

Annex 1: Measurement diagrams 22-1-0081701T008a-A1

Number of pages:	31	Date of Report:	2023-Oct-17
Testing company:	cetecom advanced GmbH Untertürkheimer Str. 6-10 66117 Saarbrücken, Germany Tel. + 49 (0) 681 598 0 Fax: + 49 (0) 681 598 9075	Applicant:	WITTE-Velbert GmbH & Co.KG
Product: Model:	Automotive NFC Outer Door Handle DH501		
FCC ID:	V2T-DH501	IC:	7575A-DH501
Testing has been carried out in accordance with:	Title 47 CFR, Chapter I FCC Regulations, Subchapter A Subpart C: §15.225 (NFC) ISED regulations: RSS-Gen, Issue 5 + Amendment 2 RSS-210, Issue 10		

Table of Contents

1	Measurement diagrams.....	3
1.1	Field strength within band 13.553 to 13.567MHz	3
1.2	Field strength of spurious radiation ($f < 30\text{MHz}$).....	7
1.3	Field strength of spurious radiation ($f > 30\text{MHz}$).....	9
1.4	FCC Occupied Bandwidth	11
1.5	Frequency stability under climatic conditions	12
1.5.1	Normal conditions.....	12
1.5.2	Extreme test conditions, temperature variations	17
1.6	Frequency stability under voltage variations	30

1 Measurement diagrams

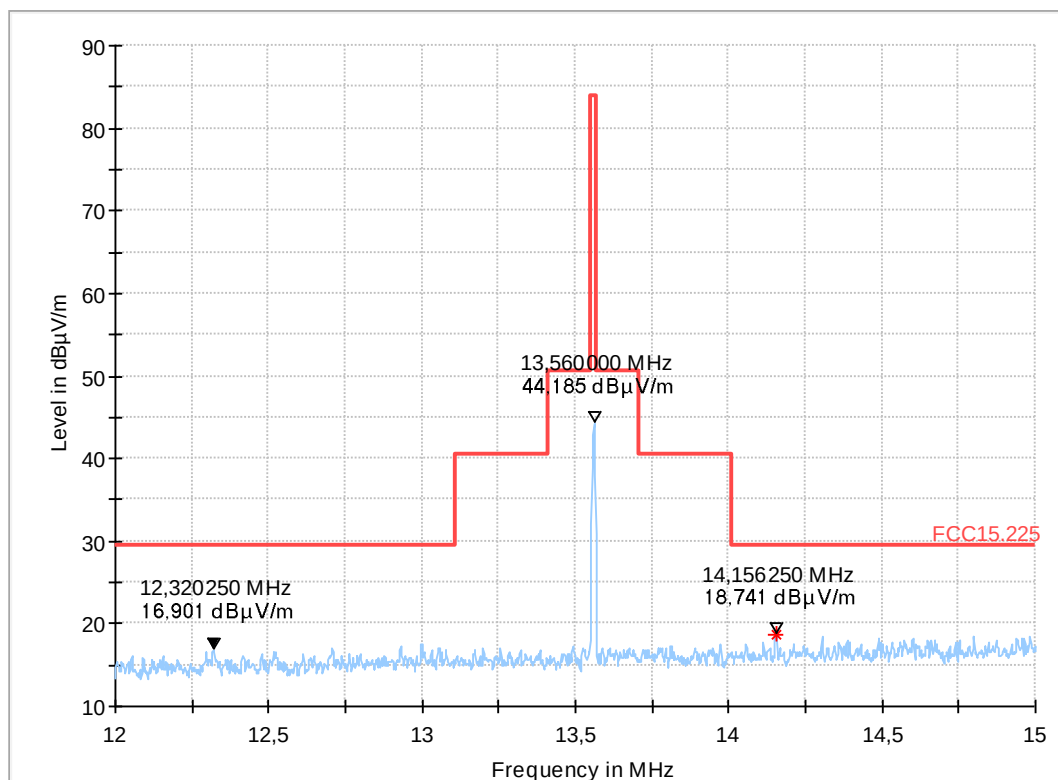
1.1 Field strength within band 13.553 to 13.567MHz

2.01a_Carrier_Mask_TX_S09_standing

Common Information

Test description:	Magnetic Field Strength Measurement related to 30/300 m distance
Test Site Location:	Ref.-Nr. 441 Semi Anechoic Chamber (SAC1) with 3 m measurement distance
Version of Testsoftware:	EMC32 V10.50.0
Distance correction:	used accord. table, pls. see test report
Technical Data:	Please see page 2 for detailed data of measurement setup
Rec. antenna (pre-scan):	height 1.00 m, parallel and 90° to EUT polarisation
Used filter:	bypass
Test Standard:	FCC 15.205 § 15.209; RSS-Gen: Issue 5
Operator:	Lor
Operating Mode:	Channel nominal modulated 13.56MHz (CW)
Power during tests:	12V DC, car-battery
Comment 1:	Unmodulated CW Mode
Comment 2:	Antenna standing
Environmental Conditions:	T=22.4deg, Humidity: 62%rH
EUT Setup:	Main EUT: S09 + Card Holder S23 + Cable shielded S17
Verdict:	Passed

Full Spectrum

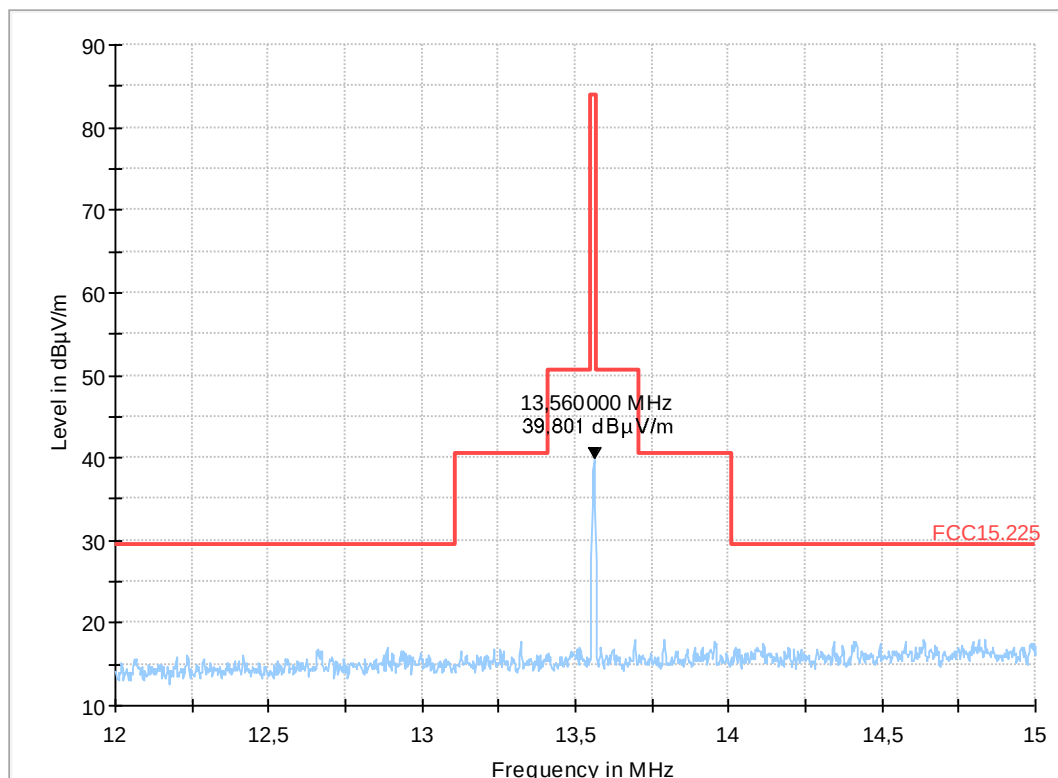


2.01b_Carrier_Mask_TX_S09_laying

Common Information

Test description:	Magnetic Field Strength Measurement related to 30/300 m distance
Test Site Location:	Ref.-Nr. 441 Semi Anechoic Chamber (SAC1) with 3 m measurement distance
Version of Testsoftware:	EMC32 V10.50.0
Distance correction:	used accord. table, pls. see test report
Technical Data:	Please see page 2 for detailed data of measurement setup
Rec. antenna (pre-scan):	height 1.00 m, parallel and 90° to EUT polarisation
Used filter:	bypass
Test Standard:	FCC 15.205 § 15.209; RSS-Gen: Issue 5
Operator:	Lor
Operating Mode:	Channel nominal modulated 13.56MHz (CW)
Power during tests:	12V DC, car-battery
Comment 1:	Unmodulated CW Mode
Comment 2:	Antenna laying
Environmental Conditions:	T=22.4deg, Humidity: 62%rH
EUT Setup:	Main EUT: S09 + Card Holder S23 + Cable shielded S17
Verdict:	Inconclusive

Full Spectrum



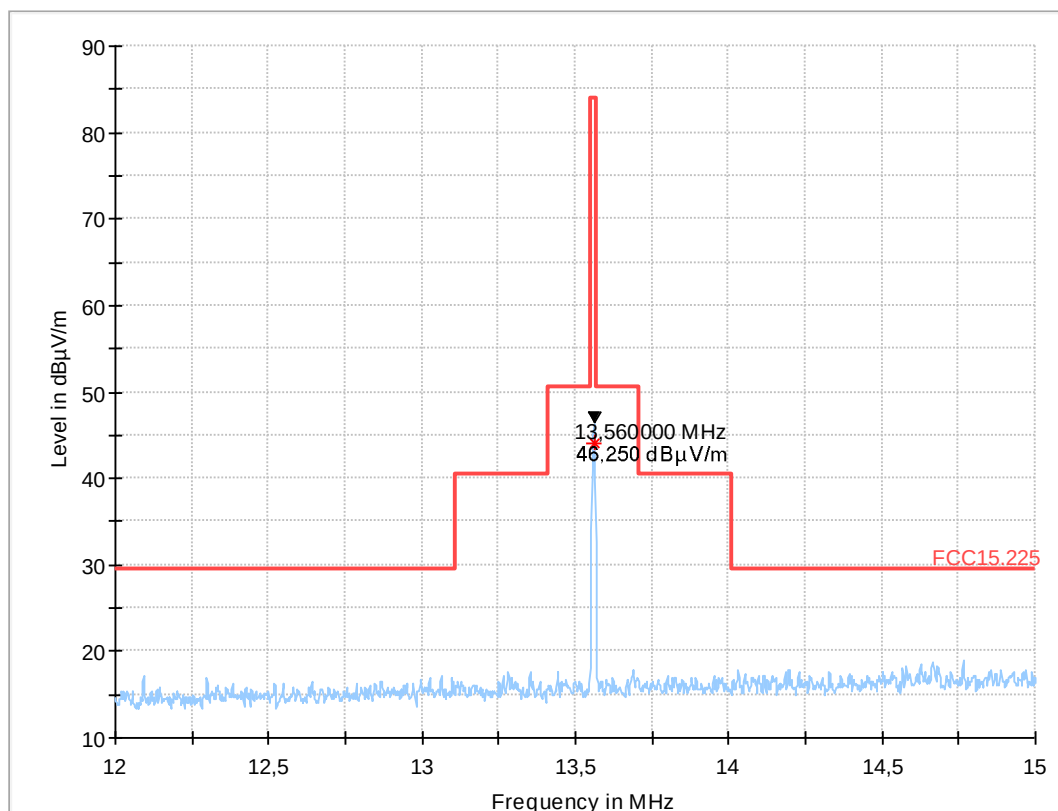
2.02a_Carrier_Mask_TXRX_S12_standing

Common Information

Test description:	Magnetic Field Strength Measurement related to 30/300 m distance
Test Site Location:	Ref.-Nr. 441 Semi Anechoic Chamber (SAC1) with 3 m measurement distance
Version of Testsoftware:	EMC32 V10.50.0
Distance correction:	used accord. table, pls. see test report
Technical Data:	Please see page 2 for detailed data of measurement setup
Rec. antenna (pre-scan):	height 1.00 m, parallel and 90° to EUT polarisation
Used filter:	bypass
Test Standard:	FCC 15.205 § 15.209; RSS-Gen: Issue 5
Operator:	Lor
Operating Mode:	Channel nominal modulated 13.56MHz
Power during tests:	12V DC, car-battery
Comment 1:	Channel low/middle/high
Comment 2:	
Environmental Conditions:	T=22.4deg, Humidity: 62%rH
EUT Setup:	Main EUT: S12 + Card Holder 3cm disnace to NFC Card S20 + Cable shielded S17
Verdict:	Passed

EUT Information

PMT number:	22-1-00817S12_C01
Power:	12V DC



2.02b_Carrier_Mask_TXRX_S12_standing

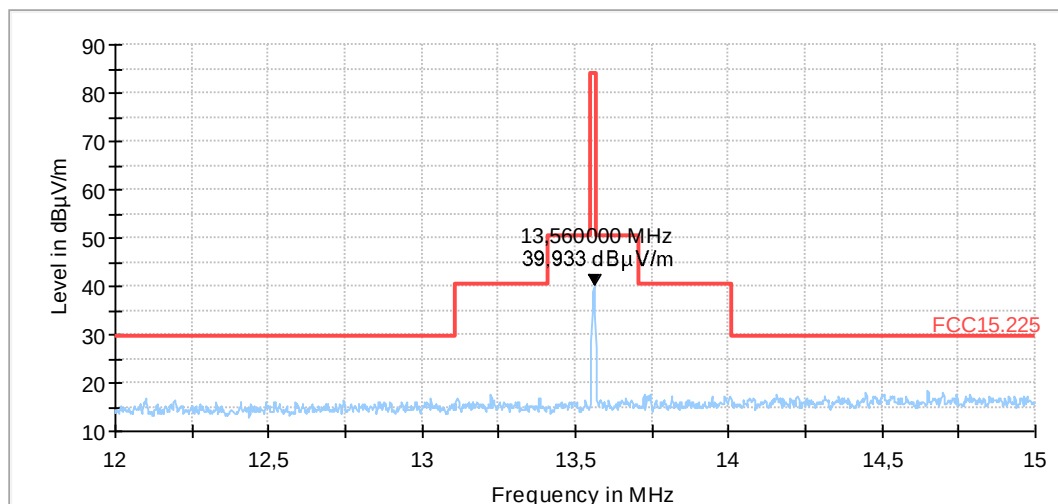
Common Information

Test description:	Magnetic Field Strength Measurement related to 30/300 m distance
Test Site Location:	Ref.-Nr. 441 Semi Anechoic Chamber (SAC1) with 3 m measurement distance
Version of Testsoftware:	EMC32 V10.50.0
Distance correction:	used accord. table, pls. see test report
Technical Data:	Please see page 2 for detailed data of measurement setup
Rec. antenna (pre-scan):	height 1.00 m, parallel and 90° to EUT polarisation
Used filter:	bypass
Test Standard:	FCC 15.205 § 15.209; RSS-Gen: Issue 5
Operator:	Lor
Operating Mode:	Channel nominal modulated 13.56MHz
Power during tests:	12V DC, car-battery
Comment 1:	antenna laying
Comment 2:	
Environmental Conditions:	T=22.4deg, Humidity: 62%rH
EUT Setup:	Main EUT: S12 + Card Holder 3cm disnace to NFC Card S20 + Cable shielded S17
Verdict:	Inconclusive

EUT Information

PMT number:	22-1-00817S12_C01
Power:	12V DC

Full Spectrum



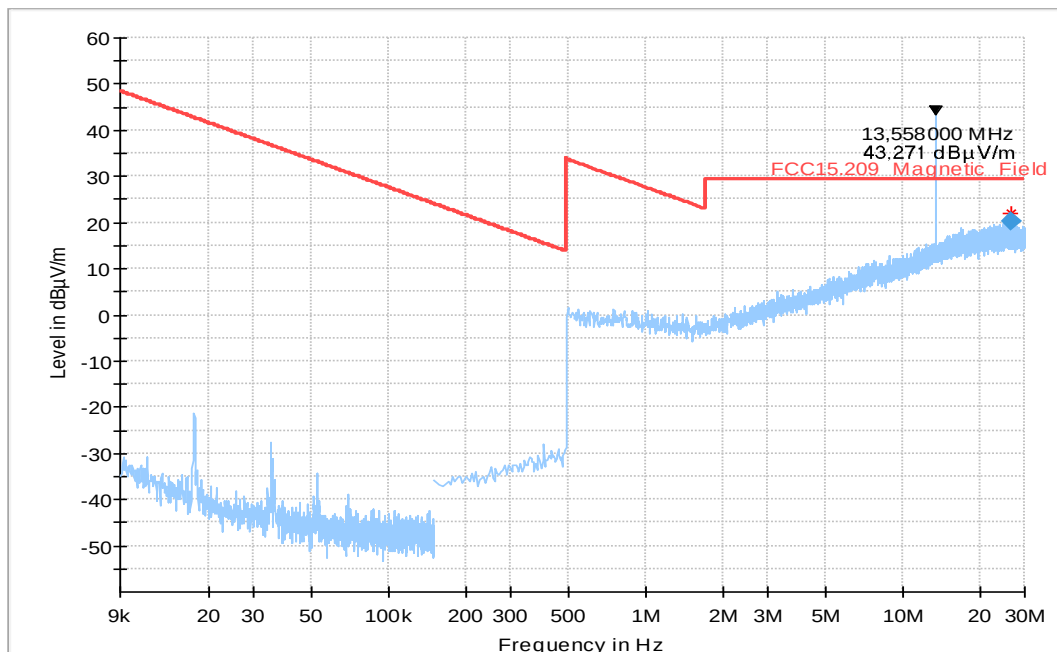
1.2 Field strength of spurious radiation (f<30MHz)

2.03_RSE_TX_S09

Common Information

Test description:	Magnetic Field Strength Measurement related to 30/300 m distance
Test Site Location:	Ref.-Nr. 441 Semi Anechoic Chamber (SAC1) with 3 m measurement distance
Version of Testsoftware:	EMC32 V10.50.0
Distance correction:	used accord. table, pls. see test report
Technical Data:	Please see page 2 for detailed data of measurement setup
Rec. antenna (pre-scan):	height 1.00 m, parallel and 90° to EUT polarisation
Used filter:	bypass
Test Standard:	FCC 15.205 § 15.209; RSS-Gen: Issue 5
Operator:	Lor
Operating Mode:	Channel nominal modulated 13.56MHz (CW)
Power during tests:	12V DC, car-battery
Comment 1:	Unmodulated CW Mode
Comment 2:	Antenna standing
Environmental Conditions:	T=22.4deg, Humidity: 62%rH
EUT Setup:	Main EUT: S09 + Card Holder S23 + Cable shielded S17
Verdict:	Passed

Full Spectrum



Final Result

Frequency (MHz)	MaxPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Bandwidth (kHz)	Pol	Azimuth (deg)	Corr. (dB/m)	Comment
26.426000	20.16	29.54	9.38	9.000	H	256.0	2.1	12:09:25 - 18.09.2023

2.04_RSE_TXRX_S12

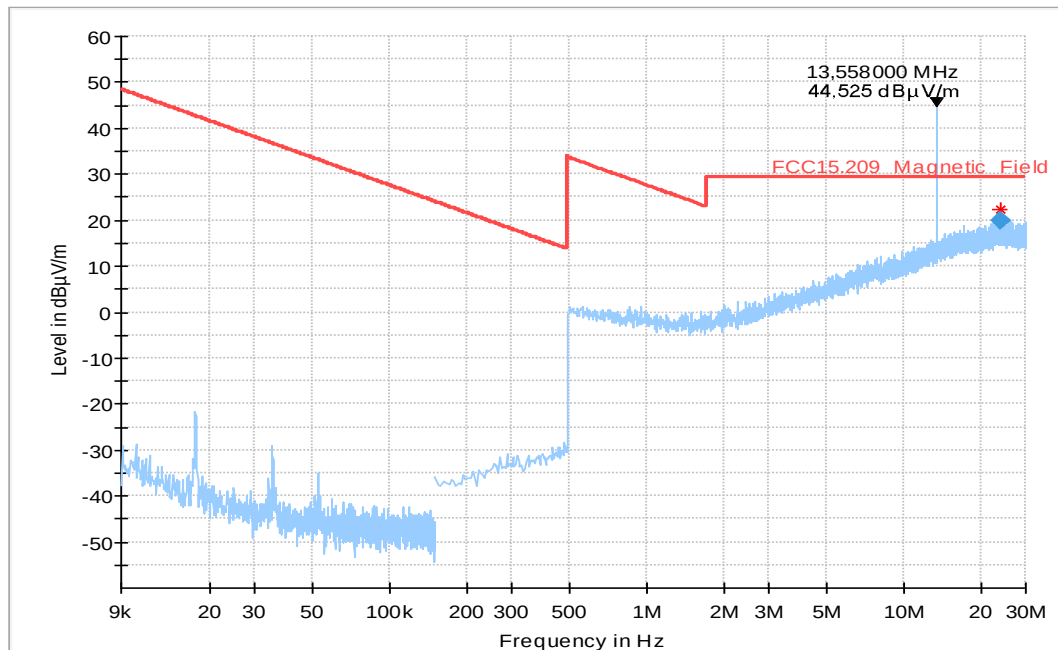
Common Information

Test description:	Magnetic Field Strength Measurement related to 30/300 m distance
Test Site Location:	Ref.-Nr. 441 Semi Anechoic Chamber (SAC1) with 3 m measurement distance
Version of Testsoftware:	EMC32 V10.50.0
Distance correction:	used accord. table, pls. see test report
Technical Data:	Please see page 2 for detailed data of measurement setup
Rec. antenna (pre-scan):	height 1.00 m, parallel and 90° to EUT polarisation
Used filter:	bypass
Test Standard:	FCC 15.205 § 15.209; RSS-Gen: Issue 5
Operator:	Lor
Operating Mode:	Channel nominal modulated 13.56MHz (modulated)
Power during tests:	12V DC, car-battery
Comment 1:	antenna standing
Comment 2:	
Environmental Conditions:	T=22.4deg, Humidity: 62%rH
EUT Setup:	Main EUT: S12 + Card Holder 3cm distance to NFC Card S20 + Cable shielded S17
Verdict:	Passed

EUT Information

PMT number:	22-1-00817S12_C01
Power:	12V DC

Full Spectrum

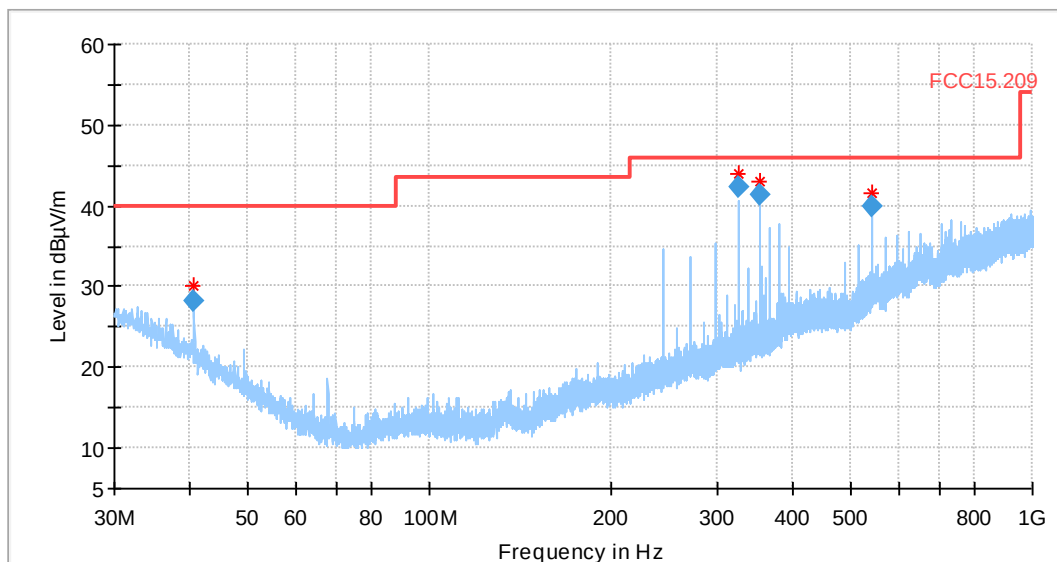


1.3 Field strength of spurious radiation (f>30MHz)

3.01_TX_CW_shielded

Common Information

Test Description:	Radiated field strength emission in 3m distance
Test Site:	CETECOM GmbH Essen
Test Standard:	FCC 15.205&15.209 & RSS Gen. Issue 5
Antenna polarisation:	horizontal/vertical
Environmental Conditions:	Humidity: 61%rH; Temperature: 22.1C
Operator Name:	Lor
EUT:	20230817_06, HW: D6new, SW: 18-CW
Operating Mode:	TX-Mode (CW)
Power supply:	12V DC battery
Comment:	Channel nominal 13.56MHz
Verdict:	Passed



Final_Result

Frequency (MHz)	QuasiPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Sig Path (dB)	Preamp (dB)
40.670000	28.11	40.00	11.89	120.000	105.0	V	273.0	16.2	0.0	0.6
325.430000	42.31	46.00	3.69	120.000	100.0	H	126.0	15.9	0.0	1.8
352.550000	41.36	46.00	4.64	120.000	107.0	H	17.0	16.5	0.0	2.0
542.390000	39.80	46.00	6.20	120.000	167.0	H	85.0	21.9	0.0	2.5

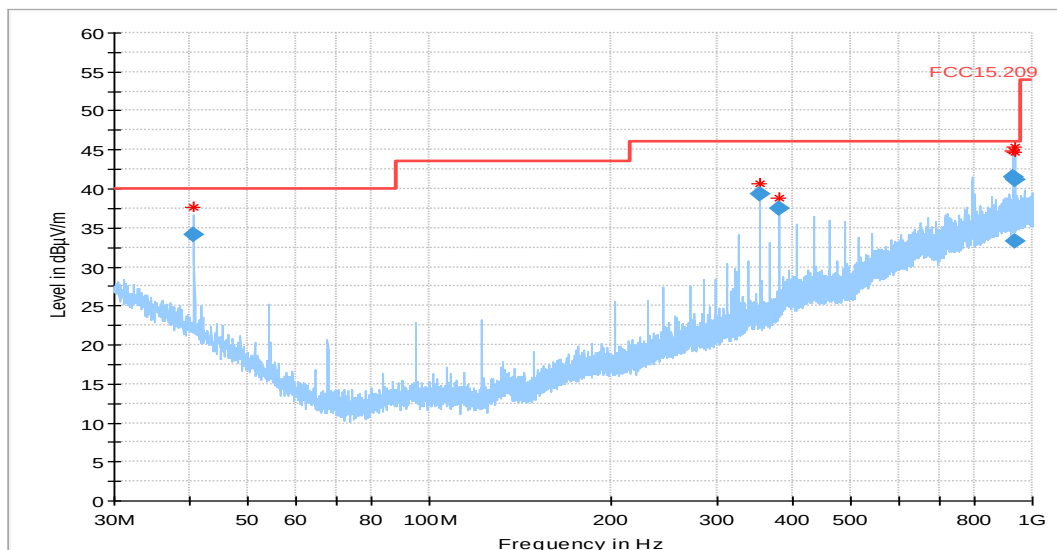
(continuation of the "Final_Result" table from column 18 ...)

Frequency (MHz)	Trd Corr. (dB/m)	Raw Rec (dBμV)	Comment
40.670000	15.6	11.9	10:03:05 - 23.08.2023
325.430000	14.1	26.4	09:52:29 - 23.08.2023
352.550000	14.5	24.9	09:47:19 - 23.08.2023
542.390000	19.4	17.9	09:57:46 - 23.08.2023

3.02_TXRX_Sample17_06_withTag_S20

Common Information

Test Description:	Radiated field strength emission in 3m distance
Test Site:	CETECOM GmbH Essen
Test Standard:	FCC 15.205&15.209 & RSS Gen. Issue 5
Antenna polarisation:	horizontal/vertical
Environmental Conditions:	Humidity: 67%rH; Temperature: 22.4°C
Operator Name:	Lor
EUT:	Main EUT S12 + Base Plate S23 + NFC Card S20 + CAB shielded S17
Operating Mode:	TX/RX Polling NFC Card continuously
Power supply:	12V DC Car-battery
Comment:	Channel nominal modulated 13.56MHz
Verdict:	Passed



Final_Result

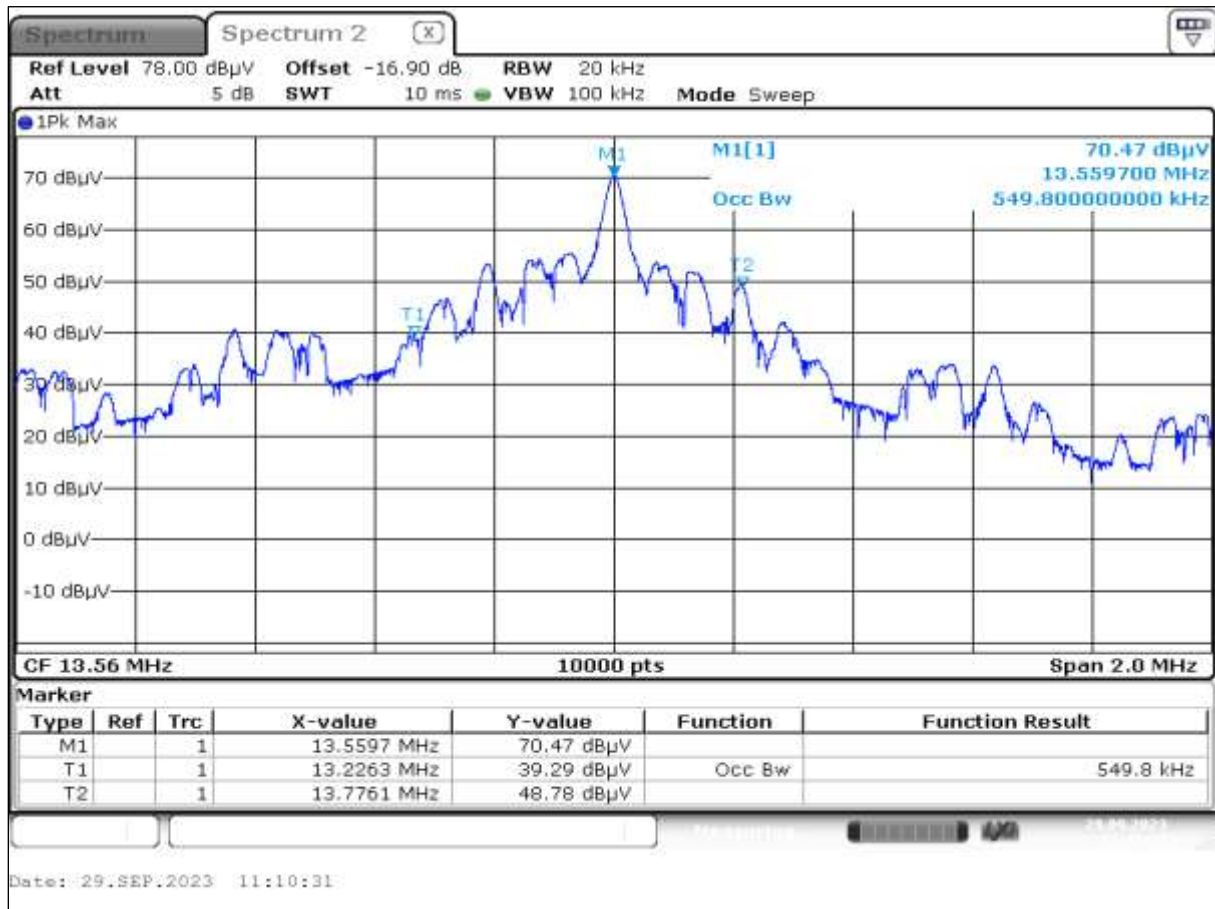
Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Sig Path (dB)	Preamp (dB)
40.670000	34.12	40.00	5.88	120.000	105.0	V	303.0	16.2	0.0	0.6
352.550000	39.25	46.00	6.75	120.000	104.0	H	170.0	16.5	0.0	2.0
379.670000	37.40	46.00	8.60	120.000	100.0	H	216.0	18.0	0.0	2.0
927.070000	41.59	46.00	4.41	120.000	112.0	H	193.0	27.0	0.0	3.4
933.010000	41.13	46.00	4.87	120.000	368.0	H	87.0	27.1	0.0	3.4
934.190000	33.28	46.00	12.72	120.000	317.0	V	354.0	27.1	0.0	3.4

(continuation of the "Final_Result" table from column 18 ...)

Frequency (MHz)	Trd Corr. (dB/m)	Raw Rec (dBµV)	Comment
40.670000	15.6	17.9	10:33:32 - 18.09.2023
352.550000	14.5	22.8	10:08:18 - 18.09.2023
379.670000	16.0	19.4	10:13:18 - 18.09.2023
927.070000	23.6	14.6	10:24:04 - 18.09.2023
933.010000	23.7	14.1	10:18:08 - 18.09.2023
934.190000	23.7	6.2	10:28:24 - 18.09.2023

1.4 FCC Occupied Bandwidth

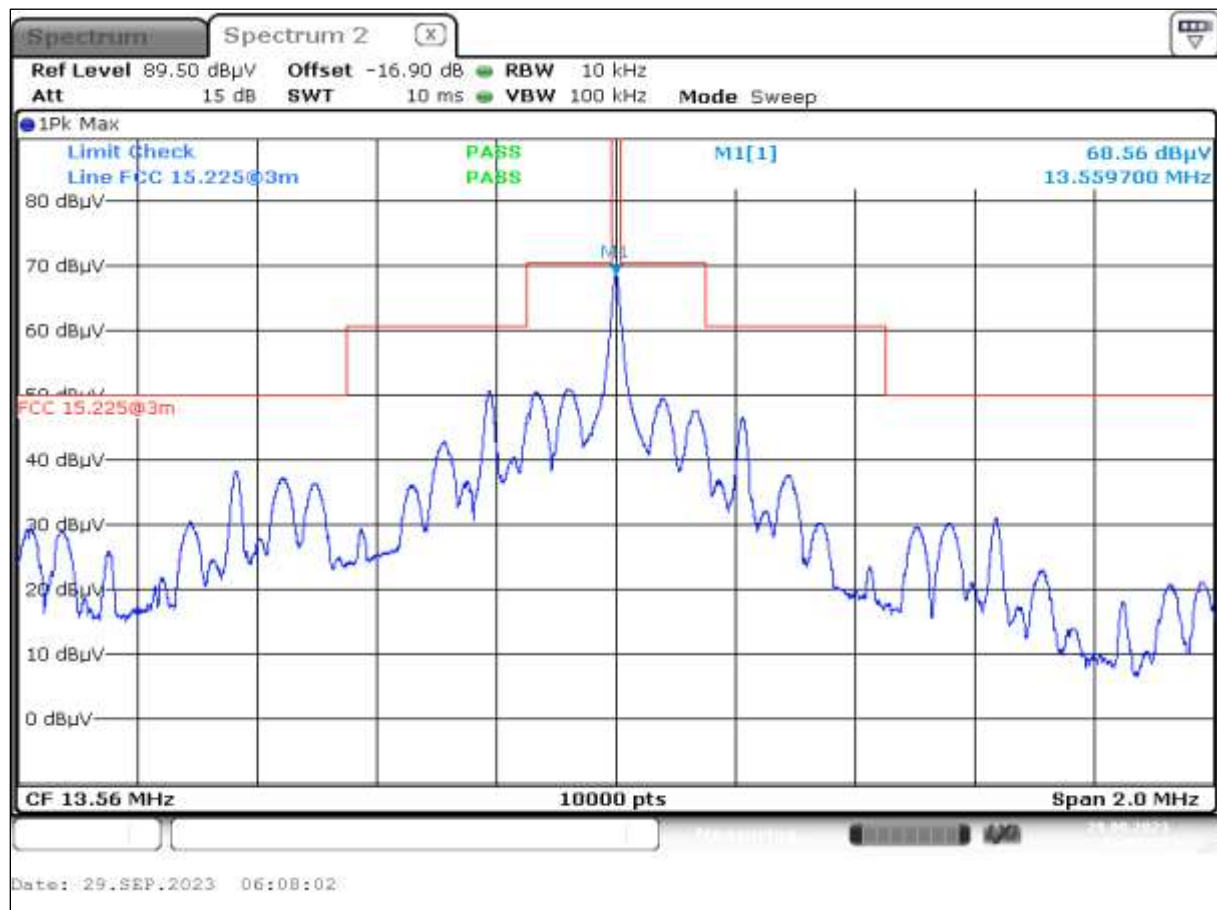
FCC Occupied Bandwidth



1.5 Frequency stability under climatic conditions

1.5.1 Normal conditions

FCC Spektrumsmaske

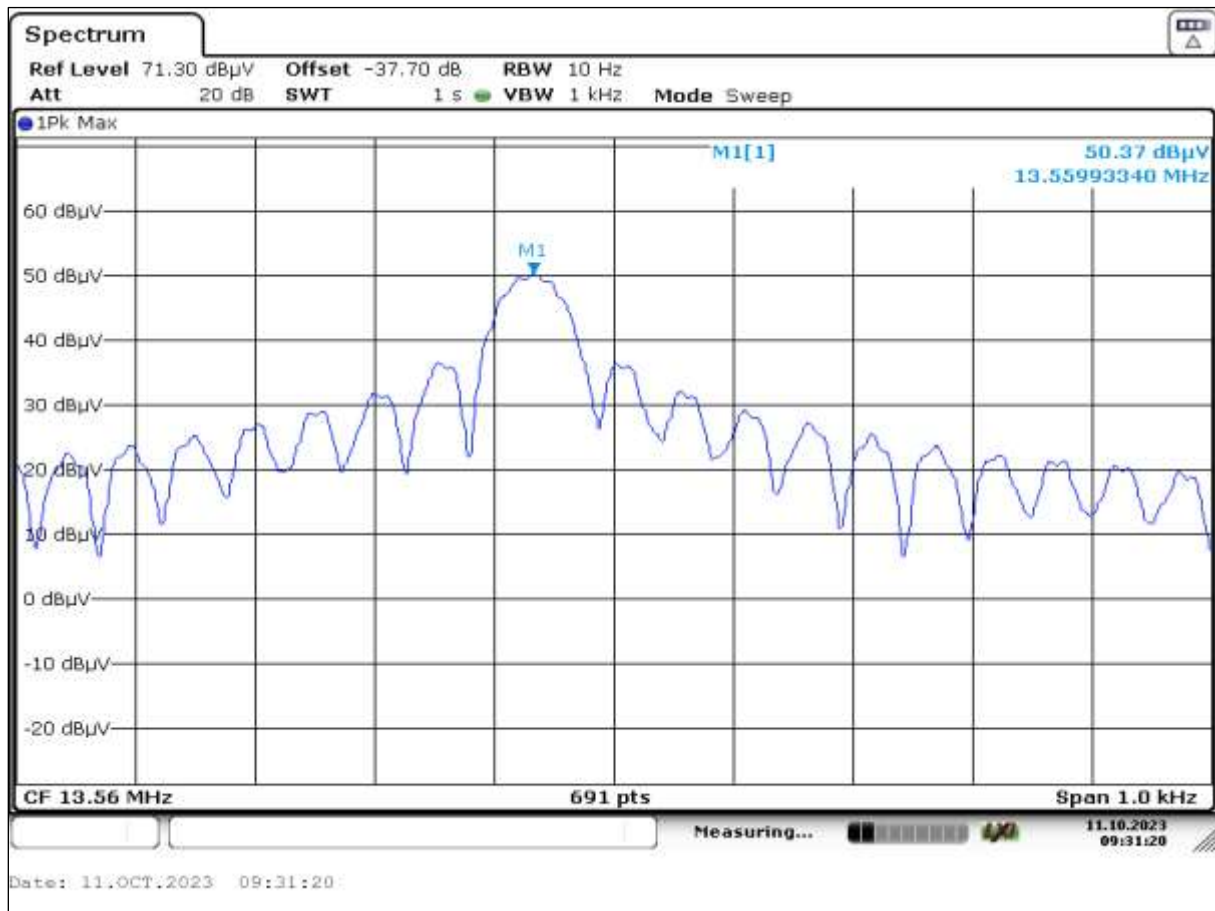


Frequency_20°C_13.5V

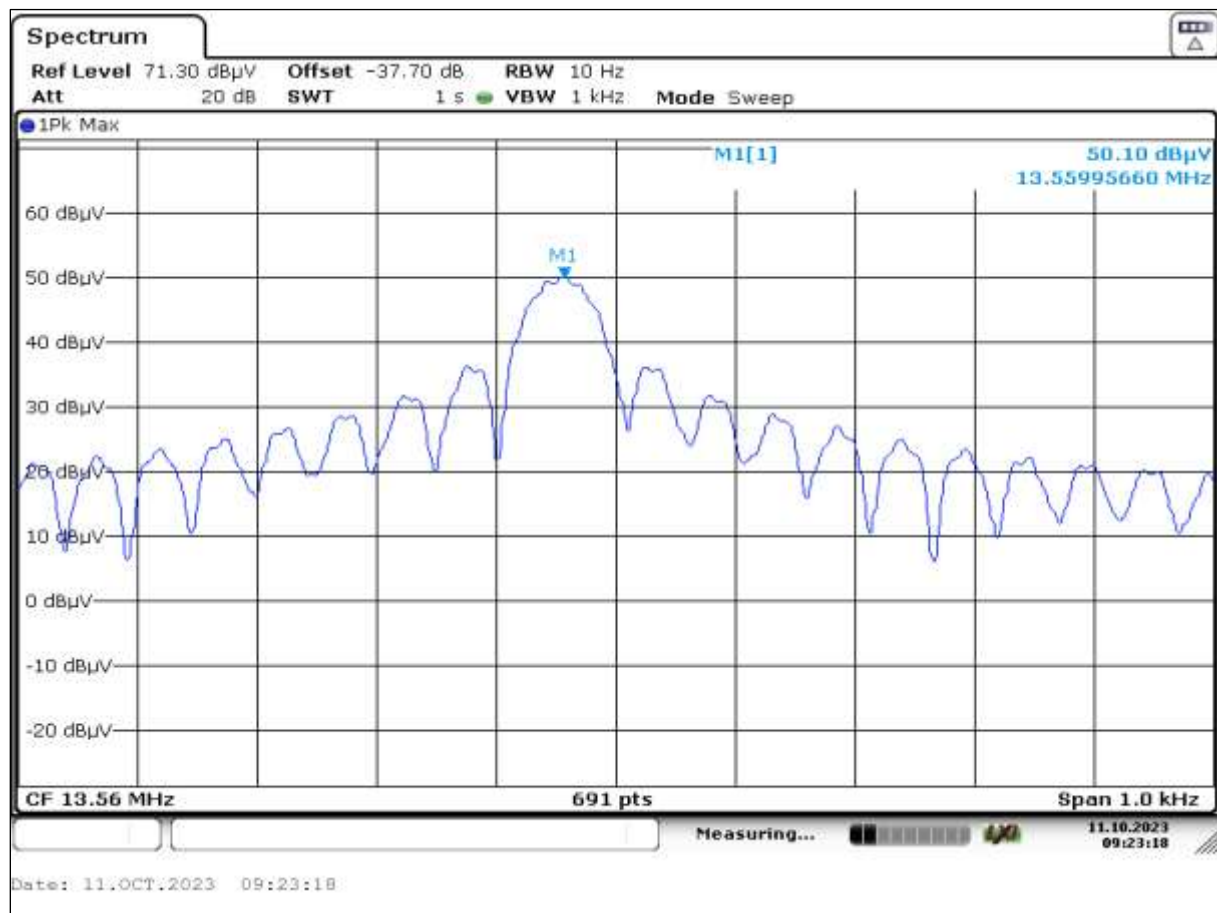


Frequency error reference

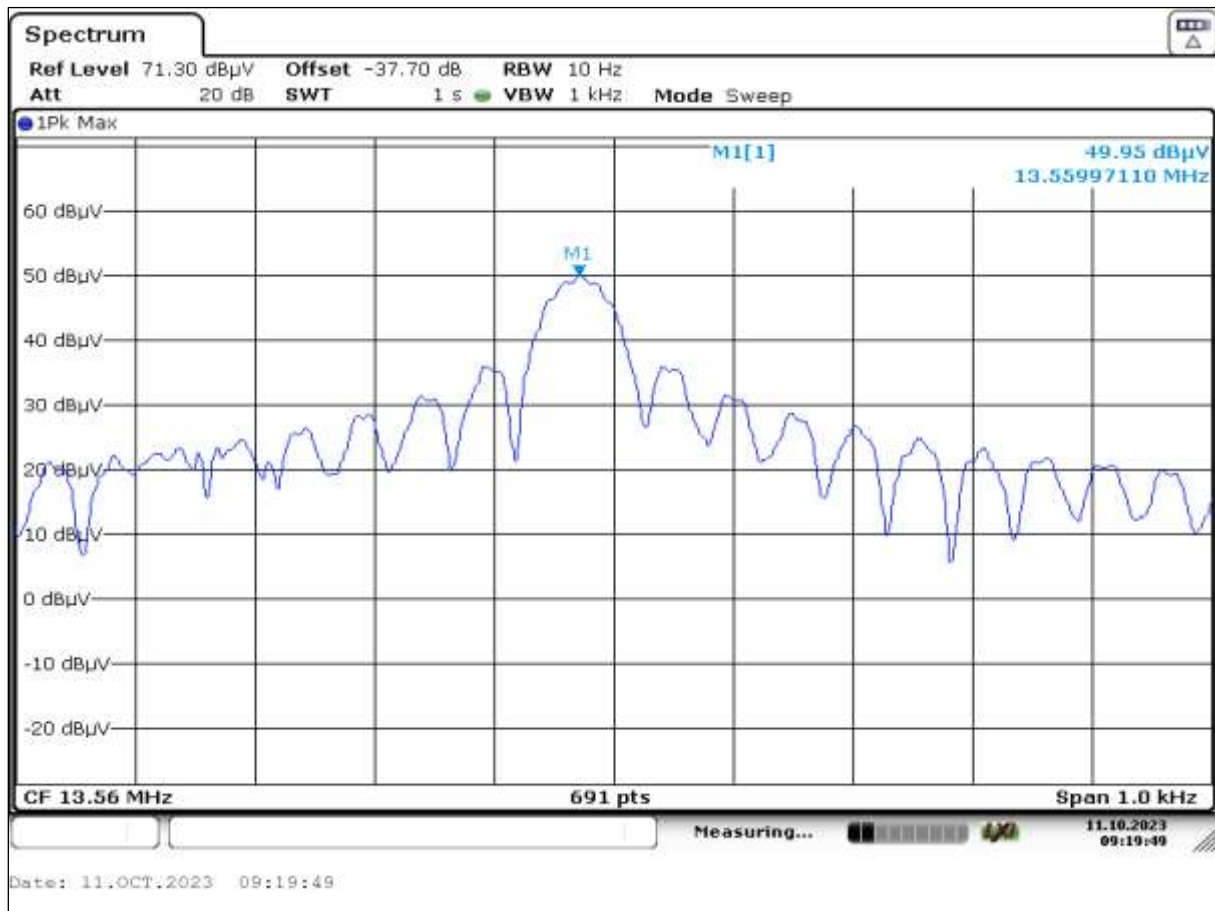
10 Minuten



2 Minuten

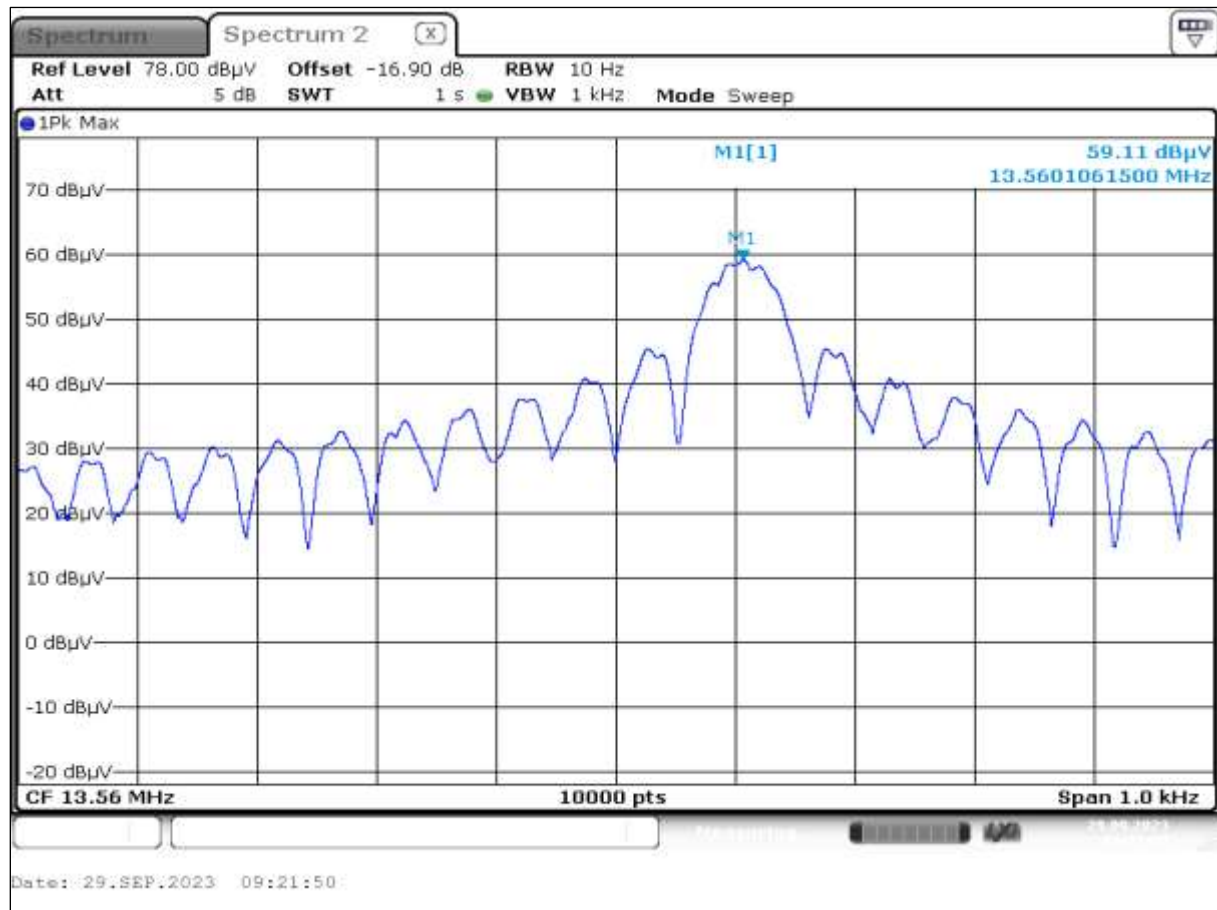


Einschalten

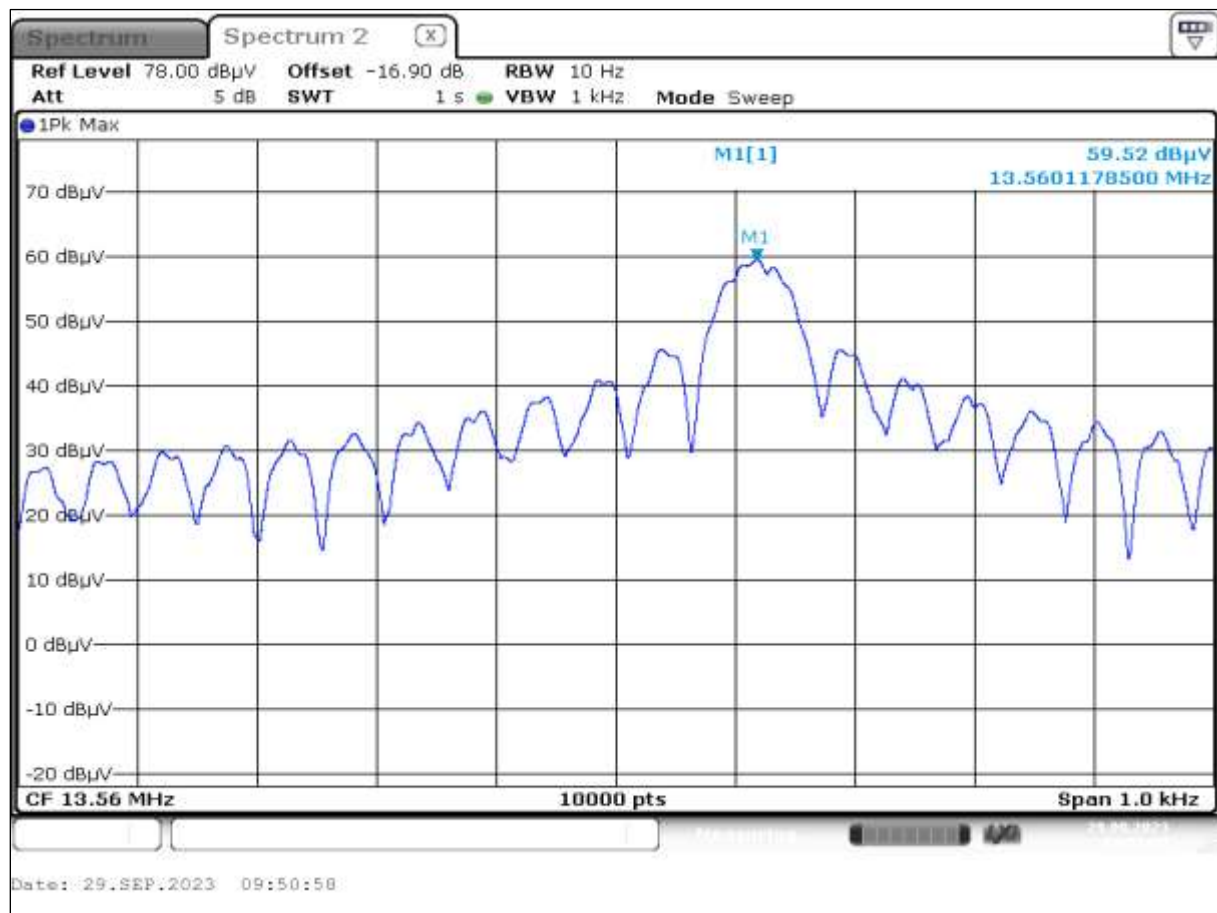


1.5.2 Extreme test conditions, temperature variations

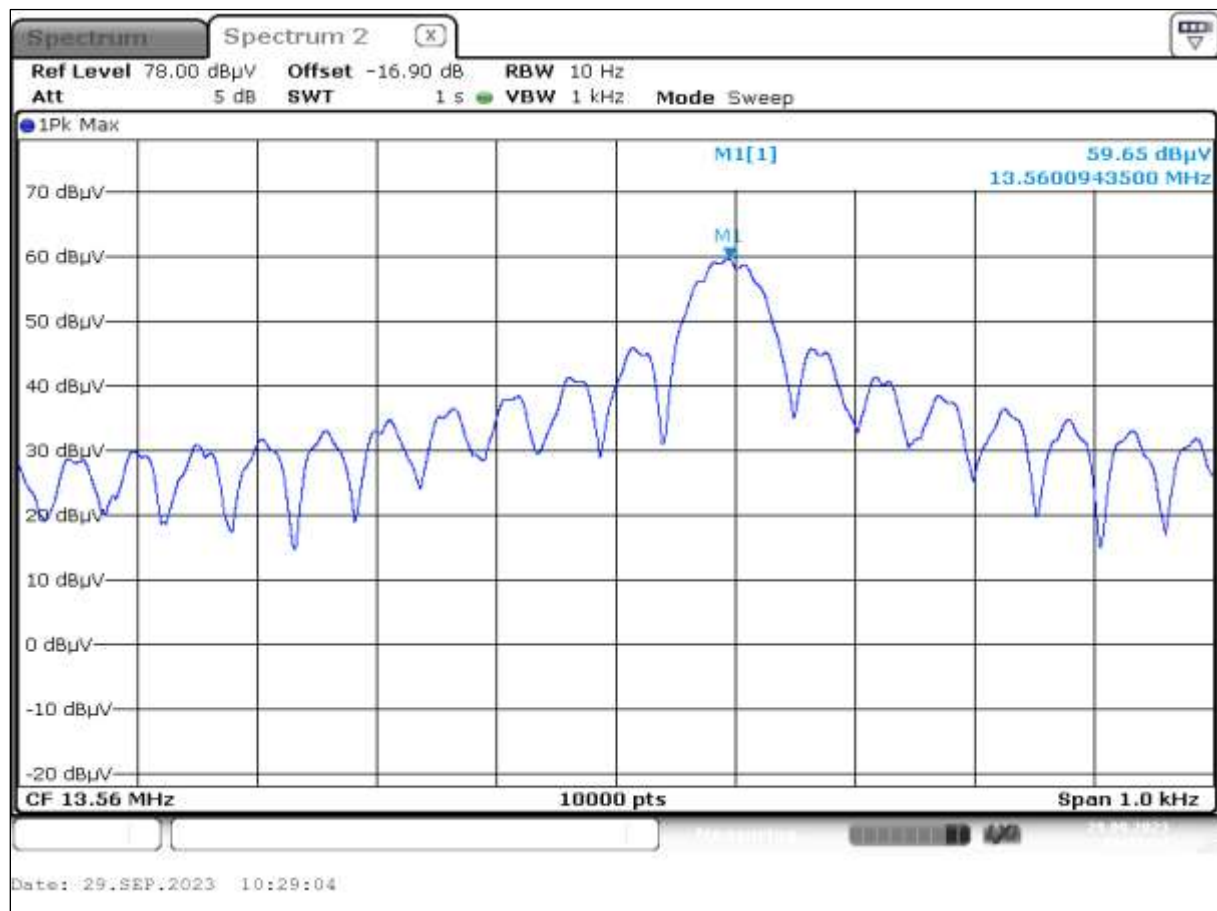
Frequency_-10°C_13.5V



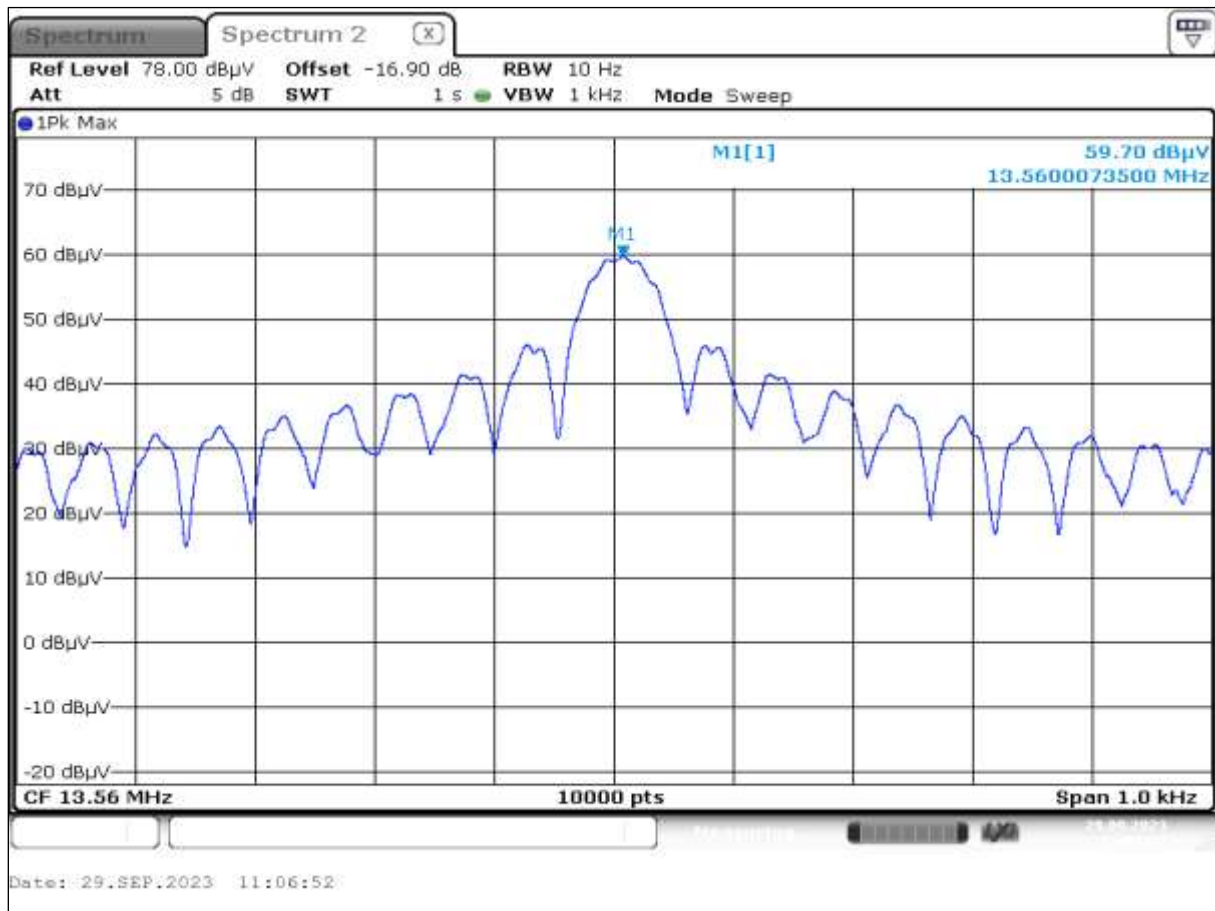
Frequency_-20°C_13.5V



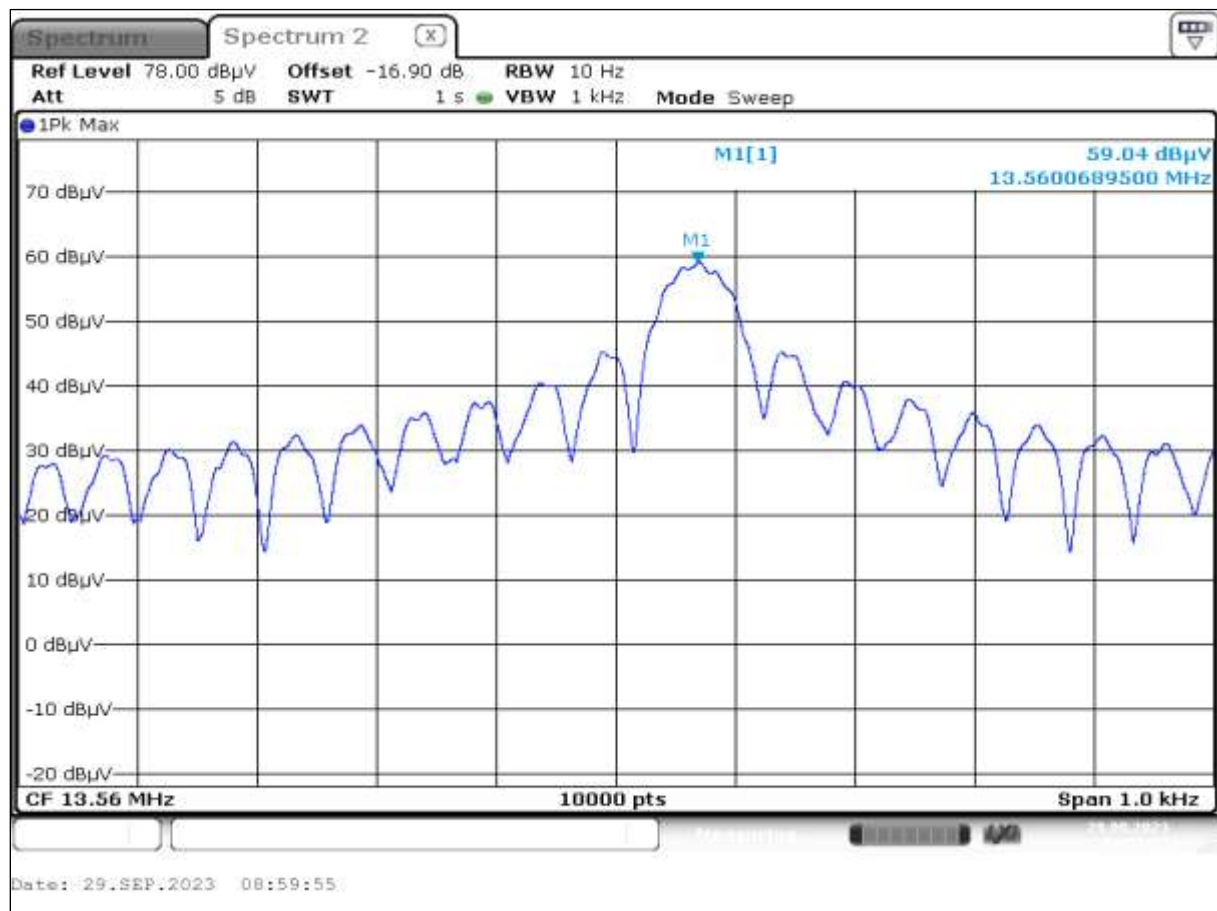
Frequency_-30°C_13.5V



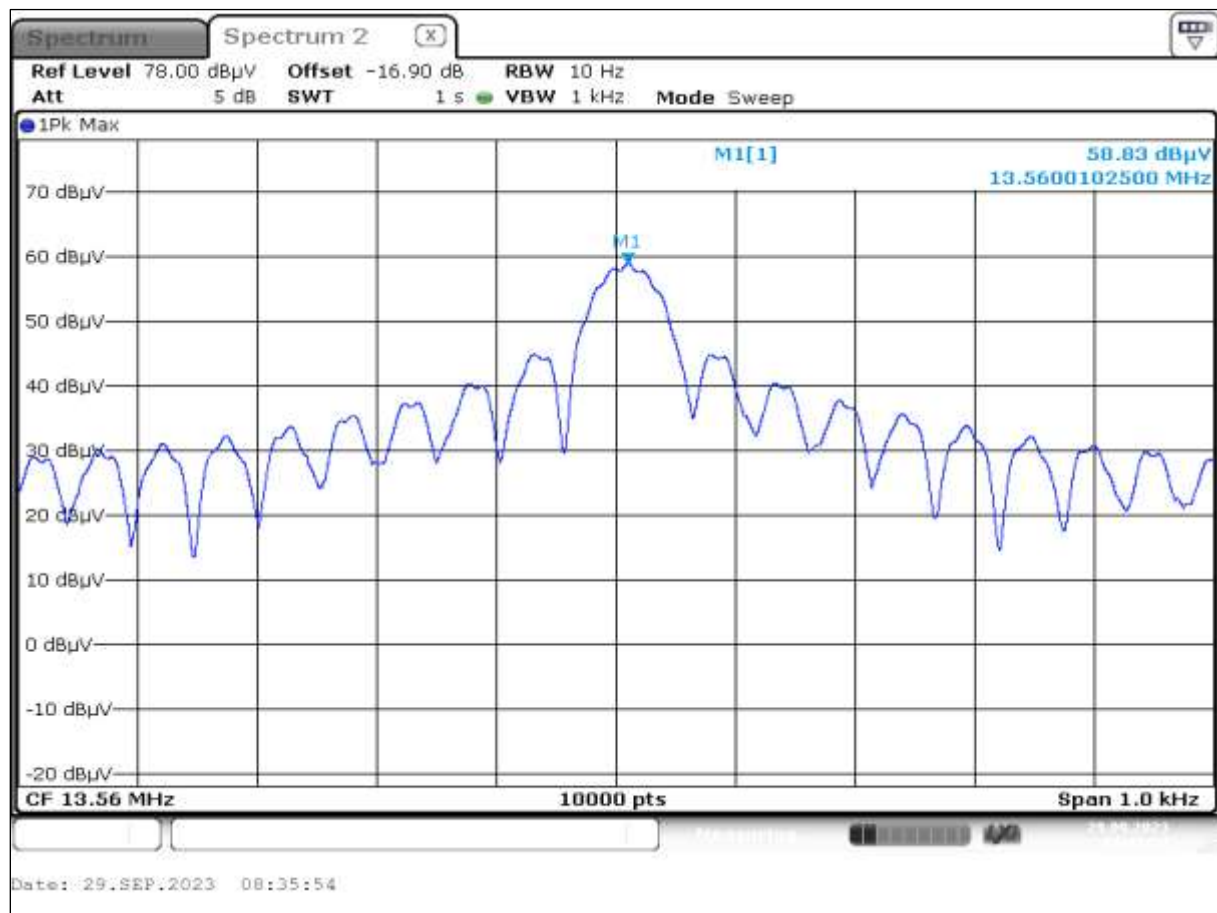
Frequency_-40°C_13.5V



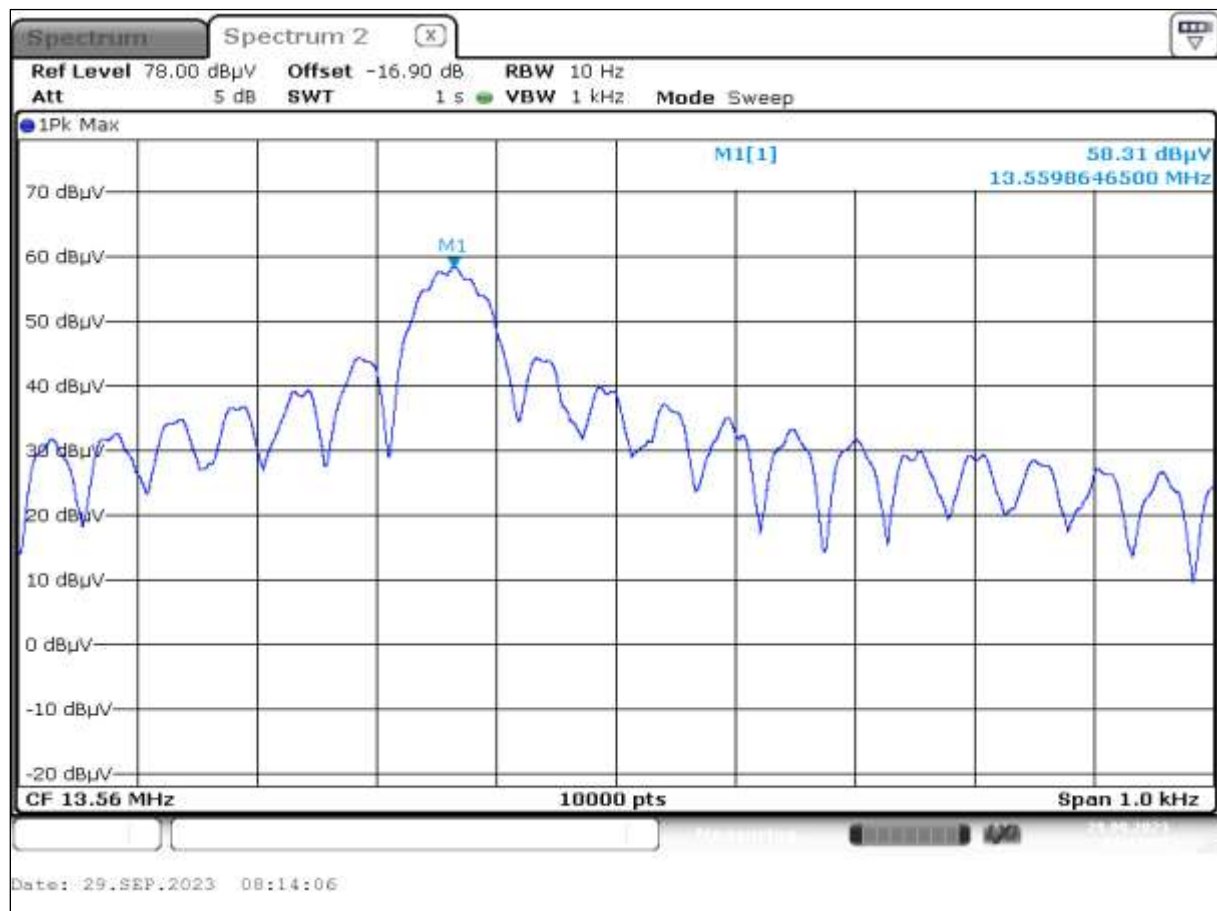
Frequency_0°C_13.5V



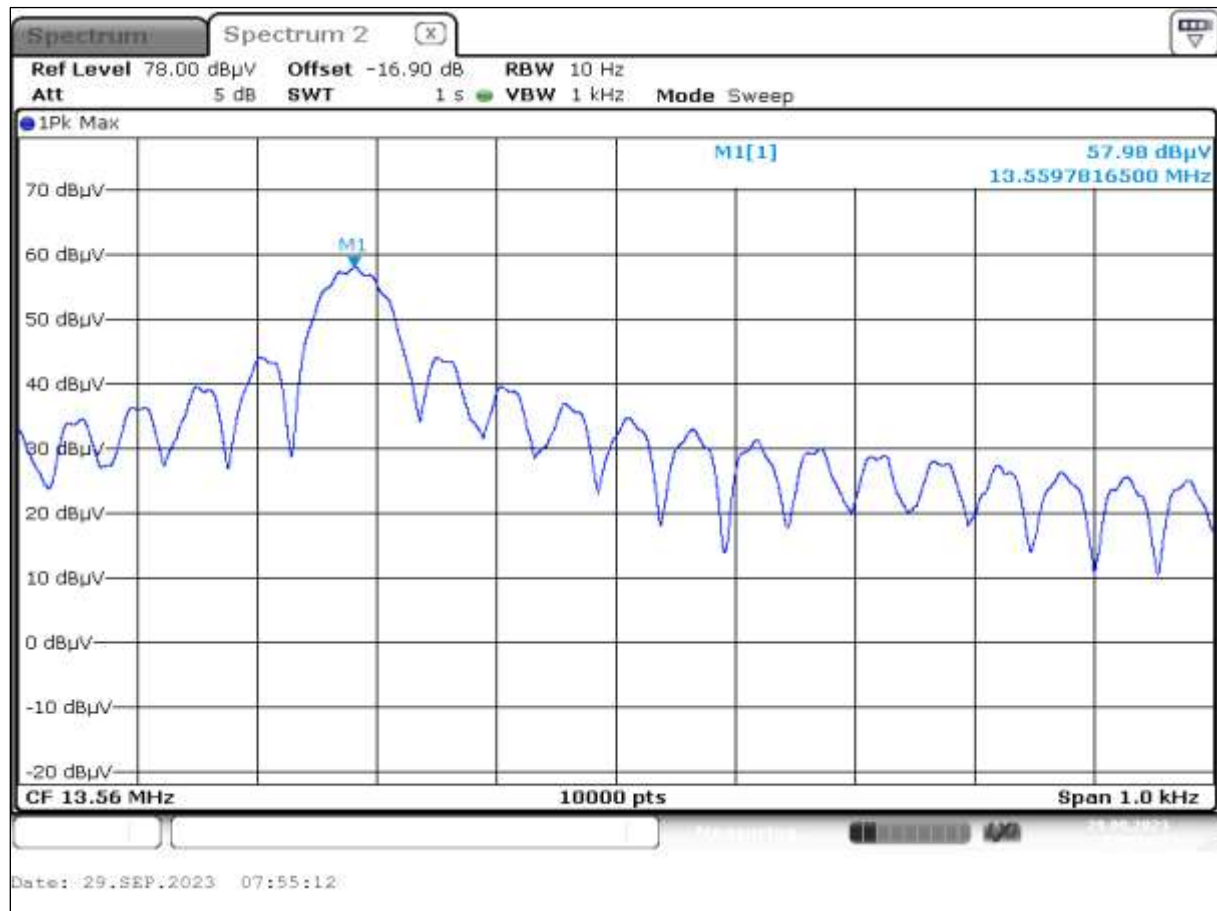
Frequency_10°C_13.5V



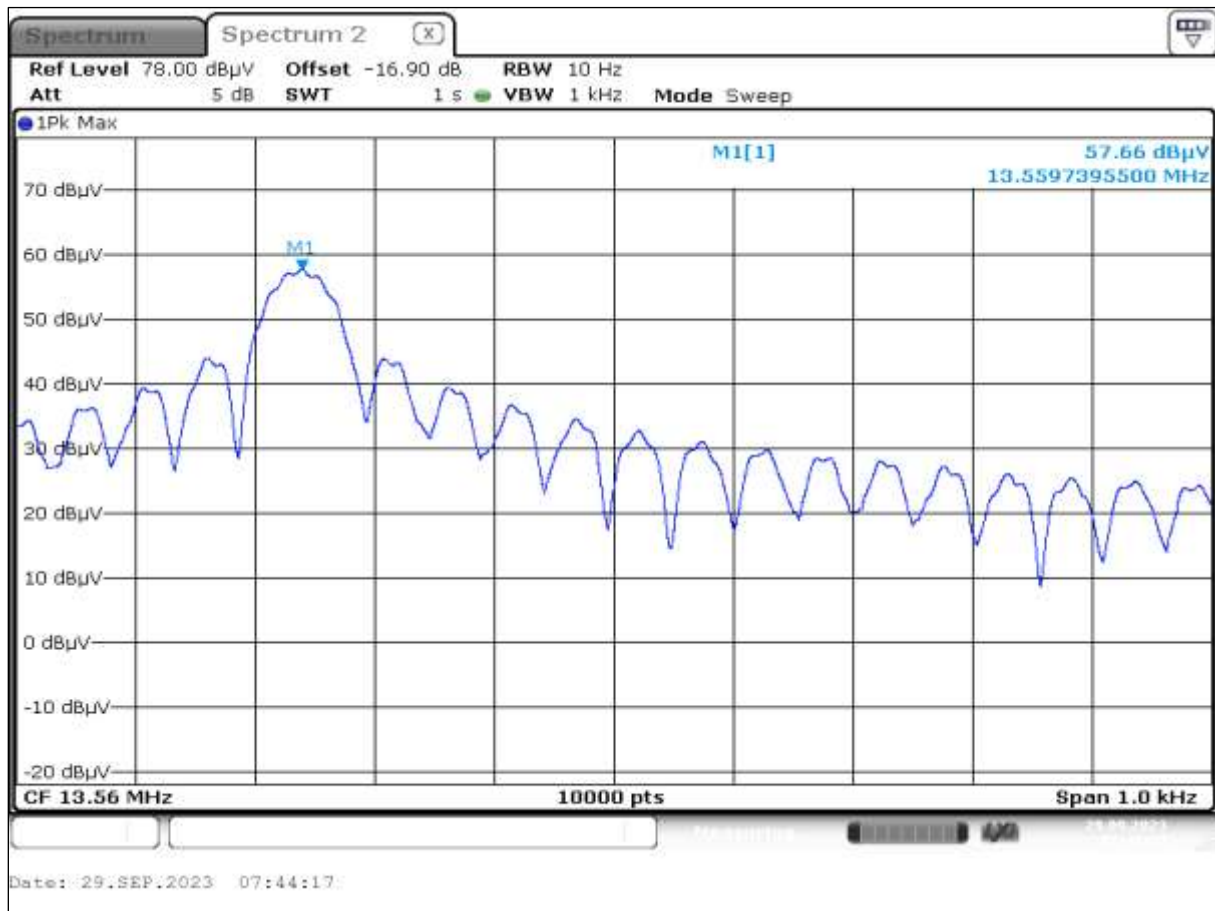
Frequency_30°C_13.5V



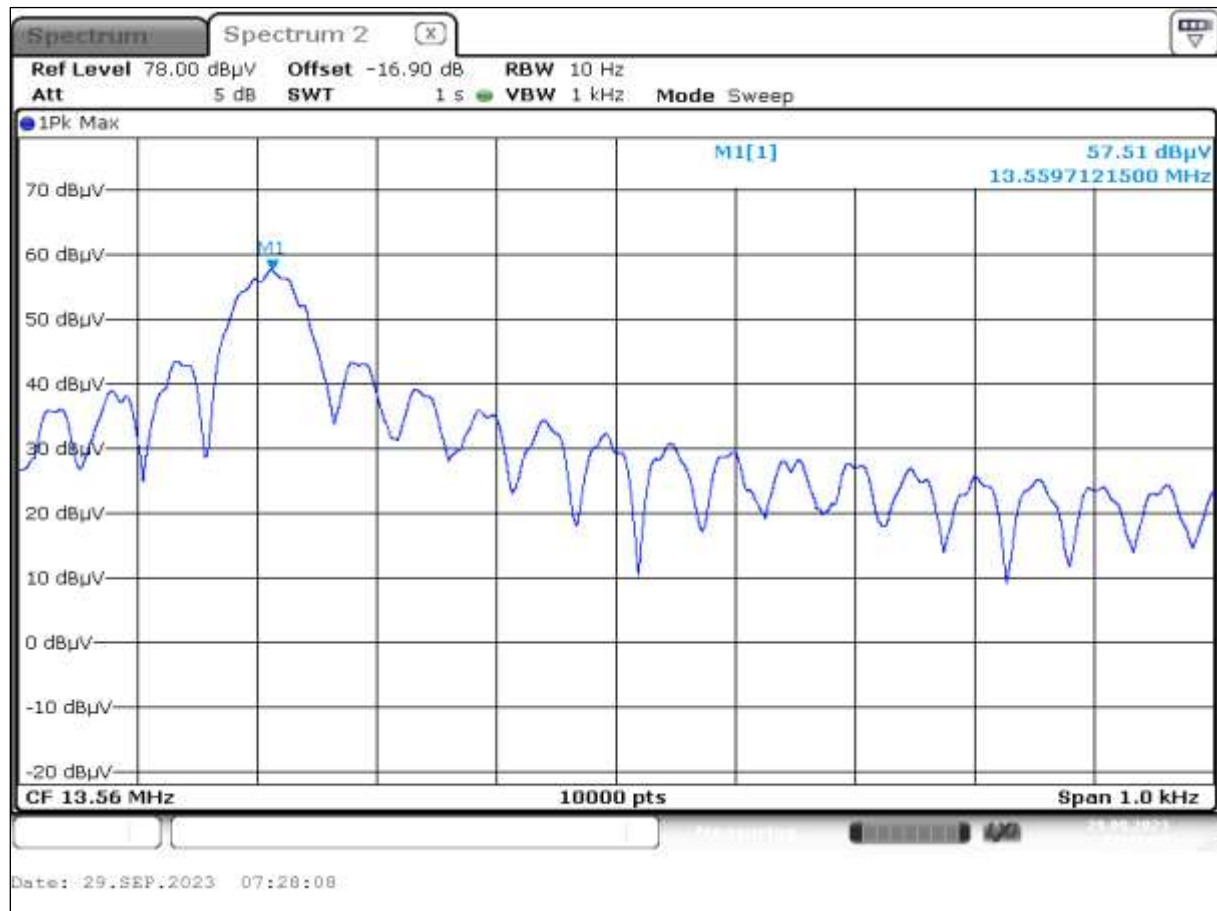
Frequency_40°C_13.5V



Frequency_50°C_13.5V



Frequency_60°C_13.5V



Frequency_70°C_13.5V



Frequency_80°C_13.5V

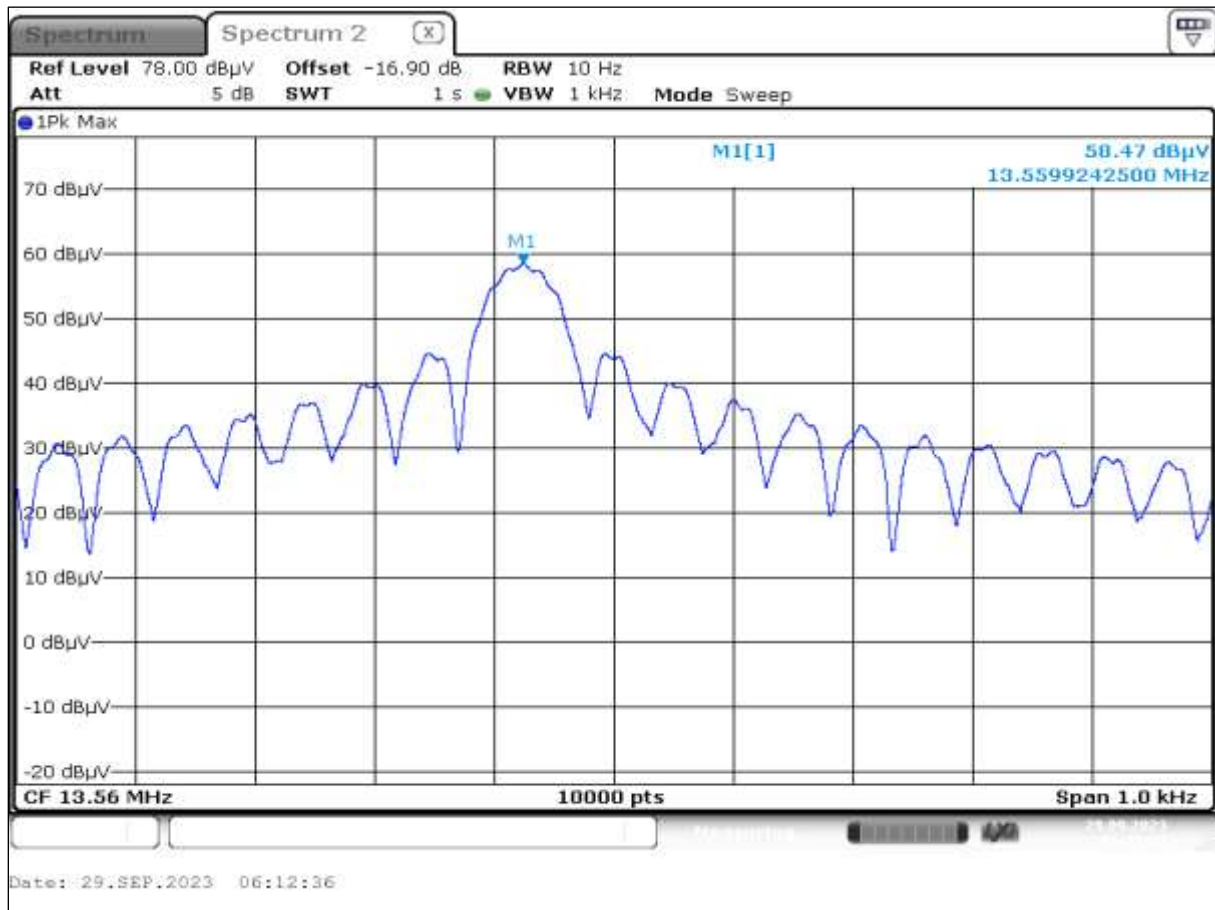


Frequency_85°C_13.5V



1.6 Frequency stability under voltage variations

Frequency_20°C_16V



Maximum voltage

Frequency_20°C_8V



Minimum voltage

End Of Annex 1