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Shenzhen Branch

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TEST REPORT

Application No.:	SZEM1701000241CR
Applicant:	Gibson Innovations Limited
Address of Applicant:	5/F, Philips Electronics Building, 5 Science Part East Avenue, Hong Kong Science Park, Shatin, N.T. Hong Kong
Manufacturer:	Gibson Innovations Limited
Address of Manufacturer:	5/F, Philips Electronics Building, 5 Science Part East Avenue, Hong Kong Science Park, Shatin, N.T. Hong Kong
Factory:	Minami Acoustics Limited
Address of Factory:	NO.13, Maonan Road, Torch Development District, Zhongshan City, Guangdong Province, China.
Equipment Under Test (EUT):	
EUT Name:	Bluetooth Headphones
Model No.:	"SHB3075, SHB3075YY/XX, SHB3075BK/27, SHB3075WT/27, SHB3075RD/27, SHB3075BL/27" (X = 0 to 9, Y = A to Z for marketing purpose) ♣
♣	Please refer to section 2 of this report which indicates which model was actually tested and which were electrically identical.
Trade Mark:	Philips
FCC ID:	2AANUSHB3075
Standards:	47 CFR Part 15, Subpart C (2016)
Date of Receipt:	2017-01-10
Date of Test:	2017-01-11 to 2017-01-14
Date of Issue:	2017-01-18
Test Result :	**PASS***

* In the configuration tested, the EUT complied with the standards specified above.

Jack Zhang
EMC Laboratory Manager

The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report.
If the product in this report is used in any configuration other than that detailed in the report, the manufacturer must ensure the new system complies with all relevant standards. Any mention of SGS International Electrical Approvals or testing done by SGS International Electrical Approvals in connection with, distribution or use of the product described in this report must be approved by SGS International Electrical Approvals in writing.
The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the federal government. All test results in this report can be traceable to National or International Standards.

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Revision Record				
Version	***Chapter***	***Date***	***Modifier***	***Remark***
01		*2017-01-18*		*Original*

Authorized for issue by:				
Tested By		Bill Chen **(Bill Chen) /Project Engineer**		2017-01-14 **Date**
Checked By		Eric Fu **(Eric Fu) /Reviewer**		2017-01-18 **Date**

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2 Test Summary

Radio Spectrum Technical Requirement				
Item	**Standard**	**Method**	**Requirement**	**Result**
Antenna Requirement	47 CFR Part 15, Subpart C 15.247	N/A	47 CFR Part 15, Subpart C 15.203 & 15.247(c)	Pass
Other requirements Frequency Hopping Spread Spectrum System Hopping Sequence	47 CFR Part 15, Subpart C 15.247	N/A	47 CFR Part 15, Subpart C 15.247(a)(1),(g),(h)	Pass

Radio Spectrum Matter Part				
Item	**Standard**	**Method**	**Requirement**	**Result**
Conducted Disturbance at AC Power Line (150kHz-30MHz)	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 6.2	47 CFR Part 15, Subpart C 15.207	Pass
20dB Bandwidth	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 7.8.7	47 CFR Part 15, Subpart C 15.247(a)(1)	Pass
Conducted Peak Output Power	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 7.8.5	47 CFR Part 15, Subpart C 15.247(b)(1)	Pass
Carrier Frequencies Separation	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 7.8.2	47 CFR Part 15, Subpart C 15.247a(1)	Pass
Hopping Channel Number	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 7.8.3	47 CFR Part 15, Subpart C 15.247a(1)(iii)	Pass
Dwell Time	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 7.8.4	47 CFR Part 15, Subpart C 15.247a(1)(iii)	Pass
Conducted Spurious Emissions	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 7.8.8	47 CFR Part 15, Subpart C 15.247(d)	Pass
Radiated Spurious Emissions	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 6.4,6.5,6.6	47 CFR Part 15, Subpart C 15.205 & 15.209	Pass
Radiated Emissions which fall in the restricted bands	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 6.10.5	47 CFR Part 15, Subpart C 15.205 & 15.209	Pass
Conducted Band Edges Measurement	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 7.8.6	47 CFR Part 15, Subpart C 15.247(d)	Pass

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Remark:

Model No.: “SHB3075, SHB3075YY/XX, SHB3075BK/27, SHB3075WT/27, SHB3075RD/27, SHB3075BL/27” (X = 0 to 9, Y = A to Z for marketing purpose)

Only the model SHB3075 was tested, since the electrical circuit design, layout, components used and internal wiring were identical for the above models, only different on model name and color.

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4 General Information

4.1 Details of E.U.T.

Operation Frequency:	2402MHz~2480MHz
Bluetooth Version:	V4.1 Classic mode
Modulation Technique:	Frequency Hopping Spread Spectrum(FHSS)
Modulation Type:	GFSK, π/4DQPSK, 8DPSK
Number of Channel:	79
Hopping Channel Type:	Adaptive Frequency Hopping systems
Sample Type:	Portable production
Antenna Type:	Integral
Antenna Gain:	0dBi
Power Supply:	Internal rechargeable battery: DC 3.7V 240mAh Charge by USB DC 5V
Test Voltage:	AC 120V 60Hz
Cable:	USB cable: 50cm unshielded

4.2 Description of Support Units

Description	Manufacturer	Model No.	Serial No.
Adapter	Apple	A1357 W010A051	REF. No.SEA0500

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4.3 Measurement Uncertainty

No.	Item	Measurement Uncertainty
1	Radio Frequency	7.25 x 10-8
2	Timeout	2s
3	Duty cycle	0.37%
4	Occupied Bandwidth	3%
5	RF conducted power	0.75dB
6	RF power density	2.84dB
7	Conducted Spurious emissions	0.75dB
8	RF Radiated power	4.5dB (below 1GHz)
		4.8dB (above 1GHz)
9	Radiated Spurious emission test	4.5dB (30MHz-1GHz)
		4.8dB (1GHz-18GHz)
10	Conduction emission	3.45dB (9kHz to 150kHz)
		3.0dB (150kHz to 30MHz)
11	Temperature test	1℃
12	Humidity test	3%
13	Supply voltages	1.5%
13	Time	3%

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4.4 Standards Applicable for Testing

Table 1 : Tests Carried Out Under 47 CFR Part 15, Subpart C 15.247

Item	Status
Conducted Disturbance at AC Power Line(150kHz-30MHz)	√
20dB Bandwidth	√
Conducted Peak Output Power	√
Carrier Frequencies Separation	√
Hopping Channel Number	√
Dwell Time	√
Minimum 6dB Bandwidth	×
Power Spectrum Density	×
Conducted Spurious Emissions	√
Radiated Spurious Emissions	√
Radiated Emissions which fall in the restricted bands	√
Conducted Band Edges Measurement	√
Antenna Requirement	√
Other requirements Frequency Hopping Spread Spectrum System Hopping Sequence	√

× Indicates that the test is not applicable
√ Indicates that the test is applicable

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4.5 Test Location

All tests were performed at:

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen Branch

No. 1 Workshop, M-10, Middle Section, Science & Technology Park, Shenzhen, Guangdong, China. 518057.

Tel: +86 755 2601 2053 Fax: +86 755 2671 0594

No tests were sub-contracted.

4.6 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

• **CNAS (No. CNAS L2929)**

CNAS has accredited SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch EMC Lab to ISO/IEC 17025:2005 General Requirements for the Competence of Testing and Calibration Laboratories (CNAS-CL01 Accreditation Criteria for the Competence of Testing and Calibration Laboratories) for the competence in the field of testing.

• **A2LA (Certificate No. 3816.01)**

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory is accredited by the American Association for Laboratory Accreditation(A2LA). Certificate No. 3816.01.

• **VCCI**

The 10m Semi-anechoic chamber and Shielded Room of SGS-CSTC Standards Technical Services Co., Ltd. have been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: G-823, R-4188, T-1153 and C-2383 respectively.

• **FCC – Registration No.: 556682**

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration No.: 556682.

• **Industry Canada (IC)**

Two 3m Semi-anechoic chambers and the 10m Semi-anechoic chamber of SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch EMC Lab have been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 4620C-1, 4620C-2, 4620C-3.

4.7 Deviation from Standards

None

4.8 Abnormalities from Standard Conditions

None

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5 Equipment List

Conducted Disturbance at AC Power Line(150kHz-30MHz)					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
Shielding Room	ZhongYu Electron	GB-88	SEM001-06	2016-05-13	2017-05-13
LISN	Rohde & Schwarz	ENV216	SEM007-01	2016-10-09	2017-10-09
LISN	ETS-LINDGREN	3816/2	SEM007-02	2016-04-25	2017-04-25
8 Line ISN	Fischer Custom Communications Inc.	FCC-TLISN-T8-02	EMC0120	2016-09-28	2017-09-28
4 Line ISN	Fischer Custom Communications Inc.	FCC-TLISN-T4-02	EMC0121	2016-09-28	2017-09-28
2 Line ISN	Fischer Custom	FCC-TLISN-T2-02	EMC0122	2016-09-28	2017-09-28

RF connected test					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
DC Power Supply	ZhaoXin	RXN-305D	SEM011-02	2016-10-09	2017-10-09
Spectrum Analyzer	Rohde & Schwarz	FSP	SEM004-06	2016-10-09	2017-10-09
Signal Generator	Rohde & Schwarz	SML03	SEM006-02	2016-04-25	2017-04-25
Power Meter	Rohde & Schwarz	NRVS	SEM014-02	2016-10-09	2017-10-09

RE in Chamber					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
10m Semi-Anechoic Chamber	SAEMC	FSAC1018	SEM001-03	2016-05-13	2017-05-13
EMI Test Receiver (9k-7GHz)	Rohde & Schwarz	ESR	SEM004-03	2016-04-25	2017-04-25
Trilog-Broadband Antenna(30M-1GHz)	Schwarzbeck	VULB9168	SEM003-18	2016-06-29	2019-06-29
Pre-amplifier	Sonoma Instrument Co	310N	SEM005-03	2016-07-06	2017-07-06
Loop Antenna	ETS-Lindgren	6502	SEM003-08	2015-08-14	2018-08-14

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RE in Chamber					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
3m Semi-Anechoic Chamber	AUDIX	N/A	SEM001-02	2016-05-13	2017-05-13
EXA Spectrum Analyzer	Agilent Technologies Inc	N9010A	SEM004-09	2016-07-19	2017-07-19
BiConiLog Antenna (26-3000MHz)	ETS-Lindgren	3142C	SEM003-02	2014-11-15	2017-11-15
Amplifier (0.1-1300MHz)	HP	8447D	SEM005-02	2016-10-09	2017-10-09
Horn Antenna (1-18GHz)	Rohde & Schwarz	HF907	SEM003-07	2015-06-14	2018-06-14
Horn Antenna (18-26GHz)	ETS-Lindgren	3160	SEM003-12	2014-11-24	2017-11-24
Horn Antenna(26GHz-40GHz)	A.H.Systems, inc.	SAS-573	SEM003-13	2015-02-12	2018-02-12
Low Noise Amplifier	Black Diamond Series	BDLNA-0118-352810	SEM005-05	2016-10-09	2017-10-09
Band filter	Amindeon	Asi 3314	SEM023-01	N/A	N/A

General used equipment					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
Humidity/ Temperature Indicator	Shanghai Meteorological Industry Factory	ZJ1-2B	SEM002-03	2016-10-12	2017-10-12
Humidity/ Temperature Indicator	Shanghai Meteorological Industry Factory	ZJ1-2B	SEM002-04	2016-10-12	2017-10-12
Humidity/ Temperature Indicator	Mingle	N/A	SEM002-08	2016-10-12	2017-10-12
Barometer	Changchun Meteorological Industry Factory	DYM3	SEM002-01	2016-05-18	2017-05-18

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6 Radio Spectrum Technical Requirement

6.1 Antenna Requirement

6.1.1 Test Requirement:

47 CFR Part 15, Subpart C 15.203 & 15.247(c)

6.1.2 Conclusion

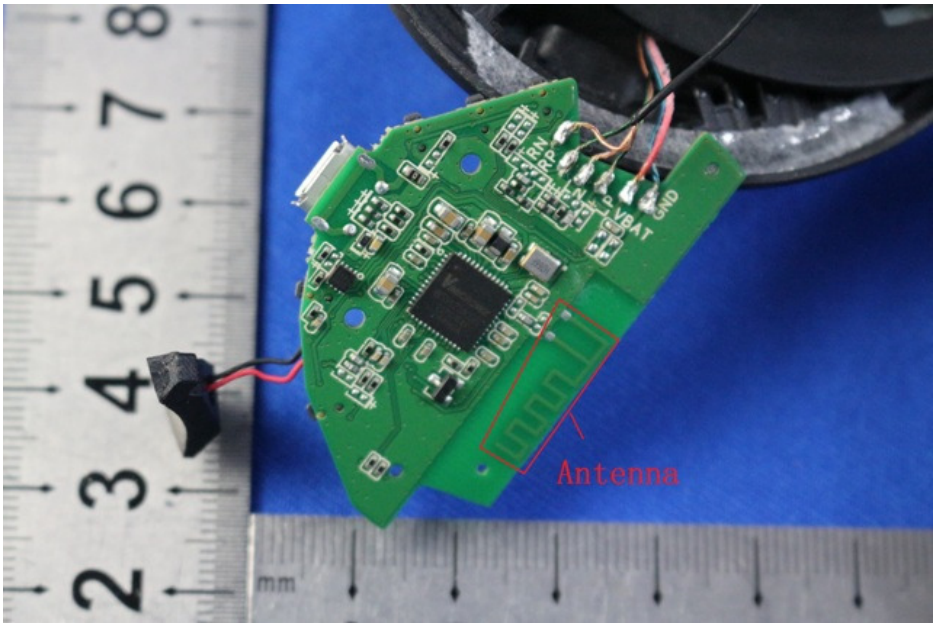
Standard Requirment:

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. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

15.247(b) (4) requirement:

The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

EUT Antenna:



The antenna is integrated on the main PCB and no consideration of replacement. The best case gain of the antenna is 0dBi.

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6.2 Other requirements Frequency Hopping Spread Spectrum System Hopping Sequence

6.2.1 Test Requirement:

47 CFR Part 15, Subpart C 15.247(a)(1),(g),(h)

6.2.2 Conclusion

Standard Requirment:

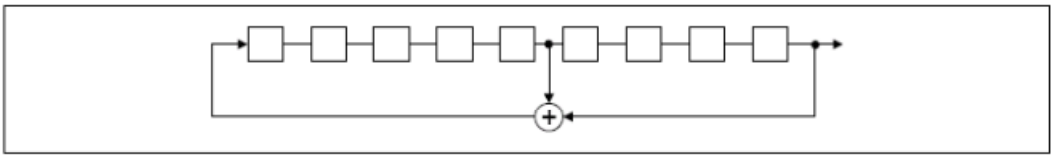
The system shall hop to channel frequencies that are selected at the system hopping rate from a Pseudorandom ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

Frequency hopping spread spectrum systems are not required to employ all available hopping channels during each transmission. However, the system, consisting of both the transmitter and the receiver, must be designed to comply with all of the regulations in this section should the transmitter be presented with a continuous data (or information) stream. In addition, a system employing short transmission bursts must comply with the definition of a frequency hopping system and must distribute its transmissions over the minimum number of hopping channels specified in this section.

The incorporation of intelligence within a frequency hopping spread spectrum system that permits the system to recognize other users within the spectrum band so that it individually and independently chooses and adapts its hopsets to avoid hopping on occupied channels is permitted. The coordination of frequency hopping systems in any other manner for the express purpose of avoiding the simultaneous occupancy of individual hopping frequencies by multiple transmitters is not permitted.

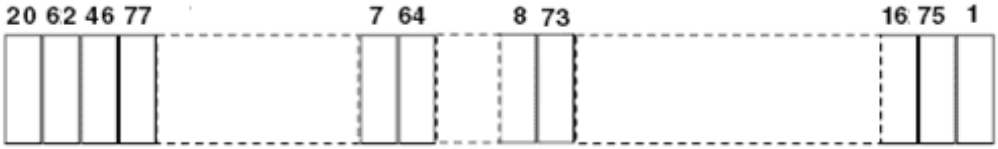
Compliance for section 15.247(a)(1):
According to Bluetooth Core Specification, the pseudorandom sequence may be generated in a nine-stage shift register whose 5th and 9th stage
outputs are added in a modulo-two addition stage. And the result is fed back to the input of the first stage. The sequence begins with the first ONE of 9 consecutive ONEs; i.e. the shift register is initialized with nine ones.

- Number of shift register stages: 9
- Length of pseudo-random sequence: 2^9 -1 = 511 bits
- Longest sequence of zeros: 8 (non-inverted signal)



Linear Feedback Shift Register for Generation of the PRBS sequence

An example of Pseudorandom Frequency Hopping Sequence as follow:



Each frequency used equally on the average by each transmitter.

According to Bluetooth Core Specification, Bluetooth receivers are designed to have input and IF bandwidths that match the hopping channel bandwidths of any Bluetooth transmitters and shift

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frequencies in synchronization with the transmitted signals.

Compliance for section 15.247(g)

According to Bluetooth Core Specification, the Bluetooth system transmits the packet with the pseudorandom hopping frequency with a continuous data and the short burst transmission from the Bluetooth system is also transmitted under the frequency hopping system with the pseudorandom hopping frequency system.

Compliance for section 15.247(h)

According to Bluetooth Core specification, the Bluetooth system incorporates with an adaptive system to detect other user within the spectrum band so that it individually and independently to avoid hopping on the occupied channels.

According to the Bluetooth Core specification, the Bluetooth system is designed not have the ability to coordinated with other FHSS System in an effort to avoid the simultaneous occupancy of individual hopping frequencies by multiple transmitter.

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7 Radio Spectrum Matter Test Results

7.1 Conducted Disturbance at AC Power Line(150kHz-30MHz)

Test Requirement: 47 CFR Part 15, Subpart C 15.207
Test Method: ANSI C63.10 (2013) Section 6.2
Limit:

Frequency of emission(MHz)	Conducted limit(dBμV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50
*Decreases with the logarithm of the frequency.		

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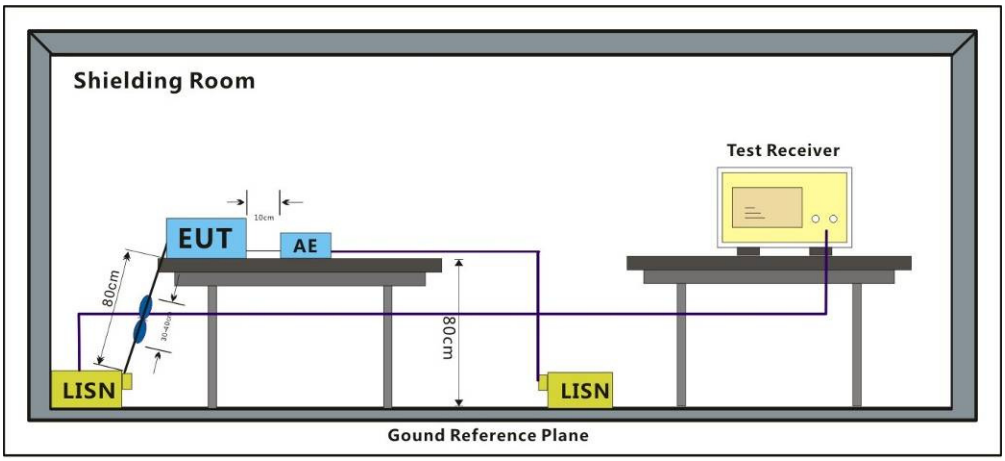
7.1.1 E.U.T. Operation

Operating Environment:

Temperature: 25.0 °C Humidity: 56 % RH Atmospheric Pressure: 1020 mbar

Test mode: b:Charge, Keep the EUT being charged by adapter. (The charge mode and transmitting mode can not work simultaneously. Only the charge mode is being performed on this test.)

7.1.2 Test Setup Diagram



7.1.3 Measurement Data

1) The mains terminal disturbance voltage test was conducted in a shielded room.

2) The EUT was connected to AC power source through a LISN 1 (Line Impedance Stabilization Network) which provides a 50ohm/50μH + 5ohm linear impedance. The power cables of all other units of the EUT were connected to a second LISN 2, which was bonded to the ground reference plane in the same way as the LISN 1 for the unit being measured. A multiple socket outlet strip was used to connect multiple power cables to a single LISN provided the rating of the LISN was not exceeded.

3) The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane,

4) The test was performed with a vertical ground reference plane. The rear of the EUT shall be 0.4 m from the vertical ground reference plane. The vertical ground reference plane was bonded to the horizontal ground reference plane. The LISN 1 was placed 0.8 m from the boundary of the unit under test and bonded to a ground reference plane for LISNs mounted on top of the ground reference plane. This distance was between the closest points of the LISN 1 and the EUT. All other units of the EUT and associated equipment was at least 0.8 m from the LISN 2.

5) In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10: 2013 on conducted measurement.

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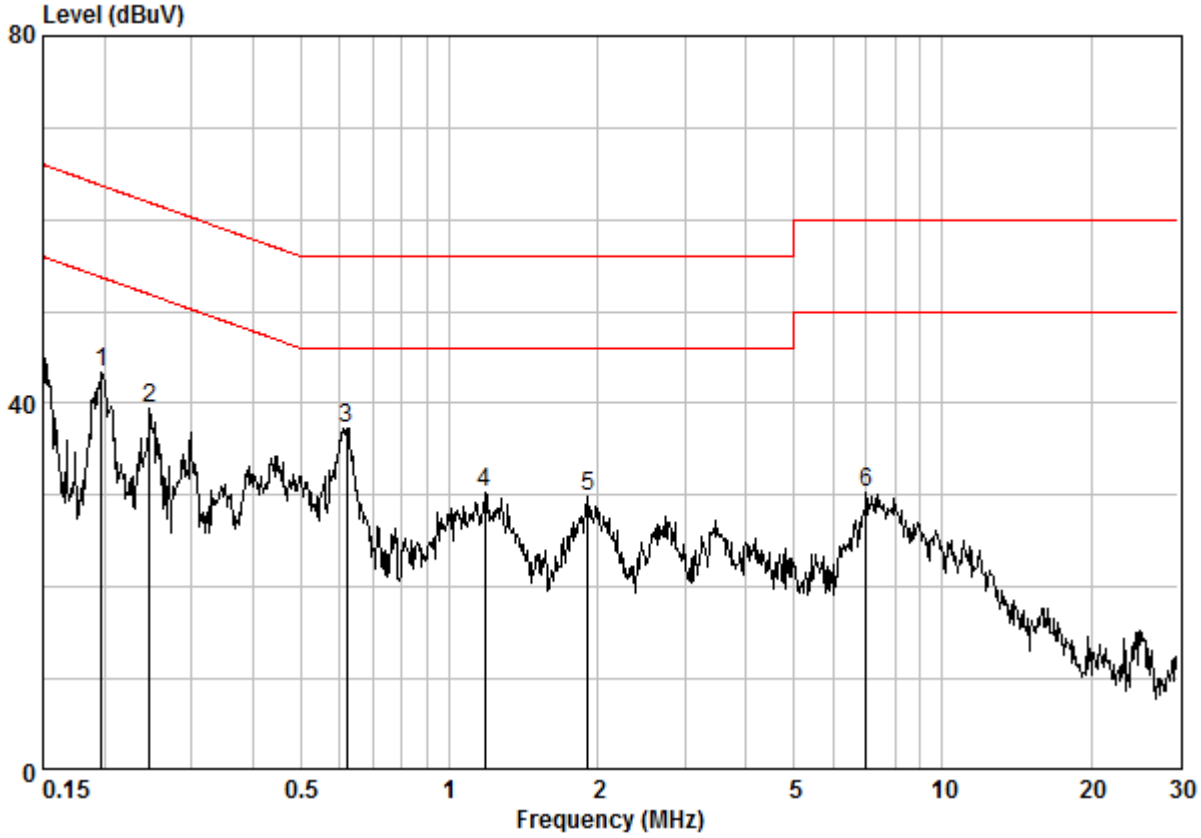
Mode:b;Line:Neutral Line



Site : Shielding Room
Condition : CE NEUTRAL
Job No. : 0241CR
Test Mode : b

	Freq	Cable Loss	LISN Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB	dBuV	dBuV	dBuV	dB	
1	0.19758	0.02	9.62	33.66	43.30	53.71	-10.41	Peak
2	0.24682	0.02	9.61	29.87	39.50	51.86	-12.36	Peak
3 @	0.62054	0.02	9.63	27.72	37.37	46.00	-8.63	Peak
4	1.178	0.03	9.65	20.66	30.34	46.00	-15.66	Peak
5	1.908	0.03	9.66	20.20	29.88	46.00	-16.12	Peak
6	6.988	0.08	9.74	20.44	30.26	50.00	-19.74	Peak

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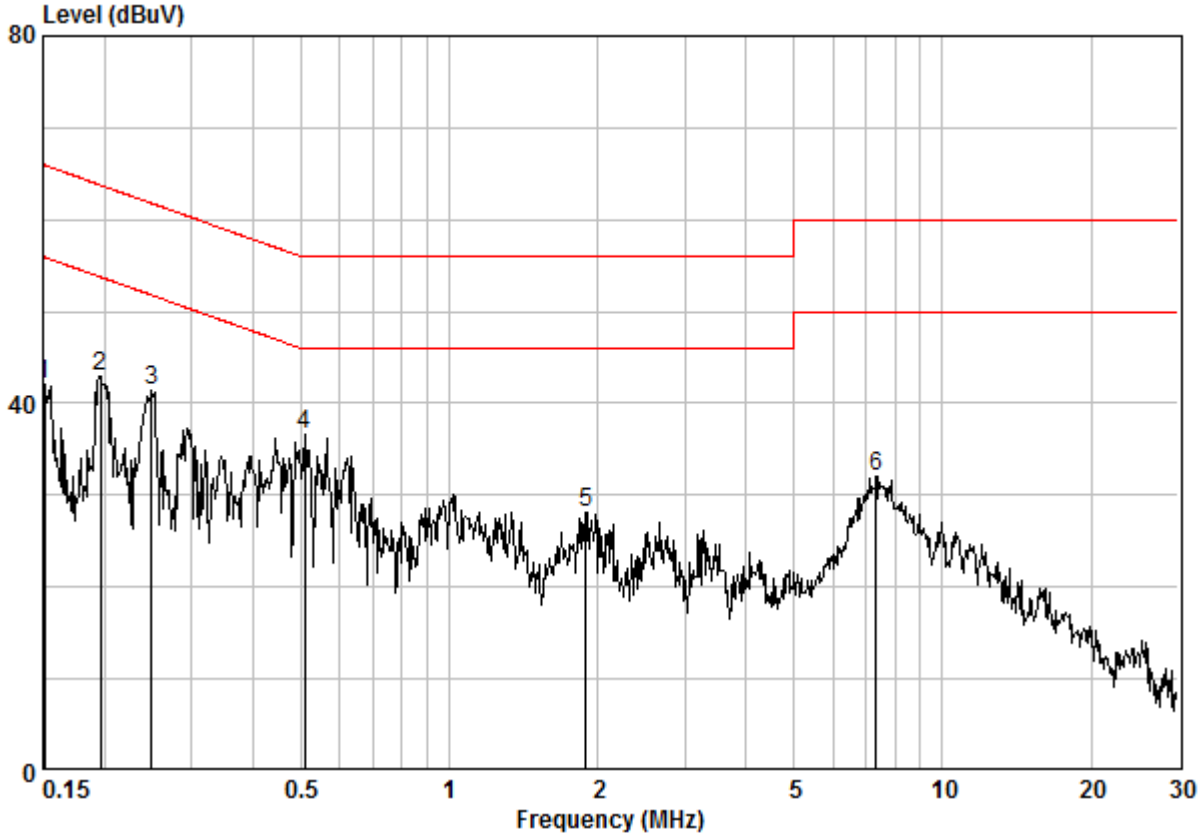
Mode:b;Line:Live Line



Site : Shielding Room
Condition : CE LINE
Job No. : 0241CR
Test Mode : b

	Freq	Cable Loss	LISN Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB	dBuV	dBuV	dBuV	dB	
1	0.15080	0.02	9.59	32.42	42.03	55.96	-13.93	Peak
2	0.19654	0.02	9.60	33.43	43.05	53.76	-10.71	Peak
3	0.24945	0.02	9.60	31.72	41.34	51.78	-10.44	Peak
4 @	0.51007	0.02	9.59	27.08	36.69	46.00	-9.31	Peak
5	1.888	0.03	9.63	18.51	28.17	46.00	-17.83	Peak
6	7.329	0.09	9.68	22.36	32.13	50.00	-17.87	Peak

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7.2 20dB Bandwidth

Test Requirement: 47 CFR Part 15, Subpart C 15.247(a)(1)

Test Method: ANSI C63.10 (2013) Section 7.8.7

7.2.1 E.U.T. Operation

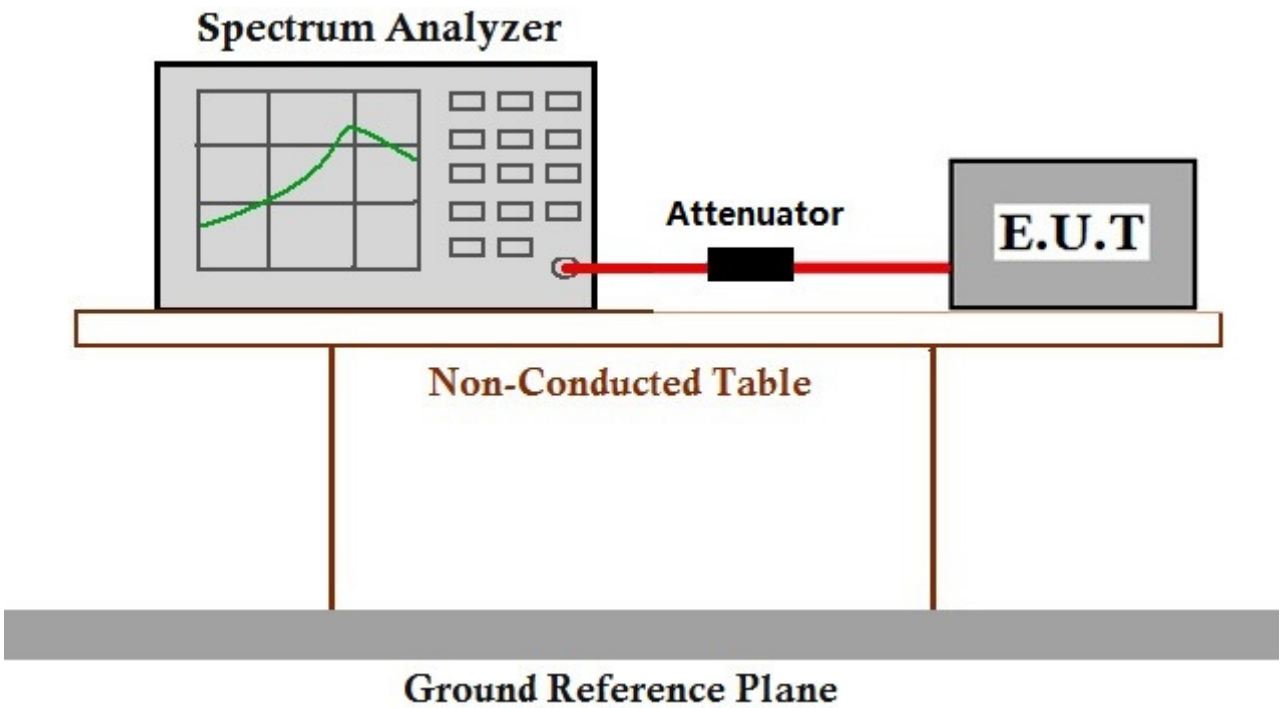
Operating Environment:

Temperature: 23.0 °C Humidity: 56 % RH Atmospheric Pressure: 1020 mbar

Exploratory Test Mode: Non-hopping transmitting with all kind of modulation and all kind of data type.

Final Test Mode: Through Pre-scan, find the DH1 of data type is the worst case of GFSK modulation type, 2-DH1 of data type is the worst case of π/4DQPSK modulation type, 3-DH1 of data type is the worst case of 8DPSK modulation type.

7.2.2 Test Setup Diagram



7.2.3 Measurement Data

The detailed test data see: Appendix 15.247

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7.3 Conducted Peak Output Power

Test Requirement: 47 CFR Part 15, Subpart C 15.247(b)(1)
Test Method: ANSI C63.10 (2013) Section 7.8.5
Limit:

Frequency range(MHz)	Output power of the intentional radiator(watt)
902-928	1 for ≥50 hopping channels
	0.25 for <50 hopping channels
	1 for digital modulation
2400-2483.5	1 for ≥75 non-overlapping hopping channels
	0.125 for all other frequency hopping systems
	1 for digital modulation
5725-5850	1 for frequency hopping systems and digital modulation

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7.3.1 E.U.T. Operation

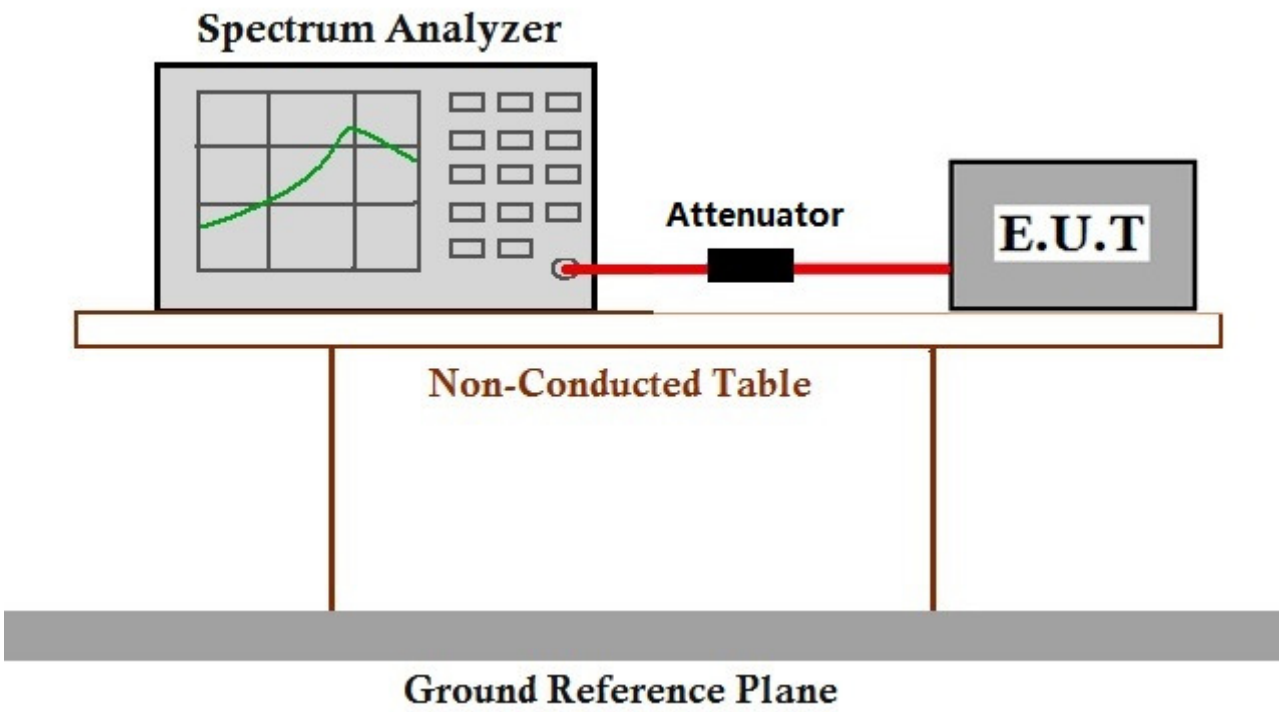
Operating Environment:

Temperature: 23.0 °C Humidity: 56 % RH Atmospheric Pressure: 1020 mbar

Exploratory Test Mode: Non-hopping transmitting with all kind of modulation and all kind of data type.

Final Test Mode: Through Pre-scan, find the DH1 of data type is the worst case of GFSK modulation type, 2-DH1 of data type is the worst case of π/4DQPSK modulation type, 3-DH1 of data type is the worst case of 8DPSK modulation type.

7.3.2 Test Setup Diagram



7.3.3 Measurement Data

The detailed test data see: Appendix 15.247

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7.4 Carrier Frequencies Separation

Test Requirement:	47 CFR Part 15, Subpart C 15.247a(1)
Test Method:	ANSI C63.10 (2013) Section 7.8.2
Limit:	2/3 of the 20dB bandwidth base on the transmission power is less than 0.125W

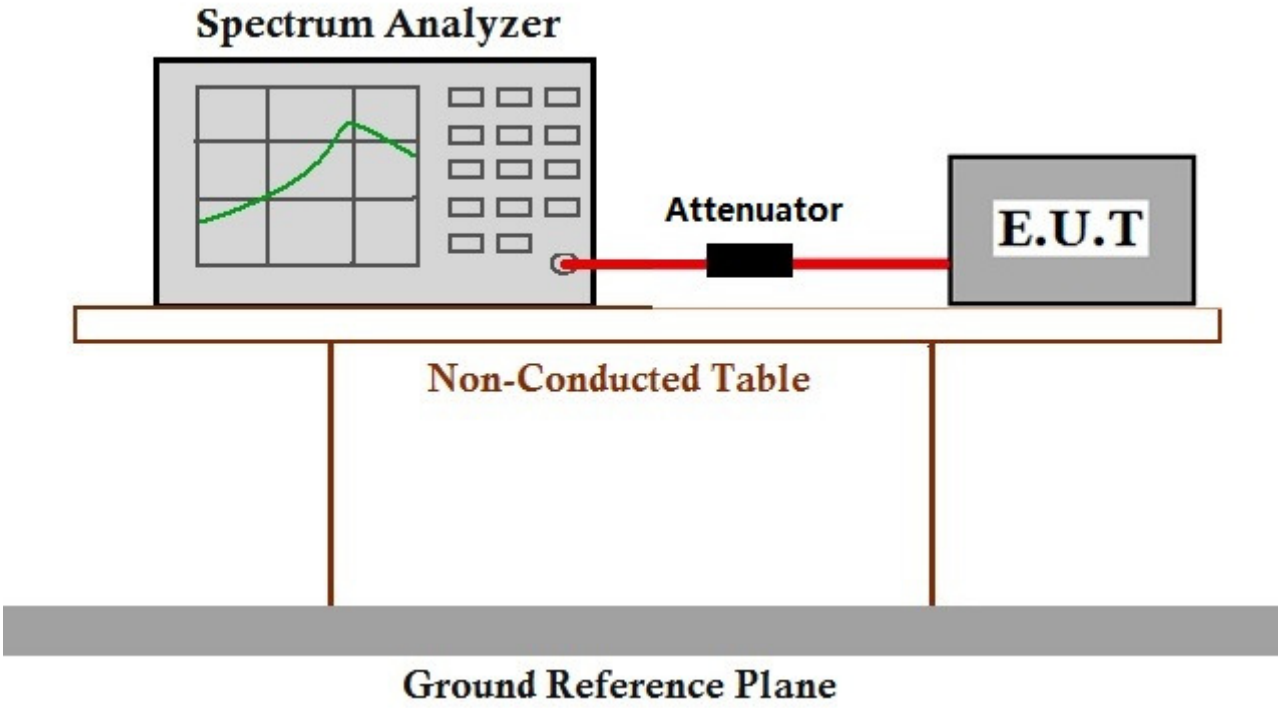
7.4.1 E.U.T. Operation

Operating Environment:

Temperature:	23.0 °C	Humidity:	56 % RH	Atmospheric Pressure:	1020	mbar

Exploratory Test Mode:	Hopping transmitting with all kind of modulation and all kind of data type.
Final Test Mode:	Through Pre-scan, find the DH1 of data type is the worst case of GFSK modulation type, 2-DH1 of data type is the worst case of π/4DQPSK modulation type, 3-DH1 of data type is the worst case of 8DPSK modulation type.

7.4.2 Test Setup Diagram



7.4.3 Measurement Data

The detailed test data see: Appendix 15.247

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7.5 Hopping Channel Number

Test Requirement: 47 CFR Part 15, Subpart C 15.247a(1)(iii)
Test Method: ANSI C63.10 (2013) Section 7.8.3
Limit:

Frequency range(MHz)	Channel Number(minimum)
902-928	50 for 20dB bandwidth <250kHz
	25 for 20dB bandwidth ≥250kHz
2400-2483.5	15
5725-5850	75

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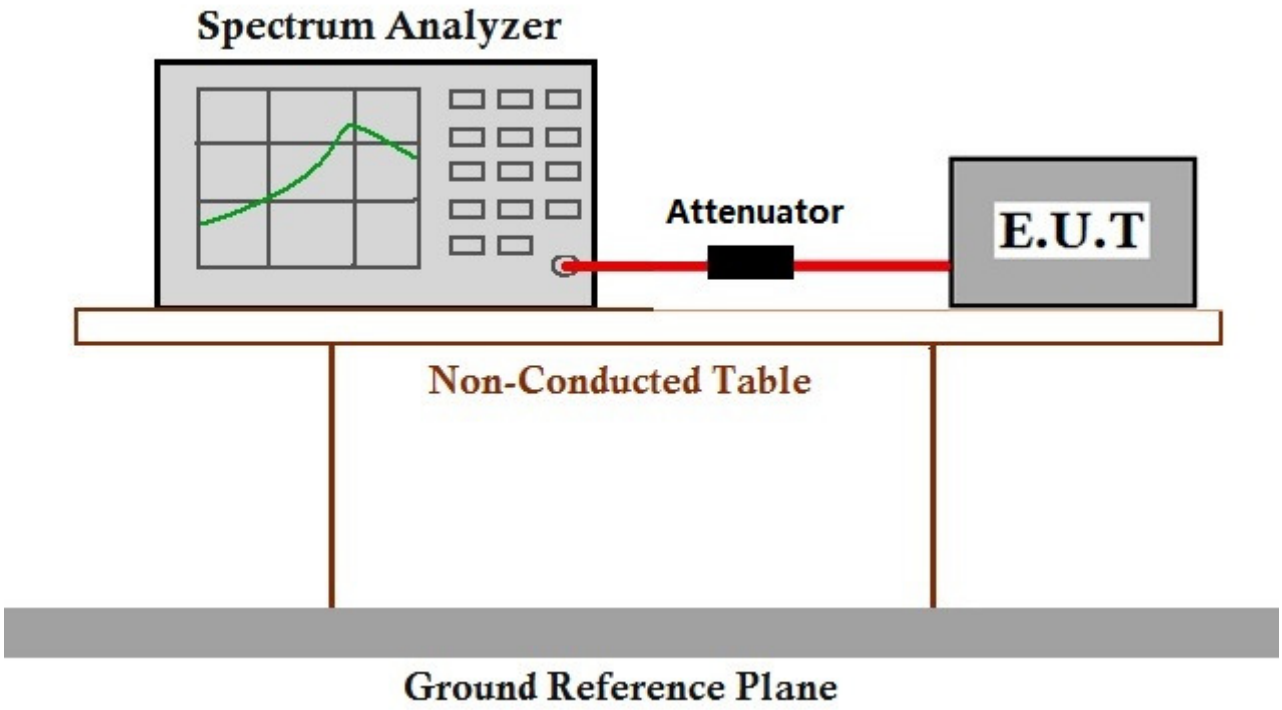
7.5.1 E.U.T. Operation

Operating Environment:

Temperature: 23.0 °C Humidity: 56 % RH Atmospheric Pressure: 1020 mbar

Test mode Hopping transmitting with all kind of modulation.

7.5.2 Test Setup Diagram



7.5.3 Measurement Data

The detailed test data see: Appendix 15.247

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7.6 Dwell Time

Test Requirement: 47 CFR Part 15, Subpart C 15.247a(1)(iii)
Test Method: ANSI C63.10 (2013) Section 7.8.4
Limit:

Frequency(MHz)	Limit
902-928	0.4S within a 20S period(20dB bandwidth<250kHz)
	0.4S within a 10S period(20dB bandwidth≥250kHz)
2400-2483.5	0.4S within a period of 0.4S*number of hopping channels
5725-5850	0.4S within a 30S period

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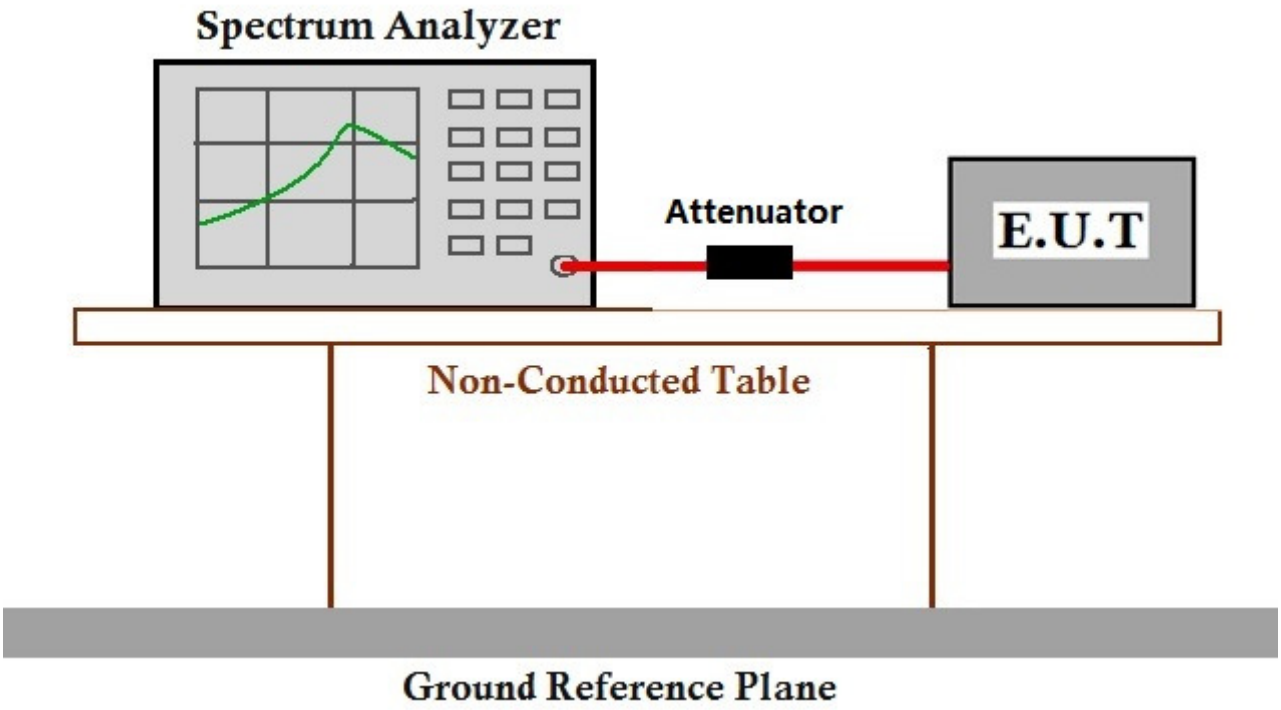
7.6.1 E.U.T. Operation

Operating Environment:

Temperature: 23.0 °C Humidity: 56 % RH Atmospheric Pressure: 1020 mbar

Test mode Hopping transmitting with all kind of modulation and all kind of data type.

7.6.2 Test Setup Diagram



7.6.3 Measurement Data

The detailed test data see: Appendix 15.247

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7.7 Conducted Spurious Emissions

Test Requirement: 47 CFR Part 15, Subpart C 15.247(d)

Test Method: ANSI C63.10 (2013) Section 7.8.8

Limit: In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.

7.7.1 E.U.T. Operation

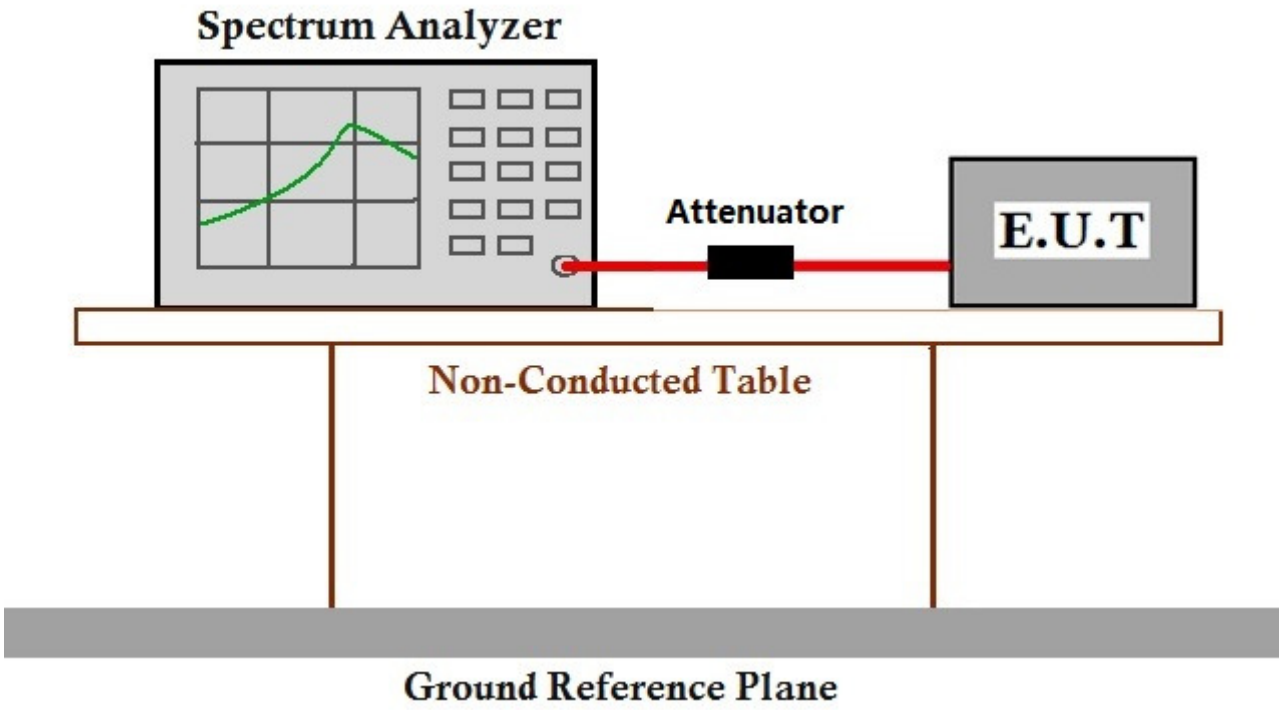
Operating Environment:

Temperature: 23.0 °C Humidity: 56 % RH Atmospheric Pressure: 1020 mbar

Exploratory Test Mode: Non-hopping transmitting with all kind of modulation and all kind of data type.

Final Test Mode: Through Pre-scan, find the DH1 of data type is the worst case of GFSK modulation type, 2-DH1 of data type is the worst case of π/4DQPSK modulation type, 3-DH1 of data type is the worst case of 8DPSK modulation type.

7.7.2 Test Setup Diagram



7.7.3 Measurement Data

The detailed test data see: Appendix 15.247

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7.8 Radiated Spurious Emissions

Test Requirement: 47 CFR Part 15, Subpart C 15.205 & 15.209
Test Method: ANSI C63.10 (2013) Section 6.4,6.5,6.6
Measurement Distance: 10m
Limit:

Frequency(MHz)	Field strength(microvolts/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
Remark: The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90kHz, 110-490kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.		

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7.8.1 E.U.T. Operation

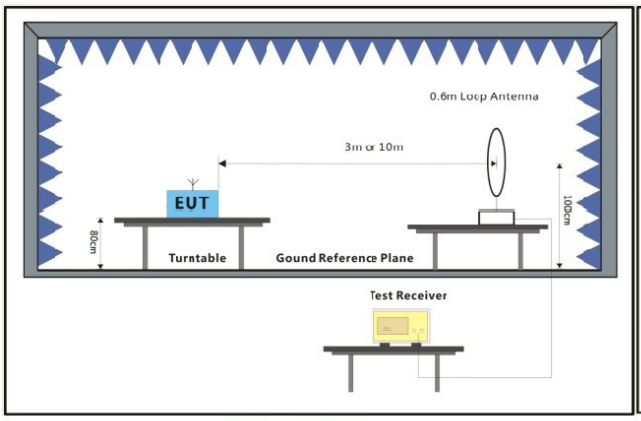
Operating Environment:

Temperature: 23.0 °C Humidity: 56 % RH Atmospheric Pressure: 1020 mbar

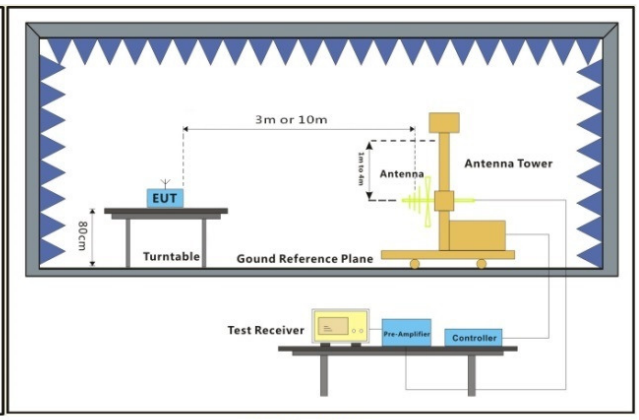
Exploratory Test Mode: Non-hopping transmitting mode with all kind of modulation and all kind of data type
a: Transmitting mode

Final Test Mode: Through Pre-scan, find the 3-DH1 of data type and 8DPSK modulation is the worst case.
For below 1GHz part, through pre-scan, the worst case is the lowest channel.
Only the worst case is recorded in the report.

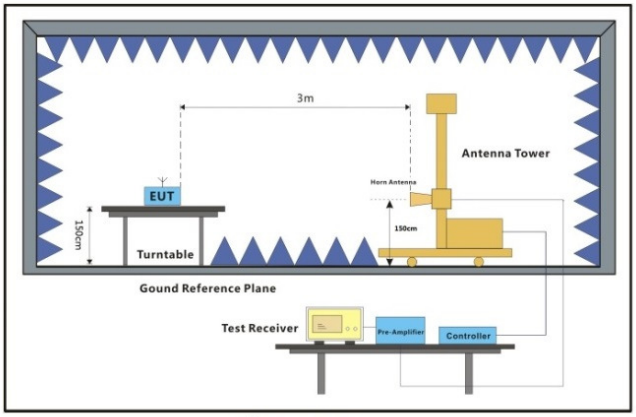
7.8.2 Test Setup Diagram



Below 30MHz



30MHz-1GHz



Above 1GHz

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7.8.3 Measurement Procedure

a. For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 and 10 meter semi-anechoic camber. The table was rotated 360 degrees to determine the position of the highest radiation.

b. For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter semi-anechoic camber. The table was rotated 360 degrees to determine the position of the highest radiation.

c. The EUT was set 3 or 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

d. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

e. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

f. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

g. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

h. Test the EUT in the lowest channel (2402MHz),the middle channel (2441MHz),the Highest channel (2480MHz)

i. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.

j. Repeat above procedures until all frequencies measured was complete.

7.8.4 Measurement Data

The detailed test data see: Appendix 15.247

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7.9 Radiated Emissions which fall in the restricted bands

Test Requirement: 47 CFR Part 15, Subpart C 15.205 & 15.209

Test Method: ANSI C63.10 (2013) Section 6.10.5

Measurement Distance: 3m

7.9.1 E.U.T. Operation

Operating Environment:

Temperature: 23.0 °C Humidity: 53 % RH Atmospheric Pressure: 1020 mbar

Exploratory Test Mode: Non-hopping transmitting mode with all kind of modulation and all kind of data type

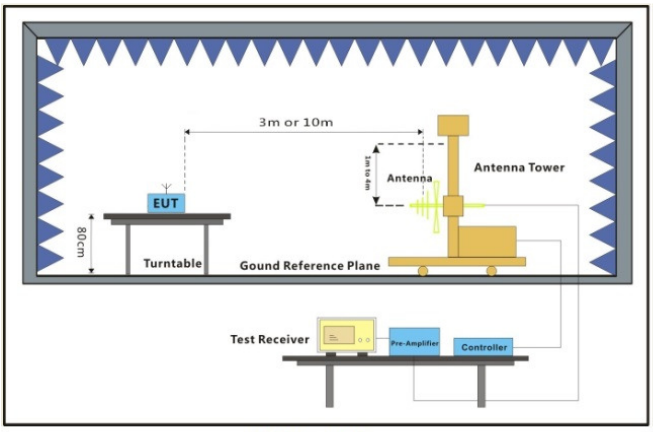
a: Transmitting mode

Final Test Mode: Through Pre-scan, find the 3-DH5 of data type and 8DPSK modulation is the worst case.

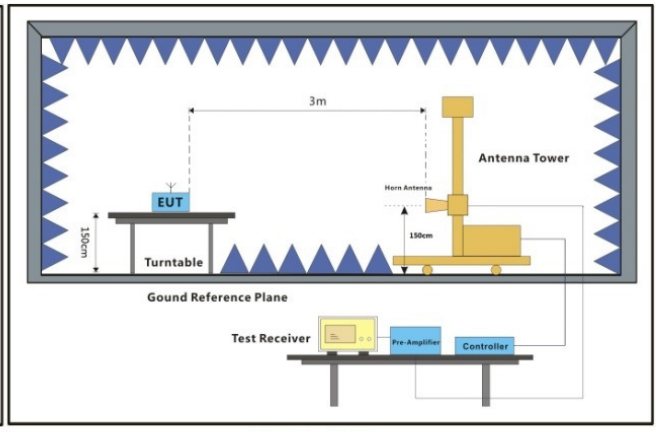
For below 1GHz part, through pre-scan, the worst case is the lowest channel.

Only the worst case is recorded in the report.

7.9.2 Test Setup Diagram



30MHz-1GHz



Above 1GHz

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7.9.3 Measurement Procedure

a. For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 and 10 meter semi-anechoic camber. The table was rotated 360 degrees to determine the position of the highest radiation.

b. For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter semi-anechoic camber. The table was rotated 360 degrees to determine the position of the highest radiation.

c. The EUT was set 3 or 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

d. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

e. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

f. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

g. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

h. Test the EUT in the lowest channel (2402MHz),the middle channel (2441MHz),the Highest channel (2480MHz)

i. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.

j. Repeat above procedures until all frequencies measured was complete.

7.9.4 Measurement Data

The detailed test data see: Appendix 15.247

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7.10 Conducted Band Edges Measurement

Test Requirement: 47 CFR Part 15, Subpart C 15.247(d)

Test Method: ANSI C63.10 (2013) Section 7.8.6

7.10.1 E.U.T. Operation

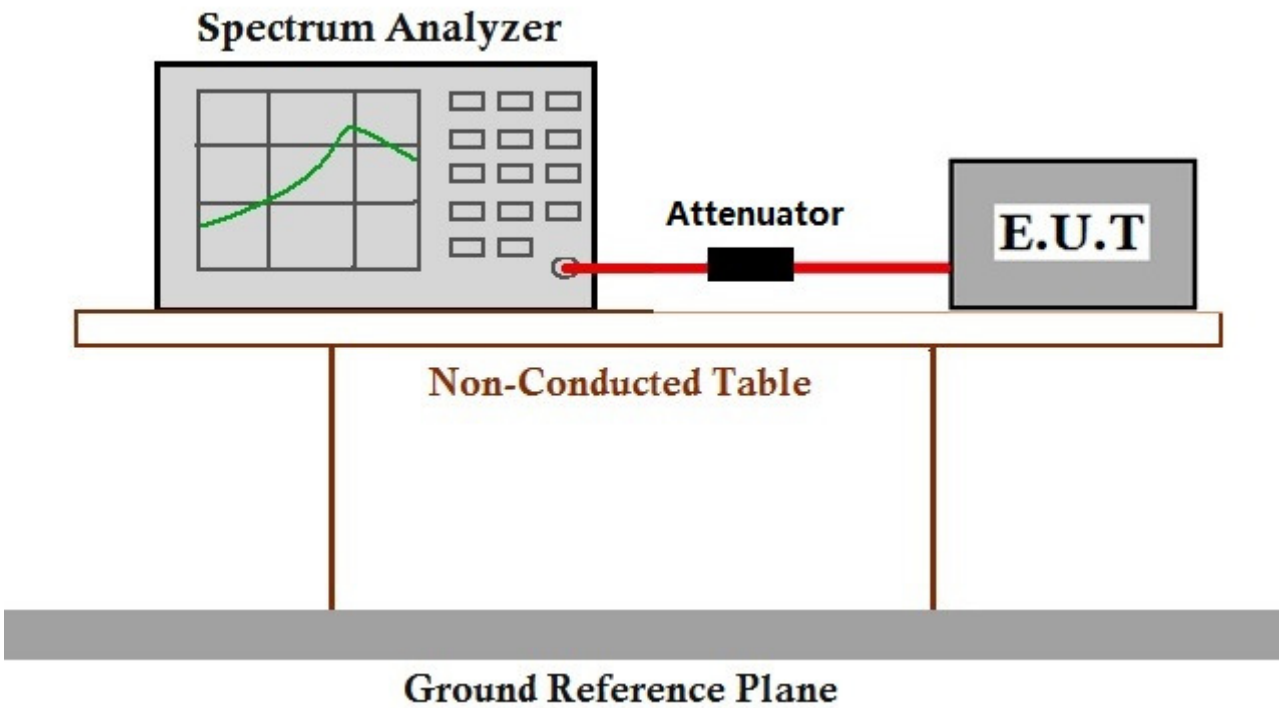
Operating Environment:

Temperature: 23.0 °C Humidity: 56 % RH Atmospheric Pressure: 1020 mbar

Exploratory Test Mode: Hopping and non-hopping transmitting with all kind of modulation and all kind of data type.

Final Test Mode: Through Pre-scan, find the DH1 of data type is the worst case of GFSK modulation type, 2-DH1 of data type is the worst case of π/4DQPSK modulation type, 3-DH1 of data type is the worst case of 8DPSK modulation type.

7.10.2 Test Setup Diagram



7.10.3 Measurement Data

The detailed test data see: Appendix 15.247

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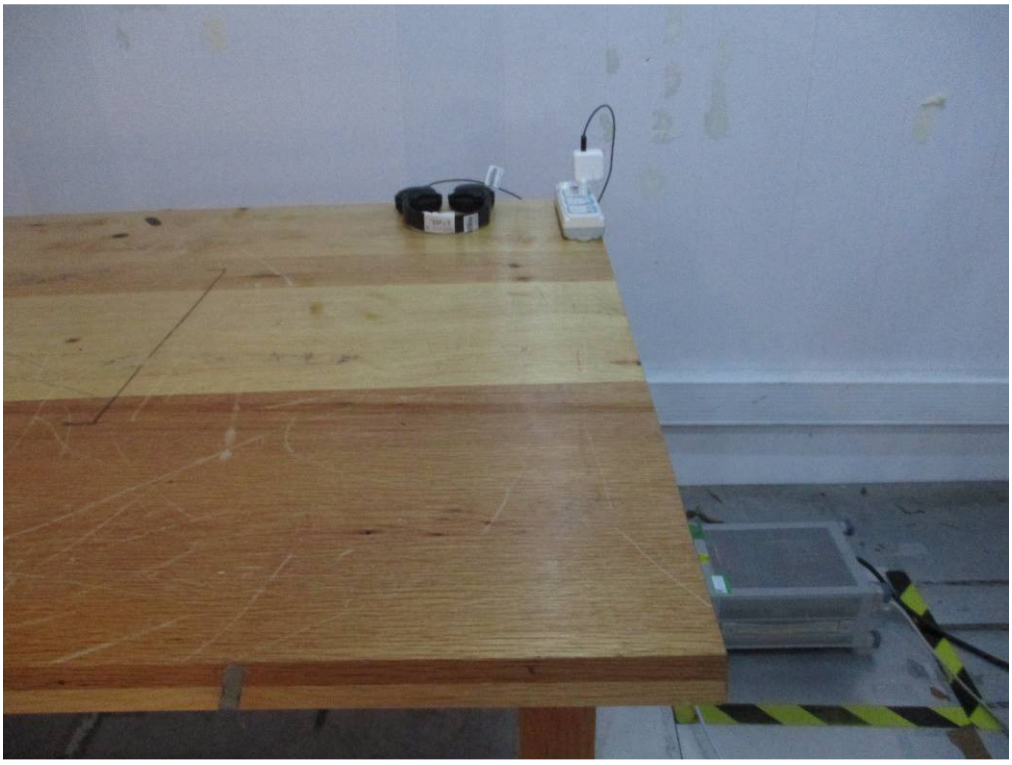
8 Photographs

8.1 Conducted Disturbance at AC Power Line(150kHz-30MHz) Test Setup



8.2 Radiated Emissions Test Setup

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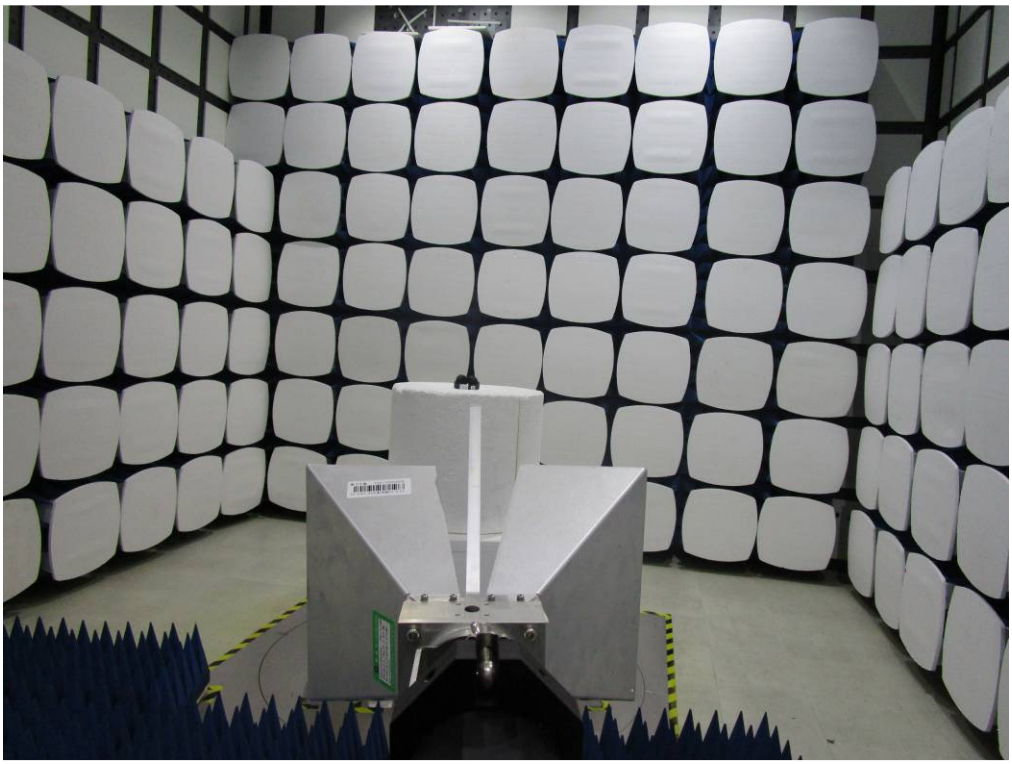

8.3 EUT Constructional Details

Refer to Appendix A - Photographs of EUT Constructional Details for SZEM1701000241CR.

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9 Appendix

9.1 Appendix 15.247

1.20 dB Bandwidth

Test Mode	Test Channel	EBW[MHz]	Limit	Verdict
DH5	2402	1.112	---	PASS
DH5	2441	1.114	---	PASS
DH5	2480	1.114	---	PASS
2DH5	2402	1.370	---	PASS
2DH5	2441	1.374	---	PASS
2DH5	2480	1.378	---	PASS
3DH5	2402	1.370	---	PASS
3DH5	2441	1.372	---	PASS
3DH5	2480	1.374	---	PASS

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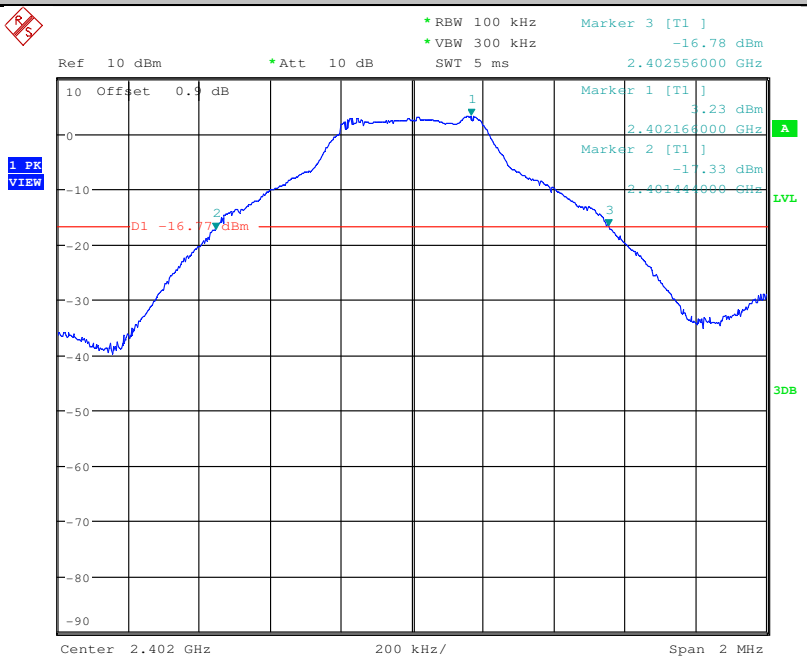
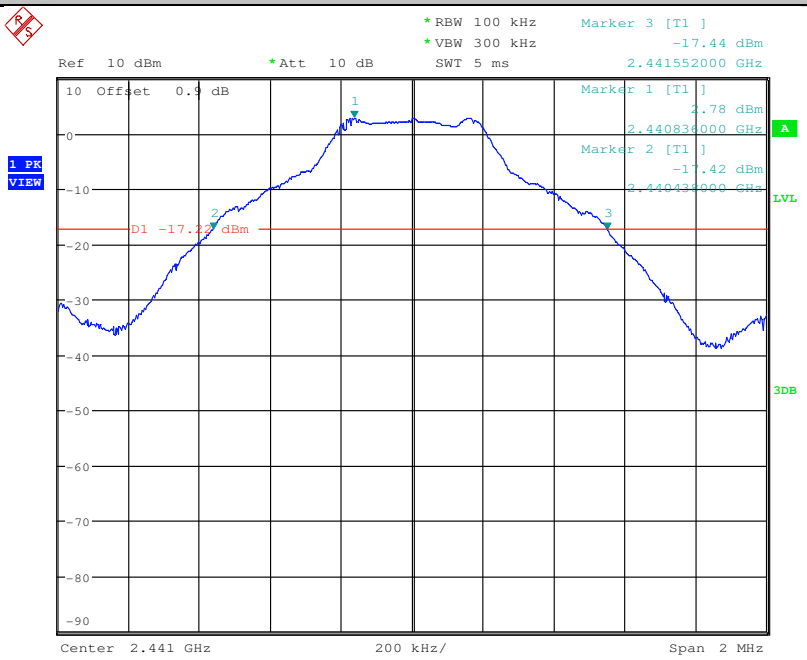
TEST PLOT

20 dB Bandwidth_DH5_2402



20 dB Bandwidth_DH5_2441



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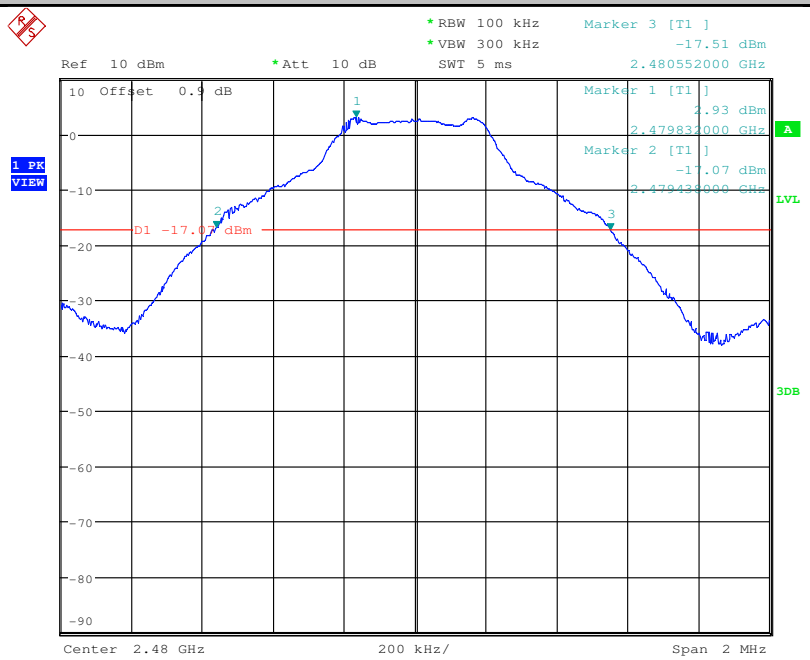
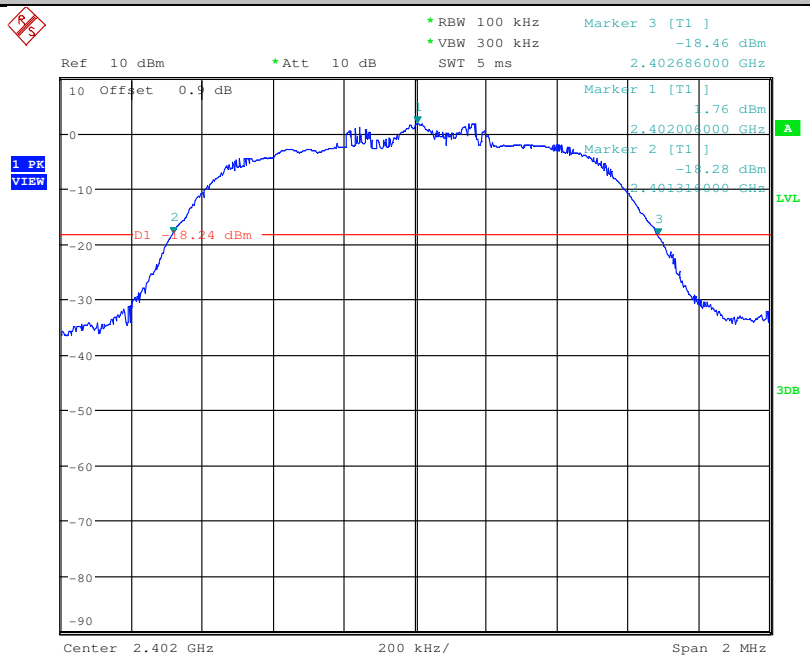
20 dB Bandwidth_DH5_2480



20 dB Bandwidth_2DH5_2402



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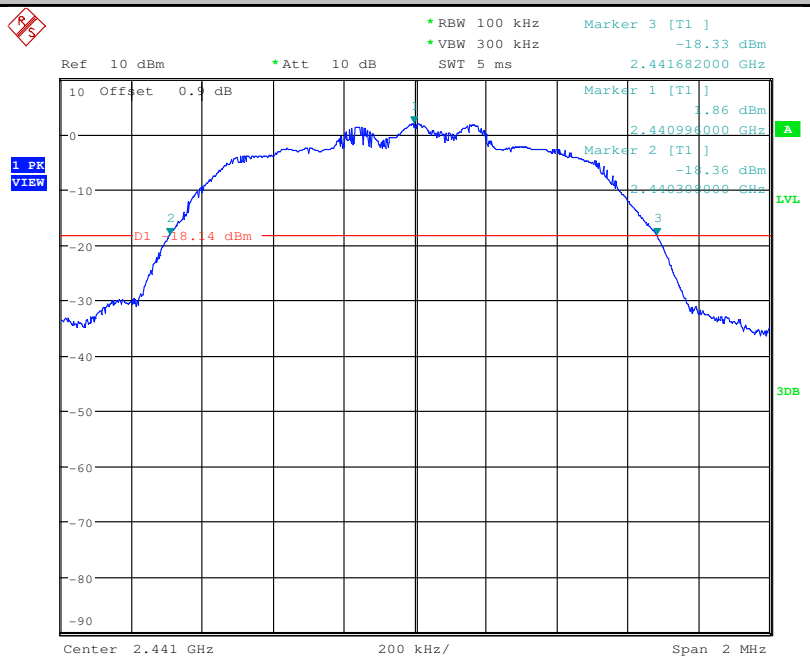
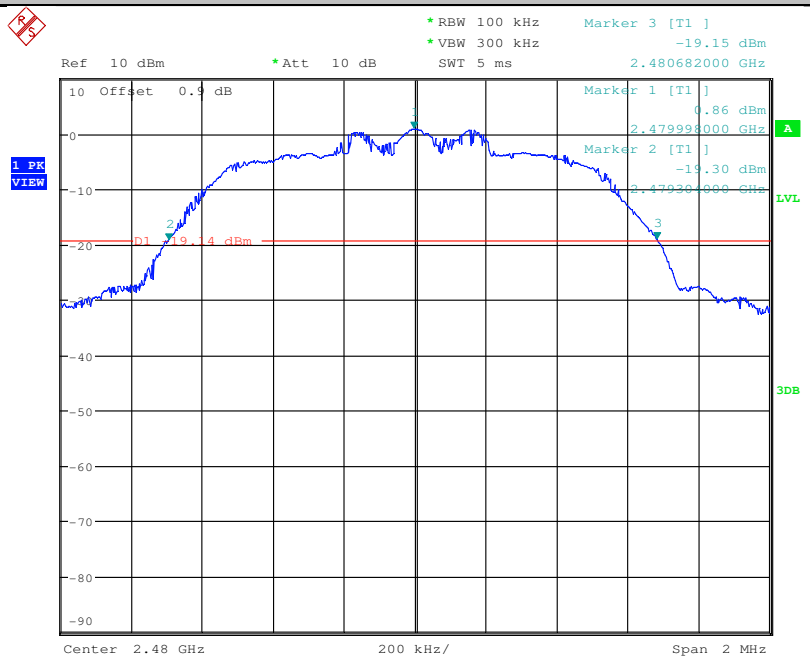
20 dB Bandwidth_2DH5_2441



20 dB Bandwidth_2DH5_2480



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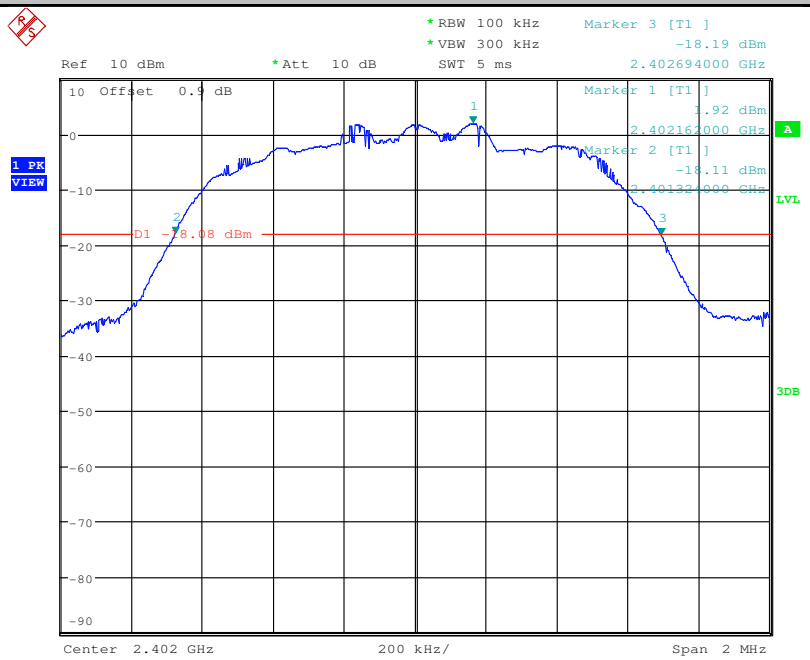
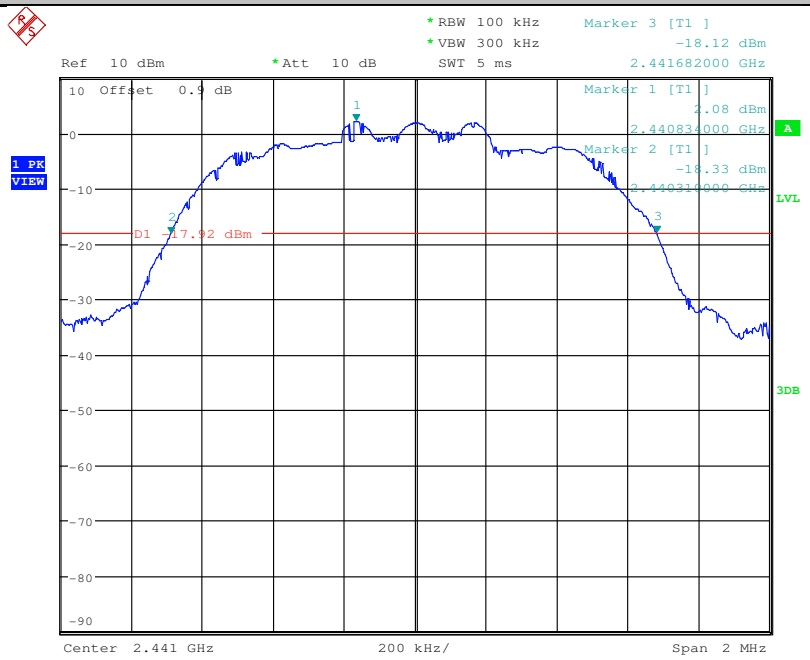
20 dB Bandwidth_3DH5_2402



20 dB Bandwidth_3DH5_2441



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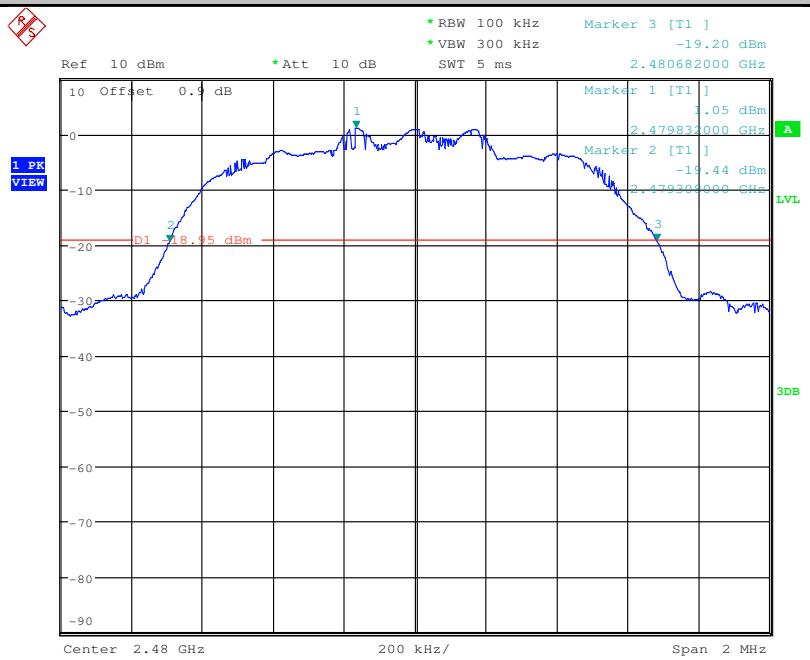
20 dB Bandwidth_3DH5_2480



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2.Conducted Peak Output Power

Test Mode	Test Channel	Power[dBm]	Limit[dBm]	Verdict
DH5	2402	3.52	<20.97	PASS
DH5	2441	3.7	<20.97	PASS
DH5	2480	3.51	<20.97	PASS
2DH5	2402	3.61	<20.97	PASS
2DH5	2441	3.77	<20.97	PASS
2DH5	2480	3.6	<20.97	PASS
3DH5	2402	3.88	<20.97	PASS
3DH5	2441	4.03	<20.97	PASS
3DH5	2480	3.85	<20.97	PASS

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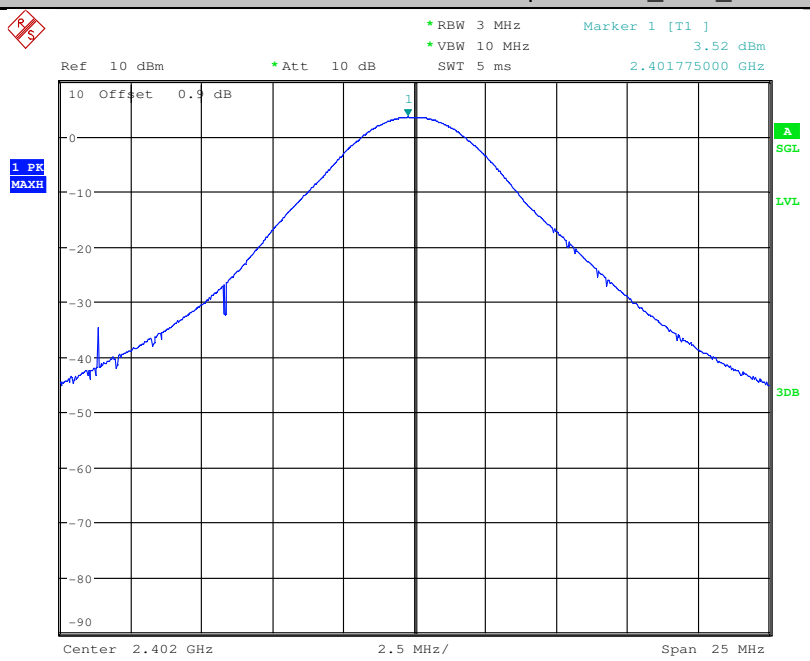
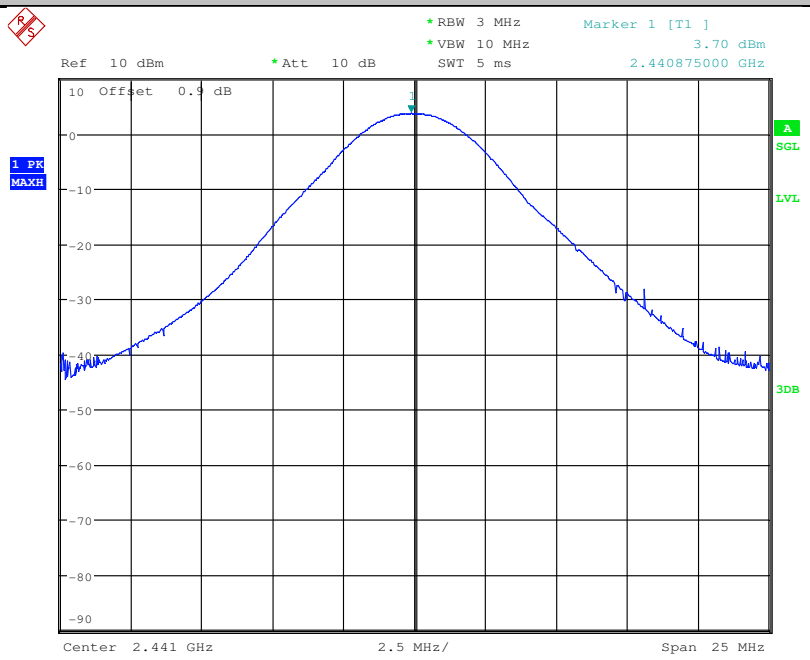
TEST PLOT

Conducted Peak Output Power_DH5_2402



Conducted Peak Output Power_DH5_2441



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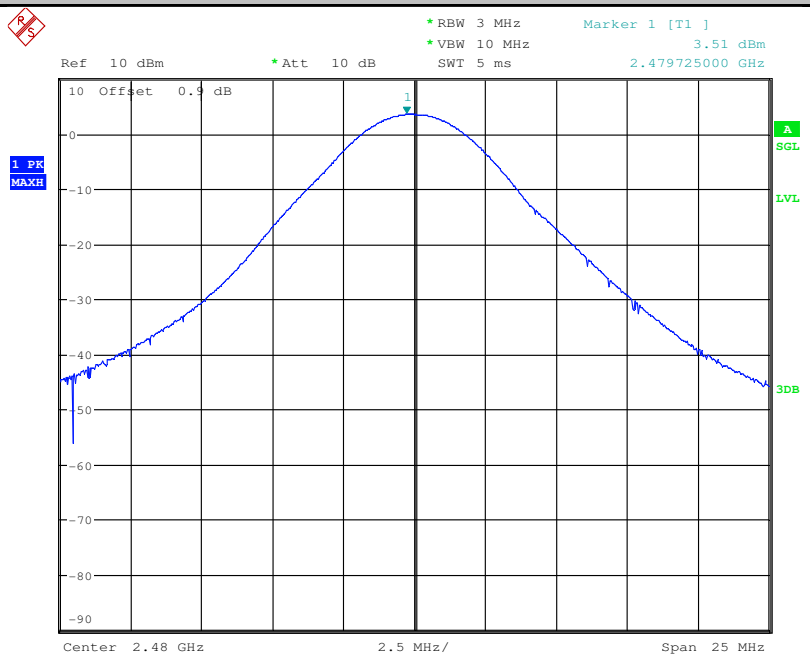
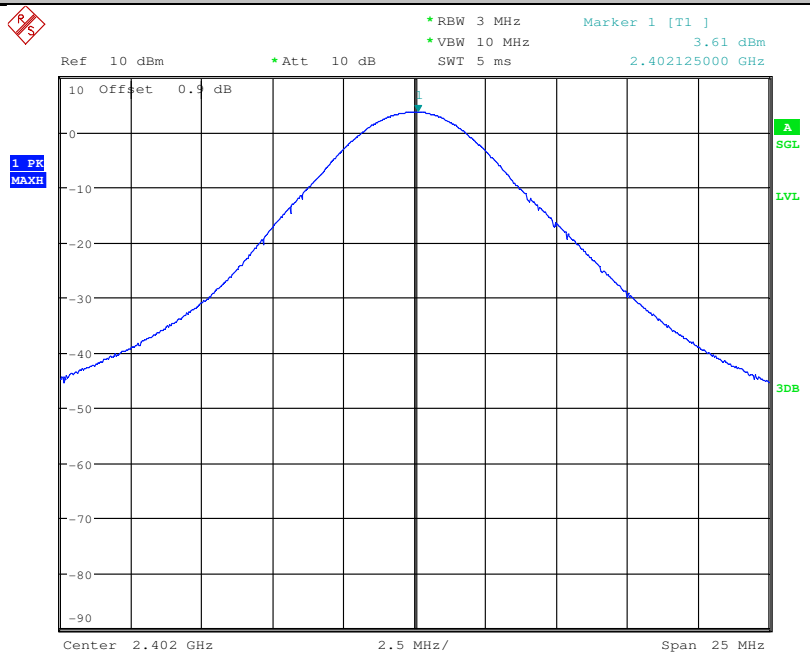
Conducted Peak Output Power_DH5_2480



Conducted Peak Output Power_2DH5_2402



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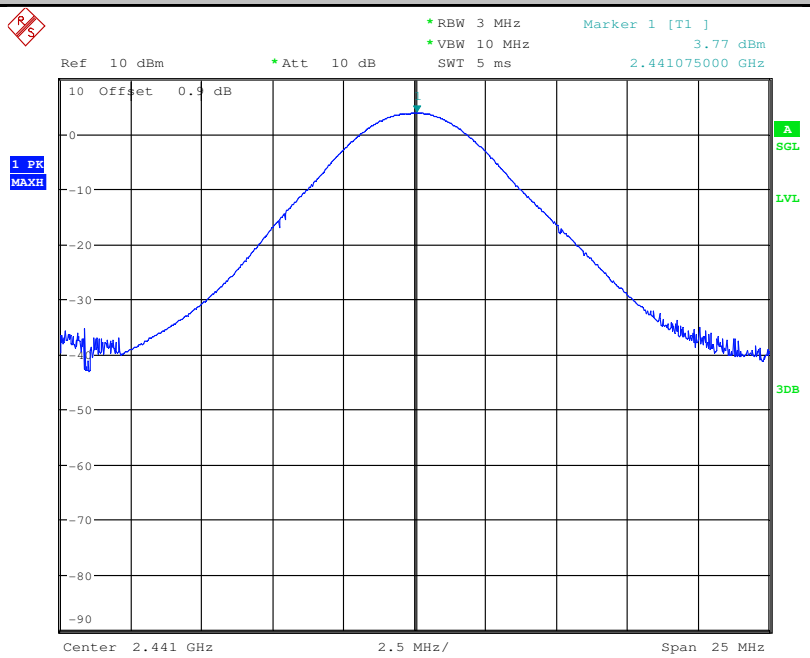
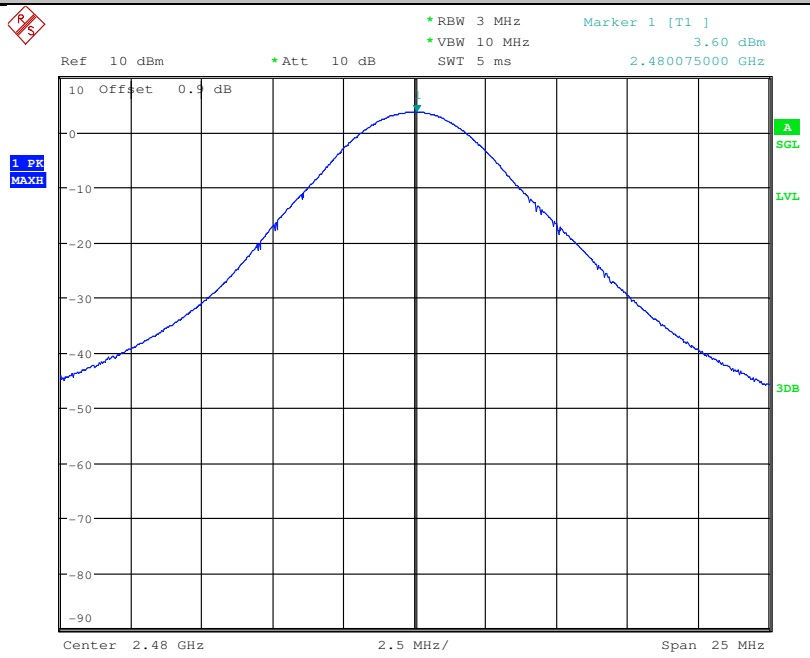
Conducted Peak Output Power_2DH5_2441



Conducted Peak Output Power_2DH5_2480



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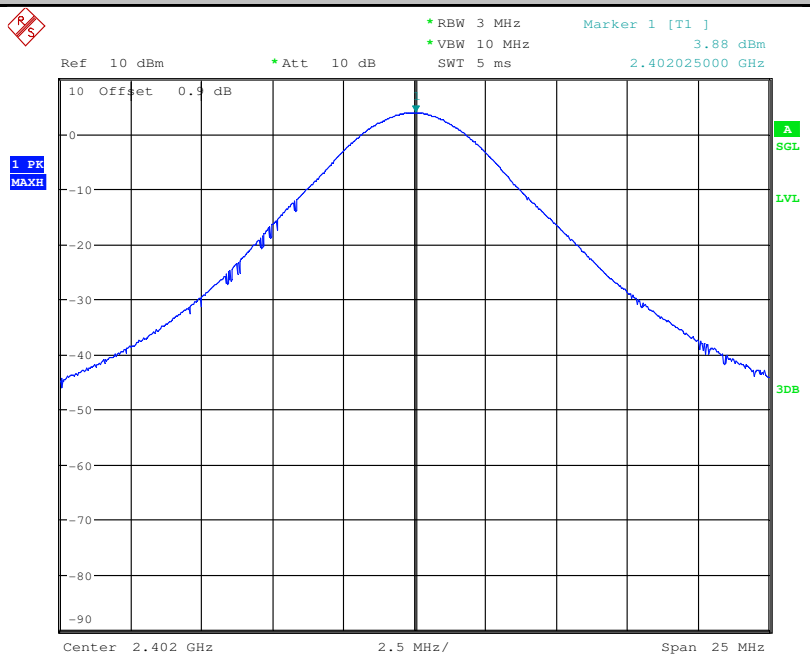
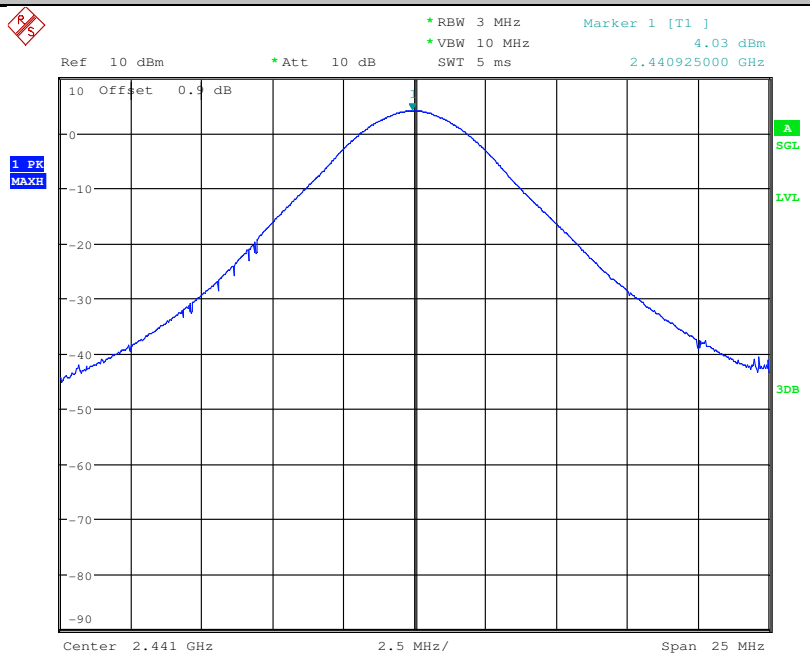
Conducted Peak Output Power_3DH5_2402



Conducted Peak Output Power_3DH5_2441



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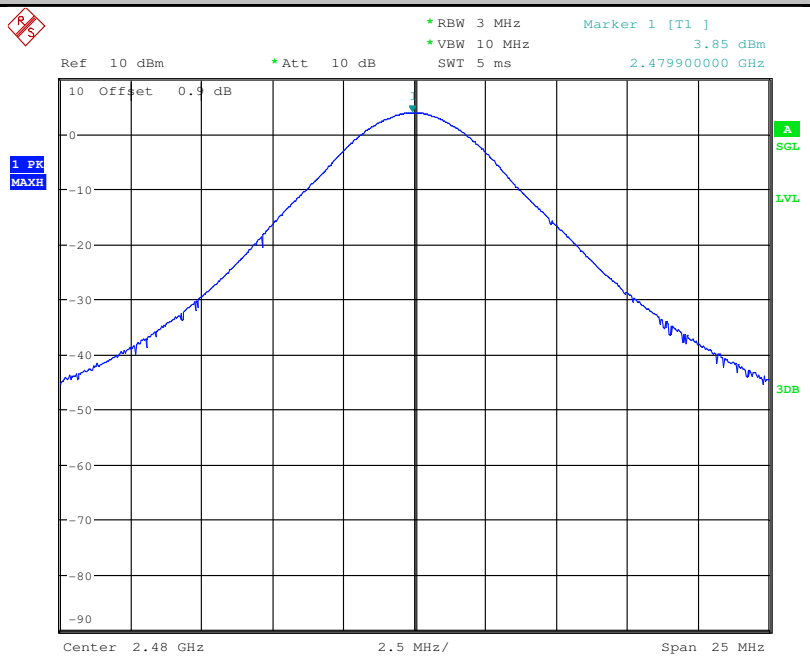
Conducted Peak Output Power_3DH5_2480



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3.Carrier Frequency Separation

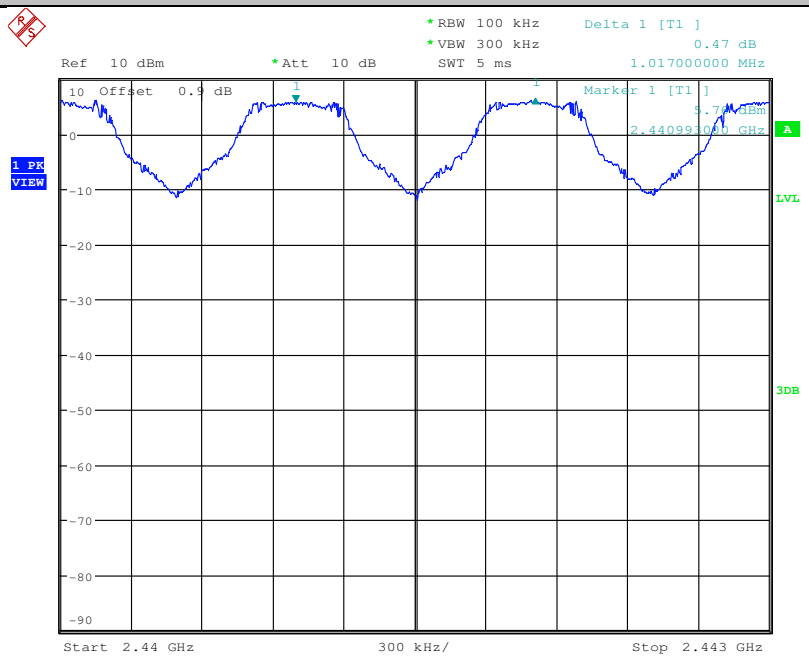
Test Mode	Test Channel	Result[MHz]	Verdict
DH5	2441	1.017	PASS
2DH5	2441	1.005	PASS
3DH5	2441	0.999	PASS

Note: According to 20dB bandwidth

Test Mode	20dB bandwidth (kHz) (worse case)	Limit (kHz) (Carrier Frequencies Separation)
DH5	1114	742.67
2DH5	1378	918.67
3DH5	1374	916

TEST PLOT

Carrier Frequency Separation_DH5_2441



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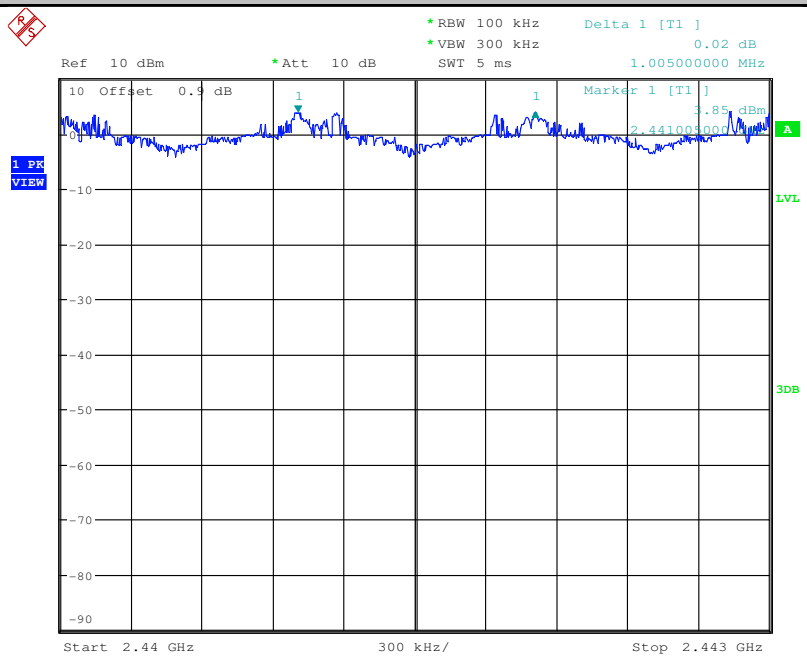
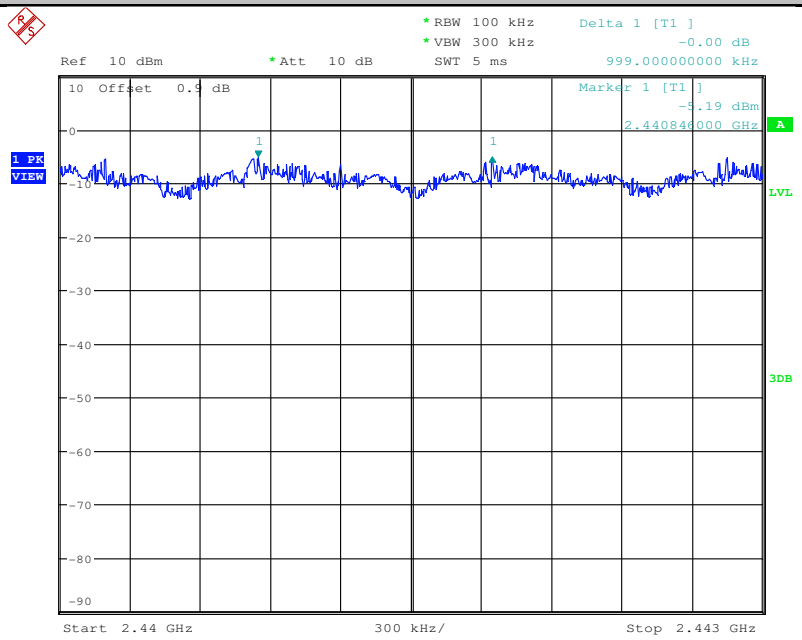
Carrier Frequency Separation_2DH5_2441



Carrier Frequency Separation_3DH5_2441



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4.Dwell Time

Test Mode	Test Channel	Burst Width[ms/hop/ch]	Total Hops[hop*ch]	Dwell Time[ms]	Limit[ms]	Verdict
DH1	2402	0.4	320	0.128	<=0.4	PASS
DH3	2402	1.66	160	0.266	<=0.4	PASS
DH5	2402	2.9	110	0.319	<=0.4	PASS
2DH1	2402	0.41	320	0.131	<=0.4	PASS
2DH3	2402	1.67	160	0.267	<=0.4	PASS
2DH5	2402	2.91	110	0.32	<=0.4	PASS
3DH1	2402	0.41	320	0.131	<=0.4	PASS
3DH3	2402	1.67	160	0.267	<=0.4	PASS
3DH5	2402	2.91	110	0.32	<=0.4	PASS

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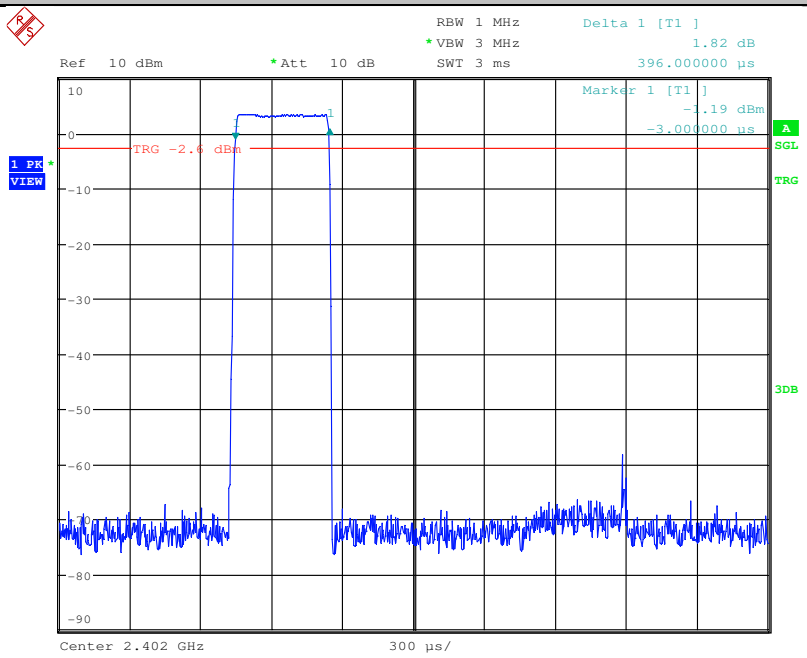
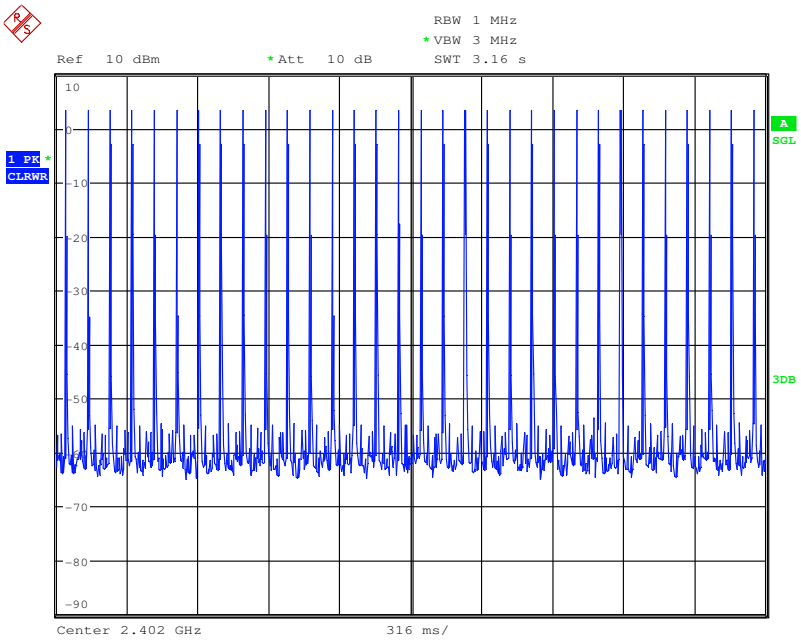
TEST PLOT

Dwell Time_DH1_2402





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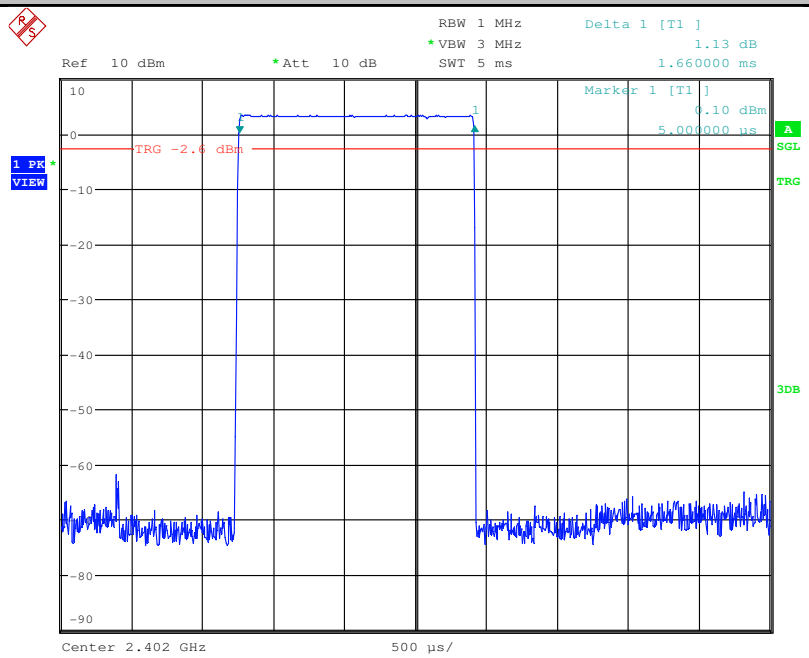
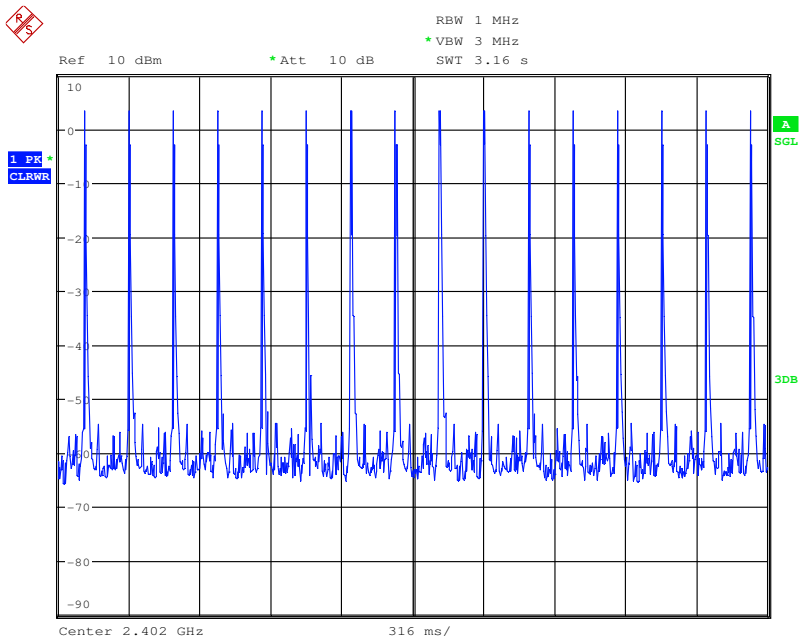
Dwell Time_DH3_2402





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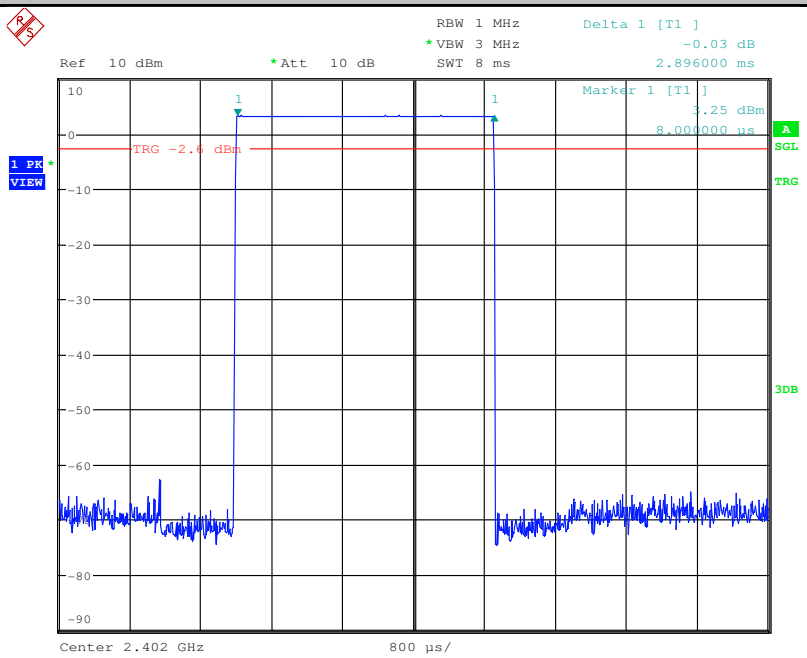
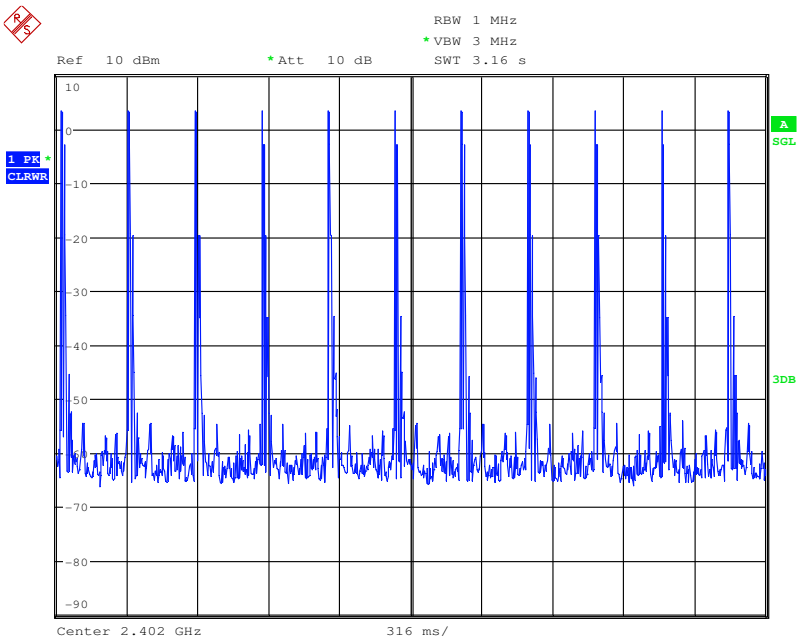
Dwell Time_DH5_2402





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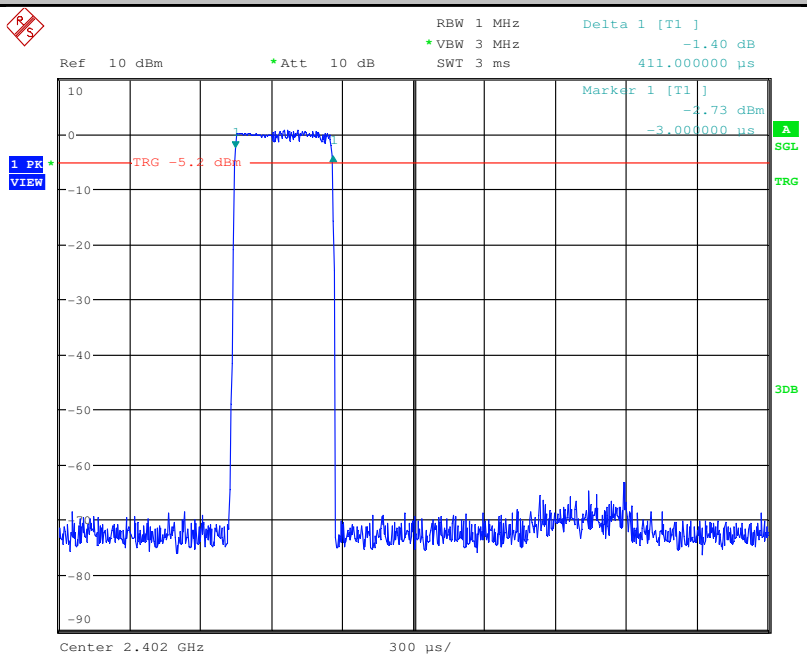
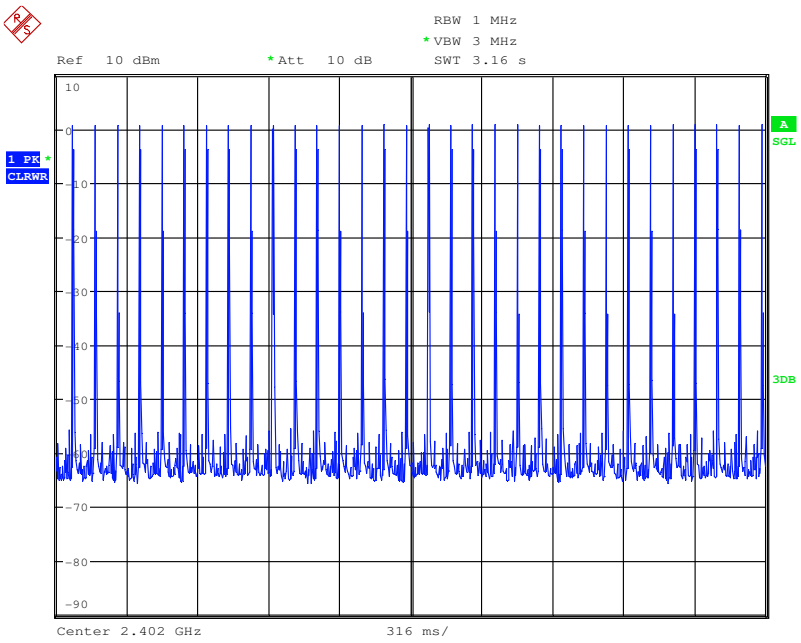
Dwell Time_2DH1_2402





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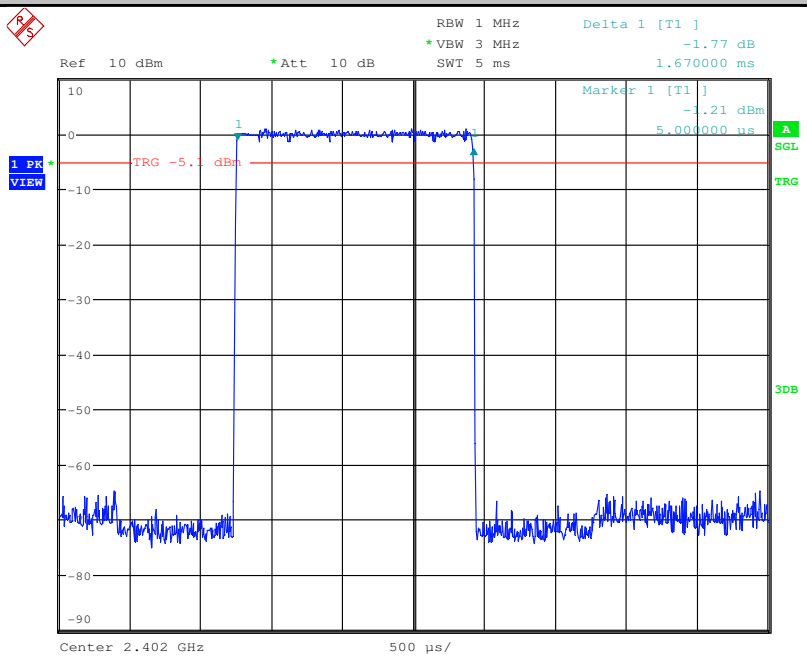
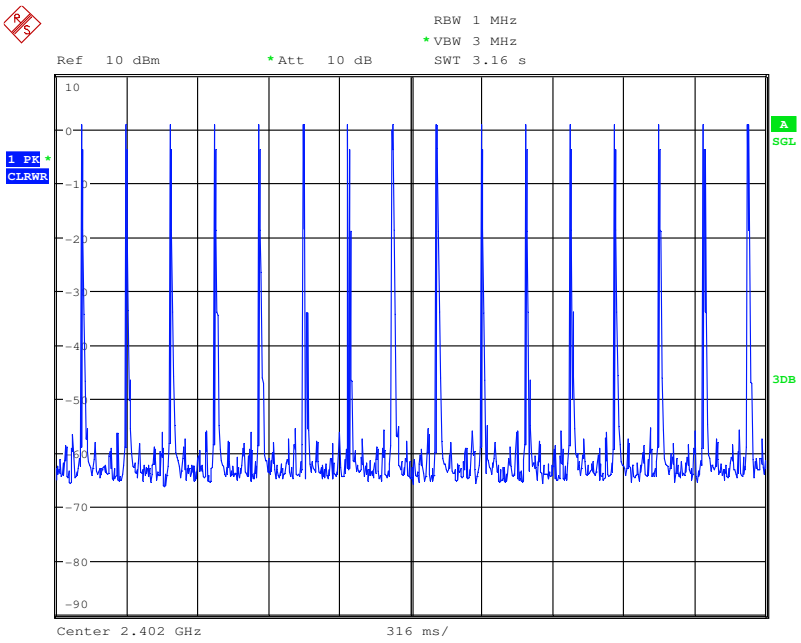
Dwell Time_2DH3_2402





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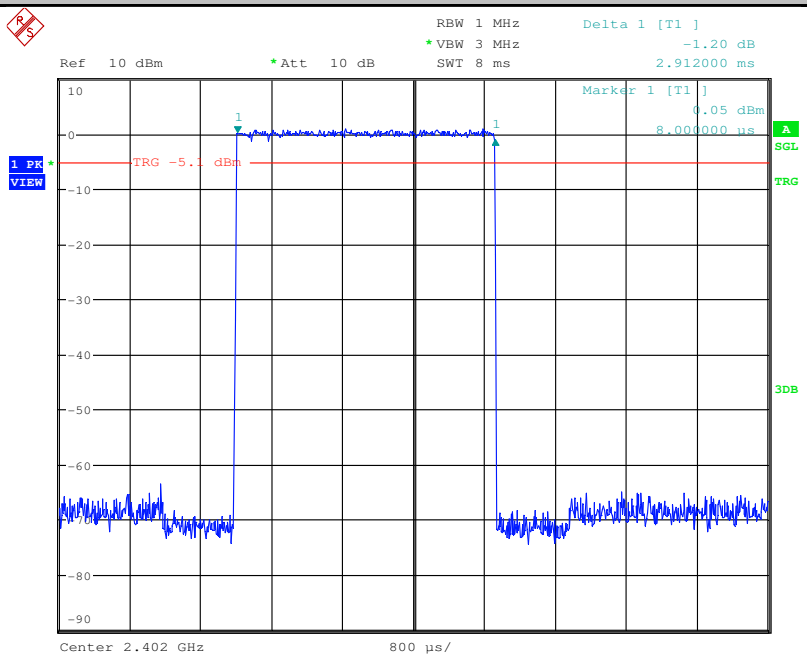
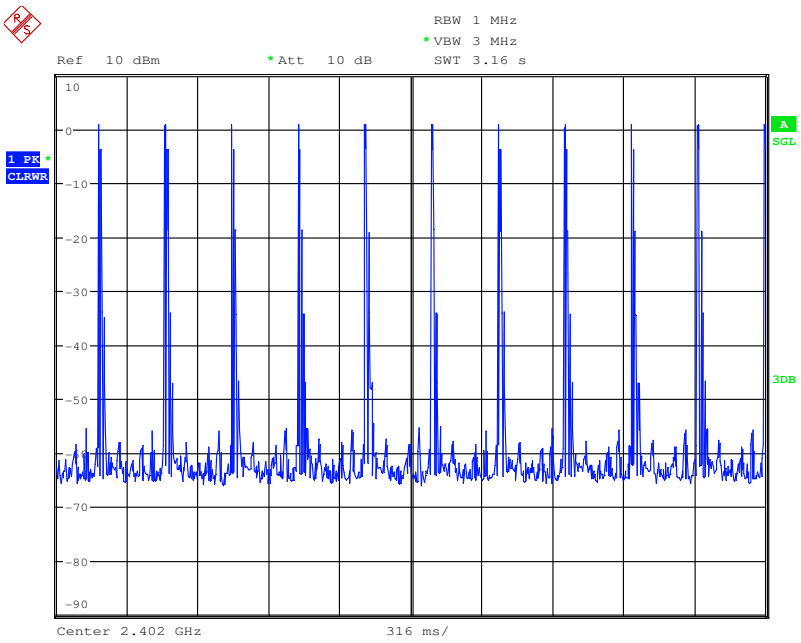
Dwell Time_2DH5_2402





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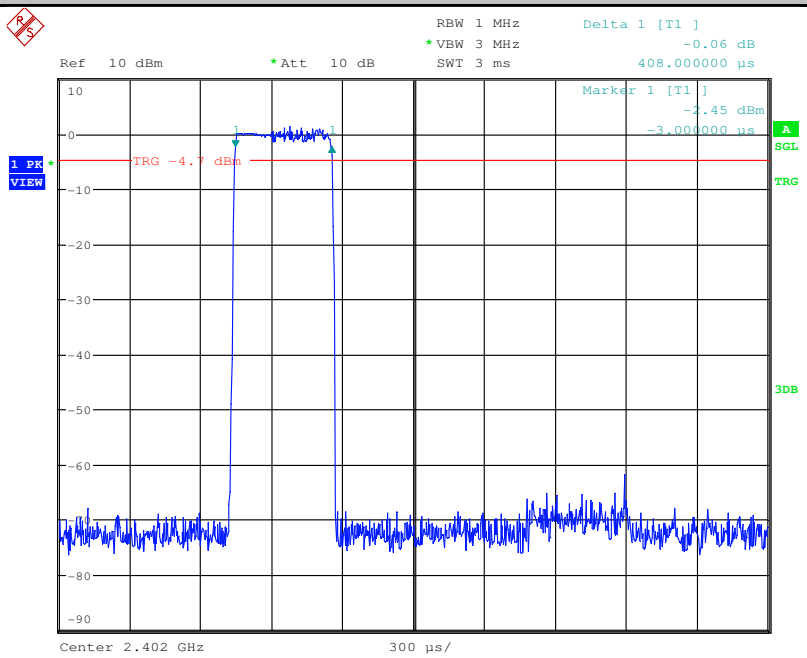
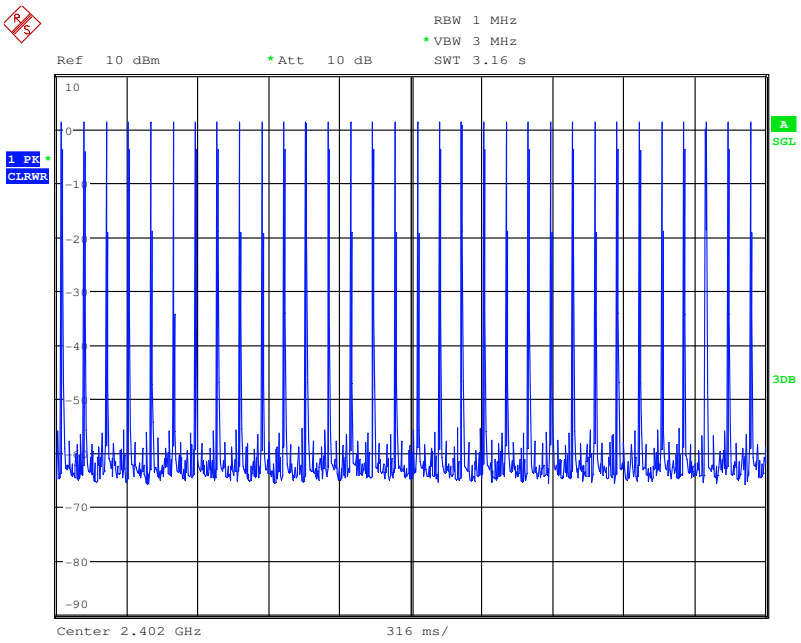
Dwell Time_3DH1_2402





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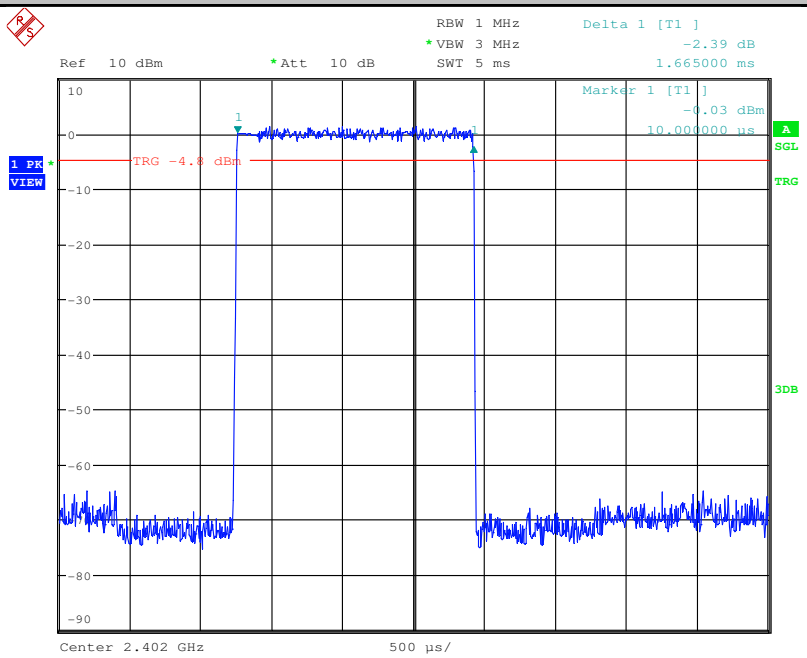
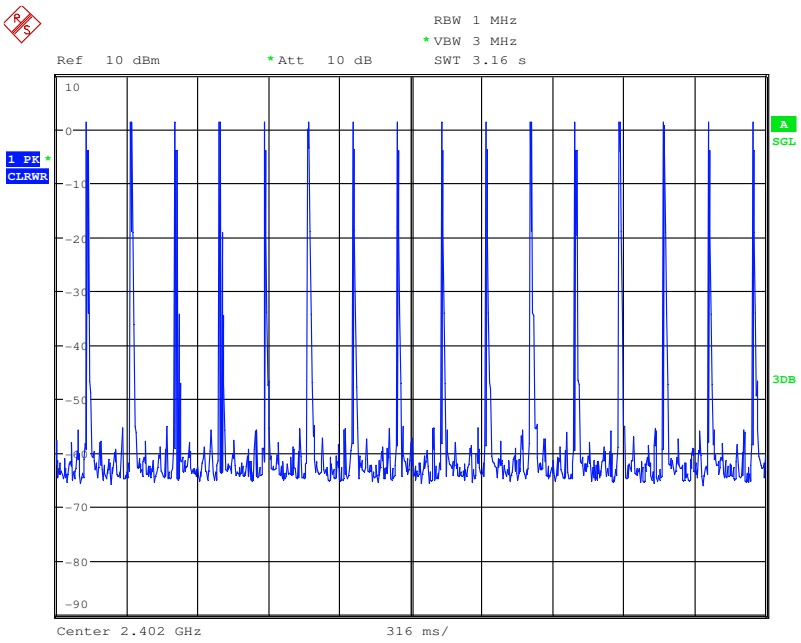
Dwell Time_3DH3_2402





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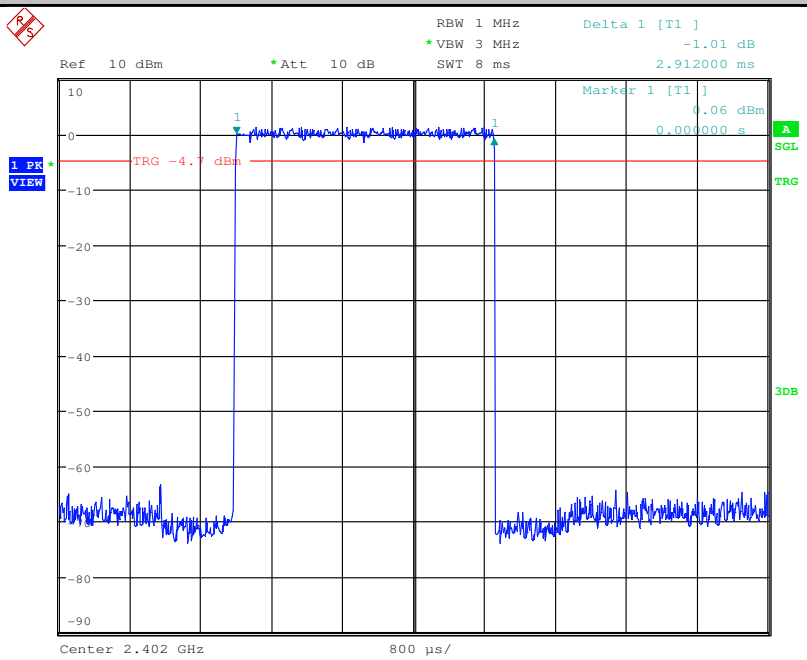
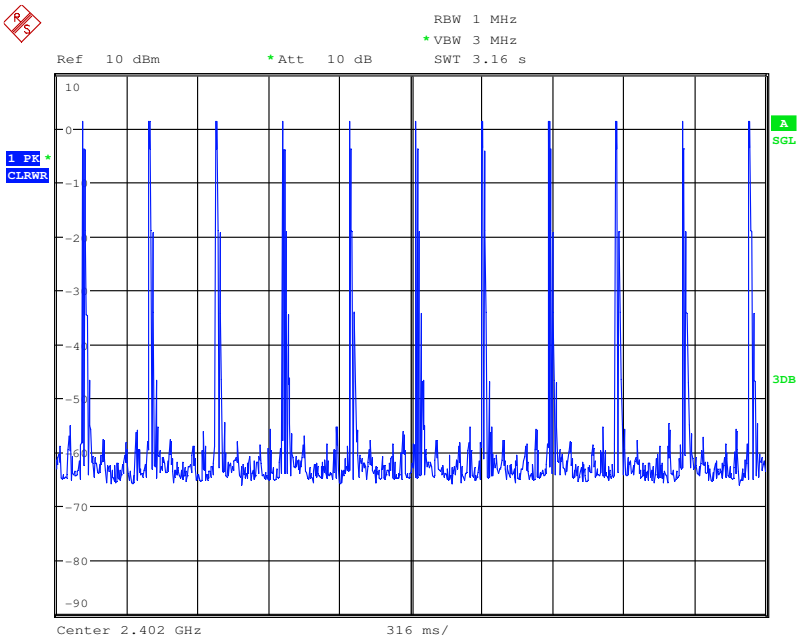
Dwell Time_3DH5_2402





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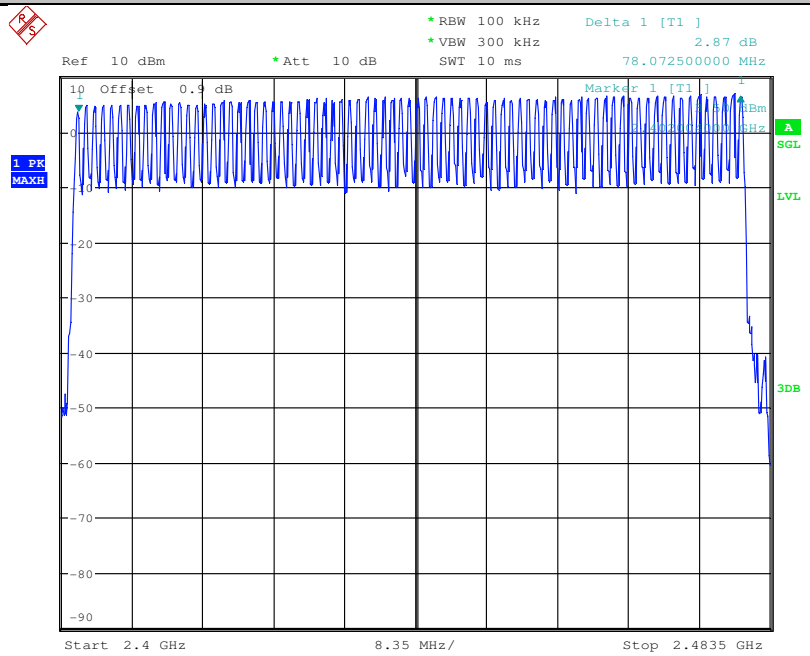
5.Hopping Channel Number

Test Mode	Test Channel	Number of Hopping Channel[N]	Limit[N]	Verdict
DH5	2402	79	>=15	PASS
2DH5	2402	79	>=15	PASS
3DH5	2402	79	>=15	PASS

TEST PLOT

Hopping Channel Number_DH5_2402



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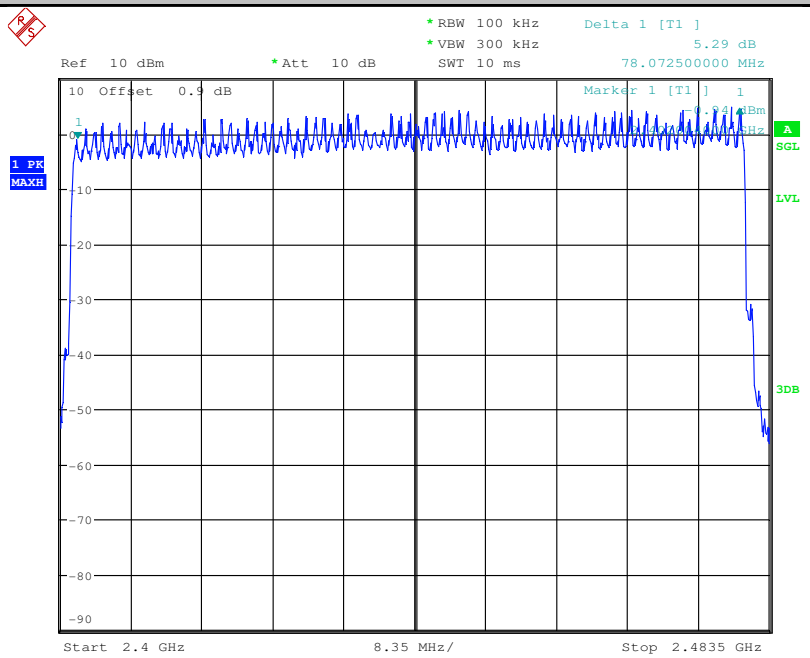
Hopping Channel Number_2DH5_2402



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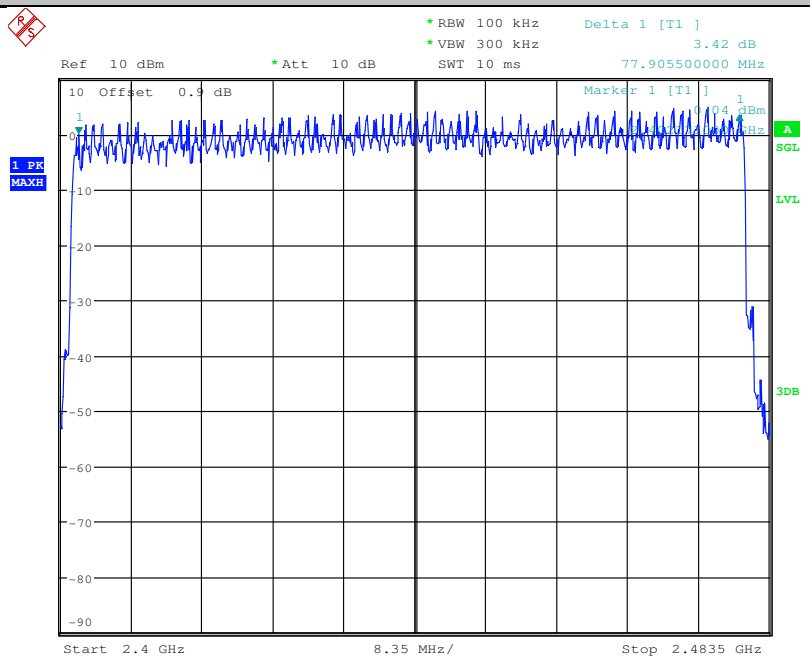

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6.Band-edge for RF Conducted Emissions

Test Mode	Test Channel	Hopping	Carrier Power[dBm]	Max. Spurious Level [dBm]	Limit[dBm]	Verdict
DH5	2402	Off	2.400	-66.225	<-17.6	PASS
DH5	2480	Off	2.420	-47.210	<-17.58	PASS
2DH5	2402	Off	2.140	-66.154	<-17.86	PASS
2DH5	2480	Off	-4.750	-49.363	<-24.75	PASS
3DH5	2402	Off	2.290	-66.716	<-17.71	PASS
3DH5	2480	Off	2.040	-47.077	<-17.96	PASS
DH5	2402	On	4.860	-52.344	<-15.14	PASS
DH5	2480	On	6.230	-46.549	<-13.77	PASS
2DH5	2402	On	-0.810	-57.044	<-20.81	PASS
2DH5	2480	On	4.110	-50.444	<-15.89	PASS
3DH5	2402	On	-1.970	-56.852	<-21.97	PASS
3DH5	2480	On	2.700	-51.598	<-17.3	PASS

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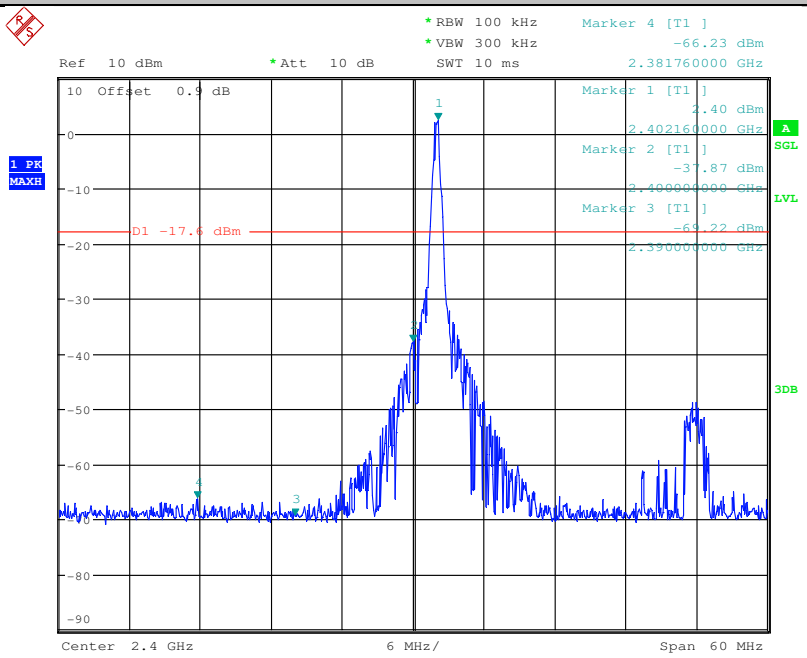
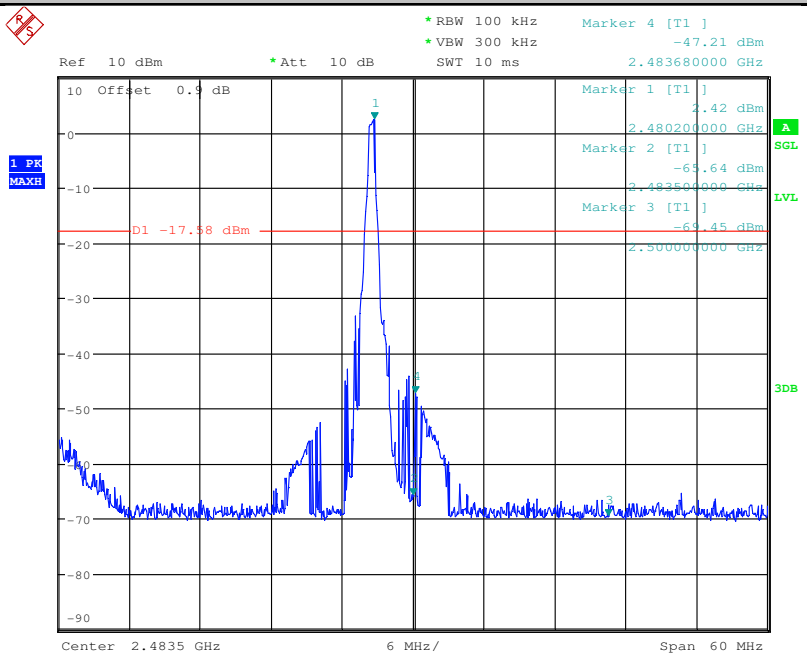
TEST PLOT

Band-edge for RF Conducted Emissions_DH5_2402_Hopping Off



Band-edge for RF Conducted Emissions_DH5_2480_Hopping Off



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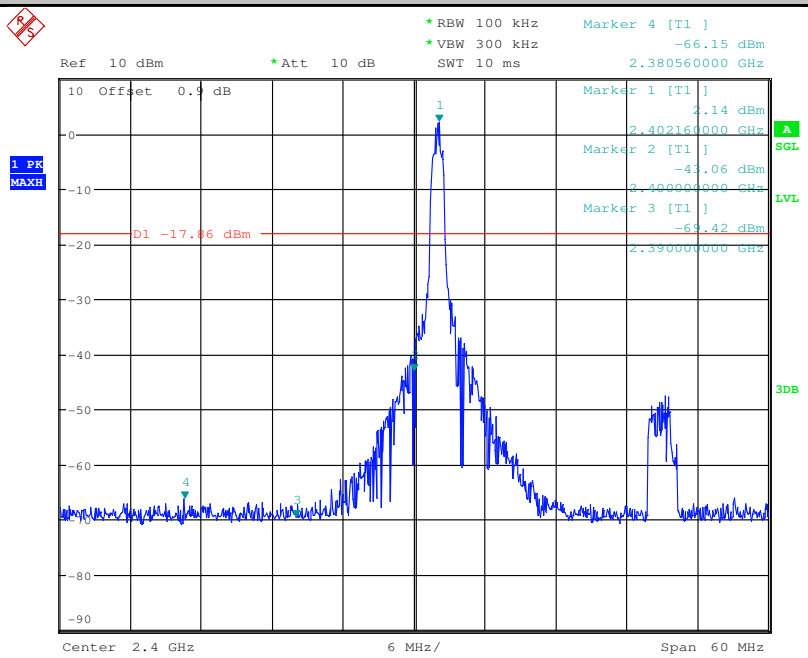
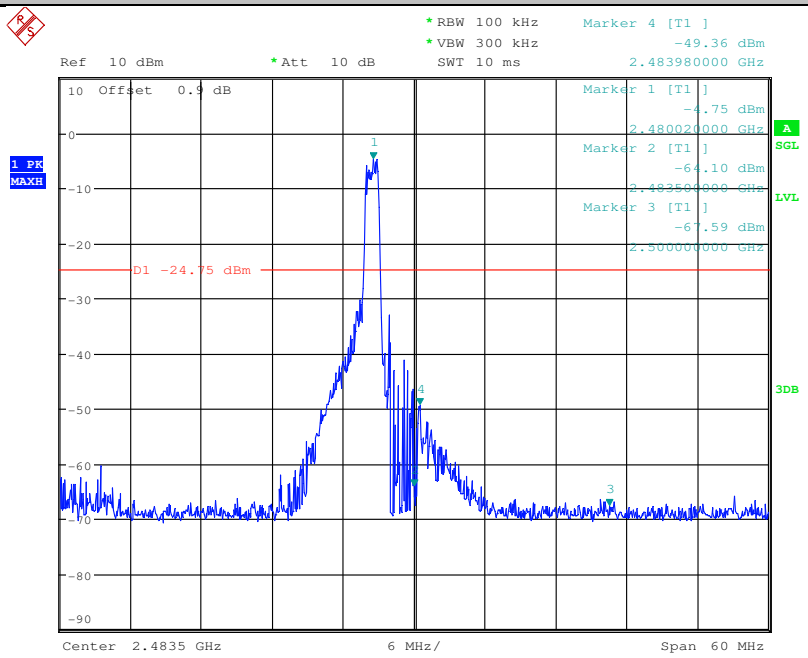
Band-edge for RF Conducted Emissions_2DH5_2402_Hopping Off



Band-edge for RF Conducted Emissions_2DH5_2480_Hopping Off



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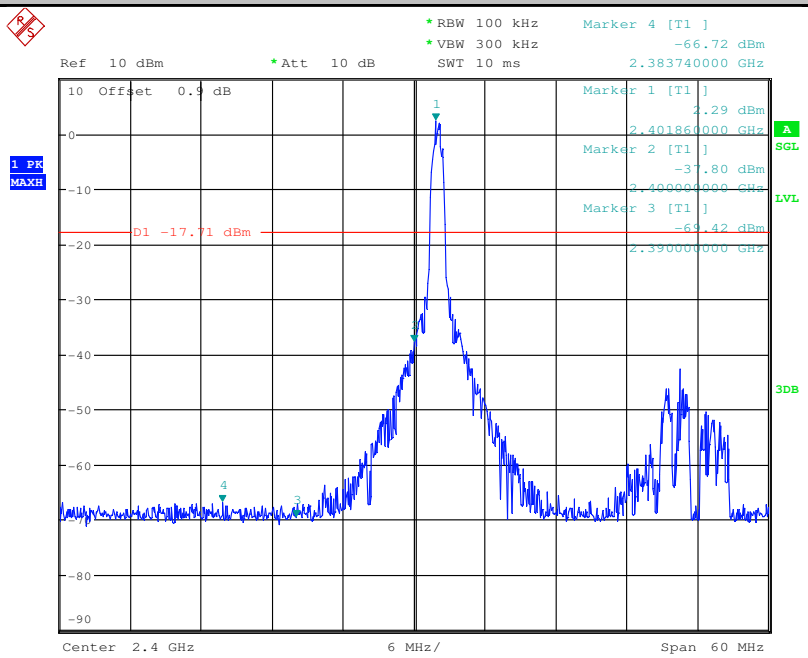
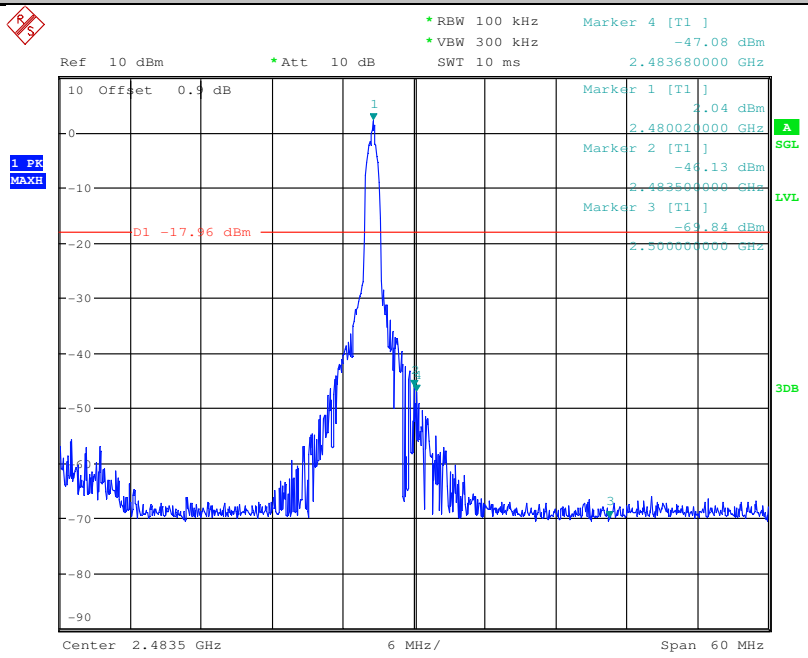
Band-edge for RF Conducted Emissions_3DH5_2402_Hopping Off



Band-edge for RF Conducted Emissions_3DH5_2480_Hopping Off



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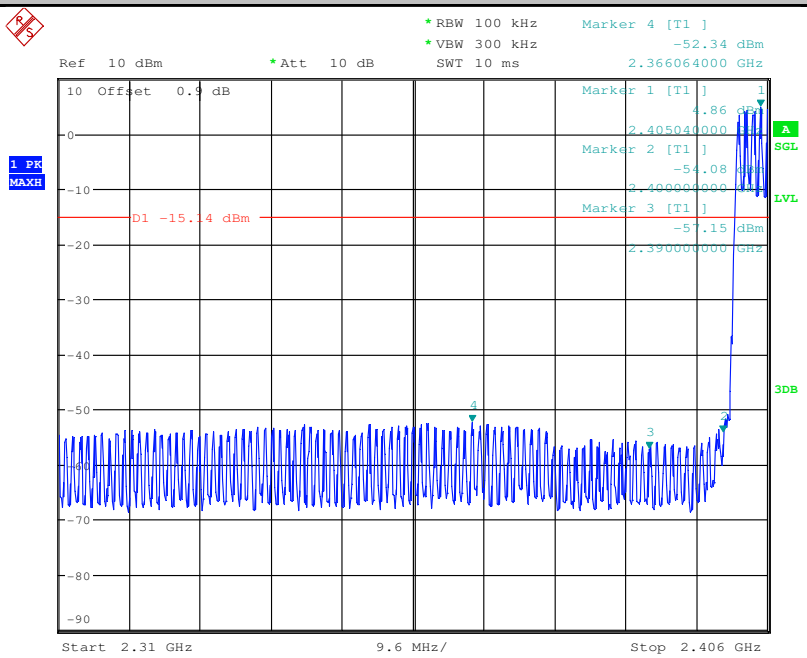
Band-edge for RF Conducted Emissions_DH5_2402_Hopping On



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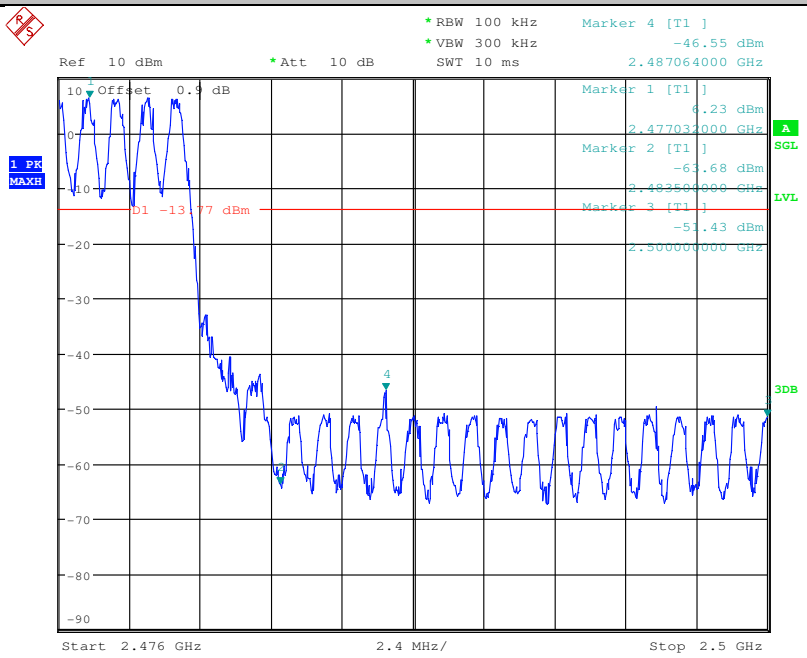

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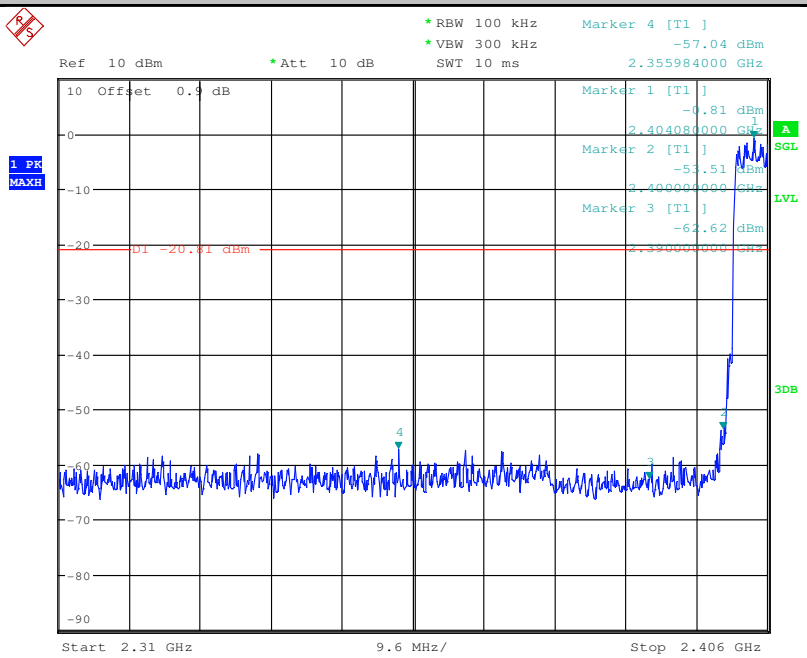
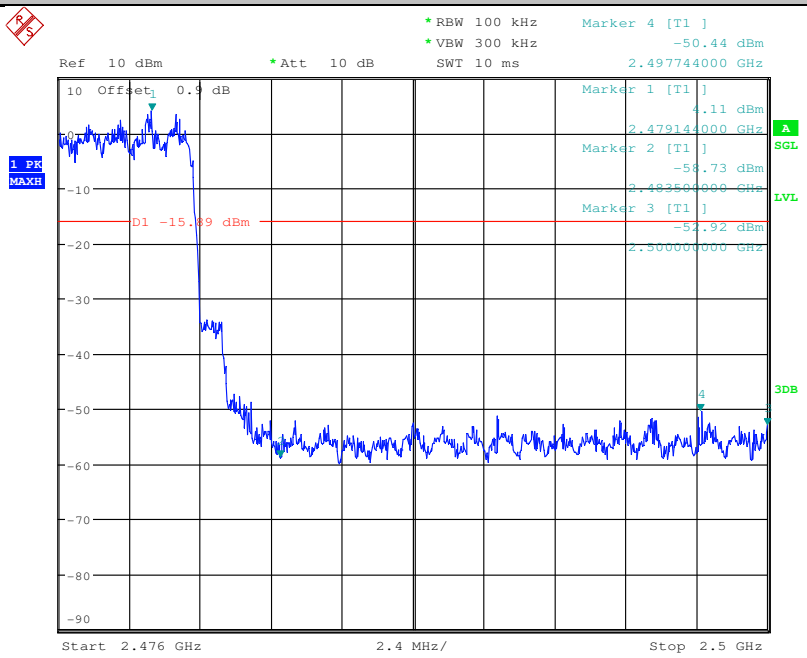
Band-edge for RF Conducted Emissions_2DH5_2402_Hopping On



Band-edge for RF Conducted Emissions_2DH5_2480_Hopping On



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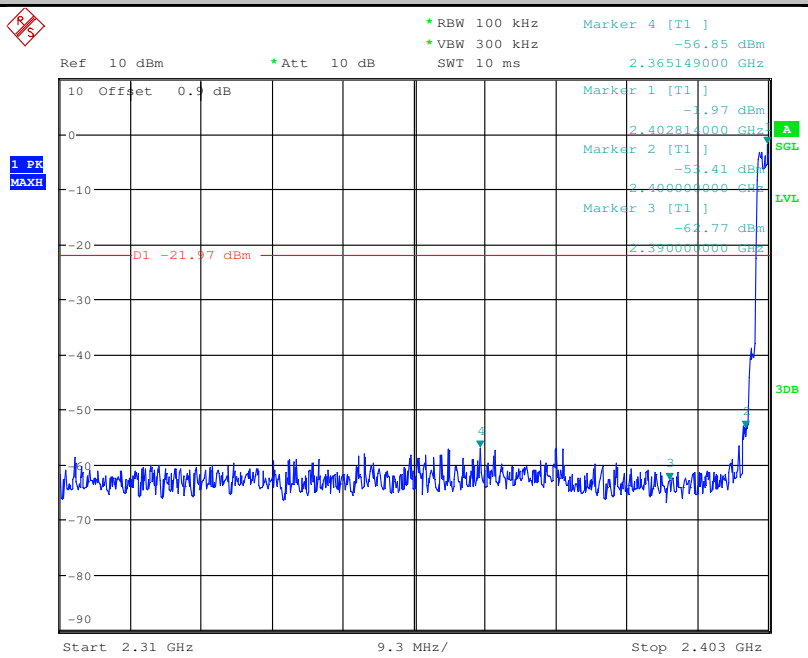
Band-edge for RF Conducted Emissions_3DH5_2402_Hopping On



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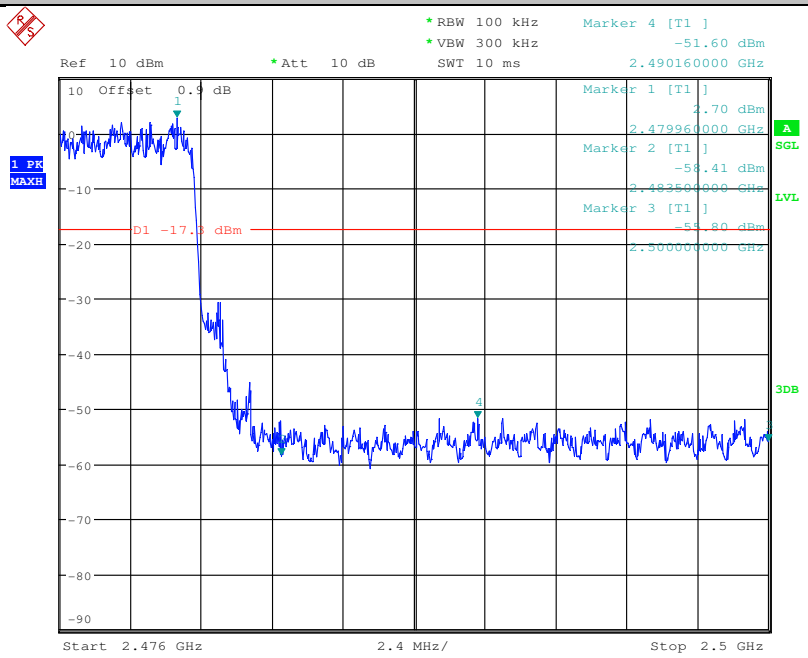

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7.RF Conducted Spurious Emissions

Test Mode	Test Channel	StartFre [MHz]	StopFre [MHz]	RBW [kHz]	VBW [kHz]	Pref[dBm]	Max. Level [dBm]	Limit [dBm]	Verdict
DH5	2402	30	10000	1000	3000	2.48	-38.530	<-17.52	PASS
DH5	2402	10000	25000	1000	3000	2.48	-45.580	<-17.52	PASS
DH5	2441	30	10000	1000	3000	2.69	-37.500	<-17.31	PASS
DH5	2441	10000	25000	1000	3000	2.69	-46.510	<-17.31	PASS
DH5	2480	30	10000	1000	3000	2.55	-36.860	<-17.45	PASS
DH5	2480	10000	25000	1000	3000	2.55	-46.390	<-17.45	PASS
2DH5	2402	30	10000	1000	3000	1.77	-39.630	<-18.23	PASS
2DH5	2402	10000	25000	1000	3000	1.77	-46.870	<-18.23	PASS
2DH5	2441	30	10000	1000	3000	1.12	-38.150	<-18.88	PASS
2DH5	2441	10000	25000	1000	3000	1.12	-46.520	<-18.88	PASS
2DH5	2480	30	10000	1000	3000	1.85	-36.430	<-18.15	PASS
2DH5	2480	10000	25000	1000	3000	1.85	-46.860	<-18.15	PASS
3DH5	2402	30	10000	1000	3000	0.59	-39.140	<-19.41	PASS
3DH5	2402	10000	25000	1000	3000	0.59	-46.420	<-19.41	PASS
3DH5	2441	30	10000	1000	3000	2.36	-37.620	<-17.64	PASS
3DH5	2441	10000	25000	1000	3000	2.36	-46.760	<-17.64	PASS
3DH5	2480	30	10000	1000	3000	1.88	-37.530	<-18.12	PASS
3DH5	2480	10000	25000	1000	3000	1.88	-46.250	<-18.12	PASS

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TEST PLOT	
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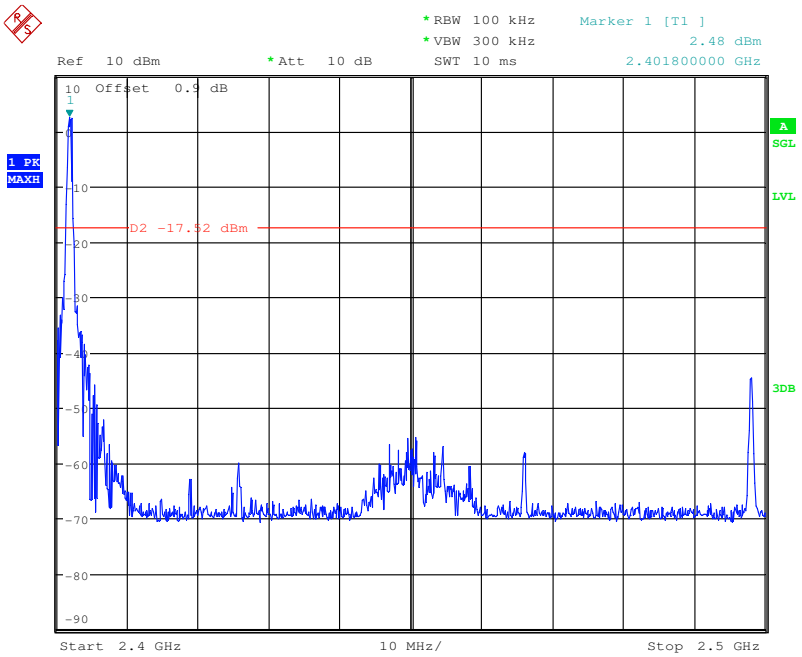
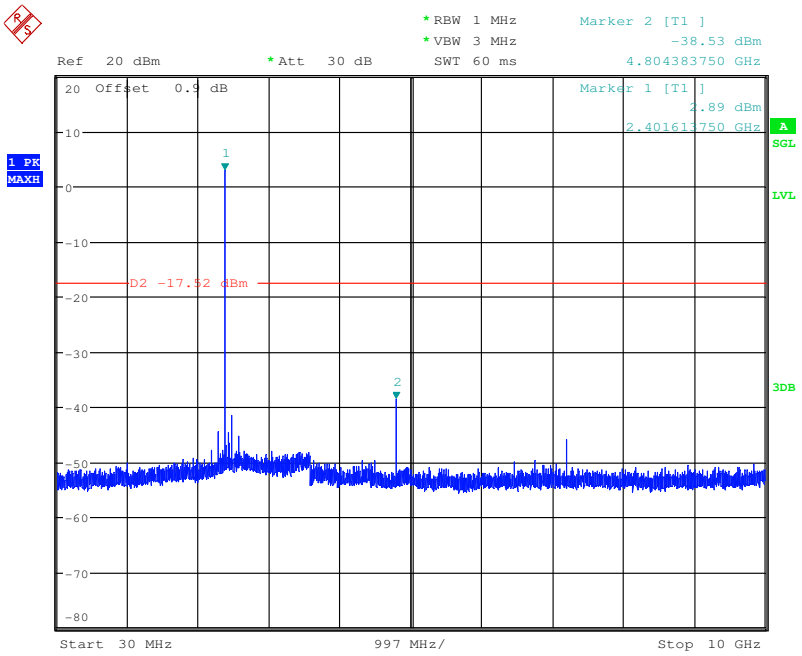
Pref	
CSE_1	

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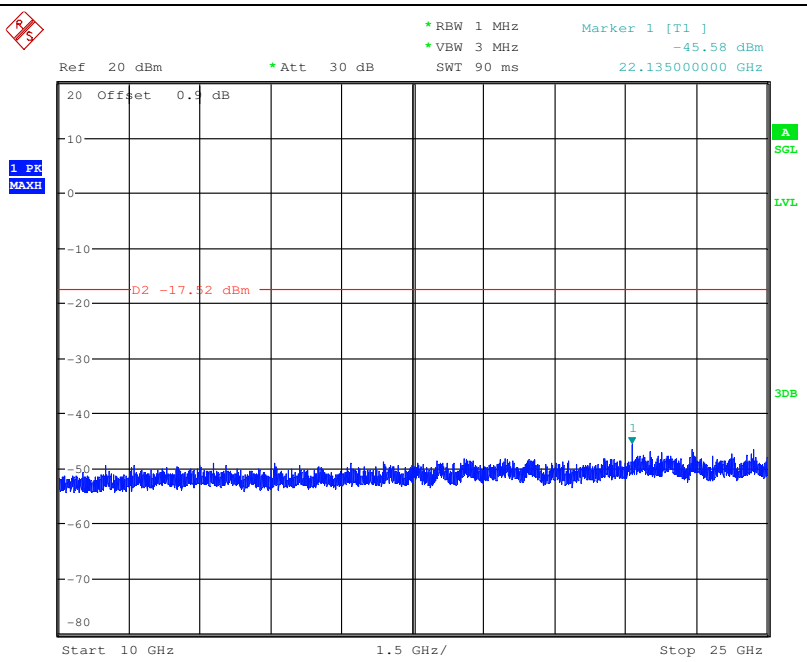
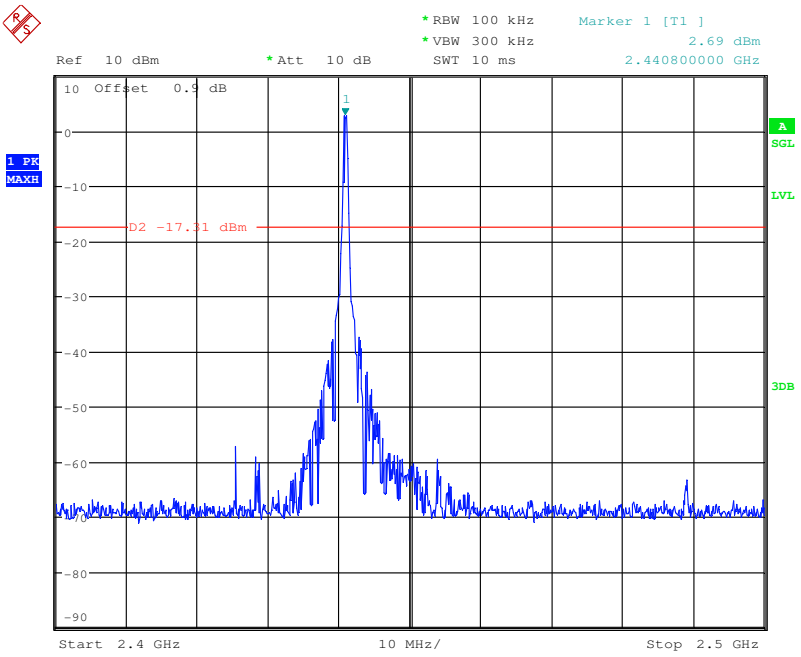
CSE_2



RF Conducted Spurious Emissions_DH5_2441

Pref



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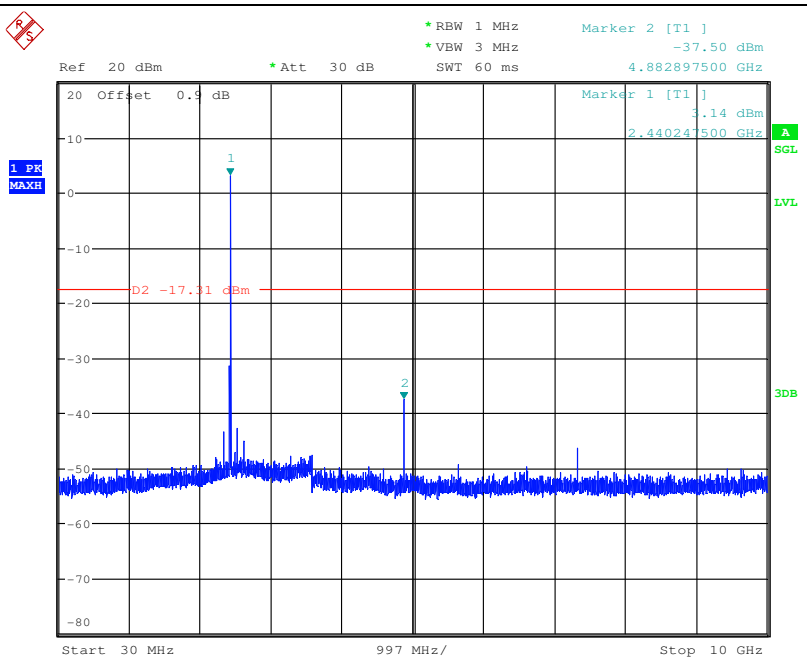
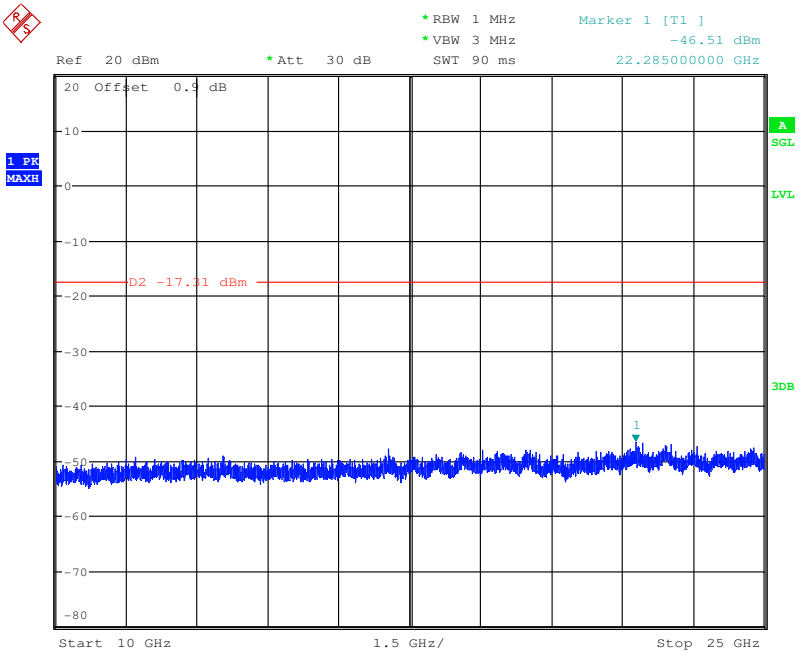
CSE_1	
CSE_2	

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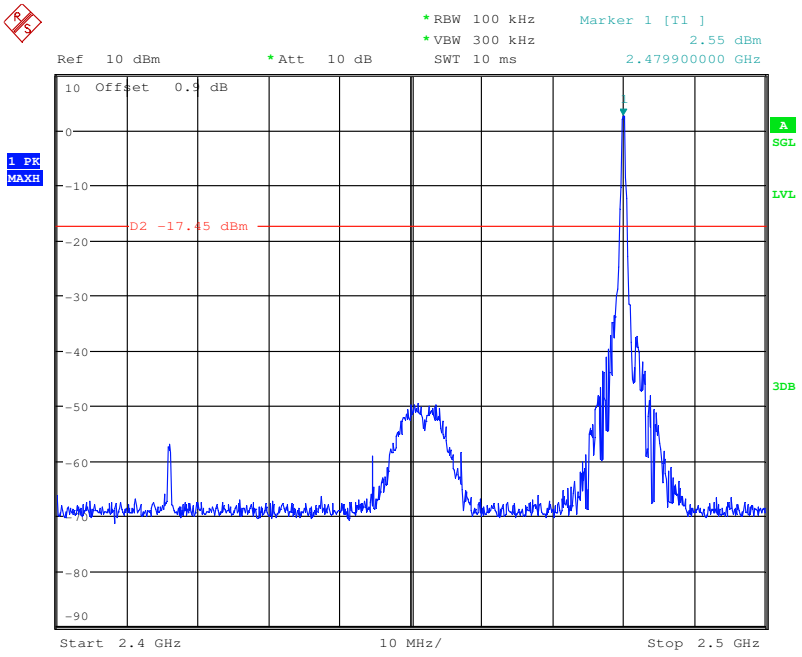
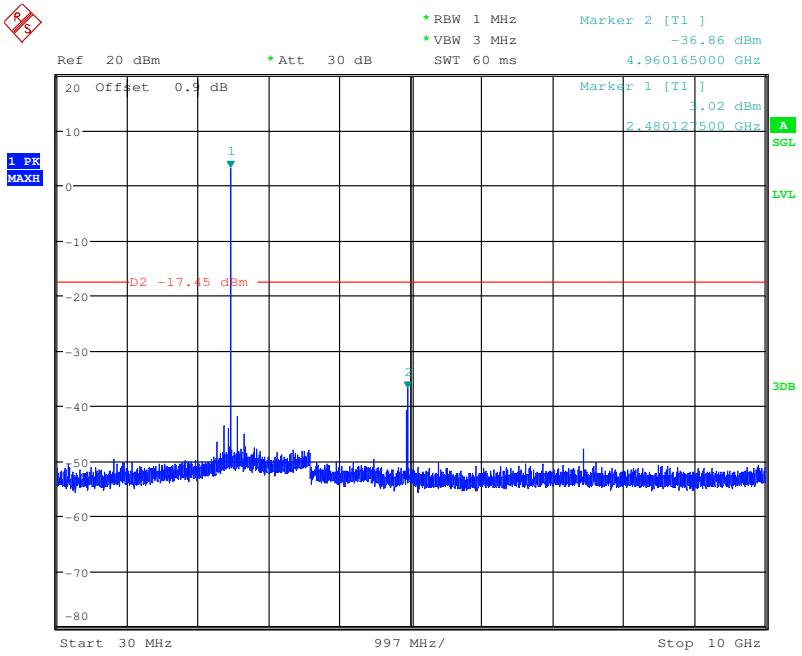
Pref	
CSE_1	

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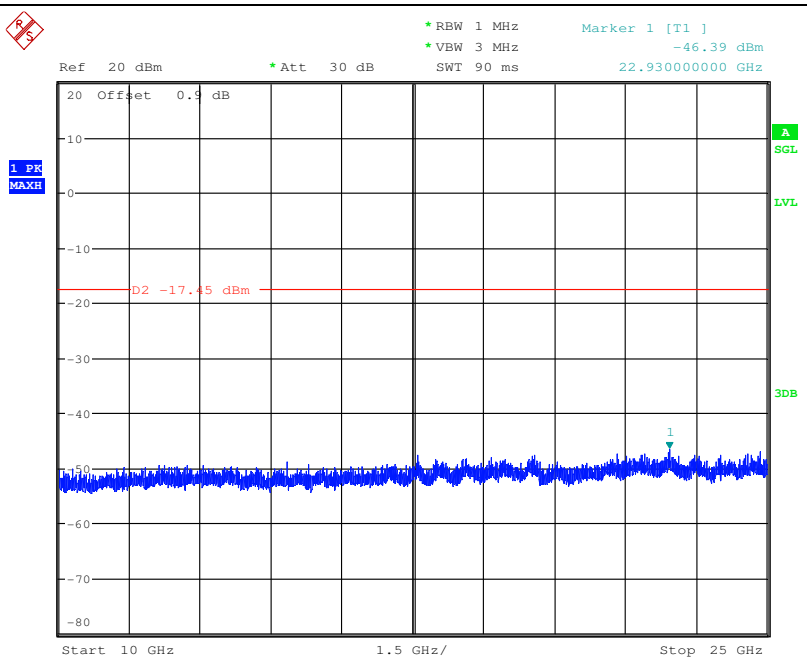
CSE_2



RF Conducted Spurious Emissions_2DH5_2402

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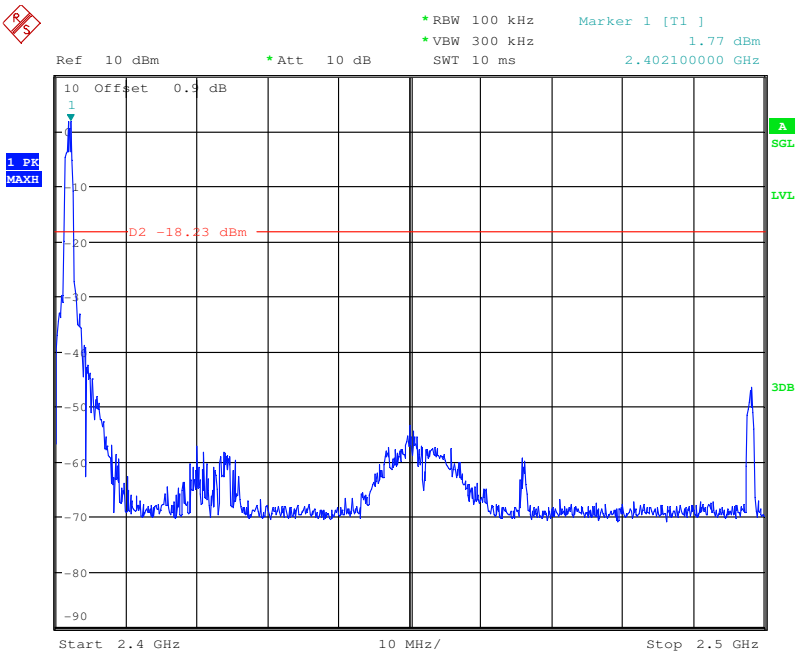

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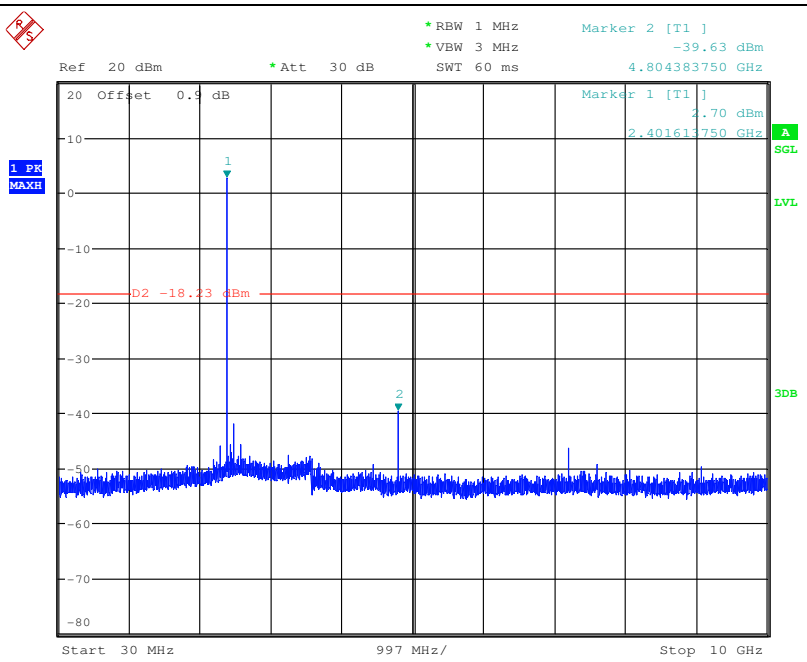
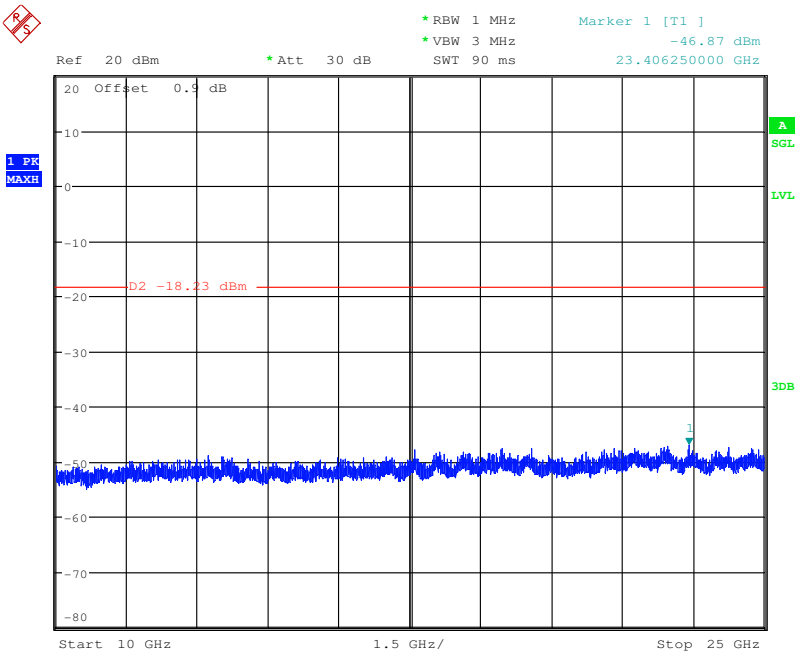
CSE_1	
CSE_2	

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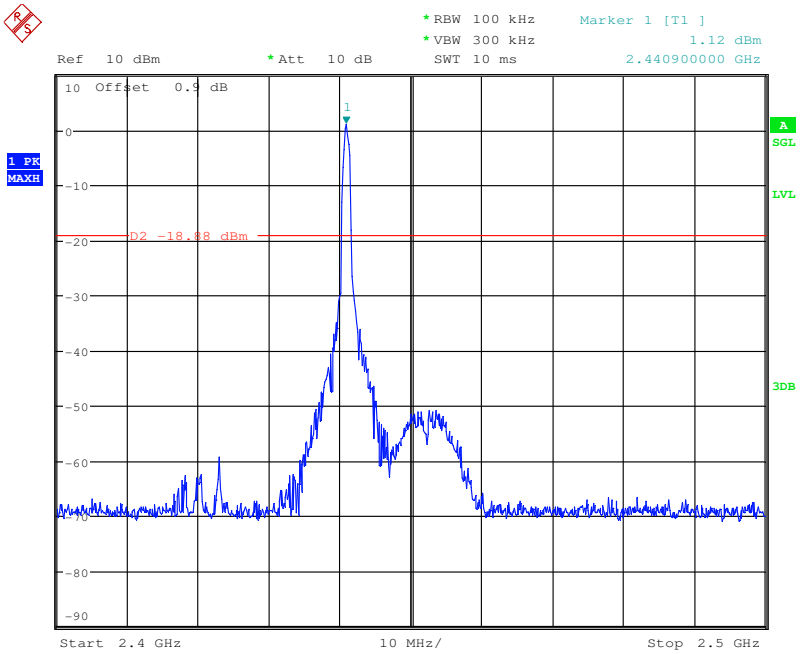
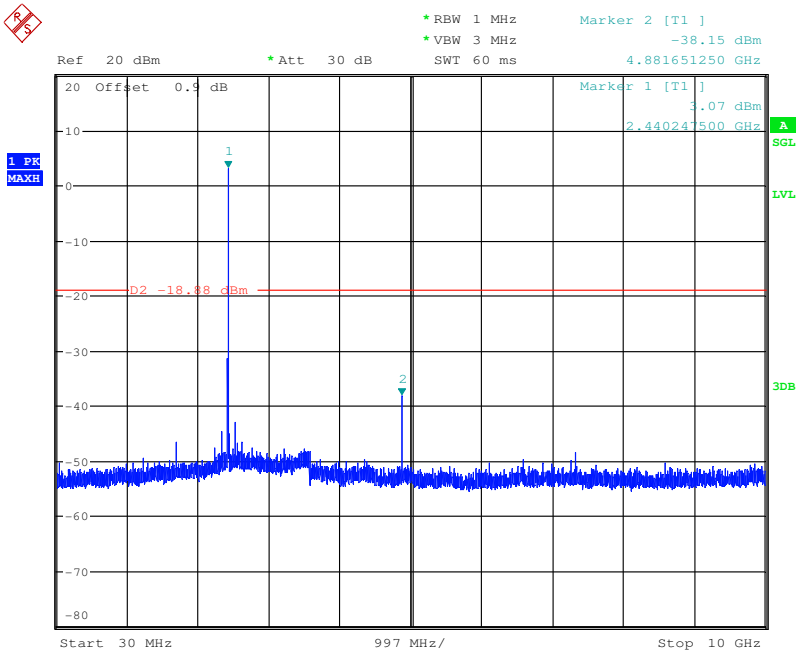
Pref	
CSE_1	

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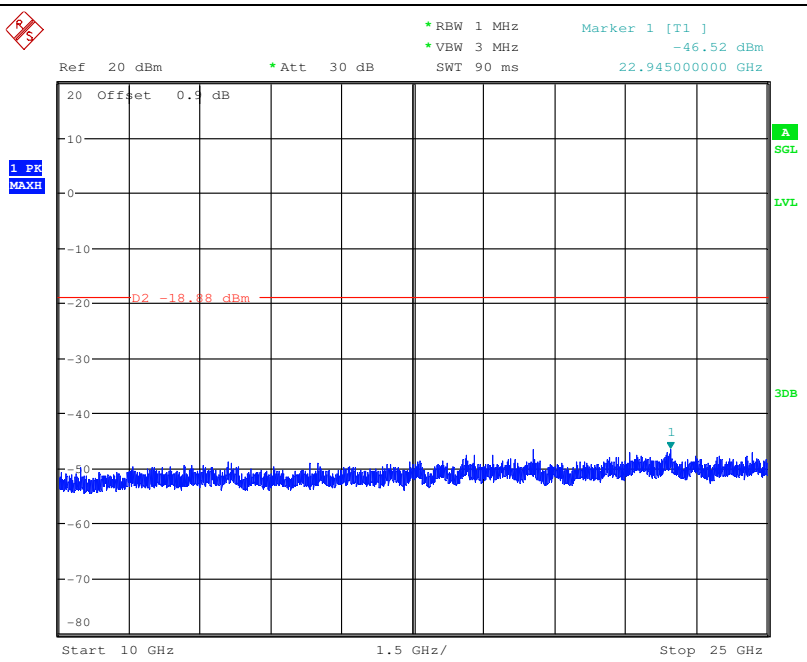
CSE_2



RF Conducted Spurious Emissions_2DH5_2480

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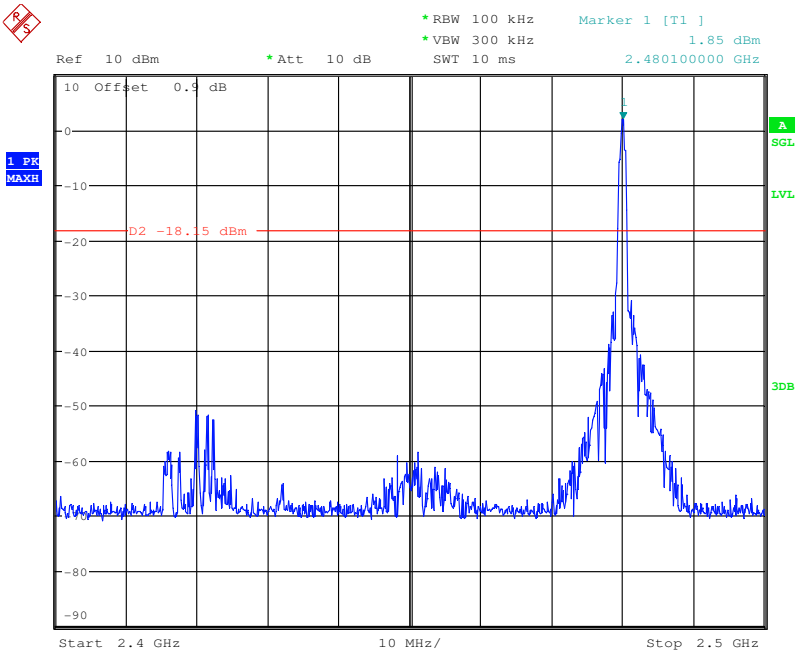

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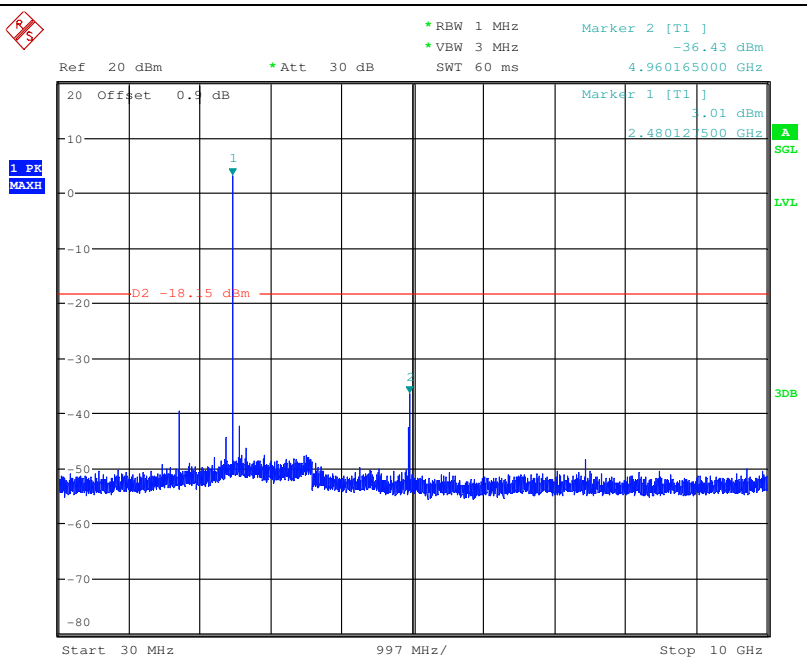
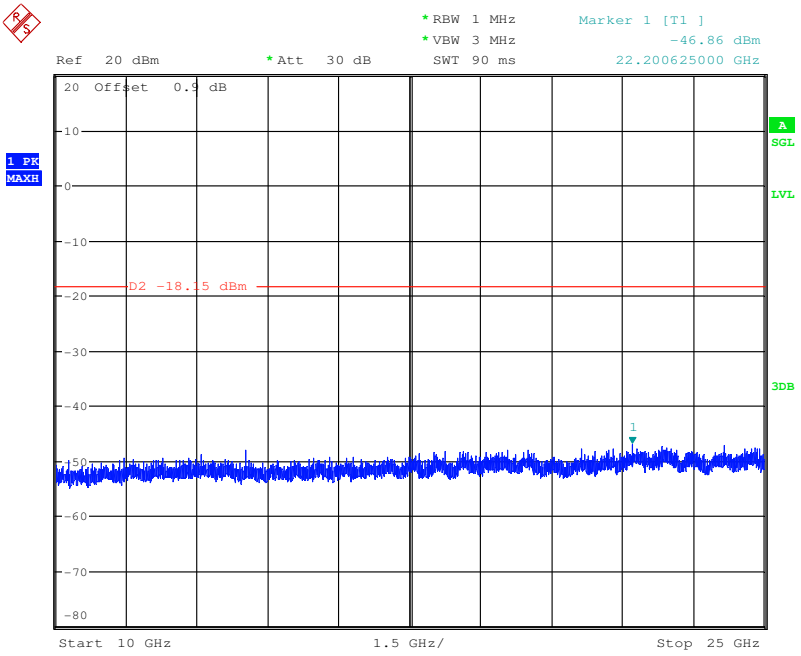
CSE_1	
CSE_2	

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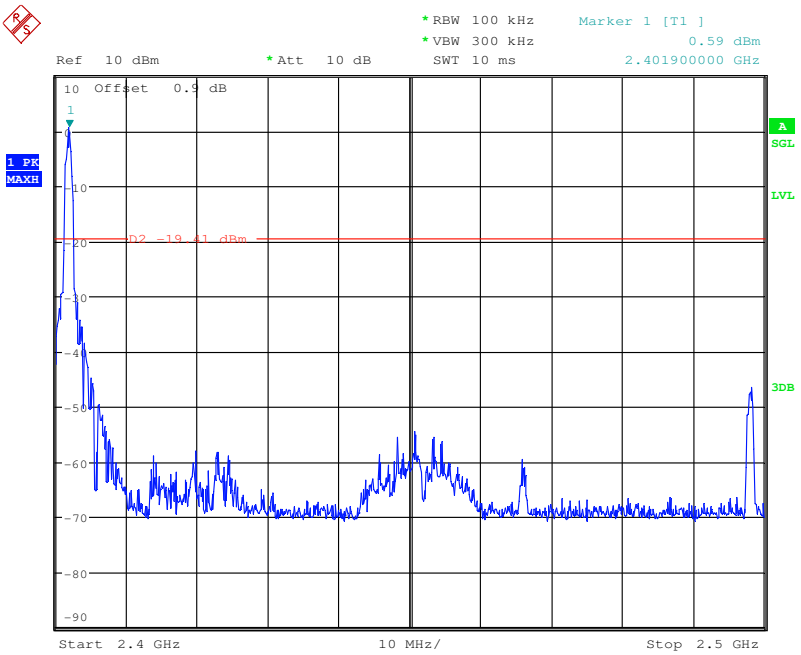
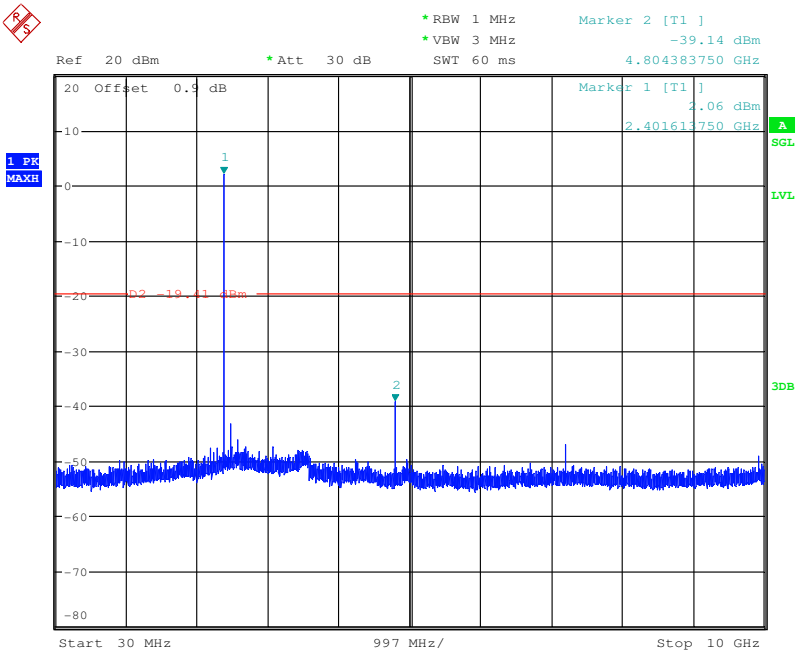
Pref	
CSE_1	

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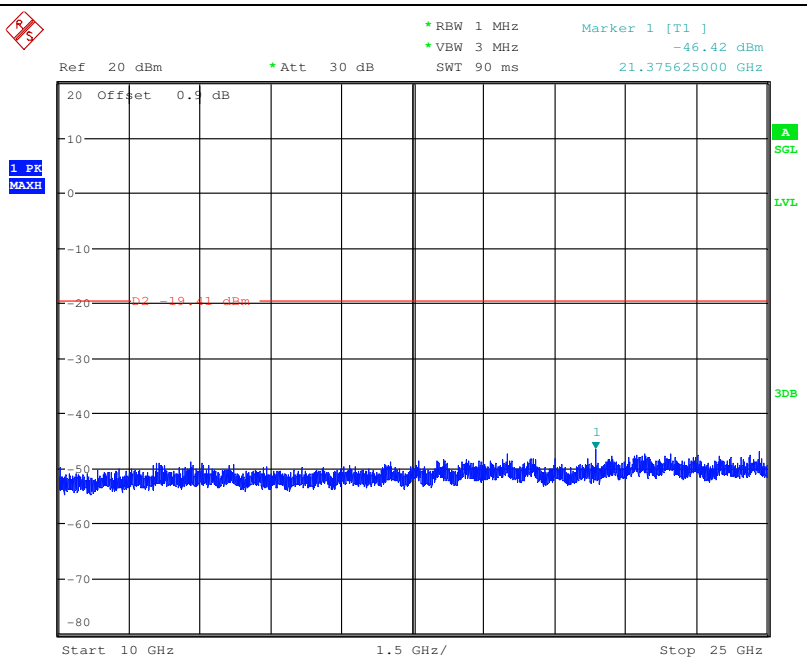
CSE_2



RF Conducted Spurious Emissions_3DH5_2441

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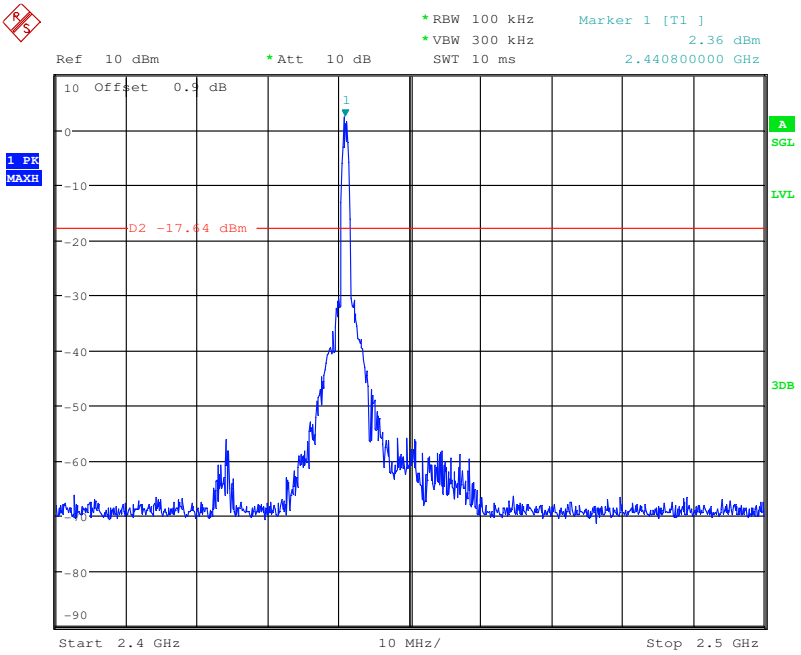

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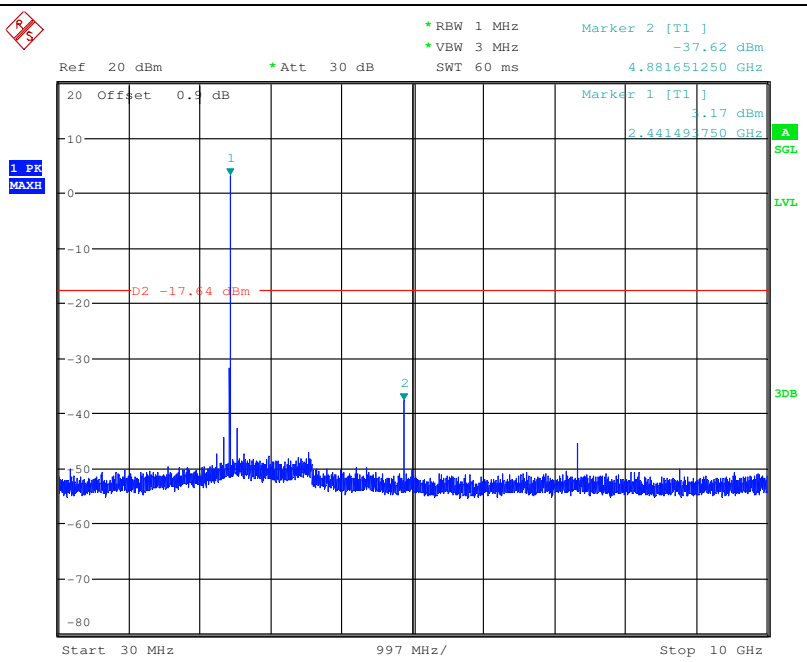
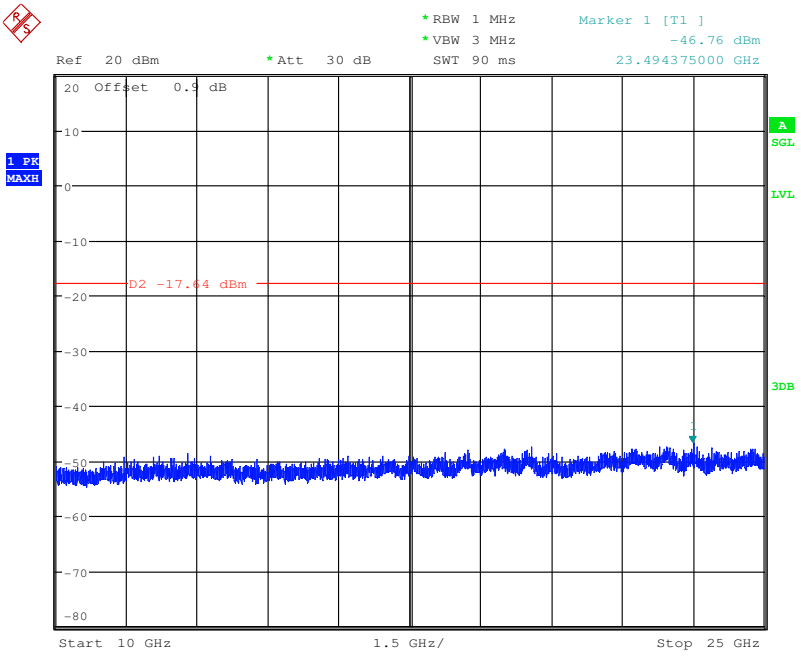
CSE_1	
CSE_2	

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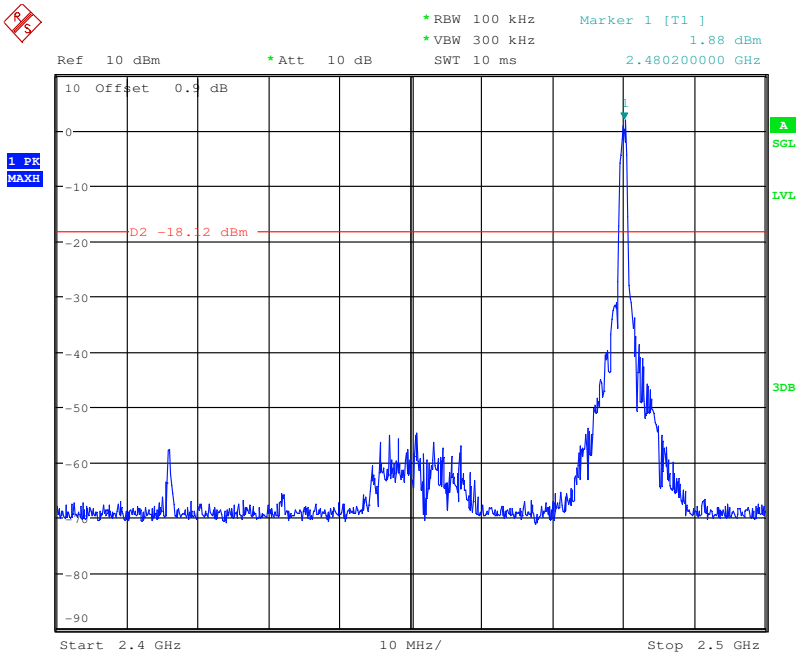
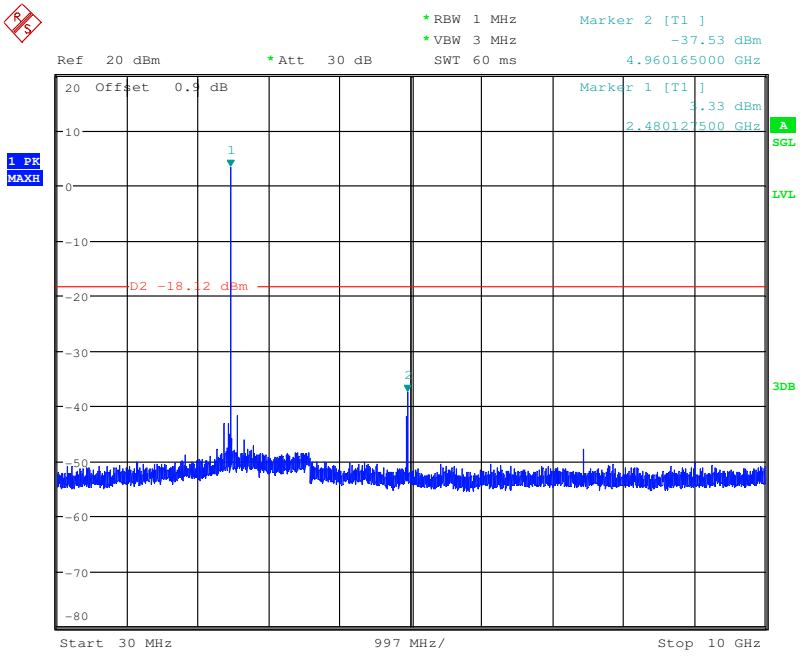
RF Conducted Spurious Emissions_3DH5_2480	
Pref	
CSE_1	

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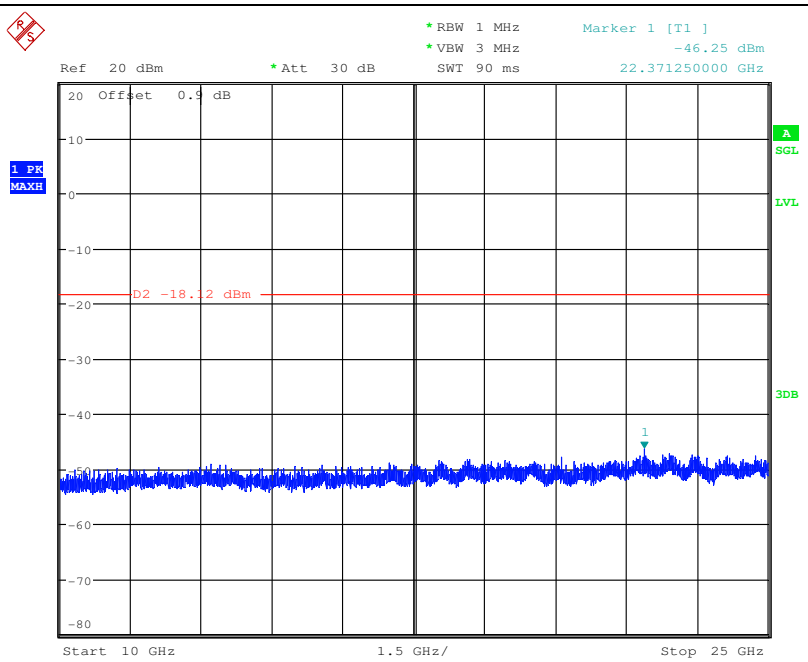
CSE_2	

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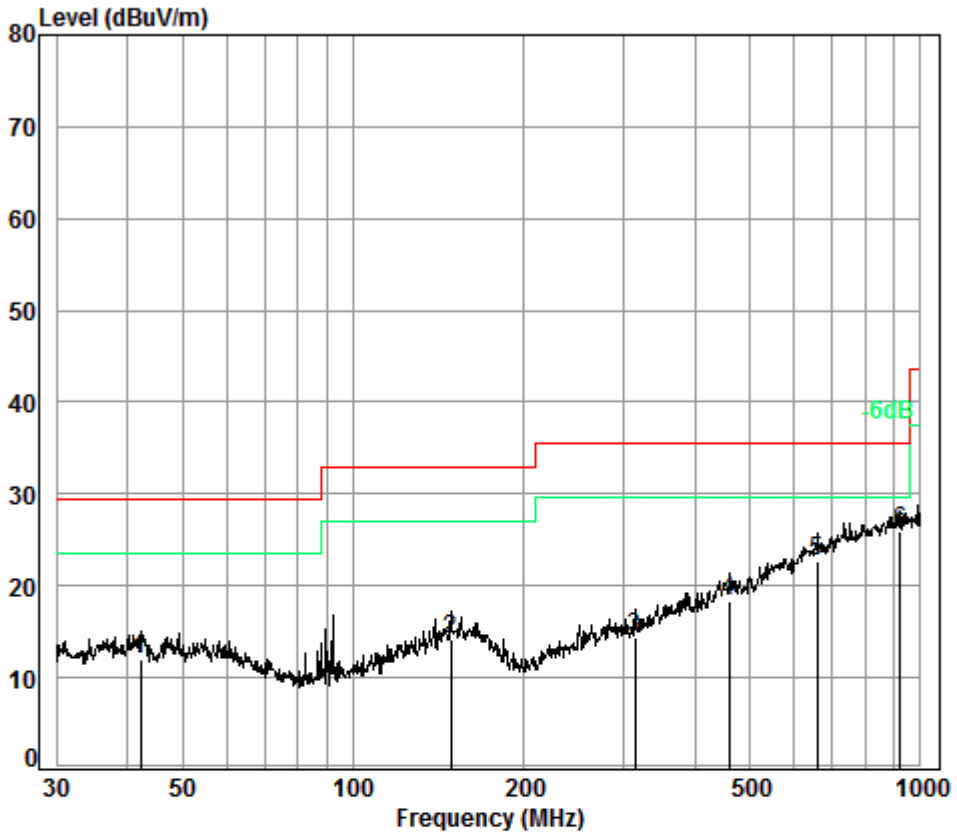
8. Radiated Spurious Emissions

For below 1GHz:

Mode:a;Polarization:Vertical



Condition: 10m VERTICAL
Job No. : 0241CR
Test Mode: a

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1	42.15	6.80	13.13	32.99	25.01	11.95	29.50	-17.55
2	148.44	7.44	13.31	32.74	26.26	14.27	33.00	-18.73
3	314.38	8.09	13.08	32.60	25.87	14.44	35.60	-21.16
4	460.73	8.45	16.30	32.60	26.11	18.26	35.60	-17.34
5	658.84	9.05	19.64	32.60	26.65	22.74	35.60	-12.86
6 pp	922.52	9.51	22.53	32.50	26.50	26.04	35.60	-9.56

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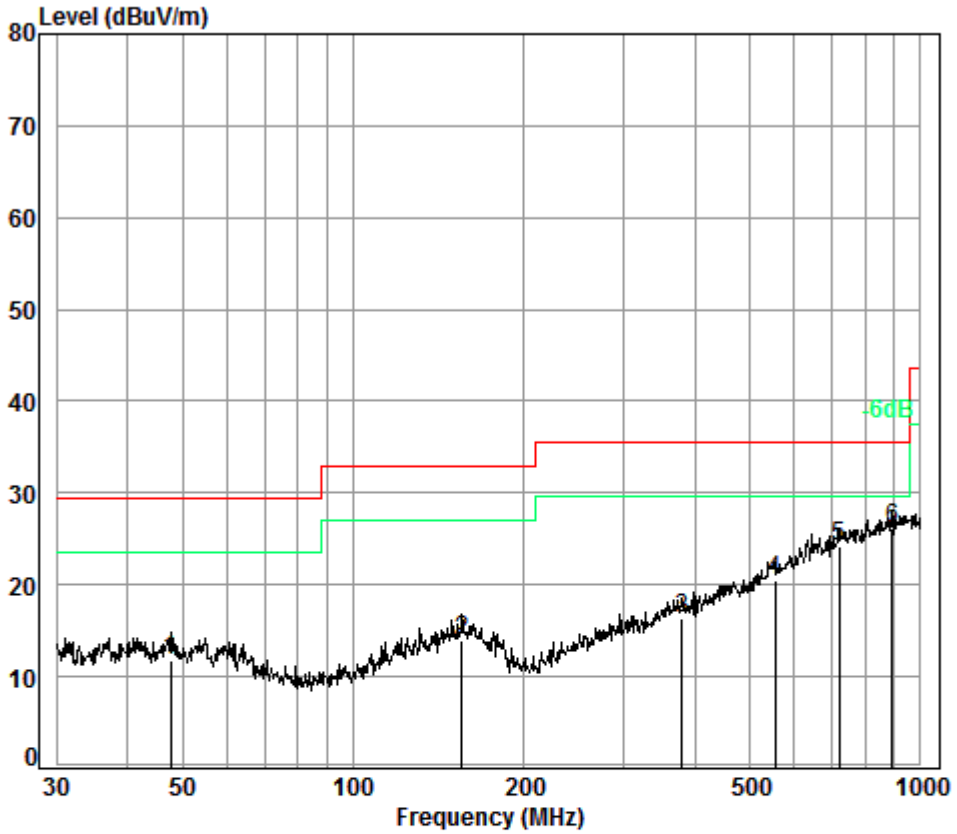
Mode:a;Polarization:Horizontal



Condition: 10m HORIZONTAL
Job No. : 0241CR
Test Mode: a

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1	47.66	6.85	12.83	33.00	25.17	11.85	29.50	-17.65
2	155.36	7.48	13.40	32.74	25.71	13.85	33.00	-19.15
3	379.91	8.30	14.48	32.60	26.25	16.43	35.60	-19.17
4	554.83	8.79	17.82	32.60	26.48	20.49	35.60	-15.11
5	719.20	9.20	20.38	32.60	27.28	24.26	35.60	-11.34
6 pp	890.73	9.50	22.10	32.51	27.02	26.11	35.60	-9.49

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The test was performed at a 10m test site. According to below formulate and the test data at 10m test distance,

$L_3 / L_{10} = D_{10} / D_3$

Note:

L_3: Level @ 3m distance. Unit: uV/m;

L_{10}: Level @ 10m distance. Unit: uV/m;

D_3: 3m distance. Unit: m

D_{10}: 10m distance. Unit: m

The level at 3m test distance is below:

Frequency (MHz)	Level @ 10m (dBuV/m)	Level @ 10m (uV/m)	Level @ 3m (uV/m)	Level @ 3m (dBuV/m)	Limit @ 3m (dBuV/m)	Margin (dB)	Ant. Polarization
42.15	11.95	3.96	13.19	22.41	40.00	-17.59	V
148.44	14.27	5.17	17.23	24.73	43.50	-18.77	V
314.38	14.44	5.27	17.57	24.90	46.00	-21.10	V
460.73	18.26	8.18	27.28	28.72	46.00	-17.28	V
658.84	22.74	13.71	45.70	33.20	46.00	-12.80	V
922.52	26.04	20.04	66.82	36.50	46.00	-9.50	V
47.66	11.85	3.91	13.04	22.31	40.00	-17.69	H
155.36	13.85	4.93	16.42	24.31	43.50	-19.19	H
379.91	16.43	6.63	22.10	26.89	46.00	-19.11	H
554.83	20.49	10.58	35.27	30.95	46.00	-15.05	H
719.20	24.26	16.33	54.44	34.72	46.00	-11.28	H
890.73	26.11	20.21	67.36	36.57	46.00	-9.43	H

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For above 1GHz:

Test mode:	8DPSK(3-DH1)	Test channel:	Lowest	Remark:	Peak

Frequency (MHz)	Antenna factors (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Read Level (dBuV)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
3584.372	32.45	7.66	37.96	43.77	45.92	74.00	-28.08	Vertical
4804.000	34.16	8.87	38.4	52.92	57.55	74.00	-16.45	Vertical
6025.661	34.72	10.53	38.27	44.29	51.27	74.00	-22.73	Vertical
7206.000	36.42	10.68	37.11	48.91	58.90	74.00	-15.10	Vertical
9608.000	37.52	12.50	35.10	37.06	51.98	74.00	-22.02	Vertical
12243.770	38.75	14.36	36.19	36.09	53.01	74.00	-20.99	Vertical
3594.760	32.48	7.67	37.96	44.80	46.99	74.00	-27.01	Horizontal
4804.000	34.16	8.87	38.40	52.75	57.38	74.00	-16.62	Horizontal
5794.797	34.58	9.98	38.34	44.75	50.97	74.00	-23.03	Horizontal
7206.000	36.42	10.68	37.11	46.58	56.57	74.00	-17.43	Horizontal
9608.000	37.52	12.50	35.10	37.76	52.68	74.00	-21.32	Horizontal
12137.940	38.68	14.45	35.93	36.62	53.82	74.00	-20.18	Horizontal

Test mode:	8DPSK(3-DH1)	Test channel:	Lowest	Remark:	Average

Frequency (MHz)	Antenna factors (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Read Level (dBuV)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
4804.000	34.16	8.87	38.4	44.39	49.02	54.00	-4.98	Vertical
7206.000	36.42	10.68	37.11	39.82	49.81	54.00	-4.19	Vertical
4804.000	34.16	8.87	38.40	45.29	49.92	54.00	-4.08	Horizontal
7206.000	36.42	10.68	37.11	38.15	48.14	54.00	-5.86	Horizontal

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Test mode:	8DPSK(3-DH1)	Test channel:	Middle	Remark:	Peak

Frequency (MHz)	Antenna factors (dB/m)	Cable Loss (dB)	Cable Loss (dB)	Reading Level (dBμV)	Emission Level (dBμV/m)	Limit (dBμV/m)	Over limit (dB)	Polarization
3842.163	33.18	7.76	37.98	45.09	48.05	74.00	-25.95	Vertical
4882.000	34.30	8.98	38.44	50.39	55.23	74.00	-18.77	Vertical
6078.201	34.76	10.46	38.22	44.26	51.26	74.00	-22.74	Vertical
7323.000	36.37	10.72	37.01	47.17	57.25	74.00	-16.75	Vertical
9764.000	37.55	12.58	35.02	36.62	51.73	74.00	-22.27	Vertical
12208.390	38.73	14.39	36.10	36.47	53.49	74.00	-20.51	Vertical
3759.672	32.95	7.73	37.98	43.99	46.69	74.00	-27.31	Horizontal
4882.000	34.30	8.98	38.44	54.03	58.87	74.00	-15.13	Horizontal
6034.386	34.73	10.52	38.27	45.05	52.03	74.00	-21.97	Horizontal
7323.000	36.37	10.72	37.01	45.47	55.55	74.00	-18.45	Horizontal
9764.000	37.55	12.58	35.02	37.24	52.35	74.00	-21.65	Horizontal
12243.770	38.75	14.36	36.19	36.94	53.86	74.00	-20.14	Horizontal

Test mode:	8DPSK(3-DH1)	Test channel:	Middle	Remark:	Average

Frequency (MHz)	Antenna factors (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Read Level (dBuV)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
4882.000	34.30	8.98	38.44	44.89	49.73	54.00	-4.27	Vertical
7323.000	36.37	10.72	37.01	39.11	49.19	54.00	-4.81	Vertical
4882.000	34.30	8.98	38.44	44.88	49.72	54.00	-4.28	Horizontal
7323.000	36.37	10.72	37.01	37.68	47.76	54.00	-6.24	Horizontal

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Test mode:	8DPSK(3-DH1)	Test channel:	Highest	Remark:	Peak

Frequency (MHz)	Antenna factors (dB/m)	Cable Loss (dB)	Preamp factor (dB)	Reading Level (dBμV)	Emission Level (dBμV/m)	Limit (dBμV/m)	Over limit (dB)	Polarization
3743.387	32.90	7.72	37.97	45.66	48.31	74.00	-25.69	Vertical
4960.000	34.43	9.09	38.48	53.73	58.77	74.00	-15.23	Vertical
6069.413	34.76	10.47	38.23	44.65	51.65	74.00	-22.35	Vertical
7440.000	36.32	10.77	36.90	45.46	55.65	74.00	-18.35	Vertical
9920.000	37.58	12.67	34.94	35.87	51.18	74.00	-22.82	Vertical
12350.53	38.81	14.27	36.44	37.13	53.77	74.00	-20.23	Vertical
3842.163	33.18	7.76	37.98	44.61	47.57	74.00	-26.43	Horizontal
4960.000	34.43	9.09	38.48	52.80	57.84	74.00	-16.16	Horizontal
6051.874	34.74	10.49	38.25	44.45	51.43	74.00	-22.57	Horizontal
7440.000	36.32	10.77	36.90	47.66	57.85	74.00	-16.15	Horizontal
9920.000	37.58	12.67	34.94	36.33	51.64	74.00	-22.36	Horizontal
12261.500	38.76	14.34	36.23	36.27	53.14	74.00	-20.86	Horizontal

Test mode:	8DPSK(3-DH1)	Test channel:	Highest	Remark:	Average

Frequency (MHz)	Antenna factors (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Read Level (dBuV)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
4960.000	34.43	9.09	38.48	44.86	49.90	54.00	-4.10	Vertical
7440.000	36.32	10.77	36.90	39.50	49.69	54.00	-4.31	Vertical
4960.000	34.43	9.09	38.48	44.19	49.23	54.00	-4.77	Horizontal
7440.000	36.32	10.77	36.90	38.75	48.94	54.00	-5.06	Horizontal

Remark:

1) The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:

   Final Test Level =Receiver Reading + Antenna Factor + Cable Factor – Preamplifier Factor

2) Scan from 9kHz to 25GHz, the disturbance above 13GHz and below 30MHz was very low, and the above harmonics were the highest point could be found when testing, so only the above harmonics had been displayed. The amplitude of spurious emissions from the radiator which are attenuated more than 20dB below the limit need not be reported.

3) As shown in this section, for frequencies above 1GHz, the field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. So, only the above measurements were shown in the report.

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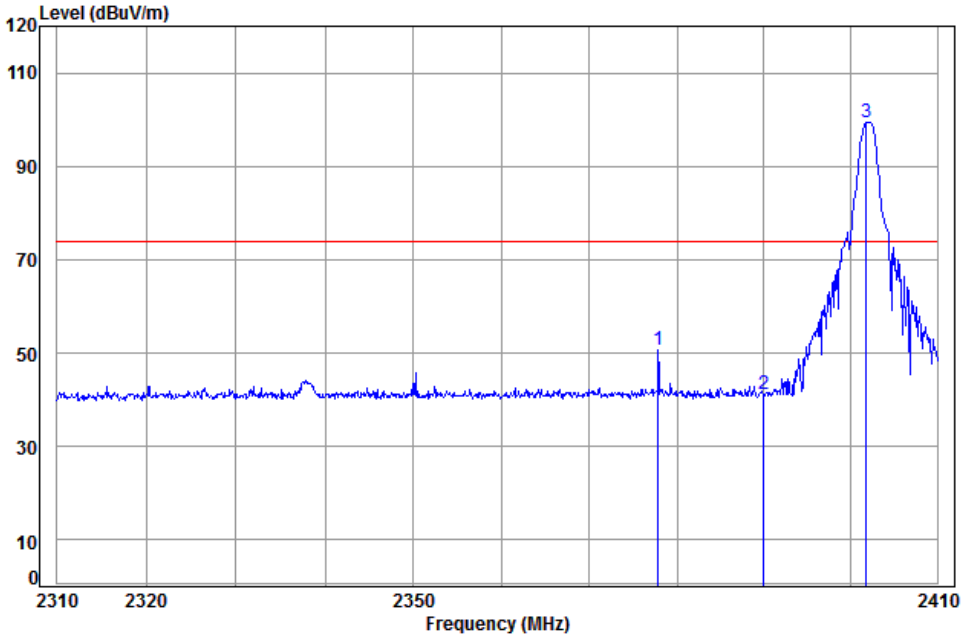
9. Restricted bands around fundamental frequency

Worse case mode:	8DPSK(3-DH5)	Test channel:	Lowest	Remark:	Peak	Vertical



Condition: 3m Vertical
Job No: : 0241CR
Mode: : 2402 Bandedge
: BT

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	2377.840	5.33	29.04	37.96	54.35	50.76	74.00	-23.24	
2	2390.000	5.34	29.08	37.96	44.73	41.19	74.00	-32.81	
3 pp	2401.843	5.35	29.11	37.96	102.99	99.49	74.00	25.49	

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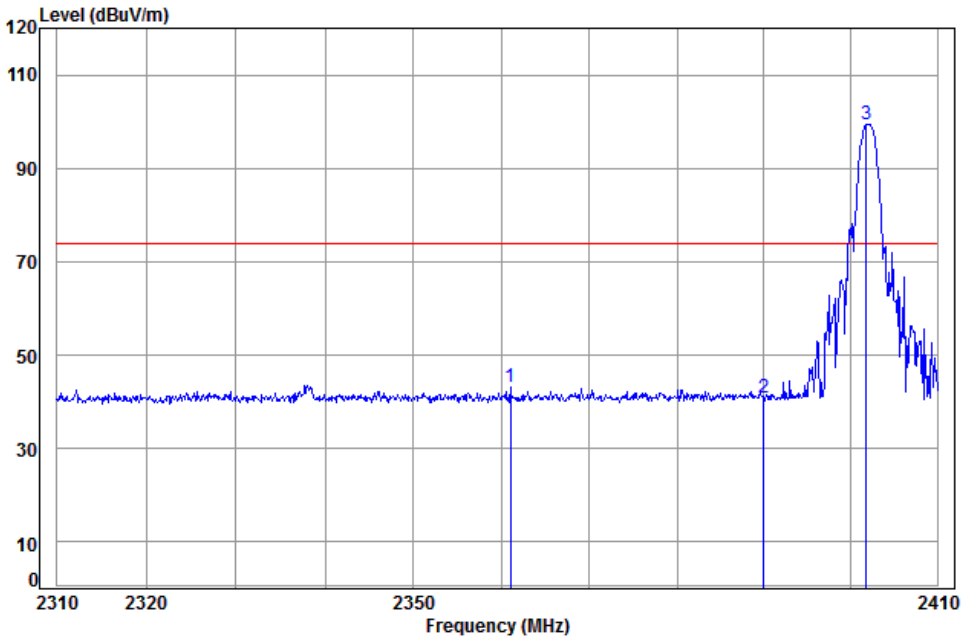
Worse case mode:	8DPSK(3-DH5)	Test channel:	Lowest	Remark:	Peak	Horizontal



Condition: 3m HORIZONTAL
Job No: : 0241CR
Mode: : 2402 Bandedge
: BT

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	2360.971	5.31	28.99	37.96	46.91	43.25	74.00	-30.75	
2	2390.000	5.34	29.08	37.96	44.33	40.79	74.00	-33.21	
3 pp	2401.843	5.35	29.11	37.96	102.85	99.35	74.00	25.35	

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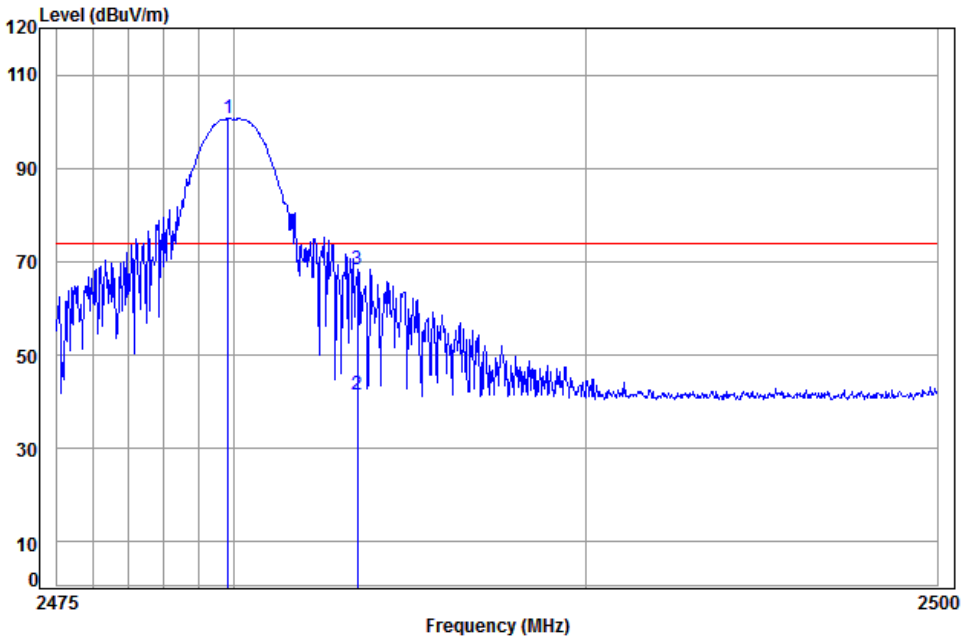
Worse case mode:	8DPSK(3-DH5)	Test channel:	Highest	Remark:	Peak	Vertical



Condition: 3m VERTICAL
Job No: : 0241CR
Mode: : 2480 Bandedge
: BT

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1 pp	2479.830	5.41	29.34	37.95	103.82	100.62	74.00	26.62	
2 av	2483.500	5.41	29.35	37.95	44.59	41.40	54.00	-12.60	Average
3 pk	2483.500	5.41	29.35	37.95	71.53	68.34	74.00	-5.66	Peak

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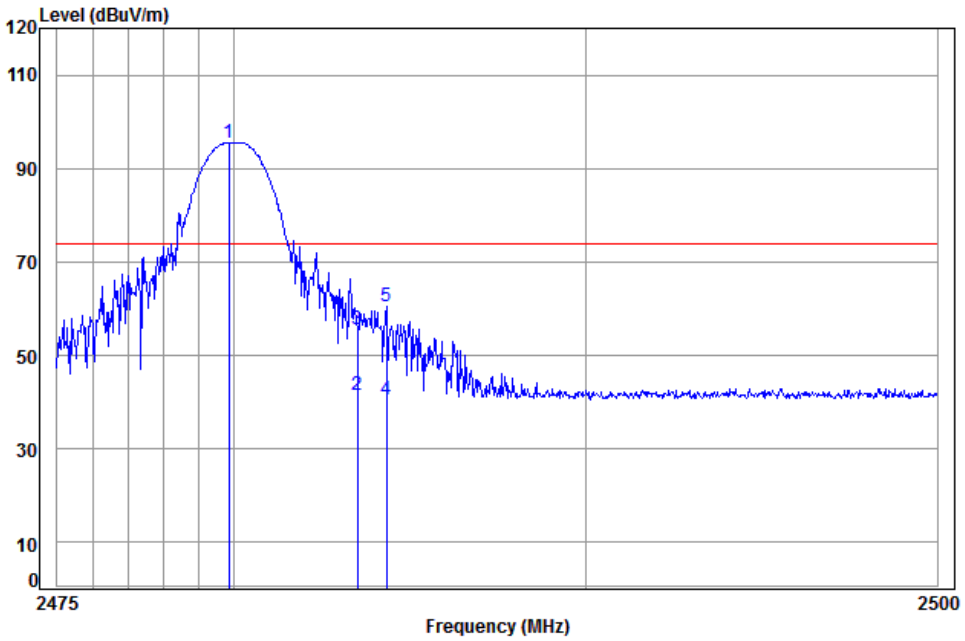
Worse case mode:	8DPSK(3-DH5)	Test channel:	Highest	Remark:	Peak	Horizontal



Condition: 3m HORIZONTAL
Job No: : 0241CR
Mode: : 2480 Bandedge
: BT

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1 pp	2479.855	5.41	29.34	37.95	98.71	95.51	74.00	21.51	
2 av	2483.500	5.41	29.35	37.95	44.62	41.43	54.00	-12.57	Average
3	2483.500	5.41	29.35	37.95	58.81	55.62	74.00	-18.38	Peak
4	2484.321	5.41	29.35	37.95	43.61	40.42	54.00	-13.58	Average
5 pk	2484.321	5.41	29.35	37.95	63.69	60.50	74.00	-13.50	Peak

Note:
The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:
Final Test Level =Receiver Reading + Antenna Factor + Cable Factor – Preamplifier Factor

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