# FCC CFR47 CERTIFICATION

# PART 24E

# TEST REPORT

***FOR***

# TRIM TRAC

# MODEL: 51200-00

# FCC ID: JUPTRIMTRAC1

# REPORT NUMBER: 03U2250-1

# ISSUE DATE: JANUARY 6, 2004

*Prepared for*
**Trimble Navigation Limited**
**749 NORTH MARY AVE.**
**SUNNYVAL, CA 94088-3642, USA**

*Prepared by*
**COMPLIANCE CERTIFICATION SERVICES**
**561F MONTEREY ROAD, ROUTE 2**
**MORGAN HILL, CA 95037, USA**
**TEL: (408) 463-0885**
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# TABLE OF CONTENT

# 1. TEST RESULT CERTIFICATION

**COMPANY NAME:** TRIMBLE NAVIGATION LIMITED
749 NORTH MARY AVE.
SUNNYVALE, CA 94086

**EUT DESCRIPTION:** TRIM TRAC

**MODEL NUMBER:** 51200-00

**DATE TESTED:** 12/16/2003 – 12/17/2003
12/29/2003 – 12/31/2003

| | |
|---|---|
| TYPE OF EQUIPMENT | INTENTIONAL RADIATOR, LICENSED TX MODULE IN MOBILE APPLICATION |
| MEASUREMENT PROCEDURE | ANSI C63.4 / 2001, TIA/EIA 603 |
| PROCEDURE | CERTIFICATION |
| FCC RULE | CFR 47 PART 24 Subpart E |

Compliance Certification Services, Inc. tested the above equipment for compliance with the requirement set forth in CFR 47, PART 24 Subpart E-Broadband PCS. The equipment in the configuration described in this report, shows the measured emission levels emanating from the equipment do not exceed the specified limit.

**Note**: This document reports conditions under which testing was conducted and results of tests performed. This document may not be altered or revised in any way unless done so by Compliance Certification Services and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by Compliance Certification Services will constitute fraud and shall nullify the document.

Tested By:

WILLIM ZHUANG
EMC ENGINEER
COMPLIANCE CERTIFICATION SERVICES

Released For CCS By:

THU CHAN
EMC SUPERVISOR
COMPLIANCE CERTIFICATION SERVICES

# 2. EUT DESCRIPTION

The EUT is a Tri-band GSM cellular transceiver with GPS receiver built-in. The device is a stand-alone unit design to be placed in a high-value asset such as a vehicle or cargo-container.

The device has built in Tri-Band GSM900, DCS1800, and PCS1900 cellular antenna embedded in the only PCS used in the product.

The EUT of GSM1900 has an output power of 30.3dBm / 1.071W (EIRP) which is designed for the bands transmitting of frequency range 1850.2MHz to 1909.9MHz.

# 3. TEST METHODOLOGY

Both conducted and radiated testing were performed according to the procedures documented on chapter 13 of ANSI C63.4 and FCC CFR 47 2.1046, 2.1047, 2.1049, 2.1051, 2.1053, 2.1055 and 2.1057.

# 4. TEST FACILITY

The open area test sites and conducted measurement facilities used to collect the radiated data are located at 561F Monterey Road, Morgan Hill, California, USA. The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4 and CISPR Publication 22.

# 5. ACCREDITATION AND LISTING

The test facilities used to perform radiated and conducted emissions tests are accredited by National Voluntary Laboratory Accreditation Program for the specific scope of accreditation under Lab Code: 200065-0 to perform Electromagnetic Interference tests according to FCC PART 15 AND CISPR 22 requirements. No part of this report may be used to claim or imply product endorsement by NVLAP or any agency of the US Government. In addition, the test facilities are listed with Federal Communications Commission (reference no: 31040/SIT (1300B3) and 31040/SIT (1300F2))

# 6. MEASURING INSTRUMENT CALIBRATION

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipment, which is traceable to recognized national standards.

# 7. TEST SETUP, PROCEDURE AND RESULT

## 7.1. SECTION 2.1046: RF POWER OUTPUT

INSTRUMENTS LIST

| EQUIPMENT | MANUFACTURE | MODEL NO. | SERIAL NO. | CAL. DUE DATE |
|---|---|---|---|---|
| PSA Analyzer | Agilent | E446A | US42070220 | 1/13/04 |
| DC Power Supply | Kenwood | PA36-3A | 7060074 | N/A |
| Bilog Antenna | A.R.A. | LPB 2520/A | 1185 | 3/6/04 |
| Tune Dipole | ETS | DB-4 | 1629 | 5/14/04 |
| Tx Horn Antenna | EMCO | 3115 | 6739 | 2/4/2004 |
| Rx Horn Antenna | EMCO | 3115 | 6717 | 2/4/2004 |
| Amplifier | MITEQ | NSP2600-SP | 924342 | 4/25/2004 |
| HPF | MICROLAB | FH-2400H | N/A | N/A |

MEASUREMENT PROCEDURE

1). On a test site, the EUT shall be placed on a turntable, and in the position closest to the normal use as declared by the user.

2). The test antenna shall be oriented initially for vertical polarization located 3m from the EUT to correspond to the frequency of the transmitter.

3). The output of the test antenna shall be connected to the measuring receiver and either a peak or quasi-peak detector was used for the measurement as indicated on the report. The detector selection is based on how close the emission level was approaching the limit.

4). The transmitter shall be placed 0.80 meter above the ground plane, the X, Y, and Z positions shall be tested and the worst case reported. The transmitter shall be switched on with typical modulation and the measurement receiver shall be tuned to the frequency of the transmitter under test.

5). The test antenna shall be raised and lowered through the specified range of height until the measuring receiver detects a maximum signal level.

6). The transmitter shall than be rotated through 360° in the horizontal plane, until the maximum signal level is detected by the measuring receiver.

7). The test antenna shall be raised and lowered again through the specified range of height until a maximum signal level is detected by the measuring receiver.

8). The maximum signal level detected by the measuring receiver shall be noted.

9). The transmitter shall be replaced by a tuned dipole / horn (substitution antenna).

10). The substitution antenna shall be oriented for vertical polarization and the length of the substitution antenna shall be adjusted to correspond to the frequency of the transmitter.

11). The substitution antenna shall be connected to a calibrated signal generator.

12). If necessary, the input attenuator setting of the measuring receiver shall be adjusted in order to increase the sensitivity of the measuring receiver.

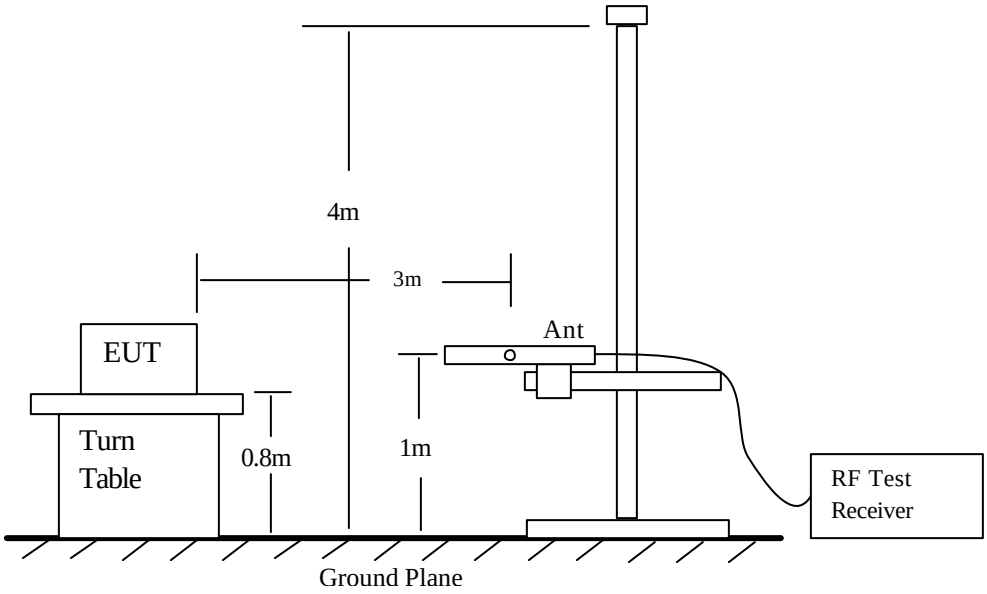
13). The test antenna shall be raised and lowered through the specified range of the height to ensure that the maximum signal is received.

14). The input signal to the substitution antenna shall be adjusted to the level that produces a level detected by the measuring receiver, that is equal to the level noted while the transmitter radiated power was measured, corrected for the change of input attenuation setting of the measuring receiver.

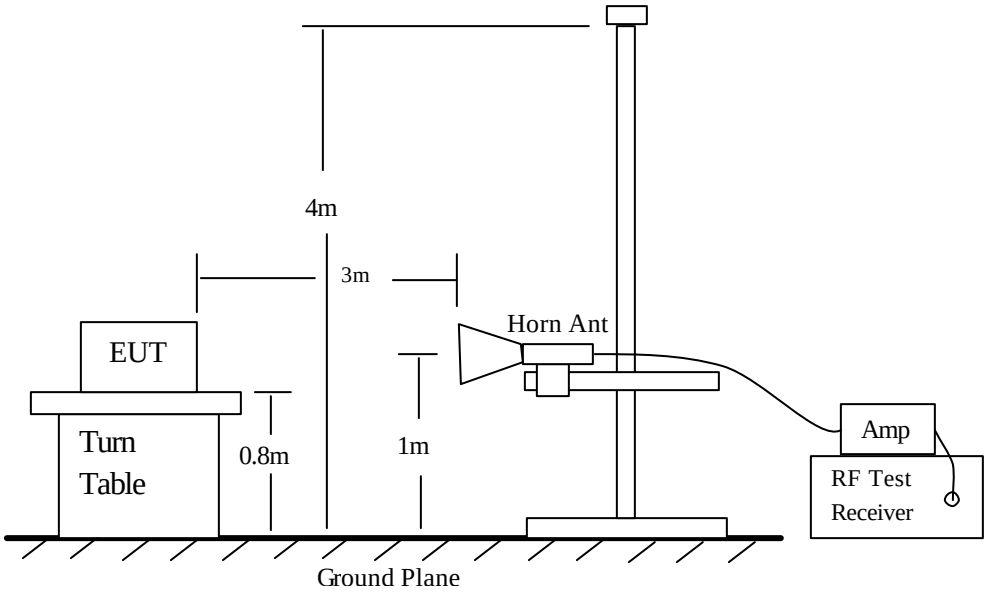
15). The input level to the substitution antenna shall be recorded as power level in dBm, corrected for any change of input attenuator setting of the measuring receiver.

16). The measurement shall be repeated with the test antenna and the substitution antenna oriented for horizontal polarization.

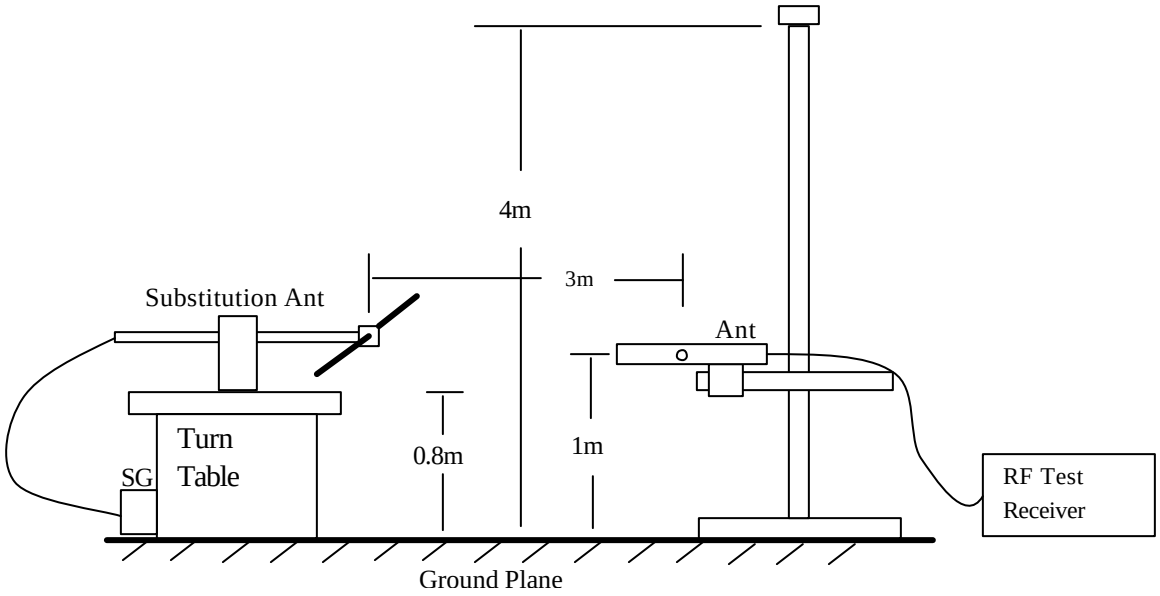
17). The measure of the effective radiated power is the larger of the two levels recorded, at the input to the substitution antenna, corrected for the gain of the substitution antenna if necessary.

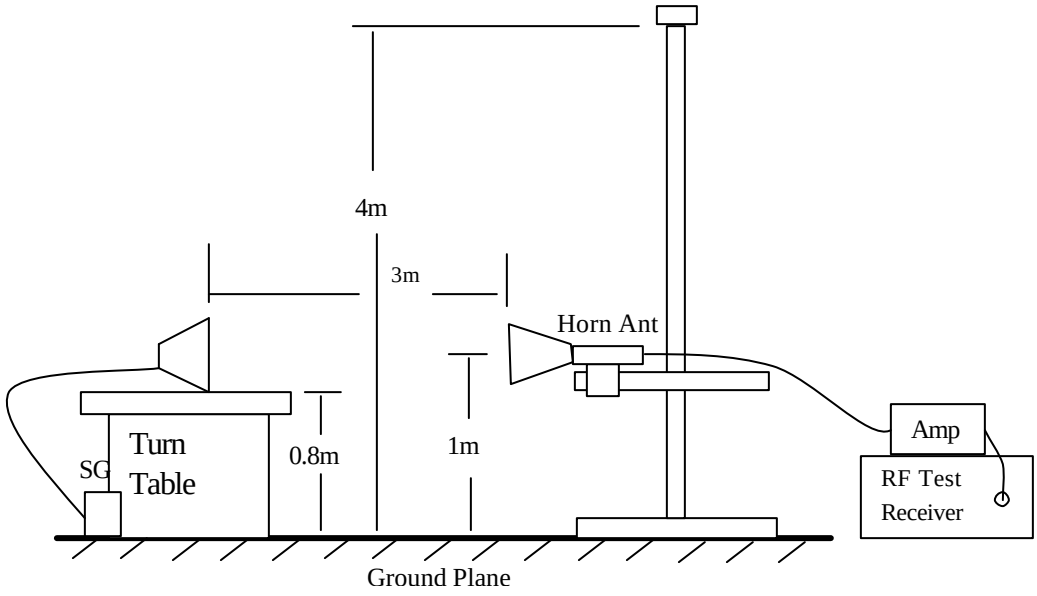



Radiated Emission Measurement 30 to 1000 MHz




Radiated Emission Above 1000 MHz



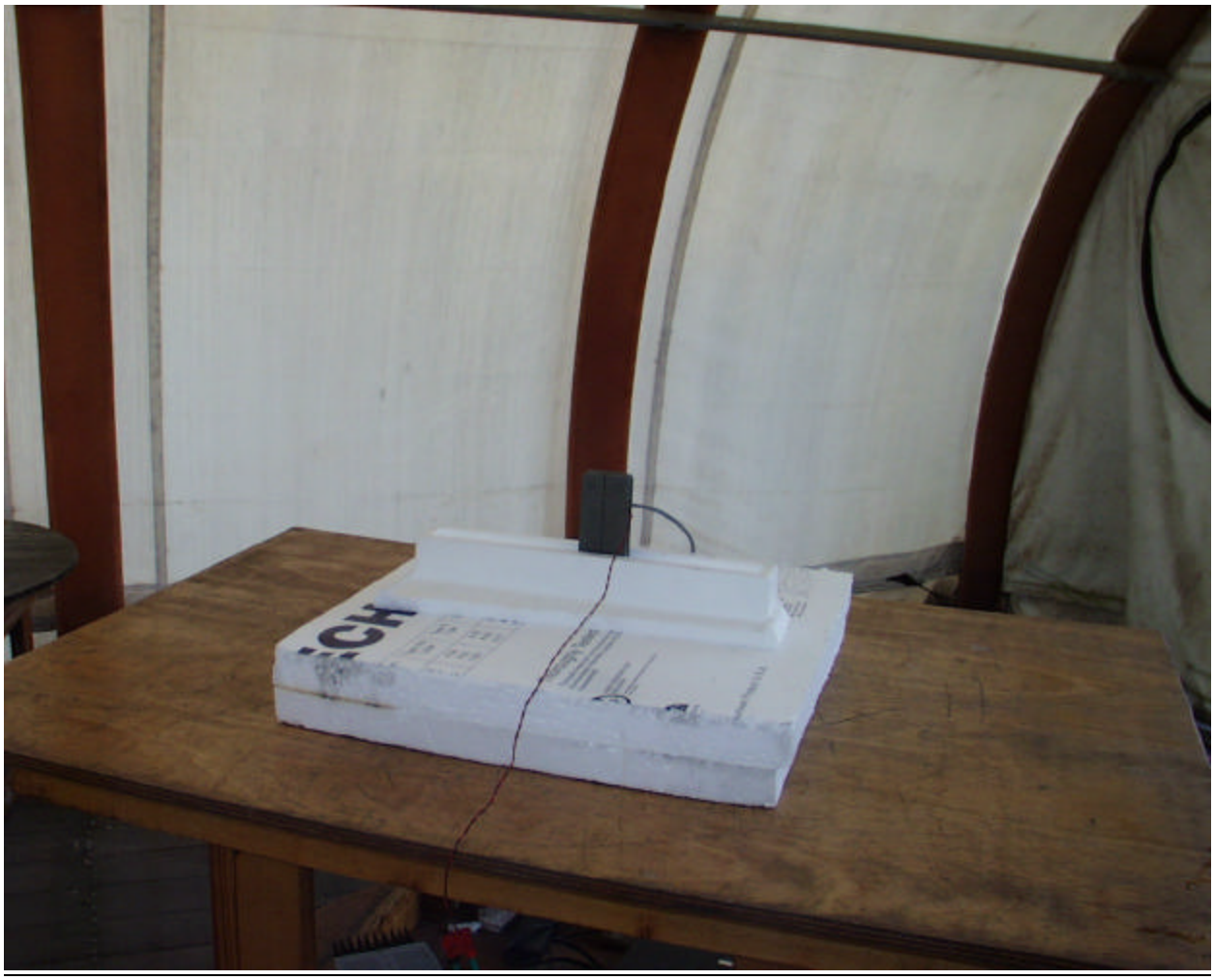

Radiated Emission – Substitution Method Set-up

## Radiated Emissions

## X –Orientation

**Y –Orientation**

**Z–Orientation**



## MEASUREMENT RESULT:

Output Power (EIRP) at worst X-Position:

12/30/03 **High Frequency Substitution Measurement**
**Compliance Certification Services, Morgan Hill Open Field Site**

**Test Engr:William Zhuang**
**Project #:03U2250**
**Company:Trimble Navigation Limited**
**EUT Descrip.:Trimble Navigation Asset Tracker w/GPS & GSM**
**EUT M/N:51200-00**
**Test Target:FCC Part24 (1900MHz)**
**Mode Oper:Transmit**

**Test Equipment:**

| EMCO Horn 1-18GHz | Pre-amplifer 1-26GHz | Spectrum Analyzer | Horn > 18GHz | Limit |
|---|---|---|---|---|
| T73: S/N: 6717 @1n | | Agilent E4446A Analyzer | | FCC 24 |

Hi Frequency Cables
☐ (2 ft) ☐ (2 ~ 3 ft) ☐ (4 ~ 6 ft) ☑ (12 ft)

**Peak Measurements:**
Fundamental: RBW>99% or 26dB Emissions BW, VBW=RBW
Bandedge: RBW=>1% Emissions BW, VBW=> 3*RBW
Spurious: RBW=1MHz, VBW=1MHz

| f GHz | SA reading (dBm) | SG reading (dBm) | CL (dB) | Gain (dBi) | Gain (dBd) | EIRP (dBm) | Limit (dBm) | Margin (dB) | Notes |
|---|---|---|---|---|---|---|---|---|---|
| TX at worst position: | | | | | | | | | |
| 1.850 | 96.8 | 20.1 | 2.2 | 7.4 | 5.3 | 25.3 | 33.0 | -7.7 | H, X position |
| 1.850 | 97.1 | 23.3 | 2.2 | 7.4 | 5.3 | 28.6 | 33.0 | -4.4 | V, X position |
| 1.880 | 99.8 | 22.7 | 2.2 | 7.4 | 5.3 | 27.9 | 33.0 | -5.1 | H, X position |
| 1.880 | 99.4 | 24.7 | 2.2 | 7.4 | 5.3 | 29.9 | 33.0 | -3.1 | V, X position |
| 1.910 | 98.1 | 21.3 | 2.2 | 7.5 | 5.3 | 26.6 | 33.0 | -6.4 | H, X position |
| 1.910 | 98.9 | 25.0 | 2.2 | 7.5 | 5.3 | 30.3 | 33.0 | -2.7 | V, X position |
| | | | | | | | | | |
| RBW=VBW=3MHz | | | | | | | | | |
| | | | | | | | | | |

## 7.2. SECTION 2.1047: MODULATION CHARACTERISTICS

Not applicable.

## 7.3. SECTION 2.1049: OCCUPIED BANDWIDTH

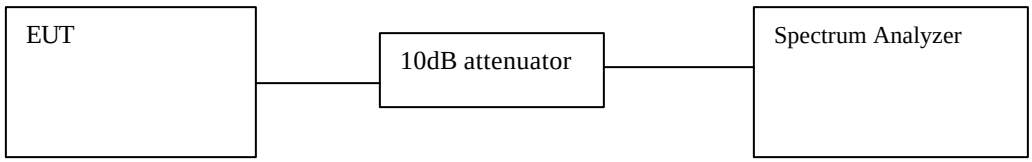
INSTRUMENTS LIST

| EQUIPMENT | MANUFACTURE | MODEL NO. | SERIAL NO. | CAL. DUE DATE |
|---|---|---|---|---|
| PSA Analyzer | Agilent | E446A | US42070220 | 1/13/04 |
| 10dB Attenuator | Agilent | 8493C | 59028 | N/A |
| DC Power Supply | Kenwood | PA36-3A | 7060074 | N/A |

TEST PROCEDURE

The EUT's output RF connector was connected with a short cable to the spectrum analyzer, RES BW was set to about 1% of emission BW, -26 dBc display line was placed on the screen, the occupied BW is the delta frequency between the two points where the display line intersects the signal trace. 26dB BW was measured for low, middle and high channels.

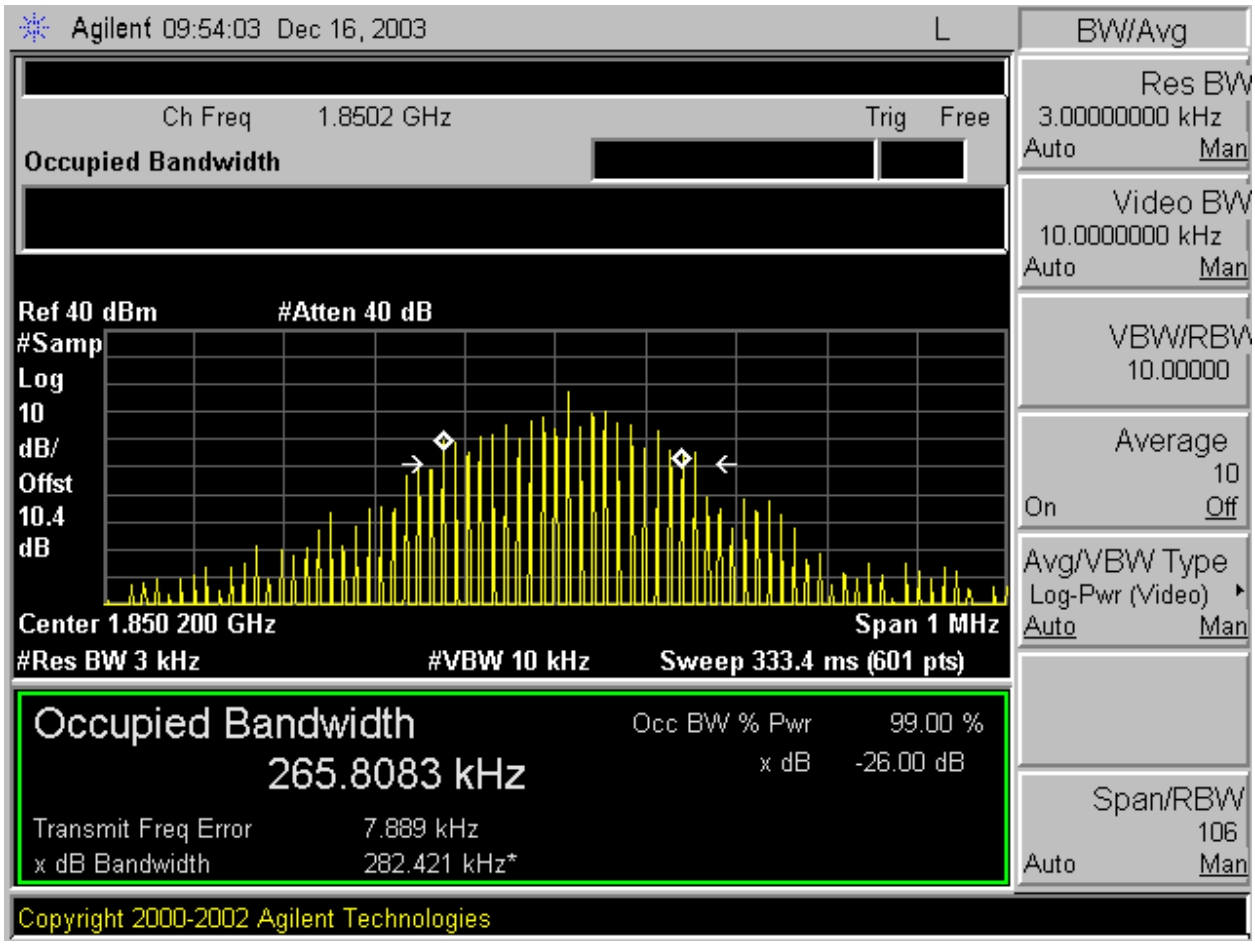
TEST SETUP



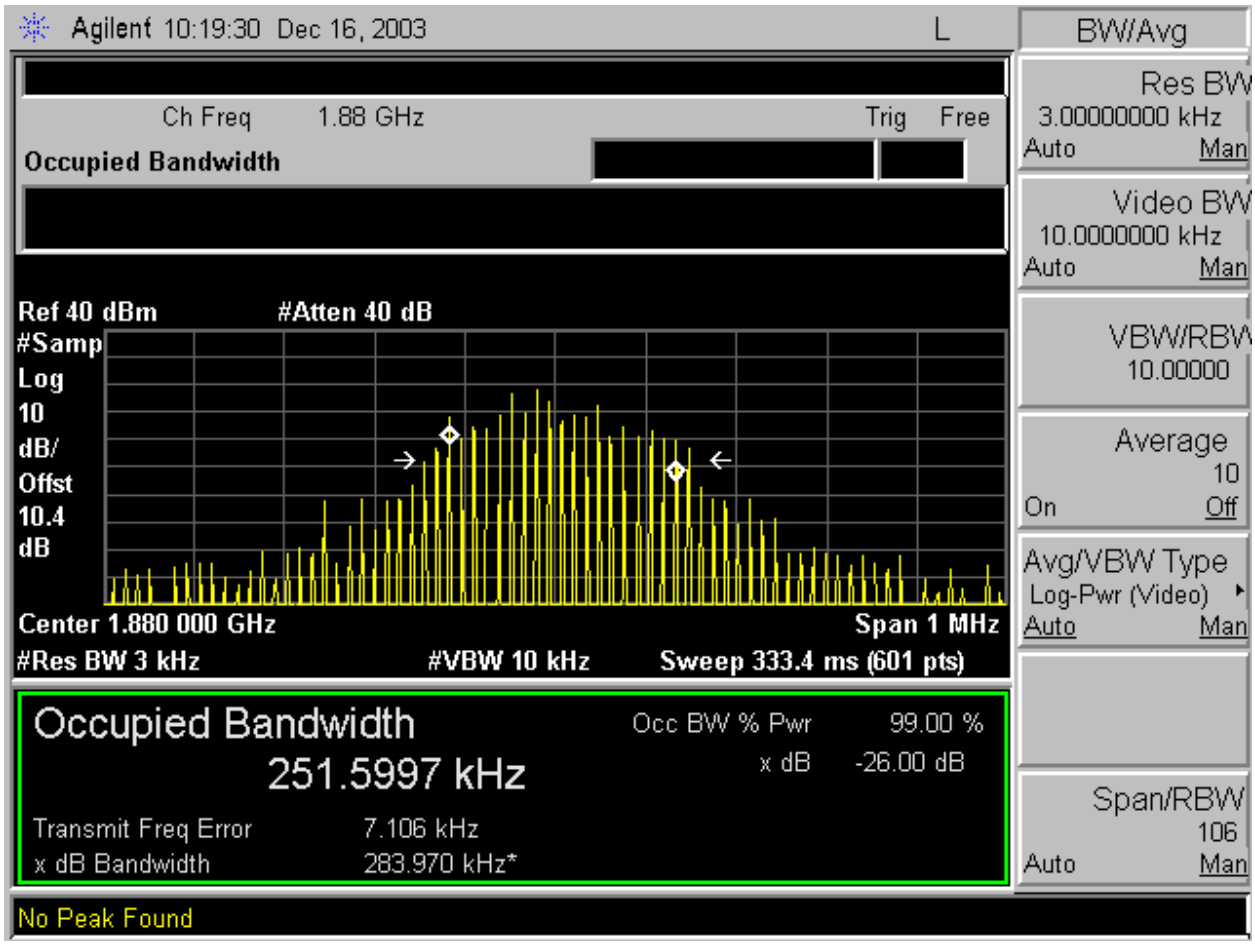

RESULT

| Channel | Frequency (MHz) | -26dBc BW (KHz) |
|---|---|---|
| Low | 1850.2 | 282.421 |
| Middle | 1880.0 | 283.970 |
| High | 1909.8 | 295.074 |

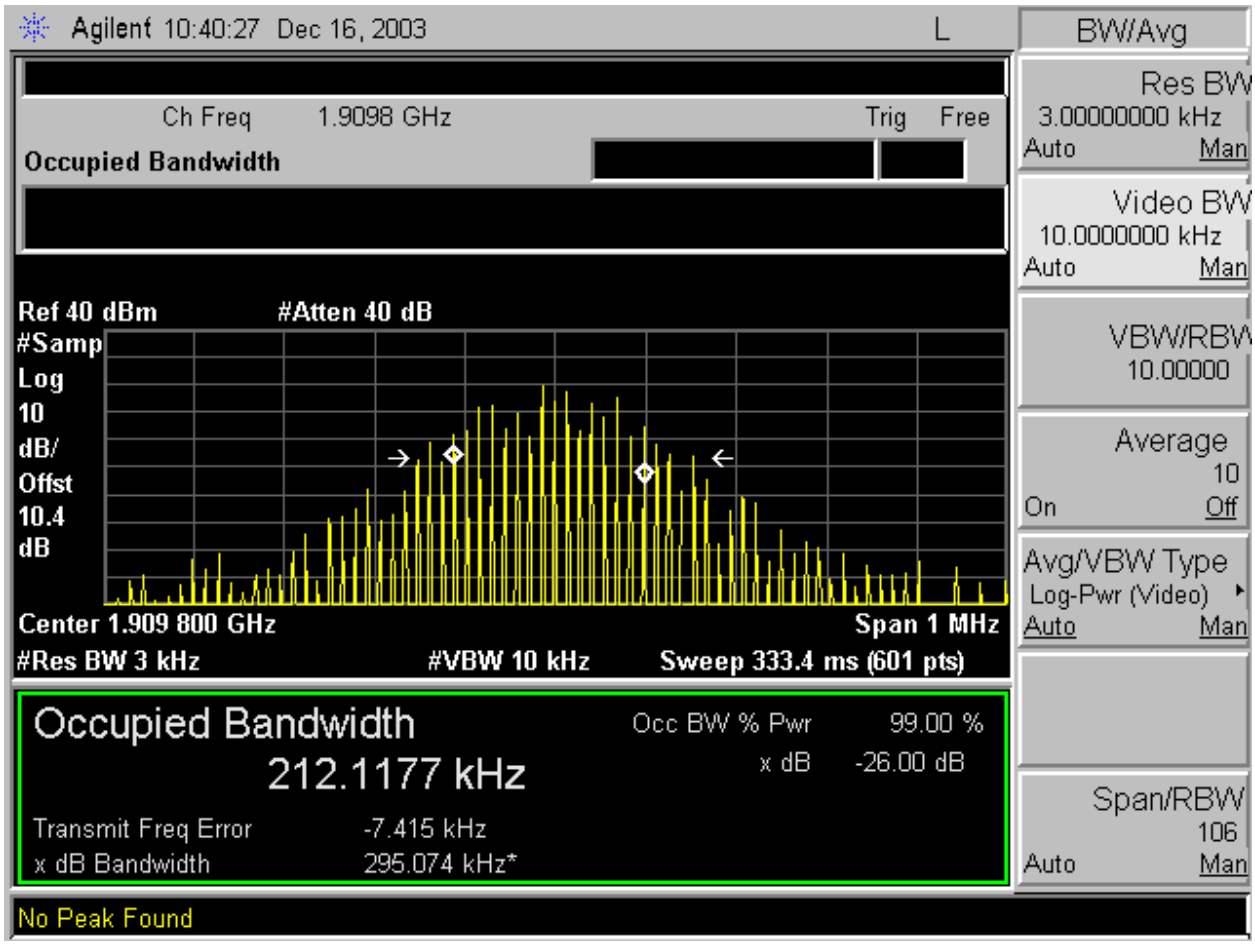
**Low Channel**



**Mid Channel**



**High Channel**

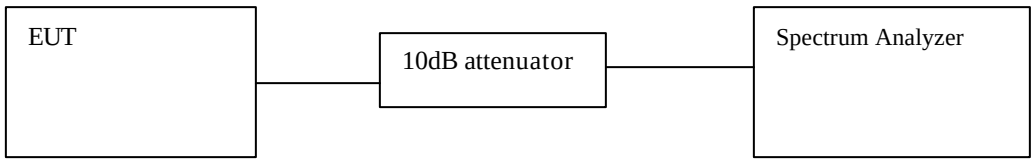


## 7.4. SECTION 2.1051: SPURIOUS EMISSION AT ANTENNA TERMINAL

**INSTRUMENTS LIST**

| EQUIPMENT | MANUFACTURE | MODEL NO. | SERIAL NO. | CAL. DUE DATE |
|---|---|---|---|---|
| PSA Analyzer | Agilent | E446A | US42070220 | 1/13/04 |
| 10dB Attenuator | Agilent | 8493C | 59028 | N/A |
| DC Power Supply | Kenwood | PA36-3A | 7060074 | N/A |

**TEST SETUP**




**TEST PROCEDURE**

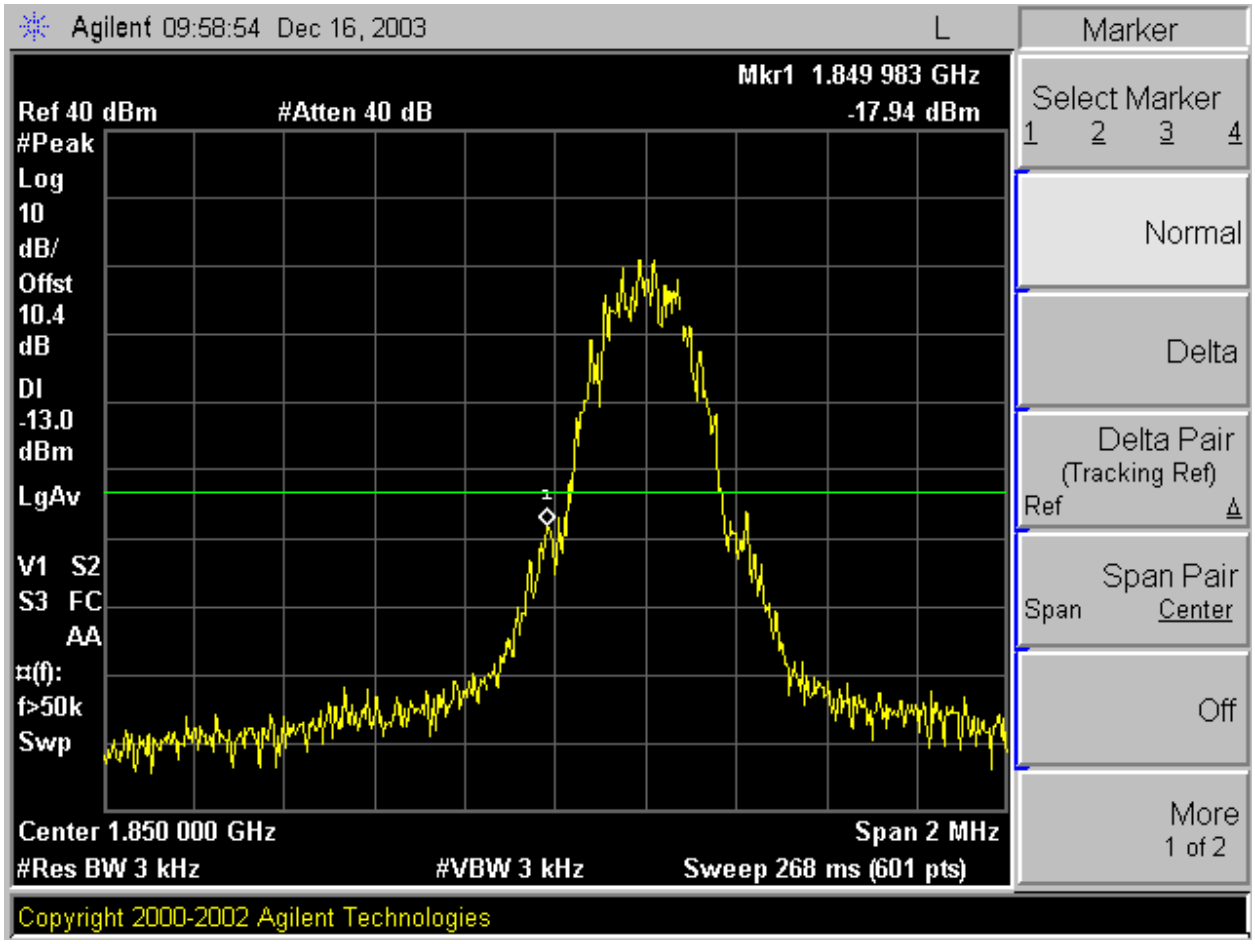
1) EUT's RF output connector (made solely for the purpose of the test) is connected to the spectrum analyzer, and set as close as possible to the bottom of the block edge and one set as close as possible to the top of the block edge. Set the RES BW to 1% of the emission bandwidth to show compliance with the –13dBm limit, in the 1 MHz bands immediately outside and adjacent to the top and bottom edges of the frequency block.

2) For the Out-of-Band measurements a 1 MHz RES BW was used to scan from 15 MHz to 10x$fo$ of the fundamental carrier for all frequency block. A display line was placed at –13dBm to show compliance for spurious, and harmonics.

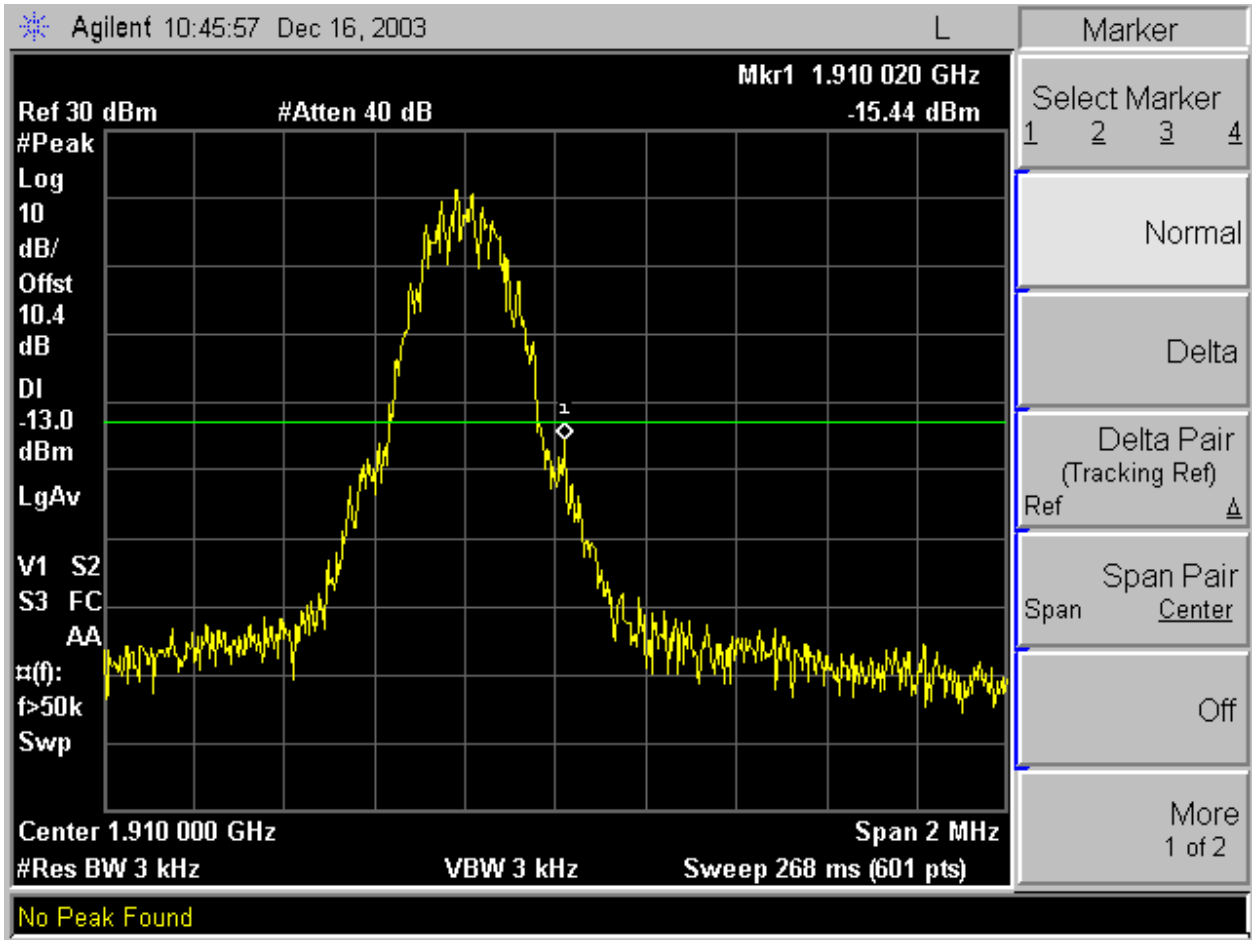
**MEASUREMENT RESULT:**

Low / High Band Edges, Low / Mid / High Out-Of-Band Emissions:

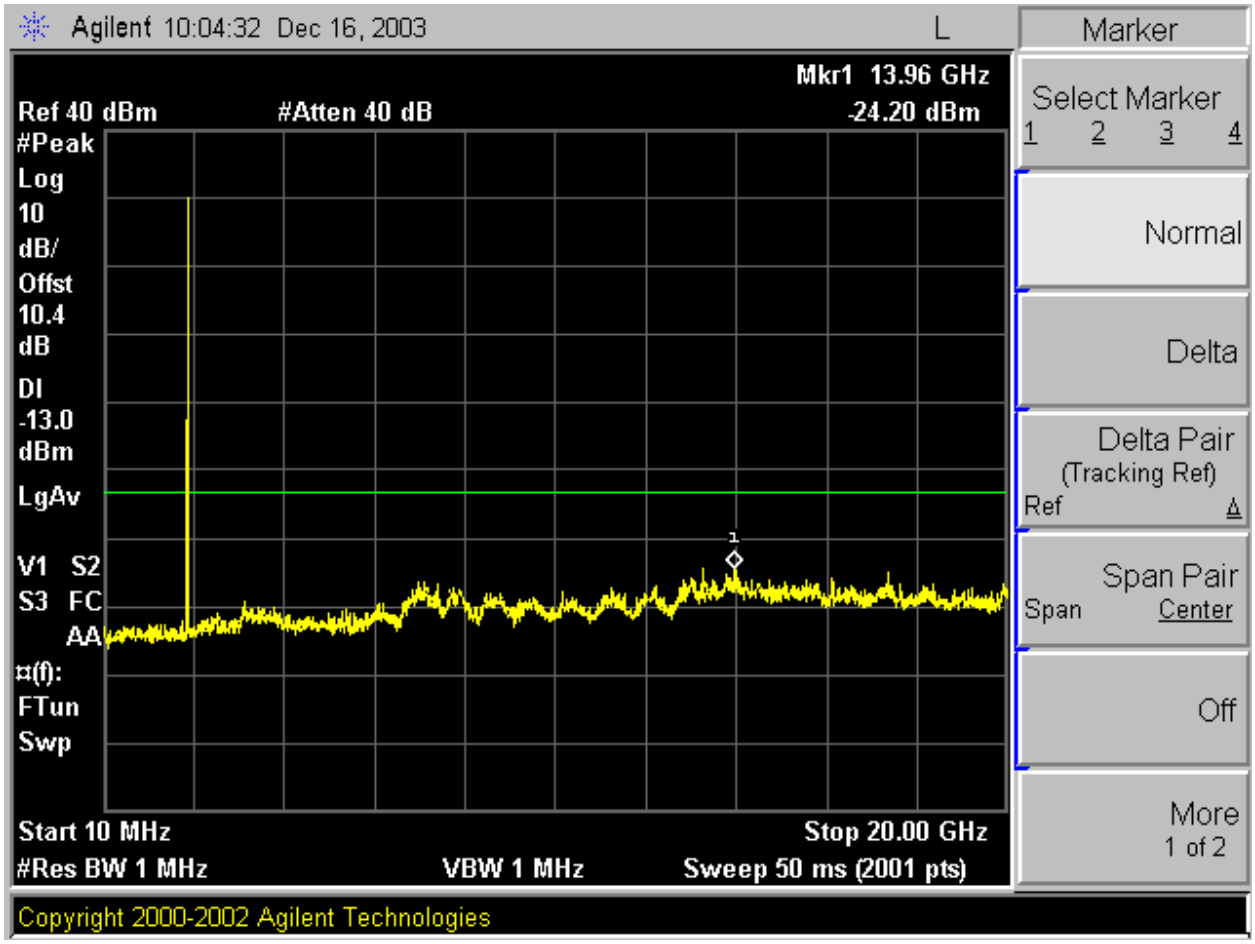
Low Band Edge- Ch 512 (Low Channel)



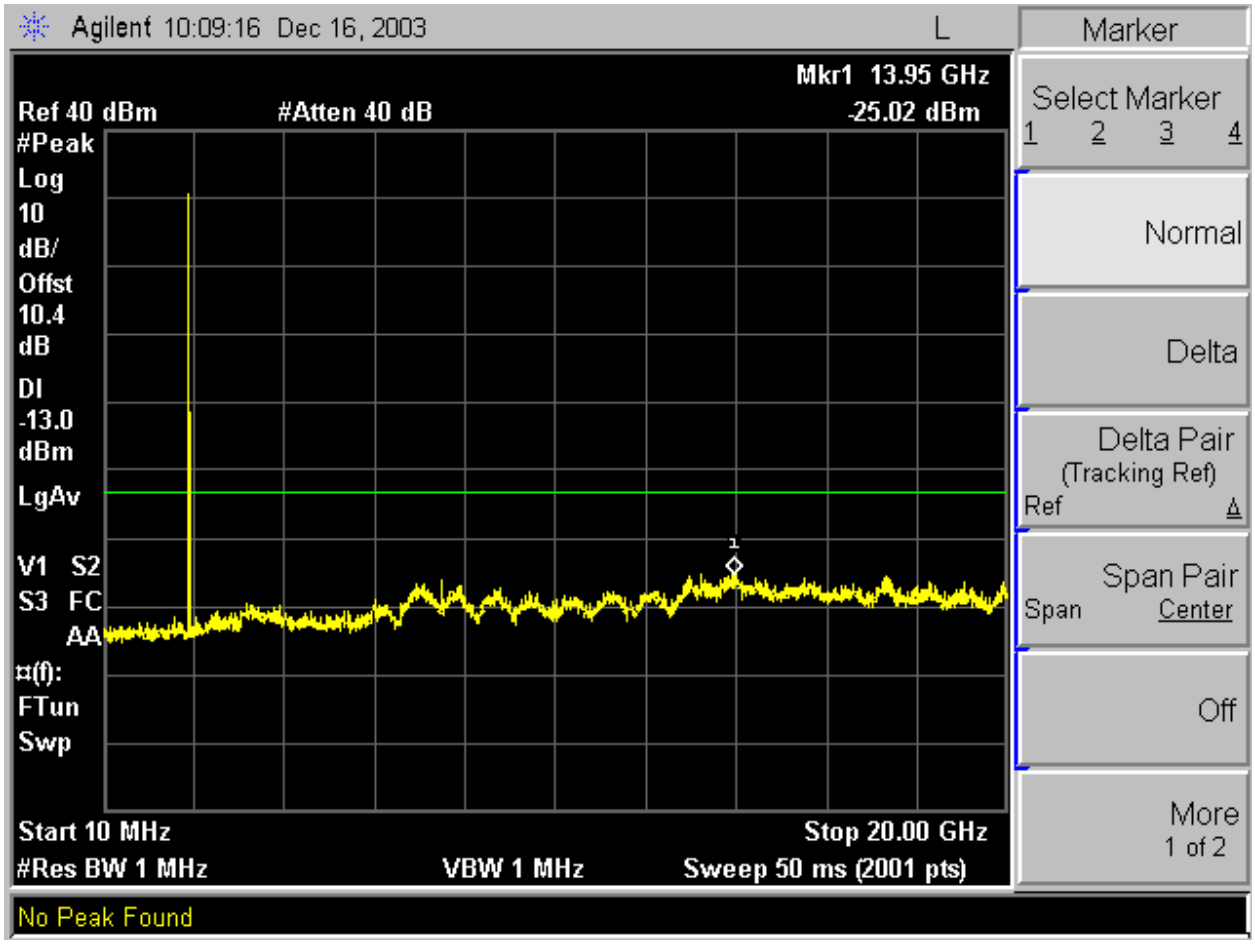
High Band Edge- Ch 810 (High Channel)



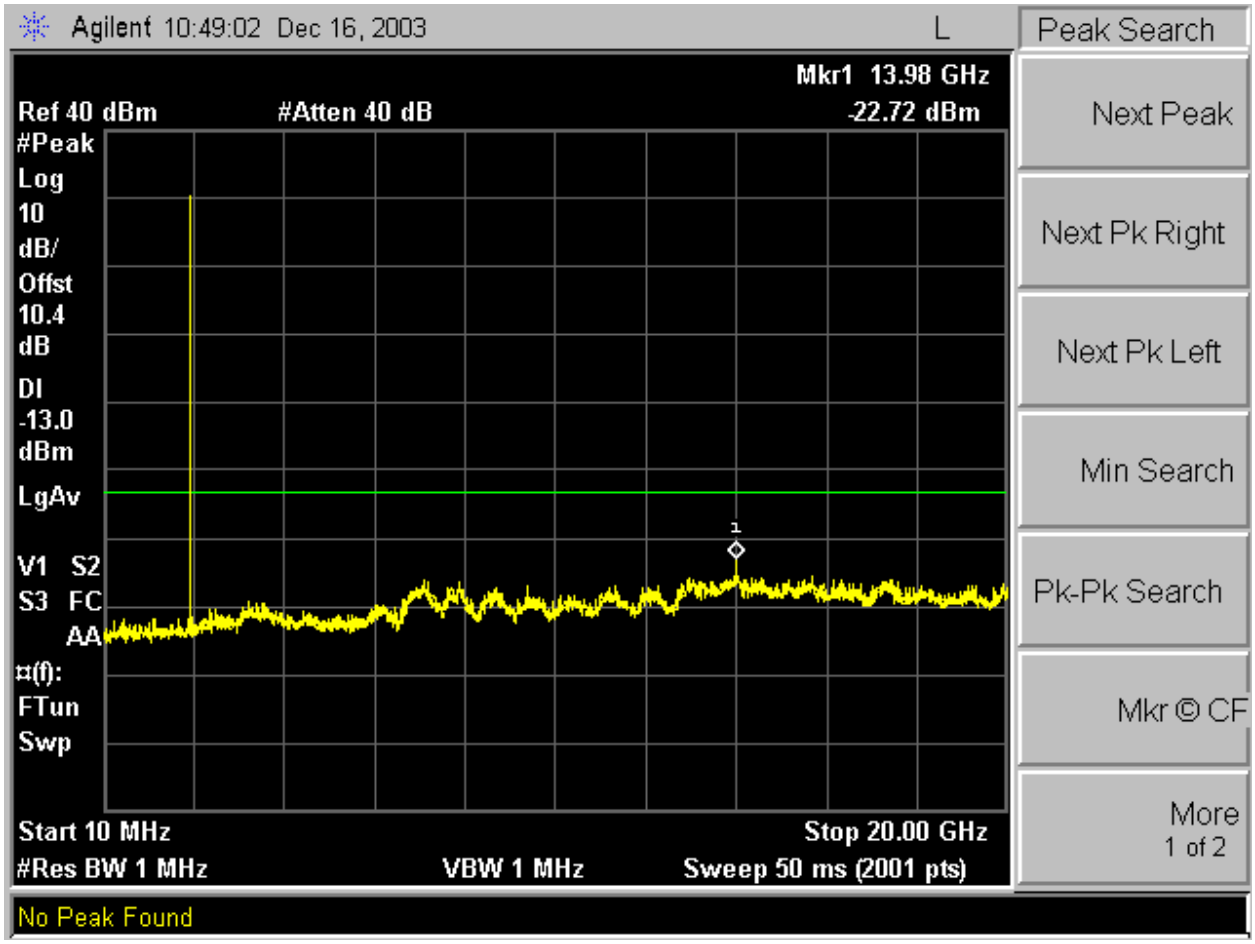
Out-Of-Band Emissions-Low Channel



Out-Of-Band Emissions-Mid Channel



Out-Of-Band Emissions-High Channel



## 7.5. SECTION 2.1053: FIELD STRENGTH OF SPURIOUS RADIATION

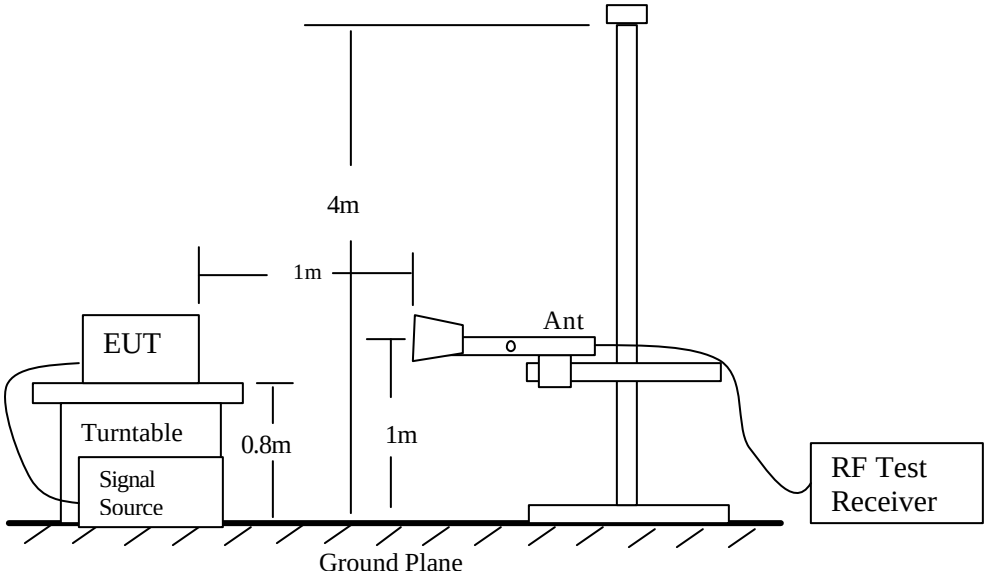
**INSTRUMENTS LIST**

| EQUIPMENT | MANUFACTURE | MODEL NO. | SERIAL NO. | CAL. DUE DATE |
|---|---|---|---|---|
| PSA Analyzer | Agilent | E446A | US42070220 | 1/13/04 |
| DC Power Supply | Kenwood | PA36-3A | 7060074 | N/A |
| Bilog Antenna | A.R.A. | LPB 2520/A | 1185 | 3/6/04 |
| Tune Dipole | ETS | DB-4 | 1629 | 5/14/04 |
| Tx Horn Antenna | EMCO | 3115 | 6739 | 2/4/2004 |
| Rx Horn Antenna | EMCO | 3115 | 6717 | 2/4/2004 |
| Amplifier | MITEQ | NSP2600-SP | 924342 | 4/25/2004 |
| HPF | MICROLAB | FH-2400H | N/A | N/A |

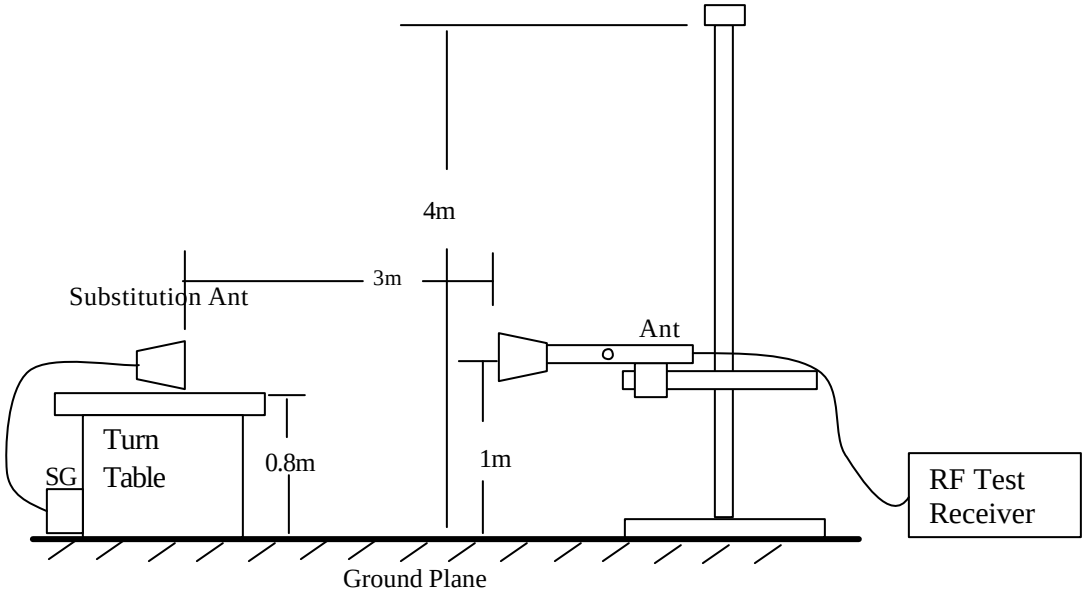
**Detector Function Setting of Test Receiver**

| Frequency Range (MHz) | Detector Function | Resolution Bandwidth | Video Bandwidth |
|---|---|---|---|
| Above 1000 | ☒ Peak<br>☐ Average | ☒ 1 MHz<br>☐ 1 MHz | ☒ 1 MHz<br>☐ 10 Hz |

**TEST SETUP**




Radiated Emission Measurement




Radiated Emission – Substitution Method set-up

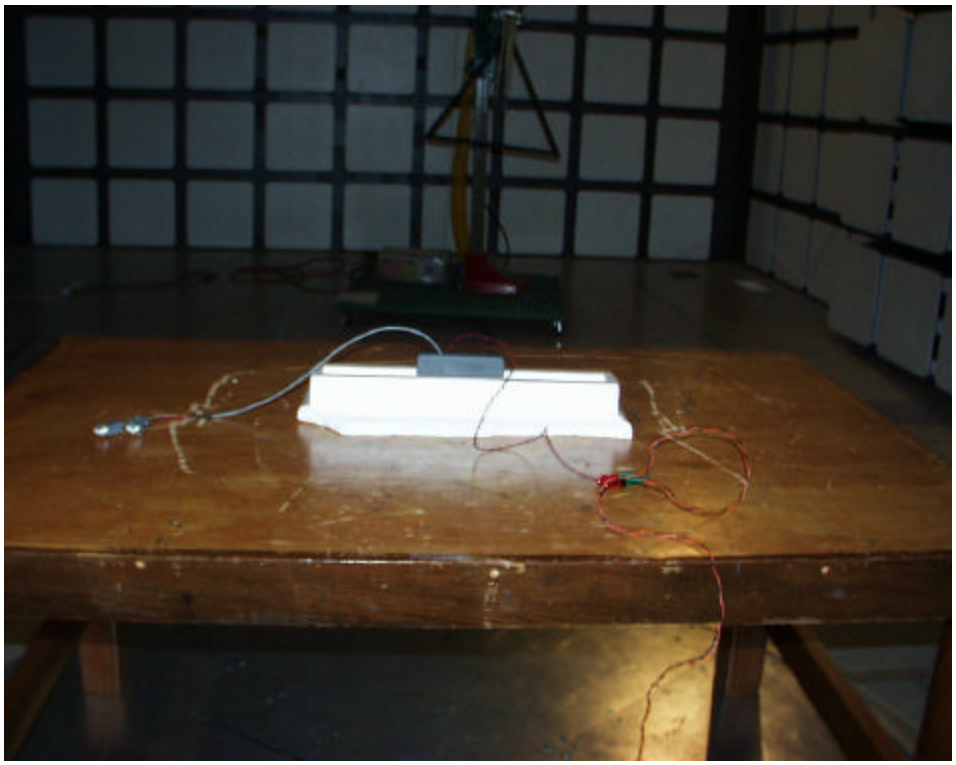
**TEST PROCEDURE**

1). On a test site, the EUT shall be placed on a turntable, and in the position closest to the normal use as declared by the user.
2). The test antenna shall be oriented initially for vertical polarization located 1m from the EUT to correspond to the frequency of the transmitter.
3). The output of the test antenna shall be connected to the measuring receiver and either a peak or average detector was used for the measurement as indicated on the report. The detector selection is based on how close the emission level was approaching the limit.
4). The transmitter shall be switched on, if possible, without the modulation and the measurement receiver shall be tuned to the frequency of the transmitter under test.
5). The test antenna shall be raised and lowered through the specified range of height until a maximum signal level is detected by the measuring receiver.
6). The transmitter shall than be rotated through 360° in the horizontal plane, until the maximum signal level is detected by the measuring receiver.
7). The test antenna shall be raised and lowered again through the specified range of height until a maximum signal level is detected by the measuring receiver.
8). The maximum signal level detected by the measuring receiver shall be noted.
9). The transmitter shall be replaced by a substitution antenna.
10). The substitution antenna shall be oriented for vertical polarization.
11). The substitution antenna shall be connected to a calibrated signal generator.
12). If necessary, the input attenuator setting of the measuring receiver shall be adjusted in order to increase the sensitivity of the measuring receiver.
13). The test antenna shall be raised and lowered through the specified range of the height to ensure that the maximum signal is received.
14). The input signal to the substitution antenna shall be adjusted to the level that produces a level detected by the measuring receiver, that is equal to the level noted while the transmitter radiated power was measured, corrected for the change of input attenuation setting of the measuring receiver.
15). The input level to the substitution antenna shall be recorded as power level in dBm, corrected for any change of input attenuator setting of the measuring receiver.
16). The measurement shall be repeated with the test antenna and the substitution antenna oriented for horizontal polarization.
17). The measure of the effective radiated power is the larger of the two levels recorded, at the input to the substitution antenna, corrected for the gain of the substitution antenna if necessary.

**MEASUREMENT RESULT**

No non-compliance noted, as shown below

Radiated Emission Setup Photos:



Harmonics & Spurious Emissions: Low, Mid, & High Channels:

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 1/5/2004 | | **High Frequency Measurement** | | | | | | |
| **Compliance Certification Services,Mogan Hill Open Field Site** | | | | | | | | |
| | | | | | | | | |
| **Test Engineer:** | | William Zhuang | | | | | | |
| **Project#:** | | 03U2250 | | | | | | |
| **Company:** | | Trimble Navigation Limited | | | | | | |
| **EUT Description:** | | Trimble Navigation Asset Tracker w/GPS & GSM | | | | | | |
| **EUT M/N:** | | 51200-00 | | | | | | |
| **Test Target:** | | FCC PART24 (1900MHz) | | | | | | |
| **Mode Operate:** | | Transmit | | | | | | |
| | | | | | | | | |
| **Test Equipment:** | | | | | | | | |
| | | | | | | | | |
| EMCO Horn 1-18GHz | | Pre-amplifier 1-26GHz | | | | Spectrum Analyzer | | |
| EMCO T73 S/N 6717 | | T87,NSP 2600-SP | | | | E4446A | | |
| EMCO T73 S/N 3245 | | | | | | | | |
| Signal Generator | | | | | | | | |
| R&S SMP04 | | | | | | | | |

| Frequency (MHz) | Reading level (dBuV) | Antenna Polarization | S.G. (dBm) | Cable loss (dB) | Ant.Gain (dBd) | Emission level (dBm) | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|
| **Low Channel** | | | | | | | | |
| 3700.40 | 76.78 | H | -32.68 | 2.16 | 7.31 | -27.52 | -13.00 | -14.52 |
| 5550.60 | 75.37 | H | -33.13 | 2.83 | 9.14 | -26.83 | -13.00 | -13.83 |
| 7400.80 | 67.47 | H | -38.00 | 3.20 | 9.32 | -31.87 | -13.00 | -18.87 |
| 9251.00 | 66.29 | H | -34.81 | 3.67 | 9.20 | -29.28 | -13.00 | -16.28 |
| 11101.20 | 47.79 | H | -51.72 | 3.92 | 10.66 | -44.97 | -13.00 | -31.97 |
| **Mid Channel** | | | | | | | | |
| 3760.00 | 79.43 | H | -29.84 | 2.19 | 7.35 | -24.67 | -13.00 | -11.67 |
| 5640.00 | 72.67 | H | -35.78 | 2.85 | 9.18 | -29.45 | -13.00 | -16.45 |
| 7520.00 | 68.03 | H | -37.09 | 3.25 | 9.29 | -31.05 | -13.00 | -18.05 |
| 9400.00 | 62.00 | H | -38.64 | 3.73 | 9.45 | -32.92 | -13.00 | -19.92 |
| 11280.00 | 54.68 | H | -45.26 | 3.89 | 10.62 | -38.53 | -13.00 | -25.53 |
| **High Channel** | | | | | | | | |
| 3819.60 | 79.37 | H | -29.74 | 2.22 | 7.39 | -24.57 | -13.00 | -11.57 |
| 5729.40 | 73.45 | H | -34.95 | 2.86 | 9.22 | -28.59 | -13.00 | -15.59 |
| 7639.20 | 74.97 | H | -29.83 | 3.31 | 9.26 | -23.88 | -13.00 | -10.88 |
| 9549.00 | 63.83 | H | -36.38 | 3.78 | 9.68 | -30.48 | -13.00 | -17.48 |
| 11458.80 | 62.48 | H | -37.86 | 3.87 | 10.57 | -31.16 | -13.00 | -18.16 |
| 13368.60 | 54.17 | H | -46.56 | 4.06 | 9.91 | -40.71 | -13.00 | -27.71 |

| Frequency (MHz) | Reading level (dBuV) | Antenna Polarization | S.G. (dBm) | Cable loss (dB) | Ant.Gain (dBd) | Emission level (dBm) | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|
| **Low Channel** | | | | | | | | |
| 3700.40 | 80.30 | V | -29.01 | 2.16 | 7.31 | -23.86 | -13.00 | -10.86 |
| 5550.60 | 79.60 | V | -29.14 | 2.83 | 9.14 | -22.84 | -13.00 | -9.84 |
| 7400.80 | 70.33 | V | -35.96 | 3.20 | 9.32 | -29.84 | -13.00 | -16.84 |
| 9251.00 | 63.68 | V | -38.92 | 3.67 | 9.20 | -33.39 | -13.00 | -20.39 |
| 11101.20 | 48.50 | V | -50.80 | 3.92 | 10.66 | -44.05 | -13.00 | -31.05 |
| **Mid Channel** | | | | | | | | |
| 3760.00 | 80.74 | V | -28.40 | 2.19 | 7.35 | -23.24 | -13.00 | -10.24 |
| 5640.00 | 82.58 | V | -26.15 | 2.85 | 9.18 | -19.82 | -13.00 | -6.82 |
| 7520.00 | 68.90 | V | -37.08 | 3.25 | 9.29 | -31.05 | -13.00 | -18.05 |
| 9400.00 | 59.31 | V | -42.77 | 3.73 | 9.45 | -37.05 | -13.00 | -24.05 |
| 11280.00 | 51.64 | V | -47.98 | 3.89 | 10.62 | -41.25 | -13.00 | -28.25 |
| **High Channel** | | | | | | | | |
| 3819.60 | 76.87 | V | -32.13 | 2.22 | 7.39 | -26.96 | -13.00 | -13.96 |
| 5729.40 | 80.32 | V | -28.40 | 2.86 | 9.22 | -22.04 | -13.00 | -9.04 |
| 7639.20 | 73.50 | V | -32.20 | 3.31 | 9.26 | -26.25 | -13.00 | -13.25 |
| 9549.00 | 65.56 | V | -36.04 | 3.78 | 9.68 | -30.14 | -13.00 | -17.14 |
| 11458.80 | 60.20 | V | -39.72 | 3.87 | 10.57 | -33.01 | -13.00 | -20.01 |
| 13368.60 | 57.32 | V | -44.92 | 4.06 | 9.91 | -39.07 | -13.00 | -26.07 |

## 7.6. RADIATED EMISSION - DIGITAL TEST

**INSTRUMENTS LIST**

| Name of Equipment | Manufacturer | Model No. | Serial No. | Due Date |
|---|---|---|---|---|
| EMI Receiver, 9 kHz ~ 2.9 GHz | HP | 8542E | 3942A00286 | 11/20/2004 |
| RF Filter Section | HP | 85420E | 3705A00256 | 11/20/2004 |
| Antenna, Bicon/Log, 25 ~ 2000 MHz | ARA | LPB-2520/A | 1185 | 3/6/2004 |

**DETECTOR SETTING OF SPECTRUM ANALYZER**

| Frequency Range (MHz) | Detector Function | Resolution Bandwidth | Video Bandwidth |
|---|---|---|---|
| 30 to 1000 | ☒ Peak<br>☒ Quasi Peak | ☒ 100 KHz<br>☒ 1 MHz | ☒ 100 KHz<br>☒ 1 MHz |

**TEST PROCEDURE**

1. The EUT was placed on the turn table 0.8 meter above ground inside 3 meter Anechoic Chamber.
2. Set the resolution bandwidth to 120KHz in the test receiver and select Peak function to scan the frequency below 1 GHz.
3. Shift the interference-receiving antenna located in antenna tower upwards and downwards between 1 and 4 meters above ground and find out the local peak emission on frequency domain.
4. Locate the interference-receiving antenna at the position where the local peak reach the maximum emission.
5. Rotate the turn table and stop at the angle where the measurement device has maximum reading
6. Shift the interference-receiving antenna again to detect the maximum emission of the local peak
7. If the reading of the local peak under Peak function is lower than limit by 6dB, then Quasi Peak detection is not needed and this reading should be recorded. And if it is higher than Peak limit, then the test is fail. Others, switch the receiver to Quasi Peak function, set the resolution bandwidth to 100kHz and repeat the procedures (3)~(6). If the reading is lower than limit, this reading should be recorded, otherwise, the test is fail.

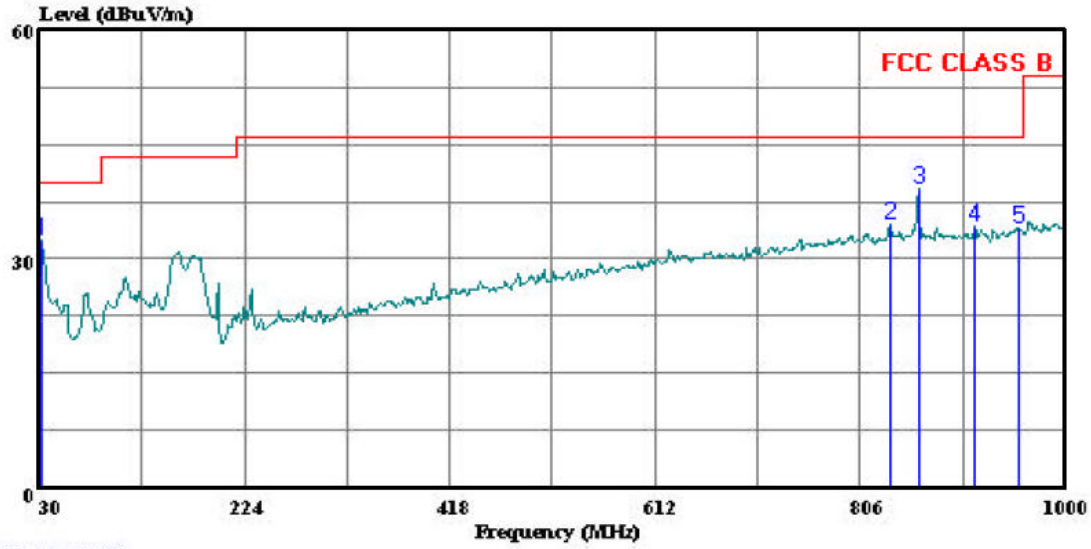
**MEASUREMENT RESULT**

*No non-compliance noted, as shown below.*

COMPLIANCE Engineering Services, Inc.
FCC,VCCI,CISPR,CE UL,CSA,TUV

561F Monterey Road
San Jose, CA 95131
Tel: (408) 463-0888
Fax: (408) 463-0885

Data#: 4 File#: emi.EMI Date: 12-31-2003 Time: 10:06:30




(Audix ATC)

Trace: 3 Ref Trace:

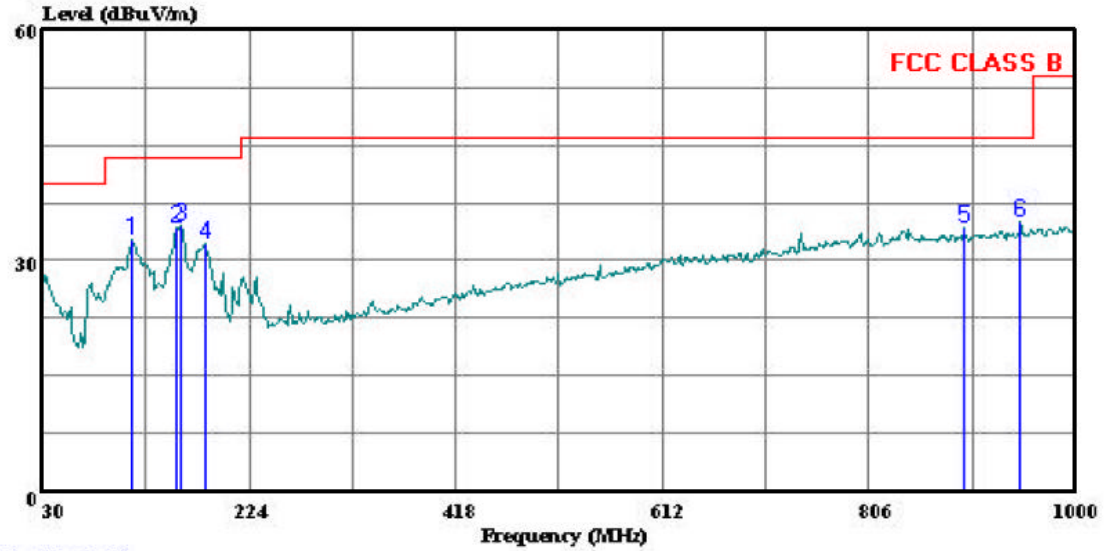
Condition: FCC CLASS B CHAMBER 030306 1185 VERTICAL
Test Eng: : William Zhuang
Project #: : 03U2250
Company: : Trimble Navigation Ltd.
EUT: : Trimble Navigation Asset Tracker
: w/GPS & GMS
Model No: : 51200-00
Configuration: : EUT/Power Supply
Target of Test: : FCC-B
Mode of Operation: TX (WORST CASE)

Page: 1

| | Freq | Remark | Read Level | Factor | Level | Limit Line | Over Limit |
|---|---|---|---|---|---|---|---|
| | MHz | | dBuV | dB | dBuV/m | dBuV/m | dB |
| 1 | 31.940 | Peak | 14.84 | 17.53 | 32.37 | 40.00 | -7.63 |
| 2 | 834.130 | Peak | 11.34 | 23.16 | 34.50 | 46.00 | -11.50 |
| 3 | 861.290 | Peak | 15.80 | 23.39 | 39.19 | 46.00 | -6.81 |
| 4 | 914.640 | Peak | 10.41 | 23.94 | 34.35 | 46.00 | -11.65 |
| 5 | 955.380 | Peak | 9.78 | 24.34 | 34.12 | 46.00 | -11.88 |

561F Monterey Road
San Jose, CA 95131
Tel: (408) 463-0888
Fax: (408) 463-0885

Data#: 2 File#: emi.EMI Date: 12-31-2003 Time: 09:55:50




(Audix ATC)

Trace: 1 Ref Trace:

Condition: FCC CLASS B CHAMBER 030306 1185 HORIZONTAL
Test Eng: : William Zhuang
Project #: : 03U2250
Company: : Trimble Navigation Ltd.
EUT: : Trimble Navigation Asset Tracker
: w/GPS & GMS
Model No: : 51200-00
Configuration: : EUT/Power Supply
Target of Test: : FCC-B
Mode of Operation: TX (WORST CASE)

Page: 1

| | Freq | Remark | Read Level | Factor | Level | Limit Line | Over Limit |
|---|---|---|---|---|---|---|---|
| | MHz | | dBuV | dB | dBuV/m | dBuV/m | dB |
| 1 | 114.390 | Peak | 21.50 | 11.18 | 32.68 | 43.50 | -10.83 |
| 2 | 155.130 | Peak | 24.76 | 9.63 | 34.39 | 43.50 | -9.11 |
| 3 | 159.980 | Peak | 24.61 | 9.83 | 34.44 | 43.50 | -9.06 |
| 4 | 182.290 | Peak | 22.05 | 10.10 | 32.15 | 43.50 | -11.35 |
| 5 | 895.240 | Peak | 10.33 | 23.83 | 34.16 | 46.00 | -11.84 |
| 6 | 948.590 | Peak | 10.68 | 24.28 | 34.96 | 46.00 | -11.04 |

## 7.7. POWERLINE CONDUCTED EMISSION

Not applicable, EUT is operating only DC voltage.

## 7.8. SECTION 2.1055: FREQUENCY STABILITY

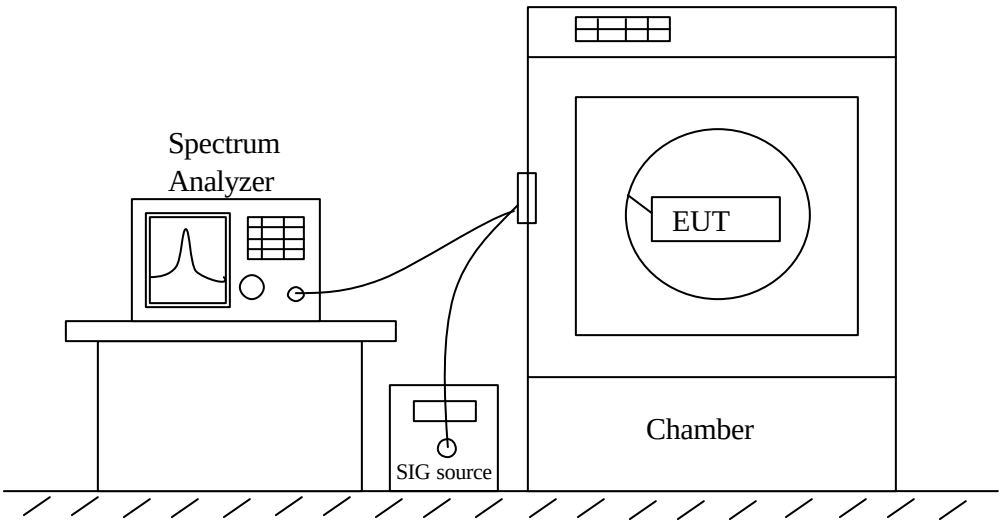
**INSTRUMENTS LIST**

| EQUIPMENT | MANUFACTURE | MODEL NO. | SERIAL NO. | CAL. DUE DATE |
|---|---|---|---|---|
| PSA Analyzer | Agilent | E446A | US42070220 | 1/13/04 |
| 10dB Attenuator | Agilent | 8493C | 59028 | N/A |
| Environmental Chamber | Thermotron | SE 600-10-10 | 2980 | 4/23/04 |
| DC Power Supply | Kenwood | PA36-3A | 7060074 | N/A |

**DETECTOR SETTING OF TEST RECEIVER**

| Frequency Range (MHz) | Detector Function | Resolution Bandwidth | Video Bandwidth |
|---|---|---|---|
| Above 1000 | Peak | 300 Hz | 300 Hz |

**TEST SETUP**




Frequency Stability Setup

**TEST PROCEDURE**

- **Frequency stability versus environmental temperature**

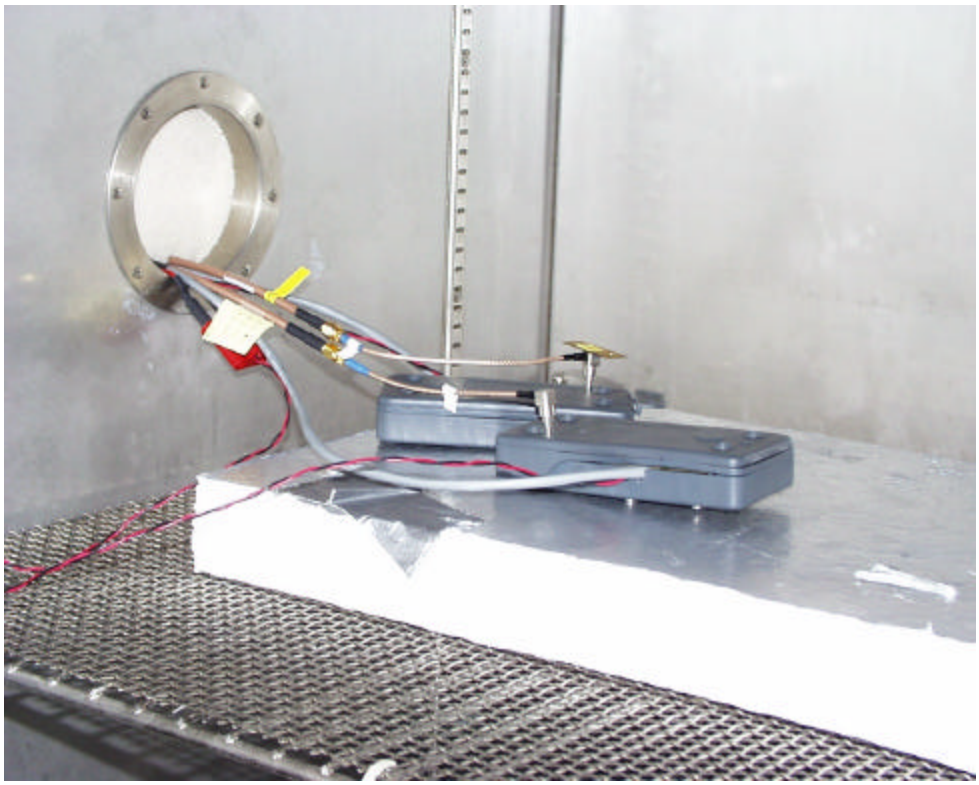
1). Setup the configuration per figure 6 for frequencies measurement inside the environmental chamber. Set the temperature of the chamber to 25°C. Set SA Resolution Bandwidth low enough to obtain the desired frequency resolution and measure the EUT 25°C operating frequency as reference frequency.
2). Turn EUT off and set Chamber temperature to -30°C.
3). Allow sufficient time (approximately 20 to 30 minus after chamber reach the assigned temperature) for EUT to stabilize. Turn on EUT and measure the EUT operating frequency. Turn off EUT after the measurement.
4). Repeat step 3 with a 10°C increased per stage until the highest temperature of +50°C reached, record all measured frequencies on each temperature step.

- **Frequency stability versus AC input voltage**

1). Setup the configuration per figure 6 and set chamber temperature to 25°C. Use a variable AC power supply to power the EUT and set AC output voltage to EUT nominal input AC voltage. Set SA Resolution Bandwidth low enough to obtain the desired frequency resolution and measure the EUT 25°C operating frequency as reference frequency.
2). Slowly reduce the EUT input voltage to specified extreme voltage variation (±15%) and record the maximum frequency change.

**MEASUREMENT RESULT**

*No non-compliance noted, as shown below.*



| Reference Frequency: PCS Mid Channel 1880.00000MHz @ 25˚C<br>Limit: to stay ± 2.5 ppm = 4700.039 Hz | | | | |
|---|---|---|---|---|
| Power Supply (Vdc) | Environment Temperature (˚C) | Frequency Deviation Measureed with Time Elapse | | |
| | | (MHz) | Delta (ppm) | Limit (ppm) |
| 5.00 | 50 | 1880.01637 | -0.418 | ± 2.5 |
| 5.00 | 40 | 1880.01596 | -0.199 | ± 2.5 |
| 5.00 | 30 | 1880.01580 | -0.116 | ± 2.5 |
| ***5.00*** | ***25*** | ***1880.01558*** | ***0*** | ***± 2.5*** |
| 5.00 | 20 | 1880.01558 | 0.003 | ± 2.5 |
| 5.00 | 10 | 1880.01555 | 0.018 | ± 2.5 |
| 5.00 | 0 | 1880.01530 | 0.152 | ± 2.5 |
| 5.00 | -10 | 1880.01507 | 0.271 | ± 2.5 |
| 5.00 | -20 | 1880.01492 | 0.354 | ± 2.5 |
| 5.00 | -30 | 1880.01477 | 0.433 | ± 2.5 |
| 3.00 (end point) | 25 | 1880.01538 | 0.110 | ± 2.5 |
| 4.25 | 25 | 1880.01605 | -0.248 | ± 2.5 |
| 5.75 | 25 | 1880.01603 | -0.240 | ± 2.5 |

# 8. APPENDICES

## 8.1. EXTERNAL & INTERNAL PHOTOS

## 8.2. SCHEMATICS

## 8.3. BLOCK DIAGRAM

## 8.4. USER MANUAL

# END OF REPORT