

# CETECOM ICT Services GmbH

Radio Satellite Communication

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RSC11

Issued test report consists of 97 pages

Page 1 (97)

Recognized by the  
Federal Communications Commission  
**Anechoic chamber registration no.: 90462 (FCC)**  
**Anechoic chamber registration no.: 3463 (IC)**  
**TCB ID: DE 0001**



Accredited by the  
German Accreditation Council  
**DAR-Registration Number**

**TTI-P-G 166/98**

Independent ETSI  
compliance test house



**Accredited Bluetooth™ Test Facility (BQTF)**

**Test report no.: 2\_3450-01-01/03****FCC Part 24/22/15****MC56****FCC ID: QIPMC56****IC: 267W-MC56**

CETECOM – ICT Services GmbH

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### 1 General information

#### 1.1 Notes

The test results of this test report relate exclusively to the test item specified in 1.5. The CETECOM ICT Services GmbH does not assume responsibility for any conclusions and generalizations drawn from the test results with regard to other specimens or samples of the type of the equipment represented by the test item. The test report may only be reproduced or published in full. Reproduction or publication of extracts from the report requires the prior written approval of the CETECOM ICT Services GmbH.

#### 1.2 Testing laboratory

CETECOM ICT Services GmbH  
Untertürkheimer Straße 6 - 10  
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Germany  
Telefon : + 49 681 598 - 9100  
Telefax : + 49 681 598 - 9075  
E-mail : info@ict.cetecom.de  
Internet : www.cetecom-ict.de

#### Accredited testing laboratory

The test laboratory (area of testing) is accredited according to DIN EN ISO/IEC 17025.

DAR registration number: TTI-P-G-166/98

Listed by : Federal Communications Commission (FCC)

Identification/Registration No : 90462

**Accredited Bluetooth™ Test Facility (BQTF)**

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2      Technical test

For Part 24/22 we use the substitution method ( TIA/EIA 603).

All measurements in this report are done in GSM mode. Device is able to transmit data in GPRS mode also. But because the current measurements are performed in PEAK mode no other results from GPRS mode are possible. The only different is the modulation average power, which is 3 dB higher (by using 2 timeslots in the Up-link (GPRS mode 10)).

**Remarks:**

Test setup :                      The sample was tested in a special test board to bring power to the card and connect RF over a special coax connector to a standard coax adapter.  
For radiated measurements we used a standard magnetic dualband mobile antenna mounted on a metal plate to get comparative results.

No deviations from the technical specification(s) were ascertained in the course of the tests performed.

**FINAL VERDICT: PASS**

Technical responsibility for area of testing :

2003-12-15                      RSC 8414   Ames H.

Date	Section	Name	Signature
2003-12-15	RSC 8414	Ames H.	

Technical responsibility for area of testing :

2003-12-15                      RSC8412   Hausknecht D.

Date	Section	Name	Signature
2003-12-15	RSC8412	Hausknecht D.	

**2.2      Test report**

**TEST REPORT**

**Test report no. : 2\_3450-01-01/03**

## TEST REPORT REFERENCE

## LIST OF MEASUREMENTS

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## POWER OUTPUT

## SUBCLAUSE § 24.232

### Summary:

This paragraph contains both average , peak output powers and EIRP measurements for the mobile station. In all cases, the peak output power is within the required mask (this mask is specified in the JTC standards, TIA PN3389 Vol. 1 Chap 7, and is no FCC requirement).

### Method of Measurements:

The mobile was set up for the max. output power with pseudo random data modulation.  
 The power was measured with R&S Signal Analyzer FSIQ 26 ( peak and average)  
 This measurements were done at 3 frequencies, 1850,2 MHz, 1880,0 MHz and 1909,8 MHz (bottom, middle and top of operational frequency range)

### Limits:

Power Step	Nominal Peak Output Power (dBm)	Tolerance (dB)
0	+30	± 2

### Power Measurements:

#### Conducted:

Frequency (MHz)	Power Step	Peak Output Power (dBm)	Average in the burst Output Power (dBm)
1850.2	0	28.7	28.6
1880.0	0	28.4	28.3
1909.8	0	28.5	28.4
Measurement uncertainty		±0.5 dB	

### REFERENCE NUMBER(S) OF TEST EQUIPMENT USED

(for reference numbers see test equipment listing)



## EIRP Measurements

Description: This is the test for the maximum radiated power from the phone.

Rule Part 24.232(b) specifies that "Mobile/portable stations are limited to 2 watts e.i.r.p. peak power..." and 24.232(c) specifies that "Peak transmit power must be measured over any interval of continuous transmission using instrumentation calibrated in terms of an rms-equivalent voltage."

Method of Measurement:

1. In an anechoic antenna test chamber, a half-wave dipole antenna for the frequency band of interest is placed at the reference center of the chamber. An RF Signal source for the frequency band of interest is connected to the dipole with a cable that has been constructed to not interfere with the radiation pattern of the antenna. A known (measured) power (Pin) is applied to the input of the dipole, and the power received (Pr) at the chamber's probe antenna is recorded.
2. A "reference path loss" is established as  $Pin + 2.1 - Pr$ .
3. The EUT is substituted for the dipole at the reference centre of the chamber. The EUT is put into CW test mode and a scan is performed to obtain the radiation pattern.
4. From the radiation pattern, the co-ordinates where the maximum antenna gain occurs is identified.
5. The EUT is then put into pulse mode at its maximum power level (Power Step 0).
6. "Gated mode" power measurements are performed with the receiving antenna placed at the co-ordinates determined in Step 3 to determine the output power as defined in FCC Rule 24.232 (b) and (c). The "reference path loss" from Step 1 is added to this result.
7. This value is EIRP since the measurement is calibrated using a half-wave dipole antenna of known gain (2.1 dBi) and known input power (Pin).
8. ERP can be calculated from EIRP by subtracting the gain of the dipole,  $ERP = EIRP - 2.1 \text{ dBi}$ .

## Limits:

Power Step	Burst PEAK EIRP (dBm)
0	<33

## Power Measurements ( Radiated )

Frequency (MHz)	Power Step	BURST PEAK EIRP (dBm)		MODULATION AVERAGE (dBm)	
		EIRP	ERP	EIRP	ERP
1850.2	0	27.2	25.1	18.2	16.1
1880.0	0	27.4	25.3	18.4	16.3
1909.8	0	25.8	23.7	16.8	15.7
Measurement uncertainty		±3 dB			

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED  
(for reference numbers see test equipment listing)

## FREQUENCY STABILITY

## SUBCLAUSE § 24.235

### **Method of Measurement:**

In order to measure the carrier frequency under the condition of AFC lock, it is necessary to make measurements with the mobile station in a "call mode". This is accomplished with the use of a R&S CMU 200 DIGITAL RADIOCOMMUNICATION TESTER..

1. Measure the carrier frequency at room temperature.
2. Subject the mobile station to overnight soak at -30 C.
3. With the mobile station, powered with 3.6 Volts, connected to the CMU 200 and in a simulated call on channel 661 (centre channel), measure the carrier frequency. These measurements should be made within 2 minutes of powering up the mobile station, to prevent significant self warming.
4. Repeat the above measurements at 10 C increments from -30 C to +60 C. Allow at least 1 1/2 hours at each temperature, un-powered, before making measurements.
5. Re-measure carrier frequency at room temperature with nominal 3.8 Volts. Vary supply voltage from minimum 3.3 Volts to maximum 4.4 Volts, in 12 steps re-measuring carrier frequency at each voltage. Pause at 3.8 V dc Volts for 1 1/2 hours un-powered, to allow any self heating to stabilize, before continuing.
6. Subject the mobile station to overnight soak at +60 C.
7. With the mobile station, powered with 3.8 Volts, connected to the CMU 200 and in a simulated call on channel 661(center channel), measure the carrier frequency. These measurements should be made within 2 minutes of powering up the mobile station, to prevent significant self warming.
8. Repeat the above measurements at 10 C increments from +60 C to -30 C. Allow at least 1 1/2 hours at each temperature, un-powered, before making measurements.
9. At all temperature levels hold the temperature to +/- 0.5 C during the measurement procedure.

### **Measurement Limit:**

According to the JTC standard the frequency stability of the carrier shall be accurate to within 0.1 ppm of the received frequency from the base station. This accuracy is sufficient to meet Sec. 24.235, Frequency Stability. The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.. This transceiver is specified to operate with an input voltage of between 3.3 V dc and 4.4 V dc, with a nominal voltage of 3.8 V dc.

**REFERENCE NUMBER(S) OF TEST EQUIPMENT USED**  
(for reference numbers see test equipment listing)

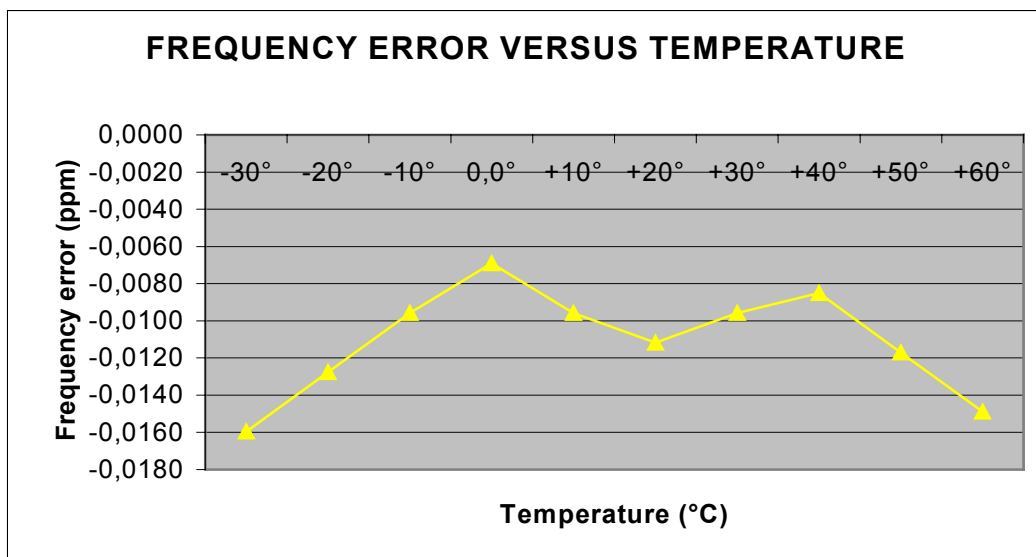
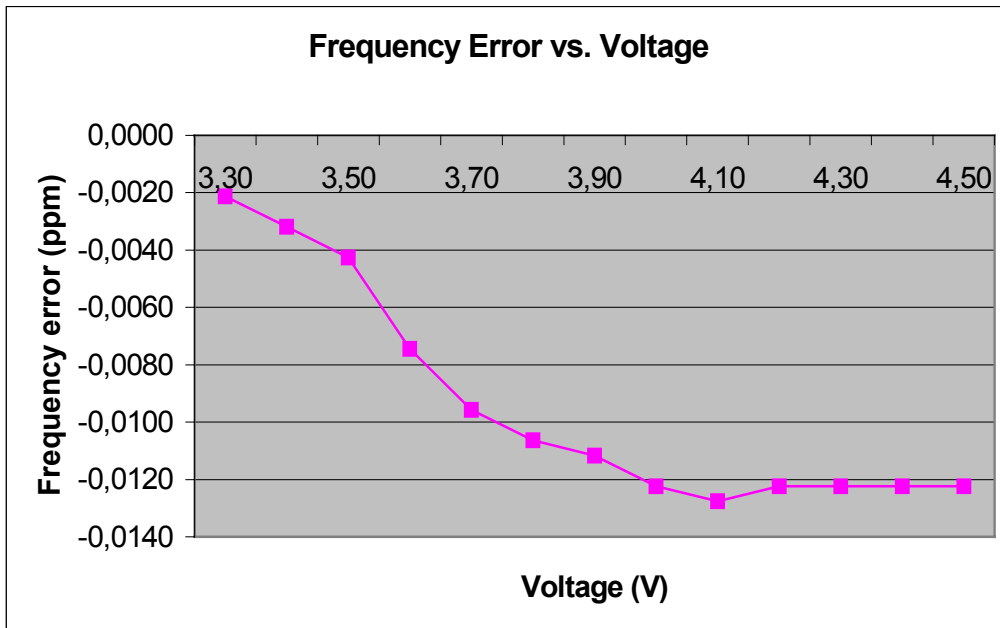
**AFC FREQ ERROR vs. VOLTAGE**

Voltage (V)	Frequency Error (Hz)	Frequency Error (%)	Frequency Error (ppm)
3.3	-4	-0,0000021	-0,0021
3.4	-6	-0,0000032	-0,0032
3.5	-8	-0,0000043	-0,0043
3.6	-14	-0,0000074	-0,0074
3.7	-18	-0,0000096	-0,0096
3.8	-20	-0,0000106	-0,0106
3.9	-21	-0,0000112	-0,0112
4.0	-23	-0,0000122	-0,0122
4.1	-24	-0,0000128	-0,0128
4.2	-23	-0,0000122	-0,0122
4.3	-23	-0,0000122	-0,0122
4.4	-23	-0,0000122	-0,0122
4.5	-23	-0,0000122	-0,0122

**AFC FREQ ERROR vs. TEMPERATURE**

TEMPERATURE (°C)	Frequency Error (Hz)	Frequency Error (%)	Frequency Error (ppm)
-30	-30	-0,0000160	-0,0160
-20	-24	-0,0000128	-0,0128
-10	-18	-0,0000096	-0,0096
±0.0	-13	-0,0000069	-0,0069
+10	-18	-0,0000096	-0,0096
+20	-21	-0,0000112	-0,0112
+30	-18	-0,0000096	-0,0096
+40	-16	-0,0000085	-0,0085
+50	-22	-0,0000117	-0,0117
+60	-28	-0,0000149	-0,0149

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED  
(for reference numbers see test equipment listing)



REFERENCE NUMBER(S) OF TEST EQUIPMENT USED  
(for reference numbers see test equipment listing)

## EMISSIONS LIMITS

§24.238

### **Measurement Procedure:**

The following steps outline the procedure used to measure the radiated emissions from the mobile station. The site is constructed in accordance with ANSI C63.4 – 1992 requirements and is recognised by the FCC to be in compliance for a 3 and a 10 meter site. The spectrum was scanned from 30 MHz to the 10th harmonic of the highest frequency generated within the equipment, which is the transmitted carrier that can be as high as 1910 MHz. This was rounded up to 20 GHz. The resolution bandwidth is set as outlined in Part 24.238. The spectrum was scanned with the mobile station transmitting at carrier frequencies that pertain to low, mid and high channels of the USPCS band.

### **The final open field emission ( here 10m semi-anechoic chamber listed by FCC) test procedure is as follows:**

- a) The test item was placed on a 0.8 meter high non-conductive stand at a 3 meter test distance from the receive antenna.
- b) The antenna output was terminated in a 50 ohm load.
- c) A double ridged waveguide antenna was placed on an adjustable height antenna mast 3 meters from the test item for emission measurements.
- d) Detected emissions were maximized at each frequency by rotating the test item and adjusting the receive antenna height and polarization. The maximum meter reading was recorded. The radiated emission measurements of the harmonics of the transmit frequency through the 10th harmonic were measured with peak detector and 1 MHz bandwidth. If the harmonic could not be detected above the noise floor, the ambient level was recorded.
- e) Now each detected emissions were substituted by the Substitution method, in accordance with the TIA/EIA 603.

### **Measurement Limit:**

Sec. 24.238 Emission Limits.

(a) On any frequency outside a licensee' s frequency block (e.g. A, D, B, etc.) within the USPCS spectrum, the power of any emission shall be attenuated below the transmitter power (P, in Watts) by at least  $43+10\text{Log}(P)$  dB. The specification that emissions shall be attenuated below the transmitter power (P) by at least  $43 + 10 \log (P)$  dB, translates in the relevant power range (1 to 0.001 W) to -13 dBm. At 1 W the specified minimum attenuation becomes 43 dB and relative to a 30 dBm (1 W) carrier becomes a limit of -13 dBm. At 0.001 W (0 dBm) the minimum attenuation is 13 dB which again yields a limit of -13 dBm. In this way a translation of the specification from relative to absolute terms is carried out.

**Measurement Results:**

Radiated emissions measurements were made only at the upper, center, and lower carrier frequencies of the USPCS band (1850.2 MHz, 1879.8 MHz and 1909.8 MHz). It was decided that measurements at these three carrier frequencies would be sufficient to demonstrate compliance with emissions limits because it was seen that all the significant spurs occur well outside the band and no radiation was seen from a carrier in one block of the USPCS band into any of the other blocks. The equipment must still, however, meet emissions requirements with the carrier at all frequencies over which it is capable of operating and it is the manufacturer's responsibility to verify this.

**RESULTS OF OPEN FIELD RADIATED TEST FOR FCC-24:**

The final open field radiated levels are presented on the next pages.

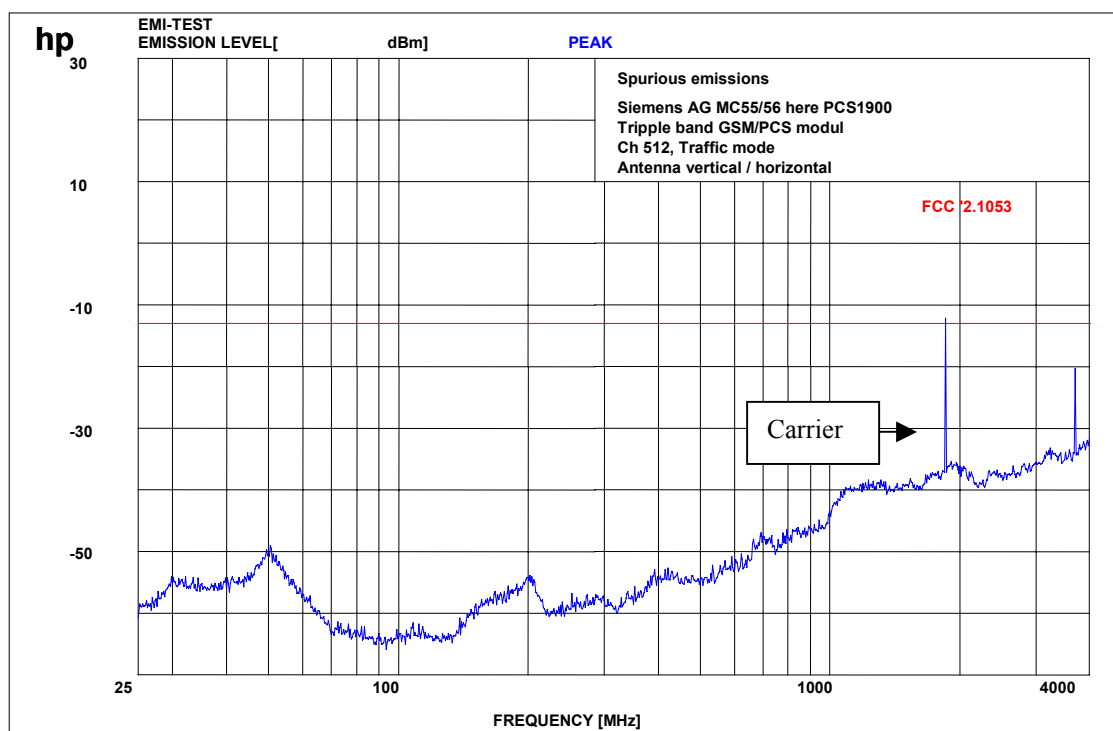
All measurements were done in horizontal and vertical polarization, the plots show the worst case.  
As can be seen from this data, the emissions from the test item were within the specification limit.

**RESULTS OF OPEN FIELD RADIATED TEST FOR FCC-24:**

EMISSION LIMITATIONS					
f (MHz)		amplitude of emission (dBm)	limit max. allowed emission power (dBm)	actual attenuation below frequency of operation (dBc)	results
<b>CH 512</b>					
1850.2		27.2	-13.0 (40.2 dBc)		carrier complies
3700.4		-20.4		60.6	
<b>CH 661</b>					
1880.0		27.4	-13.0 (40.4 dBc)		carrier
<b>CH 810</b>					
1909.8		25.8	-13.0 (38.8 dBc)		carrier
<b>Measurement uncertainty</b>		<b>± 0.5dB</b>			

**REFERENCE NUMBER(S) OF TEST EQUIPMENT USED**  
(for reference numbers see test equipment listing)

## Channel 512 (up to 4 GHz)



$f < 1 \text{ GHz} : \text{RBW/VBW: } 100 \text{ kHz}$

$f \geq 1 \text{ GHz} : \text{RBW / VBW } 1 \text{ MHz}$

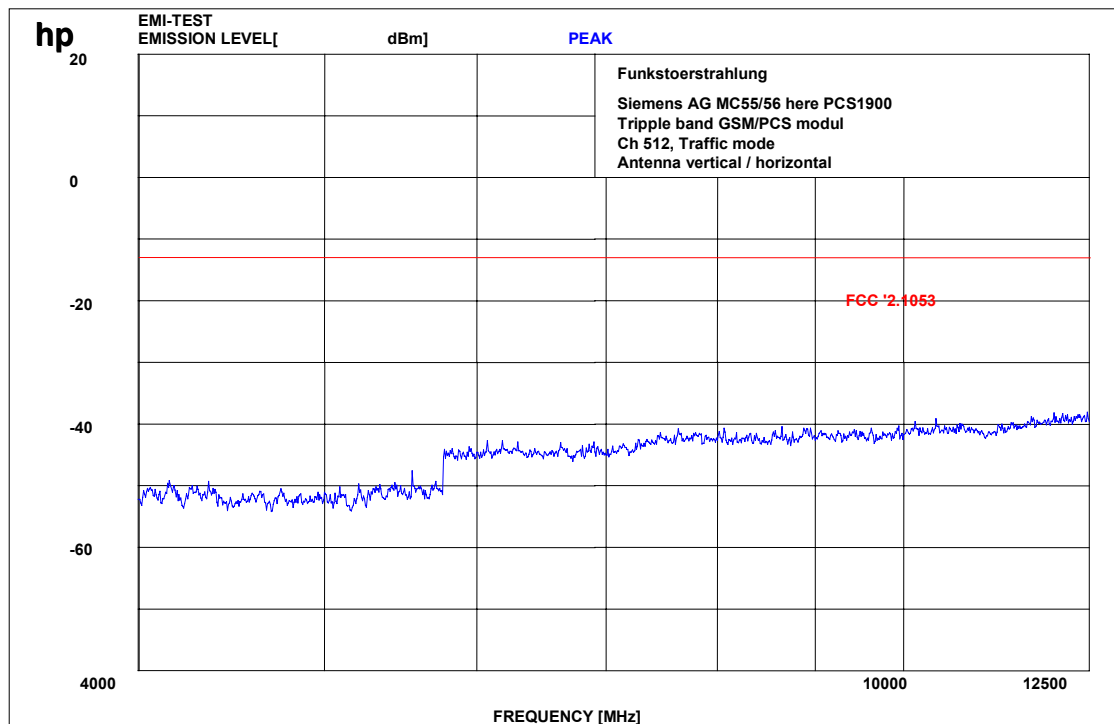
**Carrier suppressed with a rejection filter**

**REFERENCE NUMBER(S) OF TEST EQUIPMENT USED**

(for reference numbers see test equipment listing)

17 – 24; 64

## Channel 512 (up to 12 GHz)



$f < 1 \text{ GHz}$  : RBW/VBW: 100 kHz

$f \geq 1 \text{ GHz}$  : RBW / VBW 1 MHz

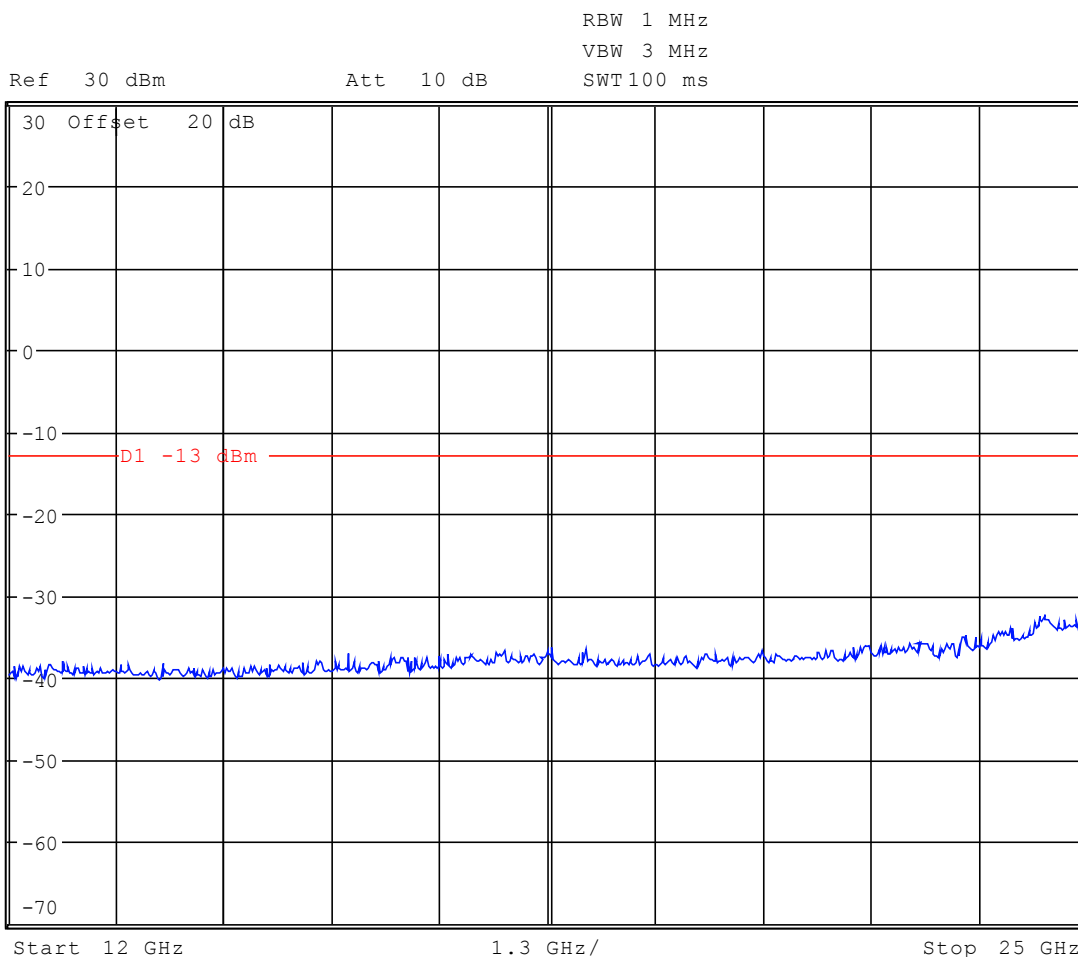
**REFERENCE NUMBER(S) OF TEST EQUIPMENT USED**

(for reference numbers see test equipment listing)

17 – 24; 64



## Channel 512 :- 25 GHz valid for all three channels

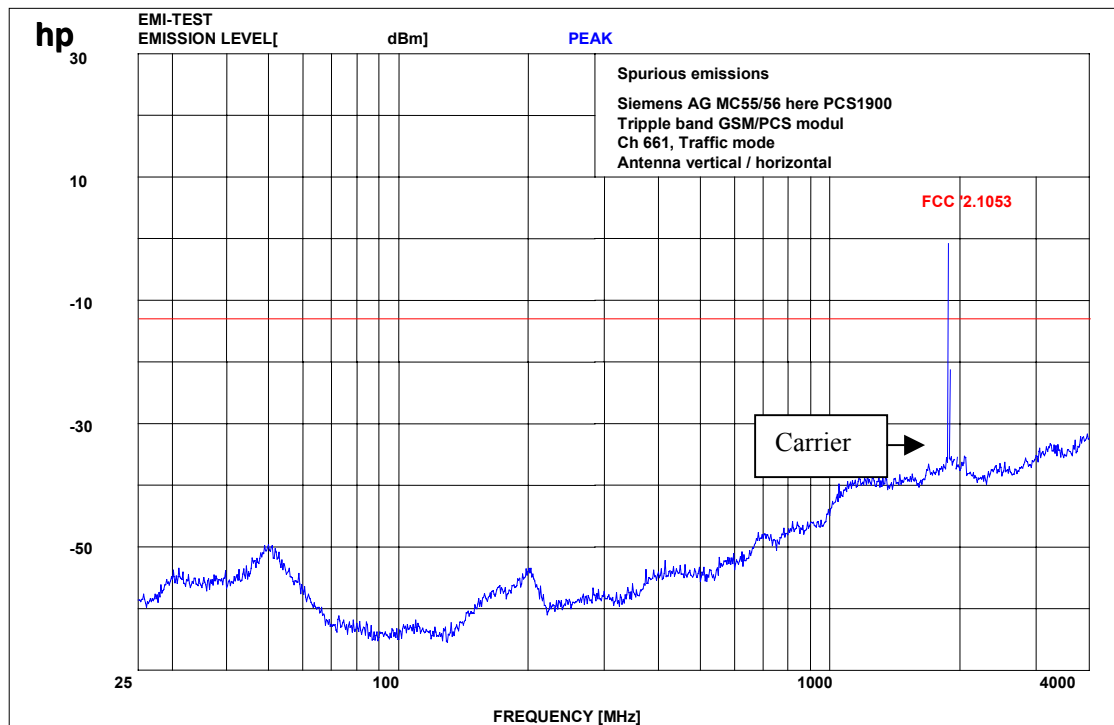


### REFERENCE NUMBER(S) OF TEST EQUIPMENT USED

(for reference numbers see test equipment listing)

17 - 24, 64

## Channel 661 (up to 4 GHz)



$f < 1 \text{ GHz} : \text{RBW/VBW: } 100 \text{ kHz}$        $f \geq 1 \text{ GHz} : \text{RBW / VBW } 1 \text{ MHz}$

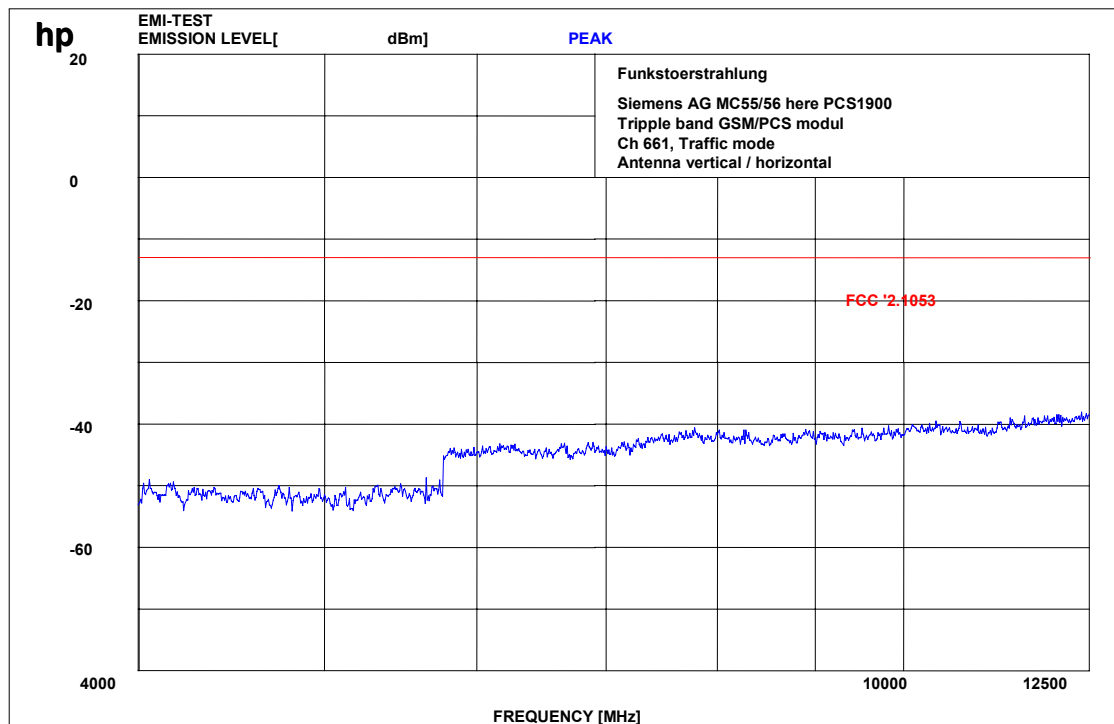
**Carrier suppressed with a rejection filter.**

**REFERENCE NUMBER(S) OF TEST EQUIPMENT USED**

(for reference numbers see test equipment listing)

17 – 24, 64

## Channel 661 (up to 12 GHz )



$f < 1 \text{ GHz} : \text{RBW/VBW: } 100 \text{ kHz}$

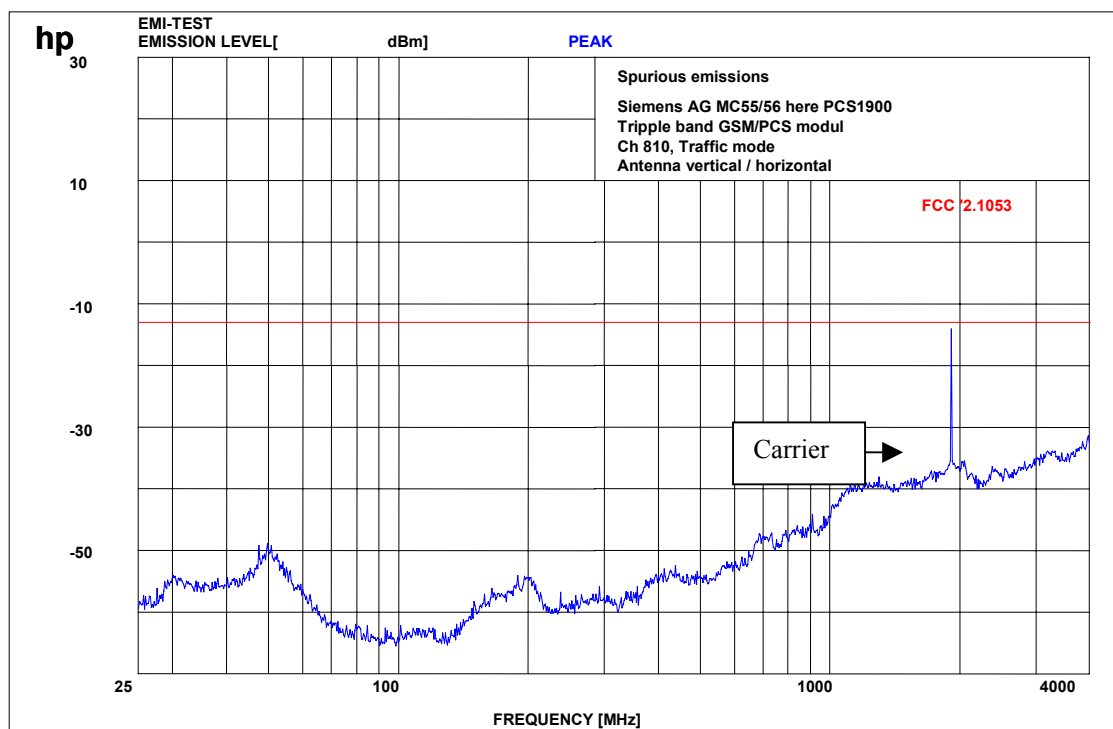
$f \geq 1 \text{ GHz} : \text{RBW / VBW } 1 \text{ MHz}$

**REFERENCE NUMBER(S) OF TEST EQUIPMENT USED**

(for reference numbers see test equipment listing)

17 – 24, 64

## Channel 810 up to 4 GHz



$f < 1 \text{ GHz} : \text{RBW/VBW: } 100 \text{ kHz}$

$f \geq 1 \text{ GHz} : \text{RBW / VBW } 1 \text{ MHz}$

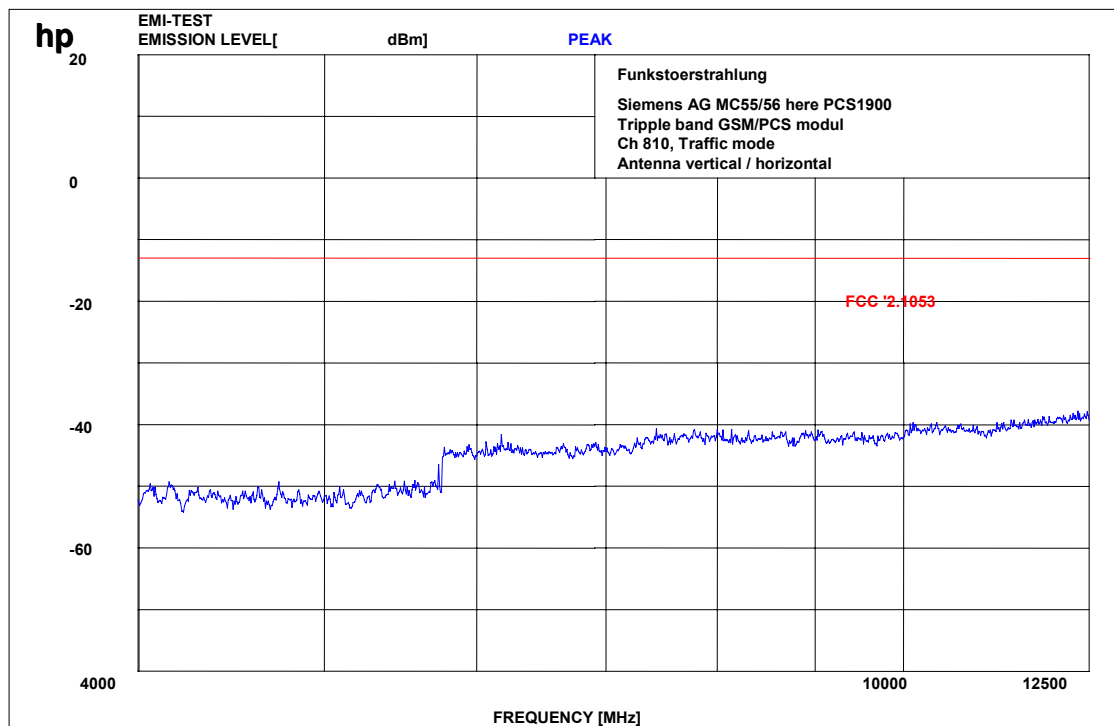
**Carrier suppressed with a rejection filter**

**REFERENCE NUMBER(S) OF TEST EQUIPMENT USED**

(for reference numbers see test equipment listing)

17 – 24, 64

## Channel 810 up to 12 GHz



$f < 1 \text{ GHz} : \text{RBW/VBW: } 100 \text{ kHz}$

$f \geq 1 \text{ GHz} : \text{RBW/VBW } 1 \text{ MHz}$

**REFERENCE NUMBER(S) OF TEST EQUIPMENT USED**

(for reference numbers see test equipment listing)

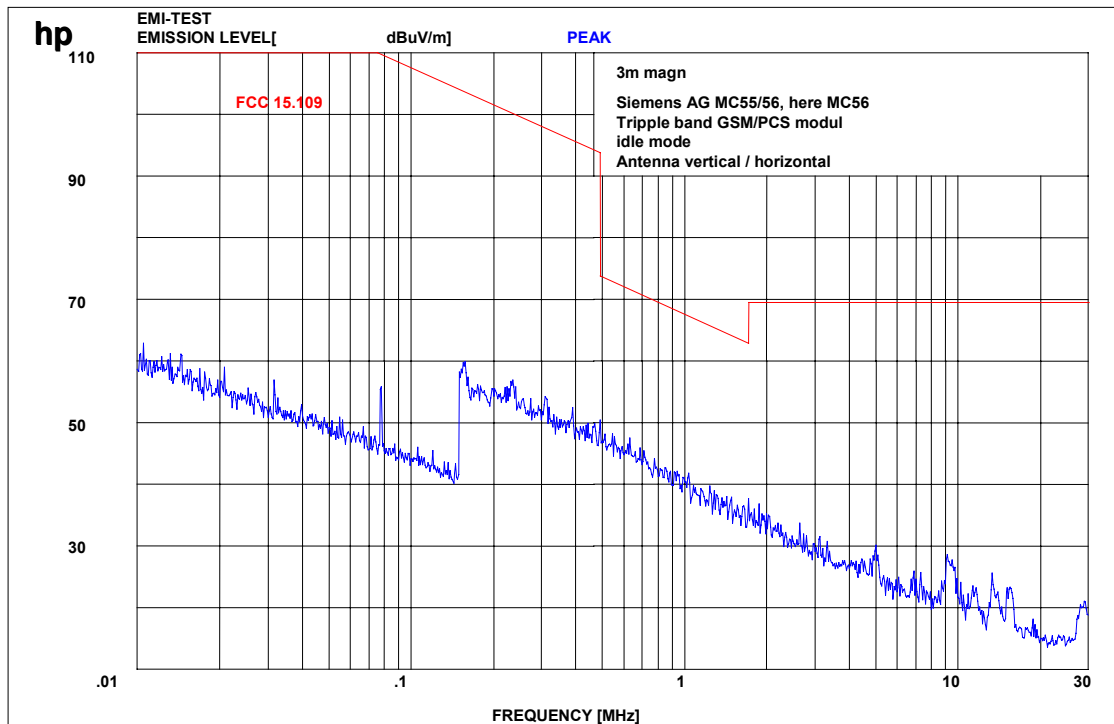
17 – 24, 64



## Part15 Spurious radiation from 9 kHz to 30 MHz

Idle Mode (this is valid for PCS 850 and PCS 1900 up to 30 MHz)

Recalculated from 300m or 30m to 3m with 40db/decade according FCC rules.



For peak measurement we use 100 kHz RBW/VBW

For CISPR QP measurement we use 200 Hz from 9 kHz to 150kHz

9 kHz for 150 kHz to 30 MHz

### Limits

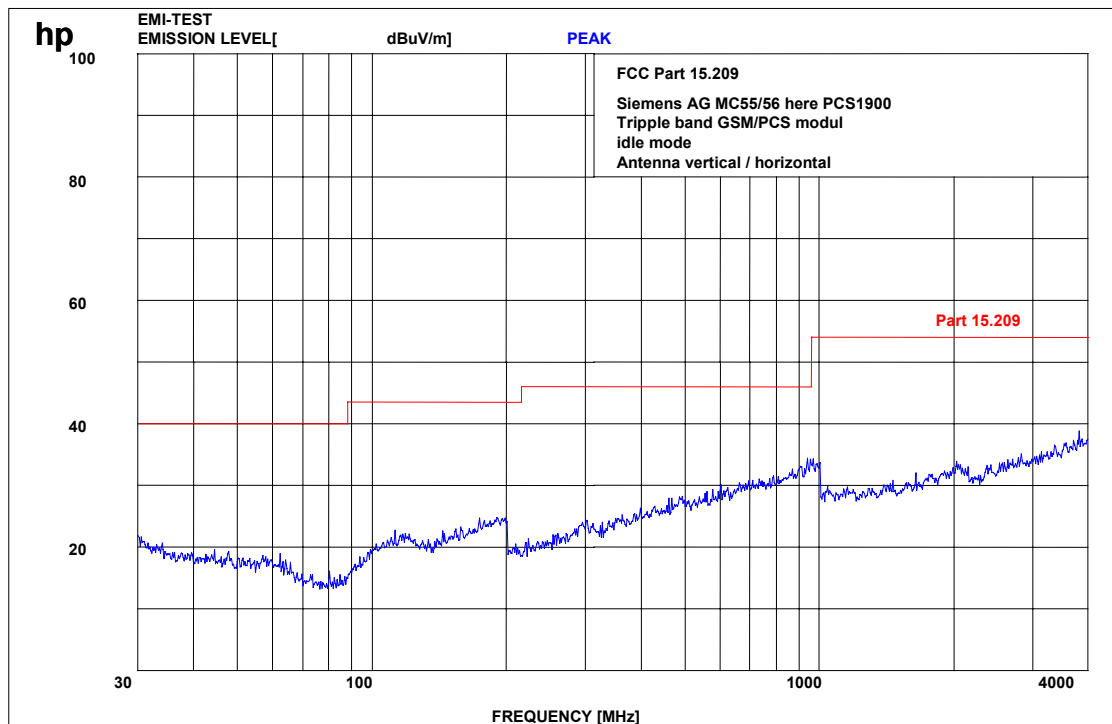
### SUBCLAUSE § 15.109

Frequency (MHz)	Field strength ( $\mu\text{V}/\text{m}$ )	Measurement distance (m)
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30.0	30 / 29.5 dB $\mu\text{V}/\text{m}$	30

### REFERENCE NUMBER(S) OF TEST EQUIPMENT USED

(for reference numbers see test equipment listing)

## Idle-Mode (up to 4 GHz)



$f < 1 \text{ GHz}$  : RBW/VBW: 100 kHz

$f \geq 1 \text{ GHz}$  : RBW/VBW 1 MHz

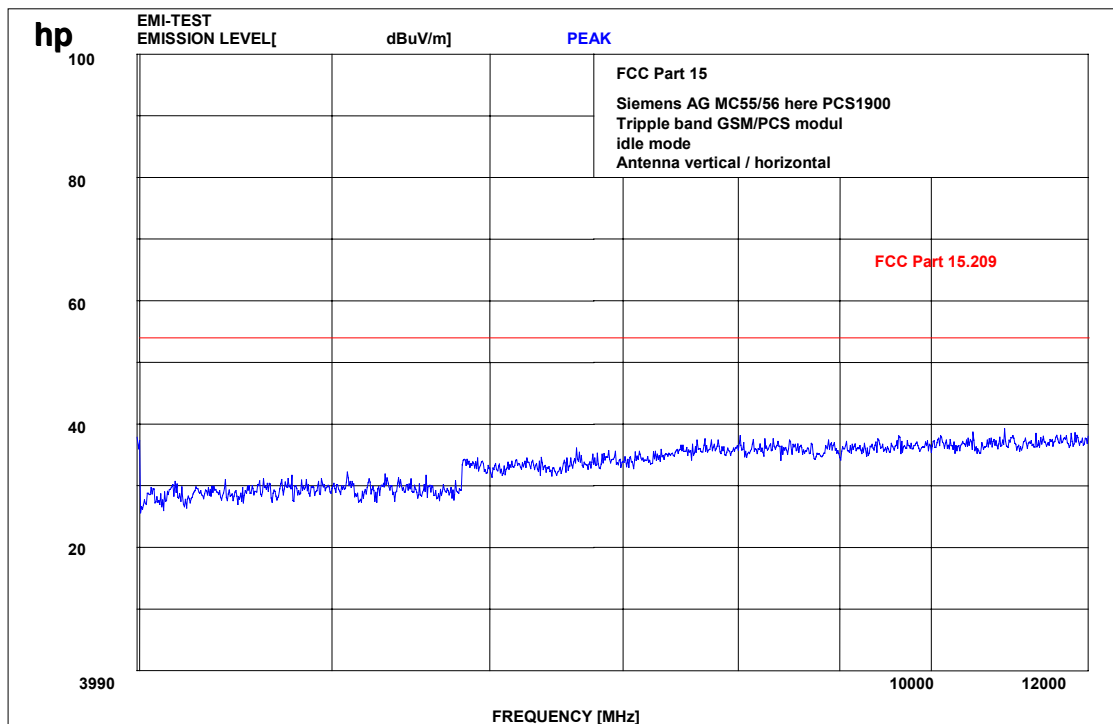
**REFERENCE NUMBER(S) OF TEST EQUIPMENT USED**

(for reference numbers see test equipment listing)

17 – 24, 64



## Idle-Mode (this is valid up to 12 GHz)



$f < 1 \text{ GHz}$  : RBW/VBW: 100 kHz

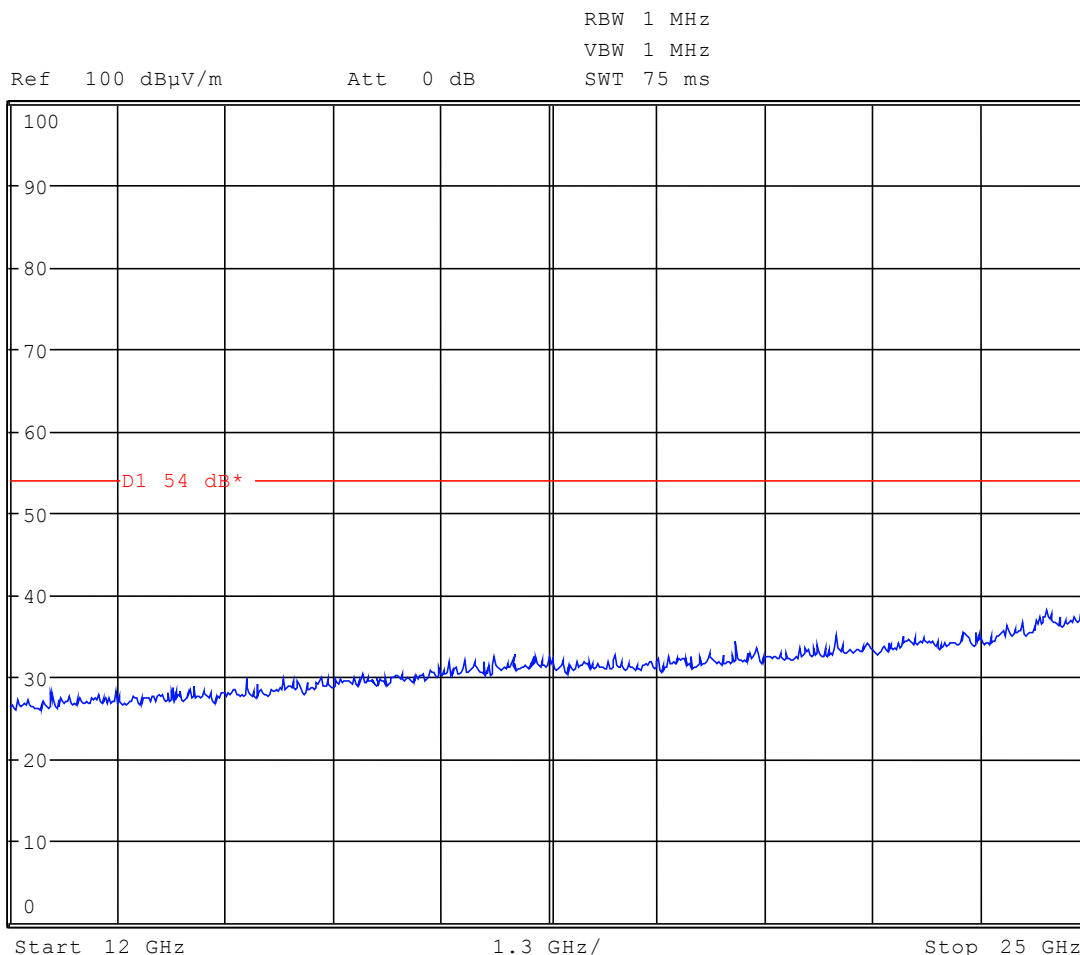
$f \geq 1 \text{ GHz}$  : RBW/VBW 1 MHz

### REFERENCE NUMBER(S) OF TEST EQUIPMENT USED

(for reference numbers see test equipment listing)

17 – 24, 64

## Idle-Mode (this is valid up to 25 GHz)



**For this measurement we used a special wideband horn antenna and a low noise preamp.**

### REFERENCE NUMBER(S) OF TEST EQUIPMENT USED

(for reference numbers see test equipment listing)

17 – 24, 64

## CONDUCTED SPURIOUS EMISSIONS

### Measurement Procedure:

The following steps outline the procedure used to measure the conducted emissions from the mobile station.

1. Determine frequency range for measurements: From CFR 2.1057 the spectrum should be investigated from the lowest radio frequency generated in the equipment up to at least the 10th harmonic of the carrier frequency.

For the mobile station equipment tested, this equates to a frequency range of 13 MHz to 19.1 GHz, data taken from 10 MHz to 20 GHz.

2. Determine mobile station transmit frequencies: below outlines the band edge frequencies pertinent to conducted emissions testing.

### USPCS Transmitter

#### Channel Frequency

512 1850.2 MHz

661 1880.0 MHz

810 1909.8 MHz

### Measurement Limit:

Sec. 24.238 Emission Limits.

(a) On any frequency outside frequency band of the USPCS spectrum, the power of any emission shall be attenuated below the transmitter power (P, in Watts) by at least  $43+10\log(P)$  dB. For all power levels +30 dBm to 0 dBm, this becomes a constant specification limit of -13 dBm.

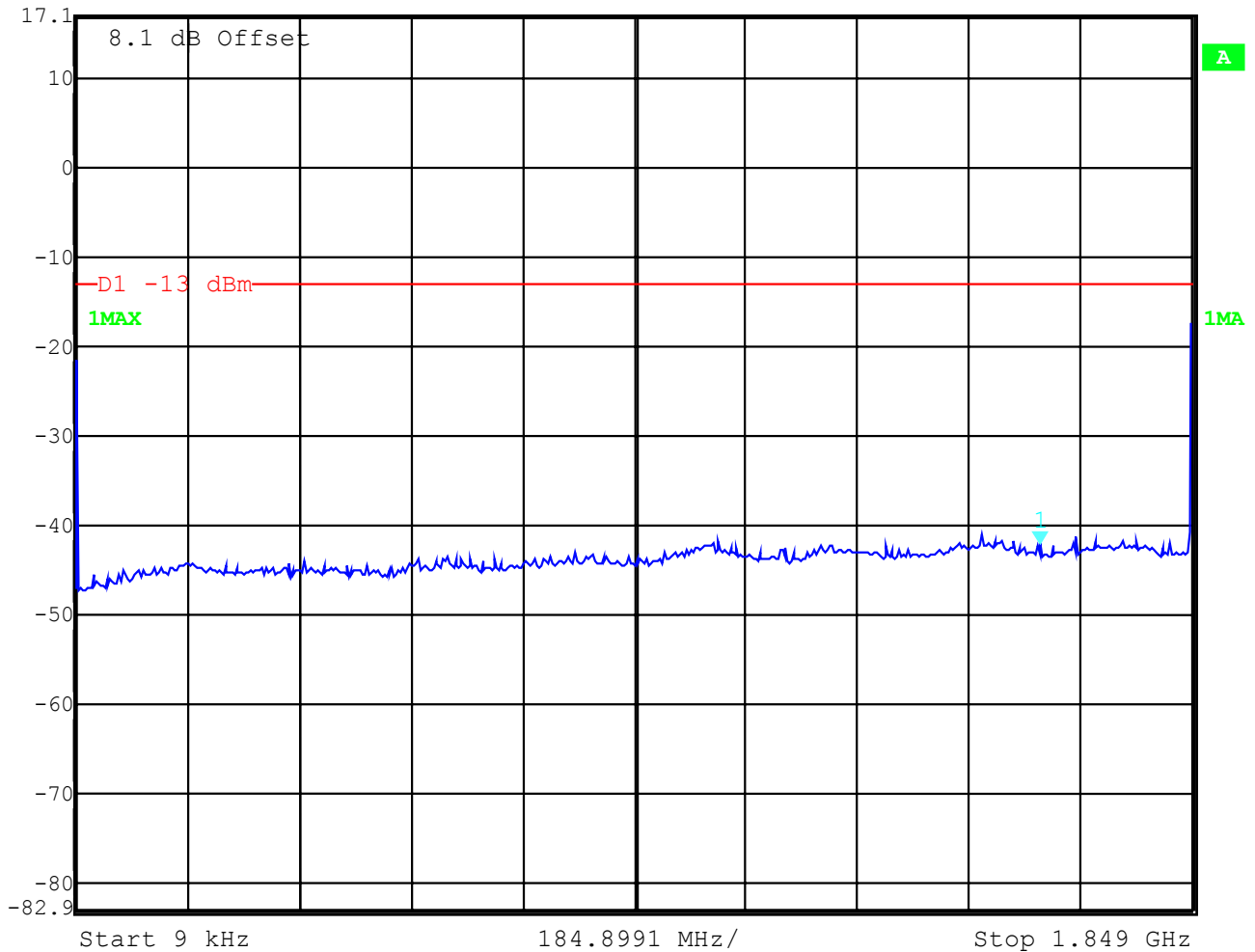
EMISSION LIMITATIONS					
f (MHz)		amplitude of emission (dBm)	limit max. allowed emission power (dBm)	actual attenuation below frequency of operation (dBc)	results
<b>CH 512</b>					
<b>1850.2</b>		<b>28.70</b>	<b>-13.0</b> <b>(41.7 dBc)</b>		<b>carrier</b> <b>complies</b>
<b>1849.99</b>		<b>-16.29</b>		<b>44.99</b>	
<b>CH 661</b>					
<b>1880.0</b>		<b>28.40</b>	<b>-13.0</b> <b>(41.4 dBc)</b>		<b>carrier</b>
<b>CH 810</b>					
<b>1909.8</b>		<b>28.50</b>	<b>-13.0</b> <b>(41.5 dBc)</b>		<b>carrier</b> <b>complies</b>
<b>1910.00</b>		<b>-14.76</b>		<b>43.22</b>	
<b>Measurement uncertainty</b>		<b>± 0.5dB</b>			

**REFERENCE NUMBER(S) OF TEST EQUIPMENT USED**  
(for reference numbers see test equipment listing)

## Measurements:

### Channel: 512

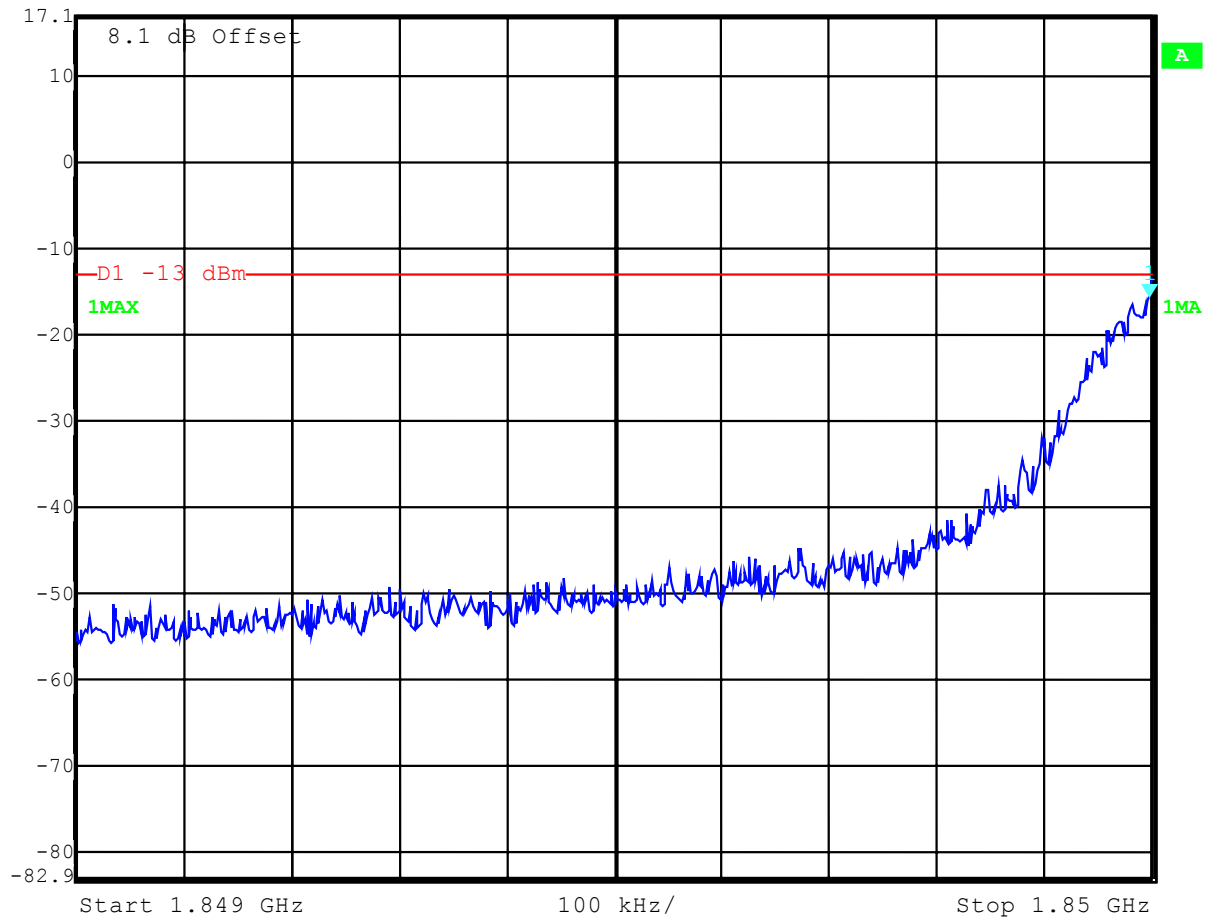
	Ref Lvl	Marker 1 [T1]	RBW	1 MHz	RF Att	30 dB
	17.1 dBm	-41.99 dBm	VBW	1 MHz		
		1.59703329 GHz	SWT	5 ms	Unit	dBm



**REFERENCE NUMBER(S) OF TEST EQUIPMENT USED**  
 (for reference numbers see test equipment listing)

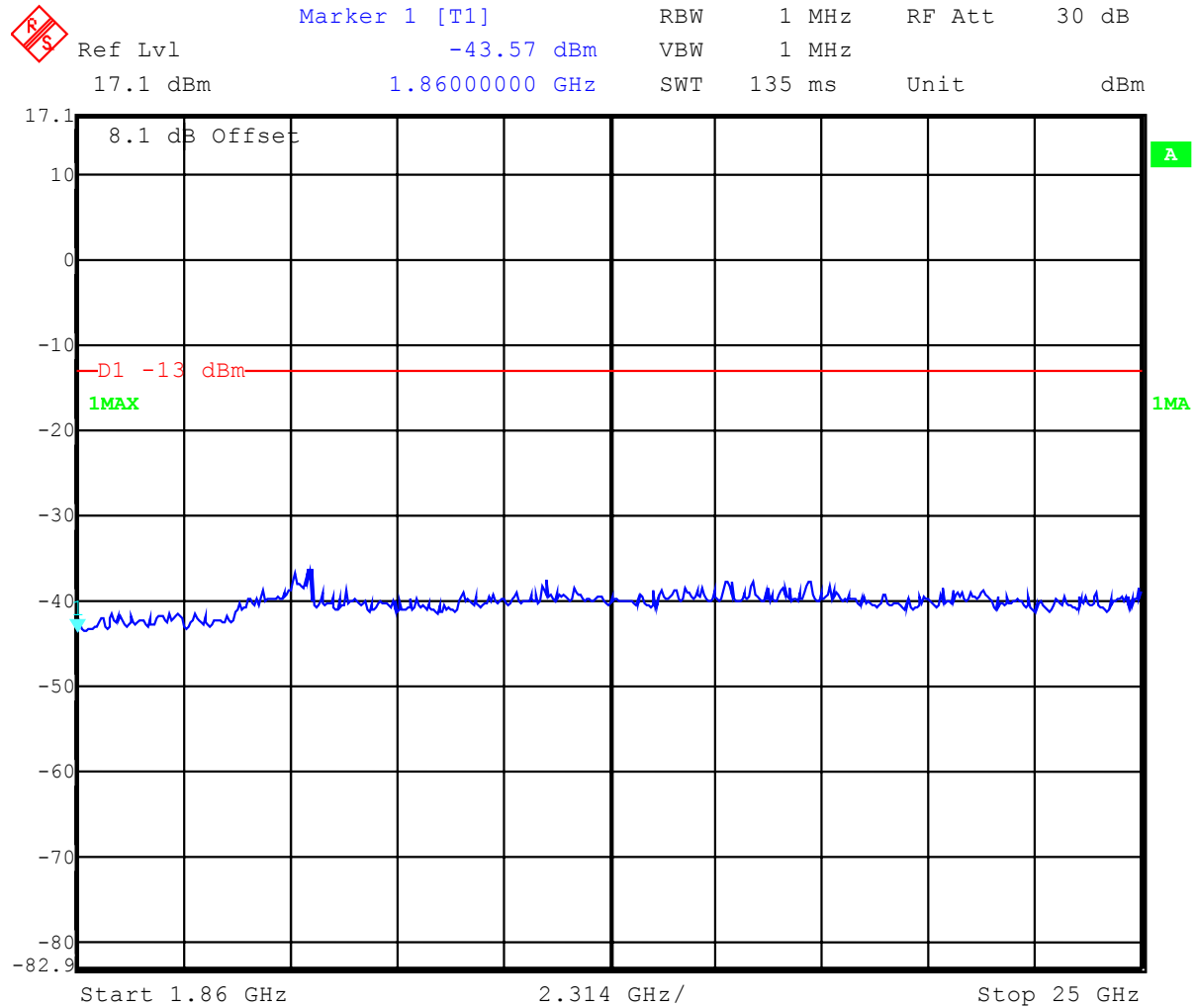
## Channel 512

	Marker 1 [T1]	RBW	3 kHz	RF Att	30 dB
	Ref Lvl	-15.52 dBm	VBW	3 kHz	
	17.1 dBm	1.84999800 GHz	SWT	280 ms	Unit                  dBm



**REFERENCE NUMBER(S) OF TEST EQUIPMENT USED**  
 (for reference numbers see test equipment listing)

## Channel 512

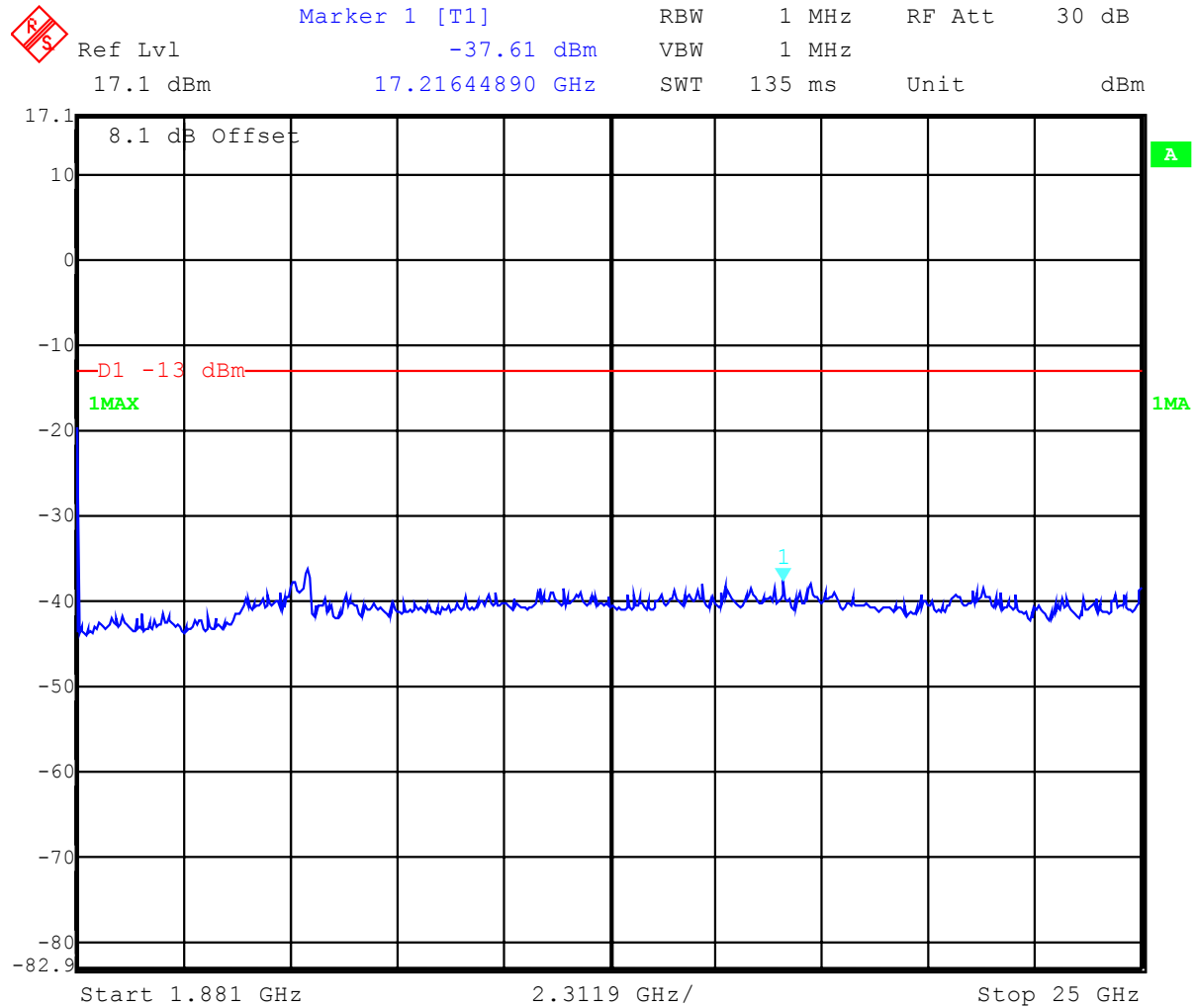


### REFERENCE NUMBER(S) OF TEST EQUIPMENT USED

(for reference numbers see test equipment listing)



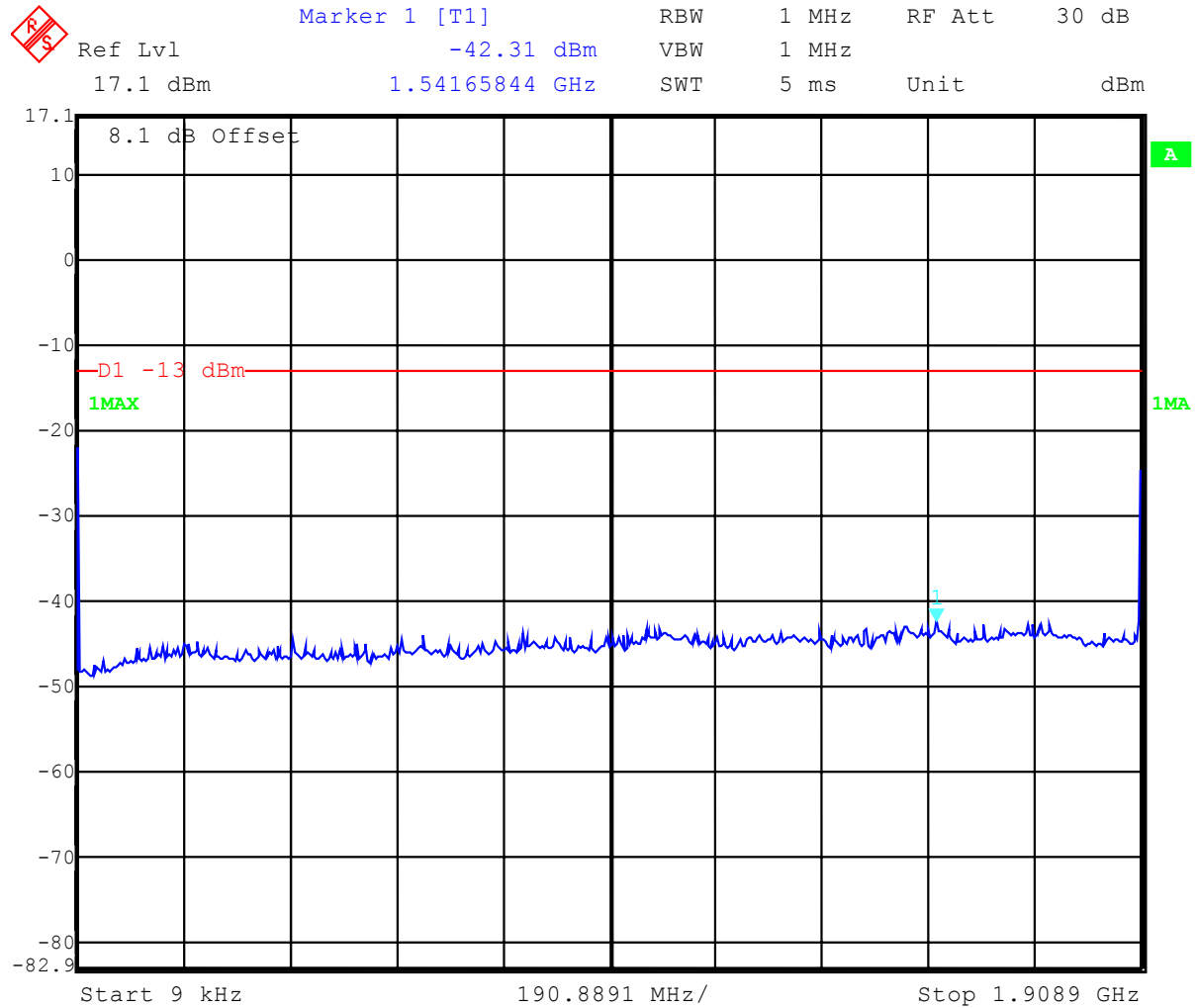
## Channel 661



**REFERENCE NUMBER(S) OF TEST EQUIPMENT USED**  
 (for reference numbers see test equipment listing)



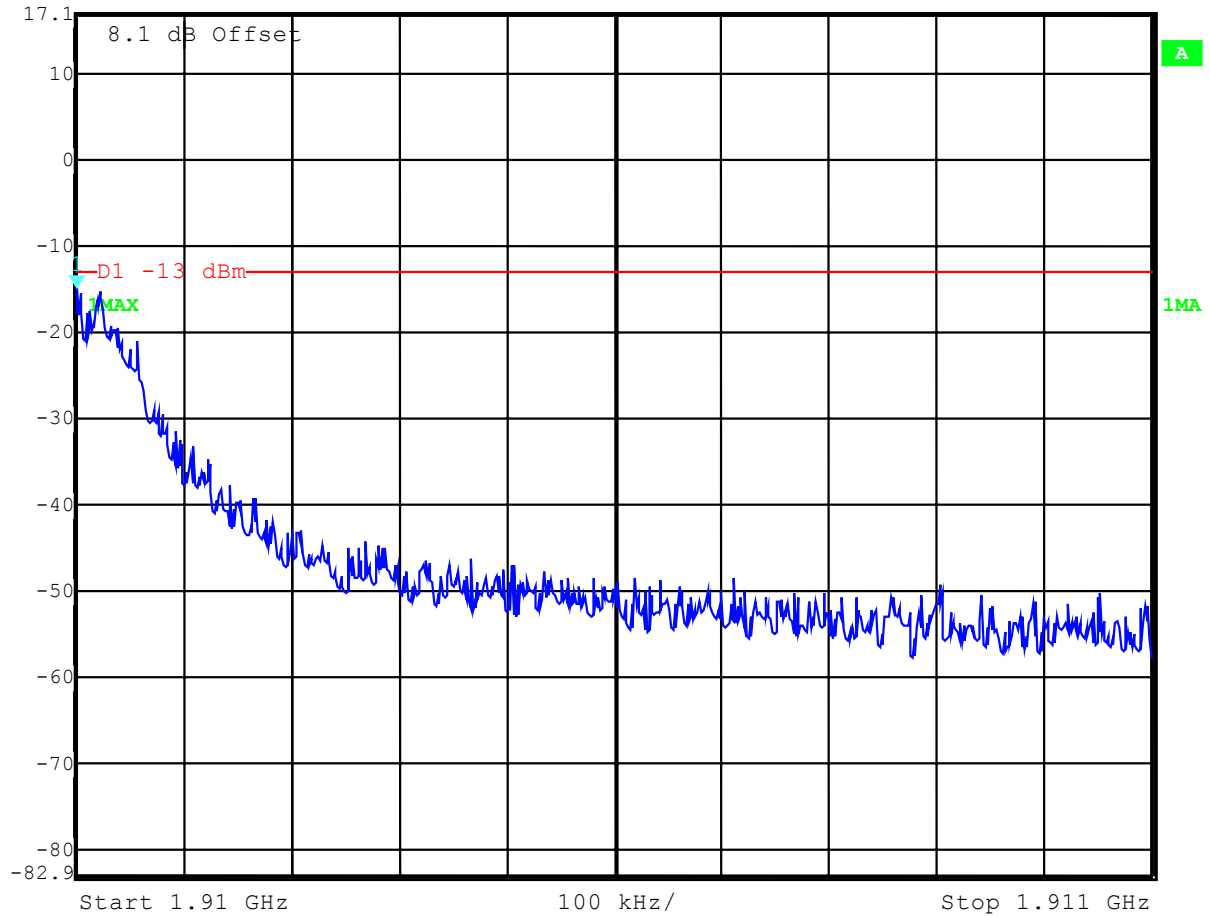
## Channel 810



**REFERENCE NUMBER(S) OF TEST EQUIPMENT USED**  
 (for reference numbers see test equipment listing)

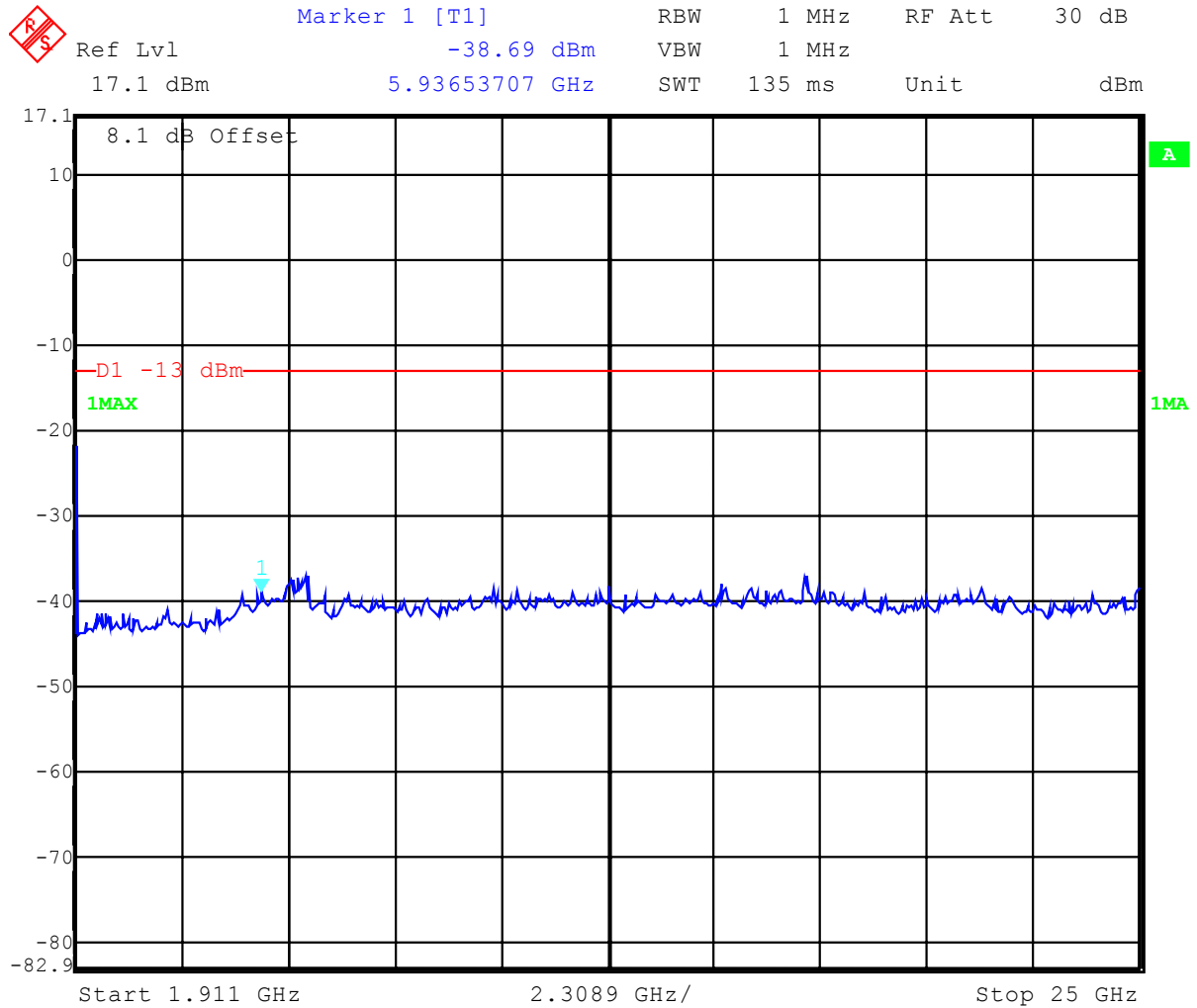
## Channel 810

	Marker 1 [T1]	RBW	3 kHz	RF Att	30 dB
	Ref Lvl	-14.76 dBm	VBW	3 kHz	
	17.1 dBm	1.91000000 GHz	SWT	280 ms	Unit      dBm



**REFERENCE NUMBER(S) OF TEST EQUIPMENT USED**  
 (for reference numbers see test equipment listing)

Channel 810



**REFERENCE NUMBER(S) OF TEST EQUIPMENT USED**  
 (for reference numbers see test equipment listing)

## BLOCK EDGE COMPLIANCE FOR BLOCK A AND C

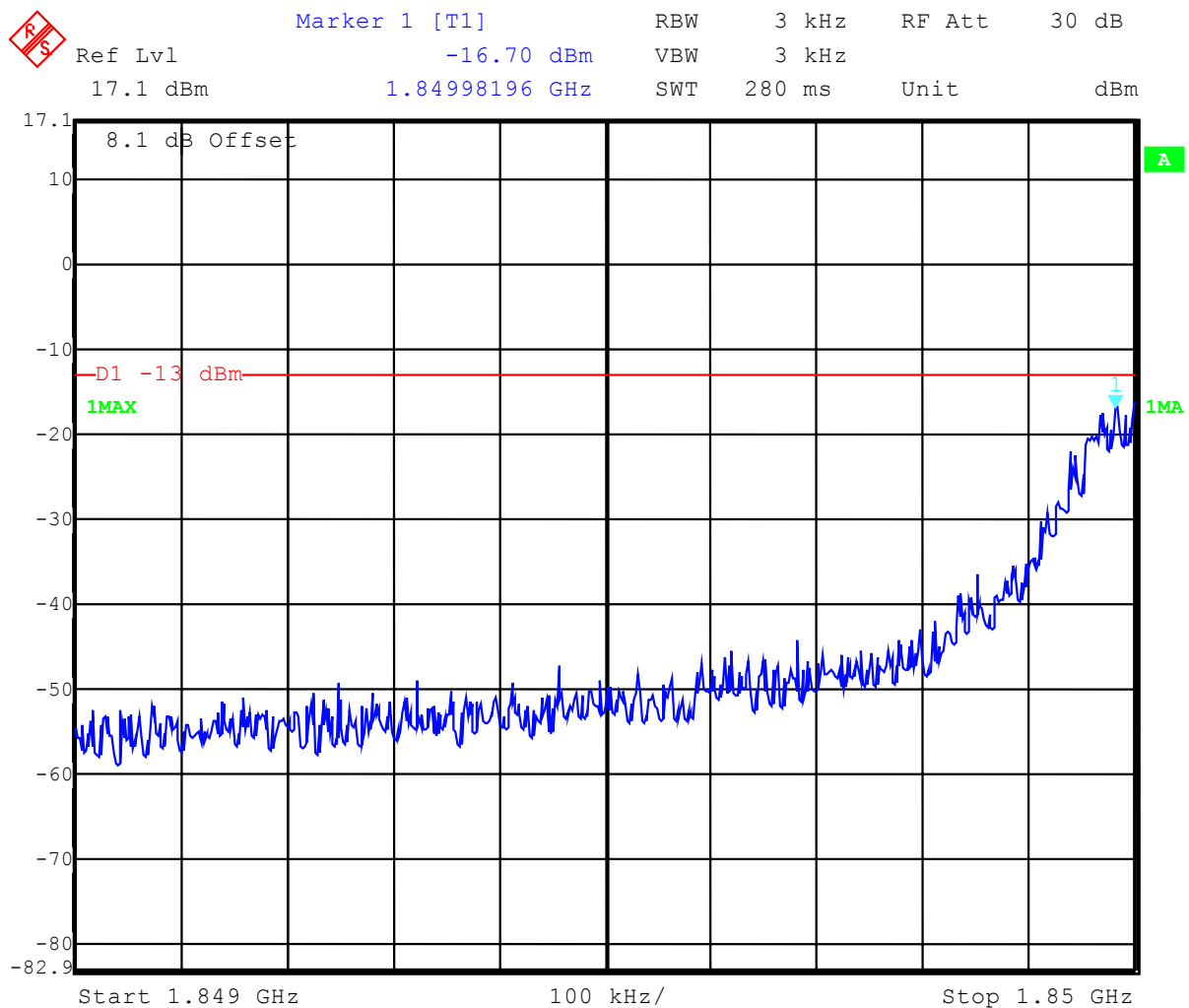
### Measurement Limit:

Sec. 24.238 Emission Limits.

(a) On any frequency outside frequency band of the USPCS spectrum, the power of any emission shall be attenuated below the transmitter power (P, in Watts) by at least  $43+10\text{Log}(P)$  dB. For all power levels +30 dBm to 0 dBm, this becomes a constant specification limit of -13 dBm.

### Measurements:

#### Block A Channel 512

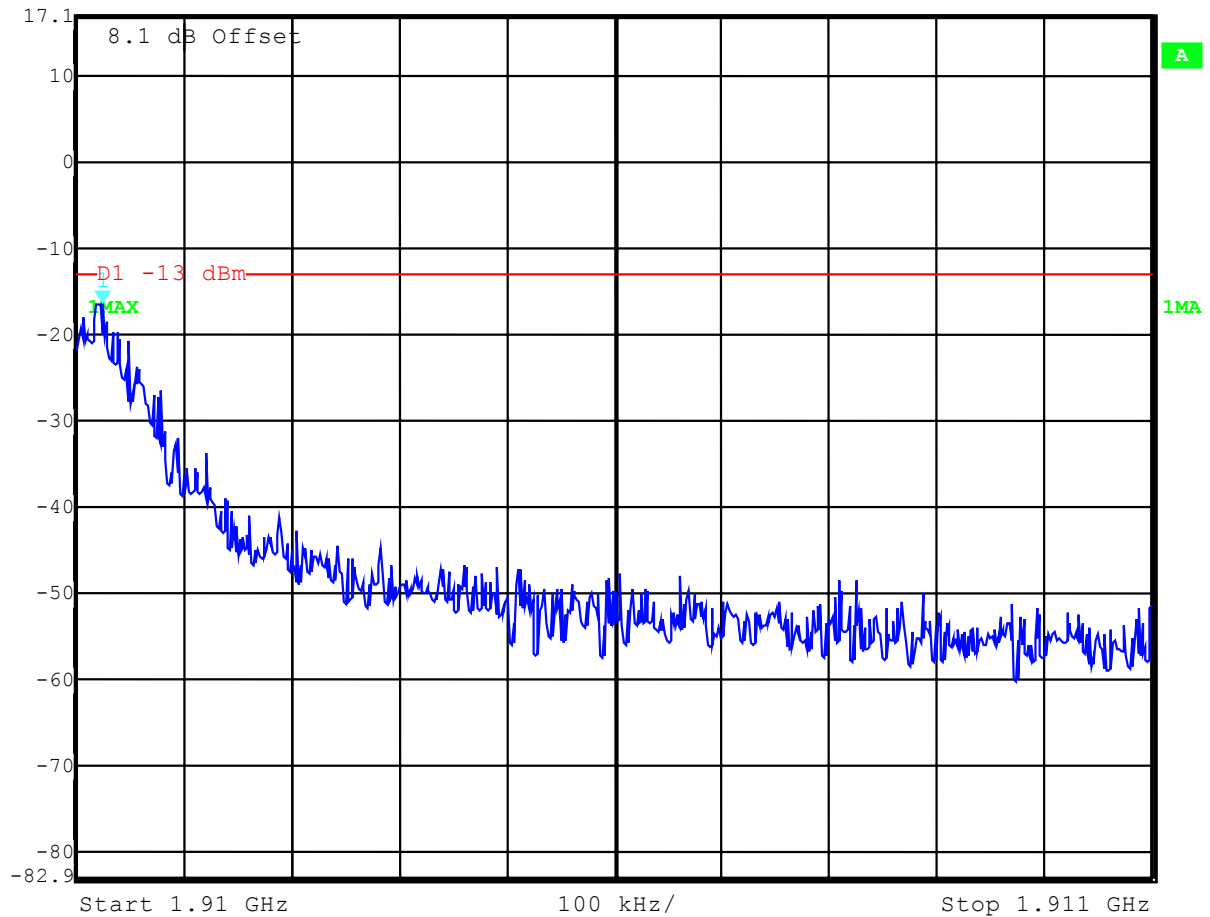


### REFERENCE NUMBER(S) OF TEST EQUIPMENT USED

(for reference numbers see test equipment listing)

## Block C Channel 810

	Marker 1 [T1]	RBW	3 kHz	RF Att	30 dB
	Ref Lvl	-16.25 dBm	VBW	3 kHz	
	17.1 dBm	1.91002405 GHz	SWT	280 ms	Unit                  dBm



**REFERENCE NUMBER(S) OF TEST EQUIPMENT USED**  
 (for reference numbers see test equipment listing)  
 64

**OCCUPIED BANDWIDTH** **§2.989**

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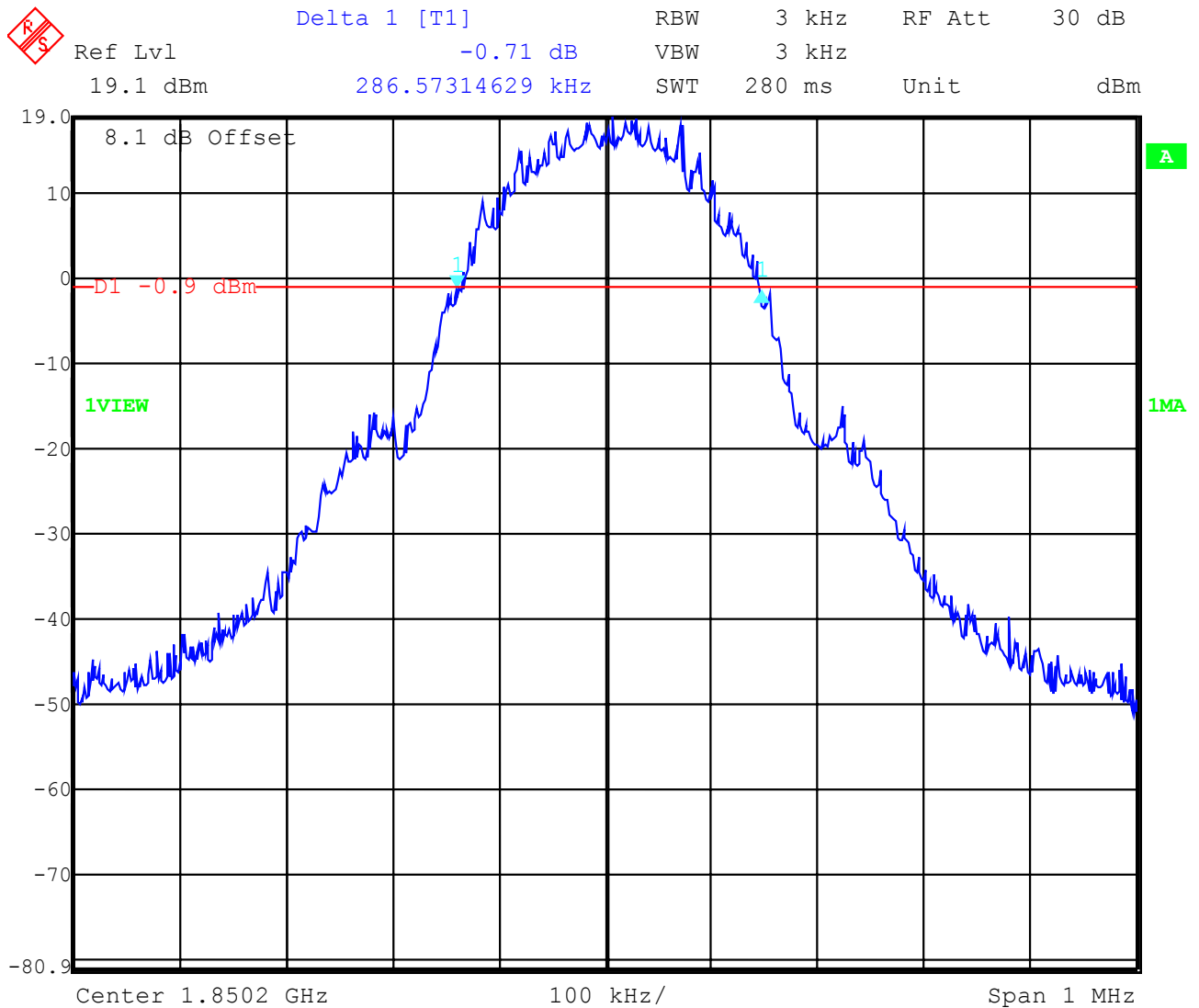
**Occupied Bandwidth Results**

Similar to conducted emissions, occupied bandwidth measurements are only provided for selected frequencies in order to reduce the amount of submitted data. Data were taken at the extreme and mid frequencies of the USPCS frequency band. Table 8.2 below lists the measured 99% power and -26dBC occupied bandwidths. Spectrum analyzer plots are included on the following pages.

<b>Frequency</b>	<b>99% Occupied Bandwidth</b>	<b>-26 dBc Bandwidth</b>
<b>1850.2 MHz</b>	<b>286.573</b>	<b>322.645</b>
<b>1880.0 MHz</b>	<b>272.545</b>	<b>318.637</b>
<b>1909.8 MHz</b>	<b>290.581</b>	<b>316.633</b>

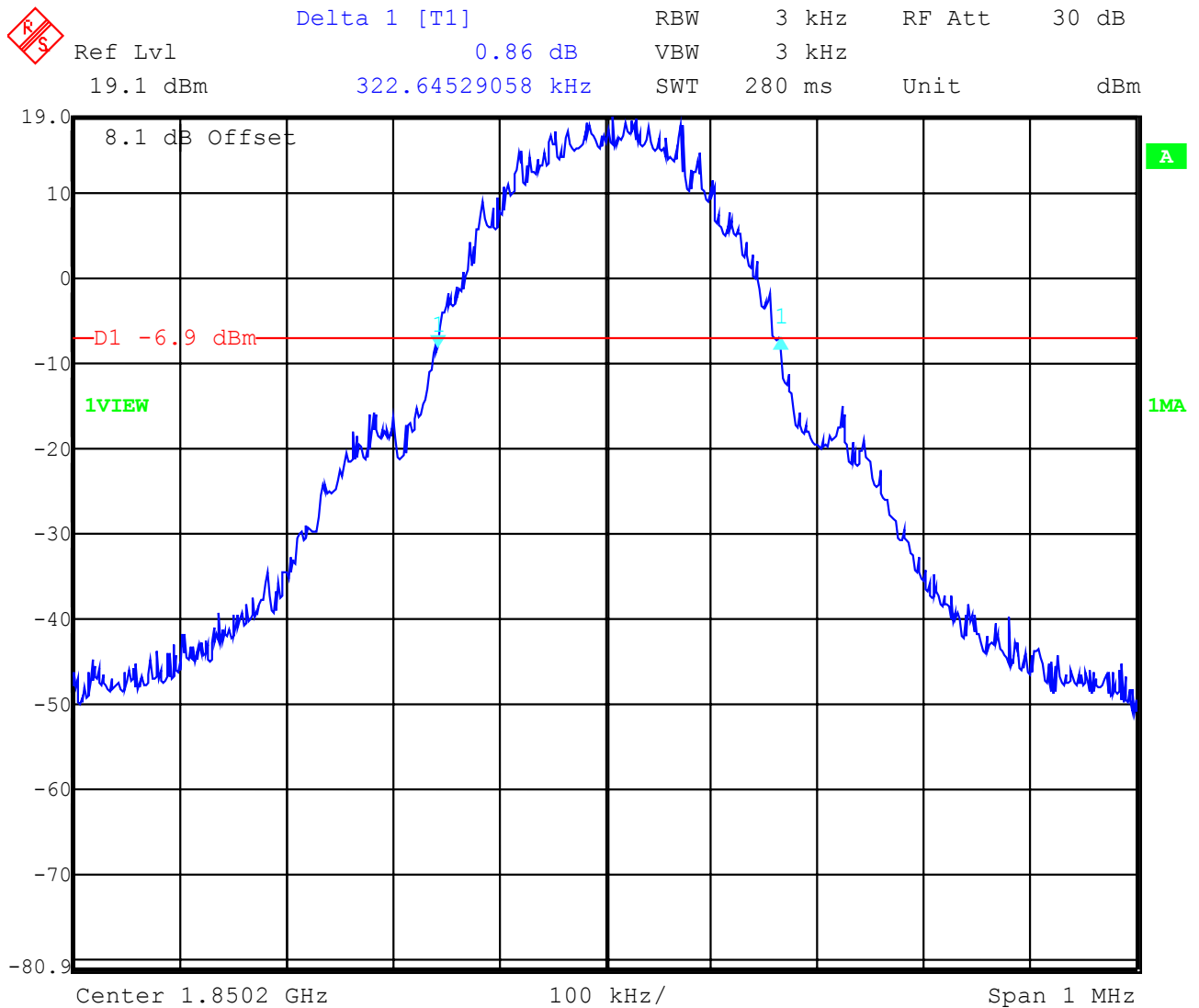
Part 24.238 (a) requires a measurement bandwidth of at least 1% of the occupied bandwidth. For ca. 299.7 kHz, this equates to a resolution bandwidth of at least 3.0 kHz. For this testing, a resolution bandwidth 3.0 kHz was used.

## Channel 512 99% Occupied Bandwidth



**REFERENCE NUMBER(S) OF TEST EQUIPMENT USED**  
(for reference numbers see test equipment listing)

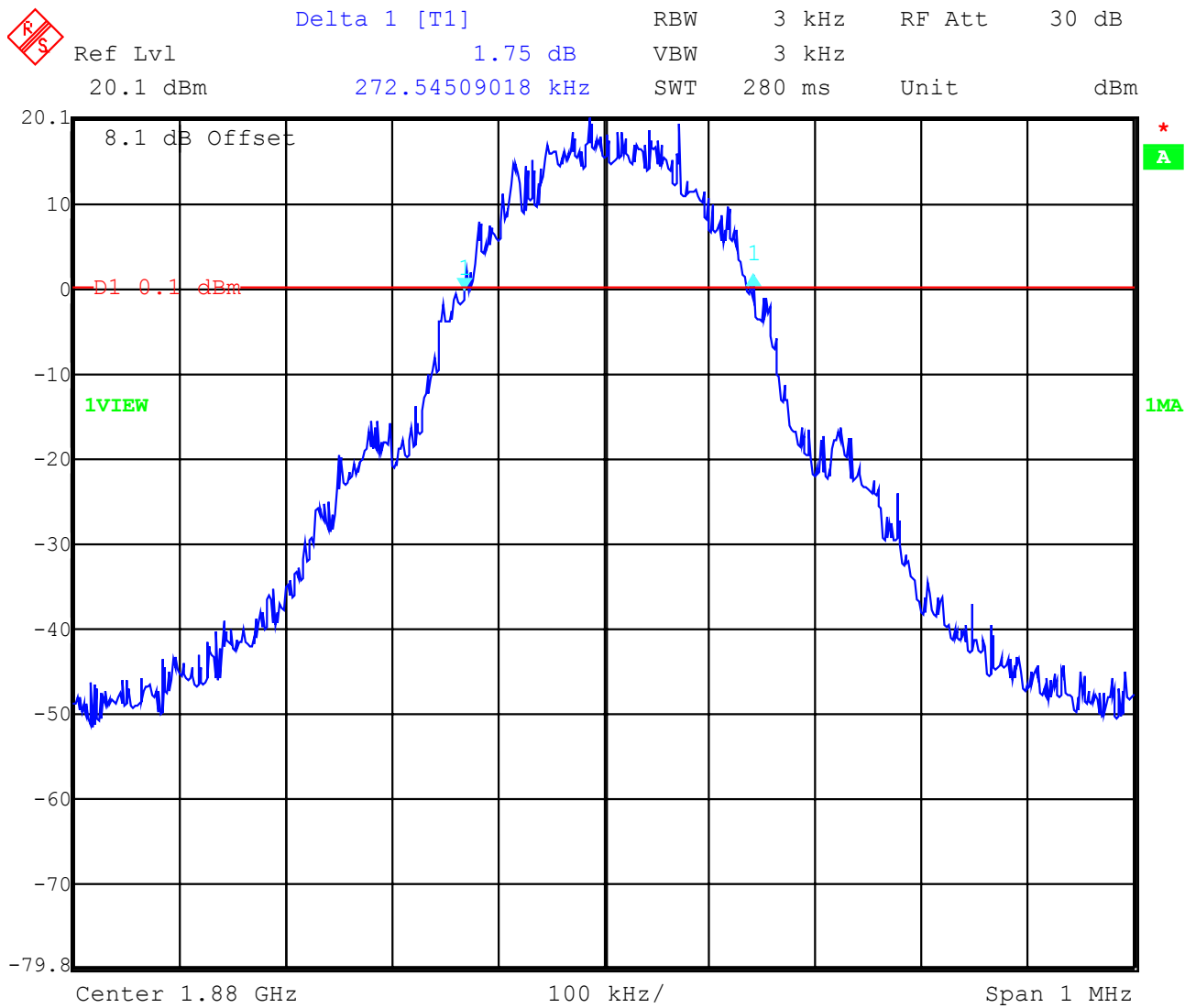
**Channel 512**  
**-26 dBc Bandwidth**



**REFERENCE NUMBER(S) OF TEST EQUIPMENT USED**  
(for reference numbers see test equipment listing)



## Channel 661 99% Occupied Bandwidth

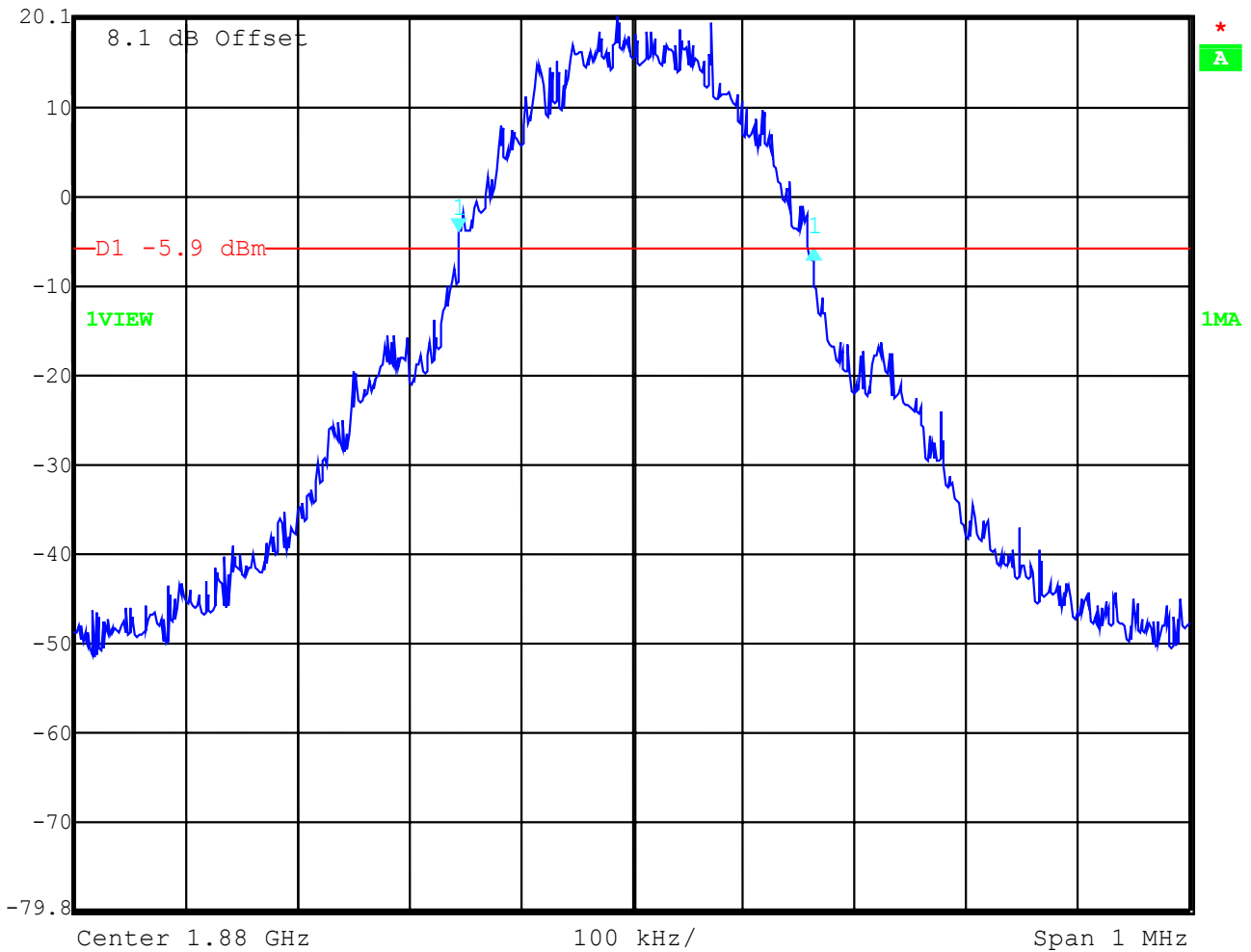


**REFERENCE NUMBER(S) OF TEST EQUIPMENT USED**  
(for reference numbers see test equipment listing)

## Channel 661 -26 dBc Bandwidth



	Delta 1 [T1]	RBW	3 kHz	RF Att	30 dB
Ref Lvl	-1.95 dB	VBW	3 kHz		
20.1 dBm	318.63727455 kHz	SWT	280 ms	Unit	dBm



**REFERENCE NUMBER(S) OF TEST EQUIPMENT USED**  
(for reference numbers see test equipment listing)

## Channel 810 99% Occupied Bandwidth



Delta 1 [T1]

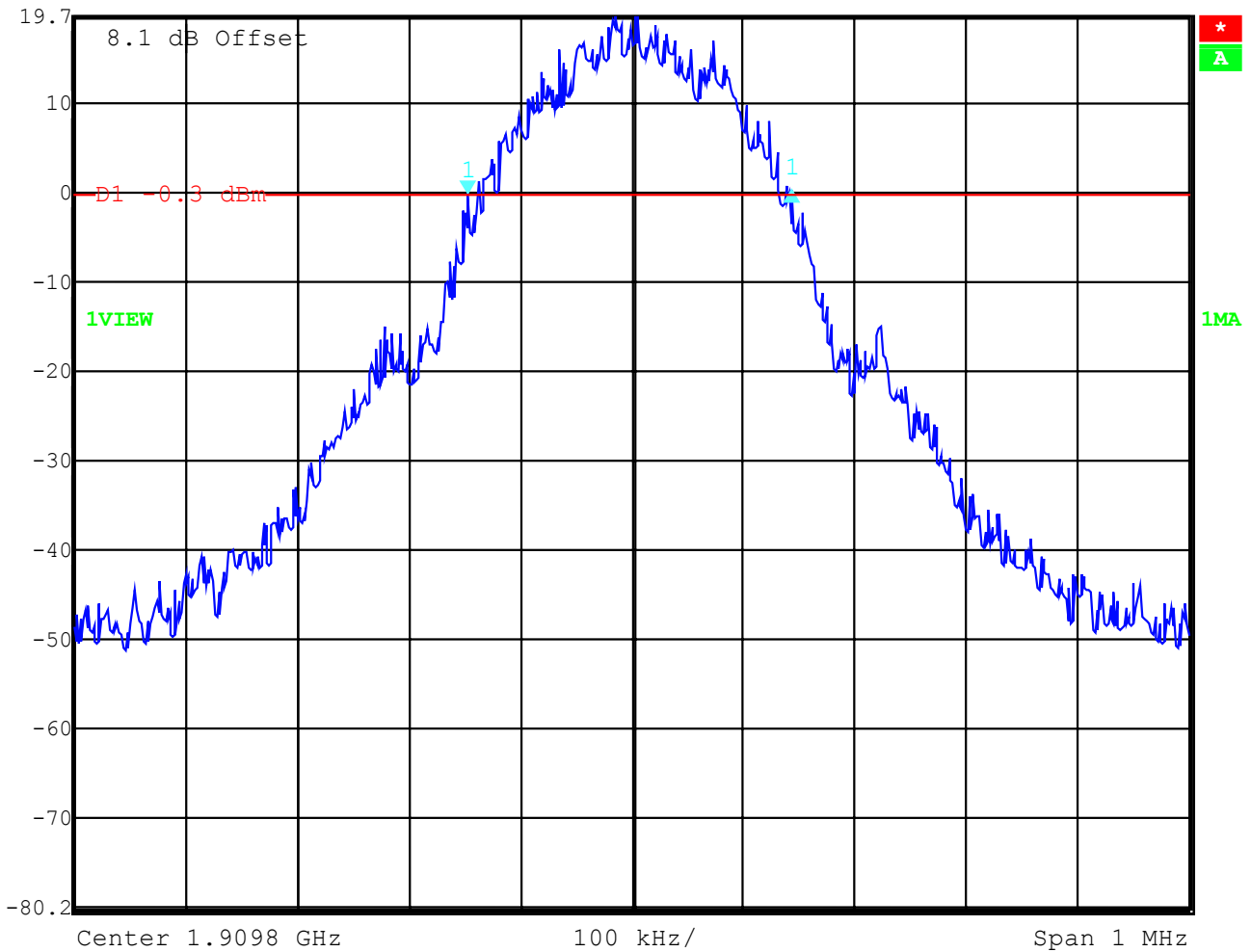
RBW      3 kHz      RF Att      30 dB

Ref Lvl      0.18 dB

VBW      3 kHz

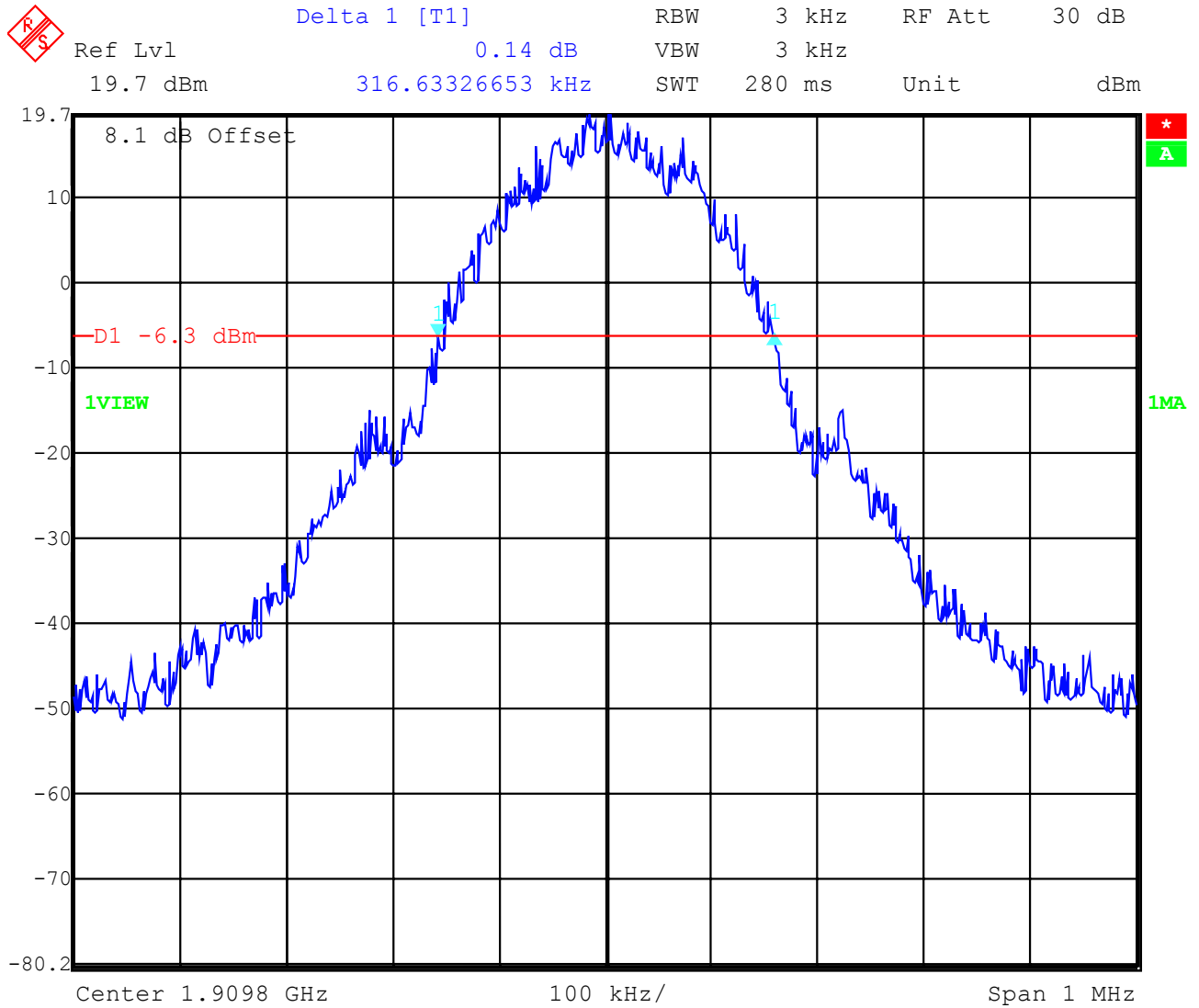
19.7 dBm      290.58116232 kHz

SWT      280 ms      Unit      dBm



**REFERENCE NUMBER(S) OF TEST EQUIPMENT USED**  
(for reference numbers see test equipment listing)

## Channel 810 -26 dBc Bandwidth



**REFERENCE NUMBER(S) OF TEST EQUIPMENT USED**  
(for reference numbers see test equipment listing)

## PART PCS 850

### POWER OUTPUT

### SUBCLAUSE § 22.913

#### Summary:

This paragraph contains both average , peak output powers and EIRP measurements for the mobile station. In all cases, the peak output power is within the required mask (this mask is specified in the JTC standards, TIA PN3389 Vol. 1 Chap 7, and is no FCC requirement).

#### Method of Measurements:

The mobile was set up for the max. output power with pseudo random data modulation. The power was measured with R&S Signal Analyzer FSIQ 26 ( peak and average) This measurements were done at 3 frequencies, 824.2 MHz, 836.2 MHz and 848.8 MHz (bottom, middle and top of operational frequency range)

#### Limits:

Power Step	Nominal Peak Output Power (dBm)	Tolerance (dB)
5	+33	± 2

#### Power Measurements:

#### Conducted:

Frequency (MHz)	Power Step	Peak Output Power (dBm)	Average Output Power (dBm)
824.2	5	33.0	32.9
836.4	5	32.8	32.7
848.8	5	32.6	32.5
Measurement uncertainty		±0.5 dB	

#### REFERENCE NUMBER(S) OF TEST EQUIPMENT USED

(for reference numbers see test equipment listing)

17 – 24; 64

**ERP Measurements**

Description: This is the test for the maximum radiated power from the phone.

Rule Part 22.913 specifies that "Mobile/portable stations are limited to 7 watts ERP.

Method of Measurement:

1. In an anechoic antenna test chamber, a half-wave dipole antenna for the frequency band of interest is placed at the reference center of the chamber. An RF Signal source for the frequency band of interest is connected to the dipole with a cable that has been constructed to not interfere with the radiation pattern of the antenna. A known (measured) power (Pin) is applied to the input of the dipole, and the power received (Pr) at the chamber's probe antenna is recorded.
2. A "reference path loss" is established as  $Pin + 2.1 - Pr$ .
3. The EUT is substituted for the dipole at the reference centre of the chamber. The EUT is put into CW test mode and a scan is performed to obtain the radiation pattern.
4. From the radiation pattern, the co-ordinates where the maximum antenna gain occurs is identified.
5. The EUT is then put into pulse mode at its maximum power level (Power Step 5).
6. "Gated mode" power measurements are performed with the receiving antenna placed at the co-ordinates determined in Step 3 to determine the output power as defined in FCC Rule 22.913 (a). The "reference path loss" from Step 1 is added to this result.
7. This value is EIRP since the measurement is calibrated using a half-wave dipole antenna of known gain (2.1 dBi) and known input power (Pin).
8. ERP can be calculated from EIRP by subtracting the gain of the dipole,  $ERP = EIRP - 2.1 \text{ dBi}$ .

**Limits:**

Power Step	Burst Peak (dBm)
0	<33

**Power Measurements ( Radiated )**

Frequency (MHz)	Power Step	BURST Peak (dBm)		MODULATION AVERAGE (dBm)	
		EIRP	ERP	EIRP	ERP
824.2	5	26.1	24.0	17.1	15.0
836.4	5	26.9	24.8	17.9	15.8
848.8	5	26.3	24.2	17.3	15.2
Measurement uncertainty		±3 dB			

**REFERENCE NUMBER(S) OF TEST EQUIPMENT USED**  
 (for reference numbers see test equipment listing)

## FREQUENCY STABILITY

## SUBCLAUSE § 22.355

### **Method of Measurement:**

In order to measure the carrier frequency under the condition of AFC lock, it is necessary to make measurements with the mobile station in a “call mode”. This is accomplished with the use of a R&S CMU 200 DIGITAL RADIOCOMMUNICATION TESTER..

1. Measure the carrier frequency at room temperature.
2. Subject the mobile station to overnight soak at -30 C.
3. With the mobile station, powered with 3.6 Volts, connected to the CMU 200 and in a simulated call on channel 661 (centre channel), measure the carrier frequency. These measurements should be made within 2 minutes of powering up the mobile station, to prevent significant self warming.
4. Repeat the above measurements at 10 C increments from -30 C to +60 C. Allow at least 1 1/2 hours at each temperature, un-powered, before making measurements.
5. Re-measure carrier frequency at room temperature with nominal 3.6 Volts. Vary supply voltage from minimum 3.3 Volts to maximum 4.4 Volts, in 13 steps re-measuring carrier frequency at each voltage. Pause at 3.7 V ac Volts for 1 1/2 hours un-powered, to allow any self heating to stabilize, before continuing.
6. Subject the mobile station to overnight soak at +60 C.
7. With the mobile station, powered with 3.7 Volts, connected to the CMU 200 and in a simulated call on channel 661 (center channel), measure the carrier frequency. These measurements should be made within 2 minutes of powering up the mobile station, to prevent significant self warming.
8. Repeat the above measurements at 10 C increments from +60 C to -30 C. Allow at least 1 1/2 hours at each temperature, un-powered, before making measurements.
9. At all temperature levels hold the temperature to +/- 0.5 C during the measurement procedure.

### **Measurement Limit:**

According to the JTC standard the frequency stability of the carrier shall be accurate to within 0.1 ppm of the received frequency from the base station. This accuracy is sufficient to meet Sec. 22.355, Frequency Stability. The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.. This transceiver is specified to operate with an input voltage of between 3.3 V dc and 4.4 V dc, with a nominal voltage of 3.8 V dc.

**AFC FREQ ERROR vs. VOLTAGE**

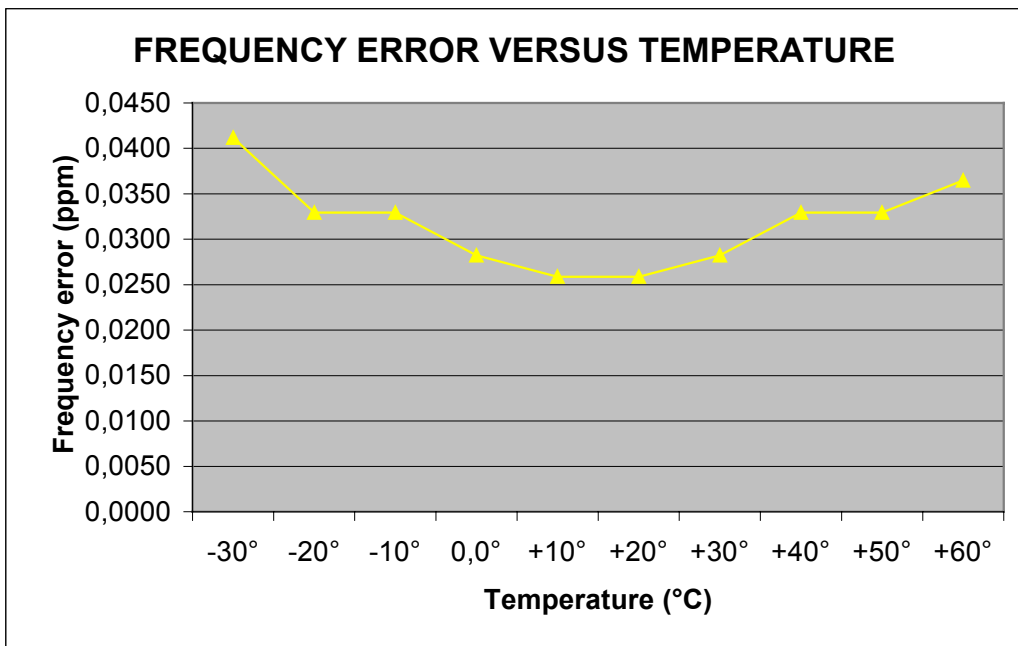
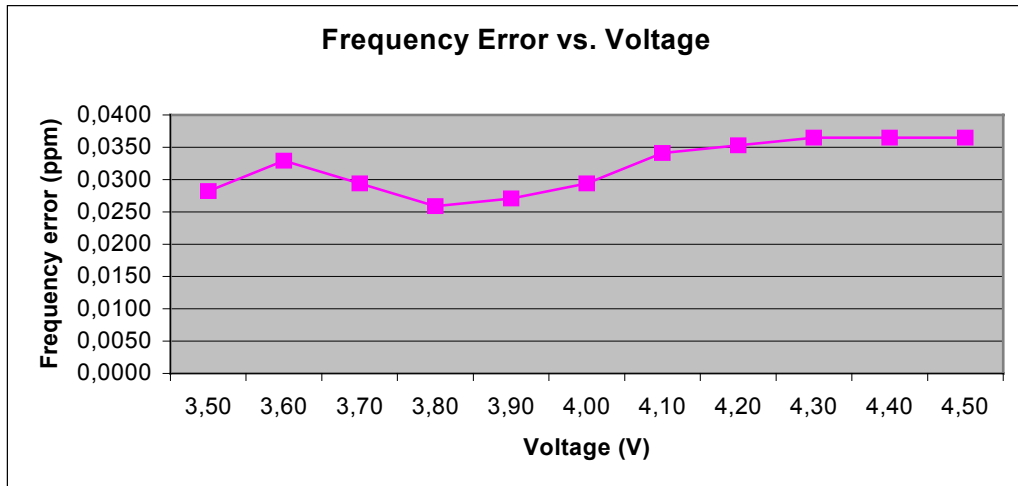
Voltage (V)	Frequency Error (Hz)	Frequency Error (%)	Frequency Error (ppm)
3.3	30	0,00000353	0,0353
3.4	25	0,00000294	0,0294
3.5	24	0,00000282	0,0282
3.6	28	0,00000329	0,0329
3.7	25	0,00000294	0,0294
3.8	22	0,00000259	0,0259
3.9	23	0,00000271	0,0271
4.0	25	0,00000294	0,0294
4.1	29	0,00000341	0,0341
4.2	30	0,00000353	0,0353
4.3	31	0,00000365	0,0365
4.4	31	0,00000365	0,0365
4.5	31	0,00000365	0,0365

**AFC FREQ ERROR vs. TEMPERATURE**

TEMPERATURE (°C)	Frequency Error (Hz)	Frequency Error (%)	Frequency Error (ppm)
-30	35	0,00000412	0,0412
-20	28	0,00000329	0,0329
-10	28	0,00000329	0,0329
±0.0	24	0,00000282	0,0282
+10	22	0,00000259	0,0259
+20	22	0,00000259	0,0259
+30	24	0,00000282	0,0282
+40	28	0,00000329	0,0329
+50	28	0,00000329	0,0329
+60	31	0,00000365	0,0365

**REFERENCE NUMBER(S) OF TEST EQUIPMENT USED**  
 (for reference numbers see test equipment listing)





REFERENCE NUMBER(S) OF TEST EQUIPMENT USED

(for reference numbers see test equipment listing)

17 – 24, 64

## EMISSIONS LIMITS

§22.917

### **Measurement Procedure:**

The following steps outline the procedure used to measure the radiated emissions from the mobile station. The site is constructed in accordance with ANSI C63.4 – 1992 requirements and is recognized by the FCC to be in compliance for a 3 and a10 meter site. The spectrum was scanned from 30 MHz to the 10th harmonic of the highest frequency generated within the equipment, which is the transmitted carrier that can be as high as 848.8 MHz. This was rounded up to 12 GHz. The resolution bandwidth is set as outlined in Part 22.917. The spectrum was scanned with the mobile station transmitting at carrier frequencies that pertain to low, mid and high channels of the USPCS band.

### **The final open field emission ( here 10m semi-anechoic chamber listed by FCC) test procedure is as follows:**

- a) The test item was placed on a 0.8 meter high non-conductive stand at a 3 meter test distance from the receive antenna.
- b) The antenna output was terminated in a 50 ohm load.
- c) A double ridged waveguide antenna was placed on an adjustable height antenna mast 3 meters from the test item for emission measurements.
- d) Detected emissions were maximized at each frequency by rotating the test item and adjusting the receive antenna height and polarization. The maximum meter reading was recorded. The radiated emission measurements of the harmonics of the transmit frequency through the 10th harmonic were measured with peak detector and 1 MHz bandwidth. If the harmonic could not be detected above the noise floor, the ambient level was recorded. The equivalent power into a dipole antenna was calculated from the field intensity levels measured at 3 meters using the equation shown below:
- e) Now each detected emissions were substituted by the Substitution method, in accordance with the TIA/EIA 603 .

### **Measurement Limit:**

Sec. 22.917 Emission Limits.

(a) On any frequency outside a licensee's frequency block (e.g. A, D, B, etc.) within the USPCS spectrum, the power of any emission shall be attenuated below the transmitter power (P, in Watts) by at least  $43 + 10 \log(P)$  dB. The specification that emissions shall be attenuated below the transmitter power (P) by at least  $43 + 10 \log(P)$  dB, translates in the relevant power range (1 to 0.001 W) to -13 dBm. At 1 W the specified minimum attenuation becomes 43 dB and relative to a 30 dBm (1 W) carrier becomes a limit of -13 dBm. At 0.001 W (0 dBm) the minimum attenuation is 13 dB which again yields a limit of -13 dBm. In this way a translation of the specification from relative to absolute terms is carried out.

**Measurement Results:**

Radiated emissions measurements were made only at the upper, center, and lower carrier frequencies of the USPCS band (824.2 MHz, 836.2 MHz and 848.8 MHz). It was decided that measurements at these three carrier frequencies would be sufficient to demonstrate compliance with emissions limits because it was seen that all the significant spurs occur well outside the band and no radiation was seen from a carrier in one block of the USPCS band into any of the other blocks. The equipment must still, however, meet emissions requirements with the carrier at all frequencies over which it is capable of operating and it is the manufacturer's responsibility to verify this.

**RESULTS OF OPEN FIELD RADIATED TEST FOR FCC-22:**

The final open field radiated levels are presented on the next pages.

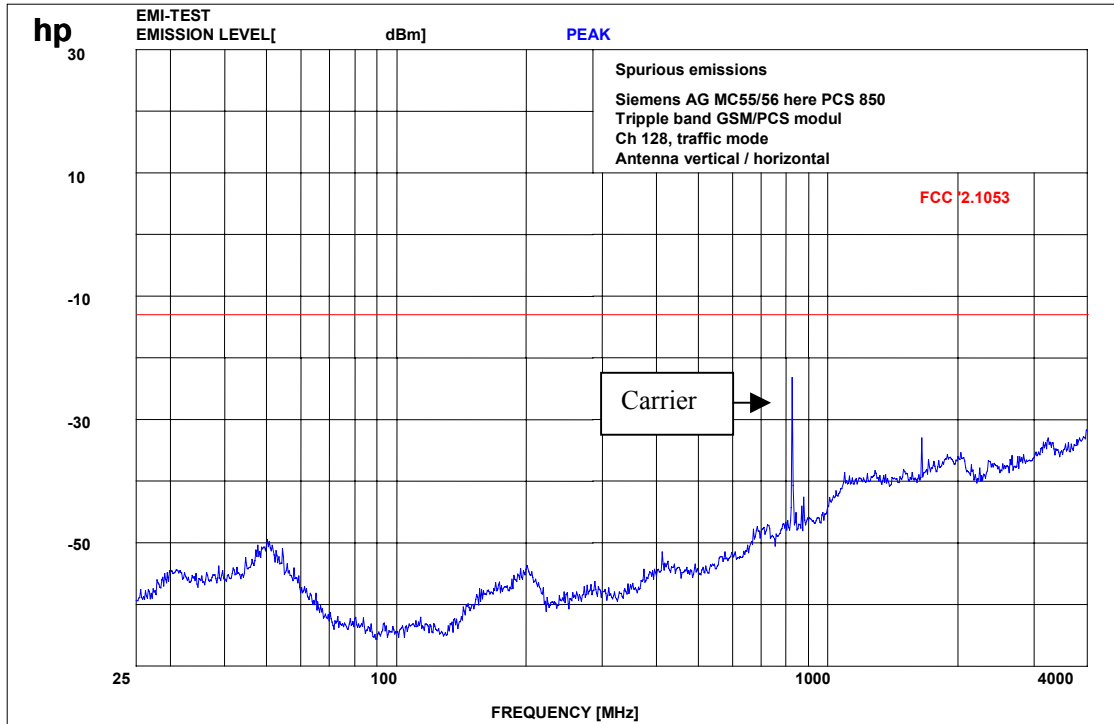
**All measurements were done in horizontal and vertical polarization, the plots shows the worst case.**

**As can be seen from this data, the emissions from the test item were within the specification limit.**

EMISSION LIMITATIONS					
f (MHz)		amplitude of emission ERP (dBm)	limit max. allowed emission power (dBm)	actual attenuation below frequency of operation (dBc)	results
<b>CH 128</b>					
<b>824.2</b>		<b>24.0</b>	<b>-13.0 (37.0 dBc)</b>		<b>carrier</b>
<b>CH 189</b>					
<b>836.4</b>		<b>24.8</b>	<b>-13.0 (37.8 dBc)</b>		<b>carrier</b>
<b>CH 251</b>					
<b>848.8</b>		<b>24.2</b>	<b>-13.0 (37.2 dBc)</b>		<b>carrier</b>
<b>Measurement uncertainty</b>		<b>± 0.5dB</b>			

**REFERENCE NUMBER(S) OF TEST EQUIPMENT USED**  
(for reference numbers see test equipment listing)

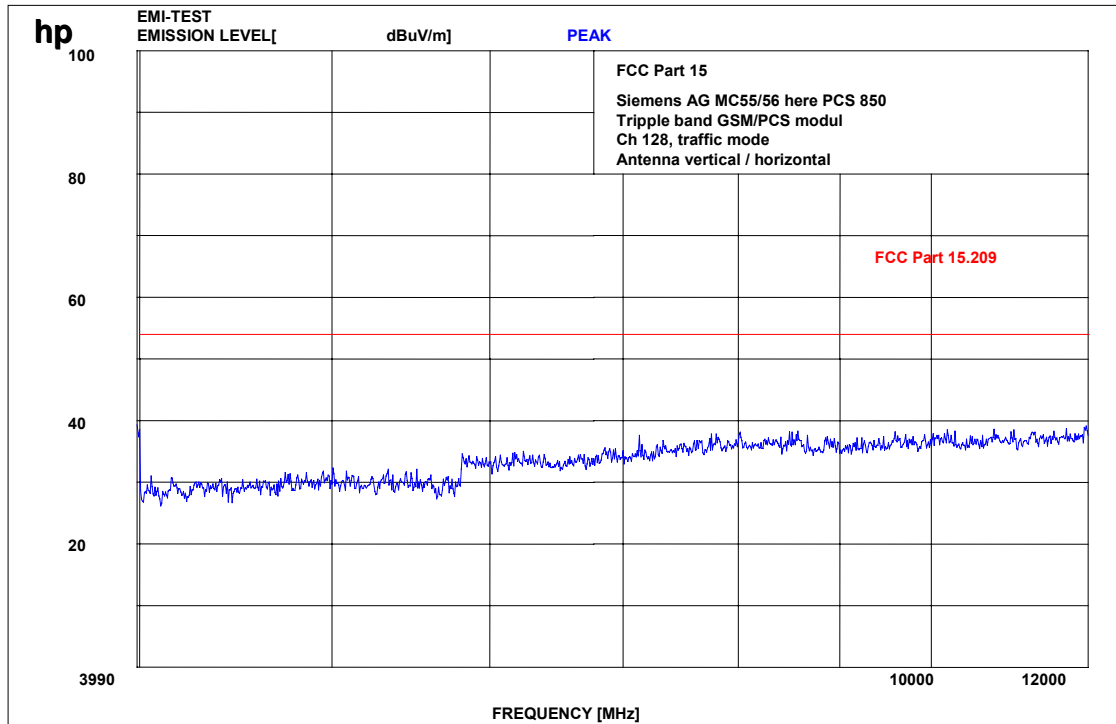
## Channel 128 (up to 4 GHz)



$f < 1 \text{ GHz}$  : RBW/VBW: 100 kHz       $f \geq 1 \text{ GHz}$  : RBW/VBW 1 MHz  
Carrier suppressed with a rejection filter

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED  
(for reference numbers see test equipment listing)

## Channel 128 (up to 12 GHz)



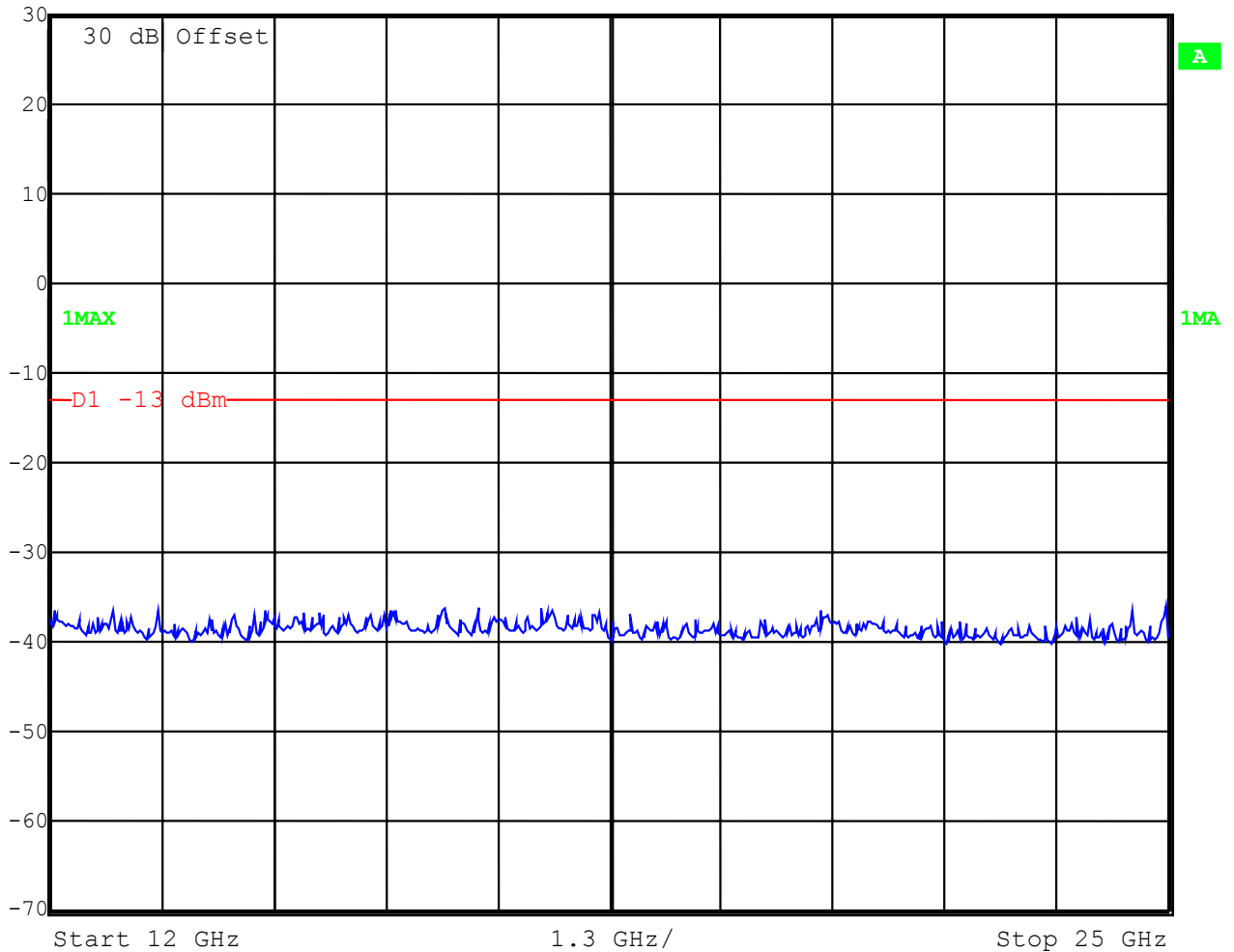
$f < 1 \text{ GHz}$  : RBW/VBW: 100 kHz       $f \geq 1 \text{ GHz}$  : RBW/VBW 1 MHz  
**Carrier suppressed with a rejection filter**

**REFERENCE NUMBER(S) OF TEST EQUIPMENT USED**  
 (for reference numbers see test equipment listing)

## Channel 128 :- 25 GHz (valid for all three channels)



Ref Lvl	RBW	1 MHz	RF Att	10 dB
30 dBm	VBW	1 MHz		
	SWT	74 ms	Unit	dBm

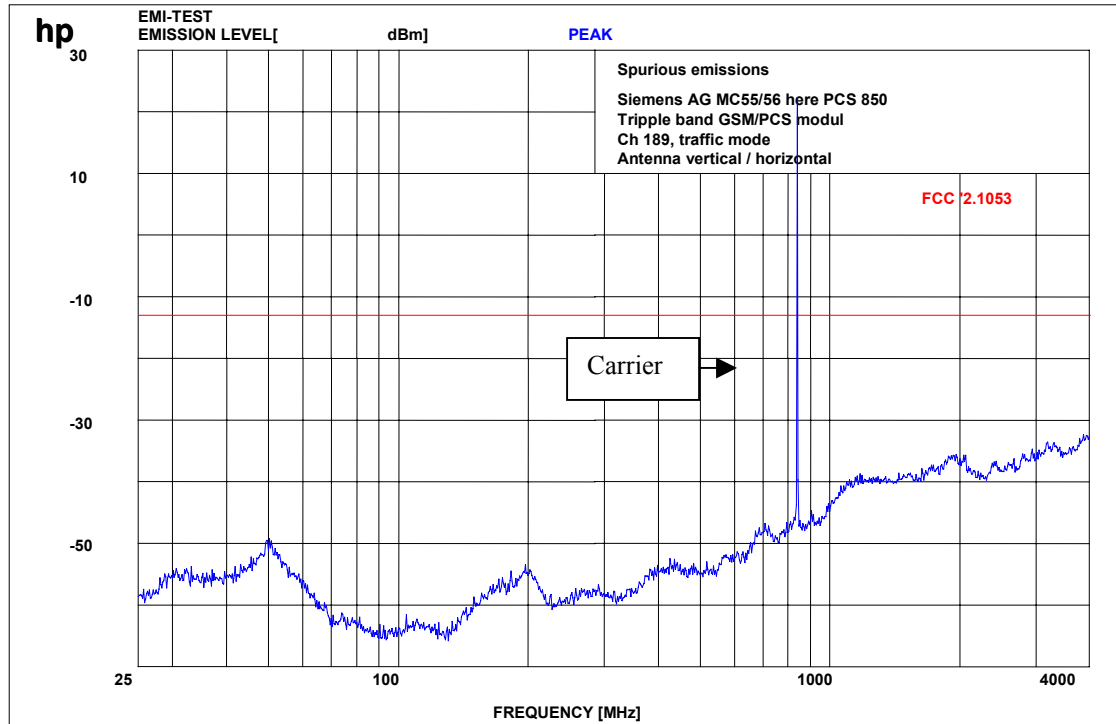


### REFERENCE NUMBER(S) OF TEST EQUIPMENT USED

(for reference numbers see test equipment listing)

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## Channel 189 (up to 4 GHz)



$f < 1 \text{ GHz}$  : RBW/VBW: 100 kHz       $f \geq 1 \text{ GHz}$  : RBW/VBW 1 MHz

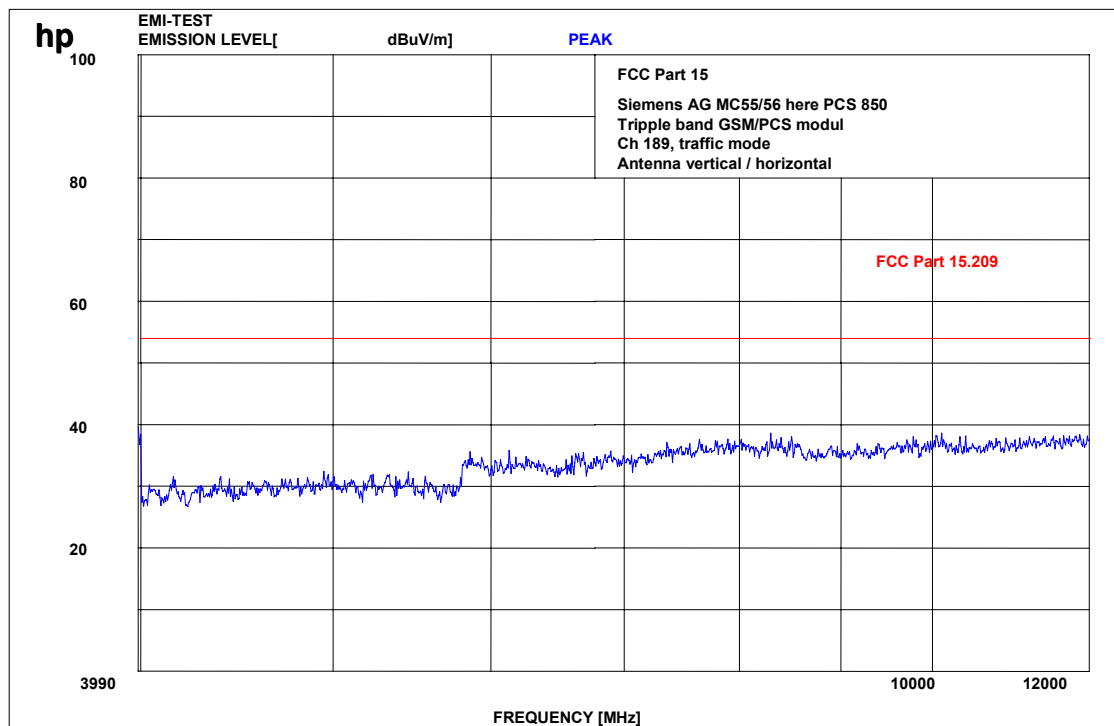
Carrier suppressed with a rejection filter

### REFERENCE NUMBER(S) OF TEST EQUIPMENT USED

(for reference numbers see test equipment listing)

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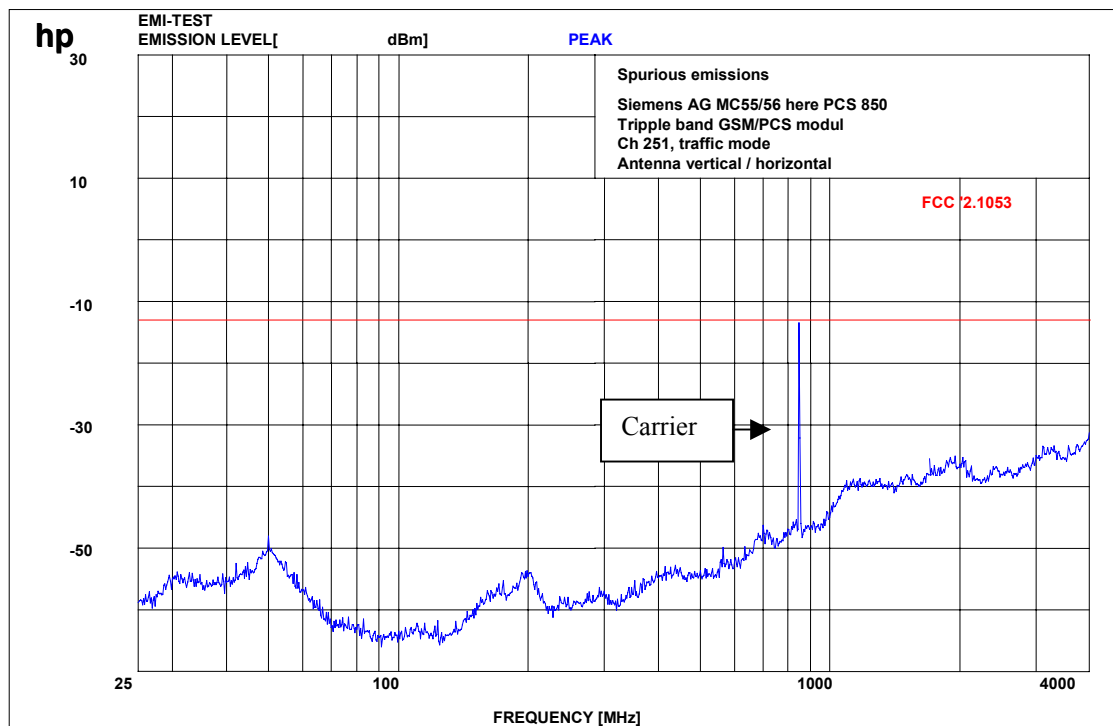
## Channel 189 (up to 12 GHz )



$f < 1 \text{ GHz} : \text{RBW/VBW: } 100 \text{ kHz}$        $f \geq 1 \text{ GHz} : \text{RBW/VBW } 1 \text{ MHz}$   
**Carrier suppressed with a rejection filter**

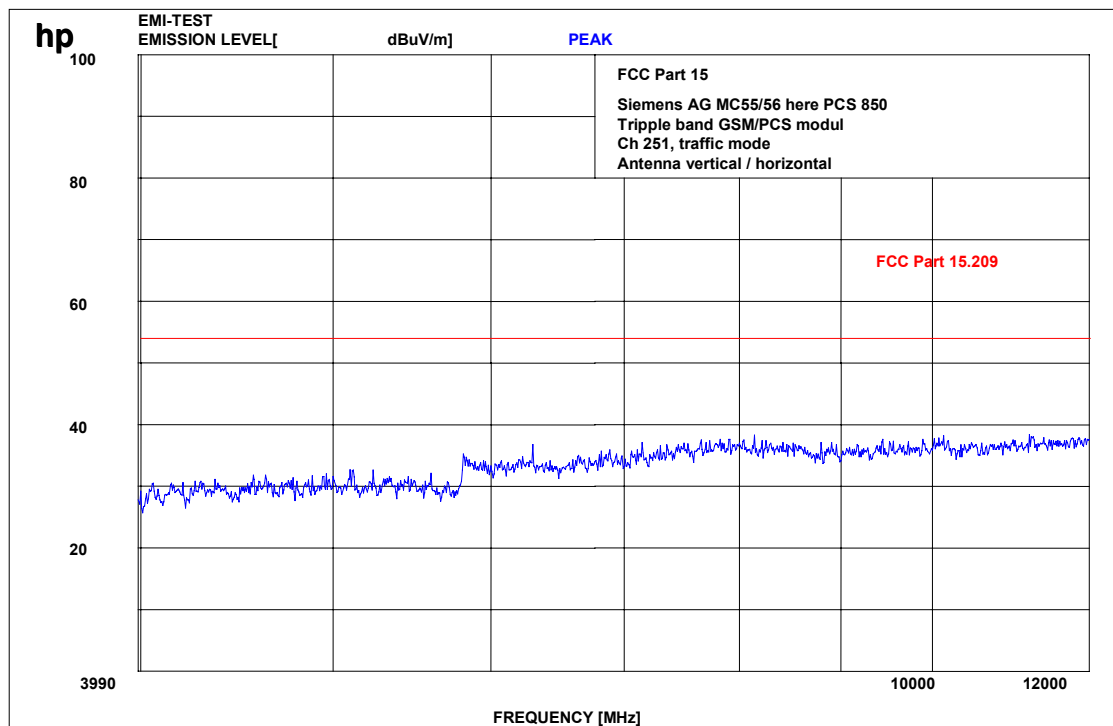


## Channel 251 up to 4 GHz



$f < 1 \text{ GHz}$  : RBW/VBW: 100 kHz       $f \geq 1 \text{ GHz}$  : RBW/VBW 1 MHz  
Carrier suppressed with a rejection filter

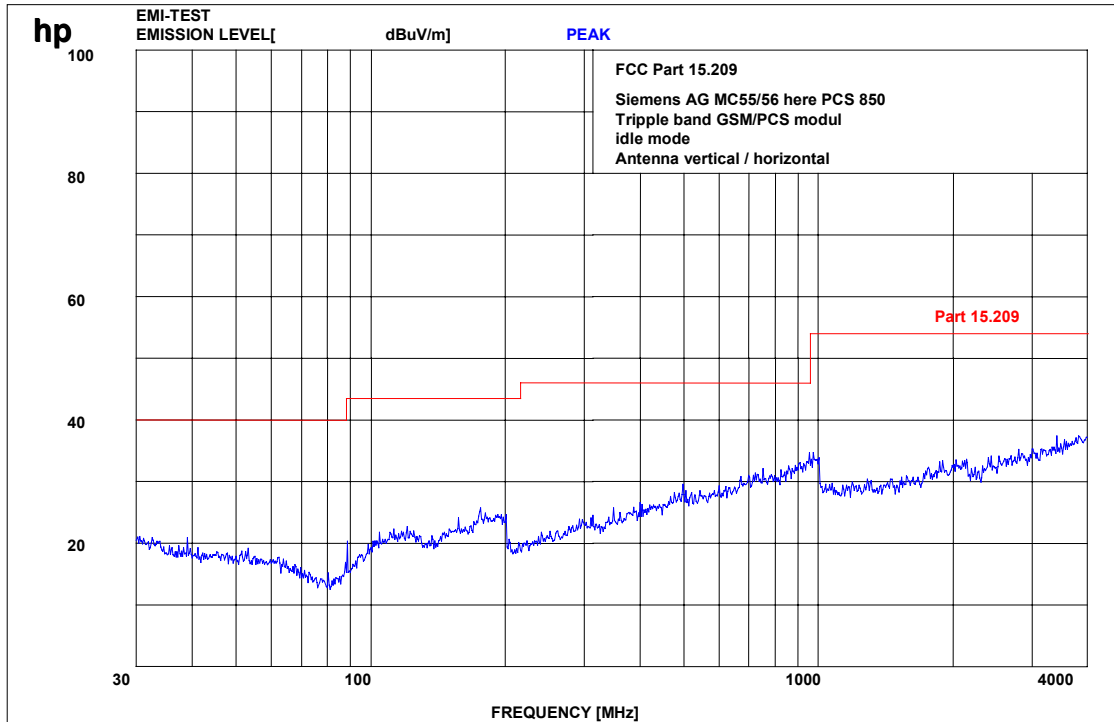
## Channel 251 up to 12 GHz



$f < 1 \text{ GHz}$  : RBW/VBW: 100 kHz       $f \geq 1 \text{ GHz}$  : RBW/VBW 1 MHz  
Carrier suppressed with a rejection filter



Idle-Mode (this is valid for all channels and up to 4 GHz)



$f < 1 \text{ GHz} : \text{RBW/VBW: } 100 \text{ kHz}$

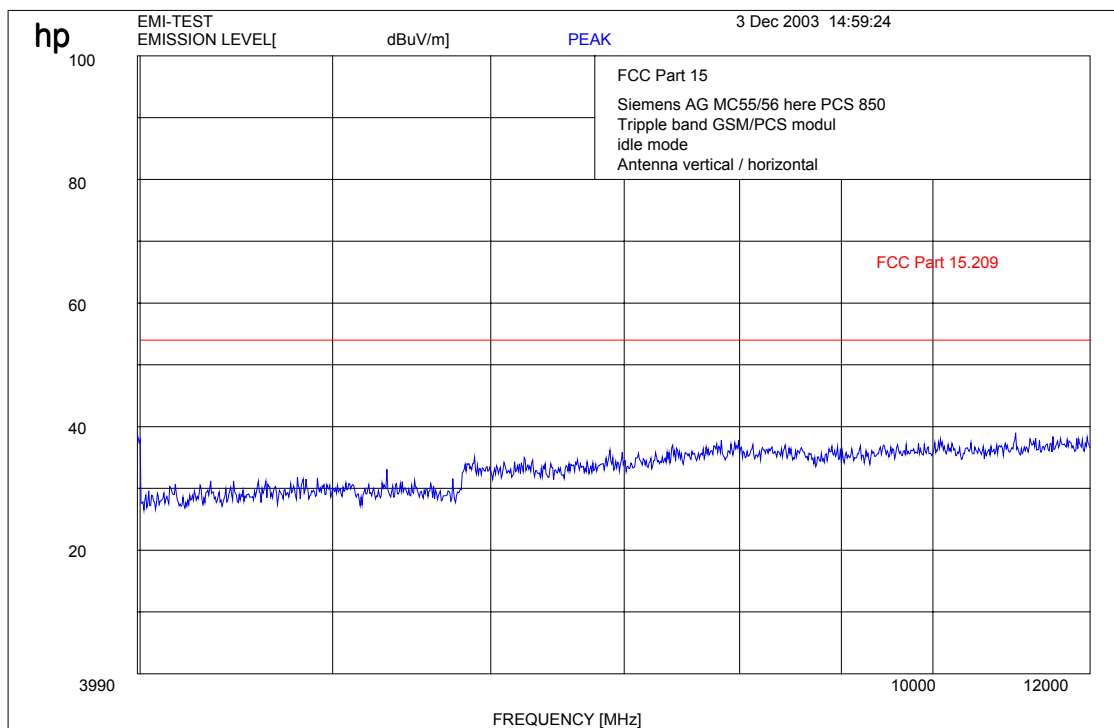
$f \geq 1 \text{ GHz} : \text{RBW/VBW } 1 \text{ MHz}$

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED

(for reference numbers see test equipment listing)

17 – 24, 64

## Idle-Mode (this is valid for all channels and up to 12 GHz)



$f < 1 \text{ GHz} : \text{RBW/VBW: } 100 \text{ kHz}$

$f \geq 1 \text{ GHz} : \text{RBW/VBW } 1 \text{ MHz}$

### REFERENCE NUMBER(S) OF TEST EQUIPMENT USED

(for reference numbers see test equipment listing)

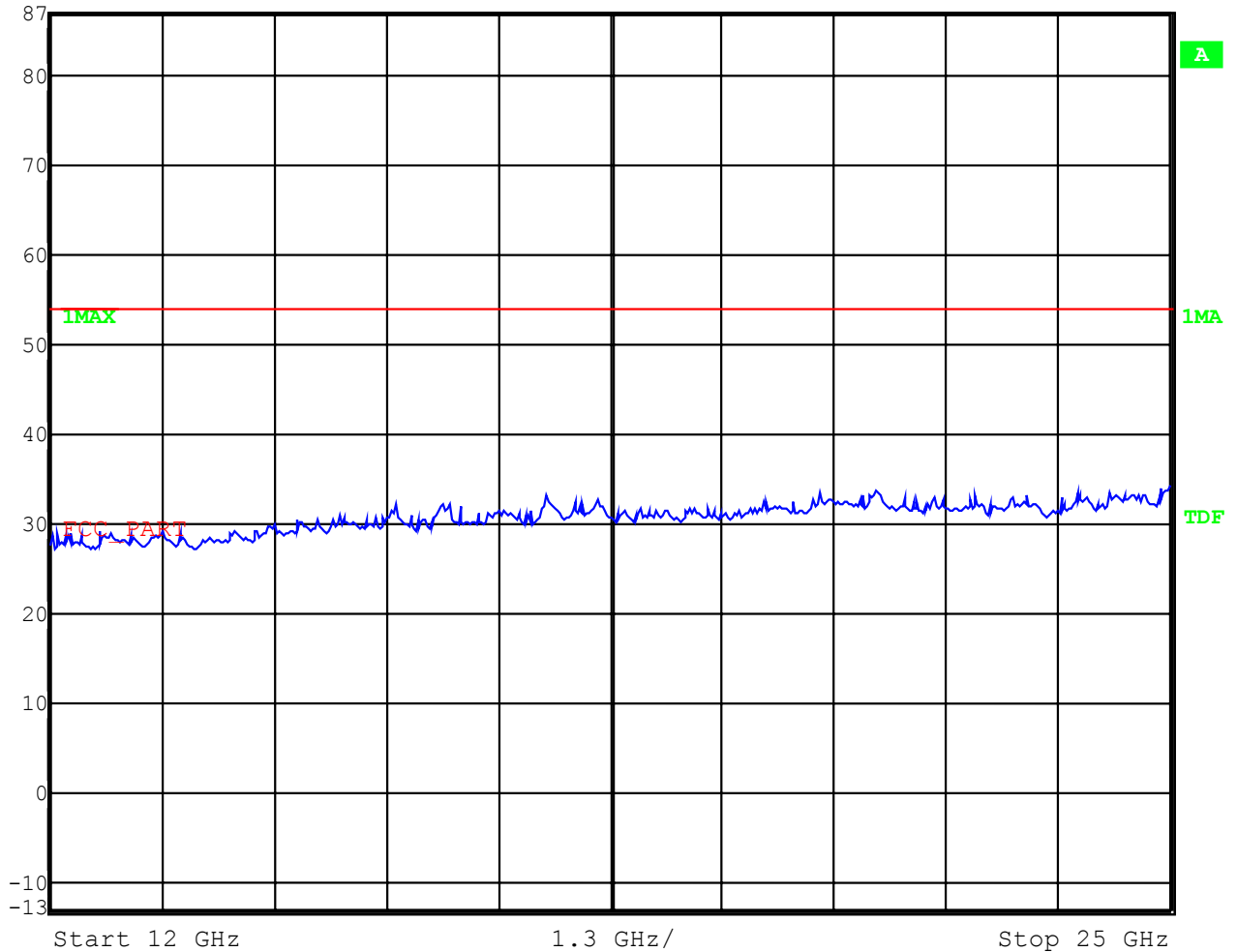
17 – 24, 64

this is valid for all 3 channels and up to 25 GHz



Ref Lvl  
87 dB\*

RBW	1 MHz	RF Att	0 dB
VBW	1 MHz		
SWT	74 ms	Unit	dBµV/m



## CONDUCTED SPURIOUS EMISSIONS

### Measurement Procedure:

The following steps outline the procedure used to measure the conducted emissions from the mobile station.

1. Determine frequency range for measurements: From CFR 2.1057 the spectrum should be investigated from the lowest radio frequency generated in the equipment up to at least the 10th harmonic of the carrier frequency.

For the mobile station equipment tested, this equates to a frequency range of 13 MHz to 19.1 GHz, data taken from 10 MHz to 20 GHz.

2. Determine mobile station transmit frequencies: below outlines the band edge frequencies pertinent to conducted emissions testing.

### USPCS Transmitter

#### Channel Frequency

128 824.2 MHz

189 836.2 MHz

251 848.8 MHz

### Measurement Limit:

Sec. 24.238 Emission Limits.

(a) On any frequency outside frequency band of the USPCS spectrum, the power of any emission shall be attenuated below the transmitter power (P, in Watts) by at least  $43+10\text{Log}(P)$  dB. For all power levels +30 dBm to 0 dBm, this becomes a constant specification limit of -13 dBm.

<b>EMISSION LIMITATIONS</b>					
<b>f (MHz)</b>		<b>amplitude of emission (dBm)</b>	<b>limit max. allowed emission power (dBm)</b>	<b>actual attenuation below frequency of operation (dBc)</b>	<b>results</b>
<b>CH 128</b>					
<b>824,2</b>		<b>33.0</b>	<b>-13.0 (46.0 dBc)</b>		<b>carrier</b>
<b>823.981</b>		<b>-13.7</b>		<b>46.7</b>	<b>carrier</b>
<b>806.5</b>		<b>-34.6</b>		<b>67.6</b>	<b>complies</b>
<b>1643.4</b>		<b>-31.0</b>		<b>64.0</b>	<b>complies</b>
<b>CH 189</b>					
<b>836,4</b>		<b>32.8</b>	<b>-13.0 (45.80 dBc)</b>		<b>carrier</b>
<b>826,6</b>		<b>-33.8</b>		<b>66.6</b>	<b>complies</b>
<b>1681.9</b>		<b>-33.9</b>		<b>66.7</b>	<b>complies</b>
<b>CH 251</b>					
<b>848,8</b>		<b>32.8</b>	<b>-13.0 (45.80 dBc)</b>		<b>carrier</b>
<b>849.018</b>		<b>-14.1</b>		<b>46.7</b>	<b>complies</b>
<b>831.7</b>		<b>-37.1</b>		<b>69.7</b>	<b>complies</b>
<b>1694.3</b>		<b>-35.7</b>		<b>68.5</b>	<b>complies</b>
<b>Measurement uncertainty</b>		<b>± 0.5dB</b>			

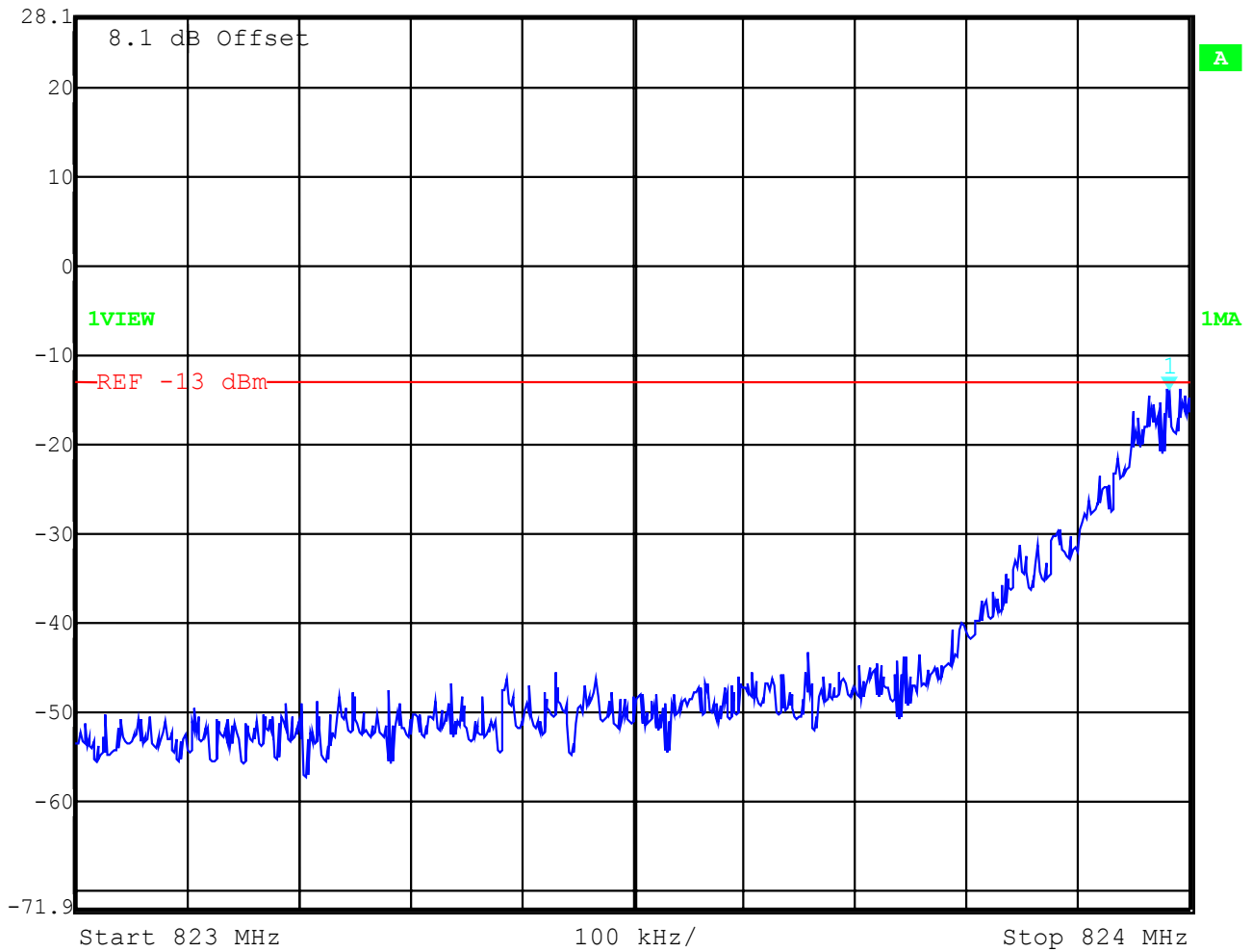
**REFERENCE NUMBER(S) OF TEST EQUIPMENT USED**  
(for reference numbers see test equipment listing)





## Channel 128

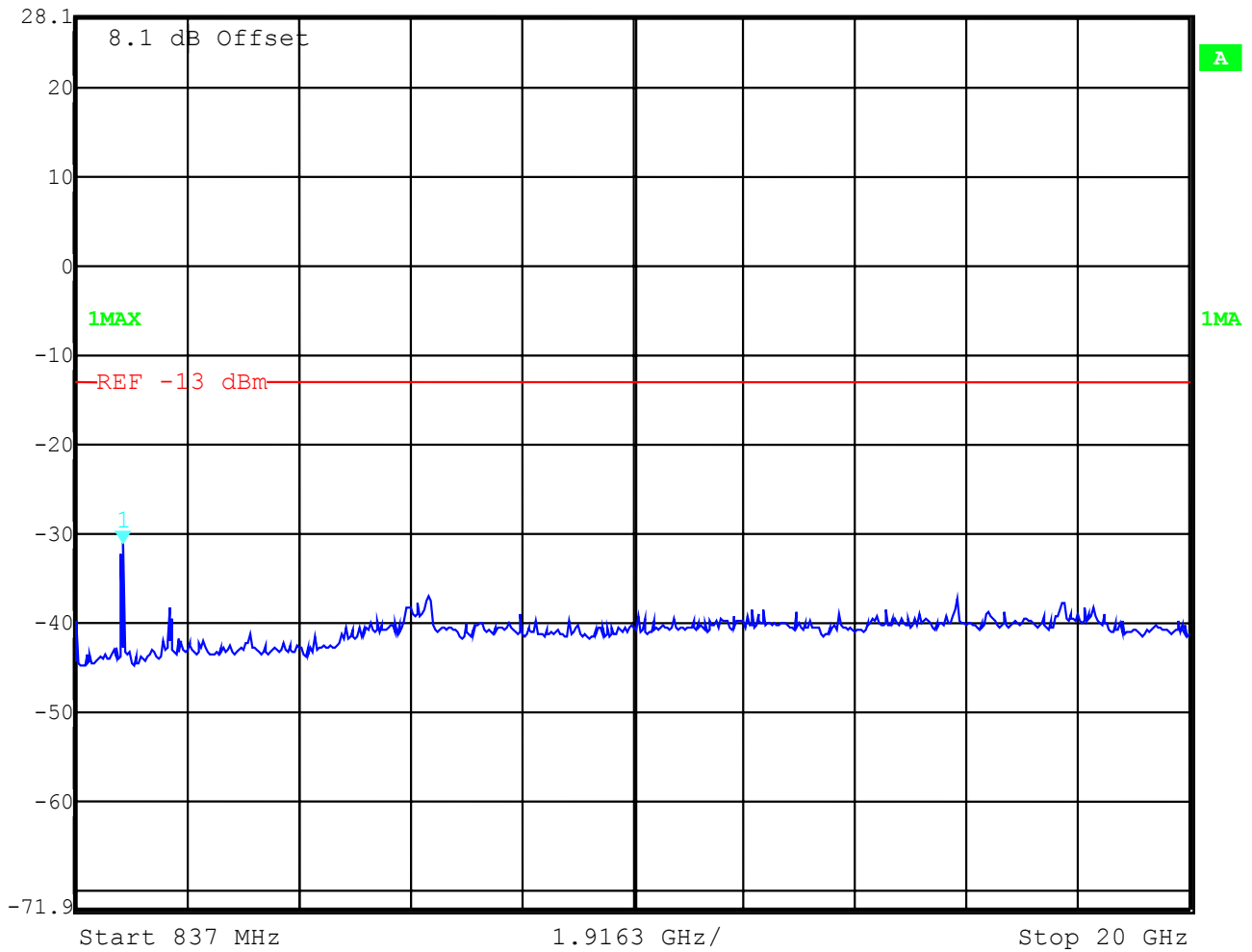
	Ref Lvl	Marker 1 [T1]	RBW	3 kHz	RF Att	30 dB
	28.1 dBm	-13.65 dBm	VBW	3 kHz		
		823.98196393 MHz	SWT	280 ms	Unit	dBm



**REFERENCE NUMBER(S) OF TEST EQUIPMENT USED**  
 (for reference numbers see test equipment listing)

## Channel 128

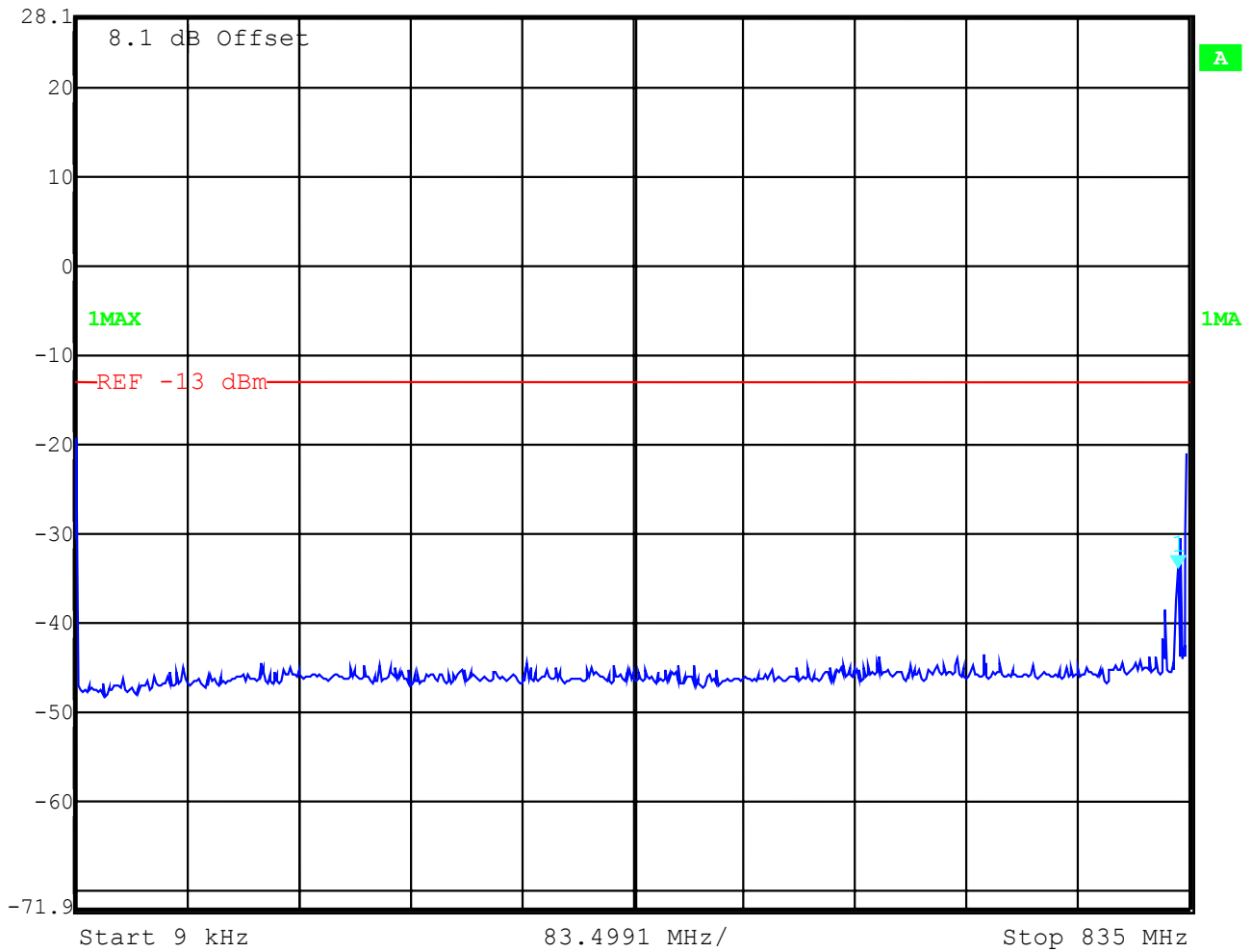
	Ref Lvl	Marker 1 [T1]	RBW	1 MHz	RF Att	30 dB
	28.1 dBm	-31.01 dBm	VBW	1 MHz		
		1.64345892 GHz	SWT	110 ms	Unit	dBm



**REFERENCE NUMBER(S) OF TEST EQUIPMENT USED**  
 (for reference numbers see test equipment listing)

## Channel 189

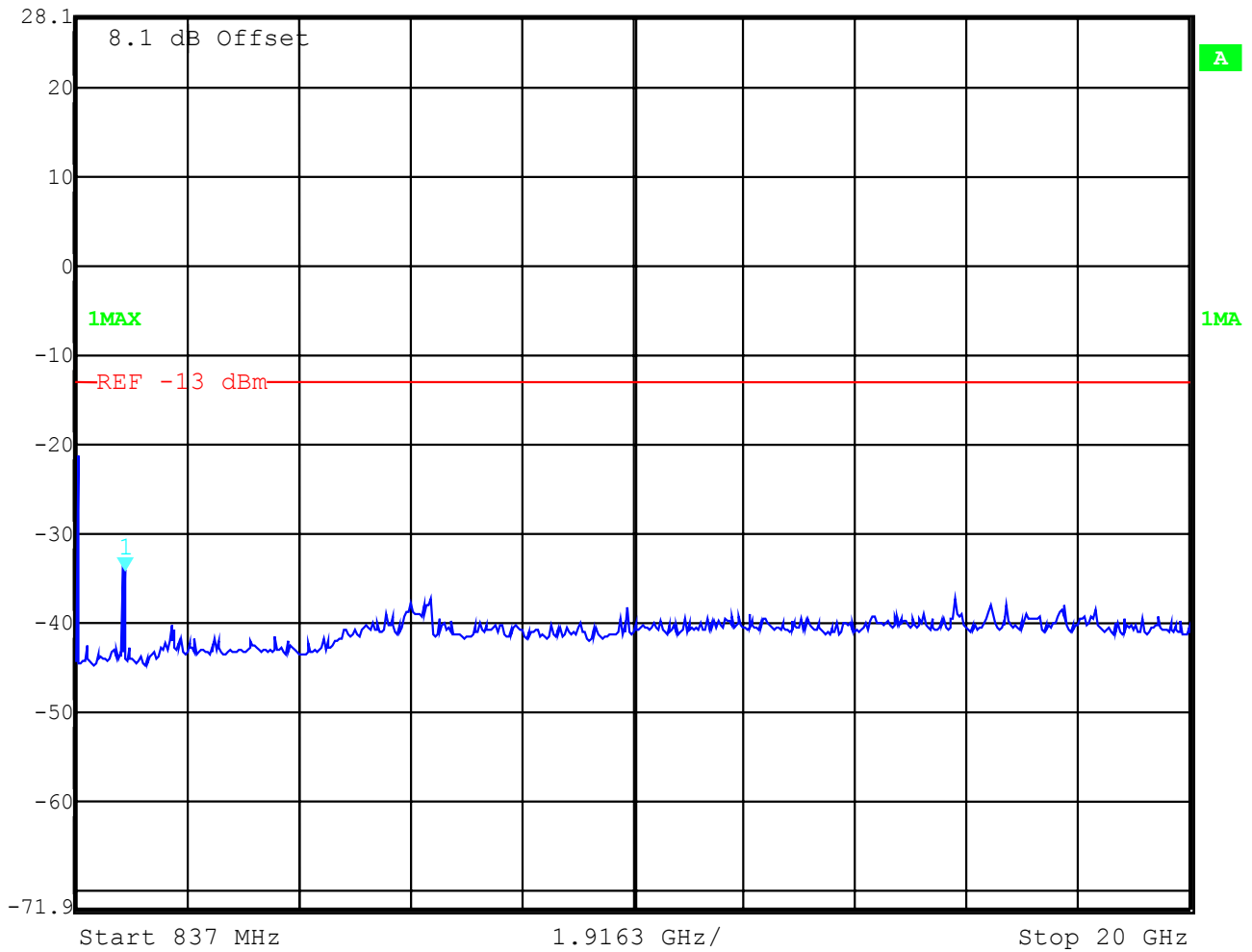
	Marker 1 [T1]	RBW	1 MHz	RF Att	30 dB
	Ref Lvl	-33.75 dBm	VBW	1 MHz	
	28.1 dBm	826.63335671 MHz	SWT	5 ms	Unit      dBm



**REFERENCE NUMBER(S) OF TEST EQUIPMENT USED**  
 (for reference numbers see test equipment listing)

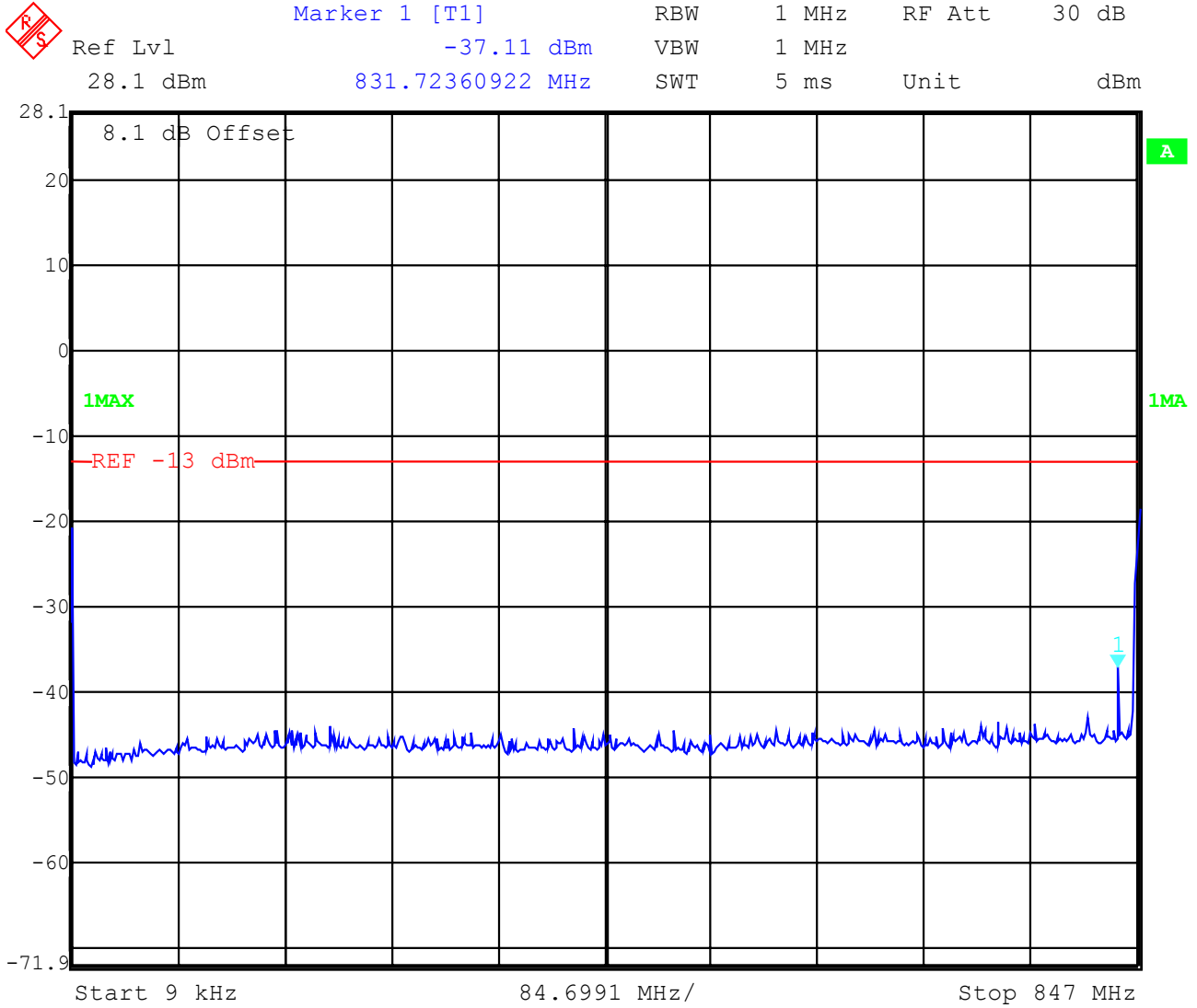
## Channel 189

	Marker 1 [T1]	RBW	1 MHz	RF Att	30 dB
	Ref Lvl	-33.94 dBm	VBW	1 MHz	
	28.1 dBm	1.68186172 GHz	SWT	110 ms	Unit      dBm



**REFERENCE NUMBER(S) OF TEST EQUIPMENT USED**  
 (for reference numbers see test equipment listing)

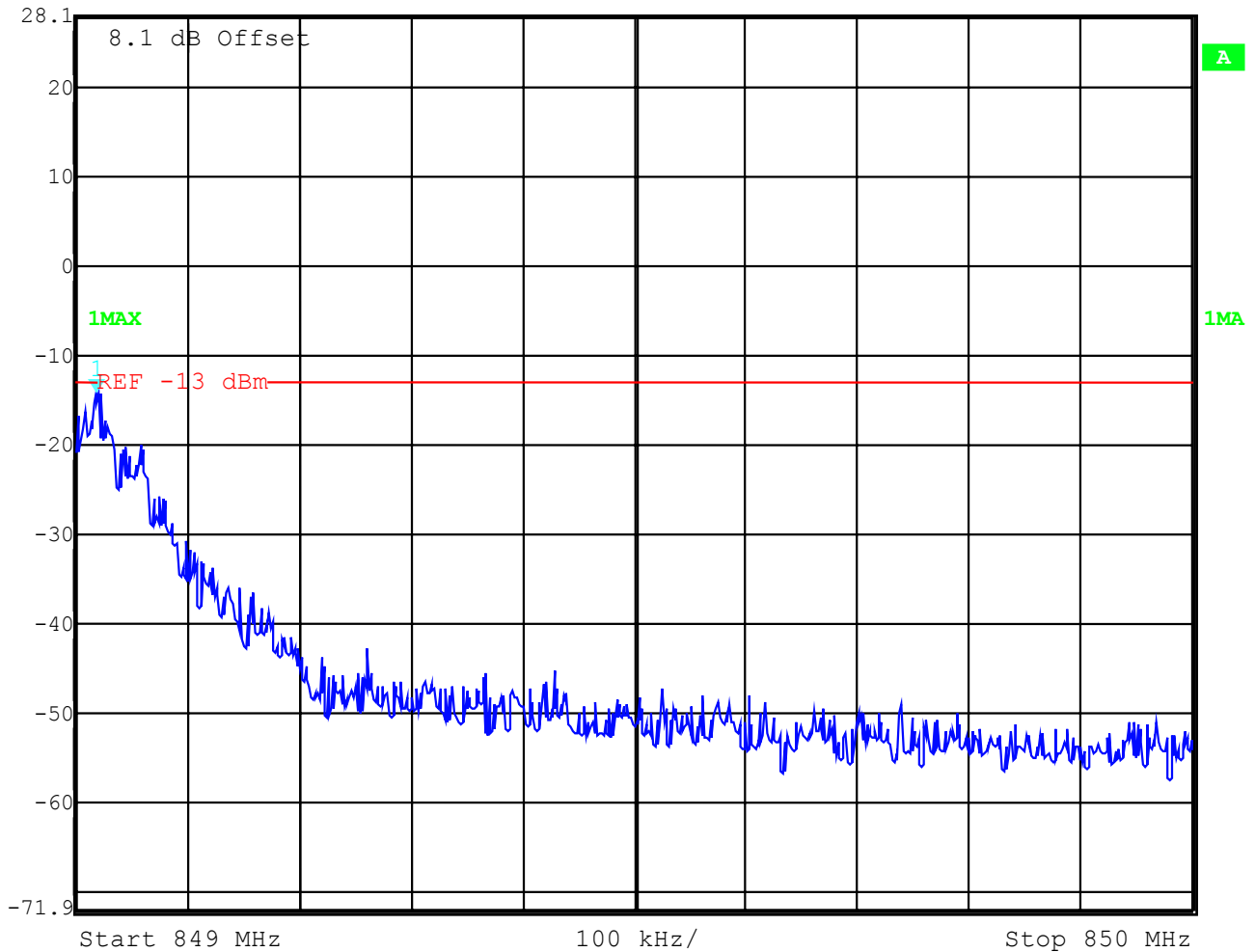
Channel 251



REFERENCE NUMBER(S) OF TEST EQUIPMENT USED  
(for reference numbers see test equipment listing)

## Channel 251

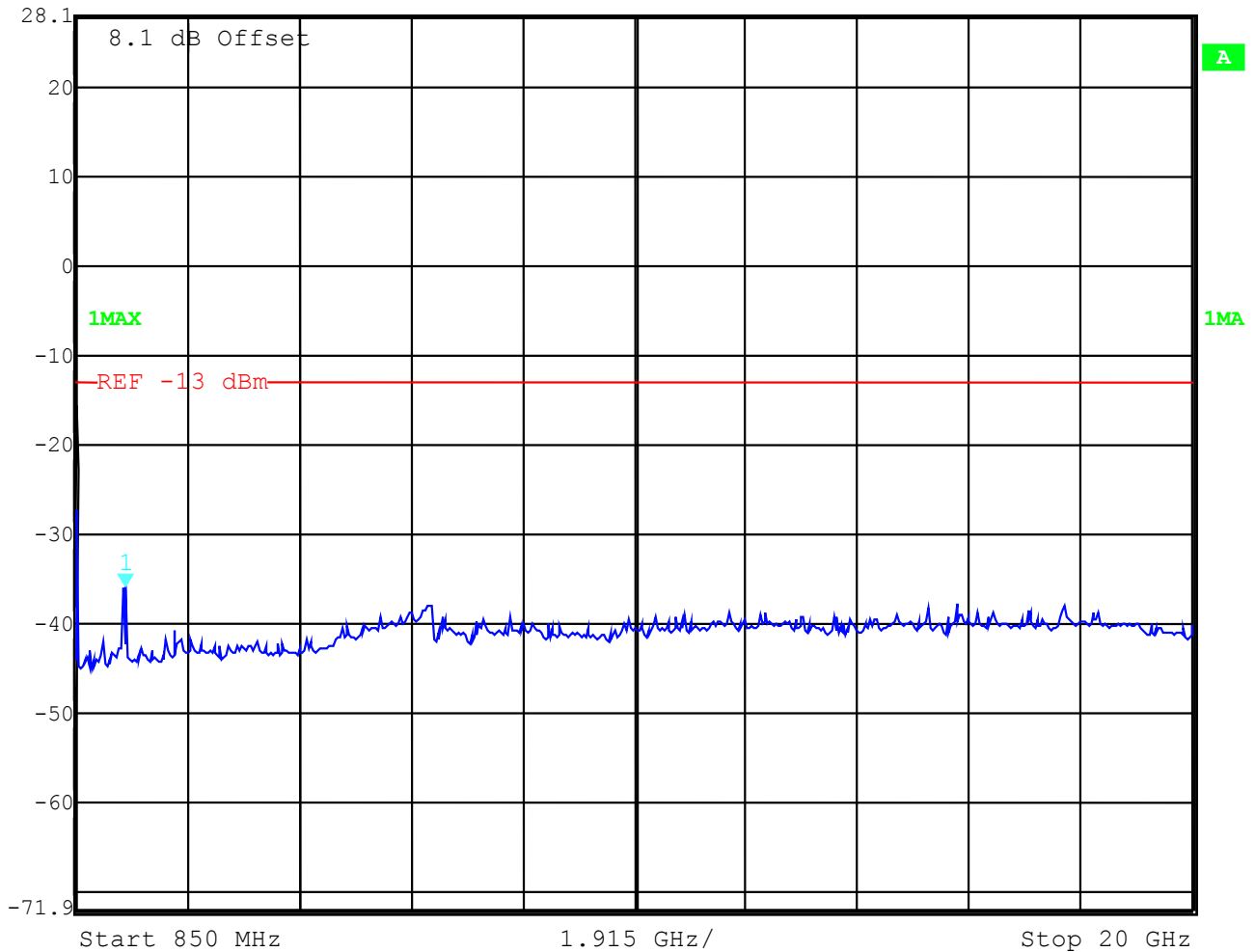
	Ref Lvl	Marker 1 [T1]	RBW	3 kHz	RF Att	30 dB
	28.1 dBm	-14.06 dBm	VBW	3 kHz		
		849.01803607 MHz	SWT	280 ms	Unit	dBm



**REFERENCE NUMBER(S) OF TEST EQUIPMENT USED**  
 (for reference numbers see test equipment listing)

## Channel 251

	Marker 1 [T1]	RBW	1 MHz	RF Att	30 dB
	Ref Lvl	-35.70 dBm	VBW	1 MHz	
	28.1 dBm	1.69428858 GHz	SWT	110 ms	Unit      dBm



**REFERENCE NUMBER(S) OF TEST EQUIPMENT USED**  
 (for reference numbers see test equipment listing)

**BLOCK EDGE REQUIREMENTS**

**Measurement Limit:**

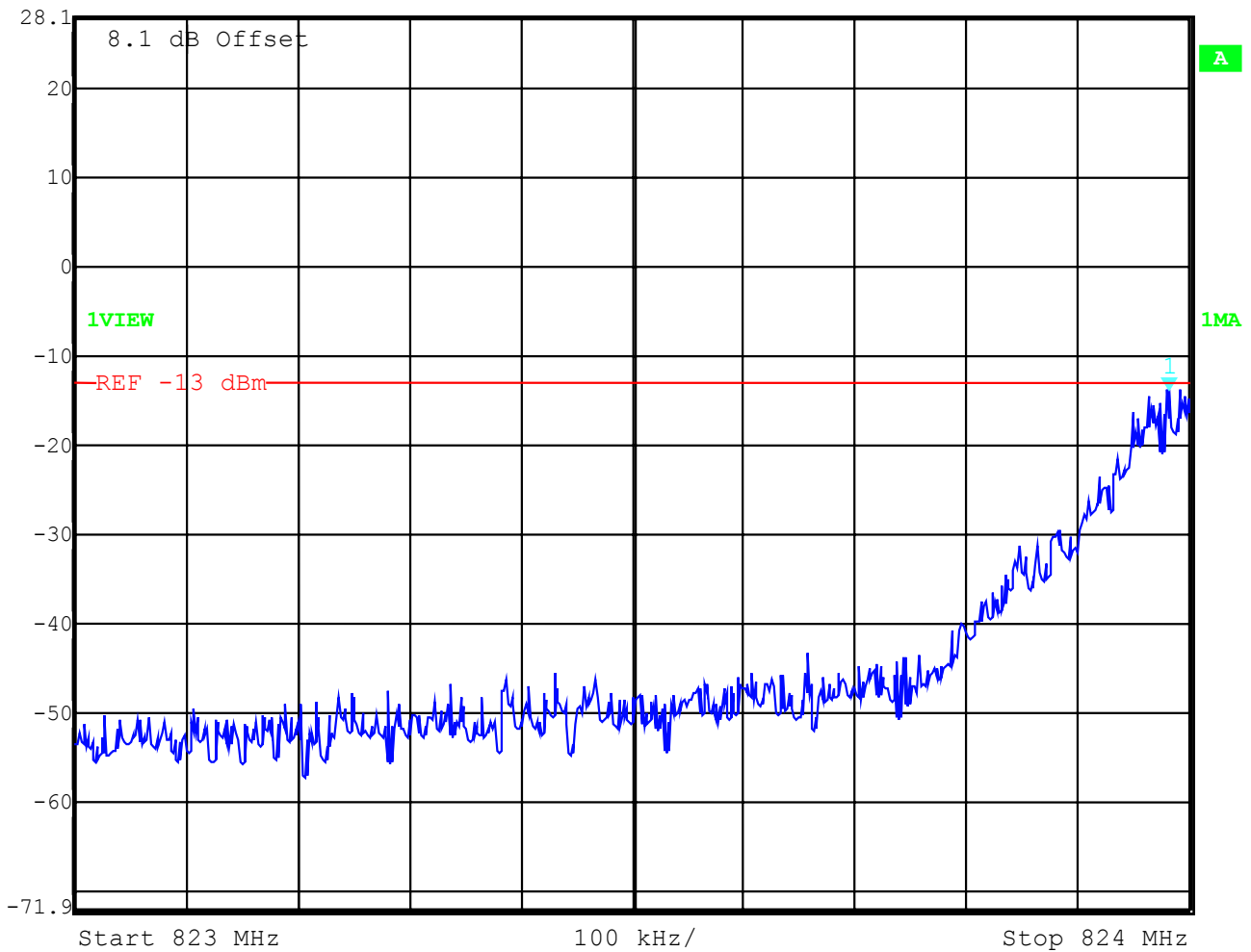
Sec. 22.917(b) Emission Limits.

(a) On any frequency outside frequency band of the USPCS spectrum, the power of any emission shall be attenuated below the transmitter power (P, in Watts) by at least  $43+10\text{Log}(P)$  dB. For all power levels +33 dBm to 0 dBm, this becomes a constant specification limit of -13 dBm.

**Measurements:**

**Block 1 Channel 128**

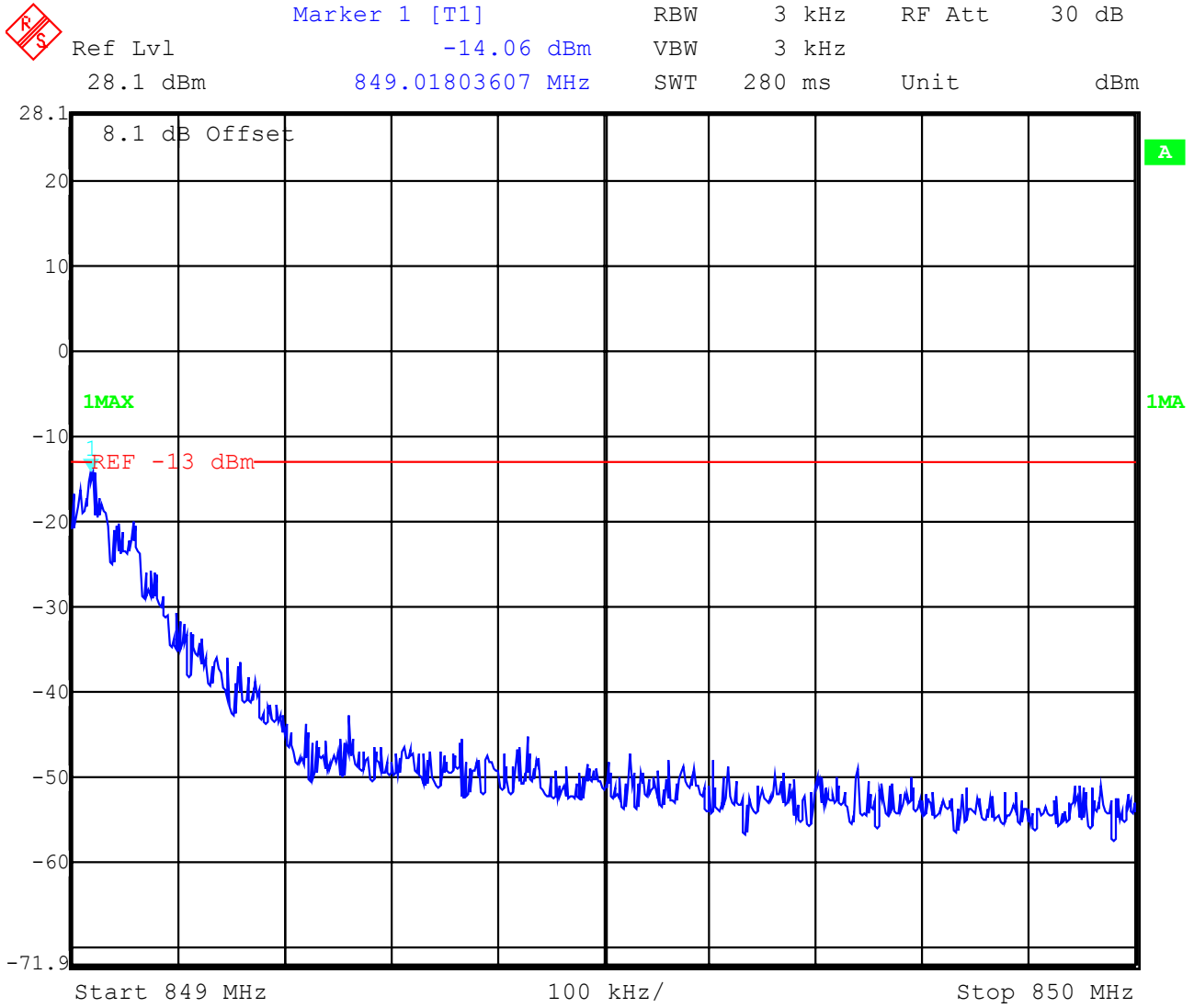
	Marker 1 [T1]	RBW	3 kHz	RF Att	30 dB
	Ref Lvl	-13.65 dBm	VBW	3 kHz	
	28.1 dBm	823.98196393 MHz	SWT	280 ms	Unit
					dBm



**REFERENCE NUMBER(S) OF TEST EQUIPMENT USED**  
 (for reference numbers see test equipment listing)



Block 4 Channel 251



REFERENCE NUMBER(S) OF TEST EQUIPMENT USED  
(for reference numbers see test equipment listing)

**OCCUPIED BANDWIDTH** **§2.989**

**Occupied Bandwidth Results**

Similar to conducted emissions, occupied bandwidth measurements are only provided for selected frequencies in order to reduce the amount of submitted data. Data were taken at the extreme and mid frequencies of the USPCS frequency band. Table 8.2 below lists the measured 99% power and -26dBC occupied bandwidths. Spectrum analyzer plots are included on the following pages.

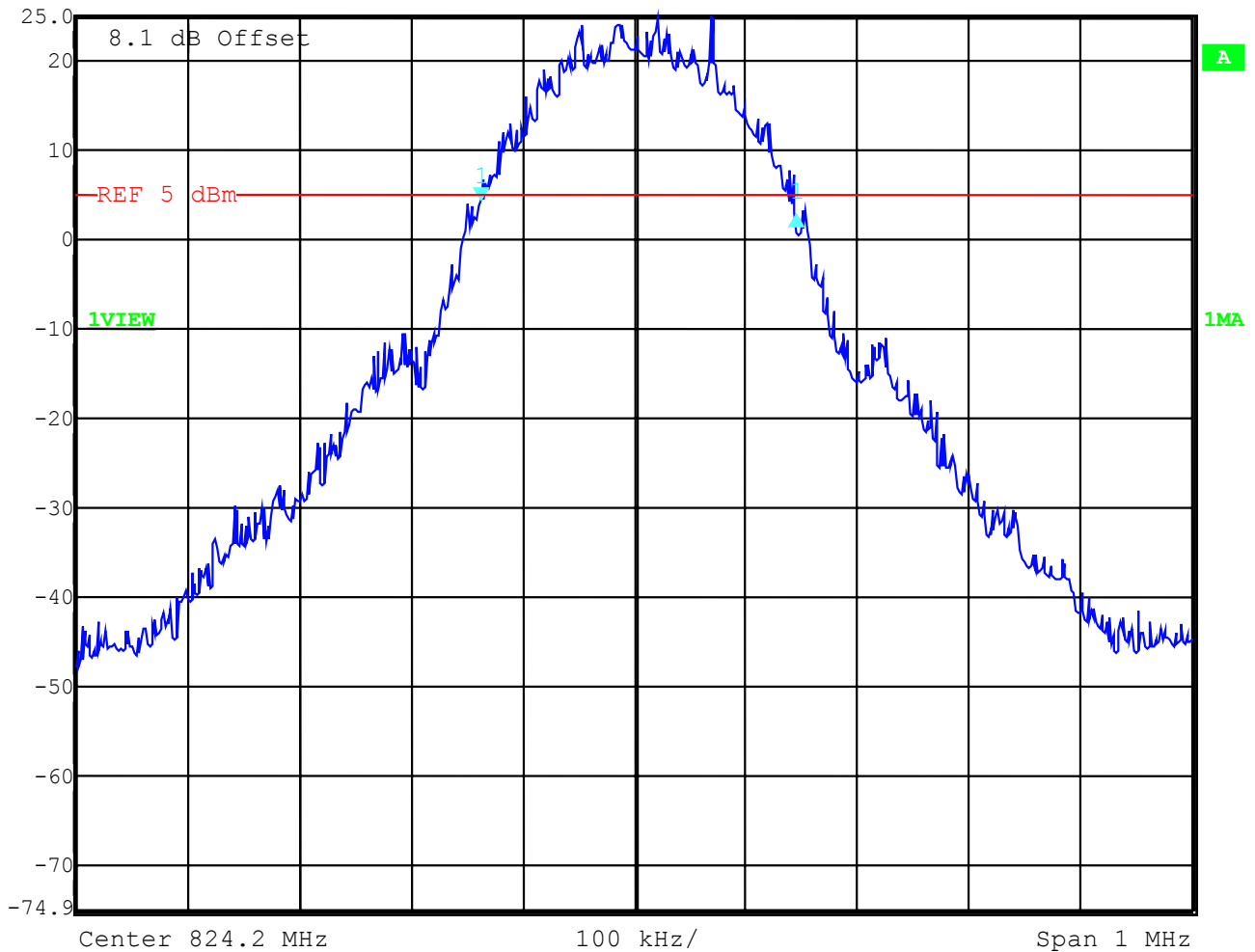
<b>Frequency</b>	<b>99% Occupied Bandwidth</b>	<b>-26 dBc Bandwidth</b>
<b>824.2 MHz</b>	<b>282.565</b>	<b>314.629</b>
<b>836.4 MHz</b>	<b>278.557</b>	<b>314.629</b>
<b>848.8 MHz</b>	<b>276.553</b>	<b>314.629</b>

Part 24.238 (a) requires a measurement bandwidth of at least 1% of the occupied bandwidth. For ca. 299 kHz, this equates to a resolution bandwidth of at least 3 kHz. For this testing, a resolution bandwidth 3.0 kHz was used.

## Channel 128 99% Occupied Bandwidth



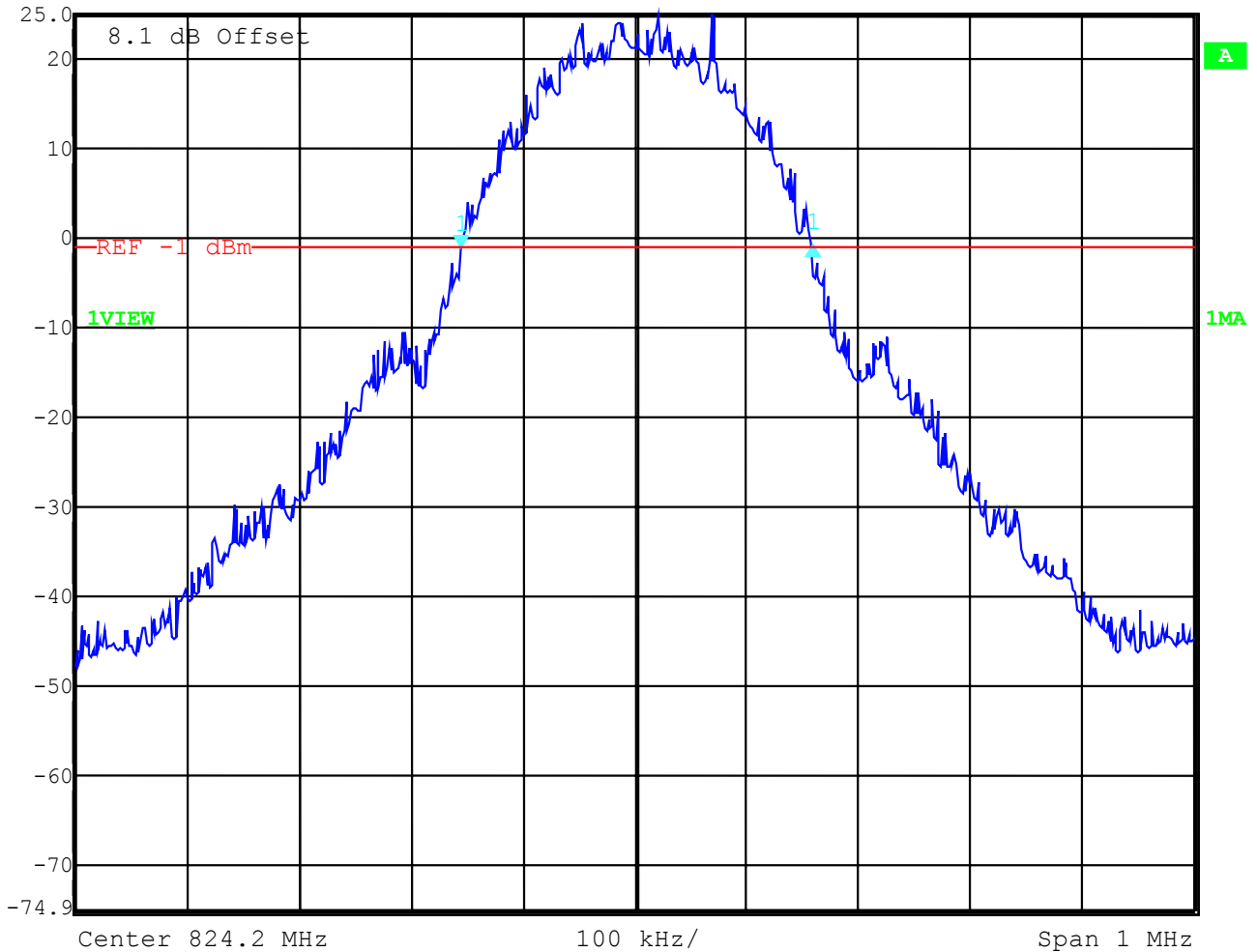
	Delta 1 [T1]	RBW	3 kHz	RF Att	30 dB
Ref Lvl	-1.72 dB	VBW	3 kHz		
25 dBm	282.56513026 kHz	SWT	280 ms	Unit	dBm



**REFERENCE NUMBER(S) OF TEST EQUIPMENT USED**  
(for reference numbers see test equipment listing)

**Channel 128**  
**-26 dBc Bandwidth**

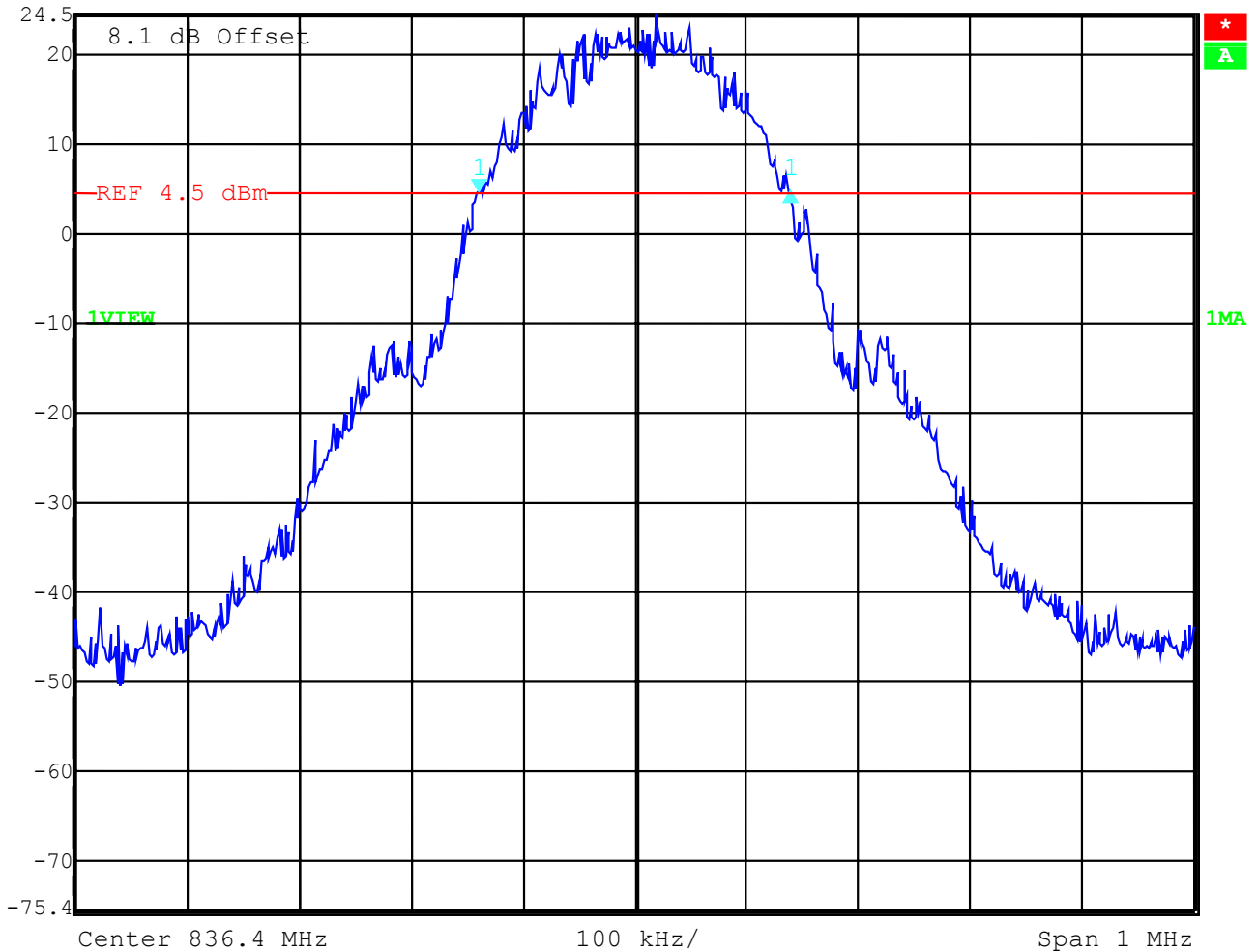
	Delta 1 [T1]	RBW	3 kHz	RF Att	30 dB
	Ref Lvl	0.37 dB	VBW	3 kHz	
	25 dBm	314.62925852 kHz	SWT	280 ms	Unit dBm



**REFERENCE NUMBER(S) OF TEST EQUIPMENT USED**  
(for reference numbers see test equipment listing)

**Channel 189**  
**99% Occupied Bandwidth**

	Delta 1 [T1]	RBW	3 kHz	RF Att	30 dB
	Ref Lvl	-0.16 dB	VBW	3 kHz	
	24.5 dBm	278.55711423 kHz	SWT	280 ms	Unit

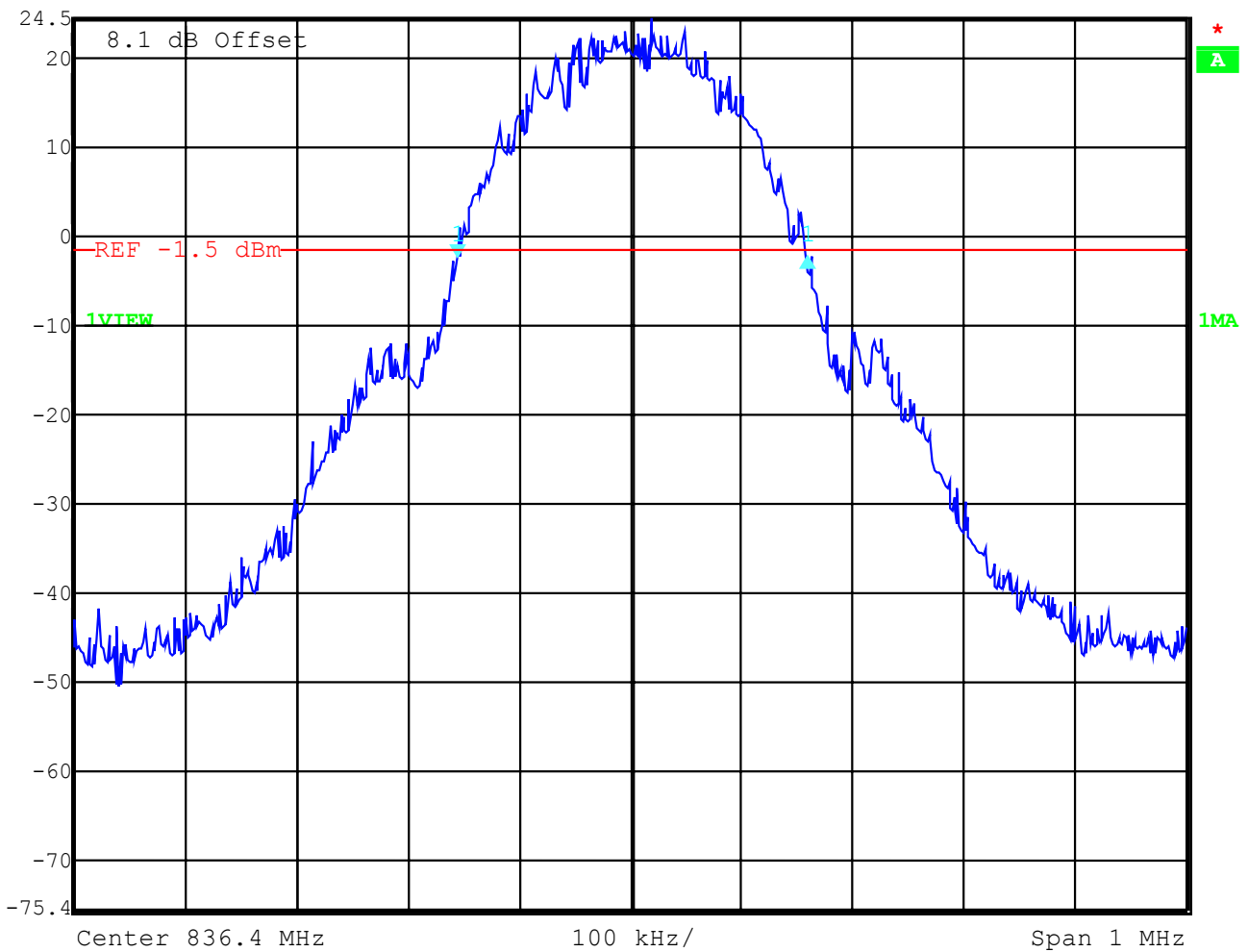


**REFERENCE NUMBER(S) OF TEST EQUIPMENT USED**  
(for reference numbers see test equipment listing)

## Channel 189 -26 dBc Bandwidth



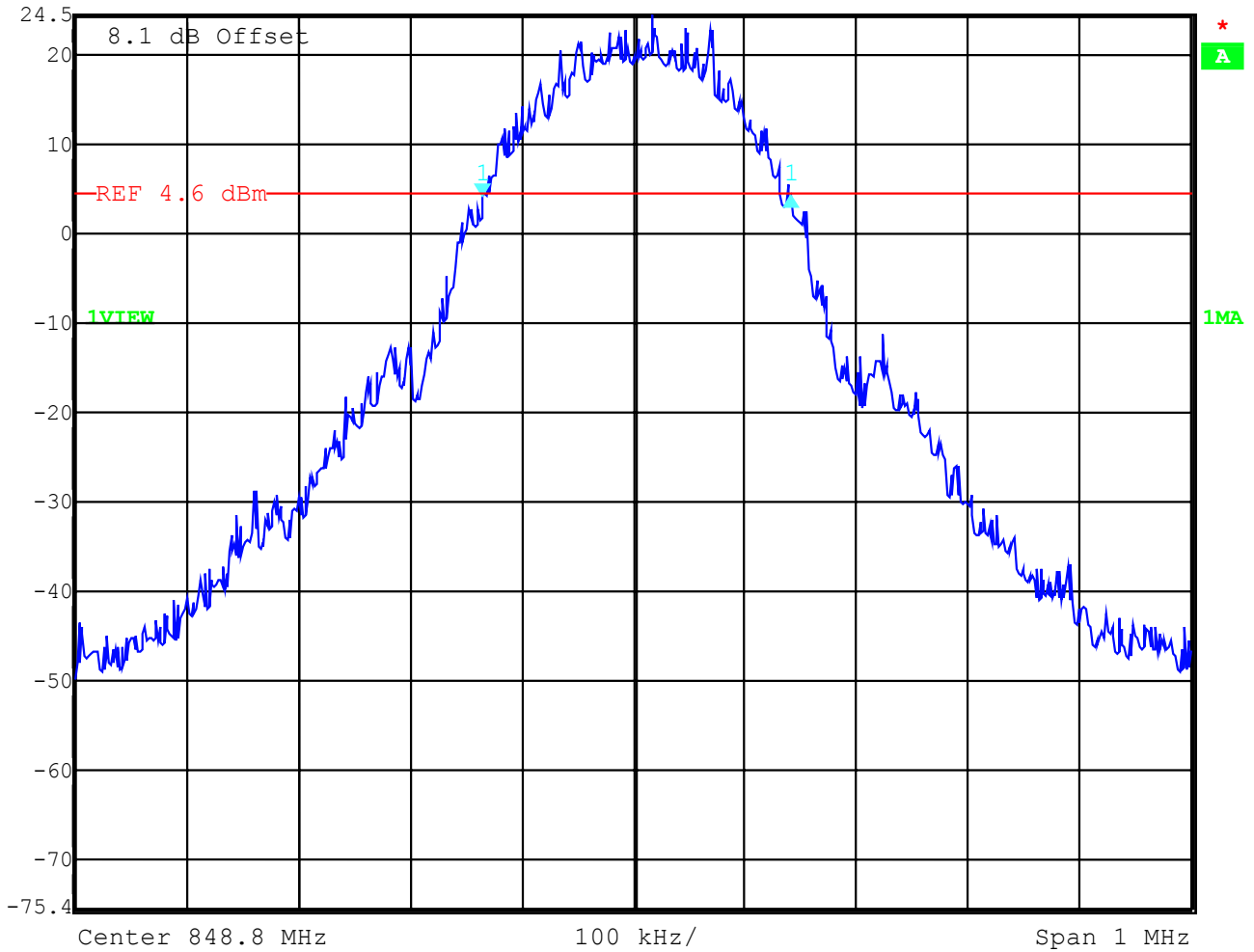
	Delta 1 [T1]	RBW	3 kHz	RF Att	30 dB
Ref Lvl	-0.13 dB	VBW	3 kHz		
24.5 dBm	314.62925852 kHz	SWT	280 ms	Unit	dBm



**REFERENCE NUMBER(S) OF TEST EQUIPMENT USED**  
(for reference numbers see test equipment listing)

**Channel 251**  
**99% Occupied Bandwidth**

	Delta 1 [T1]	RBW	3 kHz	RF Att	30 dB
	Ref Lvl	0.04 dB	VBW	3 kHz	
	24.6 dBm	276.55310621 kHz	SWT	280 ms	Unit dBm



**REFERENCE NUMBER(S) OF TEST EQUIPMENT USED**  
(for reference numbers see test equipment listing)



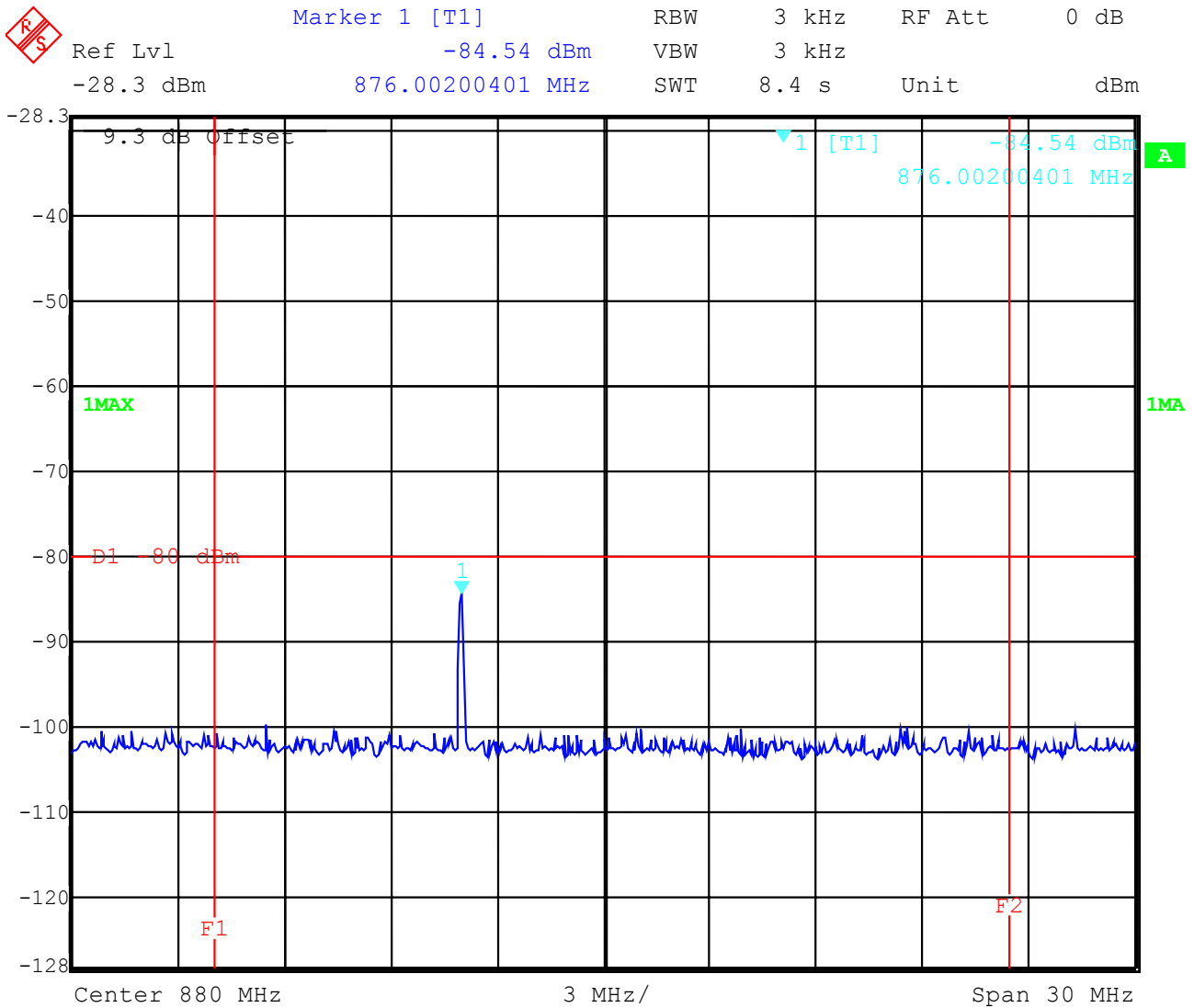


**EMISSION LIMITATIONS FOR CELLULAR §22.917(F)**

Mobile emissions in the base frequency range

All peaks are below -80 dBm in the base frequency range.

Idle Mode base station frequency range A



F1 = 869 MHz, F2 = 891.5 MHz

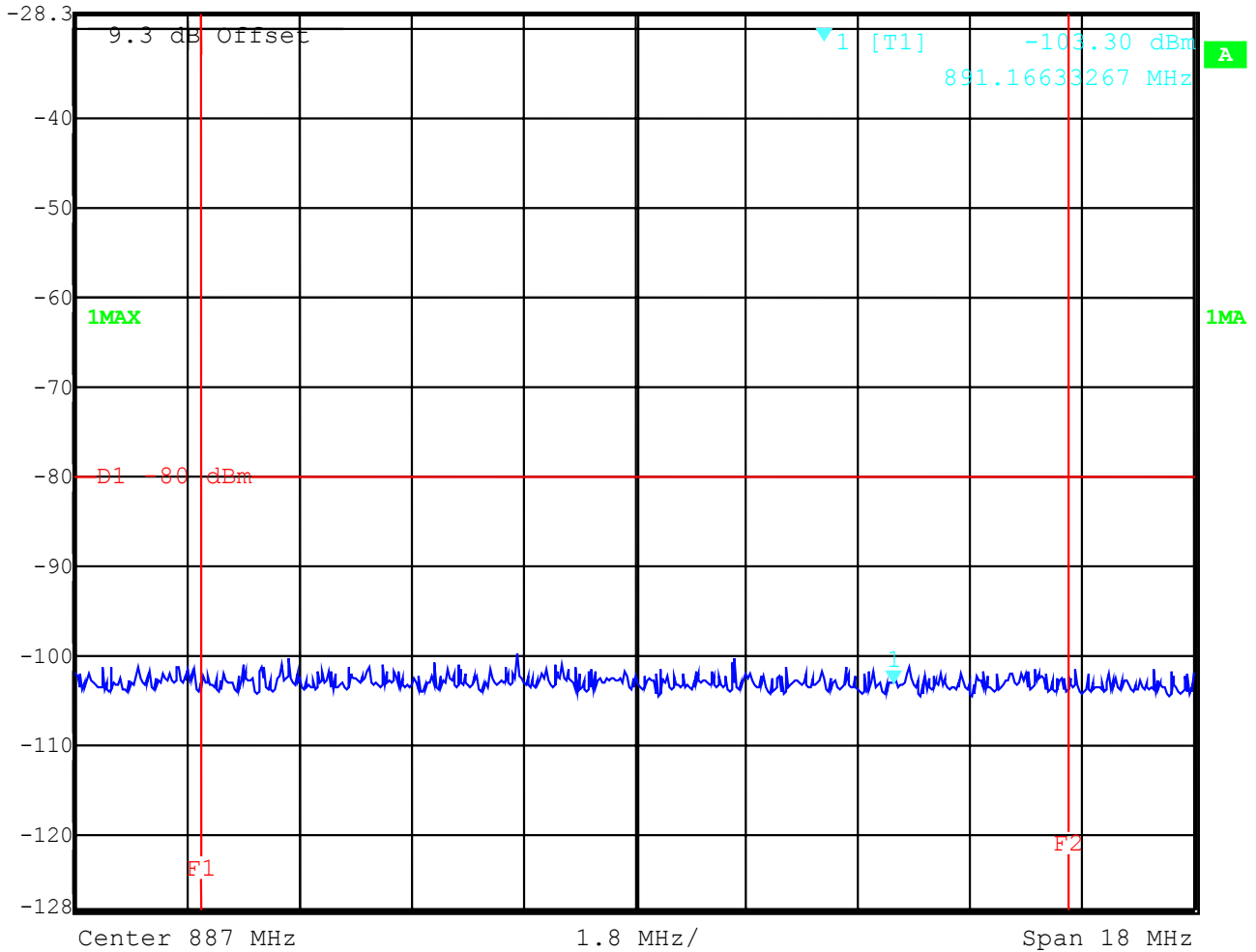
**LIMITS §22.917(f)**

The mean power of any emissions appearing in the base station frequency range from cellular mobile transmitters operated must be attenuated to a level not to exceed -80dBm at the transmitter antenna connector

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED  
(for reference numbers see test equipment listing)

Mobile emissions in the base frequency range  
**Idle Mode base station frequency range B**

	Ref Lvl	Marker 1 [T1]	RBW	3 kHz	RF Att	0 dB
	-28.3 dBm	-103.30 dBm	VBW	3 kHz		
		891.16633267 MHz	SWT	5 s	Unit	dBm



**F1 = 880 MHz, F2 = 894 MHz**

**LIMITS**

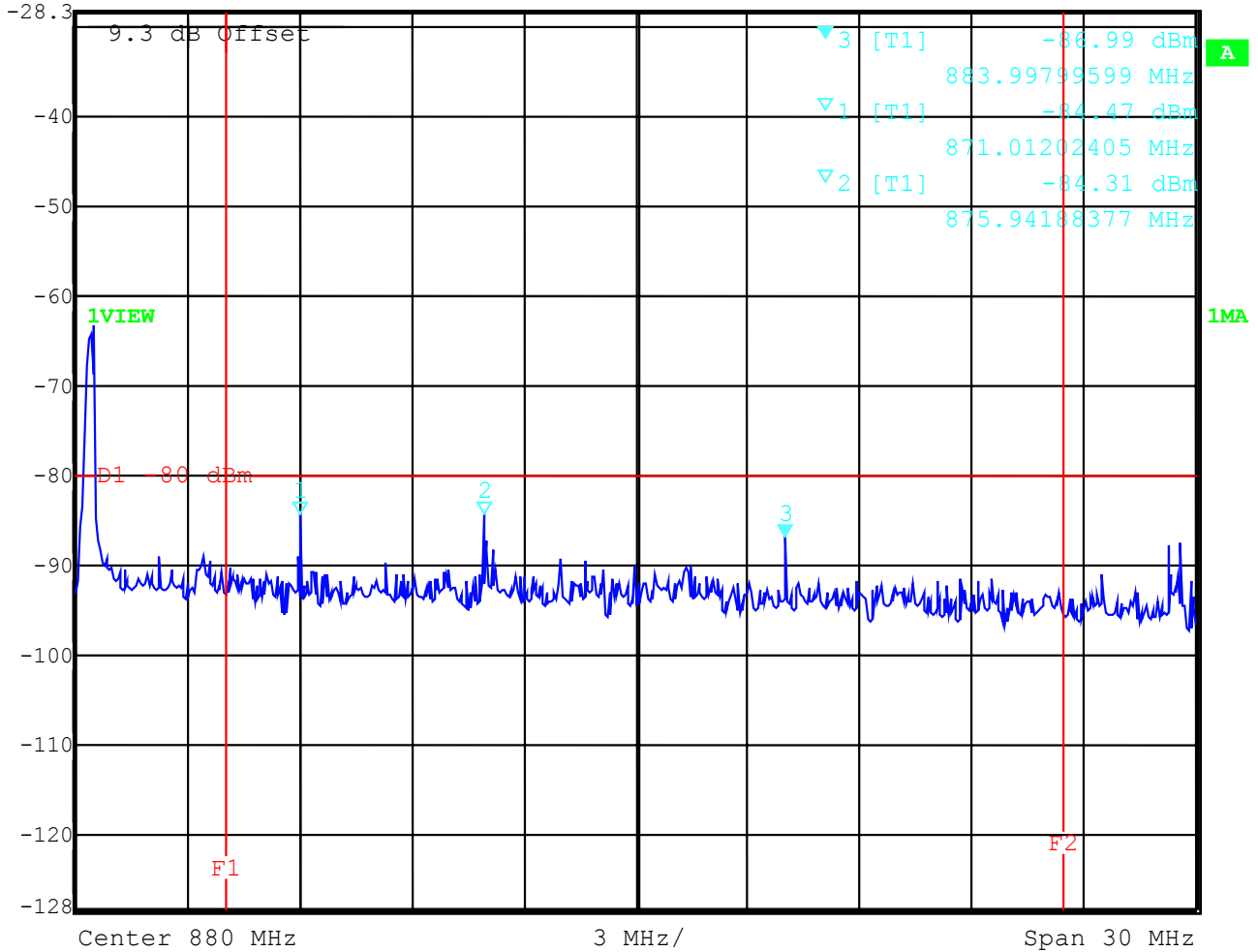
**§22.917(f)**

The mean power of any emissions appearing in the base station frequency range from cellular mobile transmitters operated must be attenuated to a level not to exceed **-80dBm** at the transmitter antenna connector

**REFERENCE NUMBER(S) OF TEST EQUIPMENT USED**  
 (for reference numbers see test equipment listing)

Mobile emissions in the base frequency range  
**TX Mode CH 128 base station frequency range A**

	Ref Lvl	Marker 3 [T1]	RBW	3 kHz	RF Att	0 dB
	-28.3 dBm	-86.99 dBm	VBW	3 kHz		
		883.99799599 MHz	SWT	8.4 s	Unit	dBm



**F1 = 869 MHz, F2 = 891.5 MHz**

**LIMITS**

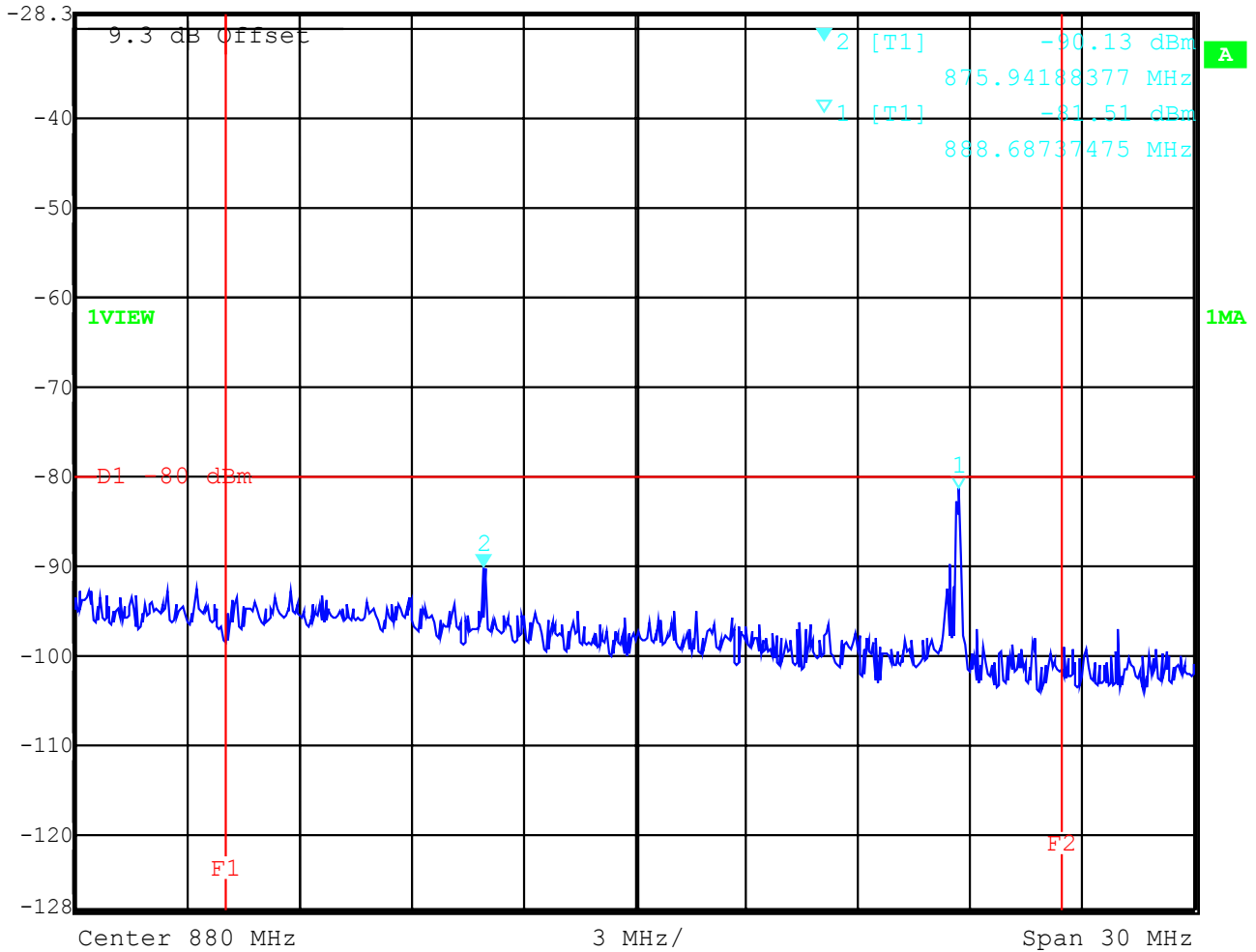
**§22.917(f)**

The mean power of any emissions appearing in the base station frequency range from cellular mobile transmitters operated must be attenuated to a level not to exceed **-80dBm** at the transmitter antenna connector

**REFERENCE NUMBER(S) OF TEST EQUIPMENT USED**  
 (for reference numbers see test equipment listing)

Mobile emissions in the base frequency range  
**TX Mode CH 189 base station frequency range A**

	Ref Lvl	Marker 2 [T1]	RBW	3 kHz	RF Att	0 dB
	-28.3 dBm	-90.13 dBm	VBW	3 kHz		
		875.94188377 MHz	SWT	8.4 s	Unit	dBm



**F1 = 869 MHz, F2 = 891.5 MHz**

**LIMITS**

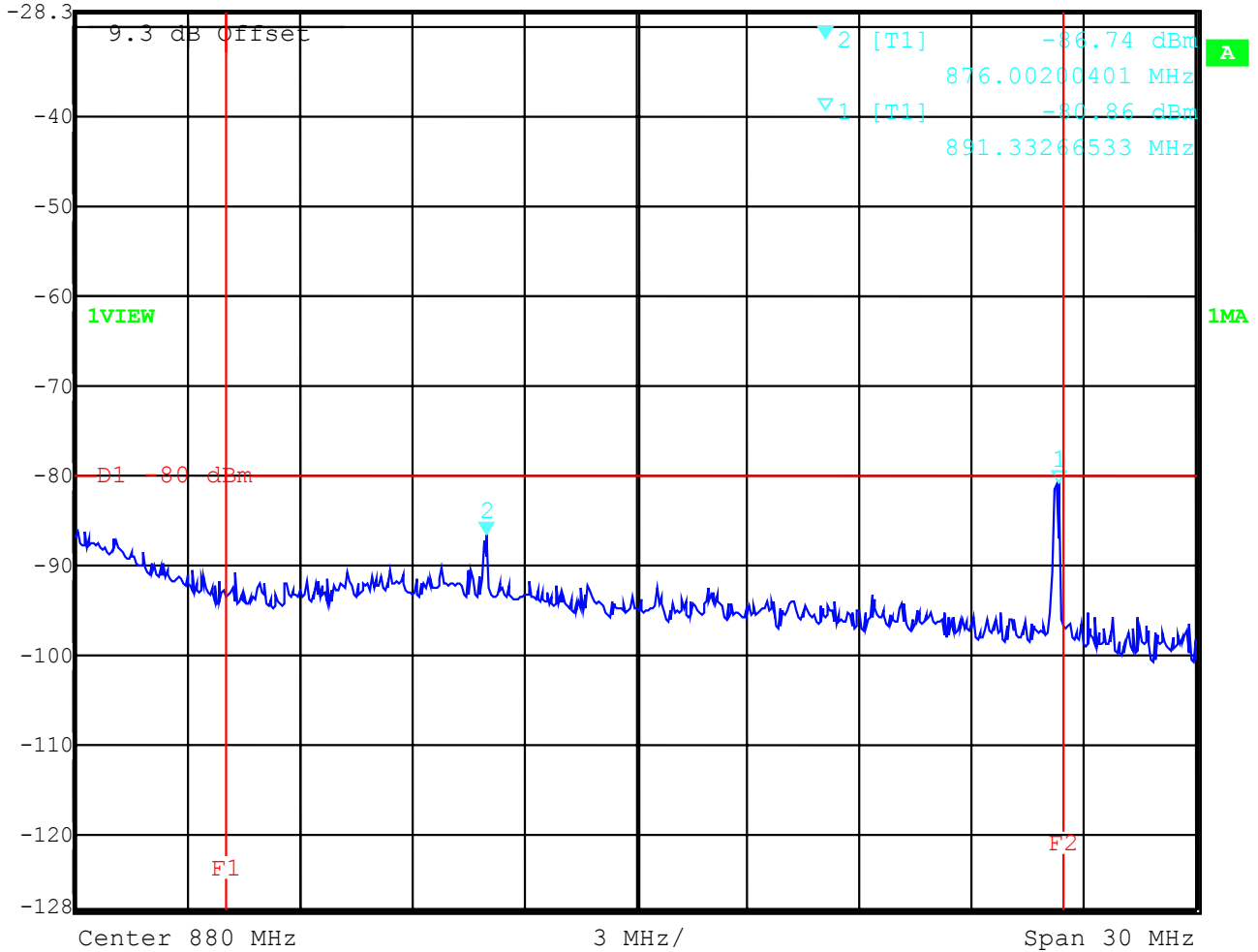
**§22.917(f)**

The mean power of any emissions appearing in the base station frequency range from cellular mobile transmitters operated must be attenuated to a level not to exceed -80dBm at the transmitter antenna connector

**REFERENCE NUMBER(S) OF TEST EQUIPMENT USED**  
 (for reference numbers see test equipment listing)

Mobile emissions in the base frequency range  
**TX Mode CH 251 base station frequency range A**

	Ref Lvl	Marker 2 [T1]	RBW	3 kHz	RF Att	0 dB
	-28.3 dBm	-86.74 dBm	VBW	3 kHz		
		876.00200401 MHz	SWT	8.4 s	Unit	dBm



**F1 = 869 MHz, F2 = 891.5 MHz**

**LIMITS**

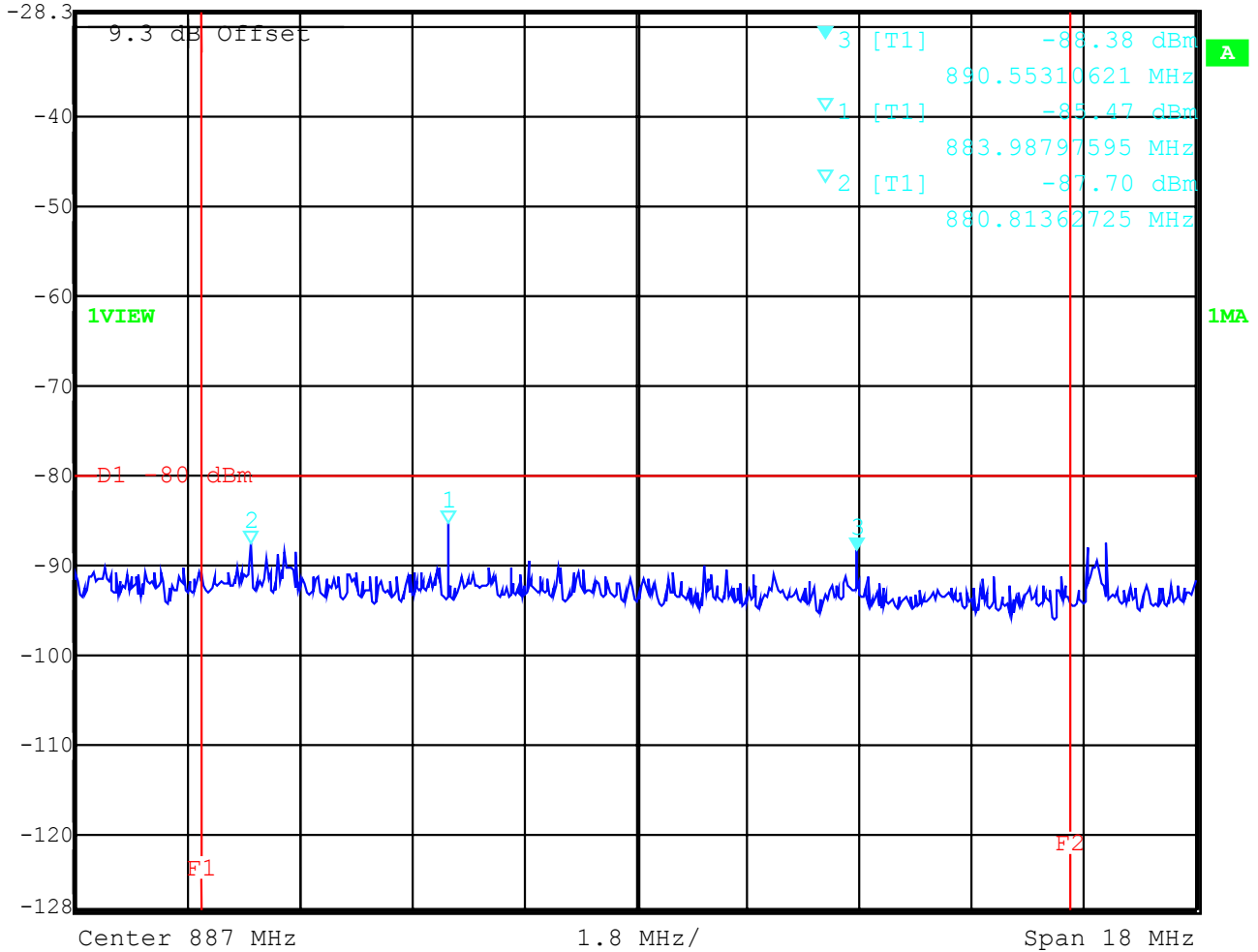
**§22.917(f)**

The mean power of any emissions appearing in the base station frequency range from cellular mobile transmitters operated must be attenuated to a level not to exceed -80dBm at the transmitter antenna connector

**REFERENCE NUMBER(S) OF TEST EQUIPMENT USED**  
 (for reference numbers see test equipment listing)

Mobile emissions in the base frequency range  
**TX Mode CH 128 base station frequency range B**

	Ref Lvl	Marker 3 [T1]	RBW	3 kHz	RF Att	0 dB
	-28.3 dBm	-88.38 dBm	VBW	3 kHz		
		890.55310621 MHz	SWT	5 s	Unit	dBm



**F1 = 880 MHz, F2 = 894 MHz**

**LIMITS**

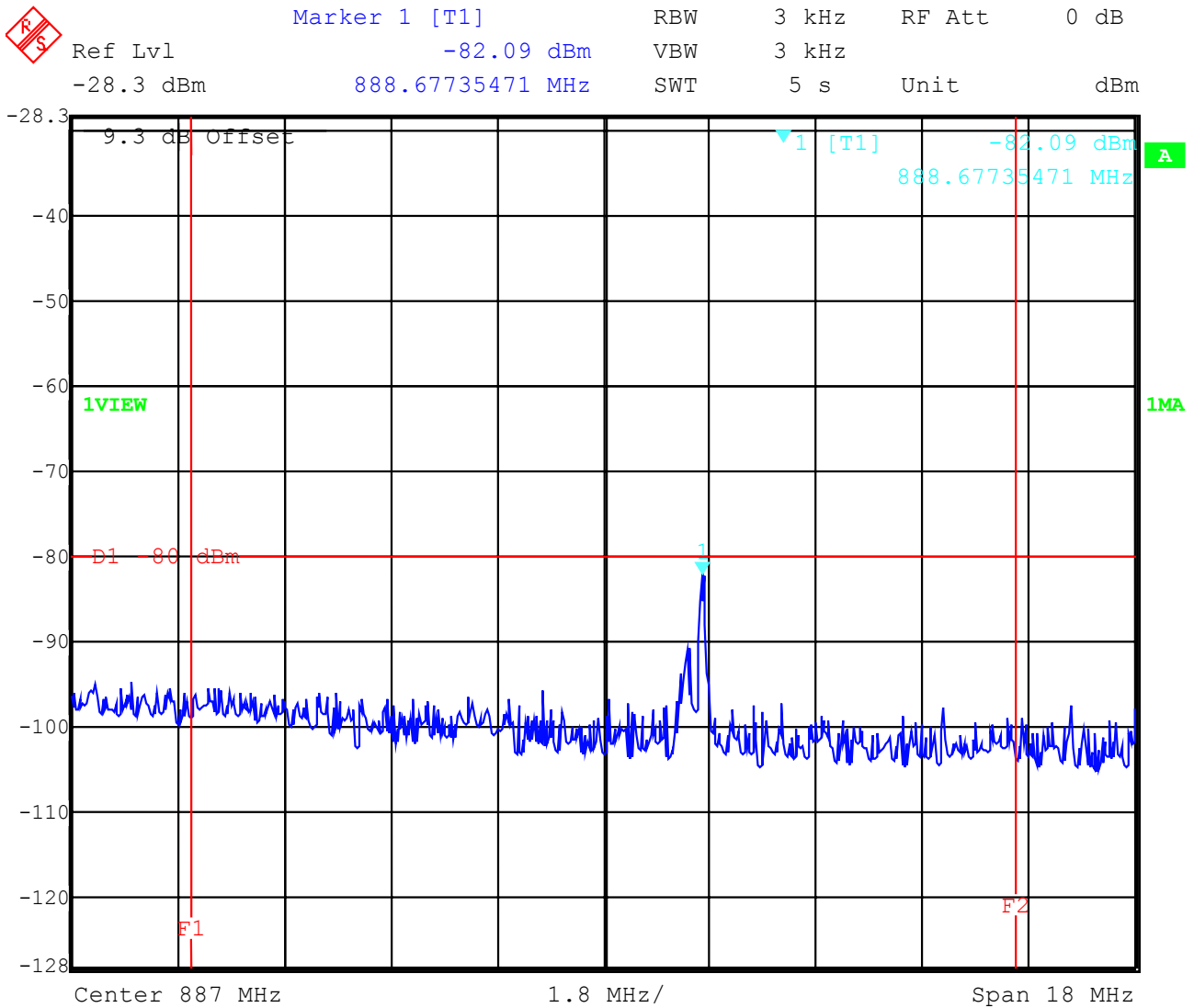
**§22.917(f)**

The mean power of any emissions appearing in the base station frequency range from cellular mobile transmitters operated must be attenuated to a level not to exceed **-80dBm** at the transmitter antenna connector

**REFERENCE NUMBER(S) OF TEST EQUIPMENT USED**  
 (for reference numbers see test equipment listing)

Mobile emissions in the base frequency range

**TX Mode CH 189 base station frequency range B**



**F1 = 880 MHz, F2 = 894 MHz**

**LIMITS**

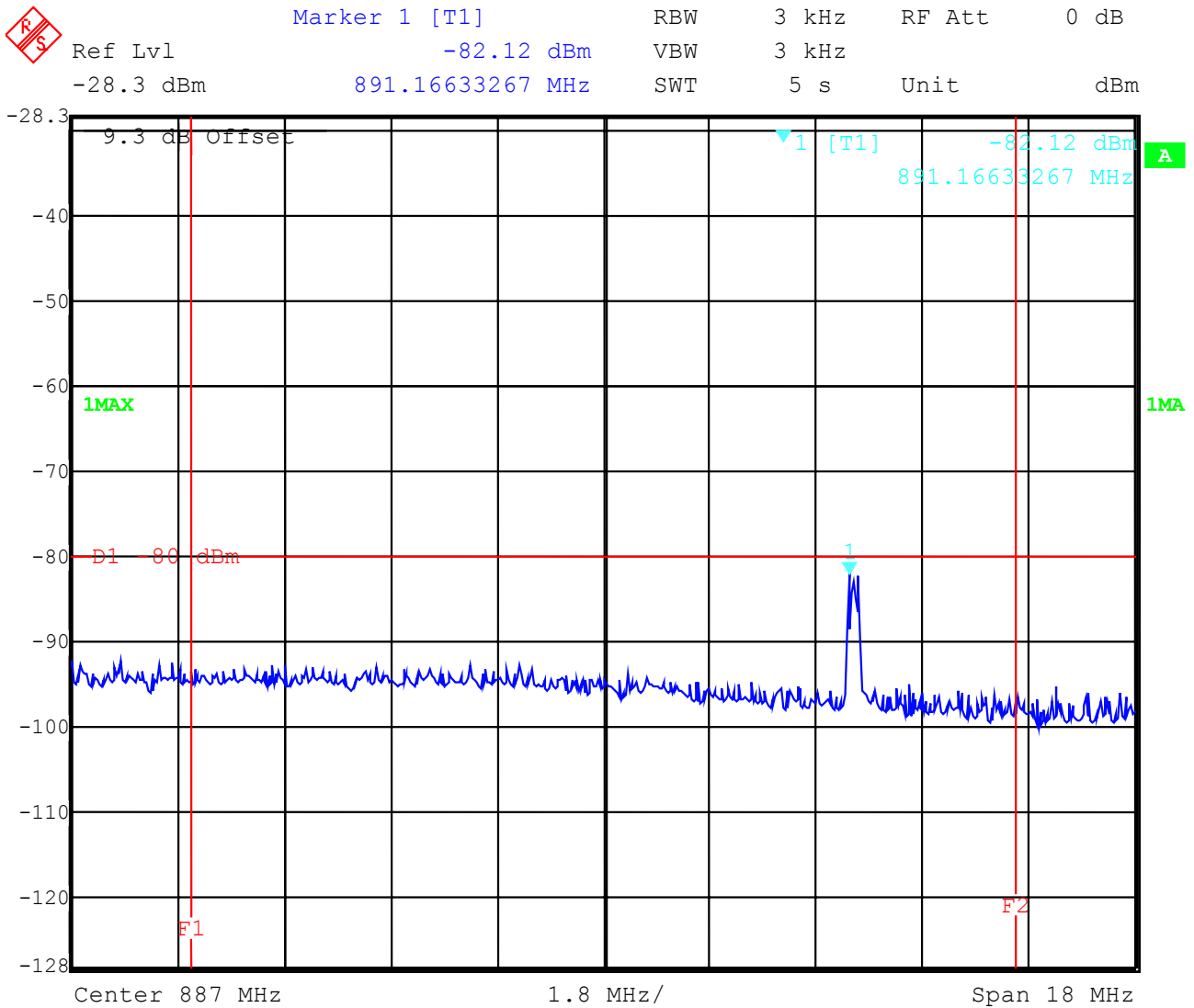
**§22.917(f)**

The mean power of any emissions appearing in the base station frequency range from cellular mobile transmitters operated must be attenuated to a level not to exceed -80dBm at the transmitter antenna connector

**REFERENCE NUMBER(S) OF TEST EQUIPMENT USED**  
(for reference numbers see test equipment listing)

Mobile emissions in the base frequency range

**TX Mode CH 251 base station frequency range B**



**F1 = 880 MHz, F2 = 894 MHz**

**LIMITS**

§22.917(f)

The mean power of any emissions appearing in the base station frequency range from cellular mobile transmitters operated must be attenuated to a level not to exceed -80dBm at the transmitter antenna connector

**REFERENCE NUMBER(S) OF TEST EQUIPMENT USED**  
(for reference numbers see test equipment listing)



## ADDITIONAL MEASUREMENTS FOR ANCILLARY EQUIPMENT      PART 15.109

The radiated measurements are performed in vertical and horizontal plane in the frequency range from 9 kHz to 20 GHz in semi-anechoic chambers. The EUT is positioned on a non-conductive support with a height of 0.80 m above a conductive ground plane that covers the whole chamber.

The receiving antennas conform with specifications ANSI C63.2-1987 clause 15 and ANSI C63.4-1992 clause 4.1.5. These antennas can be moved over the height range between 1.0 m and 4.0 m in order to search for maximum field strength emitted from EUT. The measurement distances between EUT and receiving antennas are indicated in the test setups for the various frequency ranges. For each measurement, the EUT is rotated in all three axes until the maximum field strength is received.

The wanted and unwanted emissions are received by spectrum analyzers where the detector modes and resolution bandwidths over various frequency ranges are set according to requirement ANSI C63-4-1992 clause 4.2.

Antennas conform with ANSI C63.2-1996 item 15.

9 kHz - 30 MHz: Quasi Peak measurement, 9kHz Bandwidth, passive loop antenna.

30 MHz - 200 MHz: Quasi Peak measurement, 120KHz Bandwidth, biconical antenna

200MHz - 1GHz: Quasi Peak measurement, 120KHz Bandwidth, log periodic antenna

1GHz: Average, RBW 1MHz, VBW 10 Hz, wave-guide horn

### Ancillary equipment :

No ancillary equipment

## TEST EQUIPMENT AND ANCILLARIES USED FOR TESTS

To simplify the identification on each page of the test equipment used, on each page of the test report, each item of test equipment and ancillaries such as cables are identified (numbered) by the Test Laboratory, below.

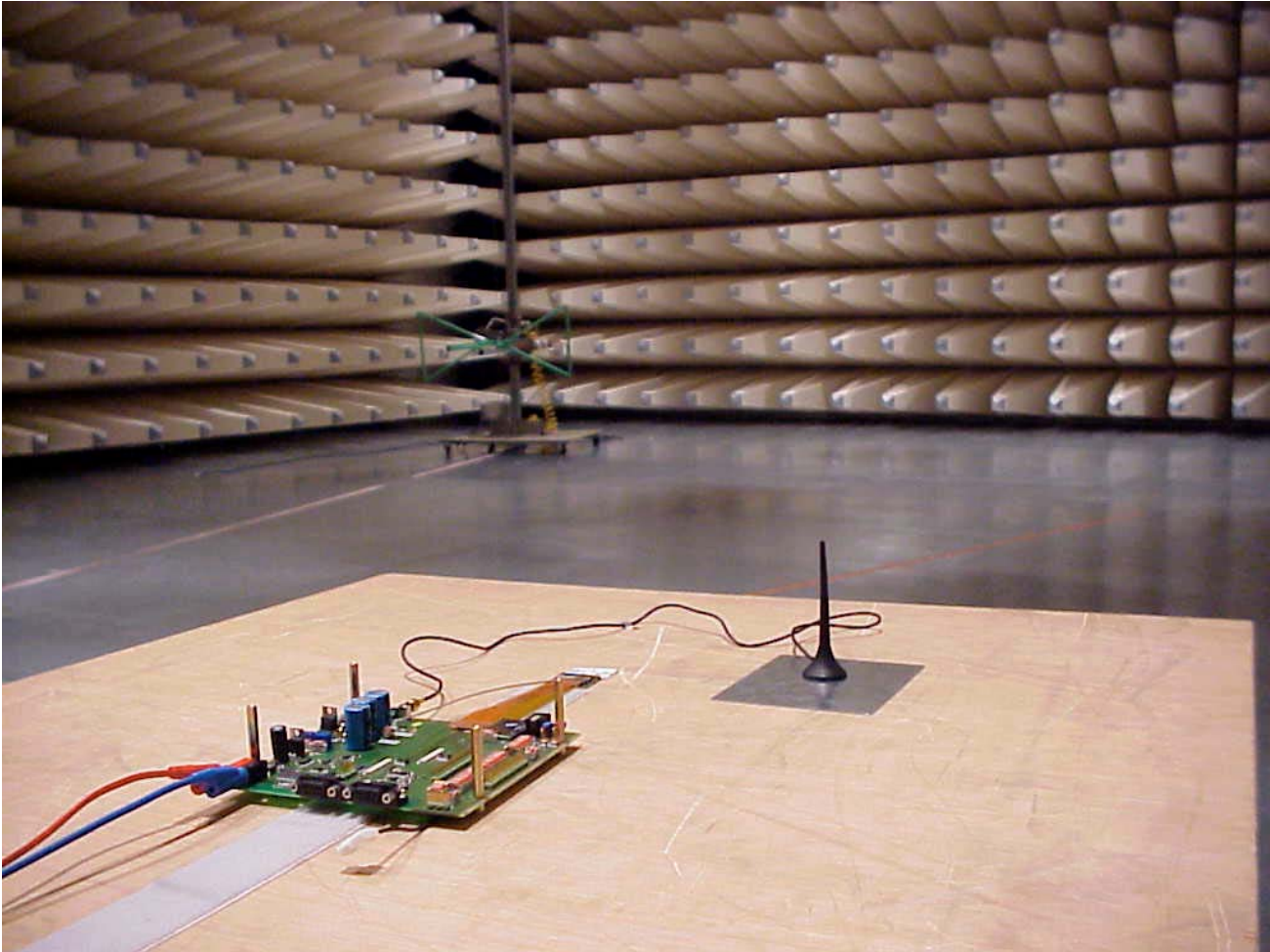
No	Instrument/Ancillary	Type	Manufacturer	Serial No.
01	Spectrum Analyzer	8566 A	Hewlett-Packard	1925A00257
02	Analyzer Display	8566 A	Hewlett-Packard	1925A00860
03	Oscilloscope	7633	Tektronix	230054
04	Radio Communication Analyzer	CMTA 54	Rohde & Schwarz	894 043/010
05	System Power Supply	6038 A	Hewlett-Packard	2848A07027
06	Signal Generator	8111 A	Hewlett-Packard	2215G00867
07	Signal Generator	8662 A	Hewlett-Packard	2224A01012
08	Function Generator	AFGU	Rohde & Schwarz	862 480/032
09	Regulating Transformer	MPL	Erfi	91350
10	LISN	NNLA 8120	Schwarzbeck	8120331
11	Relay-Matrix	PSU	Rohde & Schwarz	893 285/020
12	Power-Meter	436 A	Hewlett-Packard	2101A12378
13	Power-Sensor	8484 A	Hewlett-Packard	2237A10156
14	Power-Sensor	8482 A	Hewlett-Packard	2237A00616
15	Modulation Meter	9008	Racal-Dana	2647
16	Frequency Counter	5340 A	Hewlett-Packard	1532A03899
17	Anechoic Chamber	---	MWB	87400/002
18	Spectrum Analyzer	85660 B	Hewlett-Packard	2747A05306
19	Analyzer Display	85662 A	Hewlett-Packard	2816A16541
20	Quasi Peak Adapter	85650 A	Hewlett-Packard	2811A01131
21	RF-Preselector	85685 A	Hewlett-Packard	2833A00768
22	Biconical Antenna	3104	Emco	3758
23	Log. Per. Antenna	3146	Emco	2130
24	Double Ridged Horn	3115	Emco	3088
25	EMI-Testreceiver	ESAI	Rohde & Schwarz	863 180/013
26	EMI-Analyzer-Display	ESAI-D	Rohde & Schwarz	862 771/008
27	Biconical Antenna	HK 116	Rohde & Schwarz	888 945/013
28	Log. Per. Antenna	HL 223	Rohde & Schwarz	825 584/002
29	Relay-Switch-Unit	RSU	Rohde & Schwarz	375 339/002
30	Highpass	HM985955	FSY Microwave	001
31	Amplifier	P42-GA29	Tron-Tech	B 23602
32	Anechoic Chamber		Frankonia	
33	Control Computer	PSM 7	Rohde & Schwarz	834 621/004
34	EMI Test Receiver	ESMI	Rohde & Schwarz	827 063/010
35	EMI Test Receiver	Display	Rohde & Schwarz	829 808/010

## TEST EQUIPMENT AND ANCILLARIES USED FOR TESTS

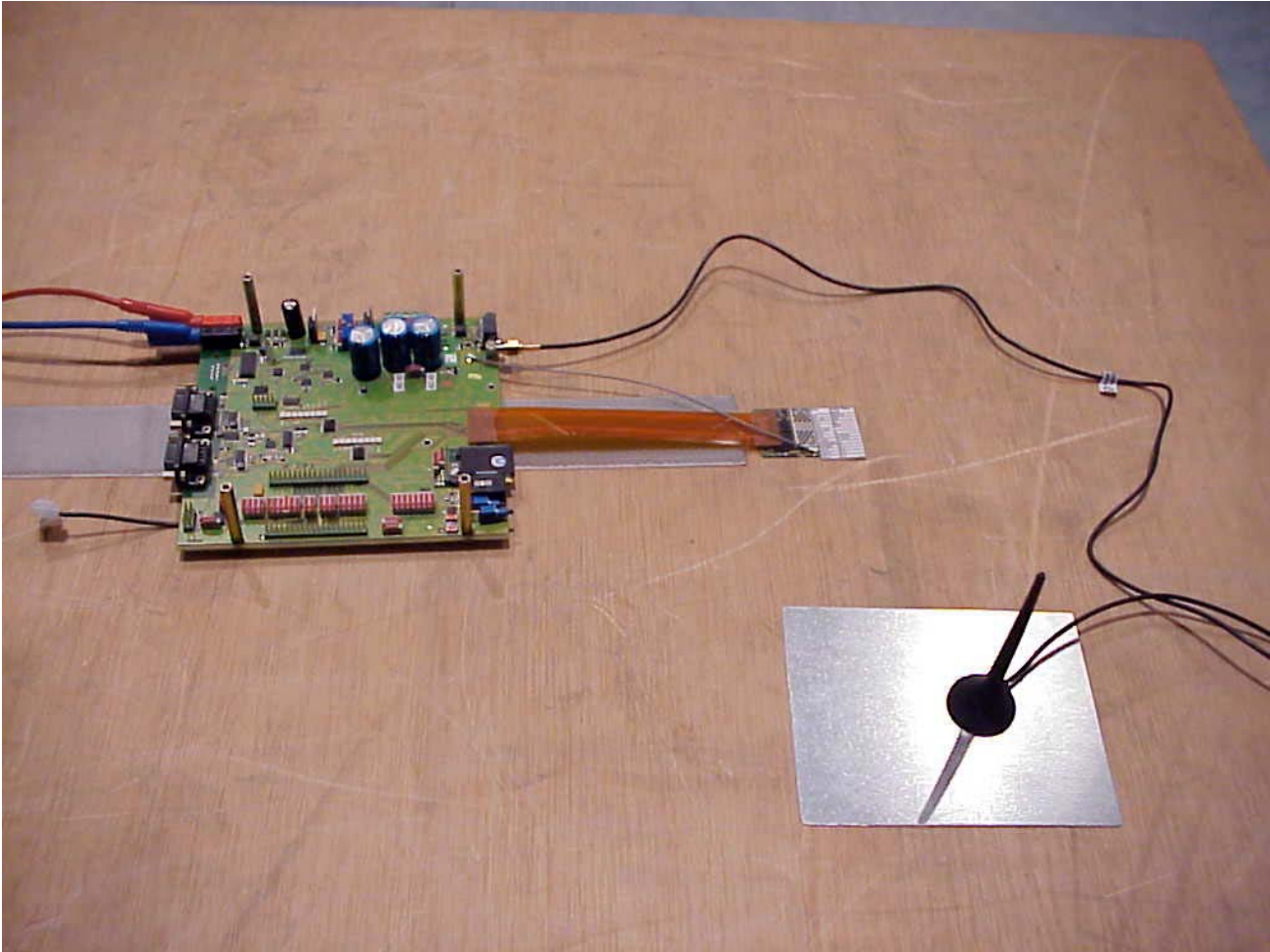
To simplify the identification on each page of the test equipment used, on each page of the test report, each item of test equipment and ancillaries such as cables are identified (numbered) by the Test Laboratory, below.

No	Instrument/Ancillary	Type	Manufacturer	Serial No.
36	Control Computer	HD 100	Deisel	100/322/93
37	Relay Matrix	PSN	Rohde & Schwarz	829 065/003
38	Control Unit	GB 016 A2	Rohde & Schwarz	344 122/008
39	Relay Switch Unit	RSU	Rohde & Schwarz	316 790/001
40	Power Supply	6032A	Hewlett Packard	2846A04063
41	Spectrum Monitor	EZM	Rohde & Schwarz	883 720/006
42	Measuring Receiver	ESH 3	Rohde & Schwarz	890 174/002
43	Measuring Receiver	ESVP	Rohde & Schwarz	891 752/005
44	Bicon Ant. 20-300MHz	HK 116	Rohde & Schwarz	833 162/011
45	Logper Ant. 0.3-1 GHz	HL 223	Rohde & Schwarz	832 914/010
46	Amplifier 0.1-4 GHz	AFS4	Miteq Inc.	206461
47	Logper Ant. 1-18 GHz	HL 024 A2	Rohde & Schwarz	342 662/002
48	Polarisation Network	HL 024 Z1	Rohde & Schwarz	341 570/002
49	Double Ridged Horn Antenna 1-26.5 GHz	3115	EMCO	9107-3696
50	Microw. Sys. Amplifier 0.5- 26.5 GHz	8317A	Hewlett Packard	3123A00105
51	Audio Analyzer	UPD	Rohde & Schwarz	1030.7500.04
52	Controler	PSM 7	Rohde & Schwarz	883 086/026
53	DC V-Network	ESH3-Z6	Rohde & Schwarz	861 406/005
54	DC V-Network	ESH3-Z6	Rohde & Schwarz	893 689/012
55	AC 2 Phase V-Network	ESH3-Z5	Rohde & Schwarz	861 189/014
56	AC 2 Phase V-Network	ESH3-Z5	Rohde & Schwarz	894 981/019
57	AC-3 Phase V-Network	ESH2-Z5	Rohde & Schwarz	882 394/007
58	Power Supply	6032A	Rohde & Schwarz	2933A05441
59	RF-Test Receiver	ESVP.52	Rohde & Schwarz	881 487/021
60	Spectrum Monitor	EZM	Rohde & Schwarz	883 086/026
61	RF-Test Receiver	ESH3	Rohde & Schwarz	881 515/002
62	Relay Matrix	PSU	Rohde & Schwarz	882 943/029
63	Relay Matrix	PSU	Rohde & Schwarz	828 628/007
64	Spectrum Analyzer	FSIQ 26	Rohde & Schwarz	119.6001.27
65	Spectrum Analyzer	HP 8565E	Hewlett Packard	3473A00773
66				
67				
68				

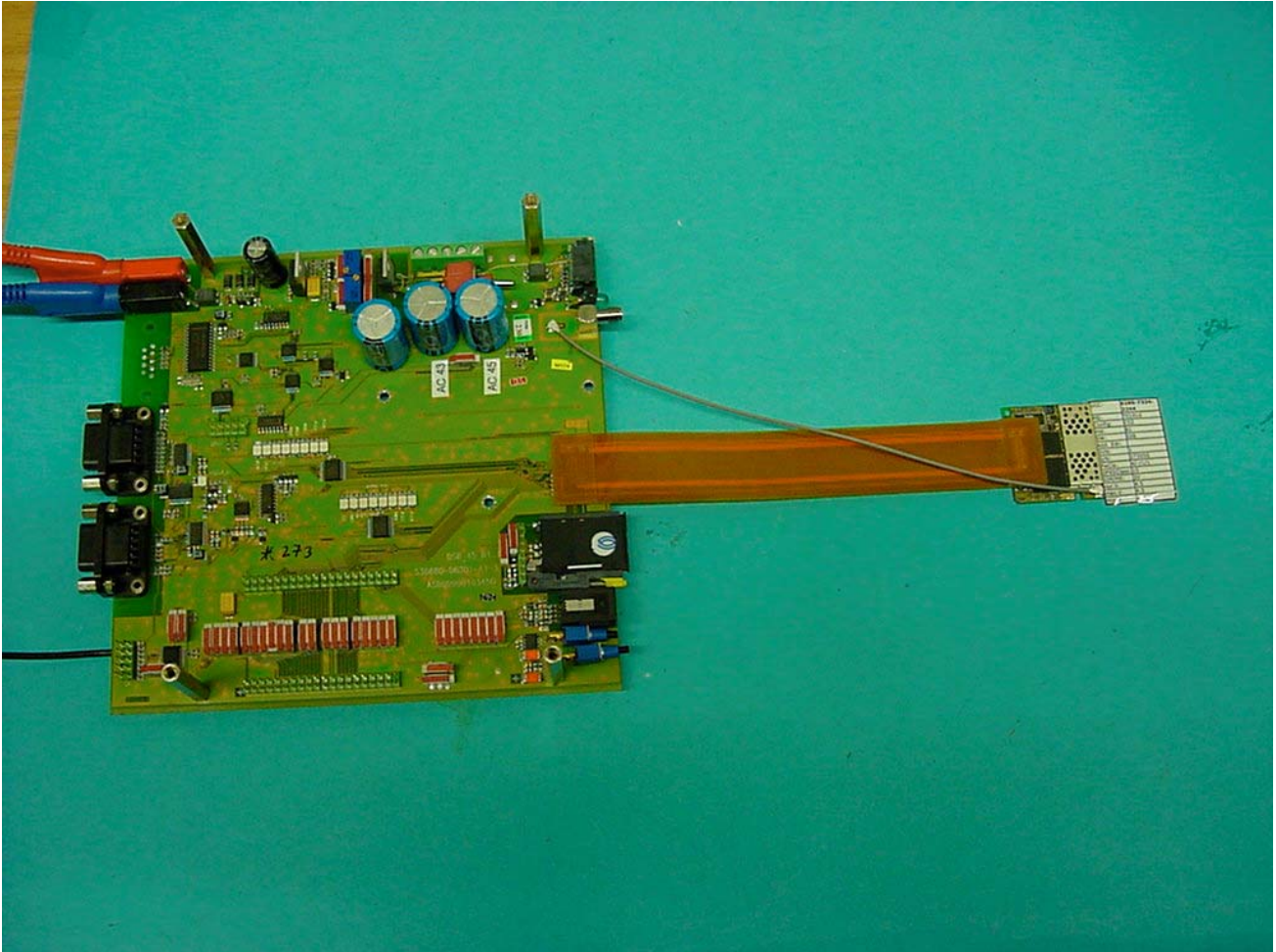
Test site



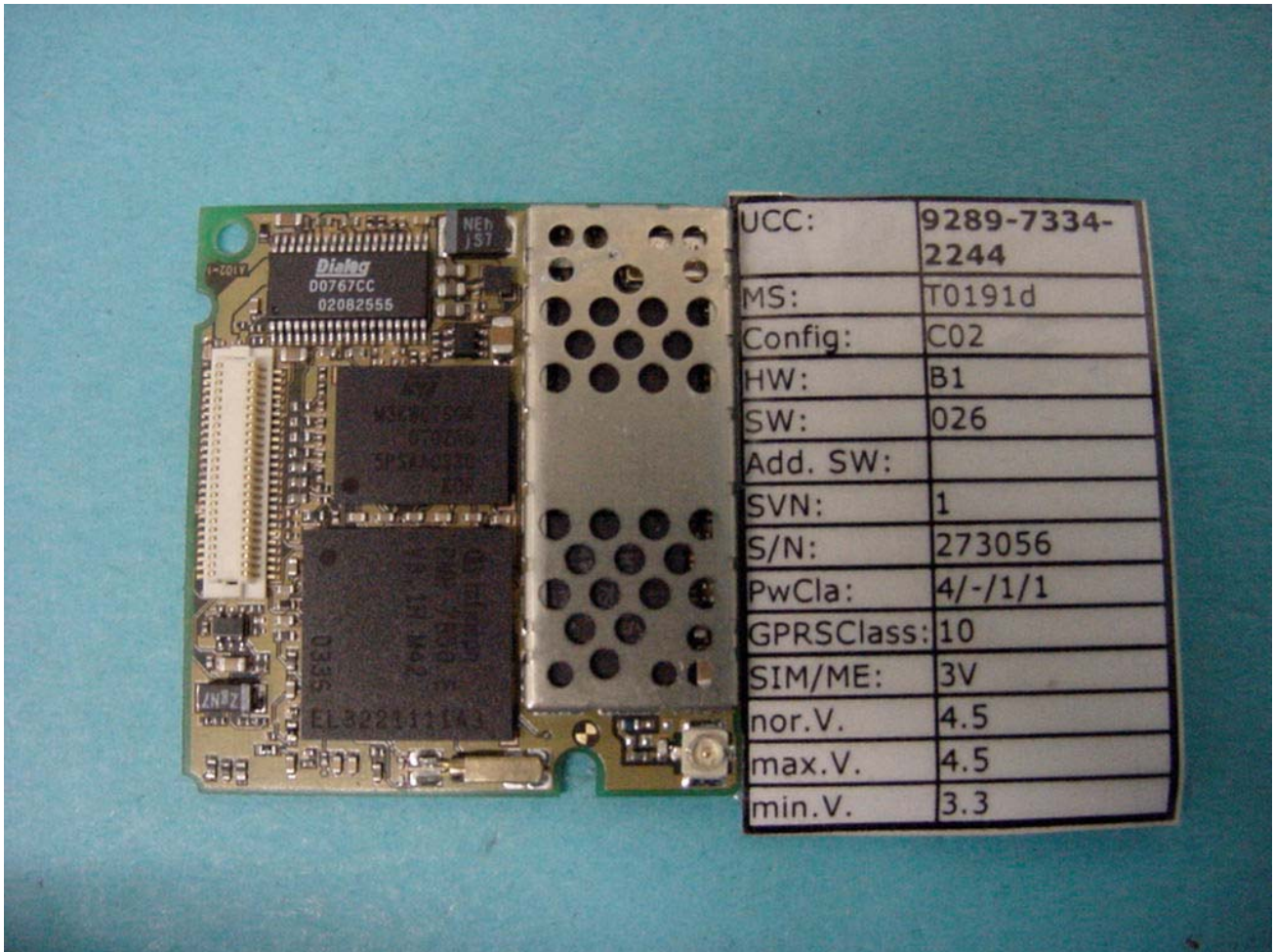
Card with connection board and sample antenna



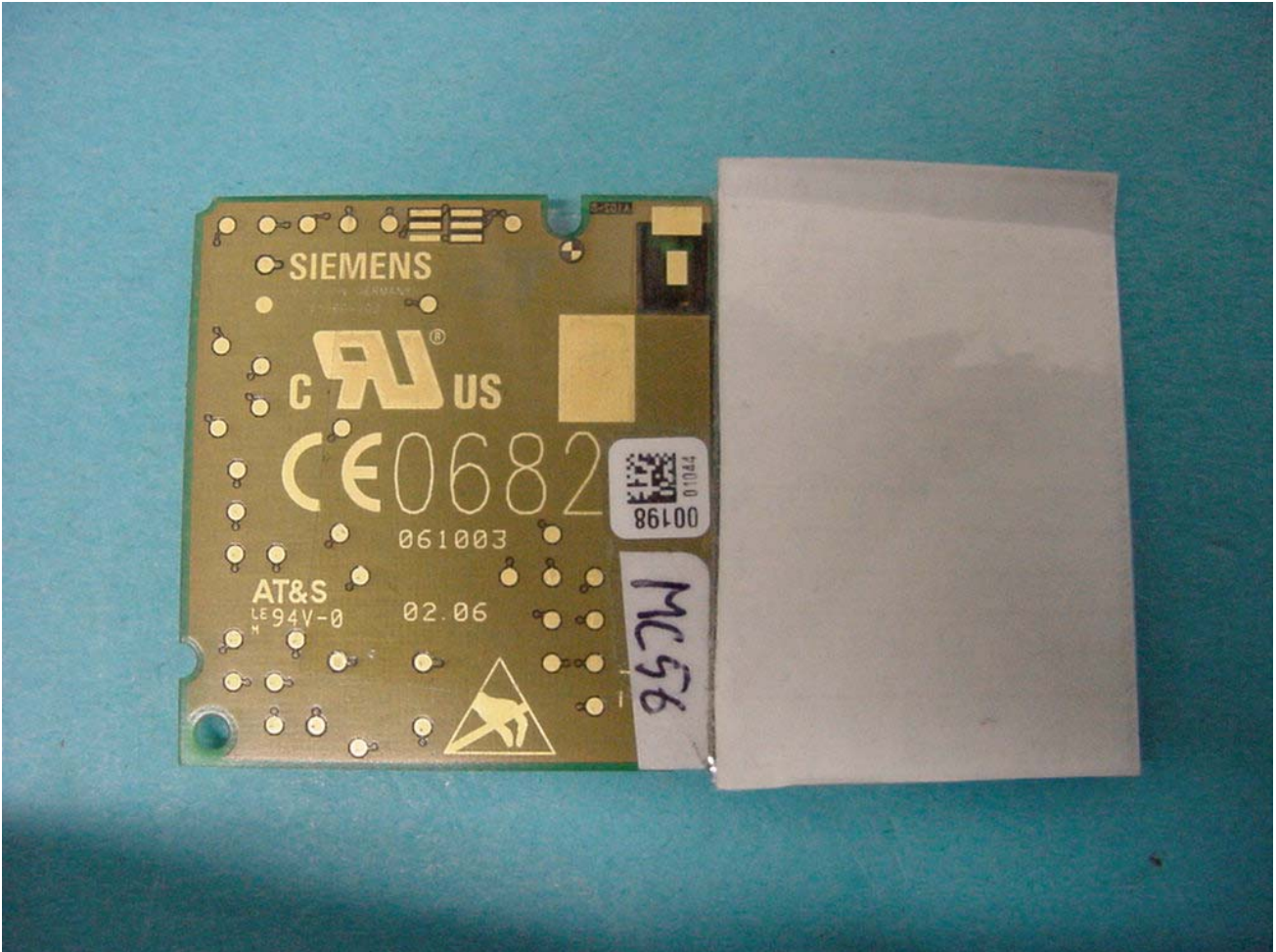
Card with connection board



Photographs of the equipment



Photographs of the equipment





Photographs of the equipment

