

CETECOM Inc.



CETECOM Inc.

411 Dixon Landing Road, Milpitas, CA-95035, USA
Phone: +1 408 586 6200 Fax: +1 408 586 6299
www.cetecom.com

Test report no.: 255FCC22/2002

Issued test report consists of 20 Pages

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FCC LISTED, REG. NO.: 101450 & RECOGNIZED BY INDUSTRY CANADA IC – 3925
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**Test report no.: 255-2FCC22/2002
Class II Permissive change
FCC Part 22
(FCC ID: BFYT3017)**

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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 Inc. does not assume responsibility for any conclusions and generalisations 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.

1.2 Testing laboratory

CETECOM Inc.

411 Dixon Landing Road, Milpitas, CA-95035, USA

Phone: +1 408 586 6200 Fax: +1 408 586 6299

E-mail: lothar.schmidt@cetecomusa.com

Internet: www.cetecom.com

Test report prepared by:

Pete Krebill

EMC Engineer

1.3 Details of applicant

Name : Shintom Co. Ltd.
Street : 1-19-20 Shin Yokohama Kohoku-ku
City : Yokohama
Country : Japan
Contact : Takeo Watanabe
Telephone : +81-45-476-3541
Tele-fax : +81-45-476-3540
e-mail : watanabe@shintom.co.jp

1.4 Application details

Date of receipt of application : February 6, 2002
Date of receipt test item : February 21, 2002
Date of test : March 8, 11 & 12, 2002

1.5 Test item

Manufacturer : Shintom Co. Ltd.
Model No : TR93
Antenna model : 594N
Description : Mobile Cellular Telephone
Serial No. : 17400000825
FCC ID No. : BFYT3017
Frequency : 824.04MHz to 848.97MHz
Type of modulation : AMPS (40K0F8W, 40K0F1D)
Number of channels : 832
Antenna : Detachable
Power supply : Automotive battery
Output power : Max. ERP = 31.81dBm / 1.517 Watts

1.6 Test standards

FCC Part 22

2 Technical test

2.1 Summary of test results

The testing, detailed in this report, is to verify that the characteristics of the device are compliant to FCC requirements. The installation location of the transceiver antenna is different from that in the original grant. There is no change in the transceiver itself, FCC ID: BFYT3017.

Technical responsibility for area of testing:

March 18, 2002

EMC & Radio

Lothar Schmidt



Date

Section

Name

Signature

2.2 Test report

TEST REPORT

**Test report no.: 255-2FCC22/2002
(TR93)**

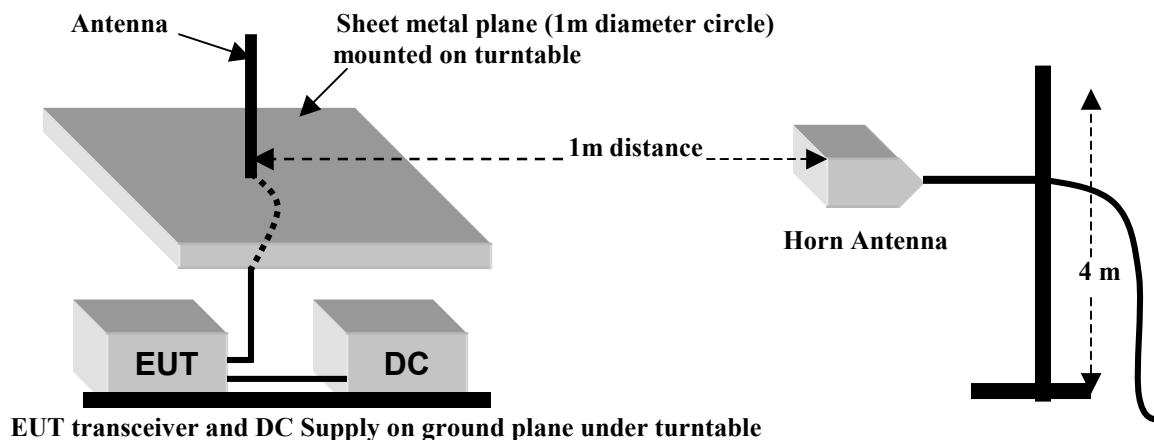
Test set-up diagrams:

Conducted set-up:



The EUT's RF port is connected to either a spectrum analyser or a power meter with attenuators and co-axial cable.

Radiated set-up:



EUT operating mode:

During the testing process, the EUT was controlled by service mode commands. Service mode was used to set the channel and output power of the EUT. During all testing listed in this report, the EUT was set to its maximum power setting. During all testing listed in this report, the EUT was powered by a DC power supply with 13.7VDC output.

RF power output**Subclause § 2.1046****Method of Measurements:**

Attenuators and co-axial cable were used to connect the RF port of the EUT to a spectrum analyser or power meter. The measurement equipment was offset for cable loss and attenuators. The spectrum analyser was used for peak measurements, the power meter for average measurements.

Conducted RF Power Output:

Frequency (MHz)	Peak Output Power (dBm)	Average Output Power (dBm)
824.04	34.78	34.33
836.49	34.83	34.50
848.97	34.26	33.90
Measurement uncertainty	± 0.5 dB	

Analyser settings: RBW = 3MHz VBW = 3MHz

Effective radiated power (ERP)**Subclause § 22.913****Description:**

This is the test for the maximum radiated power from the EUT.

Rule Part 22.913 (a) specifies that the effective radiated power of mobile transmitters must not exceed 7 Watts.

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 centre 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 (P_{in}) is applied to the input of the dipole, and the power received (P_r) at the chamber's probe antenna is recorded.
2. A "reference path loss" is established as $P_{in} - P_r$.
3. The EUT is substituted for the dipole at the reference centre of the chamber. The EUT is put into test mode at maximum power. The turntable is rotated exposing 360 degrees of the EUT to the measurement antenna. At the azimuth of the highest emission, the height of the measurement antenna is varied from 1 to 4 meters. At the height of highest emission, the EUT is rotated 360 degrees. The highest reading is recorded.
4. The "reference path loss" from Step 1 is added to this result.
5. This value is ERP since the measurement is calibrated using a half-wave dipole antenna of known gain and known input power (P_{in}).

Limits:

ERP	<38.45 dBm, <7 Watts
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Results:

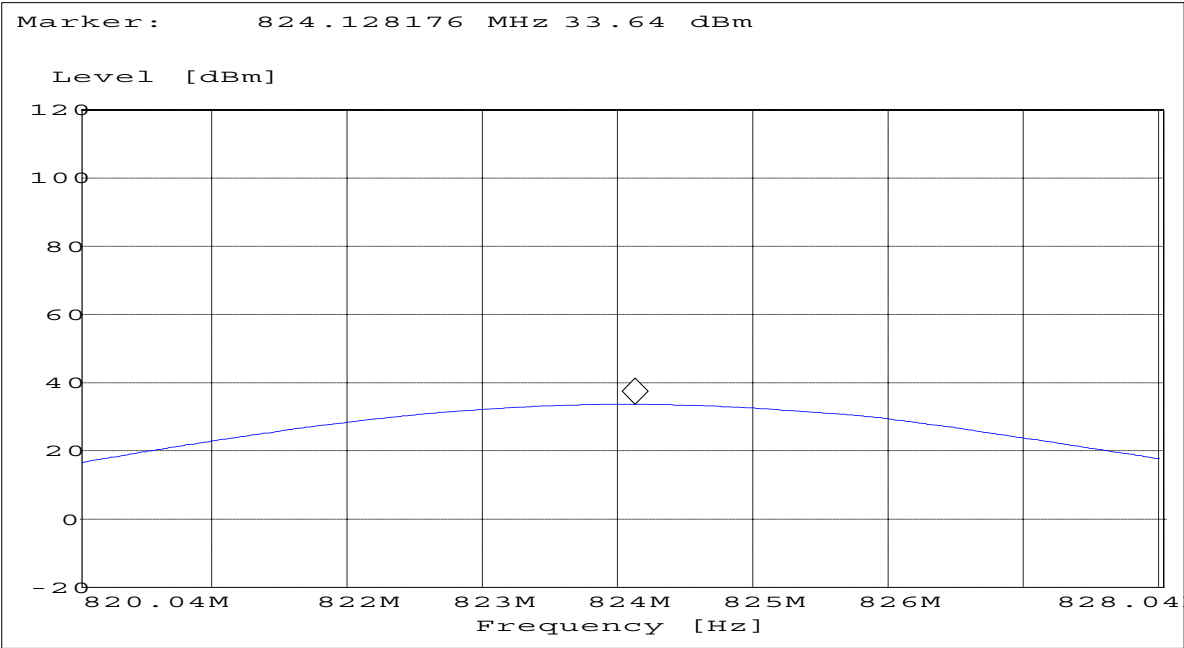
The measurement software is configured to measure EIRP. The plots below show EIRP values. The ERP values are shown in the table below. The ERP was calculated by subtracting 2.2dB from the EIRP values.

Plots are shown on next pages.

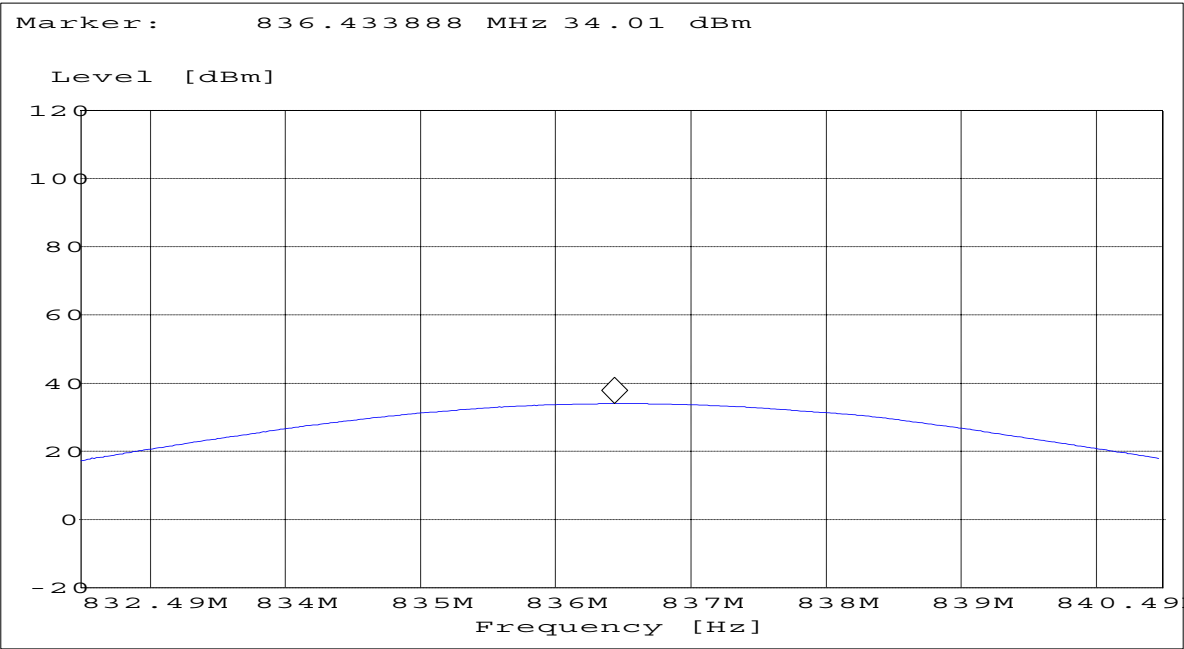
Frequency (MHz)	EIRP (dBm)	ERP (dBm)	Watts
824.04	33.64	31.44	1.393
836.49	34.01	31.81	1.517
848.97	31.99	29.79	0.953
Measurement uncertainty	±0.5 dB		

Analyser settings: RBW = 3MHz VBW = 3MHz

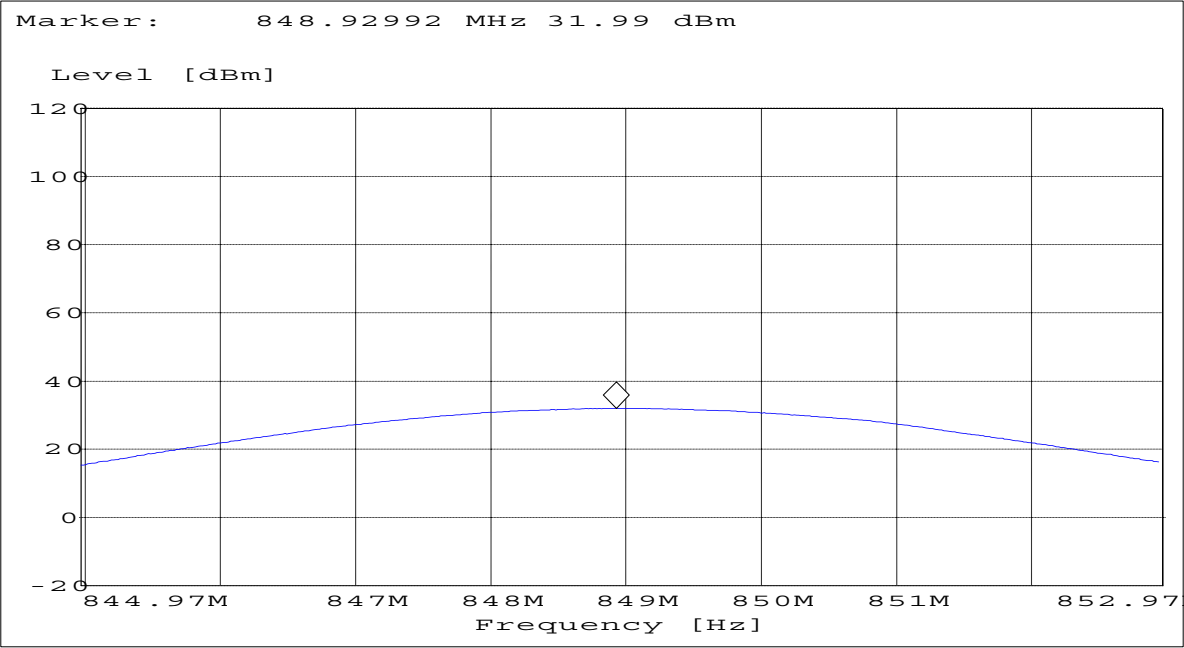
EIRP channel 991:



EIRP channel 383:



EIRP channel 799:



Field Strength of Spurious Radiation**Subclause §22.917(e)****Measurement Procedure:**

The following steps outline the procedure used to measure the radiated emissions from the EUT. The site is constructed in accordance with ANSI C63.4 – 1992 requirements and is recognised by the FCC.. The spectrum was scanned from 1GHz to 9GHz. The resolution bandwidth is set to 30KHz as outlined in subclause 22.917(h). The spectrum was scanned with the mobile station transmitting at carrier frequencies that pertain to low, mid and high channels (Ch:991 @ 824.04 MHz, Ch:383 @ 836.49MHz and Ch:799 @ 848.97 MHz). The equipment must still, however, meet the 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.

The final Radiated emission test procedure is as follows:

- 1) The test item was placed on a non-conductive stand. The stand was 0.8m high.
- 2) A double ridged waveguide antenna was placed on an adjustable height antenna mast 1 meters from the test item for emission measurements.
- 3) Detected emissions were maximized at each frequency by rotating the test item and adjusting the receive antenna height and polarization. The maximum meter readings were recorded. The radiated emission measurements of all non-harmonic and harmonics of the transmit frequency to the 10th harmonic were measured with a peak detector. If a harmonic could not be detected above the noise floor, the ambient level was recorded. The equivalent power into a dipole antenna was determined by the substitution method described for ERP measurements.

Measurement Limit:

Subclause 22.917(e) Out of band emissions.

- (a) The mean power of any emissions must be attenuated below the mean power of the unmodulated carrier on any frequency twice or more than twice the fundamental frequency by at least (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.

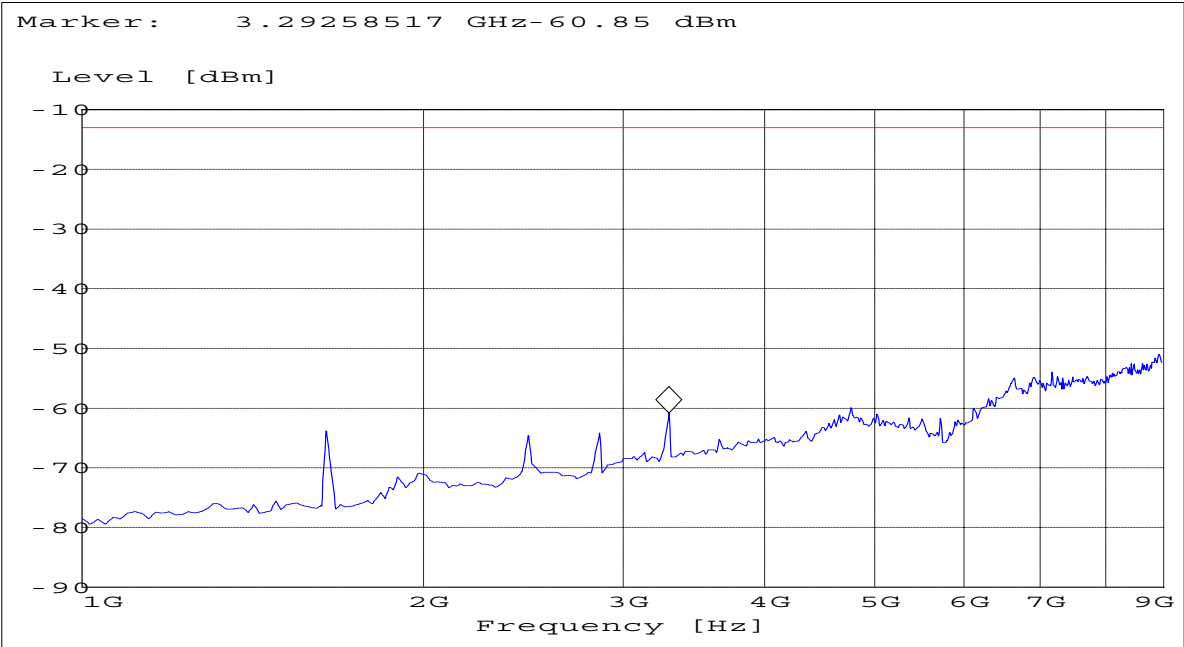
Measurement Results:

Radiated emissions results are shown in the tables below. Radiated emissions plots are included in the following pages.

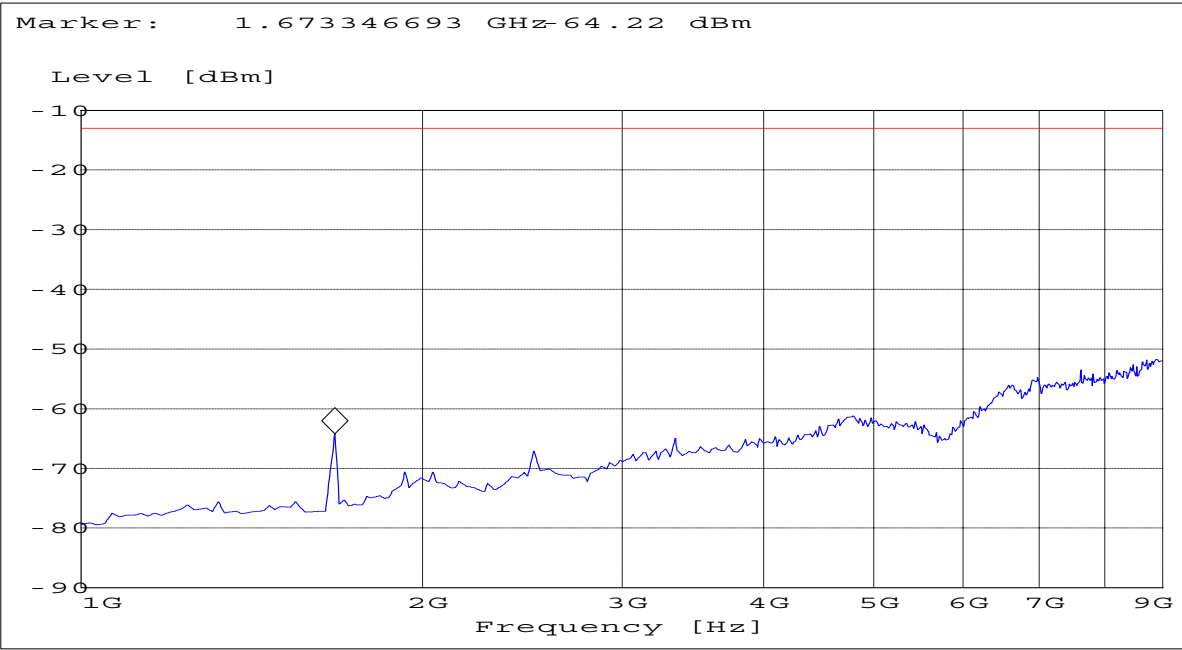
Results of radiated emissions measurements:

Harmonics	Tx ch-991 824.04MHz Freq. (MHz)	Level (dBm)	Tx ch-383 836.49MHz Freq. (MHz)	Level (dBm)	Tx ch-799 848.97MHz Freq. (MHz)	Level (dBm)
2	1648.08	-63.82	1672.98	-64.22	1697.94	-61.47
3	2472.12	-64.57	2509.47	-67.12	2546.91	-69.48
4	3296.16	-60.85	3345.96	-64.96	3395.88	-66.46
5	4120.2	-64.94	4182.45	-64.76	4244.85	-64.69
6	4944.24	-61.02	5018.94	-62.04	5093.82	-61.90
7	5768.28	-61.71	5855.43	-63.11	5942.79	-62.60
8	6592.32	-54.95	6691.92	-55.21	6791.76	-55.51
9	7416.36	-54.77	7528.41	-53.54	7640.73	-54.49
10	8240.4	-53.92	8364.9	-53.87	8489.7	-52.84

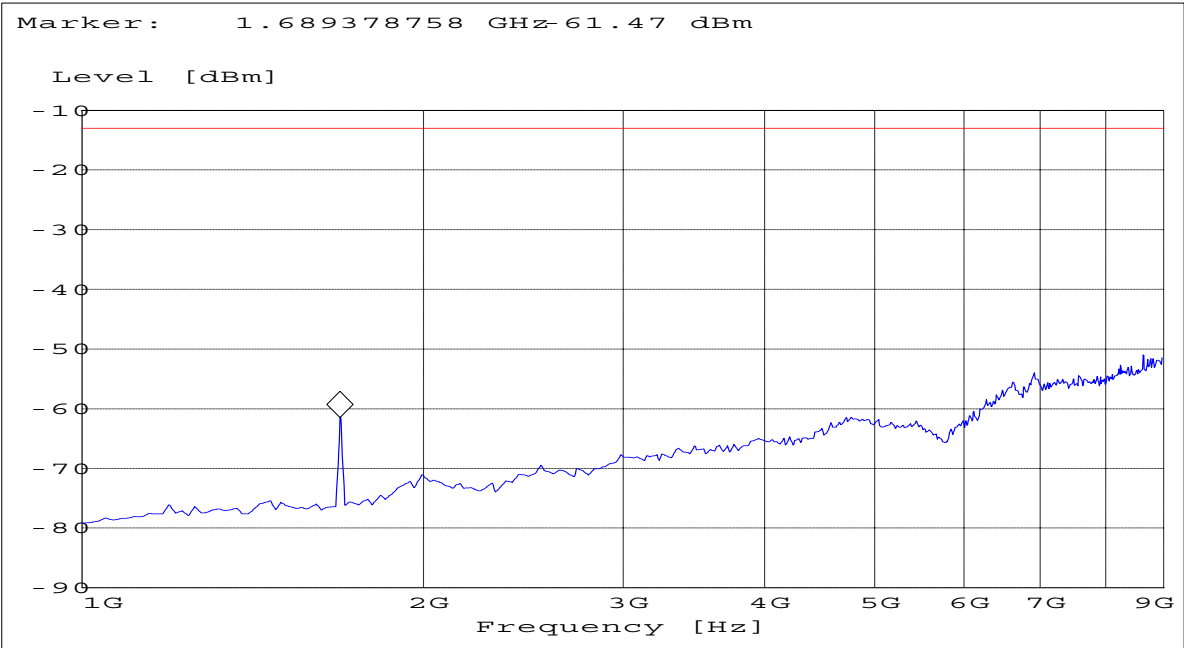
spurious emissions channel 991:



spurious emissions channel 383:



spurious emissions channel 799:

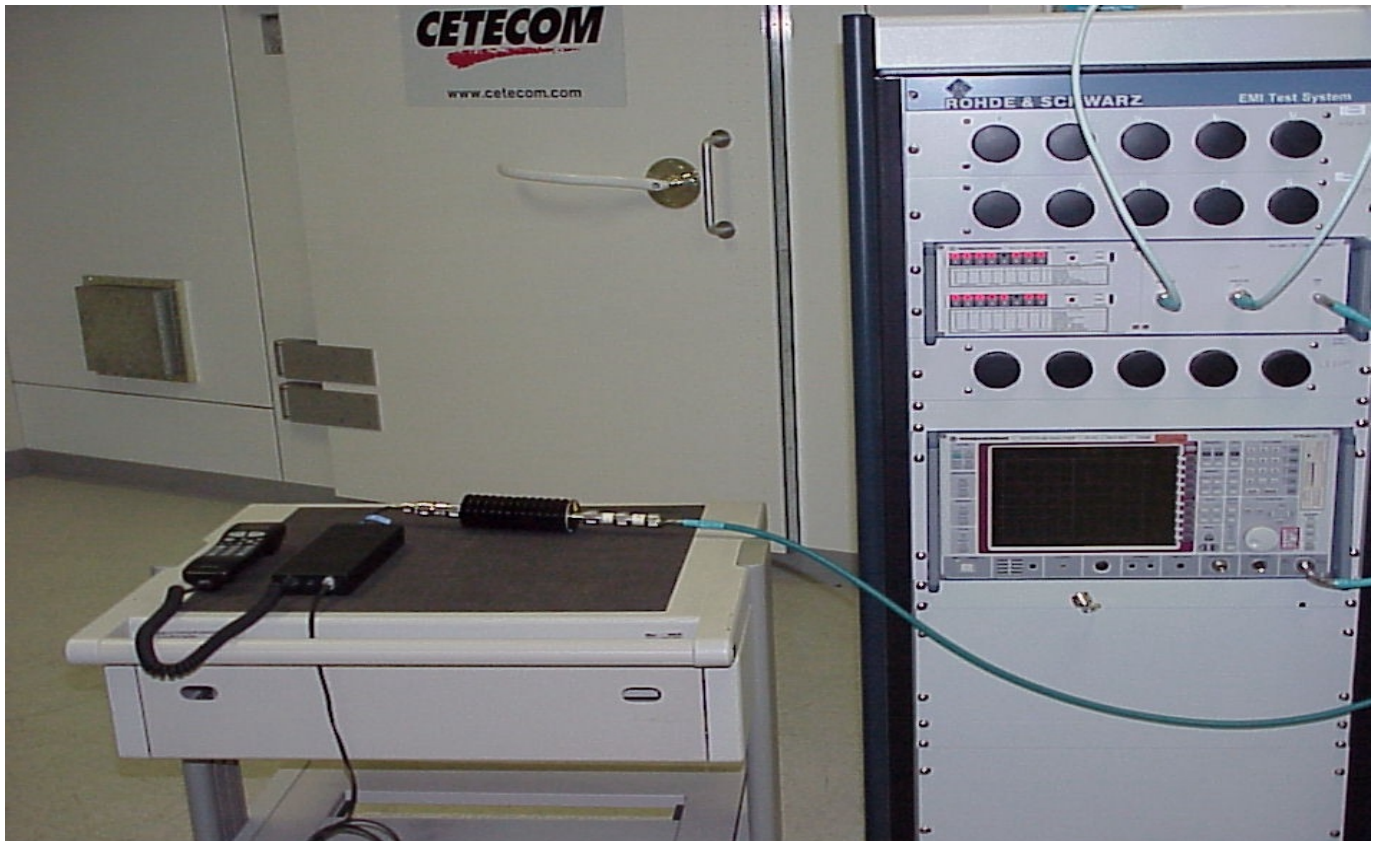


Test equipment list:

No	Instrument/Ancillary	Type	Manufacturer	Serial No.
01	Spectrum Analyzer	FSEM 30	Rohde & Schwarz	826880/010
02	Signal Generator	SMY02	Rohde & Schwarz	836878/011
03	Power-Meter	NRVD	Rohde & Schwarz	0857.8008.02
04	Power Amplifier	250W1000	Amplifier Research	300031
05	Biconilog Antenna	3141	EMCO	0005-1186
06	Horn Antenna	SAS-200/571	AH Systems	325
07	Power Splitter	11667B	Hewlett Packard	645348
09	Pre-Amplifier	JS4-00102600	Miteq	00616
10	Power Sensor	URV5-Z2	Rohde & Schwarz	DE30807

Test set-up photos:

Conducted set-up:



594N model radiated set-up:



END OF REPORT