



FCC Test Report

FCC Part 24

FOR:

GSM/UMTS/HSDPA Mobile Phone

MODEL #: RG4-E01

Toshiba Information Systems (UK) Ltd., Mobile Communications Division

**Riverside Way
Camberley, Surrey, GU15 3YA UK**

FCC ID: SP2-RG4-E01

**TEST REPORT #: EMC_CETEC_009_06502_FCC_24
DATE: 2006-12-06**



**FCC listed#
101450**

**IC recognized #
3925**

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1 Assessment

The following is in compliance with the applicable criteria specified in FCC rules Parts 2, 22 and 24 of Title 47 of the Code of Federal Regulations and in compliance with the applicable criteria specified in Industry Canada rules RSS132 and RSS133.

Company	Description	Model #
Toshiba Information Systems (UK) Ltd., Mobile Communications Division	GSM/UMTS/HSDPA Mobile Phone	RG4-E01

Technical responsibility for area of testing:

2006-12-07 EMC & Radio Lothar Schmidt
(Test Lab Manager)



Date	Section	Name	Signature
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The test results of this test report relate exclusively to the test item specified in Identification of the Equipment under Test. The CETECOM Inc. USA 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 Inc USA.

2 Administrative Data

2.1 Identification of the Testing Laboratory Issuing the EMC Test Report

Company Name:	CETECOM Inc.
Department:	EMC
Address:	411 Dixon Landing Road Milpitas, CA 95035 U.S.A.
Telephone:	+1 (408) 586 6200
Fax:	+1 (408) 586 6299
Responsible Test Lab Manager:	Lothar Schmidt
Responsible Project Leader:	Peter Mu
Date of test:	2006-10-27 to 2006-11-14

2.2 Identification of the Client

APPLICANT	
Applicant (Company Name)	Toshiba Information Systems (UK) Ltd., MobileCommunications Division
Street Address	Riverside Way
City/Zip Code	Camberley, Surrey, GU15 3YA
Country	UK
Contact Person	Adrian Coyle
Telephone	+44 1276 405100
Fax	+44 1276 405111
e-mail	adrian.coyle@toshiba.co.uk

2.3 Identification of the Manufacturer

MANUFACTURER	
Manufacturer	Toshiba Corporation
Street Address	1-1, Shibaura 1-Chome, Minato-ku
City/Zip Code	Tokyo, 105-8001
Country	Japan

3 Equipment under Test (EUT)

3.1 Specification of the Equipment under Test

EUT	
Marketing Name of EUT (if not same as Model No.)	RG4-E01
Description	GSM/UMTS/HSDPA Mobile Phone
Model No.	RG4-E01
Serial No.	
H/W & S/W	HW version: SP1 SW version: TF_QCT2340C_SHARK_VER_01.25_20061130
FCC-ID	SP2-RG4-E01
IC-ID (Industry Canada)	N/A

Frequency Range:	1850.2MHz – 1909.8MHz for PCS 1900
Type(s) of Modulation:	GMSK, 8-PSK
Number of Channels:	299 for PCS-1900
Antenna Type:	PIFA/average Gain is about -5dBi
Max. Output Power:	Conducted : 29.12dBm (0.871W) @ CH512, GMSK 28.50dBm (0.708W) @ CH661, 8PSK Radiated : 30.64dBm (1.16W) @CH512, GMSK 29.52dBm (0.895W) @ CH661, 8PSK

3.2 Identification of the Equipment Under Test (EUT)

EUT #	TYPE	MANF.	MODEL	SERIAL #
1	EUt	Toshiba Corporation	RG4-E01	004401-120210-360

3.3 Identification of Accessory equipment

AE #	TYPE	MANF.	MODEL	SERIAL #
1	AC/DC ADAPTER	TAMURA	AWW0515KA (SP)	0640

4 Subject of Investigation

All testing was performed on the EUT listed in Section 3. The EUT was maximized in the X,Y, Z positions , all data in this report shows the worst case between horizontal and vertical polarization for above 1GHz.

The objective of the measurements done by Cetecom Inc. was to measure the performance of the EUT as specified by requirements listed in FCC rules Parts 2, 22 and 24 of Title 47 of the Code of Federal Regulations and Industry Canada rules RSS132 and RSS133. The maximization of portable equipment is conducted in accordance with ANSI C63.4.

5 Measurements

5.1 RF Power Output

5.1.1 FCC 2.1046 Measurements required: RF power output.

Power output shall be measured at the RF output terminals when the transmitter is adjusted in accordance with the tune-up procedure to give the values of current and voltage on circuit elements as specified. The electrical characteristics of the radio frequency load attached to the output terminals when this test is made shall be stated.

5.1.2 Limits:

5.1.2.1 FCC 22.913 (a) Effective radiated power limits.

The effective radiated power (ERP) of mobile transmitters must not exceed 7 Watts.

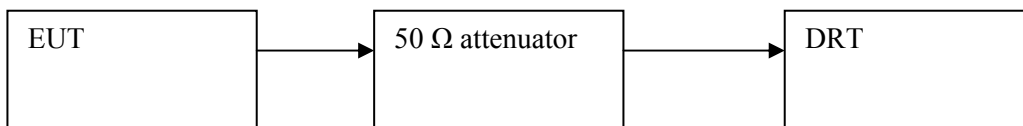
5.1.2.2 FCC 24.232 (b)(c) Power limits.

(b) Mobile/portable stations are limited to 2 Watts effective isotropic radiated power (EIRP).

(c) Peak transmit power must be measured over any interval of continuous transmission using instrumentation calibrated in terms of an rms equivalent voltage. The measurement results shall be properly adjusted for any limitations, such as detector response times, limited resolution bandwidth capability when compared to the emission bandwidth, sensitivity, etc., so as to obtain a true peak measurement over the full bandwidth of the channel.

5.1.3 Conducted Output Power Measurement procedure: Based on TIA-603C 2004

2.2.1 Conducted Carrier Output Power Rating

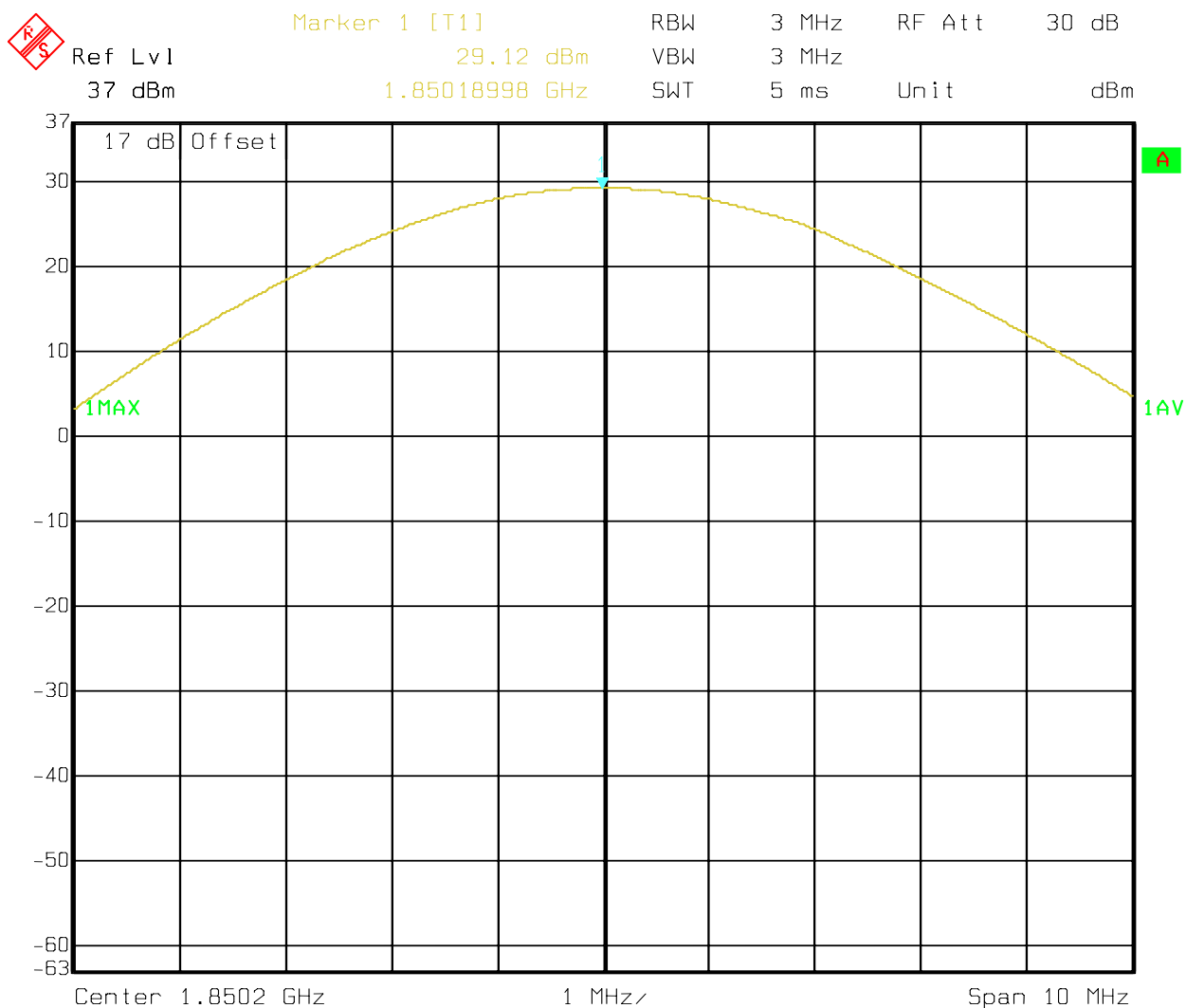


1. Connect the equipment as shown in the above diagram. A Digital Radiocommunication Tester (DRT) is used to enable the EUT to transmit and to measure the output power.
2. Adjust the settings of the DRT to set the EUT to its maximum power at the required channel.
3. Record the output power level measured by the DRT.
4. Correct the measured level for all losses in the RF path.
5. Measurements are to be performed with the EUT set to the low, middle and high channel of each frequency band.

5.1.4 Results 1900 MHz band(conducted):

Frequency (MHz)	Conducted Output Power (dBm)	
	GPRS	EGPRS
1850.2	29.12	25.66
1880.0	28.70	28.50
1909.8	28.14	27.85

**RF OUTPUT POWER (PCS-1900)
 CHANNEL 512 GPRS**



Date: 08.NOV.2006 17:01:10

**RF OUTPUT POWER (PCS-1900)
CHANNEL 661 GPRS**

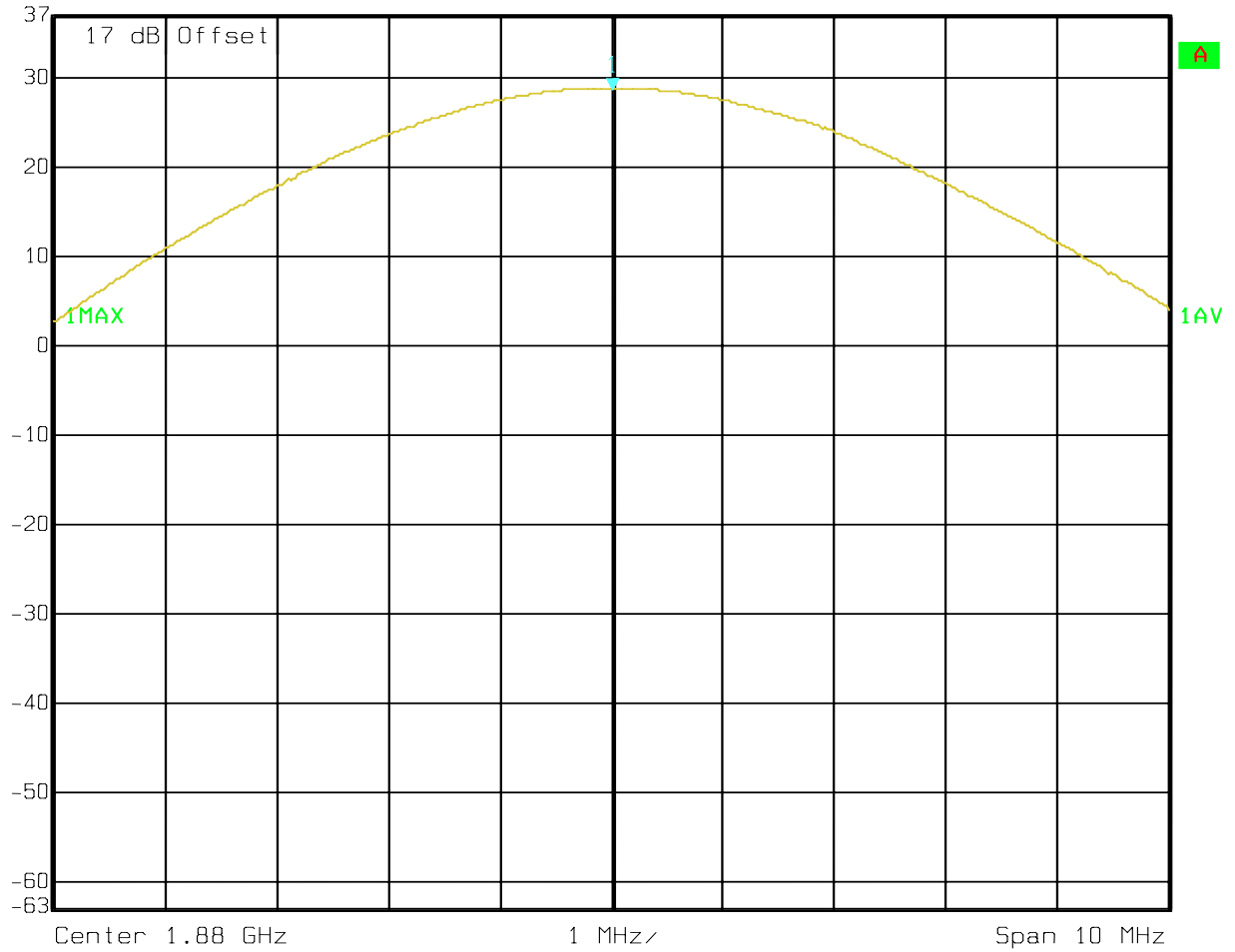


Ref Lvl
37 dBm

Marker 1 [T1]

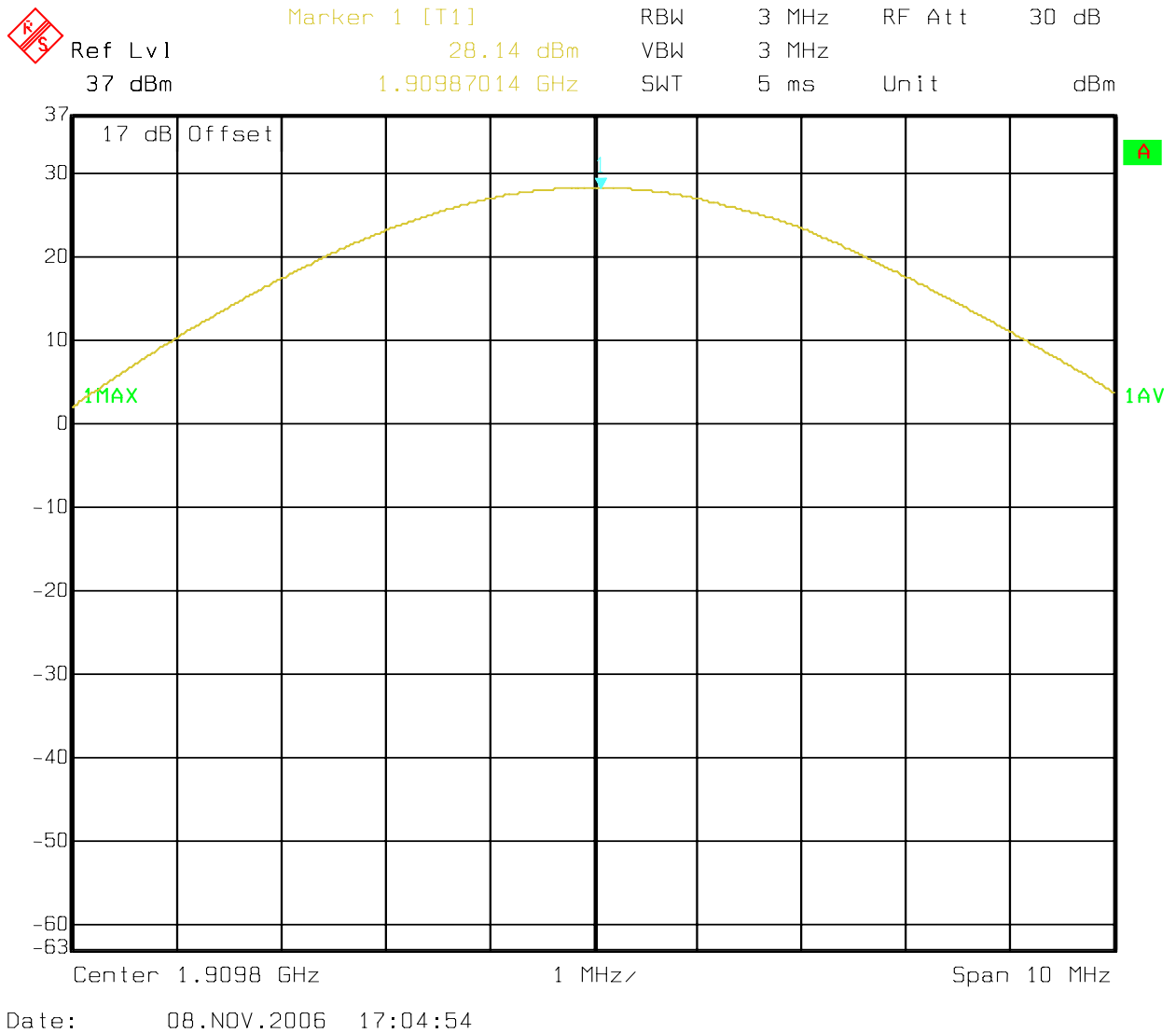
28.70 dBm
1.88001002 GHz

RBW 3 MHz RF Att 30 dB
VBW 3 MHz
SWT 5 ms Unit dBm

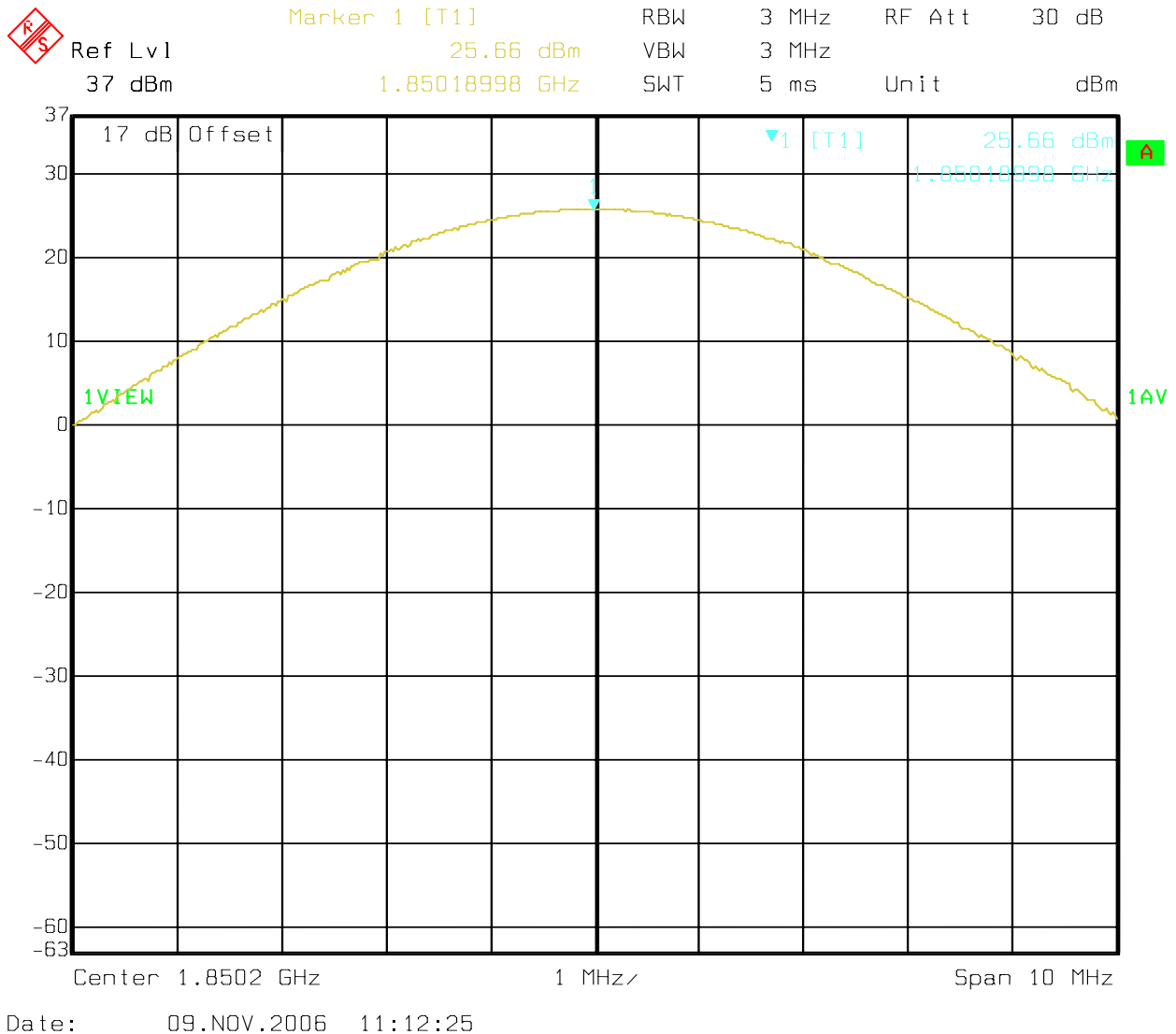


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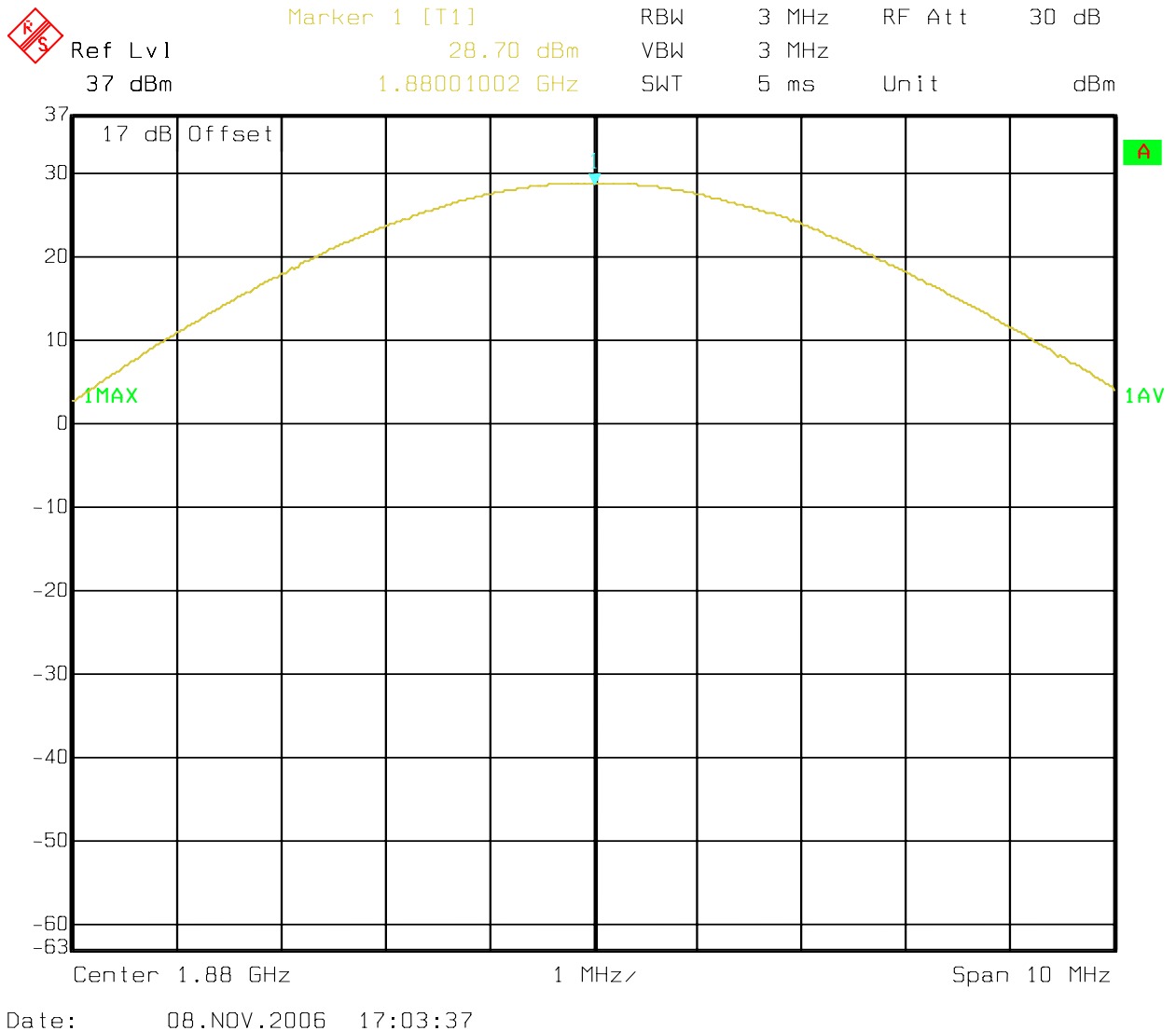
**RF OUTPUT POWER (PCS-1900)
 CHANNEL 810 GPRS**



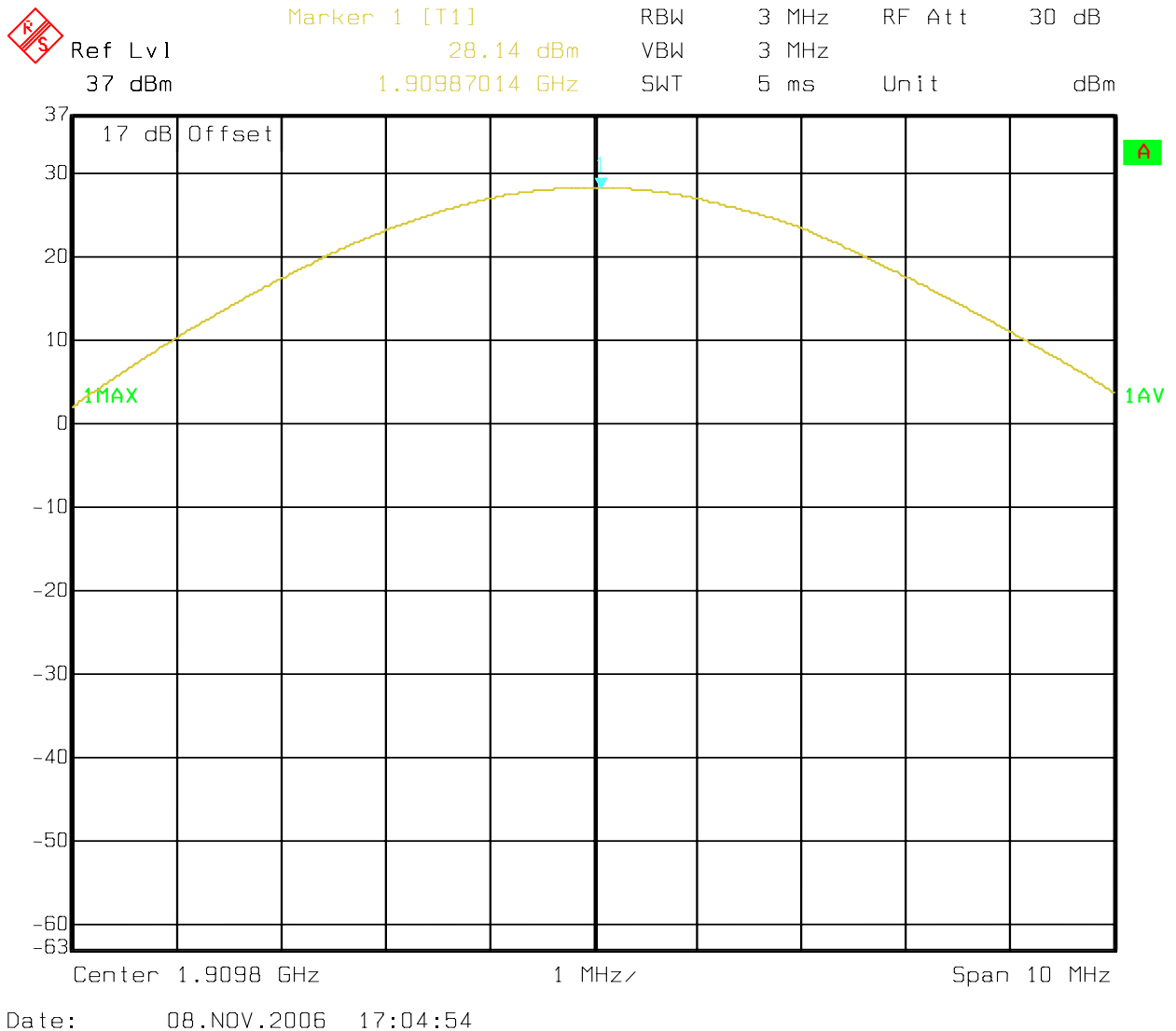
**RF OUTPUT POWER (PCS-1900)
 CHANNEL 512 EGPRS**



**RF OUTPUT POWER (PCS-1900)
 CHANNEL 661 EGPRS**



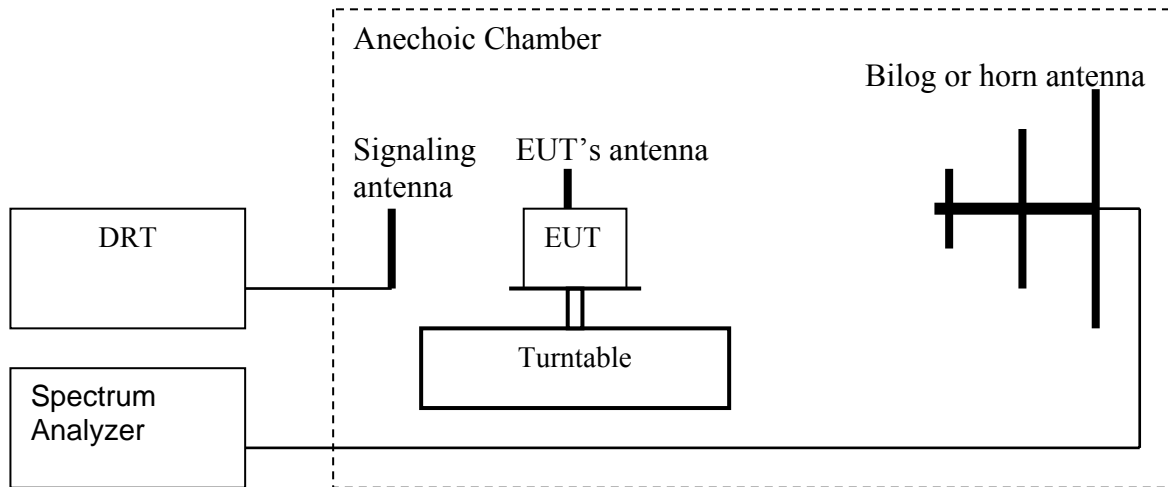
**RF OUTPUT POWER (PCS-1900)
 CHANNEL 810 EGPRS**



5.1.5 Radiated Output Power Measurement procedure:

Based on TIA-603C 2004

2.2.17.2 Effective Radiated Power (ERP) or Effective Isotropic Radiated Power (EIRP)



1. Connect the equipment as shown in the above diagram with the EUT's antenna in a vertical orientation.
 2. Adjust the settings of the Digital Radiocommunication Tester (DRT) to set the EUT to its maximum power at the required channel.
 3. Set the spectrum analyzer to the channel frequency. Set the analyzer to measure peak hold with the required settings.
 4. Rotate the EUT 360°. Record the peak level in dBm (**LVL**).
 5. Replace the EUT with a vertically polarized half wave dipole or known gain antenna. The center of the antenna should be at the same location as the center of the EUT's antenna.
 6. Connect the antenna to a signal generator with known output power and record the path loss in dB (**LOSS**). **LOSS** = Generator Output Power (dBm) – Analyzer reading (dBm).
 7. Determine the ERP using the following equation:
ERP (dBm) = LVL (dBm) + LOSS (dB)
 8. Determine the EIRP using the following equation:
EIRP (dBm) = ERP (dBm) + 2.14 (dB)
 9. Measurements are to be performed with the EUT set to the low, middle and high channel of each frequency band. **Spectrum analyzer settings = rbw=vbw=3MHz**
- (note: Steps 5 and 6 above are performed prior to testing and **LOSS** is recorded by test software. Steps 3, 4, 7 and 8 above are performed with test software.)

5.1.6 EIRP Results 1900 MHz band:

Power Control Level	Burst Peak EIRP	
0	≤33dBm (2W)	

Frequency (MHz)	Effective Isotropic Radiated Power (dBm)	
	GPRS	EGPRS
1850.2	30.64*	27.18**
1880.0	29.72*	29.52**
1909.8	28.79*	28.50**

* Results obtained from OTA Antenna Lab measurement.

** Calculated results based on antenna gain and Conducted Peak Power measurement.

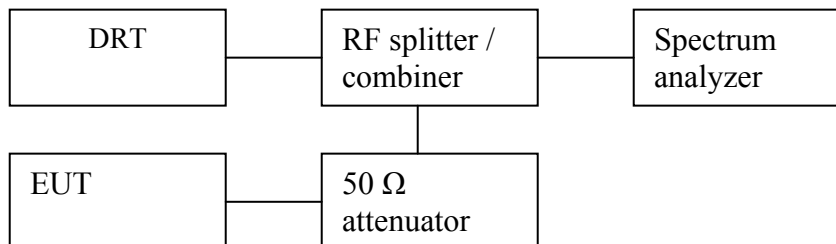
5.2 Occupied Bandwidth/Emission Bandwidth

5.2.1 FCC 2.1049 Measurements required: Occupied bandwidth

The occupied bandwidth, that is the frequency bandwidth such that below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission shall be measured under the following conditions as applicable.

(h) Transmitters employing digital modulation techniques-when modulated by an input signal such that its amplitude and symbol rate represent the maximum rated conditions under which the equipment will be operated.

5.2.2 Occupied / emission bandwidth measurement procedure:



1. Connect the equipment as shown in the above diagram.
2. Adjust the settings of the Digital Radiocommunication Tester (DRT) to set the EUT to its maximum power at the required channel.
3. Set the spectrum analyzer to measure the 99% (-20 dB) occupied bandwidth. Record the value.
4. Set the spectrum analyzer to measure the 99.5% (-26 dB) emission bandwidth. Record the value.
5. Measurements are to be performed with the EUT set to the low, middle and high channel of each frequency band.

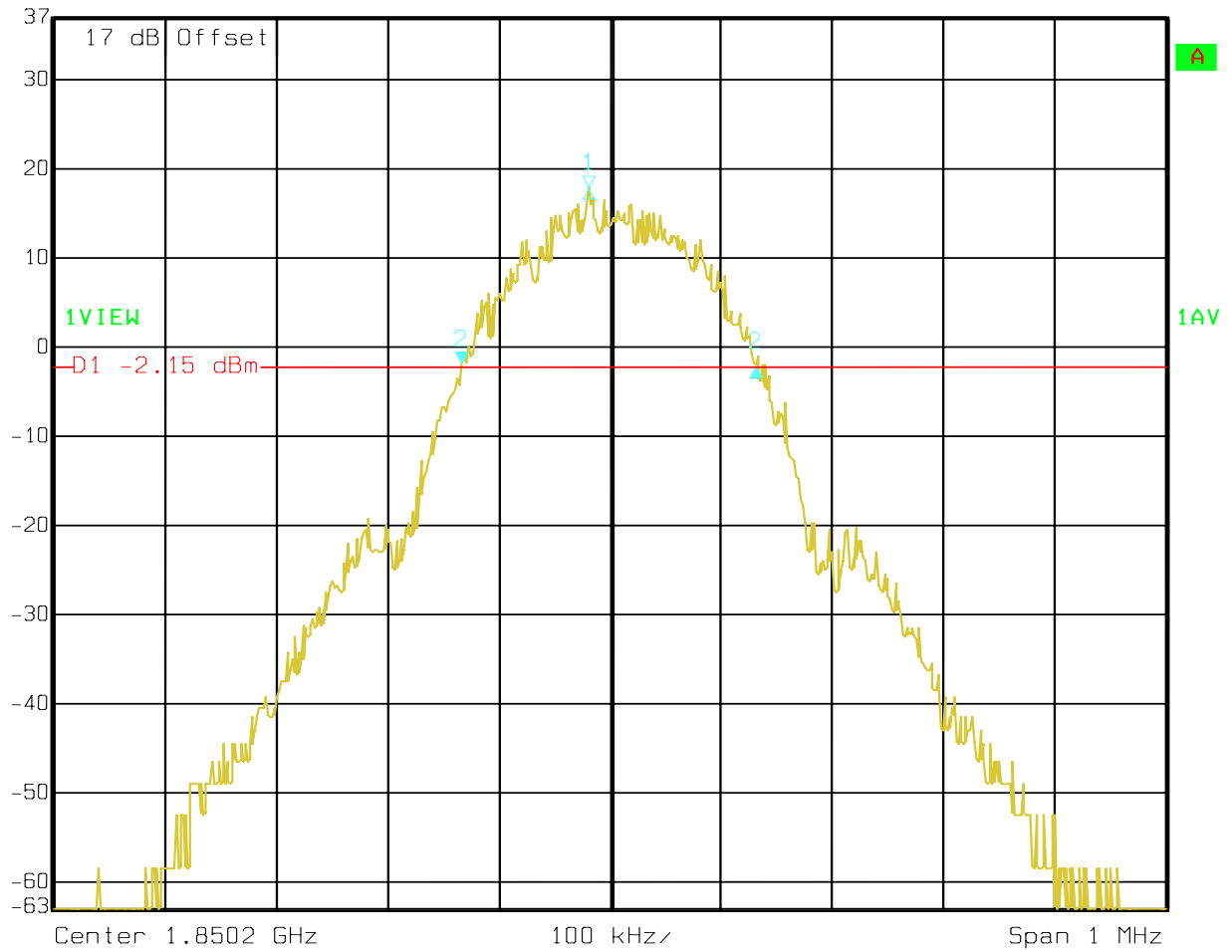
5.2.3 Occupied / Emission bandwidth results 1900 MHz band:

Frequency (MHz)	Occupied B/W -20 dB (KHz)		Emission B/W -26 dB (KHz)	
	GPRS	E-GPRS	GPRS	E-GPRS
1850.2	264.529	278.557	314.629	306.613
1880.0	260.529	284.569	302.605	306.613
1909.8	274.549	282.565	310.621	306.613

**-20dB (PCS-1900)
CHANNEL 512 GPRS**



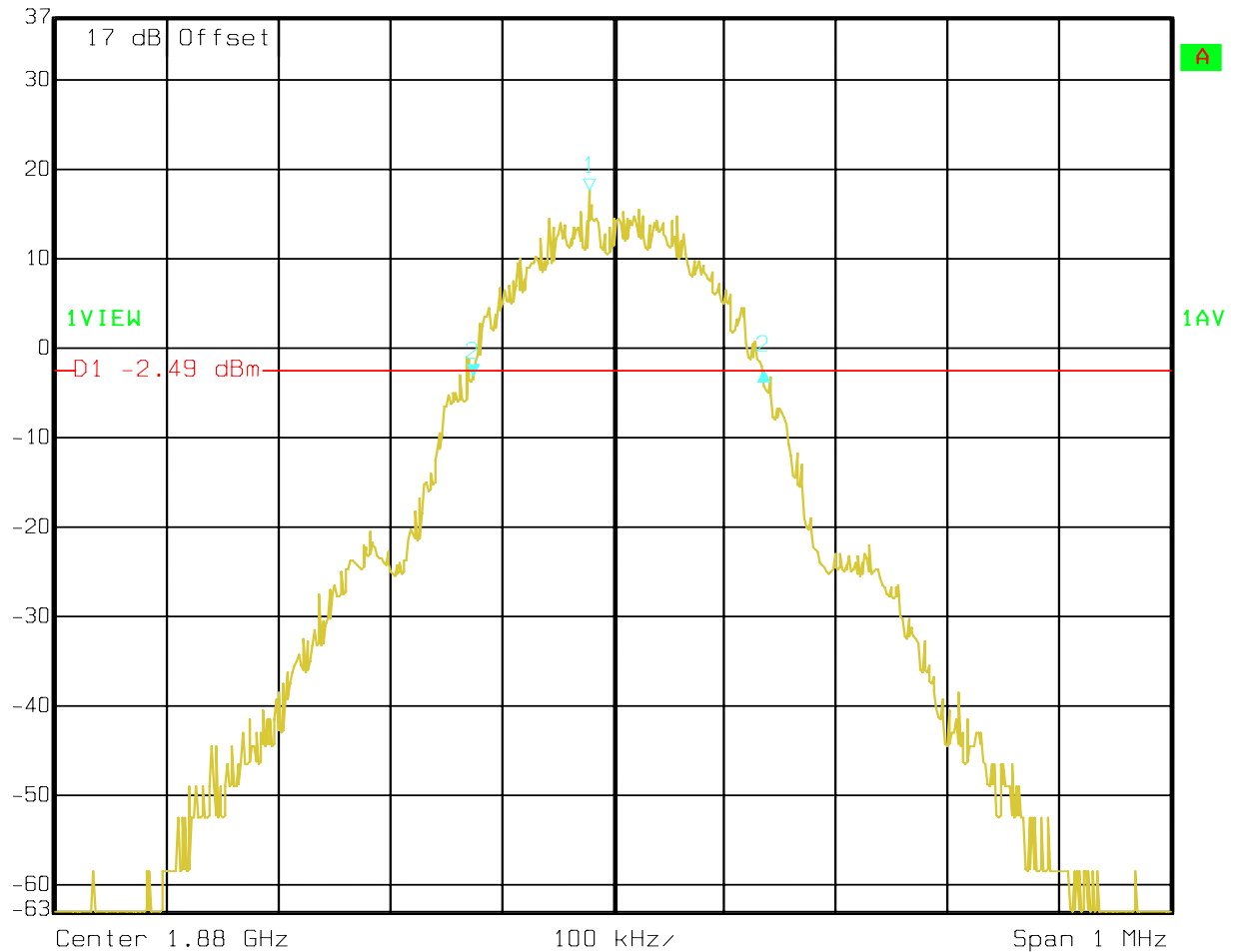
Ref Lvl 37 dBm
Delta 2 [T1] -0.19 dB
264.52905812 kHz
RBW 3 kHz
VBW 3 kHz
SWT 280 ms
RF Att 30 dB
Unit dBm



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**-20dB (PCS-1900)
 CHANNEL 661 GPRS**

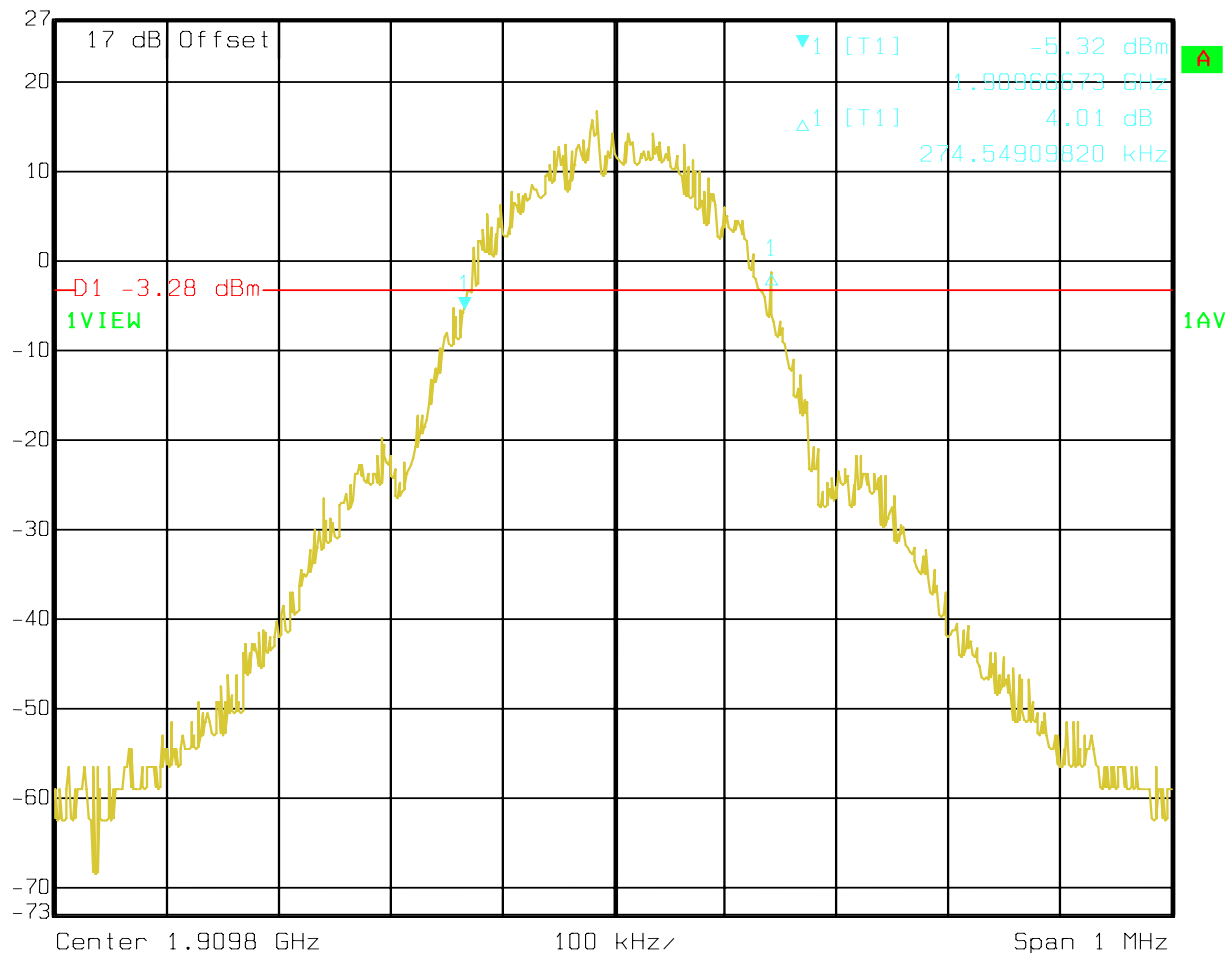

 Ref Lvl 37 dBm
 Delta 2 [T1] 0.94 dB
 260.52104208 kHz
 RBW 3 kHz
 VBW 3 kHz
 SWT 280 ms
 RF Att 30 dB
 Unit dBm



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**-20dB (PCS-1900)
 CHANNEL 810 GPRS**


 Ref Lvl 27 dBm
 Marker 1 [T1] -5.32 dBm
 1.90966673 GHz
 RBW 3 kHz
 VBW 3 kHz
 SWT 280 ms
 RF Att 20 dB
 Unit dBm

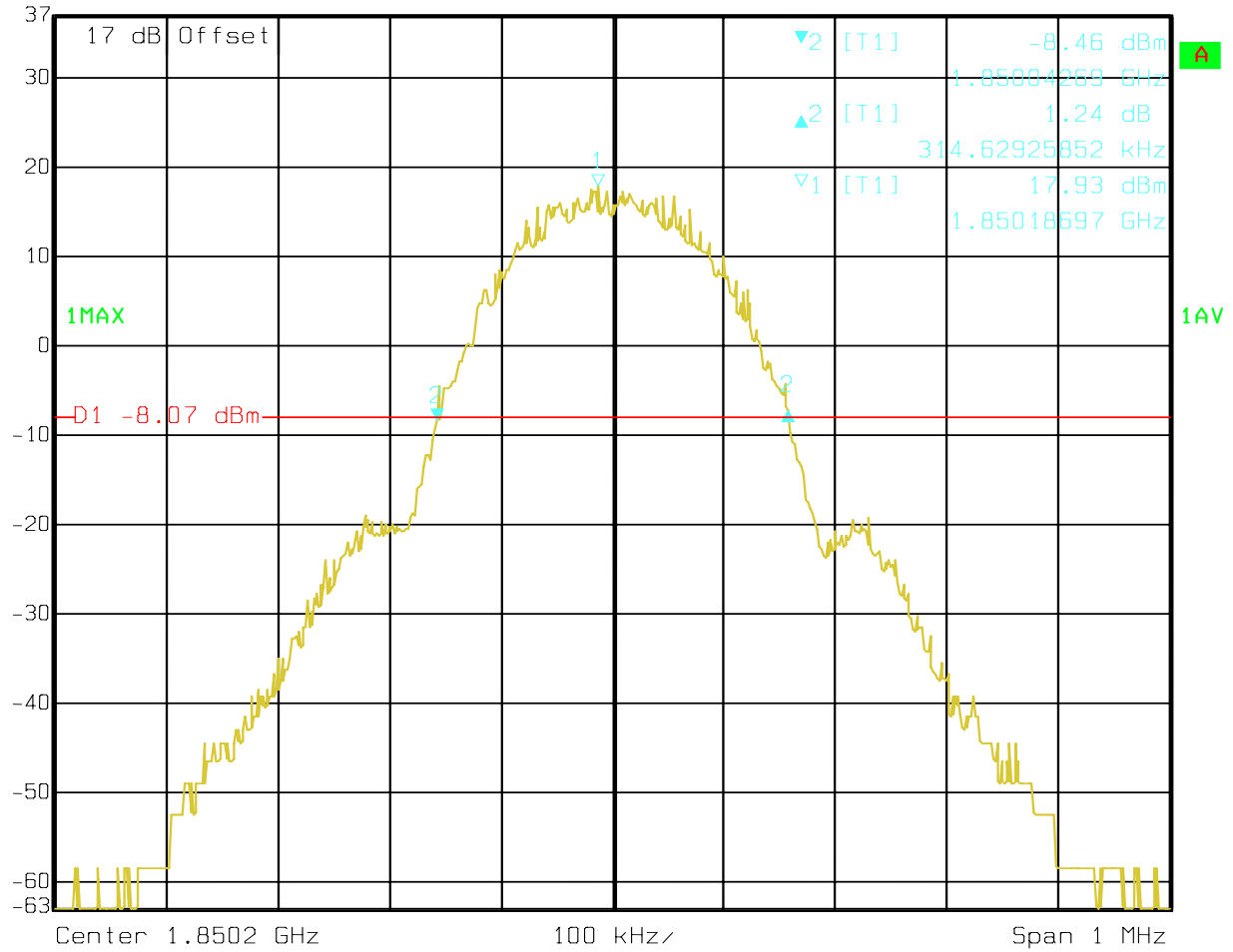


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**-26dB (PCS-1900)
CHANNEL 512 GPRS**



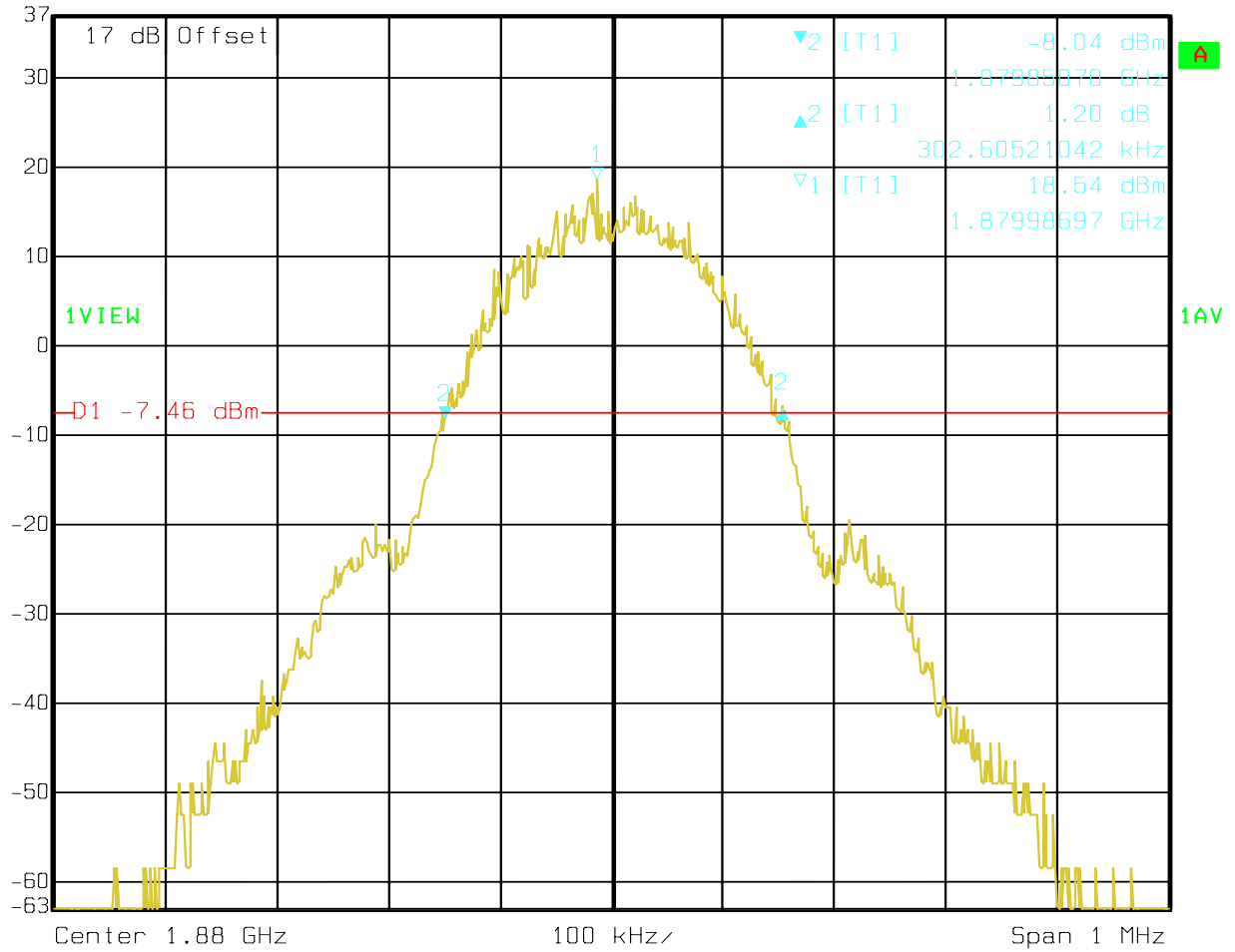
Ref Lvl 37 dBm
Delta 2 [T1] 1.24 dB
314.62925852 kHz
RBW 3 kHz
VBW 3 kHz
SWT 280 ms
RF Att 30 dB
Unit dBm



**-26dB (PCS-1900)
CHANNEL 661 GPRS**



Ref Lvl 37 dBm
Delta 2 [T1] 1.20 dB
302.60521042 kHz
RBW 3 kHz
VBW 3 kHz
SWT 280 ms
RF Att 30 dB
Unit dBm

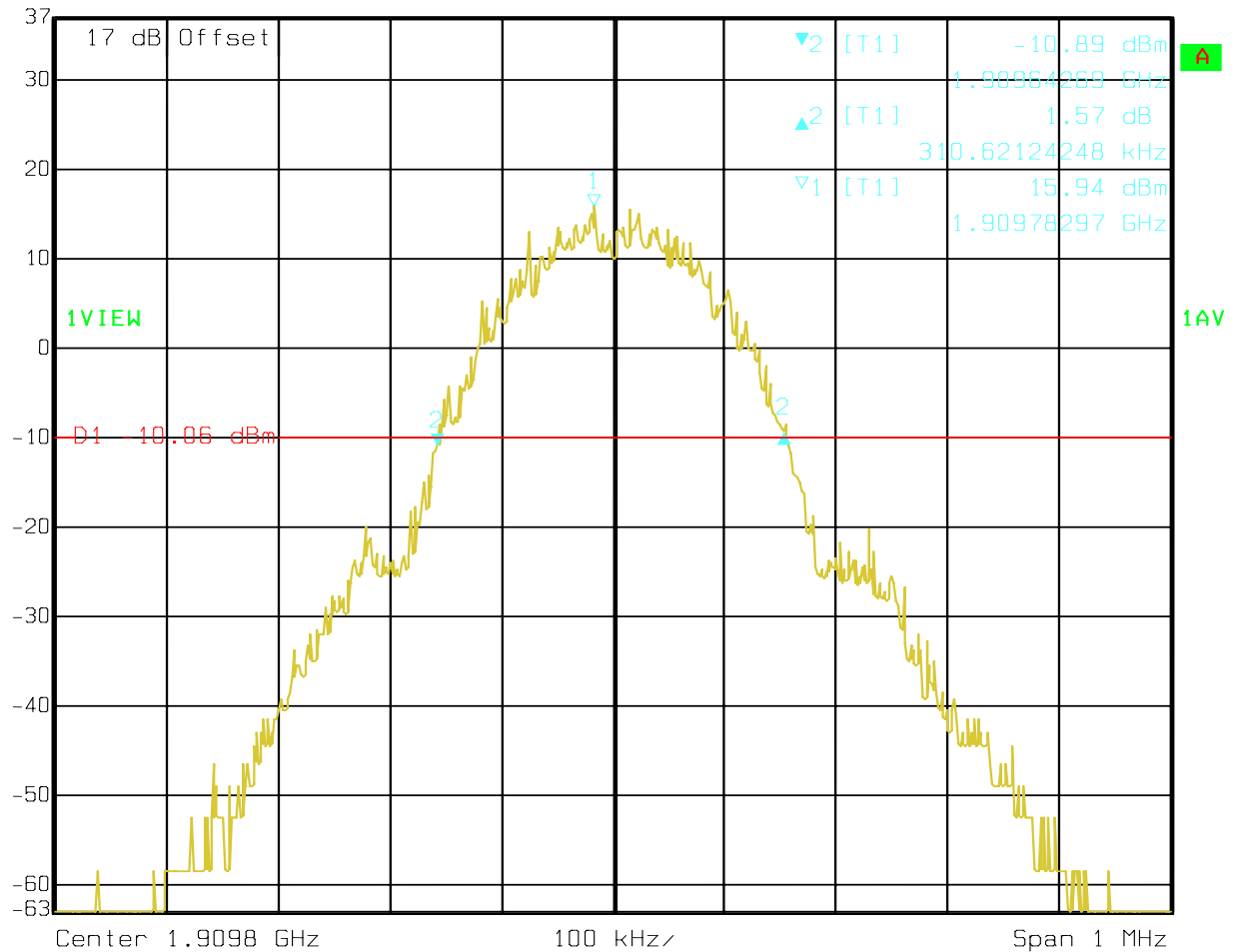


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**-26dB (PCS-1900)
CHANNEL 810 GPRS**



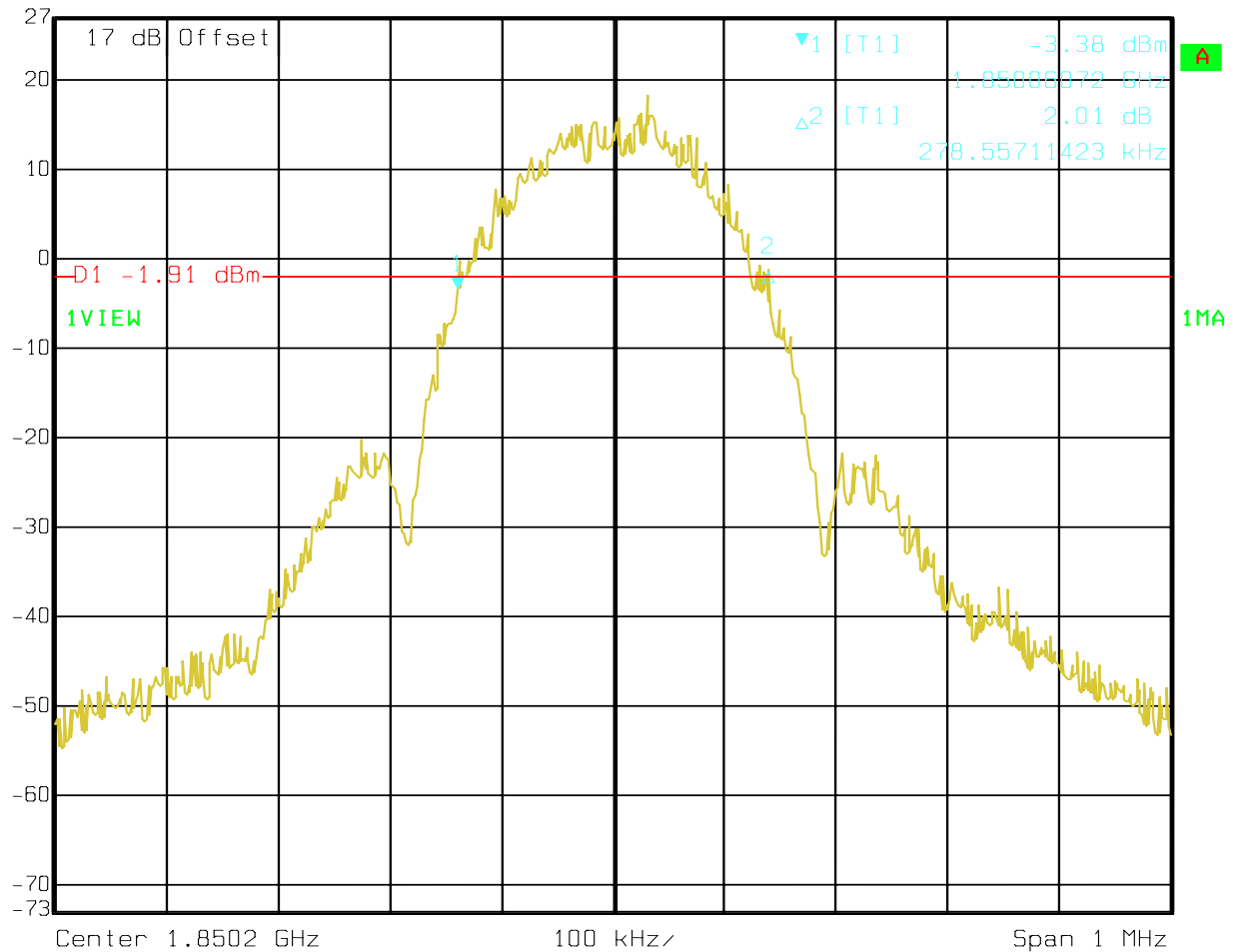
Ref Lvl 37 dBm
Delta 2 [T1] 1.57 dB
310.62124248 kHz
RBW 3 kHz
VBW 3 kHz
SWT 280 ms
RF Att 30 dB
Unit dBm



Date: 08.NOV.2006 18:09:09

**-20dB (PCS-1900)
 CHANNEL 512 EGPRS**

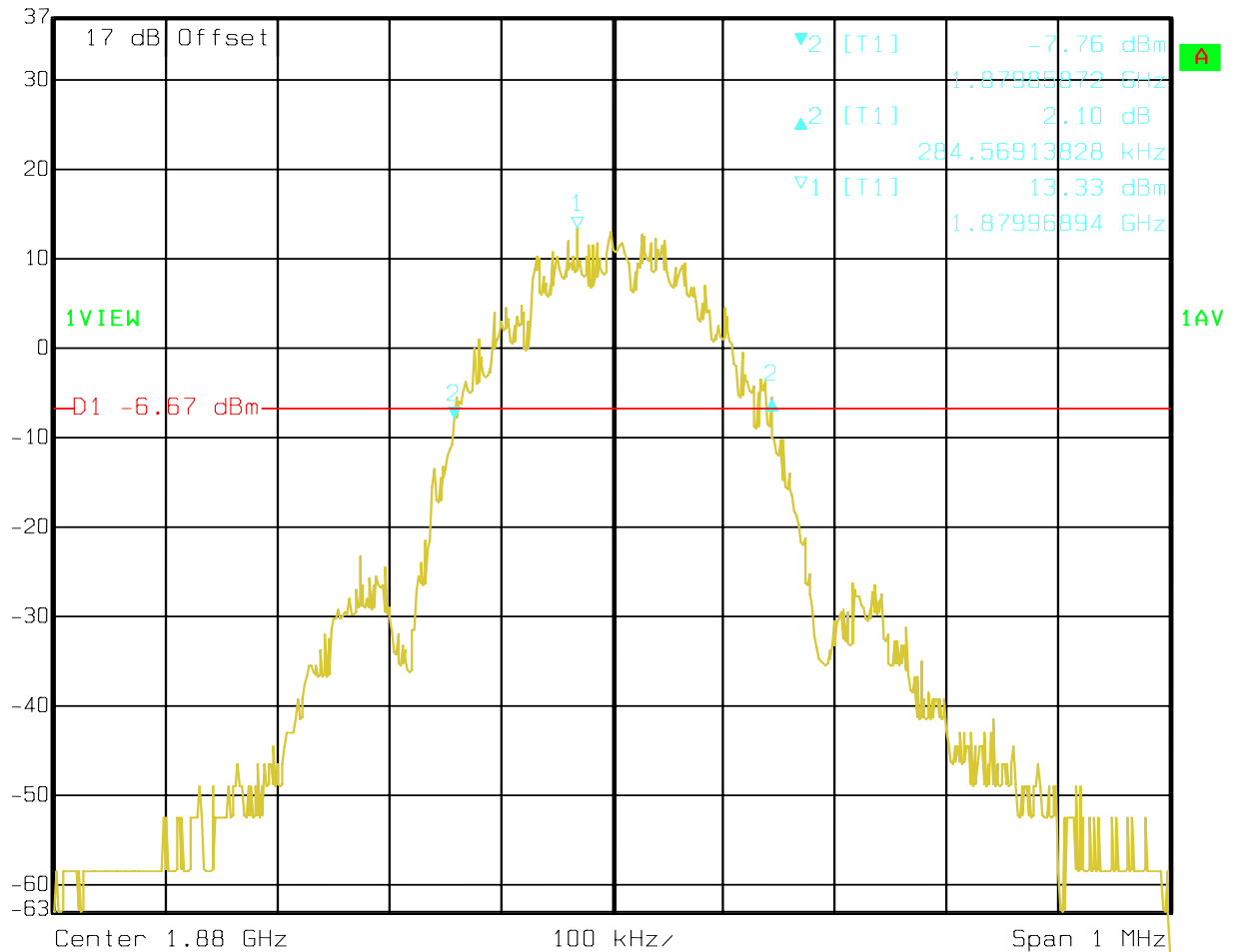

 Ref Lvl 27 dBm
 Marker 1 [T1] -3.38 dBm
 1.85006072 GHz
 RBW 3 kHz
 VBW 3 kHz
 SWT 280 ms
 RF Att 20 dB
 Unit dBm



Date: 09.NOV.2006 12:47:18

**-20dB (PCS-1900)
CHANNEL 661 EGPRS**

 Ref Lvl 37 dBm Delta 2 [T1] 2.10 dB RBW 3 kHz RF Att 30 dB
284.56913828 kHz VBW 3 MHz Unit dBm
SWT 280 ms

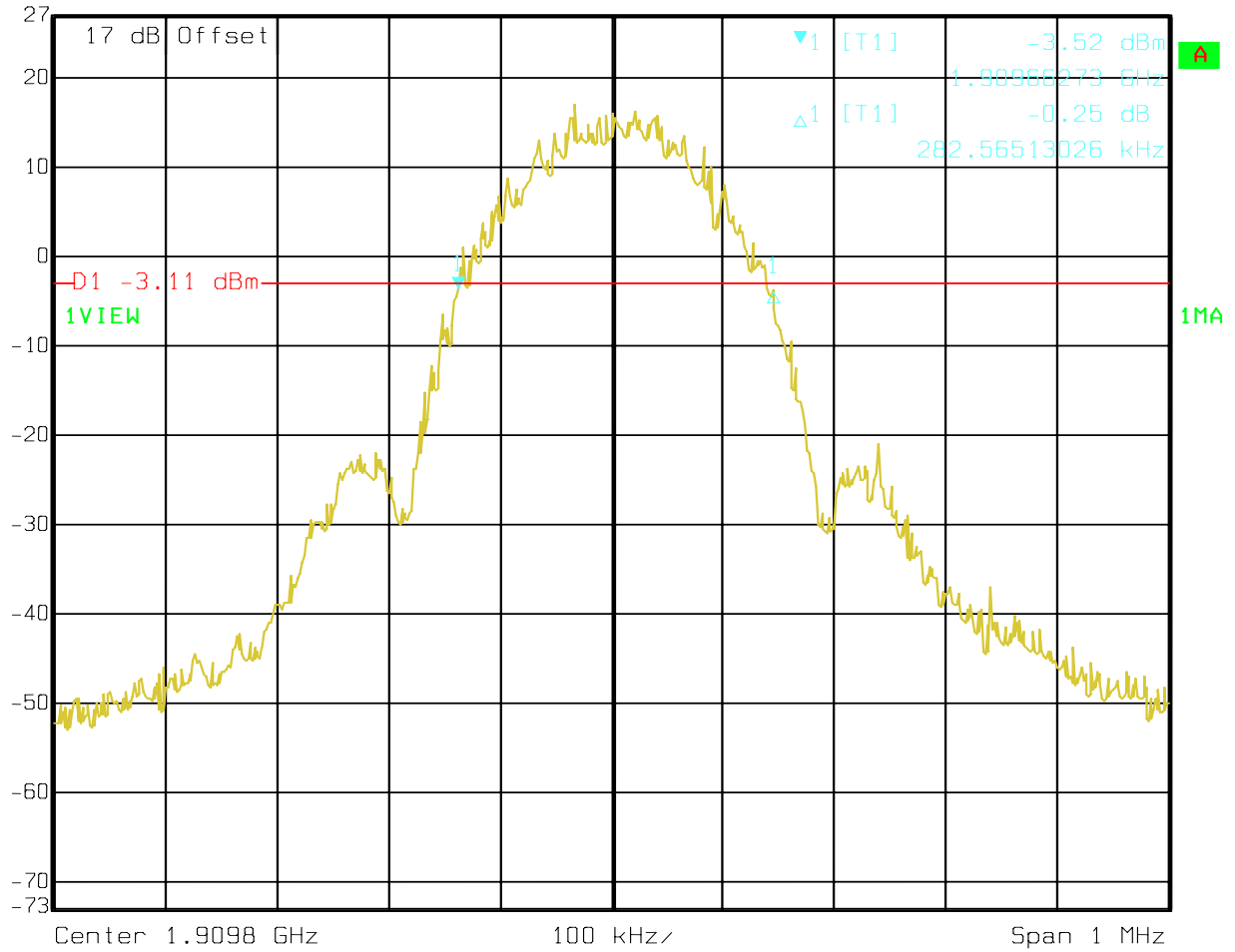


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**-20dB (PCS-1900)
CHANNEL 810 EGPRS**

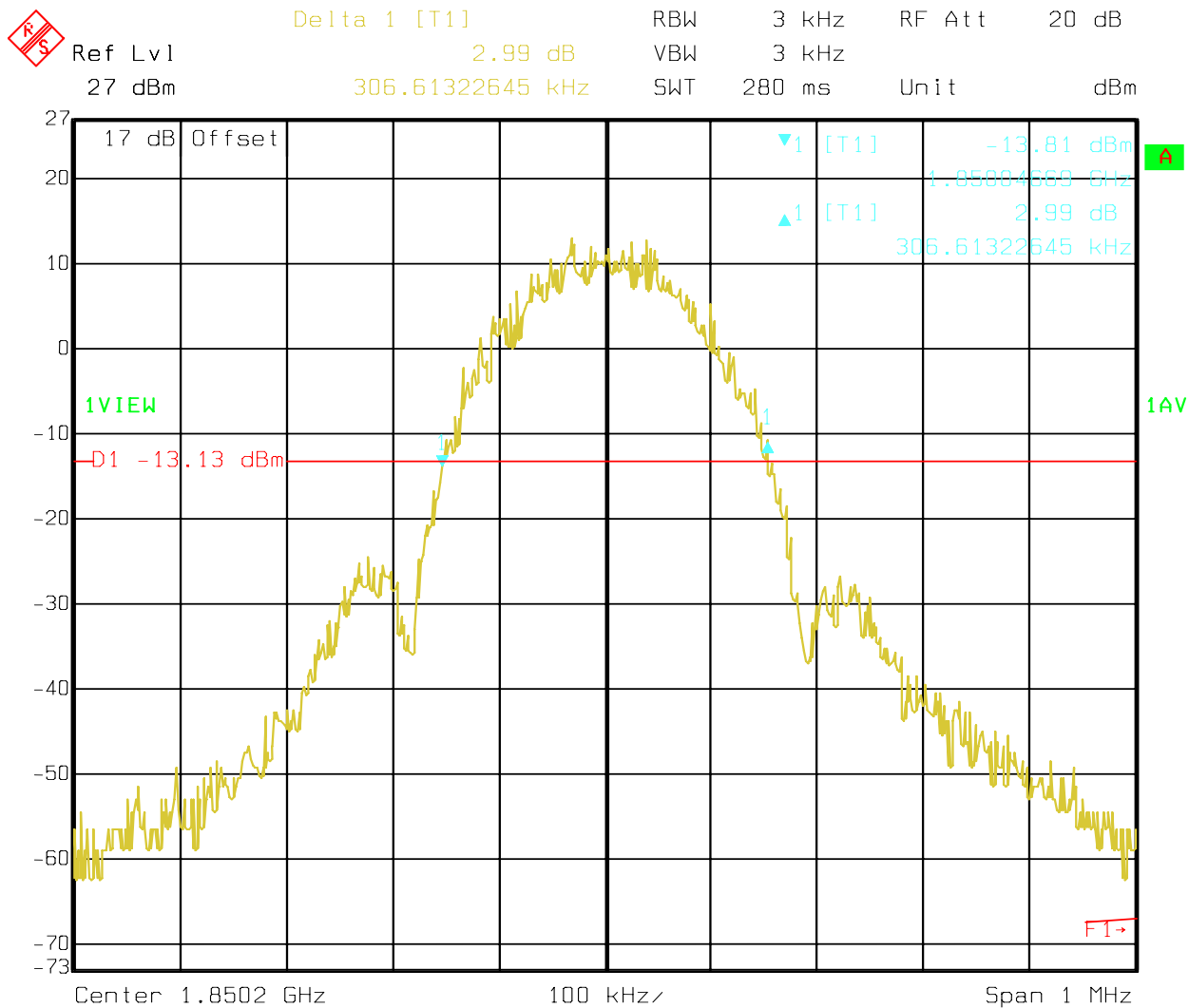


Marker 1 [T1] RBW 3 kHz RF Att 20 dB
Ref Lvl -3.52 dBm VBW 3 kHz
27 dBm 1.90966273 GHz SWT 280 ms Unit dBm



Date: 09.NOV.2006 12:49:23

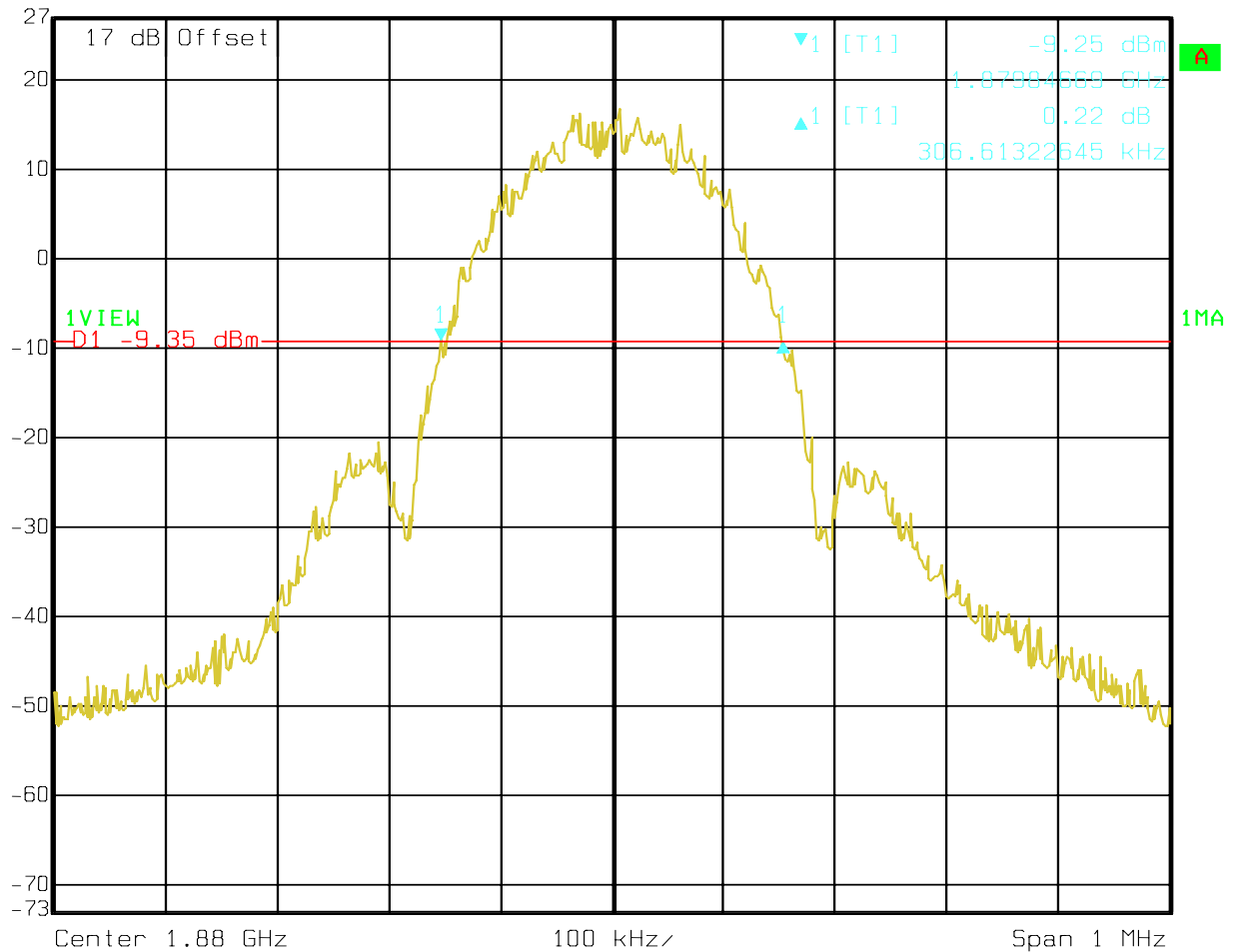
-26dB (PCS-1900)
CHANNEL 512 EGPRS



Date: 09.NOV.2006 14:10:59

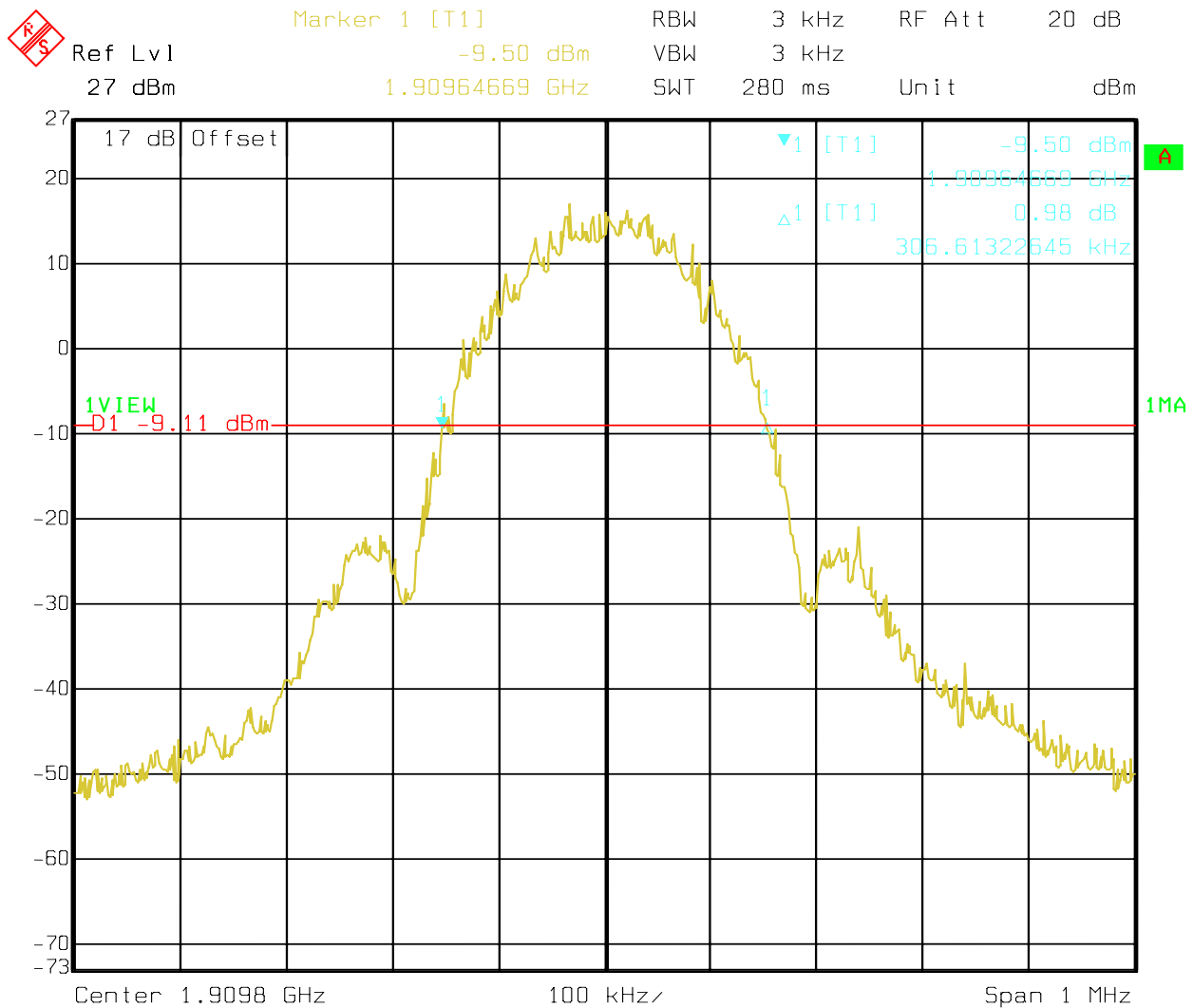
**-26dB (PCS-1900)
 CHANNEL 661 EGPRS**


 Delta 1 [T1] RBW 3 kHz RF Att 20 dB
 Ref Lvl 0.22 dB VBW 3 kHz
 27 dBm 306.61322645 kHz SWT 280 ms Unit dBm



Date: 09.NOV.2006 12:54:01

-26dB (PCS-1900)
CHANNEL 810 EGPRS



Date: 09.NOV.2006 12:50:56

5.3 Frequency Stability

5.3.1 Limit

For Hand carried battery powered equipment:

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. As this transceiver is considered "Hand carried, battery powered equipment" Section 2.1055(d)(2) applies. This requires that the lower voltage for frequency stability testing be specified by the manufacturer. This transceiver is specified to operate with an input voltage of between 3.2VDC and 4.5VDC, with a nominal voltage of 3.7VDC. Operation above or below these voltage limits is prohibited by transceiver software in order to prevent improper operation as well as to protect components from overstress. These voltages represent a tolerance of -2.7% and +21.62%. For the purposes of measuring frequency stability these voltage limits are to be used.

Method of Measurement:

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

1. Measure the carrier frequency at room temperature.
2. Subject the EUT to overnight soak at -30 C.
3. With the EUT, powered via nominal voltage, connected to the CMU 200 and in a simulated call on mid channel (190 for GSM 850 & 4183 for FDD5 & 661 for PCS-1900&9400 for FDD2), measure the carrier frequency. These measurements should be made within 2 minutes of powering up the EUT, to prevent significant self-warming.
4. Repeat the above measurements at 10 C increments from -30 C to +50 C. Allow at least 1 1/2 hours at each temperature, unpowered, before making measurements.
5. Remeasure carrier frequency at room temperature with nominal voltage. Vary supply voltage from minimum voltage to maximum voltage, in 0.1 Volt increments remeasuring carrier frequency at each voltage. Pause at nominal voltage for 1 1/2 hours unpowered, to allow any self-heating to stabilize, before continuing.
6. Subject the EUT to overnight soak at +50 C.
7. With the EUT, powered via nominal voltage, connected to the CMU 200 and in a simulated call on mid channel (190 for GSM 850 & 4183 for FDD5 & 661 for PCS-1900&9400 for FDD2), measure the carrier frequency. These measurements should be made within 2 minutes of powering up the EUT, to prevent significant self-warming.
8. Repeat the above measurements at 10 C increments from +50 C to -30 C. Allow at least 1 1/2 hours at each temperature, unpowered, before making measurements.
9. At all temperature levels hold the temperature to +/- 0.5 C during the measurement procedure.

For equipment powered by primary supply voltage:

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.

For this EUT section 2.1055(d)(1) applies. This requires to vary primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried battery equipment.

5.3.2 FREQUENCY STABILITY (PCS-1900)

Channel No. : 661 at 1880 MHz

§2.1055 / §24.235 AFC FREQ ERROR vs. VOLTAGE

NOTE: Freq. Error (ppm) = Freq. Error (Hz) / 1880

Voltage (VDC)	Frequency Error (Hz)	Frequency Error (ppm)
3.6	15	0.00798
4.2	17	0.00904

AFC FREQ ERROR vs. TEMPERATURE

TEMPERATURE (°C)	Frequency Error (Hz)	Frequency Error (ppm)
-30	-9	0.00479
-20	+27	0.0144
-10	+15	0.00798
0	+5	0.00266
+10	+24	0.0128
+20	+14	0.00745
+30	0	0
+40	+28	0.0149
+50	+31	0.0165

5.4 Spurious Emissions Conducted

5.4.1 FCC 2.1051 Measurements required: Spurious emissions at antenna terminals.

The radio frequency voltage or power generated within the equipment and appearing on a spurious frequency shall be checked at the equipment output terminals when properly loaded with a suitable artificial antenna. Curves or equivalent data shall show the magnitude of each harmonic and other spurious emission that can be detected when the equipment is operated under the conditions specified in FCC 2.1049 as appropriate. The magnitude of spurious emissions which are attenuated more than 20 dB below the permissible value need not be specified.

5.4.2 Limits:

5.4.2.1 FCC 22.917 Emission limitations for cellular equipment.

The rules in this section govern the spectral characteristics of emissions in the Cellular Radiotelephone Service.

(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.

(b) *Measurement procedure.* Compliance with these provisions is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater. In the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (*i.e.* 100 kHz of 1 percent of emission bandwidth, as specified). 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.

5.4.2.2 FCC 24.238 Emission limitations for Broadband PCS equipment.

The rules in this section govern the spectral characteristics of emissions in the Broadband Personal Communications Service.

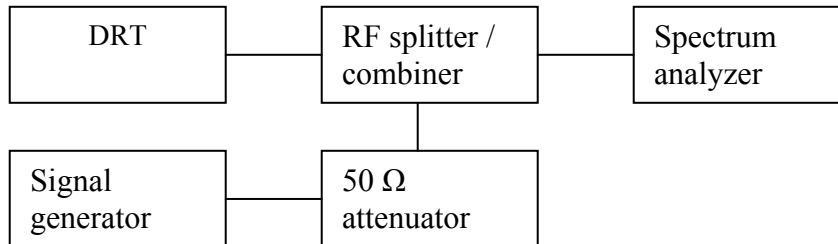
(a) *Out of band emissions.* The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log(P)$ dB.

(b) *Measurement procedure.* Compliance with these provisions is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to

improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (*i.e.* 100 kHz of 1 percent of emission bandwidth, as specified). 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.

5.4.3 Conducted out of band emissions measurement procedure:
Based on TIA-603C 2004

2.2.13 Unwanted Emissions: Conducted Spurious

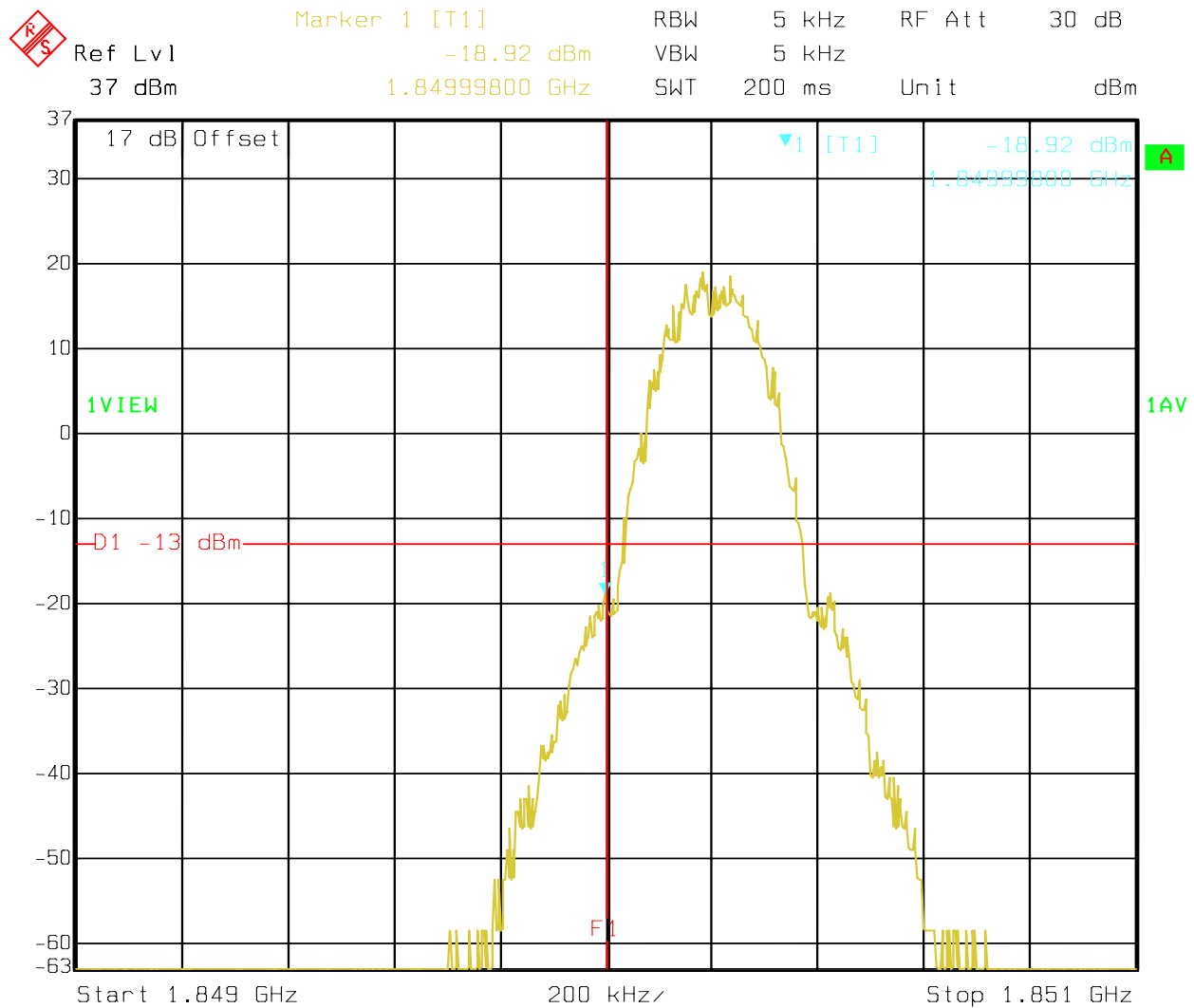


1. Connect the equipment as shown in the above diagram.
2. Set the spectrum analyzer to measure peak hold with the required settings.
3. Set the signal generator to a known output power and record the path loss in dB (**LOSS**) for frequencies up to the tenth harmonic of the EUT's carrier frequency. **LOSS** = Generator Output Power (dBm) – Analyzer reading (dBm).
4. Replace the signal generator with the EUT.
5. Adjust the settings of the Digital Radiocommunication Tester (DRT) to set the EUT to its maximum power at the required channel.
6. Set the spectrum analyzer to measure peak hold with the required settings. Offset the spectrum analyzer reference level by the path loss measured above.
7. Measure and record all spurious emissions up to the tenth harmonic of the carrier frequency.
8. Measurements are to be performed with the EUT set to the low, middle and high channel of each frequency band.
9. If necessary steps 6 and 7 may be performed with the spectrum analyzer set to average detector.

(note: Step 3 above is performed prior to testing and **LOSS** is recorded by test software. Steps 2, 6, and 7 above are performed with test software.)

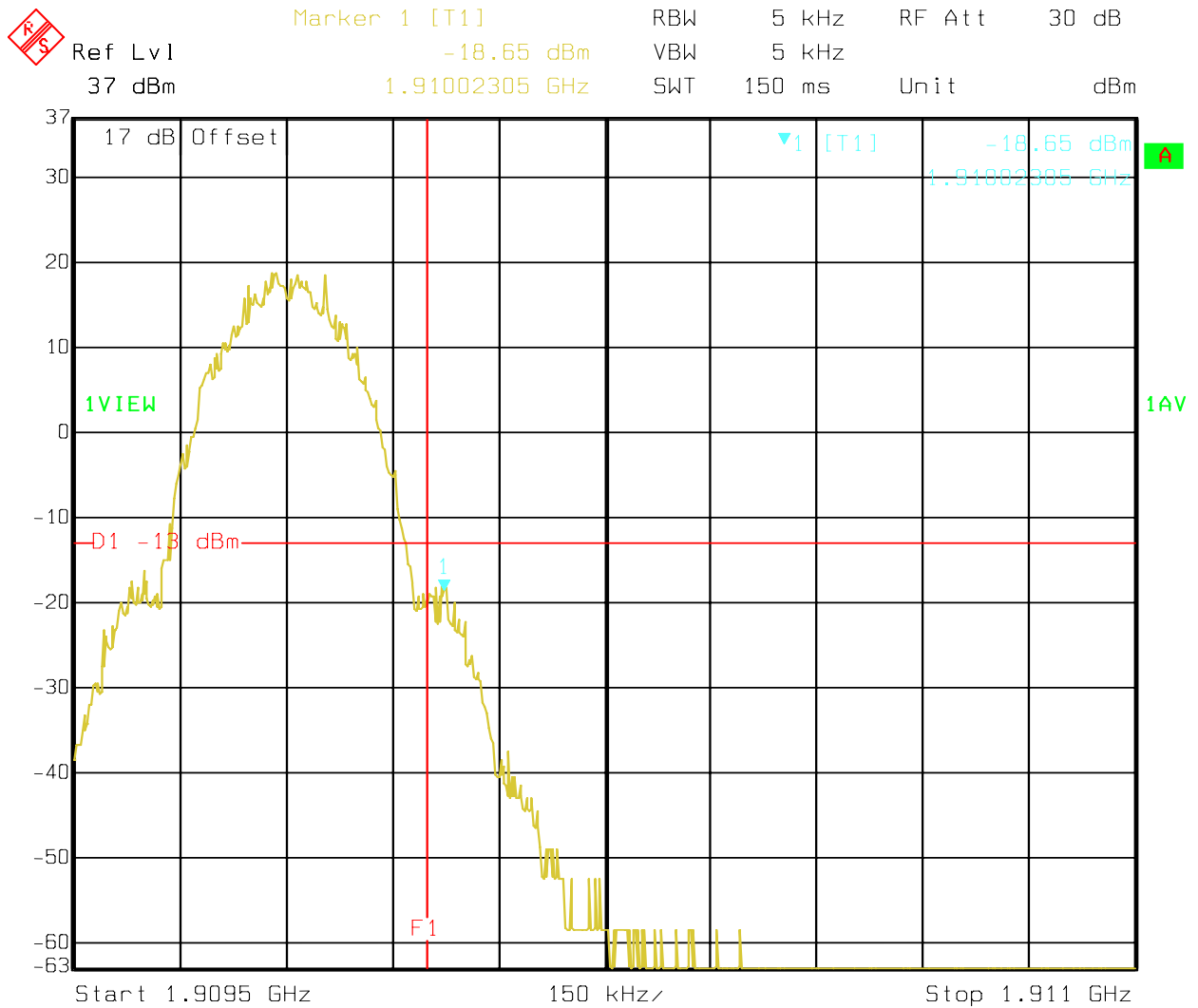
5.4.4 Band Edge Results PCS-1900

PCS-1900 Lower Band Edge GPRS CHANNEL 512



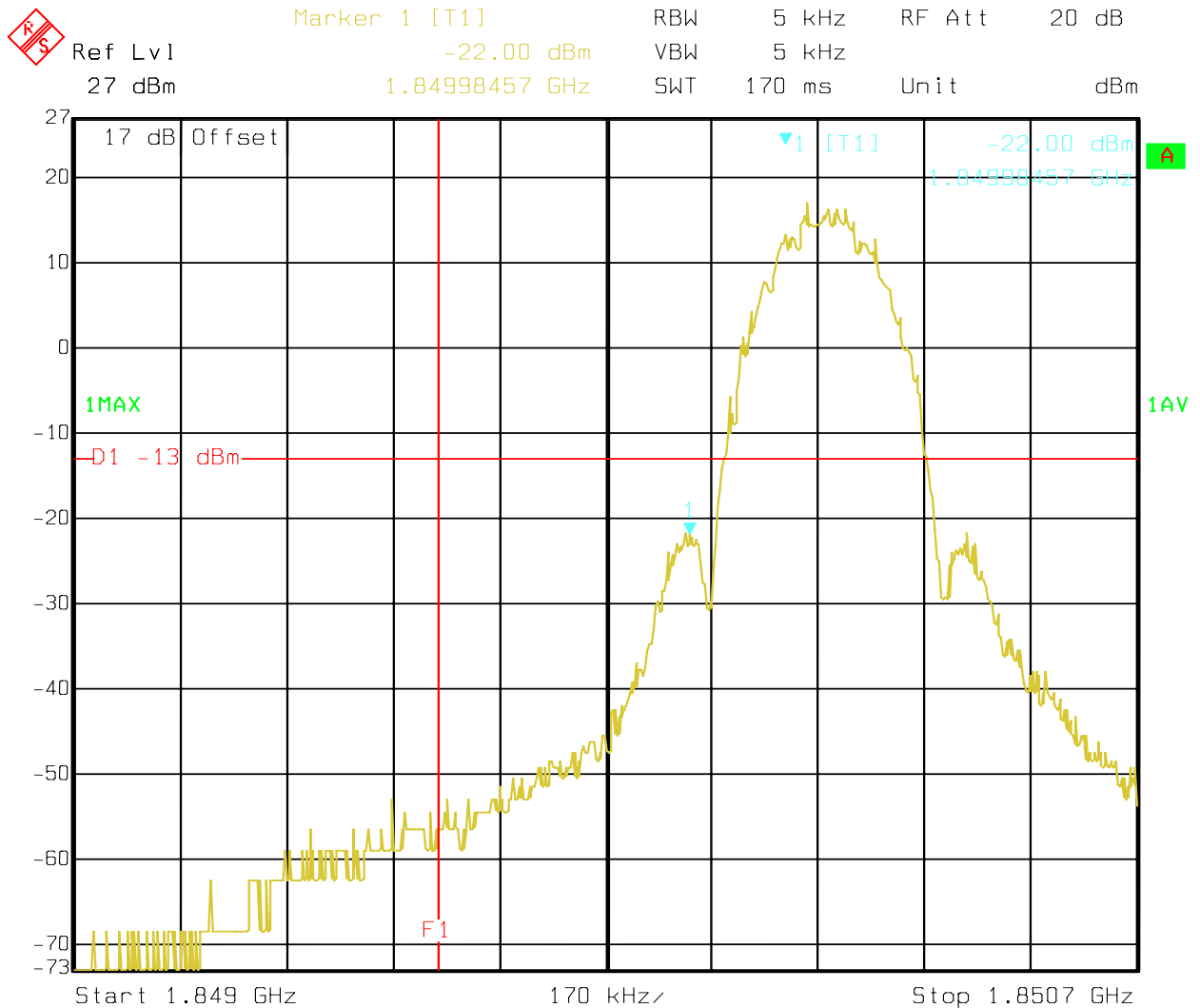
Date: 08.NOV.2006 18:46:48

**PCS-1900 Higher Band Edge GPRS
 CHANNEL 810**



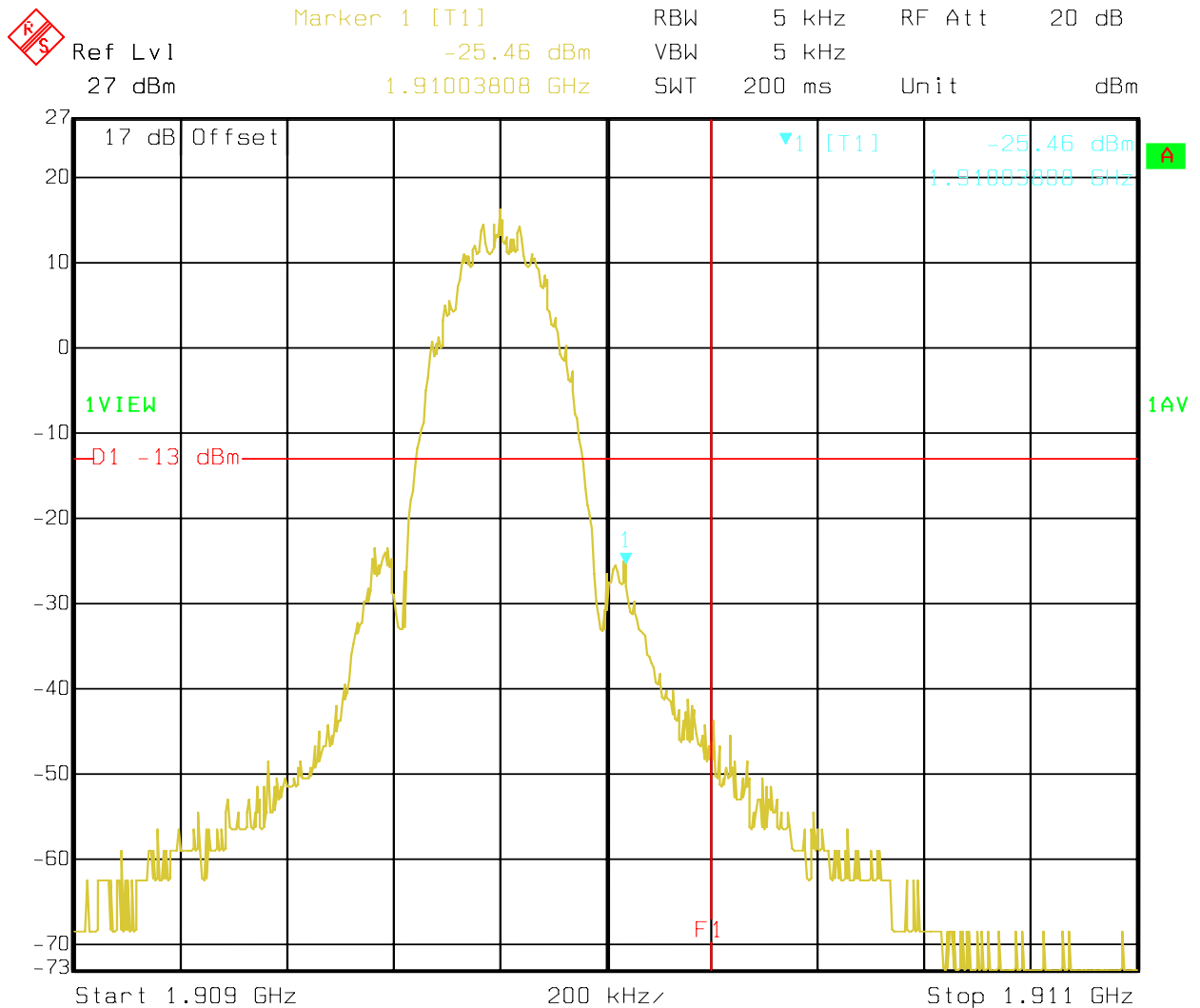
Date: 08.NOV.2006 18:34:42

**PCS-1900 Lower Band Edge EPRS
 CHANNEL 512**



Date: 09.NOV.2006 13:02:27

**PCS-1900 Higher Band Edge EPRS
 CHANNEL 810**

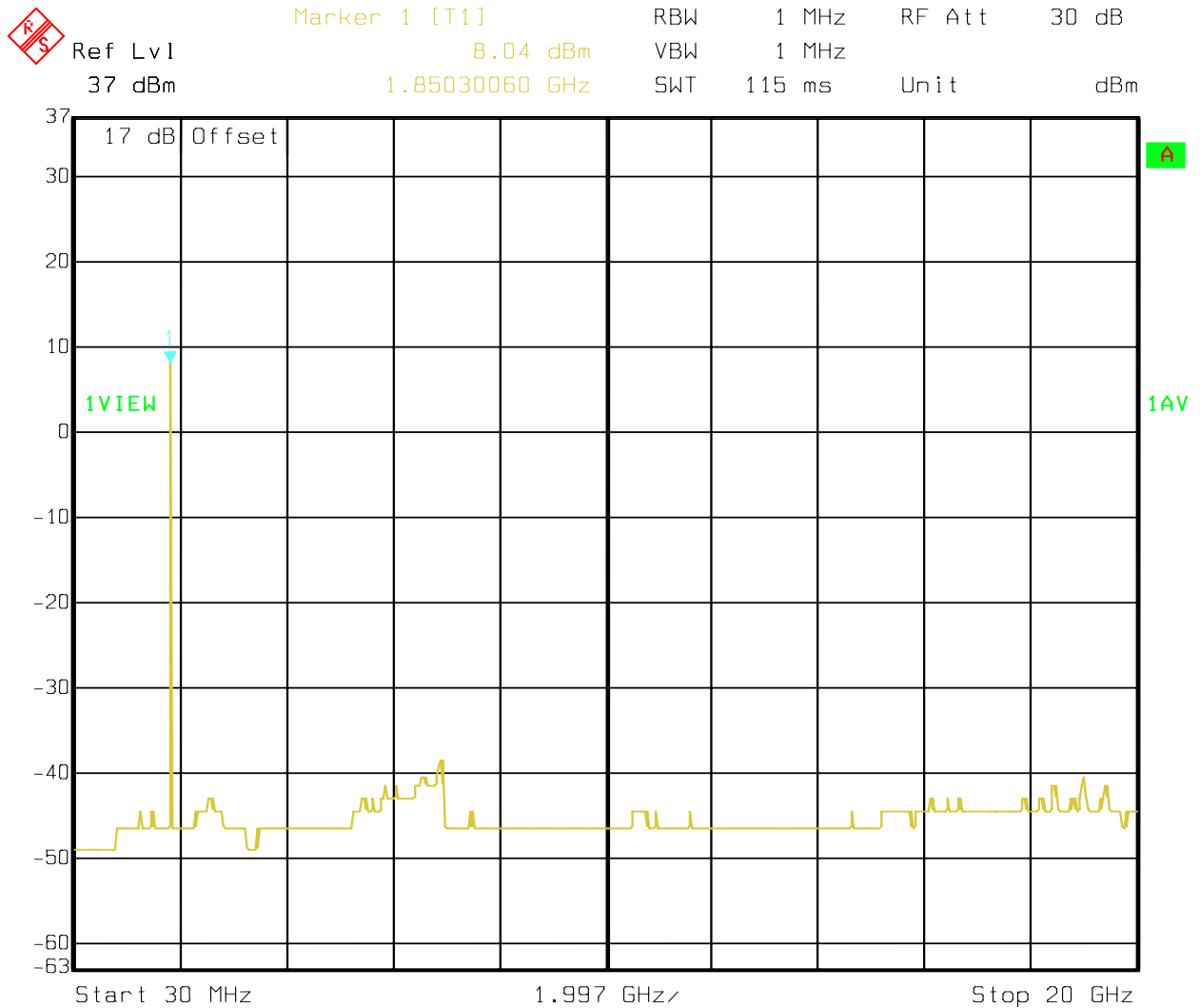


Date: 09.NOV.2006 13:04:49

Conducted Spurious Results PCS-1900

CHANNEL 512 (PCS-1900)
30MHz – 20GHz

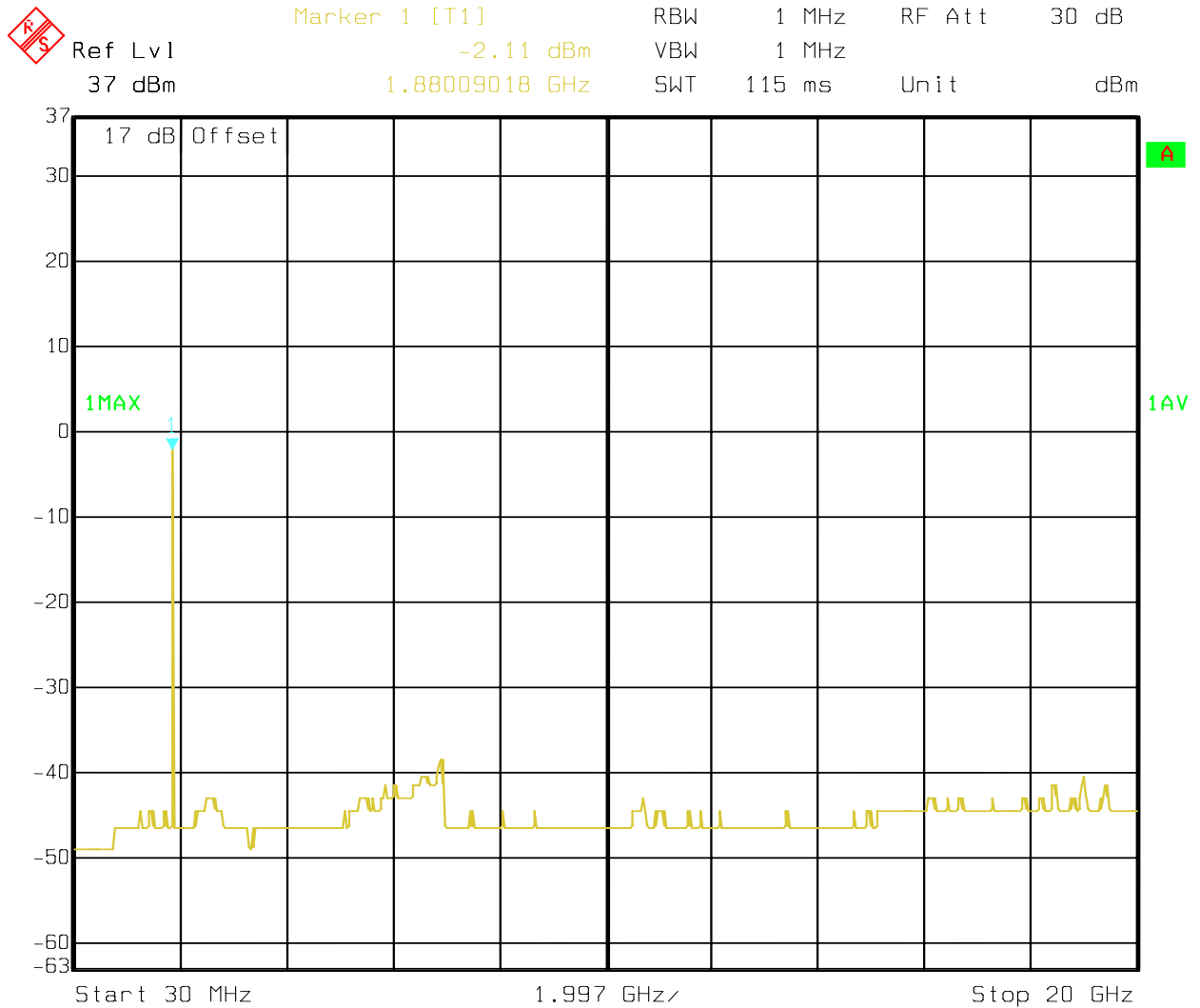
Note: The peak above the limit line is the carrier freq. at ch-512



Date: 08.NOV.2006 17:26:34

CHANNEL 661 (PCS-1900)
30MHz – 20GHz

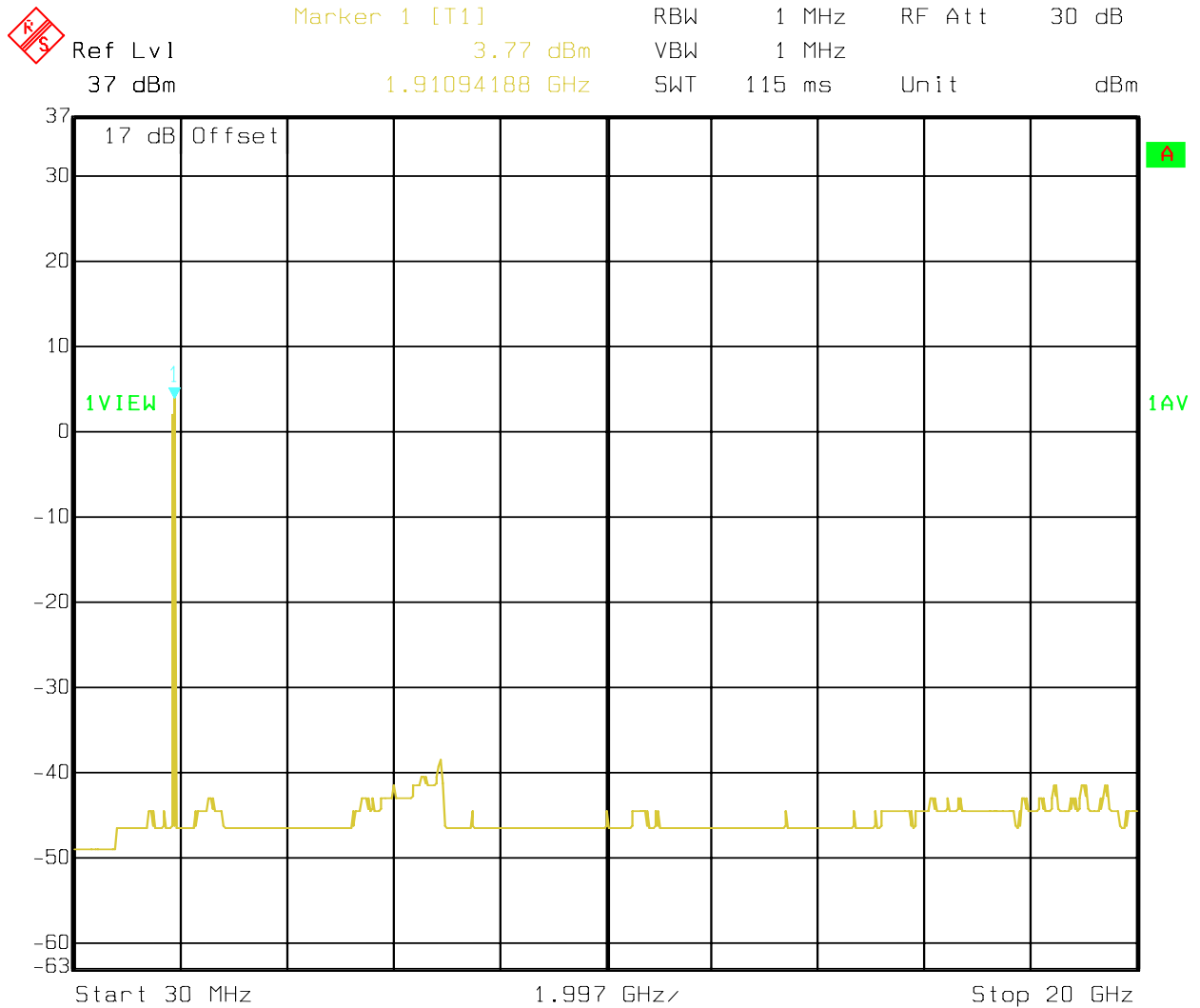
Note: The peak above the limit line is the carrier freq. at ch-661



Date: 08.NOV.2006 17:24:25

CHANNEL 810 (PCS-1900)
30MHz – 20GHz

Note: The peak above the limit line is the carrier freq. at ch-810



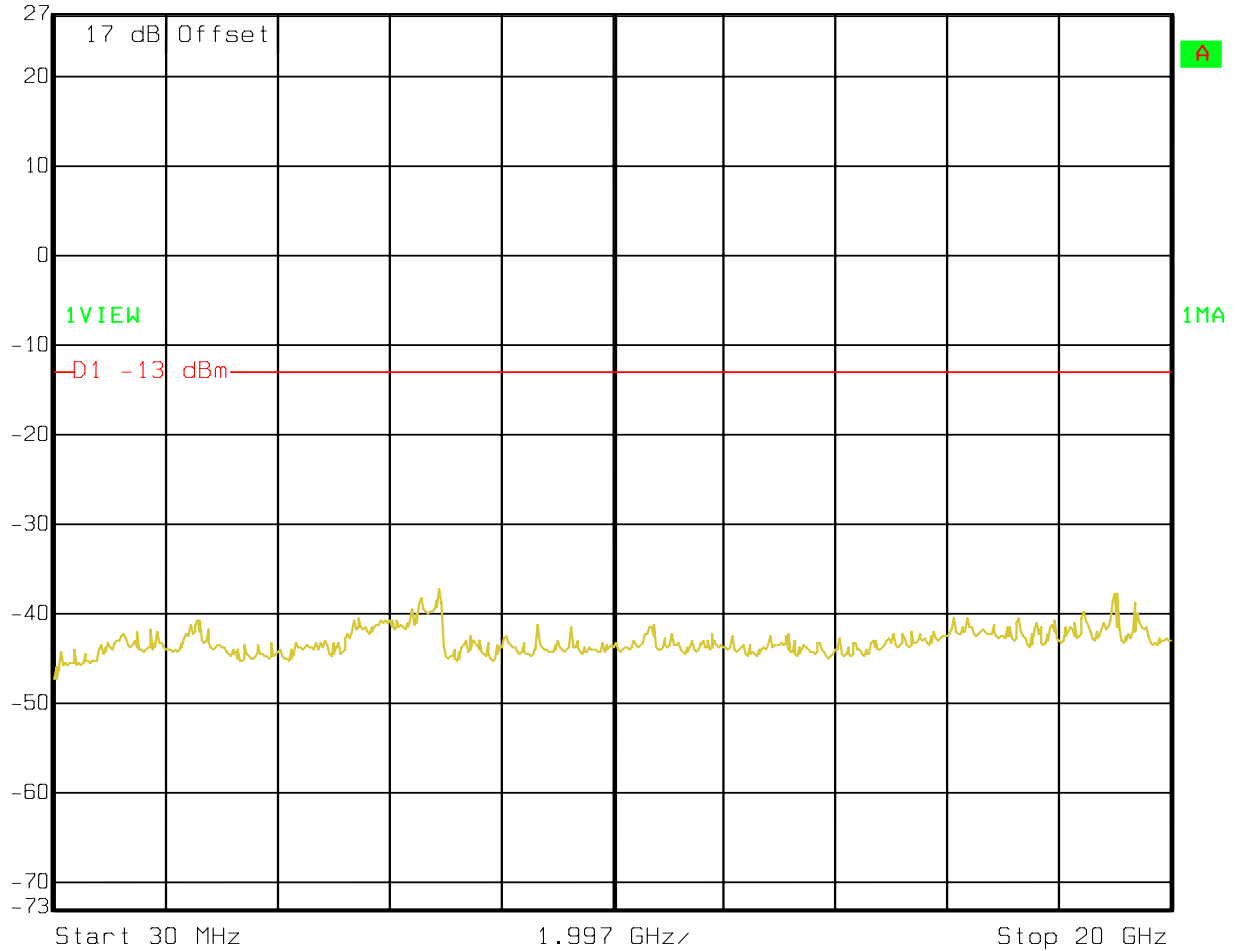
Date: 08.NOV.2006 17:27:31

IDLE (PCS-1900)
30MHz – 20GHz



Ref Lvl
27 dBm

RBW 1 MHz RF Att 20 dB
VBW 1 MHz
SWT 115 ms Unit dBm



Date: 12.JUL.2006 13:12:10

5.5 Spurious Emissions Radiated

5.5.1 FCC 2.1053 Measurements required: Field strength of spurious radiation.

- (a) Measurements shall be made to detect spurious emissions that may be radiated directly from the cabinet, control circuits, power leads or intermediate circuit elements under normal conditions of installation and operation. Curves or equivalent data shall be supplied showing the magnitude of each harmonic and other spurious emission.

5.5.2 Limits:

5.5.2.1 FCC 22.917 Emission limitations for cellular equipment.

The rules in this section govern the spectral characteristics of emissions in the Cellular Radiotelephone Service.

- (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.

(b) *Measurement procedure.* Compliance with these provisions is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater. In the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (*i.e.* 100 kHz of 1 percent of emission bandwidth, as specified). 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.

5.5.2.2 FCC 24.238 Emission limitations for Broadband PCS equipment.

The rules in this section govern the spectral characteristics of emissions in the Broadband Personal Communications Service.

- (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.

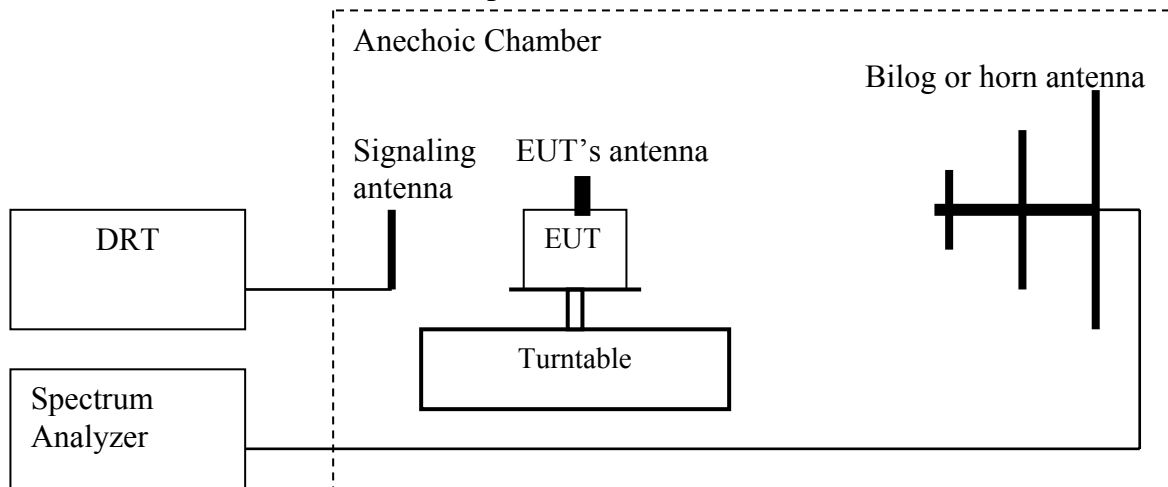
(b) *Measurement procedure.* Compliance with these provisions is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (*i.e.* 100 kHz of 1 percent of emission bandwidth, as specified). 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.

5.5.3 Radiated out of band measurement procedure:

Based on TIA-603C 2004

2.2.12 Unwanted emissions: Radiated Spurious



1. Connect the equipment as shown in the above diagram with the EUT's antenna in a horizontal orientation.
2. Adjust the settings of the Digital Radiocommunication Tester (DRT) to set the EUT to its maximum power at the required channel.
3. Set the spectrum analyzer to measure peak hold with the required settings.
4. Place the measurement antenna in a horizontal orientation. Rotate the EUT 360°. Raise the measurement antenna up to 4 meters in 0.5 meters increments and rotate the EUT 360° at each height to maximize all emissions. Measure and record all spurious emissions (**LVL**) up to the tenth harmonic of the carrier frequency.
5. Replace the EUT with a horizontally polarized half wave dipole or known gain antenna. The center of the antenna should be at the same location as the center of the EUT's antenna.
6. Connect the antenna to a signal generator with known output power and record the path loss in dB (**LOSS**). **LOSS** = Generator Output Power (dBm) – Analyzer reading (dBm).
7. Determine the level of spurious emissions using the following equation:
Spurious (dBm) = **LVL** (dBm) + **LOSS** (dB):
8. Repeat steps 4, 5 and 6 with all antennas vertically polarized.
9. Determine the level of spurious emissions using the following equation:
Spurious (dBm) = **LVL** (dBm) + **LOSS** (dB):
10. Measurements are to be performed with the EUT set to the low, middle and high channel of each frequency band.

(note: Steps 5 and 6 above are performed prior to testing and **LOSS** is recorded by test software. Steps 3, 4 and 7 above are performed with test software.)

Spectrum analyzer settings:

Res B/W: 1 MHz

Vid B/W: 1 MHz

Measurement Survey:

Radiated emissions measurements were made only at the upper, middle, and lower carrier frequencies of the GSM-850 & PCS-1900 bands. 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 GSM-850 & PCS-1900 band into any of the other blocks respectively. 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.

5.5.4 Radiated out of band emissions results on EUT:

5.5.4.1 RESULTS OF RADIATED TESTS PCS-1900:

Harmonic	Tx ch-512 Freq.(MHz)	Level (dBm)	Tx ch-661 Freq. (MHz)	Level (dBm)	Tx ch-810 Freq. (MHz)	Level (dBm)
2	3700.4	NF	3760	NF	3819.6	NF
3	5550.6	NF	5640	NF	5729.4	NF
4	7400.8	NF	7520	NF	7639.2	NF
5	9251	NF	9400	NF	9549	NF
6	11101.2	NF	11280	NF	11458.8	NF
7	12951.4	NF	13160	NF	13368.6	NF
8	14801.6	NF	15040	NF	15278.4	NF
9	16651.8	NF	16920	NF	17188.2	NF
10	18502	NF	18800	NF	19098	NF
NF = NOISE FLOOR						

5.5.4.2 RADIATED SPURIOUS EMISSIONS(PCS 1900)

TX: 30MHz - 1GHz

Spurious emission limit -13dBm

Antenna: vertical

Note: This plot is valid for low, mid & high channels (worst-case plot)

CETECOM Inc., 411 Dixon Landing Road, Milpitas CA 95035, USA

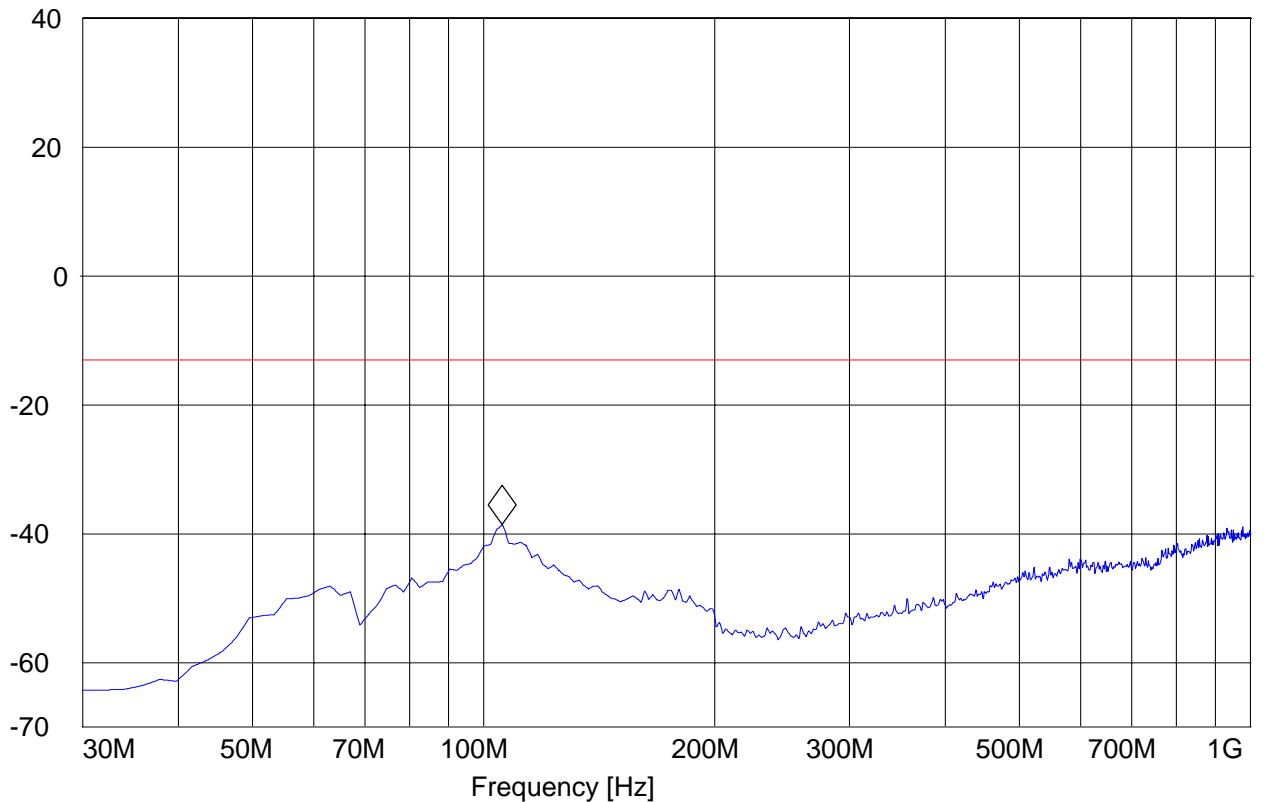
EUT:: 004401-120210-360
Customer: Toshiba
Test Mode: GSM1900 CH810
Ant Orientation: V
EUT Orientation: V
Test Engineer: PETER MU
Voltage:: AC Adapter
Sweep: FCC24 SPURI 30M-1G_V

SWEEP TABLE: "FCC 24 Spur 30M-1G_V"

Short Description:		FCC 24 30MHz-1GHz			
Start	Stop	Detector	Meas.	IF	Transducer
Frequency	Frequency		Time	Bandw.	
30.0 MHz	1.0 GHz	MaxPeak	Coupled	1 MHz	DUMMY-DBM

Marker: 105.811623 MHz -38.59 dBm

Level [dBm]



RADIATED SPURIOUS EMISSIONS(PCS 1900)

Tx @ 1850.2MHz: 1GHz – 3GHz

Spurious emission limit –13dBm

Note: The peak above the limit line is the carrier freq. at ch-512.

CETECOM Inc., 411 Dixon Landing Road, Milpitas CA 95035, USA

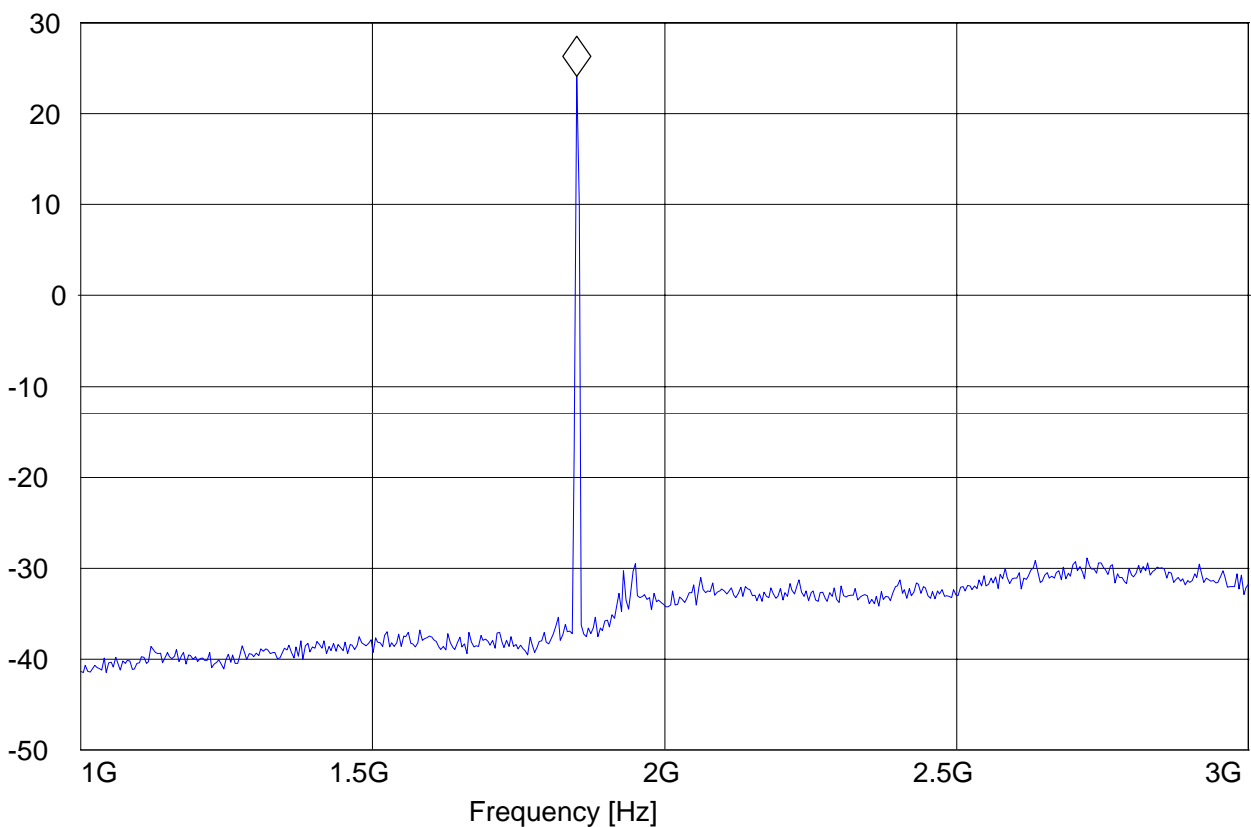
EUT IMEI:: 004401-120210-360
 Customer: Toshiba
 Test Mode: GPRS CH512
 Ant Orientation: V
 EUT Orientation: V
 Test Engineer: Peter Mu
 Voltage:: AC Adaptor
 Sweep: FCC24 SPURI 1-3G

SWEEP TABLE: "FCC 24Spuri 1-3G"

Short Description:		FCC 24 1GHz-8GHz			
Start	Stop	Detector	Meas.	IF	Transducer
Frequency	Frequency	Time	Bandw.		
1.0 GHz	3.0 GHz	MaxPeak	Coupled	1 MHz	DUMMY-DBM

Marker: 1.849699399 GHz 24.09 dBm

Level [dBm]



RADIATED SPURIOUS EMISSIONS(PCS 1900)

Tx @ 1850.2MHz: 3GHz – 18GHz

Spurious emission limit -13dBm

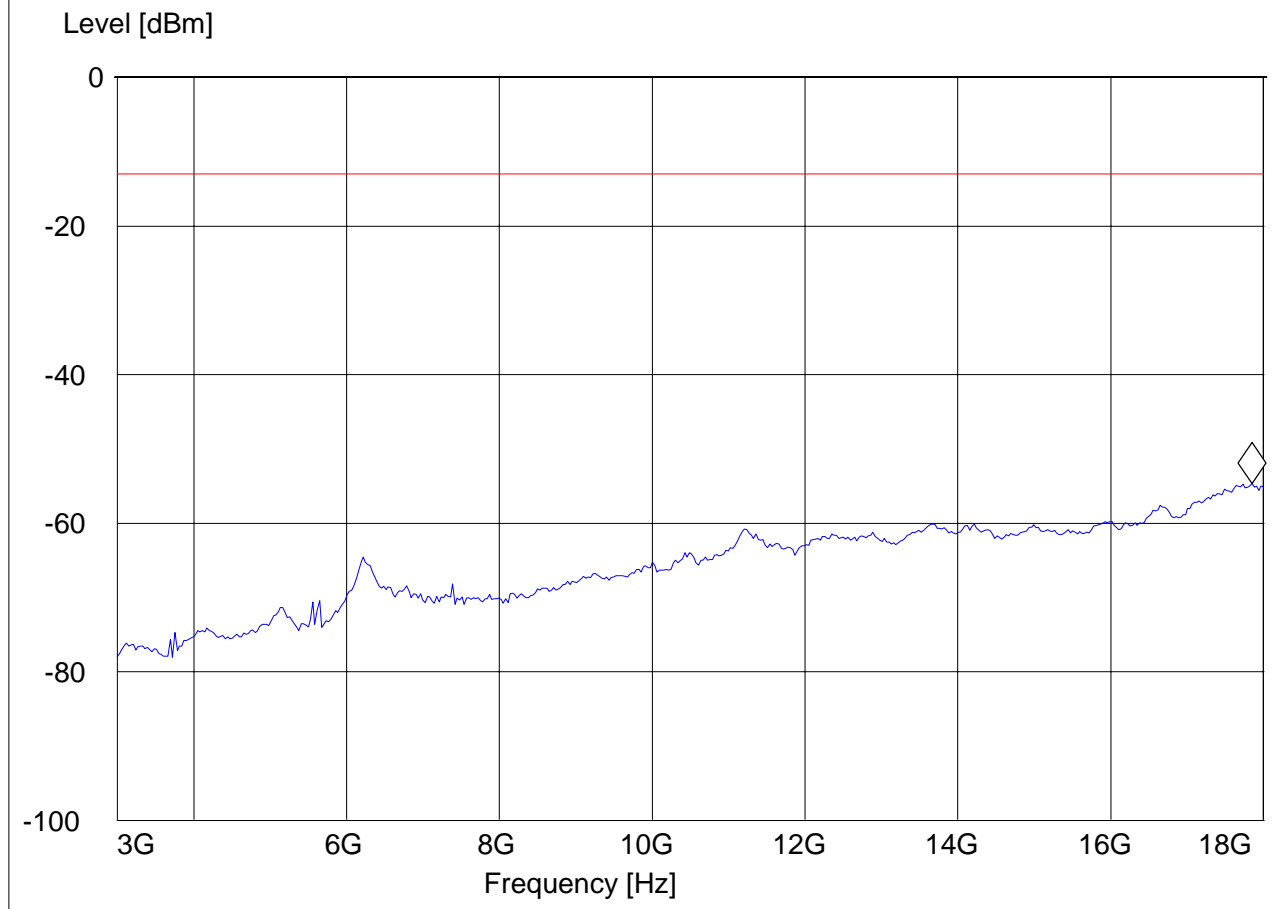
CETECOM Inc., 411 Dixon Landing Road, Milpitas CA 95035, USA

EUT IMEI:: 004401-120210-360
Customer: Toshiba
Test Mode: GPRS CH512
Ant Orientation: V
EUT Orientation: V
Test Engineer: Peter Mu
Voltage:: AC Adaptor
Sweep: FCC24 SPURI 3-18G

SWEEP TABLE: "FCC 24Spuri 3-18G"

Start Frequency	Stop Frequency	Detector	Meas. Time	IF Bandw.	Transducer
3.0 GHz	18.0 GHz	MaxPeak	Coupled	1 MHz	DUMMY-DBM

Marker: 17.849699399 GHz -54.65 dBm



RADIATED SPURIOUS EMISSIONS(PCS 1900)

Tx @ 1880.0MHz: 1GHz – 3GHz

Spurious emission limit –13dBm

Note: The peak above/close to the limit line is the carrier freq. at ch-661.

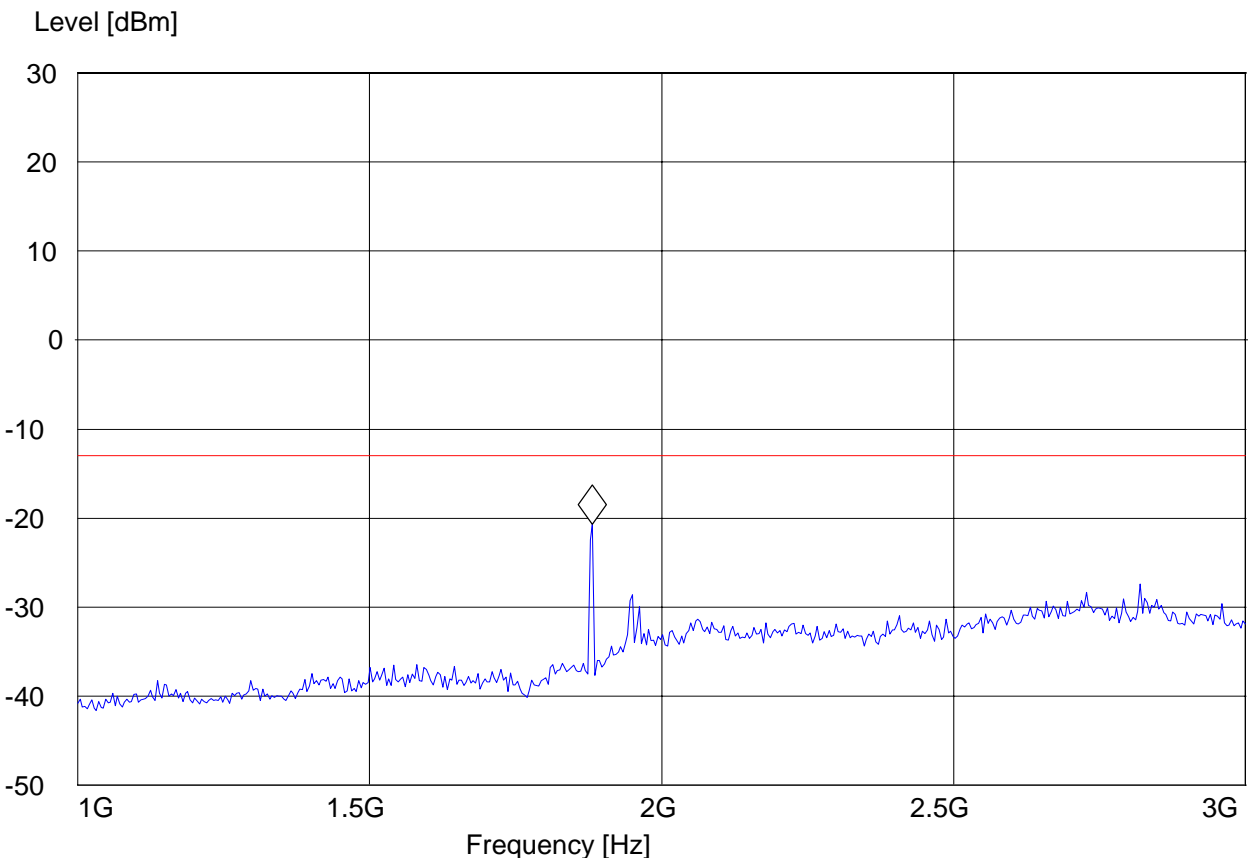
CETECOM Inc., 411 Dixon Landing Road, Milpitas CA 95035, USA

EUT IMEI:: 004401-120210-360
Customer: Toshiba
Test Mode: GPRS CH661
Ant Orientation: V
EUT Orientation: V
Test Engineer: Peter Mu
Voltage:: AC Adaptor
Sweep: FCC24 SPURI 1-3G

SWEEP TABLE: "FCC 24Spuri 1-3G"

Short Description:		FCC 24 1GHz-8GHz			
Start	Stop	Detector	Meas.	IF	Transducer
Frequency	Frequency		Time	Bandw.	
1.0 GHz	3.0 GHz	MaxPeak	Coupled	1 MHz	DUMMY-DBM

Marker: 1.881763527 GHz -20.71 dBm



RADIATED SPURIOUS EMISSIONS(PCS 1900)

Tx @ 1880.0MHz: 3GHz – 18GHz

Spurious emission limit –13dBm

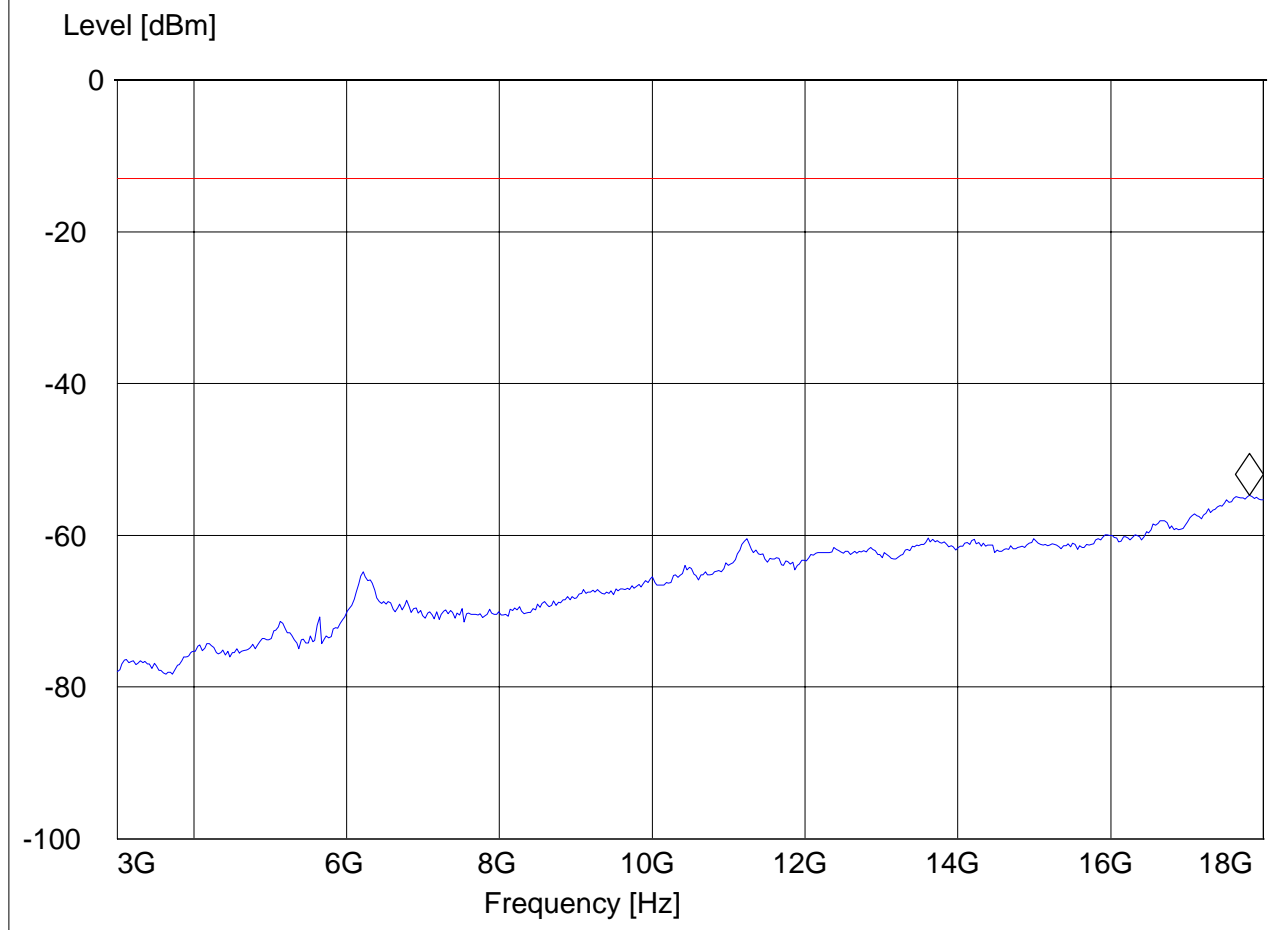
CETECOM Inc., 411 Dixon Landing Road, Milpitas CA 95035, USA

EUT IMEI:: 004401-120210-360
Customer: Toshiba
Test Mode: GPRS CH661
Ant Orientation: V
EUT Orientation: V
Test Engineer: Peter Mu
Voltage:: AC Adaptor
Sweep: FCC24 SPURI 3-18G

SWEEP TABLE: "FCC 24Spuri 3-18G"

Start Frequency	Stop Frequency	Detector	Meas. Time	IF Bandw.	Transducer
3.0 GHz	18.0 GHz	MaxPeak	Coupled	1 MHz	DUMMY-DBM

Marker: 17.819639279 GHz -54.72 dBm



RADIATED SPURIOUS EMISSIONS(PCS 1900)

Tx @ 1909.8MHz: 1GHz – 3GHz

Spurious emission limit –13dBm

Note: The peak above the limit line is the carrier freq. at ch-810.

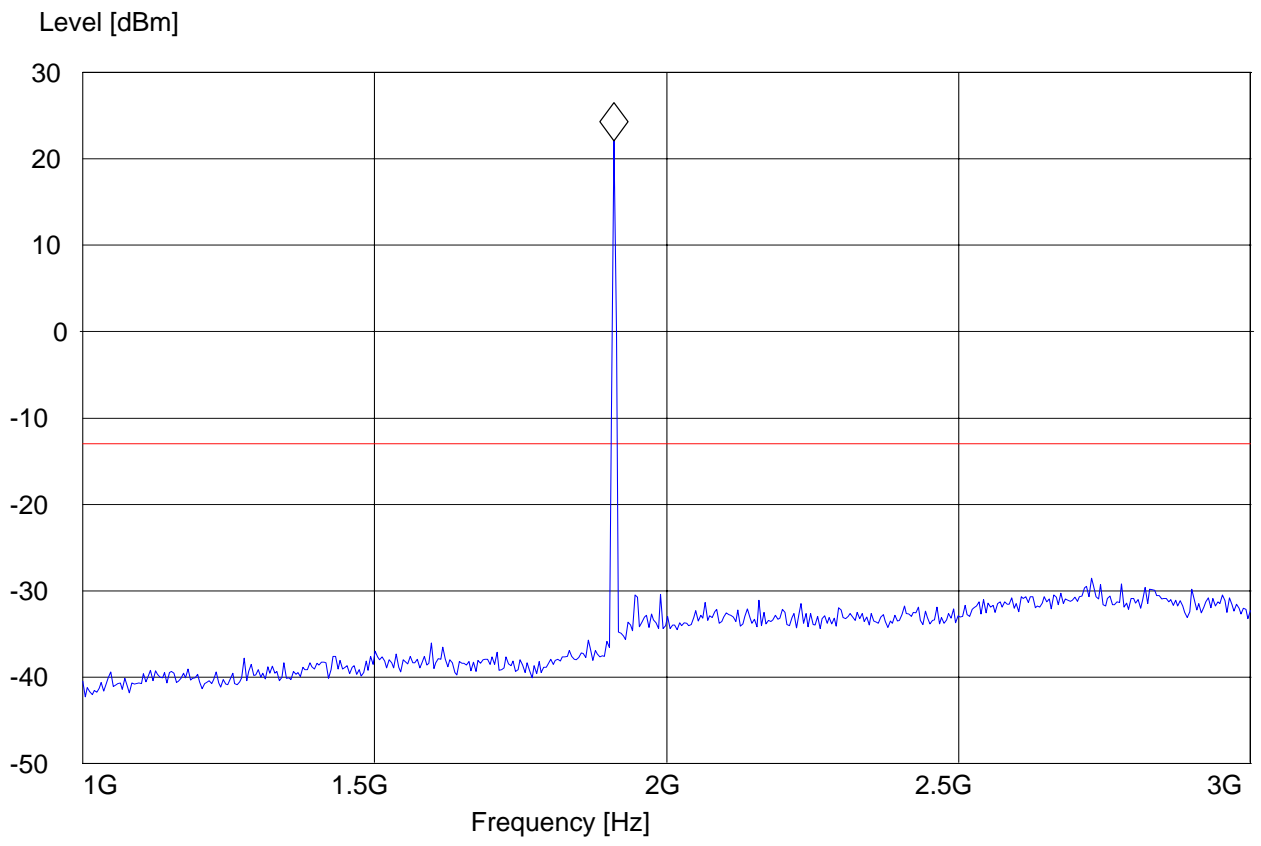
CETECOM Inc., 411 Dixon Landing Road, Milpitas CA 95035, USA

EUT IMEI:: 004401-120210-360
Customer: Toshiba
Test Mode: GPRS CH810
Ant Orientation: V
EUT Orientation: V
Test Engineer: Peter Mu
Voltage:: AC Adaptor
Sweep: FCC24 SPURI 1-3G

SWEEP TABLE: "FCC 24Spuri 1-3G"

Short Description:		FCC 24 1GHz-8GHz				
Start	Stop	Detector	Meas.	IF	Transducer	
Frequency	Frequency		Time	Bandw.		
1.0 GHz	3.0 GHz	MaxPeak	Coupled	1 MHz	DUMMY-DBM	

Marker: 1.909819639 GHz 22.1 dBm



RADIATED SPURIOUS EMISSIONS(PCS 1900)

Tx @ 1909.8MHz: 3GHz – 18GHz

Spurious emission limit –13dBm

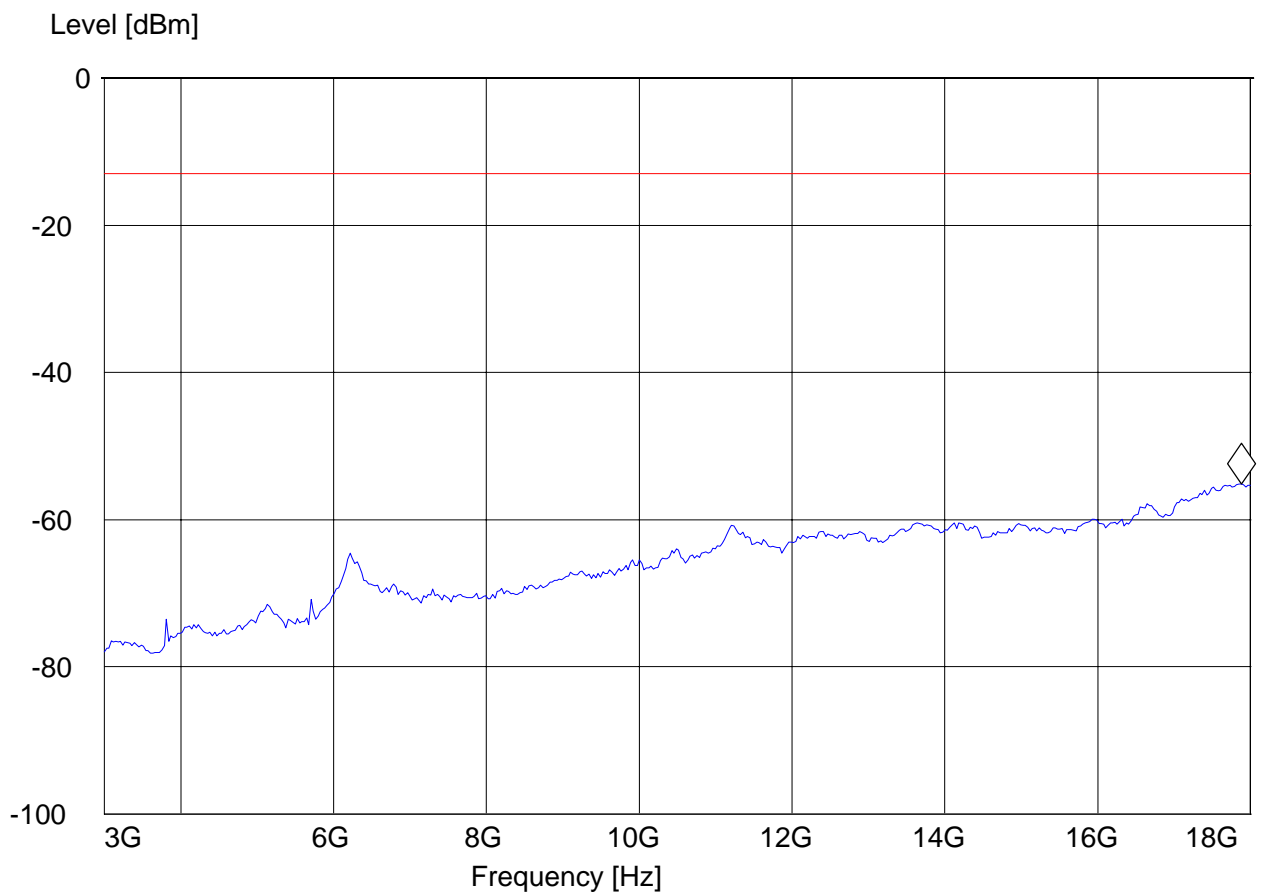
CETECOM Inc., 411 Dixon Landing Road, Milpitas CA 95035, USA

EUT IMEI:: 004401-120210-360
Customer: Toshiba
Test Mode: GPRS CH810
Ant Orientation: V
EUT Orientation: V
Test Engineer: Peter Mu
Voltage:: AC Adaptor
Sweep: FCC24 SPURI 3-18

SWEEP TABLE: "FCC 24Spuri 3-18G"

Start Frequency	Stop Frequency	Detector	Meas. Time	IF Bandw.	Transducer
3.0 GHz	18.0 GHz	MaxPeak	Coupled	1 MHz	DUMMY-DBM

Marker: 17.879759519 GHz -55.12 dBm



RADIATED SPURIOUS EMISSIONS(PCS 1900)

18GHz – 19.1GHz

Spurious emission limit –13dBm

Note: This plot is valid for low, mid & high channels (worst-case plot)

CETECOM Inc., 411 Dixon Landing Road, Milpitas CA 95035, USA

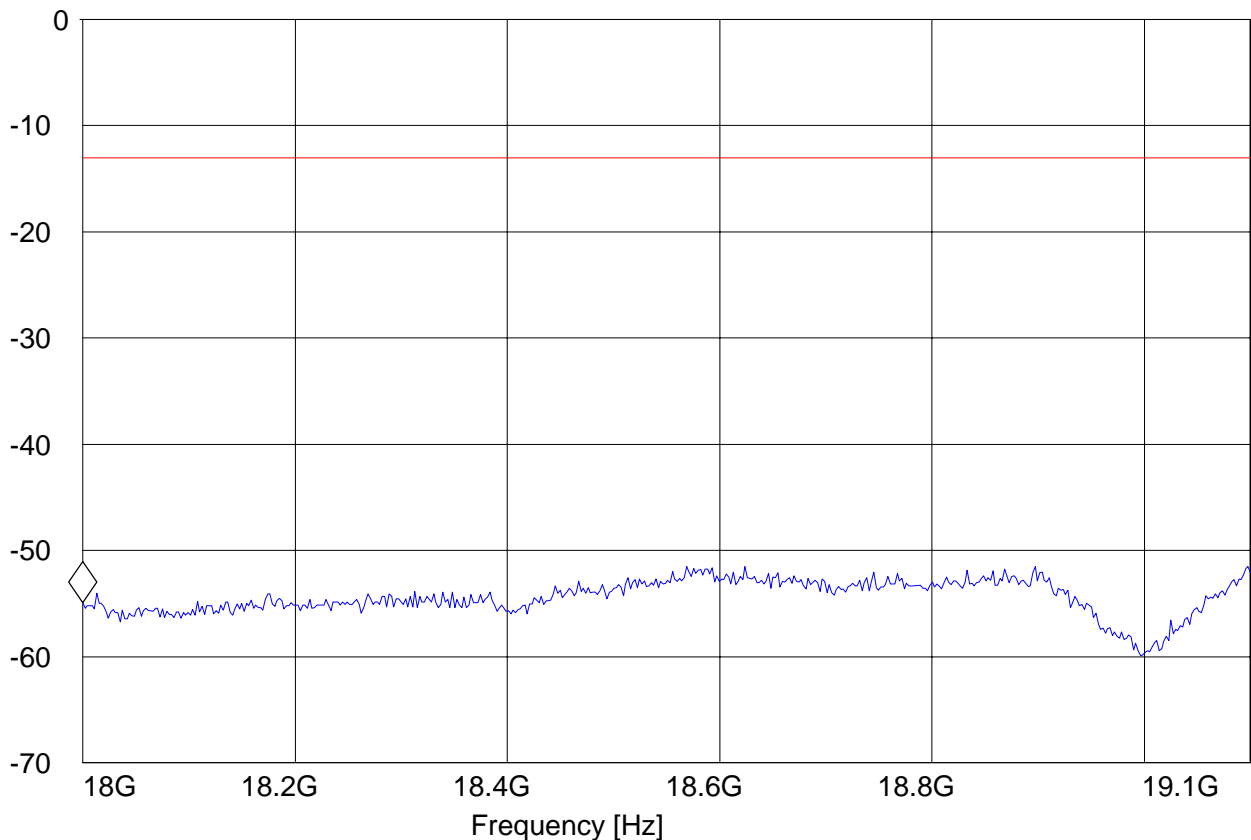
EUT IMEI:: 004401-120210-360
Customer: Toshiba
Test Mode: GPRS CH661
Ant Orientation: V
EUT Orientation: V
Test Engineer: Peter Mu
Voltage:: AC Adaptor
Sweep: FCC24 SPURI 18-19G

SWEEP TABLE: "FCC 24spuri 18-19.1G"

Short Description:		FCC 24 18GHz-19.1GHz			
Start	Stop	Detector	Meas.	IF	Transducer
Frequency	Frequency		Time	Bandw.	
18.0 GHz	19.1 GHz	MaxPeak	Coupled	1 MHz	DUMMY-DBM

Marker: 18 GHz -54.93 dBm

Level [dBm]



5.6 RECEIVER RADIATED EMISSIONS

§ 2.1053 / RSS-132 & 133

NOTE:

1. The radiated emissions were done with different settings, using the relevant pre-amplifiers for the relevant frequency ranges. This is the reason that the graphs show different noise levels. In the range between 3GHz and 26.5GHz very short cable connections to the antenna was used to minimize the noise level.

Limits

SUBCLAUSE § RSS-133

Frequency (MHz)	Field strength (µV/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	30
30 - 88	100	3
88 - 216	150	3
216 - 960	200	3
Above 960	500	3

5.6.1 Receiver Spurious on EUT 1900MHz

RECEIVER RADIATED EMISSIONS

EUT in Idle Mode: 30MHz – 1GHz

Antenna: horizontal

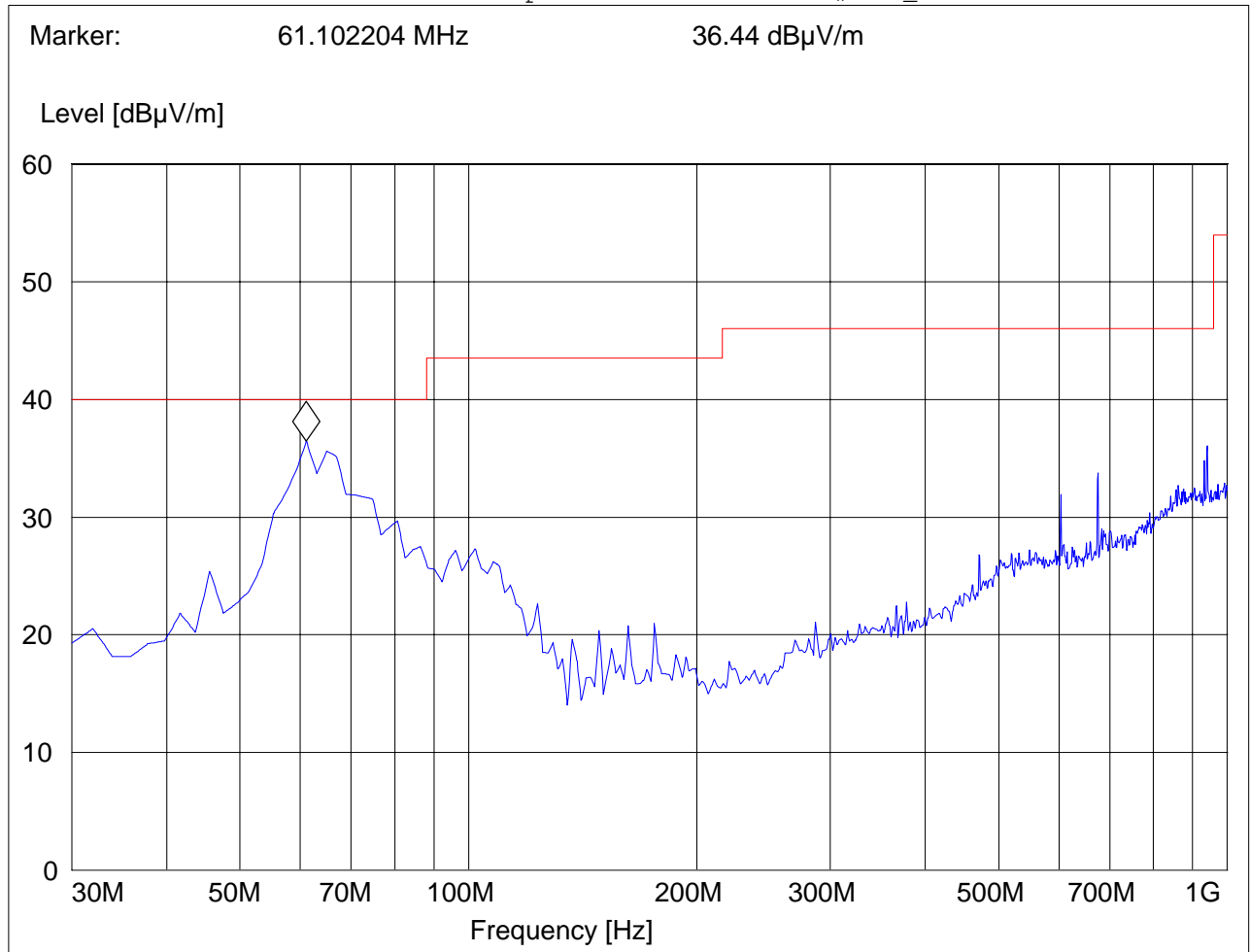
Note: Peak Reading Vs. Quasi-Peak Limit.

CETECOM Inc., 411 Dixon Landing Road, Milpitas CA 95035, USA

EUT IMEI:: 004401-120210-360
Customer: Toshiba
Test Mode: GPRS, Idle Mode
Ant Orientation: V
EUT Orientation: V
Test Engineer: Ed
Voltage:: AC Adaptor
Sweep: Canada Re_30M-1G_V

SWEEP TABLE: "CANADA RE_30M-1G_Hor"

Start	Stop	Detector	Meas.	IF	Transducer
Frequency	Frequency		Time	Bandw.	
30.0 MHz	1.0 GHz	MaxPeak	Coupled	100 kHz	3141-#1186_Vert



RECEIVER RADIATED EMISSIONS

EUT in Idle Mode: 1GHz – 3GHz

Note: Peak Reading Vs. Average Limit.

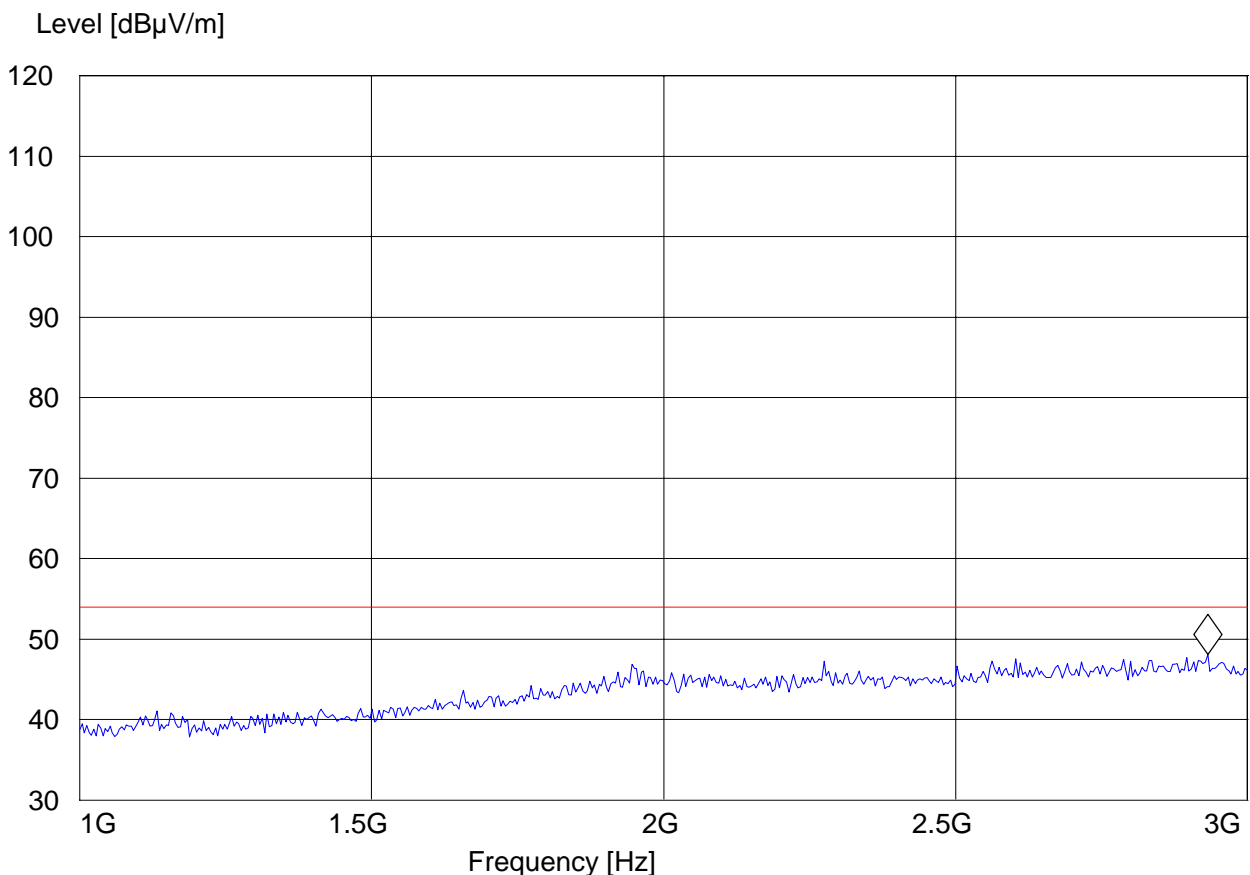
CETECOM Inc., 411 Dixon Landing Road, Milpitas CA 95035, USA

EUT IMEI:: 004401-120210-360
Customer: Toshiba
Test Mode: GPRS, Idle Mode
Ant Orientation: V
EUT Orientation: V
Test Engineer: Ed
Voltage:: AC Adaptor
Sweep: Canada Re_1-3G

SWEEP TABLE: "CANADA RE_1-3G"

Start Frequency	Stop Frequency	Detector	Meas. Time	IF Bandw.	Transducer
1.0 GHz	3.0 GHz	MaxPeak	Coupled	1 MHz	#326horn_AF_vert

Marker: 2.931863727 GHz 48.11 dB μ V/m



RECEIVER RADIATED EMISSIONS
EUT in Idle Mode: 3GHz – 18GHz

Note: Peak Reading Vs. Average Limit.

CETECOM Inc., 411 Dixon Landing Road, Milpitas CA 95035, USA

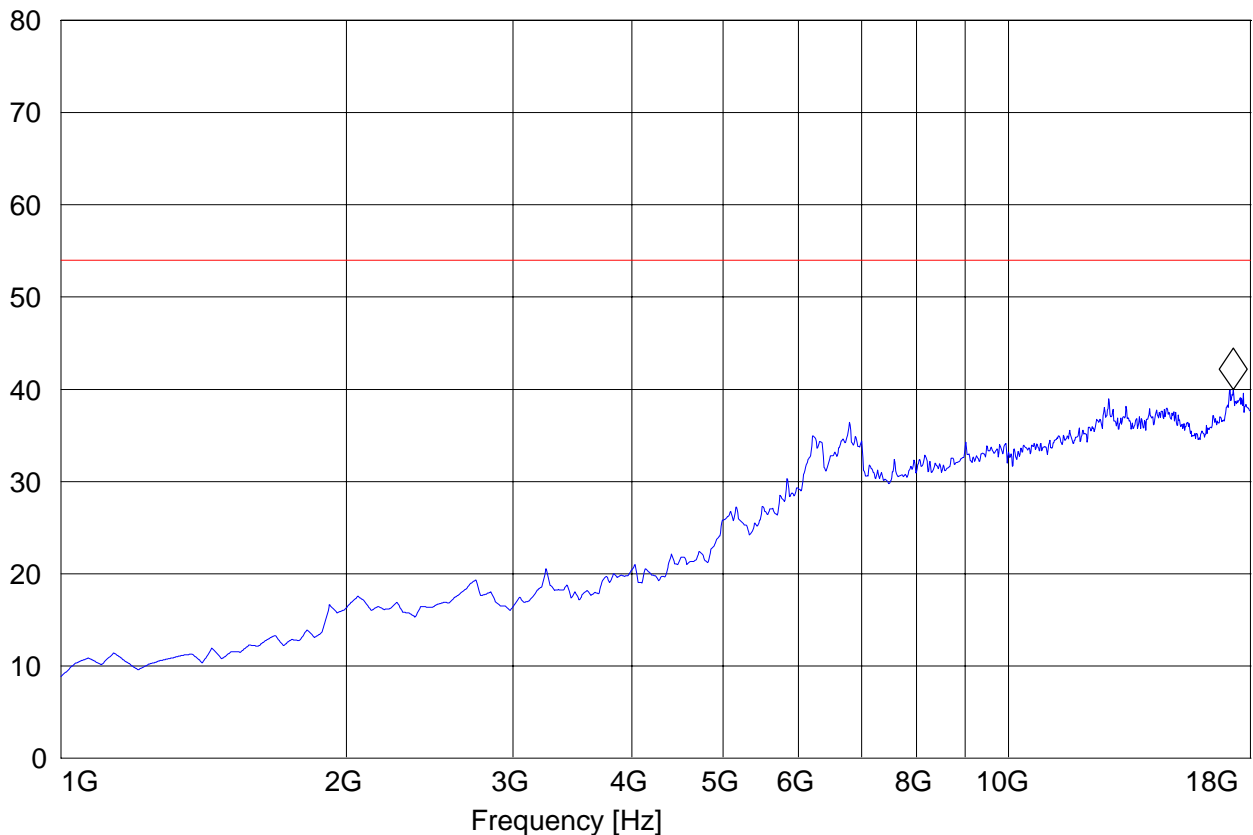
EUT IMEI:: 004401-120210-360
Customer: Toshiba
Test Mode: GPRS, Idle Mode
Ant Orientation: V
EUT Orientation: V
Test Engineer: Ed
Voltage:: AC Adaptor
Sweep: Canada Re_3-18G

SWEEP TABLE: "CANADA RE_3-18G"

Start Frequency	Stop Frequency	Detector	Meas. Time	IF Bandw.	Transducer
1.0 GHz	18.0 GHz	MaxPeak	Coupled	1 MHz	#326horn_AF_vert

Marker: 17.250501002 GHz 39.98 dB μ V/m

Level [dB μ V/m]



RECEIVER RADIATED EMISSIONS
EUT in Idle Mode: 18GHz – 19.1GHz

Note: Peak Reading Vs. Average Limit.

CETECOM Inc., 411 Dixon Landing Road, Milpitas CA 95035, USA

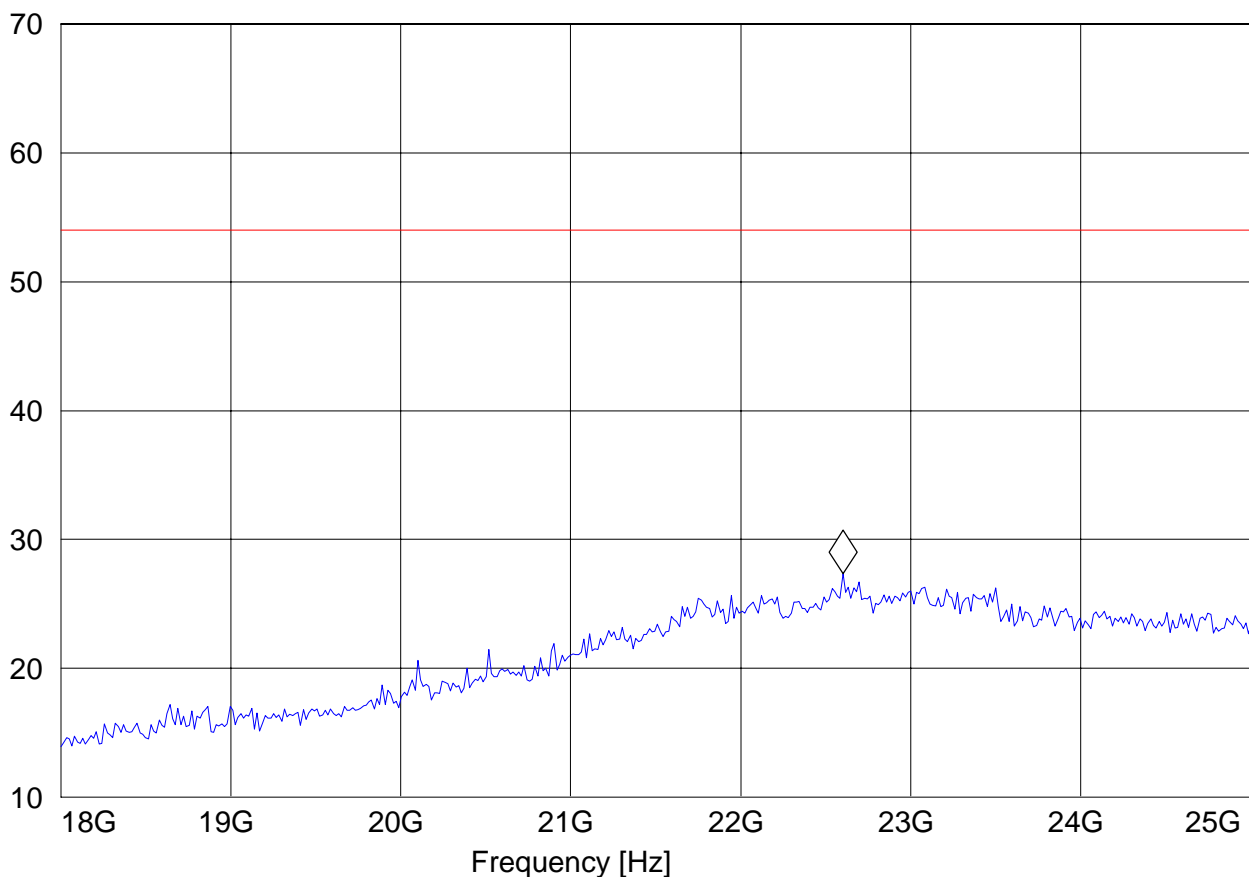
EUT IMEI:: 004401-120210-360
Customer: Toshiba
Test Mode: GPRS, Idle Mode
Ant Orientation: V
EUT Orientation: V
Test Engineer: Ed
Voltage:: AC Adaptor
Sweep: Canada Re_18-26.5G

SWEEP TABLE: "CANADA RE_18-26.5G"

Start Frequency	Stop Frequency	Detector	Meas. Time	IF Bandw.	Transducer
18.0 GHz	26.5 GHz	MaxPeak	Coupled	1 MHz	3160 Horn 18-26.5G

Marker: 22.601202405 GHz 27.36 dBμV/m

Level [dBμV/m]



6 TEST EQUIPMENT AND ANCILLARIES USED FOR TESTS

No	Instrument/Ancillary	Type	Manufacturer	Serial No.	Cal Due	Interval
01	Spectrum Analyzer	ESIB 40	Rohde & Schwarz	100107	May 2007	1 year
02	Spectrum Analyzer	FSEM 30	Rohde & Schwarz	100017	August 2007	1 year
03	Signal Generator	SMY02	Rohde & Schwarz	836878/011	May 2007	1 year
04	Power-Meter	NRVD	Rohde & Schwarz	0857.8008.02	May 2007	1 year
05	Biconilog Antenna	3141	EMCO	0005-1186	June 2007	1 year
06	Horn Antenna (1-18GHz)	SAS-200/571	AH Systems	325	June 2007	1 year
07	Horn Antenna (18-26.5GHz)	3160-09	EMCO	1240	June 2007	1 year
08	Power Splitter	11667B	Hewlett Packard	645348	n/a	n/a
09	Climatic Chamber	VT4004	Voltsch	G1115	May 2007	1 year
10	High Pass Filter	5HC2700	Trilithic Inc.	9926013	n/a	n/a
11	High Pass Filter	4HC1600	Trilithic Inc.	9922307	n/a	n/a
12	Pre-Amplifier	JS4-00102600	Miteq	00616	May 2007	1 year
13	Power Sensor	URV5-Z2	Rohde & Schwarz	DE30807	May 2007	1 year
14	Digital Radio Comm. Tester	CMD-55	Rohde & Schwarz	847958/008	May 2007	1 year
15	Universal Radio Comm. Tester	CMU 200	Rohde & Schwarz	832221/06	May 2007	1 year
16	LISN	ESH3-Z5	Rohde & Schwarz	836679/003	May 2007	1 year
17	Loop Antenna	6512	EMCO	00049838	July 2007	2 years

7 References

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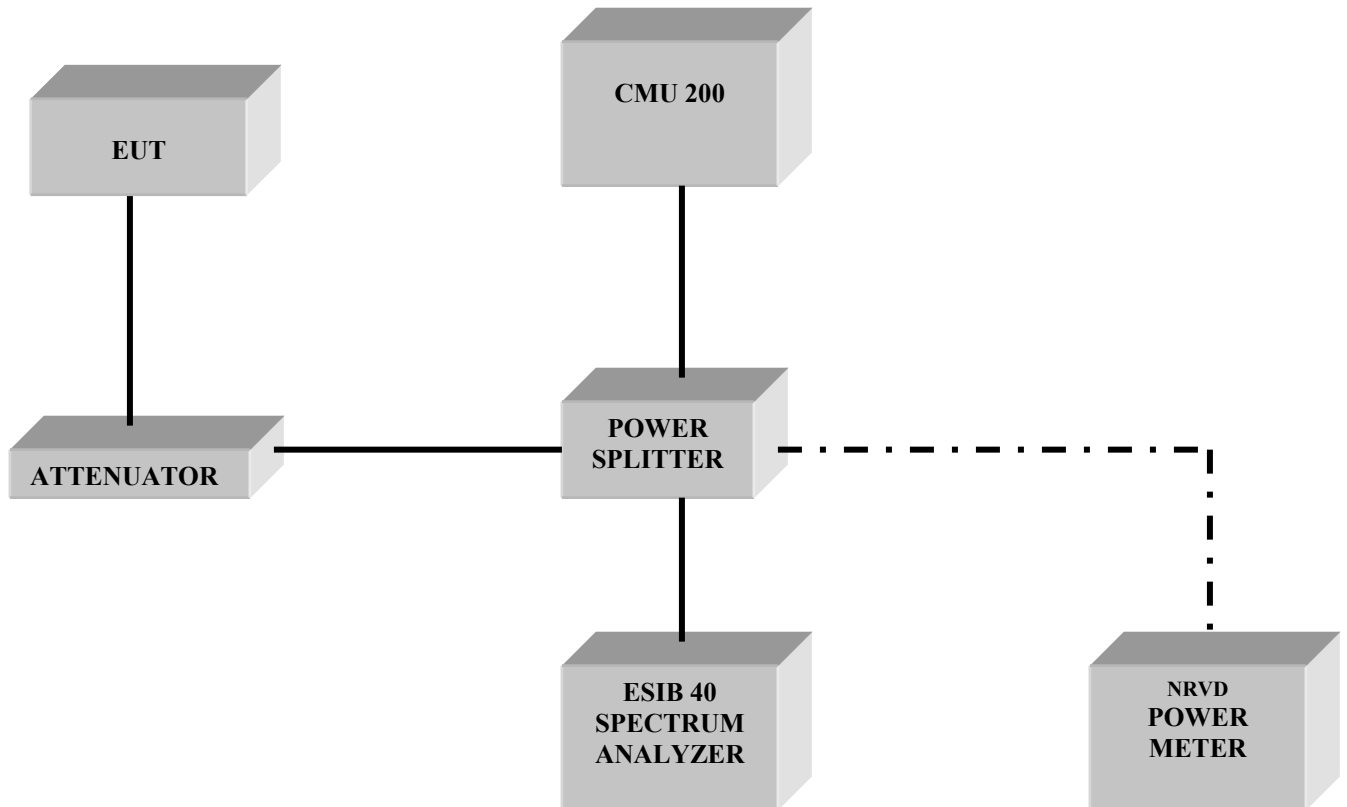
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8 BLOCK DIAGRAMS

Conducted Testing



Radiated Testing

ANECHOIC CHAMBER

