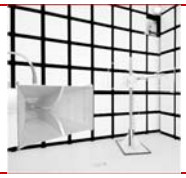
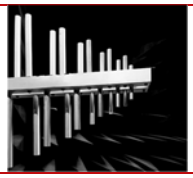
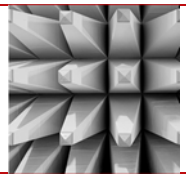

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TEST REPORT

Test report no.: 1-0162/15-01-03-B

ilac-MRA DAkkS Deutsche Akkreditierungsstelle D-PL-12076-01-00

Testing laboratory

CETECOM ICT Services GmbH
Untertuerkheimer Strasse 6 – 10
66117 Saarbruecken / Germany
Phone: + 49 681 5 98 - 0
Fax: + 49 681 5 98 - 9075
Internet: http://www.cetecom.com
e-mail: ict@cetecom.com

Accredited Testing Laboratory:
The testing laboratory (area of testing) is accredited according to DIN EN ISO/IEC 17025 (2005) by the Deutsche Akkreditierungsstelle GmbH (DAkkS)
The accreditation is valid for the scope of testing procedures as stated in the accreditation certificate with the registration number: D-PL-12076-01-00

Applicant

ifm electronic gmbh
Friedrichsstraße 1
45128 Essen / GERMANY
Phone: +49 201 2422-0
Fax: +49 7542 518-561761
Contact: Christoph Ehrhart
e-mail: Christoph.Ehrhart@ifm.com
Phone: +49 7542 518-1761

Manufacturer

ifm electronic gmbh
Friedrichsstraße 1
45128 Essen / GERMANY

Test standard/s

47 CFR Part 15	Title 47 of the Code of Federal Regulations; Chapter I; Part 15 - Radio frequency devices
RSS - 210 Issue 8	Spectrum Management and Telecommunications Radio Standards Specification - Licence-exempt Radio Apparatus (All Frequency Bands): Category I Equipment

For further applied test standards please refer to section 3 of this test report.

Test Item

Kind of test item:	**13.56 MHz RFID Reader**
Model name:	**DTM434 / DTM435 / DTM436 / DTM437**
FCC ID:	**UN6-DTMHFIB (for DTM434 & 436)** **UN6-DTMHFIN (for DTM435 & 437)**
IC:	**6799A-DTMHFIB (for DTM434 & 436)** **6799A-DTMHFIN (for DTM435 & 437)**
Frequency:	13.56 MHz
Technology tested:	RFID
Antenna:	Integrated PCB loop-coil antenna
Power supply:	9 V to 32 V DC by external power supply
Temperature range:	-40°C to +85°C

This test report is electronically signed and valid without handwriting signature. For verification of the electronic signatures, the public keys can be requested at the testing laboratory.

Test report authorized:

cn=Christoph Schneider, o=CETECOM ICT Services GmbH, ou=SND-120402, email=christoph.schneider@cetecom.com, c=DE
2015.11.26 14:53:47 +01'00'

Christoph Schneider
Testing Manager
Radio Communications & EMC

Test performed:

cn=Tobias Wittenmeier, o=CETECOM ICT Services GmbH, ou=WIT-111222, email=tobias.wittenmeier@cetecom.com, c=DE
2015.11.26 14:07:54 +01'00'

Tobias Wittenmeier
Testing Manager
Radio Communications & EMC

1 Table of contents

2 General information

2.1 Notes and disclaimer

The test results of this test report relate exclusively to the test item specified in this test report. CETECOM ICT Services GmbH does not assume responsibility for any conclusions and generalizations drawn from the test results with regard to other specimens or samples of the type of the equipment represented by the test item.
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This test report is electronically signed and valid without handwritten signature. For verification of the electronic signatures, the public keys can be requested at the testing laboratory.

This test report replaces the test report with the number 1-0162/15-01-03-A and dated 2015-11-11

2.2 Application details

Date of receipt of order:	2015-08-06
Date of receipt of test item:	2015-10-09
Start of test:	2015-10-16
End of test:	2015-10-20
Person(s) present during the test:	-/-

3 Test standard/s

Test standard	Date	Test standard description
47 CFR Part 15	-/-	Title 47 of the Code of Federal Regulations; Chapter I; Part 15 - Radio frequency devices
RSS - 210 Issue 8	01.12.2010	Spectrum Management and Telecommunications Radio Standards Specification - Licence-exempt Radio Apparatus (All Frequency Bands): Category I Equipment
RSS - 210 Issue 8 Amendment 1	05.02.2015	RSS-210, Amendment 1 — Licence-Exempt, Low-Power Radio Apparatus Operating in the Television Bands (February 2015)
RSS - Gen Issue 4	01.11.2014	General Requirements & Information for the Certification of Radio Apparatus under test standards.

3.1 Measurement guidance

Guidance	Version	Description
ANSI C63.4-2014	-/-	American national standard for methods of measurement of radio-noise emissions from low-voltage electrical and electronic equipment in the range of 9 kHz to 40 GHz

4 Test environment

Temperature	:	T_{nom} T_{max} T_{min}	+22 °C during room temperature tests +85 °C during high temperature tests -40 °C during low temperature tests
Relative humidity content	:		55 %
Barometric pressure	:		not relevant for this kind of testing
Power supply	:	V_{nom} V_{max} V_{min}	24.0 V DC by external power supply 32.0 V 9.0 V

5 Test item

5.1 General description

Kind of test item	:	13.56 MHz RFID Reader
Type identification	:	DTM434 / DTM435 / DTM436 / DTM437
PMN	:	DTM434 DTM435 DTM436 DTM437
HVIN	:	DTM434 DTM435 DTM436 DTM437
FVIN	:	DTM434 DTM435 DTM436 DTM437
HMN	:	n.a.
S/N serial number	:	DTM434 151434_#67 DTM435 151434_#61 DTM436 151893_#12 DTM437 151893_#04
HW hardware status	:	No information available
SW software status	:	No information available
Frequency band	:	13.56 MHz
Type of radio transmission Use of frequency spectrum	: :	Modulated carrier
Type of modulation	:	ASK
Number of channels	:	1
Antenna	:	Integrated PCB loop-coil antenna
Power supply	:	9 V to 32 V DC by external power supply
Temperature range	:	-40°C to +85°C

5.2 Additional information

DTM434, DTM435, DTM436 and DTM437 based on the same PCB but with different housing and different software options. For further information, see 1-0162/15-01-01_AnnexA and 1-0162/15-01-01_AnnexB as well as the manufacturer data sheets.

The content of the following annexes is defined in the QA. It may be that not all of the listed annexes are necessary for this report, thus some values in between may be missing.

Test setup- and EUT-photos are included in test report:	1-0162/15-01-01_AnnexA 1-0162/15-01-01_AnnexB 1-0162/15-01-01_AnnexD

6 Test laboratories sub-contracted

None

7 Description of the test setup

Typically, the calibrations of the test apparatus are commissioned to and performed by an accredited calibration laboratory. The calibration intervals are determined in accordance with the DIN EN ISO/IEC 17025. In addition to the external calibrations, the laboratory executes comparison measurements with other calibrated test systems or effective verifications. Weekly chamber inspections and range calibrations are performed. Where possible, RF generating and signaling equipment as well as measuring receivers and analyzers are connected to an external high-precision 10 MHz reference (GPS-based or rubidium frequency standard).

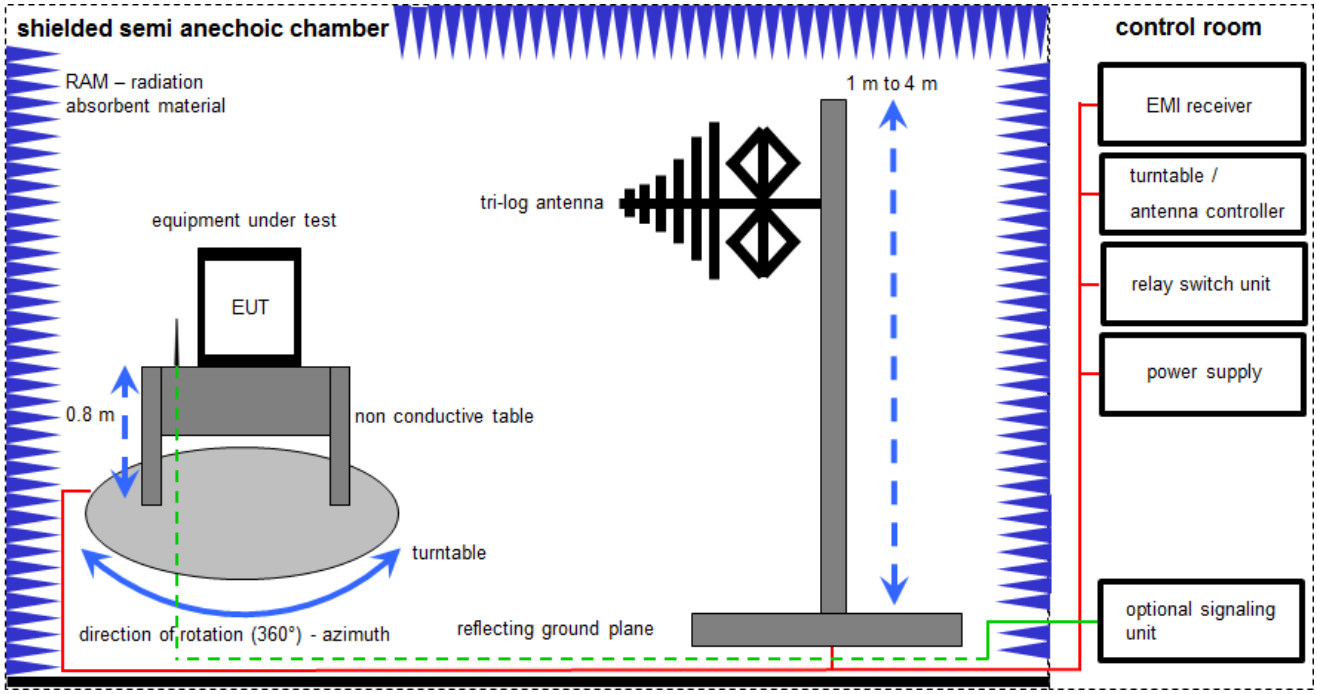
In order to simplify the identification of the equipment used at some special tests, some items of test equipment and ancillaries can be provided with an identifier or number in the equipment list below (Lab/Item).

Agenda: Kind of Calibration

k	calibration / calibrated	EK	limited calibration
ne	not required (k, ev, izw, zw not required)	zw	cyclical maintenance (external cyclical maintenance)
ev	periodic self verification	izw	internal cyclical maintenance
Ve	long-term stability recognized	g	blocked for accredited testing
vlkl!	Attention: extended calibration interval		
NK!	Attention: not calibrated	*)	next calibration ordered / currently in progress

7.1 Shielded semi anechoic chamber

The radiated measurements are performed in vertical and horizontal plane in the frequency range from 9 kHz to 1 GHz in semi-anechoic chambers. The EUT is positioned on a non-conductive support with a height of 0.80 m above a conductive ground plane that covers the whole chamber. The receiving antennas are confirmed with specifications ANSI C63. These antennas can be moved over the height range between 1.0 m and 4.0 m in order to search for maximum field strength emitted from EUT. The measurement distances between EUT and receiving antennas are indicated in the test setups for the various frequency ranges. For each measurement, the EUT is rotated in all three axes until the maximum field strength is received. The wanted and unwanted emissions are received by spectrum analyzers where the detector modes and resolution bandwidths over various frequency ranges are set according to requirement ANSI C63.



Measurement distance: tri-log antenna 10 meter

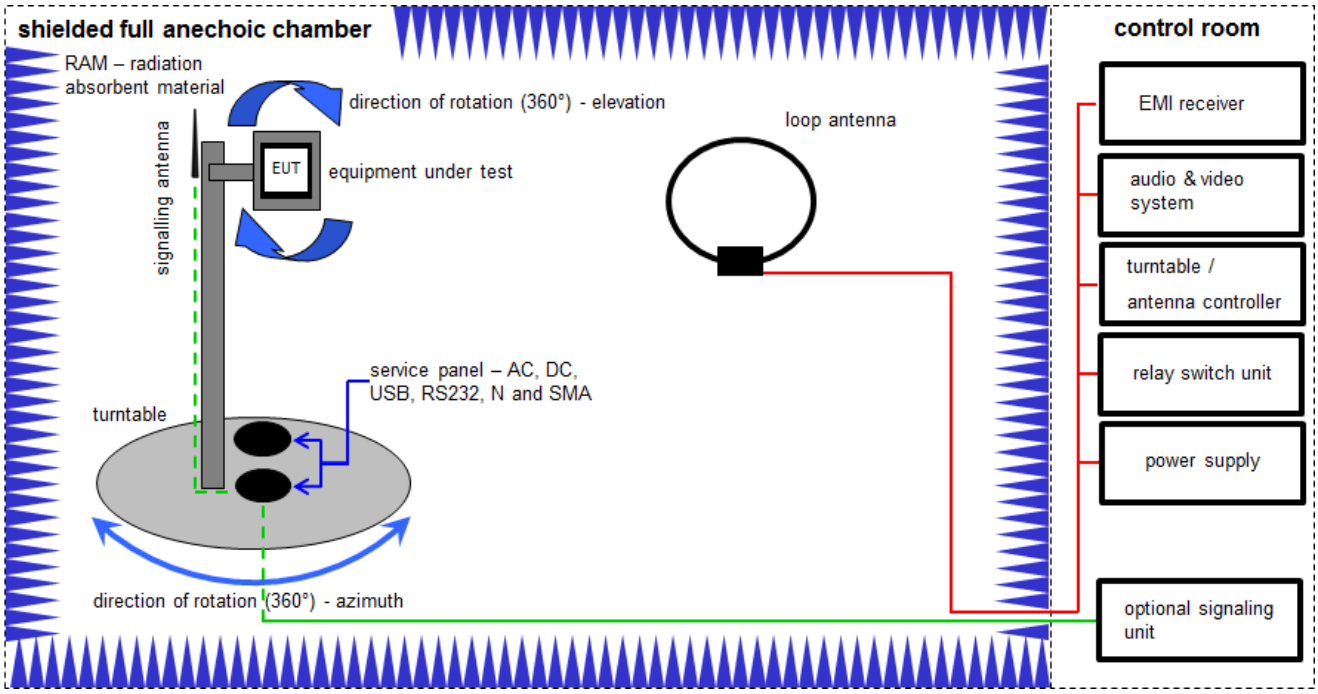
FS = UR + CL + AF
(FS-field strength; UR-voltage at the receiver; CL-loss of the cable; AF-antenna factor)

Example calculation:
FS [dBµV/m] = 12.35 [dBµV/m] + 1.90 [dB] + 16.80 [dB/m] = 31.05 [dBµV/m] (35.69 µV/m)

Equipment table:

No.	Lab / Item	Equipment	Type	Manufacturer	Serial No.	INV. No Cetecom	Kind of Calibration	Last Calibration	Next Calibration
1	A	Switch-Unit	3488A	HP	2719A14505	300000368	ev		
2	A	RF-Filter-section	85420E	HP	3427A00162	300002214	k	27.11.2006	
3	A	EMI Test Receiver	ESCI 3	R&S	100083	300003312	k	26.01.2015	26.01.2016
4	A	Antenna Tower	Model 2175	ETS-Lindgren	64762	300003745	izw		
5	A	Positioning Controller	Model 2090	ETS-Lindgren	64672	300003746	izw		
6	A	Turntable Interface-Box	Model 105637	ETS-Lindgren	44583	300003747	izw		
7	A	TRILOG Broadband Test-Antenna 30 MHz - 3 GHz	VULB9163	Schwarzbeck	295	300003787	k	22.04.2014	22.04.2016
8	A	DC power supply, 60Vdc, 50A, 1200 W	6032A	HP	2920A04590	300001041	Ve	20.01.2015	20.01.2018

7.2 Shielded fully anechoic chamber



Measurement distance: loop antenna 3 meter / 1 meter

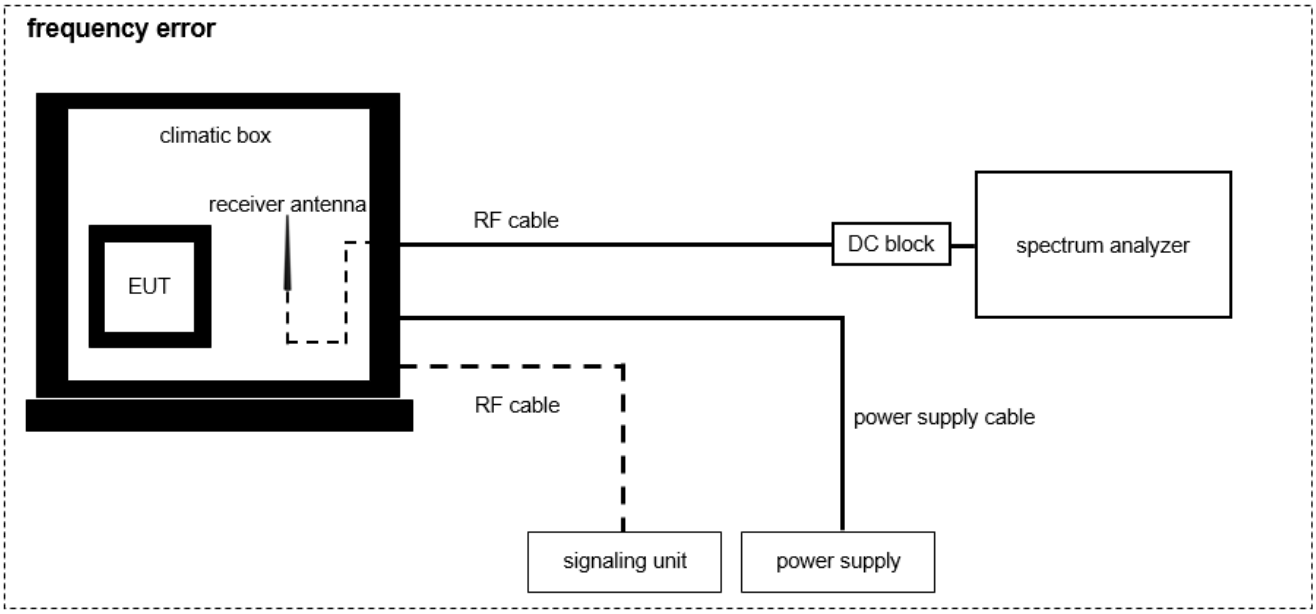
FS = UR + CA + AF
(FS-field strength; UR-voltage at the receiver; CA-loss of the signal path; AF-antenna factor)

Example calculation:
FS [dBµV/m] = 40.0 [dBµV/m] + (-35.8) [dB] + 32.9 [dB/m] = 37.1 [dBµV/m] (71.61 µV/m)

Equipment table:

No.	Lab / Item	Equipment	Type	Manufacturer	Serial No.	INV. No Cetecom	Kind of Calibration	Last Calibration	Next Calibration
1	A	Active Loop Antenna 10 kHz to 30 MHz	6502	EMCO/2	8905-2342	300000256	k	24.06.2015	24.06.2017
2	A	4U RF Switch Platform	L4491A	Agilent Technologies	MY50000032	300004510	ne		
3	A	Messrechner und Monitor	Intel Core i3 3220/3,3 GHz, Prozessor	Agilent Technologies	2V2403033A5421	300004591	ne		
4	A	NEXIO EMV-Software	BAT EMC	EMCO	2V2403033A5421	300004682	ne		
5	A	EMI Test Receiver 20Hz- 26,5GHz	ESU26	R&S	100037	300003555	k	22.01.2015	22.01.2016
6	A	DC power supply, 60Vdc, 50A, 1200 W	6032A	HP	2920A04590	300001041	Ve	20.01.2015	20.01.2018

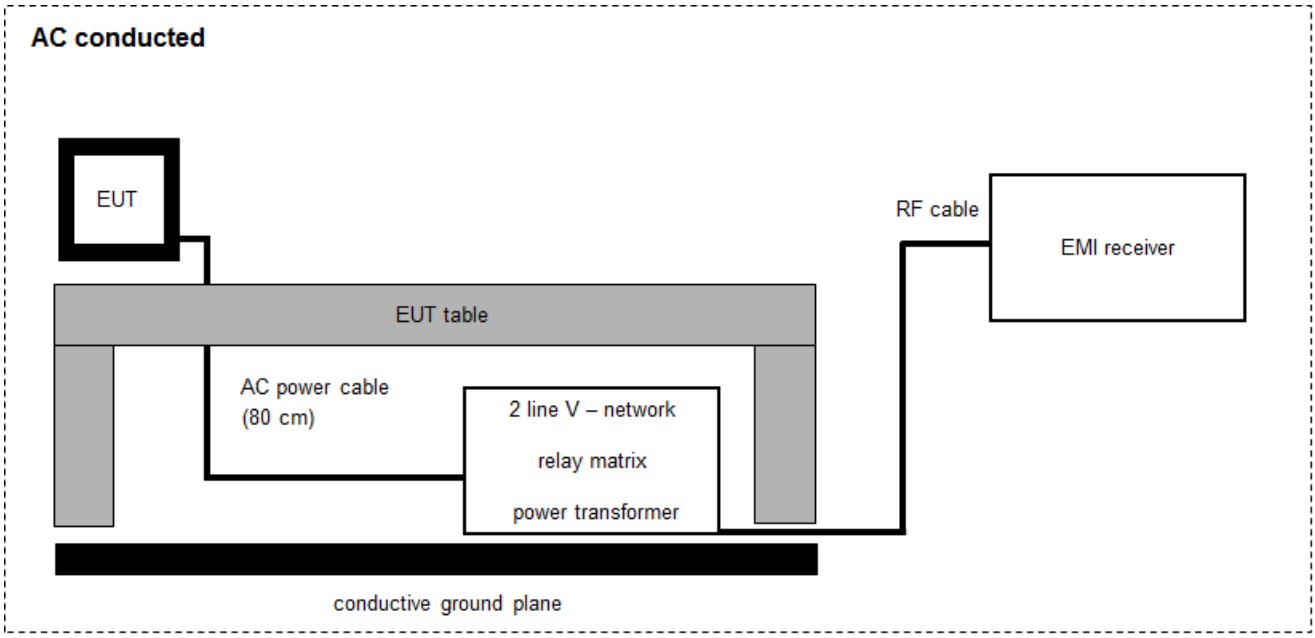
7.3 Frequency error



Equipment table:

No.	Lab / Item	Equipment	Type	Manufacturer	Serial No.	INV. No Cetecom	Kind of Calibration	Last Calibration	Next Calibration
1 1	A	Temperature Test Chamber	T-40/50	CTS GmbH	064023	300003540	ev	03.09.2015	03.09.2017
2	A	EMI Test Receiver 9 kHz - 3 GHz incl. Preselector	ESPI3	R&S	101713	300004059	k	23.01.2015	23.01.2016
3	A	Loop Antenna		ZEG TS Steinfurt	101713	400001208	ev		
4	A	RF Cable BNC	RG58	Huber & Suhner	101713	400001209	ev		
5	A	DC power supply, 60Vdc, 50A, 1200 W	6032A	HP	2920A04590	300001041	Ve	20.01.2015	20.01.2018

7.4 AC conducted



FS = UR + CF + VC
(FS-field strength; UR-voltage at the receiver; CR-loss of the cable and filter; VC-correction factor of the ISN)

Example calculation:
FS [dBµV/m] = 37.62 [dBµV/m] + 9.90 [dB] + 0.23 [dB] = 47.75 [dBµV/m] (244.06 µV/m)

Equipment table:

No.	Lab / Item	Equipment	Type	Manufact.	Serial No.	INV. No Cetecom	Kind of Calibration	Last Calibration	Next Calibration
1	A	Netznachbildung	ESH3-Z5	R&S	892475/017	300002209	k	17.06.2014	17.06.2016
2	A	EMI-Receiver	8542E	HP	3617A00170	300000568	k	28.01.2015	28.01.2016
3	A	Analyzer-Reference-System (Harmonics and Flicker)	ARS 16/1	SPS	A3509 07/0 0205	300003314	Ve	11.02.2014	11.02.2016

8 Sequence of testing

8.1 Sequence of testing radiated spurious 9 kHz to 30 MHz

Setup

- The equipment is set up to simulate normal operation mode as described in the user manual or defined by the manufacturer.
- If the EUT is a tabletop system, a 2-axis positioner with 1.5 m height is used.
- If the EUT is a floor standing device, it is placed directly on the turn table.
- Auxiliary equipment and cables are positioned to simulate normal operation conditions as described in ANSI C 63.4.
- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- Measurement distance is 3 m (see ANSI C 63.4) – see test details.
- EUT is set into operation.

Premeasurement

- The turntable rotates from 0° to 315° using 45° steps.
- The antenna height is 1.5 m.
- At each turntable position the analyzer sweeps with positive-peak detector to find the maximum of all emissions.

Final measurement

- Identified emissions during the premeasurement are maximized by the software by rotating the turntable from 0° to 360°. In case of the 2-axis positioner is used the elevation axis is also rotated from 0° to 360°.
- The final measurement is done in the position (turntable and elevation) causing the highest emissions with quasi-peak (as described in ANSI C 63.4).
- Final levels, frequency, measuring time, bandwidth, turntable position, correction factor, margin to the limit and limit will be recorded. A plot with the graph of the premeasurement and the limit is stored.

8.2 Sequence of testing radiated spurious 30 MHz to 1 GHz

Setup

- The equipment is set up to simulate normal operation mode as described in the user manual or defined by the manufacturer.
- If the EUT is a tabletop system, a table with 0.8 m height is used, which is placed on the ground plane.
- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.
- Auxiliary equipment and cables are positioned to simulate normal operation conditions as described in ANSI C 63.4.
- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- Measurement distance is 10 m or 3 m (see ANSI C 63.4) – see test details.
- EUT is set into operation.

Premeasurement

- The turntable rotates from 0° to 315° using 45° steps.
- The antenna is polarized vertical and horizontal.
- The antenna height changes from 1 m to 3 m.
- At each turntable position, antenna polarization and height the analyzer sweeps three times in peak to find the maximum of all emissions.

Final measurement

- The final measurement is performed for at least six highest peaks according to the requirements of the ANSI C63.4.
- Based on antenna and turntable positions at which the peak values are measured the software maximize the peaks by changing turntable position ± 45° and antenna height between 1 and 4 m.
- The final measurement is done with quasi-peak detector (as described in ANSI C 63.4).
- Final levels, frequency, measuring time, bandwidth, antenna height, antenna polarization, turntable angle, correction factor, margin to the limit and limit are recorded. A plot with the graph of the premeasurement with marked maximum final results and the limit is stored.

9 Measurement uncertainty

Measurement uncertainty	
Test case	**Uncertainty**
Spectrum bandwidth	± 21.5 kHz absolute; ± 15.0 kHz relative
Maximum output power	± 1 dB
Spurious emissions radiated below 30 MHz	± 3 dB
Spurious emissions radiated 30 MHz to 1 GHz	± 3 dB
Frequency error	± 10 Hz

10 Summary of measurement results

☒	No deviations from the technical specifications were ascertained
☐	There were deviations from the technical specifications ascertained
☐	This test report is only a partial test report. The content and verdict of the performed test cases are listed below.

TC Identifier	Description	Verdict	Date	Remark
RF-Testing	CFR Part 15 RSS 210 Issue 8 RSS Gen Issue 4	See table!	2015-11-26	-/-

Test specification clause	Test case	Temperature conditions	Power source conditions	C	NC	NA	NP	Remark
RSS Gen Issue 4	Occupied bandwidth	Nominal	Nominal	☒	☐	☐	☐	-/-
§ 15.225 (a)	Field strength of the fundamental	Nominal	Nominal	☒	☐	☐	☐	-/-
§ 15.209 & § 15.225 (b-d)	Field strength of the harmonics and spurious	Nominal	Nominal	☒	☐	☐	☐	-/-
§ 15.109	Receiver spurious emissions and cabinet radiations	Nominal	Nominal	☐	☐	☒	☐	Colocated receiver
§15.107 §15.207	Conducted limits	Nominal	Nominal	☒	☐	☐	☐	-/-
§ 15.225 (a)	Frequency tolerance	Normal & extreme conditions	Normal & extreme conditions	☒	☐	☐	☐	-/-

Note: C = Complies; NC = Not complies; NA = Not applicable; NP = Not performed

11 Additional comments

Reference documents: None

Special test descriptions: None

Configuration descriptions: None

12 Measurement results

12.1 Occupied bandwidth

Measurement:

The emission bandwidth (x dB) is defined as the frequency range between two points, one above and one below the carrier frequency, at which the spectral density of the emission is attenuated x dB below the maximum in-band spectral density of the modulated signal.

Measurement parameters	
Detector:	Peak
Resolution bandwidth:	1 % – 5 % of the occupied bandwidth
Video bandwidth:	≥ 3x RBW
Trace mode:	Max hold
Analyser function:	99 % power function
Used equipment:	See chapter 7.3 A
Measurement uncertainty:	See chapter 9

Limit:

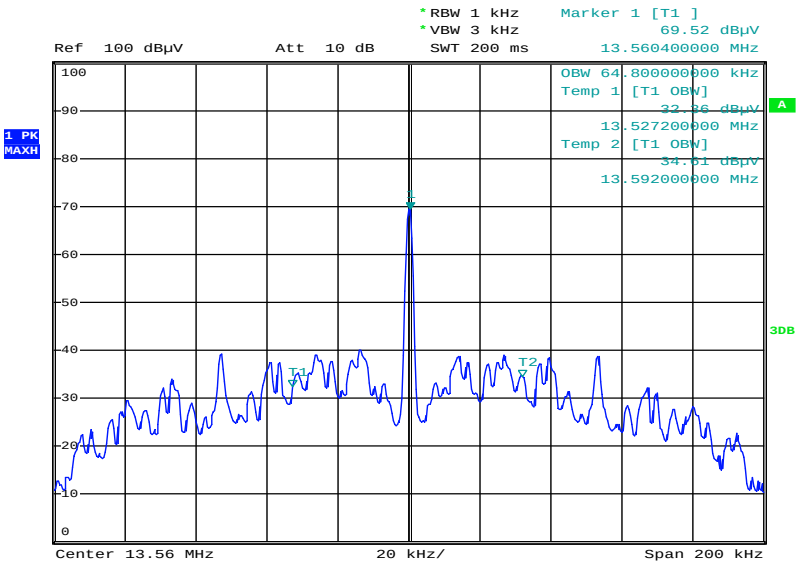
IC
for RSP-100 test report coversheet only

Result:

99% emission bandwidth [kHz]	
DTM434	64.8
DTM435	83.2
DTM436	68.4
DTM437	66.8

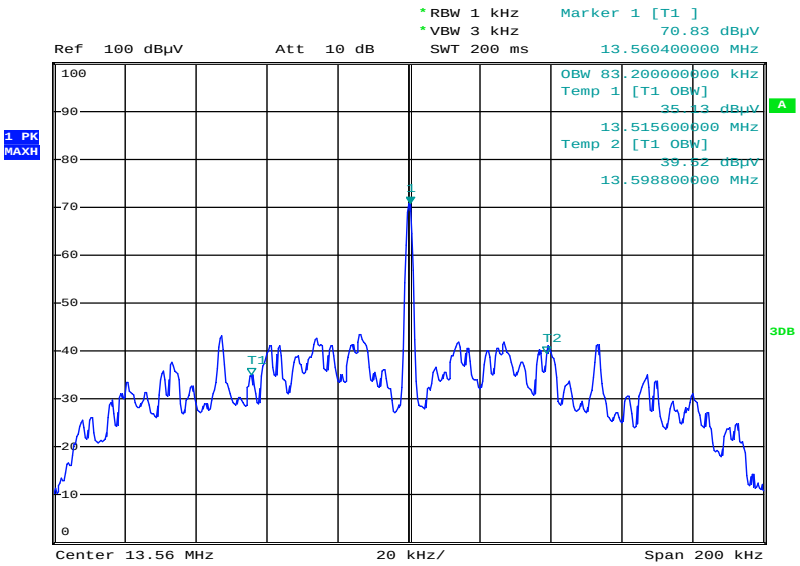
Plot:

Plot 1: 99 % emission bandwidth DTM434



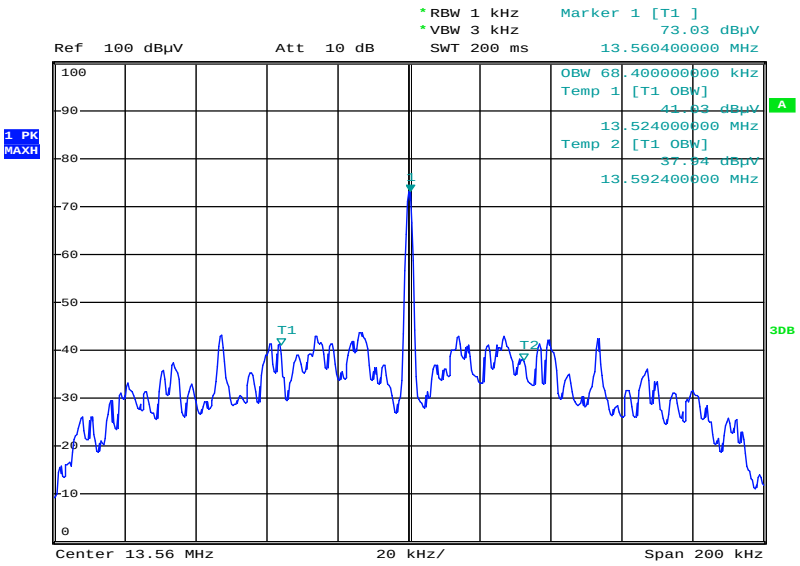
Date: 22.OCT.2015 09:46:29

Plot 1: 99 % emission bandwidth DTM435



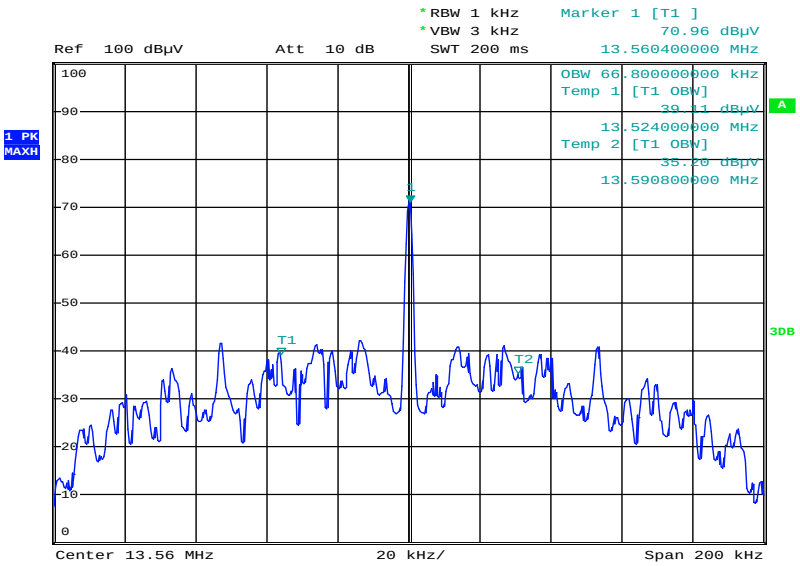
Date: 22.OCT.2015 09:48:29

Plot 1: 99 % emission bandwidth DTM436



Date: 22.OCT.2015 09:49:37

Plot 4: 99 % emission bandwidth DTM437



Date: 22.OCT.2015 09:50:21

12.2 Field strength of the fundamental

Measurement:

The maximum detected field strength for the carrier signal.

Measurement parameters	
Detector:	Quasi peak / peak (worst case)
Resolution bandwidth:	120 kHz
Video bandwidth:	≥ 3x RBW
Trace mode:	Max hold
Used equipment:	See chapter 7.2 A
Measurement uncertainty:	See chapter 9

Limit:

FCC & IC		
Frequency (MHz)	Field strength (µV/m)	Measurement distance (m)
13.553 to 13.567	15,848 (84 dBµV/m)	30

Recalculation:

According to ANSI C63.10		
Frequency	Formula	Correction value
13.56 MHz	$FS_{limit} = FS_{max} - 40\log\left(\frac{d_{nearfield}}{d_{measure}}\right) - 20\log\left(\frac{d_{limit}}{d_{nearfield}}\right)$	-21.39

According to ANSI C63.10

Result:

Field strength of the fundamental			
Frequency		13.56 MHz	
Distance		@ 3 m	@ 30 m
Measured / calculated value	DTM434	57.1 dBµV/m	35.7 dBµV/m
	DTM435	61.9 dBµV/m	40.5 dBµV/m
	DTM436	56.2 dBµV/m	34.8 dBµV/m
	DTM437	58.5 dBµV/m	37.1 dBµV/m

12.3 Field strength of the harmonics and spurious

Measurement:

The maximum detected field strength for the harmonics and spurious.

Measurement parameters	
Detector:	Quasi peak / average or peak (worst case – pre-scan)
Resolution bandwidth:	F < 150 kHz: 200 Hz 150 kHz < F < 30 MHz: 9 kHz 30 MHz < F < 1 GHz: 120 kHz
Video bandwidth:	F < 150 kHz: 1 kHz 150 kHz < F < 30 MHz: 100 kHz 30 MHz < F < 1 GHz: 300 kHz
Trace mode:	Max hold
Used equipment:	See chapter 7.2 A / 7.3 A
Measurement uncertainty:	See chapter 9

Limit:

FCC & IC		
Frequency (MHz)	Field strength (dBµV/m)	Measurement distance (m)
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30	30 (29.5 dBµV/m)	30
30 – 88	100 (40 dBµV/m)	3
88 – 216	150 (43.5 dBµV/m)	3
216 – 960	200 (46 dBµV/m)	3

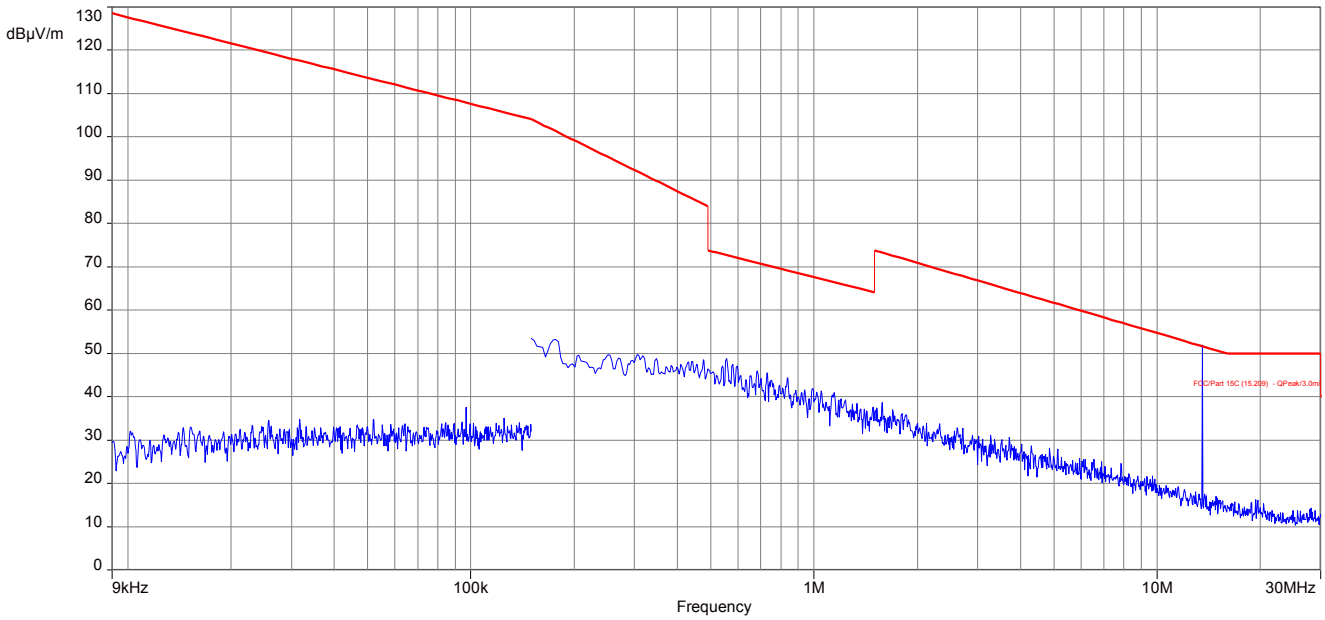
Note: For a reduced measurement distance, please take a look at the limit line and the ANSI C63.10-2013 sub clause 6.4 radiated emissions from unlicensed wireless devices below 30 MHz.

Results DTM434 & 435 & 436 & 437:

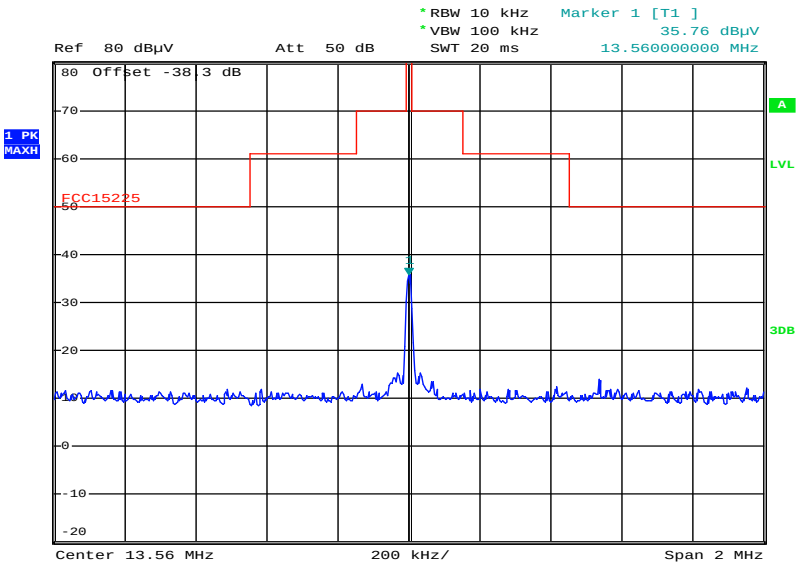
Detected emissions			
Frequency (MHz)	Detector	Resolution bandwidth (kHz)	Detected value
No emissions closer 10 dB to the limit.			

Plots DTM434:

Plot 1: 9 kHz – 30 MHz, magnetic emissions

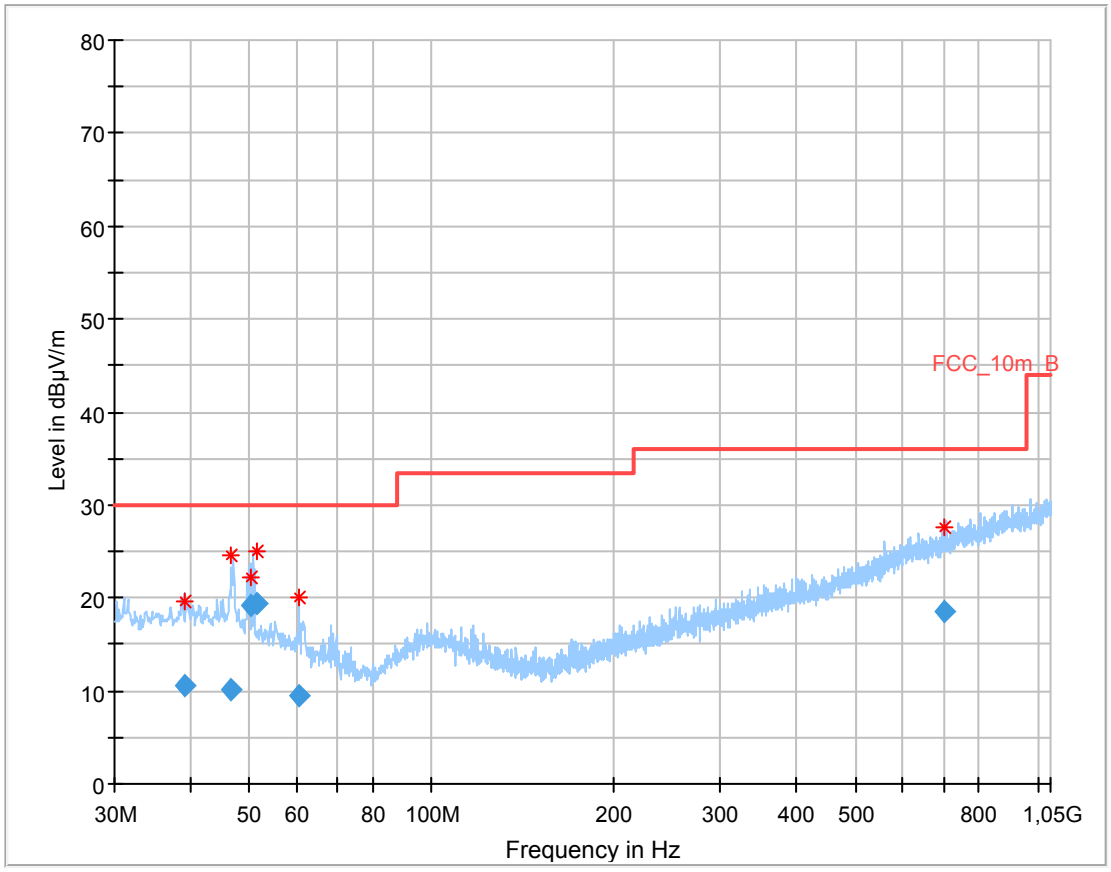


Plot 2: Spectrum mask (the limits are recalculated according to the ANSI C63.10-2013 sub clause 6.4)



Date: 22.OCT.2015 09:59:19

Plot 3: 30 MHz – 1 GHz, vertical and horizontal polarizations

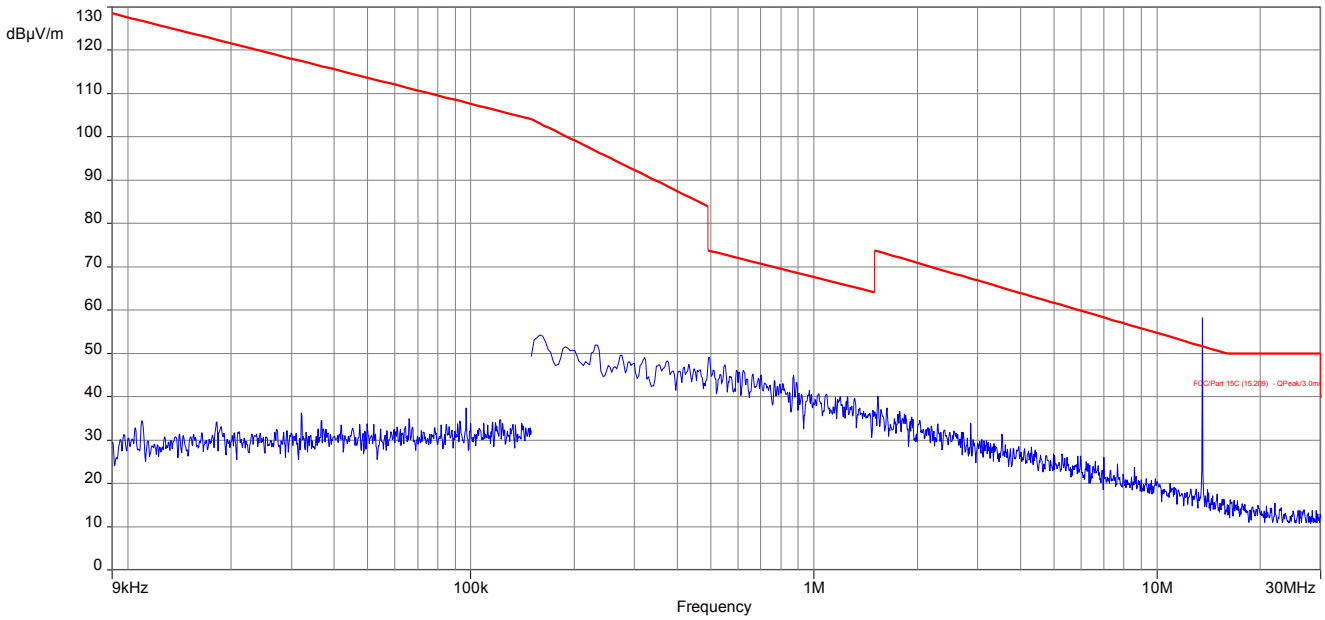


Final_Result

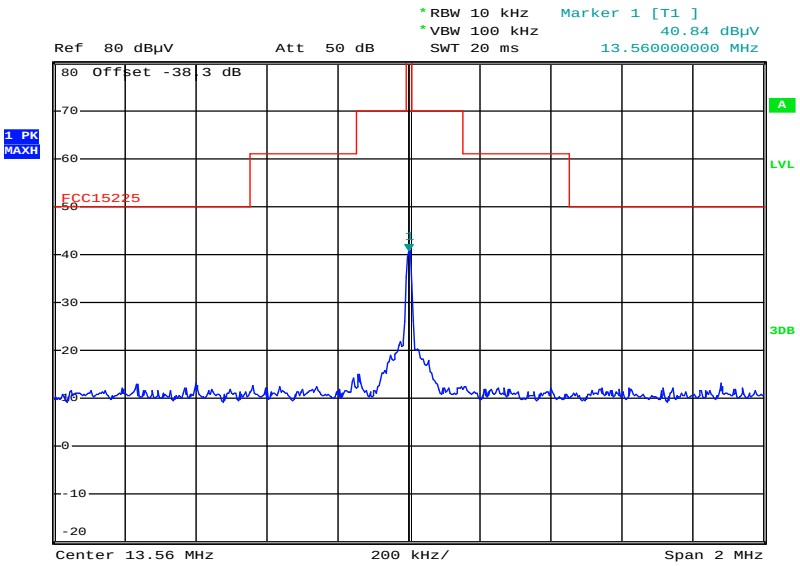
Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
39.155250	10.46	30.00	19.54	1000.0	120.000	101.0	V	101	14.0
46.534500	10.21	30.00	19.79	1000.0	120.000	101.0	V	236	13.5
50.330850	19.28	30.00	10.72	1000.0	120.000	98.0	V	338	12.6
51.379800	19.30	30.00	10.70	1000.0	120.000	98.0	V	295	12.4
60.249900	9.46	30.00	20.54	1000.0	120.000	170.0	V	248	10.5
701.355600	18.55	36.00	17.45	1000.0	120.000	170.0	H	236	21.6

Plots DTM435:

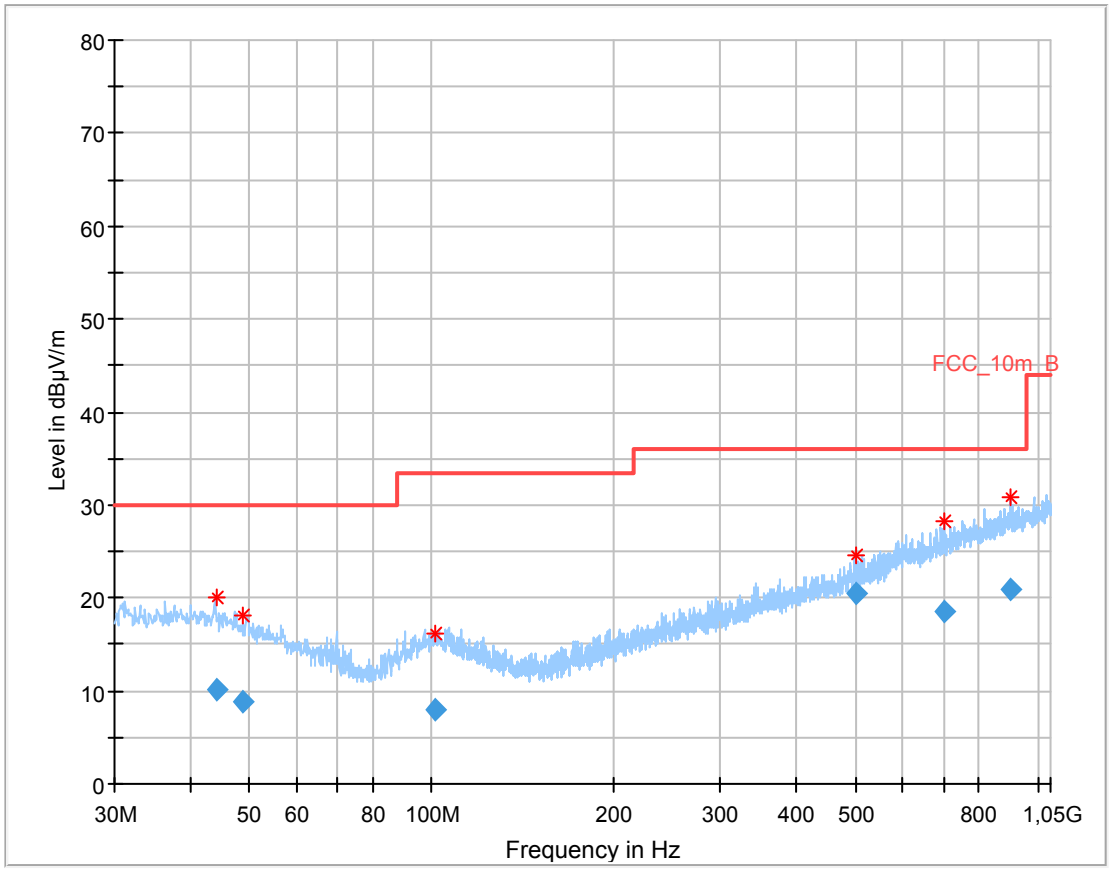
Plot 1: 9 kHz – 30 MHz, magnetic emissions



Plot 2: Spectrum mask (the limits are recalculated according to the ANSI C63.10-2013 sub clause 6.4)



Plot 3: 30 MHz – 1 GHz, vertical and horizontal polarization

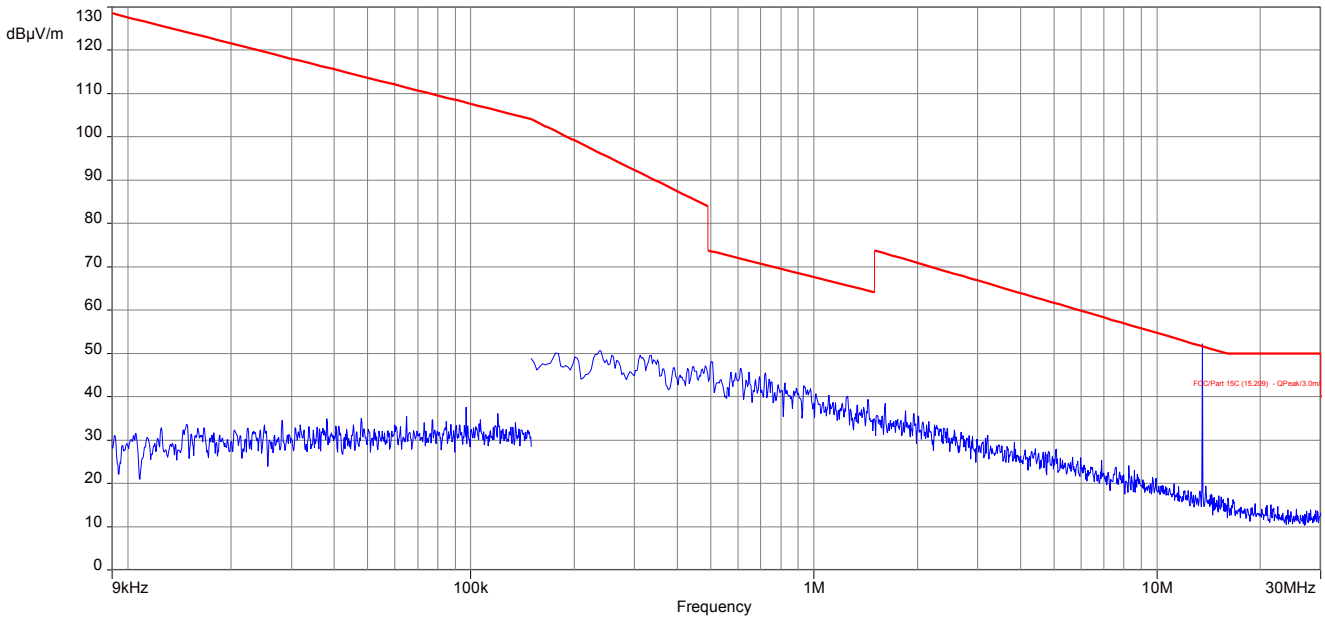


Final_Result

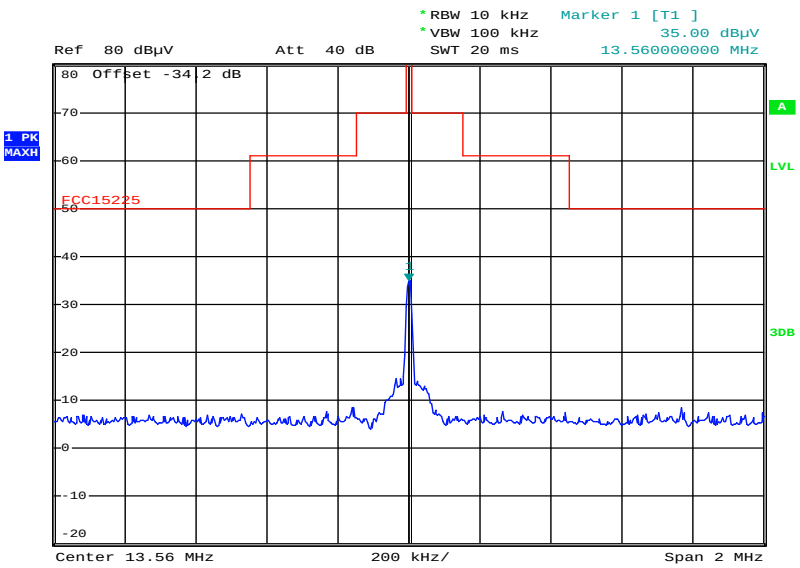
Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
44.087250	10.09	30.00	19.91	1000.0	120.000	101.0	V	322	13.9
48.982800	8.85	30.00	21.15	1000.0	120.000	170.0	H	342	12.9
101.688000	8.03	33.50	25.47	1000.0	120.000	101.0	H	98	12.0
501.762750	20.43	36.00	15.57	1000.0	120.000	170.0	H	37	18.7
699.772050	18.53	36.00	17.47	1000.0	120.000	170.0	H	212	21.5
902.152500	21.00	36.00	15.00	1000.0	120.000	170.0	V	148	24.1

Plots DTM436:

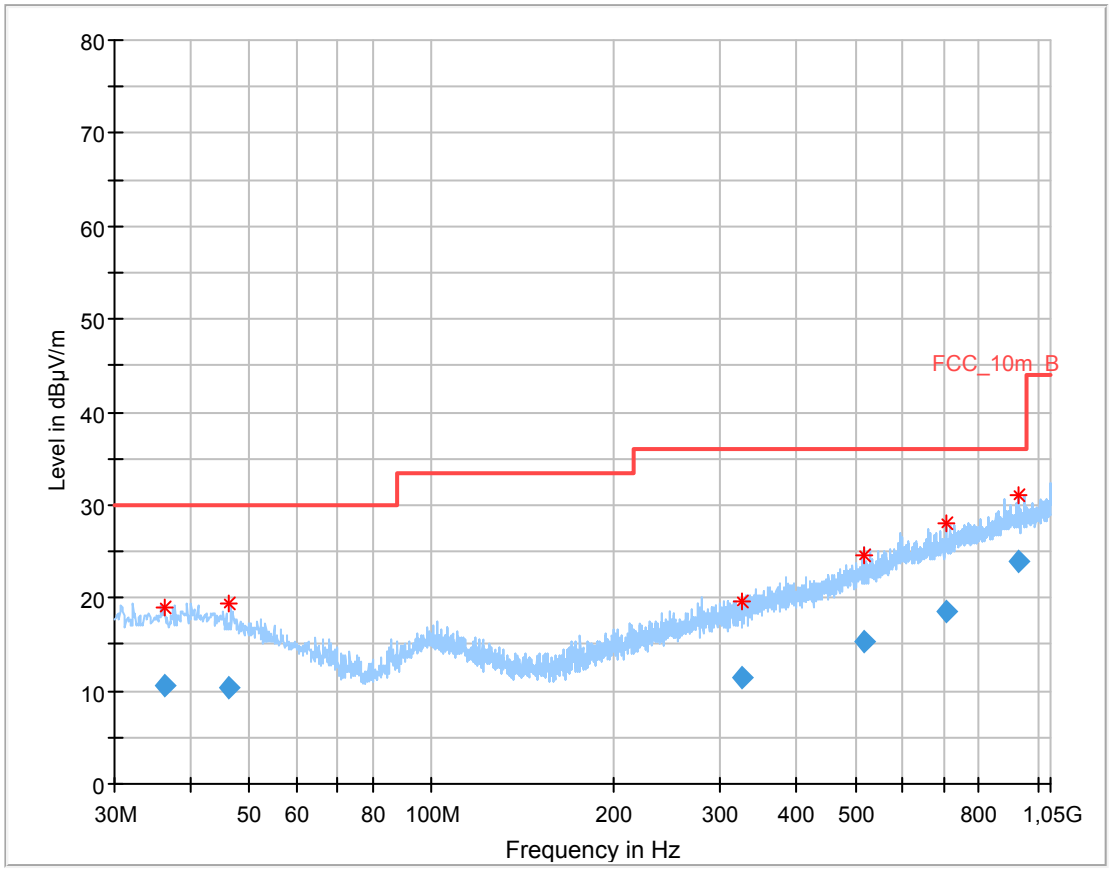
Plot 1: 9 kHz – 30 MHz, magnetic emissions



Plot 2: Spectrum mask (the limits are recalculated according to the ANSI C63.10-2013 sub clause 6.4)



Plot 3: 30 MHz – 1 GHz, vertical and horizontal polarization

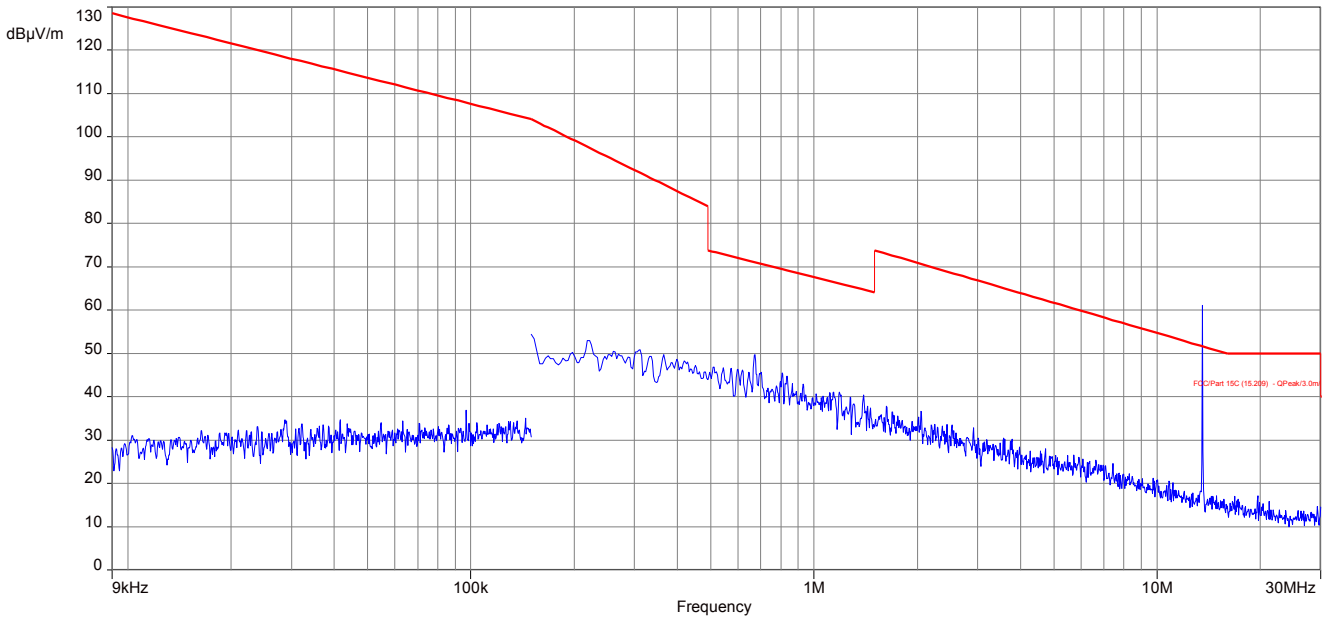


Final_Result

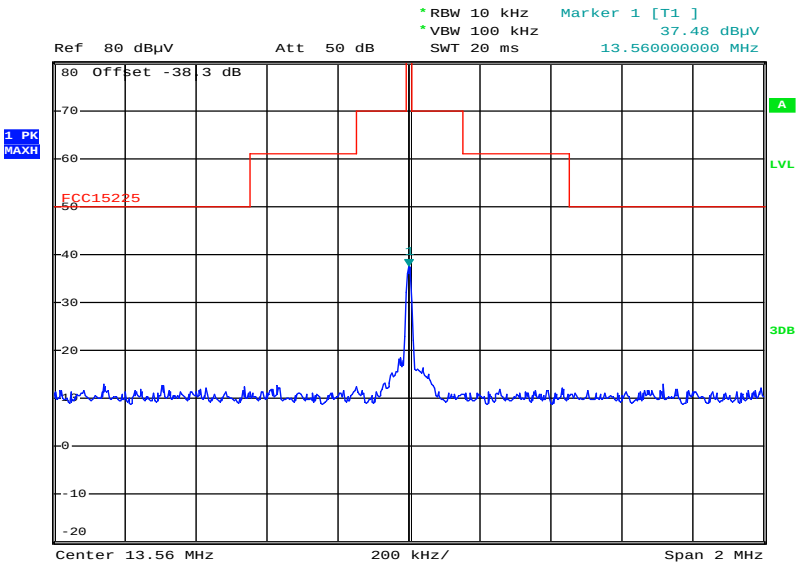
Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
36.197400	10.48	30.00	19.52	1000.0	120.000	170.0	V	101	13.9
46.257450	10.34	30.00	19.66	1000.0	120.000	101.0	V	319	13.5
325.523250	11.50	36.00	24.50	1000.0	120.000	101.0	H	25	15.3
516.655950	15.30	36.00	20.70	1000.0	120.000	170.0	V	157	18.9
708.078450	18.58	36.00	17.42	1000.0	120.000	98.0	V	39	21.7
927.465450	23.95	36.00	12.05	1000.0	120.000	100.0	V	101	24.2

Plots DTM437:

Plot 1: 9 kHz – 30 MHz, magnetic emissions



Plot 2: Spectrum mask (the limits are recalculated according to the ANSI C63.10-2013 sub clause 6.4)



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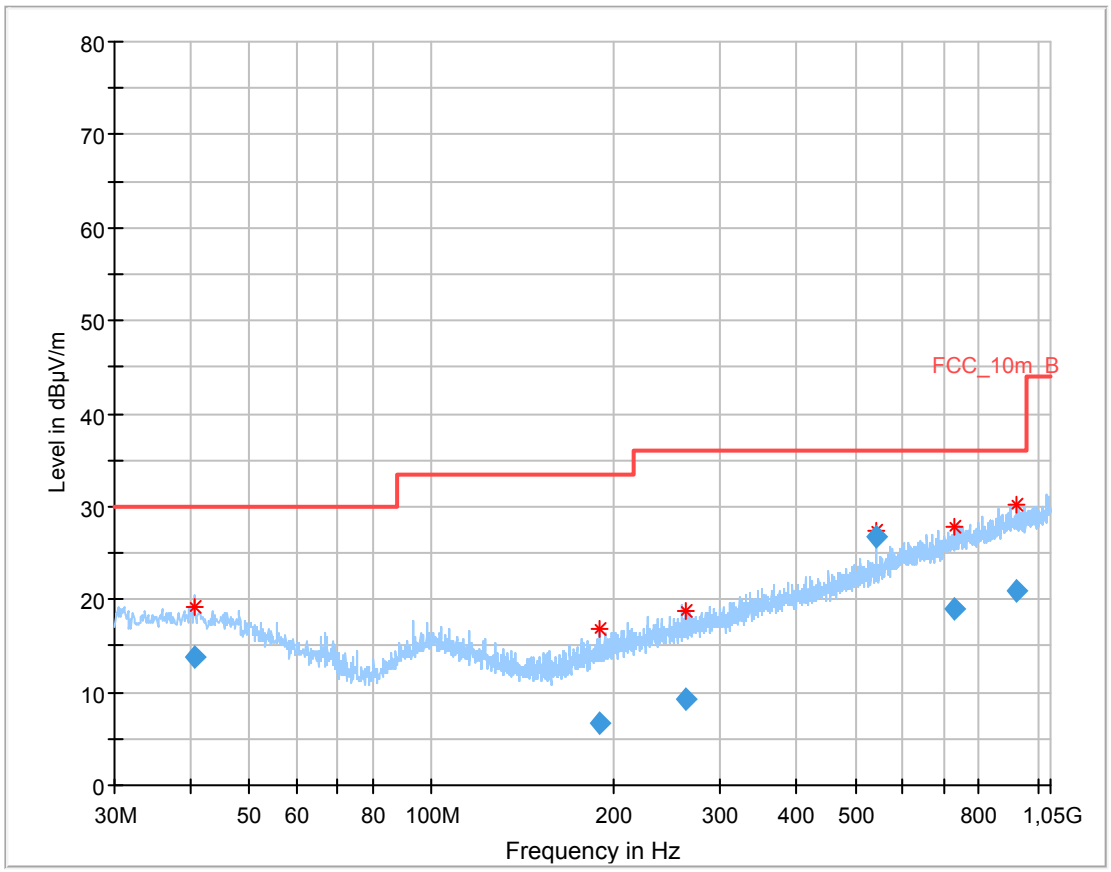
Plot 3: 30 MHz – 1 GHz, vertical and horizontal polarization



Final_Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
40.668150	13.81	30.00	16.19	1000.0	120.000	98.0	V	284	14.0
188.846400	6.74	33.50	26.76	1000.0	120.000	170.0	H	291	11.0
262.221750	9.36	36.00	26.64	1000.0	120.000	100.0	V	303	13.6
542.411100	26.84	36.00	9.16	1000.0	120.000	170.0	H	93	19.2
727.234350	18.99	36.00	17.01	1000.0	120.000	170.0	V	179	22.2
925.503450	21.01	36.00	14.99	1000.0	120.000	100.0	H	104	24.2

12.4 Conducted limits

Measurement:

Measurement parameter	
Detector:	Peak / Quasi-Peak / Average
Sweep time:	Auto
Resolution bandwidth:	9 kHz
Video bandwidth:	50 kHz
Span:	30 MHz
Trace-Mode:	Max Hold

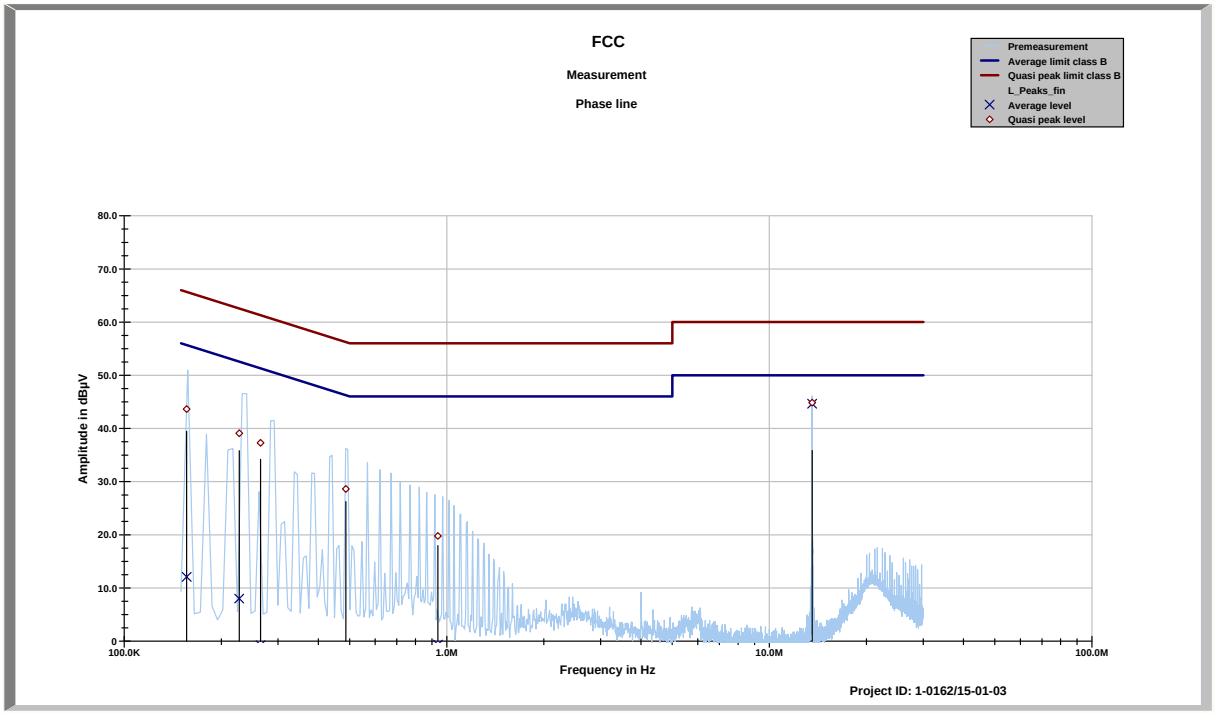
Limits:

FCC	IC	
Conducted limits		
Frequency of Emission (MHz)	**Conducted Limit (dBµV)**	
	Quasi-peak	Average
0.15 – 0.5	66 to 56 *	56 to 46 *
0.5 – 5	56	46
5 - 30	60	50

*Decreases with the logarithm of the frequency

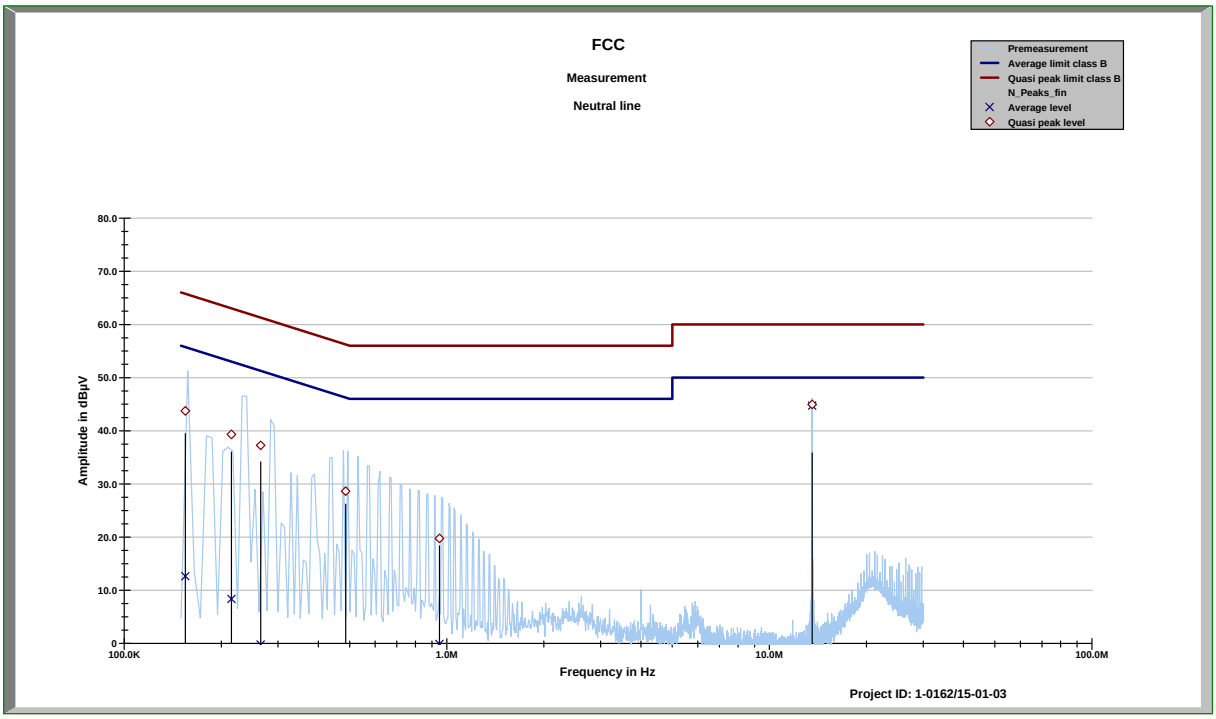
Plots DTM434:

Plot 1: phase line



Frequency	Quasi peak level	Margin quasi peak	Average level	Margin average
MHz	dBµV	dBµV	dBµV	dBµV
0.15621	43.64	22.02	12.07	43.76
0.22734	39.08	23.46	7.99	45.80
0.26477	37.26	24.02	-0.77	53.49
0.48647	28.61	27.61	-2.95	49.34
0.93876	19.78	36.22	-0.66	46.66
13.562	44.85	15.15	44.63	5.37

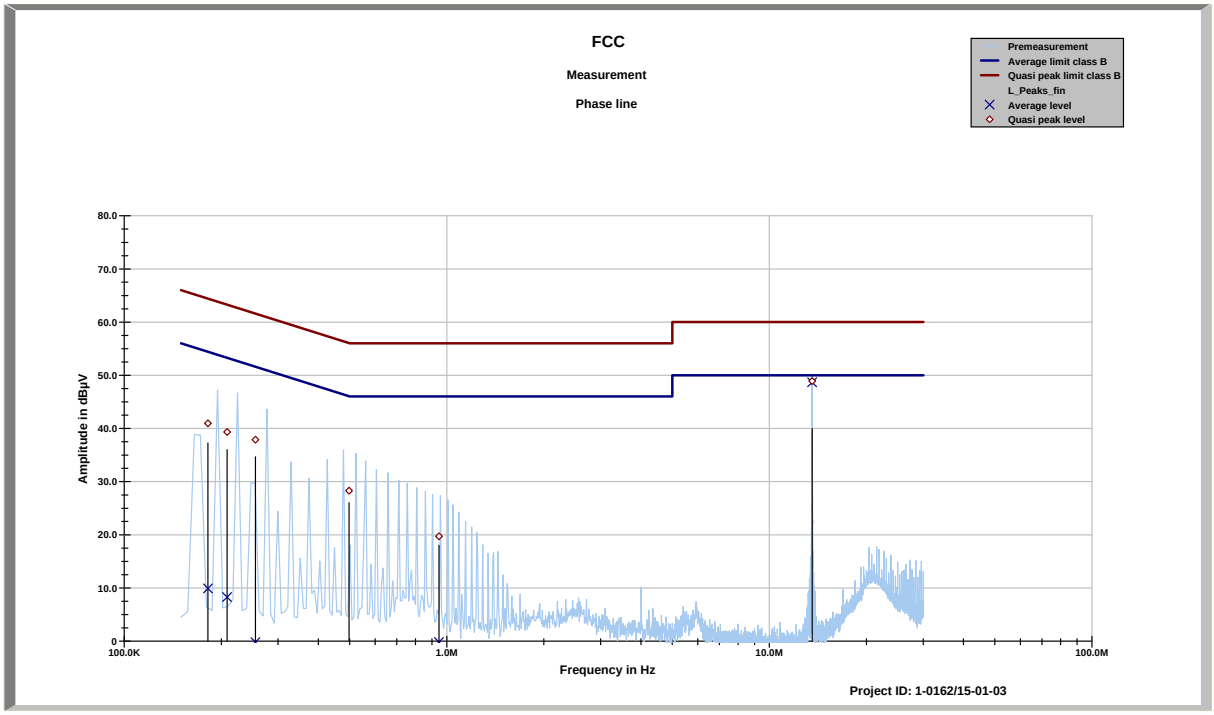
Plot 2: neutral line



Frequency	Quasi peak level	Margin quasi peak	Average level	Margin average
MHz	dBµV	dBµV	dBµV	dBµV
0.15478	43.73	22.01	12.64	43.22
0.21505	39.32	23.69	8.37	45.77
0.26483	37.25	24.03	-0.22	52.94
0.4857	28.64	27.61	-2.84	49.25
0.94894	19.75	36.25	-0.11	46.11
13.562	44.95	15.05	44.74	5.26

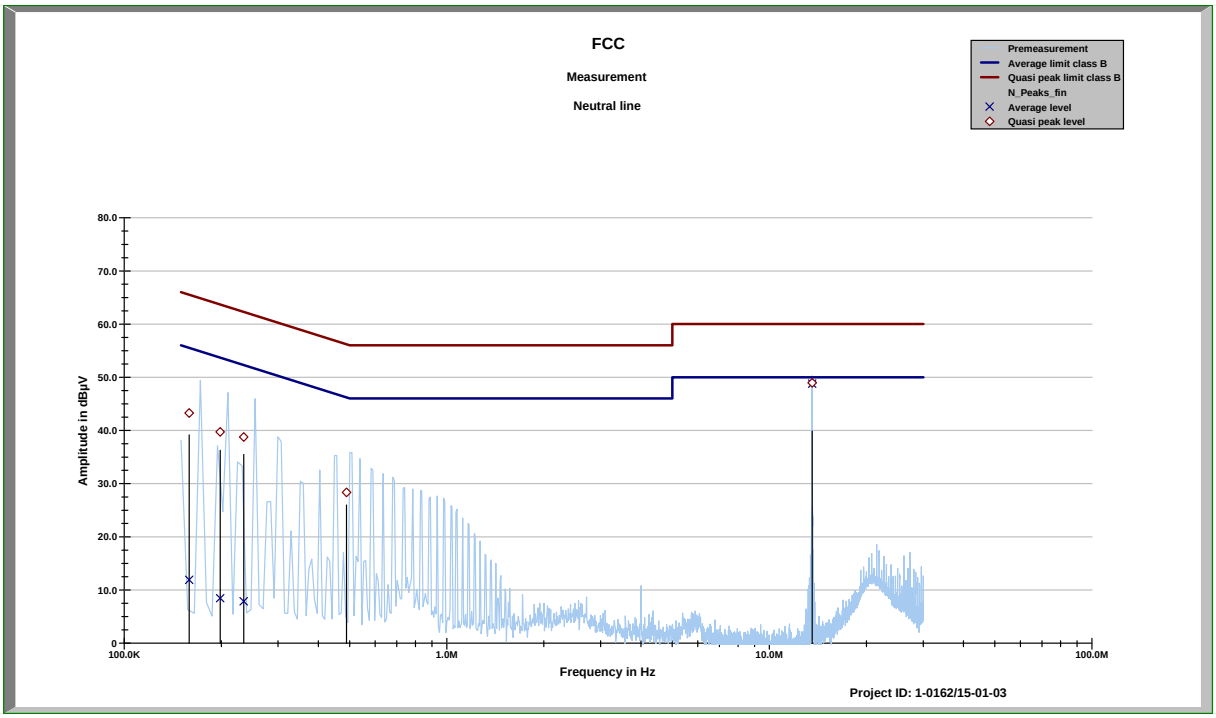
Plots DTM435:

Plot 1: phase line



Frequency	Quasi peak level	Margin quasi peak	Average level	Margin average
MHz	dBµV	dBµV	dBµV	dBµV
0.18172	40.95	23.46	9.91	45.19
0.20835	39.34	23.93	8.27	46.06
0.25516	37.89	23.70	-0.19	53.19
0.49775	28.27	27.77	-3.09	49.15
0.94546	19.71	36.29	-0.18	46.18
13.562	48.89	11.11	48.68	1.32

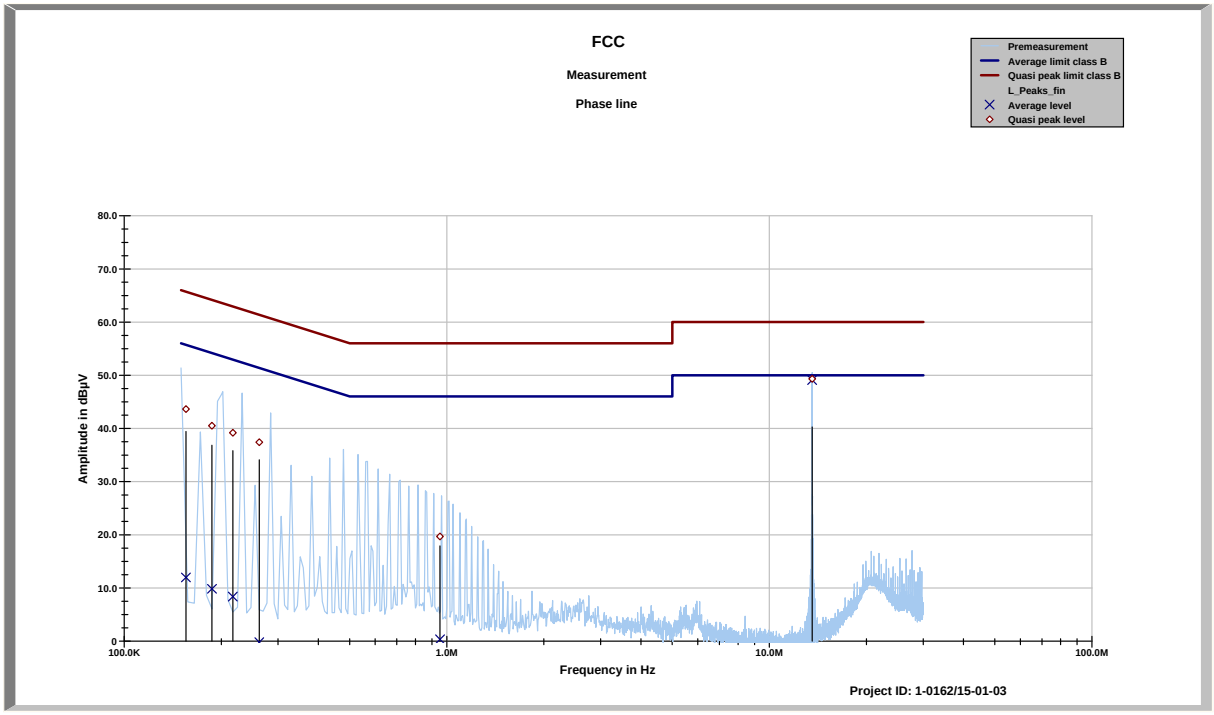
Plot 2: neutral line



Frequency	Quasi peak level	Margin quasi peak	Average level	Margin average
MHz	dBµV	dBµV	dBµV	dBµV
0.15908	43.27	22.24	11.89	43.85
0.19839	39.71	23.96	8.44	46.17
0.23467	38.76	23.52	7.86	45.72
0.48887	28.35	27.84	-3.06	49.38
13.562	48.94	11.06	48.78	1.22

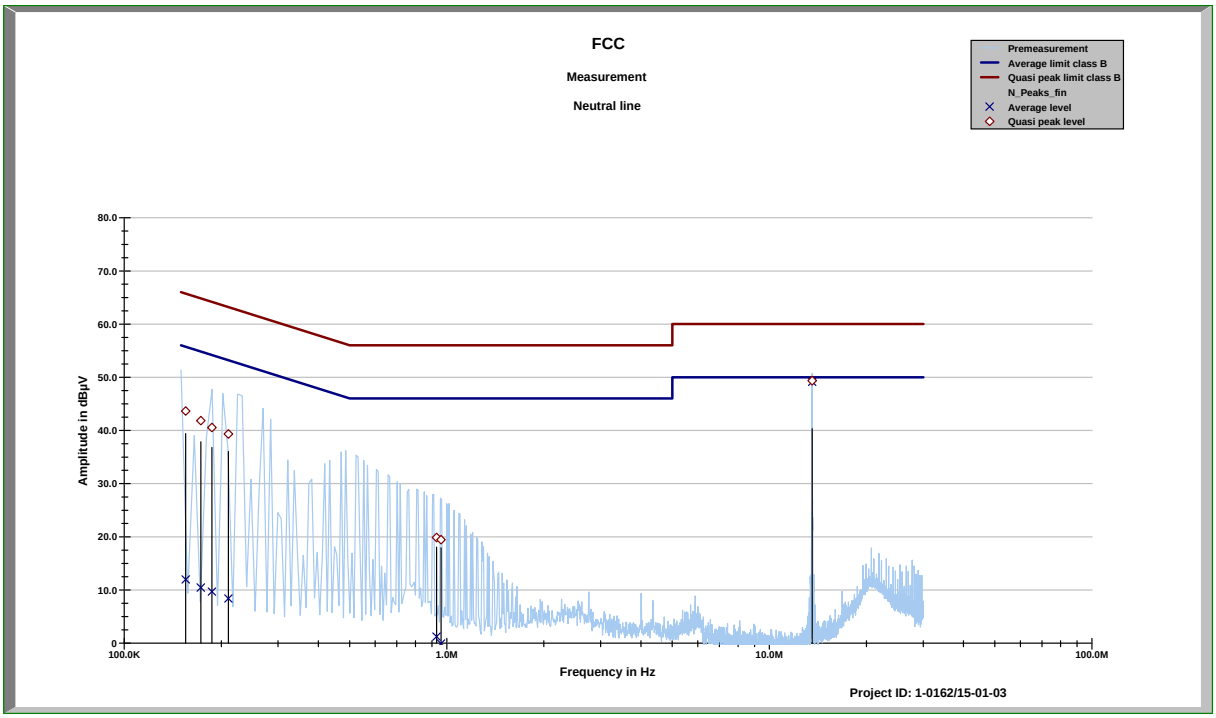
Plots DTM436:

Plot 1: phase line



Frequency	Quasi peak level	Margin quasi peak	Average level	Margin average
MHz	dBµV	dBµV	dBµV	dBµV
0.18172	40.95	23.46	9.91	45.19
0.20835	39.34	23.93	8.27	46.06
0.25516	37.89	23.70	-0.19	53.19
0.49775	28.27	27.77	-3.09	49.15
0.94546	19.71	36.29	-0.18	46.18
13.562	48.89	11.11	48.68	1.32

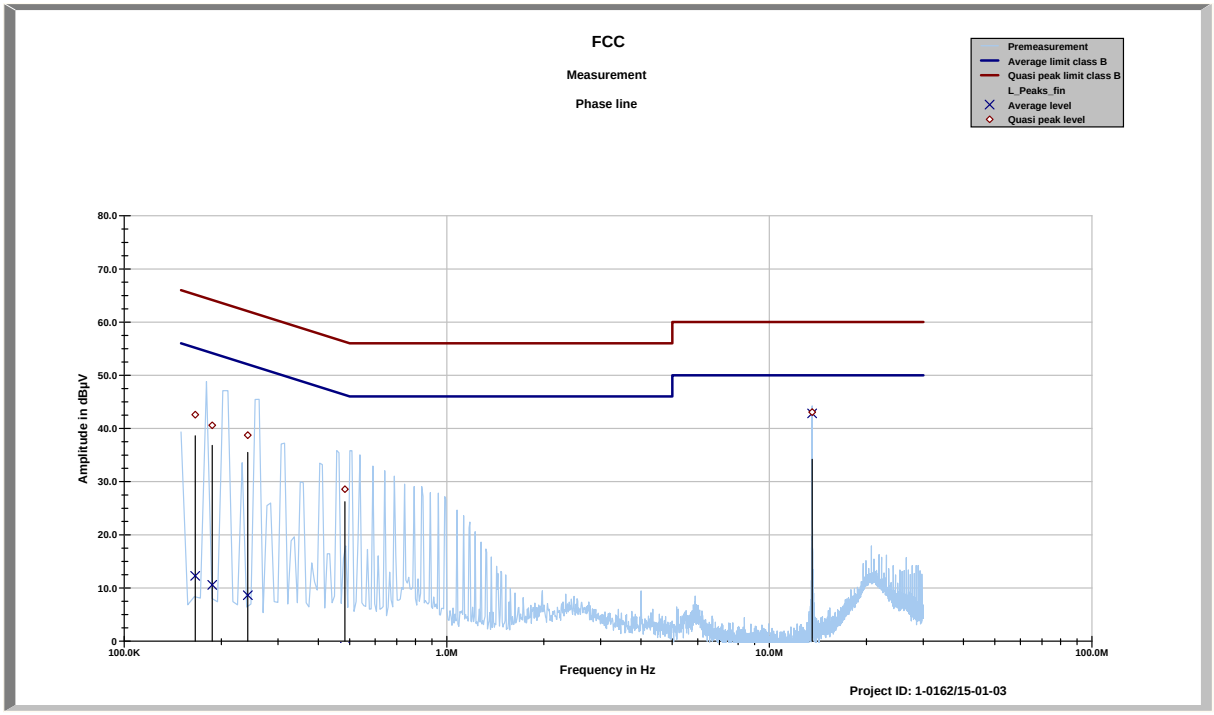
Plot 2: neutral line



Frequency	Quasi peak level	Margin quasi peak	Average level	Margin average
MHz	dBµV	dBµV	dBµV	dBµV
0.15908	43.27	22.24	11.89	43.85
0.19839	39.71	23.96	8.44	46.17
0.23467	38.76	23.52	7.86	45.72
0.48887	28.35	27.84	-3.06	49.38
13.562	48.94	11.06	48.78	1.22

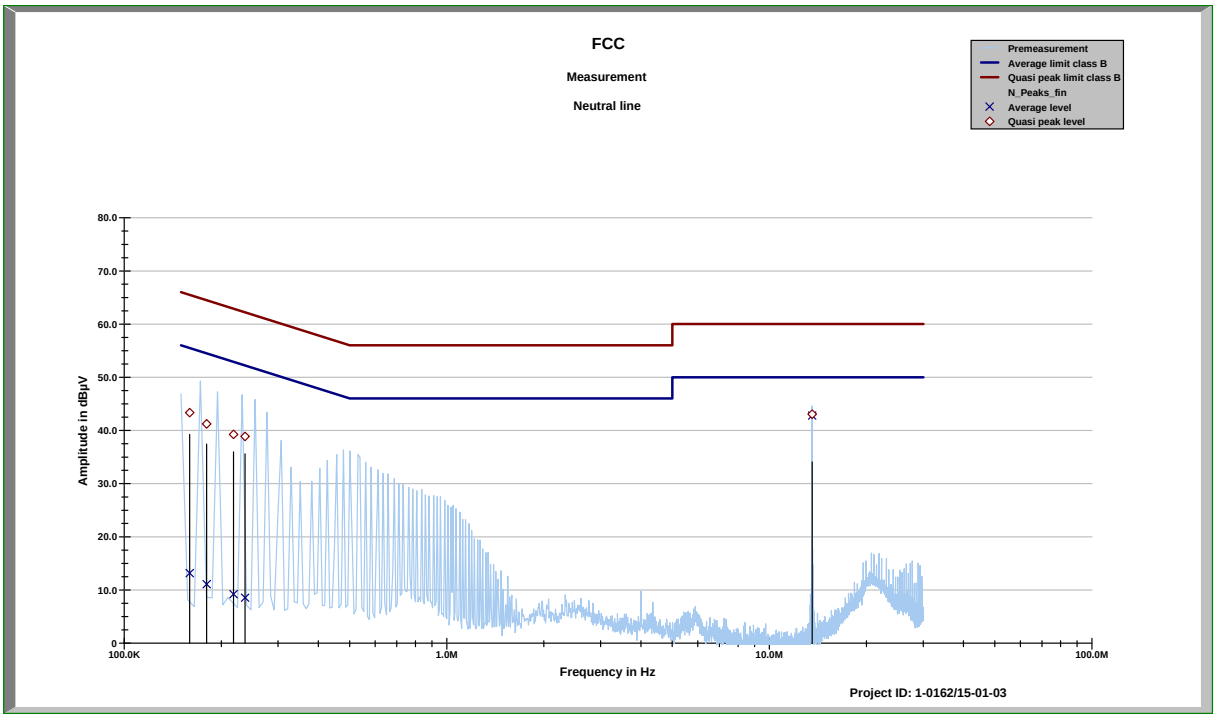
Plots DTM437:

Plot 1: phase line



Frequency	Quasi peak level	Margin quasi peak	Average level	Margin average
MHz	dBµV	dBµV	dBµV	dBµV
0.16609	42.58	22.57	12.26	43.28
0.18747	40.57	23.58	10.56	44.37
0.24166	38.72	23.31	8.62	44.76
0.48349	28.57	27.71	-1.07	47.54
13.562	43.07	16.93	42.82	7.18

Plot 2: neutral line



Frequency	Quasi peak level	Margin quasi peak	Average level	Margin average
MHz	dBµV	dBµV	dBµV	dBµV
0.15967	43.35	22.13	13.16	42.56
0.18018	41.22	23.26	11.08	44.06
0.21836	39.24	23.64	9.20	44.84
0.23698	38.86	23.34	8.53	44.99
13.562	43.05	16.95	42.78	7.22

12.5 Frequency error

Measurement:

The maximum detected field strength for the spurious.

Measurement parameters	
Detector:	Peak detector
Resolution bandwidth:	100 Hz
Video bandwidth:	> RBW
Trace mode:	Max hold
Used equipment:	See chapter 7.3 A
Measurement uncertainty:	See chapter 9

Limit:

FCC
The frequency tolerance of the carrier signal shall be maintained within +/- 0.01% of the operating frequency over a temperature variation of -20 degrees to +50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. (±1.356 kHz)

Result: Temperature variation

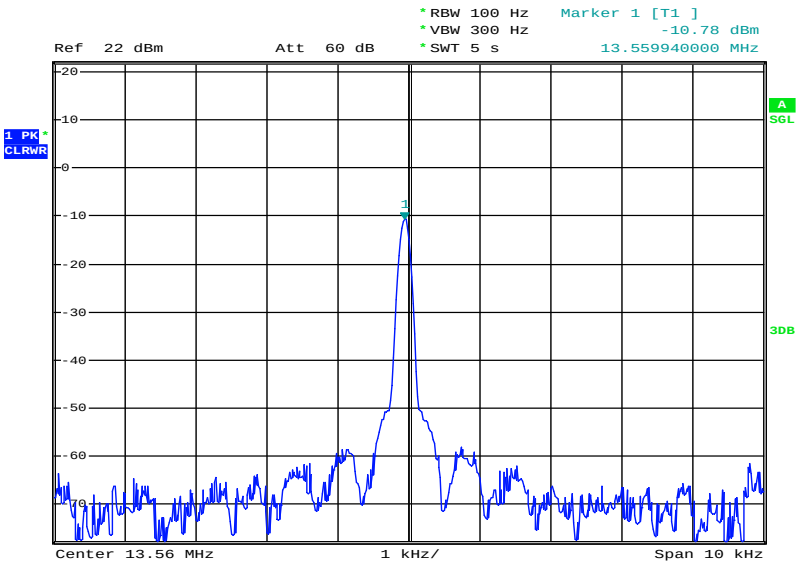
Frequency tolerance					
Measured frequency (MHz)				Conditions	Result
DTM434	DTM435	DTM436	DTM437		
13.56022	13.56020	13.56016	13.56020	-40 °C & 100% voltage	complies
13.56026	13.56026	13.56028	13.56018	-30 °C & 100% voltage	complies
13.56032	13.56034	13.56028	13.56026	-20 °C & 100% voltage	complies
13.56038	13.56036	13.56034	13.56030	-10 °C & 100% voltage	complies
13.56036	13.56036	13.56034	13.56028	0 °C & 100% voltage	complies
13.56034	13.56032	13.56028	13.56028	+10 °C & 100% voltage	complies
13.56028	13.56022	13.56024	13.56022	+20 °C & 100% voltage	complies
13.56020	13.56022	13.56020	13.56018	+30 °C & 100% voltage	complies
13.56014	13.56014	13.56012	13.56006	+40 °C & 100% voltage	complies
13.56012	13.56010	13.56004	13.56006	+50 °C & 100% voltage	complies
13.56004	13.56000	13.56002	13.56002	+60 °C & 100% voltage	complies
13.55996	13.55998	13.55996	13.55996	+70 °C & 100% voltage	complies
13.55996	13.55994	13.55994	13.55994	+80 °C & 100% voltage	complies
13.55994	13.55992	13.55992	13.55994	+85 °C & 100% voltage	complies

Result: Voltage variation

Frequency tolerance					
Measured frequency (MHz)				Conditions	Result
DTM434	DTM435	DTM436	DTM437		
13.56018	13.56018	13.56016	13.56018	+20 °C & 85% voltage	complies
13.56018	13.56016	13.56016	13.56016	+20 °C & 100% voltage	complies
13.56020	13.56016	13.56018	13.56016	+20 °C & 115% voltage	complies

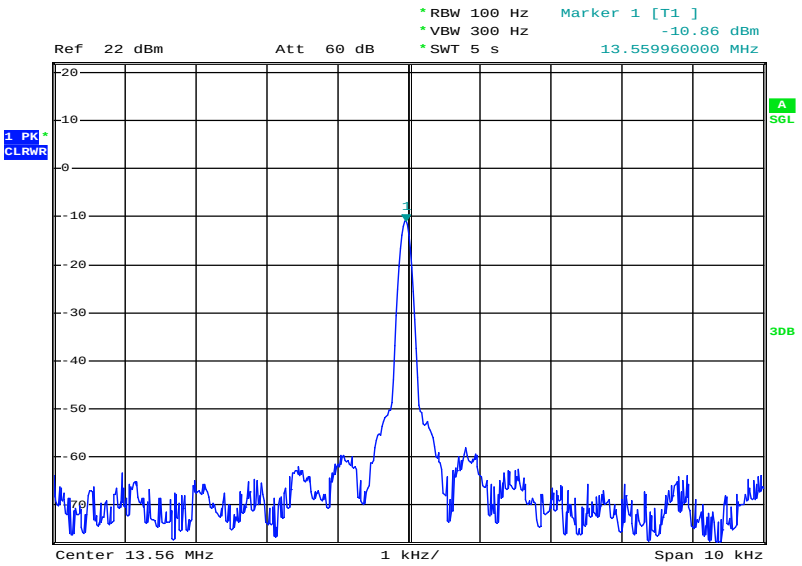
Plots DTM434:

Plot 1: 100% voltage; 85°C



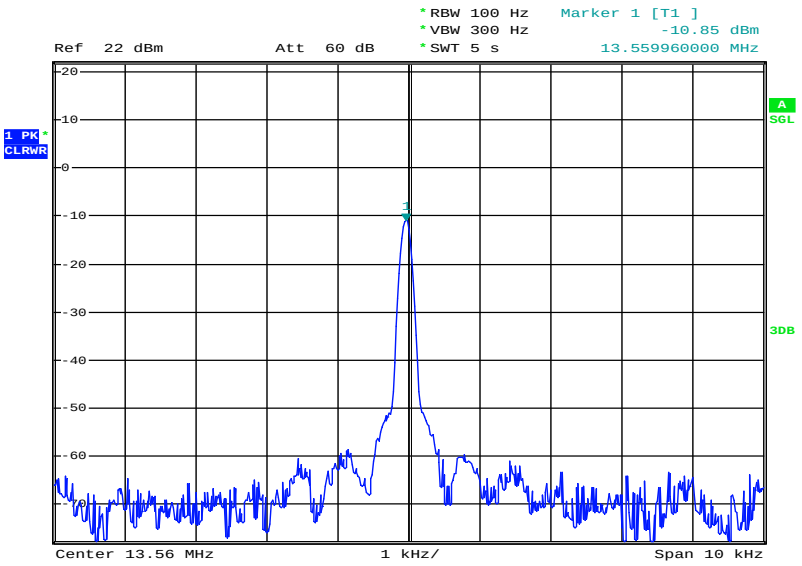
Date: 19.OCT.2015 12:30:21

Plot 2: 100% voltage; 80°C



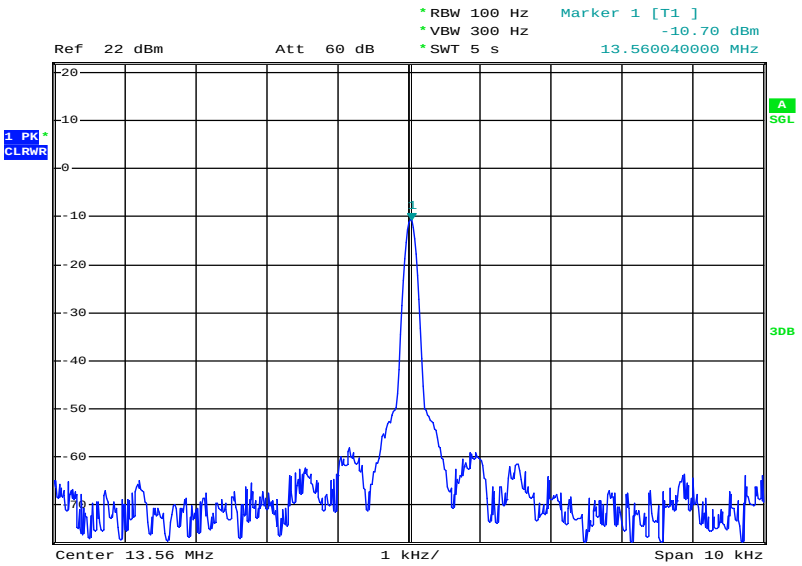
Date: 19.OCT.2015 12:22:46

Plot 3: 100% voltage; 70°C



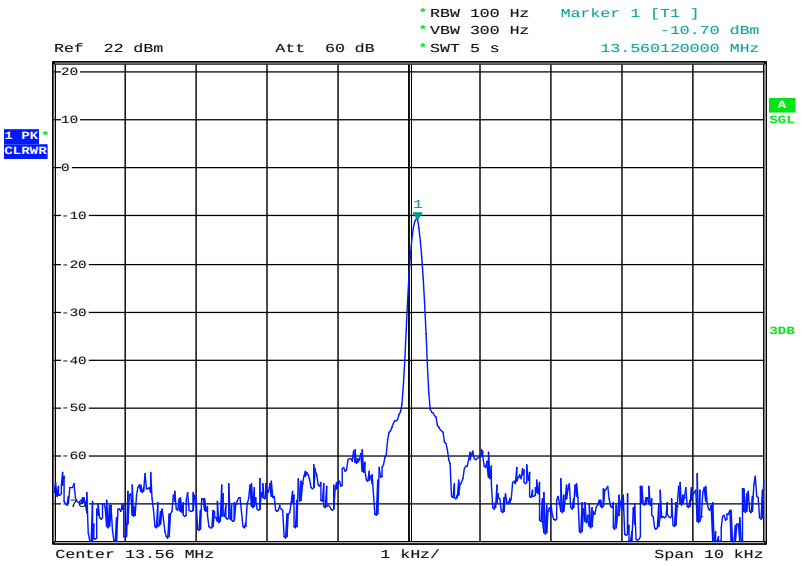
Date: 19.OCT.2015 12:13:43

Plot 4: 100% voltage; 60°C



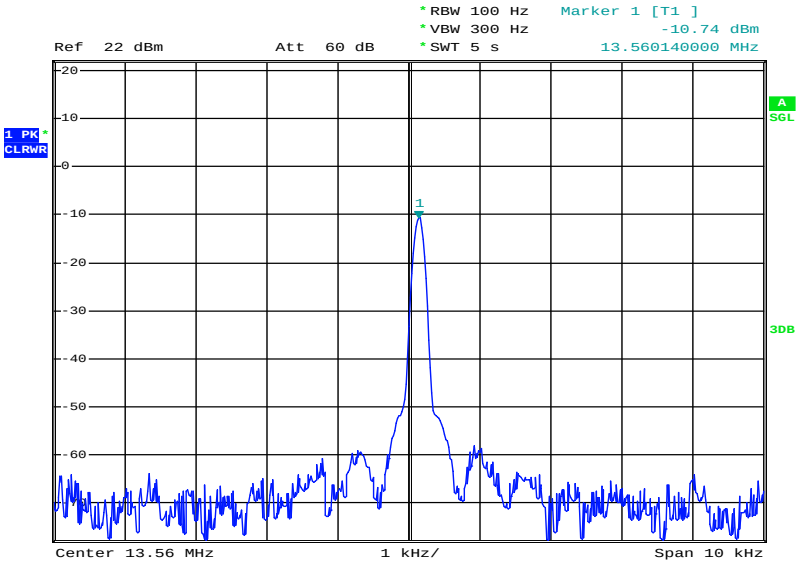
Date: 19.OCT.2015 12:03:00

Plot 5: 100% voltage; 50°C



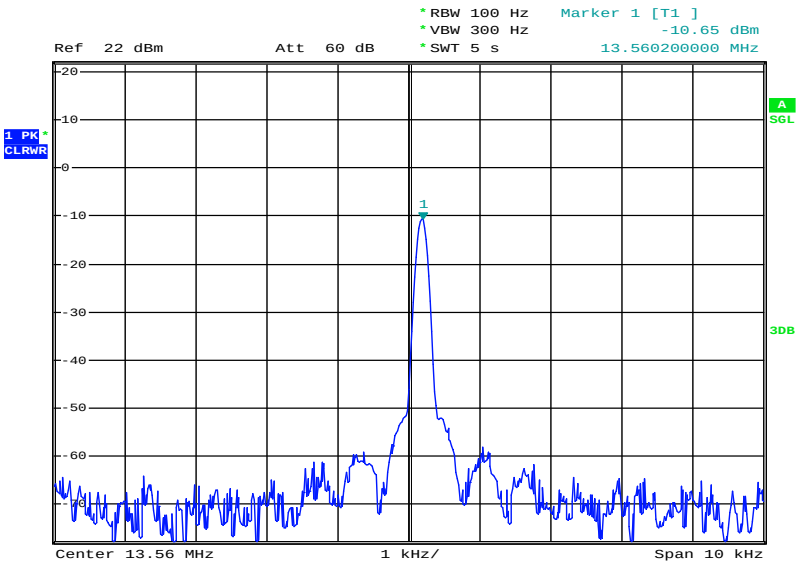
Date: 19.OCT.2015 11:50:49

Plot 6: 100% voltage; 40°C



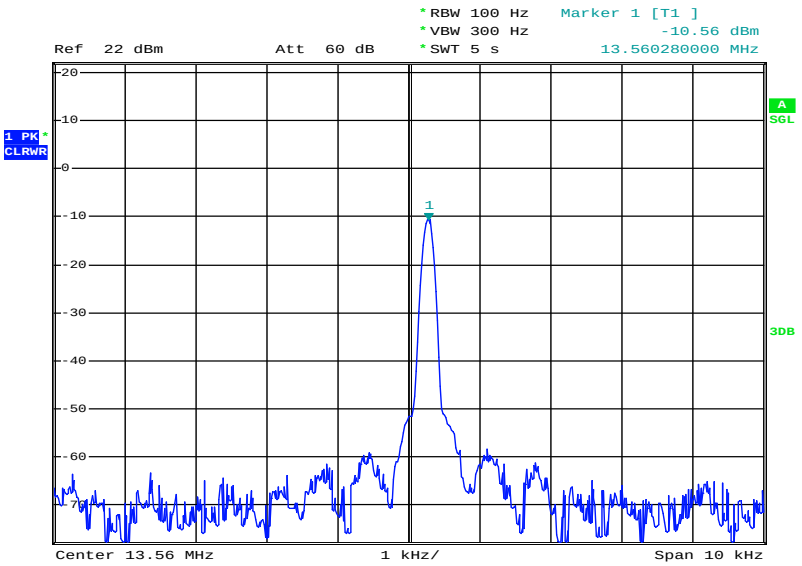
Date: 19.OCT.2015 11:42:36

Plot 7: 100 % voltage; 30°C



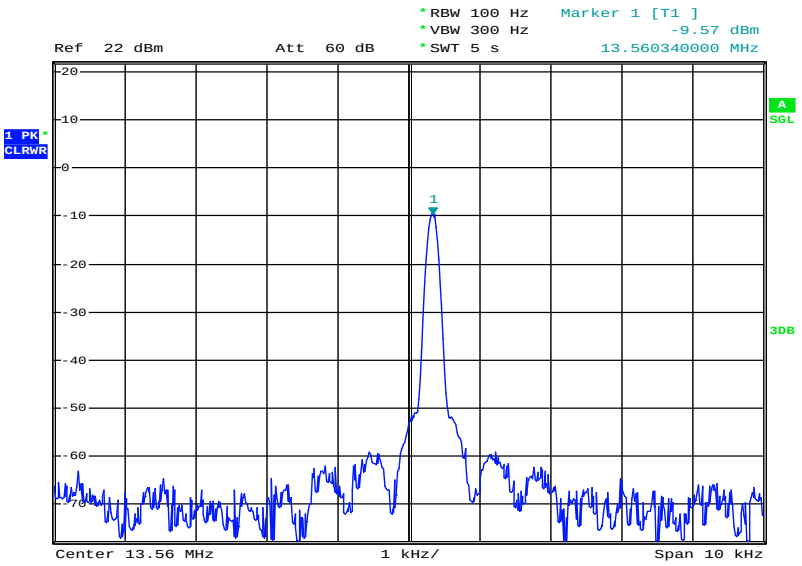
Date: 19.OCT.2015 11:26:42

Plot 8: 100 % voltage; 20°C



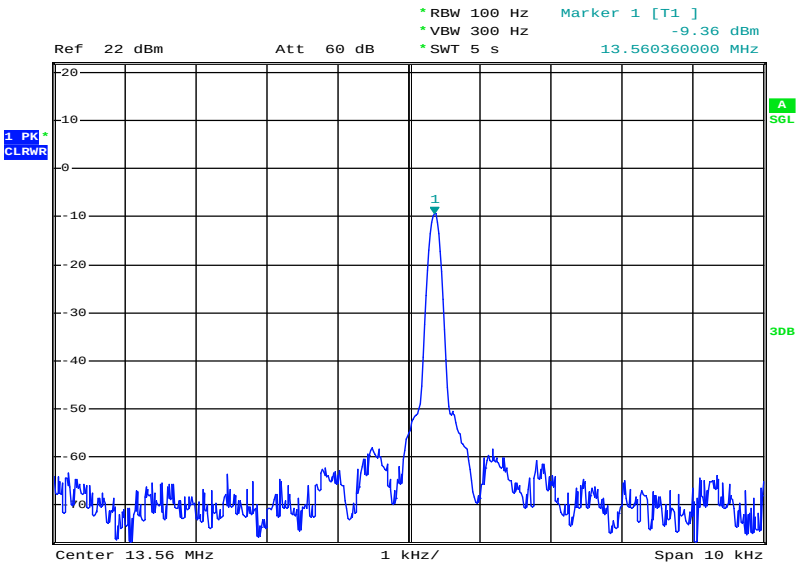
Date: 19.OCT.2015 11:17:29

Plot 9: 100 % voltage; 10°C



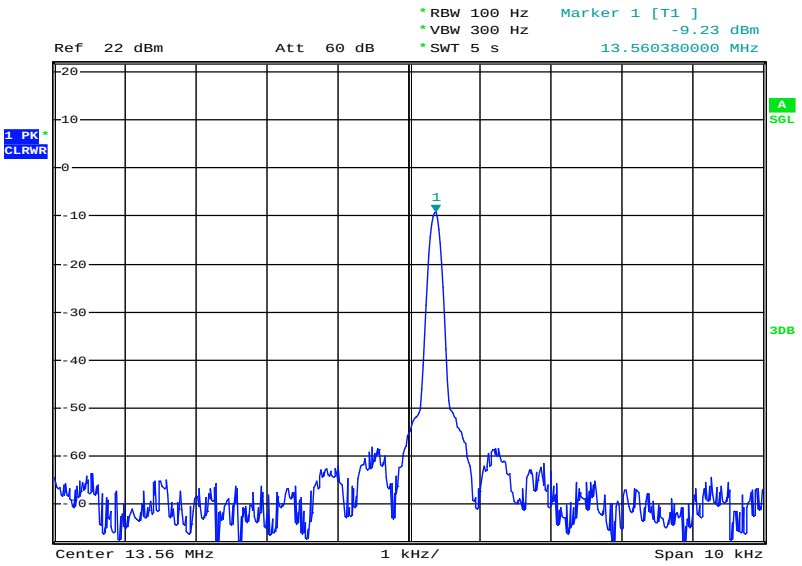
Date: 19.OCT.2015 11:00:47

Plot 10: 100 % voltage; 0°C



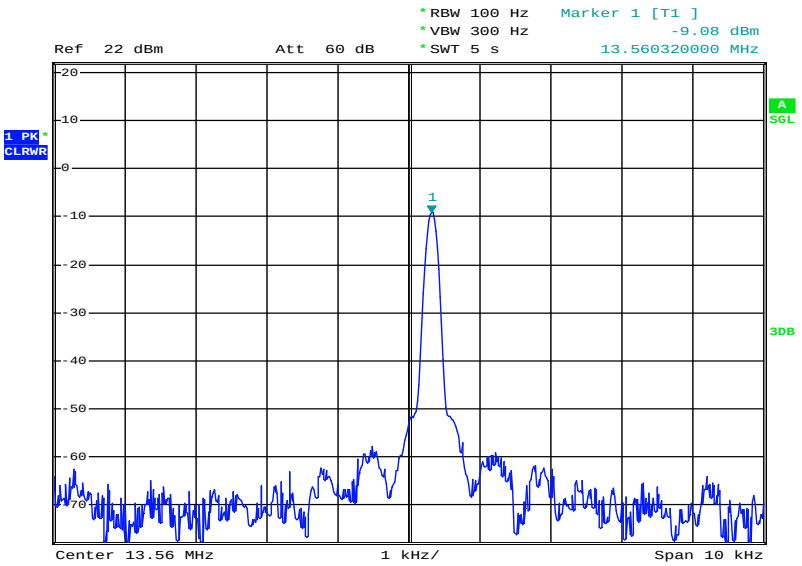
Date: 19.OCT.2015 10:47:08

Plot 11: 100 % voltage; -10°C



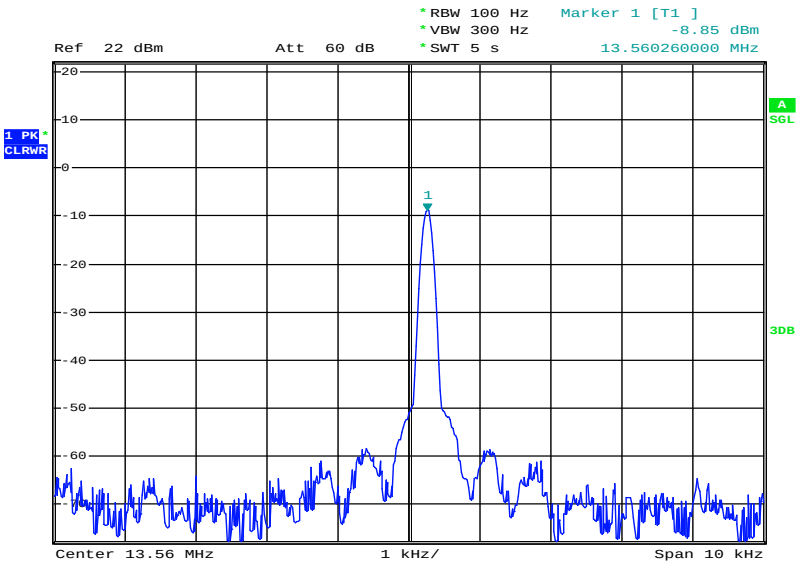
Date: 19.OCT.2015 10:34:32

Plot 12: 100 % voltage; -20°C



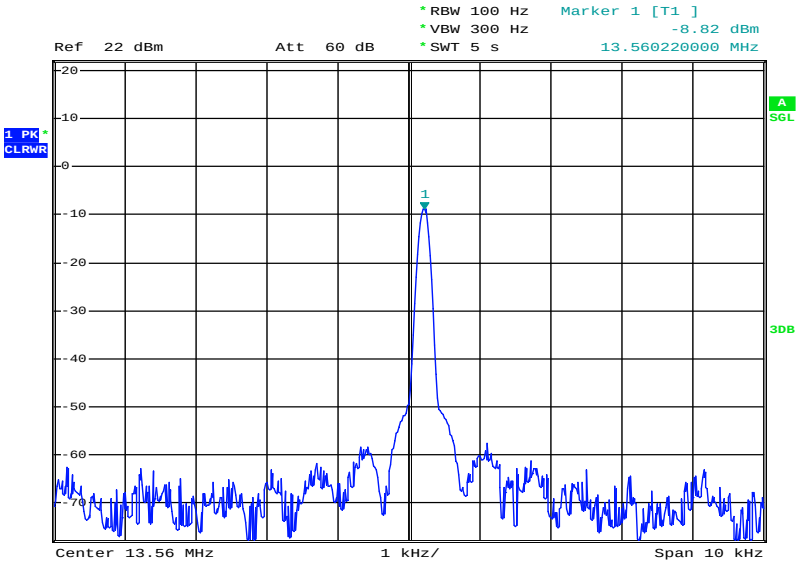
Date: 19.OCT.2015 10:23:49

Plot 13: 100 % voltage; -30°C



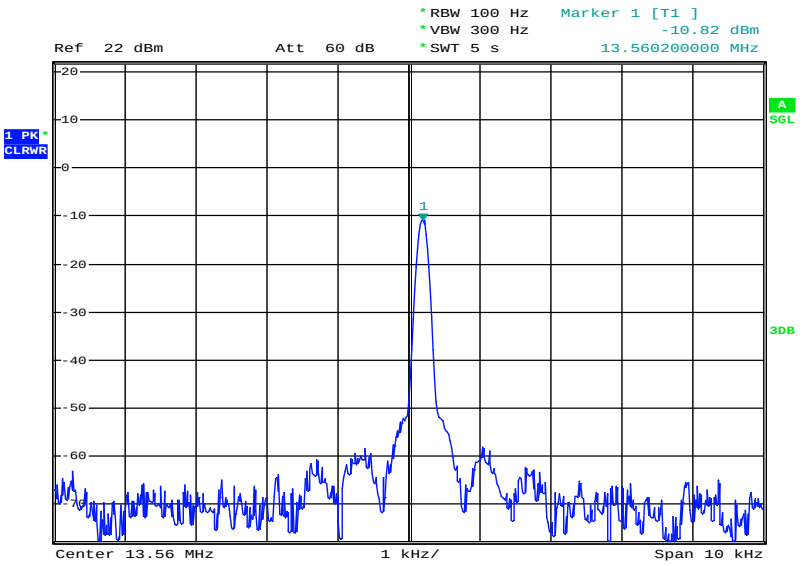
Date: 19.OCT.2015 10:14:24

Plot 14: 100 % voltage; -40°C



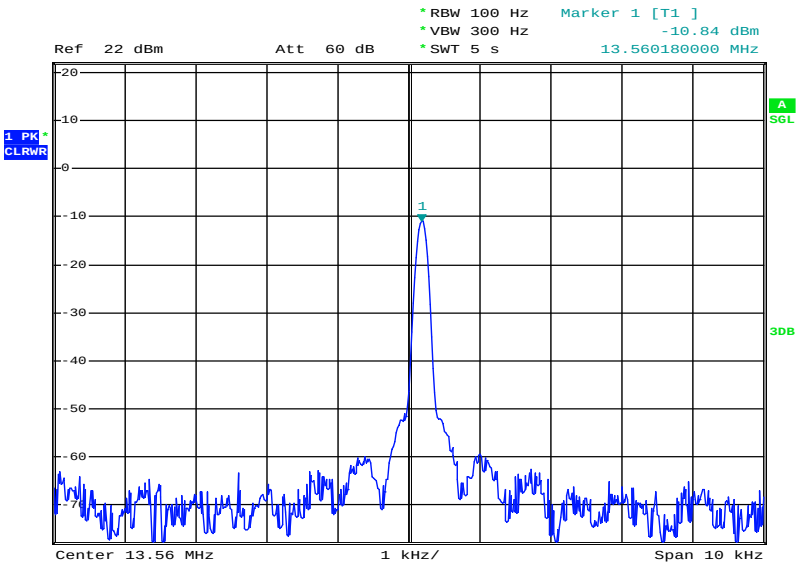
Date: 19.OCT.2015 10:03:41

Plot 15: 115 % voltage; 20°C



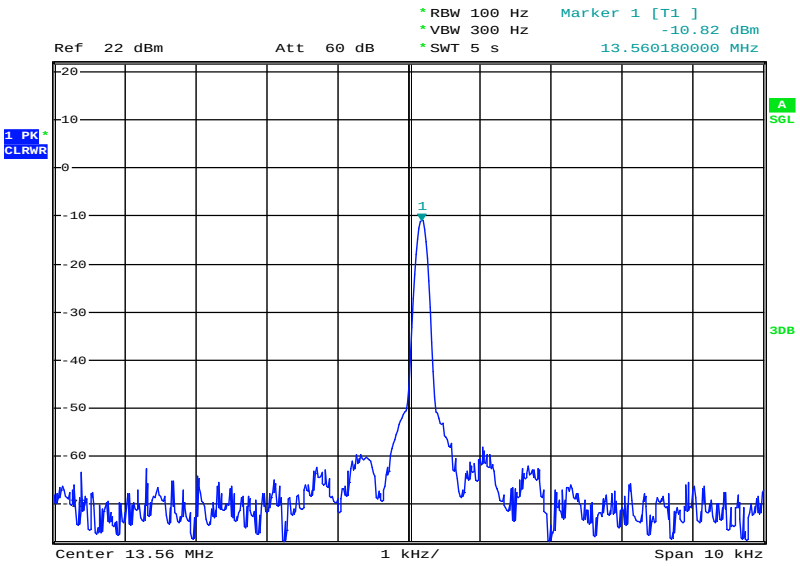
Date: 19.OCT.2015 08:34:35

Plot 16: 100 % voltage; 20°C



Date: 19.OCT.2015 08:35:27

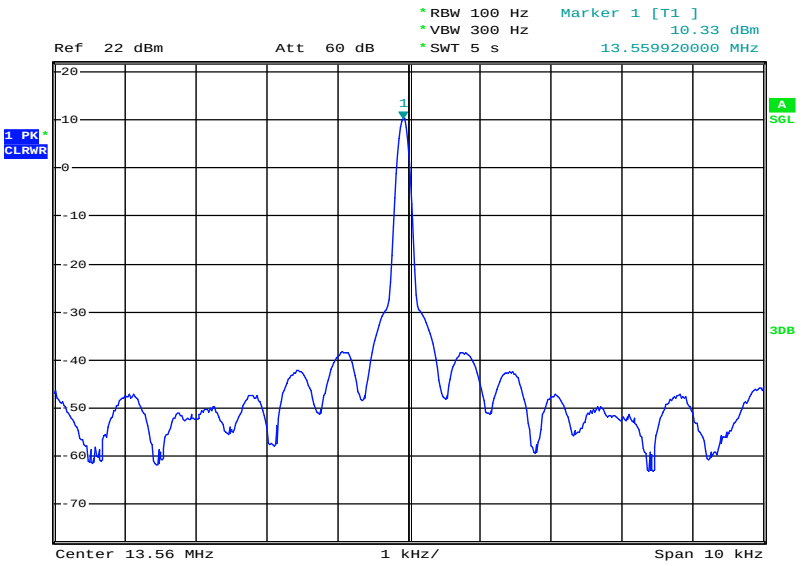
Plot 17: 85 % voltage; 20°C



Date: 19.OCT.2015 08:36:01

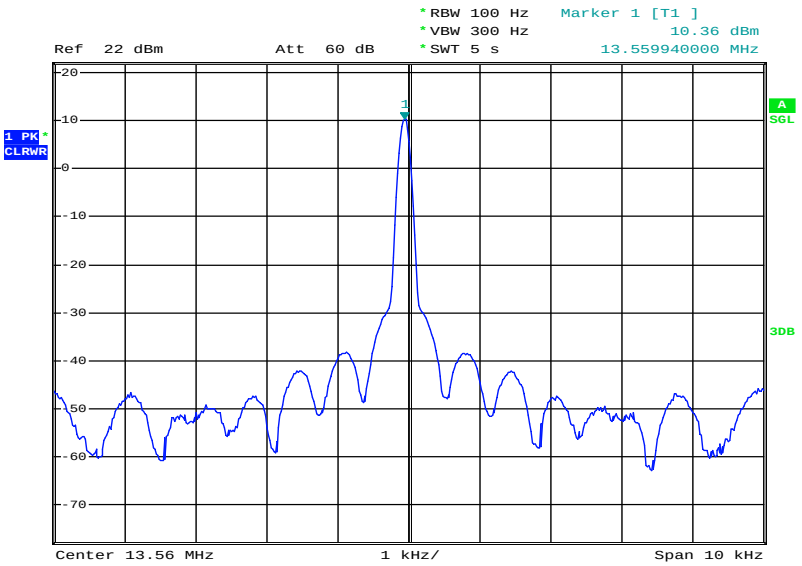
Plots DTM435:

Plot 1: 100% voltage; 85°C



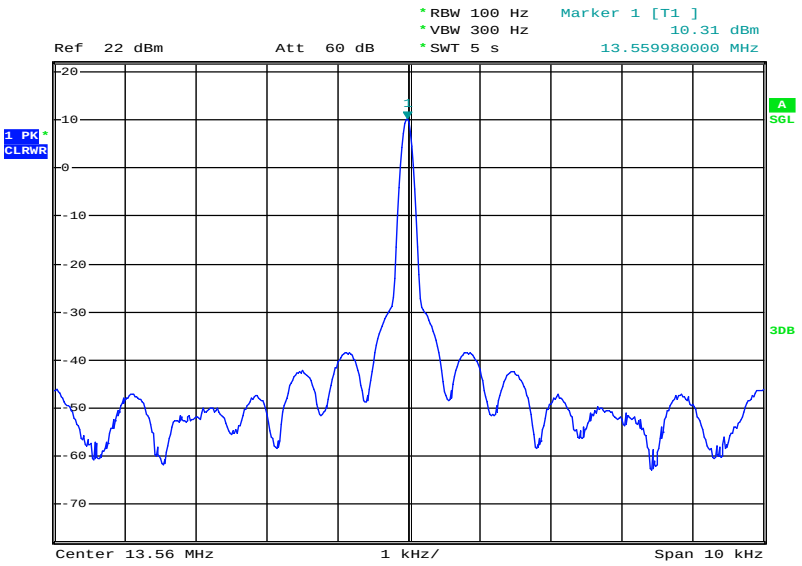
Date: 19.OCT.2015 12:31:00

Plot 2: 100% voltage; 80°C



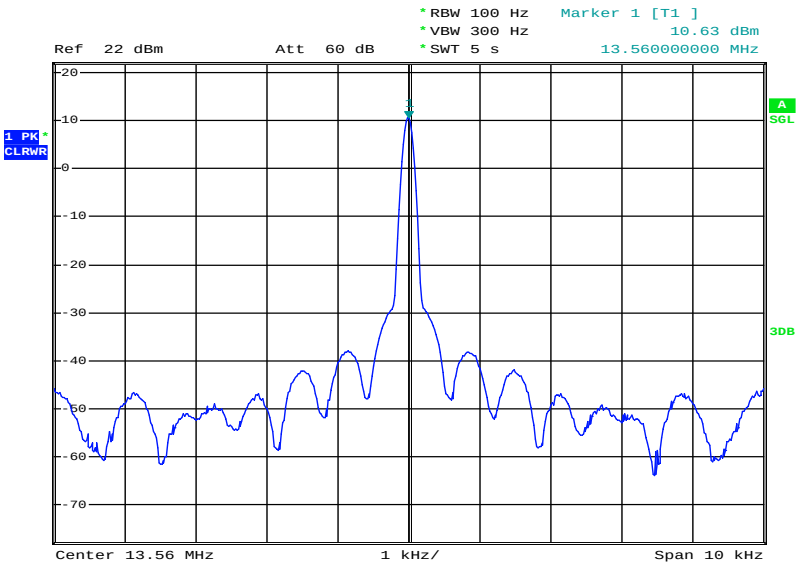
Date: 19.OCT.2015 12:23:27

Plot 3: 100% voltage; 70°C



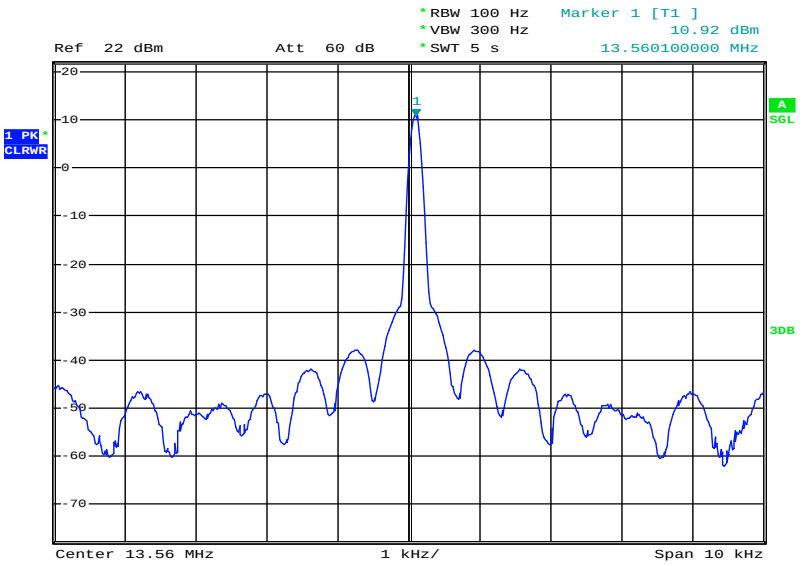
Date: 19.OCT.2015 12:14:18

Plot 4: 100% voltage; 60°C



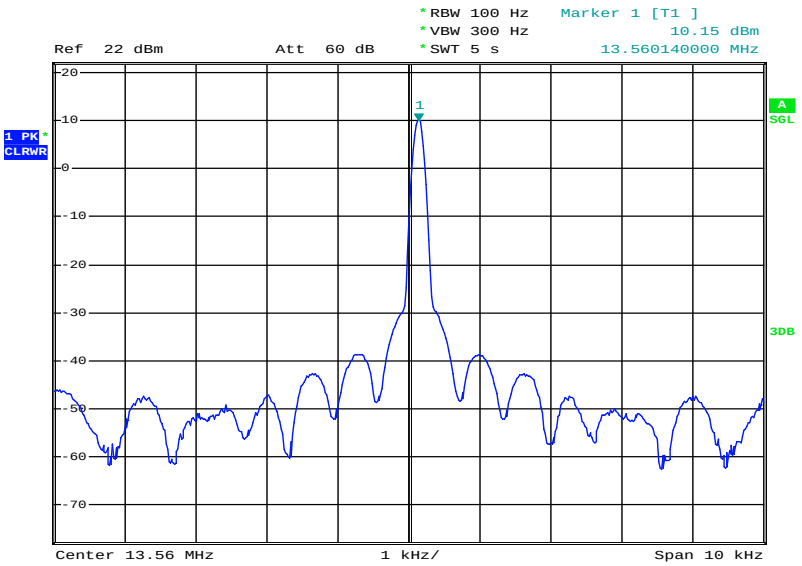
Date: 19.OCT.2015 12:00:55

Plot 5: 100% voltage; 50°C



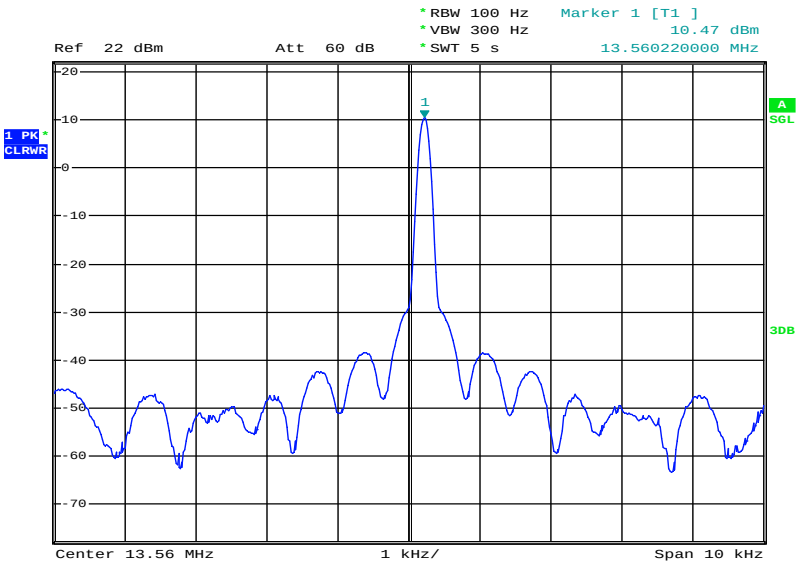
Date: 19.OCT.2015 11:51:35

Plot 6: 100% voltage; 40°C



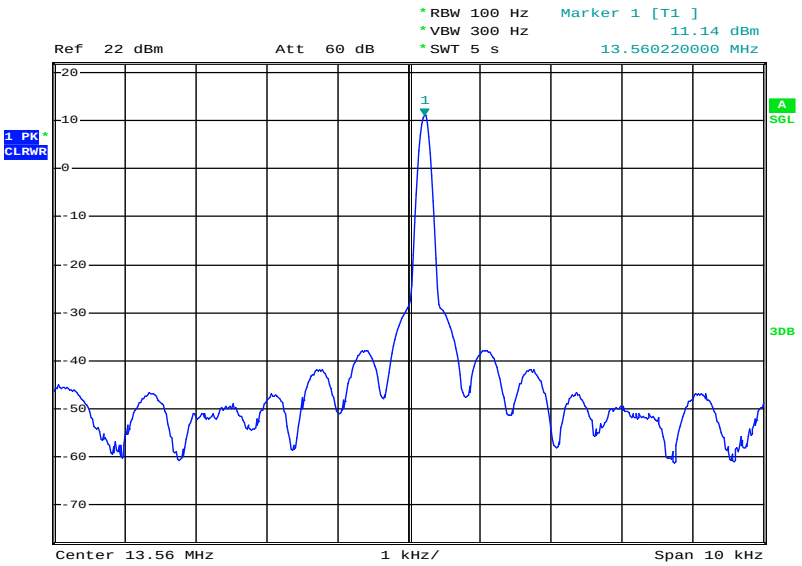
Date: 19.OCT.2015 11:43:15

Plot 7: 100 % voltage; 30°C



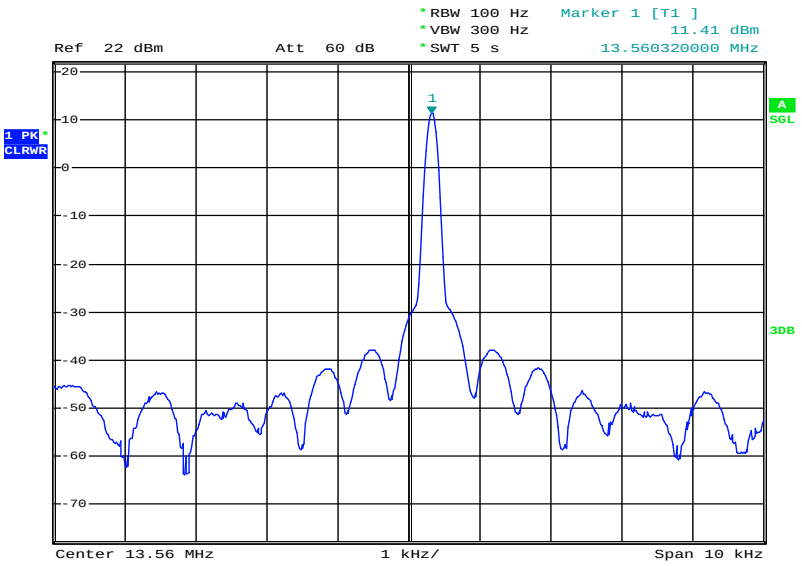
Date: 19.OCT.2015 11:27:31

Plot 8: 100 % voltage; 20°C

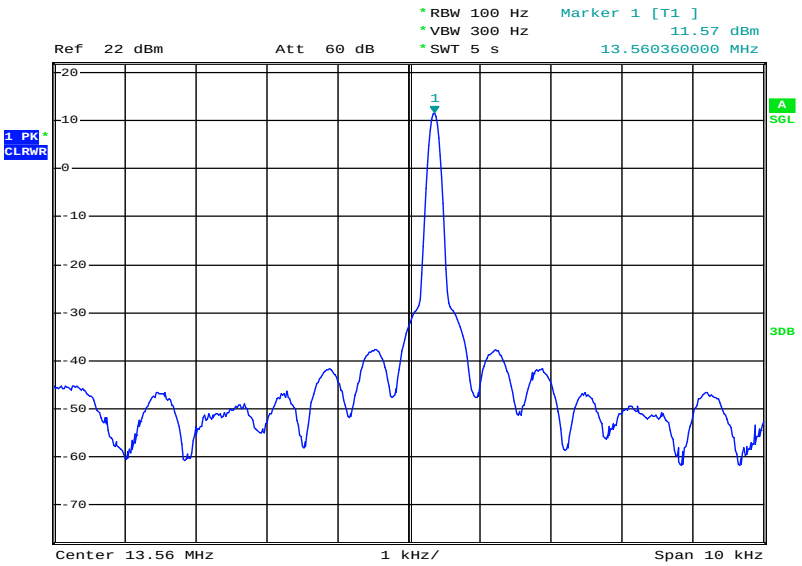


Date: 19.OCT.2015 11:15:21

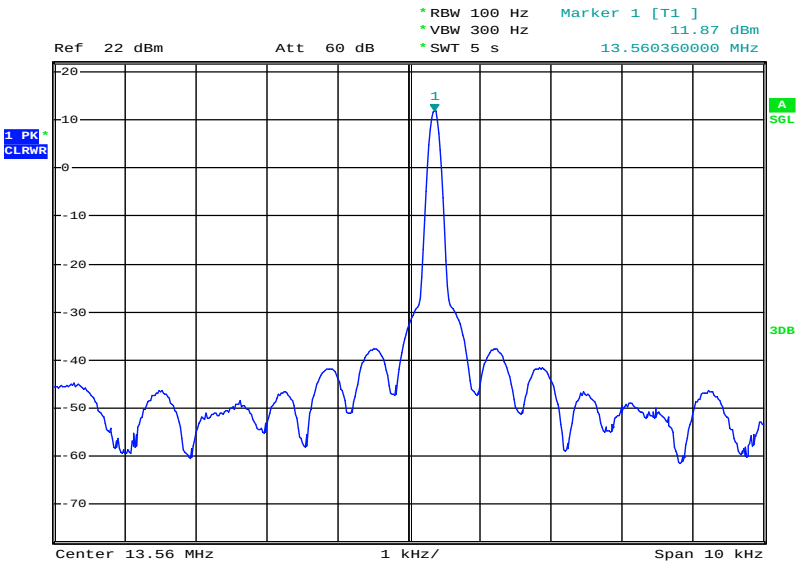
Plot 9: 100 % voltage; 10°C



Plot 10: 100 % voltage; 0°C

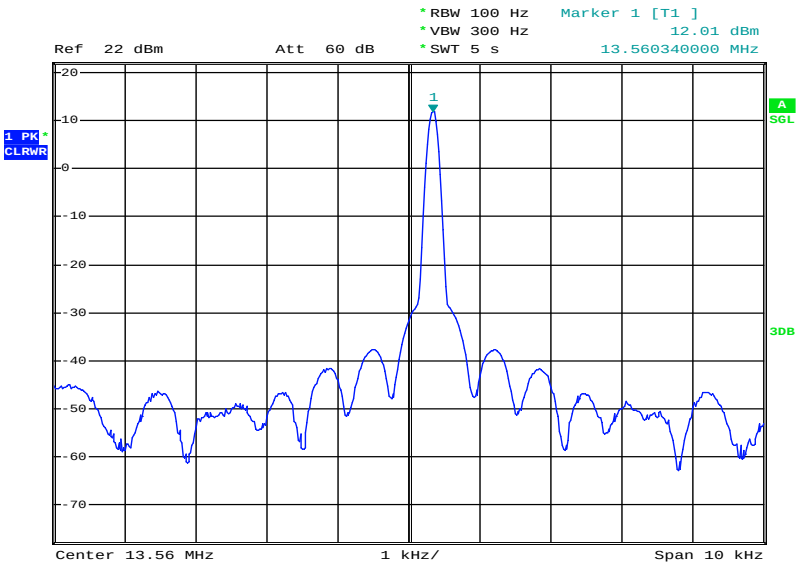


Plot 11: 100 % voltage; -10°C



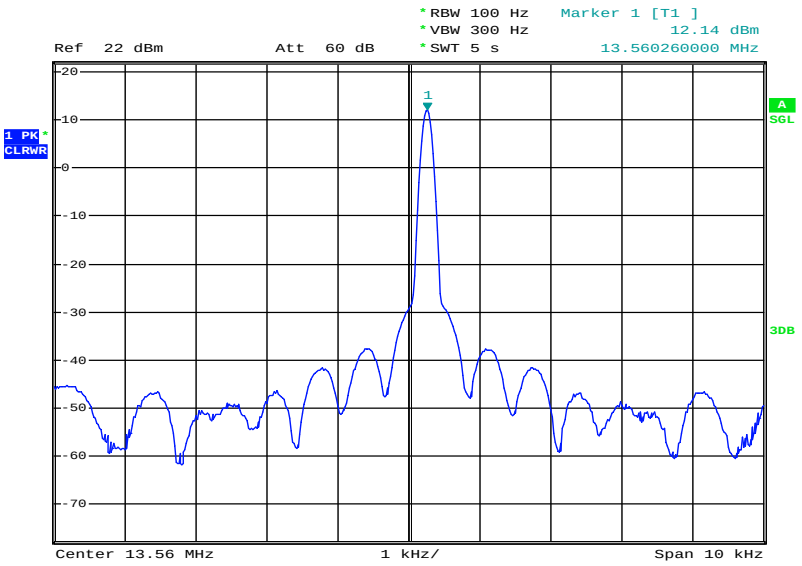
Date: 19.OCT.2015 10:35:17

Plot 12: 100 % voltage; -20°C



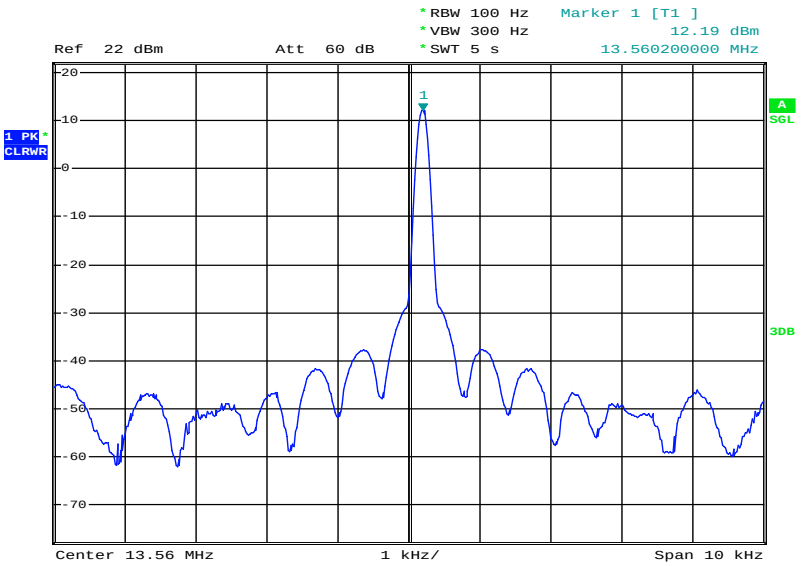
Date: 19.OCT.2015 10:21:30

Plot 13: 100 % voltage; -30°C



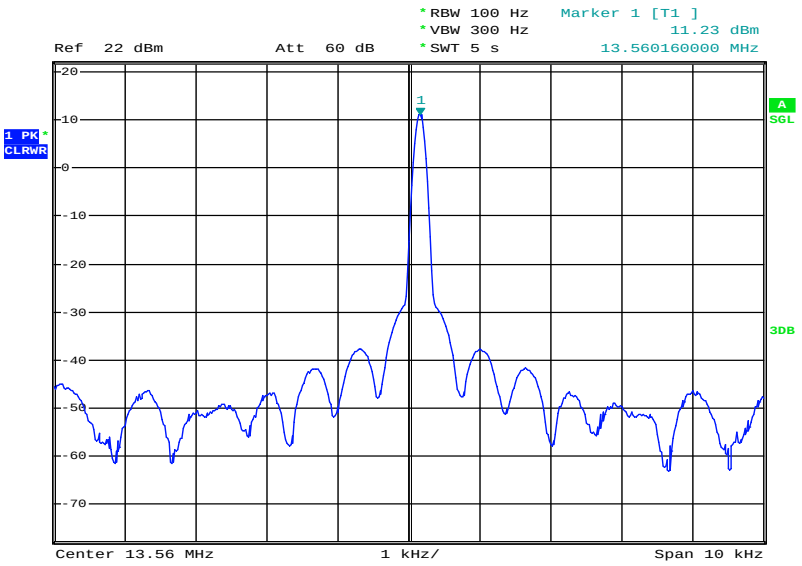
Date: 19.OCT.2015 10:15:21

Plot 14: 100 % voltage; -40°C



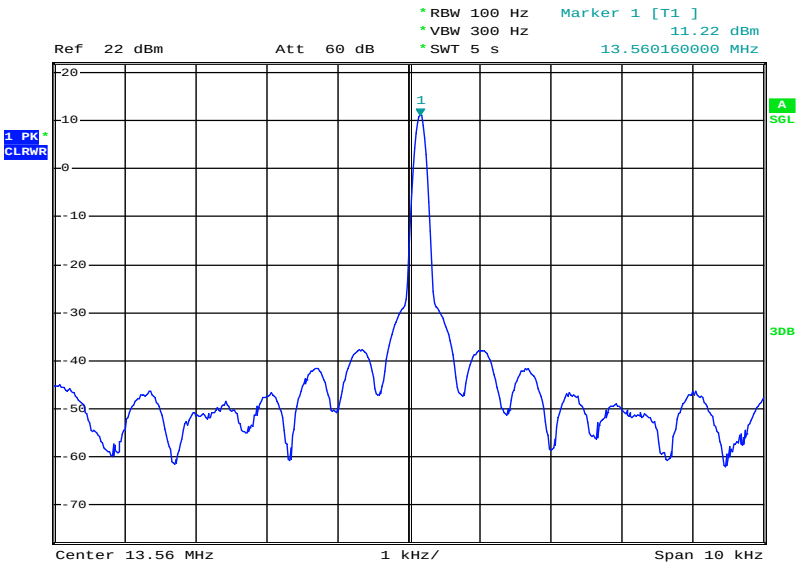
Date: 19.OCT.2015 10:04:28

Plot 15: 115 % voltage; 20°C



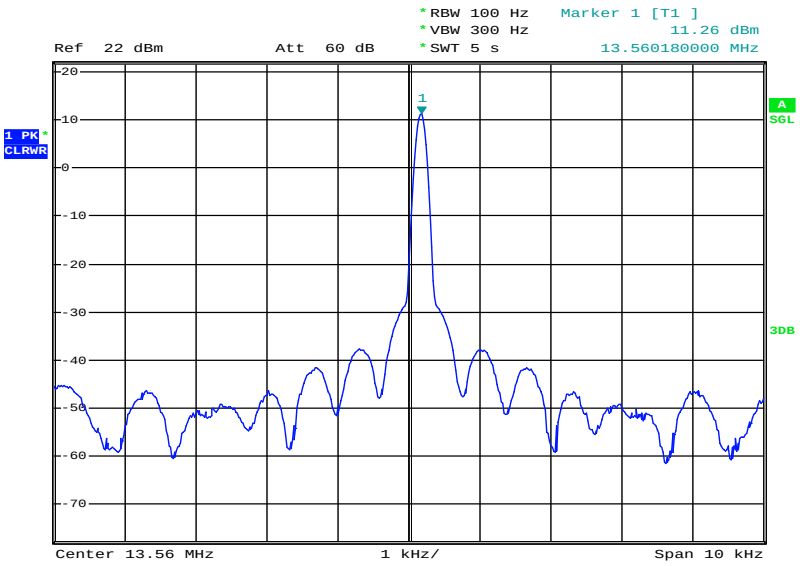
Date: 19.OCT.2015 08:38:26

Plot 16: 100 % voltage; 20°C



Date: 19.OCT.2015 08:37:57

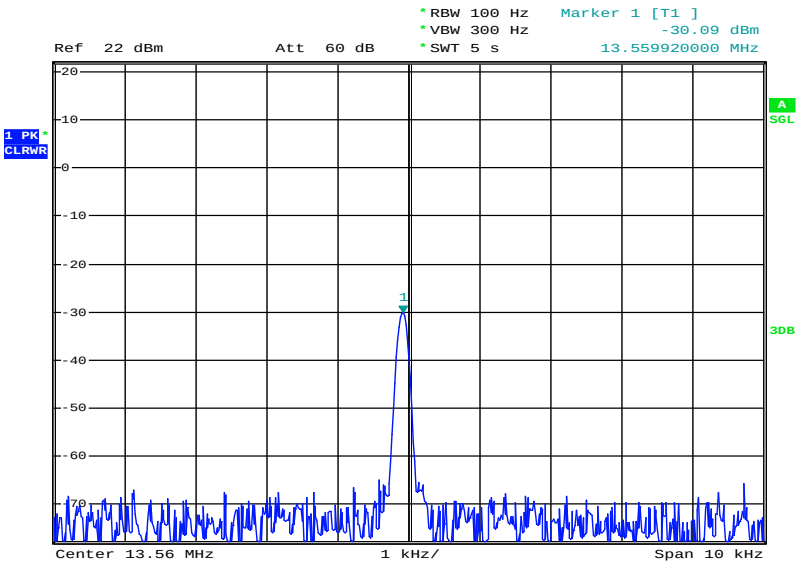
Plot 17: 85 % voltage; 20°C



Date: 19.OCT.2015 08:37:25

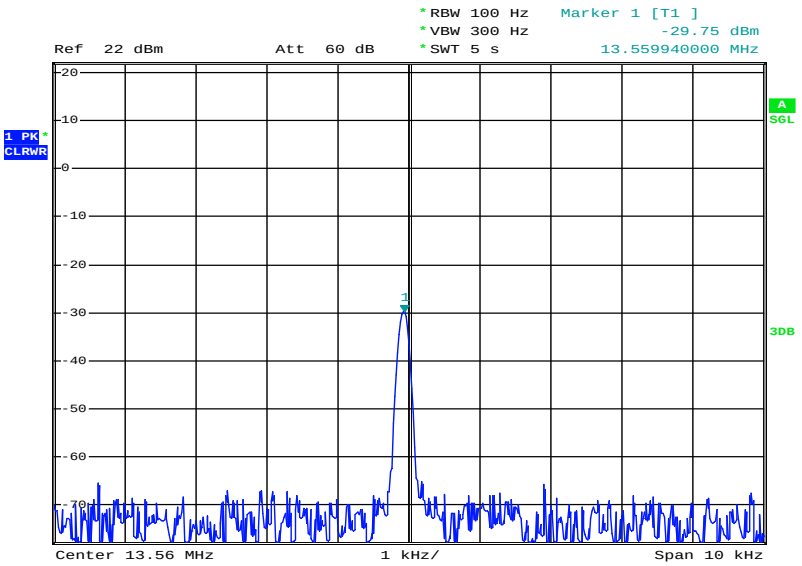
Plots DTM436

Plot 1: 100% voltage; 85°C



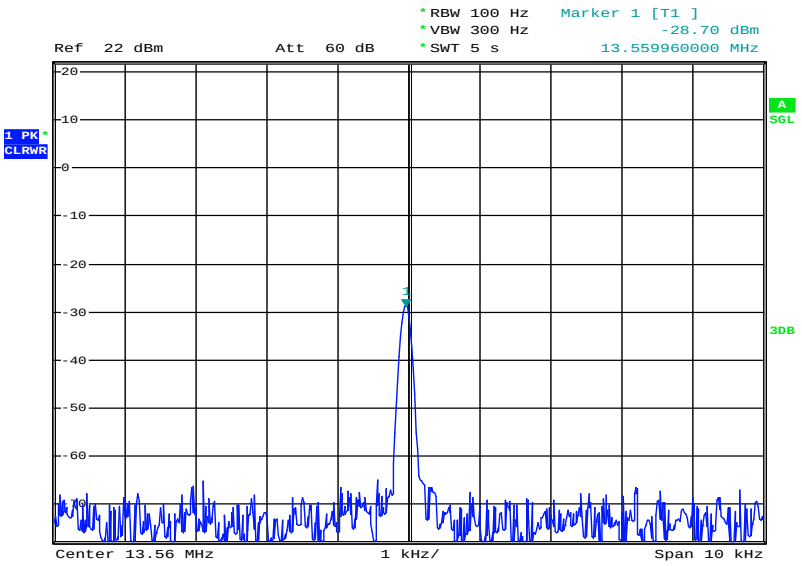
Date: 19.OCT.2015 12:28:45

Plot 2: 100% voltage; 80°C



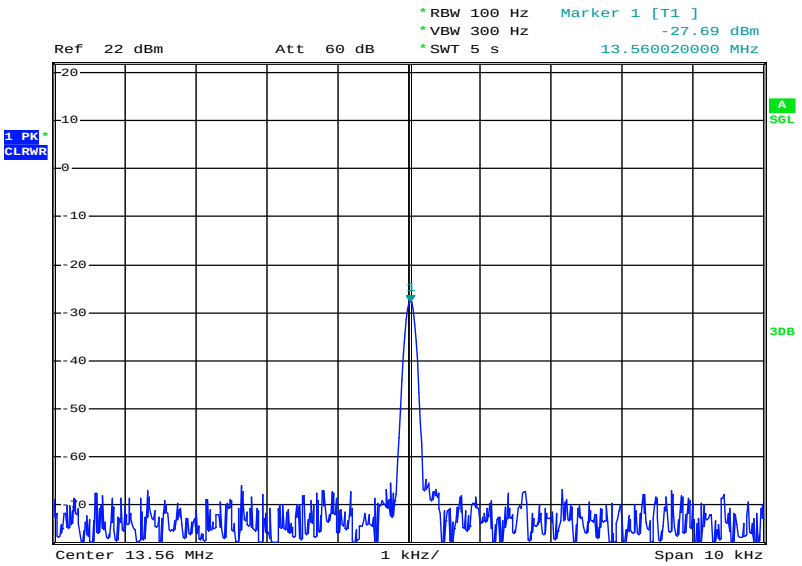
Date: 19.OCT.2015 12:24:16

Plot 3: 100% voltage; 70°C



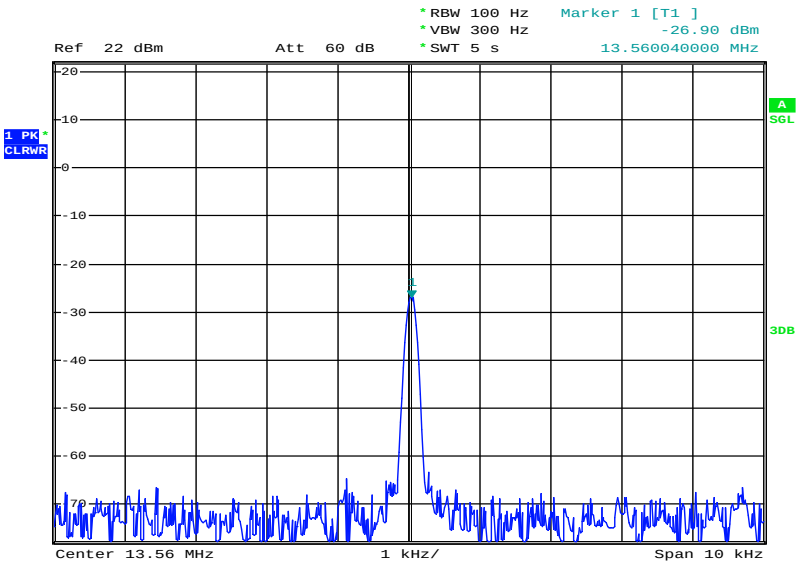
Date: 19.OCT.2015 12:15:03

Plot 4: 100% voltage; 60°C



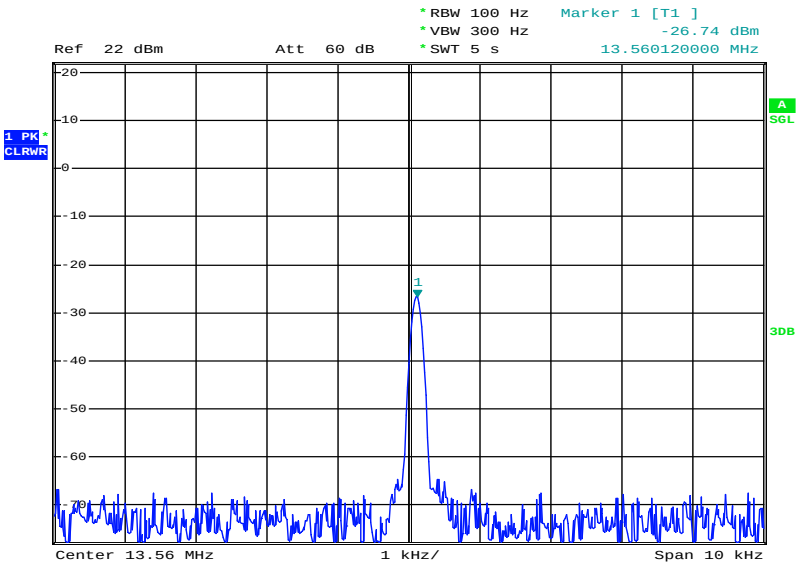
Date: 19.OCT.2015 12:01:39

Plot 5: 100% voltage; 50°C



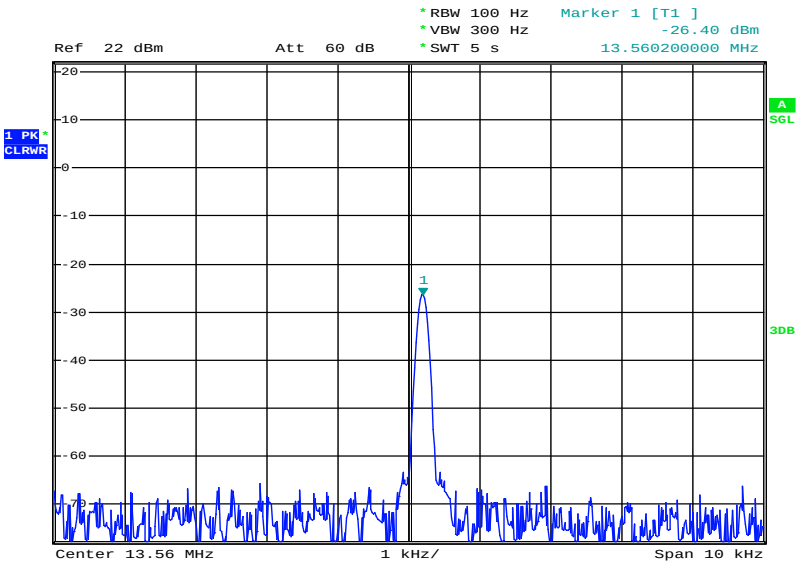
Date: 19.OCT.2015 11:49:30

Plot 6: 100% voltage; 40°C



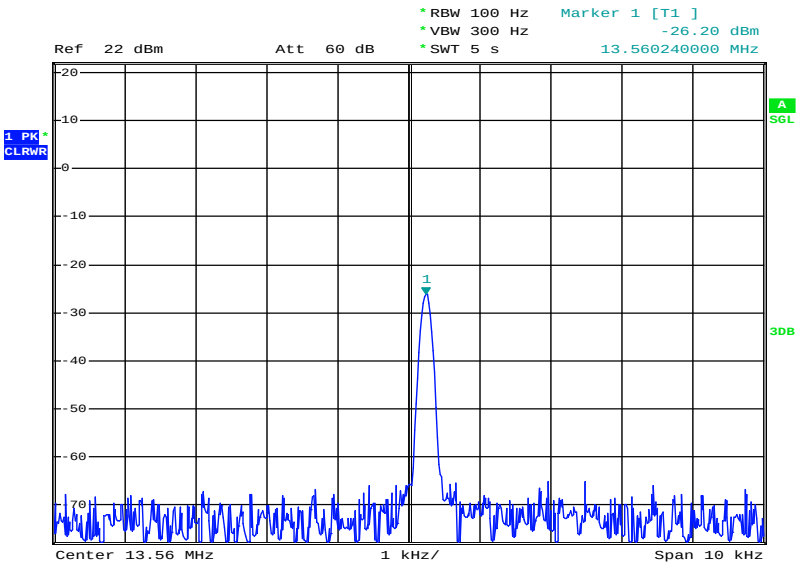
Date: 19.OCT.2015 11:43:56

Plot 7: 100 % voltage; 30°C



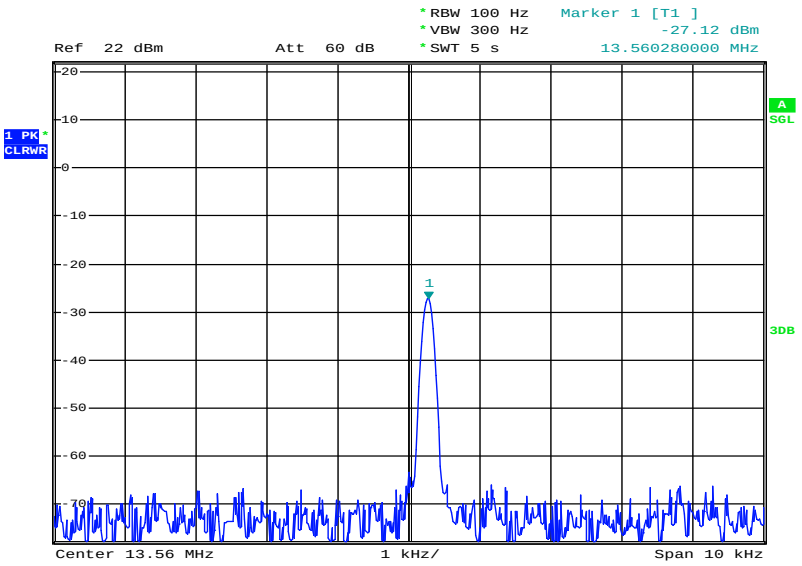
Date: 19.OCT.2015 11:28:04

Plot 8: 100 % voltage; 20°C



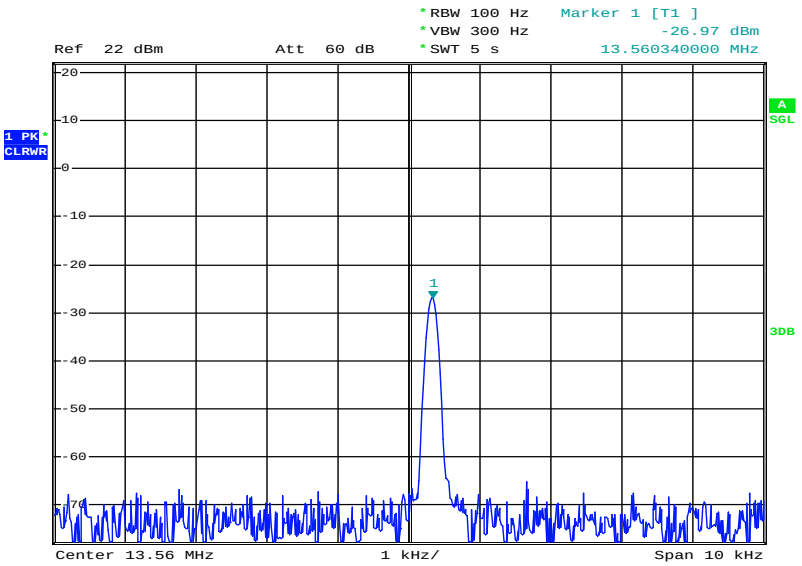
Date: 19.OCT.2015 11:16:03

Plot 9: 100 % voltage; 10°C



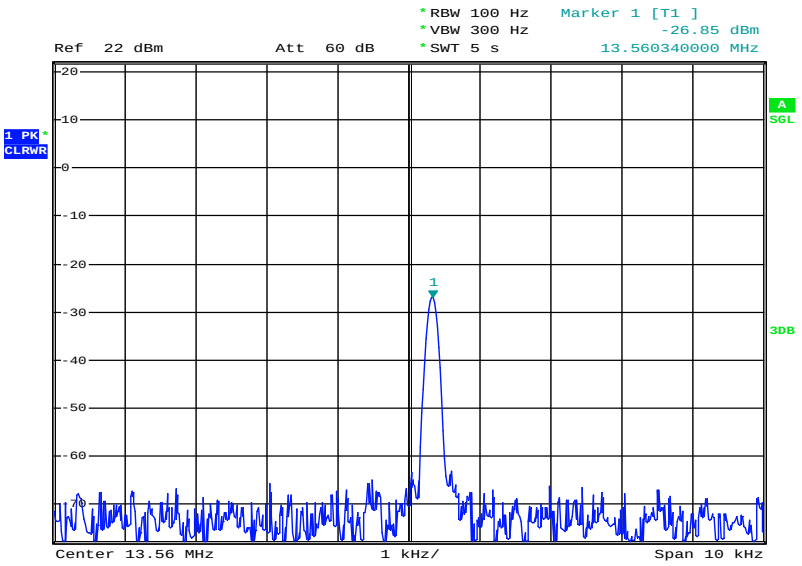
Date: 19.OCT.2015 10:59:20

Plot 10: 100 % voltage; 0°C



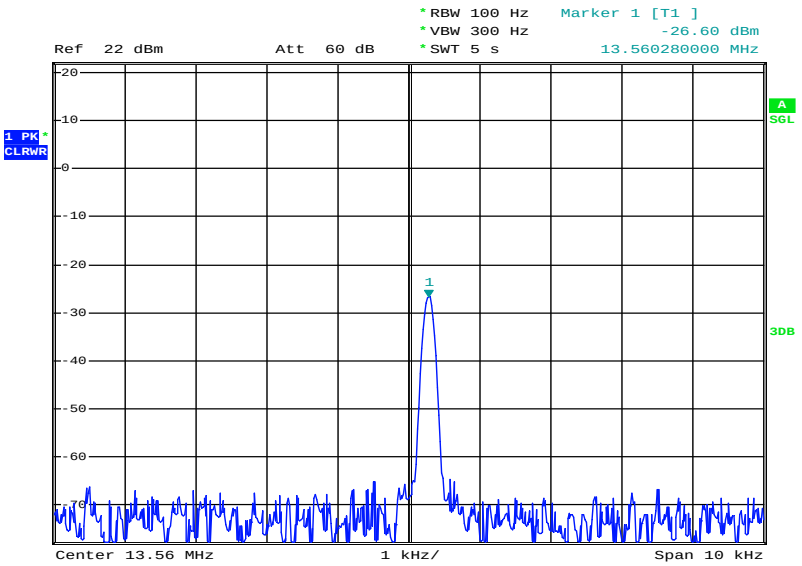
Date: 19.OCT.2015 10:48:38

Plot 11: 100 % voltage; -10°C



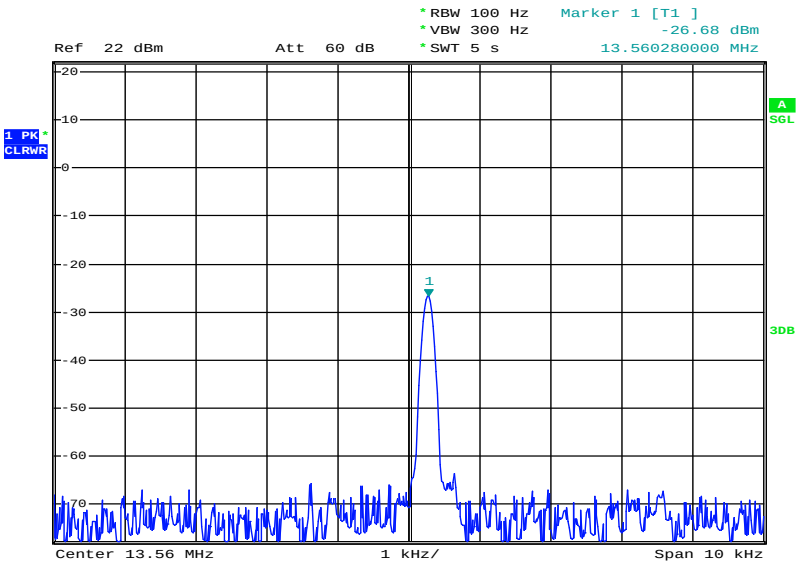
Date: 19.OCT.2015 10:35:59

Plot 12: 100 % voltage; -20°C



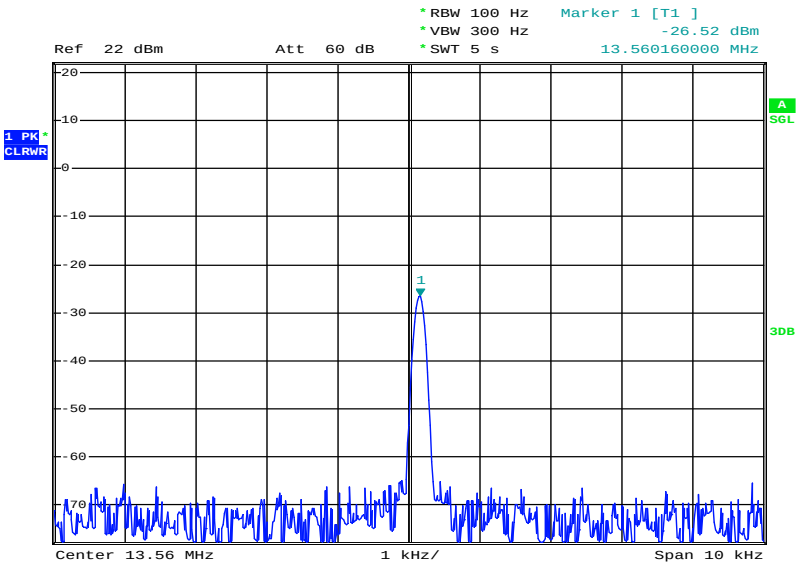
Date: 19.OCT.2015 10:22:13

Plot 13: 100 % voltage; -30°C



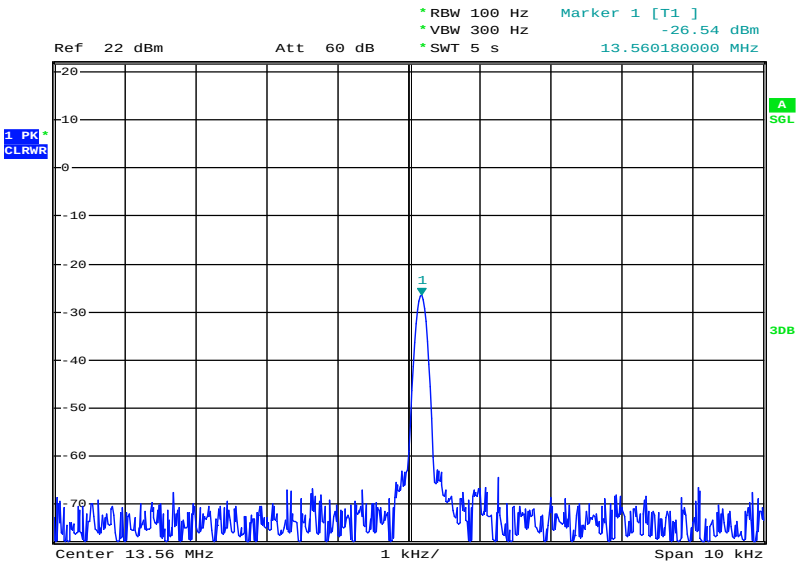
Date: 19.OCT.2015 10:12:38

Plot 14: 100 % voltage; -40°C



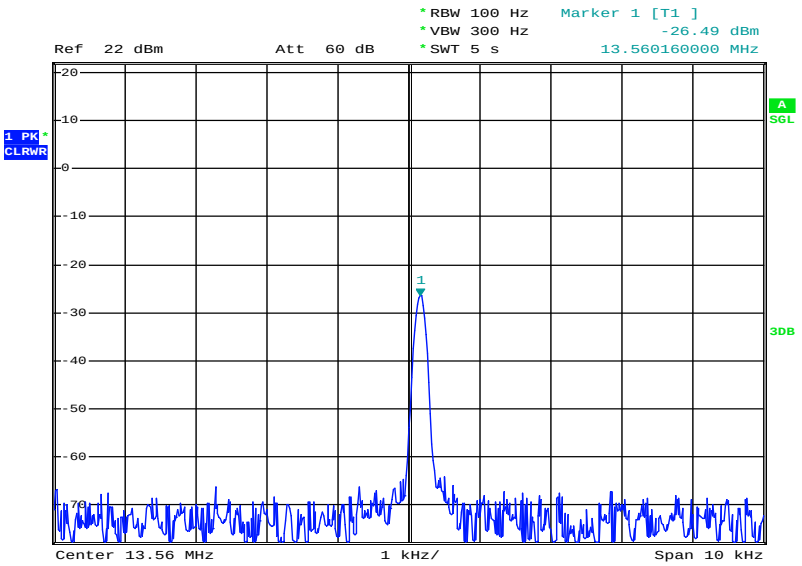
Date: 19.OCT.2015 10:05:15

Plot 15: 115 % voltage; 20°C



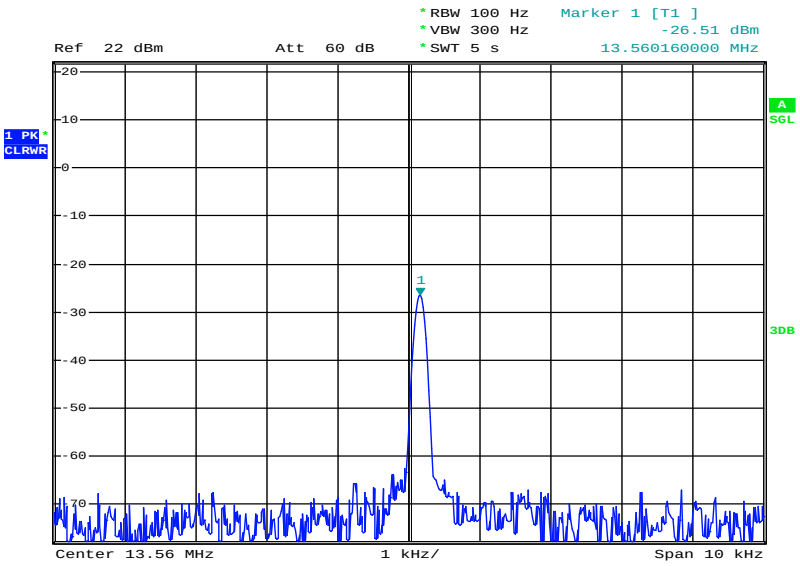
Date: 19.OCT.2015 08:39:34

Plot 16: 100 % voltage; 20°C



Date: 19.OCT.2015 08:40:14

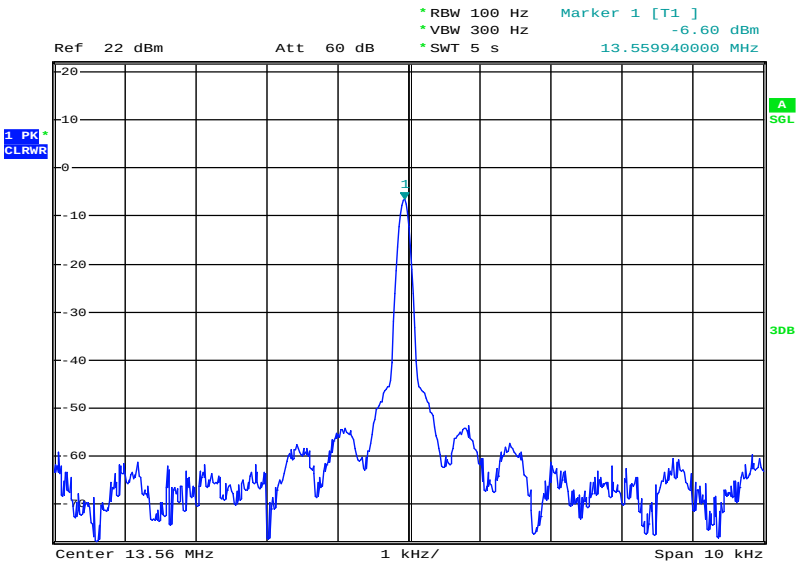
Plot 17: 85 % voltage; 20°C



Date: 19.OCT.2015 08:40:58

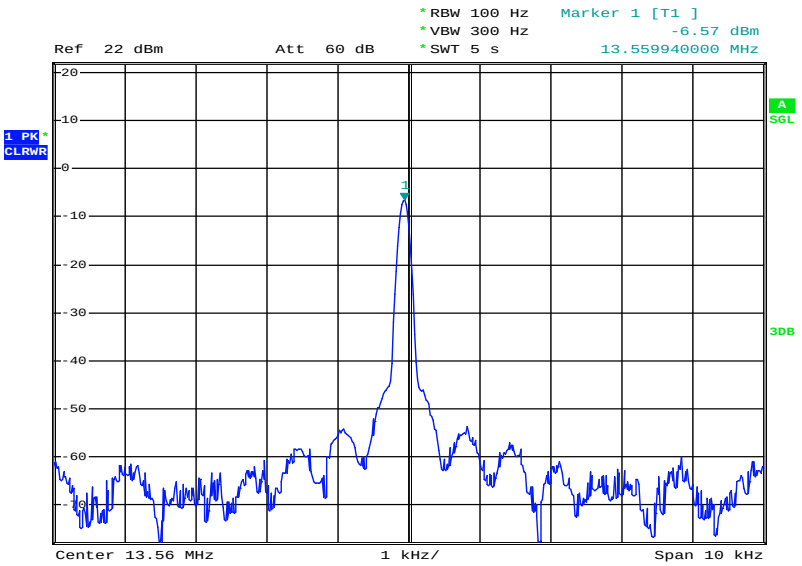
Plots DTM437

Plot 1: 100% voltage; 85°C



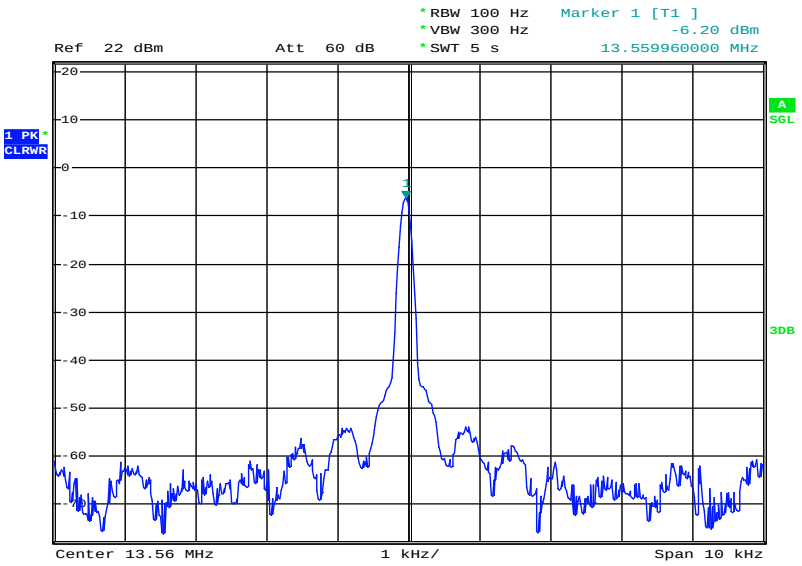
Date: 19.OCT.2015 12:29:46

Plot 2: 100% voltage; 80°C



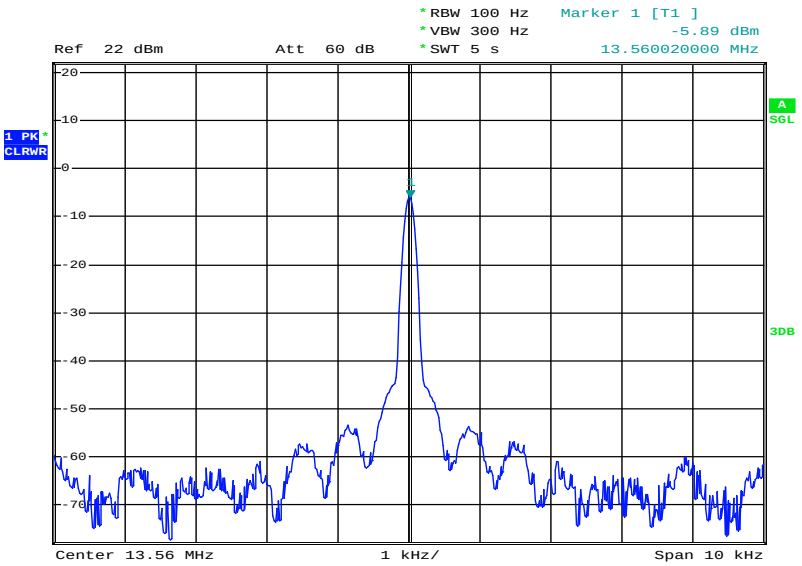
Date: 19.OCT.2015 12:22:10

Plot 3: 100% voltage; 70°C



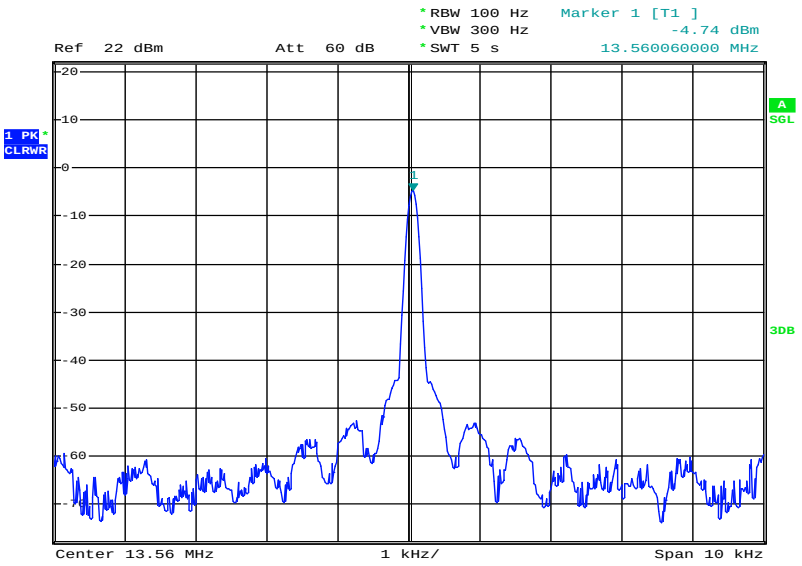
Date: 19.OCT.2015 12:15:45

Plot 4: 100% voltage; 60°C



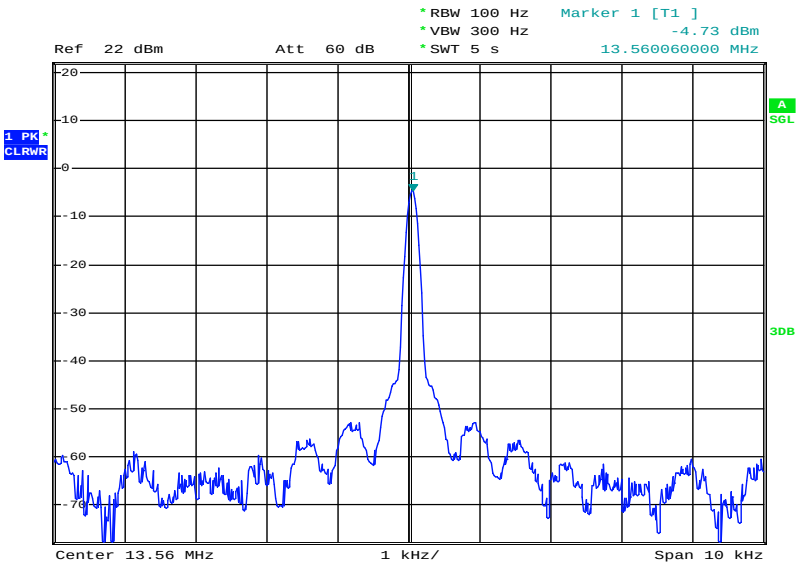
Date: 19.OCT.2015 12:02:18

Plot 5: 100% voltage; 50°C



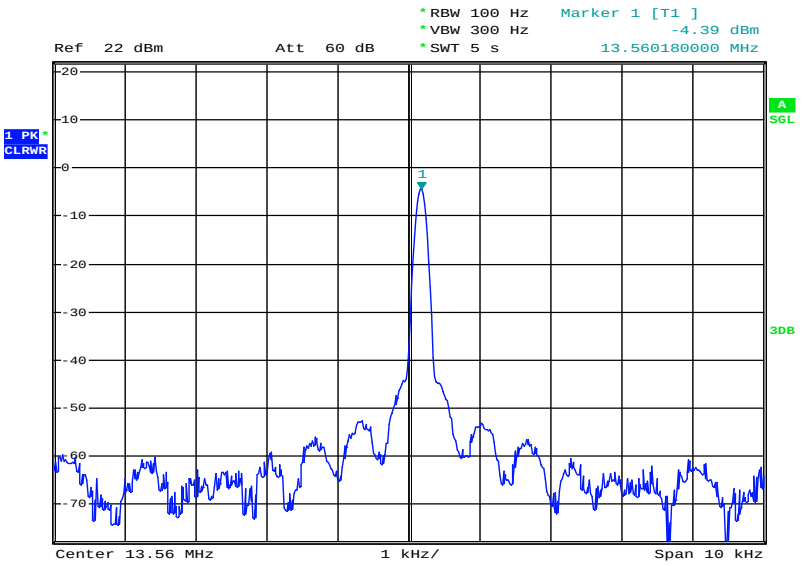
Date: 19.OCT.2015 11:50:05

Plot 6: 100% voltage; 40°C



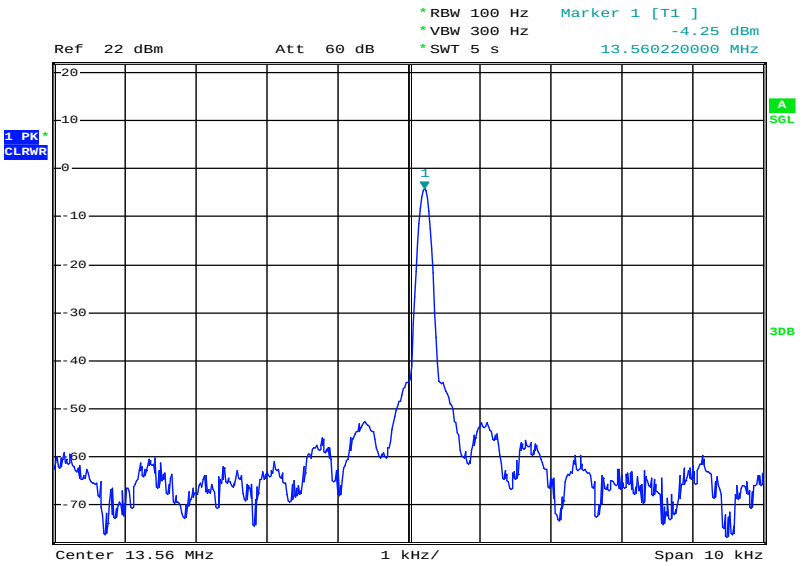
Date: 19.OCT.2015 11:41:38

Plot 7: 100 % voltage; 30°C



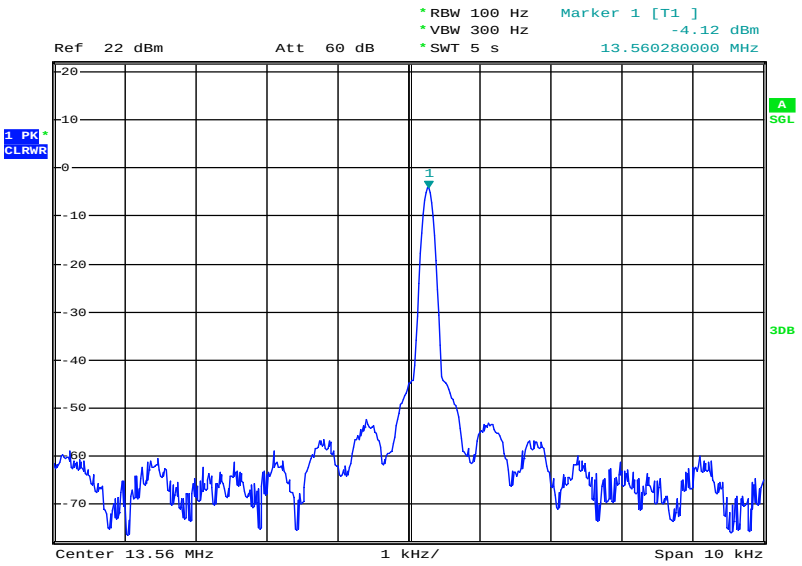
Date: 19.OCT.2015 11:28:45

Plot 8: 100 % voltage; 20°C



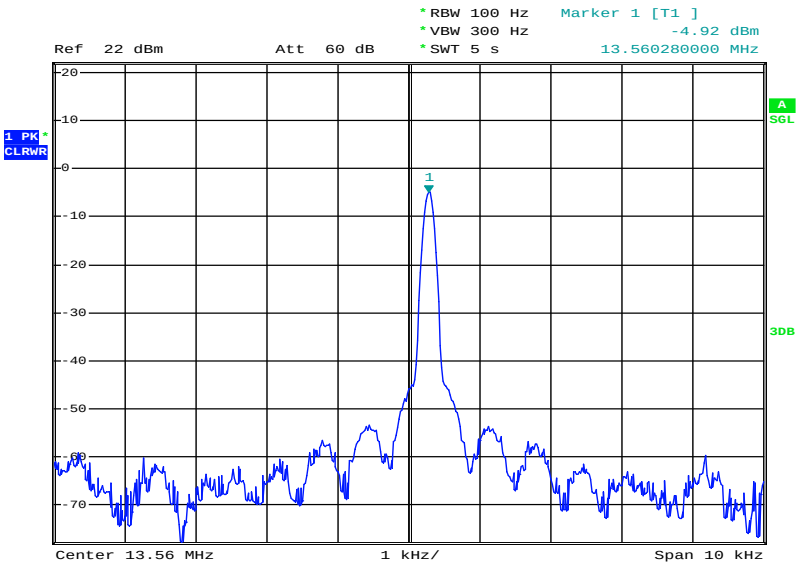
Date: 19.OCT.2015 11:16:44

Plot 9: 100 % voltage; 10°C



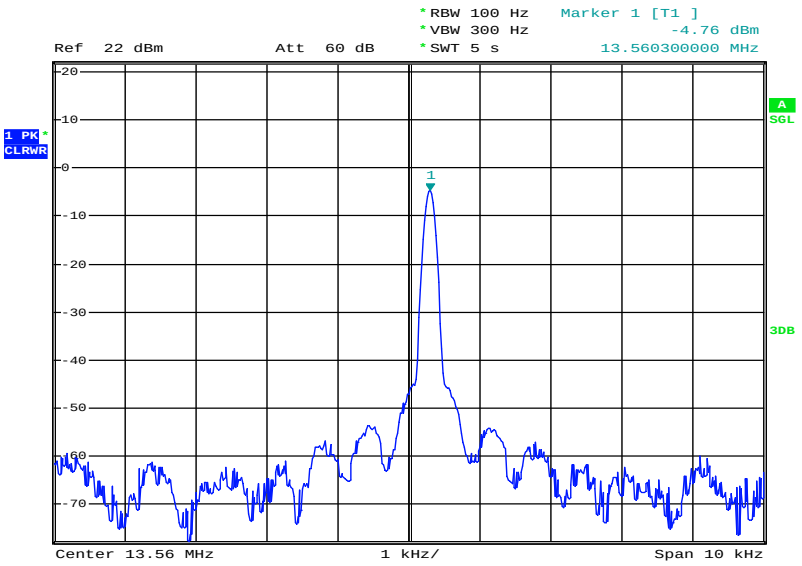
Date: 19.OCT.2015 11:00:00

Plot 10: 100 % voltage; 0°C



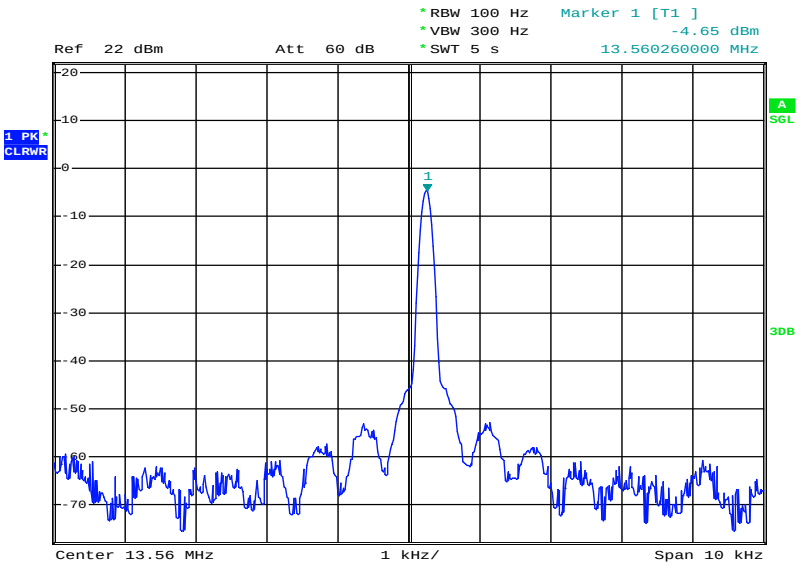
Date: 19.OCT.2015 10:46:27

Plot 11: 100 % voltage; -10°C



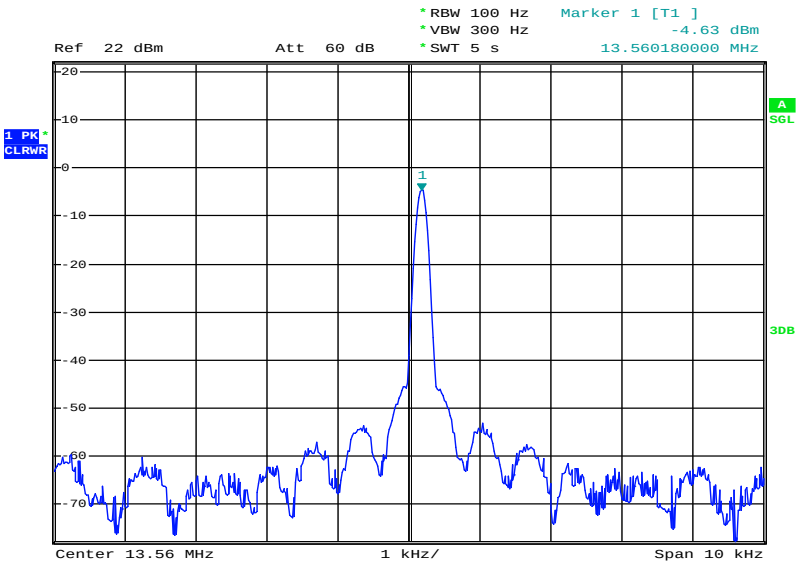
Date: 19.OCT.2015 10:36:52

Plot 12: 100 % voltage; -20°C



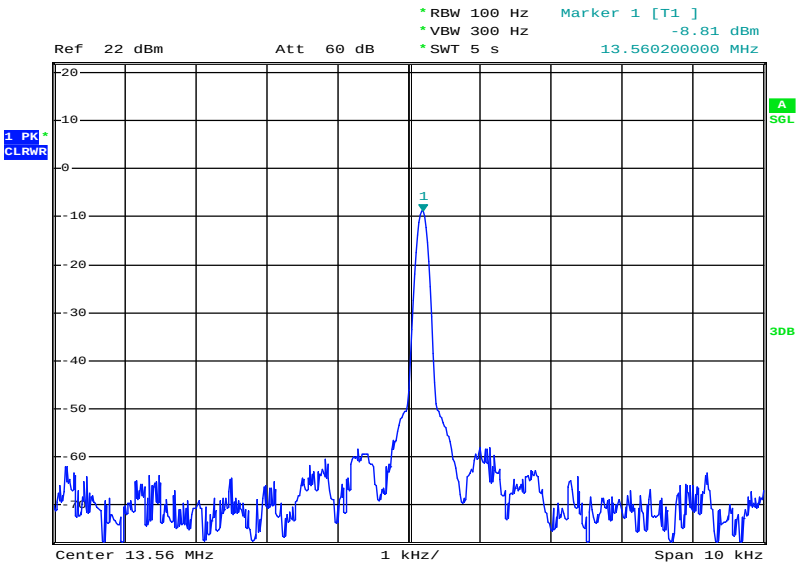
Date: 19.OCT.2015 10:23:01

Plot 13: 100 % voltage; -30°C



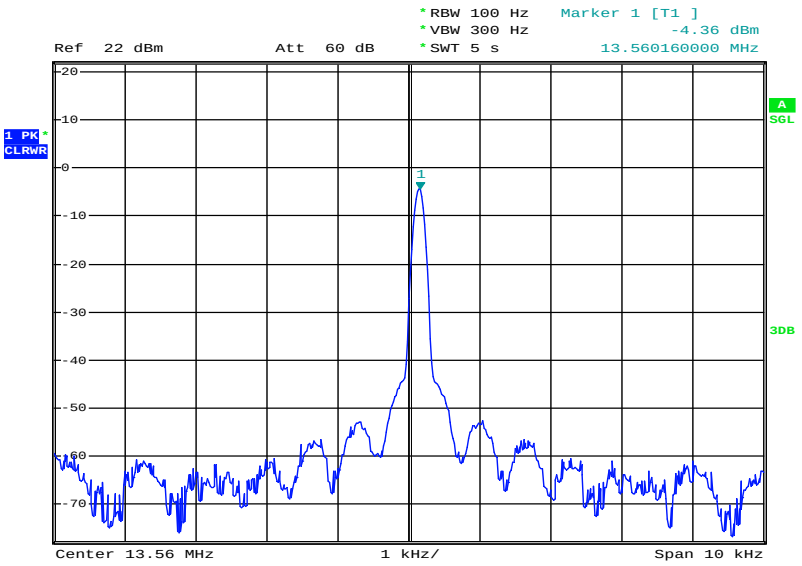
Date: 19.OCT.2015 10:13:26

Plot 14: 100 % voltage; -40°C



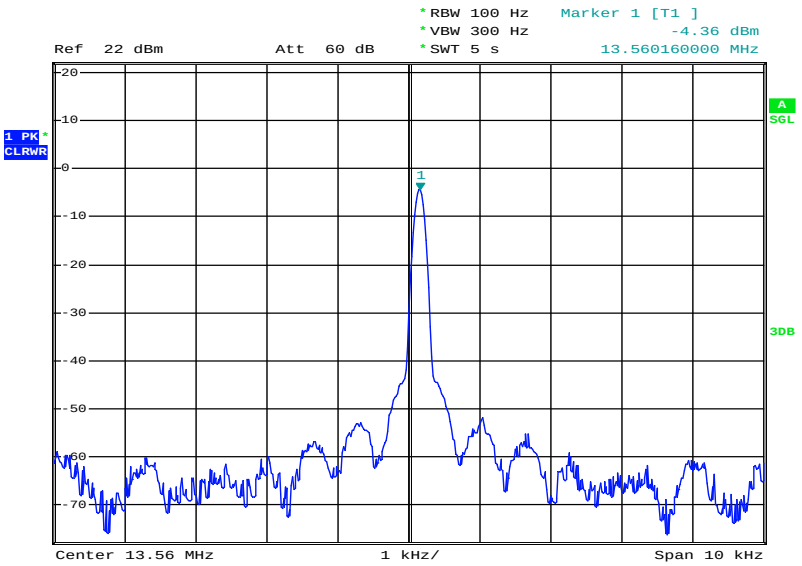
Date: 19.OCT.2015 10:02:58

Plot 15: 115 % voltage; 20°C



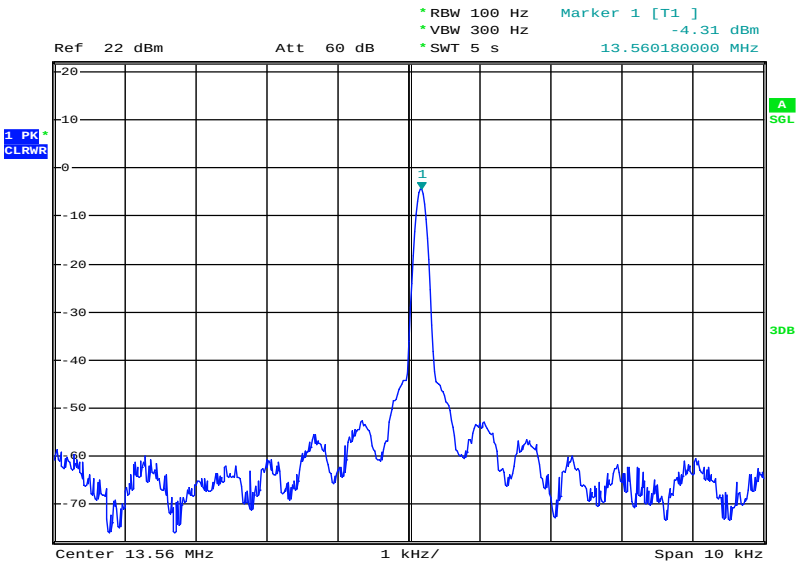
Date: 19.OCT.2015 08:43:46

Plot 16: 100 % voltage; 20°C



Date: 19.OCT.2015 08:43:25

Plot 17: 85 % voltage; 20°C



Date: 19.OCT.2015 08:42:24

13 Observations

No observations except those reported with the single test cases have been made.

Annex A Document history

Version	Applied changes	Date of release
	Initial release	2015-10-30
-A	Editorial corrections & addition of AC conducted test setup	2015-11-11
-B	Correction of HMN	2015-11-26

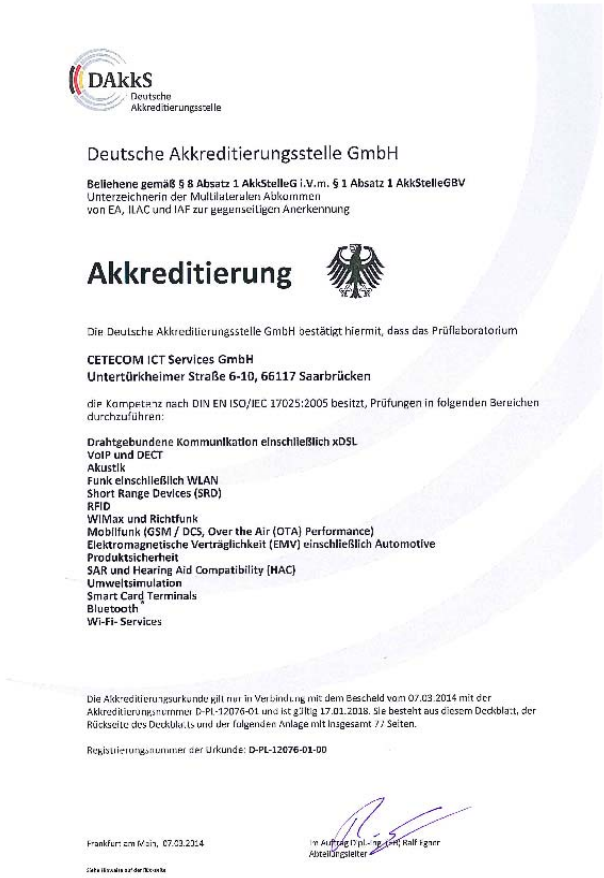
Annex B Further information

Glossary

AVG	-	Average
DUT	-	Device under test
EMC	-	Electromagnetic Compatibility
EN	-	European Standard
EUT	-	Equipment under test
ETSI	-	European Telecommunications Standard Institute
FCC	-	Federal Communication Commission
FCC ID	-	Company Identifier at FCC
HW	-	Hardware
IC	-	Industry Canada
Inv. No.	-	Inventory number
N/A	-	Not applicable
PP	-	Positive peak
QP	-	Quasi peak
S/N	-	Serial number
SW	-	Software
PMN		Product marketing name
HMN		Host marketing name
HVIN		Hardware version identification number
FVIN		Firmware version identification number

Annex C Accreditation Certificate

Front side of certificate



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Deutsche Akkreditierungsstelle

Deutsche Akkreditierungsstelle GmbH

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Untertürkheimer Straße 6-10, 66117 Saarbrücken

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VoIP und DECT
Akustik
Funk einschließlich WLAN
Short Range Devices (SRD)
RFID
WiMax und Richtfunk
Mobilfunk (GSM / DCS, Over the Air (OTA) Performance)
Elektromagnetische Verträglichkeit (EMV) einschließlich Automotive
Produktsicherheit
SAR und Hearing Aid Compatibility (HAC)
Umweltsimulation
Smart Card Terminals
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Die Akkreditierungsurkunde gilt nur in Verbindung mit dem Bescheid vom 07.03.2014 mit der Akkreditierungsnummer D-PL-12076-01 und ist gültig 17.01.2018. Sie besteht aus diesem Deckblatt, der Rückseite des Deckblatts und der folgenden Anlage mit insgesamt 77 Seiten.

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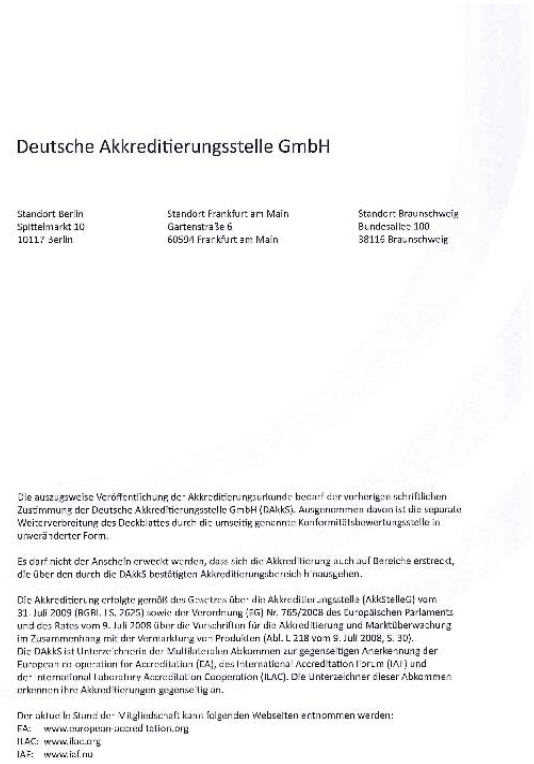
Frankfurt am Main, 07.03.2014

Im Auftrag Dipl.-Ing. (FH) Ralf Egner
Abteilungsleiter

Back side of certificate



Deutsche Akkreditierungsstelle GmbH

Standort Berlin
Spittelmarkt 10
10117 Berlin

Standort Frankfurt am Main
Gartenstraße 6
60594 Frankfurt am Main

Standort Braunschweig
Bundesallee 100
38116 Braunschweig

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Note:

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