TEST REPORT
FROM
RADIO FREQUENCY
INVESTIGATION LTD.

Test Of: Airspan Communications.
Subscriber Terminal - 1054 ST Antenna

To: FCC Part 24

Test Report Serial No:
RFI/MPTE1/RP46299JD02B

This Test Report Is Issued Under The Authority Of Richard Jacklin, Operations Director: pp	**Checked By: Nigel Davison** pp
Tested By: Adam Miller	**Release Version No: PDF01**
Issue Date: 01 July 2004	**Test Dates: 01 June 2004 to 17 June 2004**

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1. Client Information

Company Name:	Airspan Communications
Address:	Cambridge House Oxford Road Uxbridge Middlesex UK
Contact Name:	Mr C Blackham

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:	Airspan Communications
Model Name or Number:	P1 Band ODU
Unique Type Identification:	303-1054-910
Serial Number:	F00102276T0123M
FCC ID Number:	02J-STODU-PCS
Country of Manufacture:	UK
Date of Receipt:	01 June 2004

Brand Name:	Airspan Communications
Model Name or Number:	P2 Band ODU
Unique Type Identification:	303-1054-920
Serial Number:	F00060820T0035M
FCC ID Number:	02J-STODU-PCS
Country of Manufacture:	UK
Date of Receipt:	01 June 2004

Brand Name:	Airspan Communications
Model Name or Number:	P3 Band ODU
Unique Type Identification:	303-1054-930
Serial Number:	F00132000T0216M
FCC ID Number:	02J-STODU-PCS
Country of Manufacture:	UK
Date of Receipt:	01 June 2004

2.2. Description Of EUT

Airspan's Fixed Wireless Access system offers voice and data communication between Central Terminal and Subscriber Terminal.

The Central Terminal Outdoor unit can be used with integral or external Antenna. The Type 42 IDU provides power to the ODU and connectivity via an IF link.

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:	Nominal 115 V, 60 Hz AC Mains Supply 13 Amp (max)		
Equipment Category:	Transceiver		
Type of Unit:	Fixed Wireless Access equipment operating in PCS Band		
Interface Ports:	Integral Antenna or external antenna via N-type F-type connector – co-ax cable to SIU		
Transmit Frequency Range	1850 MHz to 1910 MHz		
Transmit Channels Tested	**Channel ID**	**Channel Number**	**Channel Frequency (MHz)**
	Bottom	180	1852
	Middle	197	1880
	Top	215	1908
Receive Frequency Range	1930 MHz to 1990 MHz		
Receive Channels Tested	**Channel ID**	**Channel Number**	**Channel Frequency (MHz)**
	Bottom	180	1932
	Middle	197	1960
	Top	215	1988
Maximum Power Output	22.8 dBm		
Highest Unintentionally Generated Frequency:	1908 MHz		
Highest Oscillator Frequency:	1888.25 MHz		

2.5. Support Equipment

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

Description:	IDU
Brand Name:	Airspan Communications
Model Name or Number:	Type 42 SIU
Serial Number:	S00002631T0235D
Cable Length And Type:	Co-ax
Connected to Port:	F-type on ODU

Description:	IDU
Brand Name:	Airspan Communications
Model Name or Number:	Type 42 SIU
Serial Number:	S00002575T0235D
Cable Length And Type:	Co-ax
Connected to Port:	F-type on ODU

Description:	IDU
Brand Name:	Airspan Communications
Model Name or Number:	Type 42 SIU
Serial Number:	S00016735T0246D
Cable Length And Type:	Co-ax
Connected to Port:	F-type on ODU

Description:	PSU
Brand Name:	Airspan Communications
Model Name or Number:	Type 7
Serial Number:	EMC2
Cable Length And Type:	Integral
Connected to Port:	DC in of Type 42

Support Equipment (Continued)

Description:	Laptop
Brand Name:	Dell
Model Name or Number:	Latitude
Serial Number:	AIRN02995
Cable Length And Type:	Cat 5 UTP
Connected to Port:	Type 42 SIU

Description:	Telephones
Brand Name:	Telcom
Model Name or Number:	260
Serial Number:	121036011

Description:	Telephones
Brand Name:	Telcom
Model Name or Number:	260
Serial Number:	146086663

3. Test Specification, Methods And Procedures

3.1. Test Specifications

Reference:	FCC Part 24 Subpart E: 2003 (Broadband PCS)
Title:	Code of Federal Regulations, Part 24 (47CFR24) Personal Communication Services.
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)
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

Nominal 115 V, 60 Hz AC Mains Supply 13 Amp (max)

5.2. Operating Modes

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

QPSK ½ - QPSK modulation with ½ FEC

QPSK ¾ - QPSK with ¾ FEC

QAM ½ - QAM modulation with ½ FEC

QAM ¾ - QAM with ¾ FEC

5.3. Configuration And Peripherals

The EUT was tested in the following configuration:

Please refer to Appendix 2 for a schematic drawing of the test configuration, drawing number DRG\46299JD01\001

The reason for choosing this configuration was that the client defined it as being likely to be the worst case with regards to EMC.

6. Summary Of Test Results

6.1. Central Terminal

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: 2003 Section 15.107	AC Mains Input	Complied
Transmitter Carrier Output Power	C.F.R. 47 FCC Part 2: 2003 Section 2.1046(a)	Antenna Terminals	Complied
Transmitter Frequency Stability (Temperature Variation)	C.F.R. 47 FCC Part 24: 2003 Section 24.235	Antenna Terminals	Complied
Transmitter Frequency Stability (Voltage Variation)	C.F.R. 47 FCC Part 24: 2003 Section 24.235	Antenna Terminals	Complied
Transmitter Occupied Bandwidth	C.F.R. 47 FCC Part 24: 2003 Section 24.238	Antenna Terminals	Complied
Transmitter Out of Band Conducted Emissions	C.F.R. 47 FCC Part 24: 2003 Section 2.1051/24.238	Antenna Terminals	Complied
Transmitter Band Edge Conducted Emissions	C.F.R. 47 FCC Part 24: 2003 Section 2.1051/24.238	Antenna Terminals	Complied
Transmitter Out of Band Radiated Emissions	C.F.R. 47 FCC Part 24: 2003 Section 2.1053/24.238	Antenna	Complied
Transmitter Band Edge Radiated Emissions	C.F.R. 47 FCC Part 2: 2003 Section 2.1053/24.238	Antenna	Complied

6.2. 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.

7.2. Idle Mode AC Conducted Spurious Emissions: Section 15.107

7.2.1. The EUT was configured as for AC conducted emissions measurements as described in Section 8 of this report.

7.2.2. Tests were performed to identify the maximum emissions levels on the AC mains line of the EUT.

7.2.3. IT was discovered that QAM was deemed worse case as such test were performed in QAM mode only.

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

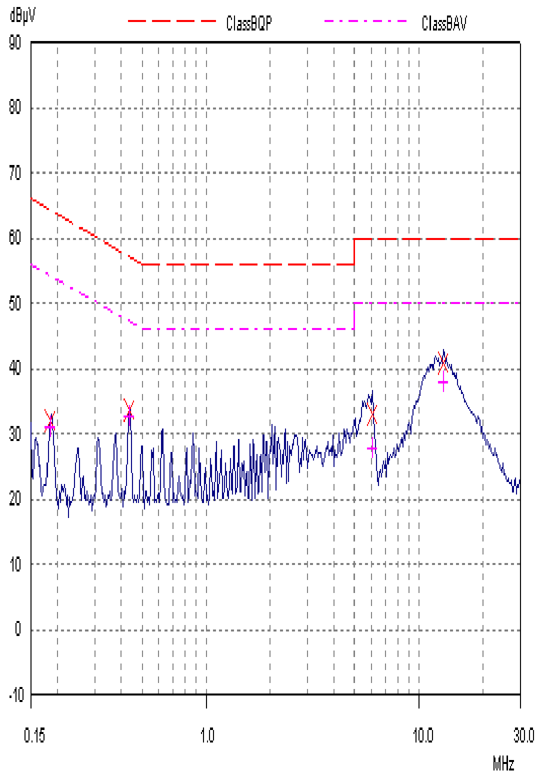
Frequency (MHz)	Line	Q-P Level (dBμV)	Q-P Limit (dBμV)	Margin (dB)	Result
0.1855	Live	32.08	64.24	32.16	Complied
0.43354	Live	33.55	57.18	23.63	Complied
6.06883	Live	33.12	60.00	26.88	Complied
13.00007	Live	40.94	60.00	19.06	Complied

Results: Average Detector Measurements On Live And Neutral Lines

Frequency (MHz)	Line	Av. Level (dBμV)	Av. Limit (dBμV)	Margin (dB)	Result
0.1855	Live	30.89	54.24	23.35	Complied
0.43354	Live	32.71	47.18	14.47	Complied
6.06883	Live	27.81	50.00	22.19	Complied
13.00007	Live	37.92	50.00	12.08	Complied

**Note: P1 and P2 exhibited the same results as P3, as such; only results for P3 were reported.*

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.

7.3. Transmitter Carrier Output Power: Section 24.232 (a)

7.3.1. The EUT was configured as for conducted RF output power as described in Section 8 of this report.

7.3.2. Tests were performed to identify the EUT's maximum conducted transmit power.

Results: QAM

Channel	Frequency (MHz)	Conducted RF O/P Power (dBm)	Output Power Limit (dBm)	Margin (dB)	Result
Bottom	1932.0	22.8	50.0	27.2	Complied
Middle	1960.0	22.6	50.0	27.4	Complied
Top	1988.0	21.1	50.0	28.9	Complied

Results: QPSK

Channel	Frequency (MHz)	Conducted RF O/P Power (dBm)	Output Power Limit (dBm)	Margin (dB)	Result
Bottom	1932.0	21.0	50.0	29.0	Complied
Middle	1960.0	21.0	50.0	29.0	Complied
Top	1988.0	19.4	50.0	30.6	Complied

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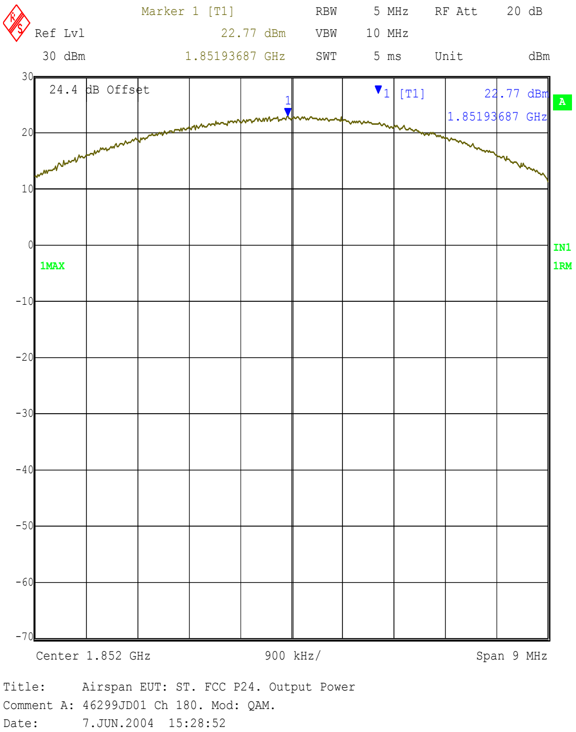
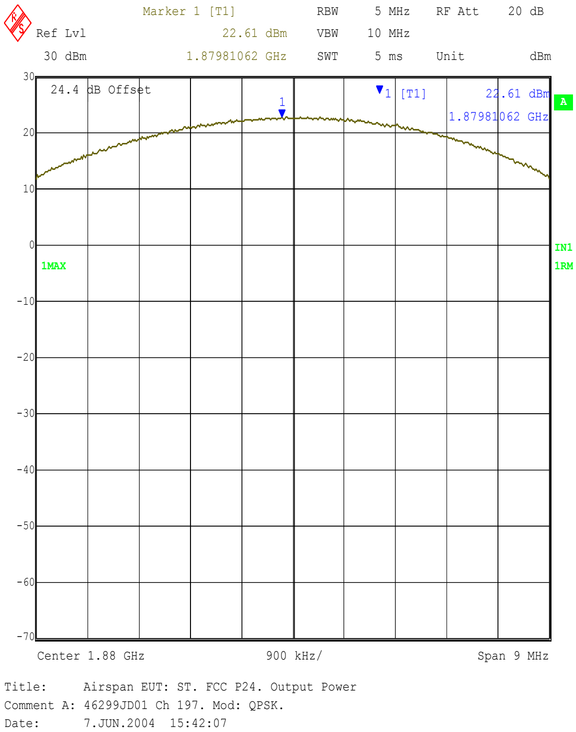
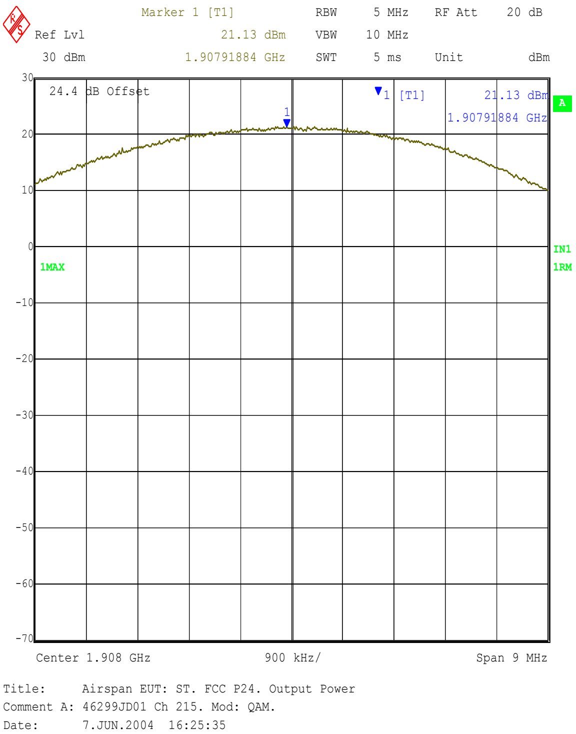
Transmitter Carrier Output Power: Section 24.232 (a) (Continued) - QAM

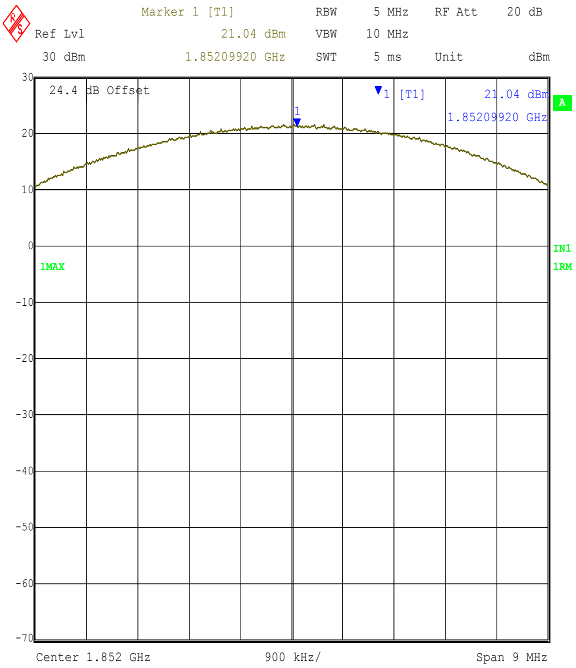






Note: Output power on middle channel has been incorrectly labelled as QPSK, and should in fact read QAM.

Transmitter Carrier Output Power: Section 24.232 (a) (Continued) - QPSK



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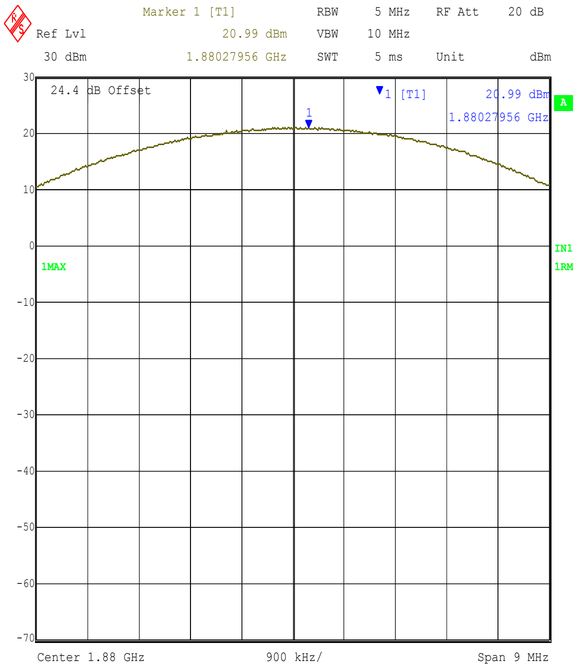
Date: 7.JUN.2004 15:30:48



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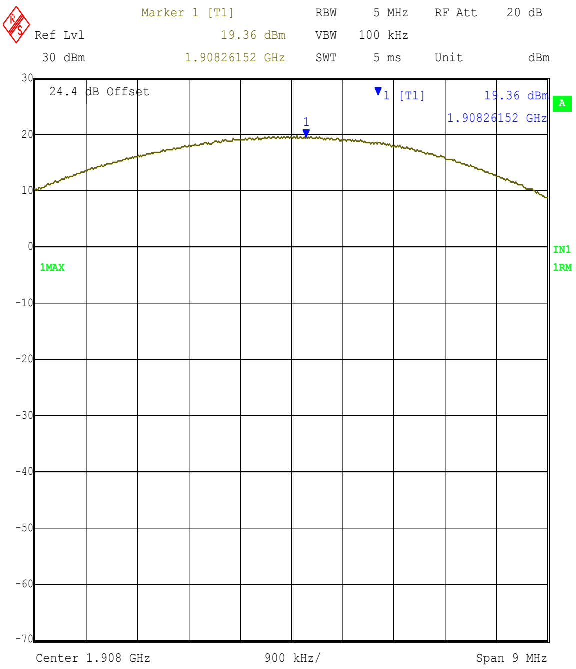
Date: 7.JUN.2004 15:37:46



Title: Airspan EUT: ST. FCC P24. Output Power
Comment A: 46299JD01 Ch 215. Mod: QPSK.
Date: 7.JUN.2004 16:01:13

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

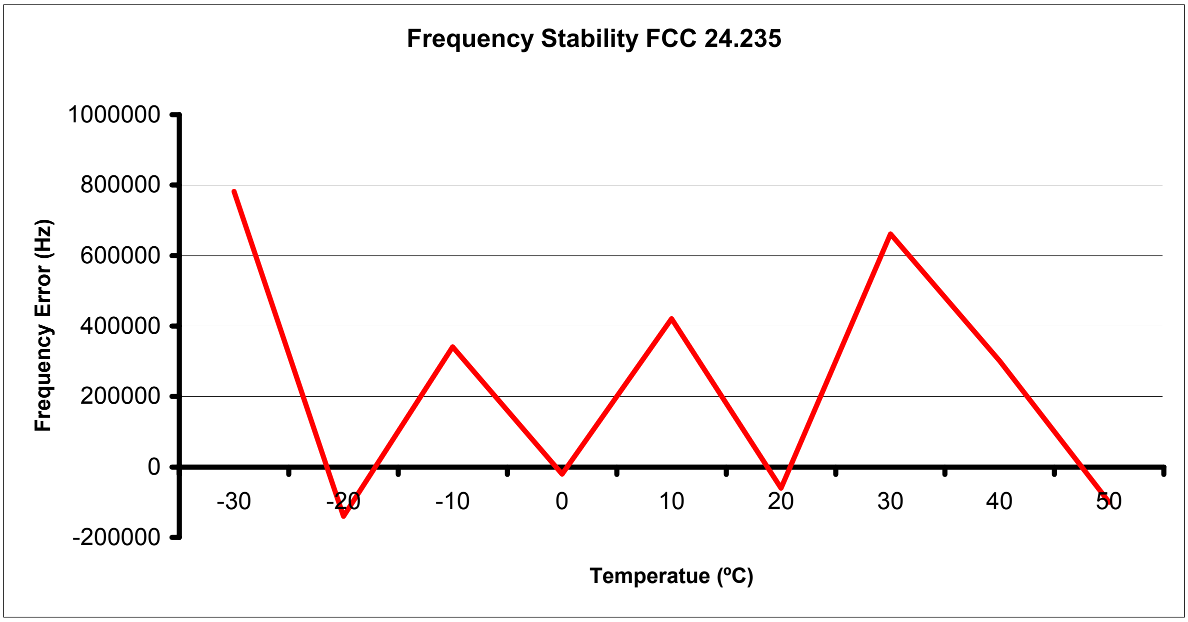
7.4.1. The EUT was configured as for frequency stability measurements as described in Section 8 of this report.

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

Results Bottom Channel (1852 MHz)

Temp (ºC)	Frequency Error (Hz)	Measured Frequency (MHz)	Lower Band Edge Limit (MHz)	Margin (MHz)	Result
-30	782.000	1852.782	1850.0	2.782000	Complied
-20	-140.000	1851.860	1850.0	1.860000	Complied
-10	341.000	1852.341	1850.0	2.341000	Complied
0	-20.000	1851.980	1850.0	1.980000	Complied
10	421.000	1851.579	1850.0	2.421000	Complied
20	-60.000	1851.940	1850.0	1.940000	Complied
30	661.000	1852.661	1850.0	2.661000	Complied
40	301.000	1852.301	1850.0	2.301000	Complied
50	-100.000	1851.900	1850.0	1.900000	Complied

Frequency Variation From 1852.0 MHz

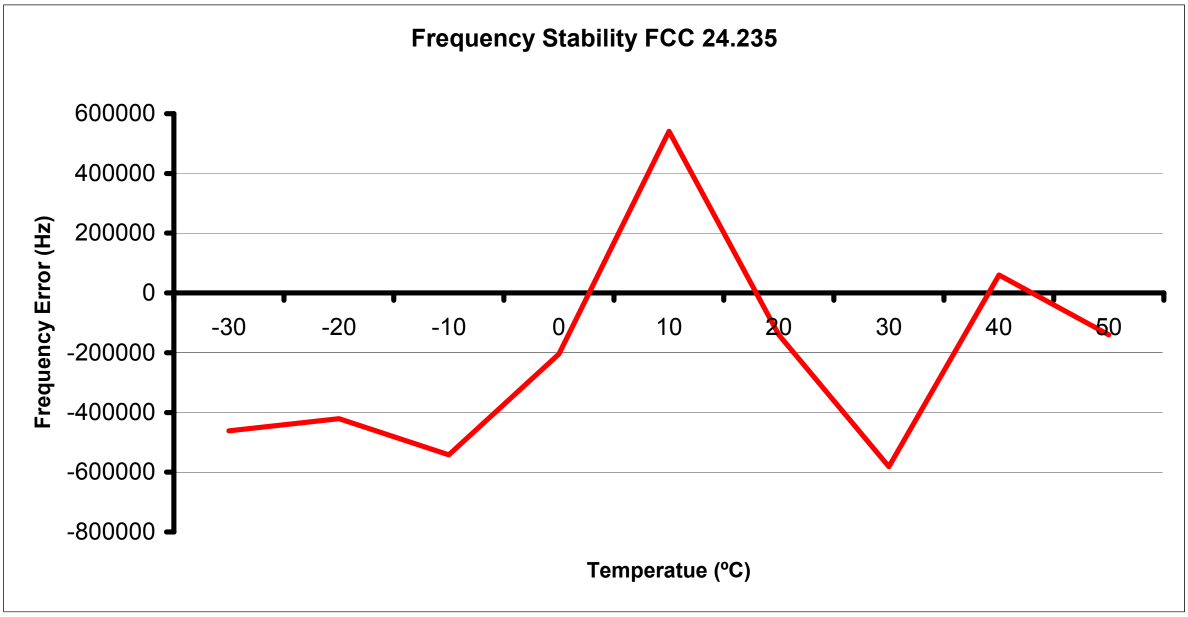


Transmitter Frequency Stability (Temperature Variation): Section 24.235 (Continued)

Results Top Channel (1908.0 MHz)

Temp (ºC)	Frequency Error (Hz)	Measured Frequency (MHz)	Upper Band Edge Limit (MHz)	Margin (MHz)	Result
-30	-461.000	1907.539	1910.0	-2.461000	Complied
-20	-421.000	1907.579	1910.0	-2.421000	Complied
-10	-542.000	1907.458	1910.0	-2.542000	Complied
0	-204.000	1907.796	1910.0	-2.204000	Complied
10	-541.000	1908.541	1910.0	-1.459000	Complied
20	-14.0000	1907.860	1910.0	-2.140000	Complied
30	-581.000	1907.419	1910.0	-2.581000	Complied
40	-60.000	1908.060	1910.0	-1.940000	Complied
50	-140.000	1907.860	1910.0	-2.140000	Complied

Frequency Variation From 1908.0 MHz



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

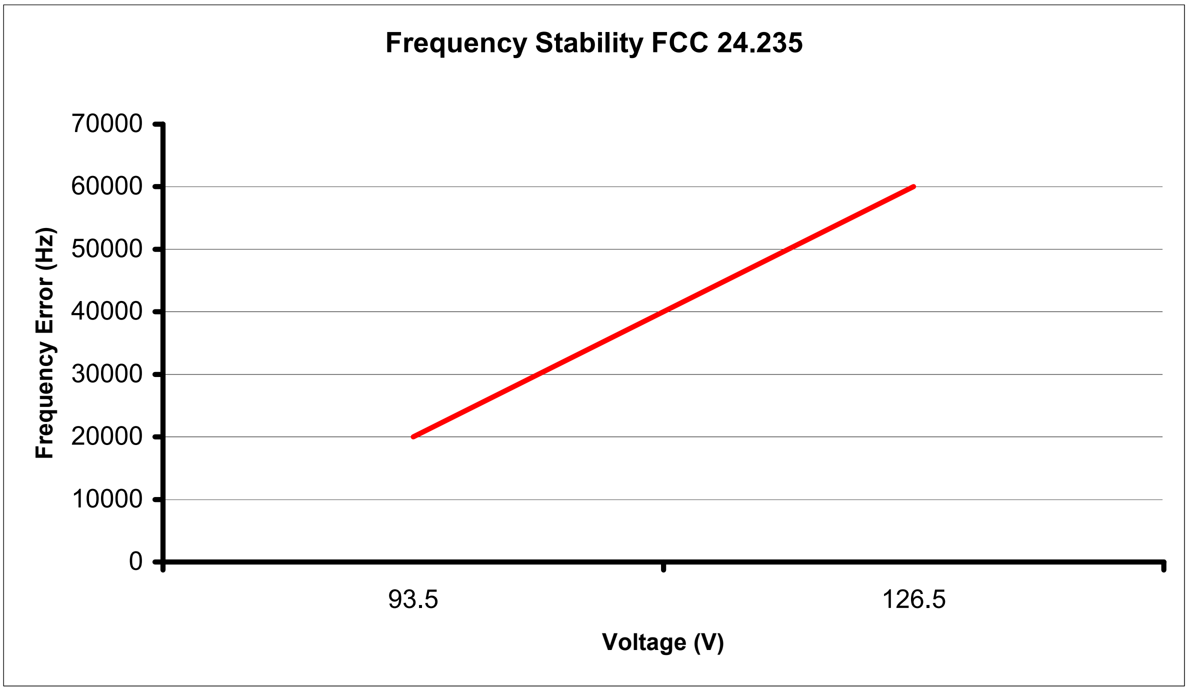
7.5.1. The EUT was configured as for frequency stability measurements as described in Section 8 of this report.

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

Results Bottom Channel (1852.0 MHz)

Supply Voltage (V) (AC)	Frequency Error (Hz)	Measured Frequency (MHz)	Lower Band Edge Limit (MHz)	Margin (MHz)	Result
93.5	20.000	1852.020	1850.0	2.020000	Complied
126.5	60.000	1852.060	1850.0	2.060000	Complied

Frequency Variation From 1852.0 MHz



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

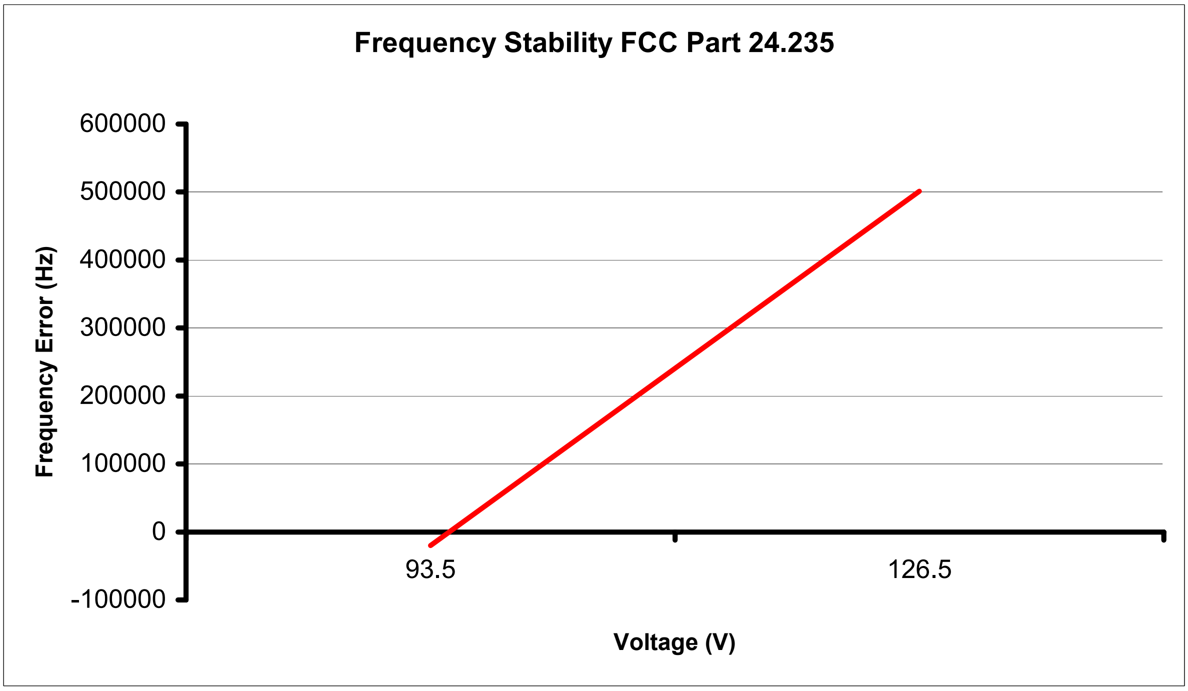
7.5.3. The EUT was configured as for frequency stability measurements as described in Section 8 of this report.

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

Results Top Channel (1908.0 MHz)

Supply Voltage (V)	Frequency Error (Hz)	Measured Frequency (MHz)	Lower Band Edge Limit (MHz)	Margin (MHz)	Result
93.5	-20.000	1907.980	1910.0	2.020000	Complied
126.5	501.000	1908.501	1910.0	1.499000	Complied

Frequency Variation From 1908.0 MHz



7.6. Transmitter Occupied Bandwidth: Section 24.238

7.6.1. The EUT was configured as for Occupied Bandwidth measurements as described in Section 8 of this report.

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

Results: QAM

Channel	Frequency (MHz)	Resolution Bandwidth (kHz)	Video Bandwidth (kHz)	Occupied Bandwidth (MHz)
Bottom	1852.0	100.0	300.0	2.993988
Middle	1880.0	100.0	300.0	2.921844
Top	1908.0	100.0	300.0	2.975952

Results: QPSK

Channel	Frequency (MHz)	Resolution Bandwidth (kHz)	Video Bandwidth (kHz)	Occupied Bandwidth (MHz)
Bottom	1852.0	100.0	300.0	2.903808
Middle	1880.0	100.0	300.0	2.903808
Top	1908.0	100.0	300.0	2.903808

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.

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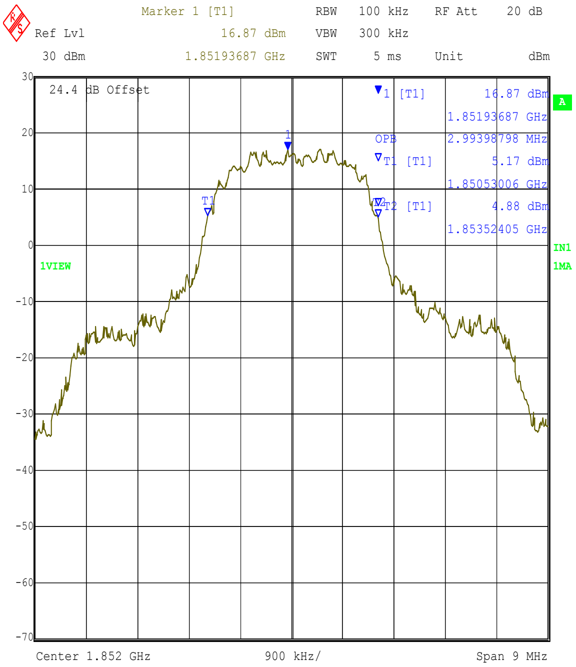
Transmitter Occupied Bandwidth: Section 24.238 (Continued) - QAM



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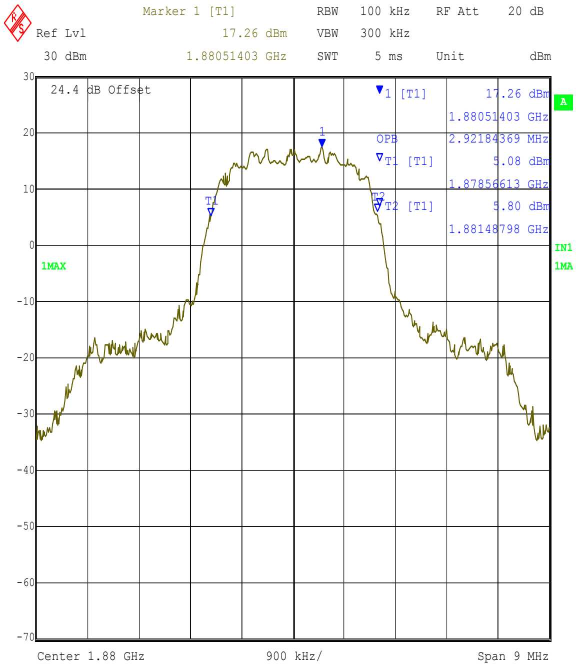
Comment A: 46299JD01 Ch 180. Mod: QAM.
Date: 7.JUN.2004 15:04:25



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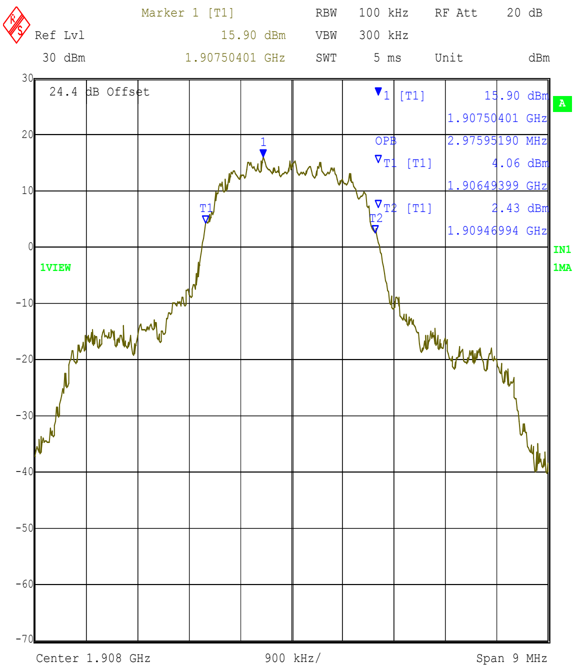
Date: 7.JUN.2004 15:41:08



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Comment A: 46299JD01 Ch 215. Mod: QAM.
Date: 7.JUN.2004 16:26:40

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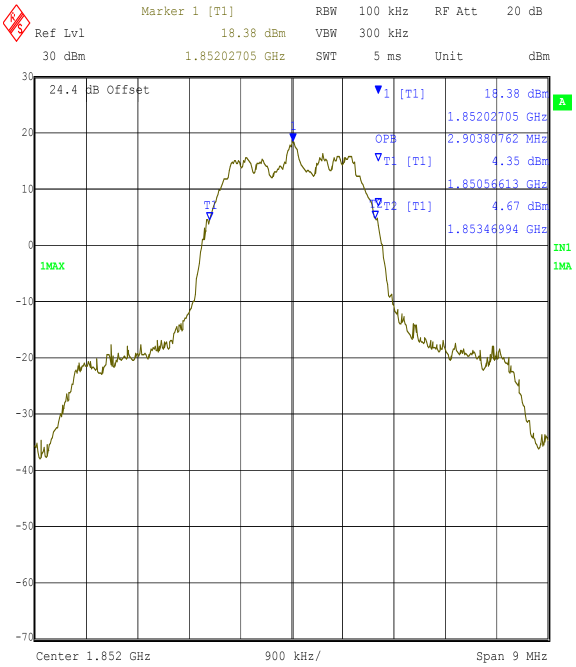
Transmitter Occupied Bandwidth: Section 24.238 (Continued) - QPSK



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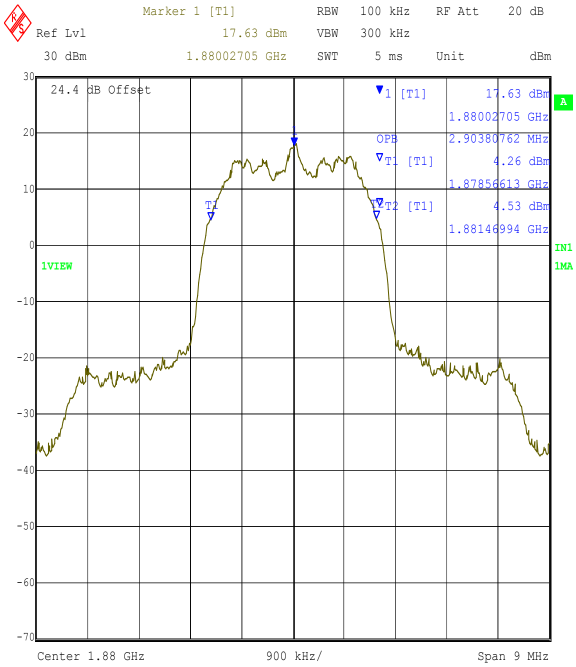

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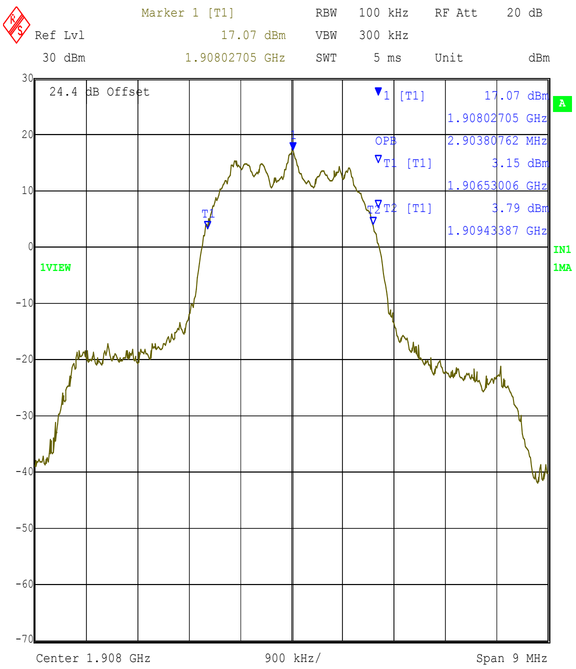


Title: Airspan EUT: ST. FCC P24. Occuppied Bandwith
Comment A: 46299JD01 Ch 215. Mod: QPSK.
Date: 7.JUN.2004 16:02:23

7.7. Transmitter Out of Band Conducted Emissions: Section 2.1051/24.238

7.7.1. The EUT was configured as for transmitter conducted emissions measurements as described in Section 8 of this report.

7.7.2. Tests were performed to identify the maximum transmitter conducted emission levels.

7.7.3. Results are reported for QAM mode only as this mode was found to be marginally the worse mode of operation, when comparing occupied bandwidth, output power and taking data rate into consideration.

Result: Top Channel (P1)

Frequency (MHz)	Peak Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
1843.186	-32.6	-13.0	19.6	Complied

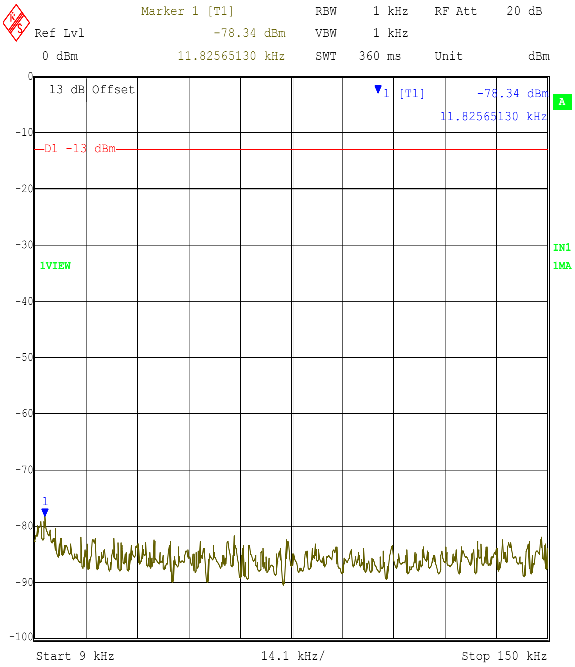
Result: Top Channel (P2)

Frequency (MHz)	Peak Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
1857.796	-28.7	-13.0	15.7	Complied

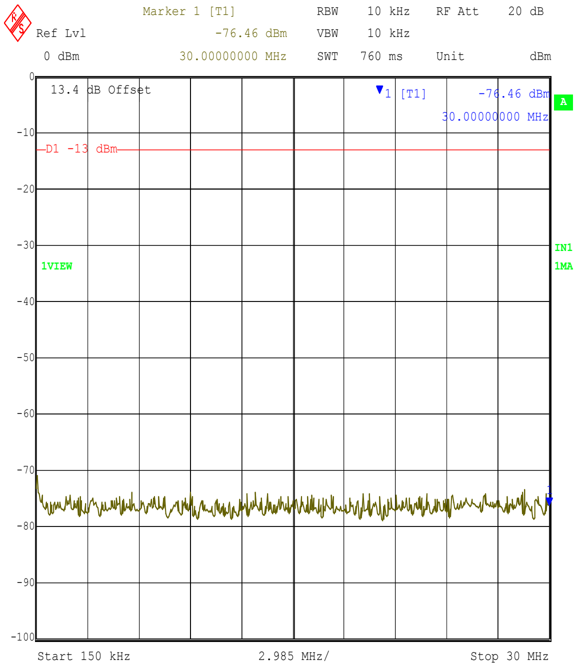
Result: Top Channel (P3)

Frequency (MHz)	Peak Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
1879.299	-25.7	-13.0	12.7	Complied

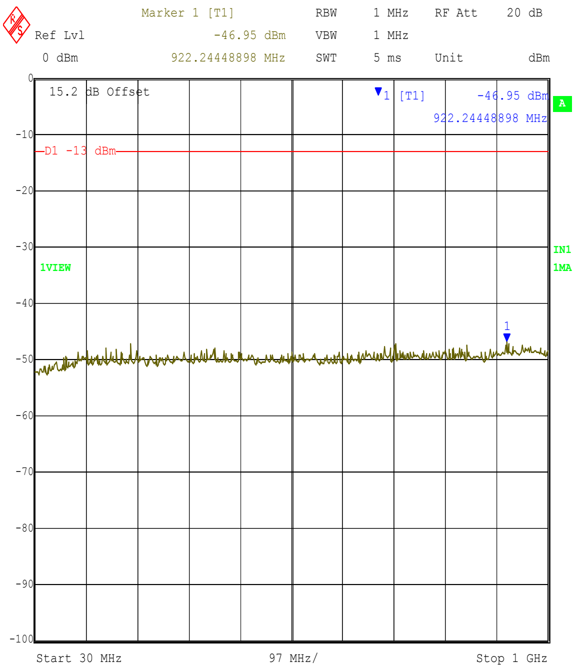
Transmitter Out of Band Conducted Emissions: Section 2.1051/24.238 (Continued)



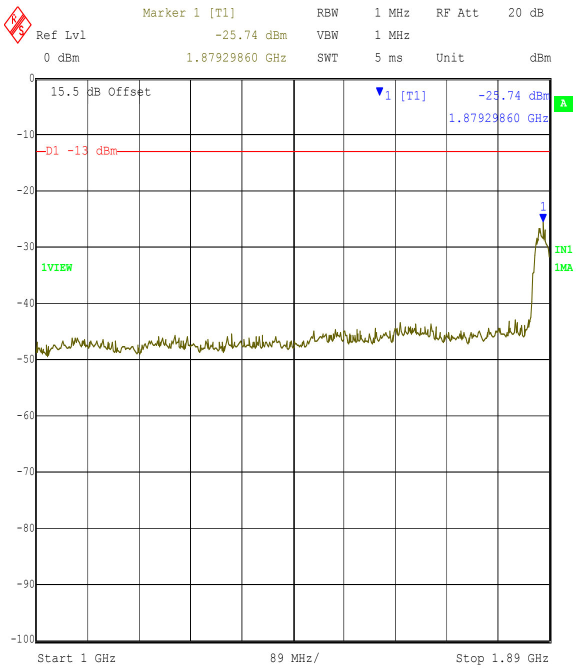
Title: Airspan EUT: ST. P3. FCC P24. Conducted Emissions
Comment A: 46299JD02 Ch 215. Mod: QAM. Power: 21 dBm
Date: 8.JUN.2004 11:23:07



Title: Airspan EUT: ST. P3. FCC P24. Conducted Emissions
Comment A: 46299JD02 Ch 215. Mod: QAM. Power: 21 dBm
Date: 8.JUN.2004 11:34:31

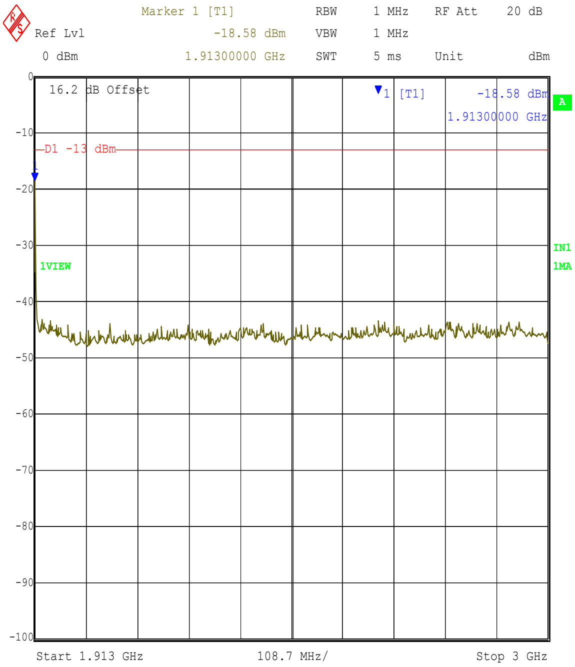


Title: Airspan EUT: ST. P3. FCC P24. Conducted Emissions
Comment A: 46299JD02 Ch 215. Mod: QAM. Power: 21 dBm
Date: 8.JUN.2004 11:39:21

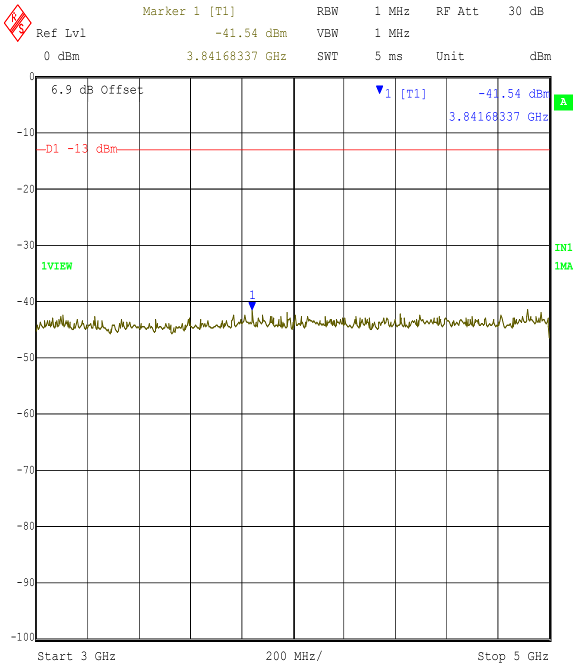


Title: Airspan EUT: ST. P3. FCC P24. Conducted Emissions
Comment A: 46299JD02 Ch 215. Mod: QAM. Power: 21 dBm
Date: 8.JUN.2004 11:40:48

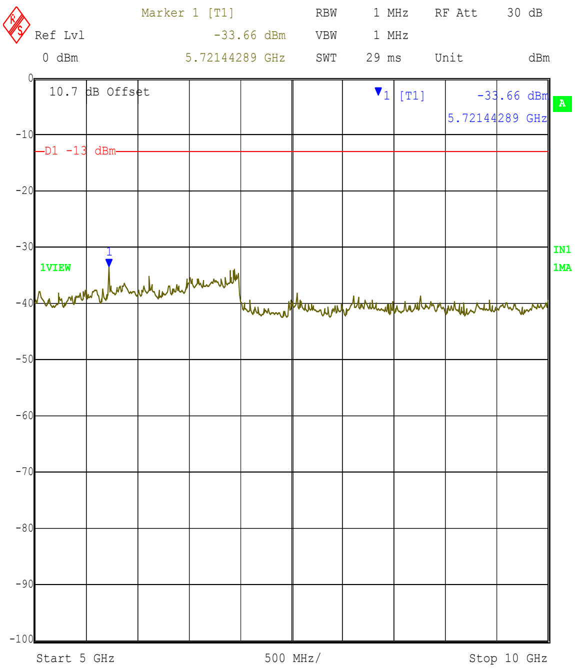
Transmitter Out of Band Conducted Emissions: Section 2.1051/24.238 (Continued)



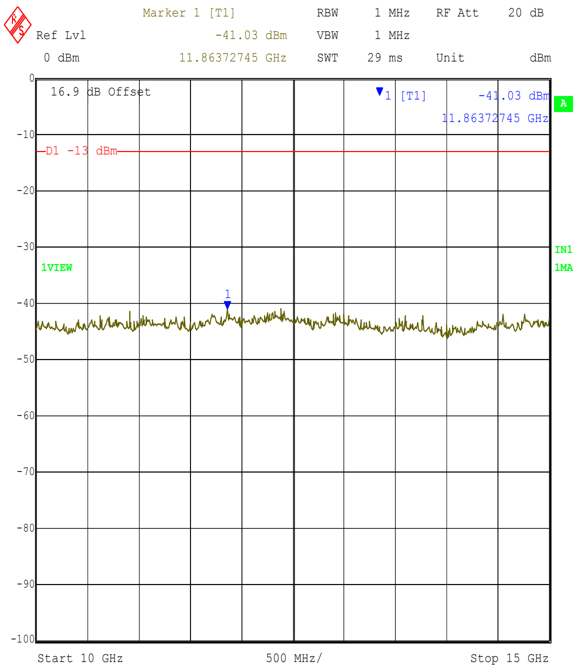
Title: Airspan EUT: ST. P3. FCC P24. Conducted Emissions
Comment A: 46299JD02 Ch 215. Mod: QAM. Power: 21 dBm
Date: 8.JUN.2004 11:42:07



Title: Airspan EUT: ST. P3. FCC P24. Conducted Emissions
Comment A: 46299JD02 Ch 215. Mod: QAM. Power: 21 dBm
Date: 8.JUN.2004 11:43:38

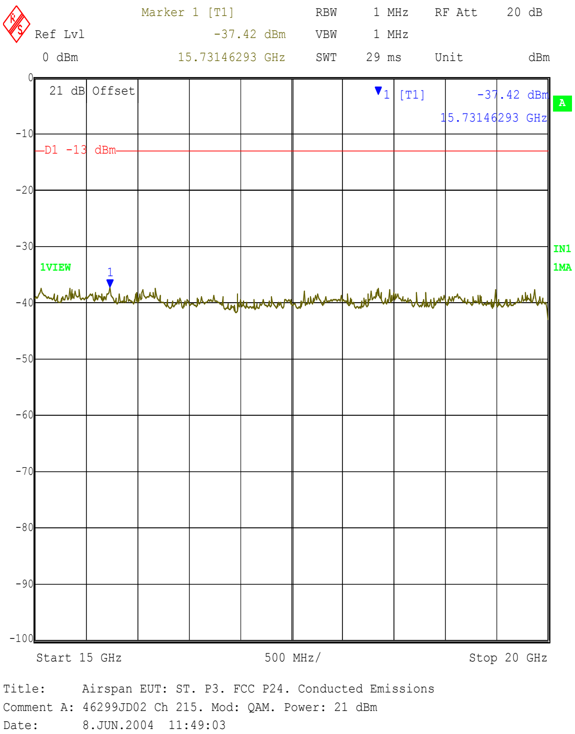


Title: Airspan EUT: ST. P3. FCC P24. Conducted Emissions
Comment A: 46299JD02 Ch 215. Mod: QAM. Power: 21 dBm
Date: 8.JUN.2004 11:44:55



Title: Airspan EUT: ST. P3. FCC P24. Conducted Emissions
Comment A: 46299JD02 Ch 215. Mod: QAM. Power: 21 dBm
Date: 8.JUN.2004 11:48:12

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



Note: Pre-scans were performed on top channel of each band (P1, P2, P3), Channels 191,203, and 215 respectively. Plots of P3, CH215 are shown for indication purposes only. For final measurements see accompanying result tables.

7.8. Transmitter Conducted Emissions At Band Edges: Section 2.1051/24.238

7.8.1. The EUT was configured as for transmitter conducted emissions testing described in Section 8 of this report.

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

Results: QAM

Bottom Band Edge

Modulation Channel	Frequency (MHz)	Peak Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
180	1850	-22.4	-13.0	9.4	Complied

Top Band Edge

Modulation Channel	Frequency (MHz)	Peak Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
215	1910	-19.4	-13.0	6.4	Complied

Results: QPSK

Bottom Band Edge

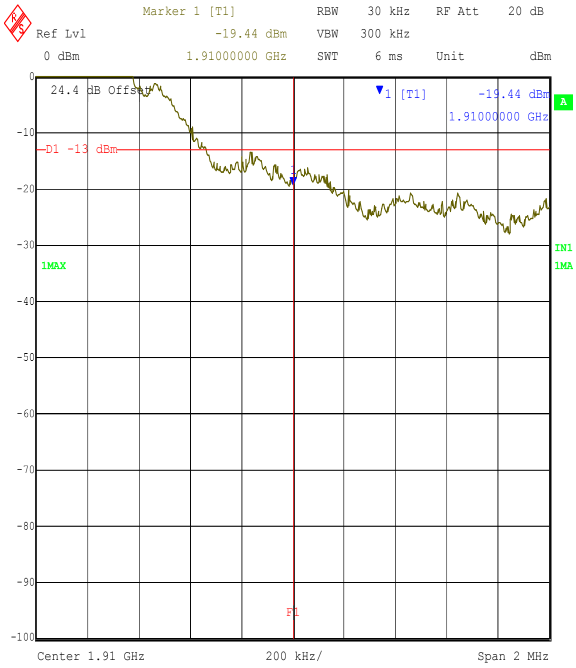
Modulation Channel	Frequency (MHz)	Peak Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
180	1850	-21.4	-13.0	8.4	Complied

Top Band Edge

Modulation Channel	Frequency (MHz)	Peak Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
215	1910	-15.6	-13.0	2.6	Complied

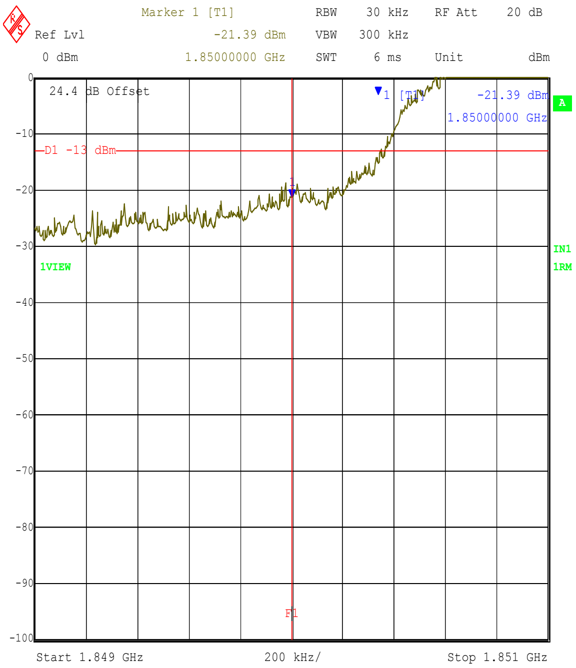
Transmitter Conducted Emissions At Band Edges: Section 2.1051/24.238 (Continued) - QAM

Title: Airspan EUT: ST. FCC P24. Conducted Lower Band Edge
Comment A: 46299JD01 Ch 180. Mod: QAM.
Date: 7.JUN.2004 15:25:44

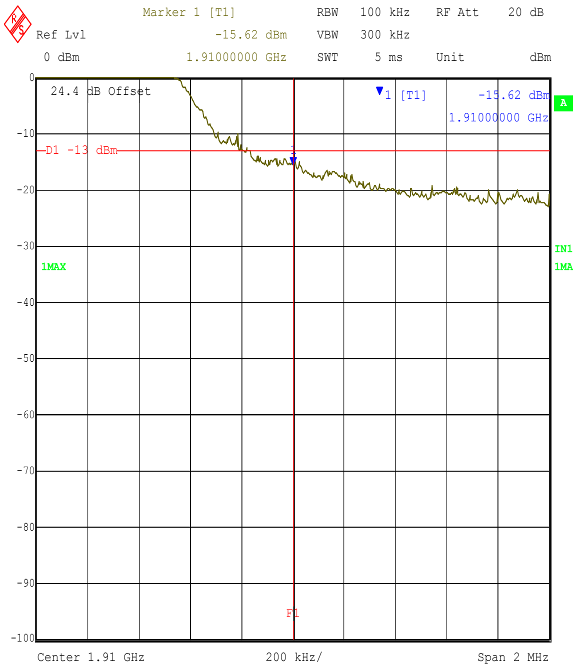


Title: Airspan EUT: ST. FCC P24. Conducted Upper Band Edge
Comment A: 46299JD01 Ch 215. Mod: QAM.
Date: 7.JUN.2004 16:27:56

Transmitter Conducted Emissions At Band Edges: Section 2.1051/24.238 (Continued) - QPSK



Title: Airspan EUT: ST. FCC P24. Conducted Lower Band Edge
Comment A: 46299JD01 Ch 180. Mod: QPSK.
Date: 7.JUN.2004 15:20:00



Title: Airspan EUT: ST. FCC P24. Conducted Upper Band Edge
Comment A: 46299JD01 Ch 215. Mod: QPSK.
Date: 7.JUN.2004 16:03:31

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

Integrated Power Over 1 MHz Strips.

Measurements in the 2nd and 3rd 1 MHz blocks away from the adjacent 1 MHz block from 1911 MHz to 1912 MHz and 1912 MHz to 1913 MHz and the 2nd and 3rd 1 MHz blocks away from the adjacent 1 MHz block from 1847 MHz to 1848 MHz and 1848 MHz to 1849 MHz.

The channel power function of the R&S ESIB spectrum analyser was used to measure the channel power using appropriate bandwidths.

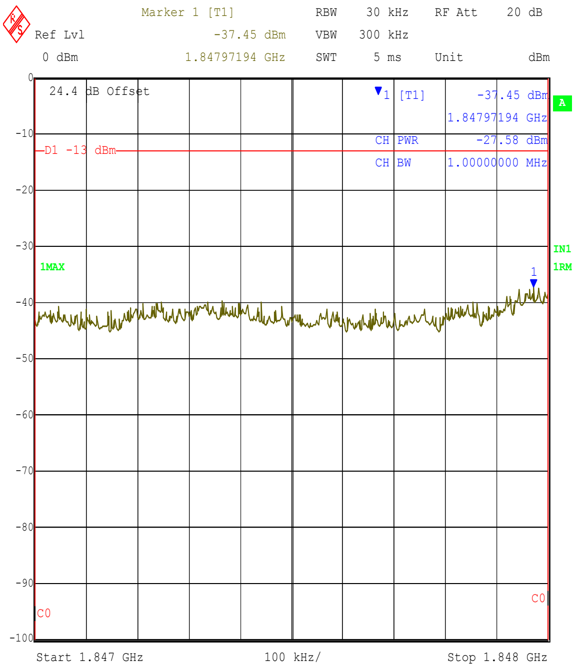
Result: QAM

Band (MHz)	Channel Power (dBm)	Limit (dBm/MHz)	Margin (dB)	Status
1847 to 1848	-27.6	-13.0	14.6	Complied
1848 to 1849	-14.3	-13.0	1.3	Complied
1911 to 1912	-13.9	-13.0	1.9	Complied
1912 to 1913	-29.7	-13.0	16.7	Complied

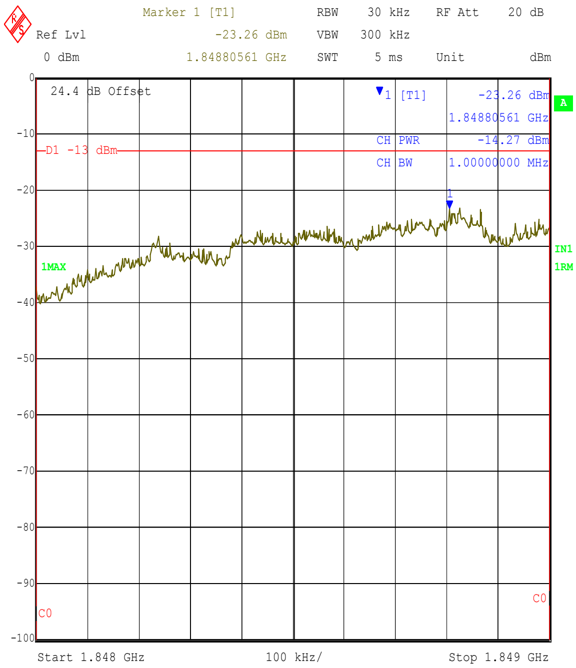
Result: QPSK

Band (MHz)	Channel Power (dBm)	Limit (dBm/MHz)	Margin (dB)	Status
1847 to 1848	-27.6	-13.0	14.6	Complied
1848 to 1849	-14.8	-13.0	1.8	Complied
1911 to 1912	-14.4	-13.0	1.4	Complied
1912 to 1913	-28.9	-13.0	15.9	Complied

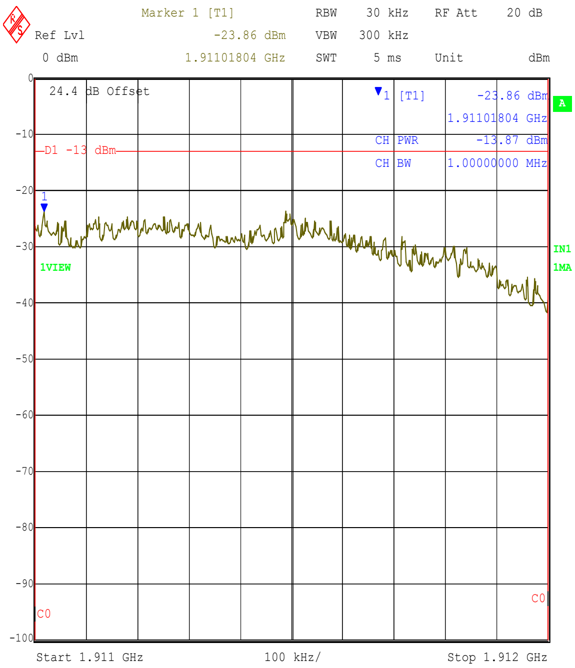
Transmitter Out of Band Conducted Emissions: Section 2.1051/24.238 (Continued) - QAM



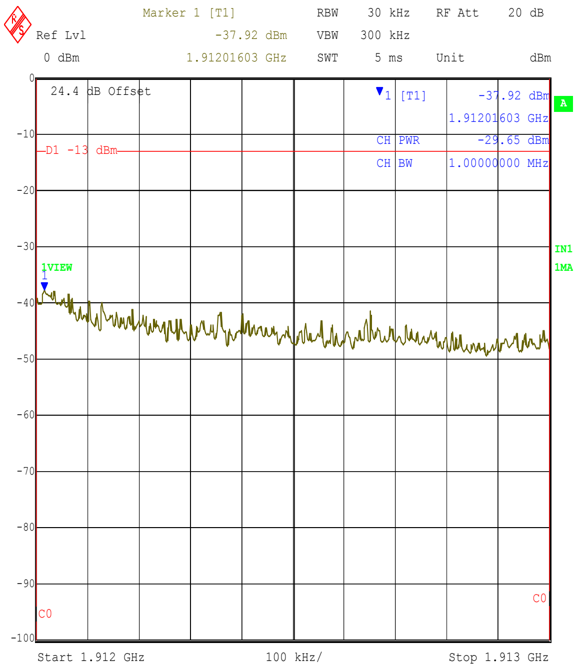
Title: Airspan EUT: ST. FCC P24. Conducted Lower Band Strip
Comment A: 46299JD01 Ch 180. Mod: QAM.
Date: 7.JUN.2004 15:24:03



Title: Airspan EUT: ST. FCC P24. Conducted Lower Band Strip
Comment A: 46299JD01 Ch 180. Mod: QAM.
Date: 7.JUN.2004 15:24:59

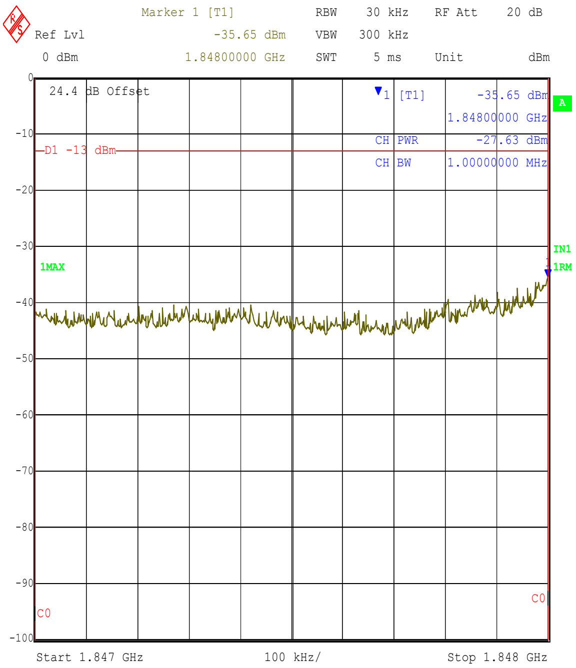


Title: Airspan EUT: ST. FCC P24. Conducted Upper Band Strip
Comment A: 46299JD01 Ch 215. Mod: QAM.
Date: 7.JUN.2004 16:28:43

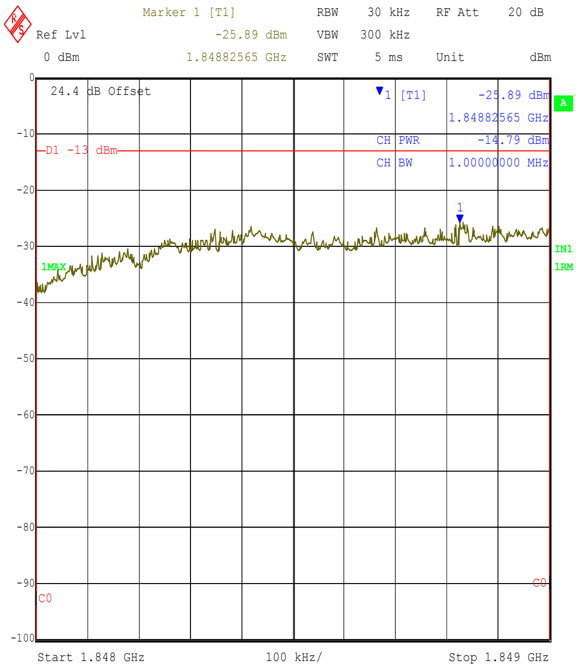


Title: Airspan EUT: ST. FCC P24. Conducted Upper Band Strip
Comment A: 46299JD01 Ch 215. Mod: QAM.
Date: 7.JUN.2004 16:29:15

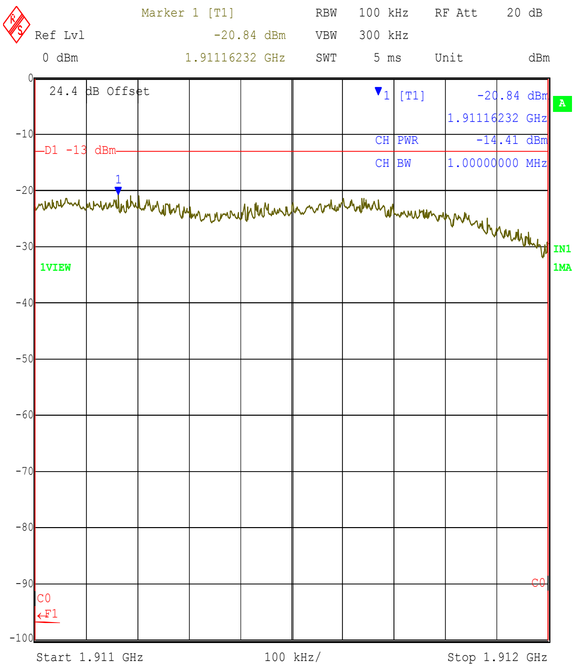
Transmitter Out of Band Conducted Emissions: Section 2.1051/24.238 (Continued) - QPSK



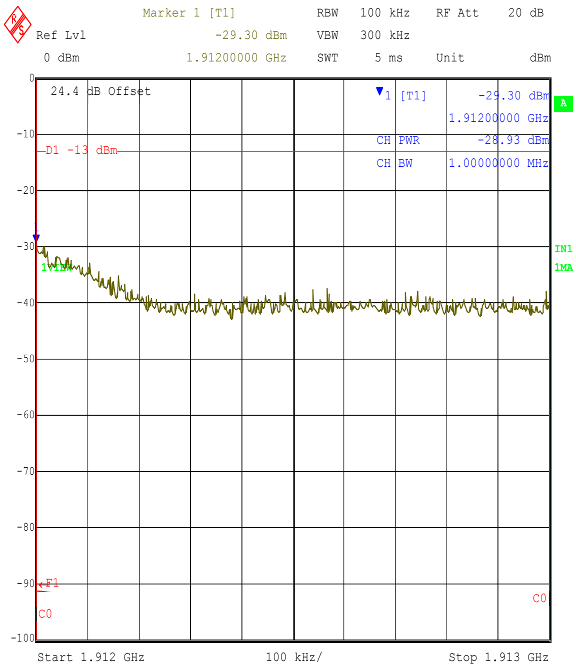
Title: Airspan EUT: ST. FCC P24. Conducted Lower Band Strip
Comment A: 46299JD01 Ch 180. Mod: QPSK.
Date: 7.JUN.2004 15:22:58



Title: Airspan EUT: ST. FCC P24. Conducted Lower Band Strip
Comment A: 46299JD01 Ch 180. Mod: QPSK.
Date: 7.JUN.2004 15:22:18



Title: Airspan EUT: ST. FCC P24. Conducted Upper Band Strip
Comment A: 46299JD01 Ch 215. Mod: QPSK.
Date: 7.JUN.2004 16:04:11



Title: Airspan EUT: ST. FCC P24. Conducted Upper Band Strip
Comment A: 46299JD01 Ch 215. Mod: QPSK.
Date: 7.JUN.2004 16:04:37

7.9. Transmitter Out of Band Radiated Emissions: Section 2.1053/24.238

7.9.1. The EUT was configured as for transmitter-radiated emissions testing as described in Section 8 of this report.

7.9.2. Tests were performed to identify the maximum transmitter radiated emission levels.

7.9.3. Results are reported for QAM mode only as this mode was found to be marginally the worse mode of operation, when comparing occupied bandwidth, output power and taking data rate into consideration.

Result: Bottom Channel

Frequency (MHz)	Peak Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
5610.000	-34.3	-13.0	21.3	Complied

Result: Middle Channel

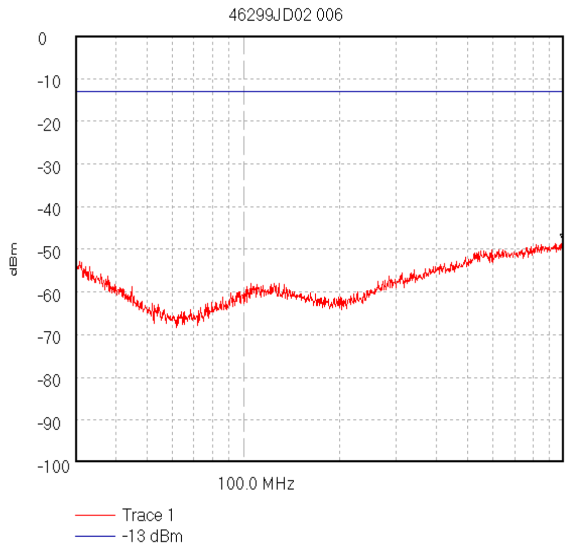
Frequency (MHz)	Peak Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
5668.889	-34.6	-13.0	21.6	Complied

Result: Top Channel

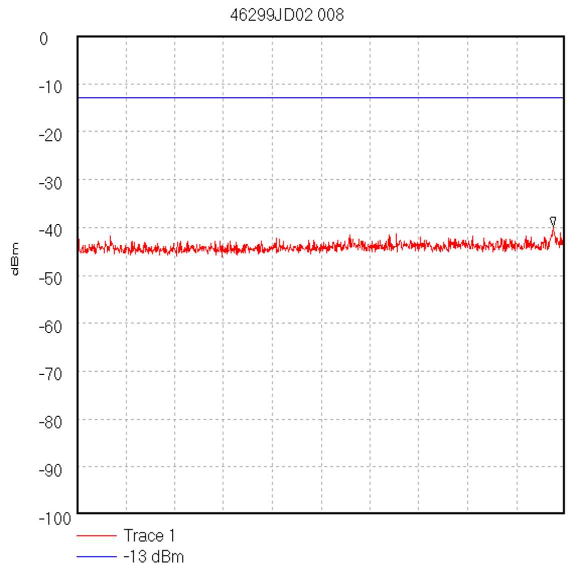
Frequency (MHz)	Peak Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
1910.000	-13.8	-13.0	0.8	Complied
5727.778	-35.0	-13.0	22.0	Complied
14013.333	-29.1	-13.0	16.1	Complied

Note: The emission at 1988 MHz is generated from the Central Terminal and is a downlink signal and is not measured.

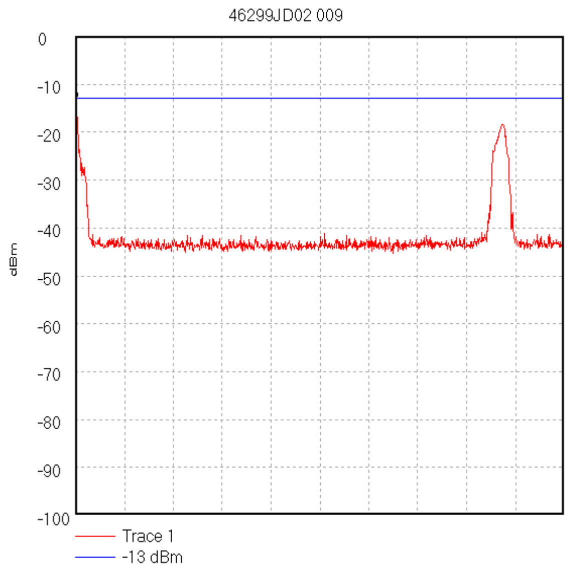
Transmitter Out of Band Radiated Emissions: Section 2.1053/24.238 (Continued) - QAM



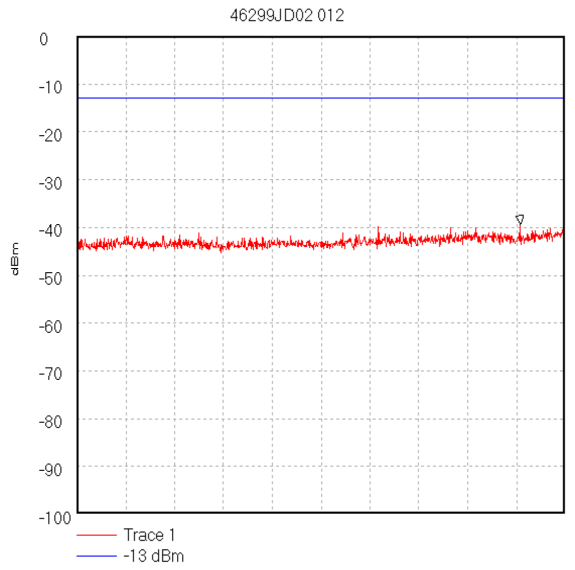
Start 30.0 MHz; Stop 1.0 GHz - Log Scale
Ref 0 dBm; Ref Offset 11.8 dB; 10 dB/div
RBW 120.0 kHz; VBW 100.0 kHz; Att 10 dB; Swp 80.0 mS
Peak 996.111 MHz, -48.24 dBm
Display Line: -13 dBm; ; Limit Test Passed
Transducer Factors: A1037
14/06/2004 09:49:19



Start 1.0 GHz; Stop 1.89 GHz
Ref 0 dBm; Ref Offset 11.8 dB; 10 dB/div
RBW 1000.0 kHz; VBW 1.0 MHz; Att 10 dB; Swp 20.0 mS
Peak 1.868 GHz, -39.76 dBm
Display Line: -13 dBm; ; Limit Test Passed
14/06/2004 10:22:55

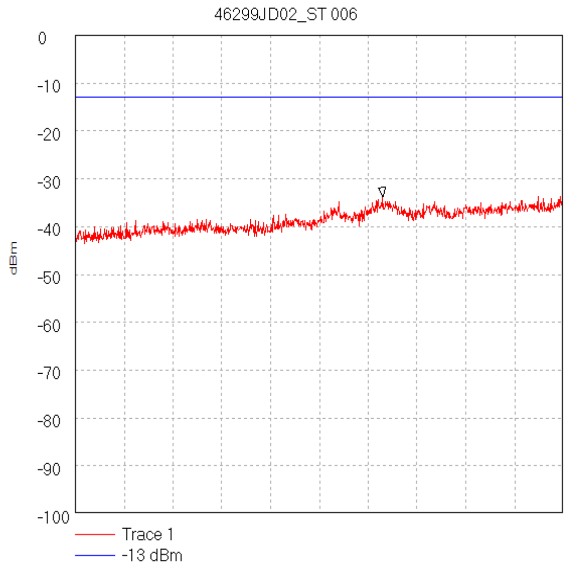


Start 1.91 GHz; Stop 2.0 GHz
Ref 0 dBm; Ref Offset 11.8 dB; 10 dB/div
RBW 1000.0 kHz; VBW 1.0 MHz; Att 10 dB; Swp 20.0 mS
Peak 1.91 GHz, -13.81 dBm
Display Line: -13 dBm; ; Limit Test Passed
14/06/2004 10:24:07

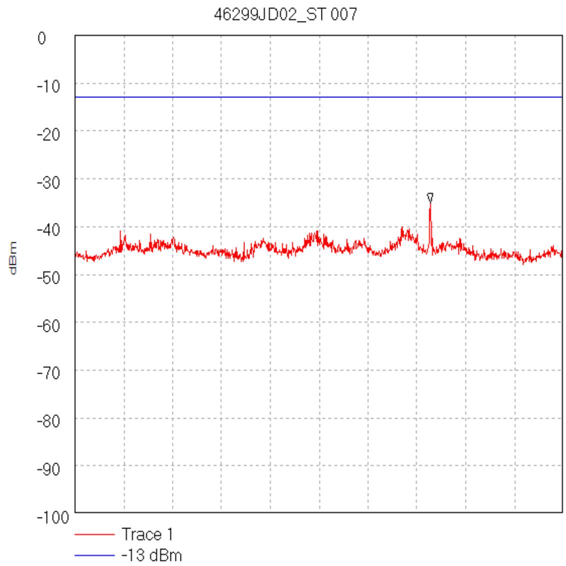


Start 2.0 GHz; Stop 4.0 GHz
Ref 0 dBm; Ref Offset 11.8 dB; 10 dB/div
RBW 1000.0 kHz; VBW 1.0 MHz; Att 10 dB; Swp 20.0 mS
Peak 3.816 GHz, -39.41 dBm
Display Line: -13 dBm; ; Limit Test Passed
14/06/2004 10:32:23

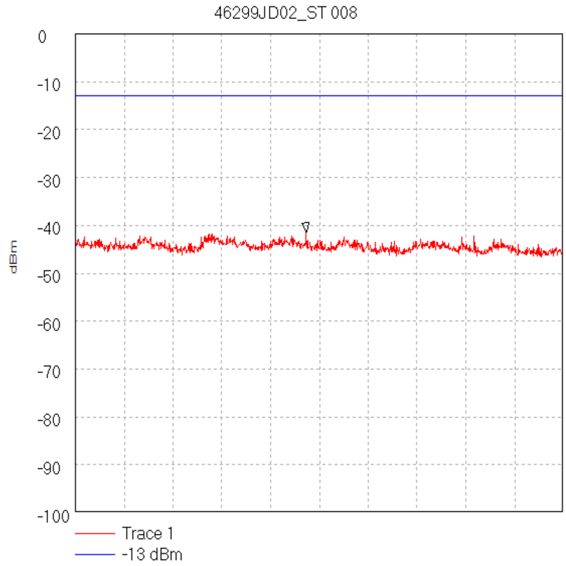
Transmitter Out of Band Radiated Emissions: Section 2.1053/24.238 (Continued) - QAM



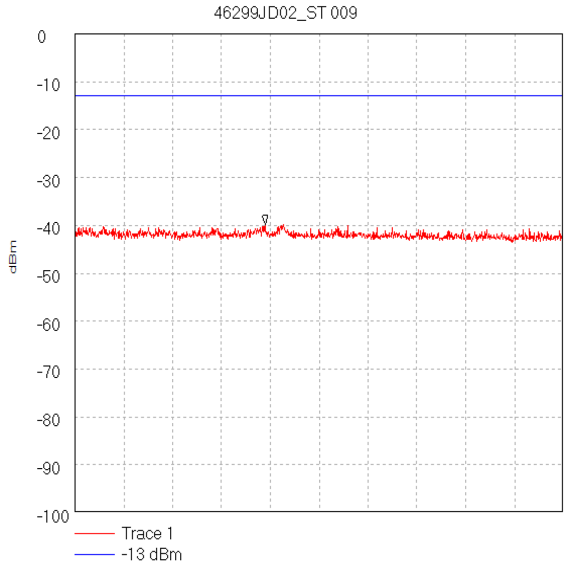
Start 4.0 GHz; Stop 5.0 GHz
Ref 0 dBm; Ref Offset 11.8 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 5 dB; Swp 20.0 mS
Peak 4.63 GHz, -33.79 dBm
Display Line: -13 dBm;
Tested by ND 16/06/2004 13:47:34



Start 5.0 GHz; Stop 6.0 GHz
Ref 0 dBm; Ref Offset 11.8 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 5 dB; Swp 20.0 mS
Peak 5.727778 GHz, -34.99 dBm
Display Line: -13 dBm;
Tested by ND 16/06/2004 13:50:07

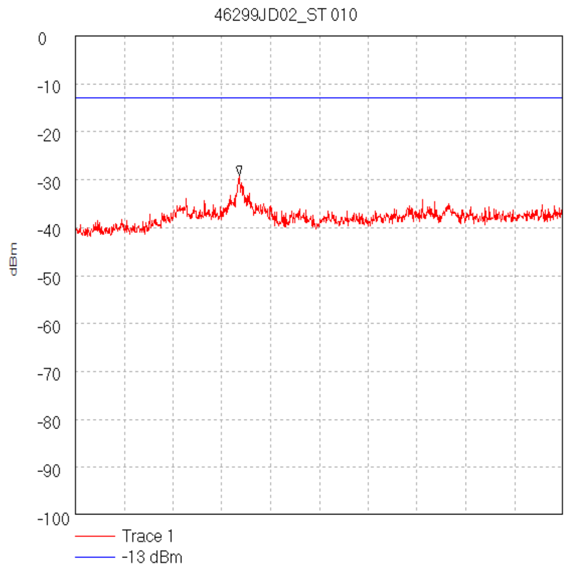


Start 6.0 GHz; Stop 8.0 GHz
Ref 0 dBm; Ref Offset 11.8 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 5 dB; Swp 20.0 mS
Peak 6.946667 GHz, -41.46 dBm
Display Line: -13 dBm;
Tested by ND 16/06/2004 14:00:04

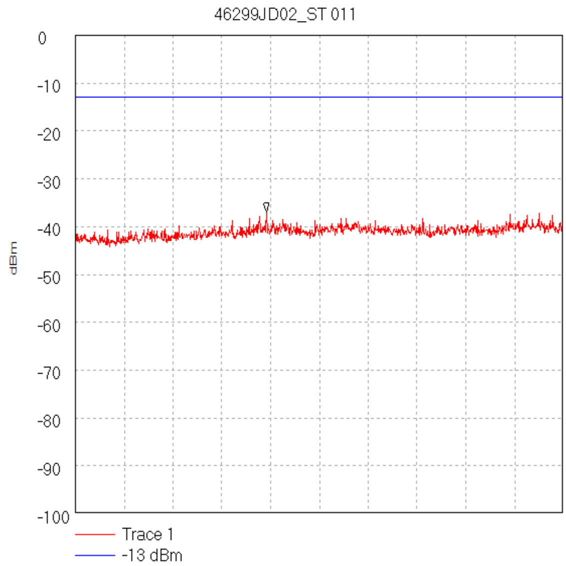


Start 8.0 GHz; Stop 12.0 GHz
Ref 0 dBm; Ref Offset 11.8 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 5 dB; Swp 20.0 mS
Peak 9.56 GHz, -39.81 dBm
Display Line: -13 dBm;
Tested by ND 16/06/2004 14:06:57

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



Start 12.0 GHz; Stop 18.0 GHz
Ref 0 dBm; Ref Offset 11.8 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 5 dB; Swp 40.0 mS
Peak 14.013333 GHz, -29.07 dBm
Display Line: -13 dBm;
Tested by ND 16/06/2004 14:20:50



Start 18.0 GHz; Stop 20.0 GHz
Ref 0 dBm; Ref Offset 11.8 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 5 dB; Swp 20.0 mS
Peak 18.784444 GHz, -36.94 dBm
Display Line: -13 dBm;
Tested by ND 16/06/2004 14:31:12

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

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

7.10.1. The EUT was configured as for transmitter radiated emissions testing described in Section 8 of this report.

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

Results: QAM

Bottom Band Edge

Modulation Channel	Frequency (MHz)	Spurious Emission (dBm)	Limit (dBm)	Margin (dB)	Result
180	1850	-33.9	-13.0	20.9	Complied

Top Band Edge

Modulation Channel	Frequency (MHz)	Peak Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
215	1910	-28.9	-13.0	15.9	Complied

Results: QPSK

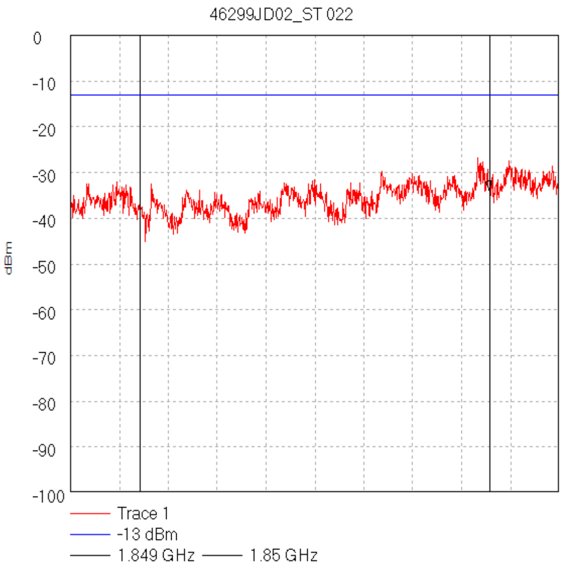
Bottom Band Edge

Modulation Channel	Frequency (MHz)	Spurious Emission (dBm)	Limit (dBm)	Margin (dB)	Result
180	1850	-25.9	-13.0	12.9	Complied

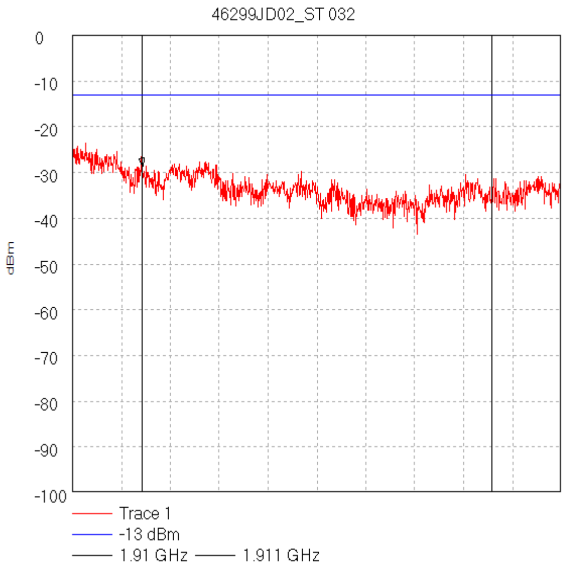
Top Band Edge

Modulation Channel	Frequency (MHz)	Peak Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
215	1910	-30.3	-13.0	17.3	Complied

Transmitter Radiated Emissions At Band Edges: Section 2.1053/24.238 (Continued) - QAM

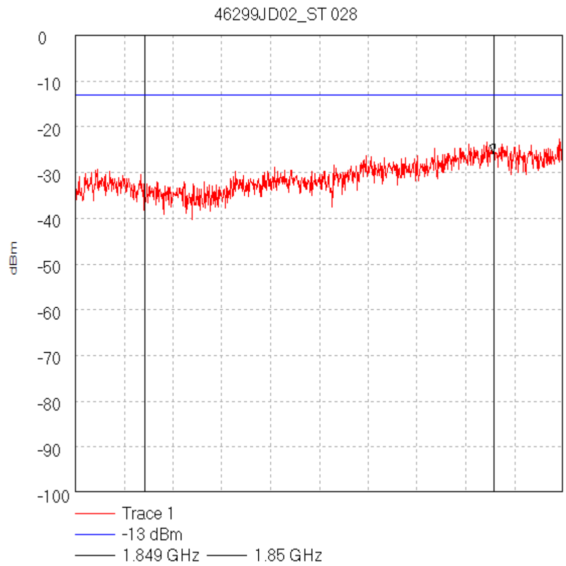


Start 1.8488 GHz; Stop 1.8502 GHz
Ref 0 dBm; Ref Offset 11.8 dB; 10 dB/div
RBW 30.0 kHz; VBW 100.0 kHz; Att 20 dB; Swp 20.0 mS
Marker 1.85 GHz, -33.87 dBm
Display Line: -13 dBm;
Tested by ND 16/06/2004 16:41:23

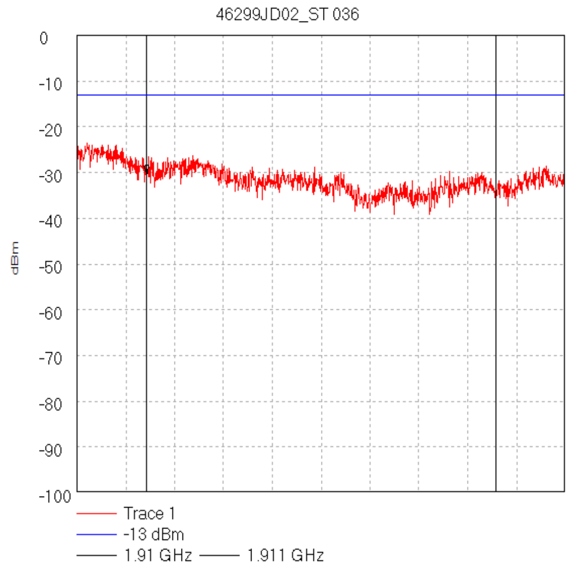


Start 1.9098 GHz; Stop 1.9112 GHz
Ref 0 dBm; Ref Offset 11.8 dB; 10 dB/div
RBW 30.0 kHz; VBW 100.0 kHz; Att 20 dB; Swp 20.0 mS
Marker 1.91 GHz, -28.87 dBm
Display Line: -13 dBm;
Tested by ND 16/06/2004 17:38:46

Transmitter Radiated Emissions At Band Edges: Section 2.1053/24.238 (Continued) - QPSK



Start 1.8488 GHz; Stop 1.8502 GHz
Ref 0 dBm; Ref Offset 11.8 dB; 10 dB/div
RBW 30.0 kHz; VBW 100.0 kHz; Att 20 dB; Swp 20.0 mS
Marker 1.85 GHz, -25.87 dBm
Display Line: -13 dBm;
Tested by ND 16/06/2004 17:04:39



Start 1.9098 GHz; Stop 1.9112 GHz
Ref 0 dBm; Ref Offset 11.8 dB; 10 dB/div
RBW 30.0 kHz; VBW 100.0 kHz; Att 20 dB; Swp 20.0 mS
Marker 1.91 GHz, -30.31 dBm
Display Line: -13 dBm;
Tested by ND 16/06/2004 17:47:47

8. Measurement Method

8.1. Conducted Output Power

The EUT was connected to a spectrum analyser and to the Central terminal (Clients equipment), via suitable cables, RF attenuators and combiners.

The connection was made to the EUT either via an antenna port or by antenna terminals made available by the client.

The total loss of the cables, attenuators and combiner were measured and entered as a reference level offset into the measuring receiver to correct for the losses.

The EUT was set to the required channel and the transmitter set to operate at full power.

A marker was set to the maximum indicated peak and the conducted power was recorded.

This test was performed on the bottom, middle and top channels.

The test equipment settings for conducted antenna port measurements were as follows:

Receiver Function	Setting
Detector Type:	RMS Peak
Mode:	Max Hold
Bandwidth:	1 MHz
Amplitude Range:	100 dB
Step Size:	Continuous sweep
Sweep Time:	Coupled

8.2. Frequency Stability

The EUT was situated within an environmental test chamber and connected to the central terminal (clients equipment) and a spectrum analyser via suitable cables, RF attenuators and combiners. The Bandwidth of the spectrum analyser was reduced sufficiently so as to measure the carrier frequency.

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 hand carried 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. If this margin is positive, the result is compliant. If it goes negative, the result is a non-compliance. There is also a frequency graph presented offering the frequency variation around nominal frequency.

8.3. Occupied Bandwidth

The EUT was connected to a spectrum analyser enabled with an occupied bandwidth function and a central terminal (clients equipment) via a bi-directional coupler to its antenna port.

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 ≥ 1% of occupied bandwidth.

8.4. Transmitter Conducted Emissions Measurements:

The test was performed in a laboratory environment.

Spurious emission measurements at the antenna port were performed from the lowest declared frequency to 10 times the highest EUT fundamental frequency.

A measuring receiver was connected to the antenna port of the EUT via a suitable cable and RF Attenuator. The total loss of both the cable and the attenuator were measured and entered as a reference level offset into the measuring receiver to correct for the losses.

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.

The frequency band described above was investigated with the transmitter operating at full power on the top, bottom and middle channels. Any spurious observed were then recorded and 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.

The measurements in the 2nd and 3rd 1 MHz blocks away from the adjacent 1 MHz block from 1911 MHz to 1912 MHz and 1912 MHz to 1913 MHz and the measurements in the 2nd and 3rd 1 MHz blocks away from the adjacent 1 MHz block from 1847 MHz to 1848 MHz and 1848 MHz to 1849 MHz were carried out using an analyser span of 1 MHz using the channel power function of the R&S ESI spectrum analyser to measure the channel power in the appropriate bandwidths. The test equipment settings for conducted antenna port measurements were as follows:

Receiver Function	Settings
Detector Type:	RMS
Mode:	Max Hold
Bandwidth:	1 MHz >1 GHz
Bandwidth:	10 kHz <1 GHz
Amplitude Range:	100 dB
Step Size:	Continuous sweep
Sweep Time:	Coupled

The resolution bandwidth used for measurements in the 1 MHz blocks either side of the declared operating frequency block were set as described in the procedure above.

8.5. 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

8.6. 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.

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.

All measurements were performed using broadband Horn antennas.

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.

9. Measurement Uncertainty

9.1. 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.

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

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

9.4. 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
Carrier Output Power	Not applicable	95%	+/- 0.46 dB
Conducted Emissions	9 kHz to 26 GHz	95%	+/- 1.2 dB
Conducted Emissions Antenna Port	30 MHz to 40 GHz	95%	+/- 1.2 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

9.5. 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.
A027	Horn Antenna	Eaton	9188-2	301
A028	Horn Antenna	Eaton	91888-2	304
A1362	Eaton	Stoddart Aircraft Radio Co., Inc.	91889-1	N/A
A1399	Weinschel Associates	Weinschel Associates	WA46-10	A126
A248	60 dB Variable Attenuator	Narda	743-60	01411
A253	WG 12 Microwave Horn	Flann Microwave	12240-20	128
A256	WG 18 Microwave Horn	Flann Microwave	18240-20	400
A427	WG 14 horn	Flann	14240-20	150
A429	WG 16 horn	Flann	16240-20	561
A436	WG 20 horn	Flann	20240-20	330
M051	Multimeter	Fluke	75	52571394
M069	ESMI Spectrum Analyser / Receiver	Rohde & Schwarz	ESMI	829 808/007 (DU) / 827 063/008 (RU)
M1124	Rohde & Schwarz	Rohde & Schwarz	ESIB26	100046K
M1122	40 GHz Peak Power Sensor	Boonton Electronics	57340	3297
M1123	RF Power Meter	Boonton Electronics	4531	138201
M212	Digital Thermometer	RS Components	RS 206-3738	70319456
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\46299JD02\EMICON	Test configuration for measurement of conducted emissions
DRG\46299JD02\EMIRAD	Test configuration for measurement of radiated emissions
DRG\46299JD02\001	Block diagram of the EUT, support equipment and interconnecting cables used for the test

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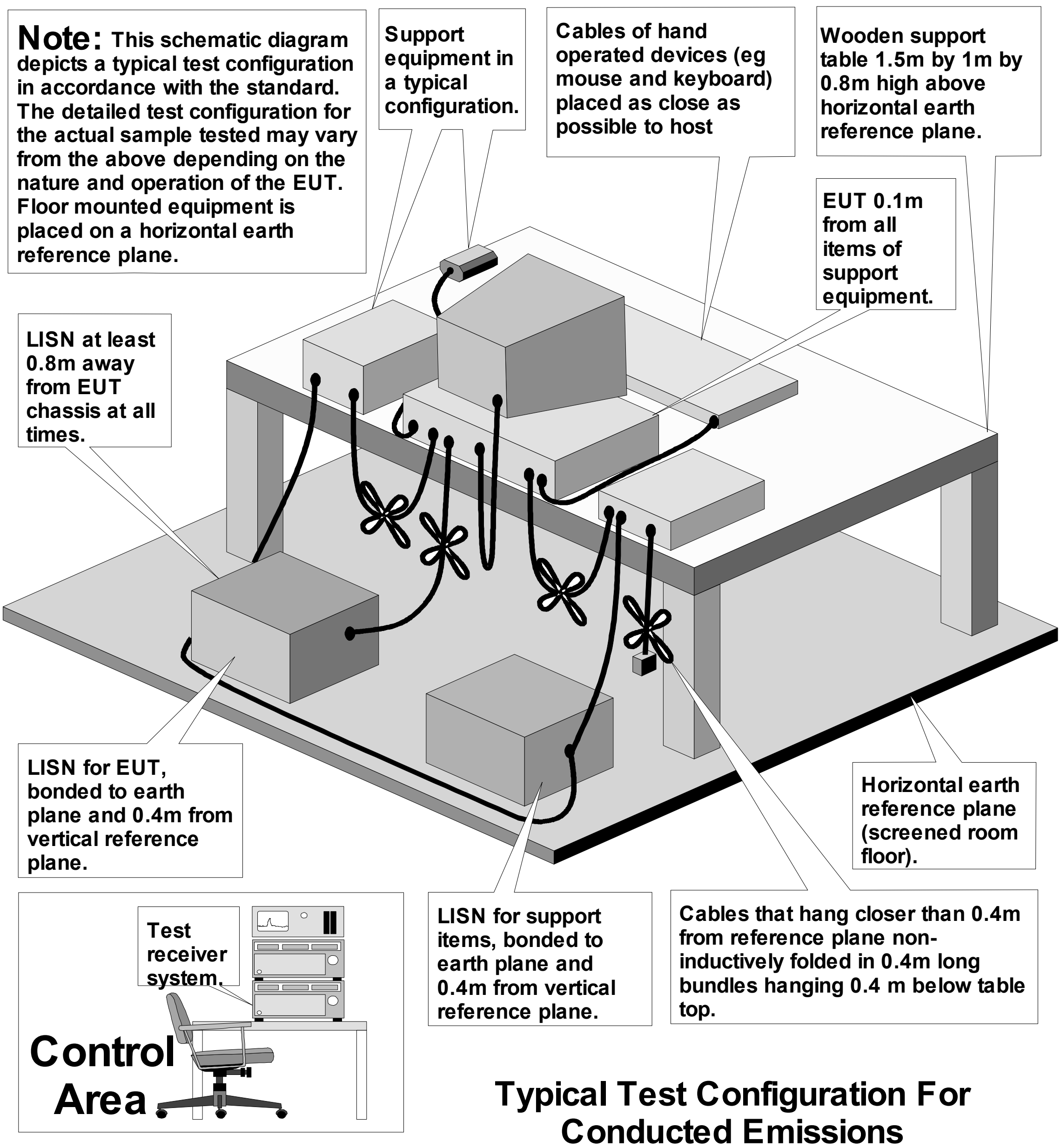
DRG\46299JD02\EMICON

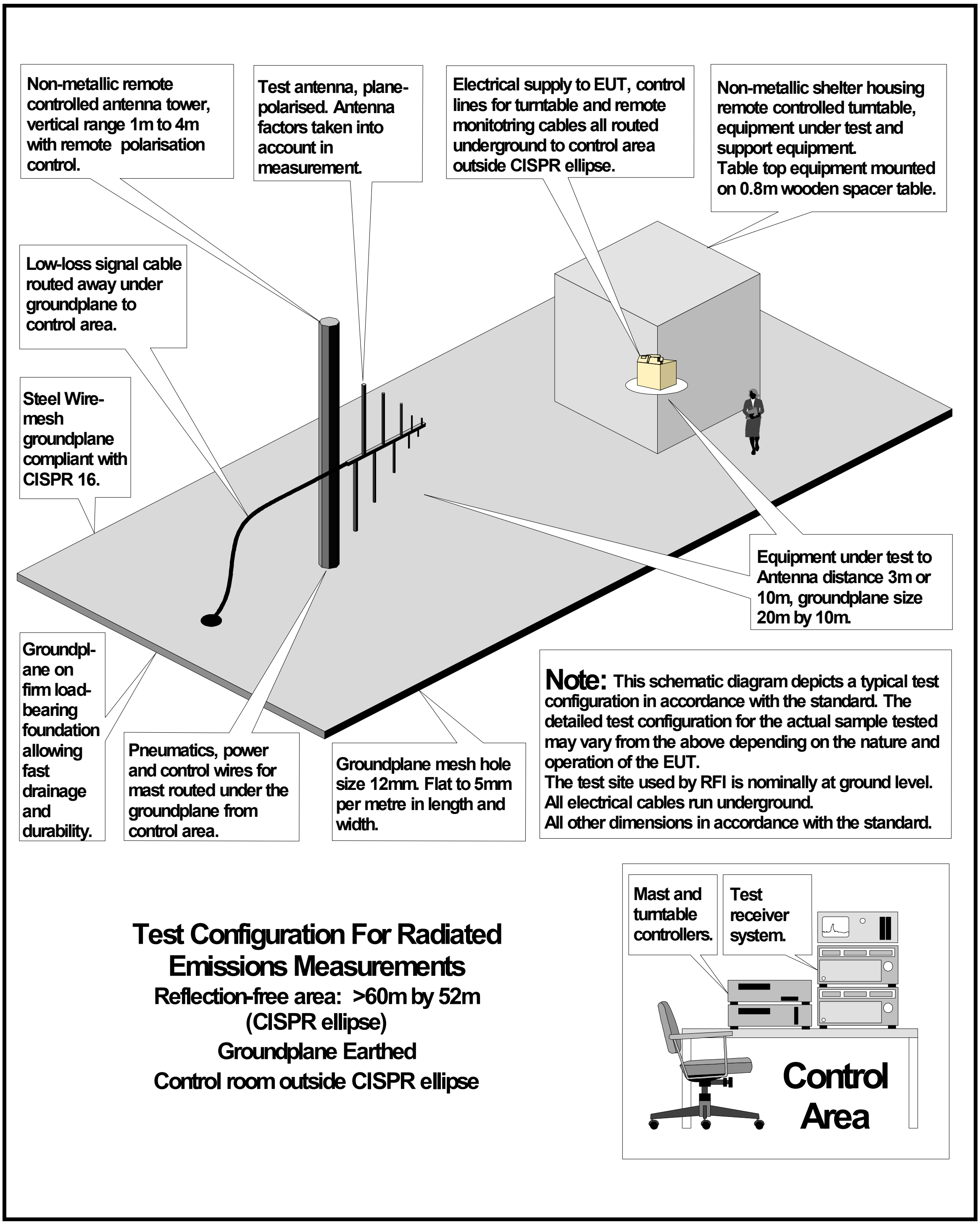


Typical Test Configuration For Conducted Emissions Measurements In Accordance With ANSI C63.4-1992
Tests performed in a screened enclosure

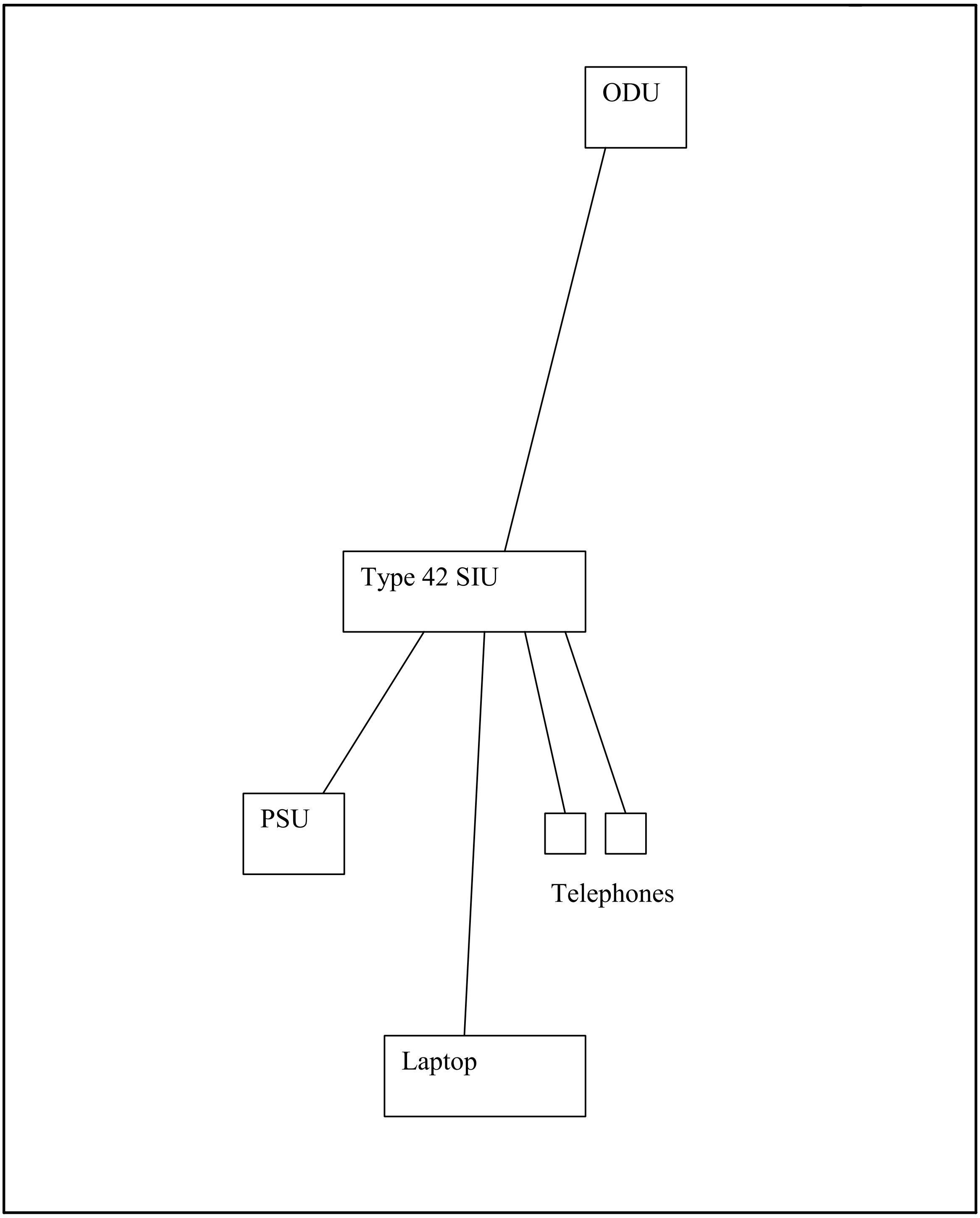
Test Of: Airspan Communications.
Subscriber Terminal - 1054 ST Antenna

To: FCC Part 24

DRG\46299JD02\EMIRAD



DRG\46299JD02\001



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