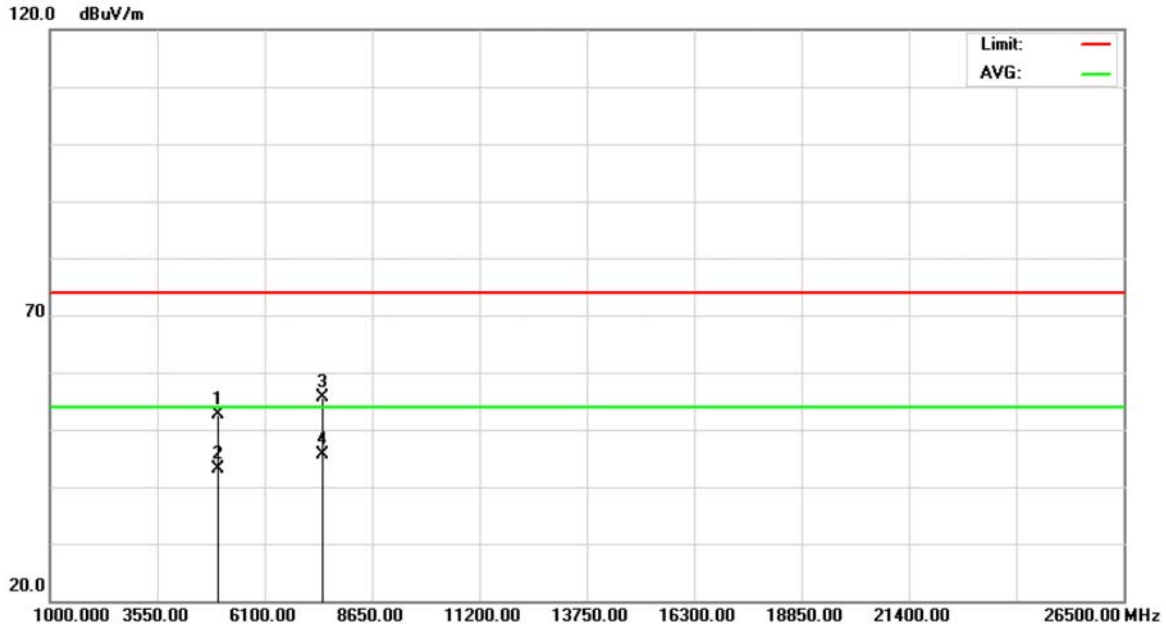
Polarization: Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	X	2480.000	59.80	33.48	93.28	74.00	19.28	peak	
2	*	2480.000	47.01	33.48	80.49	54.00	26.49	AVG	
3		2483.500	26.95	33.50	60.45	74.00	-13.55	peak	
4		2483.500	17.30	33.50	50.80	54.00	-3.20	AVG	

E.U.T	Laser Data Collector	Model Name	OPN-2002i
Temperature	26°C	Relative Humidity	60%
Test Voltage	DC 3.7V		
Test Mode	Bluetooth/3 Mbps/2480		

Polarization: Horizontal

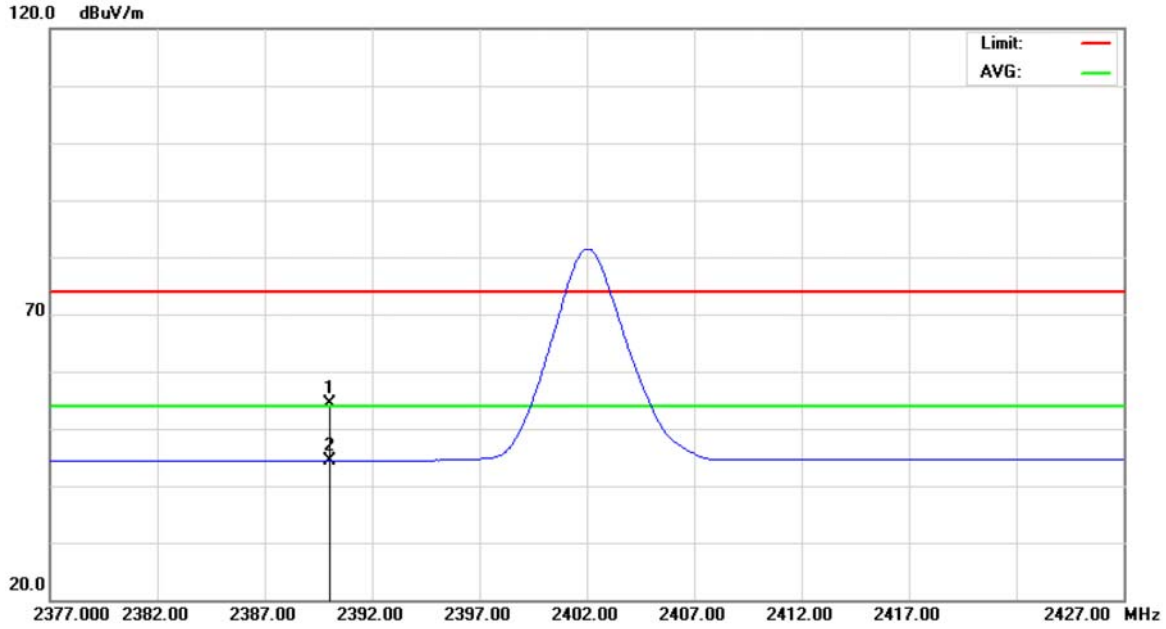


No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		4960.000	44.62	7.98	52.60	74.00	-21.40	peak	
2		4960.000	35.20	7.98	43.18	54.00	-10.82	AVG	
3		7440.000	40.25	15.40	55.65	74.00	-18.35	peak	
4	*	7440.000	30.26	15.40	45.66	54.00	-8.34	AVG	

9.9 TEST RESULTS (RESTRICTED BANDS)

E.U.T	Laser Data Collector	Model Name	OPN-2002i
Temperature	24°C	Relative Humidity	46%
Test Voltage	DC 3.7V		
Test Mode	Bluetooth/1 Mbps/2402		
NOTE	The transmitter was setup to transmit at the lowest channel and the field strength was measured at 2310-2390 MHz.		

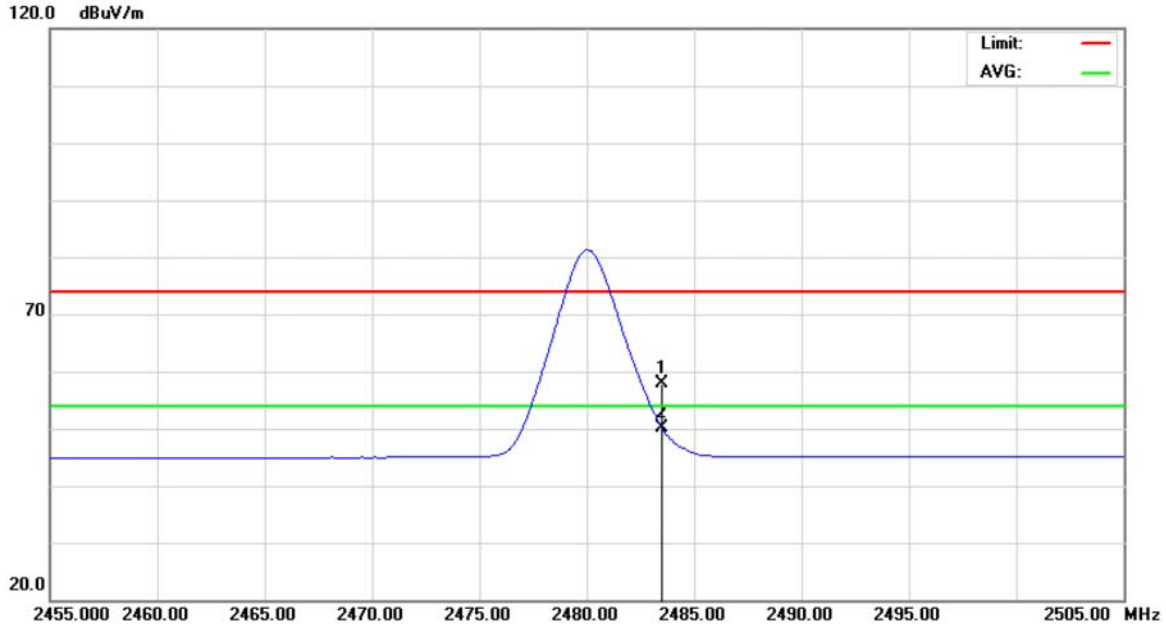
Polarization: Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		2390.000	21.46	32.99	54.45	74.00	-19.55	peak	
2	*	2390.000	11.43	32.99	44.42	54.00	-9.58	AVG	

E.U.T	Laser Data Collector	Model Name	OPN-2002i
Temperature	24°C	Relative Humidity	46%
Test Voltage	DC 3.7V		
Test Mode	Bluetooth/1 Mbps/2480		
NOTE	The transmitter was setup to transmit at the highest channel and the field strength was measured at 2483.5-2500 MHz.		

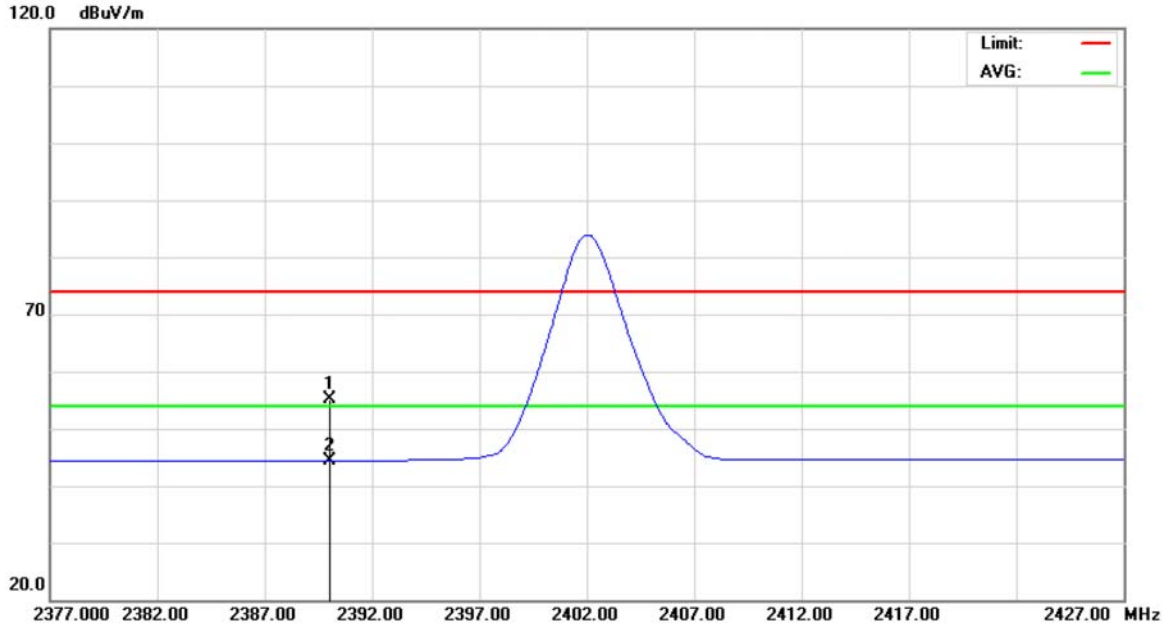
Polarization: Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		2483.500	24.30	33.50	57.80	74.00	-16.20	peak	
2	*	2483.500	16.67	33.50	50.17	54.00	-3.83	AVG	

E.U.T	Laser Data Collector	Model Name	OPN-2002i
Temperature	24°C	Relative Humidity	46%
Test Voltage	DC 3.7V		
Test Mode	Bluetooth/1 Mbps/2402		
NOTE	The transmitter was setup to transmit at the lowest channel and the field strength was measured at 2310-2390 MHz.		

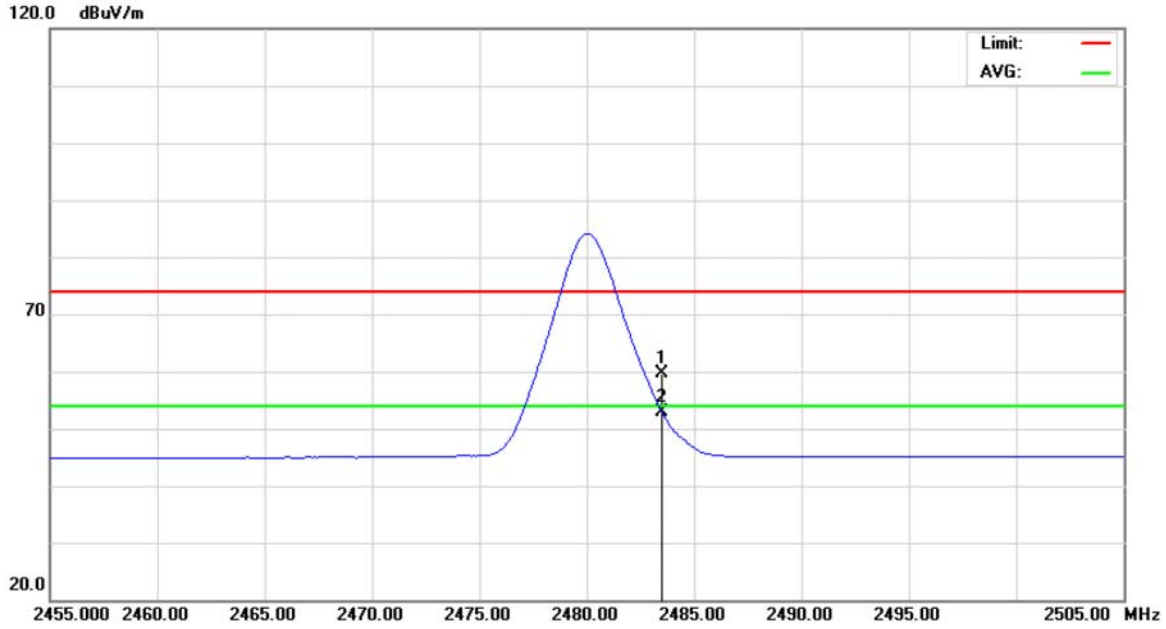
Polarization: Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		2390.000	22.10	32.99	55.09	74.00	-18.91	peak	
2	*	2390.000	11.45	32.99	44.44	54.00	-9.56	AVG	

E.U.T	Laser Data Collector	Model Name	OPN-2002i
Temperature	24°C	Relative Humidity	46%
Test Voltage	DC 3.7V		
Test Mode	Bluetooth/1 Mbps/2480		
NOTE	The transmitter was setup to transmit at the highest channel and the field strength was measured at 2483.5-2500 MHz.		

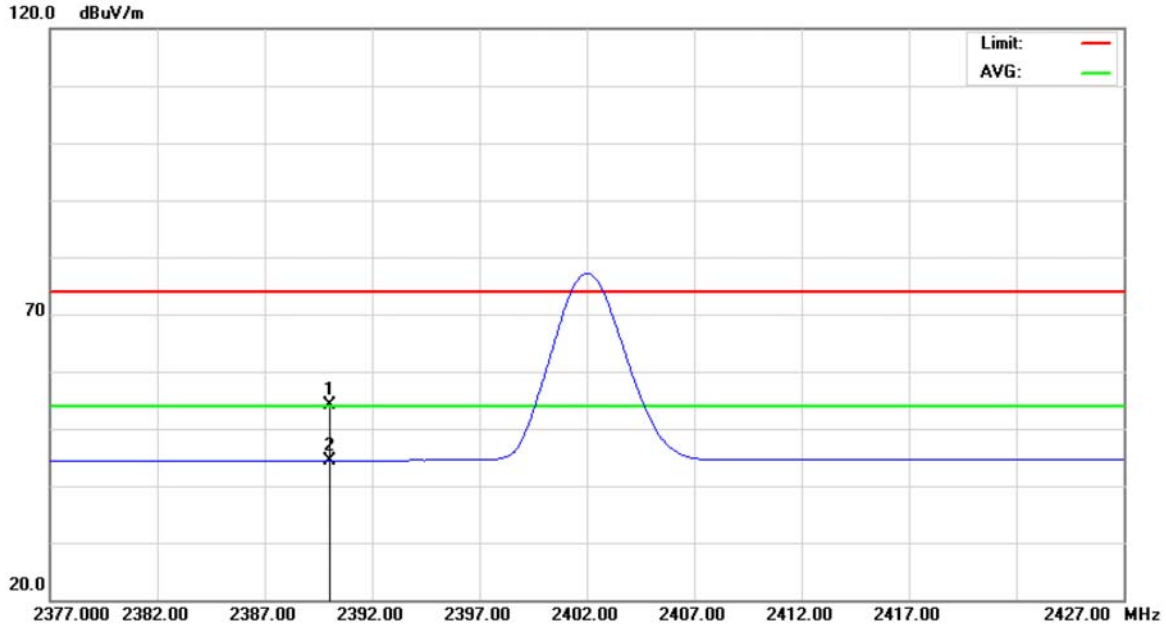
Polarization: Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		2483.500	26.05	33.50	59.55	74.00	-14.45	peak	
2	*	2483.500	19.36	33.50	52.86	54.00	-1.14	AVG	

E.U.T	Laser Data Collector	Model Name	OPN-2002i
Temperature	24°C	Relative Humidity	46%
Test Voltage	DC 3.7V		
Test Mode	Bluetooth/3 Mbps/2402		
NOTE	The transmitter was setup to transmit at the lowest channel and the field strength was measured at 2310-2390 MHz.		

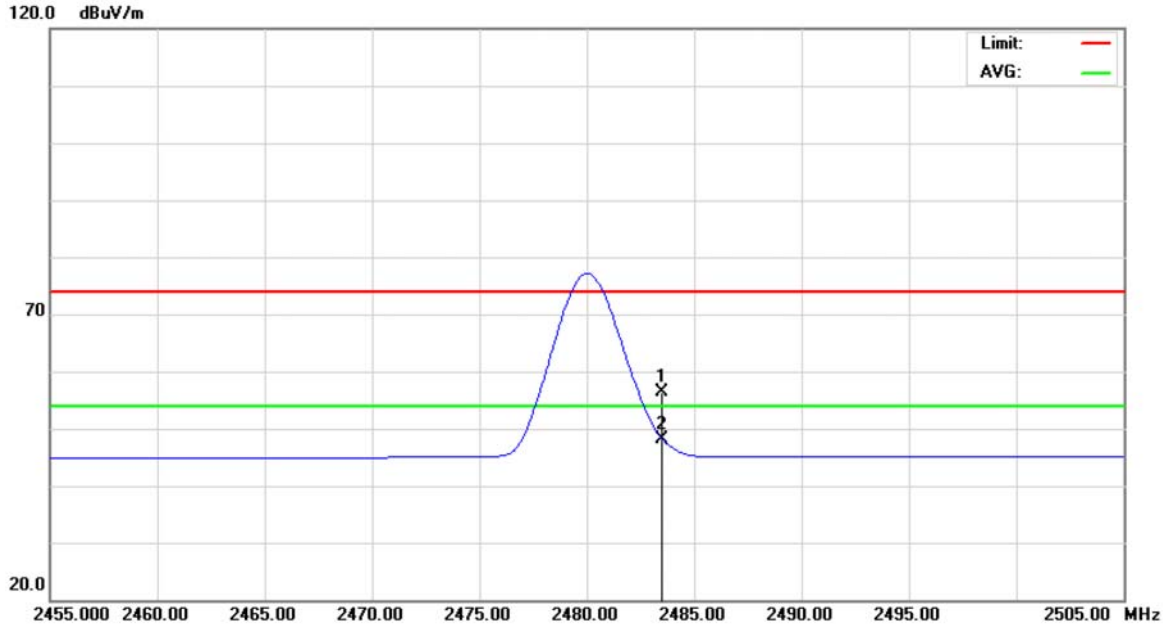
Polarization: Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		2390.000	21.17	32.99	54.16	74.00	-19.84	peak	
2	*	2390.000	11.46	32.99	44.45	54.00	-9.55	AVG	

E.U.T	Laser Data Collector	Model Name	OPN-2002i
Temperature	24°C	Relative Humidity	46%
Test Voltage	DC 3.7V		
Test Mode	Bluetooth/3 Mbps/2480		
NOTE	The transmitter was setup to transmit at the highest channel and the field strength was measured at 2483.5-2500 MHz.		

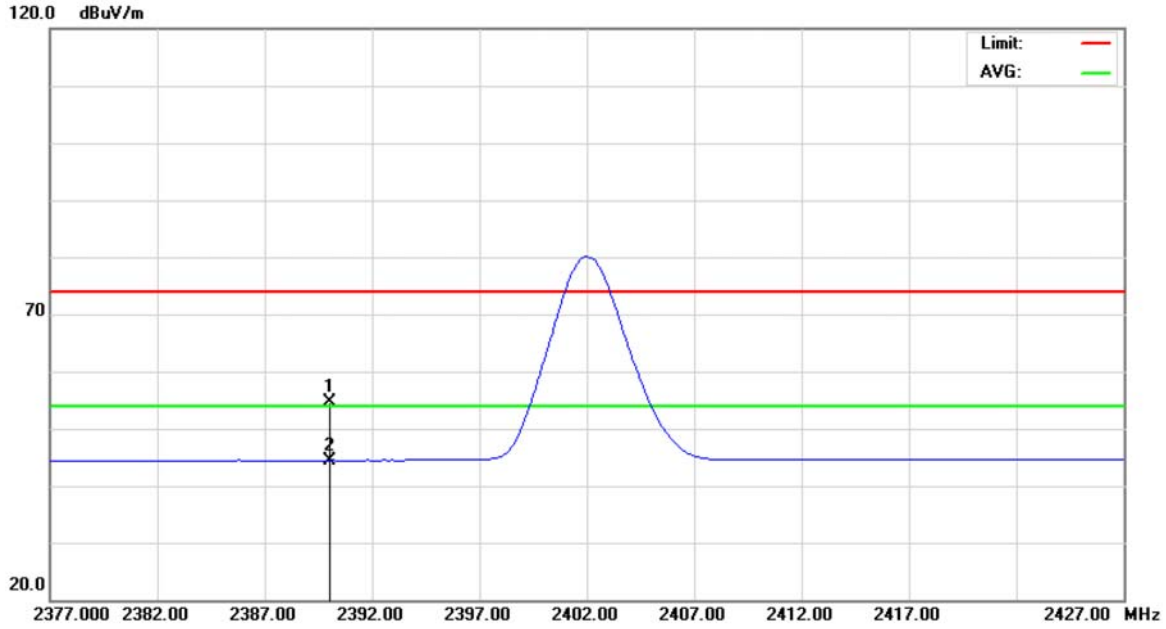
Polarization: Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		2483.500	22.91	33.50	56.41	74.00	-17.59	peak	
2	*	2483.500	14.69	33.50	48.19	54.00	-5.81	AVG	

E.U.T	Laser Data Collector	Model Name	OPN-2002i
Temperature	24°C	Relative Humidity	46%
Test Voltage	DC 3.7V		
Test Mode	Bluetooth/3 Mbps/2402		
NOTE	The transmitter was setup to transmit at the lowest channel and the field strength was measured at 2310-2390 MHz.		

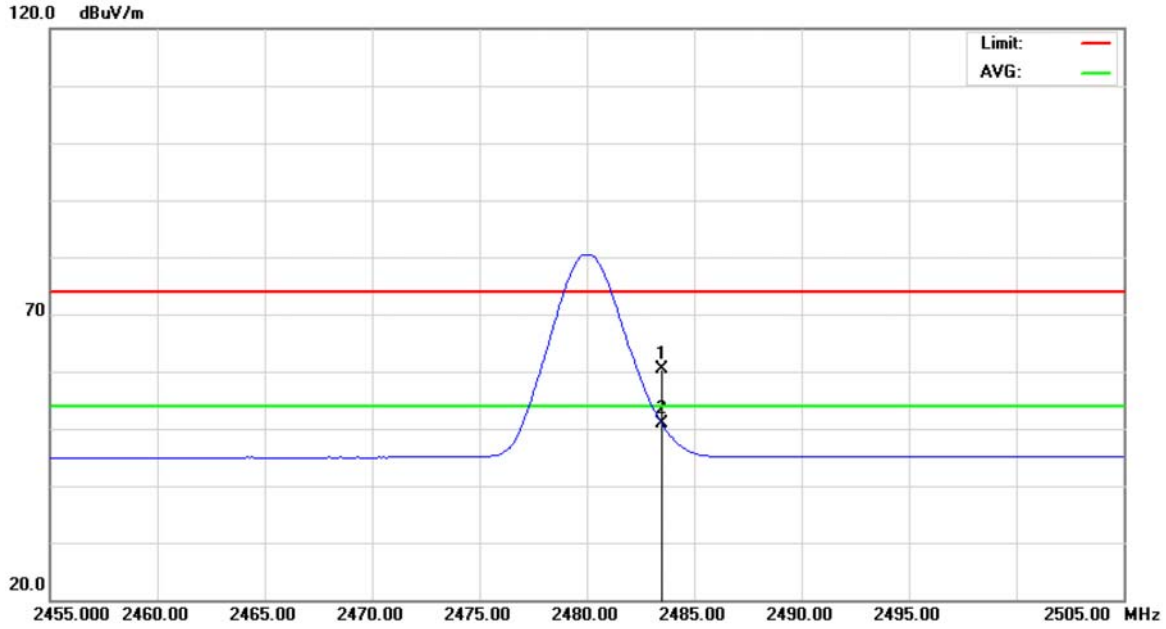
Polarization: Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		2390.000	21.68	32.99	54.67	74.00	-19.33	peak	
2	*	2390.000	11.49	32.99	44.48	54.00	-9.52	AVG	

E.U.T	Laser Data Collector	Model Name	OPN-2002i
Temperature	24°C	Relative Humidity	46%
Test Voltage	DC 3.7V		
Test Mode	Bluetooth/3 Mbps/2480		
NOTE	The transmitter was setup to transmit at the highest channel and the field strength was measured at 2483.5-2500 MHz.		

Polarization: Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		2483.500	26.95	33.50	60.45	74.00	-13.55	peak	
2	*	2483.500	17.30	33.50	50.80	54.00	-3.20	AVG	

10 NUMBER OF HOPPING FREQUENCY

10.1 LIMIT

Test Item	Frequency Range (MHz)	Limit
Number of Hopping Channel	2400-2483.5	shall use at least 15 channels

10.2 MEASUREMENT INSTRUMENTS LIST

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	FSP-40	100129	Oct. 06, 2012

NOTE: **N/A**: denotes No Model Name, No Serial No. or No Calibration specified.

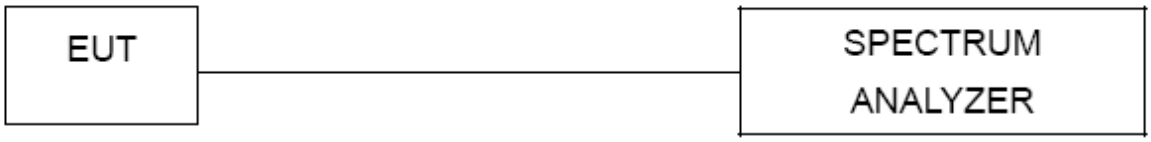
10.3 MEASURING INSTRUMENTS SETTING

Spectrum Analyzer	Parameter Setting
Attenuation	Auto
Span Frequency	> Operating Frequency Range
RB	100 kHz
VB	100 kHz
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

10.4 TEST PROCEDURES

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= 100 kHz, VBW=100 kHz, Sweep time = Auto.

10.5 TEST SETUP LAYOUT



10.6 DEVIATION FROM TEST STANDARD

No deviation

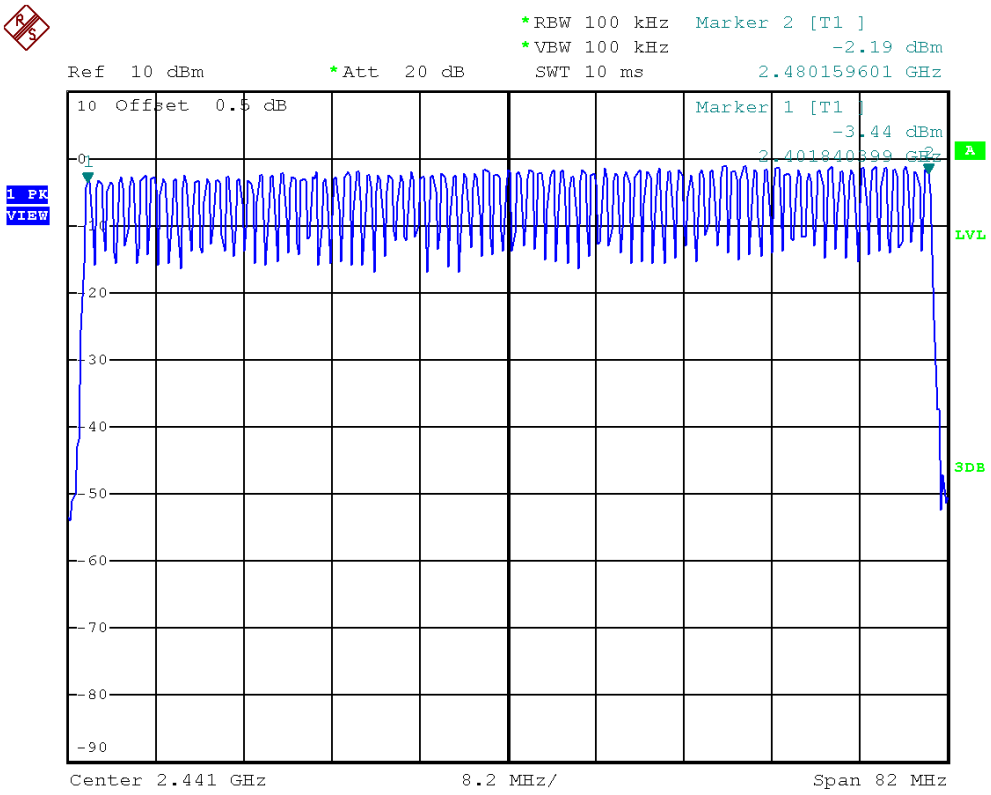
10.7 EUT OPERATING CONDITIONS

The EUT tested system was configured as the statements of **4.6** Unless otherwise a special operating condition is specified in the follows during the testing.

10.8TEST RESULTS

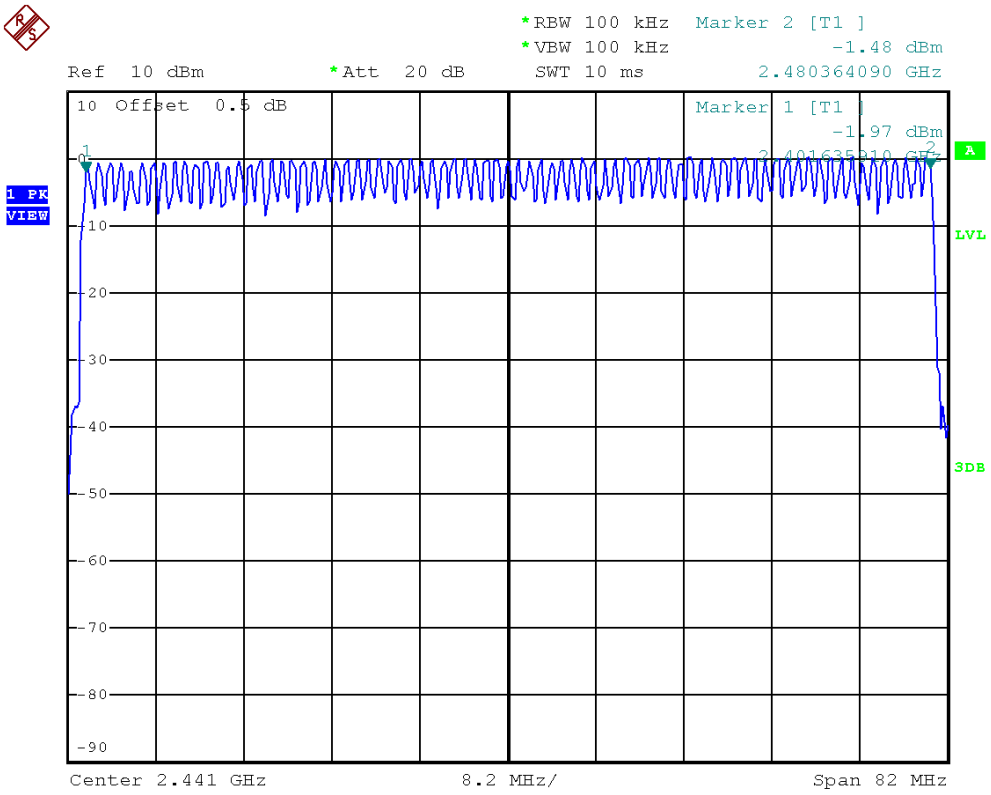
E.U.T	Laser Data Collector	Model Name	OPN-2002i
Temperature	26°C	Relative Humidity	60%
Test Voltage	DC 3.7V		
Test Mode	Bluetooth/1 Mbps		

Number of Hopping Channel	Limit	Result
79	15	Pass



E.U.T	Laser Data Collector	Model Name	OPN-2002i
Temperature	26°C	Relative Humidity	60%
Test Voltage	DC 3.7V		
Test Mode	Bluetooth/3 Mbps		

Number of Hopping Channel	Limit	Result
79	15	Pass



11 AVERAGE TIME OF OCCUPANCY

11.1LIMIT

Test Item	Frequency Range (MHz)	Limit
Average time of occupancy	2400-2483.5	shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

11.2MEASUREMENT INSTRUMENTS LIST

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	FSP-40	100129	Oct. 06, 2012

NOTE: **N/A**: denotes No Model Name, No Serial No. or No Calibration specified.

11.3TEST PROCEDURES

a. The transmitter output (antenna port) was connected to the spectrum analyzer
b. Set RBW of spectrum analyzer to 100 kHz and VBW to 100 kHz.
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. DH5 Packet permit maximum 1600/ 79 / 6 = 3.37 hops per second in each channel (5 time slots RX, 1 time slot TX). So, the dwell time is the time duration of the pulse times 3.37 x 31.6 = 106.6 within 31.6 seconds.
j. DH3 Packet permit maximum 1600 / 79 / 4 = 5.06 hops per second in each channel (3 time slots RX, 1 time slot TX). So, the dwell time is the time duration of the pulse times 5.06 x 31.6 = 160 within 31.6 seconds.
k. DH1 Packet permit maximum 1600 / 79 /2 = 10.12 hops per second in each channel (1 time slot RX, 1 time slot TX). So, the dwell time is the time duration of the pulse times 10.12 x 31.6 = 320 within 31.6 seconds.

11.4TEST SETUP LAYOUT

11.5DEVIATION FROM TEST STANDARD

No deviation

11.6 EUT OPERATING CONDITIONS

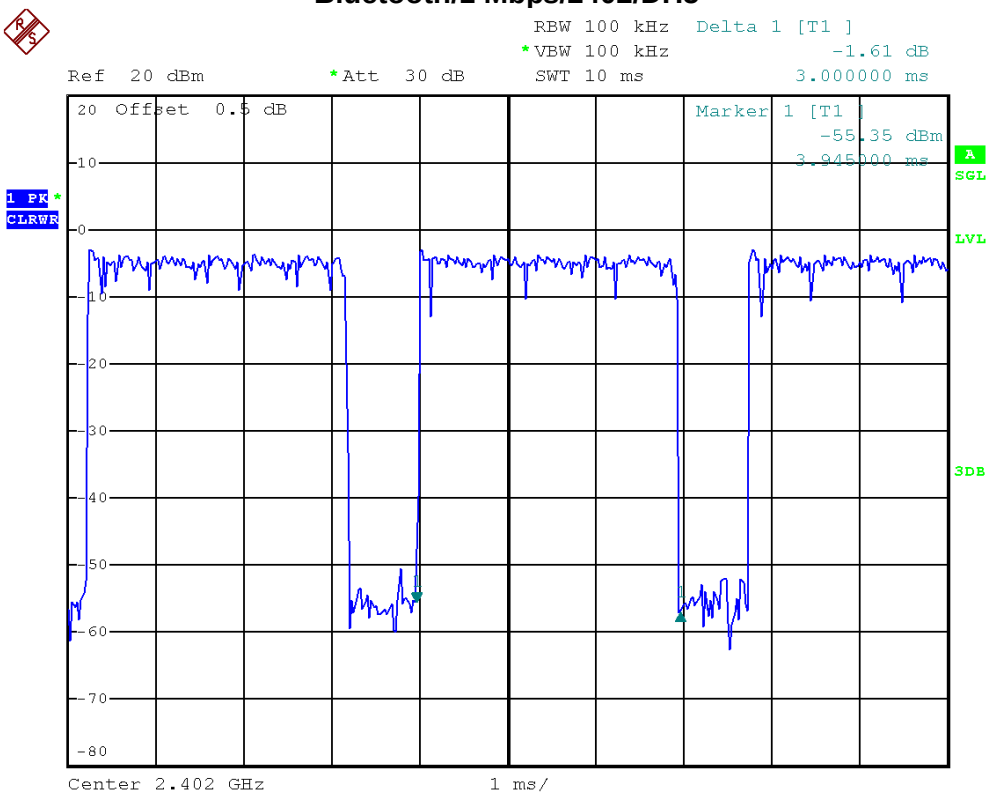
The EUT tested system was configured as the statements of **4.6** Unless otherwise a special operating condition is specified in the follows during the testing.

11.7TEST RESULTS

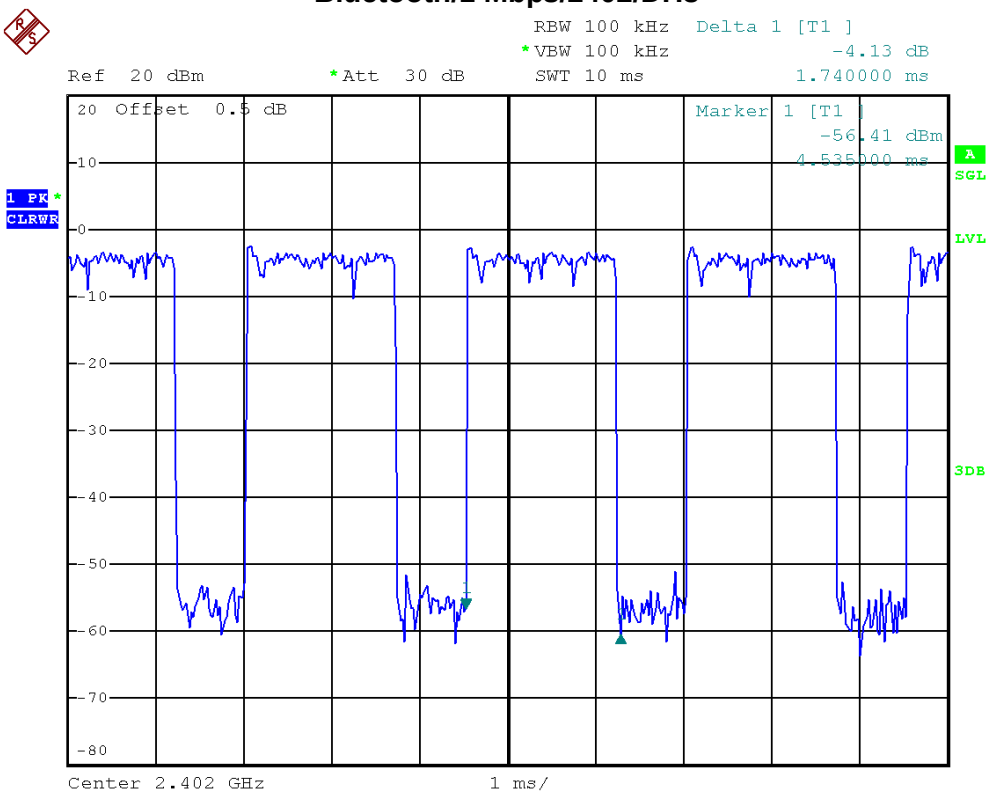
E.U.T	Laser Data Collector	Model Name	OPN-2002i
Temperature	26°C	Relative Humidity	46%
Test Voltage	DC 3.7V		
Test Mode	Bluetooth/1 Mbps/2402		

Data Packet	Frequency	Pulse Duration (ms)	Dwell Time (s)	Limit (s)	Result
DH5	2402	3.0000	0.3200	0.4	PASS
DH3	2402	1.7400	0.2784	0.4	PASS
DH1	2402	0.5200	0.1664	0.4	PASS

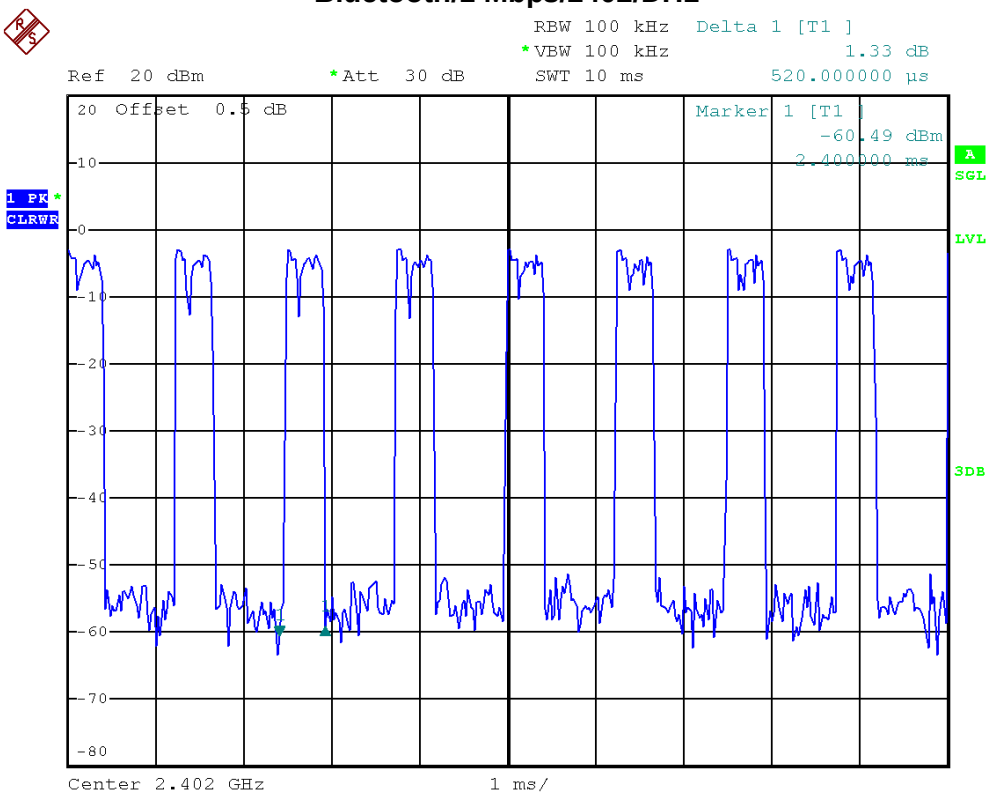
Bluetooth/1 Mbps/2402/DH5



Bluetooth/1 Mbps/2402/DH3



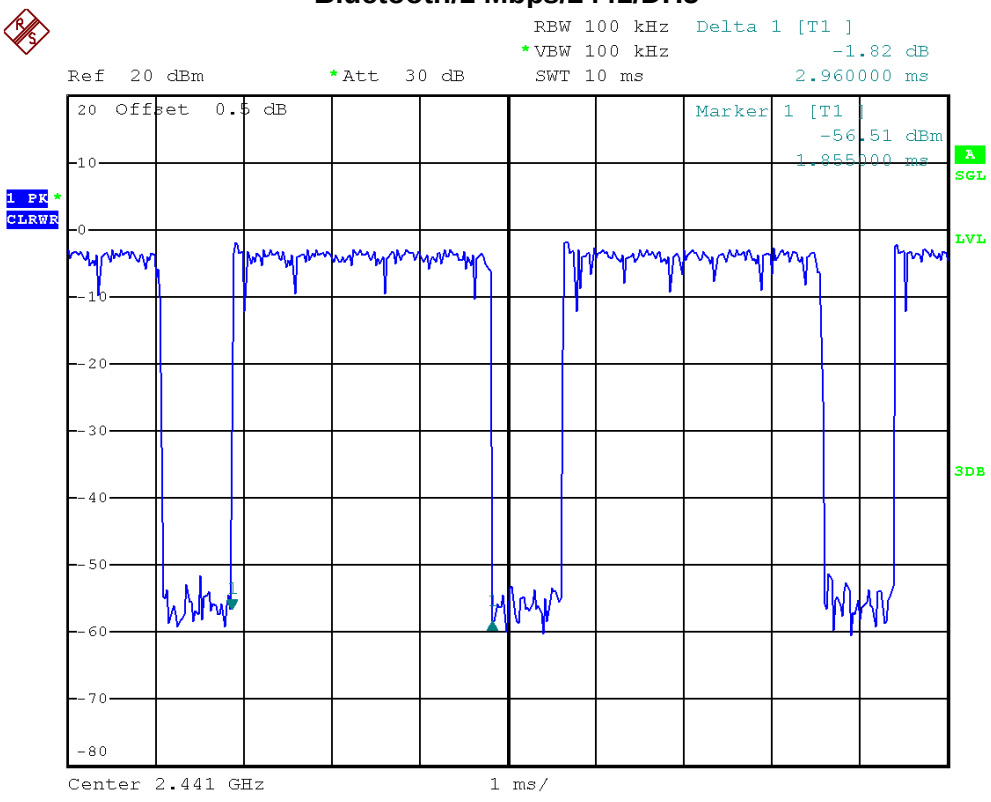
Bluetooth/1 Mbps/2402/DH1



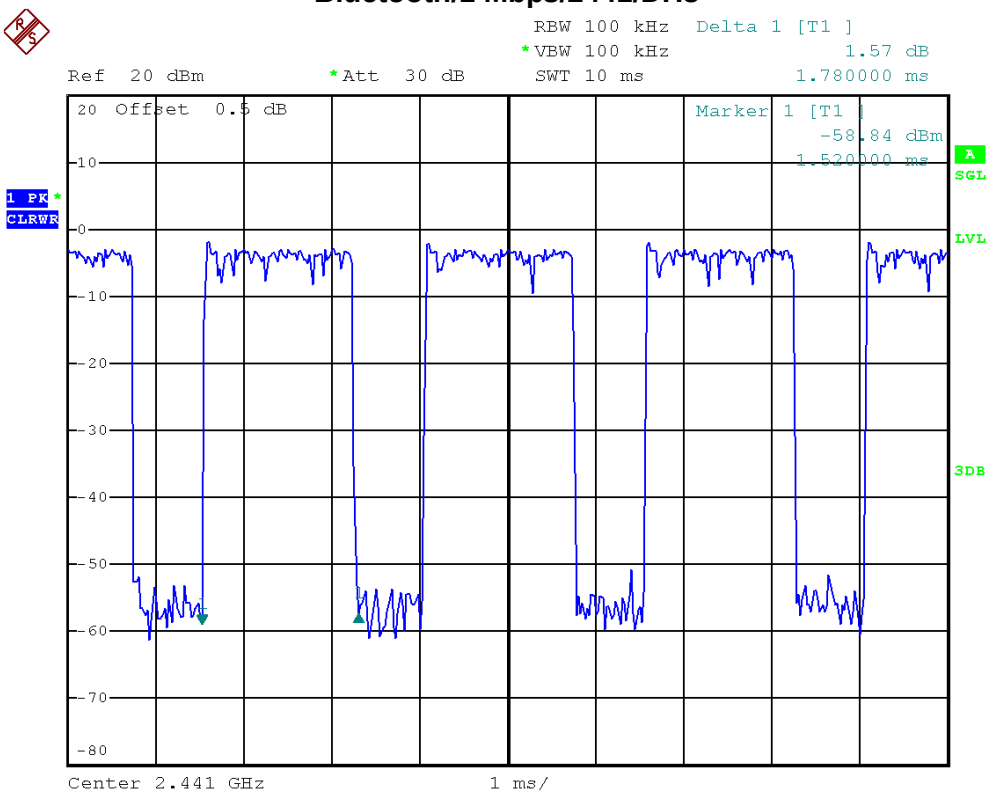
E.U.T	Laser Data Collector	Model Name	OPN-2002i
Temperature	26°C	Relative Humidity	46%
Test Voltage	DC 3.7V		
Test Mode	Bluetooth/1 Mbps/2441		

Data Packet	Frequency	Pulse Duration (ms)	Dwell Time (s)	Limit (s)	Result
DH5	2441	2.9600	0.3157	0.4	PASS
DH3	2441	1.7800	0.2848	0.4	PASS
DH1	2441	0.4600	0.1472	0.4	PASS

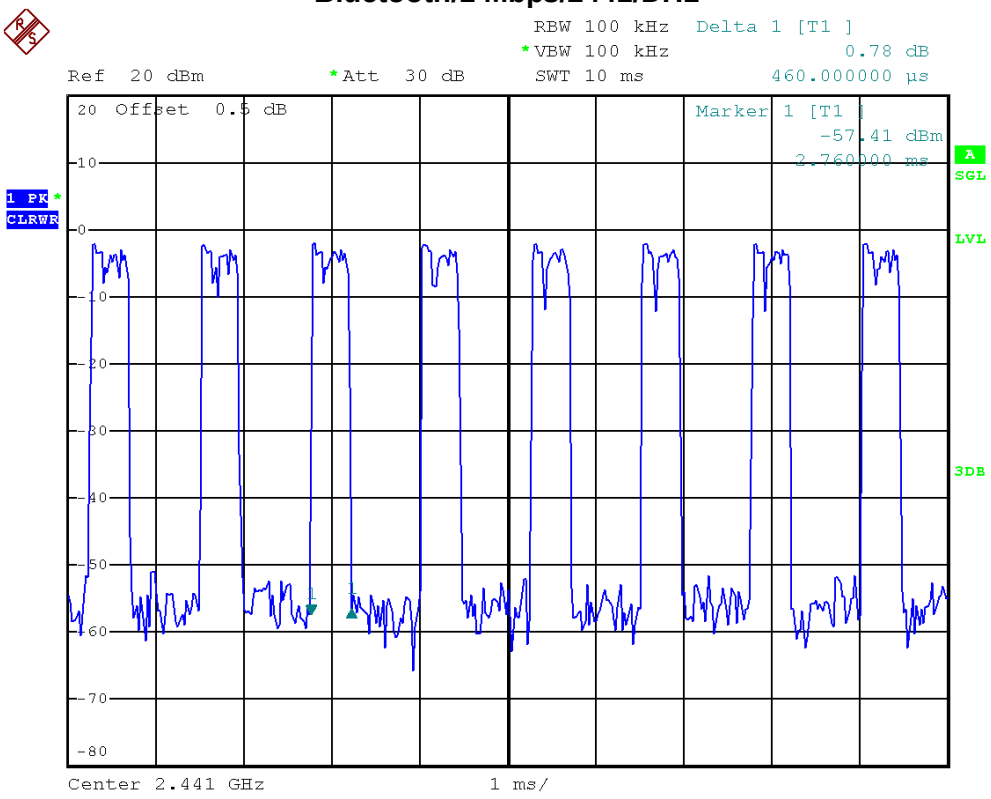
Bluetooth/1 Mbps/2441/DH5



Bluetooth/1 Mbps/2441/DH3



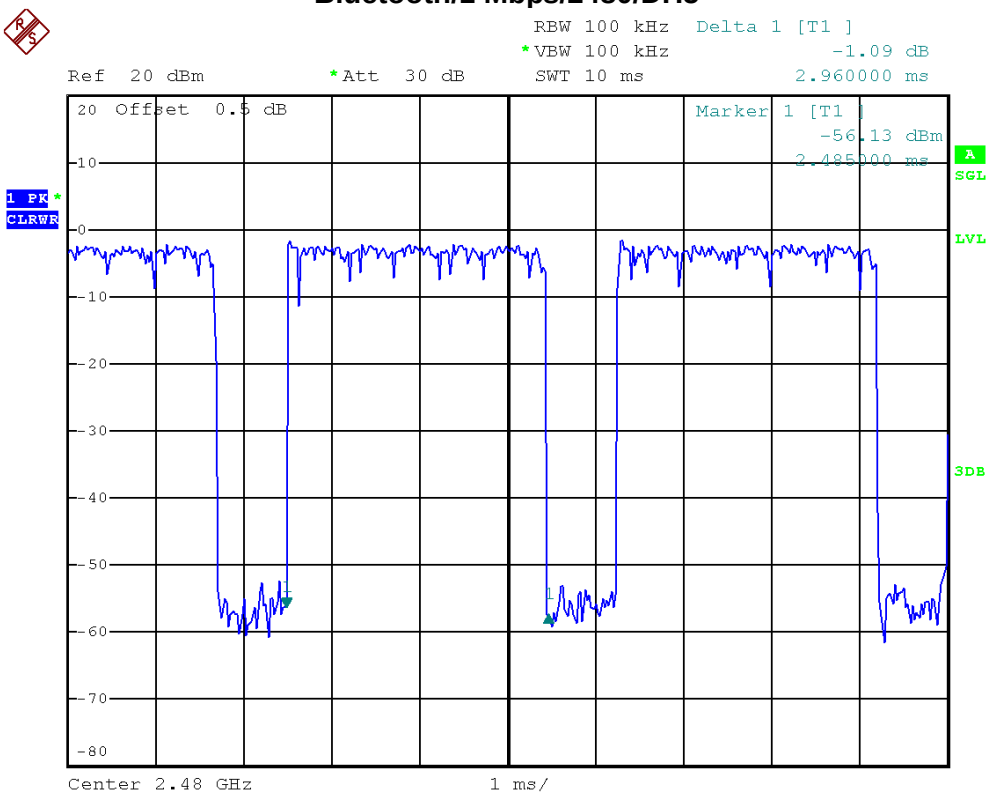
Bluetooth/1 Mbps/2441/DH1



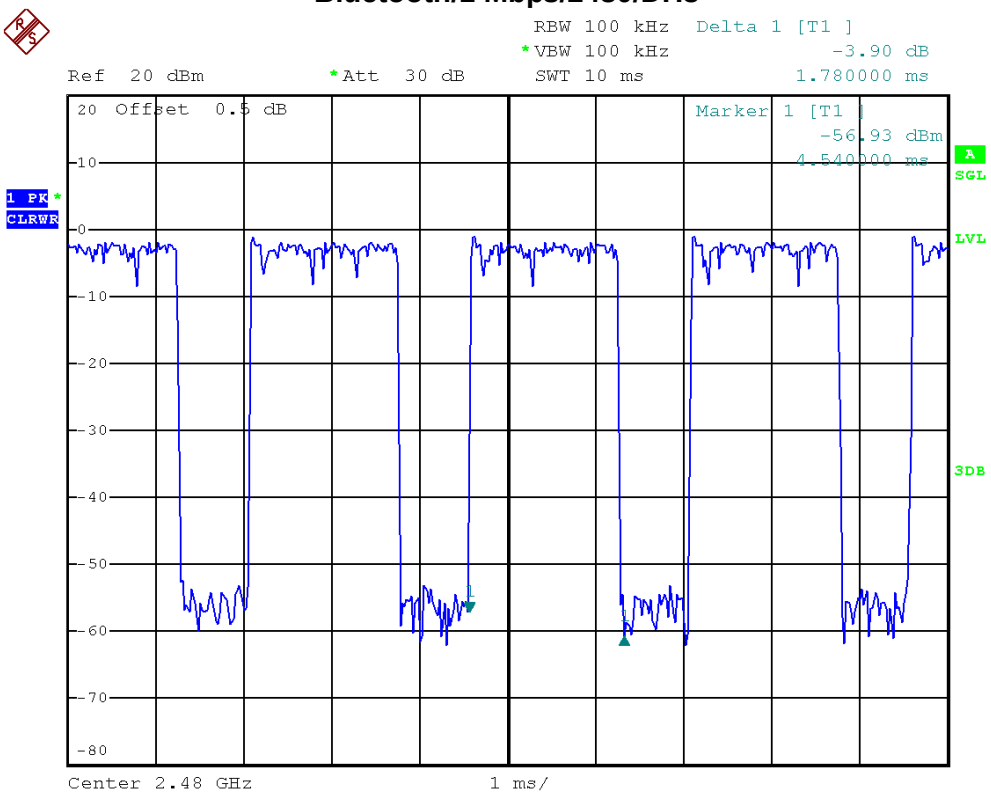
E.U.T	Laser Data Collector	Model Name	OPN-2002i
Temperature	26°C	Relative Humidity	46%
Test Voltage	DC 3.7V		
Test Mode	Bluetooth/1 Mbps/2480		

Data Packet	Frequency	Pulse Duration (ms)	Dwell Time (s)	Limit (s)	Result
DH5	2480	2.9600	0.3157	0.4	PASS
DH3	2480	1.7800	0.2848	0.4	PASS
DH1	2480	0.5200	0.1664	0.4	PASS

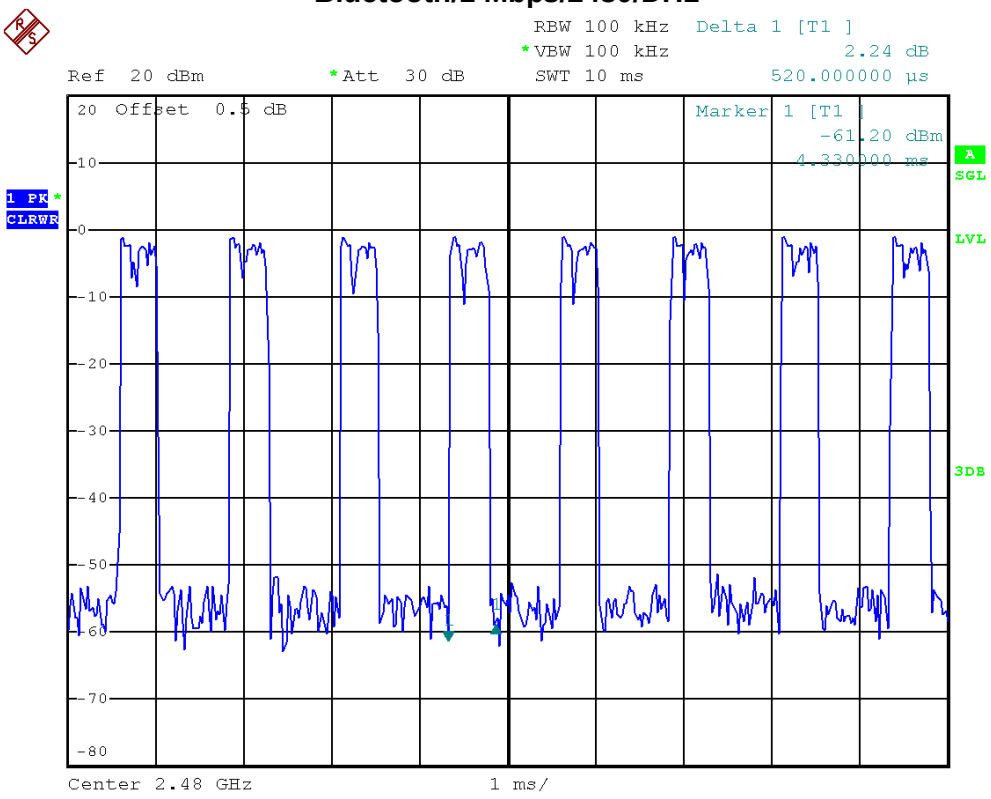
Bluetooth/1 Mbps/2480/DH5



Bluetooth/1 Mbps/2480/DH3



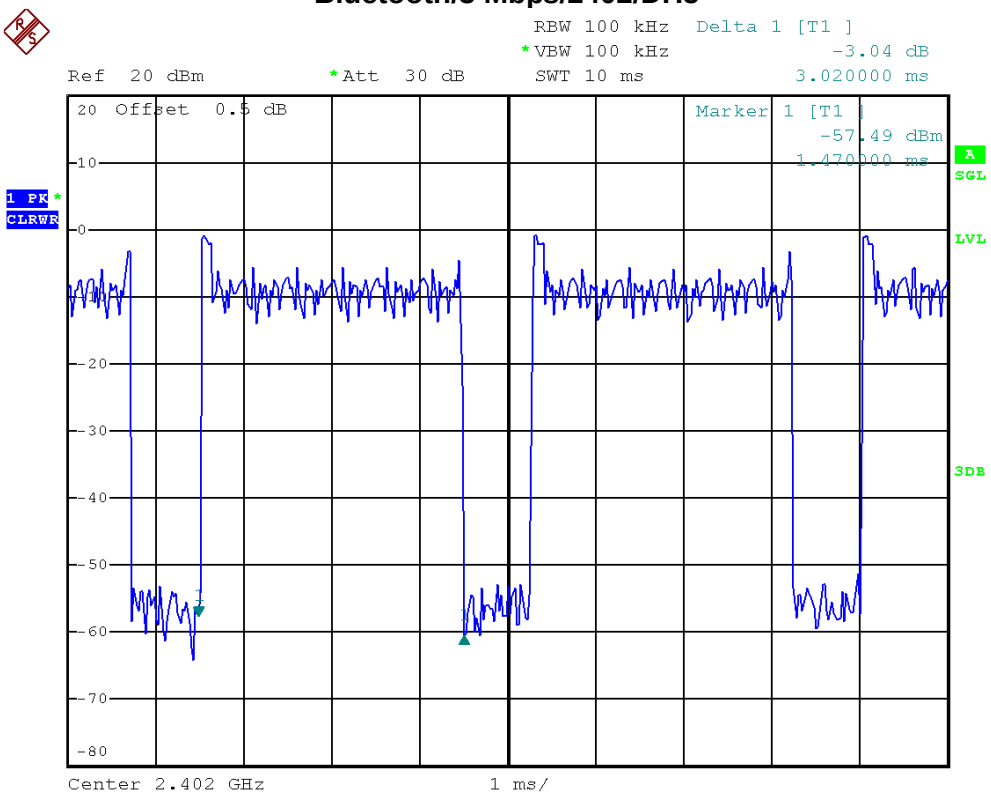
Bluetooth/1 Mbps/2480/DH1



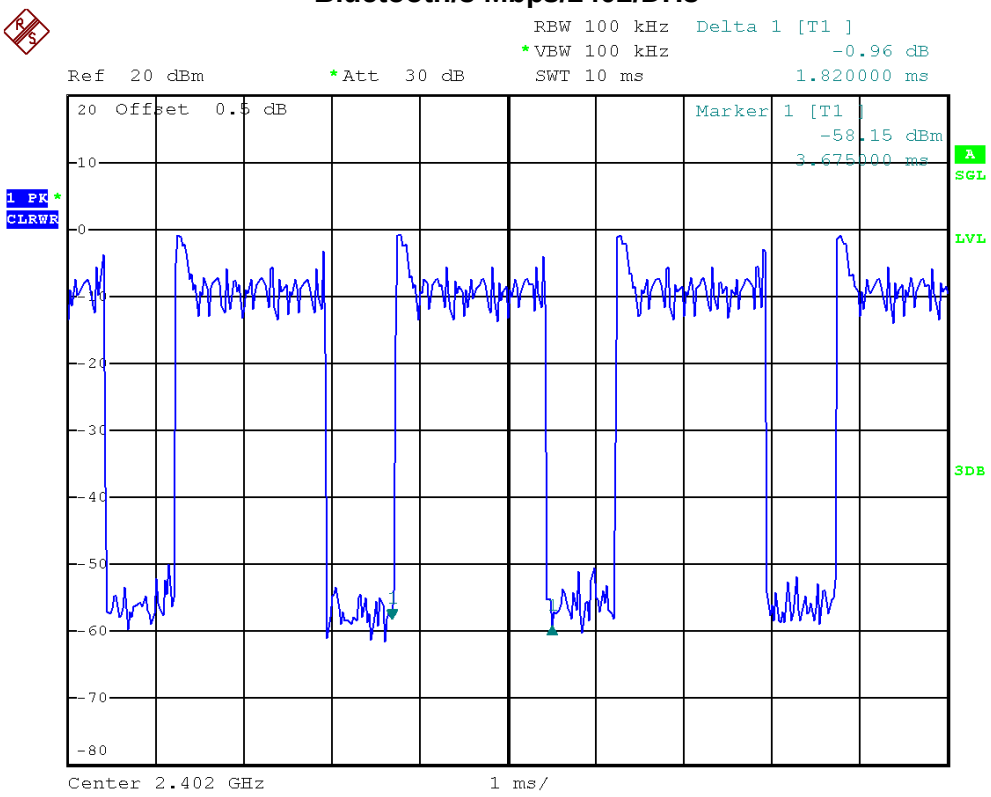
E.U.T	Laser Data Collector	Model Name	OPN-2002i
Temperature	26°C	Relative Humidity	46%
Test Voltage	DC 3.7V		
Test Mode	Bluetooth/3 Mbps/2402		

Data Packet	Frequency	Pulse Duration (ms)	Dwell Time (s)	Limit (s)	Result
DH5	2402	3.0200	0.3221	0.4	PASS
DH3	2402	1.8200	0.2912	0.4	PASS
DH1	2402	0.5000	0.1600	0.4	PASS

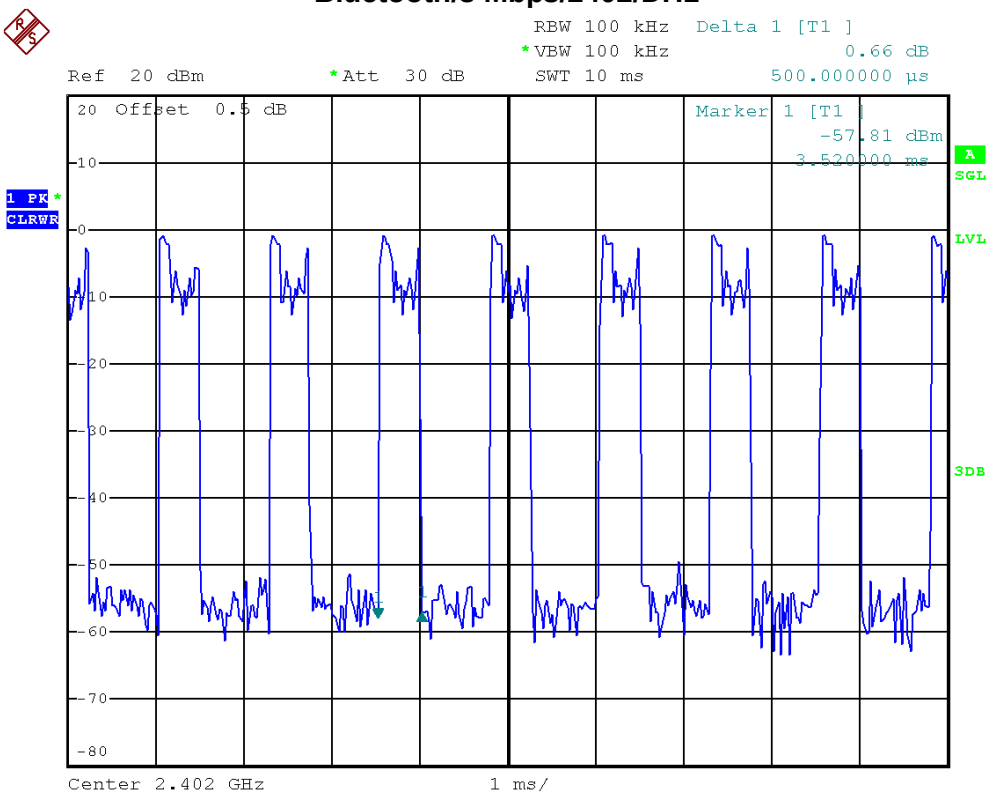
Bluetooth/3 Mbps/2402/DH5



Bluetooth/3 Mbps/2402/DH3



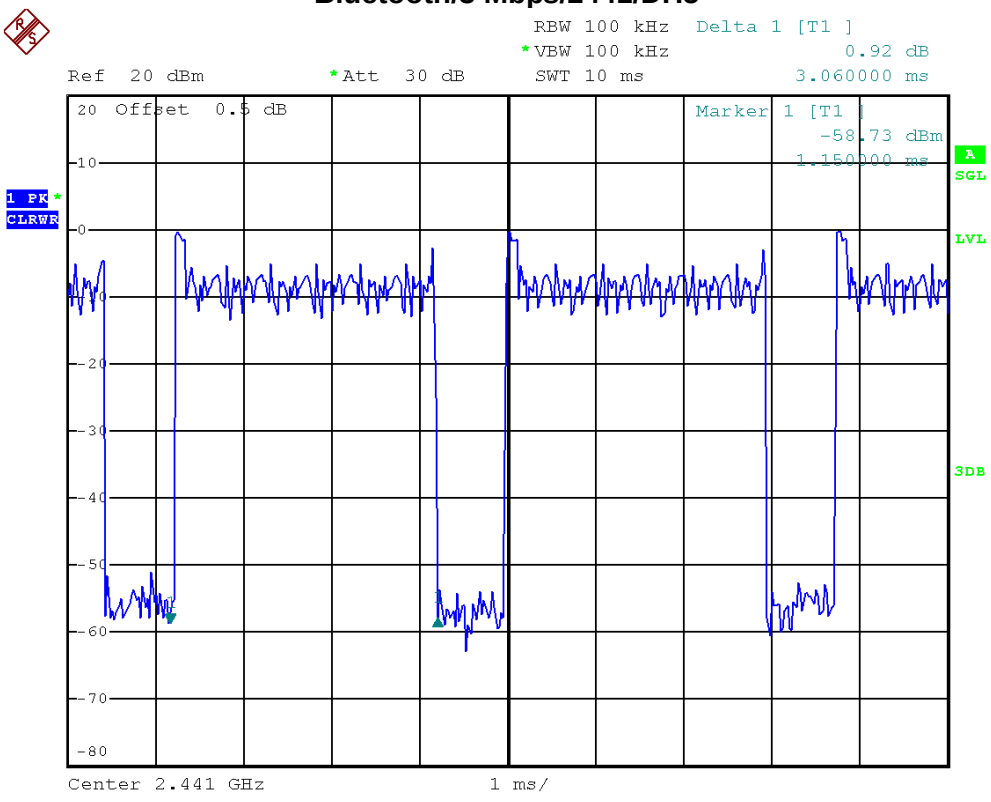
Bluetooth/3 Mbps/2402/DH1



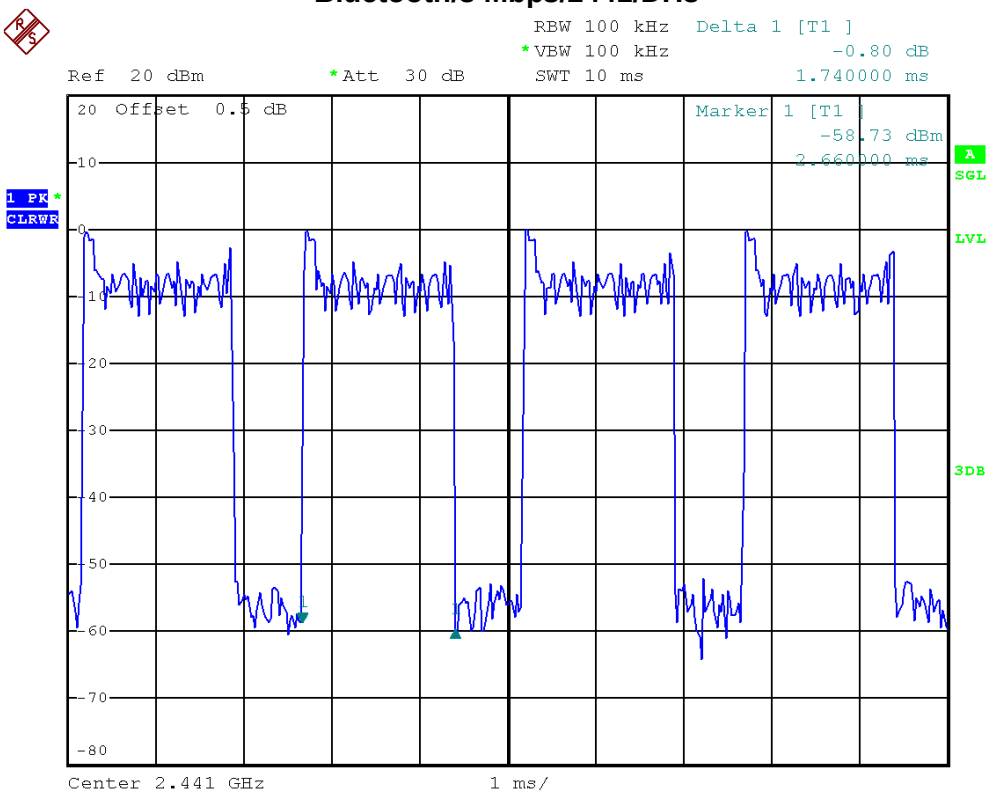
E.U.T	Laser Data Collector	Model Name	OPN-2002i
Temperature	26°C	Relative Humidity	46%
Test Voltage	DC 3.7V		
Test Mode	Bluetooth/3 Mbps/2441		

Data Packet	Frequency	Pulse Duration (ms)	Dwell Time (s)	Limit (s)	Result
DH5	2441	3.0600	0.3264	0.4	PASS
DH3	2441	1.7400	0.2784	0.4	PASS
DH1	2441	0.6200	0.1984	0.4	PASS

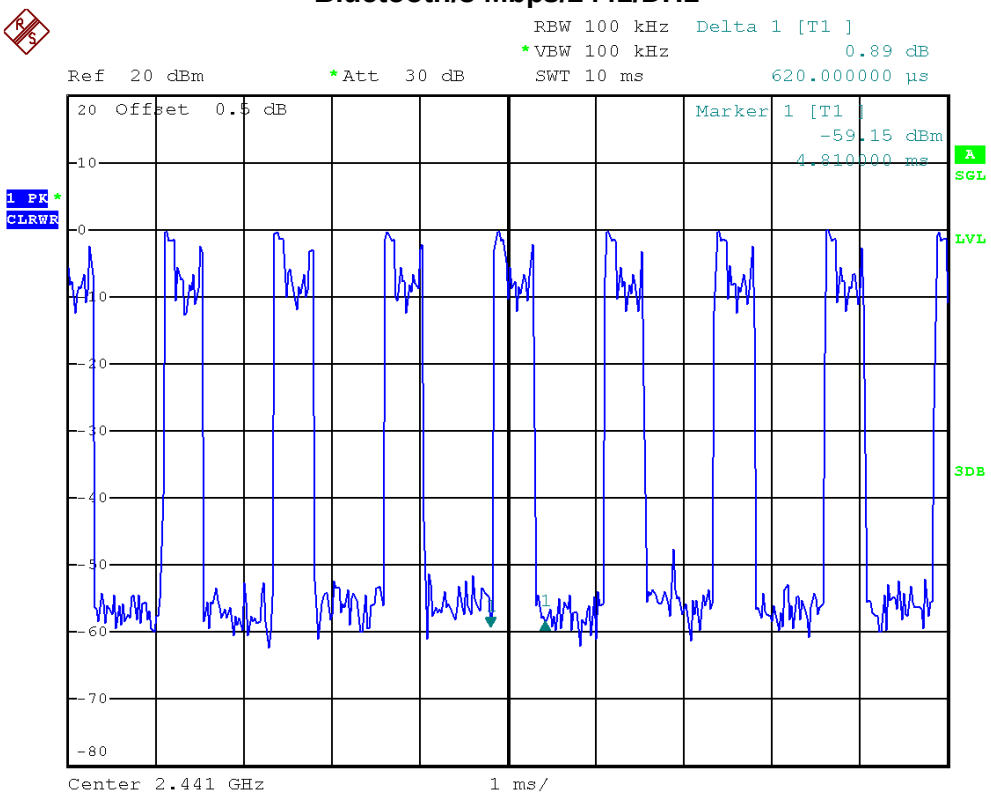
Bluetooth/3 Mbps/2441/DH5



Bluetooth/3 Mbps/2441/DH3



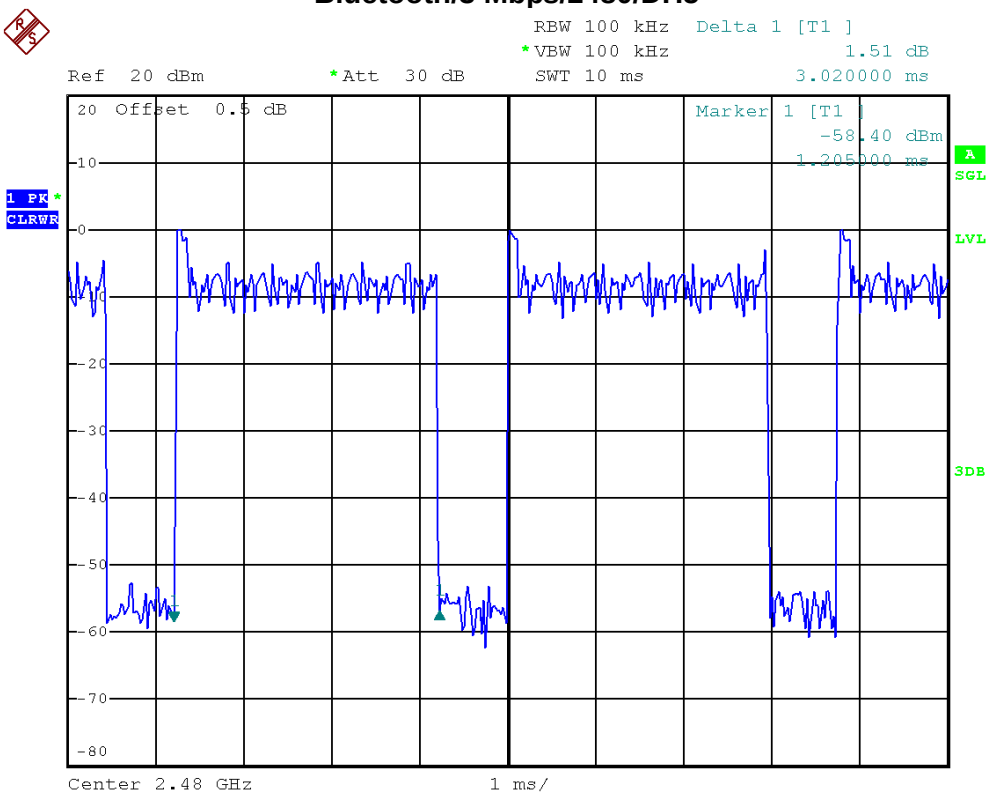
Bluetooth/3 Mbps/2441/DH1



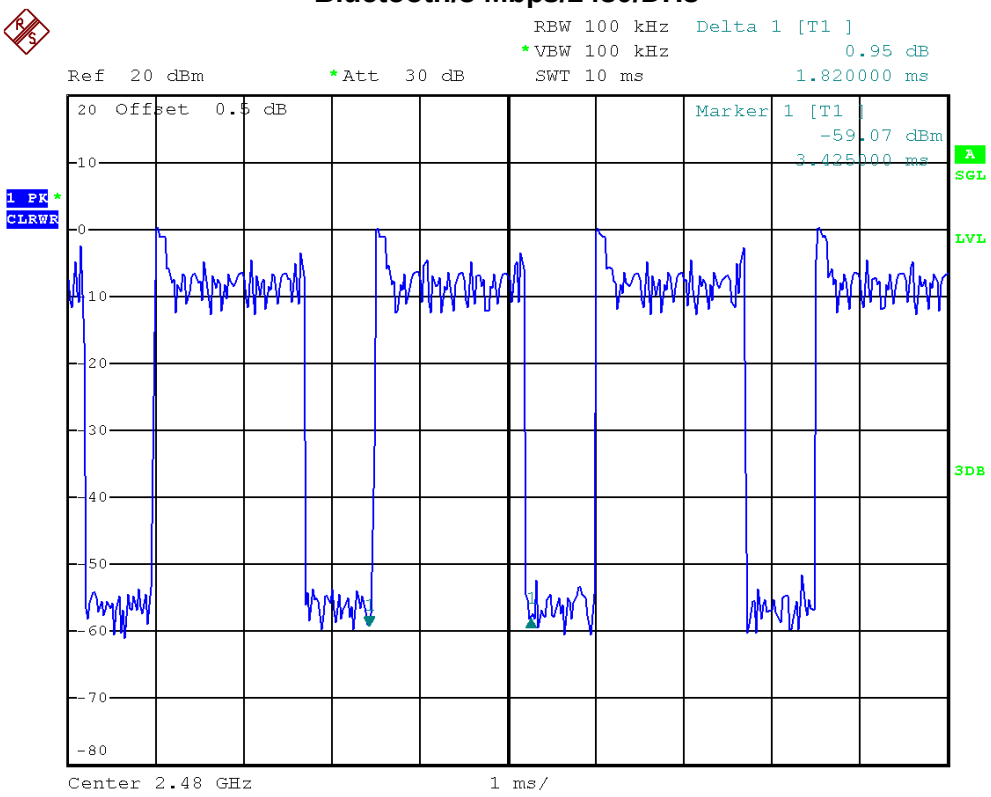
E.U.T	Laser Data Collector	Model Name	OPN-2002i
Temperature	26°C	Relative Humidity	46%
Test Voltage	DC 3.7V		
Test Mode	Bluetooth/3 Mbps/2480		

Data Packet	Frequency	Pulse Duration (ms)	Dwell Time (s)	Limit (s)	Result
DH5	2480	3.0200	0.3221	0.4	PASS
DH3	2480	1.8200	0.2912	0.4	PASS
DH1	2480	0.5800	0.1856	0.4	PASS

Bluetooth/3 Mbps/2480/DH5



Bluetooth/3 Mbps/2480/DH3



Bluetooth/3 Mbps/2480/DH1