# Response to FCC Correspondence Reference Number 6847, 3/29/99 and to FCC Correspondence Reference Number 7112, 4/8/99

# Bosch Telecom Transmitter, FCC ID NNS3214823, FCC Form 731 Confirmation Number EA92571

**Background:**

This document contains the responses to action items that relate to the Bosch Transmitter resulting from a telephone call between Mr. Frank Coperich (FCC Lab) and Tom Dombrowsky (Wiley, Rein & Fielding) on 25 March 99 and a meeting at the FCC Lab, Columbia MD, on 31 March 99.

Four action items relating to the Transmitter resulted from the 25 March telephone call and FCC Correspondence Reference Number 6847 requested information addressing these action items. During this telephone conversation, it was also determined that representatives from Bosch Telecom should meet with Frank Coperich at the FCC Lab to review the KTL test report. Attendees at the meeting on March 31, 1999 were Frank Coperich (FCC Lab), Tom Dombrowsky (Wiley, Rein & Fielding), Mike Grizzaffi and Bill Paschetag (Bosch Telecom). Twelve action items resulted from the 31 March meeting for the transmitter.

**Format of this Document:**

The Action Items are discussed as "line items" in the main portion of this document. Letters, tables and graphs to provide non-test information requested are presented in Appendix A. New and repeat test data on the CPE Roof Unit, required as part of these action items to demonstrate compliance with the –56 dBc emission limit requirement of Part 101, is presented in Appendix B. Revised pages to the KTL report, corrected as action items, are presented in Appendix C.

**Action Item 1 from the 25 March 1999 Telephone Call, Frank Coperich/Tom Dombrowsky**

*Bosch should prepare a letter to FCC stating Bosch's agreement to use B=850 MHz for calculation of the emission mask of Part 101 paragraph 101.111 (a) (2) (ii) and (iii) instead of the presumed emission mask submitted with the application.*

**Response:** Bosch Telecom has prepared a letter agreeing to using the 850 MHz Authorized Bandwidth in the calculation of the emission limit as defined in Part 101 paragraphs 101.111 (a) (2) (ii) and (iii). This letter is included on pages 2 and 3 of Appendix A to this document.

**Action Item 2 from the 25 March 1999 Telephone Call, Frank Coperich/Tom Dombrowsky**

*Bosch is requested to clarify the frequency range over which the 56 dB attenuation applies and at what frequencies the 250% bandwidth occurs.*

**Response:** Bosch Telecom has prepared a chart and table indicating the range over which the 56 dB attenuation applies. The emission mask is symmetrical about the center of the 850 MHz authorized band for LMDS (i.e., 27.925 GHz) and the required attenuation equation is based on this 850 MHz bandwidth. This chart and table is presented on pages 4 and 5 of Appendix A to this document.

**Action Item 3 from the 25 March 1999 Telephone Call, Frank Coperich/Tom Dombrowsky**

*Bosch is requested to clarify what was intended in the reference to Power Spectral Density in the applications.*

**Response:** The Power Spectral Density sample calculation on test report page 16 shows all the factors necessary to convert the measured data (in terms of dBm/Hz) to EIRP (in terms of dBW/MHz).

A note has been added to this section (see test report change page 15 in Appendix C) to direct the reader to the Power Spectral Density summary (located on page 17 of Appendix C). This note also directs the reader to test data (spectrum analyzer scans, located on pages 56 through 60 of test report (not included in the report change pages).

Additionally, a chart was added to test report page 57 to summarize the results indicated on each of the three Spectrum Analyzer scans (page 57 in appendix C).

**Action Item 4 from the 25 March 1999 Telephone Call, Frank Coperich/Tom Dombrowsky**

*Spectrum plots were taken with a 50 millisecond sweep which Frank Coperich felt may be too fast to detect all emissions; he requested comparison with 100, 500 and 1000 millisecond sweep speeds.*

**Response:** Bosch Telecom has performed several occupied bandwidth measurements using the HP 8564E Spectrum Analyzer to evaluate the sweep time and video averaging as an effect on the accuracy of the measurement of Occupied Bandwidth which are summarized on page 16 in the Appendix B to this document.

The HP 8564E has a built-in user-measurement function to measure Occupied Bandwidth. The instrument will automatically select the fastest sweep speed that will produce an accurate measurement but also will allow the operator to manually select a sweep speed and it will display a warning to the operator if the sweep speed will not produce an accurate measurement.

The user may also select a “Video Averaging” mode of operation whereby the average value of many sweeps is displayed (for instance, the average of the last 100 sweeps); this function provides a “cleaner” display with some sacrifice in display accuracy of noise or noise-type signals.

The occupied bandwidth measurement evaluation was performed on a 30 MHz multi-channel QPSK signal from the transmitter at a power level of 1.0 Watt at 50, 100, 200, 500 and 1000 millisecond sweep times and in the Detector Normal mode and with Video Averaging on and off. The results indicate no real variation as a function of sweep rate but the occupied bandwidth measurement function indicated a slightly wider bandwidth (approximately 3%) with video averaging off than with video averaging on. It was noted that there was considerably less variation in the indicated value for occupied bandwidth when measured with Video Averaging on between several successive measurements of the same waveform as compared to successive measurements with Video Averaging off.

**Action Item 1 from the 31 March 1999 Meeting at FCC Lab**

*Delete the request for confidentiality on Exhibits 2, 3, 6 and 7 of the application.*

**Response:** On 5 April 1999, the request for confidentiality for transmitter application Exhibits 2, 3, 6 and 7 was withdrawn by electronic submittal to Correspondence Reference 6847; this completed Action Item 1 from the 31 March meeting. Although this was only one action item from the 31 March meeting, the electronic submittal resulted in closure of Correspondence Reference 6847.

Correspondence Reference Number 7112 was opened to include all of the remaining transmitter-related action items from the 25 March 99 phone call and the 31 March 99 meeting which are included in this document.

**Action Item 2 from the 31 March 1999 Meeting at FCC Lab**

*Clarify the reference to 960 MHz on page 8 of Exhibit 1 of the application.*

**Response:** The reference to 960 MHz on page 8 of Exhibit 1 of the application relates to the Intermediate Frequency input to the transmitter when used to transmit the system pilot tone. The Bosch SpectraPoint system requires a 27.510 GHz cw signal to synchronize the local oscillators in the subscriber units (Customer Premises Equipment Roof Unit Transceivers, Bosch part number 3214864, FCC ID NNS3214864). One transmitter per $90^{o}$ sector of each node is designated as the "pilot tone" transmitter. It receives a stable 960 MHz I/F input signal from the Bosch SpectraPoint Base equipment, upconverts it to the transmit frequency of 27.510 MHz and transmits this signal at a maximum power of 1.0 Watt.

**Action Item 3 from the 31 March 1999 Meeting at FCC Lab**

*Clarify the need for the 24 dB correction factor on the data sheets. Also, determine whether the measurement at 27.4 GHz is a typographical error (similar to 26.4 GHz local oscillator frequency).*

**Response:** The 24 dB correction factor on some data sheets in the test report is to convert measured levels to the terms of the emission limit of Part 101 paragraph 101.111 (a) (2) (iii), "In any 4 kHz band…" since some of the measurements were made on the Spectrum Analyzer in 1 MHz Resolution Bandwidth.

The measurement at 27.4 GHz is suspected to be a typographical error in that it appears once on page 89 of the test report (Antenna Terminal Conducted) and as "27.04" on page 115 of the test report (Radiated Emissions). The transmitter is normally set to one of three local oscillator frequencies -- 26.040, 26.400 or 26.550 GHz. Some test data sheets indicate measurements at 26.040, 26.400 and 26.550 GHz specifically searching for local oscillator leakage. In the radiated tests, measurements at these frequencies and at "27.04" GHz indicate nothing above noise floor (refer to pages 99,100, 103, 104, 107, 108, 111, 114 and 115).

On page 89 of the KTL test report, the Antenna Terminal Conducted test data sheet shows a measurement of –42.8 dBm at "27.400" GHz. The technician performing the test did not annotate the "Comments" column of the data sheet for this measurement and does not remember any details of this test. If this signal is actually at 27.400 GHz, the Antenna Conducted spec limit at this frequency is –15 dBm (-45 dBc) and the measured level of –42.8 dBm has a margin of of compliance of 27.8 dB. However, if the measurement were actually at 26.400 GHz, the Antenna Conducted spec limit at this frequency is –26 dBm (-56 dBc), resulting in a margin of compliance of 16.8 dB.

**Action Item 4 from the 31 March 1999 Meeting at FCC Lab**

*Define factors in Field Strength calculation on page 17.*

**Response:** The equation on page 17 of the Transmitter Test Report is derived from the KTL (formerly International Compliance Corporation) technical handbook, page 4 (Test Data Format) and page 5 (Appendix A).

Field Intensity (equivalent to 1 W into tuned dipole)

= 30 dBm-28.87+116+10.5 = 127.63 dB above one microvolt/meter

| | | |
|---|---|---|
| where: | 30 dBm = | the Transmitter Power Output (i.e., 1 Watt) |
| | -28.87 [dBm] = | the Power Density at a distance of 10 meters resulting from 1 milliwatt applied to a tuned dipole antenna |
| | 116 [dB] = | Conversion, Power Density in terms of dBm/sq.meter to dB microVolts/meter |
| | 10.5 [dB] = | Extrapolation, 10 meter test distance to 3 meters |

Note: Using the "standard" equation for Field Intensity, E = SqRt(49.2*P)/(distance in meters), 1 Watt into a tuned dipole antenna will result in a Field Intensity of 127.37 dB above 1 microvolt per meter at a distance of 3 meters.

Page 17 of the test report has been revised to define these missing factors and is in the test report pages of the Appendix.

**Action Item 5 from the 31 March 1999 Meeting at FCC Lab**

*Number comments on page 23.*

**Response:** Numbers to "Comments" to the Test Results Summary on page 23 of the test report have been added and the revised page is in the test report pages of Appendix C (new page number 29).

**Action Item 6 from the 31 March 1999 Meeting at FCC Lab**

*Clarify references to "Quasi-Peak" on data sheets 21 – 23 of the test report.*

**Response:** KTL uses common data sheet and report page formats for Part 15 or Part 2 testing and the column headings were mislabeled. The "Quasi Peak" column headings on pages 21 to 23 of the test report have been corrected to read "dBc". Pages 21 to 23 of the test report has been revised to define these incorrect column headings and are in the test report pages of Appendix C (new page numbers 27 through 29).

**Action Item 7 from the 31 March 1999 Meeting at FCC Lab**

*Clarify bottom chart on page 31 and on page 100 of the test report. Also clarify Power Spectral Density Sample Calculation table on page 16, PSD Summary Data on Page 18 and PSD Test Data on pages 57 to 60.*

**Response:** The test report data sheet on page 100 has been corrected to indicate the limit of 56 dB below the Mean Power Output Level. Also, the levels associated with the frequencies between 27.5 and 28.35 GHz have been declared "N/A" since these are in the authorized band of operation. The corresponding summary chart on the bottom of page 31 of the test report has been changed to agree with the test data sheet. These corrections are in the test report change pages of Appendix C (pages 31a and 100).

The Power Spectral Density sample calculation on test report page 16 shows all the factors necessary to convert the measured data (in terms of dBm/Hz) to EIRP (in terms of dBW/MHz).

A note has been added to direct the reader to the Power Spectral Density summary on Page 17 of Appendix C and also to the test data (Spectrum Analyzer scans) on pages 58 through 60 of the test report.

Additionally, a chart was added to test report page 57 to summarize the results indicated on each of the three Spectrum Analyzer scans.

**Action Item 8 from the 31 March 1999 Meeting at FCC Lab**

*Clarify Occupied Bandwidth measurements and justify usage of 30/40/50 MHz bandwidths relative to the measurements presented.*

**Response:** Bosch Telecom plans to use single-channel QPSK modulation for video and data and multi-channel QPSK modulation for telephony transmission to LMDS subscribers. Since the maximum anticipated single-channel data rate is 50 Mbps, the maximum occupied bandwidth is anticipated to be 65 MHz (based on an alpha of 0.3) similar to that shown on page 68 in the test report. The minimum single-channel data rate is anticipated to be approximately 27 Mbps with a corresponding occupied bandwidth of approximately 35 MHz. It is also possible that more than one single-channel signal, and each possibly having different bandwidths, will be transmitted simultaneously from a single transmitter.

The multi-channel telephony modulation is comprised of up to twenty QPSK frequency-division-multiplexed "channels", each having a bandwidth of approximately 1.3 to 2.0 MHz. The maximum occupied bandwidth of the multi-channel signal is approximately 43 MHz as shown on page 69 of the KTL test report.

During the meeting on March 31$^{st}$, Bosch was advised to select the widest bandwidth and define the emission designator for it even though narrower bandwidth signals may be transmitted.

The modulation designator for the single-channel QPSK modulation is **65M0 G2X**.

The modulation designator for the multi-channel QPSK modulated transmission is **43M0 G7W**.

The maximum **EIRP** for the Bosch Transmitter is **+1.0 dBW/MHz**.

**Action Item 9 from the 31 March 1999 Meeting at FCC Lab**

*Explain why test data on pages 92 – 96 of the test report appears different than the remainder of the test report.*

**Response:** According to KTL, the test data sheets on pages 92 to 96 are different from the remainder of the test report because of the standard report formats used by KTL. Report pages 92 through 96 are done using a Quattro spreadsheet template while the remainder of the data sheets are done using an Excel spreadsheet template. International Compliance Corporation, Lewisville, Texas, was purchased by KTL (a European company) in the spring of 1998 when these tests began. Some of the early data in the test report still has an ICC logo.

The spectrum analyzer scans for Modulation Characteristics and Occupied Bandwidth (test report pages 62 through79) were made on a HP plotter and converted to electronic format for the application by digital scanning. Spectrum analyzer scans for Power Spectral Density (test report pages 58 through 60) were electronically "captured" by a personal computer interfaced to the HP 8564E spectrum analyzer through a GPIB bus using Hewlett Packard Benchlink software.

**Action Item 10 from the 31 March 1999 Meeting at FCC Lab**

*Explain or provide test data for the 26.5 GHz measurements on pages 100. 104, 107 and 108 and additionally, the 27.04 GHz measurement on page 115.*

**Response:** The recording of "26.5 GHz" on page 99 is the upper end of the tuning range of the spectrum analyzer used for this test (HP 8563E, KTL (ICC) ID G2624, and does not represent a particularly high point of interest. The noise floor at these measurements is slightly greater than 56 dB below the Mean Output Power Level of one Watt.

KTL states in their TEST RESULTS SUMMARY, page 15 of their revised test report, that "*The test results further confirm that the spurious emissions (microwave field strength) are not within the FCC Part 101 and FCC Part 2 Requirements at 26.5 GHz to 40 GHz*." A more accurate statement, as evidenced by their data sheets, is that KTL was unable to measure radiated emissions from the local oscillator (at 26.550 GHz on test report page 100, at 26.040 GHz on pages 103, 104, 107 and 108 and 115 and at 26.400 on pages111 and 114) *due to the internal noise level* of their spectrum analyzer operated in a 1 MHz Resolution Bandwidth. In these instances, the reported level of the noise floor was too high to accurately measure to Part 101 requirements (i.e., not greater than 56 dB plus error margin below the carrier).

For those cases where the local oscillator emission level was masked by the KTL test instrumentation noise floor, Bosch Telecom repeated these measurements in the Bosch EMC Lab, Richardson, Texas. Microwave amplifiers and reduced spectrum analyzer resolution bandwidths provided the ability to measure these signals and confirm that the transmitter does in fact comply with the –56 dBc requirements of Part 101. A test report with test data is presented on pages 2 through 15 of Appendix B of this document.

The recording of "27.04 GHz" on page 115 of the test report was considered by KTL to be a typographical error for the local oscillator frequency of 26.04 GHz. This was changed by KTL on the data sheet in the test report (refer to page 115 in Appendix C of this document). This level, though noise floor in the KTL measurement, was measured during the retest to be compliant with Part 101 by greater than 20 dB (refer to pages 12 and 13 of Appendix B of this document).

**Action Item 11 from the 31 March 1999 Meeting at FCC Lab**

*A request was made for a more legible parts list for the Transmitter. The parts list was included in the original application as part of Exhibit 2 (Label Information) but was not specifically identified and was difficult to read on the computer terminal.*

**Response:** On 8 April 1999, Exhibit 10, containing the Transmitter Parts List, was electronically submitted to the FCC Lab completing Action Item 11 from the 31 March meeting.

**Conclusion:**

Bosch Telecom concludes, based on the test data contained in the original KTL test report as amended by the data contained in this response to Correspondence Reference Number 7112, that the Bosch transmitter, FCC ID NNS3214823, Form 731 Confirmation Number EA92571, complies fully with the requirements of FCC Part 101 and respectfully requests the approval of this transmitter application for use in the Local Multipoint Distribution Service.

Respectfully submitted,

E. W. Paschetag
Bosch Telecom, Inc.
1125 East Collins Blvd.
Richardson TX 75081
(972) 852-6949

Appendix A

To

FCC Correspondence Reference Number 7112

Letters, Tables and Graphs

Bosch Telecom Transmitter

FCC ID:  NNS3214823

FCC Form 731 Confirmation Number:  EA92571

May 4, 1999

**BOSCH TELECOM, INC.**

**BOSCH**

Telephone: (972) 852-6700
(800) 296-4268
Fax: (972) 852-6797

1125 E. Collins Blvd.
Richardson, Texas 75081

March 30, 1999

Mr. Frank Coperich
Federal Communications Commission
Office of Engineering and Technology
7435 Oakland Mills Road
Columbia, MD 21046

***RE: Bosch Telecom, Inc. Requests for Equipment Authorization Correspondence Ref. Numbers 6847 and 6848.***

Dear Frank:

Bosch Telecom, Inc. ("Bosch"), a manufacturer of telecommunications equipment, is in the process of seeking the initial approval of Local Multipoint Distribution Service ("LMDS") transmitting equipment from the Commission. On December 10 and 31, 1998 (FCC IDs: NNS3214823 and NNS3214864), Bosch filed the first LMDS equipment authorization applications with the Commission. Additionally, on January 27, 1999, Bosch requested that the Commission provide an interpretation of Part 101 of its rules concerning emission mask requirements.

Section 101.111(a)(2)(ii) of the Commission's rules[1] requires the mean power of emissions to be attenuated below the mean output power of the transmitter[2] as specified by the following equation but in no event less than 11 dB:

**$A = 11 + 0.4(P - 50) + 10 \text{Log}_{10}B$ (attenuation greater than 56 dB is not required.)**

**where A = attenuation in dB below the mean output power level**
**P = percent removed from the carrier frequency**
**B = authorized bandwidth in MHz**

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1 *See* 47 C.F.R. § 101.111(a)(2)(ii).

2 When using digital modulation techniques for operating frequencies above 15 GHz, in any 1 MHz band, the center frequency of which is removed from the assigned frequency by more than 50 percent up to and including 250 percent of the authorized bandwidth.

**BOSCH TELECOM, INC.**

**BOSCH**

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Richardson, Texas 75081

Moreover, Section 101.109 of the Commission's rules asserts that the maximum authorized bandwidth for LMDS transmitters is 850 MHz, which is the value determined by the Commission that should be substituted in the equation above for "B". Bosch agrees that this interpretation of the current rules be applied to its current requests for equipment authorization.

Please contact Scott Marin or myself should any additional information be required.

Sincerely,

Harry Lindgoth, VP. Engr & Dev
for

James W. McCoy
Chief Technology Officer

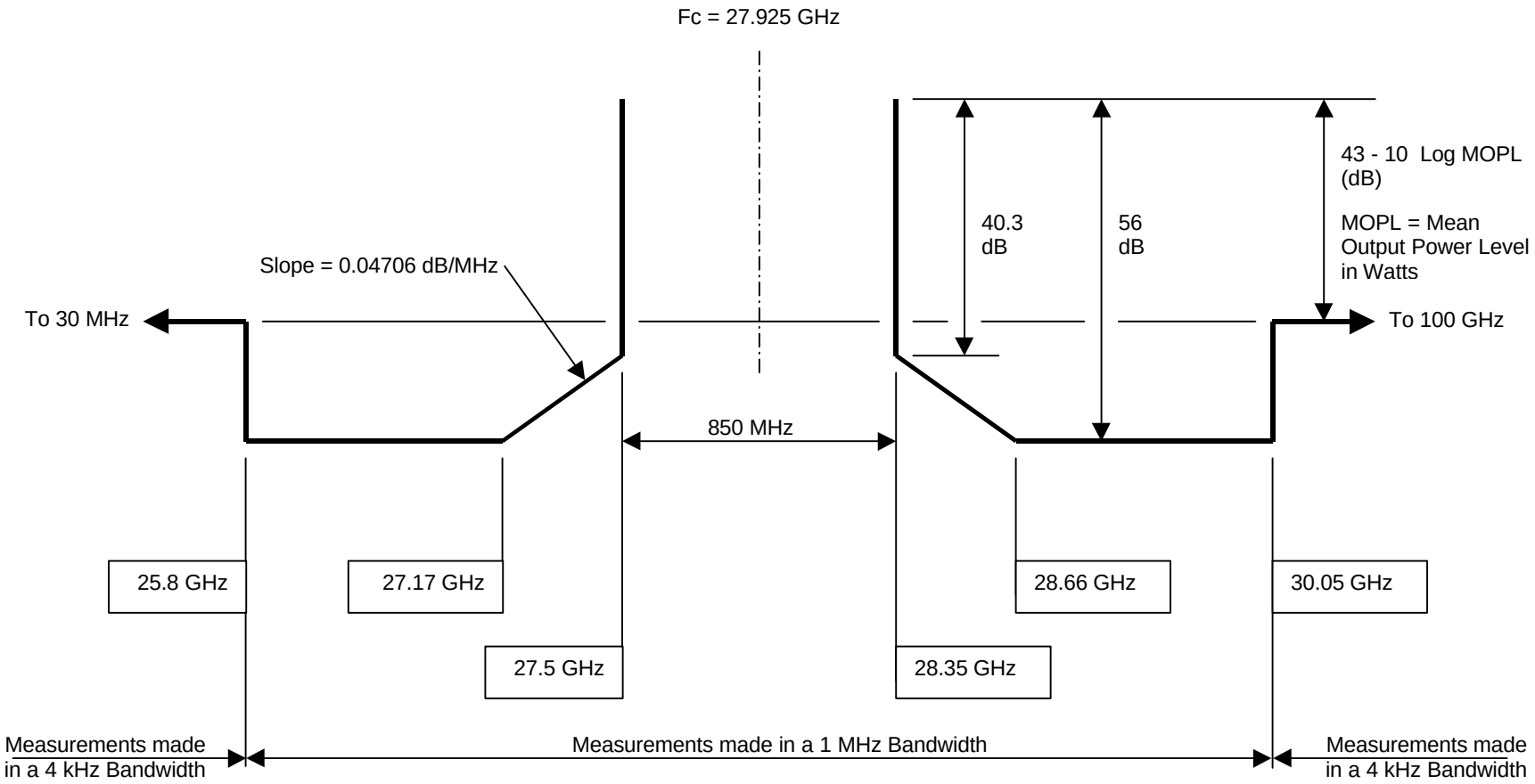



Figure 1 – Part 101 Paragraph 101.111 (a) (2) (ii) & (iii) Emission Limit (For Transmitters Employing Digital Modulation Techniques and Operating Above 15 GHz)

**Limit for Radiated Emissions from the Node Transmitter at a Test Distance of 3 meters**

| Frequency Range | Radiated Emission Limit | Comments |
|---|---|---|
| 30 MHz to 25.8 GHz | 84.6 dBμV/m (per 4 kHz BW) | 127.6 dBμV/m – (43 + 10 $Log_{10}$ MOPW) dB = 87.3 dBμV/m |
| 25.8 GHz to 27.17 GHz | 61.6 dBμV/m (per 1 MHz BW) | 127.6 dBμV/m – 56 dB = 71.6 dBμV/m |
| 27.17 GHz to 27.5 GHz | Increases linearly from 61.6 dBμV/m at 27.17 GHz to 77.3 dBμV/m at 27.5 GHz (per 1 MHz BW) | 127.6 dBμV/m - 11 - 0.4 (P-50) - 10 $Log_{10}$ B<br>where B = 850 MHz<br>P = Percent of Bandwidth from Center Frequency |
| 27.5 GHz to 28.35 GHz | N/A | Not Applicable within the 850 MHz Authorized Bandwidth (27.5 – 28.35 GHz) |
| 28.35 GHz to 28.66 GHz | Decreases linearly from 77.3 dBμV/m at 28.35 GHz to 61.6 dBμV/m at 28.66 GHz (per 1 MHz BW) | 127.6 dBμV/m - 11 - 0.4 (P-50) - 10 $Log_{10}$ B<br>where B = 850 MHz<br>P = Percent of Bandwidth from Center Frequency |
| 28.66 GHz to 30.05 GHz | 61.6 dBμV/m (per 1 MHz BW) | 127.6 dBμV/m – 56 dB = 71.6 dBμV/m |
| 30.05 GHz to 100 GHz | 84.3 dBμV/m (per 4 kHz BW) | 127.6 dBμV/m – (43 + 10 $Log_{10}$ MOPW) dB = 87.3 dBμV/m |

Appendix B

To

FCC Correspondence Reference Number 7112

New Test Data

Bosch Telecom Transmitter

FCC ID:  NNS3214823

FCC Form 731 Confirmation Number:  EA92571

May 5, 1999

# Unwanted Emission Tests on Node Transmitter

Data taken on 3/27/99 by Bill Paschetag and Vijay Ujjain

## Test Objective:

Measure the emissions from the Node transmitter when it is transmitting at its maximum rated output power for comparison with FCC Part 101 paragraph 101.111 (a) (2) (ii) and (iii) emission mask for the LMDS 27.500 to 28.350 GHz band. For this mask, $B_n$= 850 MHz. The center frequency for the mask is the center frequency of the band (i.e. $f_{cm}$ = (27.5+28.35)/2 = 27.925 GHz.).

## Test Setup:

Node transmitter operating at 1 watt total mean power, $P_{tot}$. Measurements are at the waveguide flange ( transmitter output port with the antenna removed).

The multicarrier emission for all plots is from 20 T1 modems using QPSK modulation and operating with a mix of 1/2, 3/4 and 7/8 code rates plus one 140 kbps broadcast carrier with QPSK modulation rate 1/2 code rate operated at the low frequency end of the carrier group. Automatic level control for the transmitter was turned off and drive to the transmitter was adjusted for a maximum rated power output.

The test setup diagram is shown in Figure 1.

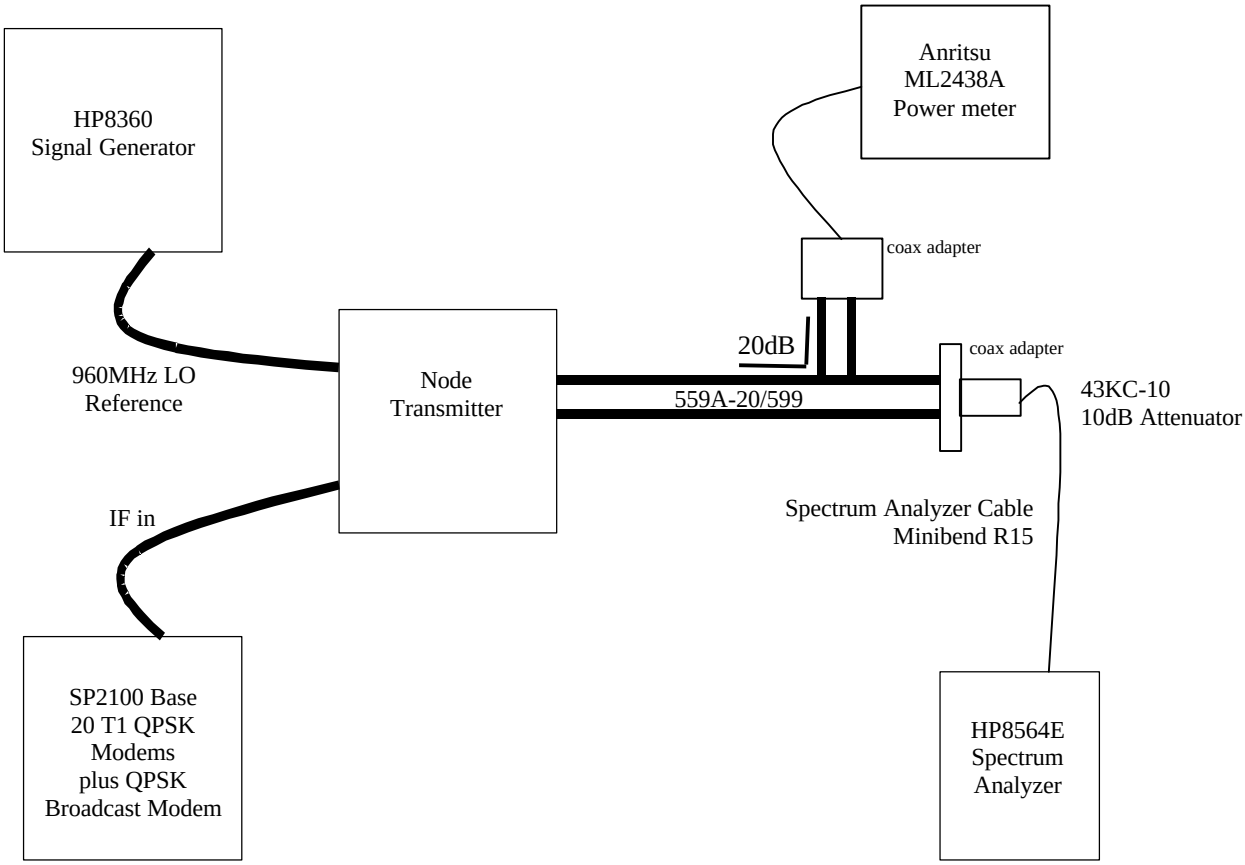



Figure 1 -- Test Setup for Antenna Conducted Measurements on the Bosch Transmitter

## Calibration*:*

The waveguide and cables are calibrated at the tested frequencies. The signal generator output is set to 0dBm and the outputs at the coupled and through ports are measured using a power meter. The spectrum analyzer cable and the 10dB pad are part of the setup during the calibration. The values are given below.

| Frequency | Power at input port | Measured Power at coupled port | Measured power at through port |
|---|---|---|---|
| 27.550GHz | 0dBm | -19.2dBm | -12.52dBm |
| 27.730GHz | 0dBm | -19.42dBm | -12.75dBm |
| 27.945GHz | 0dBm | -19.38dBm | -12.68dBm |

## Test Procedure:

1. Tune the transmitter to its first frequency of the LMDS band.
2. Center the 30MHz channel on the spectrum analyzer screen.
3. Set the span to 50MHz.
4. Set resolution bandwidth to 1MHz and video bandwidth to 3MHz.
5. Set the first reference line of the spectrum analyzer corresponding to +30dBm using the calibration table given above.
6. Increase the output power of the transmitter to +30dBm. Use the calibrated power meter connected to the coupled port to measure the output power.
7. Turn the detector modes and video averaging ON.
8. Take a plot of the spectrum analyzer screen.
9. Turn the video averaging off.
10. Set the center frequency of the spectrum analyzer to 27.5GHz. This is the lower band edge.
11. Set the span to 1GHz and take a plot of the screen.
12. Take another plot of the screen, this time with video averaging on.
13. Turn the video averaging off.
14. Set the center frequency to 28GHz and span to 5GHz.
15. Take a plot of the spectrum analyzer screen.
16. Tune the transmitter to the middle of its tunable range and repeat all the steps above.
17. Tune the transmitter to the high end of its tunable range and repeat all the steps above.

## Summary of the plots:

All the plots are taken with a resolution BW of 1MHz and a Video BW of 3MHz.

| Plot Number | Frequency | Span | Video Averaging |
|---|---|---|---|
| 1a | 27.550GHz | 50MHz | ON |
| 1b | 27.550GHz | 1GHz | ON |
| 1c | 27.550GHz | 1GHz | OFF |
| 1d | 27.550GHz | 5GHz | OFF |
| 2a | 27.730GHz | 50MHz | ON |
| 2b | 27.730GHz | 1GHz | ON |
| 2c | 27.730GHz | 1GHz | OFF |
| 2d | 27.730GHz | 5GHz | OFF |
| 3a | 27.945GHz | 50MHz | ON |
| 3b | 27.945GHz | 1GHz | ON |
| 3c | 27.945GHz | 1GHz | OFF |
| 3d | 27.945GHz | 5GHz | OFF |

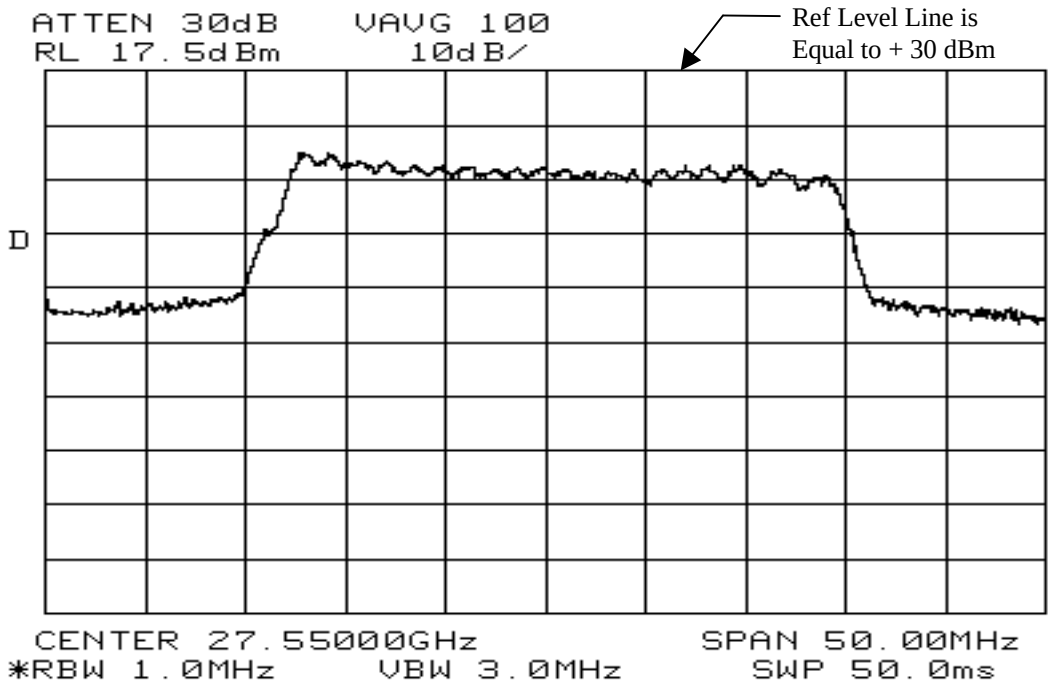



Figure 2a -- Tuned Frequency = 27.550 GHz, Output = +30 dBm, Video Average On

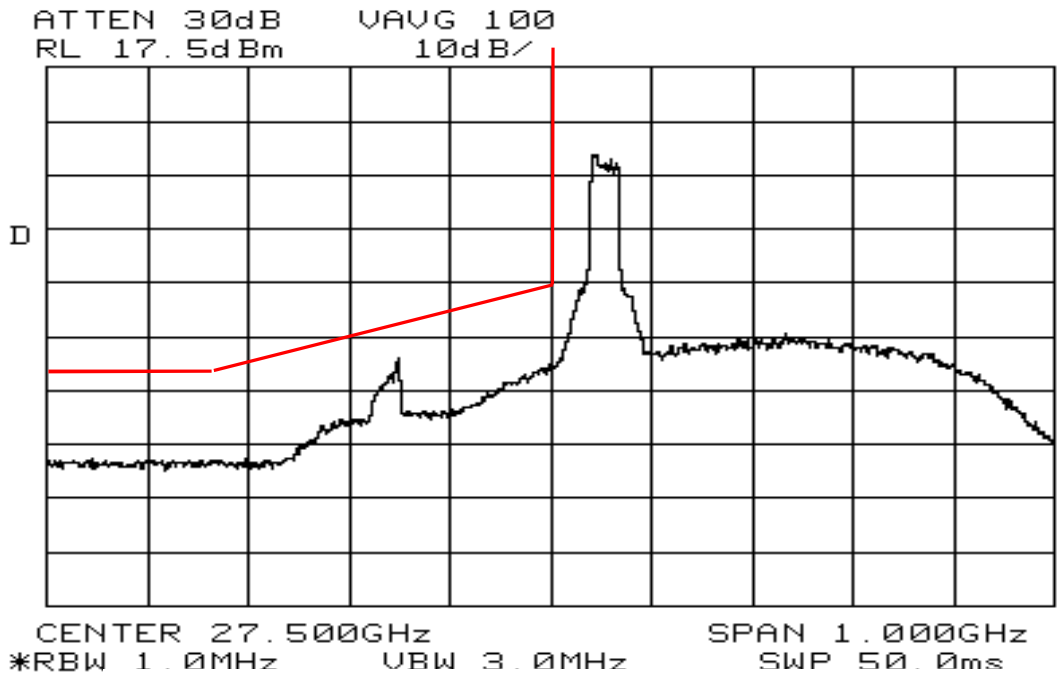



Figure 2b -- Tuned Frequency = 27.550 GHz, Output = +30 dBm, Video Average On

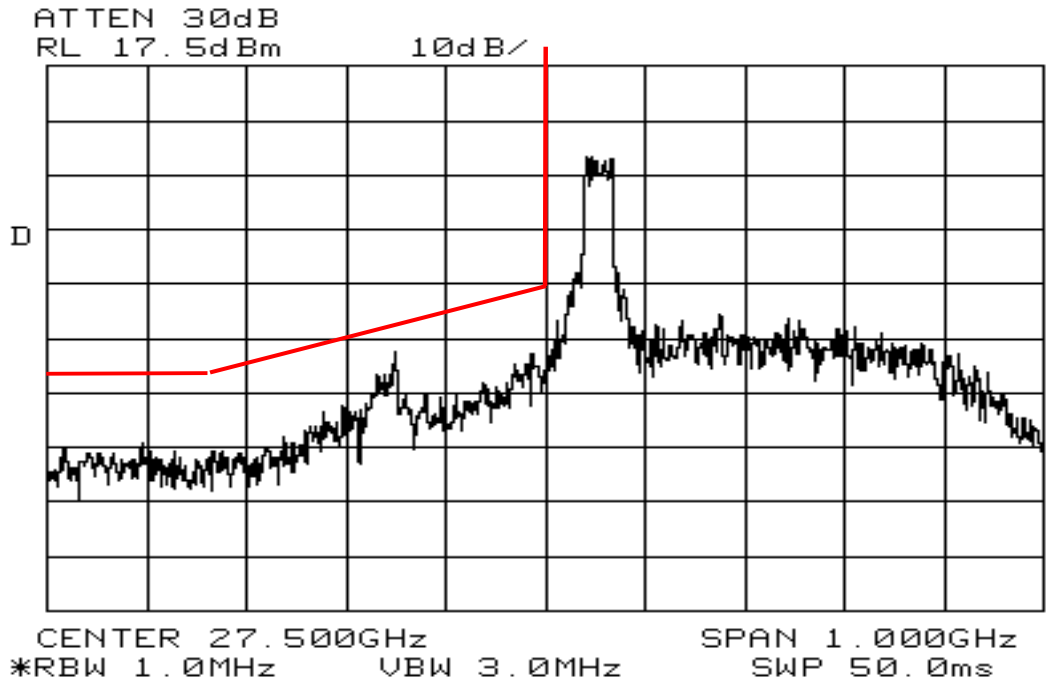



Figure 2c -- Tuned Frequency = 27.550 GHz, Output = +30 dBm, Video Average Off

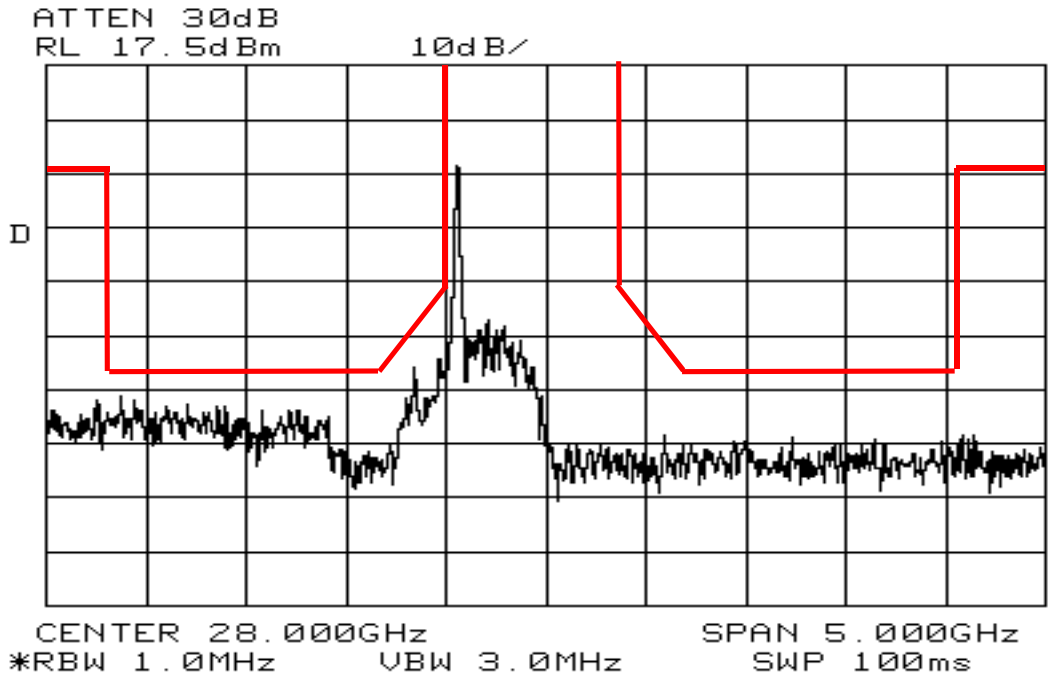



Figure 2d -- Tuned Frequency = 27.550 GHz, Output = +30 dBm, Video Average Off

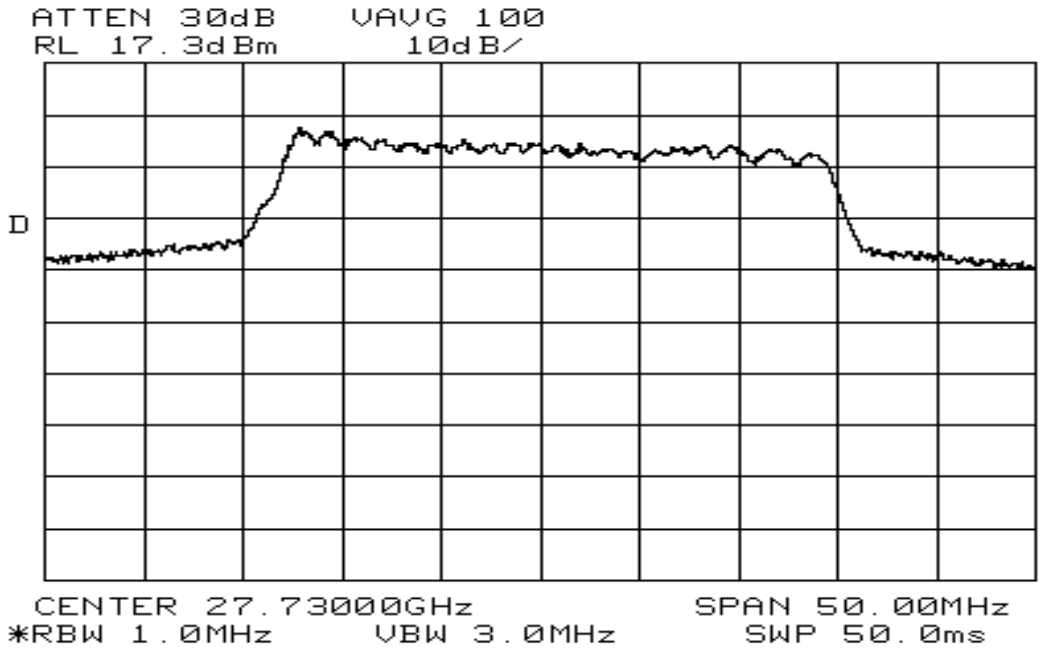



Figure 3a -- Tuned Frequency = 27.730 GHz, Output = +30 dBm, Video Averaging On

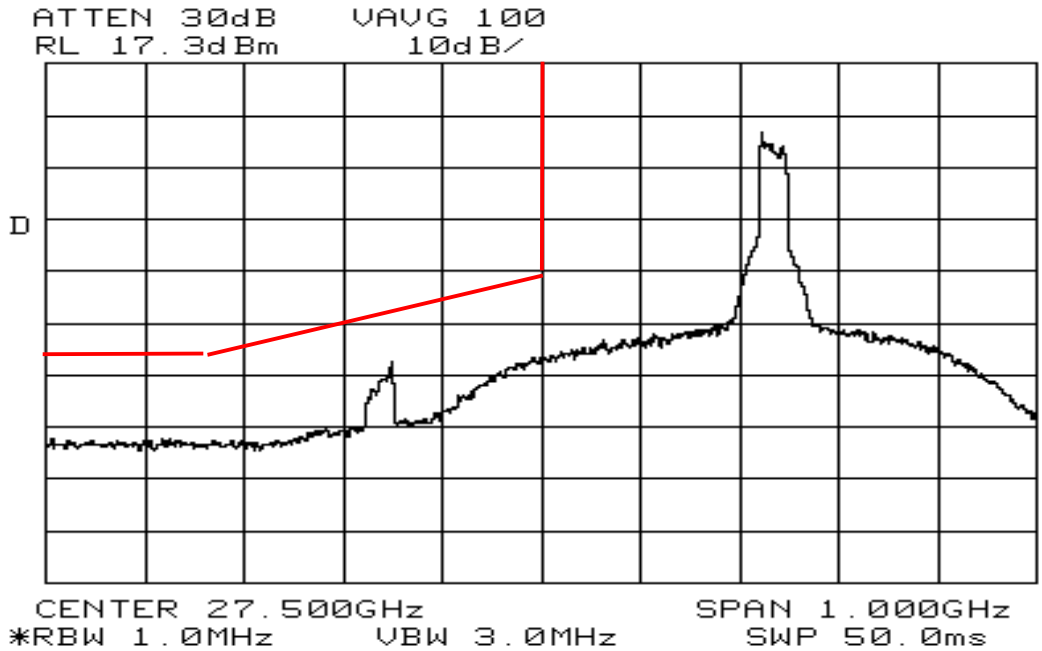
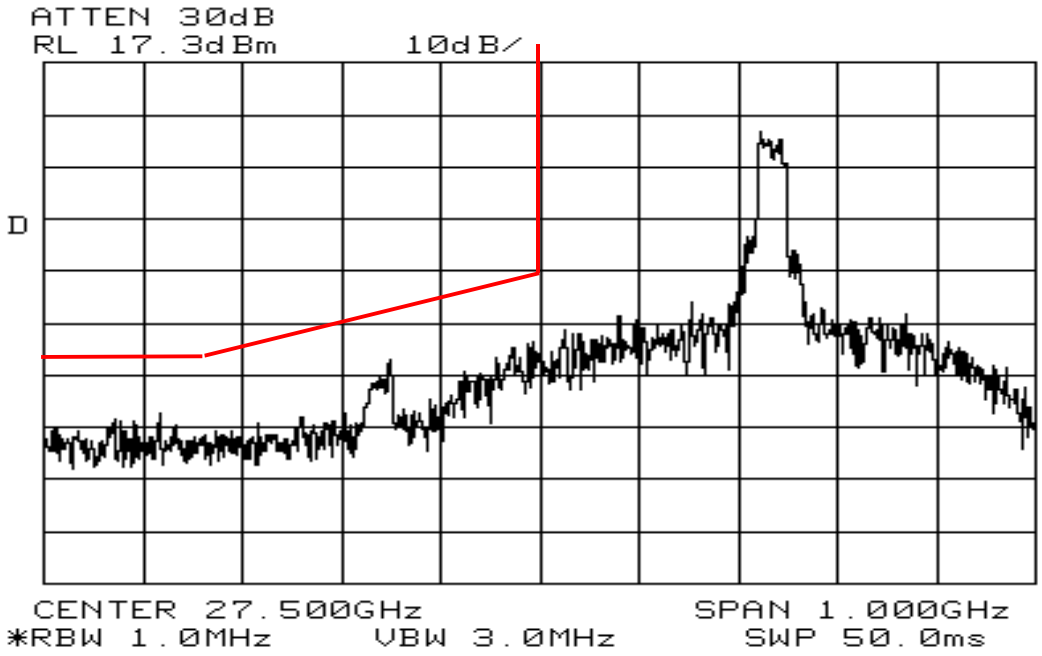



Figure 3b -- Tuned Frequency = 27.730 GHz, Output = +30 dBm, Video Averaging On




Figrue 3c -- Tuned Frequency = 27.730 GHz, Output = +30 dBm, Video Averaging Off

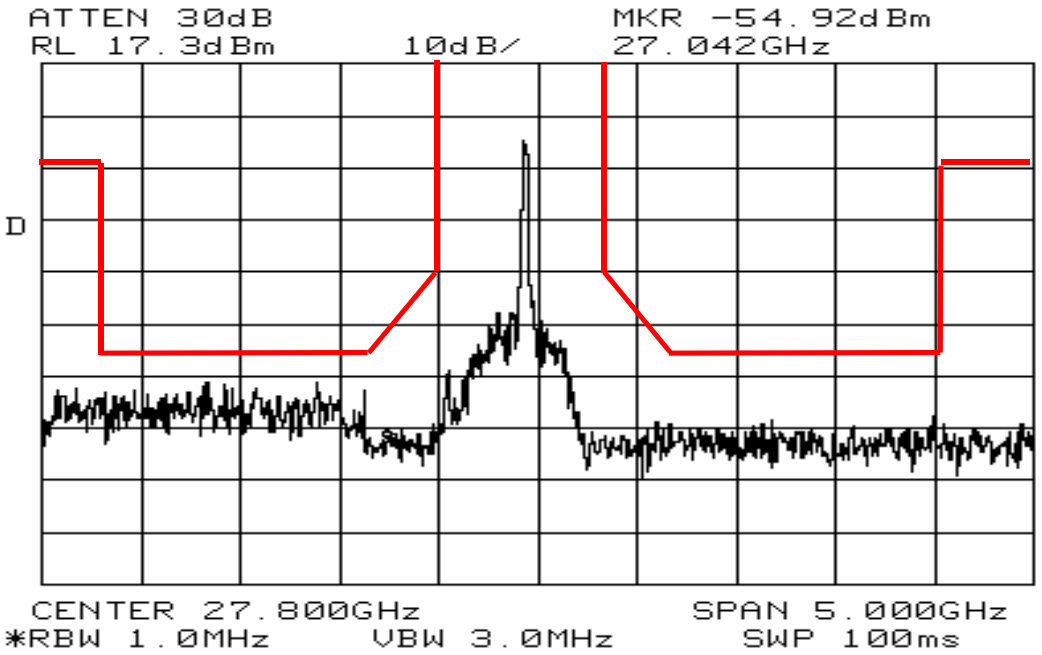



Figure 3d -- Tuned Frequency = 27.730 GHz, Output = +30 dBm, Video Averaging Off

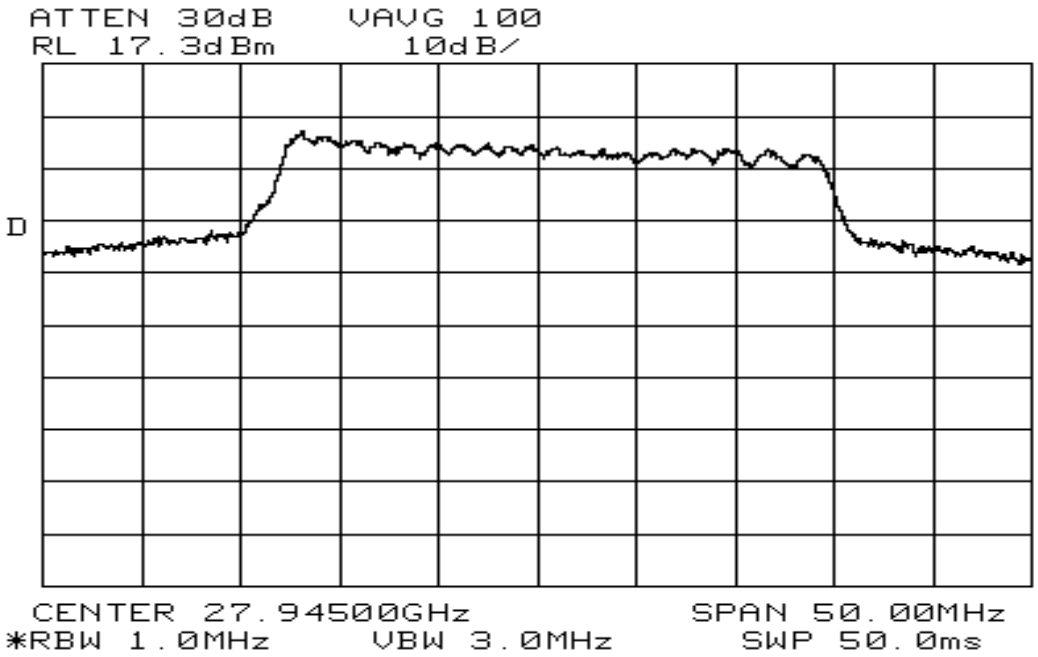



Figure 4a -- Tuned Frequency = 27.945 GHz, Output = +30 dBm, Video Averaging On

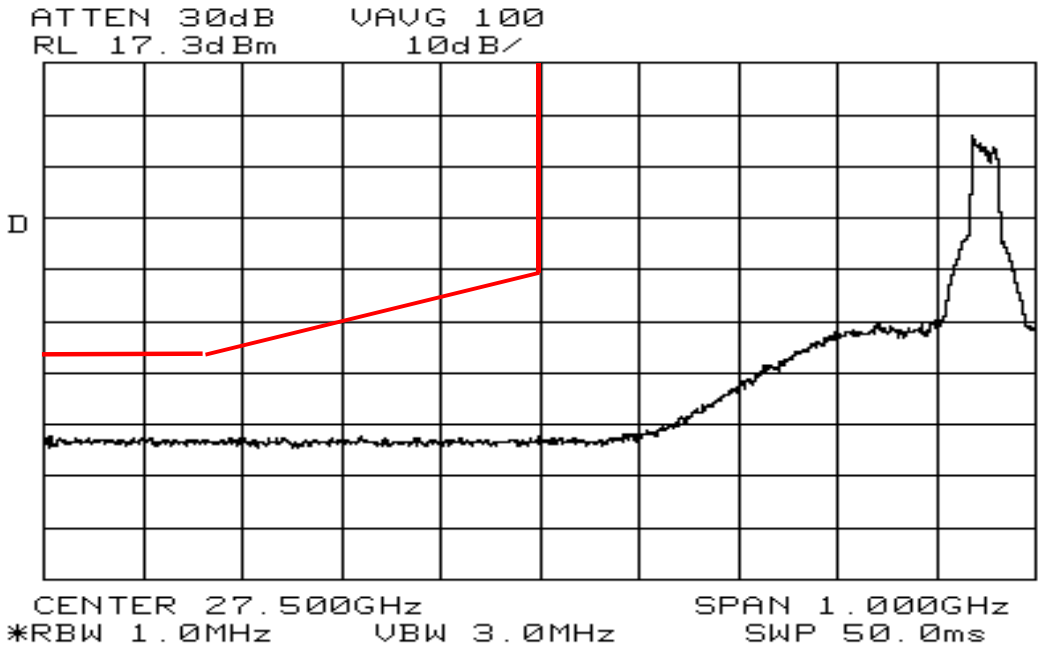



Figure 4b -- Tuned Frequency = 27.945 GHz, Output = +30 dBm, Video Averaging On

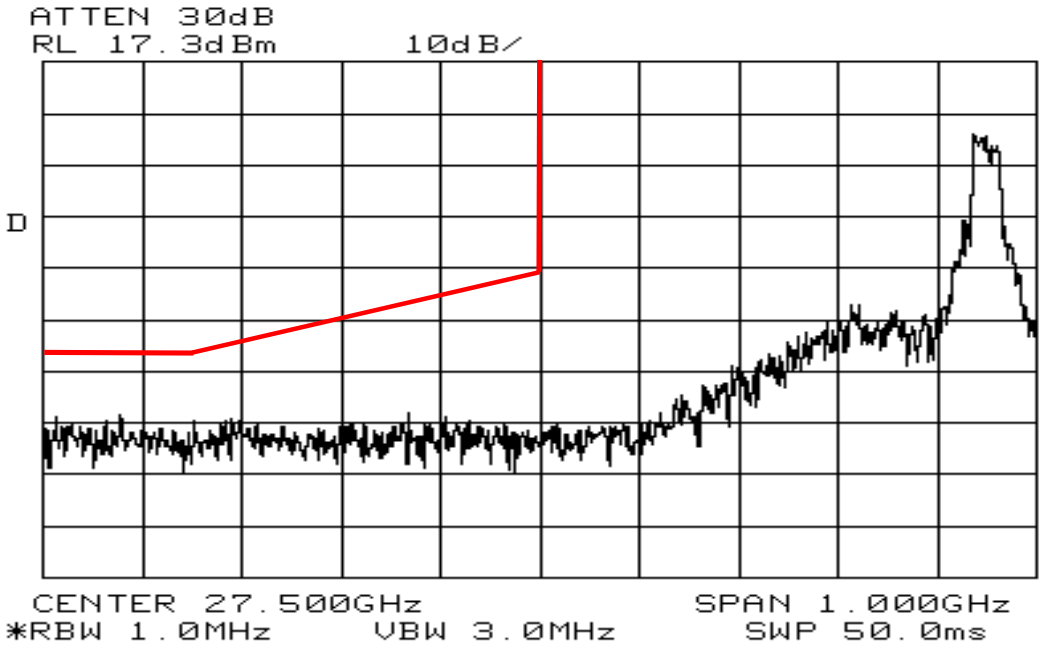



Figure 4c -- Tuned Frequency = 27.945 GHz, Output = +30 dBm, Video Averaging Off

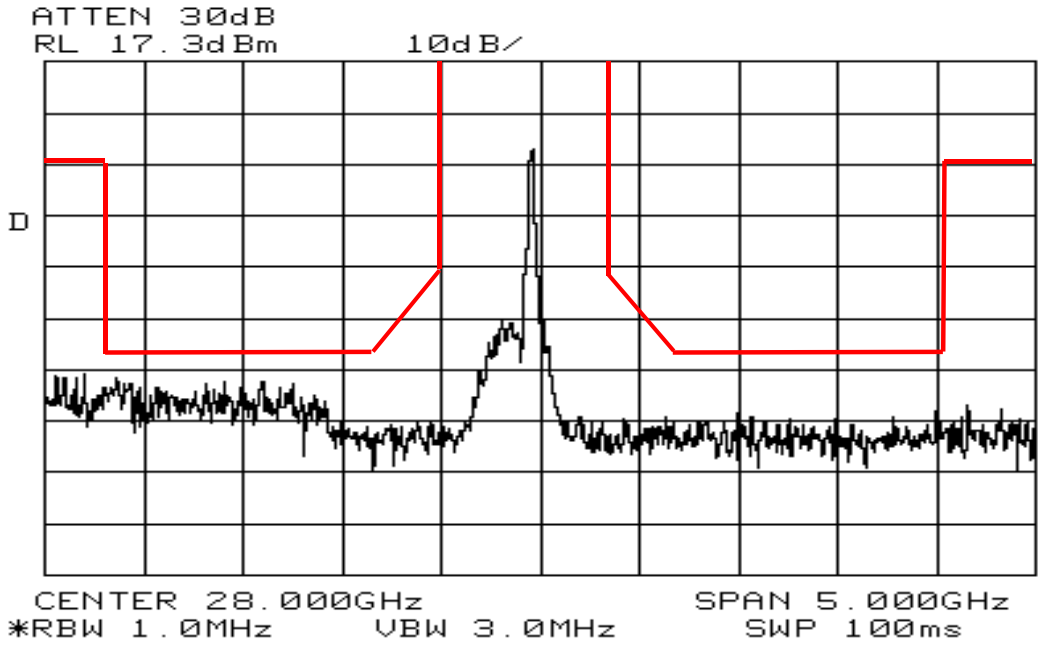



Figure 4d -- Tuned Frequency = 27.945 GHz, Output = +30 dBm, Video Averaging Off

## Conclusion:

The Bosch transmitter complies with the FCC Antenna Terminal Conducted emission limitation requirements of Part 101.111 at low, mid and high tuning frequencies as shown in the above plots.

# Measurement of Local Oscillator Radiation

RF radiated emission testing was performed on the Bosch Transmitter to measure the level of Local Oscillator and other spurious emissions from the Bosch Transmitter to demonstrate compliance with the emission limitation requirements of FCC Part 101 Paragraph 101.111 (a) (2) (ii). These tests were performed in the EMC Lab of Bosch Telecom, Inc., Richardson, Texas at a test distance of 3 meters.

The Transmitter Local Oscillator is commanded to operate at either 26.040 or 26.400 GHz depending on the frequency plan for a given deployment of telephony, video or data transmission. If the Transmitter is being deployed as a "Pilot Tone" transmitter, the Local Oscillator frequency will be commanded to 26.550 GHz.

Radiated measurements were initially performed at KTL (Dallas, Texas) on the transmitter and no RF leakage at the Local Oscillator frequencies were detectable above instrument internal noise at a test distance of three meters. However, the internal noise level of the test instrumentation did not permit measurement lower than approximately –50 dBc. Test data for these tests are included in KTL test report for the transmitter, 980193.REP.

Within the frequency range of 25.8 to 30.05 GHz, it is desirable to have a noise floor significantly below the carrier level to insure compliance with emission limitation requirements.

Results of the tests are shown in the Spectrum Analyzer scans (Figure 5a, 5b, 6a, 6b, 7a and 7b) and are summarized in the following table:

| Frequency (GHz) | Pol. (V or H) | Measured Level (dBµV) | Antenna Correction Factor (dB/m) | Amplifier Correction Factor (dB) | Cable Correction Factor (dB) | Final Level (dBµV/m) | dBc | Limit (dBc) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|
| 26.040 | H | 59.17 | 36.0 | -54.8 | 4.7 | 45.1 | -82.3 | -56 | 26.3 |
| 26.400 | H | 68.83 | 36.0 | -54.7 | 4.7 | 54.8 | -72.6 | -56 | 16.6 |
| 26.550 | H | 56.83 | 36.1 | -54.7 | 4.8 | 43.0 | -84.4 | -56 | 28.8 |
| | | | | | | | | | |
| 26.040 | V | 54.67 | 36.0 | -54.8 | 4.7 | 40.6 | -86.6 | -56 | 30.6 |
| 26.400 | V | 62.00 | 36.0 | -54.7 | 4.7 | 48.0 | 79.4 | -56 | 23.4 |
| 26.550 | V | 60.00 | 36.1 | -54.7 | 4.8 | 46.2 | 81.2 | -56 | 25.2 |
| | | | | | | | | | |

Field Intensity of 1.0 Watt Carrier at 3 meters = 127.4 dBµV/m

**Conclusion:**

The results of these tests indicate that radiated emissions from the Transmitter, measured at a distance of 3 meters, complies with the limits of FCC Part 101 Paragraph 101.111 (a) (2) (ii) with an adequate margin. Previous data (taken at KTL and contained in their test report) indicates that radiated emissions from the Transmitter, also measured at a distance of 3 meters, complies with the limits of FCC Part 101 Paragraph 101.111 (a) (2) (iii) with an adequate margin.

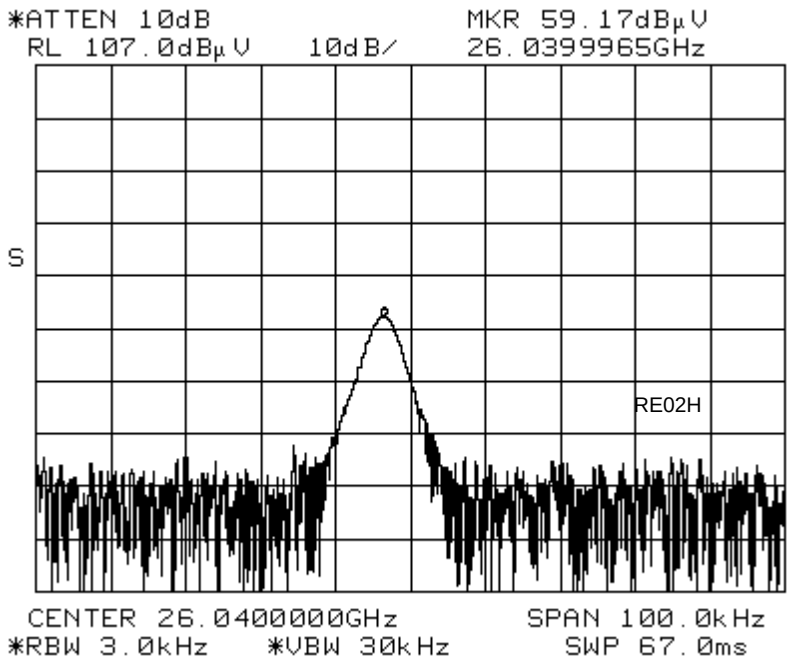



Figure 5a -- Horizontally Polarized Test Antenna, 3 meter Test Distance, Approximately 5 Degrees Left of Rear of the Transmitter

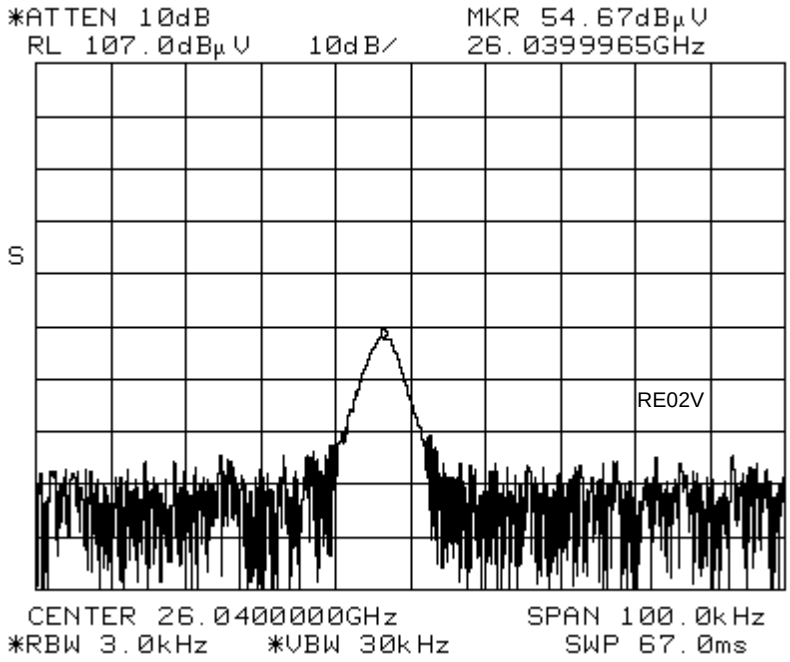



Figure 5b -- Vertically Polarized Test Antenna, 3 meter Test Distance, Approximately 45 Degrees Right of Rear of the Transmitter

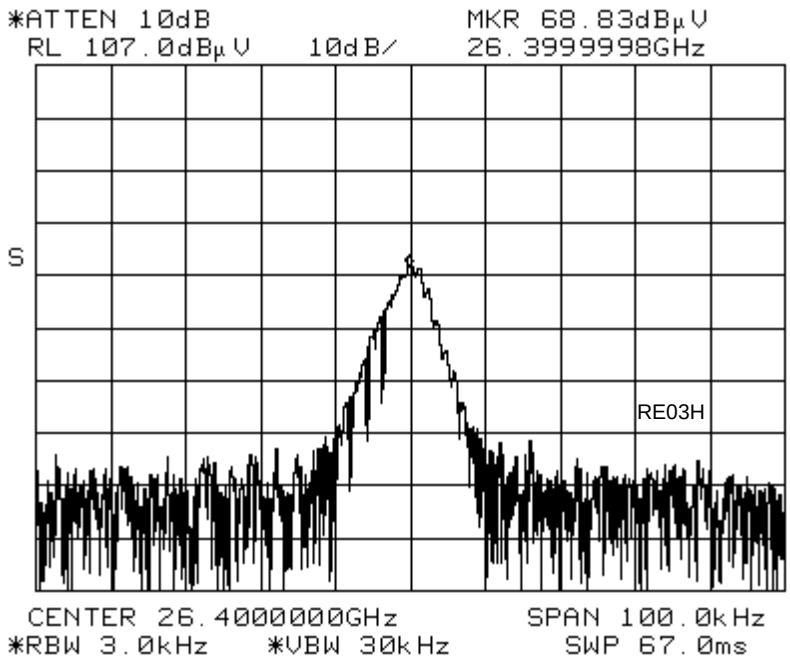



Figure 6a -- Horizontally Polarized Test Antenna, 3 meter Test Distance, Approximately 20 Degrees Right of Rear of the Transmitter

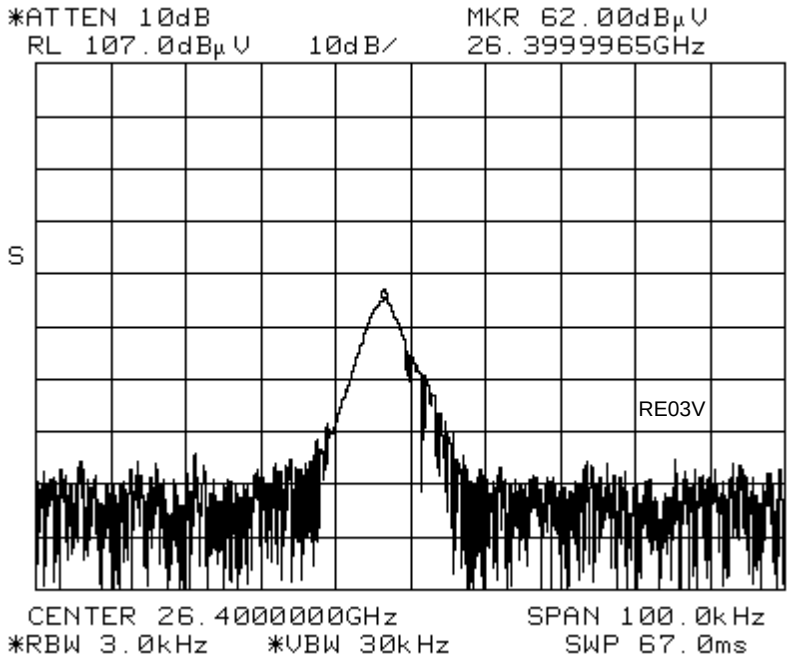



Figure 6b -- Vertically Polarized Test Antenna, 3 meter Test Distance, Approximately 10 Degrees Left of Rear of the Transmitter

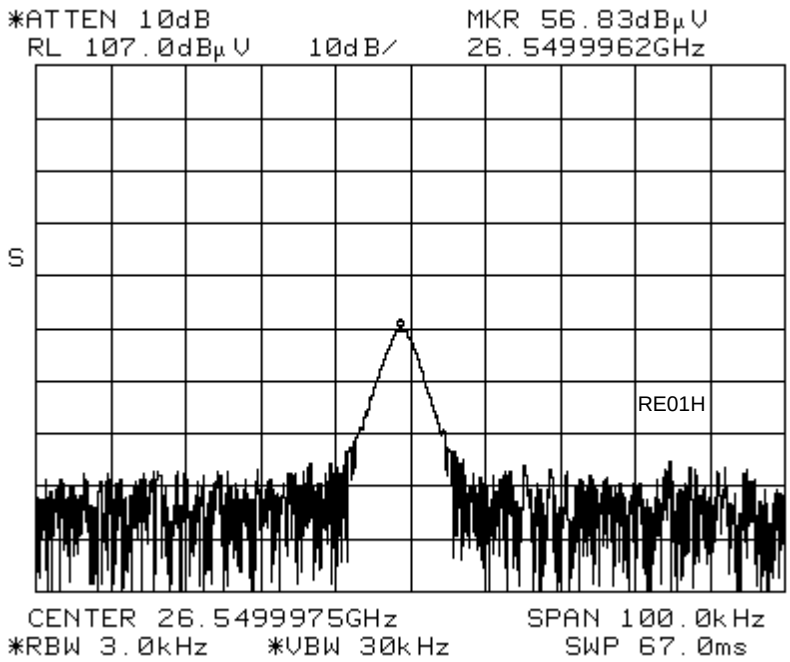



Figure 7a -- Vertically Polarized Test Antenna, 3 meter Test Distance, Approximately 45 Degrees Right of Rear of the Transmitter

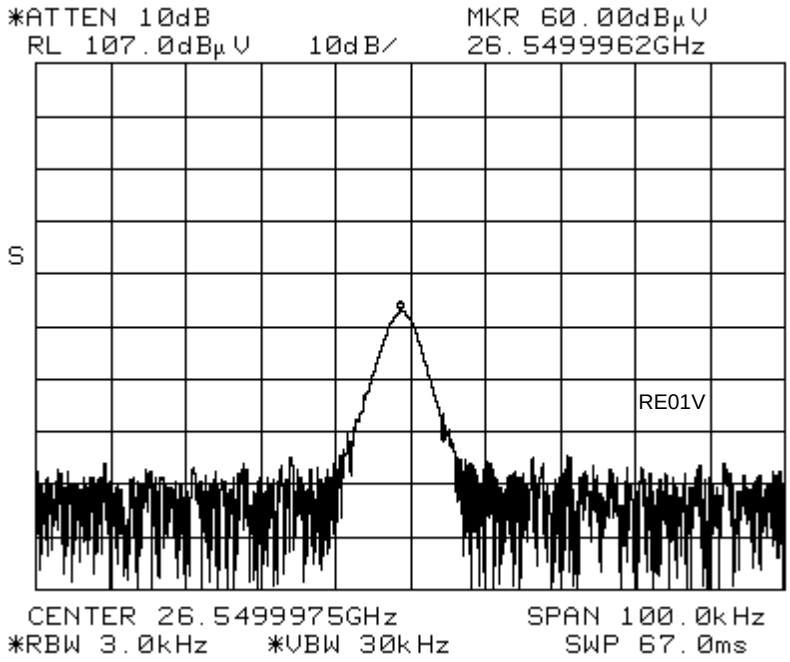



Figure 7b -- Vertically Polarized Test Antenna, 3 meter Test Distance, Approximately 10 Degrees Left of Rear of the Transmitter

# Measurement of Occupied Bandwidth
# With Various Sweep Times and Video Average On Vs. Off

**Background:**

Testing was performed on the Bosch Transmitter to evaluate measurement accuracy of Occupied Bandwidth under varying conditions of sweep time and video averaging.

**Test Setup:**

The Bosch Transmitter was operated at a tuned frequency of 27.945 GHz with a 20 T1 multichannel mixed-rate QPSK modulation and at maximum rated output power of 1.0 Watt. Antenna Terminal conducted measurements were performed using a waveguide directional coupler to monitor RF output power and sufficient inline RF attenuation to protect the HP 8564E spectrum analyzer.

The spectrum analyzer was operated with a span of 50 MHz, Resolution Bandwidth of 1 MHz, Video Bandwidth of 3 MHz and in the Detector Sample mode. The QPSK waveform occupied about 60% of the display width.

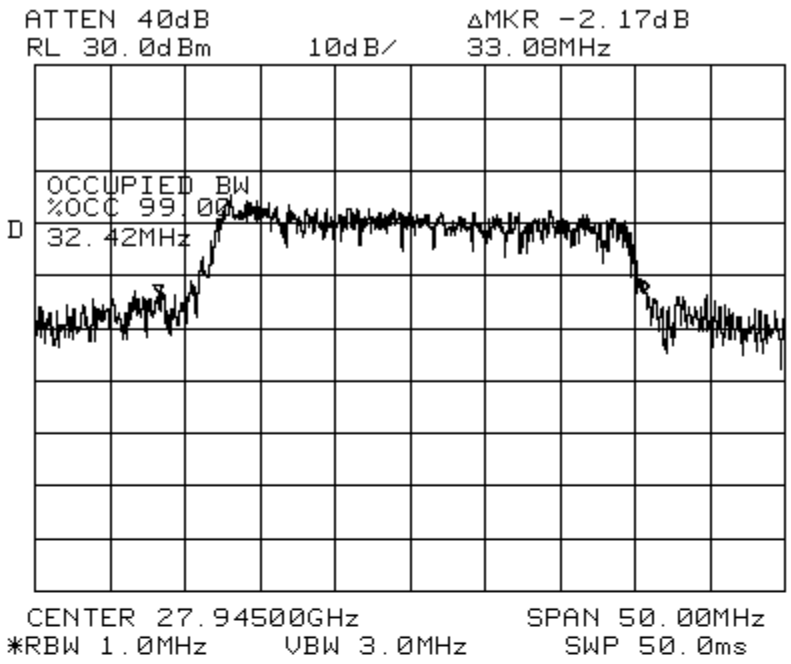
**Test Results:**

The test results are summarized in the following table:

| Sweep Time | Occupied BW with Video Avg Off | Occupied BW with Video Avg On |
|---|---|---|
| 50 ms | 32.42 MHz | 31.50 MHz |
| 100 ms | 32.83 MHz | 31.33 MHz |
| 200 ms | 32.83 MHz | 31.58 MHz |
| 500 ms | 32.42 MHz | 31.42 MHz |
| 1 second | 31.75 MHz | 31.50 MHz |

**Conclusion:**

It is concluded that Occupied Bandwidth measurements performed the HP 8564E spectrum analyzer will be approximately 3% wider when Video Averaging is on relative to Video Averaging off. It is also concluded that there is no significant difference between Occupied Bandwidth measurements as a function of sweep time.



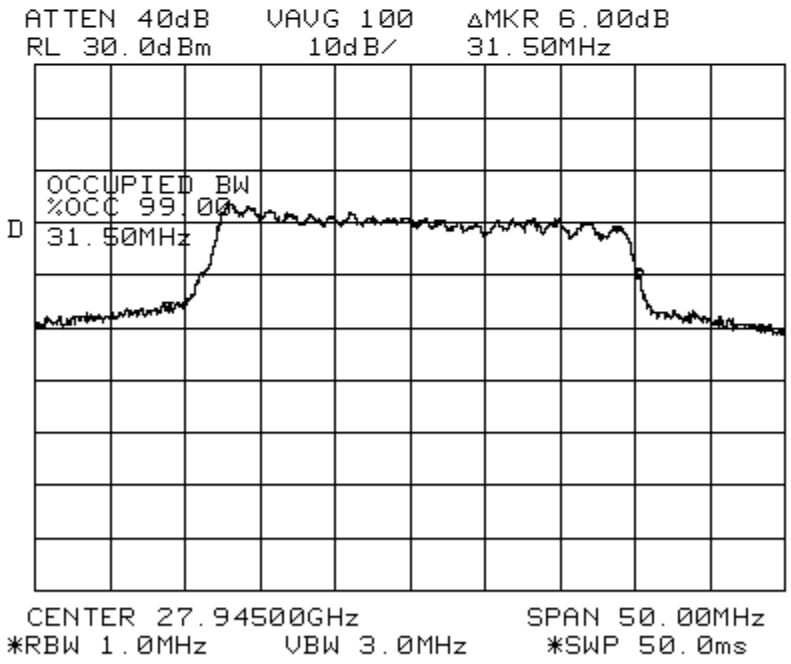




Figure 8 – Measurement of Occupied Bandwidth Using the HP 8564E Spectrum Analyzer, Sweeptime = 50 milliseconds

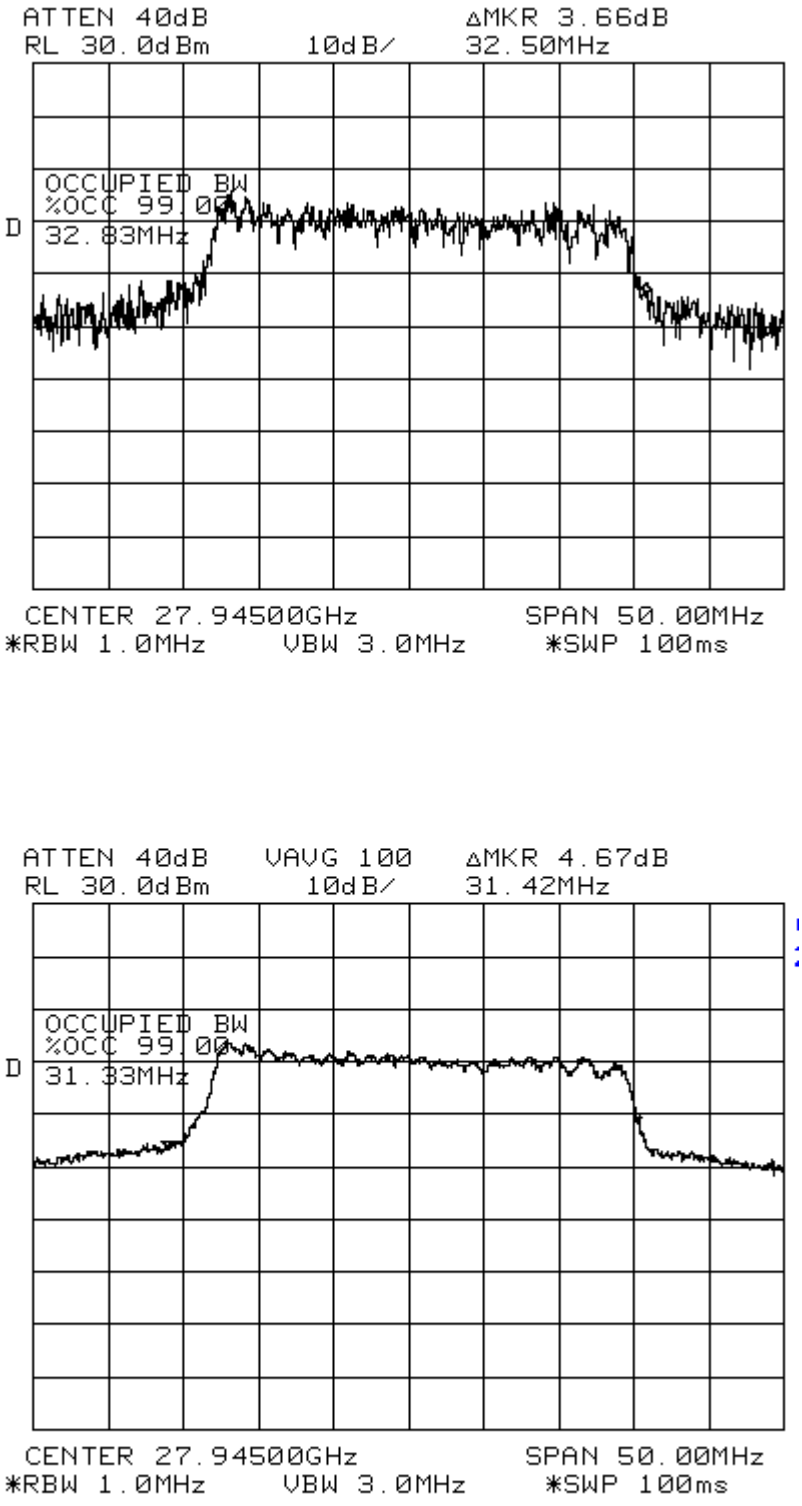
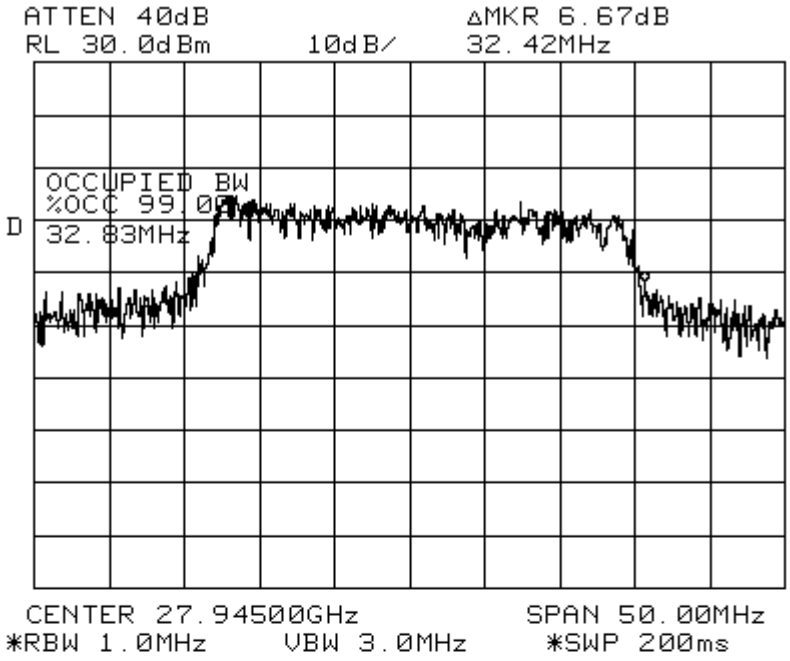



Figure 9 – Measurement of Occupied Bandwidth Using the HP 8564E Spectrum Analyzer, Sweeptime = 100 milliseconds



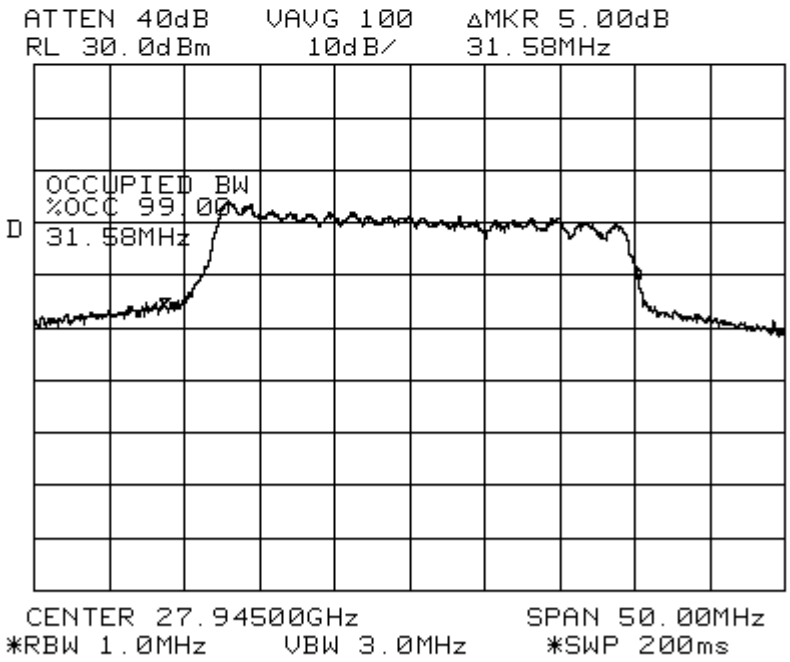
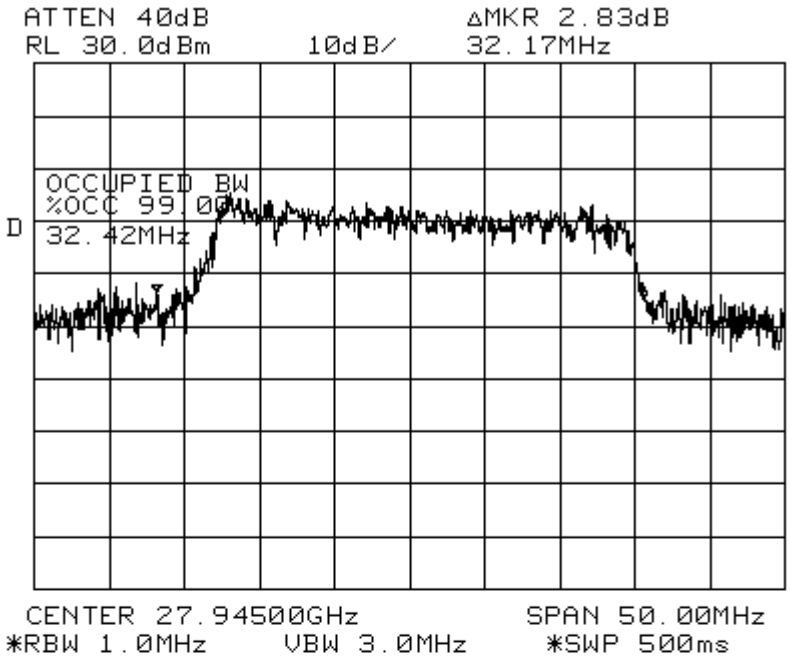




Figure 10 – Measurement of Occupied Bandwidth Using the HP 8564E Spectrum Analyzer, Sweeptime = 200 milliseconds



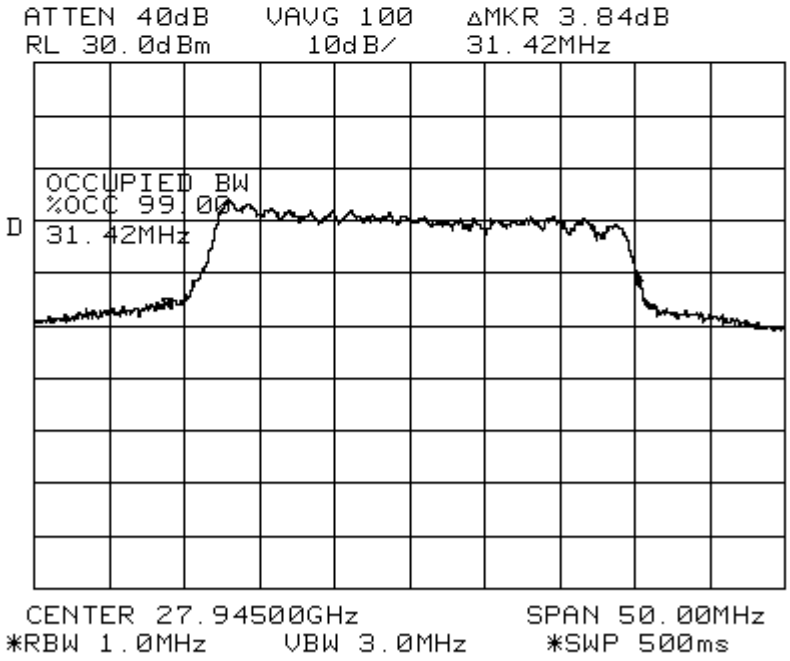
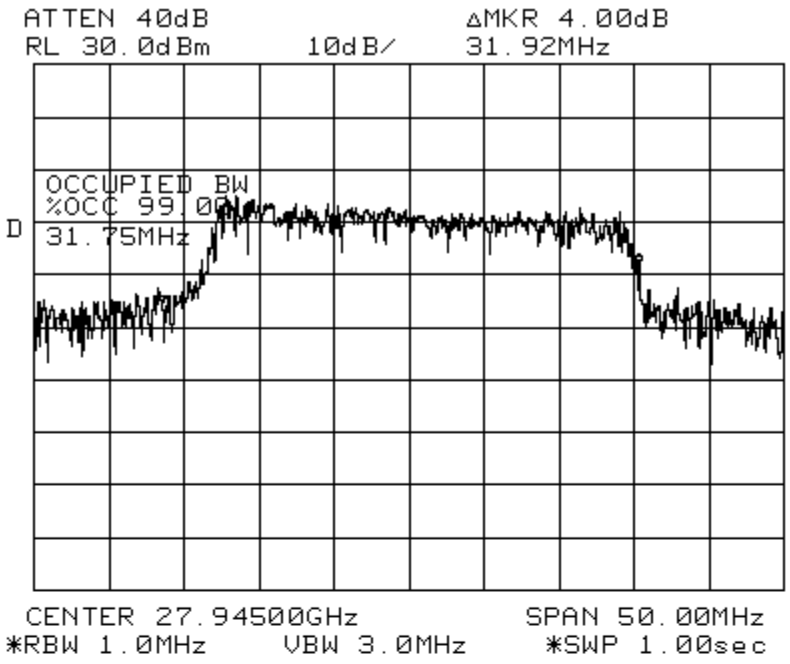




Figure 11 – Measurement of Occupied Bandwidth Using the HP 8564E Spectrum Analyzer, Sweeptime = 500 milliseconds



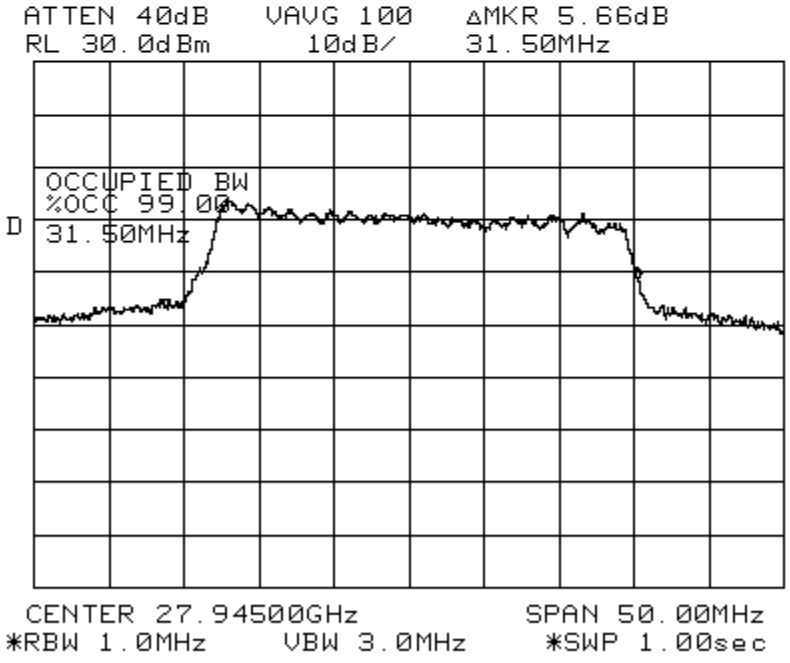




Figure 12 – Measurement of Occupied Bandwidth Using the HP 8564E Spectrum Analyzer, Sweeptime = 1 second

Appendix C

To

FCC Correspondence Reference Number 7112

Revised Pages to the KTL Test Report

Bosch Telecom Transmitter

FCC ID:  NNS3214823

FCC Form 731 Confirmation Number:  EA92571

May 5, 1999

# A. INTRODUCTION (Continued)

**SPURIOUS EMISSIONS (MICROWAVE FIELD STRENGTH)**

The microwave spurious radiated emissions amplitudes were measured from the Bosch Telecom, Inc. Model Node Equipment Solid State Transmitter (US) at the KTL Dallas, Inc. Open Area Test Site on. June 18th, 19th, 22nd, and 23rd of 1998. **The test results confirm that the amplitudes of the microwave radiated emissions from the Bosch Telecom, Inc. Model Node Equipment Solid State Transmitter (US) tested in conjunction with other equipment (identified later in this report) are within the FCC Part 101 (FCC Part 2.993) requirements at 1 GHz to 18 GHz and 40 GHz to 100 GHz. The test results, however, confirm that the amplitudes of the microwave radiated emissions from the Bosch Telecom, Inc. Model Node Equipment Solid State Transmitter (US) tested in conjunction with other equipment (identified later in this report) are not within the FCC Part 101 (FCC Part 2.993) requirements at 26.5 GHz to 40 GHz.**

**FREQUENCY STABILITY**

The frequency stability was measured from the Bosch Telecom, Inc. Model Node Equipment Solid State Transmitter (US)at the KTL Dallas, Inc. Environmental Chamber on April 08, 1998. **The test results confirm that the frequency stability from the Bosch Telecom, Inc. Model Node Equipment Solid State Transmitter (US) tested in conjunction with other equipment (identified later in this report) are within the FCC Part 101 (FCC Part 2.995) requirements.**

| TEST | CATEGORY | | PASS/FAIL |
|---|---|---|---|
| FCC Part 2/101 | | | |
| RF Power Spectral Density | Part 101.113 - | 27.550 GHz, 27.5900, 27.7109 GHz | Pass |
| Modulation Characteristics | Part 101 (2.987) | 27.5100 GHz , 27.5500 GHz, 27.5900 GHz, 27.7100 GHz, | Pass |
| Occupied Bandwidth | Part 101 (2.989) | 27.5100 GHz , 27.5500 GHz, 27.7109 GHz | Pass |
| Spurious Radiated Emission (Antenna Terminal) | Part 101 (2.991) | 30 MHz - 40 GHz | Pass |
| | | 40 GHz - 100 GHz | Pass |
| Spurious Emissions (Field Strength) | Part 101 (2.993) – | 30 MHz - 1000 MHz | Pass |
| Spurious Emissions (Microwave Field Strength) | Part 101 (2.993) – | 1GHz - 18 GHz | Pass |
| | | 18 GHz - 26.5 GHz | Pass |
| | | 26.5 GHz - 40 GHz | Fail |
| | | 40 GHz - 100 GHz | Pass |
| Frequency Stability | Part 101 (2.995) | 27.920000 GHz | Pass |

## B. TEST RESULTS (Continued)

### MODES OF OPERATION

The EUT was operating in a steady state with unit operating at one CW frequency, three simulated, and one actual QPSK input frequencies, all at max. rated output power (1 watt).

### CHANGES TO THE EUT AFTER RECEIPT OF SAMPLE

No additional measures were taken over those already incorporated in the product.

### DEVIATION CRITERIA

No deviation was required.

# C. TEST PROCEDURE

**RF POWER SPECTRAL DENSITY:**

The RF Power Spectral Density amplitudes were measured at the Bosch Telecom, Inc. Facility in the following configurations:

TX 27.510GHz 30dBm CW SIGNAL (U.S.)
TX 27.710GHz 30dBm QPSK/30MHz BW TEST EQUIPMENT CONFIGURATION
TX 27.550GHz 30dBm QPSK/40MHz BW
TX 27.590GHz 30dBm QPSK/50MHz BW.

**MODUALATION CHARACTERISTICS:**

The modulation characteristics were measured at the KTL Dallas, Inc. Electromagnetic Measurements Laboratory in the following configurations:

Fundamental Frequency 27.510000 GHz, IF Input -16.0 dBm measured through 30 dBm Attentuation, 30.0 dBm Output.
Fundamental Frequency 27.710000 GHz, IF Input -10.2 dBm measured through 30 dBm Attentuation, 30.0 dBm Output, 30MHz QPSK BW
Fundamental Frequency 27.7100 GHz, IF Input -10.2 dBm measured through 30 dBm Attentuation, 30.0 dBm Output, 30MHz QPSK BW
Fundamental Frequency 27.5500 GHz, IF Input -11.9 dBm measured through 30 dBm Attentuation, 30.0 dBm Output, 40MHz QPSK BW
Fundamental Frequency 27.5500 GHz, IF Input -11.5 dBm measured through 30 dBm Attentuation, 30.0 dBm Output, 40MHz QPSK BW
Fundamental Frequency 27.5900 GHz, IF Input -12.7 dBm measured through 30 dBm Attentuation, 30.0 dBm Output, 50MHz QPSK BW
Fundamental Frequency 27.5900 GHz, IF Input -12.7 dBm measured through 30 dBm Attentuation, 30.0 dBm Output, 50MHz QPSK BW
Fundamental Frequency 27.7109 GHz, IF Input -20.9 dBm measured through 30 dBm Attentuation, 30.0 dBm Output, 30MHz QPSK BW, Bosch Modem Test Set
Fundamental Frequency 27.7109 GHz, IF Input -20.9 dBm measured through 30 dBm Attentuation, 30.0 dBm Output, 30MHz QPSK BW, Bosch Modem Test Set.

# C. TEST PROCEDURE (Continued)

**OCCUPIED BANDWIDTH:**

Fundamental Frequency 27.710000 GHz, IF Input -10.2 dBm measured through 30 dBm Attentuation, 30.0 dBm Output, 30MHz QPSK BW
Fundamental Frequency 27.7100 GHz, IF Input -10.2 dBm measured through 30 dBm Attentuation, 30.0 dBm Output, 30MHz QPSK BW
Fundamental Frequency 27.5500 GHz, IF Input -11.9 dBm measured through 30 dBm Attentuation, 30.0 dBm Output, 40MHz QPSK BW
Fundamental Frequency 27.5500 GHz, IF Input -11.5 dBm measured through 30 dBm Attentuation, 30.0 dBm Output, 40MHz QPSK BW
Fundamental Frequency 27.5900 GHz, IF Input -12.7 dBm measured through 30 dBm Attentuation, 30.0 dBm Output, 50MHz QPSK BW
Fundamental Frequency 27.5900 GHz, IF Input -12.7 dBm measured through 30 dBm Attentuation, 30.0 dBm Output, 50MHz QPSK BW
Fundamental Frequency 27.7109 GHz, IF Input -20.9 dBm measured through 30 dBm Attentuation, 30.0 dBm Output, 30MHz QPSK BW, Bosch Modem Test Set
Fundamental Frequency 27.7109 GHz, IF Input -20.9 dBm measured through 30 dBm Attentuation, 30.0 dBm Output, 30MHz QPSK BW, Bosch Modem Test Set.

## • ELECTROMAGNETIC EMISSIONS

The test procedures used for determining FCC Part 101 Private Land Mobile Radio Services compliance were in accordance with FCC Rules and Regulations, ANSI C63.4-1992 Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.

All measurements were performed using the CISPR quasi-peak, peak or average detector functions of the receiver or spectrum analyzer. The bandwidths (6-dB) were as follows for the different detector functions and frequency ranges (deviations if necessary would be noted on the individual data sheets):

| FREQUENCY RANGE | QUASI-PEAK | PEAK | AVERAGE |
|---|---|---|---|
| 10 kHz – 150kHz | 200 Hz | 200 Hz | 200 Hz |
| 150 kHz – 30 kHz | 9 kHz | 10 kHz | 10 kHz |
| 30 MHz – 1000 MHz | 120 kHz | 100 kHz | 100 kHz |
| > 1000 MHz | N/A | 1 MHz | 1 MHz |

# C. TEST PROCEDURE (Continued)

**SPURIOUS RADIATED EMISSIONS AT ANTENNA TERMINALS:**

The antenna terminal spurious radiated emissions amplitudes were measured at the KTL Dallas, Inc. Open Area Test Site. Measurements were made in the following configurations:

TX 27.510 GHz U.S. TX 30.0dBm CW (Scan 30 MHz – 40 GHz)
TX 27.510 GHz U.S. TX 30.0dBm CW (Scan 40 GHz – 100 GHz)
TX 27.710 GHz OPSK 30 MHz BW 30.0dBm (Scan 30 MHz - 40 GHz)
TX 27.710 GHz OPSK 30 MHz BW 30.0dBm (Scan 40 GHz - 100 GHz)
TX 27.550 GHz QPSK 40 MHz BW 30.0dBm (Scan 30 MHz –40 GHz)
TX 27.550 GHz QPSK 40 MHz BW 30.0dBm (Scan 40 –100 GHz)
TX 27.550 GHz QPSK 50 MHz BW 30.0dBm (Scan 30 MHz –40 GHz)
TX 27.590 GHz QPSK 50 MHz BW 30.0dBm, (Scan 40 GHz – 100 GHz)
TX 27.710926 GHz OPSK 30 MHz BW, Bosch Modem Test Set (Scan 30 MHz – 40 GHz)
TX 27.710926 GHz OPSK 30 MHz BW, Bosch Modem Test Set (Scan 40 GHz – 100 GHz)

**RADIATED EMISSIONS (FIELD STRENGTH) MEASUREMENTS:**

The radiated electromagnetic emissions were measured between 30 MHz and 1 GHz at the KTL Dallas, Inc. Open Area Test Site at a 3 meter distance in the following configurations:

TX 30.0 dBm 27.510 GHz CW US Frequency
TX 27.710926 QPSK/30 MHz BW
TX 27.550 GHz QPSK/40 MHz
TX 27.590 GHz QPSK/50 MHz).
TX 27.710926 QPSK/30 MHz BW Bosch Modem Test Set

The antennas were vertically and then horizontally polarized. The antenna height was varied between 1 and 4 meters. The electric-field radiated-emissions amplitudes were measured at various azimuthal orientations in order to maximize amplitudes. Cables were oriented to maximize the field strength amplitudes.

# C. TEST PROCEDURE (Continued)

**MICROWAVE RADIATED EMISSIONS (FIELD STRENGTH) MEASUREMENTS:**

The microwave radiated electromagnetic emissions were measured at the KTL Dallas, Inc. Open Area Test Site at a 3 meter distance. Measurements were made in the following configurations:

TX 30.0 dBm 27.510 GHz CW Signal U.S. Frequency – (Scan 1 GHz- 18 GHz)
TX 30.0 dBm 27.510 GHz CW Signal U.S. Frequency –(Scan 18 GHz- 26.5 GHz)
TX 30.0 dBm 27.510 GHz CW Signal U.S. Frequency - (Scan 26.5 GHz- 40 GHz)
TX 30.0 dBm 27.510 GHz CW Signal U.S. Frequency – (Scan 40 GHz – 100 GHz)
TX 30.0 dBm QPSK/30 MHz BW (Scan 1 GHz- 18 GHz)
TX 30.0 dBm QPSK/30 MHz BW – (Scan (18 GHz- 26.5 GHz)
TX 30.0 dBm QPSK/30 MHz BW – (Scan (26.5 GHz- 40 GHz)
TX 30.0 dBm QPSK/30 MHz BW – (Scan (40 GHz- 100 GHz)
TX 30.0 dBm QPSK/40 MHz BW (Scan 18 GHz- 26.5 GHz)
TX 30.0 dBm QPSK/40 MHz BW (Scan 18 GHz- 26.5 GHz)
TX 30.0 dBm QPSK/40 MHz BW (Scan 26.5 GHz- 40 GHz)
TX 30.0 dBm QPSK/40 MHz BW (Scan 40 GHz- 100 GHz)
TX 30.0 dBm QPSK/50 MHz BW (Scan 1 GHz – 18 GHz)
TX 30.0 dBm QPSK/50 MHz BW (Scan 18 GHz – 26.5 GHz)
TX 30.0 dBm QPSK/50 MHz BW (Scan 40 GHz- 100 GHz)
TX 30.0 dBm Bosch MODEM TEST SET (Scan 1 GHz- 18 GHz)
TX 30.0 dBm Bosch MODEM TEST SET (Scan 18 GHz – 26.5GHz)
TX 30.0 dBm 27.710926 GHz QSK/30MHz BW BOSCH MODEM TEST SET (Scan 26.5 –40 GHz)
TX 30.0 dBm 27.710926 GHz QSK/30MHz BW BOSCH MODEM TEST SET (Scan 40 – 100 GHz)

The antennas were vertically and then horizontally polarized. The antenna height was set at 1 meter. The microwave radiated-emissions amplitudes were measured at various azimuthal orientations in order to maximize amplitudes. Cables were oriented to maximize the field strength amplitudes.

Unless otherwise specified, broadband antennas were used. Standard broadband antennas used were selected from the following: Biconical 30 MHz - 300 MHz, Log Periodic 0.3 GHz - 1 GHz and Horn 1 GHz - 40 GHz. For measurements (up to 1 GHz) that were close to the limit, a tuned dipole antenna may have been used.

**FREQUENCY STABILITY:**

Frequency Stability was measured at the KLT Dallas, Inc. Environmental Chamber in TX 27.920000 GHz configuration at voltages, 40.0 Vdc, 48.0 Vdc and 55.2 Vdc, with the following temperatures: - 30ºC, -20ºC, -10ºC, 0ºC, 10ºC, 20ºC, 30ºC, 40ºC, and 50ºC.

# D. TEST RESULTS (Continued)

## • TEST RESULTS SUMMARY

***The test results confirm that the RF Power Spectral Density, modulation characteristics, occupied bandwidth, antenna terminal conducted emissions, spurious emissions (field strength) amplitudes, amplitudes and frequency stability are within the FCC Part 101 and FCC Part 2 Requirements. The test results also confirm that the spurious emissions (microwave field strength) are within the FCC Part 101 and FCC Part 2 Requirements at 1GHz to 26.5 GHz and 40 GHz to 100 GHz. The test results further confirm that the spurious emissions (microwave field strength) are not within the FCC Part 101 and FCC Part 2 Requirements at 26.5 GHz to 40 GHz.***

## • SAMPLE CALCULATIONS

***RF Power Spectral Density (Refer to Page # 17 and Appendix B Page # 56-Page # 60)***

| Center Frequency (GHz) | Channel Bandwidth (MHz) | Analyzer Reading (dBm/Hz ) | External Attenuation (dB) | Conversions | | Antenna Gain (dBi) | Corrected Reading (dBW/MHz) | Limit (dBW/MHz) |
|---|---|---|---|---|---|---|---|---|
| | | | | Hz to MHz (dB) | dBm to dBW (dB) | | | |
| 27.7109 | 30 | -92.7 | 45.7 | 60 | -30 | 15 | -2 | 30 |

The calculation proceeds as follows: Analyzer Reading (dBm/Hz) + External Attenuation (dB) + Conversion Hz to MHz (dB) + Conversion dBm to dBW (dB) + Antenna Gain (dBi) = Corrected Reading (dBw/MHz).

***Antenna Terminal Conducted Emission (Refer to Page 22 Test # 218V1 and Appendix B Page # 89)***

| Test #: 218V1 | Frequency: | 27.400 MHz | Power Line: | | |
|---|---|---|---|---|---|
| Meter Reading (dBm) | Attenuation (dB) | Cable Loss (dB) | 4 kHz RBW Correction Factor (dB) | Corrected Reading (dBm) | Limit dBc |
| -50.0 | 30.2 | 1.0 | -24.0 | -42.8 | -15.0 |

The calculation proceeds as follows: Meter Reading (dBm) + Attenuation (dB) + Cable Loss (dB) + 4 kHz RBW Correction Factor (dB) = Corrected Reading (dBm).

4 kHz RBW Correction Factor Calculation:

Ratio BW / [10 x log ($RBW_{4k}/RBW_{100k}$)] = - 23.979 = - 24.0 dB.

dBc Limit Calculation:

$A = 43 \text{ dB} + 10 \log_{10} M0PW = -13 \text{ dB}$

# D. TEST RESULTS (Continued)

***Radiated Emissions (Field Strength) [Refer to Page # 28 Test RE-1 and Appendix B Page # 96]***

| Test #: RE-1 | Frequency: | 35.000 MHz | Polarization: | Vertical |
|---|---|---|---|---|
| Meter Reading (dBµV) | Antenna Factor (dB) | Path Loss (dB) | Amplifier Gain (dB) | Field Strength (dBµV/m) |
| 31.0 | 10.6 | 1.4 | 24.6 | 18.4 |

The calculations proceed as follows: Meter Reading (dBµV) + Antenna Factor (dB) + Path Loss (dB) - Amplifier Gain (dB) = Field Strength (dBµV/m).

When the emission level is less than 6 dB above the ambient noise floor, the antenna is moved closer to the EUT. A 3-meter measurement level is compared with a 10-meter limit by extrapolating the limit to a 3-meter distance. One adds a factor of 10.5 dB to the limit, which is derived from:

Correction Factor (dB) = 20 log (10 m/3 m) = 10.5 dB

e.g., Limit @ 10 m = 30 dBµV/m @ 10 m
Limit @ 3 m = 40.5 dBµV/m @ 3 m

Similarly, a 10-meter limit is extrapolated to a specified 30-meter limit by use of a correction factor of 20 log (10 m/30 m) = -9.5 dB.

***Microwave Radiated Emissions (Field Strength) [Refer to Page # 30 Test # REMW02 and Appendix B Page # 98]***

| Test # | REMW02 | Frequency: | 1.920 GHz | Polarization: | Vertical | | |
|---|---|---|---|---|---|---|---|
| Meter Reading (dBµV) | 4 kHz RBW Correction Factor (dB) | Antenna Factor (dB) | Cable Loss (dB) | Amplifier Gain (dB) | Field Strength (dBµV/m) | dBc | dB Limit |
| 36.0 | -24 | 28.2 | 3.5 | 30.9 | 12.8 | -114.8 | -43.0 |

The calculations proceed as for RF Radiated Emissions, except for the added conversion factor.

4 kHz RBW Correction Factor Calculation:

Ratio BW / [10 x log ($RBW_{4k}/RBW_{100k}$)] =23.979 = - 24.0 dBm.

dBc Limit Calculation:

$A = 43 dB + 10 \log_{10} M0PW = -43 dB$

Field Intensity (equivalent to 1 W into tuned dipole) = 30 dBm-28.87 +116 + 10.5 = 127.63 dBµV/m.

Where:

-28.7 $dBm^2$ is the power density resulting from a 1 milliwatt signal radiating from half-wave dipole antenna at a distance of 10 meters.
116 is the conversion from $dBm/m^2$ to dBuV/m
10.5 dB is the extrapolation from 10 meters to 3 meters.

# TABLE D-I. RF POWER SPECTRAL DENSITY DATA

**(Refer to Page # 58 – Page # 60)**

| Center Frequency GHz | Channel Bandwidth | Analyzer Reading dBm/Hz | External Attenuation dB | Conversions | | Antenna Gain dBi | Corrected Reading | FCC Limit 101.113 dBW/MHz | Delta dB |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Hz to MHz | dBm to dBW | | | | |
| 27.55 | 30 | -92.5 | 44.6 | 60 | -30 | 15 | -2.9 | 30 | -32.9 |
| 27.59 | 30 | -93.6 | 44.7 | 60 | -30 | 15 | -3.9 | 30 | -33.9 |
| 27.7109 | 30 | -92.7 | 45.7 | 60 | -30 | 15 | -2 | 30 | -32 |

Comments:

1.Data contained in Appendix B- Test RF Power Spectral Density.

# TABLE D-II. ANTENNA TERMINAL CONDUCTED EMISSIONS DATA

**Scan 30 MHz – 40 GHz (Refer to Appendix B Page # 81)**

**Test # 218V3 TX 27.510 GHz U. S. TX 30.0 dBm CW, -48 Vdc**

| Frequency (GHz) | Meter Reading (dBm) | Attenuation (db) | Cable Loss (dB) | Corrected Reading (dBm) | FCC 2.991 Limit (dBm) | Margin* (dB) 81(Limit-Amplitude) | Comments |
|---|---|---|---|---|---|---|---|
| 1.1900 | -72.0 | 30.2 | 1.0 | -40.8 | -13.0 | 27.8 | 1,5 |
| 13.090 | -71.0 | 30.2 | 1.0 | -39.8 | -13.0 | 26.8 | 1,5 |
| 27.666 | -54.0 | 30.2 | 1.0 | -22.8 | N/A | N/A | 1 |
| 27.717 | -48.5 | 30.2 | 1.0 | -17.3 | N/A | N/A | 1 |
| 28.130 | -60.0 | 30.2 | 1.0 | -28.8 | N/A | N/A | 1 |

**Scan 40 GHz – 100 GHz (Refer to Appendix B Page # 82)**

**Test # 218V7 TX 27.510 GHz U. S. TX 30.0 dBm CW, -48 Vdc**

| Frequency (GHz) | Meter Reading (dBm) | Attenuation (dB) | Cable Loss (dB) | Corrected Reading (dBm) | FCC 2.991 Limit (dBm) | Margin* (dB) (Limit-Amplitude) | Comments |
|---|---|---|---|---|---|---|---|
| 53.100 | -73.0 | 28.2 | 1.0 | -67.8 | -13.0 | 54.8 | 1,2 |
| 55.020 | -74.0 | 28.2 | 1.0 | -68.8 | -13.0 | 55.8 | 1,3 |
| 79.650 | -69.0 | 28.2 | 1.0 | -63.8 | -13.0 | 50.8 | 1,4 |
| 82.530 | -70.5 | 28.2 | 1.0 | -65.3 | -13.0 | 52.3 | 1,3 |

**Scan 30 MHz- 40 GHz (Refer to Appendix B Page # 83)**

**Test # 218V4 TX 27.710GHz QPSK/30MHz BW TX 30.0dBm, -48 Vdc**

| Frequency (GHz) | Meter Reading (dBm) | Attenuation (dB) | Cable Loss (dB) | Corrected Reading (dBm) | FCC 2.991 Limit (dBm) | Margin* (dB) (Limit-Amplitude) | Comments |
|---|---|---|---|---|---|---|---|
| 1.190 | -72.5 | -30.20 | 1.0 | -65.3 | -13.0 | 52.3 | 1,5 |
| 13.090 | -70.0 | -30.2 | 1.0 | -62.9 | -13.0 | 49.9 | 1,5 |

**Scan 40 GHz- 100 GHz (Refer to Appendix B Page # 84)**

**Test # 218V9 TX 27.710GHz QPSK/30MHz BW TX 30.0dBm, -48 Vdc**

| Frequency (GHz) | Meter Reading (dBm) | Attenuation (dB) | Cable Loss (dB) | Corrected Reading (dBm) | FCC 2.991 Limit (dBm) | Margin* (dB) (Limit-Amplitude) | Comments |
|---|---|---|---|---|---|---|---|
| 52.080 | -74.0 | 28.2 | 1.0 | -44.8 | -13.0 | 31.8 | 1,2 |
| 55.420 | -73.0 | 28.2 | 1.0 | -43.8 | -13.0 | 30.8 | 1,3 |
| 78.120 | -69.0 | 28.2 | 1.0 | -39.8 | -13.0 | 26.8 | 1,4 |
| 83.130 | -70.0 | 28.2 | 1.0 | -40.8 | -13.0 | 27.8 | 1,3 |

## D. TEST RESULTS (Continued)

**Scan 30 MHz- 40 GHz (Refer to Appendix B Page # 85)**

**Test # 218V5 TX 27.550GHz QPSK/40MHz BW TX 30.0dBm, -48 Vdc**

| Frequency (GHz) | Meter Reading (dBm) | Attenuation (dB) | Cable Loss (dB) | Corrected Reading (dBm) | FCC 2.991 Limit (dBm) | Margin* (dB) (Limit-Amplitude) | Comments |
|---|---|---|---|---|---|---|---|
| 1.1900 | -72.0 | 30.2 | 1.0 | -40.8 | -13.0 | 27.8 | 1,5 |
| 13.090 | -70.0 | 30.2 | 1.0 | -38.8 | -13.0 | 25.8 | 1,5 |

**Scan 40 GHz- 100 GHz (Refer to Appendix B Page # 86)**

**Test # 218V10 TX 27.550 GHz QPSK 40 MHz BW TX 30.0dBm, -48 Vdc**

| Frequency (GHz) | Meter Reading (dBm) | Attenuation (dB) | Cable Loss (dB) | Corrected Reading (dBm) | FCC 2.991 Limit (dBm) | Margin* (dB) (Limit-Amplitude) | Comments |
|---|---|---|---|---|---|---|---|
| 52.080 | -74.0 | 28.2 | 1.0 | -68.8 | -13.0 | 55.8 | 1,2 |
| 55.100 | -73.0 | 28.2 | 1.0 | -67.8 | -13.0 | 54.8 | 1,3 |
| 78.120 | -70.0 | 28.2 | 1.0 | -64.8 | -13.0 | 51.8 | 1,4 |
| 83.650 | -70.0 | 28.2 | 1.0 | -64.8 | -13.0 | 51.8 | 1,,3 |

**Scan 30 MHz- 40 GHz (Refer to Appendix B Page # 87)**

**Test # 218V6 TX 27.590 GHz QPSK 50 MHz BW TX 30.0dBm, -48 Vdc**

| Frequency (GHz) | Meter Reading (dBm) | Attenuation (dB) | Cable Loss (dB) | Corrected Reading (dBm) | FCC 2.991 Limit (dBm) | Margin* (dB) (Limit-Amplitude) | Comments |
|---|---|---|---|---|---|---|---|
| 1.1900 | -72.0 | -30.2 | 1.0 | -40.8 | -13.0 | 27.8 | 1,5 |
| 13.090 | -75.5 | -30.2 | 1.0 | -41.3 | -13.0 | 28.3 | 1,5 |

**Scan 40 GHz- 100 GHz (Refer to Appendix B Page # 88)**

**Test # 218V11 TX 27.590 GHz QPSK 50 MHz BW TX 30.0dBm, -48 Vdc**

| Frequency (GHz) | Meter Reading (dBm) | Attenuation (dB) | Cable Loss (dB) | Corrected Reading (dBm) | FCC 2.991 Limit (dBm) | Margin* (dB) (Limit-Amplitude) | Comments |
|---|---|---|---|---|---|---|---|
| 52.800 | -74.0 | 28.2 | 1.0 | -44.8 | -13.0 | 31.8 | 1,2 |
| 55.180 | -73.0 | 28.2 | 1.0 | -43.8 | -13.0 | 30.8 | 1,3 |
| 79.200 | -70.0 | 28.2 | 1.0 | -40.8 | -13.0 | 27.8 | 1,4 |
| 82.770 | -70.5 | 28.2 | 1.0 | -41.3 | -13.0 | 28.3 | 1,3 |

## D. TEST RESULTS (Continued)

**Scan 30 MHz- 40 GHz (Refer to Appendix B Page # 89)**

**Test # 218V1 TX 30.0 dBm 27.710926 GHz, QPSK/30MHz BW,**
**Bosch Modem Test Set, -48 Vdc**

| Frequency (GHz) | Meter Reading (dBm) | Attenuation (dB) | Cable Loss (dB) | Corrected Reading (dBm) | FCC 2.991 Limit (dBm) | Margin* (dB) (Limit-Amplitude) | Comments |
|---|---|---|---|---|---|---|---|
| 27.400 | -50.0 | 30.2 | 1.0 | -42.8 | -15.0 | 27.8 | 1,6 |
| 1.1900 | -72.5 | 30.2 | 1.0 | -65.3 | -13.0 | 52.3 | 1,5 |
| 13.090 | -70.0 | 30.2 | 1.0 | -62.8 | -13.0 | 49.8 | 1,5 |

**Scan 40 GHz- 100 GHz (Refer to Appendix B Page # 90)**

**Test # 218V08 TX 30.0dBm 27.710926 GHz QPSK/30MHz BW**
**Bosch Modem Test Set, -48 Vdc**

| Frequency (GHz) | Meter Reading (dBm) | Attenuation (dB) | Cable Loss (dB) | Corrected Reading (dBm) | FCC 2.991 Limit (dBm) | Margin* (dB) (Limit-Amplitude) | Comments |
|---|---|---|---|---|---|---|---|
| 52.08000 | -73.0 | 28.2 | 1.0 | -67.8 | -13.0 | 54.8 | 1,2 |
| 55.42185 | -72.0 | 28.2 | 1.0 | -66.8 | -13.0 | 53.8 | 1,3 |
| 78.12000 | -71.0 | 28.2 | 1.0 | -65.8 | -13.0 | 52.8 | 1,4 |
| 82.13278 | -70.0 | 28.2 | 1.0 | -64.8 | -13.0 | 51.8 | 1,3 |

1) Comments:

2) Data contained in Appendix B - Tests # 218V1, # 218V3, # 218V4, Test # 218V5, and # 218V6 (06/17/98) and Tests # 218V7, # 218V9, # 218V10 and # 218V11 (06/2398).

3) Second harmonic/Local Oscillator.

4) Second harmonic/Fundamental.

5) Third harmonic/Local Oscillator.

6) Noise floor reading.

7) Limit based on 101.111 2 (a) (2) (ii).

Note:

*Calculations may not agree exactly with data due to rounding of numbers.

4 kHz RBW correction factor of –24 dB was added to the formula (refer to sample calculations).

Amplitudes were measured using the peak detector. Reference detector specified in the limit is the peak detector

# TABLE D-III WORST-CASE SPURIOUS EMISSIONS (FIELD STRENGTH) DATA

**(Refer to Appendix B Page # 92)**
**Test # RE-3, TX 30.0 dBm 27.510 GHz CW US Frequency, -48 Vdc**

| Frequency (MHz) | Amplitude Peak (dBµV/m) | FCC 2.993 Limit (dBµV/m) | Margin* (dB) (Limit-Amplitude) | Polarization Vertical/ Horizontal | Comments |
|---|---|---|---|---|---|
| 32.835 | 33.7 | 84.6 | 50.9 | Vertical | 1 |
| 175.252 | 37.7 | 84.6 | 46.9 | Vertical | 1,2 |
| 960.000 | 47.1 | 84.6 | 37.5 | Vertical | 1 |
| 220.620 | 31.7 | 84.6 | 52.9 | Horizontal | 1,2 |
| 650.000 | 35.6 | 84.6 | 49.0 | Horizontal | 1,2 |
| 960.000 | 38.5 | 84.6 | 46.1 | Horizontal | 1,2 |

**(Refer to Appendix B Page # 93)**
**Test # RE-5, TX 30.0 dBm 27.550 GHz QSPK/40 MHz BW, -48 Vdc**

| Frequency (MHz) | Amplitude Peak (dBµV/m) | FCC 2.993 Limit (dBµV/m) | Margin* (dB) (Limit-Amplitude) | Polarization Vertical/ Horizontal | Comments |
|---|---|---|---|---|---|
| 421.250 | 32.4 | 84.6 | 52.2 | Vertical | 1 |
| 650.000 | 33.6 | 84.6 | 51.0 | Vertical | 1 |
| 900.000 | 37.8 | 84.6 | 46.8 | Vertical | 1 |
| 250.000 | 28.3 | 84.6 | 56.3 | Horizontal | 1,2 |
| 650.000 | 33.6 | 84.6 | 51.0 | Horizontal | 1,2 |
| 900.000 | 37.8 | 84.6 | 46.8 | Horizontal | 1,2 |

**(Refer to Appendix B Page # 94)**
**Test # RE-6, TX 30.0 dBm 27.590 GHz QSPK/50 MHz BW, -48 Vdc**

| Frequency (MHz) | Amplitude Peak (dBµV/m) | FCC 2.993 Q.P. Limit (dBµV/m) | Margin* (dB) (Limit-Amplitude) | Polarization Vertical/ Horizontal | Comments |
|---|---|---|---|---|---|
| 421.250 | 33.4 | 84.6 | 51.2 | Vertical | 1 |
| 650.000 | 33.6 | 84.6 | 51.0 | Vertical | 1,2 |
| 900.000 | 37.8 | 84.6 | 46.8 | Vertical | 1,2 |
| 250.000 | 27.2 | 84.6 | 57.4 | Horizontal | 1,2 |
| 650.000 | 33.6 | 84.6 | 51.0 | Horizontal | 1,2 |
| 900.000 | 37.8 | 84.6 | 46.8 | Horizontal | 1,2 |

**(Refer to Appendix B Page # 95)**
**Test # RE-4, TX 30 dBm 27.710926 GHz QPSK/30 MHz BW Bosch Modem Test Set, -48 Vdc**

| Frequency (MHz) | Amplitude Peak (dBµV/m) | FCC 2.993 Limit (dBµV/m) | Margin* (dB) (Limit-Amplitude) | Polarization Vertical/ Horizontal | Comments |
|---|---|---|---|---|---|
| 32.835 | 32.4 | 84.6 | 52.2 | Vertical | 1 |
| 650.000 | 34.6 | 84.6 | 50.0 | Vertical | 1,2 |
| 900.000 | 38.8 | 84.6 | 45.8 | Vertical | 1,2 |
| 30.000 | 19.1 | 84.6 | 65.5 | Horizontal | 1,2 |
| 32.835 | 27.4 | 84.6 | 57.2 | Horizontal | 1 |
| 650.000 | 34.6 | 84.6 | 50.0 | Horizontal | 1,2 |

# D. TEST RESULTS (Continued)

**(Refer to Appendix B Page # 96)**
**Test # RE-1, TX 30 dBm 270710926 GHz QPSK/30 MHz BE Bosch Modem Test Set, -48 Vdc**

| Frequency (MHz) | Amplitude Peak (dBµV/m) | FCC 2.993 Limit (dBµV/m) | Margin* (dB) (Limit-Amplitude) | Polarization Vertical/ Horizontal | Comments |
|---|---|---|---|---|---|
| 320.000 | 28.3 | 84.6 | 56.3 | Vertical | 1,2 |
| 425.000 | 27.4 | 84.6 | 57.2 | Vertical | 1,2 |
| 960.000 | 37.5 | 84.6 | 47.1 | Vertical | 1,2 |
| 320.000 | 28.3 | 84.6 | 56.3 | Horizontal | 1,2 |
| 425.000 | 28.4 | 84.6 | 56.2 | Horizontal | 1,2 |
| 960.000 | 38.5 | 84.6 | 46.1 | Horizontal | 1,2 |

Comments:

1. Data contained in Appendix B - Tests # RE-1 (06/19/98) and # RE-3, # RE-4, # RE-5, and # RE-6 (06/22/98).

2. Noise floor reading.

Notes:

*Calculations may not agree exactly with data due to rounding of numbers.

All other radiated emissions amplitudes were at least 10 dB within the FCC Part 2 Subpart 2.993 Limits. Emissions were scanned from 30 MHz to 1 GHz with antennas in both the vertical and horizontal orientation. The specified radiated emissions antenna reference distance was 3 meters. Testing of the EUT was conducted at 3 meters. No additional signal was detected.

Amplitudes were measured using the peak detector. Reference detector specified in the limit is the CISPR quasi-peak detector.

# TABLE D-IV. WORST-CASE SPURIOUS EMISSIONS (MICROWAVE FIELD STRENGTH) DATA

**SCAN 1 18 GHz (Refer to Appendix B Page # 98)**

**Test # REMW02, TX 30.0 dBm 27.510 GHz CW Signal U. S. Frequency, -48 Vdc**

| Frequency (GHz) | dBc (dB) | FCC 2.993 Limit (dB) | Margin* (dB) (Limit-Amplitude) | Corrected Reading (dBµV/m) | Polarization Vertical/ Horizontal | Comments |
|---|---|---|---|---|---|---|
| 1.920 | -114.8 | -43.0 | 71.8 | 12.8 | Vertical | 1,2 |
| 10.560 | -101.9 | -43.0 | 58.9 | 25.7 | Vertical | 1,2 |
| 17.280 | -91.8 | -43.0 | 48.8 | 35.8 | Vertical | 1,2 |
| 1.920 | -115.8 | -43.0 | 72.8 | 11.8 | Horizontal | 1,2 |
| 10.560 | -101.9 | -43.0 | 58.9 | 25.7 | Horizontal | 1,2 |
| 17.280 | -91.8 | -43.0 | 48.8 | 35.8 | Horizontal | 1,2 |

**SCAN 18-26.5 GHz (Refer to Appendix B Page # 99)**

**Test # REMW08, TX 30.0 dBm 27.510 GHz CW Signal U. S. Frequency, -48 Vdc**

| Frequency (GHz) | dBc (dB) | FCC 2.993 Limit (dB) | Margin* (dB) (Limit-Amplitude) | Corrected Reading (dBµV/m) | Polarization Vertical/ Horizontal | Comments |
|---|---|---|---|---|---|---|
| 18.000 | -90.5 | -43.0 | 47.5 | 37.1 | Vertical | 1,2 |
| 22.000 | -84.2 | -43.0 | 41.2 | 43.4 | Vertical | 1,2 |
| 26.500 | -61.8 | -56.0 | 5.8 | 65.8 | Vertical | 1,2,3 |
| 18.000 | -90.5 | -43.0 | 47.5 | 37.1 | Horizontal | 1,2 |
| 22.000 | -84.2 | -43.0 | 41.2 | 43.4 | Horizontal | 1,2 |
| 26.500 | -61.8 | -56.0 | 5.8 | 65.8 | Horizontal | 1,2,3 |

**SCAN 26.5-40 GHz (Refer to Appendix B Page # 100)**

**Test # 218U03, TX 30.0 dBm 27.510 GHz CW Signal US Frequency, -48 Vdc**

| Frequency (GHz) | dBc (dB) | FCC 2.993 Limit (dB) | Margin* (dB) (Limit-Amplitude) | Corrected Reading (dBµV/m) | Polarization Vertical/ Horizontal | Comments |
|---|---|---|---|---|---|---|
| 26.550 | -49.2 | -56.0 | -6.8 | 78.4 | Vertical | 1,2,3,4 |
| 27.510 | -N/A | -43.0 | N/A | 83.3 | Vertical | 1,2 |
| 32.000 | -74.1 | -43.0 | 31.1 | 53.5 | Vertical | 1,2 |
| 26.550 | -50.2 | -56.0 | -5.8 | 77.4 | Horizontal | 1,2,3,4 |
| 27.510 | N/A | -43.0 | N/A | 77.4 | Horizontal | 1,2 |
| 32.000 | -73.1 | -43.0 | 30.1 | 54.5 | Horizontal | 1,2 |

# D. TEST RESULTS (Continued)

**SCAN 40-100 GHz (Refer to Appendix B Page # 101)**

**Test # 218U11, TX 30.0 dBm 27.510 GHz CW Signal US Frequency, -48 Vdc**

| Frequency (GHz) | dBc (dB) | FCC 2.993 Limit (dB) | Margin* (dB) (Limit-Amplitude) | Corrected Reading (dBµV/m) | Polarization Vertical/ Horizontal | Comments |
|---|---|---|---|---|---|---|
| 60.000 | -60.4 | -43.0 | 17.4 | 67.2 | Vertical | 1,2 |
| 79.650 | -67.5 | -43.0 | 24.5 | 60.1 | Vertical | 1,2 |
| 82.530 | -67.3 | -43.0 | 24.3 | 60.3 | Vertical | 1,2 |
| 60.000 | -60.3 | -43.0 | 17.3 | 67.3 | Horizontal | 1,2 |
| 79.650 | -67.7 | -43.0 | 24.7 | 59.9 | Horizontal | 1,2 |
| 82.530 | -67.5 | -43.0 | 24.5 | 60.1 | Horizontal | 1,2 |
| ***300 kHz RBW*** | | | | | | |
| 60.000 | -60.4 | -43.0 | 17.4 | 67.2 | Vertical | 1,2 |
| 60.000 | -60.3 | -43.0 | 17.3 | 67.3 | Horizontal | 1,2 |

**SCAN 1-18 GHz (Refer to Appendix B Page # 102)**

**Test # REMW03, TX 30.0 dBm QPSK/30 MHz BW, -48 Vdc**

| Frequency (GHz) | dBc (dB) | FCC 2.993 Limit (dB) | Margin* (db) (Limit-Amplitude) | Corrected Reading (dBµV/m) | Polarization Vertical/ Horizontal | Comments |
|---|---|---|---|---|---|---|
| 1.670 | -117.6 | -43.0 | 74.6 | 10.0 | Vertical | 1,2 |
| 10.020 | -103.5 | -43.0 | 60.5 | 24.1 | Vertical | 1,2 |
| 16.700 | -96.5 | -43.0 | 53.5 | 31.1 | Vertical | 1,2 |
| 1.670 | -118.6 | -43.0 | 75.6 | 9.0 | Horizontal | 1,2 |
| 10.020 | -102.5 | -43.0 | 59.5 | 25.1 | Horizontal | 1,2 |
| 16.700 | -95.5 | -43.0 | 52.5 | 32.1 | Horizontal | 1,2 |

**SCAN 18-26.5 GHz (Refer to Appendix B Page # 103)**

**Test #REMW09, TX 30.0 dBm QPSK/30 MHz BW, -48 Vdc**

| Frequency (GHz) | dBc (dB) | FCC 2.993 Limit (dB) | Margin* (dB) (Limit-Amplitude) | Corrected Reading (dBµV/m) | Polarization Vertical/ Horizontal | Comments |
|---|---|---|---|---|---|---|
| 18.000 | -90.5 | -43.0 | 47.5 | 37.1 | Vertical | 1,2 |
| 22.000 | -87.2 | -43.0 | 44.2 | 40.4 | Vertical | 1,2 |
| 26.040 | -60.8 | -56.0 | 4.8 | 66.8 | Vertical | 1,2,3 |
| 18.000 | -90.5 | -43.0 | 47.5 | 37.1 | Horizontal | 1,2 |
| 22.000 | -84.2 | -43.0 | 41.2 | 43.4 | Horizontal | 1,2 |
| 26.040 | -59.8 | -56.0 | 3.8 | 66.8 | Horizontal | 1,2,3 |

# D. TEST RESULTS (Continued)

**SCAN 26.5 - 40 GHz (Refer to Appendix B Page # 104)**

**Test # 218U04, TX 30.0 dBm 27.710GHz QPSK/30 MHz BW, -48 Vdc**

| Frequency (GHz) | dBc (dB) | FCC 2.993 Limit (dB) | Margin* (dB) (Limit-Amplitude) | Corrected Reading (dBµV/m) | Polarization Vertical/ Horizontal | Comments |
|---|---|---|---|---|---|---|
| 26.040 | -48.8 | -56.0 | -7.2 | 78.8 | Vertical | 1,2,3,4 |
| 27.710 | N/A | -43.0 | N/A | 78.4 | Vertical | 1,2 |
| 32.000 | -73.1 | -43.0 | 30.1 | 54.5 | Vertical | 1,2 |
| 26.040 | -49.0 | -56.0 | -7.0 | 78.6 | Horizontal | 1,2,3,4 |
| 27.710 | -N/A | -43.0 | N/A | 79.4 | Horizontal | 1,2 |
| 32.000 | -73.1 | -43.0 | 30.1 | 54.5 | Horizontal | 1,2 |

**SCAN 40-100 GHz (Refer to Appendix B Page # 105)**

**Test # 218U09, TX 30.0 dBm 27.710GHz QPSK/30 MHz BW, -48 Vdc**

| Frequency (GHz) | dBc (dB) | FCC 2.993 Limit (dB) | Margin* (dB) (Limit-Amplitude) | Corrected Reading (dBµV/m) | Polarization Vertical/ Horizontal | Comments |
|---|---|---|---|---|---|---|
| 60.000 | -60.3 | -43.0 | 17.3 | 67.3 | Vertical | 1,2 |
| 78.120 | -67.5 | -43.0 | 24.5 | 60.1 | Vertical | 1,2 |
| 83.130 | -67.6 | -43.0 | 24.6 | 60.0 | Vertical | 1,2 |
| 60.000 | -60.5 | -43.0 | 17.5 | 67.1 | Horizontal | 1,2 |
| 78.120 | -67.6 | -43.0 | 24.6 | 60.0 | Horizontal | 1,2 |
| 83.130 | -67.0 | -43.0 | 24.0 | 60.6 | Horizontal | 1,2 |
| ***300 kHz RBW*** | | | | | | |
| 60.000 | -64.1 | -43.0 | 21.1 | 63.5 | Vertical | 1,2 |
| 60.000 | -64.1 | -43.0 | 21.1 | 63.5 | Horizontal | 1,2 |

**SCAN 1-18GHz (Refer to Appendix B Page # 106)**

**Test # REMW04, TX 30.0 dBm QPSK/40 MHz BW, -48 Vdc**

| Frequency (GHz) | dBc (dB) | FCC 2.993 Limit (dB) | Margin* (dB) (Limit-Amplitude) | Corrected Reading Peak (dBµV/m) | Polarization Vertical/ Horizontal | Comments |
|---|---|---|---|---|---|---|
| 1.510 | -117.6 | -43.0 | 74.6 | 10.0 | Vertical | 1,2 |
| 9.060 | -104.2 | -43.0 | 61.2 | 23.4 | Vertical | 1,2 |
| 16.610 | -94.5 | -43.0 | 51.5 | 33.1 | Vertical | 1,2 |
| 1.510 | -117.6 | -43.0 | 74.6 | 10.0 | Horizontal | 1,2 |
| 9.060 | -104.2 | -43.0 | 61.2 | 23.4 | Horizontal | 1,2 |
| 16.610 | -94.5 | -43.0 | 51.5 | 33.1 | Horizontal | 1,2 |

# D. TEST RESULTS (Continued)

**SCAN 18-26.5 GHz (Refer to Appendix B Page # 107)**

**Test # REMW10, TX 30.0 dBm QPSK/40 MHz BW, -48 Vdc**

| Frequency (GHz) | dBc (dB) | FCC 2.993 Limit (dB) | Margin* (dB) (Limit-Amplitude) | Corrected Reading (dBµV/m) | Polarization Vertical/ Horizontal | Comments |
|---|---|---|---|---|---|---|
| 18.000 | -90.5 | -43.0 | 47.5 | 37.1 | Vertical | 1,2 |
| 22.000 | -84.2 | -43.0 | 41.2 | 43.4 | Vertical | 1,2 |
| 26.040 | -59.8 | -56.0 | 3.8 | 67.8 | Vertical | 1,2,3 |
| 18.000 | -90.5 | -43.0 | 47.5 | 37.1 | Horizontal | 1,2 |
| 22.000 | -84.2 | -43.0 | 41.2 | 43.4 | Horizontal | 1,2 |
| 26.040 | -59.8 | -56.0 | 3.8 | 67.8 | Horizontal | 1,2,3 |

**SCAN 26.5-40 GHz (Refer to Appendix B Page # 108)**

**Test # 218U05, TX 30.0 dBm 27.550GHz QPSK/40 MHz BW, -48 Vdc**

| Frequency (GHz) | dBc (dB) | FCC 2.993 Limit (dB) | Margin* (dB) (Limit-Amplitude) | Corrected Reading (dBµV/m) | Polarization Vertical/ Horizontal | Comments |
|---|---|---|---|---|---|---|
| 26.040 | -48.2 | -56.0 | -7.8 | 79.4 | Vertical | 1,2,3,4 |
| 27.550 | N/A | -43.0 | N/A | 54.4 | Vertical | 1,2 |
| 32.000 | -72.6 | -43.0 | 29.6 | 55.0 | Vertical | 1,2 |
| 26.040 | -48.2 | -56.0 | -7.8 | 79.4 | Horizontal | 1,2,3,4 |
| 27.550 | N/A | -43.0 | N/A | 54.4 | Horizontal | 1,2 |
| 32.000 | -73.1 | -43.0 | 30.1 | 54.5.5 | Horizontal | 1,2 |

**SCAN 40-100 GHz (Refer to Appendix B Page # 109)**

**Test # 218U08, TX 30.0 dBm 27.550GHz QPSK/40 MHz BW, -48 Vdc**

| Frequency (GHz) | dBc (dB) | FCC 2.993 Limit (dB) | Margin* (dB) (Limit-Amplitude) | Corrected Reading (dBµV/m) | Polarization Vertical/ Horizontal | Comments |
|---|---|---|---|---|---|---|
| 60.000 | -61.0 | -43.0 | 18.0 | 66.6 | Vertical | 1,2 |
| 78.120 | -67.3 | -43.0 | 24.3 | 60.3 | Vertical | 1,2 |
| 82.650 | -67.3 | -43.0 | 24.3 | 60.3 | Vertical | 1,2 |
| 60.000 | -61.3 | -43.0 | 18.3 | 66.3 | Horizontal | 1,2 |
| 78.120 | -68.5 | -43.0 | 25.5 | 59.1 | Horizontal | 1,2 |
| 82.650 | -67.3 | -43.0 | 24.3 | 60.3 | Horizontal | 1,2 |
| ***300 kHz RBW*** | | | | | | |
| 60.000 | -64.1 | -43 | 21.1 | 63.5 | Vertical | 1,2 |
| 60.000 | -64.1 | -43 | 21.1 | 63.5 | Horizontal | 1,2 |

# D. TEST RESULTS (Continued)

**SCAN 1-18 GHz (Refer to Appendix B Page # 110)**

**Test # REMW 05, TX 30.0 dBm QPSK/50 MHz BW, -48 Vdc**

| Frequency (GHz) | dBc (dB) | FCC 2.993 Limit (dB) | Margin* (dB) (Limit-Amplitude) | Corrected Reading (dBµV/m) | Polarization Vertical/ Horizontal | Comments |
|---|---|---|---|---|---|---|
| 1.190 | -119.4 | -43.0 | 76.4 | 8.2 | Vertical | 1,2 |
| 9.520 | -102.9 | -43.0 | 59.4 | 24.7 | Vertical | 1,2 |
| 17.850 | -92.2 | -43.0 | 49.2 | 35.4 | Vertical | 1,2 |
| 1.190 | -119.4 | -43.0 | 76.4 | 8.2 | Horizontal | 1,2 |
| 9.520 | -102.9 | -43.0 | 59.9 | 24.7 | Horizontal | 1,2 |
| 17.850 | -92.2 | -43.0 | 49.2 | 34.4 | Horizontal | 1,2 |

**SCAN 18-26 GHz (Refer to Appendix B Page # 111)**

**Test #REMW11, TX 30.0 dBm QPSK/50 MHz BW, -48 Vdc**

| Frequency (GHz) | dBc (dB) | FCC 2.993 Limit (dB) | Margin* (dB) (Limit-Amplitude) | Corrected Reading (dBµV/m) | Polarization Vertical/ Horizontal | Comments |
|---|---|---|---|---|---|---|
| 18.000 | -90.5 | -43.0 | 47.5 | 37.1 | Vertical | 1,2 |
| 22.000 | -84.2 | -43.0 | 41.2 | 43.4 | Vertical | 1,2 |
| 26.400 | -60.8 | -56.0 | 4.8 | 66.8 | Vertical | 1,2,3 |
| 18.00 | -90.5 | -43.0 | 47.5 | 37.1 | Horizontal | 1,2 |
| 22.00 | -84.2 | -43.0 | 41.2 | 43.4 | Horizontal | 1,2 |
| 26.400 | -60.8 | -56.0 | 4.8 | 66.8 | Horizontal | 1,2,3 |

**SCAN 40-100 GHz (Refer to Appendix B Page # 112)**

**Test # 218U07, TX 30.0 dBm 27.590 GHz QPSK/50 MHz BW, -48 Vdc**

| Frequency (GHz) | dBc (dB) | FCC 2.993 Limit (dB) | Margin* (dB) (Limit-Amplitude) | Corrected Reading (dBµV/m) | Polarization Vertical/ Horizontal | Comments |
|---|---|---|---|---|---|---|
| 60.000 | -60.3 | -43.0 | 17.3 | 67.3 | Vertical | 1,2 |
| 79.200 | -67.7 | -43.0 | 24.7 | 59.9 | Vertical | 1,2 |
| 82.770 | -67.1 | -43.0 | 24.1 | 60.5 | Vertical | 1,2 |
| 60.000 | -60.3 | -43.0 | 17.3 | 67.3 | Horizontal | 1,2 |
| 79.200 | -67.4 | -43.0 | 24.4 | 60.2 | Horizontal | 1,2 |
| 82.770 | -67.0 | -43.0 | 24.0 | 60.6 | Horizontal | 1,2 |
| ***300 kHz RBW*** | | | | | | |
| 60.000 | -64.1 | -43.0 | 21.1 | 63.5 | Vertical | 1,2 |
| 60.000 | -64.1 | -43.0 | 21.1 | 63.5 | Horizontal | 1,2 |

# D. TEST RESULTS (Continued)

**SCAN 1-18 GHz (Refer to Appendix B Page # 113)**

**Test # REMW06, TX 30.0 dBm BOSCH MODEM TEST SET, -48 Vdc**

| Frequency (GHz) | dBc (dB) | FCC 2.993 Limit (dB) | Margin* (dB) (Limit-Amplitude) | Corrected Reading (dBµV/m) | Polarization Vertical/ Horizontal | Comments |
|---|---|---|---|---|---|---|
| 1.670926 | -117.6 | -43.0 | 74.6 | 10.0 | Vertical | 1,2 |
| 8.35463 | -105.3 | -43.0 | 62.3 | 22.3 | Vertical | 1,2 |
| 16.70926 | -96.5 | -43.0 | 53.5 | 31.1 | Vertical | 1,2 |
| 1.670926 | -117.6 | -43.0 | 74.6 | 10.0 | Horizontal | 1,2 |
| 8.35463 | -103.3 | -43.0 | 60.3 | 24.3 | Horizontal | 1,2 |
| 16.70926 | -95.5 | -43.0 | 52.5 | 32.1 | Horizontal | 1,2 |

**SCAN 18-26.5 GHz (Refer to Appendix B Page # 114)**

**Test # REMW12, TX 30.0 dBm BOSCH MODEM TEST SET, -48 Vdc**

| Frequency (GHz) | dBc (dB) | FCC 2.993 Limit (dB) | Margin* (dB) (Limit-Amplitude) | Corrected Reading (dBµV/m) | Polarization Vertical/ Horizontal | Comments |
|---|---|---|---|---|---|---|
| 18.000 | -90.5 | -43.0 | 47.5 | 37.1 | Vertical | 1,2 |
| 22.00 | -84.2 | -43.0 | 41.2 | 43.4 | Vertical | 1,2 |
| 26.400 | -60.8 | -56.0 | 4.8 | 66.8 | Vertical | 1,2,3 |
| 18.000 | -90.5 | -43.0 | 47.5 | 37.1 | Horizontal | 1,2 |
| 22.000 | -84.2 | -43.0 | 41.2 | 43.4 | Horizontal | 1,2 |
| 26.400 | -60.8 | -56.0 | 4.8 | 66.8 | Horizontal | 1,2,3 |

**SCAN 26.5-40 GHz (Refer to Appendix B Page # 115)**

**Test # 218U01, TX 30.0 dBm 27.710926GHz QPSK/30 MHz BW Bosch Modem Test Set, -48 Vdc**

| Frequency (GHz) | dBc (dB) | FCC 2.993 Limit (dB) | Margin* (dB) (Limit-Amplitude) | Corrected Reading (dBµV/m) | Polarization Vertical/ Horizontal | Comments |
|---|---|---|---|---|---|---|
| 26.040 | -51.2 | -56.0 | -4.8 | 76.4 | Vertical | 1,2 |
| 27.710 | N/A | -43.0 | N/A | 76.4 | Vertical | 1,2 |
| 32.000 | -75.1 | -43.0 | 32.1 | 52.5 | Vertical | 1,2 |
| 26.040 | -51.2 | -56.0 | -4.8 | 76.4 | Horizontal | 1,2 |
| 27.710 | N/A | -43.0 | N/A | 76.4 | Horizontal | 1,2 |
| 32.000 | -75.1 | -43.0 | 32.1 | 52.5 | Horizontal | 1,2 |

# D. TEST RESULTS (Continued)

**SCAN 40-100 GHz (Refer to Appendix B Page # 116)**

**Test # 218U10, TX 30.0 dBm 27.710926GHz QPSK/30 MHz BW Bosch Modem Test Set, -48 Vdc**

| Frequency (GHz) | dBc (dB) | FCC 2.993 Limit (dB) | Margin* (dB) (Limit-Amplitude) | Corrected Reading (dBµV/m) | Polarization Vertical/ Horizontal | Comments |
|---|---|---|---|---|---|---|
| 60.00000 | -63.3 | -43.0 | 20.3 | 64.3 | Vertical | 1,2 |
| 78.12000 | -67.3 | -43.0 | 24.3 | 60.3 | Vertical | 1,2 |
| 83.13278 | -67.5 | -43.0 | 24.5 | 60.1 | Vertical | 1,2 |
| 60.0000 | -63.3 | -43.0 | 20.3 | 64.3 | Horizontal | 1,2 |
| 78.12000 | -66.3 | -43.0 | 23.3 | 61.3 | Horizontal | 1,2 |
| 83.13278 | -67.5 | -43.0 | 24.5 | 60.1 | Horizontal | 1,2 |
| ***300 kHz RBW*** | | | | | | |
| 60.0000 | 64.1 | -43.0 | 21.1 | 63.5 | Vertical | 1,2 |
| 60.0000 | 64.1 | -43.0 | 21.1 | 63.5 | Horizontal | 1,2 |

Comments:

1) Data contained in Appendix B - Tests # 218U01, # 21803, # 218U04, and # 218U05 (06/18/98) and Tests # 218U07, # 218U08, # 218U09, #218U10, # 218U11, (06/19/98). Tests # REMW02, #REMW03, # REMW04, # REMW05, and # REMW06 (06/22/98) and # REMW08, # REMW09, # REMW10, # REMW10 and # REMW12 (06/23/98).

2) Noise floor reading.

3) dBc level = -56 dB

4) The reading was above the specified limit.

Notes:

4 kHz RBW correction factor of -24 dB was added to the formula (refer to sample calculations).

*Calculations may not agree exactly with data due to rounding of numbers.

All other radiated emissions amplitudes were at least 10 dB within the FCC Part 2 Subpart 2.993 Limits. Emissions were scanned from 1 GHz to 18 GHz, 18GHz-26.5 GHz, 26.5 GHz to 40 GHz, and 40 to 100 GHz with antennas in both the vertical and horizontal orientation. The specified radiated emissions antenna reference distance was 3 meters. Testing of the EUT was conducted at 3 meters. No additional signal was detected.

Amplitudes were measured using the peak detector. Reference detector specified in the limit is the average detector.

# TABLE D-V. FREQUENCY STABILITY DATA

**(Refer to Appendix B Page # 118- Page # 120)**
**Frequency Stability Configuration: TX 27.920000 GHz**

| Frequency (MHz) | Temperature | FCC Limit 101 (2.995) | Voltage | Time |
|---|---|---|---|---|
| 27.920000010 (R/F) freq | -30ºC | .001% (+/- 279.2 kHz) | (-15%) 40.8 Vdc | |
| 27.920000011 (R/F) freq | -30ºC | .001% (+/- 279.2 kHz) | Nominal 48 Vdc | 1030 |
| 27.920000020 (R/F) freq | -30ºC | .001% (+/- 279.2 kHz) | (- 15%) 55.2 Vdc) | |
| | | | | |
| 27.920000105 (RF) freq | -20ºC | .001% (+/- 279.2 kHz) | (-15%) 40.8 Vdc | |
| 27.920000099 (RF) freq | -20ºC | .001% (+/- 279.2 kHz) | Nominal 48.0 Vdc | 1115 |
| 27.920000099 (RF) freq | -20ºC | .001% (+/- 279.2 kHz) | (+15%) 55.2 Vdc | |
| | | | | |
| 27.920000216 (RF) freq | -10ºC | .001% (+/- 279.2 kHz) | (-15%) 40.8 Vdc | |
| 27.920000215 (RF) freq | -10ºC | .001% (+/- 279.2 kHz) | Nominal 48.0 Vdc | 1200 |
| 27.920000208 (RF) freq | -10ºC | .001% (+/- 279.2 kHz) | (+15%) 55.2 Vdc | |
| | | | | |
| 27.920000206 (RF) freq | 0ºC | .001% (+/- 279.2 kHz) | (-15%) 40.8 Vdc | |
| 27.920000197 (RF) freq | 0ºC | .001% (+/- 279.2 kHz) | Nominal 48.0 Vdc | 1245 |
| 27.920000215 (RF) freq | 0C | .001% (+/- 279.2 kHz) | (+15%) 55.2 Vdc | |
| | | | | |
| 27.920000181 (RF) freq | 10ºC | .001% (+/- 279.2 kHz) | (-15%) 40.8 Vdc | |
| 27.920000192 (RF) freq | 10ºC | .001% (+/- 279.2 kHz) | Nominal 48.0 Vdc | 1330 |
| 27.920000202 (RF) freq | 10ºC | .001% (+/- 279.2 kHz) | (+15%) 55.2 Vdc | |
| | | | | |
| 27.920000205 (RF) freq | 20ºC | .001% (+/- 279.2 kHz) | (-15%) 40.8 Vdc | |
| 27.920000194 (RF) freq | 20ºC | .001% (+/- 279.2 kHz) | Nominal 48.0 Vdc | 1415 |
| 27.920000197 (RF) freq | 20ºC | .001% (+/- 279.2 kHz) | (+15%) 55.2 Vdc | |
| | | | | |
| 27.920000148 (RF) freq | 30ºC | .001% (+/- 279.2 kHz) | (-15%) 40.8 Vdc | |
| 27.920000136 (RF) freq | 30ºC | .001% (+/- 279.2 kHz) | Nominal 48.0 Vdc | 1500 |
| 27.920000116 (RF) freq | 30ºC | .001% (+/- 279.2 kHz) | (+15%) 55.2 Vdc | |
| | | | | |
| 27.920000106 (RF) freq | 40ºC | .001% (+/- 279.2 kHz) | (-15%) 40.8 Vdc | |
| 27.920000103 (RF) freq | 40ºC | .001% (+/- 279.2 kHz) | Nominal 48.0 Vdc | 1545 |
| 27.920000120 (RF) freq | 40ºC | .001% (+/- 279.2 kHz) | (+15%) 55.2 Vdc | |
| | | | | |
| 27.920000108 (RF) freq | 50ºC | .001% (+/- 279.2 kHz) | (-15%) 40.8 Vdc | |
| 27.920000112 (RF) freq | 50ºC | .001% (+/- 279.2 kHz) | Nominal 48.0 Vdc | 1630 |
| 27.920000107 (RF) freq | 50ºC | .001% (+/- 279.2 kHz) | (+15%) 55.2 Vdc | |

Comments:

1. Data contained in Appendix B – Test Frequency Stability (05/08/98).

# E. MEASUREMENT FACILITY AND INSTRUMENTATION

## TABLE E-1 TEST EQUIPMENT

The listing below indicates the test equipment utilized for the test (s).

| KTL/(ICC) ID | Nomenclature | Manufacturer Model Number | Serial Number | Calibration Date |
|---|---|---|---|---|
| CF00 | Storm Cable (7.7 meters) | | | 04/28/98 |
| CF06 | Flex Cable (0.3 meter N) | | | 08/11/97 |
| CF20 | Semi Flex Cable (3 meters) | | | CNR |
| CF24 | Workhorse (3.6 meters) | | | 12/02/97 |
| 180 | DC Block | Tektronix 7A26 | NSN | 02/27/98 |
| 181 | Limiter | Fischer FCC-45013-1.2 | NSN | 02/12/98 |
| 227 | Antenna, LP | A.H. Systems SAS-200/510 | 556 | 01/24/98 |
| 230 | Biconical Antenna (30 MHz – 300 MHz) | International Compliance Corporation. BCON-30300 | 210 | 01/17/98 |
| 401 | Low Noise Preamplifier (1 MHz - 1 GHz) | RF Consultants LNA-14 | 020 | 08/11/97 |
| 494 | Horn Antenna | A.H. Systems SAS-200/571 | 162 | 04/29/98 |
| 697 | Spectrum Analyzer | Hewlett Packard 8563E | 3551A04428 | 08/01/97 |
| 739 | Environmental Chamber | Environtics SH27 | 129010083 | 11/06/98 |
| 878 | Mixer | Hewlett Packard 11970A | 2332A01929 | 10/17/97 |
| 879 | Mixer | Hewlett Packard 5356D | 2521A00583 | 10/30/97 |
| 881 | Harmonic Mixer | Hewlett Packard 1197OU | 2332A00116 | 10/20/97 |
| 897 | Signal Generator | Marconi 2022D | 119223029 | 01/27/98 |

# TABLE E-1 TEST EQUIPMENT
(Continued)

The listing below indicates the test equipment utilized for the test (s).

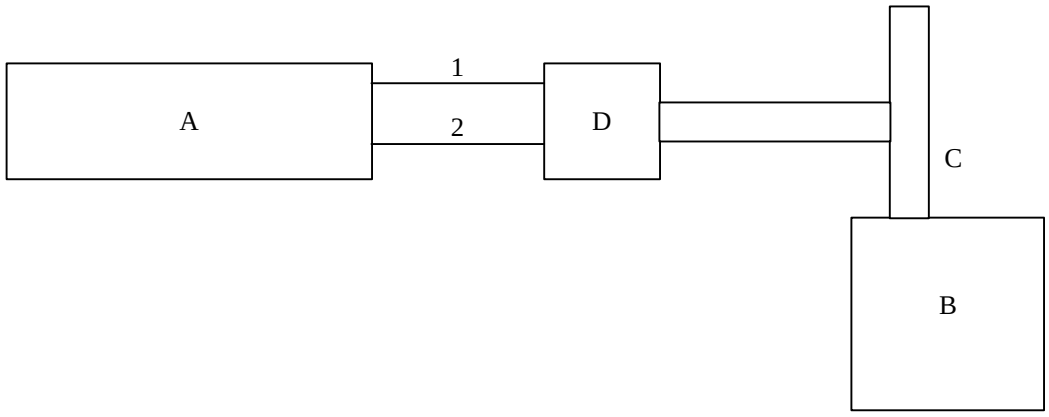
| KTL/(ICC) ID | Nomenclature | Manufacturer Model Number | Serial Number | Calibration Date |
|---|---|---|---|---|
| EM2200 | Amplifier | Hewlett Packard 8449A | 2749A00159 | 02/22/98 |
| | Bosch Telecom Power Meter | Anritsu MN: 2438A | 97500031 | 03/18/98 |
| G2624 | Spectrum Analyzer | Hewlett Packard 8563E | 3551A04428 | 10/05/98 |
| | Attenuators | DC9807 | 521A-20/599 | 10/27/98 |
| | Attenuator | | 521A-6/599 | 10/27/98 |
| | Directional Coupler | | 559A-20/599 | 10/27/98 |
| | | **LAB #2 (IN DOOR)** | | |
| | | **SITE B O.A.T.S. (OPEN AREA TEST SITE) 10 Meter Site** | | |
| | Turntable Flush Mounted, Metal Covered, 8 Foot | RF Consultants Model AT-8 (Automated) | | CNR |
| | Antenna Mast, 4 Meter | ICC (Automated) | | CNR |
| | | **BOSCH TELECOM, INC. FACILITY** | | |

**LEGEND:**

CNR = CALIBRATION NOT REQUIRED
N/A = NOT APPLICABLE
CBU = CALIBRATED BEFORE

## BLOCK DIAGRAM

| | |
|---|---|
| Client Name: Bosch Telecom | Work Order # **180218** |
| Model Number: Node Transmitter | Date: **10/27/98** |
| Configuration: Power Spectral Density | |




**HARDWARE:**

A: HP Spectrum Analyzer Model 8563E, KTL # G2624
B: EUT - Bosch Transmitter Model TX005
C: Millimeter Products Inc. 20 dB Directional Coupler p/n 559A-20/599 s/n DC9808, 20 dB attenuator p/n 521A-20/599, s/n DC9807 and 6 dB attenuator , p/n 521A-6/599, s/n DC9810
D: HP Harmonic Mixer Model 11970A KTL # ICC878

**CABLE:**
1: Coaxial Cable KTL # CF24
2. Coaxial Cable KTL # CF20

Note:
Power measurements were made at the forward power port of the directional coupler with the 20 dB and 6 dB attenuators in line. The direct output of the directional coupler is terminated with a 50 ohm load.

| Center | Channel | Analyzer Reading | External | Conversions | | Antenna | Corrected | Limit | Delta |
|---|---|---|---|---|---|---|---|---|---|
| Frequency GHZ | Bandwidth | dBm/Hz | Attenuation dB | Hz to MHz | dBm to dBW | Gain dBi | Reading dBW/MHz | dBW/MHz | dB |
| 27.55 | 30 | -92.5 | 44.6 | 60 | -30 | 15 | -2.9 | 30 | -32.9 |
| 27.59 | 30 | -93.6 | 44.7 | 60 | -30 | 15 | -3.9 | 30 | -33.9 |
| 27.7109 | 30 | -92.7 | 45.7 | 60 | -30 | 15 | -2 | 30 | -32 |

Comments:

1) Please refer to Page # 58 - Page # 60.

KTL Dallas, Inc.

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Lewisville, TX 75057
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Fax: (972) 436-2667

# ANTENNA TERMINAL CONDUCTED DATA

Complete X Preliminary ___ Page 1 of 1

Client: BOSCH TELECOM Test #: 218V3 W.O.#: 180218

EUT: NODE TRANSMITTER S/N: UNIT #5 Photo ID: 180218 V3

Technician: M SEVERSON & D LIGHT Specification: CFR 47 P 2.991 Lab: BOATS Date: 6/17/98

Equipment Used: 697,878

Configuration: TX 27.510 GHz U.S. TX 30.0dBm CW

Readings taken at antenna terminals

Bandwidth: 1MHZ Video Bandwidth: 100KHZ Antenna Distance n/a m Detector:

Climatic Conditions:
Temperature: 20 C
Relative Humidity: 39 %
Atmospheric Pressure: 996 mbar

EUT Power: ___ 115 V.A.C. n/a 60 Hz
___ 208 V.A.C. n/a 50 Hz
___ 230 V.A.C.
X Other -48VDC n/a 1 Phase n/a 3 Phase

X Peak
___ Average

| Freq. (GHz) | Meter Reading (dBm) | Antenna Factor (dB) | Cable Loss (dB) | 4kHz RBW Correction Factor | Atten dB | Corrected Reading (dBm) | Limit dBm | | Comments: |
|---|---|---|---|---|---|---|---|---|---|
| 27.510 | -.64 | 0 | 1.02 | 0 | 30.2 | 30.6 | N/A | | Fundamental |
| 27.666 | -54 | 0 | 1.02 | 0 | 30.2 | -22.8 | N/A | | |
| 27.717 | -48.5 | 0 | 1.02 | 0 | 30.2 | -17.3 | N/A | | |
| 28.13 | -60 | 0 | 1.02 | 0 | 30.2 | -28.8 | N/A | | |
| | | | | | | | | | |
| 1.19 | -72 | 0 | 1 | 0 | 30.2 | -40.8 | -13.0 | | Noise floor |
| 13.09 | -71 | 0 | 1 | 0 | 30.2 | -39.8 | -13.0 | | Noise floor |
| | | | | | | | | | Scanned |
| | | | | | | | | | 30Mhz-40Ghz |
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DATACOMMON\FORMS\TESTDATASHEETS\MICRORE REV 030597

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Fax: (972) 436-2667

## DRAFT ANTENNA TERMINAL CONDUCTED DATA

Complete X Preliminary ___ Page 1 of 1

Client: BOSCH TELECOM Test #: 218V1 W.O.#: 180218

EUT: NODE TRANSMITTER S/N: UNIT #5 Photo ID: 180218 V1

Technician: MARK SEVERSON Specification: CFR 47 P 2.991 Lab: BOATS Date: 6/17/98

Equipment Used: 697,878

Configuration: TX 30.0dBm 27.710926Ghz QPSK/30Mhx BW Bosch Modem Test Set

Readings taken at antenna terminals

Bandwidth: 1MHZ Video Bandwidth: 100KHZ Antenna Distance n/a m Detector:

Climatic Conditions: EUT Power: ___ 115 V.A.C. n/a 60 Hz X Peak
Temperature: 20 C ___ 208 V.A.C. n/a 50 Hz ___ Average
Relative Humidity: 39 % ___ 230 V.A.C.
Atmospheric Pressure: 996 mbar X Other -48VDC n/a 1 Phase n/a 3 Phase

| Freq. (GHz) | Meter Reading (dBm) | Antenna Factor (dB) | Cable Loss (dB) | 4kHz RBW Correction Factor (dB) | Atten dB | Corrected Reading (dBm) | Limit dBm | | Comments: |
|---|---|---|---|---|---|---|---|---|---|
| 27.710926 | -11.0 | 0 | 1.02 | -24 | 30.2 | -3.8 | N/A | | Fundamental |
| 27.400 | -50.0 | 0 | 1.02 | -24 | 30.2 | -42.8 | -15.0 | | ** See Note |
| | | | | | | | | | |
| | | | | | | | | | |
| 1.19 | -72.5 | 0 | 1 | -24 | 30.2 | -65.3 | -13.0 | | Noise floor |
| 13.09 | -70 | 0 | 1 | -24 | 30.2 | -62.8 | -13.0 | | Noise floor |
| | | | | | | | | | Scanned |
| | | | | | | | | | 30MHz-40GHz |
| | | | | | | | | | |
| | | | | | | | | | Note: Limit is |
| | | | | | | | | | Based on |
| | | | | | | | | | CFR 47 Part |
| | | | | | | | | | 101.111 2(a)(2) (ii) |
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DATACOMMON\FORMS\TESTDATASHEETS\MICRORE REV 030597

KTL Dallas, Inc.

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## Microwave Radiated Emissions Data

Complete X Preliminary ___ Page 1 of 1

Client: Bosch Telecom Test #: REMW02 W.O.#: 180218

EUT: Node Transmitter S/N: Unit #5 Photo ID: 180218

Technician: D. Light Specification: 2.993 Lab: BOATS Date: 6/22/98

Equipment Used: EM2200,180,CF00,CF06,697,494
30 dBm @ 3m = 127.6 dBuV/m

Configuration: Tx 30.0 dBm 27.510 GHz CW Signal U.S. Frequency

Bandwidth: 1 MHz Video Bandwidth: 100 kHz Antenna Distance 3 m Detector:

Climatic Conditions: EUT Power: ___ 115 V.A.C. ___ 60 Hz X Peak
Temperature: 35 C ___ 208 V.A.C. ___ 50 Hz ___ Average
Relative Humidity: 45 % ___ 230 V.A.C.
Atmospheric Pressure: 1000 mbar X Other -48 VDC _____ 1 Phase ___ 3 Phase
Conversion: _____ dBpW= _____ dBuV/m @ _____ m dBc Limit = -43 dB

| Freq. (GHz) | Meter Reading (dBuV) | Antenna Factor (dB) | Cable Loss (dB) | RF Gain (dB) | 4kHz RBW Correction Factor (dB) | Corrected Reading (dBuV/m) | dBc | Pol. | Comments: |
|---|---|---|---|---|---|---|---|---|---|
| 1.92 | 36 | 28.2 | 3.52 | 30.9 | -24 | 12.8 | -114.8 | V | Noise floor |
| 10.56 | 33 | 38.9 | 10 | 32.2 | -24 | 25.7 | -101.9 | V | Noise floor |
| 17.28 | 33 | 44.3 | 14.39 | 31.9 | -24 | 35.8 | -91.8 | V | Noise floor |
| | | | | | | | | | |
| 1.92 | 35 | 28.2 | 3.52 | 30.9 | -24 | 11.8 | -115.8 | H | Noise floor |
| 10.56 | 33 | 38.9 | 10 | 32.2 | -24 | 25.7 | -101.9 | H | Noise floor |
| 17.28 | 33 | 44.3 | 14.39 | 31.9 | -24 | 35.8 | -91.8 | H | Noise floor |
| | | | | | | | | | |
| | | | | | | | | | Scanned |
| | | | | | | | | | 1-18 GHz |
| | | | | | | | | | |
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## Microwave Radiated Emissions Data

Complete X Preliminary ___ Page 1 of 1

Client: Bosch Telecom Test #: REMW08 W.O.#: 180218

EUT: Node Transmitter S/N: Unit #5 Photo ID: 180218

Technician: D. Light Specification: 2.993 Lab: BOATS Date: 6/23/98

Equipment Used:

Configuration: TX 30.0 dBm 27.510 GHz CW Signal U.S. Frequency
30 dBm @ 3 m = 127.6 dBuV/m

Bandwidth: 1 MHz Video Bandwidth: 100 kHz Antenna Distance 3 m Detector:

Climatic Conditions: EUT Power: ___ 115 V.A.C. ___ 60 Hz X Peak
Temperature: 35 C ___ 208 V.A.C. ___ 50 Hz ___ Average
Relative Humidity: 45 % ___ 230 V.A.C.
Atmospheric Pressure: 1000 mbar X Other -48 VDC ___ 1 Phase ___ 3 Phase
Conversion: ___ dBpW= ___ dBuV/m @ ___ m dBc Limit = -43 dB

| Freq. (GHz) | Meter Reading (dBuV) | Antenna Factor (dB) | Cable Loss (dB) | RF Gain (dB) | 4kHz RBW Correction Factor (dB) | Corrected Reading (dBuV/m) | dBc | Pol. | Comments: |
|---|---|---|---|---|---|---|---|---|---|
| 18 | 41 | 40.2 | 19.9 | 40 | -24 | 37.1 | -90.5 | V | NOISE FLOOR |
| 22 | 45 | 40.3 | 22.1 | 40 | -24 | 43.4 | -84.2 | V | NOISE FLOOR |
| 26.5 | 41 | 40.5 | 24.3 | 40 | 0 | 65.8 | -61.8 | V | *NOISE FLOOR |
| | | | | | | | | | |
| 18 | 41 | 40.2 | 19.9 | 40 | -24 | 37.1 | -90.5 | H | NOISE FLOOR |
| 22 | 45 | 40.3 | 22.1 | 40 | -24 | 43.4 | -84.2 | H | NOISE FLOOR |
| 26.5 | 41 | 40.5 | 24.3 | 40 | 0 | 65.8 | -61.8 | H | *NOISE FLOOR |
| | | | | | | | | | |
| | | | | | | | | | Note: 26.5 GHz |
| | | | | | | | | | dBc Limit = -56 dB |
| | | | | | | | | | |
| | | | | | | | | | Scanned |
| | | | | | | | | | 18-26.5 GHz |

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## Microwave Radiated Emissions Data

Complete X Preliminary ___ Page 1 of 1

Client: BOSCH TELECOM Test #: 218U03 W.O.#: 180218

EUT: NODE TRANSMITTER S/N: UNIT #5 Photo ID: 180218 U03

Technician: M SEVERSON&$ D LIGHT Specification: CFR 47 P 2.993 Lab: BOATS Date: 6/18/98

Equipment Used: 897,935

Configuration: TX 30.0dBm 27.510GHZ CW Signal U.S. Frequency
30.0dBm at 3m = 127.6dBuV/m

Bandwidth: 1MHZ Video Bandwidth: 100KHZ Antenna Distance 3 m Detector:

Climatic Conditions:
Temperature: 32 C
Relative Humidity: 45 %
Atmospheric Pressure: 997 mbar

EUT Power: ___ 115 V.A.C. N/A 60 Hz X Peak
___ 208 V.A.C. N/A 50 Hz ___ Average
___ 230 V.A.C.
X Other -48VDC N/A 1 Phase N/A 3 Phase
dBc limit = -43dB

| Freq. (GHz) | Meter Reading (dBuV) | Antenna Factor (dB) | Cable Loss (dB) | RF Gain (dB) | 4kHz RBW Correction Factor (dB) | Corrected Reading (dBuV/m) | dBc | Pol. | Comments: |
|---|---|---|---|---|---|---|---|---|---|
| 26.550 | 33 | 43.4 | 1.02 | 0 | 0 | 77.4 | -50.2 | H | Noise floor |
| 27.510 | 33 | 43.4 | 1.02 | 0 | 0 | 77.4 | N/A | H | Noise floor |
| 32.0 | 34 | 43.52 | 1.02 | 0 | -24 | 54.5 | -73.1 | H | Noise floor |
| | | | | | | | | | |
| 26.550 | 34 | 43.4 | 1.02 | 0 | 0 | 78.4 | -49.2 | V | Noise floor |
| 27.510 | 38.87 | 43.4 | 1.02 | 0 | 0 | 83.3 | N/A | V | Noise floor |
| 32.0 | 33 | 43.52 | 1.02 | 0 | -24 | 53.5 | 74.1 | V | Noise floor |
| | | | | | | | | | Scanned |
| | | | | | | | | | 26.5-40Ghz |
| | | | | | | | | | |
| | | | | | | | | | Note: 26.550 GHz |
| | | | | | | | | | dBc limit = -56dB |
| | | | | | | | | | |
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## Microwave Radiated Emissions Data

Complete X Preliminary ___ Page 1 of 1

Client: BOSCH TELECOM Test #: 218U11 W.O.#: 180218

EUT: NODE TRANSMITTER S/N: UNIT #5 Photo ID: 180218 U11

Technician: M SEVERSON & D LIGHT Specification: CFR 47 P 2.993 Lab: BOATS Date: 6/19/98

Equipment Used: 897,935

Configuration: TX 30.0dBm 27.510GHz CW U.S. FREQUENCY
30.0 dBm at 3m = 127.6 dBuV/m

Bandwidth: 1MHZ Video Bandwidth: 100KHZ Antenna Distance 3 m Detector:

Climatic Conditions:
Temperature: 32 C
Relative Humidity: 45 %
Atmospheric Pressure: 997 mbar

EUT Power: ___ 115 V.A.C. n/a 60 Hz X Peak
___ 208 V.A.C. n/a 50 Hz ___ Average
___ 230 V.A.C.
X Other -48VDC n/a 1 Phase n/a 3 Phase
dBc limit = -43dB

| Freq. (GHz) | Meter Reading (dBuV) | Antenna Factor (dB) | Cable Loss (dB) | RF Gain (dB) | 4kHz RBW Correction Factor (dB) | Corrected Reading (dBuV/m) | dBc | Pol. | Comments: |
|---|---|---|---|---|---|---|---|---|---|
| 53.1 | 33 | 41.17 | 1.02 | 0 | -24 | 51.2 | -76.4 | H | Noise floor |
| 55.02 | 34 | 41.46 | 1.02 | 0 | -24 | 52.5 | -75.1 | H | Noise floor |
| 40.0 | 36 | 38.7 | 1.02 | 0 | -24 | 51.7 | -75.9 | H | Noise floor |
| | | | | | | | | | |
| 53.1 | 33 | 41.17 | 1.02 | 0 | -24 | 51.2 | -76.4 | V | Noise floor |
| 55.02 | 33 | 41.46 | 1.02 | 0 | -24 | 51.5 | -76.1 | V | Noise floor |
| 40.0 | 35 | 38.7 | 1.02 | 0 | -24 | 50.7 | -76.9 | V | Noise floor |
| | | | | | | | | | |
| 79.65 | 38.2 | 44.7 | 1.02 | 0 | -24 | 59.9 | -67.7 | H | Noise floor |
| 82.53 | 38 | 45.1 | 1.02 | 0 | -24 | 60.1 | -67.5 | H | Noise floor |
| 60.0 | 47 | 43.3 | 1.02 | 0 | -24 | 67.3 | -60.3 | H | Noise floor |
| | | | | | | | | | |
| 79.65 | 38.4 | 44.7 | 1.02 | 0 | -24 | 60.1 | -67.5 | V | Noise floor |
| 82.53 | 38.2 | 45.1 | 1.02 | 0 | -24 | 60.3 | -67.3 | V | Noise floor |
| 60.0 | 46.9 | 43.3 | 1.02 | 0 | -24 | 67.2 | -60.4 | V | Noise floor |
| | | | | | | | | | |
| 60.0 | 47 | 43.3 | 1.02 | 0 | -24 | 67.3 | -60.3 | H | 300 kHz RBW |
| 60.0 | 46.9 | 43.3 | 1.02 | 0 | -24 | 67.2 | -60.4 | V | 300 kHz RBW |
| | | | | | | | | | **Scanned** |
| | | | | | | | | | **40-100 GHz** |

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## Microwave Radiated Emissions Data

Complete X Preliminary ___ Page 1 of 1

Client: Bosch Telecom Test #: REMW03 W.O.#: 180218

EUT: Node Transmitter S/N: Unit #5 Photo ID: 180218

Technician: D. Light Specification: 2.993 Lab: BOATS Date: 6/22/98

Equipment Used: EM2200,180,CF00,CF06,697,494

Configuration: TX 30.0 dBm QPSK/30 MHz BW
30.0 dBm at 3m = 127.6 dBuV/m

Bandwidth: 1 MHz Video Bandwidth: 100 kHz Antenna Distance 3 m Detector:

Climatic Conditions: EUT Power: ___ 115 V.A.C. ___ 60 Hz X Peak
Temperature: 35 C ___ 208 V.A.C. ___ 50 Hz ___ Average
Relative Humidity: 45 % ___ 230 V.A.C.
Atmospheric Pressure: 1000 mbar X Other -48 VDC ___ 1 Phase ___ 3 Phase
Conversion: ___ dBpW= ___ dBuV/m @ ___ m dBc Limit = -43

| Freq. (GHz) | Meter Reading (dBuV) | Antenna Factor (dB) | Cable Loss (dB) | RF Gain (dB) | 4kHz RBW Correction Factor (dB) | Corrected Reading (dBuV/m) | dBc | Pol. | Comments: |
|---|---|---|---|---|---|---|---|---|---|
| 1.67 | 37 | 25.1 | 2.88 | 31 | -24 | 9.98 | -117.6 | V | Noise floor |
| 10.02 | 34 | 37.8 | 9.4 | 33.1 | -24 | 24.1 | -103.5 | V | Noise floor |
| 16.7 | 32 | 42.1 | 13.67 | 32.7 | -24 | 31.1 | -96.5 | V | Noise floor |
| | | | | | | | | | |
| 1.67 | 36 | 25.1 | 2.88 | 31 | -24 | 8.98 | -118.6 | H | Noise floor |
| 10.02 | 35 | 37.8 | 9.4 | 33.1 | -24 | 25.1 | -102.5 | H | Noise floor |
| 16.7 | 33 | 42.1 | 13.67 | 32.7 | -24 | 32.1 | -95.5 | H | Noise floor |
| | | | | | | | | | |
| | | | | | | | | | Scanned |
| | | | | | | | | | 1-18 GHz |
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## Microwave Radiated Emissions Data

Complete X Preliminary ___ Page 1 of 1

Client: Bosch Telecom Test #: REMW09 W.O.#: 180218

EUT: Node Transmitter S/N: Unit #5 Photo ID: 180218

Technician: D. Light Specification: 2.993 Lab: BOATS Date: 6/23/98

Equipment Used:

Configuration: TX 30.0 dBm QPSK/30 MHz BW
30.0 dBm at 3m = 127.6 dBuV/m

Bandwidth: 1 MHz Video Bandwidth: 100 kHz Antenna Distance 3 m Detector:

Climatic Conditions: EUT Power: ___ 115 V.A.C. ___ 60 Hz X Peak
Temperature: 35 C ___ 208 V.A.C. ___ 50 Hz ___ Average
Relative Humidity: 45 % ___ 230 V.A.C.
Atmospheric Pressure: 1000 mbar X Other -48 VDC ___ 1 Phase ___ 3 Phase
Conversion: ___ dBpW= ___ dBuV/m @ ___ m dBc Limit = -43 dB

| Freq. (GHz) | Meter Reading (dBuV) | Antenna Factor (dB) | Cable Loss (dB) | RF Gain (dB) | 4kHz RBW Correction Factor (dB) | Corrected Reading (dBuV/m) | dBc | Pol. | Comments: |
|---|---|---|---|---|---|---|---|---|---|
| 18 | 41 | 40.2 | 19.9 | 40 | -24 | 37.1 | -90.5 | V | NOISE FLOOR |
| 22 | 42 | 40.3 | 22.1 | 40 | -24 | 40.4 | -87.2 | V | NOISE FLOOR |
| 26.04 | 42 | 40.5 | 24.3 | 40 | 0 | 66.8 | -60.8 | V | *NOISE FLOOR |
| | | | | | | | | | |
| 18 | 41 | 40.2 | 19.9 | 40 | -24 | 37.1 | -90.5 | H | NOISE FLOOR |
| 22 | 45 | 40.3 | 22.1 | 40 | -24 | 43.4 | -84.2 | H | NOISE FLOOR |
| 26.04 | 43 | 40.5 | 24.3 | 40 | 0 | 67.8 | -59.8 | H | *NOISE FLOOR |
| | | | | | | | | | |
| | | | | | | | | | Note: 26.04GHz |
| | | | | | | | | | dBc Limit =-56dB |
| | | | | | | | | | |
| | | | | | | | | | Scanned |
| | | | | | | | | | 18-26.5 GHz |
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## Microwave Radiated Emissions Data

Complete X Preliminary ___ Page 1 of 1

Client: BOSCH TELECOM Test #: 218U04 W.O.#: 180218

EUT: NODE TRANSMITTER S/N: UNIT #5 Photo ID: 180218 U04

Technician: M SEVERSON&$ D LIGHT Specification: CFR 47 P 2.993 Lab: BOATS Date: 6/18/98

Equipment Used: 897,935

Configuration: TX 30.0dBm 27.710GHZ QPSK/30MHz BW
30.0dBm at 3m = 127.6dBuV/m

Bandwidth: 1MHZ Video Bandwidth: 100KHZ Antenna Distance 3 m Detector:

Climatic Conditions: EUT Power: ___ 115 V.A.C. N/A 60 Hz X Peak
Temperature: 32 C ___ 208 V.A.C. N/A 50 Hz ___ Average
Relative Humidity: 45 % ___ 230 V.A.C.
Atmospheric Pressure: 997 mbar X Other -48VDC n/a 1 Phase N/A 3 Phase
dBc limit = -43dB

| Freq. (GHz) | Meter Reading (dBuV) | Antenna Factor (dB) | Cable Loss (dB) | RF Gain (dB) | 4kHz RBW Correction Factor (dB) | Corrected Reading (dBuV/m) | dBc | Pol. | Comments: |
|---|---|---|---|---|---|---|---|---|---|
| 26.040 | 34.2 | 43.4 | 1.02 | 0 | 0 | 78.6 | -49.0 | H | *Noise floor |
| 27.710 | 35 | 43.4 | 1.02 | 0 | 0 | 79.4 | N/A | H | Noise floor |
| 32.0 | 34 | 43.52 | 1.02 | -24 | 0 | 54.5 | -73.1 | H | Noise floor |
| | | | | | | | | | |
| 26.040 | 34.4 | 43.4 | 1.02 | 0 | 0 | 78.8 | -48.8 | V | *Noise floor |
| 27.710 | 34 | 43.4 | 1.02 | 0 | 0 | 78.4 | N/A | V | Noise floor |
| 32.0 | 34 | 43.52 | 1.02 | -24 | 0 | 54.5 | -73.1 | V | Noise floor |
| | | | | | | | | | Scanned |
| | | | | | | | | | 26.5-40 GHz |
| | | | | | | | | | |
| | | | | | | | | | Note: 26.04GHz |
| | | | | | | | | | dBc Limit =-56dB |
| | | | | | | | | | |
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## Microwave Radiated Emissions Data

Complete X Preliminary ___ Page 1 of 1

Client: BOSCH TELECOM Test #: 218U09 W.O.#: 180218

EUT: NODE TRANSMITTER S/N: UNIT #5 Photo ID: 180218 U09

Technician: M SEVERSON & D LIGHT Specification: CFR 47 P 2.993 Lab: BOATS Date: 6/19/98

Equipment Used: 897,935

Configuration: TX 30.0dBm 27.710 GHz QPSK/30MHz BW
30.0dBm at 3m = 127.6dBuV/m

Bandwidth: 1MHZ Video Bandwidth: 100KHZ Antenna Distance 3 m Detector:

Climatic Conditions: EUT Power: ___ 115 V.A.C. n.a 60 Hz X Peak
Temperature: 32 C ___ 208 V.A.C. n.a 50 Hz ___ Average
Relative Humidity: 45 % ___ 230 V.A.C.
Atmospheric Pressure: 997 mbar X Other -48VDC n/a 1 Phase n/a 3 Phase
dBc limit = -43dB

| Freq. (GHz) | Meter Reading (dBuV) | Antenna Factor (dB) | Cable Loss (dB) | RF Gain (dB) | Correction Factor (dB) | Corrected Reading (dBuV/m) | dBc | Pol. | Comments: |
|---|---|---|---|---|---|---|---|---|---|
| 52.08 | 34.5 | 41.17 | 1.02 | 0 | -24 | 52.7 | -74.9 | H | Noise floor |
| 55.42 | 33 | 41.46 | 1.02 | 0 | -24 | 51.5 | -76.1 | H | Noise floor |
| 40.0 | 36 | 38.7 | 1.02 | 0 | -24 | 51.7 | -75.9 | H | Noise floor |
| | | | | | | | | | |
| 52.08 | 33.5 | 41.17 | 1.02 | 0 | -24 | 51.7 | -75.9 | V | Noise floor |
| 55.42 | 33.7 | 41.46 | 1.02 | 0 | -24 | 52.2 | -75.4 | V | Noise floor |
| 40.0 | 36 | 38.7 | 1.02 | 0 | -24 | 51.7 | -75.9 | V | Noise floor |
| | | | | | | | | | |
| 78.12 | 38.4 | 44.6 | 1.02 | 0 | -24 | 60 | -67.6 | H | Noise floor |
| 83.13 | 38.5 | 45.1 | 1.02 | 0 | -24 | 60.6 | -67.0 | H | Noise floor |
| 60.0 | 46.8 | 43.3 | 1.02 | 0 | -24 | 67.1 | -60.5 | H | Noise floor |
| | | | | | | | | | |
| 78.12 | 38.5 | 44.6 | 1.02 | 0 | -24 | 60.1 | -67.5 | V | Noise floor |
| 83.13 | 37.9 | 45.1 | 1.02 | 0 | -24 | 60 | -67.6 | V | Noise floor |
| 60.0 | 47 | 43.3 | 1.02 | 0 | -24 | 67.3 | -60.3 | V | Noise floor |
| | | | | | | | | | |
| 60.0 | 38 | 43.3 | 1.02 | 0 | -18.8 | 63.5 | -64.1 | H | 300 kHz RBW |
| 60.0 | 38 | 43.3 | 1.02 | 0 | -18.8 | 63.5 | -64.1 | V | 300 kHz RBW |
| | | | | | | | | | **Scanned** |
| | | | | | | | | | **40-100 GHz** |

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## Microwave Radiated Emissions Data

Complete X Preliminary ___ Page 1 of 1

Client: Bosch Telecom Test #: REMW04 W.O.#: 180218

EUT: Node Transmitter S/N: Unit #5 Photo ID: 180218

Technician: D. Light Specification: 2.993 Lab: BOATS Date: 6/22/98

Equipment Used: EM2200,180,CF00,CF06,697,494

Configuration: TX 30.0 dBm QPSK/40 MHz BW
30.0dBm at 3m = 127.6dBuV/m

Bandwidth: 1 MHz Video Bandwidth: 100 kHz Antenna Distance 3 m Detector:

Climatic Conditions: EUT Power: ___ 115 V.A.C. ___ 60 Hz X Peak
Temperature: 35 C ___ 208 V.A.C. ___ 50 Hz ___ Average
Relative Humidity: 45 % ___ 230 V.A.C.
Atmospheric Pressure: 1000 mbar X Other -48 VDC ___ 1 Phase ___ 3 Phase
Conversion: ___ dBpW= ___ dBuV/m @ ___ m dBc limit = -43dB

| Freq. (GHz) | Meter Reading (dBuV) | Antenna Factor (dB) | Cable Loss (dB) | RF Gain (dB) | 4kHz RBW Correction Factor (dB) | Corrected Reading (dBuV/m) | dBc | Pol. | Comments: |
|---|---|---|---|---|---|---|---|---|---|
| 1.51 | 37 | 25.1 | 2.88 | 31 | -24 | 9.98 | -117.6 | V | NOISE FLOOR |
| 9.06 | 34 | 37.7 | 8.68 | 33 | -24 | 23.4 | -104.2 | V | NOISE FLOOR |
| 16.61 | 34 | 42.1 | 13.67 | 32.7 | -24 | 33.1 | -94.5 | V | NOISE FLOOR |
| | | | | | | | | | |
| 1.51 | 37 | 25.1 | 2.88 | 31 | -24 | 9.98 | -117.6 | H | NOISE FLOOR |
| 9.06 | 34 | 37.7 | 8.68 | 33 | -24 | 23.4 | -104.2 | H | NOISE FLOOR |
| 16.61 | 34 | 42.1 | 13.67 | 32.7 | -24 | 33.1 | -94.5 | H | NOISE FLOOR |
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| | | | | | | | | | Scanned |
| | | | | | | | | | 1-18 GHZ |
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DATACOMMON\FORMS\TESTDATASHEETS\MICRORE REV 030597

**Dallas Headquarters:**
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***KTL Dallas, Inc.***

## Microwave Radiated Emissions Data

Complete X Preliminary ___ Page 1 of 1

Client: Bosch Telecom Test #: REMW10 W.O.#: 180218

EUT: Node Transmitter S/N: Unit #5 Photo ID: 180218

Technician: D. Light Specification: 2.993 Lab: BOATS Date: 6/23/98

Equipment Used: EM2200,180,CF00,CF06,697,494

Configuration: TX 30.0 dBm QPSK/40 MHz BW
30.0dBm at 3m = 127.6dBuV/m

Bandwidth: 1 MHz Video Bandwidth: 100 kHz Antenna Distance 3 m Detector:

Climatic Conditions: EUT Power: ___ 115 V.A.C. ___ 60 Hz X Peak
Temperature: 35 C ___ 208 V.A.C. ___ 50 Hz ___ Average
Relative Humidity: 45 % ___ 230 V.A.C.
Atmospheric Pressure: 1000 mbar X Other -48 VDC _____ 1 Phase ___ 3 Phase
Conversion: _____ dBpW= _____ dBuV/m @ _____ m dBc Limit = -43 dB

| Freq. (GHz) | Meter Reading (dBuV) | Antenna Factor (dB) | Cable Loss (dB) | RF Gain (dB) | 4kHz RBW Correction Factor (dB) | Corrected Reading (dBuV/m) | dBc | Pol. | Comments: |
|---|---|---|---|---|---|---|---|---|---|
| 18 | 41 | 40.2 | 19.9 | 40 | -24 | 37.1 | -90.5 | V | NOISE FLOOR |
| 22 | 45 | 40.3 | 22.1 | 40 | -24 | 43.4 | -84.2 | V | NOISE FLOOR |
| 26.04 | 43 | 40.5 | 24.3 | 40 | 0 | 67.8 | -59.8 | V | *NOISE FLOOR |
| | | | | | | | | | |
| 18 | 41 | 40.2 | 19.9 | 40 | -24 | 37.1 | -90.5 | H | NOISE FLOOR |
| 22 | 45 | 40.3 | 22.1 | 40 | -24 | 43.4 | -84.2 | H | NOISE FLOOR |
| 26.04 | 43 | 40.5 | 24.3 | 40 | 0 | 67.8 | -59.8 | H | *NOISE FLOOR |
| | | | | | | | | | |
| | | | | | | | | | Scanned |
| | | | | | | | | | 18-26.5 GHz |
| | | | | | | | | | |
| | | | | | | | | | Note: 26.04GHz |
| | | | | | | | | | dBc Limit =-56dB |
| | | | | | | | | | |
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## Microwave Radiated Emissions Data

Complete X Preliminary ___ Page 1 of 1

Client: BOSCH TELECOM Test #: 218U05 W.O.#: 180218

EUT: NODE TRANSMITTER S/N: UNIT #5 Photo ID: 180218 U05

Technician: M SEVERSON&$ D LIGHT Specification: CFR 47 P 2.993 Lab: BOATS Date: 6/18/98

Equipment Used: 897,935

Configuration: TX 30.0dBm 27.550 GHz QPSK/40MHz BW
30.0dBm at 3m = 127.6dBuV/m

Bandwidth: 1MHZ Video Bandwidth: 100KHZ Antenna Distance 3 m Detector:

Climatic Conditions:
Temperature: 32 C
Relative Humidity: 45 %
Atmospheric Pressure: 997 mbar

EUT Power: ___ 115 V.A.C. n.a 60 Hz X Peak
___ 208 V.A.C. n.a 50 Hz ___ Average
___ 230 V.A.C.
X Other -48VDC n/a 1 Phase n/a 3 Phase
dBc limit = -43dB

| Freq. (GHz) | Meter Reading (dBuV) | Antenna Factor (dB) | Cable Loss (dB) | RF Gain (dB) | 4kHz RBW Correction Factor (dB) | Corrected Reading (dBuV/m) | dBc | Pol. | Comments: |
|---|---|---|---|---|---|---|---|---|---|
| 26.040 | 35 | 43.4 | 1.02 | 0 | 0 | 79.4 | -48.2 | H | *Noise floor |
| 27.550 | 34 | 43.4 | 1.02 | 0 | -24 | 54.4 | N/A | H | Noise floor |
| 32.0 | 34 | 43.52 | 1.02 | 0 | -24 | 54.5 | -73.1 | H | Noise floor |
| | | | | | | | | | |
| 26.040 | 35 | 43.4 | 1.02 | 0 | 0 | 79.4 | -48.2 | V | *Noise floor |
| 27.550 | 34 | 43.4 | 1.02 | 0 | -24 | 54.4 | N/A | V | Noise floor |
| 32.0 | 34.5 | 43.52 | 1.02 | 0 | -24 | 55 | -72.6 | V | Noise floor |
| | | | | | | | | | Scanned |
| | | | | | | | | | 26.5-40Ghz |
| | | | | | | | | | |
| | | | | | | | | | Note: 26.04GHz |
| | | | | | | | | | dBc Limit =-56dB |
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## Microwave Radiated Emissions Data

Complete X Preliminary ___ Page 1 of 1

Client: BOSCH TELECOM Test #: 218U08 W.O.#: 180218

EUT: NODE TRANSMITTER S/N: UNIT #5 Photo ID: 180218 U08

Technician: M SEVERSON & D LIGHT Specification: CFR 47 P 2.993 Lab: BOATS Date: 6/19/98

Equipment Used: 897,935

Configuration: TX 30.0dBm 27.550 GHz QPSK/40MHz BW
30.0dBm at 3m = 127.6dBuV/m

Bandwidth: 1MHZ Video Bandwidth: 100KHZ Antenna Distance 3 m Detector:

Climatic Conditions:
Temperature: 32 C
Relative Humidity: 45 %
Atmospheric Pressure: 997 mbar

EUT Power: ___ 115 V.A.C. n/a 60 Hz
___ 208 V.A.C. n/a 50 Hz
___ 230 V.A.C.
X Other -48VDC n/a 1 Phase n/a 3 Phase

X Peak
___ Average

dBc limit = -43dB

| Freq. (GHz) | Meter Reading (dBuV) | Antenna Factor (dB) | Cable Loss (dB) | RF Gain (dB) | 4kHz RBW Correction Factor (dB) | Corrected Reading (dBuV/m) | dBc | Pol. | Comments: |
|---|---|---|---|---|---|---|---|---|---|
| 52.08 | 34 | 41.17 | 1.02 | 0 | -24 | 52.2 | -75.4 | H | Noise floor |
| 55.1 | 34 | 41.46 | 1.02 | 0 | -24 | 52.5 | -75.1 | H | Noise floor |
| 40.0 | 35.5 | 38.7 | 1.02 | 0 | -24 | 51.2 | -76.4 | H | Noise floor |
| | | | | | | | | | |
| 52.08 | 34 | 41.17 | 1.02 | 0 | -24 | 52.2 | -75.4 | V | Noise floor |
| 55.1 | 33.5 | 41.46 | 1.02 | 0 | -24 | 52 | -75.6 | V | Noise floor |
| 40.0 | 36 | 38.7 | 1.02 | 0 | -24 | 51.7 | -75.9 | V | Noise floor |
| | | | | | | | | | |
| 78.12 | 37.5 | 44.6 | 1.02 | 0 | -24 | 59.1 | -68.5 | H | Noise floor |
| 82.65 | 38.2 | 45.1 | 1.02 | 0 | -24 | 60.3 | -67.3 | H | Noise floor |
| 60 | 46 | 43.3 | 1.02 | 0 | -24 | 66.3 | -61.3 | H | Noise floor |
| | | | | | | | | | |
| 78.12 | 38.7 | 44.6 | 1.02 | 0 | -24 | 60.3 | -67.3 | V | Noise floor |
| 82.65 | 38.2 | 45.1 | 1.02 | 0 | -24 | 60.3 | -67.3 | V | Noise floor |
| 60 | 46.3 | 43.3 | 1.02 | 0 | -24 | 66.6 | -61.0 | V | Noise floor |
| | | | | | | | | | |
| 60 | 38 | 43.3 | 1.02 | 0 | -18.8 | 63.5 | -64.1 | H | 300 kHz RBW |
| 60 | 38 | 43.3 | 1.02 | 0 | -18.8 | 63.5 | -64.1 | V | 300 kHz RBW |
| | | | | | | | | | **Scanned** |
| | | | | | | | | | **40-100 GHz** |

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# Microwave Radiated Emissions Data

Complete X Preliminary ___ Page 1 of 1

Client: Bosch Telecom Test #: REMW05 W.O.#: 180218

EUT: Node Transmitter S/N: Unit #5 Photo ID: 180218

Technician: D. Light Specification: 2.993 Lab: BOATS Date: 6/22/98

Equipment Used: EM2200,180,CF00,CF06,697,494

Configuration: TX 30.0 dBm QPSK/50 MHz BW
30.0dBm at 3m = 127.6dBuV/m

Bandwidth: 1 MHz Video Bandwidth: 100 kHz Antenna Distance 3 m Detector:

Climatic Conditions: EUT Power: ___ 115 V.A.C. ___ 60 Hz X Peak
Temperature: 35 C ___ 208 V.A.C. ___ 50 Hz ___ Average
Relative Humidity: 45 % ___ 230 V.A.C.
Atmospheric Pressure: 1000 mbar X Other -48 VDC _____ 1 Phase ___ 3 Phase
Conversion: _____ dBpW= _____ dBuV/m @ _____ m dBc limit = -43dB

| Freq. (GHz) | Meter Reading (dBuV) | Antenna Factor (dB) | Cable Loss (dB) | RF Gain (dB) | 4kHz RBW Correction Factor (dB) | Corrected Reading (dBuV/m) | dBc | Pol. | Comments: |
|---|---|---|---|---|---|---|---|---|---|
| 1.19 | 35 | 23.1 | 2.32 | 28.2 | -24 | 8.22 | -119.4 | V | Noise floor |
| 9.52 | 34 | 37.9 | 9.93 | 33.1 | -24 | 24.7 | -102.9 | V | Noise floor |
| 17.85 | 33 | 44.4 | 14.46 | 32.5 | -24 | 35.4 | -92.24 | V | Noise floor |
| | | | | | | | | | |
| 1.19 | 35 | 23.1 | 2.32 | 28.2 | -24 | 8.22 | -119.4 | H | Noise floor |
| 9.52 | 34 | 37.9 | 9.93 | 33.1 | -24 | 24.7 | -102.9 | H | Noise floor |
| 17.85 | 33 | 44.4 | 14.46 | 32.5 | -24 | 35.4 | -92.24 | H | Noise floor |
| | | | | | | | | | |
| | | | | | | | | | Scanned |
| | | | | | | | | | 1-18 GHz |
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## Microwave Radiated Emissions Data

Complete X Preliminary ___ Page 1 of 1

Client: Bosch Telecom Test #: REMW11 W.O.#: 180218

EUT: Node Transmitter S/N: Unit #5 Photo ID: 180218

Technician: D. Light Specification: 2.993 Lab: BOATS Date: 6/23/98

Equipment Used: EM2200,180,CF00,CF06,697,494

Configuration: TX 30.0 dBm QPSK/50 MHz BW
30.0dBm at 3m = 127.6dBuV/m

Bandwidth: 1 MHz Video Bandwidth: 100 kHz Antenna Distance 3 m Detector:

Climatic Conditions: EUT Power: ___ 115 V.A.C. ___ 60 Hz X Peak
Temperature: 35 C ___ 208 V.A.C. ___ 50 Hz ___ Average
Relative Humidity: 45 % ___ 230 V.A.C.
Atmospheric Pressure: 1000 mbar X Other -48 VDC ___ 1 Phase ___ 3 Phase
Conversion: ___ dBpW= ___ dBuV/m @ ___ m dBc Limit = -43 dB

| Freq. (GHz) | Meter Reading (dBuV) | Antenna Factor (dB) | Cable Loss (dB) | RF Gain (dB) | 4 kHz RBW Correction Factor (dB) | Corrected Reading (dBuV/m) | dBc | Pol. | Comments: |
|---|---|---|---|---|---|---|---|---|---|
| 18 | 41 | 40.2 | 19.9 | 40 | -24 | 37.1 | -90.5 | V | NOISE FLOOR |
| 22 | 45 | 40.3 | 22.1 | 40 | -24 | 43.4 | -84.2 | V | NOISE FLOOR |
| 26.4 | 42 | 40.5 | 24.3 | 40 | 0 | 66.8 | -60.8 | V | *NOISE FLOOR |
| | | | | | | | | | |
| 18 | 41 | 40.2 | 19.9 | 40 | -24 | 37.1 | -90.5 | H | NOISE FLOOR |
| 22 | 45 | 40.3 | 22.1 | 40 | -24 | 43.4 | -84.2 | H | NOISE FLOOR |
| 26.4 | 42 | 40.5 | 24.3 | 40 | 0 | 66.8 | -60.8 | H | *NOISE FLOOR |
| | | | | | | | | | |
| | | | | | | | | | Note: 26.04GHz |
| | | | | | | | | | dBc Limit =-56dB |
| | | | | | | | | | |
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| | | | | | | | | | Scanned |
| | | | | | | | | | 18-26.5 GHz |
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## Microwave Radiated Emissions Data

Complete X Preliminary ___ Page 1 of 1

Client: BOSCH TELECOM Test #: 218U07 W.O.#: 180218

EUT: NODE TRANSMITTER S/N: UNIT #5 Photo ID: 180218 U07

Technician: M SEVERSON&$ D LIGHT Specification: CFR 47 P 2.993 Lab: BOATS Date: 6/19/98

Equipment Used: 897,935

Configuration: TX 30.0dBm 27.590 GHz QPSK/50MHz BW
30.0dBm at 3m = 127.6dBuV/m

Bandwidth: 1MHZ Video Bandwidth: 100KHZ Antenna Distance 3 m Detector:

Climatic Conditions:
Temperature: 32 C
Relative Humidity: 45 %
Atmospheric Pressure: 997 mbar

EUT Power: ___ 115 V.A.C. n.a 60 Hz
___ 208 V.A.C. n.a 50 Hz
___ 230 V.A.C.
X Other -48VDC

X Peak
___ Average

n/a 1 Phase n/a 3 Phase

dBc limit = -43dB

| Freq. (GHz) | Meter Reading (dBuV) | Antenna Factor (dB) | Cable Loss (dB) | RF Gain (dB) | 4kHz RBW Correction Factor (dB) | Corrected Reading (dBuV/m) | dBc | Pol. | Comments: |
|---|---|---|---|---|---|---|---|---|---|
| 52.8 | 33.5 | 41.17 | 1.02 | 0 | -24 | 51.7 | -75.9 | H | Noise floor |
| 55.18 | 34 | 41.46 | 1.02 | 0 | -24 | 52.5 | -75.1 | H | Noise floor |
| 40.0 | 36 | 38.7 | 1.02 | 0 | -24 | 51.7 | -75.9 | H | Noise floor |
| | | | | | | | | | |
| 52.8 | 34 | 41.17 | 1.02 | 0 | -24 | 52.2 | -75.4 | V | Noise floor |
| 55.18 | 33.5 | 41.46 | 1.02 | 0 | -24 | 52 | -75.6 | V | Noise floor |
| 40.0 | 35.7 | 38.7 | 1.02 | 0 | -24 | 51.4 | -76.2 | V | Noise floor |
| | | | | | | | | | |
| 79.2 | 38.5 | 44.7 | 1.02 | 0 | -24 | 60.2 | -67.4 | H | Noise floor |
| 82.77 | 38.5 | 45.1 | 1.02 | 0 | -24 | 60.6 | -67.0 | H | Noise floor |
| 60.0 | 47 | 43.3 | 1.02 | 0 | -24 | 67.3 | -60.3 | H | Noise floor |
| | | | | | | | | | |
| 79.2 | 38.2 | 44.7 | 1.02 | 0 | -24 | 59.9 | -67.7 | V | Noise floor |
| 82.77 | 38.4 | 45.1 | 1.02 | 0 | -24 | 60.5 | -67.1 | V | Noise floor |
| 60.0 | 47 | 43.3 | 1.02 | 0 | -24 | 67.3 | -60.3 | V | Noise floor |
| | | | | | | | | | |
| 60.0 | 38 | 43.3 | 1.02 | 0 | -18.8 | 63.5 | -64.1 | H | 300 kHz RBW |
| 60.0 | 38 | 43.3 | 1.02 | 0 | -18.8 | 63.5 | -64.1 | V | 300 kHz RBW |
| | | | | | | | | | **Scanned** |
| | | | | | | | | | **40-100 GHz** |

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## Microwave Radiated Emissions Data

Complete X Preliminary ___ Page 1 of 1

Client: Bosch Telecom Test #: REMW06 W.O.#: 180218

EUT: Node Transmitter S/N: Unit #5 Photo ID: 180218

Technician: D. Light Specification: 2.993 Lab: BOATS Date: 6/22/98

Equipment Used: EM2200,180,CF00,CF06,697,494

Configuration: Tx 30.0 dBm BOSCH MODEM TEST SET
30.0dBm at 3m = 127.6dBuV/m

Bandwidth: 1 MHz Video Bandwidth: 100 kHz Antenna Distance 3 m Detector:

Climatic Conditions:
Temperature: 35 C
Relative Humidity: 45 %
Atmospheric Pressure: 1000 mbar

EUT Power: ___ 115 V.A.C. ___ 60 Hz
___ 208 V.A.C. ___ 50 Hz
___ 230 V.A.C.
X Other -48 VDC ___ 1 Phase ___ 3 Phase

X Peak
___ Average

Conversion: ___ dBpW= ___ dBuV/m @ ___ m dBc Limit = -43 dB

| Freq. (GHz) | Meter Reading (dBuV) | Antenna Factor (dB) | Cable Loss (dB) | RF Gain (dB) | 4 kHz RBW Correction Factor (dB) | Corrected Reading (dBuV/m) | dBc | Pol. | Comments: |
|---|---|---|---|---|---|---|---|---|---|
| 1.670926 | 37 | 25.1 | 2.88 | 31 | -24 | 9.98 | -117.6 | V | Noise floor |
| 8.35463 | 32 | 37.7 | 8.23 | 31.6 | -24 | 22.3 | -105.3 | V | Noise floor |
| 16.70926 | 32 | 42.1 | 13.67 | 32.7 | -24 | 31.1 | -96.53 | V | Noise floor |
| | | | | | | | | | |
| 1.670926 | 37 | 25.1 | 2.88 | 31 | -24 | 9.98 | -117.6 | H | Noise floor |
| 8.35463 | 34 | 37.7 | 8.23 | 31.6 | -24 | 24.3 | -103.3 | H | Noise floor |
| 16.70926 | 33 | 42.1 | 13.67 | 32.7 | -24 | 32.1 | -95.53 | H | Noise floor |
| | | | | | | | | | |
| | | | | | | | | | Scanned |
| | | | | | | | | | 1-18 GHz |
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## Microwave Radiated Emissions Data

Complete X Preliminary ___ Page 1 of 1

Client: Bosch Telecom Test #: REMW12 W.O.#: 180218

EUT: Node Transmitter S/N: Unit #5 Photo ID: 180218

Technician: D. Light Specification: 2.993 Lab: BOATS Date: 6/23/98

Equipment Used: EM2200,180,CF00,CF06,697,494

Configuration: Tx 30.0 dBm BOSCH MODEM TEST SET
30.0dBm at 3m = 127.6dBuV/m

Bandwidth: 1 MHz Video Bandwidth: 100 kHz Antenna Distance 3 m Detector:

Climatic Conditions: EUT Power: ___ 115 V.A.C. ___ 60 Hz X Peak
Temperature: 35 C ___ 208 V.A.C. ___ 50 Hz ___ Average
Relative Humidity: 45 % ___ 230 V.A.C.
Atmospheric Pressure: 1000 mbar X Other -48 VDC 1 Phase ___ 3 Phase
Conversion: _____ dBpW= _____ dBuV/m @ _____ m dBc Limit = -43 dB

| Freq. (GHz) | Meter Reading (dBuV) | Antenna Factor (dB) | Cable Loss (dB) | RF Gain (dB) | 4kHz RBW Correction Factor (dB) | Corrected Reading (dBuV/m) | dBc | Pol. | Comments: |
|---|---|---|---|---|---|---|---|---|---|
| 18 | 41 | 40.2 | 19.9 | 40 | -24 | 37.1 | -90.5 | V | NOISE FLOOR |
| 22 | 45 | 40.3 | 22.1 | 40 | -24 | 43.4 | -84.2 | V | NOISE FLOOR |
| 26.4 | 42 | 40.5 | 24.3 | 40 | 0 | 66.8 | -60.8 | V | *NOISE FLOOR |
| | | | | | | | | | |
| 18 | 41 | 40.2 | 19.9 | 40 | -24 | 37.1 | -90.5 | H | NOISE FLOOR |
| 22 | 45 | 40.3 | 22.1 | 40 | -24 | 43.4 | -84.2 | H | NOISE FLOOR |
| 26.4 | 42 | 40.5 | 24.3 | 40 | 0 | 66.8 | -60.8 | H | *NOISE FLOOR |
| | | | | | | | | | |
| | | | | | | | | | Note: 26.04GHz |
| | | | | | | | | | dBc Limit =-56dB |
| | | | | | | | | | |
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| | | | | | | | | | Scanned |
| | | | | | | | | | 18-26.5 GHz |
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## Microwave Radiated Emissions Data

Complete X Preliminary ___ Page 1 of 1

Client: BOSCH TELECOM Test #: 218U01 W.O.#: 180218

EUT: NODE TRANSMITTER S/N: UNIT #5 Photo ID: 180218 U01

Technician: M SEVERSON&$ D LIGHT Specification: CFR 47 P 2.993 Lab: BOATS Date: 6/18/98

Equipment Used: 897,935

Configuration: TX 30.0dBm 27.710926GHZ QPSK/30MHz BW BOSCH MODEM TEST SET
30.0dBm at 3m = 127.6dBuV/m

Bandwidth: 1MHZ Video Bandwidth: 100KHZ Antenna Distance 3 m Detector:

Climatic Conditions:
Temperature: 32 C
Relative Humidity: 45 %
Atmospheric Pressure: 997 mbar

EUT Power: ___ 115 V.A.C. n/a 60 Hz X Peak
___ 208 V.A.C. n/a 50 Hz ___ Average
___ 230 V.A.C.
X Other -48VDC n/a 1 Phase n/a 3 Phase

dBc limit = -43dB

| Freq. (GHz) | Meter Reading (dBuV) | Antenna Factor (dB) | Cable Loss (dB) | RF Gain (dB) | 4kHz RBW Correction Factor (dB) | Corrected Reading (dBuV/m) | dBc | Pol. | Comments: |
|---|---|---|---|---|---|---|---|---|---|
| 26.04 | 32 | 43.4 | 1.02 | 0 | 0 | 76.42 | -51.2 | H | *Noise floor |
| 27.710 | 32 | 43.4 | 1.02 | 0 | 0 | 76.42 | N/A | H | Noise floor |
| 32.0 | 32 | 43.52 | 1.02 | 0 | -24 | 52.54 | -75.1 | H | Noise floor |
| | | | | | | | | | |
| 26.04 | 32 | 43.4 | 1.02 | 0 | 0 | 76.42 | -51.2 | V | *Noise Floor |
| 27.710 | 32 | 43.4 | 1.02 | 0 | 0 | 76.42 | N/A | V | Noise floor |
| 32.0 | 32 | 43.52 | 1.02 | 0 | -24 | 52.54 | -75.1 | V | Noise floor |
| | | | | | | | | | Scanned |
| | | | | | | | | | 26.5-40Ghz |
| | | | | | | | | | |
| | | | | | | | | | Note: 26.04GHz |
| | | | | | | | | | dBc Limit =-56dB |
| | | | | | | | | | |
| | | | | | | | | | |
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DATACOMMON\FORMS\TESTDATASHEETS\MICRORE REV 030597

**Dallas Headquarters:**
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***KTL Dallas, Inc.***

## Microwave Radiated Emissions Data

Complete X Preliminary ___ Page 1 of 1

Client: BOSCH TELECOM Test #: 218U10 W.O.#: 180218

EUT: NODE TRANSMITTER S/N: UNIT #5 Photo ID: 180218 U10

Technician: M SEVERSON & D LIGHT Specification: CFR 47 P 2.993 Lab: BOATS Date: 6/19/98

Equipment Used: 897,935

Configuration: TX 30.0dBm 27.710926 GHz QPSK/30MHz BW Bosch Modem Test Set
30.0dBm at 3m = 127.6dBuV/m

Bandwidth: 1MHZ Video Bandwidth: 100KHZ Antenna Distance 3 m Detector:

Climatic Conditions:
Temperature: 32 C
Relative Humidity: 45 %
Atmospheric Pressure: 997 mbar

EUT Power: ___ 115 V.A.C. n.a 60 Hz X Peak
___ 208 V.A.C. n.a 50 Hz ___ Average
___ 230 V.A.C.
X Other -48VDC n/a 1 Phase n/a 3 Phase

dBc limit = -43dB

| Freq. (GHz) | Meter Reading (dBuV) | Antenna Factor (dB) | Cable Loss (dB) | RF Gain (dB) | 4kHz RBW Correction Factor (dB) | Corrected Reading (dBuV/m) | dBc | Pol. | Comments: |
|---|---|---|---|---|---|---|---|---|---|
| 52.08 | 33.9 | 41.17 | 1.02 | 0 | -24 | 52.1 | -75.5 | H | Noise floor |
| 55.4218 | 33.4 | 41.46 | 1.02 | 0 | -24 | 51.9 | -75.7 | H | Noise floor |
| 40.0 | 35.7 | 38.7 | 1.02 | 0 | -24 | 51.4 | -76.2 | H | Noise floor |
| | | | | | | | | | |
| 52.08 | 33 | 41.17 | 1.02 | 0 | -24 | 51.2 | -76.4 | V | Noise floor |
| 55.4218 | 33 | 41.46 | 1.02 | 0 | -24 | 51.5 | -76.1 | V | Noise floor |
| 40.0 | 36 | 38.7 | 1.02 | 0 | -24 | 51.7 | -75.9 | V | Noise floor |
| | | | | | | | | | |
| 78.12 | 39.7 | 44.6 | 1.02 | 0 | -24 | 61.3 | -66.3 | H | Noise floor |
| 83.13278 | 38 | 45.1 | 1.02 | 0 | -24 | 60.1 | -67.5 | H | Noise floor |
| 60.0 | 44 | 43.3 | 1.02 | 0 | -24 | 64.3 | -63.3 | H | Noise floor |
| | | | | | | | | | |
| 78.12 | 38.7 | 44.6 | 1.02 | 0 | -24 | 60.3 | -67.3 | V | Noise floor |
| 83.13278 | 38 | 45.1 | 1.02 | 0 | -24 | 60.1 | -67.5 | V | Noise floor |
| 60.0 | 44 | 43.3 | 1.02 | 0 | -24 | 64.3 | -63.3 | V | Noise floor |
| | | | | | | | | | |
| 60.0 | 38 | 43.3 | 1.02 | 0 | -18.8 | 63.5 | -64.1 | H | 300 kHz RBW |
| 60.0 | 38 | 43.3 | 1.02 | 0 | -18.8 | 63.5 | -64.1 | V | 300 kHz RBW |
| | | | | | | | | | **Scanned** |
| | | | | | | | | | **40-100 GHz** |

DATACOMMON\FORMS\TESTDATASHEETS\MICRORE REV 030597