

Annex 201: Measurement diagrams 1-6927-23-01-03-TR1-A201-R01

Number of pages:	25	Date of Report:	2024-Aug-28
Testing company:	cetecom advanced GmbH Untertuerkheimer Str. 6-10 66117 Saarbruecken GERMANY	Applicant:	Acconeer AB
Product: Model:	IoT module XM126		
FCC ID:	2AQ6KXM002	IC:	24388-XM002
Testing has been carried out in accordance with:	FCC - Title 47 of the Code of Federal Regulations; Chapter I Part 15 - Radio frequency devices Canada – RSS-210 Issue 11 License –exempt Radio Apparatus: Category I equipment Annex J: Devices operating in the band 57-71 GHz		

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1 Measurement diagrams

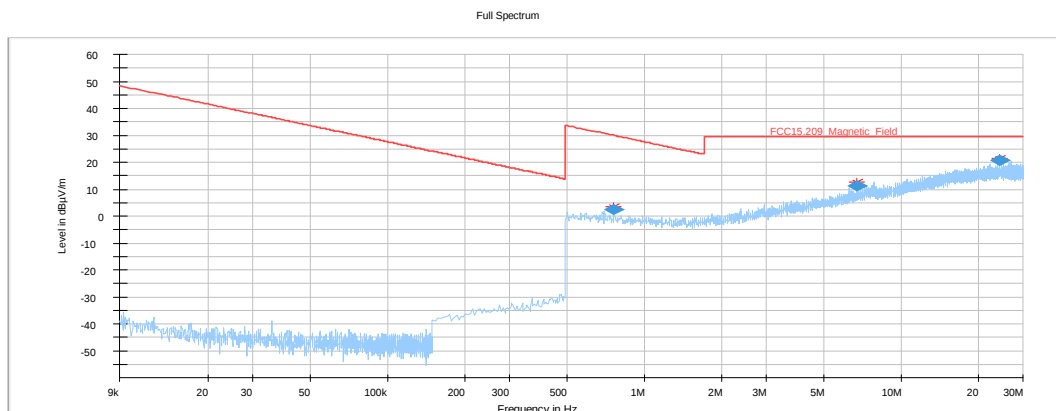
1.1 Radiated emissions §15.209, RSS-Gen, Issue 5, §8.9

1.1.1 Frequency range 9kHz to 30MHz

TID030a_RSE_TX_9kHz-30MHz_EUT_laying

Common Information

Test description:	Magnetic Field Strength Measurement related to 30/300 m distance
Test Site Location:	Ref.-Nr. 441 Semi Anechoic Chamber (SAC1) with 3 m measurement distance
Version of Testsoftware:	EMC32 V10.60.20
Distance correction:	used accord. table, pls. see test report
Technical Data:	Please see page 2 for detailed data of measurement setup
Rec. antenna (pre-scan):	height 1.00 m, parallel and 90° to EUT polarisation
Used filter:	bypass
Test Standard:	FCC 15.205 § 15.209; RSS-Gen: Issue 5, §8.9
Operator:	Lor
Operating Mode:	RADAR on, (BT-Test SW2 setting)
Power during tests:	internal battery
Comment 1:	Channel nominal
Comment 2:	--
Environmental Conditions:	Humidity: 58% rH; Temperature: 21.5 °C
EUT Setup:	1 (XM126)
Verdict:	Passed



Final Result

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Pol	Azimuth (deg)	Corr. (dB/m)	Comment
0.766000	2.50	29.93	27.43	9.000	H	215.0	-20.5	09:11:56 - 17.06.2024
6.730000	11.09	29.54	18.45	9.000	H	151.0	-8.1	09:18:01 - 17.06.2024
24.206000	20.69	29.54	8.85	9.000	H	167.0	1.9	09:14:35 - 17.06.2024

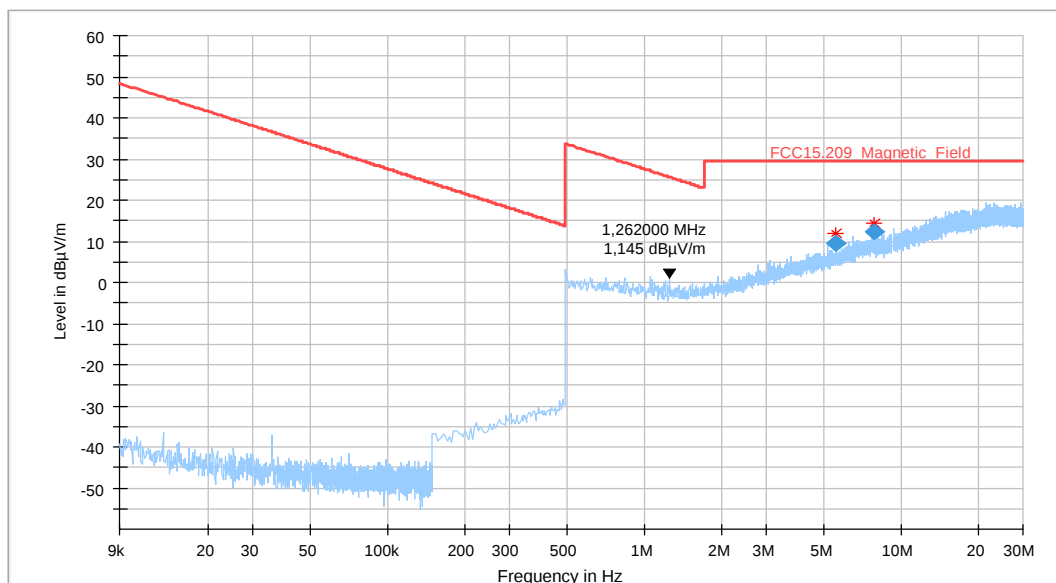
TID030b_RSE_TX_9kHz-30MHz_EUT_standing

Common Information

Test description: Magnetic Field Strength Measurement related to 30/300 m distance
Test Site Location: Ref.-Nr. 441 Semi Anechoic Chamber (SAC1) with 3 m measurement distance
Version of Testsoftware: EMC32 V10.60.20
Distance correction: used accord. table, pls. see test report
Technical Data: Please see page 2 for detailed data of measurement setup
Rec. antenna (pre-scan): height 1.00 m, parallel and 90° to EUT polarisation
Used filter: bypass
Test Standard: FCC 15.205 § 15.209; RSS-Gen: Issue 5

Operator: Lor
Operating Mode: RADAR on, (BT-Test SW2 setting)
Power during tests: internal battery
Comment 1: Channel nominal
Comment 2:
Environmental Conditions: Humidity: 58% rH; Temperature: 21.5 °C
EUT Setup: 1 (XM126)
Verdict: Passed

Full Spectrum

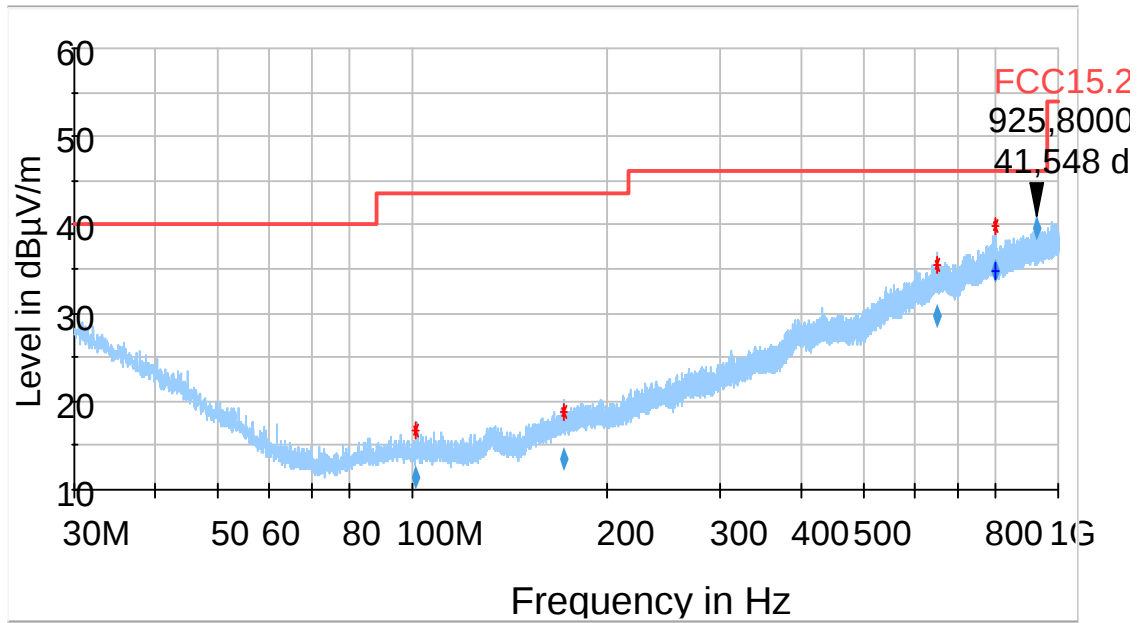


Final Result

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Pol	Azimuth (deg)	Corr. (dB/m)	Comment
5.630000	9.59	29.54	19.95	9.000	H	20.0	-9.7	08:46:11 - 17.06.2024
7.930000	12.29	29.54	17.25	9.000	H	124.0	-6.7	08:42:20 - 17.06.2024

1.1.2 Frequency range 30MHz to 1GHz

Diagram no.: TID018_RSE_TX_30M-1GHz



No critical emission determined.

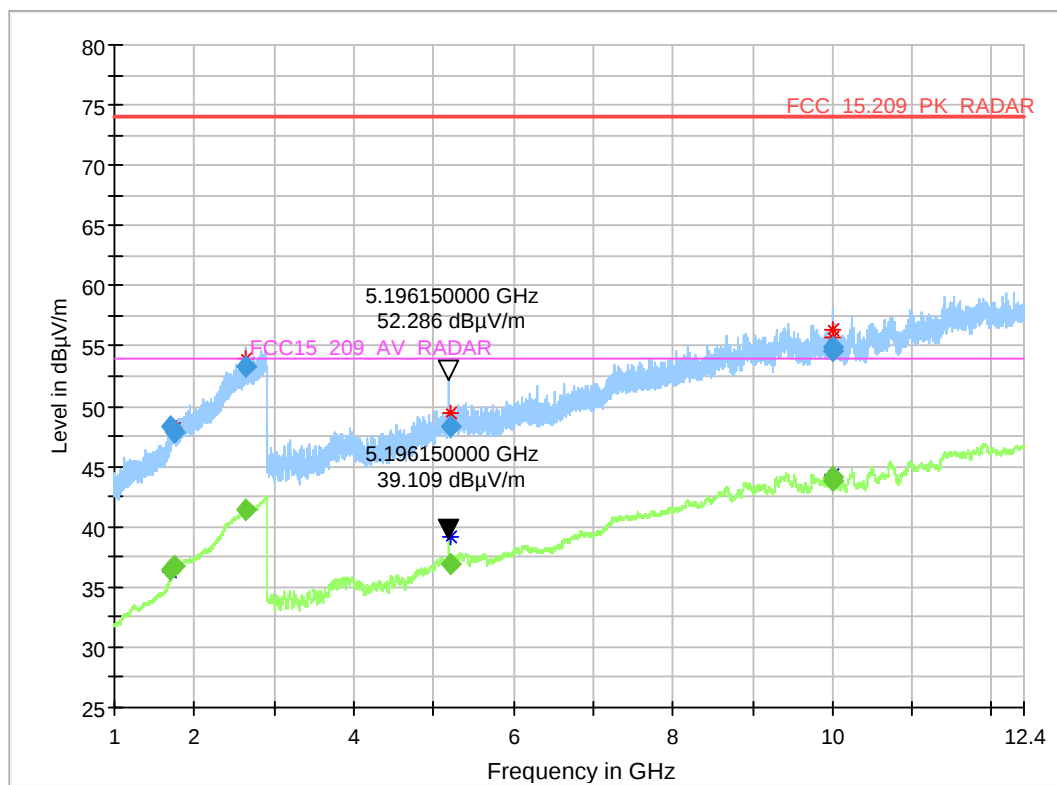
1.1.3 Frequency range 1GHz to 12.4GHz

TID019_RSE_TX_1G-12.4GHz

Common Information

Test Description:	Radiated Field Strength Emission@3m distance
Test Site Location:	cetecom advanced Essen
Test Site:	Fully Anechoic Room (FAR2)
Test Standard:	FCC 15.209
Operating Mode:	Operator, please fill in the operating mode
Environmental Conditions:	Humidity: 52%rH; Temperature: 22.3°C
SW-Version:	EMC32 V10.60.20
Operator:	Setup: Main EUT
Set-up:	XM126
Verdict:	Passed
Remark:	--

Full Spectrum



Final_Result_PK+

Frequency (MHz)	MaxPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB/m)
1708.000000	48.26	74.00	25.74	1000.000	155.0	V	310.0	90.0	30.7
1746.868421	47.76	74.00	26.24	1000.000	155.0	V	323.0	0.0	31.0
2655.000000	53.26	74.00	20.74	1000.000	155.0	H	62.0	90.0	34.1
5213.075000	48.28	74.00	25.72	1000.000	155.0	H	38.0	0.0	1.0
9997.705000	54.62	74.00	19.38	1000.000	155.0	H	89.0	90.0	9.4
10015.090000	54.99	74.00	19.01	1000.000	155.0	V	343.0	0.0	9.4

(continuation of the "Final_Result_PK+" table from column 12 ...)

Frequency (MHz)	Preamp (dB)	Trd Corr. (dB/m)	Raw Rec (dBμV)	Comment
1708.000000	0.0	26.6	17.5	12:58:14 PM - 17-May-24
1746.868421	0.0	27.0	16.8	12:55:00 PM - 17-May-24
2655.000000	0.0	29.2	19.2	12:56:40 PM - 17-May-24
5213.075000	0.0	33.8	47.3	2:08:11 PM - 17-May-24
9997.705000	0.0	37.9	45.2	2:12:40 PM - 17-May-24
10015.090000	0.0	37.9	45.5	2:10:27 PM - 17-May-24

Final_Result_RMS

Frequency (MHz)	RMS (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB/m)
1708.000000	36.45	54.00	17.55	1000.000	155.0	V	310.0	90.0	30.7
1746.868421	36.73	54.00	17.27	1000.000	155.0	V	323.0	0.0	31.0
2655.000000	41.47	54.00	12.53	1000.000	155.0	H	62.0	90.0	34.1
5213.075000	36.85	54.00	17.15	1000.000	155.0	H	38.0	0.0	1.0
9997.705000	44.06	54.00	9.94	1000.000	155.0	H	89.0	90.0	9.4
10015.090000	43.82	54.00	10.18	1000.000	155.0	V	343.0	0.0	9.4

(continuation of the "Final_Result_RMS" table from column 12 ...)

Frequency (MHz)	Preamp (dB)	Trd Corr. (dB/m)	Raw Rec (dBμV)	Comment
1708.000000	0.0	26.6	5.7	12:58:14 PM - 17-May-24
1746.868421	0.0	27.0	5.8	12:55:00 PM - 17-May-24
2655.000000	0.0	29.2	7.4	12:56:41 PM - 17-May-24
5213.075000	0.0	33.8	35.9	2:08:12 PM - 17-May-24
9997.705000	0.0	37.9	34.6	2:12:40 PM - 17-May-24
10015.090000	0.0	37.9	34.4	2:10:27 PM - 17-May-24

1.1.4 Frequency range 12.4 to 18GHz

Diagram no.: TID020a_RSE_TX_12_4G-18G_AntH

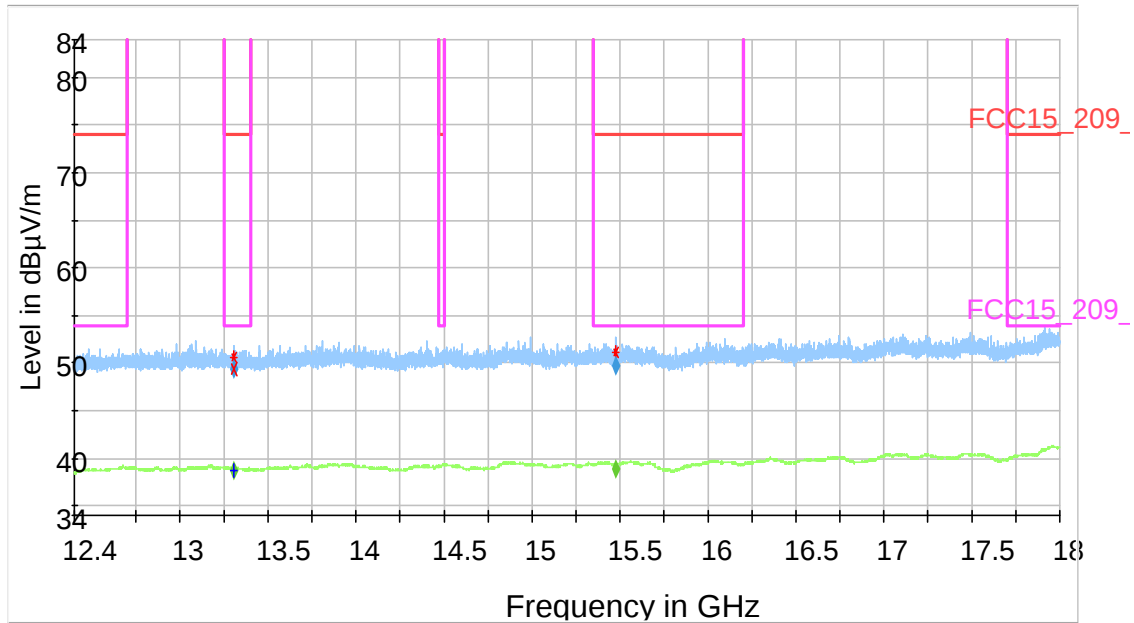
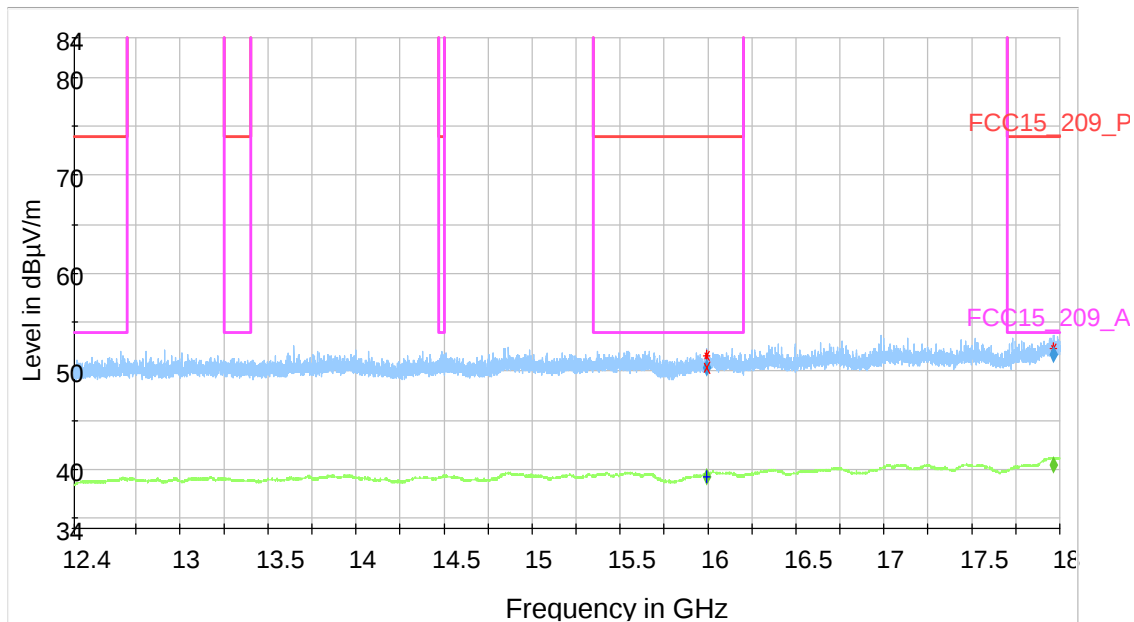


Diagram no.: TID020b_RSE_TX_12_4G-18G_AntV



1.1.5 Frequency range 18 to 40GHz

Diagram no.: TID021a_RSE_TX_18G-40G_Anth_laying

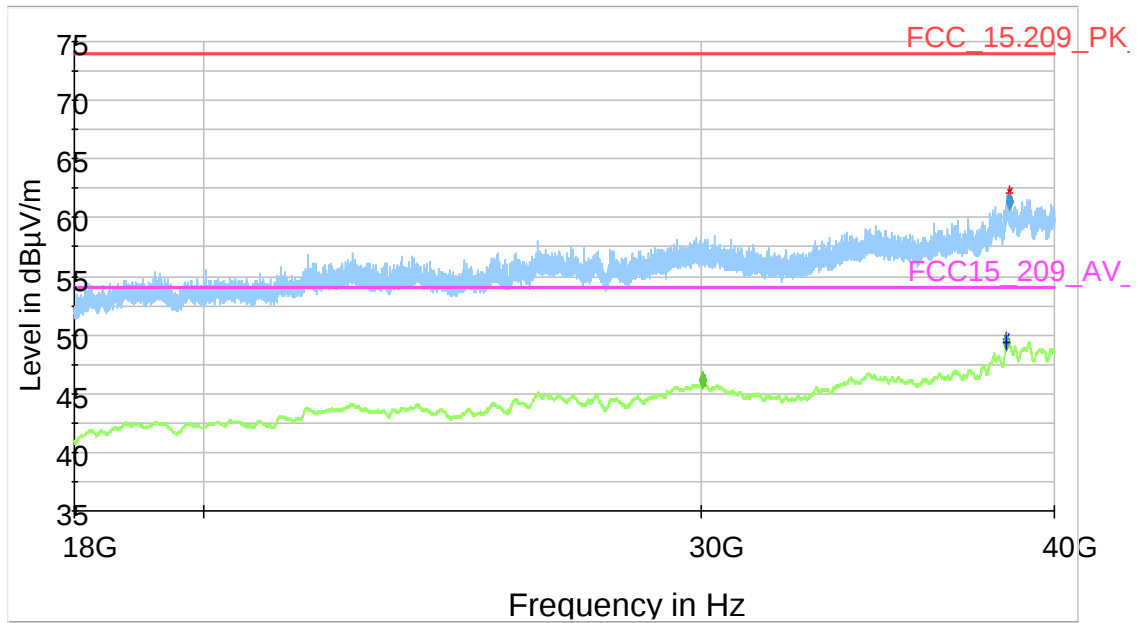


Diagram no.: TID021a_RSE_TX_18G-40G_Anth_standing

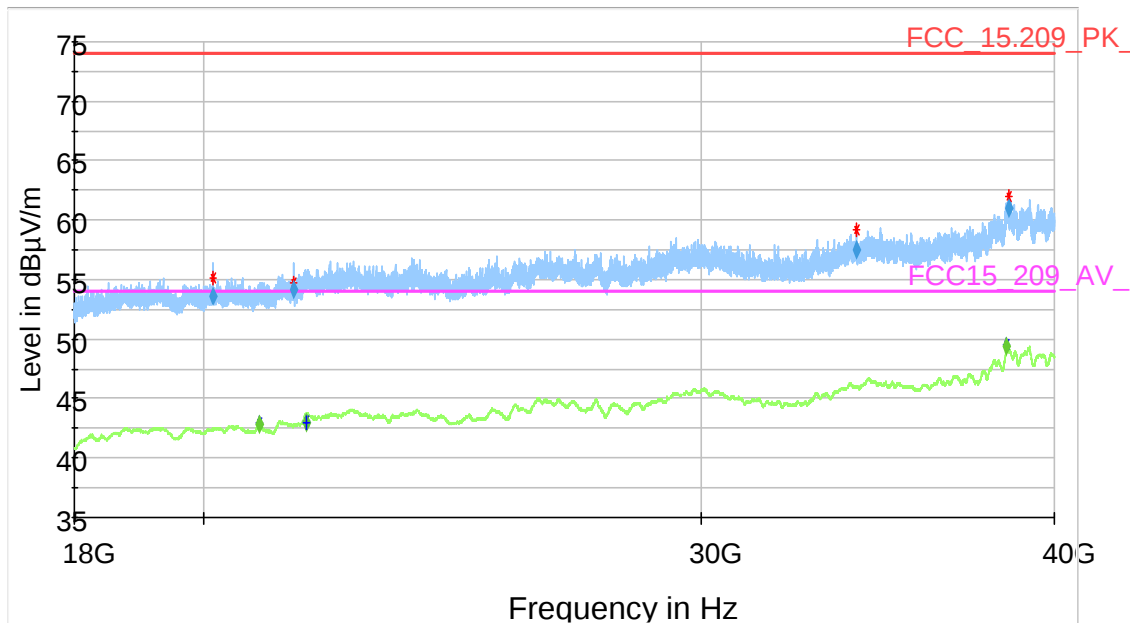


Diagram no.: TID021b_RSE_TX_18G-40G_AntV_laying

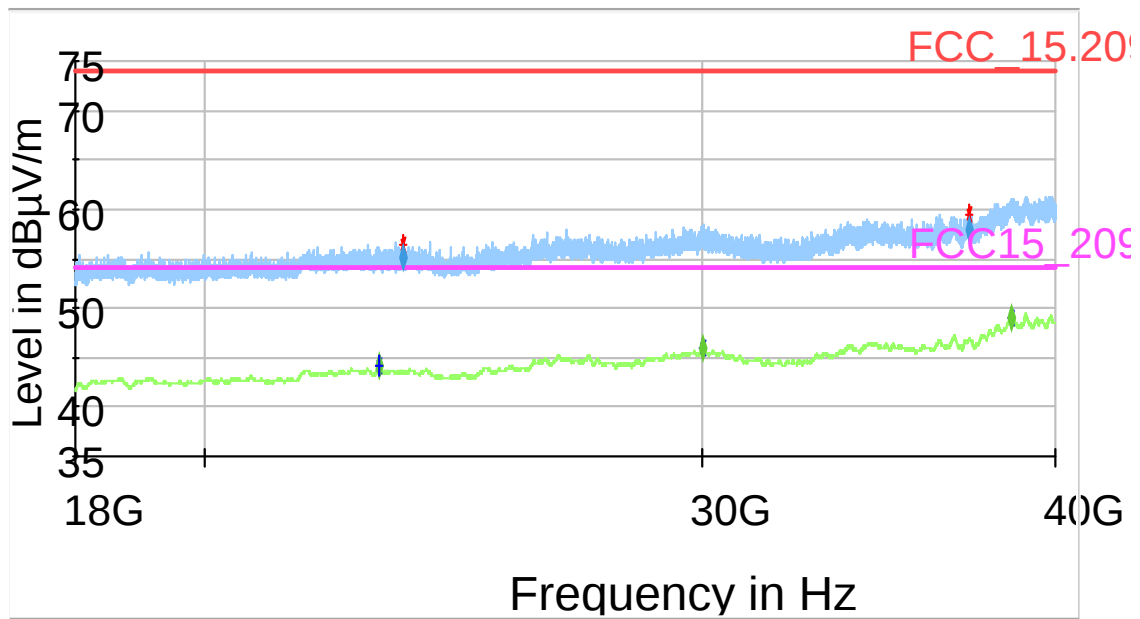
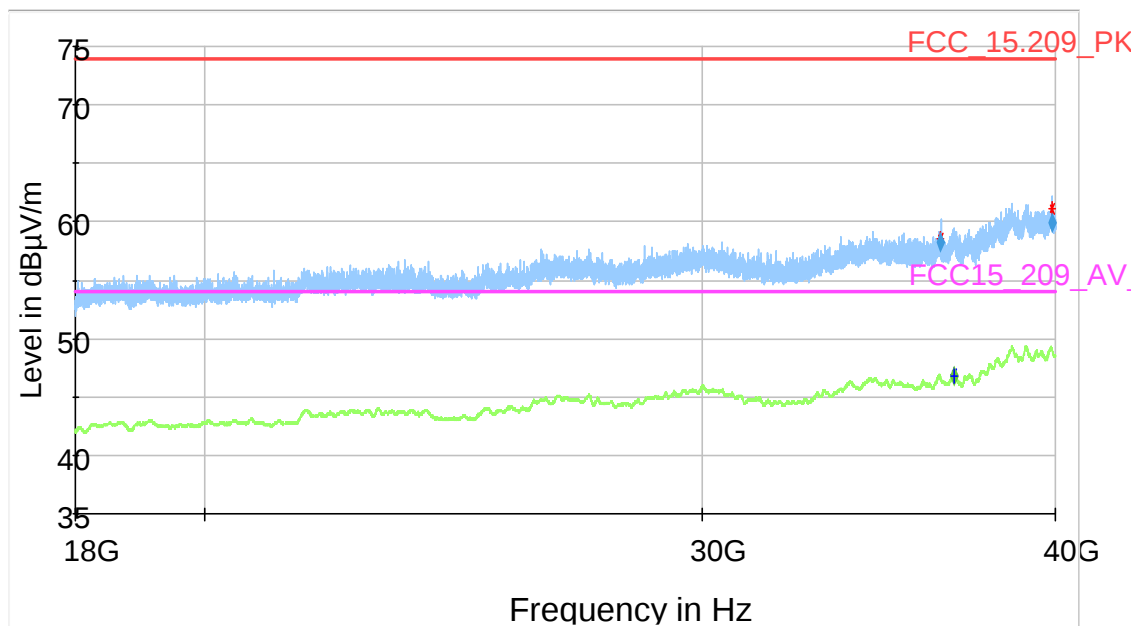


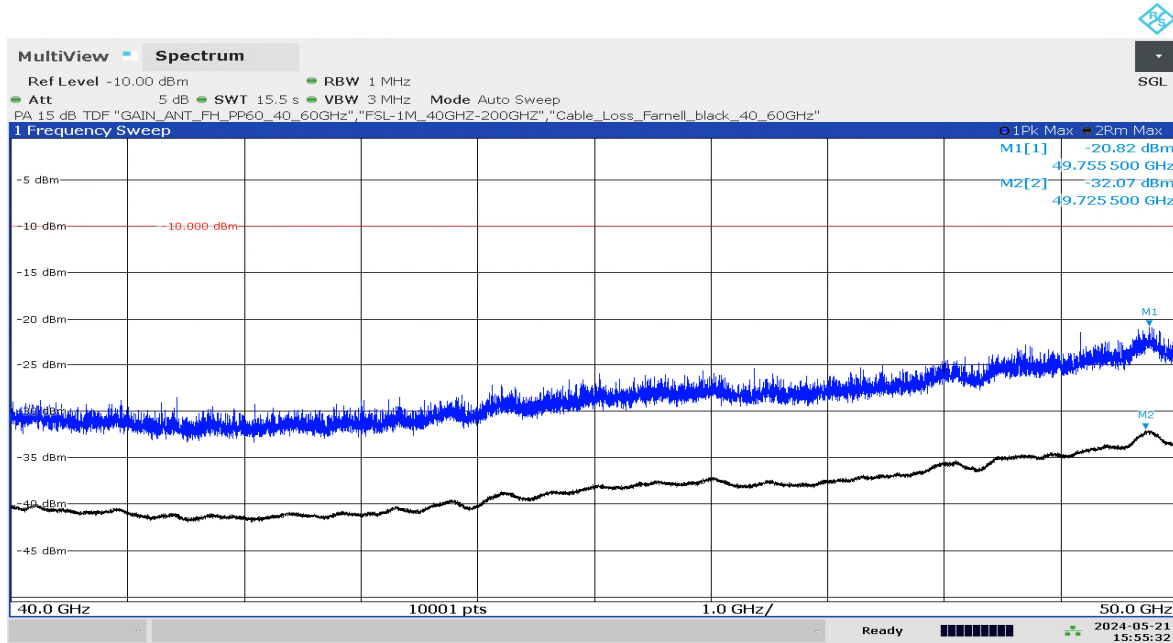
Diagram no.: TID021b_RSE_TX_18G-40G_AntV_standing



1.2 Radiated emissions §15.255(d), RSS-210, Issue 11, §J.4c.

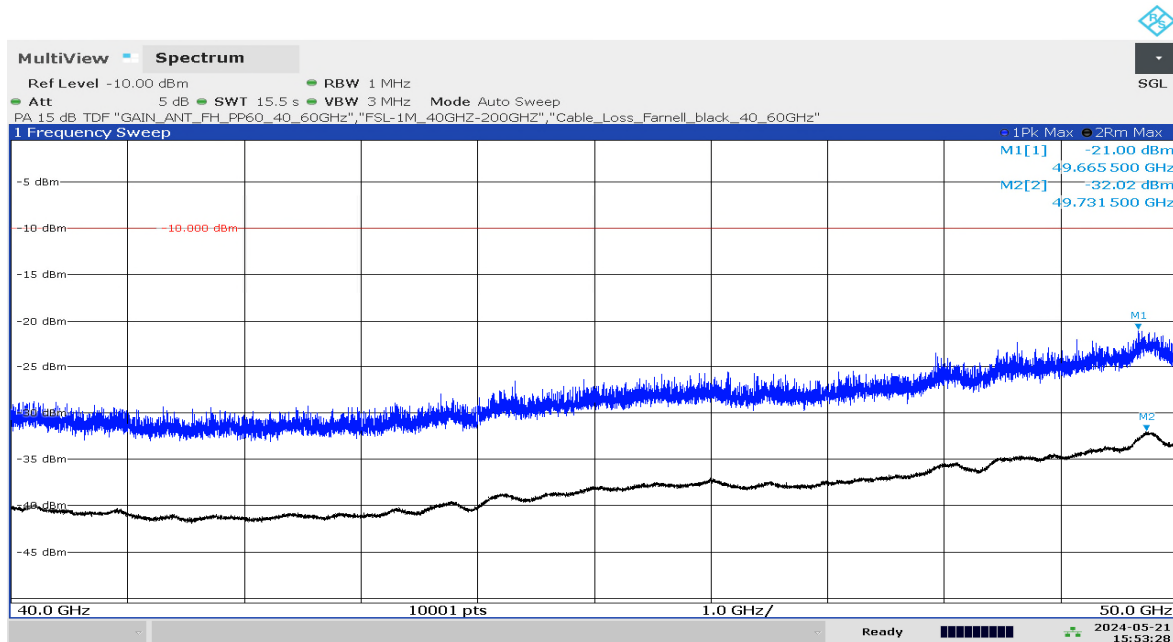
1.2.1 Frequency range 40 to 50GHz

Diagram no.: TID022a_1-6927_23-1-3_AntH_40G - 50GHz.PNG



03:55:32 05/21/2024

Diagram no.: TID022b_1-6927_23-1-3_AntV_40G - 50GHz.PNG



03:53:29 05/21/2024

1.2.2 Frequency range 50-75GHz

Diagram no.: TID023a_1-6927_23-1-3_AntH_50G - 75GHz_overview.PNG

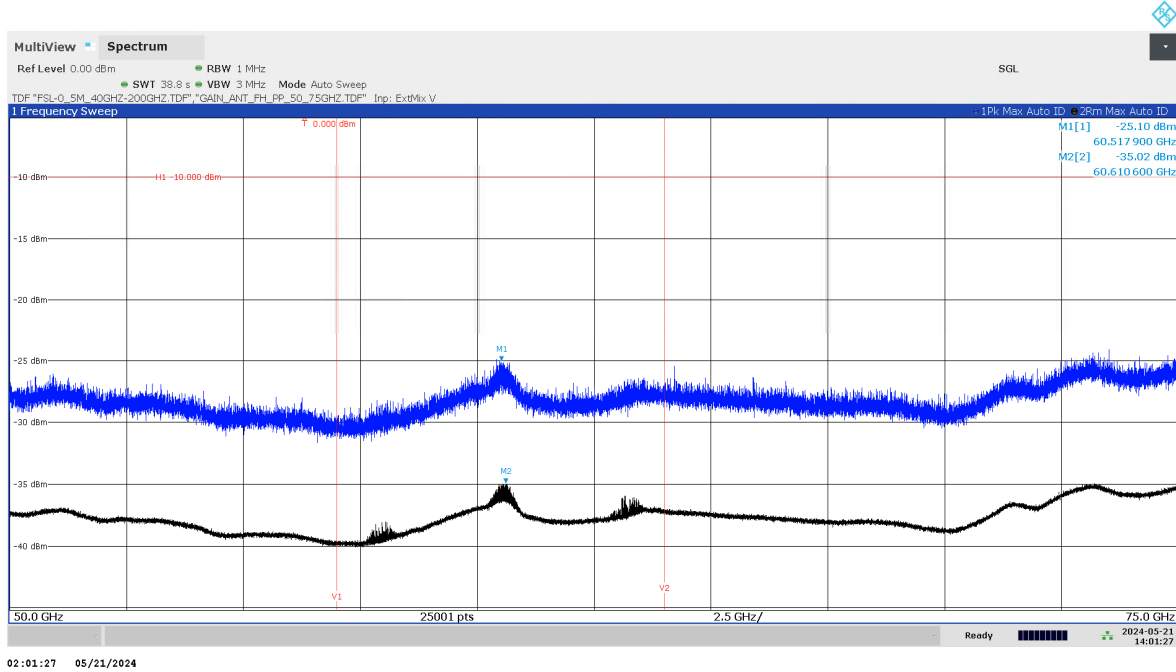


Diagram no.: TID023b_1-6927_23-1-3_AntV_50G - 75GHz_overview.PNG

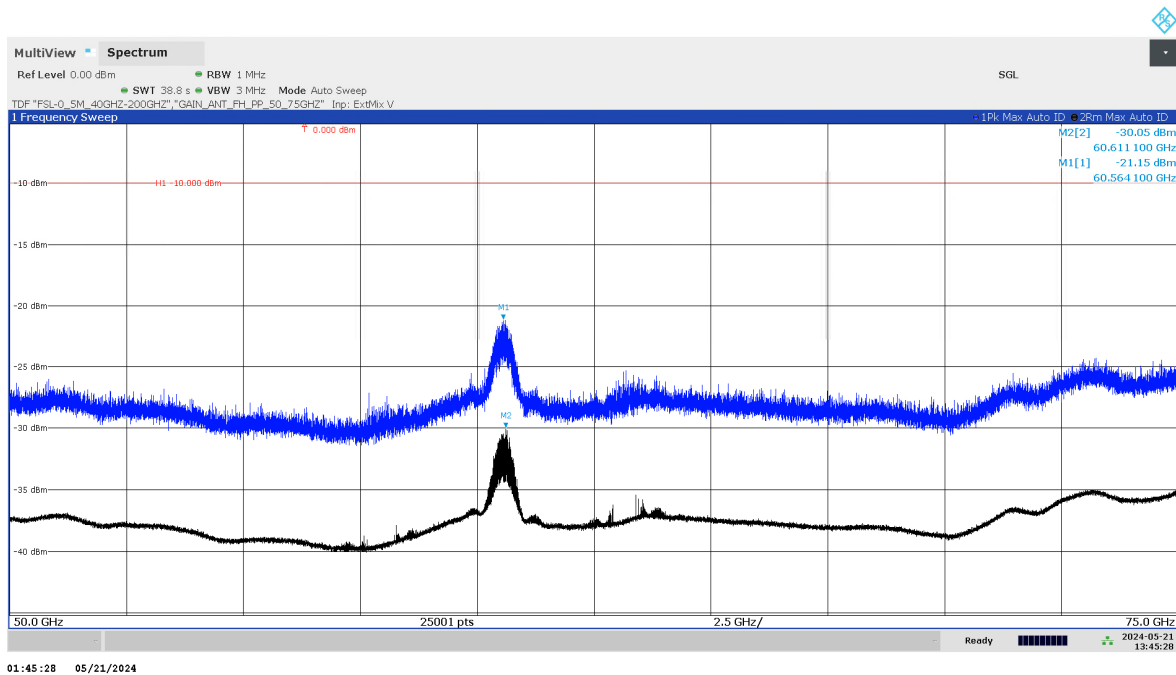


Diagram no.: TID026a_1-6927_23-1-3_AntV_67G - 75GHz.PNG

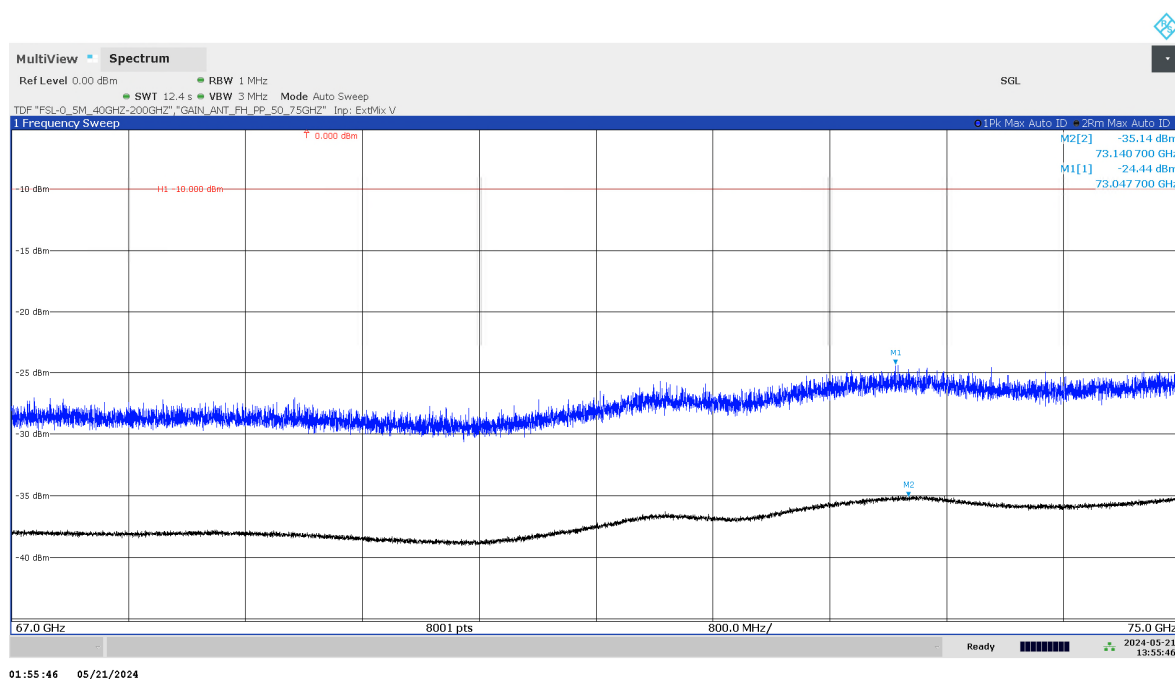
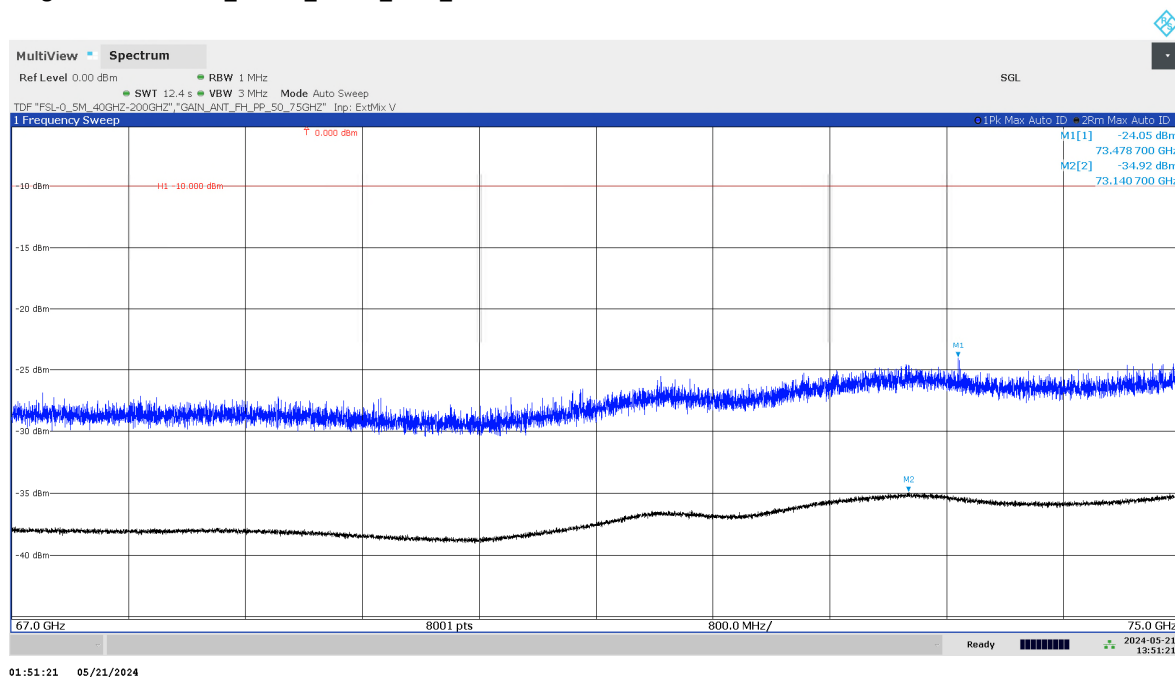


Diagram no.: TID026b_1-6927_23-1-3_AntV_67G - 75GHz.PNG



1.2.3 Frequency range 75-110GHz

Diagram no.: TID027a_1-6927_23-1-3_AntH_75G - 110GHz.PNG

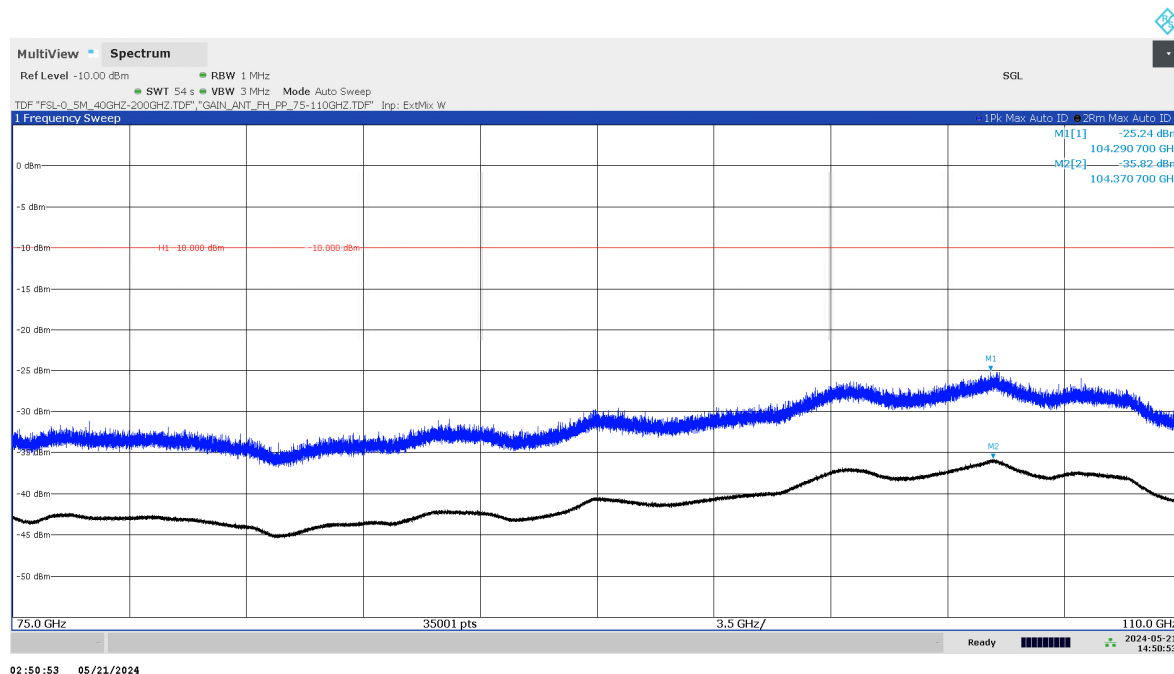
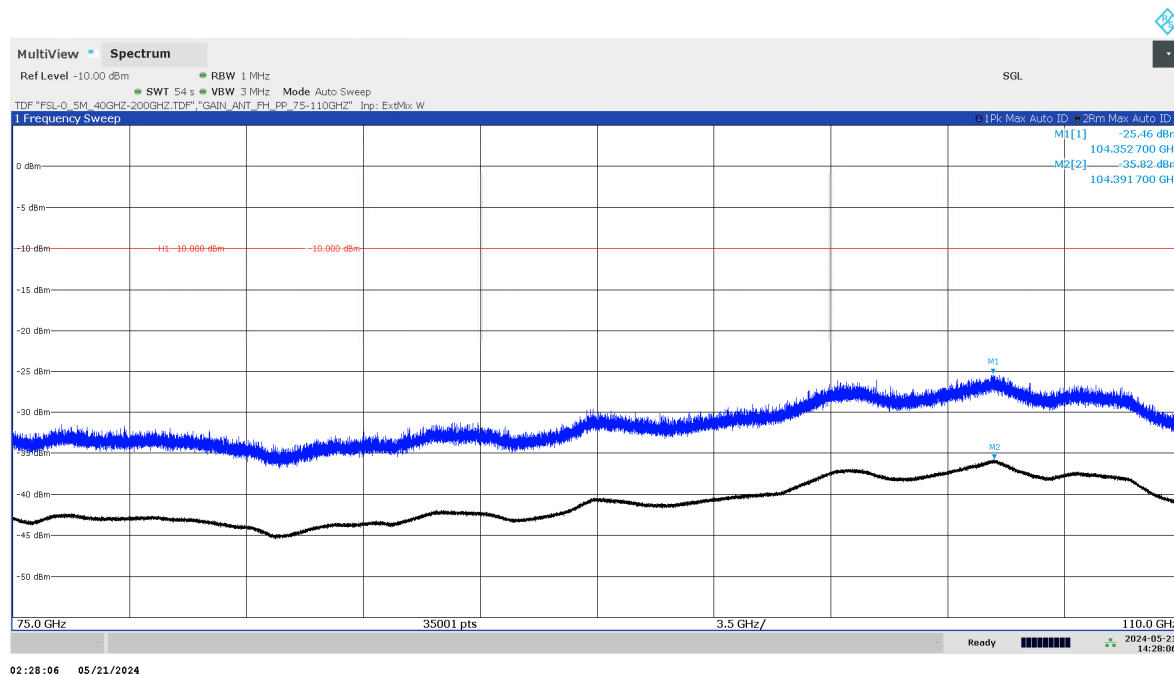


Diagram no.: TID027b_1-6927_23-1-3_AntV_75G - 110GHz.PNG



1.2.4 Frequency range 110-140GHz

Diagram no.: TID028a_1-6927_23-1-3_AntH_110G - 140GHz.PNG

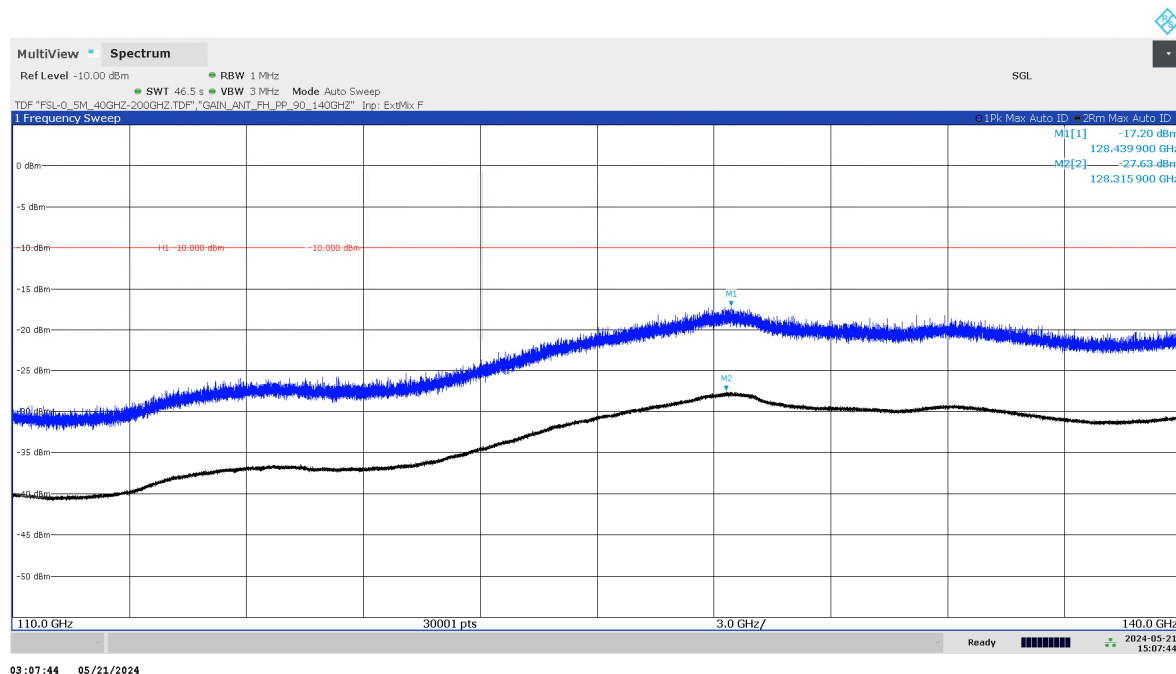
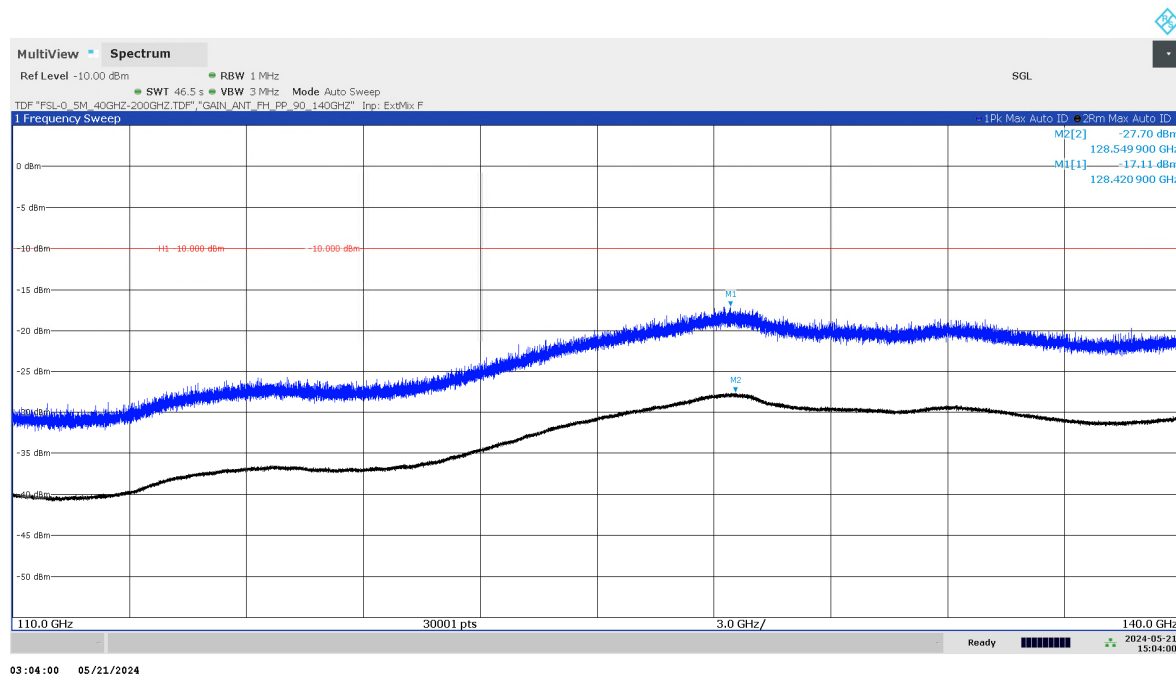


Diagram no.: TID028b_1-6927_23-1-3_AntV_110G - 140GHz.PNG



1.2.5 Frequency range 140-200GHz

Diagram no.: TID029a_RSE_140G-200GHz_AntH.PNG

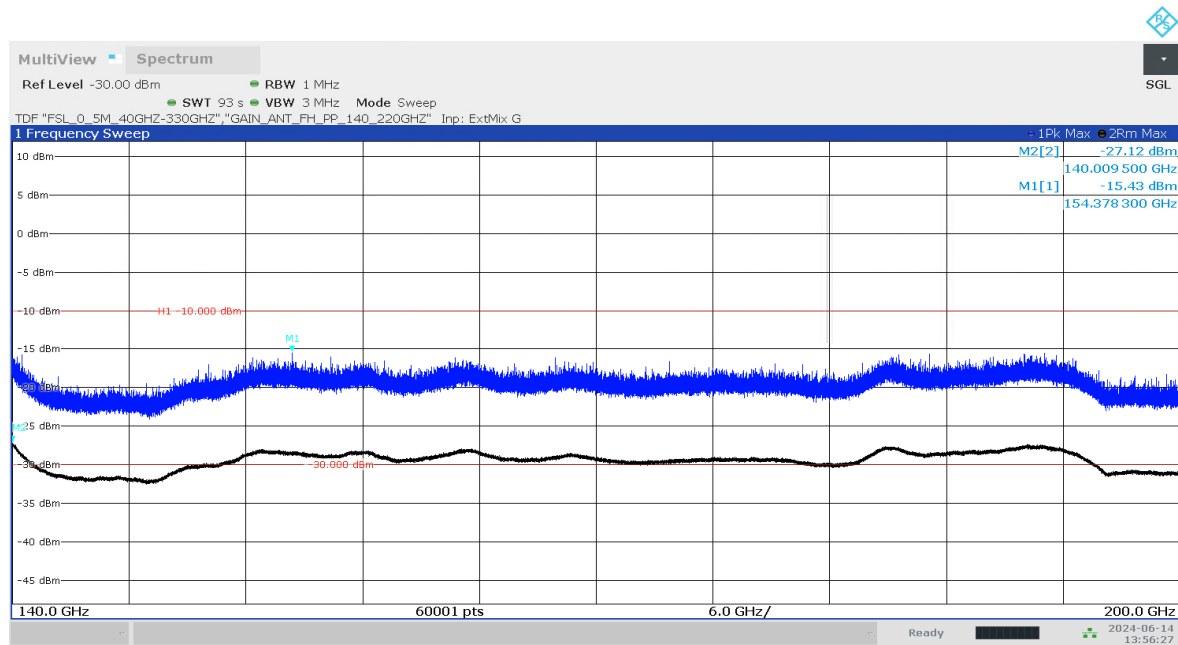


Diagram no.: TID029b_RSE_140G-200GHz_AntV.PNG

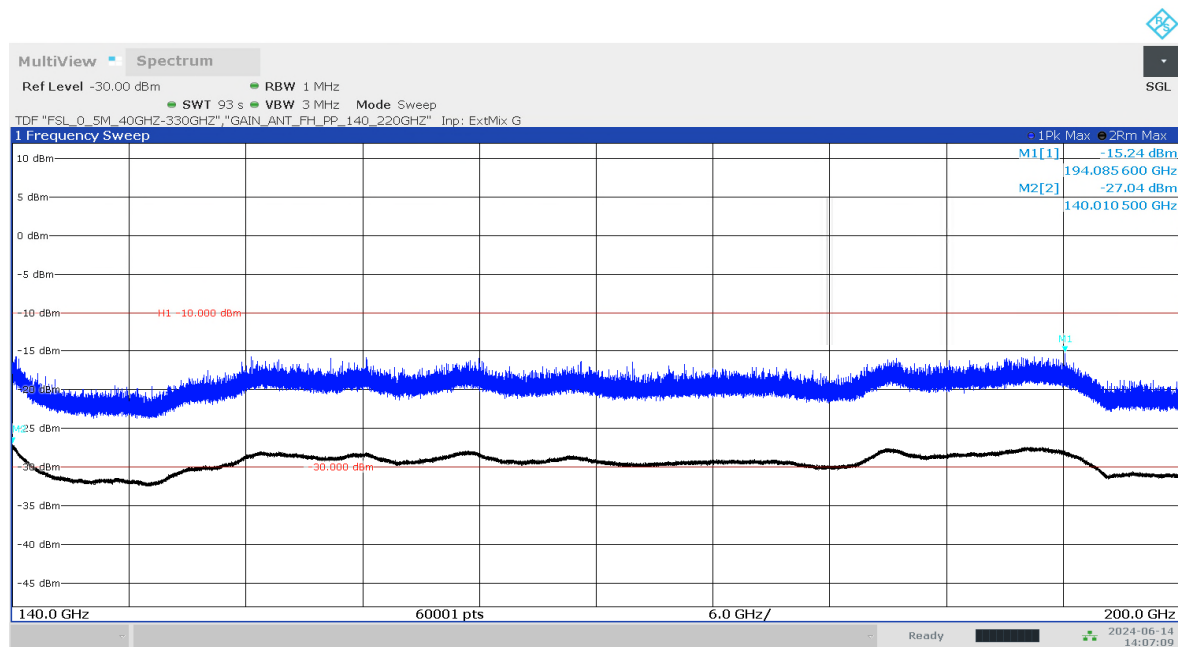


Diagram no.: TID029b_01_f1_194_085GHz_AntV.PNG

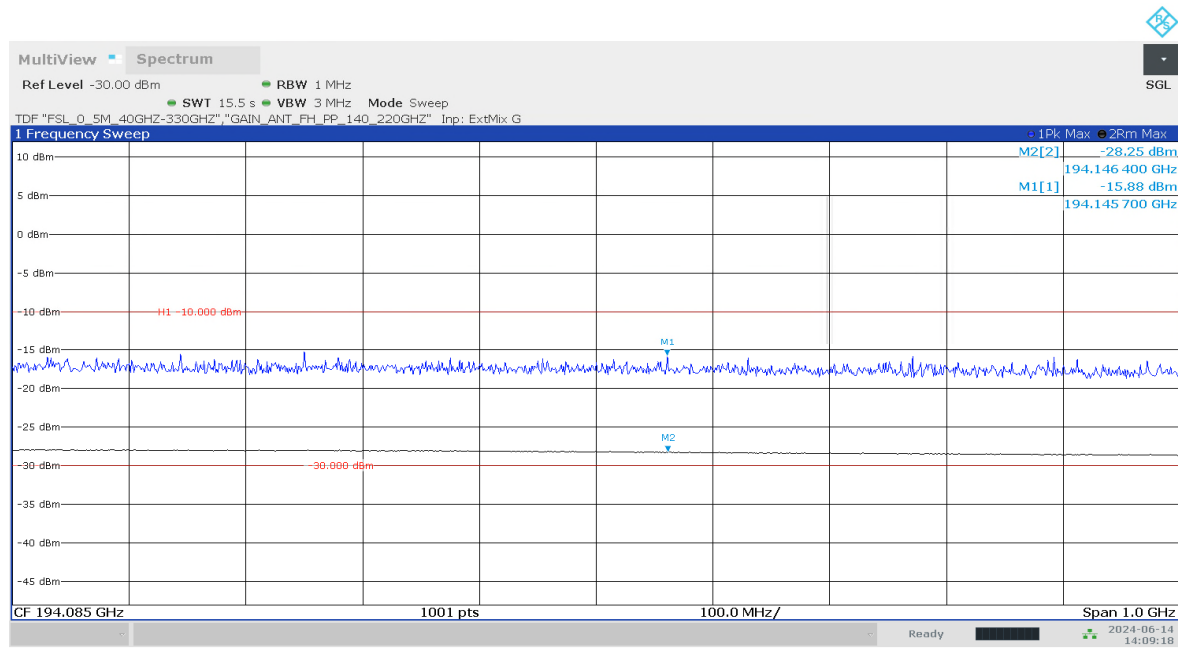
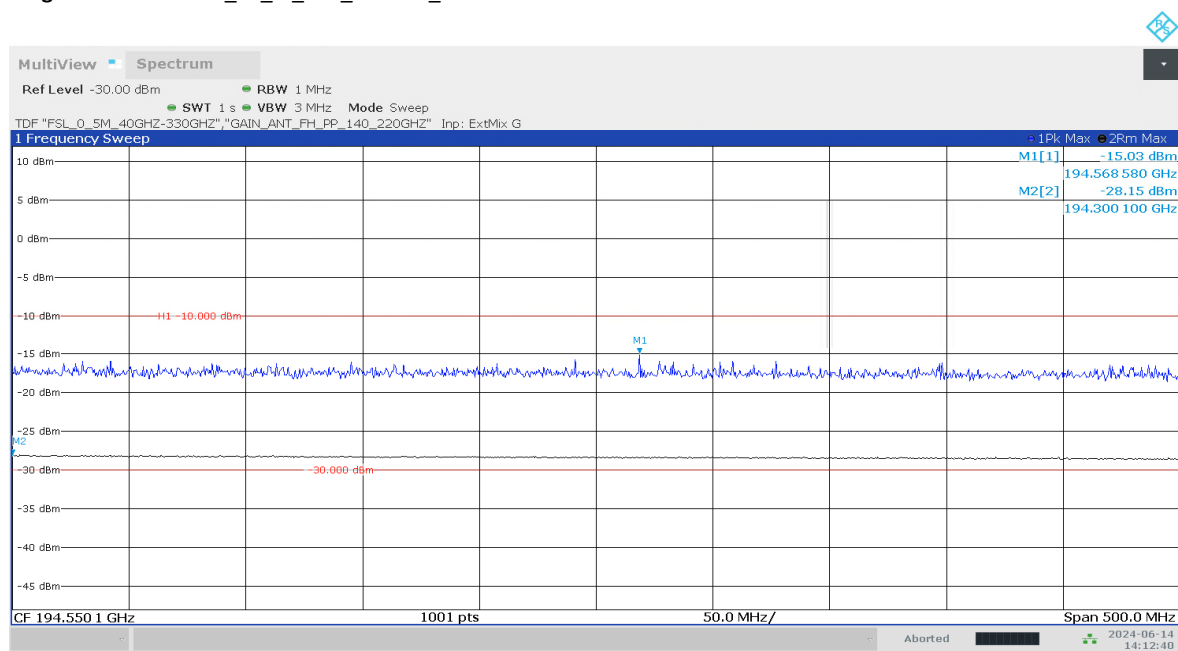
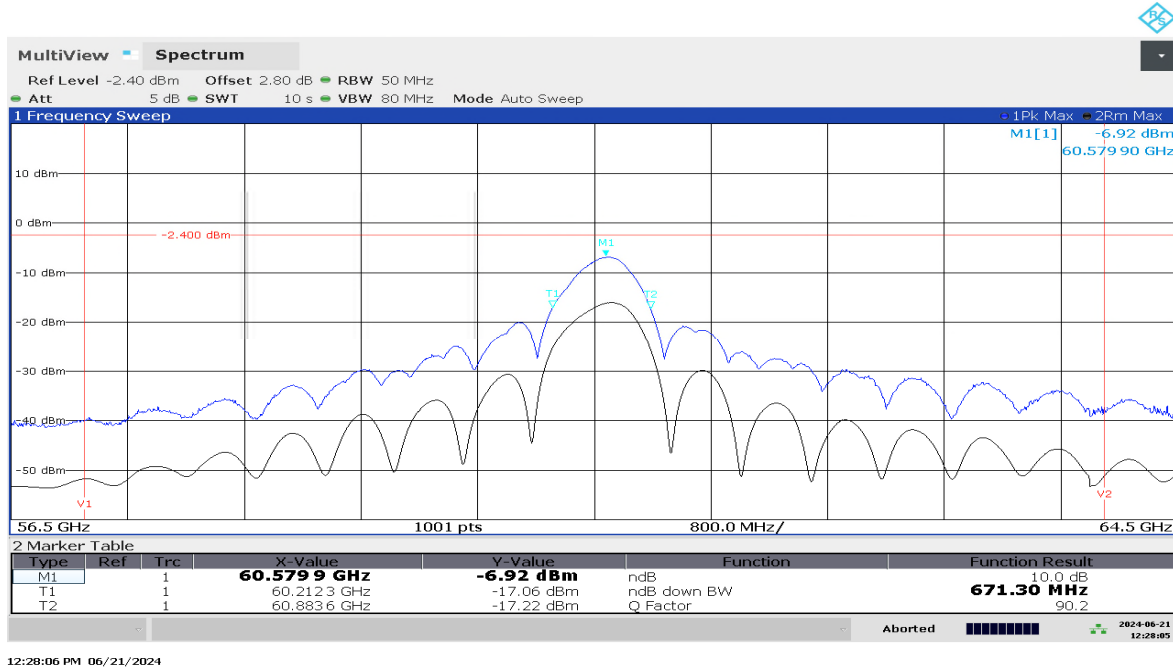


Diagram no.: TID029b_02_f2_194_568GHz_AntV.PNG



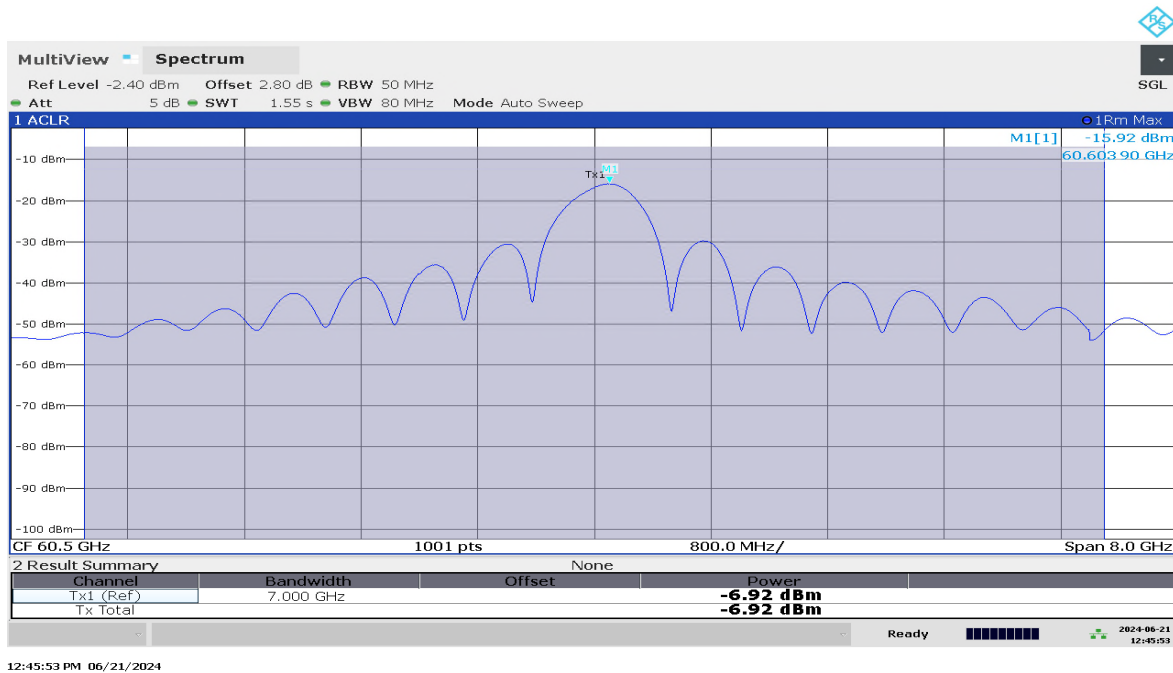
1.3 10dB bandwidth

Diagram no.: TID001_10dB_BW_AntH.PNG



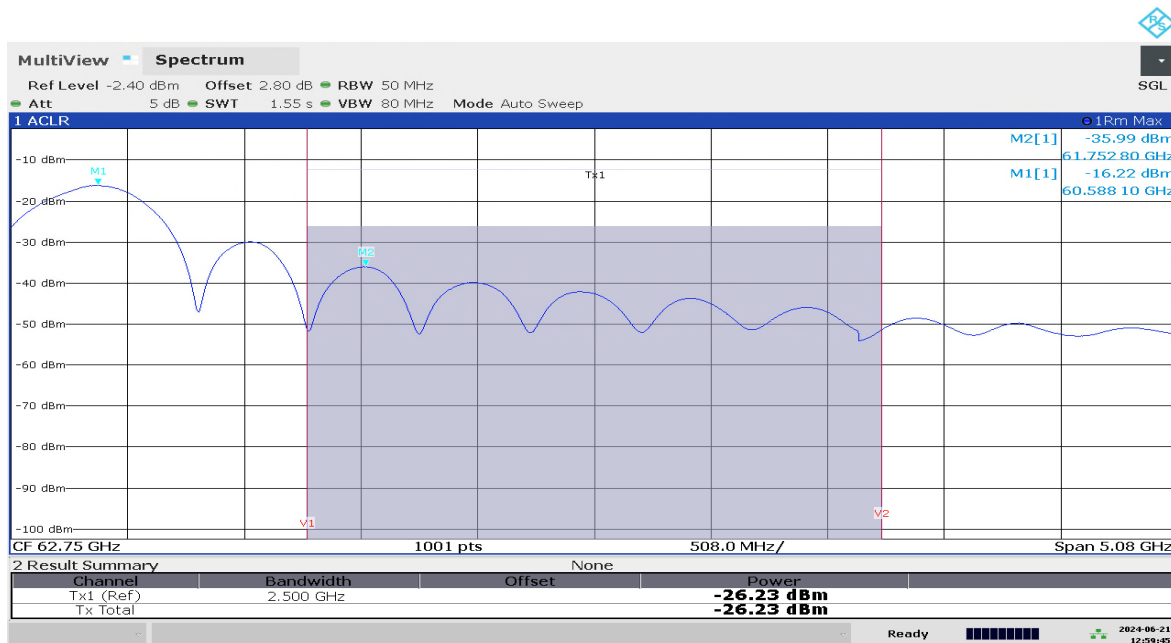
1.4 Average power

Diagram no.: TID002_CH-PWR_AntH.PNG



1.5 Average EIRP in the band 61.5 to 64GHz

Diagram no.: TID003_EIRP__61_5G-64G__AntH.PNG



12:59:46 PM 06/21/2024

1.6 Timing of transmissions

Diagram no.: TID005_single pulse.png

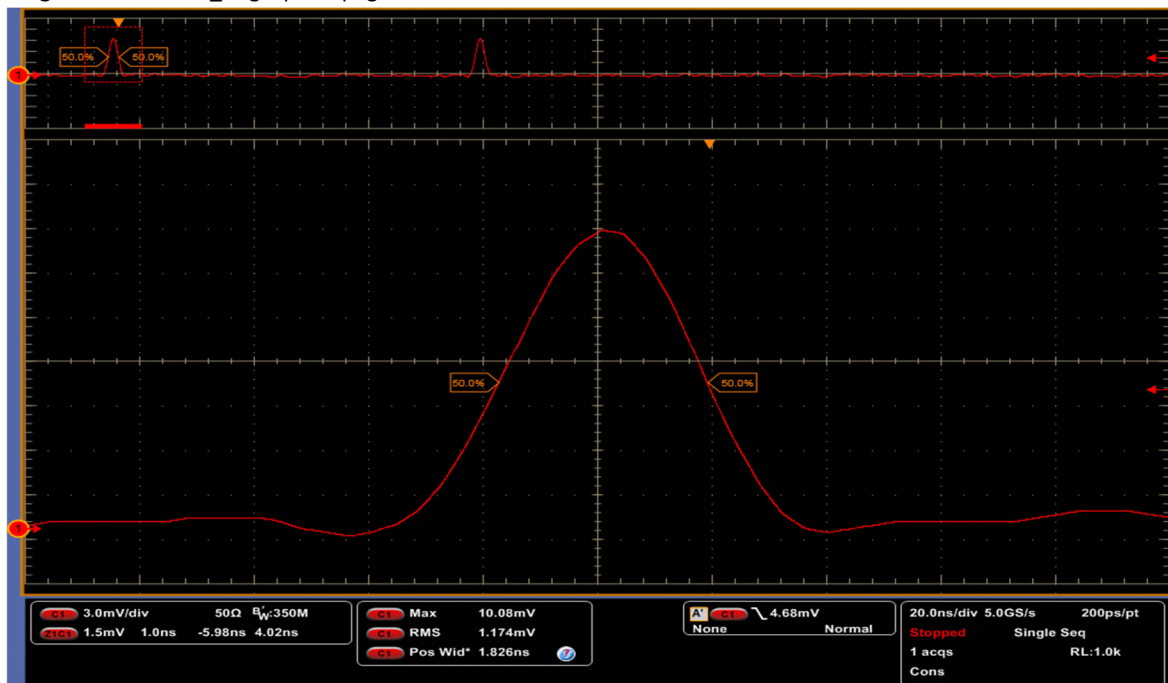


Diagram no.: TID006_Period.png

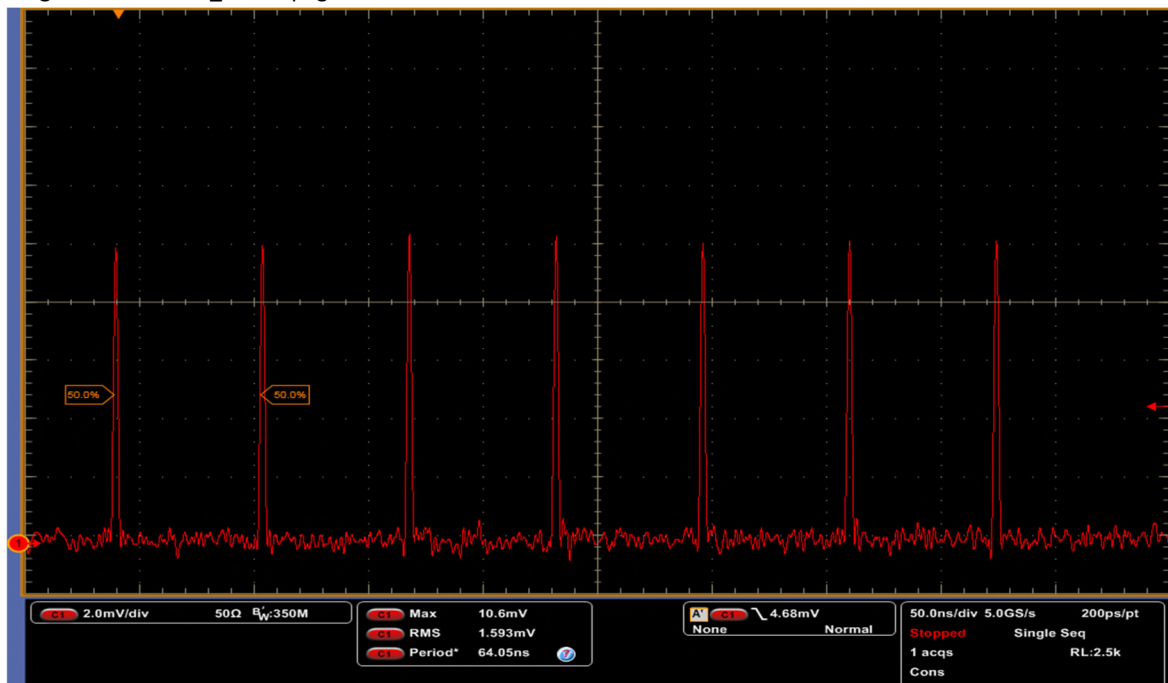
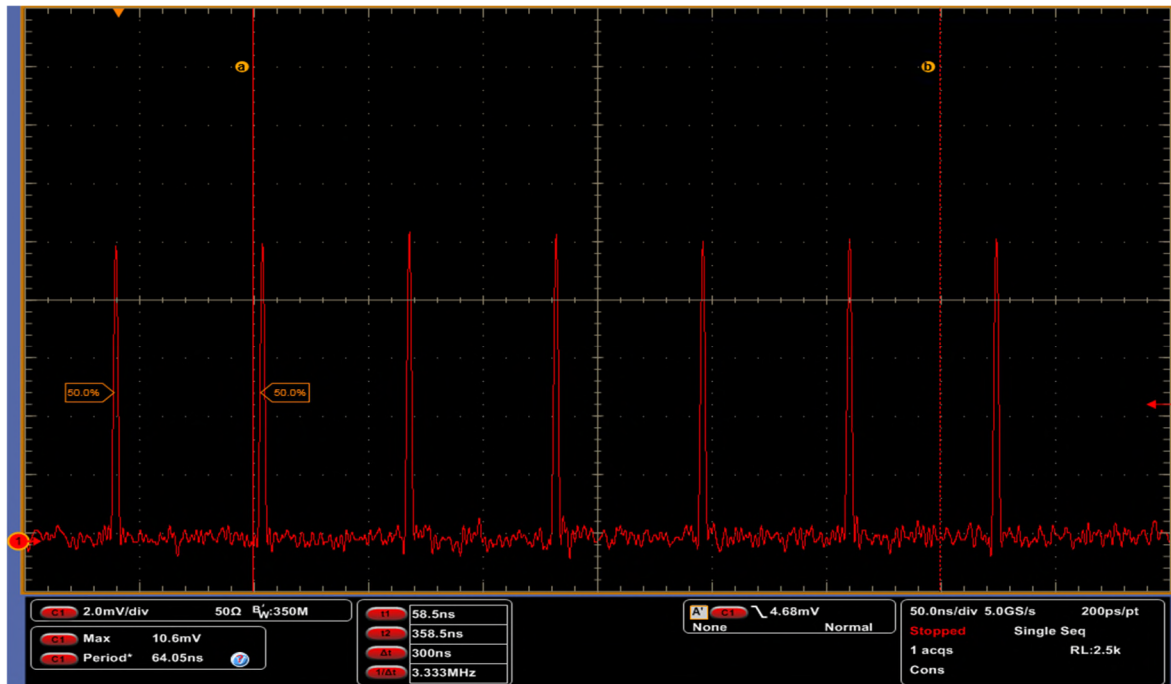
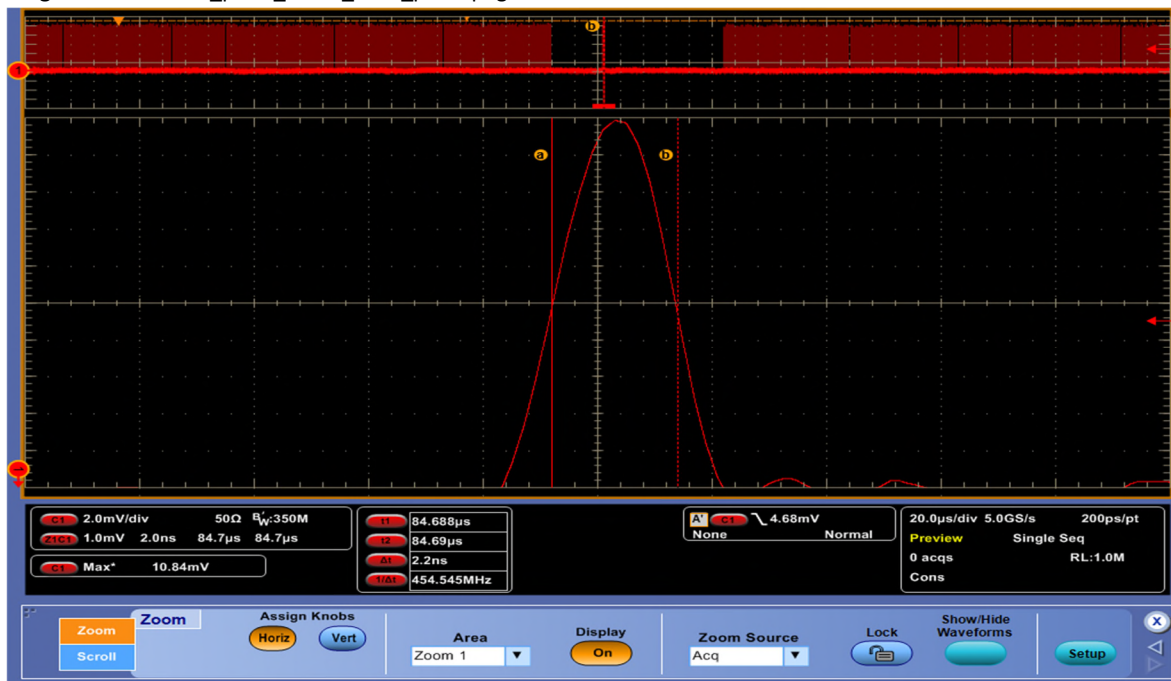


Diagram no.: TID007_number_of_pulses_5.png



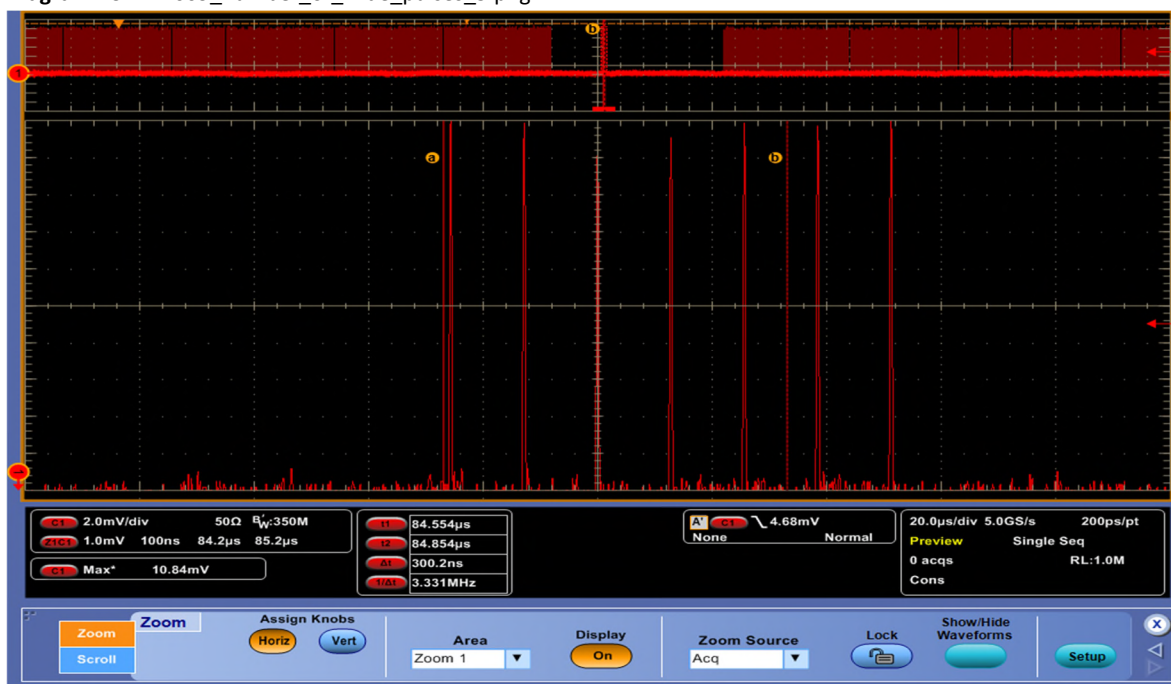
Number of pulses within 0.3us period: 5 pulses

Diagram no.: TID008_pulse_width_wide_pulse.png



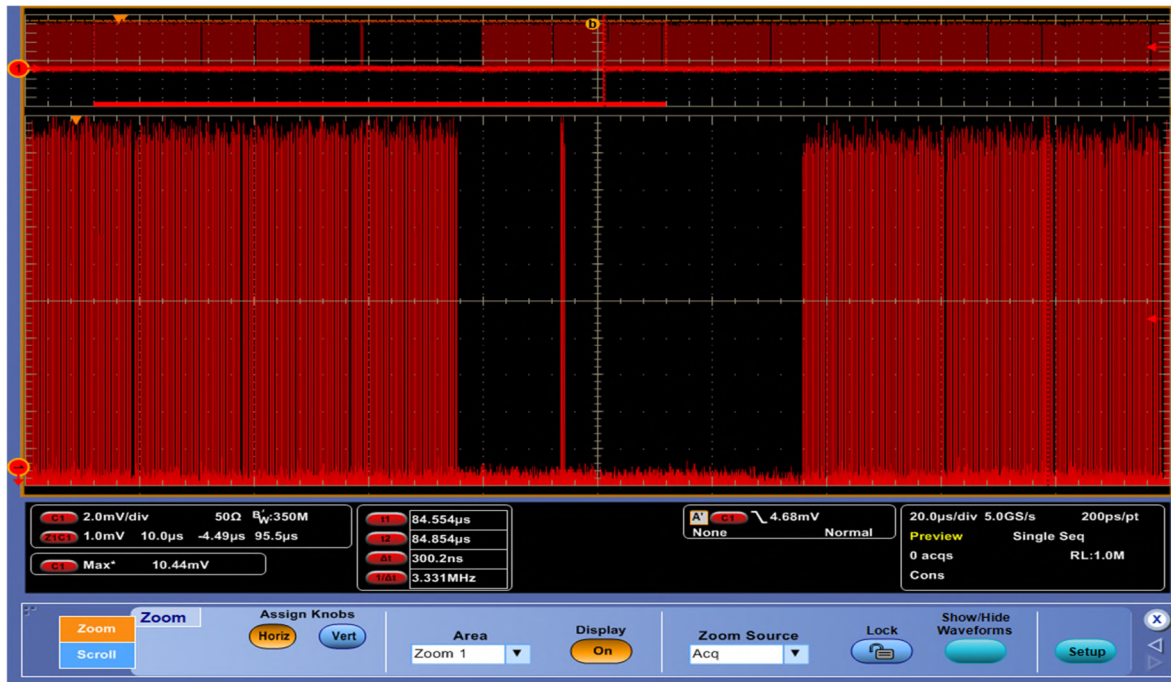
Pulse width within pulse train, op.mode 2:2.2ns

Diagram no.: TID009_number_of_wide_pulses_5.png



Number of pulses for pulse train, op. mode 2: 5 pulses

Diagram no.: TID010_overview.png



Pulse train overview

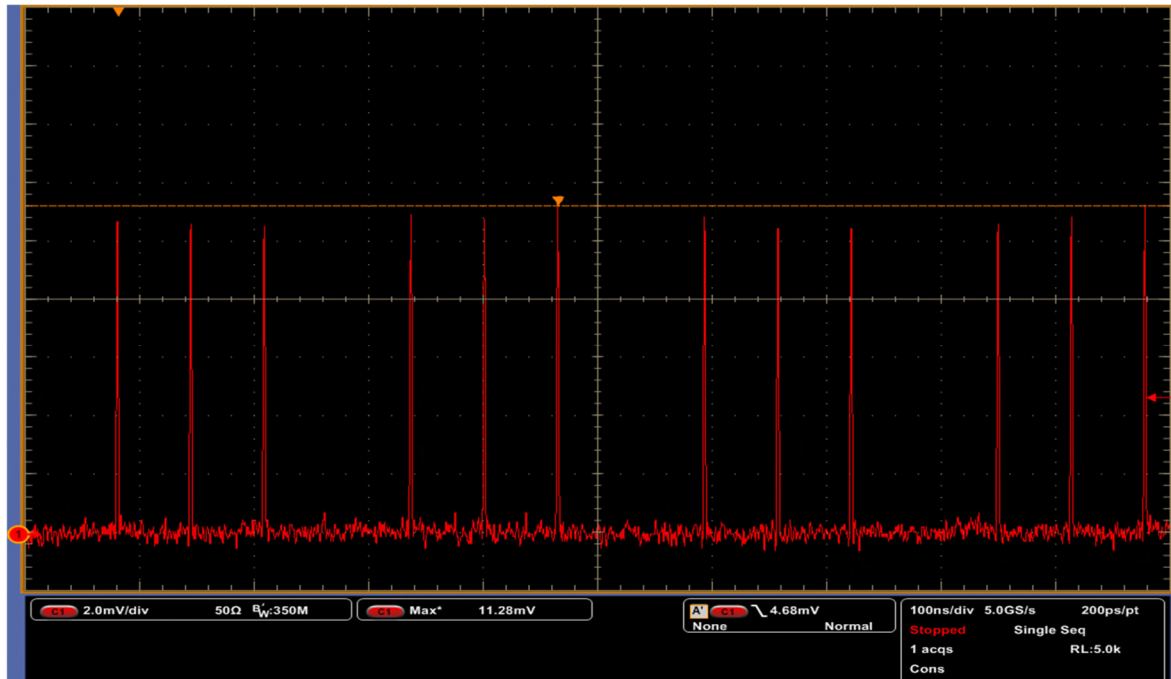
1.7 Peak power with RF-power detector

1.7.1 Pulse voltage measurement

Used Equipment

1. Low Noise Amplifier Waveguide & Std. Gain Horn Antenna 50-75 GHz
2. RF-Detector (V-Band Amplitude Detector)
3. Oscilloscope

Diagram no.: TID011_max_power.png



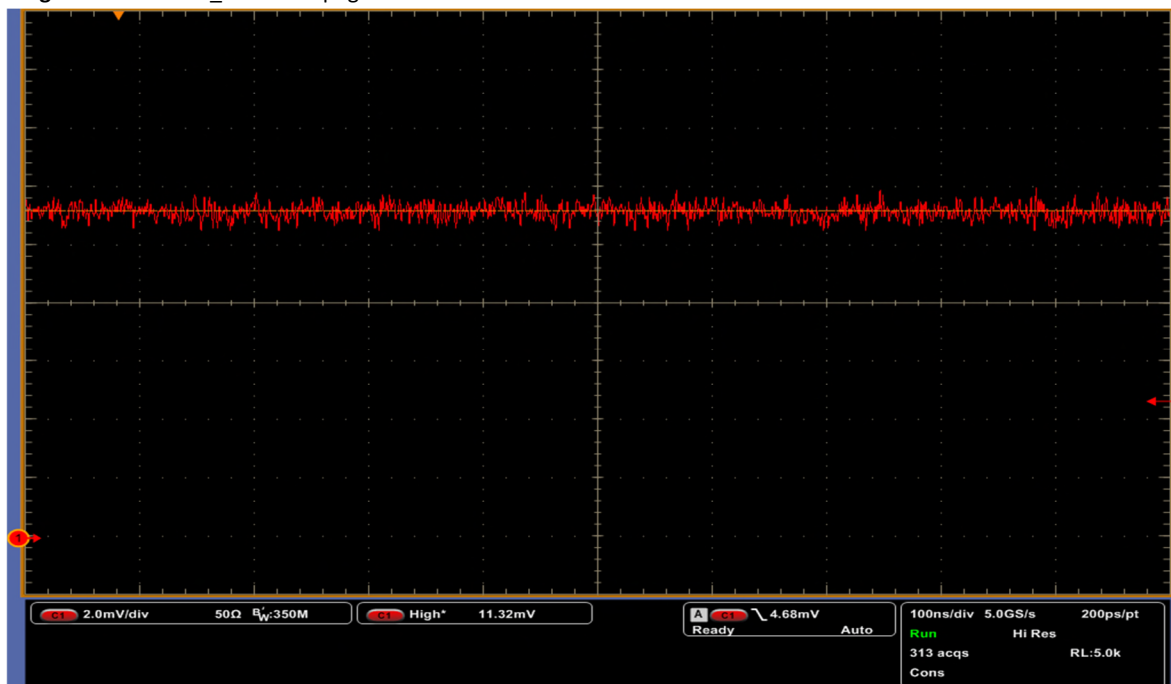
11.28mV peak value

1.7.2 Substituted voltage level with CW-source

Used Equipment

1. Synthesized Sweeper 10 MHz - 40 GHz
2. CW reference source: SG Extension Module 50 - 75 GHz & Rotary Attenuator & Std. Gain Horn Antenna 49.9-75.8 GHz
3. Low Noise Amplifier Waveguide & Std. Gain Horn Antenna 50-75 GHz
4. RF-Detector (V-Band Amplitude Detector)
5. Power meter
6. Rotary Attenuator
7. SG Extension Module 50 - 75 GHz (connected to Synthesized Sweeper 10 MHz - 40 GHz)
8. Oscilloscope

Diagram no.: TID012_reference.png



11.32mV substituted value

End Of Annex 201