

TEST REPORT

Application No.: GZEM2009015347CR
Applicant: Seamless Integration Electronics Technology Co., Ltd
Address of Applicant: Room 402, Bldg D., No.1 Nanxiang zhi Rd, Huangpu Dis., Guangzhou, China.
Manufacturer: Seamless Integration Electronics Technology Co., Ltd
Address of Manufacturer: Room 402, Bldg D., No.1 Nanxiang zhi Rd, Huangpu Dis., Guangzhou, China.
Factory: Seamless Integration Electronics Technology Co., Ltd
Address of Factory: Room 402, Bldg D., No.1 Nanxiang zhi Rd, Huangpu Dis., Guangzhou, China.
Equipment Under Test (EUT):

EUT Name: Car in-dash Multimedia Navigation

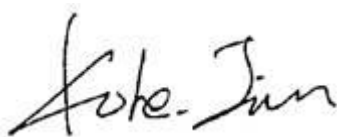
Model No.: G1C096A, G1C129A, G1C097A, G1C130A, G1C098A, G1C131A, G1C099A, G1C132A, G1C100A, G1C133A, G1C101A, G1C134A, G1C102A, G1C135A, G1C103A, G1C136A, G1C104A, G1C137A, G1C105A, G1C138A, G1C106A, G1C139A, G1C107A, G1C140A, G1C108A, G1C141A, G1C109A, G1C142A, G1C110A, G1C143A, G1C111A, G1C144A, G1C112A, G1C145A, G1C113A, G1C146A, G1C114A, G1C147A, G1C115A, G1C148A, G1C116A, G1C149A, G1C117A, G1C150A, G1C118A, G1C151A, G1C119A, G1C152A, G1C120A, G1C153A, G1C121A, G1C154A, G1C122A, G1C155A, G1C123A, G1C156A, G1C124A, G1C157A, G1C125A, G1C158A, G1C126A, G1C159A, G1C127A, G1C160A, G1C128A □

□ Please refer to section 2 of this report which indicates which model was actually tested and which were electrically identical.

Trade Mark: Linkswell
Standard(s): 47 CFR Part 15, Subpart C 15.247
Date of Receipt: 2020-09-25
Date of Test: 2020-10-19 to 2020-12-01
Date of Issue: 2020-12-16

Test Result:	Pass*
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* In the configuration tested, the EUT complied with the standards specified above.



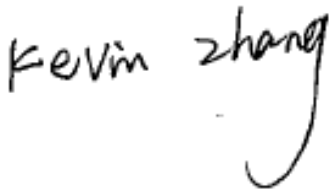
Kobe Jian
EMC Laboratory Manager



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Revision Record				
Version	Chapter	Date	Modifier	Remark
01		2020-12-16		Original

Authorized for issue by:			
Tested By		2020-10-19 to 2020-12-01	
Checked By		2020-12-16	



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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

N/A: Not applicable

Radio Spectrum Matter Part				
Item	Standard	Method	Requirement	Result
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
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
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 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
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 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
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



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▣ **Declaration of EUT Family Grouping:**

Model No.: G1C096A, G1C129A, G1C097A, G1C130A, G1C098A, G1C131A, G1C099A, G1C132A, G1C100A, G1C133A, G1C101A, G1C134A, G1C102A, G1C135A, G1C103A, G1C136A, G1C104A, G1C137A, G1C105A, G1C138A, G1C106A, G1C139A, G1C107A, G1C140A, G1C108A, G1C141A, G1C109A, G1C142A, G1C110A, G1C143A, G1C111A, G1C144A, G1C112A, G1C145A, G1C113A, G1C146A, G1C114A, G1C147A, G1C115A, G1C148A, G1C116A, G1C149A, G1C117A, G1C150A, G1C118A, G1C151A, G1C119A, G1C152A, G1C120A, G1C153A, G1C121A, G1C154A, G1C122A, G1C155A, G1C123A, G1C156A, G1C124A, G1C157A, G1C125A, G1C158A, G1C126A, G1C159A, G1C127A, G1C160A, G1C128A.

According to the declaration from the applicant, the electrical circuit design, layout, components used and internal wiring were identical for all models, with only difference on the plastic frame.

Therefore only one model **G1C098A** was tested in this report.



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4 General Information

4.1 Details of E.U.T.

Power Supply:	DC 14.5 V
Test Voltage:	DC 14.5 V
Cable:	DC input cables HDMI IN ports HDMI OUT ports Wi-Fi antenna ports with fixed antenna GPS antenna ports with fixed antenna Camera input ports USB ports AM/FM antenna ports
Function:	Multiple Media & Navigation Equipment use in vehicle
Antenna Number:	3 (1 for BT double mode, 1 for Wi-Fi & 1 for GPS receiving only)
Antenna Gain:	0 dBi declared by applicant
Antenna Type:	Integral Antenna
Channel Spacing:	1MHz
Modulation Type:	GFSK, $\pi/4$ DQPSK, 8DPSK
Number of Channels:	79
Operation Frequency:	2402MHz to 2480MHz
Spectrum Spread Technology:	Frequency Hopping Spread Spectrum (FHSS)
Hardware:	9608_TH V02_0507
Software:	SV01
S/N:	G1C098AH06E0306012122001
Test Software	BlueTest3.exe
Power Setting	6 dBm can not be changed by user
BT Version	V 5.0 for classic and BLE 1M only declared by applicant

4.2 Description of Support Units

Description	Manufacturer	Model No.	Serial No.
Laptop	Lenovo	T430u	REF. No.SEA1800
BT test board	SGS EMC	RF 07	RF 07



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4.3 Measurement Uncertainty

No.	Item	Measurement Uncertainty
1	Radio Frequency	$\pm 5.5 \times 10^{-8}$
2	Duty cycle	$\pm 0.57\%$
3	Occupied Bandwidth	$\pm 3\%$
4	RF Conducted power	0.68dB
5	RF Power Density	1.50dB
6	Conducted Spurious Emissions	1.04dB
7	RF Radiated Power	4.5dB (below 1GHz)
		4.8dB (above 1GHz)
8	Radiated Spurious Emission Test	4.5dB (30MHz-1GHz)
		4.8dB (1GHz-18GHz)
9	Temperature	$\pm 0.4^{\circ}\text{C}$
10	Humidity	$\pm 1.3\%$
11	Supply Voltages	$\pm 1.5\%$
12	Time	$\pm 3\%$

4.4 Test Location

All tests were performed at:

SGS-CSTC Standards Technical Services Co., Ltd., Guangzhou Branch EMC Laboratory,
198 Kezhu Road, Sciencetech Park, Guangzhou Economic & Technology Development District,
Guangzhou, China 510663

Tel: +86 20 82155555 Fax: +86 20 82075059

No tests were sub-contracted.



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Guangzhou Branch Testing & Calibration EMC Laboratory. 中国·广州·经济技术开发区科学城科珠路198号 邮编: 510663 t (86-20) 82155555 f (86-20) 82075058 sgs.china@sgs.com

4.5 Test Facility

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

● **NVLAP (Lab Code: 200611-0)**

SGS-CSTC Standards Technical Services Co., Ltd., Guangzhou EMC Laboratory is accredited by the National Voluntary Laboratory Accreditation Program (NVLAP/NIST). NVLAP Code: 200611-0.

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.

● **ACMA**

SGS-CSTC Standards Technical Services Co., Ltd., EMC Laboratory can also perform testing for the Australian C-Tick mark as a result of our NVLAP accreditation.

● **SGS UK(Certificate No.: 32), SGS-TUV SAARLAND and SGS-FIMKO**

Have approved SGS-CSTC Standards Technical Services Co., Ltd., EMC Laboratory as a supplier of EMC TESTING SERVICES and SAFETY TESTING SERVICES.

● **CNAS (Lab Code: L0167)**

SGS-CSTC Standards Technical Services Co., Ltd., EMC Laboratory has been assessed and in compliance with CNAS-CL01:2018 accreditation criteria for testing laboratories (identical to ISO/IEC 17025:2017 General Requirements) for the Competence of Testing Laboratories.

● **FCC Recognized 2.948 Listed Test Firm(Registration No.: 282399)**

SGS-CSTC Standards Technical Services Co., Ltd., 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 282399, May 31, 2002.

● **FCC Recognized Accredited Test Firm(Registration No.: 486818)**

SGS-CSTC Standards Technical Services Co., Ltd., EMC Laboratory has been accredited and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Designation Number: CN5016, Test Firm Registration Number: 486818, Jul 13, 2017.

● **Industry Canada (Registration No.: 4620B, CAB identifier: CN0052)**

SGS-CSTC Standards Technical Services Co., Ltd., has been registered by Innovation Science and Economic Development Canada for Wireless Device Testing laboratories to test to Canadian radio equipment requirements. Registration No. 4620B, CAB identifier: CN0052.

● **VCCI (Registration No.: R-12460, C-12584, G-10449 and T-11179)**

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.: R-12460, C-12584, G-10449 and T-11179 respectively.

● **CBTL (Lab Code: TL129)**

SGS-CSTC Standards Technical Services Co., Ltd., E&E Laboratory has been assessed and fully comply with the requirements of ISO/IEC 17025:2005, the Basic Rules, IECEE 01 and Rules of procedure IECEE 02, and the relevant IECEE CB-Scheme Operational documents.



4.6 Deviation from Standards

None

4.7 Abnormalities from Standard Conditions

None

4.8 Duty cycle of the EUT

Pre-analysis Check: While conducting average power measurement, duty cycle of each mode shall be checked to ensure its duty cycle in order to compensate for the loss due to insufficient ratio of duty cycle.

All duty cycle is pre-scanned, and result as obtained below shows only the most representative ones where duty cycle is conducted as the given transmission with given virtual operation that expresses the percent.

Formula:

Duty Cycle = Ton/(Ton+Toff)

Measurement Procedure:

1. Set span = Zero
2. RBW=8MHz
3. VBW=8MHz
4. Detector=Peak

Mode	Channel(MHz)	Duty Cycle(%)	Correction Factor(dB)*
DH5	2402	77.74	1.09
	2441	77.74	1.09
	2480	77.71	1.10
2DH5	2402	68.90	1.62
	2441	68.88	1.62
	2480	68.88	1.62
3DH5	2402	77.97	1.08
	2441	77.95	1.08
	2480	77.94	1.08

*Correction Factor(dB) =10log(1/Duty Cycle)

Please refer to appendix 15.247 for details.



5 Equipment List

Conducted Peak Output Power					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
EXA Signal Analyzer	AgilentTechnologies	N9010A	EMC2138	2020-09-17	2021-09-16
6dB Attenuator	HP	8491A	EMC2062	2020-04-15	2022-04-14
Test Software JS1120-3	HangTianXing	V2.6	GZE100-69	N/A	N/A
MI CABLE	SGS-EMC	0.8M	EMC2136	2019-11-02	2021-11-01
MI CABLE	SGS-EMC	0.8M	EMC2137	2019-11-02	2021-11-01

20dB Bandwidth					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
EXA Signal Analyzer	AgilentTechnologies	N9010A	EMC2138	2020-09-17	2021-09-16
6dB Attenuator	HP	8491A	EMC2062	2020-04-15	2022-04-14
Test Software JS1120-3	HangTianXing	V2.6	GZE100-69	N/A	N/A
MI CABLE	SGS-EMC	0.8M	EMC2136	2019-11-02	2021-11-01
MI CABLE	SGS-EMC	0.8M	EMC2137	2019-11-02	2021-11-01

Carrier Frequencies Separation					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
EXA Signal Analyzer	AgilentTechnologies	N9010A	EMC2138	2020-09-17	2021-09-16
6dB Attenuator	HP	8491A	EMC2062	2020-04-15	2022-04-14
Test Software JS1120-3	HangTianXing	V2.6	GZE100-69	N/A	N/A
MI CABLE	SGS-EMC	0.8M	EMC2136	2019-11-02	2021-11-01
MI CABLE	SGS-EMC	0.8M	EMC2137	2019-11-02	2021-11-01

Hopping Channel Number					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
EXA Signal Analyzer	AgilentTechnologies	N9010A	EMC2138	2020-09-17	2021-09-16
6dB Attenuator	HP	8491A	EMC2062	2020-04-15	2022-04-14
Test Software JS1120-3	HangTianXing	V2.6	GZE100-69	N/A	N/A
MI CABLE	SGS-EMC	0.8M	EMC2136	2019-11-02	2021-11-01
MI CABLE	SGS-EMC	0.8M	EMC2137	2019-11-02	2021-11-01



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Dwell Time					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
EXA Signal Analyzer	AgilentTechnologies	N9010A	EMC2138	2020-09-17	2021-09-16
6dB Attenuator	HP	8491A	EMC2062	2020-04-15	2022-04-14
Test Software JS1120-3	HangTianXing	V2.6	GZE100-69	N/A	N/A
MI CABLE	SGS-EMC	0.8M	EMC2136	2019-11-02	2021-11-01
MI CABLE	SGS-EMC	0.8M	EMC2137	2019-11-02	2021-11-01

Conducted Band Edges Measurement					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
EXA Signal Analyzer	AgilentTechnologies	N9010A	EMC2138	2020-09-17	2021-09-16
6dB Attenuator	HP	8491A	EMC2062	2020-04-15	2022-04-14
Test Software JS1120-3	HangTianXing	V2.6	GZE100-69	N/A	N/A
MI CABLE	SGS-EMC	0.8M	EMC2136	2019-11-02	2021-11-01
MI CABLE	SGS-EMC	0.8M	EMC2137	2019-11-02	2021-11-01

Conducted Spurious Emissions					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
EXA Signal Analyzer	AgilentTechnologies	N9010A	EMC2138	2020-09-17	2021-09-16
6dB Attenuator	HP	8491A	EMC2062	2020-04-15	2022-04-14
Test Software JS1120-3	HangTianXing	V2.6	GZE100-69	N/A	N/A
MI CABLE	SGS-EMC	0.8M	EMC2136	2019-11-02	2021-11-01
MI CABLE	SGS-EMC	0.8M	EMC2137	2019-11-02	2021-11-01



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Radiated Emissions which fall in the restricted bands					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
EMI Test Receiver	Rohde & Schwarz	ESIB26	EMC0522	2020-01-10	2021-01-09
EMI Test Receiver	Rohde & Schwarz	ESCI	EMC0056	2020-01-10	2021-01-09
Chamber cable	HangTianXing	N/A	EMC0542	2019-06-28	2021-06-27
Trilog Broadband Antenna 25MHz-1GHz	SCHWARZBECKME SS-ELEKTRONIK	VULB 9168	EMC2174	2018-09-06	2021-09-05
Bi-log Type Antenna	Schaffner Chase	CBL6143	EMC0519	2020-06-08	2023-06-07
Horn Antenna	SCHWARZBECKME SS-ELEKTRONIK	BBHA 9120D	EMC2016	2019-09-25	2022-09-24
Horn Antenna 1GHz-18GHz	Rohde & Schwarz	HF906	EMC0518	2018-09-02	2021-09-01
1GHz-26.5 GHz Pre-Amplifier	Agilent	8449B	EMC0521	2020-01-10	2021-01-09
Amplifier	HP	8447F	EMC2065	2020-05-26	2021-05-25
Pre-Amplifier MH648A	ANRITSU CORP	MH648A	EMC2086	2020-11-13	2021-11-12
Active Loop Antenna	EMCO	6502	EMC0523	2018-03-05	2021-03-04
High Pass Filter(915MHz)	FSY MICROWAVE	HM1465-9SS	EMC2079	2020-01-10	2021-01-09
2.4GHz Filter	Micro-Tronics	BRM 50702	EMC2069	2020-01-10	2021-01-09
10m Semi-Anechoic Chamber	ETS	N/A	EMC0530	2019-10-20	2022-10-19
966 Anechoic Chamber	C.R.T	9m x 6m x 6m	EMC2142	2017-12-19	2020-12-18
MXE EMI Receiver	Keysight	N9038A	EMC2139	2020-11-13	2021-11-12
EXA Signal Analyzer	Keysight	N9010A	EMC2138	2020-09-17	2021-09-16
Trilog Broadband Antenna 30MHz-1GHz	SCHWARZBECKME SS-ELEKTRONIK	VULB 9168	SEM003-18	2019-02-22	2022-02-22
Test Software E3	Audix	Ver.6.120110a	GZE100-61	N/A	N/A



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Radiated Spurious Emissions					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
EMI Test Receiver	Rohde & Schwarz	ESIB26	EMC0522	2020-01-10	2021-01-09
EMI Test Receiver	Rohde & Schwarz	ESCI	EMC0056	2020-01-10	2021-01-09
Chamber cable	HangTianXing	N/A	EMC0542	2019-06-28	2021-06-27
Trilog Broadband Antenna 25MHz-1GHz	SCHWARZBECKME SS-ELEKTRONIK	VULB 9168	EMC2174	2018-09-06	2021-09-05
Bi-log Type Antenna	Schaffner Chase	CBL6143	EMC0519	2020-06-08	2023-06-07
Horn Antenna	SCHWARZBECKME SS-ELEKTRONIK	BBHA 9120D	EMC2016	2019-09-25	2022-09-24
Horn Antenna 1GHz-18GHz	Rohde & Schwarz	HF906	EMC0518	2018-09-02	2021-09-01
1GHz-26.5 GHz Pre-Amplifier	Agilent	8449B	EMC0521	2020-01-10	2021-01-09
Amplifier	HP	8447F	EMC2065	2020-05-26	2021-05-25
Pre-Amplifier MH648A	ANRITSU CORP	MH648A	EMC2086	2020-11-13	2021-11-12
Active Loop Antenna	EMCO	6502	EMC0523	2018-03-05	2021-03-04
High Pass Filter(915MHz)	FSY MICROWAVE	HM1465-9SS	EMC2079	2020-01-10	2021-01-09
2.4GHz Filter	Micro-Tronics	BRM 50702	EMC2069	2020-01-10	2021-01-09
10m Semi-Anechoic Chamber	ETS	N/A	EMC0530	2019-10-20	2022-10-19
966 Anechoic Chamber	C.R.T	9m x 6m x 6m	EMC2142	2017-12-19	2020-12-18
MXE EMI Receiver	Keysight	N9038A	EMC2139	2020-11-13	2021-11-12
EXA Signal Analyzer	Keysight	N9010A	EMC2138	2020-09-17	2021-09-16
Trilog Broadband Antenna 30MHz-1GHz	SCHWARZBECKME SS-ELEKTRONIK	VULB 9168	SEM003-18	2019-02-22	2022-02-22
Test Software E3	Audix	Ver.6.120110a	GZE100-61	N/A	N/A

General used equipment					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
DMM	Fluke	73	EMC0006	2020-07-09	2021-07-08
DMM	Fluke	73	EMC0007	2020-07-09	2021-07-08



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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 Requirement:

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. Please refer to internal photos for details.



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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 Requirement:

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 Technical 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 Technical Specification, the receivers are designed to have input and IF bandwidths that match the hopping channel bandwidths of any transmitters and shift frequencies in synchronization with the transmitted signals.

Compliance for section 15.247(g):

According to Technical Specification, the 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 Technical specification, the system incorporates with an adaptive system to detect other user within the spectrum bands



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7 Radio Spectrum Matter Test Results

7.1 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 $25 \leq$ hopping channels < 50
	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

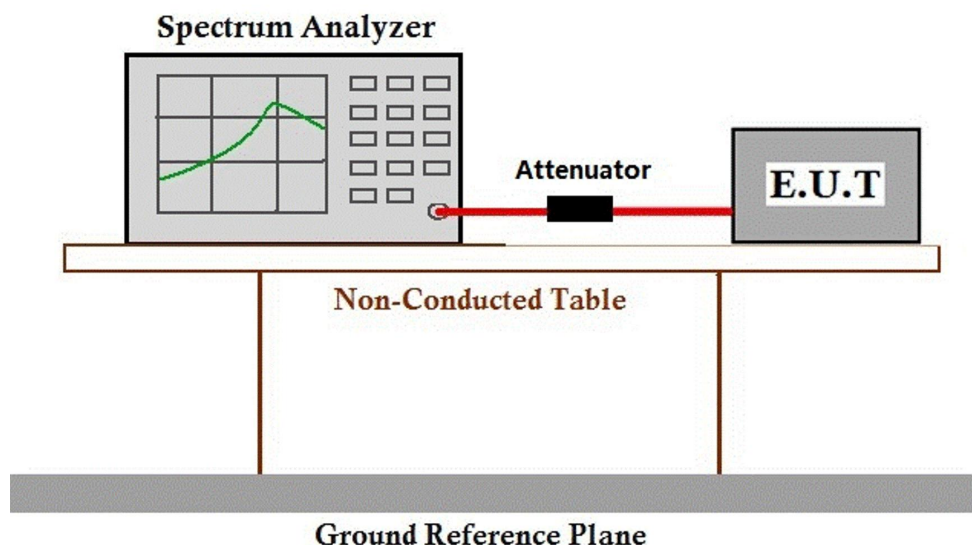
7.1.1 E.U.T. Operation

Operating Environment:

Temperature: 24.6 °C Humidity: 55.3 % RH Atmospheric Pressure: 1020 mbar

Test Mode: c:TX_non-Hop mode_Keep the EUT in continuously transmitting mode with GFSK modulation, $\pi/4$ DQPSK modulation, 8DPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.

7.1.2 Test Setup Diagram



7.1.3 Measurement Procedure and Data

The detailed test data see: Appendix 15.247



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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

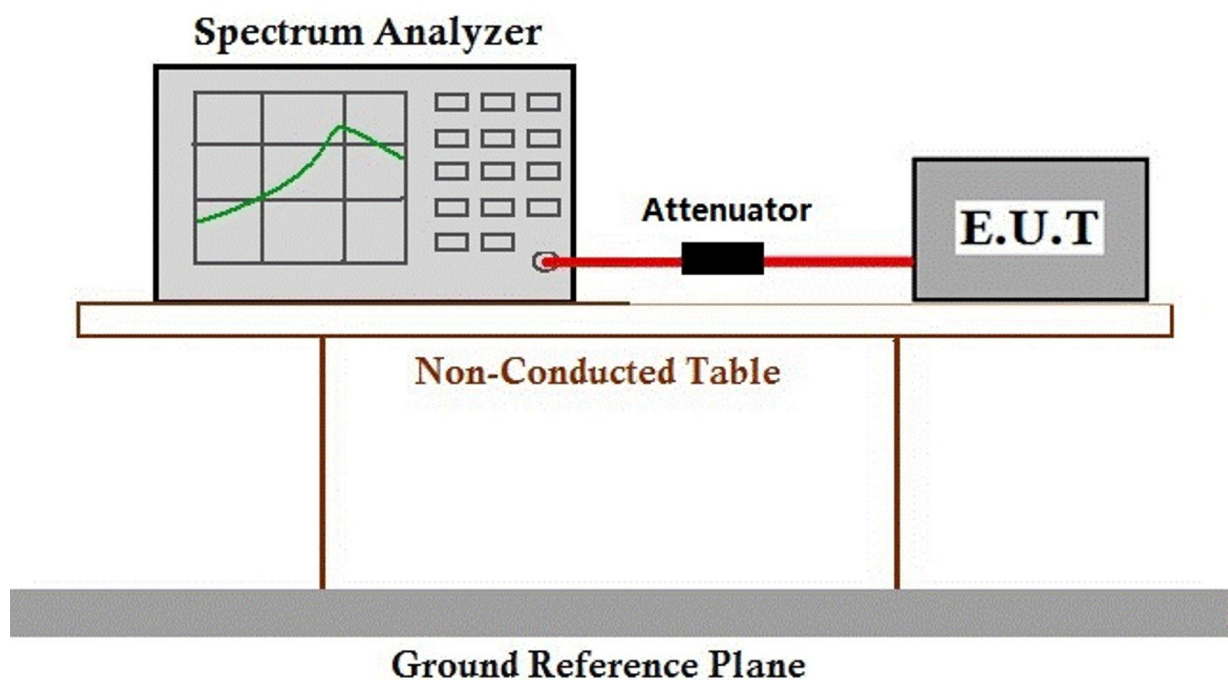
7.2.1 E.U.T. Operation

Operating Environment:

Temperature: 24.6 °C Humidity: 55.3 % RH Atmospheric Pressure: 1020 mbar

Test Mode: c:TX_non-Hop mode_Keep the EUT in continuously transmitting mode with GFSK modulation, $\pi/4$ DQPSK modulation, 8DPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.

7.2.2 Test Setup Diagram



7.2.3 Measurement Procedure and Data

The detailed test data see: Appendix 15.247



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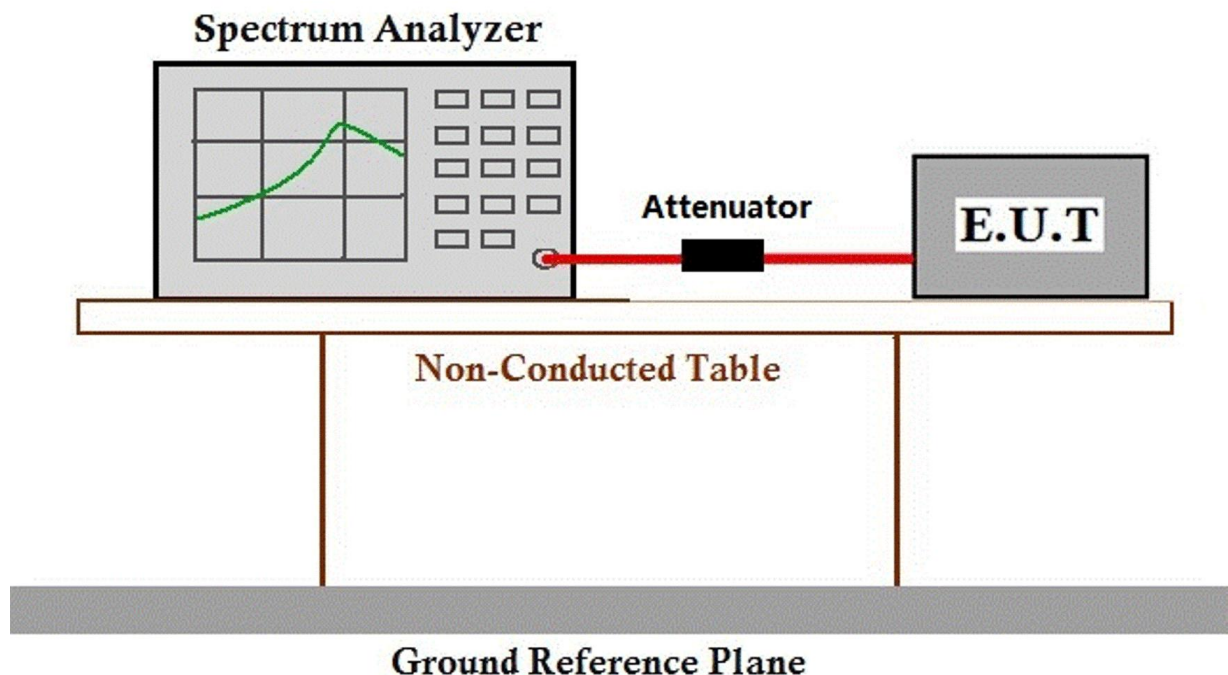
7.3 Carrier Frequencies Separation

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

7.3.1 E.U.T. Operation

Operating Environment:
 Temperature: 24.6 °C Humidity: 55.3 % RH Atmospheric Pressure: 1020 mbar
 Test Mode: b:TX_Hop mode_Keep the EUT in frequency hopping mode with GFSK modulation, $\pi/4$ DQPSK modulation, 8DPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.

7.3.2 Test Setup Diagram



7.3.3 Measurement Procedure and Data

The detailed test data see: Appendix 15.247



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7.4 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)	Number of hopping channels (minimum)
902-928	50 for 20dB bandwidth <250kHz
	25 for 20dB bandwidth ≥250kHz
2400-2483.5	15
5725-5850	75

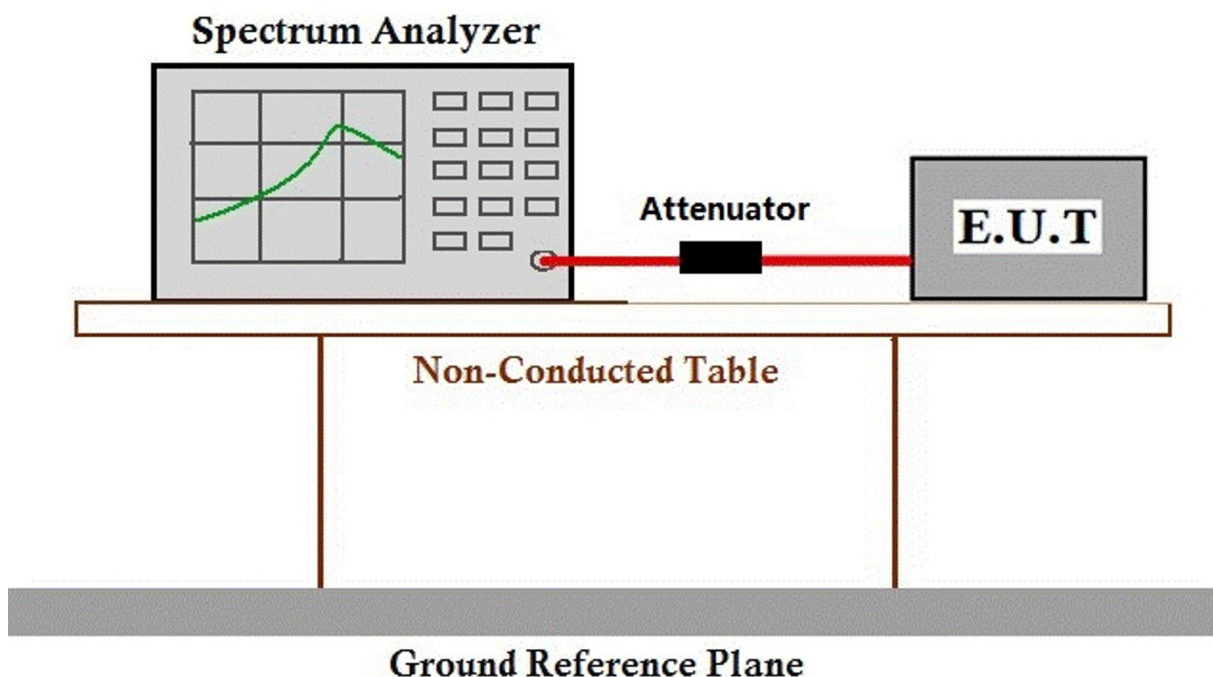
7.4.1 E.U.T. Operation

Operating Environment:

Temperature: 24.6 °C Humidity: 55.3 % RH Atmospheric Pressure: 1020 mbar

Test Mode: b:TX_Hop mode_Keep the EUT in frequency hopping mode with GFSK modulation, $\pi/4$ DQPSK modulation, 8DPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.

7.4.2 Test Setup Diagram



7.4.3 Measurement Procedure and Data

The detailed test data see: Appendix 15.247



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7.5 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 multiplied by the number of hopping channels
5725-5850	0.4S within a 30S period

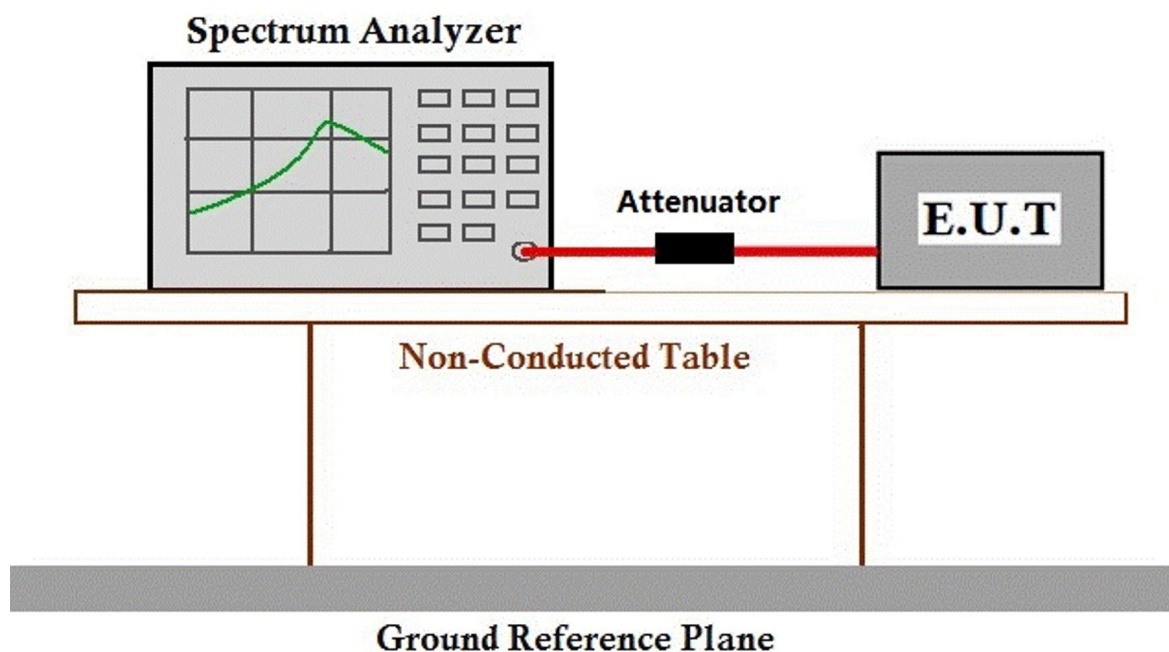
7.5.1 E.U.T. Operation

Operating Environment:

Temperature: 24.6 °C Humidity: 55.3 % RH Atmospheric Pressure: 1020 mbar

Test Mode: b:TX_Hop mode_Keep the EUT in frequency hopping mode with GFSK modulation, $\pi/4$ DQPSK modulation, 8DPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.

7.5.2 Test Setup Diagram



7.5.3 Measurement Procedure and Data

The detailed test data see: Appendix 15.247



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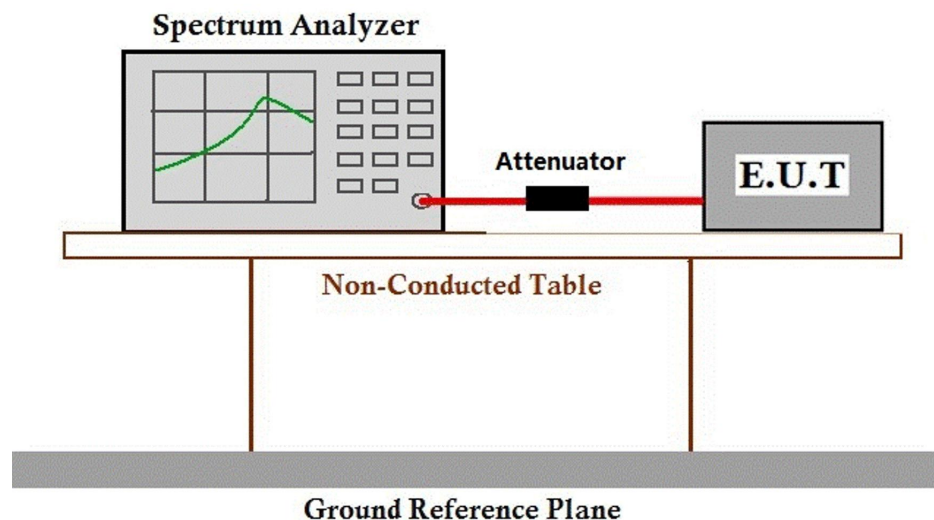
7.6 Conducted Band Edges Measurement

Test Requirement	47 CFR Part 15, Subpart C 15.247(d)
Test Method:	ANSI C63.10 (2013) Section 7.8.6
Limit:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated 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, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c))

7.6.1 E.U.T. Operation

Operating Environment:					
Temperature:	24.6 °C	Humidity:	55.3 % RH	Atmospheric Pressure:	1020 mbar
Test mode	b:TX_Hop mode_Keep the EUT in frequency hopping mode with GFSK modulation, $\pi/4$ DQPSK modulation, 8DPSK modulation. All modes have been tested and only the data of worst case is recorded in the report. c:TX_non-Hop mode_Keep the EUT in continuously transmitting mode with GFSK modulation, $\pi/4$ DQPSK modulation, 8DPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.				

7.6.2 Test Setup Diagram



7.6.3 Measurement Procedure and Data

The detailed test data see: Appendix 15.247



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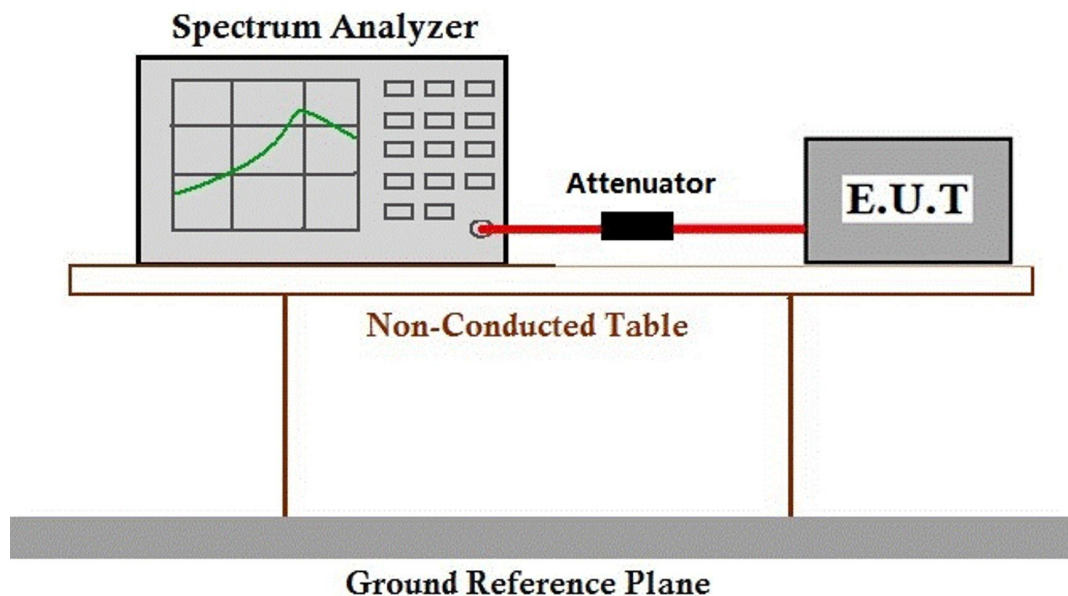
7.7 Conducted Spurious Emissions

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 or digitally modulated 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, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c))

7.7.1 E.U.T. Operation

Operating Environment:				
Temperature:	24.6 °C	Humidity:	55.3 % RH	Atmospheric Pressure: 1020 mbar
Test Mode:	c:TX_non-Hop mode_Keep the EUT in continuously transmitting mode with GFSK modulation, $\pi/4$ DQPSK modulation, 8DPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.			

7.7.2 Test Setup Diagram



7.7.3 Measurement Procedure and Data

The detailed test data see: Appendix 15.247



7.8 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

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.

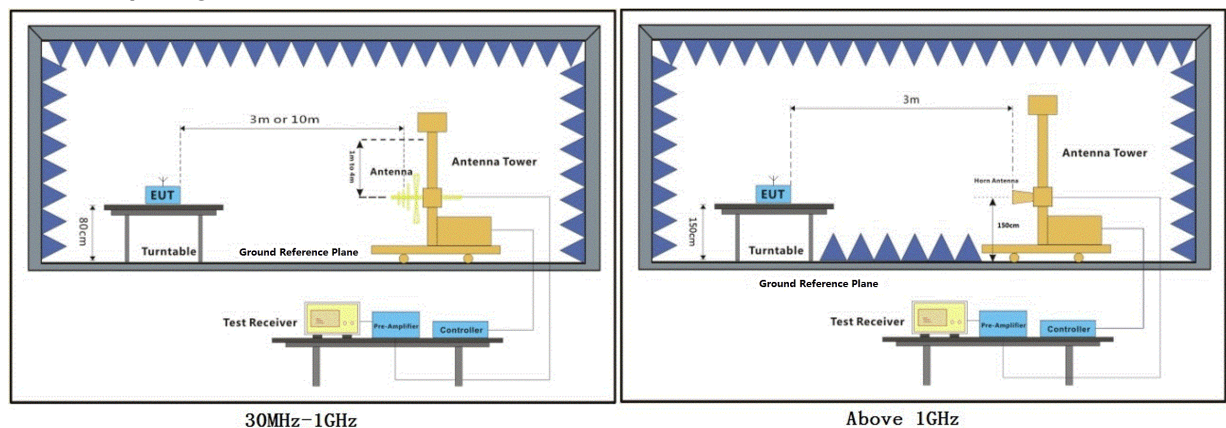
7.8.1 E.U.T. Operation

Operating Environment:

Temperature: 22 °C Humidity: 52 % RH Atmospheric Pressure: 1020 mbar

Test Mode: c:TX_non-Hop mode Keep the EUT in continuously transmitting mode with GFSK modulation, $\pi/4$ DQPSK modulation, 8DPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.

7.8.2 Test Setup Diagram



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7.8.3 Measurement Procedure and Data

- a. For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic chamber. 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 fully-anechoic chamber. 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, the middle channel, the Highest channel.
- 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.

Remark 1: Level= Read Level+ Cable Loss+ Antenna Factor- Preamp Factor

Remark 2: 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. For the emissions whose peak level is lower than the average limit, only the peak measurement is shown in the report.

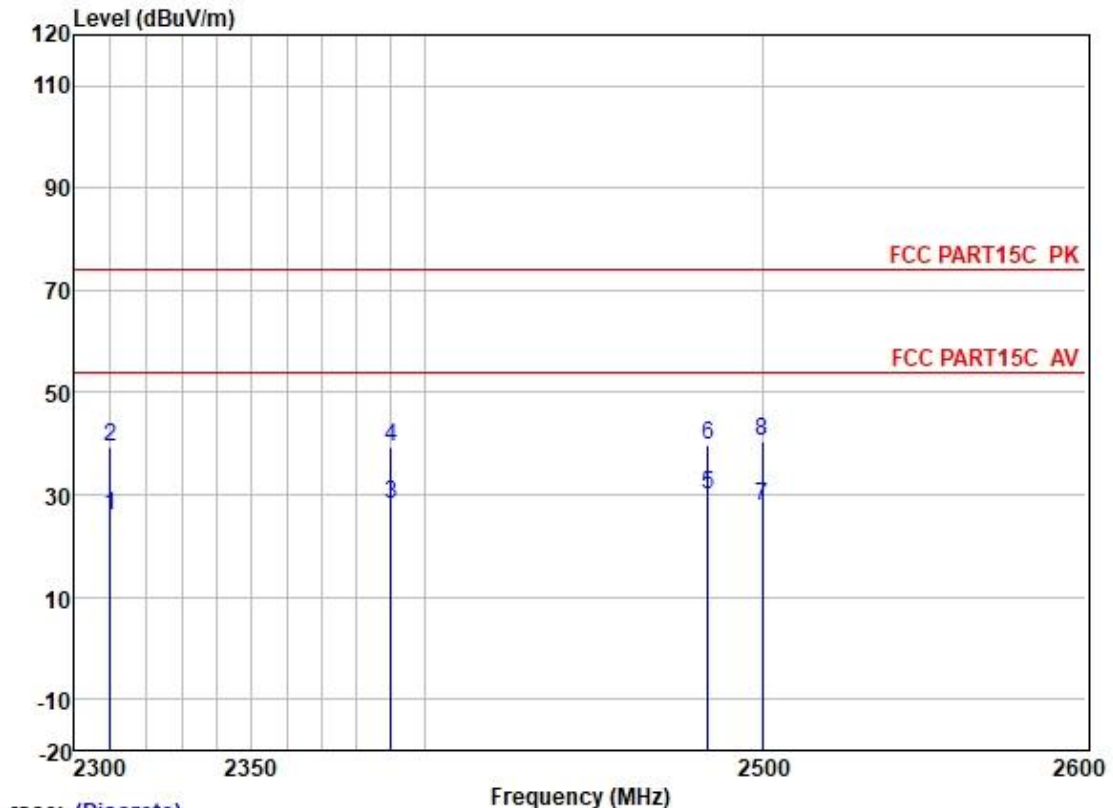
Level=Read Level + Antenna Factor + Cable Loss - Preamp Factor



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Mode:c; Polarization:Horizontal; Modulation:GFSK; ; Channel:Low



Trace: (Discrete)

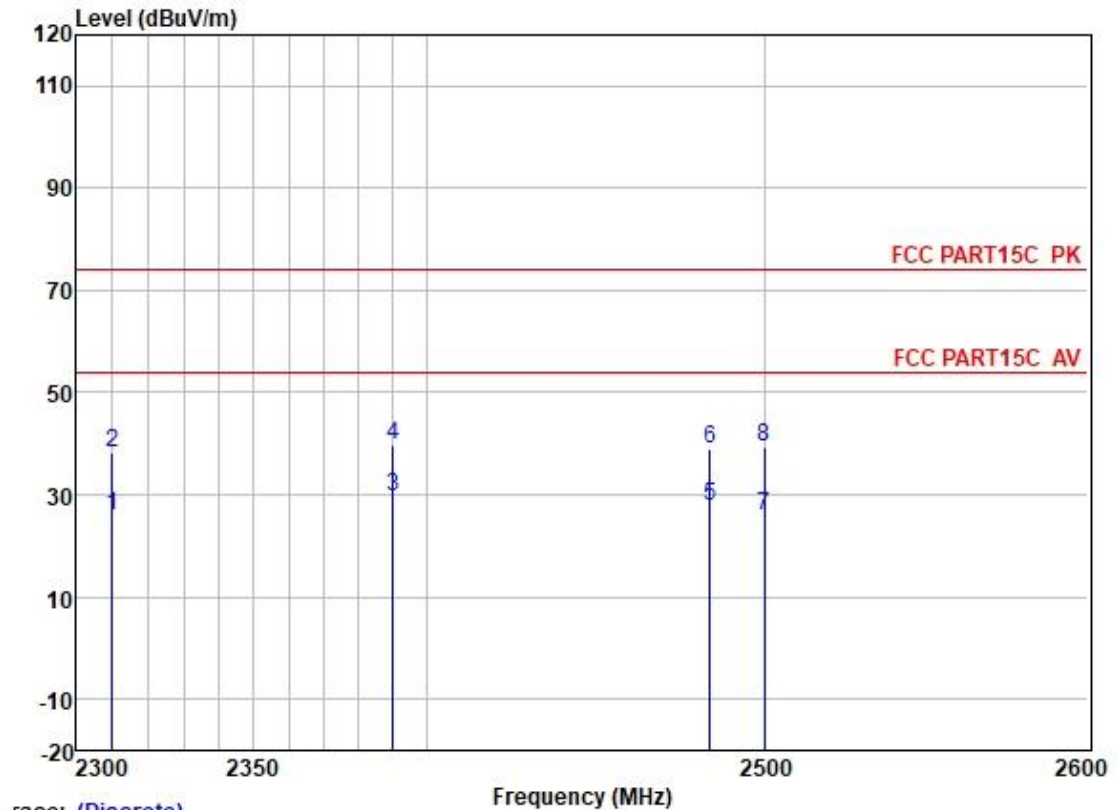
	Freq	ReadAntenna	Cable	Preamp	Level	Limit	Over		
	MHz	Level	Factor	Loss	Factor	Line	Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	2310.000	32.55	27.15	3.32	36.94	26.08	54.00	-27.92	HORIZONTAL Average
2	2310.000	45.98	27.15	3.32	36.94	39.51	74.00	-34.49	HORIZONTAL Peak
3	2390.000	34.36	27.33	3.48	36.92	28.25	54.00	-25.75	HORIZONTAL Average
4	2390.000	45.45	27.33	3.48	36.92	39.34	74.00	-34.66	HORIZONTAL Peak
5	2483.500	35.88	27.48	3.53	36.90	29.99	54.00	-24.01	HORIZONTAL Average
6	2483.500	45.50	27.48	3.53	36.90	39.61	74.00	-34.39	HORIZONTAL Peak
7	2500.000	33.89	27.50	3.40	36.89	27.90	54.00	-26.10	HORIZONTAL Average
8	2500.000	46.55	27.50	3.40	36.89	40.56	74.00	-33.44	HORIZONTAL Peak



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Mode:c; Polarization:Vertical; Modulation:GFSK; ; Channel:Low



Trace: (Discrete)

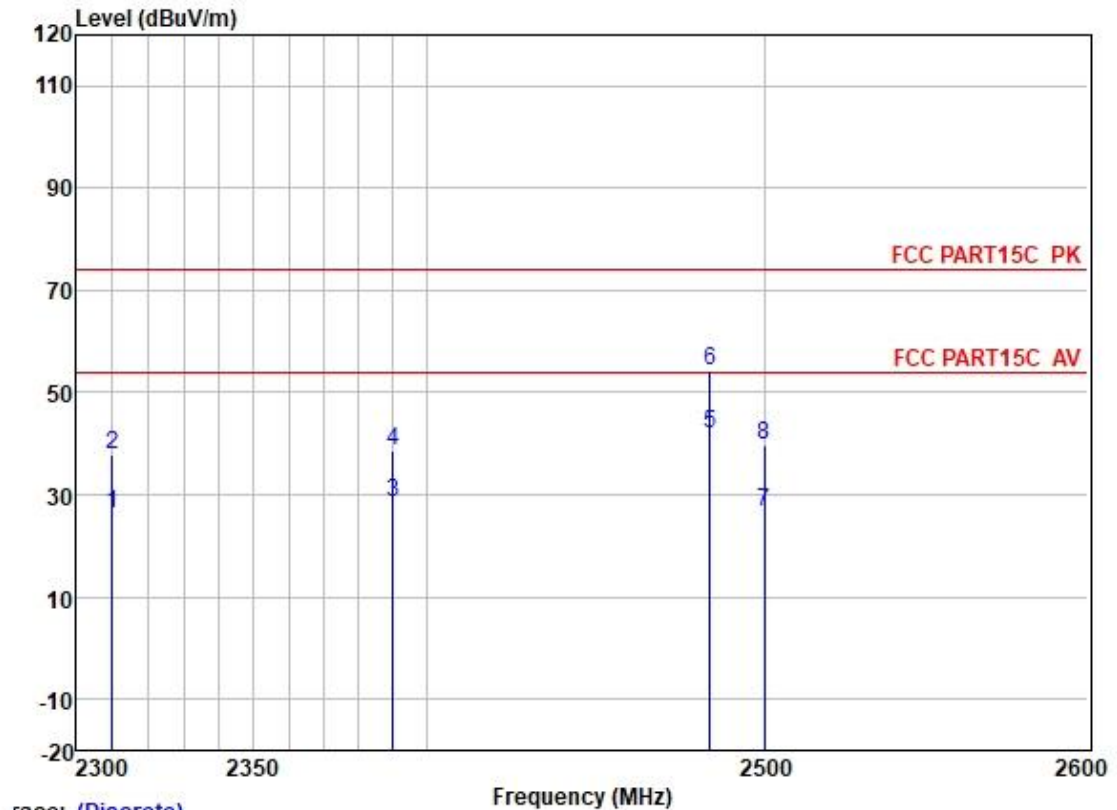
	Freq	ReadAntenna	Cable	Preamp	Level	Limit	Over		
	MHz	Level	Factor	Loss	Factor	Line	Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	2310.000	32.38	27.15	3.32	36.94	25.91	54.00	-28.09	VERTICAL Average
2	2310.000	44.57	27.15	3.32	36.94	38.10	74.00	-35.90	VERTICAL Peak
3	2390.000	35.95	27.33	3.48	36.92	29.84	54.00	-24.16	VERTICAL Average
4	2390.000	45.86	27.33	3.48	36.92	39.75	74.00	-34.25	VERTICAL Peak
5	2483.500	33.80	27.48	3.53	36.90	27.91	54.00	-26.09	VERTICAL Average
6	2483.500	44.80	27.48	3.53	36.90	38.91	74.00	-35.09	VERTICAL Peak
7	2500.000	32.06	27.50	3.40	36.89	26.07	54.00	-27.93	VERTICAL Average
8	2500.000	45.26	27.50	3.40	36.89	39.27	74.00	-34.73	VERTICAL Peak



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Mode:c; Polarization:Horizontal; Modulation:GFSK; ; Channel:High



Trace: (Discrete)

	Freq	ReadAntenna	Cable	Preamp	Level	Limit	Over		
	MHz	Level	Factor	Loss	Factor	Line	Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	2310.000	32.82	27.15	3.32	36.94	26.35	54.00	-27.65	HORIZONTAL Average
2	2310.000	44.48	27.15	3.32	36.94	38.01	74.00	-35.99	HORIZONTAL Peak
3	2390.000	34.73	27.33	3.48	36.92	28.62	54.00	-25.38	HORIZONTAL Average
4	2390.000	44.86	27.33	3.48	36.92	38.75	74.00	-35.25	HORIZONTAL Peak
5	2483.500	48.04	27.48	3.53	36.90	42.15	54.00	-11.85	HORIZONTAL Average
6	2483.500	60.35	27.48	3.53	36.90	54.46	74.00	-19.54	HORIZONTAL Peak
7	2500.000	32.71	27.50	3.40	36.89	26.72	54.00	-27.28	HORIZONTAL Average
8	2500.000	45.59	27.50	3.40	36.89	39.60	74.00	-34.40	HORIZONTAL Peak



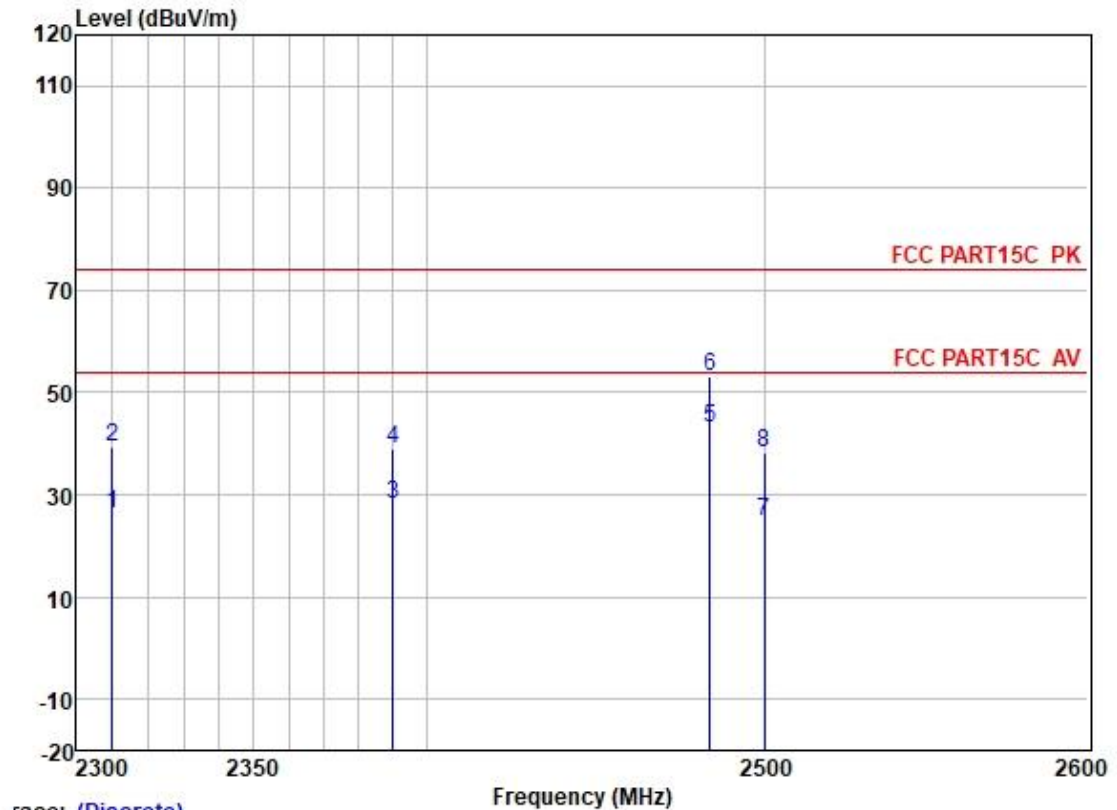
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Mode:c; Polarization:Vertical; Modulation:GFSK; ; Channel:High



Trace: (Discrete)

	Freq	ReadAntenna	Cable	Preamp	Level	Limit	Over		
	MHz	Level	Factor	Loss	Factor	Line	Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	2310.000	32.83	27.15	3.32	36.94	26.36	54.00	-27.64	VERTICAL Average
2	2310.000	45.77	27.15	3.32	36.94	39.30	74.00	-34.70	VERTICAL Peak
3	2390.000	34.16	27.33	3.48	36.92	28.05	54.00	-25.95	VERTICAL Average
4	2390.000	45.01	27.33	3.48	36.92	38.90	74.00	-35.10	VERTICAL Peak
5	2483.500	49.03	27.48	3.53	36.90	43.14	54.00	-10.86	VERTICAL Average
6	2483.500	59.01	27.48	3.53	36.90	53.12	74.00	-20.88	VERTICAL Peak
7	2500.000	30.92	27.50	3.40	36.89	24.93	54.00	-29.07	VERTICAL Average
8	2500.000	44.29	27.50	3.40	36.89	38.30	74.00	-35.70	VERTICAL Peak



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7.9 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: 3m

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.

7.9.1 E.U.T. Operation

Operating Environment:

Temperature: 22 °C Humidity: 52 % RH Atmospheric Pressure: 1020 mbar

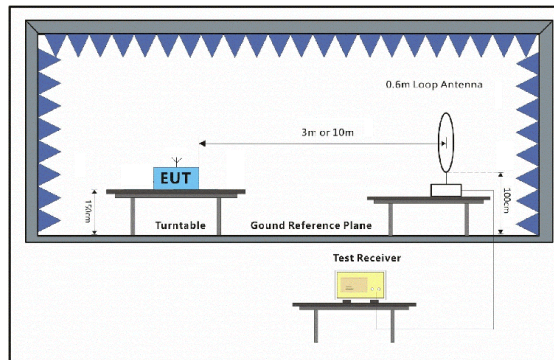
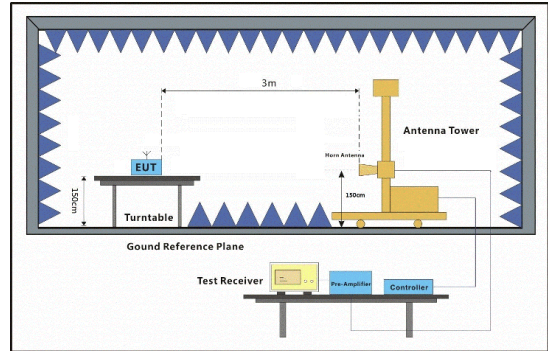
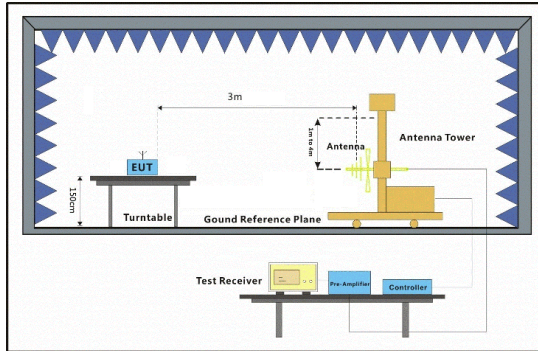
Test Mode: c:TX_non-Hop mode Keep the EUT in continuously transmitting mode with GFSK modulation, $\pi/4$ DQPSK modulation, 8DPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.



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7.9.2 Test Setup Diagram



7.9.3 Measurement Procedure and Data

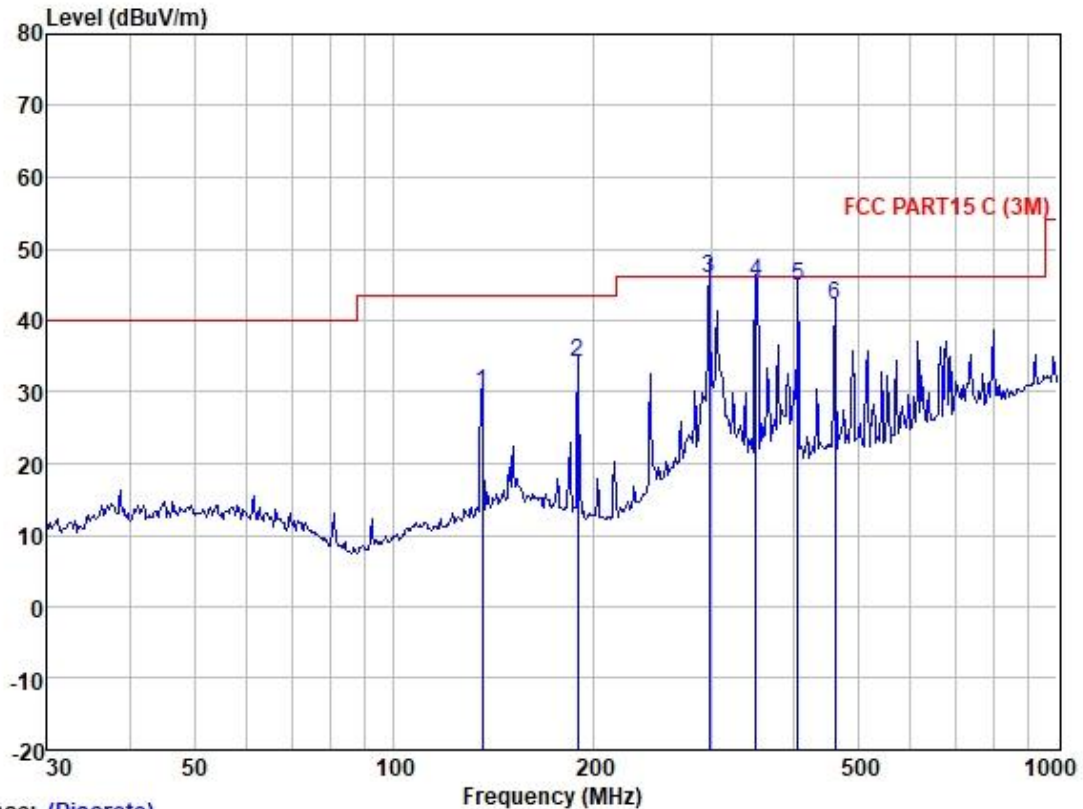
- a. For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter fully-anechoic chamber. 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, the middle channel, the Highest channel.
- 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.

Remark:

- 1) For emission below 1GHz, through pre-scan found the worst case is the lowest channel. Only the worst case is recorded in the report.
- 2) 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
- 3) Scan from 9kHz to 25GHz, the disturbance above 18GHz and below 30MHz was very low. The points marked on above plots are the highest emissions could be found when testing, so only above points had been displayed. The amplitude of spurious emissions from the radiator which are attenuated more than 20dB below the limit need not be reported.
- 4) 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. For the emissions whose peak level is lower than the average limit, only the peak measurement is shown



Mode:c; Polarization:Horizontal; Modulation:GFSK; ; Channel:Low



Trace: (Discrete)

Site : SGS

Condition: FCC PART15 C (3M) 3m HORIZONTAL

Job :

Model :

Power :

Test Mode:

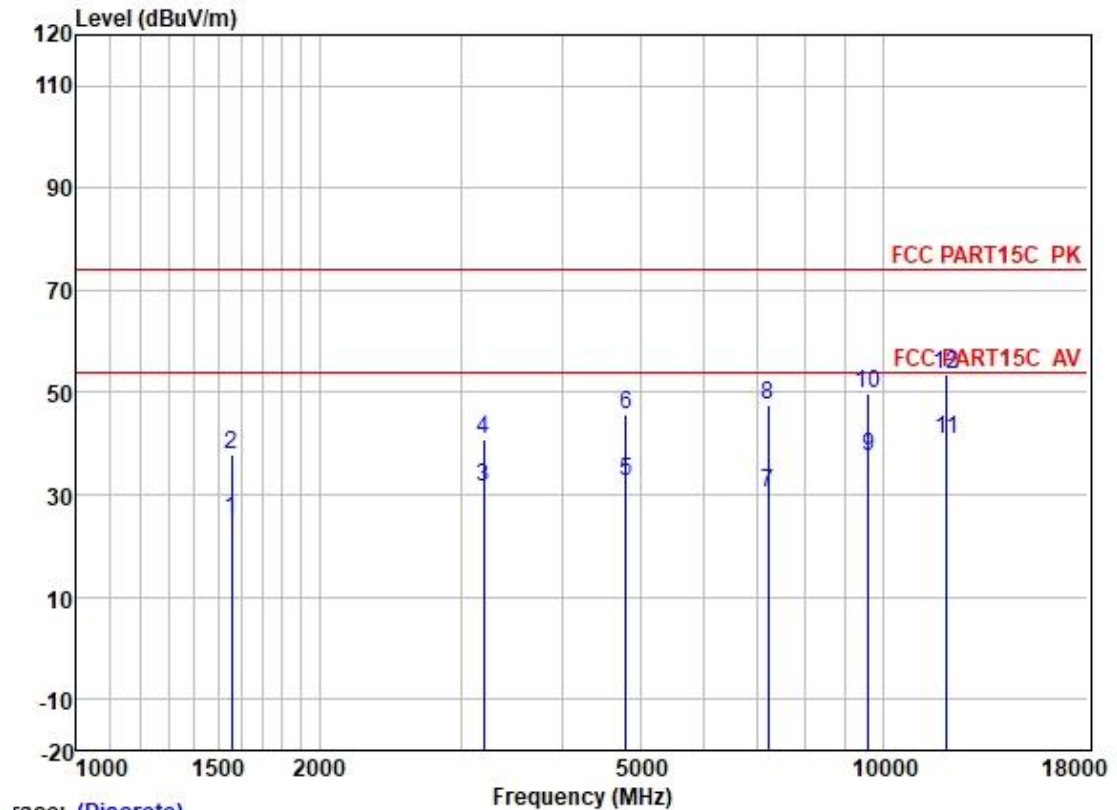
	Freq	ReadAntenna	Cable	Preamp		Limit	Over		
	MHz	Level	Factor	Loss	Factor	Level	Line	Limit	Pol/Phase
	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		Remark
1	135.982	42.06	12.80	2.03	26.96	29.93	43.50	-13.57	HORIZONTAL QP
2	189.074	47.41	11.03	2.49	26.74	34.19	43.50	-9.31	HORIZONTAL QP
3	298.268	55.67	13.57	3.16	26.55	45.85	46.00	-0.15	HORIZONTAL QP
4	350.477	54.20	14.50	3.63	27.01	45.32	46.00	-0.68	HORIZONTAL QP
5	406.088	52.34	15.82	3.95	27.36	44.75	46.00	-1.25	HORIZONTAL QP
6	462.346	48.26	17.47	4.27	27.81	42.19	46.00	-3.81	HORIZONTAL QP



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Mode:c; Polarization:Horizontal; Modulation:GFSK; ; Channel:Low



Trace: (Discrete)

	Freq	ReadAntenna	Cable	Preamp	Level	Limit	Over		
		Level	Loss	Factor	Level	Line	Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	1556.169	34.04	25.54	2.80	37.09	25.29	54.00	-28.71	HORIZONTAL Average
2	1556.169	46.52	25.54	2.80	37.09	37.77	74.00	-36.23	HORIZONTAL Peak
3	3196.094	35.41	28.58	4.00	36.51	31.48	54.00	-22.52	HORIZONTAL Average
4	3196.094	44.70	28.58	4.00	36.51	40.77	74.00	-33.23	HORIZONTAL Peak
5	4804.245	32.18	31.42	5.40	36.48	32.52	54.00	-21.48	HORIZONTAL Average
6	4804.245	45.47	31.42	5.40	36.48	45.81	74.00	-28.19	HORIZONTAL Peak
7	7206.373	25.69	35.54	5.98	36.75	30.46	54.00	-23.54	HORIZONTAL Average
8	7206.373	42.83	35.54	5.98	36.75	47.60	74.00	-26.40	HORIZONTAL Peak
9	9608.254	28.39	38.37	7.07	36.36	37.47	54.00	-16.53	HORIZONTAL Average
10	9608.254	40.66	38.37	7.07	36.36	49.74	74.00	-24.26	HORIZONTAL Peak
11	12010.920	30.02	38.90	8.19	36.40	40.71	54.00	-13.29	HORIZONTAL Average
12	12010.920	42.74	38.90	8.19	36.40	53.43	74.00	-20.57	HORIZONTAL Peak



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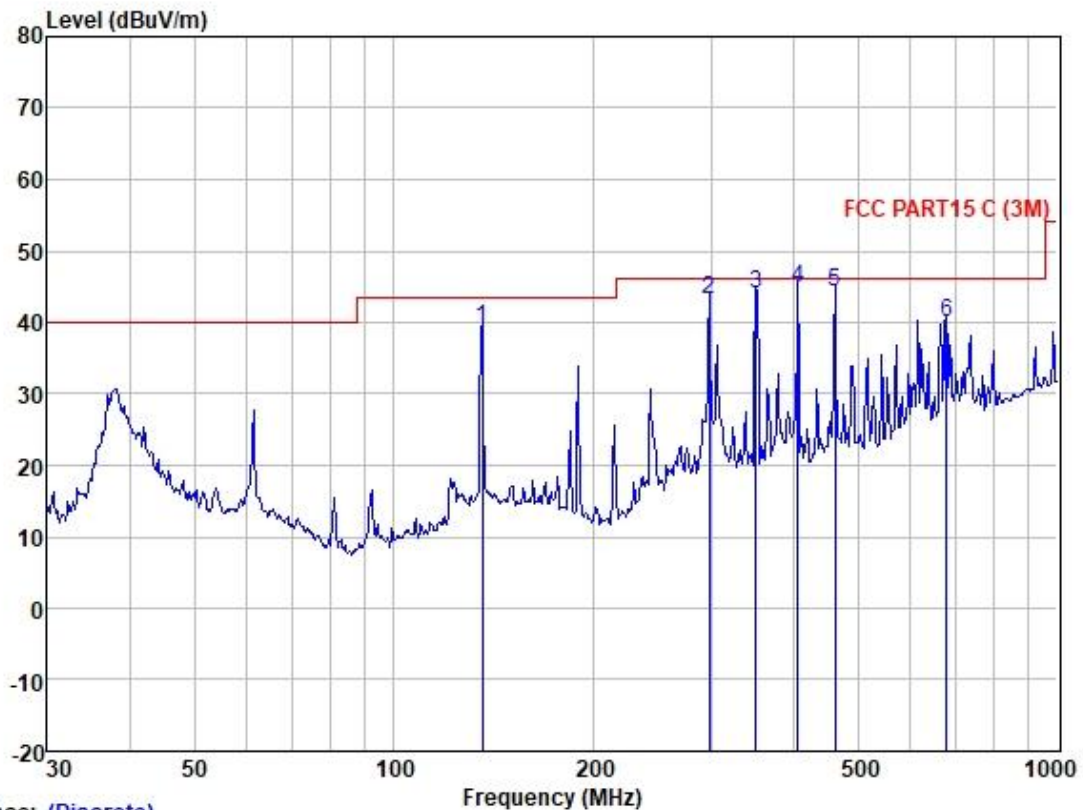
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Guangzhou Branch Testing & Calibration Laboratory

No.198 Kezhu Road, Sciencetech Park, Guangzhou Economic & Technology Development District, Guangzhou, China 510663 t (86-20) 82155555 f (86-20) 82075058 www.sgs.com.cn
中国·广州·经济技术开发区科学城科珠路198号 邮编: 510663 t (86-20) 82155555 f (86-20) 82075058 sgs.china@sgs.com

Member of the SGS Group (SGS SA)

Mode:c; Polarization:Horizontal; Modulation:GFSK; ; Channel:Low



Trace: (Discrete)

Site : SGS

Condition: FCC PART15 C (3M) 3m VERTICAL

Job :

Model :

Power :

Test Mode:

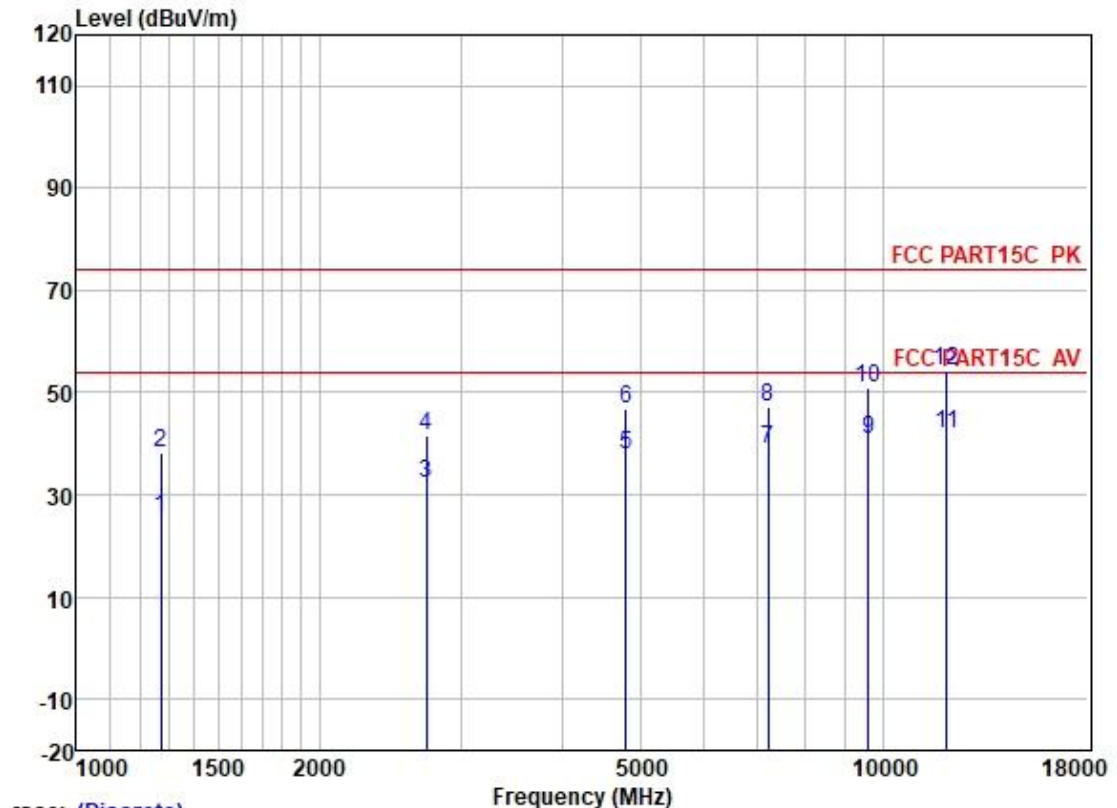
		ReadAntenna		Cable	Preamp		Limit	Over		
	Freq	Level	Factor	Loss	Factor	Level	Line	Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	135.982	51.25	12.80	2.03	26.96	39.12	43.50	-4.38	VERTICAL	QP
2	298.268	52.97	13.57	3.16	26.55	43.15	46.00	-2.85	VERTICAL	QP
3	350.477	52.90	14.50	3.63	27.01	44.02	46.00	-1.98	VERTICAL	QP
4	406.088	52.47	15.82	3.95	27.36	44.88	46.00	-1.12	VERTICAL	QP
5	462.346	50.36	17.47	4.27	27.81	44.29	46.00	-1.71	VERTICAL	QP
6	679.960	41.70	20.80	5.70	28.17	40.03	46.00	-5.97	VERTICAL	QP



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Mode:c; Polarization:Vertical; Modulation:GFSK; ; Channel:Low



Trace: (Discrete)

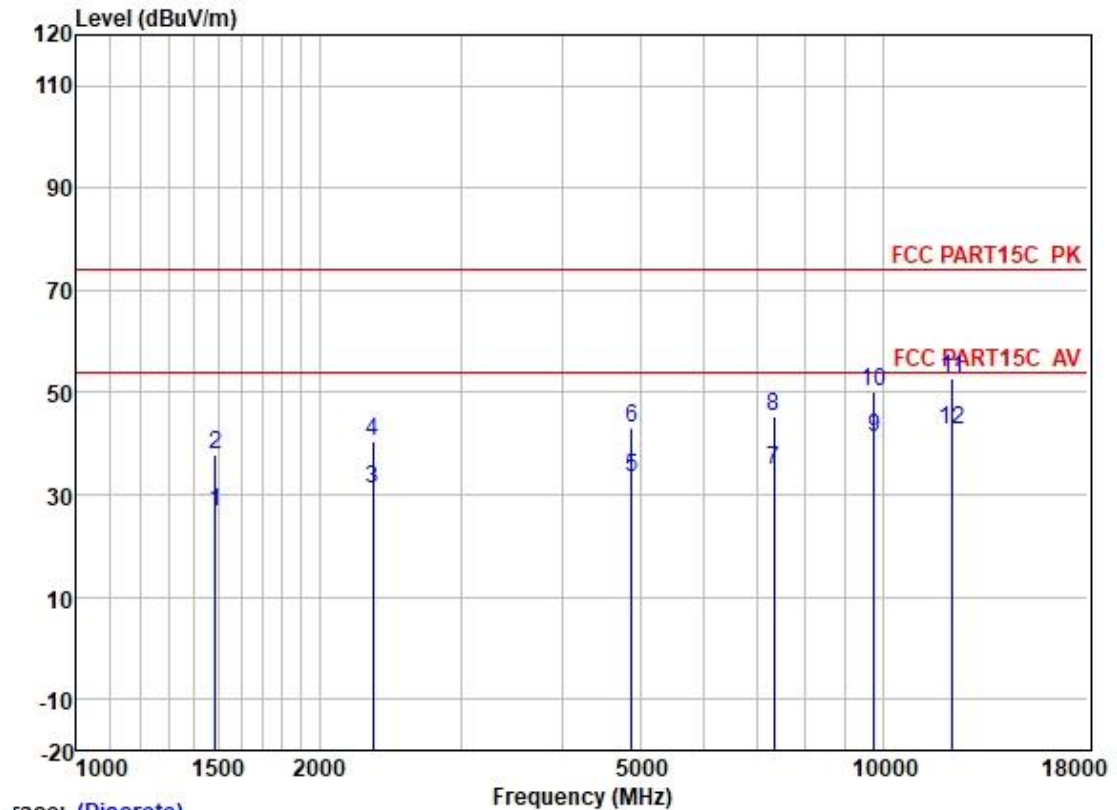
	Freq	ReadAntenna	Cable	Preamp	Level	Limit	Over	Pol/Phase	Remark
	MHz	Level	Factor	Loss	Factor	Line	Limit		
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	1271.123	35.40	25.11	2.46	37.32	25.65	54.00	-28.35	VERTICAL Average
2	1271.123	47.95	25.11	2.46	37.32	38.20	74.00	-35.80	VERTICAL Peak
3	2718.469	37.39	27.89	3.61	36.80	32.09	54.00	-21.91	VERTICAL Average
4	2718.469	46.92	27.89	3.61	36.80	41.62	74.00	-32.38	VERTICAL Peak
5	4804.559	37.58	31.42	5.40	36.48	37.92	54.00	-16.08	VERTICAL Average
6	4804.559	46.38	31.42	5.40	36.48	46.72	74.00	-27.28	VERTICAL Peak
7	7206.373	34.35	35.54	5.98	36.75	39.12	54.00	-14.88	VERTICAL Average
8	7206.373	42.56	35.54	5.98	36.75	47.33	74.00	-26.67	VERTICAL Peak
9	9608.404	31.82	38.37	7.07	36.36	40.90	54.00	-13.10	VERTICAL Average
10	9608.404	41.87	38.37	7.07	36.36	50.95	74.00	-23.05	VERTICAL Peak
11	12010.100	31.10	38.90	8.19	36.40	41.79	54.00	-12.21	VERTICAL Average
12	12010.100	43.62	38.90	8.19	36.40	54.31	74.00	-19.69	VERTICAL Peak



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Mode:c; Polarization:Horizontal; Modulation:GFSK; ; Channel:middle



Trace: (Discrete)

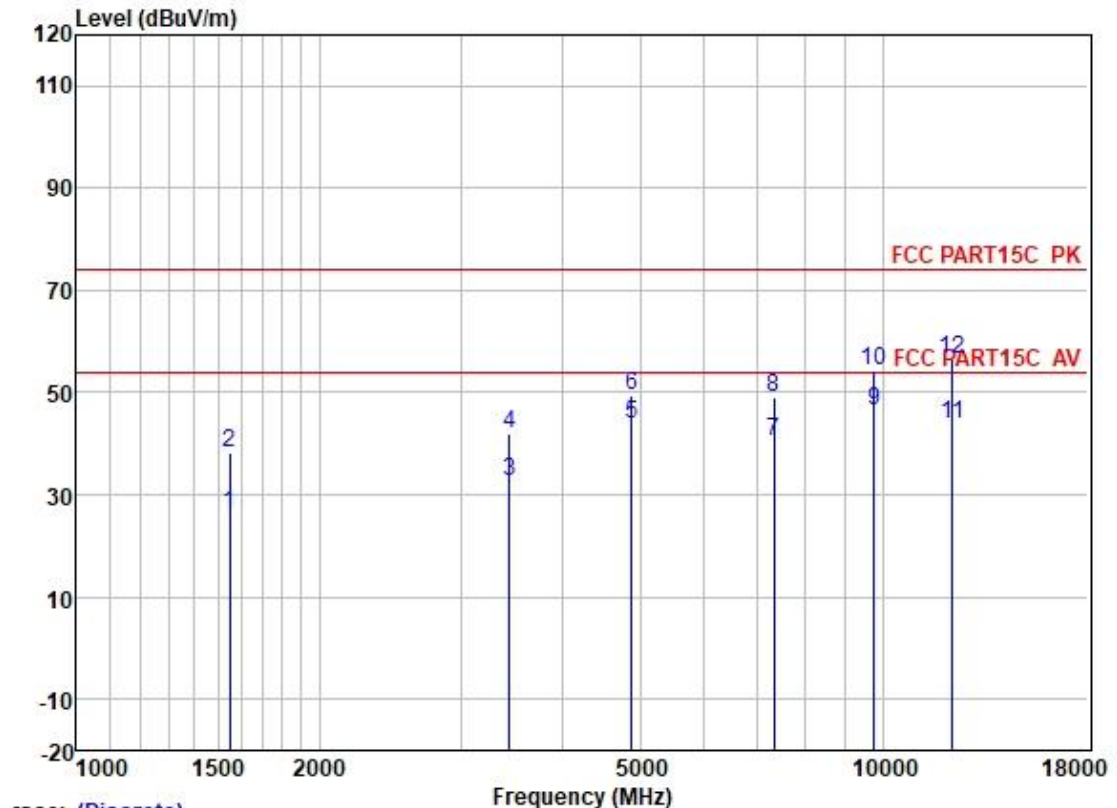
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	MHz	Level	Factor	Loss	Factor	Line	Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	1485.841	35.57	25.49	2.78	37.12	26.72	54.00	-27.28	HORIZONTAL Average
2	1485.841	46.66	25.49	2.78	37.12	37.81	74.00	-36.19	HORIZONTAL Peak
3	2332.356	37.37	27.20	3.36	36.94	30.99	54.00	-23.01	HORIZONTAL Average
4	2332.356	46.90	27.20	3.36	36.94	40.52	74.00	-33.48	HORIZONTAL Peak
5	4882.589	32.80	31.56	5.52	36.50	33.38	54.00	-20.62	HORIZONTAL Average
6	4882.589	42.42	31.56	5.52	36.50	43.00	74.00	-31.00	HORIZONTAL Peak
7	7323.418	29.52	36.00	6.13	36.76	34.89	54.00	-19.11	HORIZONTAL Average
8	7323.418	39.97	36.00	6.13	36.76	45.34	74.00	-28.66	HORIZONTAL Peak
9	9764.729	32.02	38.50	7.02	36.33	41.21	54.00	-12.79	HORIZONTAL Average
10	9764.729	40.97	38.50	7.02	36.33	50.16	74.00	-23.84	HORIZONTAL Peak
11	12205.720	42.40	38.74	8.08	36.30	52.92	74.00	-21.08	HORIZONTAL Peak
12	12205.720	32.03	38.74	8.08	36.30	42.55	54.00	-11.45	HORIZONTAL Average



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Mode:c; Polarization:Vertical; Modulation:GFSK; ; Channel:middle



Trace: (Discrete)

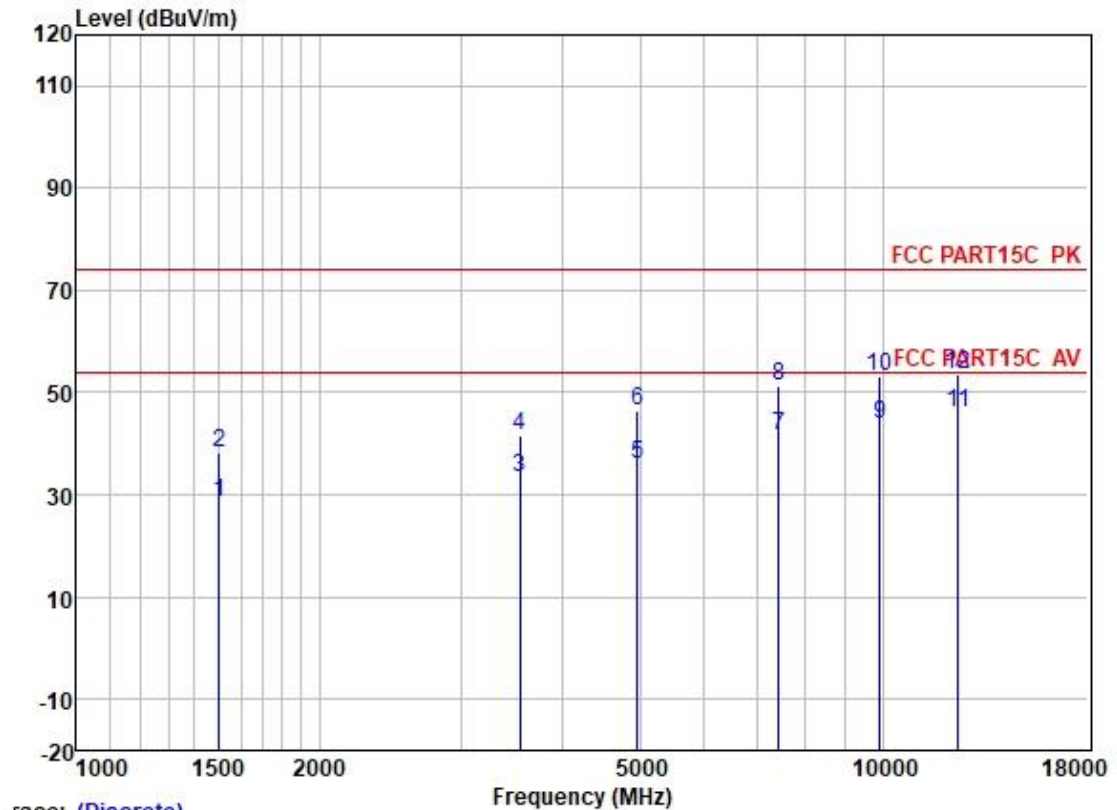
	Freq	ReadAntenna	Cable	Preamp	Level	Limit	Over	Pol/Phase	Remark
	MHz	Level	Factor	Loss	Factor	Line	Limit		
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	1547.199	34.98	25.53	2.80	37.09	26.22	54.00	-27.78	VERTICAL Average
2	1547.199	46.97	25.53	2.80	37.09	38.21	74.00	-35.79	VERTICAL Peak
3	3445.535	36.04	28.87	4.18	36.46	32.63	54.00	-21.37	VERTICAL Average
4	3445.535	45.23	28.87	4.18	36.46	41.82	74.00	-32.18	VERTICAL Peak
5	4882.975	43.08	31.56	5.52	36.50	43.66	54.00	-10.34	VERTICAL Average
6	4882.975	49.03	31.56	5.52	36.50	49.61	74.00	-24.39	VERTICAL Peak
7	7323.474	35.08	36.00	6.13	36.76	40.45	54.00	-13.55	VERTICAL Average
8	7323.474	43.81	36.00	6.13	36.76	49.18	74.00	-24.82	VERTICAL Peak
9	9764.900	37.09	38.50	7.02	36.33	46.28	54.00	-7.72	VERTICAL Average
10	9764.900	45.18	38.50	7.02	36.33	54.37	74.00	-19.63	VERTICAL Peak
11	12205.560	33.31	38.74	8.08	36.30	43.83	54.00	-10.17	VERTICAL Average
12	12205.560	46.03	38.74	8.08	36.30	56.55	74.00	-17.45	VERTICAL Peak



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Mode:c; Polarization:Horizontal; Modulation:GFSK; ; Channel:High



Trace: (Discrete)

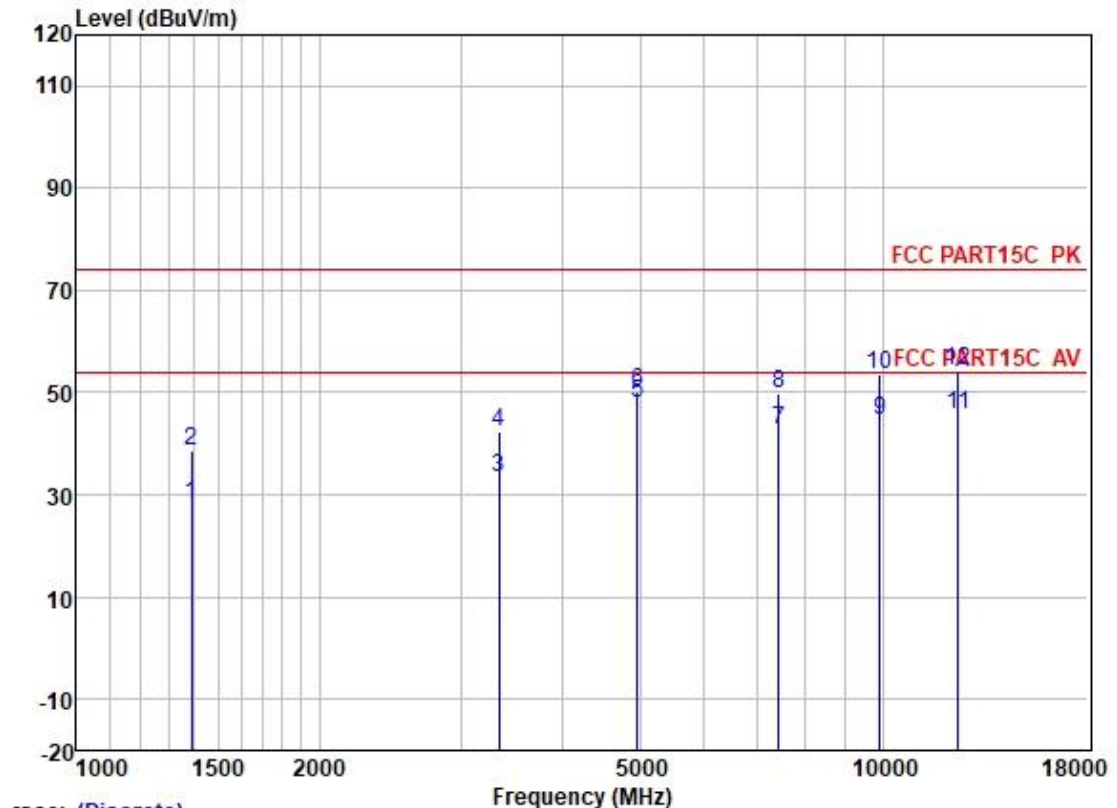
	Freq	ReadAntenna	Cable	Preamp	Level	Limit	Over		
	MHz	Level	Factor	Loss	Factor	Line	Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	1503.119	37.38	25.50	2.80	37.11	28.57	54.00	-25.43	HORIZONTAL Average
2	1503.119	47.00	25.50	2.80	37.11	38.19	74.00	-35.81	HORIZONTAL Peak
3	3546.577	36.34	28.96	4.42	36.45	33.27	54.00	-20.73	HORIZONTAL Average
4	3546.577	44.66	28.96	4.42	36.45	41.59	74.00	-32.41	HORIZONTAL Peak
5	4960.638	35.05	31.65	5.65	36.52	35.83	54.00	-18.17	HORIZONTAL Average
6	4960.638	45.50	31.65	5.65	36.52	46.28	74.00	-27.72	HORIZONTAL Peak
7	7440.473	35.86	36.27	6.22	36.77	41.58	54.00	-12.42	HORIZONTAL Average
8	7440.473	45.74	36.27	6.22	36.77	51.46	74.00	-22.54	HORIZONTAL Peak
9	9920.020	34.71	38.65	6.96	36.31	44.01	54.00	-9.99	HORIZONTAL Average
10	9920.020	43.78	38.65	6.96	36.31	53.08	74.00	-20.92	HORIZONTAL Peak
11	12400.390	35.55	38.57	7.97	36.17	45.92	54.00	-8.08	HORIZONTAL Average
12	12400.390	43.32	38.57	7.97	36.17	53.69	74.00	-20.31	HORIZONTAL Peak



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Mode:c; Polarization:Vertical; Modulation:GFSK; ; Channel:High



Trace: (Discrete)

	Freq	ReadAntenna	Cable	Preamp	Level	Limit	Over	Pol/Phase	Remark
	MHz	Level	Factor	Loss	Factor	Line	Limit		
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	1390.276	37.29	25.38	2.60	37.23	28.04	54.00	-25.96	VERTICAL Average
2	1390.276	47.68	25.38	2.60	37.23	38.43	74.00	-35.57	VERTICAL Peak
3	3337.710	37.18	28.79	4.08	36.48	33.57	54.00	-20.43	VERTICAL Average
4	3337.710	46.08	28.79	4.08	36.48	42.47	74.00	-31.53	VERTICAL Peak
5	4960.251	47.34	31.65	5.65	36.52	48.12	54.00	-5.88	VERTICAL Average
6	4960.251	49.41	31.65	5.65	36.52	50.19	74.00	-23.81	VERTICAL Peak
7	7440.474	37.00	36.27	6.22	36.77	42.72	54.00	-11.28	VERTICAL Average
8	7440.474	44.15	36.27	6.22	36.77	49.87	74.00	-24.13	VERTICAL Peak
9	9920.710	35.43	38.65	6.96	36.31	44.73	54.00	-9.27	VERTICAL Average
10	9920.710	44.37	38.65	6.96	36.31	53.67	74.00	-20.33	VERTICAL Peak
11	12400.250	35.40	38.57	7.97	36.17	45.77	54.00	-8.23	VERTICAL Average
12	12400.250	44.09	38.57	7.97	36.17	54.46	74.00	-19.54	VERTICAL Peak



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8 Appendix

8.1 Appendix 15.247

Cable Loss=0.9 dB

8.2 Appendix A: 20dB Emission Bandwidth

8.2.1 Test Result

TestMode	Antenna	Channel	20db EBW[MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
DH5	Ant1	2402	0.942	2401.532	2402.474	---	PASS
		2441	0.942	2440.529	2441.471	---	PASS
		2480	0.942	2479.529	2480.471	---	PASS
2DH5	Ant1	2402	1.227	2401.367	2402.594	---	PASS
		2441	1.236	2440.361	2441.597	---	PASS
		2480	1.251	2479.361	2480.612	---	PASS
3DH5	Ant1	2402	1.257	2401.346	2402.603	---	PASS
		2441	1.260	2440.343	2441.603	---	PASS
		2480	1.257	2479.346	2480.603	---	PASS

8.2.2 Test Graphs



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DH5_Ant1_2441



DH5_Ant1_2480



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2DH5_Ant1_2402



2DH5_Ant1_2441



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2DH5_Ant1_2480



3DH5_Ant1_2402

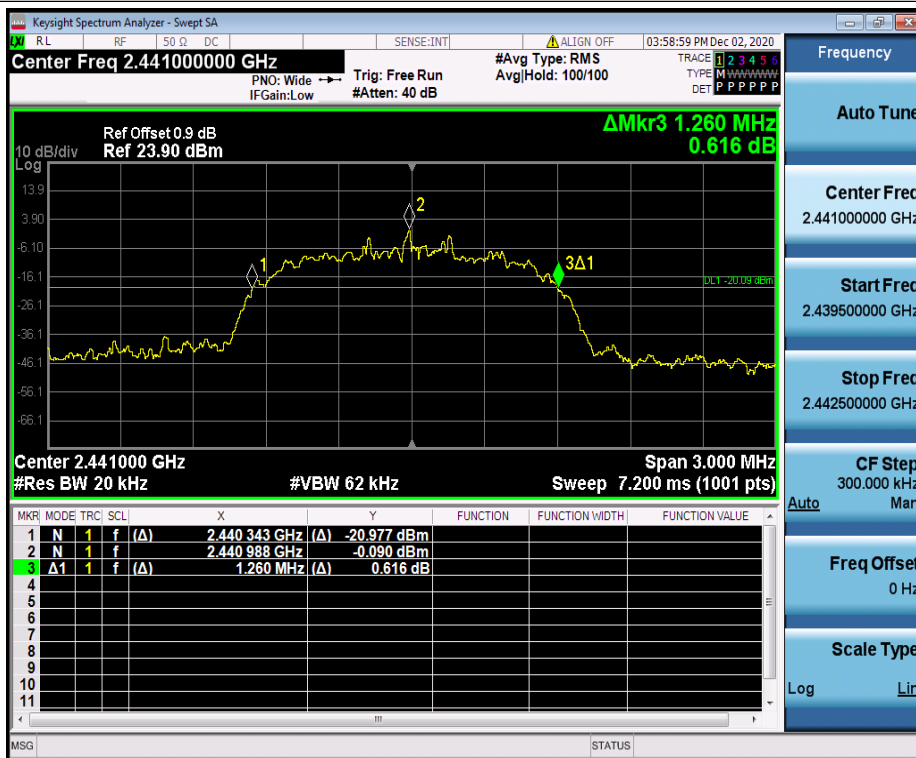


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3DH5_Ant1_2441



3DH5_Ant1_2480



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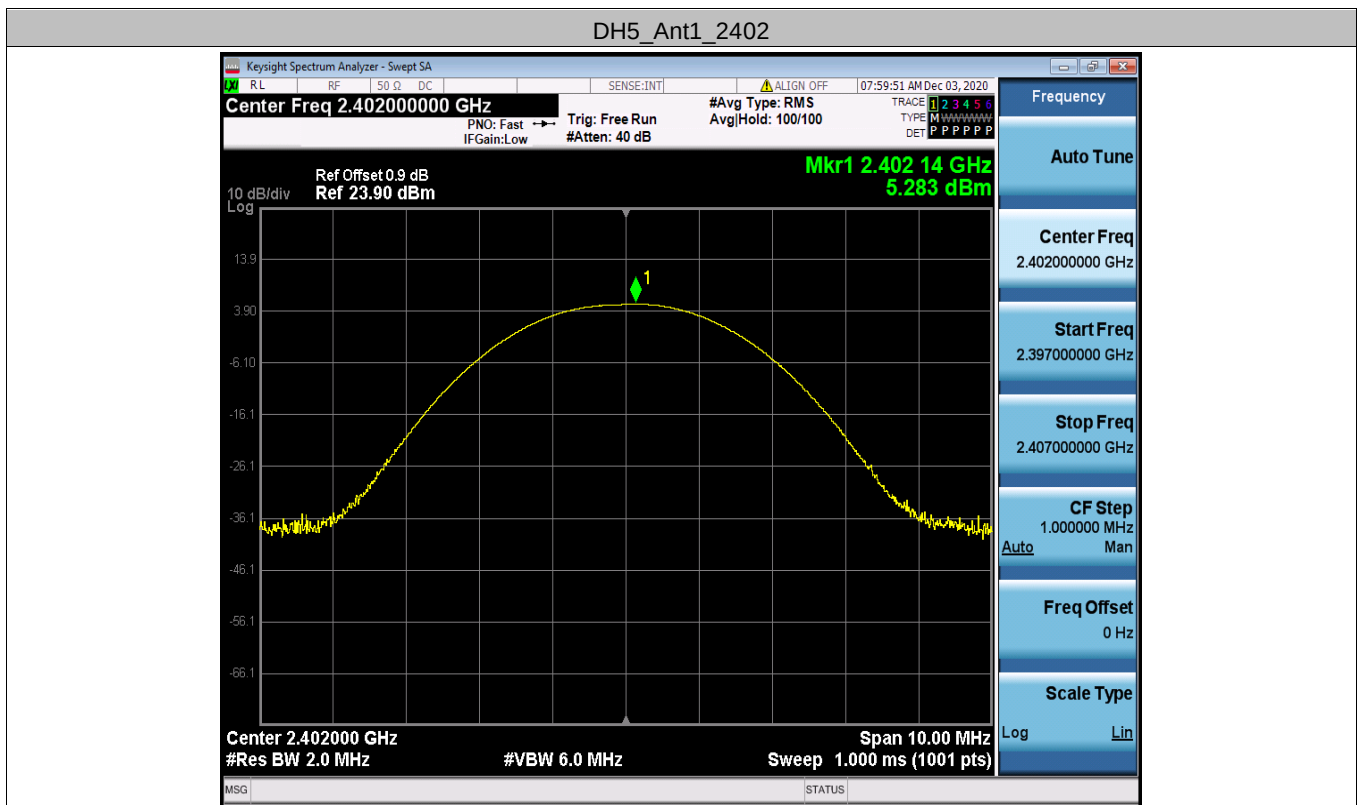
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8.3 Appendix B: Maximum conducted output power

8.3.1 Test Result

TestMode	Antenna	Channel	Result[dBm]	Limit[dBm]	Verdict
DH5	Ant1	2402	5.28	<=20.97	PASS
		2441	6.14	<=20.97	PASS
		2480	5.85	<=20.97	PASS
2DH5	Ant1	2402	3.08	<=20.97	PASS
		2441	4.05	<=20.97	PASS
		2480	3.65	<=20.97	PASS
3DH5	Ant1	2402	3.49	<=20.97	PASS
		2441	4.50	<=20.97	PASS
		2480	4.10	<=20.97	PASS

8.3.2 Test Graphs

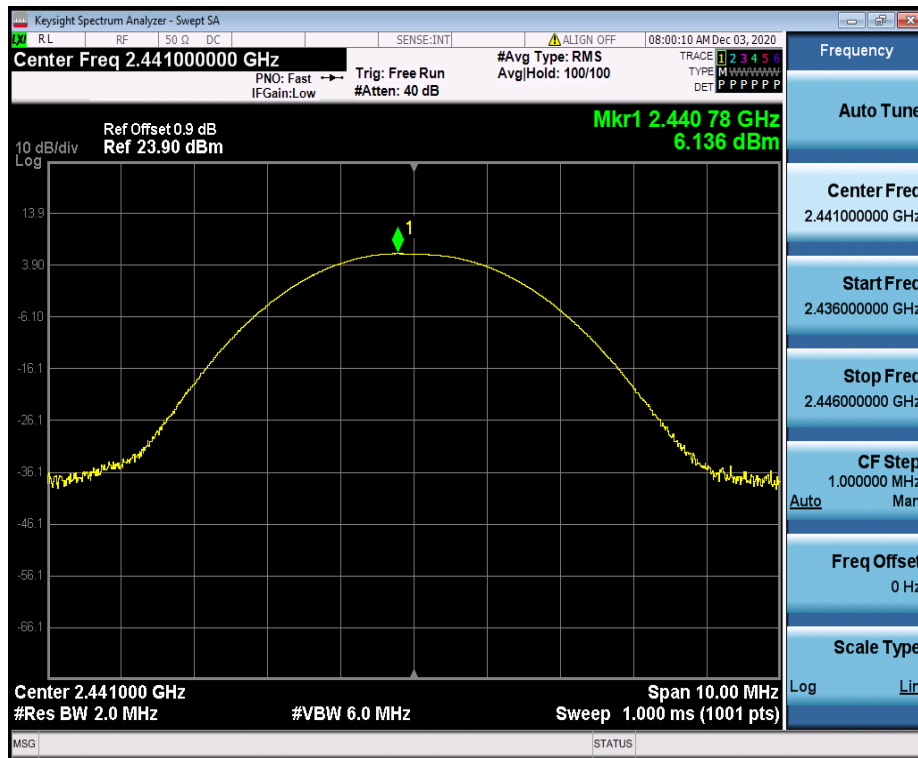


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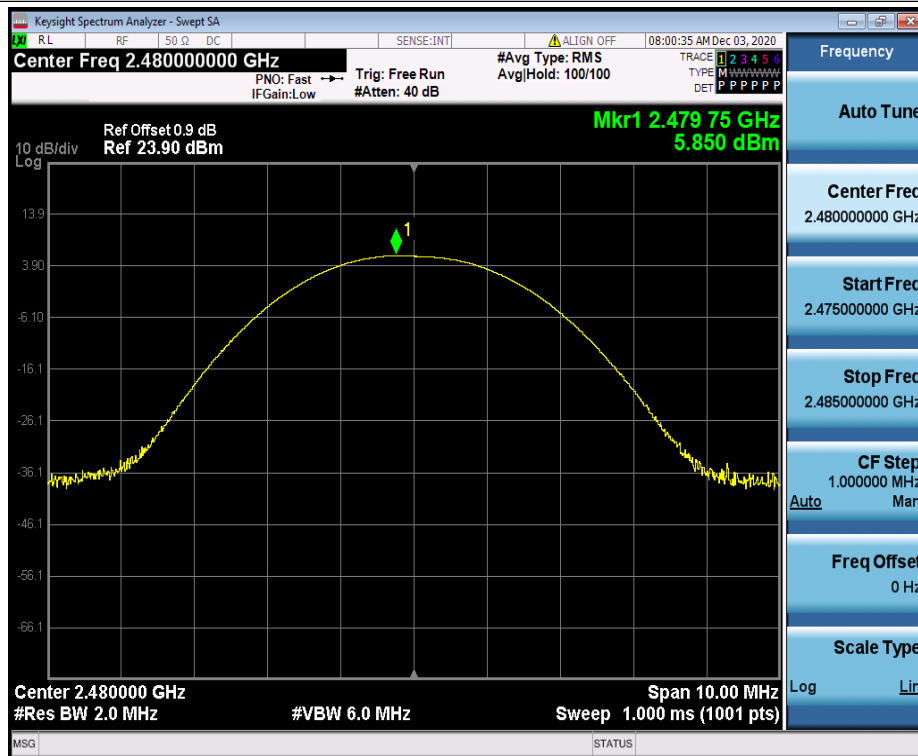
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DH5_Ant1_2441



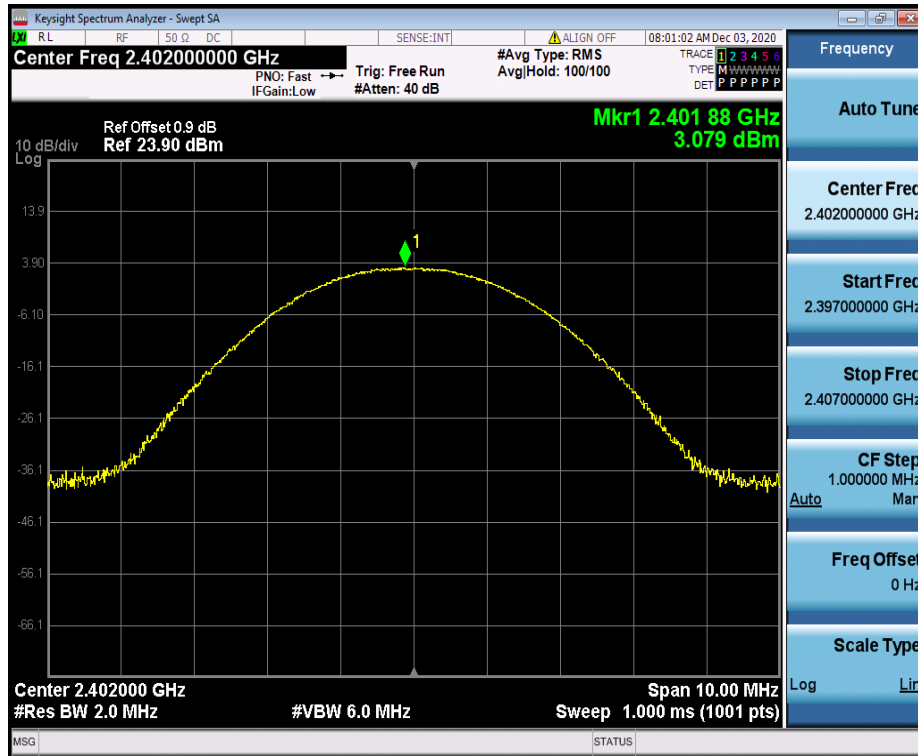
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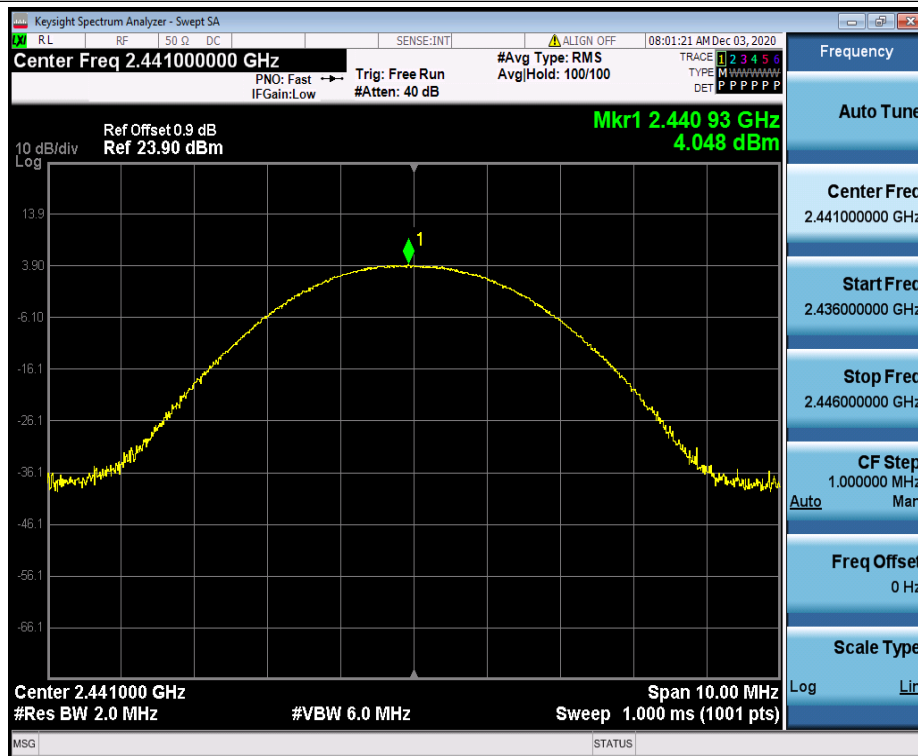
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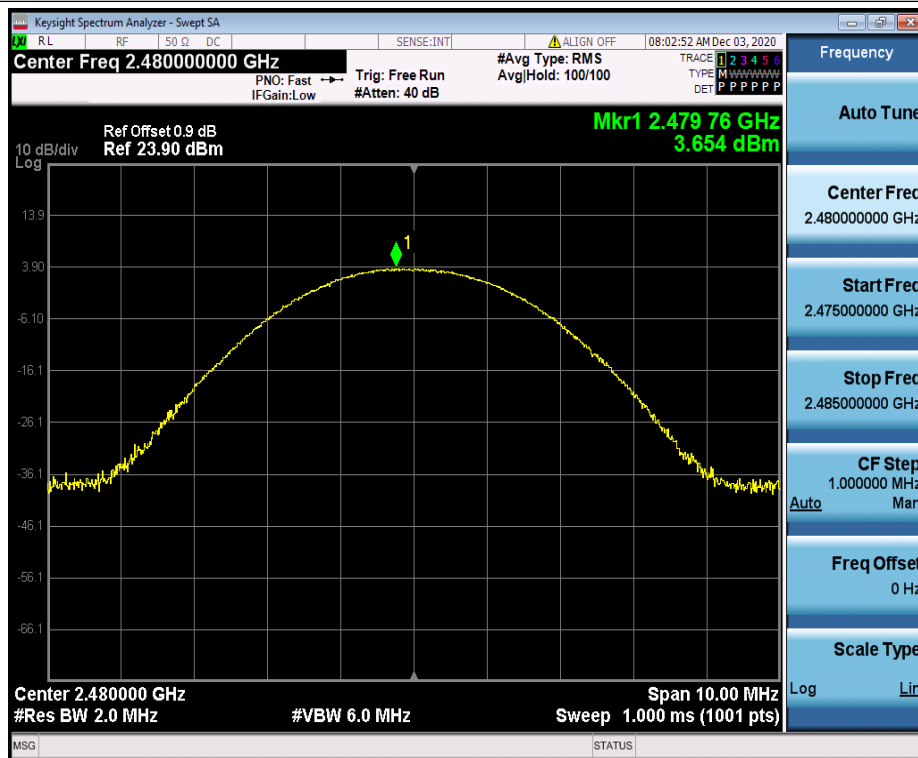
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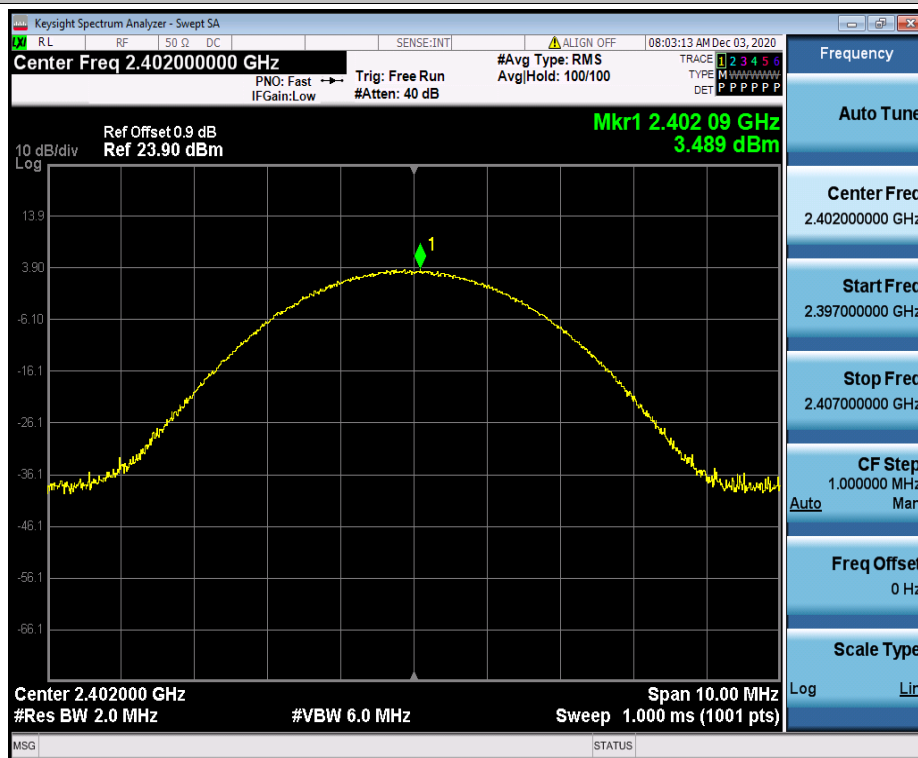
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3DH5 Ant1 2402

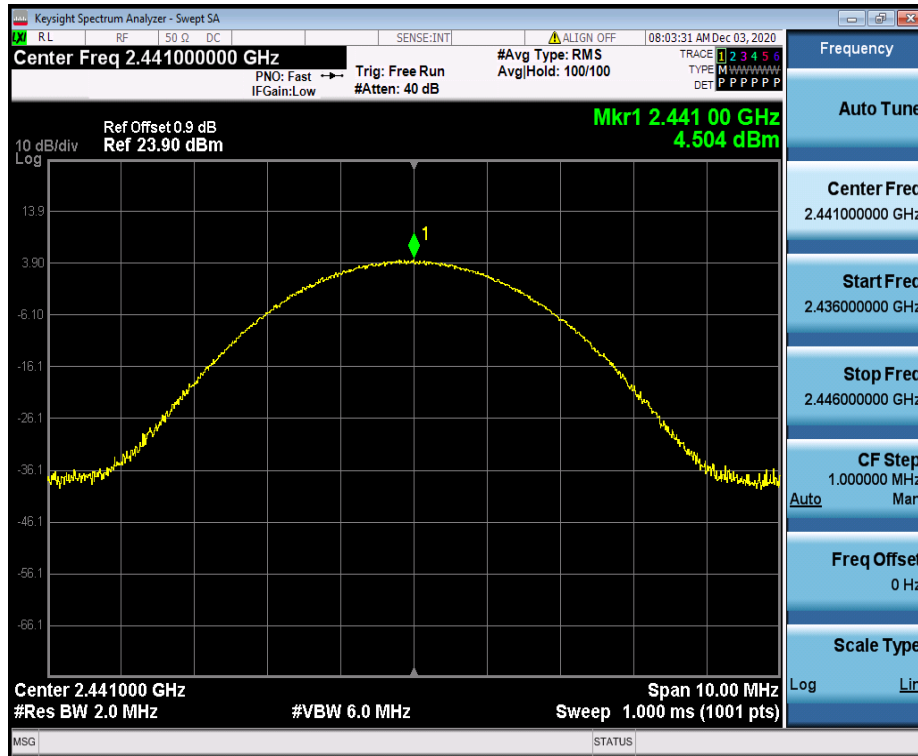


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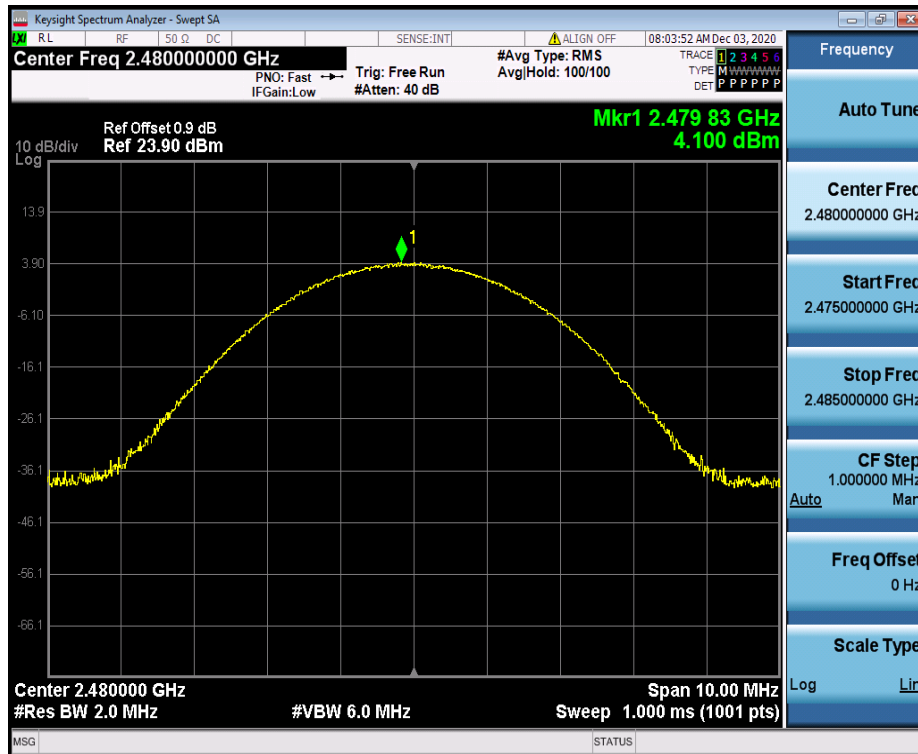
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8.4 Appendix C: Carrier frequency separation

8.4.1 Test Result

TestMode	Antenna	Channel	Result[MHz]	Limit[MHz]	Verdict
DH5	Ant1	Hop_2402	1.029	>=0.628	PASS
	Ant1	Hop_2441	1.068	>=0.628	PASS
	Ant1	Hop_2480	1.008	>=0.628	PASS

8.4.2 Test Graphs

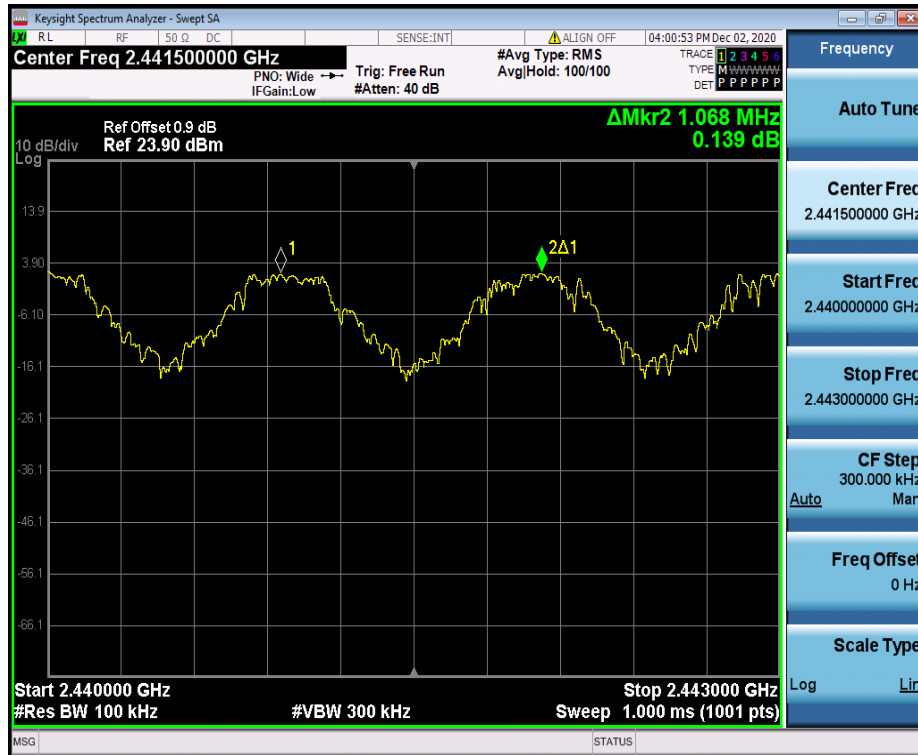


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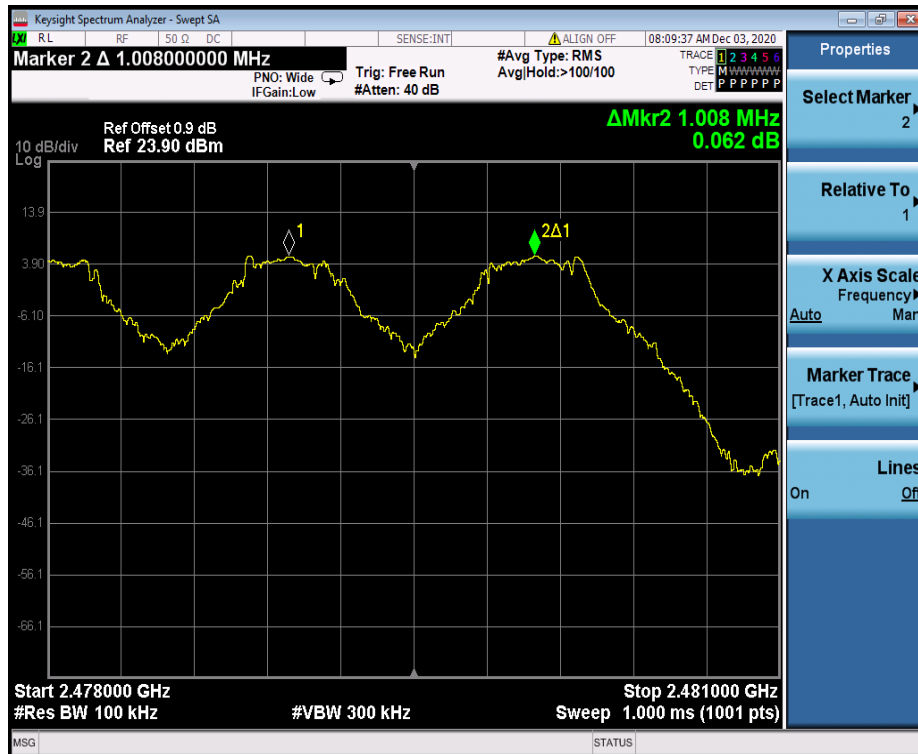
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DH5_Ant1_Hop_2441



DH5_Ant1_Hop_2480



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8.5 Appendix D: Time of occupancy

8.5.1 Test Result

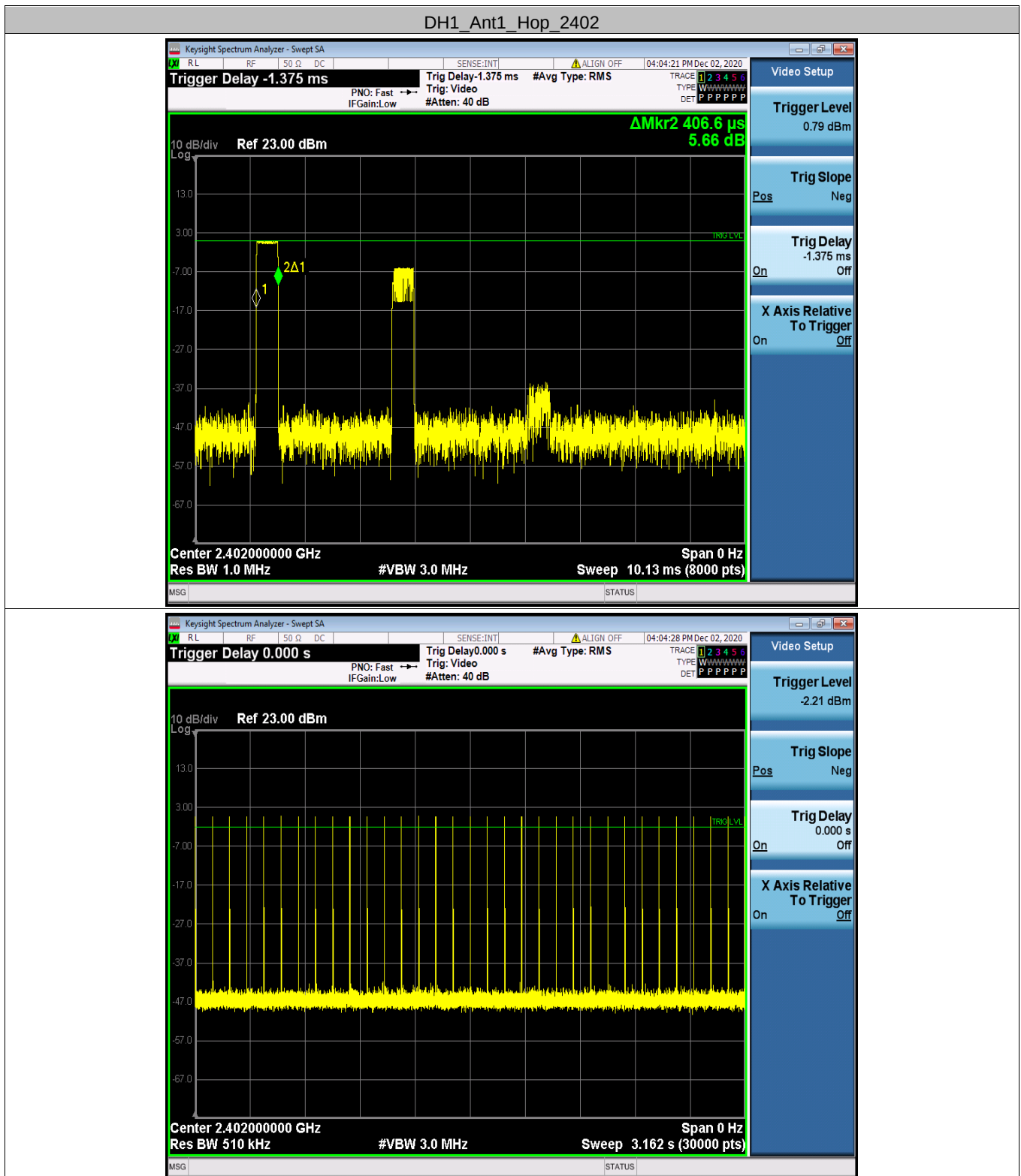
TestMode	Antenna	Channel	BurstWidth [ms]	TotalHops [Num]	Result[s]	Limit[s]	Verdict
DH1	Ant1	Hop_2402	0.41	330	0.134	<=0.4	PASS
		Hop_2441	0.41	330	0.134	<=0.4	PASS
		Hop_2480	0.41	330	0.134	<=0.4	PASS
DH3	Ant1	Hop_2402	1.66	170	0.283	<=0.4	PASS
		Hop_2441	1.66	170	0.283	<=0.4	PASS
		Hop_2480	1.66	170	0.283	<=0.4	PASS
DH5	Ant1	Hop_2402	2.91	110	0.32	<=0.4	PASS
		Hop_2441	2.91	110	0.32	<=0.4	PASS
		Hop_2480	2.91	110	0.32	<=0.4	PASS
2DH1	Ant1	Hop_2402	0.42	330	0.14	<=0.4	PASS
		Hop_2441	0.42	330	0.139	<=0.4	PASS
		Hop_2480	0.42	330	0.139	<=0.4	PASS
2DH3	Ant1	Hop_2402	1.67	170	0.284	<=0.4	PASS
		Hop_2441	1.67	170	0.285	<=0.4	PASS
		Hop_2480	1.67	170	0.285	<=0.4	PASS
2DH5	Ant1	Hop_2402	1.72	170	0.293	<=0.4	PASS
		Hop_2441	1.72	170	0.293	<=0.4	PASS
		Hop_2480	1.72	170	0.293	<=0.4	PASS
3DH1	Ant1	Hop_2402	0.42	330	0.139	<=0.4	PASS
		Hop_2441	0.42	330	0.139	<=0.4	PASS
		Hop_2480	0.42	330	0.139	<=0.4	PASS
3DH3	Ant1	Hop_2402	1.67	170	0.284	<=0.4	PASS
		Hop_2441	1.67	170	0.284	<=0.4	PASS
		Hop_2480	1.67	170	0.284	<=0.4	PASS
3DH5	Ant1	Hop_2402	2.92	110	0.321	<=0.4	PASS
		Hop_2441	2.92	110	0.322	<=0.4	PASS
		Hop_2480	2.92	110	0.322	<=0.4	PASS



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8.5.2 Test Graphs

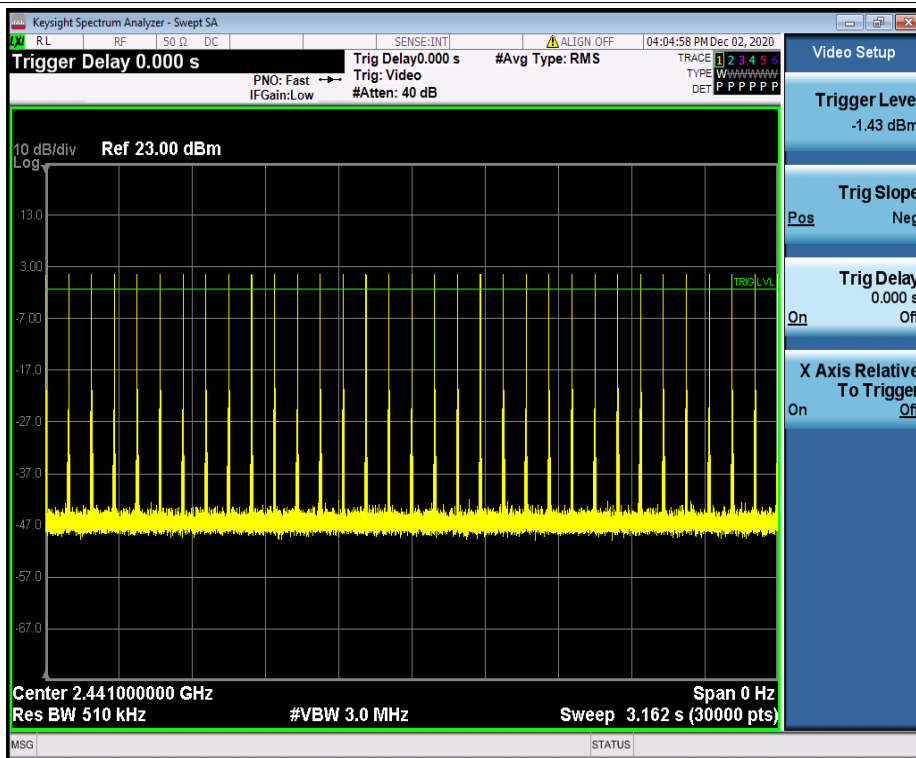
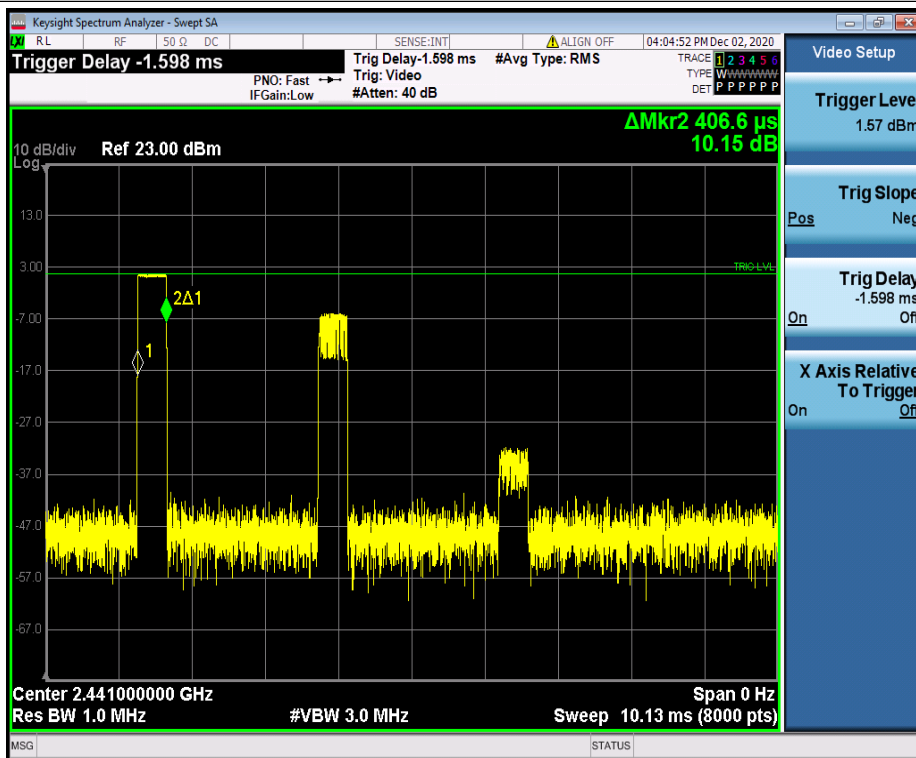


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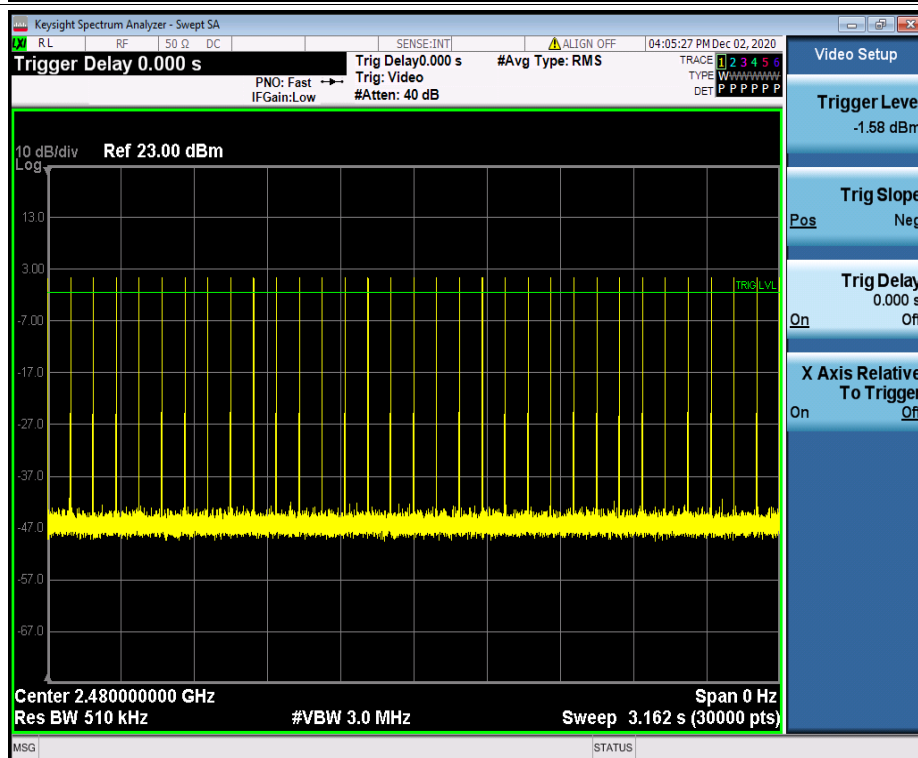
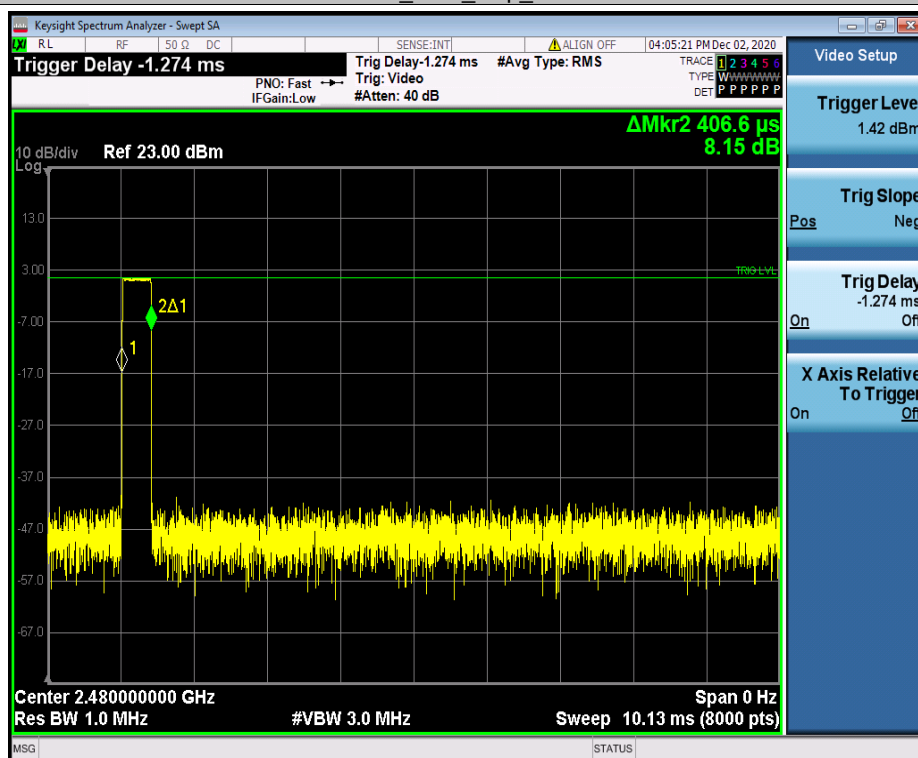
DH1_Ant1_Hop_2441



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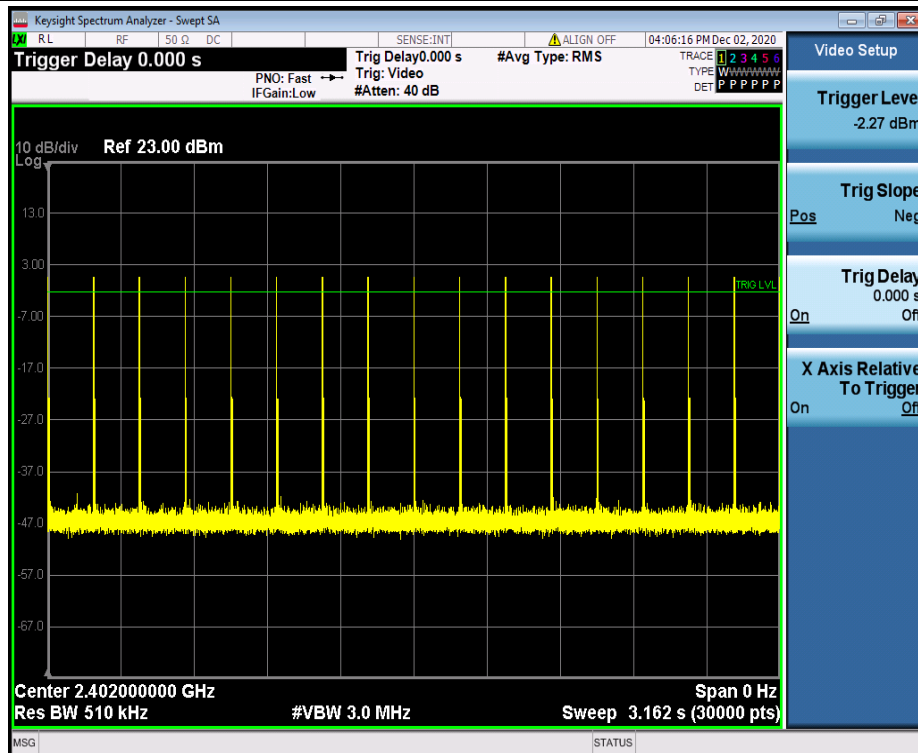
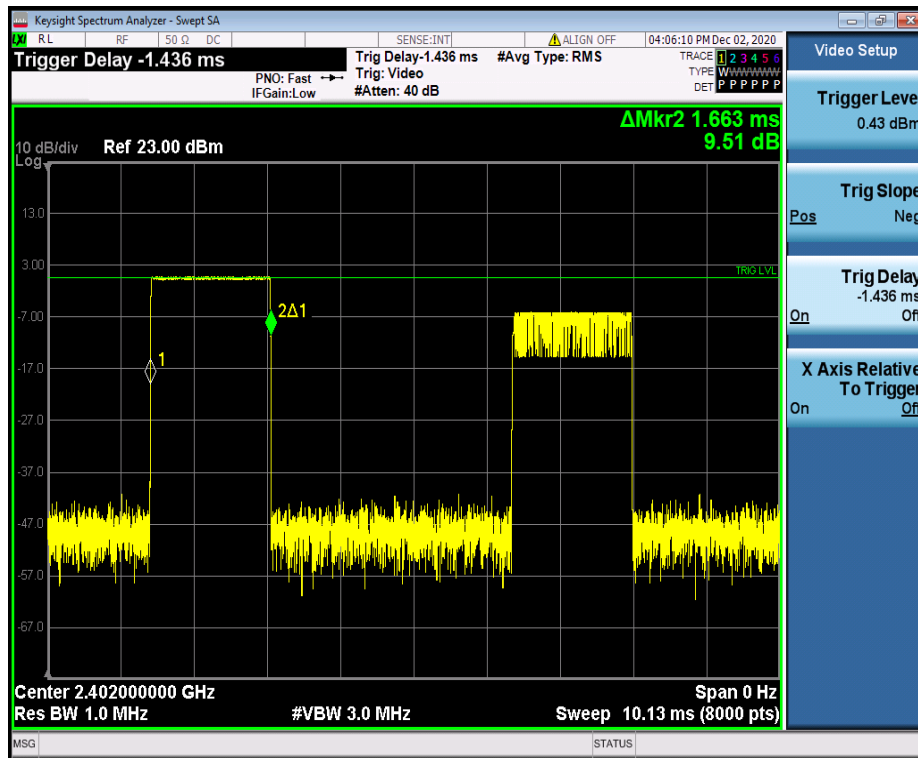
DH1 Ant1 Hop 2480



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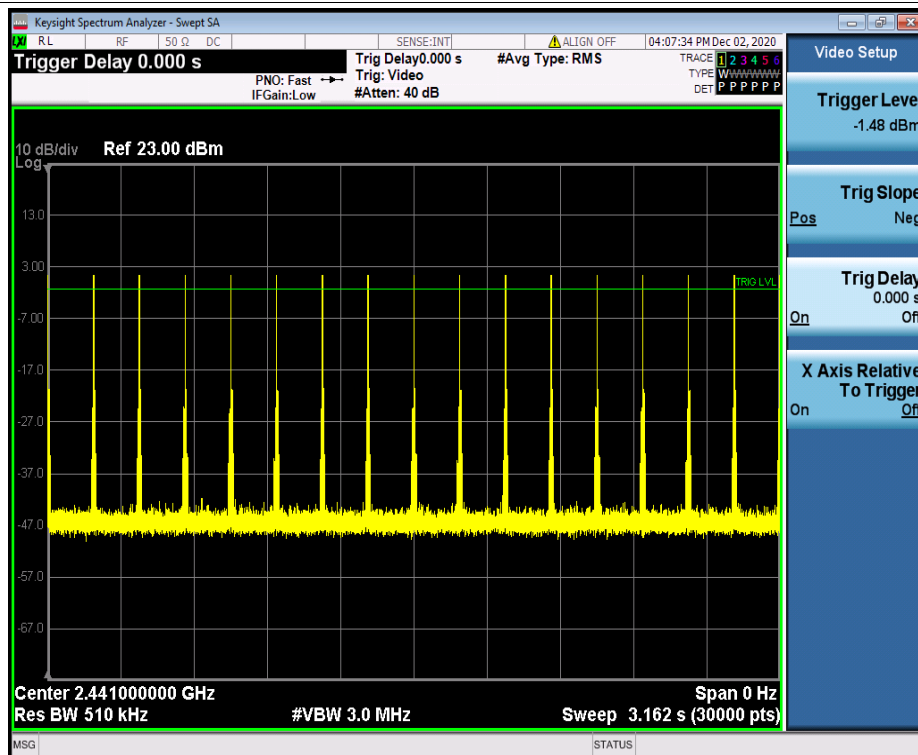
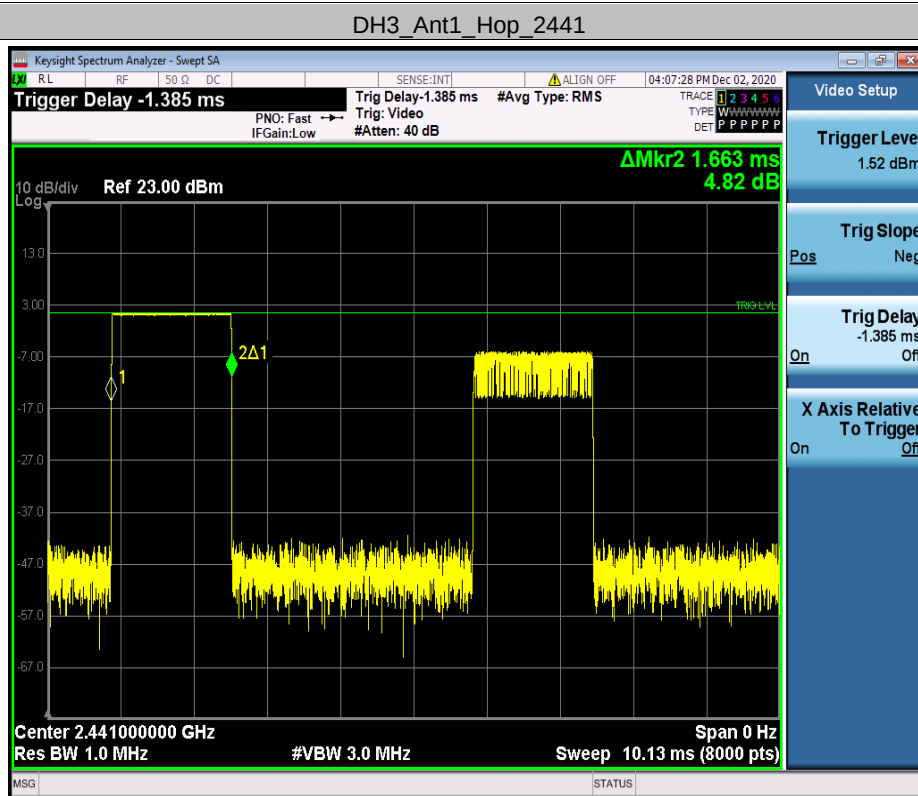
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DH3_Ant1_Hop_2402



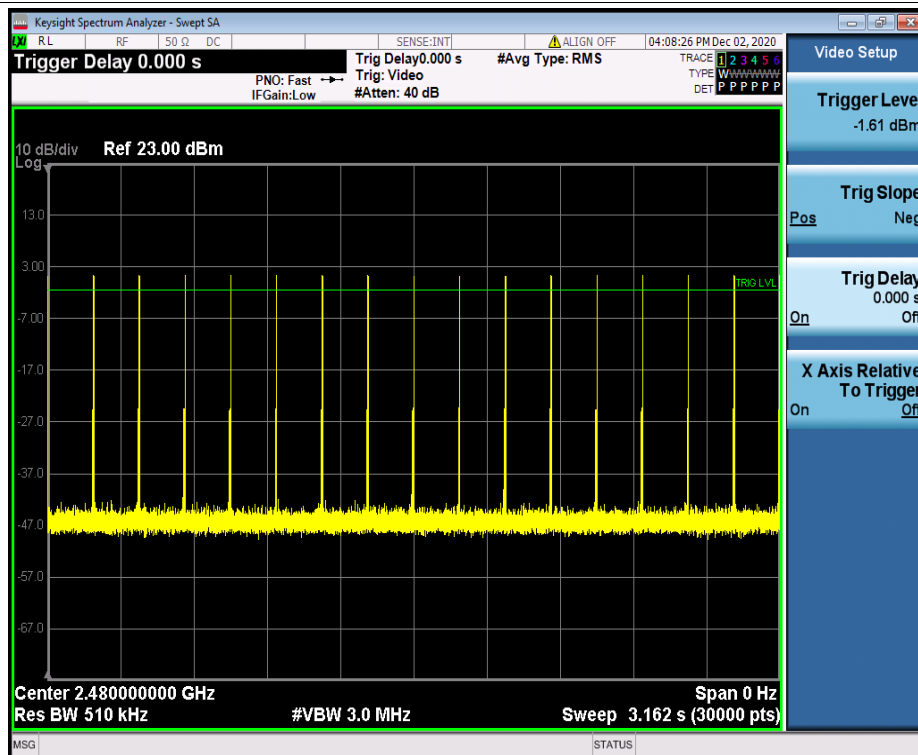
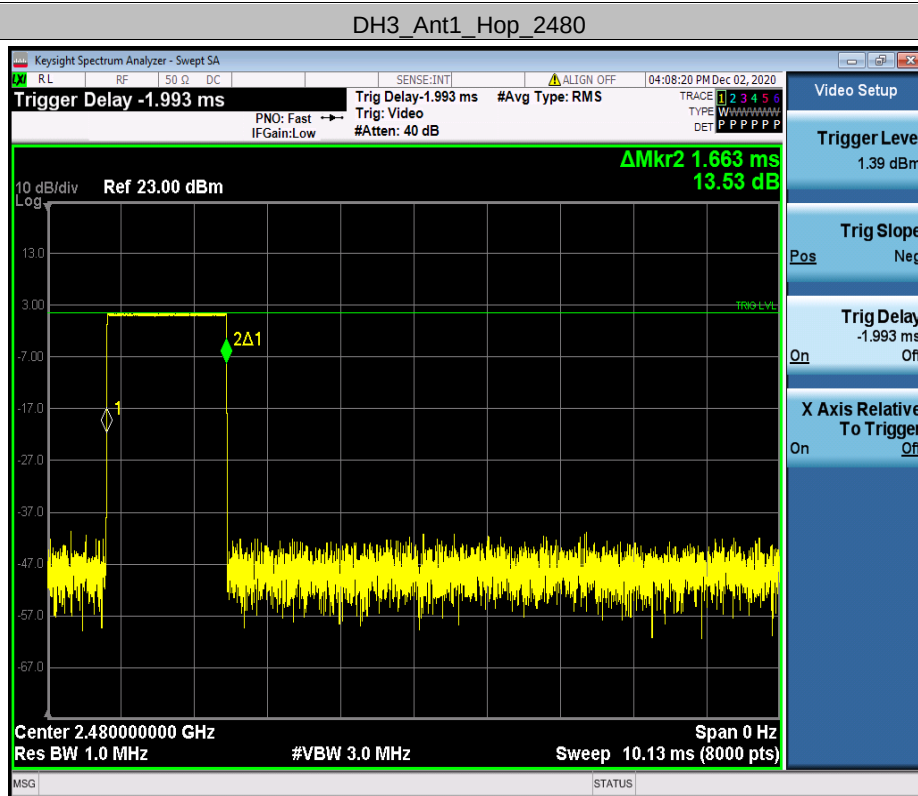
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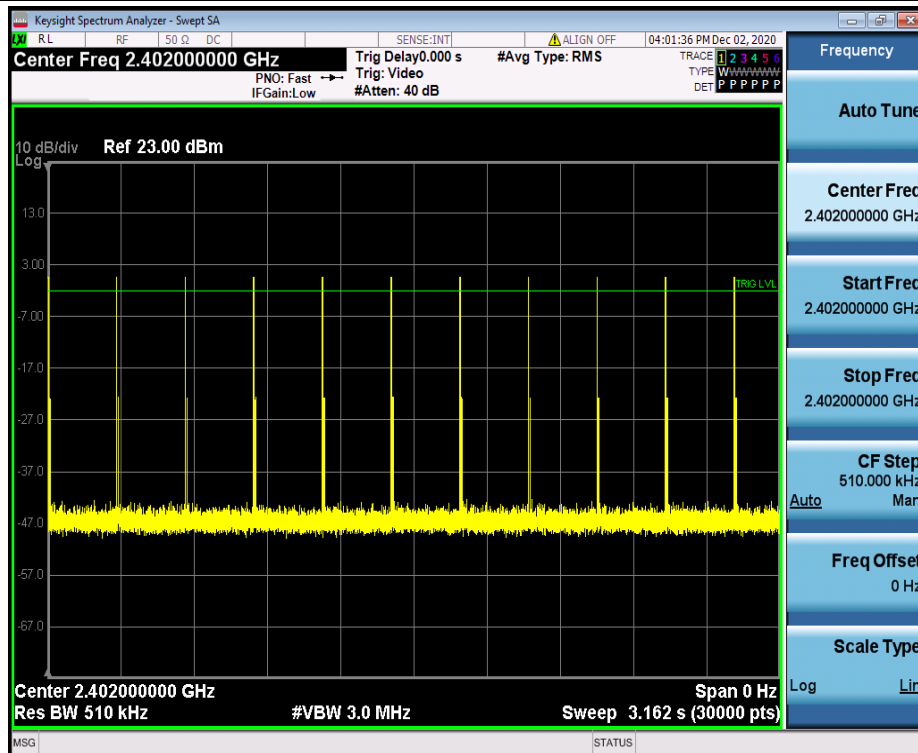
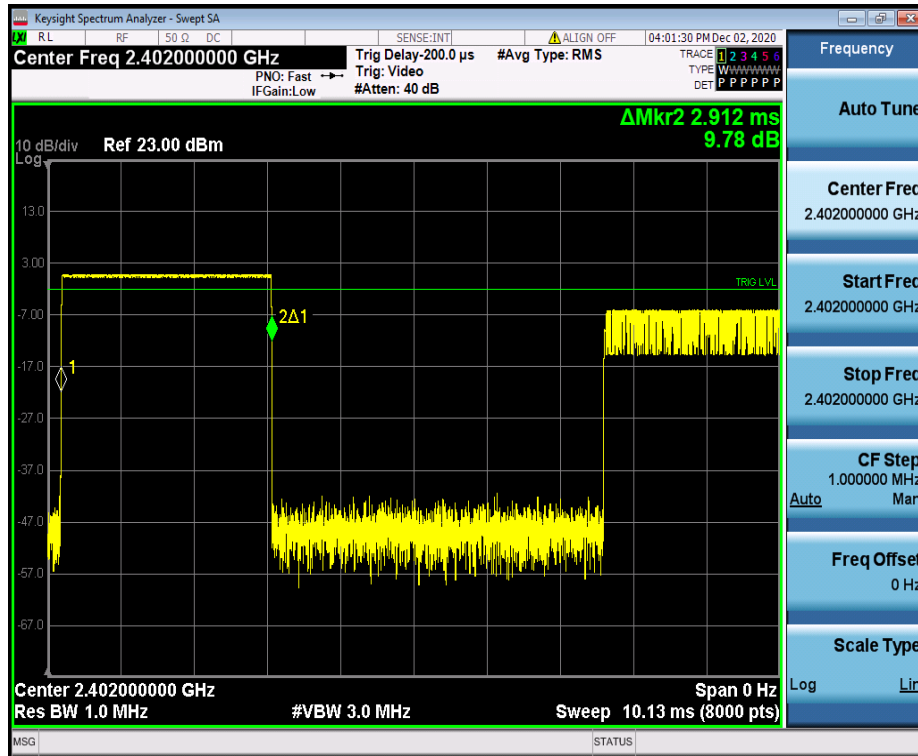
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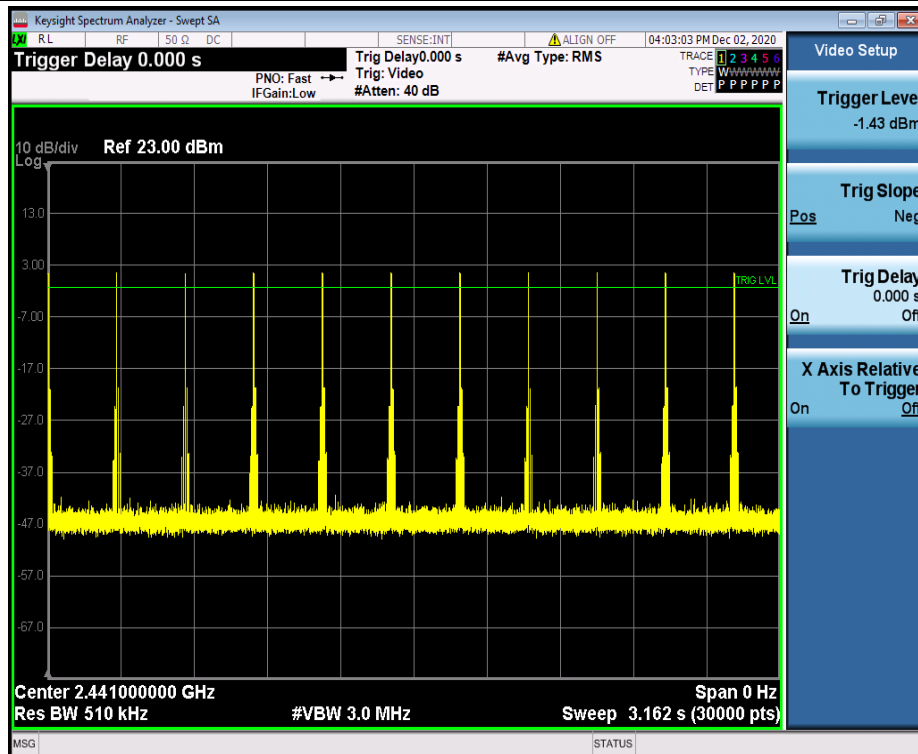
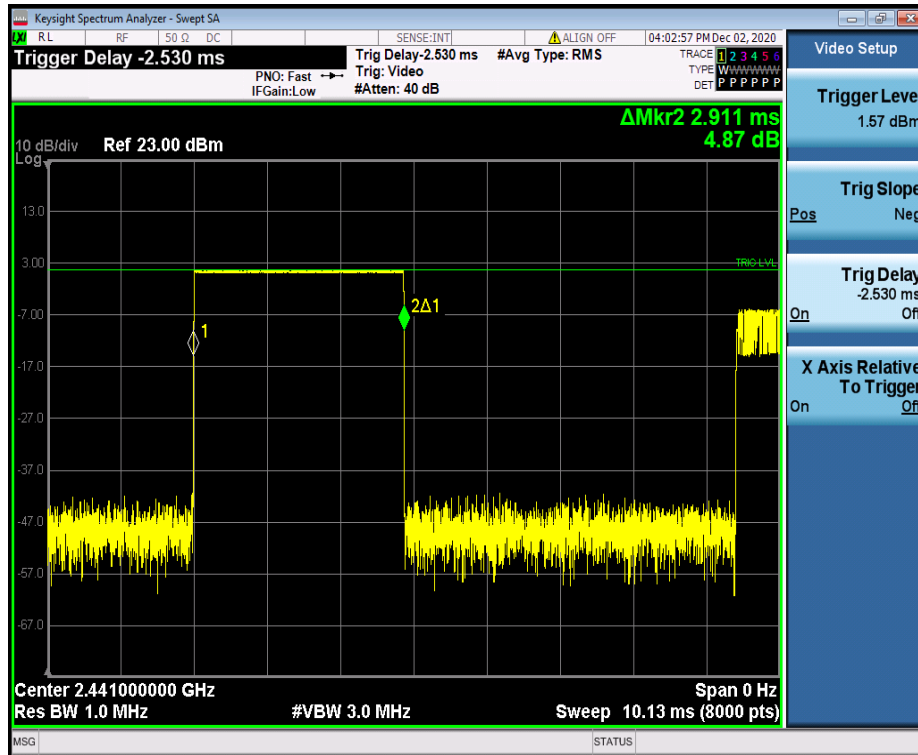
DH5_Ant1_Hop_2402



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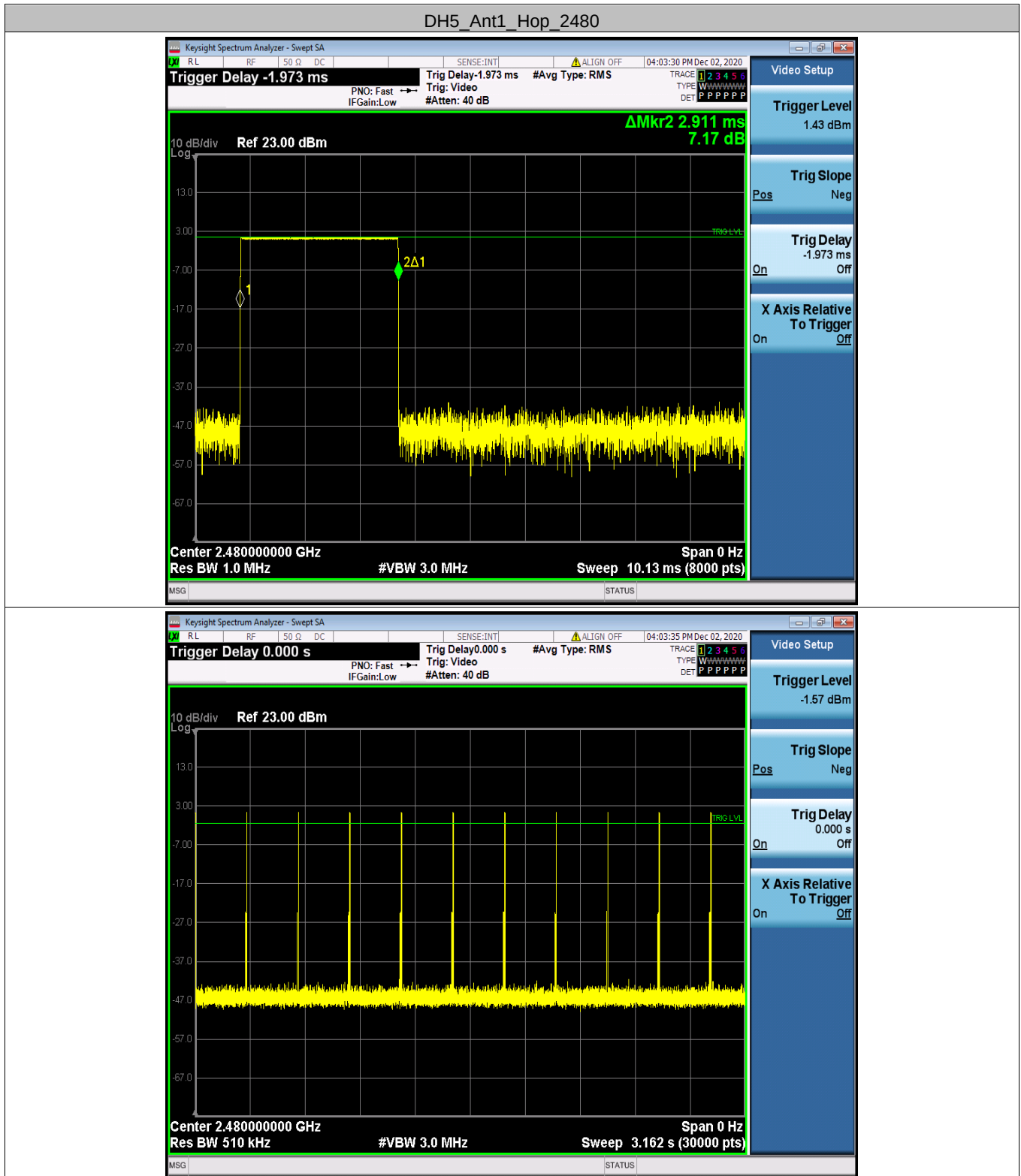
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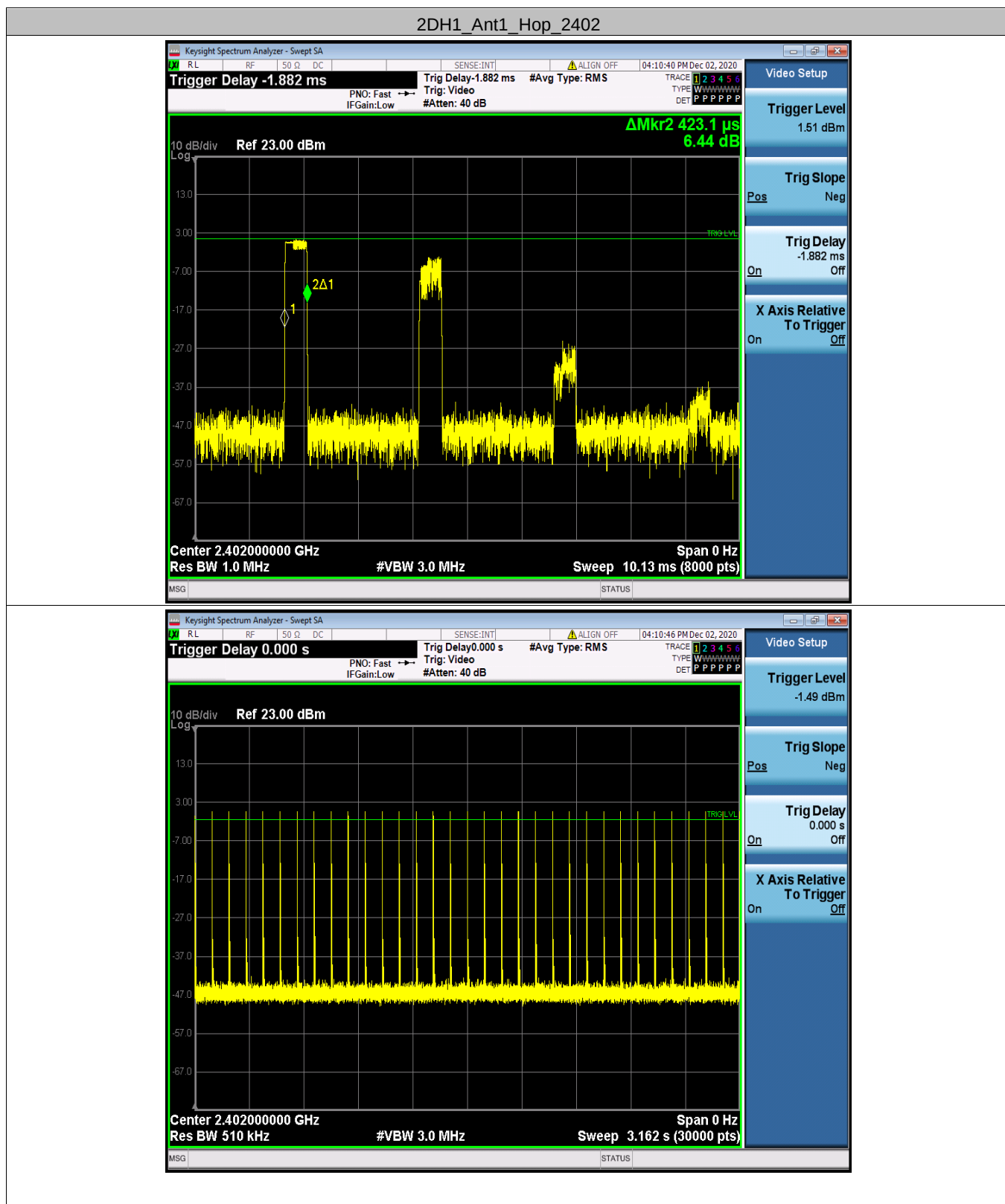
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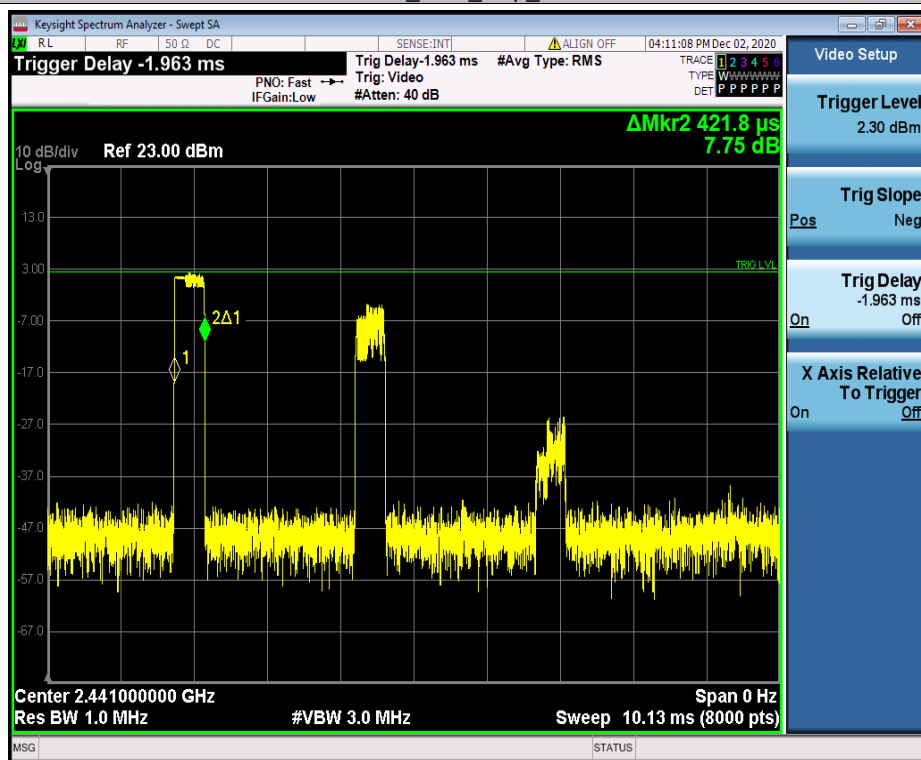
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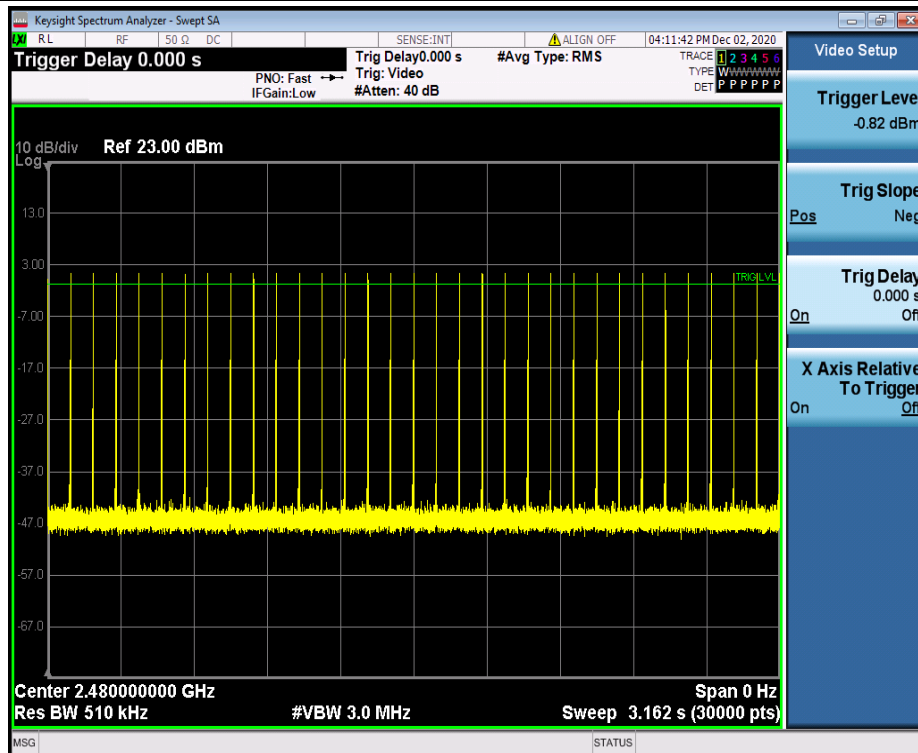
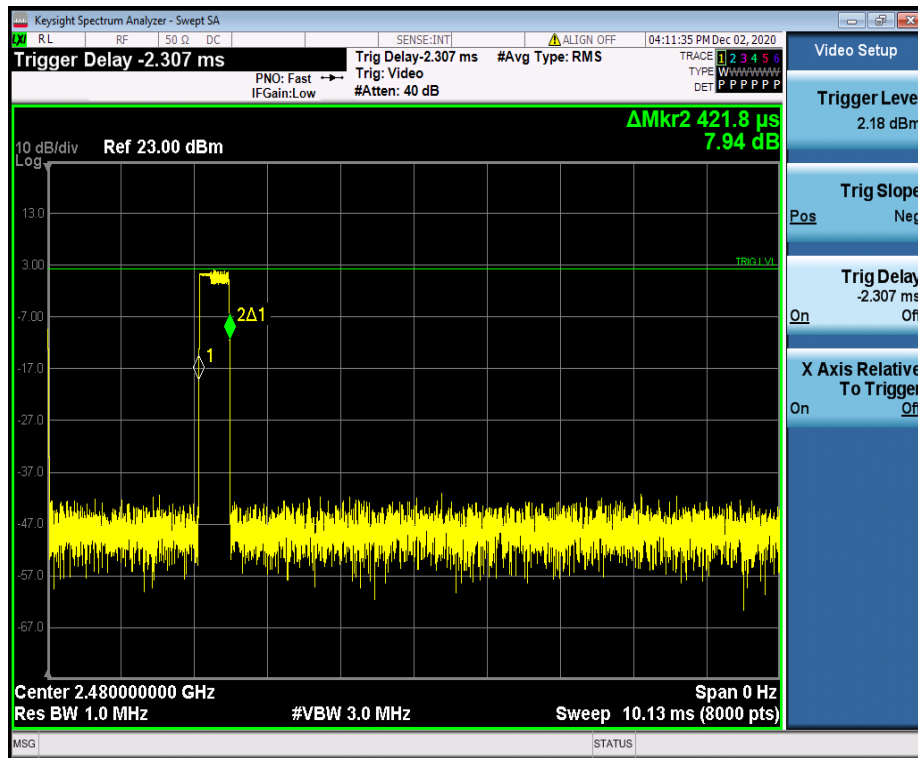
2DH1 Ant1 Hop 2441



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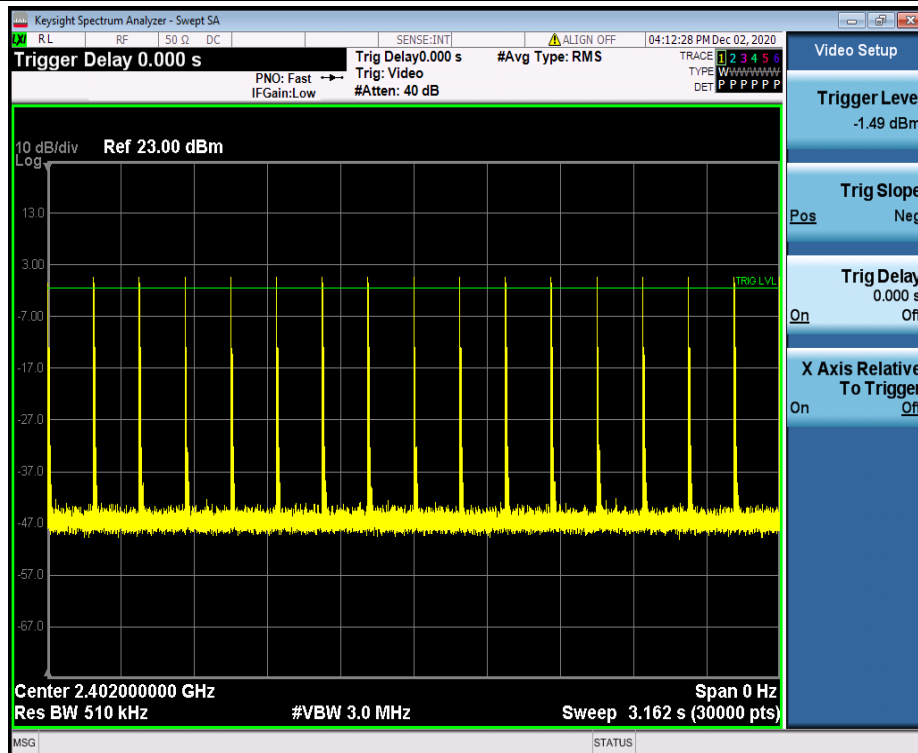
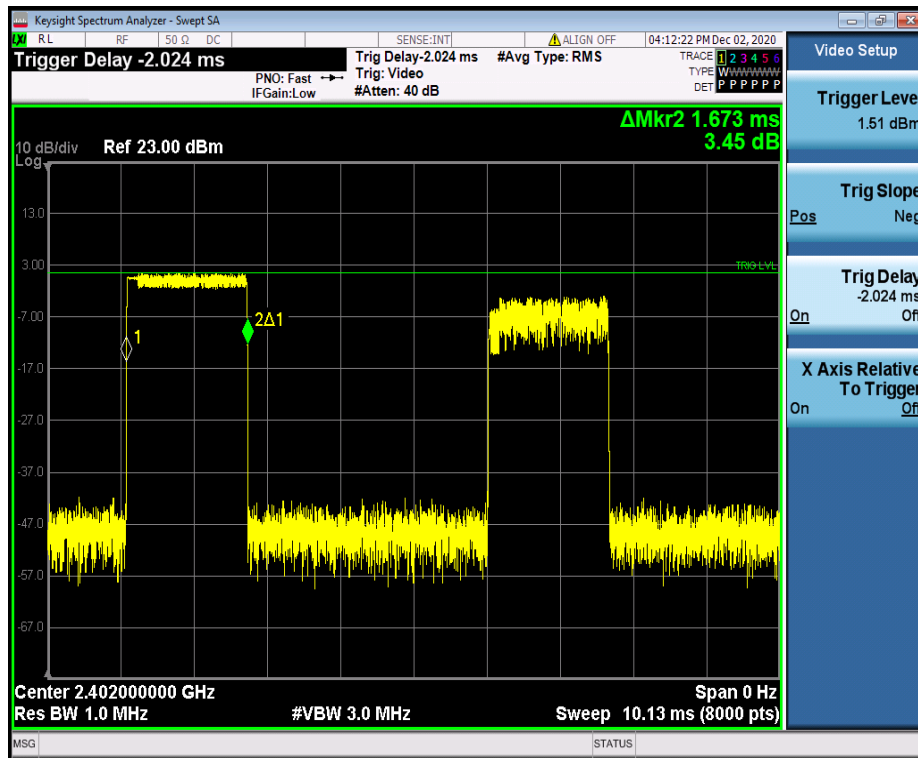
2DH1_Ant1_Hop_2480



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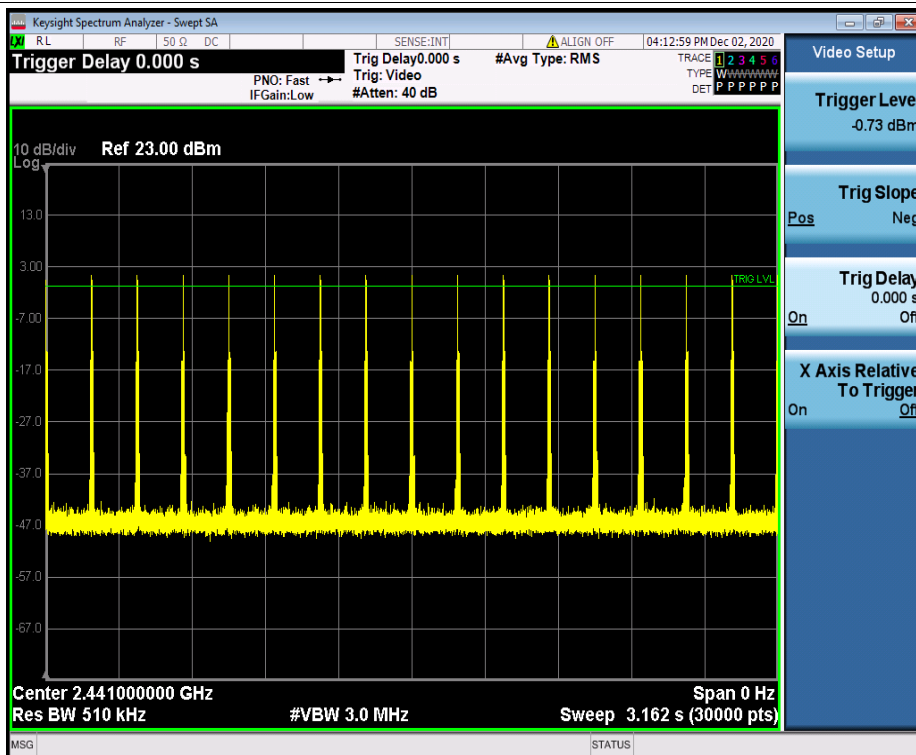
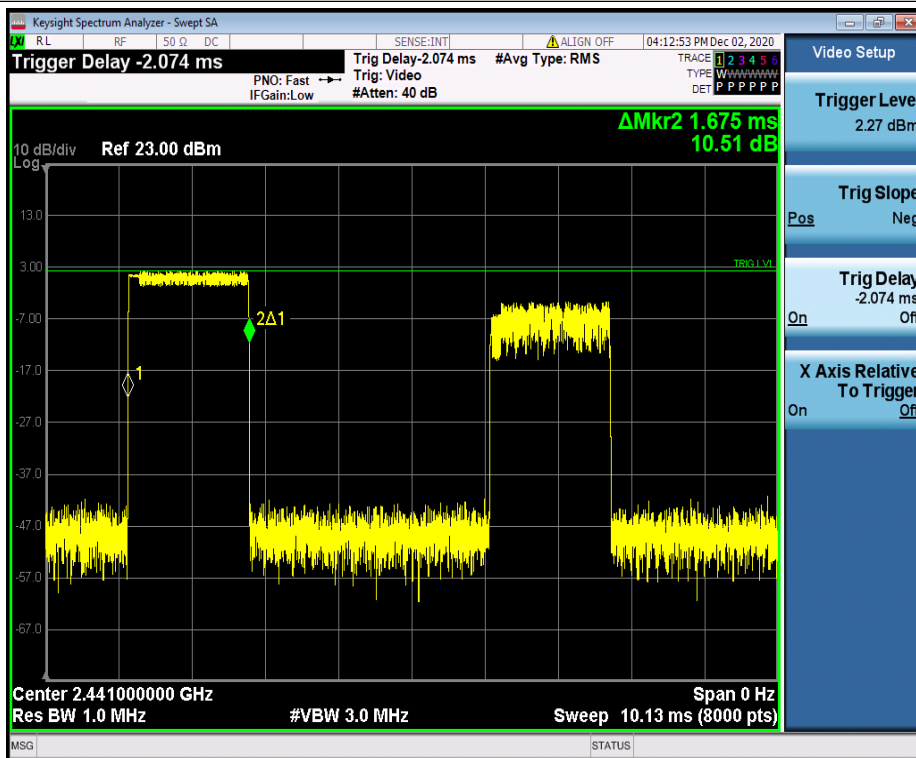
2DH3_Ant1_Hop_2402



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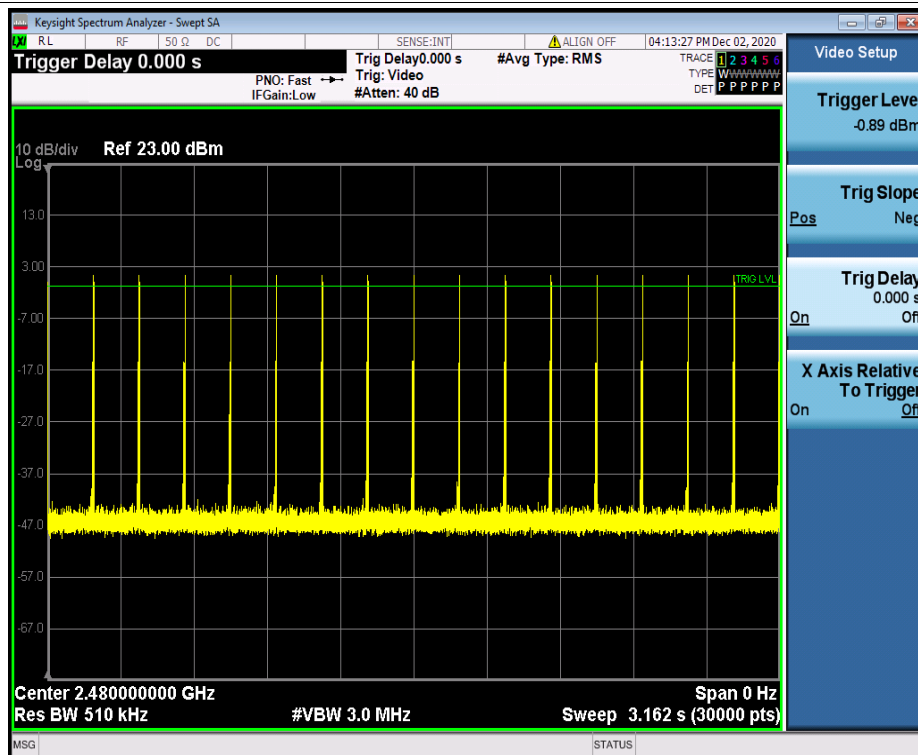
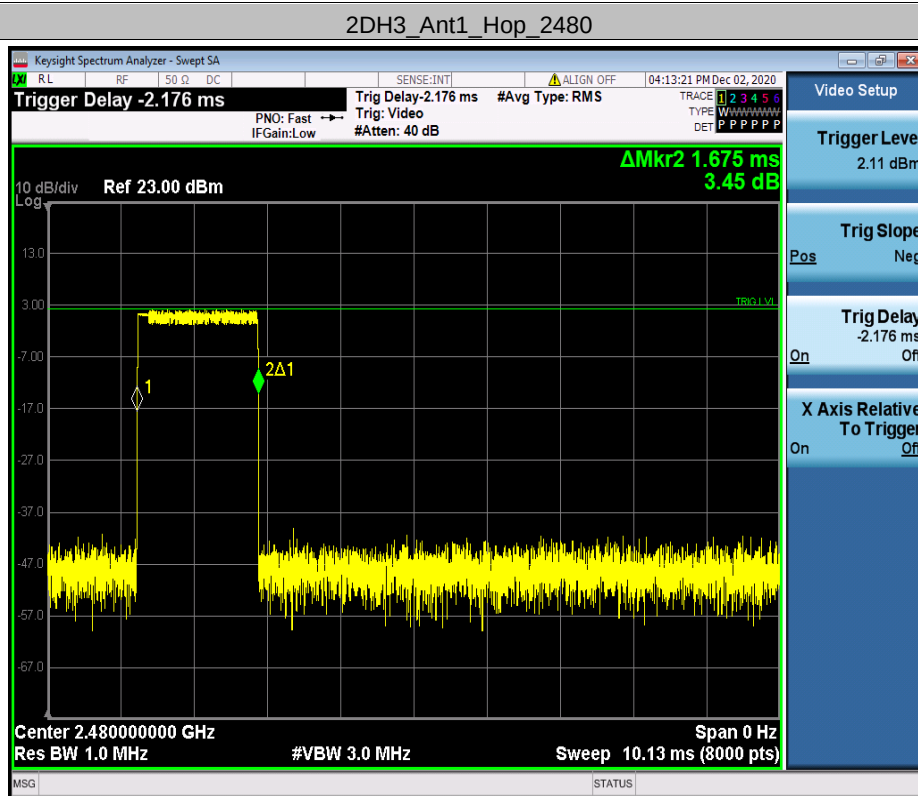
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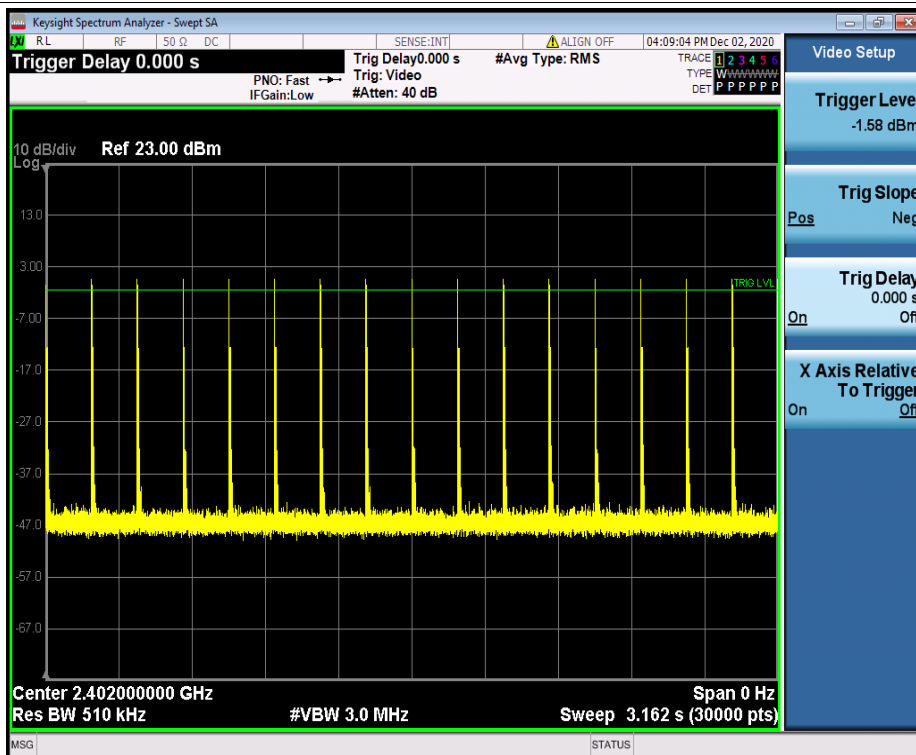
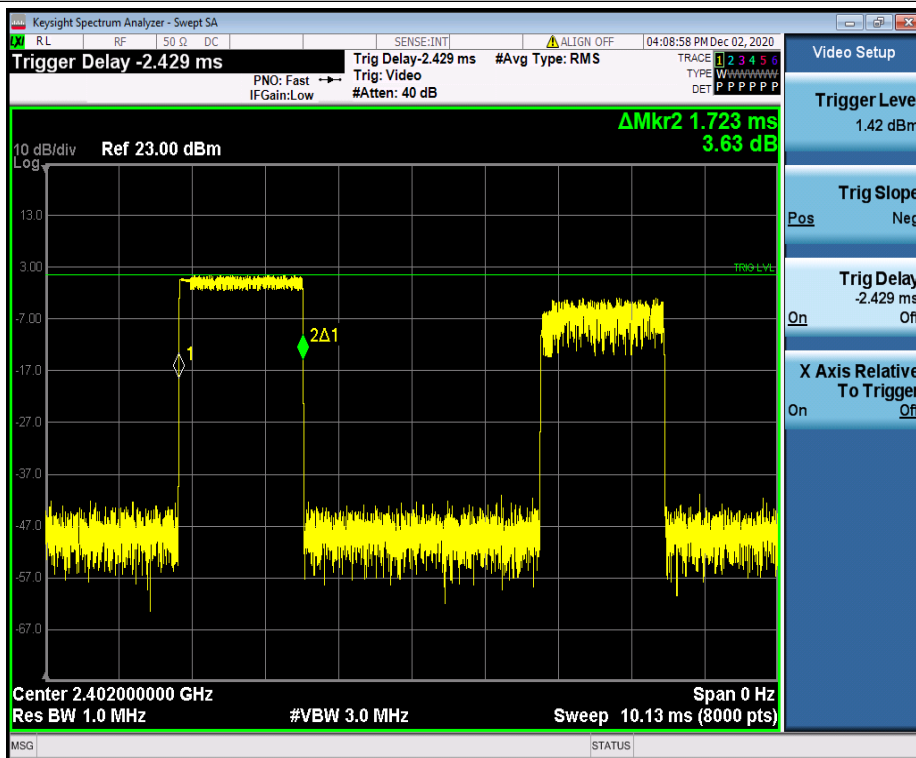
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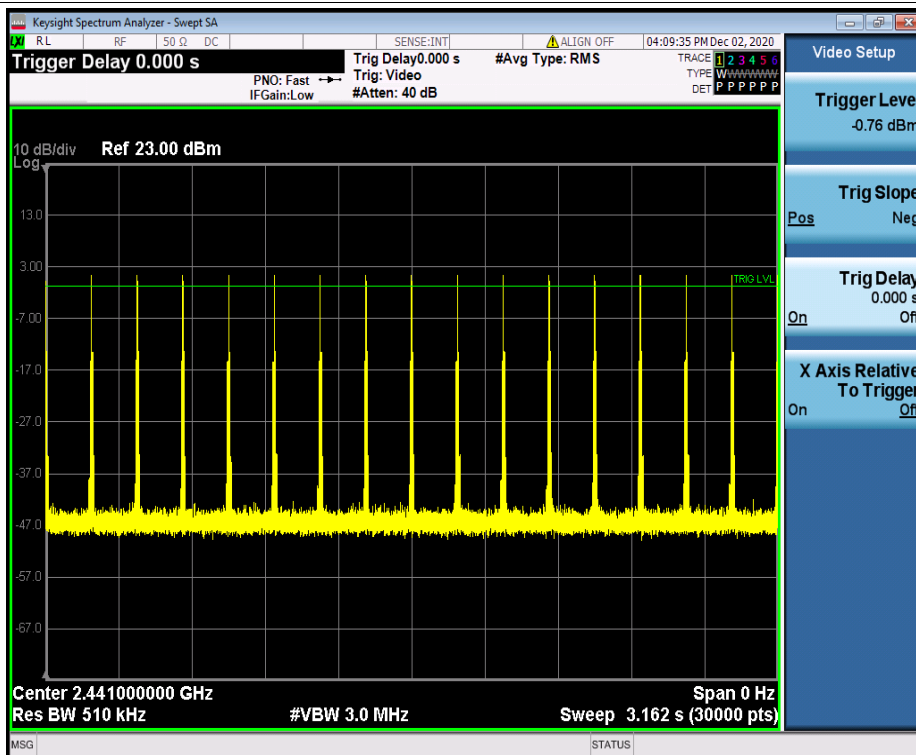
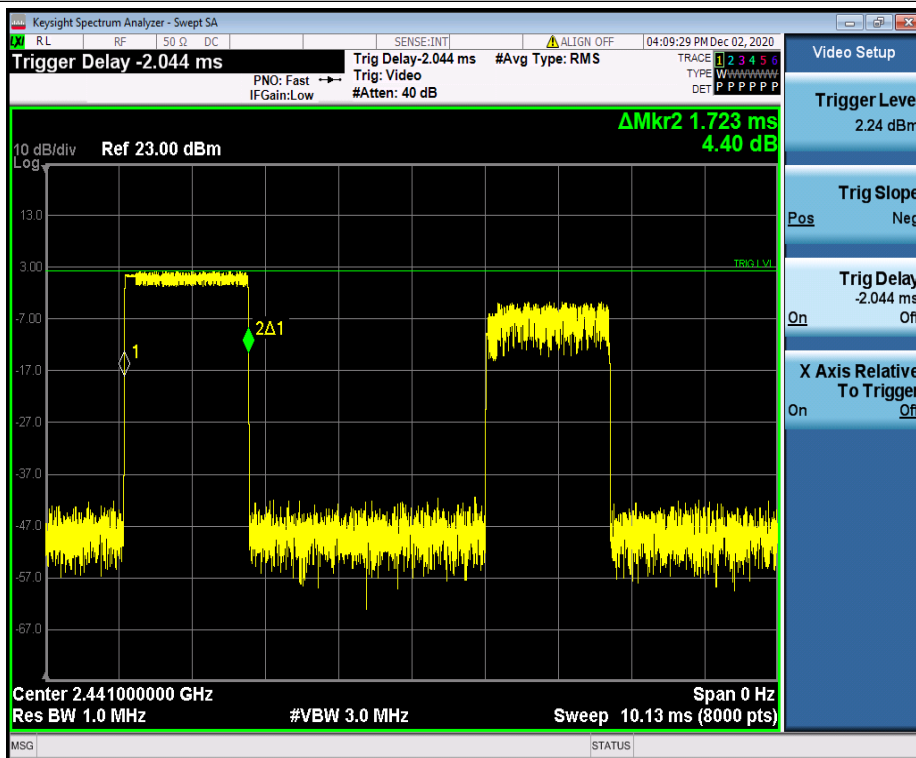


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