



## Certification Test Report

CFR 47 FCC Part 2 and Part 22, Subpart C

Model: X47 EXTA

FCC ID No.: VNBEXTA-01

Project Code: W7058-1

Revision: 1

**Prepared for:** Nokia  
6000 Connection Drive  
Building 4  
Irving, Texas 75039

**Author:** Tom Tidwell, Manager of Wireless Services

**Issued:** 20 June, 2007

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NTS Plano, 1701 E. Plano Pkwy., Plano, TX 75074 Tel: (972) 509-2566, Fax: (972) 509-0073

## Report Summary

### NTS Plano

Accreditation Numbers:      FCC: 101741  
   IC: 46405-4319      File # IC-4319

Applicant:                              Nokia  
   6000 Connection Drive  
   Building 4  
   Irving, Texas 75039

Customer Representative:      Steve Mitchell

#### EUT Description:

EUT Description	Manufacturer	Model	Revision	Serial Number
The EUT is a Base Station Transceiver (BTS) operating in the GSM850	Nokia	X47 EXTA	0	9063900978

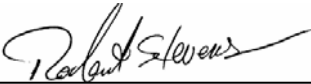
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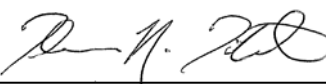
**Test Summary**

Appendix	Test/Requirement Description	Deviations from:			Pass / Fail	Applicable Rule Parts
		Base Standard	Test Basis	NTS Procedure		
A	RF Power Output	No	No	No	PASS	CFR 47, Part 2, Para. 2.1046 CFR 47, Part 22, Para. 22.913
B	Modulation Characteristics	No	No	No	PASS	CFR 47, Part 2, Para. 2.1047
C	Occupied Bandwidth	No	No	No	PASS	CFR 47, Part 2, Para. 2.1049 CFR 47, Part 22, Para. 22.917
D	Spurious Emissions at Antenna Terminals	No	No	No	PASS	CFR 47, Part 2, Para. 2.1051 CFR 47, Part 22, Para. 22.917
E	Field Strength of Spurious Radiation	No	No	No	PASS	CFR 47, Part 2, Para. 2.1053 CFR 47, Part 22, Para. 22.917
F	Frequency Stability	No	No	No	PASS	CFR 47, Part 2, Para. 2.1055 CFR 47, Part 22, Para. 22.355

Test Result: The product presented for testing complied with test requirements as shown above.

This is to certify that the preceding report is true and correct to the best of my knowledge.

  
 \_\_\_\_\_  
 Robert Stevens,  
 Quality Assurance Manager

  
 \_\_\_\_\_  
 Tom Tidwell,  
 Wireless Test Engineer

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**Register of revisions**

Revision	Reason for Revision	Release Date
0	Original	19 March, 2007

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## INTRODUCTION

### 1.1 PURPOSE

The purpose of this document is to describe the tests applied by NTS Plano to demonstrate compliance of the equipment identified below to FCC Part 22 Subpart C and Subpart H for Cellular Radiotelephone Service in accordance with the certification requirements of CFR 47, Part 2.

## 2.0 EUT DESCRIPTION

### 2.1 CONFIGURATION

#### Description of EUT

	Name	Model	Revision	Serial Number															
EUT	X47 EXTA	X47 EXTA	0	9063900978															
RF Exposure Classification	Fixed. The antenna is mounted on a fixed outdoor structure.																		
Channels/Frequency Range	824 – 849 MHz TX, 869 – 894 MHz RX																		
Power (rated)	Carrier Mode	Modulation Mode	Rated Power (W)																
	Combined	8PSK	70																
	Single	8PSK	20																
	Combined	GMSK	75																
	Single	GMSK	40																
	<b>Note: On channels 128 and 251 the rf power is reduced to the following levels:</b> <table border="1"> <thead> <tr> <th>Carrier Mode</th> <th>Modulation Mode</th> <th>Rated Power</th> </tr> </thead> <tbody> <tr> <td>Combined</td> <td>8PSK</td> <td>11</td> </tr> <tr> <td>Single</td> <td>8PSK</td> <td>9</td> </tr> <tr> <td>Combined</td> <td>GMSK</td> <td>6</td> </tr> <tr> <td>Single</td> <td>GMSK</td> <td>5</td> </tr> </tbody> </table>					Carrier Mode	Modulation Mode	Rated Power	Combined	8PSK	11	Single	8PSK	9	Combined	GMSK	6	Single	GMSK
Carrier Mode	Modulation Mode	Rated Power																	
Combined	8PSK	11																	
Single	8PSK	9																	
Combined	GMSK	6																	
Single	GMSK	5																	
Emission Designator:	<b>270KGXW:</b> GMSK(GSM) <b>270KG7W:</b> 8PSK(EDGE)																		
TX antenna details	Antenna is specified at time of licensing																		
Functional Description	The EUT is used as a base station transceiver in a GSM network.																		

#### 2.1.1 EUT POWER

Voltage	208 Vac, 60 Hz (27 Vdc and 48 Vdc supplied by DC supplies in EUT rack)
Number of Feeds	Two phase (X and Y)

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**2.2 EUT CABLES**

Quantity	Model/Type	Routing		Shielded / Unshielded	Description	Cable Length (m)
		From	To			
1	None	EUT	AC power main	Unshielded	Power cord	1.25
1						
1	Gore	EUT	50 ohm load	Shielded (coaxial)	Coaxial cable	2

**2.3 MODE OF OPERATION DURING TESTS**

The device was tested in two basic operating modes:

- GSM mode (GMSK modulation) with a single carrier
- EDGE mode (8PSK modulation) with a single carrier
- GSM mode (GMSK modulation) with combined carrier
- EDGE mode (8PSK modulation) with combined carrier

In combined carrier mode two transmitted carriers **on the same channel** are combined with phase adjustment in order to increase the transmitted rf power output.

Rated RF power at antenna port on channels 129 - 250

Carrier Mode	Modulation Mode	Rated Power
Combined	8PSK	70
Single	8PSK	20
Combined	GMSK	75
Single	GMSK	40

Rated RF power at antenna port on channels 128 and 251

Carrier Mode	Modulation Mode	Rated Power
Combined	8PSK	11
Single	8PSK	9
Combined	GMSK	6
Single	GMSK	5

Note that power is reduced when operating on the lowest and highest channels.

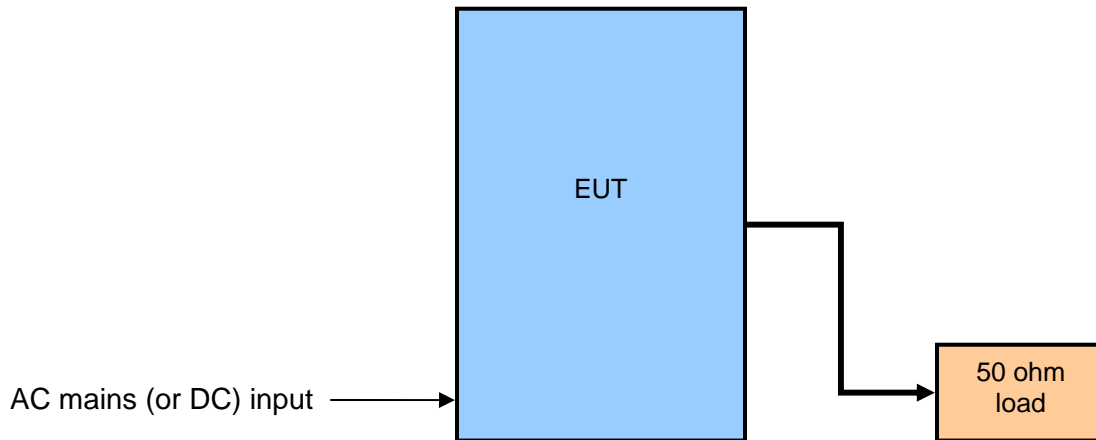
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### 3.0 SUPPORT EQUIPMENT

#### 3.1 CONFIGURATION

The radio was activated using customer-supplied test software. The software allowed the test engineer to change modulation modes and data rates as well as transmit channel.

#### 3.2 TEST BED/PERIPHERAL CABLES



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## APPENDICES

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## APPENDIX A: 2.1046 RF POWER OUTPUT

### A.1. Base Standard & Test Basis

<b>Base Standard</b>	FCC PART 2.1046
<b>Test Basis</b>	TIA 603-C, 2004
<b>Test Method</b>	TIA 603-C, 2004

### A.2. Specifications

(a) *Maximum ERP*. In general, the effective radiated power (ERP) of base transmitters and cellular repeaters must not exceed 500 Watts. However, for those systems operating in areas more than 72 km (45 miles) from international borders that:

- (1) Are located in counties with population densities of 100 persons or fewer per square mile, based upon the most recently available population statistics from the Bureau of the Census; or,
- (2) Extend coverage on a secondary basis into cellular unserved areas, as those areas are defined in §22.949, the ERP of base transmitters and cellular repeaters of such systems must not exceed 1000 Watts. The ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 Watts.

**Applicable RF Power Limit from Above:** 500 watts erp

### A.3. Deviations

Deviation Number	Time & Date	Description and Justification of Deviation	Deviation Reference			Approval
			Base Standard	Test Basis	NTS Procedure	
None						

### A.4. Test Procedure

TIA 603-C, 2004

### A.5. Test Results

The EUT is in compliance with the limits as specified above. The maximum rf output power at the antenna terminals is 72.61 watts.

### A.6. Operating Mode During Test

The transmitter was tested while in a continuous transmit mode. The EUT was tuned to a low, middle, and high channel. Both GMSK(GSM) and 8PSK(EDGE) modulation modes were tested.

### A.7. Sample Calculation

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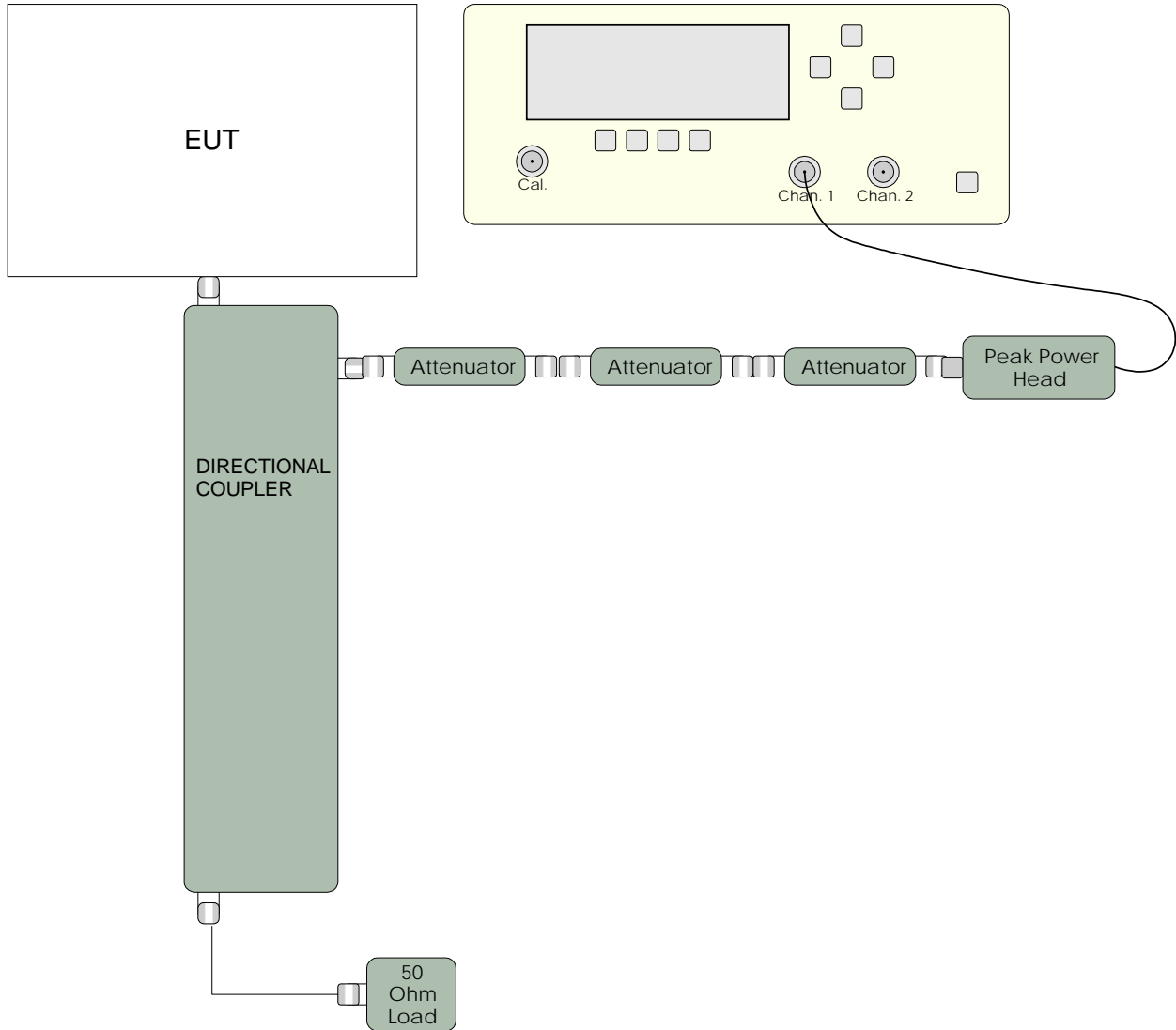
$$\text{Rf power(watts)} = 10^{(\text{rf power(dBm)}/10)} \times 1000$$

**A.8. Test Data**

Band	Channel	Carrier Mode	Modulation Mode	RF Power Output at Antenna Terminals (dBm)	RF Power Output at Antenna Terminals (W)
GSM850	Low	Combined	GMSK	38.17	6.56
GSM850	Mid	Combined	GMSK	48.61	72.61
GSM850	High	Combined	GMSK	37.91	6.18
GSM850	Low	Combined	8PSK	40.31	10.74
GSM850	Mid	Combined	8PSK	48.52	71.12
GSM850	High	Combined	8PSK	40.10	10.23
GSM850	Low	Bypass	GMSK	37.10	5.13
GSM850	Mid	Bypass	GMSK	45.86	38.55
GSM850	High	Bypass	GMSK	37.02	5.04
GSM850	Low	Bypass	8PSK	39.52	8.95
GSM850	Mid	Bypass	8PSK	43.03	20.09
GSM850	High	Bypass	8PSK	39.21	8.34

Note: RF power output was measured using a peak rf power meter designed to quantify the true peak power using a high number of samples.

**A.9. Test Diagram**



**A.10. Tested By**

Name: Tom Tidwell,  
Function: Manager of Wireless Services

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## APPENDIX B: 2.1047 MODULATION CHARACTERISTICS

### B.1. Base Standard & Test Basis

<b>Base Standard</b>	FCC 2.1047
<b>Test Basis</b>	FCC 2.1047 Modulation Characteristics
<b>Test Method</b>	TIA 603-C, 2004

### B.2. Specifications

#### 2.1047 – Modulation Characteristics

(a) *Voice modulated communication equipment.* A curve or equivalent data showing the frequency response of the audio modulating circuit over a range of 100 to 5000 Hz shall be submitted. For equipment required to have an audio low-pass filter, a curve showing the frequency response of the filter, or of all circuitry installed between the modulation limiter and the modulated stage shall be submitted.

(b) *Equipment which employs modulation limiting.* A curve or family of curves showing the percentage of modulation versus the modulation input voltage shall be supplied. The information submitted shall be sufficient to show modulation limiting capability throughout the range of modulating frequencies and input modulating signal levels employed.

(c) *Single sideband and independent sideband radiotelephone transmitters which employ a device or circuit to limit peak envelope power.* A curve showing the peak envelope power output versus the modulation input voltage shall be supplied. The modulating signals shall be the same in frequency as specified in paragraph (c) of §2.1049 for the occupied bandwidth tests.

(d) *Other types of equipment.* A curve or equivalent data which shows that the equipment will meet the modulation requirements of the rules under which the equipment is to be licensed.

### B.3. Deviations

Deviation Number	Time & Date	Description and Justification of Deviation	Deviation Reference			Approval
			Base Standard	Test Basis	NTS Procedure	
none						

### B.4. Test Method

This device is digitally modulated and does not provide for analogue or voice modulation.

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**B.5. Test Results**

Not applicable – This device is digitally modulated and does not provide for analogue or voice modulation.

**Test Data Summary**

**Emission Designators**

**GSM: 270KGXW**

**EDGE: 270KG7W**

**B.6. Test Diagram**

**N/A**

**B.7. Tested By**

Name: Tom Tidwell

Function: Manager of Wireless Services

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## APPENDIX C: 2.10.49 OCCUPIED BANDWIDTH

### C.1. Base Standard & Test Basis

<b>Base Standard</b>	FCC 2.1049
<b>Test Basis</b>	FCC 2.1049 Occupied Bandwidth
<b>Test Method</b>	TIA 603-C, 2004

### C.2. Specifications

22.917

(b) The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

### C.3. Deviations

Deviation Number	Time & Date	Description and Justification of Deviation	Deviation Reference			Approval
			Base Standard	Test Basis	NTS Procedure	
none						

### C.4. Test Method

TIA 603-C, 2004

The modulated rf carrier fed to the device during testing is described below:

Data source: PRBS (Pseudo-Random Bit Sequence)  
 Modulation: GMSK  
 Symbol Rate: 270 kbps

Data source: PRBS (Pseudo-Random Bit Sequence)  
 Modulation: 8PSK  
 Symbol Rate: 270 kbps

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**C.5. Test Results**

Compliant. See plots following.

**C.6. Deviations from Normal Operating Mode During Test**

None.

**C.7. Sample Calculation**

None.

**C.8. Test Data**

See plots following.

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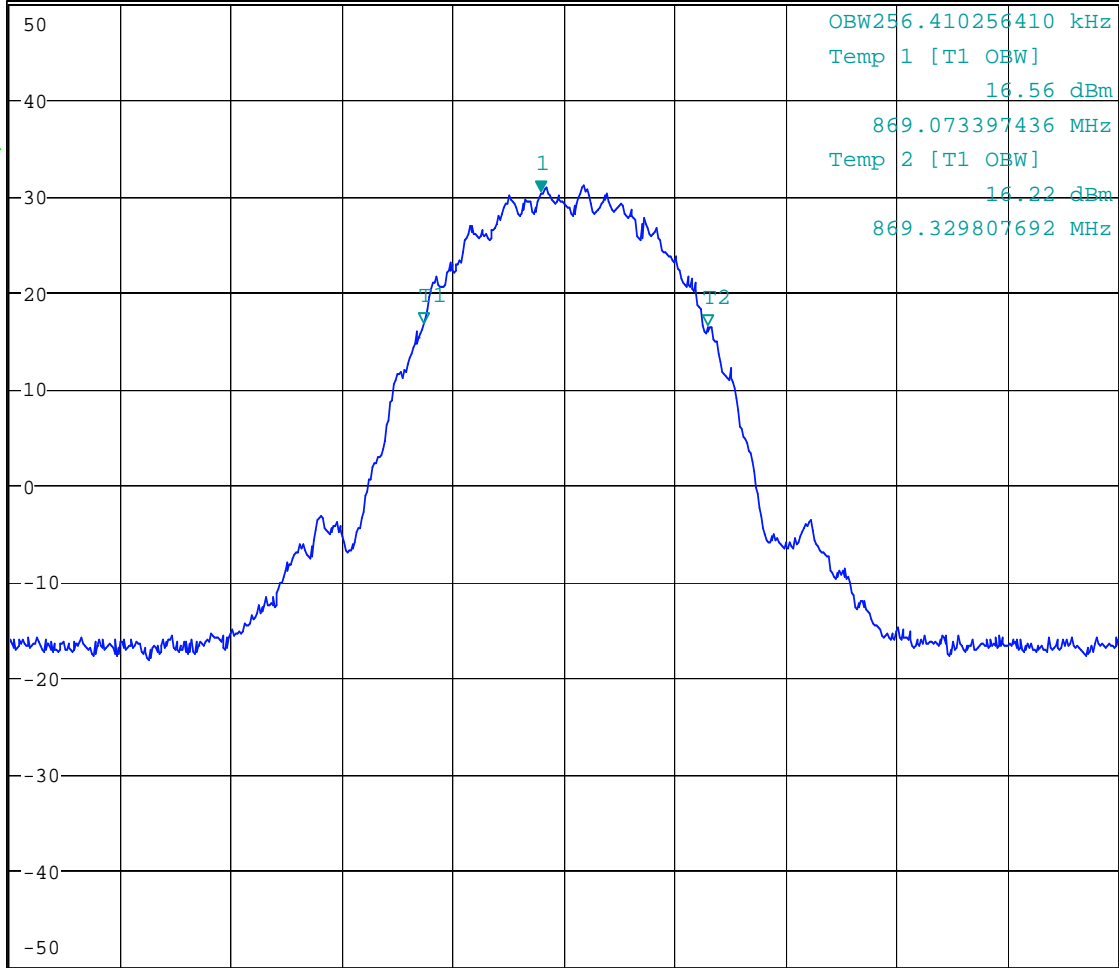


Figure 1 GMSK Occupied Bandwidth – 869.2 MHz



\*RBW 3 kHz                      Marker 1 [T1 ]  
 \*VBW 1 kHz                      30.18 dBm  
 Ref 50 dBm                      \*Att 45 dB                      SWT 560 ms                      869.178634511 MHz

1 RM \*  
 AVG



A

TDF

Center 869.2 MHz                      100 kHz/                      Span 1 MHz

Date: 27.FEB.2007 20:42:30

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Figure 4 8PSK Occupied Bandwidth – 869.2 MHz



\*RBW 3 kHz      Marker 1 [T1 ]  
\*VBW 3 kHz      -17.23 dBm  
SWT 190 ms      869.70000000 MHz

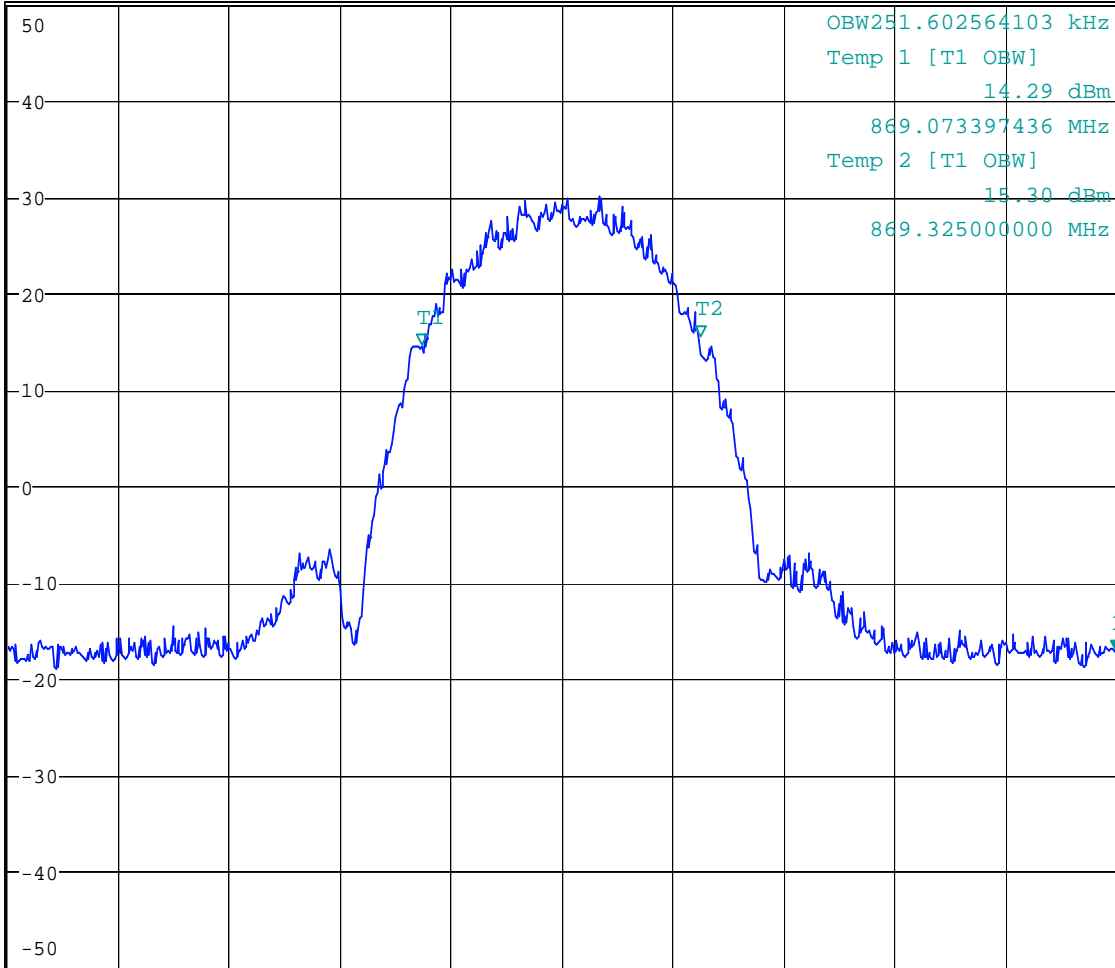
Ref 50 dBm

\*Att 45 dB

SWT 190 ms

869.70000000 MHz

1 RM \*  
AVG



Center 869.2 MHz

100 kHz/

Span 1 MHz

Date: 28.FEB.2007 00:28:42

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Figure 5 8PSK Occupied Bandwidth – 881.6 MHz



\*RBW 3 kHz  
\*VBW 3 kHz  
SWT 190 ms  
Marker 1 [T1 ]  
-17.15 dBm  
881.100000000 MHz

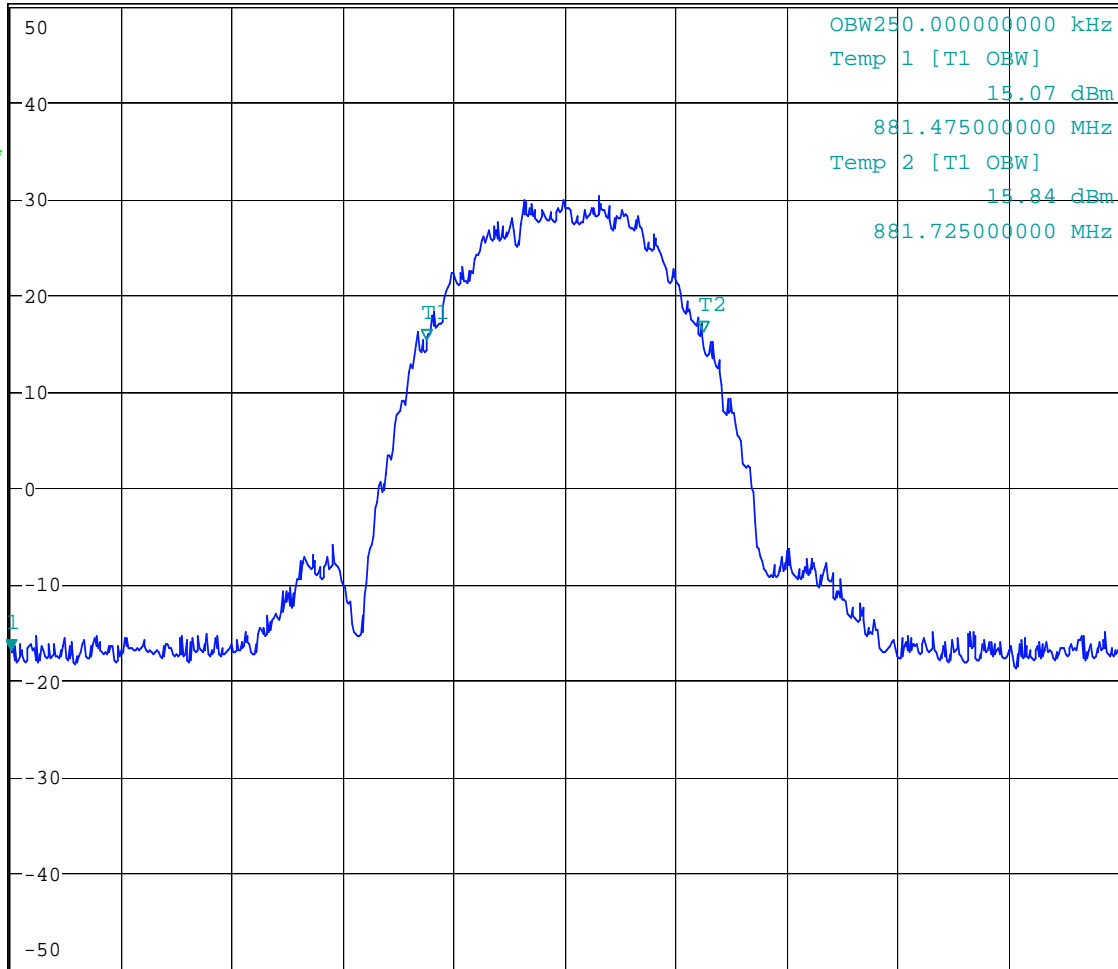
Ref 50 dBm

\*Att 45 dB

SWT 190 ms

881.100000000 MHz

1 RM \*  
AVG



Center 881.6 MHz

100 kHz/

Span 1 MHz

Date: 28.FEB.2007 00:31:23

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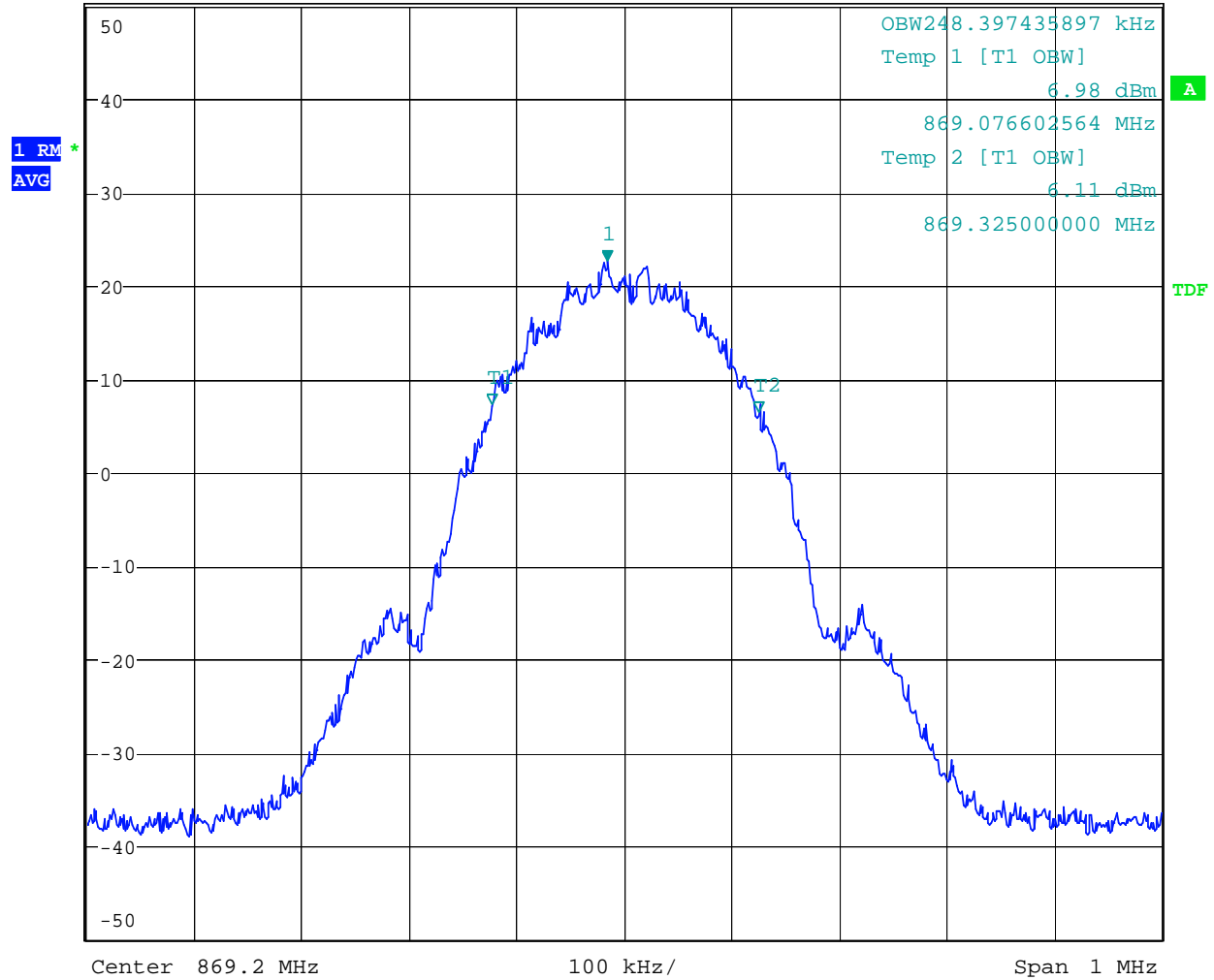


Figure 7 GMSK Occupied Bandwidth – 869.2 MHz – Carrier Bypass



\* RBW 3 kHz      Marker 1 [T1 ]  
\* VBW 3 kHz      22.36 dBm

Ref 50 dBm      \* Att 25 dB      SWT 190 ms      869.183974359 MHz



Date: 28.FEB.2007 19:55:01

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Figure 8 GMSK Occupied Bandwidth – 881.6 MHz – Carrier Bypass

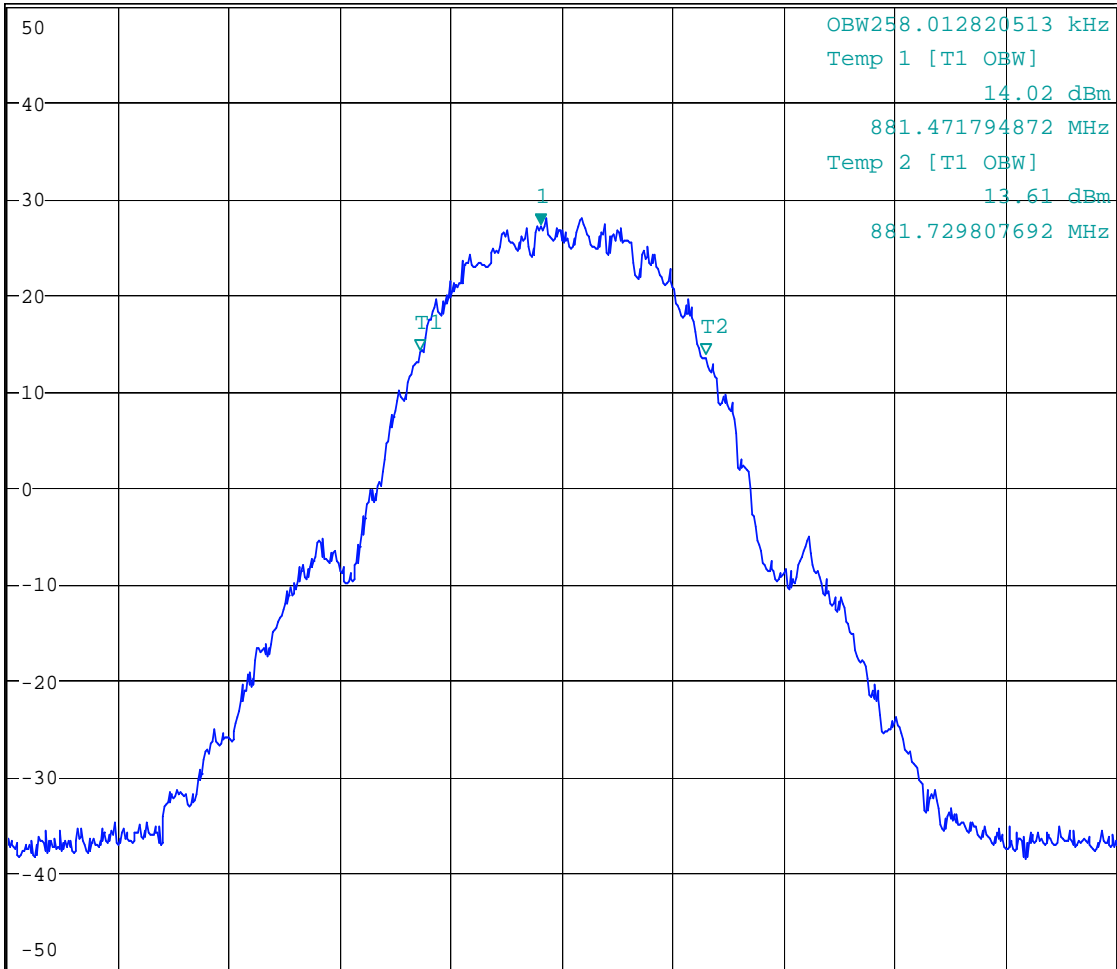


\* RBW 3 kHz  
\* VBW 3 kHz

Marker 1 [T1 ]  
27.00 dBm

Ref 50 dBm \* Att 25 dB SWT 190 ms 881.580769231 MHz

1 RM \*  
AVG



Center 881.6 MHz 100 kHz/ Span 1 MHz

Date: 28.FEB.2007 19:59:30

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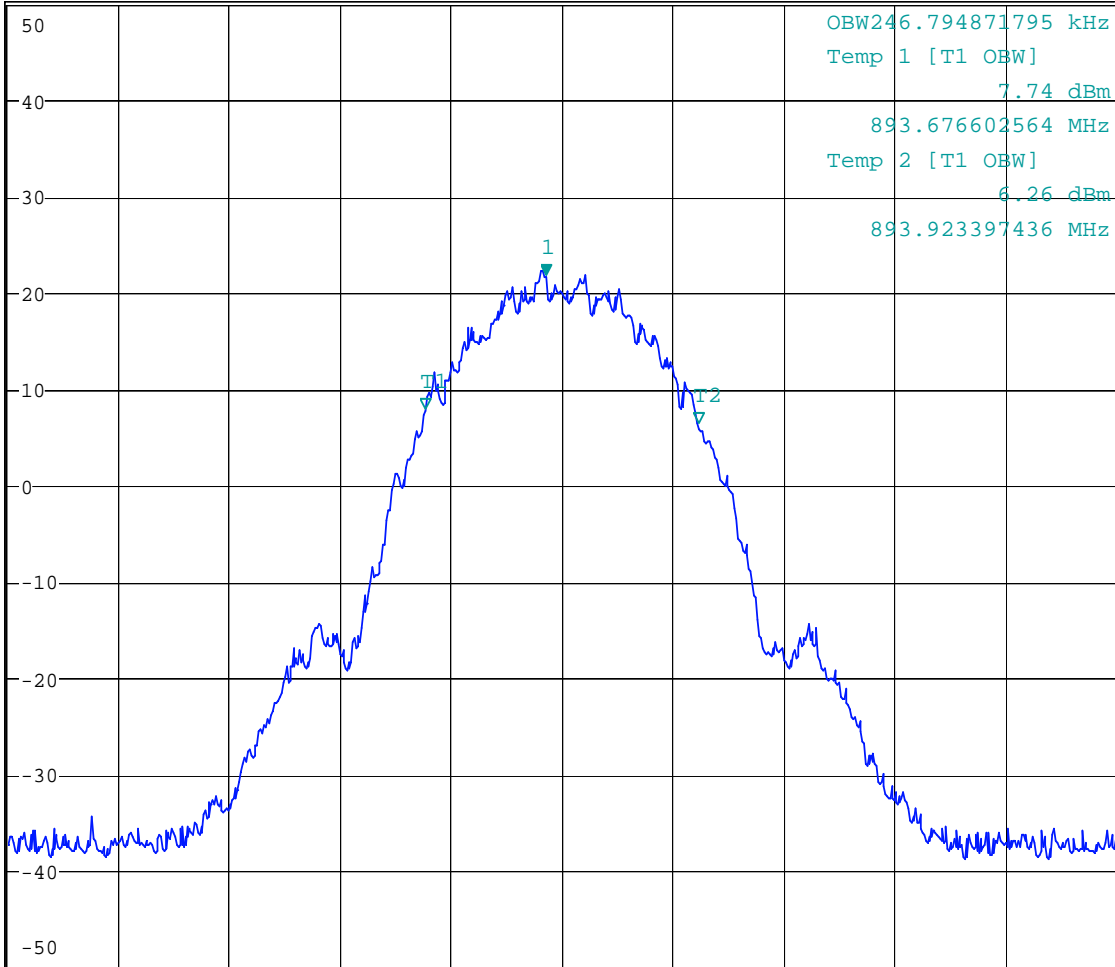
Figure 9 GMSK Occupied Bandwidth – 893.8 MHz – Carrier Bypass



\* RBW 3 kHz      Marker 1 [T1 ]  
\* VBW 3 kHz      21.48 dBm

Ref 50 dBm      \* Att 25 dB      SWT 190 ms      893.785576923 MHz

1 RM \*  
AVG



Center 893.8 MHz      100 kHz/      Span 1 MHz

Date: 28.FEB.2007 20:04:13

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Figure 10 8PSK Occupied Bandwidth – 869.2 MHz – Carrier Bypass



\*RBW 3 kHz      Marker 1 [T1 ]  
\*VBW 3 kHz      23.17 dBm  
SWT 190 ms      869.222435897 MHz

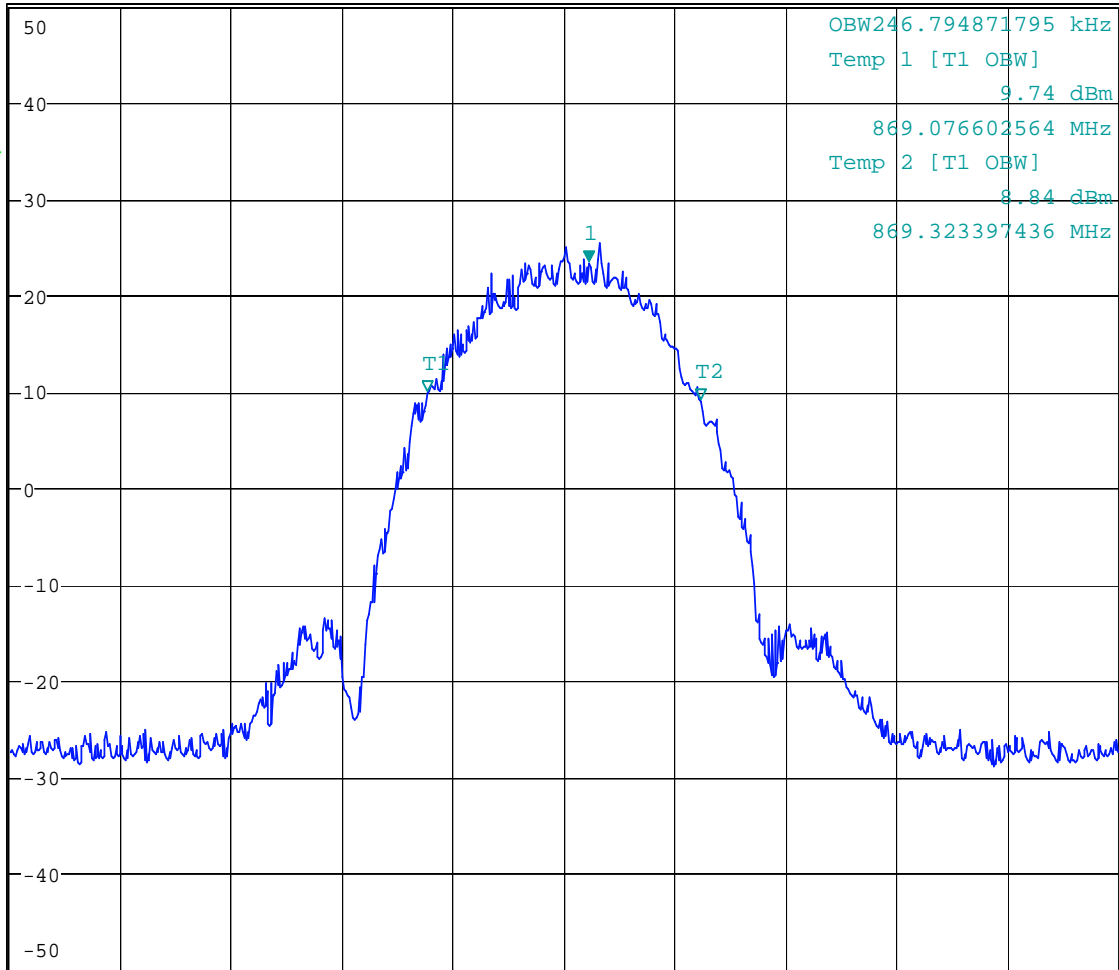
Ref 50 dBm

\*Att 35 dB

SWT 190 ms

869.222435897 MHz

1 RM \*  
AVG



Center 869.2 MHz

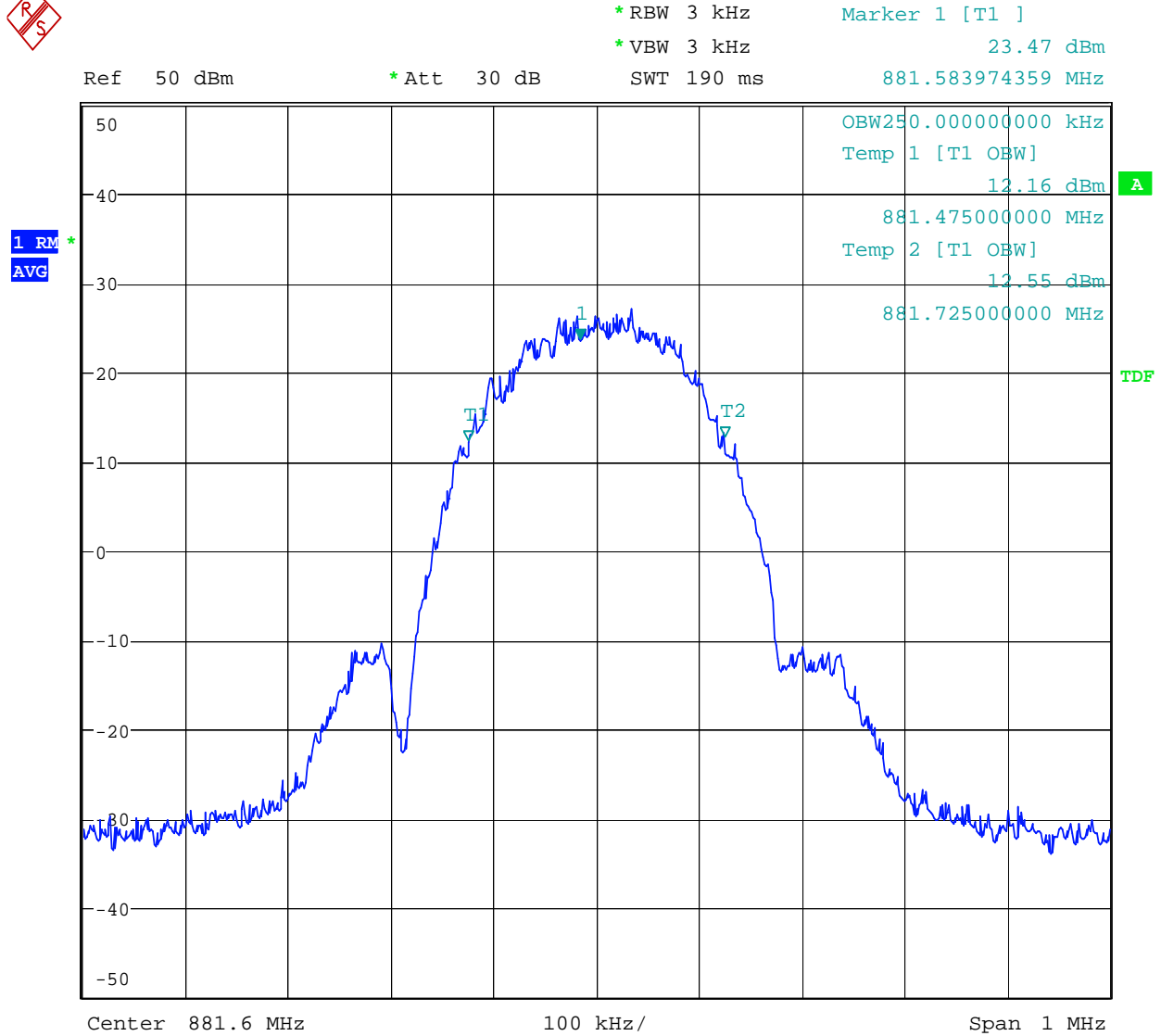
100 kHz/

Span 1 MHz

Date: 28.FEB.2007 18:03:23

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**Figure 11 8PSK Occupied Bandwidth – 881.6 MHz – Carrier Bypass**



Date: 28.FEB.2007 19:29:45

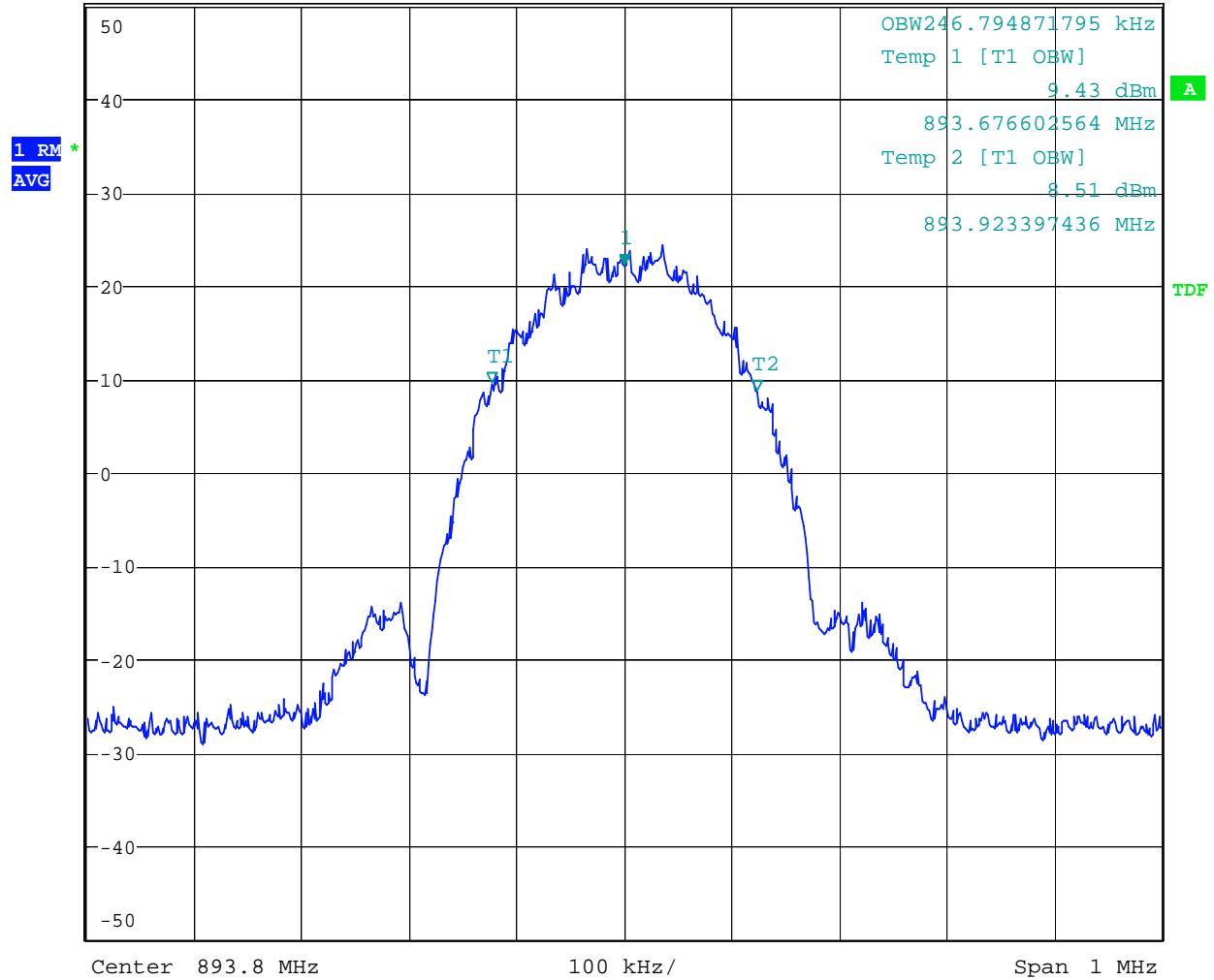
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Figure 12 8PSK Occupied Bandwidth – 893.8 MHz – Carrier Bypass



\*RBW 3 kHz      Marker 1 [T1]      21.98 dBm  
\*VBW 3 kHz

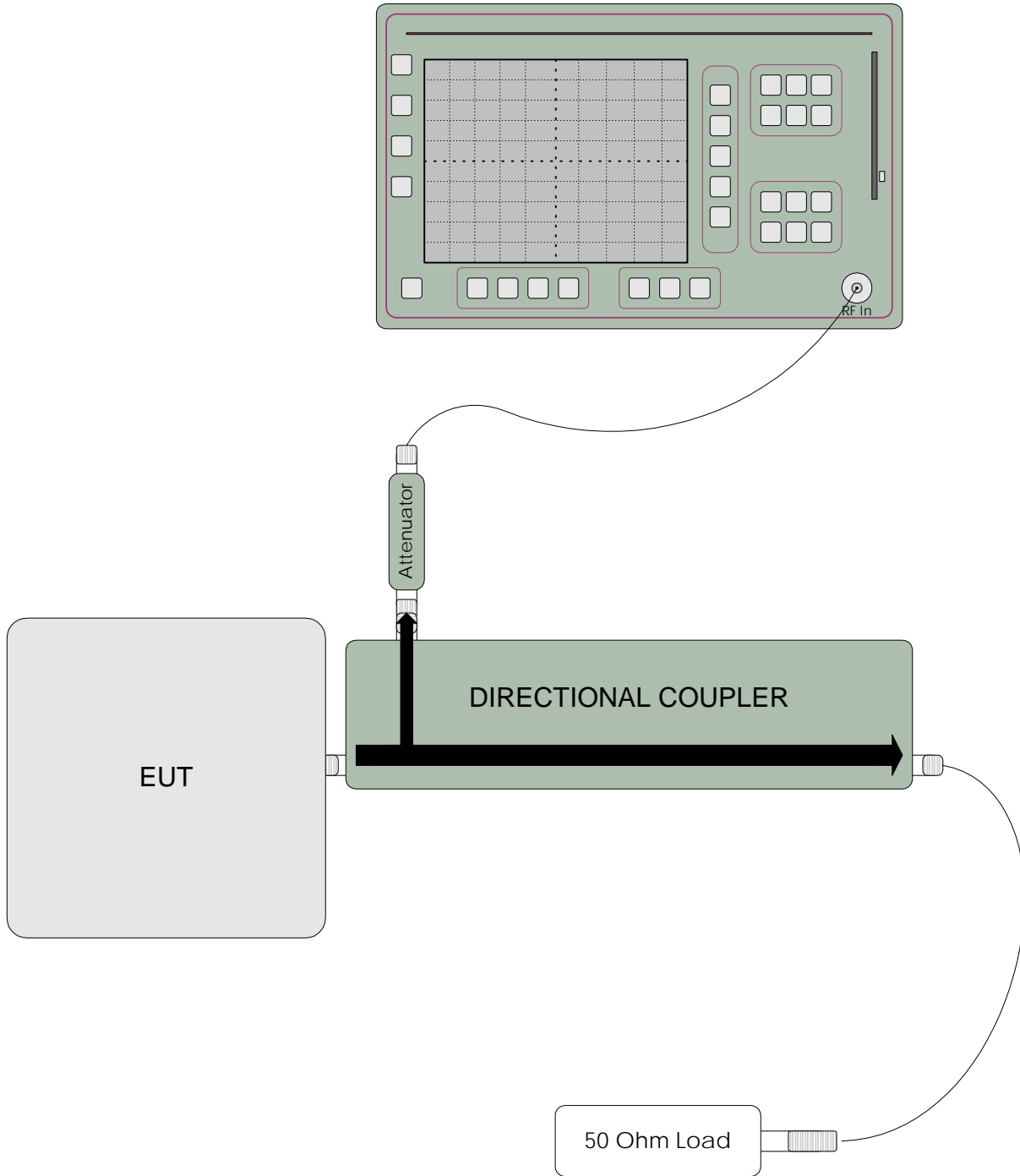
Ref 50 dBm      \*Att 35 dB      SWT 190 ms      893.80000000 MHz



Date: 28.FEB.2007 19:41:08

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**C.9. Test Diagram**



**C.10. Tested By**

Name: Tom Tidwell,  
Function: Manager of Wireless Services

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## APPENDIX D: 2.1051 SPURIOUS EMISSIONS AT ANTENNA TERMINALS

### D.1. Base Standard & Test Basis

<b>Base Standard</b>	FCC 2.1051
<b>Test Basis</b>	FCC 2.1051 Spurious Emissions at Antenna Terminals
<b>Test Method</b>	TIA 603-C, 2004

### D.2. Specifications

22.917

(a) *Out of band emissions.* The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least  $43 + 10 \log(P)$  dB.

### D.3. Measurement Uncertainty

<b>Expanded Uncertainty (K=2)</b>
+1.11/-1.22

### D.4. Deviations

Deviation Number	Time & Date	Description and Justification of Deviation	Deviation Reference			Approval
			Base Standard	Test Basis	NTS Procedure	
none						

### D.5. Test Results

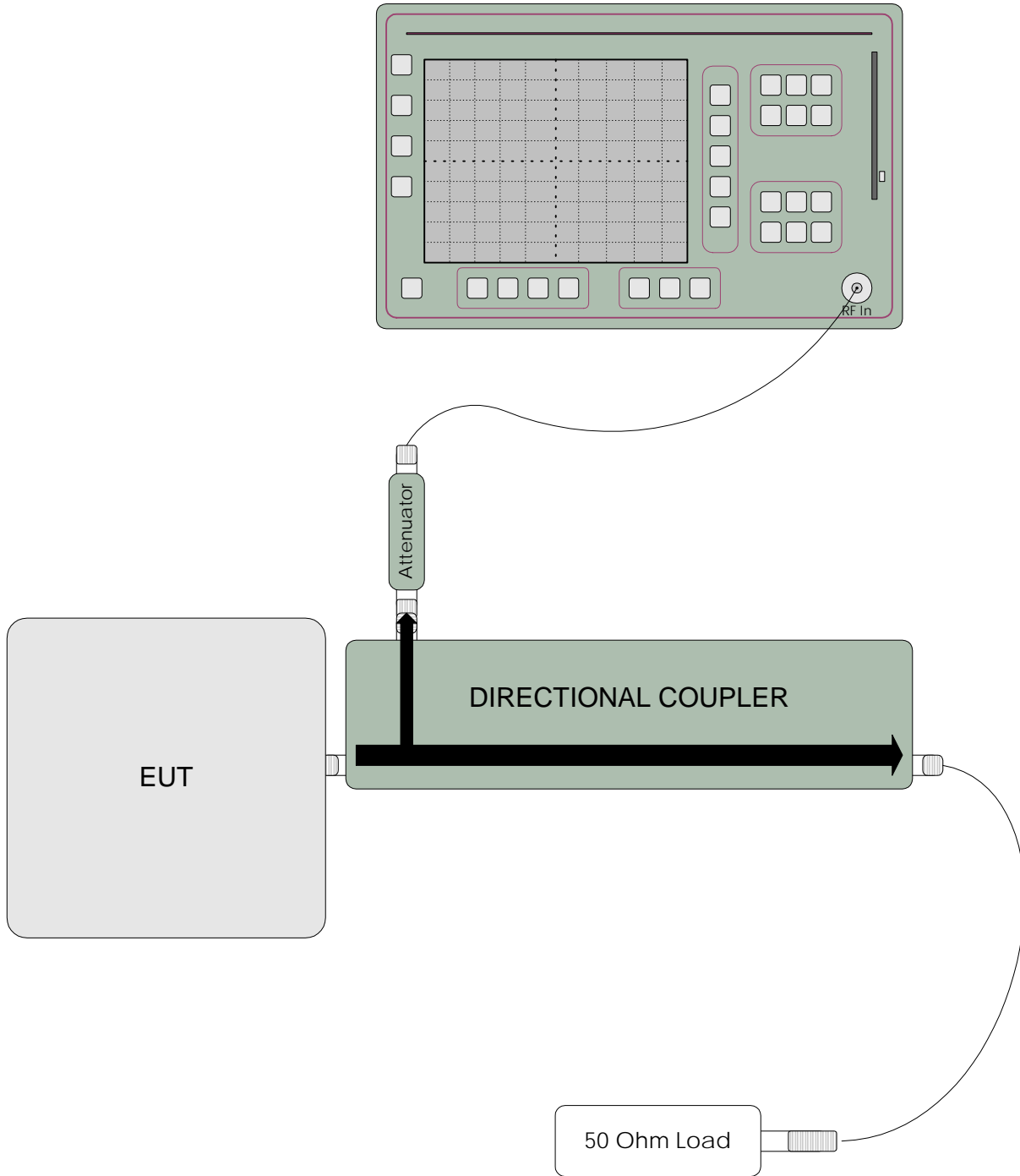
Compliant. All emissions meet the out of band limits.

Out-of-Band Emissions limit is  $43 + 10 \log(P)$  which relates to -13 dBm absolute power.

---

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**D.6. Test Diagram**



**D.7. Test Data**

See following pages.

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Figure 13 Antenna Conducted Spurious – Lower Band Edge – GMSK mode – Combined Carrier

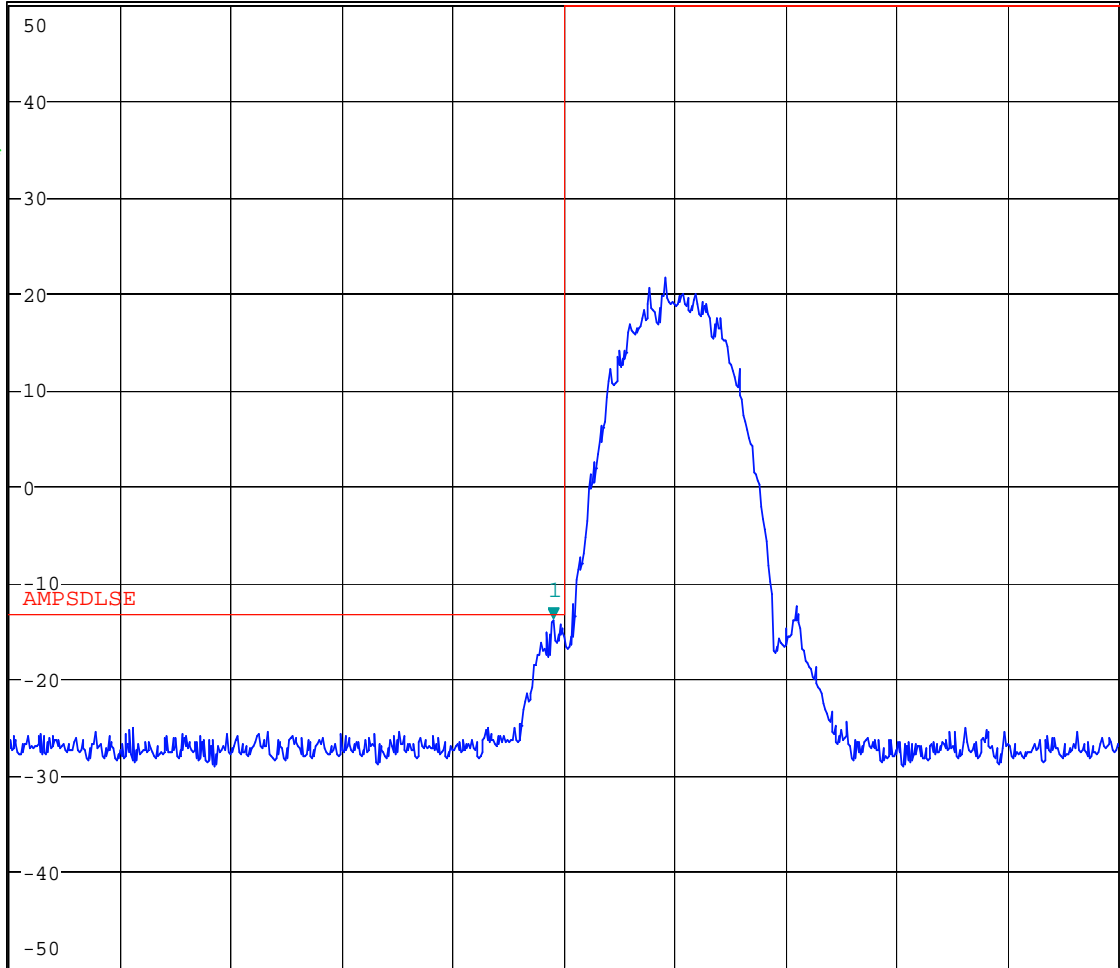


\*RBW 3 kHz      Marker 1 [T1 ]  
VBW 30 kHz      -13.90 dBm  
SWT 225 ms      868.980769231 MHz

Ref 50 dBm

\*Att 35 dB

1 RM \*  
VIEW



Center 869 MHz

200 kHz/

Span 2 MHz

Date: 27.FEB.2007 20:35:45

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Figure 14 Antenna Conducted Spurious – Upper Band Edge – GMSK mode – Combined Carrier

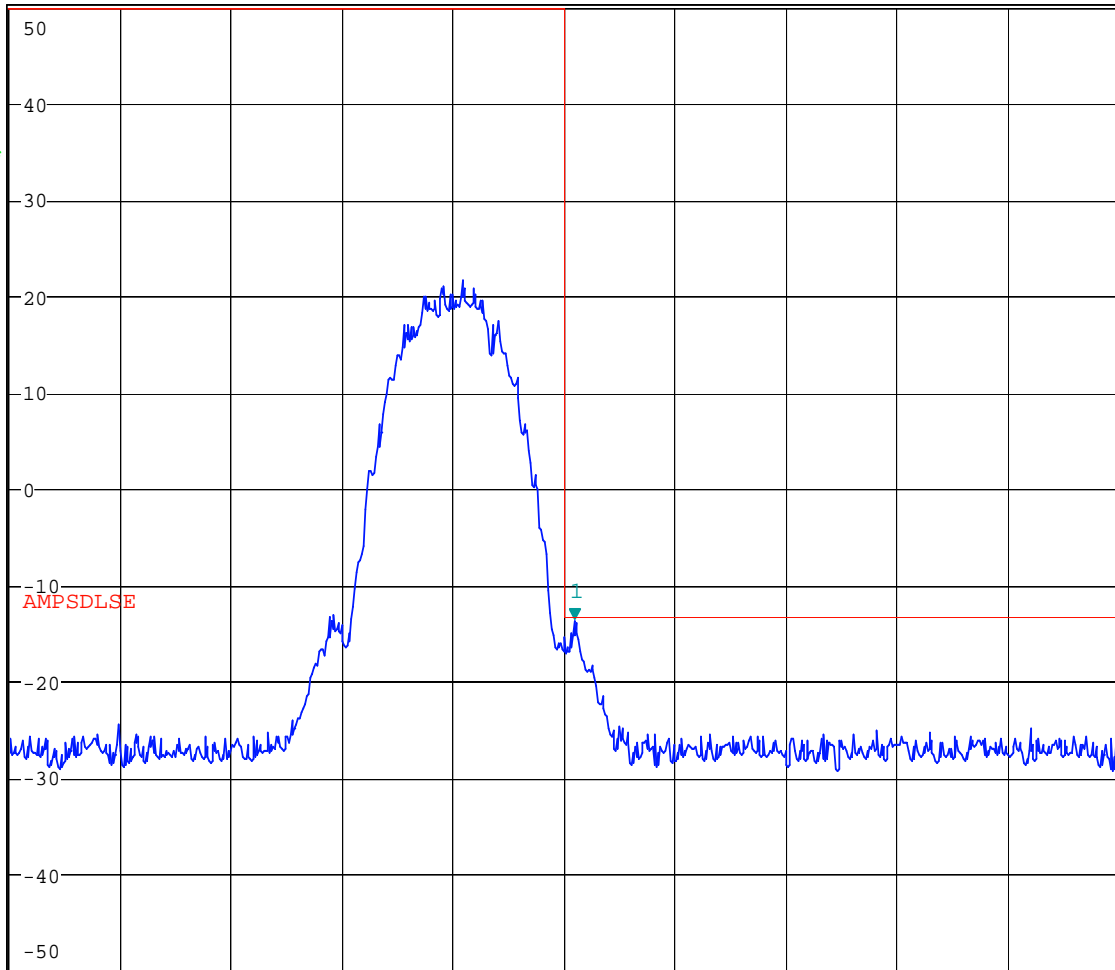


\* RBW 3 kHz      Marker 1 [T1 ]  
VBW 30 kHz      -13.79 dBm  
SWT 225 ms      894.017948718 MHz

Ref 50 dBm

\* Att 35 dB

1 RM \*  
VIEW



A

TDF

Center 894 MHz

200 kHz/

Span 2 MHz

Date: 27.FEB.2007 20:30:28

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Figure 16 Antenna Conducted Spurious – Lower Band Edge – 8PSK mode – Combined Carrier



\* RBW 3 kHz  
\* VBW 3 kHz  
SWT 190 ms  
Marker 1 [T1 ]  
-14.55 dBm  
894.003205128 MHz

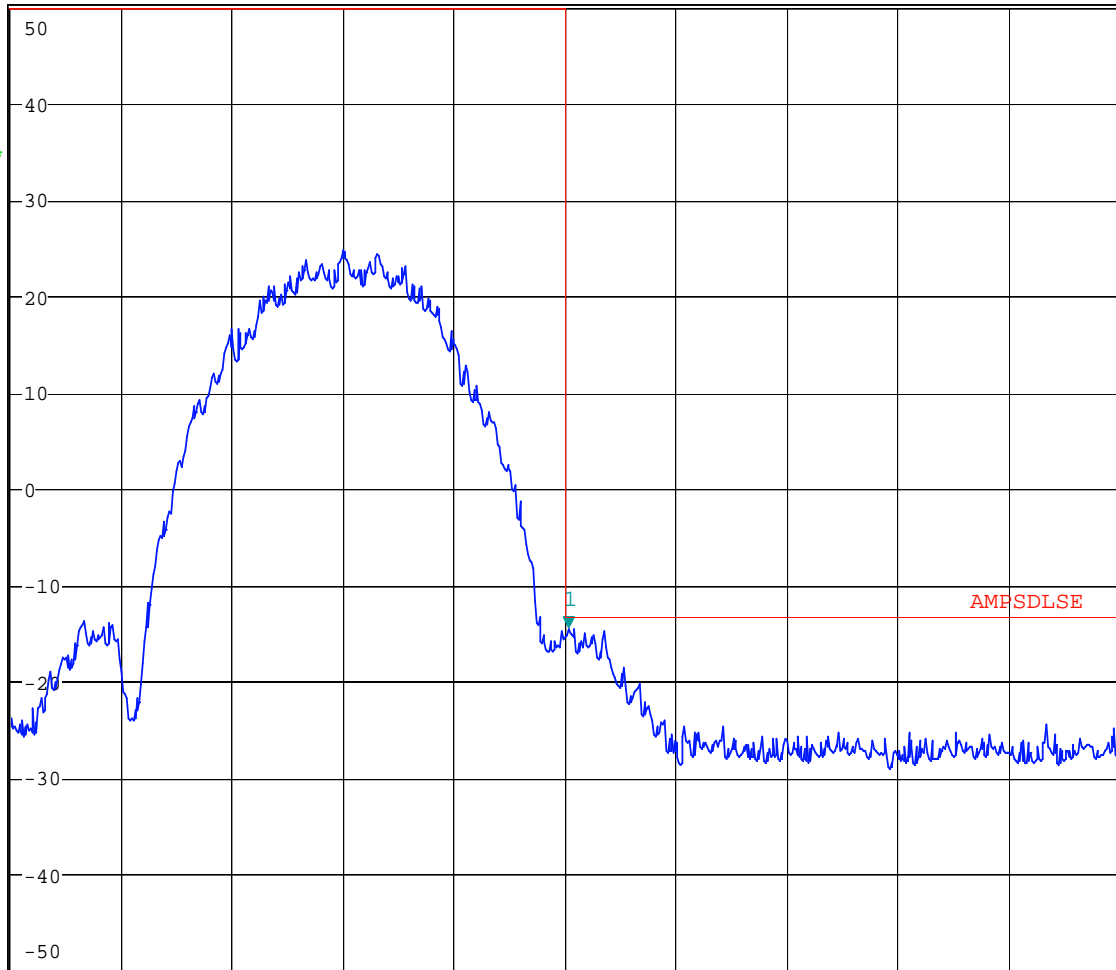
Ref 50 dBm

\* Att 35 dB

SWT 190 ms

894.003205128 MHz

1 RM \*  
VIEW



Center 894 MHz

100 kHz/

Span 1 MHz

Date: 28.FEB.2007 00:44:14

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Figure 17 Antenna Conducted Spurious – Lower Band Edge – GMSK mode – Single Carrier



\* RBW 3 kHz  
\* VBW 3 kHz  
SWT 190 ms  
Marker 1 [T1 ]  
-14.48 dBm  
868.983974359 MHz

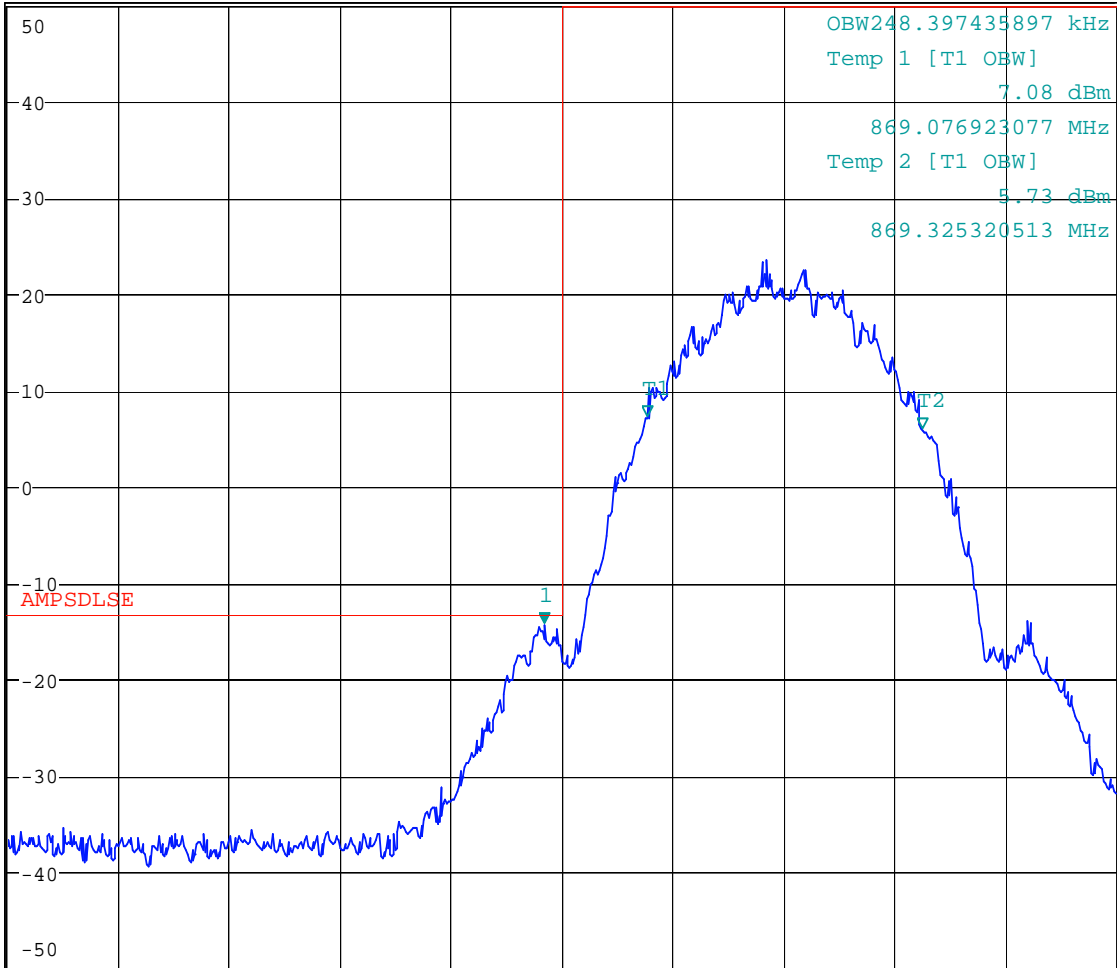
Ref 50 dBm

\* Att 25 dB

SWT 190 ms

868.983974359 MHz

1 RM \*  
VIEW



Center 869 MHz

100 kHz/

Span 1 MHz

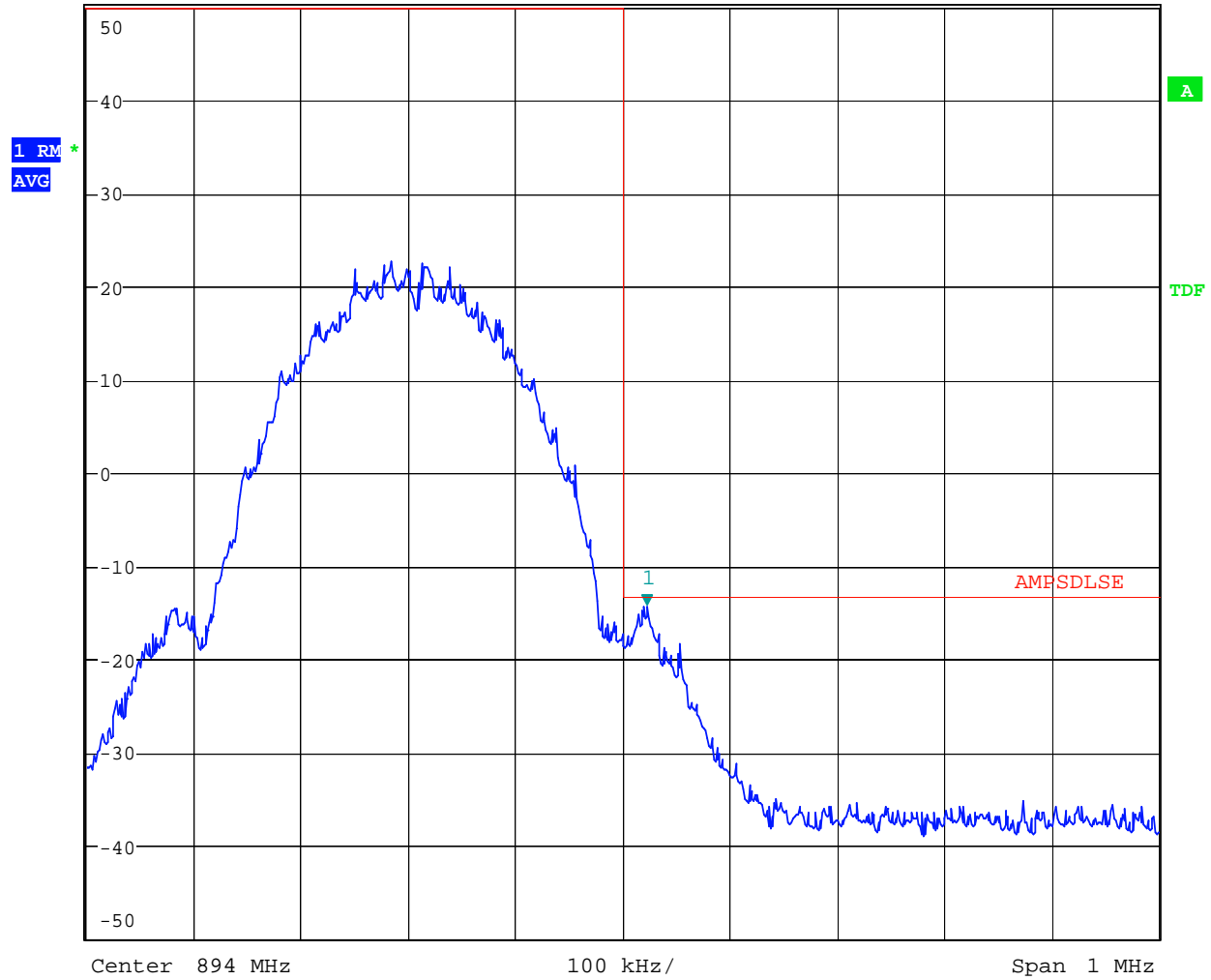
Date: 28.FEB.2007 19:53:51

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Figure 18 Antenna Conducted Spurious – Upper Band Edge – GMSK mode – Single Carrier



\*RBW 3 kHz                    Marker 1 [T1 ]  
\*VBW 3 kHz                    -14.34 dBm  
Ref 50 dBm                    \*Att 25 dB                    SWT 190 ms                    894.022435897 MHz



Date: 28.FEB.2007 20:03:22

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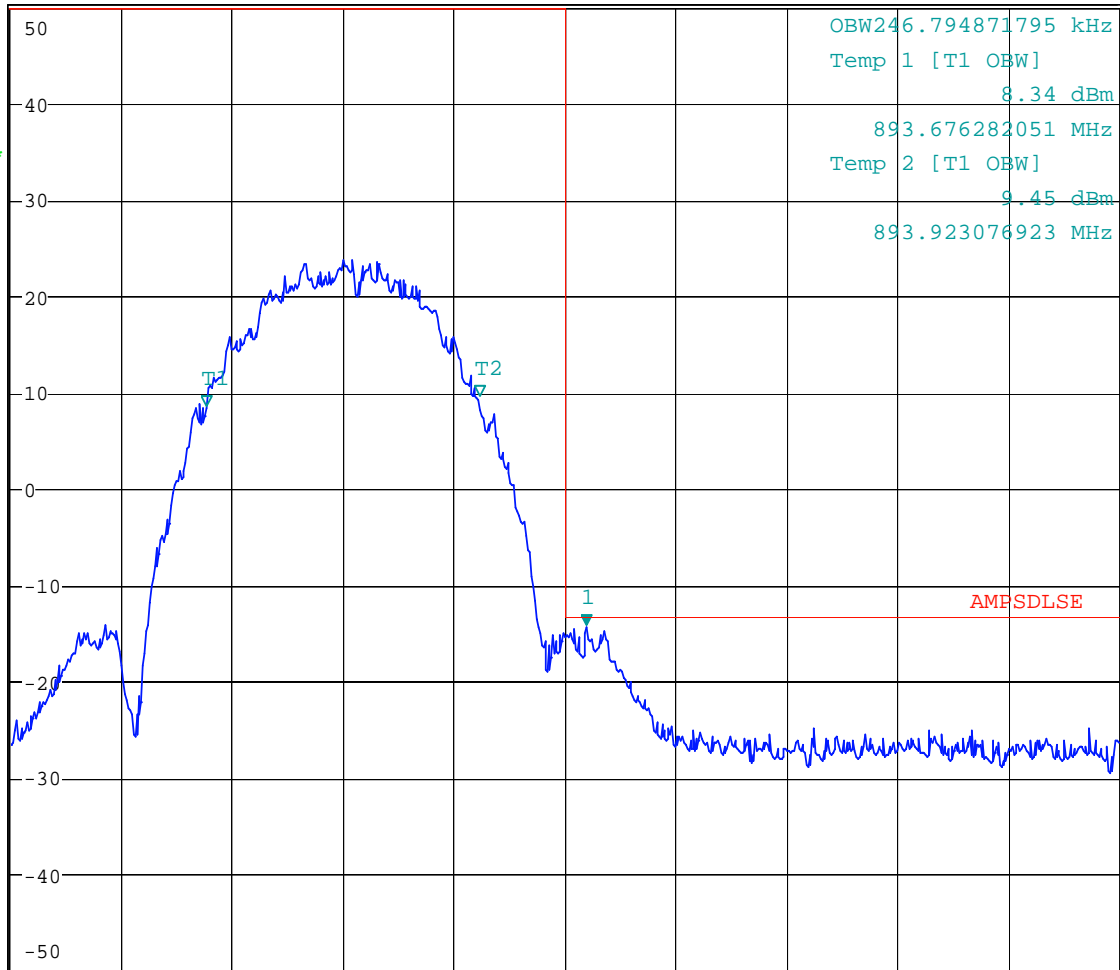


**Figure 20 Antenna Conducted Spurious – Upper Band Edge – 8PSK mode – Single Carrier**



\*RBW 3 kHz                      Marker 1 [T1 ]  
 \*VBW 3 kHz                      -14.42 dBm  
 Ref 50 dBm                      \*Att 35 dB                      SWT 190 ms                      894.019551282 MHz

1 RM \*  
 VIEW



Center 894 MHz                      100 kHz/                      Span 1 MHz

Date: 28.FEB.2007 19:37:36

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Figure 21 Antenna Conducted Spurious – GMSK 869.2 MHz - Combined Carrier Mode

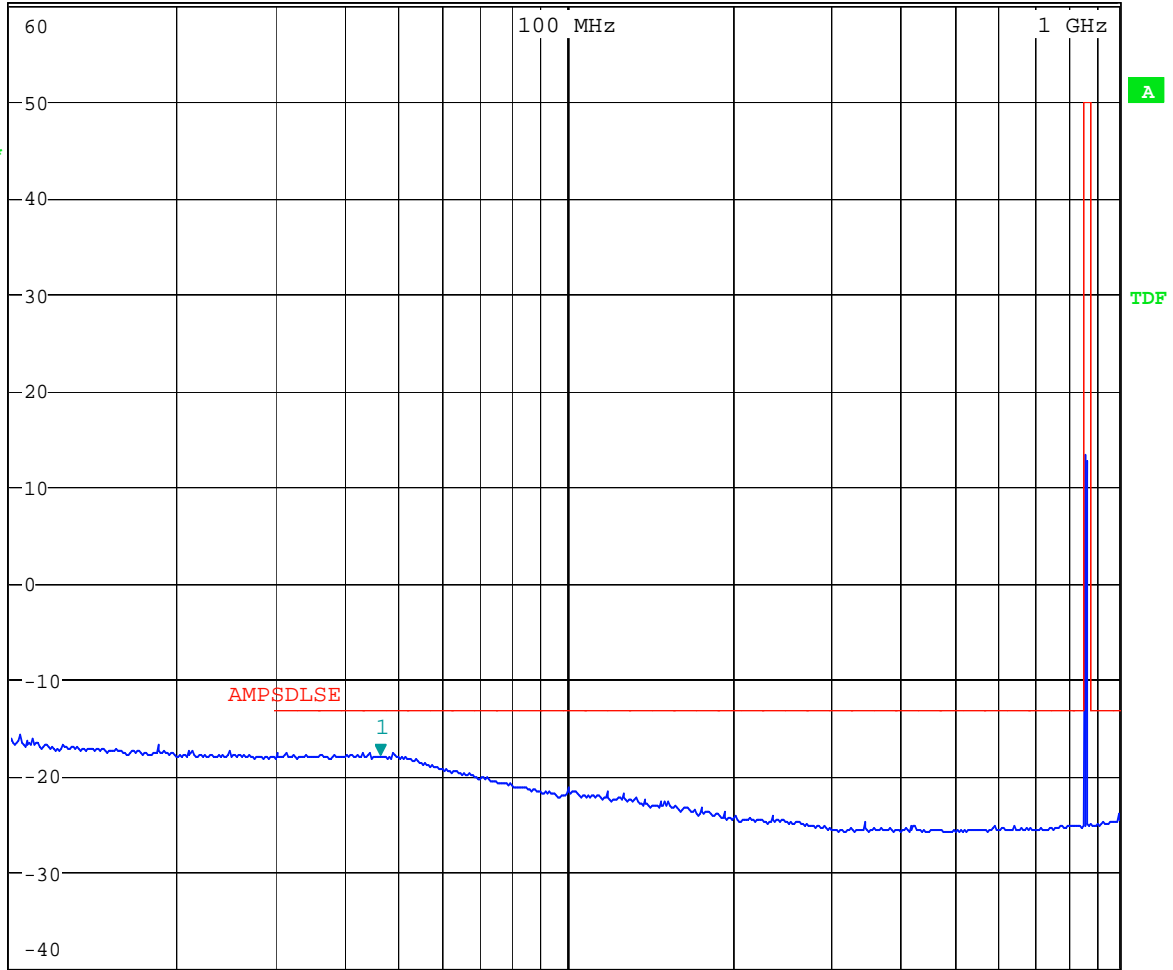


\* RBW 1 MHz      Marker 1 [T1 ]  
VBW 10 MHz      -18.03 dBm  
SWT 20 ms      46.415888336 MHz

Ref 60 dBm

\* Att 10 dB

1 RM \*  
VIEW



Start 10 MHz

Stop 1 GHz

Date: 27.FEB.2007 20:47:59

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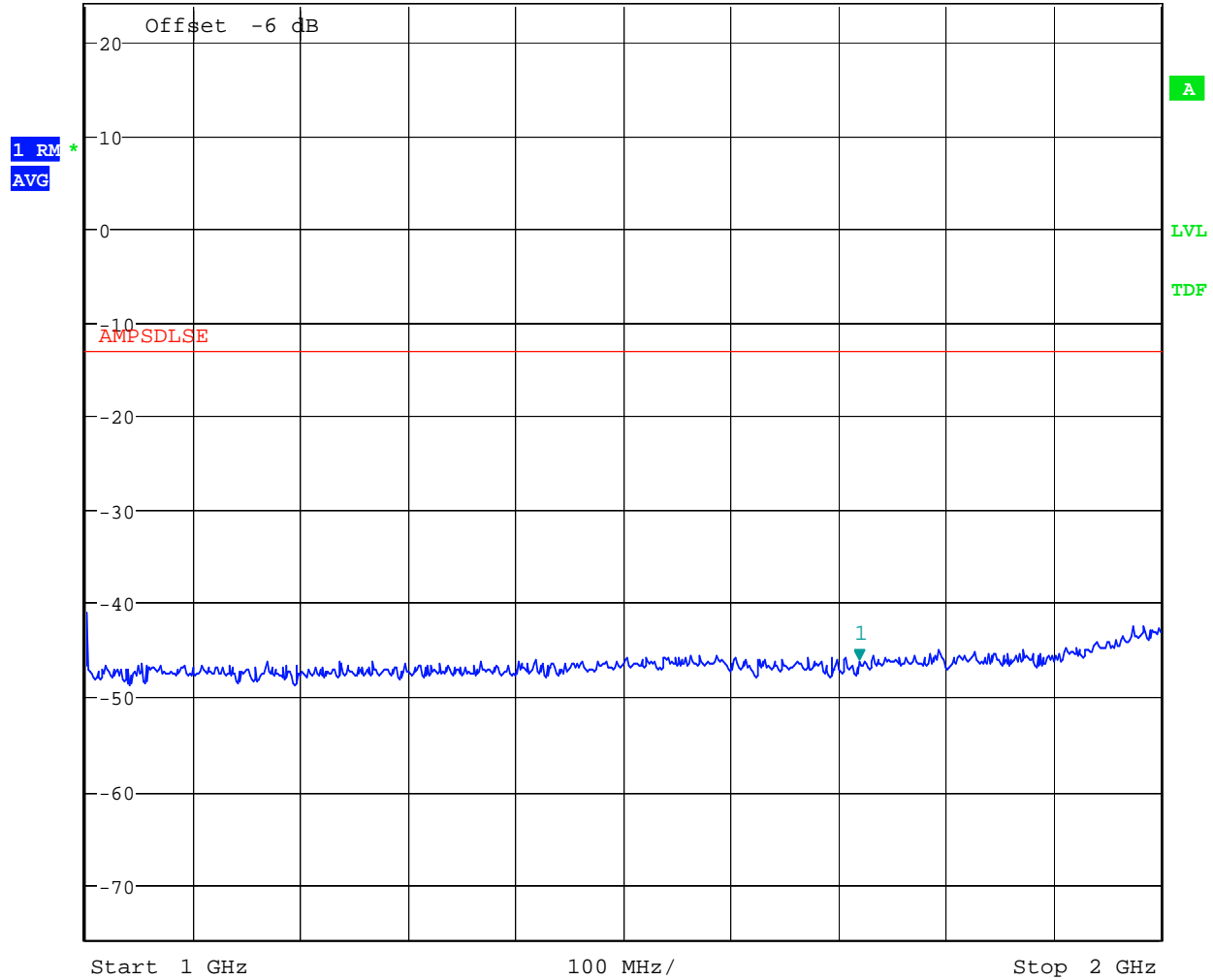


Figure 22 Antenna Conducted Spurious - GMSK 869.2 MHz – Combined Carrier Mode



\* RBW 1 MHz      Marker 1 [T1 ]  
\* VBW 1 MHz      -46.22 dBm

Ref 24 dBm      \* Att 0 dB      SWT 2.5 ms      1.719551282 GHz



Date: 27.FEB.2007 22:51:20

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Figure 23 Antenna Conducted Spurious - GMSK - 869.2 MHz - Combined Carrier Mode

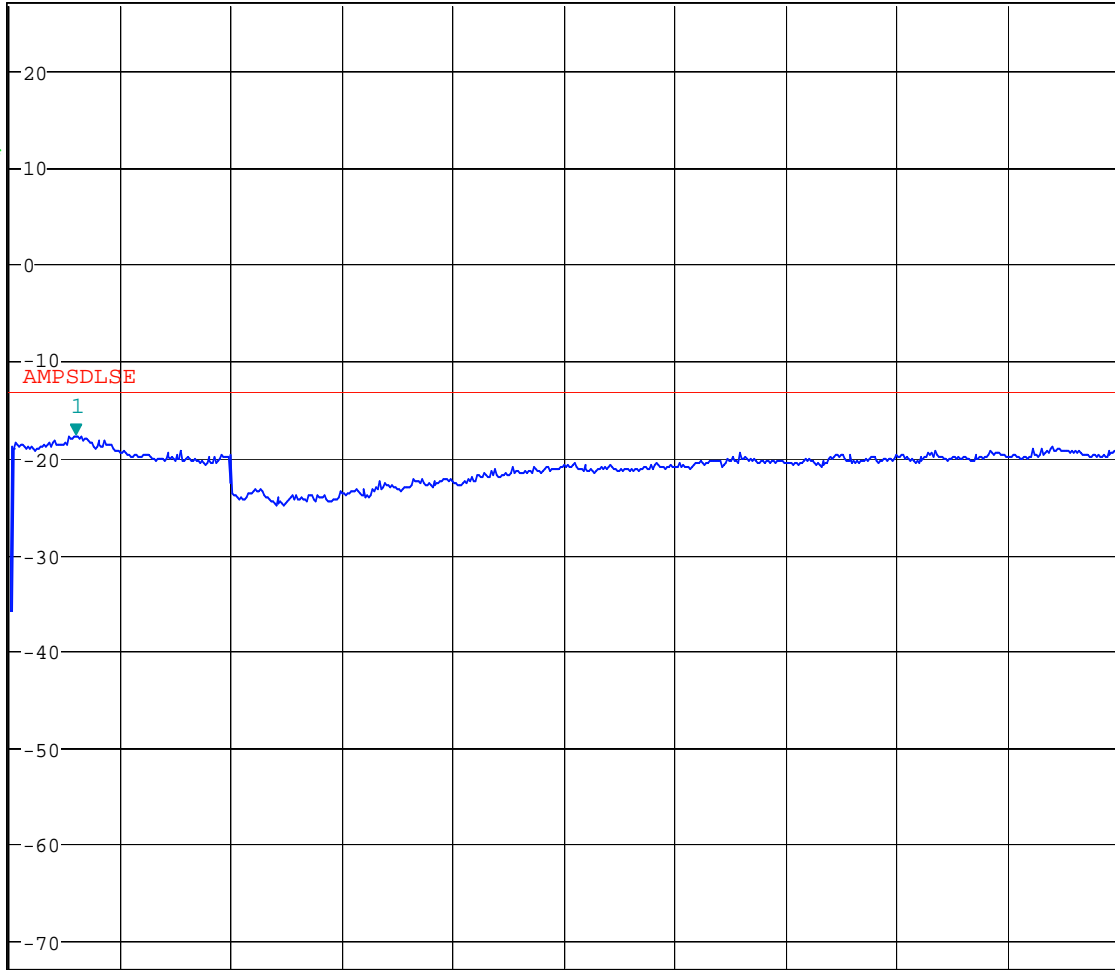


\* RBW 1 MHz  
\* VBW 1 MHz  
SWT 50 ms  
Marker 1 [T1 ]  
-17.75 dBm  
2.474358974 GHz

Ref 27 dBm

\* Att 0 dB

1 RM  
VIEW



Start 2 GHz

800 MHz/

Stop 10 GHz

Date: 27.FEB.2007 22:15:54

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Figure 24 Antenna Conducted Spurious - GMSK - 881.6 MHz - Combined Carrier Mode

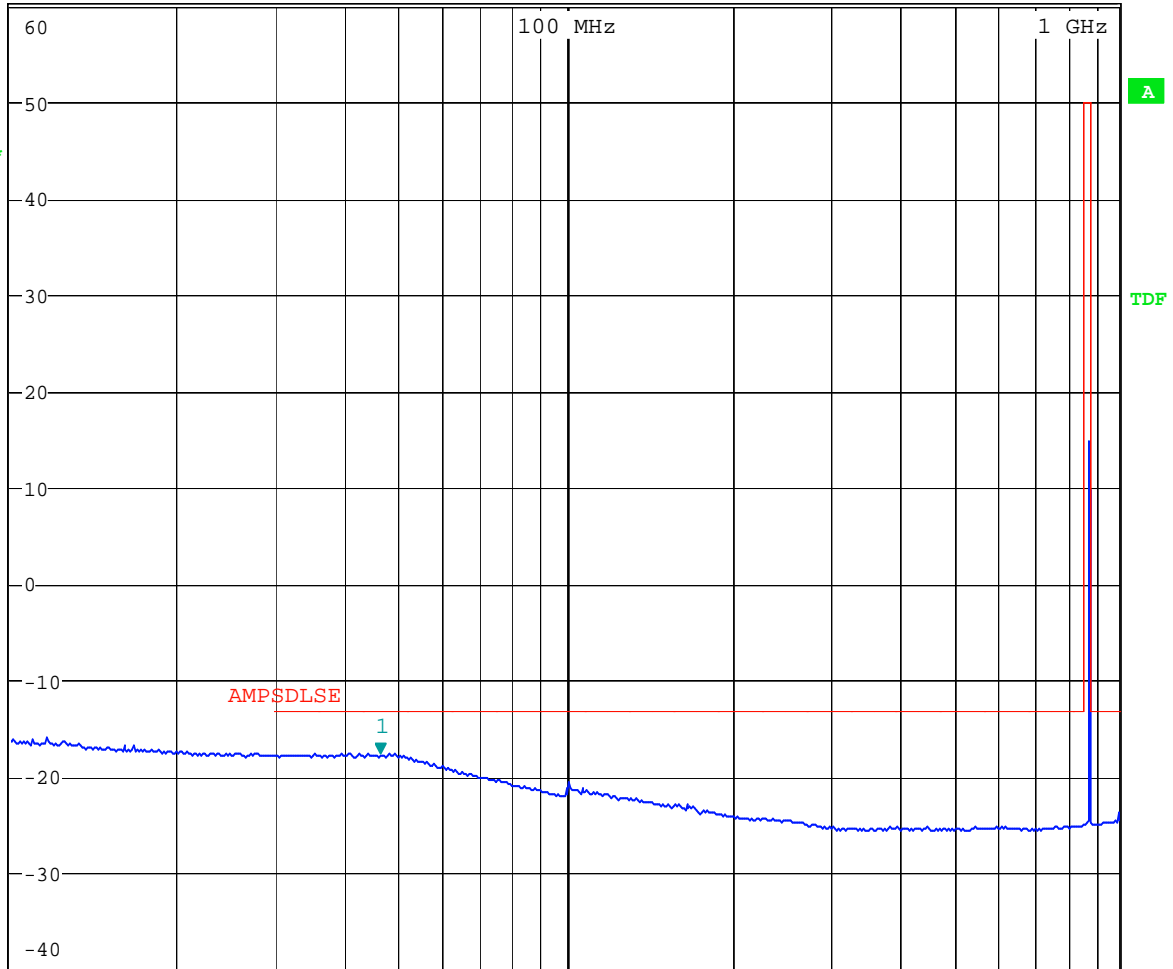


\*RBW 1 MHz      Marker 1 [T1 ]  
VBW 10 MHz      -17.89 dBm  
SWT 20 ms      46.415888336 MHz

Ref 60 dBm

\*Att 10 dB

1 RM \*  
MAXH



Start 10 MHz

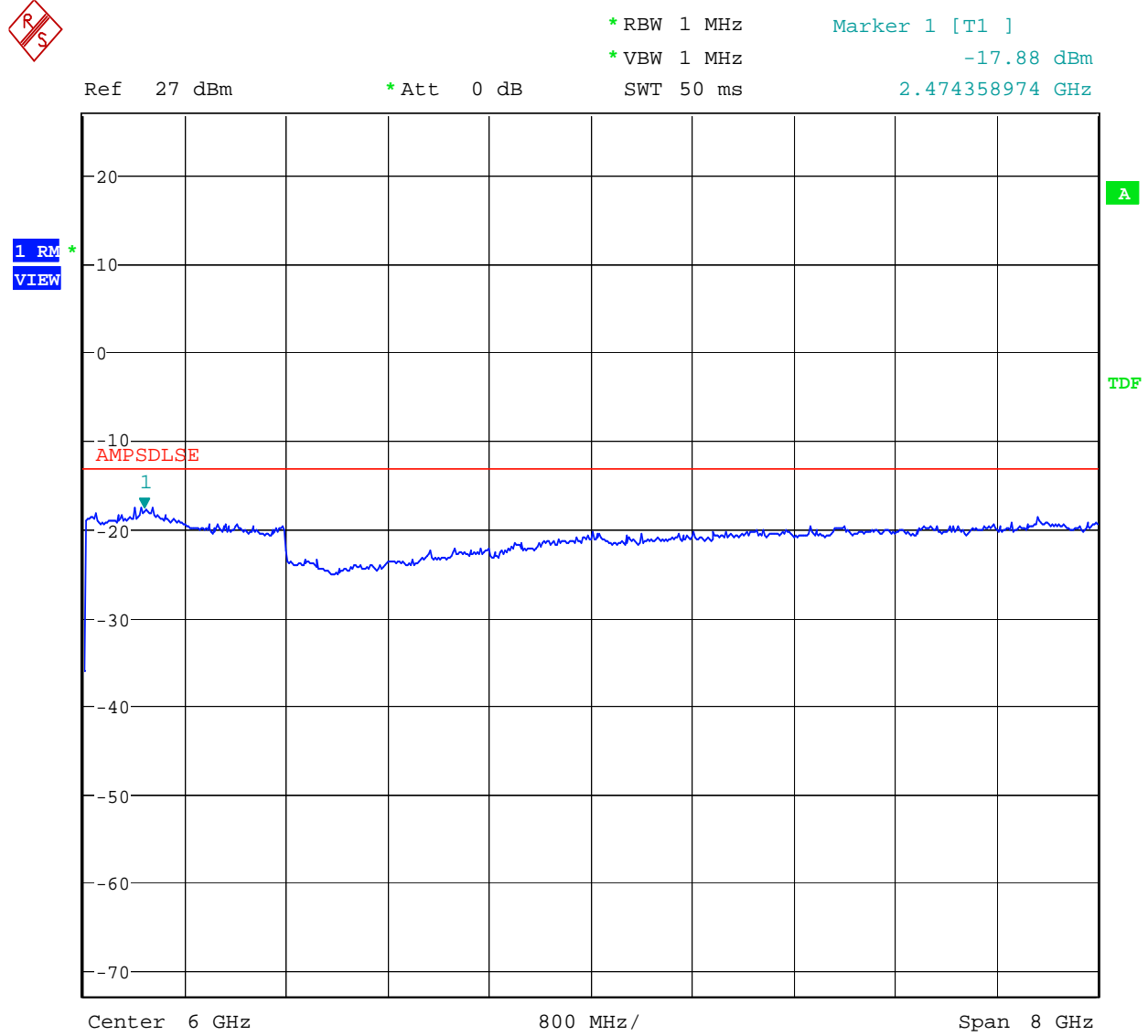
Stop 1 GHz

Date: 27.FEB.2007 20:54:59

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Figure 26 Antenna Conducted Spurious - GMSK - 881.6 MHz – Combined Carrier Mode



Date: 27.FEB.2007 22:29:19

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Figure 27 Antenna Conducted Spurious - GMSK - 893.8 MHz - Combined Carrier Mode

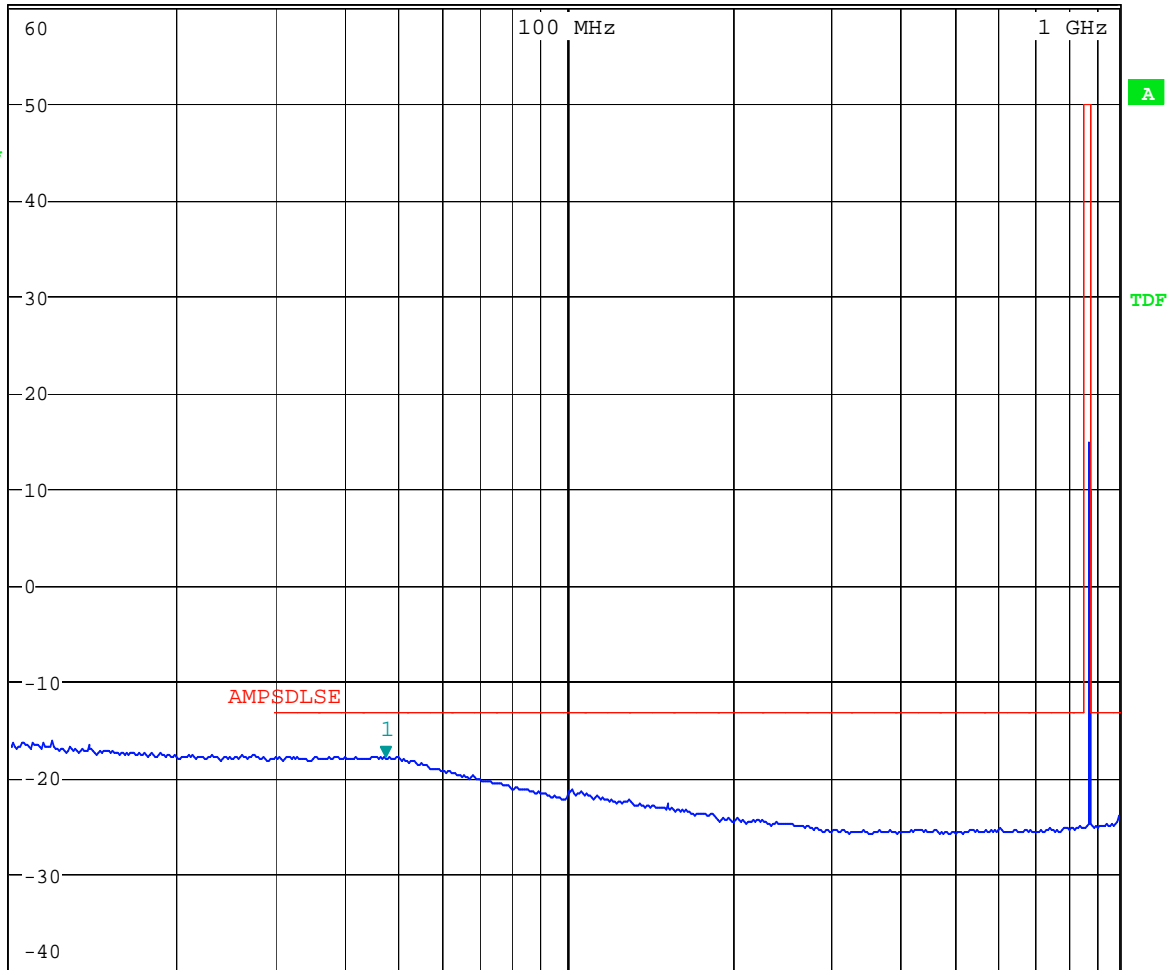


\* RBW 1 MHz      Marker 1 [T1 ]  
VBW 10 MHz      -18.01 dBm  
SWT 20 ms      47.455008037 MHz

Ref 60 dBm

\* Att 10 dB

1 RM \*  
MAXH



Start 10 MHz

Stop 1 GHz

Date: 27.FEB.2007 21:33:06

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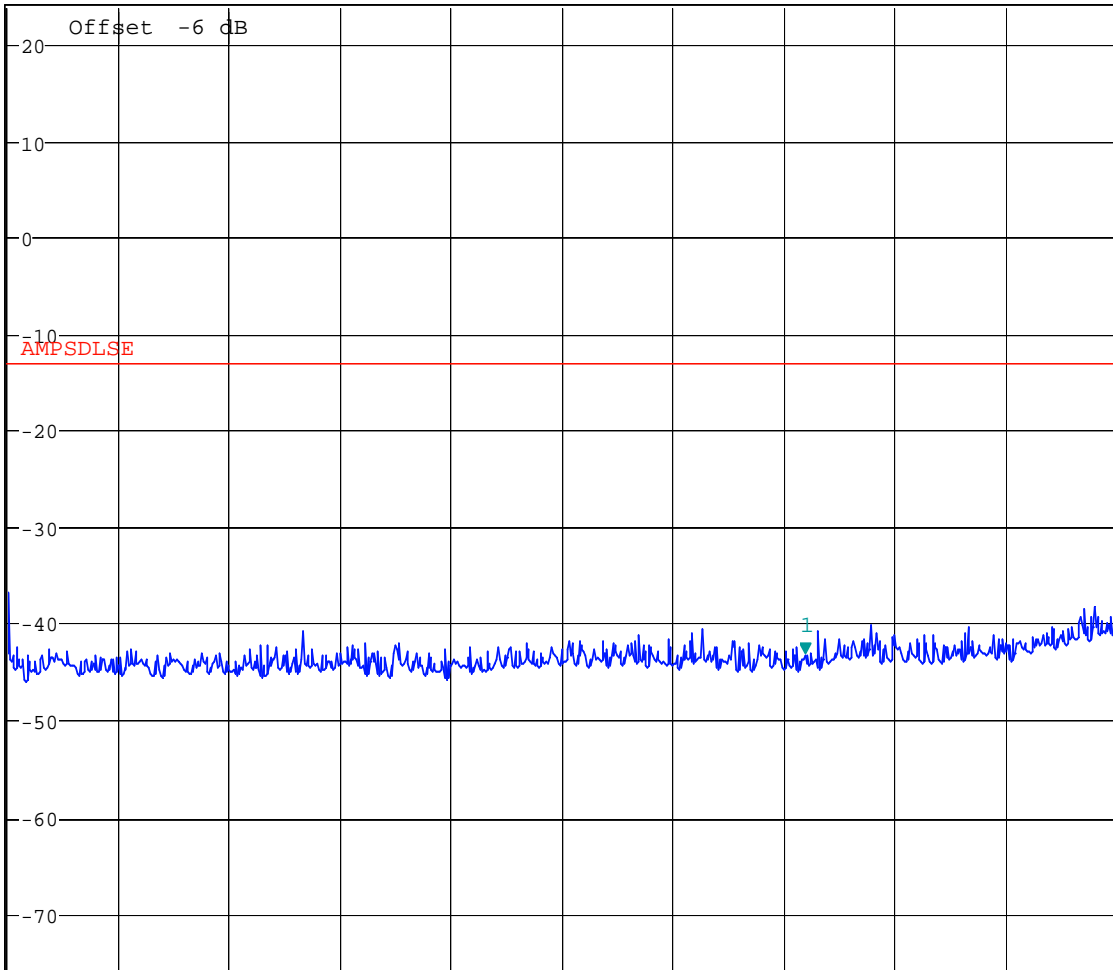
**Figure 28 Antenna Conducted Spurious - GMSK – 893.8 MHz – Combined Carrier Mode**



\* RBW 1 MHz      Marker 1 [T1 ]  
\* VBW 1 MHz      -43.30 dBm  
SWT 2.5 ms      1.719551282 GHz

Ref 24 dBm

\* Att 0 dB



Start 1 GHz

100 MHz/

Stop 2 GHz

Date: 27.FEB.2007 22:49:45

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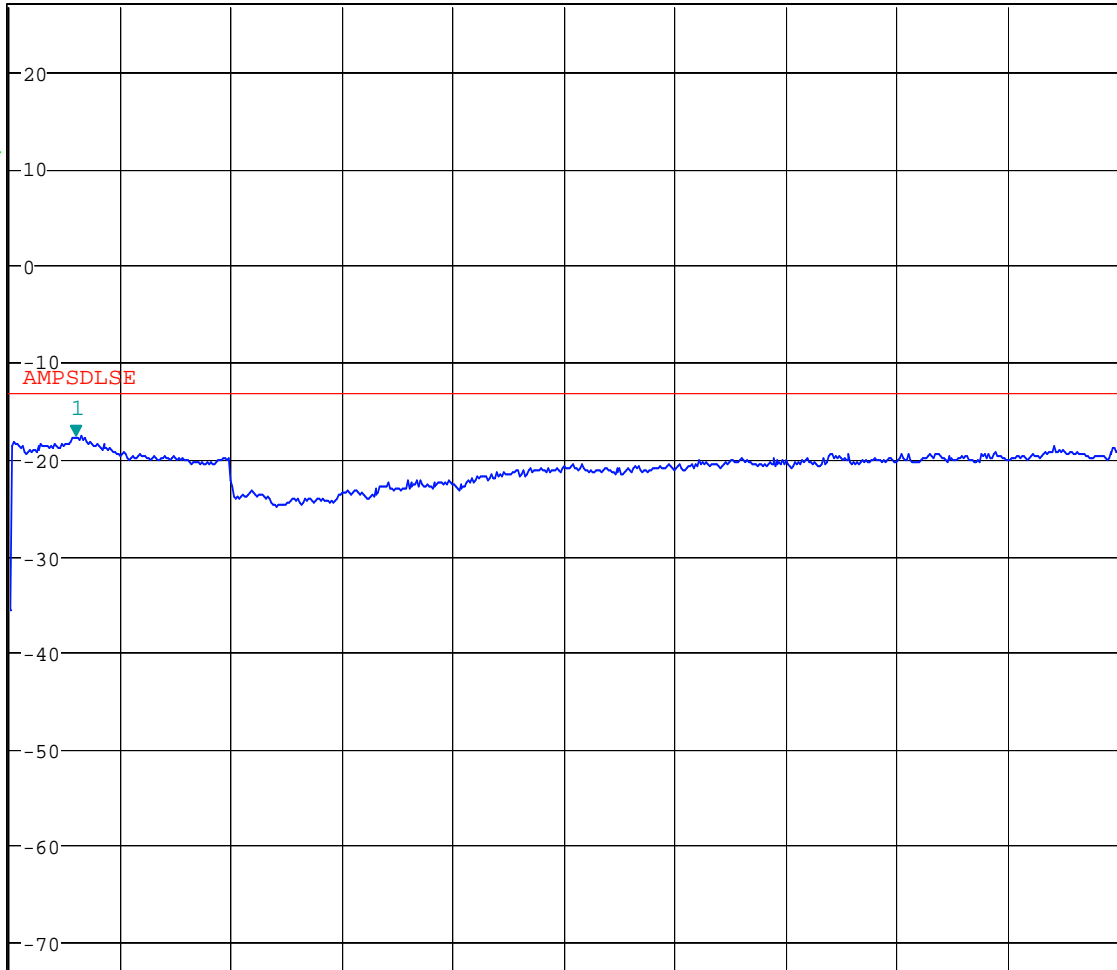
Figure 29 Antenna Conducted Spurious – GMSK – 893.8 MHz – Combined Carrier Mode



\* RBW 1 MHz      Marker 1 [T1 ]  
\* VBW 1 MHz      -17.86 dBm  
SWT 50 ms      2.474358974 GHz

Ref 27 dBm      \* Att 0 dB

1 RM  
VIEW



Start 2 GHz      800 MHz/      Stop 10 GHz

Date: 27.FEB.2007 22:34:57

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Figure 30 Antenna Conducted Spurious – 8PSK 869.2 MHz – Combined Carrier Mode

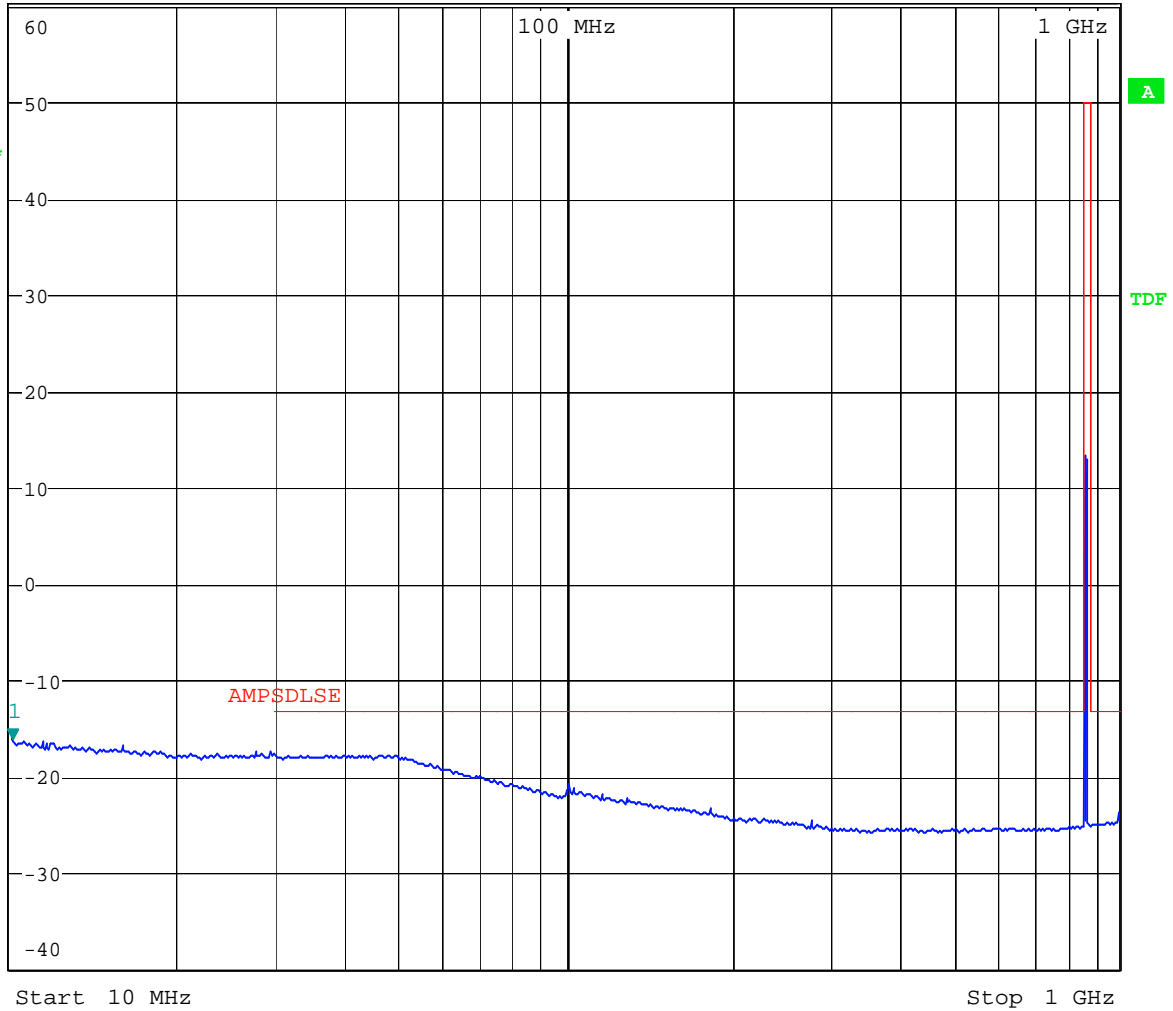


\*RBW 1 MHz      Marker 1 [T1 ]  
VBW 10 MHz      -16.32 dBm  
SWT 20 ms      10.074073803 MHz

Ref 60 dBm

\*Att 10 dB

1 RM \*  
VIEW



Date: 28.FEB.2007 00:27:32

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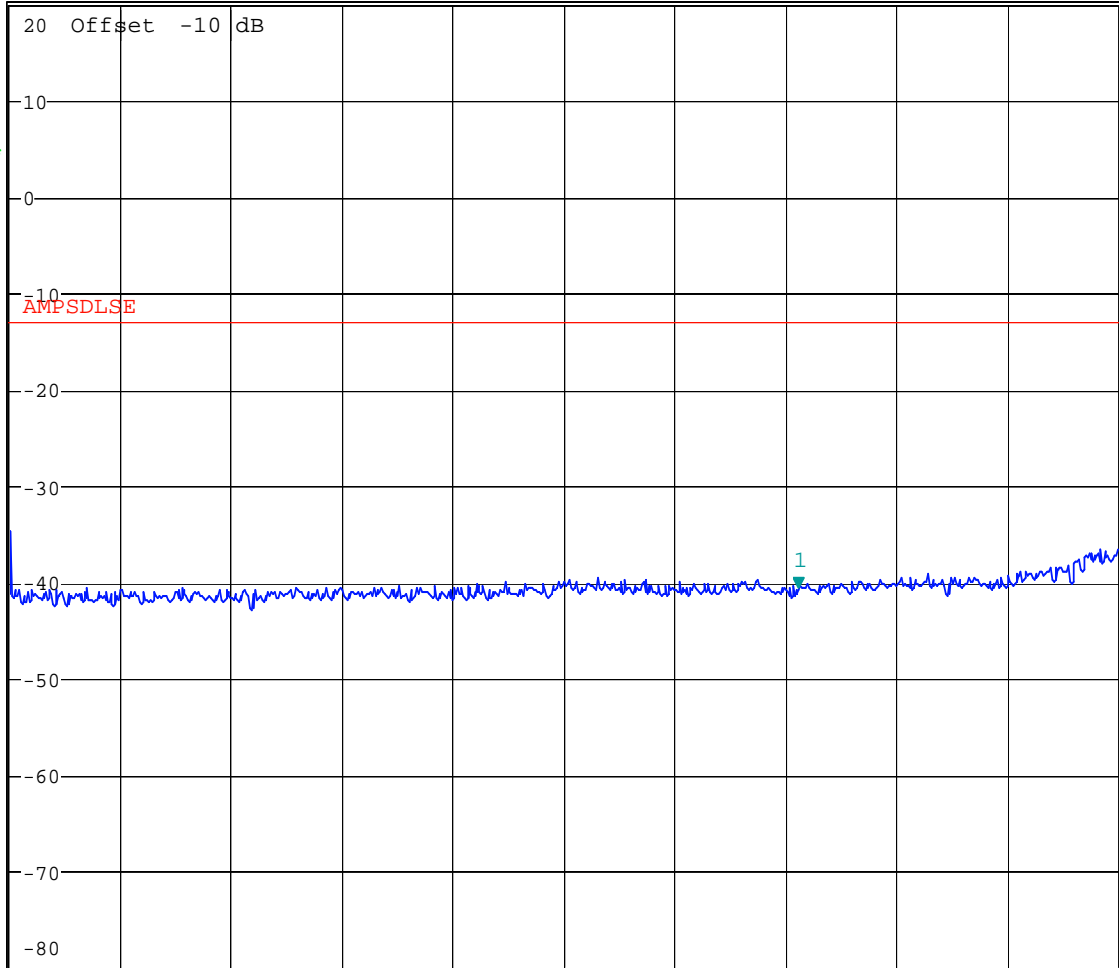
Figure 31 Antenna Conducted Spurious – 8PSK 869.2 MHz – Combined Carrier Mode



\* RBW 1 MHz      Marker 1 [T1 ]  
\* VBW 1 MHz      -40.81 dBm  
SWT 2.5 ms      1.711538462 GHz

Ref 20 dBm      \* Att 10 dB

1 RM \*  
AVG



Start 1 GHz      100 MHz/      Stop 2 GHz

Date: 28.FEB.2007 15:57:54

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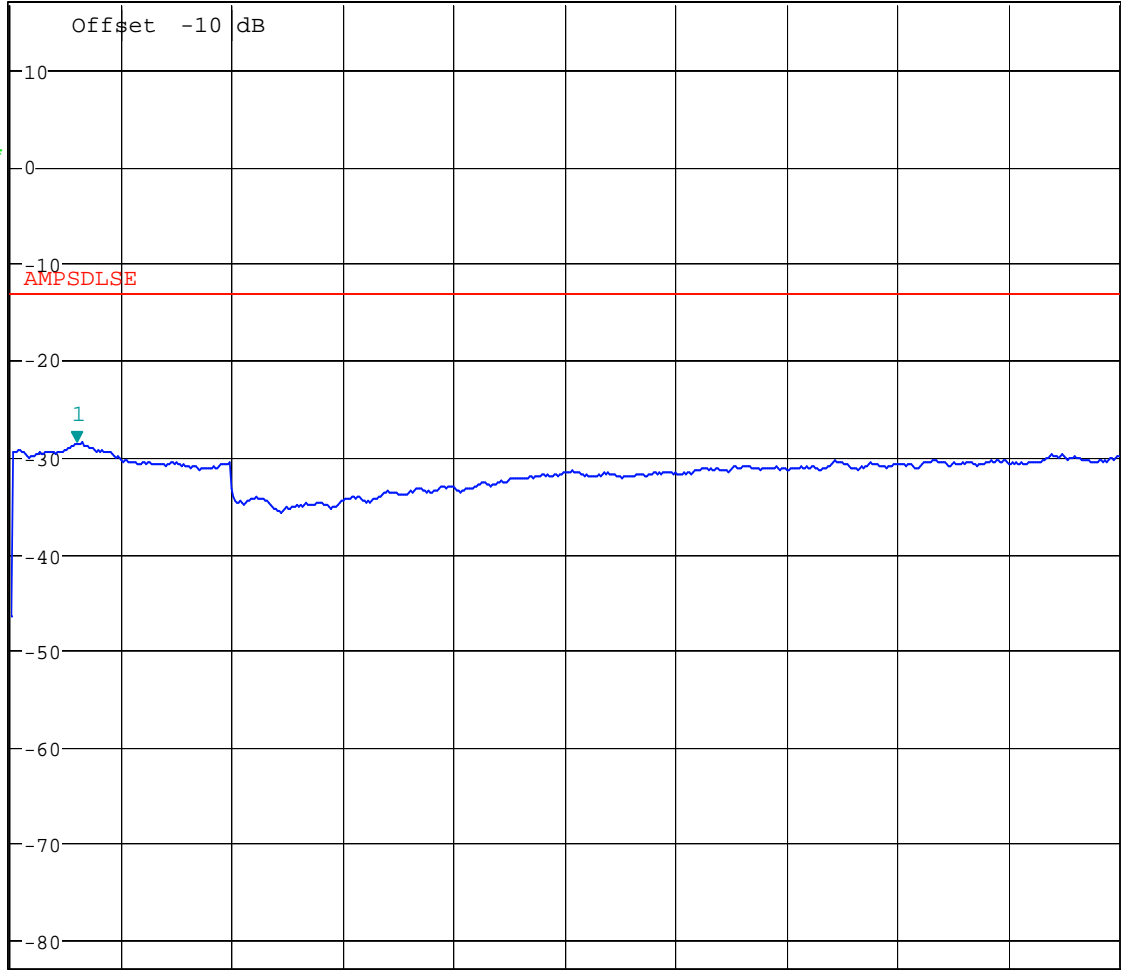
Figure 32 Antenna Conducted Spurious – 8PSK 869.2 MHz – Combined Carrier Mode



\* RBW 1 MHz      Marker 1 [T1 ]  
\* VBW 1 MHz      -28.77 dBm  
SWT 50 ms      2.474358974 GHz

Ref 17 dBm      \* Att 0 dB

1 RM \*  
AVG



Start 2 GHz      800 MHz/      Stop 10 GHz

Date: 28.FEB.2007 15:59:55

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Figure 33 Antenna Conducted Spurious – 8PSK 881.6 MHz – Combined Carrier Mode

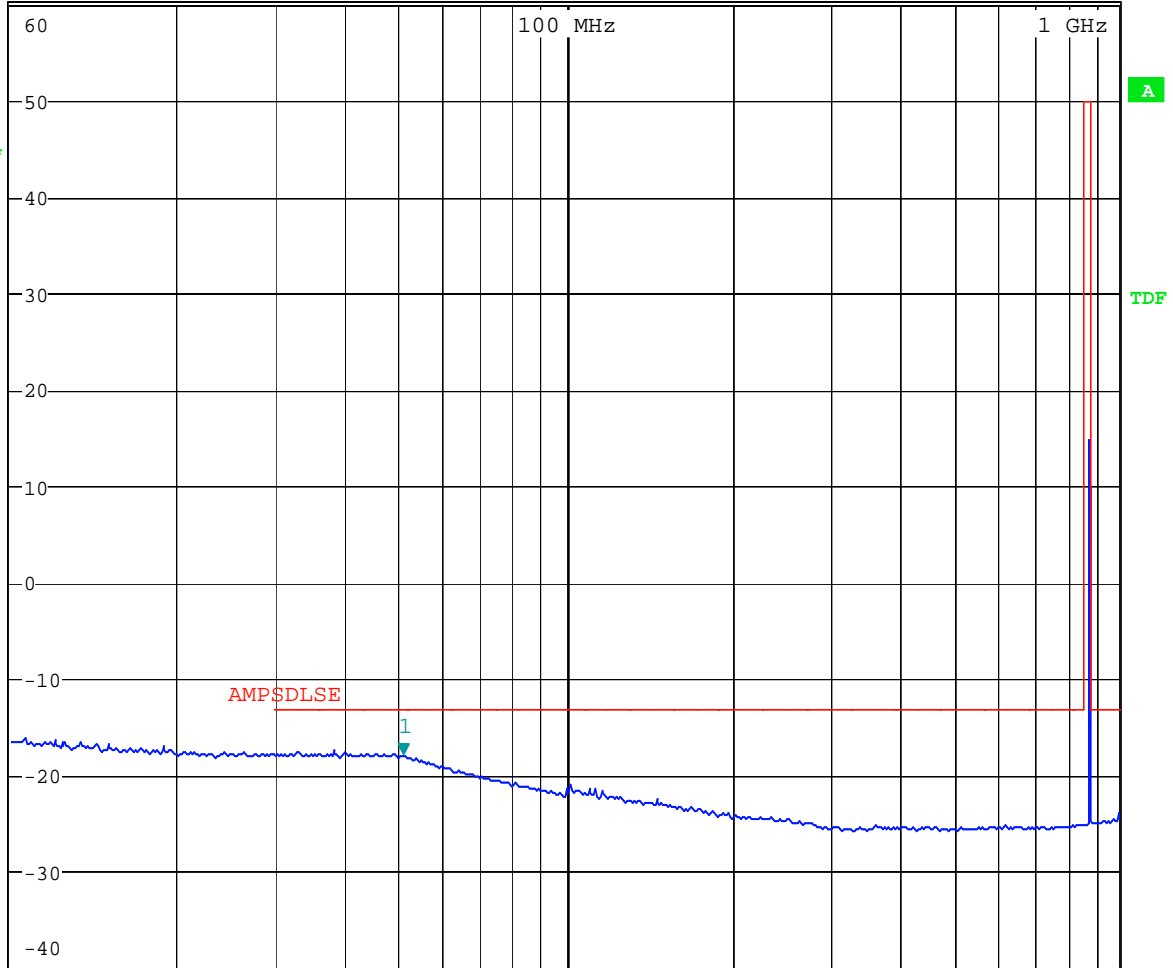


\*RBW 1 MHz      Marker 1 [T1 ]  
VBW 10 MHz      -18.07 dBm  
SWT 20 ms      51.089697745 MHz

Ref 60 dBm

\*Att 10 dB

1 RM \*  
MAXH



Start 10 MHz

Stop 1 GHz

Date: 28.FEB.2007 00:24:06

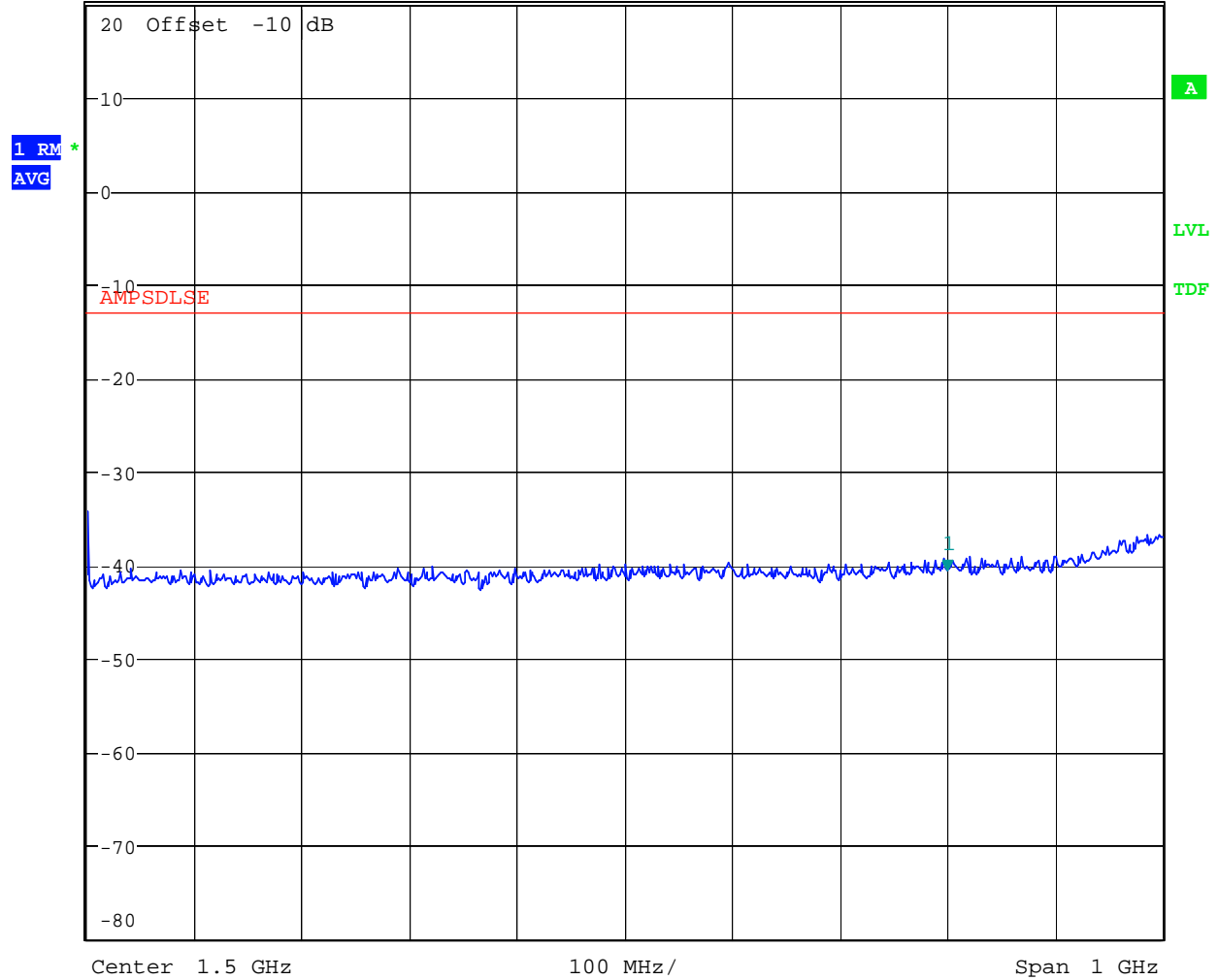
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Figure 34 Antenna Conducted Spurious – 8PSK - 881.6 MHz – Combined Carrier Mode



\* RBW 1 MHz      Marker 1 [T1 ]  
\* VBW 1 MHz      -40.77 dBm

Ref 20 dBm      \* Att 10 dB      SWT 2.5 ms      1.799679487 GHz



Date: 28.FEB.2007 16:09:39

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Figure 35 Antenna Conducted Spurious – 8PSK – 881.6 MHz – Combined Carrier Mode

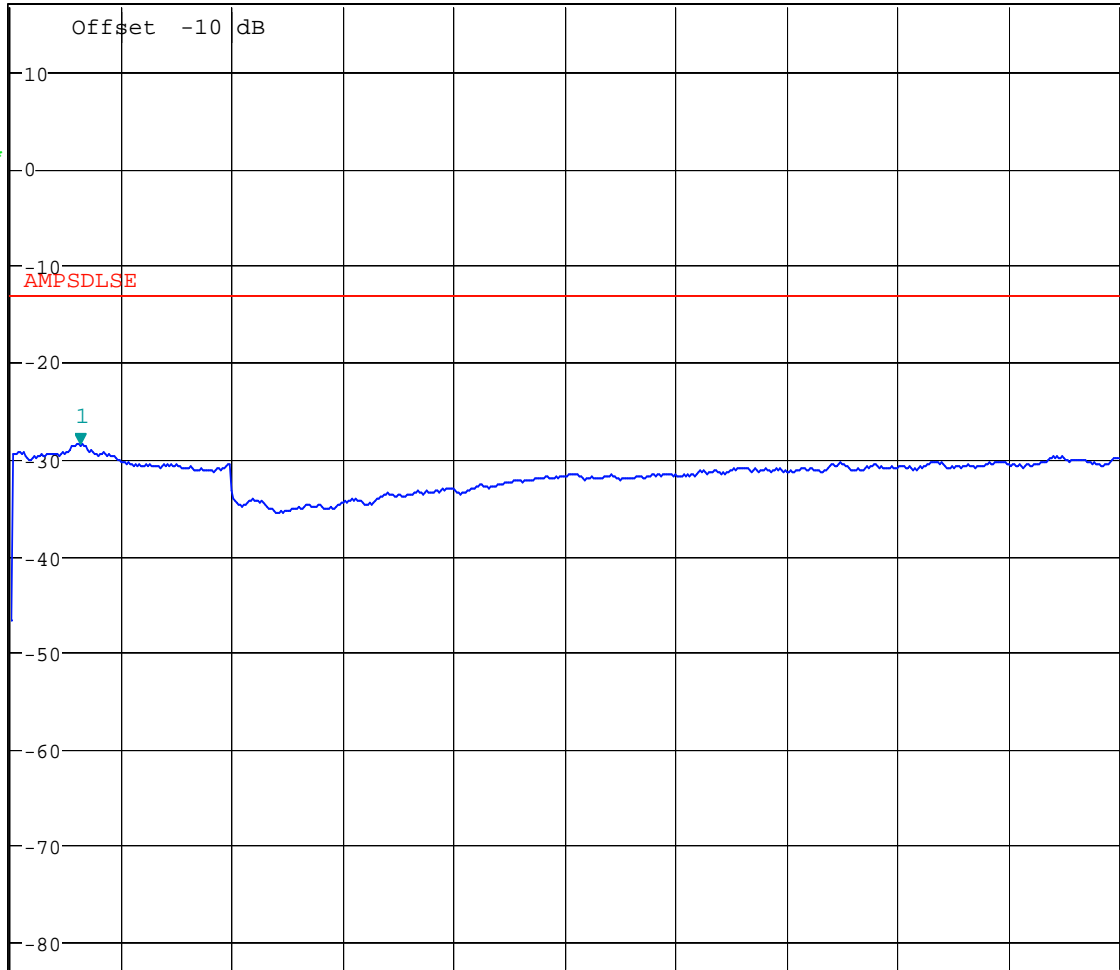


\* RBW 1 MHz                      Marker 1 [T1 ]  
\* VBW 1 MHz                      -28.61 dBm  
SWT 50 ms                      2.500000000 GHz

Ref 17 dBm

\* Att 0 dB

1 RM  
AVG



Start 2 GHz

800 MHz/

Stop 10 GHz

Date: 28.FEB.2007 16:06:01

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Figure 36 Antenna Conducted Spurious – 8PSK – 893.8 MHz – Combined Carrier Mode

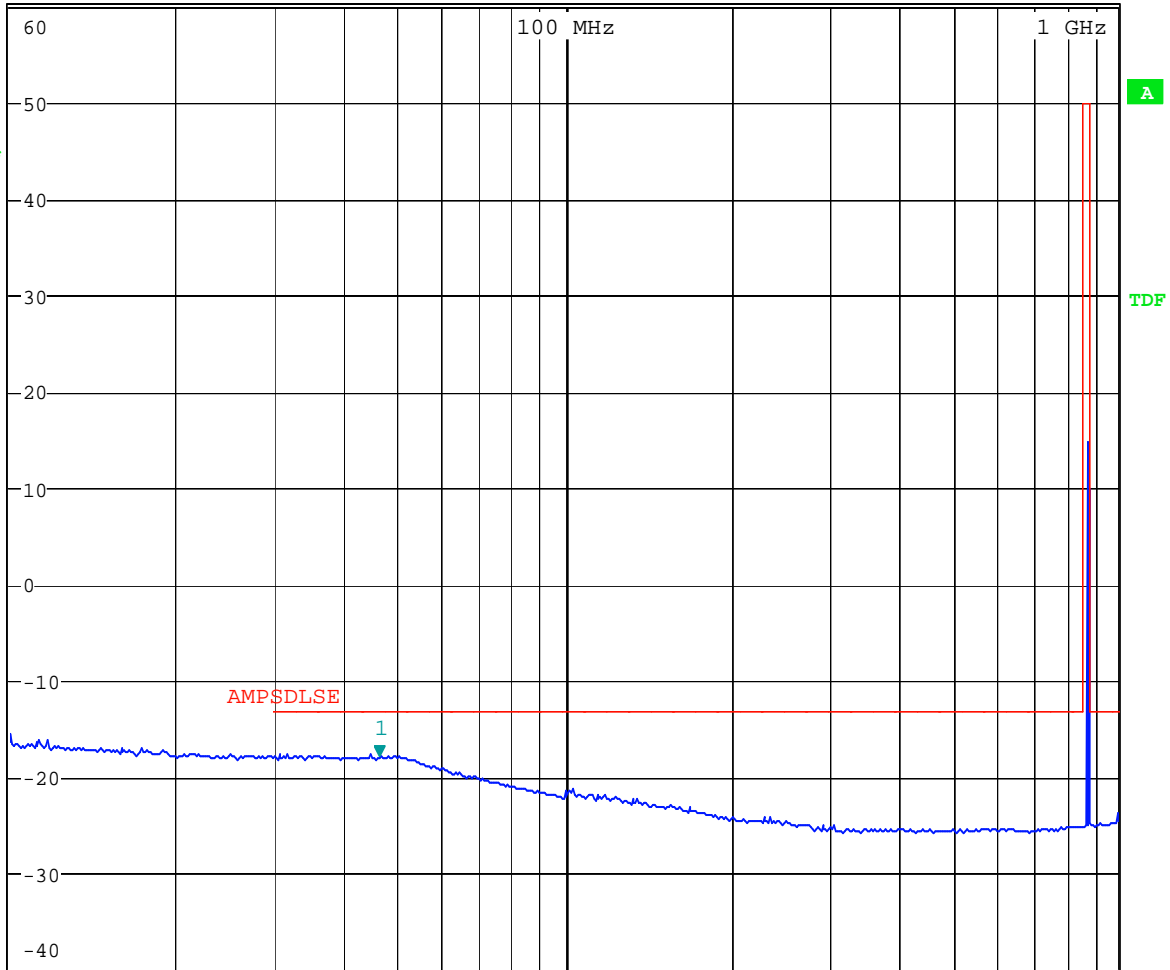


\*RBW 1 MHz      Marker 1 [T1 ]  
VBW 10 MHz      -18.11 dBm  
SWT 20 ms      46.415888336 MHz

Ref 60 dBm

\*Att 10 dB

1 RM  
MAXH



Start 10 MHz

Stop 1 GHz

Date: 28.FEB.2007 00:23:24

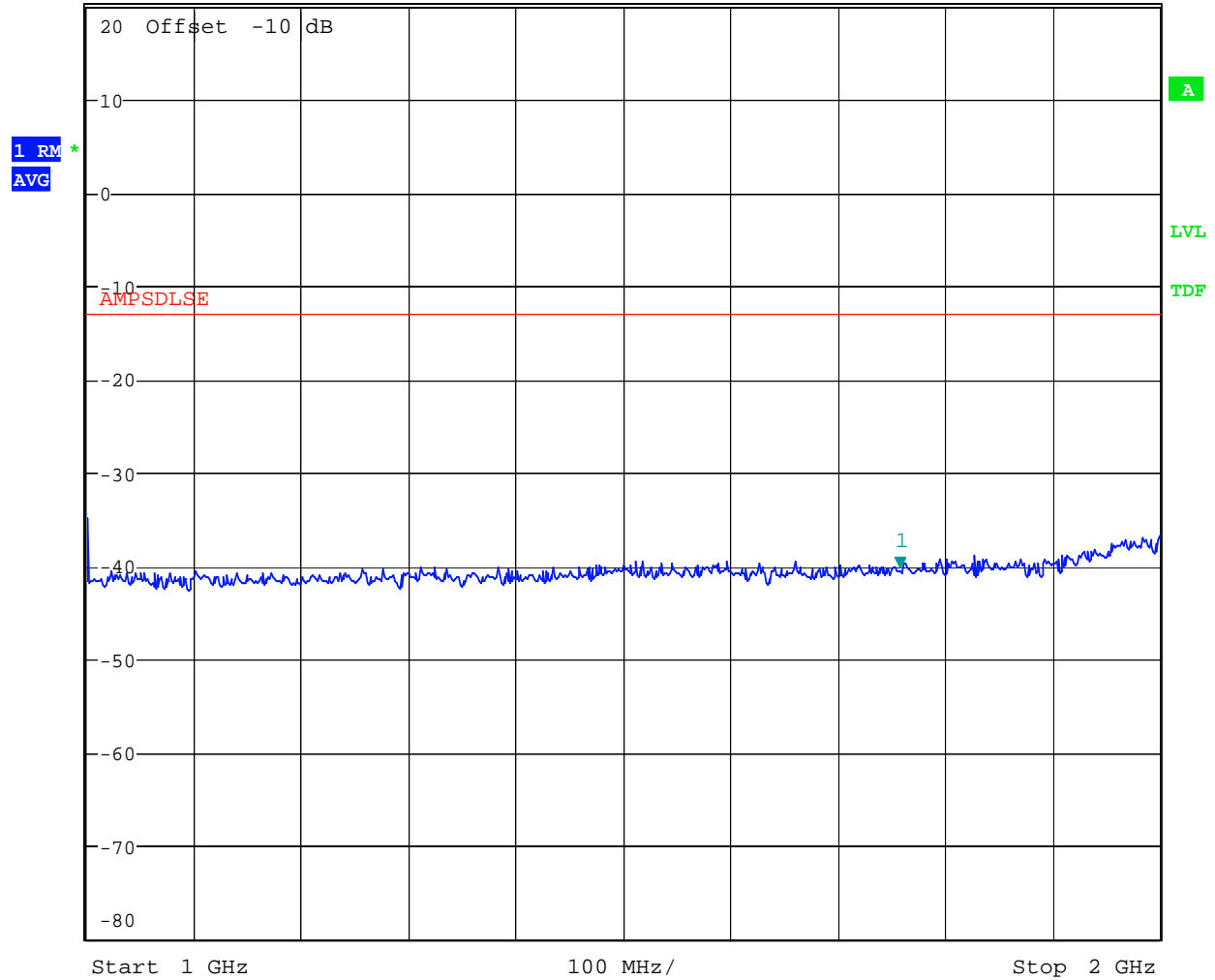
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Figure 37 Antenna Conducted Spurious – 8PSK – 893.8 MHz – Combined Carrier Mode



\* RBW 1 MHz      Marker 1 [T1 ]  
\* VBW 1 MHz      -40.47 dBm

Ref 20 dBm      \* Att 10 dB      SWT 2.5 ms      1.758012821 GHz



Date: 28.FEB.2007 16:13:02

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Figure 38 Antenna Conducted Spurious – 8PSK – 893.8 MHz – Combined Carrier Mode

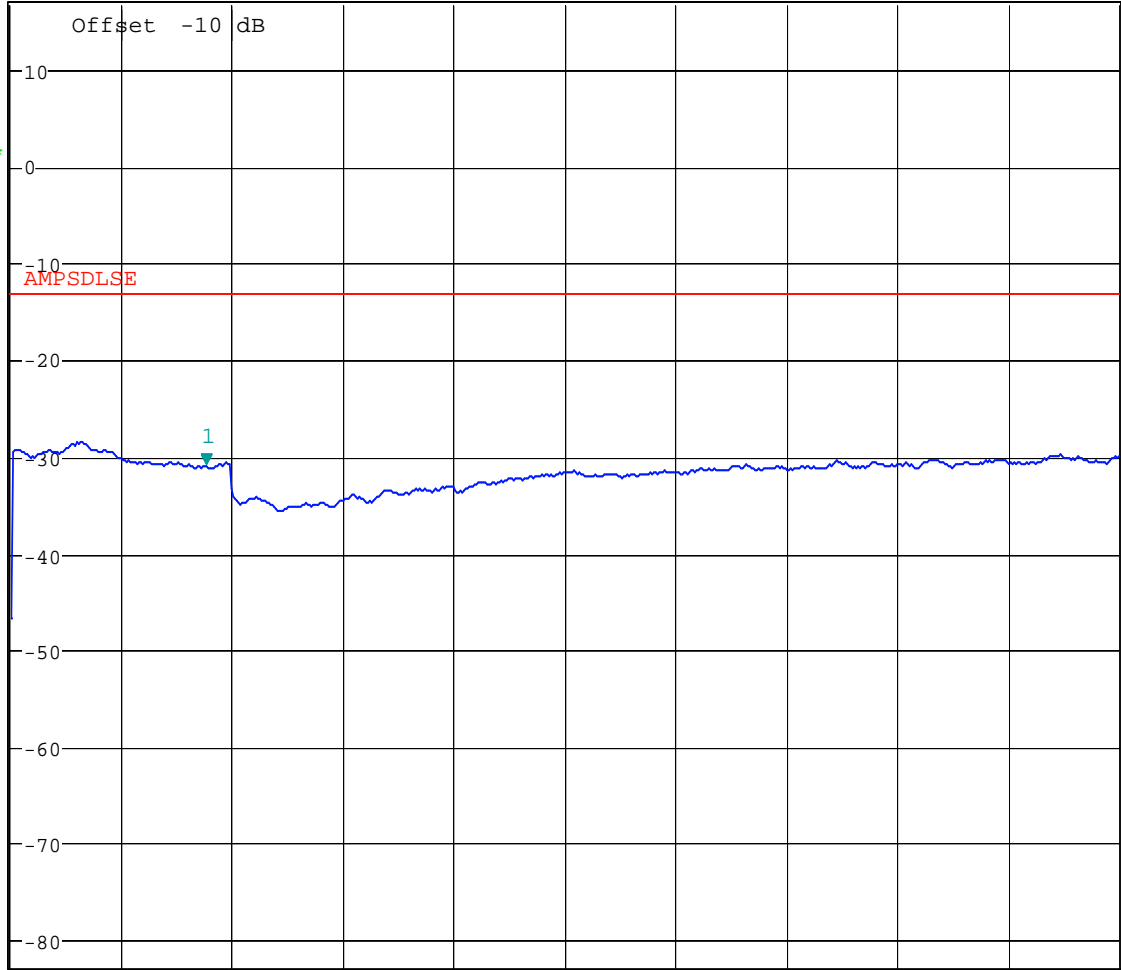


\* RBW 1 MHz      Marker 1 [T1 ]  
\* VBW 1 MHz      -31.08 dBm  
SWT 50 ms      3.410256410 GHz

Ref 17 dBm

\* Att 0 dB

1 RM  
AVG



Start 2 GHz

800 MHz/

Stop 10 GHz

Date: 28.FEB.2007 16:23:40

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Figure 39 Antenna Conducted Spurious – GMSK 869.2 MHz – Single Carrier Mode

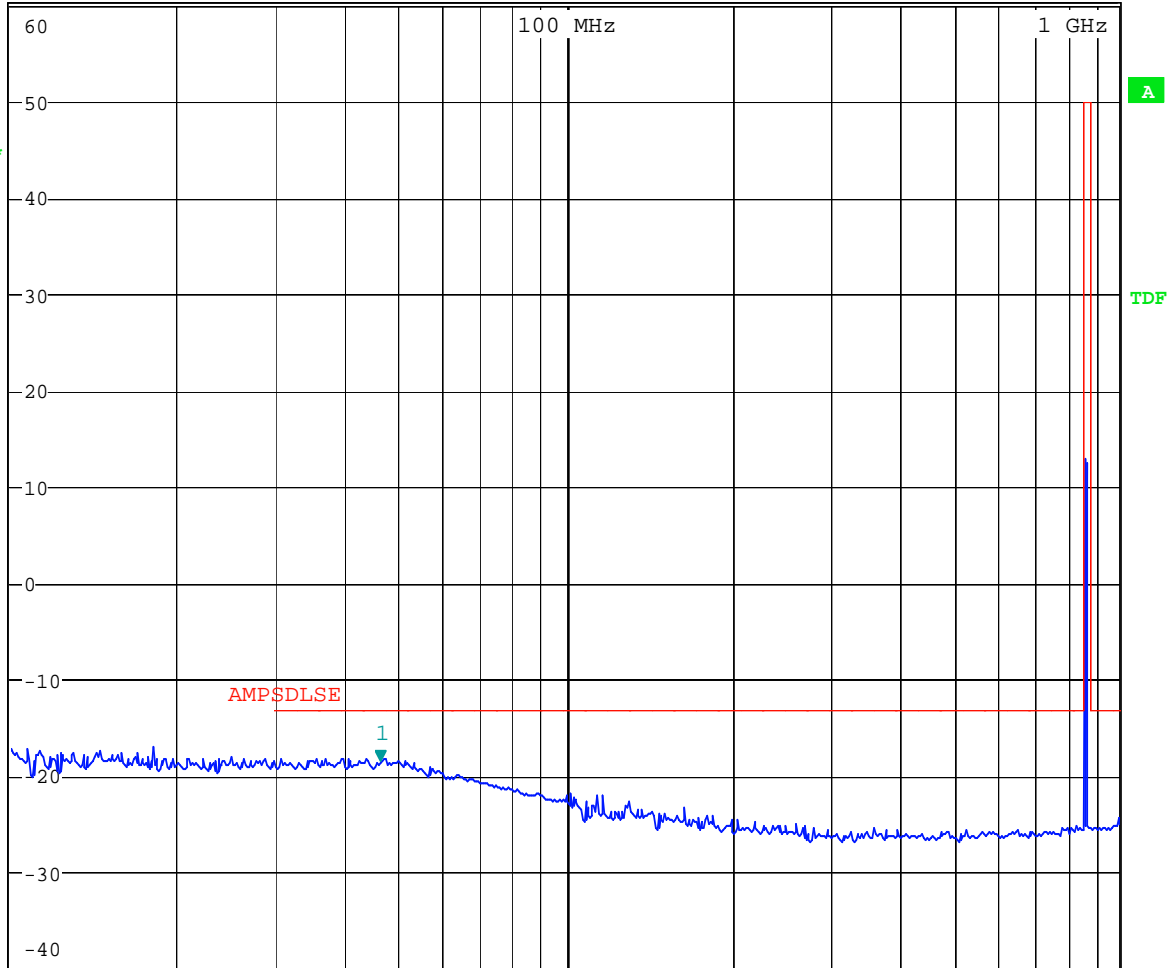


\* RBW 1 MHz      Marker 1 [T1 ]  
VBW 10 MHz      -18.77 dBm  
SWT 20 ms      46.415888336 MHz

Ref 60 dBm

\* Att 10 dB

1 RM \*  
CLRWR



Start 10 MHz

Stop 1 GHz

Date: 28.FEB.2007 17:08:19

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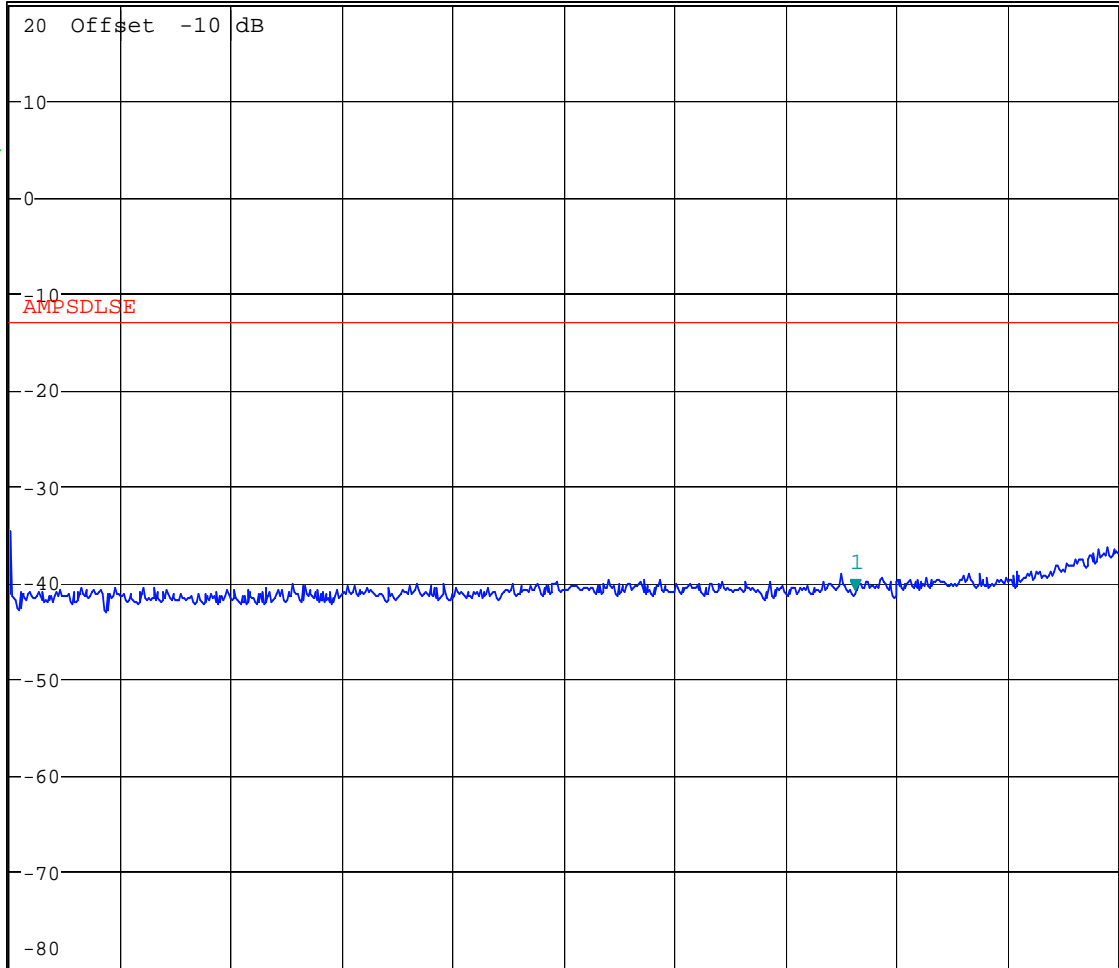
**Figure 40**      **Antenna Conducted Spurious – GMSK 869.2 MHz – Single Carrier Mode**



\* RBW 1 MHz      Marker 1 [T1 ]  
\* VBW 1 MHz      -41.11 dBm

Ref 20 dBm      \* Att 10 dB      SWT 2.5 ms      1.762820513 GHz

1 RM \*  
AVG



Start 1 GHz      100 MHz/      Stop 2 GHz

Date: 28.FEB.2007 17:13:11

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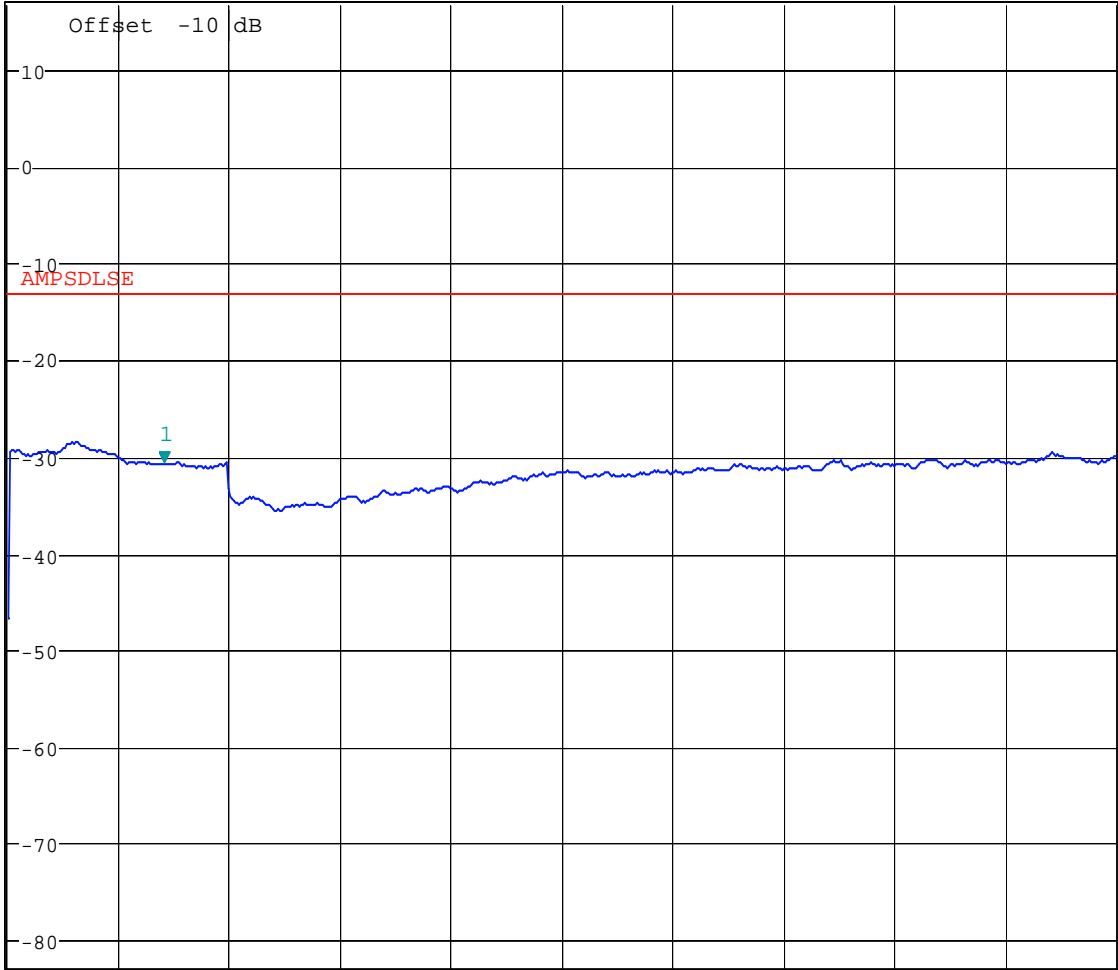
Figure 41 Antenna Conducted Spurious – GMSK 869.2 MHz – Single Carrier Mode



\* RBW 1 MHz      Marker 1 [T1 ]  
\* VBW 1 MHz      -30.70 dBm  
SWT 50 ms      3.128205128 GHz

Ref 17 dBm

\* Att 0 dB



Start 2 GHz

800 MHz/

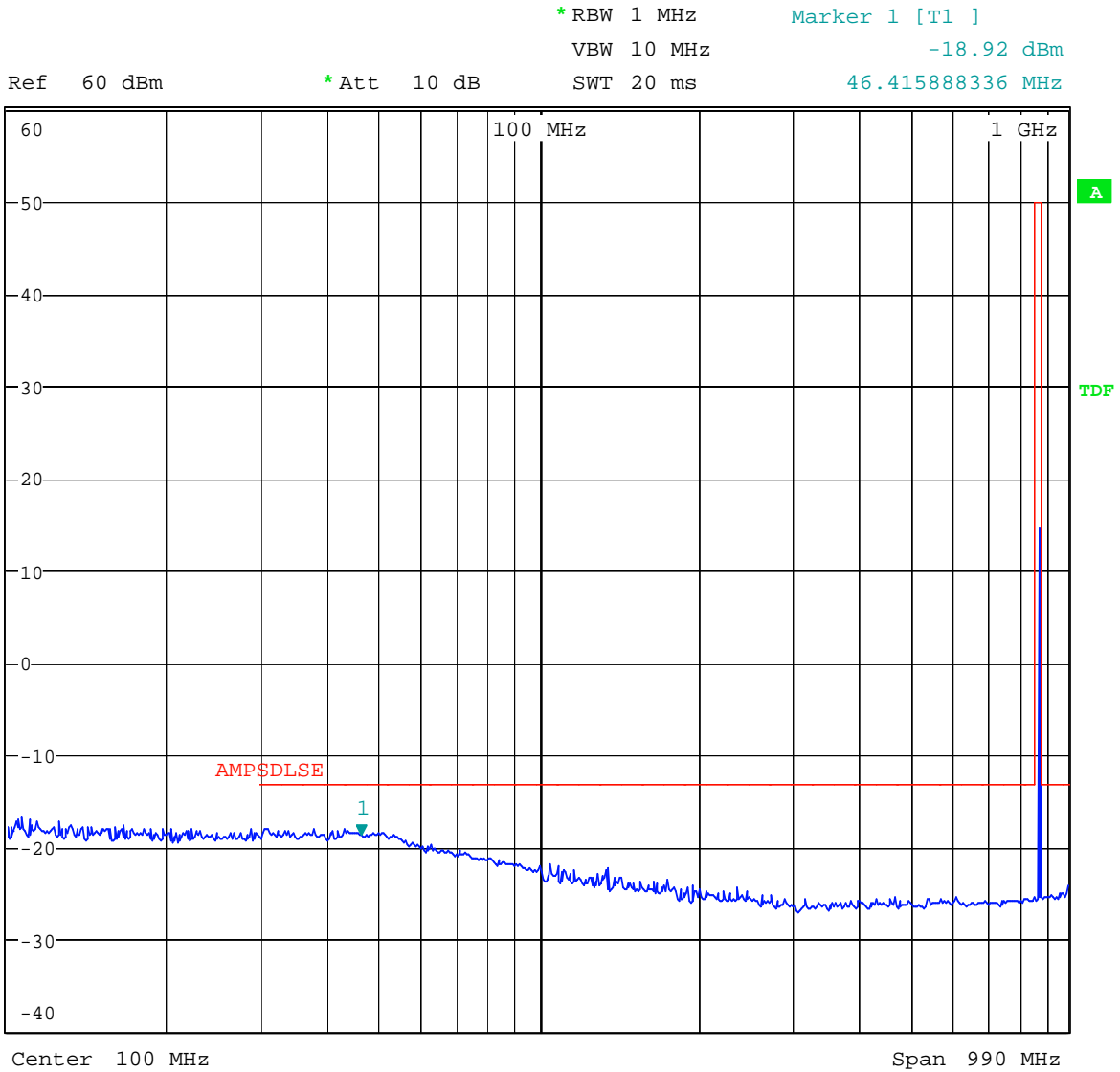
Stop 10 GHz

Date: 28.FEB.2007 17:14:56

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Figure 42 Antenna Conducted Spurious – GMSK 881.6 MHz – Single Carrier Mode



Date: 28.FEB.2007 17:22:31

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Figure 43 Antenna Conducted Spurious – GMSK 881.6 MHz – Single Carrier Mode



\* RBW 1 MHz      Marker 1 [T1 ]  
\* VBW 1 MHz      -29.71 dBm  
SWT 2.5 ms      1.766025641 GHz

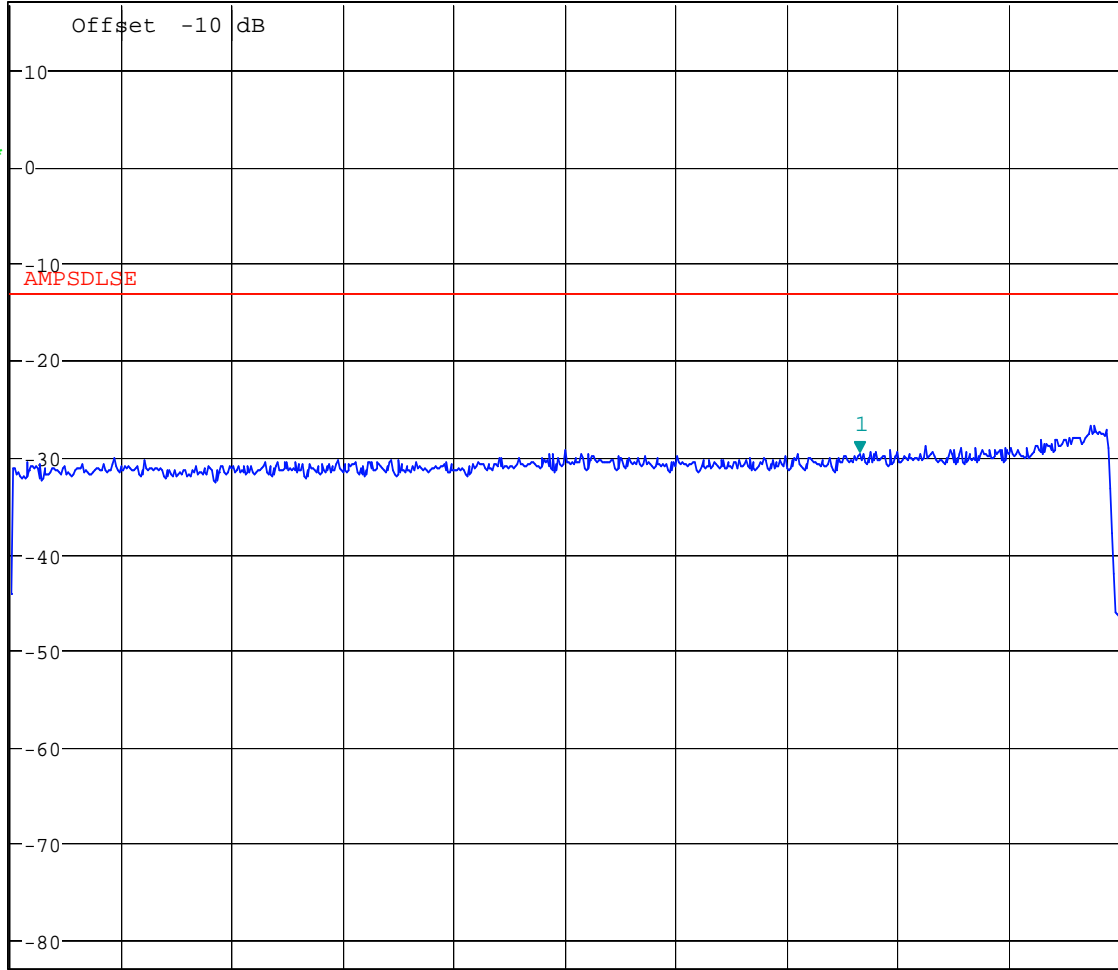
Ref 17 dBm

\* Att 0 dB

SWT 2.5 ms

1.766025641 GHz

1 RM  
AVG



Start 1 GHz

100 MHz/

Stop 2 GHz

Date: 28.FEB.2007 17:27:15

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Figure 44 Antenna Conducted Spurious – GMSK 881.6 MHz – Single Carrier Mode



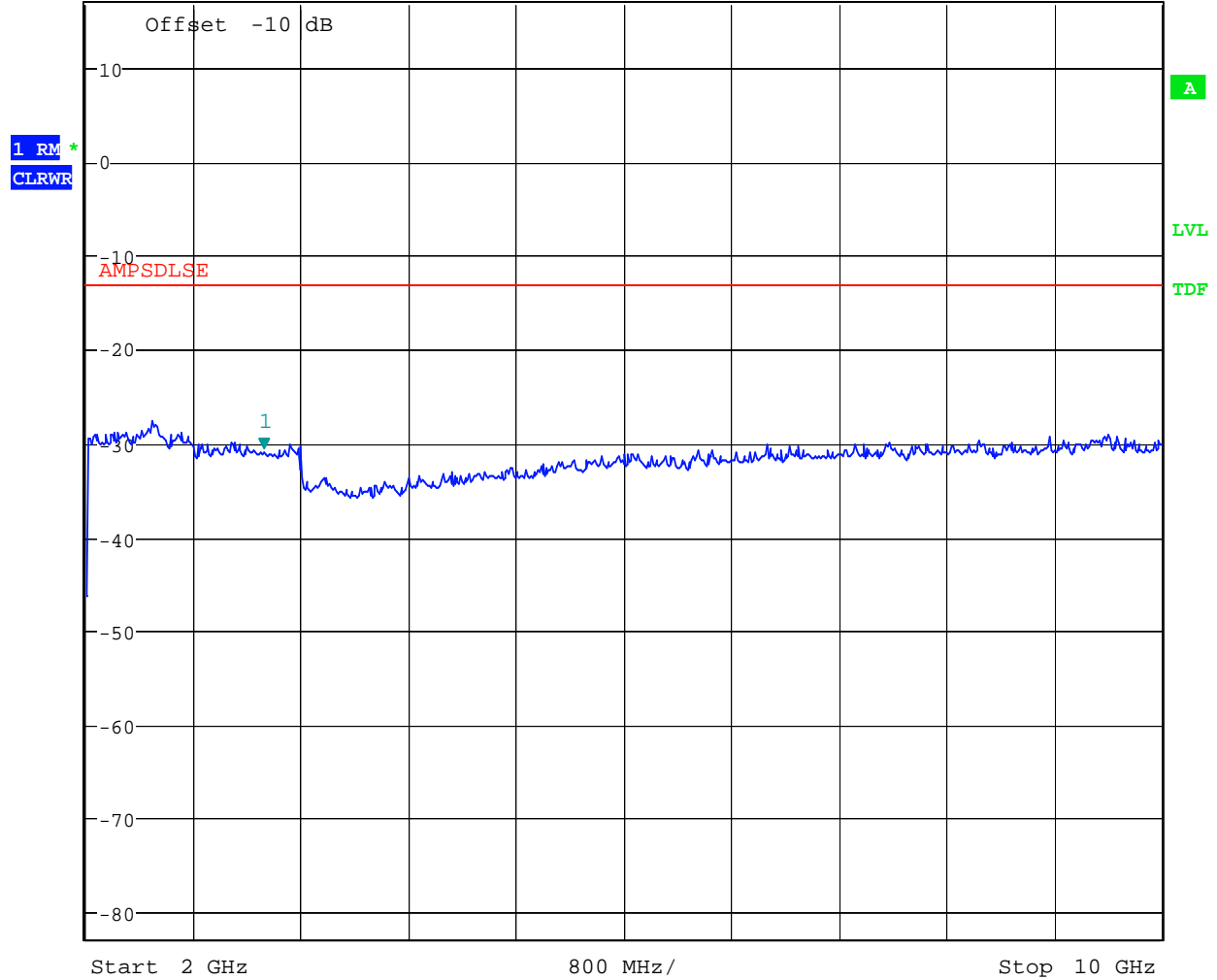
\* RBW 1 MHz      Marker 1 [T1 ]  
\* VBW 1 MHz      -30.89 dBm  
SWT 50 ms      3.320512821 GHz

Ref 17 dBm

\* Att 0 dB

SWT 50 ms

3.320512821 GHz

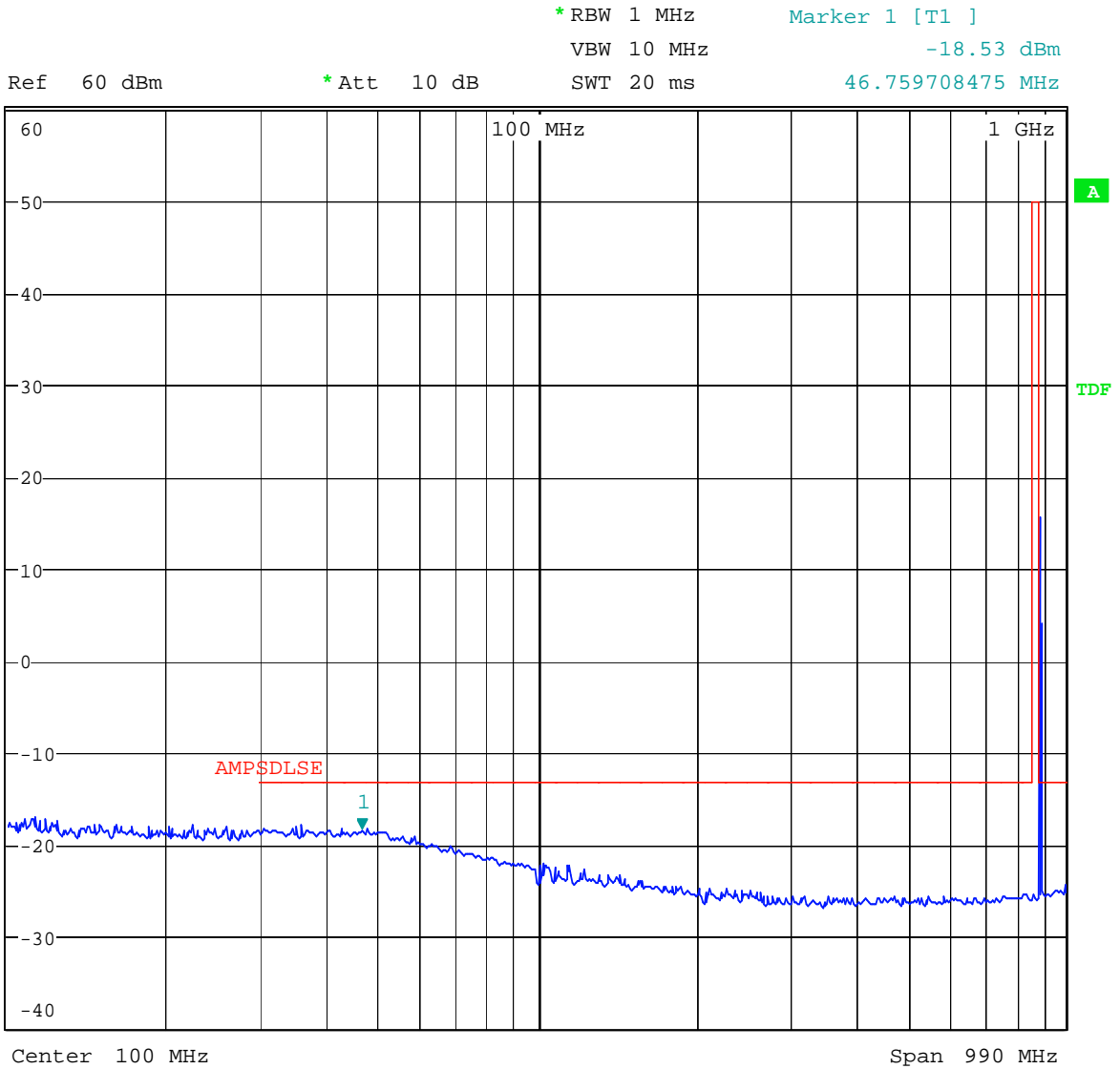


Date: 28.FEB.2007 17:25:08

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Figure 45 Antenna Conducted Spurious – GMSK 893.8 MHz – Single Carrier Mode



Date: 28.FEB.2007 17:38:57

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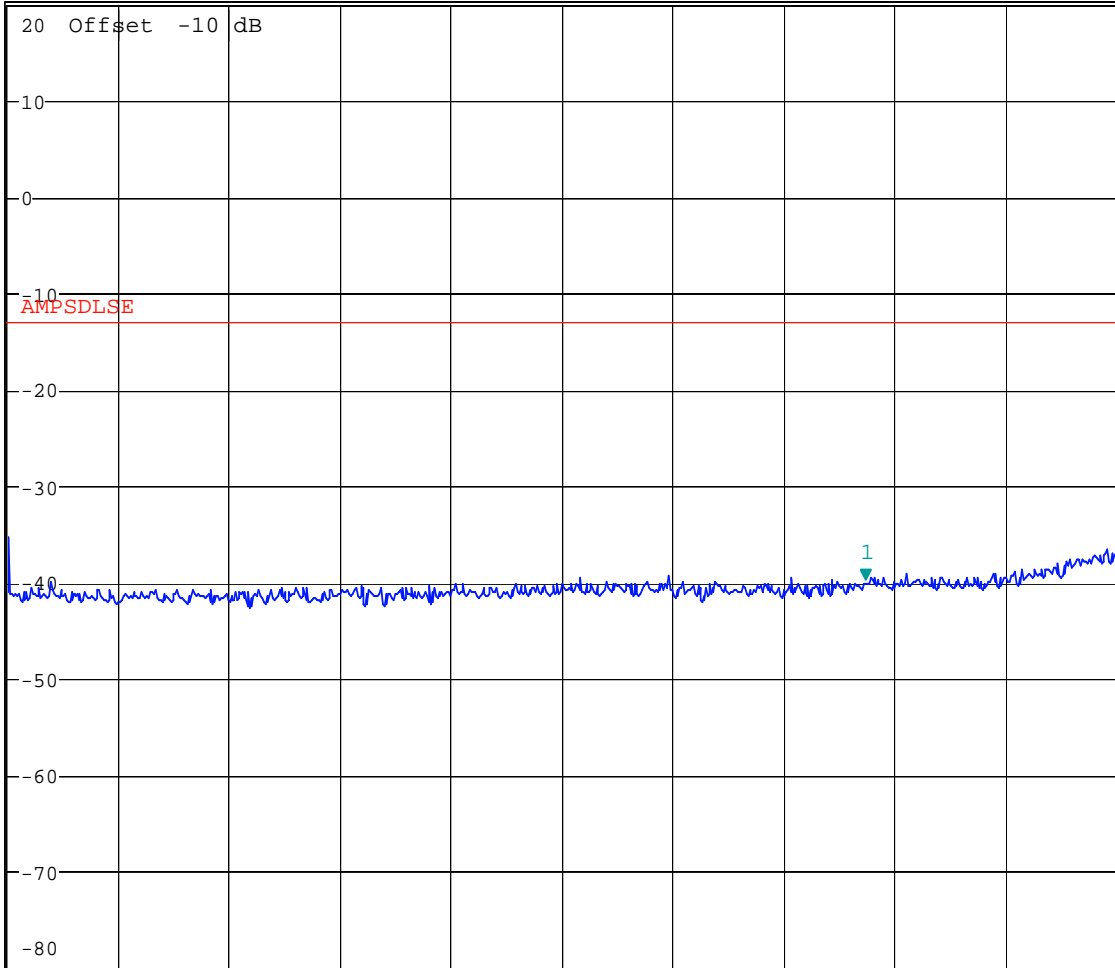
Figure 46 Antenna Conducted Spurious – GMSK 893.8 MHz – Single Carrier Mode



\* RBW 1 MHz      Marker 1 [T1 ]  
\* VBW 1 MHz      -39.94 dBm

Ref 20 dBm      \* Att 10 dB      SWT 2.5 ms      1.774038462 GHz

1 RM \*  
AVG



Start 1 GHz      100 MHz/      Stop 2 GHz

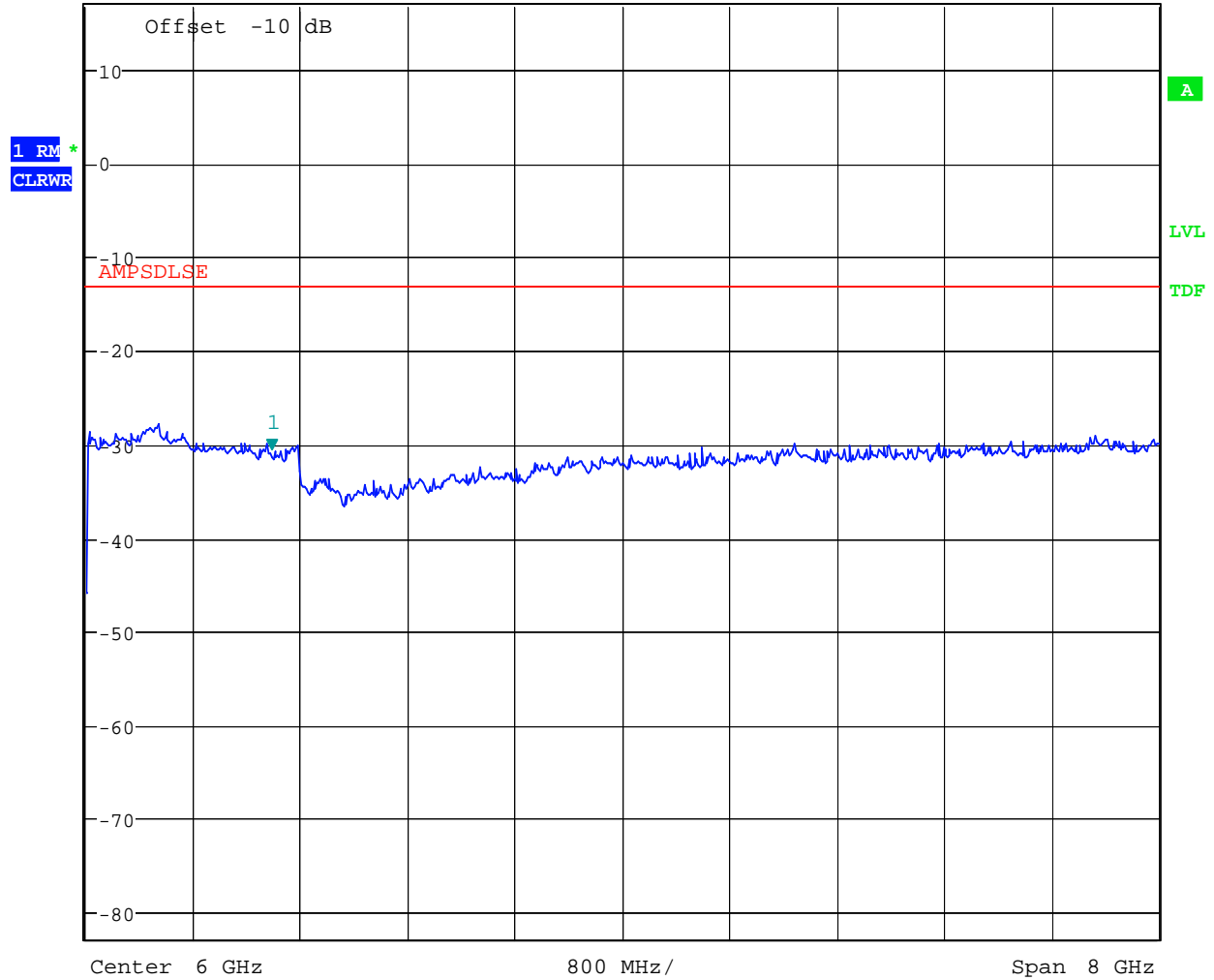
Date: 28.FEB.2007 17:41:45

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Figure 47 Antenna Conducted Spurious – GMSK 893.8 MHz – Single Carrier Mode

Ref 17 dBm \* Att 0 dB \* RBW 1 MHz Marker 1 [T1 ]  
\* VBW 1 MHz -30.71 dBm  
SWT 50 ms 3.384615385 GHz



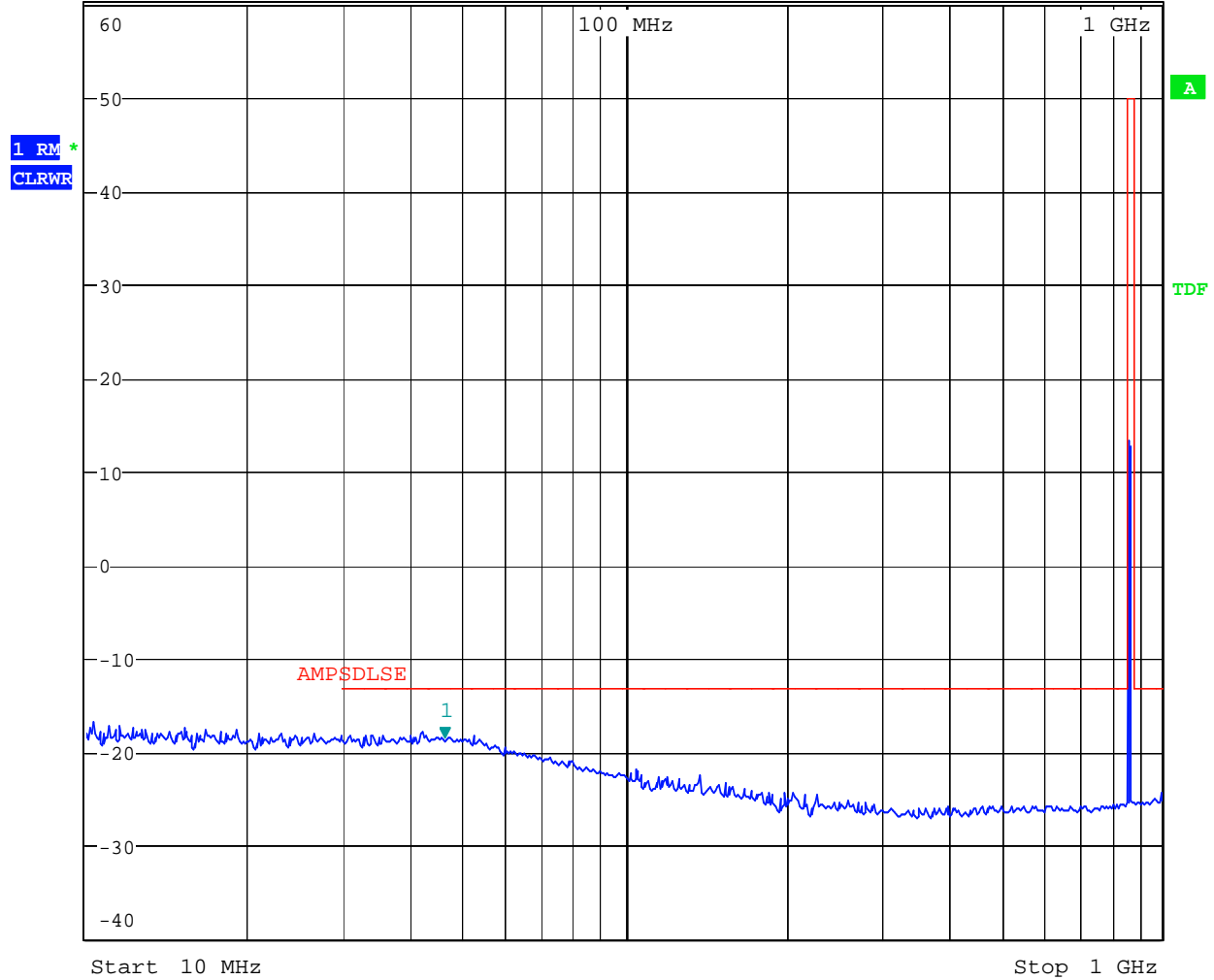
Date: 28.FEB.2007 17:42:44

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**Figure 48 Antenna Conducted Spurious – 8PSK 869.2 MHz – Single Carrier Mode**

\*RBW 1 MHz      Marker 1 [T1 ]  
VBW 10 MHz      -18.59 dBm  
Ref 60 dBm      \*Att 10 dB      SWT 20 ms      46.415888336 MHz



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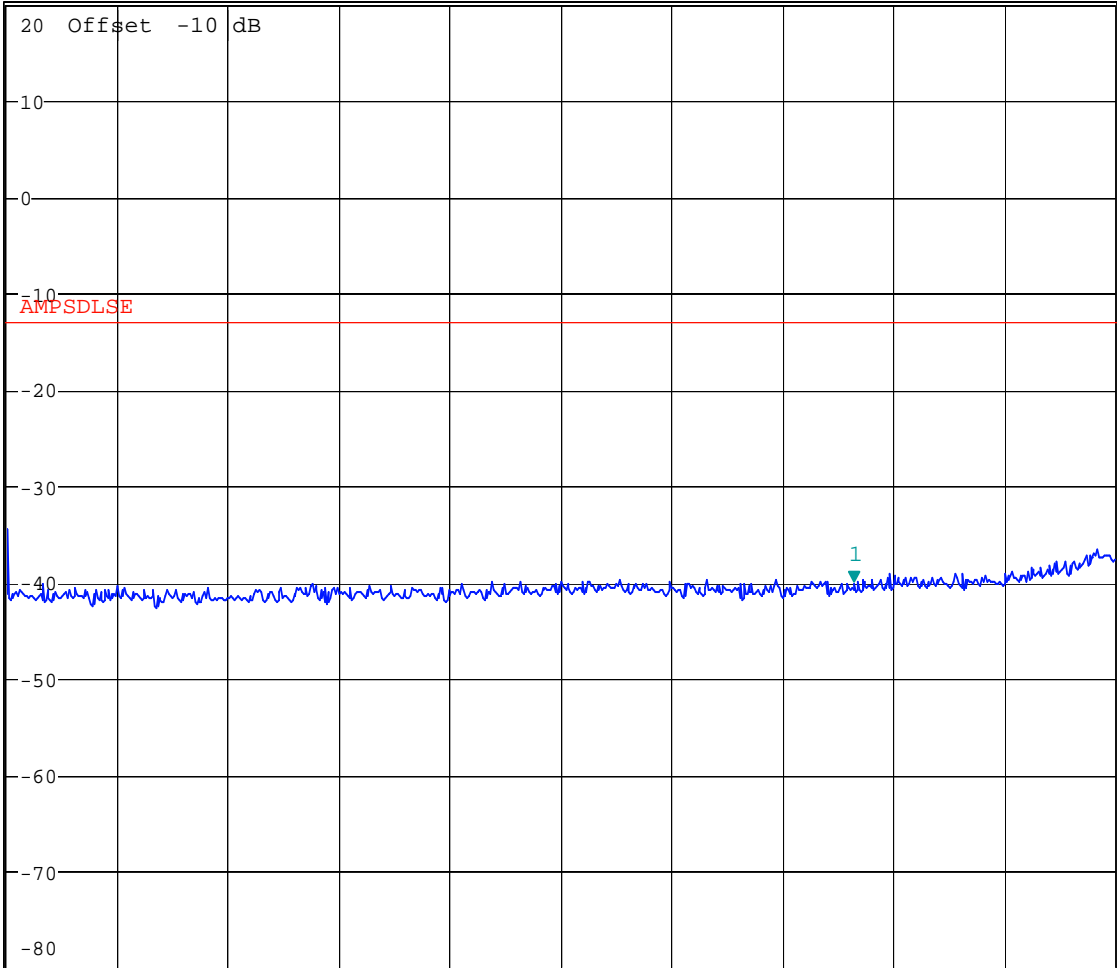


**Figure 49 Antenna Conducted Spurious – 8PSK 869.2 MHz – Single Carrier Mode**

\*RBW 1 MHz      Marker 1 [T1 ]  
\*VBW 1 MHz      -40.25 dBm  
SWT 2.5 ms      1.764423077 GHz

Ref 20 dBm      \*Att 10 dB

1 RM \*  
AVG



Start 1 GHz      100 MHz/      Stop 2 GHz

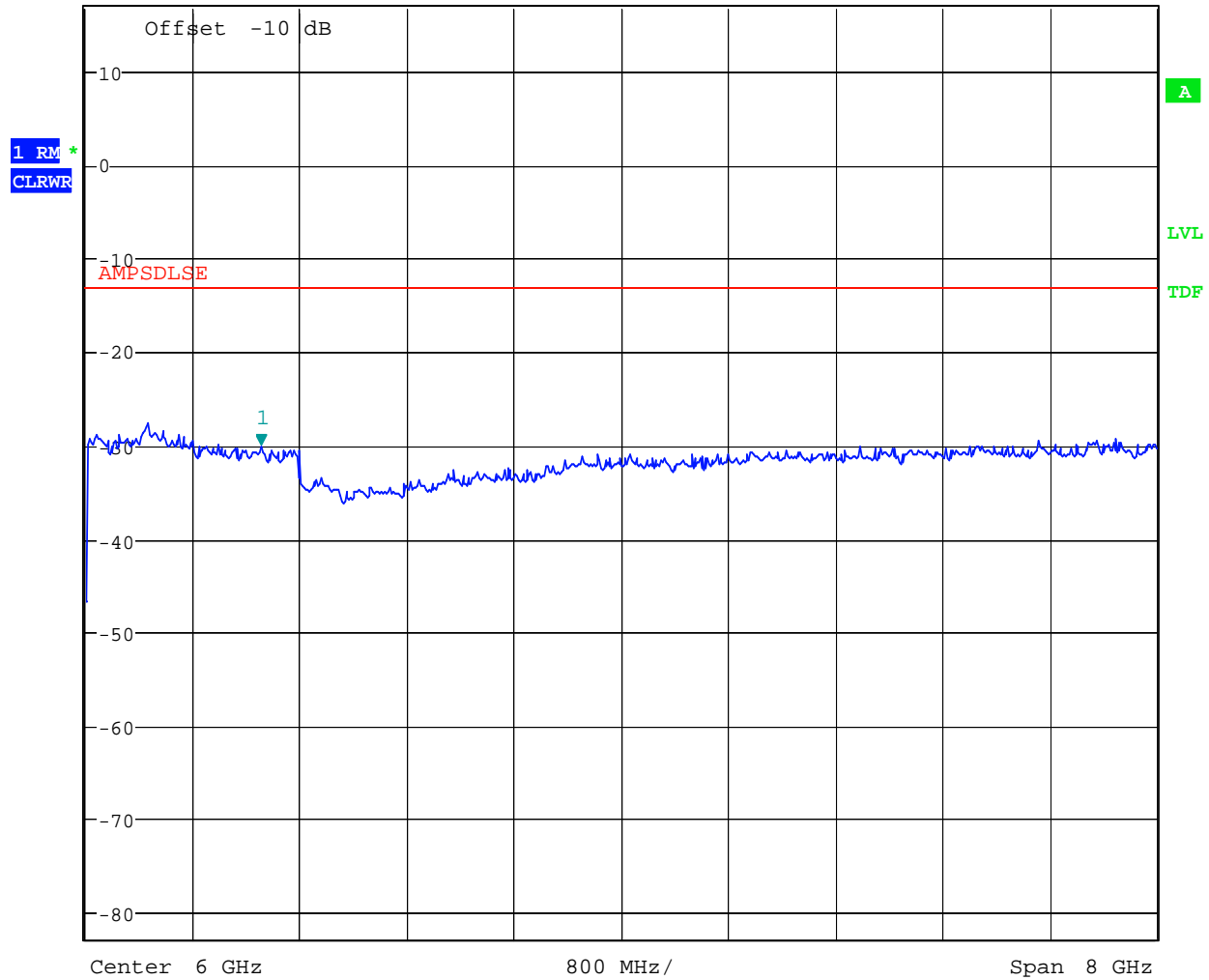
Date: 28.FEB.2007 18:10:41

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Figure 50 Antenna Conducted Spurious – 8PSK 869.2 MHz – Single Carrier Mode

Ref 17 dBm \* Att 0 dB \* RBW 1 MHz \* VBW 1 MHz Marker 1 [T1 ]  
SWT 50 ms -30.21 dBm  
3.307692308 GHz



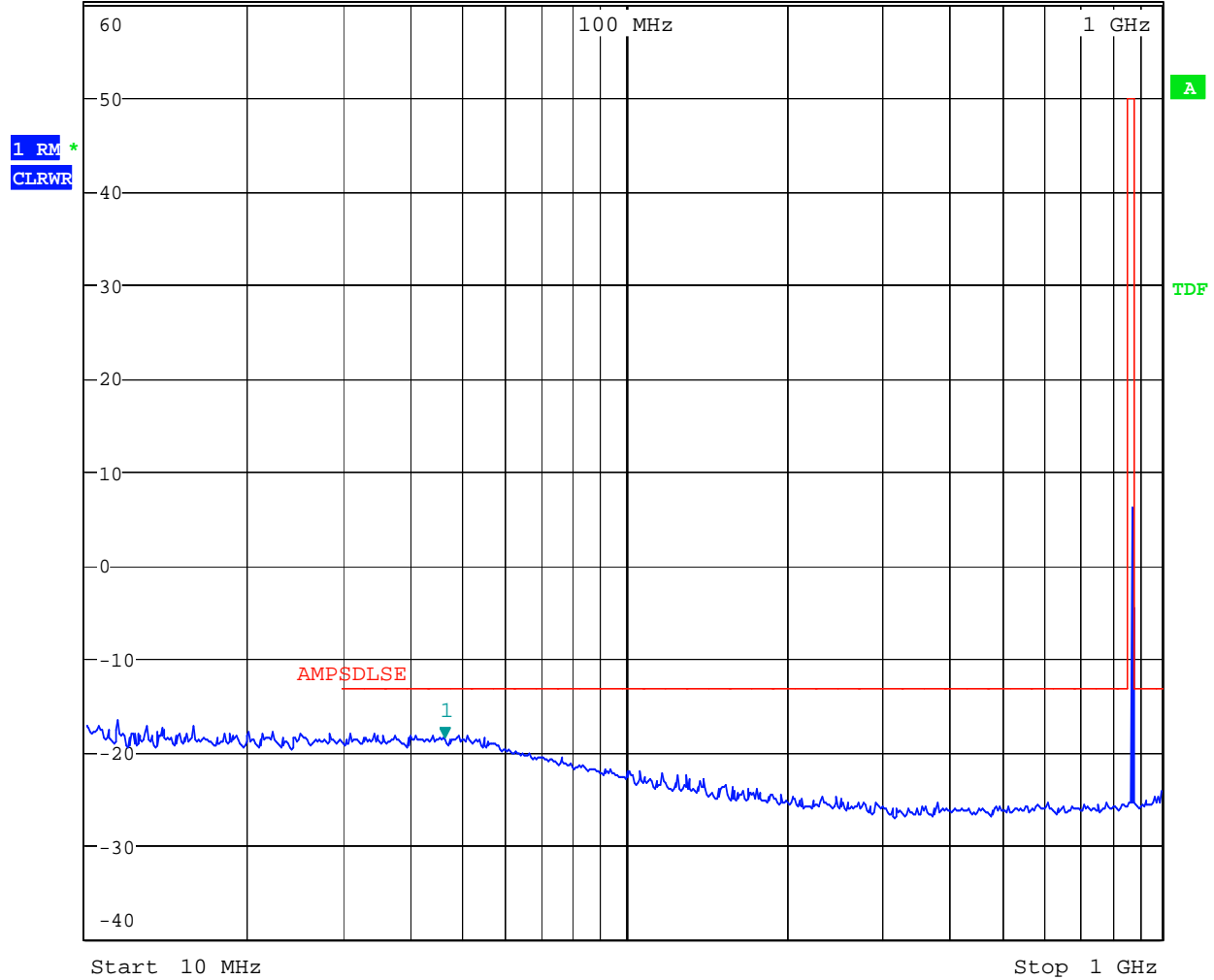
Date: 28.FEB.2007 18:11:41

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**Figure 51 Antenna Conducted Spurious – 8PSK 881.6 MHz – Single Carrier Mode**

\*RBW 1 MHz      Marker 1 [T1 ]  
VBW 10 MHz      -18.75 dBm  
Ref 60 dBm      \*Att 10 dB      SWT 20 ms      46.415888336 MHz



Date: 28.FEB.2007 19:24:00

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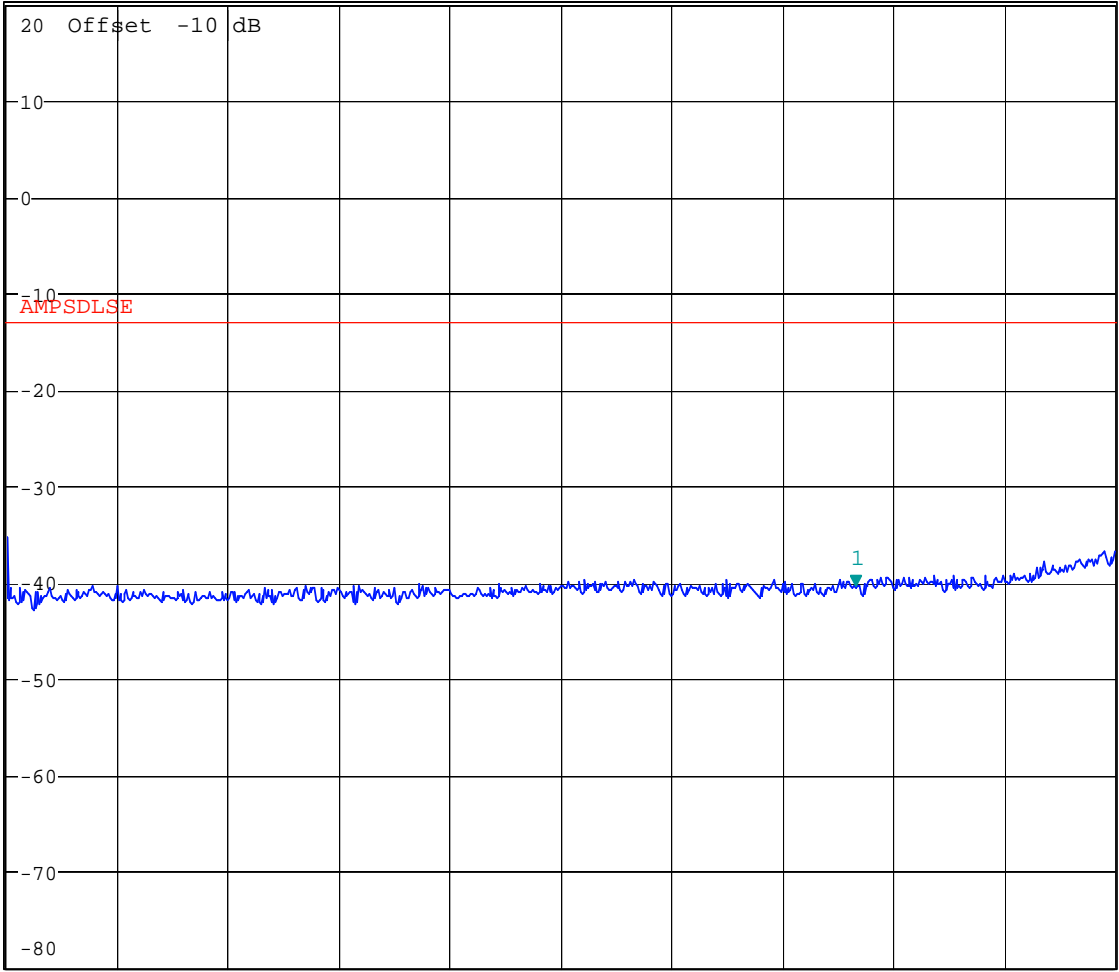


**Figure 52 Antenna Conducted Spurious – 8PSK 881.6 MHz – Single Carrier Mode**

\*RBW 1 MHz      Marker 1 [T1 ]  
\*VBW 1 MHz      -40.55 dBm  
SWT 2.5 ms      1.766025641 GHz

Ref 20 dBm      \*Att 10 dB

1 RM \*  
AVG



Start 1 GHz      100 MHz/      Stop 2 GHz

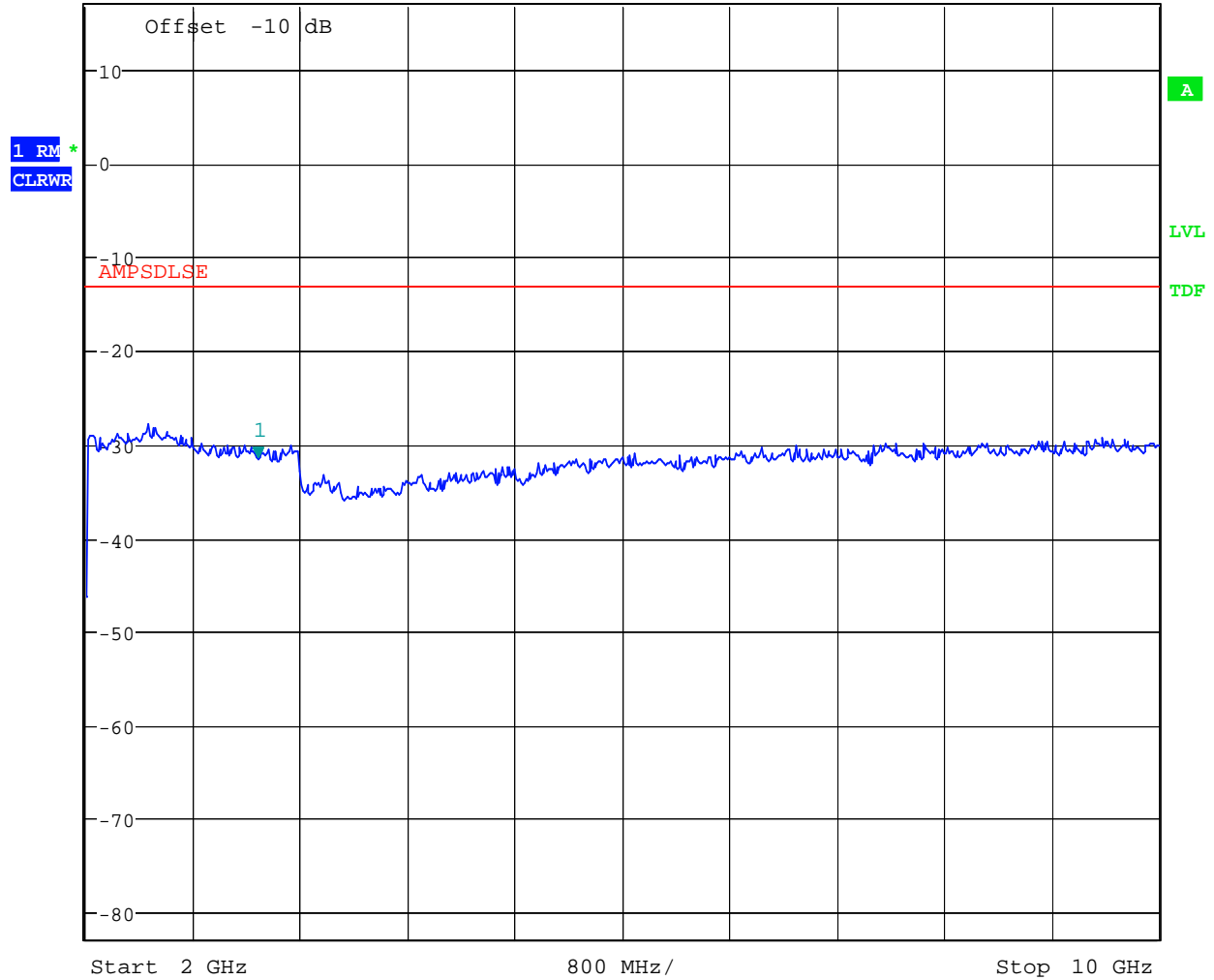
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**Figure 53 Antenna Conducted Spurious – 8PSK 881.6 MHz – Single Carrier Mode**

Ref 17 dBm \* Att 0 dB SWT 50 ms Marker 1 [T1 ]  
\* RBW 1 MHz \* VBW 1 MHz -31.53 dBm  
3.282051282 GHz



Date: 28.FEB.2007 19:20:49

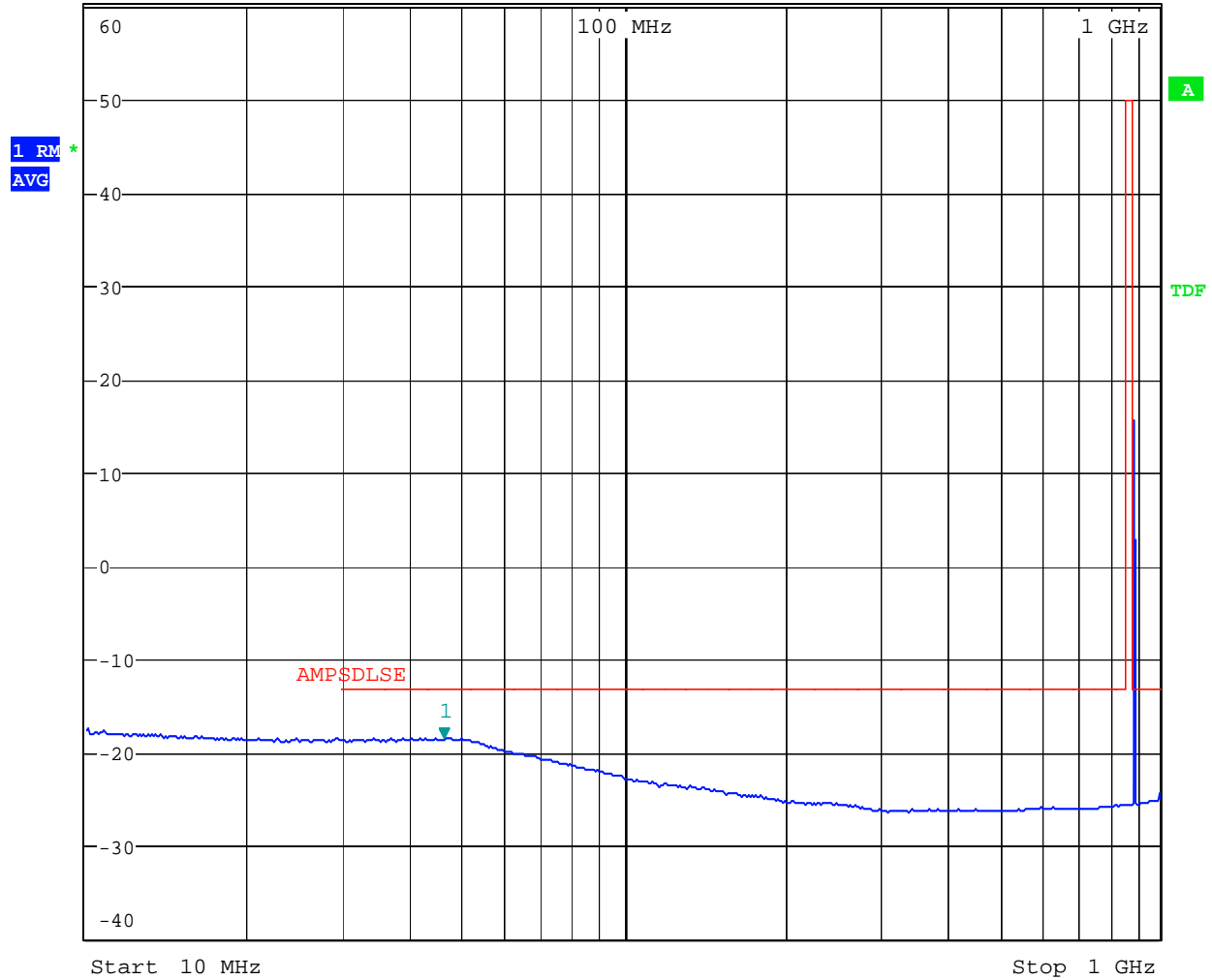
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**Figure 54 Antenna Conducted Spurious – 8PSK 893.8 MHz – Single Carrier Mode**

Ref 60 dBm \* Att 10 dB \* RBW 1 MHz VBW 10 MHz SWT 20 ms Marker 1 [T1 ] -18.60 dBm  
46.415888336 MHz



Date: 28.FEB.2007 19:42:32

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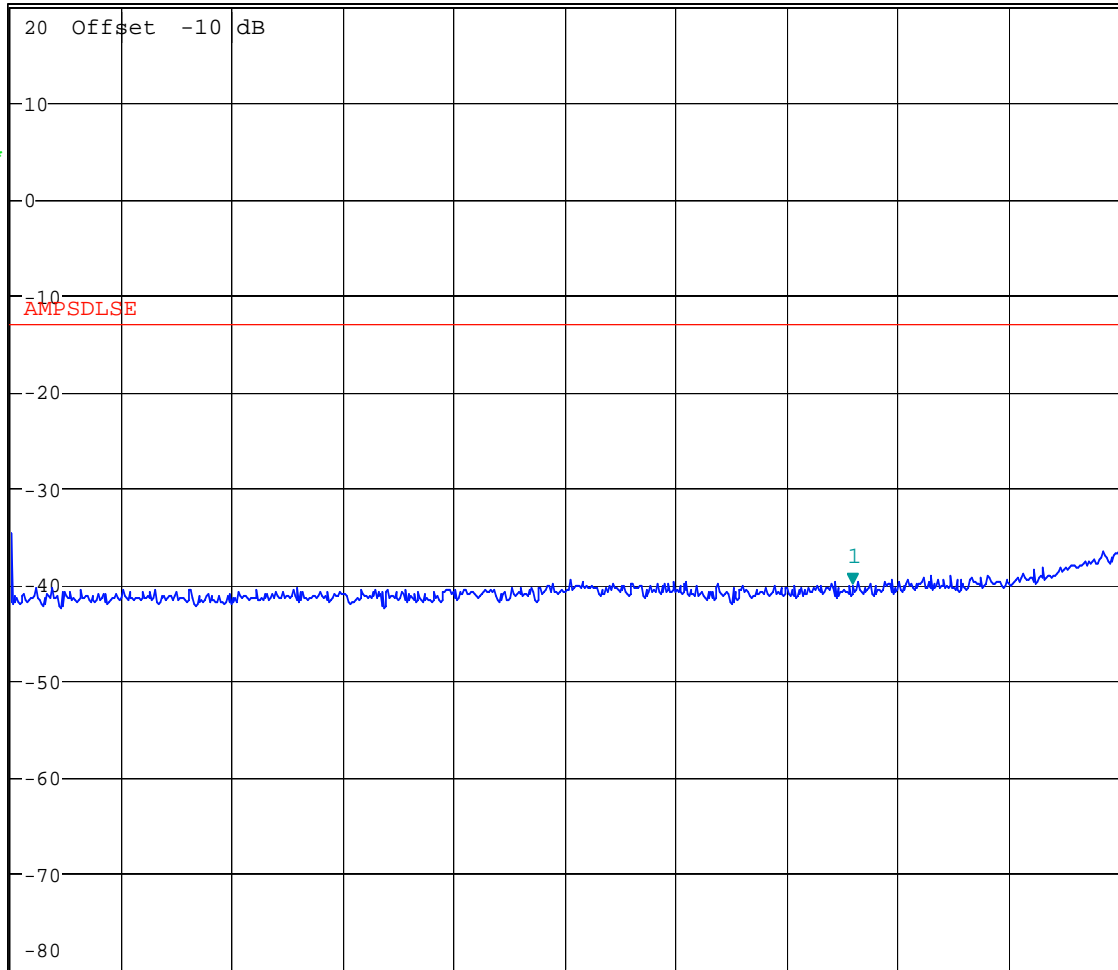


**Figure 55 Antenna Conducted Spurious – 8PSK 893.8 MHz – Single Carrier Mode**

\* RBW 1 MHz      Marker 1 [T1 ]  
\* VBW 1 MHz      -40.27 dBm

Ref 20 dBm      \* Att 10 dB      SWT 2.5 ms      1.759615385 GHz

1 RM \*  
AVG



Start 1 GHz      100 MHz/      Stop 2 GHz

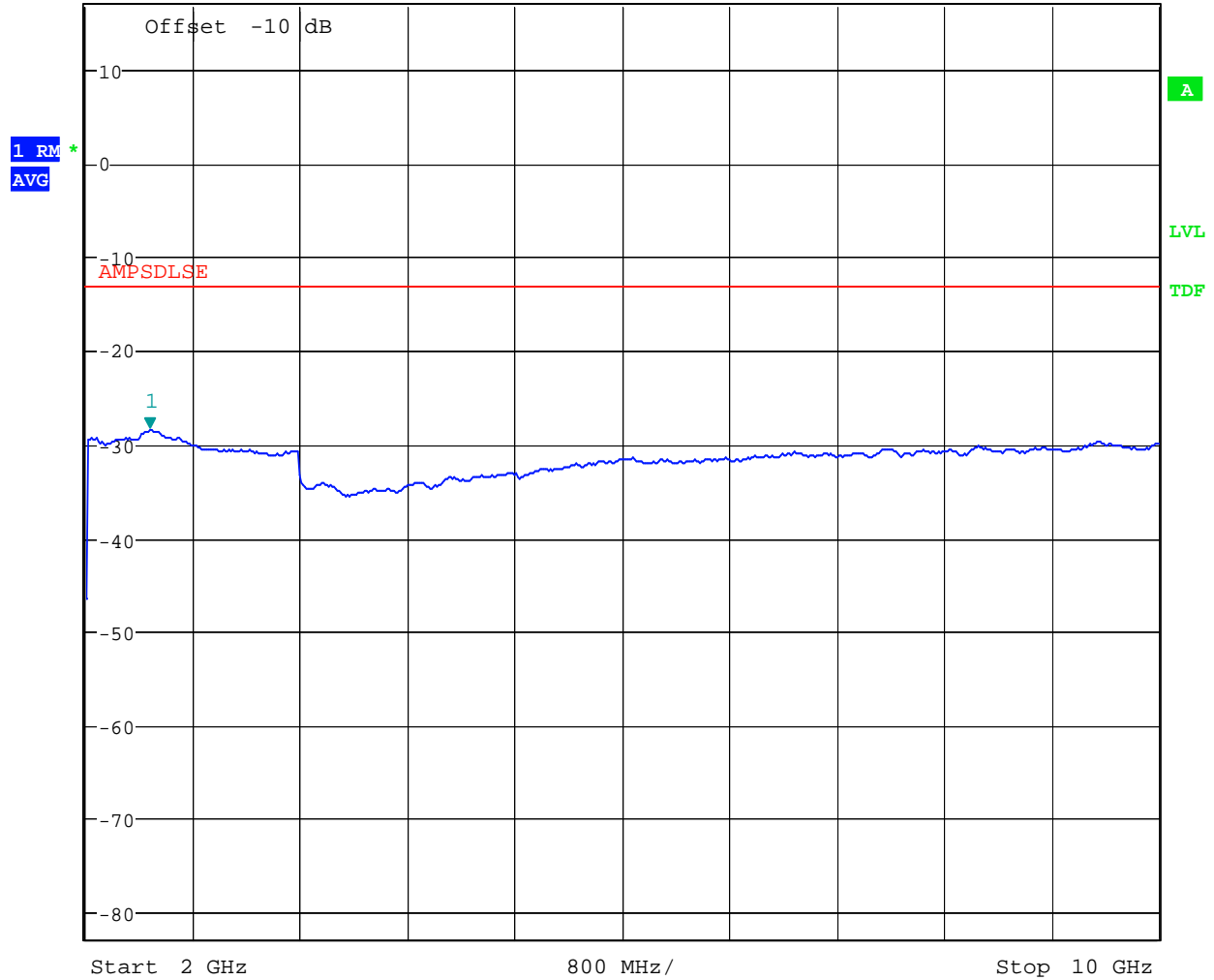
Date: 28.FEB.2007 19:43:56

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Figure 56 Antenna Conducted Spurious – 8PSK 893.8 MHz – Single Carrier Mode

Ref 17 dBm \* Att 0 dB \* RBW 1 MHz \* VBW 1 MHz SWT 50 ms Marker 1 [T1 ]  
-28.54 dBm  
2.474358974 GHz



Date: 28.FEB.2007 19:45:01

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**D.8. Tested By**

Name: Tom Tidwell,  
Function: Manager of Wireless Services

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## APPENDIX E: 2.1053 FIELD STRENGTH OF SPURIOUS RADIATION

### E.1. Base Standard & Test Basis

<b>Base Standard</b>	FCC 2.1053
<b>Test Basis</b>	FCC 2.1053 Field Strength of Spurious Radiation
<b>Test Method</b>	TIA 603-C, 2004 Substitution Antenna Method

### E.2. Limits

22.917

(a) *Out of band emissions.* The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least  $43 + 10 \log(P)$  dB.

### E.3. Test Results

Compliant. The worst-case spurious emission level was -34.1 dBm at 8816 MHz. The spectrum was searched up to 10 GHz with the device operating on three channels.

### E.4. Deviations from Normal Operating Mode During Test

None.

### E.5. Sample Calculation

**Final measured value (dBm) = Substitution level (dBm) + Antenna Gain (dBd)**

**Minimum attenuation limit (dB) =  $43 + 10 \log(P)$  where P = Peak power of the carrier in watts.**

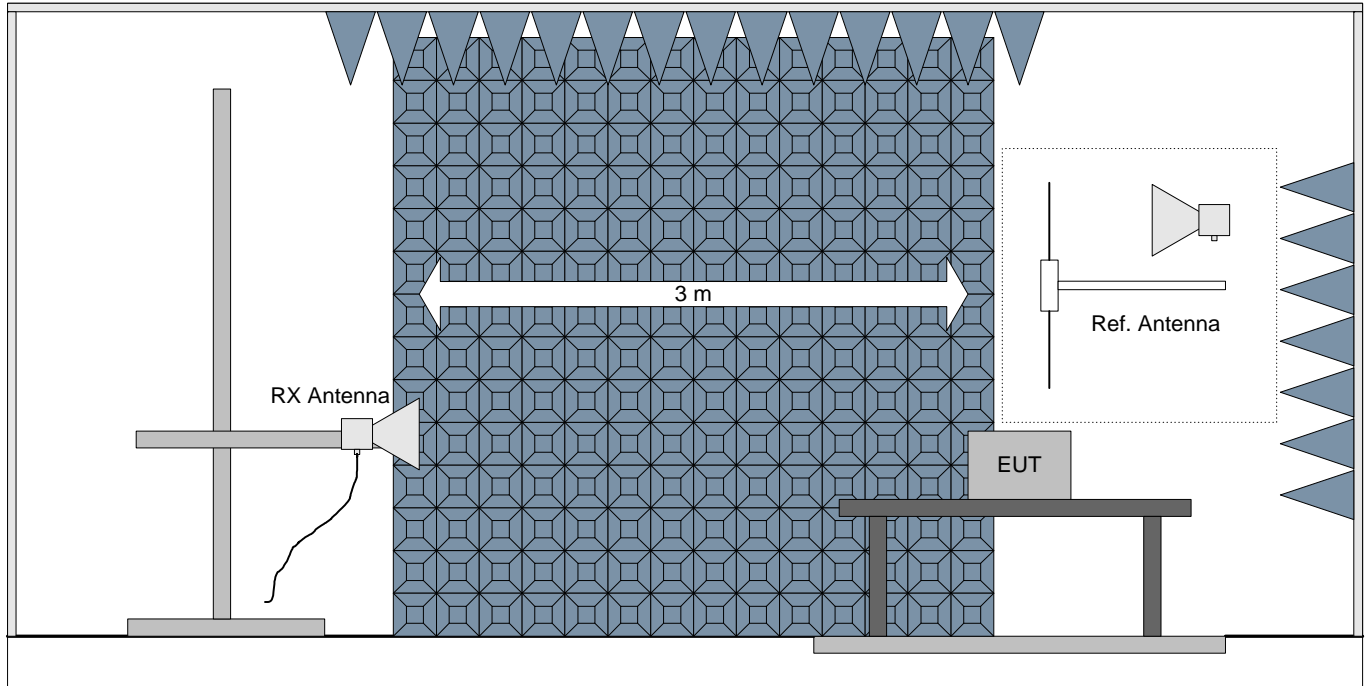
Min. Atten. Limit dB) =  $43 + 10 * \log(72 \text{ watts})$   
 = 61.6 dB

$+48.6 \text{ dBm} - 61.6 \text{ dB} = -13 \text{ dBm}$

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**E.6. Test Diagram**



Note: The EUT is set to repeat a signal at maximum rf output power into a coaxial load for this testing.

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**E.7. Test Data**

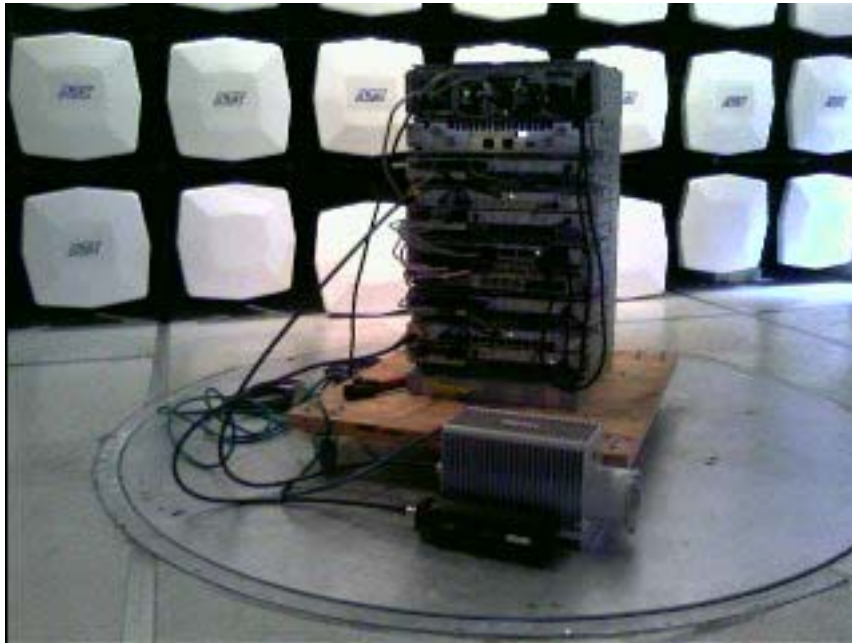
	Project No: W7058-1
	Model: EXTA-01
	Comments: Operated in combined carrier mode (maximum power) at low mid and high channels

Distance: 3 m	Standard: CFR 47, Part 2	RBW: (unless <1GHz = 120kHz >1GHz = noted) 1MHz	VBW: (unless Peak = RBW noted) Avg. = 10 Hz
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Notes	Polarization	Frequency (MHz)	Measured (dBm)	Substitution Level (dBm)	Substitution Antenna Gain (dBd)	Final Measured Value		Peak Carrier Power		Limit (dBm)	Margin (dB)
	(V/H)					(dBm)	(watts)	(dBm)	(watts)		
	H	2644.8	-91.8	-52.4	7.0	-45.4	2.88403E-08	48.57	72	-13	32.40
	V	2644.8	-105	-63.7	7.0	-56.7	2.13796E-09	48.57	72	-13	43.70
	H	2607.6	-88.4	-48.9	7.0	-41.9	6.45654E-08	48.57	72	-13	28.90
	V	2607.6	-103.5	-64.1	7.0	-57.1	1.94984E-09	48.57	72	-13	44.10
	H	2681.4	-99.6	-65.4	7.0	-58.4	1.44544E-09	48.57	72	-13	45.40
	V	2681.4	-104.2	-64.6	7.0	-57.6	1.7378E-09	48.57	72	-13	44.60
Noise Floor	H	4408	-100.8	-47.5	8.4	-39.1	1.23027E-07	48.57	72	-13	26.10
Noise Floor	V	4408	-103.7	-47.5	8.4	-39.1	1.23027E-07	48.57	72	-13	26.10
Noise Floor	H	5289.6	-98.6	-48.7	8.3	-40.4	9.12011E-08	48.57	72	-13	27.40
Noise Floor	V	5289.6	-103.3	-48.7	8.3	-40.4	9.12011E-08	48.57	72	-13	27.40
Noise Floor	H	6171.2	-100.8	-46	8.7	-37.3	1.86209E-07	48.57	72	-13	24.30
Noise Floor	V	6171.2	-101.3	-46	8.7	-37.3	1.86209E-07	48.57	72	-13	24.30
Noise Floor	H	8816	-95.1	-43	8.9	-34.1	3.89045E-07	48.57	72	-13	21.10
Noise Floor	V	8816	-95.4	-43	8.9	-34.1	3.89045E-07	48.57	72	-13	21.10

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**E.8. Test Photo**



**E.9. Tested By**

Name: Tom Tidwell,  
Function: Manager of Wireless Services

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## APPENDIX F: 2.1055 FREQUENCY STABILITY

### F.1. Base Standard & Test Basis

<b>Base Standard</b>	FCC 2.1055
<b>Test Method</b>	TIA 603-C, 2004

### Specifications

22.355 Except as otherwise provided in this part, the carrier frequency of each transmitter in the Public Mobile Services must be maintained within the tolerances given in Table C-1 of this section.

Frequency range (MHz)	Base, fixed (ppm)	Mobile > 3 watts (ppm)	Mobile < 3 watts (ppm)
25 to 50.....	20.0	20.0	50.0
50 to 450.....	5.0	5.0	50.0
450 to 512.....	2.5	5.0	5.0
821 to 896.....	1.5	2.5	2.5
928 to 929.....	5.0	n/a	n/a
929 to 960.....	1.5	n/a	n/a
2110 to 2220.....	10.0	n/a	n/a

### F.2. Deviations

Deviation Number	Time & Date	Description and Justification of Deviation	Deviation Reference			Approval
			Base Standard	Test Basis	NTS Procedure	
none						

### F.3. Test Results

Compliant.

The maximum frequency drift was 0.1338 ppm. The limit from 22.355 is 1.5 ppm.

### F.4. Observations

None

### F.5. Deviations from Normal Operating Mode During Test

None.

### F.6. Sample Calculation

Frequency drift (ppm) = Frequency Drift (Hz)/Authorized frequency (MHz)

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**F.7. Test Data**

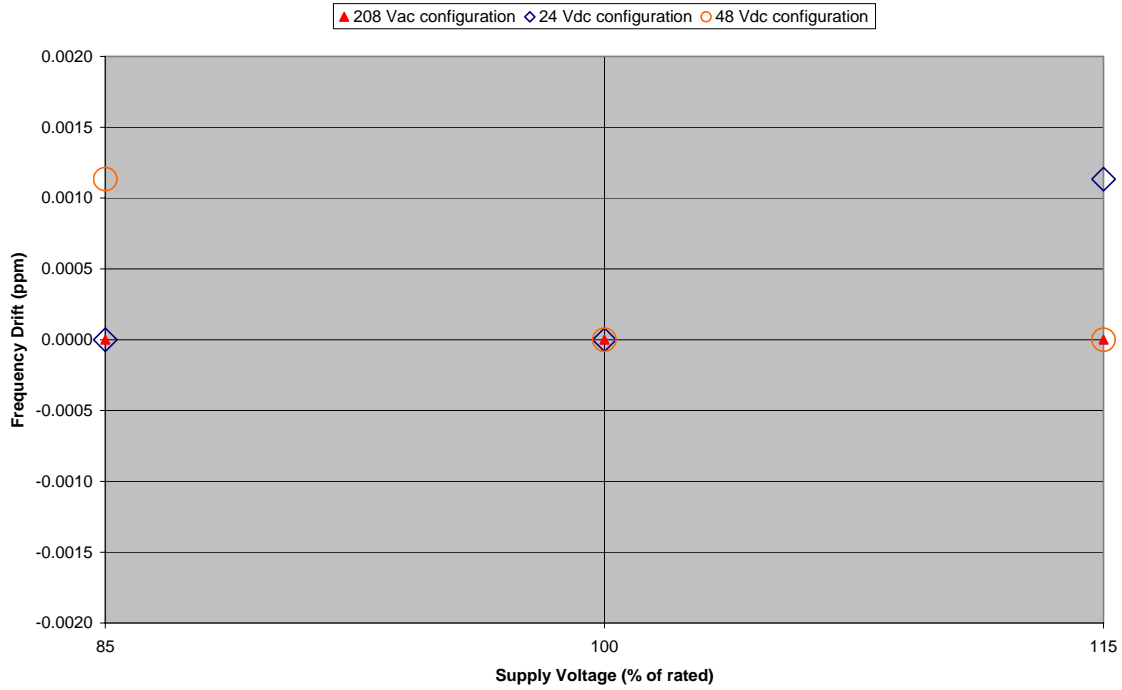
**GSM850 Band**

Supply Voltage % of rated	Ambient temperature Deg. Celsius	Reference Transmit Frequency MHz	Measured Frequency MHz	Frequency Drift (Hz)	Frequency Drift (ppm)
100	-30	881.667507	881.667607	100	0.1134
100	-20	881.667507	881.667611	104	0.1180
100	-10	881.667507	881.667625	118	0.1338
100	0	881.667507	881.667614	107	0.1214
100	10	881.667507	881.667614	107	0.1214
100	20	881.667507	881.667507	0	0.0000
100	30	881.667507	881.667615	108	0.1225
100	40	881.667507	881.667616	109	0.1236
100	50	881.667507	881.667618	111	0.1259

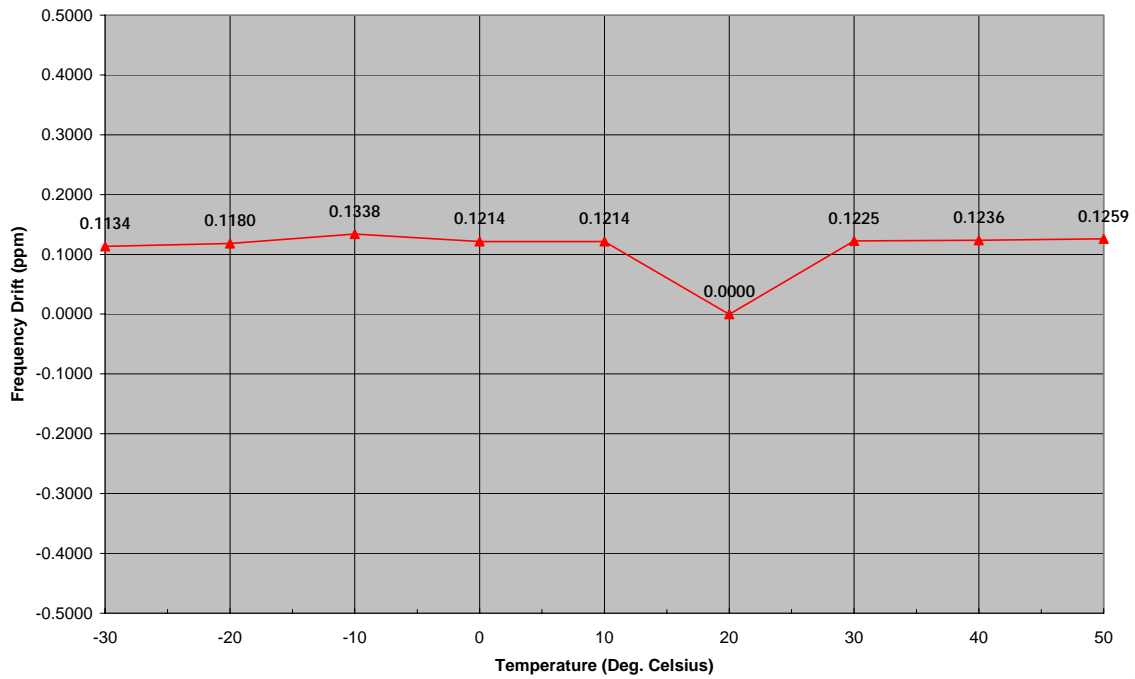
Supply Voltage	Ambient temperature Deg. Celsius	Reference Transmit Frequency MHz	Measured Frequency MHz	Frequency Drift Hz	Frequency Drift PPM
176.8 Vac	20	881.667627	881.667627	0	0.0000
208 Vac	20	881.667627	881.667627	0	0.0000
239.2 Vac	20	881.667627	881.667627	0	0.0000
20.4 Vdc	20	881.667625	881.667625	0	0.0000
24.0 Vdc	20	881.667625	881.667625	0	0.0000
27.6 Vdc	20	881.667625	881.667626	1	0.0011
40.8 Vdc	20	881.667627	881.667628	1	0.0011
48.0 Vdc	20	881.667627	881.667627	0	0.0000
55.2 Vdc	20	881.667627	881.667627	0	0.0000

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**Frequency Drift with Supply Voltage Variation**

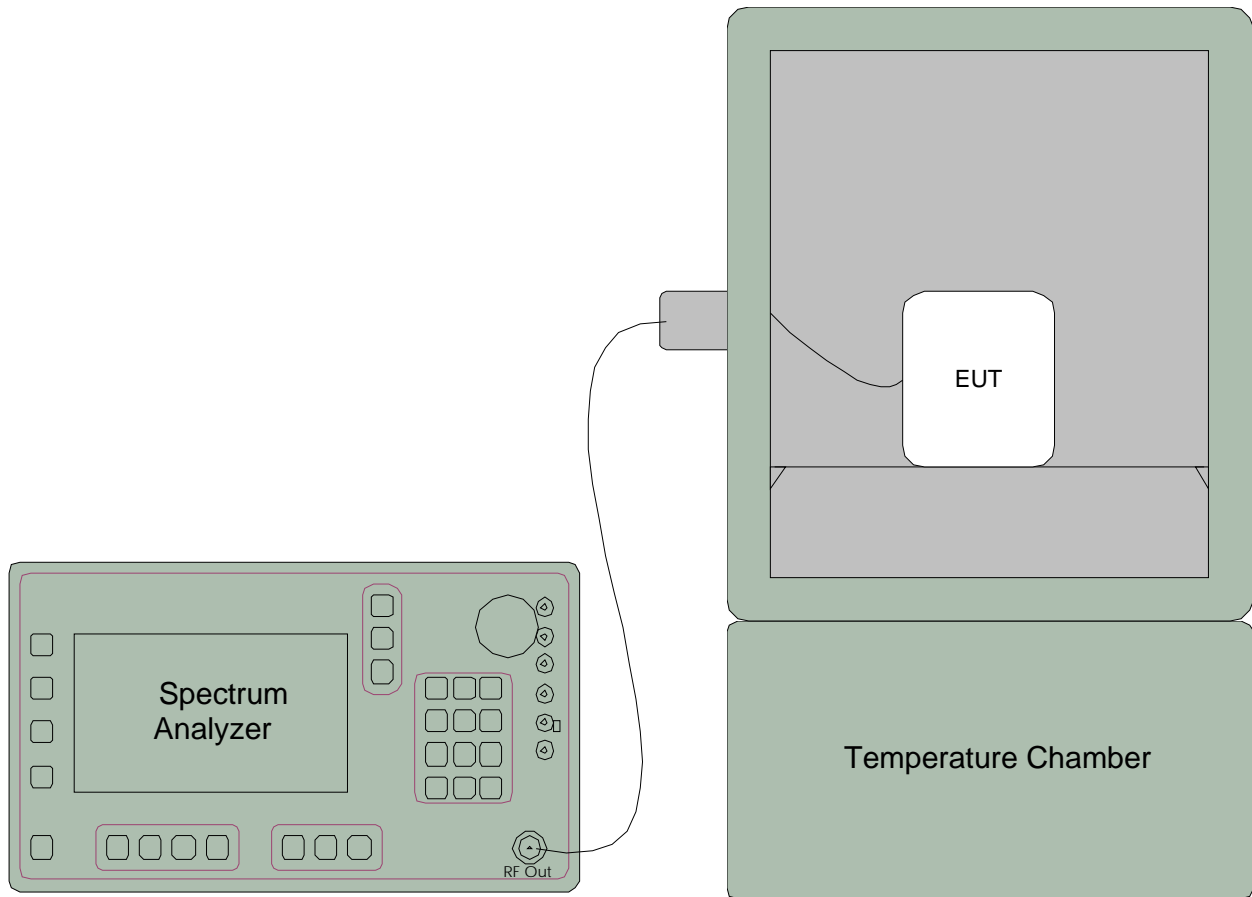


**Frequency Drift with Temperature Variation**



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**F.8. Test Diagram**



**F.9. Tested By**

Name: Tom Tidwell,  
Function: Manager of Wireless Services

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**APPENDIX G: TEST EQUIPMENT LIST****G.1. Field Strength of Spurious Emissions 30 MHz – 26.5 GHz Measurement Equipment**

Description	Manufacturer	Type/Model	Calibration Frequency	Cal Due	NTS Control No.
<b>3m ANECHOIC CHAMBER</b>					
RX Bilog Antenna	ETS	3142C	12 Months	8/17/07	E1288P
Ref. Horn Antenna	ETS	3115	12 Months	11/1/07	E1019P
RX Horn Antenna	ETS	3115	12 Months	11/14/07	E1022P
High Frequency - Cable 1	MegaPhase	TM26-3135-144	12 Months	8/23/07	W1010P
Reference Antenna	ETS	3121 Dipole Set	12 months	8/8/07	S/N. 274
<b>CONTROL ROOM</b>					
Signal Analyzer	Rohde & Schwarz	FSQ26	12 Months	10/23/07	W1020P
High Frequency - Cable 2	MegaPhase	NA	12 Months	8/23/07	W1011P
Amplifier	HP	8449B	12 Months	5/4/07	E1010P

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**G.2. Antenna Conducted Measurement Equipment**

Instrument	Manufacturer	Model	Calibration Frequency	Calibration Due	NTS Control No.
Spectrum Analyzer	Rohde & Schwarz	FSQ26	12 Months	10/23/07	W1020P
Power Meter	Boonton	4531	12 Months	9/1/07	W1001P
Peak Power Sensor	Boonton	57340		9/1/07	W1002P
High Frequency - Cable 1	MegaPhase	TM26-3135-144	12 Months	8/23/07	W1011P
Directional Coupler (10-1000MHz)	Narda	3020A	12 Months	8/28/07	W1006P
Directional Coupler (1-2GHz)	Narda	4242-10	12 Months	2/1/07	W1053P
Directional Coupler (2-26.5GHz)	Narda	27443	12 Months	2/1/07	W1052P
Tunable Notch Filter (500-1000MHz)	K&L Microwave	3TNF-500/1000-N/N	N/A	N/A*	W1043P
Tunable Notch Filter (1000-2000MHz)	K&L Microwave	3TNF-1000/2000-N/N	N/A	N/A*	W1044P
50 ohm load	Bird	8201	-	N/A*	E1193P
50 ohm load	Narda	368BNF	-	N/A*	W1054P
Environmental Chamber #9	RTP	HB-64-705-705-PP	12 Months	10/4/07	ENV-1006-P
Temperature Sensor	Watlow	-	12 Months	10/4/07	ENV-1001-P

\* This device was not used for calibrated measurements.

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