TEST REPORT
Title 47-Telecommunication

Chapter I - Federal Communications Commission - Subchapter A - General
Part 15 - Radio Frequency Devices
Subpart C - Intentional radiators
Subpart E - Unlicensed national information infrastructure devices

Report Reference No.....:	326494-4TRFFCC		
Tested by (name, function and signature).....:	P. Barbieri	(project handler)	
Approved by (name, function and signature).....:	G. Curioni	(verifier)	
Date of issue.....:	2017-03-23		
Testing Laboratory.....:	**Nemko Spa**		
Address.....:	Via del Carroccio, 4 – 20853 Biassono (MB) – Italy		
Testing location	Nemko Spa		
Address.....:	Via del Carroccio, 4 – 20853 Biassono (MB) – Italy		
Registration number:	481407		
Applicant's name.....:	**Paradox Engineering SA**		
Address.....:	Via Passeggiata, 7 – CH-6883 Novazzano – Switzerland		
Test specification:			
Standard.....:	FCC CFR 47 Part 15 Subpart C and Subpart E		
	§15.205 – Restricted bands of operation		☒
	§15.209 – Radiated emission limits; general requirements		☒
	§15.407 (b) – Undesirable emission limits		☒
Test procedure.....:	Nemko WM L0077, WM L0177 and WM L1002		
Test Report Form No.....:	FCCTRF		
TRF Originator.....:	Nemko Spa		
Master TRF.....:	2014-03		

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Test item description ..... :	**Gateway**
Trade Mark.....:	PARADOX ENGINEERING
Manufacturer.....:	Paradox Engineering SA
Address of manufacturer.....:	Via Passeggiata, 7 – CH-6883 Novazzano – Switzerland
Model.....:	PE.AMI-GW920
Ratings.....:	100-240 V ~ 50/60 Hz

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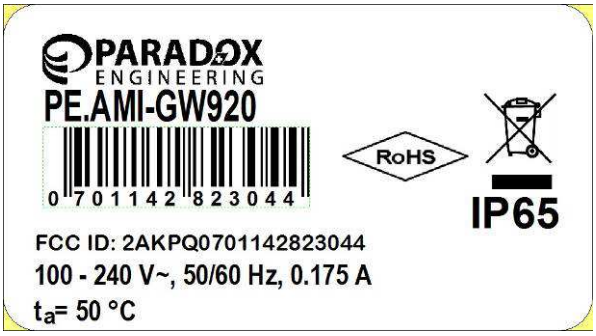
The test report merely corresponds to the tested sample.
The phase of sampling / collection of equipment under test is carried out by the customer.

This Test Report, when bearing the Nemko name and logo is only valid when issued by a Nemko laboratory, or by a laboratory having special agreement with Nemko.

Test Report No. : 326494-4TRFFCC	2017-03-23 Date of issue

Short description of the EuT	Copy of marking plate
The EUT is a gateway equipped with following radio modules: 1) ELB-PED-0077 (radio narrowband 902-928 MHz) 2) WLE600VX (Wi-Fi cards 2412-2472 MHz and 5745-5825 MHz) The EUT is also provided with the following antennas: 1) MEGWX-1551SAAX-920 (902-928 MHz) 2) OM24580703 (2412-2472 MHz) 3) MT-485001 (5745-5825 MHz)	

Number of tested samples:	1
Serial number:	1704PE000030
Device type:	Pale Mounting
Accessories and detachable parts included:	The EUT is composed by a single unit with three antennas
Other options included:	-

Testing

Date of receipt of test sample:	2017-03-17
Testing commenced on:	2017-03-20
Testing concluded on:	2017-03-23

Possible test case verdicts:

test case does not apply to the test object:	N (Not applicable)
test object does meet the requirement:	P (Pass)
test object does not meet the requirement:	F (Fail)

Symbols used in this test report

☒ The crossed square indicates that the listed condition or equipment is applicable for this report.

☐ The empty square indicates that the listed condition or equipment is not applicable for this report.

The results contained in this report reflect the results for this particular model and serial number. It is the responsibility of the manufacturer to ensure that all production models meet the intent of the requirements detailed within this report.

Verdict according to the standards listed at page 5:	**Pass**

PROJECT HISTORY		
Report number	**Modification to the report / comments**	**Date**
326494-4TRFFCC	First release	2017-03-23
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REMARKS		

PRODUCT VARIANTS		
Variant model	**Difference against the main model**	**Additional test performed**
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REMARKS		

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1 TEST STANDARDS

The tests were performed according to following standards and procedures.

NEMKO WM L0177: General routines for using instruments at Nemko

NEMKO WM L1002: Measurement Uncertainty - Policy and Statement

NEMKO WM L0077: General routines to perform EMC tests

FCC CFR 47 Part 15 Subpart C
Code of Federal Regulations – Title 47 – Part 15 Radio Frequency Devices – Subpart C Intentional radiation

FCC CFR 47 Part 15 Subpart E
Code of Federal Regulations – Title 47 – Part 15 Radio Frequency Devices – Subpart E Unlicensed national information infrastructure devices

The main standard above contains references to other standards, which are listed below.

ANSI C63.10 (2013)
American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices

2 SUMMARY OF TEST RESULTS

FCC Part 15 Subpart B requirements			
Part	**Test description**	**Frequency range**	**Verdict**
§15.205	Restricted bands of operation	30 MHz to 40 GHz	P
§15.209	Radiated emission limits; general requirements	30 MHz to 40 GHz	P
§15.407 (b)	Undesirable emission limits	30 MHz to 40 GHz	P
GENERAL REMARKS			

3 EQUIPMENT UNDER TEST

3.1 Power supply system utilised

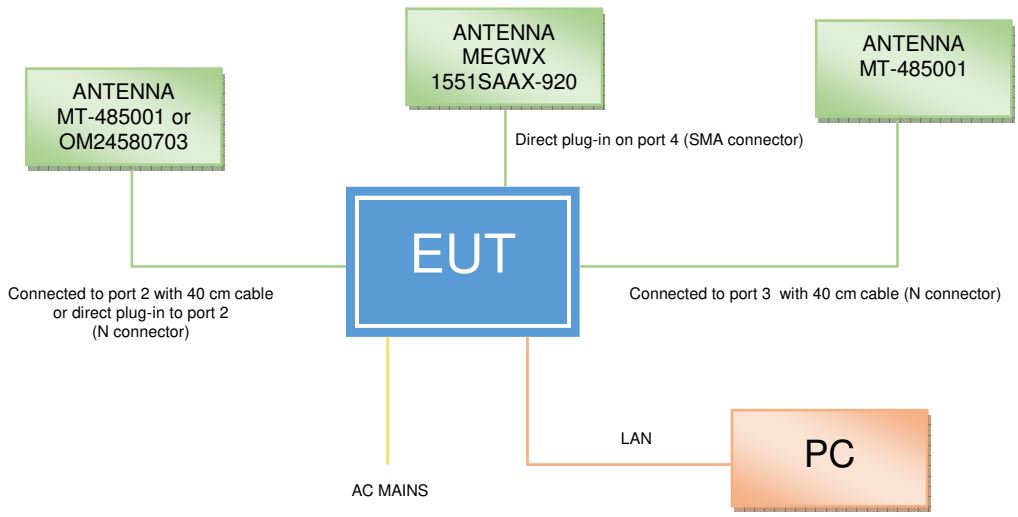
Power supply voltage:	☐	230V/50 Hz / 1ϕ	☒	115V/60Hz / 1ϕ
	☐	400V/50 Hz 3PE	☐	400V/50 Hz 3NPE
	☐	12 VDC	☐	24 VDC

3.2 EuT operation modes

Mode	Description
1	TX mode with PORT 2 set at 5805 MHz 802.11a 6 Mbps (antenna MT-485001), PORT 3 set at 5825 MHz 802.11a 6 Mbps (antenna MT-485001) and PORT 4 set at 915 MHz (antenna MEGWS-1551SAAX-920)
2	TX mode with PORT 2 set at 2437 MHz 802.11b 1 Mbps (antenna OM24580703), PORT 3 set at 5825 MHz 802.11a 6 Mbps (antenna MT-485001) and PORT 4 set at 915 MHz (antenna MEGWS-1551SAAX-920)

3.3 EuT configuration modes

The EuT was configured to measure its highest possible radiation level. The test modes selected are according to EuT instruction manual.

Mode	Description
1	

3.4 Input/Output Ports

Port	Name	Type*	Cable Max. >3m	Cable Shielded	Description
0	ENCLOSURE	N/E	—	—	—
1	AC MAINS	AC	☐	☐	Three wires cable
2	LAN	TP	☒	☐	Standard cable with RJ 45 connector
3	ANTENNA PORT 2	ANT	☒	☒	Coaxial cable or direct plug-in (N connector)
4	ANTENNA PORT 3	ANT	☒	☒	Coaxial cable (N connector)
5	ANTENNA PORT 4	ANT	☐	☐	Direct plug-in (SMA connector)

*Note:

AC = AC Power Port DC = DC Power Port N/E = Non-Electrical

I/O = Signal/Control Input or Output Port TP = Telecommunication Port ANT = Antenna Port

3.5 Equipment Used During Test

Use*	Product Type	Manufacturer	Model	Comments
AE	PC	HP	Compaq 6510b	—

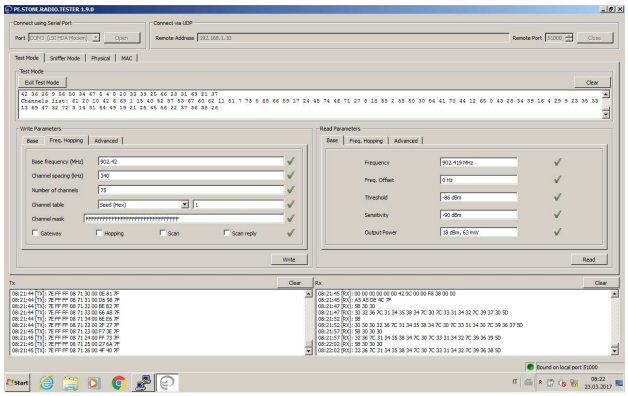
Note: * Use

EUT - Equipment Under Test

AE - Auxiliary/Associated Equipment (Not Subjected to Test)

SIM - Simulator (Not Subjected to Test)

3.6 Software Used During Test



The tx power parameter has been set to 18 for ELB-PED-0077 radio module, to 18 for WLE600VX radio module at 5 GHz and to 23 for radio module at 2.4 GHz, according to applicant's request.

4 TEST ENVIRONMENT

4.1 Address of the test laboratory

Nemko Spa
Via del Carroccio, 4
20853 Biassono (MB) - Italy

Tests site/benches are in accordance with applicable standard/s, and have been utilized by Nemko Spa testing engineer(s).

4.2 Environmental conditions

Unless different values are declared in the test case, following ambient conditions apply for the tests:

Ambient temperature: 18÷33 °C

Relative Humidity: 30÷60 %

Atmospheric pressure: 980÷1060 hPa

4.3 Test equipment used for the monitoring of the environmental conditions

Equipment	Manufacturer	Model	Serial N°	Due Date
Thermohygrometer data loggers	Testo	175-H2	20012380/305	2018-12
Barometer	MSR	MSR145B	330080	2018-03

4.4 Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report according to CISPR 16-4-2 "Specification for radio disturbance and immunity measuring apparatus and methods – Part 4-2: Uncertainties, statistics and limit modelling – Uncertainty in EMC measurements" and is documented in the Nemko Spa Technical Procedure WML1002. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device. Hereafter the best measurement capability for Nemko Spa laboratory is reported:

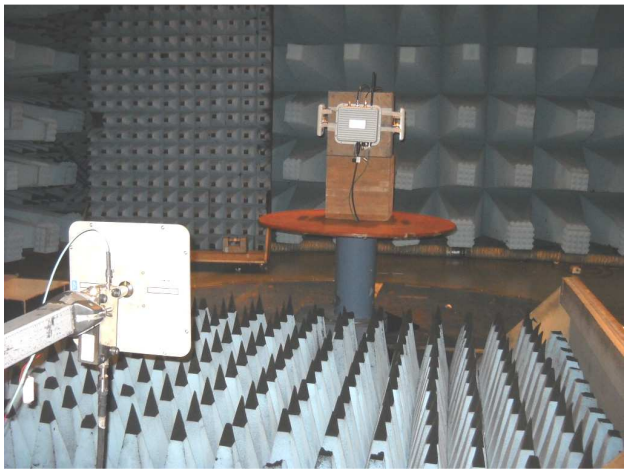
Test	Range	Measurement Uncertainty	Notes
Radiated Disturbance 3m, 10m Chamber	Antenna distance 1m, 3m, 10m (30÷200) MHz	5.0 dB	(1)
	Antenna distance 1m, 3m, 10m (0.2÷6) GHz	5.2 dB	(1)
	Antenna distance 1m, 3m (6÷18) GHz	5.8 dB	(1)
	Antenna distance 1m, 3m (18÷40) GHz	7.2 dB	(1)
Conducted Disturbance	9 kHz ÷ 150 kHz with AMN	3.8 dB	(1)
	150 kHz ÷ 30 MHz with AMN	3.4 dB	(1)
	150 kHz ÷ 30 MHz with AAN	4.6 dB	(1)
	9 kHz ÷ 30 MHz with voltage probe	2.9 dB	(1)
	9 kHz ÷ 30 MHz with current probe	2.9 dB	(1)

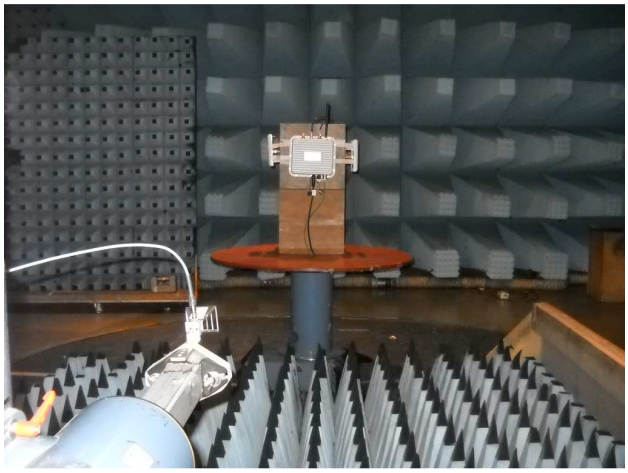
NOTES:
(1) The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k = 2 which has been derived from the assumed normal probability distribution with infinite degrees of freedom and for a coverage probability of 95 %;

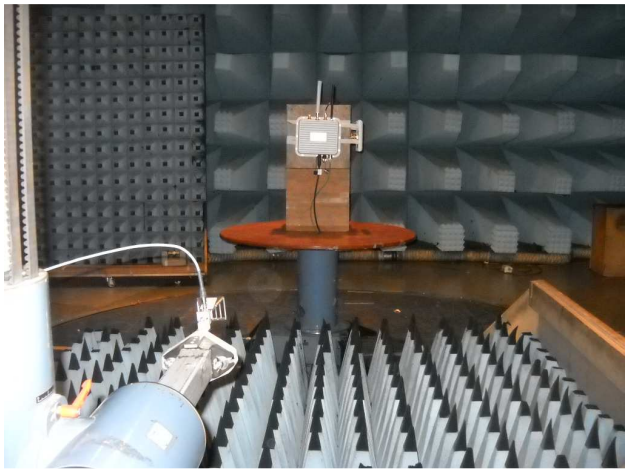
5 TEST CONDITIONS AND RESULTS

5.1 Radiated emissions limit

5.1.1 Photo documentation of the test set-up







5.1.2 Test method

Measurements were made on a semi anechoic chamber. Preliminary measurements were performed at an antenna to EUT separation distance of 3 meters with the receive antenna located at a fixed height (from 1 to 4 meter) in both horizontal and vertical polarities. Final measurements were then performed by rotating the EUT 360° and adjusting the receive antenna height from 1 to 4 meters. All frequencies were investigated in both horizontal and vertical antenna polarity, where applicable.

5.1.3 Limits for enclosure

The field strength of emissions from intentional radiators shall not exceed the following:

Frequency of emission (MHz)	Field strength (µV/m)	Field strength (dBµV/m)
30–88	100	40.0
88–216	150	43.5
216–960	200	46.0
Above 960	500	54.0

The above field strength limits are specified at a distance of 3 meters. Intentional radiators operating under the provisions of this section shall demonstrate compliance with the limits on the field strength of emissions, as shown in the above table, based on the average value of the measured emissions. As an alternative, compliance with the limits in the above table may be based on the use of measurement instrumentation with a CISPR quasi-peak detector.

5.1.4 Restricted bands of operation

MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	Above 38.6
13.36-13.41	--	--	--

5.1.5 Test result

Verdict:	☒ P ☐ F ☐ N
Frequency range:	30MHz – 40 GHz
Kind of test site:	Semi anechoic chamber
Measurement distance:	3 m
Remarks:	

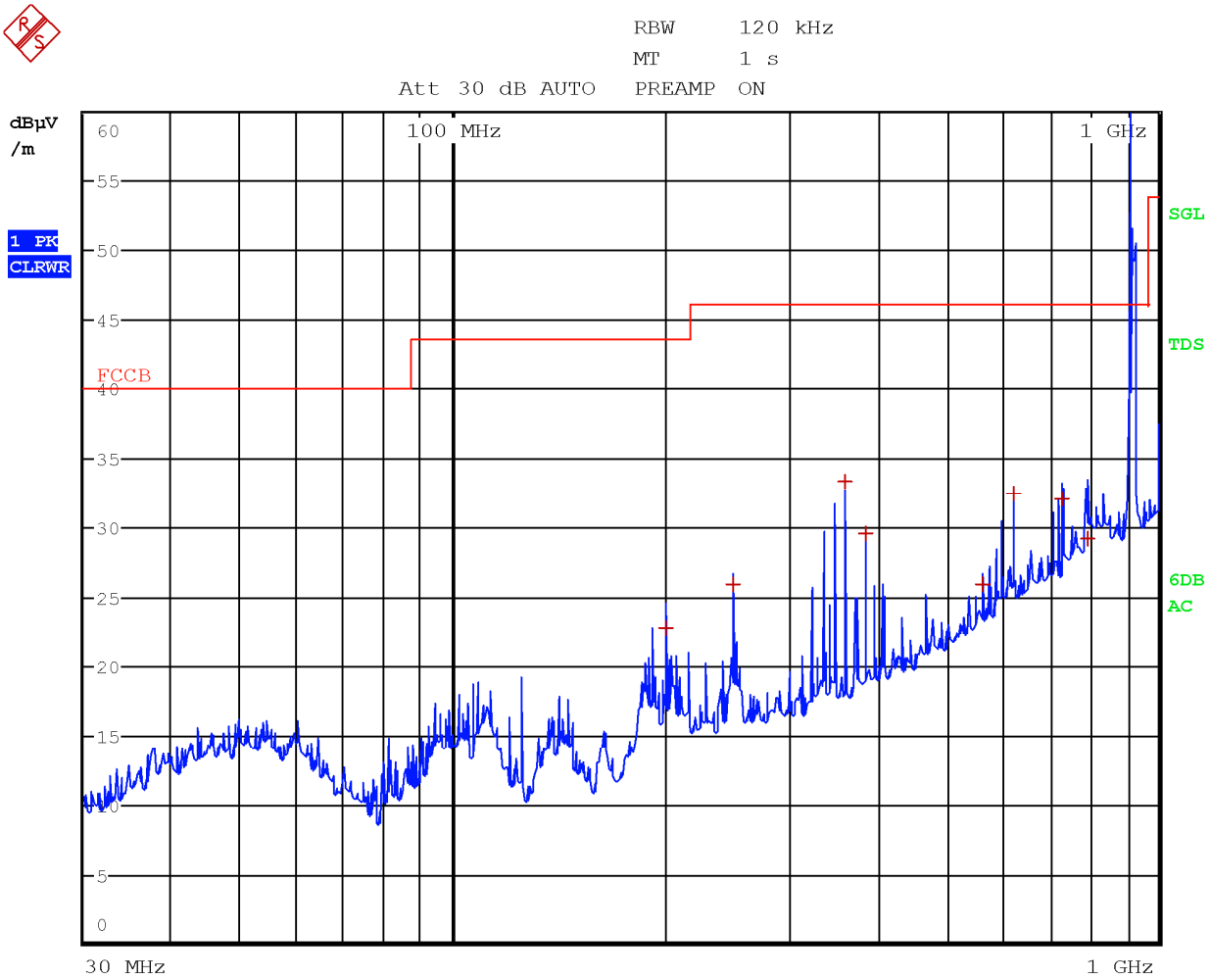
5.1.6 Test equipment used

Equipment	Manufacturer	Model	Serial N°	Due Date
Trilog Broadband Antenna 25 ÷ 8000 MHz	Schwarzbeck	VULB 9162	9162-025	2018-07
Bilog antenna 1 ÷ 18 GHz	Schwarzbeck	STLP 9148-123	123	2018-06
Horn antenna 4 ÷ 40 GHz	RFSpin	DRH40	061106A40	2020-02
Broadband preamplifier	Schwarzbeck	BBV 9718	9718-137	2017-12
Broadband preamplifier 18 ÷ 40 GHz	Miteq	JS44-18004000-35-8P-R	1.627	2017-12
EMI receiver 20 Hz ÷ 8 GHz	R&S	ESU8	100202	2017-09
Spectrum analyser 9 kHz ÷ 40 GHz	R&S	FSEK	848252/005	2018-01
Hydraulic revolving platform	Nemko	RTPL 01	4.233	NCR
Antenna mast	R&S	HCM	836 529/05	NCR
Controller	R&S	HCC	836 620/7	NCR
Semi-anechoic chamber	Nemko	10m semi-anechoic chamber	530	2018-10
Shielded room	Siemens	10m control room	1947	NCR

NCR = no calibration required

5.1.7 Test protocol

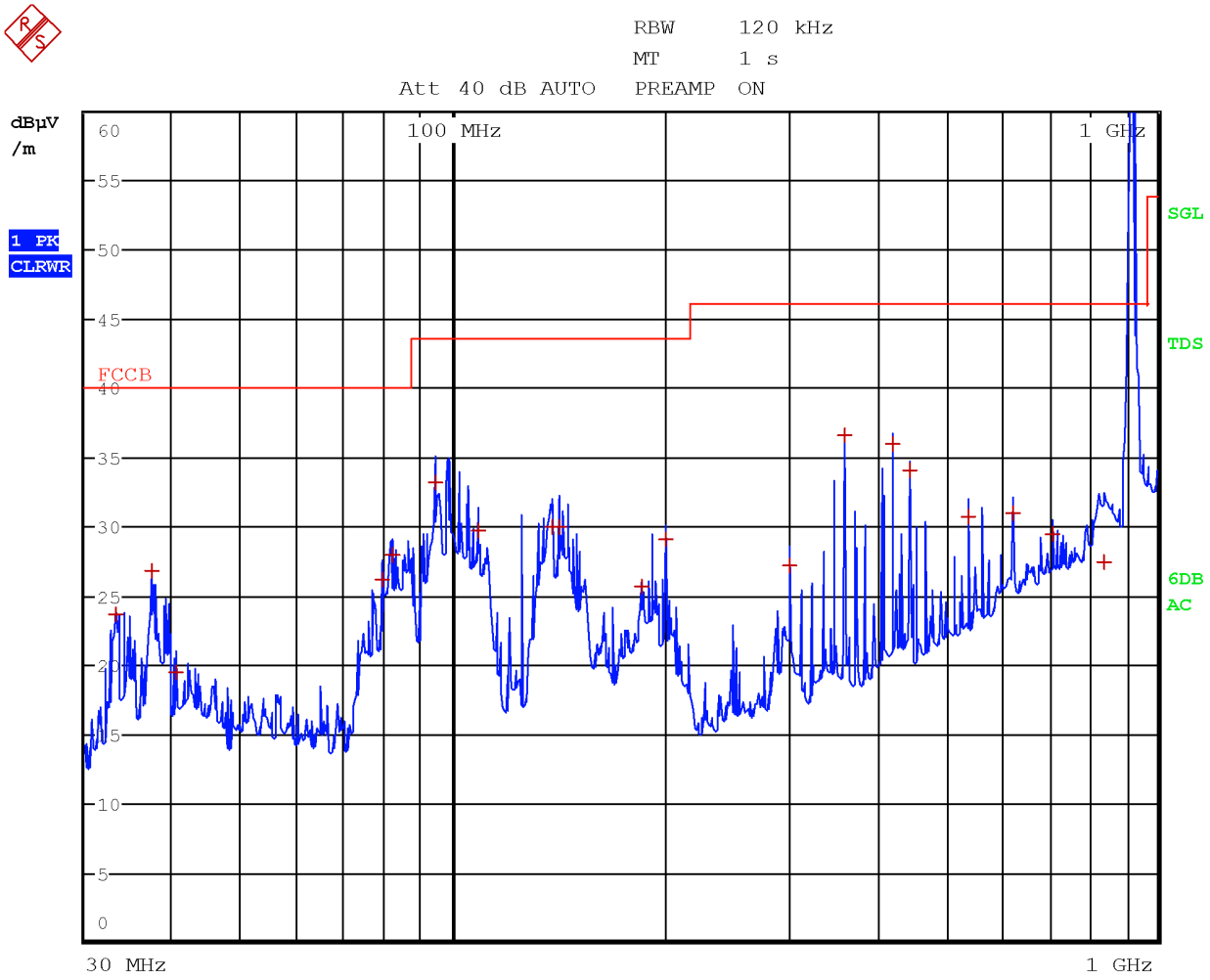
Antenna polarization: Horizontal Verdict: Pass
Operation mode: 1
Configuration mode: 1
Remarks: Frequency range: 30 to 1000 MHz



Limit exceeded by the carrier

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
199.9800	22.7	43.5	-20.8	QP
249.9900	25.9	46.0	-20.2	QP
360.0300	33.3	46.0	-12.7	QP
384.0300	29.5	46.0	-16.5	QP
564.0300	25.9	46.0	-20.2	QP
624.9900	32.5	46.0	-13.5	QP
732.0300	32.1	46.0	-14.0	QP
792.3300	29.1	46.0	-16.9	QP

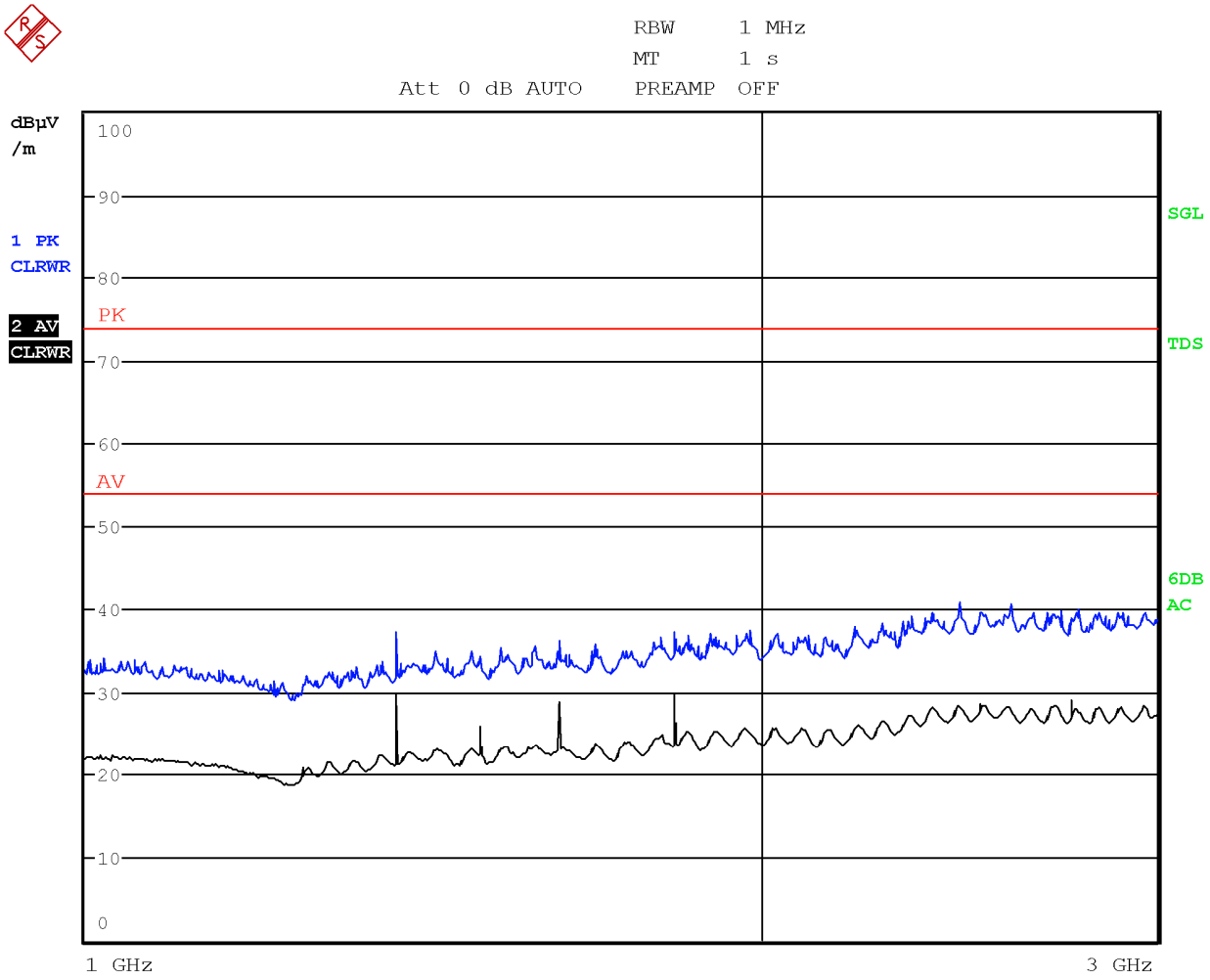
Antenna polarization: Vertical Verdict: Pass
Operation mode: 1
Configuration mode: 1
Remarks: Frequency range: 30 to 1000 MHz



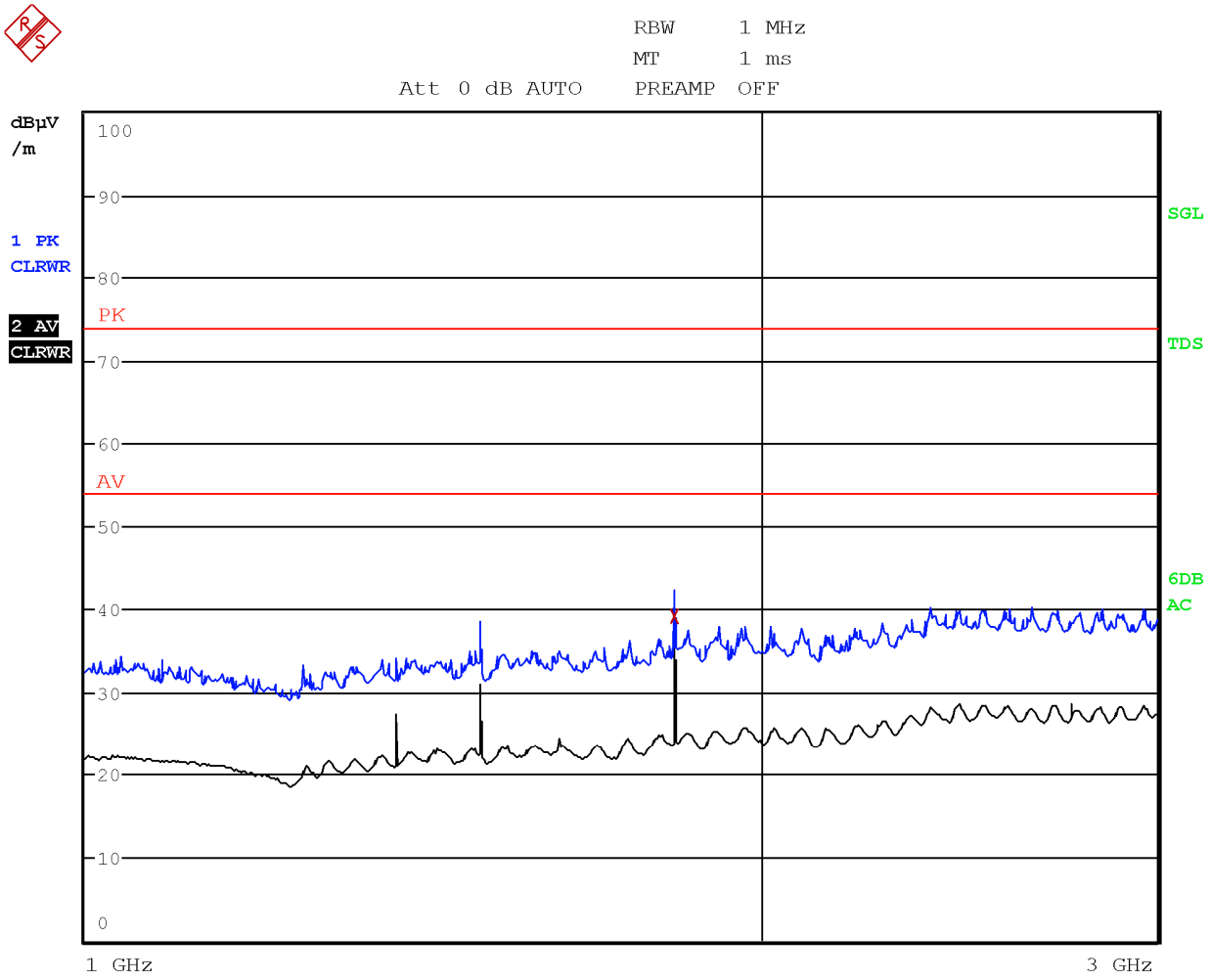
Limit exceeded by the carrier

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
33.1800	23.7	40.0	-16.3	QP
37.3800	26.8	40.0	-13.2	QP
40.3500	19.5	40.0	-20.5	QP
79.2300	26.1	40.0	-13.9	QP
82.0500	28.0	40.0	-12.0	QP
94.3800	33.2	43.5	-10.3	QP
108.8100	29.6	43.5	-13.9	QP
138.3600	29.9	43.5	-13.6	QP
141.1800	29.9	43.5	-13.6	QP
185.2200	25.7	43.5	-17.9	QP
200.0100	29.1	43.5	-14.5	QP
300.0000	27.1	46.0	-18.9	QP
360.0000	36.7	46.0	-9.4	QP
420.0300	35.9	46.0	-10.1	QP
444.0300	34.1	46.0	-11.9	QP
540.0300	30.7	46.0	-15.3	QP
624.9900	31.0	46.0	-15.0	QP
708.0300	29.4	46.0	-16.6	QP
840.9600	27.4	46.0	-18.6	QP

Antenna polarization: Horizontal Verdict: Pass
Operation mode: 1
Configuration mode: 1
Remarks: Frequency range: 1 to 3 GHz



Antenna polarization: Vertical Verdict: Pass
Operation mode: 1
Configuration mode: 1
Remarks: Frequency range: 1 to 3 GHz



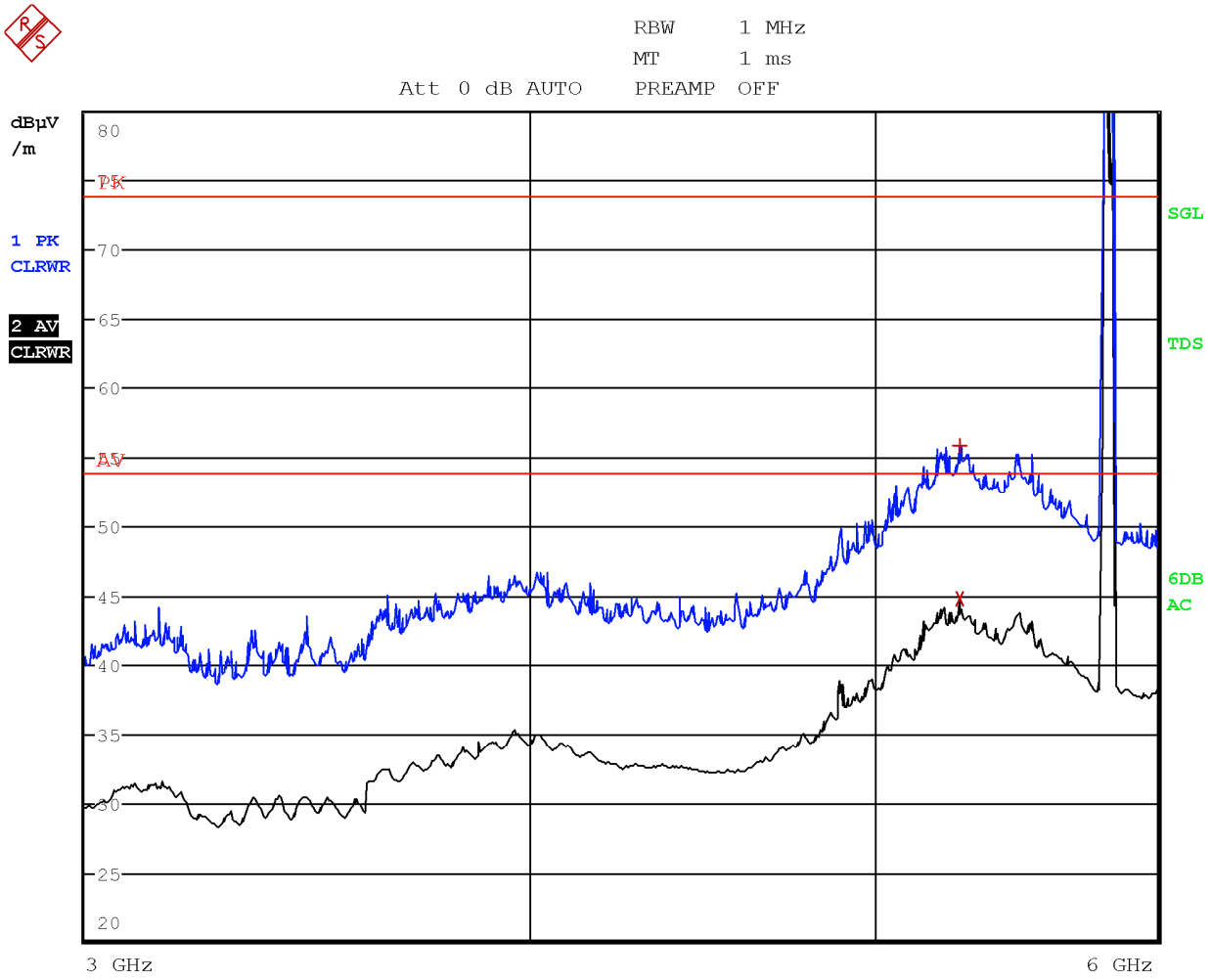
Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
1830.0000	39.2	54.0	-14.8	AV

Antenna polarization: Horizontal Verdict: Pass
Operation mode: 1
Configuration mode: 1
Remarks: Frequency range: 3 to 6 GHz

Limit exceeded by the carrier

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
5193.0000	43.6	54.0	-10.4	AV
5225.0000	54.9	74.0	-19.1	PK

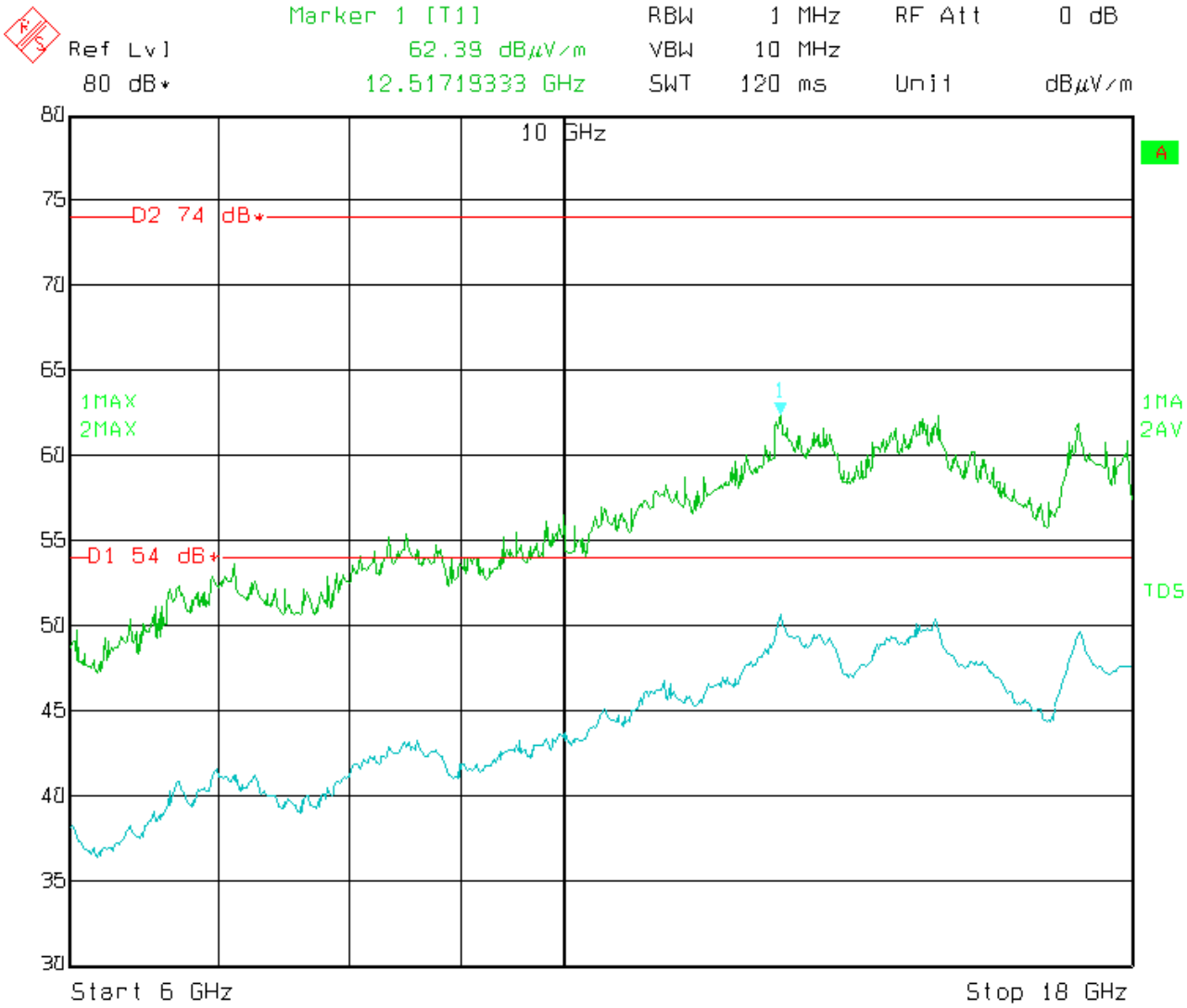
Antenna polarization: Vertical Verdict: Pass
Operation mode: 1
Configuration mode: 1
Remarks: Frequency range: 3 to 6 GHz



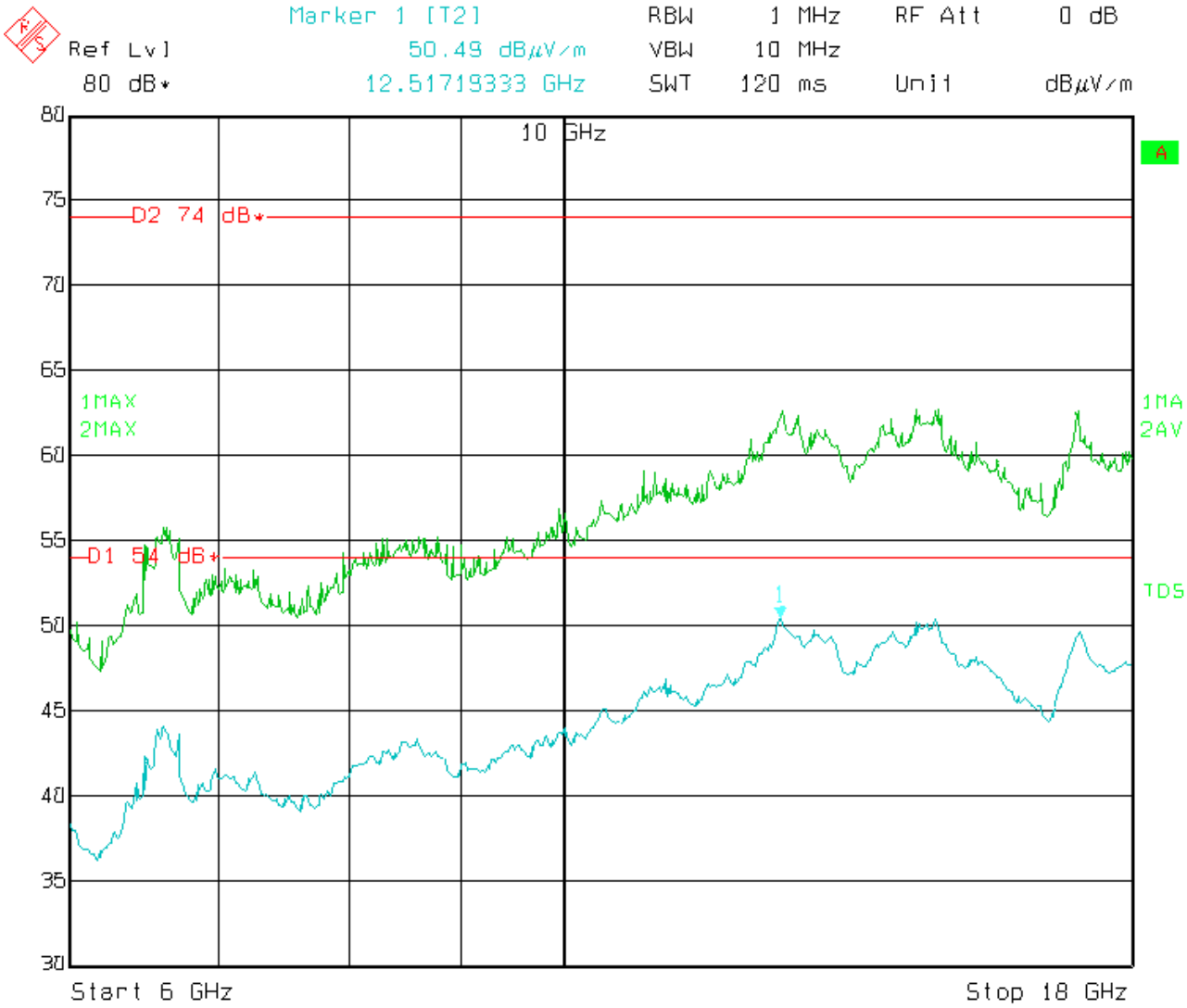
Limit exceeded by the carrier

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
5280.0000	44.7	54.0	-9.3	AV
5282.0000	55.8	74.0	-18.2	PK

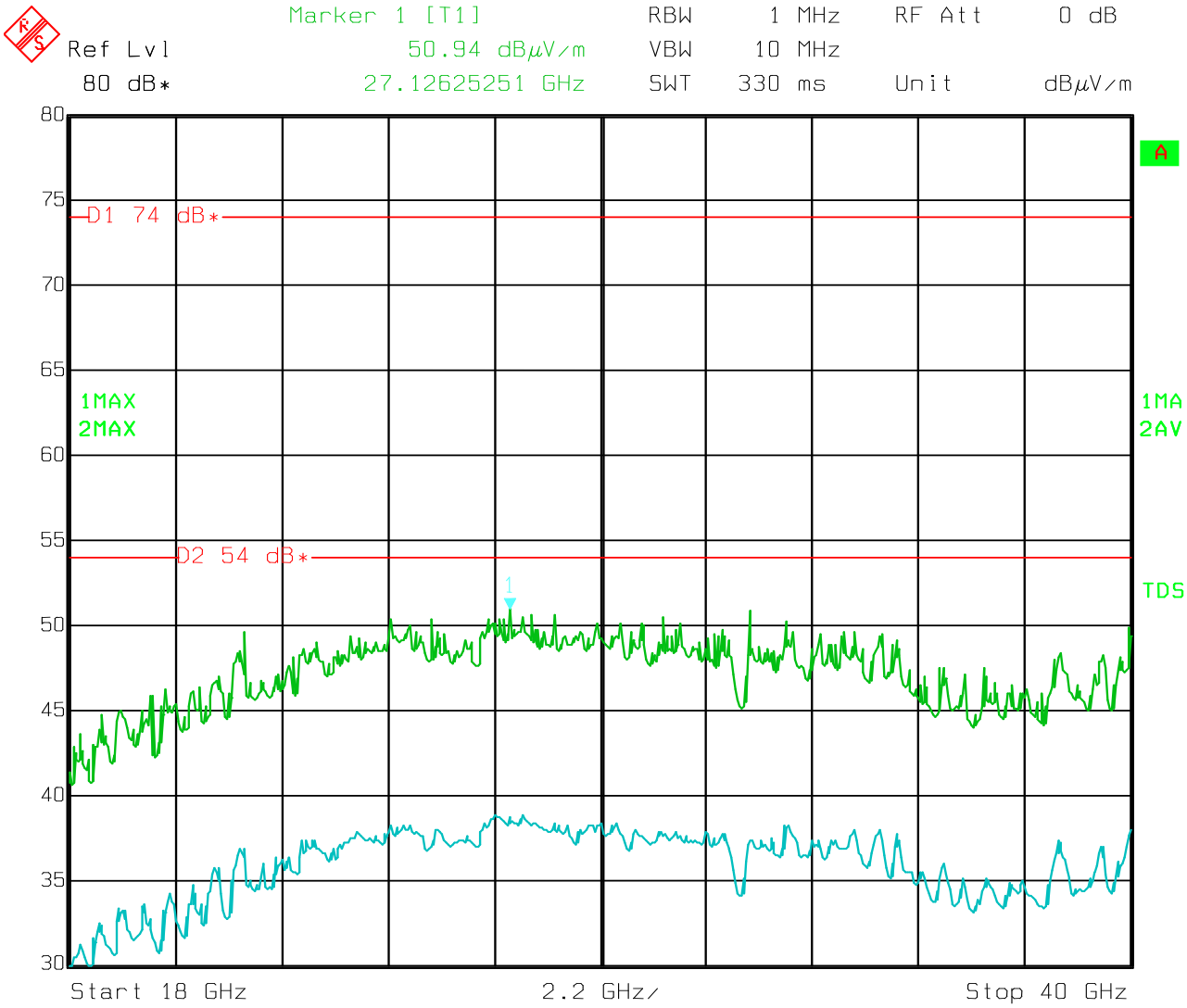
Antenna polarization: Horizontal Verdict: Pass
Operation mode: 1
Configuration mode: 1
Remarks: Frequency range: 6 to 18 GHz



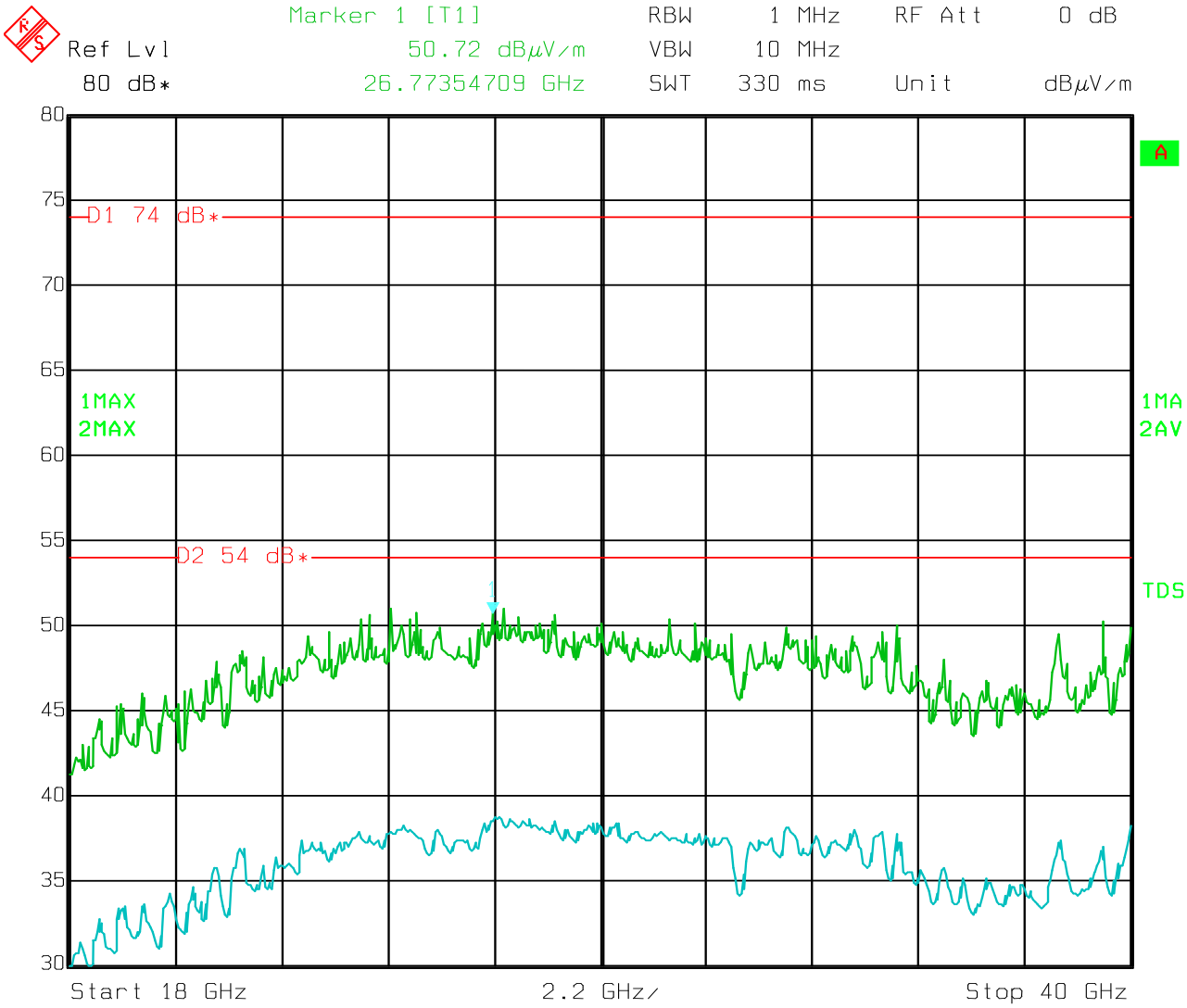
Antenna polarization: Vertical Verdict: Pass
Operation mode: 1
Configuration mode: 1
Remarks: Frequency range: 6 to 18 GHz



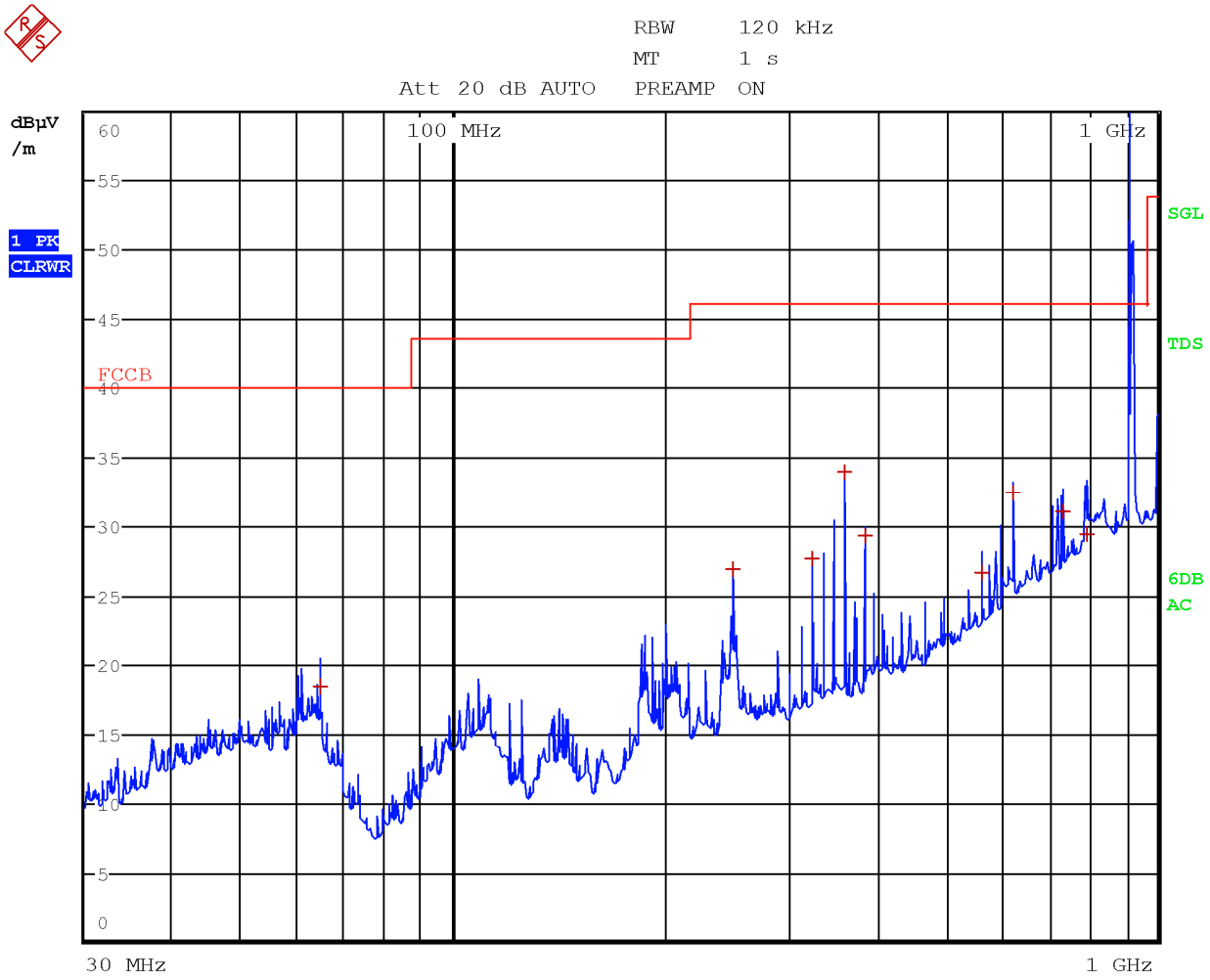
Antenna polarization: Horizontal Verdict: Pass
Operation mode: 1
Configuration mode: 1
Remarks: Frequency range: 18 to 40 GHz



Antenna polarization: Vertical Verdict: Pass
Operation mode: 1
Configuration mode: 1
Remarks: Frequency range: 18 to 40 GHz



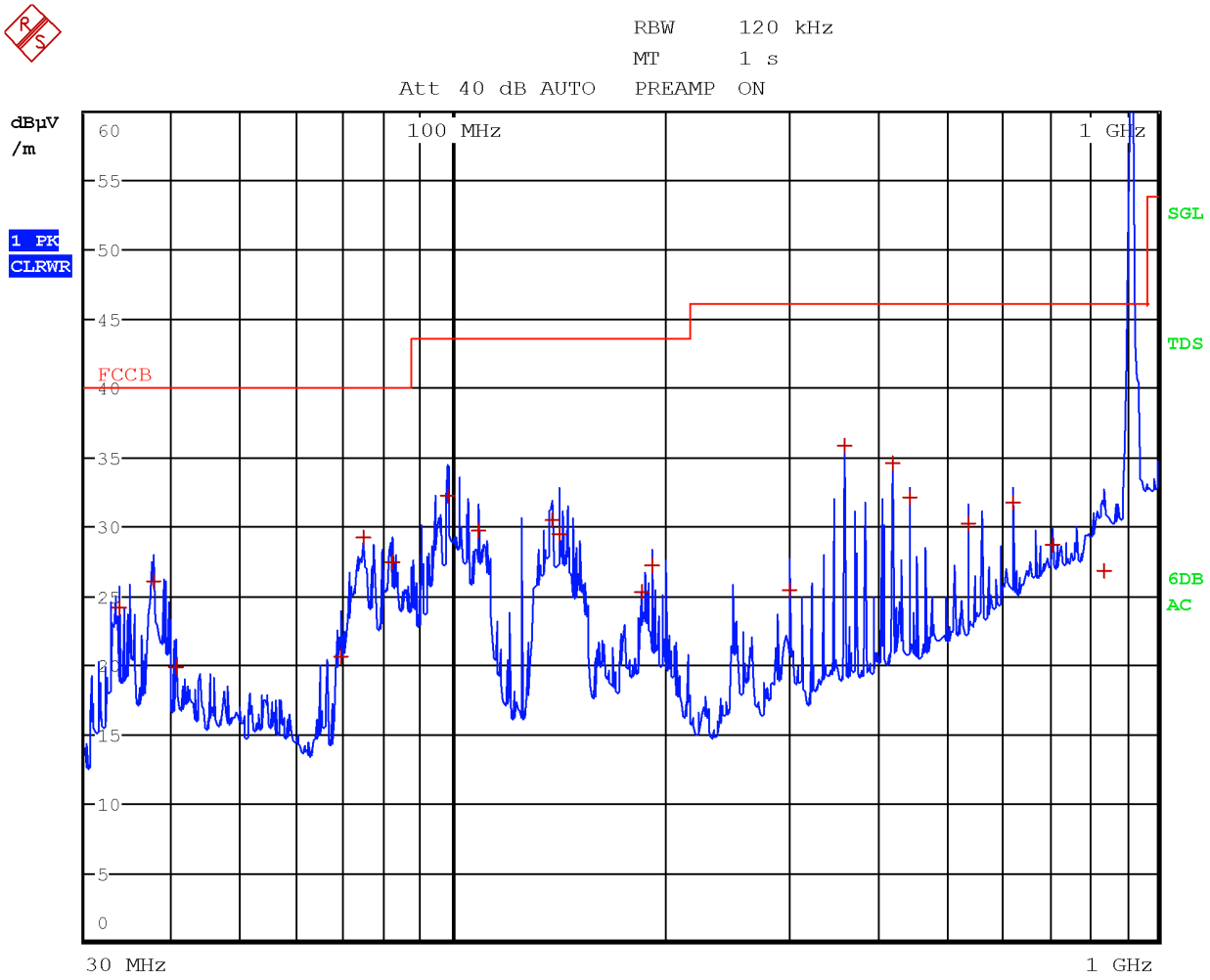
Antenna polarization: Horizontal Verdict: Pass
Operation mode: 2
Configuration mode: 1
Remarks: Frequency range: 30 to 1000 MHz



Limit exceeded by the carrier

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
64.7700	18.5	40.0	-21.5	QP
249.9900	26.9	46.0	-19.1	QP
324.0300	27.7	46.0	-18.4	QP
360.0000	33.9	46.0	-12.1	QP
384.0300	29.3	46.0	-16.7	QP
564.0300	26.7	46.0	-19.4	QP
624.9900	32.5	46.0	-13.5	QP
732.0600	31.1	46.0	-15.0	QP
792.1500	29.4	46.0	-16.6	QP

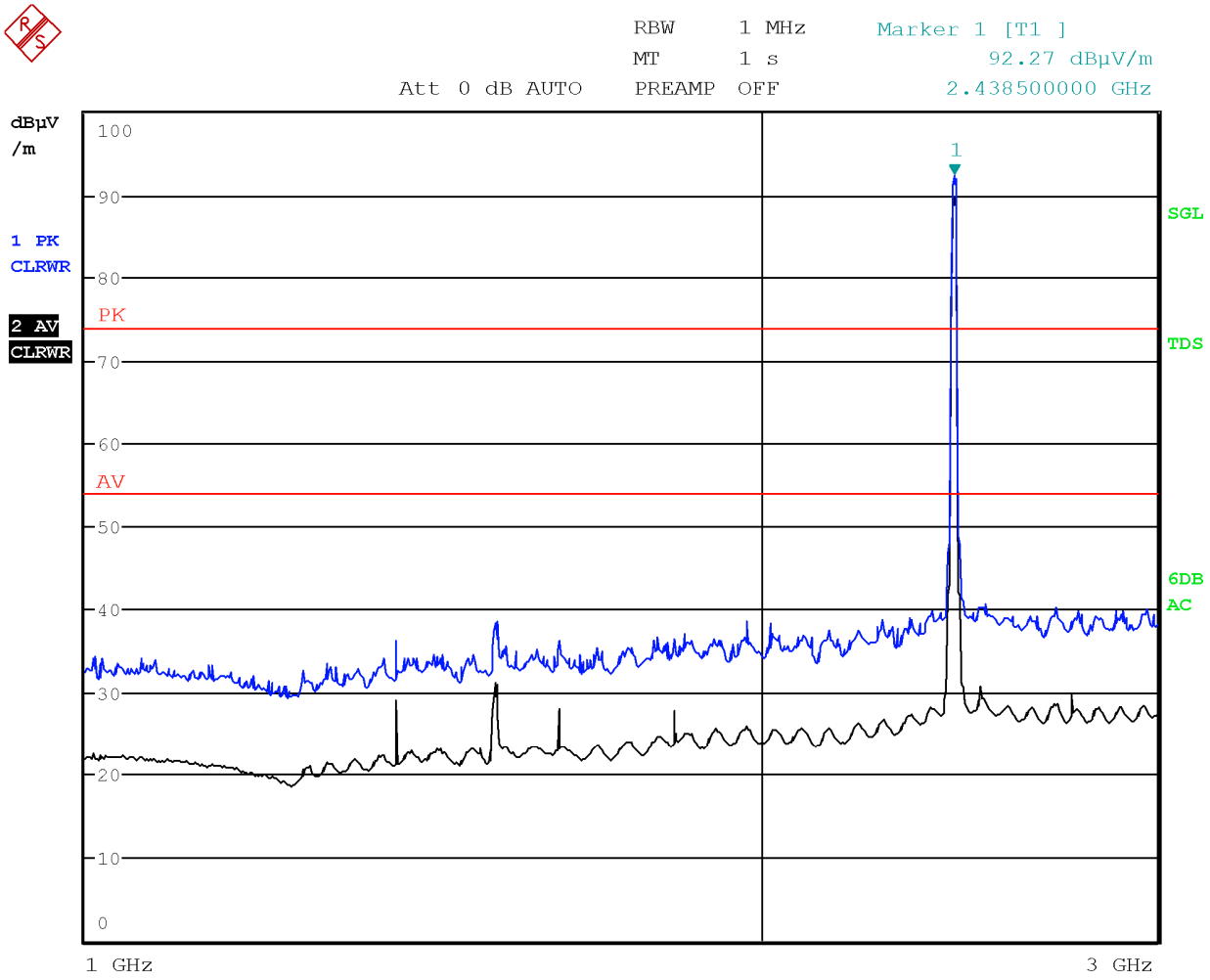
Antenna polarization: Vertical Verdict: Pass
Operation mode: 2
Configuration mode: 1
Remarks: Frequency range: 30 to 1000 MHz



Limit exceeded by the carrier

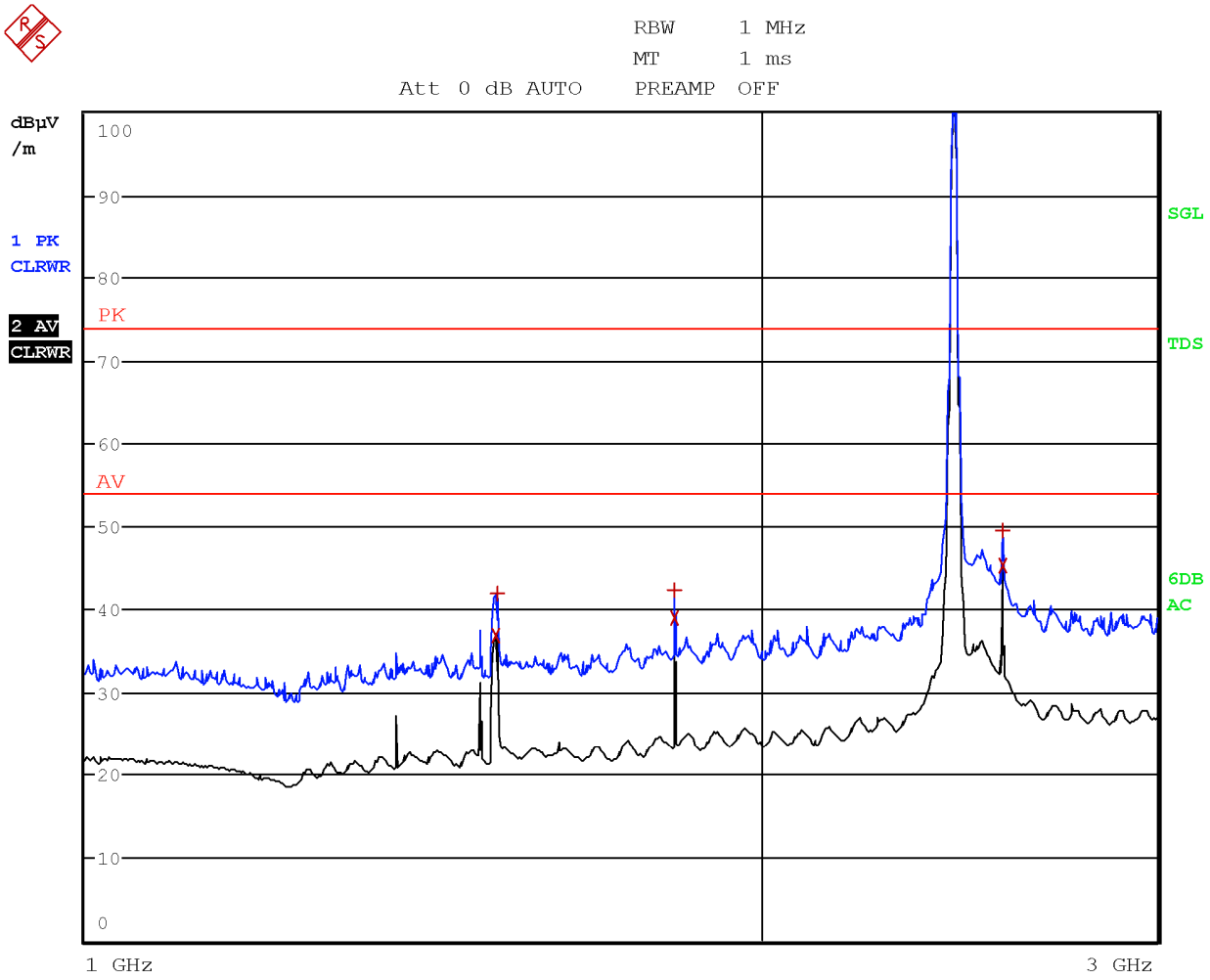
Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
33.4500	24.1	40.0	-15.9	QP
37.5300	26.1	40.0	-13.9	QP
40.3500	19.8	40.0	-20.2	QP
69.1200	20.6	40.0	-19.4	QP
74.5500	29.2	40.0	-10.8	QP
82.0500	27.4	40.0	-12.6	QP
98.4300	32.2	43.5	-11.3	QP
108.8100	29.7	43.5	-13.8	QP
138.3900	30.4	43.5	-13.1	QP
141.1800	29.5	43.5	-14.0	QP
185.2200	25.3	43.5	-18.2	QP
192.0300	27.2	43.5	-16.3	QP
300.0300	25.4	46.0	-20.7	QP
360.0000	35.8	46.0	-10.2	QP
420.0300	34.6	46.0	-11.4	QP
444.0300	32.1	46.0	-13.9	QP
540.0300	30.2	46.0	-15.9	QP
624.9900	31.7	46.0	-14.4	QP
708.0300	28.7	46.0	-17.4	QP
840.1500	26.7	46.0	-19.3	QP

Antenna polarization: Horizontal Verdict: Pass
Operation mode: 2
Configuration mode: 1
Remarks: Frequency range: 1 to 3 GHz



Limit exceeded by the carrier

Antenna polarization: Vertical Verdict: Pass
Operation mode: 2
Configuration mode: 1
Remarks: Frequency range: 1 to 3 GHz



Limit exceeded by the carrier

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
1523.0000	37.0	54.0	-17.0	AV
1524.5000	41.9	74.0	-32.1	PK
1830.0000	39.0	54.0	-15.0	AV
1830.0000	42.3	74.0	-31.7	PK
2560.0000	49.5	74.0	-24.5	PK
2560.0000	45.4	54.0	-8.6	AV

Antenna polarization: Horizontal Verdict: Pass
Operation mode: 2
Configuration mode: 1
Remarks: Frequency range: 3 to 6 GHz

Limit exceeded by the carrier

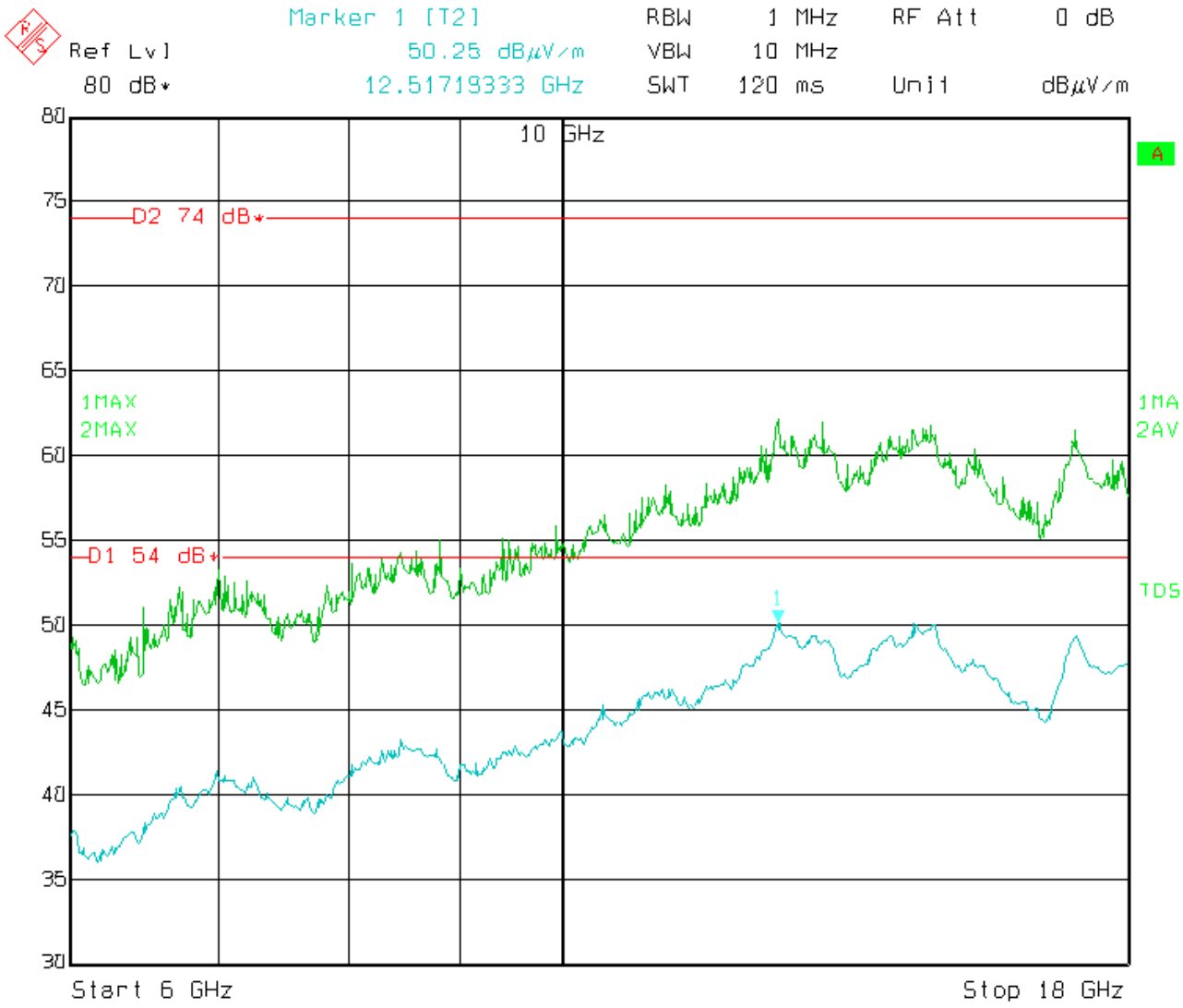
Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
5192.5000	45.7	54.0	-8.3	AV
5237.0000	57.9	74.0	-16.1	PK

Antenna polarization: Vertical Verdict: Pass
Operation mode: 2
Configuration mode: 1
Remarks: Frequency range: 3 to 6 GHz

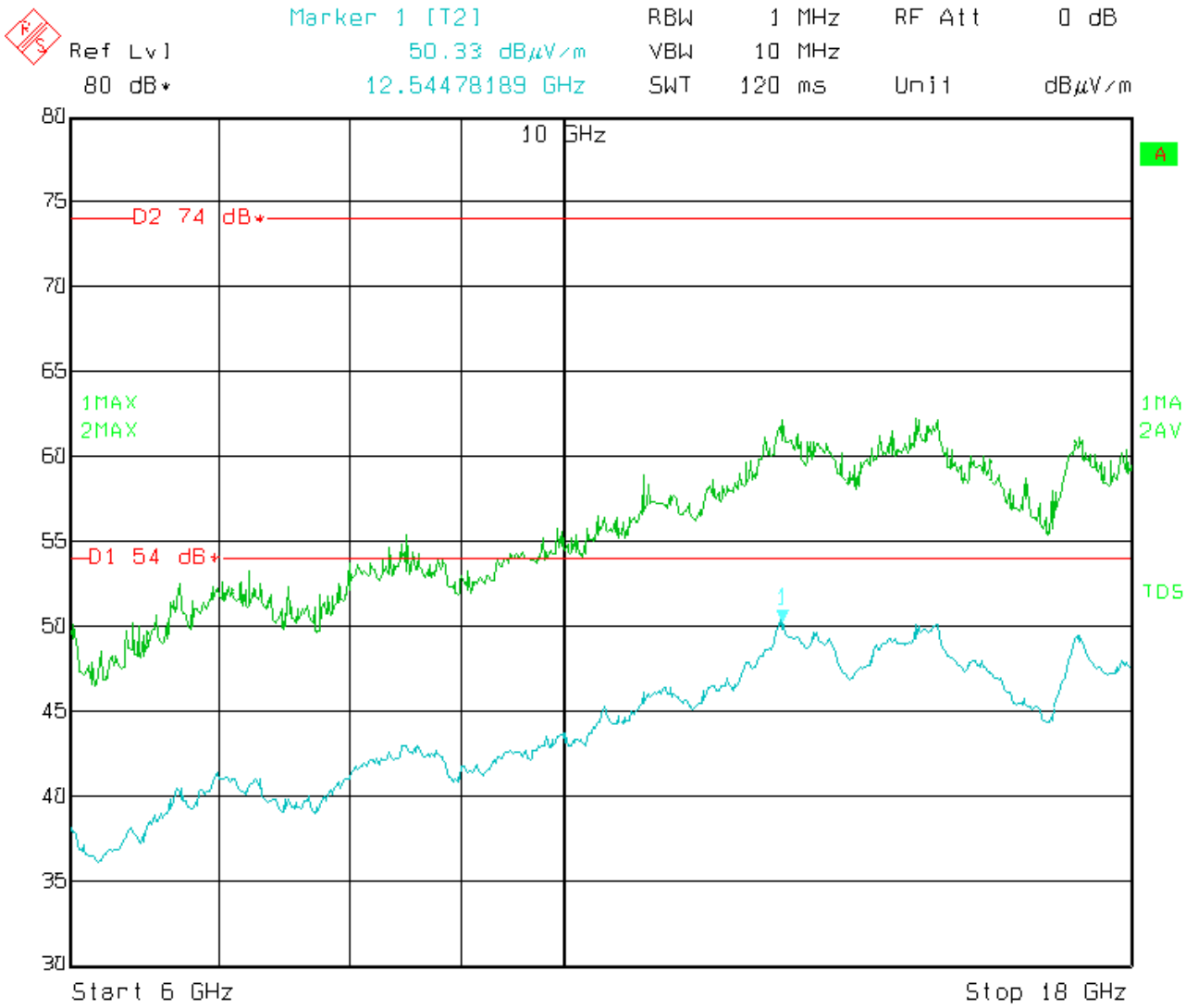
Limit exceeded by the carrier

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
3349.5000	32.9	54.0	-21.1	AV
4874.0000	37.4	54.0	-16.6	AV
5214.0000	52.3	74.0	-21.7	PK
5217.0000	40.2	54.0	-13.8	AV

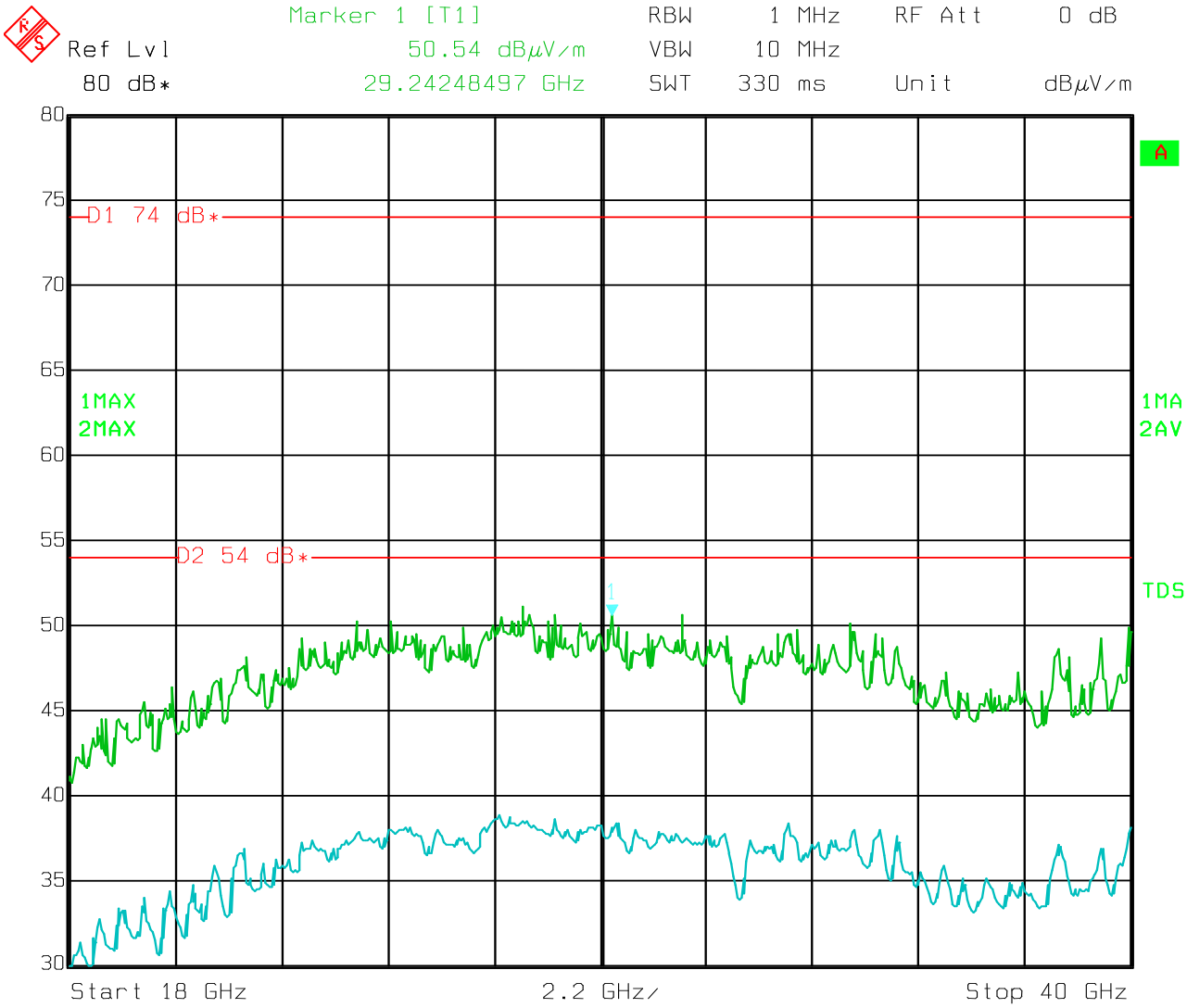
Antenna polarization: Horizontal Verdict: Pass
Operation mode: 2
Configuration mode: 1
Remarks: Frequency range: 6 to 18 GHz



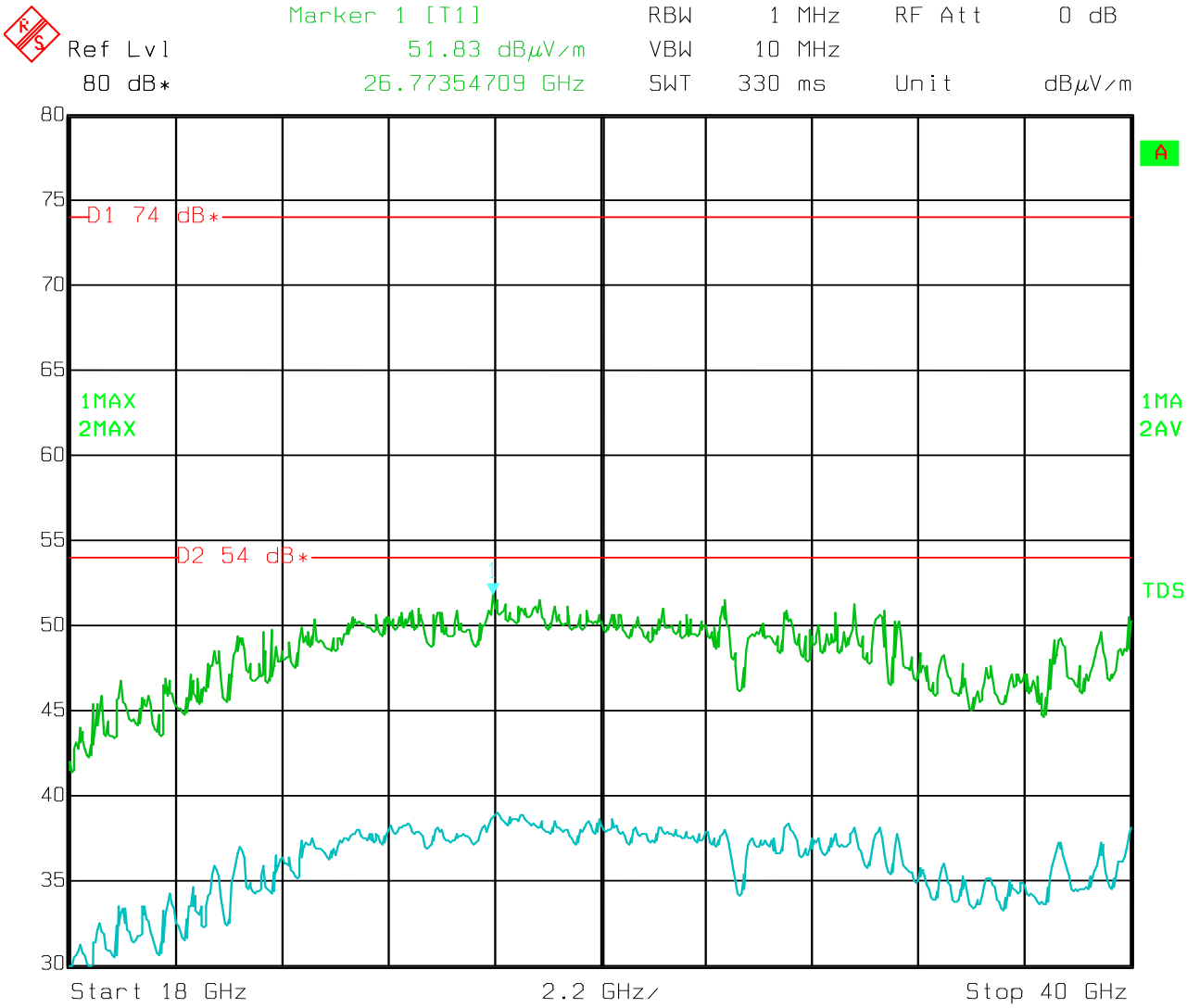
Antenna polarization: Vertical Verdict: Pass
Operation mode: 2
Configuration mode: 1
Remarks: Frequency range: 6 to 18 GHz



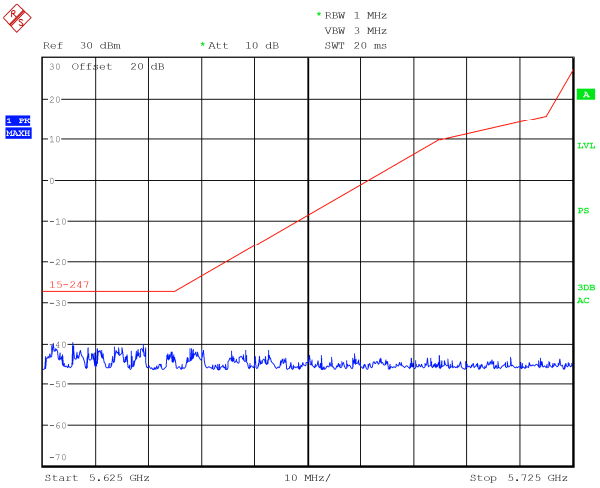
Antenna polarization: Horizontal Verdict: Pass
Operation mode: 2
Configuration mode: 1
Remarks: Frequency range: 18 to 40 GHz

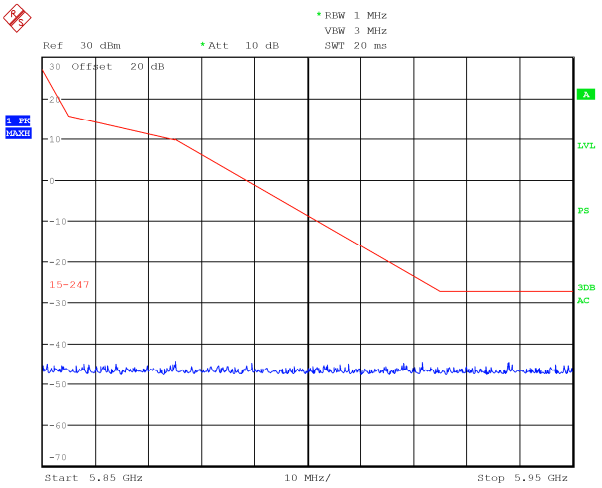


Antenna polarization: Vertical Verdict: Pass
Operation mode: 2
Configuration mode: 1
Remarks: Frequency range: 18 to 40 GHz

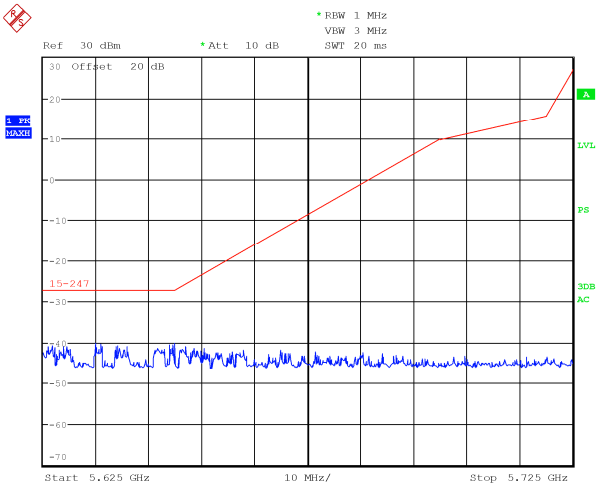


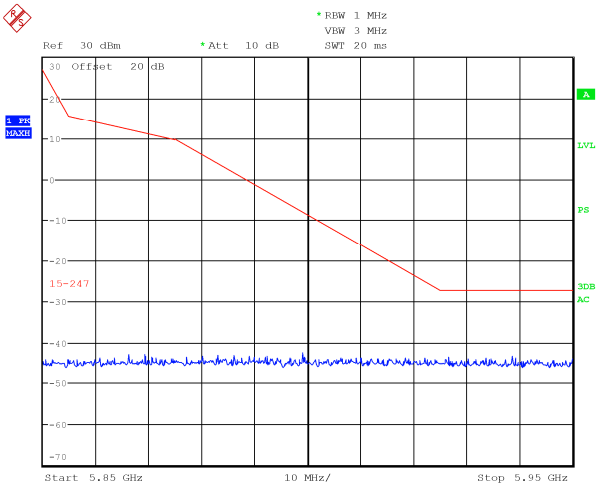
Antenna polarization: Horizontal Verdict: Pass
Operation mode: 1
Configuration mode: 1
Remarks: Clause 15.407(b) mask



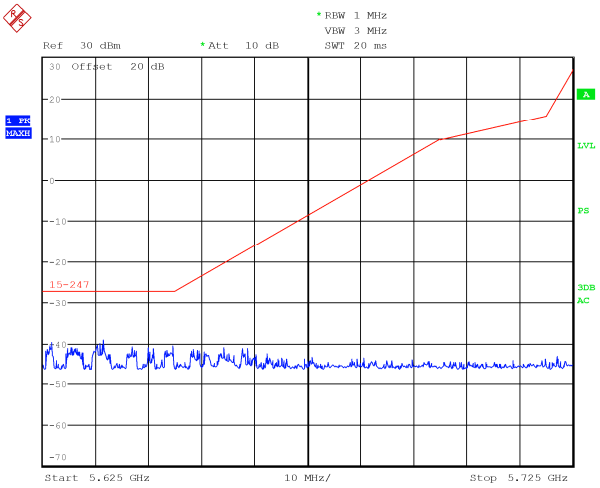


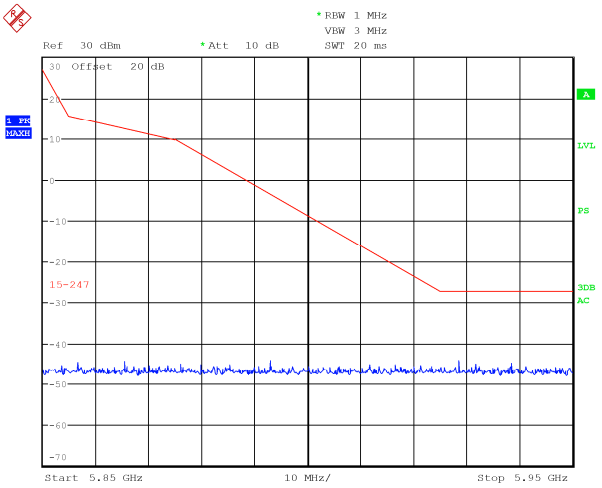
Antenna polarization: Vertical Verdict: Pass
Operation mode: 1
Configuration mode: 1
Remarks: Clause 15.407(b) mask



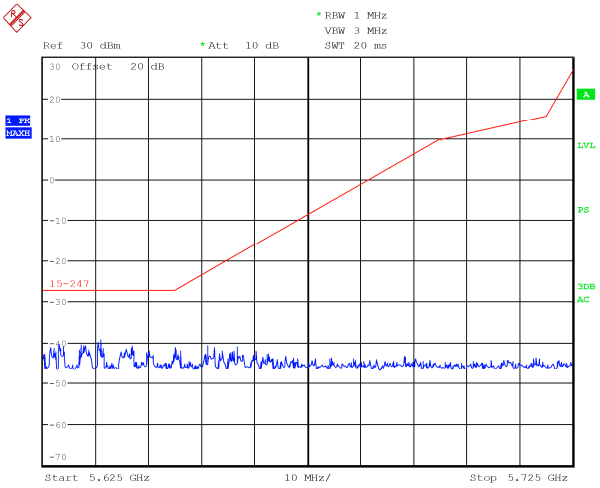


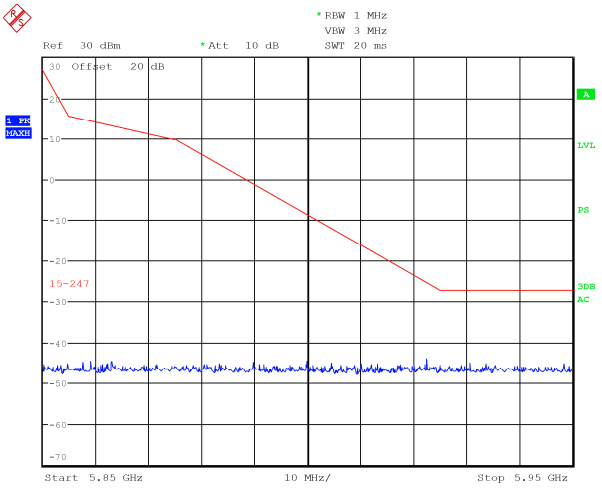
Antenna polarization: Horizontal Verdict: Pass
Operation mode: 2
Configuration mode: 1
Remarks: Clause 15.407(b) mask





Antenna polarization: Vertical Verdict: Pass
Operation mode: 2
Configuration mode: 1
Remarks: Clause 15.407(b) mask





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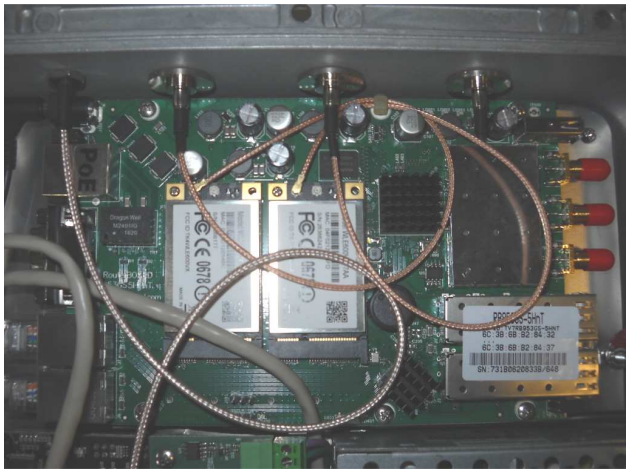

End of report