

## CERTIFICATE OF COMPLIANCE

### FCC PART 15C Certification

<b>Applicant Name:</b>	<b>Date of Testing</b>
Milre Systek CO., LTD.	March 18, 2013 to March 30, 2013
	<b>Test Site/Location</b>
<b>Address:</b>	BWS TECH Inc. #611-1 Maesan-Ri, Mohyeon-Myeon, Yongin-Si, Gyeonggi-Do 449-853, Korea
9F 201 dong Chunui Technopark II, Chuni-dong, Wonmi-Gu, Bucheon City, Kyeonggi-Do, Korea (zip: 420-857)	<b>Test Report No.:</b> BWS-13-RF-0002
	<b>BWS FRN:</b> 00099636881
<b>FCC ID: SM4MI-6300S</b> <b>APPLICANT: Milre Systek CO., LTD.</b>	

<b>Model(s):</b>	MI-6300S
<b>EUT Type:</b>	Digital Door Lock
<b>Frequency Range:</b>	13.56 MHz
<b>Modulation Type</b>	ASK
<b>FCC Classification:</b>	Low Power Communications Device Transmitter(DXX)
<b>FCC Rule Part(s):</b>	FCC Part 15 Subpart C

#### Engineering Statement:

The measurements shown in this report were made in accordance with the procedures indicated. And the emissions from this equipment were found to be within the limits applicable. I assume full responsibility for the accuracy and completeness of these measurements, and for the qualifications of all persons taking them.

**BWS TECH Inc.** Certifies that no party to this application has been denied FCC benefits pursuant to section 5301 of the Anti-Drug Abuse Act of 1998, 21 U.S.C. 862

.....  
(Date) 4/02/2013



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Tested by **Cheol-Ho, Lee**

.....  
(Date) 4/02/2013



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Reviewed by **Jung-Sik, Song**

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# FCC TEST REPORT

**Scope** – Measurement and determination of electromagnetic emission(EME) of radio frequency devices including intentional radiators and/or unintentional radiators for compliance with the technical rules and regulations of the U.S Federal Communications Commission(FCC)

## 1. General Information

### Applicant

**Company Name** : Milre Systek CO., LTD.  
**Company Address** : 9F 201 dong Chunui Technopark II, Chunui-dong,  
Wonmi-Gu, Bucheon City, Kyoenggi-Do, Korea(zip:  
420-857)  
**Phone/Fax** : Tel No. : +82-32-623-0341~6 Fax No. : +82-32-623-0340

### Manufacturer

**Company Name** : Milre Systek CO., LTD.  
**Company Address** : 9F 201 dong Chunui Technopark II, Chunui-dong,  
Wonmi-Gu, Bucheon City, Kyoenggi-Do, Korea(zip:  
420-857)  
**Phone/Fax** : Tel No. : +82-32-623-0341~6 Fax No. : +82-32-623-0340

- **EUT Type** :Digital Door Lock
- **Model Name** :MI-6300S
- **FCC ID** :SM4MI-6300S
- **S/N** :Prototype
- **Freq. Range** : 13.56 MHz
- **Number of Channels** :Single Channel
- **Modulation Method** :ASK
- **FCC Rule Part(s)** :Part 15 Subpart C
- **Test Procedure** :ANSI C63.4-2009
- **Dates of Tests** :March 18, 2012 to April 01, 2013
- **Place of Tests** :BWS TECH Inc.(FCC Registration Number : 553281)  
#611-1 Maesan-Ri, Mohyeon-Myeon, Cheoin-Gu, Yongin-Si,  
Gyeonggi-Do 449-853, Korea  
TEL: +82 31 333 5997 FAX: +82 31 333 0017
- **Test Report No.** :BWS-13-RF-0002

## 2. Description of Test Facility

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The measurement for radiated emission test were conducted at the open area test site of BWS TECH Inc. Measurement for conducted emission test were practiced at the semi EMC Anechoic Chamber test site of BWS TECH Inc. facility located at #611-1 Maesan-Ri, Mohyeon-Myeon, Cheoin-Gu, Yongin-Si, Gyeonggi-Do 449-853, Korea. The site is constructed in conformance with the requirements of the ANSI C63.4-2009 and CISPR Publication 16. The BWS TECH measurement facility has been filed to the Commission with the FCC for 3 and 10-meter site configurations. Detailed description of test facility was found to be in compliance with the requirements of Section 2.948 FCC Rules according to the ANSI C63.4-2009 and registered to the Federal Communications Commission (Registration Number : 553281 ).

The measurement procedure described in American National Standard for Method of Measurement of Radio-Noise Emission from Low-Voltage Electrical and Electronic Equipment in the Range of 9kHz to 40GHz (ANSI C.63.4-2009) was used in determining radiated emissions from the Mirle Systek CO., LTD.. Model : MI-6300S

### 3. Product Information

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#### 3.1 Equipment Description

The Equipment Under Test (EUT) is RF transmitter by the CanTops.  
Model : MI-6300S. (FCC ID :SM4MI-6300S).

#### 3.2 General Specification

The system specifications are subject to change without notice. For detailed system specifications, refer to the product catalog.

1. Relative Humidity	5% ~ 95%
2. Storage Temperature	-40°C ~ 80°C
3. Operation Temperature	-20°C ~ 60°C
4. Output Frequency	13.56MHz
5. Protocol	ISO/IEC 14443 A/B
6. Modulation Type	ASK 8~100%
7. Oscillation Method	X-TAL
8. Channel	1
9. Outdoor body	76(W) x 316(H) x 28(D)
10. Indoor body	70(W) x 310(H) x 29.5(D)
11. Mortise Lock	123(W) x 109(H) x 24.5(D)
12. Power source	DC 6V("AA"Size Battery x 8)

#### 4. Summary of Test Results

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TEST REQUIREMENTS	FCC Paragraph	Result
5.1 Radiated In-Band Emissions	§15.225(a),(b),(c)	Pass
5.2 Radiated Out-of-Band Emissions	§15.225(d) §15.209	Pass
5.3 Frequency Tolerance	§15.225(e)	Pass
5.4 Occupied Bandwidth	§2.1049	Pass

## 5. Test Data

### 5.1 Radiated In-Band Emissions

Radiated emissions of the band 13.110-14.010 MHz were measured with a bandwidth of 9 kHz according to the methods defines in FCC Part 15.225(a), 15.225(b), 15.225(c). The EUT was placed on a nonmetallic stand in the EMI Chamber, 0.8 meter above the ground plane. The interface cables and equipment positions were varied within limits of reasonable applications to determine the positions producing maximum radiated emissions.

#### 5.1.1 Test Condition

Frequency Range of Test : 13.110 to 14.010 MHz  
Test Standard : FCC Part 15.225(a), 15.225(b), 15.225(c)  
Test Environment : 21 °C, 37 %

#### 5.1.2 Test Limit

Frequency Range(MHz)	Limit(μV/m at 30m)	Limit(dBμV/m at 30m)	Limit(dBμV/m at 3m)
13.553–13.567	15,484	84.00	124
13.410–13.553, 13.567–13.710	334	50.47	90.47
13.110–13.410, 13.710–14.010	106	40.51	80.51

### Distance Correction for Measurements Below 30 MHz – Part 15.31

Radiated measurements were performed at a distance closer than 300 meters and 30m as required, according to Part 15.209. Therefore a correction factor was applied to account for propagation loss at the specified distance. The propagation loss was determined by using the square of an inverse linear distance extrapolation factor (40dB/decade) according to 15.31. A sample calculation of the distance correction factor is shown below for limits expressed at a 300m measurement distance and a 30m measurement distance.

Limits 9 kHz to 490 kHz

Distance correction factor (300m Specified Test Distance) =  $40 \cdot \log(\text{Test Distance}/300)$   
=  $40 \cdot \log(3/300)$   
= - 80 dB

Limits 490 kHz to 30 MHz

Distance correction factor (30m Specified Test Distance) =  $40 \cdot \log(\text{Test Distance}/30)$   
=  $40 \cdot \log(3/30)$   
= - 40 dB

### 5.1.3 Test Result of Radiated In-Band Emissions

Test Result (Measurement Value + ANT Factor + Cable Loss)

**Radiated Emission Test Data**

Frequency Range(MHz)	Frequency(MHz)	ANT Factor(dB)	Cable Loss(dB)	Measurement Value (dBμV/m at 3m)	Test Result(dBμV/m at 3m)	Limit(dBμV/m at 3m)
13.110-13.410	13.405	19.60	1.50	1.60	22.70	80.51
13.410-13.553	13.546	19.60	1.50	1.24	22.34	90.47
13.553-13.567	13.562	19.60	1.50	26.33	47.43	124.00
13.567-13.710	13.583	19.60	1.50	0.86	21.96	90.47
13.710-14.010	13.788	19.60	1.50	1.42	22.52	80.51



## 5.2 Radiated Out-Band Emissions

Radiated emissions of the band(9-150 kHz, 0.15-30 MHz, 30-1000MHz) were measured with a bandwidth(200Hz, 9 kHz, 120kHz) according to the methods defines in FCC Part 15.225(d), 15.209. The EUT was placed on a nonmetallic stand in the EMI Chamber, 0.8 meter above the ground plane. The interface cables and equipment positions were varied within limits of reasonable applications to determine the positions producing maximum radiated emissions.

### 5.2.1 Test Condition

Frequency Range of Test : 9 kHz to 1000 MHz

Test Standard : FCC Part 15.225(d), 15.209

Test Environment : 20 °C, 41 %

### 5.2.2 Test Standard

Frequency Range (MHz)	Field Strength (uV/m)	Distance (m)
0.009 ~ 0.490	2400 / F	300
0.490 ~ 1.705	24000 / F	30
1.705 ~ 30	30	30
30 ~ 88	100	3
88 ~ 216	150	3
216 ~ 960	200	3
Above 960	500	3

### Distance Correction for Measurements Below 30 MHz – Part 15.31

Radiated measurements were performed at a distance closer than 300 meters and 30m as required, according to Part 15.209. Therefore a correction factor was applied to account for propagation loss at the specified distance. The propagation loss was determined by using the square of an inverse linear distance extrapolation factor (40dB/decade) according to 15.31. A sample calculation of the distance correction factor is shown below for limits expressed at a 300m measurement distance and a 30m measurement distance.

Limits 9 kHz to 490 kHz

$$\begin{aligned}
 \text{Distance correction factor (300m Specified Test Distance)} &= 40 * \text{Log (Test Distance/300)} \\
 &= 40 * \text{Log (3/300)} \\
 &= - 80 \text{ dB}
 \end{aligned}$$

Limits 490 kHz to 30 MHz

$$\begin{aligned}
 \text{Distance correction factor (30m Specified Test Distance)} &= 40 * \text{Log (Test Distance/30)} \\
 &= 40 * \text{Log (3/30)} \\
 &= - 40 \text{ dB}
 \end{aligned}$$

### 5.2.3 Test Result of Radiated Emission

Test Result (Measurement Value + ANT Factor + Cable Loss)

**Radiated Emission Test Data (Below 30 MHz)**

Frequency(MHz)	Test Result(dBμV/m at 3m)	Limit(dBμV/m at 3m)
0.010	58.50	127.60
0.202	37.83	102.50
16.824	27.28	69.54

**Radiated Emission Test Data (Above 30 MHz)**

Frequency(MHz)	Test Result(dBμV/m at 3m)	Limit(dBμV/m at 3m)
81.35	31.40	40.00
108.48	29.70	43.52
135.60	31.20	43.52
216.98	29.10	46.02

## 5.3 Frequency Tolerance

The frequency tolerance of the carrier signal shall be maintained within  $\pm 0.01\%$  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.

### 5.3.1 Test Condition

Frequency Range of Limit : 13.56MHz within  $\pm 0.01\%$

Test Standard : FCC Part 15.225(e)

Test Environment : Refer to Clause 5.3.2

### 5.3.2 Test Result of Frequency Tolerance

Frequency Tolerance Test Data

Test condition	V(nom)-6.0V	V(max)-6.9V	V(min)-5.1V	Limit(MHz)
-20℃(MHz)	13.56+0.000040	13.56+0.000040	13.56+0.000040	13.56 $\pm$ 0.001356
-10℃(MHz)	13.56-0.000032	13.56-0.000032	13.56-0.000032	13.56 $\pm$ 0.001356
0℃(MHz)	13.56-0.000024	13.56-0.000024	13.56-0.000024	13.56 $\pm$ 0.001356
10℃(MHz)	13.56-0.000016	13.56-0.000016	13.56-0.000016	13.56 $\pm$ 0.001356
20℃(MHz)	13.56+0.000012	13.56+0.000012	13.56+0.000012	13.56 $\pm$ 0.001356
30℃(MHz)	13.56-0.000004	13.56-0.000004	13.56-0.000004	13.56 $\pm$ 0.001356
40℃(MHz)	13.56-0.000008	13.56-0.000008	13.56-0.000008	13.56 $\pm$ 0.001356
50℃(MHz)	13.56-0.000020	13.56-0.000020	13.56-0.000020	13.56 $\pm$ 0.001356

## 5.3 Occupied Bandwidth

The bandwidth is measured at an amplitude level reduced from the reference level by a specified ratio.

### 5.3.1 Specification

Test Standard : FCC Part 2.1049

### 5.3.2 Test Result of Occupied Bandwidth

Occupied Bandwidth Test Data

Frequency (kHz)	99% Bandwidth (Hz)	20 dB Bandwidth (Hz)
13.56 MHz	7280	8680

NOTES:

1. Peak Detector
2. RBW = VBW 300 Hz.

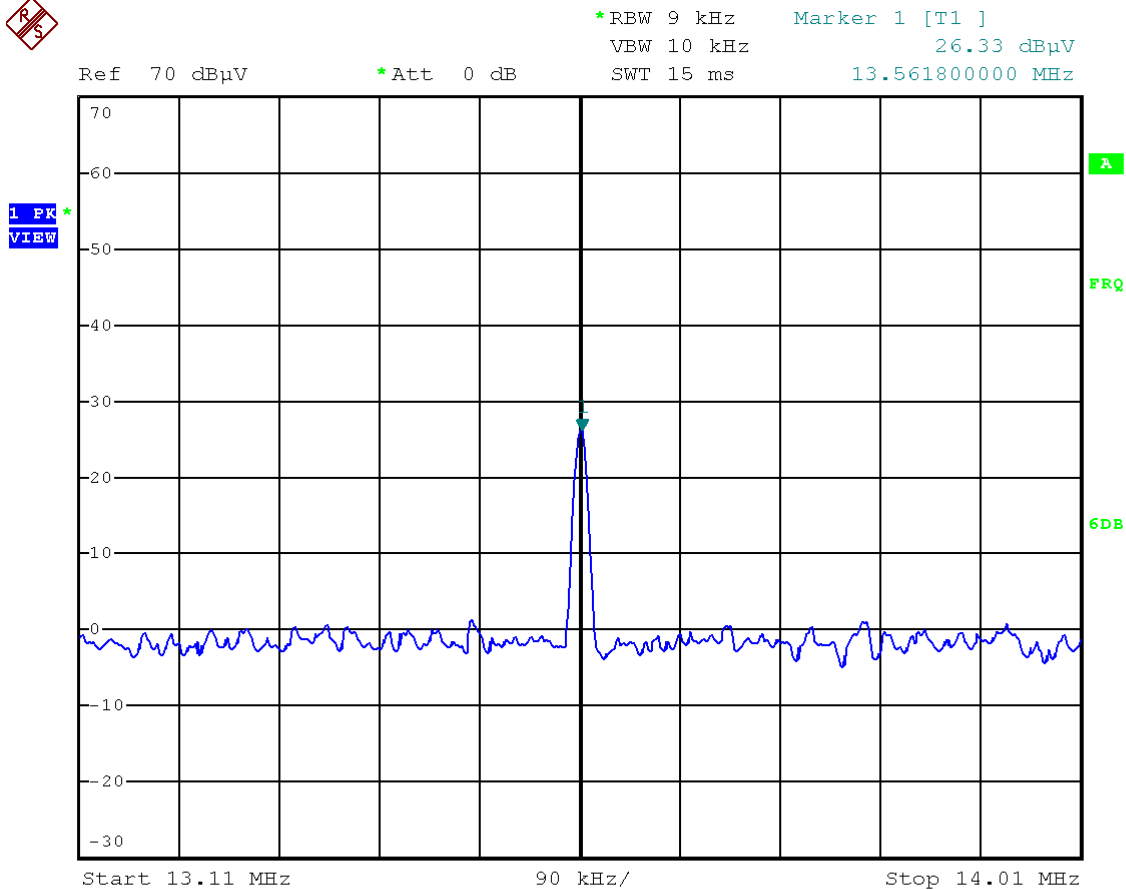
## 6. TEST EQUIPMENTS LIST

The listing below denotes the test equipments utilized for the test(s).

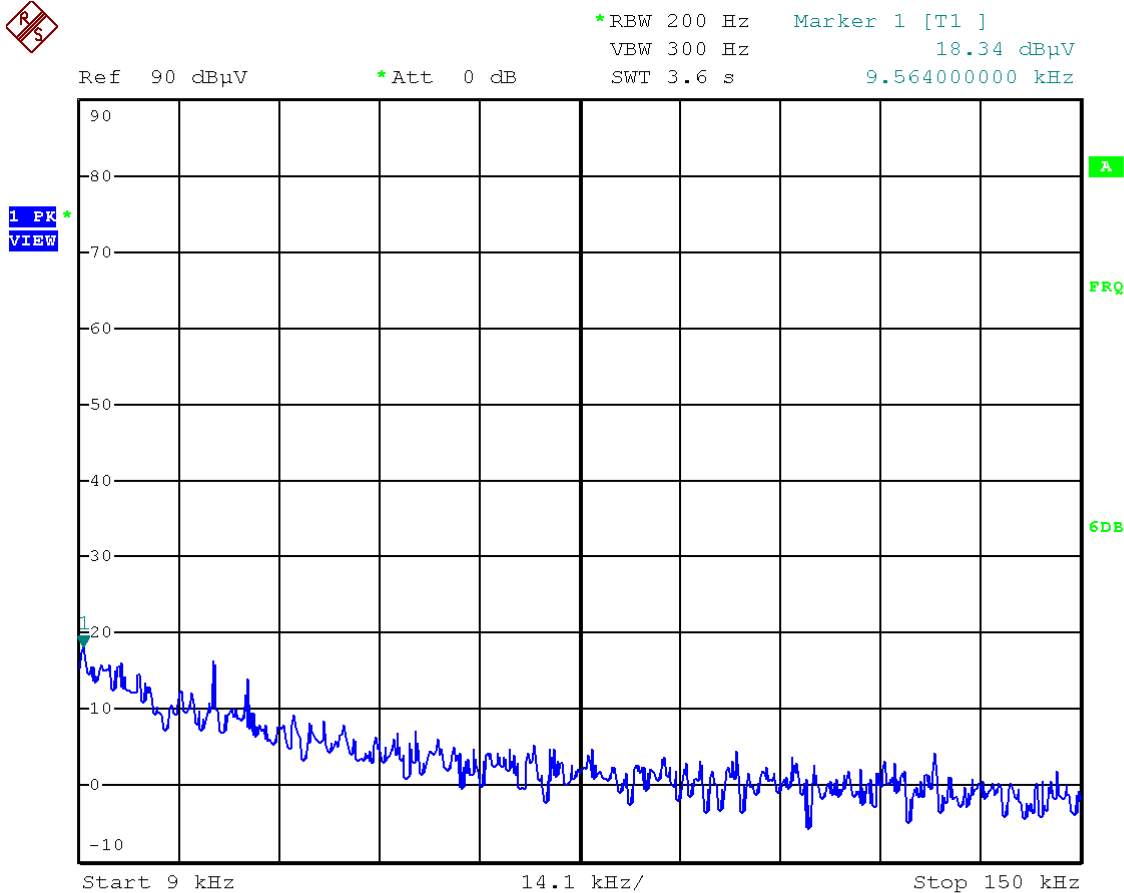
	EQUIPMENT	MODEL	MANUFACTURE	SERIAL NUMBER	Calibration Due date
1	Receiver	ESVN30	Rohde & Schwarz	832854/010	14/01/16
2	Spectrum analyzer	FSP13SE	Rohde & Schwarz	100303	13/10/22
3	Spectrum analyzer	N9020A	Agilent	US46220101	13/09/17
4	Temperature & Humidity chanber	EN-GLMP-54	Enex	N/A	13/09/13
5	Power supply	HPS-305A	HANIL T&M	2204012	13/06/25
6	AMPLIFIER	8447F	H.P	2805A02893	14/01/16
7	Bilog Antenna	VULB9160	Schwarzbeck	VULB9160-3052	13/06/29
8	Open Site Cable_0.5m	RG 214/U	SHUNER SWITZERLAND	509794	N/A
9	Open Site Cable_35m	SUCOTEST 18A	Hubersunhner	8400/18A	N/A
10	Antenna Master	JAC-3	대일 EMC	N/A	N/A
11	Antenna Turntable Controller	JAC-2	JAEMC	N/A	N/A
12	RF Cable_2m	Test No.1	Hubersunhner	N/A	N/A
13	RF Cable_10m	Test No.2	Hubersunhner	N/A	N/A
14	Bilog Antenna	VULB9161	Schwarzbeck	VULB9161-4067	13/09/29
15	Spectrum analyzer	E7403A	H.P	US39150108	14/01/19

## 6. TEST Plot

### 6.1 Radiated In-Band Emissions



## 6.2 Radiated Out-Band Emissions(below 30MHz)



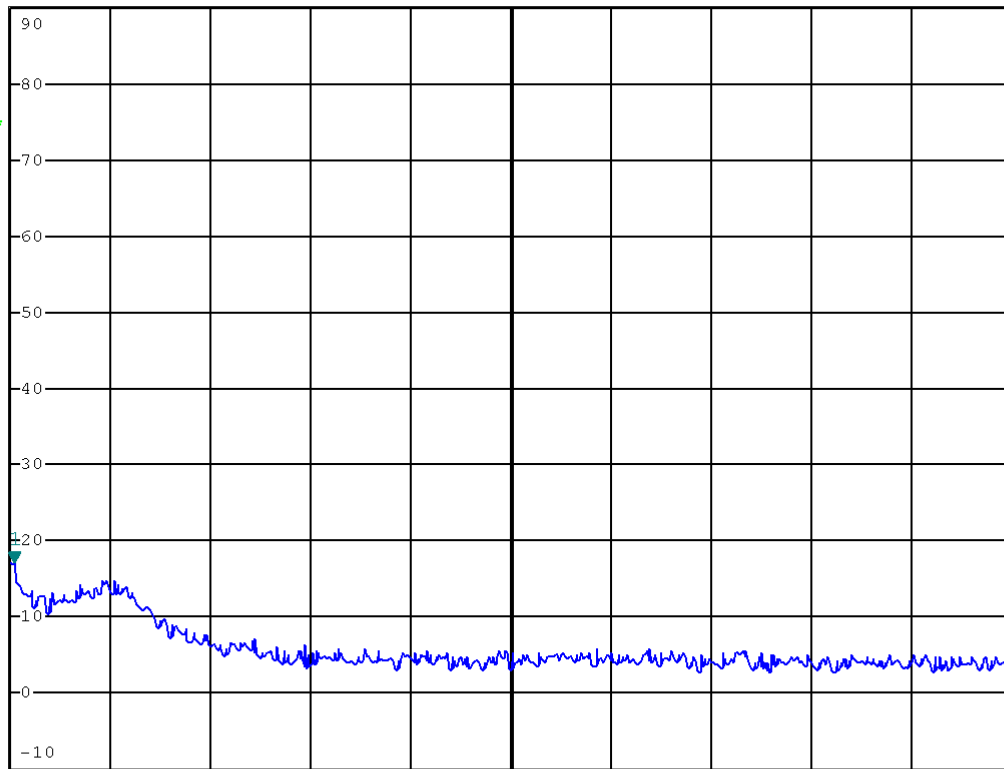


\*RBW 9 kHz Marker 1 [T1 ]  
VBW 10 kHz 17.28 dBμV  
SWT 160 ms 201.84000000 kHz

Ref 90 dBμV

\*Att 0 dB

1 FK  
VIEW



Start 150 kHz

1.296 MHz/

Stop 13.11 MHz



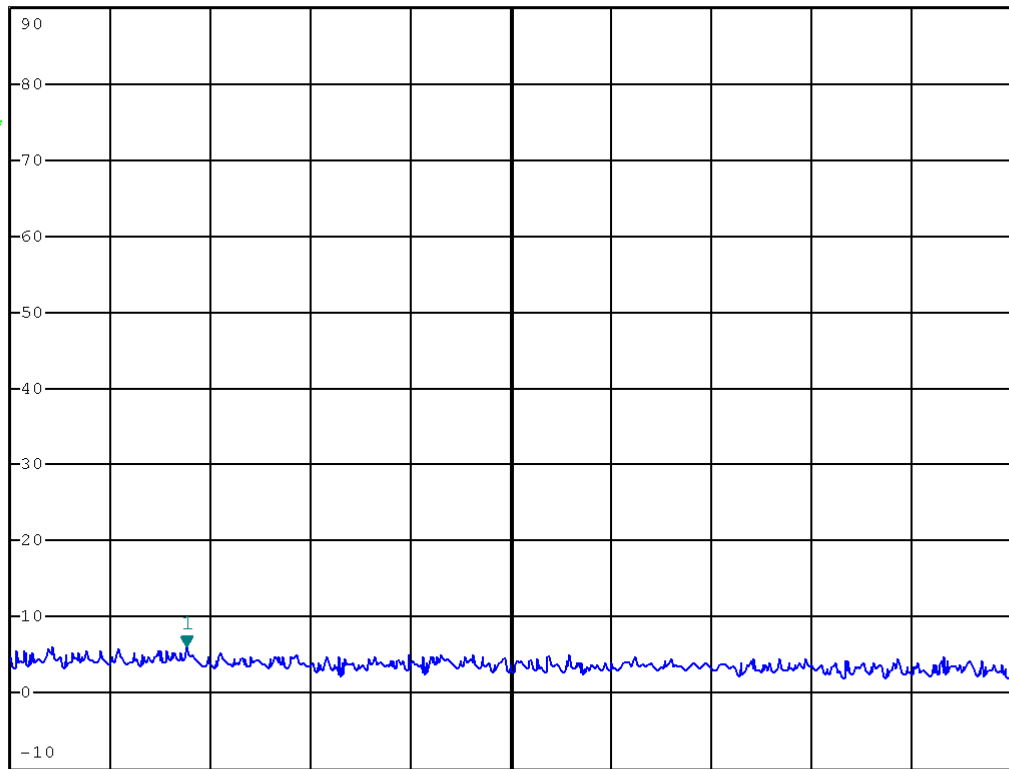


\*RBW 9 kHz      Marker 1 [T1 ]  
VBW 10 kHz      6.18 dBμV  
SWT 200 ms      16.824240000 MHz

Ref 90 dBμV

\*Att 0 dB

1 FK \*  
VIEW



Start 14.01 MHz

1.599 MHz/

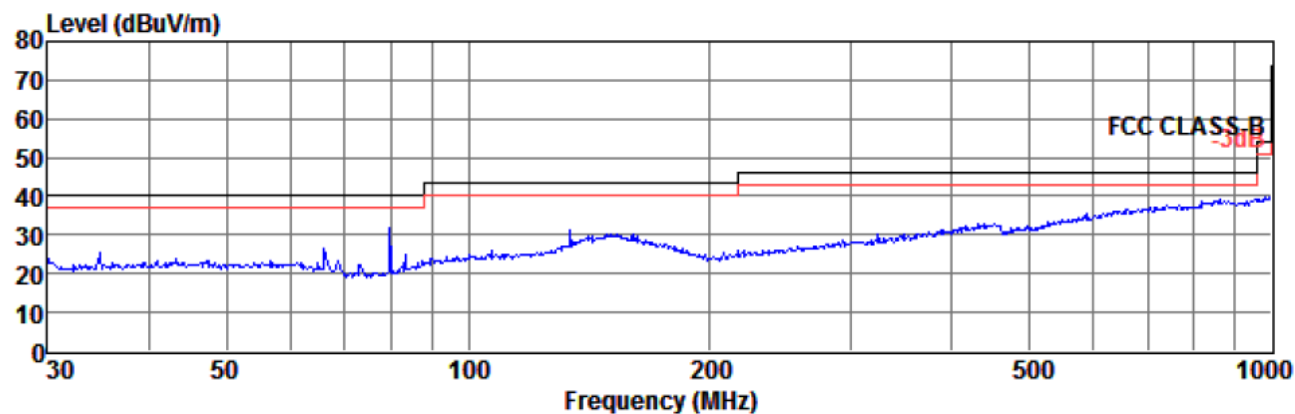
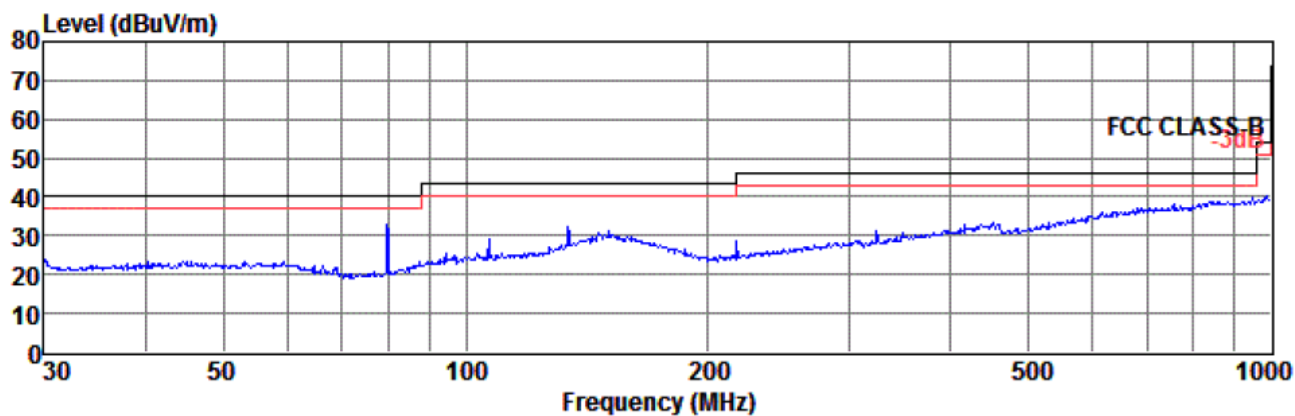
Stop 30 MHz

A

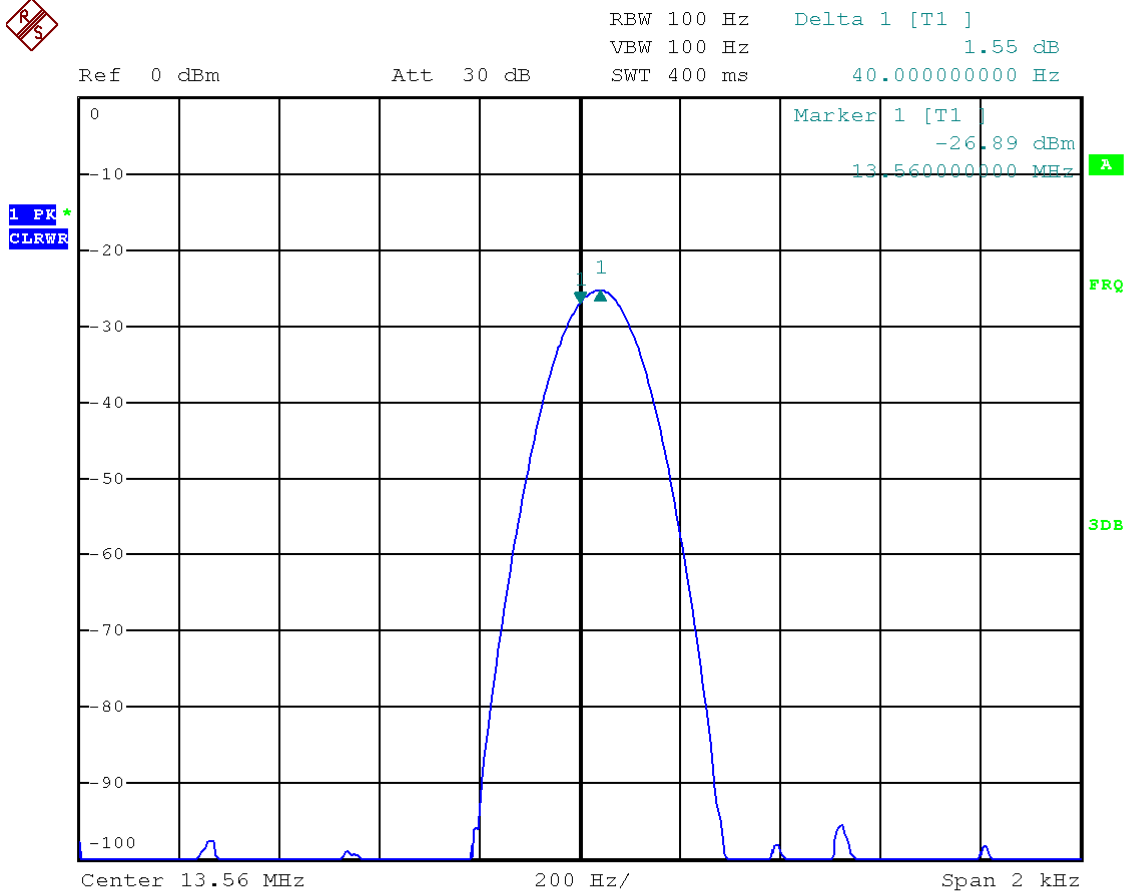
FRQ

6DB

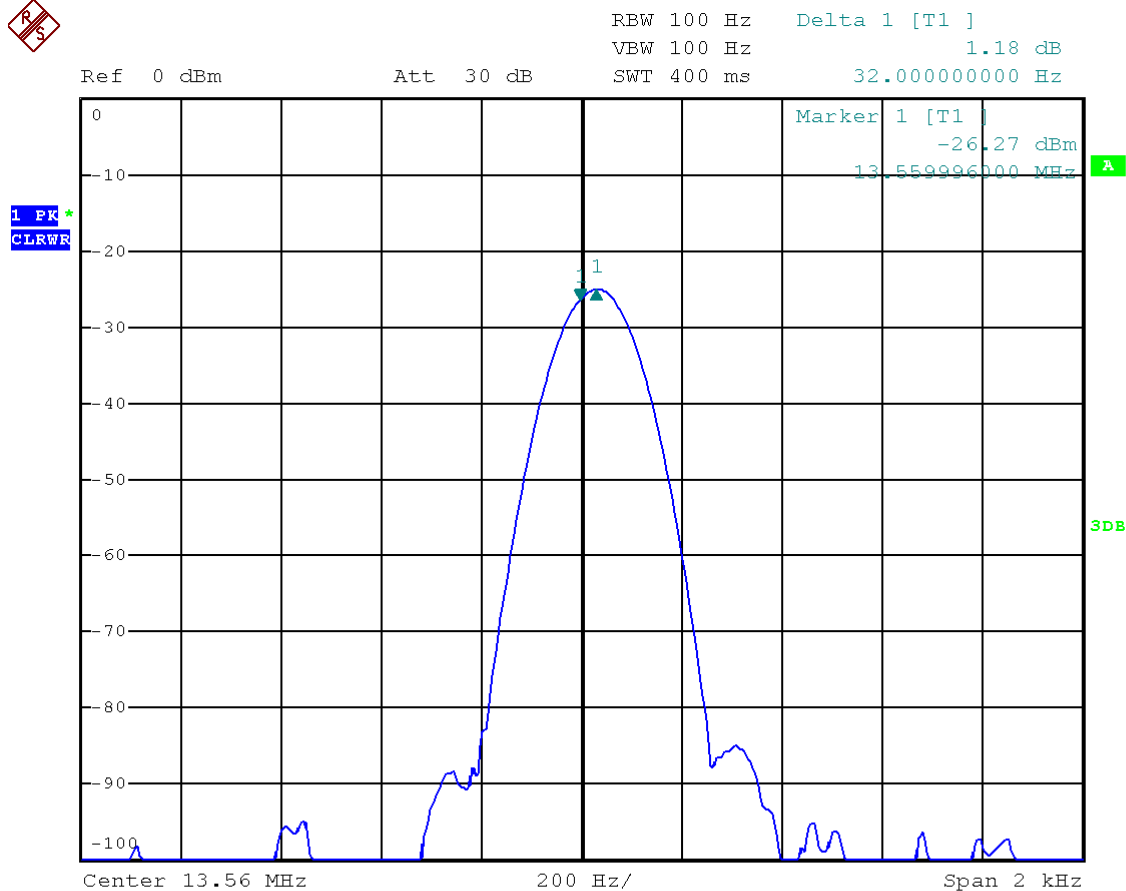
## 6.2 Radiated Out-Band Emissions(above 30MHz)



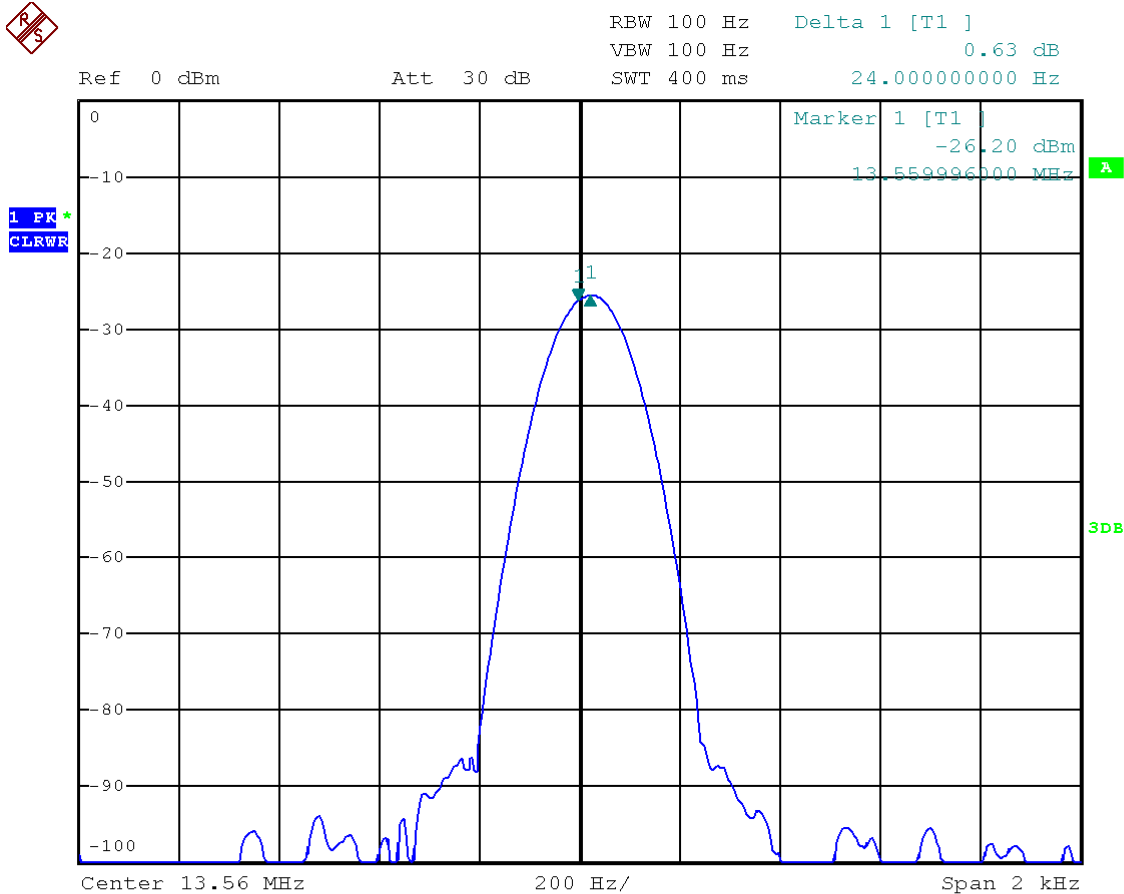
## 6.3 Frequency Tolerance(-20°C)



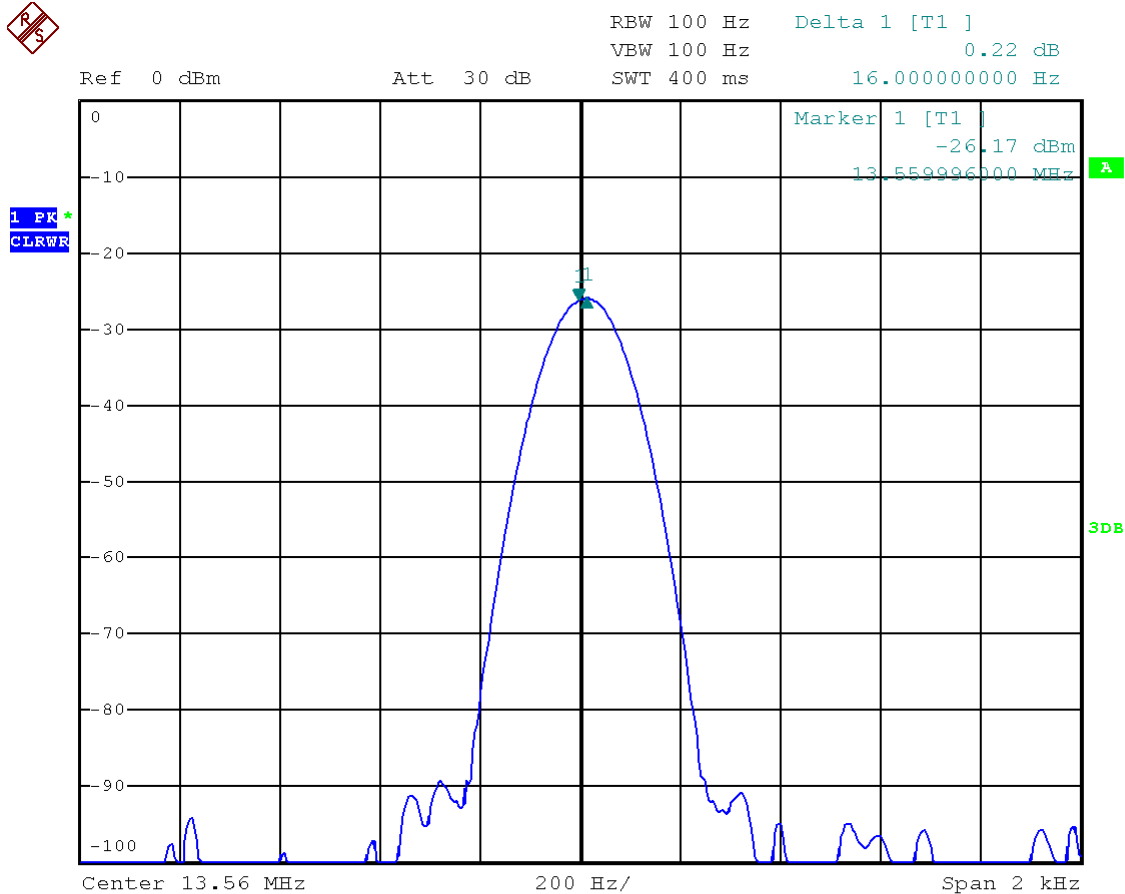
## 6.3 Frequency Tolerance(-10°C)



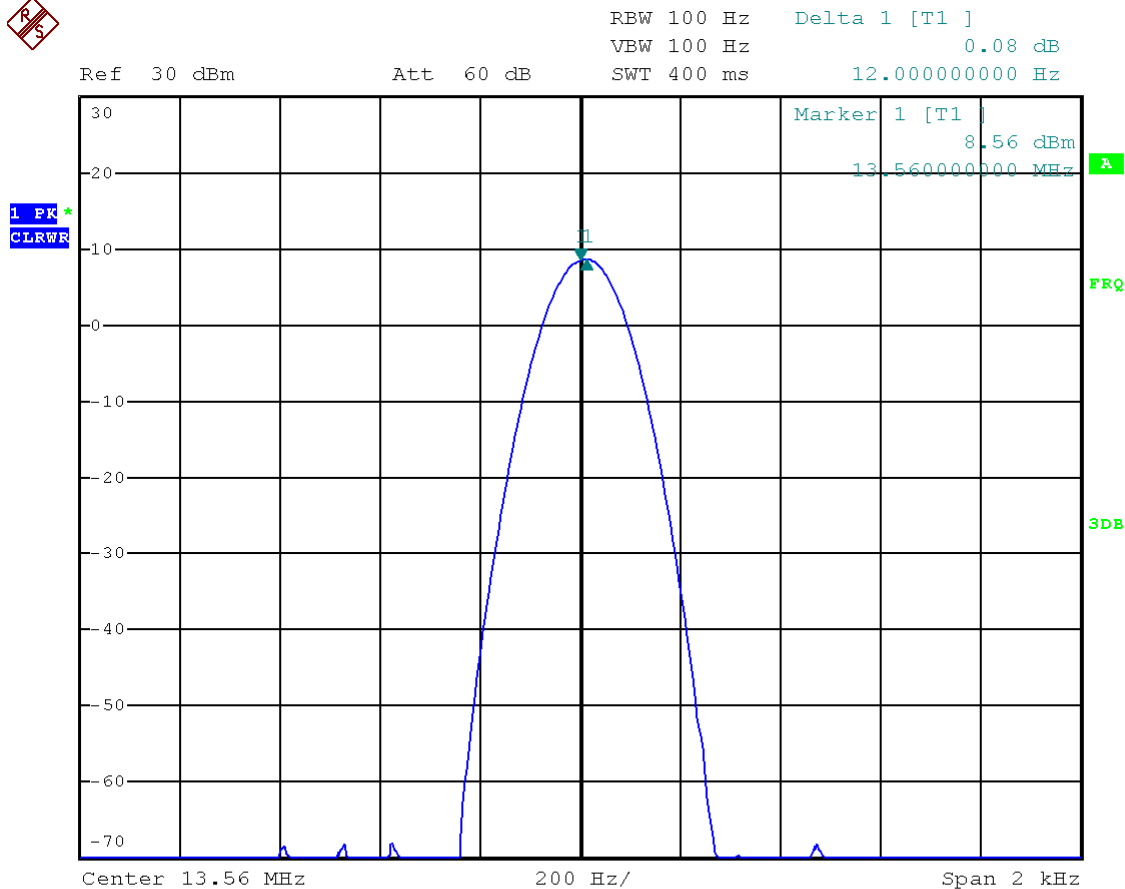
## 6.3 Frequency Tolerance(+0°C)



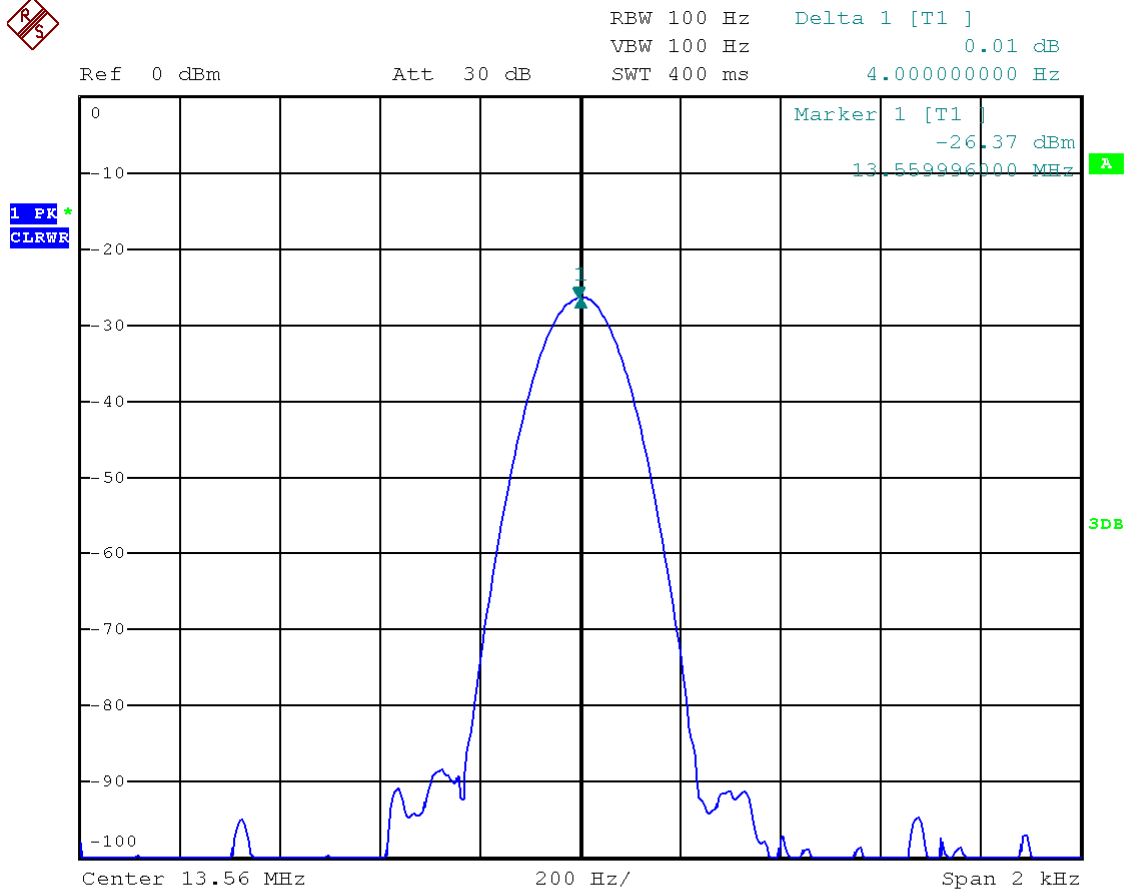
## 6.3 Frequency Tolerance(+10°C)



## 6.3 Frequency Tolerance(+20°C)

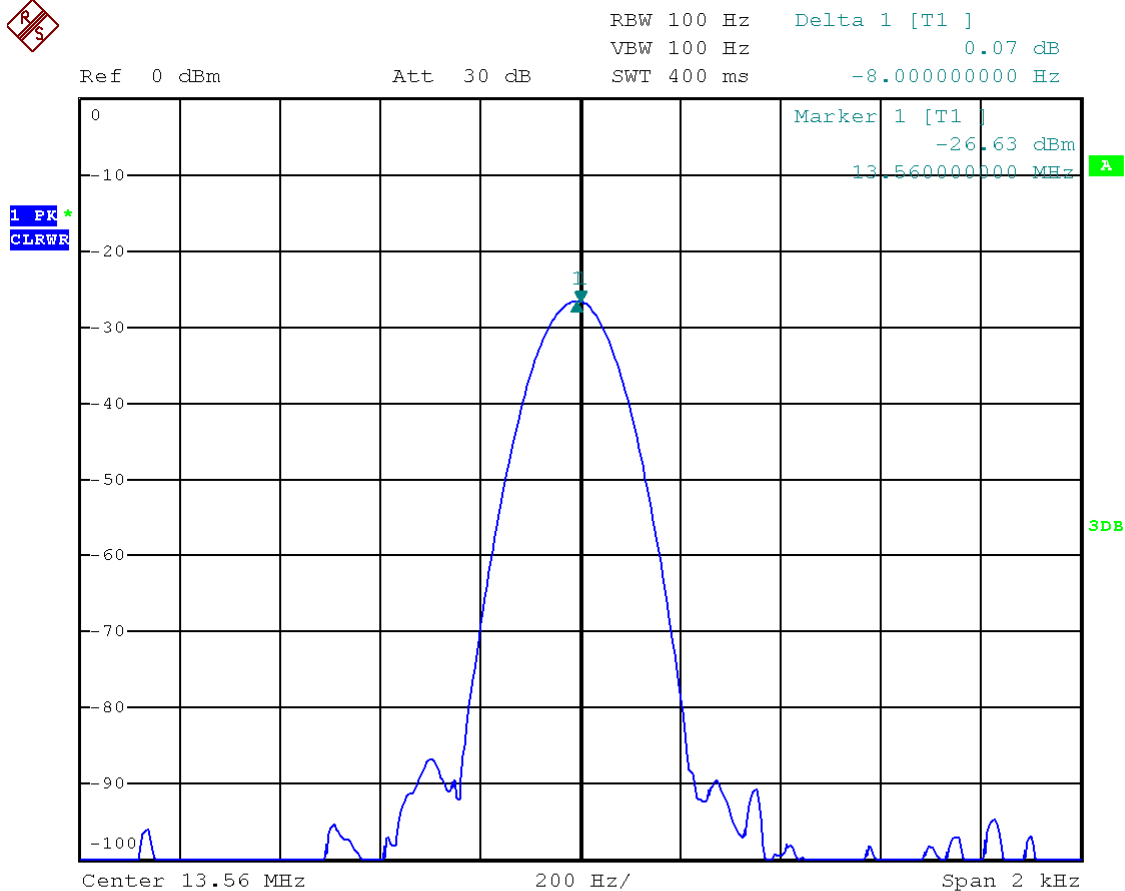


## 6.3 Frequency Tolerance(+30°C)

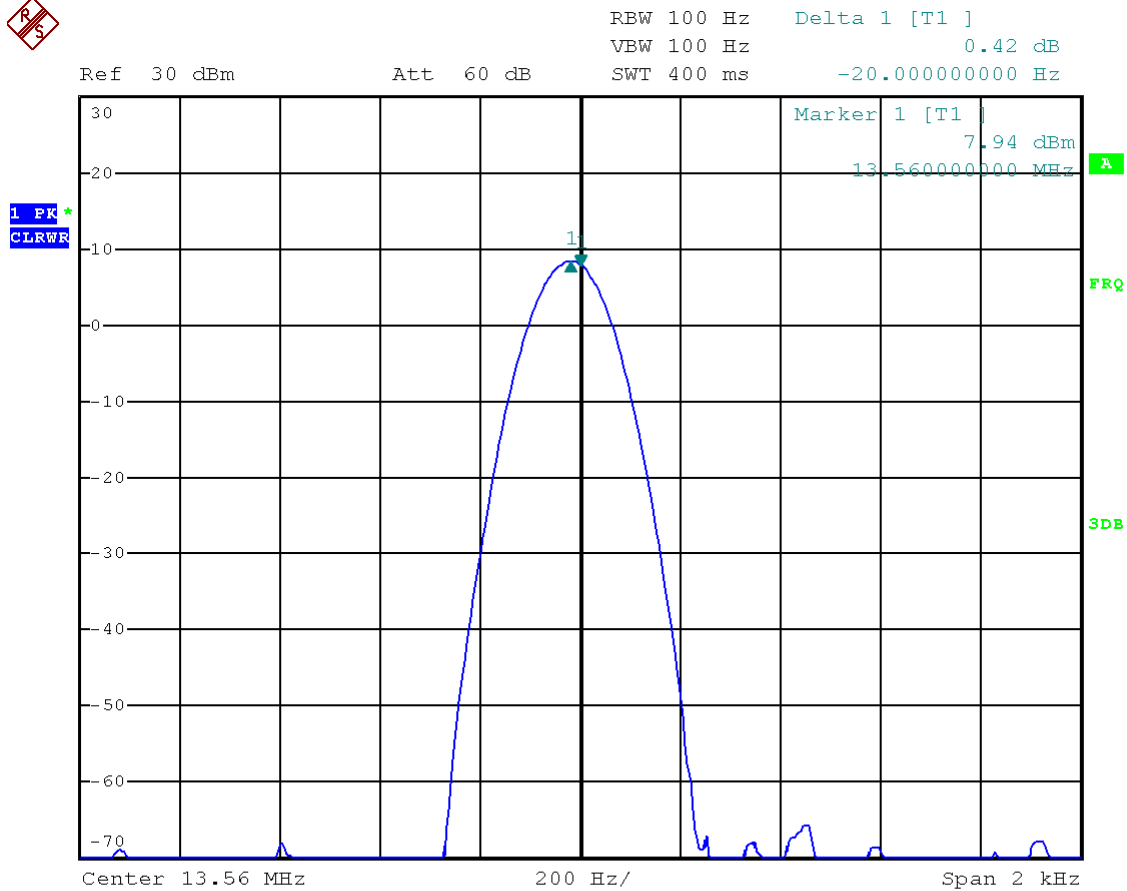




## 6.3 Frequency Tolerance(+40°C)



## 6.3 Frequency Tolerance(+50°C)



## 6.4 Occupied Bandwidth(99%)



\*RBW 3 kHz Marker 1 [T1 ]  
VBW 3 kHz 26.46 dBμV  
SWT 10 ms 13.560250000 MHz

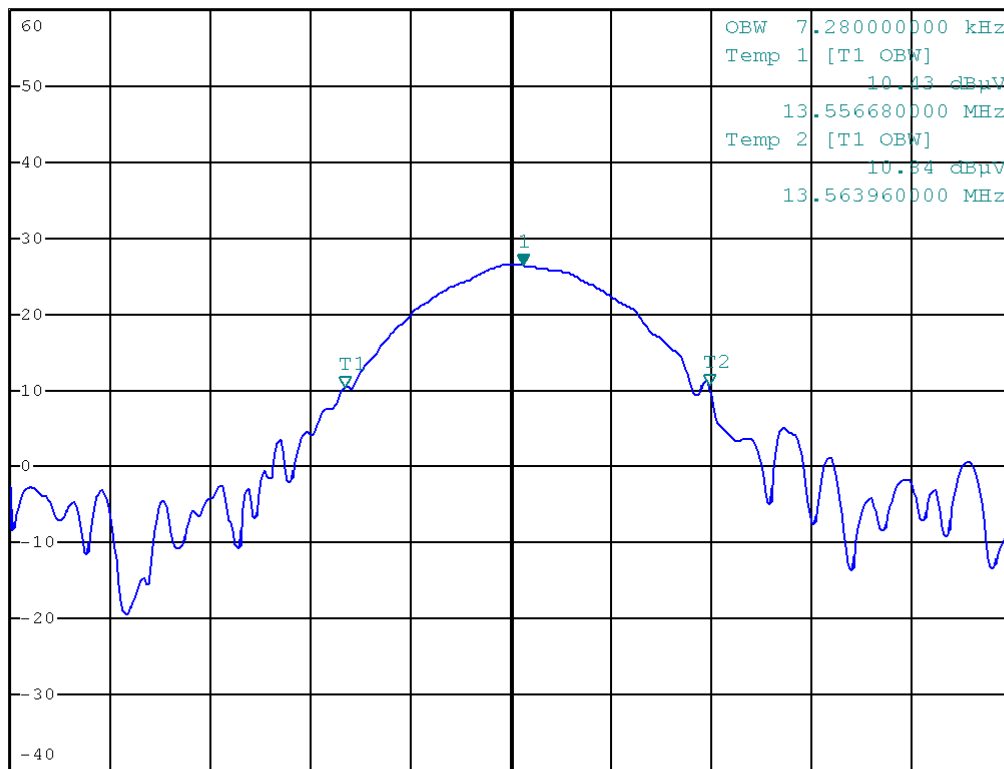
Ref 60 dBμV

\*Att 0 dB

SWT 10 ms

13.560250000 MHz

1 PK  
VIEW



Center 13.56 MHz

2 kHz/

Span 20 kHz

## 6.4 Occupied Bandwidth(20dB)



\*RBW 3 kHz Delta 3 [T1 ]  
VBW 3 kHz -20.41 dB  
SWT 10 ms -4.440000000 kHz

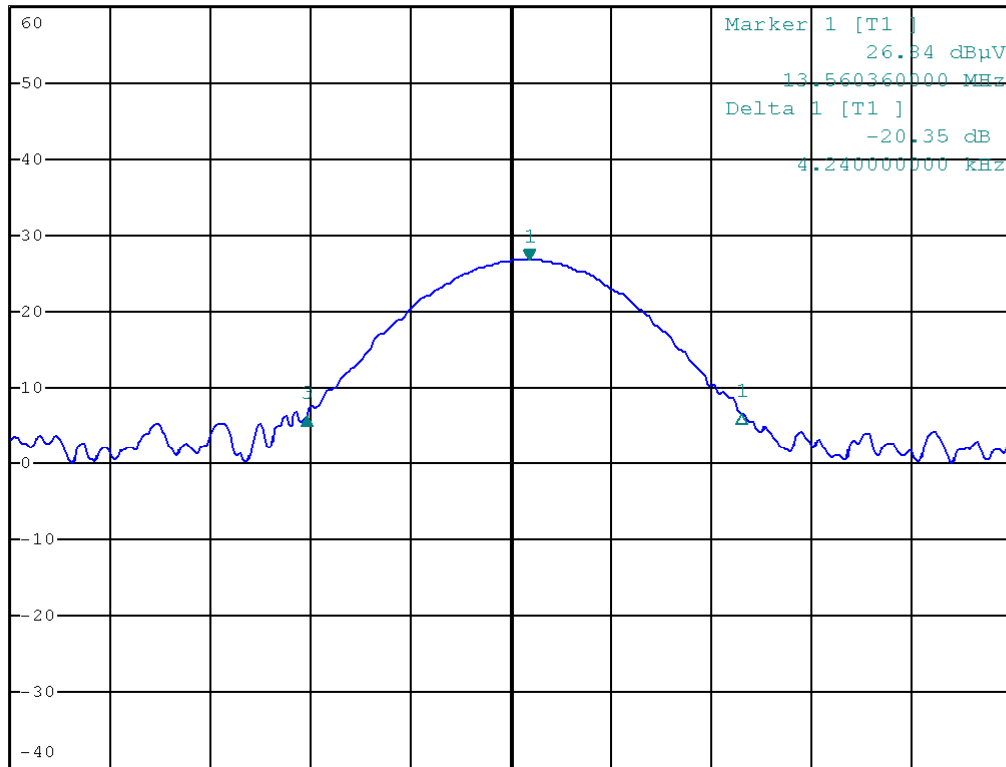
Ref 60 dBμV

\*Att 0 dB

SWT 10 ms

-4.440000000 kHz

1 PK  
VIEW



Center 13.56 MHz

2 kHz/

Span 20 kHz