9.5 Dwell Time

Test Method

1. Connect EUT antenna terminal to the spectrum analyzer with a low loss cable. Equipment mode: Spectrum analyzer
2. RBW: 1MHz; VBW: 1MHz; SPAN: Zero Span
3. Adjust the center frequency of spectrum analyzer on any frequency be measured.
4. Measure the Dwell Time by spectrum analyzer Marker function.
5. Repeat above procedures until all frequencies measured were complete.

Limit

The average time of occupancy on any frequency shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

Dwell Time

Dwell time
The maximum dwell time shall be 0.4 s.
According to the Bluetooth Core Specification, the worse result (DH5 mode) was reported to show compliance.

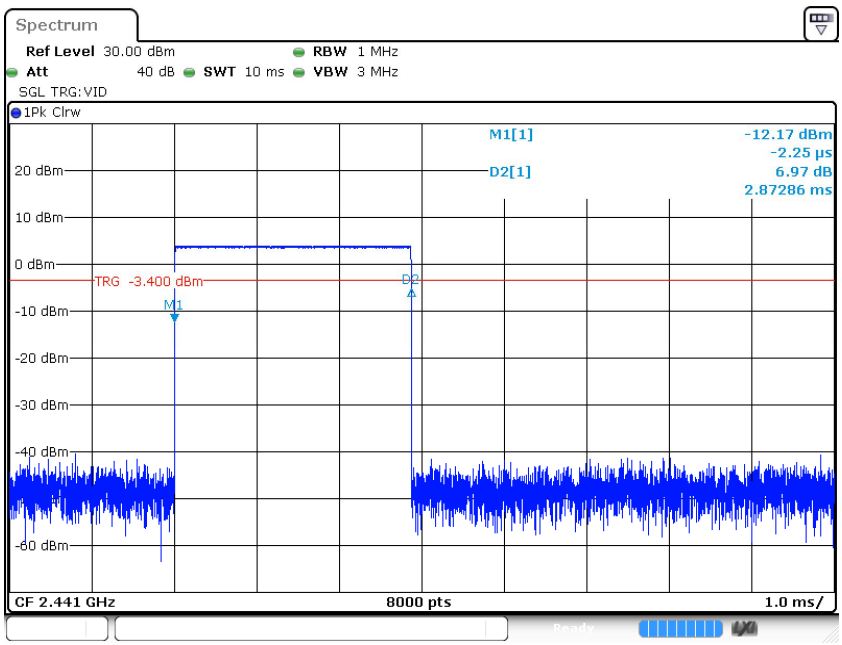
The Dwell Time = Burst Width * Total Hops. The detailed calculations are showed as follows:
The duration for dwell time calculation: 0.4 [s] * hopping number = 0.4 [s] * 79 [ch] = 31.6 [s*ch];

Left Side

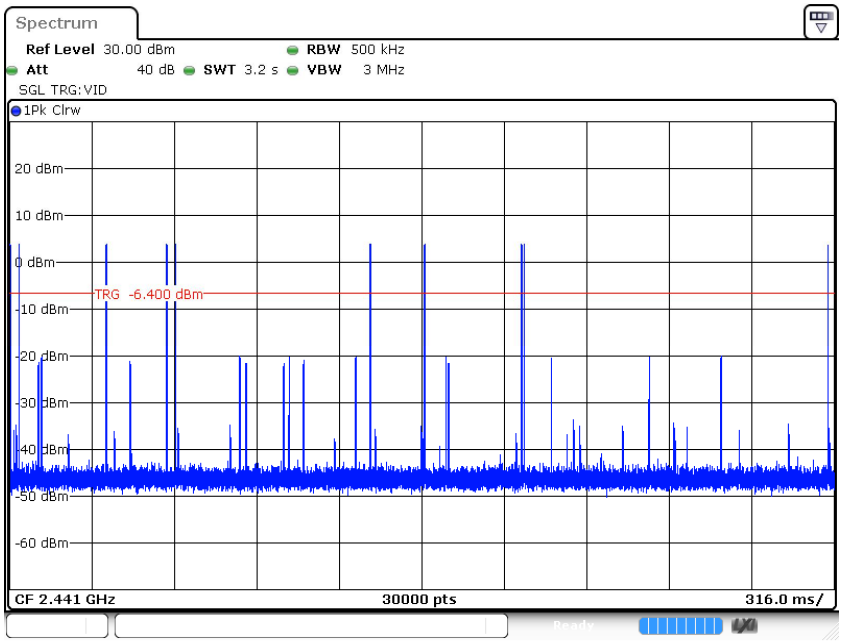
Test Result

TestMode	Channel	BurstWidth(ms)	TotalHops	Result(s)	Limit(s)	Verdict
DH5	Hop	2.87	100	0.287	<=0.4	PASS
2DH5	Hop	2.88	100	0.288	<=0.4	PASS
3DH5	Hop	2.88	90	0.259	<=0.4	PASS

GFSK Modulation



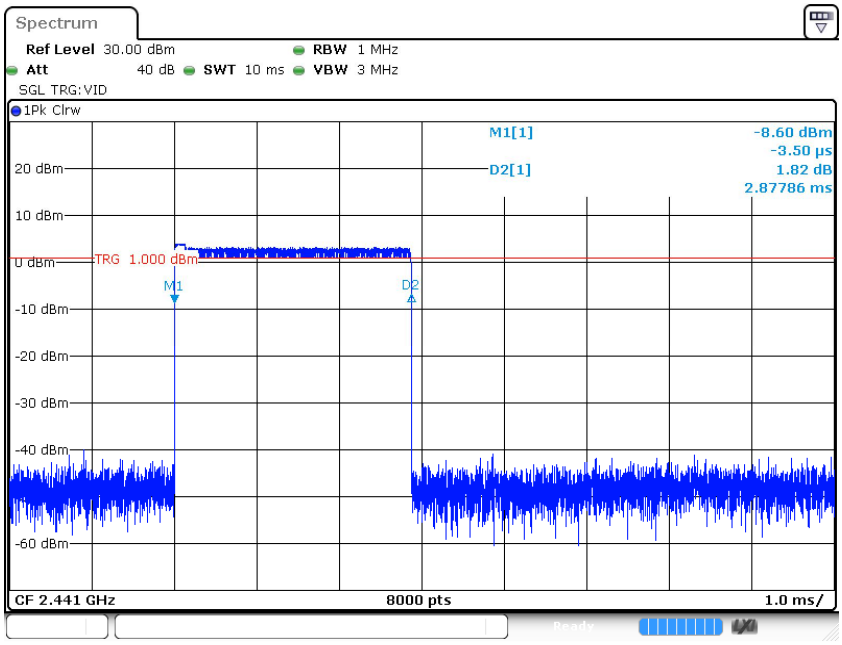
Date: 27.SEP.2020 15:19:37



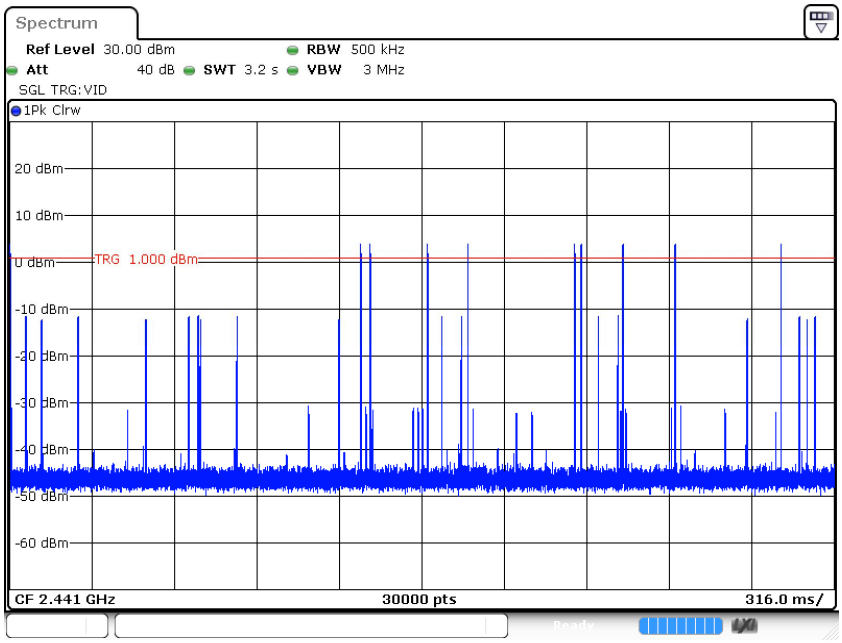
Date: 27.SEP.2020 15:19:43

DH5

π/4-DQPSK Modulation



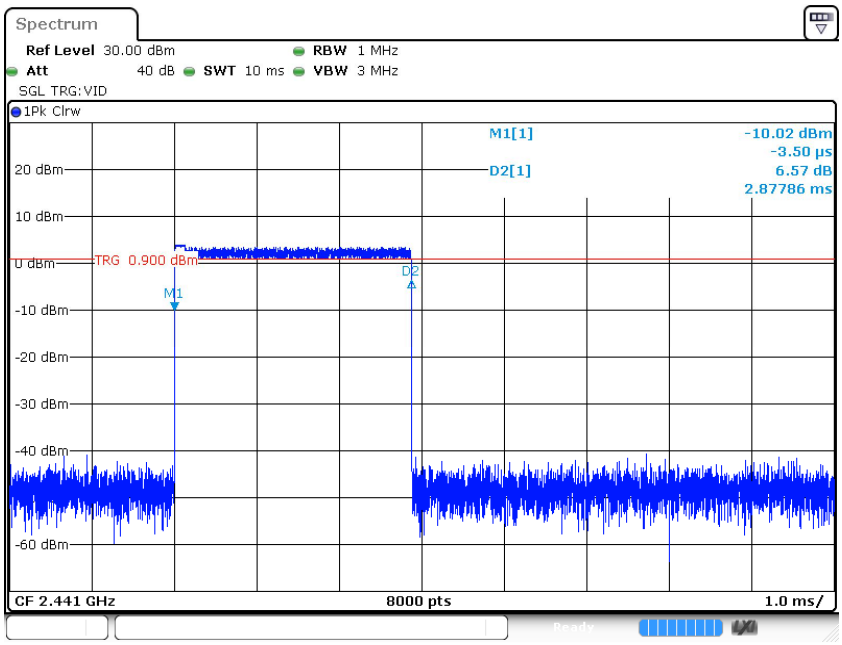
Date: 27.SEP.2020 15:21:30



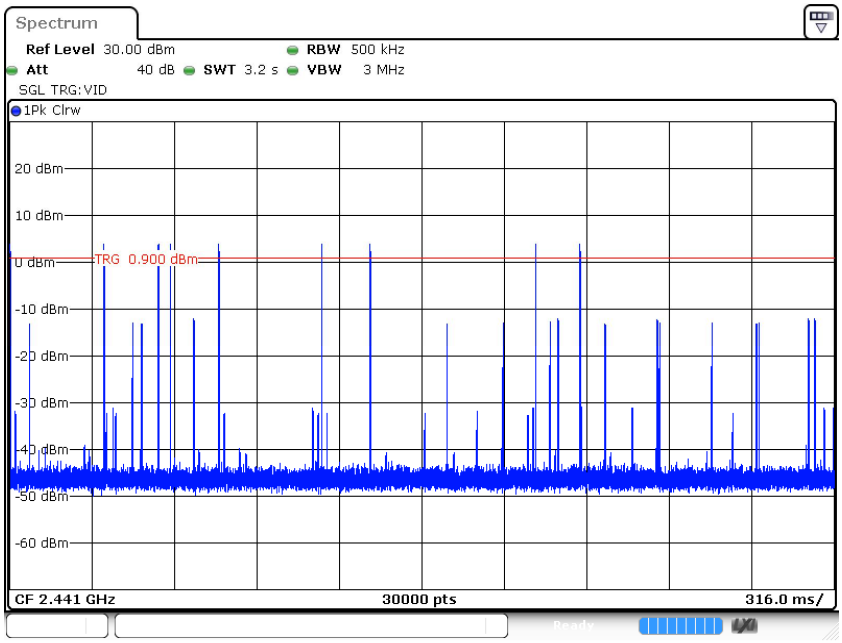
Date: 27.SEP.2020 15:21:35

2DH5

8-DPSK Modulation



Date: 27.SEP.2020 15:24:19



Date: 27.SEP.2020 15:24:25

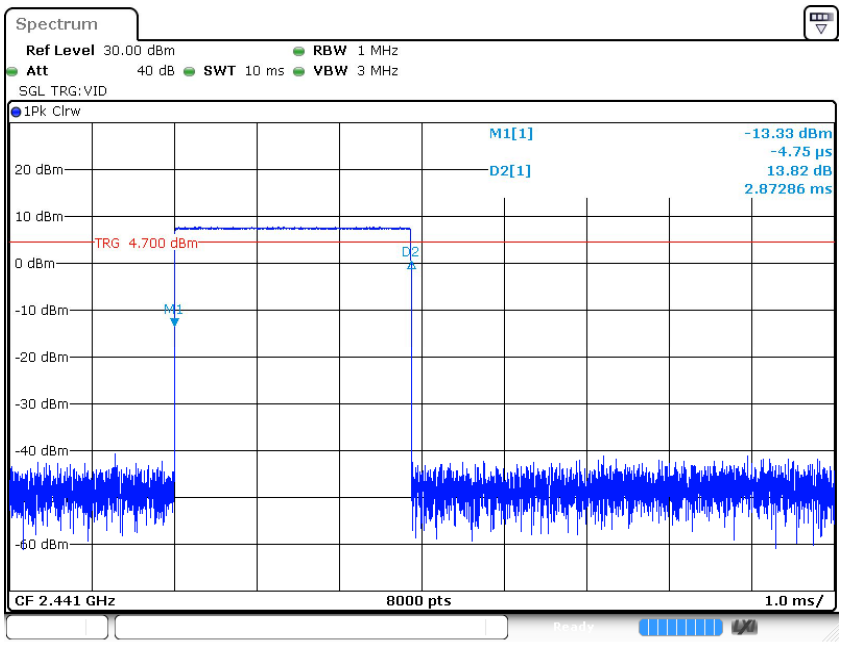
3DH5

Right Side

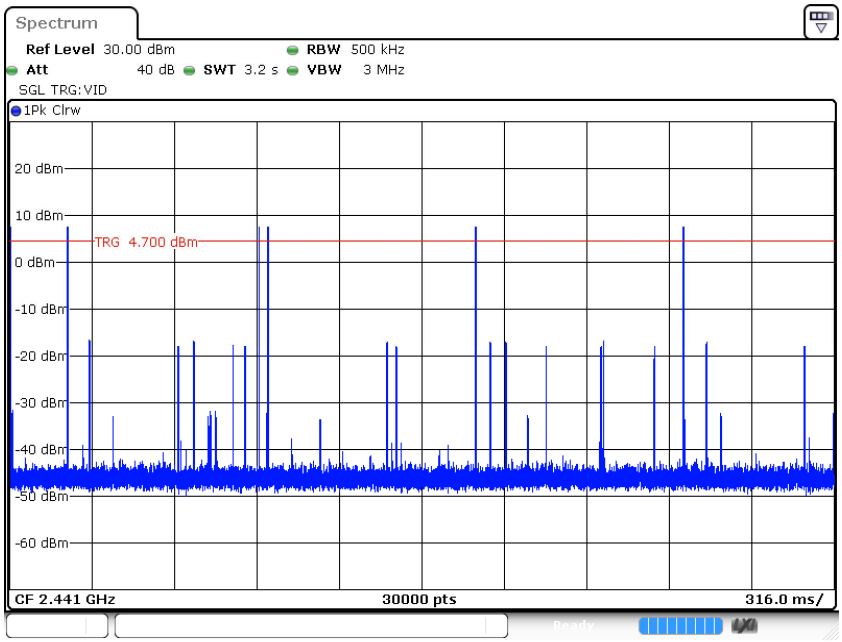
Test Result

TestMode	Channel	BurstWidth(ms)	TotalHops	Result(s)	Limit(s)	Verdict
DH5	Hop	2.87	60	0.172	<=0.4	PASS
2DH5	Hop	2.88	80	0.23	<=0.4	PASS
3DH5	Hop	2.88	110	0.317	<=0.4	PASS

GFSK Modulation



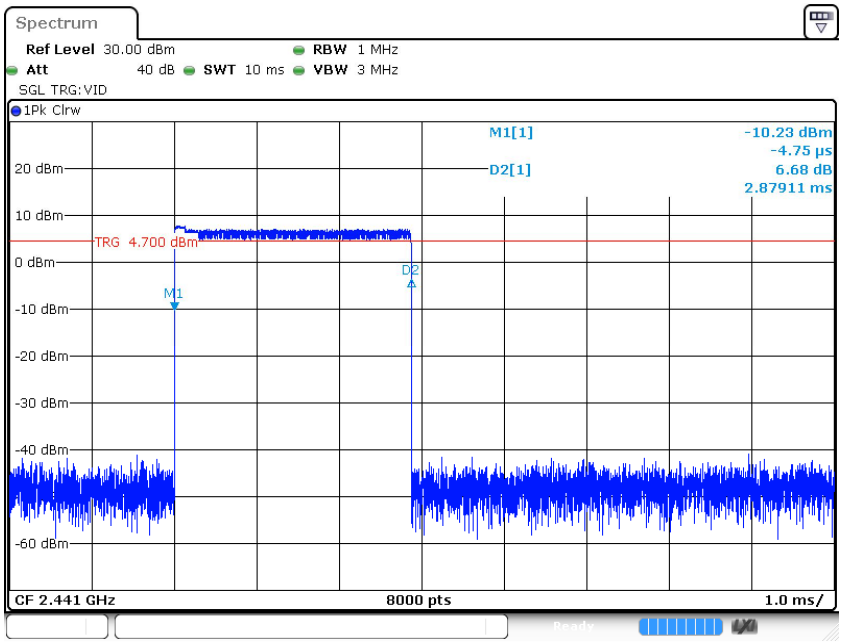
Date: 28.SEP.2020 11:11:00



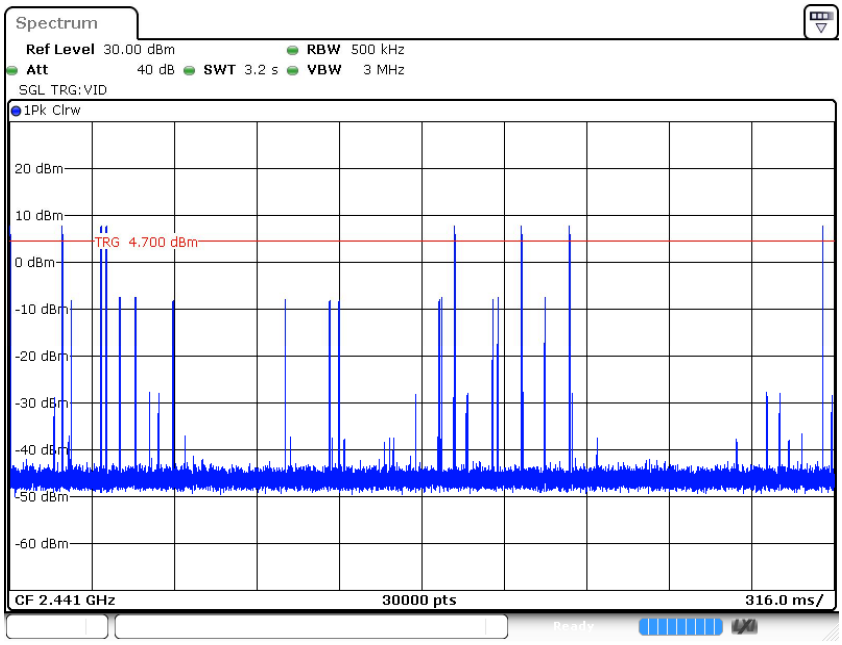
Date: 28.SEP.2020 11:11:06

DH5

π/4-DQPSK Modulation



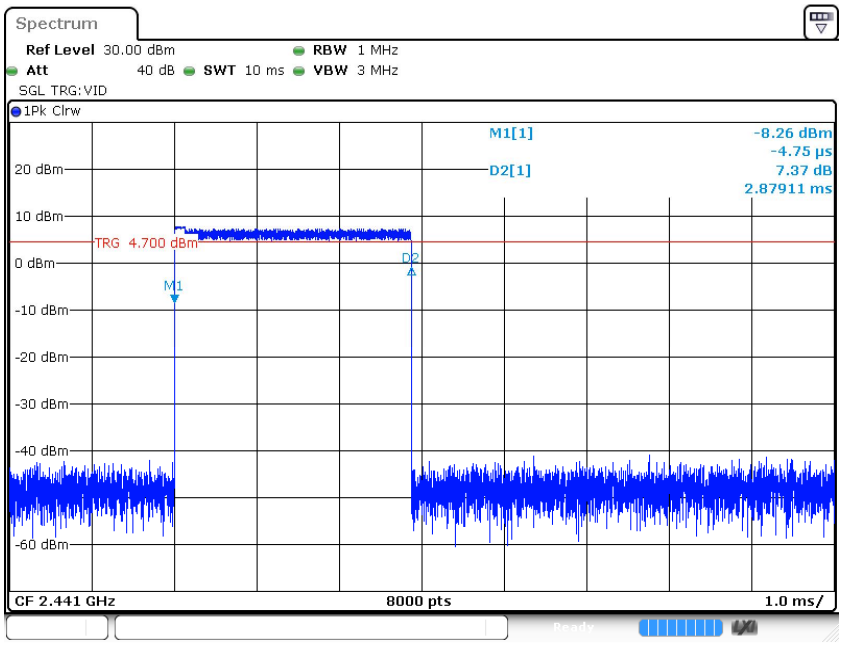
Date: 28.SEP.2020 11:13:39



Date: 28.SEP.2020 11:13:44

2DH5

8-DPSK Modulation



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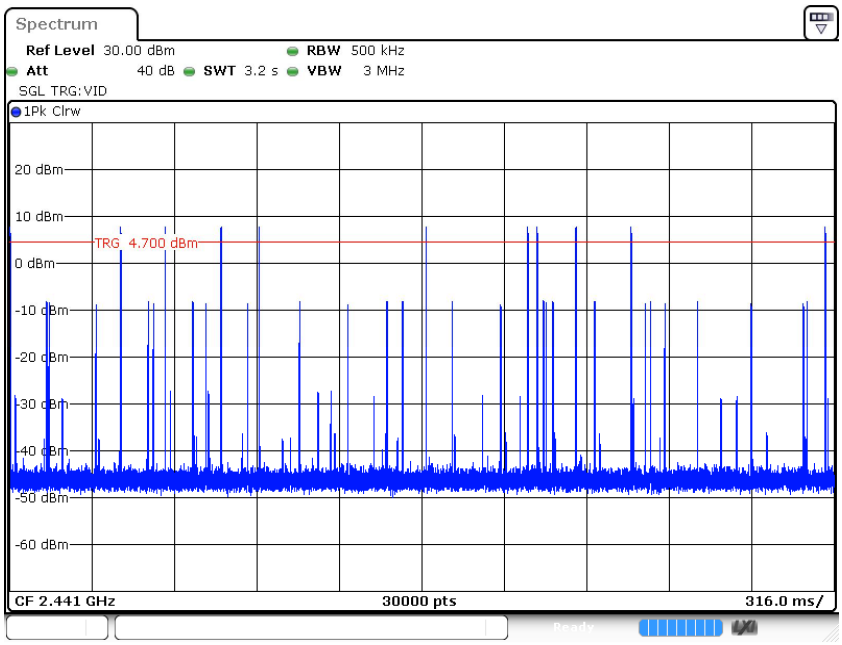


Date: 28.SEP.2020 11:18:33

3DH5

9.6 Spurious RF conducted emissions

Test Method

1. Use the following spectrum analyzer settings:
   Span = wide enough to capture the peak level of the in-band emission and all spurious emissions (e.g., harmonics) from the lowest frequency generated in the EUT up through the 10th harmonic. Typically, several plots are required to cover this entire span.
   RBW = 100 kHz, VBW≥RBW, Sweep = auto, Detector function = peak, Trace = max hold
2. Allow the trace to stabilize. Set the marker on the peak of any spurious emission recorded.
3. The level displayed must comply with the limit specified in this Section. Submit these plots.
4. Repeat above procedures until all frequencies measured were complete.

Limit

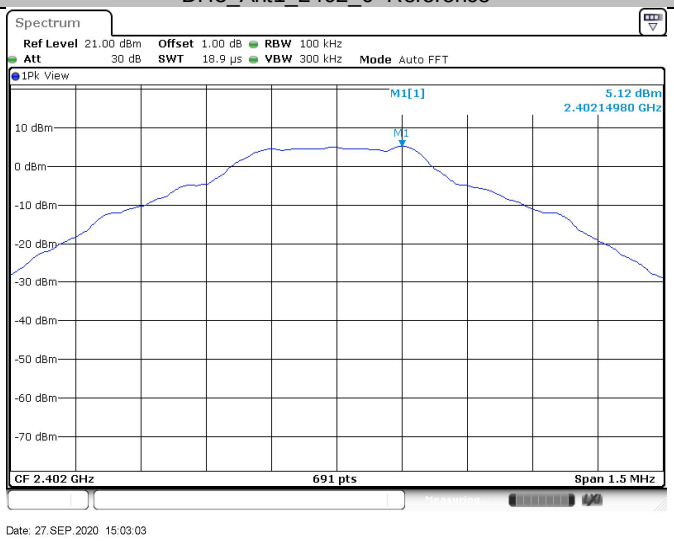
Frequency Range MHz	Limit (dBc)
30-25000	-20

Spurious RF conducted emissions

Left Side

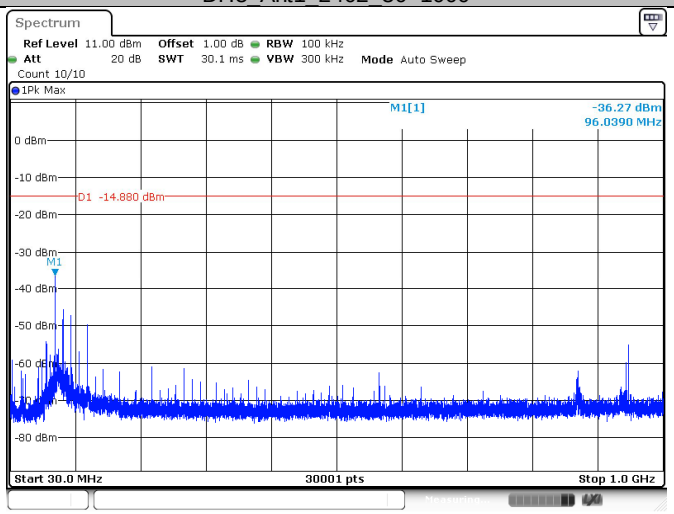
TestMode	Antenna	Channel (MHz)	FreqRange(MHz)	RefLevel	Result(dBm)	Limit(dBm)	Verdict
DH5	Ant1	2402	Reference	5.12(dBm)	5.12	---	PASS
			30~1000	30~1000(MHz)	-36.27	<=-14.88	PASS
			1000~26500	1000~26500(MHz)	-52.02	<=-14.88	PASS
		2441	Reference	4.99(dBm)	4.99	---	PASS
			30~1000	30~1000(MHz)	-35.89	<=-15.01	PASS
			1000~26500	1000~26500(MHz)	-51.78	<=-15.01	PASS
		2480	Reference	4.74(dBm)	4.74	---	PASS
			30~1000	30~1000(MHz)	-36.57	<=-15.26	PASS
			1000~26500	1000~26500(MHz)	-52.42	<=-15.26	PASS
2DH5	Ant1	2402	Reference	4.96(dBm)	4.96	---	PASS
			30~1000	30~1000(MHz)	-36.36	<=-15.04	PASS
			1000~26500	1000~26500(MHz)	-34.37	<=-15.04	PASS
		2441	Reference	4.83(dBm)	4.83	---	PASS
			30~1000	30~1000(MHz)	-36.07	<=-15.17	PASS
			1000~26500	1000~26500(MHz)	-52.15	<=-15.17	PASS
		2480	Reference	4.61(dBm)	4.61	---	PASS
			30~1000	30~1000(MHz)	-35.91	<=-15.39	PASS
			1000~26500	1000~26500(MHz)	-52.64	<=-15.39	PASS
3DH5	Ant1	2402	Reference	5.02(dBm)	5.02	---	PASS
			30~1000	30~1000(MHz)	-35.9	<=-14.98	PASS
			1000~26500	1000~26500(MHz)	-36	<=-14.98	PASS
		2441	Reference	4.93(dBm)	4.93	---	PASS
			30~1000	30~1000(MHz)	-35.97	<=-15.07	PASS
			1000~26500	1000~26500(MHz)	-52.03	<=-15.07	PASS
		2480	Reference	4.69(dBm)	4.69	---	PASS
			30~1000	30~1000(MHz)	-35.99	<=-15.31	PASS
			1000~26500	1000~26500(MHz)	-52.04	<=-15.31	PASS

DH5_Ant1_2402_0~Reference



Date: 27.SEP.2020 15:03:03

DH5_Ant1_2402_30~1000



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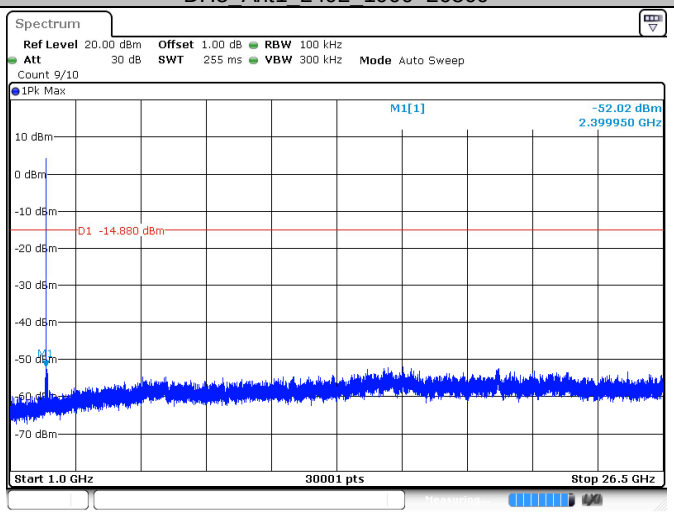
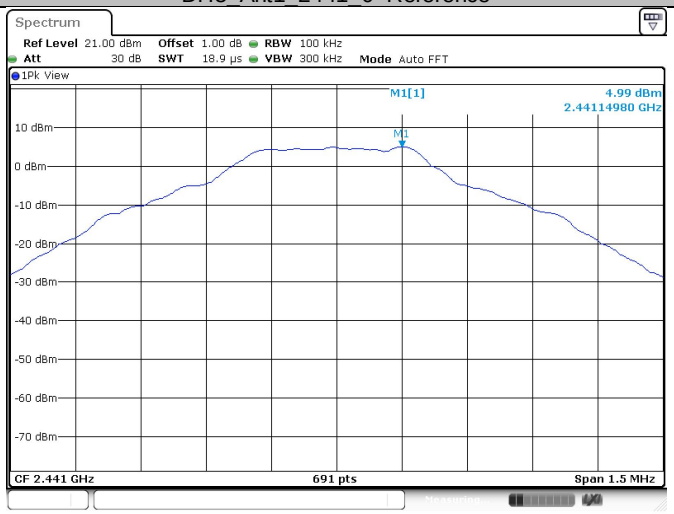
DH5_Ant1_2402_1000~26500



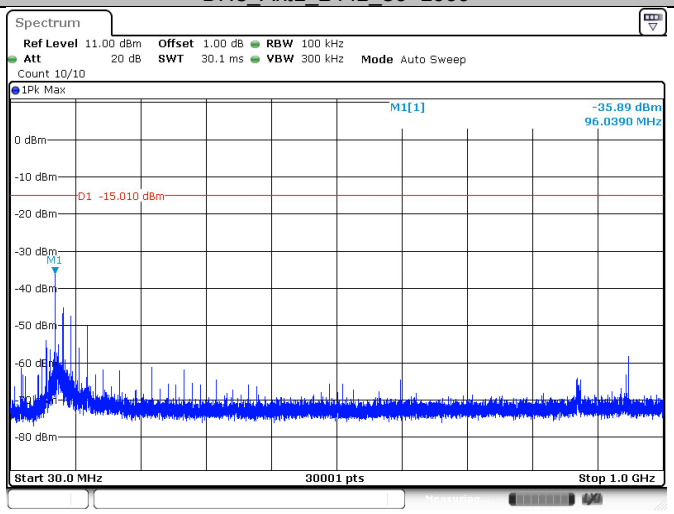
Date: 27.SEP.2020 15:03:17

DH5_Ant1_2441_0~Reference



Date: 27.SEP.2020 15:04:25

DH5_Ant1_2441_30~1000



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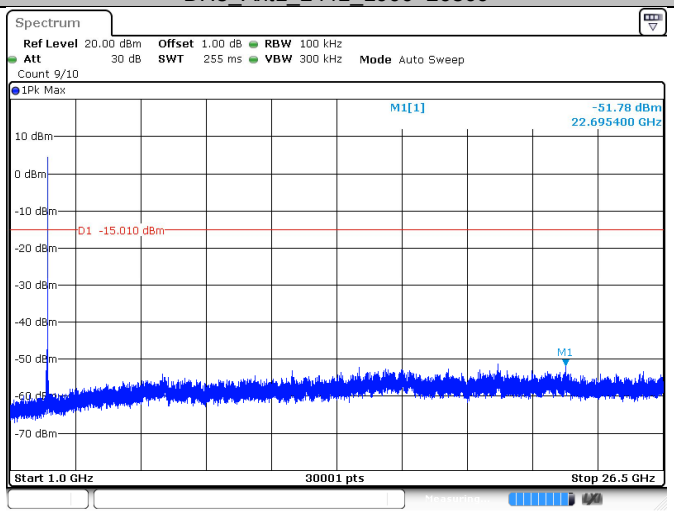
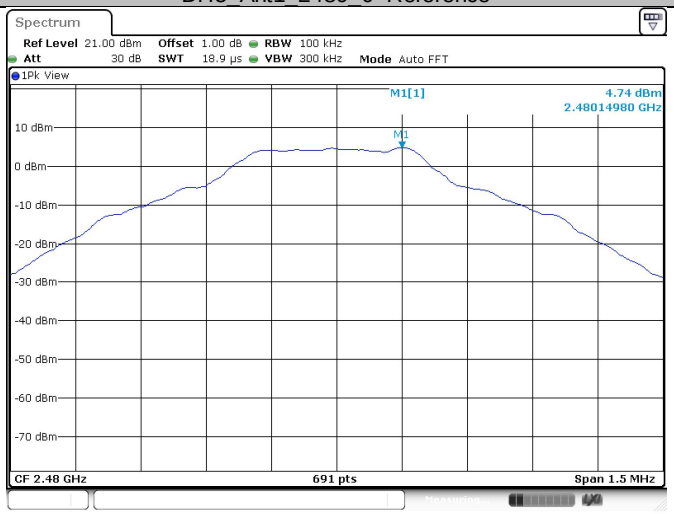
DH5_Ant1_2441_1000~26500



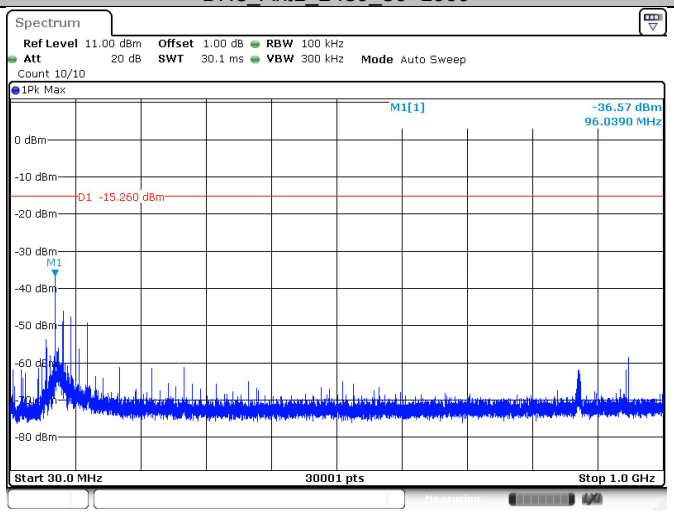
Date: 27.SEP.2020 15:04:39

DH5_Ant1_2480_0~Reference



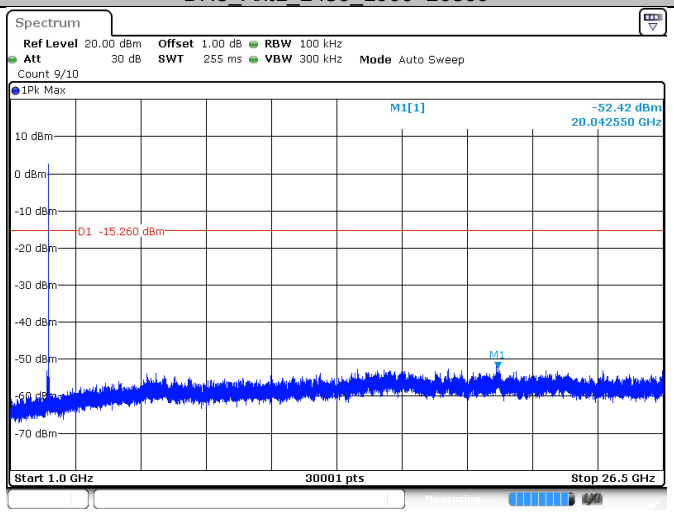
Date: 27.SEP.2020 15:07:30

DH5_Ant1_2480_30~1000



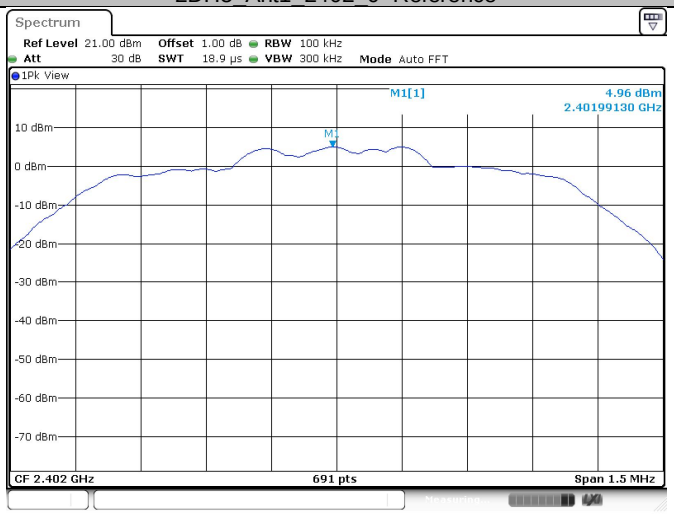
Date: 27.SEP.2020 15:07:36

DH5_Ant1_2480_1000~26500



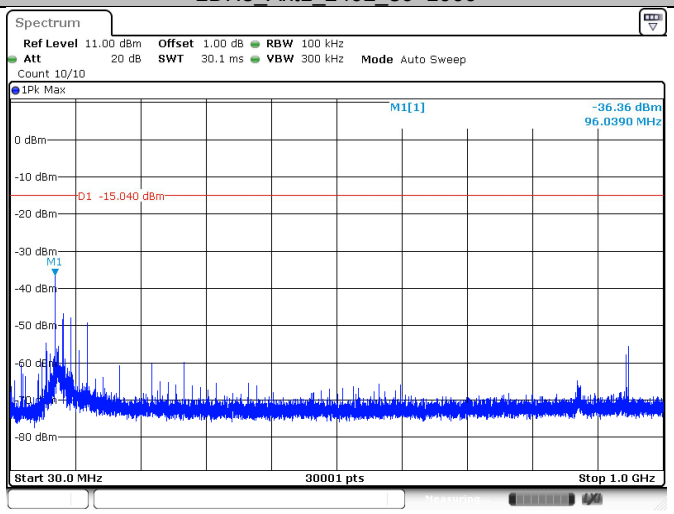
Date: 27.SEP.2020 15:07:44

2DH5_Ant1_2402_0~Reference



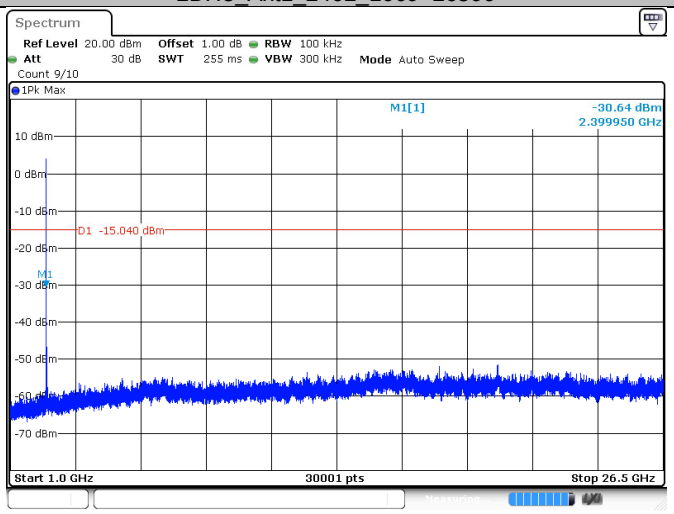
Date: 27.SEP.2020 15:09:06

2DH5_Ant1_2402_30~1000



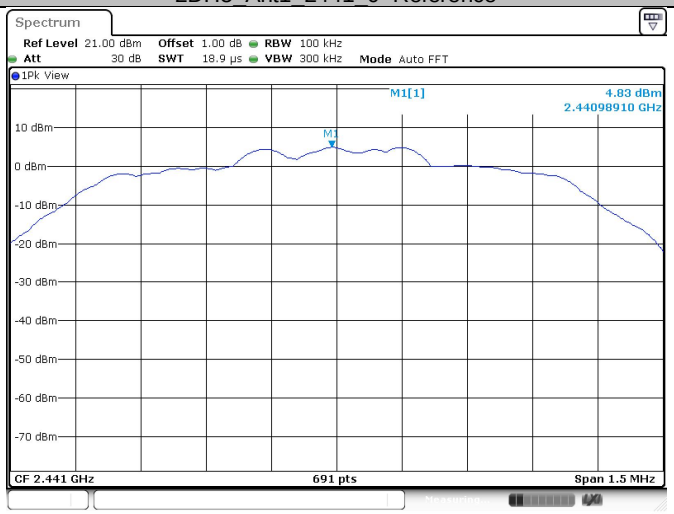
Date: 27.SEP.2020 15:09:12

2DH5_Ant1_2402_1000~26500



Date: 27.SEP.2020 15:09:20

2DH5_Ant1_2441_0~Reference



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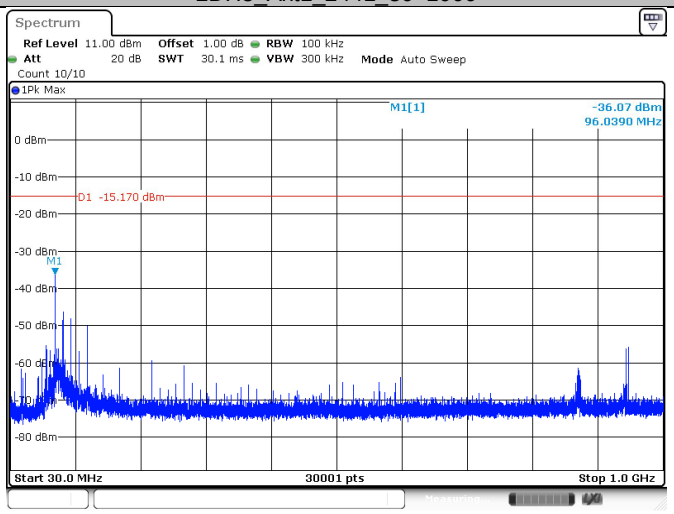
2DH5_Ant1_2441_30~1000



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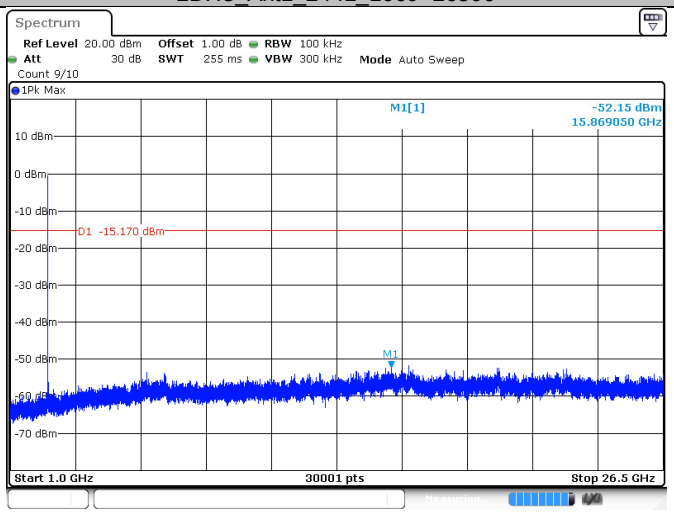
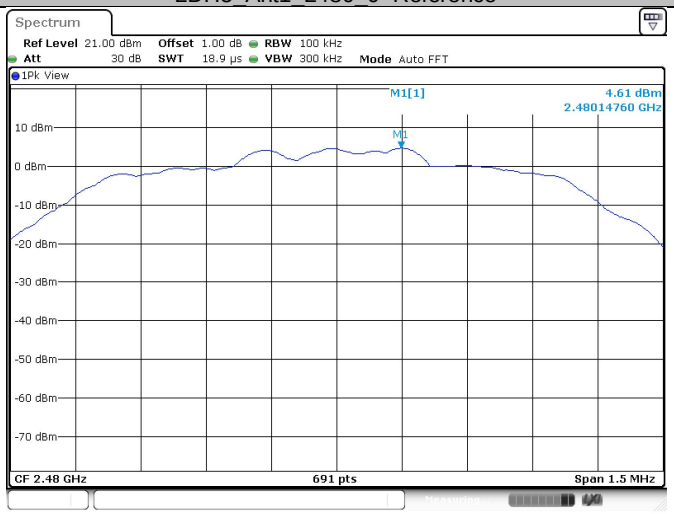
2DH5_Ant1_2441_1000~26500



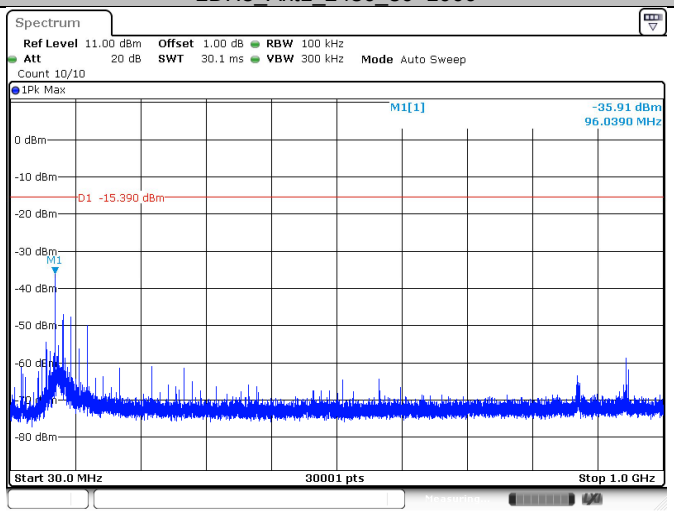
Date: 27.SEP.2020 15:10:52

2DH5_Ant1_2480_0~Reference



Date: 27.SEP.2020 15:12:08

2DH5_Ant1_2480_30~1000



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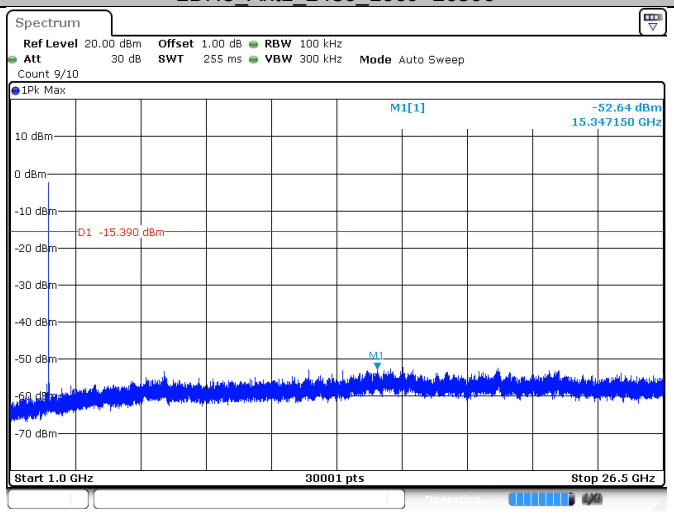
2DH5_Ant1_2480_1000~26500



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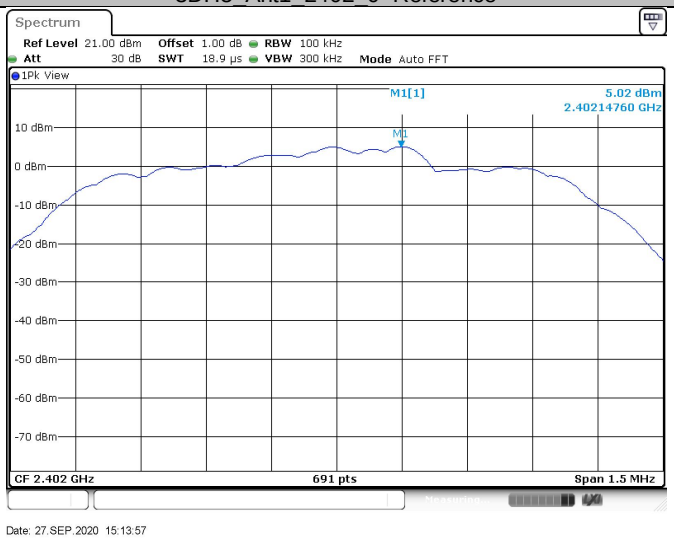
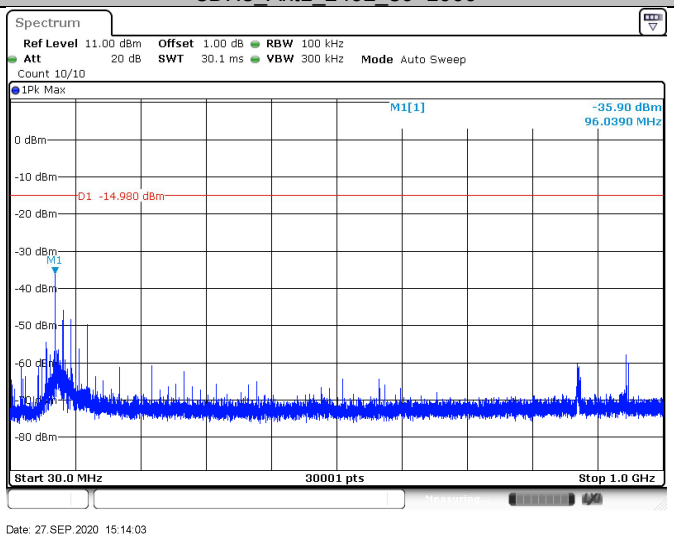
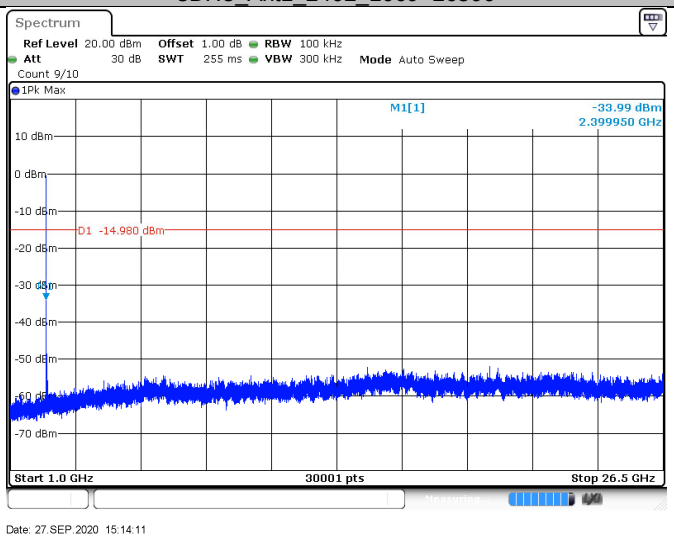
3DH5_Ant1_2402_0~Reference



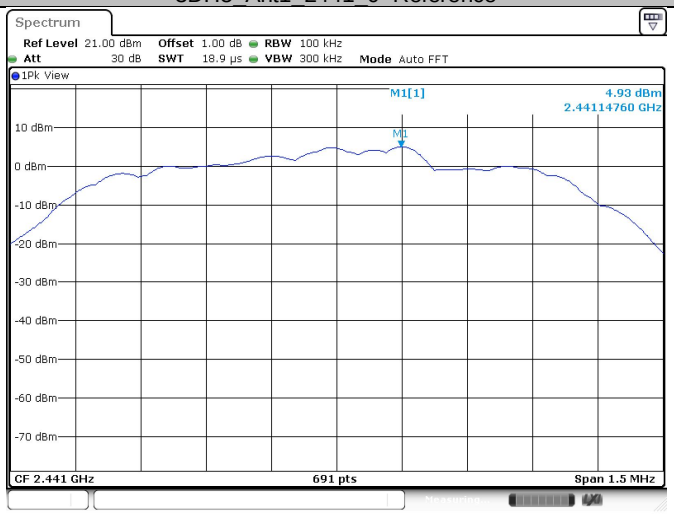
3DH5_Ant1_2402_30~1000



3DH5_Ant1_2402_1000~26500

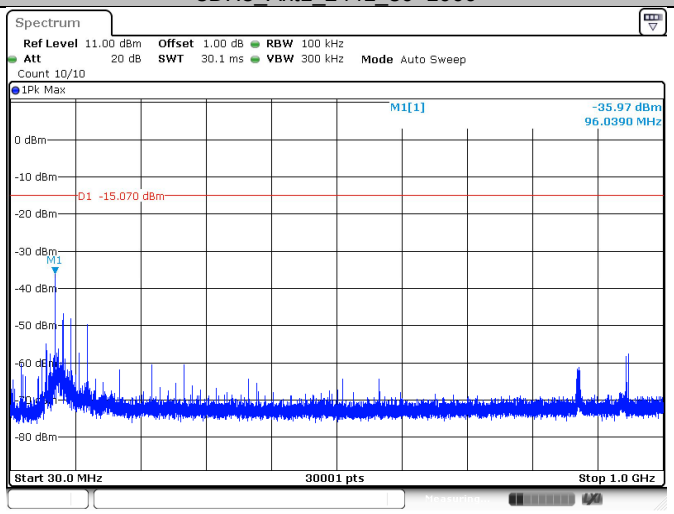


3DH5_Ant1_2441_0~Reference



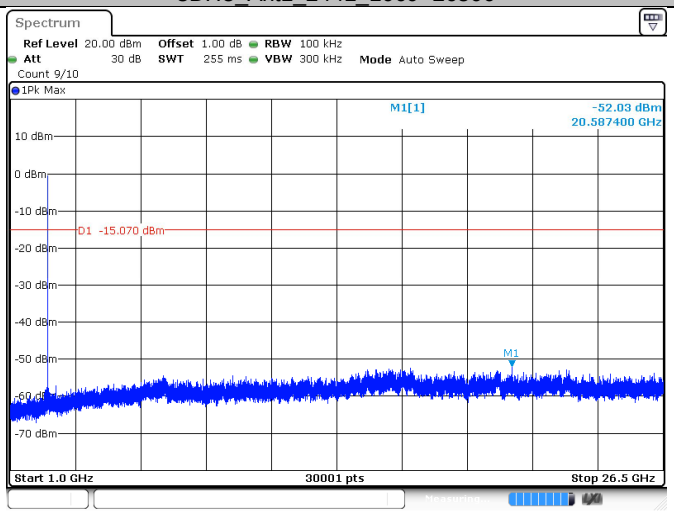
Date: 27.SEP.2020 15:15:24

3DH5_Ant1_2441_30~1000



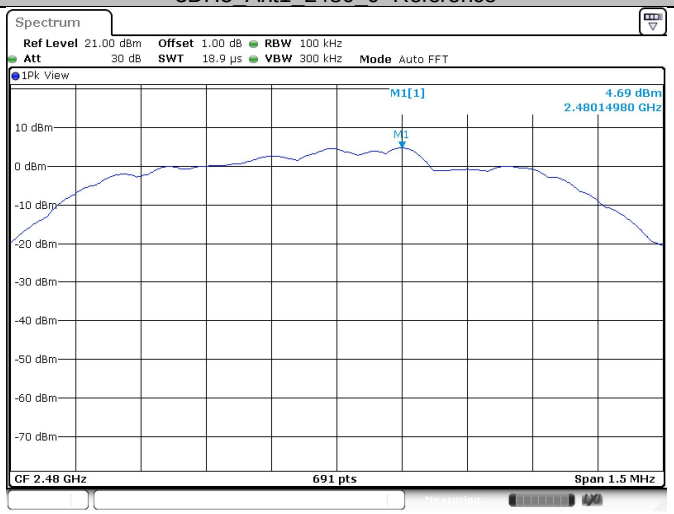
Date: 27.SEP.2020 15:15:30

3DH5_Ant1_2441_1000~26500



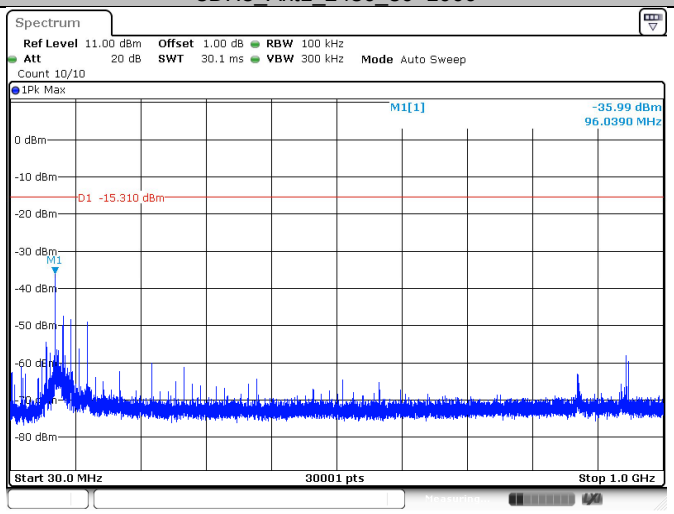
Date: 27.SEP.2020 15:15:38

3DH5_Ant1_2480_0~Reference



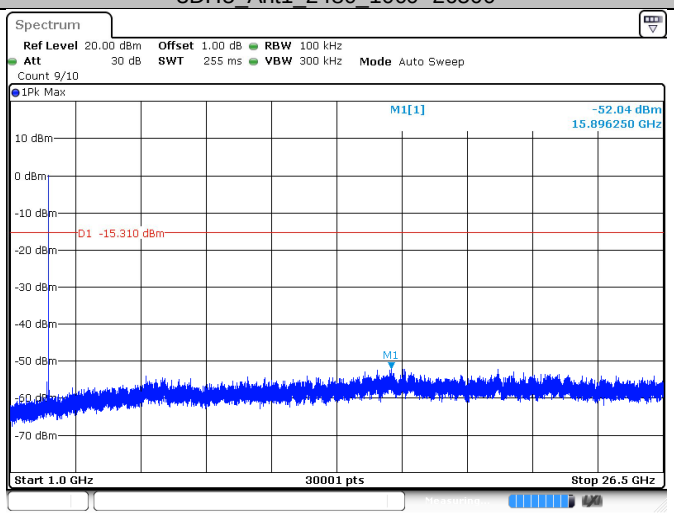
Date: 27.SEP.2020 15:17:22

3DH5_Ant1_2480_30~1000



Date: 27.SEP.2020 15:17:28

3DH5_Ant1_2480_1000~26500

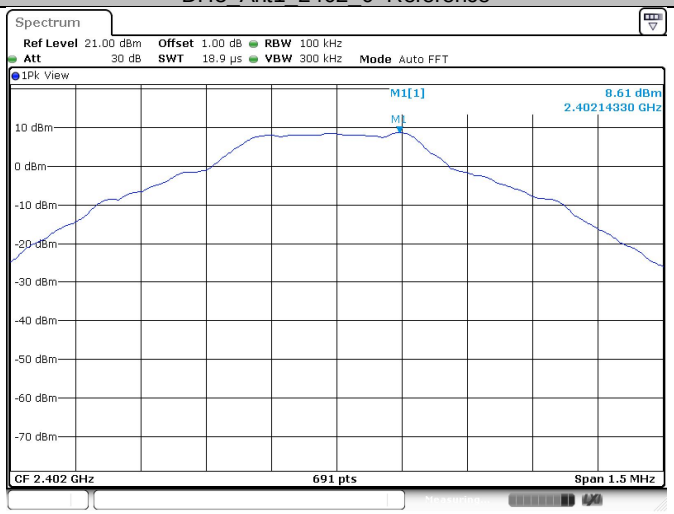


Date: 27.SEP.2020 15:17:36

Right Side

TestMode	Antenna	Channel (MHz)	FreqRange(MHz)	RefLevel	Result(dBm)	Limit(dBm)	Verdict
DH5	Ant1	2402	Reference	8.61(dBm)	8.61	---	PASS
			30~1000	30~1000(MHz)	-65.25	<=-11.39	PASS
			1000~26500	1000~26500(MHz)	-44.97	<=-11.39	PASS
		2441	Reference	8.53(dBm)	8.53	---	PASS
			30~1000	30~1000(MHz)	-65.03	<=-11.47	PASS
			1000~26500	1000~26500(MHz)	-49.85	<=-11.47	PASS
		2480	Reference	8.97(dBm)	8.97	---	PASS
			30~1000	30~1000(MHz)	-64.24	<=-11.03	PASS
			1000~26500	1000~26500(MHz)	-47.9	<=-11.03	PASS
2DH5	Ant1	2402	Reference	8.53(dBm)	8.53	---	PASS
			30~1000	30~1000(MHz)	-66.09	<=-11.47	PASS
			1000~26500	1000~26500(MHz)	-29.6	<=-11.47	PASS
		2441	Reference	8.43(dBm)	8.43	---	PASS
			30~1000	30~1000(MHz)	-65.69	<=-11.57	PASS
			1000~26500	1000~26500(MHz)	-52	<=-11.57	PASS
		2480	Reference	8.84(dBm)	8.84	---	PASS
			30~1000	30~1000(MHz)	-65.7	<=-11.16	PASS
			1000~26500	1000~26500(MHz)	-51.68	<=-11.16	PASS
3DH5	Ant1	2402	Reference	8.67(dBm)	8.67	---	PASS
			30~1000	30~1000(MHz)	-64.65	<=-11.33	PASS
			1000~26500	1000~26500(MHz)	-28.05	<=-11.33	PASS
		2441	Reference	8.57(dBm)	8.57	---	PASS
			30~1000	30~1000(MHz)	-64.05	<=-11.43	PASS
			1000~26500	1000~26500(MHz)	-52.52	<=-11.43	PASS
		2480	Reference	9.01(dBm)	9.01	---	PASS
			30~1000	30~1000(MHz)	-65.6	<=-10.99	PASS
			1000~26500	1000~26500(MHz)	-51.94	<=-10.99	PASS

DH5_Ant1_2402_0~Reference



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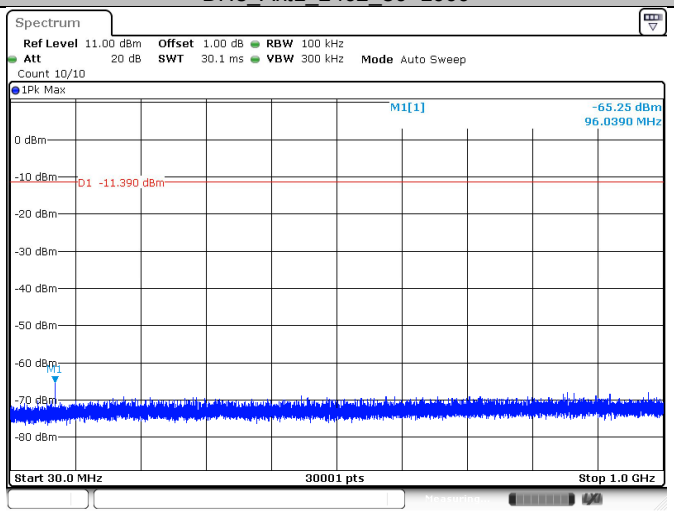
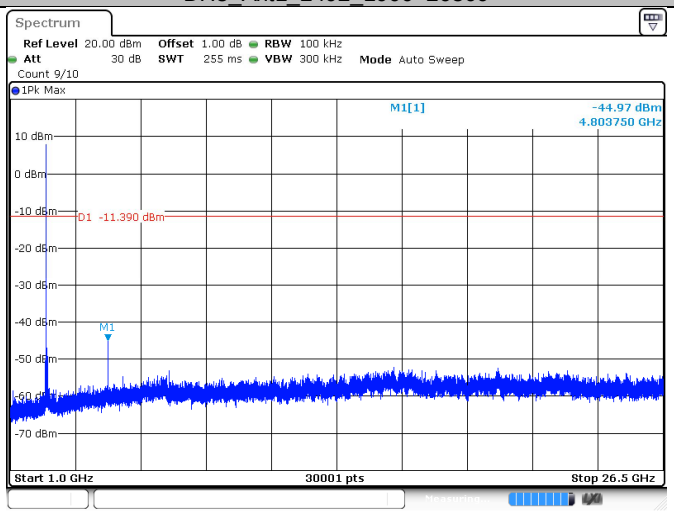
DH5_Ant1_2402_30~1000



Date: 28.SEP.2020 10:54:01

DH5_Ant1_2402_1000~26500



Date: 28.SEP.2020 10:54:09

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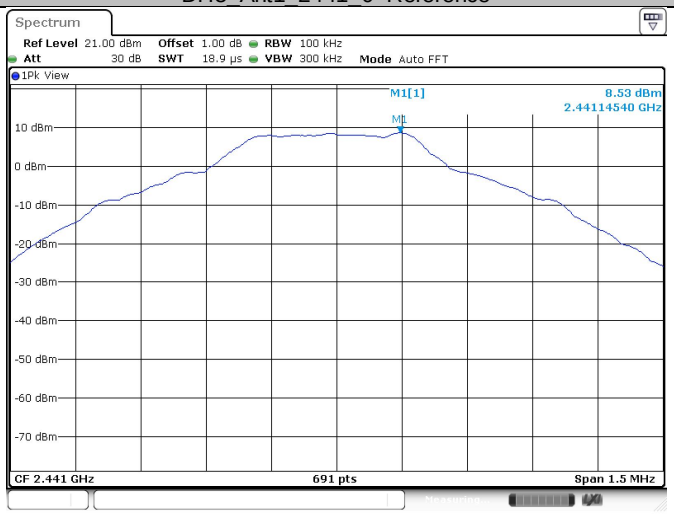

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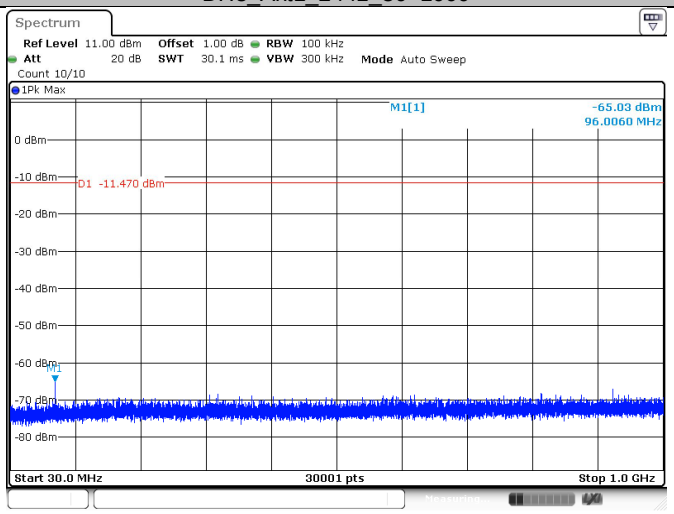

Date: 28.SEP.2020 10:55:49

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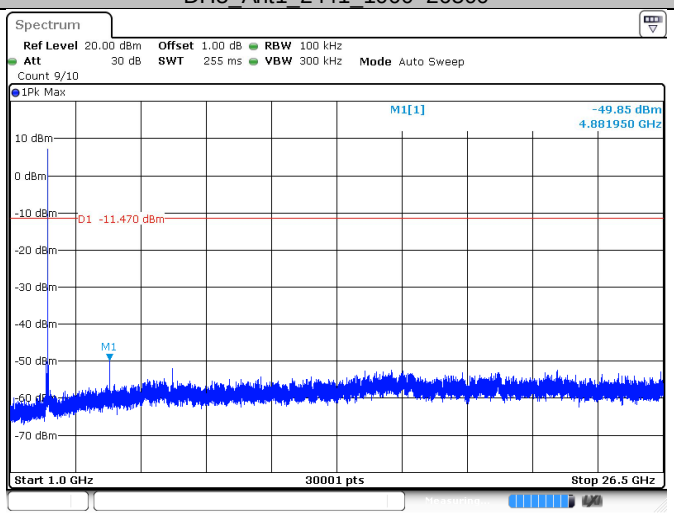

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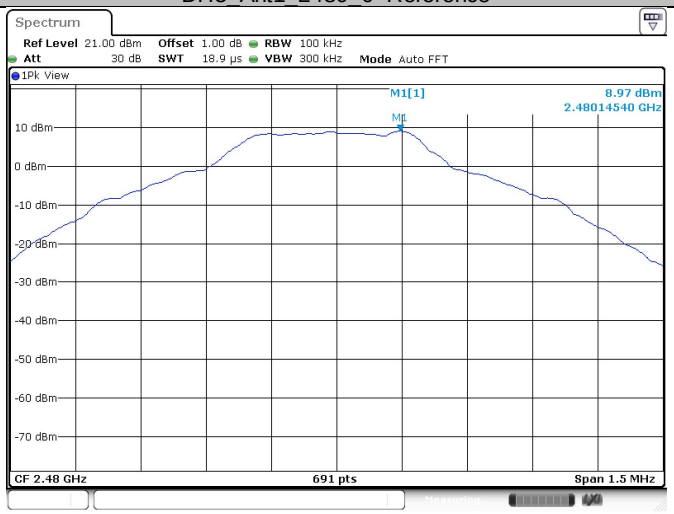
DH5_Ant1_2480_0~Reference



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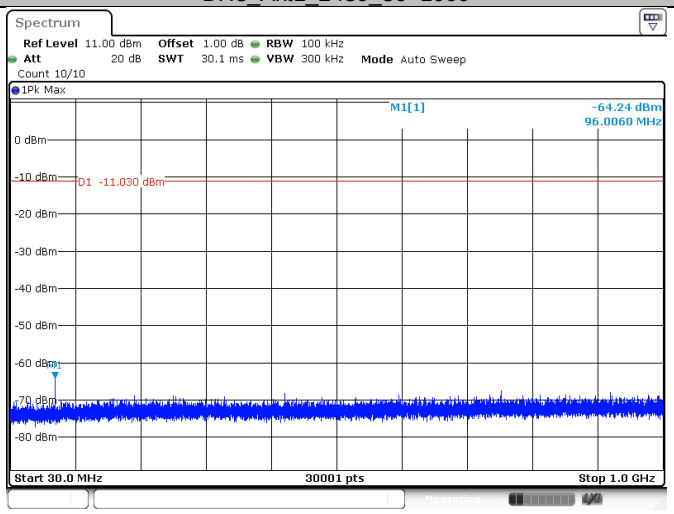

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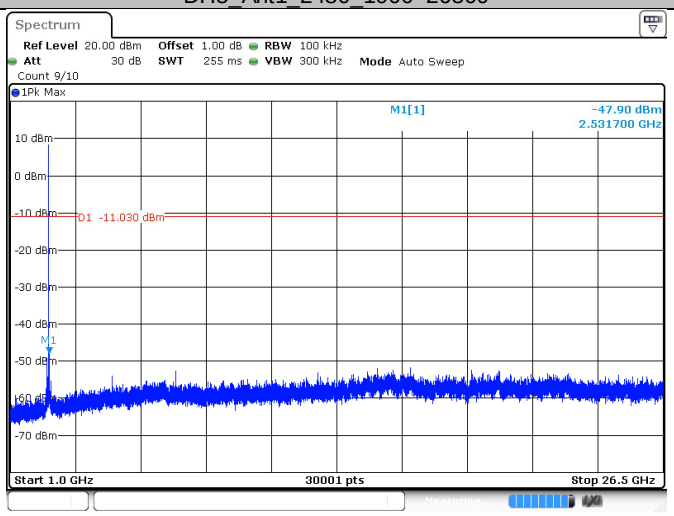

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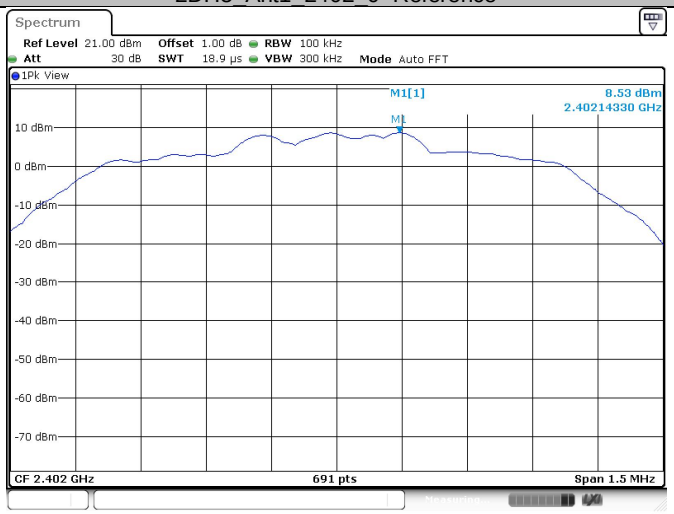

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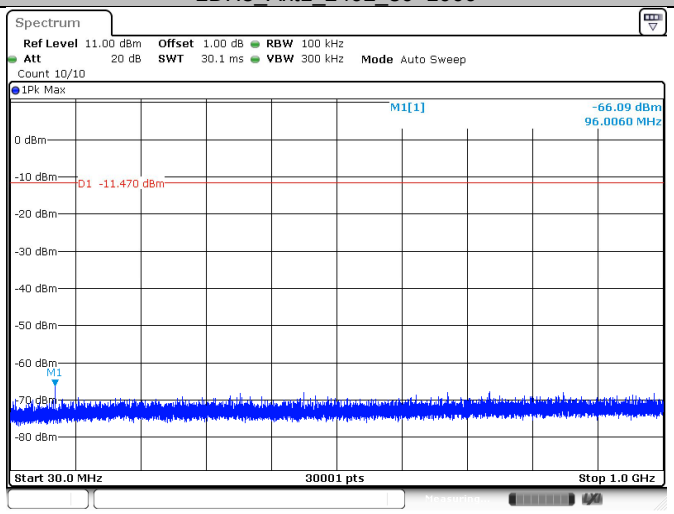

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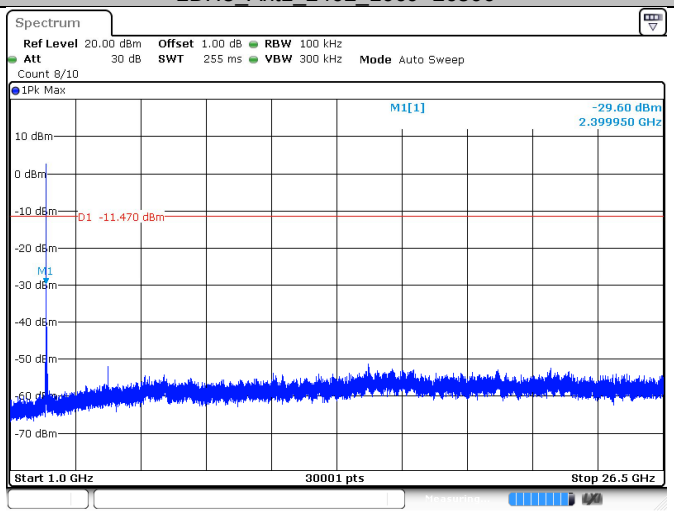

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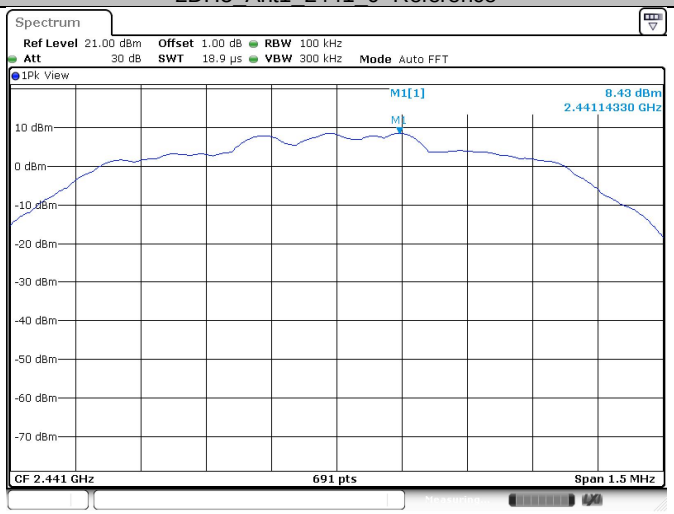

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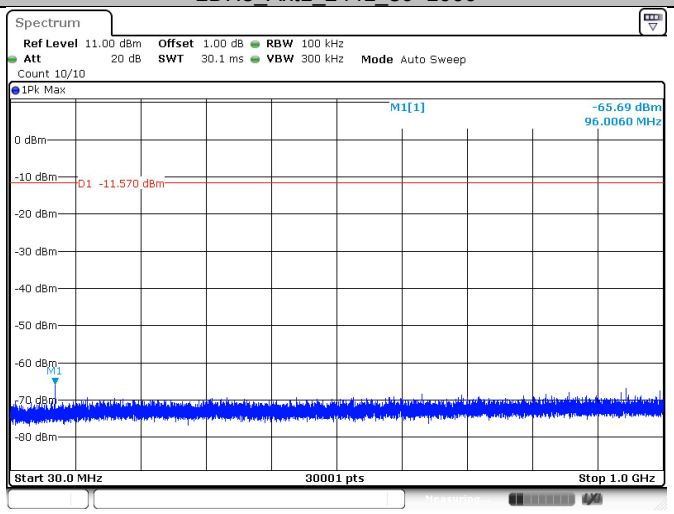

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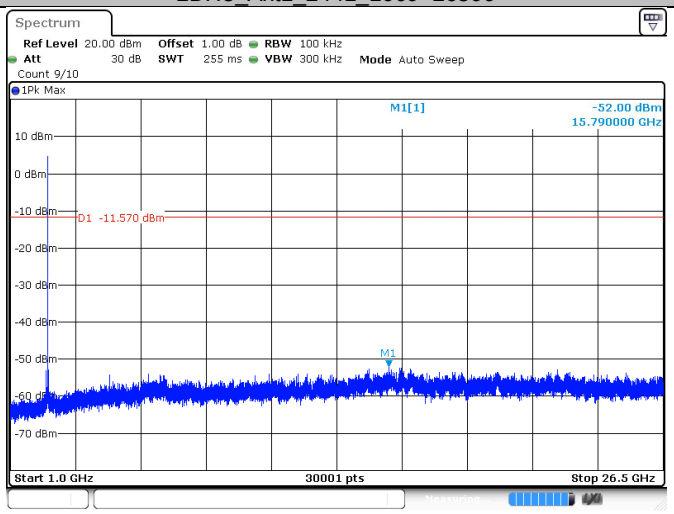
2DH5_Ant1_2441_1000~26500



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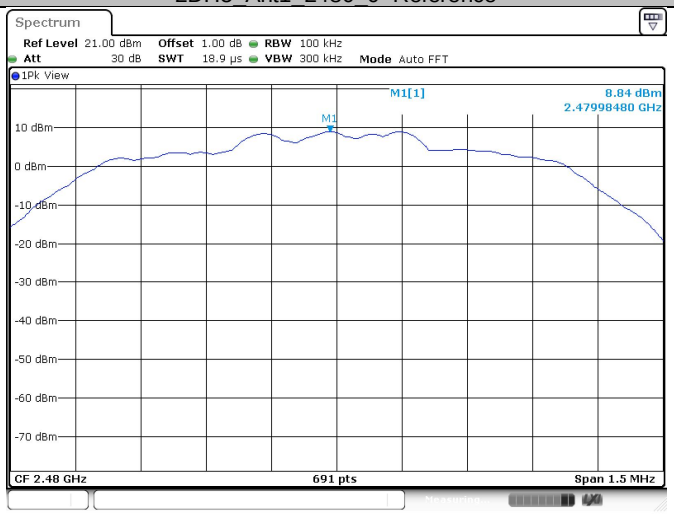

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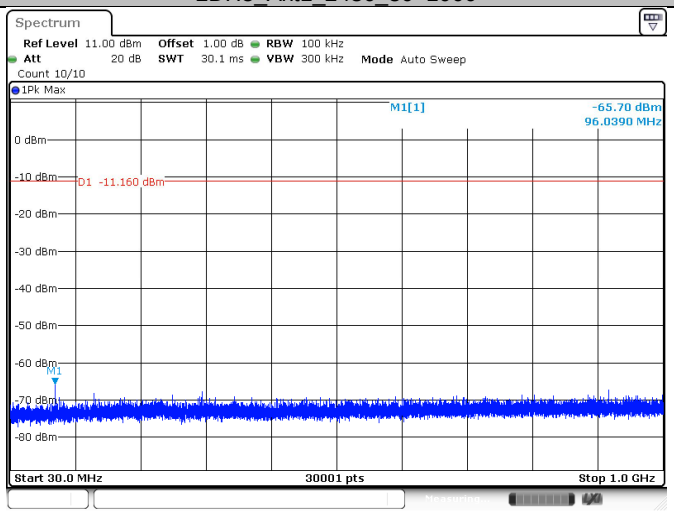

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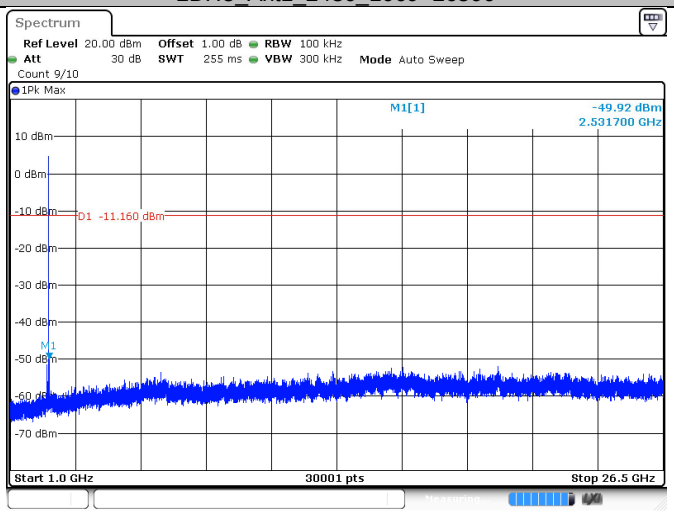

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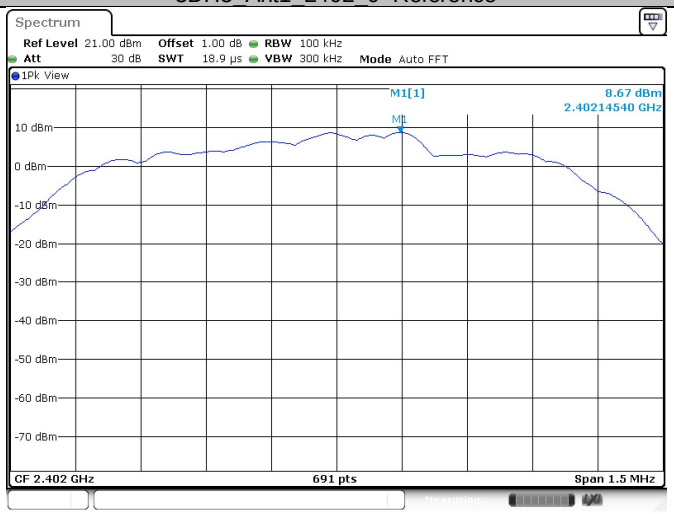

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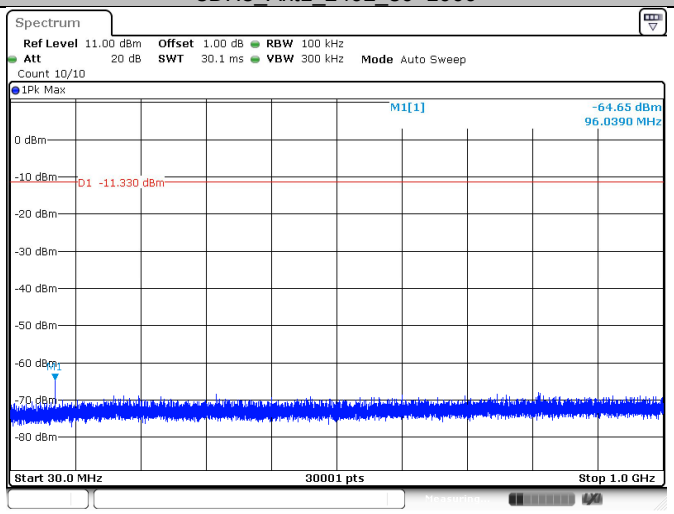

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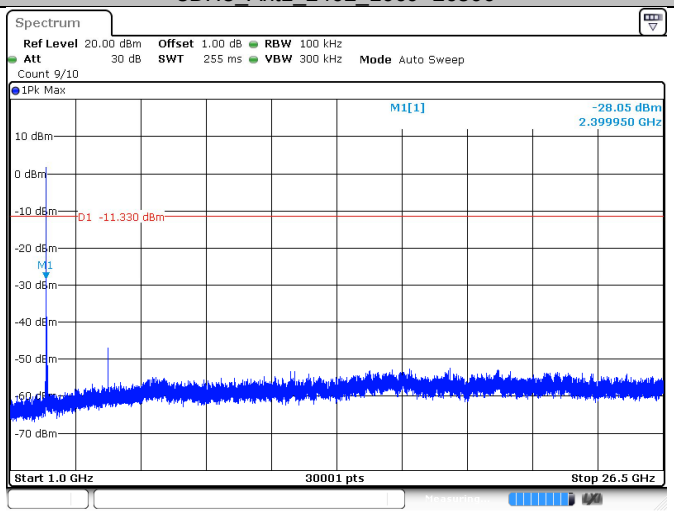
3DH5_Ant1_2402_1000~26500



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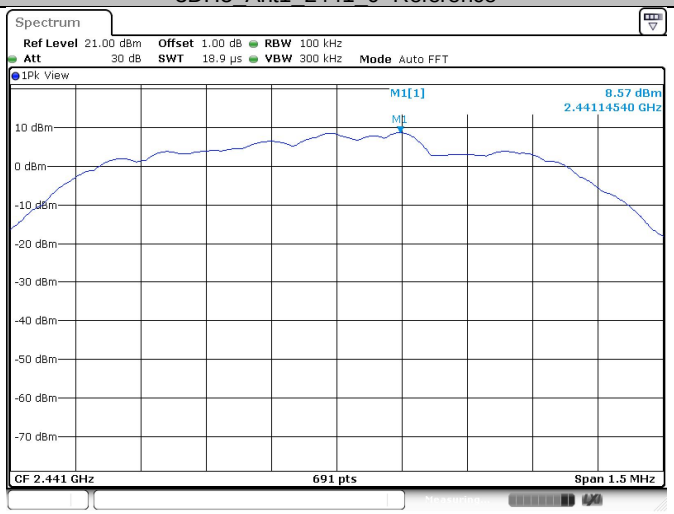

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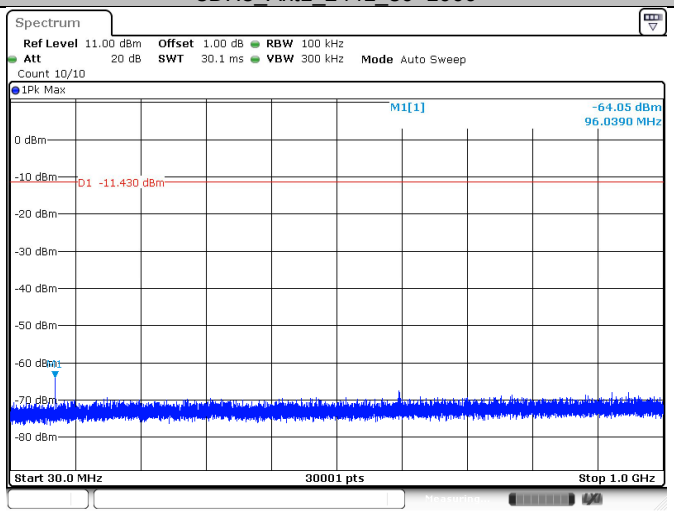

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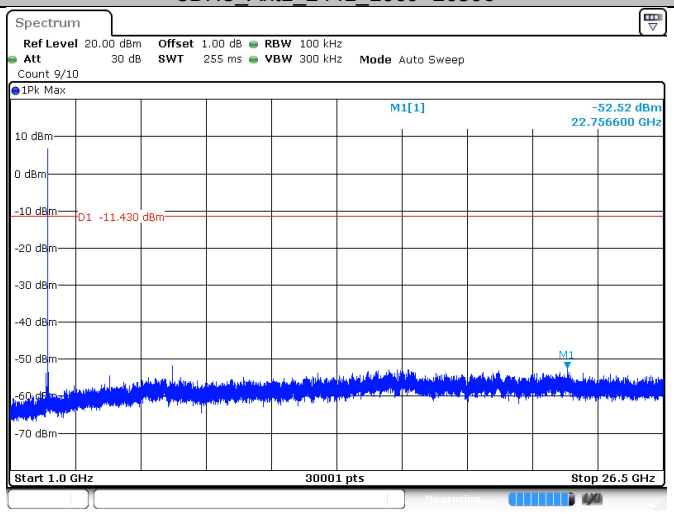
3DH5_Ant1_2441_1000~26500



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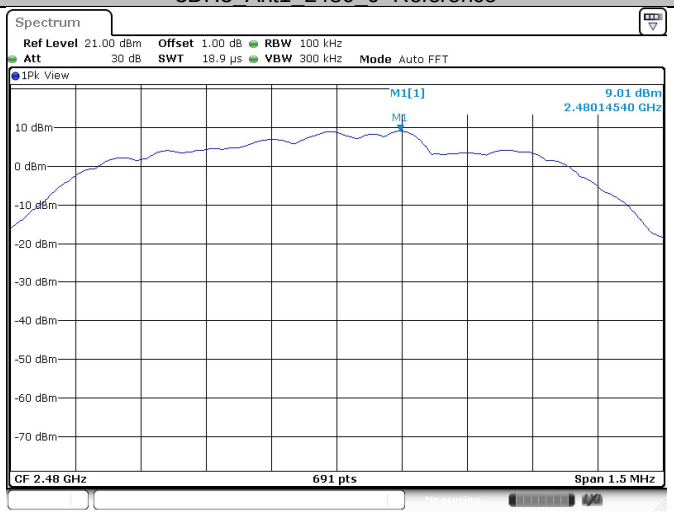

Date: 28.SEP.2020 11:06:54

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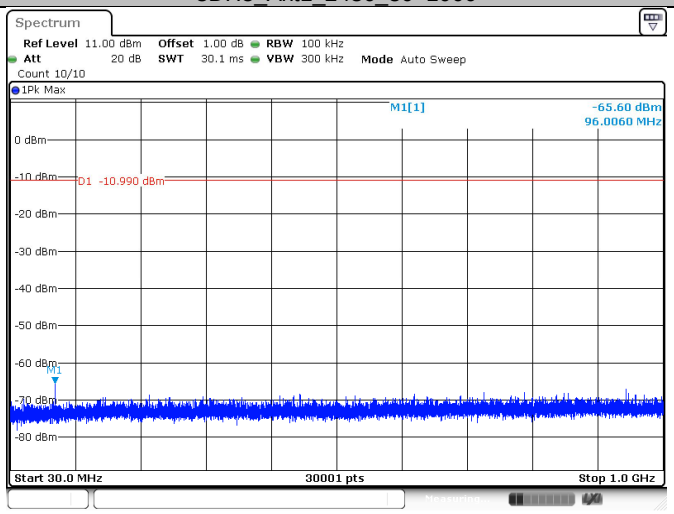
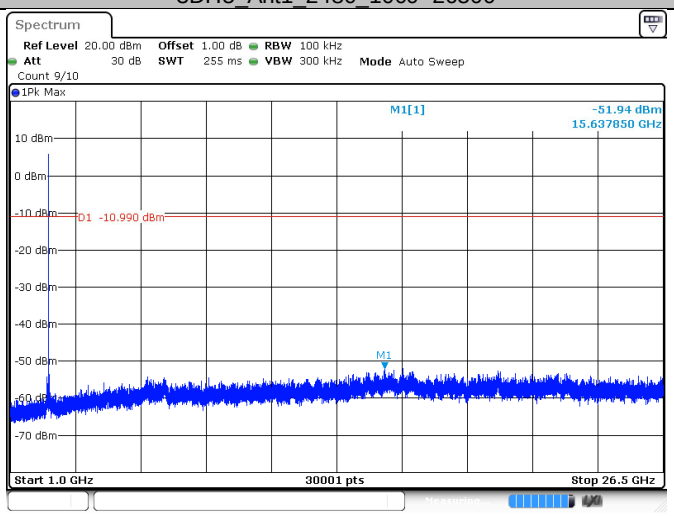


Date: 28.SEP.2020 11:07:00

3DH5_Ant1_2480_1000~26500



Date: 28.SEP.2020 11:07:08

9.7 Band edge testing

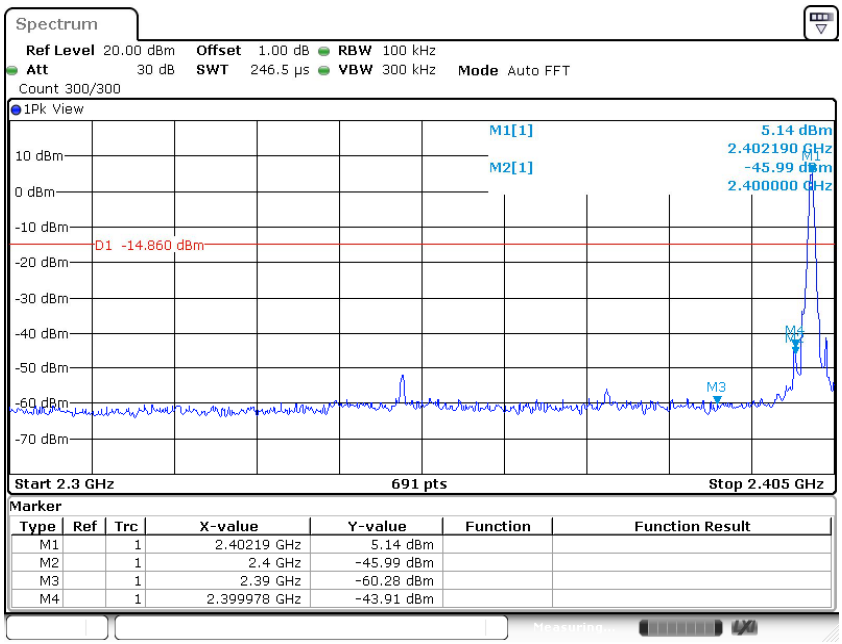
Test Method

1. Use the following spectrum analyzer settings:
   Span = wide enough to capture the peak level of the in-band emission and all spurious
   RBW = 100 kHz, VBW≥RBW, Sweep = auto, Detector function = peak, Trace = max hold
2. Allow the trace to stabilize, use the peak and delta measurement to record the result.
3. The level displayed must comply with the limit specified in this Section. .
4. Repeat the test at the hopping off and hopping on mode, submit all the plots.

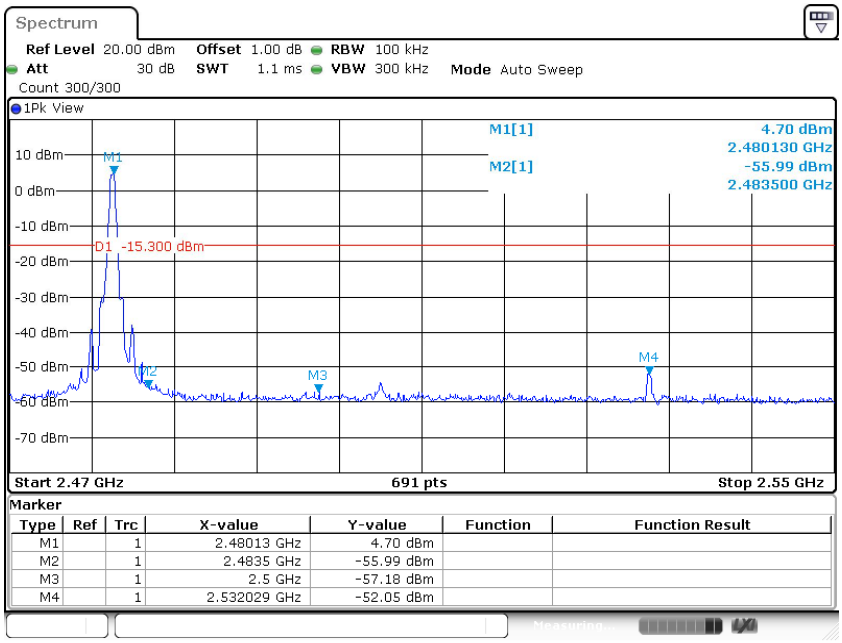
Limit:

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 dB below that in the100 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 that the transmitter demonstrates compliance with the peak conducted power limits.

Left Side
GFSK mode: Hopping off

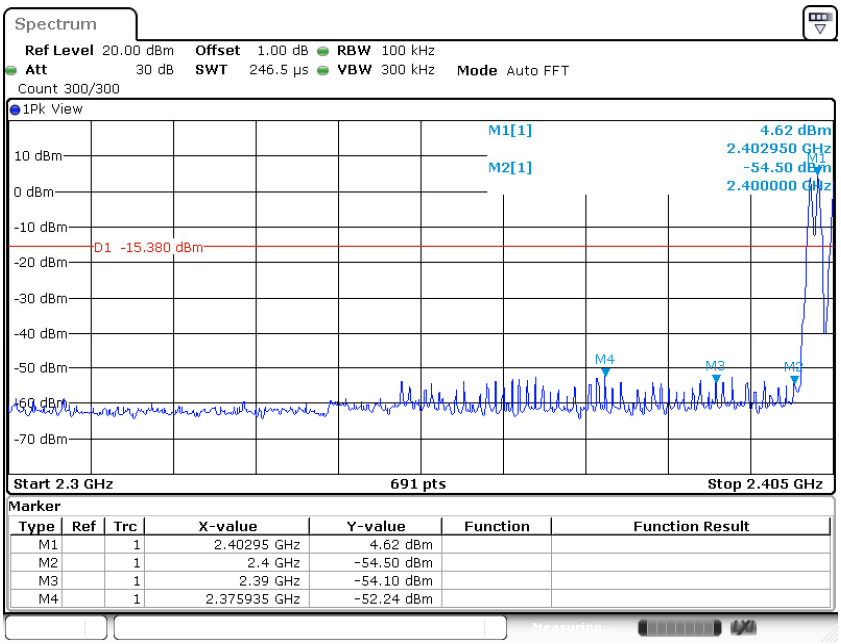


Date: 27.SEP.2020 15:02:57



Date: 27.SEP.2020 15:07:25

GFSK mode: Hopping on



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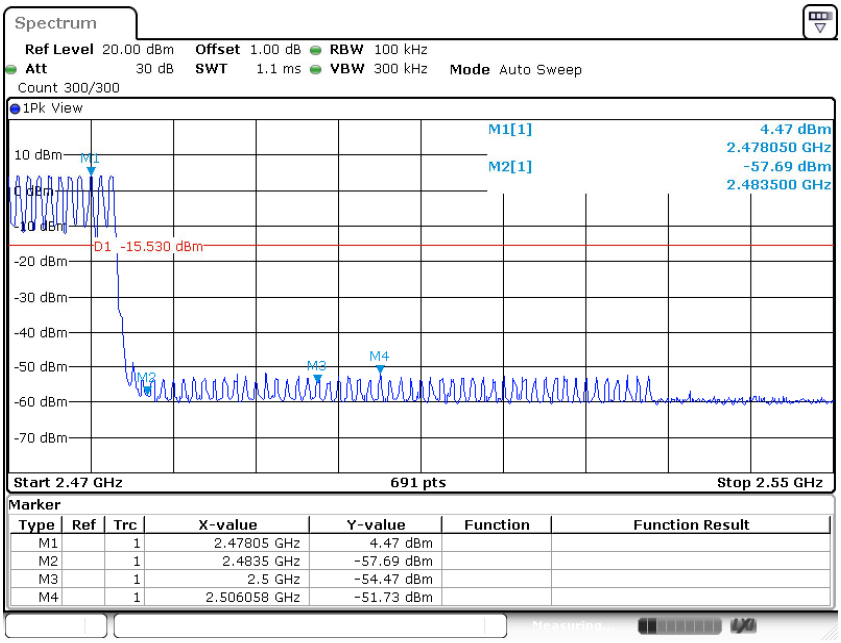
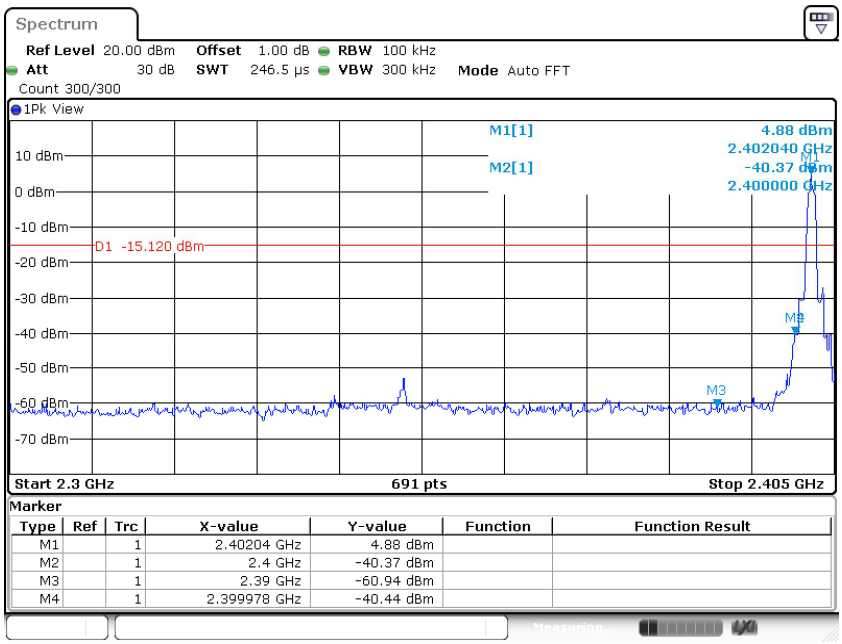


Date: 27.SEP.2020 15:19:54

8DPSK mode: Hopping off



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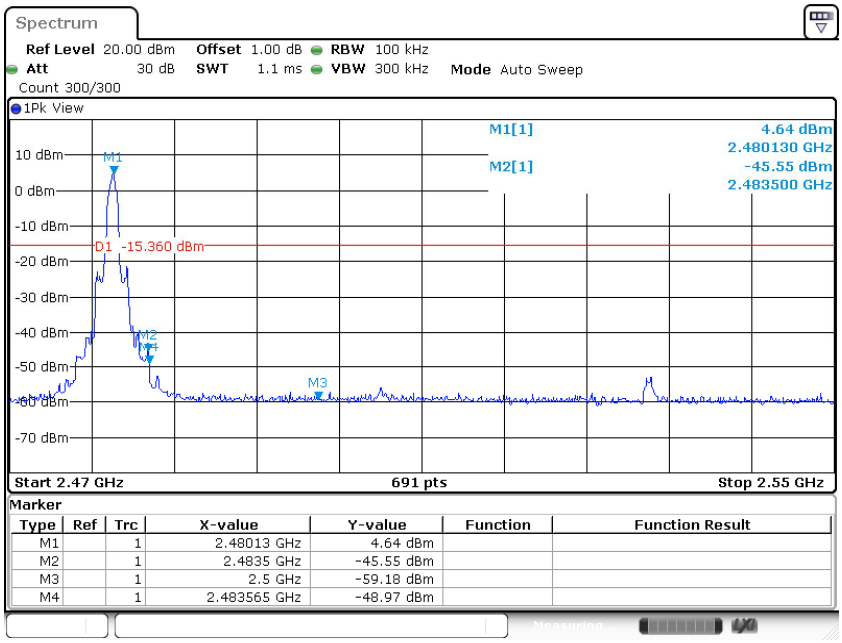

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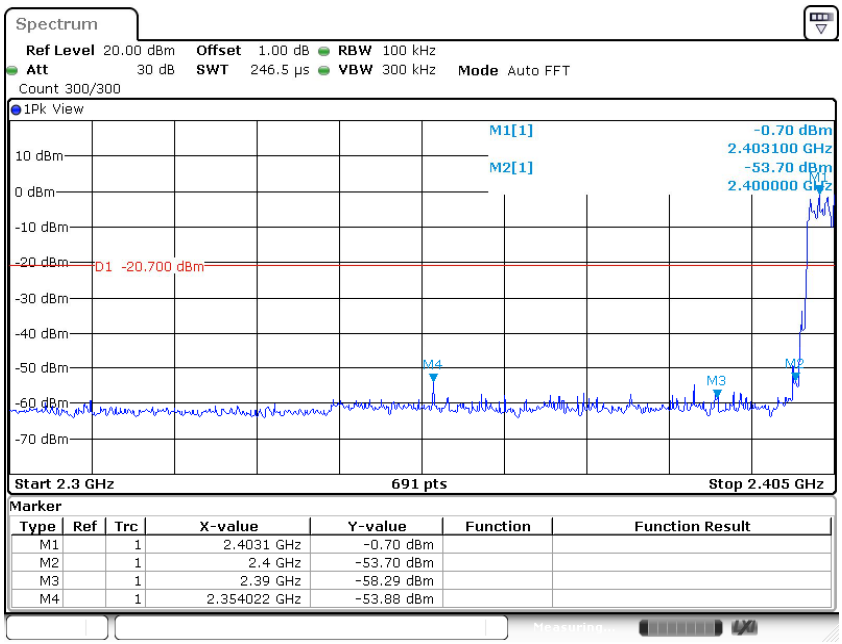
8DPSK mode: Hopping on



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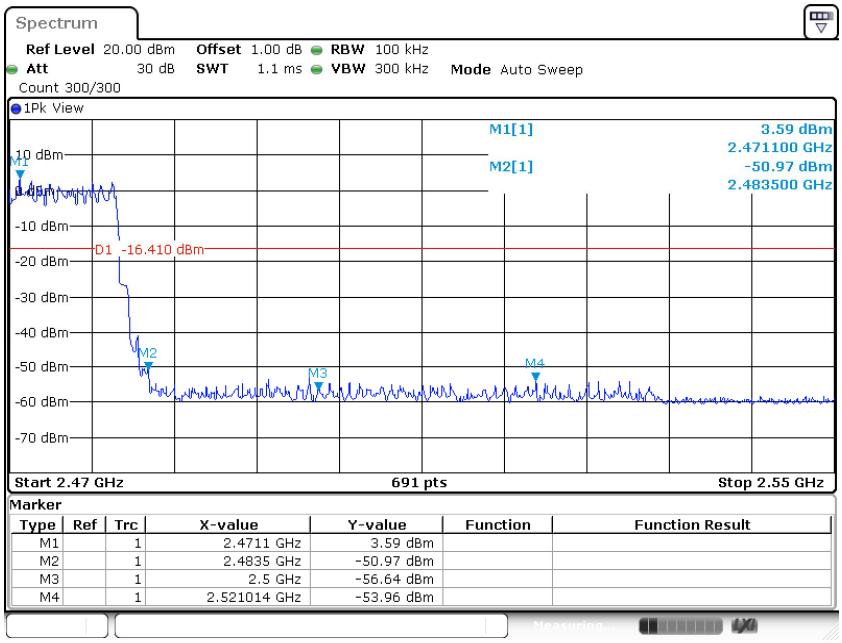
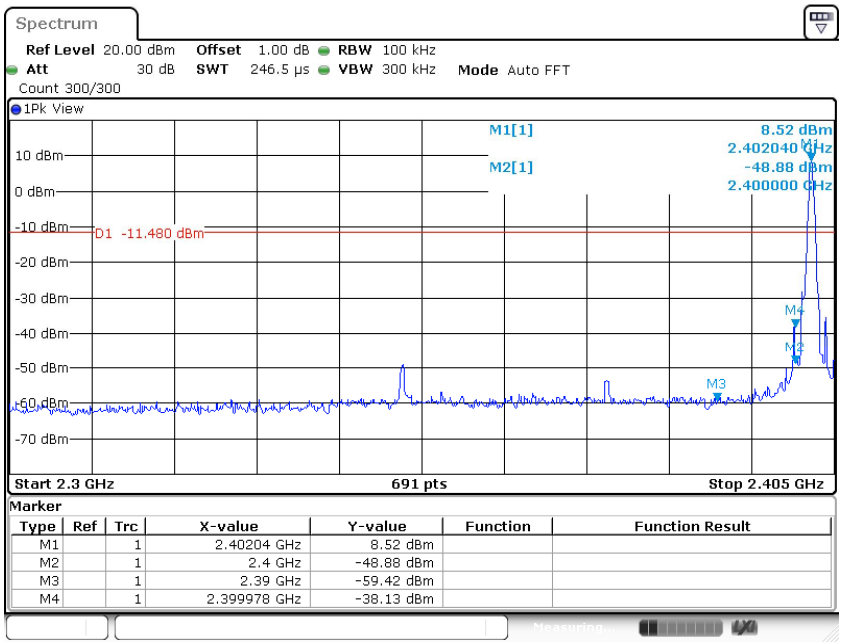
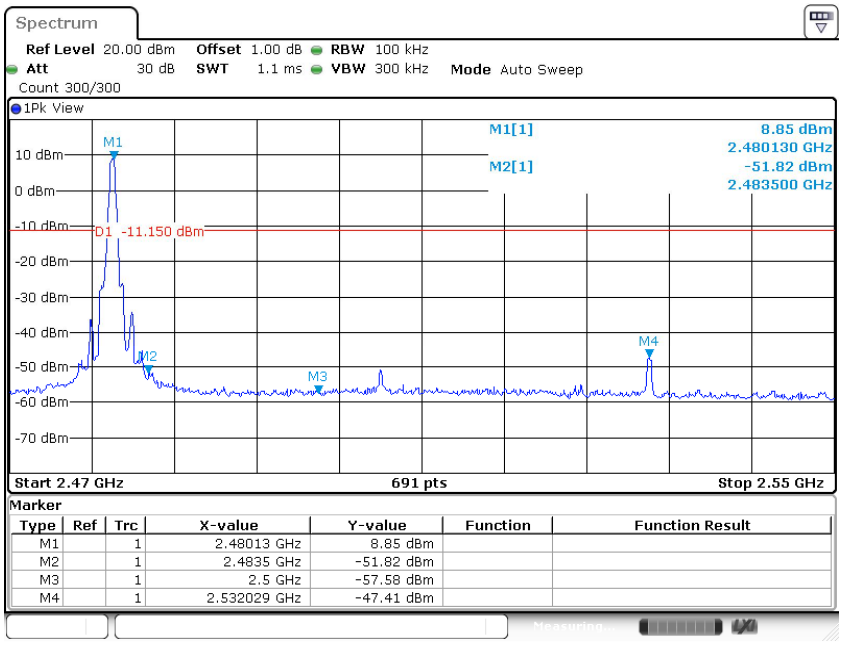


Date: 27.SEP.2020 15:24:49

Right Side
GFSK mode: Hopping off

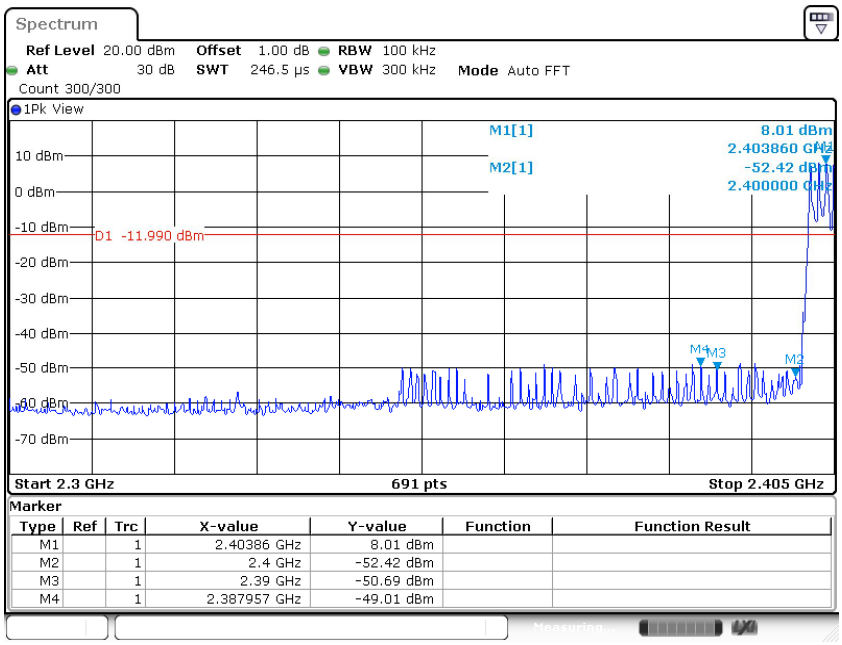


Date: 28.SEP.2020 10:53:49



Date: 28.SEP.2020 10:57:12

GFSK mode: Hopping on



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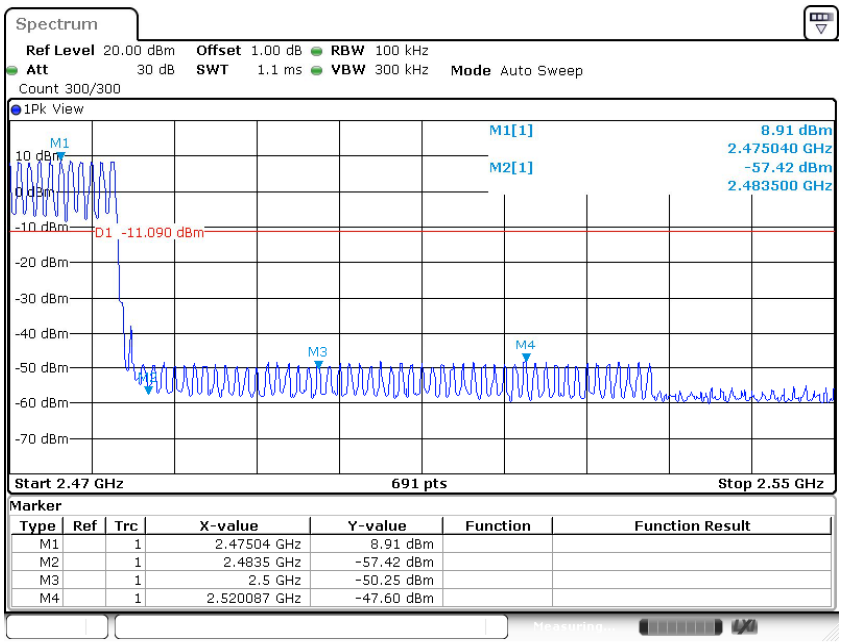
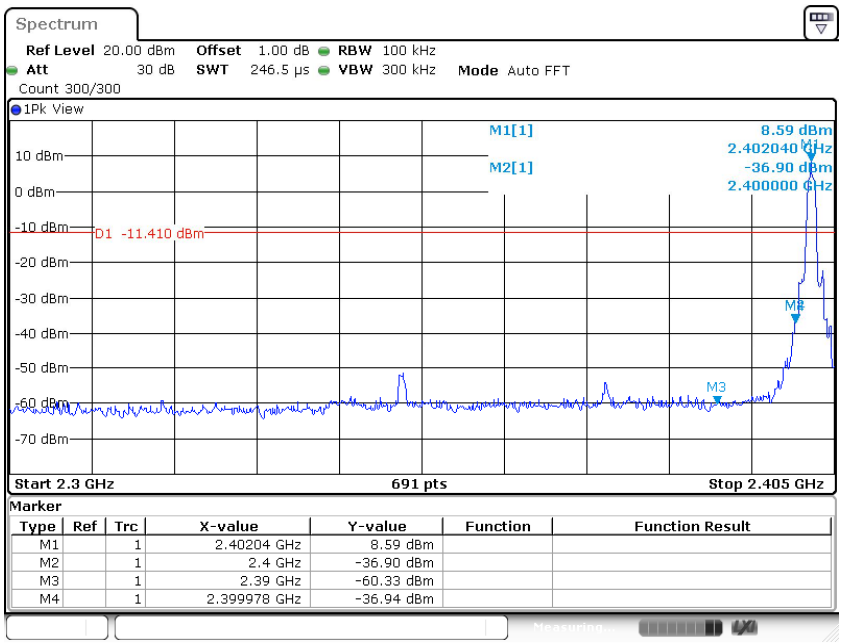


Date: 28.SEP.2020 11:11:20

8DPSK mode: Hopping off



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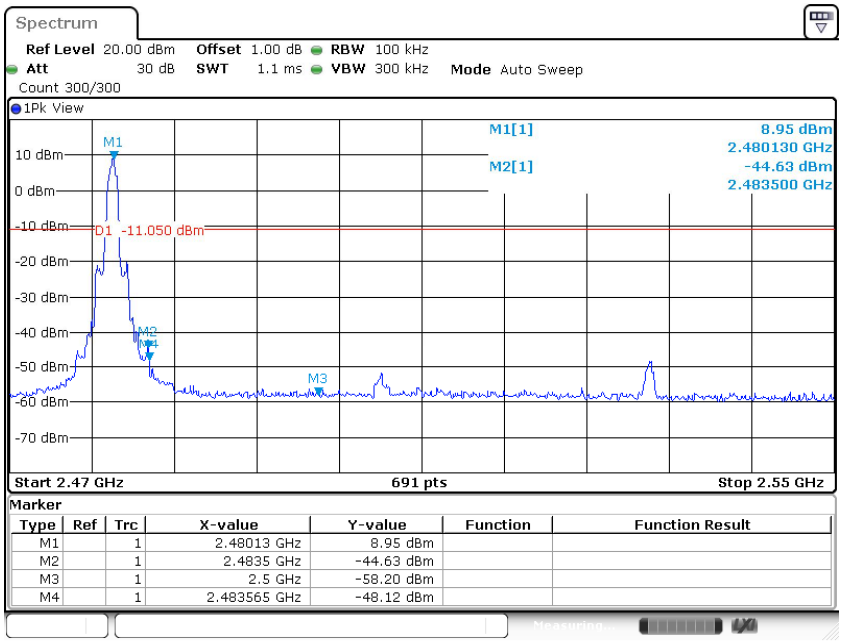

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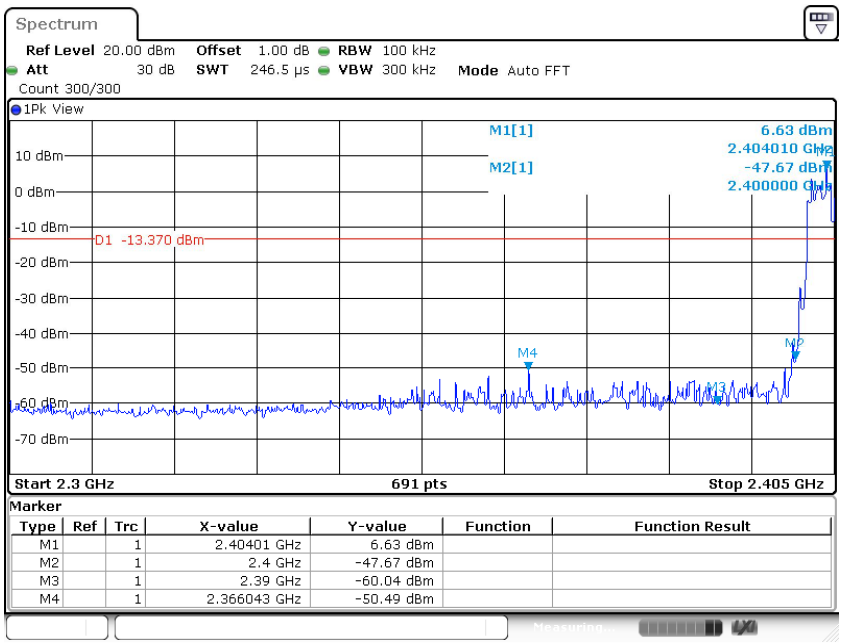
8DPSK mode: Hopping on



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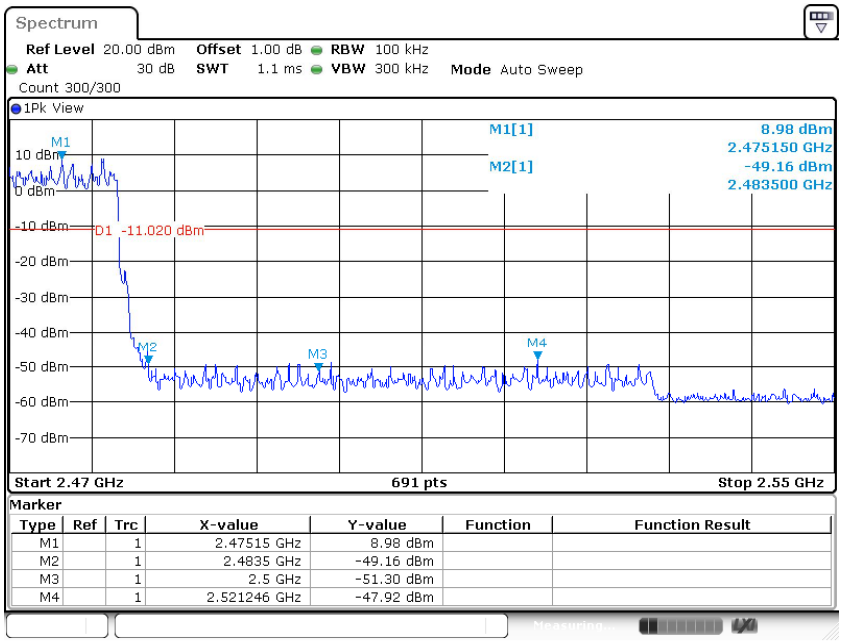


Date: 28.SEP.2020 11:18:45

9.8 Spurious radiated emissions for transmitter

Test Method

1: The EUT was place on a turn table which is 1.5m above ground plane for above 1GHz and 0.8m above ground for below 1GHz at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.

2: The EUT was set 3 meters away from the interference – receiving antenna, which was mounted on the top of a variable – height antenna tower.

3: The height of antenna 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.

4: 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 and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

5: Use the following spectrum analyzer settings According to C63.10:

For Below 1GHz

Use the following spectrum analyzer settings:

Span = wide enough to capture the peak level of the in-band emission and all spurious
RBW = 100 KHz to 120KHz, VBW≥RBW for peak measurement, Sweep = auto,
Detector function = peak, Trace = max hold.

For Peak unwanted emissions Above 1GHz:

Span = wide enough to capture the peak level of the in-band emission and all spurious
RBW = 1MHz, VBW≥RBW for peak measurement ,Sweep = auto,
Detector function = peak, Trace = max hold.

Procedures for average unwanted emissions measurements above 1000 MHz:

Span = wide enough to capture the peak level of the in-band emission and all spurious
RBW = 1MHz, VBW=10Hz, Sweep = auto, Detector function = peak, Trace = max hold.

If the dwell time per channel of the hopping signal is less than 100 ms, then the reading obtained with the 10 Hz VBW may be further adjusted by a “duty cycle correction factor”, derived from 20log(dwell time/100 ms), in an effort to demonstrate compliance with the 15.209 limit.

If the emission is pulsed, modify the unit for continuous operation; use the settings shown above, then correct the reading by subtracting the peak-average correct factor, derived from the appropriate the duty cycle calculation.

The setting method can refer to DA00-705.

Limit

The radio emission outside the operating frequency band 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. Radiated emissions which fall in the restricted bands, as defined in section15.205, must comply with the radiated emission limits specified in section 15.209.
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced 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 that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under section 5.4(d), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.

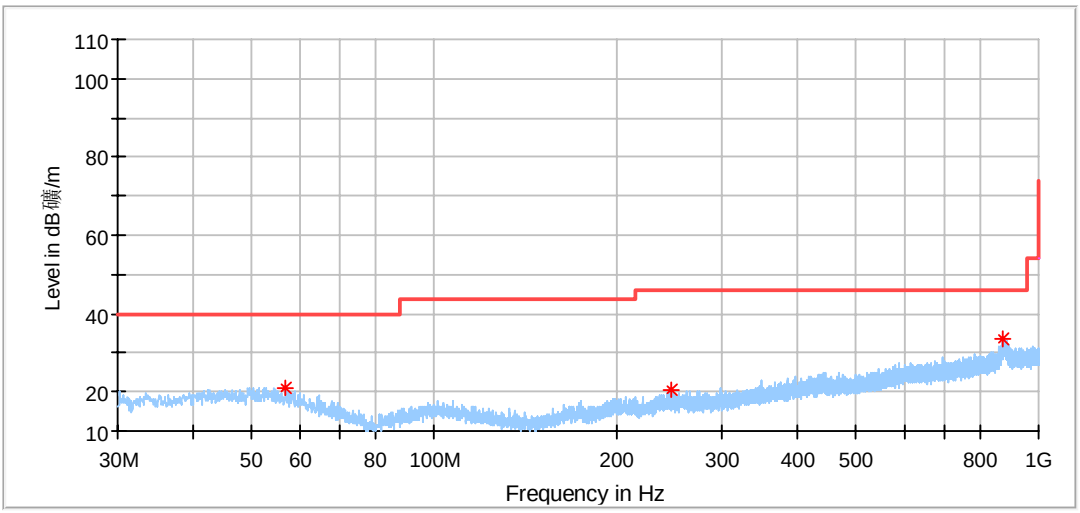
Frequency MHz	Field Strength uV/m	Field Strength dBµV/m	Detector
30-88	100	40	QP
88-216	150	43.5	QP
216-960	200	46	QP
960-1000	500	54	QP
Above 1000	500	54	AV
Above 1000	5000	74	PK

Spurious radiated emissions for transmitter

According to C63.10, if the peak (or quasi-peak) measured value complies with the average limit, it is unnecessary to perform an average measurement, so AV emission value did not show in below table if the peak value complies with average limit.
The only worse case (which is subject to the maximum EIRP, GFSK mode) test result is listed in the report.

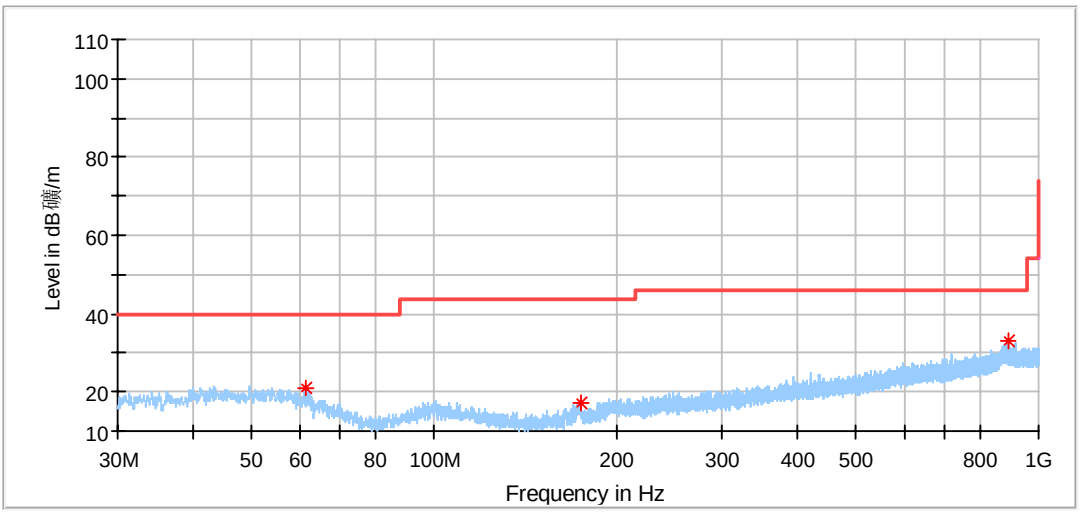
Transmitting spurious emission test result as below:

Only worst case(Right Side) test data was listed in this report.
EUT: Fauna Audio Glasses
M/N: Levia Black
Operating Condition: Tx 2402MHz, lowest Channel



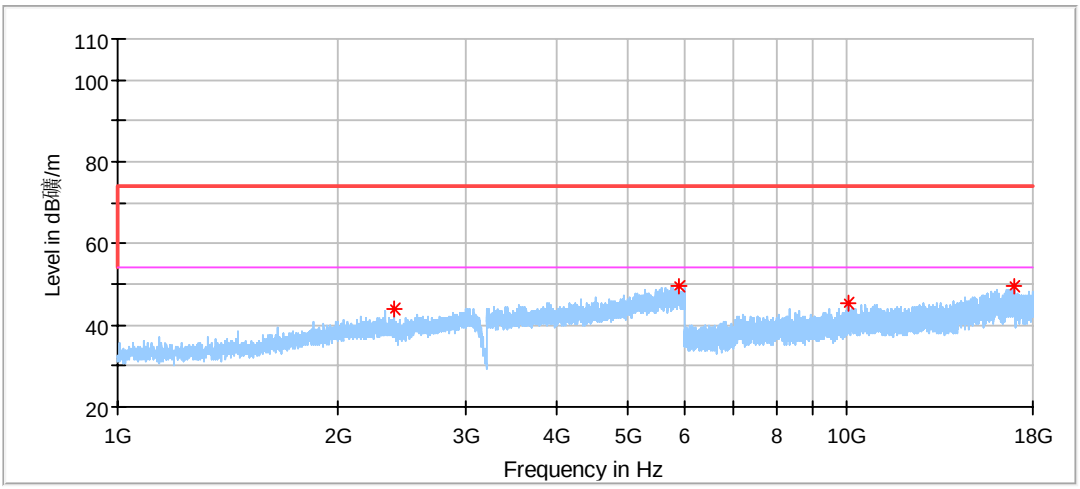
Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV /m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
56.890556	21.06	40.00	18.94	---	---	154.0	H	36.0	-25.2
247.495556	20.40	46.00	25.60	---	---	154.0	H	51.0	-26.9
874.169444	33.79	46.00	12.21	---	---	154.0	H	314.0	-16.4



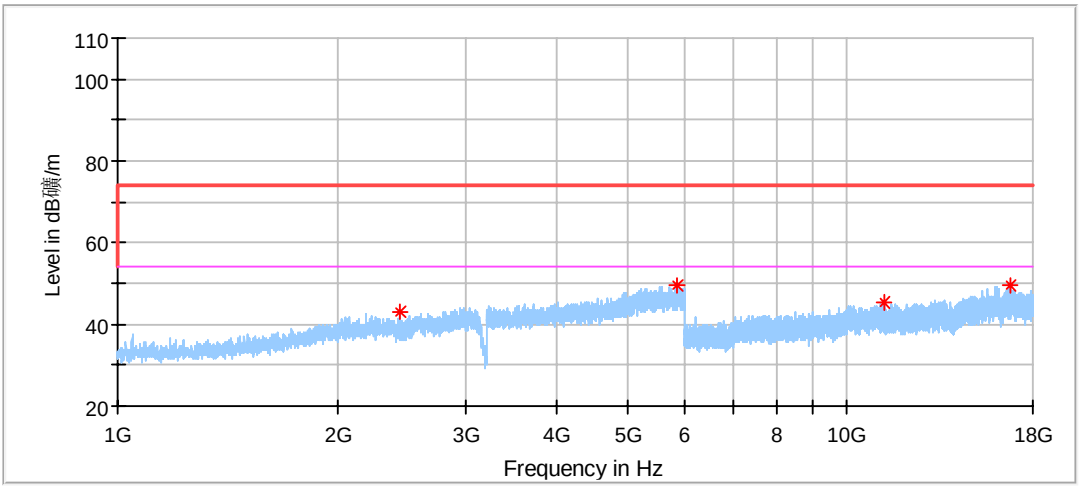
Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV /m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
61.417222	21.18	40.00	18.82	---	---	154.0	V	126.0	-26.1
174.583889	17.15	43.50	26.35	---	---	154.0	V	290.0	-30.2
893.461667	32.97	46.00	13.03	---	---	154.0	V	2.0	-16.1



Critical_Freqs

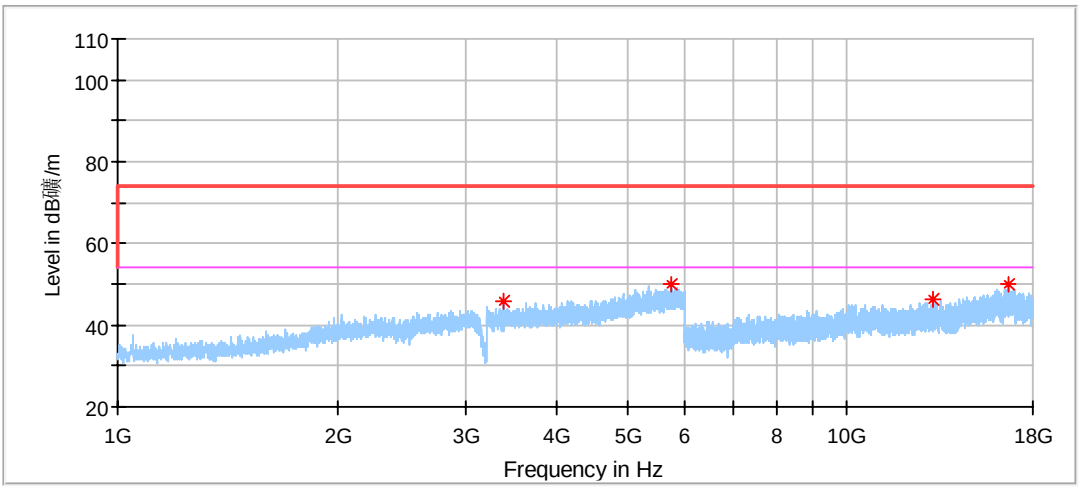
Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2392.500000	43.98	74.00	30.02	100.0	H	84.0	-3.2
5899.500000	49.31	74.00	24.69	100.0	H	104.0	5.5
10059.500000	45.53	74.00	28.47	100.0	H	207.0	9.3
16948.000000	49.63	74.00	24.37	100.0	H	306.0	16.5



Critical_Freqs

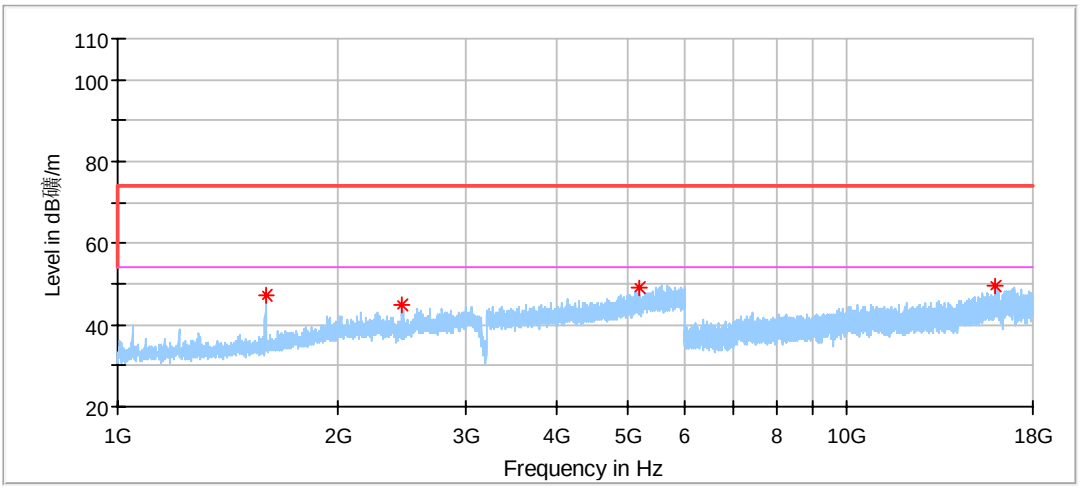
Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2440.000000	43.08	74.00	30.92	100.0	V	115.0	-3.1
5864.000000	49.68	74.00	24.32	100.0	V	318.0	5.5
11234.000000	45.50	74.00	28.50	100.0	V	226.0	8.5
16742.000000	49.57	74.00	24.43	100.0	V	47.0	16.1

EUT: Fauna Audio Glasses
M/N: Levia Black
Operating Condition: Tx 2441MHz, Middle Channel



Critical_Freqs

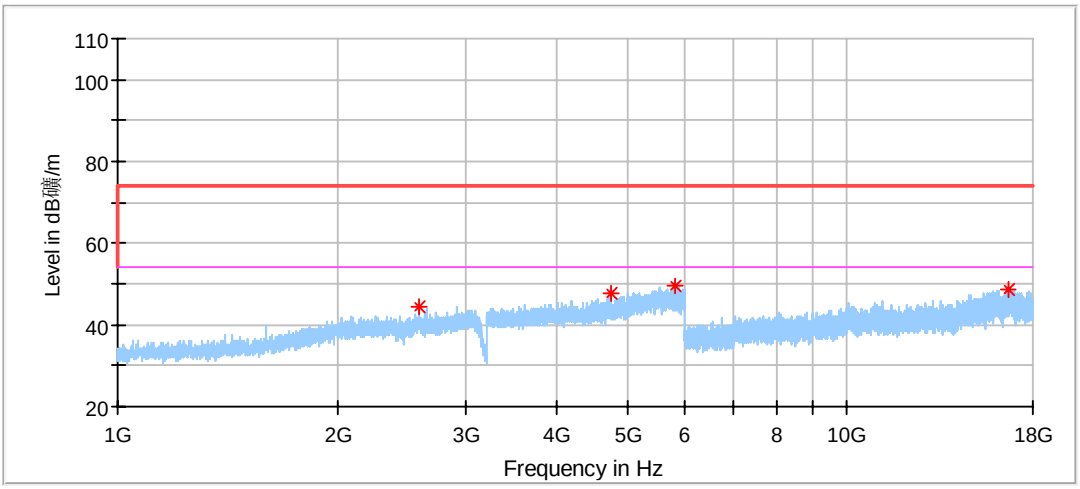
Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
3386.000000	45.70	74.00	28.30	100.0	H	198.0	-0.6
5755.500000	50.14	74.00	23.86	100.0	H	3.0	5.1
13104.000000	46.08	74.00	27.92	100.0	H	88.0	9.3
16696.000000	50.05	74.00	23.95	100.0	H	285.0	15.9



Critical_Freqs

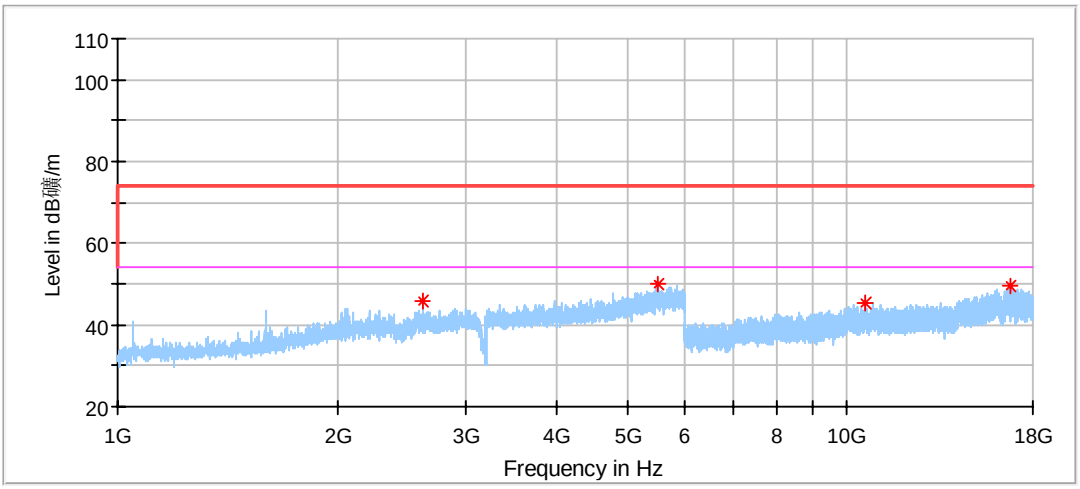
Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1600.000000	47.07	74.00	26.93	100.0	V	178.0	-7.3
2456.000000	44.76	74.00	29.24	100.0	V	68.0	-3.0
5192.500000	49.12	74.00	24.88	100.0	V	198.0	3.6
15979.000000	49.76	74.00	24.24	100.0	V	128.0	14.3

EUT: Fauna Audio Glasses
M/N: Levia Black
Operating Condition: Tx 2480MHz, High Channel)



Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2583.500000	44.24	74.00	29.76	100.0	H	231.0	-2.6
4754.500000	47.57	74.00	26.43	100.0	H	238.0	2.6
5800.000000	49.45	74.00	24.55	100.0	H	285.0	5.2
16703.000000	48.66	74.00	25.34	100.0	H	68.0	15.9



Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2614.500000	45.98	74.00	28.02	100.0	V	265.0	-2.5
5502.500000	50.08	74.00	23.92	100.0	V	138.0	4.4
10578.500000	45.60	74.00	28.40	100.0	V	228.0	8.5
16726.500000	49.31	74.00	24.69	100.0	V	48.0	16.0

Remark:

(1) Data of measurement within frequency range18-26GHz are the noise floor or attenuated more than 20dB below the permissible limits or the field strength is too small to be measured, so test data does not present in this report.

(2) Level=Reading Level + Correction Factor
Above 1GHz: Corrector factor = Antenna Factor + Cable Loss- Amplifier Gain
Below 1GHz: Corrector factor = Antenna Factor + Cable Loss
(The Reading Level is recorded by software which is not shown in the sheet)

10 Test Equipment List

List of Test Instruments

Radiated Emission Test

Description	Manufacturer	Model no.	Equipment ID	Serial no.	Calibration interval (year)	cal. due date
EMI Test Receiver	Rohde & Schwarz	ESR 26	68-4-74-14-002	101269	1	2021-6-29
Trilog Super Broadband Test Antenna	Schwarzbeck	VULB 9162	68-4-80-19-003	284	1	2021-2-24
Wave Guide Antenna	ETS	3117	68-4-80-19-001	00218954	1	2021-6-15
Pre-amplifier	Rohde & Schwarz	SCU 18F	68-4-29-19-001	100745	1	2020-12-14
Pre-amplifier	Rohde & Schwarz	SCU 08F2	68-4-29-19-004	08400018	1	2020-12-14
Sideband Horn Antenna	Q-PAR	QWH-SL-18-40-K-SG	68-4-80-14-008	12827	1	2021-8-5
Pre-amplifier	Rohde & Schwarz	SCU 40A	68-4-29-14-002	100432	1	2021-7-30
3m Semi-anechoic chamber	TDK	9X6X6	68-4-90-19-006	----	3	2022-12-29
Test software	Rohde & Schwarz	EMC32	68-4-90-19-006-A01	Version10.35.02	N/A	N/A

RF Conducted Test

Description	Manufacturer	Model no.	Equipment ID	Serial no.	Calibration interval (year)	cal. due date
Signal Analyzer	Rohde & Schwarz	FSV40	68-4-74-14-004	101030	1	2021-6-21

11 System Measurement Uncertainty

For a 95% confidence level, the measurement expanded uncertainties for defined systems, in accordance with the recommendations of ISO 17025 were:

System Measurement Uncertainty	
Test Items	Extended Uncertainty
Radiated Spurious Emission 30MHz-1000MHz	Horizontal: 4.70dB; Vertical: 4.67dB;
Radiated Spurious Emission 1000MHz-18000MHz	Horizontal: 4.65dB; Vertical: 4.63dB;
Conducted RF test with TS 8997	RF Power Conducted: 1.31dB Frequency test involved: 0.6×10^{-7} or 1%