

3.4 Frequency stability

3.4.1 Specification Reference

FCC 47 CFR Part 15C, Clause 15.215(c)
Industry Canada RSS-GEN

3.4.2 Equipment Under Test and Modification State

P2LPR, S/N: N/A - Modification State 0

Frequency stability was performed only once because all EUTs and EUT configurations contain the same electronic and transceiver hardware.

3.4.3 Date of Test

2019-08-07

3.4.4 Test Method

The test was performed in accordance with
ANSI C63.10
KDB 890966 D01
RSS-Gen

3.4.5 Environmental Conditions

Ambient Temperature 25,0 °C
Relative Humidity 56,0 %

3.4.6 Test Results

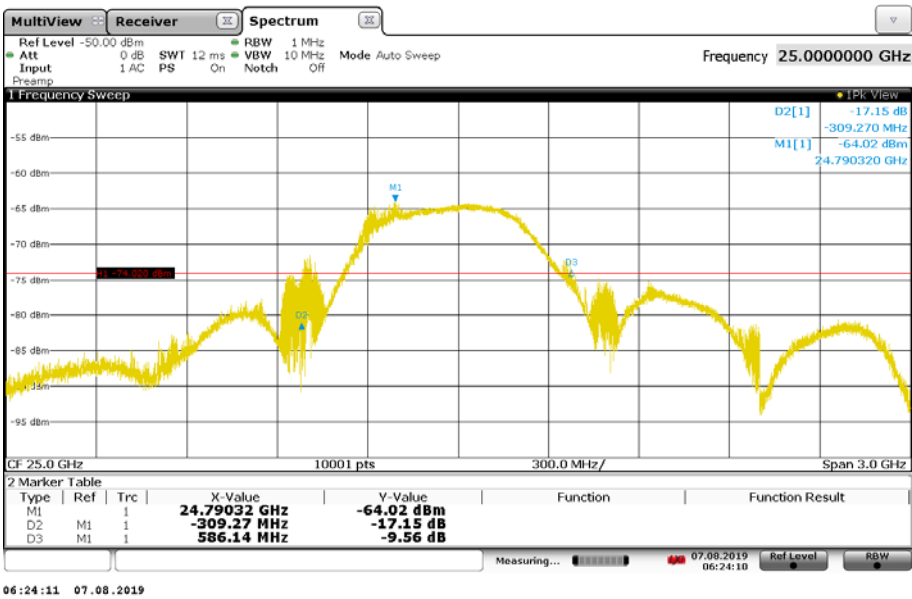
Normal operation mode: Measurement with pulsed signal

<i>Operating Conditions</i>	<i>10 dB Bandwidth (MHz)</i>	<i>f-10dB lower (GHz)</i>	<i>f-10 upper (GHz)</i>
10.2V DC / +20°C	893.61	24.45045	25.34406
34.5V DC / +20°C	895.41	24.48105	25.37646
24V DC / -20°C	1029.8	24.65823	25.68803
24V DC / -10°C	1011.2	24.47116	25.48236
24V DC / 0°C	1046.9	24.43605	25.48295
24V DC / +10°C	1001.9	24.45255	25.45445
24V DC / +20°C	878.61	24.45735	25.33596
24V DC / +30°C	980.3	24.43156	25.41186
24V DC / +40°C	907.11	24.45405	25.36116
24V DC / +50°C	915.21	24.44265	25.35786

Table 10



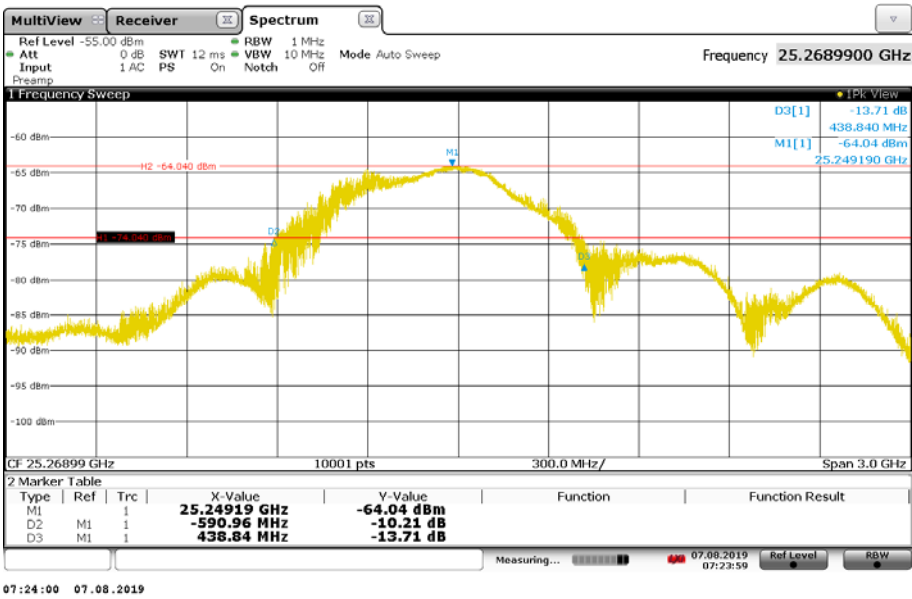
Fundamental Emission -10 dB Bandwidth – 10.2V DC / +20°C



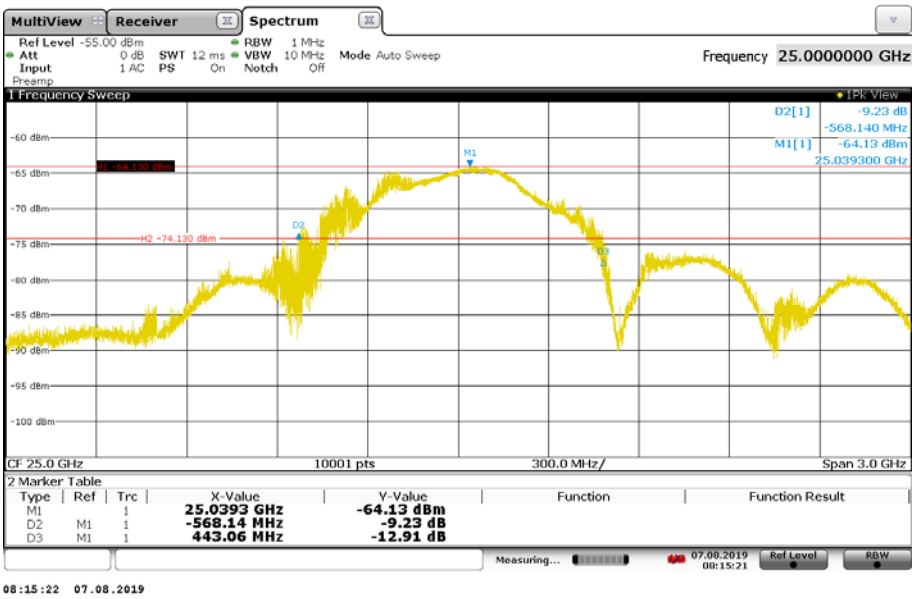
Fundamental Emission -10 dB Bandwidth – 34.5V DC / +20°C



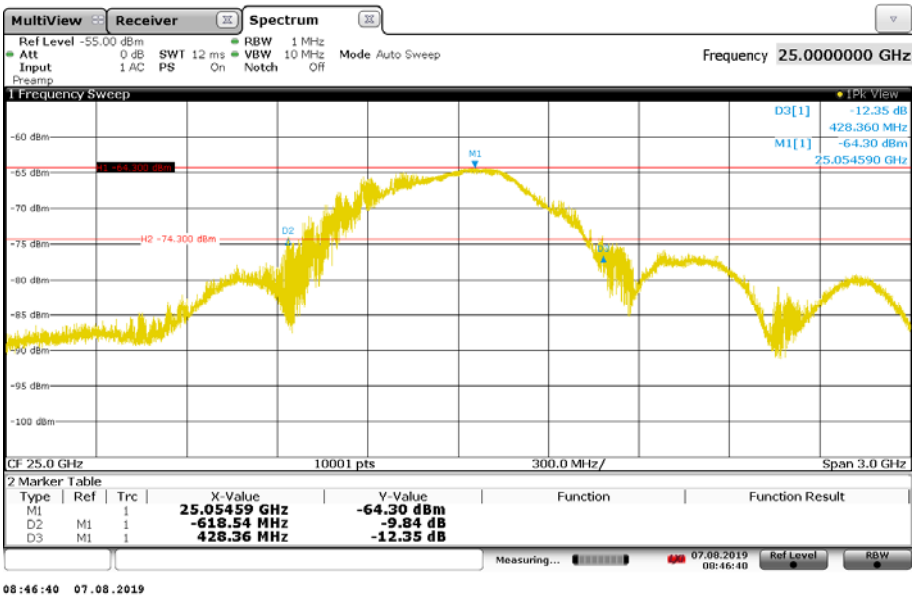
Product Service



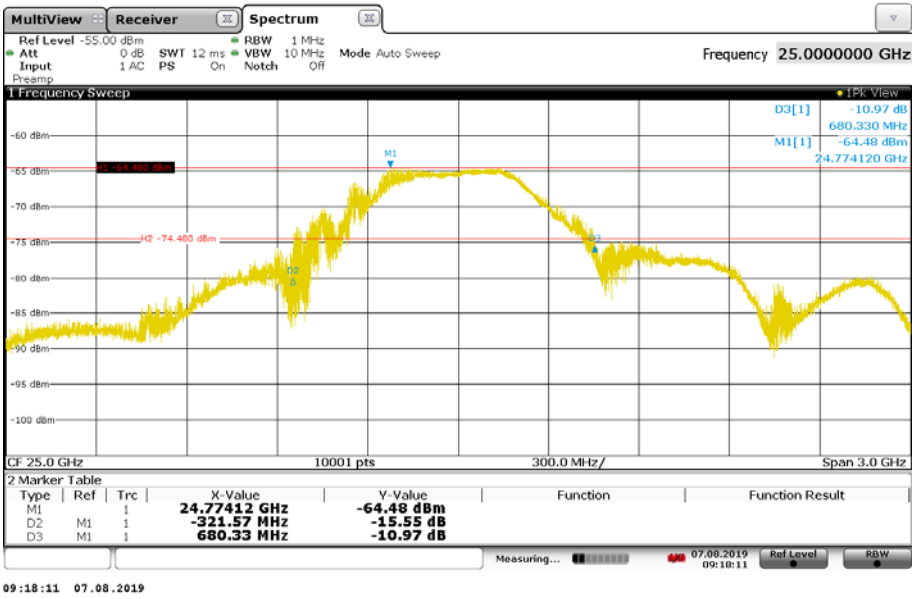
Fundamental Emission -10 dB Bandwidth – 24.0V DC / -20°C



Fundamental Emission -10 dB Bandwidth – 24.0V DC / -10°C



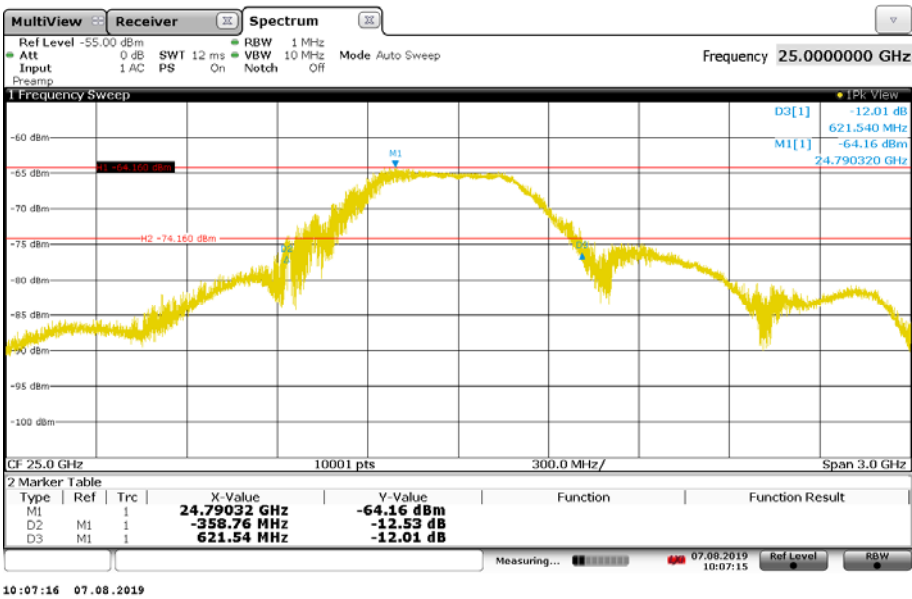
Fundamental Emission -10 dB Bandwidth – 24.0V DC / 0°C



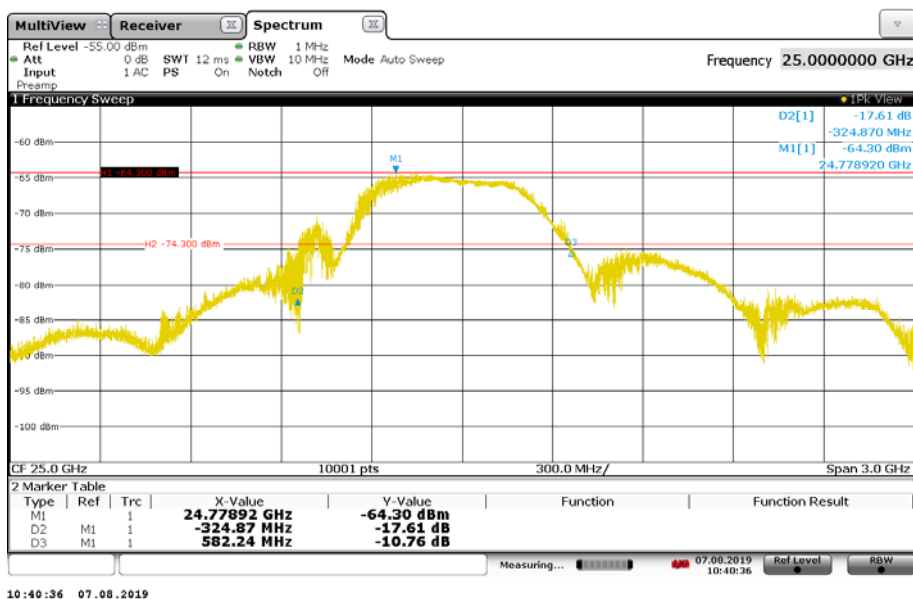
Fundamental Emission -10 dB Bandwidth – 24.0V DC / +10°C



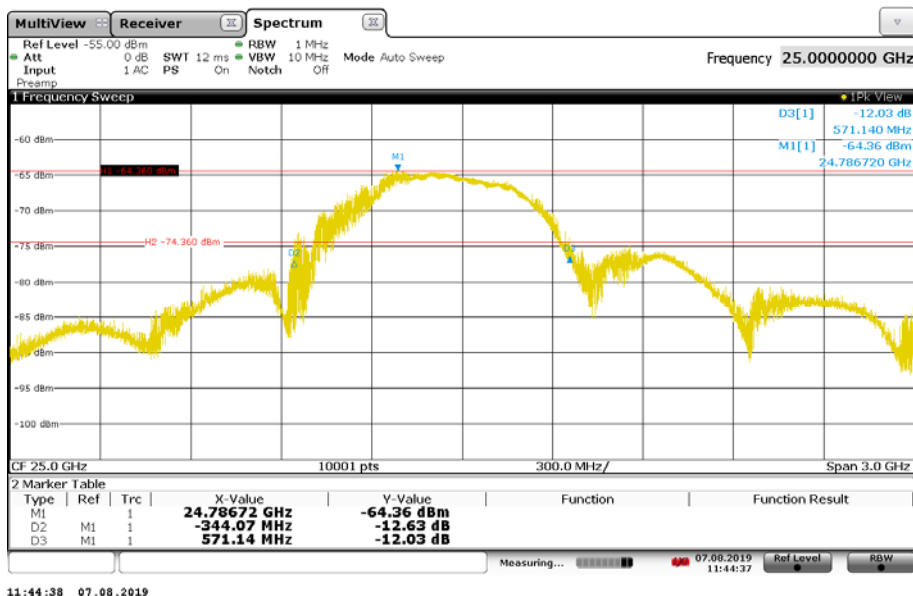
Fundamental Emission -10 dB Bandwidth – 24.0V DC / +20°C



Fundamental Emission -10 dB Bandwidth – 24.0V DC / +30°C



Fundamental Emission -10 dB Bandwidth – 24.0V DC / +40°C



Fundamental Emission -10 dB Bandwidth – 24.0V DC / +50°C

FCC 47 CFR Part 15, Limit Clause 15.215 and Industry Canada RSS GEN, Limit Clause 6.11
Emission shall fall fully into designated frequency band 24.05 to 29.00 GHz.

3.4.7 Test Location and Test Equipment Used

This test was carried out in Fully Anechoic Room no. 2.

<i>T-ID</i>	<i>Designation</i>	<i>Type</i>	<i>Last Cal.</i>	<i>Next Cal.</i>
19125	Horn antenna	3160-09	Verified	
19383	Double ridged waveguide horn antenna	3115	2017-02	2020-02
19442	Horn antenna	3160-10	Verified	
19946	Horn antenna	24240-20	Verified	
22553	Waveguide mixer	FS-Z170	2016-08	2019-08
25849	Waveguide mixer	FS-Z60	2017-04	2020-04
25850	Waveguide mixer	FS-Z90	2016-12	2019-12
25851	Waveguide mixer	FS-Z110	2016-11	2019-11
27898	Horn antenna	26240-20	Verified	
27899	Horn antenna	27240-20	Verified	
39897	EMI test receiver	ESW44	2019-02	2020-02
36954	Harmonic Mixer	FS-Z220	2018-03	2021-03
36955	Harmonic Mixer	FS-Z325	2018-02	2021-02
37863	Horn antenna	30240-20 WG30	Verified	
37864	Horn antenna	32240-20 WG32	Verified	
38401	ULTRALOG Antenna	HL562E	2018-05	2021-05

Table 11



Product Service

3.5 Unwanted emissions

3.5.1 Specification Reference

FCC 47 CFR Part 15C, Clause 15.209
Industry Canada RSS-GEN

3.5.2 Equipment Under Test and Modification State

P2LPR, S/N: N/A - Modification State
P4LPR, S/N: N/A - Modification State
P5LPR, S/N: N/A - Modification State

3.5.3 Date of Test

2018-07-30 to 2019-08-06

3.5.4 Test Method

The test was performed in accordance with
ANSI C63.10
RSS-GEN

3.5.5 Environmental Conditions

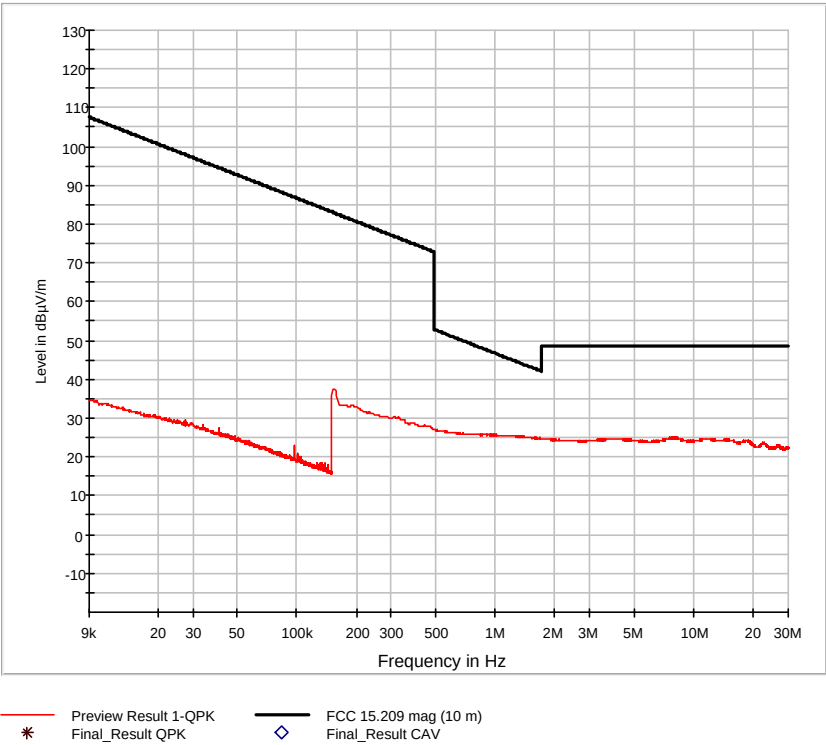
Ambient Temperature	22,0 °C
Relative Humidity	31,0 %



Product Service

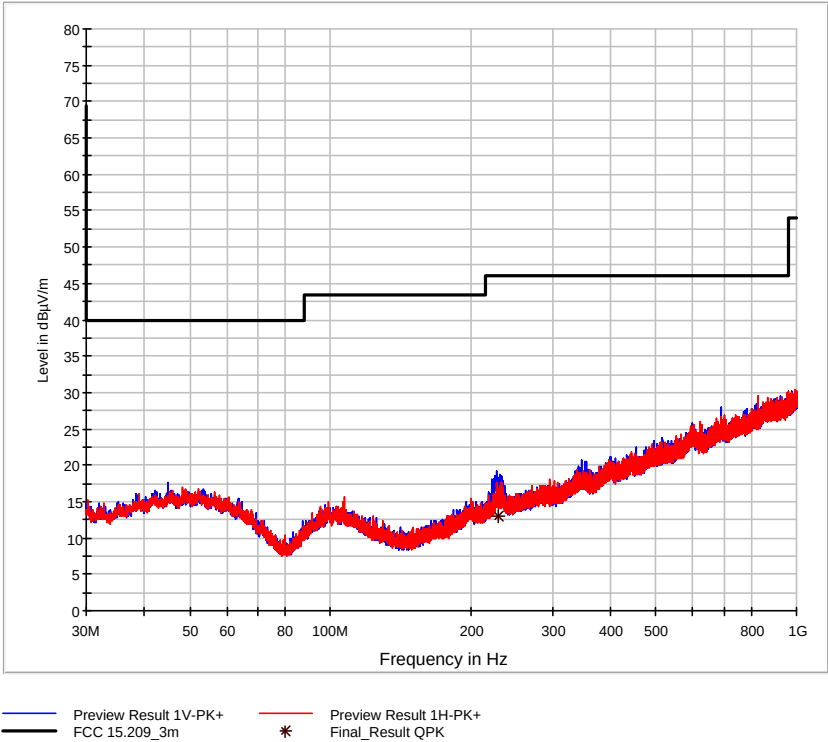
3.5.6 Test Results

EUT: P2LPR in LPR operation (radar without tank)
Normal operation mode: Measurement with pulsed signal





Product Service

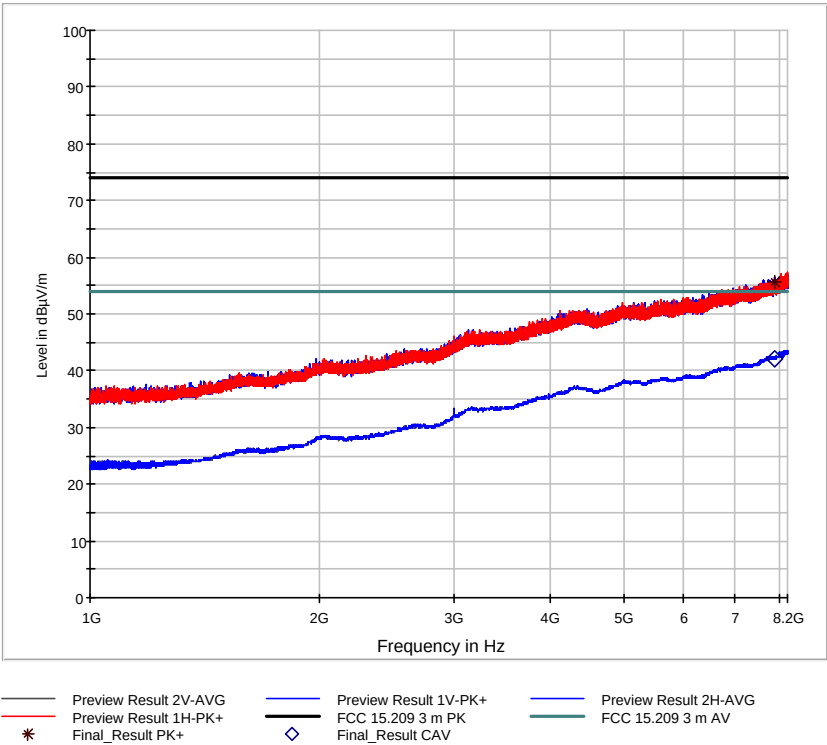


Final Results:

Frequency MHz	QuasiPeak dBµV/m	Limit dBµV/m	Margin dB	Meas. Time ms	Bandwidth kHz	Height cm	Pol	Azimuth deg	Corr. dB
228.840000	13.00	46.00	33.00	1000.0	120.000	133.0	V	-14.0	13.6



Product Service

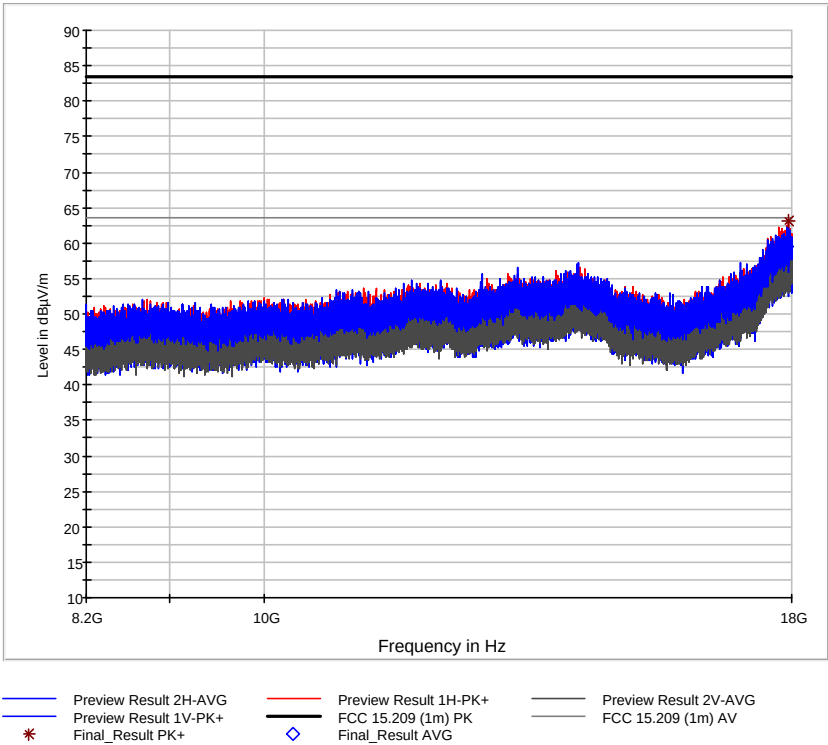


Final Results:

Frequency	MaxPeak	CAverage	Limit	Margin	Meas. Time	Bandwidth	Height	Pol	Azimuth	Corr.
MHz	dBµV/m	dBµV/m	dBµV/m	dB	ms	kHz	cm		deg	dB
7871.750000	---	42.07	53.98	11.91	1000.0	1000.000	395.0	V	27.0	46.2
7871.750000	55.66	---	73.97	18.31	1000.0	1000.000	395.0	V	27.0	46.2



Product Service

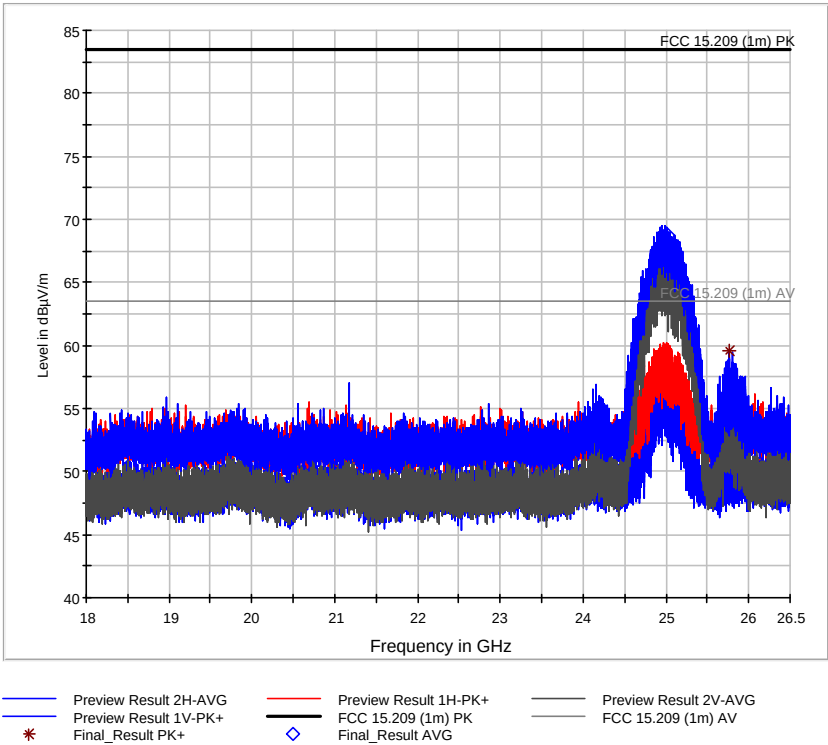


Final Results:

Frequency	MaxPeak	Average	Limit	Margin	Meas. Time	Bandwidth	Height	Pol	Azimuth	Corr.
MHz	dBµV/m	dBµV/m	dBµV/m	dB	ms	kHz	cm		deg	dB
17857.900000	---	59.58	63.50	3.92	2.5	1000.000	150.0	H	42.0	48.0
17951.326667	63.14	---	83.50	20.36	2.5	1000.000	150.0	H	0.0	48.3



Product Service



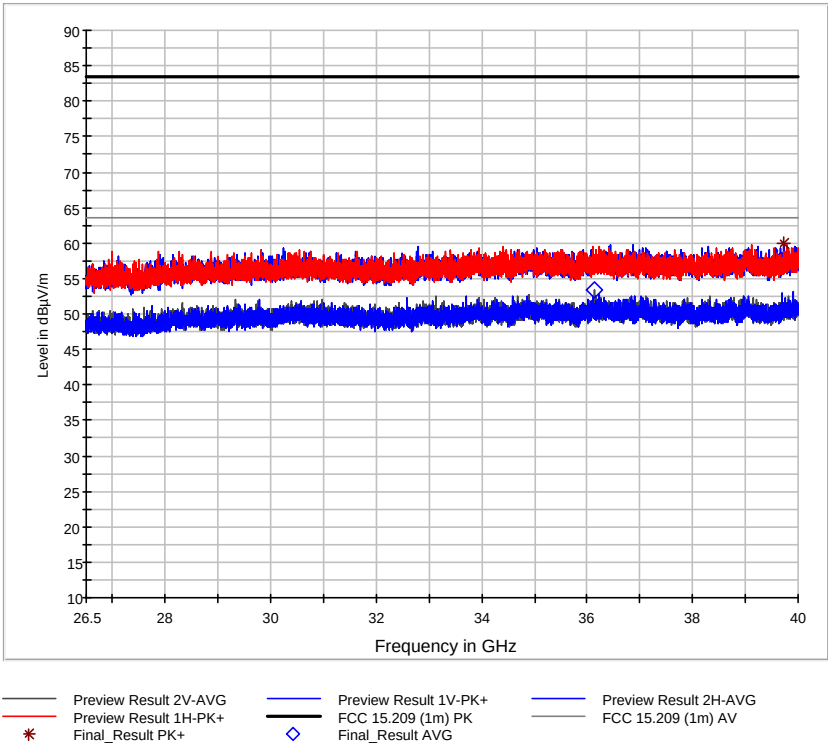
Final Result:

Frequency	MaxPeak	Average	Limit	Margin	Meas. Time	Bandwidth	Height	Pol	Azimuth	Corr.
MHz	dBµV/m	dBµV/m	dBµV/m	dB	ms	kHz	cm		deg	dB/m
25012.500000	---	68.73	#1 NA	#1 NA	2.5	1000.000	150.0	V	7.0	40
25768.613636	59.60	---	#1 NA	#1 NA	2.5	1000.000	150.0	V	7.0	41

#1 Intentional Emission within 24.05-29.00 GHz band



Product Service

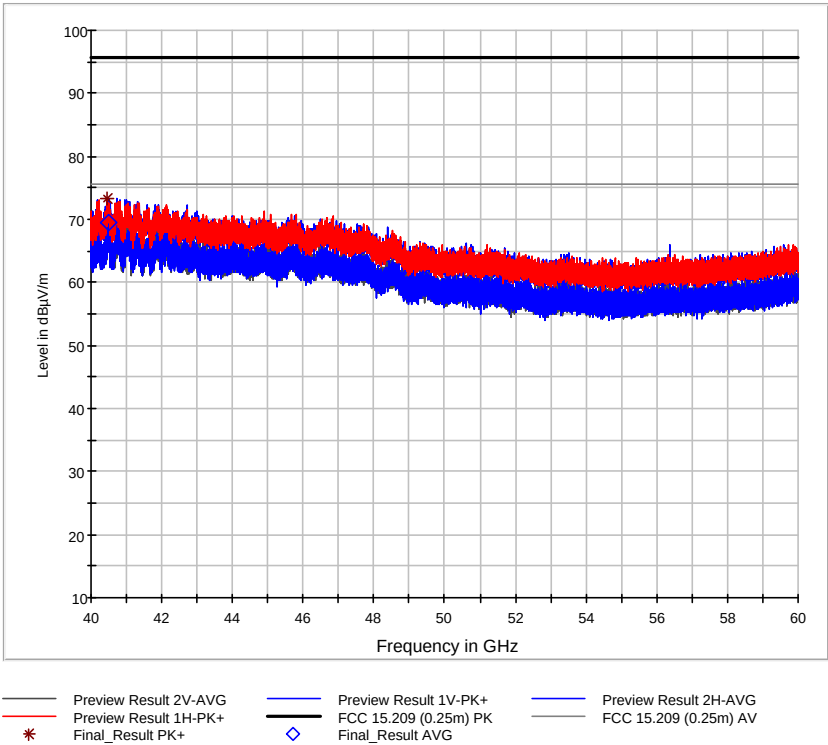


Final Results:

Frequency	MaxPeak	Average	Limit	Margin	Meas. Time	Bandwidth	Height	Pol	Azimuth	Corr.
MHz	dBµV/m	dBµV/m	dBµV/m	dB	ms	kHz	cm		deg	dB
36132.250000	---	53.43	63.50	10.07	2.5	1000.000	150.0	V	260.0	43.6
39721.900000	60.03	---	83.50	23.47	2.5	1000.000	150.0	V	42.0	43.8



Product Service

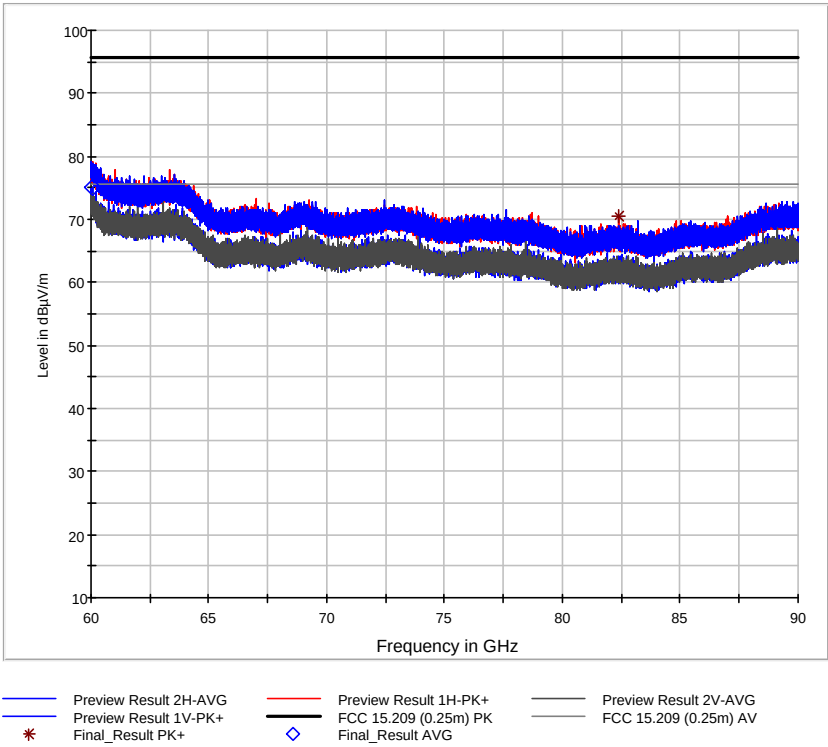


Final Results:

Frequency	MaxPeak	Average	Limit	Margin	Meas. Time	Bandwidth	Height	Pol	Azimuth	Corr.
MHz	dBµV/m	dBµV/m	dBµV/m	dB	ms	kHz	cm		deg	dB
40473.750000	73.22	--	95.60	22.38	2.5	1000.000	150.0	H	339.0	44.2
40485.000000	---	69.58	75.60	6.02	2.5	1000.000	150.0	H	61.0	44.2



Product Service

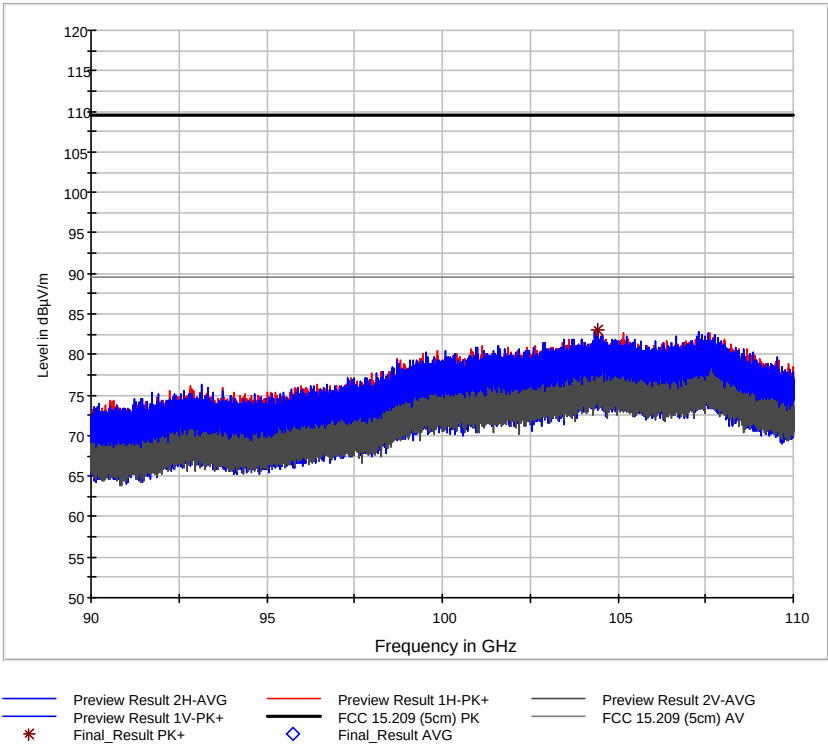


Final Results:

Frequency	MaxPeak	Average	Limit	Margin	Meas. Time	Bandwidth	Height	Pol	Azimuth	Corr.
MHz	dBµV/m	dBµV/m	dBµV/m	dB	ms	kHz	cm		deg	dB
60042.187500	---	75.08	75.60	0.52	2.5	1000.000	150.0	H	149.0	47.8
82375.312500	70.63	---	95.60	24.97	2.5	1000.000	150.0	H	0.0	48.0



Product Service



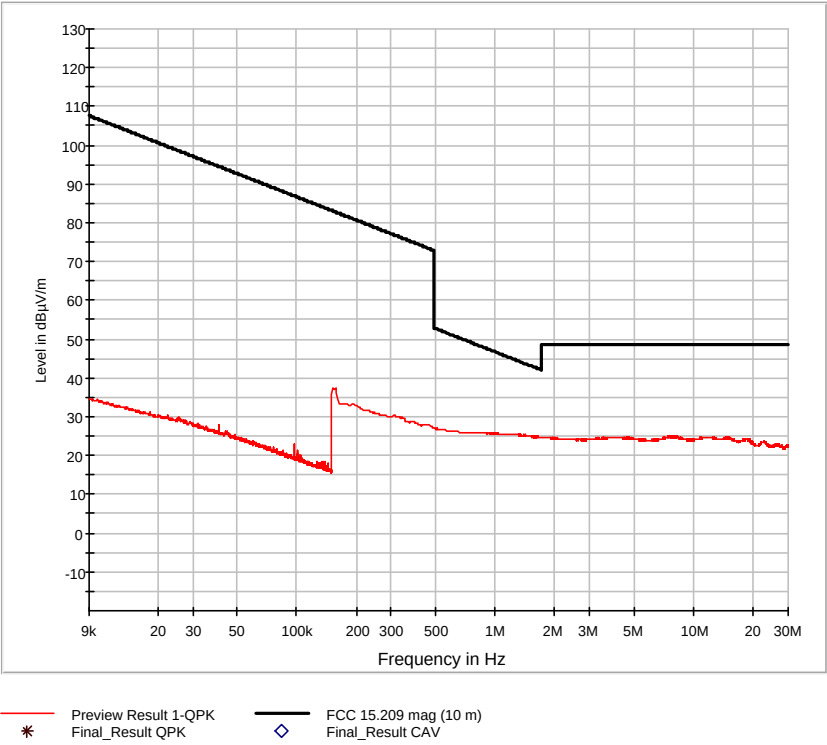
Final Results:

Frequency	MaxPeak	Average	Limit	Margin	Meas. Time	Bandwidth	Height	Pol	Azimuth	Corr.
MHz	dBµV/m	dBµV/m	dBµV/m	dB	ms	kHz	cm		deg	dB/m
104433.777778	---	80.73	89.56	8.83	2.5	1000.000	150.0	V	282.0	50
104433.777778	82.97	---	109.56	26.59	2.5	1000.000	150.0	V	282.0	50



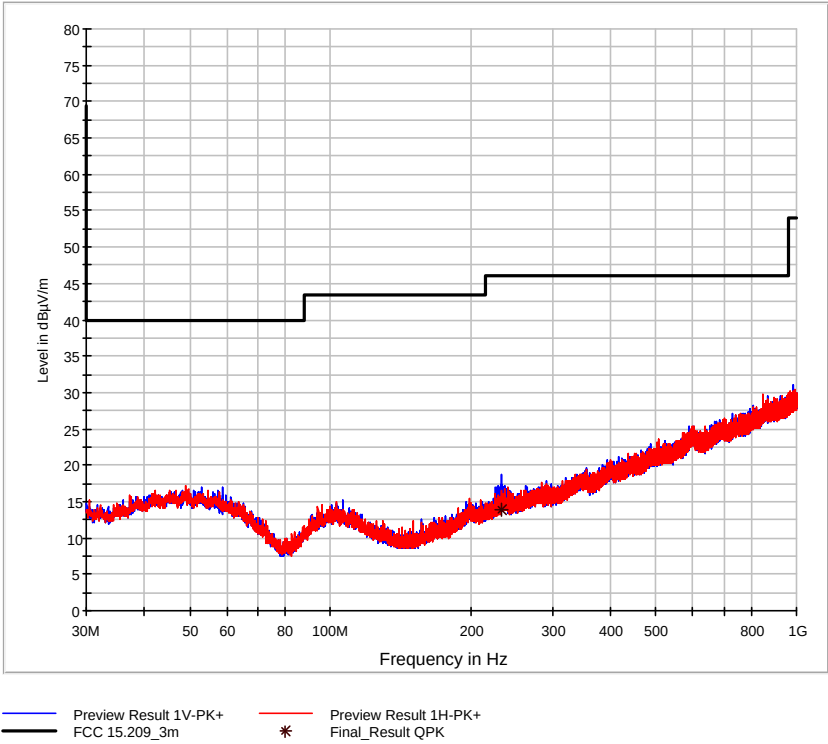
Product Service

EUT: P4LPR in LPR operation (radar without tank)
Normal operation mode: Measurement with pulsed signal





Product Service

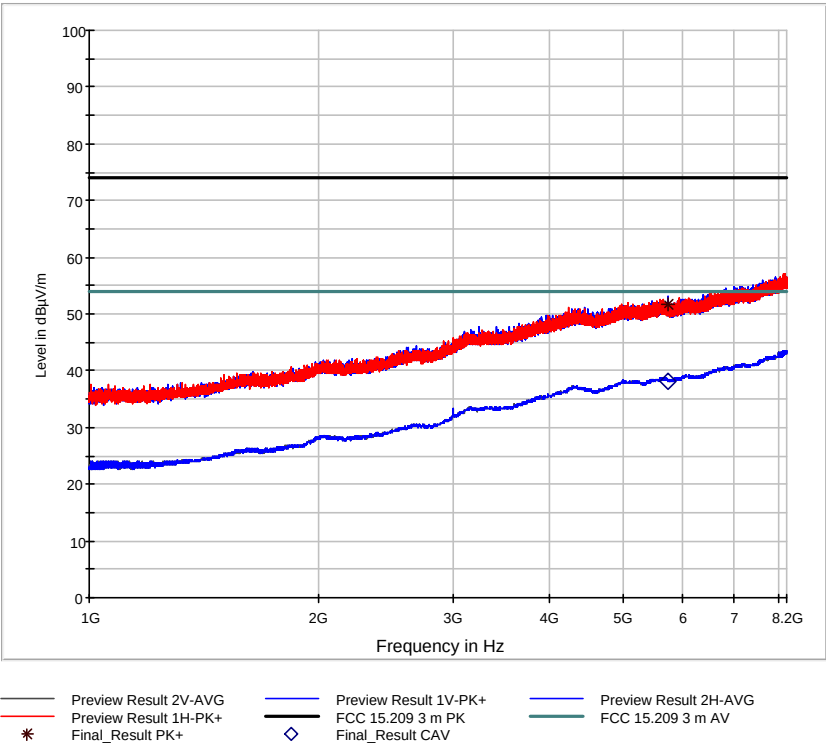


Final Results:

Frequency MHz	QuasiPeak dBµV/m	Limit dBµV/m	Margin dB	Meas. Time ms	Bandwidth kHz	Height cm	Pol	Azimuth deg	Corr. dB
232.655000	13.80	46.00	32.20	1000.0	120.000	150.0	V	-3.0	13.7



Product Service

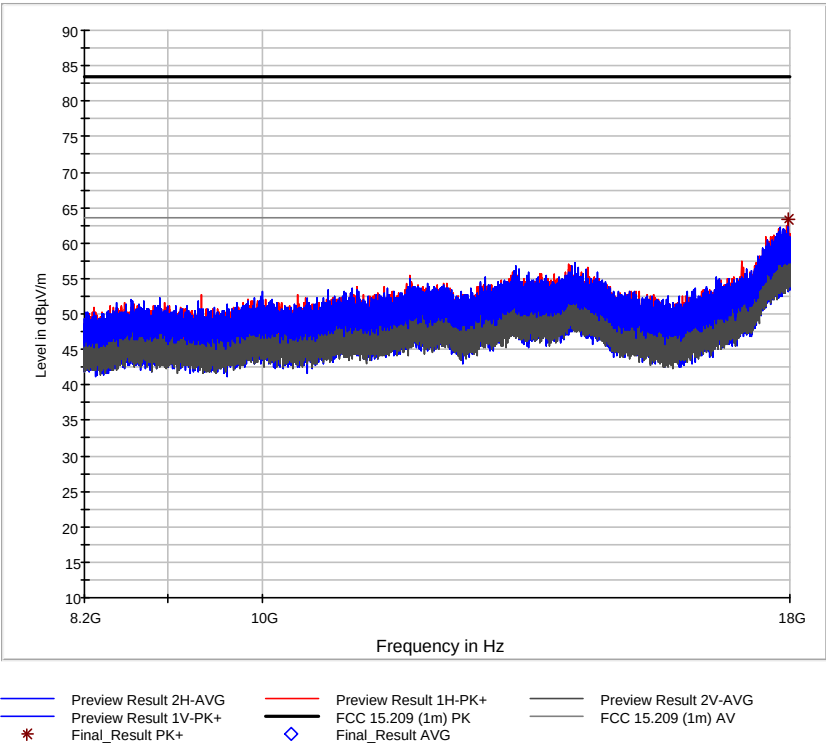


Final Results:

Frequency	MaxPeak	CAverage	Limit	Margin	Meas. Time	Bandwidth	Height	Pol	Azimuth	Corr.
MHz	dBµV/m	dBµV/m	dBµV/m	dB	ms	kHz	cm		deg	dB
5742.250000	---	38.17	53.98	15.81	1000.0	1000.000	104.0	V	-38.0	41.6
5742.250000	51.62	---	73.97	22.35	1000.0	1000.000	104.0	V	-38.0	41.6



Product Service

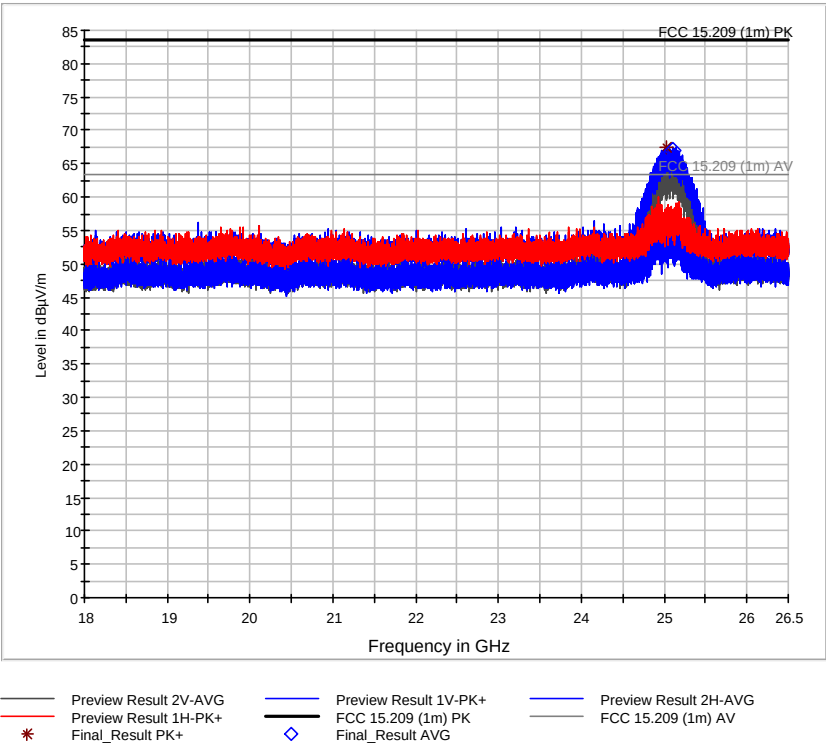


Final Results:

Frequency	MaxPeak	Average	Limit	Margin	Meas. Time	Bandwidth	Height	Pol	Azimuth	Corr.
MHz	dBµV/m	dBµV/m	dBµV/m	dB	ms	kHz	cm		deg	dB
17807.593333	---	59.46	63.50	4.04	2.5	1000.000	150.0	V	0.0	47.9
17956.553333	63.34	---	83.50	20.16	2.5	1000.000	150.0	H	38.0	48.3



Product Service



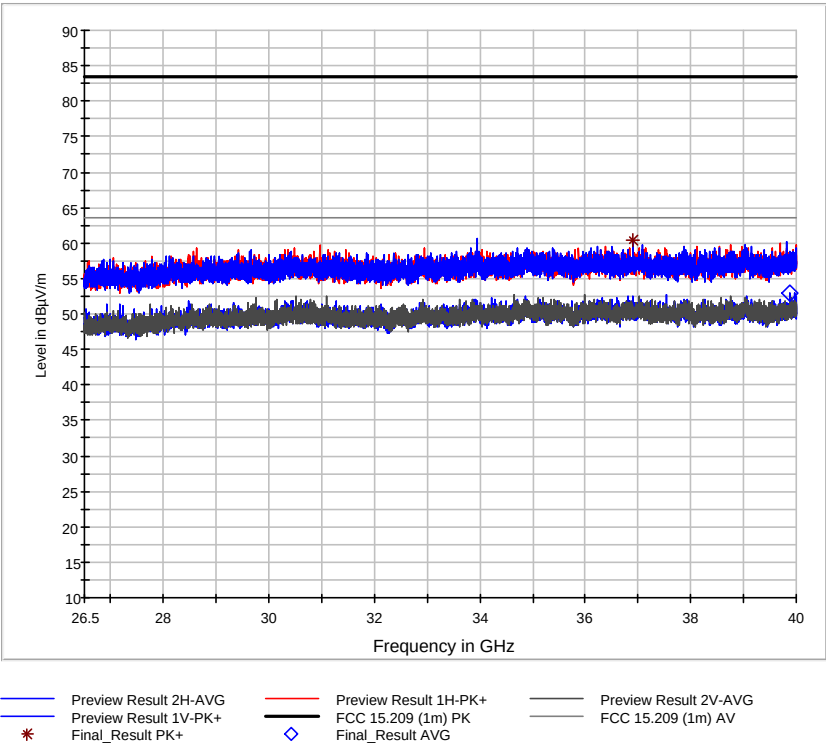
Final Results:

Frequency	MaxPeak	Average	Limit	Margin	Meas. Time	Bandwidth	Height	Pol	Azimuth	Corr.
MHz	dBµV/m	dBµV/m	dBµV/m	dB	ms	kHz	cm		deg	dB
25033.363636	67.52	---	#1 NA	#1 NA	2.5	1000.000	150.0	V	13.0	40.4
25100.204546	---	66.94	#1 NA	#1 NA	2.5	1000.000	150.0	V	13.0	40.4

#1 Intentional Emission within 24.05-29.00 GHz band



Product Service

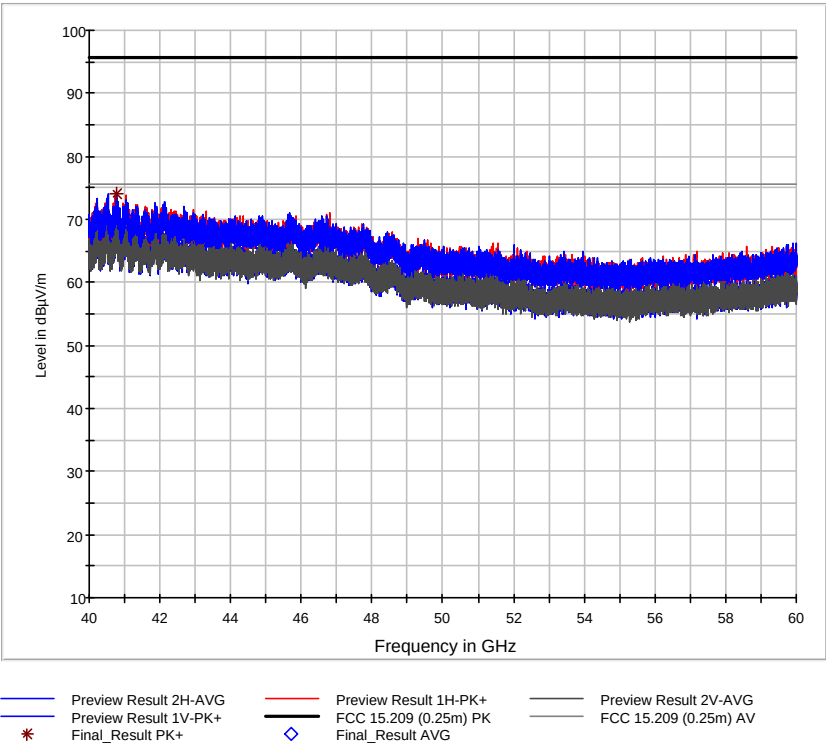


Final Results:

Frequency	MaxPeak	Average	Limit	Margin	Meas. Time	Bandwidth	Height	Pol	Azimuth	Corr.
MHz	dBµV/m	dBµV/m	dBµV/m	dB	ms	kHz	cm		deg	dB
36904.450000	60.50	---	83.50	23.00	2.5	1000.000	150.0	V	274.0	43.7
39875.800000	---	52.89	63.50	10.61	2.5	1000.000	150.0	H	260.0	43.8



Product Service

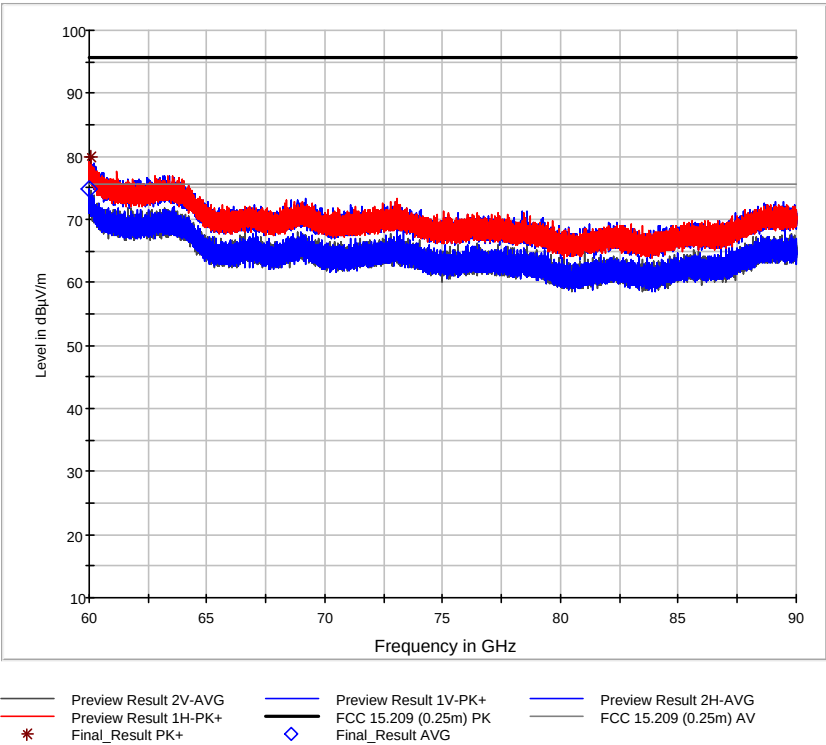


Final Results:

Frequency	MaxPeak	Average	Limit	Margin	Meas. Time	Bandwidth	Height	Pol	Azimuth	Corr.
MHz	dBµV/m	dBµV/m	dBµV/m	dB	ms	kHz	cm		deg	dB
40779.375000	74.05	---	95.60	21.55	2.5	1000.000	150.0	V	136.0	44.2
41078.125000	---	69.66	75.60	5.94	2.5	1000.000	150.0	V	0.0	44.2



Product Service

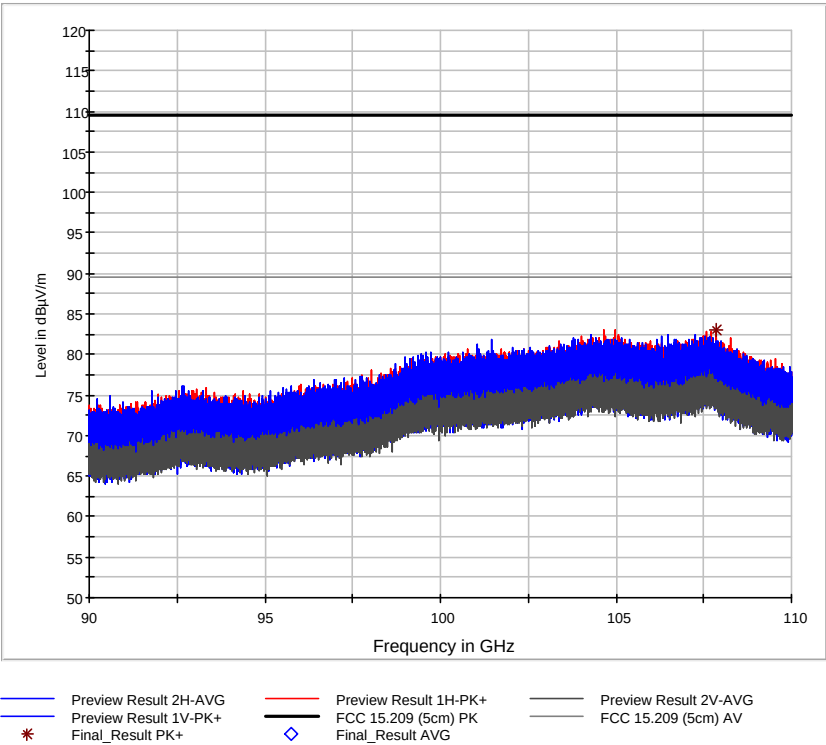


Final Results:

Frequency	MaxPeak	Average	Limit	Margin	Meas. Time	Bandwidth	Height	Pol	Azimuth	Corr.
MHz	dBµV/m	dBµV/m	dBµV/m	dB	ms	kHz	cm		deg	dB
60030.937500	---	74.85	75.60	0.75	2.5	1000.000	150.0	H	226.0	47.8
60092.812500	79.79	---	95.60	15.81	2.5	1000.000	150.0	H	327.0	47.8



Product Service



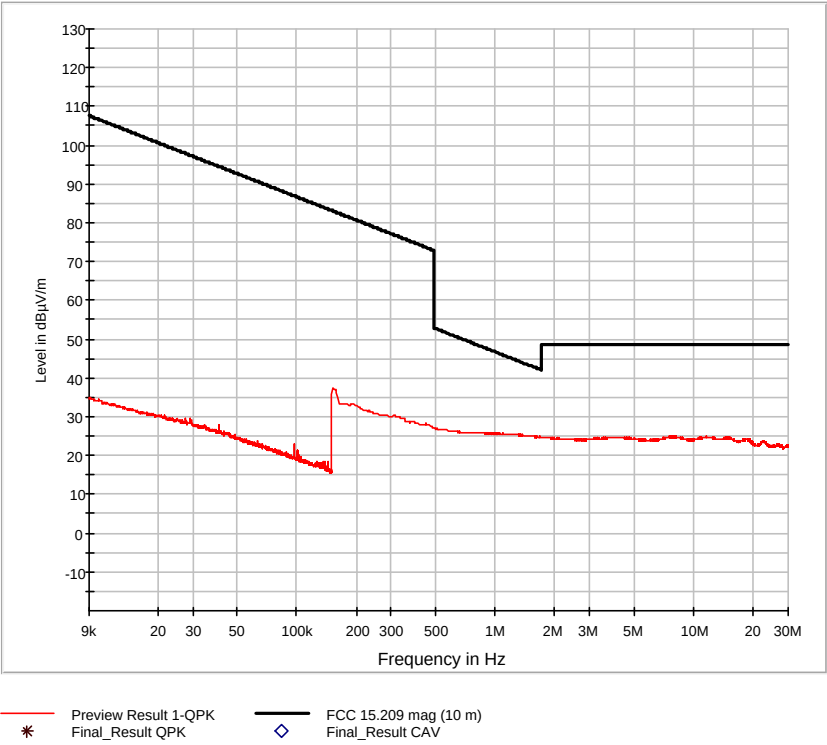
Final Results:

Frequency	MaxPeak	Average	Limit	Margin	Meas. Time	Bandwidth	Height	Pol	Azimuth	Corr.
MHz	dBµV/m	dBµV/m	dBµV/m	dB	ms	kHz	cm		deg	dB/m
107596.444445	---	79.85	89.56	9.71	2.5	1000.000	150.0	H	175.0	50
107842.666667	83.11	---	109.56	26.45	2.5	1000.000	150.0	H	75.0	50



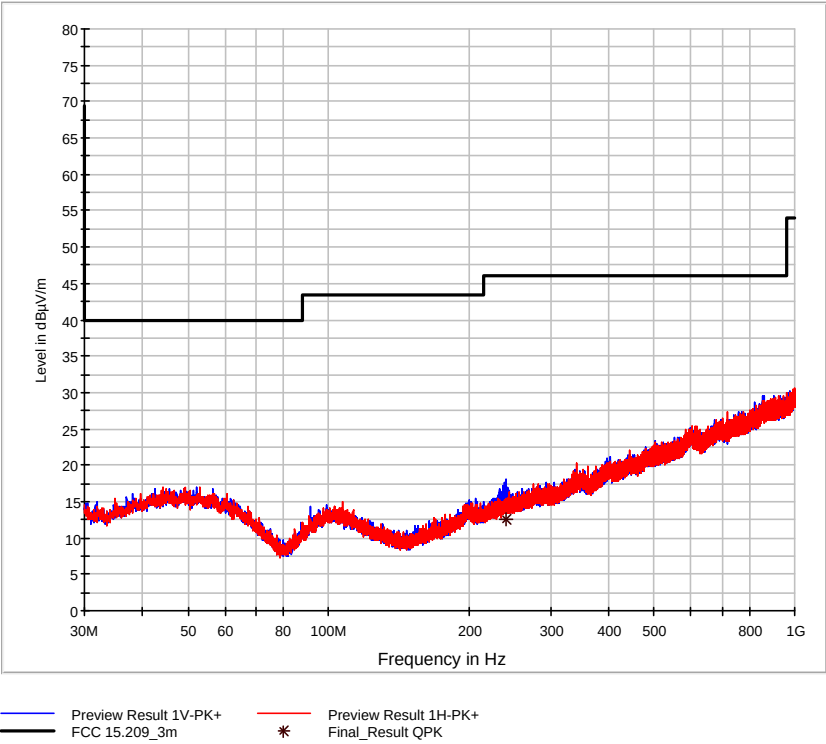
Product Service

EUT: P5LPR in LPR operation (radar without tank)
Normal operation mode: Measurement with pulsed signal





Product Service

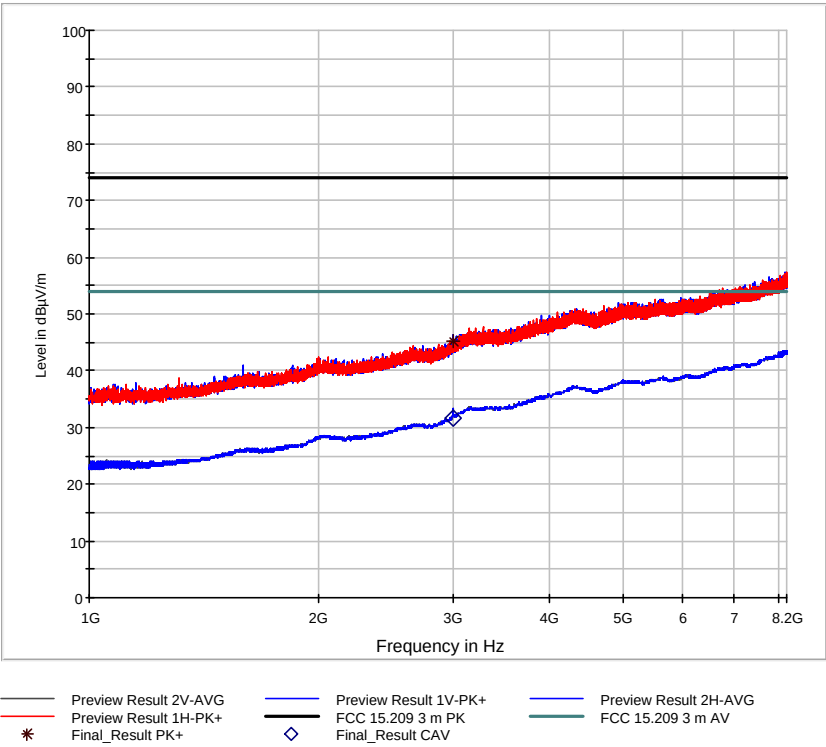


Final Results:

Frequency MHz	QuasiPeak dBµV/m	Limit dBµV/m	Margin dB	Meas. Time ms	Bandwidth kHz	Height cm	Pol	Azimuth deg	Corr. dB
239.835000	12.58	46.00	33.42	1000.0	120.000	136.0	V	-139.0	14.0



Product Service

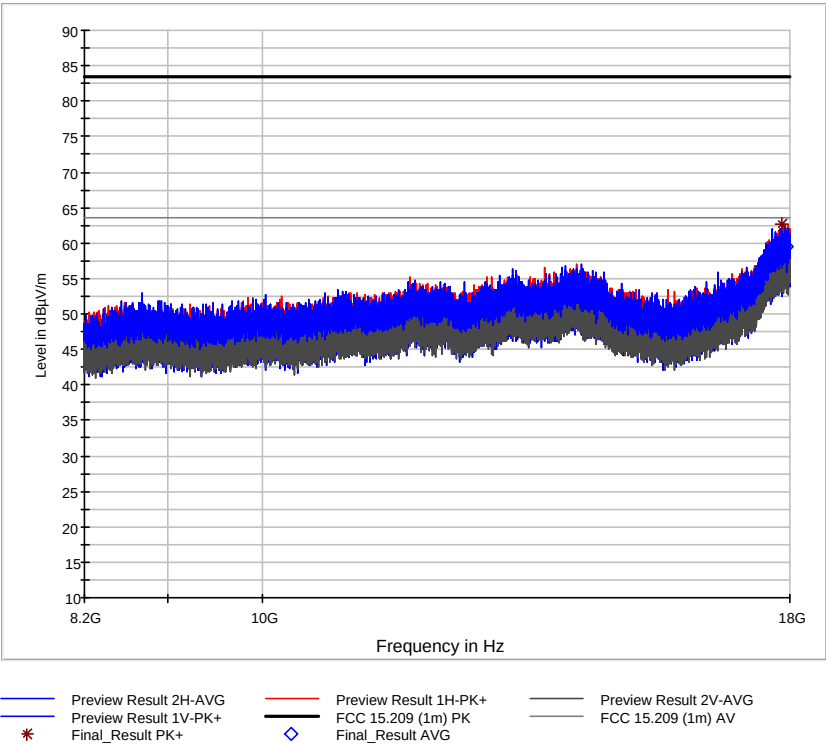


Final Results:

Frequency	MaxPeak	CAverage	Limit	Margin	Meas. Time	Bandwidth	Height	Pol	Azimuth	Corr.
MHz	dBµV/m	dBµV/m	dBµV/m	dB	ms	kHz	cm		deg	dB
2995.500000	---	31.54	53.98	22.44	1000.0	1000.000	400.0	V	-115.0	35.2
2995.500000	45.23	---	73.97	28.74	1000.0	1000.000	400.0	V	-115.0	35.2



Product Service

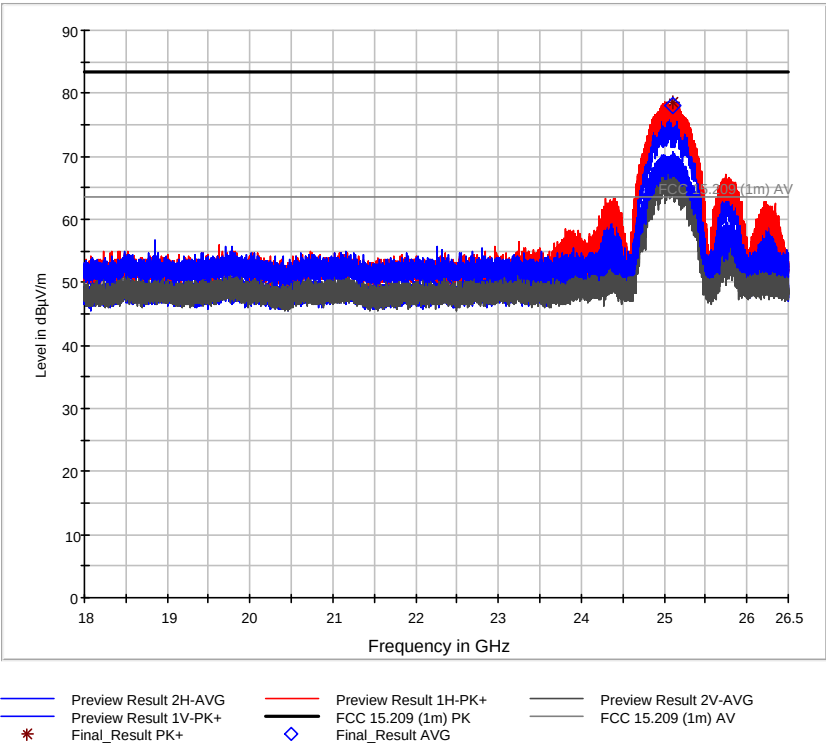


Final Results:

Frequency	MaxPeak	Average	Limit	Margin	Meas. Time	Bandwidth	Height	Pol	Azimuth	Corr.
MHz	dBµV/m	dBµV/m	dBµV/m	dB	ms	kHz	cm		deg	dB
17827.193333	62.69	---	83.50	20.81	2.5	1000.000	150.0	H	249.0	47.9
17891.220000	---	59.60	63.50	3.90	2.5	1000.000	150.0	V	258.0	48.0



Product Service



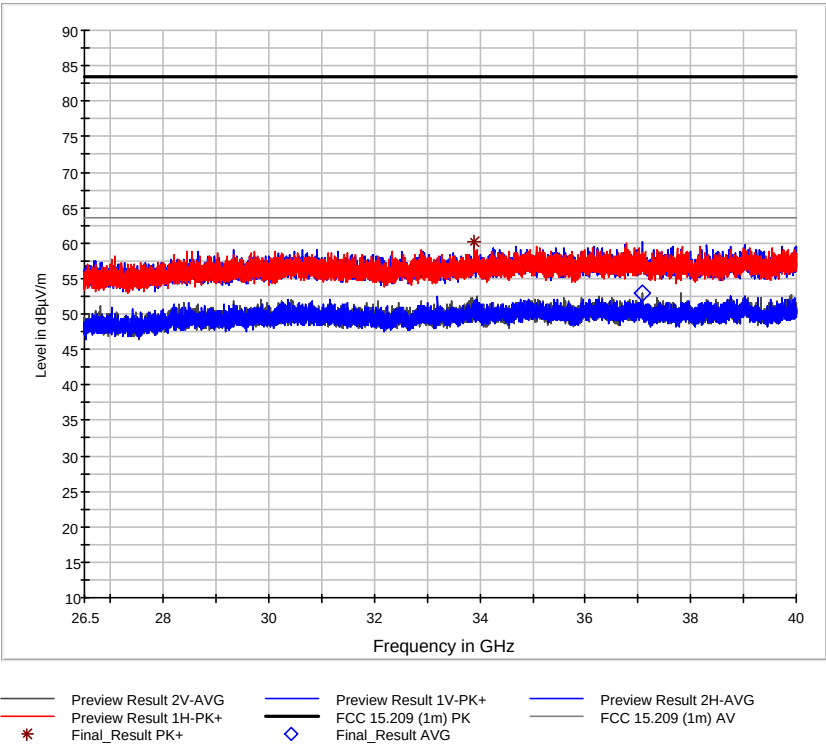
Final Results:

Frequency	MaxPeak	Average	Limit	Margin	Meas. Time	Bandwidth	Height	Pol	Azimuth	Corr.
MHz	dBµV/m	dBµV/m	dBµV/m	dB	ms	kHz	cm		deg	dB
25110.636364	---	77.98	#1 NA	#1 NA	2.5	1000.000	150.0	H	12.0	40.4
25110.636364	78.50	---	#1 NA	#1 NA	2.5	1000.000	150.0	H	12.0	40.4

#1 Intentional Emission within 24.05-29.00 GHz band



Product Service



Final Results:

Frequency	MaxPeak	Average	Limit	Margin	Meas. Time	Bandwidth	Height	Pol	Azimuth	Corr.
MHz	dBµV/m	dBµV/m	dBµV/m	dB	ms	kHz	cm		deg	dB
33889.900000	60.06	---	83.50	23.44	2.5	1000.000	150.0	H	171.0	43.6
37079.950000	---	53.05	63.50	10.45	2.5	1000.000	150.0	V	109.0	43.7