Spectral Mask and Field Trials of a COFDM Modem

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Purpose:

Provide information for comparison of the various PHYs.

Spectral Mask and Field Trials of a COFDM Modem

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Abstract

Goal of this presentation is to:

- demonstrate how well a COFDM signal meets the spectral mask requirements of the FCC regulation 47CFR21.908

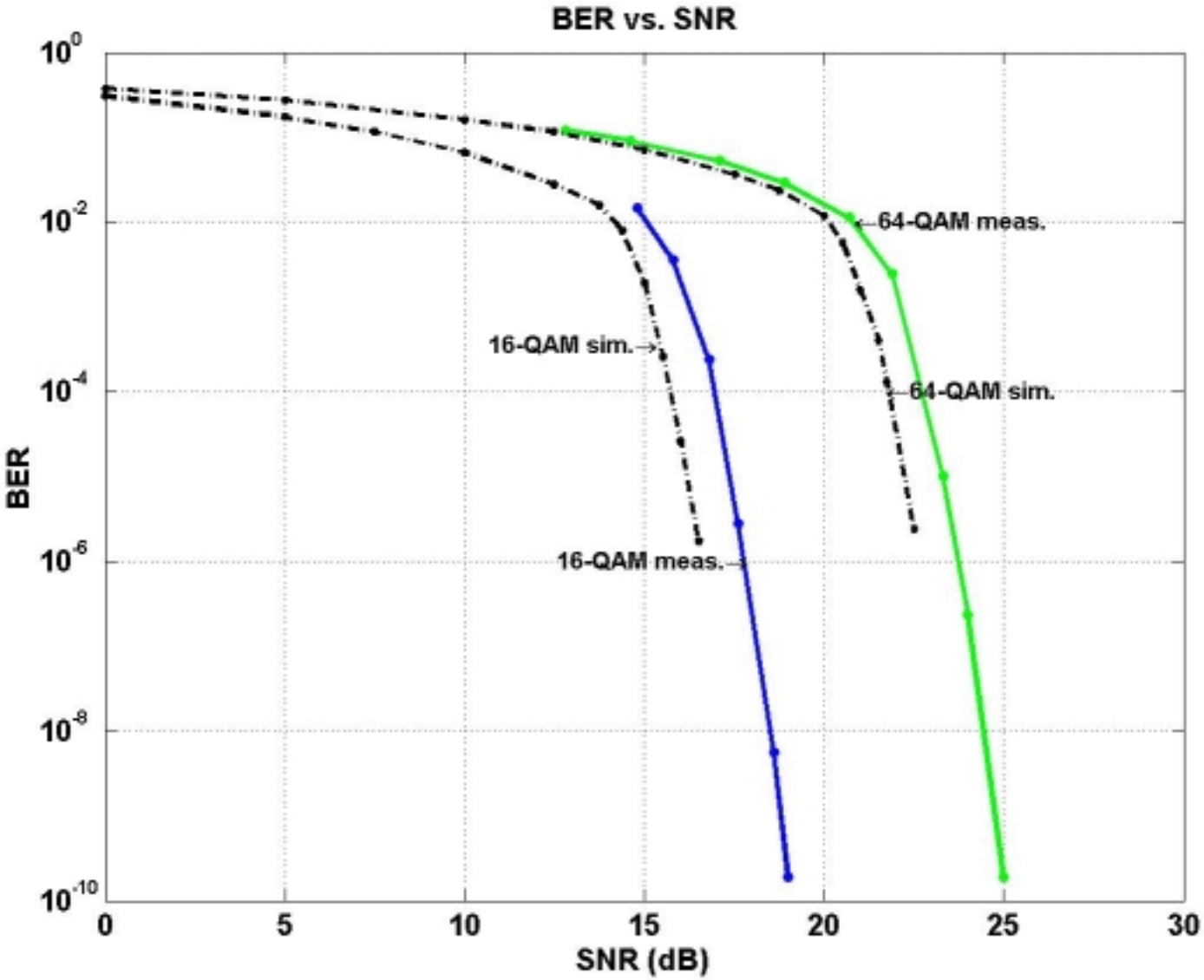
- illustrate the performance of a COFDM point-to-point connection under line-of-sight and near or non-line of sight conditions

All data here is real (and preliminary), taken either in the lab or in the field using the Wavesat Tiger Modem.

The OFDM Signal

PHY specification:

- Total bandwidth = 6 MHz
- 828 carriers / 1024 point FFT
- Carrier spacing = 6.5 kHz
- Cyclic prefix = 10 μs
- 64-QAM, 16-QAM and QPSK modulation modes
- RS error control coding (106, 122, 8)
- Three training symbols and a configuration symbol out of 115 symbols in a frame


BER vs. SNR
BER
SNR (dB)
64-QAM meas.
64-QAM sim.
16-QAM sim.
16-QAM meas.

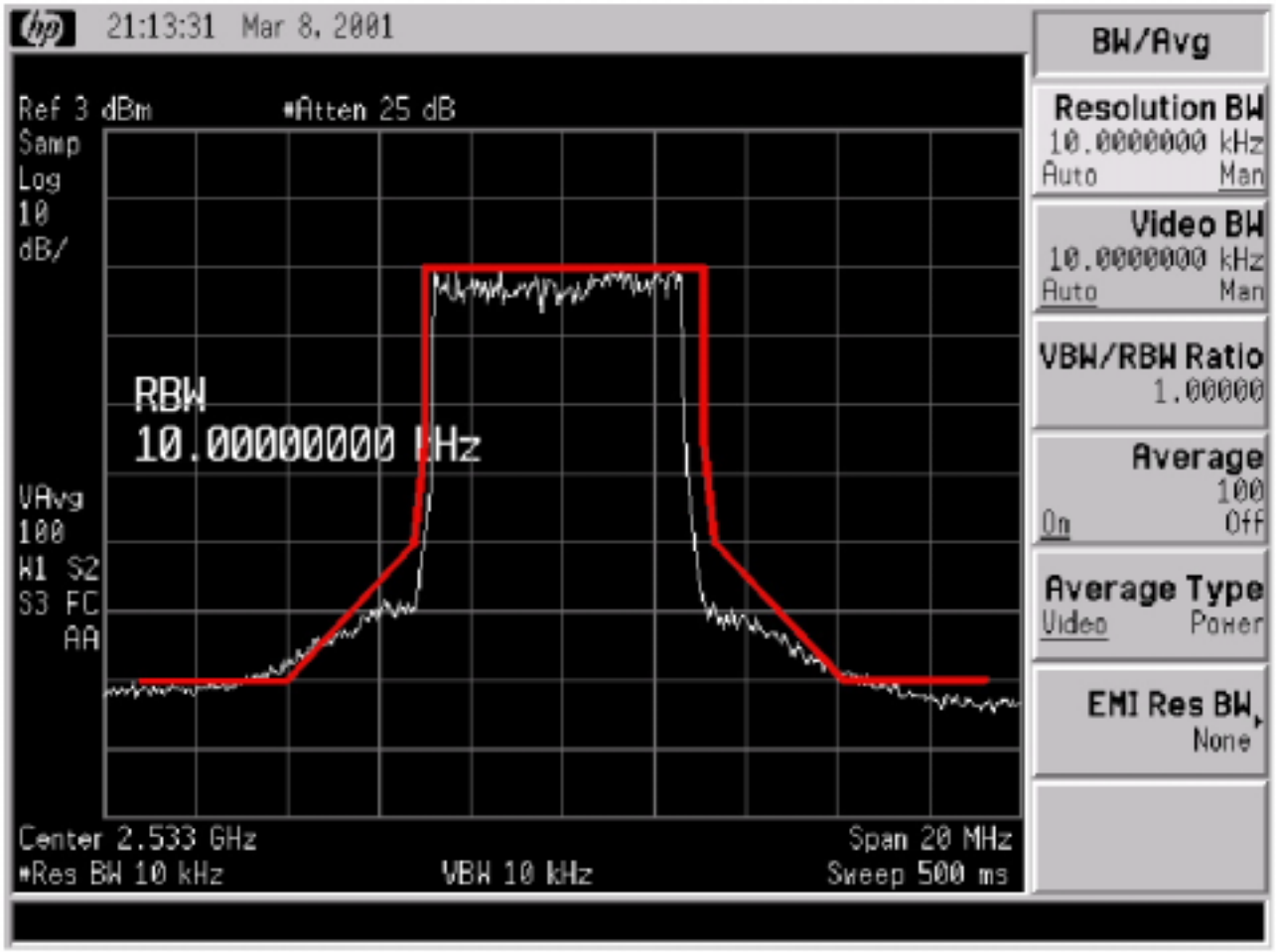
Spectral Mask

- Peak-to-average Power--10 dB (includes scrambling w/ PRBS).
- Clipping rate < 0.5 %
- (64-QAM on OFDM)

- Power Amplifier P1dB compression point is -9 dBm

Backing off by 6 dB...

6 dB back-off from PA P1dB



=> No significant problem meeting the FCC mask requirements, with the possible exception at the ± 6MHz points. This deviation will be fixed by appropriate filtering.

Field Trials

We wish to illustrate the type of frequency selective fades encountered in the MMDS frequencies and the qualitative performance of a COFDM modem under these conditions.

System configuration:

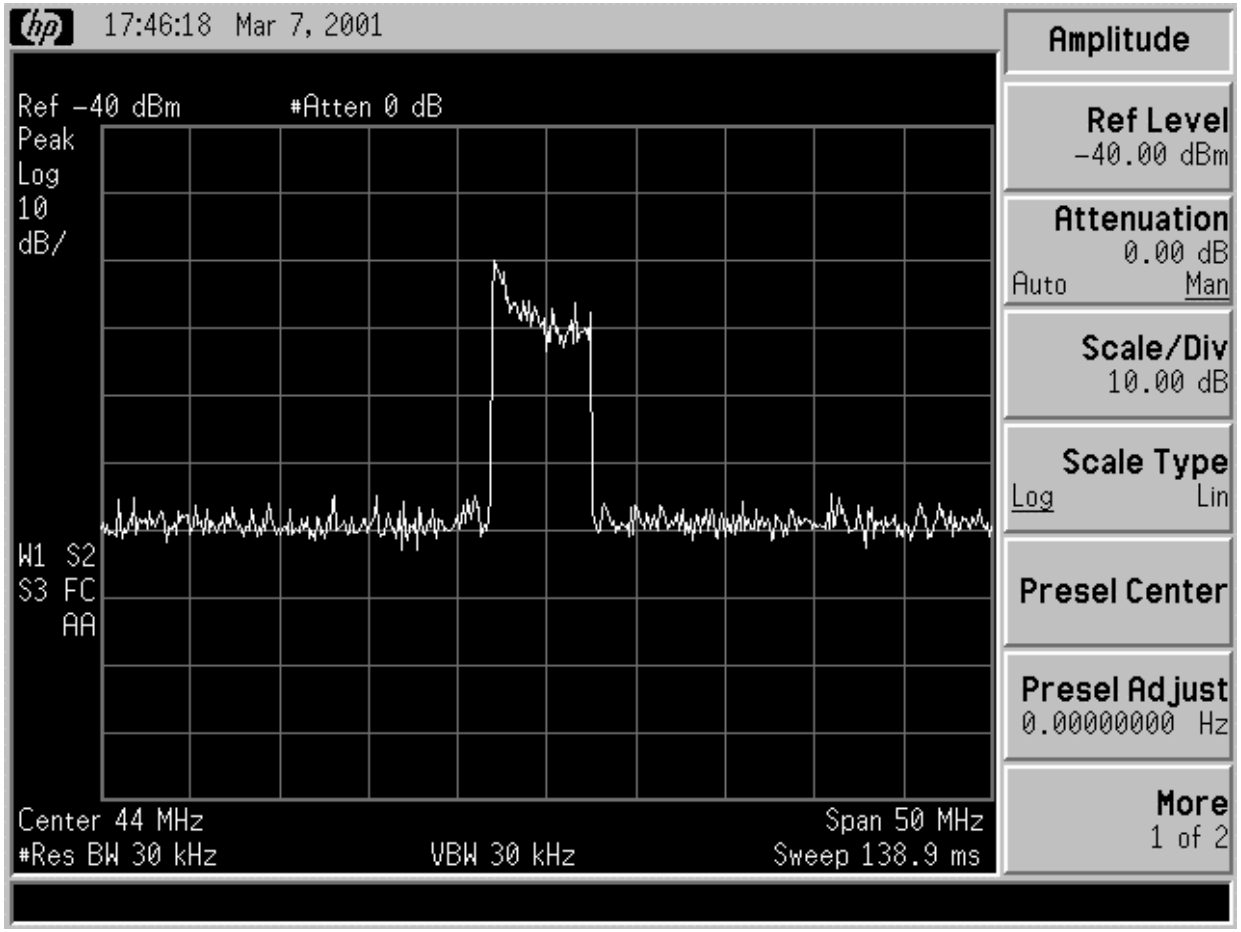
- point-to-point.
- FDD, using experimental licenses from Industry Canada for 2.533 GHz and 2.593 GHz.
- EIRP required to be no more than 10 mWatt.
- 60° antennas.
- van based for portability.
- Data stream--MPEG over ATM and then ATM over COFDM

Point to point MMDS wireless system

Connection #1: Line-of-sight

The two vans were parked approximately 500 meters apart.

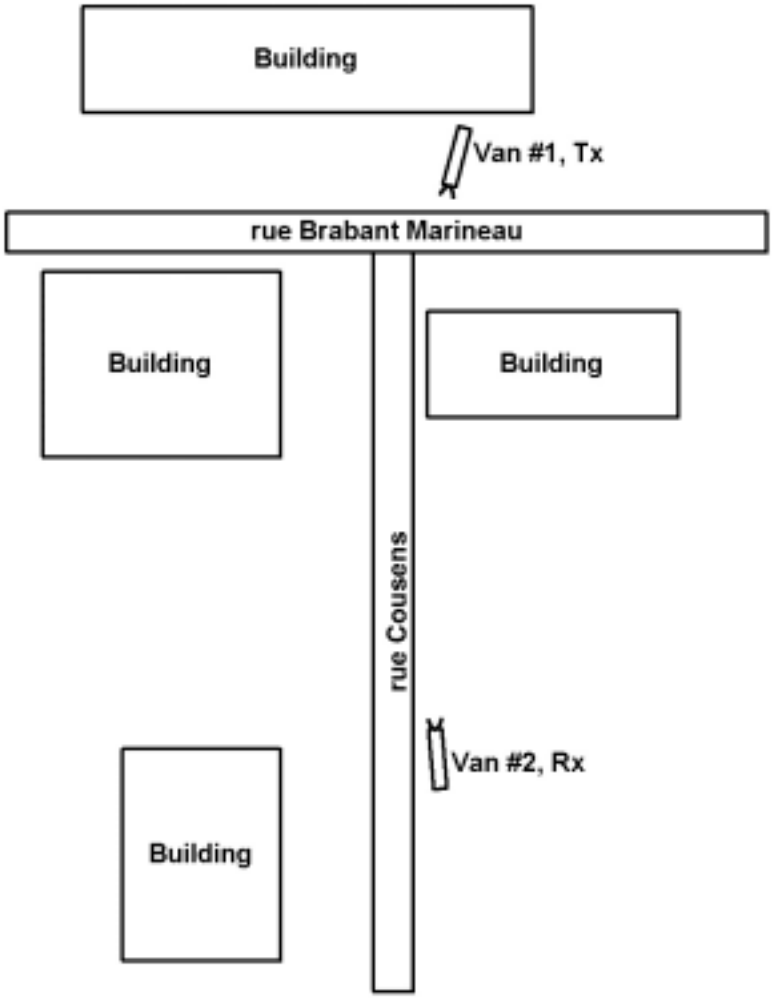
LOS Channel Response



A link was easily established with the 64-QAM configuration.

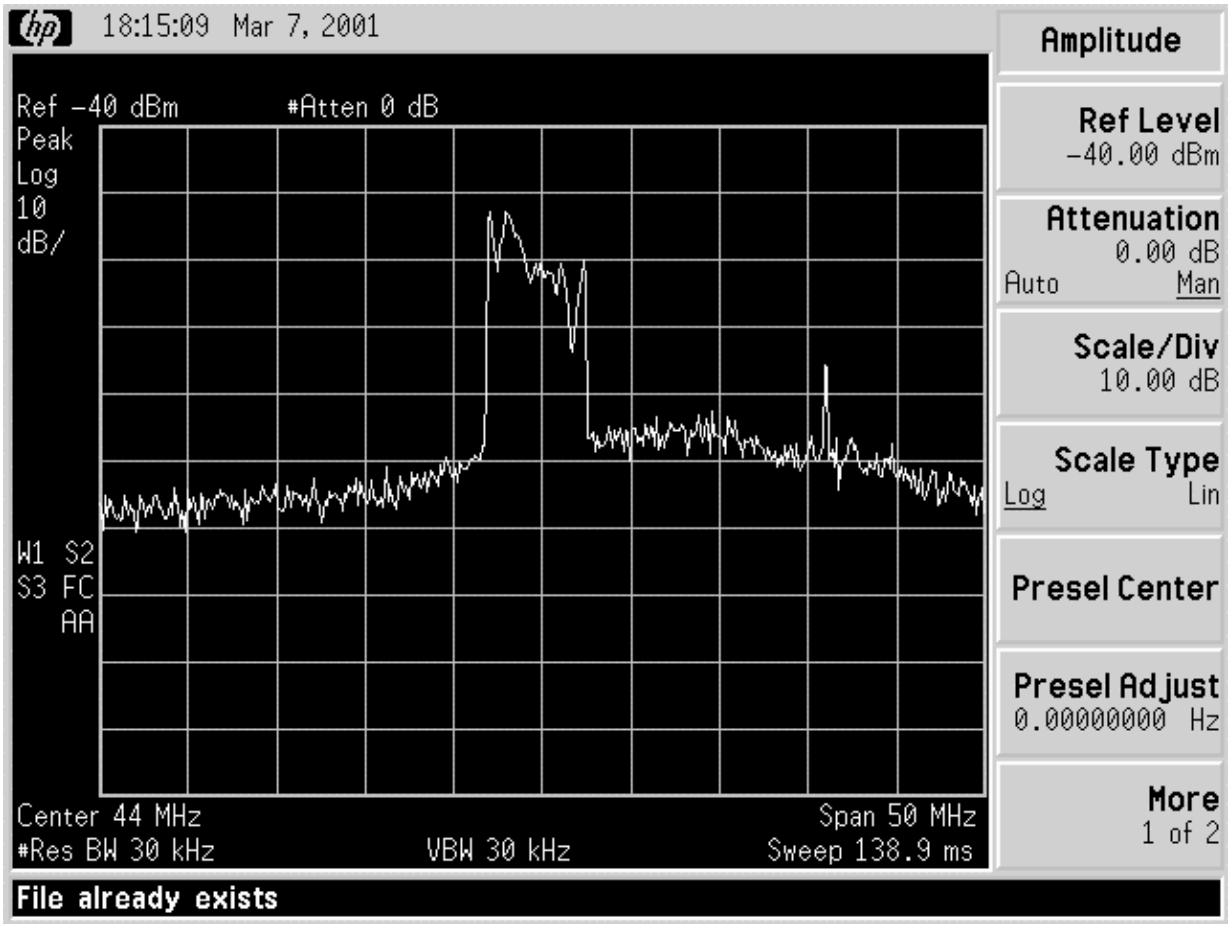
Connection #2: Non-LOS

The two vans were parked such that the receiver was seeing a diffracted and a reflected signal



Connection #2: Non-LOS (cont.)

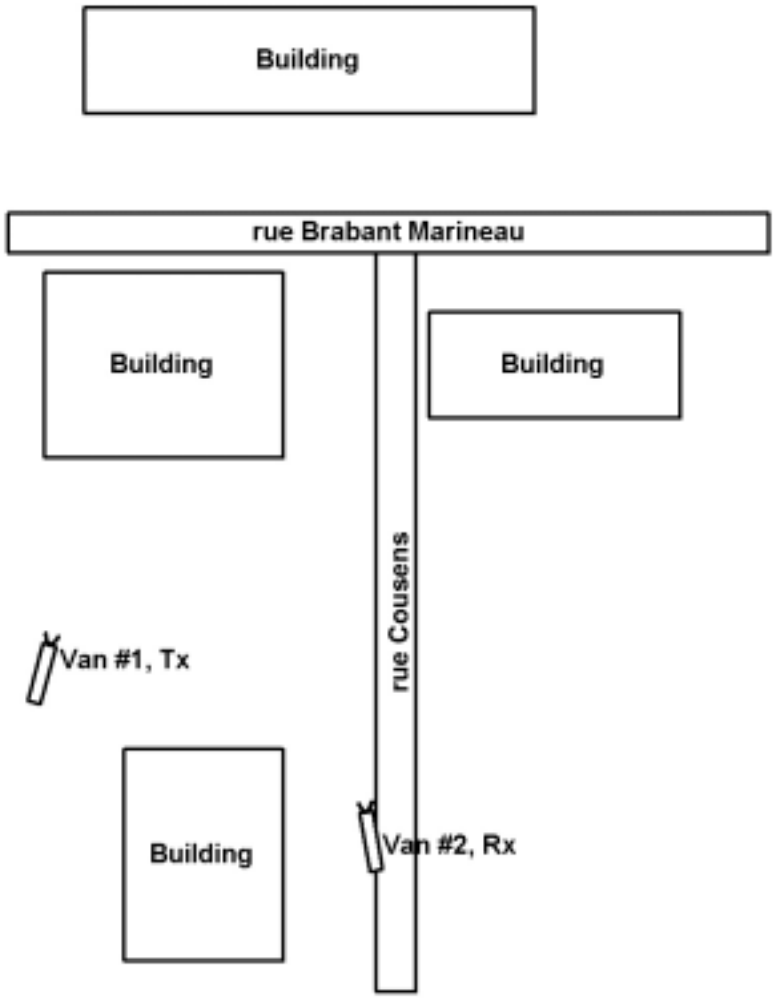
Non-LOS Channel Response



A stable link was established with the QPSK configuration.

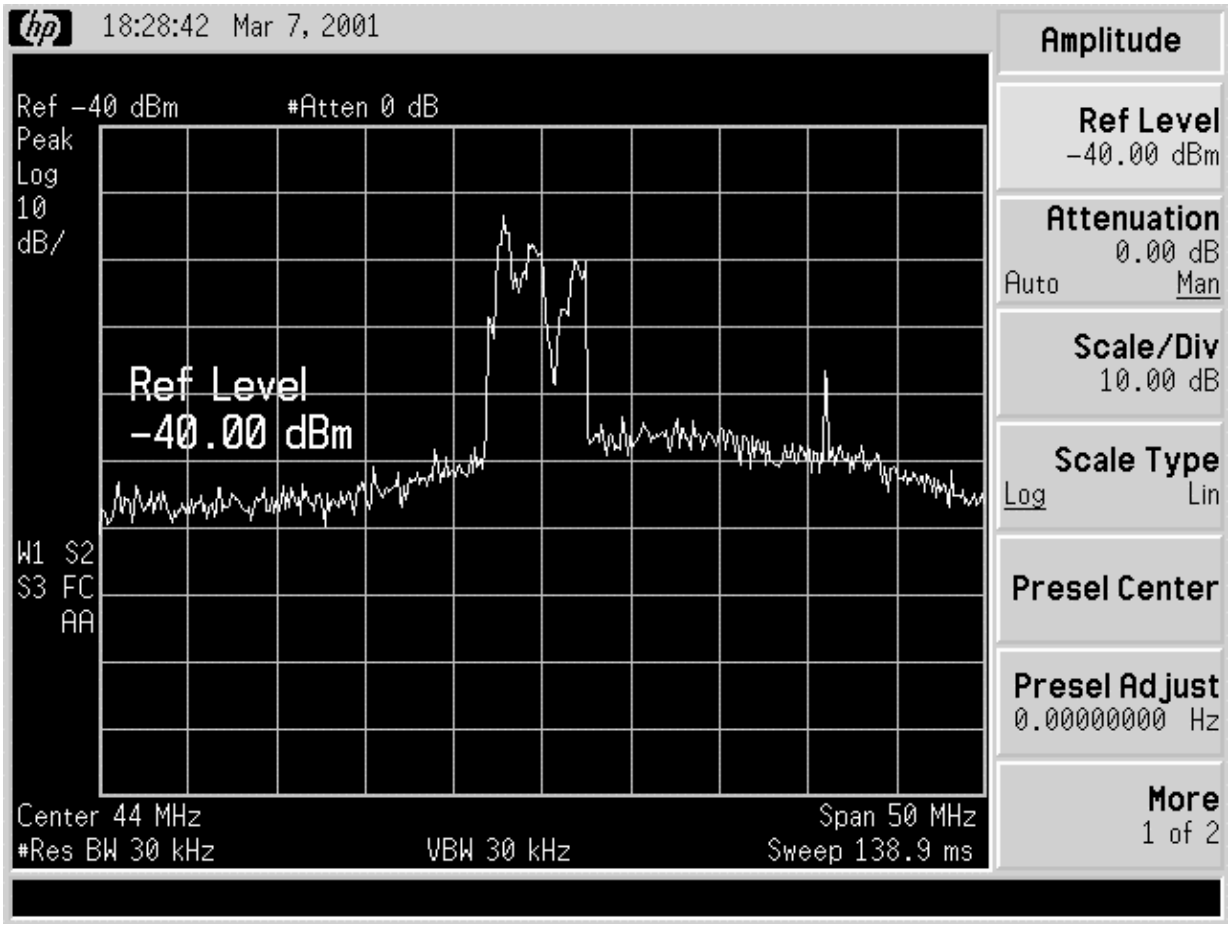
Connection #3: Non-LOS

The two vans were parked such that the receiver saw only a reflected signal



Connection #3: Non-LOS (cont.)

Non-LOS Channel Response



A stable link was established with the QPSK configuration.

Conclusions

We have demonstrated

- that the spectral mask requirements are not an issue for COFDM for back-off of only 6 dB.
- some of the channel responses that COFDM can handle.

In the future, we wish to present more quantitative results on the performance of the modem in the lab, for example BER vs. back-off, and in the field for the various non-LOS conditions.