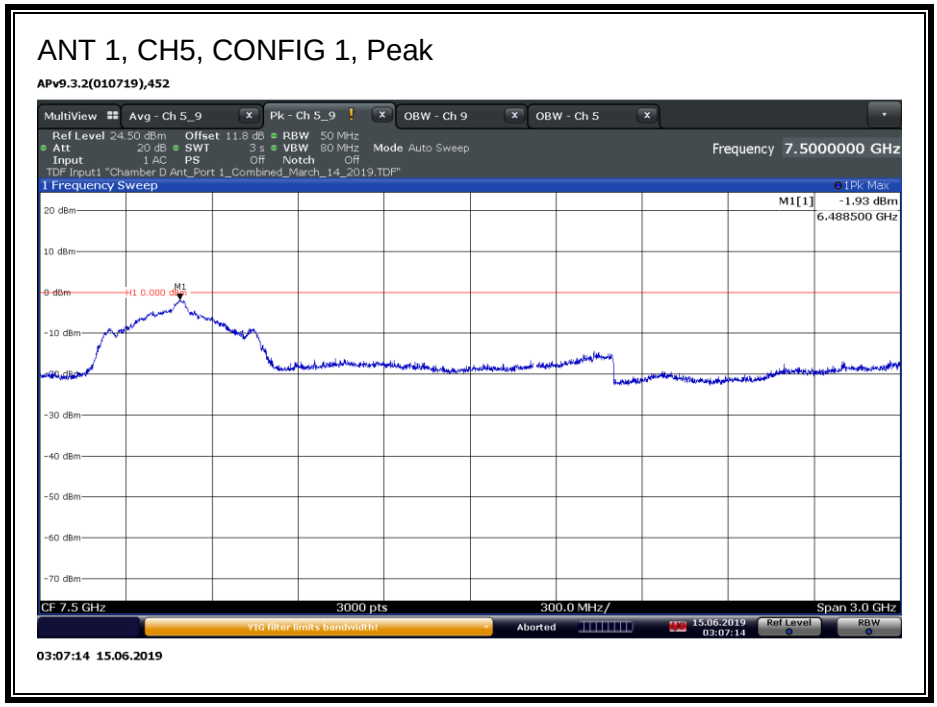
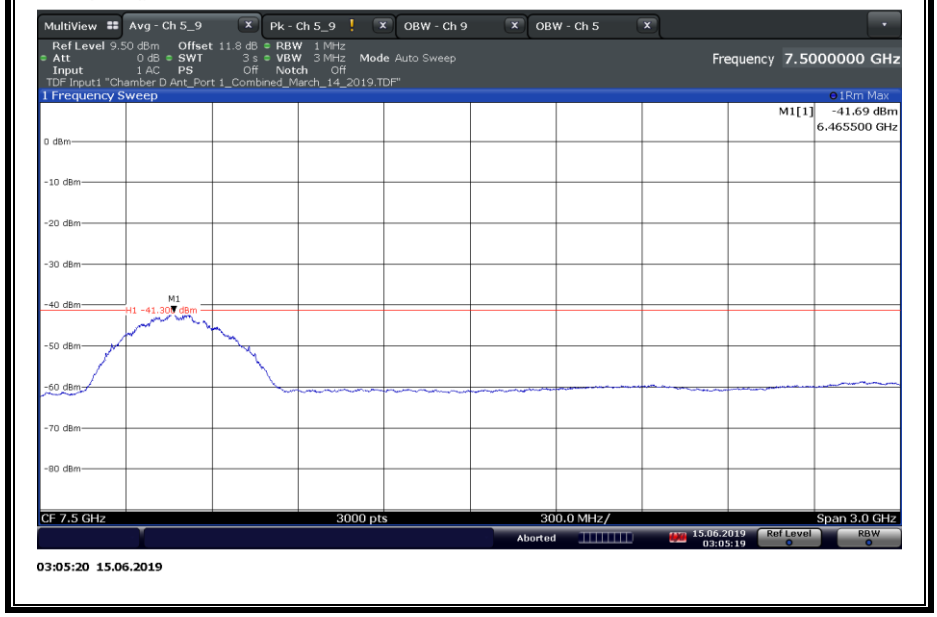
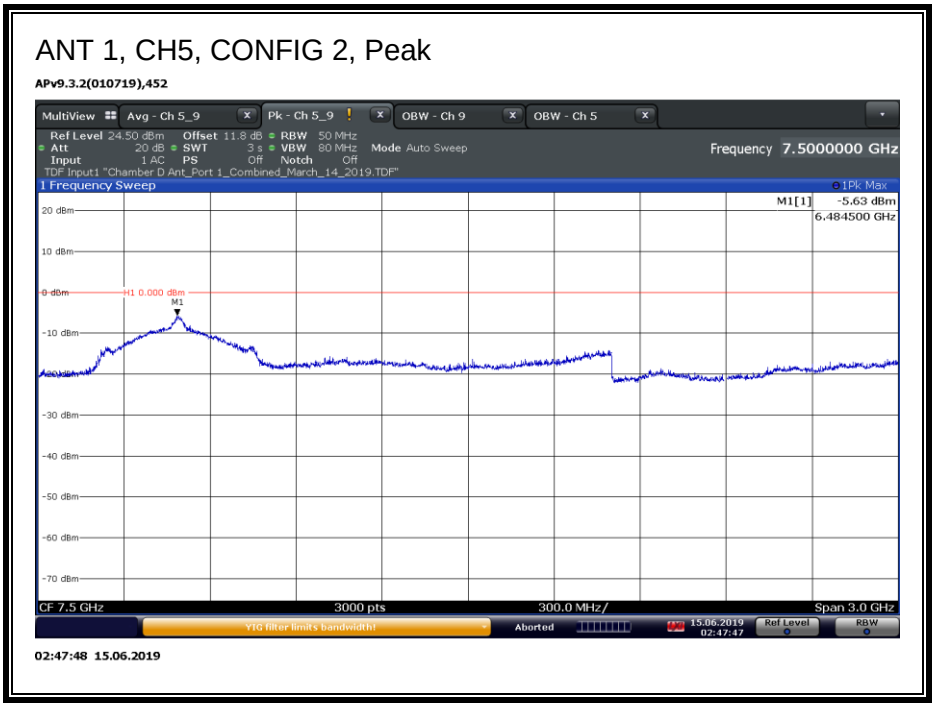
ANT 1, CH5, CONFIG 1, Peak



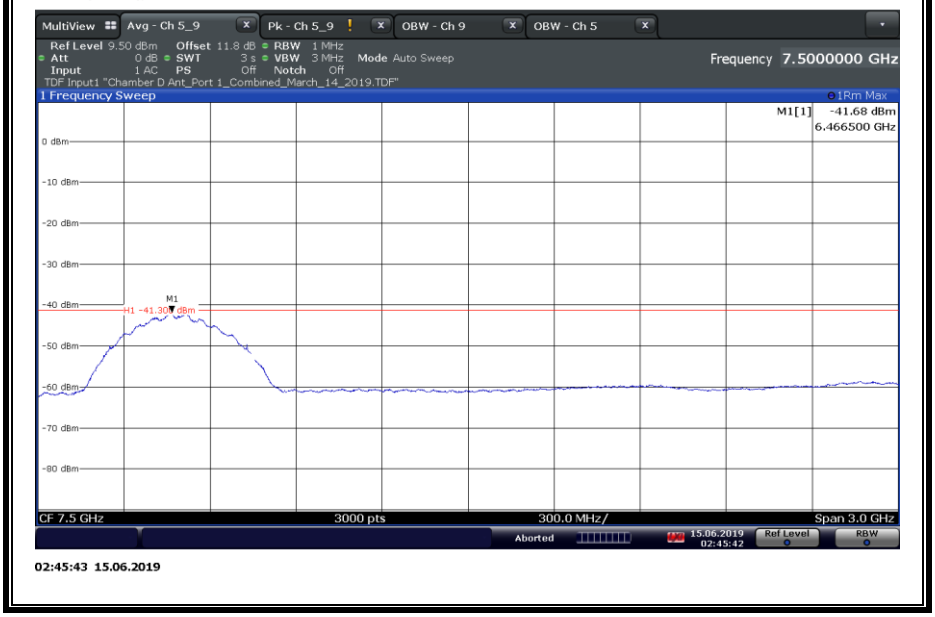
ANT 1, CH5, CONFIG 1, Avg.



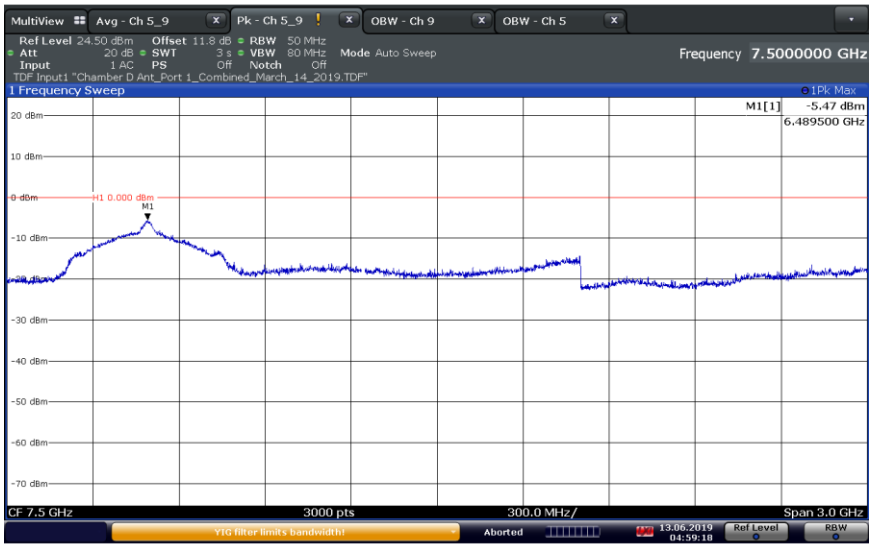
ANT 1, CH5, CONFIG 2, Peak



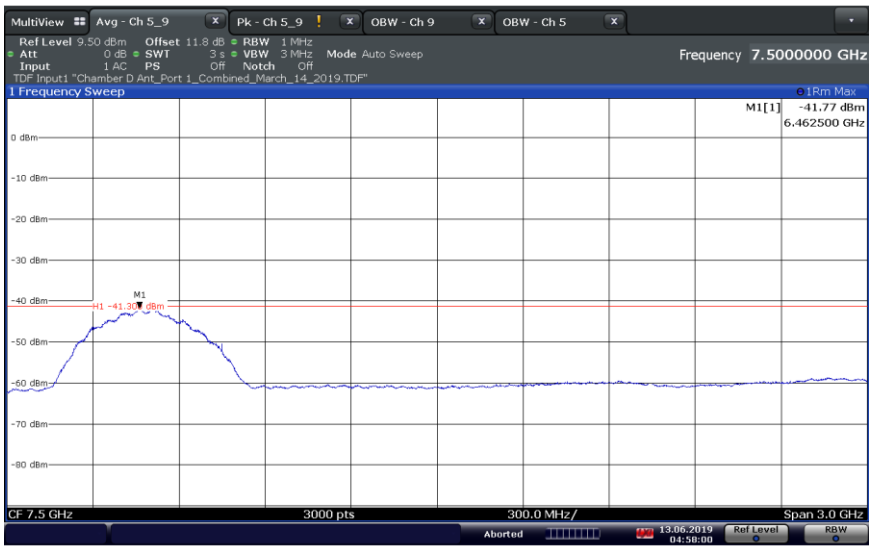
ANT 1, CH5, CONFIG 2, Avg.



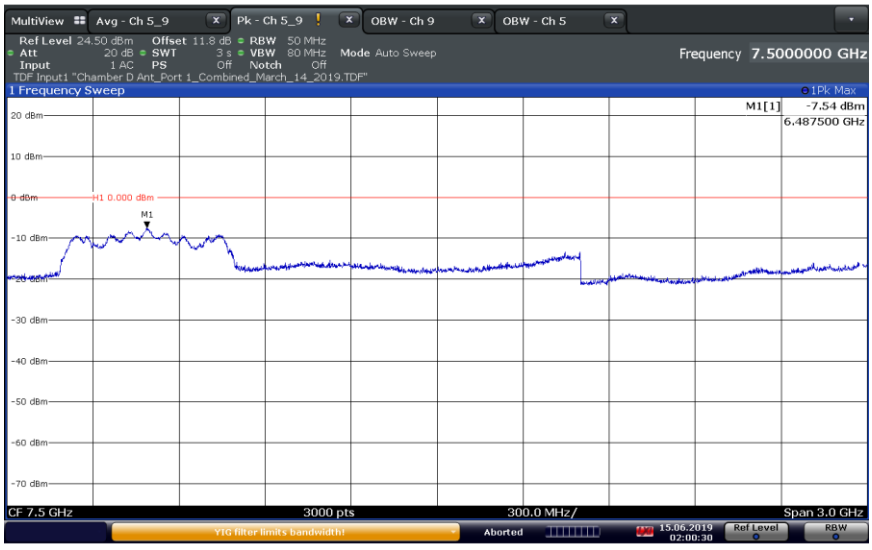
ANT 1, CH5, CONFIG 3, Peak



ANT 1, CH5, CONFIG 3, Avg.



ANT 1, CH5, CONFIG 4, Peak



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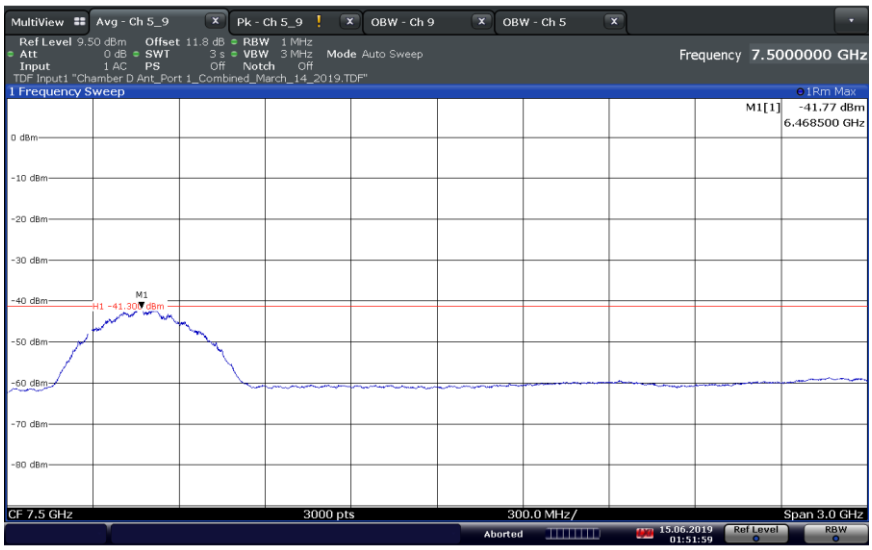
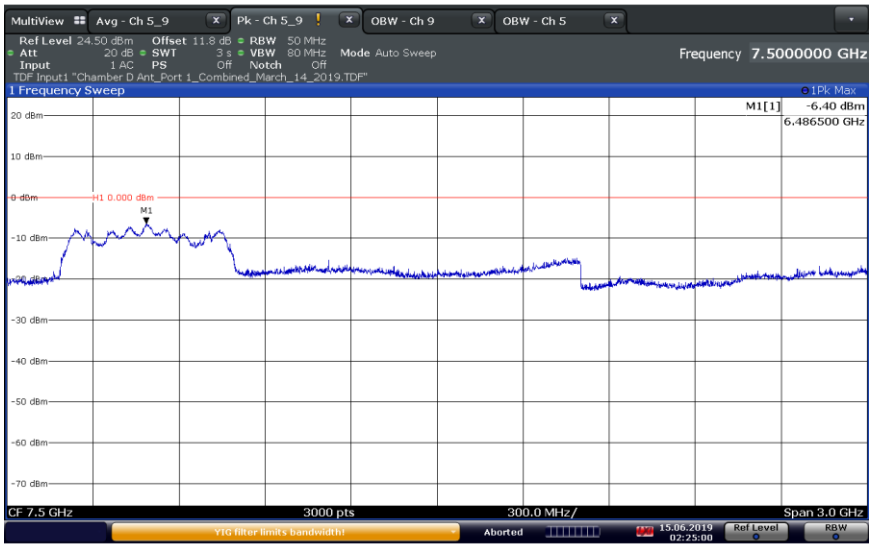


ANT 1, CH5, CONFIG 5, Peak



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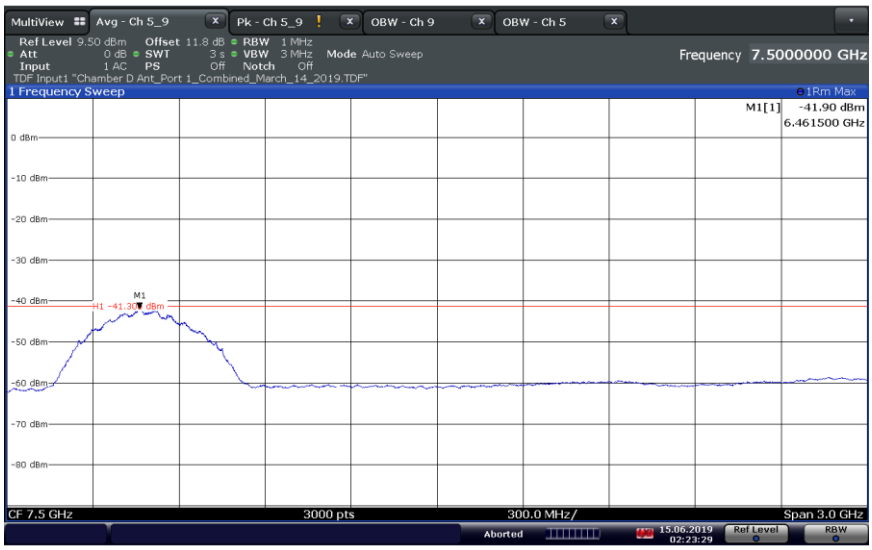
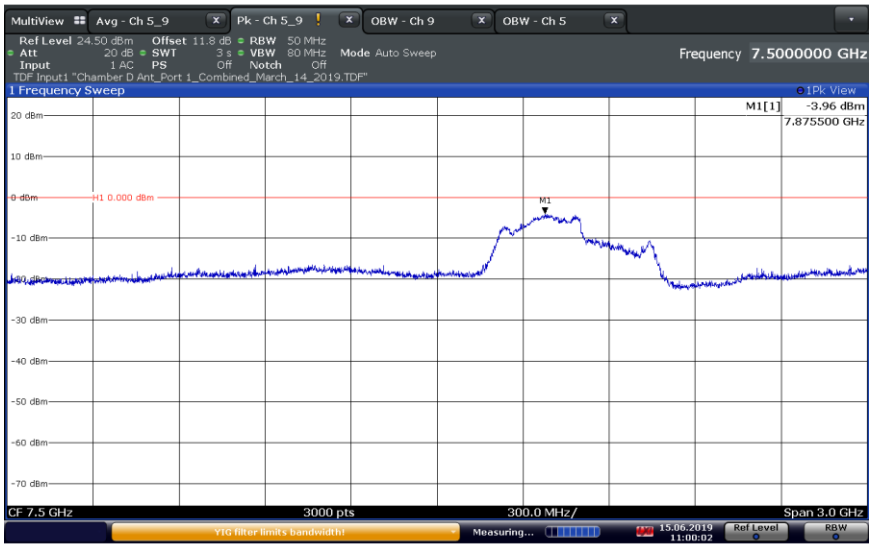


ANT 1, CH9, CONFIG 0, Peak



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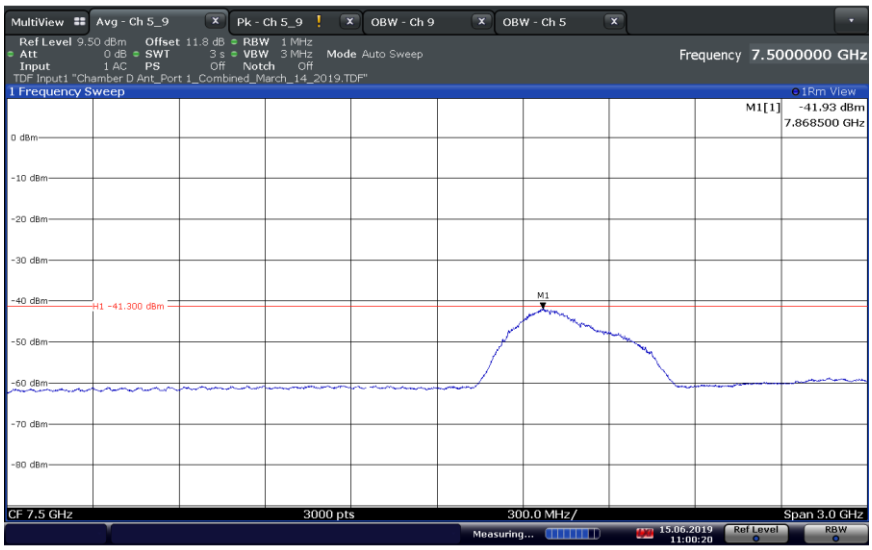
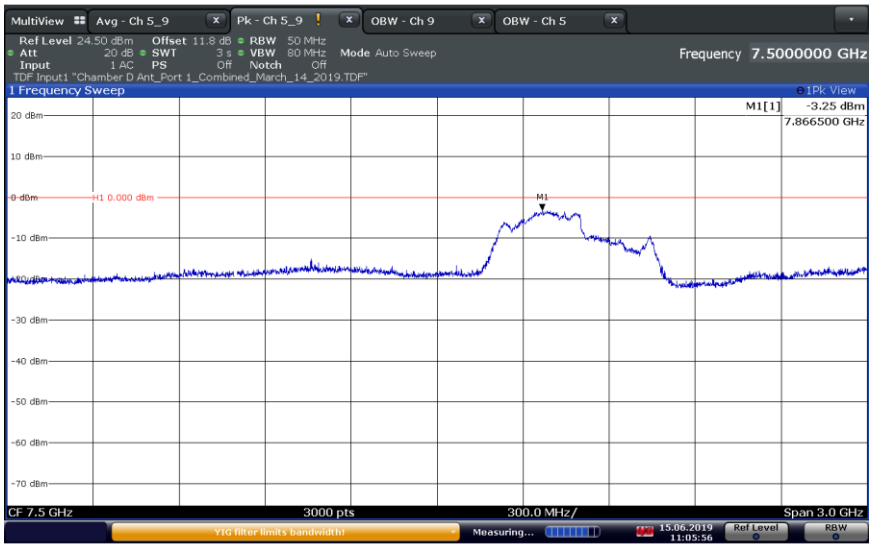


ANT 1, CH9, CONFIG 1, Peak



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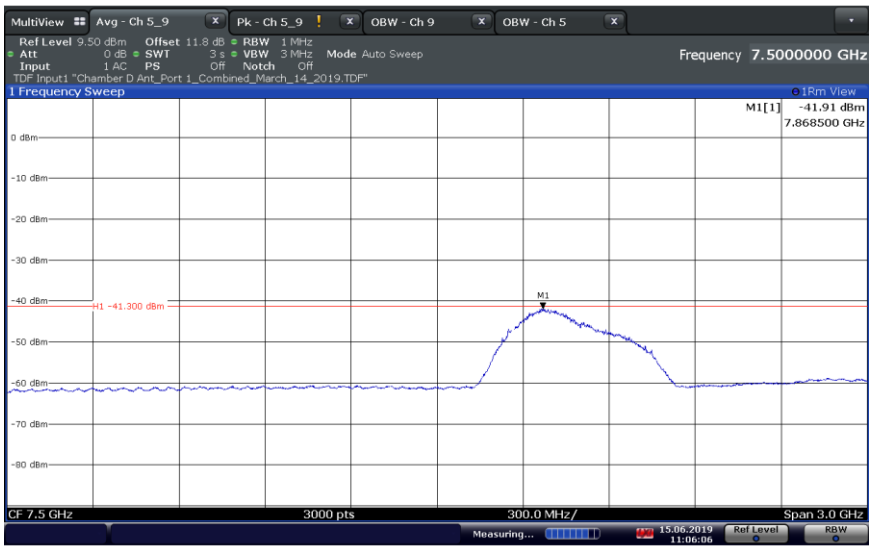
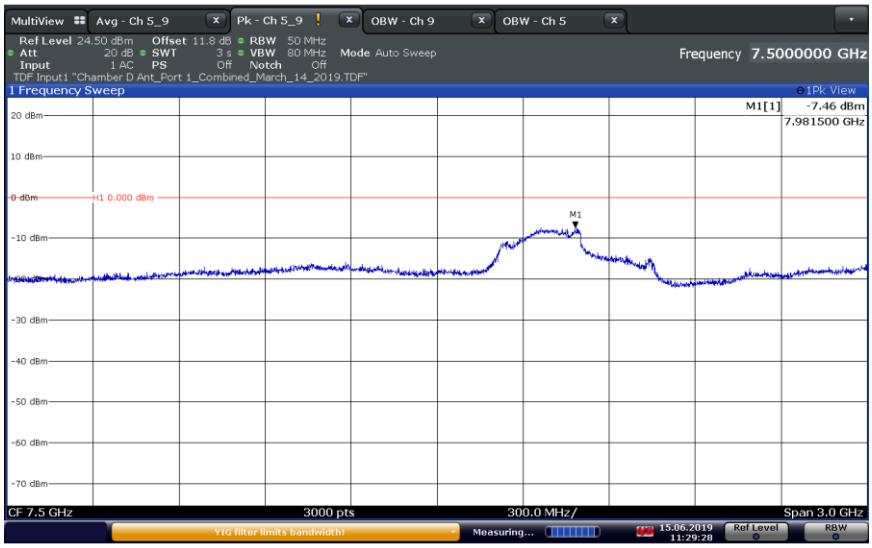


ANT 1, CH9, CONFIG 2, Peak



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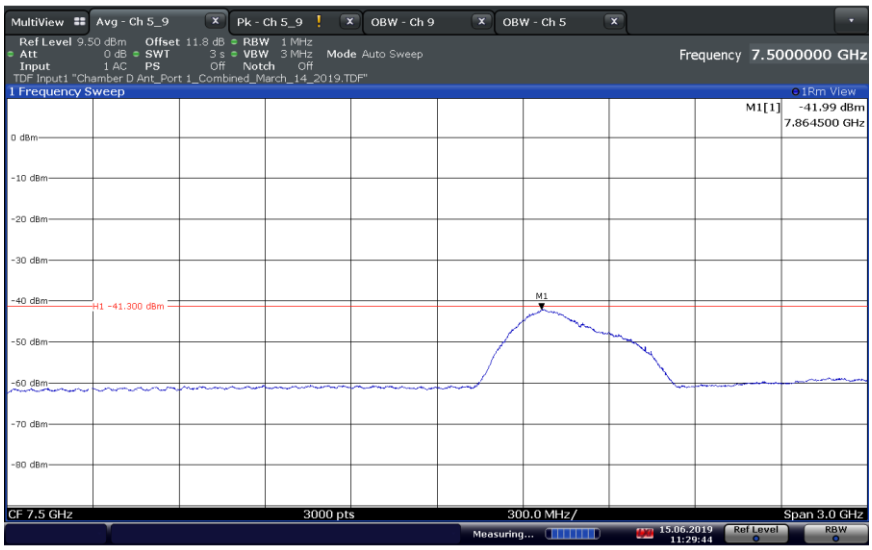
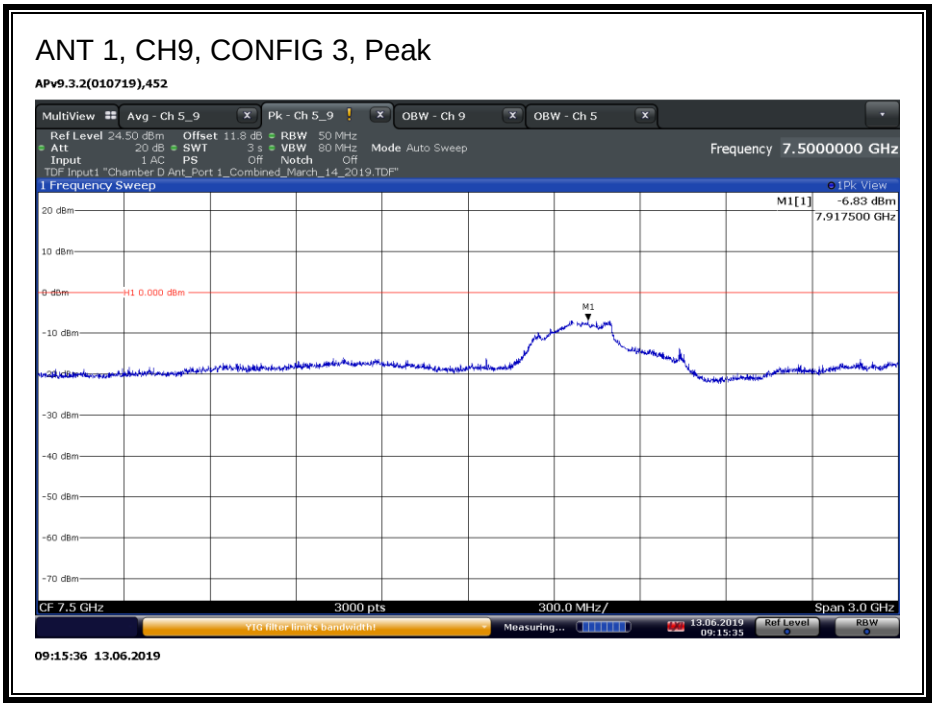
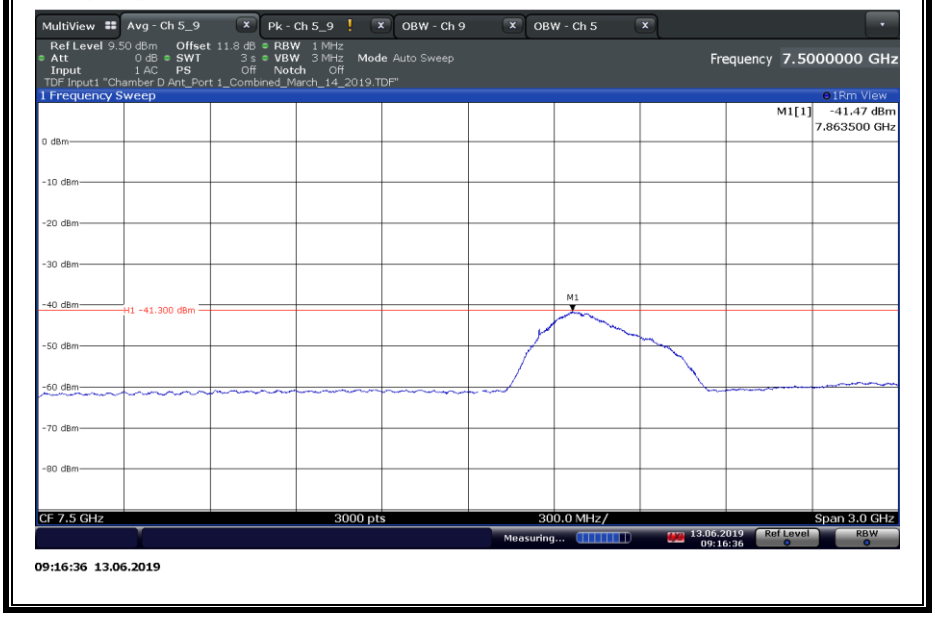


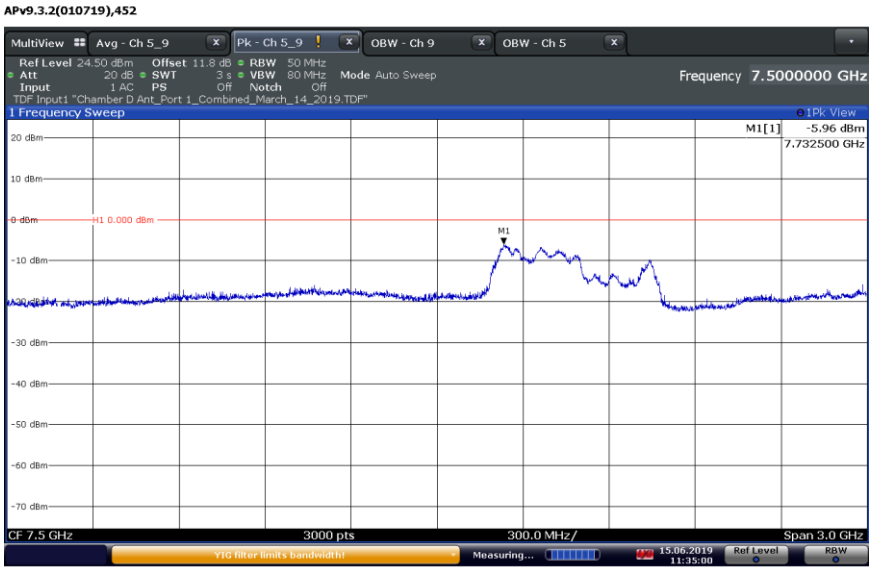
ANT 1, CH9, CONFIG 3, Peak



ANT 1, CH9, CONFIG 3, Avg.



ANT 1, CH9, CONFIG 4, Peak



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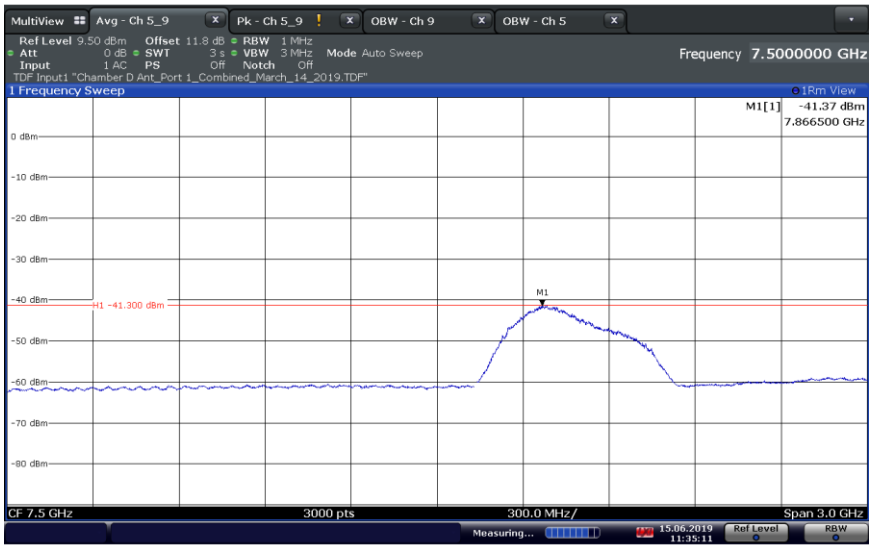
ANT 1, CH9, CONFIG 4, Avg.



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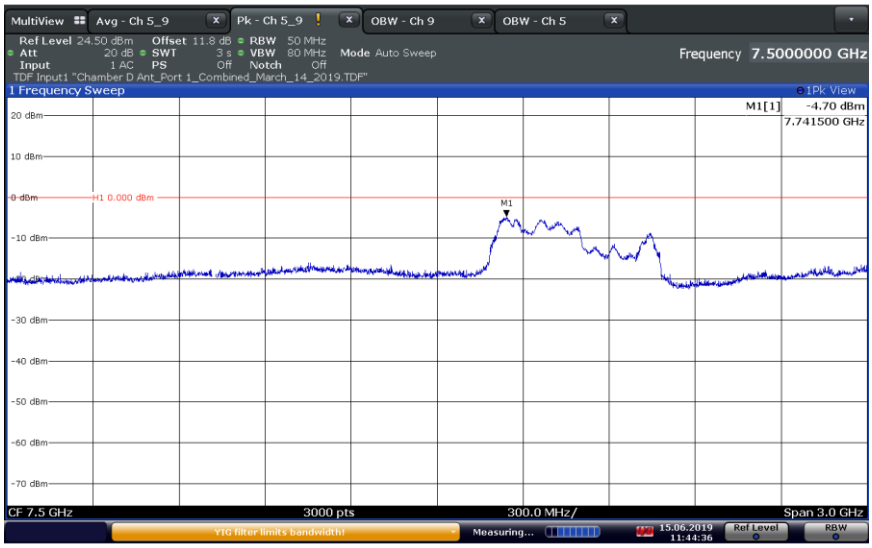
ANT 1, CH9, CONFIG 5, Peak



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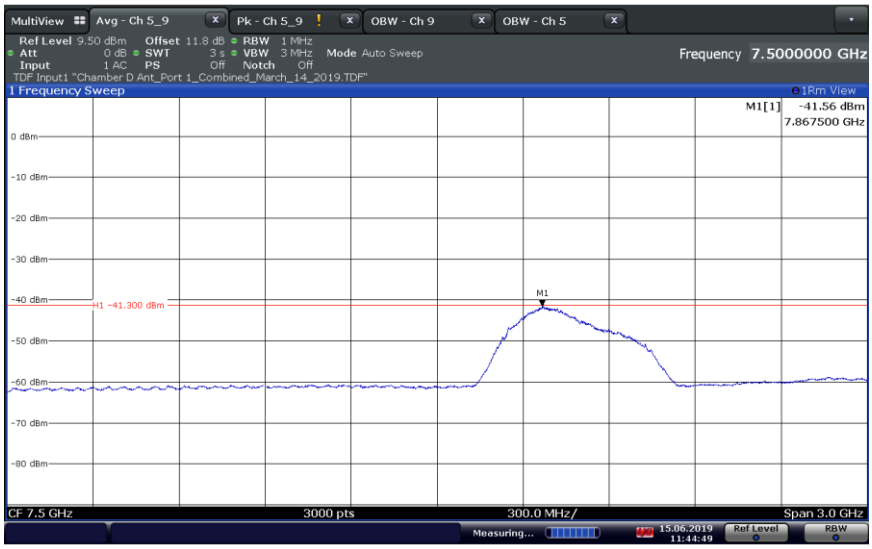
ANT 1, CH9, CONFIG 5, Avg.



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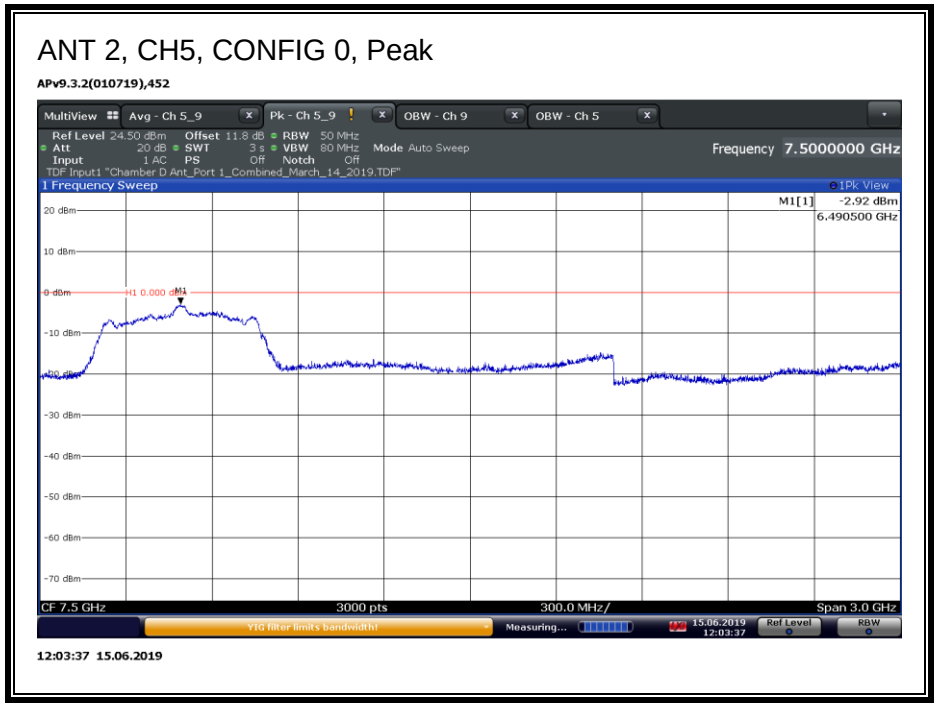

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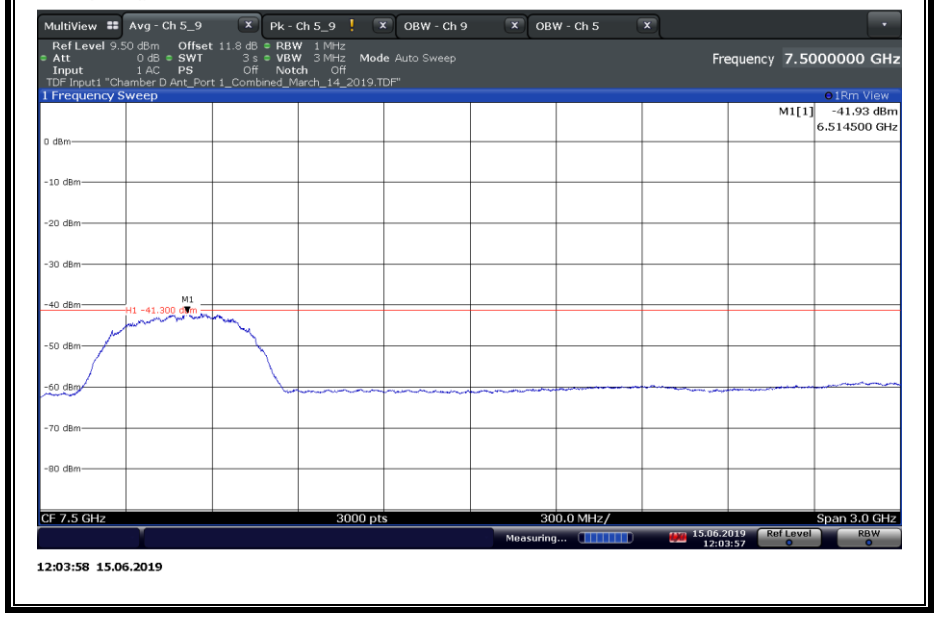
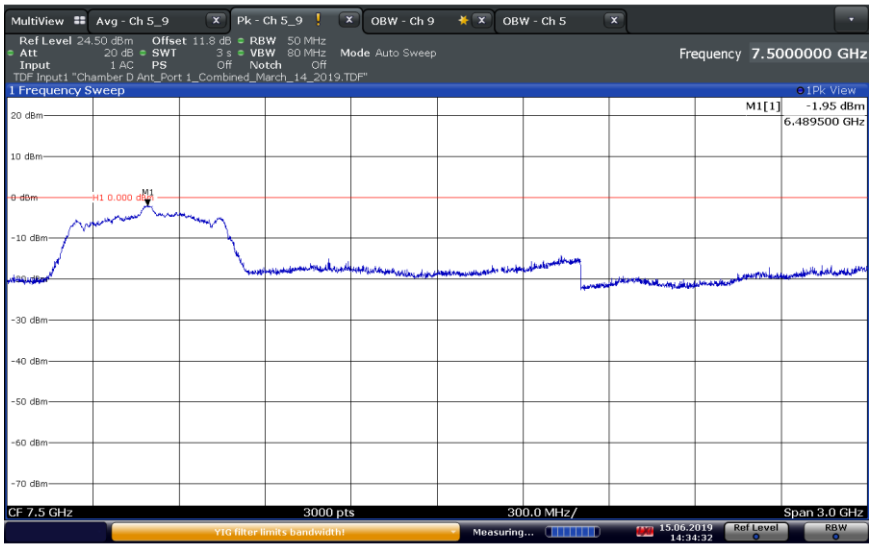


ANT 2, CH5, CONFIG 1, Peak



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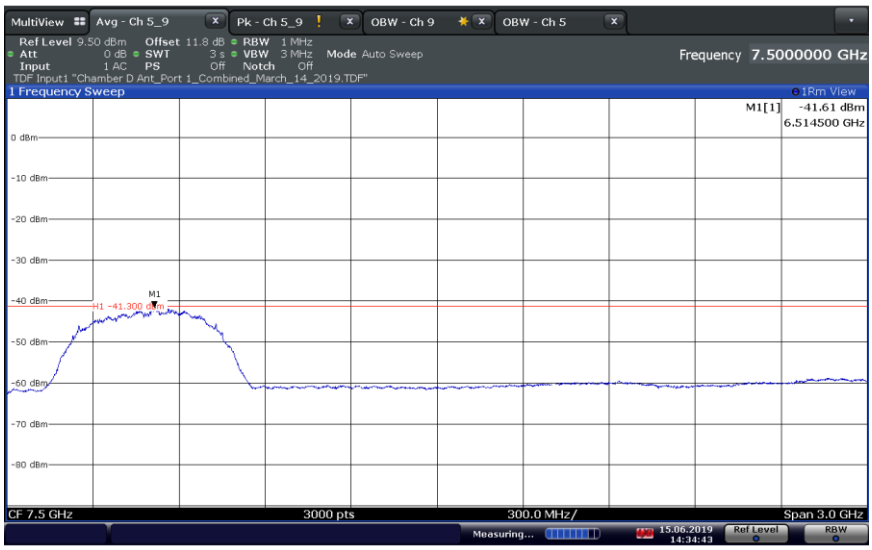

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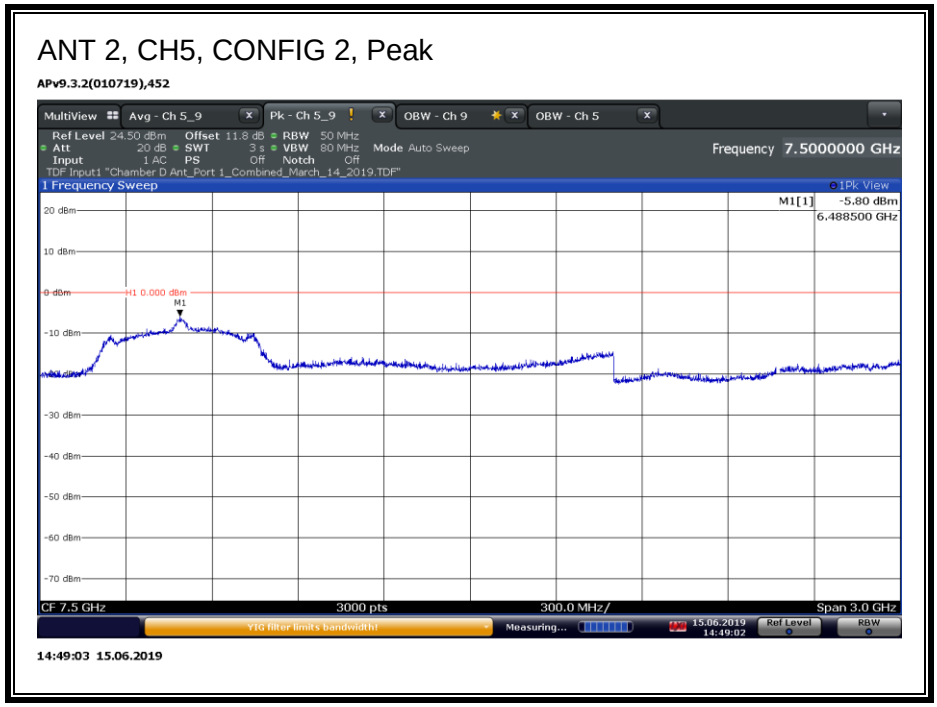

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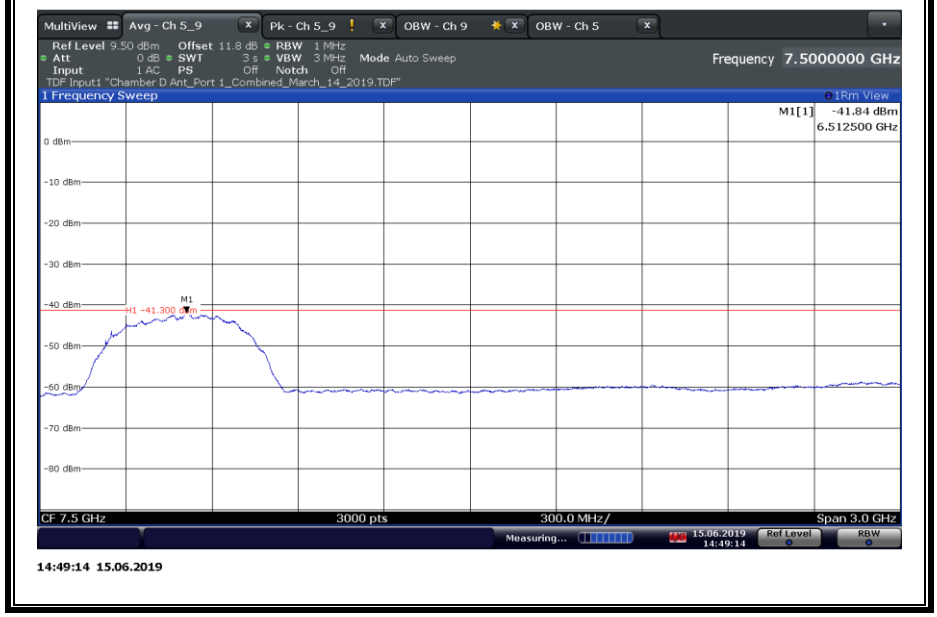
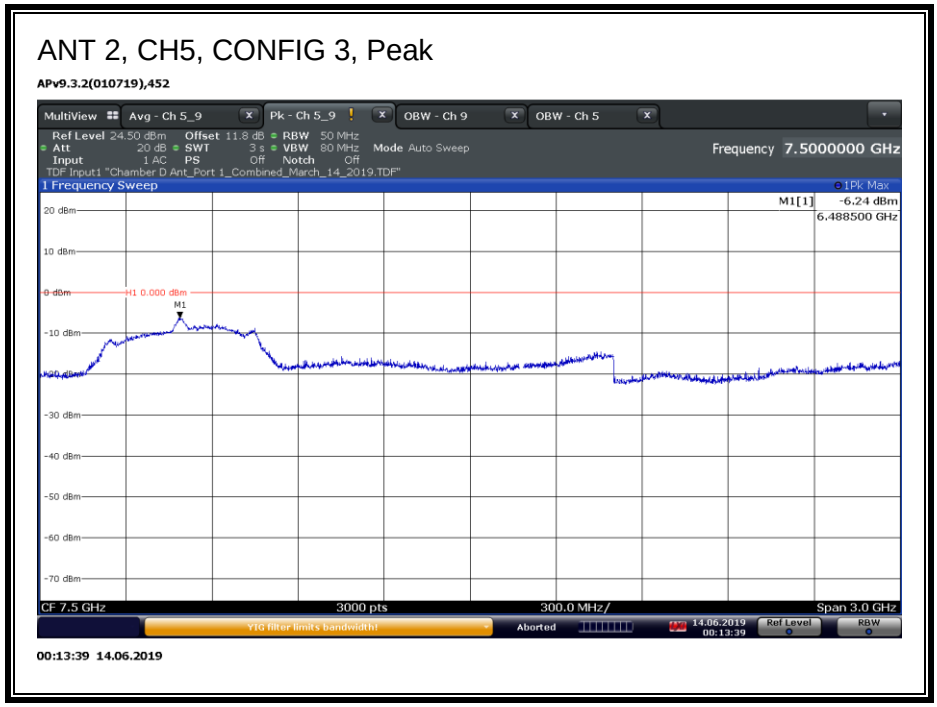


ANT 2, CH5, CONFIG 3, Peak



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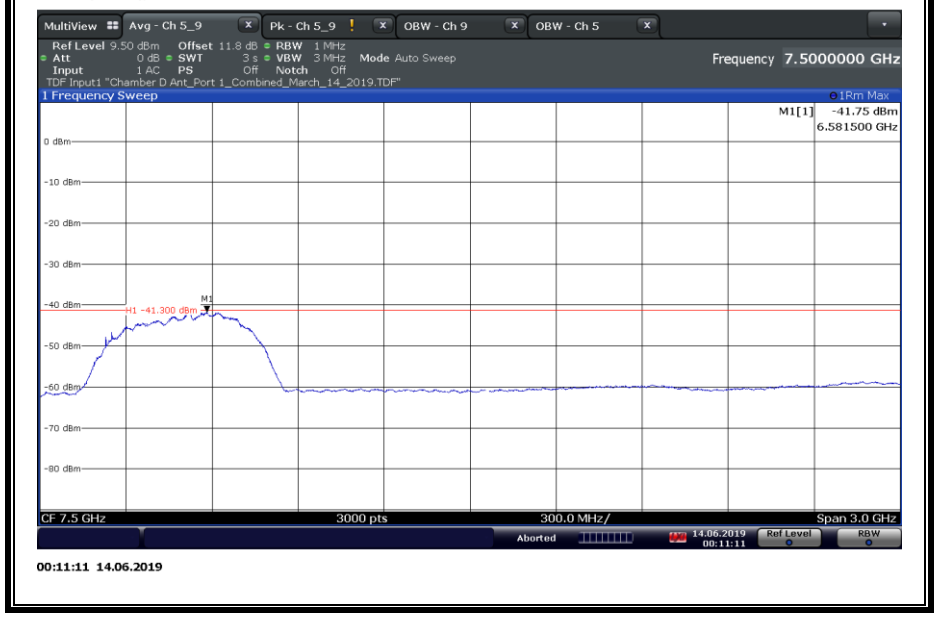

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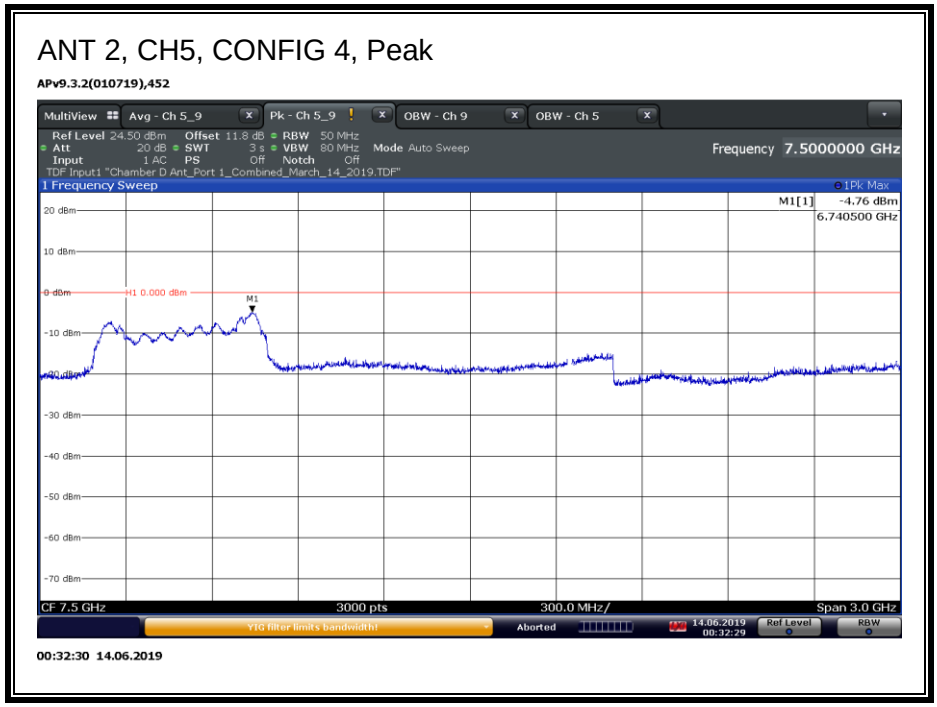
ANT 2, CH5, CONFIG 4, Peak



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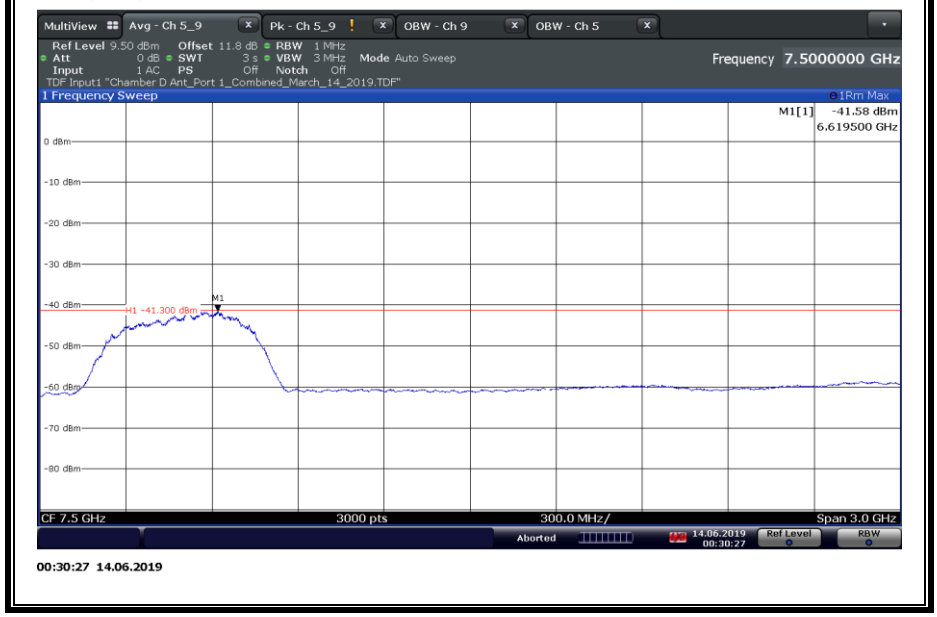
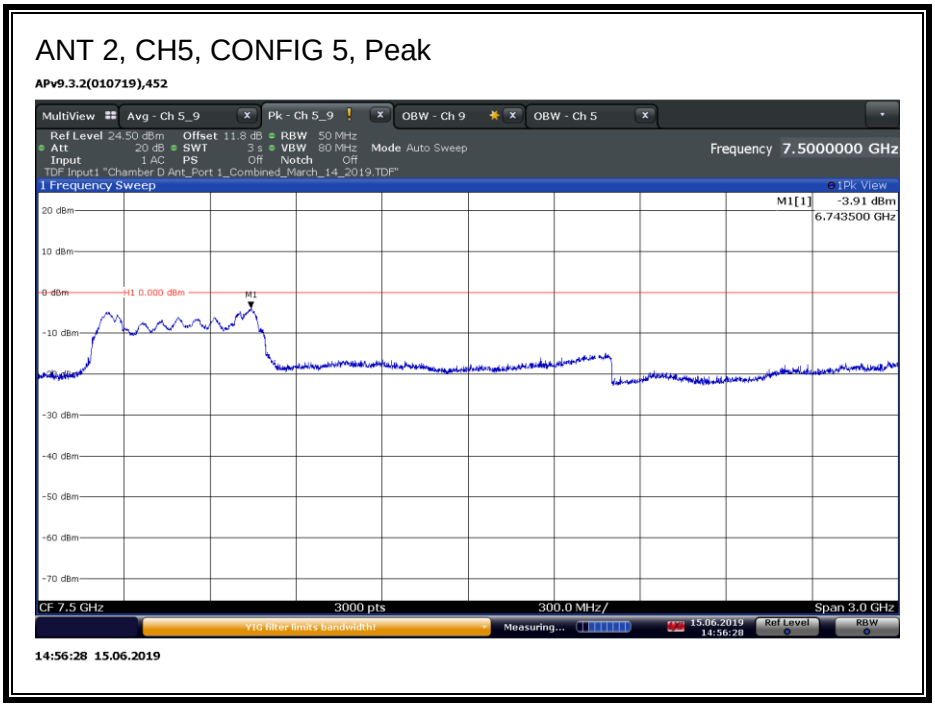


ANT 2, CH5, CONFIG 5, Peak



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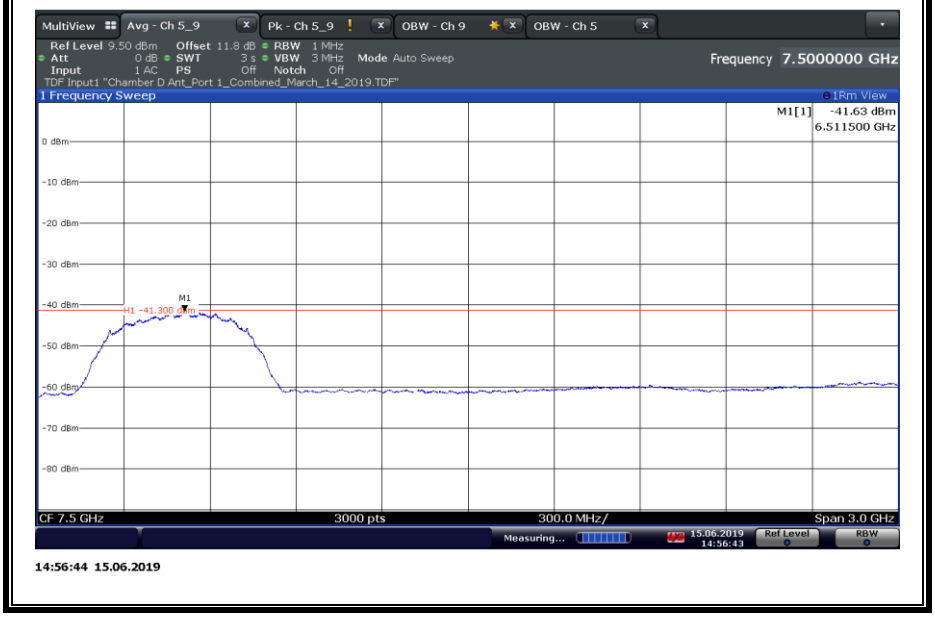

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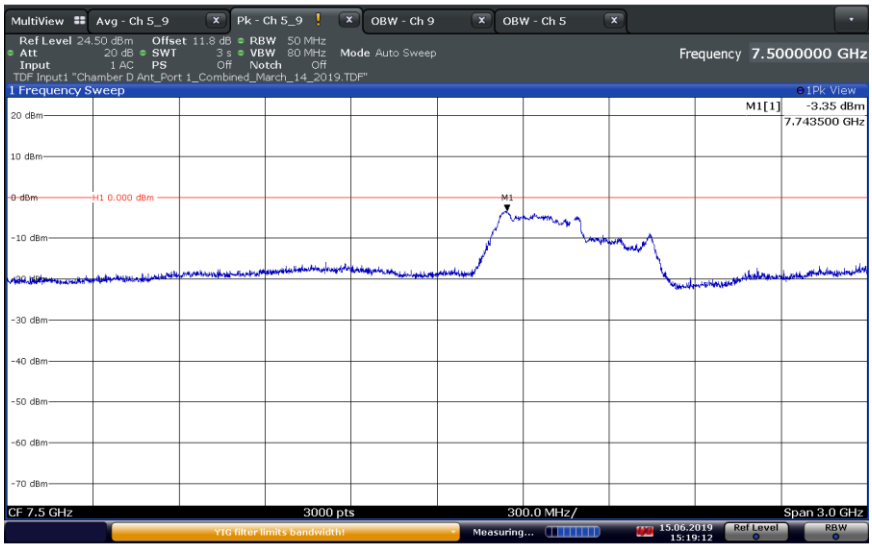
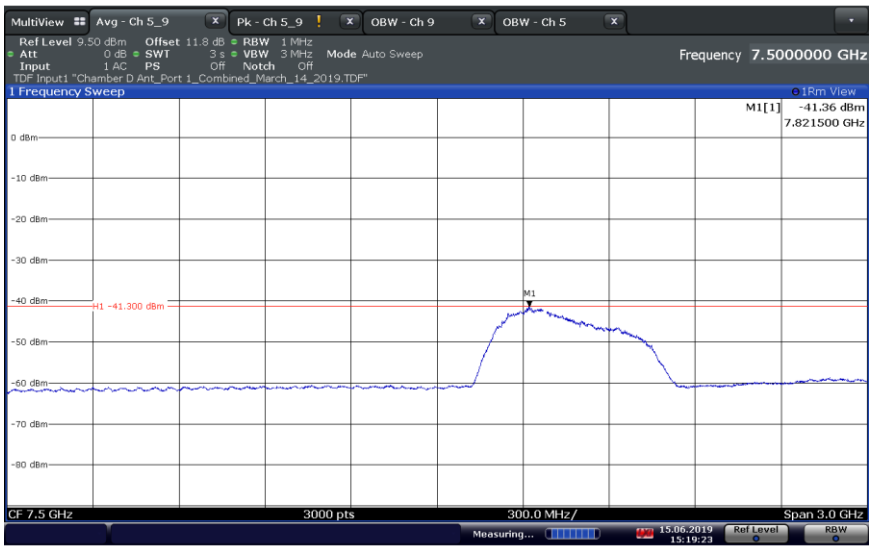
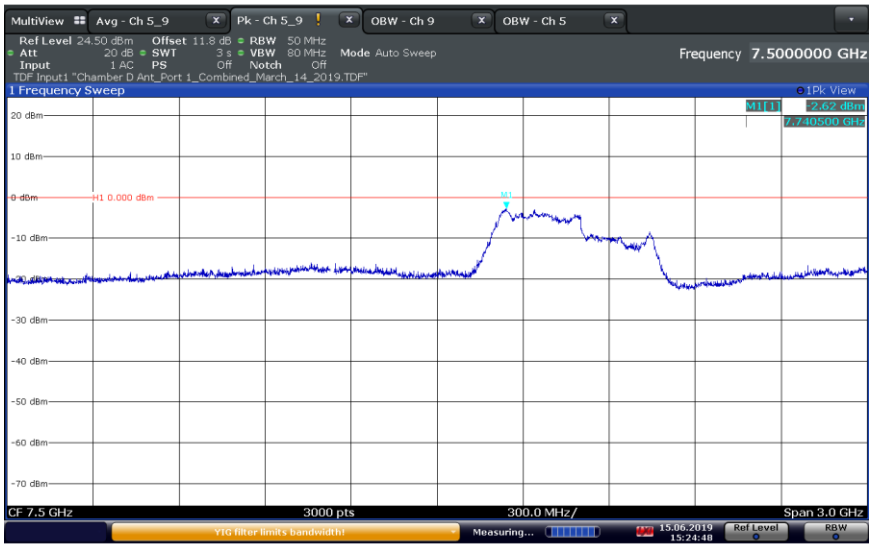


ANT 2, CH9, CONFIG 0, Avg.



ANT 2, CH9, CONFIG 1, Peak



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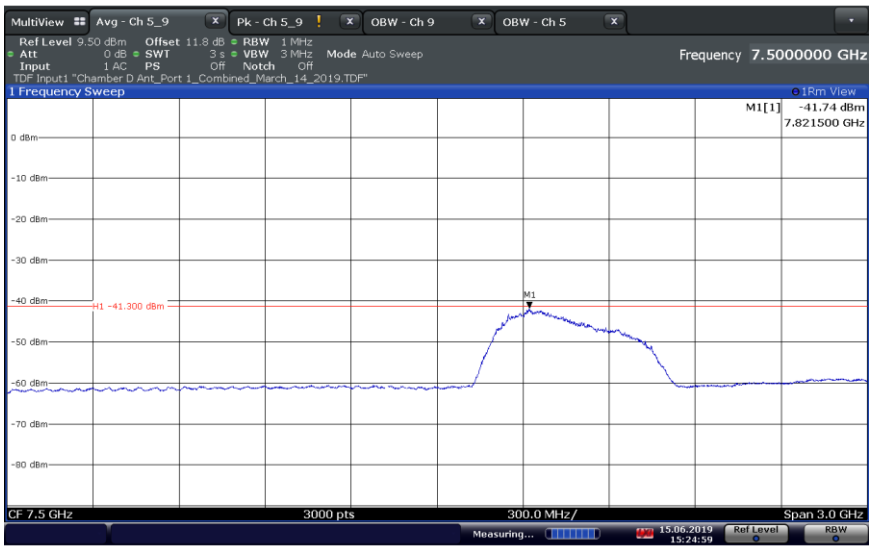

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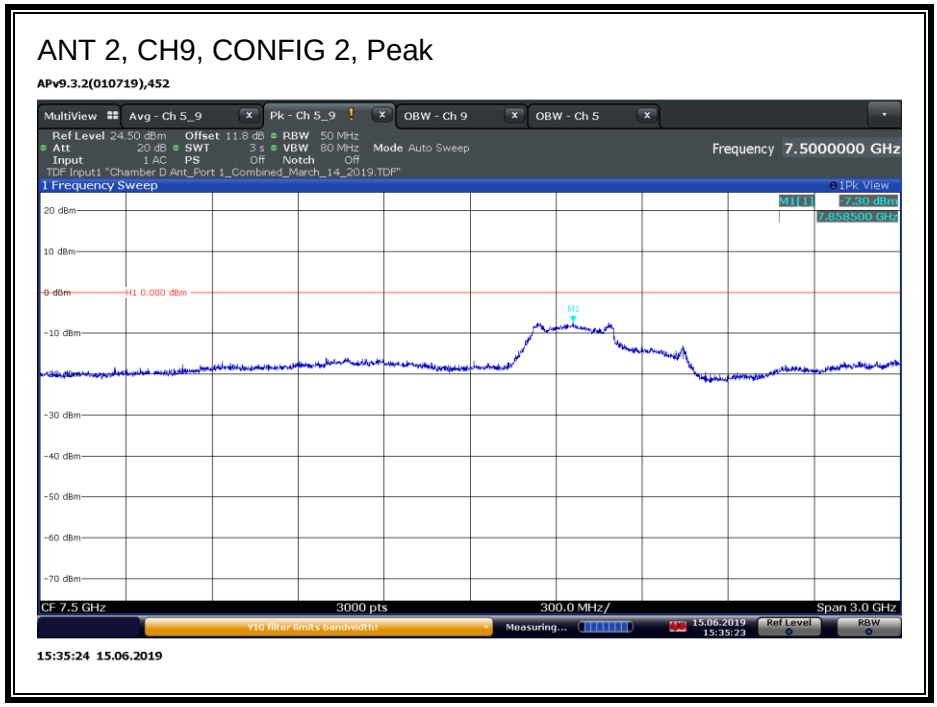

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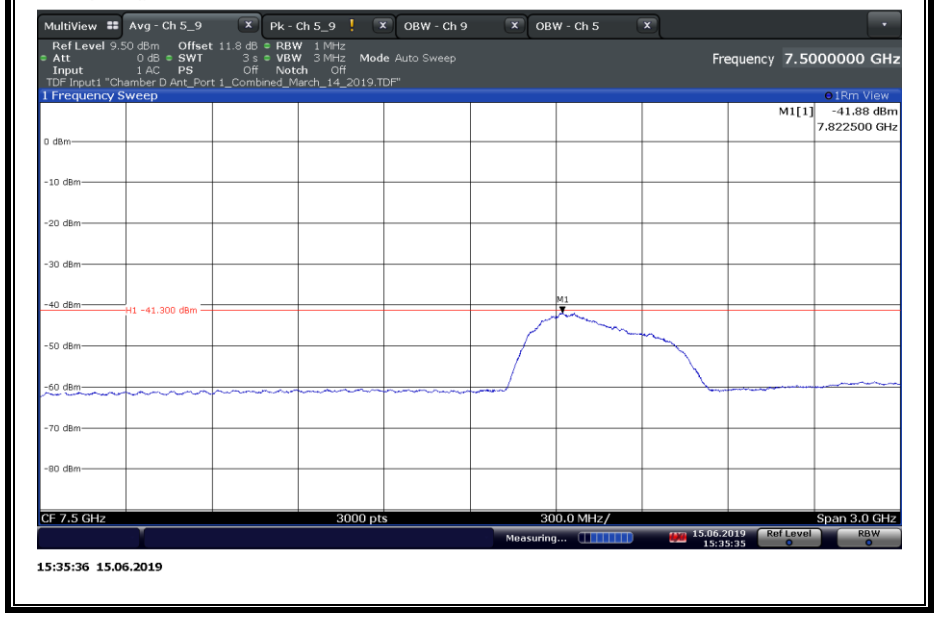
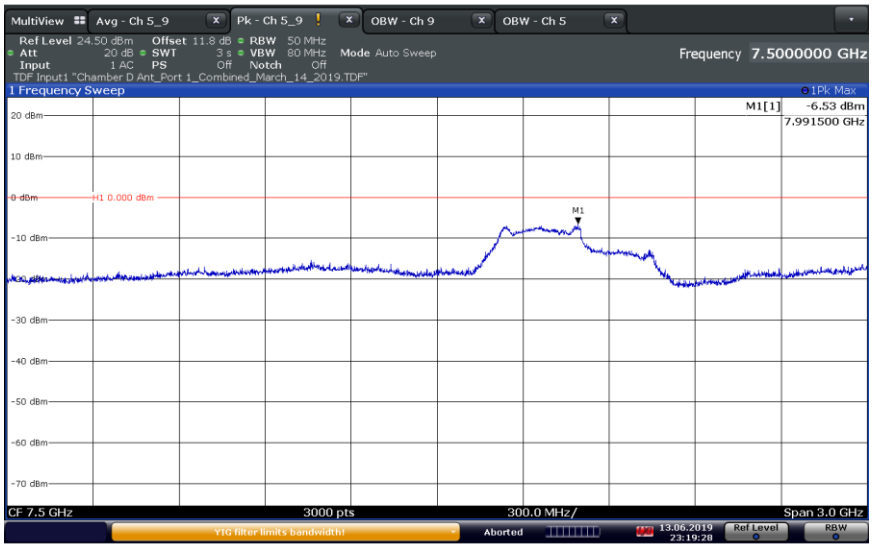


ANT 2, CH9, CONFIG 3, Peak



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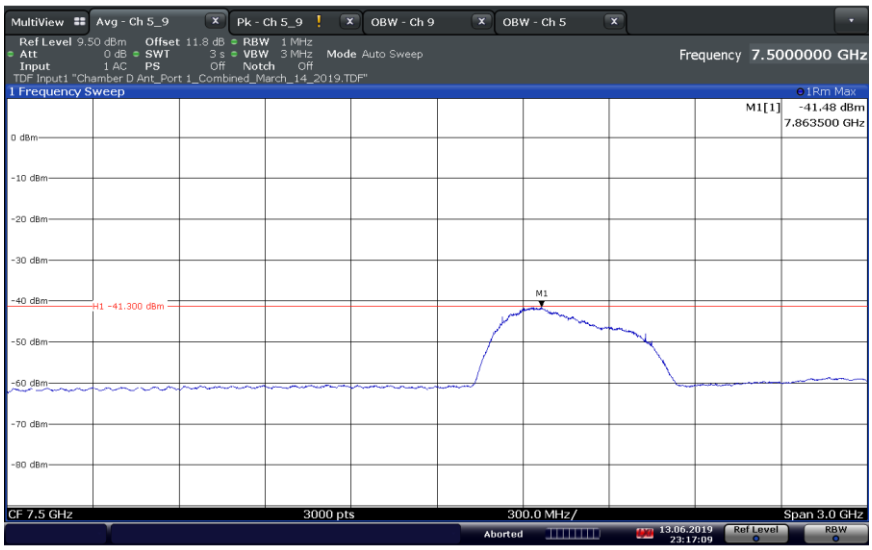
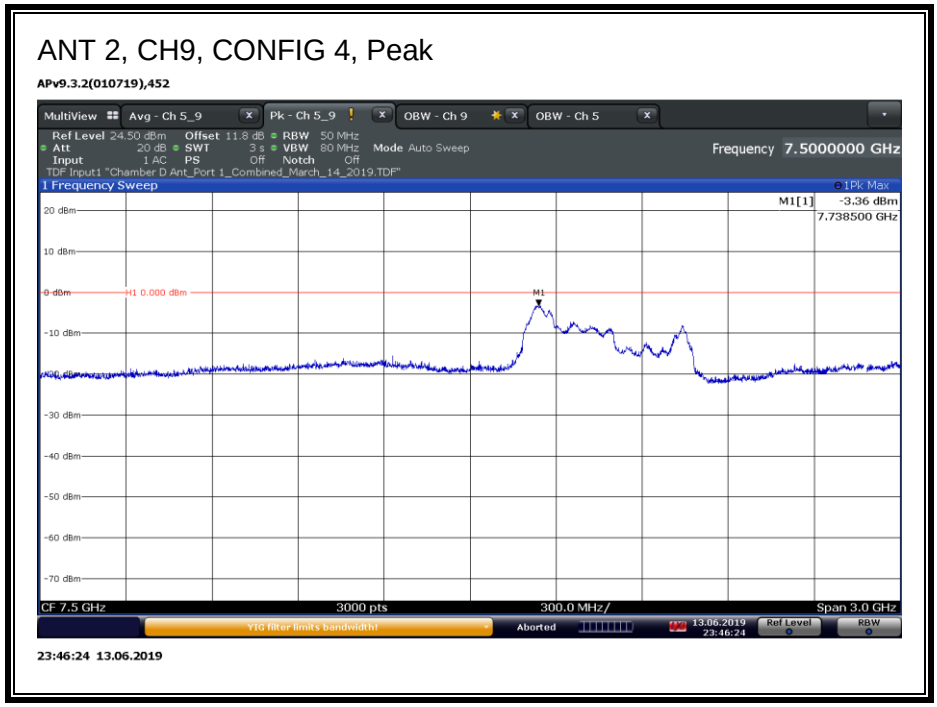


ANT 2, CH9, CONFIG 4, Peak



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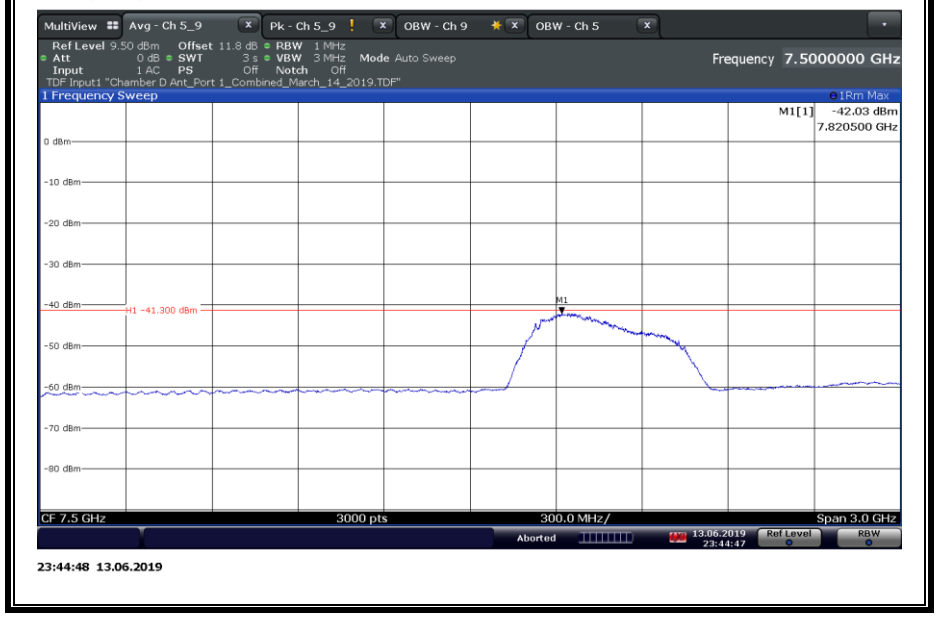
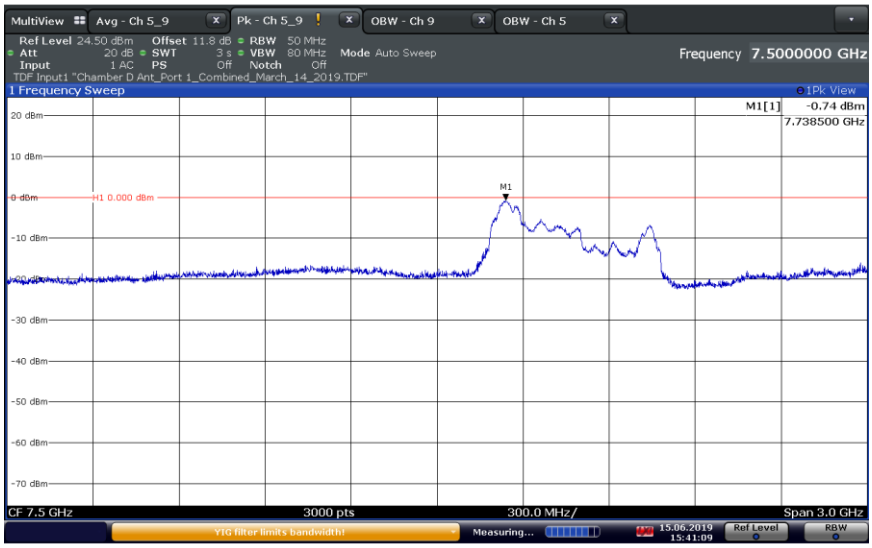


ANT 2, CH9, CONFIG 5, Peak



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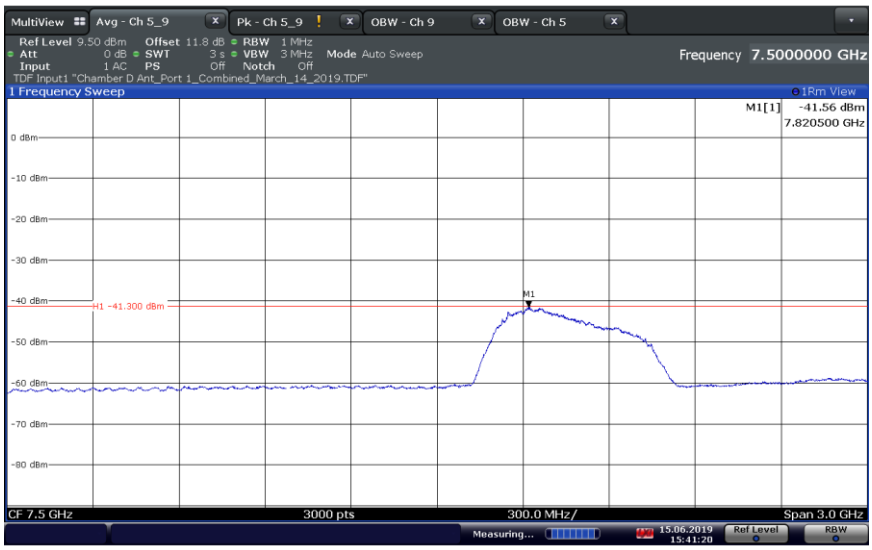
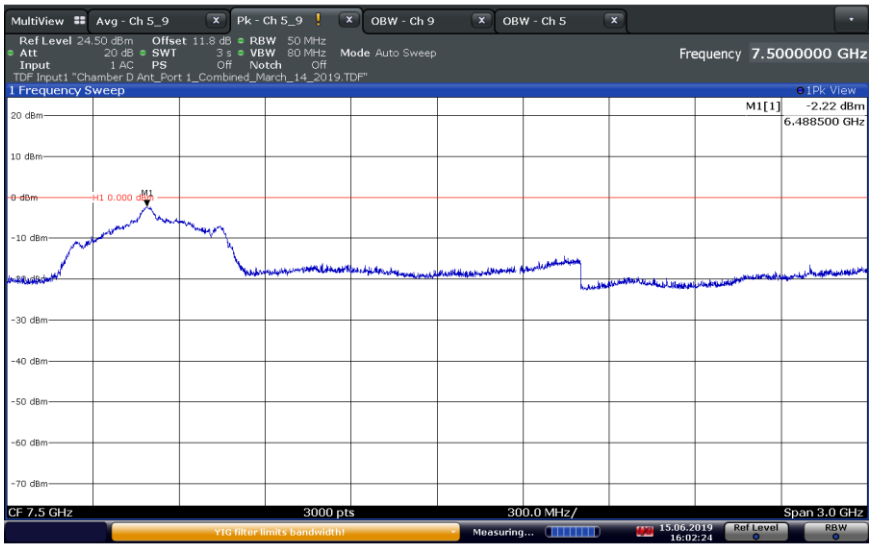
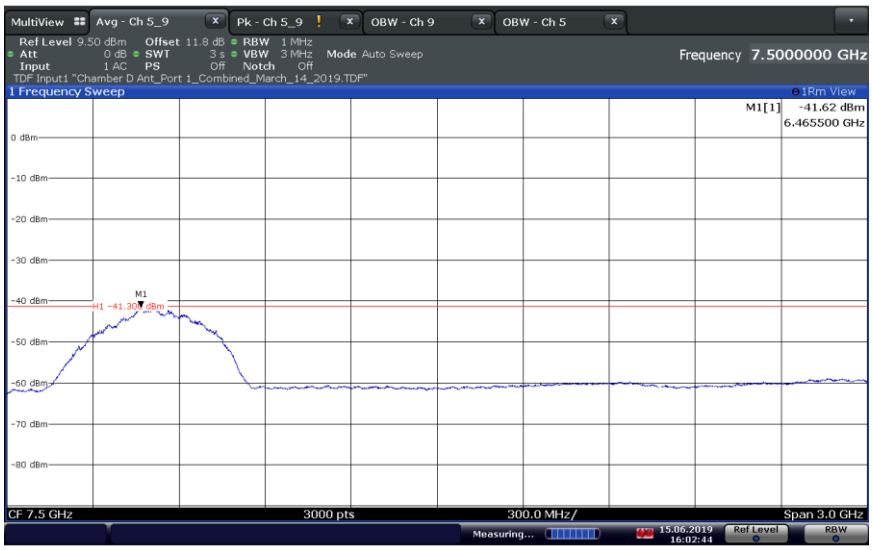


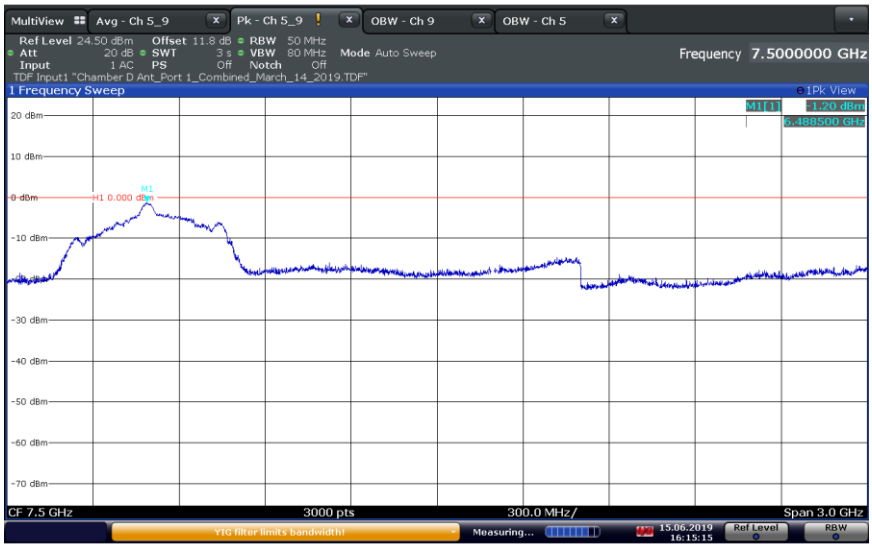
ANT 3, CH5, CONFIG 0, Peak



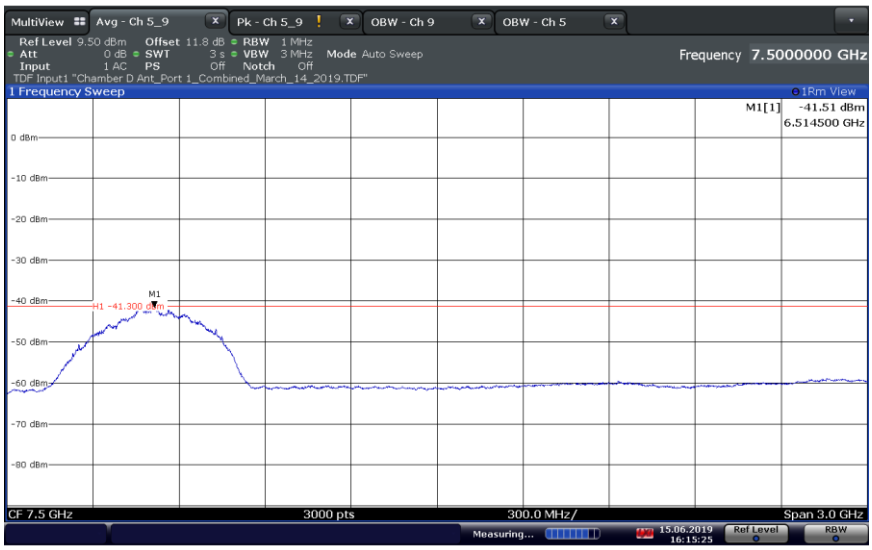
ANT 3, CH5, CONFIG 0, Avg.



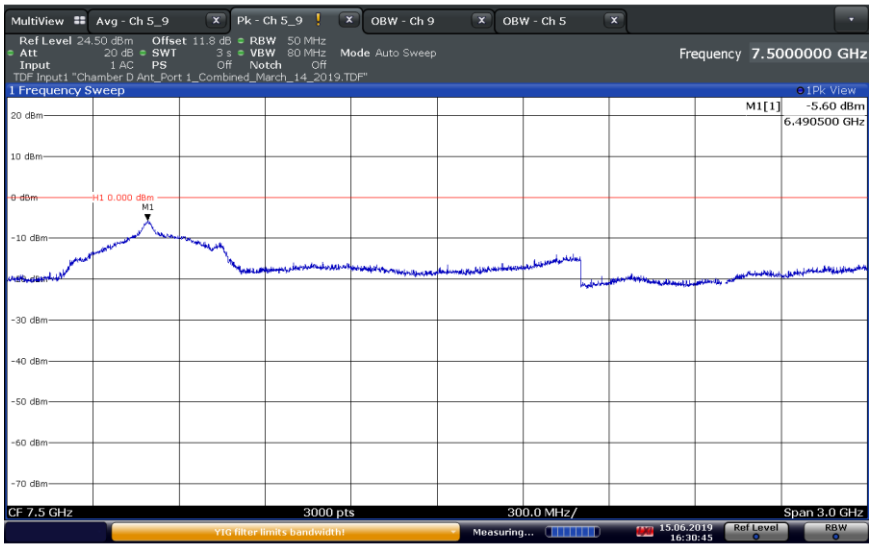
ANT 3, CH5, CONFIG 1, Peak



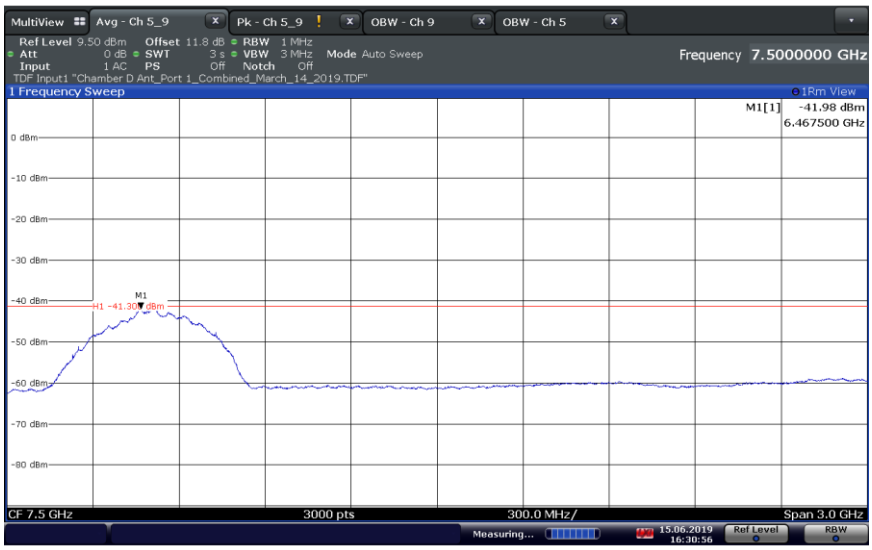
ANT 3, CH5, CONFIG 1, Avg.



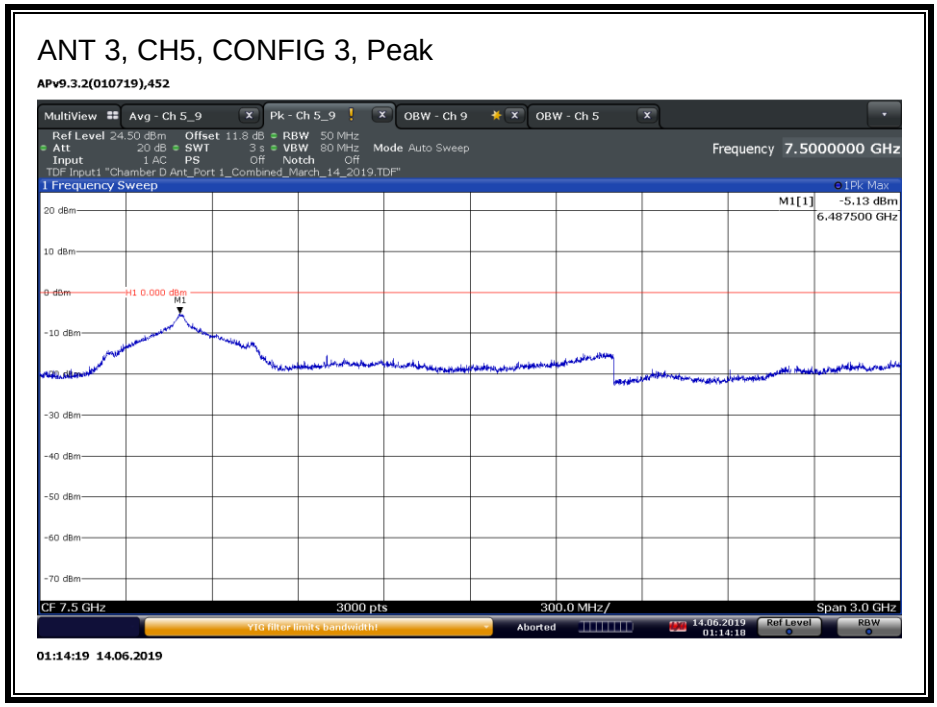
ANT 3, CH5, CONFIG 2, Peak



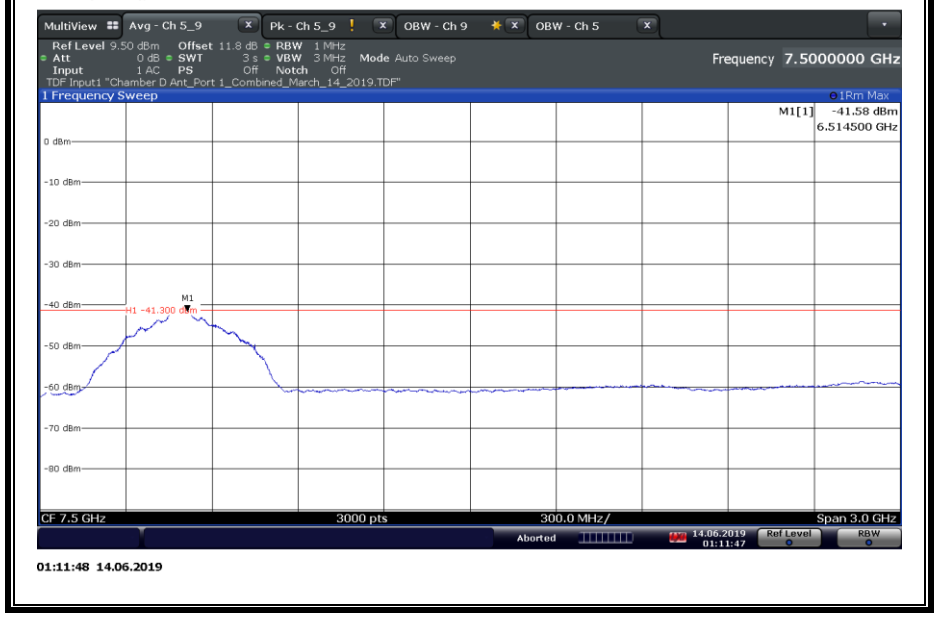
ANT 3, CH5, CONFIG 2, Avg.



ANT 3, CH5, CONFIG 3, Peak



ANT 3, CH5, CONFIG 3 , Avg.



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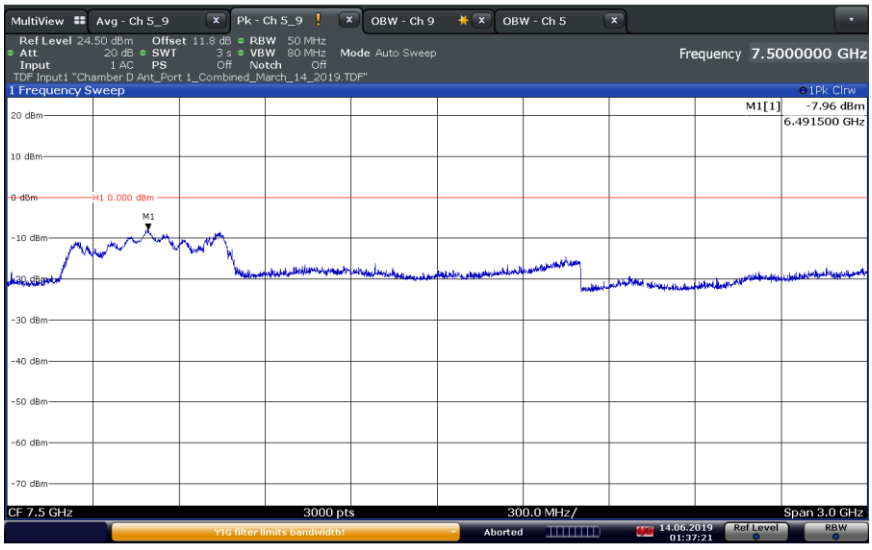

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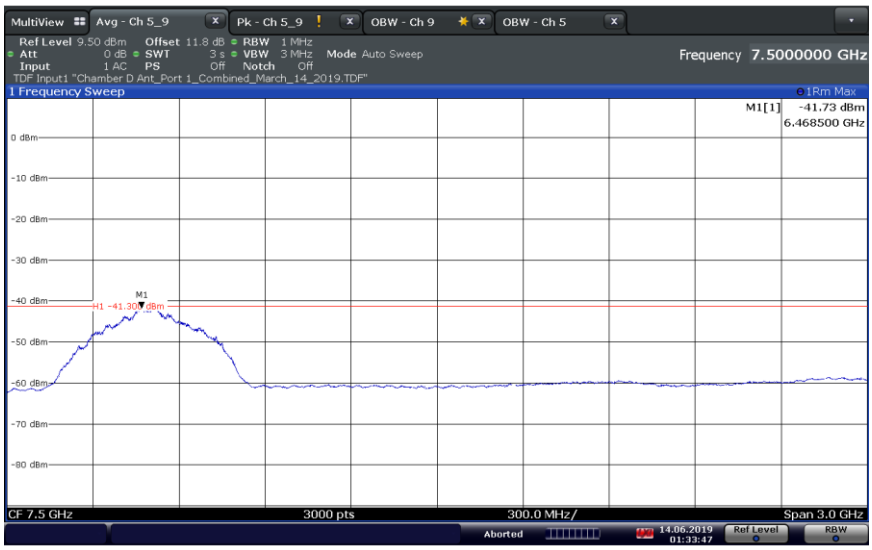
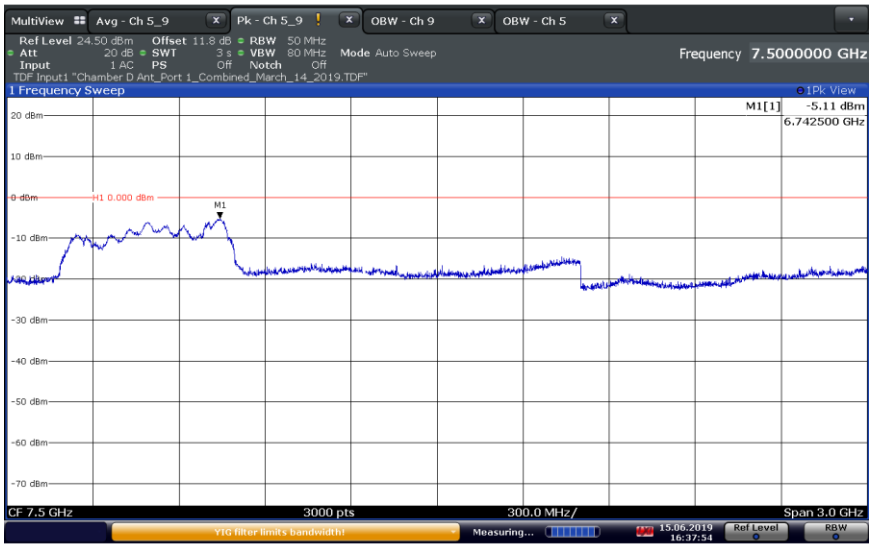
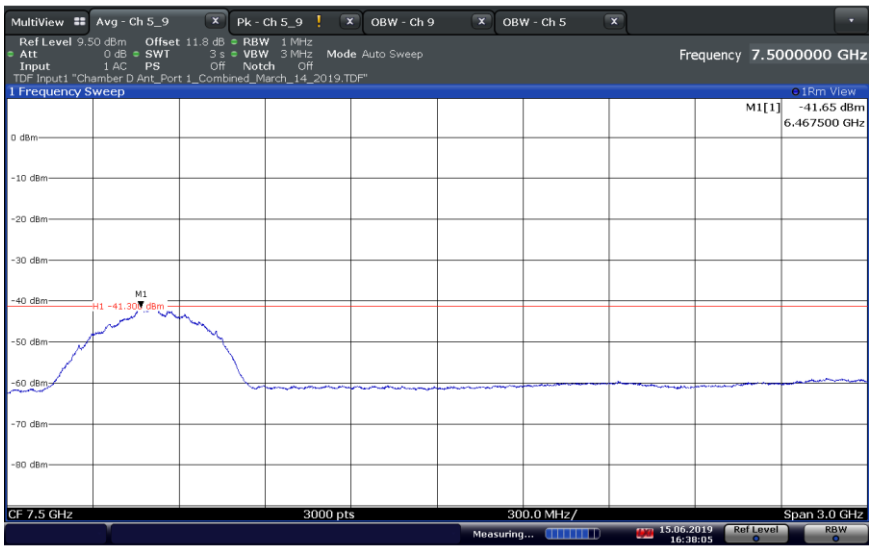


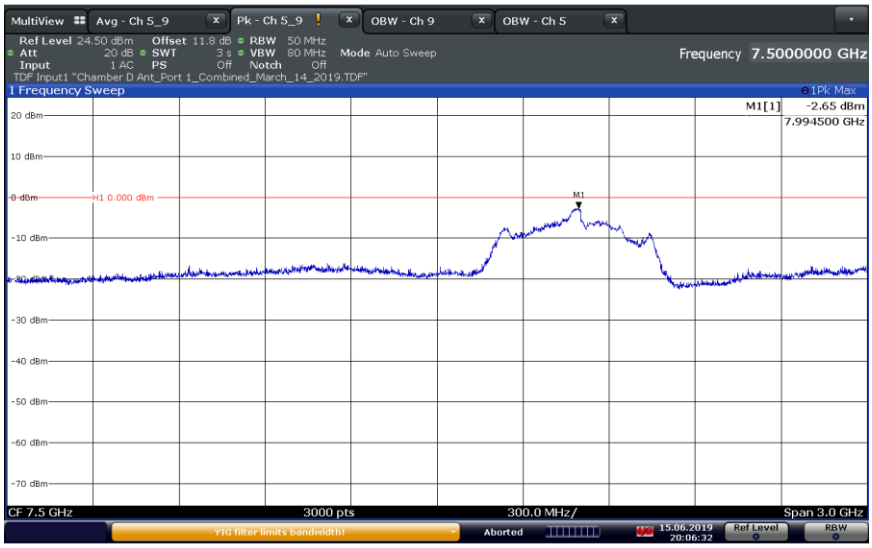
ANT 3, CH5, CONFIG 5, Peak



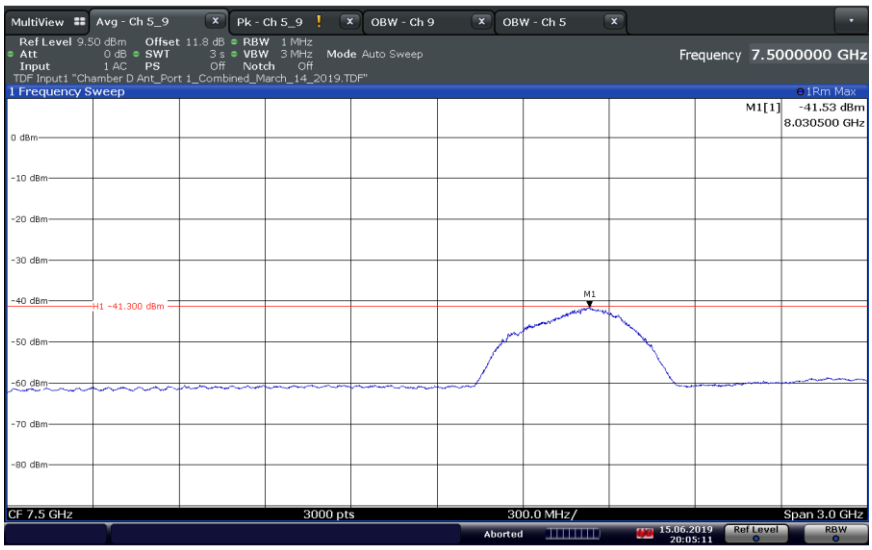
ANT 3, CH5, CONFIG 5, Avg.



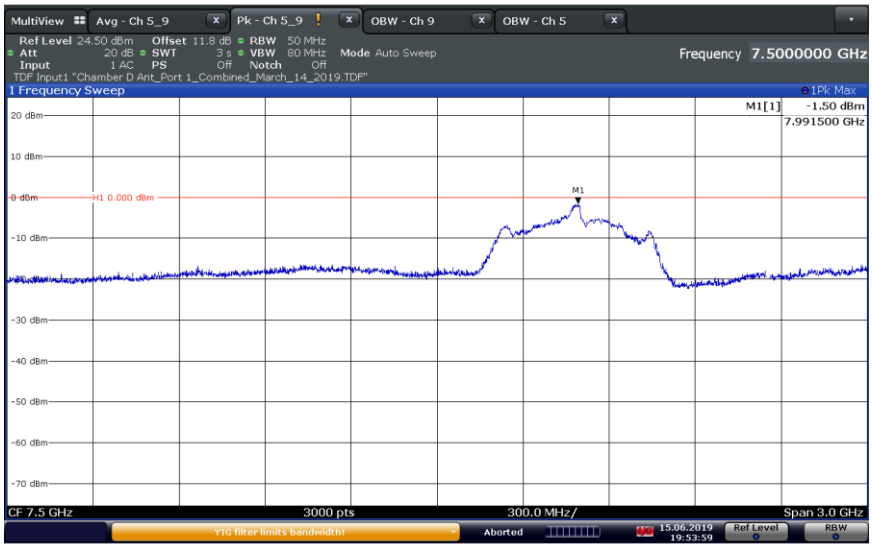
ANT 3, CH9, CONFIG 0, Peak



ANT 3, CH9, CONFIG 0, Avg.

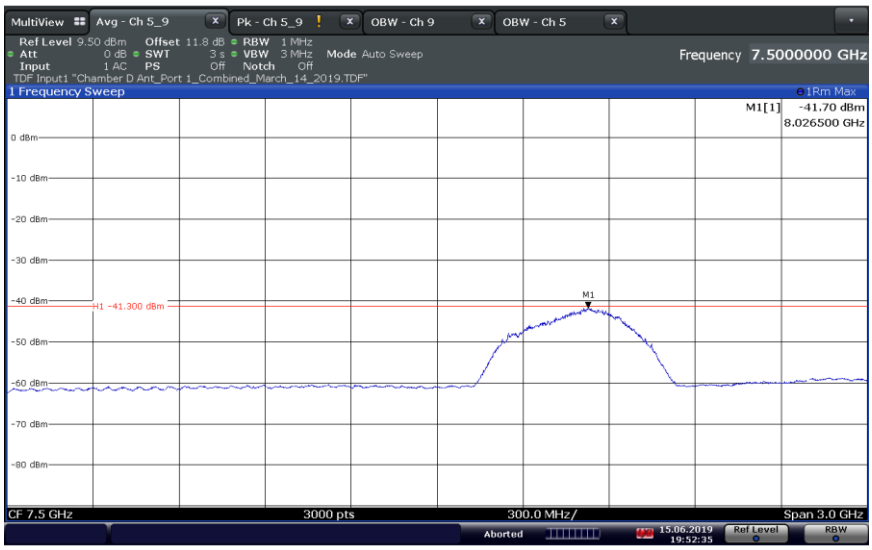


ANT 3, CH9, CONFIG 1, Peak



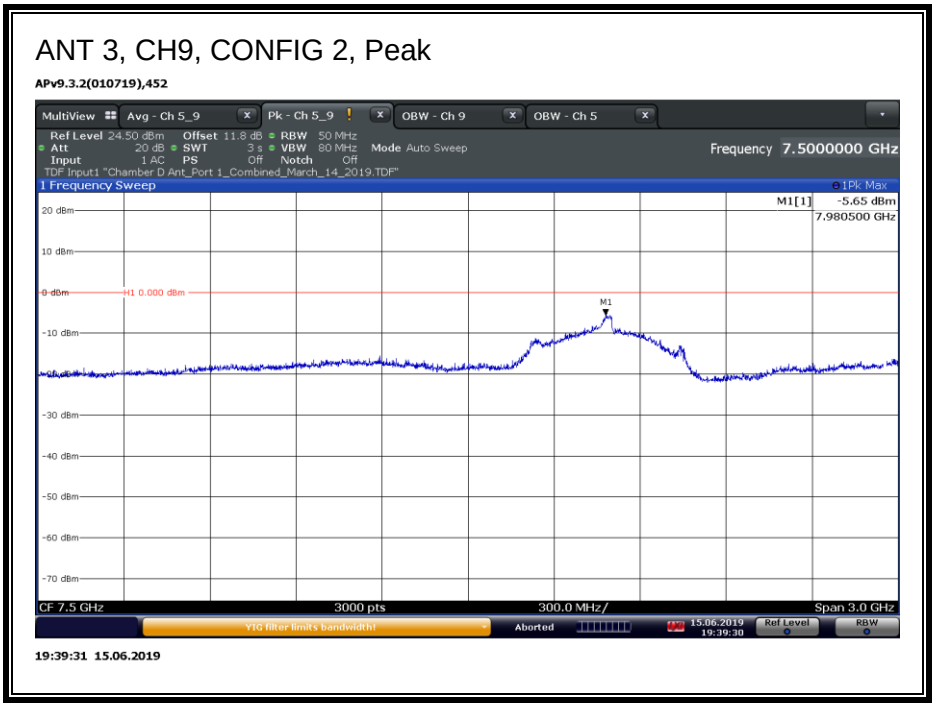
19:54:00 15.06.2019

ANT 3, CH9, CONFIG 1, Avg.

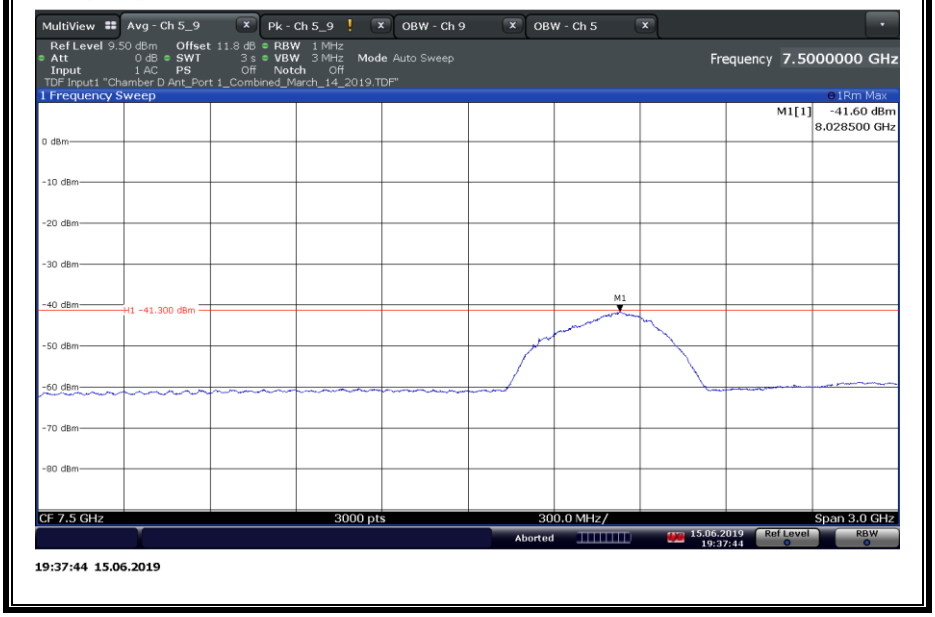


19:52:35 15.06.2019

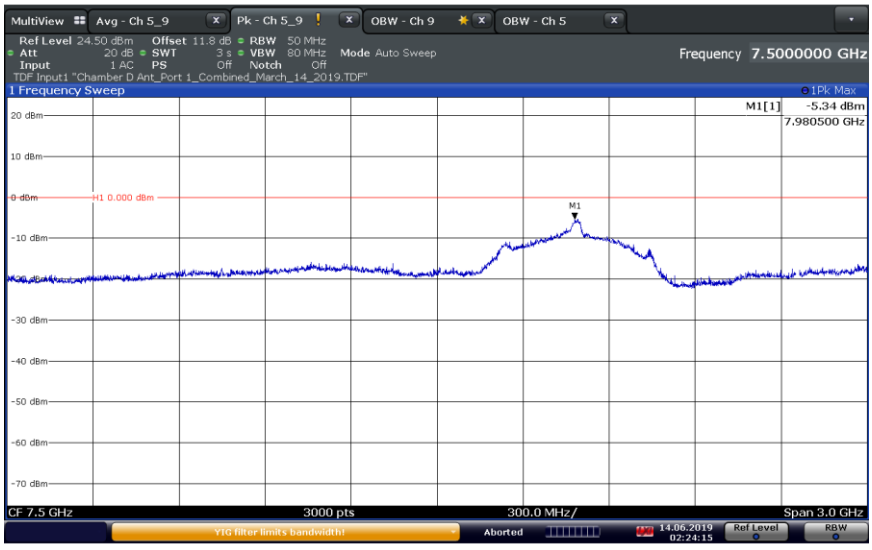
ANT 3, CH9, CONFIG 2, Peak



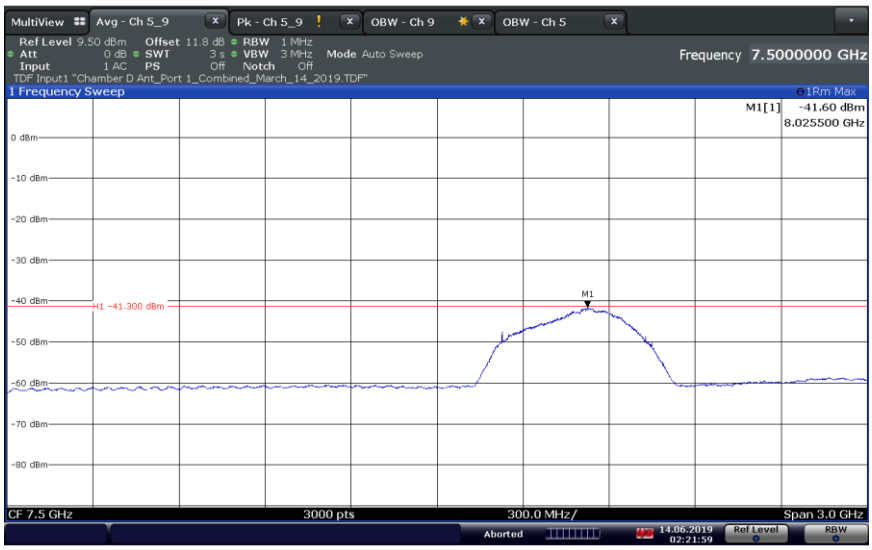
ANT 3, CH9, CONFIG 2 , Avg.



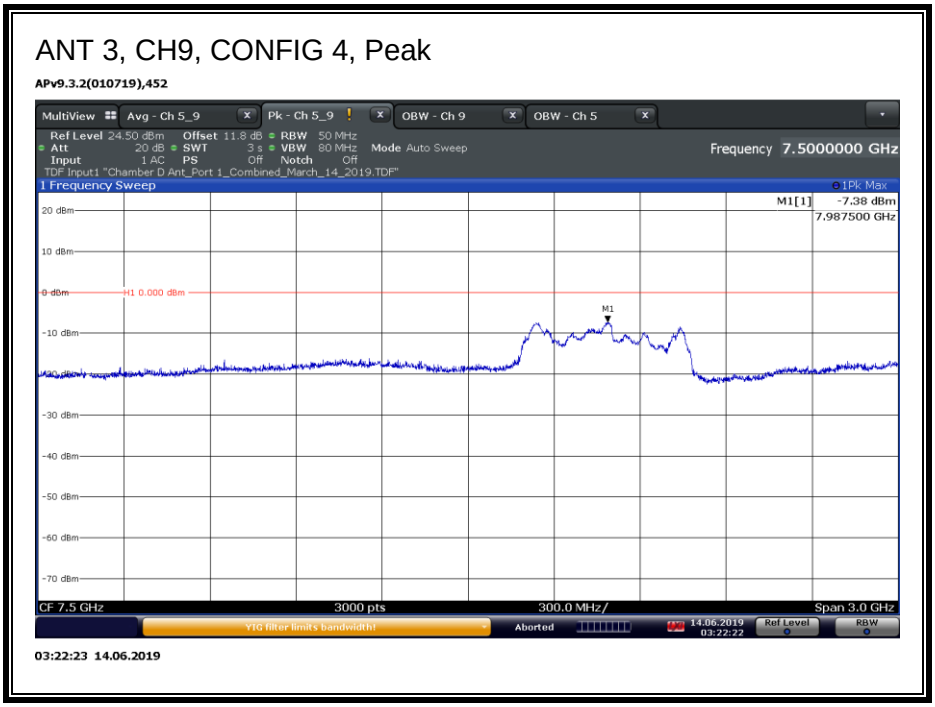
ANT 3, CH9, CONFIG 3, Peak



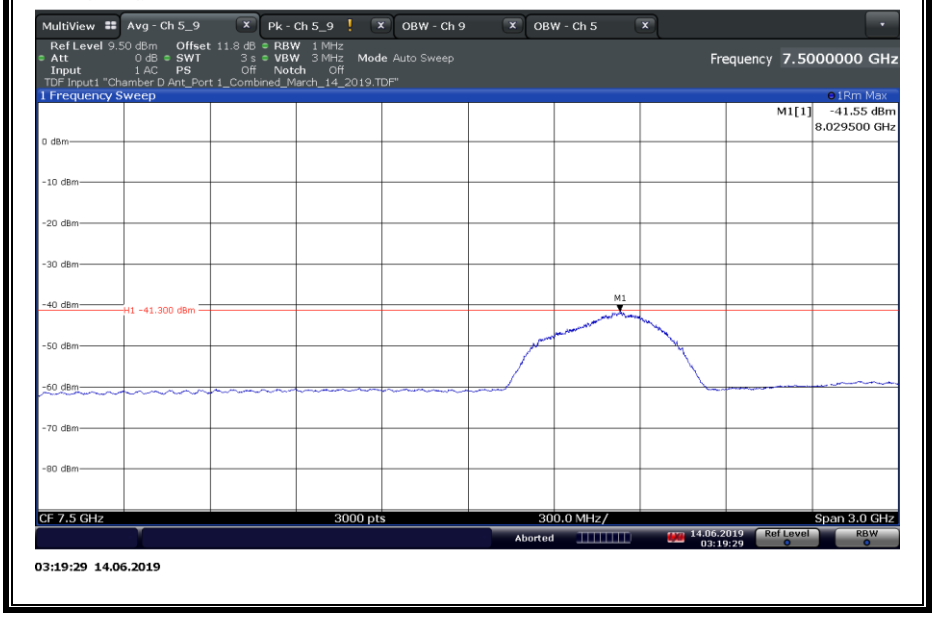
ANT 3, CH9, CONFIG 3, Avg.



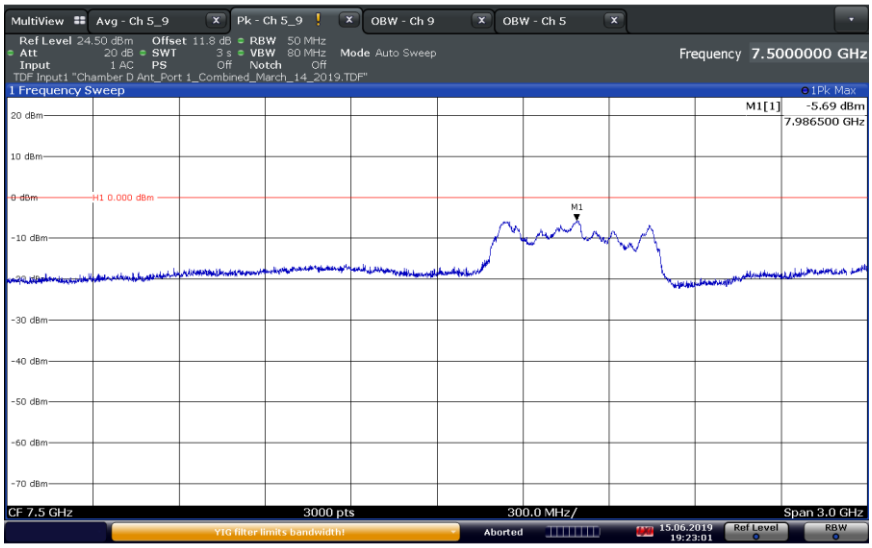
ANT 3, CH9, CONFIG 4, Peak



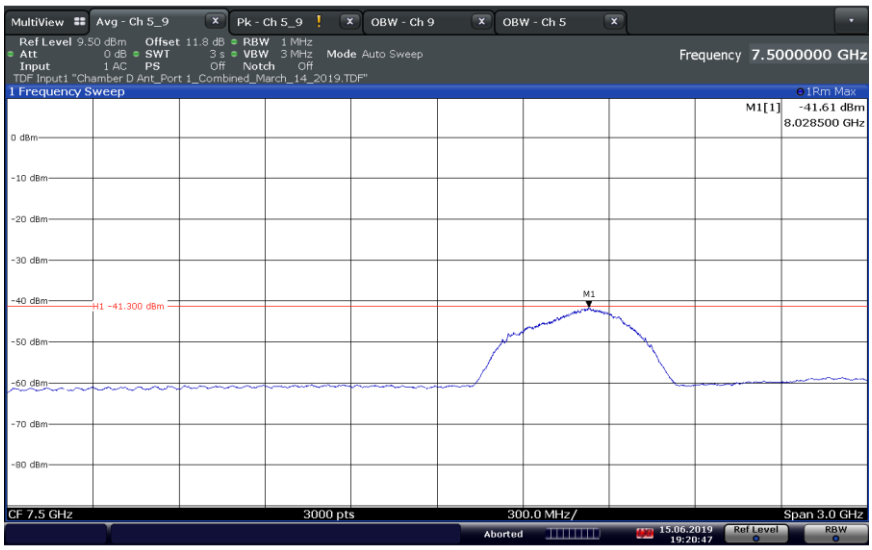
ANT 3, CH9, CONFIG 4 , Avg.



ANT 3, CH9, CONFIG 5, Peak



ANT 3, CH9, CONFIG 5, Avg.



8.3. CESSATION TIME

LIMIT

§15.519(a)(1) A UWB device operating under the provisions of this section shall transmit only when it is sending information to an associated receiver. The UWB intentional radiator shall cease transmission within 10 seconds unless it receives an acknowledgement from the associated receiver that its transmission is being received. An acknowledgment of reception must continue to be received by the UWB intentional radiator at least every 10 seconds or the UWB device must cease transmitting.

TEST PROCEDURES

Transmissions are monitored for two cases:

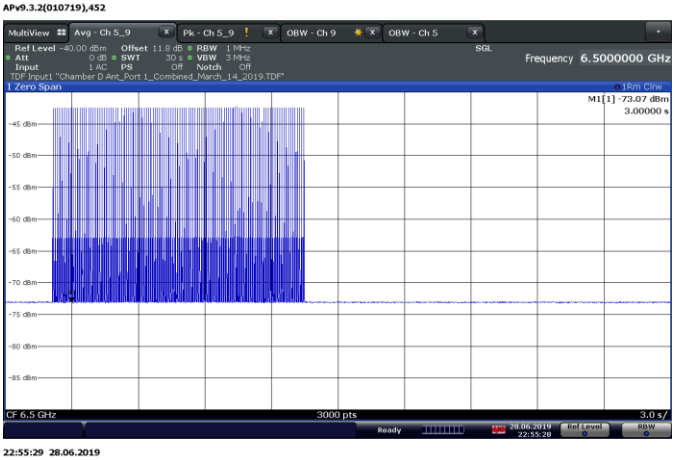
1. The smart phone ends the UWB link.
2. The EUT ends the UWB link.

RESULTS

Signal Levels on all Plots

- EUT is High Amplitude
- Smart Phone is Low Amplitude

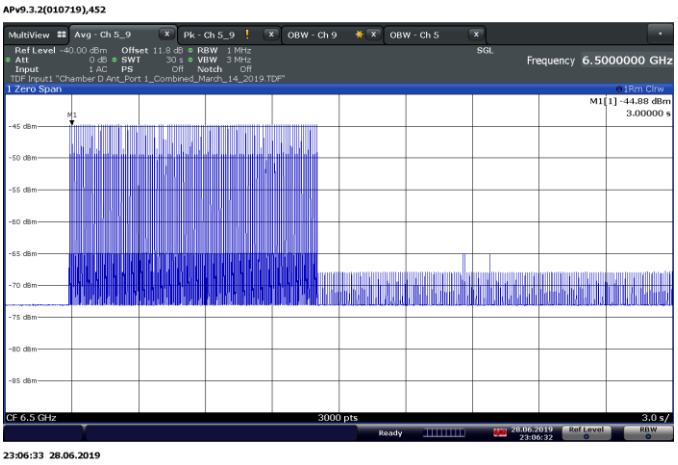
Case 1: Smart Phone ends the UWB link



RESULT

- All devices, including the EUT, cease transmissions

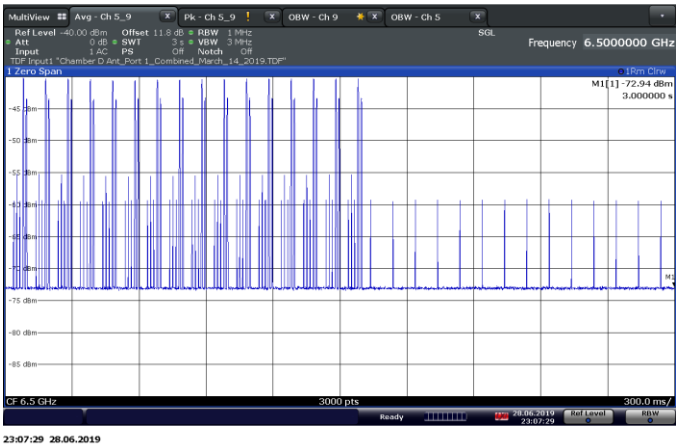
Case 2: EUT ends the UWB link



RESULT

- EUT ends the link, Smart Phone stops Acknowledgements but continues Polling
    - EUT ceases transmissions, does not respond to Polling Signals

Zoom-in Plot during On-Off Transition



RESULT

- Shows Link Traffic, Acknowledgements and Polling Signals while Link is established
- Shows Polling Signals after Link has ended

8.4. AVERAGE EMISSIONS

LIMIT

§15.519 (3)(c) The radiated emissions at or below 960 MHz from a device operating under the provisions of this section shall not exceed the emission levels in §15.209. The radiated emissions above 960 MHz from a device operating under the provisions of this section shall not exceed the following average limits when measured using a resolution bandwidth of 1 MHz:

15.209 (a)

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

15.519 (3)(c)

Frequency in MHz	EIRP in dBm
960-1610	−75.3
1610-1990	−63.3
1990-3100	−61.3
3100-10600	−41.3
Above 10600	−61.3

§15.519 (3)(d) In addition to the radiated emission limits specified in the table in paragraph (c) of this section, UWB transmitters operating under the provisions of this section shall not exceed the following average limits when measured using a resolution bandwidth of no less than 1 kHz:

Frequency in MHz	EIRP in dBm
1164-1240	−85.3
1559-1610	−85.3

TEST PROCEDURE

ANSI C63.10 Clause 10.2 and 10.3.

PROCEDURE FOR 9 kHz TO 960 MHz

Measurements are made with the antenna feeding a spectrum analyzer via a preamplifier and cables, at a maximum distance of 3m from the EUT.

PROCEDURE FOR 960 MHz TO 6 GHz

Measurements are made with the antenna feeding a spectrum analyzer via a preamplifier and cables, at a maximum distance of 0.5m from the EUT.

A low pass filter with a cut off frequency of 6 GHz is used to suppress the fundamental and perform measurement for 0.96 - 6 GHz.

RESULTS FOR 6 GHz TO 9 GHz

The 6 - 9 GHz frequency band is covered in Section 8.2.

PROCEDURE FOR 9 GHz TO 18 GHz

Measurements are made with the antenna feeding a spectrum analyzer via a preamplifier and cables, at a maximum distance of 0.5m from the EUT.

A high pass filter with pass band frequency beyond 9 GHz is used to suppress the fundamental and perform measurement for 9 - 18 GHz.

PROCEDURE FOR 1.164 TO 1.240 GHz

Measurements are made with the antenna feeding a spectrum analyzer via a preamplifier and cables, at a maximum distance of 0.5m from the EUT.

RBW = 120kHz & VBW = 360 kHz were used at pre-scan.

PROCEDURE FOR 1.559 – 1.610 GHz

Measurements are made with the antenna feeding a spectrum analyzer via a preamplifier and cables, at a maximum distance of 0.5m from the EUT.

RBW = 120kHz & VBW = 360 kHz were used at pre-scan.

PROCEDURE FOR 18 GHz TO 40 GHz

Measurements are made with the antenna feeding a spectrum analyzer via a preamplifier and cables, at a maximum distance of 0.5m from the EUT.

A final test is made at any frequencies at which emissions are found. During this final scan, the antenna is kept no further from the EUT than the maximum distance calculated for each band that yields a minimum system noise floor.

Distance Correction Factor from 3m to 0.5m = 20*log(0.5m/3m) = -15.56 dB

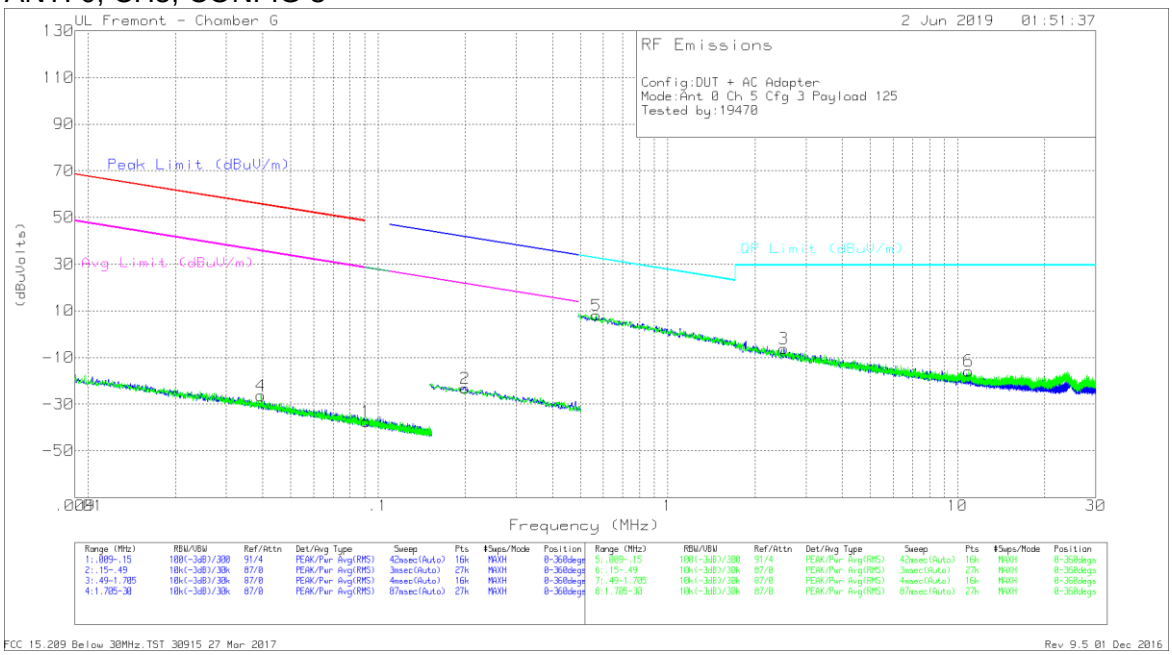
RESULTS

AVERAGE Emissions Summary

					Frequency Range						
Ant	CH	Config	Payload	Power Setting	9 kHz - 30 MHz	30 - 960 MHz	1164 - 1240 MHz	1559 - 1610 MHz	0.96 - 18 GHz	18 - 26 GHz	26 - 40 GHz
0	5	3	125	Max	PASS	PASS	PASS	PASS	PASS	PASS	PASS
0	9	3	125	Max	PASS	PASS	PASS	PASS	PASS	PASS	PASS
1	5	3	125	Max	PASS	PASS	PASS	PASS	PASS	PASS	PASS
1	9	3	125	Max	PASS	PASS	PASS	PASS	PASS	PASS	PASS
2	5	3	125	Max	PASS	PASS	PASS	PASS	PASS	PASS	PASS
2	9	3	125	Max	PASS	PASS	PASS	PASS	PASS	PASS	PASS
3	5	3	125	Max	PASS	PASS	PASS	PASS	PASS	PASS	PASS
3	9	3	125	Max	PASS	PASS	PASS	PASS	PASS	PASS	PASS

8.4.1. AVERAGE EMISSIONS, 9 kHz – 30 MHz

ANT. 0, CH5, CONFIG 3



Trace Markers

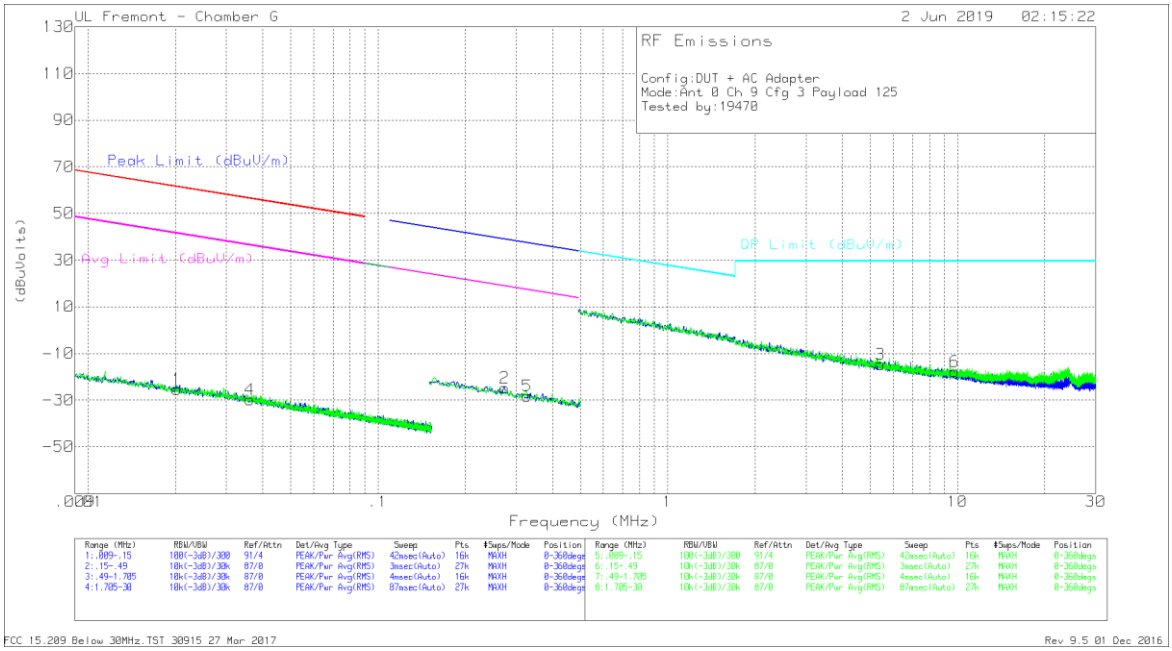
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Loop Antenna (dB/m)	Cables (dB)	Dist Corr 300 m	Corrected Reading (dBuVolts)	Peak Limit (dBuV/m)	Margin (dB)	Avg Limit (dBuV/m)	Margin (dB)	QP Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Avg Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
4	.03947	40.24	Pk	13.4	0	-80	-26.36	55.66	-82.02	35.66	-62.02	-	-	-	-	-	-	0-360
1	.09098	30.71	Pk	11.9	0	-80	-37.39	-	-	-	-	28.41	-65.8	-	-	-	-	0-360
2	.19984	45.48	Pk	11.2	.1	-80	-23.22	-	-	-	-	-	-	41.6	-64.82	21.6	-44.82	0-360

Pk - Peak detector

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Loop Antenna (dB/m)	Cables (dB)	Dist Corr 30m	Corrected Reading (dBuVolts)	QP Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
5	.56729	37.16	Pk	10.8	.1	-40	8.06	32.53	-24.47	0-360
3	2.51772	22.85	Pk	10.8	.2	-40	-6.15	29.5	-35.65	0-360
6	10.90696	13.3	Pk	10.5	.4	-40	-15.8	29.5	-45.3	0-360

Pk - Peak detector

ANT. 0, CH9, Config 3



Trace Markers

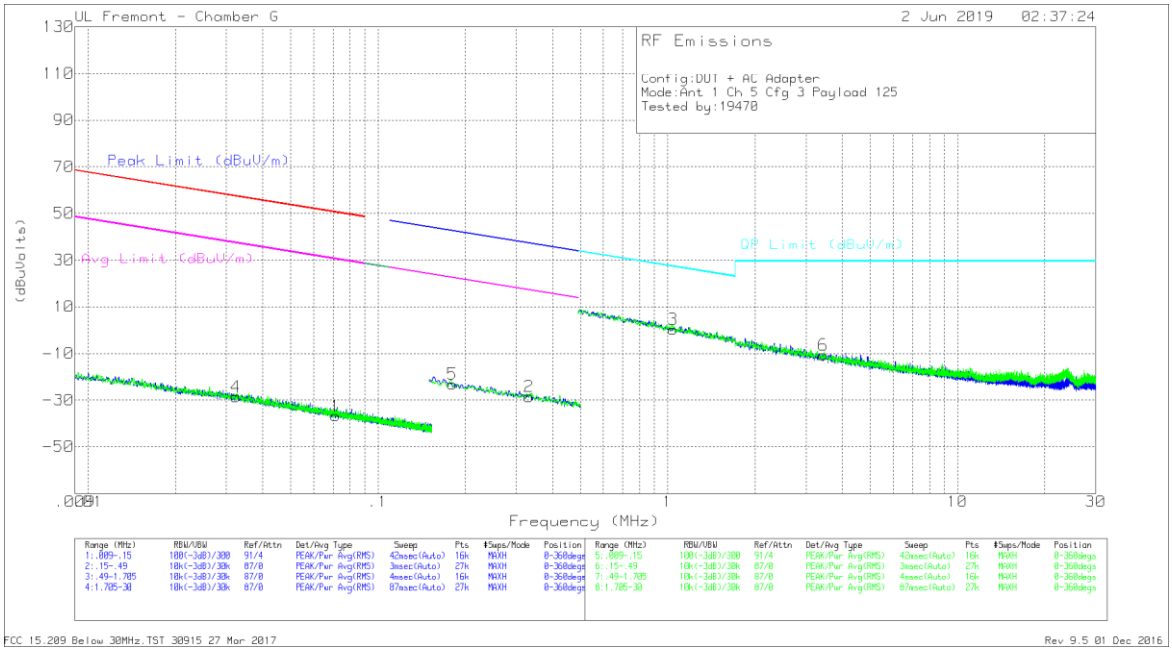
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Loop Antenna (dB/m)	Cables (dB)	Dist Corr 300m	Corrected Reading (dBuVolts)	Peak Limit (dBuV/m)	Margin (dB)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Avg Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
1	.02023	39.76	Pk	14.9	0	-80	-25.34	61.46	-86.8	41.46	-66.8	-	-	-	-	0-360
4	.03613	36.55	Pk	13.7	0	-80	-29.75	56.43	-86.18	36.43	-66.18	-	-	-	-	0-360
2	.2736	44.18	Pk	11	.1	-80	-24.72	-	-	-	-	38.87	-63.59	18.87	-43.59	0-360
5	.32731	40.81	Pk	10.9	.1	-80	-28.19	-	-	-	-	37.31	-65.5	17.31	-45.5	0-360

Pk - Peak detector

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Loop Antenna (dB/m)	Cables (dB)	Dist Corr 30m	Corrected Reading (dBuVolts)	QP Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
3	5.42226	14.26	Pk	10.8	.3	-40	-14.64	29.5	-44.14	0-360
6	9.76726	11.27	Pk	10.6	.4	-40	-17.73	29.5	-47.23	0-360

Pk - Peak detector

ANT. 1, CH5, Config 3



Trace Markers

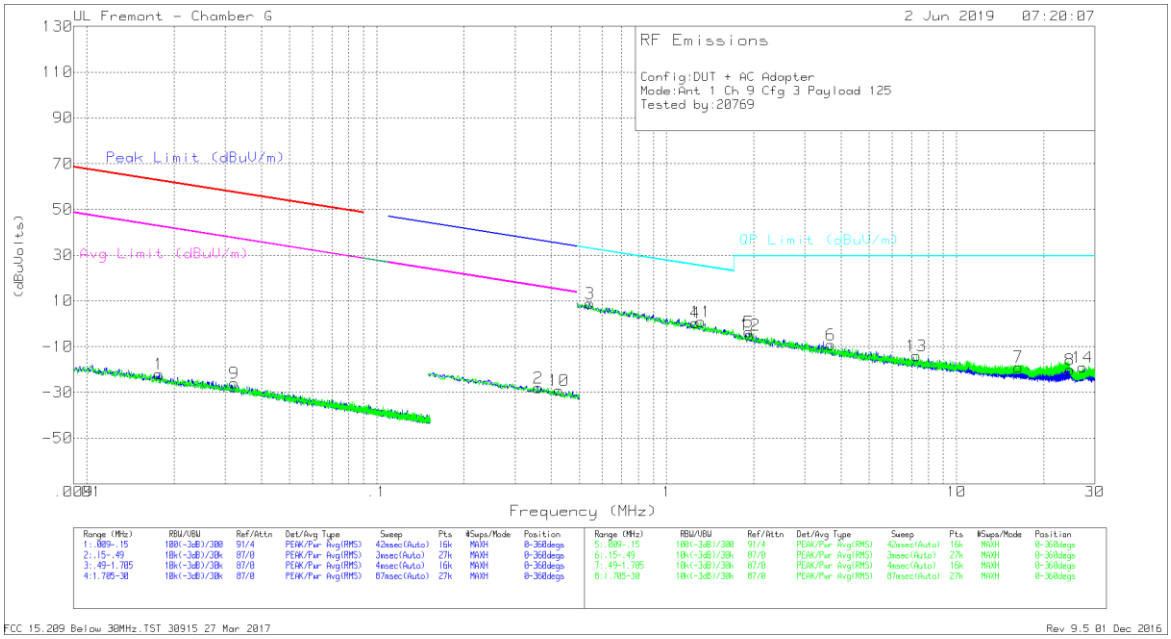
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Loop Antenna (dB/m)	Cables (dB)	Dist Corr 300m	Corrected Reading (dBuVolts)	Peak Limit (dBuV/m)	Margin (dB)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Avg Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
4	.03237	37.38	Pk	14	0	-80	-28.62	57.38	-86	37.38	-66	-	-	-	-	0-360
1	.07142	31.05	Pk	12.2	0	-80	-36.75	50.51	-87.26	30.51	-67.26	-	-	-	-	0-360
5	.18055	45.47	Pk	11.3	.1	-80	-23.13	-	-	-	-	42.49	-65.62	22.49	-45.62	0-360
2	.33208	40.52	Pk	10.9	.1	-80	-28.48	-	-	-	-	37.19	-65.67	17.19	-45.67	0-360

Pk - Peak detector

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Loop Antenna (dB/m)	Cables (dB)	Dist Corr 30m	Corrected Reading (dBuVolts)	Margin (dB)	QP Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
3	1.04305	29.52	Pk	10.7	.1	-40	.32	-	27.26	-26.94	0-360
6	3.44258	18.34	Pk	10.8	.2	-40	-10.66	-	29.5	-40.16	0-360

Pk - Peak detector

ANT. 1, CH9, Config 3



Trace Markers

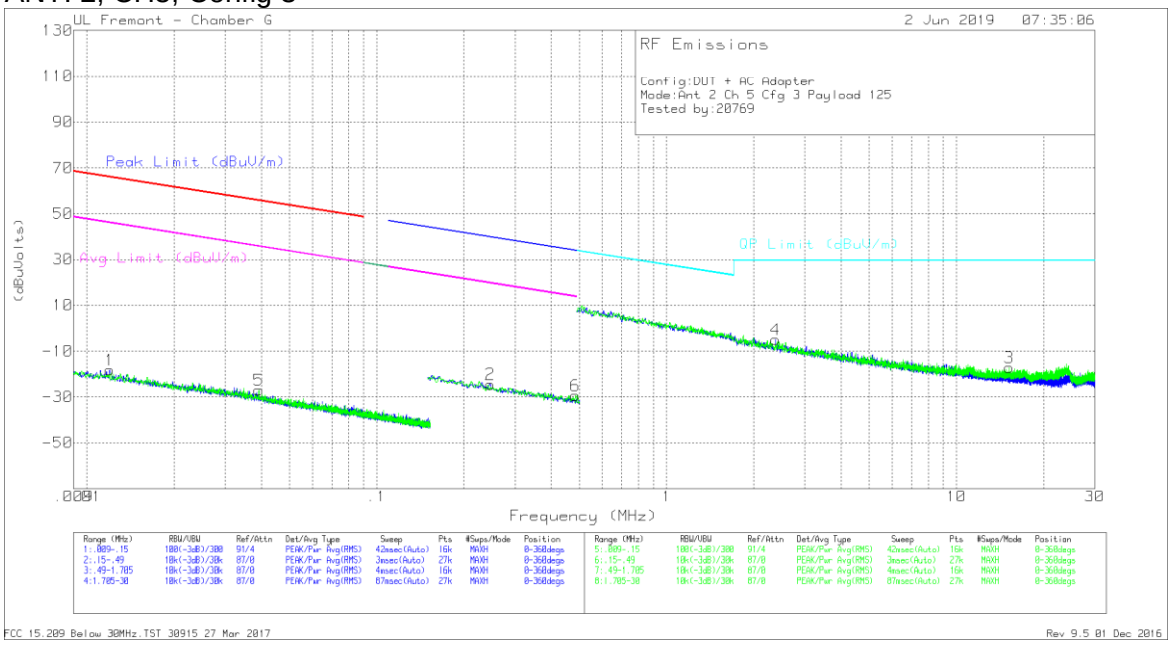
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Loop Antenna (dB/m)	Cables (dB)	Dist Corr 300m	Corrected Reading (dBuVolts)	Peak Limit (dBuV/m)	Margin (dB)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Avg Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
1	.01778	42.22	Pk	15.8	0	-80	-21.98	62.59	-84.57	42.59	-64.57	-	-	-	-	0-360
9	.03225	40.14	Pk	14	0	-80	-25.86	57.42	-83.28	37.42	-63.28	-	-	-	-	0-360
2	.36044	41.04	Pk	10.9	.1	-80	-27.96	-	-	-	-	36.47	-64.43	16.47	-44.43	0-360
10	.4249	39.88	Pk	10.9	.1	-80	-29.12	-	-	-	-	35.04	-64.16	15.04	-44.16	0-360

Pk - Peak detector

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Loop Antenna (dB/m)	Cables (dB)	Dist Corr 30m	Corrected Reading (dBuVolts)	QP Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
3	.54278	38.01	Pk	10.8	.1	-40	8.91	32.91	-24	0-360
4	1.25623	29.69	Pk	10.7	.1	-40	.49	25.65	-25.16	0-360
11	1.31259	30.14	Pk	10.7	.1	-40	.94	25.27	-24.33	0-360
5	1.92403	25.5	Pk	10.7	.2	-40	-3.6	29.5	-33.1	0-360
12	1.94394	24.22	Pk	10.7	.2	-40	-4.88	29.5	-34.38	0-360
6	3.6852	19.69	Pk	10.8	.2	-40	-9.31	29.5	-38.81	0-360
13	7.27774	15.04	Pk	10.7	.3	-40	-13.96	29.5	-43.46	0-360
7	16.37281	10.81	Pk	9.9	.4	-40	-18.89	29.5	-48.39	0-360
8	24.5645	10.82	Pk	8.6	.5	-40	-20.08	29.5	-49.58	0-360
14	27.17664	12.17	Pk	8.1	.6	-40	-19.13	29.5	-48.63	0-360

Pk - Peak detector

ANT. 2, CH5, Config 3



Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Loop Antenna (dB/m)	Cables (dB)	Dist Corr 300m	Corrected Reading (dBuVolts)	Peak Limit (dBuV/m)	Margin (dB)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Avg Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
1	.01201	43.76	Pk	18	0	-80	-18.24	66	-84.24	46	-64.24	-	-	-	-	0-360
5	.03922	39.52	Pk	13.4	0	-80	-27.08	55.71	-82.79	35.71	-62.79	-	-	-	-	0-360
2	.24666	44.43	Pk	11	.1	-80	-24.47	-	-	-	-	39.77	-64.24	19.77	-44.24	0-360
6	.48507	39.72	Pk	10.8	.1	-80	-29.38	-	-	-	-	33.89	-63.27	13.89	-43.27	0-360

Pk - Peak detector

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Loop Antenna (dB/m)	Cables (dB)	Dist Corr 30m	Corrected Reading (dBuVolts)	QP Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
4	2.37572	24.21	Pk	10.7	.2	-40	-4.89	29.5	-34.39	0-360
3	15.22001	12.22	Pk	10.1	.4	-40	-17.28	29.5	-46.78	0-360

Pk - Peak detector