

CETECOM ICT Services GmbH

Radio Satellite Communication

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Test report No.: 3-4150-01-04/04

This test report consists of 50 pages

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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 081/94-D0



Independent ETSI
compliance test house



Test Report No.: 3-4150-01-04/04
Applicant: SANYO Electric Co., Ltd.
Type: SUP-S103
Test Standards: FCC Part 24 / RSS 133
FCC ID: AEZSUP-S750
Spurious emissions only

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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
Telephone: + 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-081/94-D0

Listed by: Federal Communications Commission (FCC)

Identification/Registration No : 90462

Laboratory Manager :

2004-10-26	RSC 8431	Gillmann D
Date	Section	Name

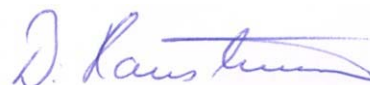
Signature



Technical responsibility for area of testing:

2004-10-26	RSC 8412	Hausknecht D.
Date	Section	Name

Signature



1.3 Details of Applicant

Name: SANYO Electric Co., Ltd.
Address: 1-1 Sanyo-cho Daito City
City: Osaka 574-8534
Country: Japan
Phone: + 81-72-870-6348
Fax: + 81-72-870-6393
Contact: Masayuki Hasegawa
Phone: + 81-72-870-6348
Fax: + 81-72-870-6393
e-mail: HASE038946@dt.sanyo.co.jp

1.4 Application Details

Date of test: 2004-10-25 to 2004-10-26

CETECOM ICT Services GmbH

Test report No. 3-4150-01-04/04

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1.5 Test Item

Type of equipment: Mobile Station (GSM/GPRS/UMTS)

Type name: SUP-S103

Manufacturer: See applicant

Address:

City:

Country:

Frequency 1850.2 – 1909.8 MHz

Type of modulation: 300KGXW

Number of channels: 300

Output power GSM 1900: conducted: 29.6 dBm (Peak), EIRP: 28.1 dBm (Burst)

Transmitter Spurious (worst case) --- μ W (noise floor)

Receiver Spurious (worst case) --- μ V/m @ 3m

Antenna: Integral antenna

Power supply (normal): 3,7 V DC Li-Polymer Battery

Power supply (extreme): 3.3 – 4.4 V DC

FCC ID: AEZSUP-S750

Certification No. IC:

Open Area Test Site IC No.: 3436

IC Standards RSS133, Issue 2, Rev. 1

ATTESTATION:

DECLARATION OF COMPLIANCE: I declare that the testing was performed or supervised by me; that the test measurements were made in accordance with the above-mentioned Industry Canada standard(s); and that the equipment identified in this application has been subjected to all the applicable test conditions specified in the Industry Canada standards and all of the requirements of the standard have been met.

Laboratory Manager :

2004-10-26

RSC 8431

Gillmann D.

Date

Section

Name

Signature



Test Set-up

Hardware: 1.2
Software 0.10000

Mobile IMEI: 354985000000152 (radiated and conducted measurements) (see photo documentation)
Mobile IMEI: 353985.00.00021.01 (radiated and conducted measurements (reported from the sample)

The radiated measurements were performed with an AC/DC charging unit :

- SANYO AC Adapter Model No.: SUP-004ADT Input 100 – 240V (AC)
- USB Cable
- Headset

1.6 Test Standards

FCC:	CFR Part 24 E
IC:	RSS 133, Issue 2, Rev. 1

2 STATEMENT OF COMPLIANCE

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

2.1 Summary of Measurement Results

2.1.1 PCS1900

Section in this Report	Test Name	Verdict
3.1.1	Radiated Emissions	pass
3.1.2	Receiver Radiated Emissions	pass
3.1.3	Conducted Spurious Emissions	pass

3 MEASUREMENTS AND RESULTS

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).

3.1 PART PCS 1900

3.1.1 Radiated Emissions

Reference

FCC:	CFR Part 24.238, 2.1053
IC:	RSS 133, Issue 2, Rev. 1, Section 6.3

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 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:

- The test item was placed on a 0.8 meter high non-conductive stand at a 3 meter test distance from the receive antenna.
- The antenna output was terminated in a 50 ohm load.
- A double ridged waveguide antenna was placed on an adjustable height antenna mast 3 meters from the test item for emission measurements.
- 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.
- 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 $43+10\log(P)$ 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

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.

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

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.

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	Nothing or more than 10 dB lower at limits	3760	Nothing or more than 10 dB lower at limits	3819.6	Nothing or more than 10 dB lower at limits
3	5550.6		5640		5729.4	
4	7400.8		7520		7639.2	
5	9251.0		9400		9549.0	
6	11101.2	-	11280	-	11458.8	-
7	12951.4	-	13160	-	13368.6	-
8	14801.6	-	15040	-	15278.4	-
9	16651.8	-	16920	-	17188.2	-
10	18502.0	-	18800	-	19098.0	-

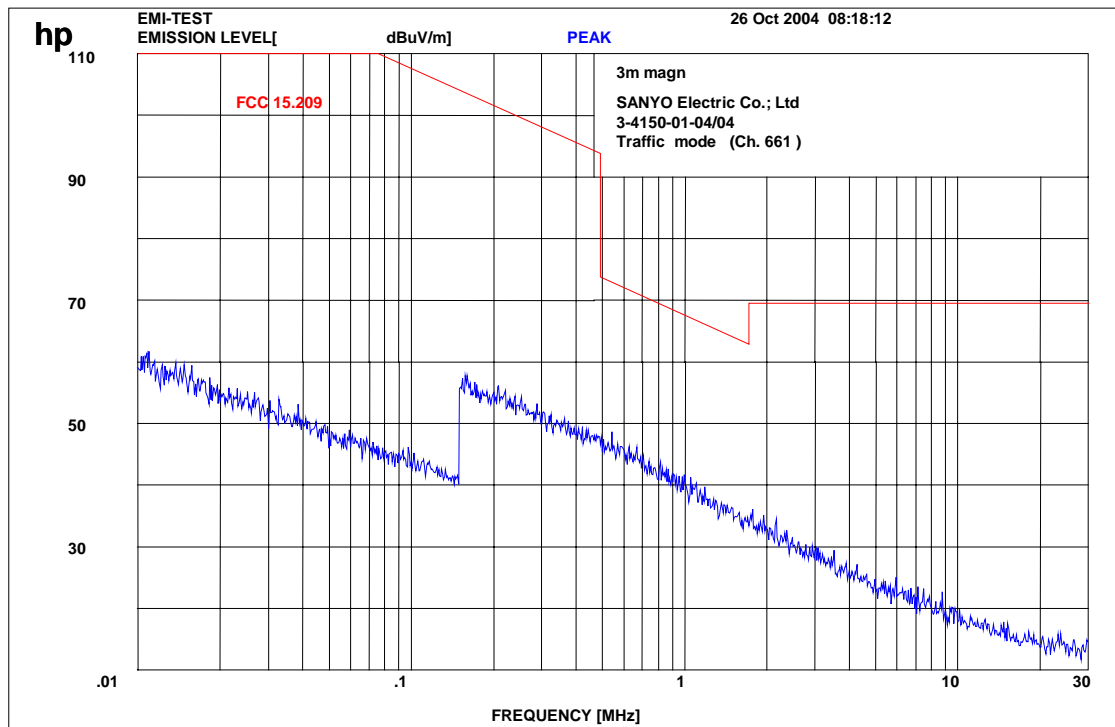
Sample calculation:

Frequenc y	SA Reading	SG Setting	Ant. gain	Dipol gain	Cable loss	EIRP Result			
MHz	dBuV	dBm	dB	dB	dB	dBm			
	-	-50.1	9.7	0.0	4.7				

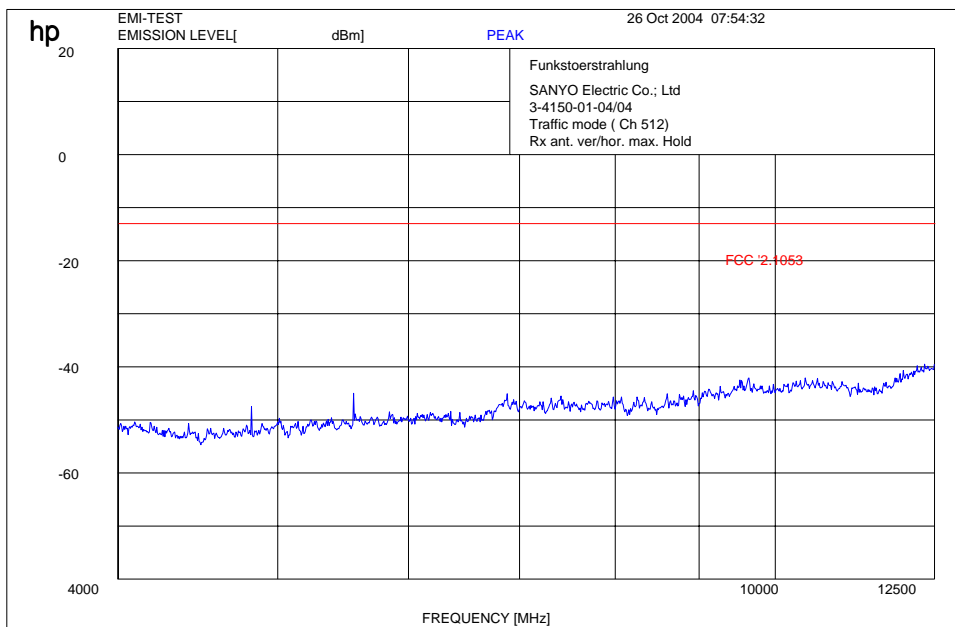
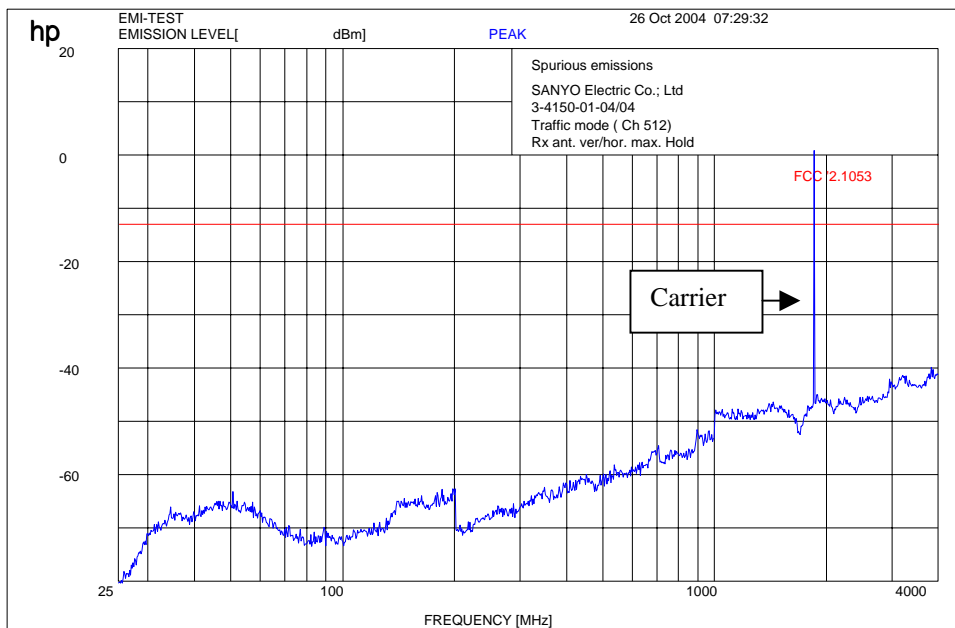
EIRP = SG (dBm) - Cable Loss (dB) + Ant. gain (dBi)

Magn. Field strength up to 30 MHz

Traffic mode (valid for all 3 channels)



Channel 512 (up to 12.5 GHz)

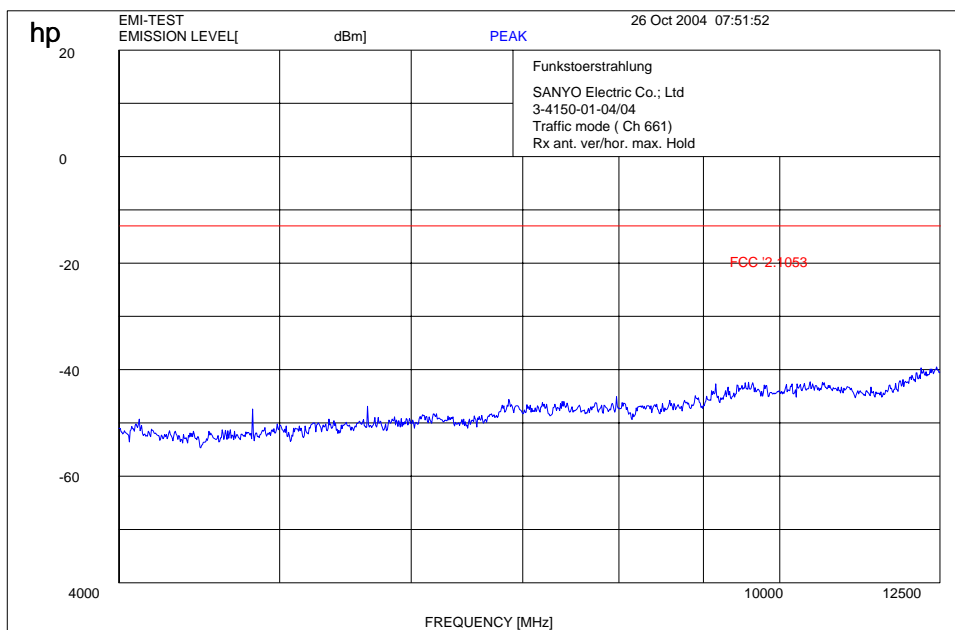
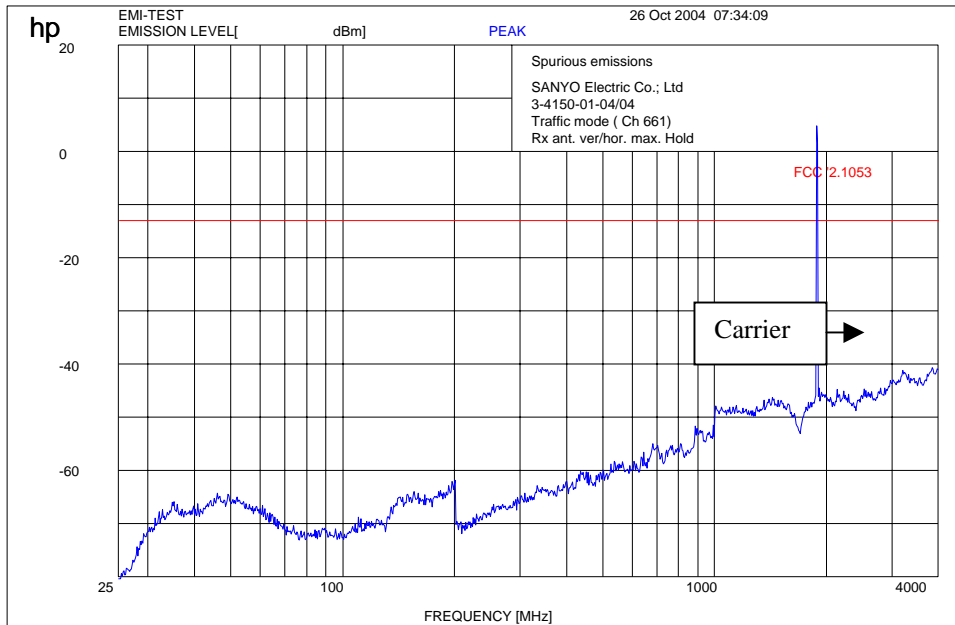


$f < 1 \text{ GHz}$: RBW/VBW: 100 kHz

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

Carrier suppressed with a rejection filter.

Channel 661 (up to 12.5 GHz)

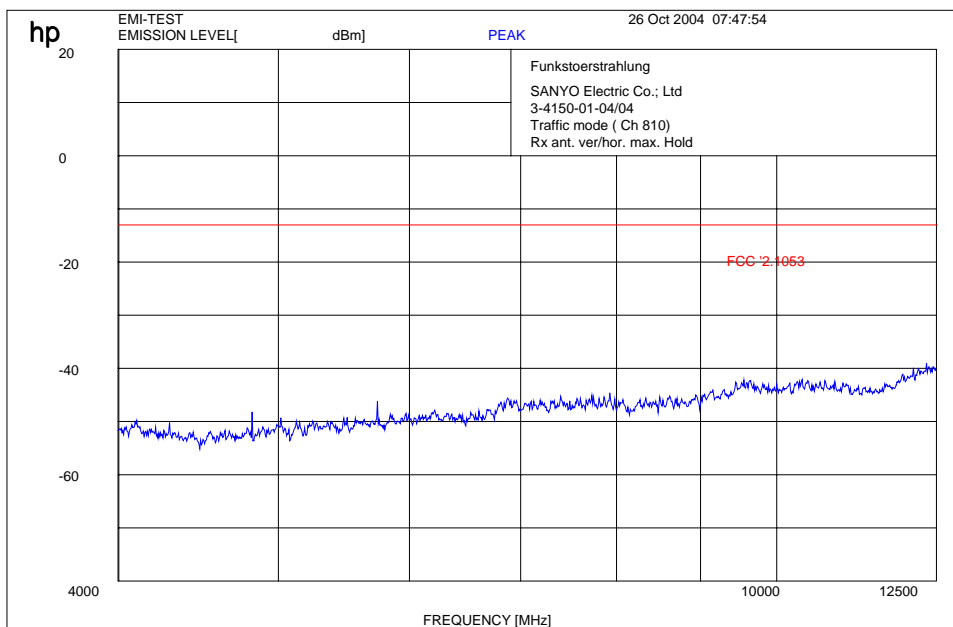
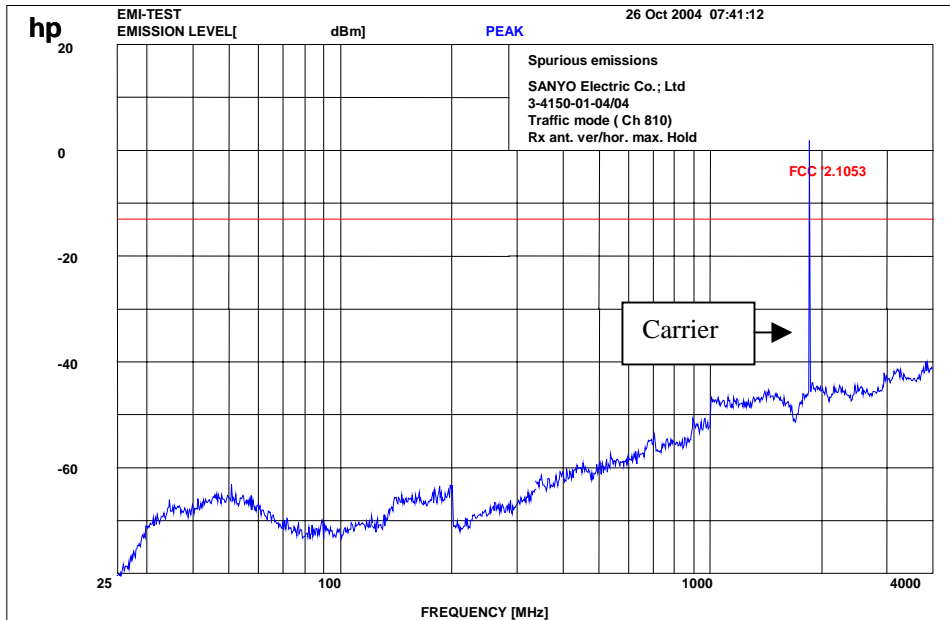


$f < 1 \text{ GHz}$: RBW/VBW: 100 kHz

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

Carrier suppressed with a rejection filter.

Channel 810 (up to 12.5 GHz)

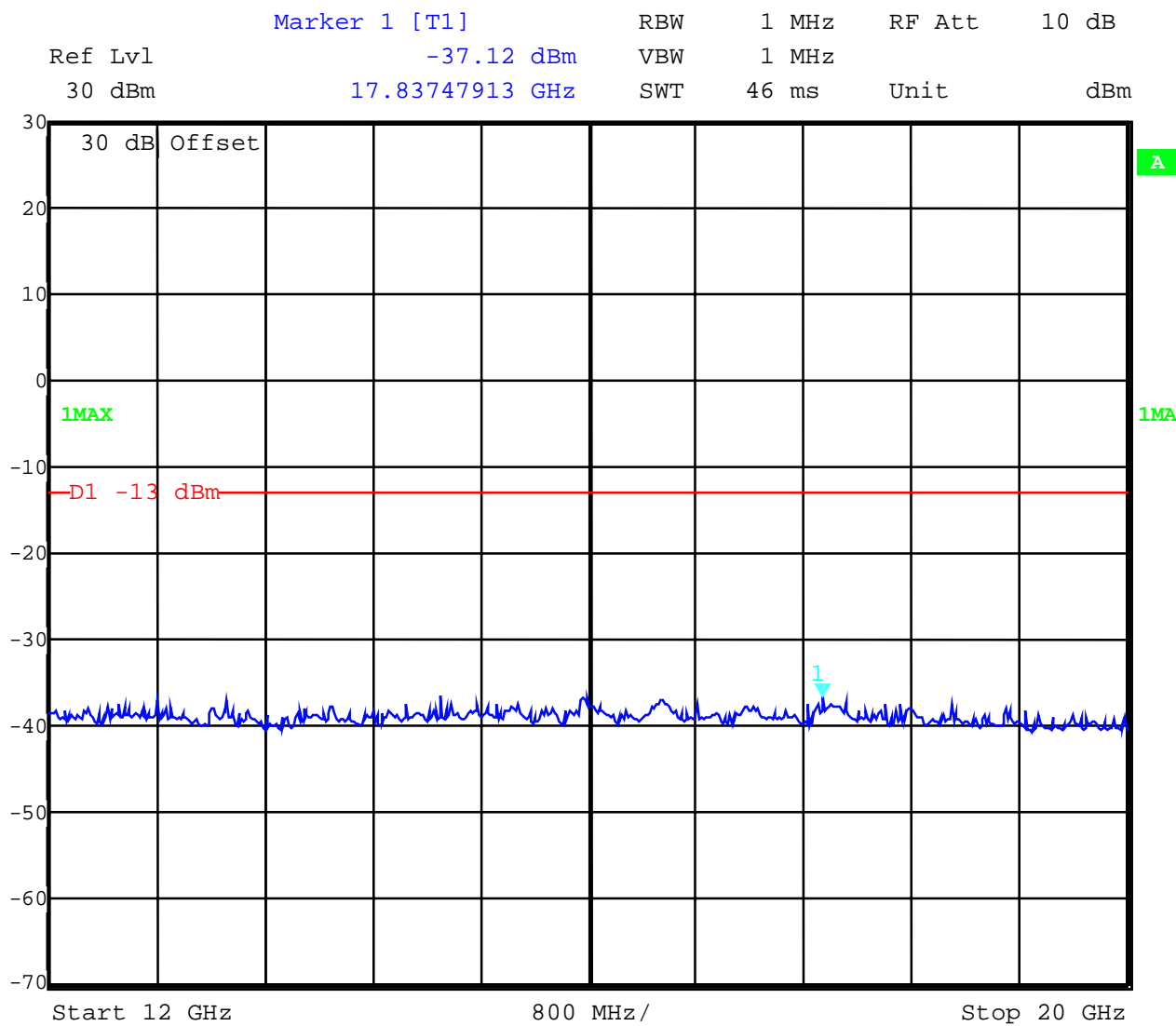


$f < 1 \text{ GHz}$: RBW/VBW: 100 kHz

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

Carrier suppressed with a rejection filter

Spurious emissions up to 20 GHz (valid for all channels)



Date: 26.OKT.2004 08:18:26

f < 1 GHz : RBW/VBW: 100 kHz f ≥ 1GHz : RBW / VBW 1 MHz

Carrier suppressed with a rejection filter

3.1.2 Receiver Radiated Emissions

Reference

FCC:	CFR Part 15.109, 2.1053
IC:	RSS 133, Issue 2, Rev. 1, Section 6.3

Measurement Results

SPURIOUS EMISSIONS LEVEL ($\mu\text{V/m}$)								
CH 512			CH 661			CH 810		
f (MHz)	Detector	Level ($\mu\text{V/m}$)	f (MHz)	Detector	Level ($\mu\text{V/m}$)	f (MHz)	Detector	Level ($\mu\text{V/m}$)
Nothing found			Nothing found			Nothing found		
Measurement uncertainty			$\pm 3\text{ dB}$					

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

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

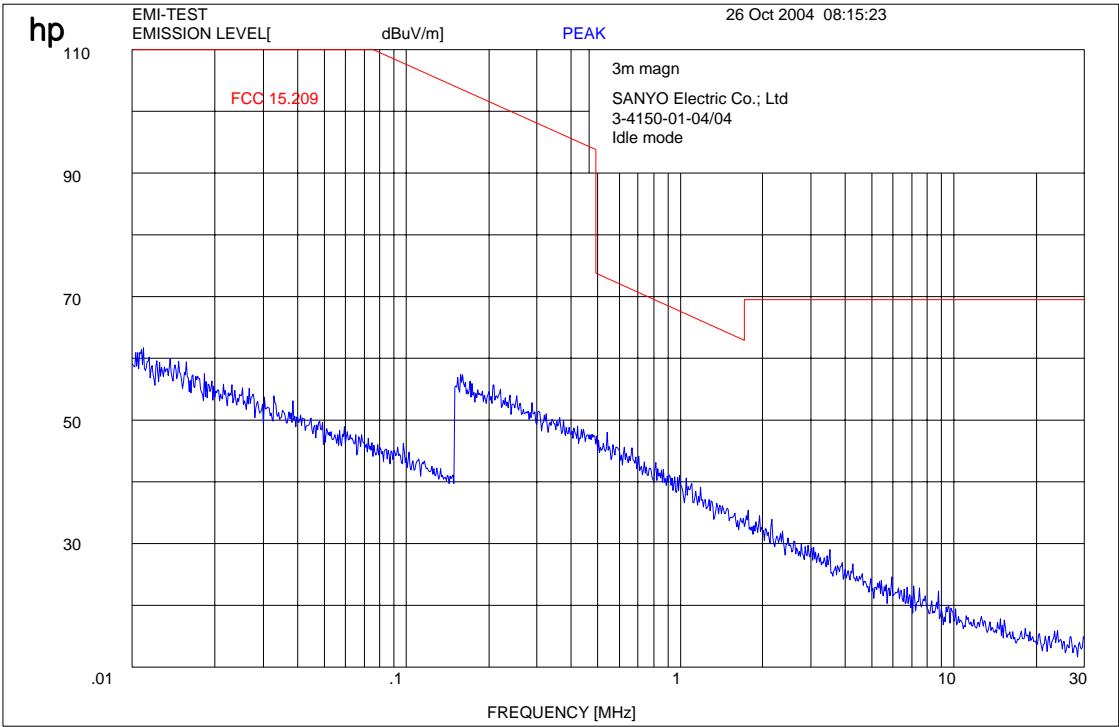
H = Horizontal ; V= Vertical

For measurement distance see table below

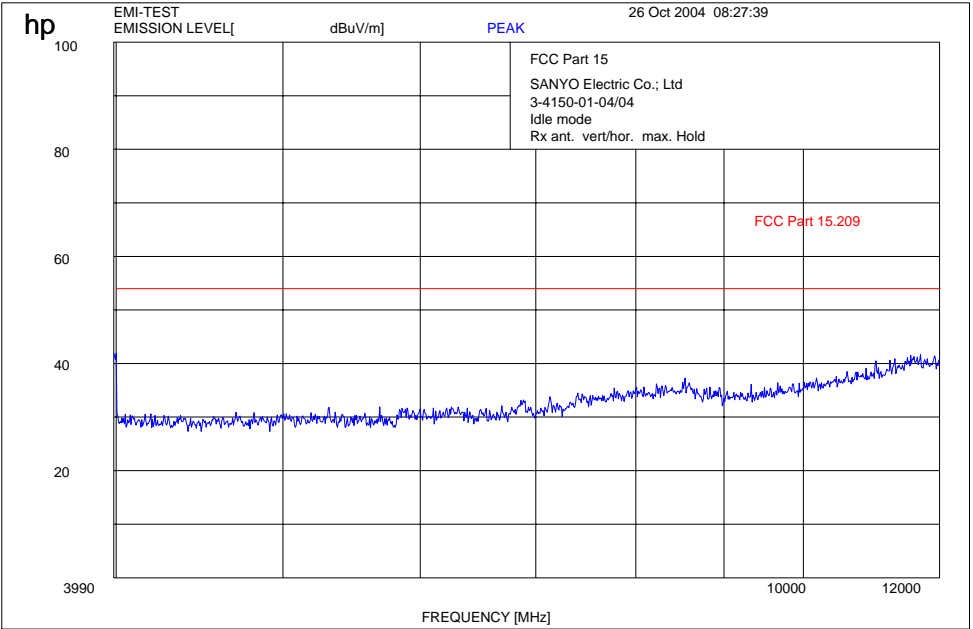
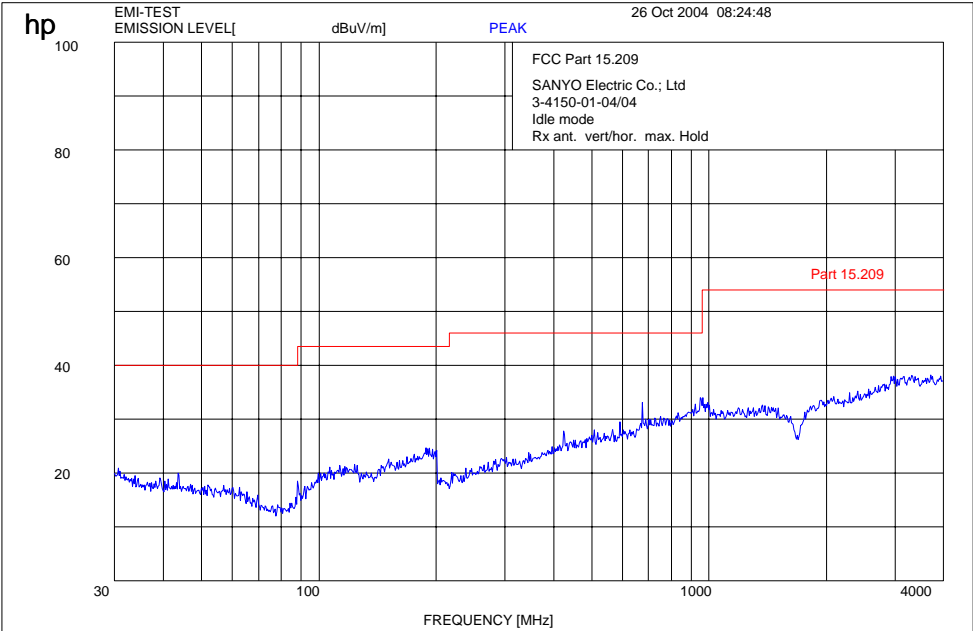
Limits: § 15.109 / 209

Frequency (MHz)	Field strength ($\mu\text{V/m}$)	Measurement distance (m)
0.009 – 0.490	$2400/F(\text{kHz})$	300
0.490 – 1.705	$24000/F(\text{kHz})$	30
1.705 – 30.0	30	30
30 - 88	100	3
88 - 216	150	3
216 - 960	200	3
above 960	500	3

Idle-Mode (up to 30 MHz)



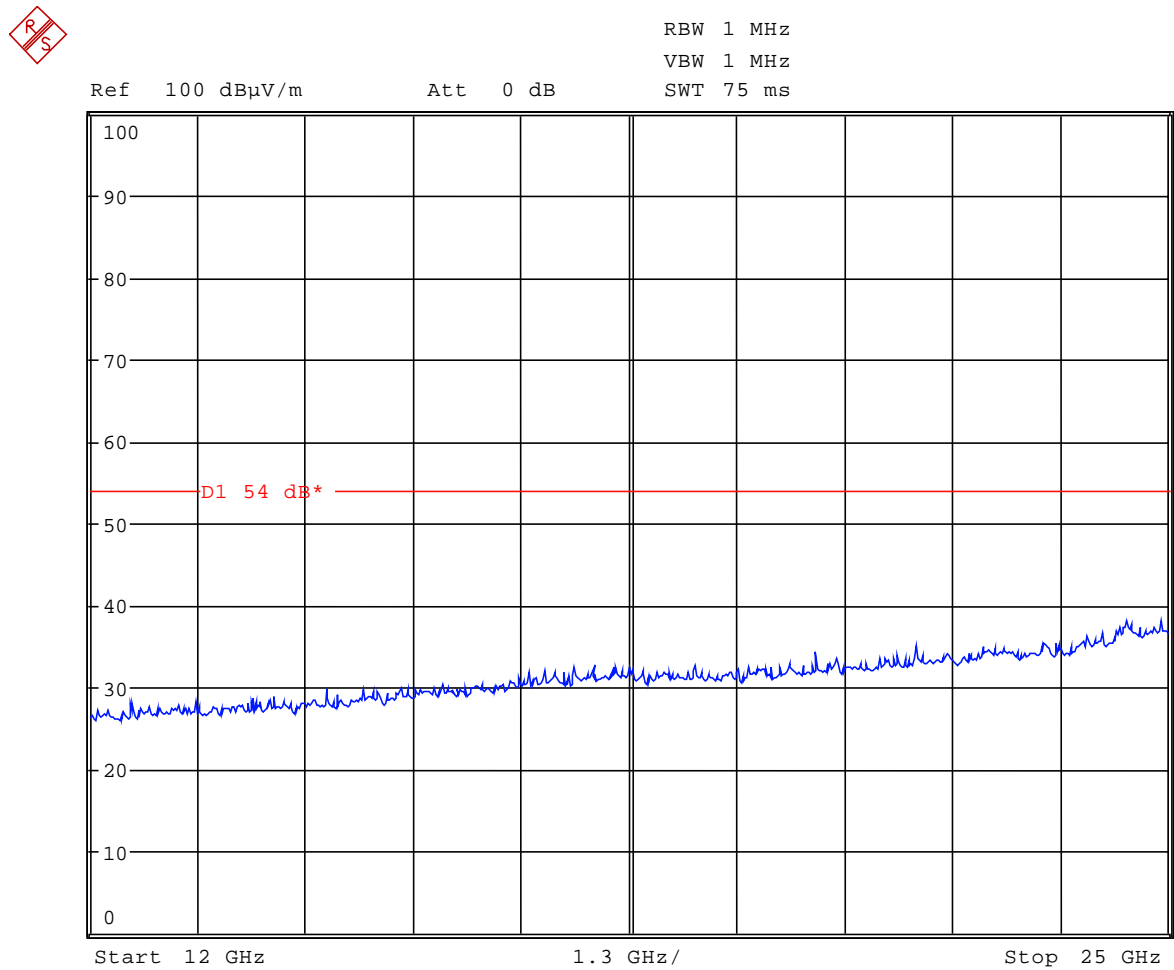
Idle-Mode (up to 12 GHz)



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

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

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



3.1.3 Conducted Spurious Emissions

Reference

FCC:	CFR Part 24.238, 2.10.51
IC:	RSS 133, Issue 2, Rev. 1, Section 6.3

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

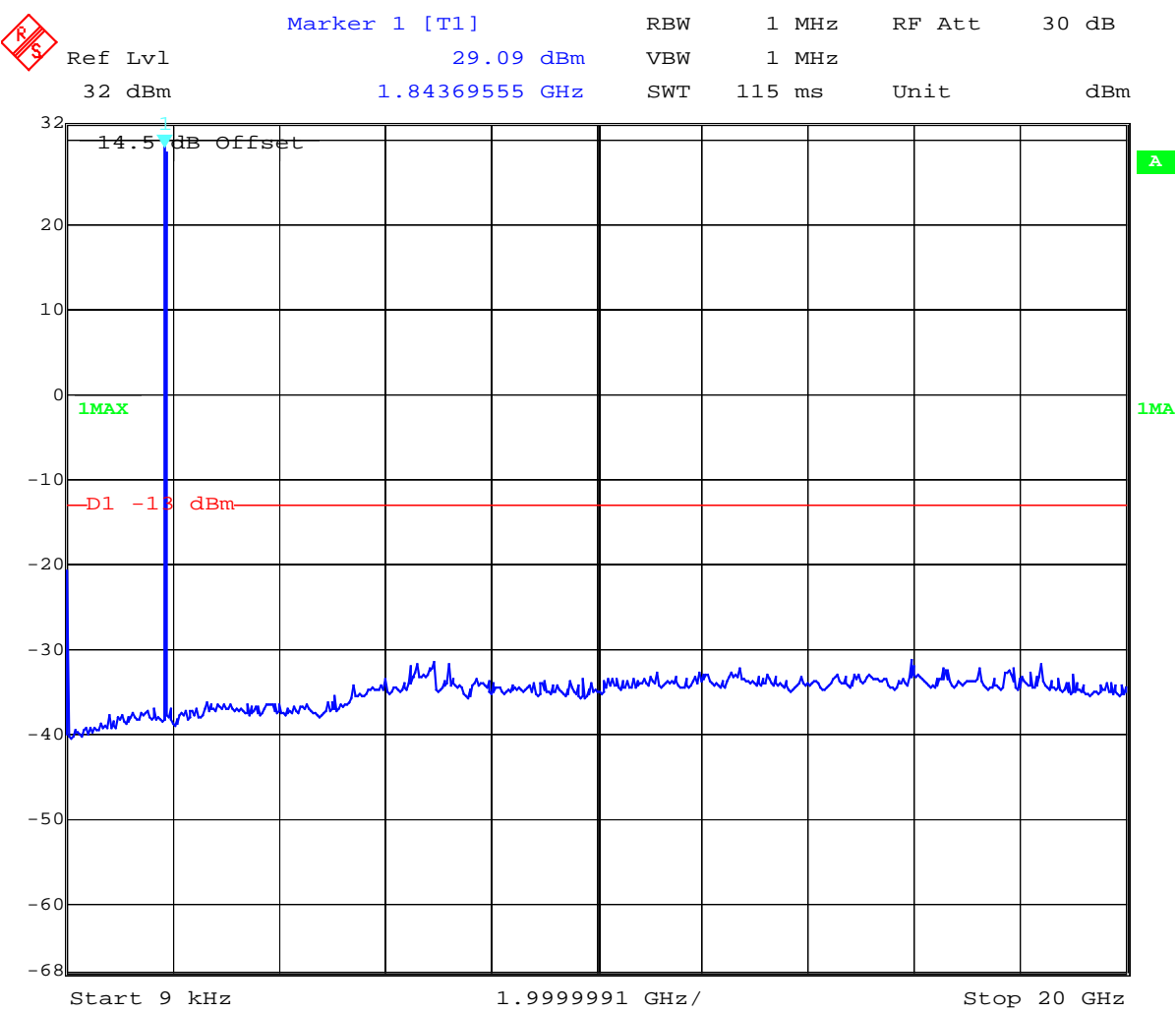
Measurement Limit:

(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.

Measurement Results:

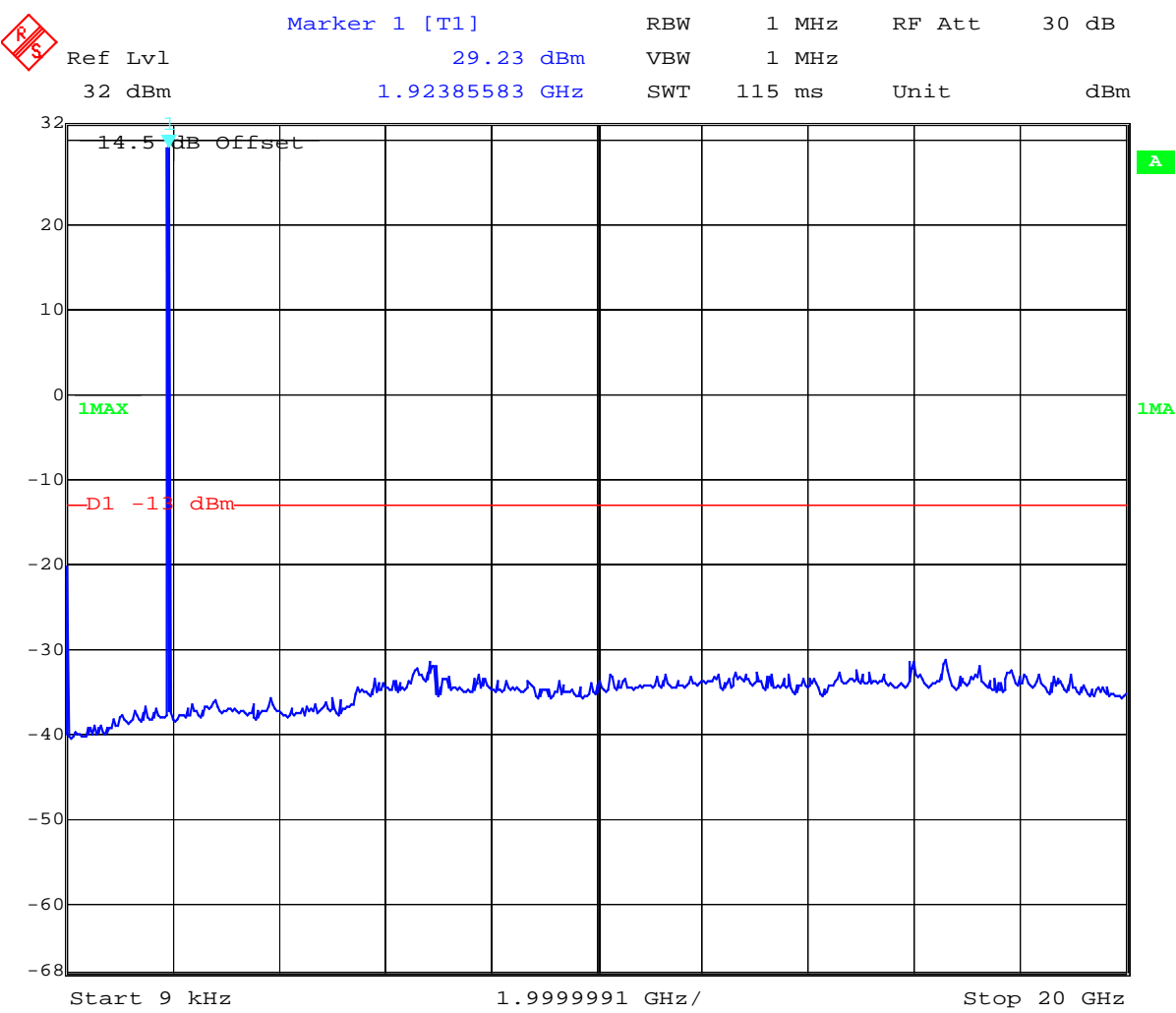
Harmonic	Tx ch.-512 Freq. (MHz)	Level (dBm)	Tx ch.-661 Freq. (MHz)	Level (dBm)	Tx ch.-810 Freq. (MHz)	Level (dBm)
2	3700.4	-	3760	-	3819.6	-
3	5550.6	-	5640	-	5729.4	-
4	7400.8	-	7520	-	7639.2	-
5	9251.0	-	9400	-	9549.0	-
6	11101.2	-	11280	-	11458.8	-
7	12951.4	-	13160	-	13368.6	-
8	14801.6	-	15040	-	15278.4	-
9	16651.8	-	16920	-	17188.2	-
10	18502.0	-	18800	-	19098.0	-

Channel 661



Date: 26.OCT.2004 10:23:01

Channel 810



Date: 26.OCT.2004 10:23:33

4 TEST EQUIPMENT AND ANCILLARIES USED FOR TESTS

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

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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

ANNEX A: Part 15 B Tests

Radiated Emissions

Reference

FCC:	CFR Part 15.109, 2.1053
IC:	RSS 133, Issue 2, Rev. 1, Section 6.3

Measurement Results

SPURIOUS EMISSIONS LEVEL ($\mu\text{V/m}$)					
Test set-up No.: 01			Test set-up No.: 02		
f (MHz)	Detector	Level ($\mu\text{V/m}$)	f (MHz)	Detector	Level ($\mu\text{V/m}$)
Nothing found			Nothing found		
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
Measurement uncertainty			$\pm 3\text{ dB}$		

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

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

H = Horizontal ; V= Vertical

For measurement distance see table below

Limits: § 15.109 / 209

Frequency (MHz)	Field strength ($\mu\text{V/m}$)	Measurement distance (m)
0.009 – 0.490	$2400/F(\text{kHz})$	300
0.490 – 1.705	$24000/F(\text{kHz})$	30
1.705 – 30.0	30	30
30 - 88	100	3
88 - 216	150	3
216 - 960	200	3
above 960	500	3

Test set-up No.: 01

- Sanyo Mobile
- AC/DC charger
- Headset

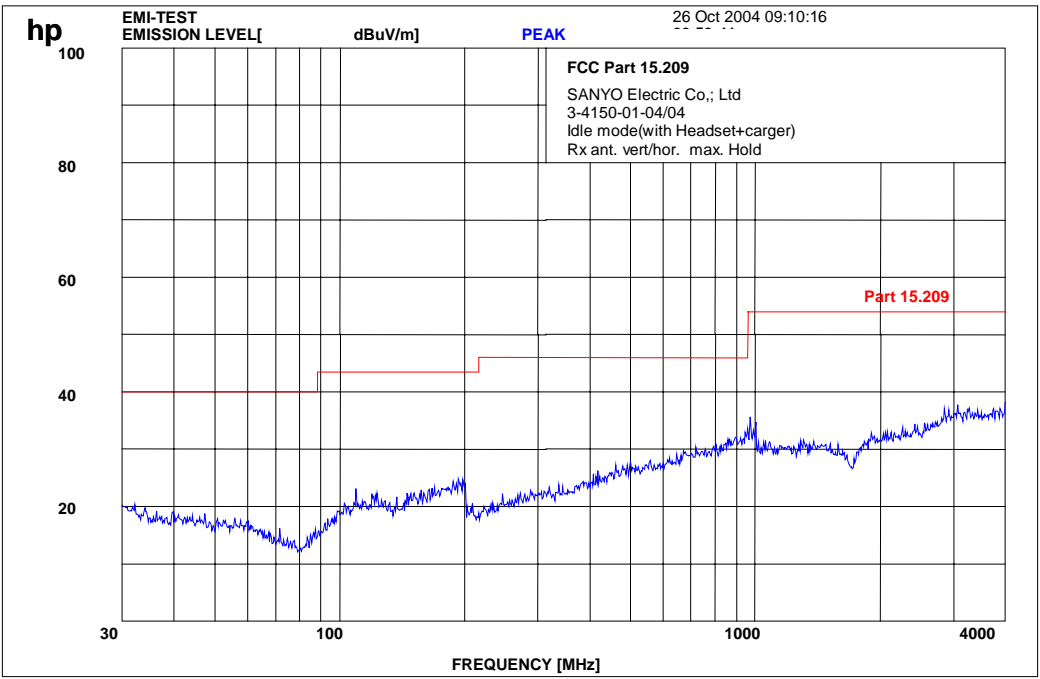
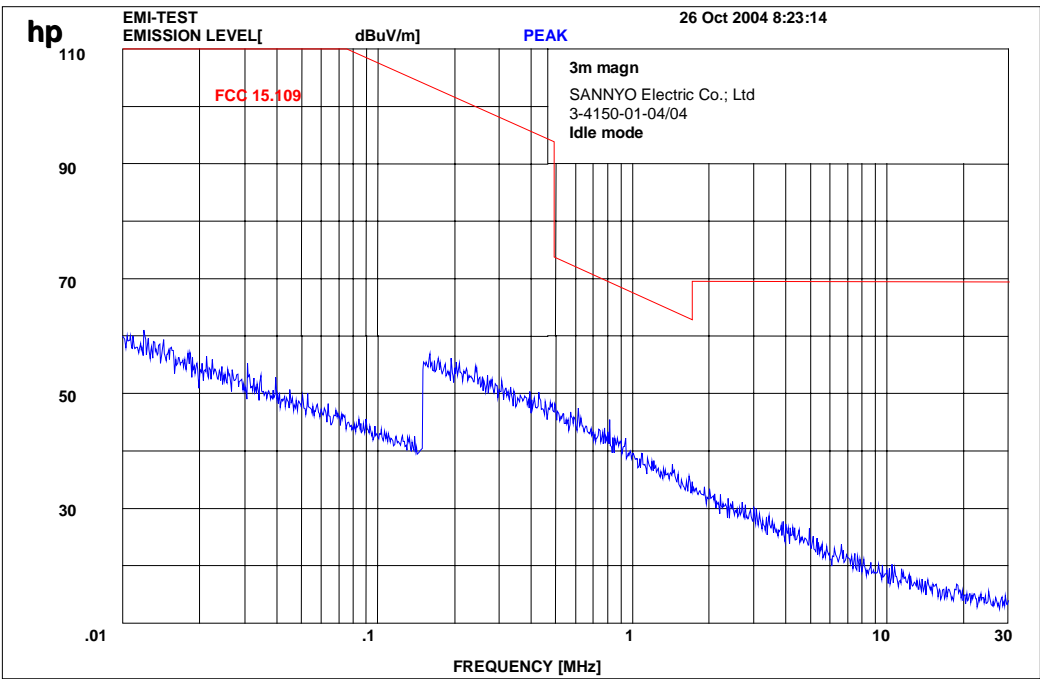


Test set-up 02

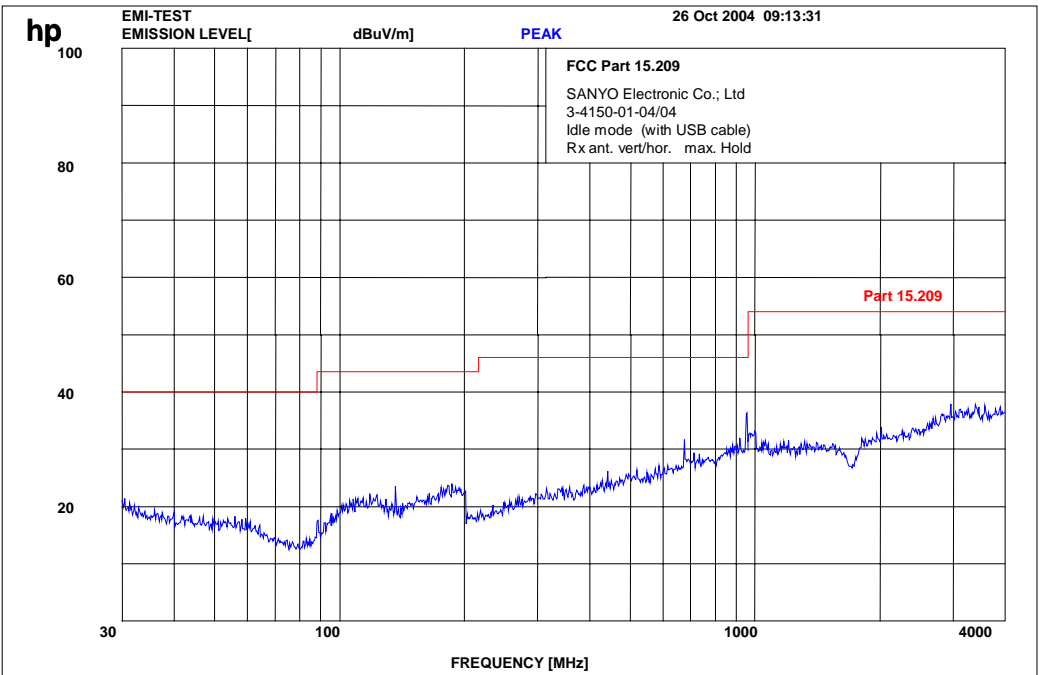
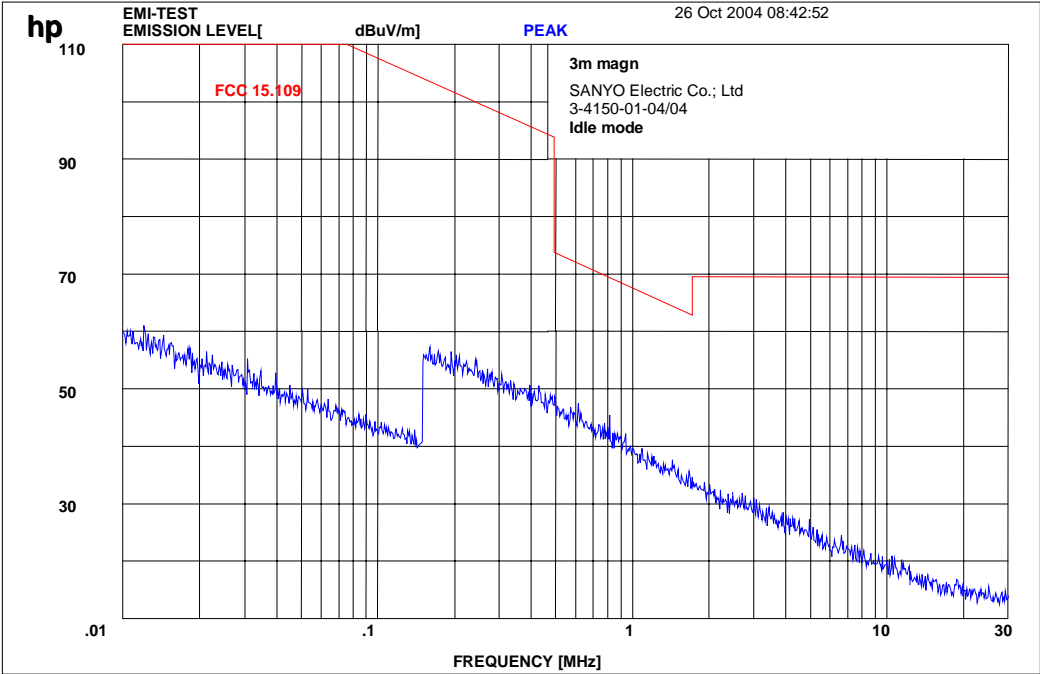
- Sanyo Mobile
- USB cable
- Headset



Test set-up No.: 01



Test set-up No.: 02



Conducted Limits

Reference

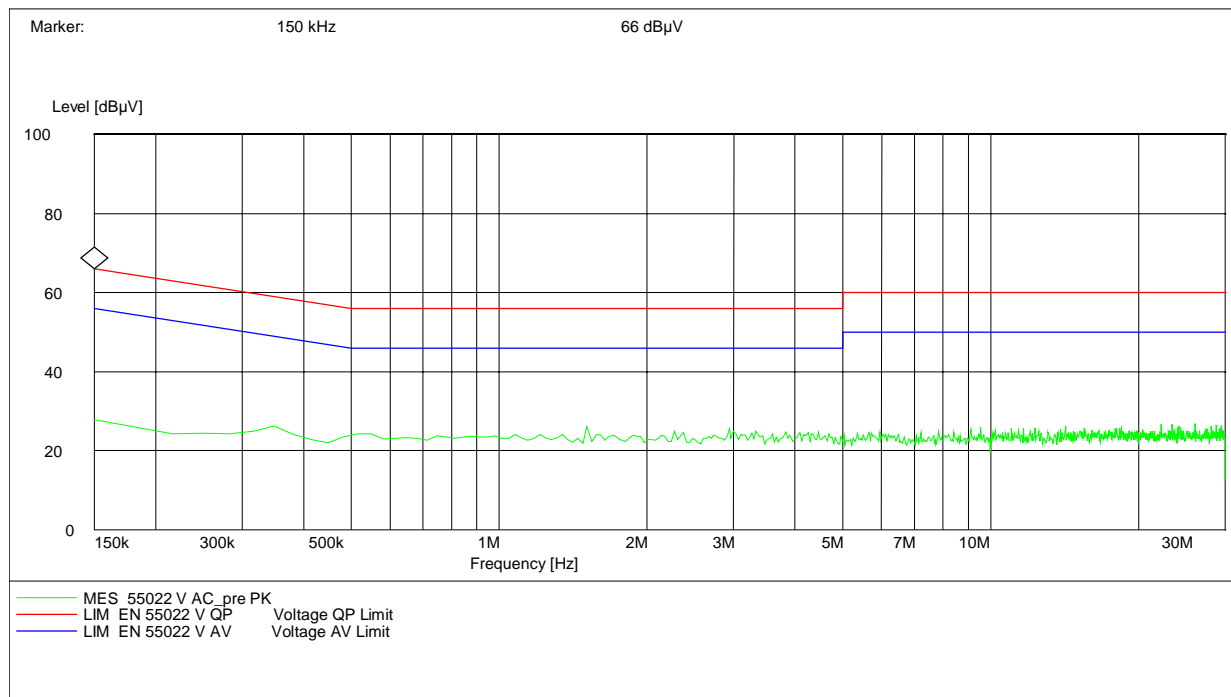
FCC:	CFR Part 15.207, 15.107
IC:	RSS 210, Issue 4, Section 6.6 , 7.4

Limits: § 15.107 / 15.207

Frequency of Emission (MHz)	Conducted Limit (dBµV)	
	Quasi-peak	Average
0.15 – 0.5	66 to 56 *	56 to 46 *
0.5 – 5	56	46
5 - 30	60	50

* Decreases with the logarithm of the frequency

EUT: SUP-S103 (with AC/DC charger 110V)
Manufacturer: SANYO
Operating Condition: Traffic mode
Test Site: Room 006 (Shielded chamber)
Operator: Gillmann
Start of Test: 26.10.04 / 11:15:20



Conducted Limits

Reference

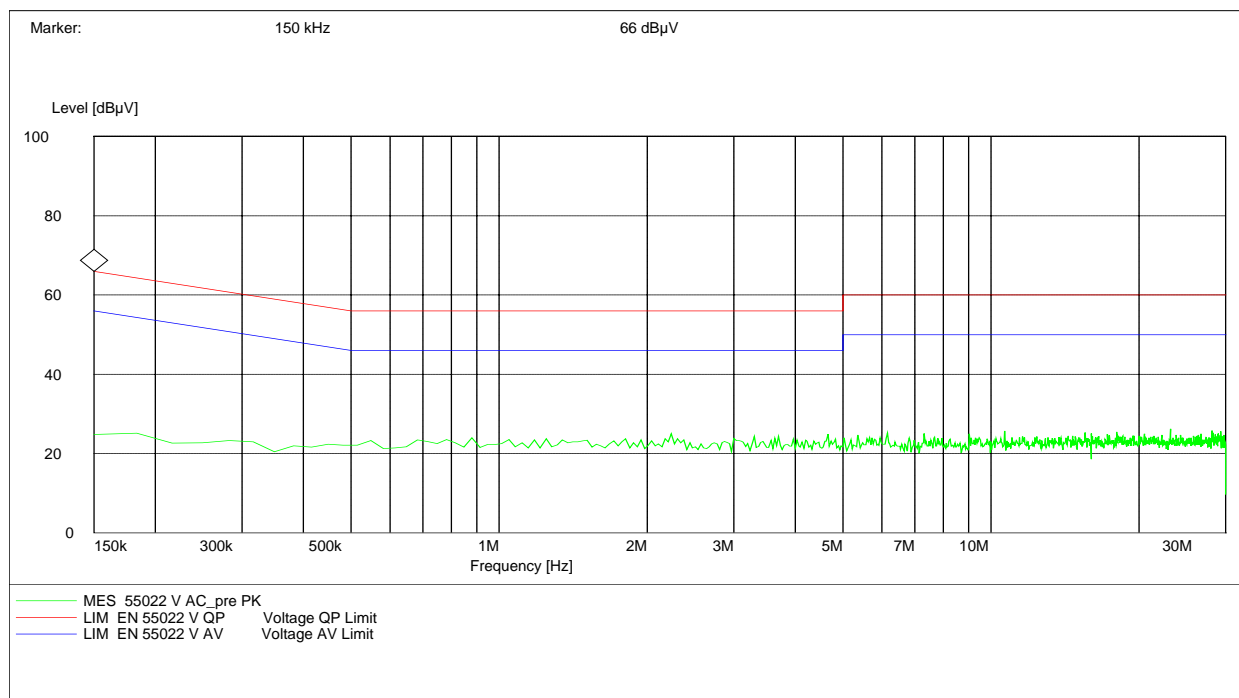
FCC:	CFR Part 15.207, 15.107
IC:	RSS 210, Issue 4, Section 6.6 , 7.4

Limits: § 15.107 / 15.207

Frequency of Emission (MHz)	Conducted Limit (dBμV)	
	Quasi-peak	Average
0.15 – 0.5	66 to 56 *	56 to 46 *
0.5 – 5	56	46
5 - 30	60	50

* Decreases with the logarithm of the frequency

EUT: SUP-S103 (with AC/DC charger 110V AC)
Manufacturer: SANYO
Operating Condition: Idle mode
Test Site: Room 006 (Shielded chamber)
Operator: Gillmann
Start of Test: 26.10.04 / 10:52:09



ANNEX B: Test Set-up Photos

