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Radio measurements on AIR 1281 B260 V2

Product name: AIR 1281 B260 V2

Product number: KRD 901 166/2

RISE Research Institutes of Sweden AB **Vehicles and Automation – EMC-IKT**

Performed by

Examined by

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Summary

Standard Listed part of	Compliant
FCC CFR 47 part 30	
2.1046 RF power output	Yes
2.1049 Occupied bandwidth	Yes
2.1053 Field strength of spurious radiation	Yes

Description of the test object

Equipment:	Radio equipment AIR 1281 B260 V2 Product number: KR D 901 166/2 including KR X 101 07/1 Rev. R1C with FCC ID: TA8AKRX10107
Hardware revision state:	R1B
Tested configuration:	3GPP NR TDD
Frequency range:	TX/ RX: 37000 – 40000 MHz
No of supported beams:	Config mode 1: 2 beams in 2 orthogonal polarizations each, 4 beams in total. Config mode 2: 1 beam in 2 orthogonal polarizations each, 2 beams in total.
Operating bandwidth:	Config mode 1: Two segments of 400 MHz Config mode 2: One segment of 400 MHz
Nominal Output power (EIRP):	53 dBm/ beam and polarization config mode 2 47 dBm/ beam and polarization config mode 1
RF configurations:	TX Diversity, SU and MU MIMO up to 2 layers 1x(2x2), Contiguous Spectrum (CS) and Non-Contiguous spectrum (NCS), Carrier Aggregation (CA) intra-band supported
Antenna beam steering:	Azimuth ± 60 deg, elevation ± 15 deg
Channel bandwidth(s)/ Sub Carrier Spacing:	50 MHz and 100 MHz/ 120 kHz
Modulations:	QPSK, 16QAM and 64QAM
Emission designators:	46M6W7D and 96M0W7D
Emission designators Carrier Aggregation:	397MW7D (4x 100 MHz) and 796MW7D (8x 100 MHz)
RF power Tolerance:	+2.4/ -2.0 dB
CPRI Speed	25 Gbps

The information above is supplied by the manufacturer.

Purpose of test

The purpose of the tests is to verify compliance to the performance characteristics specified in applicable items of FCC CFR 47 Part 30.

Operation modes during measurements

The measurements were performed with the test object transmitting test models as defined in 3GPP TS 38.141-2. Test model NR-FR2 TM 1.1 is used to represent QPSK, test model NR-FR2 TM 3.2 to represent 16QAM, test model NR-FR2 TM 3.1 to represent 64QAM modulation

The settings below were deemed representative for worst case settings, for all traffic scenarios when settings with different modulations and RF configurations was found to represent worst case settings.

MIMO mode, NR-FR2 TM1.1, QPSK with the beams locked in boresight. All measurements were performed with the test object configured for maximum transmit power.

The measurement shall be done during active part of transmission, or if the measurement is performed with constant duty cycle <98%, the result shall be adjusted for the duty cycle according to ANSI C63.26 5.2.4.3.4. The duty cycle was measured to 74% and to compensate for this 1.30 dB was added to the test results.

Measurements

The test object was powered with -48 VDC by an external power supply. Additional connections are documented in the setup drawings for radiated measurements.

Far field distance for power, OBW and Band edge measurements is 2.68 m, based on the EUT antenna dimensions and the highest transmitter frequency (40 GHz).

Far field distances for OOB emissions is based on the measurement antenna dimension and highest frequency in the measurement range :

Frequency range [GHz]	Far field distance R [m]	Measurement distance [m]
18 – 26.5	0.73	3
26.5 – 40	0.48	3
40 – 60	0.34	3
60 – 90	0.22	1
90 – 110	0.17	1
110 – 150	0.13	1
150 – 170	0.13	0.5
170 – 200	0.10	0.5

Formula for far field distance calculation, with R being far field distance and D meaning antenna aperture size:

$$R = 2x D^2 / \lambda$$

References

Measurements were done according to relevant parts of the following standards:

CFR 47 part 30, May 2020

ANSI C63.26-2015

KDB 842590 D01 Upper Microwave Flexible Use Service v01r01

KDB 971168 D01 Power Meas License Digital Systems v03r01

KDB 971168 D03 IM Emission Repeater Amp v01

3GPP TS 38.141-2 V15.5.0 (2020-03)

3GPP TR 37.842 V13.3.0 (2020-01)

Measurement equipment

	Calibration Due	RISE number
Anechoic chamber, Hertz	2021-09	BX50194
R&S FSW 43	2021-07	902 073
R&S ESU 40	2021-07	901 385
R&S ZNB 40	2021-07	BX50051
RF Cable VNA-calibration	2022-01	BX50189
RF Cable VNA-calibration	2022-01	BX50190
RF Cable	2021-05	BX50236
RF Cable	2021-09	BX50192
RF Cable	2022-01	BX81431
RF Cable	2021-05	BX81423
RF Cable	2021-09	503 681
RF Cable FSW-B21	2021-09	BX62069
RF Cable FSW-B21	2021-09	BX62073
Bilog antenna Schaffner 6143A	2021-08	504079
EMCO Horn Antenna 3115	2021-07	502 175
EMCO Horn Antenna 3115	2021-12	902 212
EMCO Horn Antenna 3116	2021-07	503 279
Flann STD Gain Horn Antenna 20240-20	-	KWP02600
Flann STD Gain Horn Antenna 22240-20	-	KWP02601
Flann STD Gain Horn Antenna 24240-20	-	BX92414
Flann STD Gain Horn Antenna 26240-20	-	BX92416
Flann STD Gain Horn Antenna 27240-20	-	BX92417
Flann STD Gain Horn Antenna 29240-20	-	BX92419
Flann STD Gain Horn Antenna 30240-20	-	BX92420
Mixer FS-Z60	2023-09	BX90566
Mixer FS-Z90	2022-01	BX90567
Mixer FS-Z110	2024-01	BX81425
Mixer FS-Z170	2024-01	BX81426
Mixer FS-Z220	2024-01	BX81427
µComp Nordic, Low Noise Amplifier	2022-01	901 544
Miteq, Low Noise Amplifier	2022-01	503 278
Temperature and humidity meter, Testo 615	2021-06	503 498

EAB Measurement equipment

Calibrated at RISE before testing.

	Calibration Due	S/N
Marki Microwave FLP2650 Low pass filter	2021-10	1827
Qualwave QBF-26400-33000-60 Band pass filter	2021-10	182704

Uncertainties

Measurement and test instrument uncertainties are described in the quality assurance documentation "SP-QD 10885". The uncertainties are calculated with a coverage factor $k=2$ (95% level of confidence).

Compliance evaluation is based on a shared risk principle with respect to the measurement uncertainty.

Reservation

The test results in this report apply only to the particular test object as declared in the report.

Delivery of test object

The test object was delivered: 2021-01-13.

Manufacturer's representative

Mikael Jansson, Ericsson AB.

Test engineers

Tomas Lennhager and Björn Skönvall, RISE

Test participant(-s)

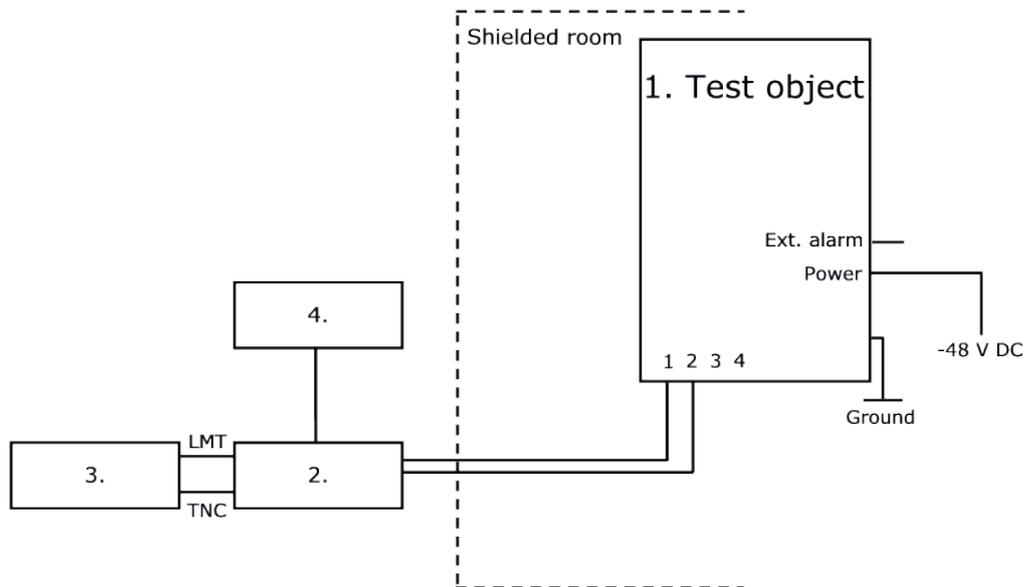
None

Test frequencies used for radiated measurements

Frequency Hor/ Ver [MHz]	Symbolic name	Comment
37025.04	BL ₅₀	50 MHz BW, TX bottom frequency configuration lower band
37800.00	ML ₅₀	50 MHz BW, TX middle frequency configuration lower band
38574.96	TL ₅₀	50 MHz BW, TX top frequency configuration lower band
38625.00	BH ₅₀	50 MHz BW, TX bottom frequency configuration higher band
39300.00	MH ₅₀	50 MHz BW, TX middle frequency configuration higher band
39975.00	TH ₅₀	50 MHz BW, TX top frequency configuration higher band
37050.00	BL ₁₀₀	100 MHz BW, TX bottom frequency configuration lower band
37800.00	ML ₁₀₀	100 MHz BW, TX middle frequency configuration lower band
38550.00	TL ₁₀₀	100 MHz BW, TX top frequency configuration lower band
38649.96	BH ₁₀₀	100 MHz BW, TX bottom frequency configuration lower band
39300.00	MH ₁₀₀	100 MHz BW, TX middle frequency configuration higher band
39949.92	TH ₁₀₀	100 MHz BW, TX top frequency configuration higher band
37050.00 37149.96	BL2 ₁₀₀	100 MHz BW, 2 carrier, TX bottom frequencies configuration lower band
38449.92 38550.00	TL2 ₁₀₀	100 MHz BW, 2 carrier, TX top frequencies configuration lower band
39849.96 39949.92	TH2 ₁₀₀	100 MHz BW, 2 carrier, TX top frequencies configuration higher band
37025.00 37074.96 37374.96	Bim ₅₀	50 MHz BW, 3 carrier, TX bottom frequencies configuration lower band
39625.08 39924.96 39975.00	Tim ₅₀	50 MHz BW, 3 carrier, TX top frequencies configuration higher band
37050.00 37149.96 37249.92 37350.00	BL4 ₁₀₀	100 MHz BW, 4 carrier, TX bottom frequencies configuration lower band
38250.00 38349.96 38449.92 38550.00	TL4 ₁₀₀	100 MHz BW, 4 carrier, TX top frequencies configuration lower band
39649.92 39750.00 39849.96 39949.92	TH4 ₁₀₀	100 MHz BW, 4 carrier, TX top frequencies configuration higher band

Frequency Hor/ Ver [MHz]	Symbolic name	Comment
37050.00 37149.96 37249.92 37350.00 37449.96 37549.92 37650.00 37749.96	BL8 ₁₀₀	100 MHz BW, 8 carrier, TX Bottom frequencies configuration lower band
38250.00 38349.96 38449.92 38550.00 38649.96 38749.92 38850.00 38949.96	M8 ₁₀₀	100 MHz BW, 8 carrier, TX top frequencies configuration lower band and bottom frequencies configuration higher band
39249.96 39349.92 39450.00 39549.96 39649.92 39750.00 39849.96 39949.92	TH8 ₁₀₀	100 MHz BW, 8 carrier, TX top frequencies configuration higher band

Test setup: radiated measurements



Test object:

1.	AIR 1281 B260 V2, KRD 901 166/2, rev. R1B, s/n: C82A593646 Radio Software: CXP 203 0045/1, rev. R7A496 including KRX 101 07/1, Rev. R1C with FCC ID: TA8AKRX10107
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Associated equipment:

2.	Testing Equipment: Baseband 6630, KDU 137 0015/1, rev. R3A, s/n: E23B947567 with software: CXP2020683/1, rev. R19A257
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Functional test equipment:

3.	Computer, HP ZBook, BAMS - 1001530471
4.	GPS Active Antenna, KRE 101 2082/1 GPS 02 01, NCD 901 41/1, rev. R1D, s/n: A401804384

Interfaces:

1, Optical Interface Link, single mode opto fibre	Signal
2, Optical Interface Link, single mode opto fibre	Signal
3, Optical Interface Link, single mode opto fibre	Signal
4, Optical Interface Link, single mode opto fibre	Signal
Power input configuration Dc: -48 V DC	Power
EXT Alarm, shielded multi-wire	Signal
Ground wire	Ground

RF power output measurements according to CFR 47 §30.202

Date	Temperature	Humidity
2021-01-13	23 °C ± 3 °C	13 % ± 5 %
2021-01-14	24 °C ± 3 °C	11 % ± 5 %

Test set-up and procedure

The test object was located in a anechoic chamber. The measuring antenna was aligned to the centre of the PAAM. A turn table was used to find the highest output power. A signal analyzer with the channel power function activated was used to measure the output power with the RMS detector activated. The bandwidth setting of the channel power function was set to 100 MHz.

A substitution measurement defined in 3GPP TR 37.842 chapter 10.3.1.1.2 was used to get the actual correction factor (Transducer factor A-D in the figure 1 below) with a Network analyzer (ZNB 40).

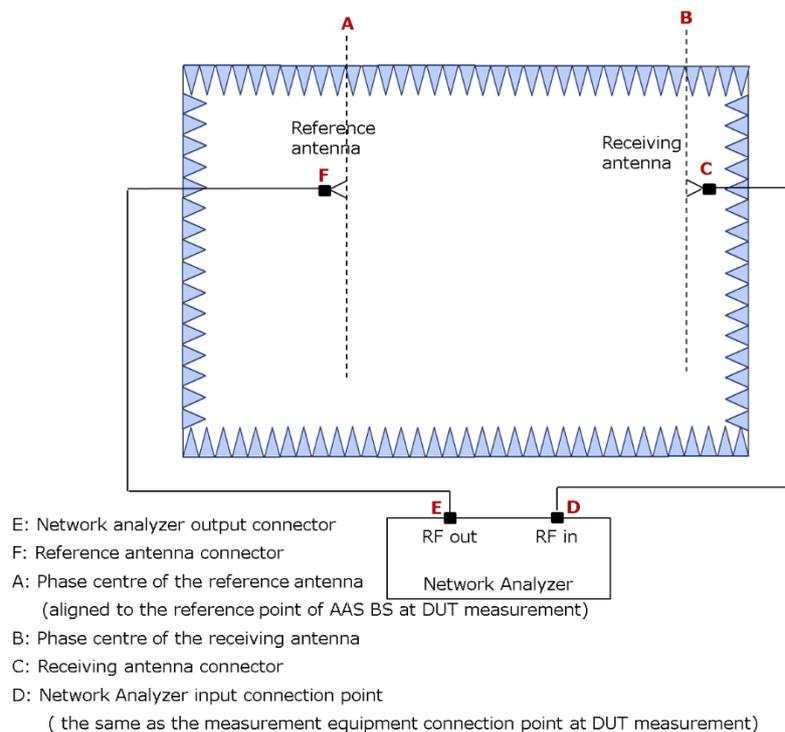


Figure 1: Indoor Anechoic Chamber calibration system setup for EIRP

Stage 1 - Calibration:

- 1) Connect the reference antenna and the receiving antenna to the measurement RF out port and RF in port of the network analyzer, respectively, as shown in figure 1.
- 2) Install the reference antenna with its *beam peak direction* and the height of its phase centre aligned with the receiving antenna.
- 3) Set the centre frequency of the network analyzer to the carrier centre frequency of the tested signal for EIRP measurement of the EUT and measure $LF_{EIRP, E \rightarrow D}$, which is equivalent to $20 \log |S_{21}|$ (dB) obtained by the network analyzer:
 $LF_{EIRP, E \rightarrow D}$: Pathloss between E and D in figure 1.
- 4) Measure the cable loss, $LF_{EIRP, E \rightarrow F}$ between the reference antenna connector and the network analyzer connector:
 $LF_{EIRP, E \rightarrow F}$: Cable loss between E and F in figure 1.

- 5) Calculate the calibration value between A and D with the following formula:

$$L_{\text{EIRP_cal, A} \rightarrow \text{D}} = L_{\text{EIRP, E} \rightarrow \text{D}} + G_{\text{REF_ANT_EIRP, A} \rightarrow \text{F}} - L_{\text{EIRP, E} \rightarrow \text{F}}$$

$$L_{\text{EIRP_cal, A} \rightarrow \text{D}}$$
: Calibration value between A and D in figure 1. Was implemented in the spectrum analyzer as a transducer.

$$G_{\text{REF_ANT_EIRP, A} \rightarrow \text{F}}$$
: Antenna gain of the reference antenna.

Stage 2 - Measurement:

- 6) Uninstall the reference antenna and install the EUT with the manufacturer declared coordinate system reference point in the same place as the phase centre of the reference antenna. The manufacturer declared coordinate system orientation of the EUT is set to be aligned with the testing system.
- 7) Measure the mean power, $P_{\text{R_EUT_EIRP, D}}$, D in figure 1.
- 8) Calculate the EIRP with the following formula:

$$\text{EIRP} = P_{\text{R_EUT_EIRP, D}} + L_{\text{EIRP_cal, A} \rightarrow \text{D}}$$

Test Setup, measuring distance 3m:

Measurement equipment	RISE number
Anechoic chamber, Hertz	BX50194
R&S FSW 43	902 073
R&S ZNB 40	BX50051
EMCO Horn Antenna 3116	503 279
FLANN Std gain 22240-20	KWP02601
RF Cable	BX81423
Testo 615, temperature and humidity meter	503 498

Measurement uncertainty: 3.3 dB

Results

Single carrier Config mode 2

Beam index 0 Bore site, Bandwidth 50MHz, QPSK
Nominal rated output power (EIRP) per Beam: 53 dBm/ Polarization.

	Output power per 100 MHz, EIRP [RMS dBm] Vertical/ Horizontal
Symbolic name	Carrier 1
BL ₅₀	53.78/ 54.04
ML ₅₀	53.33/ 53.65
TL ₅₀	53.72/ 53.38
BH ₅₀	53.51/ 53.20
MH ₅₀	53.51/ 53.18
TH ₅₀	53.09/ 53.22

Beam index 0 Bore site, Bandwidth 100MHz, QPSK
Nominal rated output power (EIRP) per Beam: 53 dBm/ Polarization.

	Output power per 100 MHz, EIRP [RMS dBm] Vertical/ Horizontal
Symbolic name	Carrier 1
BL ₁₀₀	53.40/ 53.89
ML ₁₀₀	53.07/ 53.51
TL ₁₀₀	53.57/ 53.53
BH ₁₀₀	53.22/ 53.00
MH ₁₀₀	53.55/ 52.99
TH ₁₀₀	53.01/ 53.01

Multi carrier

2-Carrier Config mode 2

Beam index 0 Bore site, Bandwidth 100MHz, QPSK

Nominal rated output power (EIRP) per Beam: 53 dBm/ Polarization.

	Output power per 100 MHz, EIRP [RMS dBm] Vertical/ Horizontal		
Symbolic name	Carrier 1	Carrier 2	Total (per 200 MHz)
BL2 ₁₀₀	49.83/ 50.51	50.28/ 50.81	53.7/ 53.67
TL2 ₁₀₀	49.94/ 50.03	50.60/ 50.49	53.29/ 53.28
TH2 ₁₀₀	49.61/ 49.96	49.68/ 49.68	52.66/ 52.83

4-Carrier Config mode 2

Beam index 0 Bore site, Bandwidth 100MHz, QPSK

Nominal rated output power (EIRP) per Beam: 53 dBm/ Polarization.

	Output power per 100 MHz, EIRP [RMS dBm] Vertical/ Horizontal				
Symbolic name	Carrier 1	Carrier 2	Carrier 3	Carrier 4	Total (per 400 MHz)
BL4 ₁₀₀	46.82/ 47.64	46.55/ 47.39	47.60/ 48.25	46.96/ 48.10	53.02/ 53.88
TL4 ₁₀₀	46.36/ 46.60	46.56/ 46.70	47.46/ 47.41	47.07/ 47.68	52.90/ 53.14
TH4 ₁₀₀	47.84/ 48.19	46.72/ 46.92	46.59/ 46.51	45.66/ 46.07	52.79/ 53.02

8-Carrier Config mode 1

Beam index 0 Boresight, Carrier Bandwidth 100 MHz, QPSK
Nominal rated output power (EIRP) per Beam: 47.0 dBm/ Polarization.

Symbolic name	Output power per 100 MHz, EIRP [RMS dBm] Vertical/ Horizontal									
	Beam 1					Beam 2				
	A	B	C	D	Total Power Beam 1 (per 400 MHz)	E	F	G	H	Total power Beam 2 (per 400 MHz)
BL ₈₁₀₀	40.38/ 41.51	40.35/ 41.43	41.59/ 42.45	41.26/ 42.59	46.95/ 48.05	40.99/ 41.15	41.10/ 41.27	41.71/ 41.78	41.78/ 41.94	47.43/ 47.57
M ₈₁₀₀	40.60/ 41.04	40.89/ 41.16	42.03/ 41.98	41.94/ 42.24	47.43/ 47.66	40.26/ 40.24	40.12/ 40.01	40.93/ 40.55	40.97/ 40.60	46.61/ 46.38
TH ₈₁₀₀	41.79/ 41.77	41.26/ 41.22	41.91/ 41.59	41.38/ 41.38	47.61/ 47.52	41.62/ 41.55	40.61/ 40.40	40.63/ 40.01	40.08/ 39.37	46.79/ 46.43

Limits

CFR47 §30.202 Power limits.

- (a) For fixed and base stations operating in connection with mobile systems, the average power of the sum of all antenna elements is limited to an equivalent isotopically radiated power (EIRP) density of +75dBm/100 MHz. For channel bandwidths less than 100 MHz the EIRP must be reduced proportionally and linearly based on the bandwidth relative to 100 MHz.

Complies?	Yes
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Occupied bandwidth measurements according to CFR47 2.1049

Date	Temperature	Humidity
2021-01-13	23 °C ± 3 °C	13 % ± 5 %
2021-01-14	24 °C ± 3 °C	11 % ± 5 %

Test set-up and procedure

The test object was located in an anechoic chamber. The measuring antenna was aligned to the centre of the of the PAAM. A turn table was used to find the highest output power. A signal analyzer with Peak detector and max hold was used to measure the OBW.

Test Setup, measuring distance 3m:

Measurement equipment	RISE number
Anechoic chamber, Hertz	BX50194
R&S FSW 43	902 073
R&S ZNB 40	BX50051
EMCO Horn Antenna 3116	503 279
FLANN Std gain 22240-20	KWP02601
RF Cable	BX81423
Testo 615, temperature and humidity meter	503 498

Measurement uncertainty: 3.3 dB

Results

Single carrier, Config mode 2, Bandwidth: 50MHz Modulation: QPSK

Diagram	Symbolic name	Polarization	Occupied BW (99%) [MHz]
1.1	TL ₅₀	Hor	46.579
1.2	TL ₅₀	Ver	46.594

Single carrier, Config mode 2, Bandwidth: 100MHz Modulation: QPSK

Diagram	Symbolic name	Polarization	Occupied BW (99%) [MHz]
1.3	TL ₁₀₀	Hor	96.018
1.4	TL ₁₀₀	Ver	95.956

Carrier Aggregation, Config mode 2, Bandwidth: 4x 100MHz, Modulation: QPSK

Diagram	Symbolic name	Polarization	Occupied BW (99%) [MHz]
1.5	TL4 ₁₀₀	Hor	396.751
1.6	TL4 ₁₀₀	Ver	396.795

Carrier Aggregation, Config mode 1, Bandwidth: 8x 100MHz, Modulation: QPSK

Diagram	Symbolic name	Polarization	Occupied BW (99%) [MHz]
1.7	M8 ₁₀₀	Hor	796.410
1.8	M8 ₁₀₀	Ver	795.625

Diagram 1.1, TL₅₀, QPSK, Horizontal:

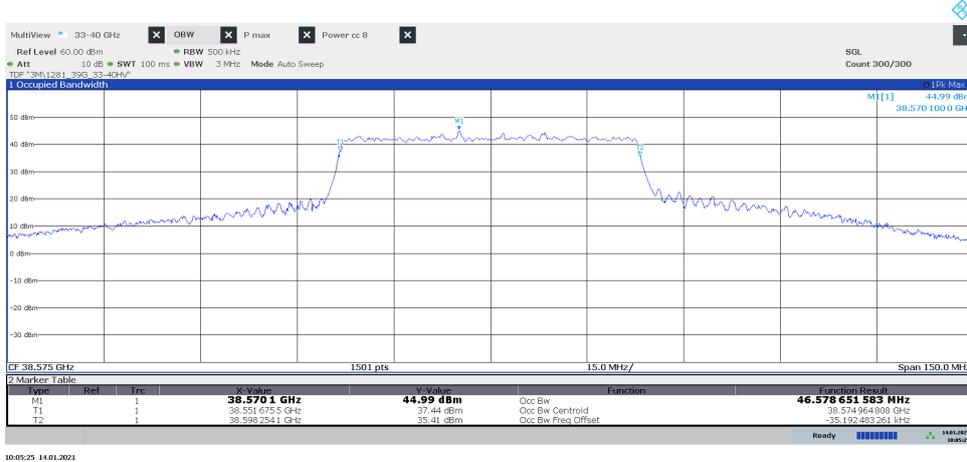


Diagram 1.2, TL₅₀, QPSK, Vertical::



Diagram 1.3, TL₁₀₀, QPSK, Horizontal:



Diagram 1.4, TL₁₀₀, QPSK, Vertical:

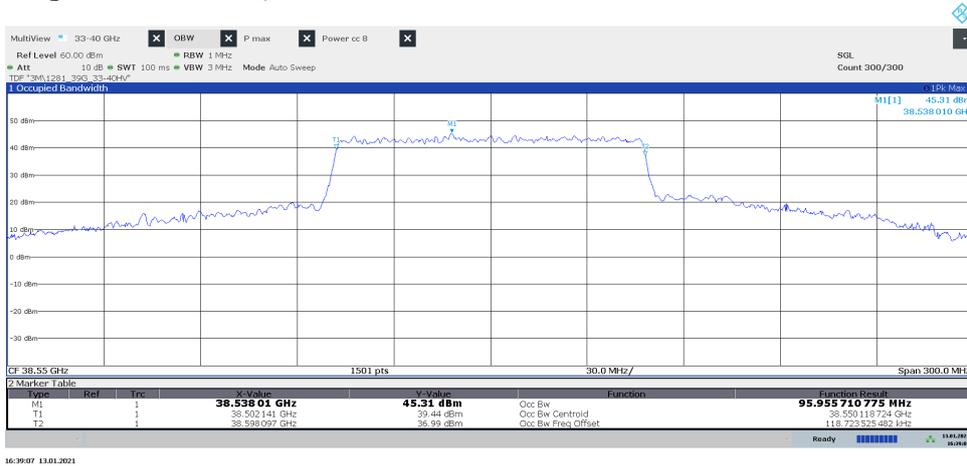


Diagram 1.5, TL4₁₀₀, QPSK, Horizontal:

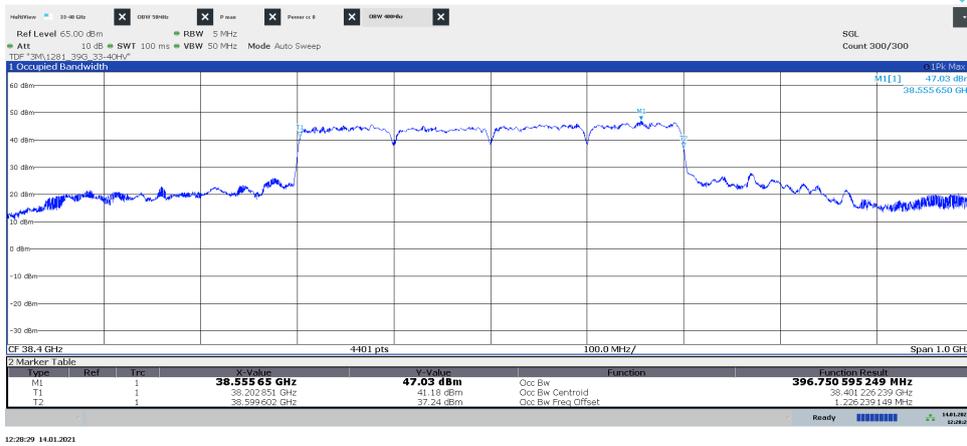


Diagram 1.6, TL4₁₀₀, QPSK, Vertical::



Diagram 1.7, M8₁₀₀, QPSK, Horizontal:



13:25:50 14.01.2021

Diagram 1.8, M8₁₀₀, QPSK, Vertical::



14:05:01 14.01.2021

Field strength of spurious radiation measurements according to CFR 47 §30.203

Date	Temperature	Humidity
2021-01-14	24 °C ± 3 °C	11 % ± 5 %
2021-01-15	23 °C ± 3 °C	9 % ± 5 %
2021-01-18	23 °C ± 3 °C	12 % ± 5 %
2021-01-19	23 °C ± 3 °C	18 % ± 5 %
2021-01-20	23 °C ± 3 °C	18 % ± 5 %
2021-01-21	23 °C ± 3 °C	17 % ± 5 %
2021-01-22	23 °C ± 3 °C	12 % ± 5 %
2021-01-25	23 °C ± 3 °C	15 % ± 5 %
2021-01-26	23 °C ± 3 °C	15 % ± 5 %
2021-01-27	23 °C ± 3 °C	10 % ± 5 %
2021-01-28	23 °C ± 3 °C	11 % ± 5 %

The measurements were performed with both horizontal and vertical polarization of the antenna. The measurement was performed with a RBW of 1 MHz. The antenna distance and test object height in the different frequency ranges is described below.

In the test range from 40 – 200 GHz

A propagation loss in free space was calculated. The used formula was

$$\gamma = 20 \log \left(\frac{4\pi D}{\lambda} \right), \gamma \text{ is the propagation loss and } D \text{ is the antenna distance.}$$

For 40 – 60 GHz D was 3.0m, for 60 – 150 GHz D was 1.0m and for 150 – 200 GHz D was 0.5m.

In the test range from 30MHz – 40 GHz a substitution measurement defined in 3GPP TR 37.842 chapter 10.3.1.1.2 was used to get the actual correction factor (Transducer factor A-D in the figure 1 below) with a Network analyzer (ZNB 40).

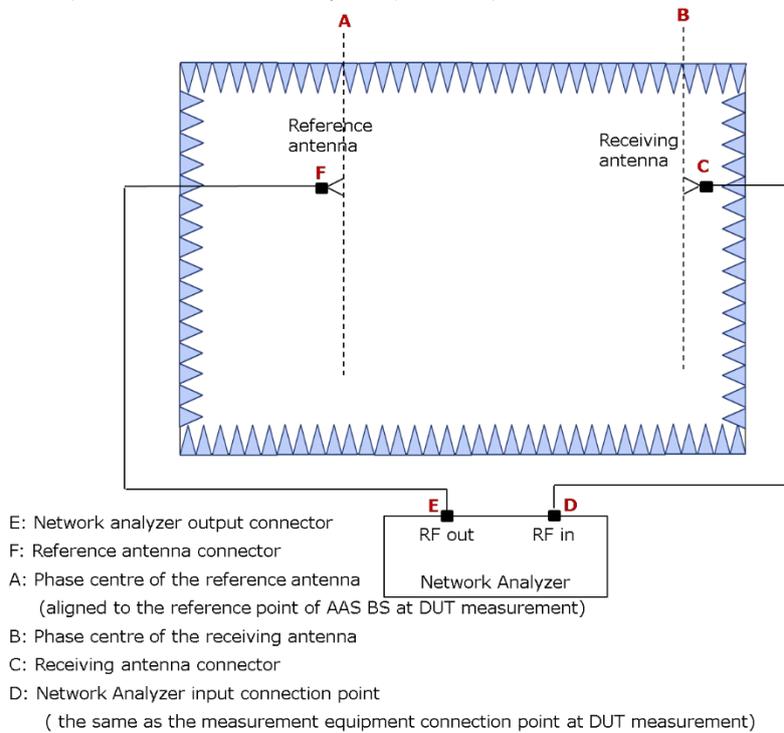


Figure 1: Indoor Anechoic Chamber calibration system setup for EIRP

Stage 1 - Calibration:

- 1) Connect the reference antenna and the receiving antenna to the measurement RF out port and RF in port of the network analyzer, respectively, as shown in figure 1.
- 2) Install the reference antenna with its *beam peak direction* and the height of its phase centre aligned with the receiving antenna.
- 3) Set the centre frequency of the network analyzer to the carrier centre frequency of the tested signal for EIRP measurement of the EUT and measure $LF_{EIRP, E \rightarrow D}$, which is equivalent to $20\log|S_{21}|$ (dB) obtained by the network analyzer:
 $LF_{EIRP, E \rightarrow D}$: Pathloss between E and D in figure 1.
- 4) Measure the cable loss, $LF_{EIRP, E \rightarrow F}$ between the reference antenna connector and the network analyzer connector:
 $LF_{EIRP, E \rightarrow F}$: Cable loss between E and F in figure 1.
- 5) Calculate the calibration value between A and D with the following formula:
 $LEIRP_{cal, A \rightarrow D} = LF_{EIRP, E \rightarrow D} + G_{REF_ANT_EIRP, A \rightarrow F} - LF_{EIRP, E \rightarrow F}$.
 $LEIRP_{cal, A \rightarrow D}$: Calibration value between A and D in figure 1. Was implemented in the spectrum analyzer as a transducer.
 $G_{REF_ANT_EIRP, A \rightarrow F}$: Antenna gain of the reference antenna.

Stage 2 - Measurement:

- 6) Uninstall the reference antenna and install the EUT with the manufacturer declared coordinate system reference point in the same place as the phase centre of the reference antenna. The manufacturer declared coordinate system orientation of the EUT is set to be aligned with the testing system.
- 7) Measure the mean power, $P_{R_EUT_EIRP, D}$, D in figure 1.
- 8) Calculate the EIRP with the following formula:

$$EIRP = P_{R_EUT_EIRP, D} + L_{EIRP_cal, A \rightarrow D}$$

The measurement procedure was as the following:

1. An EIRP pre-scan with the measurement antenna in horizontal and vertical polarization is performed with RMS detector and Max Hold on the spectrum analyzer. The turn table was slowly rotating from 0-360 degrees.
2. EIRP spurious radiation on frequencies closer than 10 dB to the TRP limit in the pre-scan a manual search for maximum response was done.
3. If the recorded EIRP value was above the TRP limit, a TRP measurement was done according to KDB 842590 D01 chapter 4.4. Overview of the methods.
 - a. Two Cut method according to KDB 842590 D01 chapter 4.4.2.2
 - i. EUT set in vertical orientation
 - ii. EIRP measurement samples with horizontal and vertical polarization of the measurement antenna. Angular step size based on frequency and dimension of the EUT
 - iii. EUT set in horizontal orientation
 - iv. EIRP measurement samples with horizontal and vertical polarization of the measurement antenna. Angular step size based on frequency and dimension of the EUT.
 - v. $TRP = EIRP$ measurement samples averaged $+\Delta TRP$. ($\Delta TRP =$ Margin factor based on grid selection).

- b. Two Cut method when pattern multiplication is applicable and used according to KDB 842590 D01 chapter 4.4.2.3
 - i. EUT set in vertical orientation
 - ii. EIRP measurement samples with horizontal and vertical polarization of the measurement antenna. Angular step size based on frequency and dimension of the EUT
 - iii. EUT set in horizontal orientation
 - iv. EIRP measurement samples with horizontal and vertical polarization of the measurement antenna. Angular step size based on frequency and dimension of the EUT.
 - v. TRP is calculated using the formula in Appendix E of KDB 842590 D01
- c. EIRP to Conducted Power Conversion in Band Edge Using Antenna Gain according to KDB 842590 D01 chapter 4.4.2.5
 - i. Convert each radiated measurement to conducted power/BW using the equations:
Conducted Power level (dBm) at any frequency/BW = Measured EIRP level (dBm)/BW – EUT antenna Gain (dBi)
 - ii. Sum the radiated power Horizontal and Vertical polarisations for total conducted power level/BW.
 - iii. Evaluate the pass/fail decision by comparing total conducted power level/BW against the applicable TRP limit.
- d. Spherical Grid Method, according to KDB 842590 D01 chapter 4.4.2.4
 - i. EUT set in horizontal orientation bottom of the EUT to the right.
 - ii. EIRP measurement samples with horizontal and vertical polarization of the measurement antenna. Angular step size of the turn table was 15 degrees from 0 – 165 degrees and 195 – 360 degrees. In cone of radiation 165 – 195 degrees the step size of the turn table was 1 degree.
 - iii. EUT was changed in 15 degrees step from horizontal bottom right to horizontal bottom to the left (twelve steps). Step ii. was repeated for all twelve steps.
 - iv. TRP was calculated according to Appendix B in KDB 842590.

Measurement equipment

	RISE number
Anechoic chamber, Hertz	BX50194
R&S FSW 43	902 073
R&S ESU	901 385
R&S ZNB 40	BX50051
RF Cable VNA-calibration	BX50189
RF Cable VNA-calibration	BX50190
RF Cable	BX50236
RF Cable	BX50192
RF Cable	BX81431
RF Cable	BX81423
RF Cable	503 681
RF Cable FSW-B21	BX62069
RF Cable FSW-B21	BX62073
Bilog antenna Schaffner 6143A	504079
EMCO Horn Antenna 3115	502 175
EMCO Horn Antenna 3115	902 212
EMCO Horn Antenna 3116	503 279
Flann STD Gain Horn Antenna 20240-20	KWP02600
Flann STD Gain Horn Antenna 22240-20	KWP02601
Flann STD Gain Horn Antenna 24240-20	BX92414
Flann STD Gain Horn Antenna 26240-20	BX92416
Flann STD Gain Horn Antenna 27240-20	BX92417
Flann STD Gain Horn Antenna 29240-20	BX92419
Flann STD Gain Horn Antenna 30240-20	BX92420
Mixer FS-Z60	BX90566
Mixer FS-Z90	BX90567
Mixer FS-Z110	BX81427
Mixer FS-Z170	BX81428
Mixer FS-Z220	BX81429
µComp Nordic, Low Noise Amplifier	901 544
Miteq, Low Noise Amplifier	503 278
Temperature and humidity meter, Testo 615	503 498

EAB Measurement equipment

Calibrated at RISE before testing.

	S/N
Marki Microwave FLP2650 Low pass filter	1827
Qualwave QBF-26400-33000-60 Band pass filter	182704

Results

The diagrams represents worst case configurations for each frequency range.

Diagram	Symbolic name	Config mode	Pol	Frequency range	Measurement method	“Early exit?”
2.1a	TL ₁₀₀	2	Hor	30-1000 MHz	Pre scan Max hold EIRP	Yes
2.1b	TL ₁₀₀	2	Ver	30-1000 MHz	Pre scan Max hold EIRP	Yes
2.2a	BL ₈₁₀₀	1	Hor	30-1000 MHz	Pre scan Max hold EIRP	Yes
2.2b	BL ₈₁₀₀	1	Ver	30-1000 MHz	Pre scan Max hold EIRP	Yes
2.3a	TL ₁₀₀	2	Hor	1-18 GHz	Pre scan Max hold EIRP	Yes
2.3b	TL ₁₀₀	2	Ver	1-18 GHz	Pre scan Max hold EIRP	Yes
2.4a	BL ₈₁₀₀	1	Hor	1-18 GHz	Pre scan Max hold EIRP	Yes
2.4b	BL ₈₁₀₀	1	Ver	1-18 GHz	Pre scan Max hold EIRP	Yes
2.5a	TL ₁₀₀	2	Hor	18-26.5 GHz	Pre scan Max hold EIRP	Yes
2.5b	TL ₁₀₀	2	Ver	18-26.5 GHz	Pre scan Max hold EIRP	Yes
2.6a	BL ₈₁₀₀	1	Hor	18-26.5 GHz	Pre scan Max hold EIRP	Yes
2.6b	BL ₈₁₀₀	1	Ver	18-26.5 GHz	Pre scan Max hold EIRP	Yes
2.7a	TH ₁₀₀	2	Hor	26.5-33 GHz	Pre scan Max hold EIRP	Yes
2.7b	TH ₁₀₀	2	Ver	26.5-33 GHz	Pre scan Max hold EIRP	Yes
2.8a	TH ₈₁₀₀	1	Hor	26.5-33 GHz	Pre scan Max hold EIRP	Yes
2.8b	TH ₈₁₀₀	1	Ver	26.5-33 GHz	Pre scan Max hold EIRP	Yes
2.9a	BL ₅₀	2	Hor	33-40 GHz 33-36.5 GHz 38.6-40 GHz	Pre scan Max hold EIRP	No Yes ² Yes ¹
2.9b	BL ₅₀	2	Ver	33-40 GHz 33-36.5 GHz 38.6-40 GHz	Pre scan Max hold EIRP	No Yes ² Yes ¹
2.9c	BL ₅₀	2	Hor	36-37 GHz	Pre scan Max average EIRP	Yes ¹
2.9d	BL ₅₀	2	Ver	36-37 GHz	Pre scan Max average EIRP	Yes ¹
2.10a	BL ₈₁₀₀	1	Hor	33-40 GHz 38.6-40 GHz	Pre scan Max hold EIRP	No Yes ¹
2.10b	BL ₈₁₀₀	1	Ver	33-40 GHz 38.6-40 GHz	Pre scan Max hold EIRP	No Yes ¹
2.10c	BL ₈₁₀₀	1	Hor	36-37 GHz	Pre scan Max average EIRP	Yes ¹
2.10d	BL ₈₁₀₀	1	Ver	36-37 GHz	Pre scan Max average EIRP	Yes ¹
2.11a	Bim ₅₀	2	Hor	33-40 GHz 38.6-40 GHz	Pre scan Max hold EIRP	No Yes ¹
2.11b	Bim ₅₀	2	Ver	33-40 GHz 38.6-40 GHz	Pre scan Max hold EIRP	No Yes ¹
2.11c	Bim ₅₀	2	Hor	36-37 GHz	Pre scan Max average EIRP	Yes ¹
2.11d	Bim ₅₀	2	Ver	36-37 GHz	Pre scan Max average EIRP	Yes ¹
2.11e	Bim ₅₀	2	Hor/ Ver	36.3-37 GHz	Pattern multiplication TRP	Compliant to TRP limit

¹⁾ Calculated conducted power based on antenna gain below limit

²⁾ Compliant to TRP limit based on Lower EIRP compared to BL₄₁₀₀ (Diagram 2.12)

Diagram	Symbolic name	Config mode	Pol	Frequency range	Measurement method	“Early exit?”
2.12a	BL ₄₀₀	2	Hor	33-40 GHz 38.6-40 GHz	Pre scan Max hold EIRP	No Yes ¹
2.12b	BL ₄₀₀	2	Ver	33-40 GHz 38.6-40 GHz	Pre scan Max hold EIRP	No Yes ¹
2.12c	BL ₄₀₀	2	Hor	36-37 GHz	Pre scan Max hold EIRP	Yes ¹
2.12d	BL ₄₀₀	2	Ver	36-37 GHz	Pre scan Max hold EIRP	Yes ¹
2.12e	BL ₄₀₀	2	Hor/ Ver	36.29-36.39 GHz	Two cut TRP	Compliant to TRP limit
2.13a	TH ₄₀₀	2	Hor	33-40 GHz	Pre scan Max hold EIRP	No
2.13b	TH ₄₀₀	2	Ver	33-40 GHz	Pre scan Max hold EIRP	No
2.13c	TH ₄₀₀	2	Hor/ Ver	35.67-35.77 GHz	Spherical grid Method TRP	Compliant to TRP limit
2.14a	TL ₅₀	2	Hor	38.35-38.85 GHz	Pre scan Max average EIRP	Yes ¹
2.14b	TL ₅₀	2	Ver	38.35-38.85 GHz	Pre scan Max average EIRP	Yes ¹
2.15a	BH ₅₀	2	Hor	38.35-38.85 GHz	Pre scan Max average EIRP	Yes ¹
2.15b	BH ₅₀	2	Ver	38.35-38.85 GHz	Pre scan Max average EIRP	Yes ¹
2.16a	TH ₅₀	2	Hor	40-43 GHz	Pre scan Max hold EIRP	No
2.16b	TH ₅₀	2	Ver	40-43 GHz	Pre scan Max hold EIRP	No
2.16c	TH ₅₀	2	Hor	40-43 GHz	Pre scan Max average EIRP	Yes ¹
2.16d	TH ₅₀	2	Ver	40-43 GHz	Pre scan Max average EIRP	Yes ¹
2.17a	TH ₈₀₀	1	Hor	40-43 GHz	Pre scan Max hold EIRP	No
2.17b	TH ₈₀₀	1	Ver	40-43 GHz	Pre scan Max hold EIRP	No
2.17c	TH ₈₀₀	1	Hor	40-43 GHz	Pre scan Max average EIRP	Yes ¹
2.17d	TH ₈₀₀	1	Ver	40-43 GHz	Pre scan Max average EIRP	Yes ¹
2.18a	Tim ₅₀	2	Hor	40-43 GHz 40.4-43 GHz	Pre scan Max hold EIRP	No Yes ³
2.18b	Tim ₅₀	2	Ver	40-43 GHz 40.4-43 GHz	Pre scan Max hold EIRP	No Yes ³
2.18c	Tim ₅₀	2	Hor	40-43 GHz	Pre scan Max average EIRP	No
2.18d	Tim ₅₀	2	Ver	40-43 GHz	Pre scan Max average EIRP	No
2.18e	Tim ₅₀	2	Hor/ Ver	40-40.4 GHz	Two cut TRP	Compliant to TRP limit
2.19a	BL ₅₀	2	Hor	40-43 GHz	Pre scan Max hold EIRP	No
2.19b	BL ₅₀	2	Ver	40-43 GHz	Pre scan Max hold EIRP	No
2.19c	BL ₅₀	2	Hor/ Ver	40.05-40.15 GHz	Spherical grid Method TRP	Compliant to TRP limit

¹⁾ Calculated conducted power based on antenna gain below limit

²⁾ Compliant to TRP limit based on Lower EIRP compared to BL₄₀₀ (Diagram 2.12)

Diagram	Symbolic name	Config mode	Pol	Frequency range	Measurement method	“Early exit?”
2.20a	BL ₅₀	2	Hor	43-60 GHz	Pre scan Max hold EIRP	Yes
2.20b	BL ₅₀	2	Ver	43-60 GHz	Pre scan Max hold EIRP	Yes
2.20c	BL ₅₀	2	Hor/ Ver	43.1-43.25 GHz	Two cut TRP	Compliant to TRP limit
2.21a	BL ₈₁₀₀	1	Hor	43-60 GHz	Pre scan Max hold EIRP	Yes
2.21b	BL ₈₁₀₀	1	Ver	43-60 GHz	Pre scan Max hold EIRP	Yes
2.22a	TL ₁₀₀	2	Hor	60-75 GHz	Pre scan Max hold EIRP	Yes
2.22b	TL ₁₀₀	2	Ver	60-75 GHz	Pre scan Max hold EIRP	Yes
2.23a	BL ₈₁₀₀	1	Hor	60-75 GHz	Pre scan Max hold EIRP	Yes
2.23b	BL ₈₁₀₀	1	Ver	60-75 GHz	Pre scan Max hold EIRP	Yes
2.24a	BL ₁₀₀	2	Hor	75-90 GHz	Pre scan Max hold EIRP	Yes
2.24b	BL ₁₀₀	2	Ver	75-90 GHz	Pre scan Max hold EIRP	Yes
2.25a	BL ₈₁₀₀	1	Hor	75-90 GHz	Pre scan Max hold EIRP	Yes
2.25b	BL ₈₁₀₀	1	Ver	75-90 GHz	Pre scan Max hold EIRP	Yes
2.26a	BL ₁₀₀	2	Hor	90-110 GHz	Pre scan Max hold EIRP	Yes
2.26b	BL ₁₀₀	2	Ver	90-110 GHz	Pre scan Max hold EIRP	Yes
2.27a	BL ₈₁₀₀	1	Hor	90-110 GHz	Pre scan Max hold EIRP	Yes
2.27b	BL ₈₁₀₀	1	Ver	90-110 GHz	Pre scan Max hold EIRP	Yes
2.28a	BL ₁₀₀	2	Hor	110-130 GHz	Pre scan Max hold EIRP	Yes
2.28b	BL ₁₀₀	2	Ver	110-130 GHz	Pre scan Max hold EIRP	Yes
2.29a	BL ₈₁₀₀	1	Hor	110-130 GHz	Pre scan Max hold EIRP	Yes
2.29b	BL ₈₁₀₀	1	Ver	110-130 GHz	Pre scan Max hold EIRP	Yes
2.30a	BL ₁₀₀	2	Hor	130-150 GHz	Pre scan Max hold EIRP	Yes
2.30b	BL ₁₀₀	2	Ver	130-150 GHz	Pre scan Max hold EIRP	Yes
2.31a	BL ₈₁₀₀	1	Hor	130-150 GHz	Pre scan Max hold EIRP	Yes
2.31b	BL ₈₁₀₀	1	Ver	130-150 GHz	Pre scan Max hold EIRP	Yes
2.32a	BL ₁₀₀	2	Hor	150-170 GHz	Pre scan Max hold EIRP	Yes
2.32b	BL ₁₀₀	2	Ver	150-170 GHz	Pre scan Max hold EIRP	Yes
2.33a	BL ₈₁₀₀	1	Hor	150-170 GHz	Pre scan Max hold EIRP	Yes
2.33b	BL ₈₁₀₀	1	Ver	150-170 GHz	Pre scan Max hold EIRP	Yes
2.34a	BL ₁₀₀	2	Hor	170-185 GHz	Pre scan Max hold EIRP	Yes
2.34b	BL ₁₀₀	2	Ver	170-185 GHz	Pre scan Max hold EIRP	Yes
2.35a	BL ₈₁₀₀	1	Hor	170-185 GHz	Pre scan Max hold EIRP	Yes
2.35b	BL ₈₁₀₀	1	Ver	170-185 GHz	Pre scan Max hold EIRP	Yes
2.36a	BL ₁₀₀	2	Hor	185-200 GHz	Pre scan Max hold EIRP	Yes
2.36b	BL ₁₀₀	2	Ver	185-200 GHz	Pre scan Max hold EIRP	Yes
2.37a	BL ₈₁₀₀	1	Hor	185-200 GHz	Pre scan Max hold EIRP	Yes
2.37b	BL ₈₁₀₀	1	Ver	185-200 GHz	Pre scan Max hold EIRP	Yes

Measurement uncertainty: 30 – 1000 MHz 3.1 dB
 1 – 18 GHz, 3.0 dB
 18 – 40 GHz, 3.1 dB
 40 – 60 GHz, 2.27 dB
 60 – 75 GHz, 2.70 dB
 75 – 110 GHz, 4.24 dB
 110 – 150 GHz, 3.61 dB
 150 – 170 GHz, 4.67 dB
 170 – 200 GHz, 5.10 dB

Limits

CFR 47 §30.203 Emission limits.

(a) The conductive power or the total radiated power of any emission outside a licensee's frequency block shall be -13 dBm/MHz or lower. However, in the bands immediately outside and adjacent to the licensee's frequency block, having a bandwidth equal to 10 percent of the channel bandwidth, the conductive power or the total radiated power of any emission shall be -5 dBm/MHz or lower.

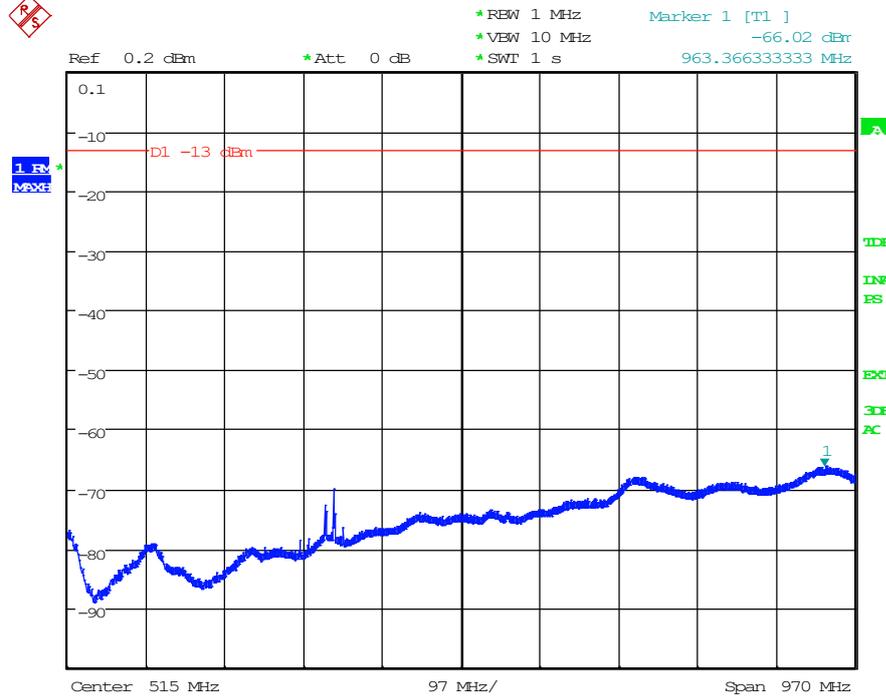
(b)(1) Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 1 megahertz or greater.

(2) When measuring the emission limits, the nominal carrier frequency shall be adjusted as close to the licensee's frequency block edges as the design permits.

(3) The measurements of emission power can be expressed in peak or average values.

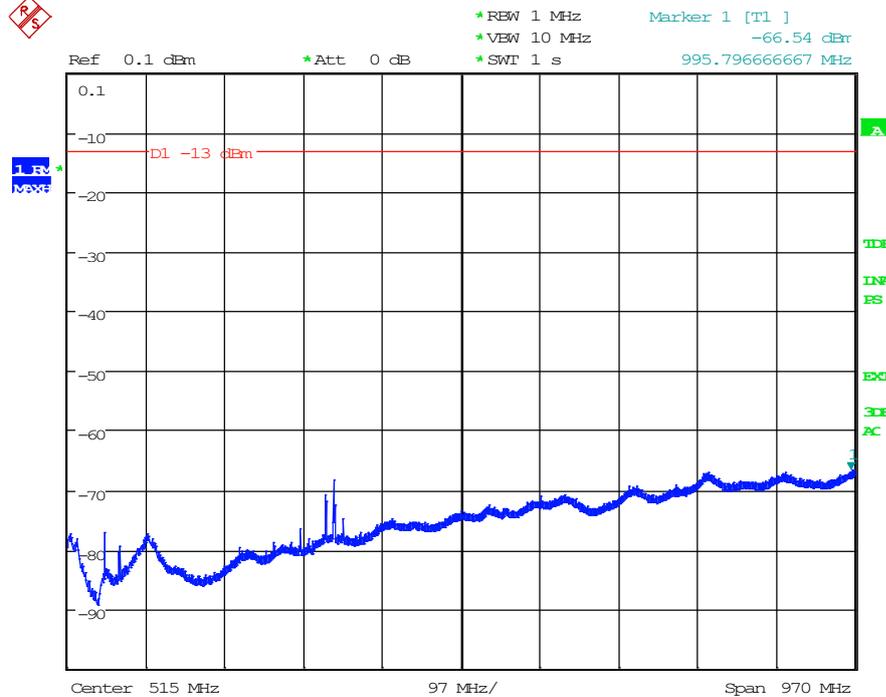
Complies?	Yes
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Diagram 2.1a: Pre scan 30 – 1000 MHz, Symbolic name: TL₁₀₀, EIRP Horizontal polarization



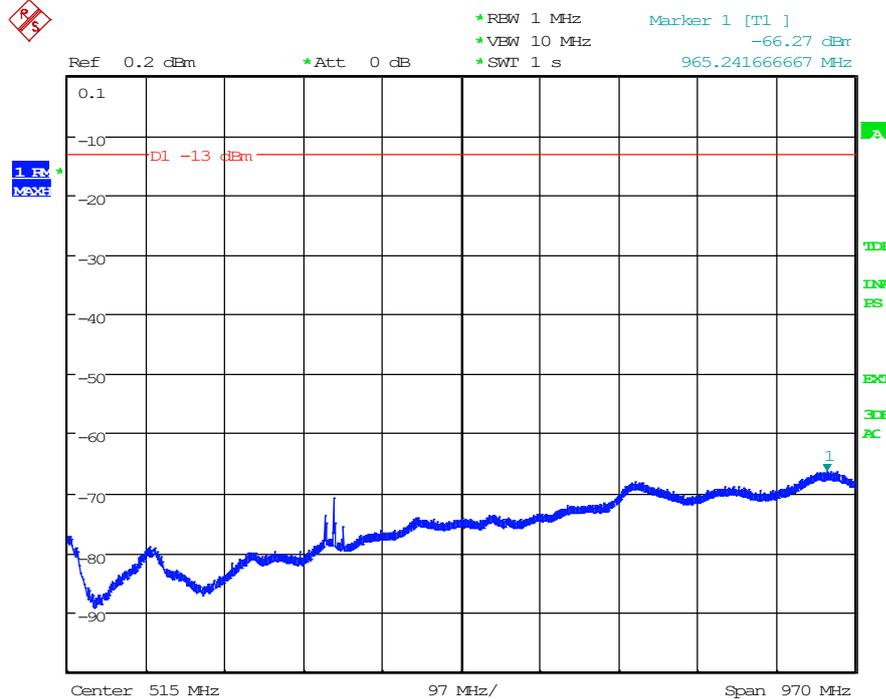
Date: 28.JAN.2021 11:17:55

Diagram 2.1b: Pre scan 30 – 1000 MHz, Symbolic name: TL₁₀₀, EIRP Vertical polarization



Date: 28.JAN.2021 11:22:15

Diagram 2.2a: Pre scan 30 – 1000 MHz, Symbolic name: BL8₁₀₀, EIRP Horizontal polarization



Date: 28.JAN.2021 11:07:39

Diagram 2.2b: Pre scan 30 – 1000 MHz, Symbolic name: BL8₁₀₀, EIRP Vertical polarization



Date: 28.JAN.2021 11:03:29

Diagram 2.3a: Pre scan 1 – 18 GHz, Symbolic name: TL₁₀₀, EIRP Horizontal polarization

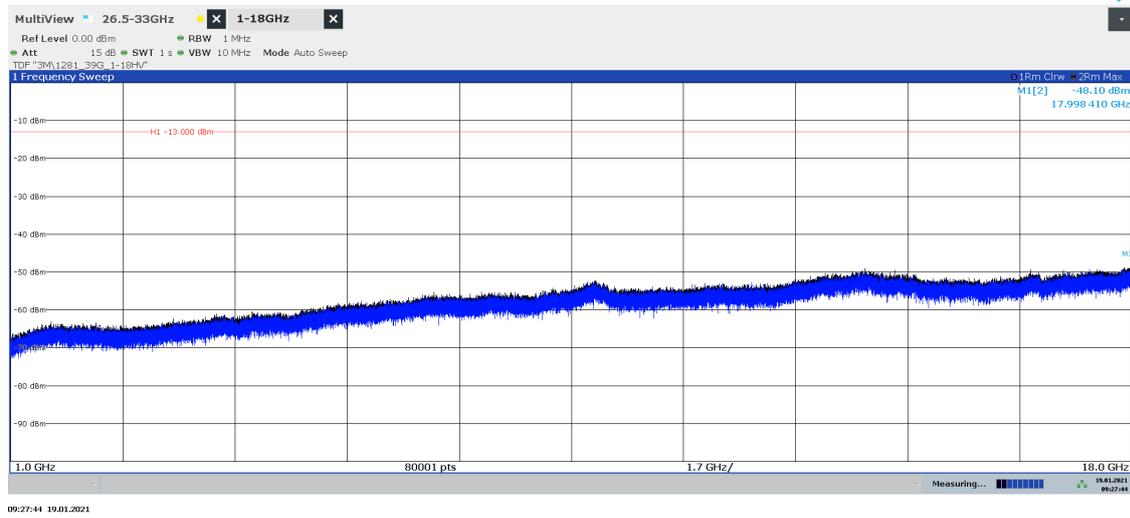


Diagram 2.3b: Pre scan 1 – 18 GHz, Symbolic name: TL₁₀₀, EIRP Vertical polarization

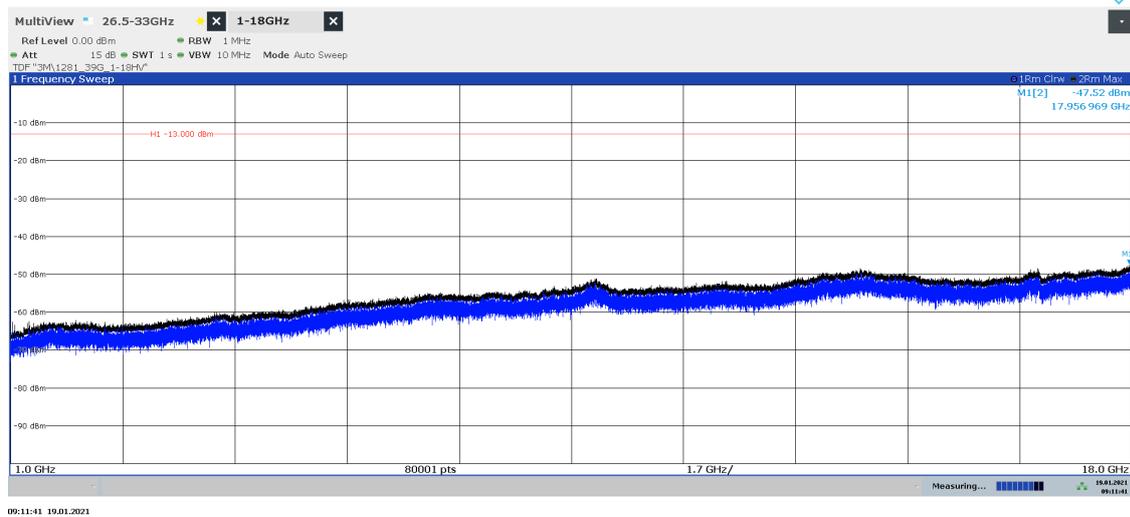


Diagram 2.4a: Pre scan 1 – 18 GHz, Symbolic name: BL8₁₀₀, EIRP Horizontal polarization

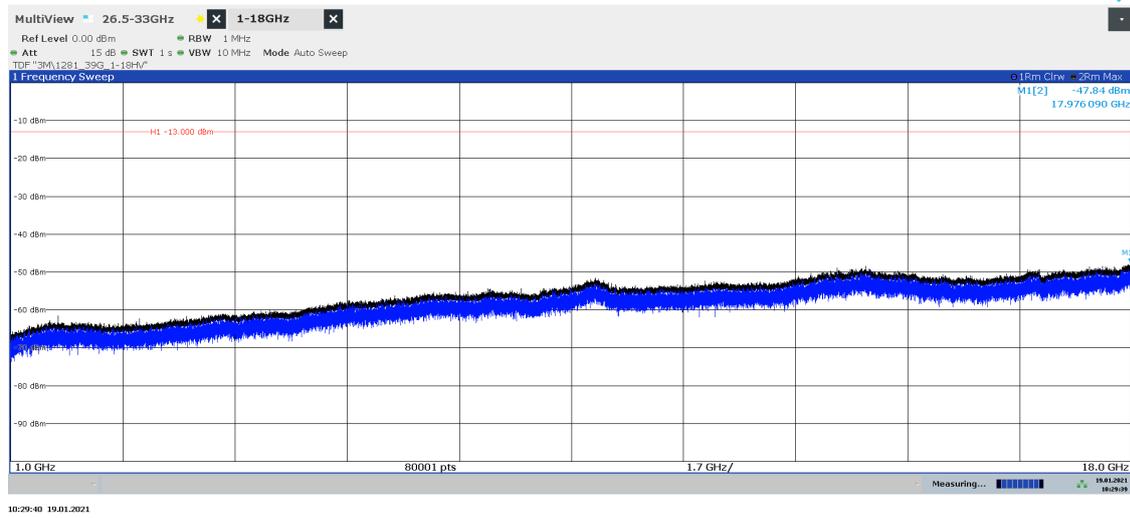


Diagram 2.4b: Pre scan 1 – 18 GHz, Symbolic name: BL8₁₀₀, EIRP Vertical polarization

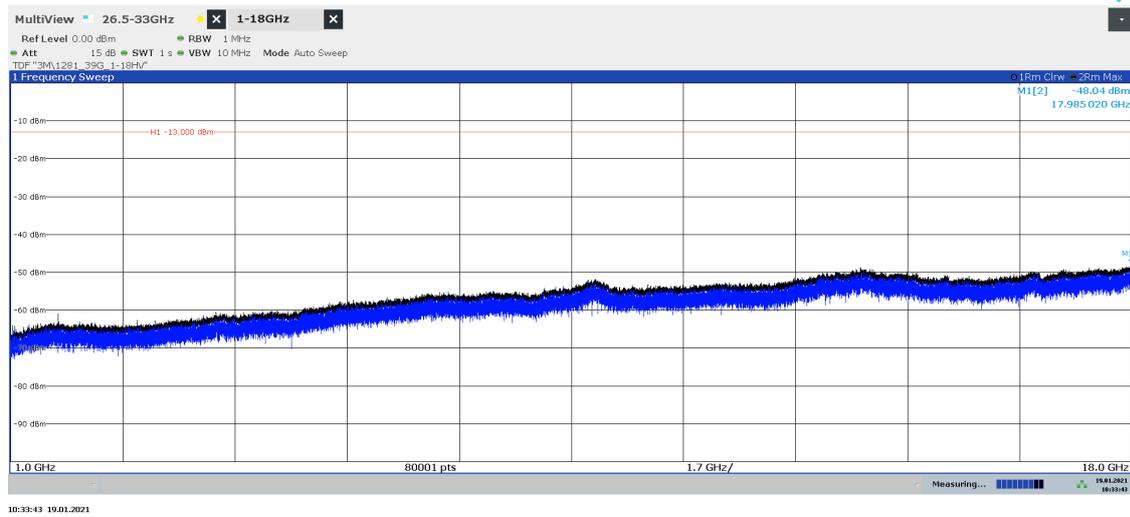


Diagram 2.5a: Pre scan 18 – 26.5 GHz, Symbolic name: TL₁₀₀, EIRP Horizontal polarization

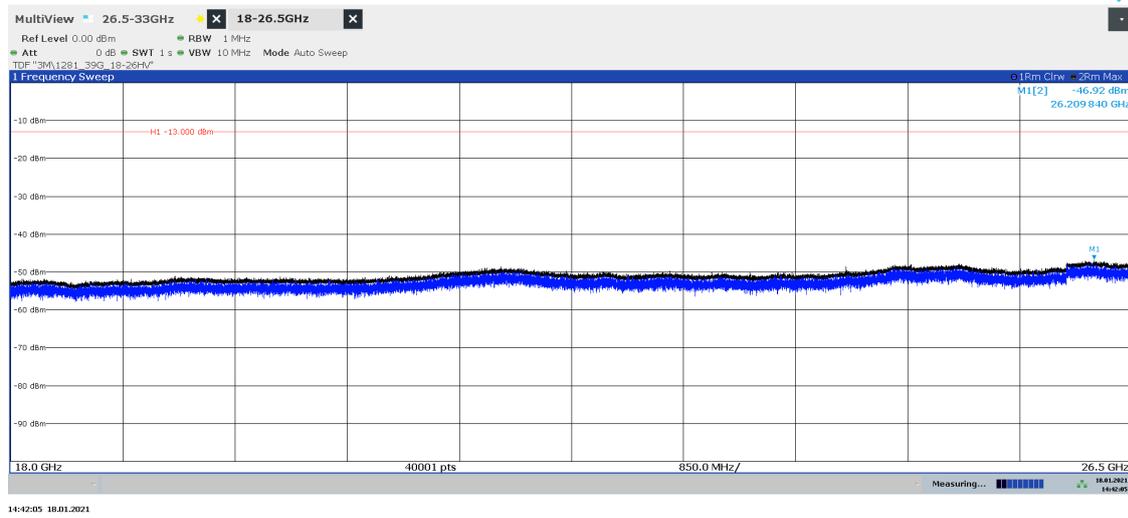


Diagram 2.5b: Pre scan 18 – 26.5 GHz, Symbolic name: TL₁₀₀, EIRP Vertical polarization

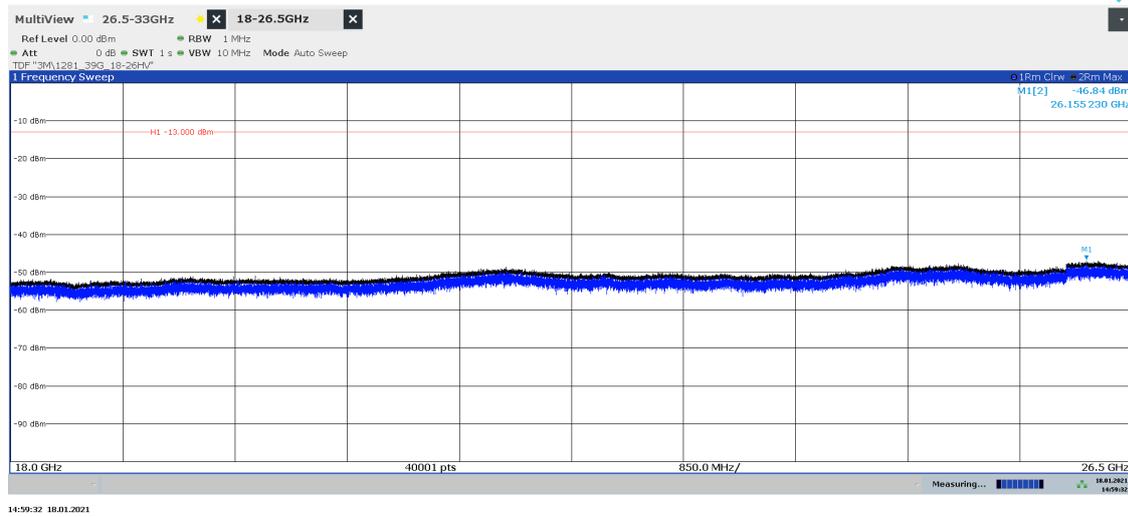


Diagram 2.6a: Pre scan 18 – 26.5 GHz, Symbolic name: BL8₁₀₀, EIRP Horizontal polarization

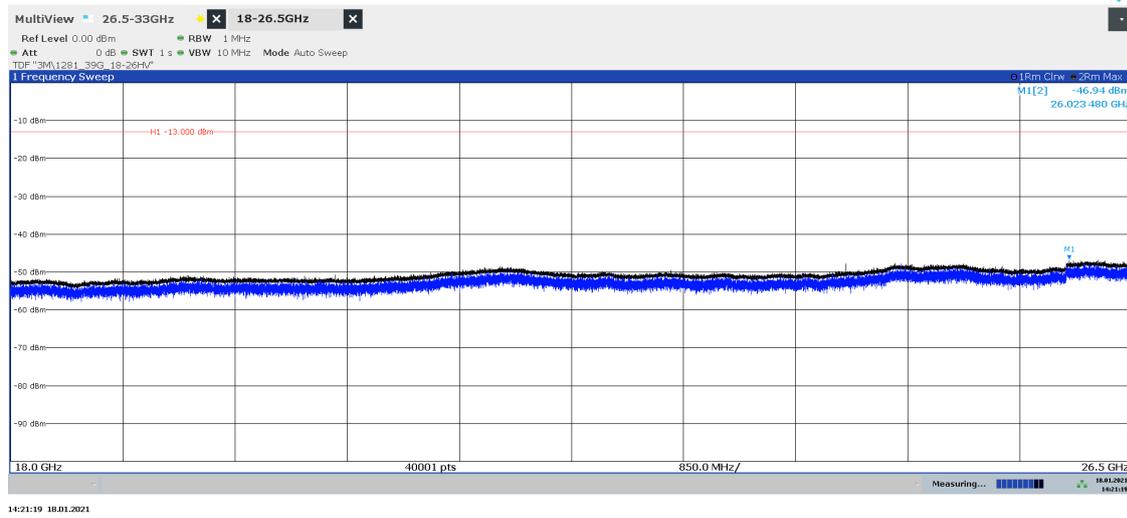


Diagram 2.6b: Pre scan 18 – 26.5 GHz, Symbolic name: BL8₁₀₀, EIRP Vertical polarization

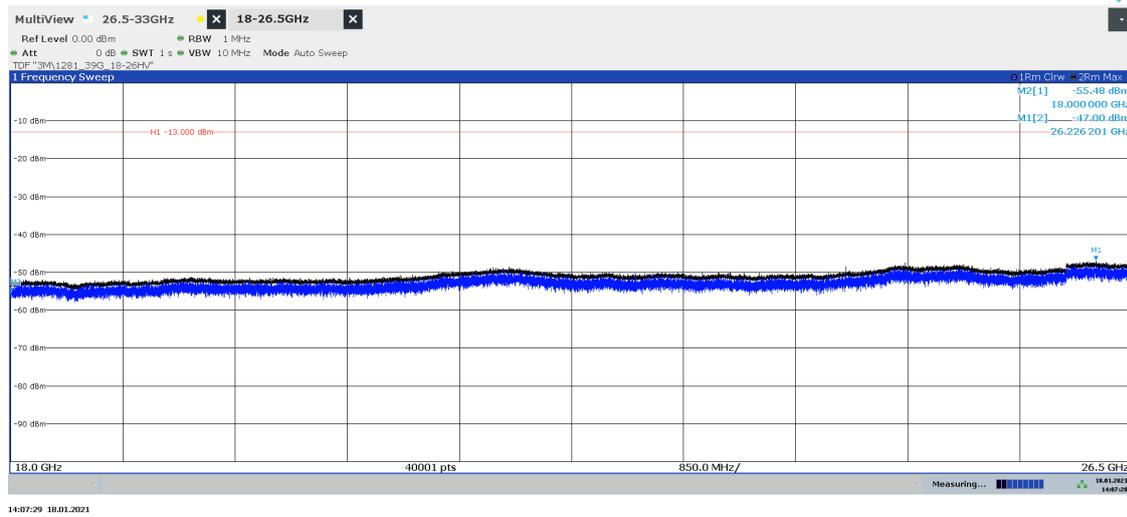


Diagram 2.7a: Pre scan 26.5 – 33 GHz, Symbolic name TH₁₀₀, EIRP Horizontal polarization

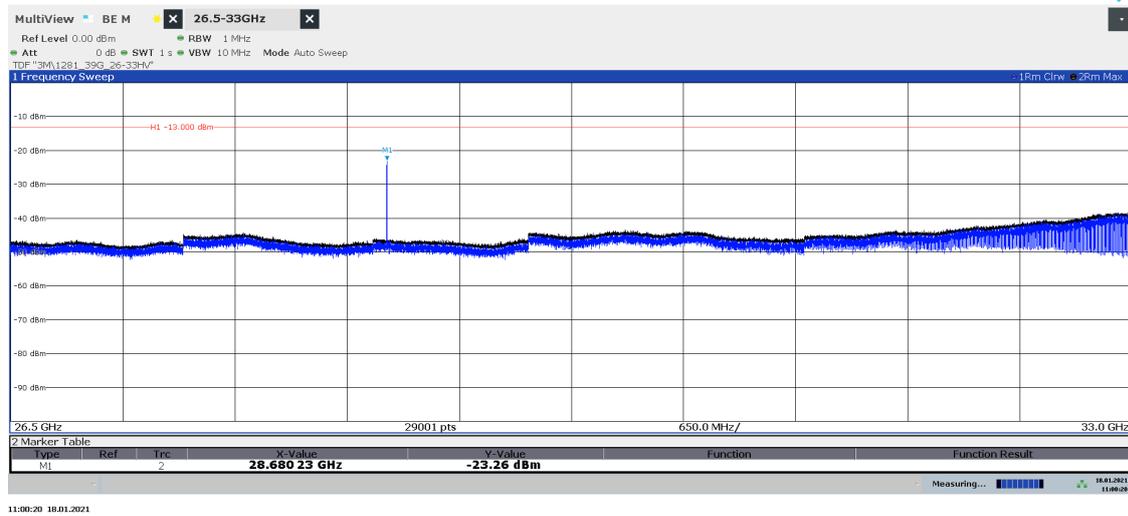


Diagram 2.7b: Pre scan 26.5 – 33 GHz, Symbolic name TH₁₀₀, EIRP Vertical polarization

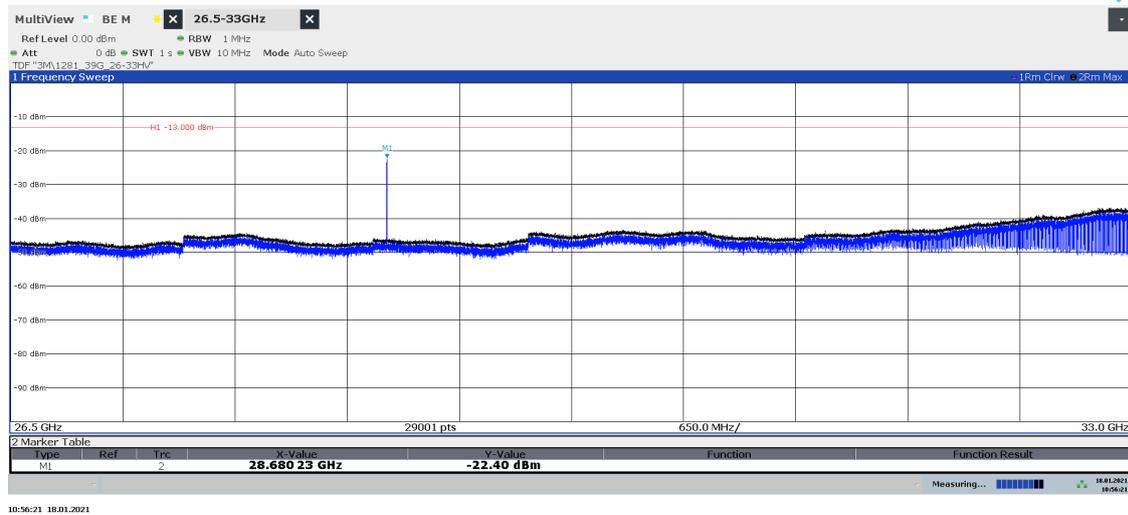


Diagram 2.8a: Pre scan 26.5 – 33 GHz, Symbolic name TH8₁₀₀, EIRP Horizontal polarization

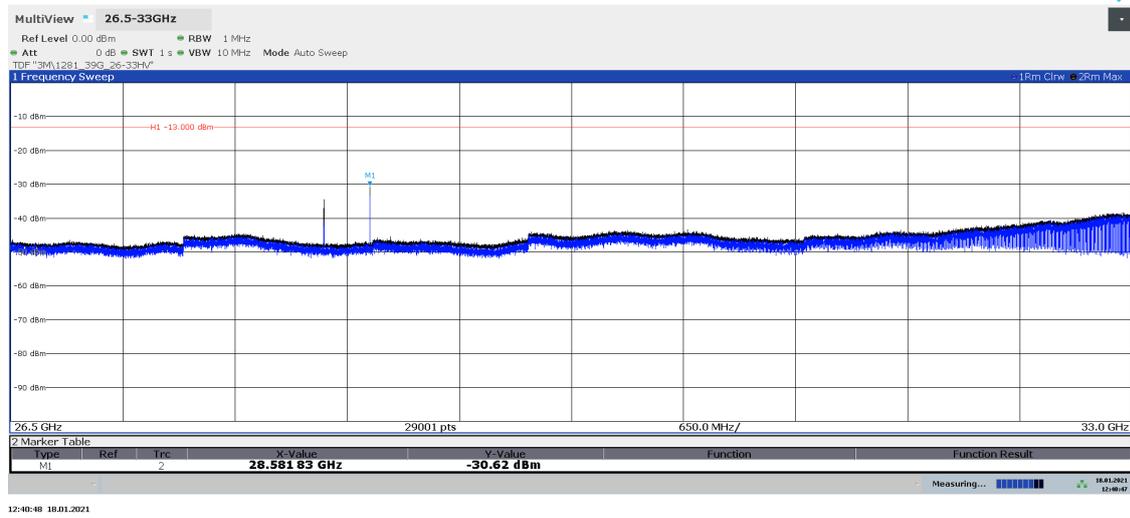


Diagram 2.8a: Pre scan 26.5 – 33 GHz, Symbolic name TH8₁₀₀, EIRP Vertical polarization

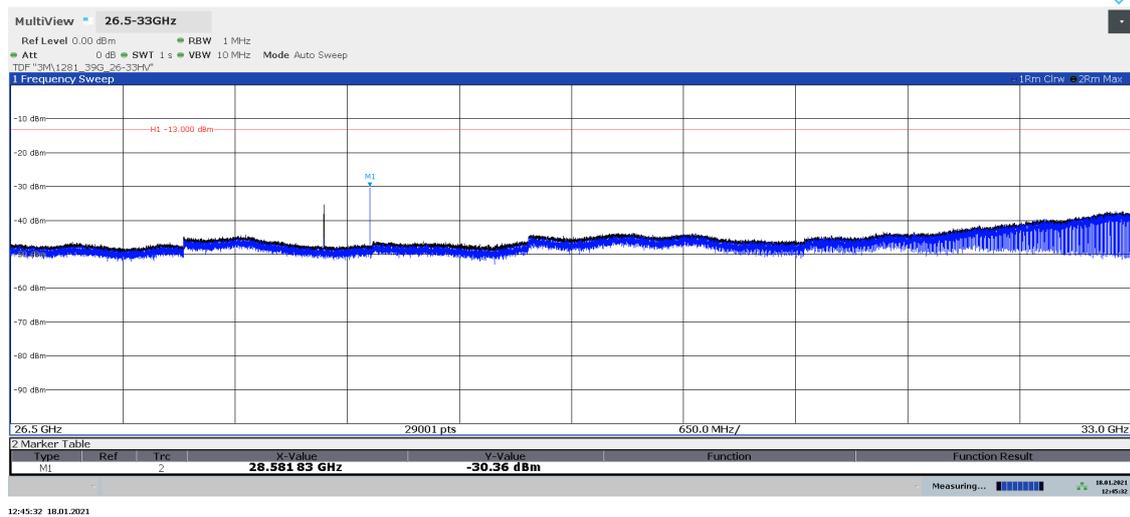
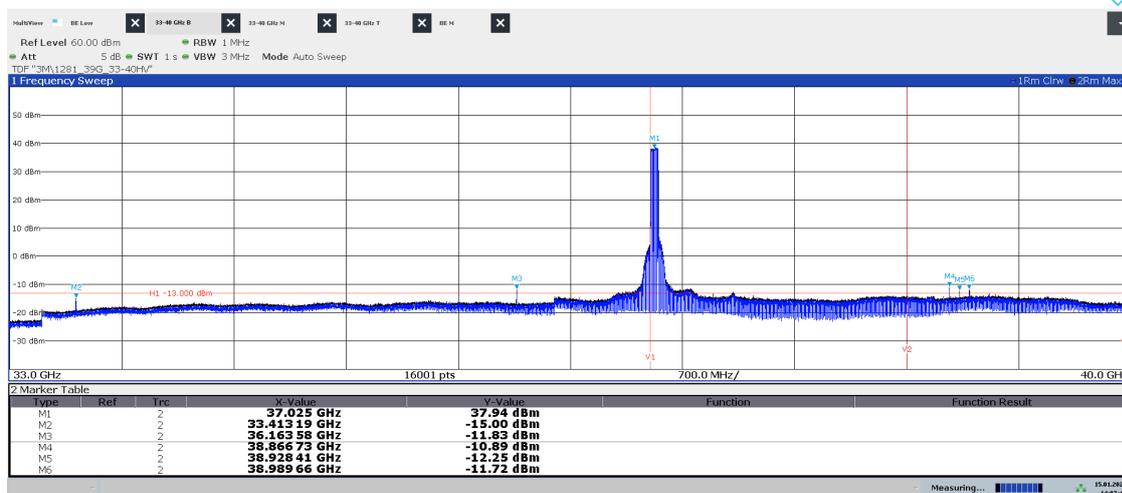
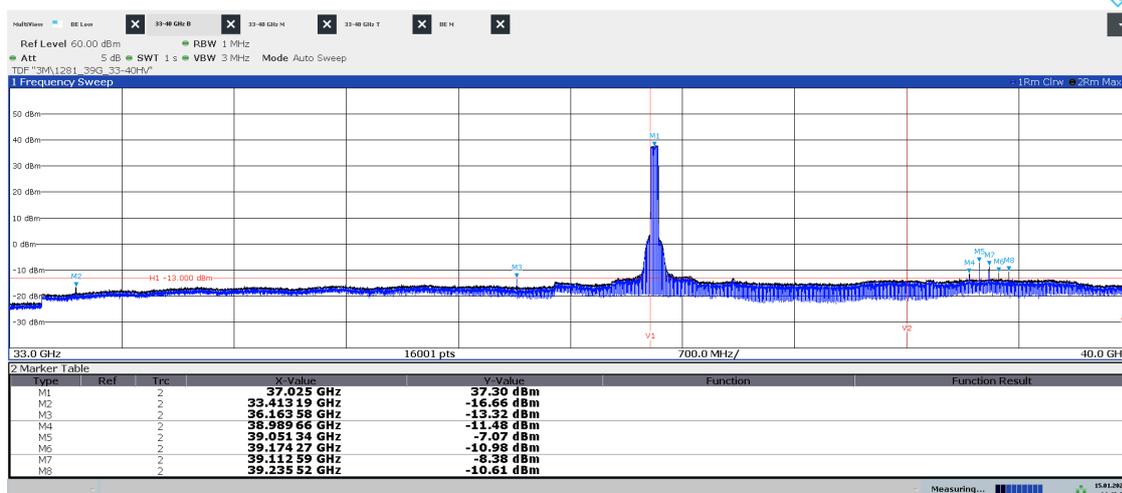


Diagram 2.9a: 33 – 40 GHz, QPSK, BL₅₀, EIRP Horizontal polarization



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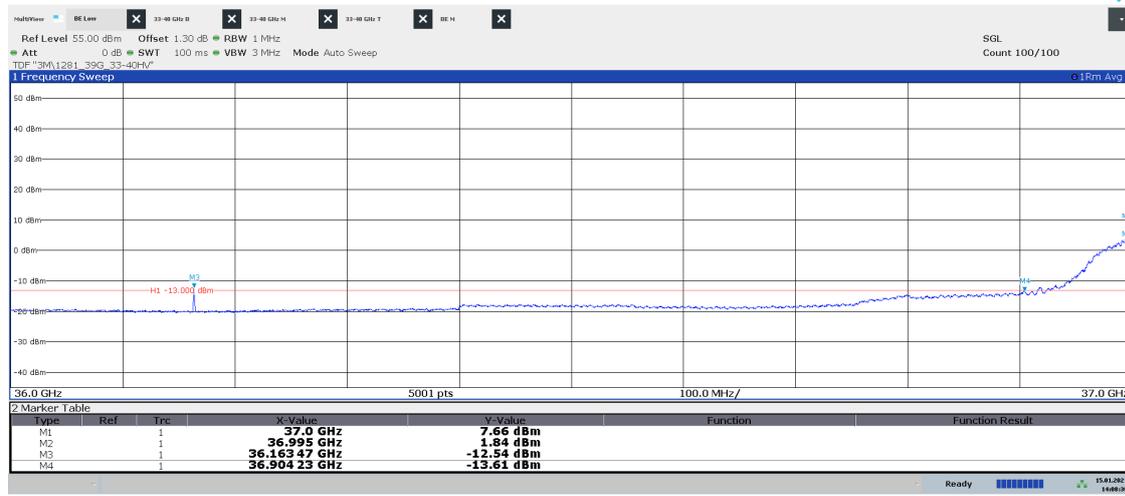
Diagram 2.9b: 33 – 40 GHz, QPSK, BL₅₀, EIRP Vertical polarization



14:43:33 15.01.2021

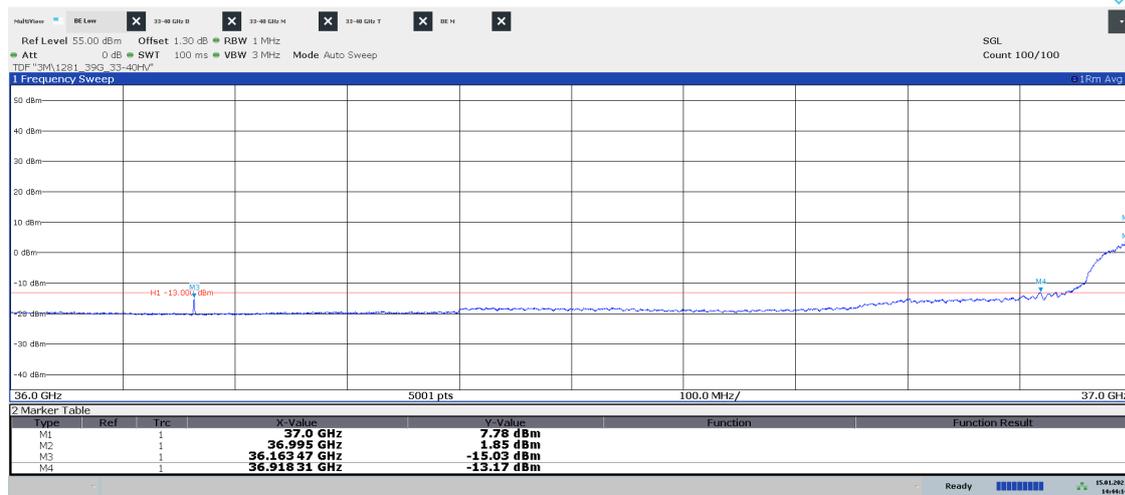
Freq [GHz]	Power Hor/ Ver [dBm]	Antenna Gain Hor/ Ver [dBi]	Total conducted power/BW (Limit -13 dBm) [dBm]/ Verdict
38.866	-10.89/	29.02/29.05	-39.91/ Pass
38.928	-12.25/	29.02/29.05	-41.27/ Pass
38.990	-11.72/ -11.48	29.02/29.05	-37.62/ Pass
39.051	/ -7.07	29.02/29.05	-36.12/ Pass
39.174	/ -10.98	29.02/29.05	-40.03/ Pass
39.113	/ -8.38	29.02/29.05	-37.43/ Pass
39.236	/ -10.61	29.02/29.05	-39.66/ Pass

Diagram 2.9c: 36 – 37 GHz, QPSK, BL₅₀, EIRP Horizontal polarization



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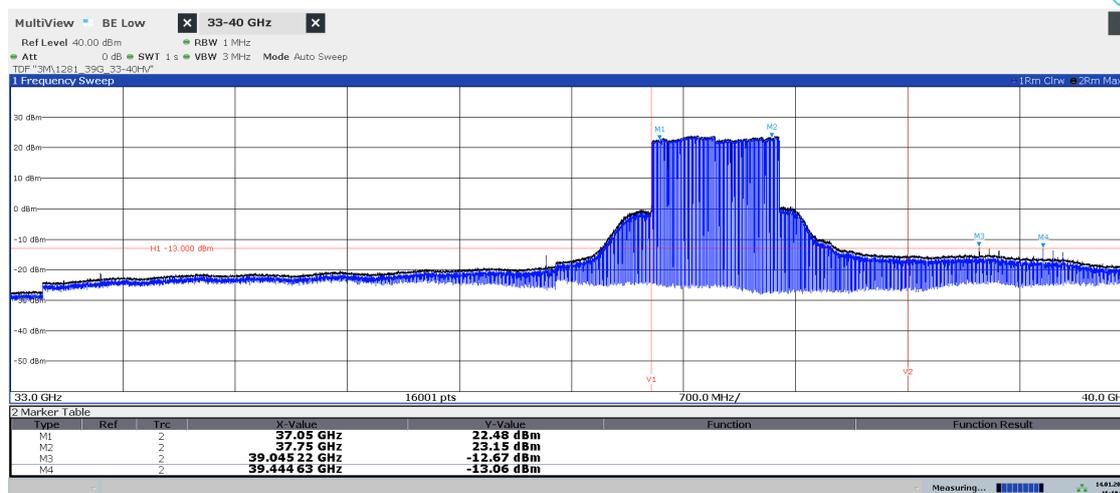
Diagram 2.9d: 36 – 37 GHz, QPSK, BL₅₀, EIRP Vertical polarization



14:44:14 15.01.2021

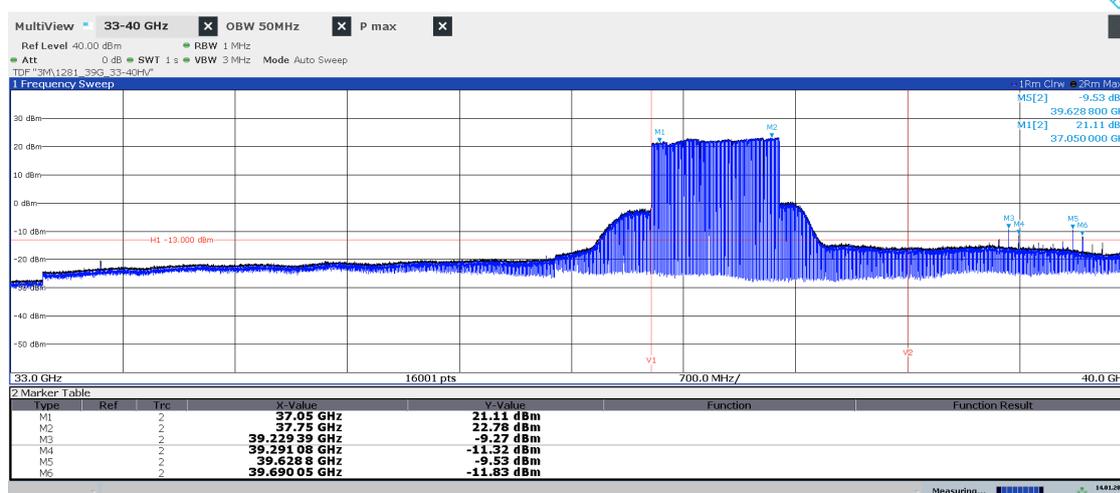
Power EIRP for 37.0 GHz Hor/ Ver [dBm]	Power EIRP for 36.995 GHz Hor/ Ver [dBm]	Antenna Gain Hor/ Ver [dBi]	Total conducted power/BW for 37.0 GHz (Limit -5 dBm) [dBm]/ Verdict	Total conducted power/BW for 36.995 GHz (Limit -13 dBm) [dBm]/ Verdict
7.66/ 7.78	1.84/ 1.85	28.68/ 28.61	-17.91/ Pass	-24.18/ Pass

Diagram 2.10a: 33 – 40 GHz, QPSK, BL8₁₀₀, EIRP Horizontal polarization



16:19:28 14.01.2021

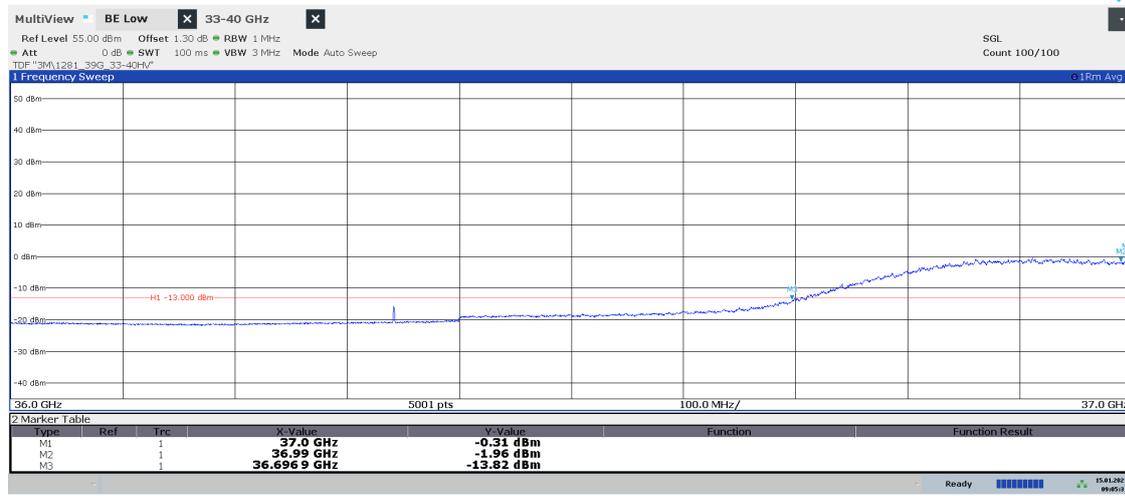
Diagram 2.10b: 33 – 40 GHz, QPSK, BL8₁₀₀, EIRP Vertical polarization



14:32:02 14.01.2021

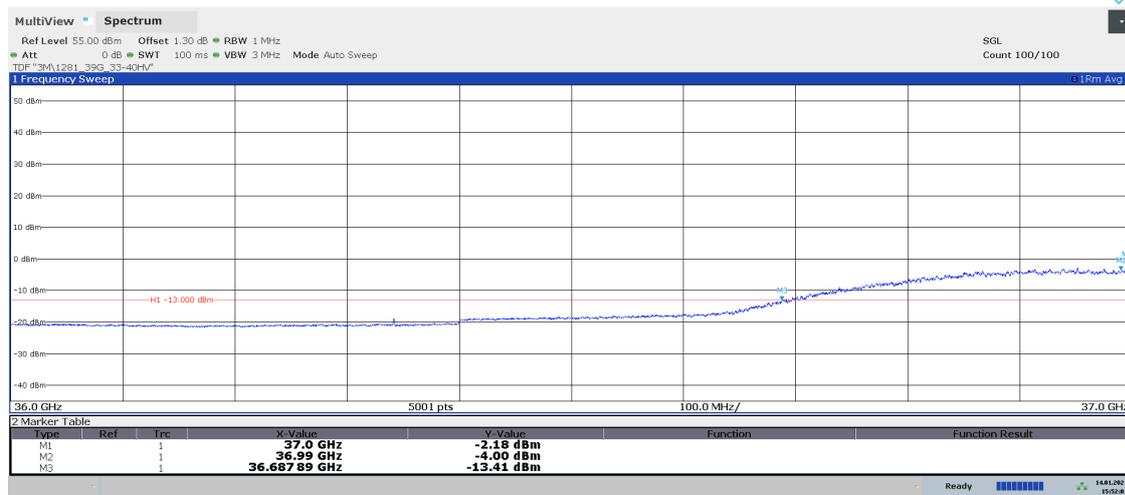
Freq [GHz]	Power Hor/ Ver [dBm]	Antenna Gain Hor/ Ver [dBi]	Total conducted power/BW (Limit -13 dBm) [dBm]/ Verdict
39.045	-12.67/	26.26/ 26.71	-38.93/ Pass
39.445	-13.06/	26.26/ 26.71	-39.32/ Pass
39.229	/ -9.27	26.26/ 26.71	-35.95/ Pass
39.291	/ -11.32	26.26/ 26.71	-38.03/ Pass
39.629	/ -9.53	26.40/26.52	-36.05/ Pass
39.690	/ -11.83	26.40/26.52	-38.35/ Pass

Diagram 2.10c: 36 – 37 GHz, QPSK, BL8₁₀₀, EIRP Horizontal polarization



09:05:32 15.01.2021

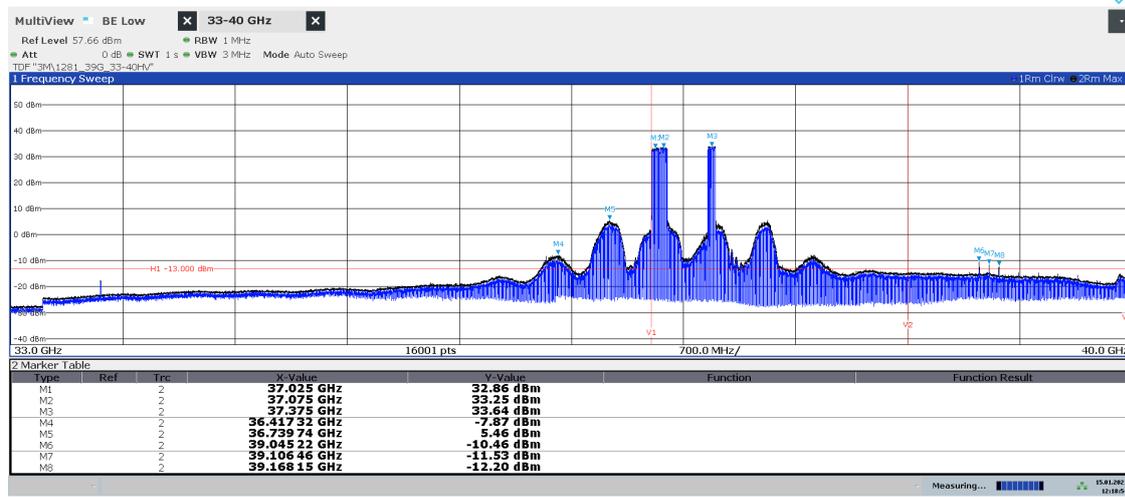
Diagram 2.10d: 36 – 37 GHz, QPSK, BL8₁₀₀, EIRP Vertical polarization



15:52:01 14.01.2021

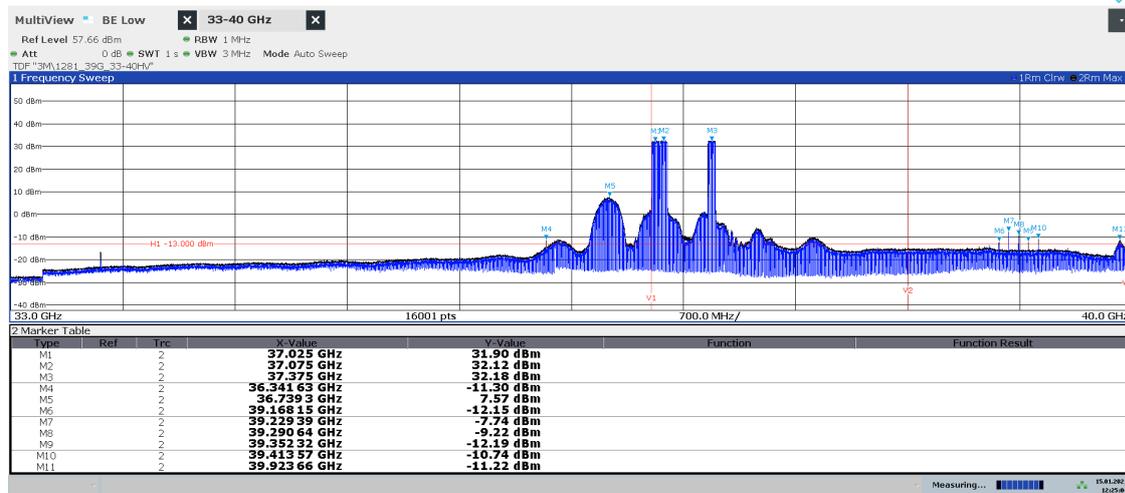
Power EIRP for 37.0 GHz Hor/ Ver [dBm]	Power EIRP for 36.990GHz Hor/ Ver [dBm]	Antenna Gain Hor/ Ver [dBi]	Total conducted power/BW for 37.0 GHz (Limit -5 dBm) [dBm]/ Verdict	Total conducted power/BW for 36.990 GHz (Limit -13 dBm) [dBm]/ Verdict
-0.31/ -2.18	-1.96/ -4.00	25.98/ 26.15	-24.18/ Pass	-25.90/ Pass

Diagram 2.11a: 33 – 40 GHz, QPSK, Bim₅₀, EIRP Horizontal polarization
See diagram 2.11e for TRP result



12:18:55 15.01.2021

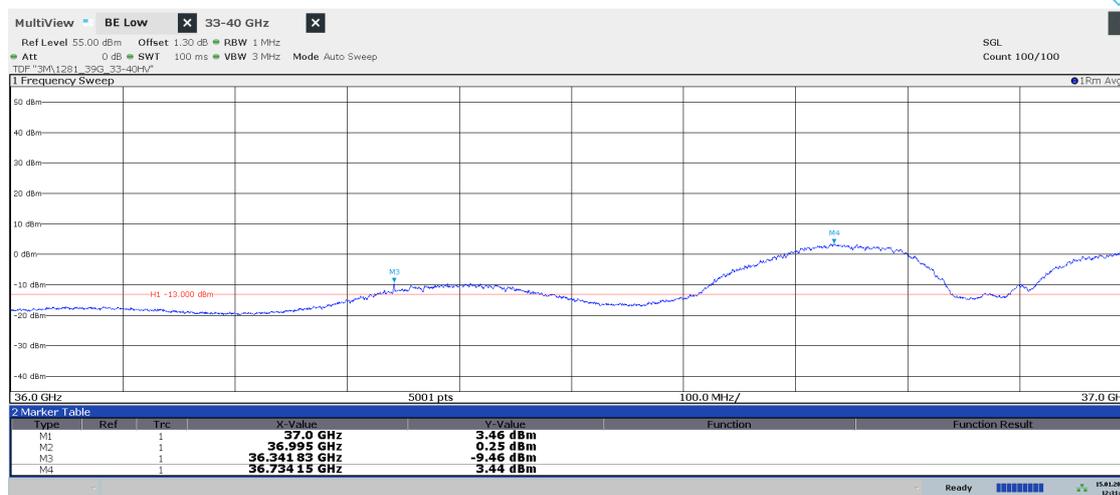
Diagram 2.11b: 33 – 40 GHz, QPSK, Bim₅₀, EIRP Vertical polarization
See diagram 2.11e for TRP result



12:25:04 15.01.2021

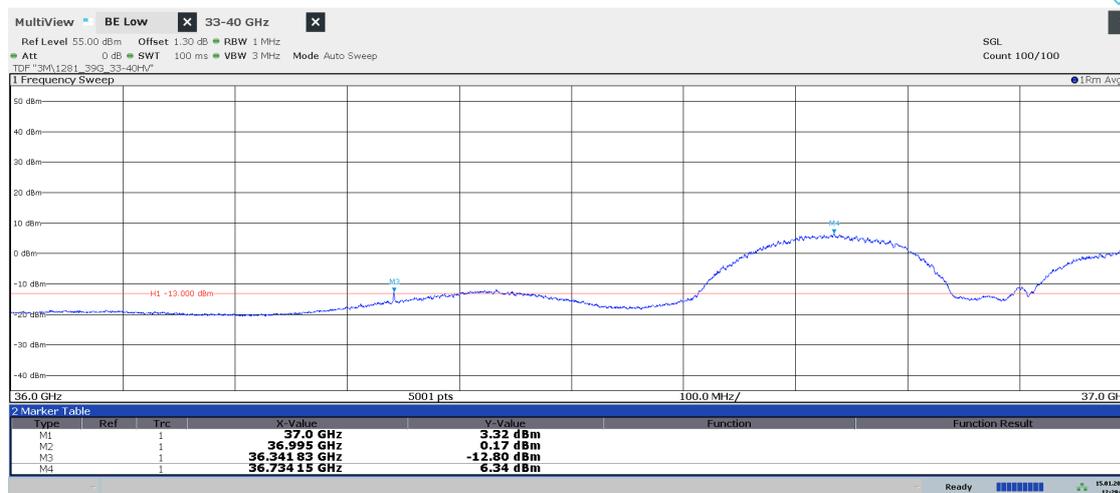
Freq [GHz]	Power Hor/ Ver [dBm]	Antenna Gain Hor/ Ver [dBi]	Total conducted power/BW (Limit -13 dBm) [dBm]/ Verdict
39.045	-10.46/	29.02/29.05	-39.48/ Pass
39.106	-11.53/	29.02/29.05	-40.55/ Pass
39.168	-12.20/ -12.15	29.02/29.05	-38.20/ Pass
39.229	/ -7.74	29.02/29.05	-36.79/ Pass
39.291	/ -9.22	29.02/29.05	-38.27/ Pass
39.352	/ -12.19	29.01/29.00	-41.19/ Pass
39.414	/ -10.74	29.01/29.00	-39.74/ Pass
39.924	/ -11.22	29.01/29.00	-40.22/ Pass

Diagram 2.11c: 36 – 37 GHz, QPSK, Bim₅₀, EIRP Horizontal polarization
See diagram 2.11e for TRP result



12:31:49 15.01.2021

Diagram 2.11d: 36 – 37 GHz, QPSK, Bim₅₀, EIRP Vertical polarization
See diagram 2.11e for TRP result



12:29:14 15.01.2021

Power EIRP for 37.00 GHz Hor/ Ver [dBm]	Power EIRP for 36.995 GHz Hor/ Ver [dBm]	Antenna Gain Hor/ Ver [dBi]	Total conducted power/BW for 37.00 GHz (Limit -5 dBm) [dBm]/ Verdict	Total conducted power/BW for 36.995 GHz (Limit -13 dBm) [dBm]/ Verdict
3.46/ 3.32	0.25/ 0.17	28.68/ 28.61	-22.24/ Pass	-25.42/ Pass

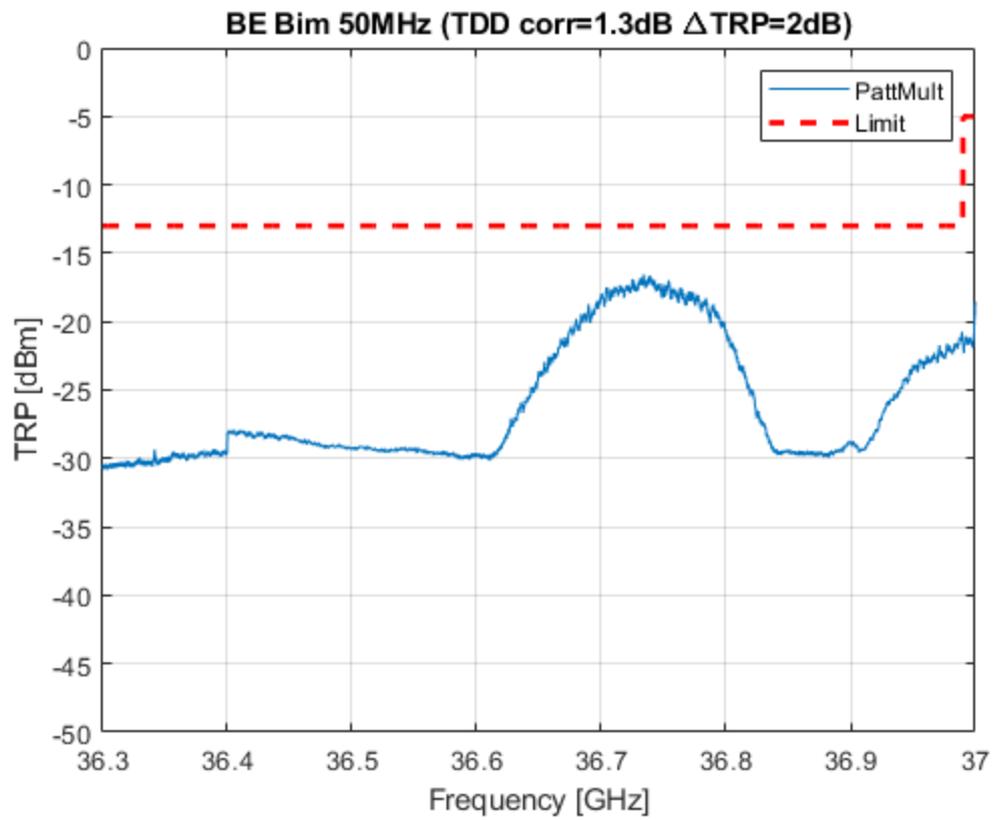
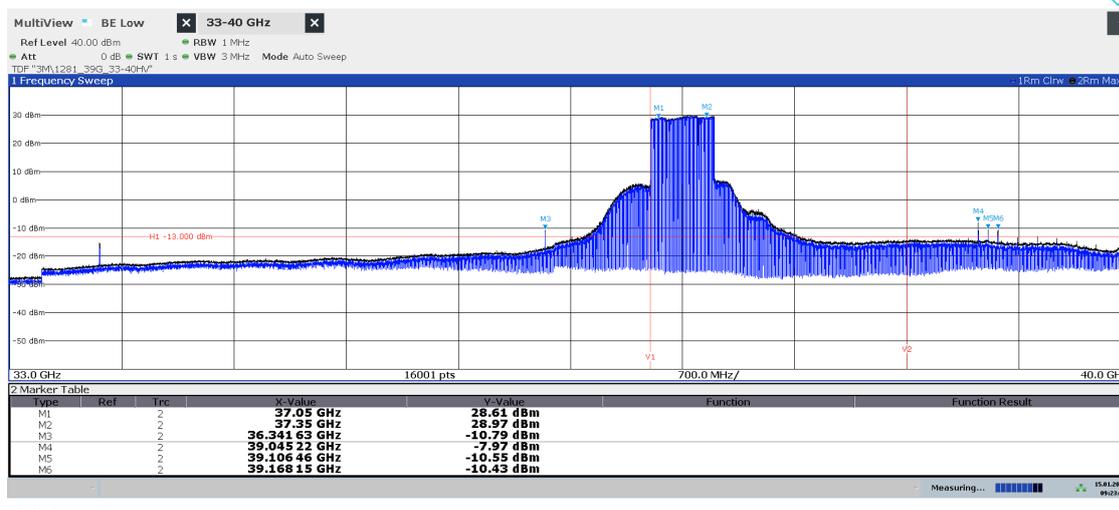
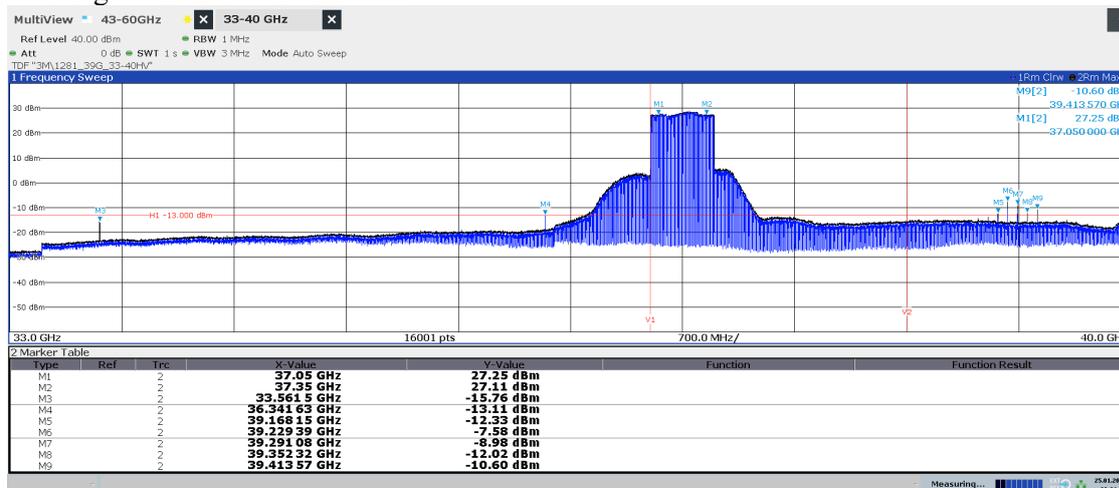
Diagram 2.11e: 36.3 – 37 GHz, QPSK, Bim₅₀, Pattern multiplication TRP

Diagram 2.12a: 33 – 40 GHz, QPSK, BL4₁₀₀, EIRP Horizontal polarization
See diagram 2.12e for TRP result



09:23:54 15.01.2021

Diagram 2.12b: 33 – 40 GHz, QPSK, BL4₁₀₀, EIRP Vertical polarization
See diagram 2.12e for TRP result



08:31:42 25.01.2021

Freq [GHz]	Power Hor/ Ver [dBm]	Antenna Gain Hor/ Ver [dBi]	Total conducted power/BW (Limit -13 dBm) [dBm]/ Verdict
39.045	-7.97/	29.02/29.05	-36.99/ Pass
39.106	-10.55/	29.02/29.05	-39.57/ Pass
39.168	-10.43/ -12.33	29.02/29.05	-37.30/ Pass
39.229	/ -7.58	29.02/29.05	-36.63/ Pass
39.291	/ -8.95	29.02/29.05	-38.00/ Pass
39.352	/ -12.02	29.01/29.00	-41.02/ Pass
39.414	/ -10.60	29.01/29.00	-39.06/ Pass

Diagram 2.12c: 37.4 – 38.4 GHz, QPSK, BL4₁₀₀, EIRP Horizontal polarization
See diagram 2.12e for TRP result

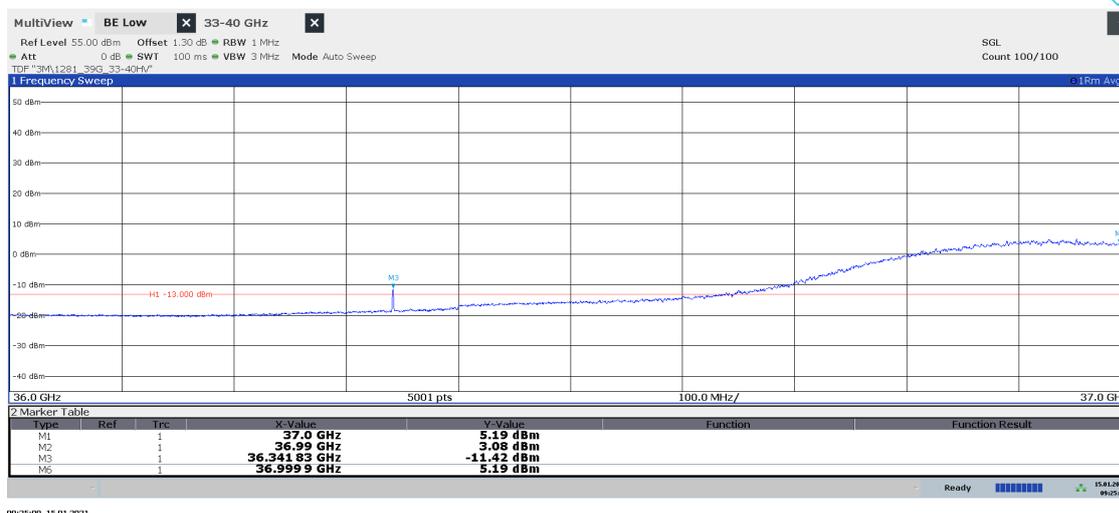
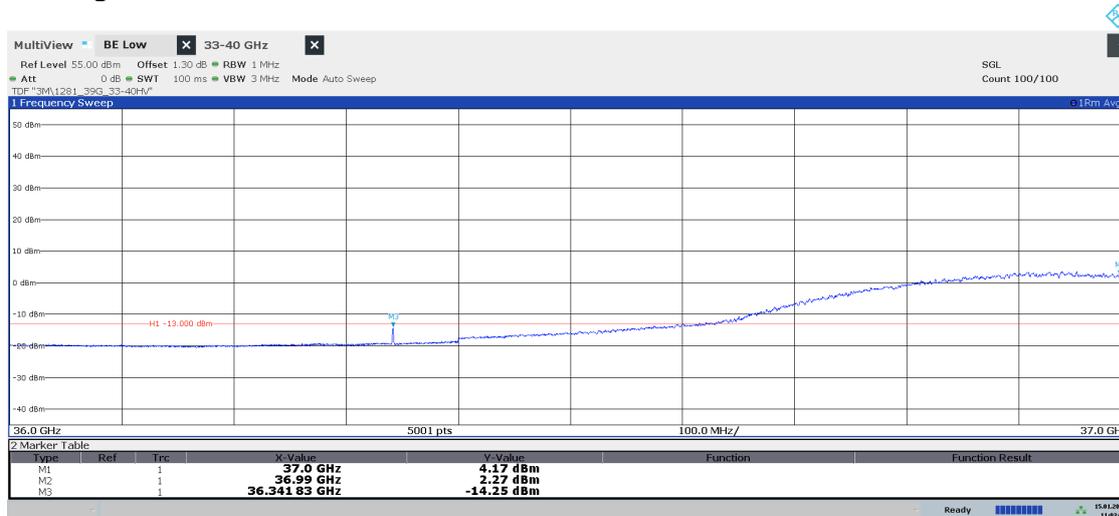


Diagram 2.12d: 37.4 – 38.4 GHz, QPSK, BL4₁₀₀, EIRP Vertical polarization
See diagram 2.12e for TRP result



Power EIRP for 37.0 GHz Hor/ Ver [dBm]	Power EIRP for 36.990GHz Hor/ Ver [dBm]	Antenna Gain Hor/ Ver [dBi]	Total conducted power/BW for 37.0 GHz (Limit -5 dBm) [dBm]/ Verdict	Total conducted power/BW for 36.990 GHz (Limit -13 dBm) [dBm]/ Verdict
5.19/ 4.17	3.08/ 2.27	28.68/ 28.61	-20.93/ Pass	-22.94/ Pass

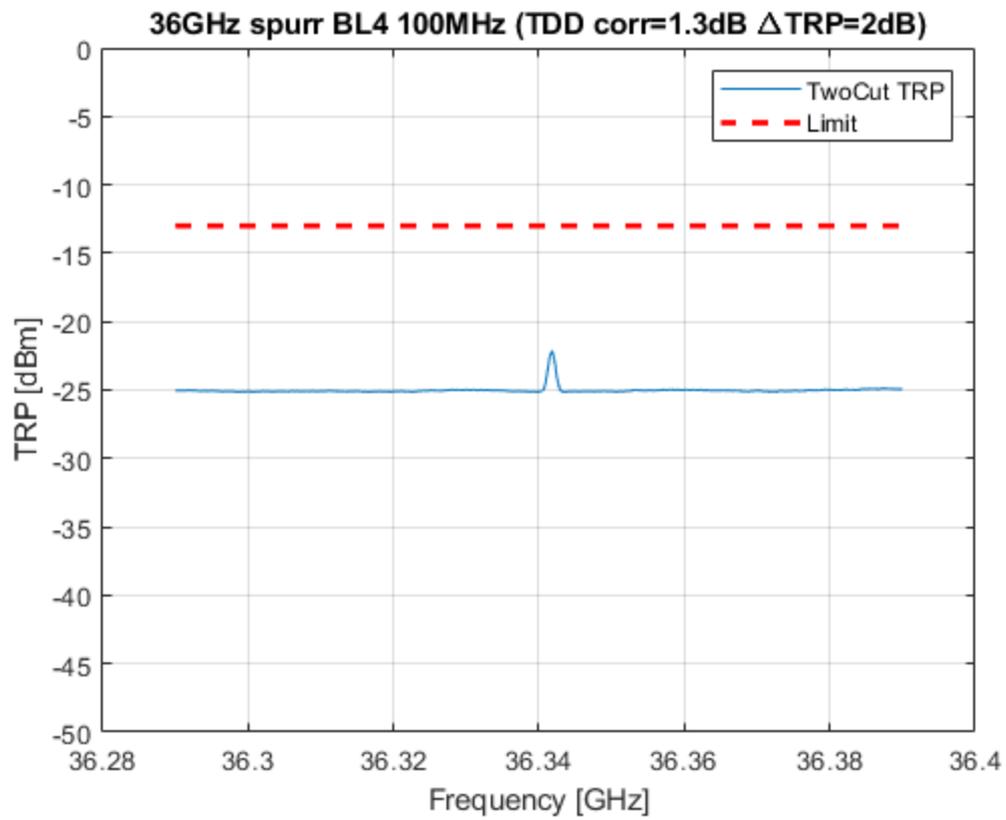
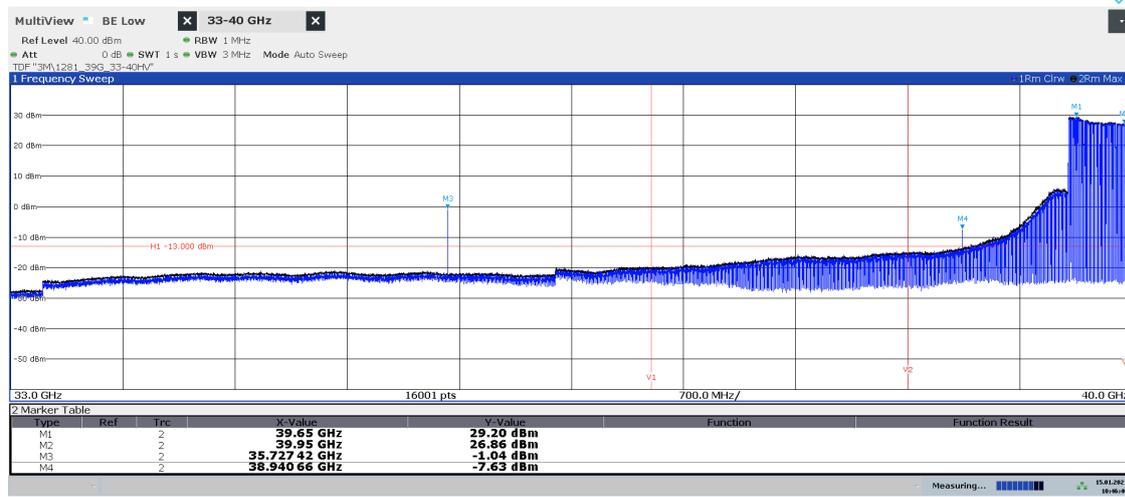
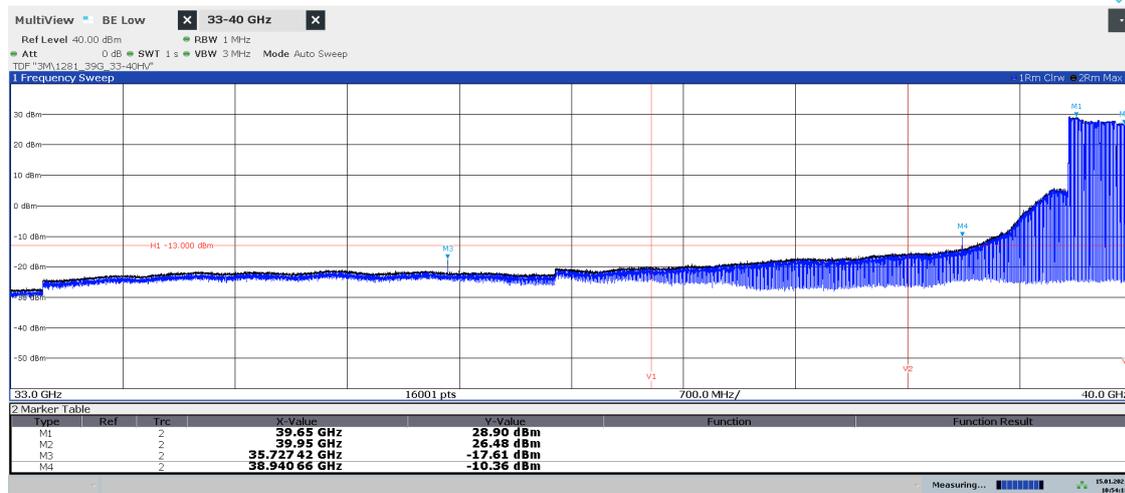
Diagram 2.12e: 36.29 – 36.39 GHz, QPSK, BL4₁₀₀, Two cut TRP

Diagram 2.13a: 33 – 40 GHz, QPSK, TH4₁₀₀, EIRP Horizontal polarization
See diagram 2.13c for TRP result



10:46:41 15.01.2021

Diagram 2.13b: 33 – 40 GHz, QPSK, TH4₁₀₀, EIRP Vertical polarization
See diagram 2.13c for TRP result



10:54:13 15.01.2021

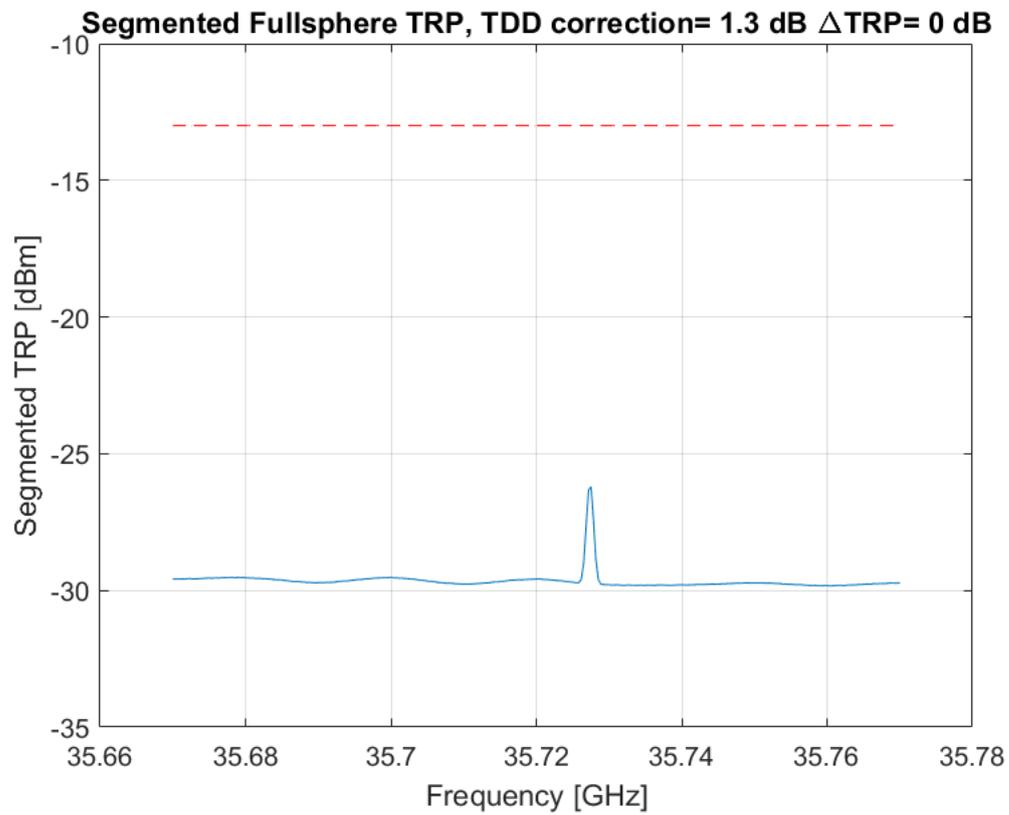
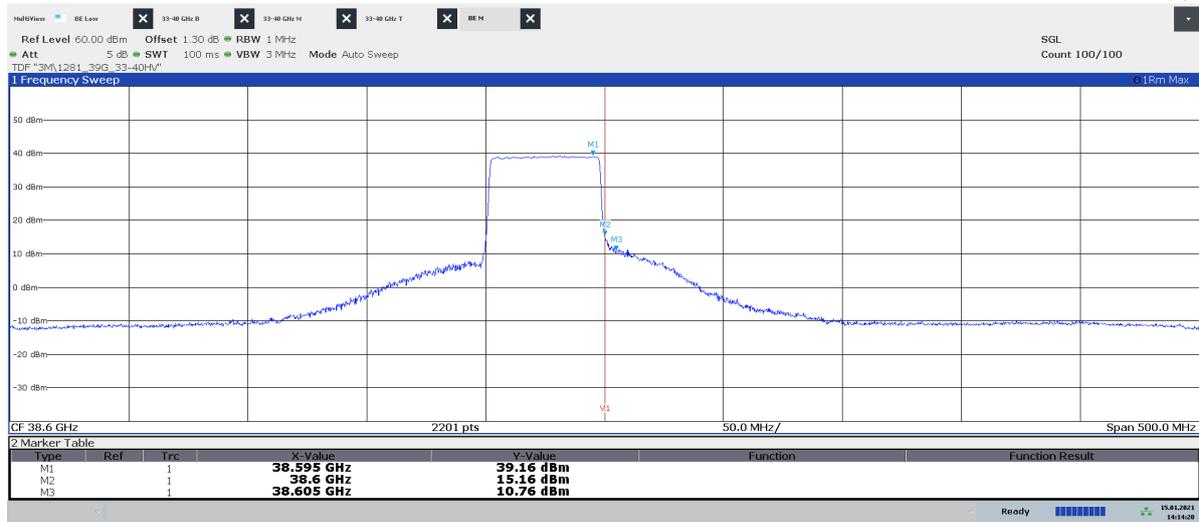
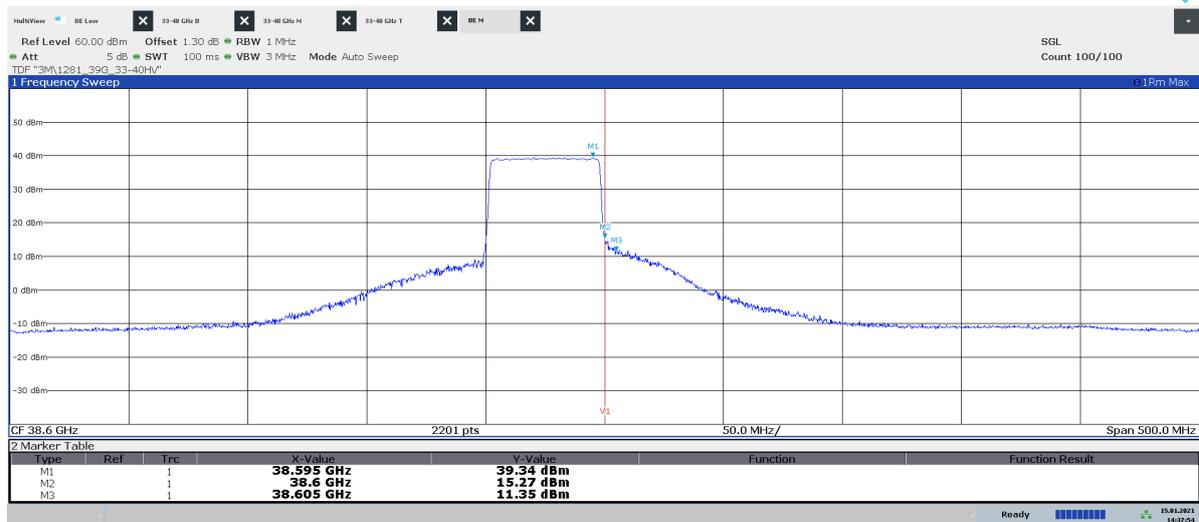
Diagram 2.13c: 35.67 – 35.77 GHz, QPSK, TH₄₁₀₀, Spherical grid

Diagram 2.14a: 38.35 – 38.85 GHz, QPSK, TL₅₀, EIRP Horizontal polarization



14:14:20 15.01.2021

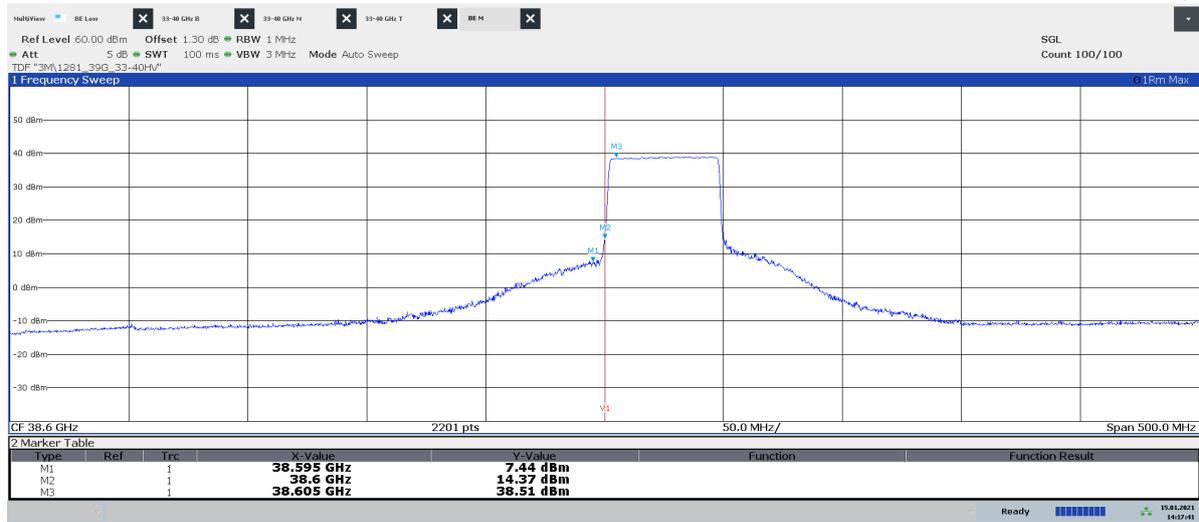
Diagram 2.14b: 38.35 – 38.85 GHz, QPSK, TL₅₀, EIRP Vertical polarization



14:37:54 15.01.2021

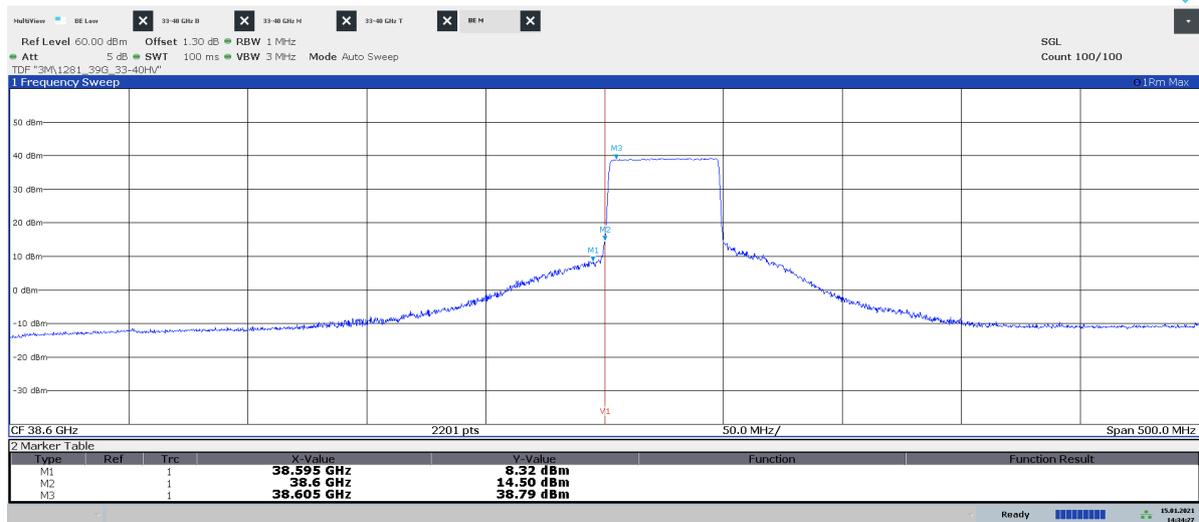
Power EIRP for 38.6 GHz Hor/ Ver [dBm]	Power EIRP for 38.605 GHz Hor/ Ver [dBm]	Antenna Gain Hor/ Ver [dBi]	Total conducted power/BW for 38.6 GHz (Limit -5 dBm) [dBm]/ Verdict	Total conducted power/BW for 38.605 GHz (Limit -13 dBm) [dBm]/ Verdict
15.16/ 15.27	10.76/ 11.35	29.02/ 29.05	-10.81/ Pass	-14.96/ Pass

Diagram 2.15a: 38.35 – 38.85 GHz, QPSK, BH₅₀, EIRP Horizontal polarization



14:17:42 15.01.2021

Diagram 2.15b: 38.35 – 38.85 GHz, QPSK, BH₅₀, EIRP Vertical polarization



14:34:27 15.01.2021

Power EIRP for 38.6 GHz Hor/ Ver [dBm]	Power EIRP for 38.595 GHz Hor/ Ver [dBm]	Antenna Gain Hor/ Ver [dBi]	Total conducted power/BW for 38.6 GHz (Limit -5 dBm) [dBm]/ Verdict	Total conducted power/BW for 38.595 GHz (Limit -13 dBm) [dBm]/ Verdict
14.37/ 14.50	7.44/ 8.32	29.02/ 29.05	-11.59/ Pass	-18.12/ Pass

Diagram 2.16a: 40 – 43 GHz, QPSK, TH₅₀, EIRP Horizontal polarization

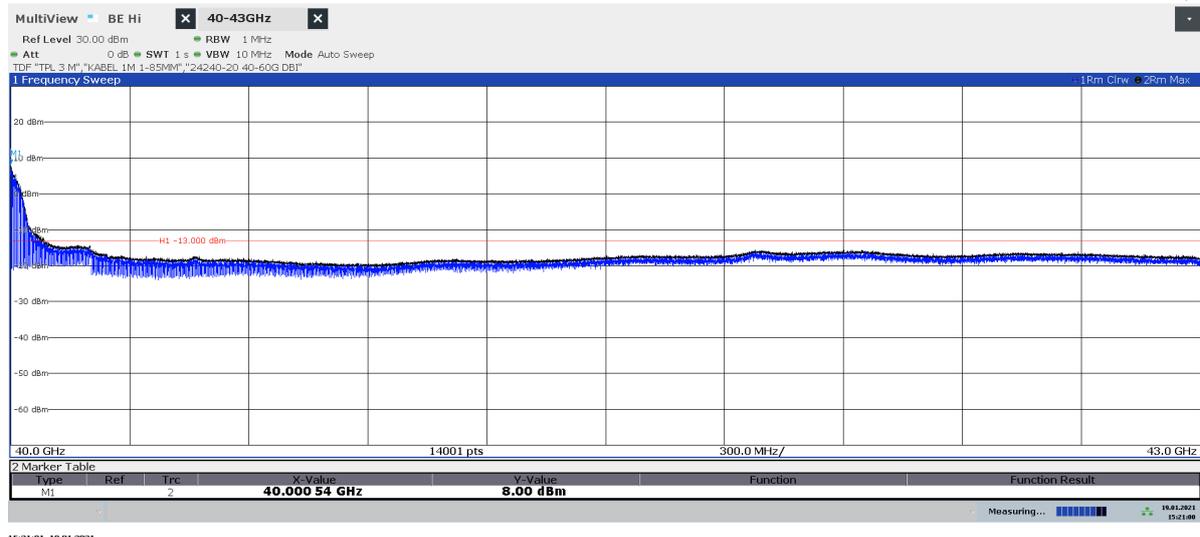


Diagram 2.16b: 40 – 43 GHz, QPSK, TH₅₀, EIRP Vertical polarization

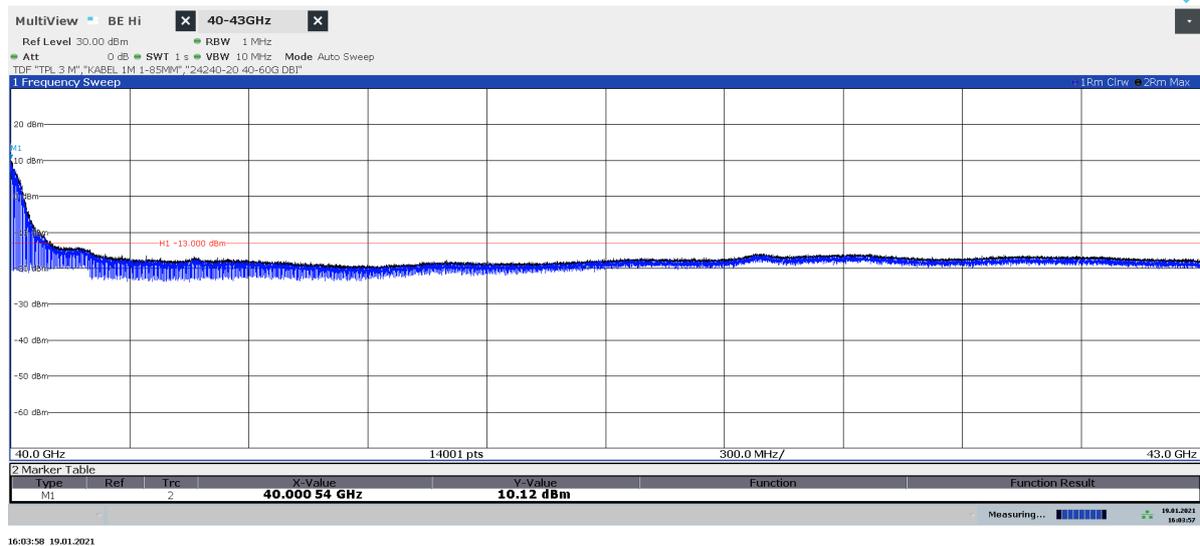
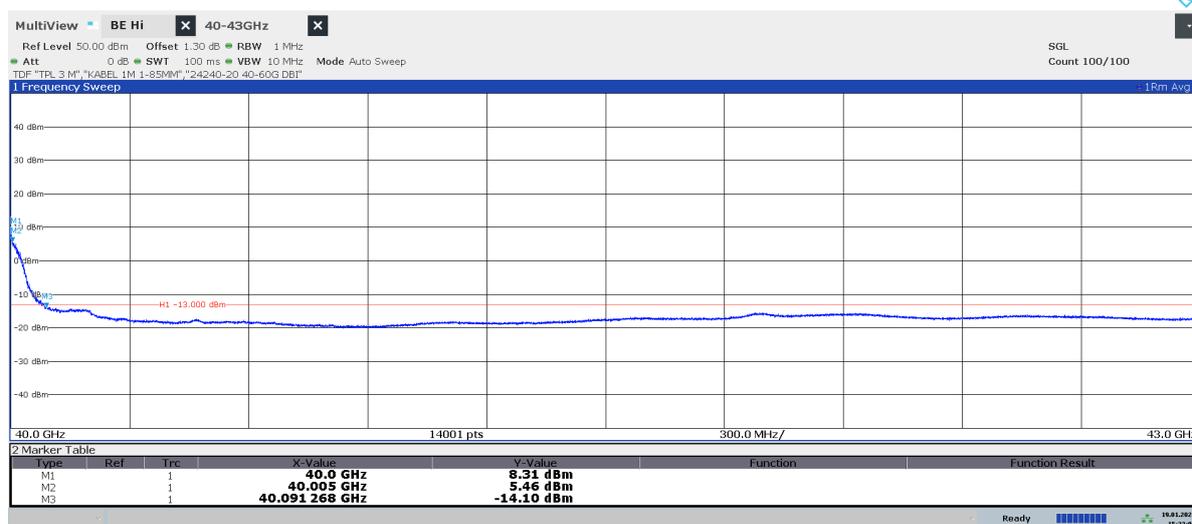
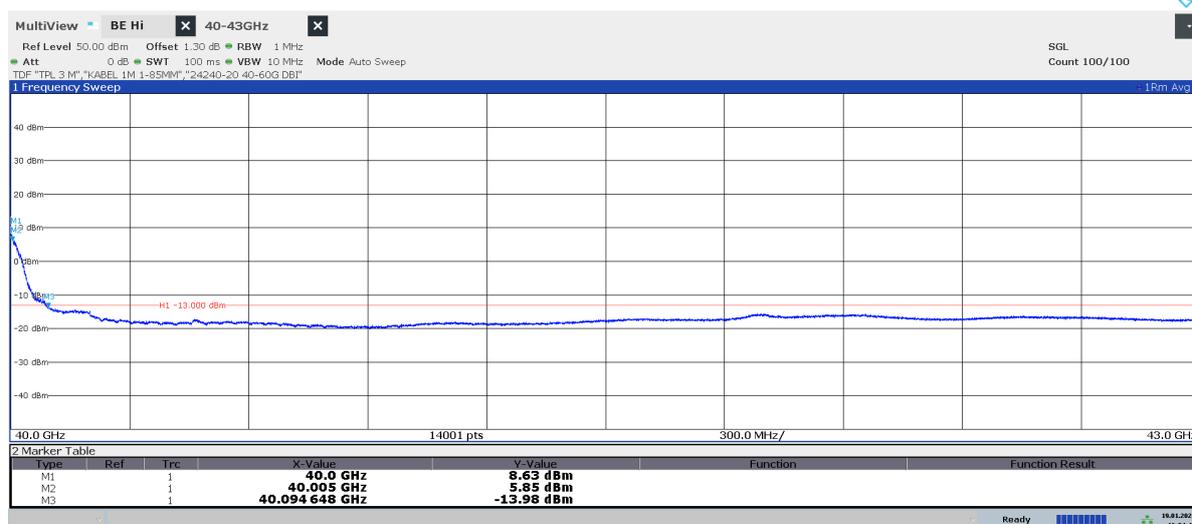


Diagram 2.16c: 40 – 43 GHz, QPSK, TH₅₀, EIRP Horizontal polarization



15:23:00 19.01.2021

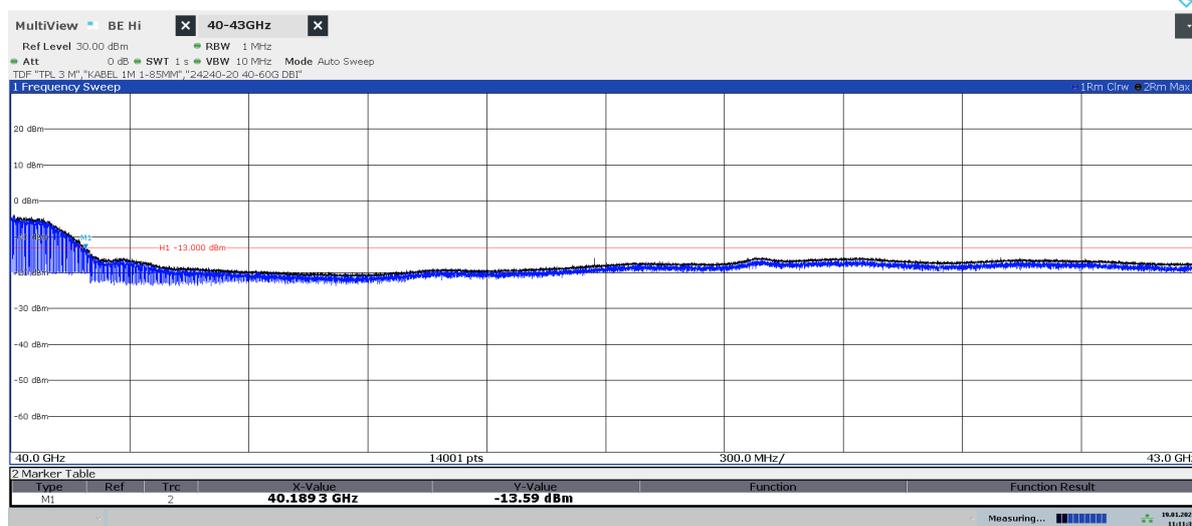
Diagram 2.16d: 40 – 43 GHz, QPSK, TH₅₀, EIRP Vertical polarization



16:04:46 19.01.2021

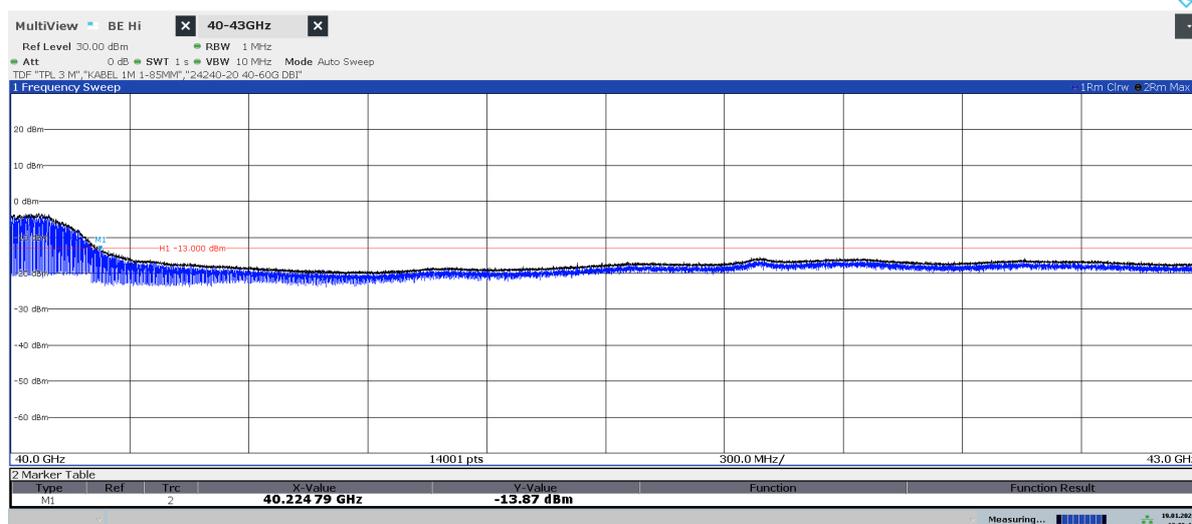
Power EIRP for 40.0 GHz Hor/ Ver [dBm]	Power EIRP for 40.005 GHz Hor/ Ver [dBm]	Antenna Gain Hor/ Ver [dBi]	Total conducted power/BW for 40.0 GHz (Limit -5 dBm) [dBm]/ Verdict	Total conducted power/BW for 40.005 GHz (Limit -13 dBm) [dBm]/ Verdict
8.31/ 8.63	5.46/ 5.85	29.01/ 29.00	-17.52/ Pass	-20.34/ Pass

Diagram 2.17a: 40 – 43 GHz, QPSK, TH8₁₀₀, EIRP Horizontal polarization



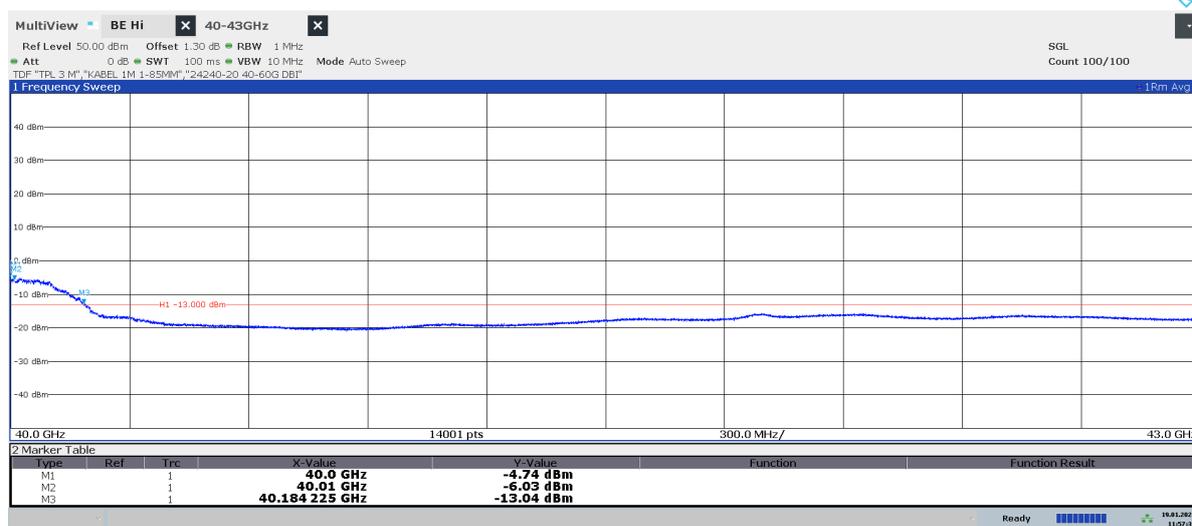
11:11:32 19.01.2021

Diagram 2.17b: 40 – 43 GHz, QPSK, TH8₁₀₀, EIRP Vertical polarization



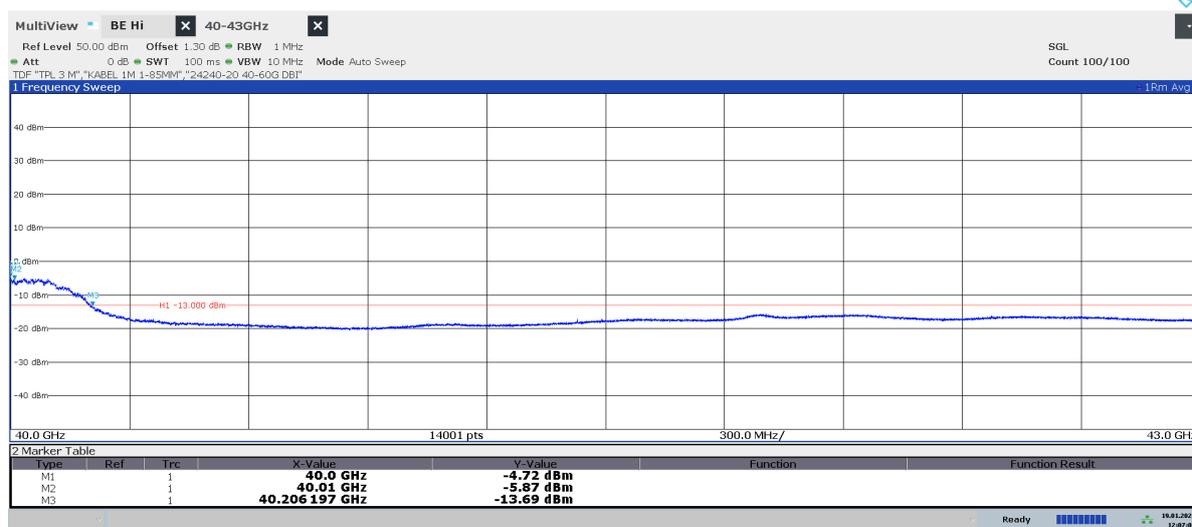
12:06:10 19.01.2021

Diagram 2.17c: 40 – 43 GHz, QPSK, TH8₁₀₀, EIRP Horizontal polarization



11:57:30 19.01.2021

Diagram 2.17d: 40 – 43 GHz, QPSK, TH8₁₀₀, EIRP Vertical polarization



12:07:04 19.01.2021

Power EIRP for 40.0 GHz Hor/ Ver [dBm]	Power EIRP for 40.01 GHz Hor/ Ver [dBm]	Antenna Gain Hor/ Ver [dBi]	Total conducted power/BW for 40.0 GHz (Limit -5 dBm) [dBm]/ Verdict	Total conducted power/BW for 40.01 GHz (Limit -13 dBm) [dBm]/ Verdict
-4.74/ -4.72	-6.03/ -5.87	26.40/ 26.52	-28.18/ Pass	-29.40/ Pass

Diagram 2.18a: 40 – 43 GHz, QPSK, Tim₅₀, EIRP Horizontal polarization
See diagram 2.18e for TRP result

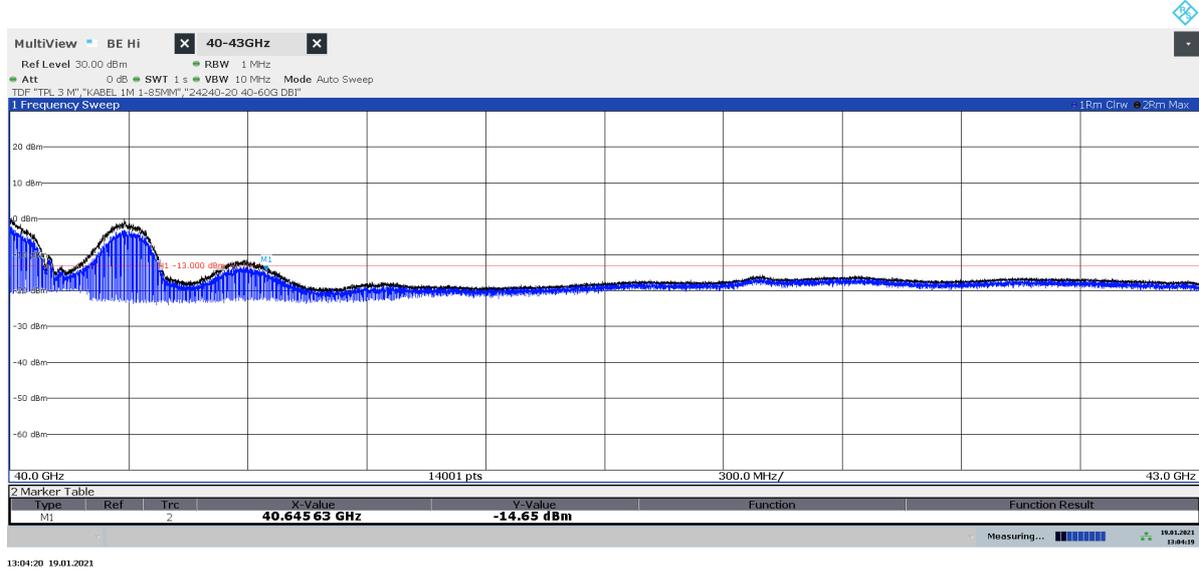


Diagram 2.18b: 40 – 43 GHz, QPSK, Tim₅₀, EIRP Vertical polarization
See diagram 2.18e for TRP result

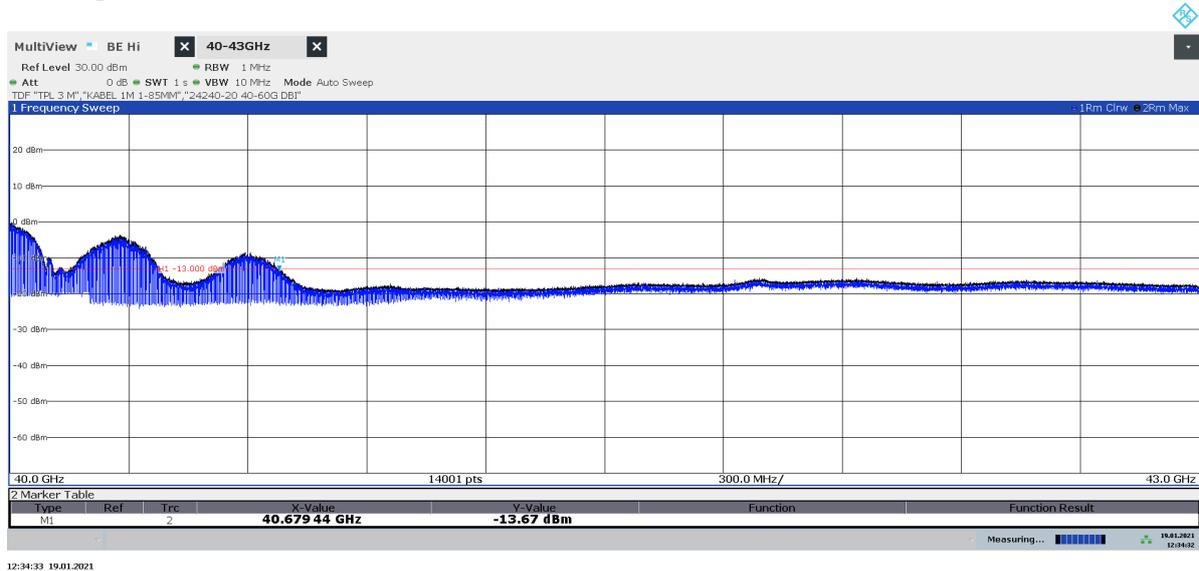
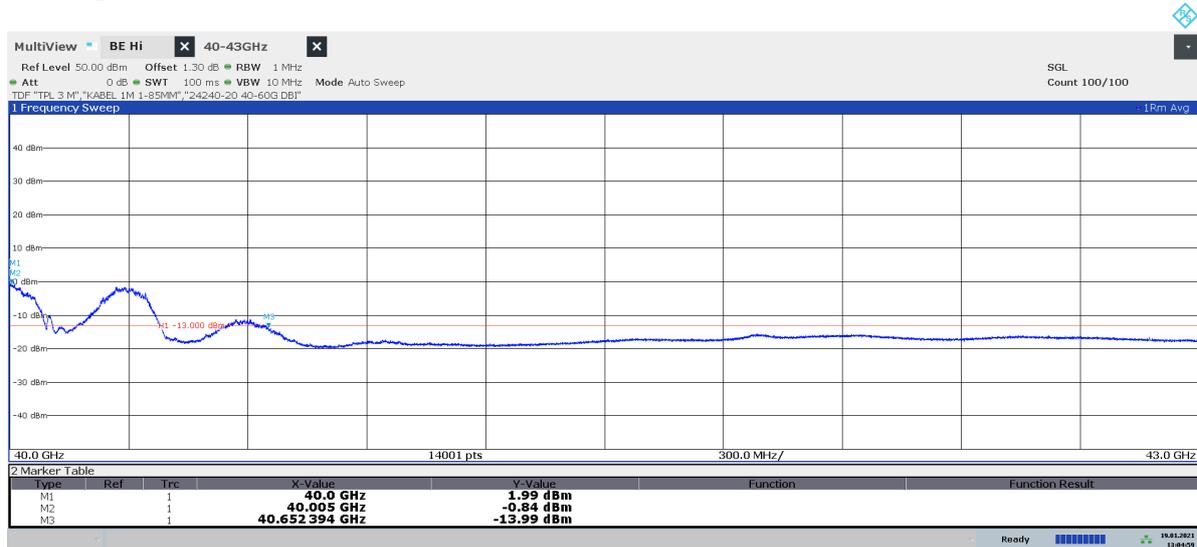
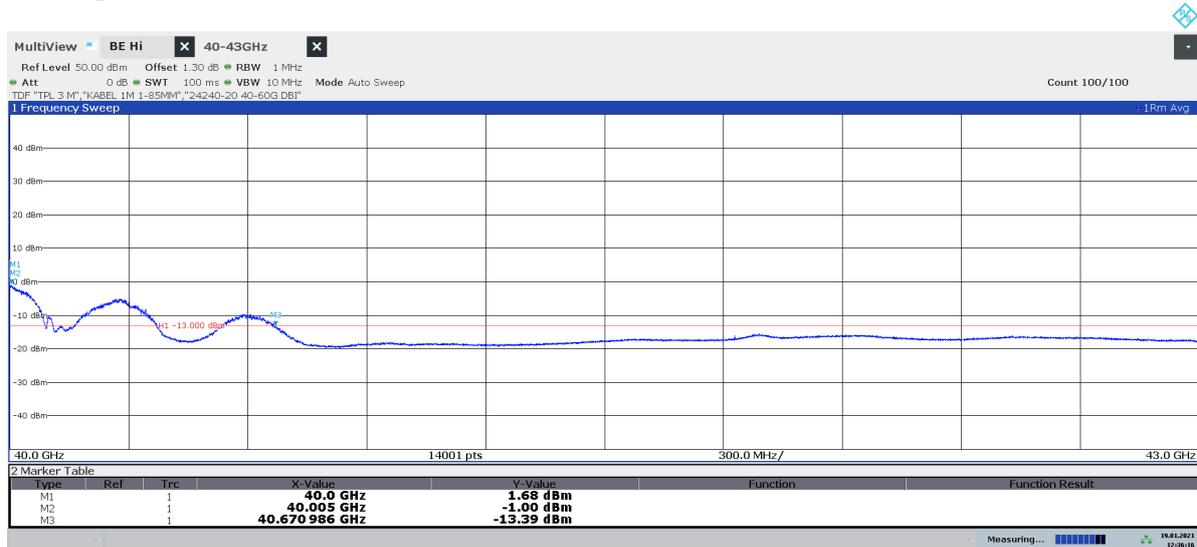


Diagram 2.18c: 40 – 43 GHz, QPSK, Tim₅₀, EIRP Horizontal polarization
See diagram 2.18e for TRP result



13:04:59 19.01.2021

Diagram 2.18d: 40 – 43 GHz, QPSK, Tim₅₀, EIRP Vertical polarization
See diagram 2.18e for TRP result



12:36:16 19.01.2021

Power EIRP for 40.0 GHz Hor/ Ver [dBm]	Power EIRP for 40.005 GHz Hor/ Ver [dBm]	Antenna Gain Hor/ Ver [dBi]	Total conducted power/BW for 40.0 GHz (Limit -5 dBm) [dBm]/ Verdict	Total conducted power/BW for 40.005 GHz (Limit -13 dBm) [dBm]/ Verdict
1.99/ 1.68	-0.84/ -1.00	29.01/ 29.00	-24.16/ Pass	-26.91/ Pass

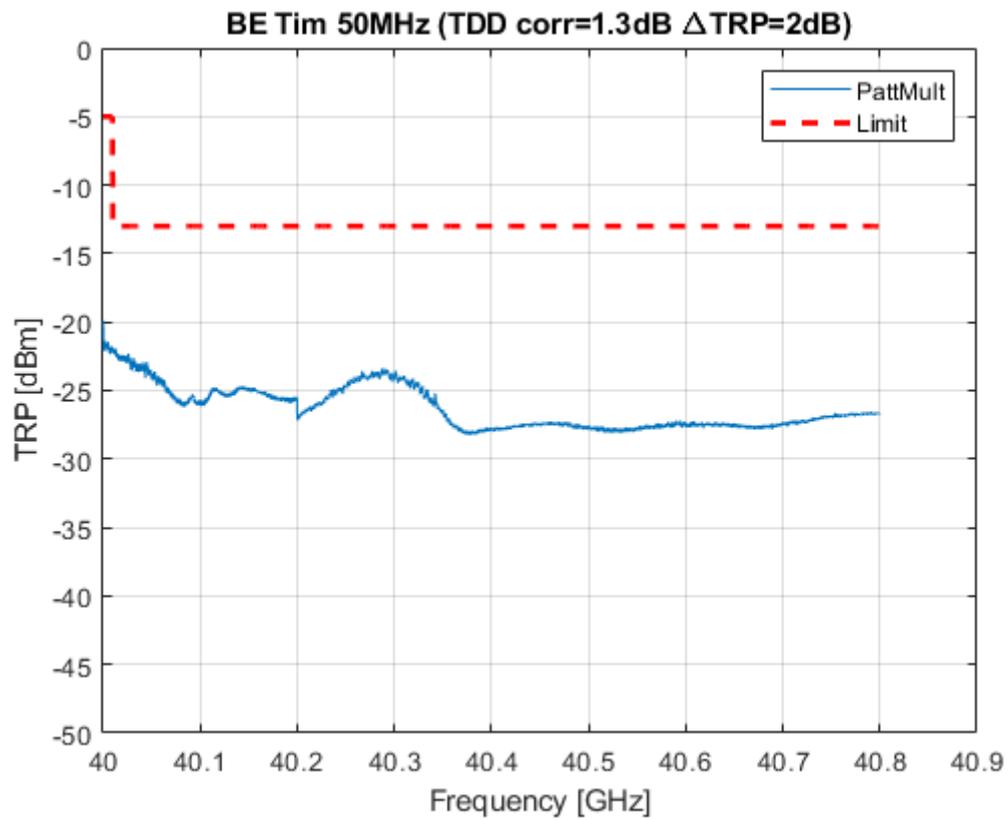
Diagram 2.18e: 40 – 40.4 GHz, QPSK, Tim₅₀, Two cut TRP

Diagram 2.19a: 40 – 43 GHz, QPSK, BL₅₀, EIRP Horizontal polarization
See diagram 2.19c for TRP result

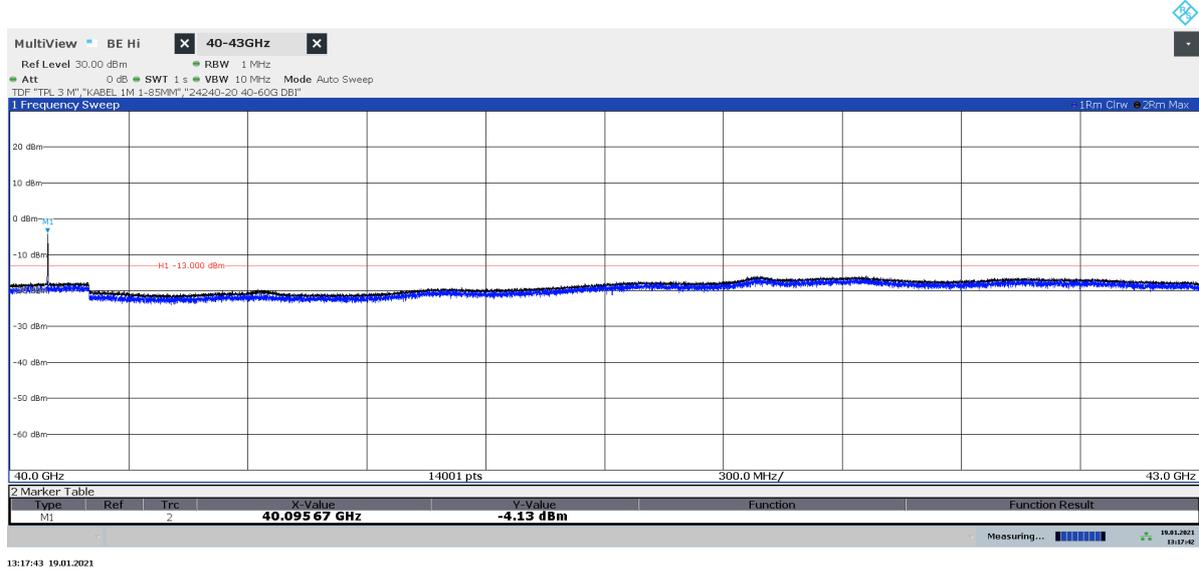


Diagram 2.19b: 40 – 43 GHz, QPSK, BL₅₀, EIRP Vertical polarization
See diagram 2.19c for TRP result

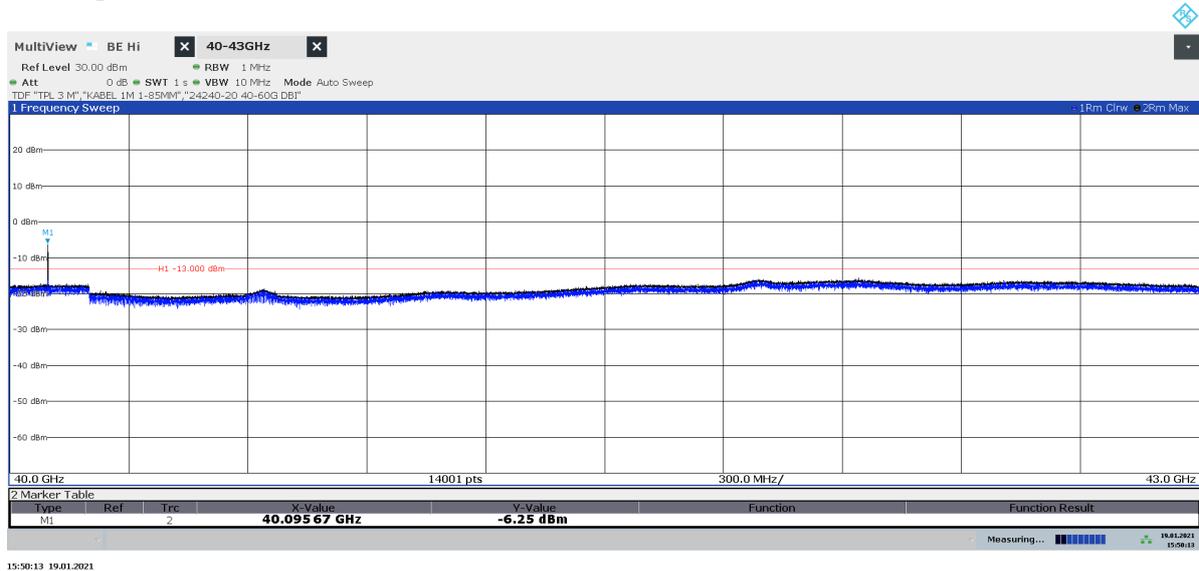


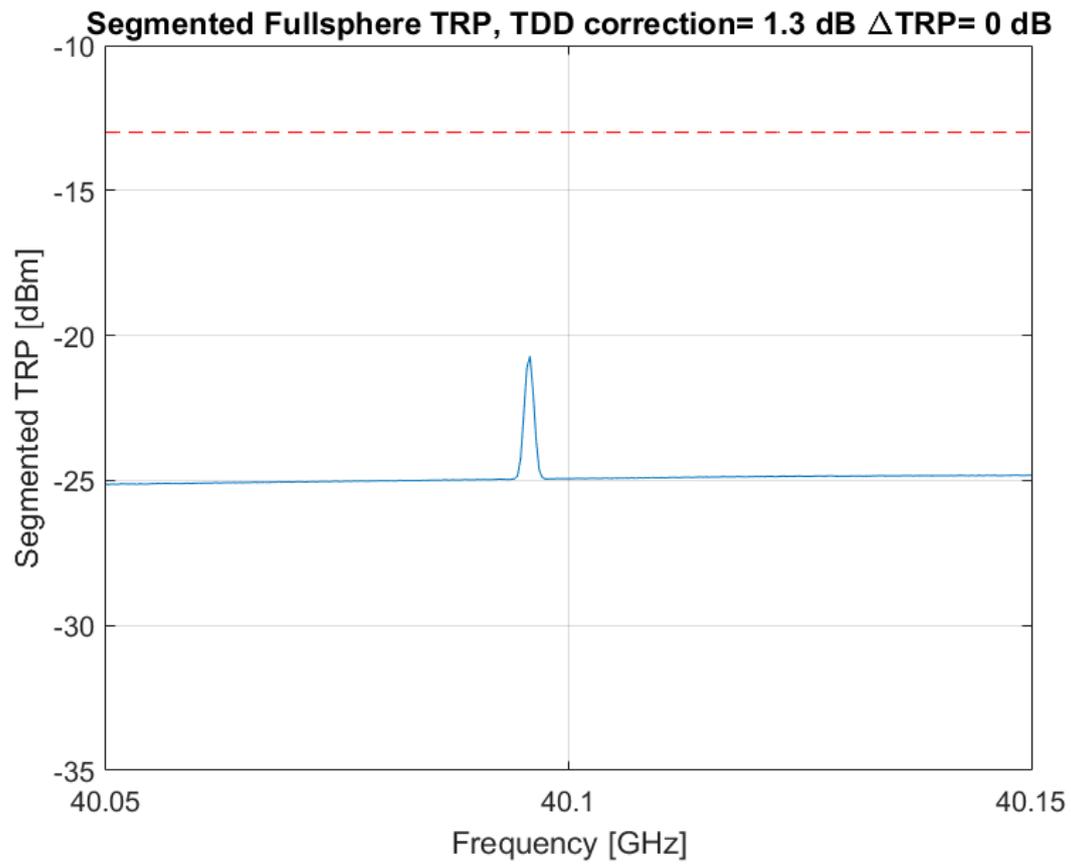
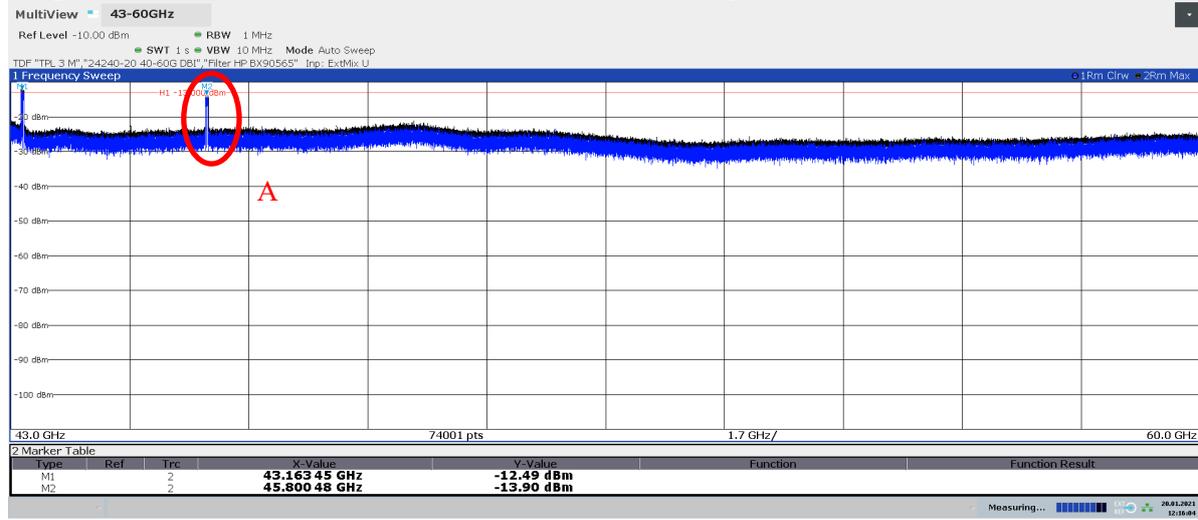
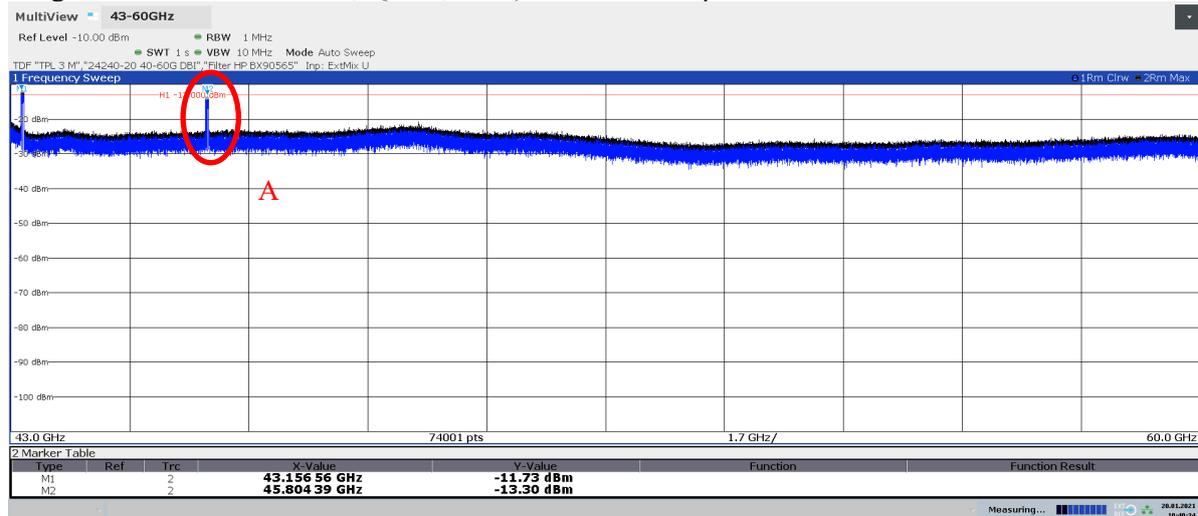
Diagram 2.19c: 40.05 – 40.15 GHz, QPSK, BL₅₀, Spherical grid Method TRP

Diagram 2.20a: 43 – 60 GHz, QPSK, BL₅₀, EIRP Horizontal polarization



12:16:04 20.01.2021

Diagram 2.20b: 43 – 60 GHz, QPSK, BL₅₀, EIRP Vertical polarization



10:40:35 20.01.2021

“False signals” originating from unwanted mixer products between LO signal generated by the spectrum analyzer and the strong out of measurement band RF-signal (EUT carrier frequencies) are marked with red circles. The frequency of the “false signals” can be calculated and are show in the table below.

Plot label	Mixing indicies			
	F EUT [GHz]	n [-]	m [-]	"False F" [GHz]
A	37.025	4	1	45.8

Diagram 2.20c: 43.1 – 43.25 GHz, QPSK, BL₅₀, Two cut TRP

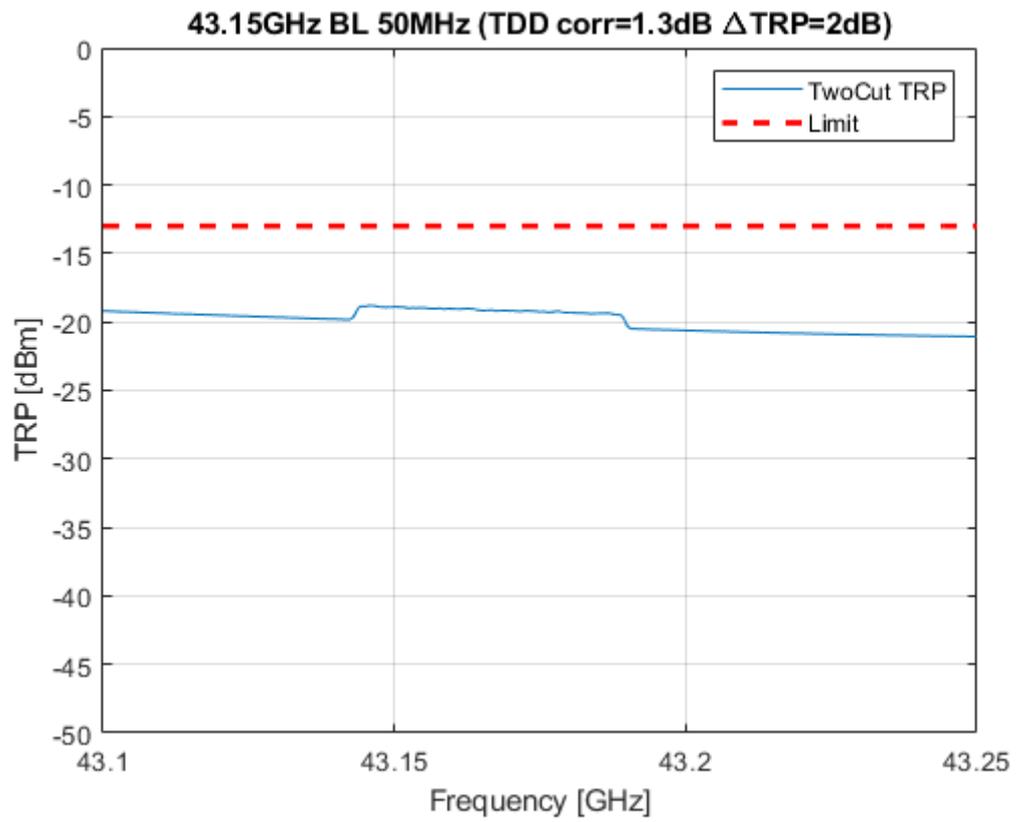
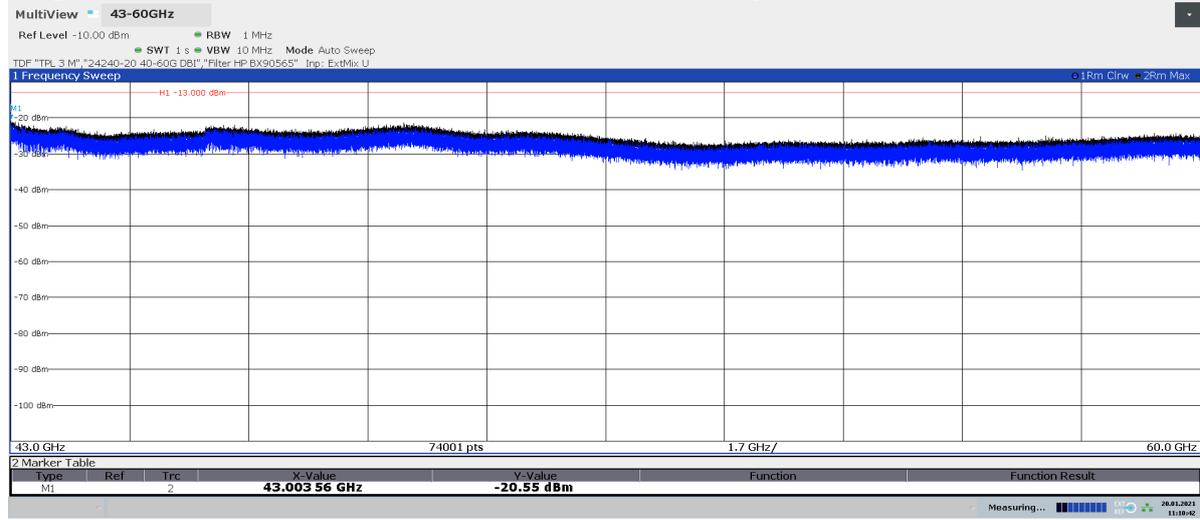
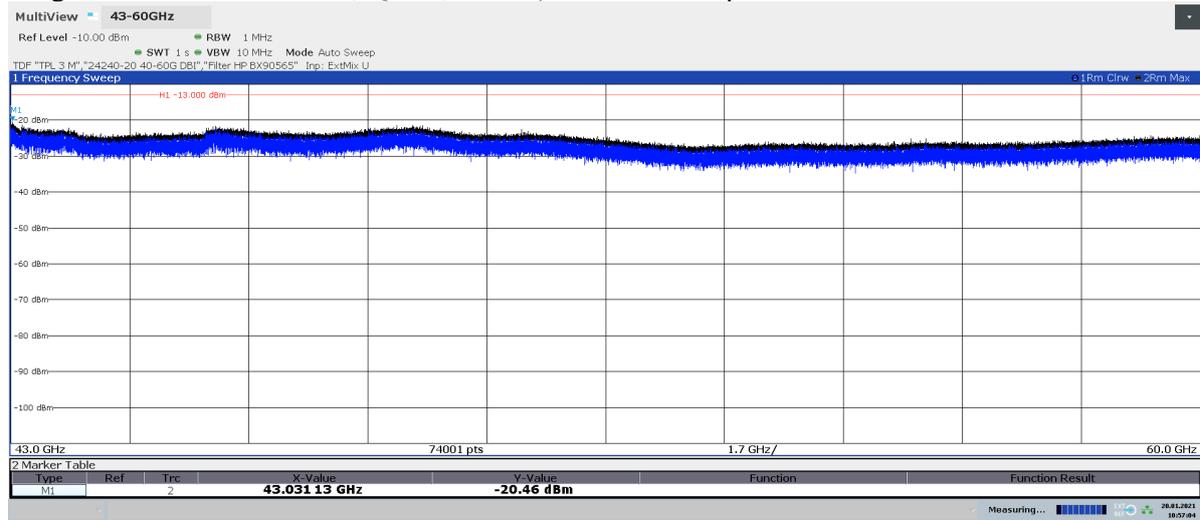


Diagram 2.21a: 43 – 60 GHz, QPSK, BL8₁₀₀, EIRP Horizontal polarization



11:18:42 20.01.2021

Diagram 2.21b: 43 – 60 GHz, QPSK, BL8₁₀₀, EIRP Vertical polarization



10:57:04 20.01.2021

Diagram 2.22a: 60 – 75 GHz, QPSK, TL₁₀₀, EIRP Horizontal polarization

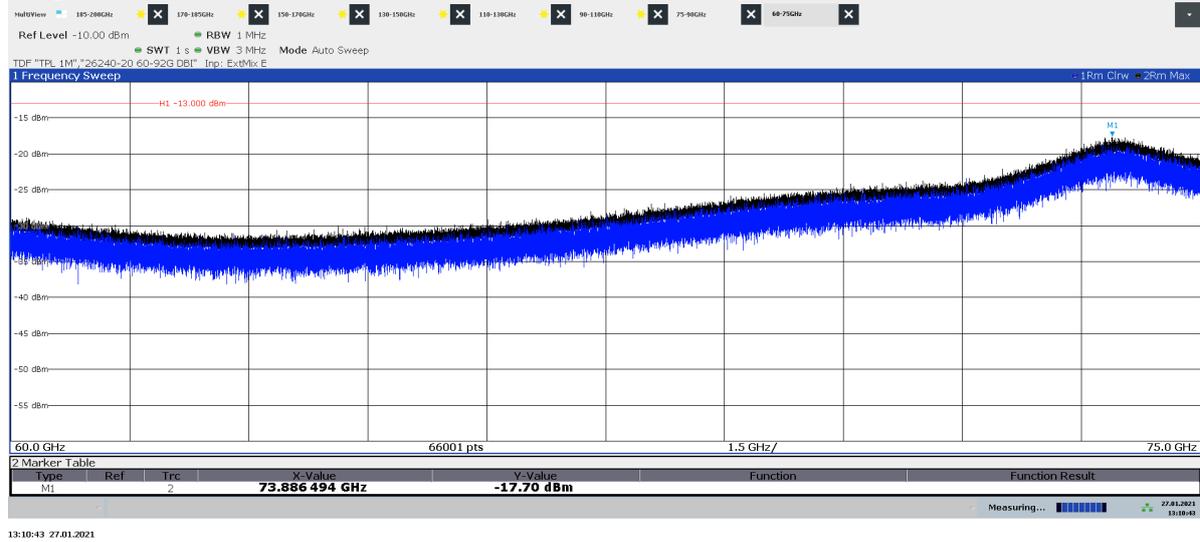


Diagram 2.22b: 60 – 75 GHz, QPSK, TL₁₀₀, EIRP Vertical polarization

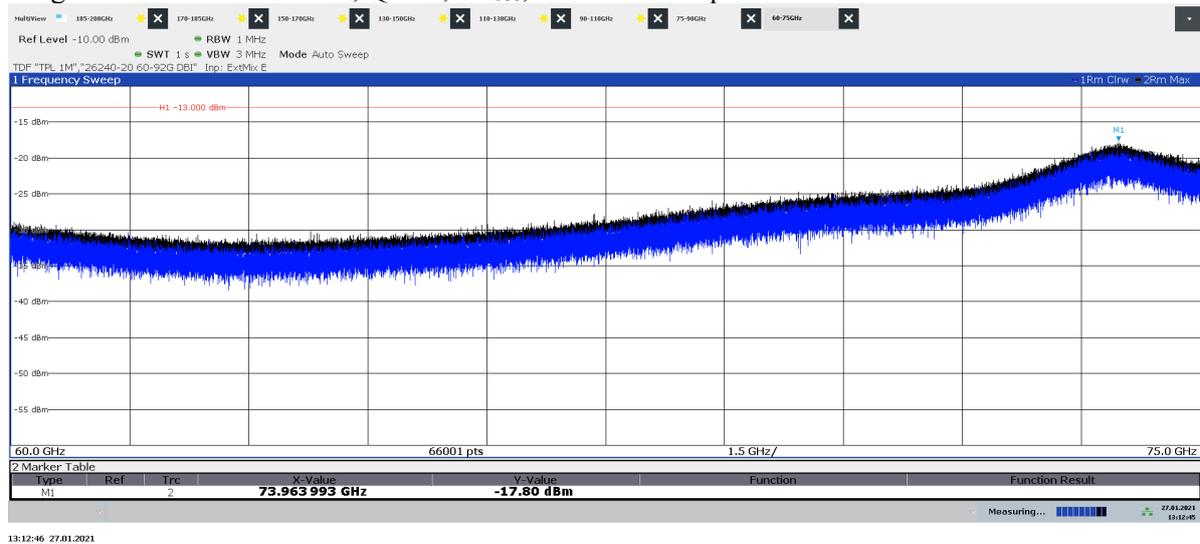


Diagram 2.23a: 60 – 75 GHz, QPSK, BL8₁₀₀, EIRP Horizontal polarization

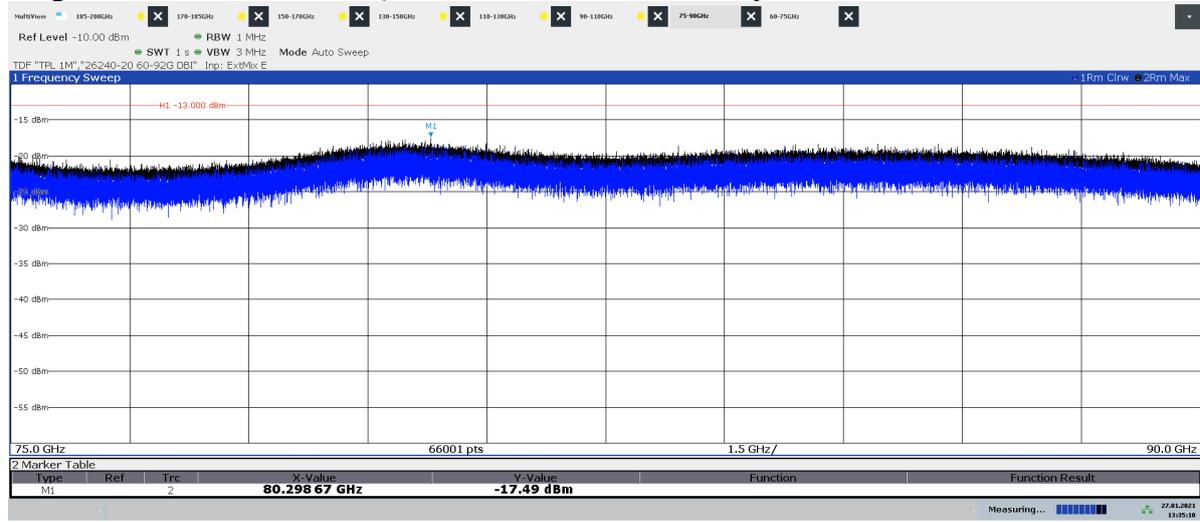


Diagram 2.23b: 60 – 75 GHz, QPSK, BL8₁₀₀, EIRP Vertical polarization

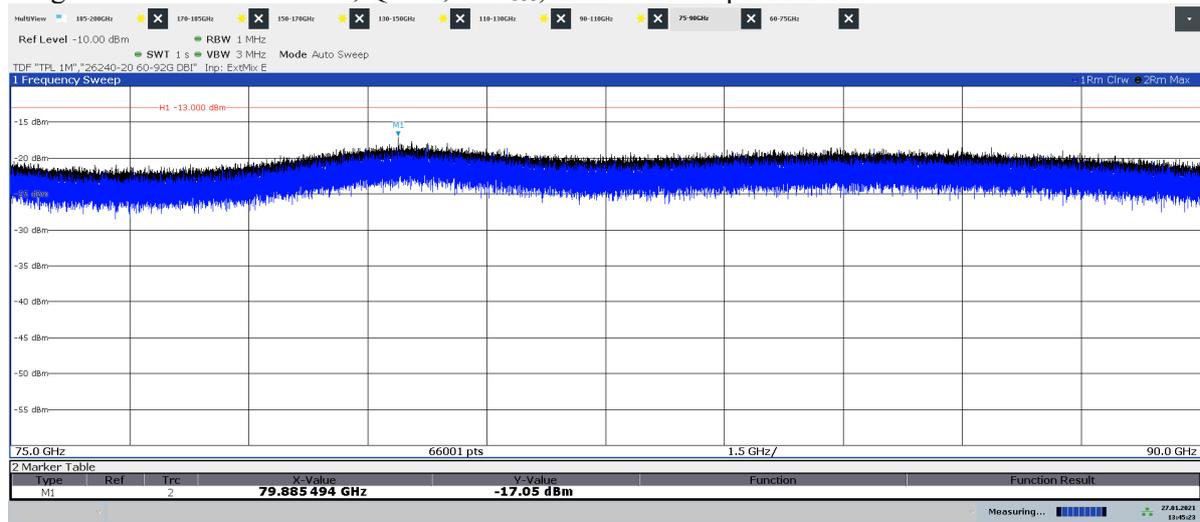
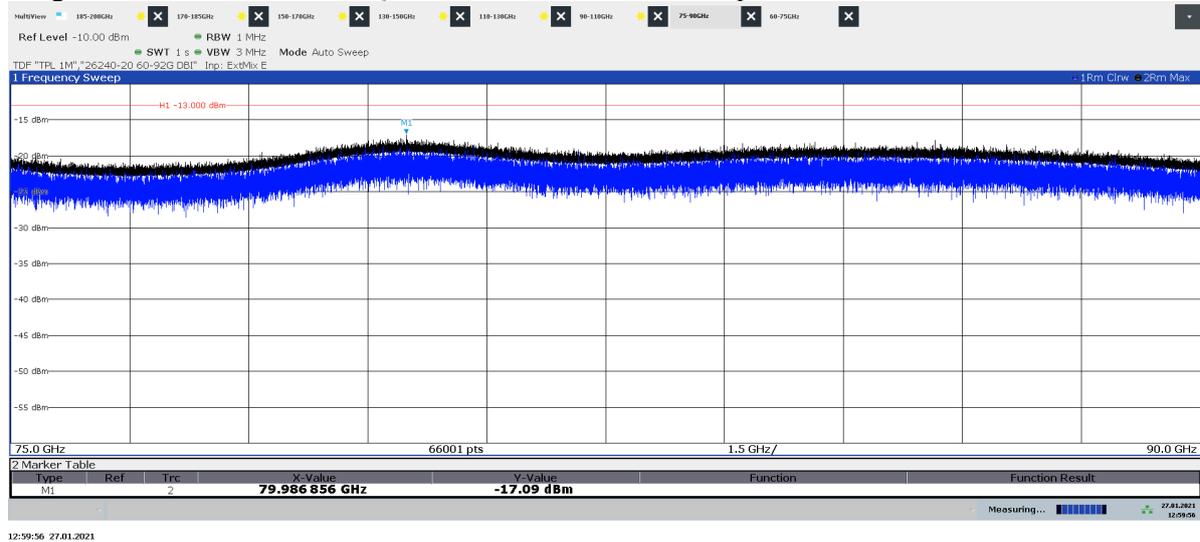
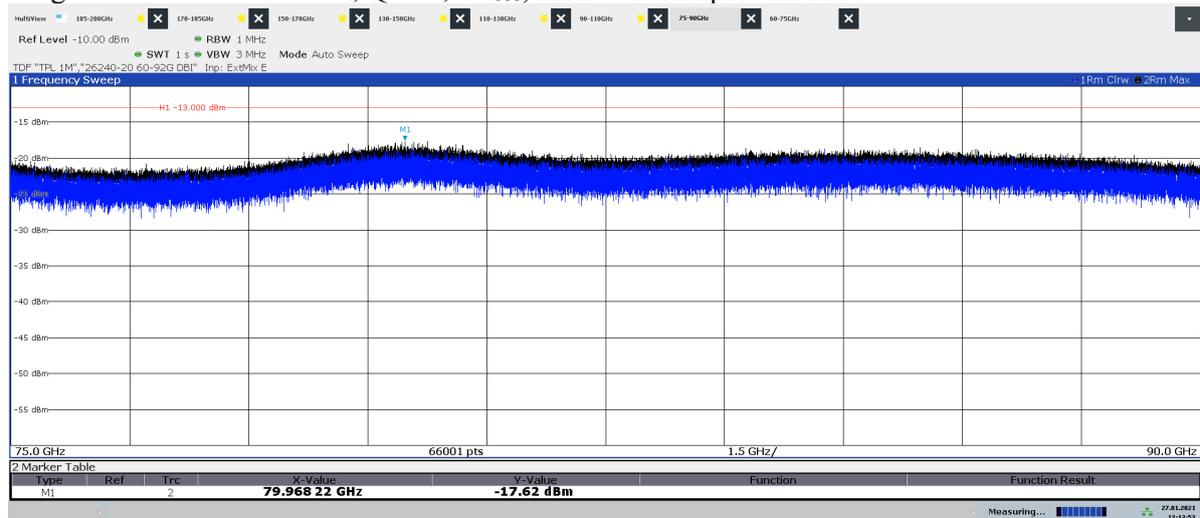


Diagram 2.24a: 75 – 90 GHz, QPSK, TL₁₀₀, EIRP Horizontal polarization



12:59:56 27.01.2021

Diagram 2.24b: 75 – 90 GHz, QPSK, TL₁₀₀, EIRP Vertical polarization



13:13:53 27.01.2021

Diagram 2.25a: 75 – 90 GHz, QPSK, BL8₁₀₀, EIRP Horizontal polarization

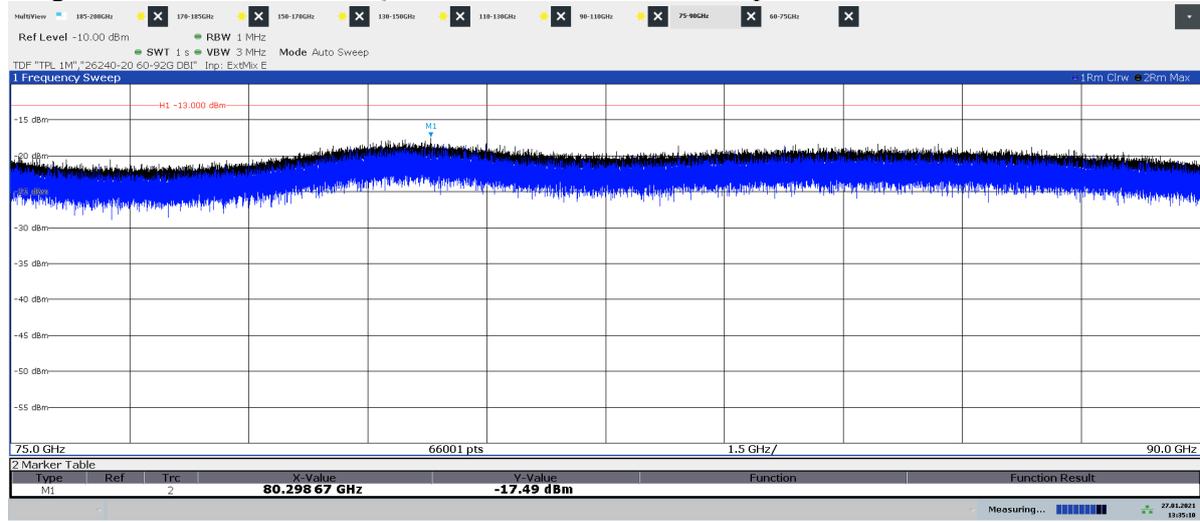


Diagram 2.25b: 75 – 90 GHz, QPSK, BL8₁₀₀, EIRP Vertical polarization

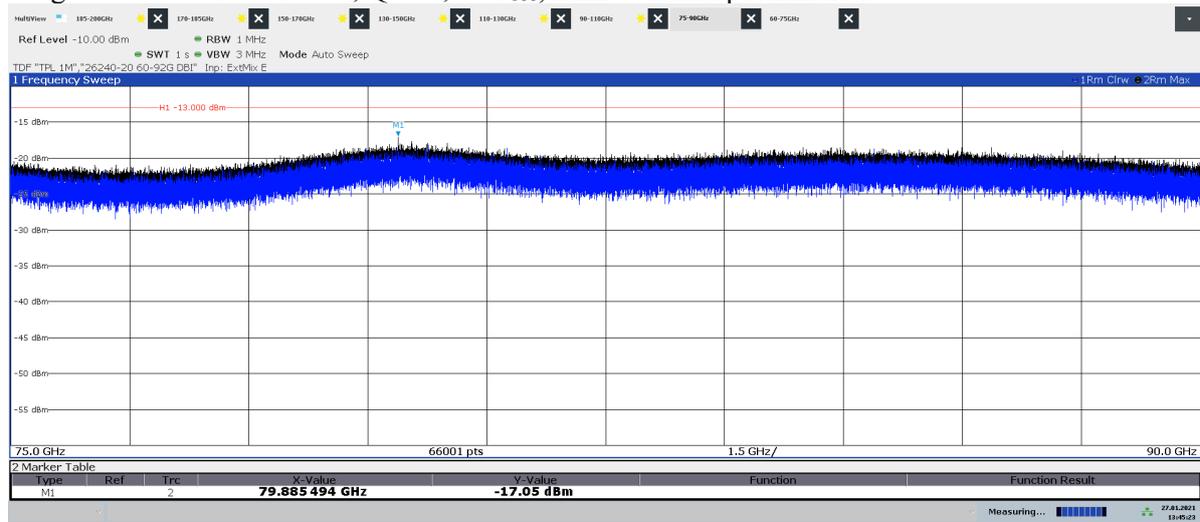


Diagram 2.26a: 90 – 110 GHz, QPSK, TL₁₀₀, EIRP Horizontal polarization

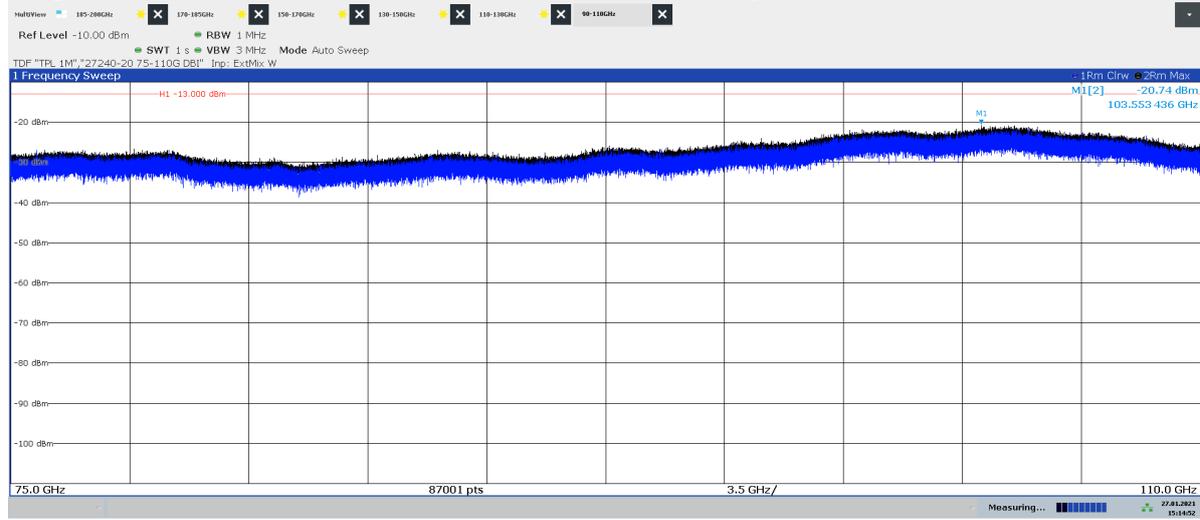


Diagram 2.26b: 90 – 110 GHz, QPSK, TL₁₀₀, EIRP Vertical polarization

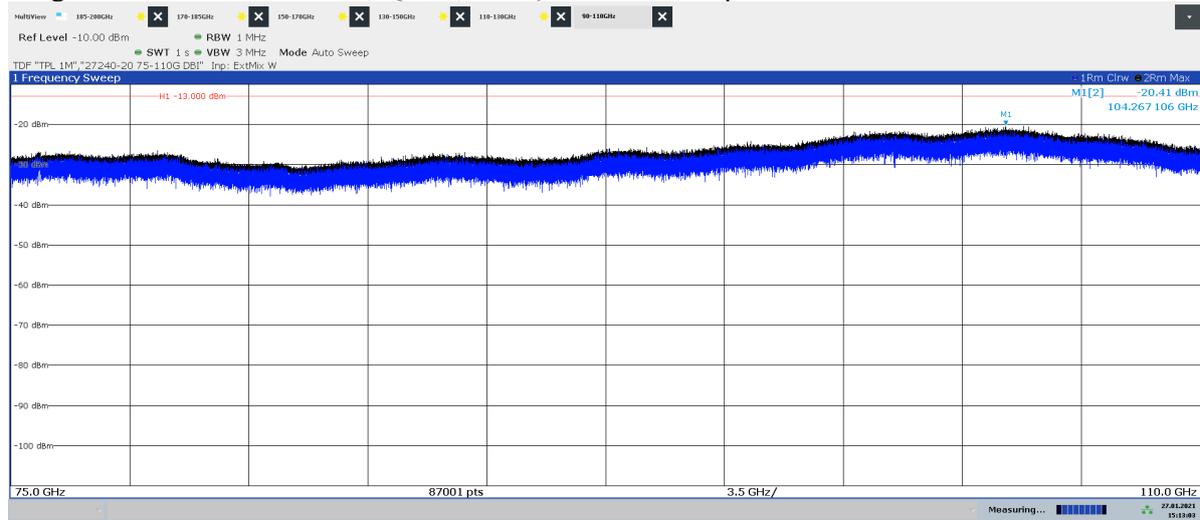
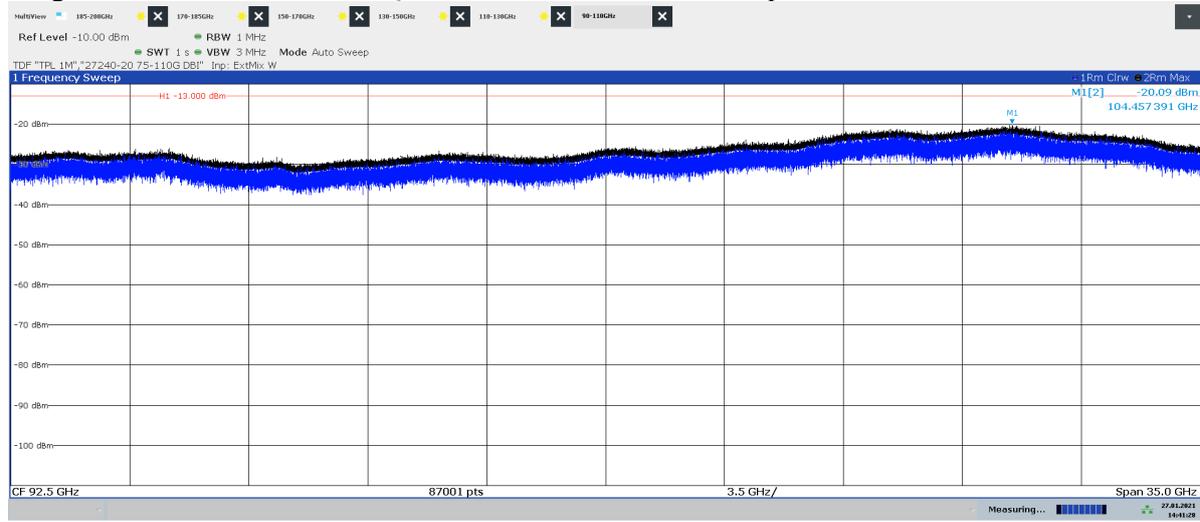
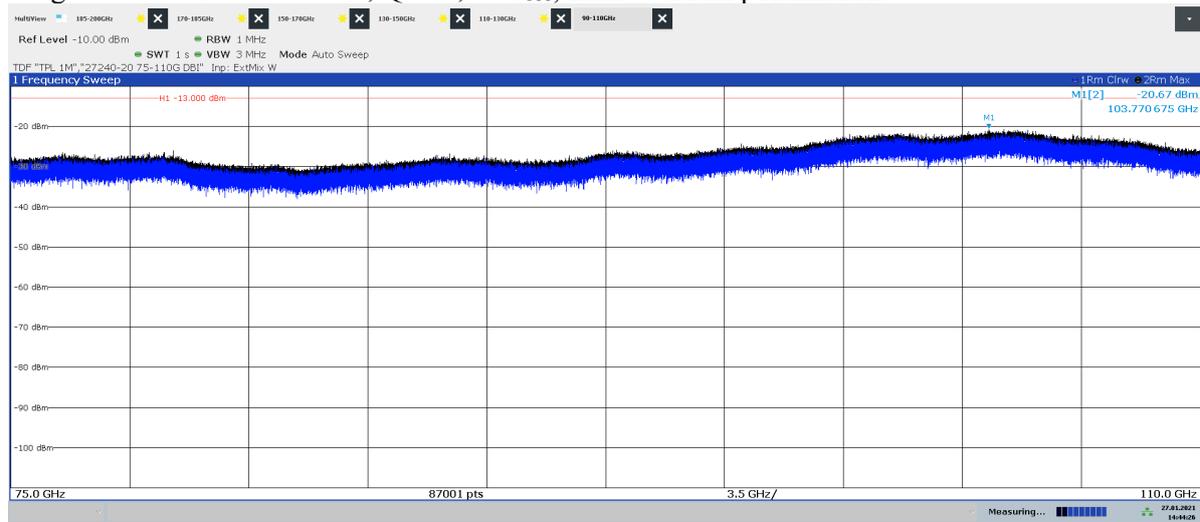


Diagram 2.27a: 90 – 110 GHz, QPSK, BL₈₁₀₀, EIRP Horizontal polarization



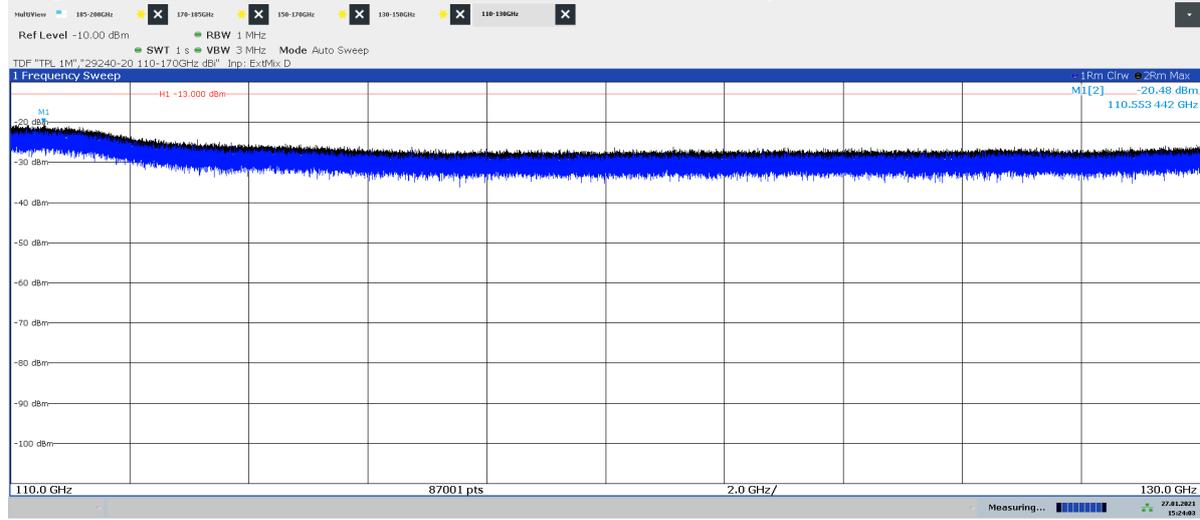
14:41:29 27.01.2021

Diagram 2.27b: 90 – 110 GHz, QPSK, BL₈₁₀₀, EIRP Vertical polarization



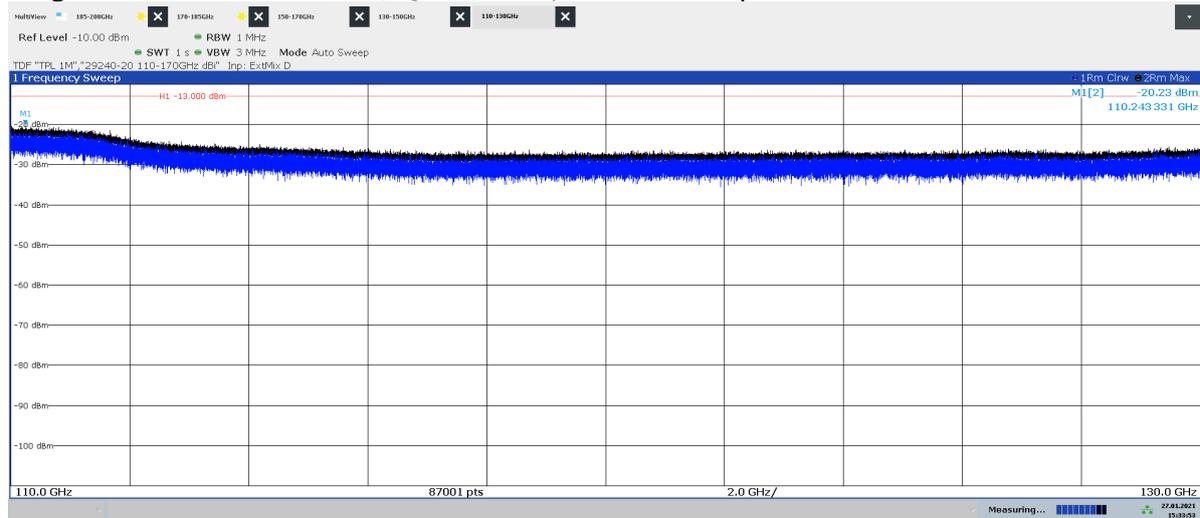
14:44:27 27.01.2021

Diagram 2.28a: 110 – 130 GHz, QPSK, TL₁₀₀, EIRP Horizontal polarization



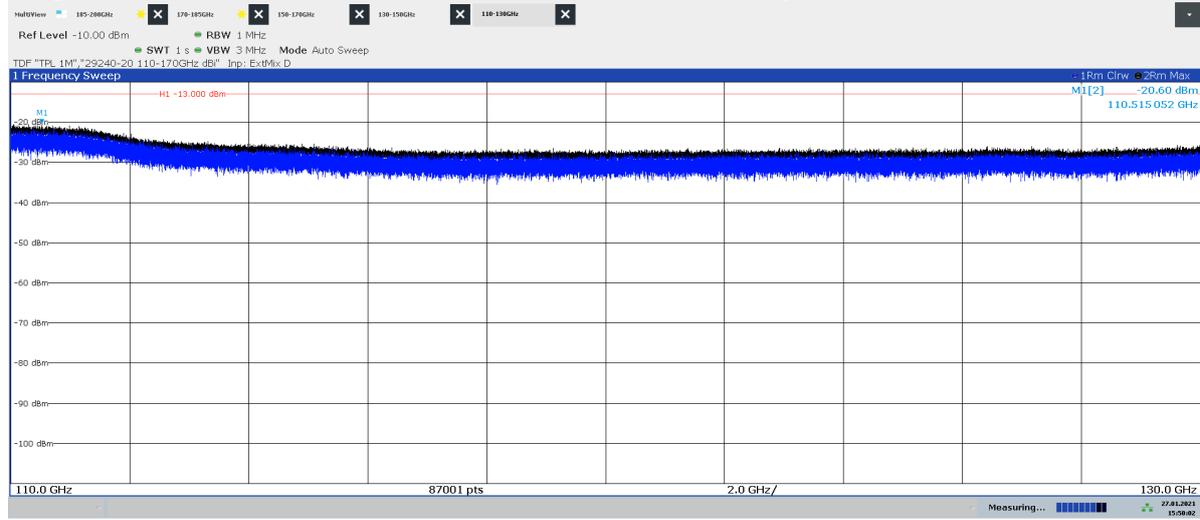
15:24:04 27.01.2021

Diagram 2.28b: 110 – 130 GHz, QPSK, TL₁₀₀, EIRP Vertical polarization



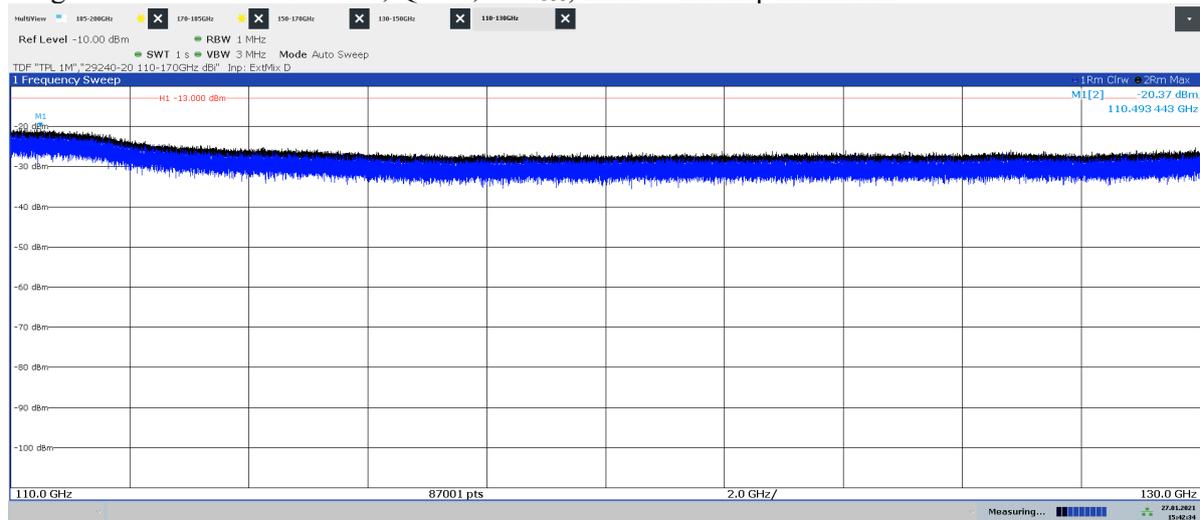
15:33:54 27.01.2021

Diagram 2.29a: 110 – 130 GHz, QPSK, BL8₁₀₀, EIRP Horizontal polarization



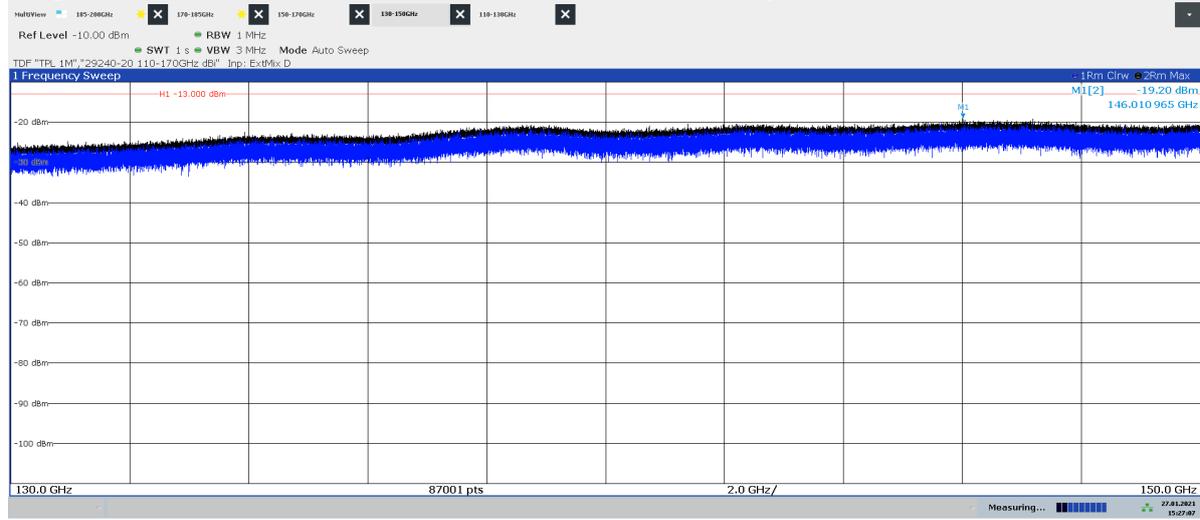
15:50:02 27.01.2021

Diagram 2.29b: 110 – 130 GHz, QPSK, BL8₁₀₀, EIRP Vertical polarization



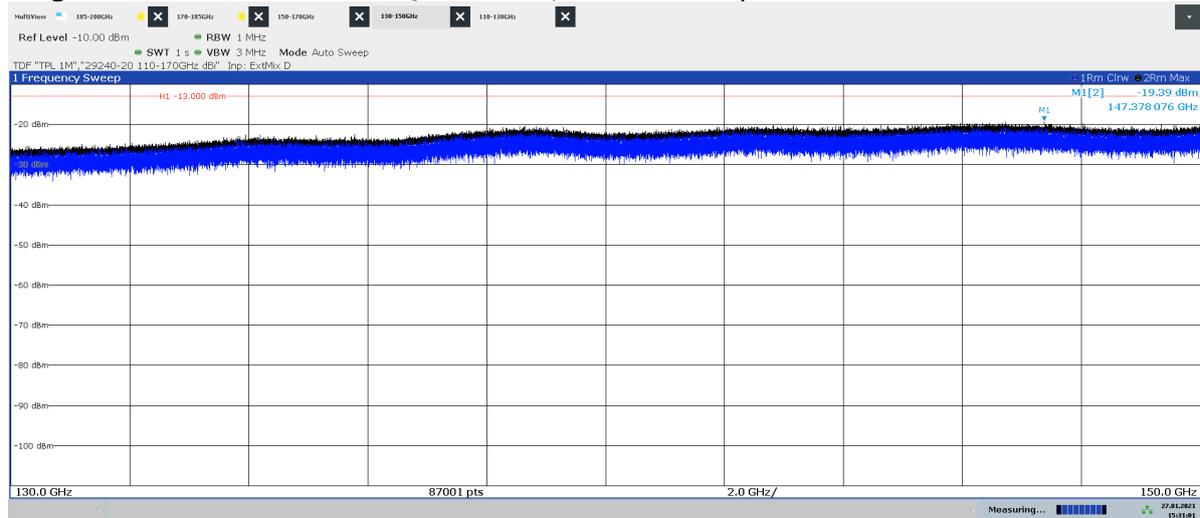
15:42:35 27.01.2021

Diagram 2.30a: 130 – 150 GHz, QPSK, TL₁₀₀, EIRP Horizontal polarization



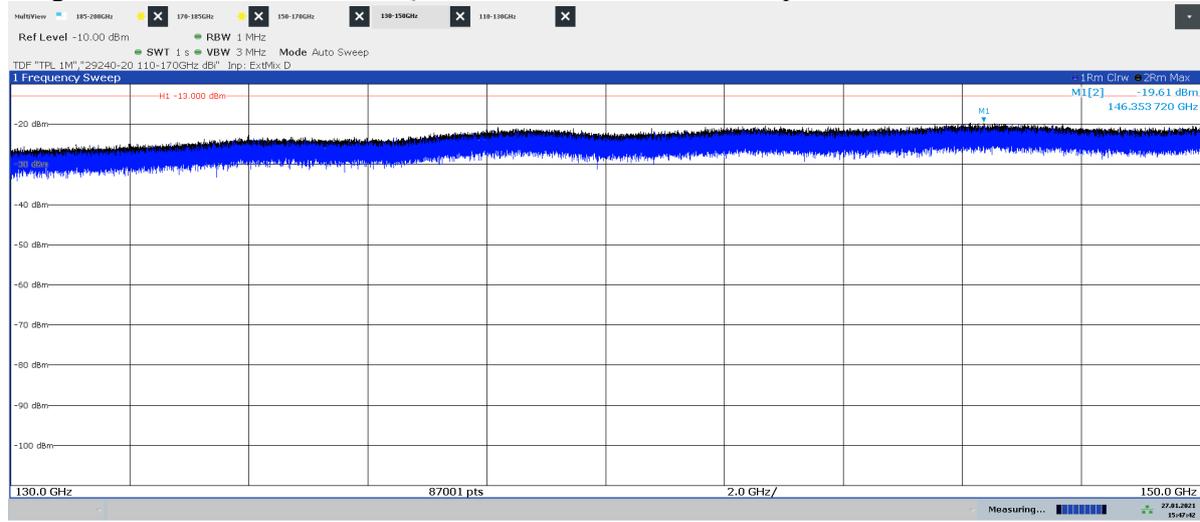
15:27:07 27.01.2021

Diagram 2.30b: 130 – 150 GHz, QPSK, TL₁₀₀, EIRP Vertical polarization



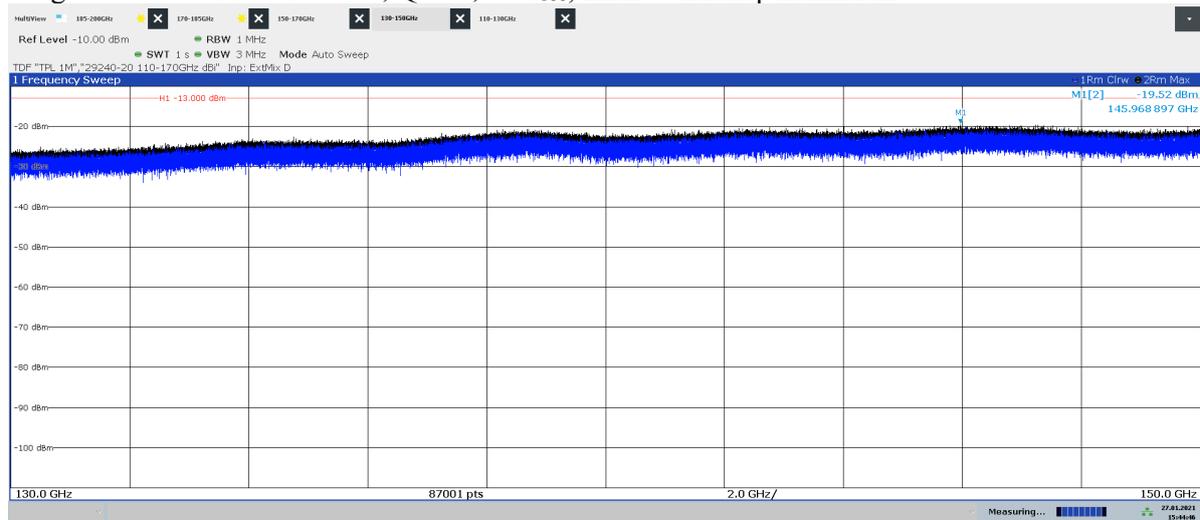
15:31:02 27.01.2021

Diagram 2.31a: 130 – 150 GHz, QPSK, BL8₁₀₀, EIRP Horizontal polarization



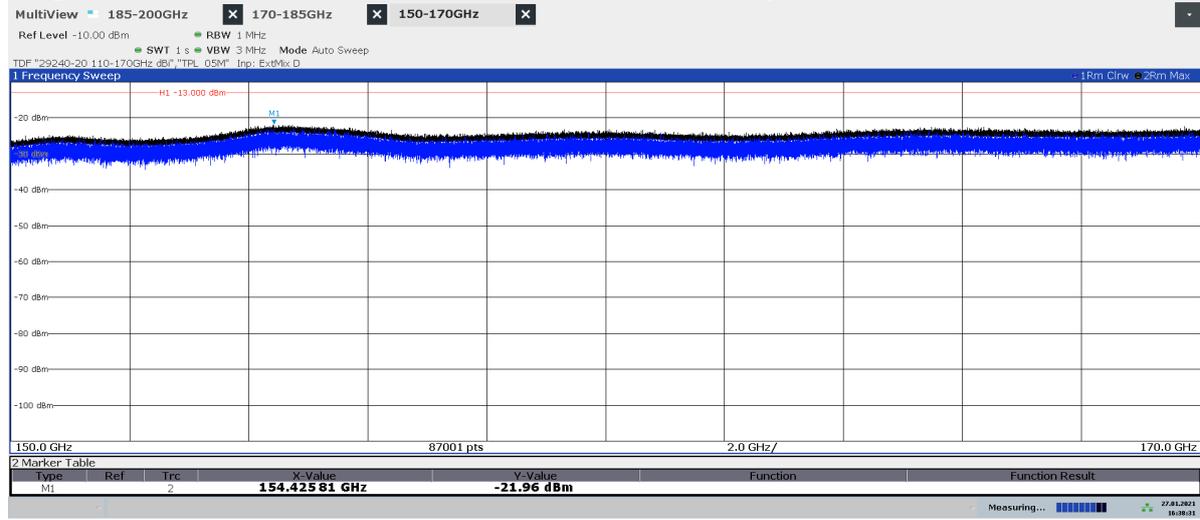
15:47:42 27.01.2021

Diagram 2.31b: 130 – 150 GHz, QPSK, BL8₁₀₀, EIRP Vertical polarization



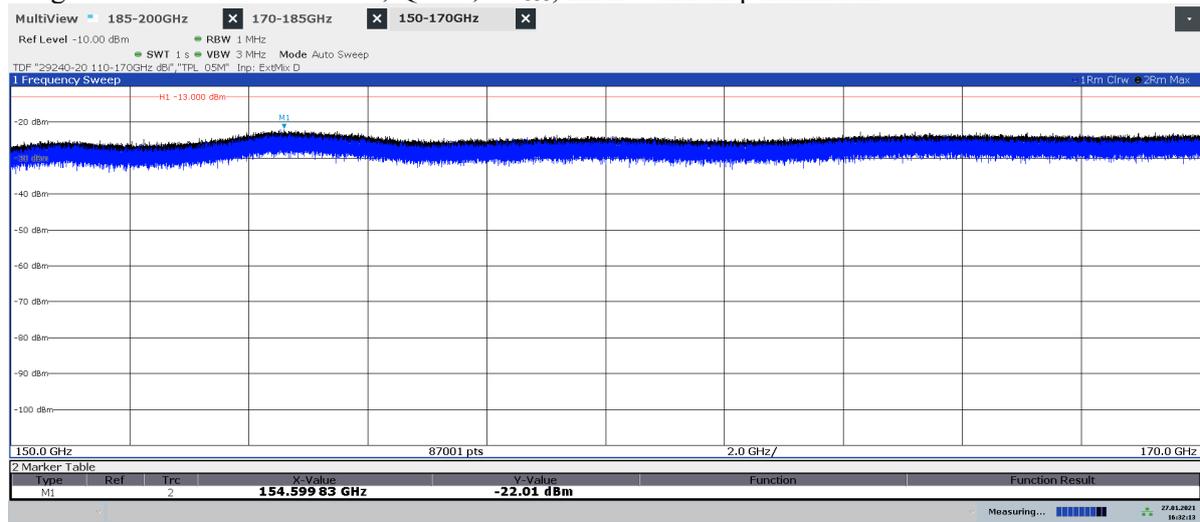
15:44:47 27.01.2021

Diagram 2.32a: 150 – 170 GHz, QPSK, TL₁₀₀, EIRP Horizontal polarization



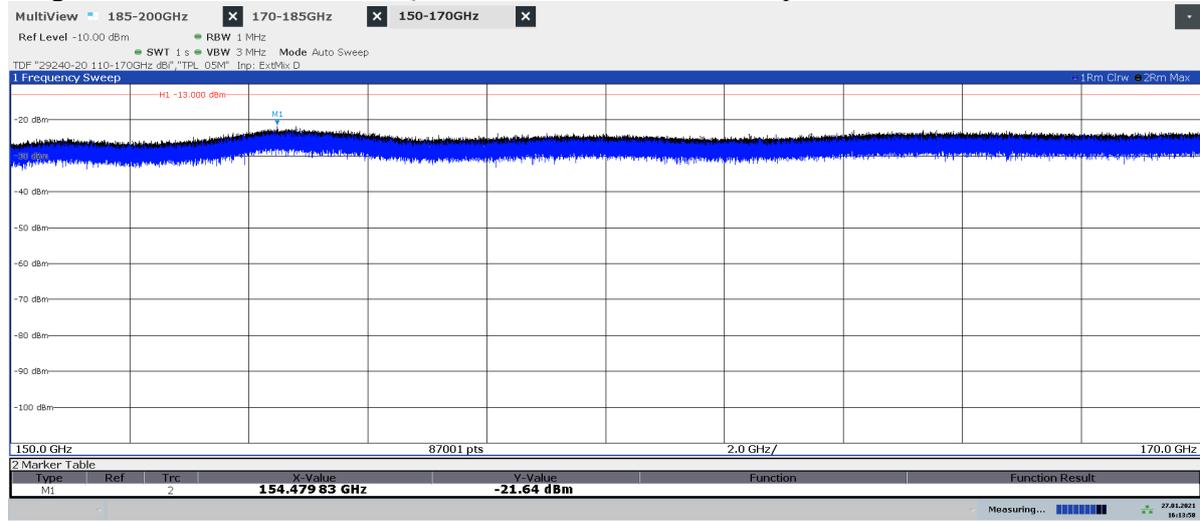
16:38:31 27.01.2021

Diagram 2.32b: 150 – 170 GHz, QPSK, TL₁₀₀, EIRP Vertical polarization



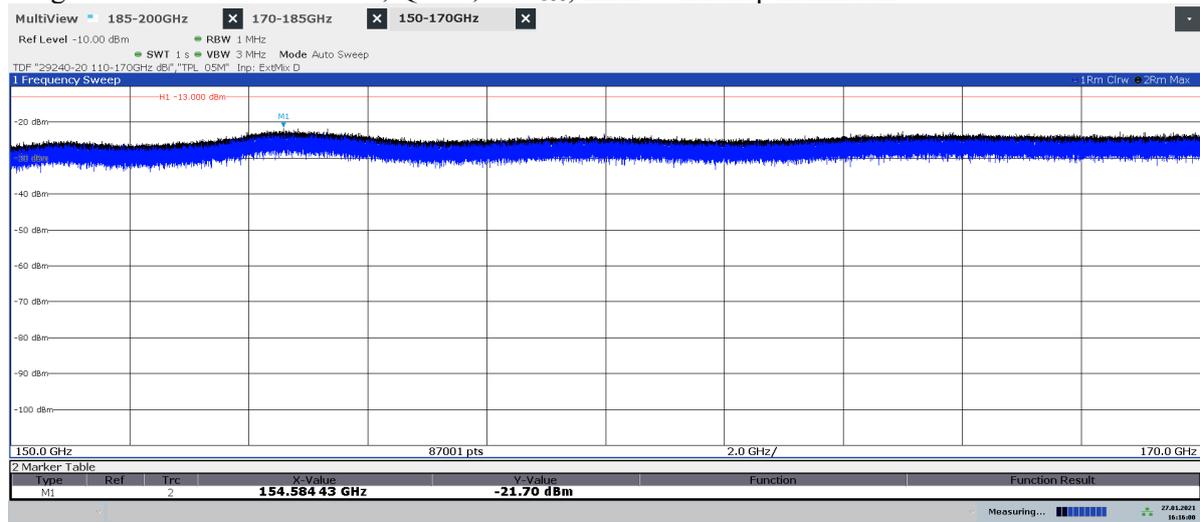
16:32:13 27.01.2021

Diagram 2.33a: 150 – 170 GHz, QPSK, BL8₁₀₀, EIRP Horizontal polarization



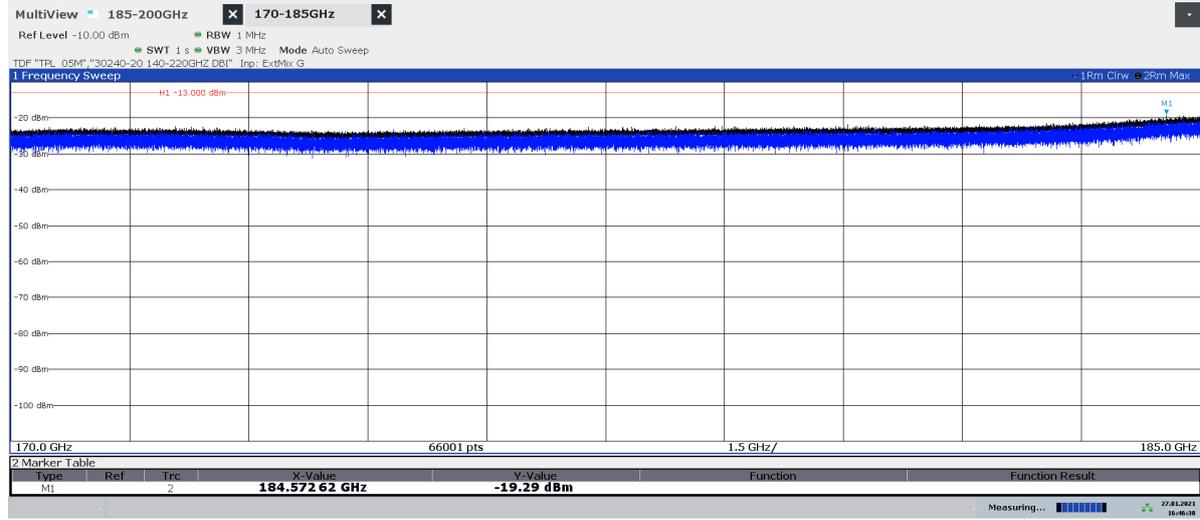
16:13:58 27.01.2021

Diagram 2.33b: 150 – 170 GHz, QPSK, BL8₁₀₀, EIRP Vertical polarization



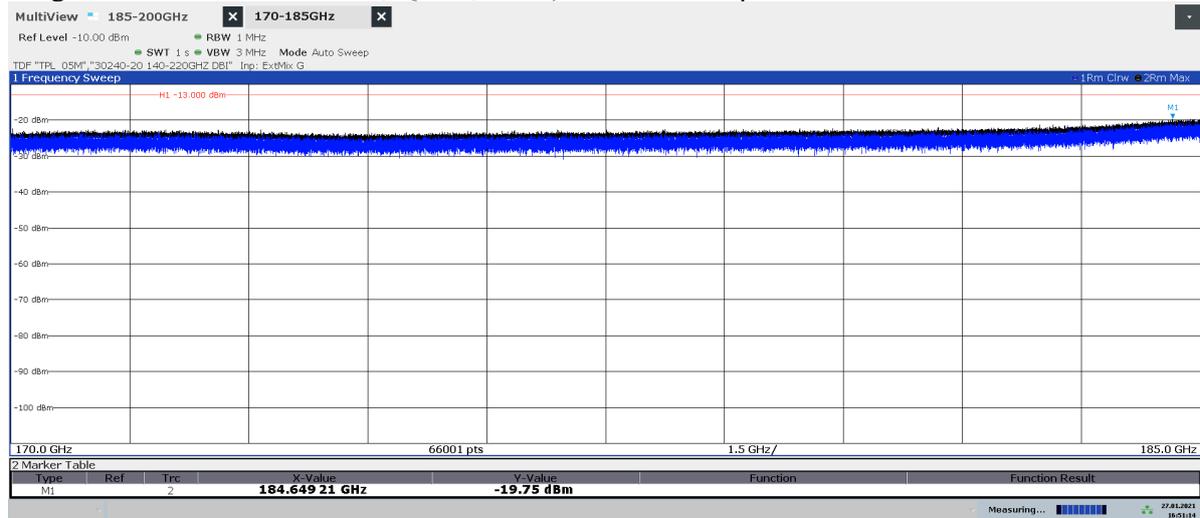
16:16:00 27.01.2021

Diagram 2.34a: 170 – 185 GHz, QPSK, TL₁₀₀, EIRP Horizontal polarization



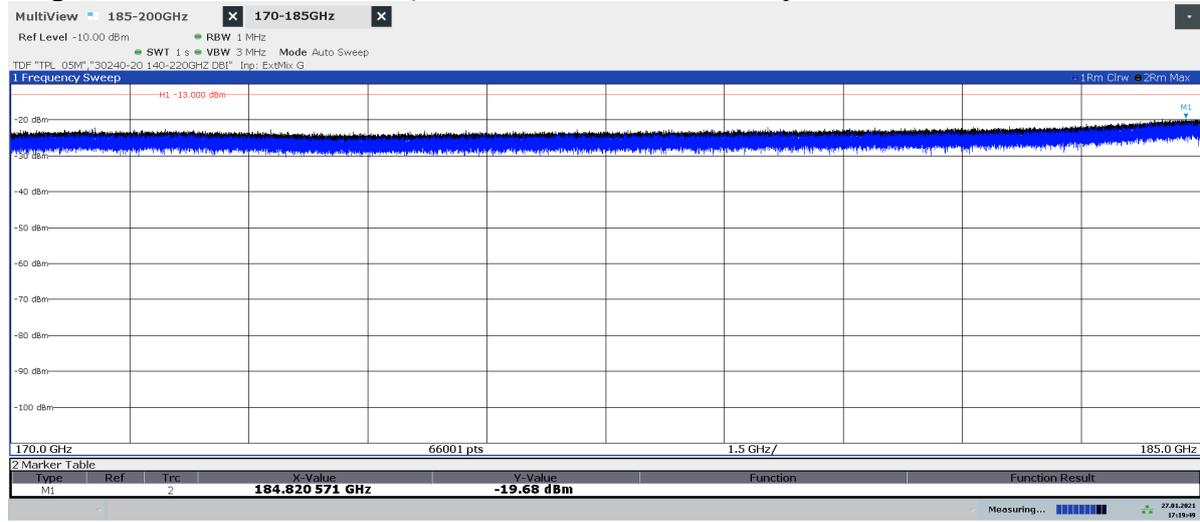
16:46:39 27.01.2021

Diagram 2.34b: 170 – 185 GHz, QPSK, TL₁₀₀, EIRP Vertical polarization



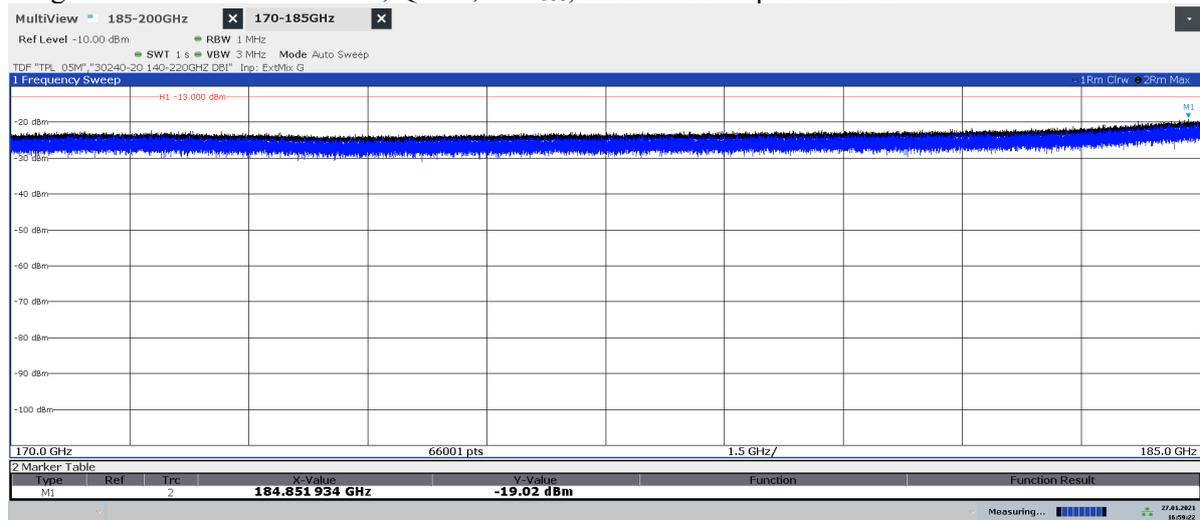
16:51:15 27.01.2021

Diagram 2.35a: 170 – 185 GHz, QPSK, BL8₁₀₀, EIRP Horizontal polarization



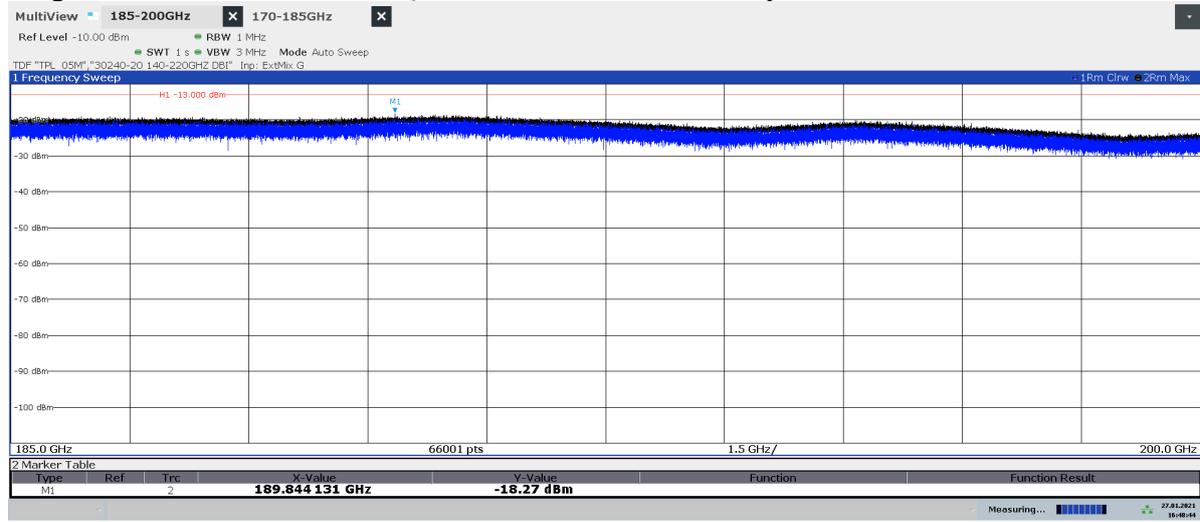
17:19:49 27.01.2021

Diagram 2.35b: 170 – 185 GHz, QPSK, BL8₁₀₀, EIRP Vertical polarization



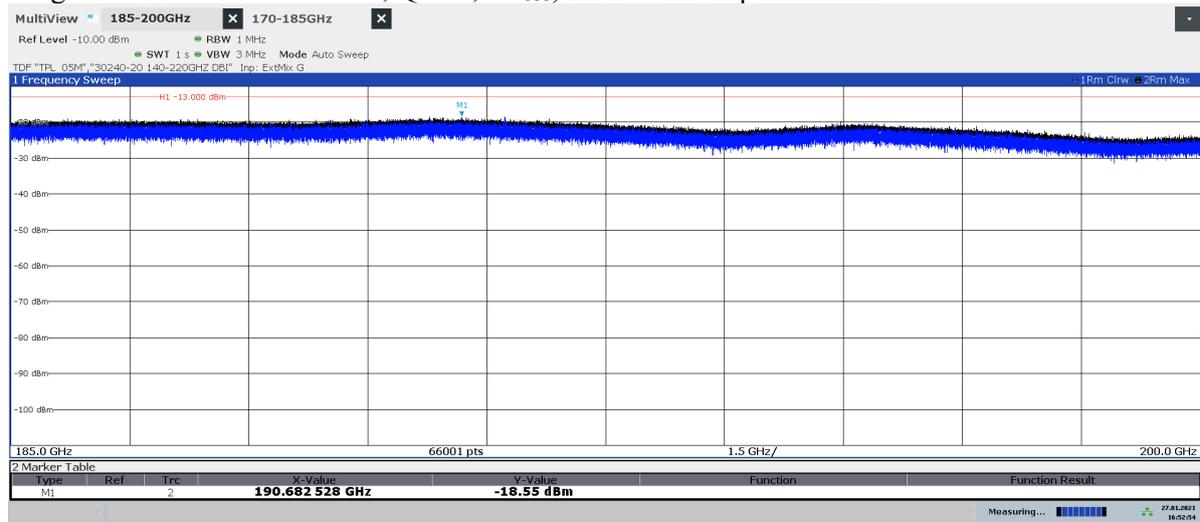
16:59:22 27.01.2021

Diagram 2.36a: 185 – 200 GHz, QPSK, TL₁₀₀, EIRP Horizontal polarization



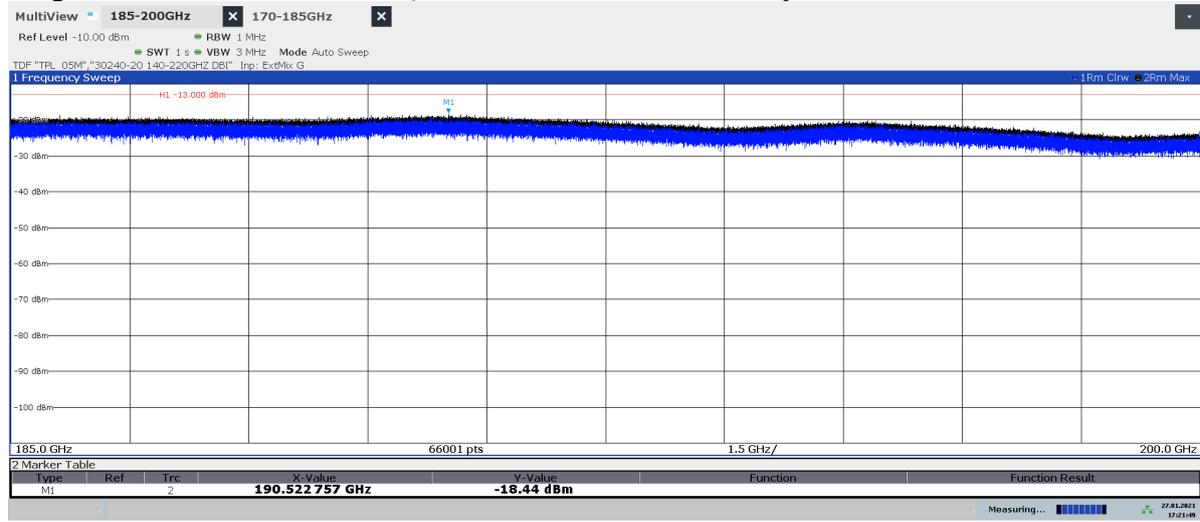
16:48:44 27.01.2021

Diagram 2.36b: 185 – 200 GHz, QPSK, TL₁₀₀, EIRP Vertical polarization



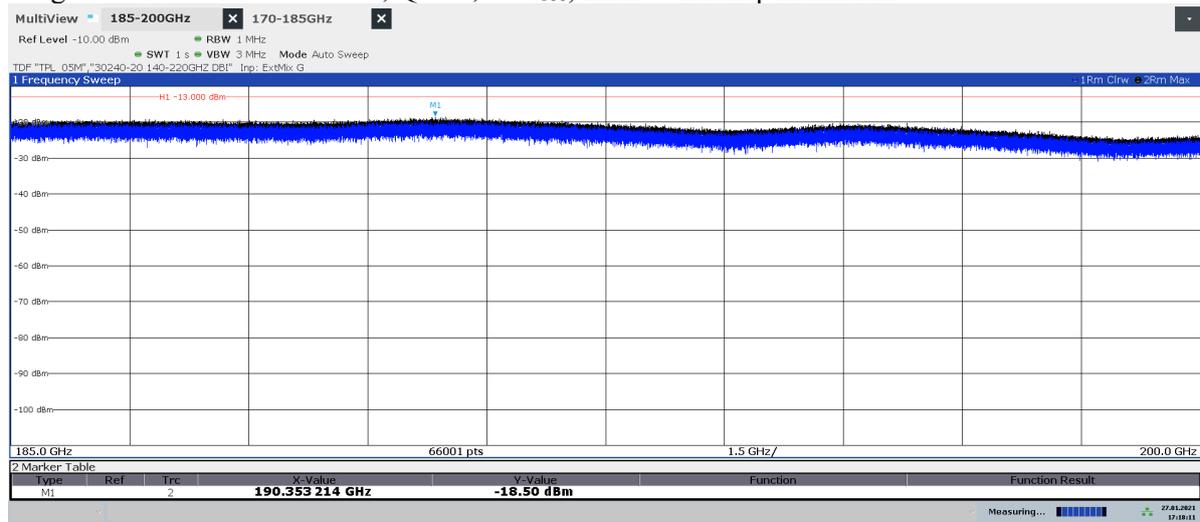
16:52:54 27.01.2021

Diagram 2.37a: 185 – 200 GHz, QPSK, BL8₁₀₀, EIRP Horizontal polarization



17:21:49 27.01.2021

Diagram 2.37b: 185 – 200 GHz, QPSK, BL8₁₀₀, EIRP Vertical polarization



17:18:11 27.01.2021

End of report.