






TEST REPORT FROM RADIO FREQUENCY INVESTIGATION LTD.

Test Of: Airspan Communications.
Combiner Shelf - Central Terminal (CT)

To: FCC Part 24

Test Report Serial No:
RFI/MPTE1/RP46299JD02A

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

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1. Client Information

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

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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: | Combiner Shelf |
| Unique Type Identification: | 503-0010-002 |
| Serial Number: | None stated by client |
| FCC ID Number: | 02J-AS4020CT-PCS |
| Country of Manufacture: | UK |
| Date of Receipt: | 01 June 2004 |

The following are RF components installed in the Combiner Shelf stated above.

| | |
|------------------------------------|------------------------|
| Brand Name: | Airspan Communications |
| Model Name or Number: | P1 DIP/LNA |
| Unique Type Identification: | 503-0020-100 |
| Serial Number: | 053 |
| FCC ID Number: | Not Applicable |
| Country of Manufacture: | USA |
| Date of Receipt: | 01 June 2004 |

| | |
|------------------------------------|------------------------|
| Brand Name: | Airspan Communications |
| Model Name or Number: | P2 DIP/LNA |
| Unique Type Identification: | 503-0020-101 |
| Serial Number: | 029 |
| FCC ID Number: | Not Applicable |
| Country of Manufacture: | USA |
| Date of Receipt: | 01 June 2004 |

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Identification Of Equipment Under Test (EUT) (Continued)

| | |
|------------------------------------|------------------------|
| Brand Name: | Airspan Communications |
| Model Name or Number: | P3 DIP-LNA |
| Unique Type Identification: | 503-0020-102 |
| Serial Number: | 012 |
| FCC ID Number: | Not Applicable |
| Country of Manufacture: | USA |
| Date of Receipt: | 01 June 2004 |

| | |
|------------------------------------|------------------------|
| Brand Name: | Airspan Communications |
| Model Name or Number: | P Band CT RF Card |
| Unique Type Identification: | 605-0010-122 |
| Serial Number: | F00067208T0040M |
| FCC ID Number: | Not Applicable |
| Country of Manufacture: | UK |
| Date of Receipt: | 01 June 2004 |

| | |
|------------------------------------|------------------------|
| Brand Name: | Airspan Communications |
| Model Name or Number: | P Band CT RF Card |
| Unique Type Identification: | 605-0010-122 |
| Serial Number: | A00007498T0041R |
| FCC ID Number: | Not Applicable |
| Country of Manufacture: | UK |
| Date of Receipt: | 01 June 2004 |

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Identification Of Equipment Under Test (EUT) (Continued)

| | |
|-----------------------------|------------------------|
| Brand Name: | Airspan Communications |
| Model Name or Number: | P Band CT RF Card |
| Unique Type Identification: | 605-0010-122 |
| Serial Number: | V00000010T0124R |
| FCC ID Number: | Not Applicable |
| Country of Manufacture: | UK |
| Date of Receipt: | 01 June 2004 |

| | |
|-----------------------------|------------------------|
| Brand Name: | Airspan Communications |
| Model Name or Number: | P Band CT RF Card |
| Unique Type Identification: | 605-0010-122 |
| Serial Number: | F00067211T0040M |
| FCC ID Number: | Not Applicable |
| Country of Manufacture: | UK |
| Date of Receipt: | 01 June 2004 |

| | |
|-----------------------------|------------------------|
| Brand Name: | Airspan Communications |
| Model Name or Number: | P Band PA |
| Unique Type Identification: | 503-0020-019 |
| Serial Number: | 148 |
| FCC ID Number: | Not Applicable |
| Country of Manufacture: | USA |
| Date of Receipt: | 01 June 2004 |

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| | |
|------------------------------------|------------------------|
| Brand Name: | Airspan Communications |
| Model Name or Number: | P Band PA |
| Unique Type Identification: | 503-0020-019 |
| Serial Number: | 263 |
| FCC ID Number: | Not Applicable |
| Country of Manufacture: | USA |
| Date of Receipt: | 01 June 2004 |

| | |
|------------------------------------|------------------------|
| Brand Name: | Airspan Communications |
| Model Name or Number: | AS4020 |
| Unique Type Identification: | 503-0025-008 |
| Serial Number: | EMC1 |
| FCC ID Number: | Not Applicable |
| Country of Manufacture: | UK |
| Date of Receipt: | 01 June 2004 |

| | |
|------------------------------------|------------------------|
| Brand Name: | Airspan Communications |
| Model Name or Number: | AS4020 |
| Unique Type Identification: | 503-0025-008 |
| Serial Number: | S00001654T0408D |
| FCC ID Number: | Not Applicable |
| Country of Manufacture: | UK |
| Date of Receipt: | 01 June 2004 |

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Identification Of Equipment Under Test (EUT) (Continued)

| | |
|------------------------------------|------------------------|
| Brand Name: | Airspan Communications |
| Model Name or Number: | AS4020 |
| Unique Type Identification: | 503-0025-008 |
| Serial Number: | S00033149T0339D |
| FCC ID Number: | Not Applicable |
| Country of Manufacture: | UK |
| Date of Receipt: | 01 June 2004 |

| | |
|------------------------------------|------------------------|
| Brand Name: | Airspan Communications |
| Model Name or Number: | AS4020 |
| Unique Type Identification: | 503-0025-008 |
| Serial Number: | S00030112T0343D |
| FCC ID Number: | Not Applicable |
| Country of Manufacture: | UK |
| Date of Receipt: | 01 June 2004 |

2.2. Description Of EUT

The equipment under test is a fixed wireless access system offering voice and data communication between a central terminal and a subscriber unit.

The central terminal comprises of AS4020 model shelves with external E1 and Ethernet Ports, and a RF port connecting to the combiner shelf. The CT RF card, PA and DIP/LNA in the combiner shelf set the frequency, amplitude and wave shape of the RF signal transmitted to a remote antenna.

2.3. Modifications Incorporated In EUT

During the course of testing the EUT was not modified.

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2.4. Additional Information Related To Testing

| | | | |
|---|---|-----------------------|--------------------------------|
| Power Supply Requirement: | DC Supply of (customer supply) 0/-48V | | |
| Equipment Category: | Base Station | | |
| Type of Unit: | Fixed Wireless Access equipment operating in PCS Band (Transceiver) | | |
| Interface Ports: | N-Type RF feeder cable port on each DIP/LNA RJ 45 Ethernet traffic port RJ 45 Ethernet Management port E1/T1 port – coax or RJ45 | | |
| Transmit Frequency Range | 1930 MHz to 1990 MHz | | |
| Transmit Channels Tested | Channel ID | Channel Number | Channel Frequency (MHz) |
| | Bottom | 180 | 1930.0 |
| | Middle | 197 | 1960.0 |
| | Top | 215 | 1988.0 |
| Receive Frequency Range | 1850 MHz to 1910 MHz | | |
| Receive Channels Tested | Channel ID | Channel Number | Channel Frequency (MHz) |
| | Bottom | 180 | 1852.0 |
| | Middle | 197 | 1880.0 |
| | Top | 215 | 1908.0 |
| Maximum Power Output (Peak RMS) | 33.6 dBm | | |
| Highest Unintentionally Generated Frequency: | 1988 MHz | | |

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2.5. Support Equipment

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

| | |
|-------------------------------|-------------------------------------|
| Description: | Ethernet Switch |
| Brand Name: | Bay Networks |
| Model Name or Number: | Baystack 252 |
| Serial Number: | FS18700122 |
| Cable Length And Type: | Cat 5 UTP 7m |
| Connected to Port: | AS4020 Traffic and Management ports |

| | |
|-------------------------------|----------------|
| Description: | DC PSU |
| Brand Name: | HP |
| Model Name or Number: | 9973A |
| Serial Number: | 3501A-00929 |
| Cable Length And Type: | Not Applicable |
| Connected to Port: | Not Applicable |

| | |
|-------------------------------|----------------|
| Description: | DC PSU |
| Brand Name: | HP |
| Model Name or Number: | 9973A |
| Serial Number: | 3501-00929 |
| Cable Length And Type: | Not Applicable |
| Connected to Port: | Not Applicable |

| | |
|-------------------------------|-----------------|
| Description: | Management PC |
| Brand Name: | Compaq |
| Model Name or Number: | Deskpro |
| Serial Number: | Airspan 003407 |
| Cable Length And Type: | Ethernet |
| Connected to Port: | Ethernet Switch |

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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. |

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.

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4. Deviations From The Test Specification

None.

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5. Operation Of The EUT During Testing

5.1. Operating Conditions

During testing, the EUT was powered by a DC Supply of (customer supply) 0/-48V

5.2. Operating Modes

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

QPSK $\frac{1}{2}$ - QPSK modulation with $\frac{1}{2}$ FEC

QPSK $\frac{3}{4}$ - QPSK with $\frac{3}{4}$ FEC

QAM $\frac{1}{2}$ - QAM modulation with $\frac{1}{2}$ FEC

QAM $\frac{3}{4}$ - QAM with $\frac{3}{4}$ FEC

5.3. Configuration And Peripherals

The EUT was tested in the following configuration:

Please refer to Appendix 2 for a Block diagram 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.

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6. Summary Of Test Results

6.1. Central Terminal

| Range Of Measurements | Specification Reference | Port Type | Compliance Status |
|--|---|----------------------|--------------------------|
| Transmitter Carrier Output Power | C.F.R. 47 FCC Part 2: 2003 Section 2.1046(a)/24.232(a),(c) | Antenna Terminals | Complied |
| Transmitter Frequency Stability (Temperature Variation) | C.F.R. 47 FCC Part 24: 2003 Section 2.1046(a)(1)/24.235 | Antenna Terminals | Complied |
| Transmitter Frequency Stability (Voltage Variation) | C.F.R. 47 FCC Part 24: 2003 Section 2.1055(d)(1)/24.235 | Antenna Terminals | Complied |
| Transmitter Occupied Bandwidth | C.F.R. 47 FCC Part 24: 2003 Section 2.1049/24.238 | Antenna Terminals | Complied |
| Transmitter Out of Band Conducted Emissions | C.F.R. 47 FCC Part 24: 2003 Section 2.1051/24.238(a) | Antenna Terminals | Complied |
| Transmitter Band Edge Conducted Emissions | C.F.R. 47 FCC Part 24: 2003 Section 2.1051/24.238(b) | Antenna Terminals | Complied |
| Transmitter Out of Band Radiated Emissions | C.F.R. 47 FCC Part 24: 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.

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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.

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

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

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

Results: QAM

| Band | Channel Number | Commissioning level (dBm) | Frequency (MHz) | Conducted Power Peak RMS (dBm) | Output Power Limit (dBm) | Margin (dB) | Result |
|------|----------------|---------------------------|-----------------|--------------------------------|--------------------------|-------------|----------|
| P1 | 180 | 15.5 | 1932.0 | 28.8 | 50.0 | 21.2 | Complied |
| P1 | 181 | 19.0 | 1933.0 | 31.7 | 50.0 | 18.3 | Complied |
| P1 | 182 | 21.0 | 1935.0 | 33.6 | 50.0 | 16.4 | Complied |
| P2 | 197 | 21.0 | 1960.0 | 33.5 | 50.0 | 16.5 | Complied |
| P3 | 213 | 21.0 | 1985.0 | 33.6 | 50.0 | 16.4 | Complied |
| P3 | 214 | 19.0 | 1987.0 | 31.8 | 50.0 | 18.2 | Complied |
| P3 | 215 | 16.0 | 1988.0 | 29.1 | 50.0 | 20.9 | Complied |

Results: QPSK

| Band | Channel Number | Commissioning level (dBm) | Frequency (MHz) | Conducted Power Peak RMS (dBm) | Output Power Limit (dBm) | Margin (dB) | Result |
|------|----------------|---------------------------|-----------------|--------------------------------|--------------------------|-------------|----------|
| P1 | 180 | 15.5 | 1932.0 | 28.4 | 50.0 | 21.6 | Complied |
| P1 | 181 | 19.0 | 1933.0 | 31.6 | 50.0 | 18.4 | Complied |
| P1 | 182 | 21.0 | 1935.0 | 33.2 | 50.0 | 16.8 | Complied |
| P2 | 197 | 21.0 | 1960.0 | 33.4 | 50.0 | 16.6 | Complied |
| P3 | 213 | 21.0 | 1985.0 | 33.4 | 50.0 | 16.6 | Complied |
| P3 | 214 | 19.0 | 1987.0 | 31.6 | 50.0 | 18.2 | Complied |
| P3 | 215 | 16.0 | 1988.0 | 28.9 | 50.0 | 21.1 | Complied |

Note: the power was measured using peak RMS. The commissioning levels as set by customer had to be reduced at the band edges in order to comply with the standard. This means that the maximum allowable output power is reduced at the lower and upper two channels.

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

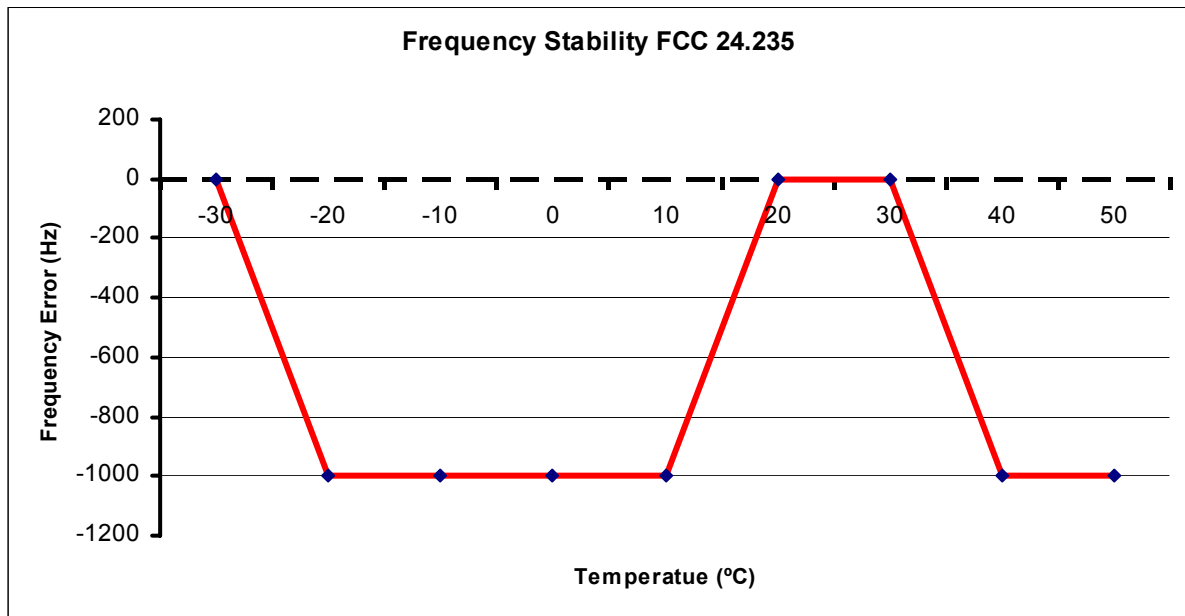
7.3.1. The EUT was configured as for frequency stability measurements as described in Section 8 of this report.

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

Results Bottom Channel (1932.0 MHz)

| Temp (°C) | Frequency Error (Hz) | Measured Frequency (MHz) | Lower Band Edge Limit (MHz) | Margin (MHz) | Result |
|-----------|----------------------|--------------------------|-----------------------------|--------------|----------|
| -30 | 0 | 1932.000 | 1930.0 | 2.000 | Complied |
| -20 | -1000 | 1931.999 | 1930.0 | 1.999 | Complied |
| -10 | -1000 | 1931.999 | 1930.0 | 1.999 | Complied |
| 0 | -1000 | 1931.999 | 1930.0 | 1.999 | Complied |
| 10 | -1000 | 1931.999 | 1930.0 | 1.999 | Complied |
| 20 | 0 | 1932.000 | 1930.0 | 2.000 | Complied |
| 30 | 0 | 1932.000 | 1930.0 | 2.000 | Complied |
| 40 | -1000 | 1931.999 | 1930.0 | 1.999 | Complied |
| 50 | -1000 | 1931.999 | 1930.0 | 1.999 | Complied |

Frequency Variation From 1932.0 MHz



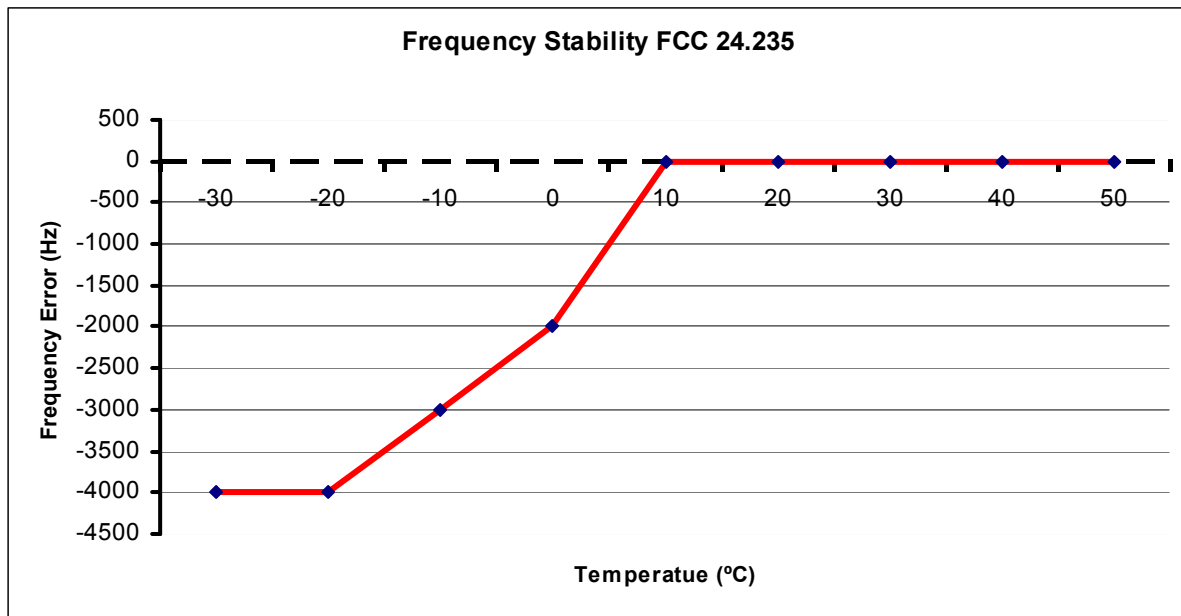
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Transmitter Frequency Stability (Temperature Variation): Section 24.235 (Continued)

Results Top Channel (1988 MHz)

| Temp (°C) | Frequency Error (Hz) | Measured Frequency (MHz) | Upper Band Edge Limit (MHz) | Margin (MHz) | Result |
|-----------|----------------------|--------------------------|-----------------------------|--------------|----------|
| -30 | -4000 | 1987.996 | 1990.0 | -2.004 | Complied |
| -20 | -4000 | 1987.996 | 1990.0 | -2.004 | Complied |
| -10 | -3000 | 1987.997 | 1990.0 | -2.003 | Complied |
| 0 | -2000 | 1987.998 | 1990.0 | -2.002 | Complied |
| 10 | 0 | 1988.000 | 1990.0 | -2.000 | Complied |
| 20 | 0 | 1988.000 | 1990.0 | -2.000 | Complied |
| 30 | 0 | 1988.000 | 1990.0 | -2.000 | Complied |
| 40 | 0 | 1988.000 | 1990.0 | -2.000 | Complied |
| 50 | 0 | 1988.000 | 1990.0 | -2.000 | Complied |

Frequency Variation From 1988 MHz



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

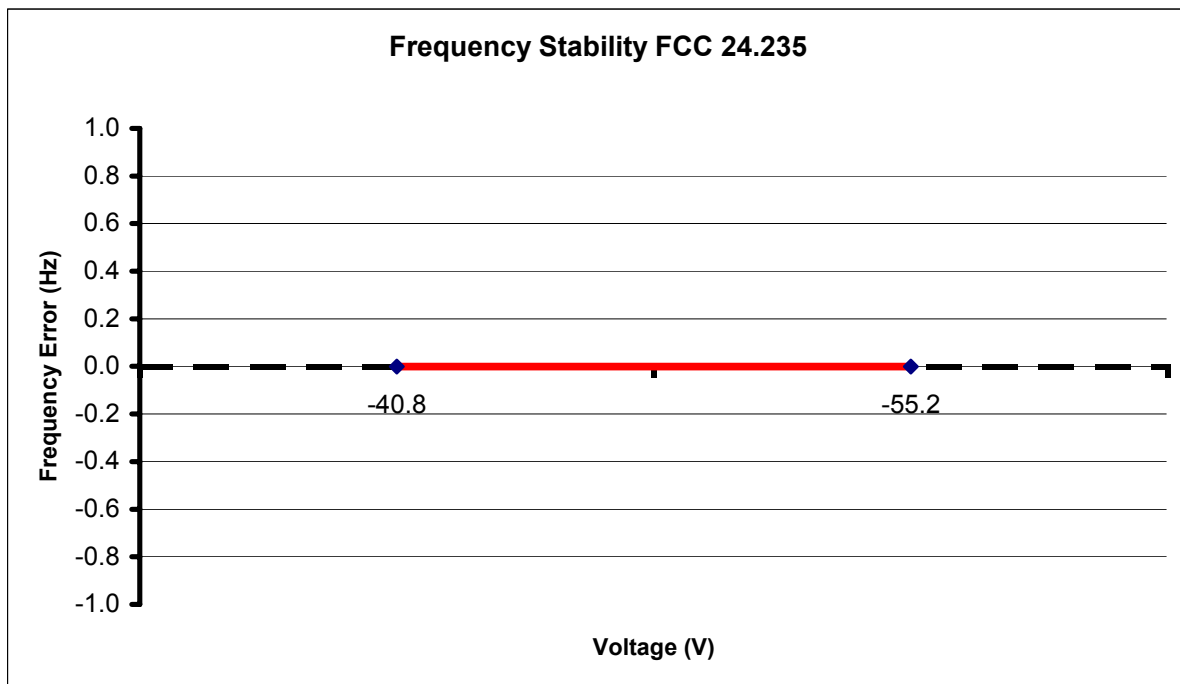
7.4.1. The EUT was configured as for frequency stability measurements as described in Section 8 of this report.

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

Results Bottom Channel (1932.0 MHz)

| Supply Voltage (V) | Frequency Error (Hz) | Measured Frequency (MHz) | Lower Band Edge Limit (MHz) | Margin (MHz) | Result |
|--------------------|----------------------|--------------------------|-----------------------------|--------------|----------|
| -40.8 | 0 | 1932.000 | 1930 | 2.000 | Complied |
| -55.2 | 0 | 1932.000 | 1930 | 2.000 | Complied |

Frequency Variation From 1932.0 MHz



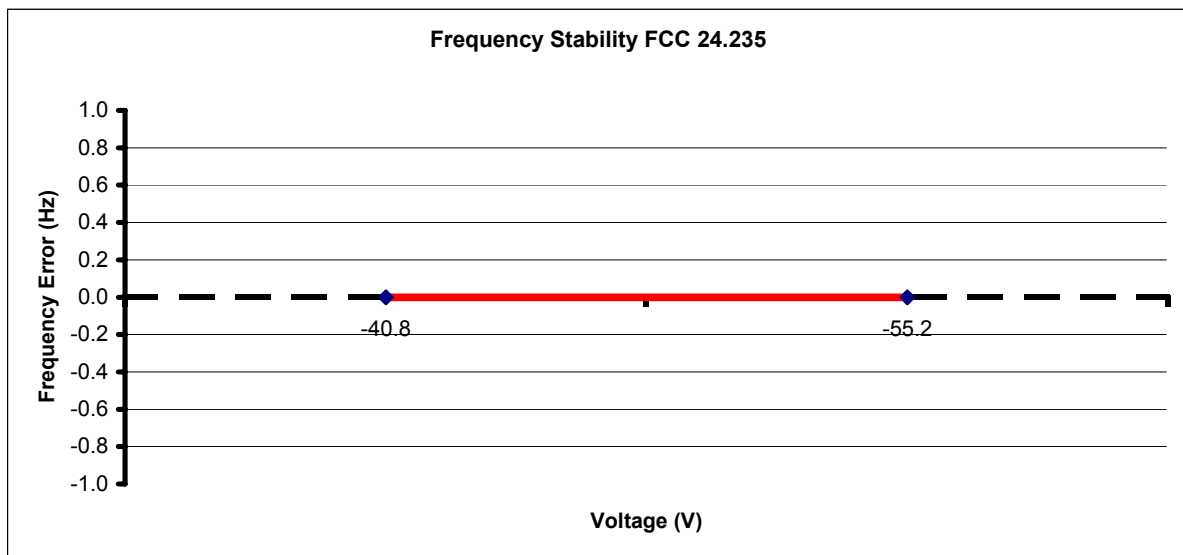
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7.5. Transmitter Frequency Stability (Voltage Variation): Section 24.235 (Continued)

Results Top Channel (1988.0 MHz)

| Supply Voltage (V) | Frequency Error (Hz) | Measured Frequency (MHz) | Lower Band Edge Limit (MHz) | Margin (MHz) | Result |
|--------------------|----------------------|--------------------------|-----------------------------|--------------|----------|
| -40.8 | 0 | 1988.000 | 1990.0 | -2.000 | Complied |
| -55.2 | 0 | 1988.000 | 1990.0 | -2.000 | Complied |

Frequency Variation From 1988.0 MHz



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7.6. Transmitter Occupied Bandwidth: Section 24.238- QAM

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.

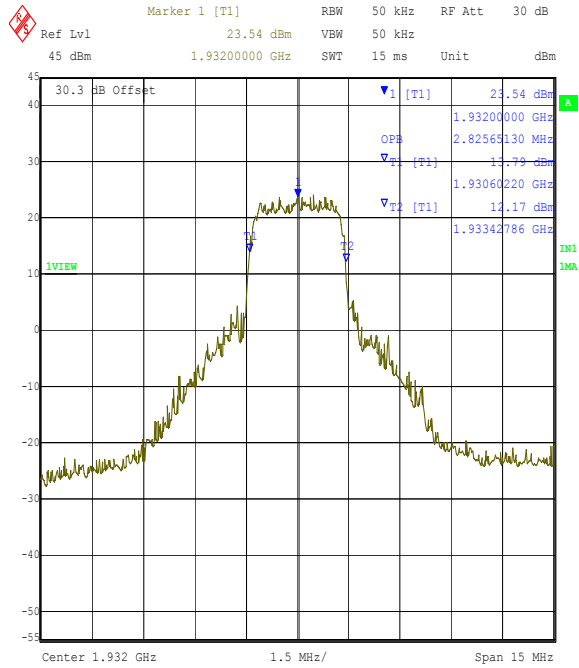
Results:

| Channel | Frequency (MHz) | Resolution Bandwidth (kHz) | Video Bandwidth (kHz) | QAM Occupied Bandwidth (MHz) | QPSK Occupied Bandwidth (MHz) |
|---------|-----------------|----------------------------|-----------------------|------------------------------|-------------------------------|
| Bottom | 1932.0 | 50.0 | 50.0 | 2.8256 | 2.8256 |
| Middle | 1960.0 | 50.0 | 50.0 | 2.8256 | 2.8557 |
| Top | 1988.00 | 50.0 | 50.0 | 2.8256 | 2.8256 |

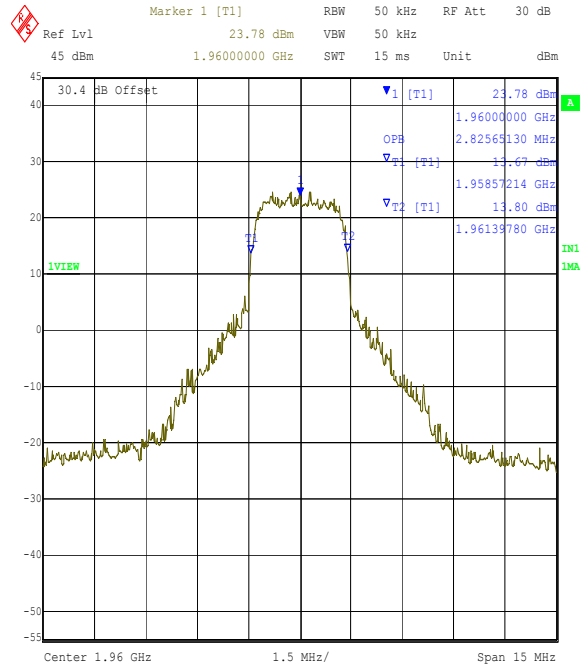
Note: The occupied bandwidth is measured using the internal OBW function of the measurement analyser. The analyser automatically configures the measurement bandwidths to make an accurate measurement. The vital data is reported in the upper right portion of the graph. See attached graphs.

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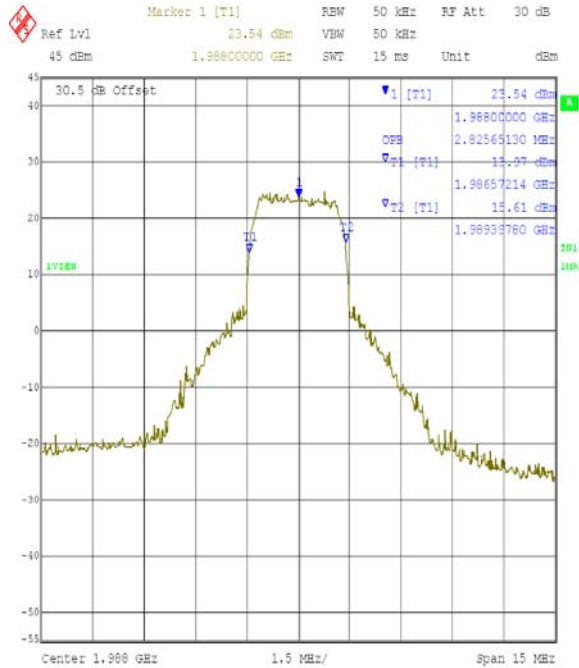
Transmitter Occupied Bandwidth: Section 24.238 (Continued) - QAM



Title: Airspan ST
Comment A: QAM CH180
Date: 3.JUN.2004 11:46:40



Title: Airspan ST
Comment A: QAM CH197
Date: 3.JUN.2004 11:17:55

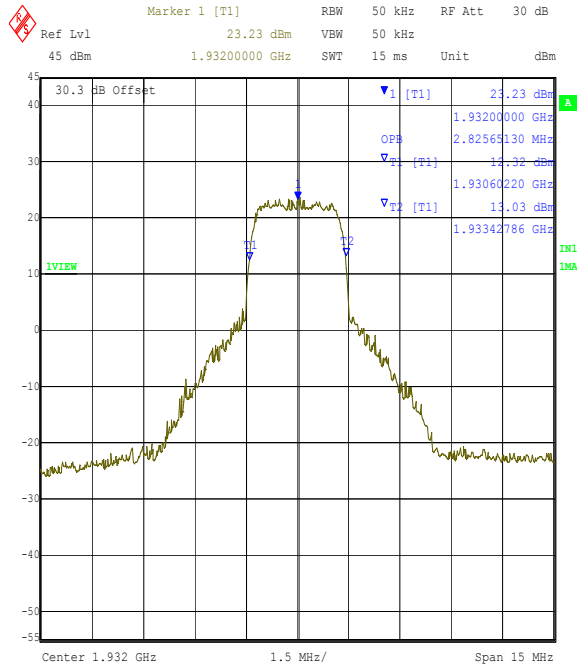


Title: Airspan ST
Comment A: QAM CH215
Date: 3.JUN.2004 12:04:07

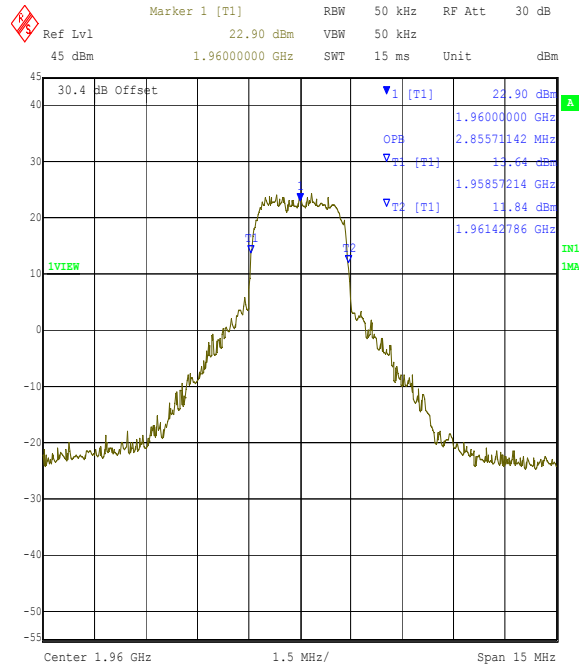
Note: The plots are all of the Central Terminal (CT) but have been labelled incorrectly as (ST).

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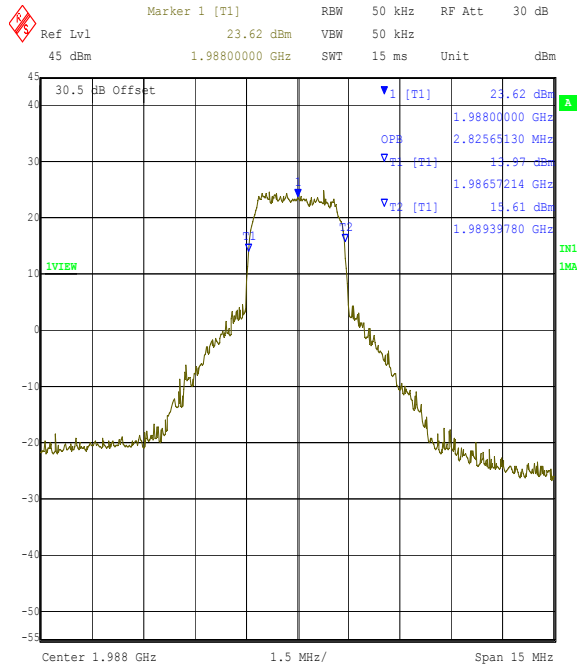
Transmitter Occupied Bandwidth: Section 24.238 (Continued) - QPSK



Title: Airspan ST
Comment A: QPSK CH180
Date: 3.JUN.2004 10:04:26



Title: Airspan ST
Comment A: QPSK CH197
Date: 3.JUN.2004 11:12:32



Title: Airspan ST
Comment A: QPSK 215
Date: 3.JUN.2004 12:16:07

Note: The plots are all of the Central Terminal (CT) but have been labelled incorrectly as (ST).

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

QAM

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.

Result: Top Channel (P1)

| Channels | Frequency (MHz) | Peak Emission Level (dBm) | Limit (dBm) | Margin (dB) | Result |
|----------|-----------------|---------------------------|-------------|-------------|----------|
| 191 | 5821.643 | -23.5 | -13.0 | 10.5 | Complied |

Result: Top Channel (P2)

| Channels | Frequency (MHz) | Peak Emission Level (dBm) | Limit (dBm) | Margin (dB) | Result |
|----------|-----------------|---------------------------|-------------|-------------|----------|
| 203 | 3920.661 | -18.6 | -13.0 | 5.6 | Complied |
| 203 | 5871.723 | -18.5 | -13.0 | 5.5 | Complied |

Result: Top Channel (P3)

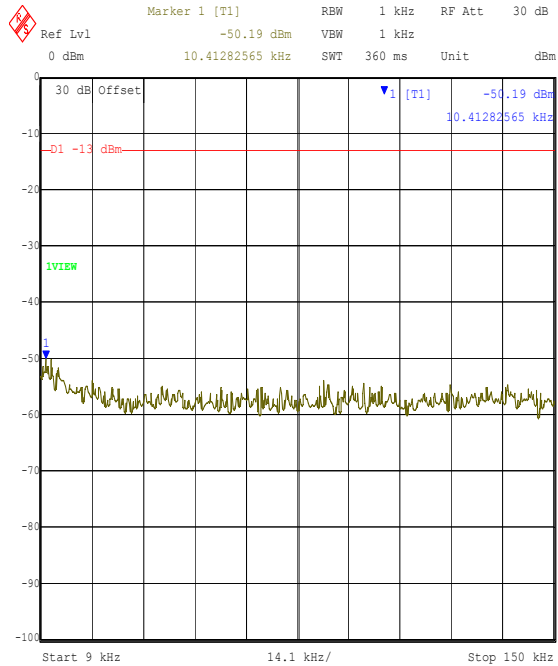
| Channels | Frequency (MHz) | Peak Emission Level (dBm) | Limit (dBm) | Margin (dB) | Result |
|----------|-----------------|---------------------------|-------------|-------------|----------|
| 215 | 3959.198 | -21.8 | -13.0 | 8.8 | Complied |
| 215 | 5931.443 | -23.0 | -13.0 | 10.0 | Complied |
| 215 | 1959.074* | -14.3 | -13.0 | 1.3 | Complied |

Note: Scans were carried out on channels 191 of P1 band, 203 of P2 band, and 215 of the P3 band. Tests were performed using QAM modulation as this was deemed worst case when comparing the occupied bandwidth, output power and due to its faster data rate.

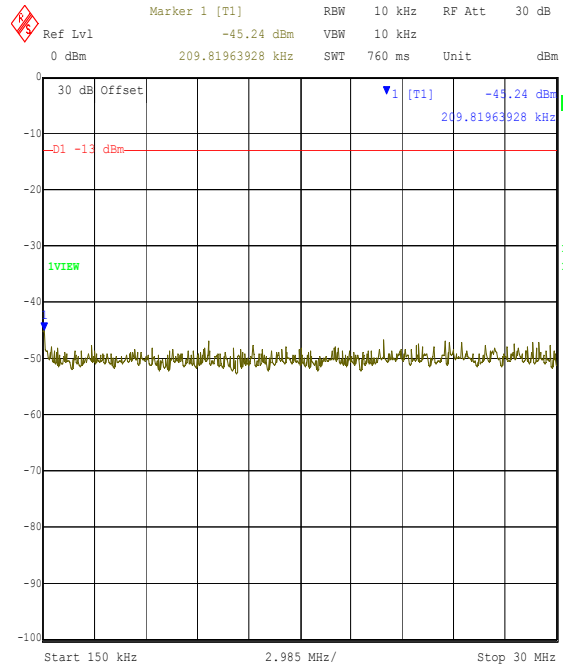
Scans were performed with the channels set to maximum power.

Test Of: Airspan Communications.
Combiner Shelf - Central Terminal
To: FCC Part 24

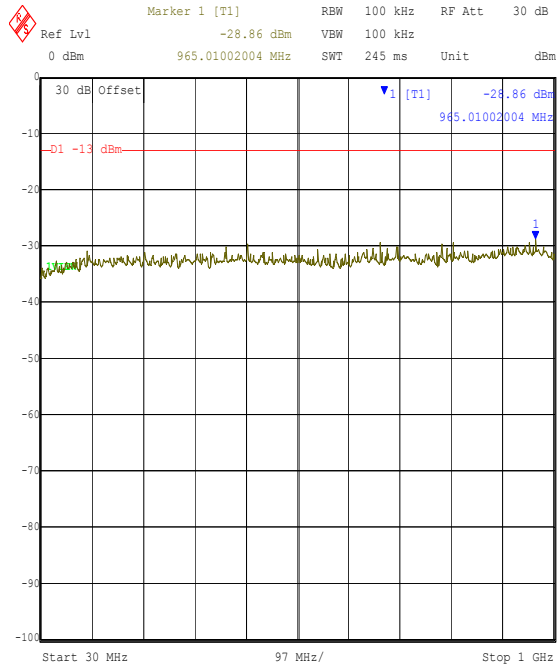
Transmitter Out of Band Conducted Emissions: Section 2.1051/24.238 (Continued)



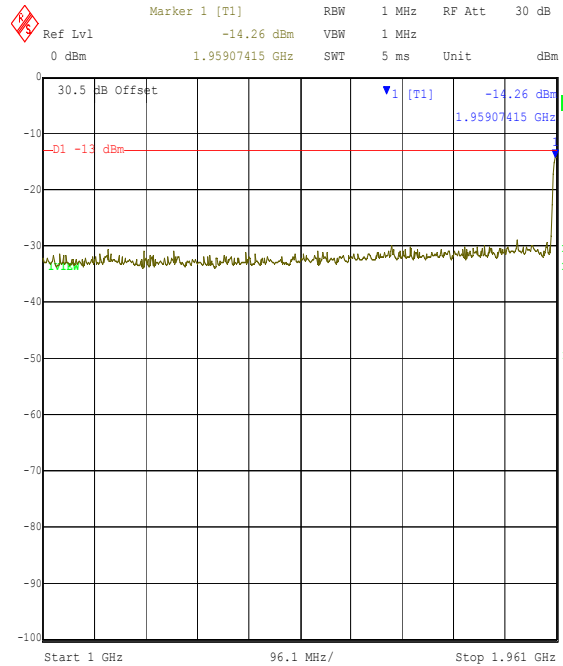
Title: AIRSPAN CT
Comment A: SPURIOUS EMISSIONS ANTENNA TERMINAL (P3)
Date: 4.JUN.2004 15:01:29



Title: AIRSPAN CT
Comment A: SPURIOUS EMISSIONS ANTENNA TERMINAL (P3)
Date: 4.JUN.2004 15:03:55



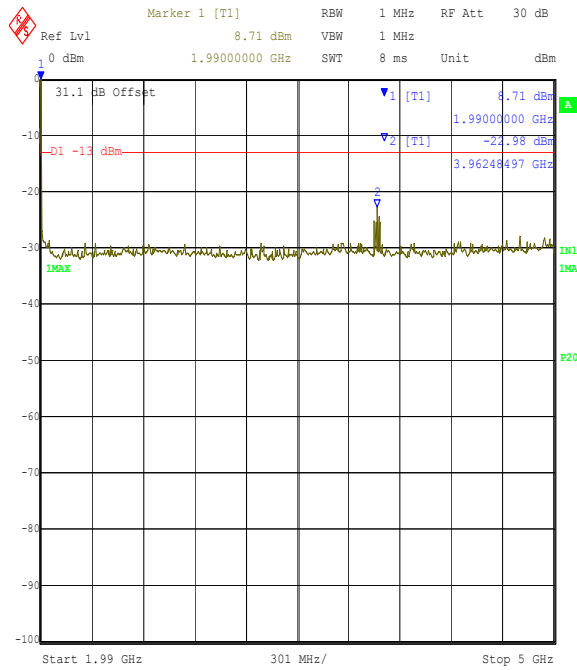
Title: AIRSPAN CT
Comment A: SPURIOUS EMISSIONS ANTENNA TERMINAL (P3)
Date: 4.JUN.2004 15:04:28



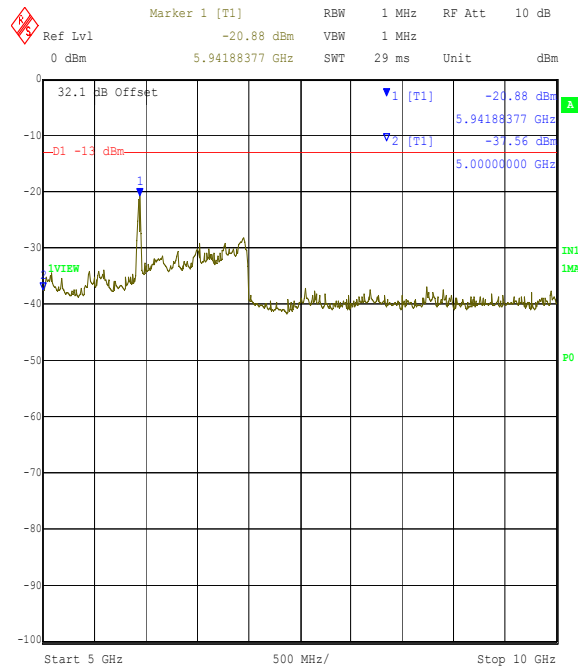
Title: AIRSPAN CT
Comment A: SPURIOUS EMISSIONS ANTENNA TERMINAL (P3)
Date: 4.JUN.2004 15:07:34

Test Of: Airspan Communications.
Combiner Shelf - Central Terminal
To: FCC Part 24

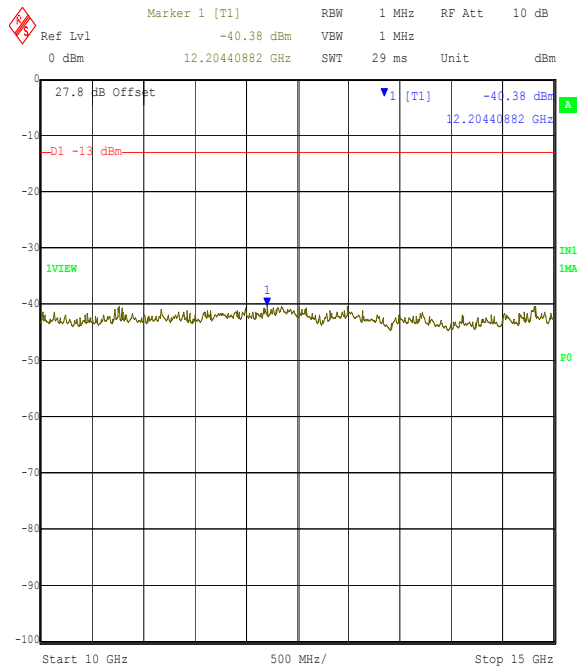
Transmitter Out of Band Conducted Emissions: Section 2.1051/24.238 (Continued)



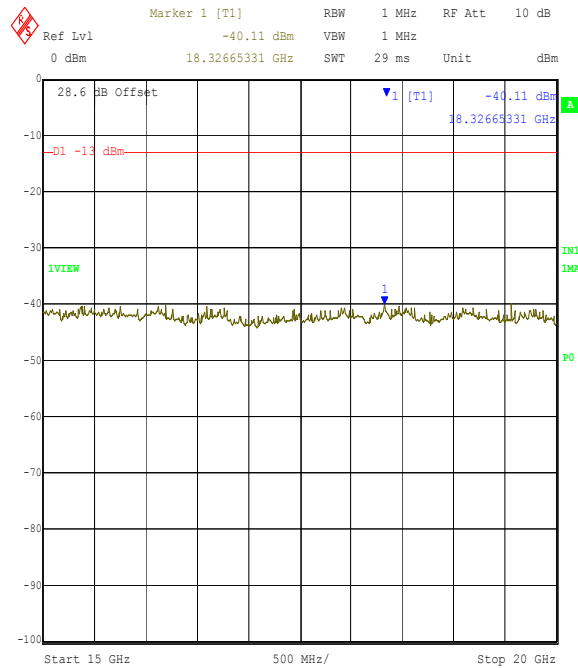
Title: AIRSPAN CT
Comment A: SPURIOUS EMISSIONS ANTENNA TERMINAL (P3)
Date: 4.JUN.2004 15:09:27



Title: AIRSPAN CT
Comment A: SPURIOUS EMISSIONS ANTENNA TERMINAL (P3)
Date: 4.JUN.2004 15:34:10



Title: AIRSPAN CT
Comment A: SPURIOUS EMISSIONS ANTENNA TERMINAL (P3)
Date: 4.JUN.2004 15:36:35



Title: AIRSPAN CT
Comment A: SPURIOUS EMISSIONS ANTENNA TERMINAL (P3)
Date: 4.JUN.2004 15:37:30

Test Of: Airspan Communications.
Combiner Shelf - Central Terminal
To: FCC Part 24

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 1927 MHz to 1928 MHz and 1928 MHz to 1929 MHz and the 2nd and 3rd 1 MHz blocks away from the adjacent 1 MHz block from 1991 MHz to 1992 MHz and 1992 MHz to 1993 MHz.

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

Result: QAM

| Channel | Band (MHz) | Channel Power (dBm) | Limit (dBm/MHz) | Margin (dB) | Result |
|---------|--------------|---------------------|-----------------|-------------|----------|
| 180 | 1927 to 1928 | -16.5 | -13.0 | 2.5 | Complied |
| 180 | 1928 to 1929 | -13.6 | -13.0 | 0.6 | Complied |
| 181 | 1927 to 1928 | -14.6 | -13.0 | 1.6 | Complied |
| 181 | 1928 to 1929 | -13.5 | -13.0 | 0.5 | Complied |
| 182 | 1927 to 1928 | -14.7 | -13.0 | 1.7 | Complied |
| 182 | 1928 to 1929 | -13.4 | -13.0 | 3.4 | Complied |
| 213 | 1991 to 1992 | -13.1 | -13.0 | 0.1 | Complied |
| 213 | 1992 to 1993 | -14.5 | -13.0 | 1.5 | Complied |
| 214 | 1991 to 1992 | -14.0 | -13.0 | 1.0 | Complied |
| 214 | 1992 to 1993 | -15.2 | -13.0 | 2.2 | Complied |
| 215 | 1991 to 1992 | -14.2 | -13.0 | 1.2 | Complied |
| 215 | 1992 to 1993 | -17.8 | -13.0 | 4.8 | Complied |

Test Of: Airspan Communications.
Combiner Shelf - Central Terminal
To: FCC Part 24

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 1927 MHz to 1928 MHz and 1928 MHz to 1929 MHz and the 2nd and 3rd 1 MHz blocks away from the adjacent 1 MHz block from 1991 MHz to 1992 MHz and 1992 MHz to 1993 MHz.

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

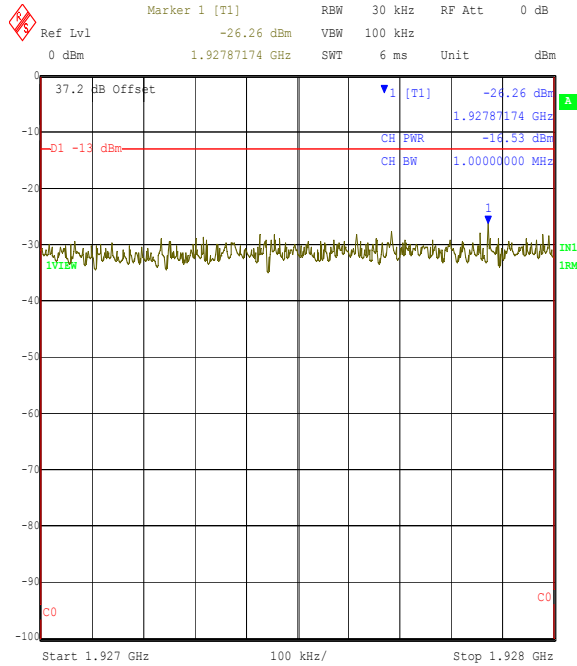
Result: QPSK

| Channel | Band (MHz) | Channel Power (dBm) | Limit (dBm/MHz) | Margin (dB) | Result |
|---------|--------------|---------------------|-----------------|-------------|----------|
| 180 | 1927 to 1928 | -16.4 | -13.0 | 3.4 | Complied |
| 180 | 1928 to 1929 | -13.6 | -13.0 | 0.6 | Complied |
| 181 | 1927 to 1928 | -14.5 | -13.0 | 1.5 | Complied |
| 181 | 1928 to 1929 | -13.4 | -13.0 | 1.4 | Complied |
| 182 | 1927 to 1928 | -14.6 | -13.0 | 1.6 | Complied |
| 182 | 1928 to 1929 | -13.4 | -13.0 | 0.4 | Complied |
| 213 | 1991 to 1992 | -13.1 | -13.0 | 0.1 | Complied |
| 213 | 1992 to 1993 | -14.5 | -13.0 | 1.5 | Complied |
| 214 | 1991 to 1992 | -13.9 | -13.0 | 0.9 | Complied |
| 214 | 1992 to 1993 | -15.4 | -13.0 | 2.4 | Complied |
| 215 | 1991 to 1992 | -14.1 | -13.0 | 1.1 | Complied |
| 215 | 1992 to 1993 | -17.7 | -13.0 | 3.7 | Complied |

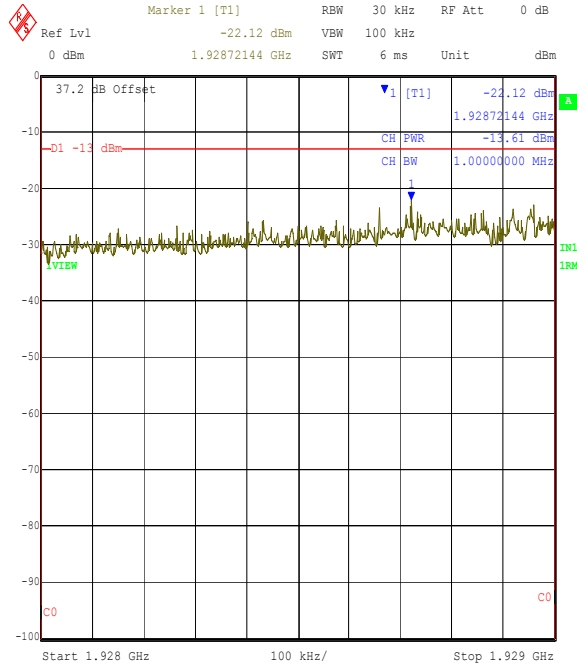
Note: The commissioning level is adjusted to varying (lower) levels for channels near bandedge (see section 7.2), and final product will be marketed with the lower levels. The channel exhibiting worst case conducted level for 1 MHz strip in accordance with commissioned power level was used.

Test Of: Airspan Communications.
Combiner Shelf - Central Terminal
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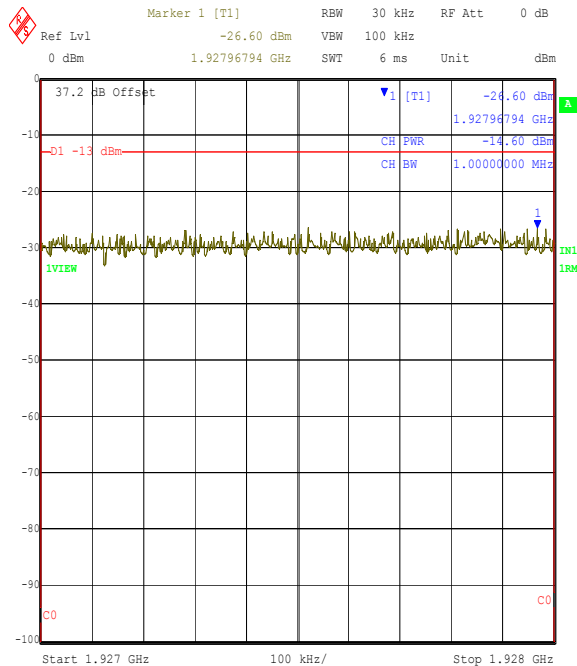
Transmitter Out of Band Conducted Emissions: Section 2.1051/24.238 (Continued) - QAM



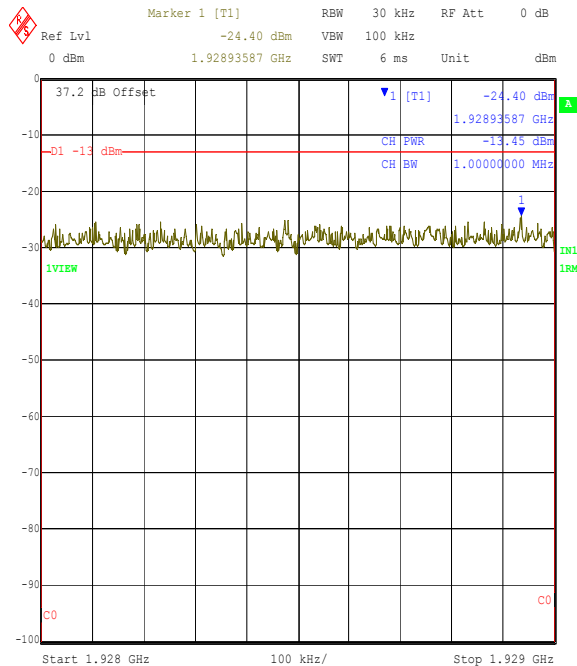
Title: Airspan EUT: CT. P1. FCC P24. Conducted Lower Band Strip.
Comment A: 46299JD01 Ch 180. Mod: QAM. Power: 15.5 dBm per user
Date: 7.JUN.2004 13:04:54



Title: Airspan EUT: CT. P1. FCC P24. Conducted Lower Band Strip.
Comment A: 46299JD01 Ch 180. Mod: QAM. Power: 15.5 dBm per user
Date: 7.JUN.2004 13:04:32



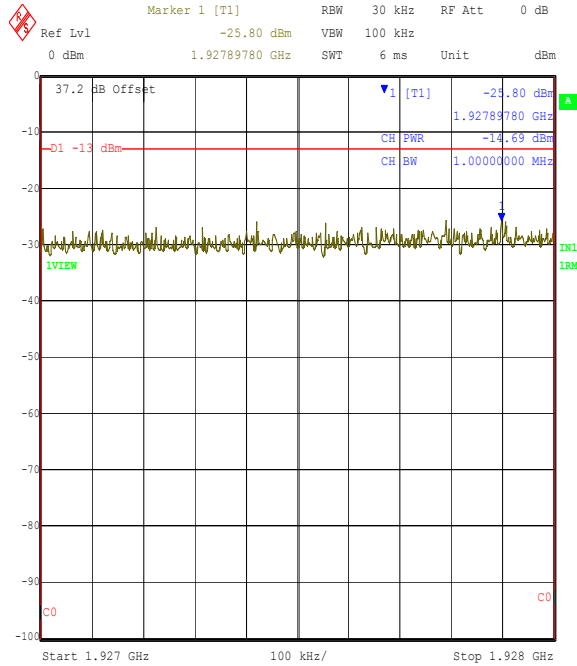
Title: Airspan EUT: CT. P1. FCC P24. Conducted Lower Band Strip.
Comment A: 46299JD01 Ch 181. Mod: QAM. Power: 19 dBm per user
Date: 7.JUN.2004 12:52:27



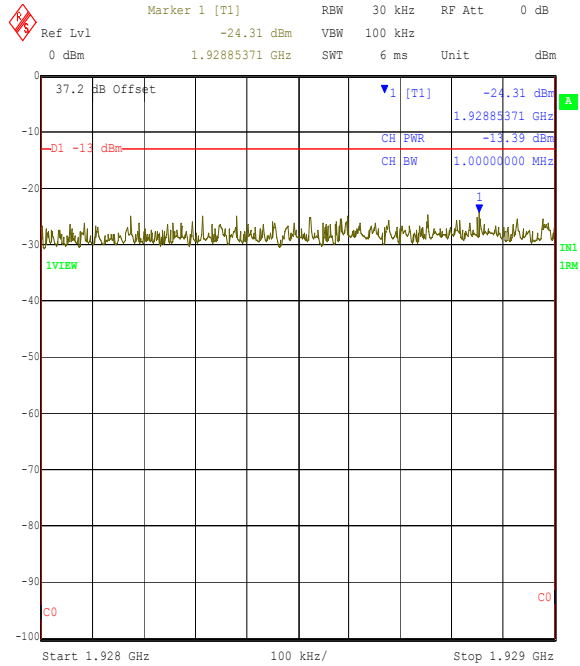
Title: Airspan EUT: CT. P1. FCC P24. Conducted Lower Band Strip.
Comment A: 46299JD01 Ch 181. Mod: QAM. Power: 19 dBm per user
Date: 7.JUN.2004 12:52:03

Test Of: Airspan Communications.
Combiner Shelf - Central Terminal
To: FCC Part 24

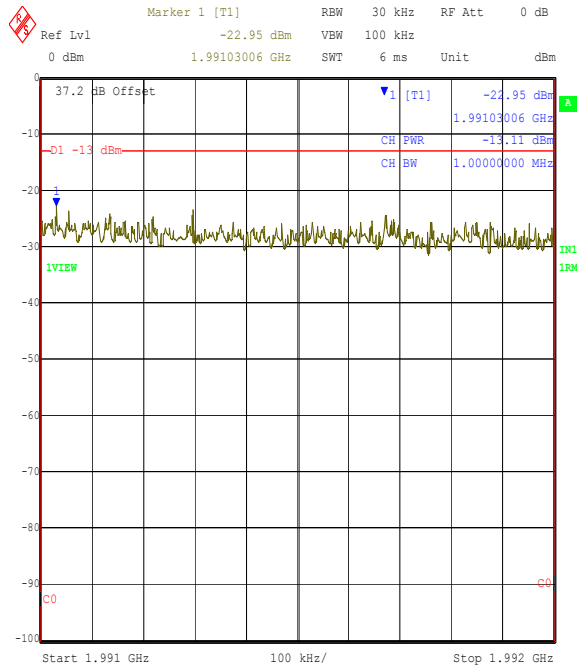
Transmitter Out of Band Conducted Emissions: Section 2.1051/24.238 (Continued) - QAM



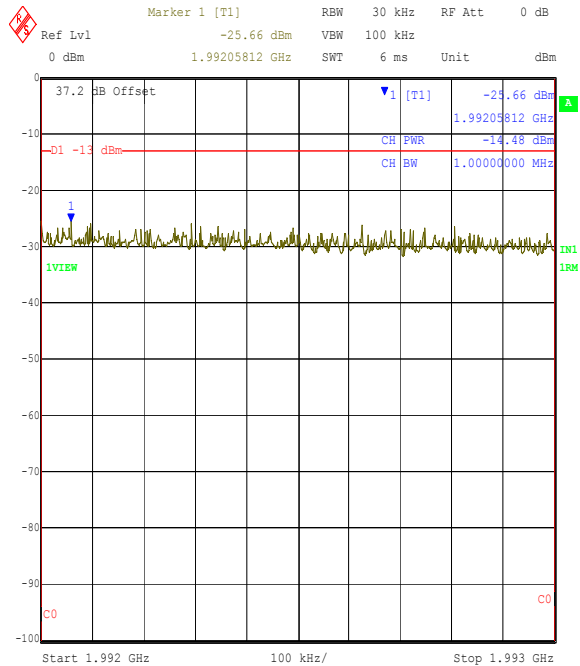
Title: Airspan EUT: CT. P1. FCC P24. Conducted Lower Band Strip.
Comment A: 46299JD01 Ch 182. Mod: QAM. Power: Max
Date: 7.JUN.2004 12:44:04



Title: Airspan EUT: CT. P1. FCC P24. Conducted Lower Band Strip.
Comment A: 46299JD01 Ch 182. Mod: QAM. Power: Max
Date: 7.JUN.2004 12:43:39



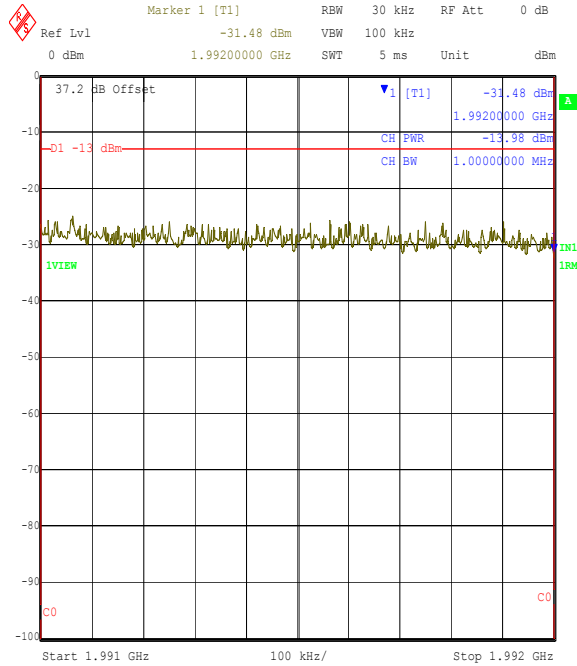
Title: Airspan EUT: CT. P3. FCC P24. Conducted Upper Band Strip.
Comment A: 46299JD01 Ch 213. Mod: QAM. Power: Max
Date: 7.JUN.2004 12:28:02



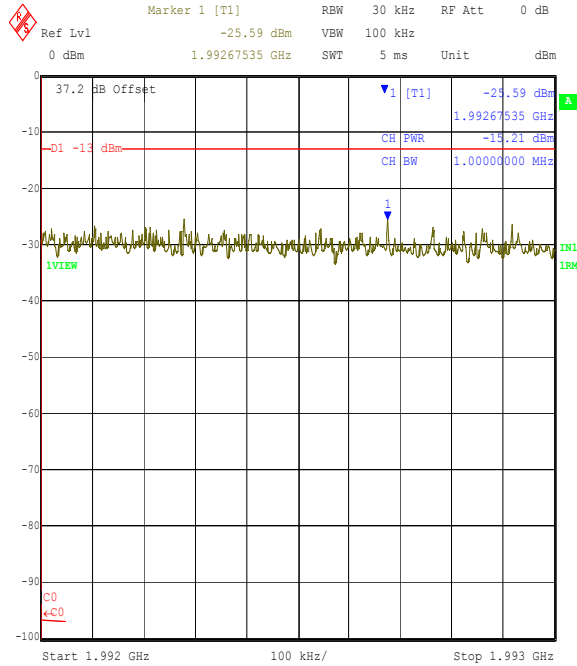
Title: Airspan EUT: CT. P3. FCC P24. Conducted Upper Band Strip.
Comment A: 46299JD01 Ch 213. Mod: QAM. Power: Max
Date: 7.JUN.2004 12:28:33

Test Of: Airspan Communications.
Combiner Shelf - Central Terminal
To: FCC Part 24

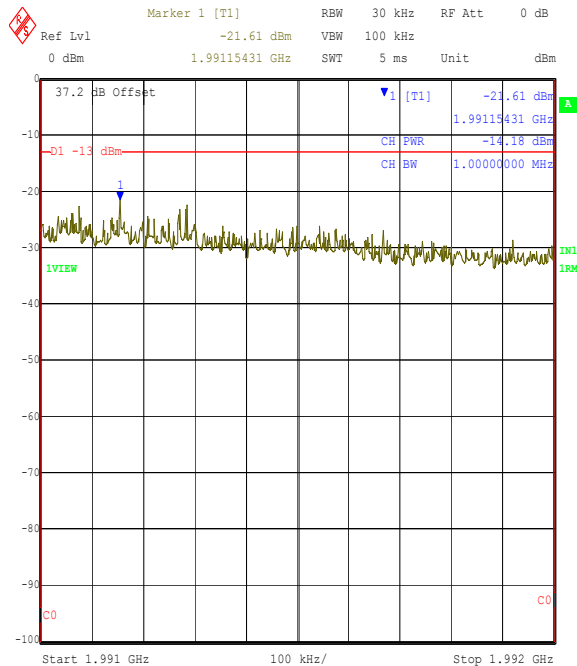
Transmitter Out of Band Conducted Emissions: Section 2.1051/24.238 (Continued) - QAM



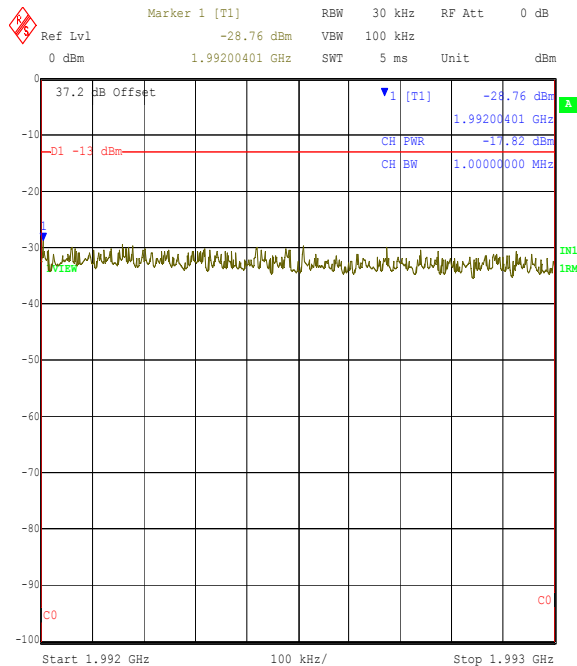
Title: Airspan EUT: CT. P3. FCC P24. Conducted Upper Band Strip.
Comment A: 46299JD01 Ch 214. Mod: QAM. Power:22.4 dBm
Date: 7.JUN.2004 12:01:58



Title: Airspan EUT: CT. P3. FCC P24. Conducted Upper Band Strip.
Comment A: 46299JD01 Ch 214. Mod: QAM. Power:22.4 dBm
Date: 7.JUN.2004 12:02:20



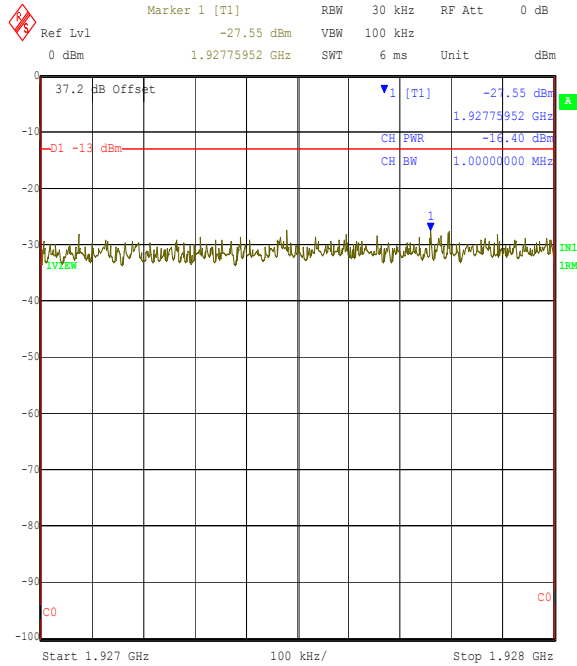
Title: Airspan EUT: CT. P3. FCC P24. Conducted Upper Band Strip.
Comment A: 46299JD01 Ch 215. Mod: QAM. Power: 16 dBm per user.
Date: 7.JUN.2004 12:13:04



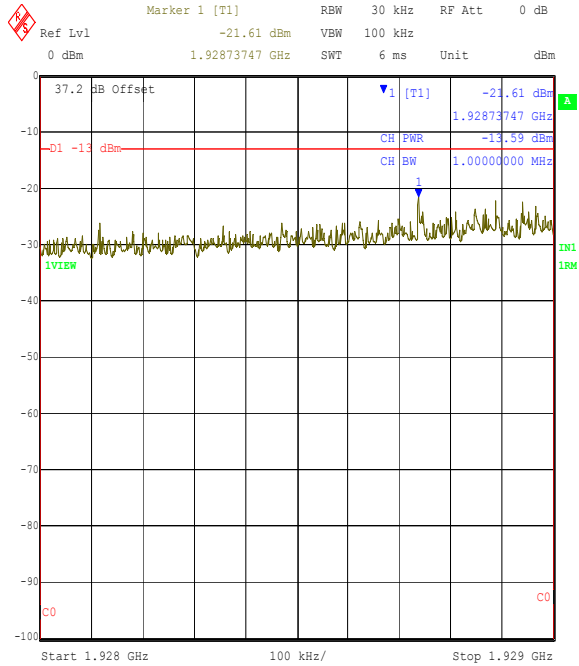
Title: Airspan EUT: CT. P3. FCC P24. Conducted Upper Band Strip.
Comment A: 46299JD01 Ch 215. Mod: QAM. Power: 16 dBm per user.
Date: 7.JUN.2004 12:14:45

Test Of: Airspan Communications.
Combiner Shelf - Central Terminal
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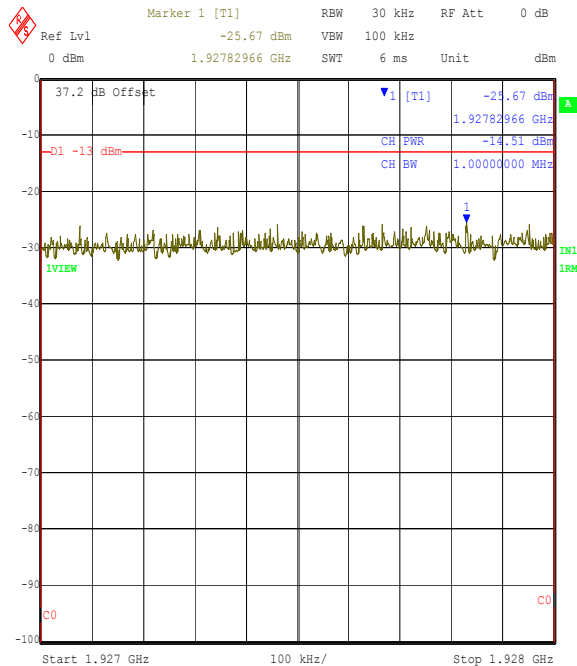
Transmitter Out of Band Conducted Emissions: Section 2.1051/24.238 (Continued) - QPSK



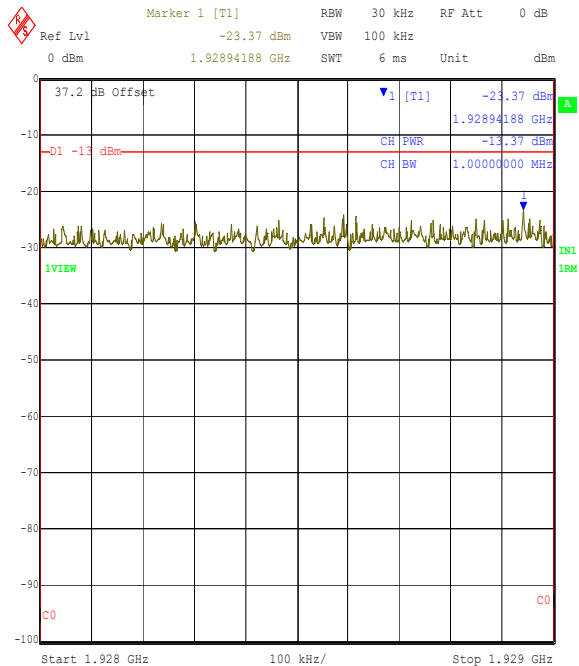
Title: Airspan EUT: CT. P1. FCC P24. Conducted Lower Band Strip.
Comment A: 46299JD01 Ch 180. Mod: QPSK. Power: 15.5 dBm per user
Date: 7.JUN.2004 13:05:25



Title: Airspan EUT: CT. P1. FCC P24. Conducted Lower Band Strip.
Comment A: 46299JD01 Ch 180. Mod: QPSK. Power: 15.5 dBm per user
Date: 7.JUN.2004 13:05:53



Title: Airspan EUT: CT. P1. FCC P24. Conducted Lower Band Strip.
Comment A: 46299JD01 Ch 181. Mod: QPSK. Power: 19 dBm per user
Date: 7.JUN.2004 12:53:02



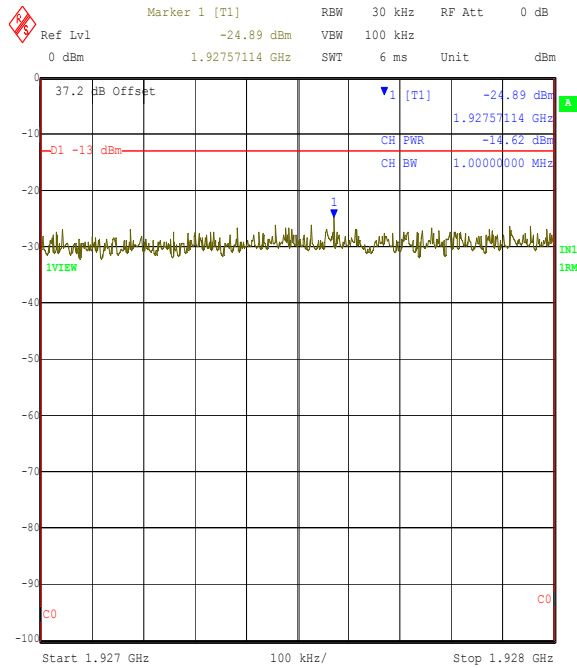
Title: Airspan EUT: CT. P1. FCC P24. Conducted Lower Band Strip.
Comment A: 46299JD01 Ch 181. Mod: QPSK. Power: 19 dBm per user
Date: 7.JUN.2004 12:53:27

Operations Department

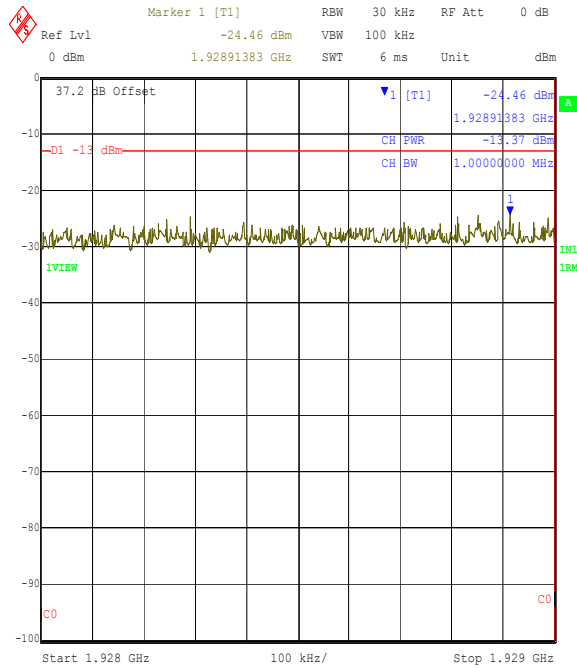
Test Of: Airspan Communications.
Combiner Shelf - Central Terminal

To: FCC Part 24

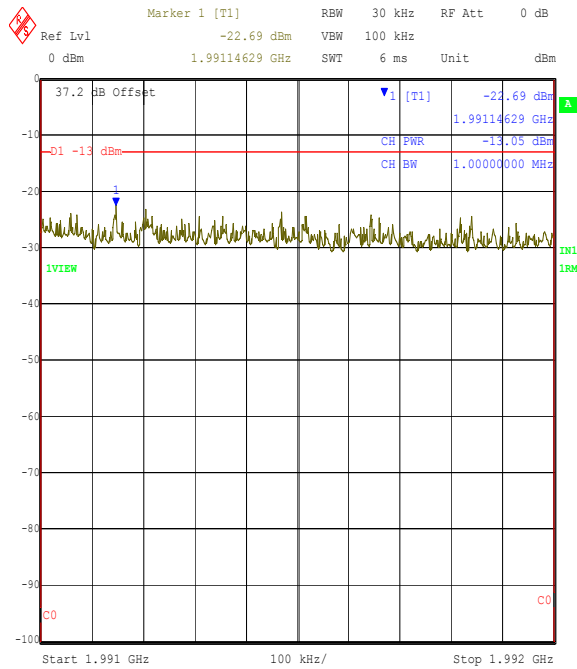
Transmitter Out of Band Conducted Emissions: Section 2.1051/24.238 (Continued) - QPSK



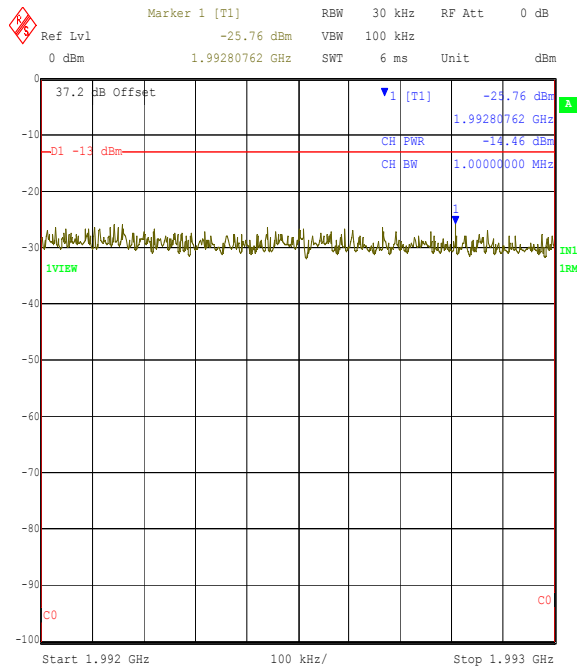
Title: Airspan EUT: CT. P1. FCC P24. Conducted Lower Band Strip.
Comment A: 46299JD01 Ch 182. Mod: QPSK. Power: Max
Date: 7.JUN.2004 12:44:42



Title: Airspan EUT: CT. P1. FCC P24. Conducted Lower Band Strip.
Comment A: 46299JD01 Ch 182. Mod: QPSK. Power: Max
Date: 7.JUN.2004 12:45:09



Title: Airspan EUT: CT. P3. FCC P24. Conducted Upper Band Strip.
Comment A: 46299JD01 Ch 213. Mod: QPSK. Power: Max
Date: 7.JUN.2004 12:29:37



Title: Airspan EUT: CT. P3. FCC P24. Conducted Upper Band Strip.
Comment A: 46299JD01 Ch 213. Mod: QPSK. Power: Max
Date: 7.JUN.2004 12:29:05

Test Of: Airspan Communications.
Combiner Shelf - Central Terminal
To: FCC Part 24

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.

7.8.3. In order for the EUT to meet the band edge requirements, the following channels needed to have their powers reduced – 180, 181, 214, 215. See accompanying **table (1a)** for corrected commissioning levels.

Results: QAM

Bottom Band Edge

| Channel | Frequency (MHz) | Peak Emission Level (dBm) | Limit (dBm) | Margin (dB) | Result |
|---------|-----------------|---------------------------|-------------|-------------|----------|
| 180 | 1930 | -17.6 | -13.0 | 4.6 | Complied |
| 181 | 1930 | -17.3 | -13.0 | 4.3 | Complied |
| 182 | 1930 | -25.9 | -13.0 | 12.9 | Complied |

Top Band Edge

| Channel | Frequency (MHz) | Peak Emission Level (dBm) | Limit (dBm) | Margin (dB) | Result |
|---------|-----------------|---------------------------|-------------|-------------|----------|
| 213 | 1990 | -24.0 | -13.0 | 11.0 | Complied |
| 214 | 1990 | -19.9 | -13.0 | 6.9 | Complied |
| 215 | 1990 | -15.1 | -13.0 | 2.1 | Complied |

Results: QPSK

Bottom Band Edge

| Channel | Frequency (MHz) | Peak Emission Level (dBm) | Limit (dBm) | Margin (dB) | Result |
|---------|-----------------|---------------------------|-------------|-------------|----------|
| 180 | 1930 | -19.3 | -13.0 | 6.3 | Complied |
| 181 | 1930 | -17.6 | -13.0 | 4.6 | Complied |
| 182 | 1930 | -26.2 | -13.0 | 13.2 | Complied |

Top Band Edge

| Channel | Frequency (MHz) | Peak Emission Level (dBm) | Limit (dBm) | Margin (dB) | Result |
|---------|-----------------|---------------------------|-------------|-------------|----------|
| 213 | 1990 | -25.2 | -13.0 | 12.2 | Complied |
| 214 | 1990 | -16.4 | -13.0 | 3.4 | Complied |
| 215 | 1990 | -14.7 | -13.0 | 1.7 | Complied |

Test Of: Airspan Communications.
Combiner Shelf - Central Terminal
To: FCC Part 24

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

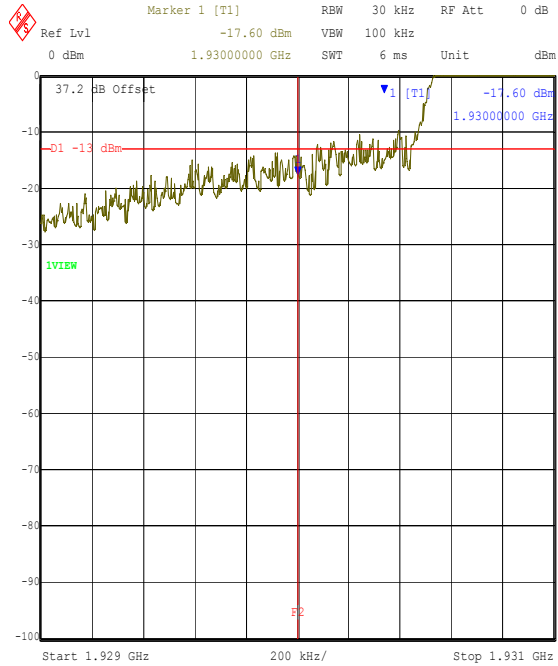
Commissioning level set for channels at edge of band and 1MHz strip as declared by customer will be as follows:

Table (1a) – Commissioning power levels

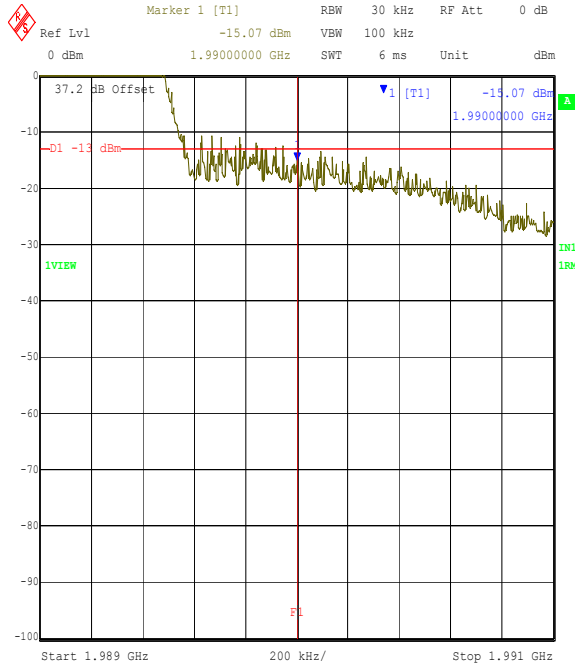
| Channel | Modulation | Commissioning Level (dBm) |
|---------|------------|---------------------------|
| 180 | QPSK | 15.5 |
| 180 | QAM | 15.5 |
| 181 | QPSK | 19.0 |
| 181 | QAM | 19.0 |
| 182 | QPSK | 21.0 |
| 182 | QAM | 21.0 |
| 213 | QPSK | 21.0 |
| 213 | QAM | 21.0 |
| 214 | QPSK | 19.0 |
| 214 | QAM | 19.0 |
| 215 | QPSK | 16.0 |
| 215 | QAM | 16.0 |

Test Of: Airspan Communications.
Combiner Shelf - Central Terminal
To: FCC Part 24

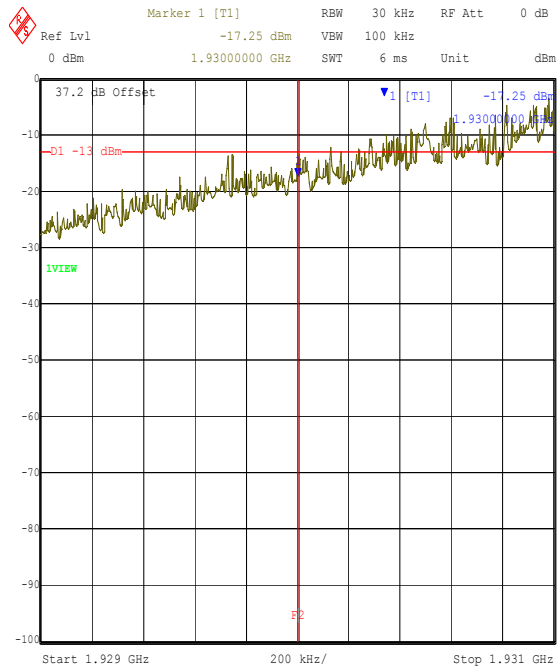
Transmitter Conducted Emissions At Band Edges: Section 2.1051/24.238 (Continued)
- QAM



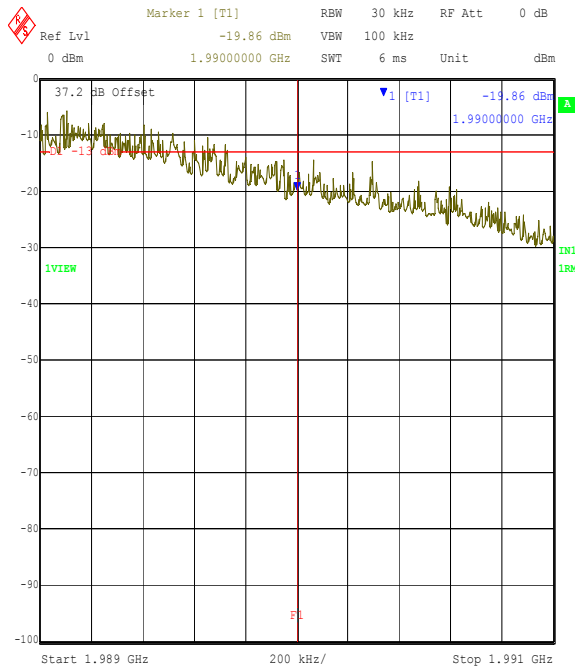
Title: Airspan EUT: CT. P1. FCC P24. Conducted Lower Band Edge.
Comment A: 46299JD01 Ch 180. Mod: QAM. Power: 15.5 dBm per user
Date: 7.JUN.2004 13:03:22



Title: Airspan EUT: CT. P3. FCC P24. Conducted Upper Band Edge.
Comment A: 46299JD01 Ch 215. Mod: QAM. Power: 16 dBm per user.
Date: 7.JUN.2004 12:09:18



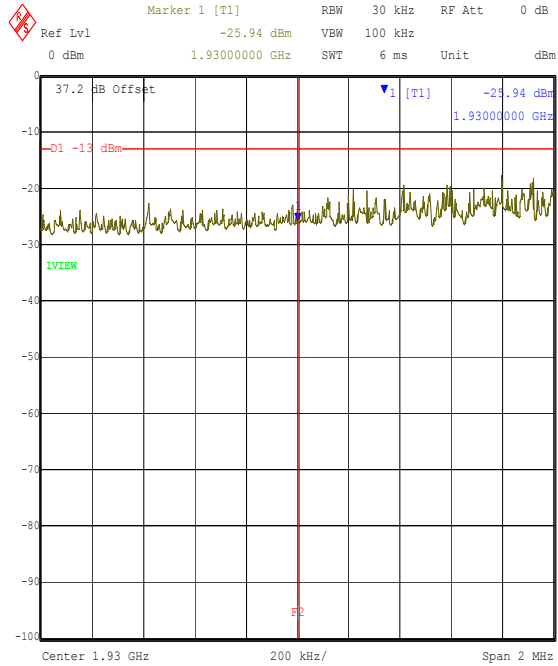
Title: Airspan EUT: CT. P1. FCC P24. Conducted Lower Band Edge.
Comment A: 46299JD01 Ch 181. Mod: QAM. Power: 19 dBm per user
Date: 7.JUN.2004 12:51:12



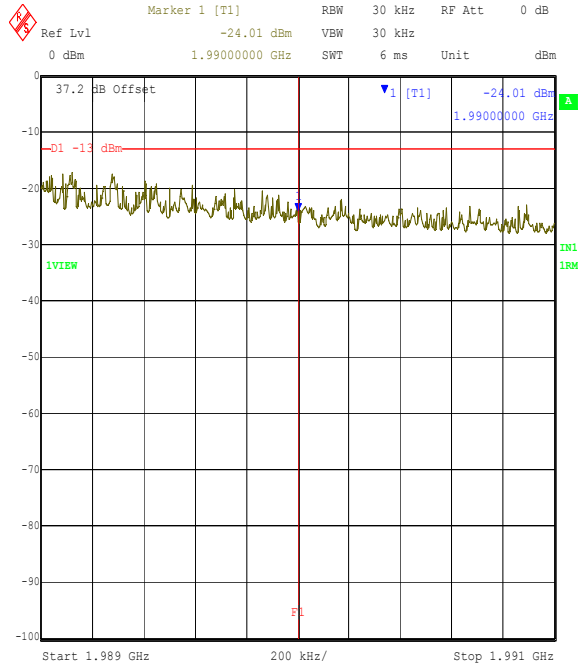
Title: Airspan EUT: CT. P3. FCC P24. Conducted Upper Band Edge.
Comment A: 46299JD01 Ch 214. Mod: QAM. Power: 19 dBm per user.
Date: 7.JUN.2004 12:10:27

Test Of: Airspan Communications.
Combiner Shelf - Central Terminal
To: FCC Part 24

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



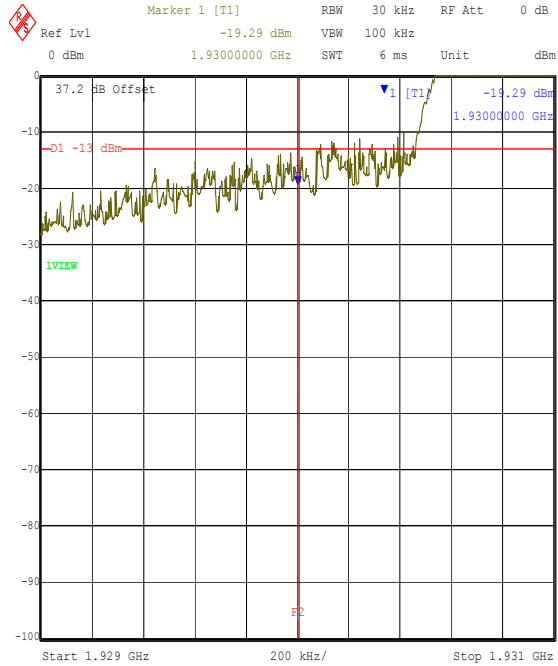
Title: Airspan EUT: CT. P1. FCC P24. Conducted Lower Band Edge.
Comment A: 46299JD01 Ch 182. Mod: QAM. Power: Max
Date: 7.JUN.2004 12:42:47



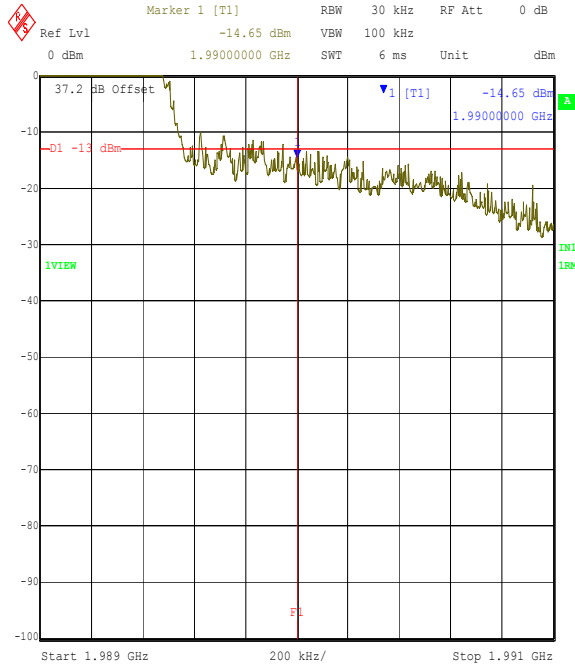
Title: Airspan EUT: CT. P3. FCC P24. Conducted Upper Band Edge.
Comment A: 46299JD01 Ch 213. Mod: QAM. Power: Max
Date: 7.JUN.2004 12:27:02

Test Of: Airspan Communications.
Combiner Shelf - Central Terminal
To: FCC Part 24

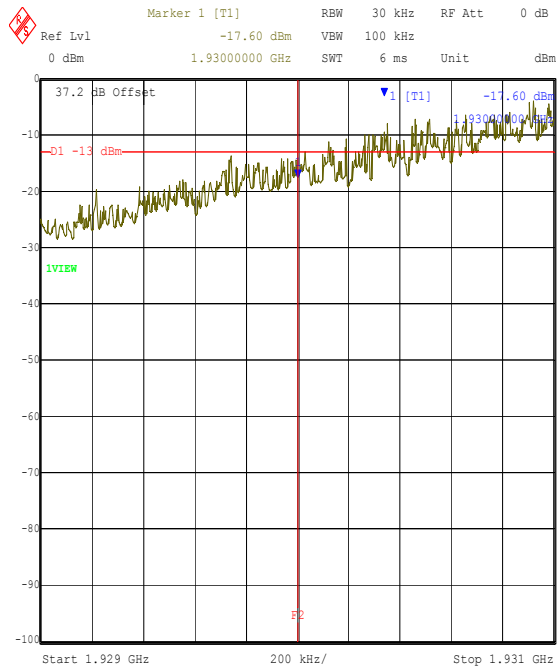
Transmitter Conducted Emissions At Band Edges: Section 2.1051/24.238 (Continued)
- QPSK



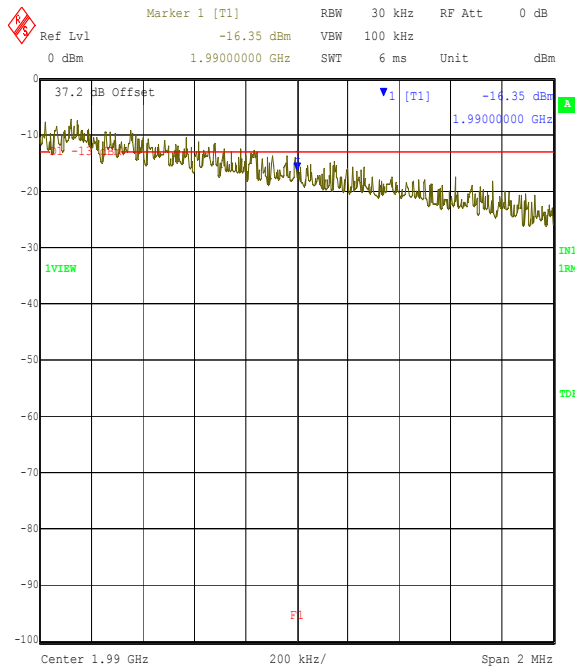
Title: Airspan EUT: CT. P1. FCC P24. Conducted Lower Band Edge.
Comment A: 46299JD01 Ch 180. Mod: QPSK. Power: 15.5 dBm per user
Date: 7.JUN.2004 13:02:38



Title: Airspan EUT: CT. P3. FCC P24. Conducted Upper Band Edge.
Comment A: 46299JD01 Ch 215. Mod: QPSK. Power: 16 dBm per user.
Date: 7.JUN.2004 12:07:49



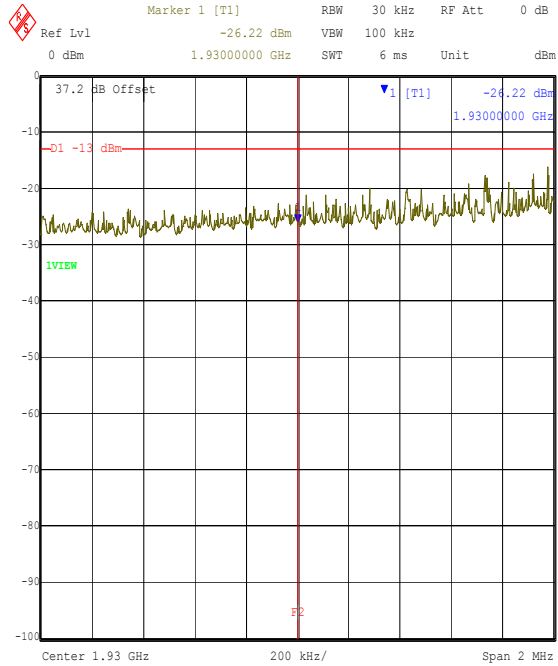
Title: Airspan EUT: CT. P1. FCC P24. Conducted Lower Band Edge.
Comment A: 46299JD01 Ch 181. Mod: QPSK. Power: 19 dBm per user
Date: 7.JUN.2004 12:50:39



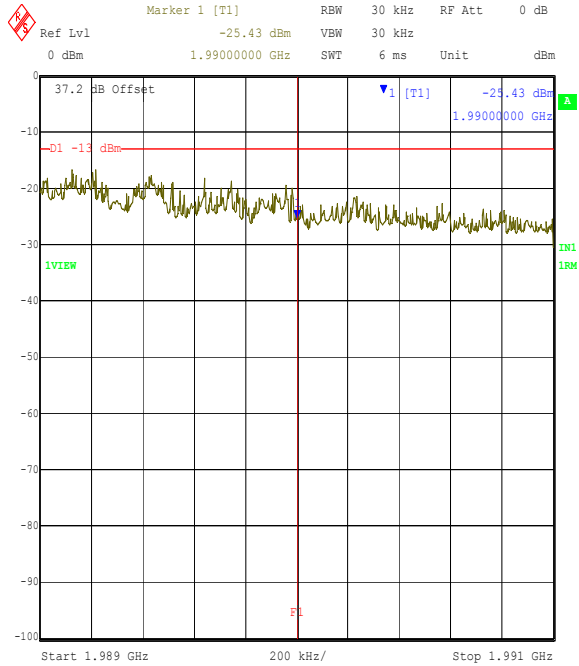
Title: Airspan EUT: CT. P3. FCC P24. Conducted Upper Band Edge.
Comment A: 46299JD01 Ch 214. Mod: QPSK. Power: 19dBm per user.
Date: 7.JUN.2004 12:12:46

Test Of: Airspan Communications.
Combiner Shelf - Central Terminal
To: FCC Part 24

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



Title: Airspan EUT: CT. P1. FCC P24. Conducted Lower Band Edge.
Comment A: 46299JD01 Ch 182. Mod: QPSK. Power: Max
Date: 7.JUN.2004 12:42:09



Title: Airspan EUT: CT. P3. FCC P24. Conducted Upper Band Edge.
Comment A: 46299JD01 Ch 213. Mod: QPSK. Power: Max
Date: 7.JUN.2004 12:26:25

Test Of: Airspan Communications.
Combiner Shelf - Central Terminal
To: FCC Part 24

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

- QAM

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

7.9.2. The EUT was configured transmit at full power to exhibit worse case emissions on channels 180, 191, 204, 215, in order to test entire frequency range.

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

Result: Bottom Band

| Frequency (MHz) | Peak Emission Level (dBm) | Limit (dBm) | Margin (dB) | Result |
|-----------------|---------------------------|-------------|-------------|----------|
| 800.000 | -37.3 | -13.0 | 24.3 | Complied |
| 5796.870 | -16.2 | -13.0 | 3.2 | Complied |

Result: Middle Band

| Frequency (MHz) | Peak Emission Level (dBm) | Limit (dBm) | Margin (dB) | Result |
|-----------------|---------------------------|-------------|-------------|----------|
| 5843.940 | -25.2 | -13.0 | 12.2 | Complied |
| 5914.680 | -24.2 | -13.0 | 11.2 | Complied |

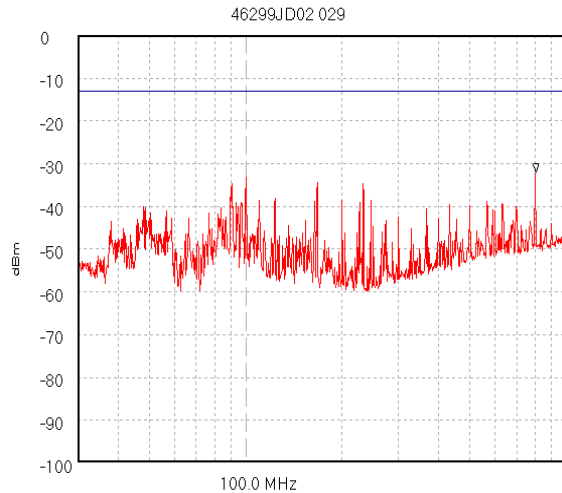
Result: Top Band

| Frequency (MHz) | Peak Emission Level (dBm) | Limit (dBm) | Margin (dB) | Result |
|-----------------|---------------------------|-------------|-------------|----------|
| 5963.800 | -27.9 | -13.0 | 14.9 | Complied |

Tests were performed using QAM modulation as this was deemed worst case when comparing the occupied bandwidth, output power and due to its faster data rate.

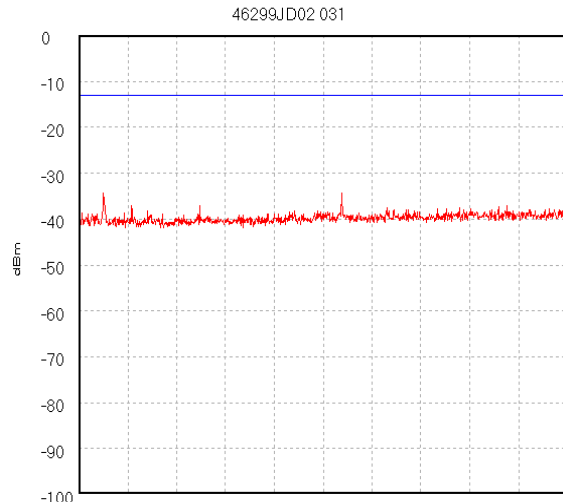
Test Of: Airspan Communications.
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Transmitter Out of Band Radiated Emissions: Section 2.1053/24.238 (Continued)



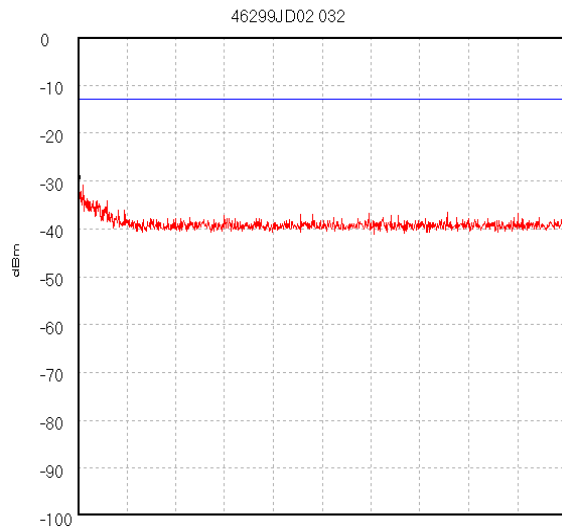
Trace 1
-13 dBm

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 803.976 MHz, -32.09 dBm
Display Line: -13 dBm; ; Limit Test Passed
Transducer Factors: A1037
14/06/2004 15:54:25



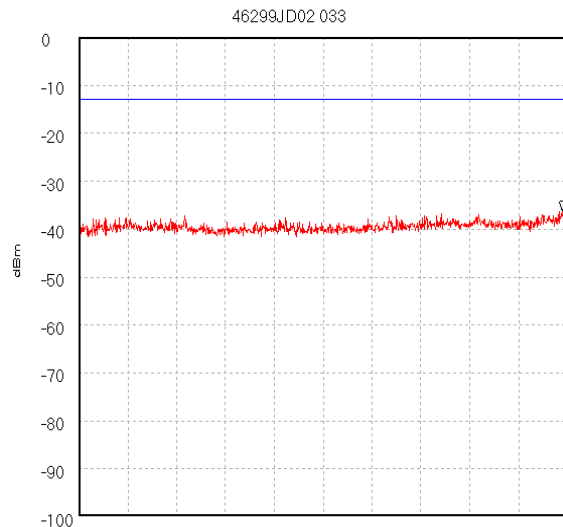
Trace 1
-13 dBm
1.93 GHz

Start 1.0 GHz; Stop 1.93 GHz
Ref 0 dBm; Ref Offset 11.8 dB; 10 dB/div
RBW 689.655 kHz; VBW 1.0 MHz; Att 10 dB; Swp 20.0 mS
Peak 1.93 GHz, -26.07 dBm
Display Line: -13 dBm; ; Limit Test Passed
14/06/2004 16:17:55



Trace 1
-13 dBm

Start 1.99 GHz; Stop 2.0 GHz
Ref 0 dBm; Ref Offset 11.8 dB; 10 dB/div
RBW 689.655 kHz; VBW 1.0 MHz; Att 10 dB; Swp 20.0 mS
Peak 1.99 GHz, -30.87 dBm
Display Line: -13 dBm; ; Limit Test Passed
14/06/2004 16:22:30

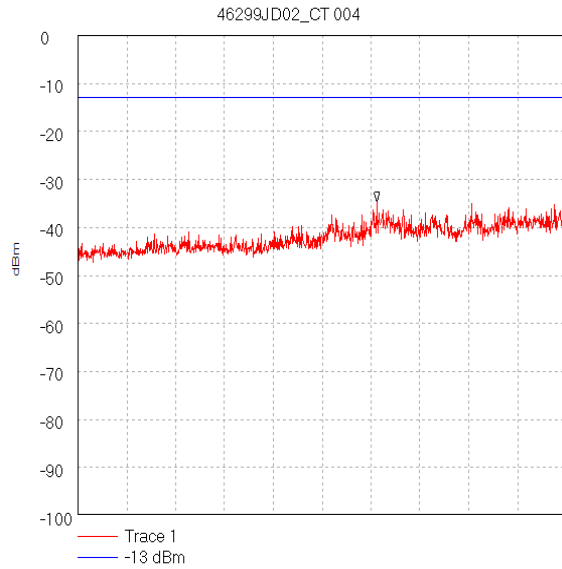


Trace 1
-13 dBm

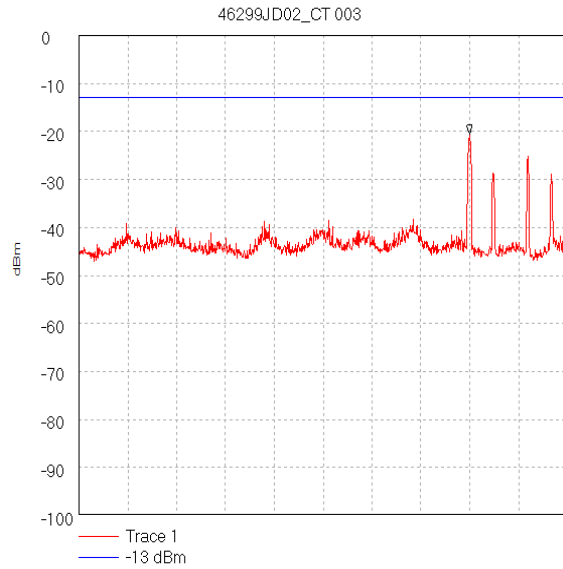
Start 2.0 GHz; Stop 4.0 GHz
Ref 0 dBm; Ref Offset 11.8 dB; 10 dB/div
RBW 689.655 kHz; VBW 1.0 MHz; Att 10 dB; Swp 20.0 mS
Peak 3.98 GHz, -36.21 dBm
Display Line: -13 dBm; ; Limit Test Passed
14/06/2004 16:32:14

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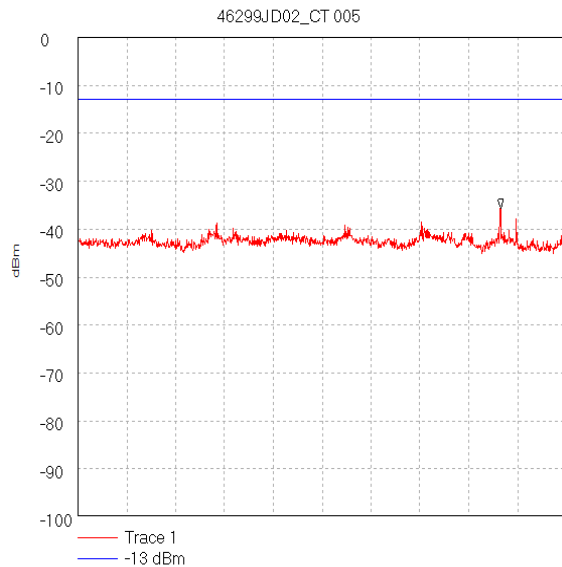
Transmitter Out of Band Radiated Emissions: Section 2.1053/24.238 (Continued)



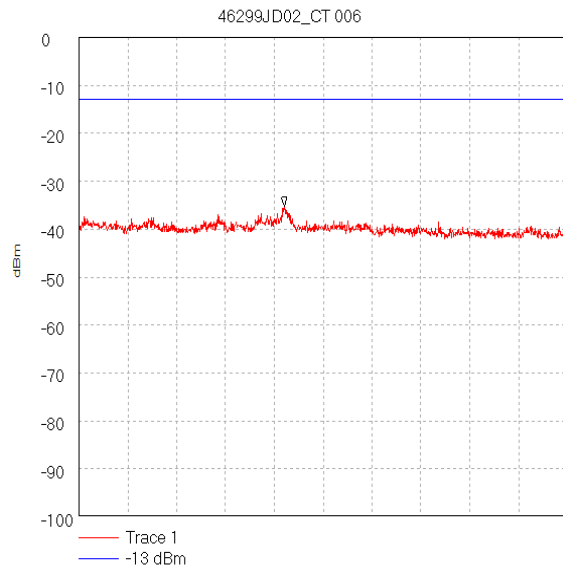
Start 4.0 GHz; Stop 5.0 GHz
Ref 0 dBm; Ref Offset 11.8 dB; 10 dB/div
RBW 1.0 MHz; VBW 3.0 MHz; Att 10 dB; Swp 20.0 mS
Peak 4.612222 GHz, -34.66 dBm
Display Line: -13 dBm;
Tested by ND 17/06/2004 10:43:02



Start 5.0 GHz; Stop 6.0 GHz
Ref 0 dBm; Ref Offset 11.8 dB; 10 dB/div
RBW 1.0 MHz; VBW 3.0 MHz; Att 10 dB; Swp 20.0 mS
Peak 5.8 GHz, -20.54 dBm
Display Line: -13 dBm;
Tested by ND 17/06/2004 10:42:10



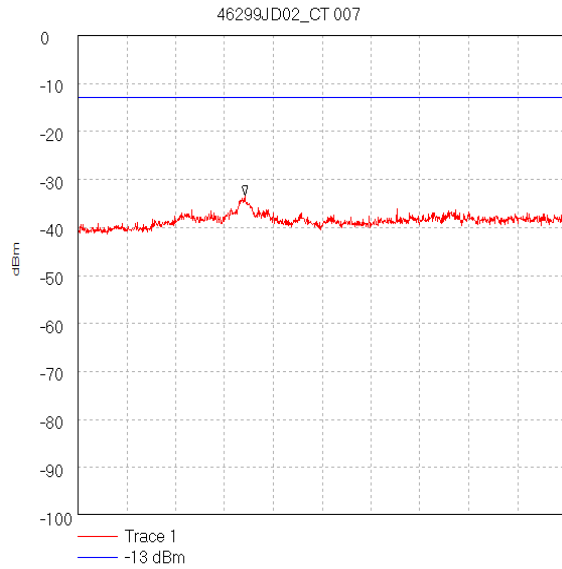
Start 6.0 GHz; Stop 8.0 GHz
Ref 0 dBm; Ref Offset 11.8 dB; 10 dB/div
RBW 1.0 MHz; VBW 3.0 MHz; Att 10 dB; Swp 20.0 mS
Peak 7.733333 GHz, -35.6 dBm
Display Line: -13 dBm;
Tested by ND 17/06/2004 10:49:32



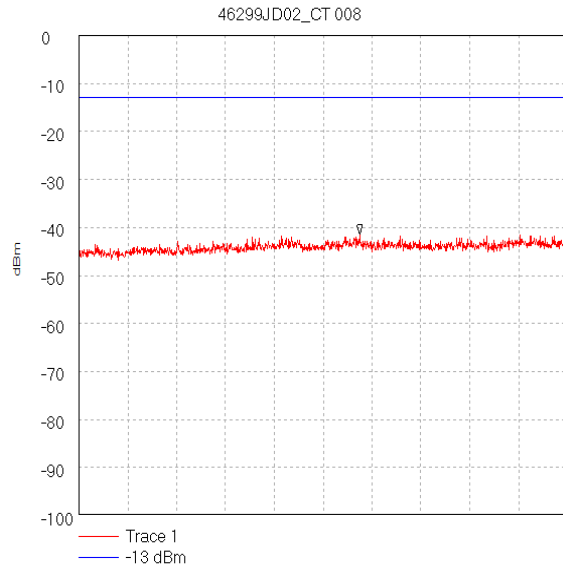
Start 8.0 GHz; Stop 12.0 GHz
Ref 0 dBm; Ref Offset 11.8 dB; 10 dB/div
RBW 1.0 MHz; VBW 3.0 MHz; Att 10 dB; Swp 20.0 mS
Peak 9.684444 GHz, -35.24 dBm
Display Line: -13 dBm;
Tested by ND 17/06/2004 10:54:20

Test Of: Airspan Communications.
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Transmitter Out of Band Radiated Emissions: Section 2.1053/24.238 (Continued)



Start 12.0 GHz; Stop 18.0 GHz
Ref 0 dBm; Ref Offset 11.8 dB; 10 dB/div
RBW 1.0 MHz; VBW 3.0 MHz; Att 0 dB; Swp 40.0 mS
Peak 14.053333 GHz, -33.39 dBm
Display Line: -13 dBm;
Tested by ND 17/06/2004 10:59:21



Start 18.0 GHz; Stop 20.0 GHz
Ref 0 dBm; Ref Offset 11.8 dB; 10 dB/div
RBW 1.0 MHz; VBW 3.0 MHz; Att 0 dB; Swp 20.0 mS
Peak 19.151111 GHz, -41.49 dBm
Display Line: -13 dBm;
Tested by ND 17/06/2004 11:03:08

Test Of: **Airspan Communications.**
 Combiner Shelf - Central Terminal
To: **FCC Part 24**

8. Measurement Method

8.1 Conducted Output Power

The EUT was connected to a spectrum analyser and to a subscriber 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, except at two extreme band edge channels, where the commissioning level was reduced.

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: | ≥ 3 MHz |
| Amplitude Range: | 100 dB |
| Step Size: | Continuous sweep |
| Sweep Time: | Coupled |

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 Combiner Shelf - Central Terminal
To: FCC Part 24**

8.2 Frequency Stability

The EUT was situated within an environmental test chamber and connected to the subscriber 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.

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 Combiner Shelf - Central Terminal
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8.3 Occupied Bandwidth

The EUT was connected to a spectrum analyser enabled with an occupied bandwidth function and a subscriber 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., $RBW \geq 1\%$ of occupied bandwidth.

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To: **FCC Part 24**

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:

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

| Receiver Function | Settings |
|--------------------------|--|
| Detector Type: | RMS - (Band Edge/Band strip) Peak (all other emissions) |
| 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.

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8.5 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:-

$$\text{EIRP} = \text{Signal Generator Level} - \text{Cable Loss} + \text{Antenna Gain}$$

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.

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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 |
|-----------------------------|--------------------|-----------------------------|-------------------------------|
| Carrier Output Power | Not applicable | 95% | +/- 0.46 dB |
| Conducted Emissions | 9 kHz to 26 GHz | 95% | +/- 1.2 dB |
| Frequency Stability | Not applicable | 95% | +/- 20 Hz |
| 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.

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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 |
| E011 | Environmental Chamber | Design Environmental | WIR3-40 | 11-96-A2103 |
| 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 | - |
| S216 | Site 16 | RFI | 16 | - |

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

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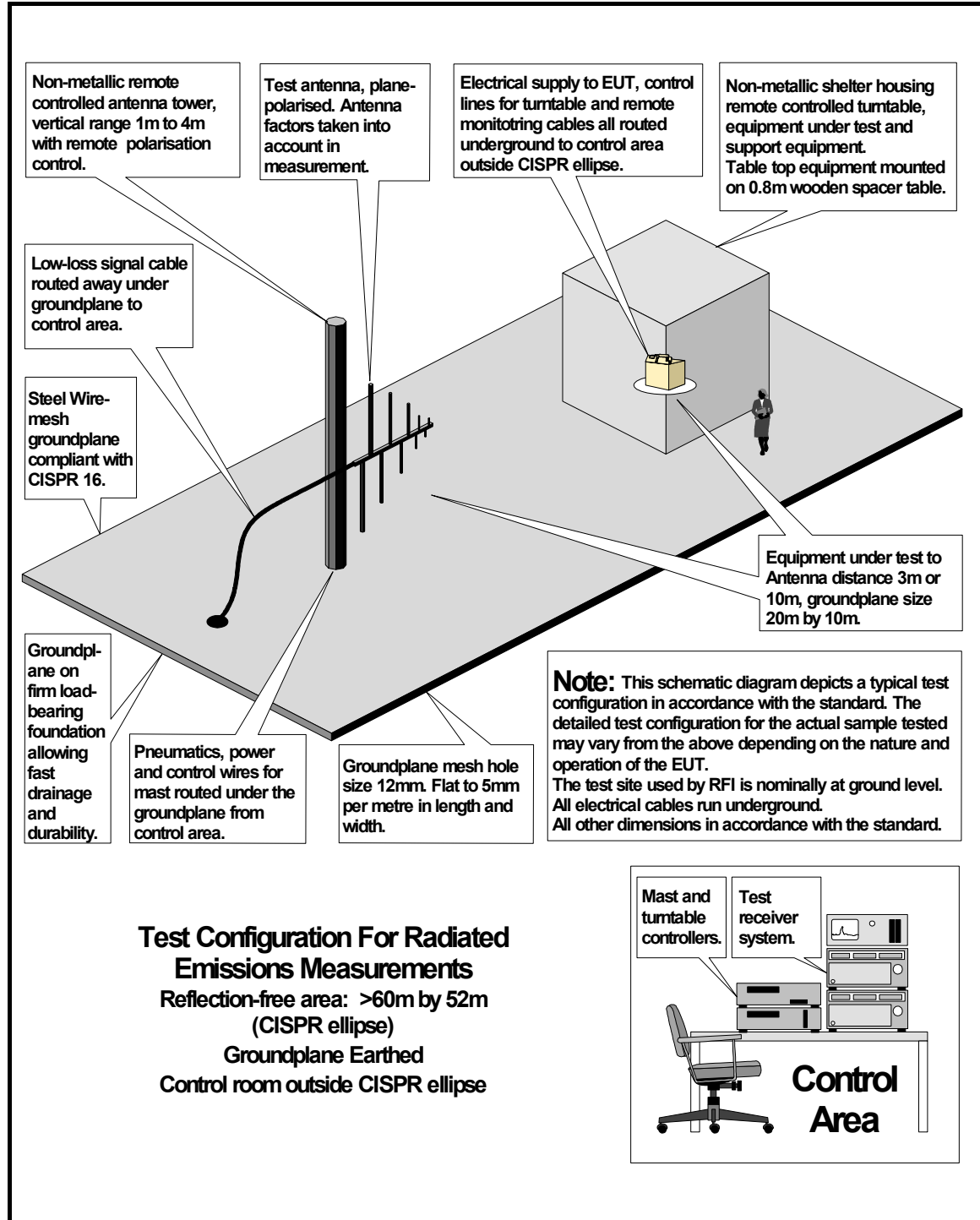
Appendix 2. Test Configuration Drawings

This appendix contains the following drawings:

| Drawing Reference Number | Title |
|---------------------------------|--|
| DRG\46299JD01\EMIRAD | Test configuration for measurement of radiated emissions |
| DRG\46299JD01\001 | Block diagram of the EUT, support equipment and interconnecting cables used for the test |

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DRG\46299JD01\001

