

**Response to FCC Correspondence Reference Number 6848, 3/29/99
and to FCC Correspondence Reference Number 7111, 4/8/99**

**Bosch Telecom CPE Roof Unit Transceiver, FCC ID NNS3214864,
FCC Form 731 Confirmation Number EA92818**

Background:

This document contains the responses to action items that relate to the Bosch CPE Roof Unit transceiver 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.

Two action items applicable to the CPE Roof Unit resulted from the 25 March telephone call and FCC Correspondence Reference Number 6848 requested information addressing these action items.

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. Nine action items resulted from the 31 March meeting for the CPE Roof Unit transceiver.

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 is 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 Dombrowski:

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 Dombrowski:

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 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, Bosch Telecom notified FCC by electronic response to FCC Correspondence Reference 6848 that confidentiality was not a requirement for Exhibits 2, 3, 6 and 7 of the CPE Roof Unit application for Certification.

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

Provide affirmative information concerning the high, low and center frequencies used for the CPE Roof Unit, the Node unit and the Pilot Tone (just the center frequency).

Response: The CPE Roof Unit Transceiver is intended to transmit a two-Megahertz wide QPSK-modulated signal in the authorized LMDS band (27.500 GHz to 28.350 GHz) at a maximum rated power level of 100 milliwatts and receive a two-Megahertz wide QPSK-modulated telephony signal and/or up to a forty-Megahertz wide QPSK-modulated data or digital video signal.

The Bosch bandplan proposes that the CPE Roof Unit transmit this two-Megahertz wide QPSK-modulated telephony signal in a 240 MHz band between 28.105926 GHz and 28.345926 GHz and receive in the 27.500 to 28.000 GHz region of the LMDS spectrum as shown in Figure 1 (next page).

Operational software controlling the modulation source determines the operational transmit and receive frequencies of the CPE Roof Unit to a granularity of 1 MHz.

The frequency stability of the CPE Roof Unit is controlled by a received pilot tone at 27.510 GHz generated in the Bosch SpectraPoint Base equipment and transmitted to the Roof Unit by the Bosch SpectraPoint Transmitter (FCC ID NNS3214823).

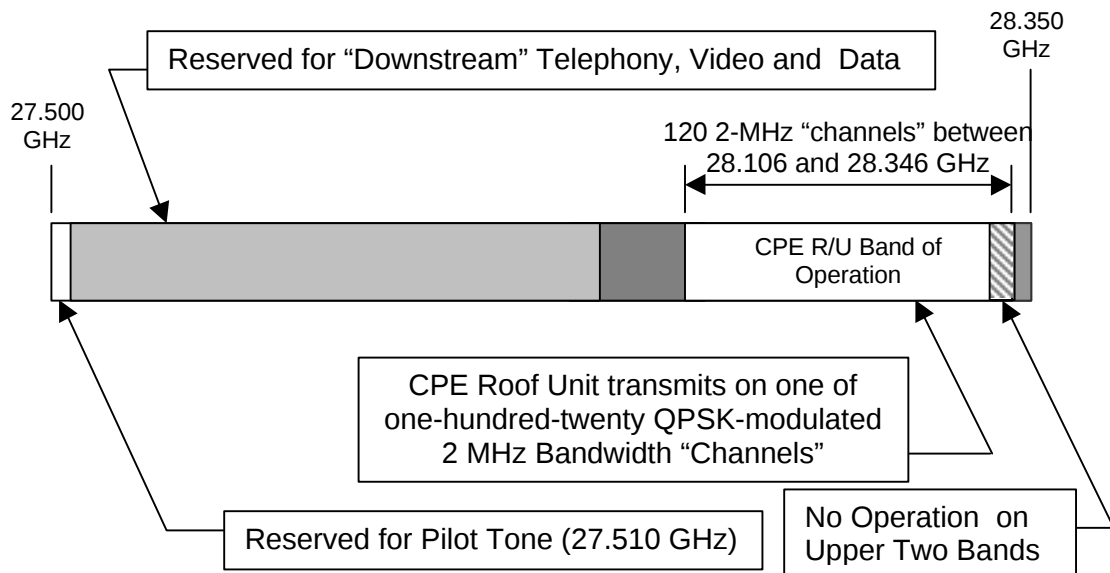


Figure 1 -- Planned Band of Operation for the Bosch Telecom CPE Roof Unit Transmitter

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

Bosch should provide additional data concerning the antenna being used and radiated emissions from the Roof Unit tested with it's integral antenna attached. FCC is to review policy and procedures for this test for LMDS.

Response: Two radiated tests were performed on the Bosch CPE Roof Unit transceiver to measure emissions from the unit with it's normal antenna and waveguide filter installed. The unit was operated at three test frequencies (28.107, 28.225 and 28.345 GHz) in the proposed band of operation identified in Action Item 2, above, at the maximum rated output power of 100 milliwatts.

Test 1 was performed with the test antenna positioned on the boresight of the CPE Roof Unit in the far field at a distance of 7.92 meters (26 feet).

Test 2 was performed with the test antenna positioned 3 meters from the CPE Roof Unit and the unit was rotated in azimuth to maximize emissions.

Figures 7c, 10b and 11a of Appendix B indicate that the CPE Roof Unit will not comply with the -56 dB requirement when tuned to the highest two "channels" (28.343 and 28.345 GHz).

Figure 11b does indicate compliance with the -56 dB requirement if the CPE Roof Unit is tuned to the third "channel" down (28.341 GHz) or lower.

To achieve compliance with Part 101 Emission Limitation requirements, Bosch will not operate on these upper two "channels", i.e., the highest 4 Mhz, of the intended bandplan.

The results of these radiated tests indicate that the unit, if tuned to any desired frequency between 28.105 and 28.342 GHz, complies with the emission limits of Part 101 paragraph 101.111 (a) (2) (ii), over the portion of the spectrum where the -56 dBc limit is imposed (i.e., bandcenter plus/minus 250% of authorized bandwidth, excluding the authorized band of operation). Test data is provided on pages 10 through 20 of Appendix B to this document and, because it relates to the current configuration of the unit, should supercede earlier data presented in the KTL test report.

Additionally, Antenna Terminal Conducted Emissions testing over the 25.8 to 30.05 GHz region was performed with the waveguide filter installed (the waveguide filter was not installed for earlier testing at KTL).

The results of these antenna terminal conducted tests also indicate that the unit, if restricted from operation in the highest two planned "channels, complies with the emission limits of Part 101 paragraph 101.111 (a) (2) (ii), over the portion of the spectrum where the -56 dBc limit is imposed (i.e., bandcenter plus/minus 250% of authorized bandwidth, excluding the authorized band of operation). Test data is provided on pages 2 through 4 of Appendix B to this document and, because it relates to the current configuration of the unit, should supercede earlier data presented in the KTL test report.

Note: Compliance with requirements of Part 101 paragraph 101.111 (a) (2) (iii), i.e., the regions below 25.8 GHz and above 30.05 GHz, has been demonstrated with the unit configured without the waveguide filter. The test results of the CPE Roof Unit without the waveguide filter are presented in the Antenna Terminal Conducted and Field Strength of Spurious Radiation portions of the original KTL test report. Amended pages of that test report per comments of the 31 March meeting are presented in Appendix C of this document.

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

Define factors in Field Strength calculation on page 20.

Response: The equation on page 20 of the CPE Roof Unit Test Report is derived from the KTL (formerly International Compliance Corporation) technical handbook, pages 4 (Test Data Format) and 5 (Appendix A):

Field Intensity (equivalent to 1 W into tuned dipole)

$$= 30 \text{ dB} - 28.87 + 116 + 10.5 = 127.63 \text{ dB above one microvolt/meter}$$

where:	30 dB =	$10 \text{ Log}_{10} (1 \text{ Watt}/1 \text{ milliwatt})$
	-28.87 [dBm/m ²] =	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 from a dipole antenna, $E = \text{SqRt}(49.2 \cdot P) / (\text{distance in meters})$, 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 20 of the test report has been revised to define these missing factors and is in the revised test report pages of Appendix C.

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

Clarify Occupied Bandwidth measurements shown on pages 145 and 146 of the test report and emission designator requirement (2 or 4 MHz).

Response: The CPE Roof Unit has an occupied bandwidth of approximately 2 MHz up to an output power of approximately +19 dBm. At the maximum rated power output of +20 dBm, the solid-state HPA (High Power Amplifier) is in compression and the 99% occupied bandwidth expands to approximately 4 MHz. Under worst-case operation of the Bosch SpectraPoint system, the Roof Unit could be driven to the maximum output.

The unit was tested at the maximum rated output of 100 milliwatts and is compliant with Part 101 requirements at that level.

Bosch is defining the emission designator for the Roof Unit as **4M00 G7W**.

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

Change the spec limit on pages 172, 175, 177, 182, 185 and 188 to –36 dBm from –13 dBm where applicable.

Response: The “Spec Limit” on pages 172, 175, 177, 182, 185 and 188 have been changed to –36 dBm from –13 dBm. These change pages are included in the corrected KTL report pages of Appendix C.

This data, however, represents an early version of the unit without the waveguide filter. The test data shown in Appendix B of this document supercedes these pages and should be used as representative of the emission characteristics of the unit.

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

Provide data to indicate that the spurious response at the 26.550 GHz local oscillator frequency is sufficiently reduced by the waveguide filter (refer to test report pages 235, 236, 243, 251, 252 and 253 of the test report).

Response: Data on these pages were from a previous version of the CPE Roof Unit that did not have integral waveguide filters in the antenna feedhorn assembly.

Bosch has installed waveguide bandpass filters in both the transmitter waveguide output and the receiver waveguide input of the CPE Roof Unit to insure reduction of out-of-band spurious signals and has retested the CPE Roof Unit to verify compliance with this requirement.

RF Radiated Emission measurements have been performed over the –56 dBc region (25.8 to 30.05 GHz). Test results which supercede the above test report pages are presented on pages 10 through 20 of Appendix B to this document.

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

Change the column heading on test report pages 247 and 256 to read "dBc" (from "Spec Limit").

Response: Column headings on pages 247 and 256 have been changed from "Spec Limit" to "dBc". These change pages are included in the corrected KTL report pages of Appendix C to this document.

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

Provide plots indicating compliance with the -56 dBc limit.

Response: Bosch has installed a waveguide bandpass filter in both the transmitter waveguide output and the receiver waveguide input of the CPE Roof Unit to insure reduction of out-of-band spurious signals and has retested the CPE Roof Unit to verify compliance with this requirement.

Antenna Terminal Conducted and RF Radiated Emissions measurements have been performed over the -56 dBc region (25.8 to 30.05 GHz) and test results which supercede the KTL test report pages are presented on pages 2 through 20 of Appendix B to this document.

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

A request was made for a more legible parts list for the CPE Roof Unit transceiver. The parts list was included in the original application as part of Exhibit 3 (Label Information) but was not specifically identified and was difficult to read on a computer terminal.

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

Conclusion:

Bosch Telecom concludes, based on the test data contained in the original KTL test report and as amended by the data contained in this response to Correspondence Reference Number 7111, that the Bosch CPE Roof Unit transceiver, FCC ID NNS3214864, Form 731 Confirmation Number EA92818, 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

Response to FCC Correspondence References Numbers 6848 and 7111