REPORT

issued by an Accredited Testing Laboratory

Contact person RISE
Tomas Lennhager
Division Safety and Transport
+46 10 516 54 09
tomas.lennhager@ri.se

Date
2021-09-01
Rev1
2022-02-08

Reference
P111266-F30-Rev1

Ericsson AB
Anders Karlsson
BURA DURA RP QRM
Torshamnsgatan 21
164 80 Stockholm

Radio measurements on Indoor AIR 1279 B260

Rev1 2022-02-08: Frequency stability added.

Product name: Indoor AIR 1279 B260
Product number: KRD 901 230/4

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

Performed by	Examined by
Signed by: Tomas Lennhager Reason: I am the author of this document Date & Time: 2022-02-08 12:49:31 +01:00	Signed by: Daniel Lundgren Reason: I have reviewed this document Date & Time: 2022-02-08 15:42:59 +01:00
Tomas Lennhager	Daniel Lundgren

Summary

Standard Listed part of	Compliant
FCC CFR 47 part 30 Subpart C	
2.1046/ 30.202 RF power output	Yes
2.1049 Occupied bandwidth	Yes
2.1053/ 30.203 Field strength of spurious radiation	Yes
2.1055 Frequency stability	Yes

Description of the test object

Equipment:	Radio equipment AIR 1279 B260 Product number: KRD 901 230/4 containing KRX 101 07/2 Rev. R1A with FCC ID: TA8AKRX10107-2
Hardware revision state:	R1A
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.
Operating bandwidth:	Config mode 1: Two segments of 400 MHz
Nominal Output power (EIRP):	Config mode 1: 37 dBm/ beam and polarization
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:	46M0W7D and 95M1W7D
Emission designators Carrier Aggregation:	798MW7D (8x 100 MHz)
RF power Tolerance:	+2.4/ -2.0 dB
CPRI Speed	10.1 and 24.3 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 tested to find 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 120 VAC 60 Hz Additional connections are documented in the setup drawings for radiated measurements.

RISE 10 MHz reference was connected to the signal analyser as external reference, during all measurements.

Evaluation of spurious emissions have been done in several beam directions, including extreme settings both in azimuth and elevation planes. Results have shown that Beam index 0/Boresight can represent worst case.

Far field distance for power, OBW and Band edge measurements is 3.83 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	4
26.5 – 40	0.48	4
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, June 2021
ANSI C63.26-2015
KDB 842590 D01 Upper Microwave Flexible Use Service v01r02
KDB 971168 D01 Power Meas License Digital Systems v03r01
KDB 971168 D03 IM Emission Repeater Amp v01
3GPP TR 38.141-2 V15.9.0
3GPP TR 37.842 V13.3.0 (2020-01)

Measurement equipment

	Calibration Due	RISE number
Anechoic chamber, Hertz	2024-07	BX50194
R&S FSW 43 test after 2021-07	2022-07	902 073
R&S FSW 43 test before 2021-07	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	2022-04	BX50236
RF Cable	2021-09	BX50192
RF Cable	2022-01	BX81431
RF Cable	2022-05	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	2021-07	504 079
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
Mizer 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	2022-06	503 498

Frequency stability 2021-12

	Calibration Due	RISE number
R&S FSW 43	2022-07	902 073
RF Cable	2022-04	BX50236
EMCO Horn Antenna 3116	2024-06	503 279
Temperature Chamber	-	902 214
Testo 635, temperature and humidity meter	2022-07	504 203
Multimeter Fluke 87	2022-05	502 190

EAB Measurement equipment

Calibrated at RISE before testing.

	Calibration Due	S/N
Marki Microwave FLP2650 Low pass filter	2022-04	1827
Qualwave QBF-26400-33000-60 Band pass filter	2022-04	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: 2021-06-21.

Manufacturer’s representative

Mikael Jansson, Ericsson AB.

Test engineers

Tomas Lennhager and Björn Skönvall, RISE

Test participant(-s)

Bing Li, Ericsson AB (partially)

Test frequencies used for radiated measurements

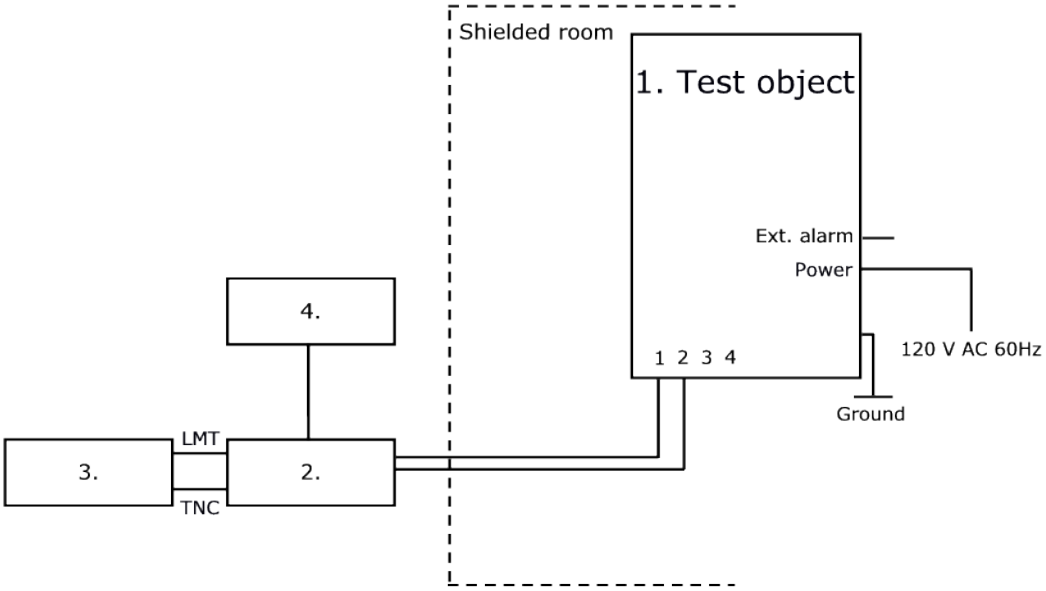
Config mode 1

Symbolic name	Beam#/ Carrier#	Frequency Hor/ Ver [MHz]	Comment
$BL1_{50}$	B1/C1 or B2/C1	37025.04	50 MHz BW, 1 beam, 1 carrier, TX bottom frequency configuration lower band
$ML1_{50}$	B1/C1 or B2/C1	37800.00	50 MHz BW, 1 beam, 1 carrier, TX middle frequency configuration lower band
$TL1_{50}$	B1/C1 or B2/C1	38574.96	50 MHz BW, 1 beam, 1 carrier, TX top frequency configuration lower band
$BH1_{50}$	B1/C1 or B2/C1	38625.00	50 MHz BW, 1 beam, 1 carrier, TX bottom frequency configuration higher band
$MH1_{50}$	B1/C1 or B2/C1	39300.00	50 MHz BW, 1 beam, 1 carrier, TX middle frequency configuration higher band
$TH1_{50}$	B1/C1 or B2/C1	39975.00	50 MHz BW, 1 beam, 1 carrier, TX top frequency configuration higher band
$BL2_{50}$	B1/C1 B2/C1	37025.04 37074.96	50 MHz BW, 2 beams, 1 carrier per beam, TX bottom frequency configuration lower band
$ML2_{50}$	B1/C1 B2/C1	37774.92 37824.96	50 MHz BW, 2 beams, 1 carrier per beam, TX middle frequency configuration lower band
$TL2_{50}$	B1/C1 B2/C1	38524.92 38574.96	50 MHz BW, 2 beams, 1 carrier per beam, TX top frequency configuration lower band
$BH2_{50}$	B1/C1 B2/C1	38625.00 38675.04	50 MHz BW, 2 beams, 1 carrier per beam, TX bottom frequency configuration higher band
$MH2_{50}$	B1/C1 B2/C1	39275.04 39324.96	50 MHz BW, 2 beams, 1 carrier per beam, TX middle frequency configuration higher band
$TH2_{50}$	B1/C1 B2/C1	39924.96 39975.00	50 MHz BW, 2 beams, 1 carrier per beam, TX top frequency configuration higher band
$BL2_{100}$	B1/C1 B2/C1	37050.00 37149.96	100 MHz BW, 2 beams, 1 carrier per beam, TX bottom frequency configuration lower band
$ML2_{100}$	B1/C1 B2/C1	37749.96 37850.04	100 MHz BW, 2 beams, 1 carrier per beam, TX middle frequency configuration lower band
$TL1_{100}$	B1/C1	38449.92	100 MHz BW, 1 beam, 1 carrier, TX top frequency configuration lower band
$TL2_{100}$	B1/C1 B2/C1	38449.92 38550.00	100 MHz BW, 2 beams, 1 carrier per beam, TX top frequency configuration lower band
$BH2_{100}$	B1/C1 B2/C1	38649.96 39350.04	100 MHz BW, 2 beams, 1 carrier per beam, TX bottom frequency configuration lower band
$MH2_{100}$	B1/C1 B2/C1	39249.96 39350.04	100 MHz BW, 2 beams, 1 carrier per beam, TX middle frequency configuration higher band
$TH2_{100}$	B1/C1 B2/C1	39849.96 39949.92	100 MHz BW, 2 beams, 1 carrier per beam, TX top frequency configuration higher band
$BL4_{100}$	B1/C1 B1/C2 B2/C1 B2/C2	37050.00 37149.96 37249.92 37350.00	100 MHz BW, 2 beams, 2 carrier per beam, TX bottom frequencies configuration lower band
$TL4_{100}$	B1/C1 B1/C2 B2/C1 B2/C2	38250.00 38349.96 38449.92 38550.00	100 MHz BW, 2 beams, 2 carrier per beam, TX top frequencies configuration lower band
$TH4_{100}$	B1/C1 B1/C2 B2/C1 B2/C2	39649.92 39750.00 39849.96 39949.92	100 MHz BW, 2 beams, 2 carrier per beam, TX top frequencies configuration higher band

Config mode 1

Symbolic name	Beam#/ Carrier#	Frequency Hor/ Ver [MHz]	Comment
$BTim6_{50}$	B1/C1 B1/C2 B1/C3 B2/C1 B2/C2 B2/C3	37025.04 37149.96 37249.92 39625.08 39924.96 39975.00	50 MHz BW, 6 carrier, bottom and top frequencies configuration
$BL8_{100}$	B1/C1 B1/C2 B1/C3 B1/C4 B2/C1 B2/C2 B2/C3 B2/C4	37050.00 37149.96 37249.92 37350.00 37449.96 37549.92 37650.00 37749.96	100 MHz BW, 8 carrier, TX Bottom frequencies configuration lower band
$M8_{100}$	B1/C1 B1/C2 B1/C3 B1/C4 B2/C1 B2/C2 B2/C3 B2/C4	38250.00 38349.96 38449.92 38550.00 38649.96 38749.92 38850.00 38949.96	100 MHz BW, 8 carrier, TX top frequencies configuration lower band and bottom frequencies configuration higher band
$TH8_{100}$	B1/C1 B1/C2 B1/C3 B1/C4 B2/C1 B2/C2 B2/C3 B2/C4	39249.96 39349.92 39450.00 39549.96 39649.92 39750.00 39849.96 39949.92	100 MHz BW, 8 carrier, TX top frequencies configuration higher band

Test setup: radiated measurements



Test object:

1.	Indoor AIR 1279 B260, KRD 901 230/4, rev. R1A, s/n: E23C904547 Radio Software: CXP 203 0045/1, rev. R9B546 containing KRX 101 07/2, Rev. R1A with FCC ID: TA8AKRX10107-2

Associated equipment:

2.	Testing Equipment: Baseband 6648, KDU 137 0015/1, rev. R3A, s/n: E23C175353 with software: CXP2010174/1, rev. R30A70 For frequency stability test Baseband 6648, KDU 137 0015/1, rev. R3A, s/n: E23B849332 with software: CXP2010174/1_R38A130 was used

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:

Power input configuration AC (KRD 901 230/4): 120 VAC 60Hz	Power
EXT Alarm, shielded multi-wire	Signal
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, not connected in this configuration	Signal
4, Optical Interface Link, single mode opto fibre, not connected in this configuration	Signal
Ground wire	Ground

RF power output measurements according to CFR 47 §30.202

Date	Temperature	Humidity
2021-06-21	23 °C ± 3 °C	43 % ± 5 %
2021-06-22	24 °C ± 3 °C	42 % ± 5 %
2021-08-27	23 °C ± 3 °C	39 % ± 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).

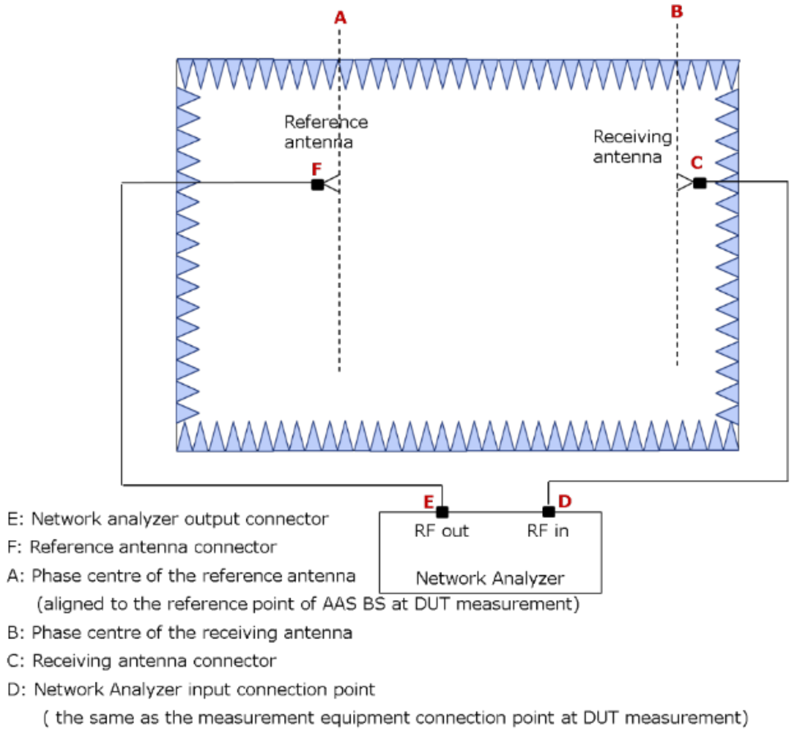


Figure 1: Indoor Anechoic Chamber calibration system setup for EIRP

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 20log|S21| (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:
   $L_{EIRP\_cal, A \rightarrow D} = LF_{EIRP, E \rightarrow D} + G_{REF\_ANT\_EIRP, A \rightarrow F} - LF_{EIRP, E \rightarrow F}$.
   $L_{EIRP\_cal, A \rightarrow D}$: 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:

   $EIRP = P_{R\_EUT\_EIRP, D} + L_{EIRP\_cal, A \rightarrow D}$

Test Setup, measuring distance 4m:

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
RF Cable VNA-calibration	BX50189
RF Cable VNA-calibration	BX50190
RF Cable	BX50236
RF Cable	BX50192
Testo 615, temperature and humidity meter	503 498

Measurement uncertainty: 3.3 dB

Results

Beam index 0 Boresight, Bandwidth 50MHz, QPSK
Nominal rated output power (EIRP) per Beam: 37 dBm/ Polarization.

	Output power per 100 MHz, EIRP [RMS dBm] Vertical/ Horizontal
Symbolic name	Beam 1 B1/C1
$BL1_{50}$	35.49/ 35.60
$ML1_{50}$	36.89/ 36.81
$TL1_{50}$	37.21/ 37.27
$BH1_{50}$	37.14/ 37.11
$MH1_{50}$	37.74/ 37.03
$TH1_{50}$	37.05/ 36.88

Beam index 0 Boresight, Bandwidth 50MHz, QPSK
Nominal rated output power (EIRP) per Beam: 37 dBm/ Polarization.

	Output power per 100 MHz, EIRP [RMS dBm] Vertical/ Horizontal
Symbolic name	Beam 2 B2/C1
$BL1_{50}$	35.46/ 35.94
$ML1_{50}$	36.64/ 36.88
$TL1_{50}$	36.91/ 37.41
$BH1_{50}$	36.86/ 37.21
$MH1_{50}$	37.43/ 37.05
$TH1_{50}$	36.94/ 36.80

Beam index 0 Boresight, Bandwidth 50MHz, QPSK
Nominal rated output power (EIRP) per Beam: 37 dBm/ Polarization.

	Output power per 100 MHz, EIRP [RMS dBm] Vertical/ Horizontal
Symbolic name	Beam 1 + Beam 2 B1/C1 + B2/C1
$BL2_{50}$	38.52/ 38.80
$ML2_{50}$	39.74/ 39.87
$TL2_{50}$	40.05/ 40.27
$BH2_{50}$	39.92/ 38.85
$MH2_{50}$	40.68/ 40.04
$TH2_{50}$	39.82/ 39.72

Beam index 0 Boresight, Bandwidth 100MHz, QPSK
Nominal rated output power (EIRP) per Beam: 37 dBm/ Polarization.

	Output power per 100 MHz, EIRP [RMS dBm] Vertical/ Horizontal	
Symbolic name	Beam 1 B1/C1	Beam 2 B2/C1
$BL2_{100}$	35.43/ 36.44	35.38/ 36.12
$ML2_{100}$	36.72/ 36.98	36.57/ 37.01
$TL2_{100}$	37.30/ 38.04	37.11/ 37.81
$BH2_{100}$	37.87/ 38.23	37.21/ 37.36
$MH2_{100}$	38.89/ 38.06	37.31/ 37.43
$TH2_{100}$	36.83/ 37.06	36.02/ 36.06

4-Carrier Config mode 1

Beam index 0 Boresight, Carrier Bandwidth 100 MHz, QPSK
Nominal rated output power (EIRP) per Beam: 37 dBm/ Polarization.

	Output power per 100 MHz, EIRP [RMS dBm] Vertical/ Horizontal					
Symbolic name	Beam 1		Total Power Beam 1 (per 200 MHz)	Beam 2		Total power Beam 2 (per 200 MHz)
	B1/C1	B1/C2		B2/C1	B2/C2	
$BL4_{100}$	32.95/ 33.40	32.77/ 33.15	35.87/ 36.29	32.24/ 32.71	33.46/ 33.87	35.90/ 36.34
$TL4_{100}$	33.33/ 34.00	33.92/ 34.52	36.65/ 37.28	33.81/ 34.48	34.55/ 35.16	37.21/ 37.84
$TH4_{100}$	35.73/ 35.70	34.83/ 34.61	38.31/ 38.20	33.65/ 33.93	33.00/ 33.11	36.35/ 37.21

8-Carrier Config mode 1

Beam index 0 Boresight, Carrier Bandwidth 100 MHz, QPSK
Nominal rated output power (EIRP) per Beam: 37 dBm/ Polarization.

	Output power per 100 MHz, EIRP [RMS dBm] Vertical/ Horizontal									
	Beam 1				Total Power Beam 1 (per 400 MHz)	Beam 2				Total power Beam 2 (per 400 MHz)
Symbolic name	B1/C1	B1/C2	B1/C3	B1/C4		B2/C1	B2/C2	B2/C3	B2/C4	
$BL8_{100}$	29.66/ 30.18	29.66/ 29.82	29.99/ 29.96	30.57/ 30.80	36.00/ 36.23	30.37/ 30.89	30.68/ 30.82	30.97/ 31.04	30.94/ 31.39	36.77/ 37.06
$M8_{100}$	30.13/ 30.85	30.81/ 31.18	31.53/ 31.81	31.80/ 32.36	37.14/ 37.61	31.19/ 31.53	31.50/ 31.31	31.97/ 31.61	32.00/ 31.97	37.70/ 37.63
$TH8_{100}$	32.58/ 32.41	32.41/ 31.80	32.47/ 31.64	32.28/ 31.69	38.46/ 37.92	32.28/ 32.97	32.48/ 31.73	30.71/ 30.37	29.42/ 29.41	37.41/ 37.35

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

Occupied bandwidth measurements according to CFR 47 2.1049

Date	Temperature	Humidity
2021-06-22	24 °C ± 3 °C	42 % ± 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 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 4m:

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
RF Cable VNA-calibration	BX50189
RF Cable VNA-calibration	BX50190
RF Cable	BX50236
RF Cable	BX50192
Testo 615, temperature and humidity meter	503 498

Measurement uncertainty: 3.3 dB

Results

Single carrier, Config mode 1, Bandwidth: 50MHz Modulation: QPSK

Diagram	Symbolic name	Polarization	Occupied BW (99%) [MHz]
1.1	$TL1_{50}$, B1/C1	Hor	46.004
1.2	$TL1_{50}$, B1/C1	Ver	45.943

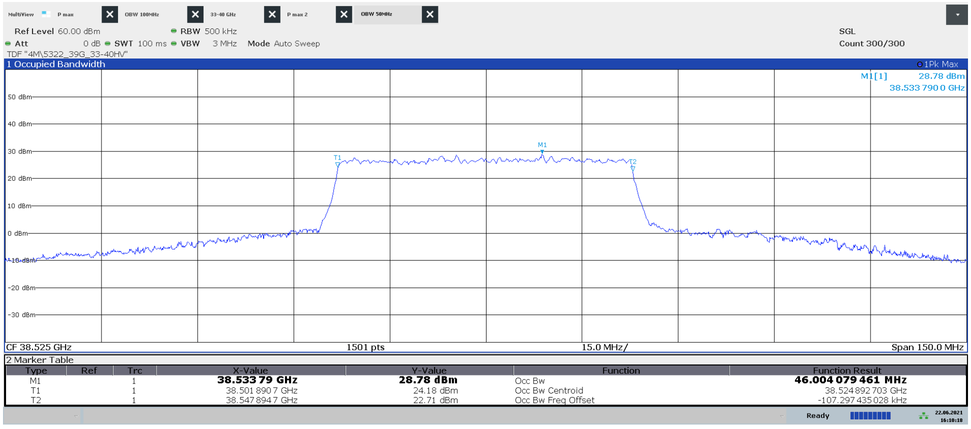
Only one Beam activated at the same time
Single carrier, Config mode 1, Bandwidth: 100MHz Modulation: QPSK

Diagram	Symbolic name	Polarization	Occupied BW (99%) [MHz]
1.3	$TL1_{100}$	Hor	95.113
1.4	$TL1_{100}$	Ver	94.933

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

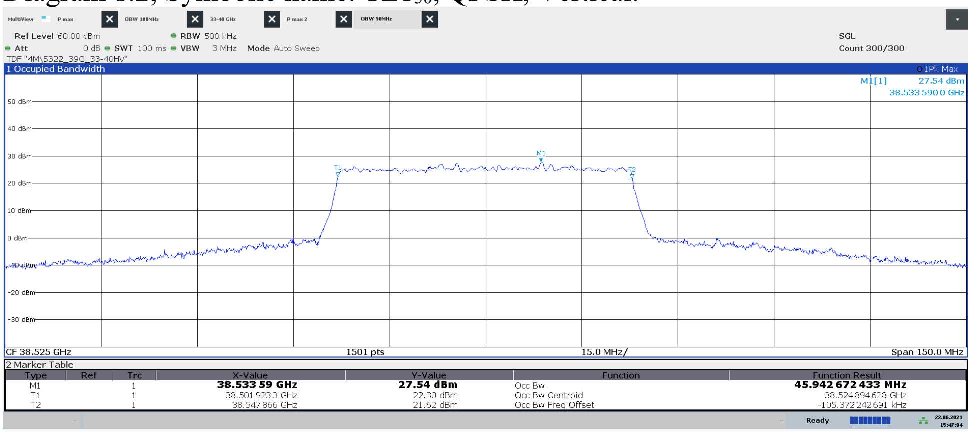
Diagram	Symbolic name	Polarization	Occupied BW (99%) [MHz]
1.5	$M8_{100}$	Hor	797.610
1.6	$M8_{100}$	Ver	794.631

Diagram 1.1, Symbolic name: $TL1_{50}$, QPSK, Horizontal:



16:10:18 22.06.2021

Diagram 1.2, Symbolic name: $TL1_{50}$, QPSK, Vertical:



15:47:05 22.06.2021

Diagram 1.3, Symbolic name: TL1$_{100}$, QPSK, Horizontal:

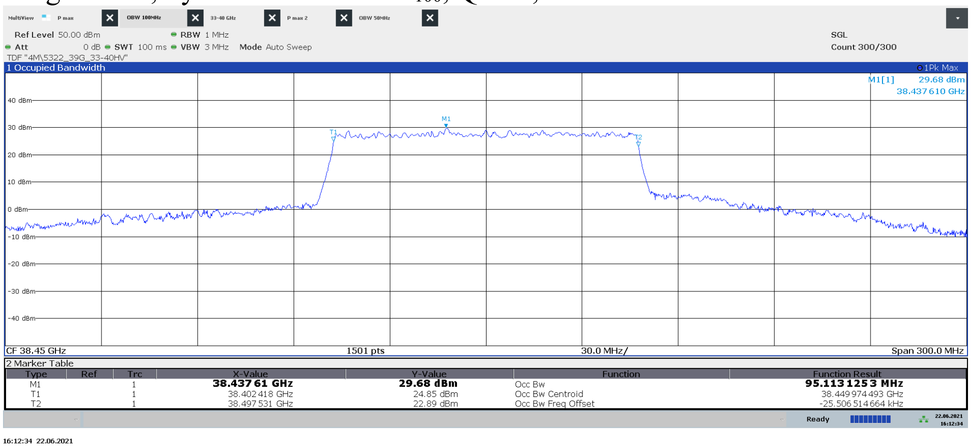


Diagram 1.4, Symbolic name: TL1$_{100}$, QPSK, Vertical:

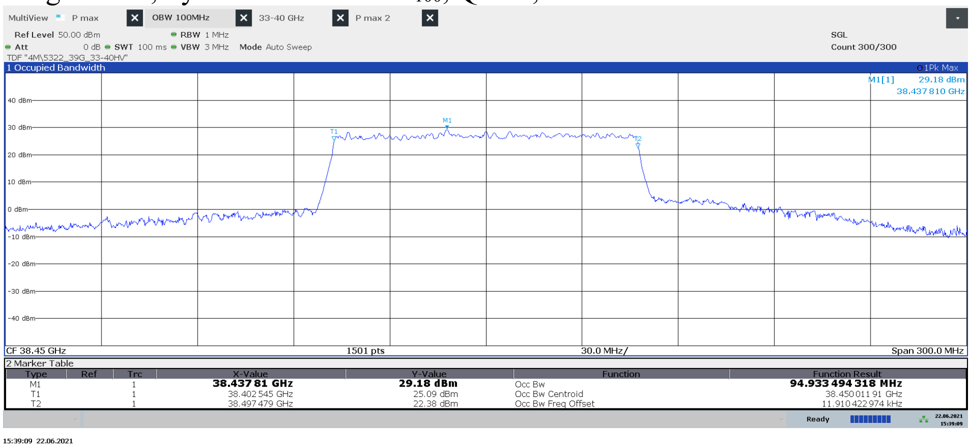
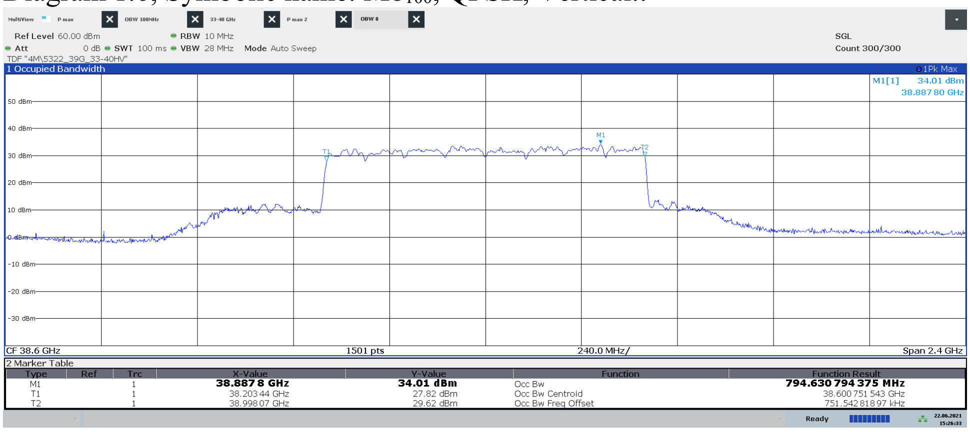


Diagram 1.5, Symbolic name: $M8_{100}$, QPSK, Horizontal:

15:22:26 22.06.2021

Diagram 1.6, Symbolic name: $M8_{100}$, QPSK, Vertical::



15:26:34 22.06.2021

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

Date	Temperature	Humidity
2021-06-23	24 °C ± 3 °C	39 % ± 5 %
2021-06-24	24 °C ± 3 °C	21 % ± 5 %
2021-06-28	24 °C ± 3 °C	36 % ± 5 %
2021-06-29	24 °C ± 3 °C	39 % ± 5 %
2021-06-30	25 °C ± 3 °C	36 % ± 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 descried below.

In the test range from 40 – 200 GHz
A propagation loss in free space was calculated. The used formula was
$\gamma = 20\log\left(\frac{4\pi D}{\lambda}\right)$, γ is the propagation loss and D 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).

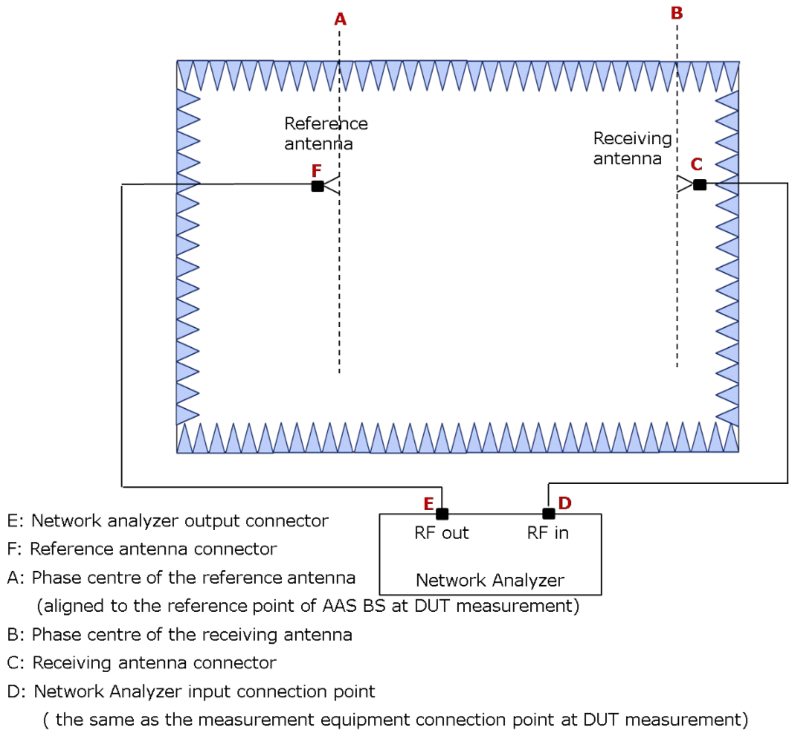


Figure 1: Indoor Anechoic Chamber calibration system setup for EIRP

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 $LF_{EIRP, E\to D}$, which is equivalent to 20log|S21| (dB) obtained by the network analyzer:
   $LF_{EIRP, E\to D}$: Pathloss between E and D in figure 1.
4) Measure the cable loss, $LF_{EIRP, E\to F}$ between the reference antenna connector and the network analyzer connector:
   $LF_{EIRP, E\to F}$: Cable loss between E and F in figure 1.
5) Calculate the calibration value between A and D with the following formula:
   $L_{EIRP\_cal, A\to D} = LF_{EIRP, E\to D} + G_{REF\_ANT\_EIRP, A\to F} - LF_{EIRP, E\to F}$.
   $L_{EIRP\_cal, A\to D}$: Calibration value between A and D in figure 1. Was implemented in the spectrum analyzer as a transducer.
   $G_{REF\_ANT\_EIRP, A\to F}$: 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:

   $EIRP = P_{R\_EUT\_EIRP, D} + L_{EIRP\_cal, A\to D}$

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 form 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+ΔTRP.
      (ΔTRP = 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 D01.

Measurement equipment

	RISE number
Anechoic chamber, Hertz	BX50194
R&S FSW 43	902 073
R&S ESU 40	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	BX81425
Mizer FS-Z170	BX81426
Mixer FS-Z220	BX81427
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

Evaluation of spurious emissions have been done in several beam directions, including extreme settings both in azimuth and elevation planes. Results have shown that Beam index 0/Boresight can represent worst case.

The diagrams represents worst case configurations (Beam index 0 /Boresight) for each frequency range.
Config mode 1:

Diagram	Symbolic name	Pol	Frequency range	Measurement method	“Early exit?”
2.1a	$BL2_{50}$	Hor	30-1000 MHz	Pre scan Max hold EIRP	Yes
2.1b	$BL2_{50}$	Ver	30-1000 MHz	Pre scan Max hold EIRP	Yes
2.2a	$BL2_{50}$	Hor	1-18 GHz	Pre scan Max hold EIRP	Yes
2.2b	$BL2_{50}$	Ver	1-18 GHz	Pre scan Max hold EIRP	Yes
2.3a	$BL2_{50}$	Hor	18-26.5 GHz	Pre scan Max hold EIRP	Yes
2.3b	$BL2_{50}$	Ver	18-26.5 GHz	Pre scan Max hold EIRP	Yes
2.4a	$TH2_{50}$	Hor	26.5-33 GHz	Pre scan Max hold EIRP	Yes
2.4b	$TH2_{50}$	Ver	26.5-33 GHz	Pre scan Max hold EIRP	Yes
2.5a	$TH2_{50}$	Hor	33-40 GHz	Pre scan Max hold EIRP	Yes
2.5b	$TH2_{50}$	Ver	33-40 GHz	Pre scan Max hold EIRP	Yes
2.6a	$BL2_{50}$	Hor	33-40 GHz	Pre scan Max hold EIRP	No
2.6b	$BL2_{50}$	Ver	33-40 GHz	Pre scan Max hold EIRP	No
2.6c	$BL2_{50}$	Hor	36-37GHz	Pre scan Max average EIRP	Yes[1]
2.6d	$BL2_{50}$	Ver	36-37GHz	Pre scan Max average EIRP	Yes[1]
2.7a	$BTim6_{50}$	Hor	33-40 GHz	Pre scan Max hold EIRP	No
2.7b	$BTim6_{50}$	Ver	33-40 GHz	Pre scan Max hold EIRP	No
2.7c	$BTim6_{50}$	Hor	36-37 GHz	Pre scan Max average EIRP	No
2.7d	$BTim6_{50}$	Ver	36-37 GHz	Pre scan Max average EIRP	No
2.7e	$BTim6_{50}$	Hor/ Ver	36.6-37 GHz	Pattern multiplication TRP	Compliant to TRP limit
2.8a	$TL2_{50}$	Hor	38.35-38.85 GHz	Pre scan Max average EIRP	Yes[1]
2.8b	$TL2_{50}$	Ver	38.35-38.85 GHz	Pre scan Max average EIRP	Yes[1]
2.9a	$BH2_{50}$	Hor	38.35-38.85 GHz	Pre scan Max average EIRP	Yes[1]
2.9b	$BH2_{50}$	Ver	38.35-38.85 GHz	Pre scan Max average EIRP	Yes[1]

1) Calculated conducted power based on antenna gain below limit

Config mode 1:

Diagram	Symbolic name	Pol	Frequency range	Measurement method	“Early exit?”
2.10a	$TH2_{50}$	Hor	40-43 GHz	Pre scan Max hold EIRP	No
2.10b	$TH2_{50}$	Ver	40-43 GHz	Pre scan Max hold EIRP	No
2.10c	$TH2_{50}$	Hor	40-43 GHz	Pre scan Max average EIRP	Yes[1]
2.10d	$TH2_{50}$	Ver	40-43 GHz	Pre scan Max average EIRP	Yes[1]
2.11a	$TH8_{100}$	Hor	40-43 GHz	Pre scan Max hold EIRP	No
2.11b	$TH8_{100}$	Ver	40-43 GHz	Pre scan Max hold EIRP	No
2.11c	$TH8_{100}$	Hor	40-43 GHz	Pre scan Max average EIRP	No
2.11d	$TH8_{100}$	Ver	40-43 GHz	Pre scan Max average EIRP	No
2.11e	$TH8_{100}$	Hor/ Ver	40-40.3 GHz	Pattern multiplication TRP	Compliant to TRP limit
2.12a	$BL2_{50}$	Hor	40-43 GHz	Pre scan Max hold EIRP	No
2.12b	$BL2_{50}$	Ver	40-43 GHz	Pre scan Max hold EIRP	No
2.12c	$BL2_{50}$	Hor/ Ver	40-40.2 GHz	Two cut TRP	Compliant to TRP limit
2.13a	$BL2_{50}$	Hor	43-60 GHz	Pre scan Max hold EIRP	Yes
2.13b	$BL2_{50}$	Ver	43-60 GHz	Pre scan Max hold EIRP	Yes
2.14a	$BL2_{50}$	Hor	60-75 GHz	Pre scan Max hold EIRP	Yes
2.14b	$BL2_{50}$	Ver	60-75 GHz	Pre scan Max hold EIRP	Yes
2.15a	$BL2_{50}$	Hor	75-90 GHz	Pre scan Max hold EIRP	Yes
2.15b	$BL2_{50}$	Ver	75-90 GHz	Pre scan Max hold EIRP	Yes
2.16a	$BL2_{50}$	Hor	90-110 GHz	Pre scan Max hold EIRP	Yes
2.16b	$BL2_{50}$	Ver	90-110 GHz	Pre scan Max hold EIRP	Yes
2.17a	$BL2_{50}$	Hor	110-130 GHz	Pre scan Max hold EIRP	Yes
2.17b	$BL2_{50}$	Ver	110-130 GHz	Pre scan Max hold EIRP	Yes
2.18a	$BL2_{50}$	Hor	130-150 GHz	Pre scan Max hold EIRP	Yes
2.18b	$BL2_{50}$	Ver	130-150 GHz	Pre scan Max hold EIRP	Yes
2.19a	$BL2_{50}$	Hor	150-170 GHz	Pre scan Max hold EIRP	Yes
2.19b	$BL2_{50}$	Ver	150-170 GHz	Pre scan Max hold EIRP	Yes
2.20a	$BL2_{50}$	Hor	170-185 GHz	Pre scan Max hold EIRP	Yes
2.20b	$BL2_{50}$	Ver	170-185 GHz	Pre scan Max hold EIRP	Yes
2.21a	$BL2_{50}$	Hor	185-200 GHz	Pre scan Max hold EIRP	Yes
2.21b	$BL2_{50}$	Ver	185-200 GHz	Pre scan Max hold EIRP	Yes

[1)] Calculated conducted power based on antenna gain below limit

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

Diagram 2.1a: Pre scan 30 – 1000 MHz, BL2$_{50}$, EIRP Horizontal polarization

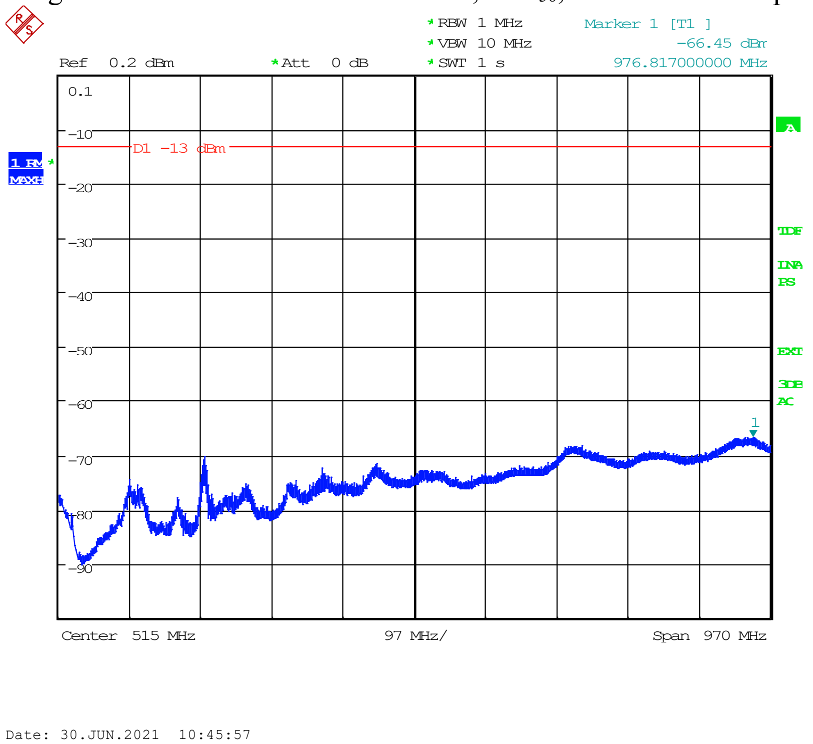


Diagram 2.1b: Pre scan 30 – 1000 MHz, BL2$_{50}$, EIRP Vertical polarization

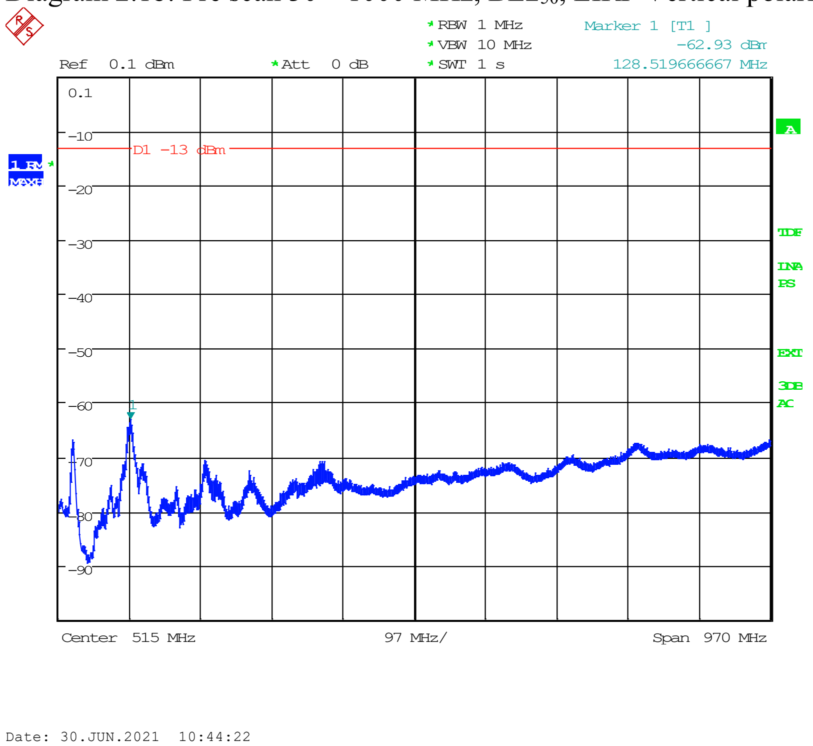
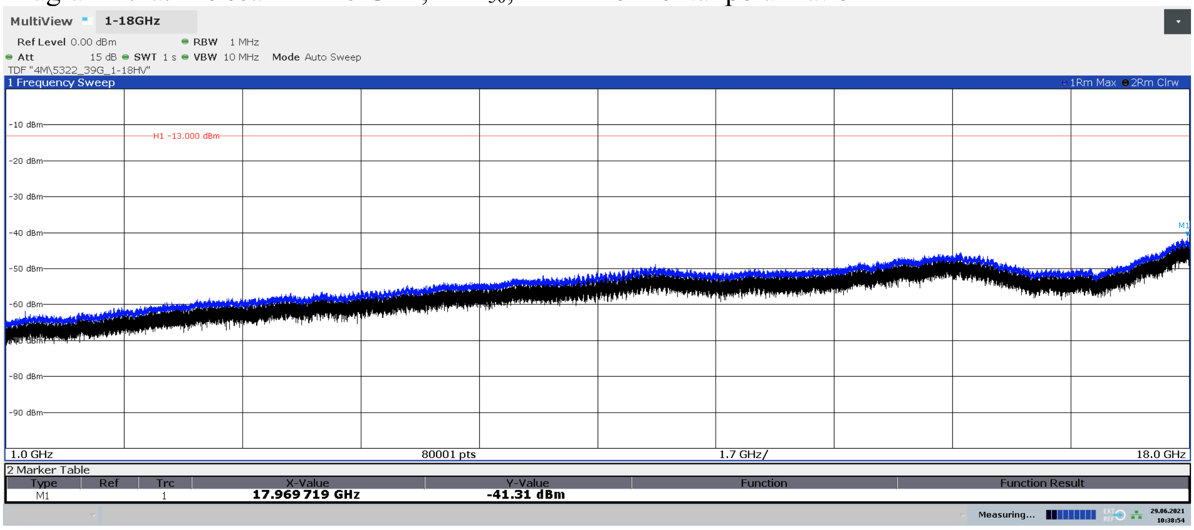
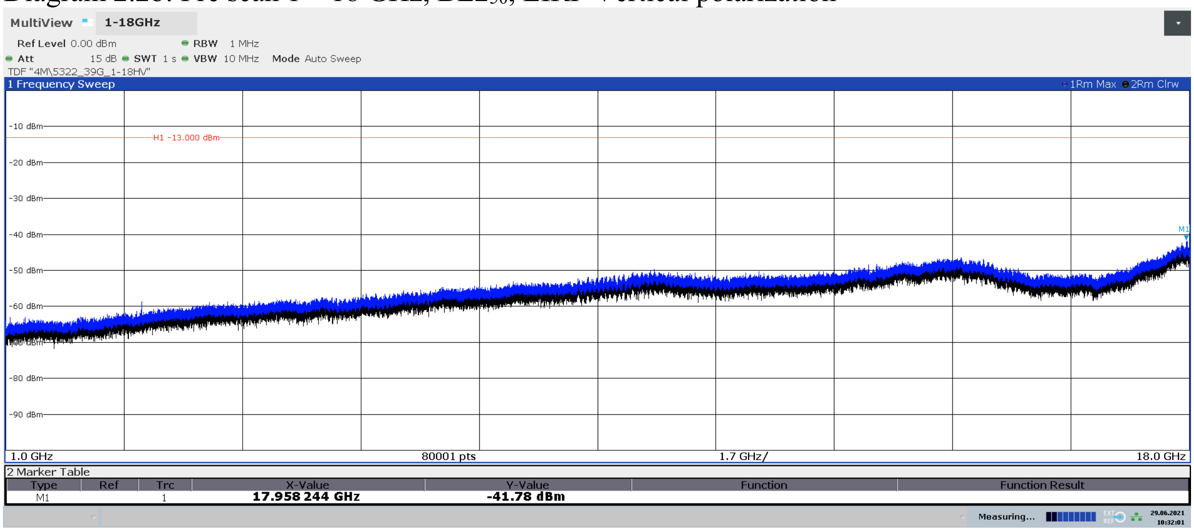


Diagram 2.2a: Pre scan 1 – 18 GHz, $BL2_{50}$, EIRP Horizontal polarization



10:38:54 29.06.2021

Diagram 2.2b: Pre scan 1 – 18 GHz, $BL2_{50}$, EIRP Vertical polarization



10:32:01 29.06.2021

Diagram 2.3a: Pre scan 18 – 26.5 GHz, $BL2_{50}$, EIRP Horizontal polarization

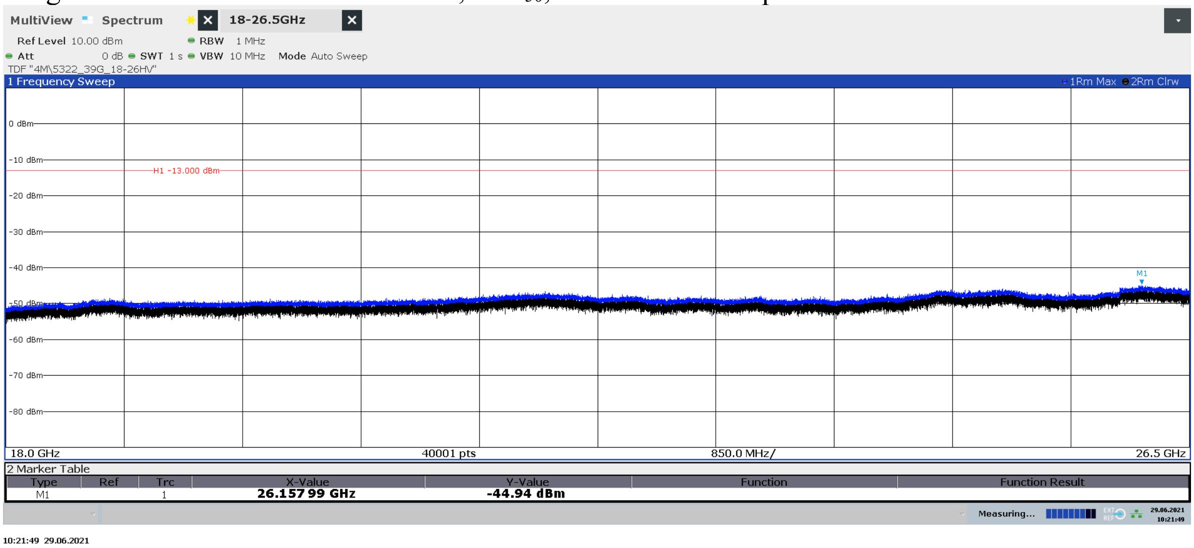


Diagram 2.3b: Pre scan 18 – 26.5 GHz, $BL2_{50}$, EIRP Vertical polarization

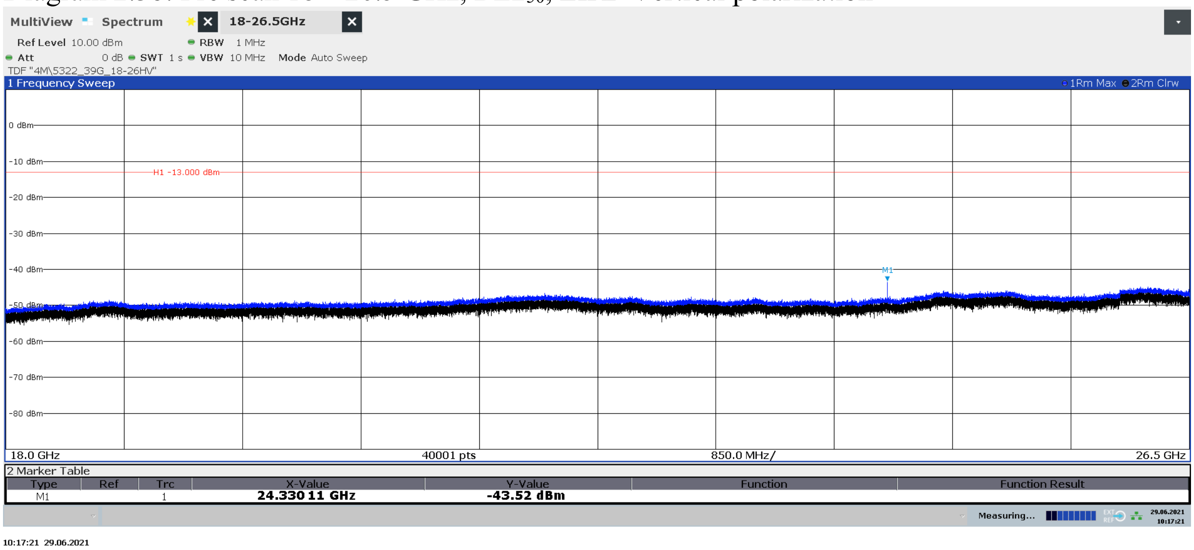
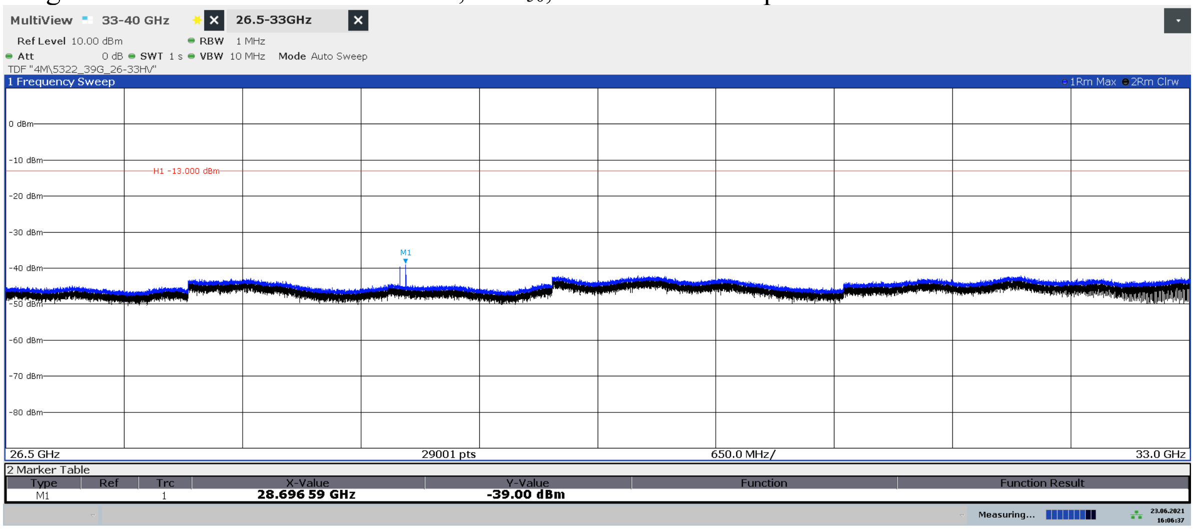
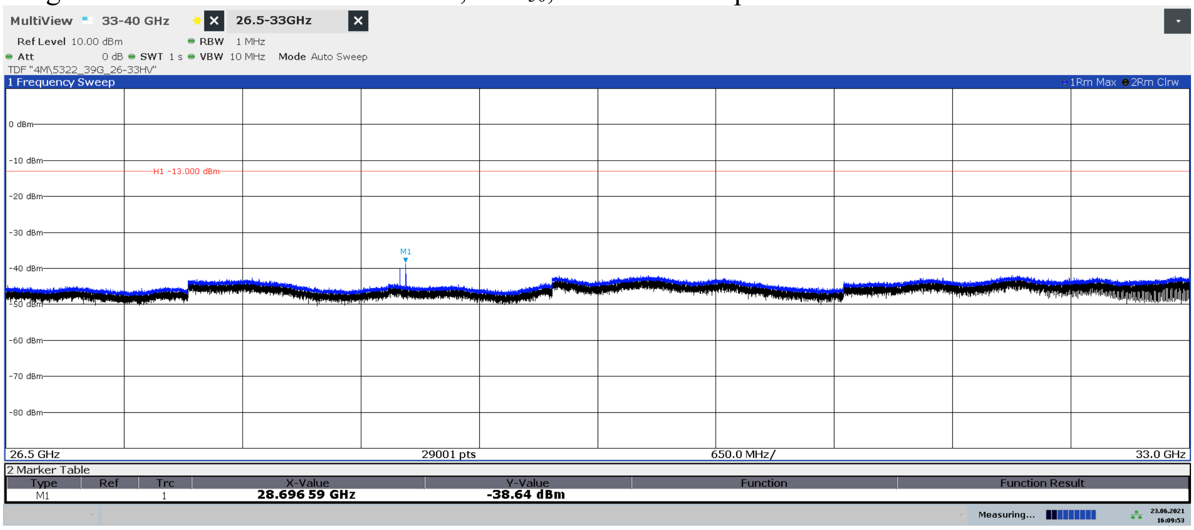


Diagram 2.4a: Pre scan 26.5 – 33 GHz, $TH2_{50}$, EIRP Horizontal polarization



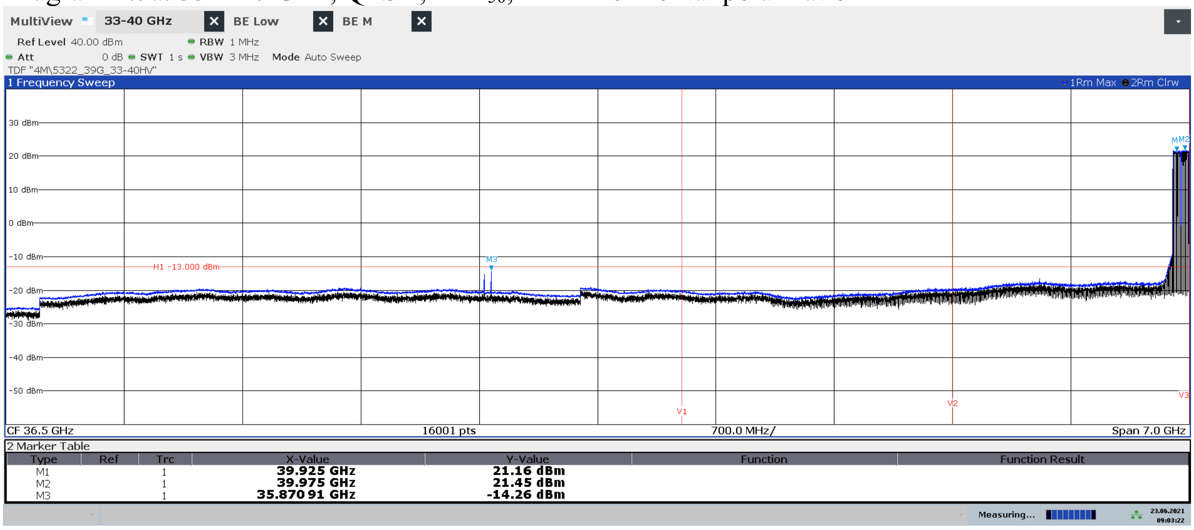
16:06:38 23.06.2021

Diagram 2.4b: Pre scan 26.5 – 33 GHz, $TH2_{50}$, EIRP Vertical polarization



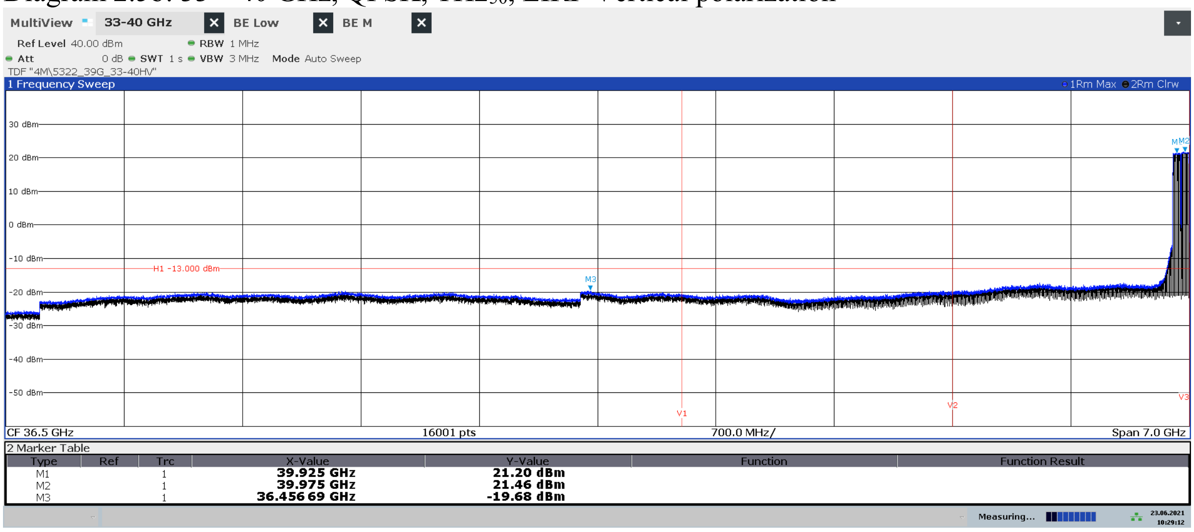
16:09:53 23.06.2021

Diagram 2.5a: 33 – 40 GHz, QPSK, TH2$_{50}$, EIRP Horizontal polarization



09:03:22 23.06.2021

Diagram 2.5b: 33 – 40 GHz, QPSK, TH2$_{50}$, EIRP Vertical polarization



10:29:12 23.06.2021

Diagram 2.6a: 33 – 40 GHz, QPSK, $BL2_{50}$, EIRP Horizontal polarization

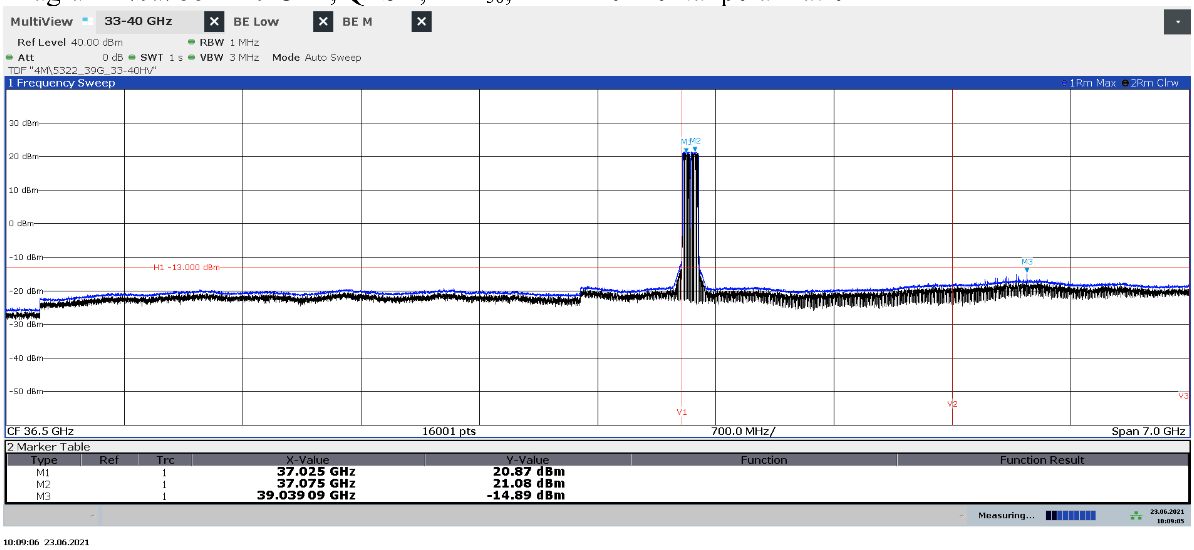


Diagram 2.6b: 33 – 40 GHz, QPSK, $BL2_{50}$, EIRP Vertical polarization

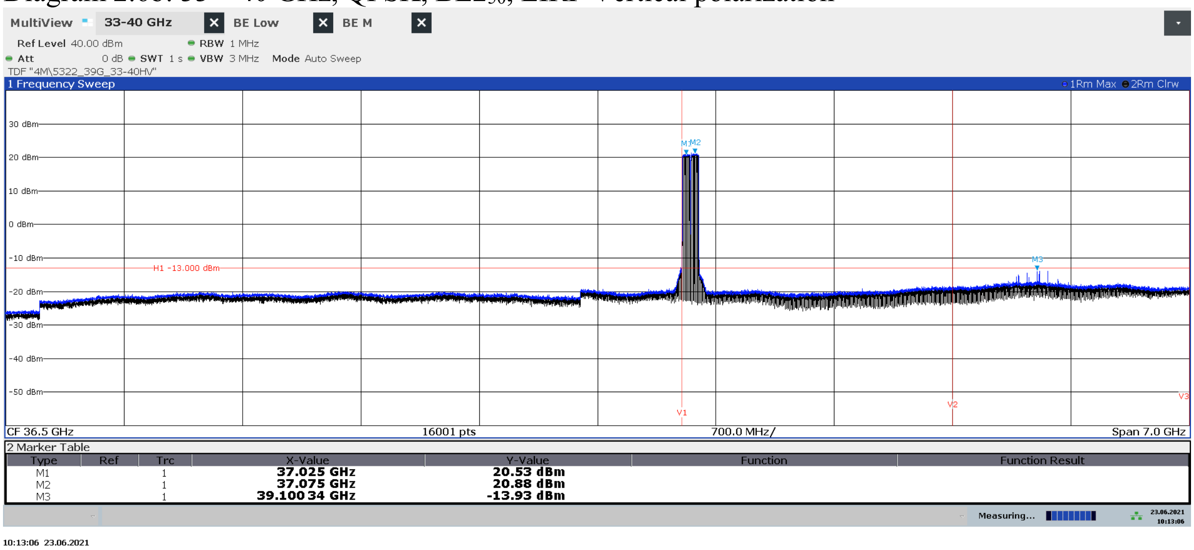


Diagram 2.6c: 36 – 37 GHz, QPSK, $BL2_{50}$, EIRP Horizontal polarization

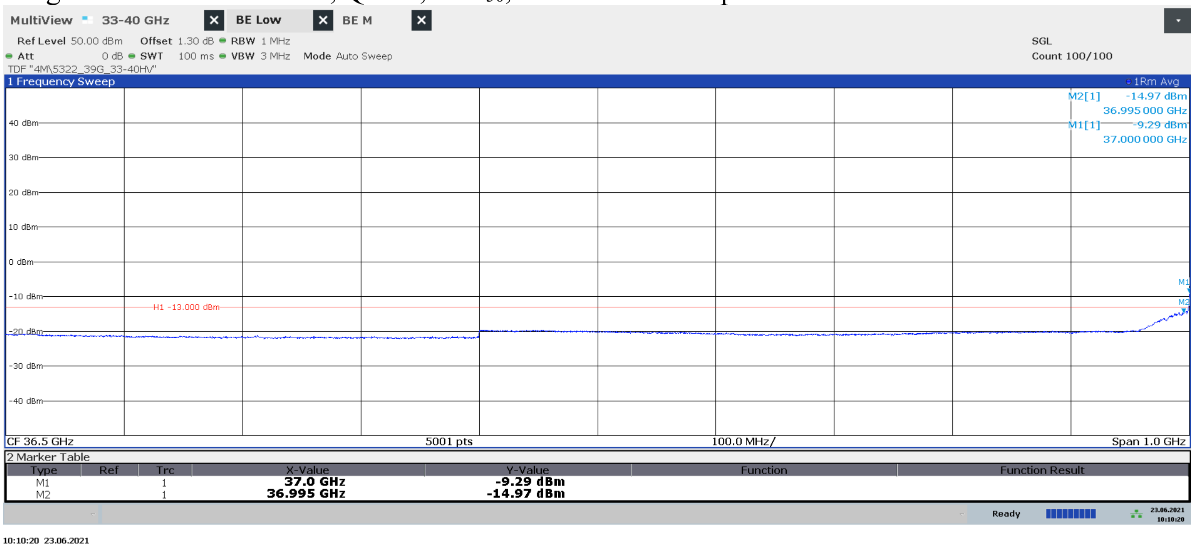
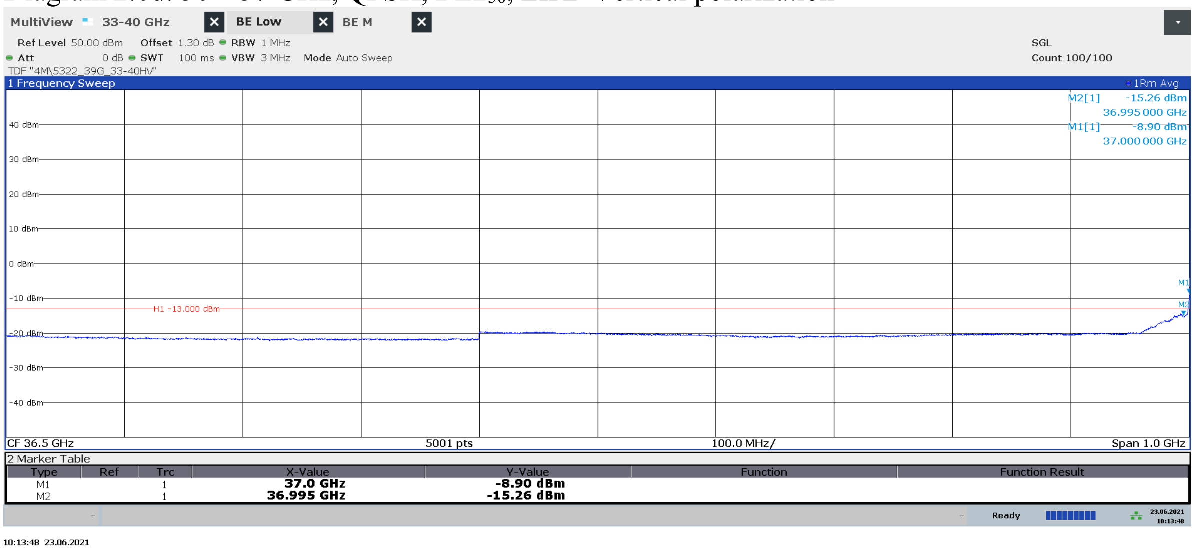
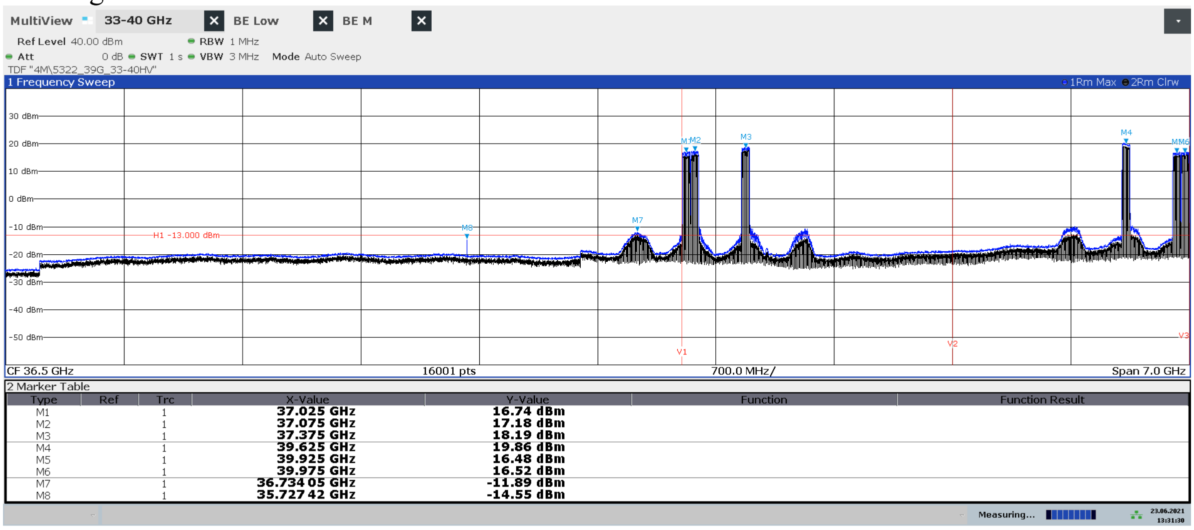


Diagram 2.6d: 36 – 37 GHz, QPSK, $BL2_{50}$, EIRP Vertical polarization



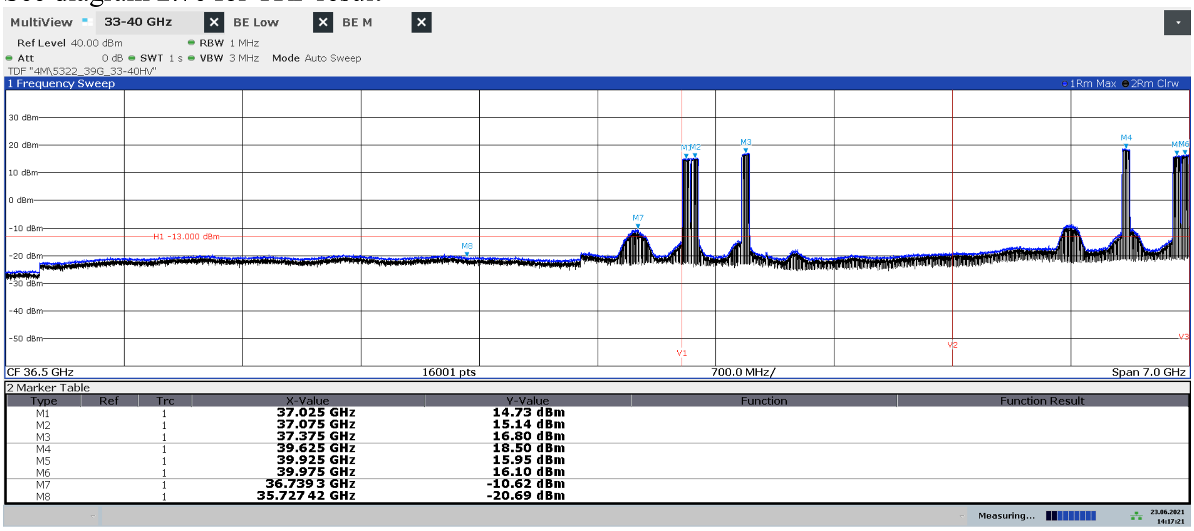
Power EIRP for 37.0 GHz Hor/ Ver [dBm]	Power EIRP for 36.995 GHz Hor/ Ver [dBm]	Antenna Gain Hor/ Ver [dBi]	Total conducted power/BW for 37.0 GHz (Limit -5 dBm) [dBm]/ Verdict	Total conducted power/BW for 36.995 GHz (Limit -13 dBm) [dBm]/ Verdict
-9.29/ -8.90	-14.97/ -15.26	20.85/ 21.06	-27.04/ Pass	-33.05/ Pass

Diagram 2.7a: 33 – 40 GHz, QPSK, BTim6$_{50}$, EIRP Horizontal polarization
See diagram 2.7e for TRP result



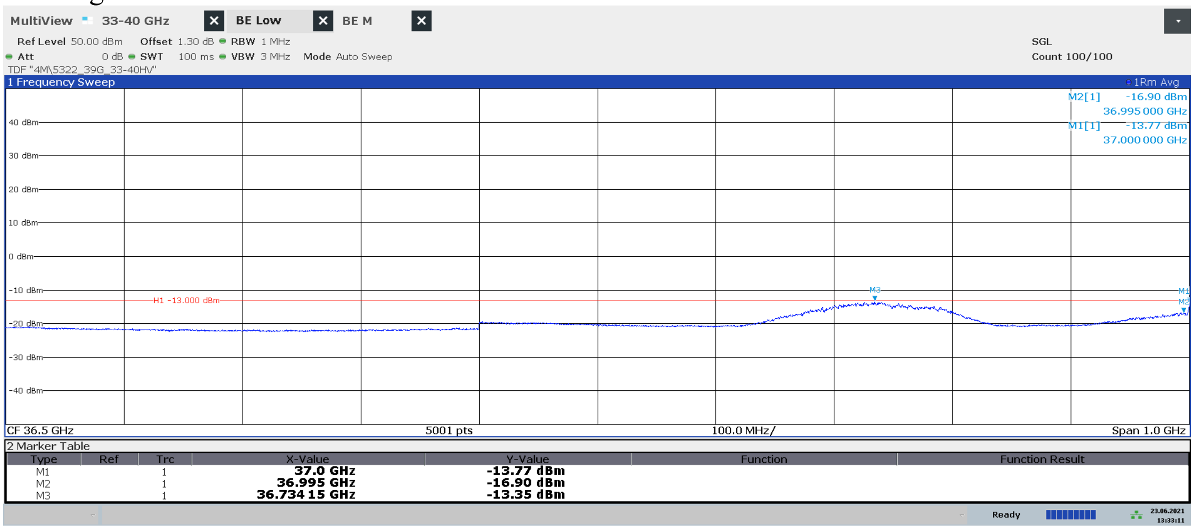
13:31:30 23.06.2021

Diagram 2.7b: 33 – 40 GHz, QPSK, BTim6$_{50}$, EIRP Vertical polarization
See diagram 2.7e for TRP result



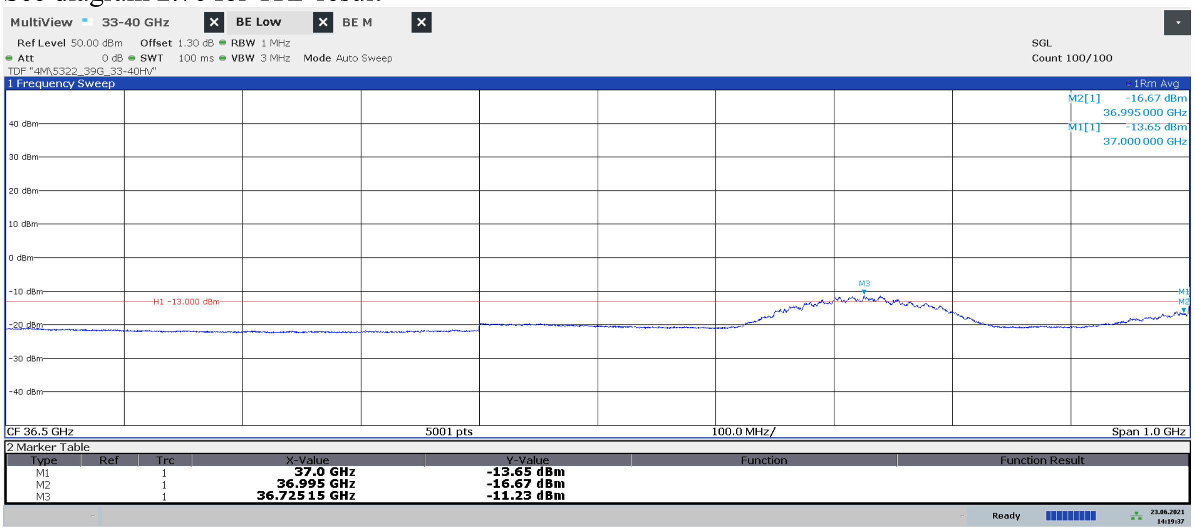
14:17:22 23.06.2021

Diagram 2.7c: 36 – 37 GHz, QPSK, BTim6$_{50}$, EIRP Horizontal polarization
See diagram 2.7e for TRP result



13:33:11 23.06.2021

Diagram 2.7d: 36 – 37 GHz, QPSK, BTim6$_{50}$, EIRP Vertical polarization
See diagram 2.7e for TRP result



14:19:37 23.06.2021

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
-13.77/ -13.65	-16.90/ -16.67	20.85/ 21.06	-31.65/ Pass	-42.81/ Pass

Diagram 2.7e: Pattern multiplication TRP 36.6 – 37 GHz, QPSK, BTim6$_{50}$

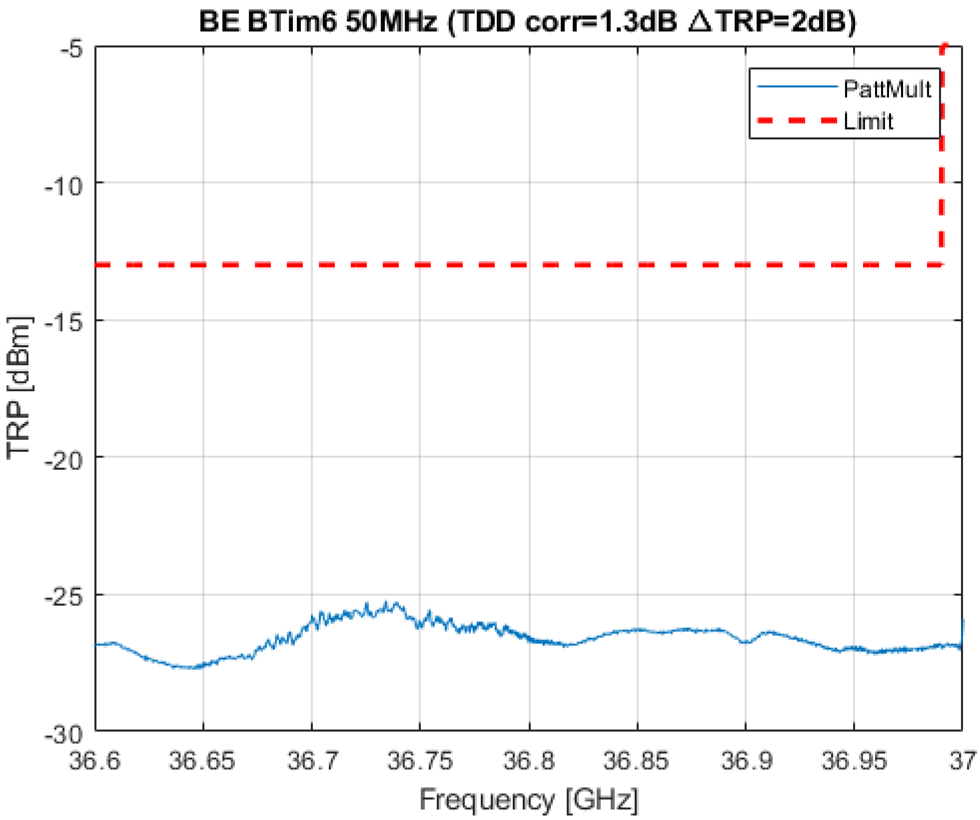
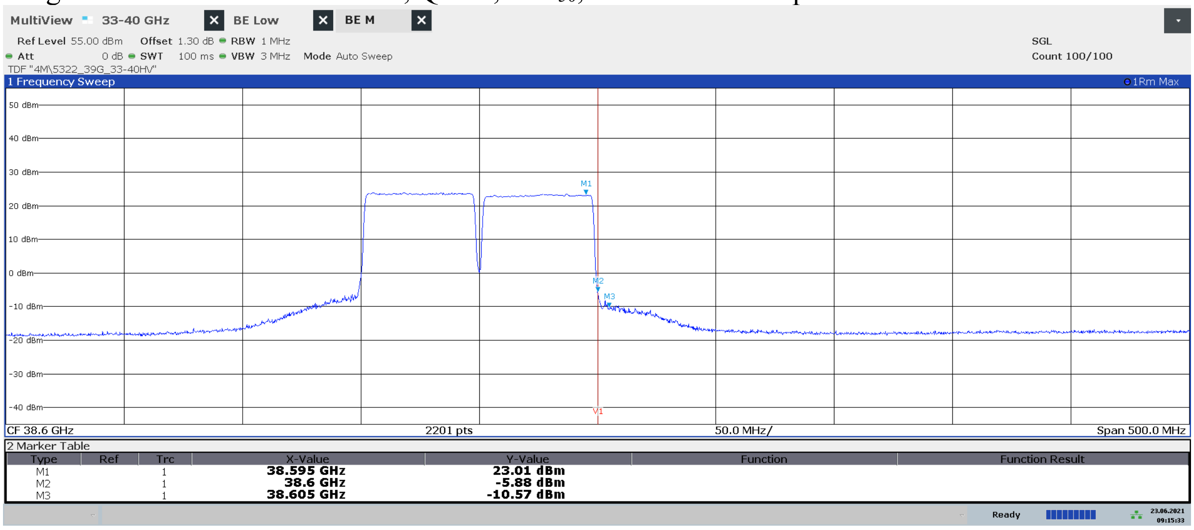
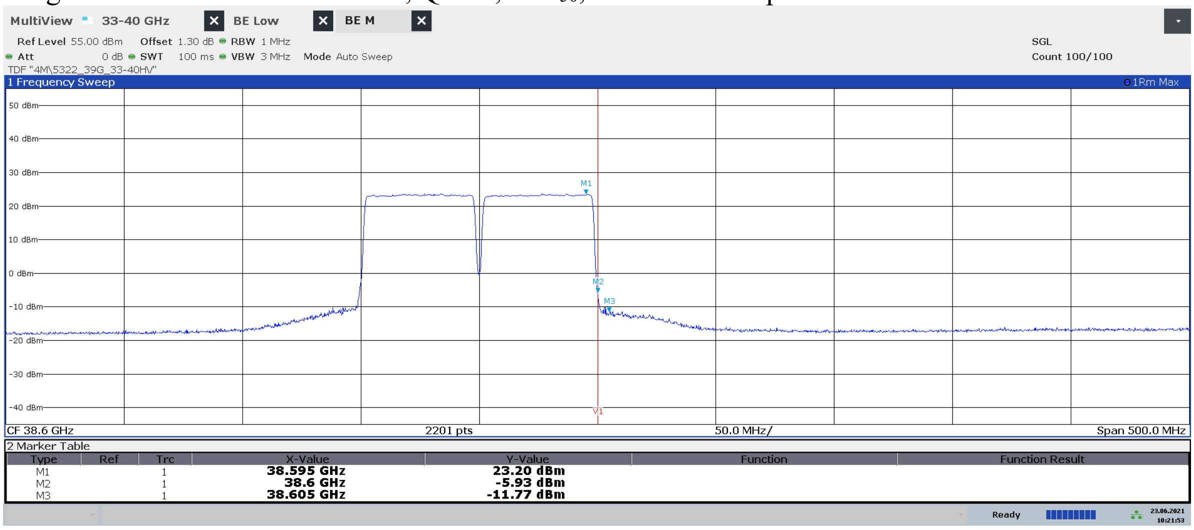


Diagram 2.8a: 38.35 – 38.85 GHz, QPSK, TL2$_{50}$, EIRP Horizontal polarization



09:15:33 23.06.2021

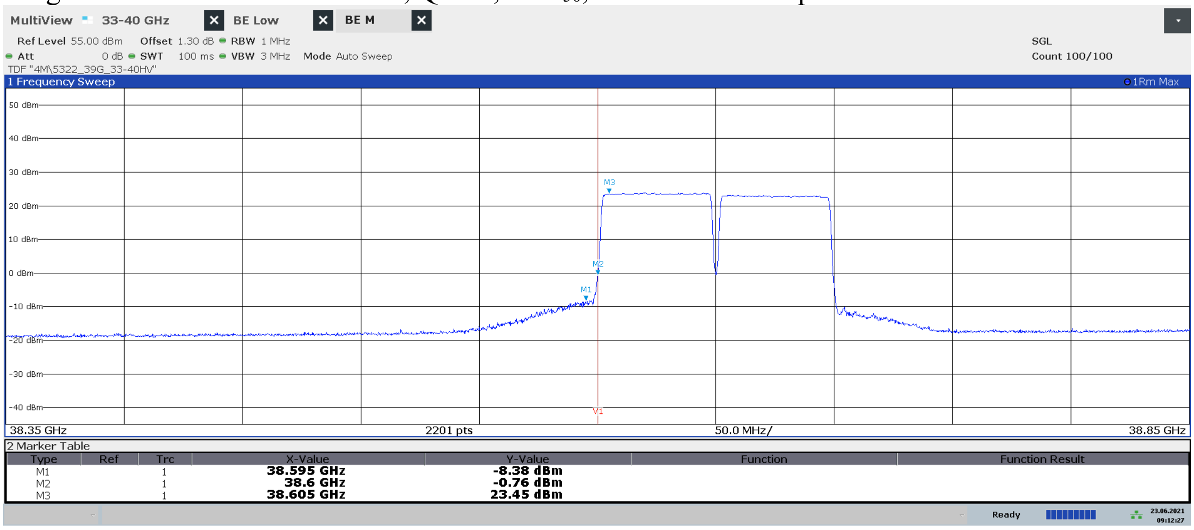
Diagram 2.8b: 38.35 – 38.85 GHz, QPSK, TL2$_{50}$, EIRP Vertical polarization



10:21:53 23.06.2021

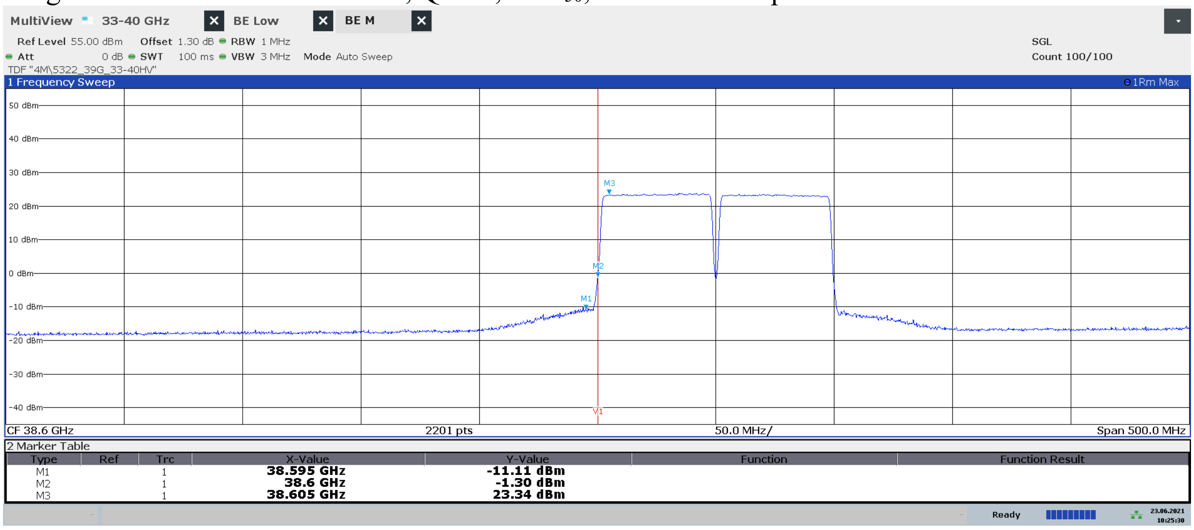
Power EIRP for 38.6 GHz Hor/ Ver [dBm]	Power EIRP for 38.605 GHz Hor/ Ver [dBm]	Antenna Gain Hor/ Ver [dBi]	Total conducted power/BW for 38.6 GHz (Limit -5 dBm) [dBm]/ Verdict	Total conducted power/BW for 38.605 GHz (Limit -13 dBm) [dBm]/ Verdict
-5.88/ -5.93	-10.37/ -11.77	21.47/ 21.46	-24.36/ Pass	-29.47/ Pass

Diagram 2.9a: 38.35 – 38.85 GHz, QPSK, $BH2_{50}$, EIRP Horizontal polarization



09:12:27 23.06.2021

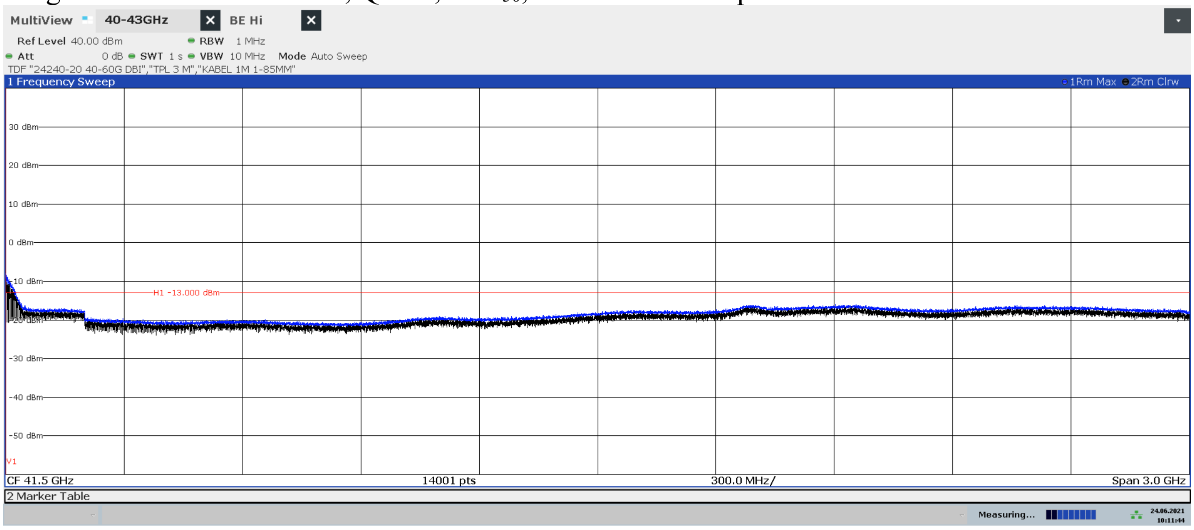
Diagram 2.9b: 38.35 – 38.85 GHz, QPSK, $BH2_{50}$, EIRP Vertical polarization



10:25:30 23.06.2021

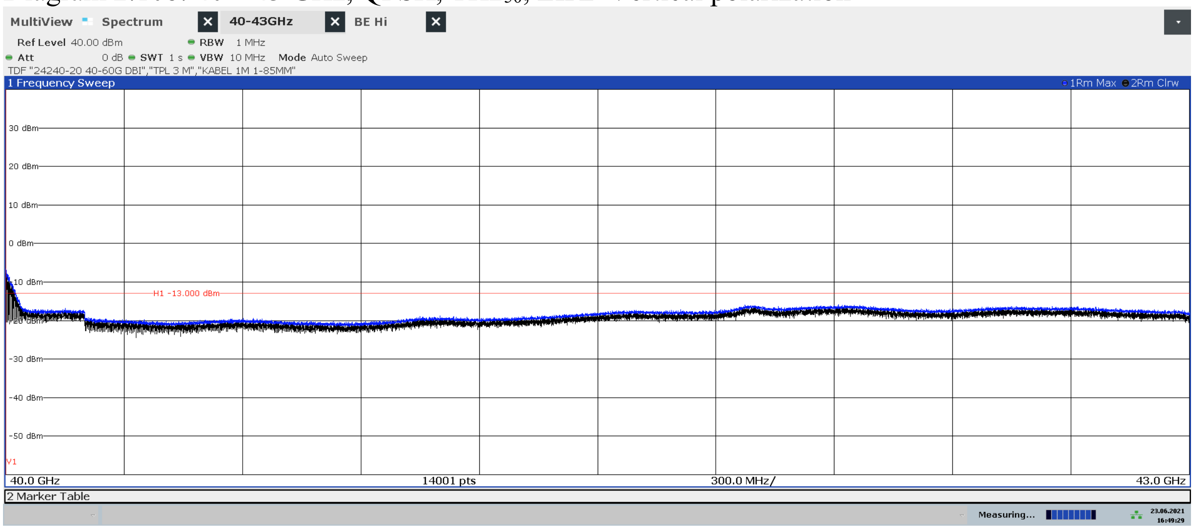
Power EIRP for 38.6 GHz Hor/ Ver [dBm]	Power EIRP for 38.595 GHz Hor/ Ver [dBm]	Antenna Gain Hor/ Ver [dBi]	Total conducted power/BW for 38.6 GHz (Limit -5 dBm) [dBm]/ Verdict	Total conducted power/BW for 38.595 GHz (Limit -13 dBm) [dBm]/ Verdict
-0.76/ -1.30	-8.38/ -11.11	21.47/ 21.46	-19.48/ Pass	-27.99/ Pass

Diagram 2.10a: 40 – 43 GHz, QPSK, $TH2_{50}$, EIRP Horizontal polarization



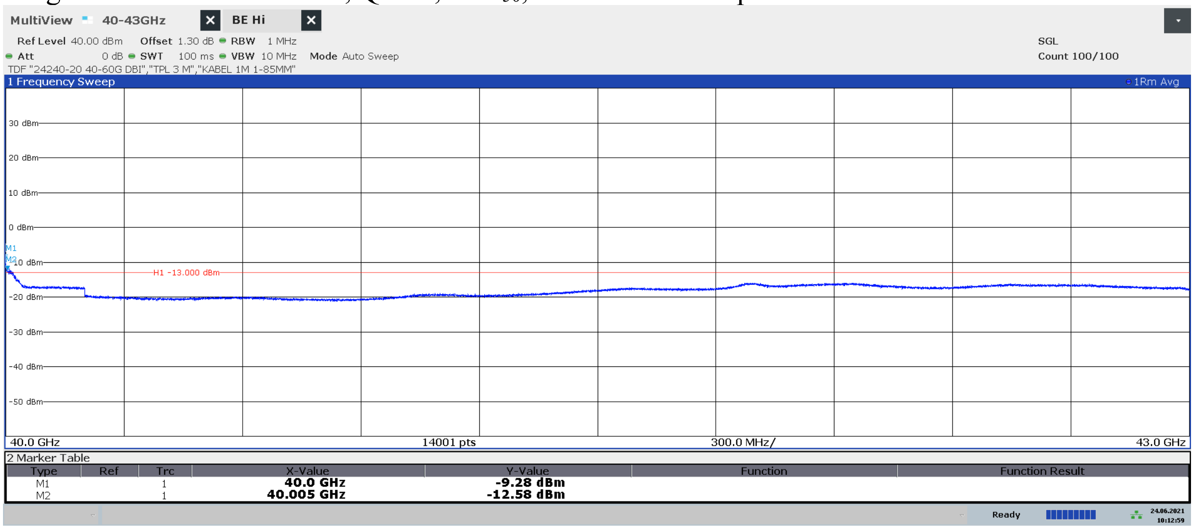
10:11:44 24.06.2021

Diagram 2.10b: 40 – 43 GHz, QPSK, $TH2_{50}$, EIRP Vertical polarization



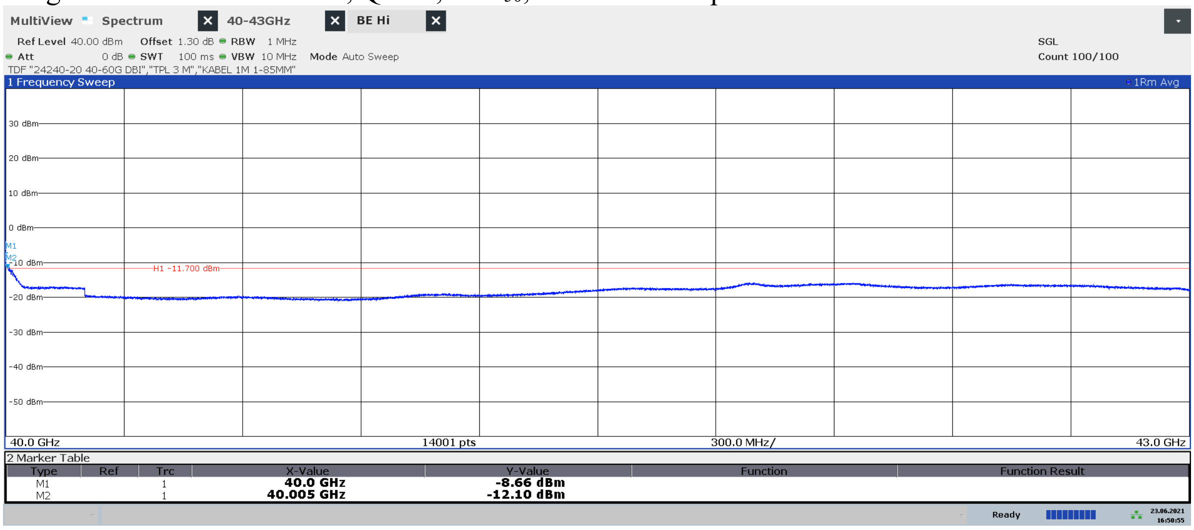
16:49:30 23.06.2021

Diagram 2.10c: 40 – 43 GHz, QPSK, TH2$_{50}$, EIRP Horizontal polarization



10:12:59 24.06.2021

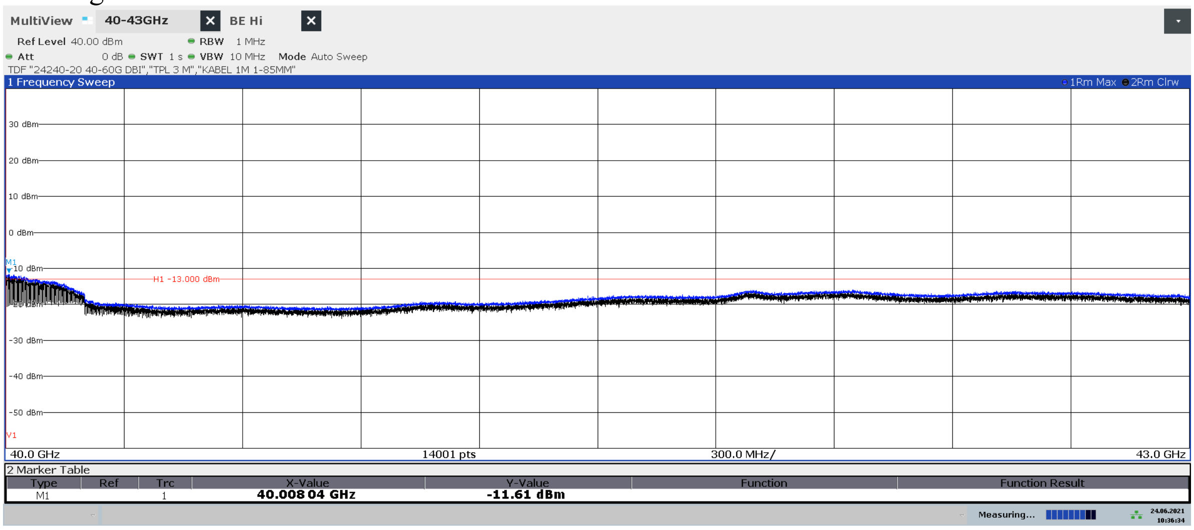
Diagram 2.10d: 40 – 43 GHz, QPSK, TH2$_{50}$, EIRP Vertical polarization



16:50:55 23.06.2021

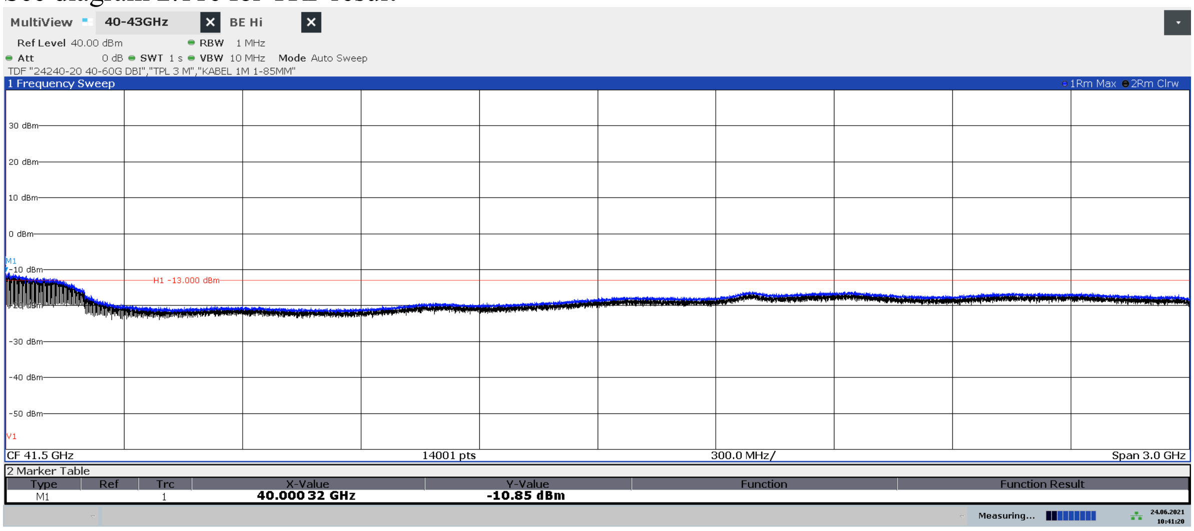
Power EIRP for 40.0 GHz Hor/ Ver [dBm]	Power EIRP for 40.005 GHz Hor/ Ver [dBm]	Antenna Gain Hor/ Ver [dBi]	Total conducted power/BW for 40.0 GHz (Limit -5 dBm) [dBm]/ Verdict	Total conducted power/BW for 40.005 GHz (Limit -13 dBm) [dBm]/ Verdict
-9.28/ -8.66	-12.58/ -12.10	21.73/ 21.88	-27.76/ Pass	-31.13/ Pass

Diagram 2.11a: 40 – 43 GHz, QPSK, $TH8_{100}$, EIRP Horizontal polarization
See diagram 2.11e for TRP result



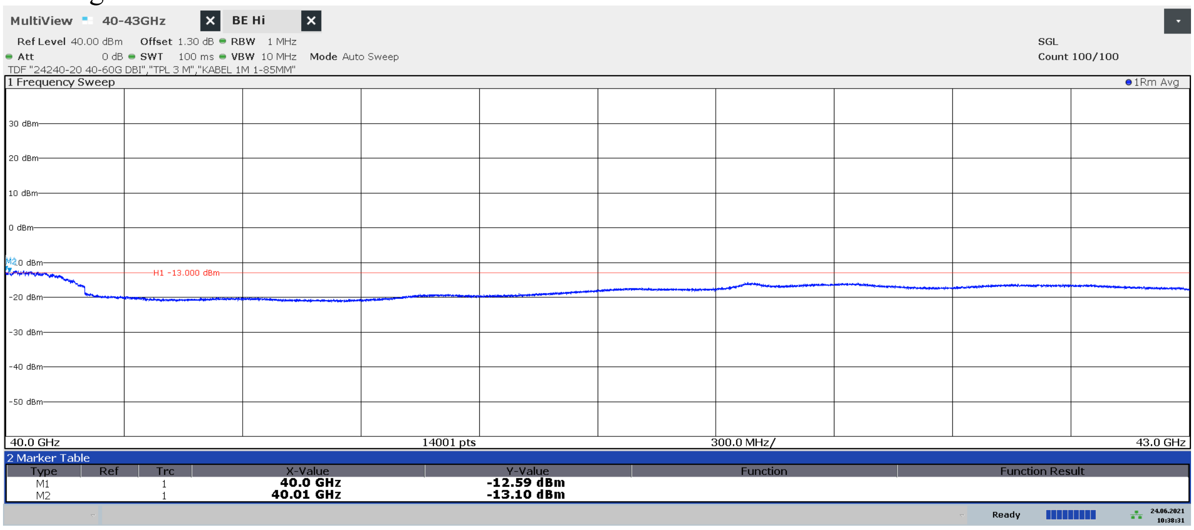
10:36:35 24.06.2021

Diagram 2.11b: 40 – 43 GHz, QPSK, $TH8_{100}$, EIRP Vertical polarization
See diagram 2.11e for TRP result



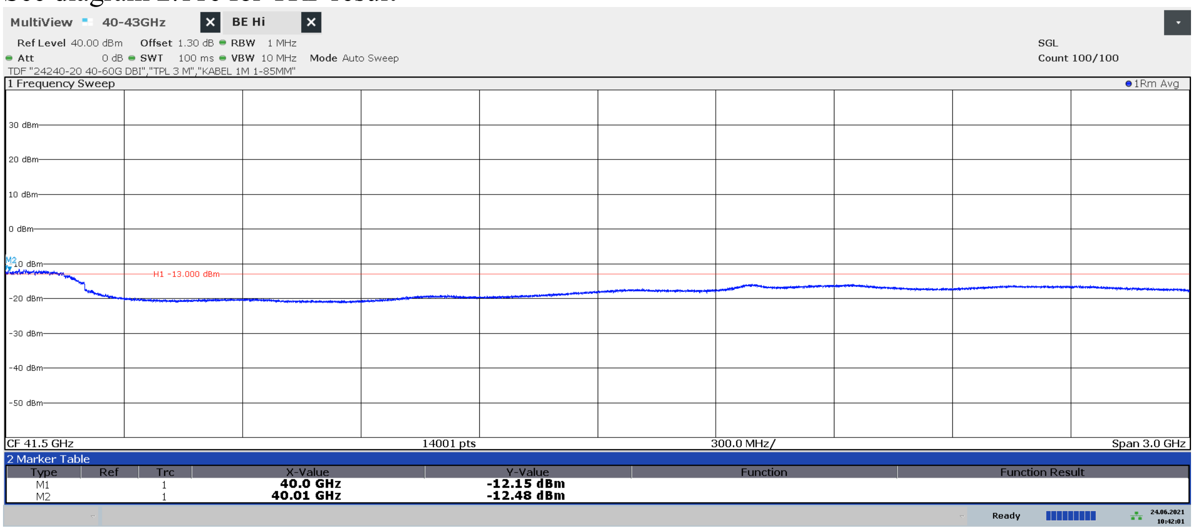
10:41:21 24.06.2021

Diagram 2.11c: 40 – 43 GHz, QPSK, TH8$_{100}$, EIRP Horizontal polarization
See diagram 2.11e for TRP result



10:38:31 24.06.2021

Diagram 2.11d: 40 – 43 GHz, QPSK, TH8$_{100}$, EIRP Vertical polarization
See diagram 2.11e for TRP result



10:42:01 24.06.2021

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
-12.59/ -12.15	-13.10/ -12.48	21.73/ 21.88	-31.16/ Pass	-31.58/ Pass

Diagram 2.11e: Pattern multiplication TRP 40 – 40.3 GHz, QPSK, $TH8_{100}$

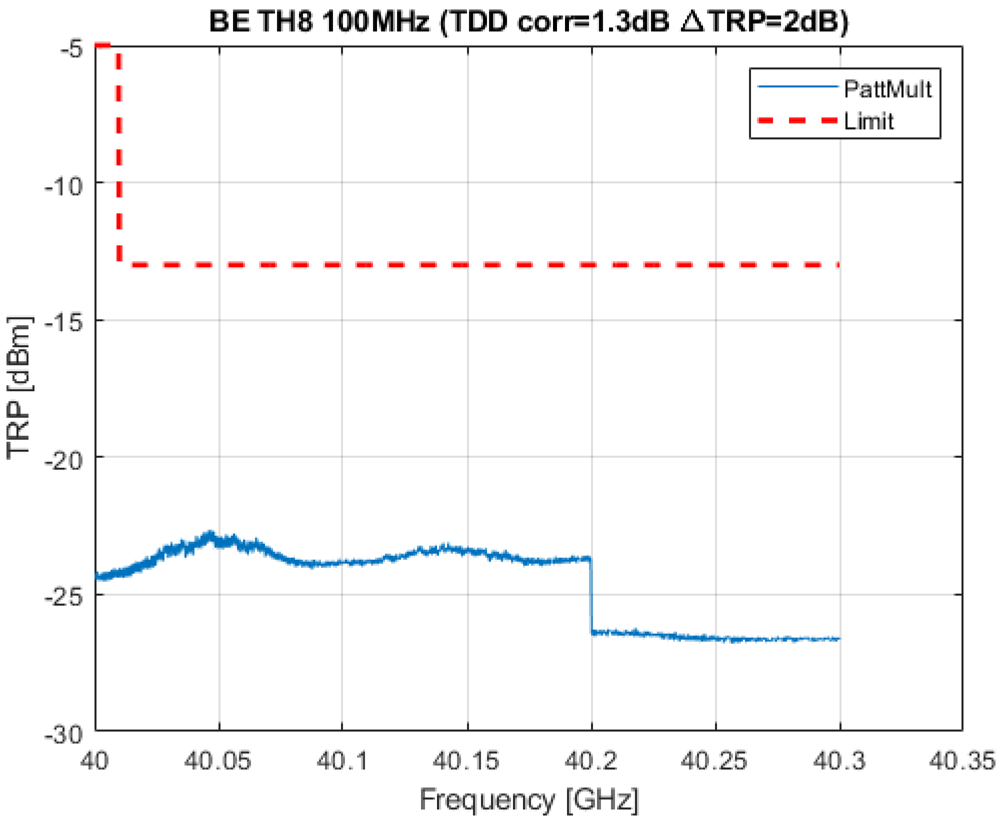
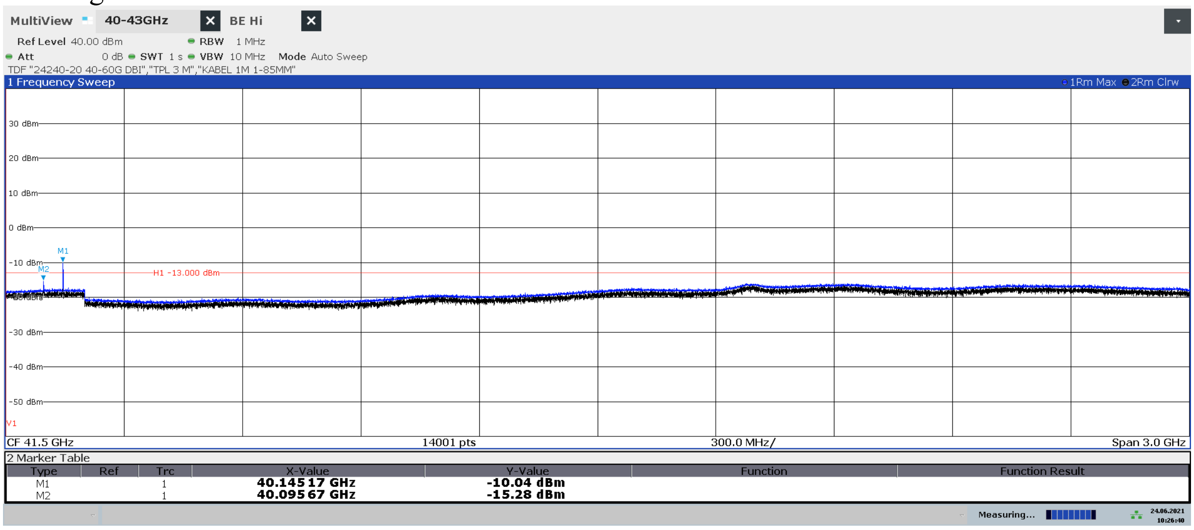


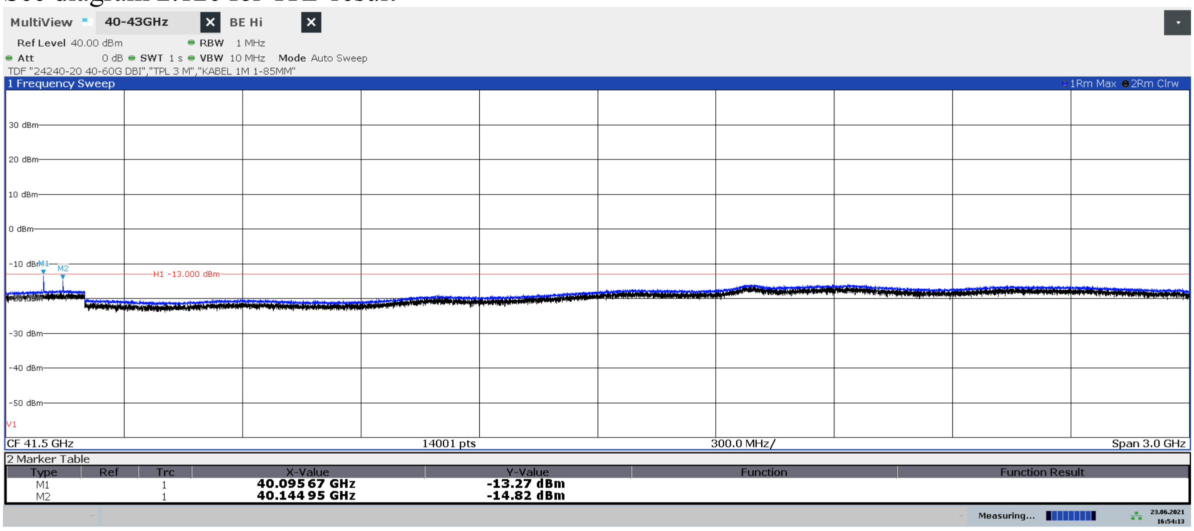
Diagram 2.12a: 40 – 43 GHz, QPSK, $BL2_{50}$, EIRP Horizontal polarization
See diagram 2.12c for TRP result



Type	Ref	Trc	X-Value	Y-Value	Function	Function Result
M1		1	40.145 17 GHz	-10.04 dBm		
M2		1	40.095 67 GHz	-15.28 dBm		

10:26:41 24.06.2021

Diagram 2.12b: 40 – 43 GHz, QPSK, $BL2_{50}$, EIRP Vertical polarization
See diagram 2.12c for TRP result



Type	Ref	Trc	X-Value	Y-Value	Function	Function Result
M1		1	40.095 67 GHz	-13.27 dBm		
M2		1	40.144 95 GHz	-14.82 dBm		

16:54:13 23.06.2021

Diagram 2.12c: 40 – 40.2 GHz, QPSK, $BL2_{50}$, Two cut TRP

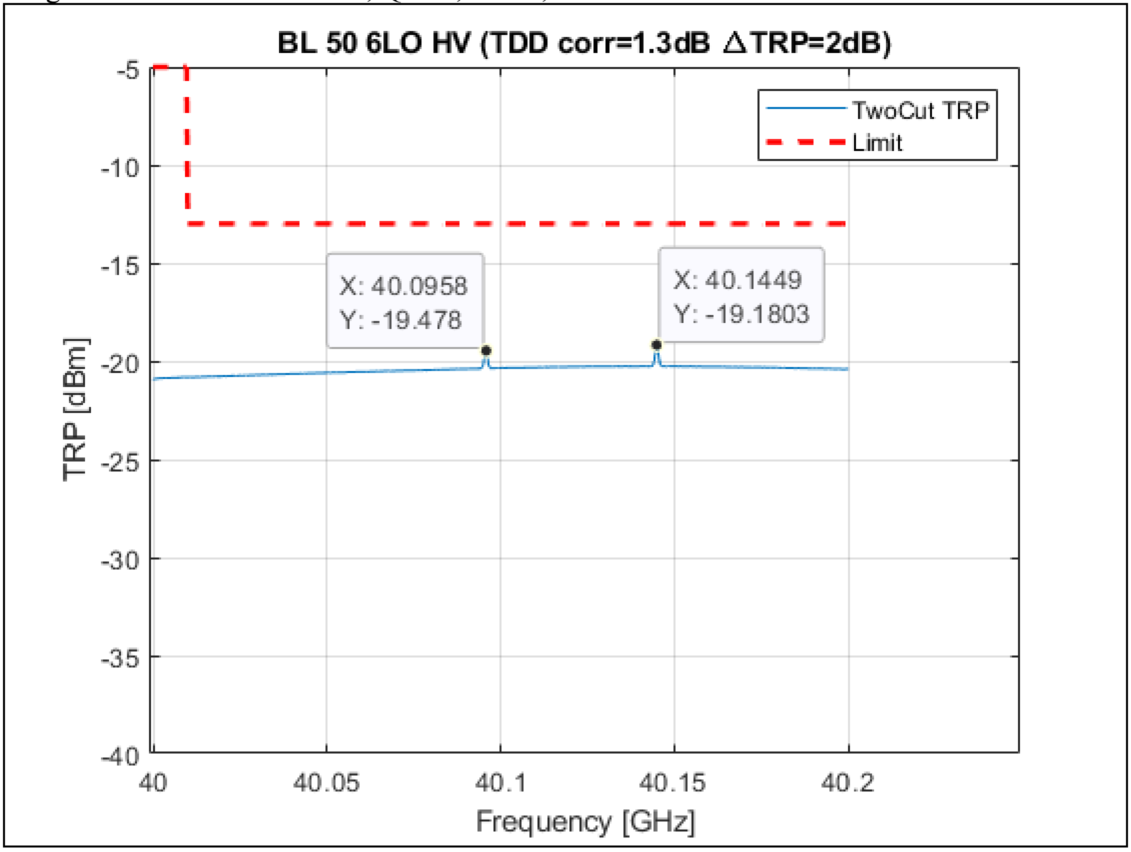
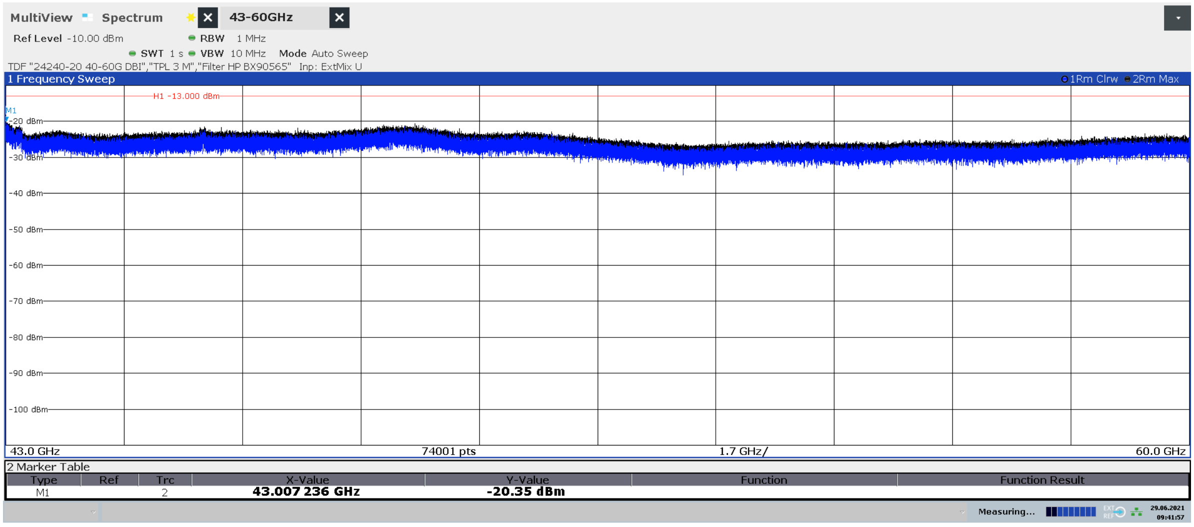
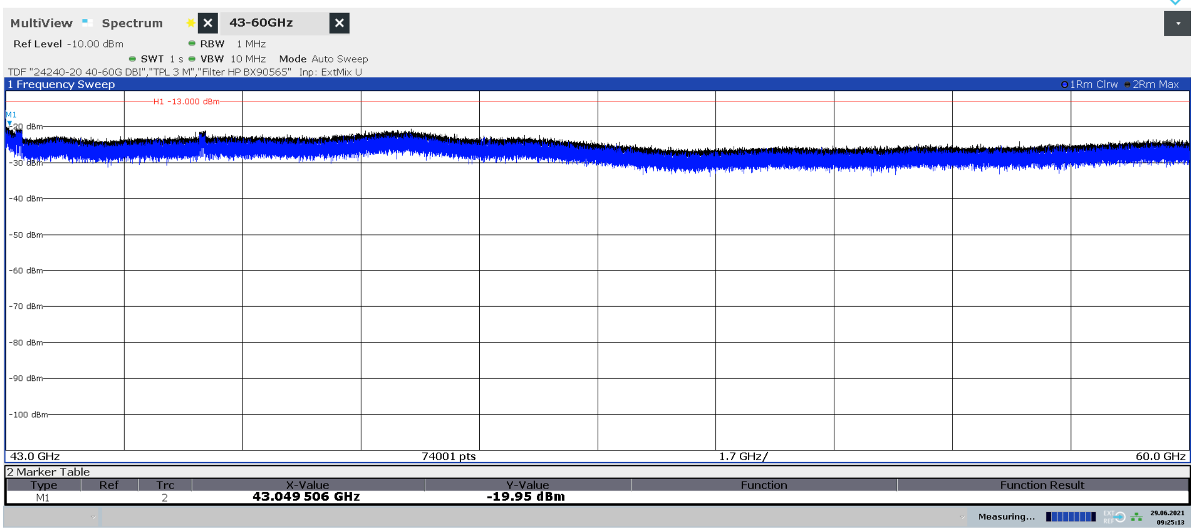


Diagram 2.13a: 43 – 60 GHz, QPSK, $BL2_{50}$, EIRP Horizontal polarization



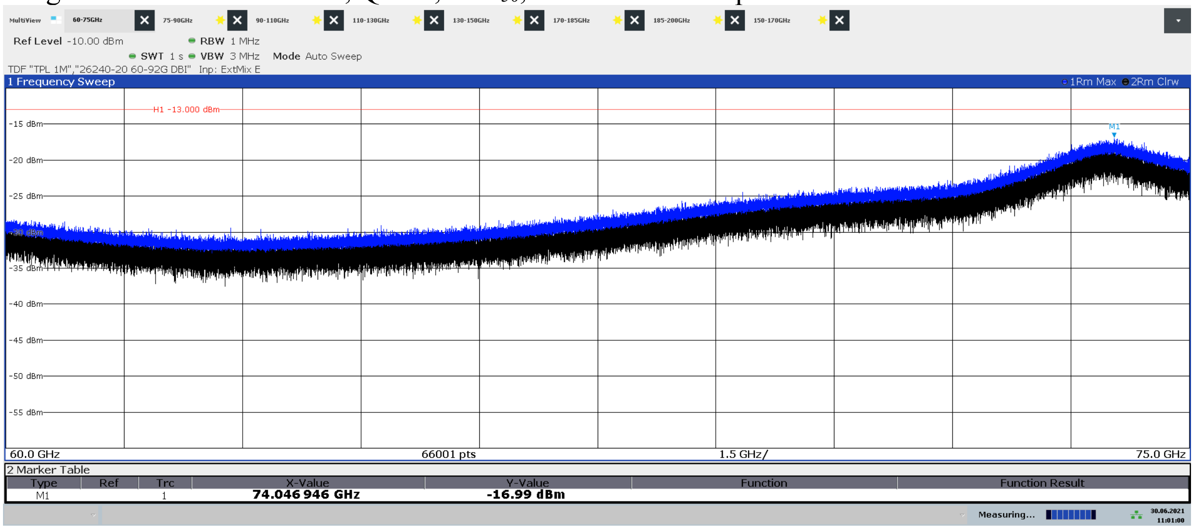
09:41:57 29.06.2021

Diagram 2.13b: 43 – 60 GHz, QPSK, $BL2_{50}$, EIRP Vertical polarization



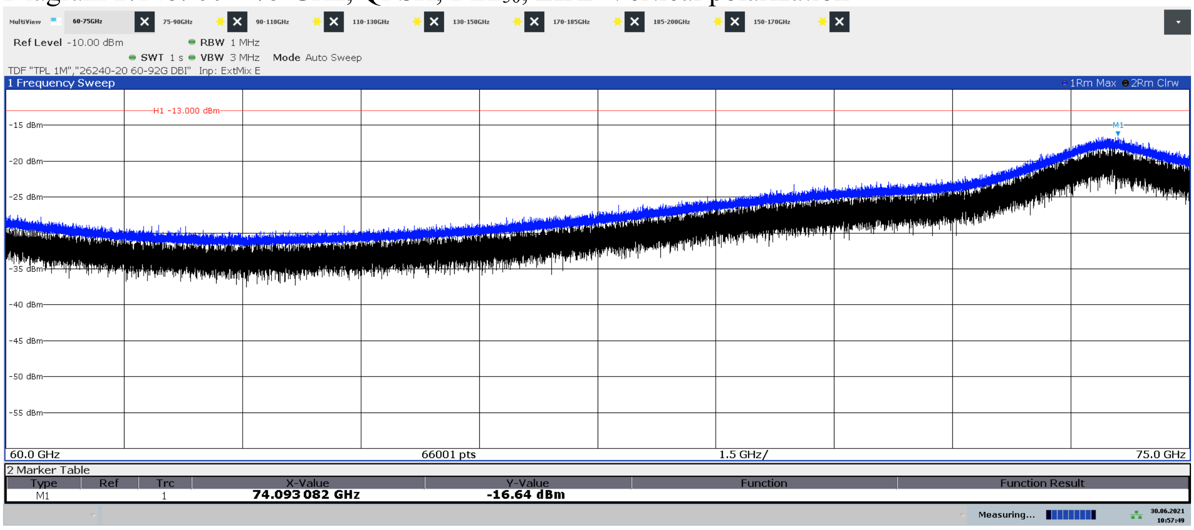
09:25:13 29.06.2021

Diagram 2.14a: 60 – 75 GHz, QPSK, BL2$_{50}$, EIRP Horizontal polarization



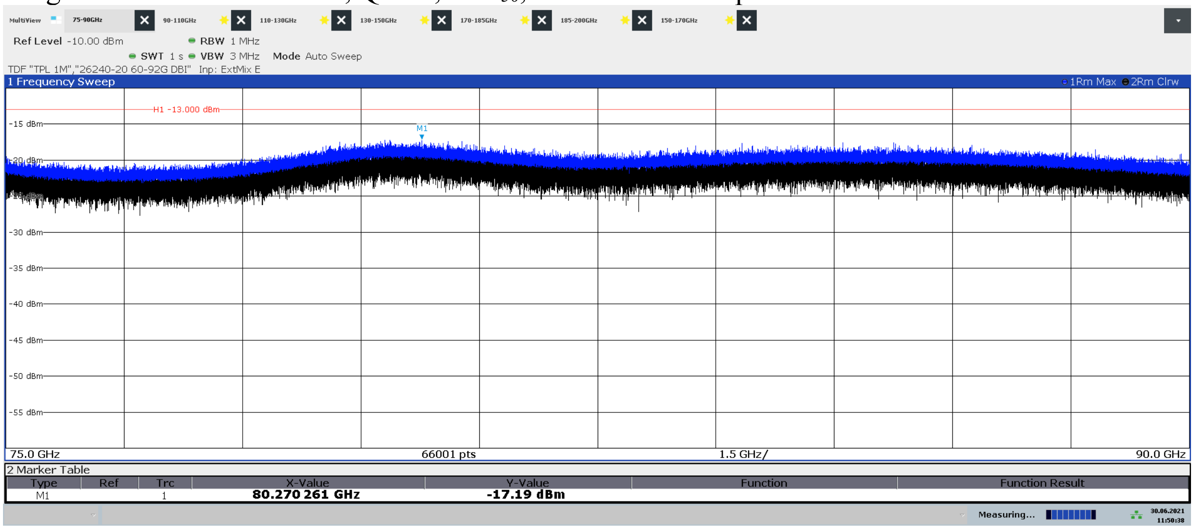
11:01:00 30.06.2021

Diagram 2.14b: 60 – 75 GHz, QPSK, BL2$_{50}$, EIRP Vertical polarization



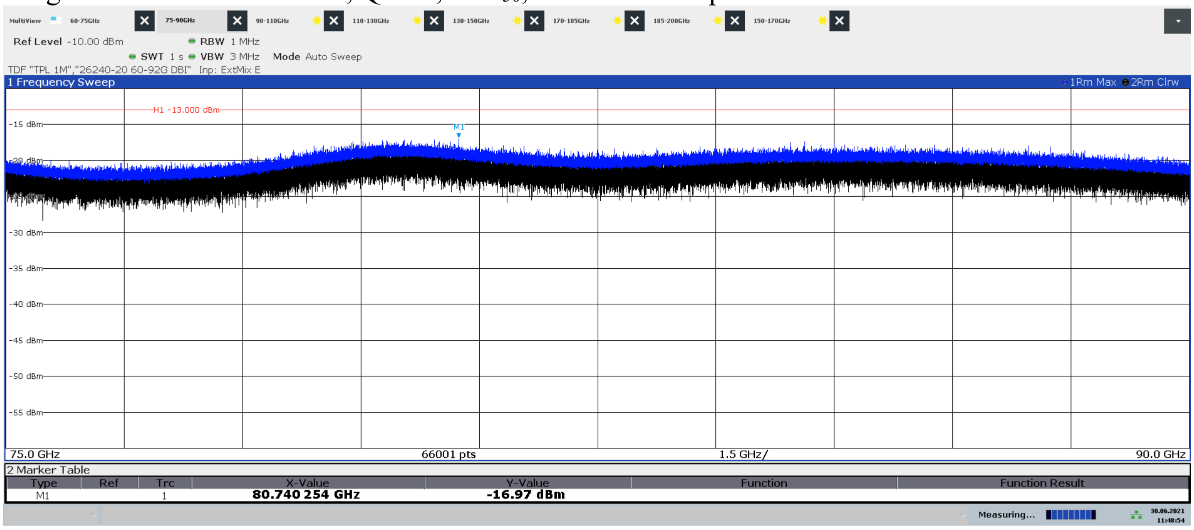
10:57:49 30.06.2021

Diagram 2.15a: 75 – 90 GHz, QPSK, BL2$_{50}$, EIRP Horizontal polarization



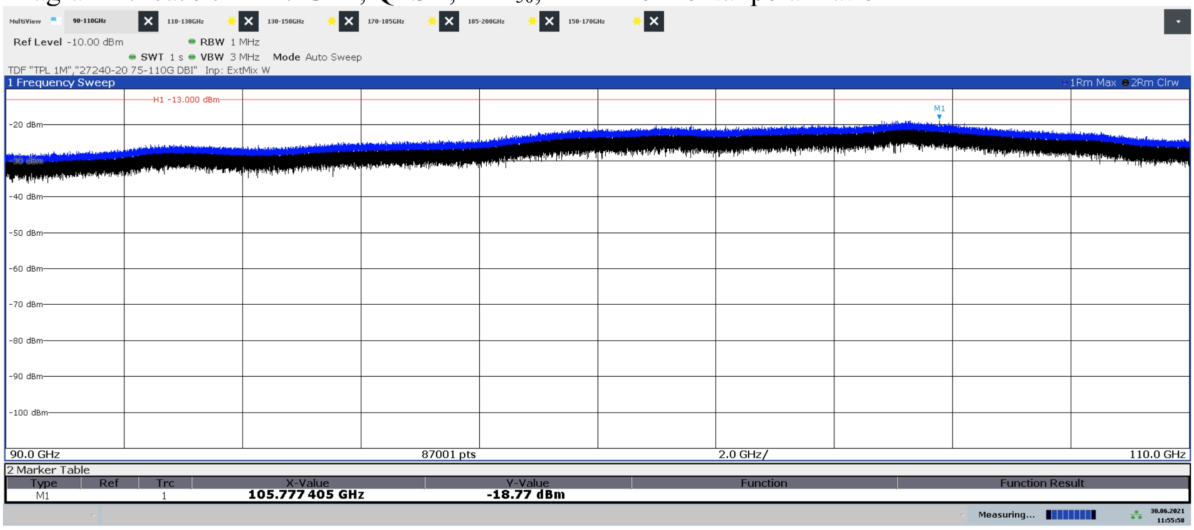
11:50:39 30.06.2021

Diagram 2.15b: 75 – 90 GHz, QPSK, BL2$_{50}$, EIRP Vertical polarization



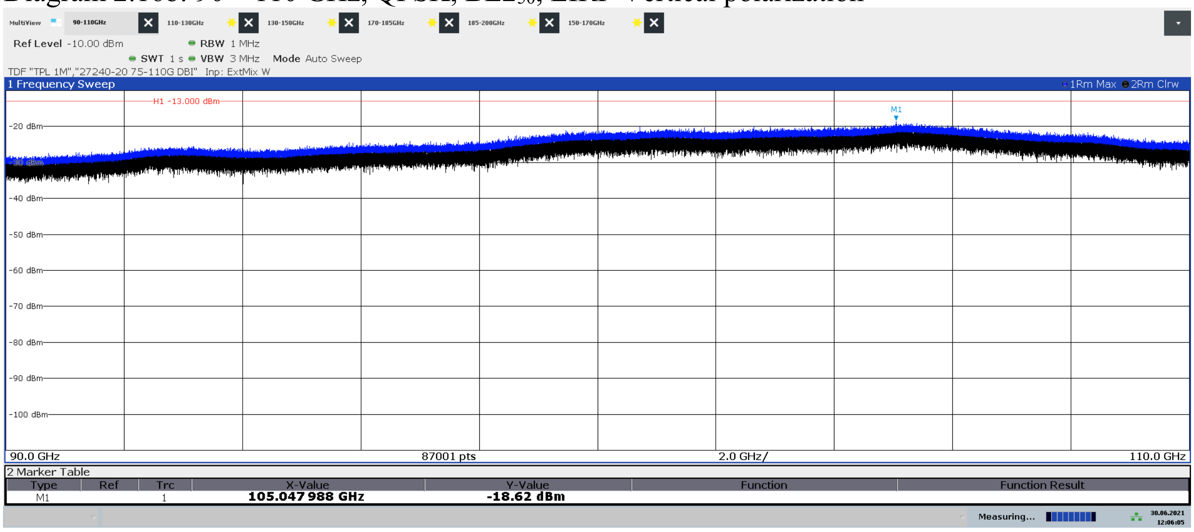
11:48:54 30.06.2021

Diagram 2.16a: 90 – 110 GHz, QPSK, BL2$_{50}$, EIRP Horizontal polarization



11:55:58 30.06.2021

Diagram 2.16b: 90 – 110 GHz, QPSK, BL2$_{50}$, EIRP Vertical polarization



12:06:05 30.06.2021

Diagram 2.17a: 110 – 130 GHz, QPSK, BL2$_{50}$, EIRP Horizontal polarization

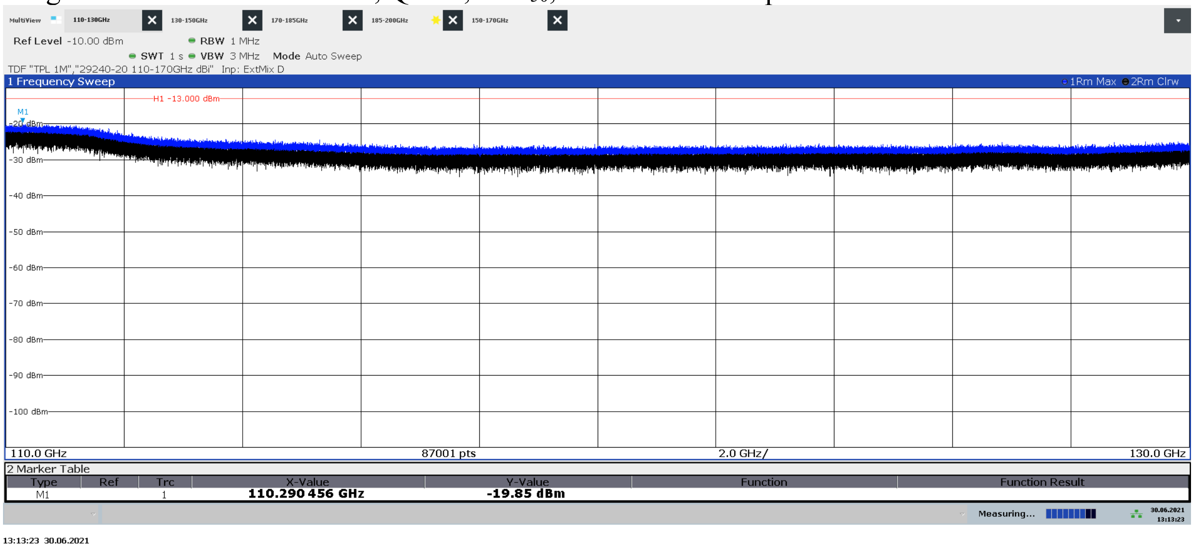


Diagram 2.17b: 110 – 130 GHz, QPSK, BL2$_{50}$, EIRP Vertical polarization

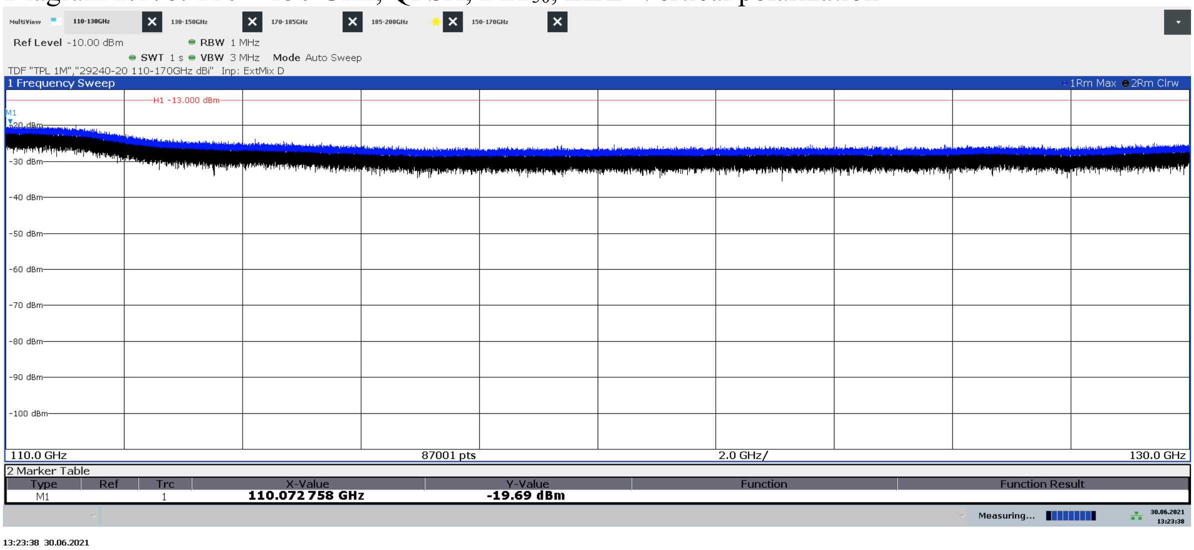
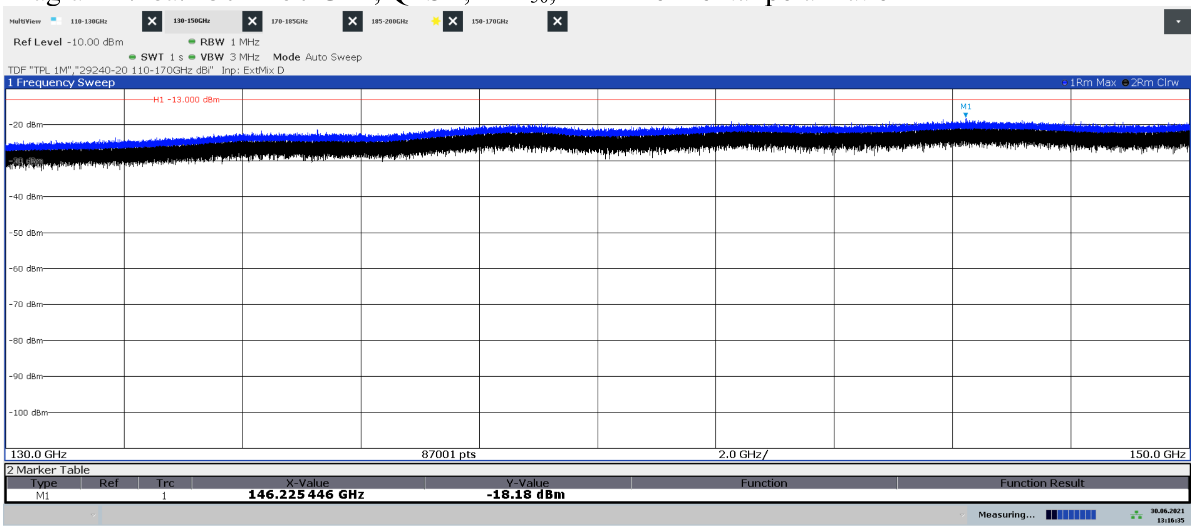
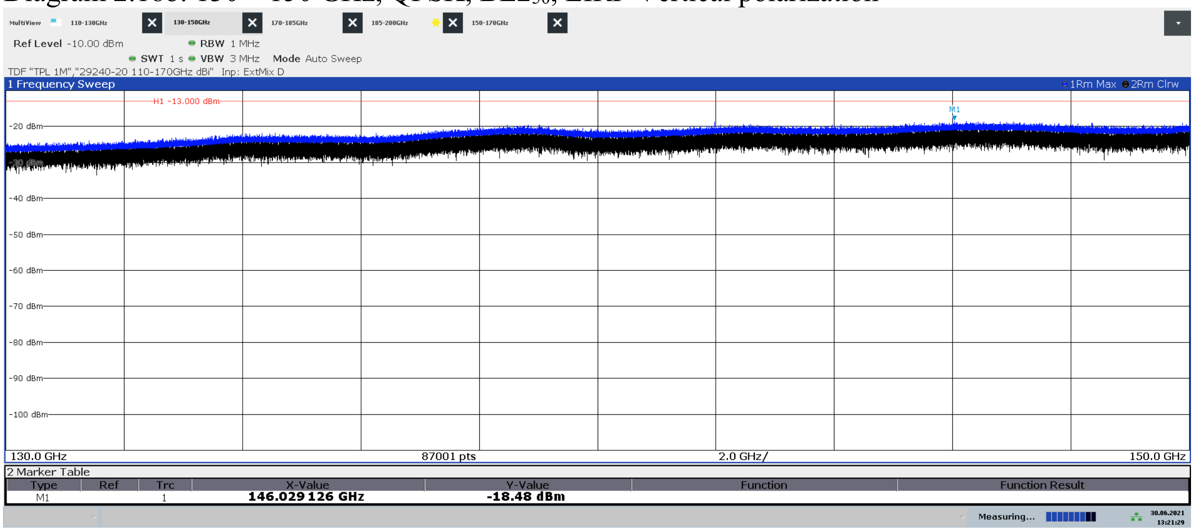


Diagram 2.18a: 130 – 150 GHz, QPSK, $BL2_{50}$, EIRP Horizontal polarization



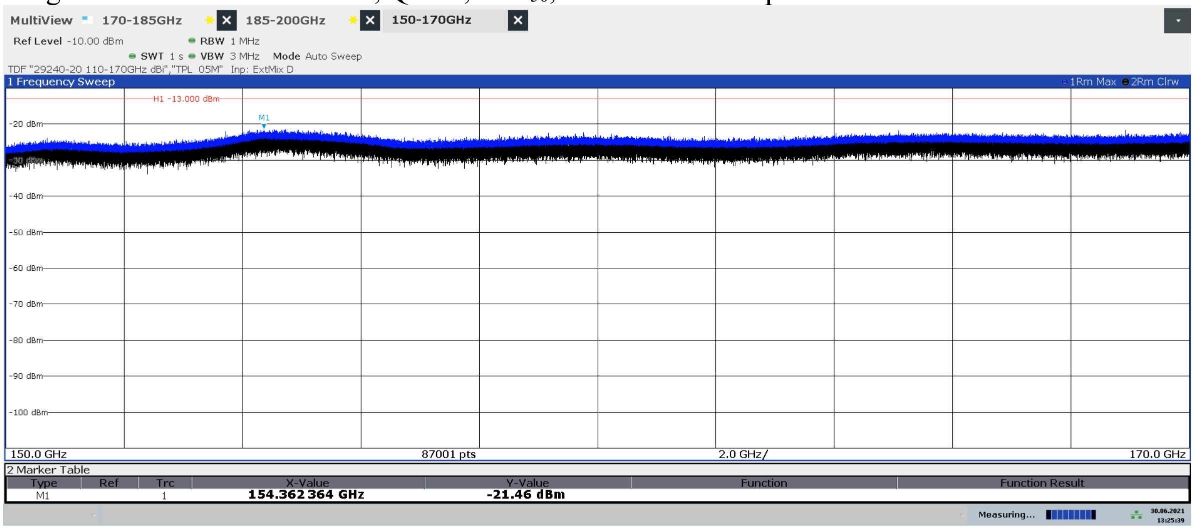
13:16:36 30.06.2021

Diagram 2.18b: 130 – 150 GHz, QPSK, $BL2_{50}$, EIRP Vertical polarization



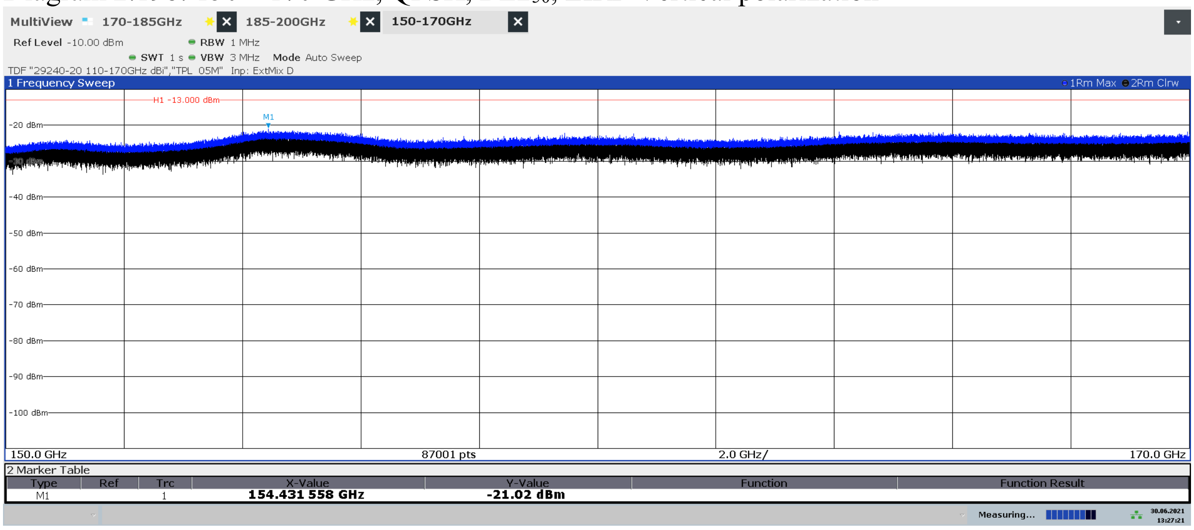
13:21:30 30.06.2021

Diagram 2.19a: 150 – 170 GHz, QPSK, BL2$_{50}$, EIRP Horizontal polarization



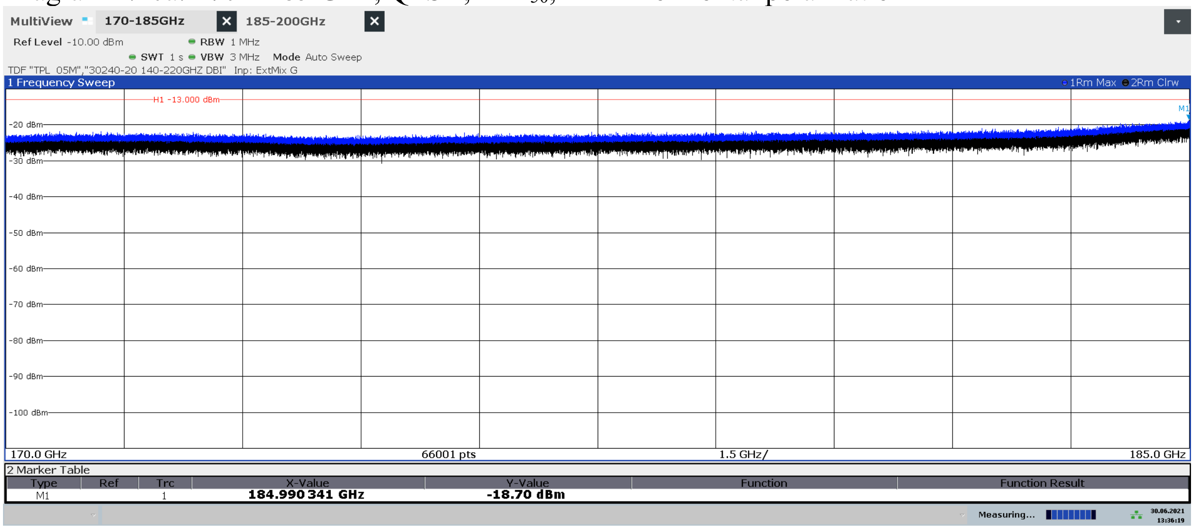
13:25:39 30.06.2021

Diagram 2.19b: 150 – 170 GHz, QPSK, BL2$_{50}$, EIRP Vertical polarization



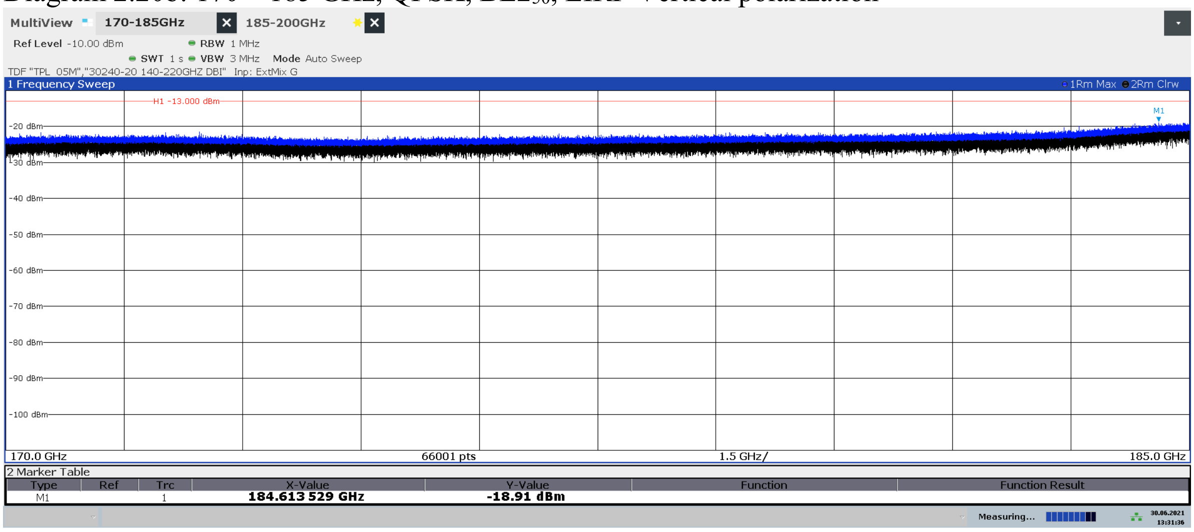
13:27:22 30.06.2021

Diagram 2.20a: 170 – 185 GHz, QPSK, $BL2_{50}$, EIRP Horizontal polarization



13:36:19 30.06.2021

Diagram 2.20b: 170 – 185 GHz, QPSK, $BL2_{50}$, EIRP Vertical polarization



13:31:36 30.06.2021

Diagram 2.21a: 185 – 200 GHz, QPSK, BL2$_{50}$, EIRP Horizontal polarization

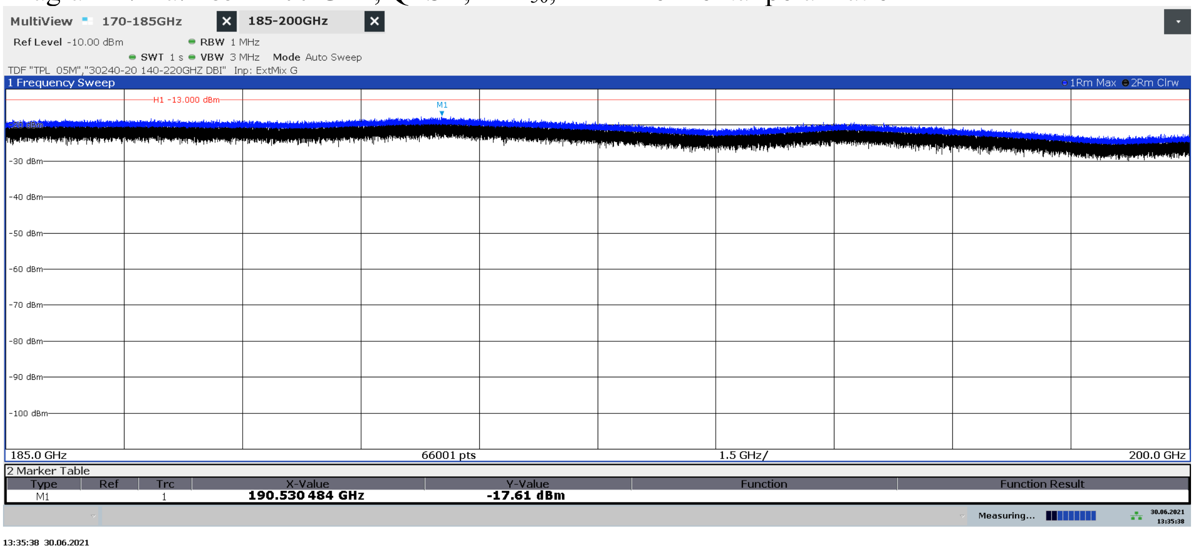
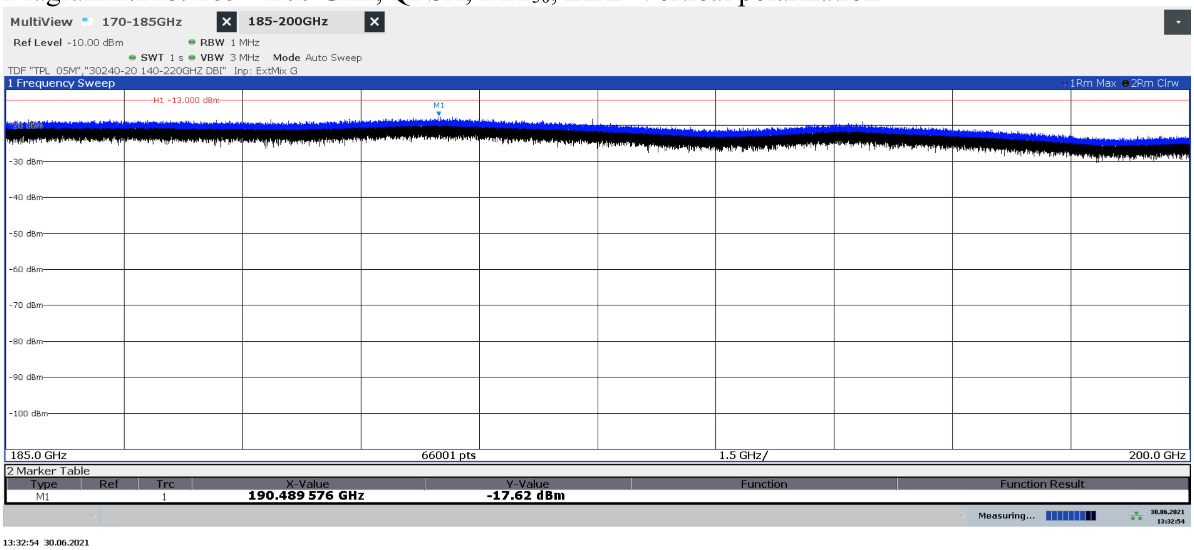


Diagram 2.21b: 185 – 200 GHz, QPSK, BL2$_{50}$, EIRP Vertical polarization



Frequency stability measurements according to 47 CFR §2.1055

Date	Temperature (test equipment)	Humidity (test equipment)
2021-12-16	23 °C ± 3 °C	37 % ± 5 %
2021-12-17	23 °C ± 3 °C	35 % ± 5 %
2021-12-20	23 °C ± 3 °C	30 % ± 5 %

Test set-up and procedure

The measurements were made per definition in ANSI C63.26, 5.6.

A temperature chamber with a RF transparent door was used and a measurement antenna was aligned outside the temperature chamber. The option NR 5G downlink measurements K144 in the spectrum analyser was used to demodulate the signal and report the frequency error.

Measurement equipment	RISE number
R&S FSW 43	902 073
RF Cable	BX50236
EMCO Horn Antenna 3116	503 279
Temperature Chamber	503 360
Testo 635, temperature and humidity meter	504 203
Multimeter Fluke 87	502 190

Results

Nominal transmitter frequency was 37025.04 MHz (BL) with a bandwidth of 50 MHz.

Test conditions		Frequency error (Hz)
Supply voltage AC (V)	Temp. (°C)	
102	+20	-53
138	+20	-53
120	+20	-50
120	+30	-57
120	+40	-55
120	+50	-57
120	+10	-57
120	0	+56
120	-10	-51
120	-20	-57
120	-30	-55
Maximum freq. error (Hz)		57
Measurement uncertainty		$< \pm 1 \times 10^{-7}$

Remark

The frequency stability performance is sufficient to ensure that the fundamental emission stays within the authorized frequency band.

End of report.