TEST REPORT
FROM
RADIO FREQUENCY
INVESTIGATION LTD.

Test Of: Sendo Ltd.
S331 GSM Mobile Telephone Handset

To: FCC Part 22 and 24

Test Report Serial No:
RFI/MPTB1/RP45705JD02A

This Test Report Is Issued Under The Authority Of Richard Jacklin, Operations Director: 	**Checked By: Tony Henriques** 
Tested By: Steven Wong  **pp**	**Release Version No: PDF01**
Issue Date: 17 February 2004	**Test Dates: 06 January 2004 to 22 January 2004**

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1. Client Information

Company Name:	Sendo Ltd.
Address:	Hatchford Brook Hatchford Way Sheldon Birmingham B26 3RZ
Contact Name:	Mr C Thornton

2. Equipment Under Test (EUT)

The following information (with the exception of the Date of Receipt) has been supplied by the client:

2.1. Identification Of Equipment Under Test (EUT)

Brand Name:	Sendo
Model Name or Number:	S331
Unique Type Identification:	SND331
IMEI Number:	004400004474589
FCC ID Number:	P6PSND331
Country of Manufacture:	Czech Republic
Date of Receipt:	06 January 2004

2.2. Description Of EUT

The equipment under test is a dual band GSM 850/1900 MHz mobile telephone.

2.3. Modifications Incorporated In EUT

During the course of testing the EUT was not modified.

2.4. Additional Information Related To Testing

Power Supply Requirement:	Internal 3.8 V (nominal) lithium ion battery
Declared Battery End Point Voltage	3.5 VDC (min) to 4.2 VDC (max)
Power Supply Requirement: (AC Battery Charger)	Nominal 110 V 60 Hz AC Mains supply
Intended Operating Environment:	Within GSM Network Coverage
Equipment Category:	Portable
Type of Unit:	Transceiver
Interface Ports:	Charger/Personal Handsfree (single port)
Highest Fundamental Frequency	1909.8 MHz
Highest Unintentionally Generated Frequency	1989.9 MHz

Additional Information Related To Testing (Continued)

GSM 850 Transmit Frequency Range	824 to 848 MHz		
Transmit Channels Tested	**Channel ID**	**Channel Number**	**Channel Frequency (MHz)**
	Bottom	128	824.2
	Middle	190	836.6
	Top	251	848.8
GSM 850 Receive Frequency Range	869 to 894 MHz		
Receive Channels Tested	**Channel ID**	**Channel Number**	**Channel Frequency (MHz)**
	Bottom	128	869.2
	Middle	190	881.6
	Top	251	893.8
Maximum Power Output (ERP)	26.6 dBm		
GSM 1900 Transmit Frequency Range	1850 to 1910 MHz		
Transmit Channels Tested	**Channel ID**	**Channel Number**	**Channel Frequency (MHz)**
	Bottom	512	1850.2
	Middle	660	1879.8
	Top	810	1909.8
GSM 1900 Receive Frequency Range	1930 to 1990 MHz		
Receive Channels Tested	**Channel ID**	**Channel Number**	**Channel Frequency (MHz)**
	Bottom	512	1930.2
	Middle	660	1960.0
	Top	810	1989.8
Maximum Power Output (EIRP)	25.9 dBm		

2.5. Accessories

The following accessories were supplied with the EUT:

Description:	AC Battery Charger
Brand Name:	Sendo
Part Number:	8D09-02313-30000
Model Number:	DVR-530TW
Serial Number:	None stated
Country of Manufacture:	China

Description:	Personal Handsfree Kit
Brand Name	Sendo
Part Number:	8P02-02000-21000
Serial Number:	None stated
Country of Manufacture:	China

Description:	Leather case
Brand Name	Sendo
Part Number:	None stated
Serial Number:	None stated
Country of Manufacture:	Not stated

2.6. Support Equipment

The following support equipment was used to exercise the EUT during testing:

Description:	GSM Test Set
Brand Name:	WillTek
Model Name or Number:	42025
Serial Number:	0513018
Connected to Port:	RF Link

Description:	Test Jig (for external DC Supply)
Brand Name:	AI Electronics Ltd
Model Name or Number:	9JF1-26112-00000
Serial Number:	037
Connected to Port:	Mobile phone internal battery connector

3. Test Specification, Methods And Procedures

3.1. Test Specifications

Reference:	FCC Part 22 Subpart H: 2002 (Cellular Radiotelephone Service)
Title:	Code of Federal Regulations, Part 22 (47CFR22) Personal Communication Services.
Comments:	A description of the test facility used for this test is on file with, and has been accepted by, the Federal Communications Commission as required by Section 2.948 of Federal Rules.
Purpose of Test:	To determine whether the equipment complied with the requirements of the specification for the purposes of certification.

Reference:	FCC Part 24 Subpart E: 2002 (Broadband PCS)
Title:	Code of Federal Regulations, Part 24 (47CFR24) Personal Communication Services.
Comments:	A description of the test facility used for this test is on file with, and has been accepted by, the Federal Communications Commission as required by Section 2.948 of Federal Rules.
Purpose of Test:	To determine whether the equipment complied with the requirements of the specification for the purposes of certification.

Reference:	FCC Part 15 Subpart B: 2001 (Section 15.107 and 15.109)
Title:	Code of Federal Regulations, Part 15 (47CFR15) Radio Frequency Devices: Radio Frequency Devices.
Comments:	A description of the test facility used for this test is on file with, and has been accepted by, the Federal Communications Commission as required by Section 2.948 of Federal Rules.
Purpose of Test:	To determine whether the equipment complied with the requirements of the specification for the purposes of certification.

3.2. Methods And Procedures

The methods and procedures used were as detailed in:

ANSI/TIA-603-B-2002
Land Mobile Communications Equipment, Measurements and performance Standards

ANSI C63.2 (1987)
Title: American National Standard for Instrumentation - Electromagnetic noise and field strength.

ANSI C63.4 (2001)
Title: American National Standard Methods of Measurement of Electromagnetic Emissions from Low Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.

ANSI C63.5 (1988)
Title: American National Standard for the Calibration of antennas used for Radiated Emission measurements in Electromagnetic Interference (EMI) control.

ANSI C63.7 (1988)
Title: American National Standard Guide for Construction of Open Area Test Sites for performing Radiated Emission Measurements.

CISPR 16-1: (1999)
Title: Specification For Radio Disturbance and Immunity Measuring Apparatus and Methods. Part 1: Radio Disturbance and Immunity Measuring Apparatus.

DA00-705 (2000)
Title: Filing and Frequency Measurement Guidelines for Frequency Hopping Spread Spectrum Systems.

3.3. Definition Of Measurement Equipment

The measurement equipment used complied with the requirements of the standards referenced in the Methods & Procedures section above. Appendix 1 contains a list of the test equipment used.

4. Deviations From The Test Specification

None.

5. Operation Of The EUT During Testing

5.1. Operating Conditions

During testing, the EUT was powered by a 3.8 V (nominal) lithium-ion battery connected to a 110 V 60 Hz AC Mains charger.

5.2. Operating Modes

The EUT was tested in the following operating modes, unless otherwise stated.

Preliminary radiated scans were performed on the EUT with the accessories stated in section 2.5 of this report connected and then disconnected. The combination that exhibited the worse case mode of operation was then used to perform final measurements. This was found to be with the EUT powered directly by its AC battery charger.

Transmitter Modes:

For carrier output power, occupied bandwidth and final transmitter radiated measurements, testing was performed at full power on top, middle and bottom channels of the assigned frequency block.

For frequency stability testing, measurements were performed at full power on the top and bottom channels of the assigned frequency block at –30 ºC through to +50 ºC in 10º increments.

All transmitter radiated spurious pre-scan tests were performed at full power on the top channel of the assigned frequency block. Final measurements were then performed on the top, middle and bottom channels if an emission was identified.

Receiver/Idle Modes:

Testing was performed with the call terminated from the GSM Test Simulator and the phone left in its Idle mode.

5.3. Configuration And Peripherals

The EUT was tested in the following configuration:

Fitted with it's leather case, configured with the AC battery charger connected to the AC mains supply (or personal handsfree kit*)

** The personal handsfree kit was connected to the dual purpose port instead of the AC charger when establishing the worst case mode of operation. After it was confirmed that the worst case was with the AC charger connected to the EUT, the personal handsfree kit was disconnected as the EUT does not allow both the AC charger and personal handsfree kit to be connected simultaneously.*

All tests were performed with the EUT connected via an air link to a GSM test set via an access point.

6. Summary Of Test Results

Part 22

Range Of Measurements	Specification Reference	Port Type	Compliancy Status
Idle Mode AC Conducted Spurious Emissions (150 kHz to 30 MHz)	C.F.R. 47 FCC Part 15: 2002 Section 15.107	AC Mains Input	Complied
Idle Mode Radiated Emissions	C.F.R. 47 FCC Part 15: 2002 Section 15.109	Antenna	Complied
Transmitter Effective Radiated Power (ERP)	C.F.R. 47 FCC Part 22: 2002 Section 22.913(a)	Antenna	Complied
Transmitter Frequency Stability (Temperature Variation)	C.F.R. 47 FCC Part 22: 2002 Section 22.355	Antenna	Complied
Transmitter Frequency Stability (Voltage Variation)	C.F.R. 47 FCC Part 22: 2002 Section 22.355	Antenna	Complied
Transmitter Occupied Bandwidth	C.F.R. 47 FCC Part 22: 2002 Section 2.1049(i)	Antenna	Complied
Transmitter Out of Band Radiated Emissions	C.F.R. 47 FCC Part 22: 2002 Section 2.1053/22.917	Antenna	Complied
Transmitter Band Edge Radiated Emissions	C.F.R. 47 FCC Part 2: 2002 Section 2.1053	Antenna	Complied

Summary Of Test Results (Continued)

Part 24

Range Of Measurements	Specification Reference	Port Type	Compliancy Status
Idle Mode AC Conducted Spurious Emissions (150 kHz to 30 MHz)	C.F.R. 47 FCC Part 15: 2002 Section 15.107	AC Mains Input	Complied
Idle Mode Radiated Spurious Emissions	C.F.R. 47 FCC Part 15: 2002 Section 15.109	Antenna	Complied
Transmitter Effective Isotropic Radiated Power (EIRP)	C.F.R. 47 FCC Part 24: 2002 Section 24.232	Antenna	Complied
Transmitter Frequency Stability (Temperature Variation)	C.F.R. 47 FCC Part 24: 2002 Section 24.235	Antenna	Complied
Transmitter Frequency Stability (Voltage Variation)	C.F.R. 47 FCC Part 24: 2002 Section 24.235	Antenna	Complied
Transmitter Occupied Bandwidth	C.F.R. 47 FCC Part 24: 2002 Section 24.238	Antenna	Complied
Transmitter Out of Band Radiated Emissions	C.F.R. 47 FCC Part 24: 2002 Section 2.1053/24.238	Antenna	Complied
Transmitter Band Edge Radiated Emissions	C.F.R. 47 FCC Part 2: 2002 Section 2.1053/24.238	Antenna	Complied

6.1. Location Of Tests

All the measurements described in this report were performed at the premises of Radio Frequency Investigation Ltd, Ewhurst Park, Ramsdell, Basingstoke, Hampshire, RG26 5RQ, England.

7. Measurements, Examinations And Derived Results

7.1. General Comments

7.1.1. This section contains test results only.

7.1.2. Measurement uncertainties are evaluated in accordance with current best practice. Our reported expanded uncertainties are based on standard uncertainties, which are multiplied by an appropriate coverage factor to provide a statistical confidence level of approximately 95%. Please refer to Section 8 for details of measurement uncertainties.

8. Test Results FCC Part 22

8.1. Idle Mode AC Conducted Spurious Emissions: Section 15.107

8.1.1. The EUT was configured as for AC conducted emissions measurements as described in Section 9 of this report.

8.1.2. Tests were performed to identify the maximum emission levels on the AC mains line of the AC Charger whilst connected to the EUT.

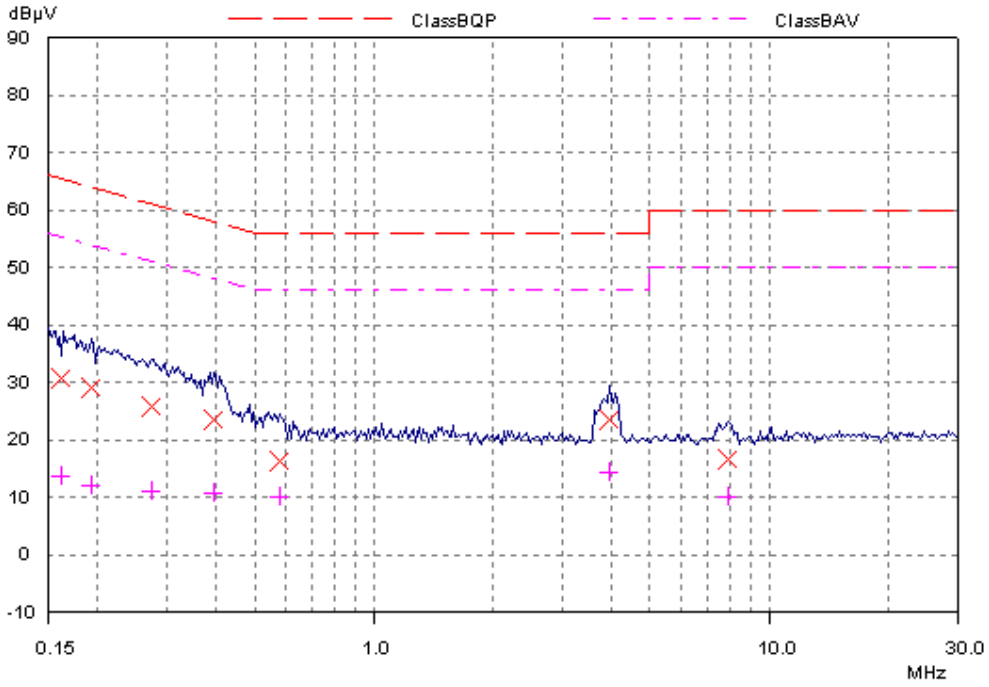
Results: Quasi-Peak Detector Measurements On Live And Neutral Lines

Frequency (MHz)	Line	Q-P Level (dBμV)	Q-P Limit (dBμV)	Margin (dB)	Result
0.16289	Neutral	30.65	65.32	34.67	Complied
0.19210	Neutral	28.98	63.95	34.97	Complied
0.27353	Neutral	25.80	61.01	35.21	Complied
0.39644	Live	23.59	57.93	34.34	Complied
0.58137	Neutral	16.41	56.00	39.59	Complied
3.96649	Live	23.47	56.00	32.53	Complied
7.90450	Neutral	16.53	60.00	43.47	Complied

Results: Average Detector Measurements On Live And Neutral Lines

Frequency (MHz)	Line	Av. Level (dBμV)	Av. Limit (dBμV)	Margin (dB)	Result
0.16289	Live	13.49	55.32	41.83	Complied
0.19210	Live	12.04	53.95	41.91	Complied
0.27353	Neutral	11.12	51.01	39.89	Complied
0.39644	Neutral	10.79	47.93	27.14	Complied
0.58137	Neutral	10.13	46.00	35.87	Complied
3.96649	Live	14.27	46.00	31.73	Complied
7.90450	Neutral	10.18	50.00	39.82	Complied

Idle Mode AC Conducted Spurious Emissions: Section 15.107 (Continued)



Note: these plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables.

8.2. Idle Mode Radiated Spurious Emissions: Section 15.109

8.2.1. Electric Field Strength Measurements (Frequency Range 30 to 1000 MHz)

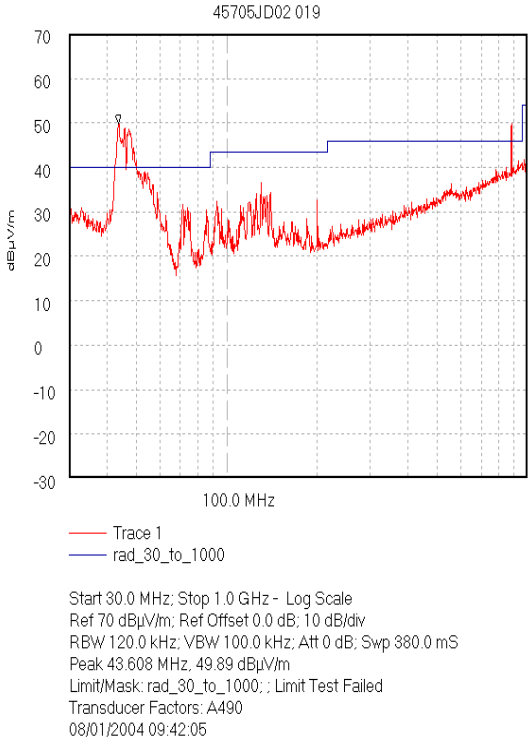
8.2.1.1. The EUT was configured as for radiated emissions testing as described in Section 9 of this report.

8.2.1.2. Tests were performed to identify the maximum radiated emissions levels while in idle mode.

Result:

Frequency (MHz)	Antenna. Polarity	Q-P Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
44.900	Vert.	36.7	40.0	3.3	Complied
45.314	Vert.	37.9	40.0	2.1	Complied
47.513	Vert.	32.7	40.0	7.3	Complied
59.500	Vert.	25.4	40.0	14.6	Complied
71.500	Vert.	25.7	40.0	14.3	Complied
111.482	Vert.	24.6	43.5	18.9	Complied
119.600	Vert.	28.8	43.5	14.7	Complied
124.742	Vert.	22.9	43.5	20.6	Complied
131.326	Vert.	21.7	43.5	21.8	Complied
164.711	Vert.	21.9	43.5	21.6	Complied
185.904	Vert.	20.4	43.5	23.1	Complied
200.000	Vert.	17.8	43.5	25.7	Complied

Idle Mode Radiated Spurious Emissions: Section 15.109 (Continued)



Note: these plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables.

Note: the emission shown in the plot at 881.400 MHz emanates from the GSM test set and not the EUT. Because the emission is not from the EUT no level as been recorded in the preceding results table.

Receiver/Idle Mode Radiated Spurious Emissions: Section 15.109 (Continued)

8.2.2. Electric Field Strength Measurements (Frequency Range 1.0 to 12.0 GHz)

8.2.2.1. The EUT was configured as for radiated emissions testing as described in Section 9 of this report.

8.2.2.2. Tests were performed to identify the maximum idle mode radiated emissions levels.

Result:

Highest Peak Level

Frequency (GHz)	Antenna. Polarity	Peak Detector Level (dBµV)	Antenna Factor	Cable Loss	Actual Peak Level (dBµV/m)	**Average Limit (dBµV/m)	Margin (dB)	Result
*5.57800	Vert.	16.4	24.3	1.9	42.7	54.0	11.3	Complied

**Note: No spurious emissions were detected above the noise floor of the measuring receiver; therefore, the highest peak noise floor reading of the measuring receiver was recorded as shown in the table above.*
***Note: The peak level was compared to the average limit as opposed to being compared to the peak limit because this is the more onerous limit.*

Test Of: **Sendo Ltd.**
S331 GSM Mobile Telephone Handset
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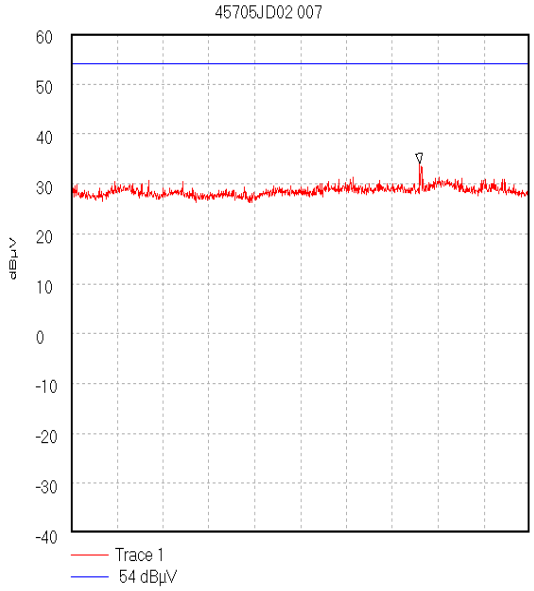
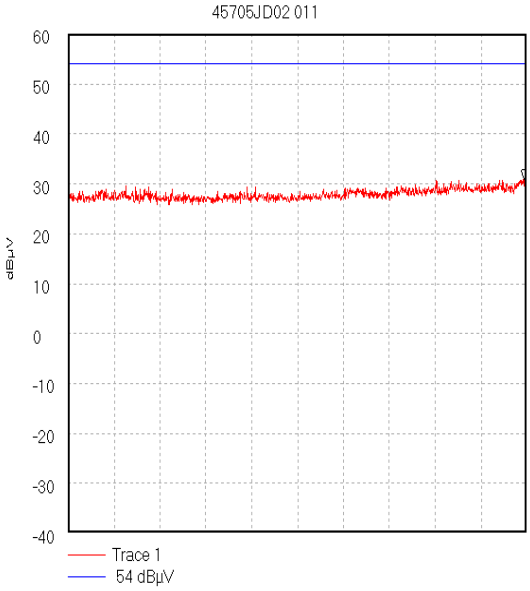
Idle Mode Radiated Spurious Emissions: Section 15.109 (Continued)



Start 1.0 GHz; Stop 2.0 GHz
Ref 60 dBµV; Ref Offset 0.0 dB; 10 dB/div
RBW 1000.0 kHz; VBW 1.0 MHz; Att 0 dB; Swp 20.0 mS
Peak 1.76 GHz, 34.05 dBµV
Display Line: 54 dBµV; ; Limit Test Passed
07/01/2004 11:44:57



Start 2.0 GHz; Stop 4.0 GHz
Ref 60 dBµV; Ref Offset 0.0 dB; 10 dB/div
RBW 1000.0 kHz; VBW 1.0 MHz; Att 0 dB; Swp 20.0 mS
Peak 3.987 GHz, 30.85 dBµV
Display Line: 54 dBµV; ; Limit Test Passed
07/01/2004 12:12:26

Note: these plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables.

Note: the emission shown in plot 45705JD02 007 at 1.76 GHz emanates from the GSM test set and not the EUT. Because the emission is not from the EUT no level as been recorded in the preceding results table.

Test Of: **Sendo Ltd.**
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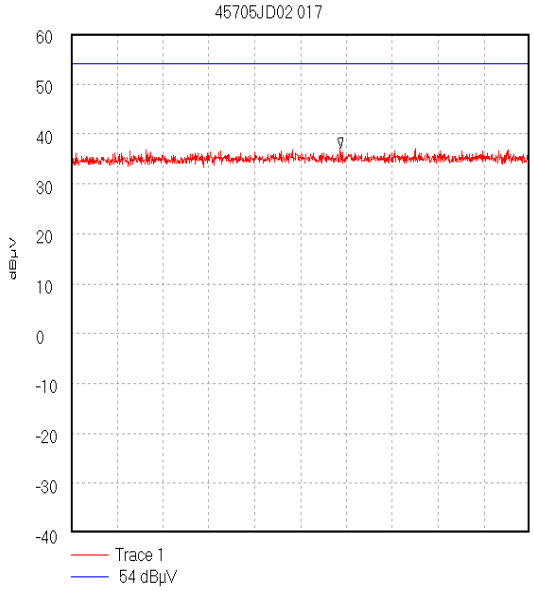
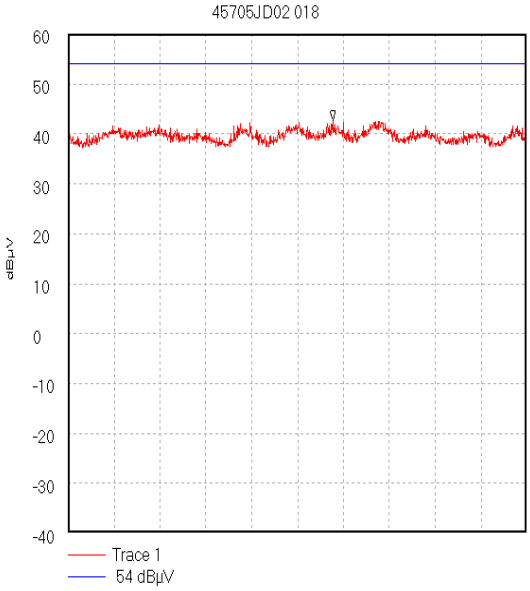
Idle Mode Radiated Spurious Emissions: Section 15.109 (Continued)



Start 4.0 GHz; Stop 5.0 GHz
Ref 60 dBµV; Ref Offset 2.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 0 dB; Swp 20.0 mS
Peak 4.587 GHz, 37.3 dBµV
Display Line: 54 dBµV;
26/01/2004 10:33:41



Start 5.0 GHz; Stop 6.0 GHz
Ref 60 dBµV; Ref Offset 2.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 0 dB; Swp 20.0 mS
Peak 5.578 GHz, 42.66 dBµV
Display Line: 54 dBµV;
26/01/2004 10:35:08

Note: these plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables.

Test Of: **Sendo Ltd.**
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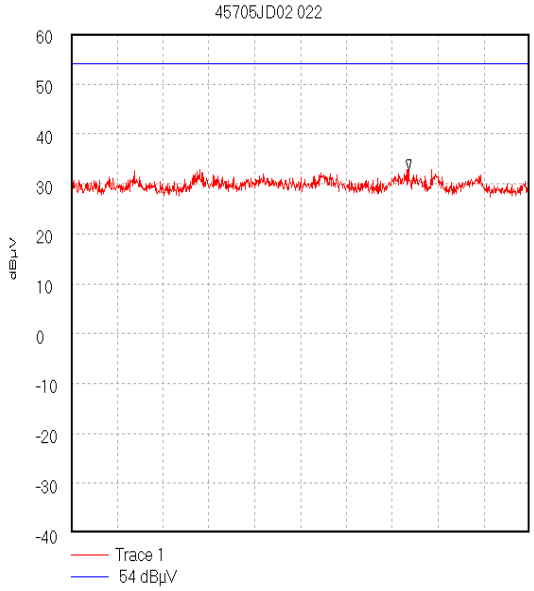
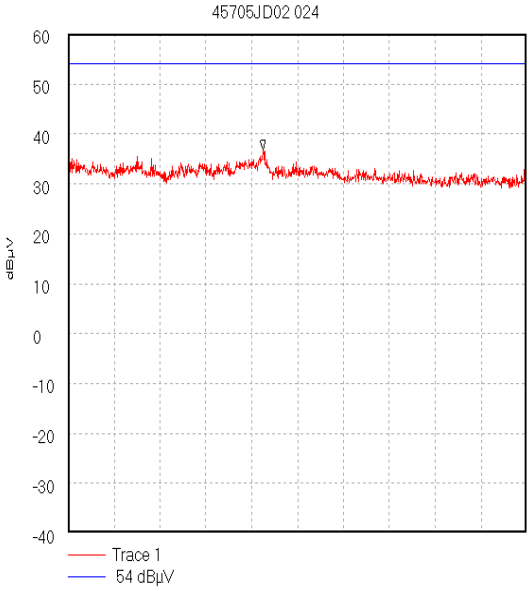
Idle Mode Radiated Spurious Emissions: Section 15.109 (Continued)



Start 6.0 GHz; Stop 8.0 GHz
Ref 60 dBµV; Ref Offset 2.3 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 0 dB; Swp 20.0 mS
Peak 7.473 GHz, 32.94 dBµV
Display Line: 54 dBµV;
26/01/2004 10:50:43



Start 8.0 GHz; Stop 12.0 GHz
Ref 60 dBµV; Ref Offset 2.2 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 0 dB; Swp 20.0 mS
Peak 9.698 GHz, 36.74 dBµV
Display Line: 54 dBµV;
26/01/2004 10:57:04

Note: these plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables.

8.3. Transmitter Effective Radiated Power (ERP): Section 22.913(a)

8.3.1. The EUT was configured as for Effective Radiated Power (ERP) as described in Section 9 of this report.

8.3.2. Tests were performed to identify the maximum effective radiated output power (ERP) from the EUT.

Results:

Channel	Measured Frequency (MHz)	Antenna Polarity	Maximum Transmitter ERP (dBm)	Limit ERP (dBm)	Margin (dB)	Result
Bottom	824.2	Vert.	26.2	38.4	12.2	Complied
Middle	836.6	Vert.	26.6	38.4	11.8	Complied
Top	848.8	Vert.	24.0	38.4	14.4	Complied

8.4. Transmitter Frequency Stability (Temperature Variation): Section 22.355

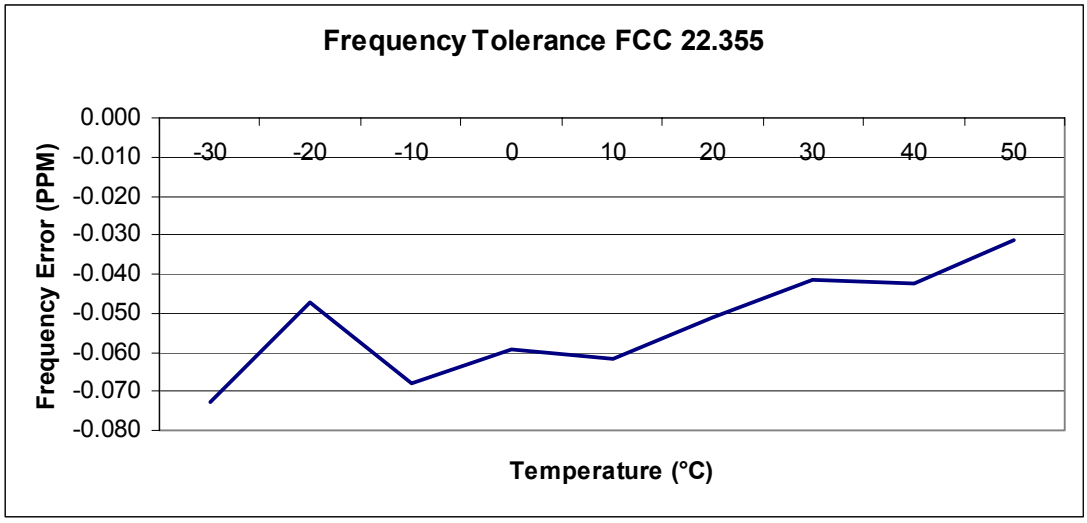
8.4.1. The EUT was configured as for frequency stability measurements as described in Section 9 of this report.

8.4.2. Tests were performed to identify the maximum frequency error of the EUT with variations in ambient temperature.

Results: Bottom Channel (824.2 MHz)

Temperature (°C)	Nominal Frequency	Measured Frequency	Frequency Error (Hz)	Frequency Error (ppm)	Limit (ppm)	Margin (ppm)	Result
-30	824.2	824.199940	-60	-0.073	2.5	2.427	Complied
-20	824.2	824.199961	-39	-0.047	2.5	2.453	Complied
-10	824.2	824.199944	-56	-0.068	2.5	2.432	Complied
0	824.2	824.199951	-49	-0.059	2.5	2.441	Complied
10	824.2	824.199949	-51	-0.062	2.5	2.438	Complied
20	824.2	824.199958	-42	-0.051	2.5	2.449	Complied
30	824.2	824.199966	-34	-0.041	2.5	2.459	Complied
40	824.2	824.199965	-35	-0.042	2.5	2.458	Complied
50	824.2	824.199974	-26	-0.032	2.5	2.468	Complied

Frequency Variation From 824.2MHz

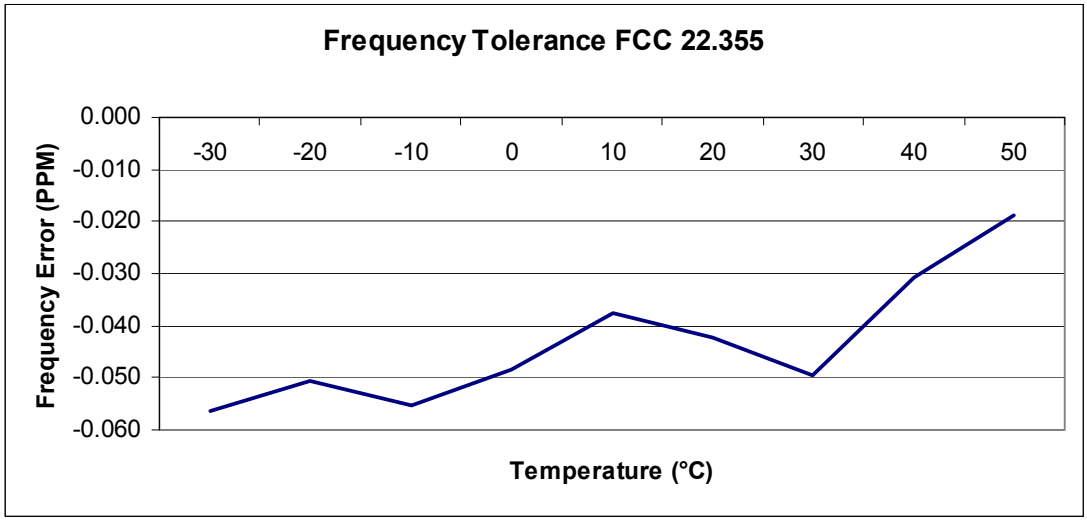


Transmitter Frequency Stability (Temperature Variation): Section 22.355 (Continued)

Results Top Channel (848.8 MHz)

Supply Voltage (V)	Nominal Frequency	Measured Frequency	Frequency Error (Hz)	Frequency Error (ppm)	Limit (ppm)	Margin (ppm)	Result
-30	848.8	848.799952	-48	-0.057	2.5	2.443	Complied
-20	848.8	848.799957	-43	-0.051	2.5	2.449	Complied
-10	848.8	848.799953	-47	-0.055	2.5	2.445	Complied
0	848.8	848.799959	-41	-0.048	2.5	2.452	Complied
10	848.8	848.799968	-32	-0.038	2.5	2.462	Complied
20	848.8	848.799964	-36	-0.042	2.5	2.458	Complied
30	848.8	848.799958	-42	-0.049	2.5	2.451	Complied
40	848.8	848.799974	-26	-0.031	2.5	2.469	Complied
50	848.8	848.799984	-16	-0.019	2.5	2.481	Complied

Frequency Variation From 848.8 MHz



8.5. Transmitter Frequency Stability (Voltage Variation): Section 22.355

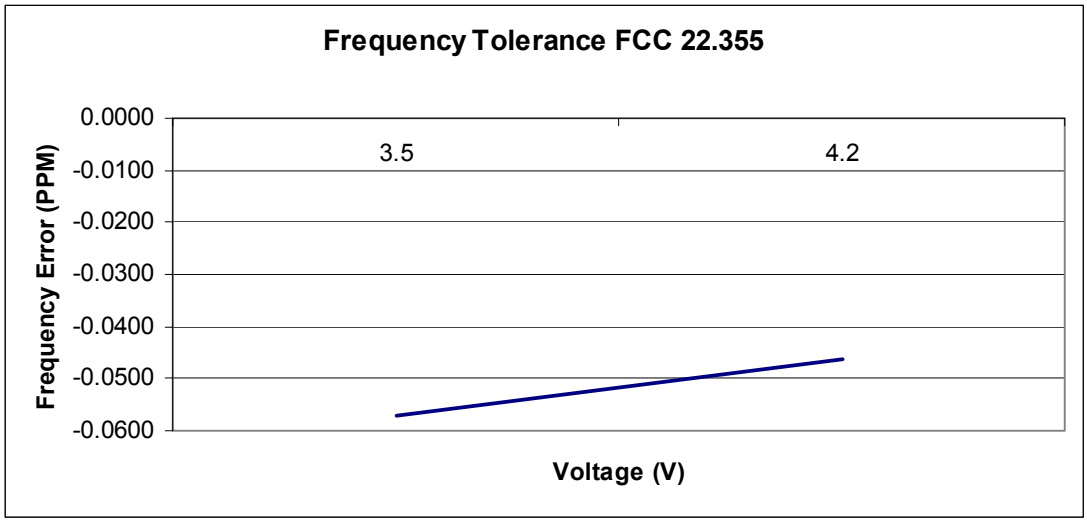
8.5.1. The EUT was configured as for frequency stability measurements as described in Section 9 of this report.

8.5.2. Tests were performed to identify the maximum frequency error of the EUT with variations in nominal DC operating voltage.

Results Bottom Channel (824.2 MHz)

Supply Voltage (V)	Nominal Frequency	Measured Frequency	Frequency Error (Hz)	Frequency Error (ppm)	Limit (ppm)	Margin (ppm)	Result
3.5	824.2	824.199953	-47	-0.057	2.5	2.443	Complied
4.2	824.2	824.199962	-38	-0.046	2.5	2.454	Complied

Frequency Variation From 824.2 MHz

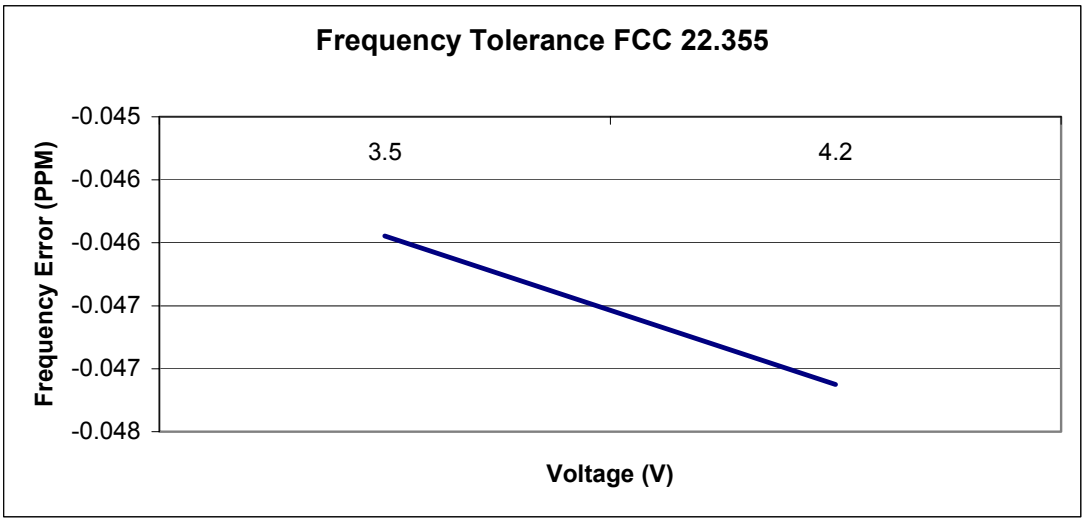


Transmitter Frequency Stability (Voltage Variation): Section 22.355 (Continued)

Results Top Channel (848.8 MHz)

Supply Voltage (V)	Nominal Frequency	Measured Frequency	Frequency Error (Hz)	Frequency Error (ppm)	Limit (ppm)	Margin (ppm)	Result
3.5	848.8	848.799961	-39	-0.046	2.5	2.454	Complied
4.2	848.8	848.799960	-40	-0.047	2.5	2.453	Complied

Frequency Variation From 848.8 MHz



8.6. Transmitter Occupied Bandwidth: Section 2.1049(i)

8.6.1. The EUT was configured as for Occupied Bandwidth measurements as described in Section 9 of this report.

8.6.2. Tests were performed to identify the maximum bandwidth occupied by the fundamental frequency of the EUT.

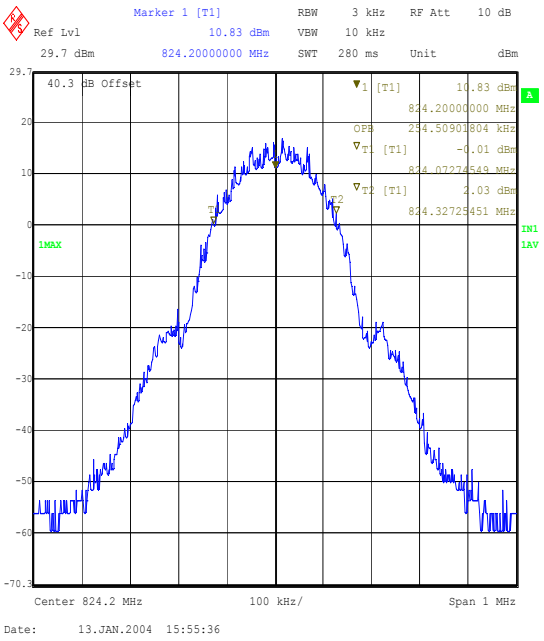
Results:

Channel	Frequency (MHz)	Resolution Bandwidth (kHz)	Video Bandwidth (kHz)	Occupied Bandwidth (kHz)
Bottom	824.2	3.0	10.0	254.509
Middle	836.6	3.0	10.0	252.505
Top	848.8	3.0	10.0	252.505

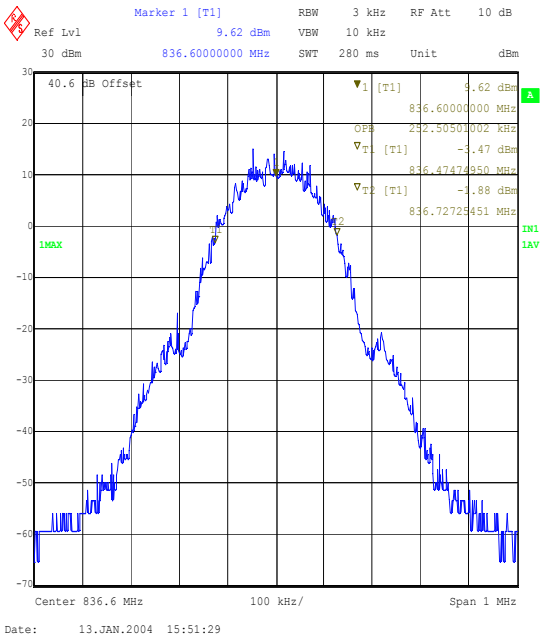
Test Of: **Sendo Ltd.**
S331 GSM Mobile Telephone Handset
To: **FCC Part 22 & 24**

Transmitter Occupied Bandwidth: Section 2.1049(i) (Continued)

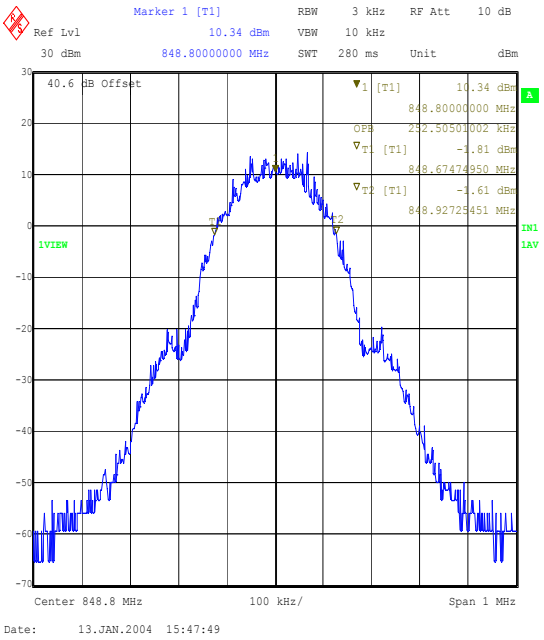
Bottom Channel



Middle Channel



Top Channel



Note: The occupied bandwidth is measured using the internal OBW function of the measurement analyser. The analyser automatically configures the measurement bandwidths to make an accurate measurement. The vital data is reported in the upper right portion of the screen. See attached graphs.

8.7. Transmitter Radiated Out of Band Emissions: Section 2.1053 & 22.917

8.7.1. The EUT was configured as for radiated emissions testing as described in Section 9 of this report.

8.7.2. Tests were performed to identify the maximum out of band transmitter radiated spurious emission level present in the band 30 MHz to 10 x the highest fundamental frequency.

Result: Bottom Channel

Frequency (MHz)	Peak Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
1648.406	-33.6	-13.0	20.6	Complied
2472.948	-40.9	-13.0	27.9	Complied
3297.171	-44.0	-13.0	31.0	Complied
4121.032	-32.1	-13.0	19.1	Complied

Result: Middle Channel

Frequency (MHz)	Peak Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
1673.144	-43.7	-13.0	30.7	Complied
2510.022	-41.0	-13.0	28.0	Complied
3346.766	-42.4	-13.0	29.4	Complied
4183.155	-30.1	-13.0	17.1	Complied

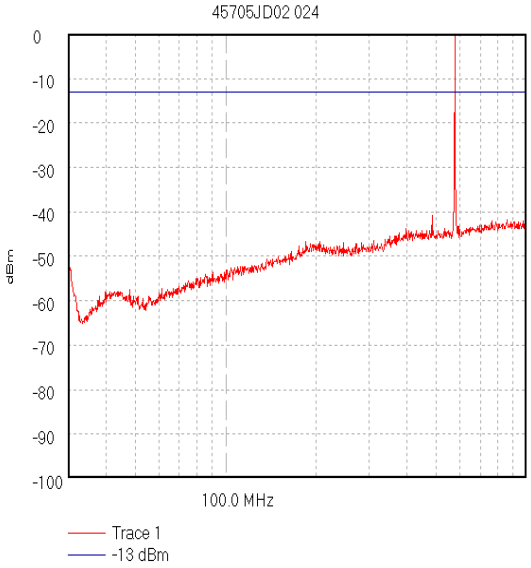
Result: Top Channel

Frequency (MHz)	Peak Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
1697.560	-40.3	-13.0	27.3	Complied
2546.462	-39.5	-13.0	26.5	Complied
3395.511	-41.8	-13.0	28.8	Complied
4244.206	-31.2	-13.0	18.2	Complied

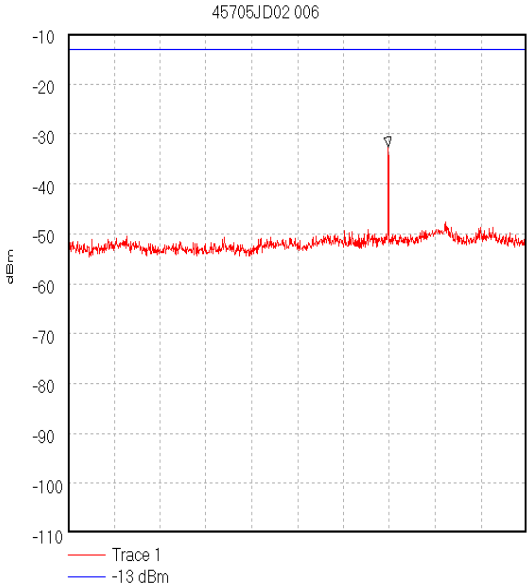
Note: All other emissions were at least 20 dB better than the stated limit.

Test Of: **Sendo Ltd.**
S331 GSM Mobile Telephone Handset
To: **FCC Part 22 & 24**

Transmitter Out of Band Emissions: Section 2.1053 & 22.917 (Continued)



Start 30.0 MHz; Stop 1.0 GHz - Log Scale
Ref 0 dBm; Ref Offset 11.8 dB; 10 dB/div
RBW 120.0 kHz; VBW 100.0 kHz; Att 10 dB; Swp 440.0 mS
Peak 848.033 MHz, 3.98 dBm
Display Line: -13 dBm; ; Limit Test Failed
Transducer Factors: A490
21/01/2004 14:31:04



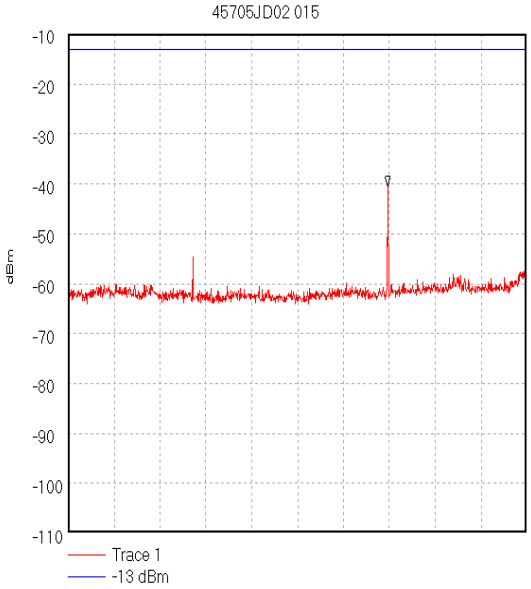
Start 1.0 GHz; Stop 2.0 GHz
Ref -10 dBm; Ref Offset 11.8 dB; 10 dB/div
RBW 1000.0 kHz; VBW 1.0 MHz; Att 0 dB; Swp 20.0 mS
Peak 1.698 GHz, -32.6 dBm
Display Line: -13 dBm; ; Limit Test Passed
07/01/2004 11:31:41

Note: these plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables.

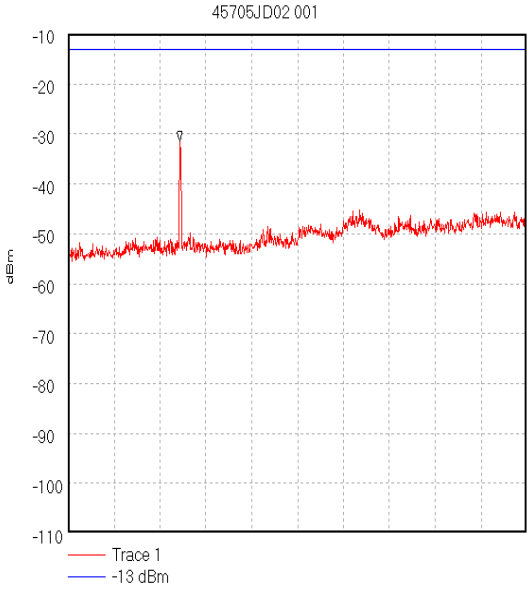
Note: the emission shown in plot 45705JD02 024 at 848.033 MHz is the transmitter fundamental (intentional) emission and not a spurious emission.

Test Of: **Sendo Ltd.**
S331 GSM Mobile Telephone Handset
To: **FCC Part 22 & 24**

Transmitter Out of Band Emissions: Section 2.1053 & 22.917 (Continued)



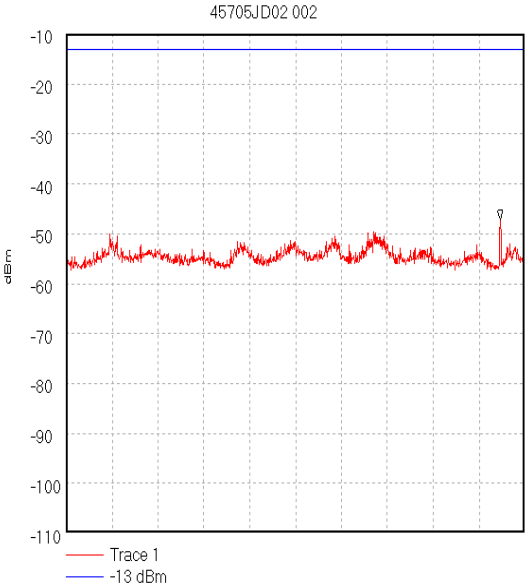
Start 2.0 GHz; Stop 4.0 GHz
Ref -10 dBm; Ref Offset 11.8 dB; 10 dB/div
RBW 1000.0 kHz; VBW 1.0 MHz; Att 0 dB; Swp 20.0 mS
Peak 3.393 GHz, -40.52 dBm
Display Line: -13 dBm; ; Limit Test Passed
07/01/2004 12:27:36



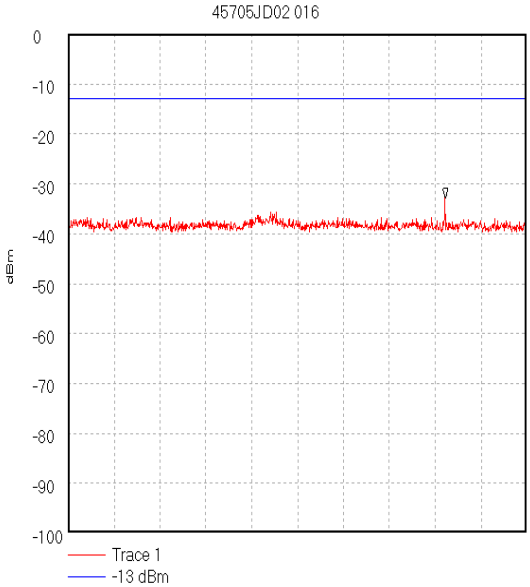
Start 4.0 GHz; Stop 5.0 GHz
Ref -10 dBm; Ref Offset 13.8 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 0 dB; Swp 20.0 mS
Peak 4.244 GHz, -31.45 dBm
Display Line: -13 dBm;
09/01/2004 11:50:38

Note: these plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables.

Transmitter Out of Band Emissions: Section 2.1053 & 22.917 (Continued)



Start 5.0 GHz; Stop 6.0 GHz
Ref -10 dBm; Ref Offset 13.8 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 0 dB; Swp 20.0 mS
Peak 5.947 GHz, -47.15 dBm
Display Line: -13 dBm;
09/01/2004 11:52:52

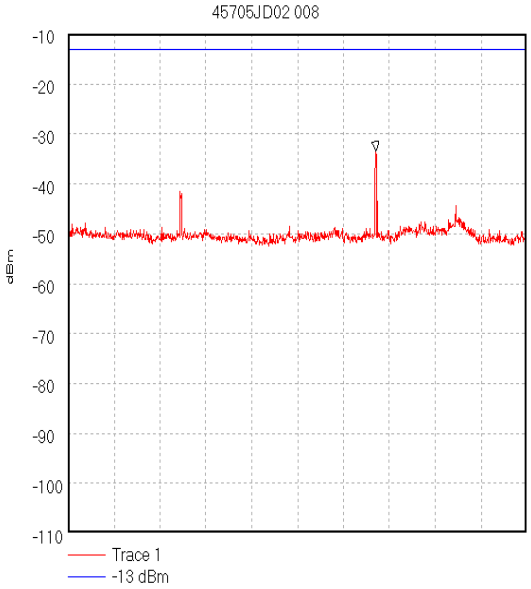


Start 6.0 GHz; Stop 8.0 GHz
Ref 0 dBm; Ref Offset 14.1 dB; 10 dB/div
RBW 1000.0 kHz; VBW 1.0 MHz; Att 10 dB; Swp 20.0 mS
Peak 7.644444 GHz, -32.91 dBm
Display Line: -13 dBm; ; Limit Test Passed
19/01/2004 18:54:10

Note: these plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables.

Test Of: **Sendo Ltd.**
S331 GSM Mobile Telephone Handset
To: **FCC Part 22 & 24**

Transmitter Out of Band Emissions: Section 2.1053 & 22.917 (Continued)



Note: these plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables.

8.8. Transmitter Radiated Emissions At Band Edges: Section 2.1053

8.8.1. The EUT was configured as for radiated emissions testing as described in Section 9 of this report.

8.8.2. Tests were performed to identify the maximum emission levels at the band edges of the frequency block of operation.

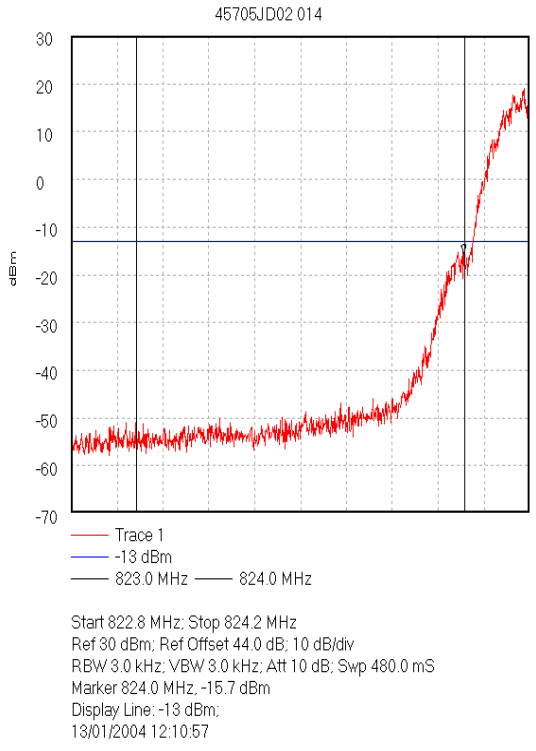
Results:

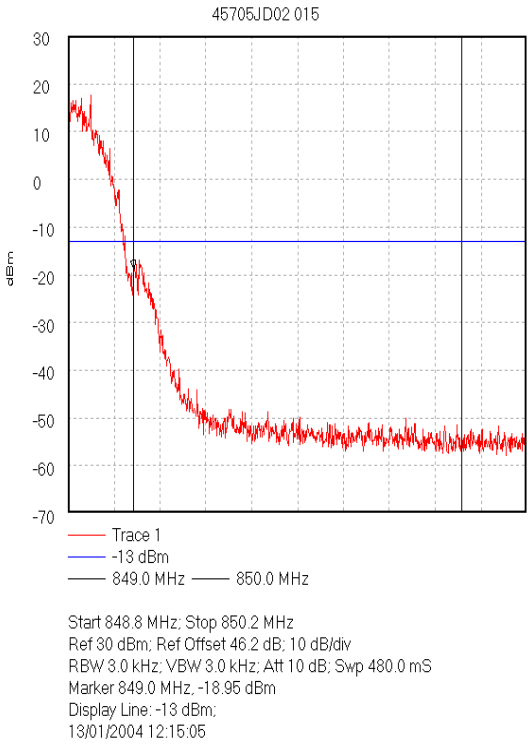
Bottom Band Edge

Frequency (MHz)	Peak Level (dBm)	Limit (dBm)	Margin (dB)	Result
824	-15.7	-13.0	2.7	Complied

Top Band Edge

Frequency (MHz)	Peak Level (dBm)	Limit (dBm)	Margin (dB)	Result
849	-19.0	-13.0	6.0	Complied





9. Measurement Methods – Part 22

9.1. Effective Radiated Power (ERP)

ERP measurements were performed in accordance with the standard, against appropriate limits.

The ERP was measured with the EUT arranged on a non-conducting turn table on a standard test site compliant with ANSI C63.4 – 2001 Clause 5.4. The transmitter was fitted with an integral antenna; as such all radiated tests were performed with the unit operating into the integral antenna.

The level of the ERP was measured using a spectrum analyser.

The test antenna was positioned in the horizontal plane. The EUT was oriented in the X plane. The test antenna was then raised and lowered until a maximum peak was observed. The turntable was then rotated through 360 degrees and the maximum peak reading obtained. The height search was then repeated to take into consideration the new angular position of the turntable. The maximum reading observed was then recorded. This procedure was then repeated with the EUT oriented in the Y and Z planes. The highest reading taken in all 3 planes was recorded. The entire procedure was then repeated with the test antenna set in the Vertical polarity.

Once the final amplitude (maximised) had been obtained, the EUT was substituted with a substitution antenna. For ERP measurements a dipole antenna was used. The centre of the substitution antenna was set to approximately the same centre location as the EUT. The substitution antenna was set to the horizontal polarity. The substitution antenna was matched into a signal generator using a 6 dB or greater attenuator. The signal generator was tuned to the EUT's frequency under test.

The test antenna was then raised and lowered to obtain a maximum reading on the spectrum analyser. The level of the signal generator output was then adjusted until the maximum recorded EUT level was observed. The signal generator level was noted. This procedure was repeated with both test antenna and substitution antenna vertically polarised. The ERP was calculated as:-

ERP = Signal Generator Level - Cable Loss + Antenna Gain

Effective Radiated Power (ERP) (Continued)

Circumstances where the signal generator could not produce the desired power substitution was performed with the signal generator set to 0 dBm. The radiated signal was maximised as previously described. The level indicated on the measuring receiver was noted. The delta between this level and the maximum level for the EUT was calculated and also noted. The ERP of the signal generator was calculated using the above formulae. The recorded delta was added to the calculated ERP to obtain the substituted EUT ERP.

Delta (dB) = EUT – SG

Where :

EUT = spectrum analyser indicated EUT raw level

SG = spectrum analyser indicated signal generator raw level

The signal generator actual ERP is calculated as:

ERP SG= Signal Generator Level - Cable Loss + Antenna Gain

The EUT ERP is calculated as:

ERP EUT = ERP SG + Delta.

The test equipment settings for ERP measurements were as follows:

Receiver Function	**Setting**
Detector Type:	Peak
Mode:	Not applicable
Bandwidth:	≥ Emission Bandwidth
Amplitude Range:	100 dB
Sweep Time:	Coupled

9.2. FCC Part 2.1055: Frequency Stability

The EUT was situated within an environmental test chamber and connected to the GSM test set via an air link.

Measurements were performed with the EUT operating under extremes of temperature in 10 degree increments within the range –30 to 50 degrees C.

Measurements were also performed at voltage extremes between the declared nominal supply voltage and at the declared endpoint voltage (for battery operated equipment) or by varying the primary supply voltage from 85% to 115% of the nominal value for all other equipment types.

The requirement was to determine the frequency stability of the device under specified environmental operating conditions.

Measurements were made on the top and bottom channels.

The EUT was switched off for a minimum of 30 minutes between each stage of testing while the environmental chamber stabilised at the next temperature within the stated temperature range.

The frequency error measured was converted to an error in ppm using the following formula as defined by TIA_EIA_603A :-

$$\text{ppm error} = \left(\frac{MCF_{MHz}}{ACF_{MHz}} - 1\right) * 10^6$$

where MCF_{MHz} is the measured carrier frequency in MHz
ACF_{MHz} is the assigned carrier frequency in MHz

The measured ppm had to be less then the relevant limits in order to comply.

9.3. Occupied Bandwidth

The EUT was connected to a spectrum analyser enabled with an occupied bandwidth function and a GSM test set via an air link.

Measurements were performed to determine the Occupied Bandwidth in accordance with FCC Part 2.1049. The Occupied Bandwidth was measured from the fundamental emission at the bottom, middle and top channels.

As the EUT is a PCS phone, no modulation input port was available. A call was thus set up using the PCS/GSM simulator and using normal modulation. The Occupied Bandwidth was measured in this configuration.

The Occupied Bandwidth was measured using the built in occupied bandwidth function of the Rohde and Schwarz FSEB or ESIB spectrum analyser. It was set to measure the bandwidth where 99% of the signal power was contained. The analyser settings were set as per those outlined in the spectrum analyser user manual for this measurement, i.e., RBW $\geq$ 1% of occupied bandwidth. A value of 3 kHz was used.

9.4. AC Mains Conducted Emissions

AC mains conducted emissions measurements were performed in accordance with the standard, against appropriate limits for each detector function.

The test was performed in a shielded enclosure with the equipment arranged as detailed in the standard on a wooden bench using the floor of the screened enclosure as the ground reference plane. The EUT was powered with 115V 60 Hz AC mains supplied via a Line Impedance Stabilisation Network (LISN).

Initial measurements in the form of swept scans covering the entire measurement band were performed in order to identify frequencies on which the EUT was generating interference. In order to minimise the time taken for these swept measurements, a Peak detector was used in conjunction with the appropriate detector IF measuring bandwidths (see table below). Repetitive scans were performed to allow for emissions with low repetition rates, and the duty cycle of the EUT. The test configuration was the same for the initial scans as for the final measurements.

Following the initial scans, a graph was produced giving an overview of the emissions from the EUT plotted against the appropriate specification limit. A tolerance line was set 6 dB below the specification limit and levels above the tolerance line were re-tested (at individual frequencies) using the appropriate detector function.

The test equipment settings for conducted emissions measurements were as follows:

Receiver Function	**Initial Scan**	**Final Measurements**
Detector Type:	Peak	Quasi-Peak (CISPR)/Average
Mode:	Max Hold	Not applicable
Bandwidth:	10 kHz*	9 kHz*
Amplitude Range:	60 dB	20 dB
Measurement Time:	Not applicable	> 1 s
Observation Time:	Not applicable	> 15 s
Step Size:	Continuous sweep	Not applicable
Sweep Time:	Coupled	Not applicable

9.5. Transmitter Radiated Emissions

Radiated emissions measurements were performed in accordance with the standard, against appropriate limits for each detector function.

Initial pre-scans covering the entire measurement band from the lowest generated frequency declared up to 10 times the highest fundamental frequency. The scans were performed within a screened chamber in order to identify frequencies on which the EUT was generating spurious. This procedure identified the frequencies from the EUT which required further examination. Repetitive scans were performed to allow for emissions with low repetition rates, and for the duty cycle of the EUT.

The initial scans were performed using an antenna height of 1.5 m and a measurement distance of 3 m. A limit line was set to the specification limit by characterising the screen room using a known signal source set at exactly the same location as the EUT. The signal source was derived from either a horn antenna or a dipole dependant on the frequency band under investigation. Any levels within 20dB of this limit were measured where possible, on occasion; the receiver noise floor came within the 20dB boundary. On these occasions, the system noise floor may have been recorded.

An open area test site using the appropriate test distance and measuring receiver with a Peak detector was used for final measurements at each frequency recorded in the screen room.

The levels were maximised by initially rotating the turntable through 360° and then varying the antenna height between 1 m and 4 m in the vertical polarisation. At this point, any signals found to be between the limit and a level 6 dB below it were further maximised by changing the configuration of the EUT, e.g. re-routing cables to peripherals and moving peripherals with respect to the EUT. The procedure was repeated for the horizontal polarisation.

Once the final amplitude (maximised) had been obtained, the EUT was substituted with a substitution antenna. For EIRP measurements a Horn antenna whose gain was based on an isotropic antenna was used, ERP measurements were done using a dipole. The centre of the substitution antenna was set to approximately the same centre location as the EUT. The substitution antenna was set to the horizontal polarity. The substitution antenna was matched into a signal generator using a 6dB or greater attenuator. The signal generator was tuned to the EUT's frequency under test.

The test antenna was then raised and lowered to obtain a maximum reading on the spectrum analyser. The level of the signal generator output was then adjusted until the maximum recorded EUT level was observed. The signal generator level was noted. This procedure was repeated with both test antenna and substitution antenna vertically polarised. The radiated power was calculated as:-

EIRP/ERP = Signal Generator Level - Cable Loss + Antenna Gain

Transmitter Radiated Emissions (Continued)

The limit in the standard states that emissions shall be attenuated by at least 43+10 log (P) dB below the transmitter power (P), where (P) is the maximum measured fundamental power for the channel under test. This limit always reduces to –13dBm therefore, the limit line presented on the accompanying plots is set to –13dBm.

Any spurious measured were then compared to the –13dBm limit. The requirement is for the emission to be less than –13dBm. The margin between emission and limit is recorded and should always be positive to indicate compliance.

It should be noted that FCC Part 22.917 states that the 1st MHz band immediately adjacent to the applicants declared frequency block may be measured using a resolution bandwidth of at least 1% of the emission bandwidth. This bandwidth was found by calculating 1% of the bandwidth measured in the transmitter occupied bandwidth section of this report. The next largest available bandwidth above this calculated figure was, therefore, used i.e. 3 kHz.

9.6. Receiver Radiated Emissions

Radiated emissions measurements were performed in accordance with the standard, against appropriate limits for each detector function.

Initial pre-scans covering the entire measurement band from the lowest generated frequency declared up to 5 times the highest unintentionally generated frequency were performed within a screened chamber in order to identify frequencies on which the EUT was generating interference. This determined the frequencies from the EUT which required further examination. In order to minimise the time taken for the swept measurements, a peak detector was used in conjunction with the appropriate detector measuring bandwidth (see table below). Repetitive scans were performed to allow for emissions with low repetition rates, and for the duty cycle of the EUT.

The initial scans were performed using an antenna height of 1.5 m and a measurement distance of 3 m. A limit line was set to the specification limit. Levels within 20dB of this limit were measured where possible, on occasion, the receiver noise floor came within the 20dB boundary. On these occasions, the system noise floor may have been recorded.

An open area test site using the appropriate test distance and measuring receiver with a Quasi-Peak detector was used for measurements below 1000 MHz, for measurements above 1000 MHz average and peak detectors were used.

For the final measurements the EUT was arranged on a non-conducting turn table on a standard test site compliant with ANSI C63.4 – 2001 Clause 5.4.

On the open area test site, at each frequency where a signal was found, the levels were maximised by initially rotating the turntable through 360° and then varying the antenna height between 1 m and 4 m in the horizontal polarisation. At this point, any signals found to be between the limit and a level 6 dB below it were further maximised by changing the configuration of the EUT, e.g. re-routing cables to peripherals and moving peripherals with respect to the EUT. The procedure was repeated for the vertical polarisation.

The final field strength was determined as the indicated level in dBμV plus cable loss and antenna factor.

The test equipment settings for radiated emissions measurements were as follows:

Receiver Function	**Initial Scan**	**Final Measurements Below 1GHz**	**Final Measurements Above 1 GHz**
Detector Type:	Peak	Quasi-Peak (CISPR)	Peak/Average
Mode:	Max Hold	Not applicable	Not applicable
Bandwidth:	(120 kHz < 1GHz) (1MHz > 1GHz)	120 kHz	1 MHz (If Applicable)
Amplitude Range:	60 dB	20 dB	20 dB (typical)
Step Size:	Continuous sweep	Not applicable	Not applicable
Sweep Time:	Coupled	Not applicable	Not applicable

10. Test Results FCC Part 24

10.1. Idle Mode AC Conducted Spurious Emissions: Section 15.107

10.1.1. The EUT was configured as for AC conducted emissions measurements as described in Section 11 of this report.

10.1.2. Tests were performed to identify the maximum emission levels on the AC mains line of the AC Charger whilst connected to the EUT.

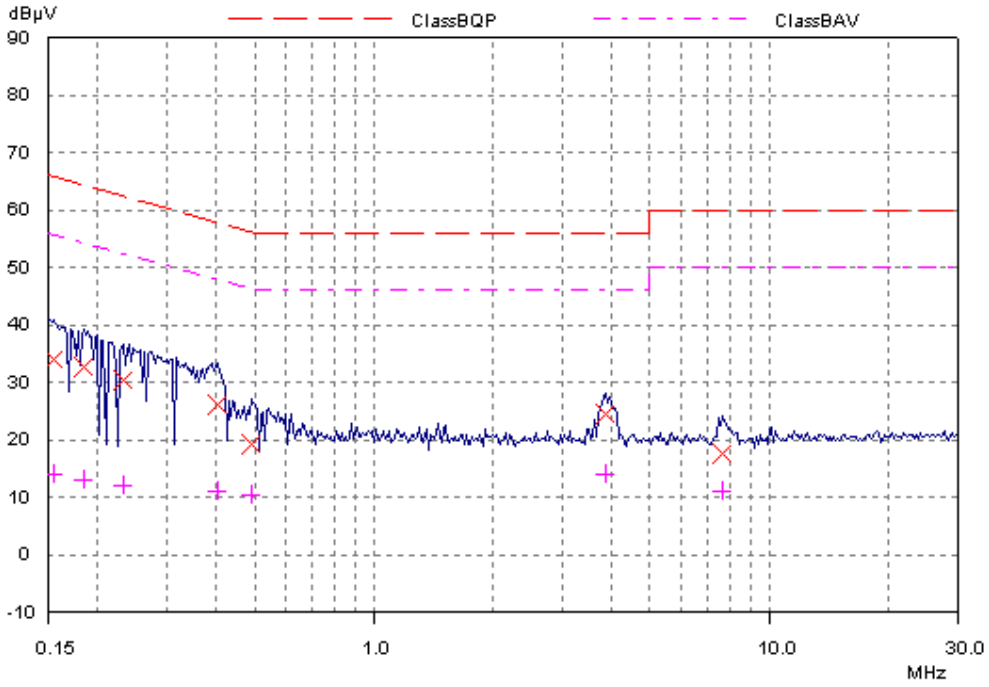
Results: Quasi-Peak Detector Measurements On Live And Neutral Lines

Frequency (MHz)	Line	Q-P Level (dBμV)	Q-P Limit (dBμV)	Margin (dB)	Result
0.15448	Neutral	34.08	65.76	31.68	Complied
0.18434	Neutral	32.61	64.29	31.68	Complied
0.23331	Live	30.42	62.33	31.91	Complied
0.40351	Live	26.06	57.78	31.72	Complied
0.49008	Neutral	19.05	56.17	37.12	Complied
3.87412	Live	24.30	56.00	31.70	Complied
7.67213	Neutral	17.60	60.00	42.40	Complied

Results: Average Detector Measurements On Live And Neutral Lines

Frequency (MHz)	Line	Av. Level (dBμV)	Av. Limit (dBμV)	Margin (dB)	Result
0.15448	Live	13.87	55.76	41.89	Complied
0.18434	Neutral	12.85	54.29	41.44	Complied
0.23331	Neutral	11.86	52.33	40.47	Complied
0.40351	Neutral	10.97	47.78	36.81	Complied
0.49008	Neutral	10.29	46.17	35.88	Complied
3.87415	Live	13.79	46.00	32.21	Complied
7.67213	Live	16.02	50.00	38.98	Complied

Idle Mode AC Conducted Spurious Emissions: Section 15.107 (Continued)



Note: these plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables.

10.2. Idle Mode Radiated Spurious Emission: Section 15.109

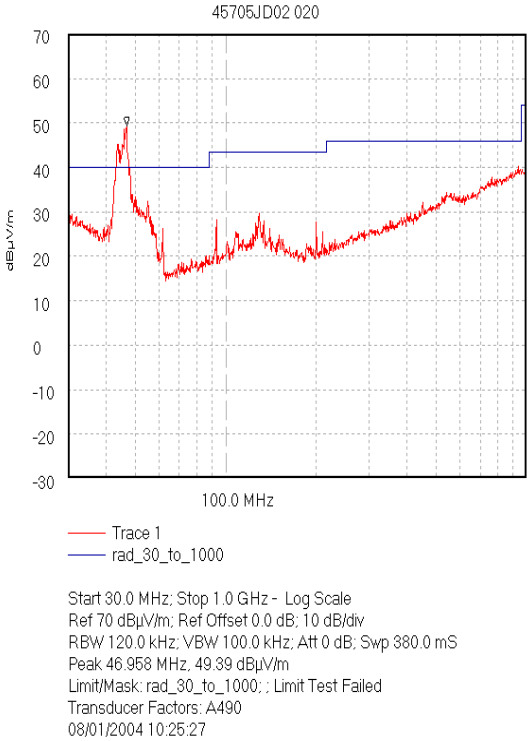
10.2.1. The EUT was configured as for radiated emissions testing as described in Section 11 of this report.

10.2.2. Tests were performed to identify the maximum idle mode radiated emissions levels.

Result:

Frequency (MHz)	Antenna Polarity	Q-P Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
43.875	Vert.	32.3	40.0	7.7	Complied
45.000	Vert.	37.5	40.0	2.5	Complied
55.250	Vert.	27.8	40.0	12.2	Complied
62.100	Vert.	25.0	40.0	15.0	Complied
108.500	Vert.	24.0	43.5	19.5	Complied
130.000	Vert.	23.5	43.5	20.0	Complied
200.000	Vert.	17.7	43.5	25.8	Complied
207.999	Vert.	18.7	43.5	24.8	Complied
455.190	Horiz.	29.7	46.0	16.3	Complied

Idle Mode Radiated Spurious Emission: Section 15.109 (Continued)



Note: these plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables.

Idle Mode Radiated Spurious Emission: Section 15.109 (Continued)

10.2.1. Electric Field Strength Measurements (Frequency Range 1.0 to 12.0 GHz)

10.2.1.1. The EUT was configured as for radiated emissions testing as described in Section 11 of this report.

10.2.1.2. Tests were performed to identify the maximum idle mode radiated emissions levels.

Result:

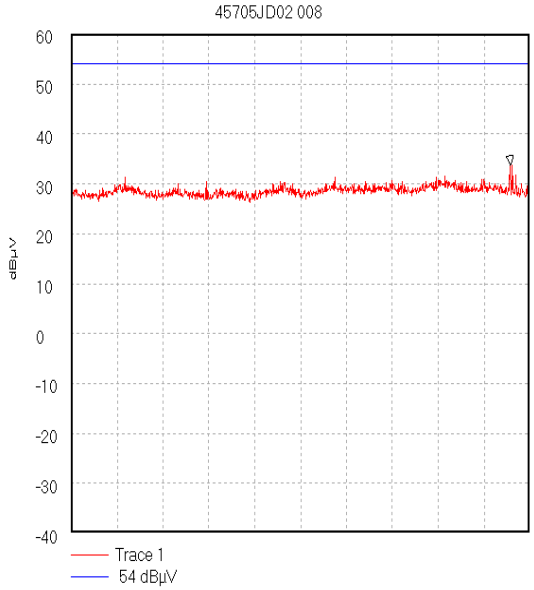
Highest Peak Level

Frequency (GHz)	Antenna. Polarity	Peak Detector Level (dBµV)	Antenna Factor	Cable Loss	Actual Peak Level (dBµV/m)	**Average Limit (dBµV/m)	Margin (dB)	Result
*5.68000	Vert.	17.0	24.4	1.9	43.3	54.0	10.7	Complied

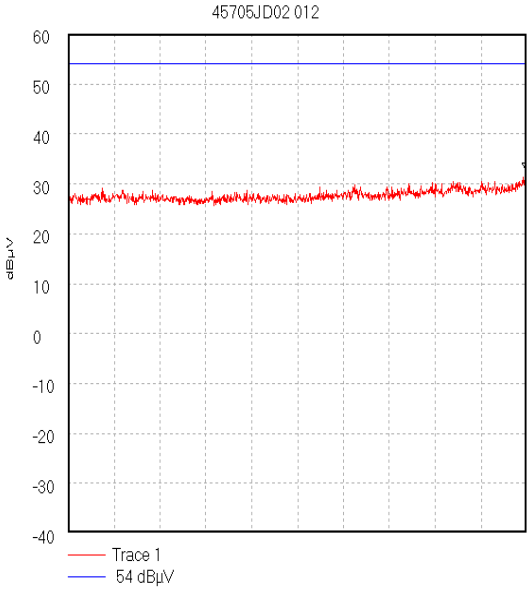
**Note: No spurious emissions were detected above the noise floor of the measuring receiver; therefore, the highest peak noise floor reading of the measuring receiver was recorded as shown in the table above.*
***Note: The peak level was compared to the average limit as opposed to being compared to the peak limit because this is the more onerous limit.*

Test Of: **Sendo Ltd.**
S331 GSM Mobile Telephone Handset
To: **FCC Part 22 & 24**

Idle Mode Radiated Spurious Emission: Section 15.109 (Continued)



Start 1.0 GHz; Stop 2.0 GHz
Ref 60 dBµV; Ref Offset 0.0 dB; 10 dB/div
RBW 1000.0 kHz; VBW 1.0 MHz; Att 0 dB; Swp 20.0 mS
Peak 1.958 GHz, 33.8 dBµV
Display Line: 54 dBµV; ; Limit Test Passed
07/01/2004 11:53:25



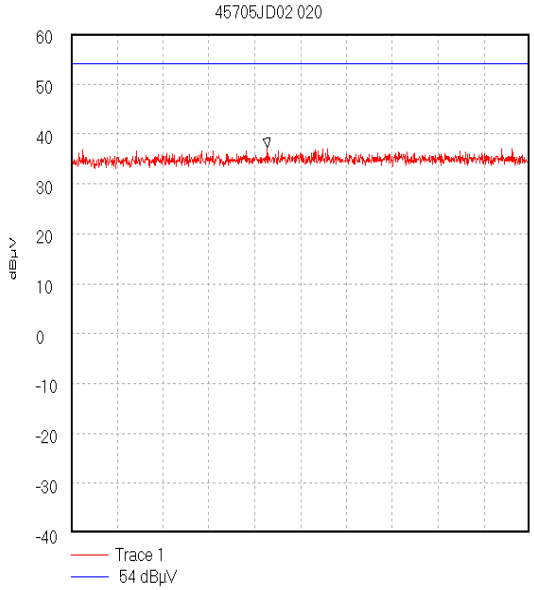
Start 2.0 GHz; Stop 4.0 GHz
Ref 60 dBµV; Ref Offset 0.0 dB; 10 dB/div
RBW 1000.0 kHz; VBW 1.0 MHz; Att 0 dB; Swp 20.0 mS
Peak 3.998 GHz, 32.5 dBµV
Display Line: 54 dBµV; ; Limit Test Passed
07/01/2004 12:15:06

Note: these plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables.

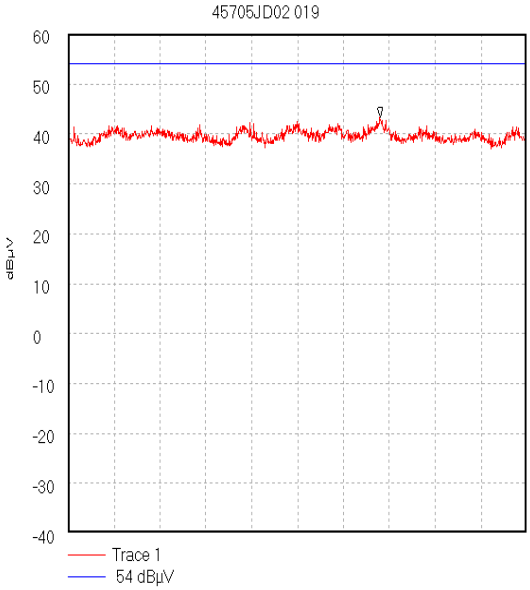
Note: the emission shown in plot 45705JD02 008 at 1.958 GHz emanates from the GSM test set and not the EUT. Because the emission is not from the EUT no level as been recorded in the preceding results table.

Test Of: **Sendo Ltd.**
S331 GSM Mobile Telephone Handset
To: **FCC Part 22 & 24**

Idle Mode Radiated Spurious Emission: Section 15.109 (Continued)



Start 4.0 GHz; Stop 5.0 GHz
Ref 60 dBµV; Ref Offset 2.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 0 dB; Swp 20.0 mS
Peak 4.428 GHz, 37.3 dBµV
Display Line: 54 dBµV;
26/01/2004 10:38:29

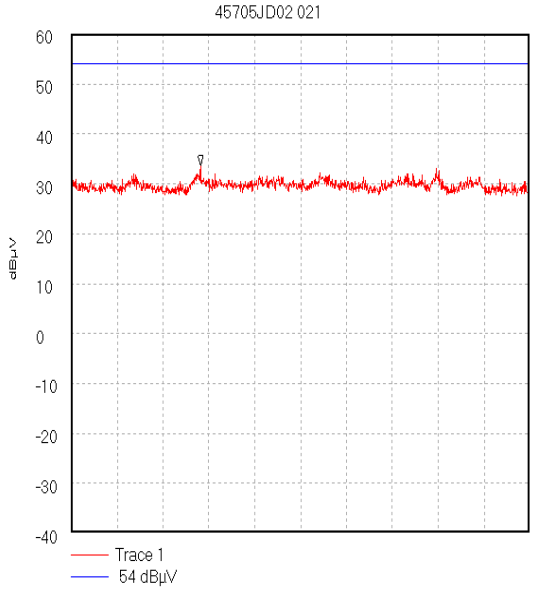


Start 5.0 GHz; Stop 6.0 GHz
Ref 60 dBµV; Ref Offset 2.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 0 dB; Swp 20.0 mS
Peak 5.68 GHz, 43.3 dBµV
Display Line: 54 dBµV;
26/01/2004 10:37:22

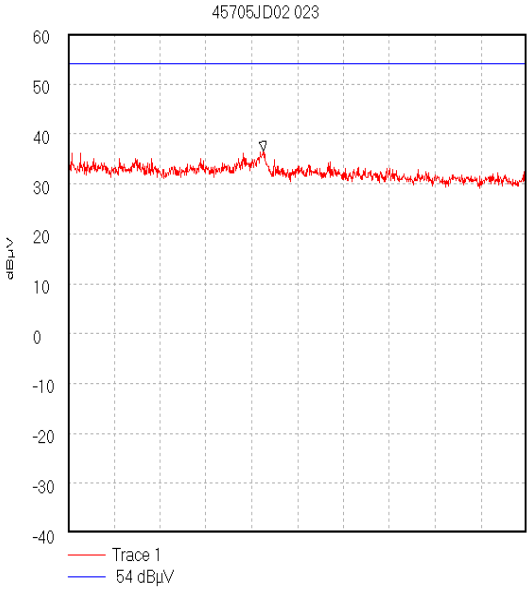
Note: these plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables.

Test Of: **Sendo Ltd.**
S331 GSM Mobile Telephone Handset
To: **FCC Part 22 & 24**

Idle Mode Radiated Spurious Emission: Section 15.109 (Continued)



Start 6.0 GHz; Stop 8.0 GHz
Ref 60 dBµV; Ref Offset 2.3 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 0 dB; Swp 20.0 mS
Peak 6.564 GHz, 33.62 dBµV
Display Line: 54 dBµV;
26/01/2004 10:47:06



Start 8.0 GHz; Stop 12.0 GHz
Ref 60 dBµV; Ref Offset 2.2 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 0 dB; Swp 20.0 mS
Peak 9.702 GHz, 36.59 dBµV
Display Line: 54 dBµV;
26/01/2004 10:54:15

Note: these plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables.

10.3. Transmitter Effective Isotropic Radiated Power (EIRP): Section 24.232

10.3.1. The EUT was configured as for Effective Isotropic Radiated Power as described in Section 11 of this report.

10.3.2. Tests were performed to identify the maximum Effective Isotropic Radiated Power (EIRP).

Results:

Channel	Measured Frequency (MHz)	Antenna Polarity	Maximum Transmitter EIRP (dBm)	Limit EIRP (dBm)	Margin (dB)	Result
Bottom	1850.2	Vert.	25.9	33.0	7.1	Complied
Middle	1879.8	Vert.	25.1	33.0	7.9	Complied
Top	1909.8	Vert.	24.9	33.0	8.1	Complied

10.4. Transmitter Frequency Stability (Temperature Variation): Section 24.235

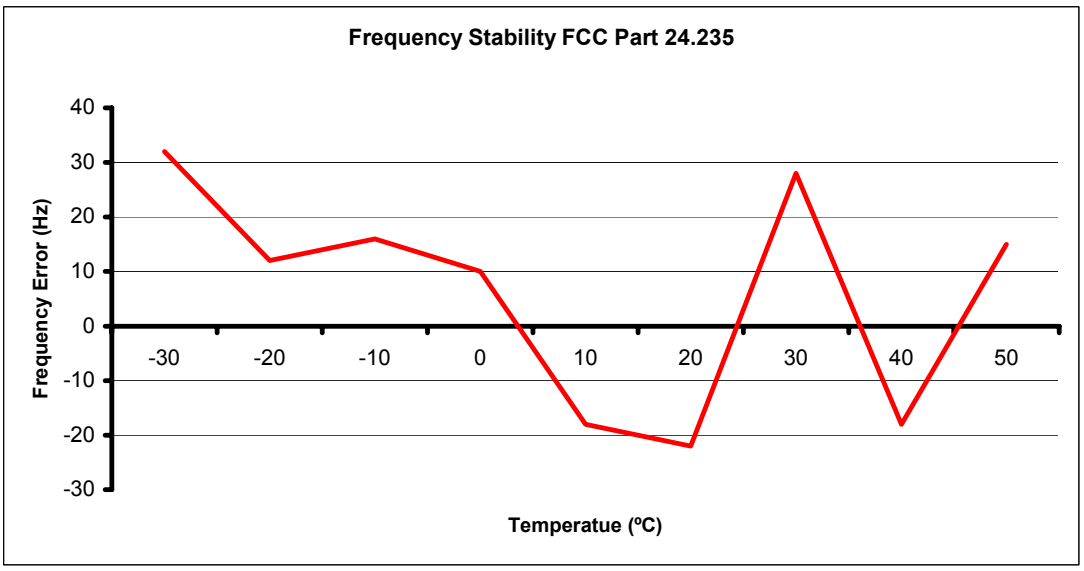
10.4.1. The EUT was configured as for frequency stability measurements as described in Section 11 of this report.

10.4.2. Tests were performed to identify the maximum frequency error of the EUT with variations in ambient temperature.

Results Bottom Channel (1850.2 MHz)

Temp (ºC)	Frequency Error (Hz)	Measured Frequency (MHz)	Lower Band Edge Limit (MHz)	Margin (MHz)	Result
-30	32	1850.200032	1850.0	0.200032	Complied
-20	12	1850.200012	1850.0	0.200012	Complied
-10	16	1850.200016	1850.0	0.200016	Complied
0	10	1850.200010	1850.0	0.200010	Complied
10	-18	1850.199982	1850.0	0.199982	Complied
20	-22	1850.199978	1850.0	0.199978	Complied
30	28	1850.200028	1850.0	0.200028	Complied
40	-18	1850.199982	1850.0	0.199982	Complied
50	15	1850.200015	1850.0	0.200015	Complied

Frequency Variation From 1850.2MHz

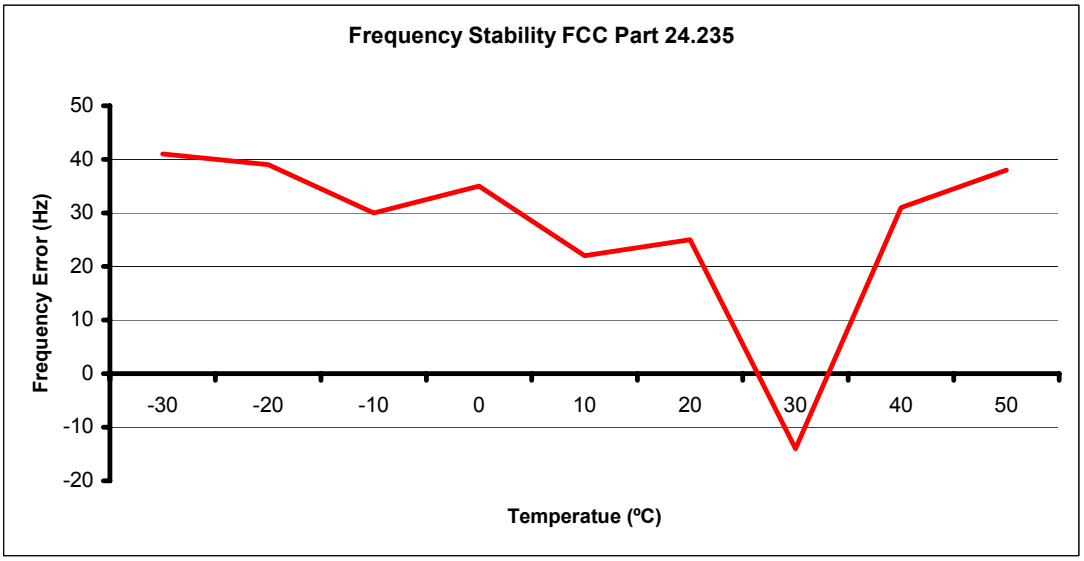


Transmitter Frequency Stability (Temperature Variation): Section 24.235 (continued)

Results Top Channel (1909.8 MHz)

Temp (ºC)	Frequency Error (Hz)	Measured Frequency (MHz)	Upper Band Edge Limit (MHz)	Margin (MHz)	Result
-30	41	1909.800041	1910.0	0.199959	Complied
-20	39	1909.800039	1910.0	0.199961	Complied
-10	30	1909.800030	1910.0	0.199970	Complied
0	35	1909.800035	1910.0	0.199965	Complied
10	22	1909.800022	1910.0	0.199978	Complied
20	25	1909.800025	1910.0	0.199975	Complied
30	-14	1909.799986	1910.0	0.200014	Complied
40	31	1909.800031	1910.0	0.199969	Complied
50	38	1909.800038	1910.0	0.199962	Complied

Frequency Variation From 1909.8MHz



10.5. Transmitter Frequency Stability (Voltage Variation): Section 24.235

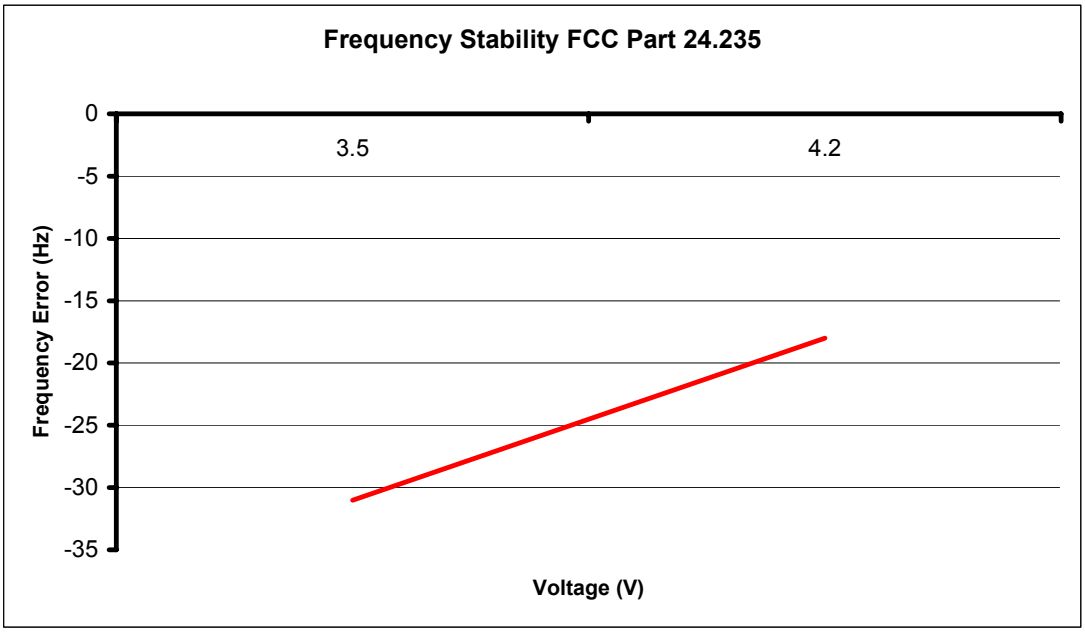
10.5.1. The EUT was configured as for frequency stability measurements as described in Section 11 of this report.

10.5.2. Tests were performed to identify the maximum frequency error of the EUT with variations in nominal DC operating voltage.

Results Bottom Channel (1850.2 MHz)

Supply Voltage (V)	Frequency Error (Hz)	Measured Frequency (MHz)	Lower Band Edge Limit (MHz)	Margin (MHz)	Result
3.5	-31	1850.199969	1850.0	0.199969	Complied
4.2	-18	1850.199982	1850.0	0.199982	Complied

Frequency Variation From 1850.2MHz

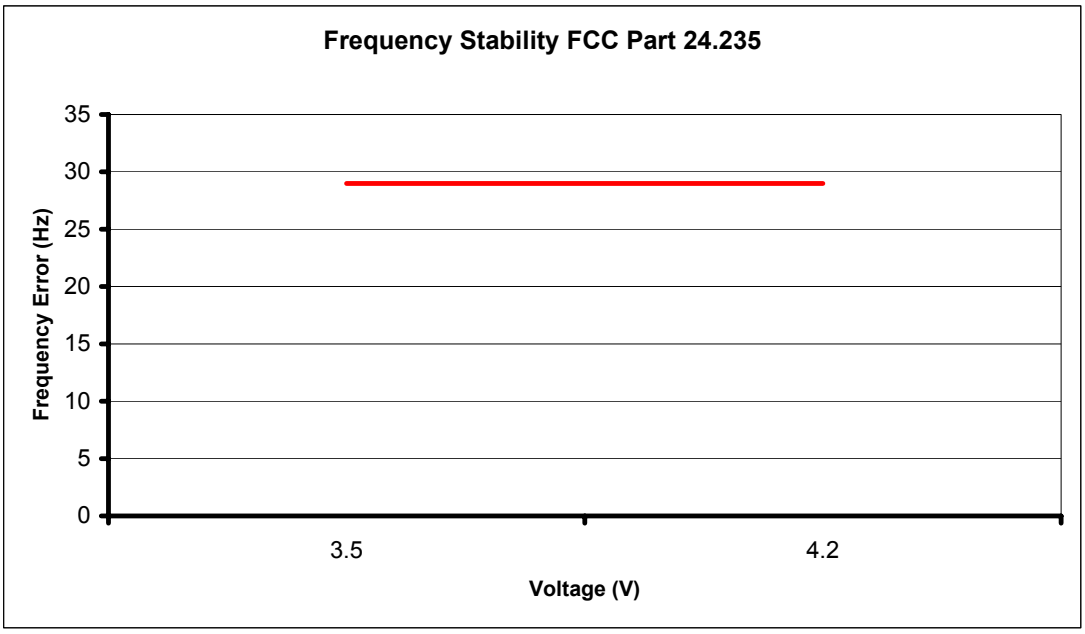


Transmitter Frequency Stability (Voltage Variation): Section 24.235 (Continued)

Results Top Channel (1909.8 MHz)

Supply Voltage (V)	Frequency Error (Hz)	Measured Frequency (MHz)	Lower Band Edge Limit (MHz)	Margin (MHz)	Result
3.5	29	1909.800029	1910	0.199971	Complied
4.2	29	1909.800029	1910	0.199971	Complied

Frequency Variation From 1909.8MHz



10.6. Transmitter Occupied Bandwidth: Section 24.238

10.6.1. The EUT was configured as for Occupied Bandwidth measurements as described in Section 11 of this report.

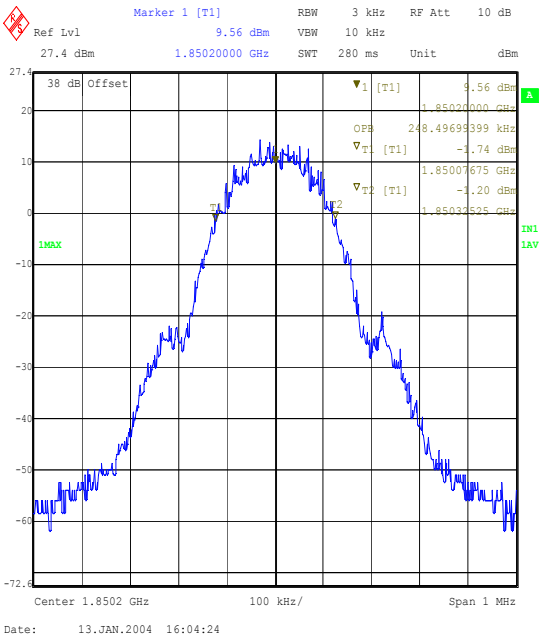
10.6.2. Tests were performed to identify the maximum bandwidth occupied by the fundamental of the EUT.

Results:

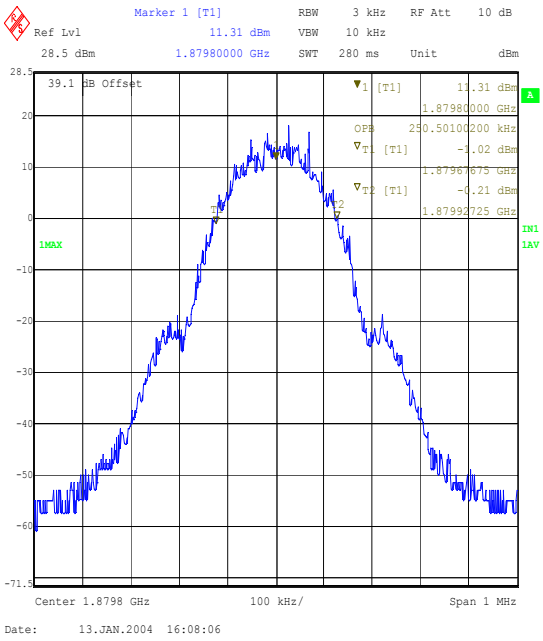
Channel	Frequency (MHz)	Resolution Bandwidth (kHz)	Video Bandwidth (kHz)	Occupied Bandwidth (kHz)
Bottom	1850.2	3.0	10.0	248.497
Middle	1879.8	3.0	10.0	250.501
Top	1909.8	3.0	10.0	248.497

Transmitter Occupied Bandwidth: Section 24.238 (Continued)

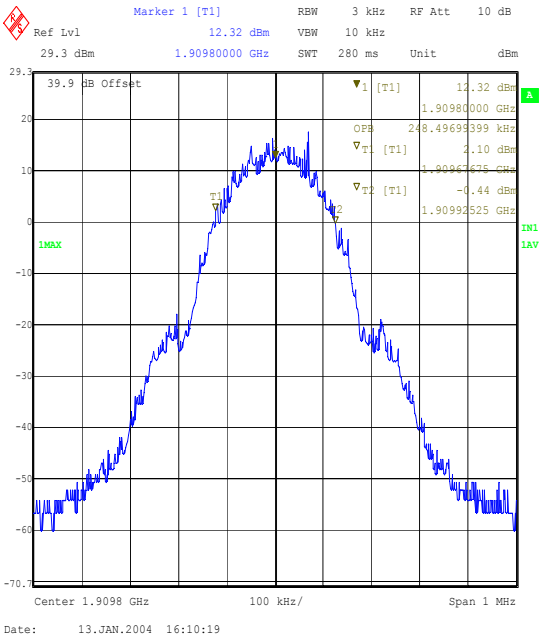
Bottom Channel



Middle Channel



Top Channel



Note: The occupied bandwidth is measured using the internal OBW function of the measurement analyser. The analyser automatically configures the measurement bandwidths to make an accurate measurement. The vital data is reported in the upper right portion of the screen. See attached graphs.

10.7. Transmitter Out of Band Emissions: Section 2.1053/24.238

10.7.1. The EUT was configured as for radiated emissions testing as described in Section 11 of this report.

10.7.2. Tests were performed to identify the maximum out of band transmitter radiated spurious emission level present in the band 30 MHz to 10 x the highest fundamental frequency.

Result: Bottom Channel

Frequency (MHz)	Peak Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
3700.462	-31.8	-13.0	18.8	Complied

Result: Middle Channel

Frequency (MHz)	Peak Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
3759.722	-24.3	-13.0	11.3	Complied

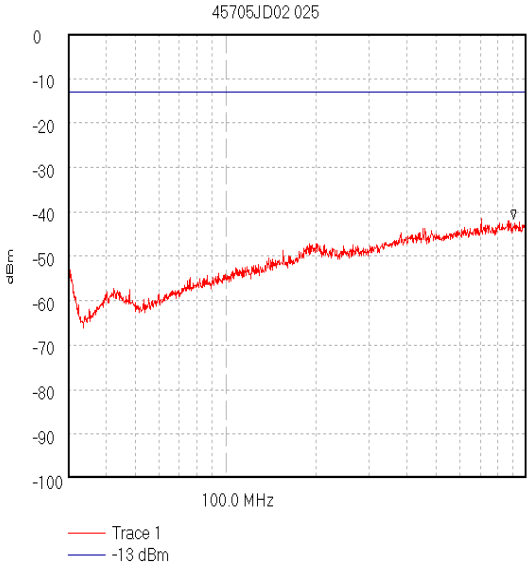
Result: Top Channel

Frequency (MHz)	Peak Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
3819.815	-23.2	-13.0	10.7	Complied

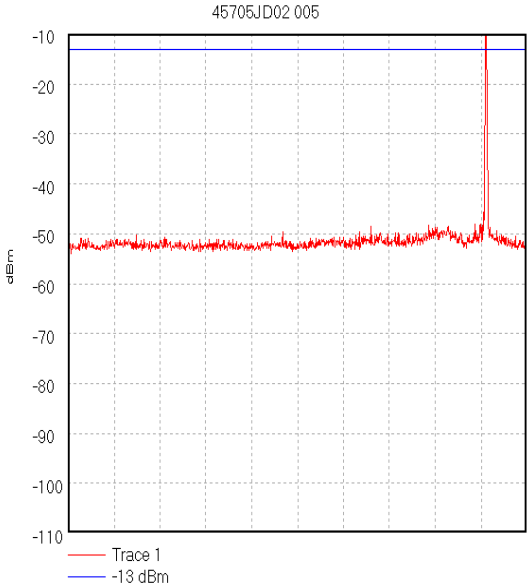
Note: All other emissions were at least 20 dB better than the stated limit.

Test Of: **Sendo Ltd.**
S331 GSM Mobile Telephone Handset
To: **FCC Part 22 & 24**

Transmitter Out of Band Emissions: Section 2.1053/24.238 (Continued)



Start 30.0 MHz; Stop 1.0 GHz - Log Scale
Ref 0 dBm; Ref Offset 11.8 dB; 10 dB/div
RBW 120.0 kHz; VBW 100.0 kHz; Att 10 dB; Swp 440.0 mS
Peak 904.078 MHz, -41.59 dBm
Display Line: -13 dBm; ; Limit Test Passed
Transducer Factors: A490
21/01/2004 14:33:43



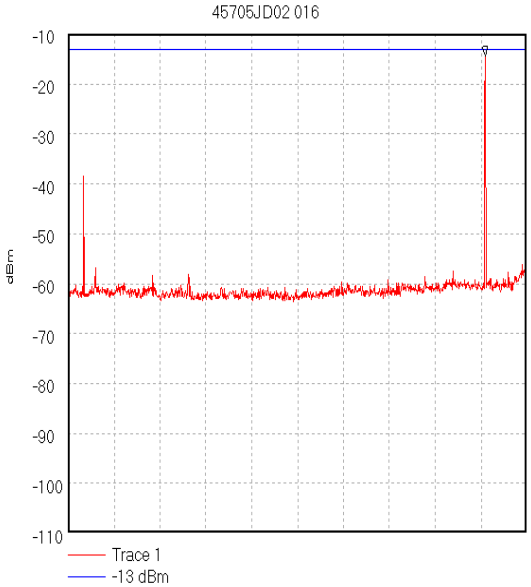
Start 1.0 GHz; Stop 2.0 GHz
Ref -10 dBm; Ref Offset 11.8 dB; 10 dB/div
RBW 1000.0 kHz; VBW 1.0 MHz; Att 0 dB; Swp 20.0 mS
Peak 1.912 GHz, -6.02 dBm
Display Line: -13 dBm; ; Limit Test Failed
07/01/2004 11:29:00

Note: these plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables.

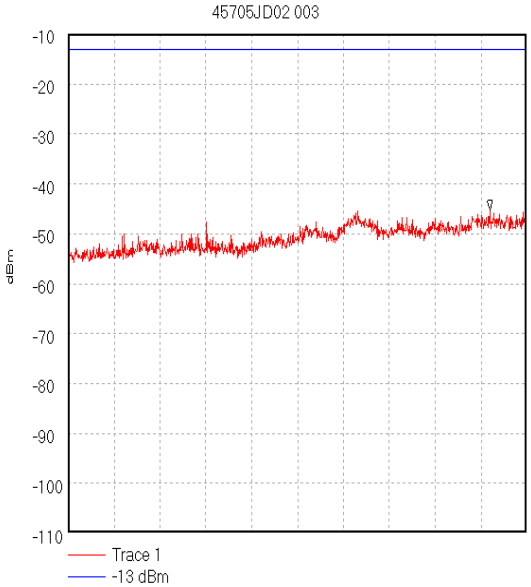
Note: the emission shown in plot 45705JD02 005 at 1.912 GHz is the transmitter fundamental (intentional) emission and not a spurious emission.

Test Of: **Sendo Ltd.**
S331 GSM Mobile Telephone Handset
To: **FCC Part 22 & 24**

Transmitter Out of Band Emissions: Section 2.1053/24.238 (Continued)



Start 2.0 GHz; Stop 4.0 GHz
Ref -10 dBm; Ref Offset 11.8 dB; 10 dB/div
RBW 1000.0 kHz; VBW 1.0 MHz; Att 0 dB; Swp 20.0 mS
Peak 3.82 GHz, -14.44 dBm
Display Line: -13 dBm; ; Limit Test Passed
07/01/2004 12:30:10

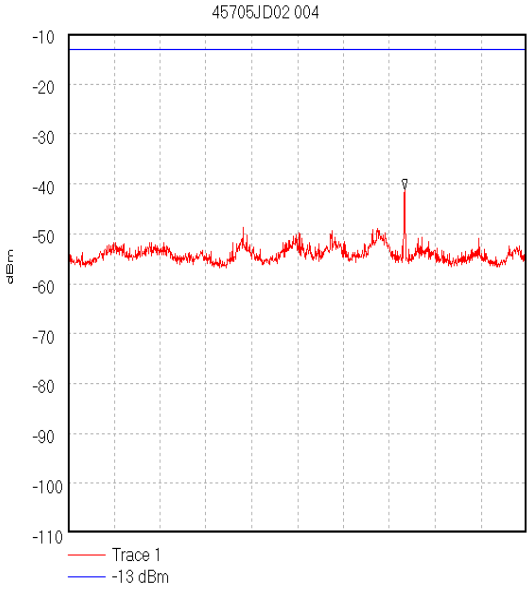


Start 4.0 GHz; Stop 5.0 GHz
Ref -10 dBm; Ref Offset 13.8 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 0 dB; Swp 20.0 mS
Peak 4.92 GHz, -45.19 dBm
Display Line: -13 dBm;
09/01/2004 11:57:59

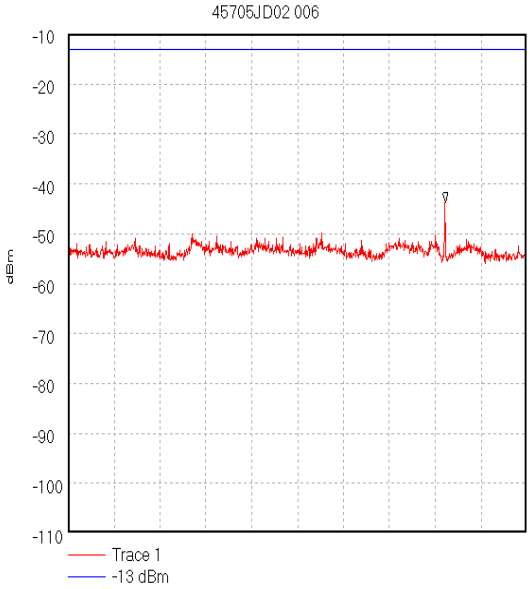
Note: these plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables.

Test Of: **Sendo Ltd.**
S331 GSM Mobile Telephone Handset
To: **FCC Part 22 & 24**

Transmitter Out of Band Emissions: Section 2.1053/24.238 (Continued)



Start 5.0 GHz; Stop 6.0 GHz
Ref -10 dBm; Ref Offset 13.8 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 0 dB; Swp 20.0 mS
Peak 5.734 GHz, -41.18 dBm
Display Line: -13 dBm;
09/01/2004 12:06:47



Start 6.0 GHz; Stop 8.0 GHz
Ref -10 dBm; Ref Offset 14.1 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 0 dB; Swp 20.0 mS
Peak 7.644 GHz, -43.64 dBm
Display Line: -13 dBm;
09/01/2004 14:13:20

Note: these plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables. If any final emission measurement fell below the limit by more than 20dB it was not recorded.

Test Of: **Sendo Ltd.**
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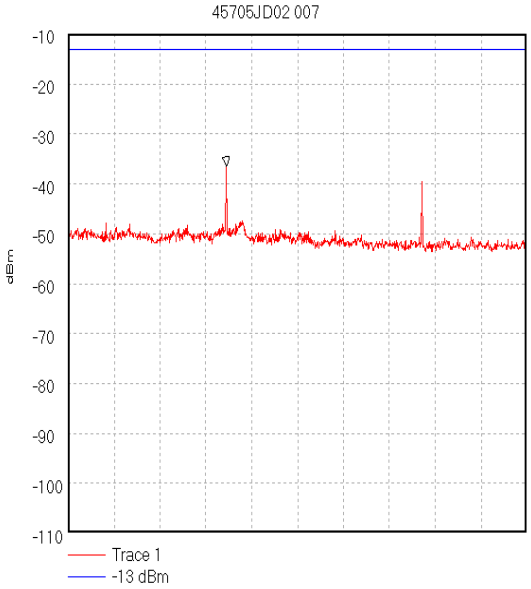
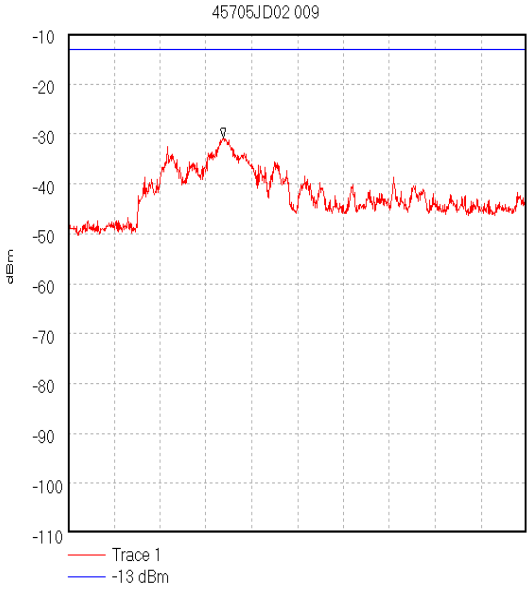
Transmitter Out of Band Emissions: Section 2.1053/24.238 (Continued)



Start 8.0 GHz; Stop 12.5 GHz
Ref -10 dBm; Ref Offset 14.1 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 0 dB; Swp 20.0 mS
Peak 9.555 GHz, -36.51 dBm
Display Line: -13 dBm;
09/01/2004 14:32:00

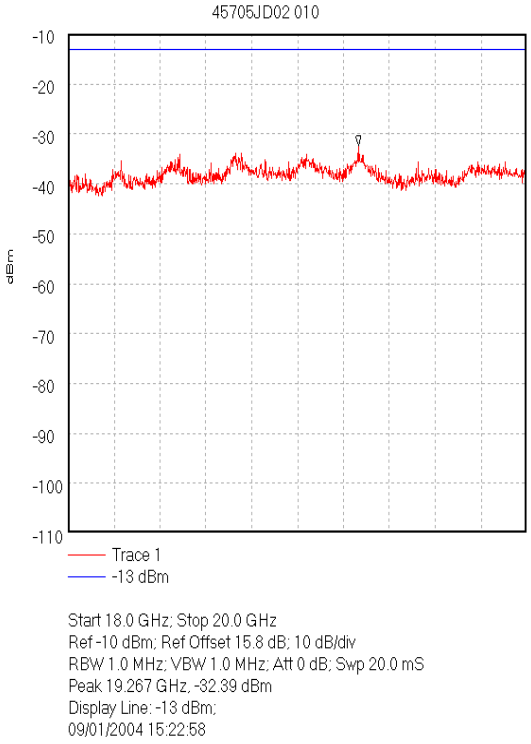


Start 12.0 GHz; Stop 18.0 GHz
Ref -10 dBm; Ref Offset 15.4 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 0 dB; Swp 40.0 mS
Peak 14.033 GHz, -30.79 dBm
Display Line: -13 dBm;
09/01/2004 15:03:16

Note: these plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables.

Test Of: **Sendo Ltd.**
S331 GSM Mobile Telephone Handset
To: **FCC Part 22 & 24**

Transmitter Out of Band Emissions: Section 2.1053/24.238 (Continued)



Note: these plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables.

Transmitter Out of Band Radiated Emissions: Section 2.1051/24.238 (Continued)

Integrated Power Over 1 MHz Strip Band: 1848 to 1849 MHz
1st 1 MHz block immediately outside adjacent frequency block

100 kHz Strip Number	Peak Power (nW/100 kHz)	100 kHz Strip Number	Peak Power (nW/100 kHz)
1	767	6	1115
2	767	7	796
3	828	8	849
4	772	9	839
5	1066	10	8527
Total Peak Power:		8651 nW/MHz	

Integrated Power Over 1 MHz Strip Band: 1847 to 1848 MHz
2nd 1 MHz block immediately outside adjacent frequency block

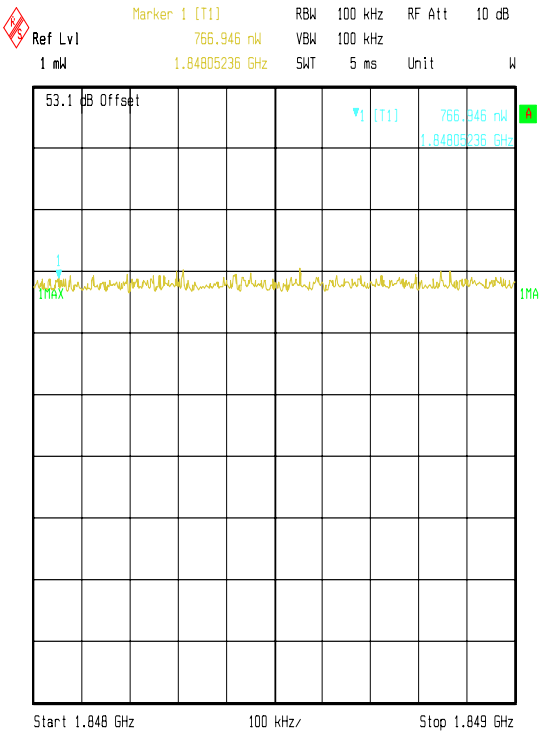
100 kHz Strip Number	Peak Power (nW/100 kHz)	100 kHz Strip Number	Peak Power (nW/100 kHz)
1	740	6	731
2	757	7	741
3	869	8	819
4	833	9	646
5	901	10	569
Total Peak Power:		7606 nW/MHz	

Result:

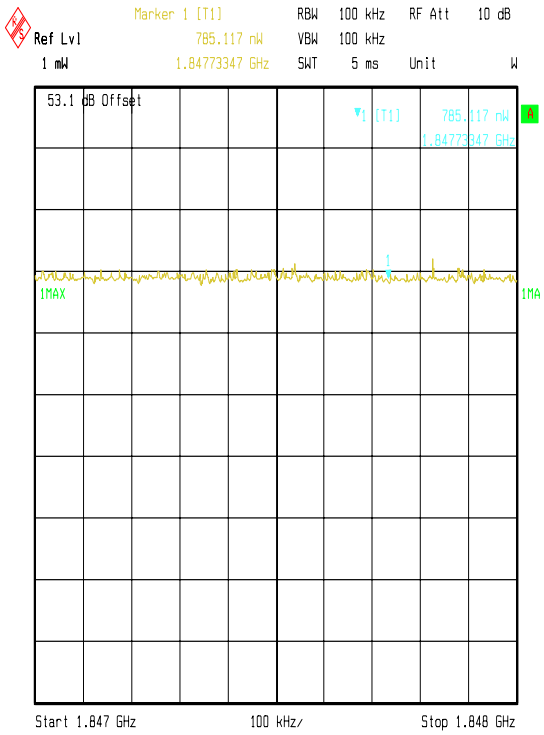
Band (MHz)	Peak Power (dBm/MHz)	Limit (dBm/MHz)	Margin (dB)	Status
1848 to 1849	-20.6	-13.0	7.6	Complied
1847 to 1848	-21.2	-13.0	8.2	Complied

Test Of: **Sendo Ltd.**
S331 GSM Mobile Telephone Handset
To: **FCC Part 22 & 24**

Transmitter Out of Band Radiated Emissions: Section 2.1051/24.238 (Continued)



Date: 16.JAN.2004 10:40:04



Date: 16.JAN.2004 10:37:57

Transmitter Out of Band Radiated Emissions: Section 2.1051/24.238 (Continued)

Integrated Power Over 1 MHz Strip Band: 1911 to 1912 MHz
1st 1 MHz block immediately outside adjacent frequency block

100 kHz Strip Number	Peak Power (nW/100 kHz)	100 kHz Strip Number	Peak Power (nW/100 kHz)
1	1489	6	1645
2	1650	7	1520
3	1324	8	1649
4	1358	9	1489
5	1246	10	1383
Total Peak Power:		15147 nW/MHz	

Integrated Power Over 1 MHz Strip Band: 1912 to 1913 MHz
2nd 1 MHz block immediately outside adjacent frequency block

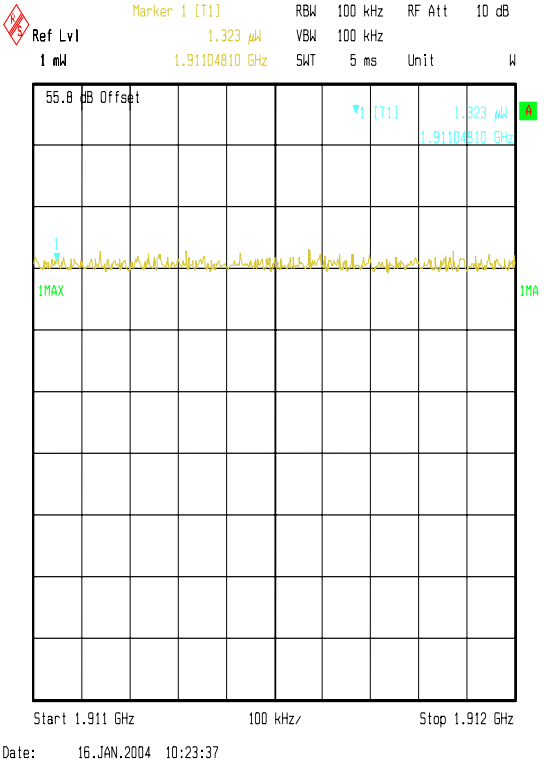
100 kHz Strip Number	Peak Power (nW/100 kHz)	100 kHz Strip Number	Peak Power (nW/100 kHz)
1	1362	6	1456
2	1329	7	1678
3	1429	8	1563
4	1751	9	1925
5	1640	10	1467
Total Peak Power:		15600 nW/MHz	

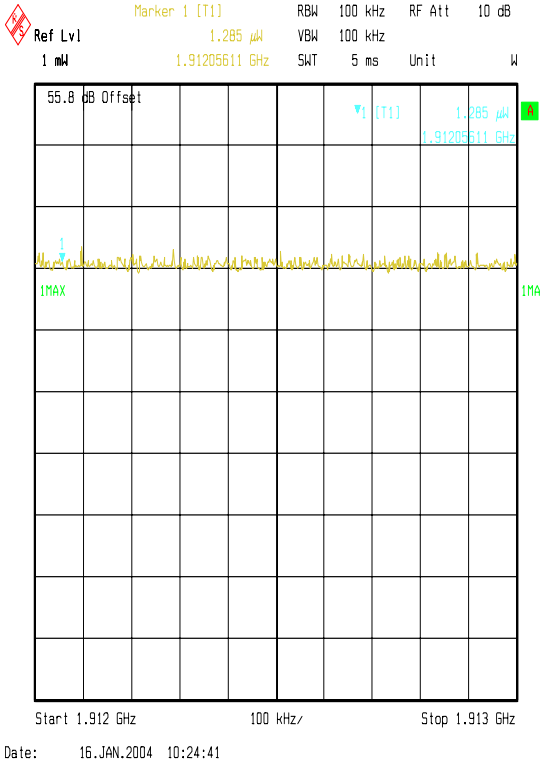
Result:

Band (MHz)	Peak Power (dBm/MHz)	Limit (dBm/MHz)	Margin (dB)	Status
1911 to 1912	-18.2	-13.0	5.2	Complied
1912 to 1913	-18.1	-13.0	5.1	Complied

Test Of: **Sendo Ltd.**
S331 GSM Mobile Telephone Handset
To: **FCC Part 22 & 24**

Transmitter Out of Band Radiated Emissions: Section 2.1051/24.238 (Continued)





10.8. Transmitter Radiated Emissions At Band Edges: Section 2.1053/24.238

10.8.1. The EUT was configured as for radiated emissions testing described in Section 11 of this report.

10.8.2. Tests were performed to identify the maximum emissions level at the band edges of the frequency band that the EUT will operate over.

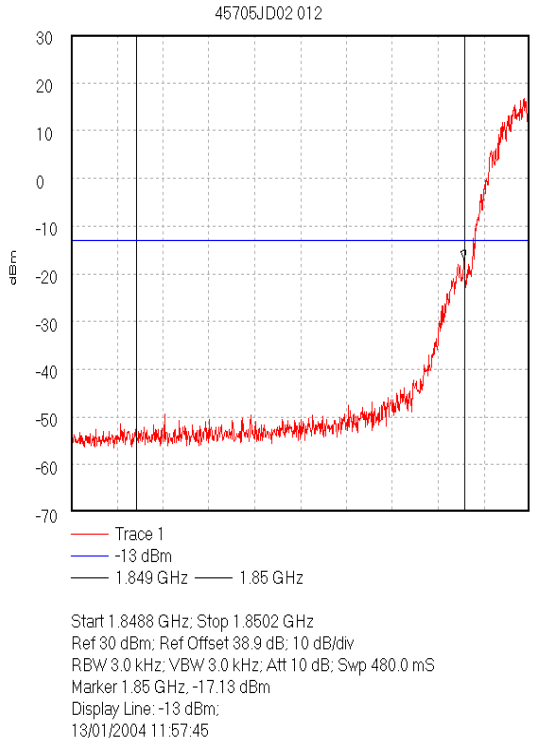
Results:

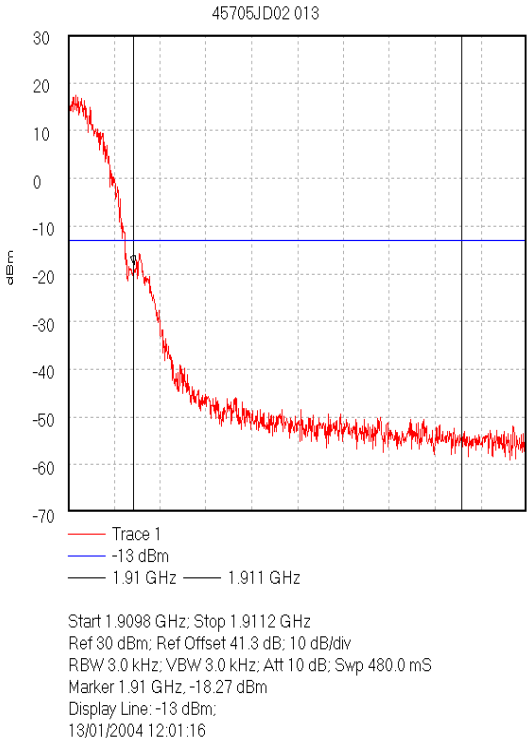
Bottom Band Edge

Frequency (MHz)	Spurious Emission (dBm)	Limit (dBm)	Margin (dB)	Result
1850.0	-17.2	-13.0	4.2	Complied

Top Band Edge

Frequency (MHz)	Peak Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
1910.0	-18.3	-13.0	6.3	Complied





11. Measurement Methods – Part 24

11.1. Effective Isotropic Radiated Power (EIRP)

EIRP measurements were performed in accordance with the standard, against appropriate limits.

The EIRP was measured with the EUT arranged on a non-conducting turn table on a standard test site compliant with ANSI C63.4 – 2001 Clause 5.4. The transmitter was fitted with an integral antenna; therefore all radiated tests were performed with the unit operating into the integral antenna.

The level of the EIRP was measured using a spectrum analyser.

The test antenna was positioned in the horizontal plane. The EUT was oriented in the X plane. The test antenna was then raised and lowered until a maximum peak was observed. The turntable was then rotated through 360 degrees and the maximum peak reading obtained. The height search was then repeated to take into consideration the new angular position of the turntable. The maximum reading observed was then recorded. This procedure was then repeated with the EUT oriented in the Y and Z planes. The highest reading taken in all 3 planes was recorded. The entire procedure was then repeated with the test antenna set in the Vertical polarity.

Once the final amplitude (maximised) had been obtained, the EUT was substituted with a substitution antenna. For EIRP measurements a Horn antenna whose gain was based on an isotropic antenna was used, ERP measurements were done using a dipole. The centre of the substitution antenna was set to approximately the same centre location as the EUT. The substitution antenna was set to the horizontal polarity. The substitution antenna was matched into a signal generator using a 6 dB or greater attenuator. The signal generator was tuned to the EUT's frequency under test.

The test antenna was then raised and lowered to obtain a maximum reading on the spectrum analyser. The level of the signal generator output was then adjusted until the maximum recorded EUT level was observed. The signal generator level was noted. This procedure was repeated with both test antenna and substitution antenna vertically polarised. The EIRP was calculated as:-

EIRP = Signal Generator Level - Cable Loss + Antenna Gain

All measurements were performed using broadband Horn antennas.

Effective Isotropic Radiated Power (EIRP) (Continued)

Circumstances where the signal generator could not produce the desired power substitution was performed with the signal generator set to 0 dBm. The radiated signal was maximised as previously described. The level indicated on the measuring receiver was noted. The delta between this level and the maximum level for the EUT was calculated and also noted. The EIRP of the signal generator was calculated using the above formulae. The recorded delta was added to the calculated EIRP to obtain the substituted EUT EIRP.

Delta (dB) = EUT – SG

where :

EUT = spectrum analyser indicated EUT raw level

SG = spectrum analyser indicated signal generator raw level

The signal generator actual EIRP is calculated as:

EIRP SG= Signal Generator Level - Cable Loss + Antenna Gain

The EUT EIRP is calculated as:

EIRP EUT = EIRP SG + Delta.

The test equipment settings for EIRP measurements were as follows:

Receiver Function	**Setting**
Detector Type:	Peak
Mode:	Not applicable
Bandwidth:	1 MHz
Amplitude Range:	100 dB
Sweep Time:	Coupled

11.2. Frequency Stability

The EUT was situated within an environmental test chamber and connected to the GSM test set via an air link.

Measurements were performed with the EUT operating under extremes of temperature in 10 degree increments within the range –30 to 50 degrees C.

Measurements were also performed at voltage extremes between the declared nominal supply voltage and at the declared endpoint voltage (for battery operated equipment) or by varying the primary supply voltage from 85% to 115% of the nominal value for all other equipment types.

The requirement was to determine the frequency stability of the device under specified environmental operating conditions and ensure they remained within specified operating parameters.

Measurements were made on the top and bottom channels.

The EUT was switched off for a minimum of 30 minutes between each stage of testing while the environmental chamber stabilised at the next temperature within the stated temperature range.

Once the environmental chamber had reached thermal equilibrium, the nominal frequency of the EUT was measured and recorded. The recorded frequency was compared to the applicants declared operating frequency band edges.

In order to show compliance, the measured frequency must remain within the declared frequency band.

The reported data shows the nominal frequency drift and its margin from the band edge. In order to get the margin from the lower band edge, subtract the lower band edge limit from the measured frequency. The margin from the upper band edge is found by subtracting the measured frequency from the upper band edge limit. In order to show compliance the margin must be positive. A negative margin shows non-compliance.

11.3. Occupied Bandwidth

The EUT was connected to a spectrum analyser enabled with an occupied bandwidth function and a GSM test set via an air link.

Measurements were performed to determine the Occupied Bandwidth in accordance with FCC Part 2.1049. The Occupied Bandwidth was measured from the fundamental emission at the bottom middle and top channels.

As the EUT is a PCS phone, no modulation input port was available. A call was therefore set up using the PCS/GSM simulator and using normal modulation. The Occupied Bandwidth was measured in this configuration.

The Occupied Bandwidth was measured using the built in occupied bandwidth function of the Rohde and Schwarz FSEB or ESIB spectrum analyser. It was set to measure the bandwidth where 99% of the signal power was contained. The analyser settings were set as per those outlined in the spectrum analyser user manual for this measurement, i.e., RBW $\geq$ 1% of occupied bandwidth. A value of 3 kHz was used.

11.4. AC Mains Conducted Emissions

AC mains conducted emissions measurements were performed in accordance with the standard, against appropriate limits for each detector function.

The test was performed in a shielded enclosure with the equipment arranged as detailed in the standard on a wooden bench using the floor of the screened enclosure as the ground reference plane. The EUT was powered with 115V 60 Hz AC mains supplied via a Line Impedance Stabilisation Network (LISN).

Initial measurements in the form of swept scans covering the entire measurement band were performed in order to identify frequencies on which the EUT was generating interference. In order to minimise the time taken for these swept measurements, a Peak detector was used in conjunction with the appropriate detector IF measuring bandwidths (see table below). Repetitive scans were performed to allow for emissions with low repetition rates, and the duty cycle of the EUT. The test configuration was the same for the initial scans as for the final measurements.

Following the initial scans, a graph was produced giving an overview of the emissions from the EUT plotted against the appropriate specification limit. A tolerance line was set 6 dB below the specification limit and levels above the tolerance line were re-tested (at individual frequencies) using the appropriate detector function.

The test equipment settings for conducted emissions measurements were as follows:

Receiver Function	**Initial Scan**	**Final Measurements**
Detector Type:	Peak	Quasi-Peak (CISPR)/Average
Mode:	Max Hold	Not applicable
Bandwidth:	10 kHz*	9 kHz*
Amplitude Range:	60 dB	20 dB
Measurement Time:	Not applicable	> 1 s
Observation Time:	Not applicable	> 15 s
Step Size:	Continuous sweep	Not applicable
Sweep Time:	Coupled	Not applicable

11.5. Transmitter Radiated Emissions

Radiated emissions measurements were performed in accordance with the standard, against appropriate limits for each detector function.

Initial pre-scans covering the entire measurement band from the lowest generated frequency declared up to 10 times the highest fundamental frequency. The scans were performed within a screened chamber in order to identify frequencies on which the EUT was generating spurious. This procedure identified the frequencies from the EUT which required further examination. Repetitive scans were performed to allow for emissions with low repetition rates, and for the duty cycle of the EUT.

The initial scans were performed using an antenna height of 1.5 m and a measurement distance of 3 m. A limit line was set to the specification limit by characterising the screen room using a known signal source set at exactly the same location as the EUT. The signal source was derived from either a horn antenna or a dipole dependant on the frequency band under investigation. Any levels within 20 dB of this limit were measured where possible, on occasion; the receiver noise floor came within the 20 dB boundary. On these occasions, the system noise floor may have been recorded.

An open area test site using the appropriate test distance and measuring receiver with a Peak detector was used for final measurements at each frequency recorded in the screen room.

The levels were maximised by initially rotating the turntable through 360° and then varying the antenna height between 1 m and 4 m in the vertical polarisation. At this point, any signals found to be between the limit and a level 6 dB below it were further maximised by changing the configuration of the EUT, e.g. re-routing cables to peripherals and moving peripherals with respect to the EUT. The procedure was repeated for the horizontal polarisation.

Once the final amplitude (maximised) had been obtained, the EUT was substituted with a substitution antenna. For EIRP measurements a Horn antenna whose gain was based on an isotropic antenna was used, ERP measurements were done using a dipole. The centre of the substitution antenna was set to approximately the same centre location as the EUT. The substitution antenna was set to the horizontal polarity. The substitution antenna was matched into a signal generator using a 6 dB or greater attenuator. The signal generator was tuned to the EUT's frequency under test.

The test antenna was then raised and lowered to obtain a maximum reading on the spectrum analyser. The level of the signal generator output was then adjusted until the maximum recorded EUT level was observed. The signal generator level was noted. This procedure was repeated with both test antenna and substitution antenna vertically polarised. The EIRP was calculated as:-

EIRP = Signal Generator Level - Cable Loss + Antenna Gain

The limit in the standard states that emissions shall be attenuated by at least 43+10 log (P) dB below the transmitter power (P), where (P) is the maximum measured fundamental power for the channel under test. This limit always reduces to –13 dBm therefore, the limit line presented on the accompanying plots is set to –13 dBm.

Transmitter Radiated Emissions (Continued)

Any spurious measured were then compared to the –13 dBm limit. The requirement is for the emission to be less than –13 dBm. The margin between emission and limit is recorded and should always be positive to indicate compliance.

It should be noted that FCC Part 24.238 states that the 1st MHz band immediately adjacent to the applicants declared frequency block may be measured using a resolution bandwidth of at least 1% of the emission bandwidth. This bandwidth was found by calculating 1% of the bandwidth measured in the transmitter occupied bandwidth section of this report. The next largest available bandwidth above this calculated figure was, therefore, used i.e. 3 kHz.

The measurements in the 2nd and 3rd 1 MHz blocks away from the adjacent 1 MHz upper band edge blocks from 1911 MHz to 1912 MHz and 1912 MHz to 1913 MHz were carried out using an analyser span of 1 MHz and a 100 kHz receiver resolution bandwidth (RBW). 10 linear readings were taken for each 100 kHz strip across the 1 MHz band. These readings were integrated to give the emission level in an equivalent 1 MHz bandwidth. The above procedure was repeated for the lower band edge blocks from 1847 MHz to 1848 MHz and 1848 MHz to 1849 MHz

11.6. Receiver Radiated Emissions

Radiated emissions measurements were performed in accordance with the standard, against appropriate limits for each detector function.

Initial pre-scans covering the entire measurement band from the lowest generated frequency declared up to 5 times the highest unintentionally generated frequency were performed within a screened chamber in order to identify frequencies on which the EUT was generating interference. This determined the frequencies from the EUT, which required further examination. In order to minimise the time taken for the swept measurements, a peak detector was used in conjunction with the appropriate detector measuring bandwidth (see table below). Repetitive scans were performed to allow for emissions with low repetition rates, and for the duty cycle of the EUT.

The initial scans were performed using an antenna height of 1.5 m and a measurement distance of 3 m. A limit line was set to the specification limit. Levels within 20 dB of this limit were measured where possible, on occasion; the receiver noise floor came within the 20 dB boundary. On these occasions, the system noise floor may have been recorded.

An open area test site using the appropriate test distance and measuring receiver with a Quasi-Peak detector was used for measurements below 1000 MHz, for measurements above 1000 MHz average and peak detectors were used.

For the final measurements the EUT was arranged on a non-conducting turn table on a standard test site compliant with ANSI C63.4 – 2001 Clause 5.4.

On the open area test site, at each frequency where a signal was found, the levels were maximised by initially rotating the turntable through 360° and then varying the antenna height between 1 m and 4 m in the horizontal polarisation. At this point, any signals found to be between the limit and a level 6 dB below it were further maximised by changing the configuration of the EUT, e.g. re-routing cables to peripherals and moving peripherals with respect to the EUT. The procedure was repeated for the vertical polarisation.

The final field strength was determined as the indicated level in dBμV plus cable loss and antenna factor.

The test equipment settings for radiated emissions measurements were as follows:

Receiver Function	**Initial Scan**	**Final Measurements Below 1 GHz**	**Final Measurements Above 1 GHz**
Detector Type:	Peak	Quasi-Peak (CISPR)	Peak/Average
Mode:	Max Hold	Not applicable	Not applicable
Bandwidth:	(120 kHz < 1 GHz) (1 MHz > 1 GHz)	120 kHz	1 MHz (If Applicable)
Amplitude Range:	60 dB	20 dB	20 dB (typical)
Step Size:	Continuous sweep	Not applicable	Not applicable
Sweep Time:	Coupled	Not applicable	Not applicable

12. Measurement Uncertainty

12.1. No measurement or test can ever be perfect and the imperfections give rise to error of measurement in the results. Consequently, the result of a measurement is only an approximation to the value of the measurand (the specific quantity subject to measurement) and is only complete when accompanied by a statement of the uncertainty of the approximation.

12.2. The expression of uncertainty of a measurement result allows realistic comparison of results with reference values and limits given in specifications and standards.

12.3. The uncertainty of the result may need to be taken into account when interpreting the measurement results.

12.4. The reported expanded uncertainties below are based on a standard uncertainty multiplied by an appropriate coverage factor, such that a confidence level of approximately 95% is maintained. For the purposes of this document “approximately” is interpreted as meaning “effectively” or “for most practical purposes”.

Measurement Type	Range	Confidence Level (%)	Calculated Uncertainty
AC Conducted Spurious Emissions	0.15 MHz to 30 MHz	95%	+/- 3.25 dB
Effective Isotropic Radiated Power (EIRP)	Not applicable	95%	+/- 1.78 dB
Frequency Stability	Not applicable	95%	+/- 20 Hz
Minimum Bandwidth	Not applicable	95%	+/- 0.12 %
Occupied Bandwidth	1850 to 1910 MHz	95%	+/- 0.12 %
Radiated Spurious Emissions	30 MHz to 1000 MHz	95%	+/- 5.26 dB
Radiated Spurious Emissions	1 GHz to 26 GHz	95%	+/- 1.78 dB

12.5. The methods used to calculate the above uncertainties are in line with those recommended within the various measurement specifications. Where measurement specifications do not include guidelines for the evaluation of measurement uncertainty, the published guidance of the appropriate accreditation body is followed.

Appendix 1. Test Equipment Used

RFI No.	Instrument	Manufacturer	Type No.	Serial No.
A004	ESH3-Z5 LISN	Rohde & Schwarz	ESH3-Z5	890 604/027
A027	Horn Antenna	Eaton	9188-2	301
A031	2 to 4 GHz Eaton Horn Antenna	Eaton	91889-2	557
A249	69 dB Variable Attenuator	Narda	745-69	02329
A253	WG 12 Microwave Horn	Flann Microwave	12240-20	128
A254	WG 14 Microwave Horn	Flann Microwave	14240-20	139
A255	WG 16 Microwave Horn	Flann Microwave	16240-20	519
A259	Bilog Antenna	Chase	CBL6111	1513
A429	WG 16 horn	Flann	16240-20	561
A430	WG 18 horn	Flann	18240-20	425
A436	WG 20 horn	Flann	20240-20	330
A559	Pulse Limiter	Rohde & Schwarz	ESH3-Z2	357881052
C1078	Rosenberger 3m Cable	Rosenberger	FA210A1030 M5050	28464-2
C222	Cable	Rosenberger	UFA210A-1-1181-70x70	None
C346	Coaxial Cable	Rosenberger	UFA210A-1-1181-70x70	1932
C363	BNC Cable	Rosenberger	RG142	None
C460	Cable	Rosenberger	UFA210A-1-1182-704704	98H0304
C461	Cable	Rosenberger	UFA210A-1-1182-704704	98H0305
C468	N-Type Coaxial Cable	Rosenberger	UFA210A-1-3937-504504	98L0440
E007	Environmental Chamber	Prolan	PV427H75F 30HV	None
M003	Spectrum Monitor	Rohde & Schwarz	EZM	883 580/008
M023	ESVP Receiver	Rohde & Schwarz	ESVP	872 991/027
M028	FSB Spectrum Analyser	Rohde & Schwarz	FSB	860 001/009 (RF), 860 161/007 (Display)
M051	Multimeter	Fluke	75	52571394
M069	ESMI Spectrum Analyser / Receiver	Rohde & Schwarz	ESMI	829 808/007 (DU) / 827 063/008 (RU)

Test Equipment Used (Continued)

RFI No.	Instrument	Manufacturer	Type No.	Serial No.
M1068	Thermometer Digital	Iso-Tech	RS55	93102884
M1093	GSM test set	Willtek	4202S	0513018
M1124	Rohde & Schwarz	Rohde & Schwarz	ESIB26	100046K
M505	Analyser Display Unit	Rohde & Schwarz	ESAI-D	825316/010
M506	RF unit	Rohde & Schwarz	ESBI-RF	827060/004
S201	Site 1	RFI	1	
S202	Site 2	RFI	2	S202-15011990

NB In accordance with UKAS requirements, all the measurement equipment is on a calibration schedule.

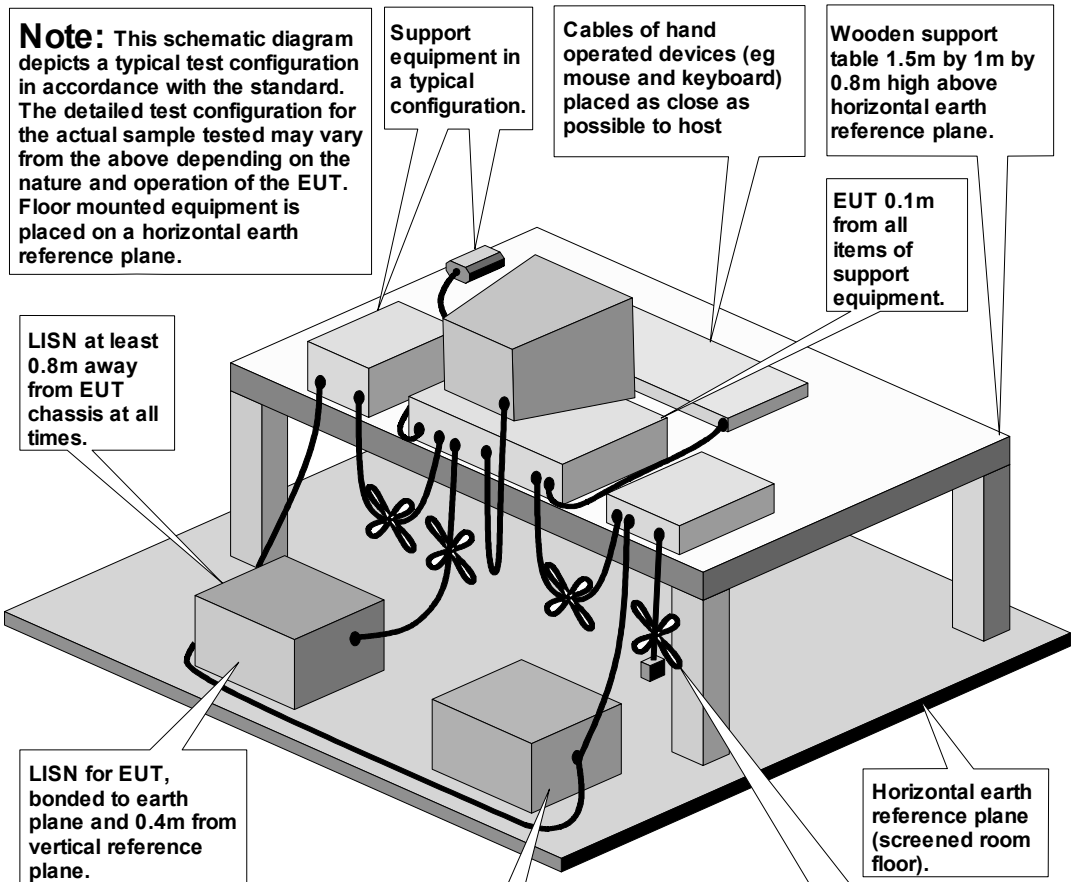
Appendix 2. Test Configuration Drawings

This appendix contains the following drawings:

Drawing Reference Number	Title
DRG\45705JD02\EMICON	Test configuration for measurement of conducted emissions
DRG\45705JD02\EMIRAD	Test configuration for measurement of radiated emissions

Test Of: Sendo Ltd.
S331 GSM Mobile Telephone Handset
To: FCC Part 22 & 24

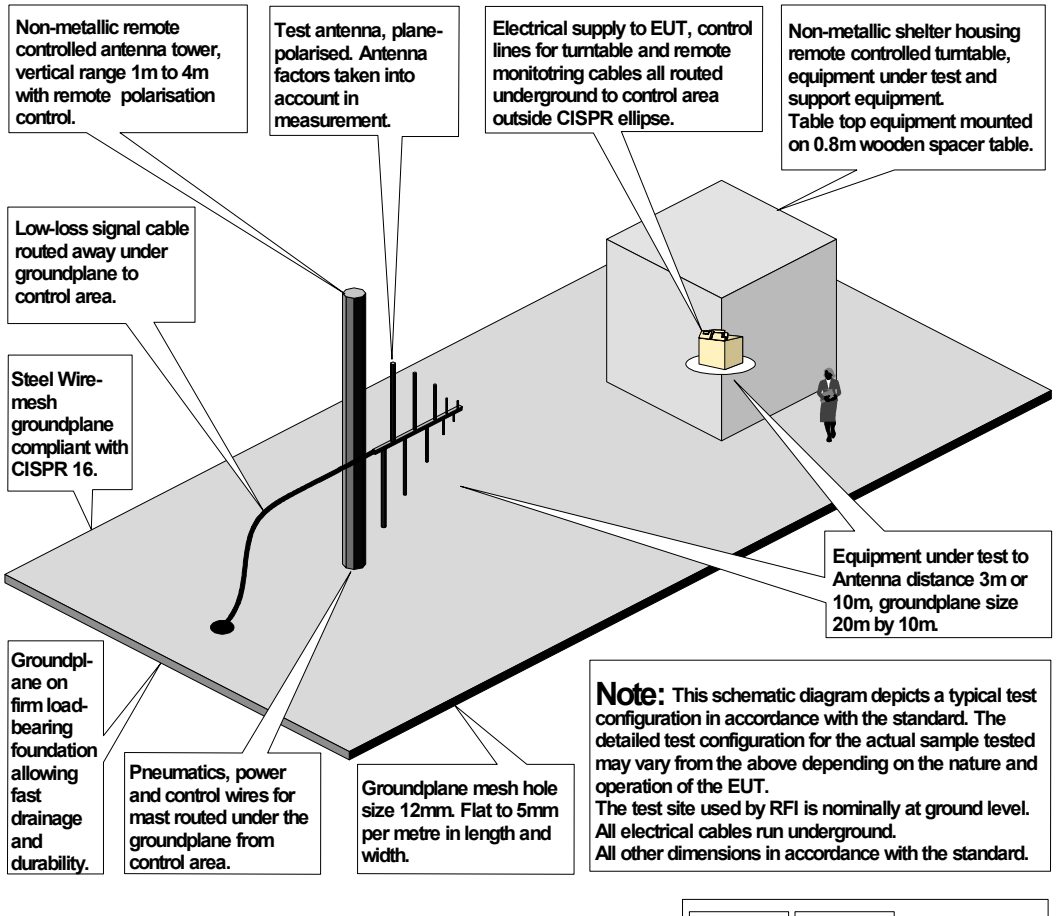
DRG\45705JD02\EMICON



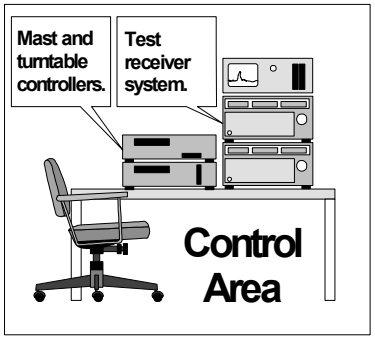
Typical Test Configuration For Conducted Emissions Measurements In Accordance With ANSI C63.4-1992
Tests performed in a screened enclosure

Test Of: **Sendo Ltd.**
S331 GSM Mobile Telephone Handset
To: **FCC Part 22 & 24**

DRG\45705JD02\EMIRAD



Test Configuration For Radiated Emissions Measurements
Reflection-free area: >60m by 52m (CISPR ellipse)
Groundplane Earthed
Control room outside CISPR ellipse



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