

Annex 1: Measurement diagrams 22-1-0097501T011a-A1

Number of pages:	82	Date of Report:	2023-Nov-22
Testing company:	cetecom advanced GmbH Untertuerkheimer Str. 6-10 66117 Saarbruecken GERMANY	Applicant:	Servus Intralogistics GmbH
Product:	Transport Robot		
Model:	Transport Robot Generation 5		
FCC ID:	2BANM-TRGEN5 Contains FCC ID: XF6-M7DB7	IC:	30441-TRGEN5 Contains IC ID: 8407A-M7DB7
Testing has been carried out in accordance with:	FCC Regulations Title 47 CFR, Chapter I, Subchapter A, Part 15, Subpart C §15.225 ISED Regulations RSS-Gen, Issue 5 + Amendment 2 RSS-210, Issue 10 Deviations, modifications or clarifications (if any) to above mentioned documents are written in each section under "Test method and limit".each section under "Test method and limit".		

1	Measurement diagrams.....	3
1.1	Emission field strength/spectrum mask §15.225(1)(b)(c)(d)	3
1.2	Radiated emissions in range 9kHz to 30MHz.....	5
1.3	Radiated emissions in range 30MHz to 1GHz.....	6
1.4	Occupied bandwidth	7
1.5	Frequency error: voltage variations	8
1.6	Frequency error: temperature variations.....	49
1.6.1	Nominal conditions – reference at 21degree	49
1.6.2	Extreme conditions / +75degree.....	50
1.6.3	Extreme conditions / +70degree.....	54
1.6.4	Extreme conditions / +60degree.....	58
1.6.5	Extreme conditions / +50degree.....	62
1.6.6	Extreme conditions / +40degree.....	66
1.6.7	Extreme conditions / +30degree.....	70
1.6.8	Extreme conditions / +10degree.....	74
1.6.9	Extreme conditions / 0degree.....	78

1 Measurement diagrams

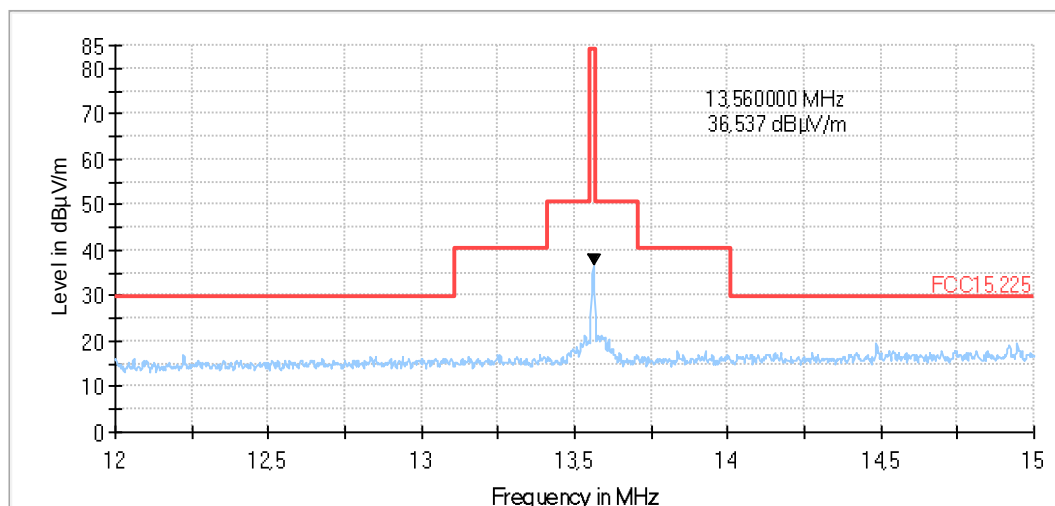
1.1 Emission field strength/spectrum mask §15.225(1)(b)(c)(d)

2.01a_Mask_NFC_ant_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:	TFra
Operating Mode:	Single Subcarrier Modulated 100%
Environmental Conditions:	Humidity : 45%rH; Temperature: 20°C
EUT Setup:	1
Verdict:	Passed

Full Spectrum

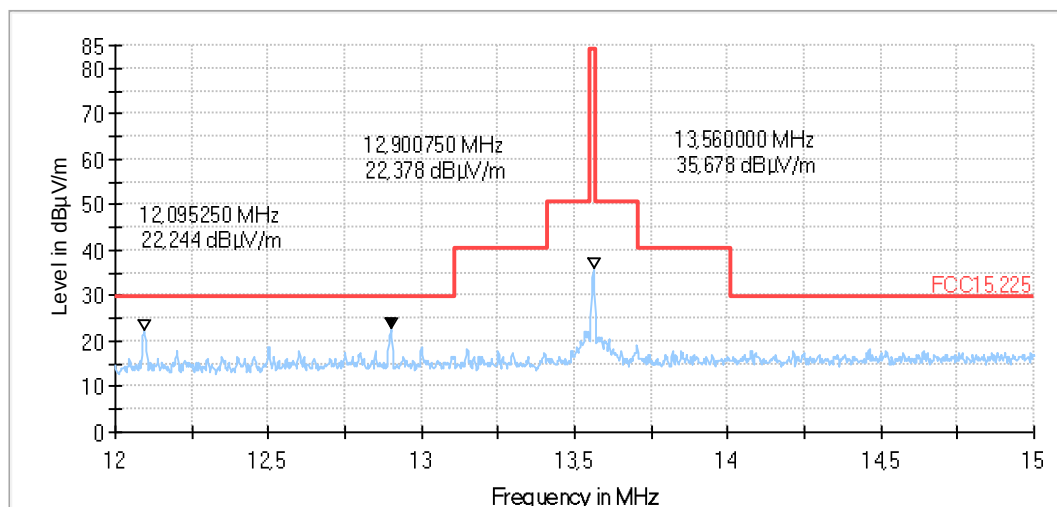


2.01b_Mask_NFC_ant_lying

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:	TFra
Operating Mode:	Single Subcarrier Modulated 100%
Environmental Conditions:	Humidity : 45%rH; Temperature: 20°C
EUT Setup:	1
Verdict:	Passed

Full Spectrum



1.2 Radiated emissions in range 9kHz to 30MHz

2.02_RSE_NFC

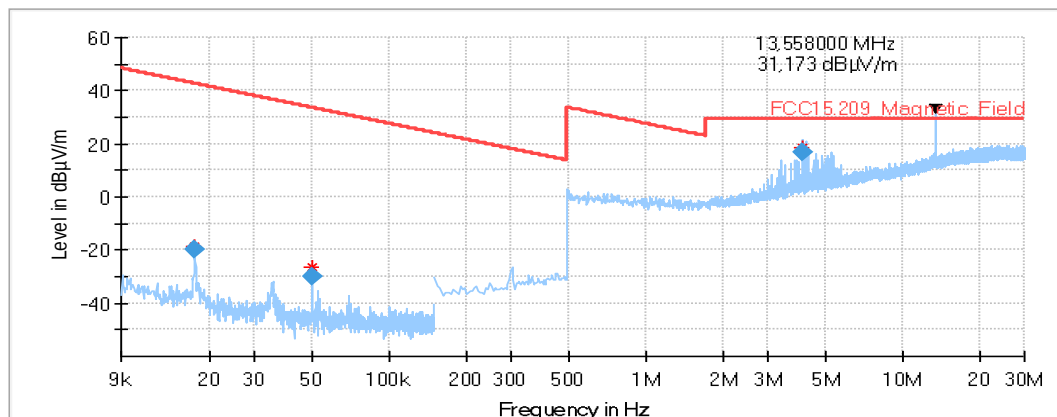
Common Information

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:	TFra
Operating Mode:	Single Subcarrier Modulated 100%
Environmental Conditions:	Humidity : 45%rH; Temperature: 20°C
EUT Setup:	1
Verdict:	Passed

EUT Information

PMT number:	xxx
Power supply:	Battery

Full Spectrum



Remark: Wanted NFC-carrier at 13.558MHz on diagram, not relevant for result

Final_Result

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Pol	Azimuth (deg)	Corr. (dB/m)	Comment
0.017400	-19.96	42.79	62.74	0.200	V	288.0	-59.2	12:06:34 - 24.04.2023
0.050040	-30.01	33.61	63.62	0.200	H	155.0	-60.2	12:01:57 - 24.04.2023
4.098000	16.89	29.54	12.65	9.000	H	113.0	-12.4	11:58:12 - 24.04.2023

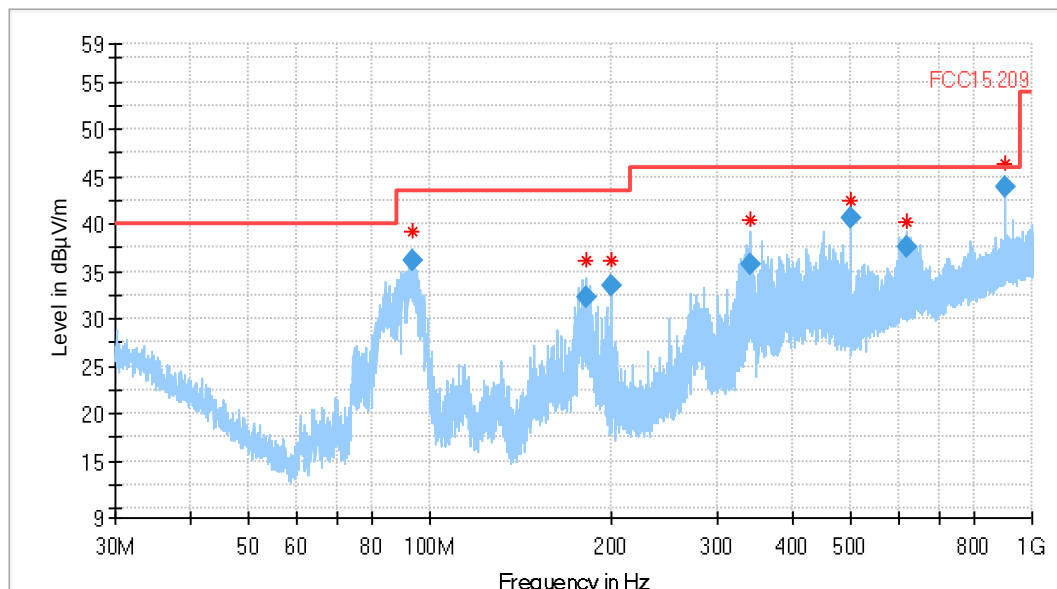
1.3 Radiated emissions in range 30MHz to 1GHz

3.01_RSE_NFC

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

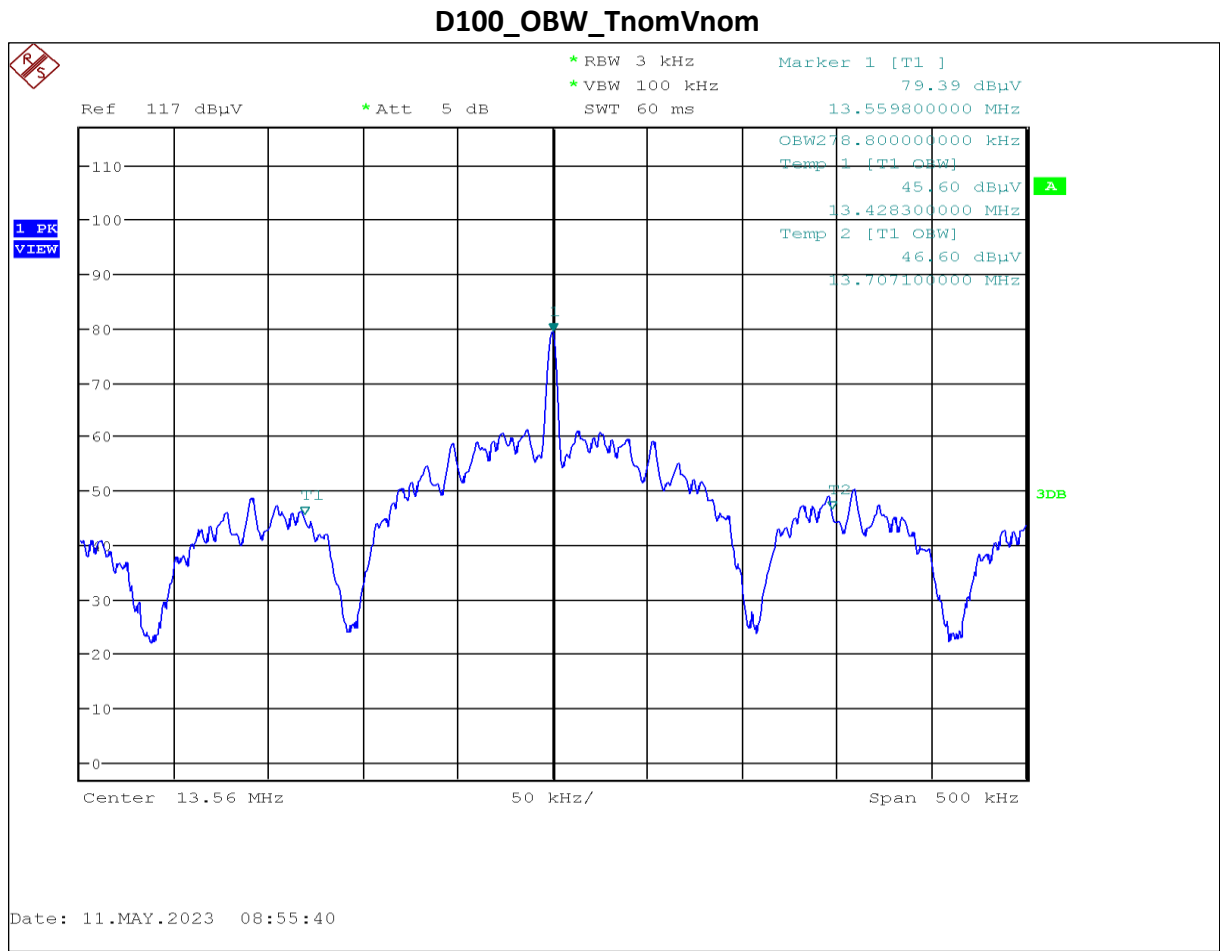
Environmental Conditions: Humidity: 37%rH; Temperature: 21.2°C
 Operator Name: TFra
 Set-up: 1
 Operating Mode: Single Subcarrier Modulated 100%
 Verdict: Passed



Final_Result

Frequency (MHz)	QuasiPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Trd Corr. (dB/m)	Raw Rec (dBμV)
93.630000	36.08	43.50	7.42	120.000	347.0	H	208.0	6.9	28.2
181.990000	32.34	43.50	11.16	120.000	179.0	H	94.0	9.3	21.8
199.990000	33.49	43.50	10.01	120.000	147.0	H	96.0	9.7	22.5
339.330000	35.76	46.00	10.24	120.000	104.0	H	89.0	14.8	19.1
499.990000	40.64	46.00	5.36	120.000	112.0	V	114.0	17.3	21.0
619.530000	37.53	46.00	8.47	120.000	105.0	V	111.0	19.9	15.0
899.990000	43.89	46.00	2.11	120.000	118.0	V	79.0	23.8	16.6

1.4 Occupied bandwidth

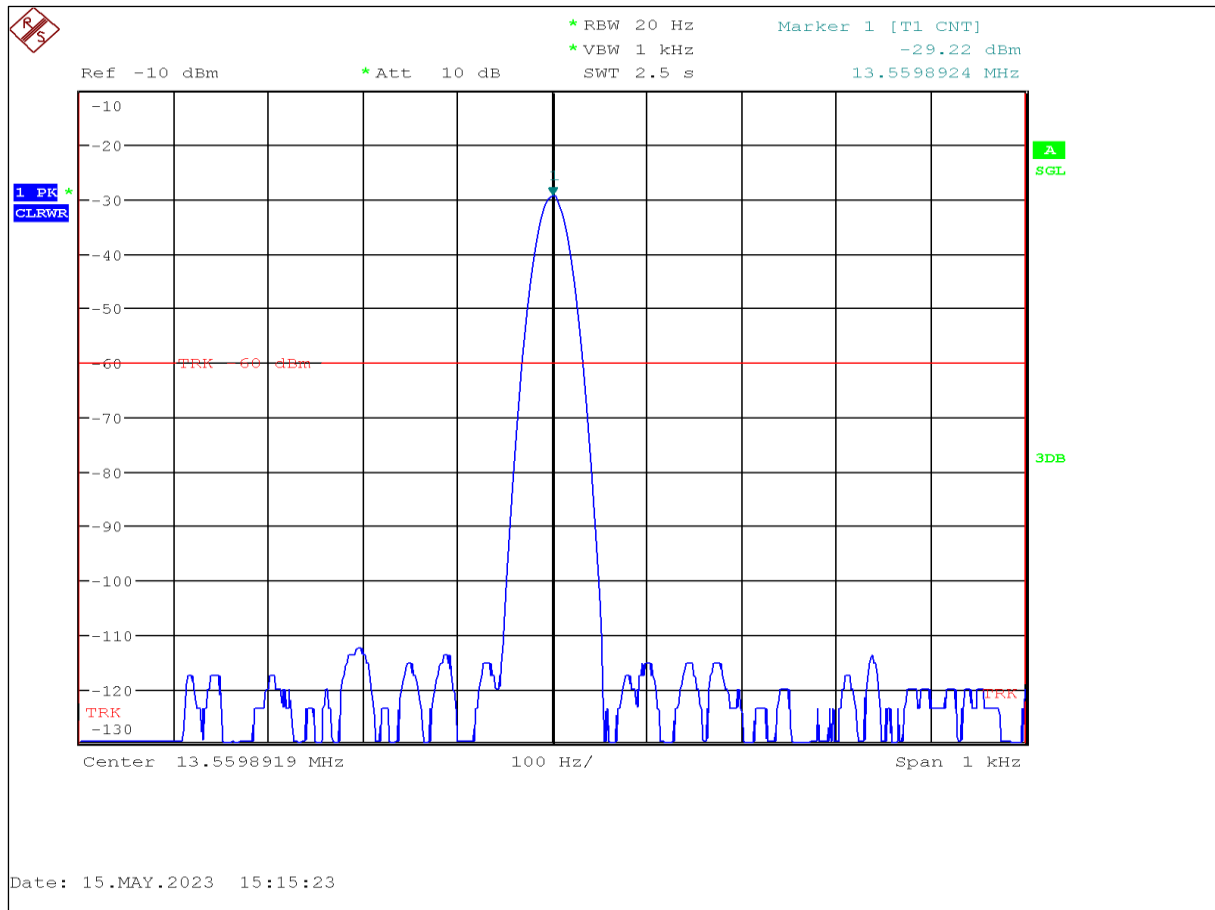


Measured OBW: 278.8MHz

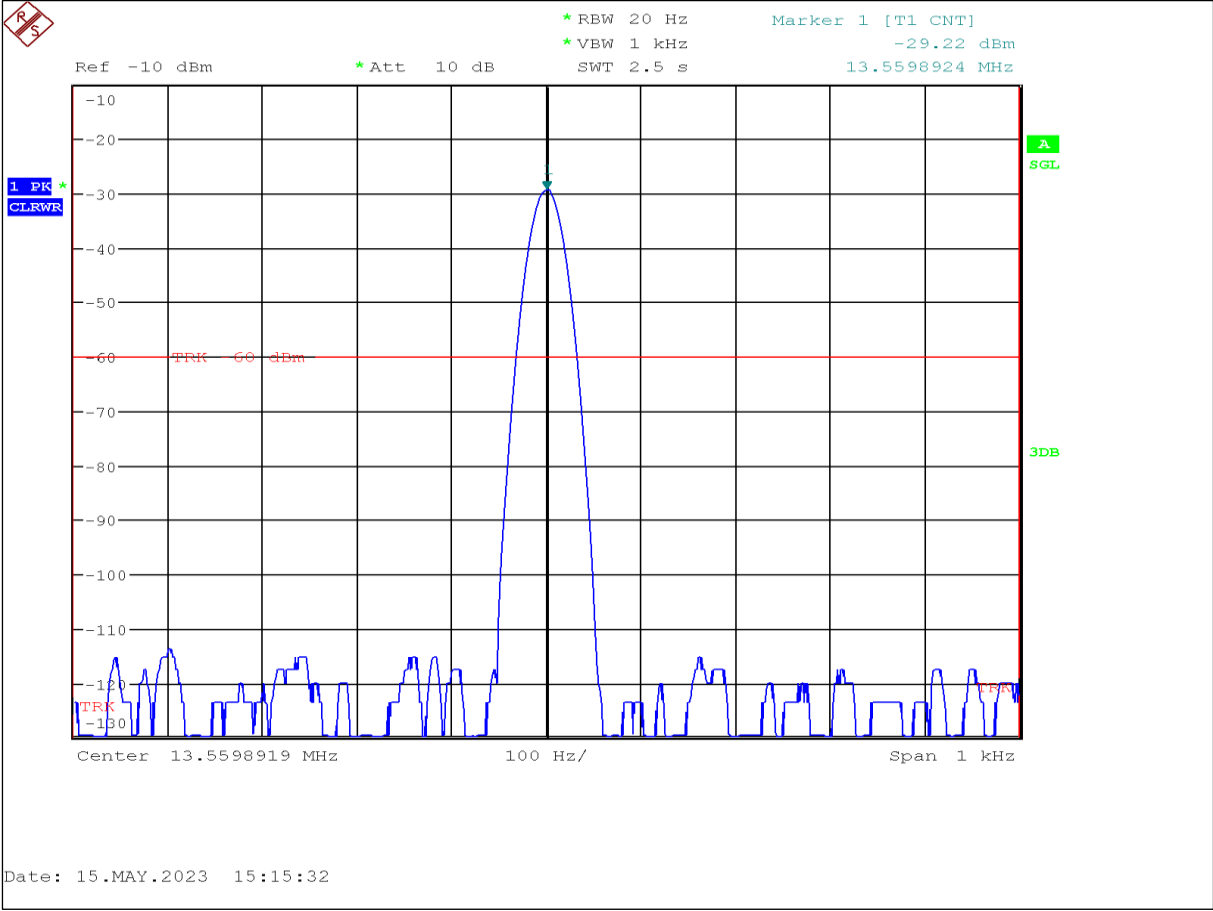
1.5 Frequency error: voltage variations

Following diagrams shows frequency error measurements in range of 22V to 26V.

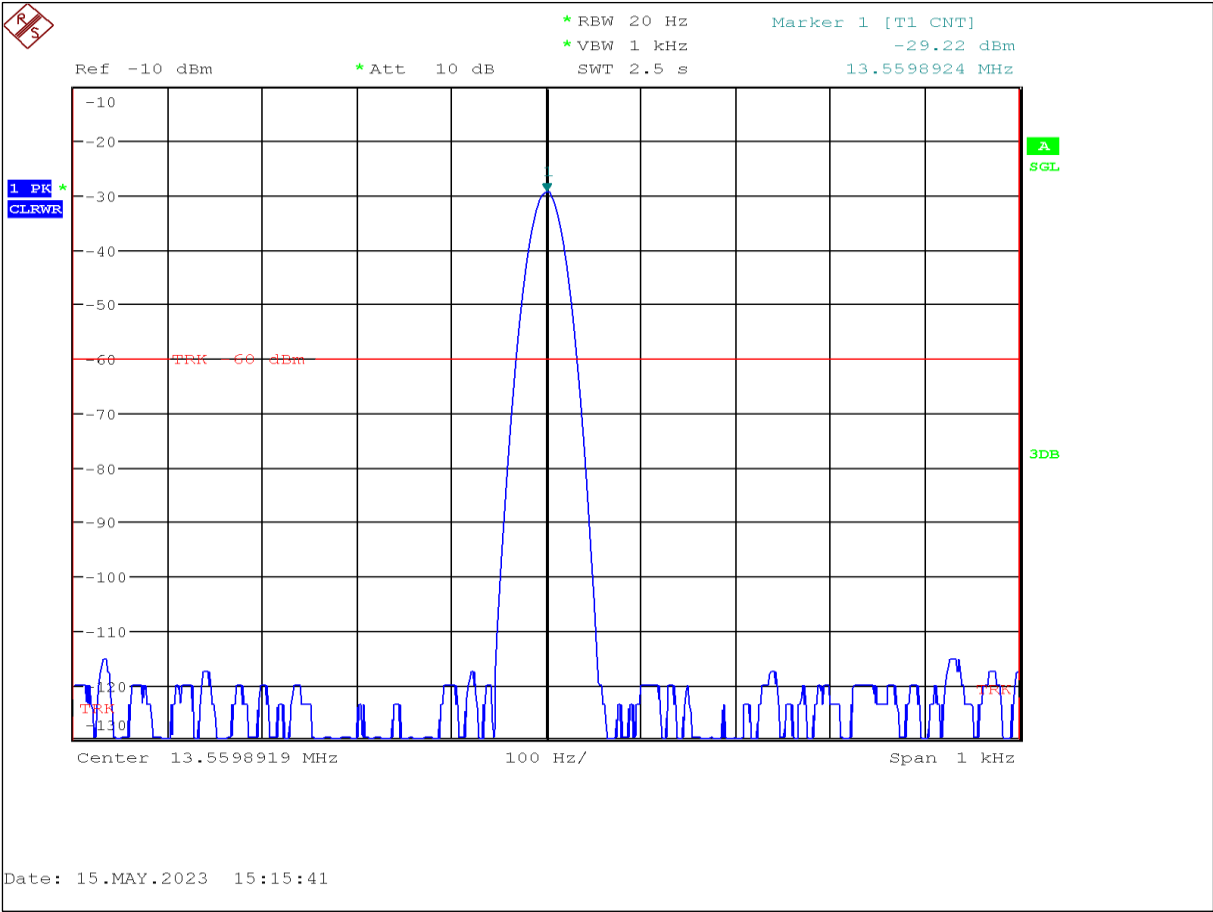
FreqError_Tnom__22.0021



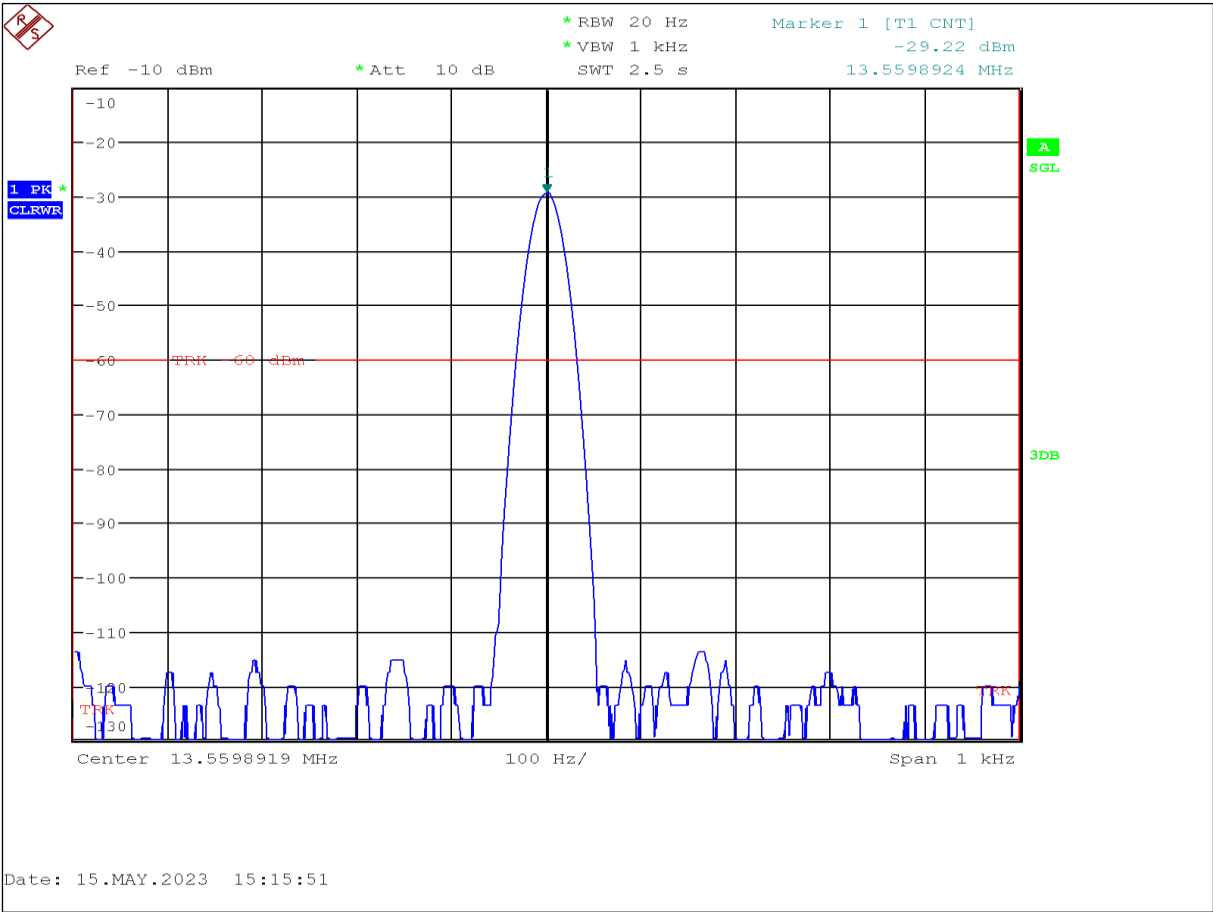
FreqError_Tnom__22.1080



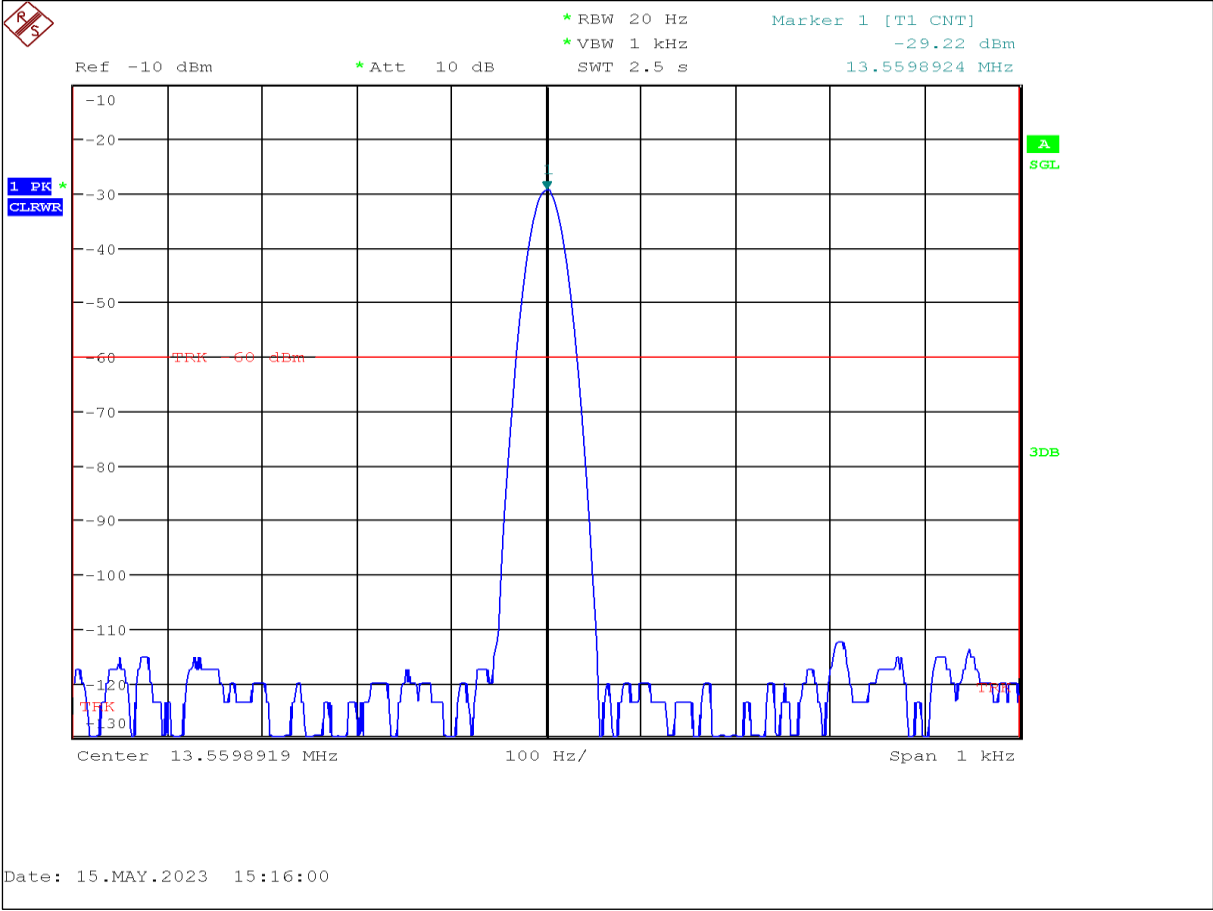
FreqError_Tnom__22.204



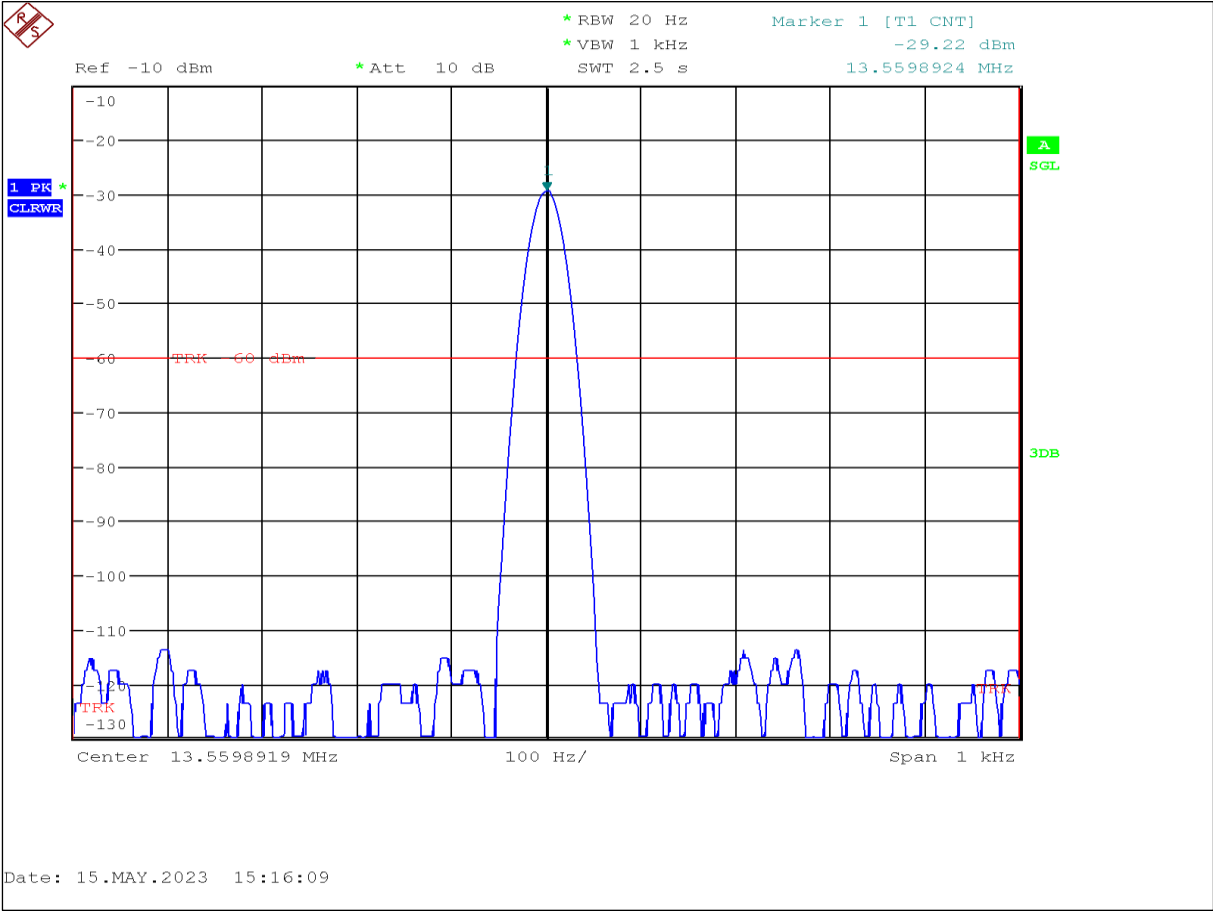
FreqError_Tnom__22.3028



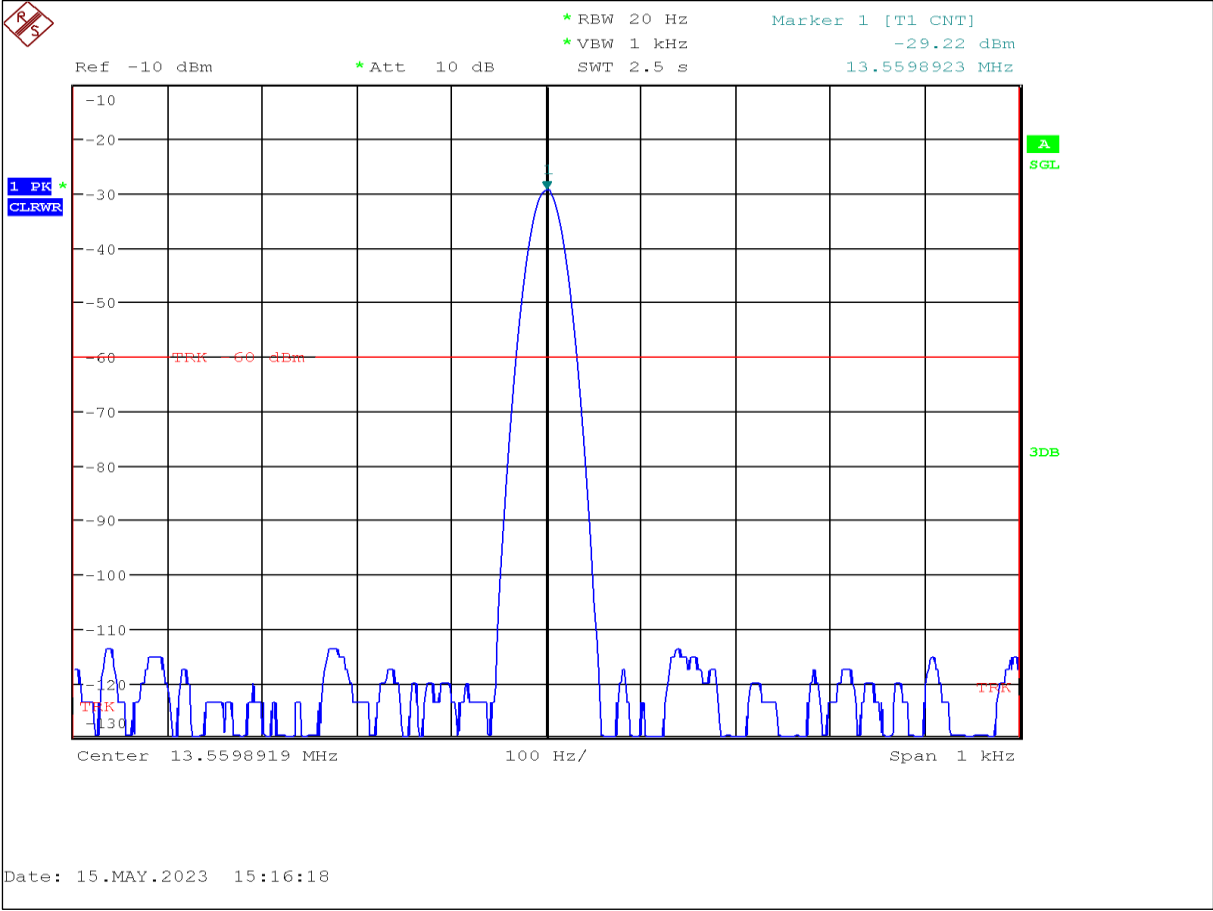
FreqError_Tnom__22.4021



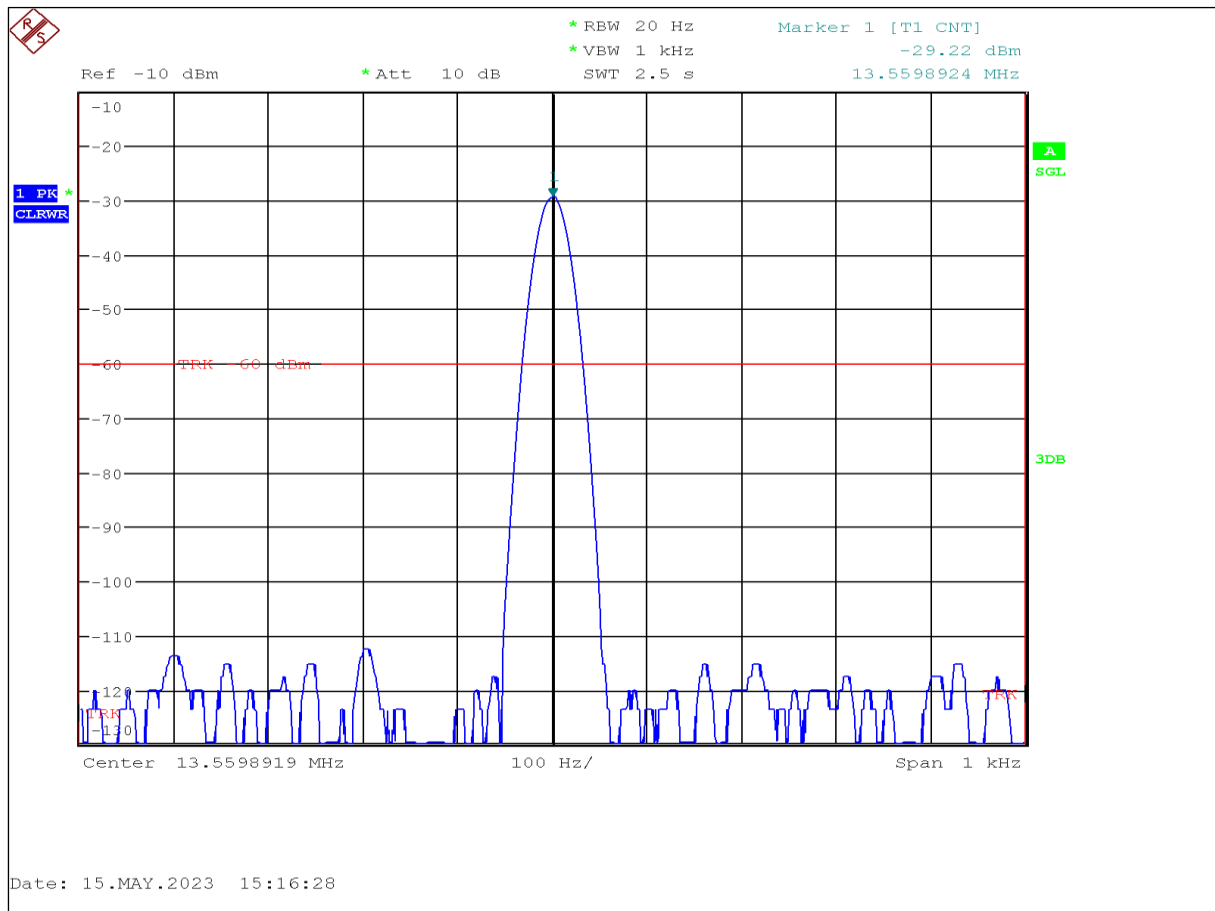
FreqError_Tnom__22.5097



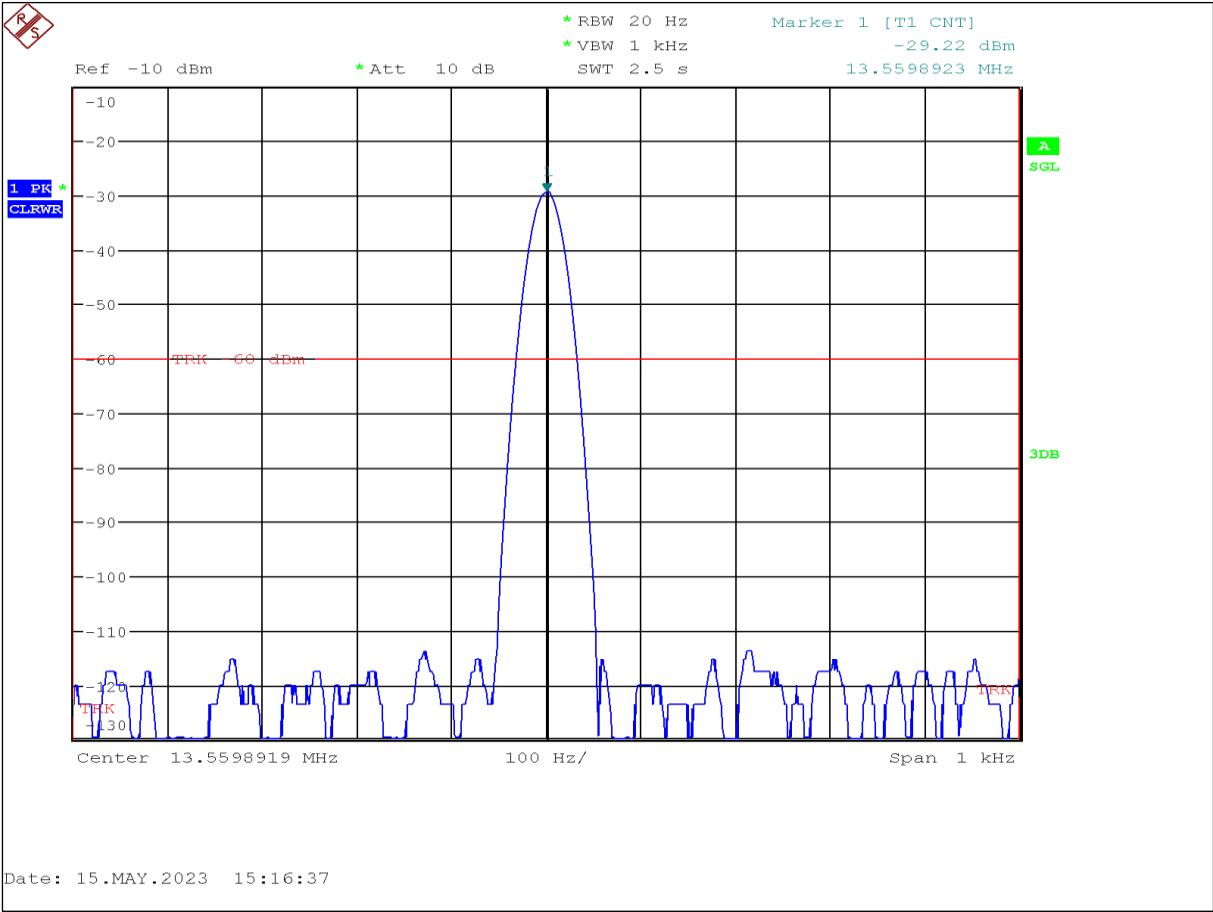
FreqError_Tnom__22.6070



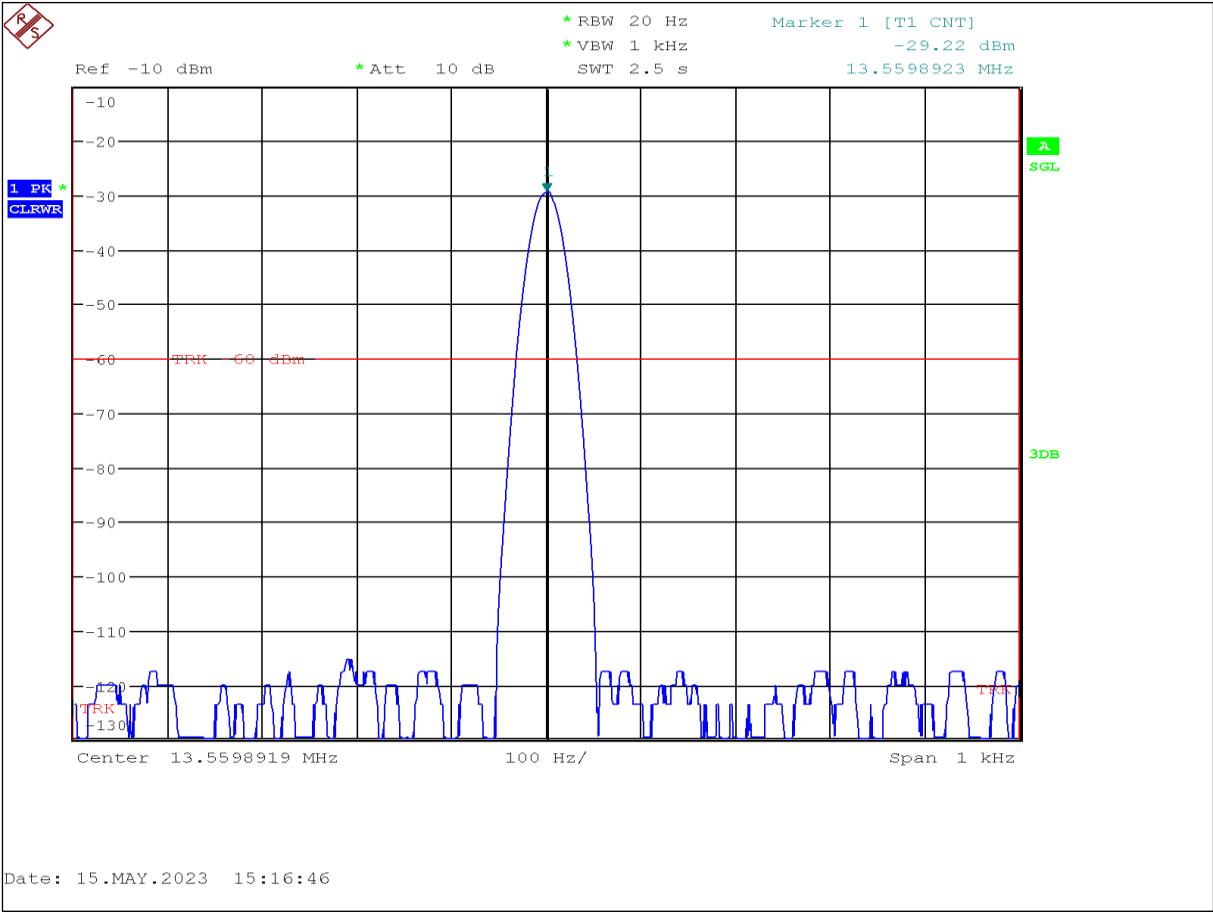
FreqError_Tnom__22.7031



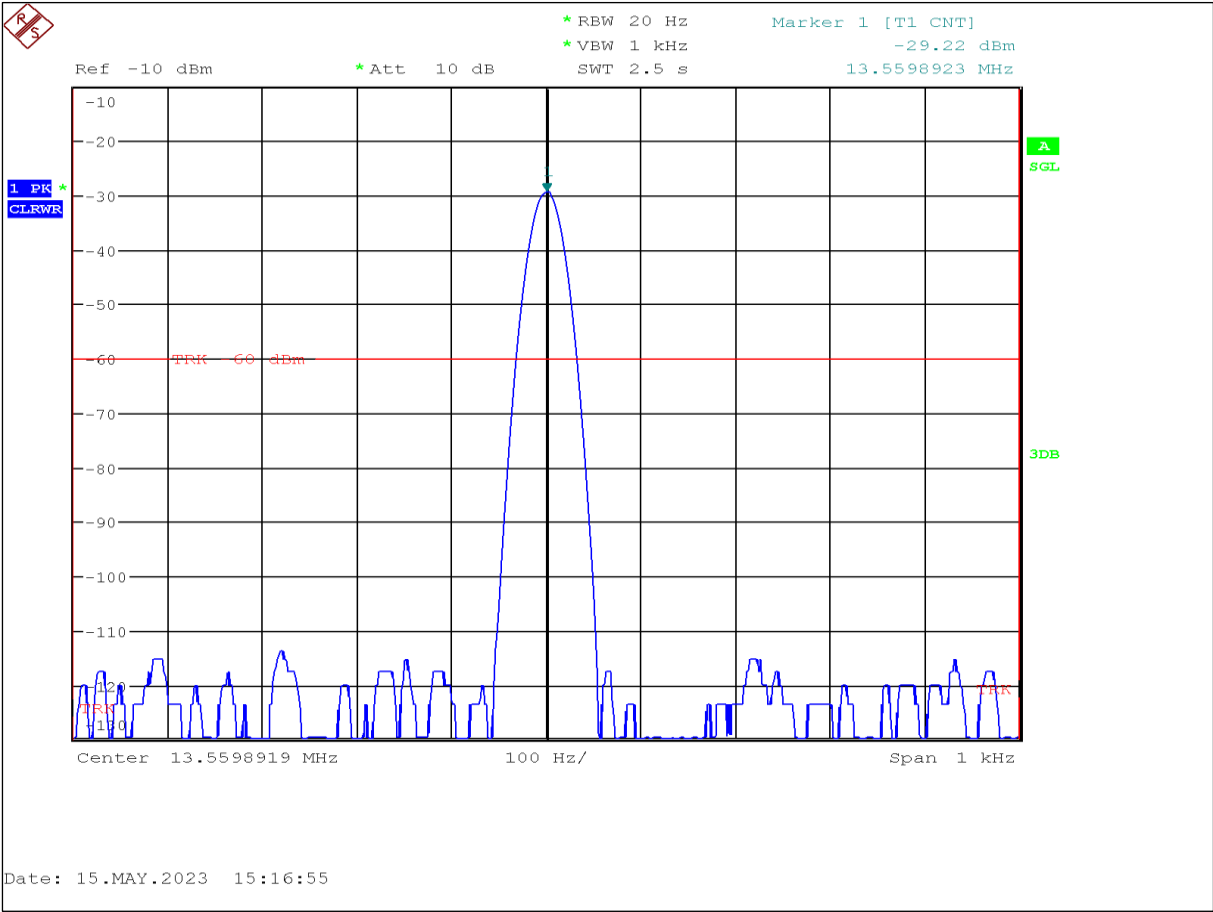
FreqError_Tnom__22.8025



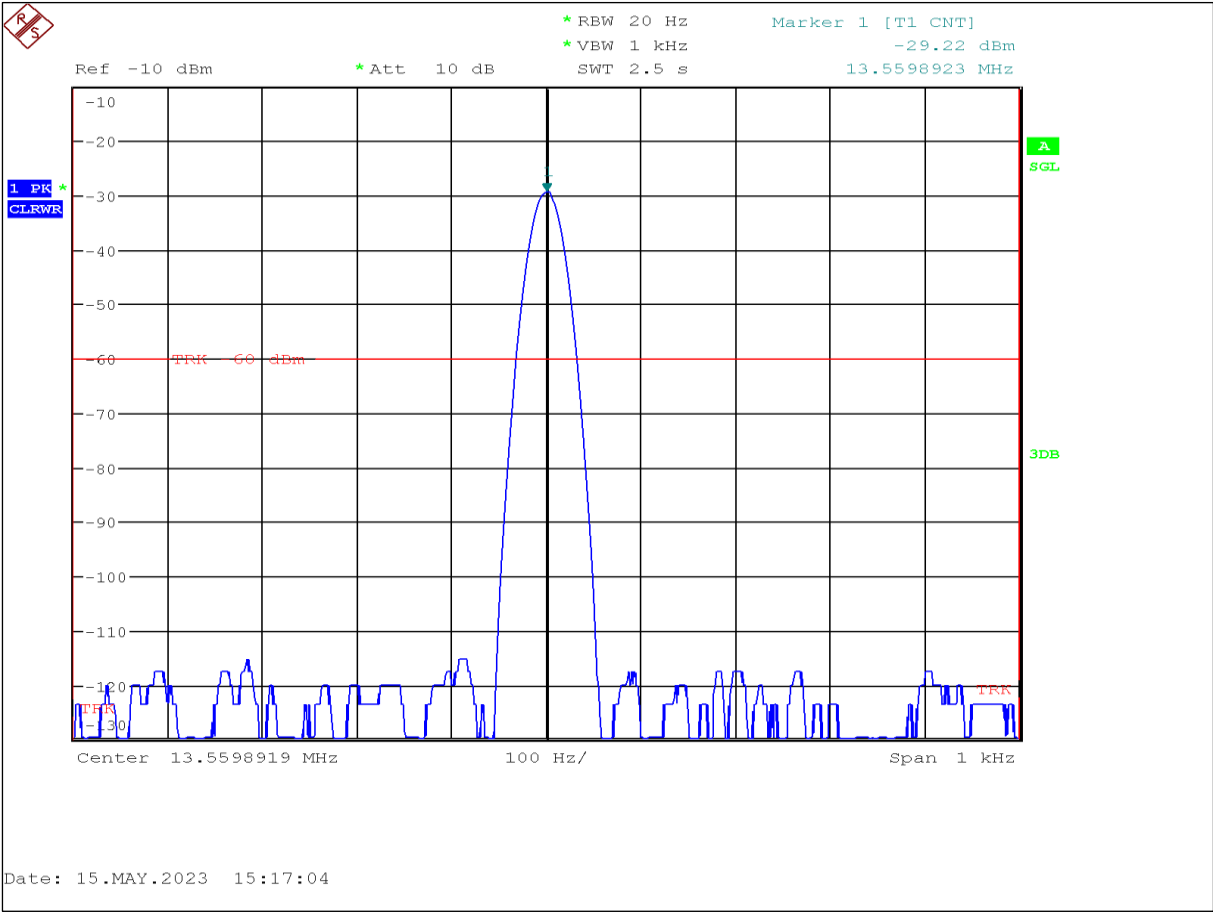
FreqError_Tnom__22.9089



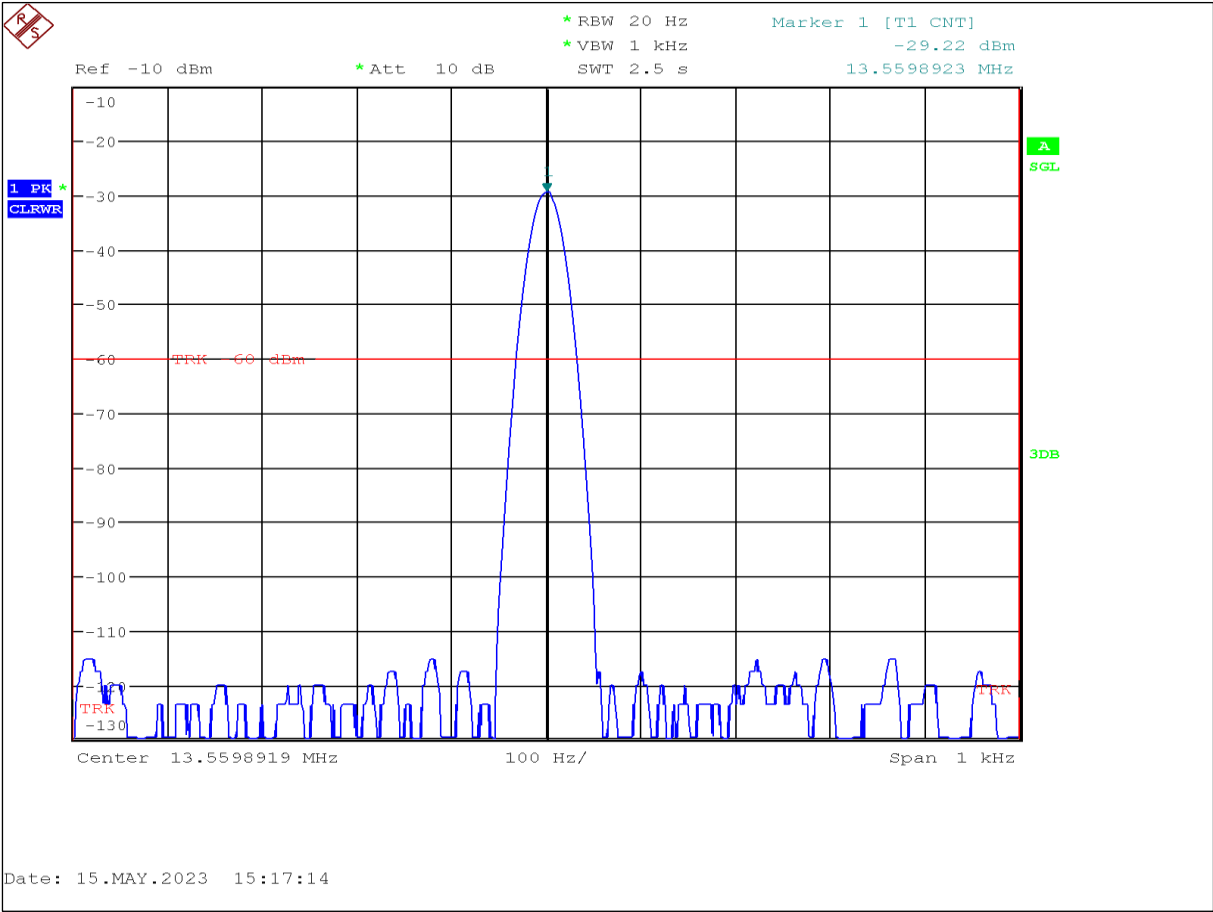
FreqError_Tnom__23.0083



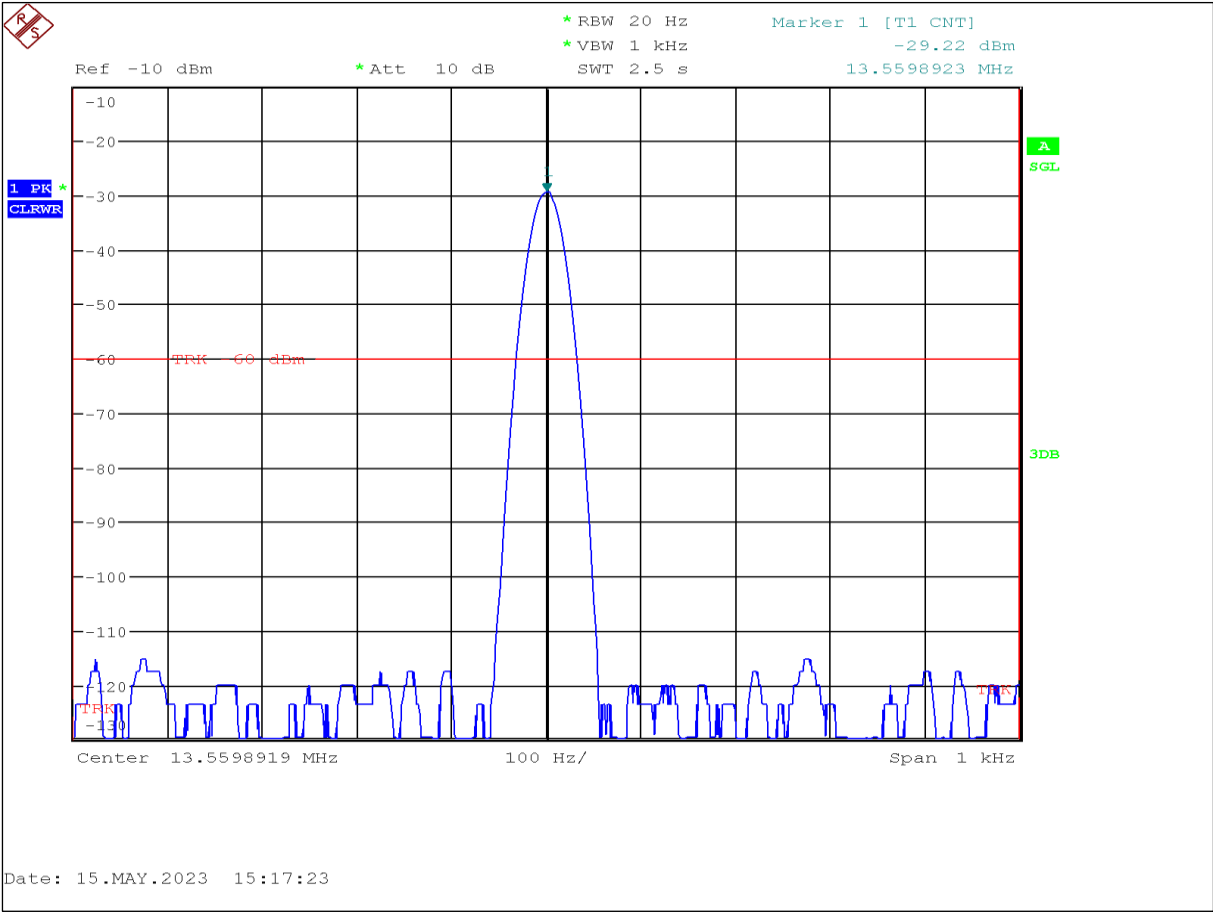
FreqError_Tnom__23.1068



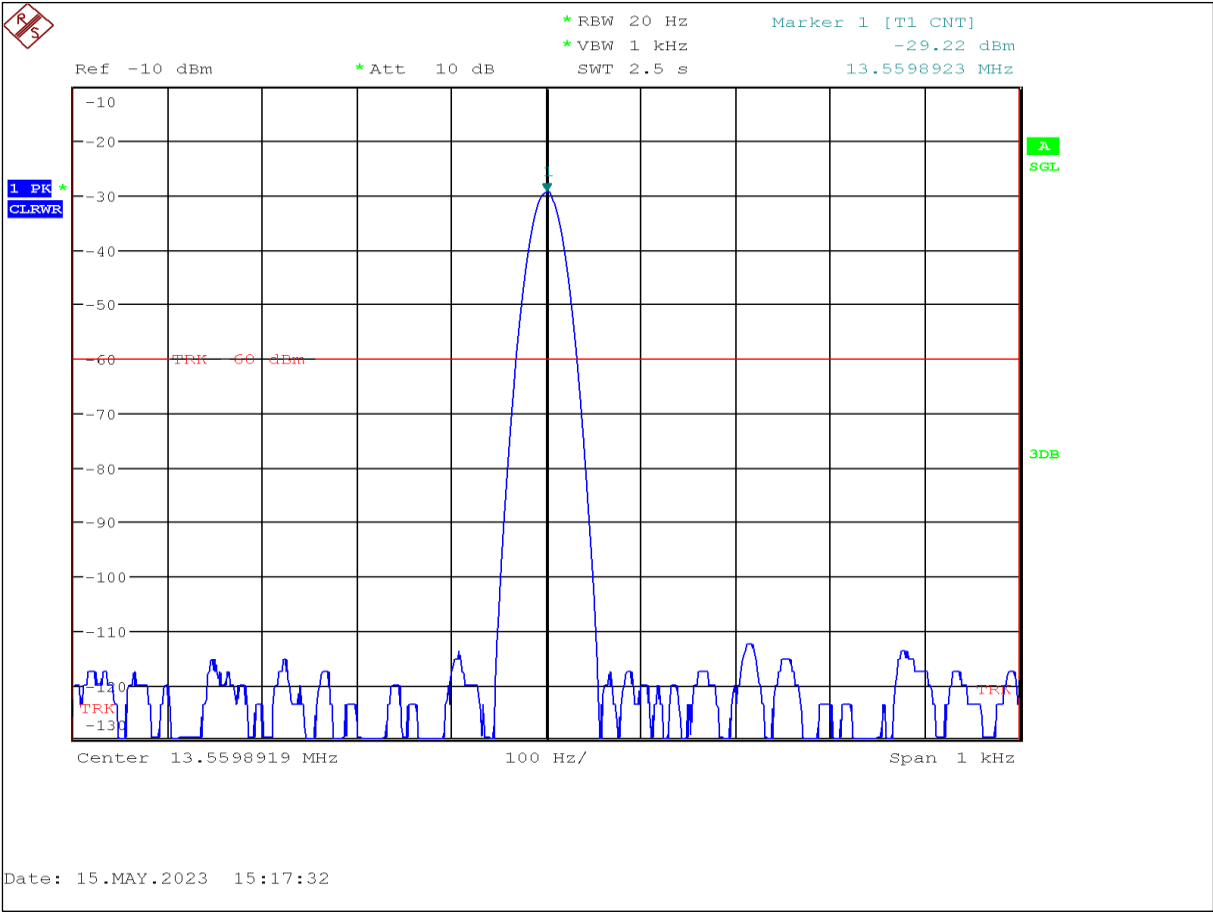
FreqError_Tnom__23.2019



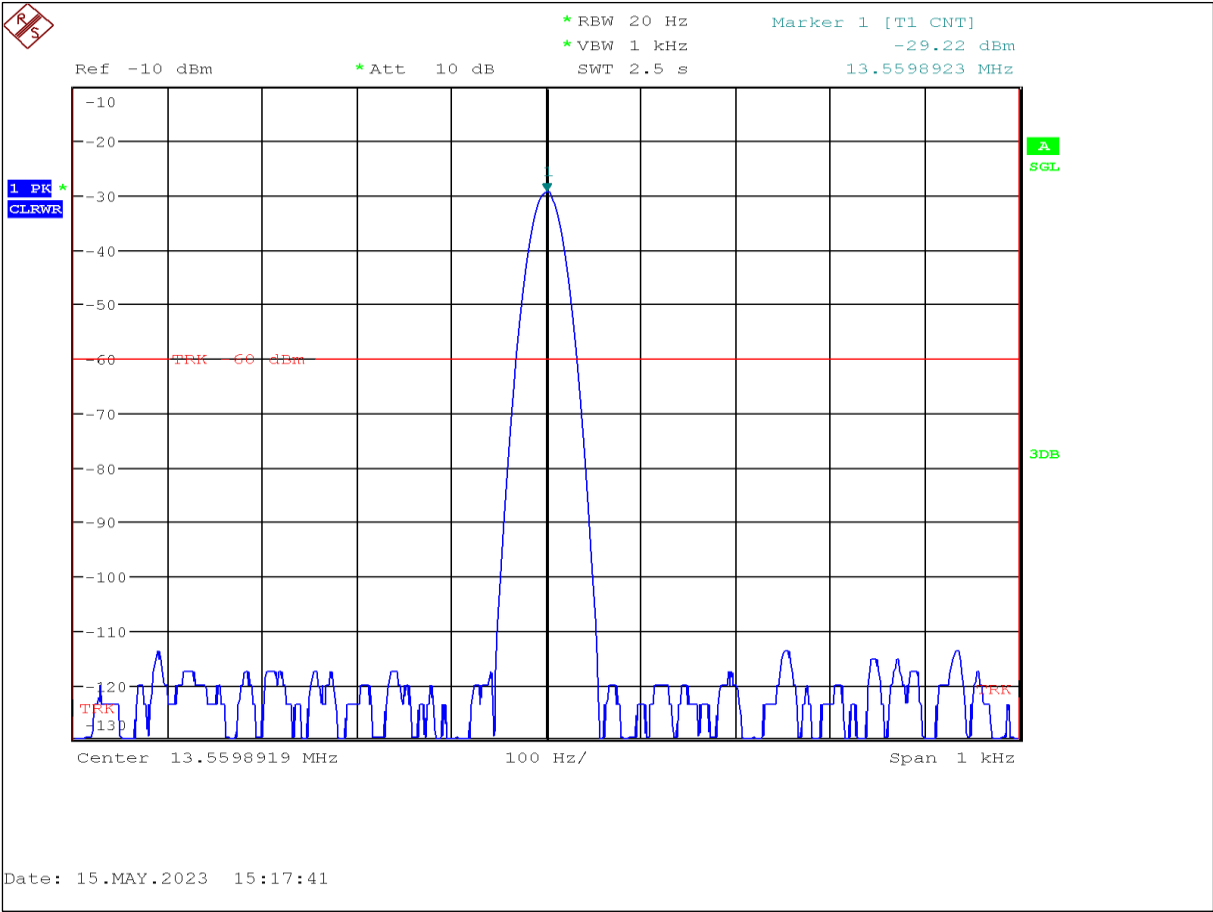
FreqError_Tnom__23.306



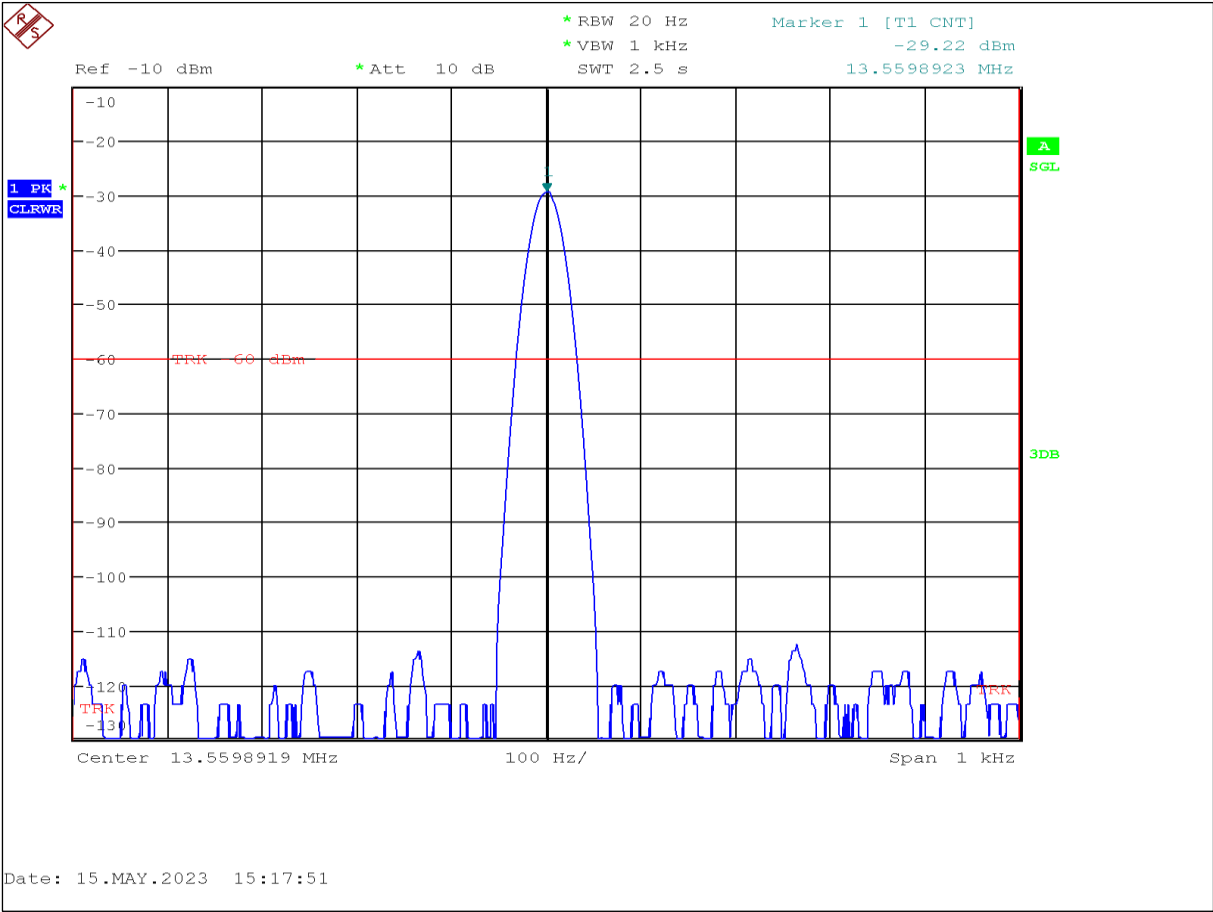
FreqError_Tnom__23.4025



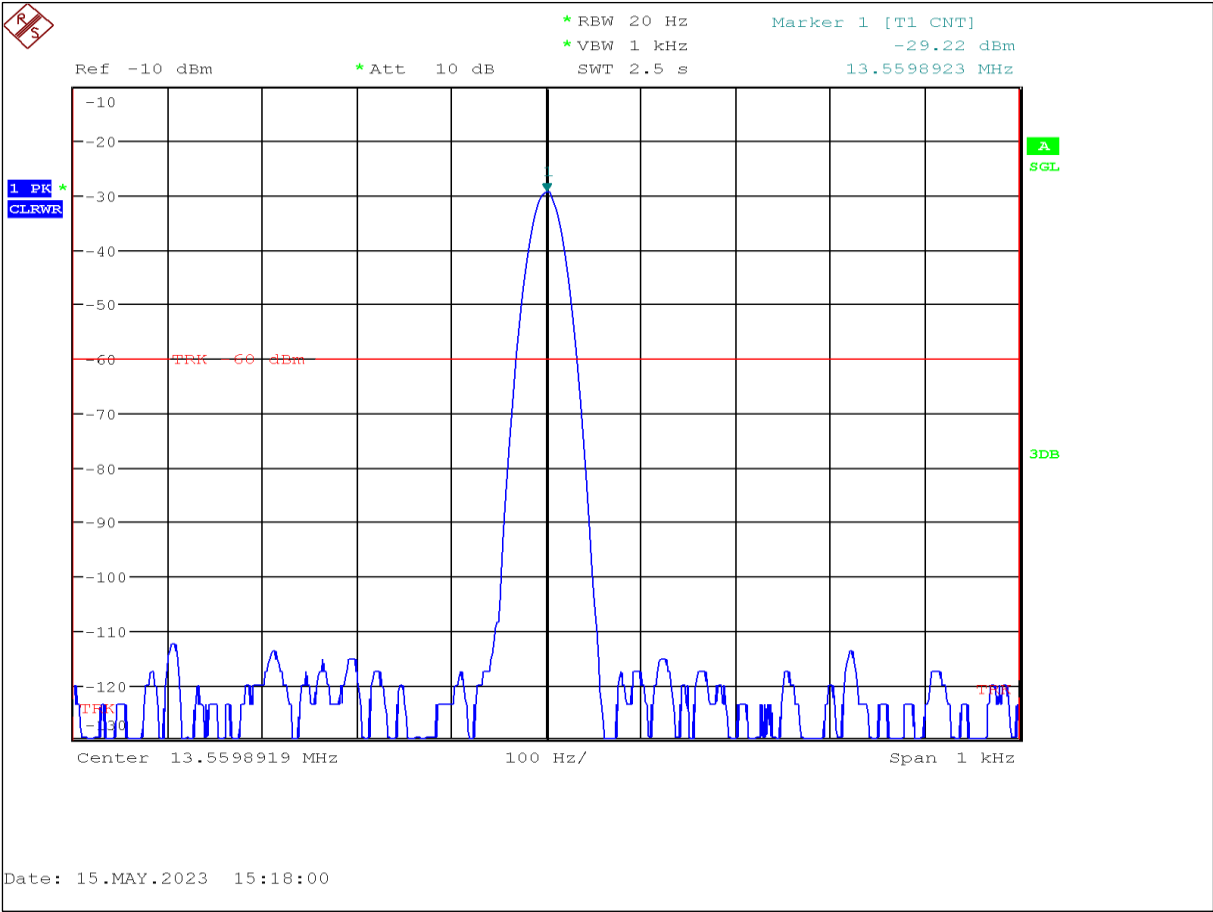
FreqError_Tnom__23.5028



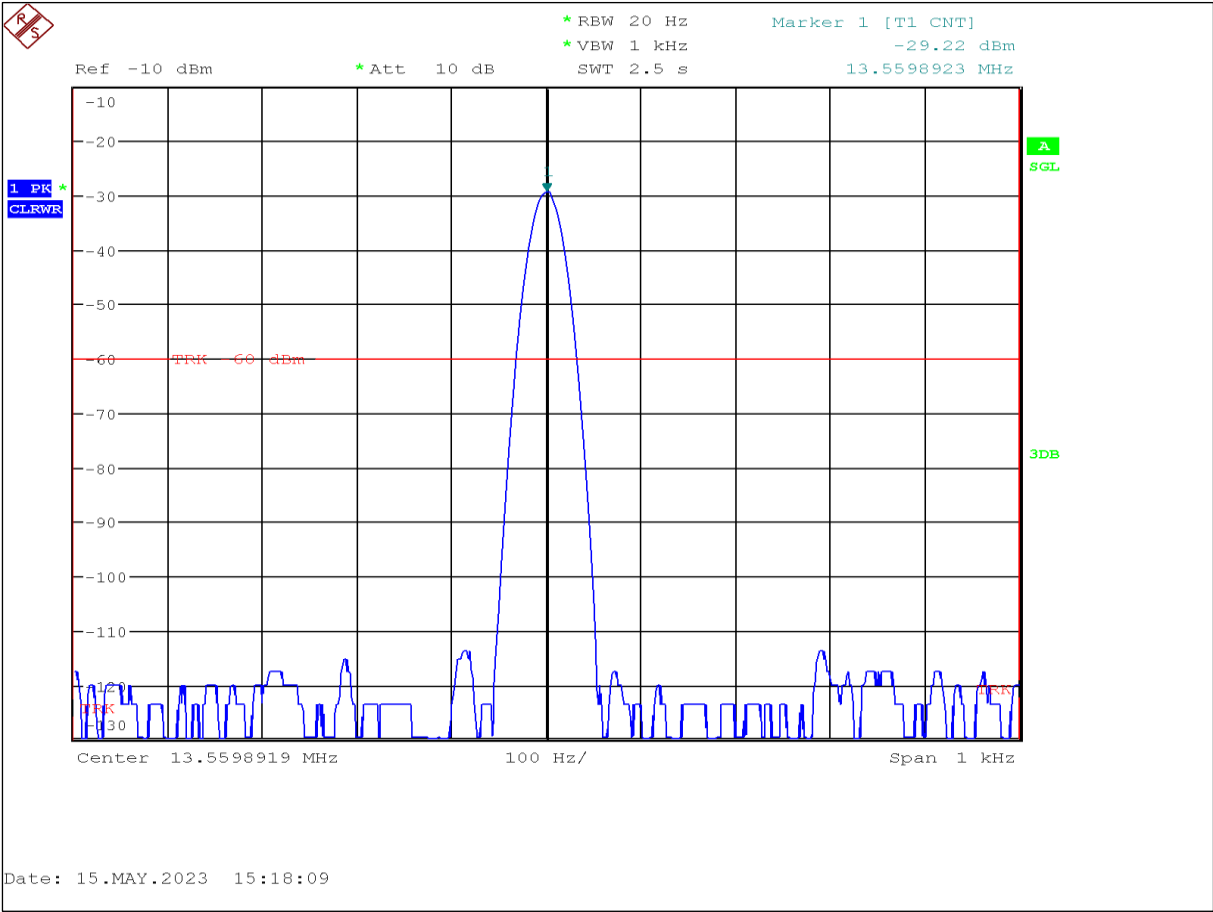
FreqError_Tnom__23.6059



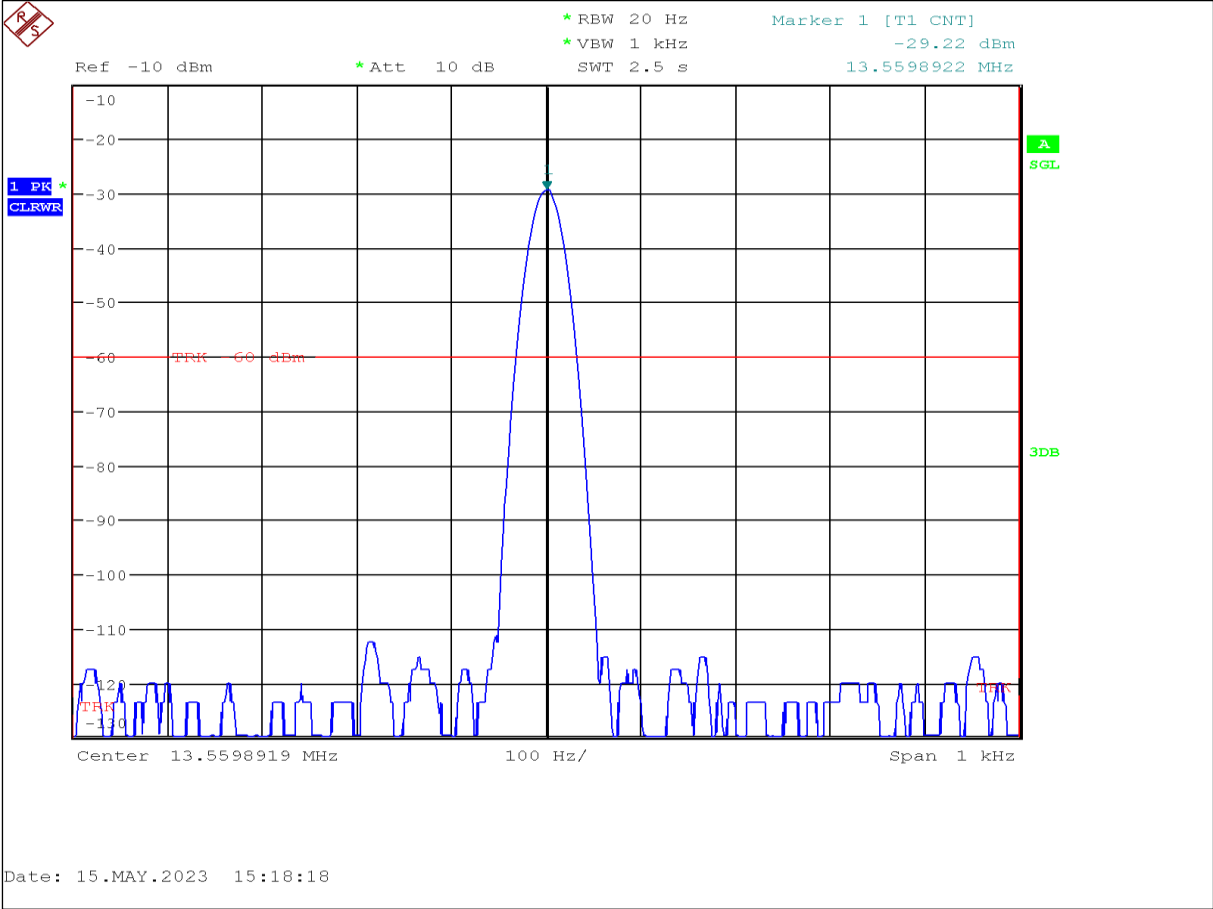
FreqError_Tnom__23.7072



FreqError_Tnom__23.8070

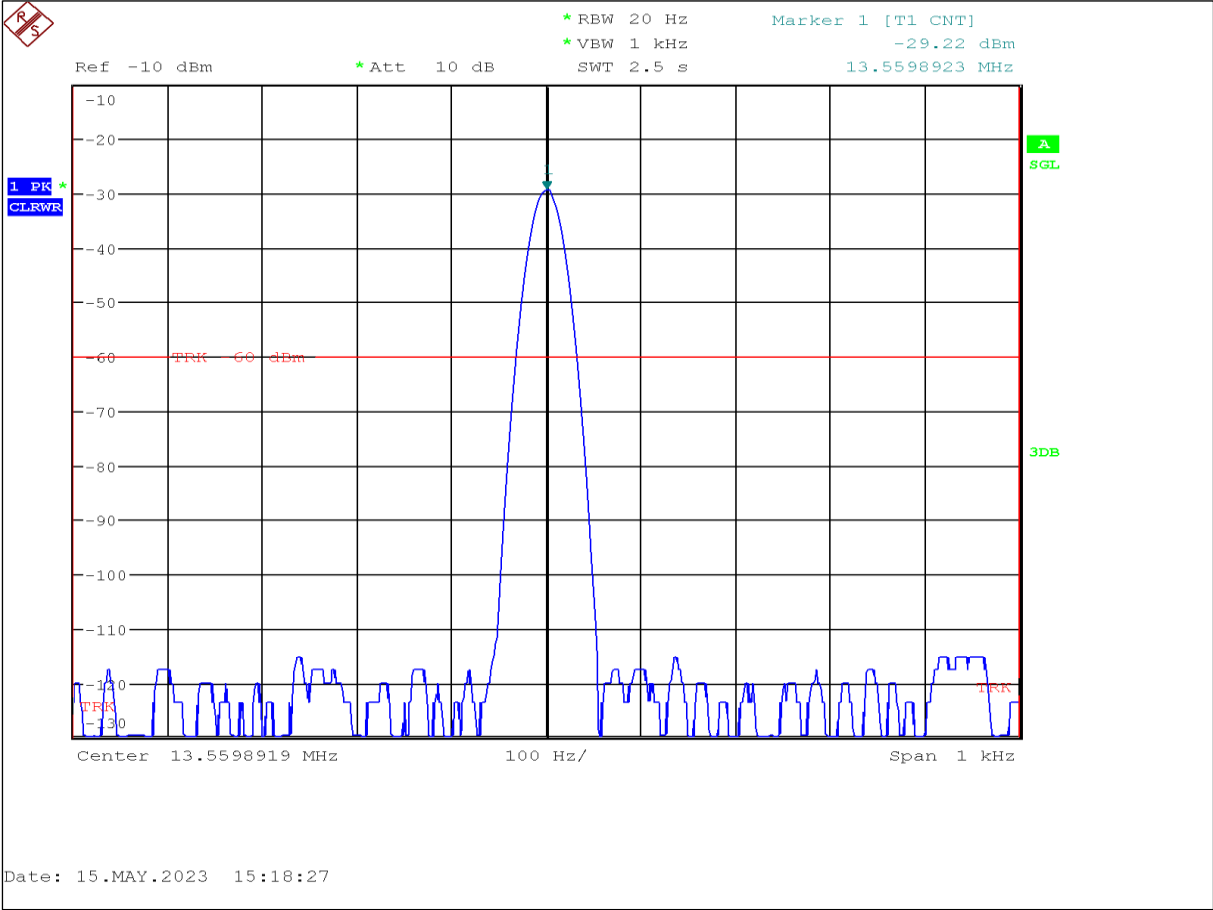


FreqError_Tnom__23.9084

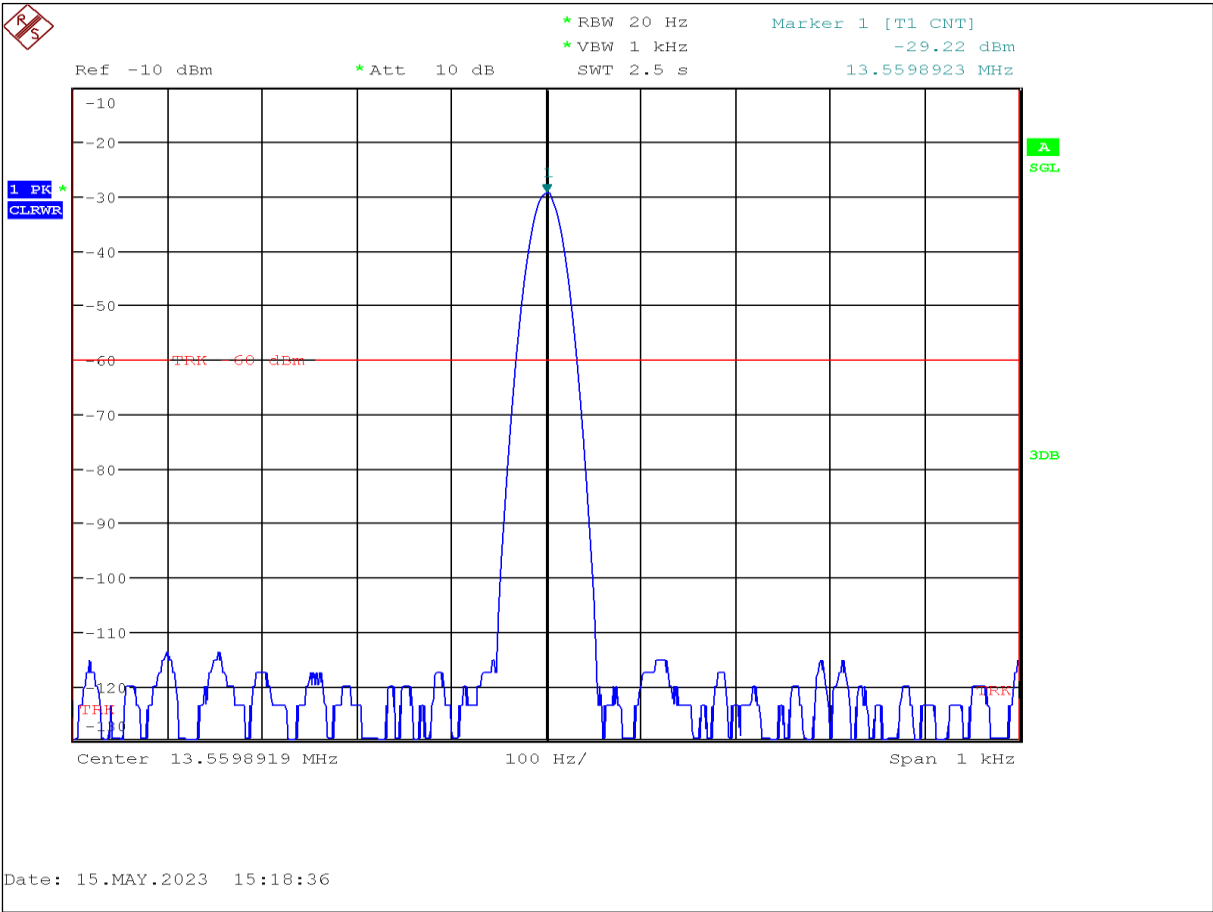


FreqError_Tnom__24.0043

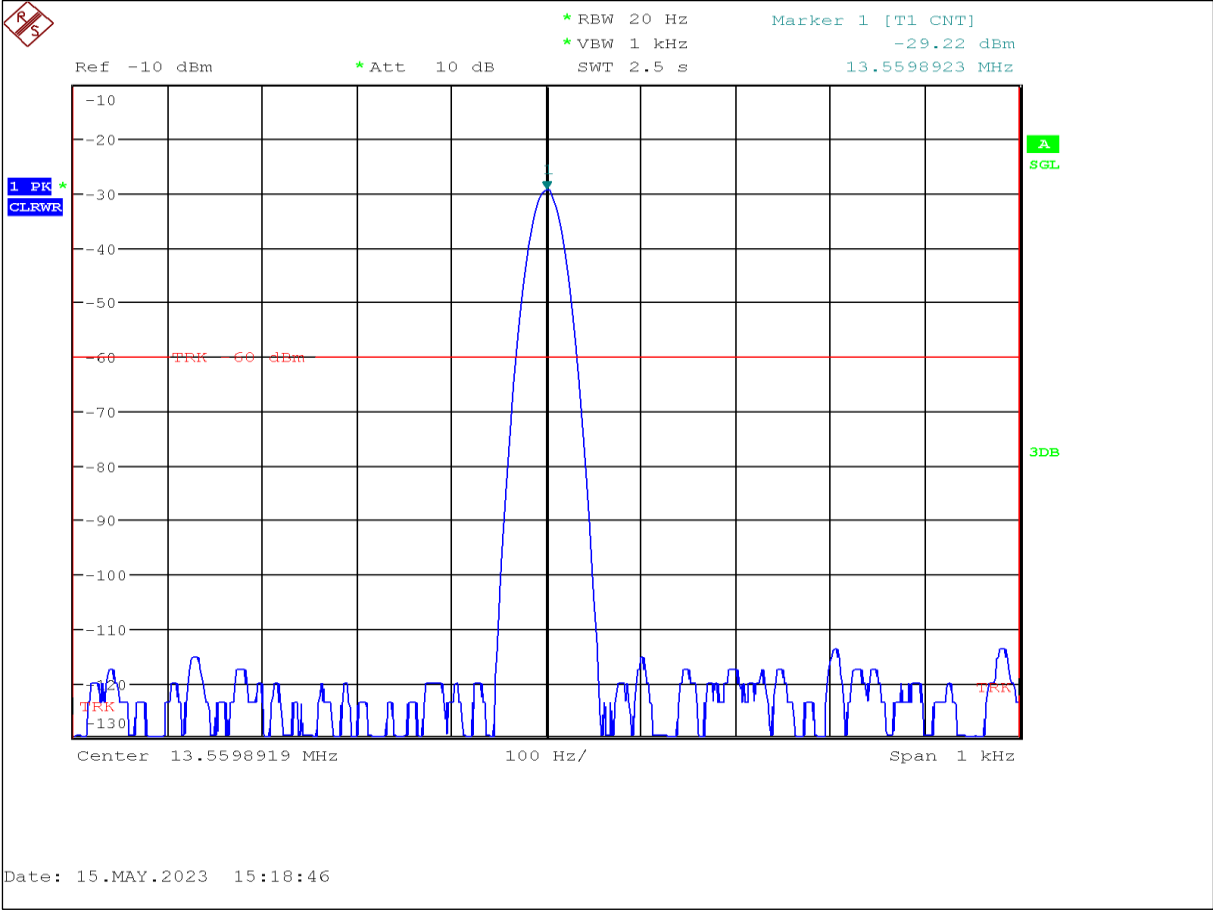
Reference voltage for voltage variations



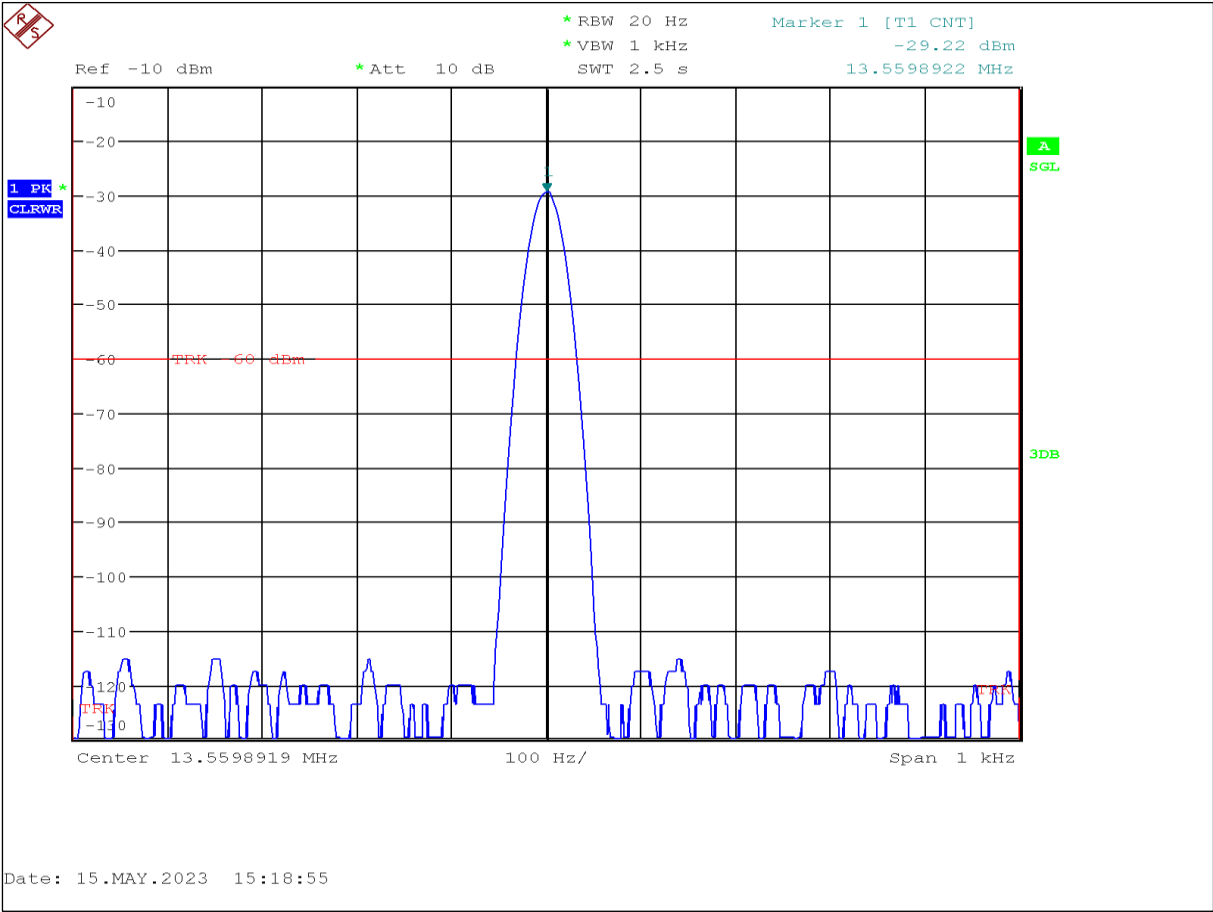
FreqError_Tnom__24.1078



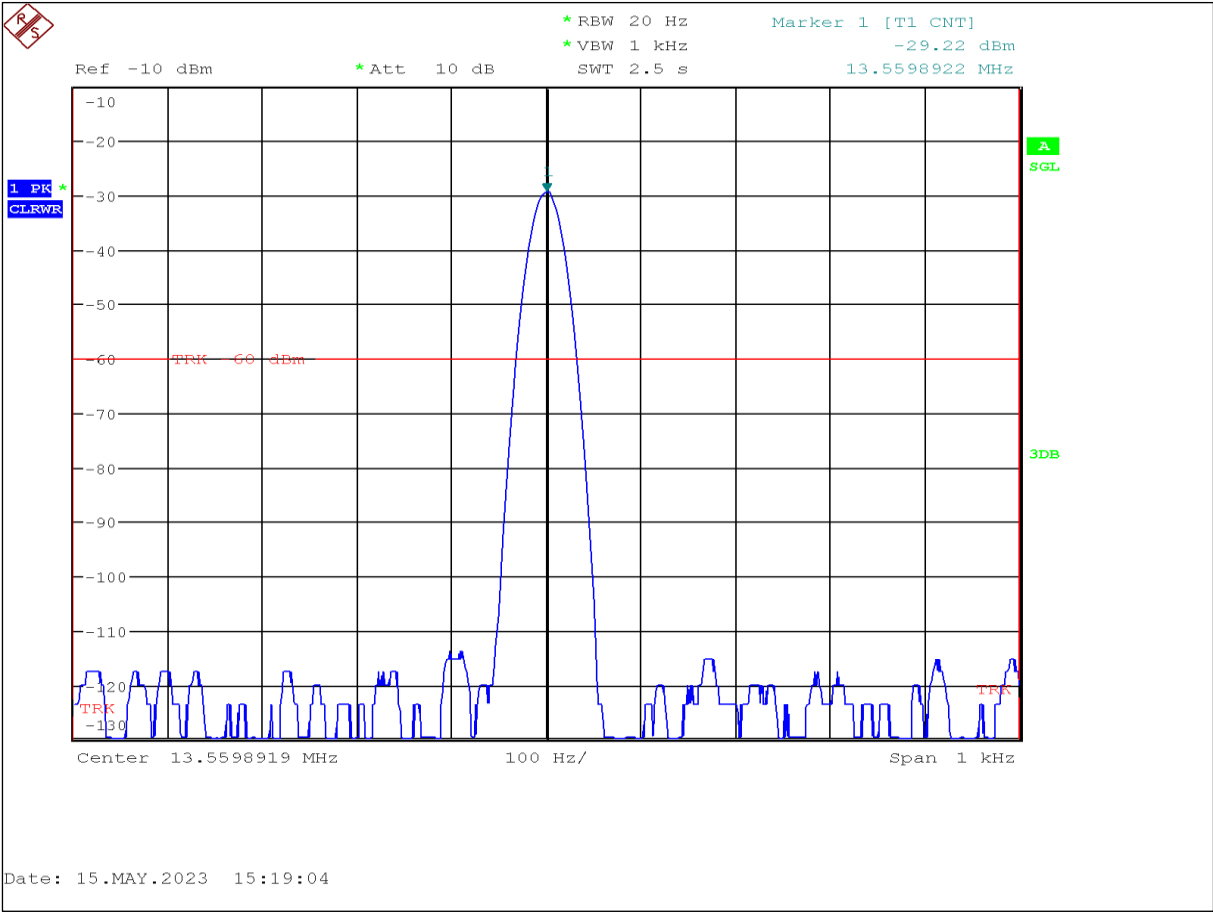
FreqError_Tnom__24.2018



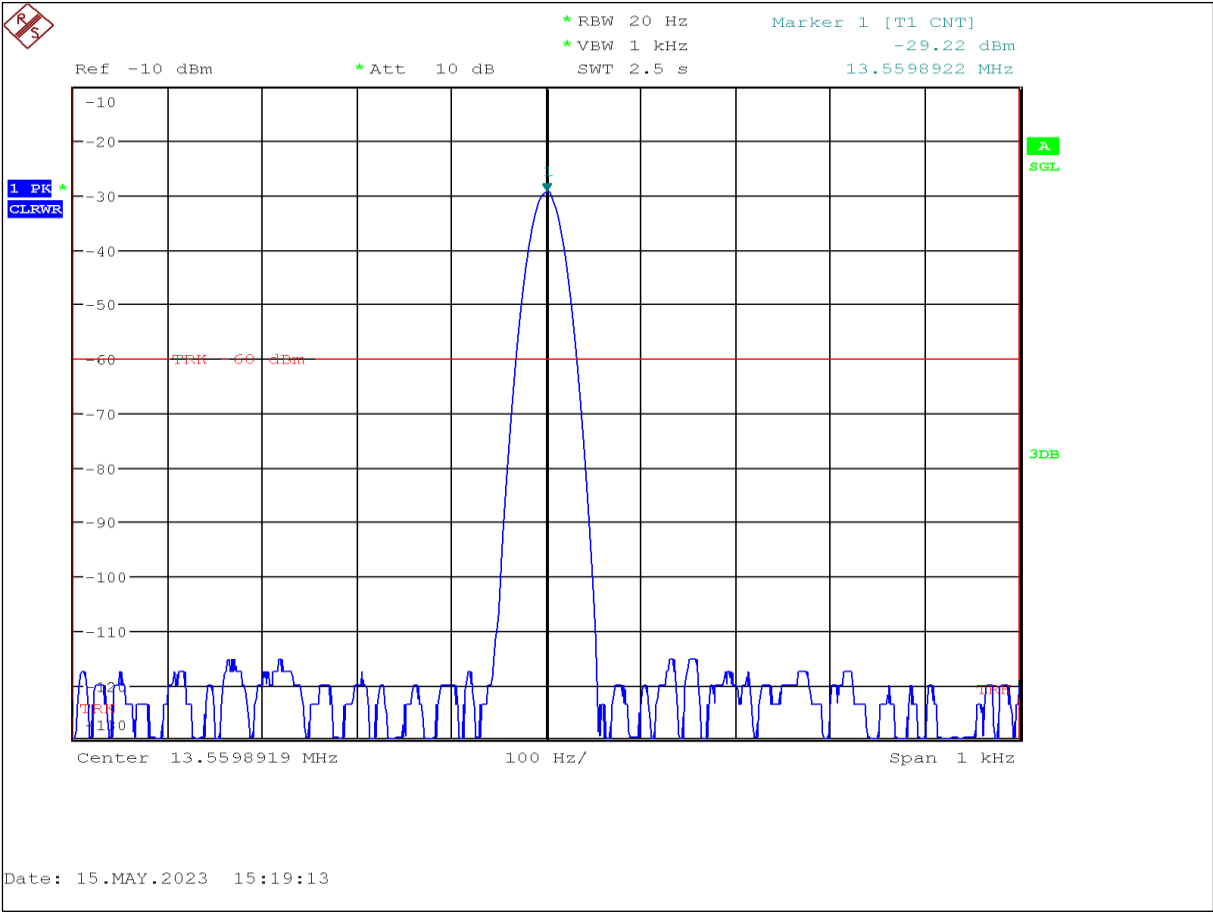
FreqError_Tnom__24.3045



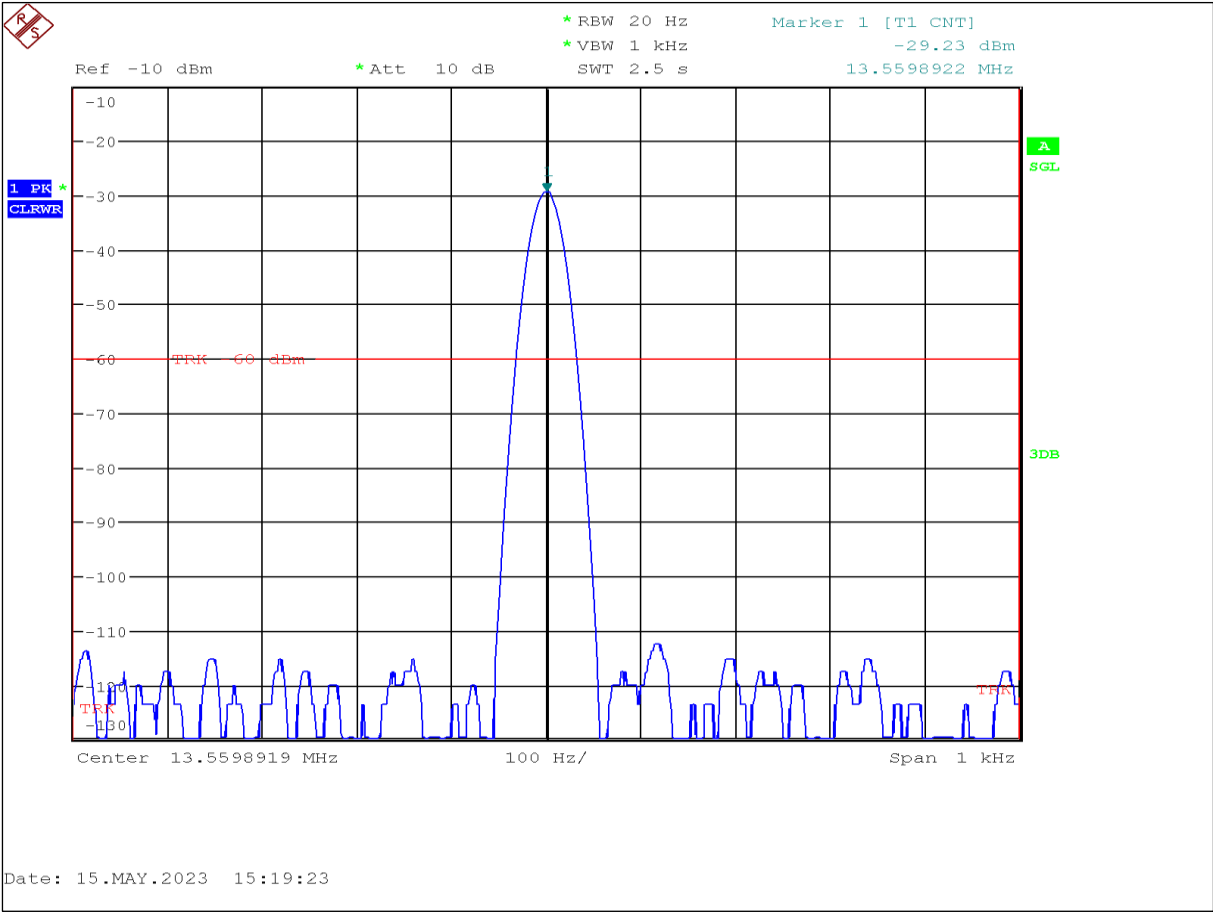
FreqError_Tnom__24.4066



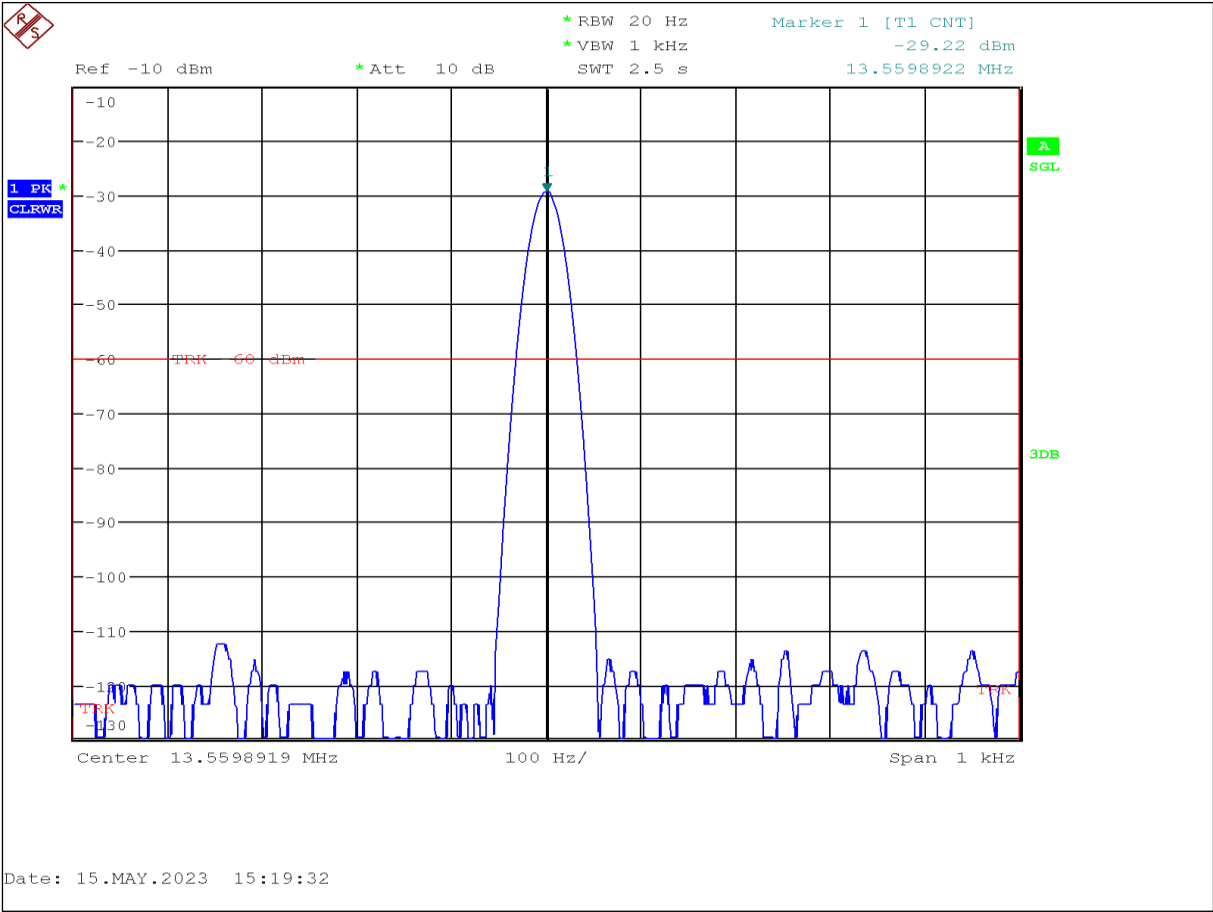
FreqError_Tnom__24.5070



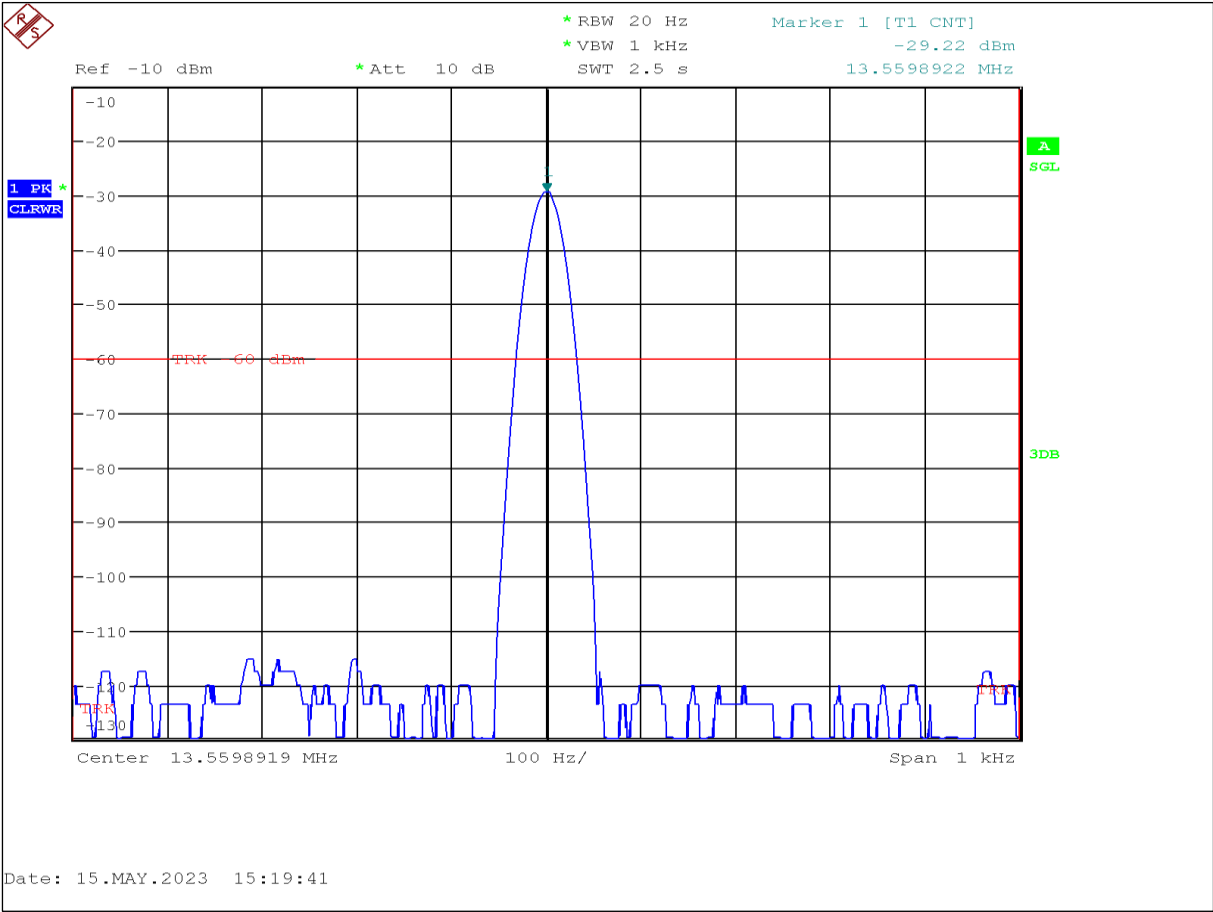
FreqError_Tnom__24.6035



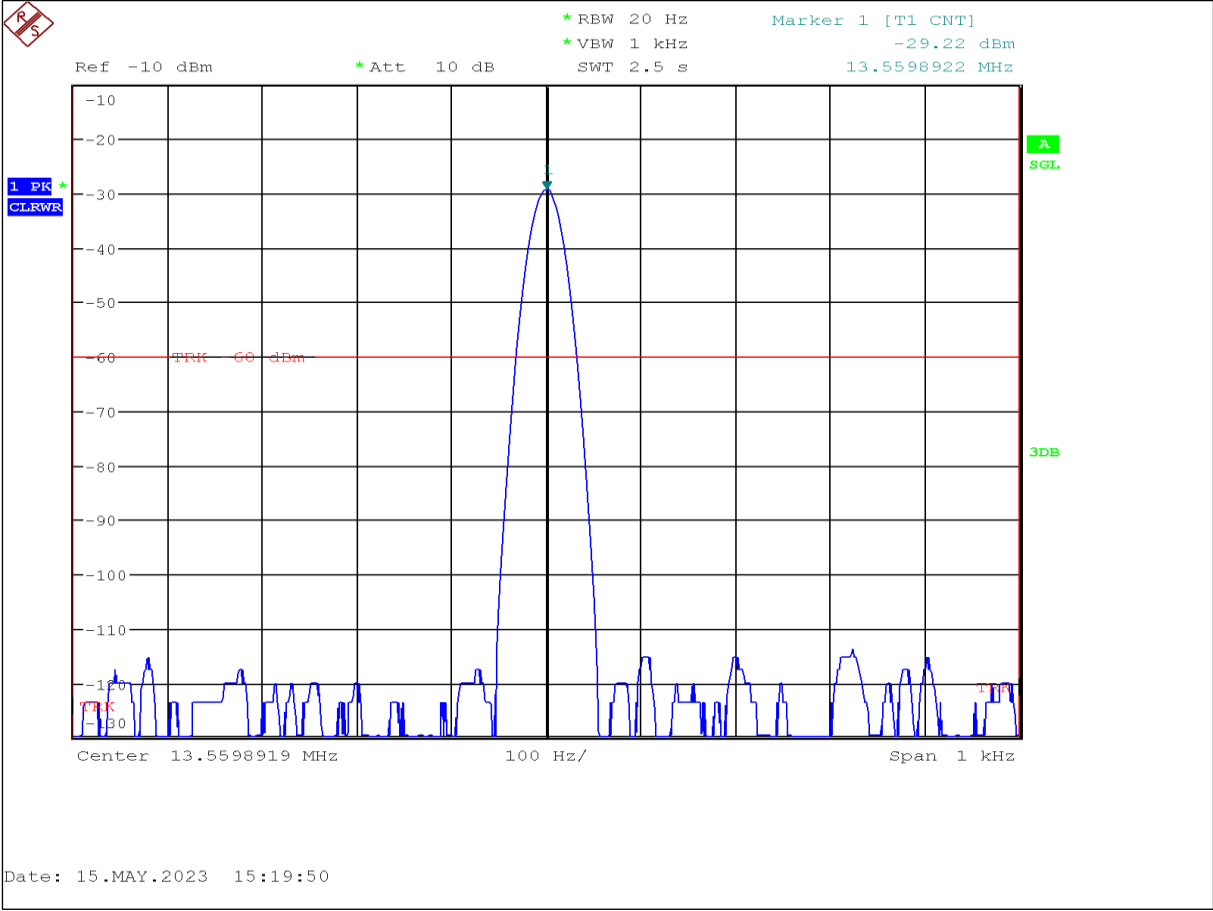
FreqError_Tnom__24.7041



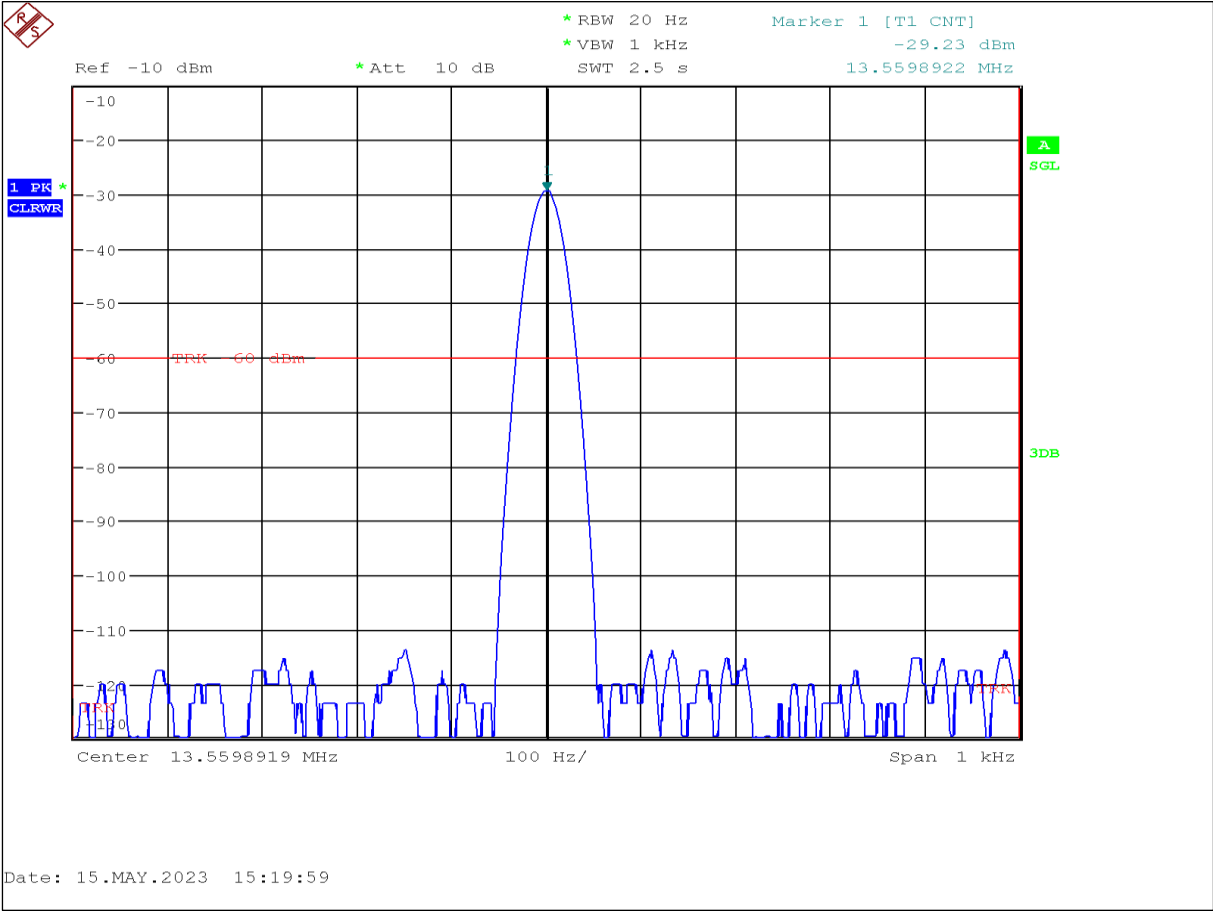
FreqError_Tnom__24.8099



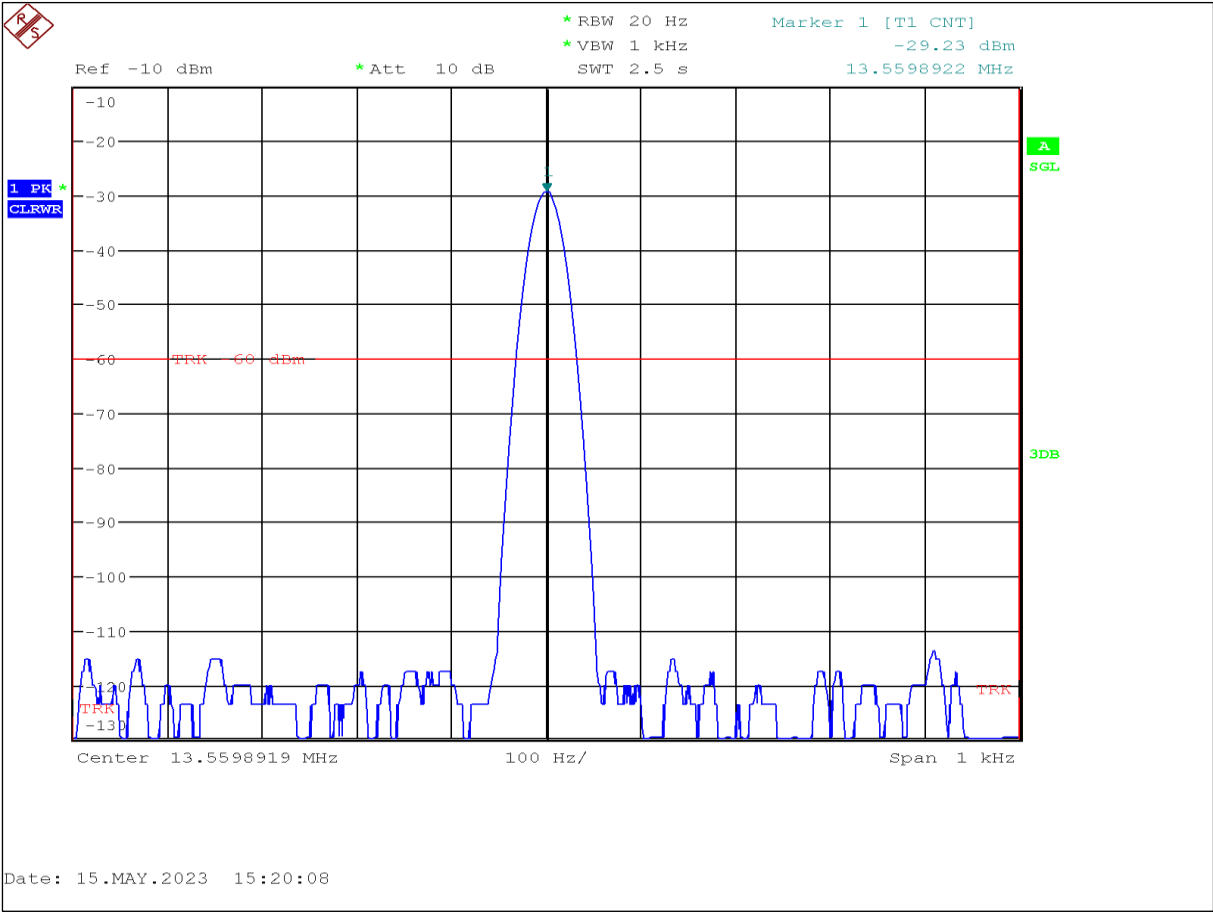
FreqError_Tnom__24.9075



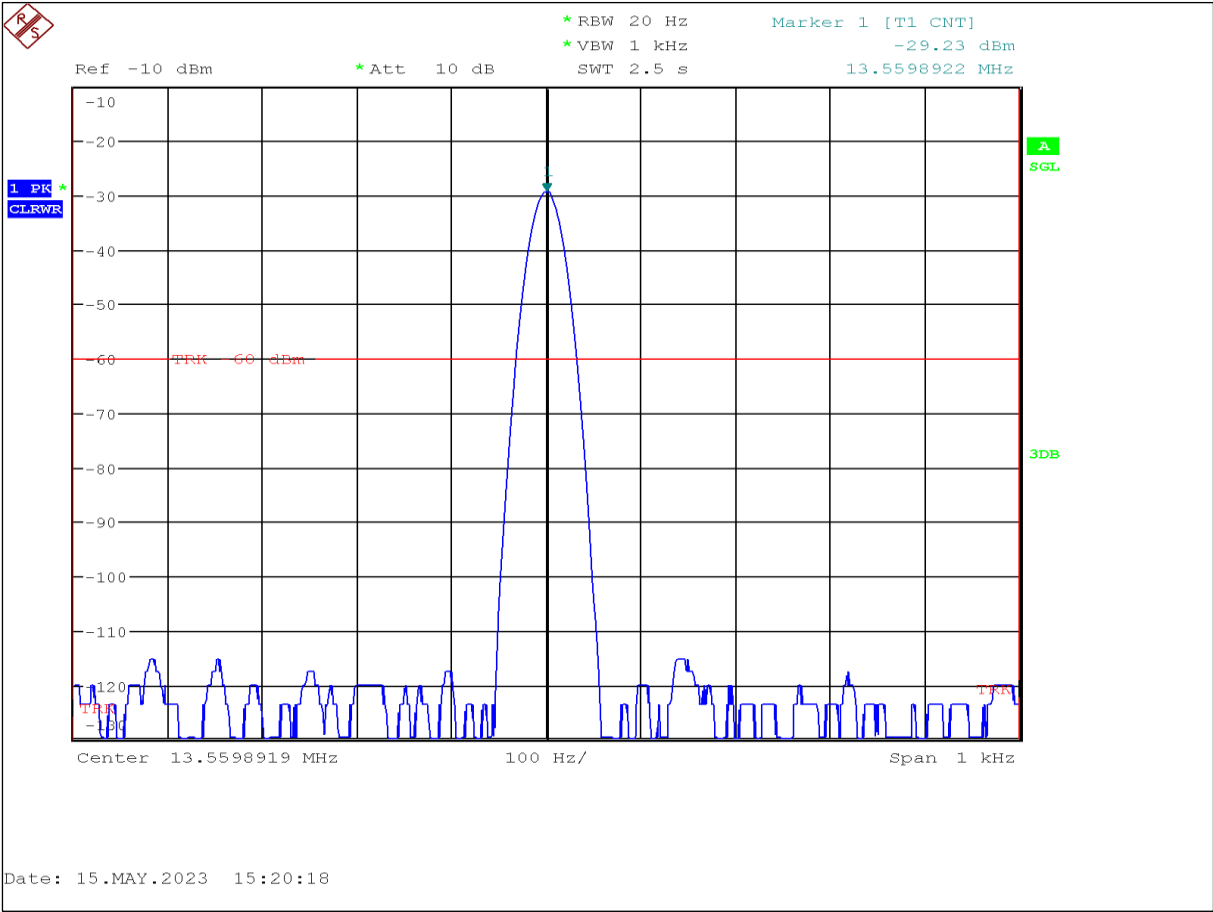
FreqError_Tnom__25.0082



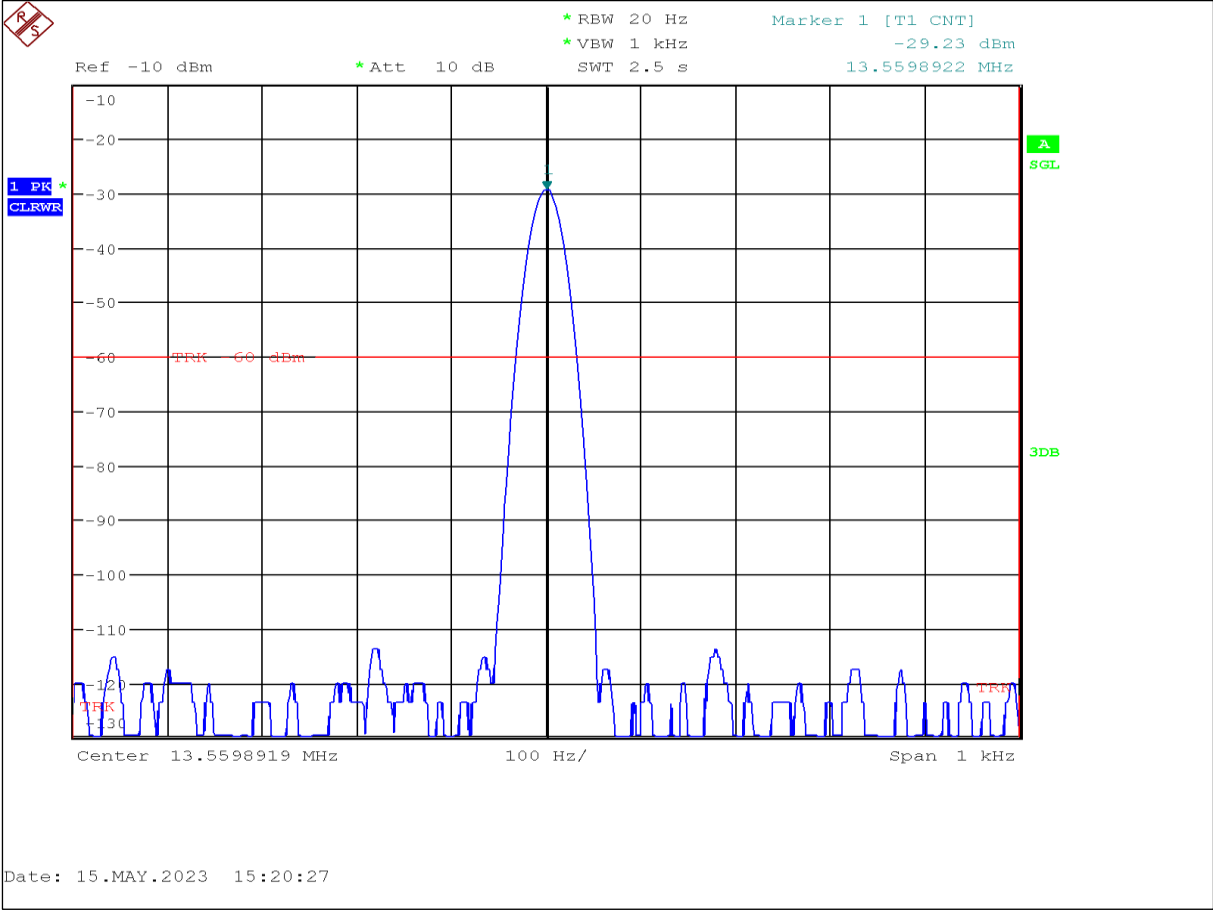
FreqError_Tnom__25.1099



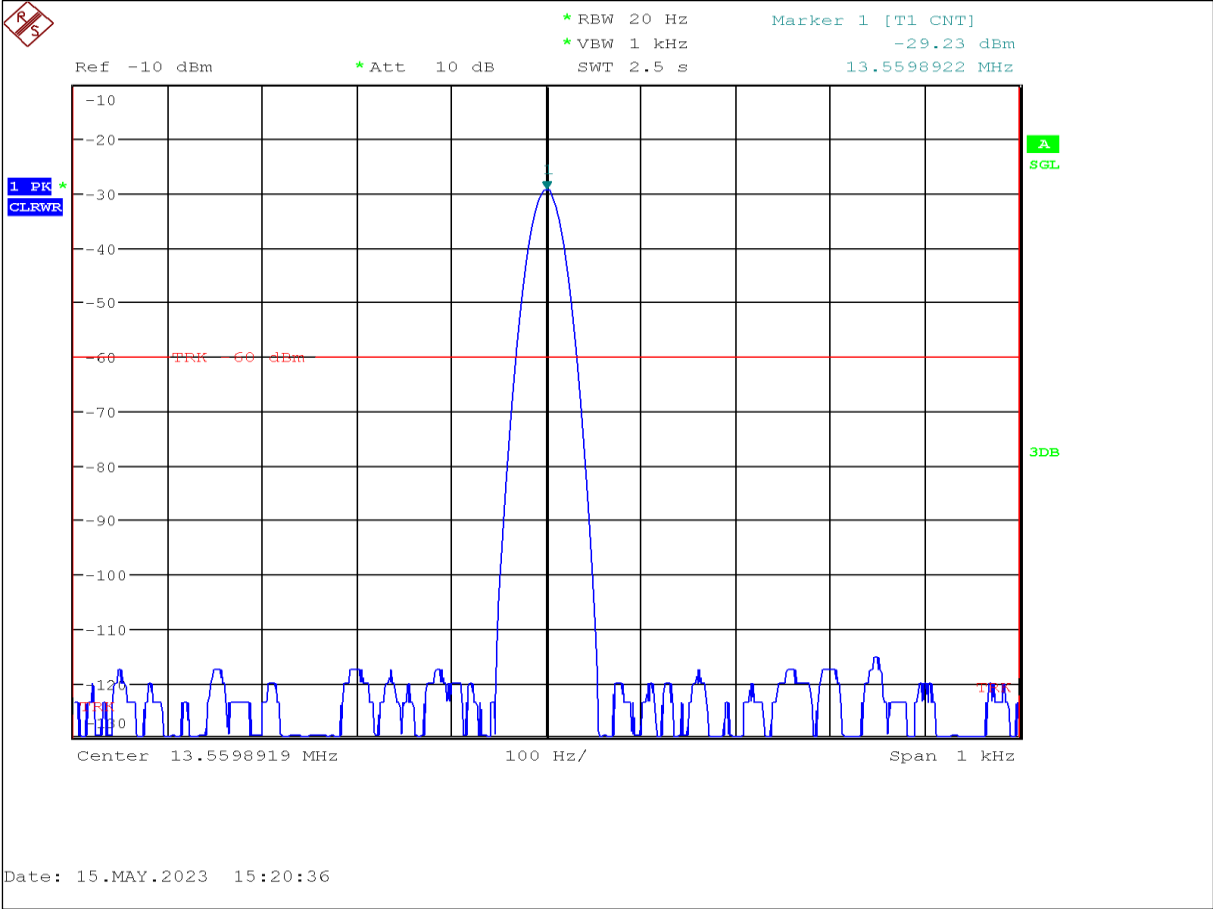
FreqError_Tnom__25.2088



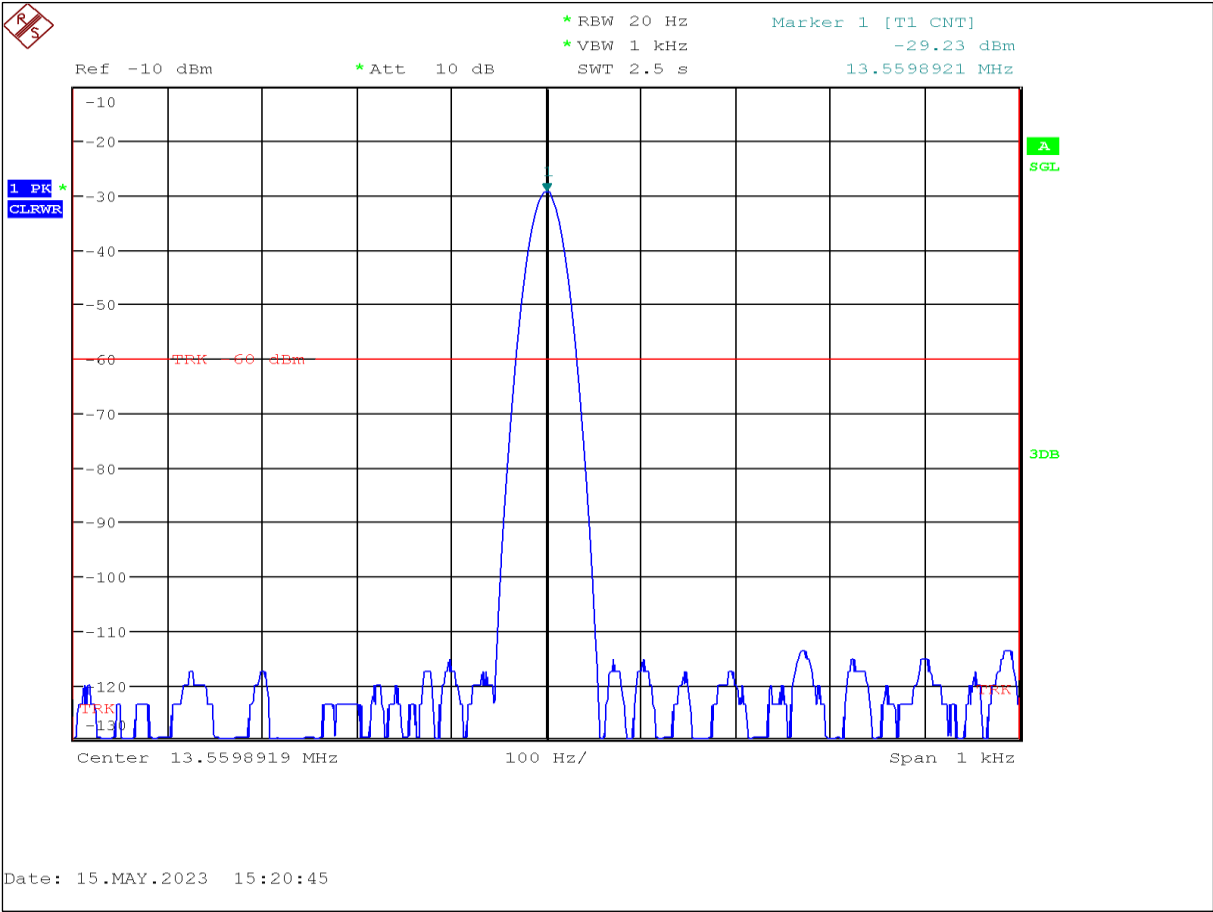
FreqError_Tnom__25.3071



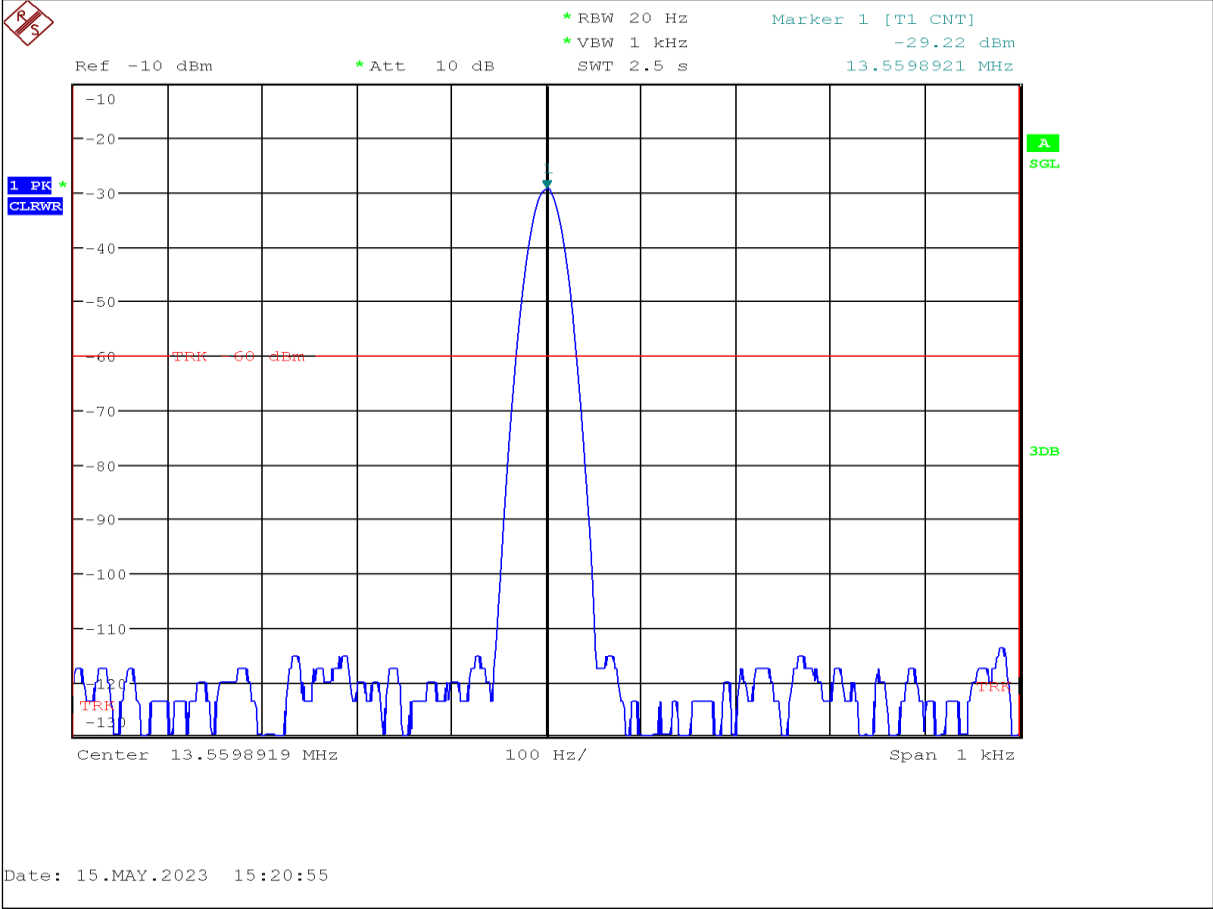
FreqError_Tnom__25.405



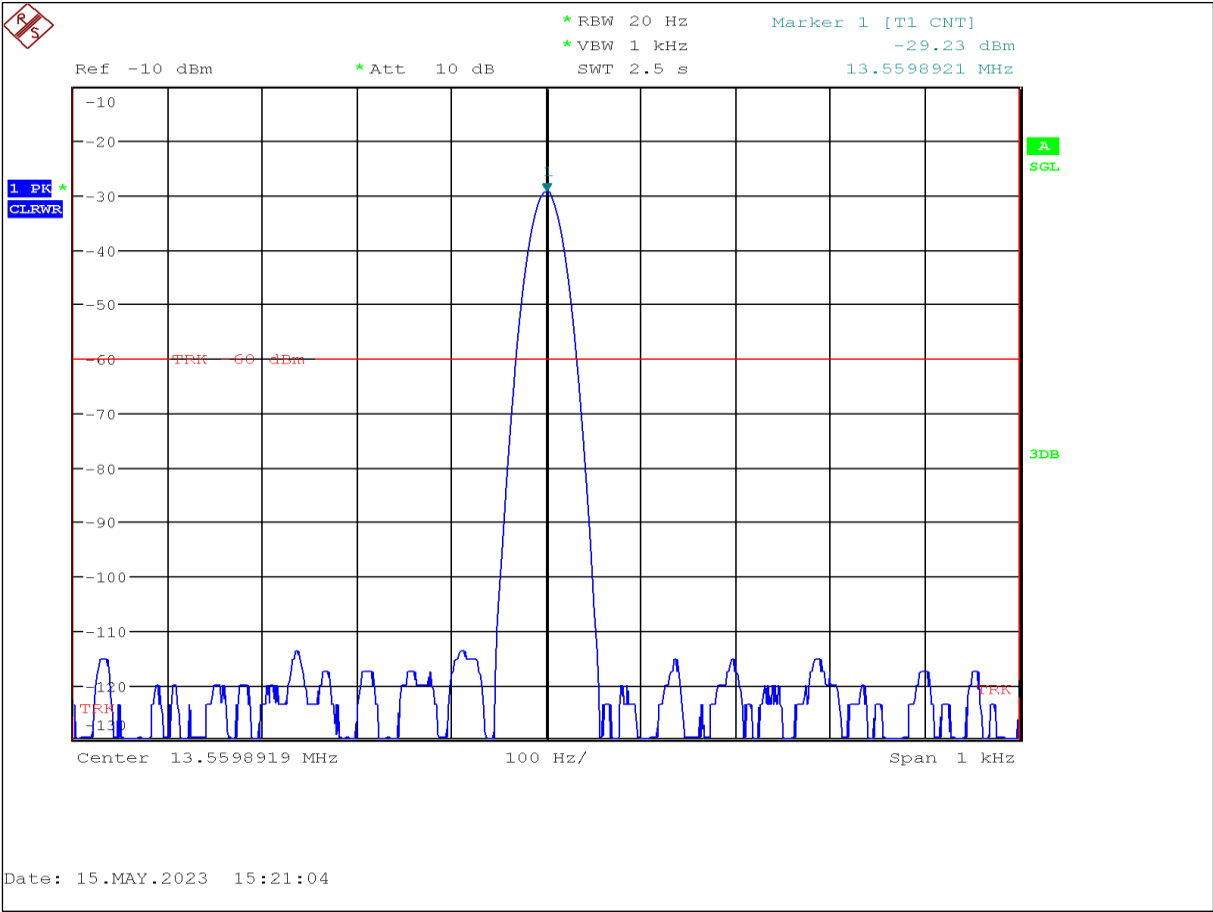
FreqError_Tnom__25.501



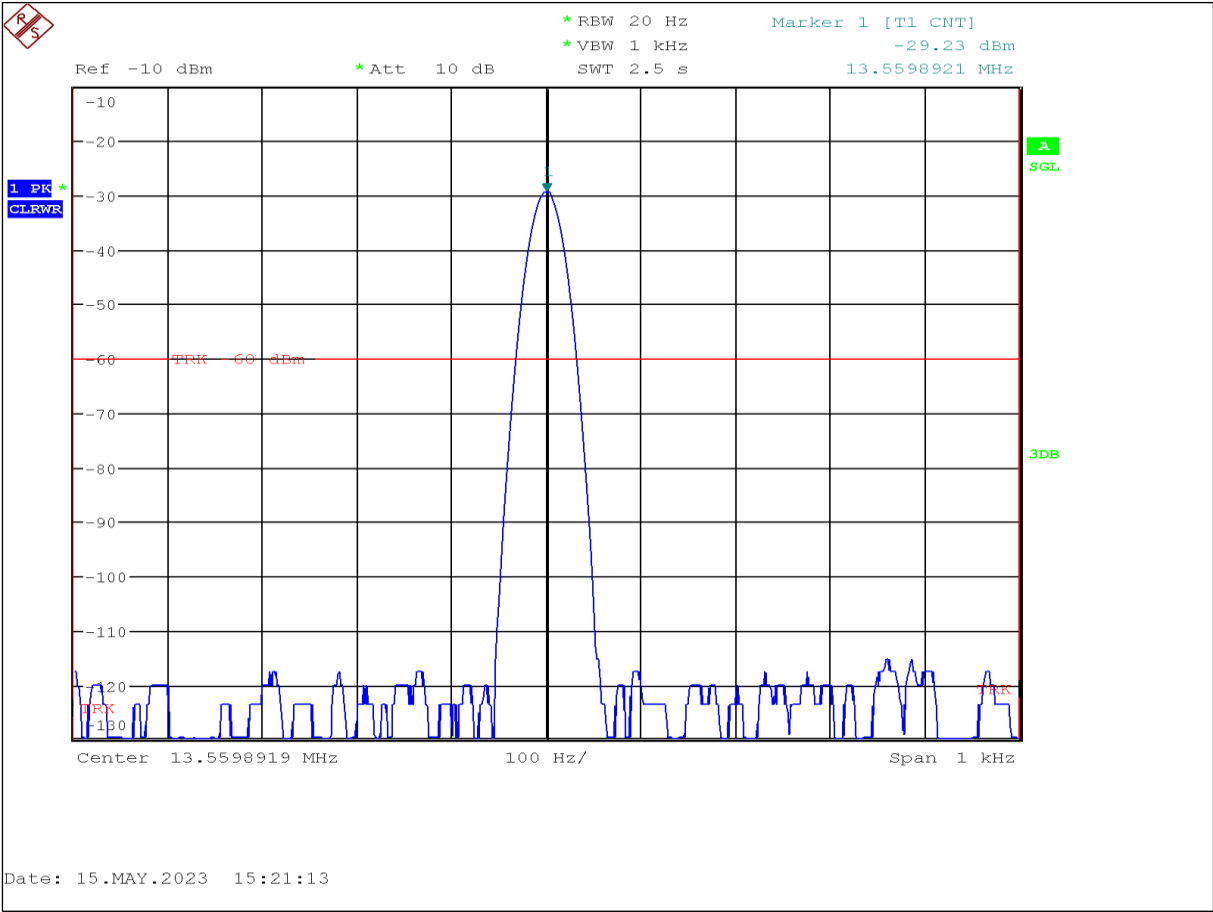
FreqError_Tnom__25.6064



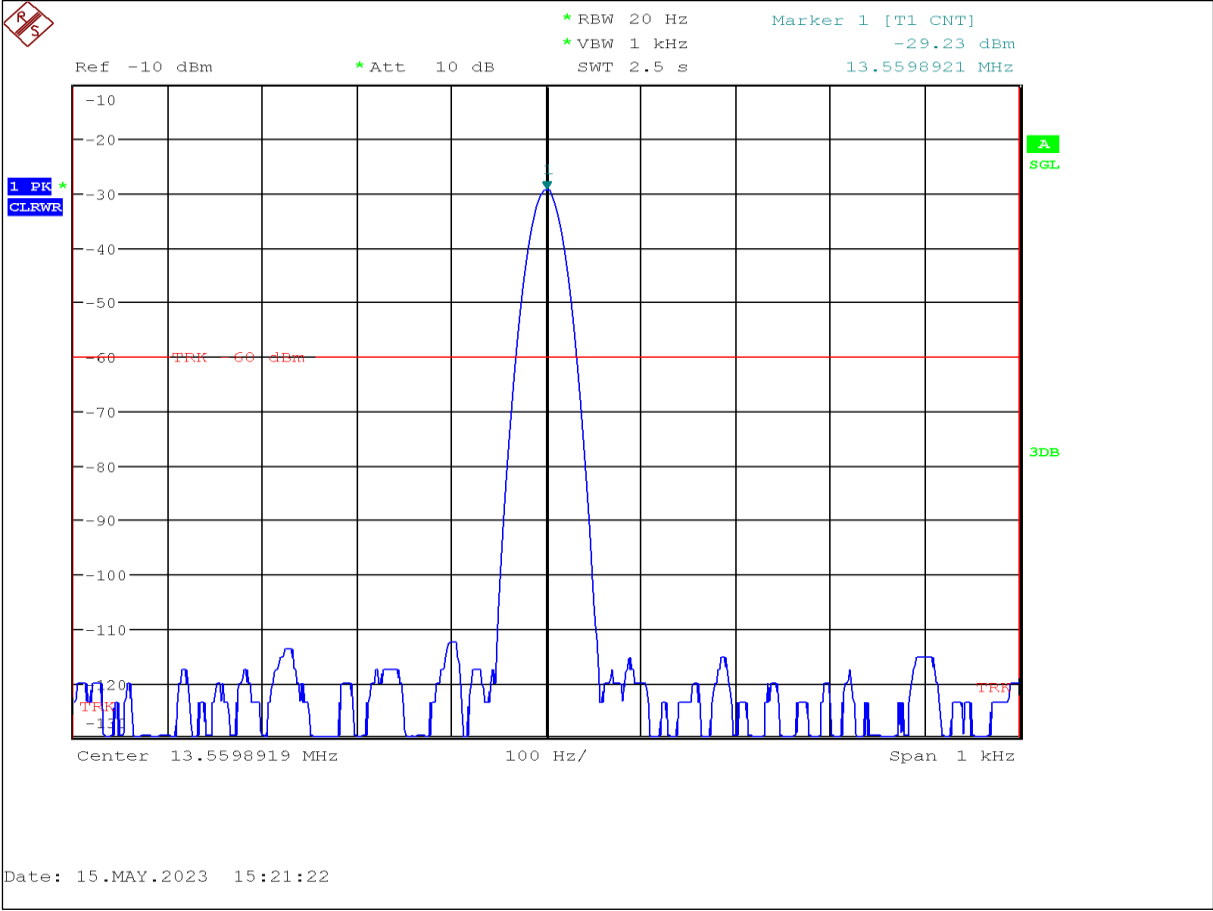
FreqError_Tnom__25.7071



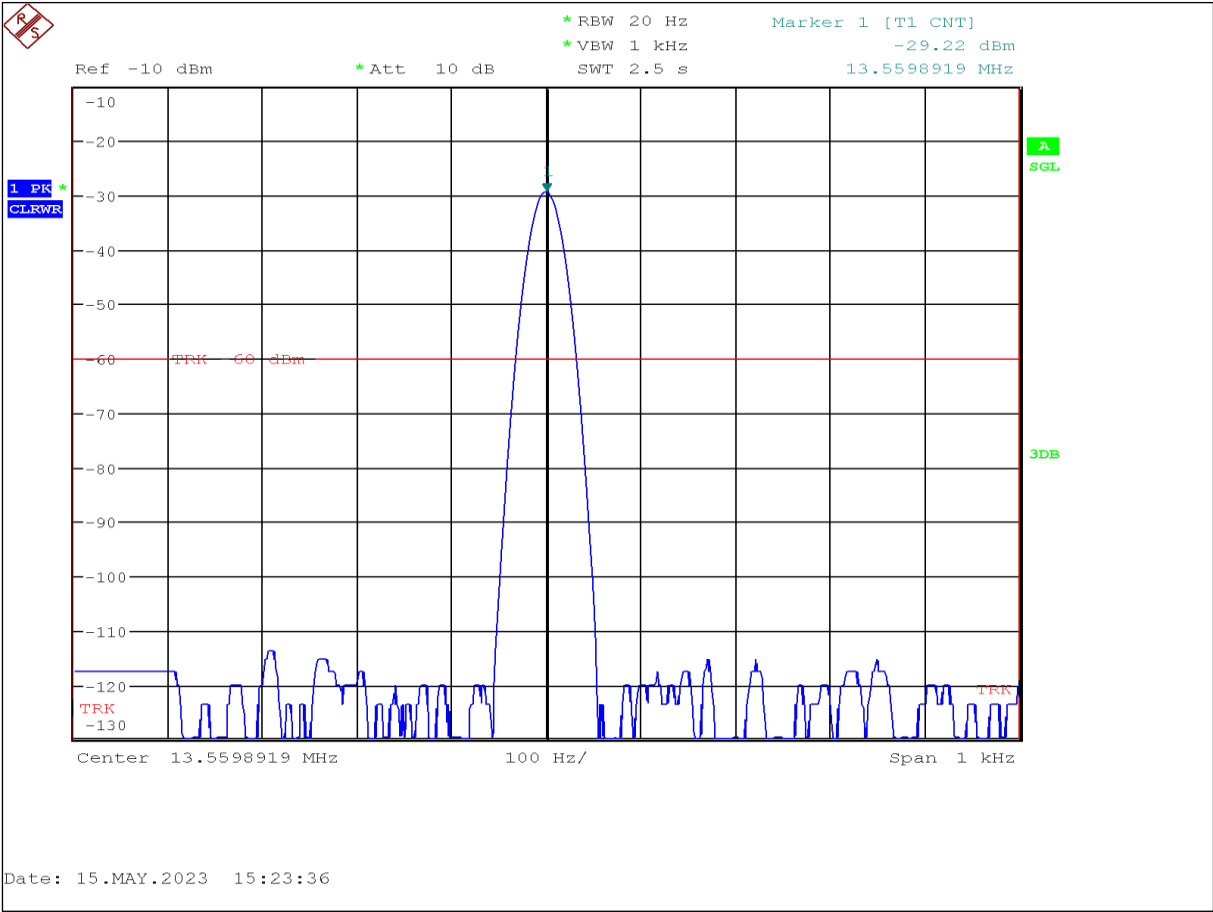
FreqError_Tnom__25.8018



FreqError_Tnom__25.9028



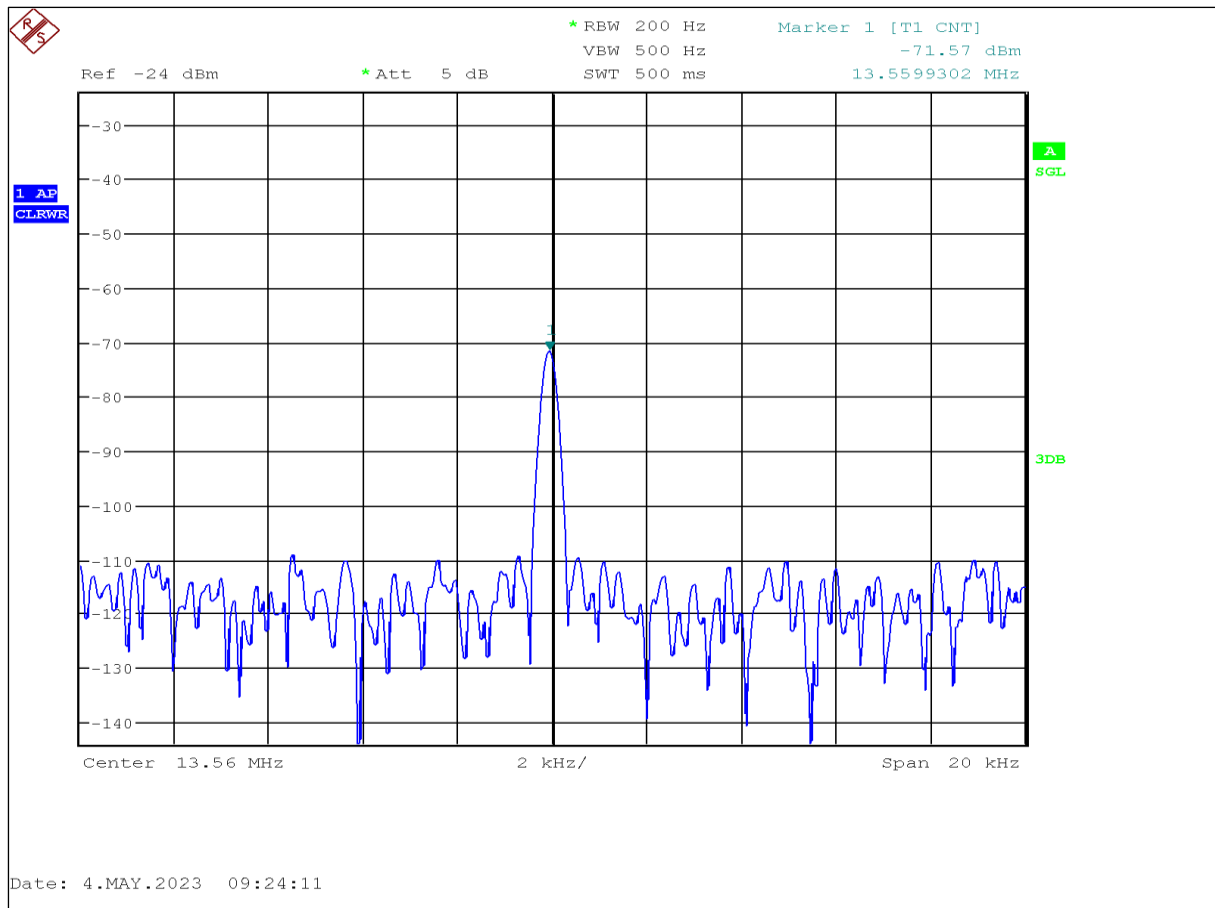
FreqError_Tnom__26.006



1.6 Frequency error: temperature variations

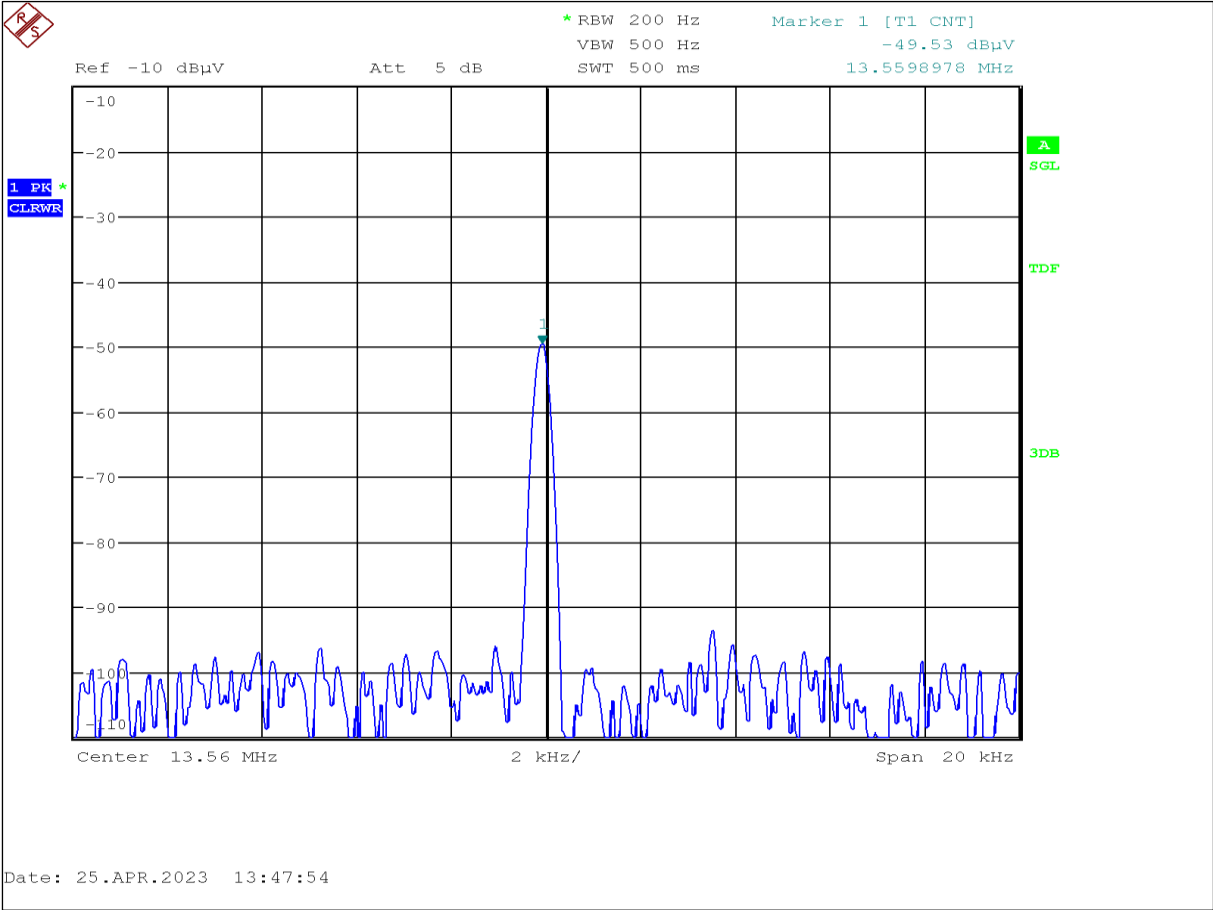
1.6.1 Nominal conditions – reference at 21degree

D000_TX_TnomVnom_24V

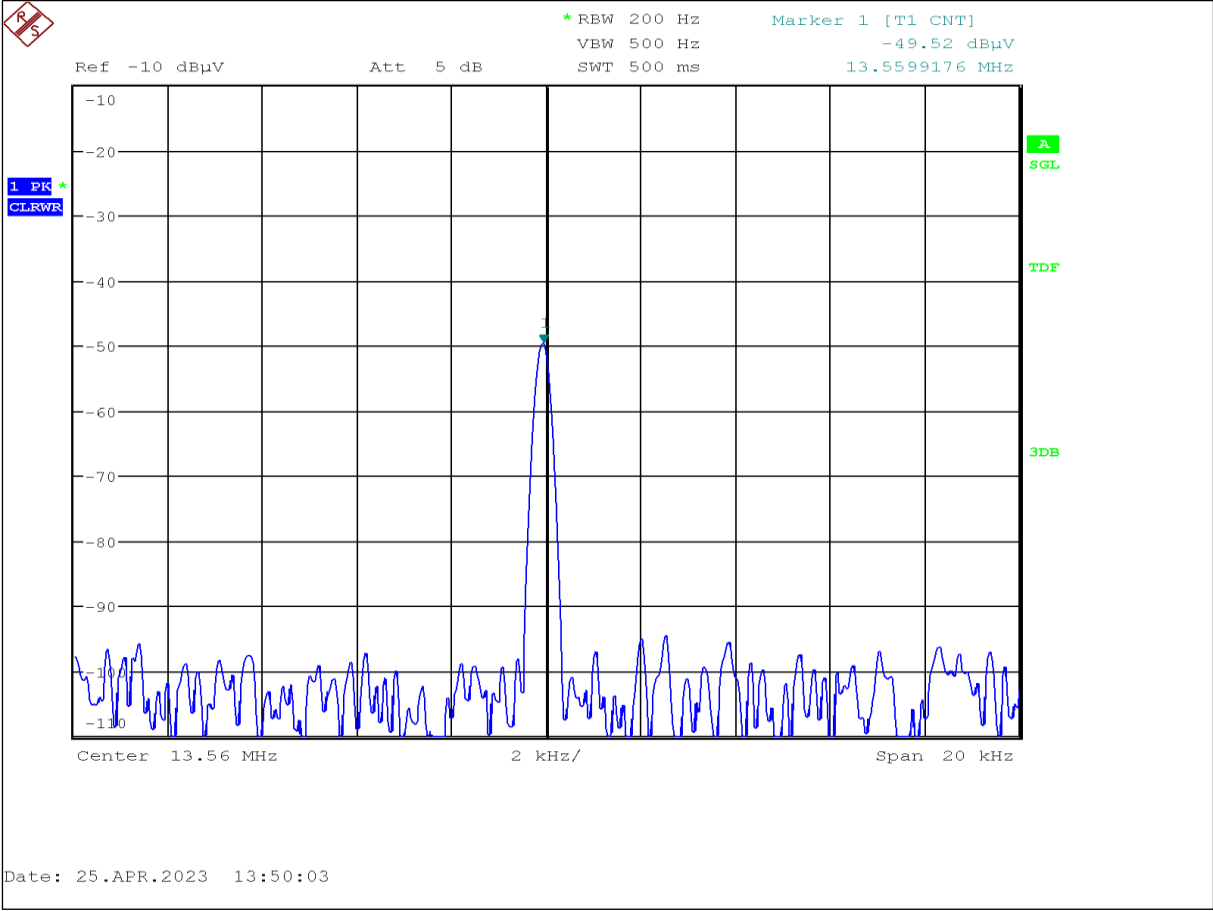


1.6.2 Extreme conditions / +75degree

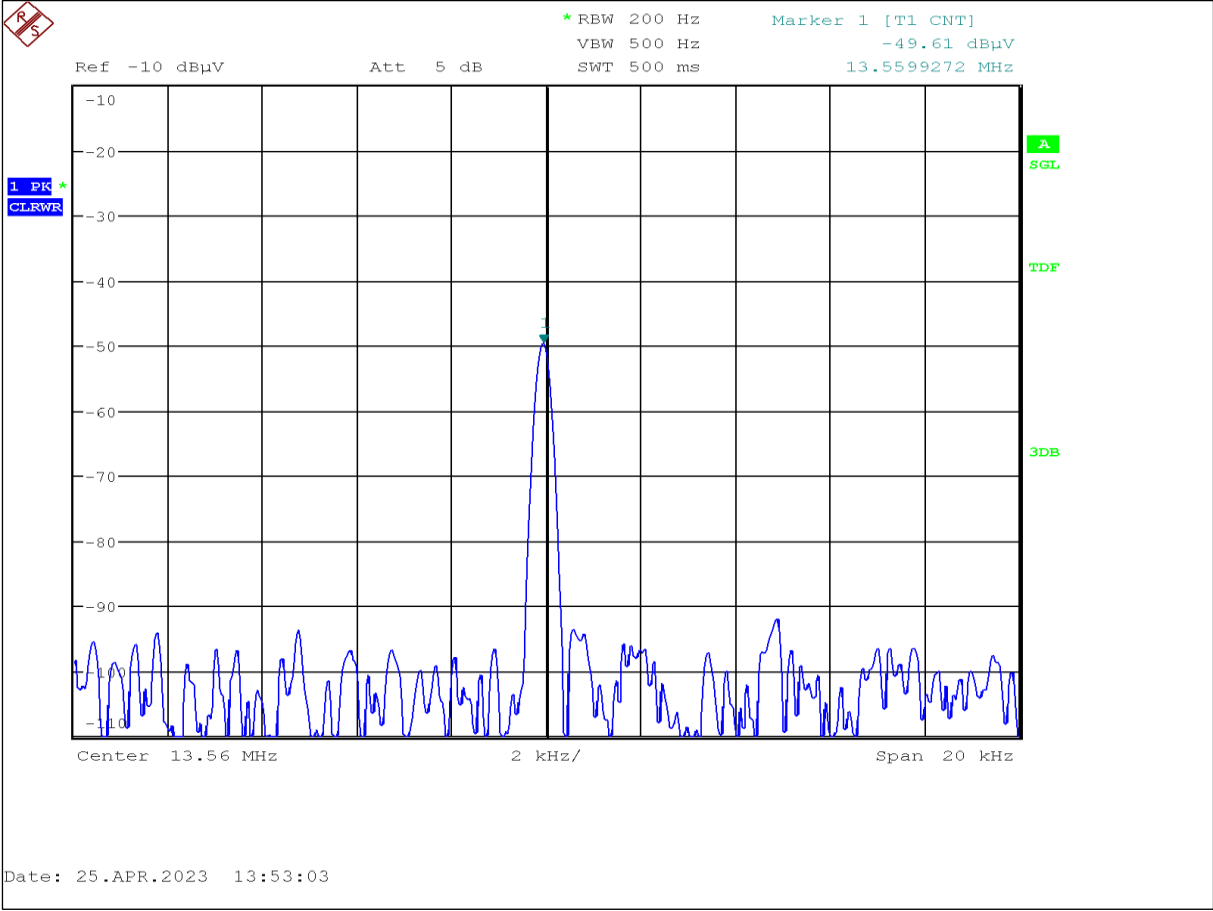
D001_1_T+75_Vnom



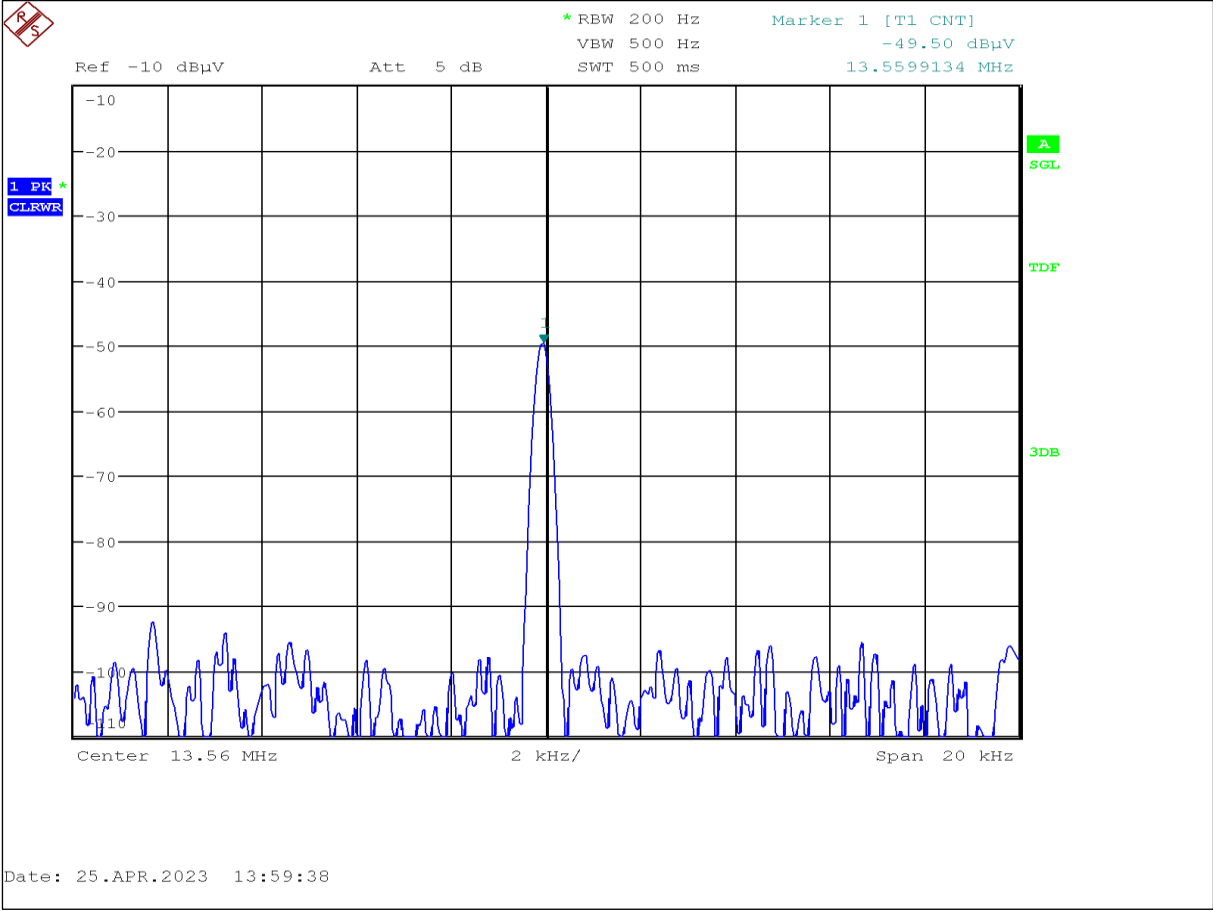
D001_2_T+75_Vnom



D001_3_T+75_Vnom

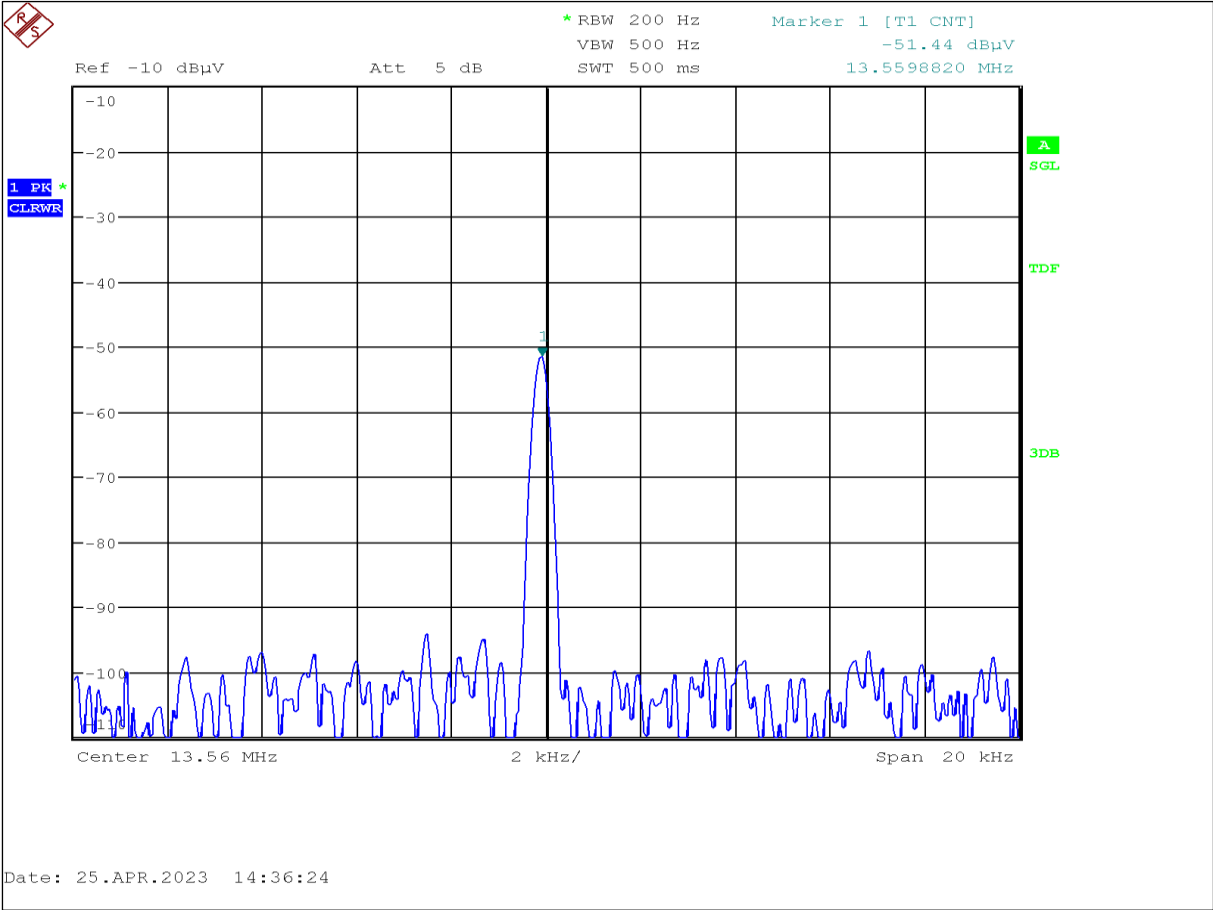


D001_4_T+75_Vnom

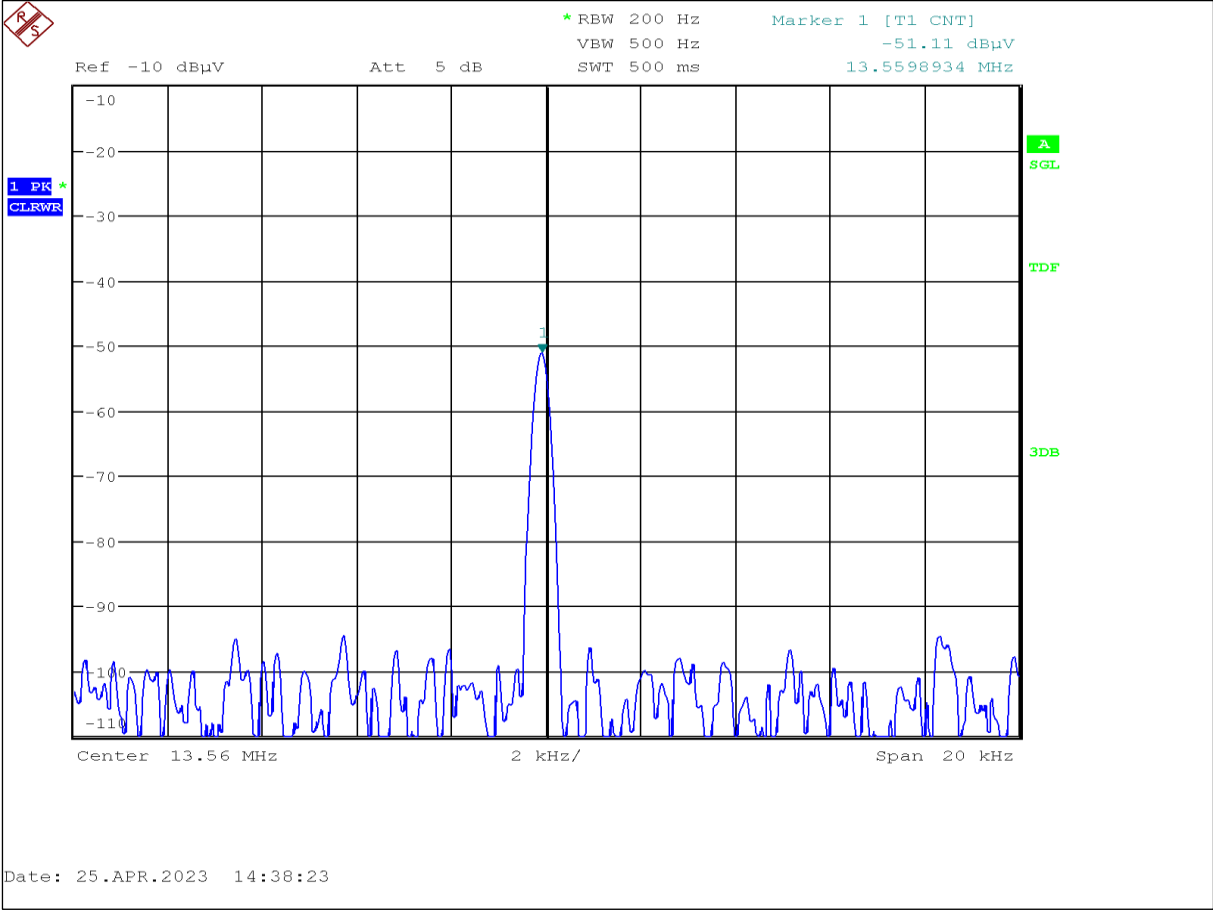


1.6.3 Extreme conditions / +70degree

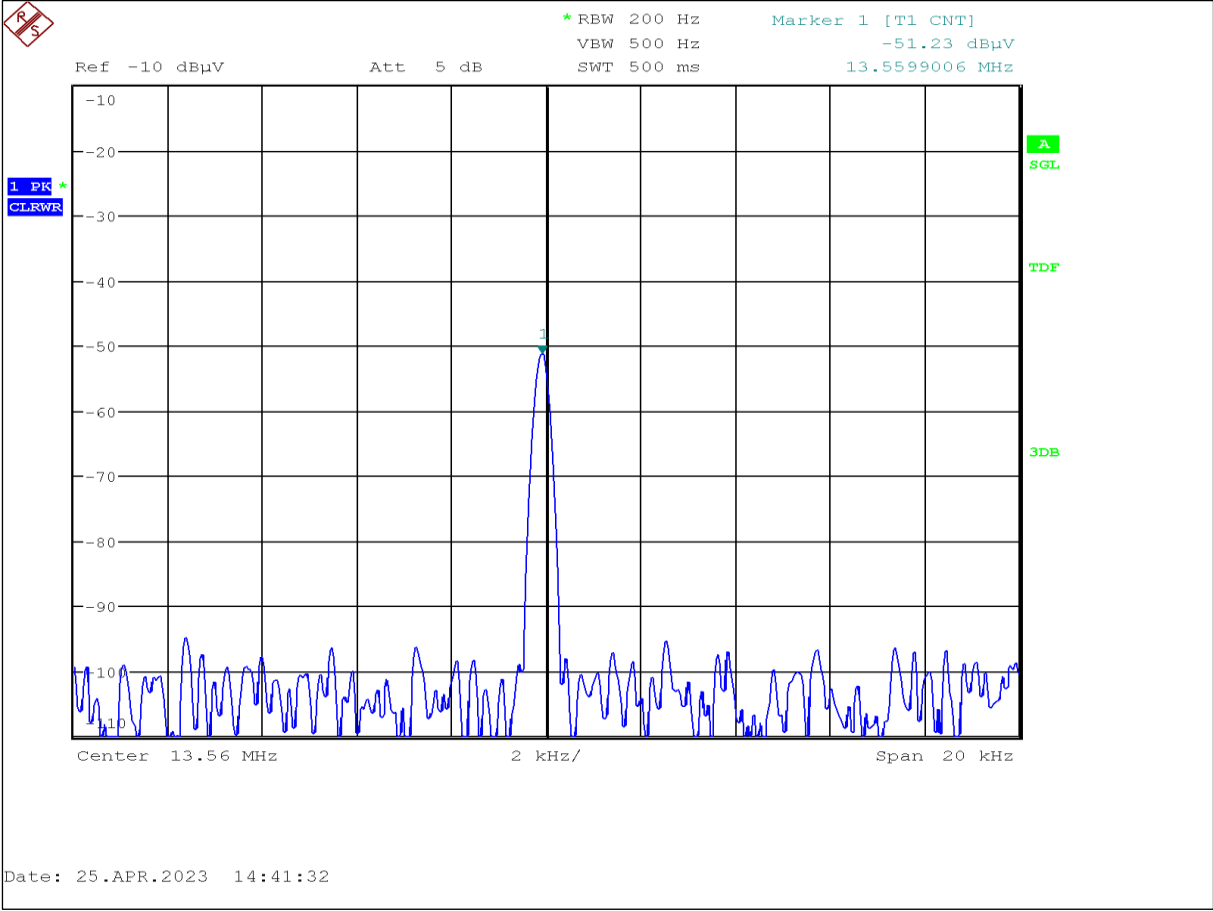
D002_1_T+70_Vnom



D002_2_T+70_Vnom



D002_3_T+70_Vnom



Ref -10 dBμV Att 5 dB RBW 200 Hz VBW 500 Hz SWT 500 ms Marker 1 [T1 CNT] -50.78 dBμV 13.5598936 MHz

1 PK
CLRWR

1
-50.78

Center 13.56 MHz 2 kHz/ Span 20 kHz

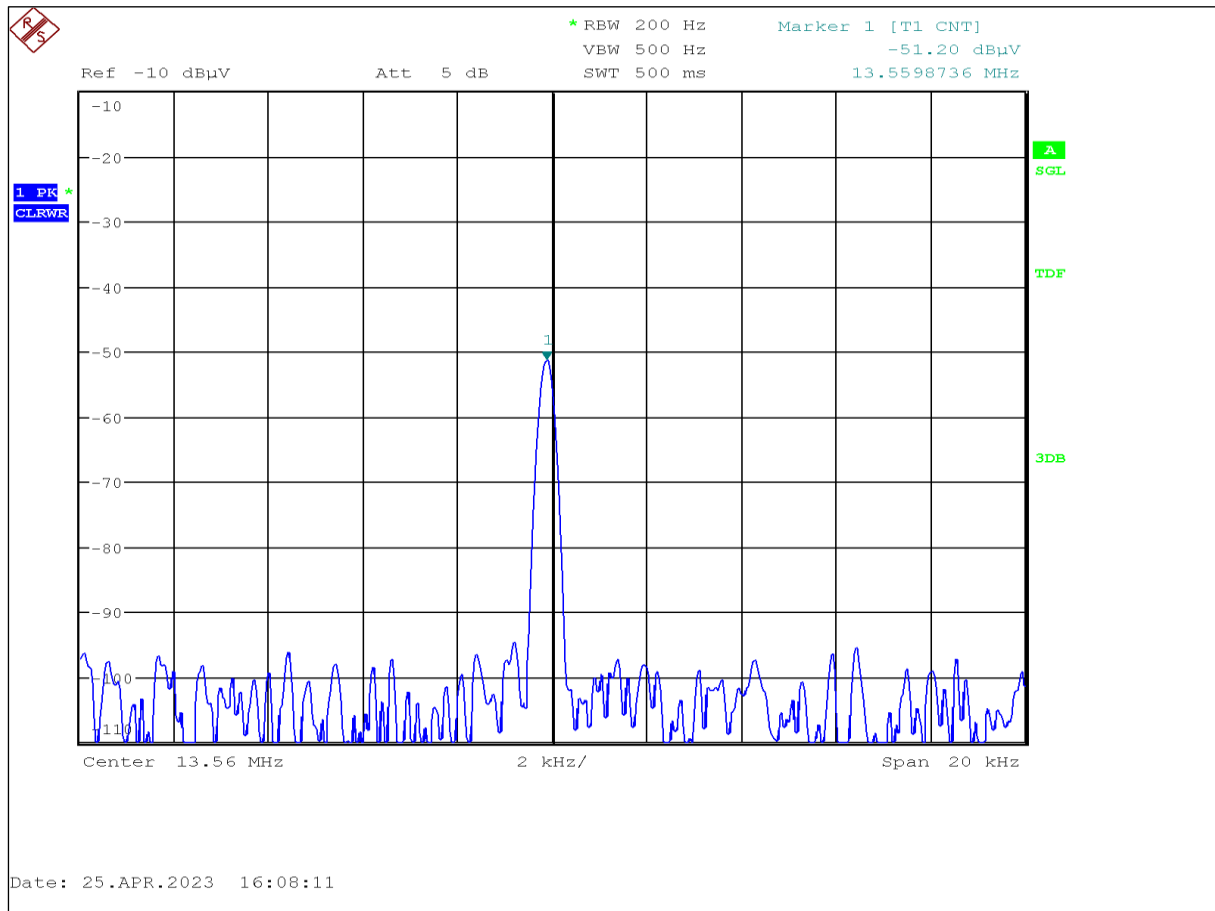
3dB

TDF

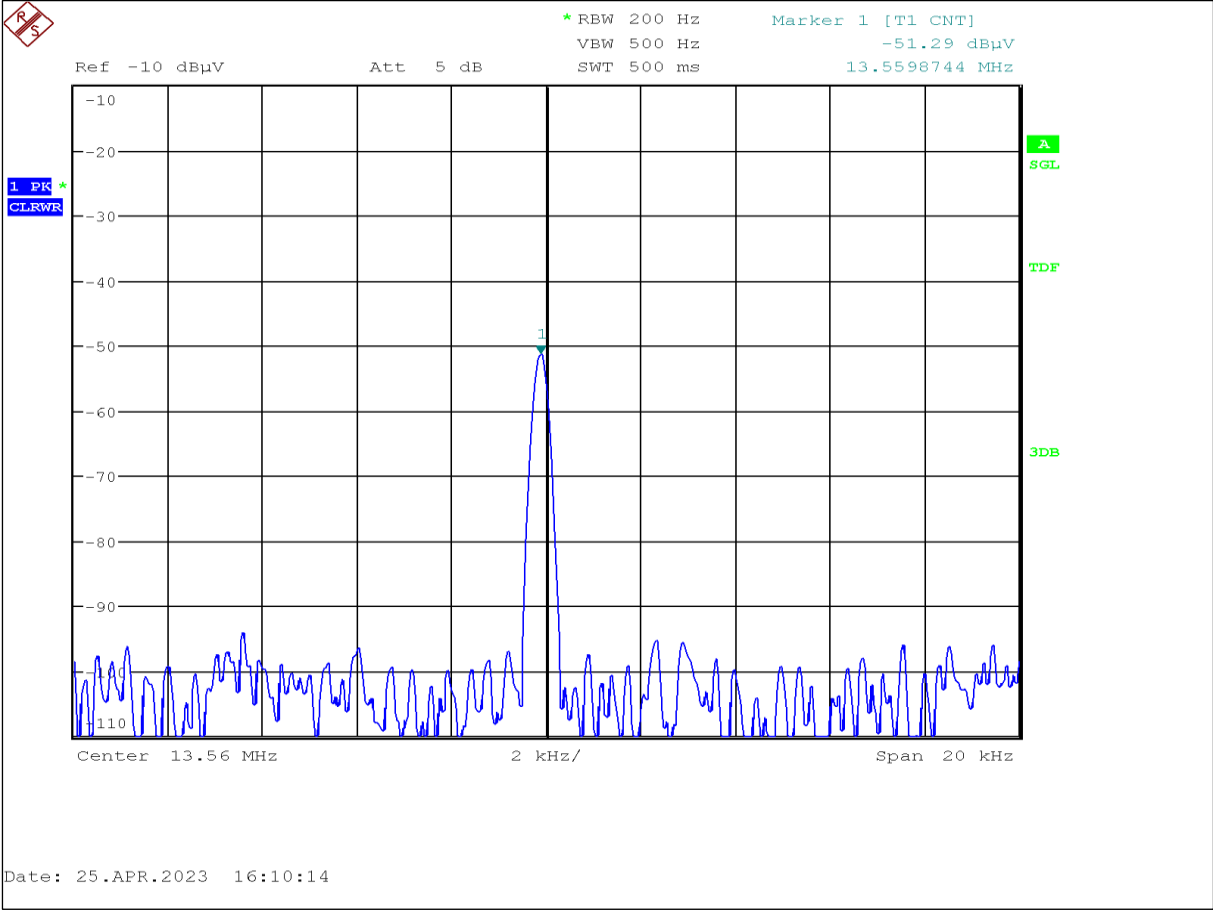
SGL

1.6.4 Extreme conditions / +60degree

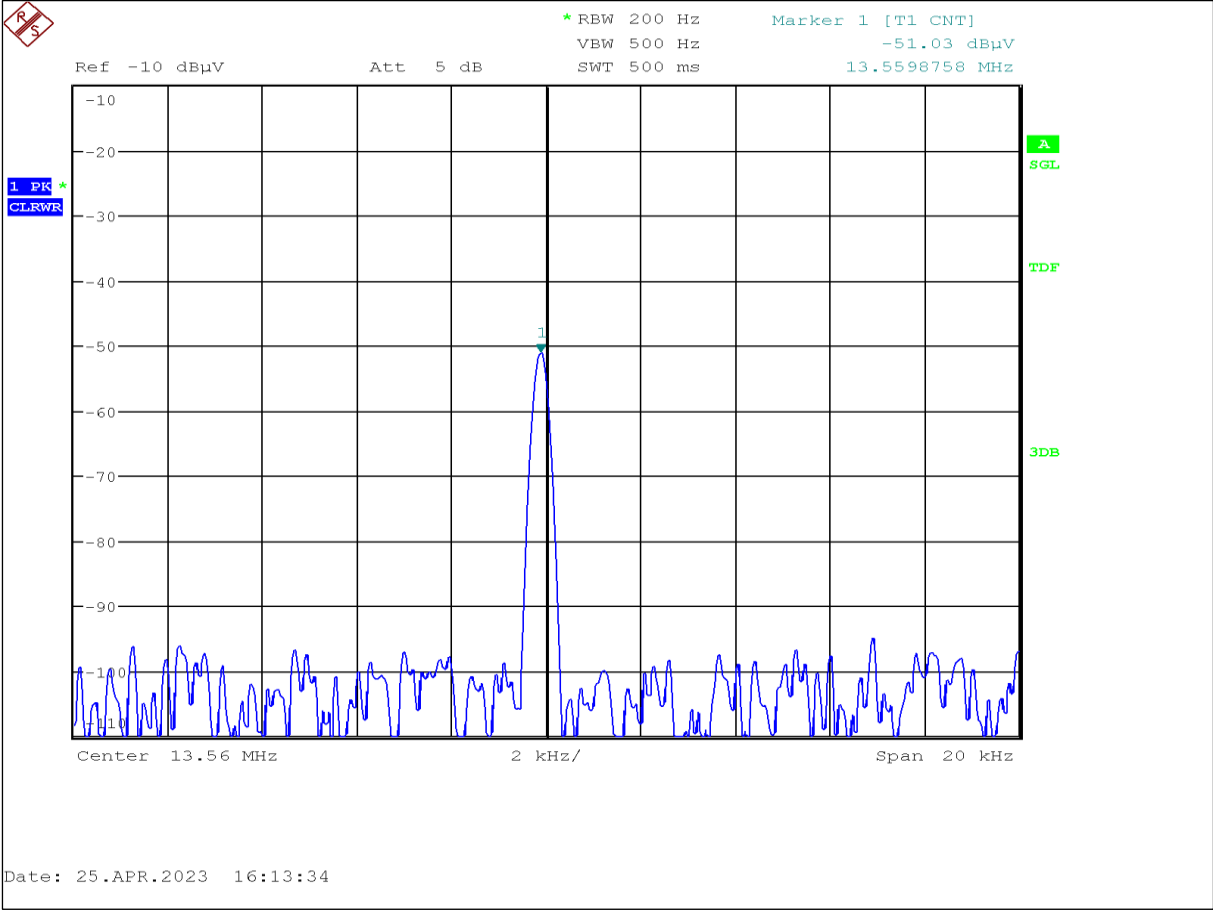
D003_1_T+60_Vnom



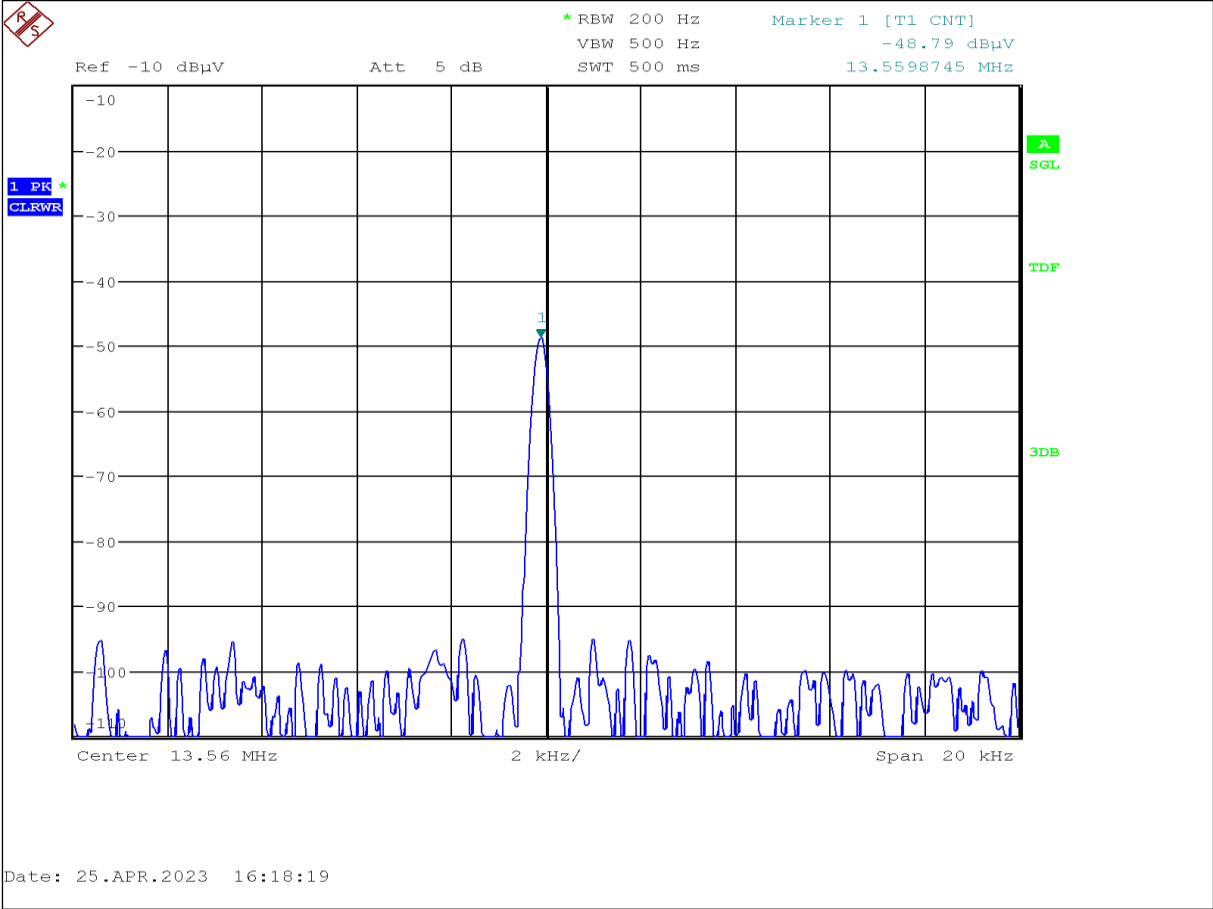
D003_2_T+60_Vnom



D003_3_T+60_Vnom

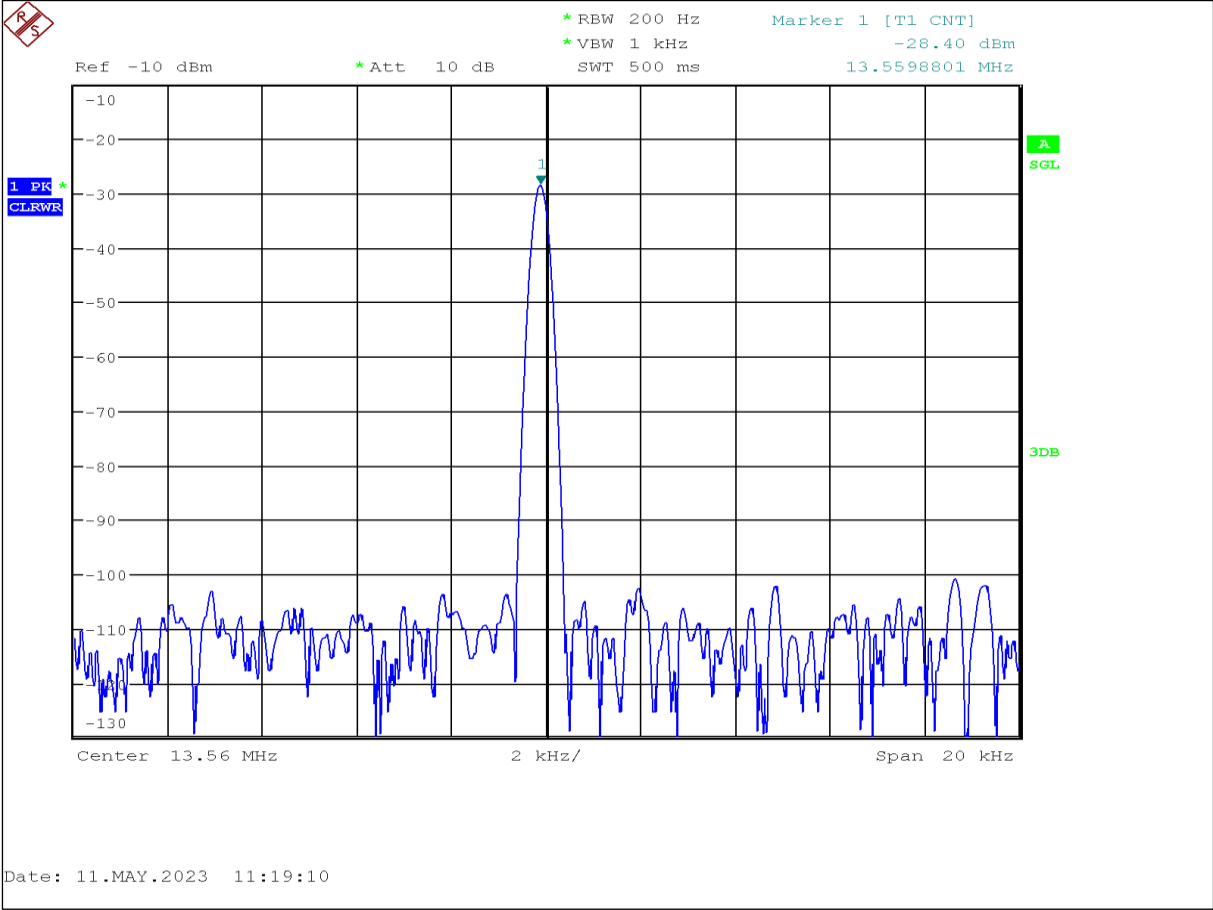


D003_4_T+60_Vnom

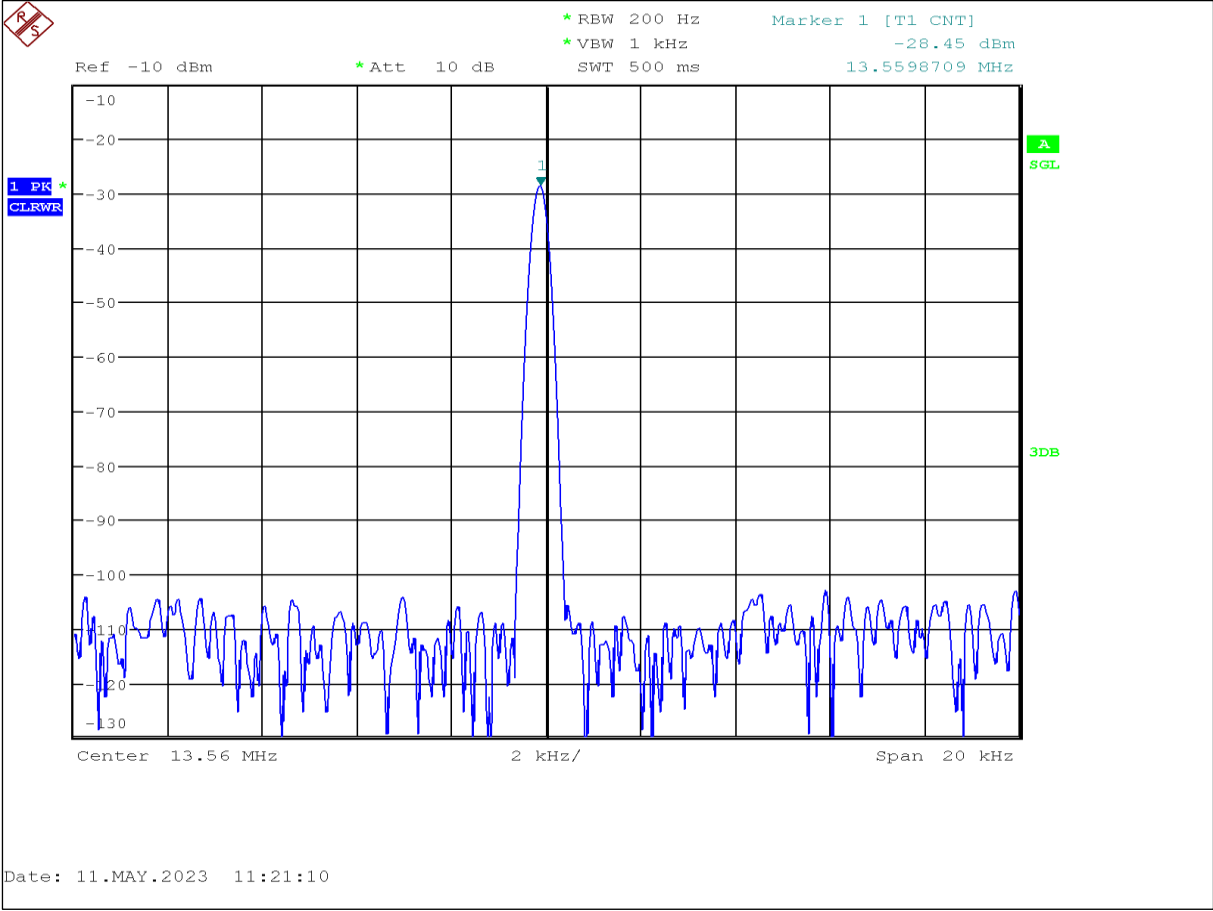


1.6.5 Extreme conditions / +50degree

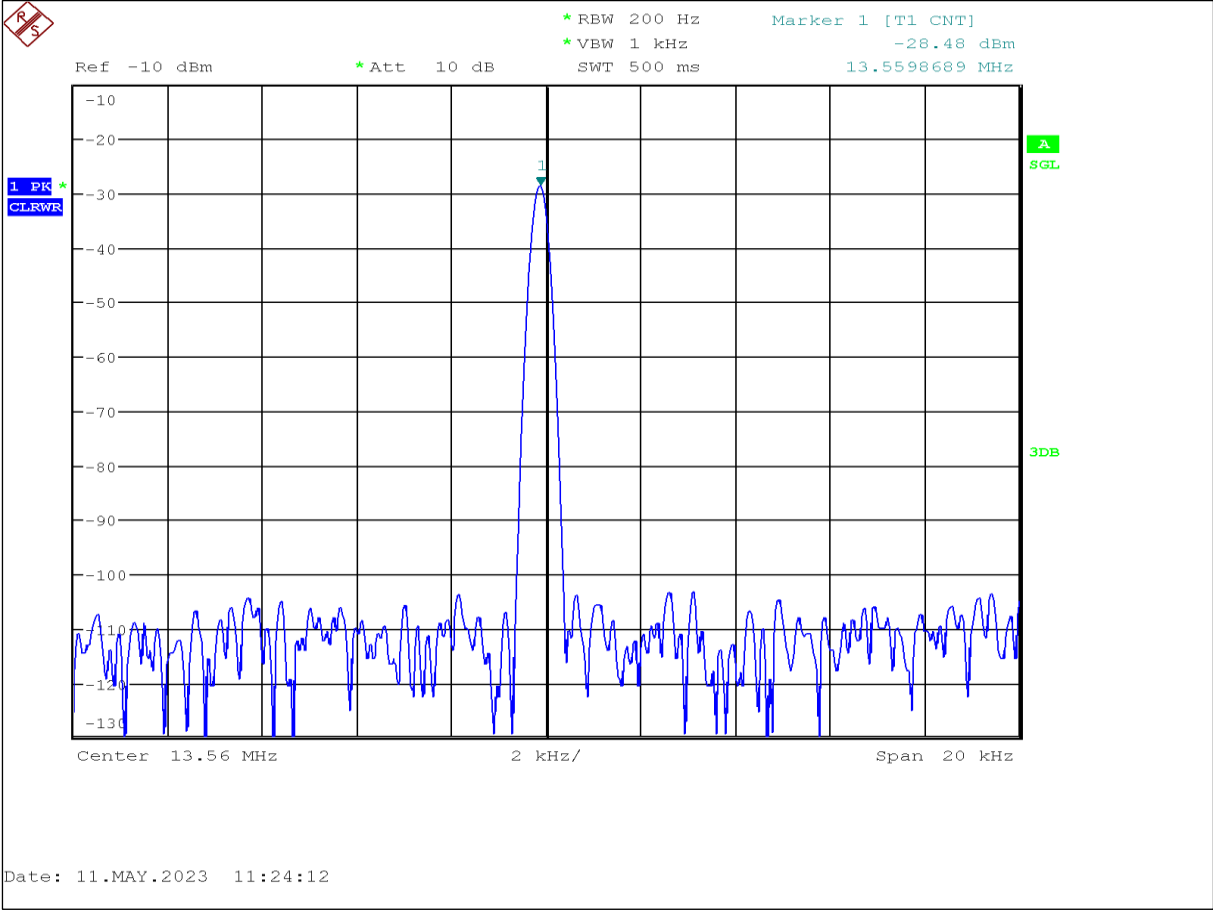
D006_FreqE__Vnom_T50_1



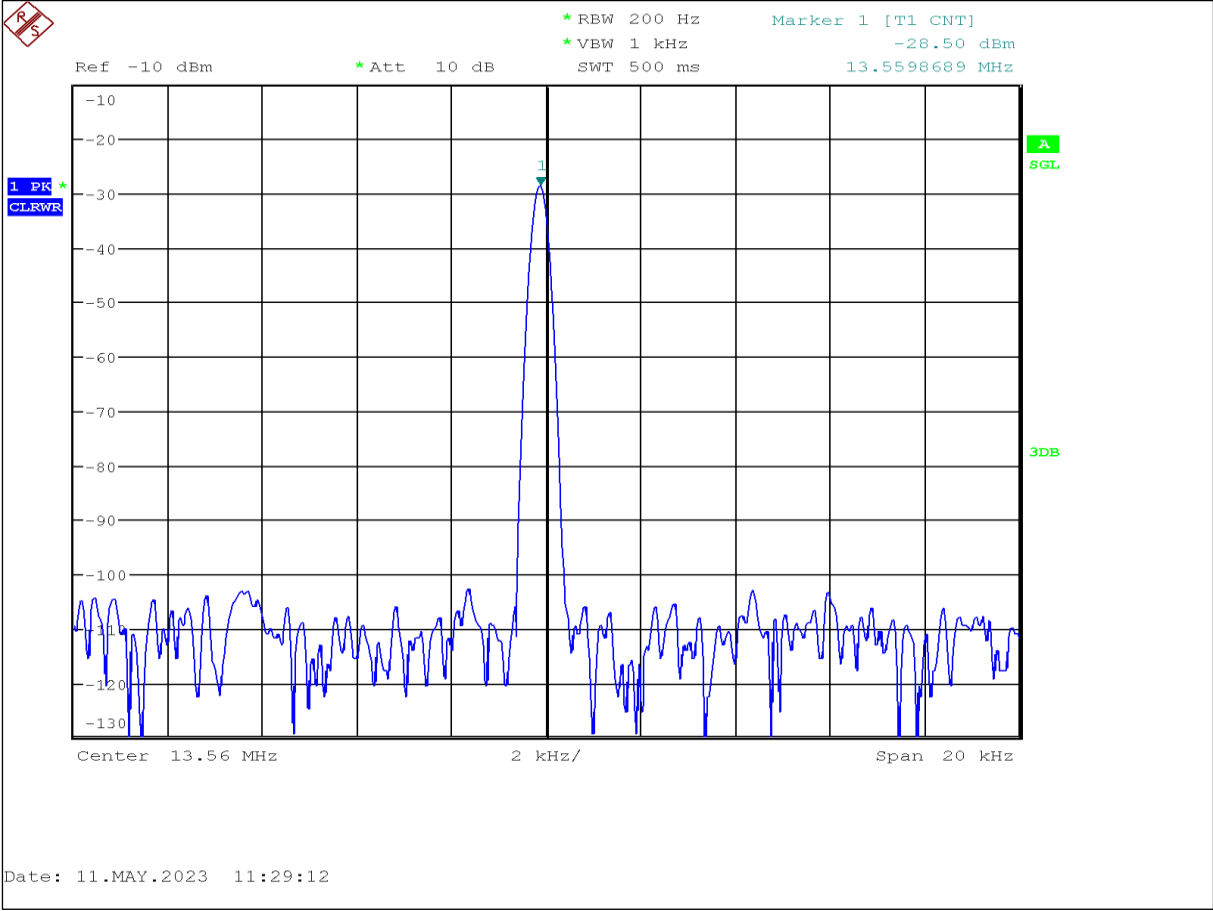
D006_FreqE__Vnom_T50_2



D006_FreqE__Vnom_T50_3

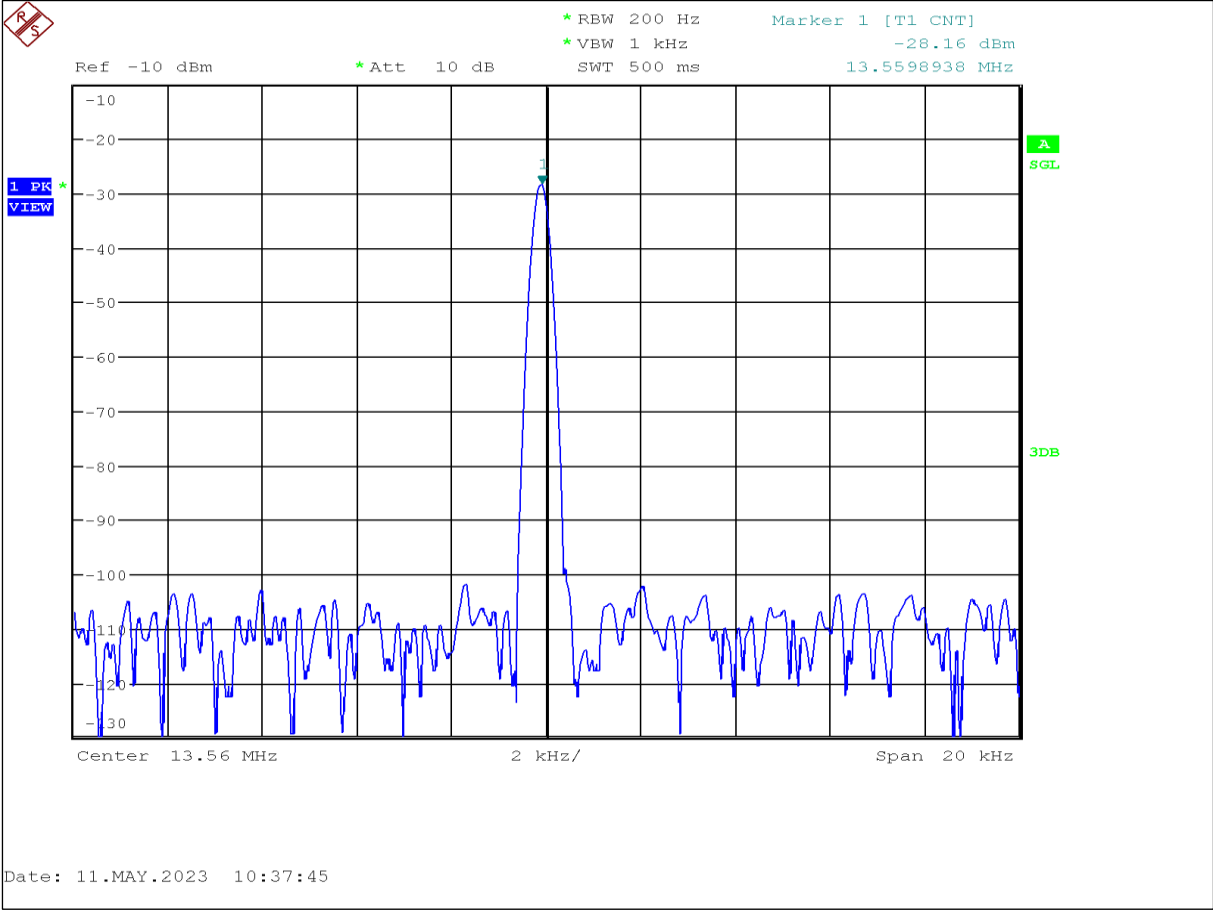


D006_FreqE__Vnom_T50_4

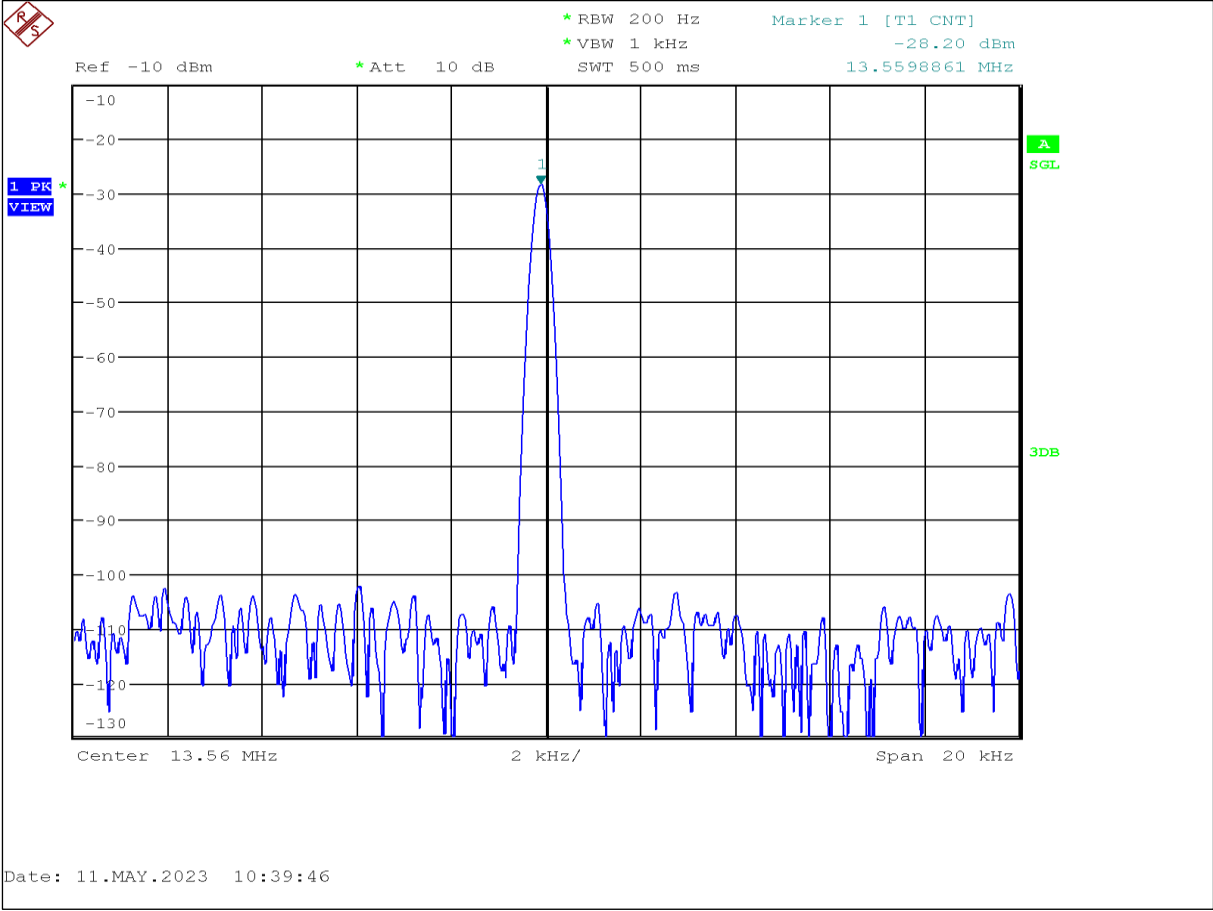


1.6.6 Extreme conditions / +40degree

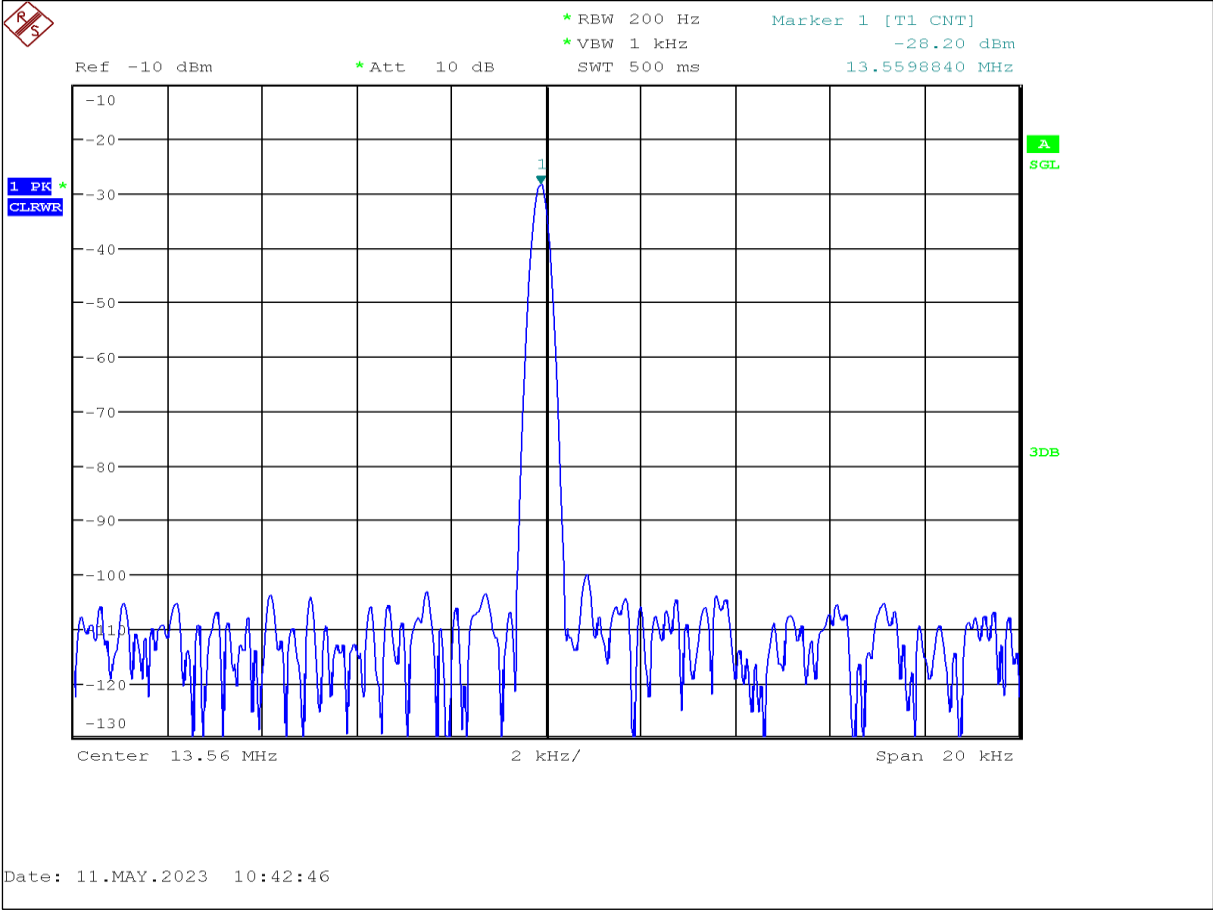
D005_FreqE__Vnom_T40_1



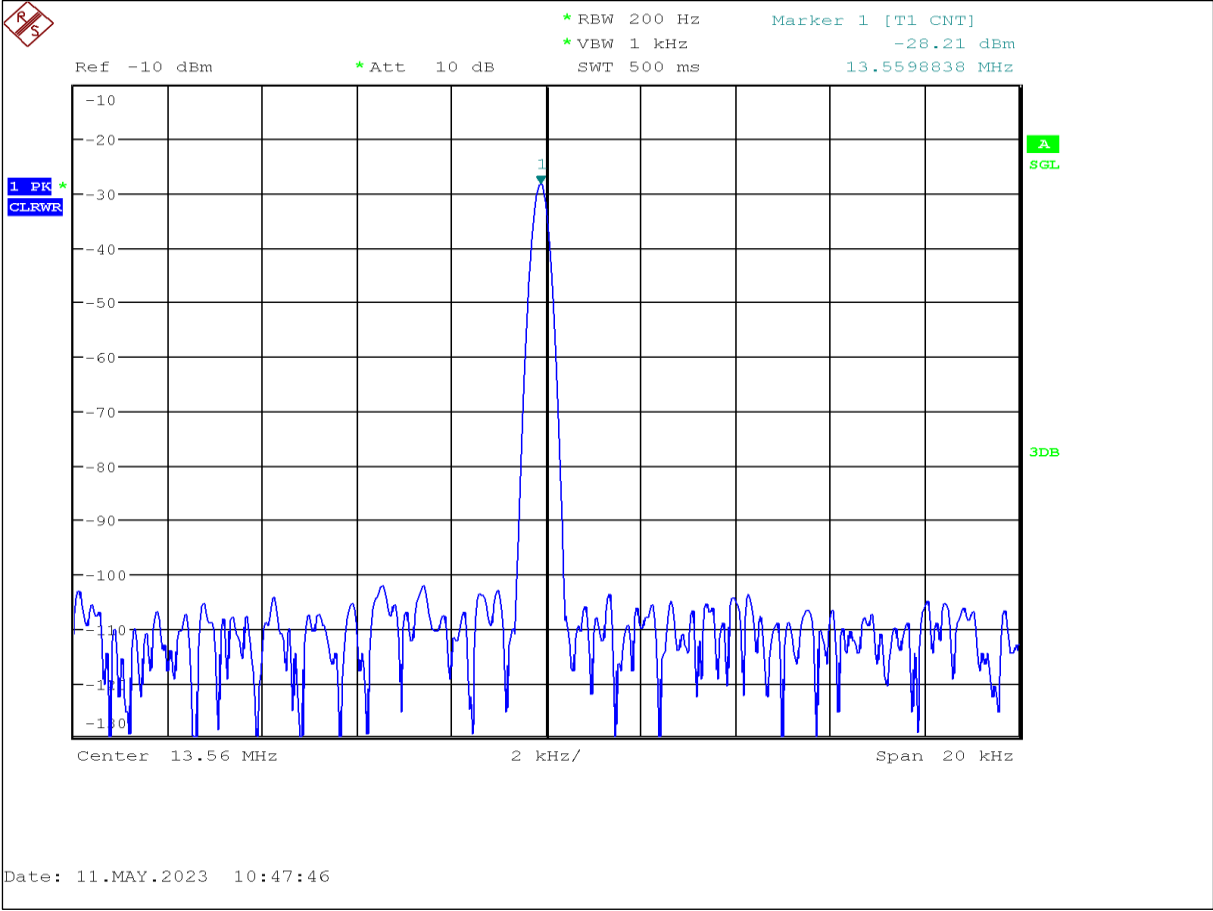
D005_FreqE__Vnom_T40_2



D005_FreqE__Vnom_T40_3

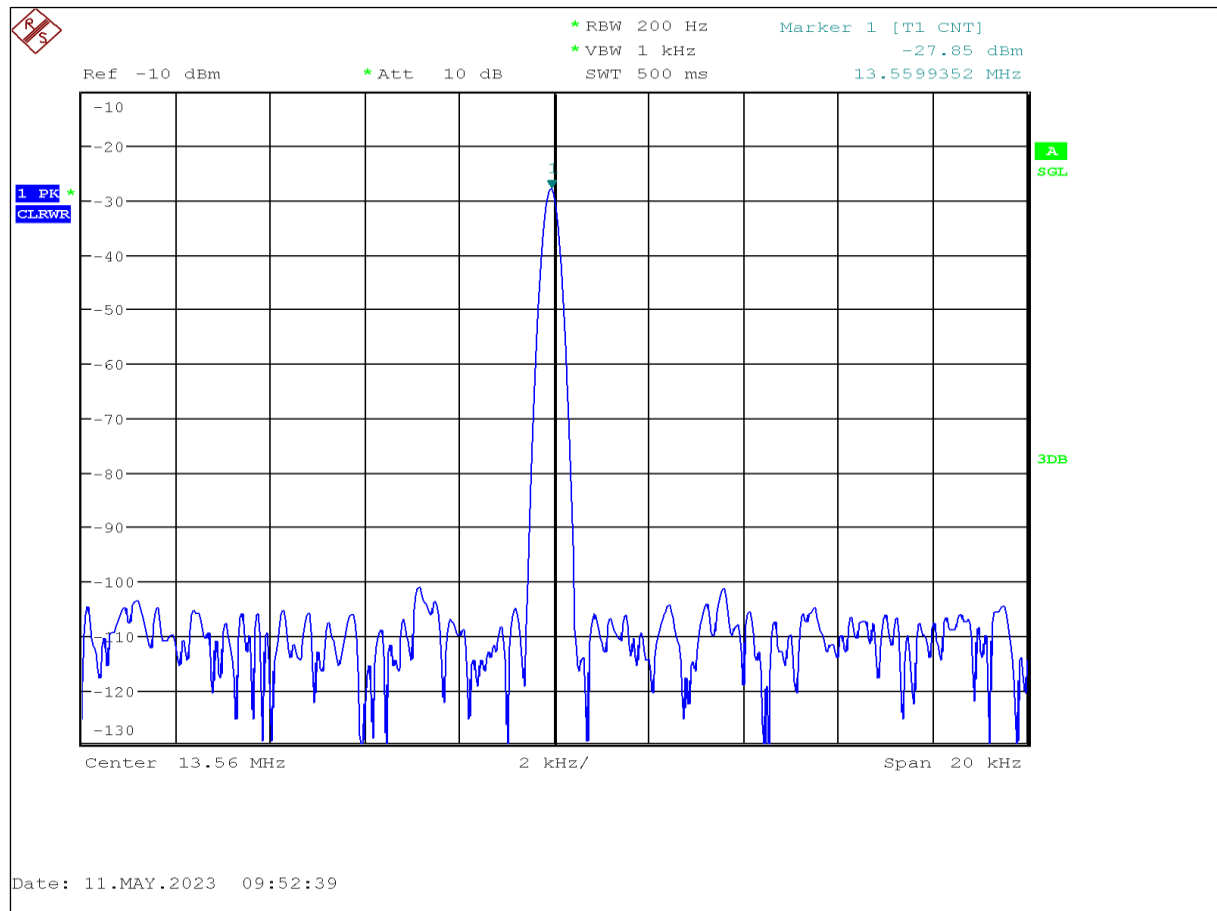


D005_FreqE__Vnom_T40_4

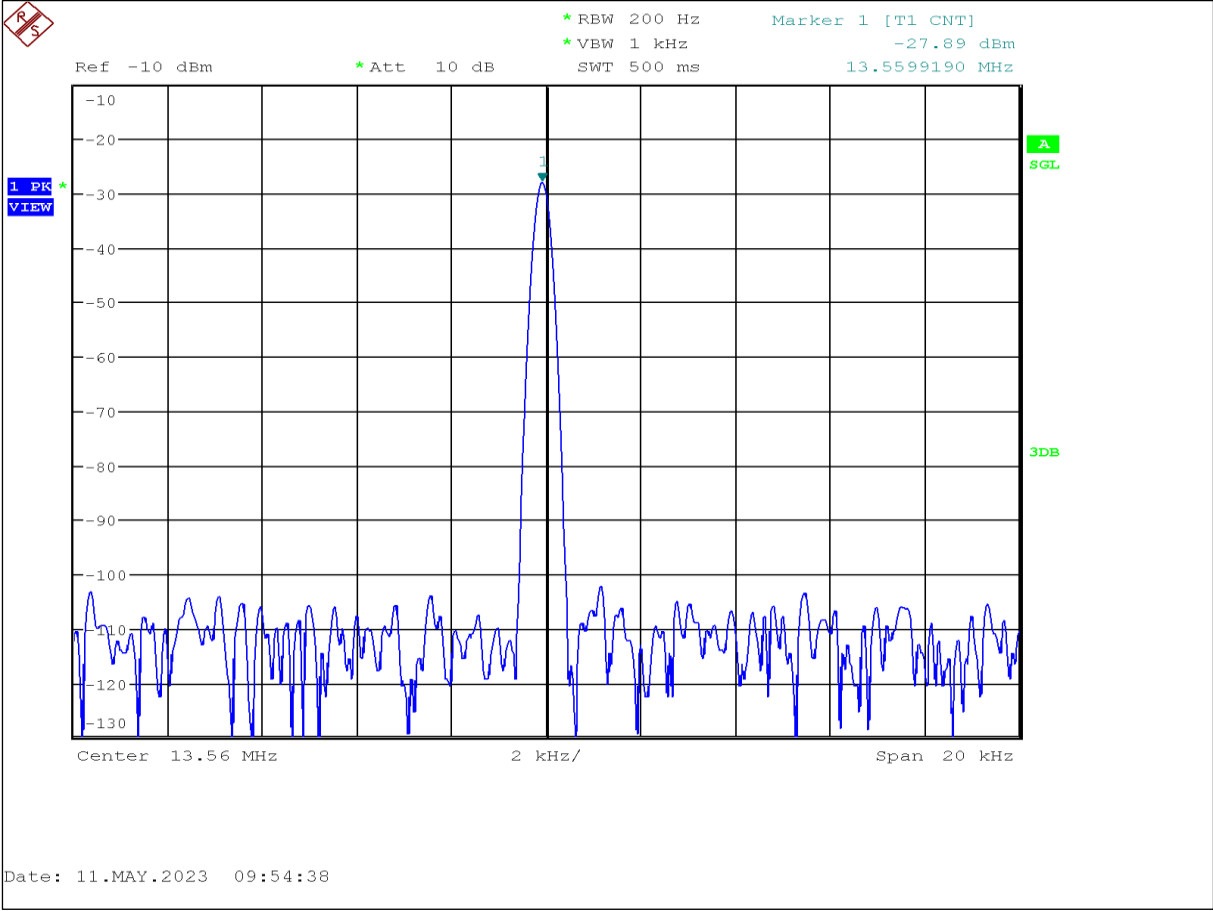


1.6.7 Extreme conditions / +30degree

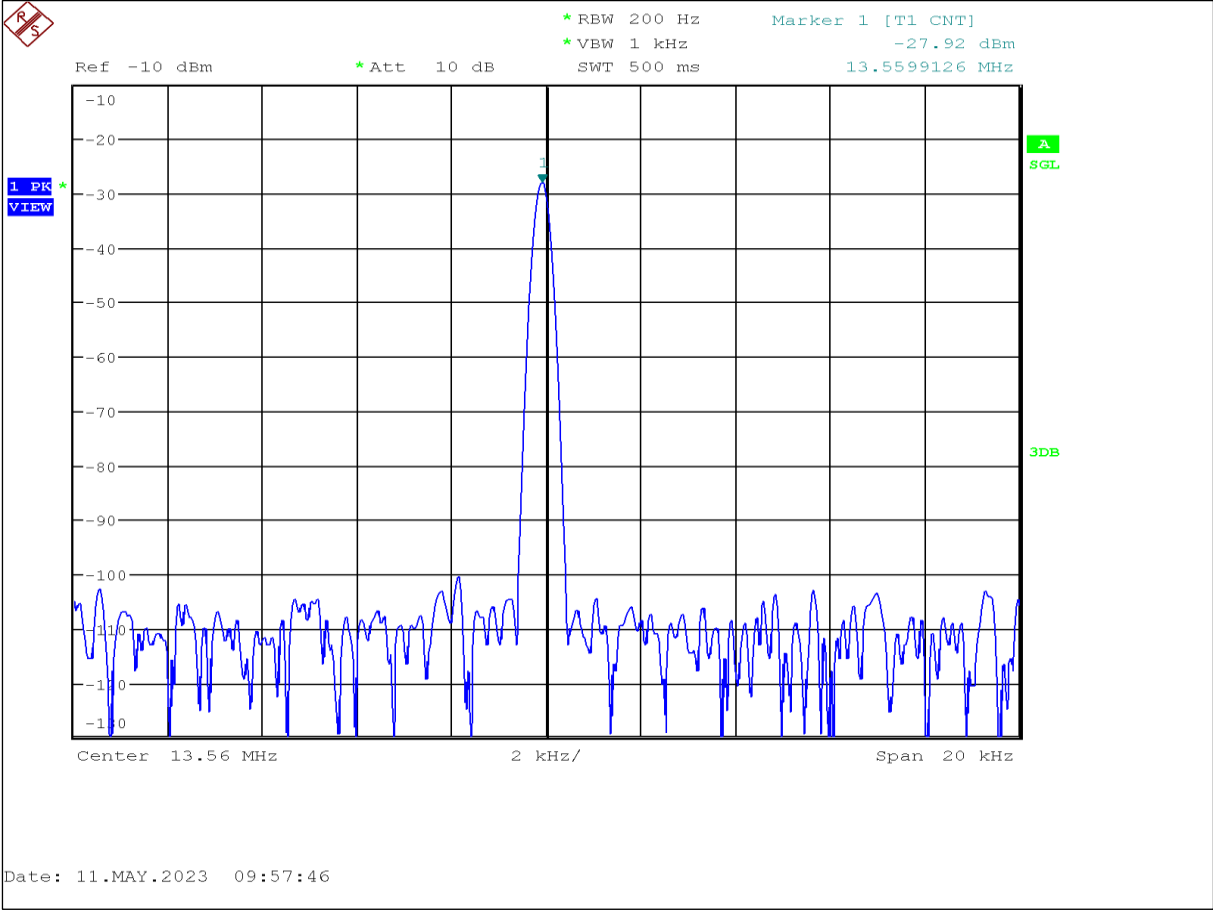
D004_FreqE__Vnom_T30_1



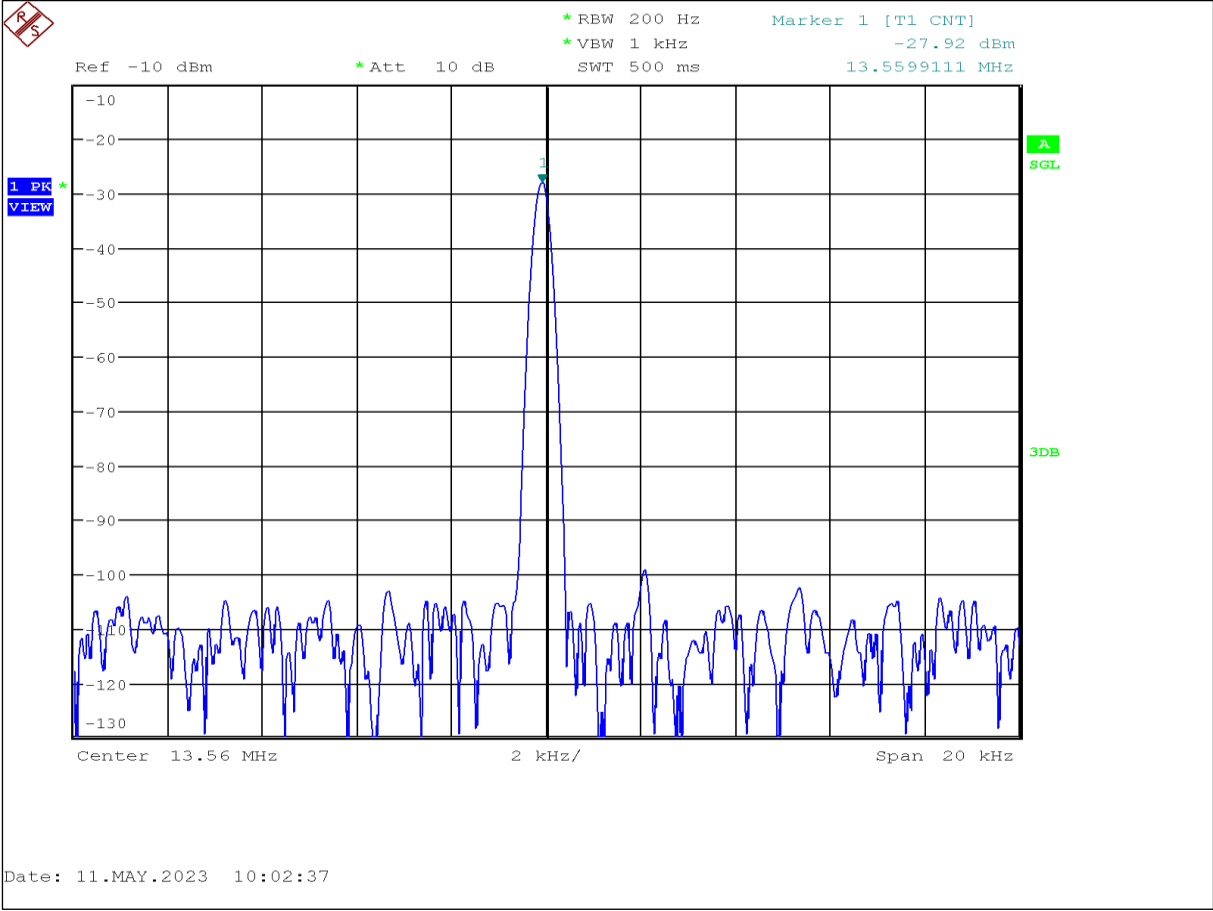
D004_FreqE__Vnom_T30_2



D004_FreqE__Vnom_T30_3

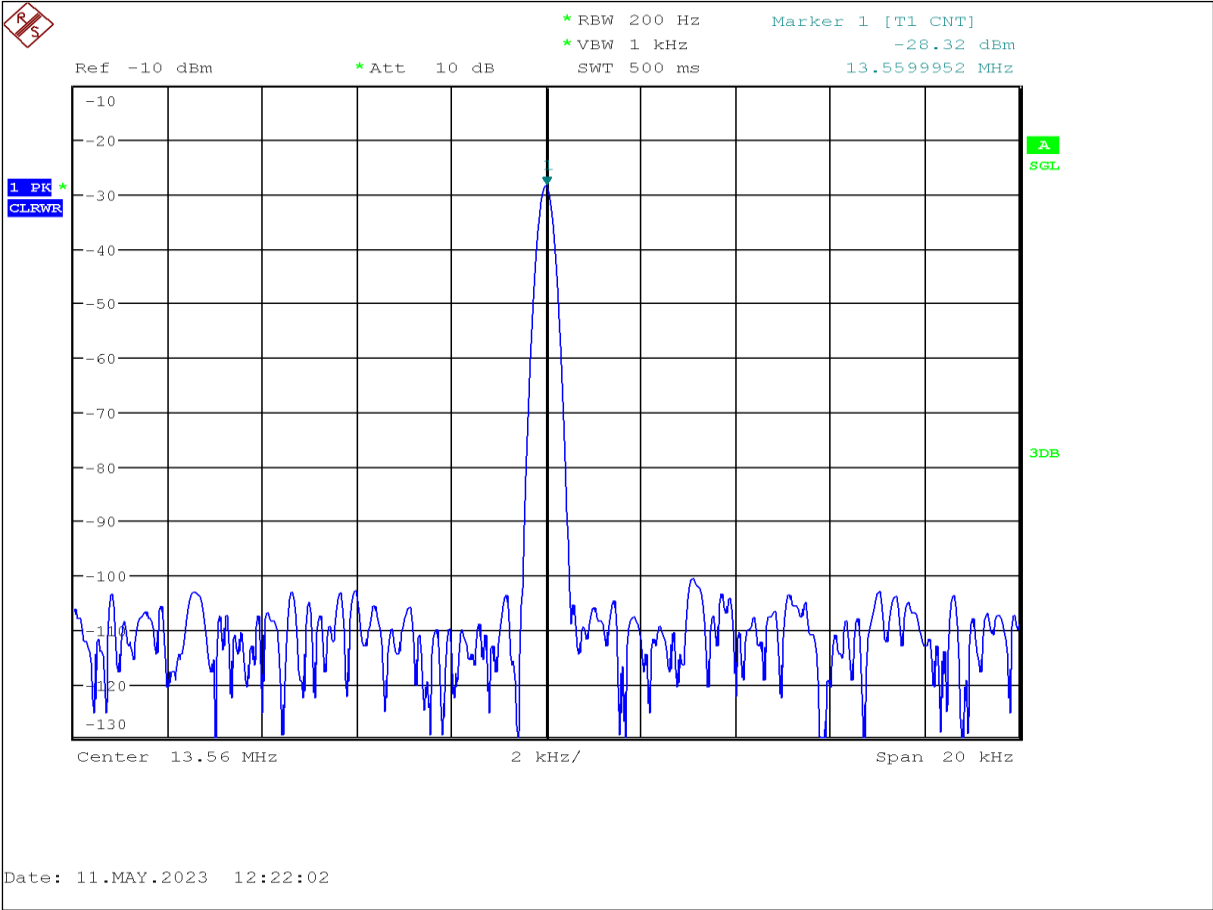


D004_FreqE__Vnom_T30_4

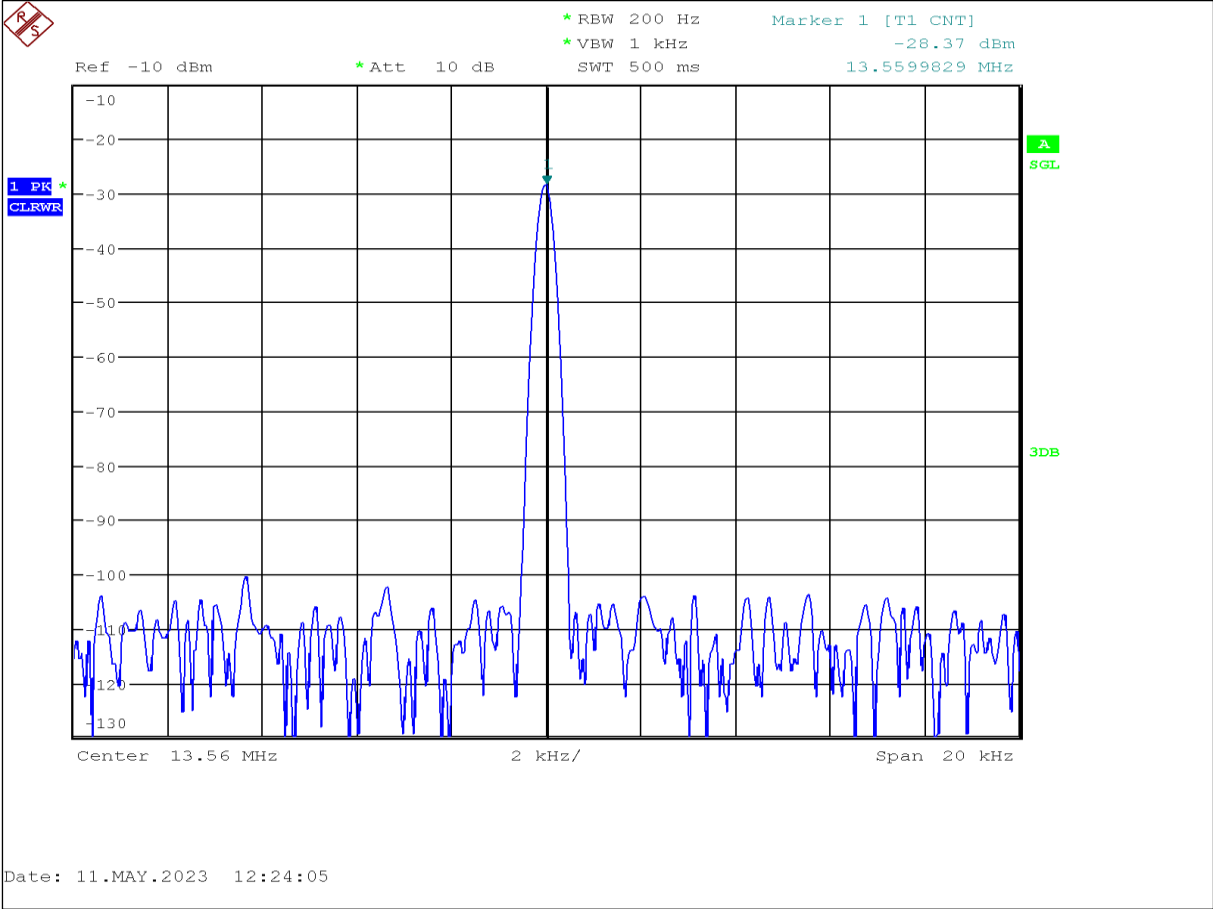


1.6.8 Extreme conditions / +10degree

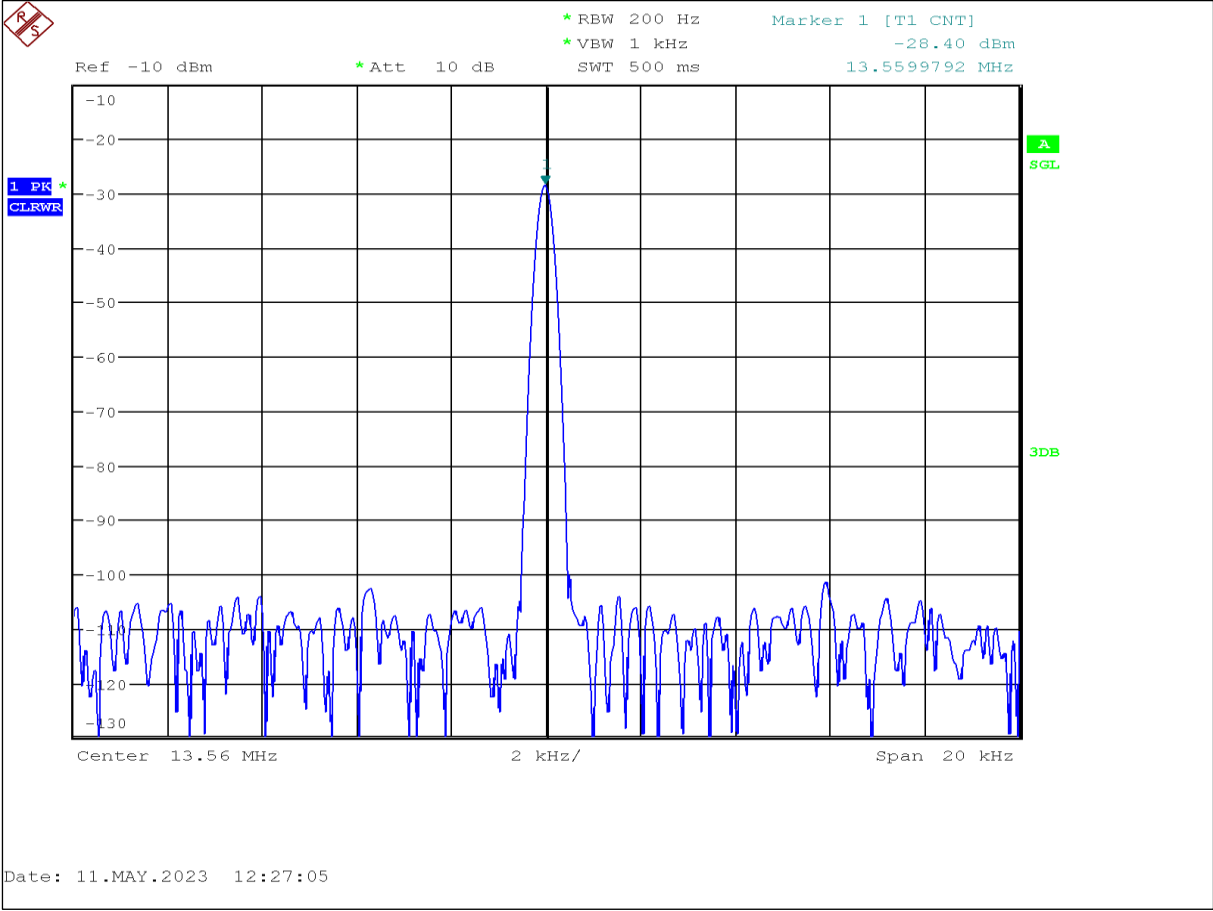
D007_FreqE__Vnom_T10_1



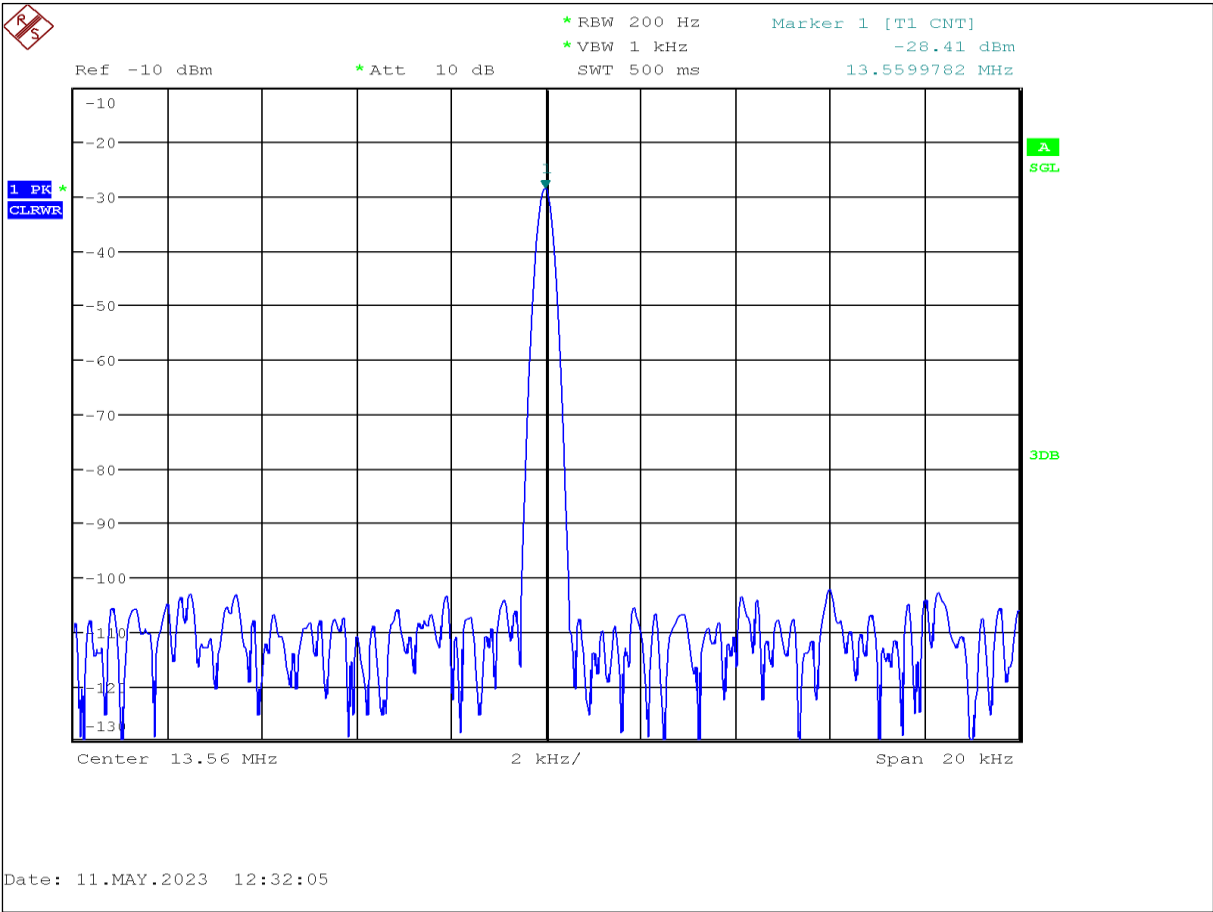
D007_FreqE__Vnom_T10_2



D007_FreqE__Vnom_T10_3

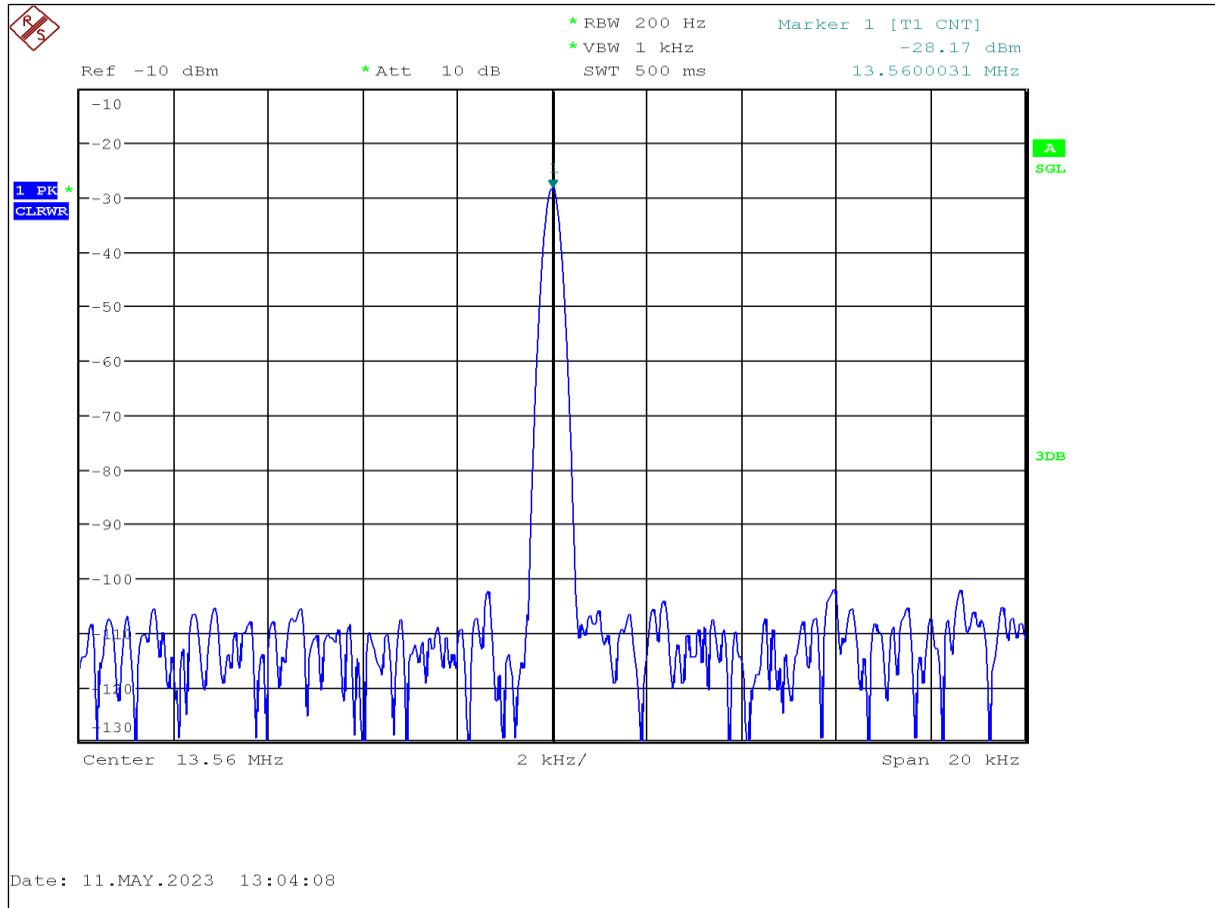


D007_FreqE__Vnom_T10_4

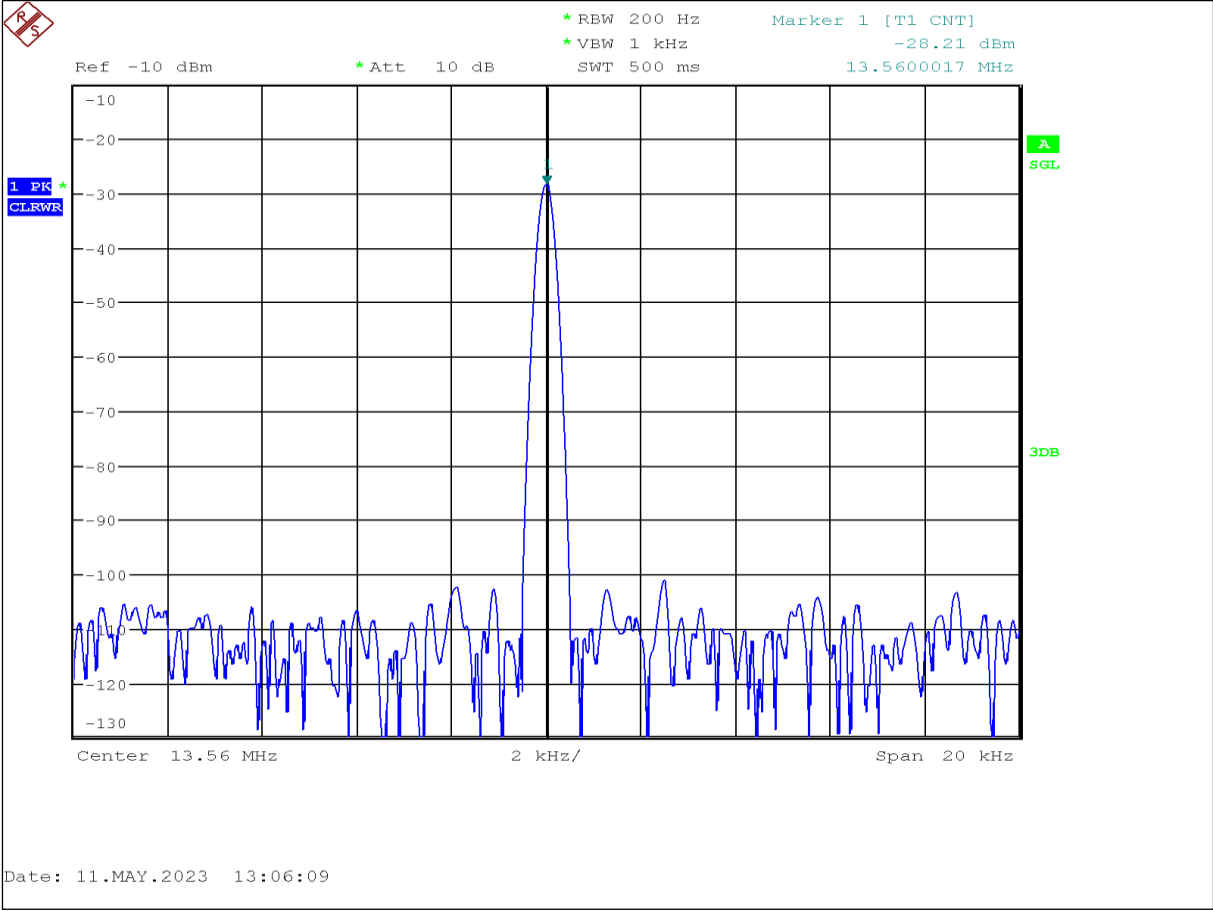


1.6.9 Extreme conditions / 0degree

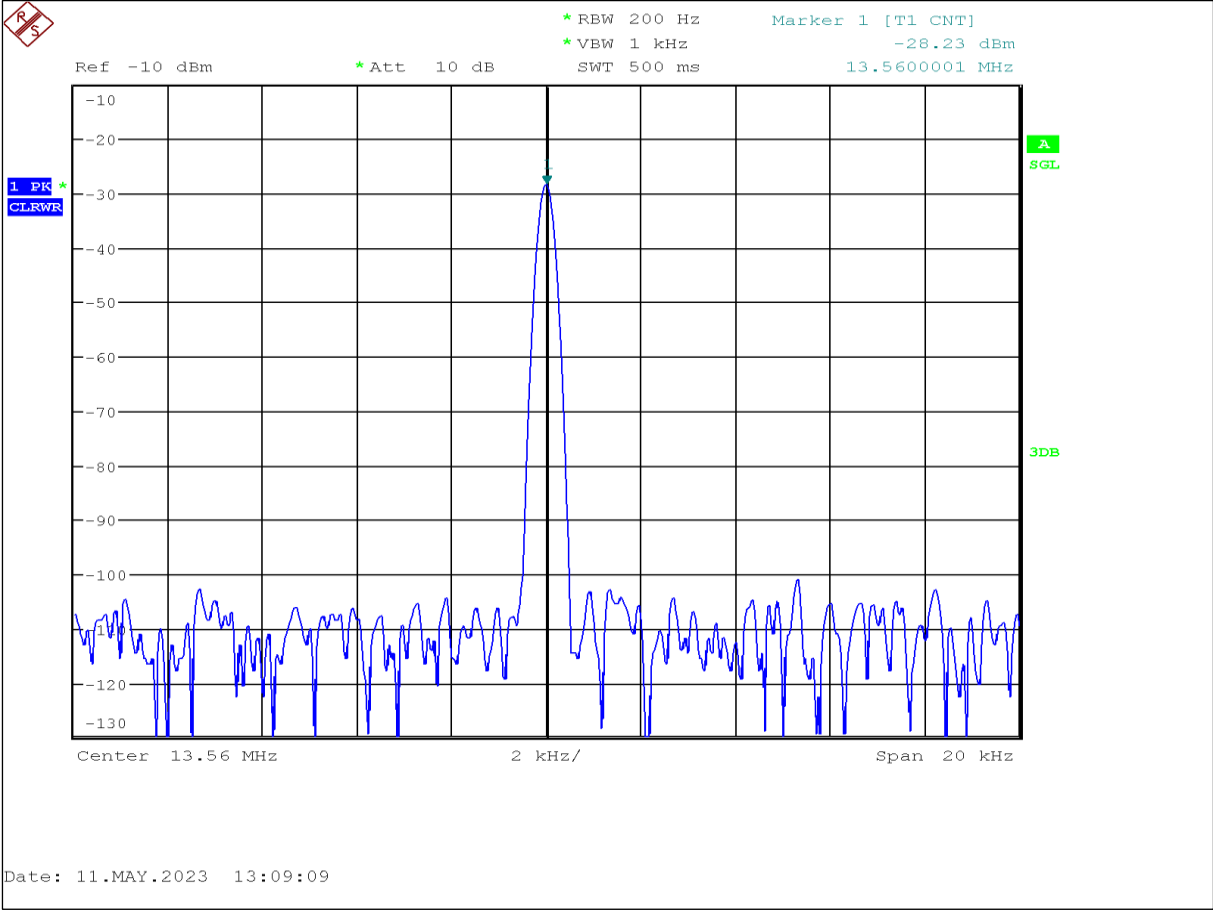
D008_FreqE__Vnom_T0_1



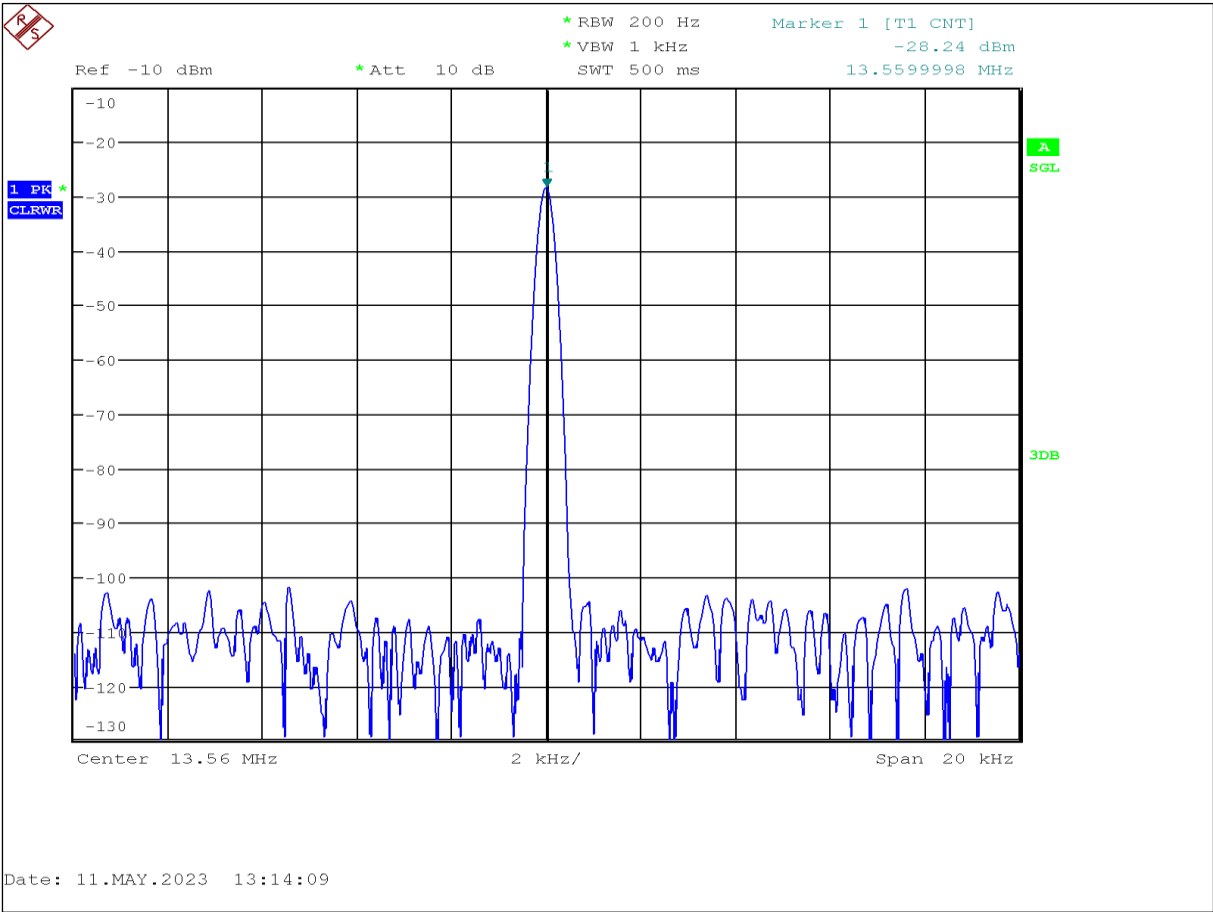
D008_FreqE__Vnom_T0_2



D008_FreqE__Vnom_T0_3



D008_FreqE__Vnom_T0_4



End Of Annex 1