⇒ Raul M.

SBC Technology Resources, Inc.

Roger V. Thompson
512-372-5810

December 19, 1997

Mr. Richard M. Smith
Chief - Office of Engineering and Technology
Federal Communications Commission
2000 M Street, NW
Room 480
Washington, DC 20554

Re: Southwestern Bell Technology Resources, Inc.
Call Sign KM2XBI
File Number: 4703-EX-ML-95
Quarterly Progress Report Number Twenty Two

Dear Mr. Smith:

In accordance with the Federal Rules and Regulations Part 5, Section 5.204(b), attached please find quarterly progress report number twenty two for SBC Technology Resources, Inc. in connection with our personal/wireless communications testbeds.

The main objective of our Austin testbed is to verify performance of the emerging wireless communications systems and technologies prior to integration into one of SBC Communications Inc.'s business units.

Please direct any inquiries to me at 512-372-5810.

Sincerely,

Roger V Thompson

Roger V. Thompson
Director, Wireless Communications

Attachment

# FCC Quarterly Progress Report Number Twenty Two (22) in Connection with Personal/Wireless Communications Testbeds

**Conducted by SBC Technology Resources, Inc.**

**December 19, 1997**

**Authorized by FCC Experimental License**
**Call Sign KM2XBI, File Number 4703-EX-ML-95**
**(expansion/continuation of 3037-EX-PL-92)**

# 1.0 Introduction

SBC Technology Resources, Inc. (TRI) has deployed a 9 site outdoor testbed located around its offices at 9505 Arboretum Blvd. in Austin, TX. This testbed will be used to perform tests on emerging wireless systems and to validate improvements to existing systems. Each site consists of a 45 ft. pole, an equipment cabinet with power, and a 38 GHz microwave link to interconnect it with TRI's Wireless Technology Laboratory within TRI's office building.

TRI anticipates conducting tests of a wireless system in the 3.4, and potentially the 3.9, GHz bands in the second quarter of 1998. In anticipation of these tests, the RF environment in this location is under investigation for potential users.

# 2.0 Austin RF Environment at 3.5 and 3.9 GHz

## *2.1 3.4 - 3.6 GHz Frequency Usage*

The PerCon Master Frequency Database revealed no transmitters in Travis or Williamson County in this frequency range. The U.S. Military uses 3.1-3.6 GHz for airborne radars such as AWACS, but since Austin is not the site of military training no conflict is anticipated.

## *2.2 3.8 - 4.0 GHz Frequency Usage*

Here there are two possible conflicts: (1) C-Band satellite television downlinks and (2) Point-to-point microwave links. These potential conflicts are addressed individually below.

### 2.2.1 C-Band Television

To analyze TRI's potential interference levels, we first note that, since Austin's latitude is about 30 deg N, receiver dishes are tilted 55 deg. from the horizon. Thus, in a worst-case scenario where the TRI transmitter is aimed right at the front of the dish and the dish, TRI transmitter and satellite are coplanar, the TRI signal will be received at 55 deg. off boresight.

Assume a typical 12-ft. dish. A simple spreadsheet program based on antenna handbook formulas shows that sidelobe levels at 3.9 GHz are about 40 dB down from boresight level at 55 deg.

We next computed the power level into the receiver from the satellite. Representative numbers are:

| | |
|---|---|
| EIRP of satellite: | 34 dBW |
| Distance: | 24,400 mi. |
| Receiver antenna gain: | 54 dB |

Applying well-know link budget formulas leads to a power level into the receiver of -78 dBm.

We next computed the power level into the receiver of TRI's signal. The candidate equipment specifications list both base station and subscriber unit as having EIRP's of about 30 dBm or 0 dBW. Applying the link formulas with the assumption of the above worst-case geometry leads to the following power levels, where D = distance between dish and TRI transmitter in miles. ( A 3 dB polarization loss is included since TRI is linear polarization and sat. signal is circular.)

| | | |
|---|---|---|
| D = 1 | TRI Power in = -98 dBm | Ratio = 20 dB |
| D = 2 | TRI Power in = -104 dBm | Ratio = 26 dB |
| D = 4 | TRI Power in = - 110 dBm | Ratio = 32 dB |

Since satellite TV operates with typical C/N ratios of 20 - 25 dB, we see that only if the distance is on the order of a mile or less will TRI's signal be above an acceptable noise level. Although it is hard to say for sure how many C-band receiver systems are within 2 miles of the TRI testbed, the number almost certainly quite small due to the presence of cable TV in the area. Also keep in mind that the above calculations are based on a worst-case geometry.

### 2.2.2 Point-to-Point Microwave Links

A check of the PerCon database revealed four links owned by MicroNet Inc., all originating in downtown Austin. The link at 3950 MHz is only two miles long, with the receiver due north of downtown and thus facing away from the TRI testbed; this link is not a potential conflict.

MicroNet links at 3810, 3870 and 3890 MHz indicate a receiver 18 miles northeast of downtown. Unfortunately, PerCon does not list the ERP of the transmitter, so some assumptions are necessary before TRI's potential interference to the receiver can be calculated.

The first assumption will be that the channel bandwidths are the maximum allowed by the FCC, as written down in Part 101, Private Operational Fixed Microwave (replacing Part 94.) The maximum channel bandwidth is 20 MHz. We also assume that the receiver antenna gain is identical to that of the transmitter, given in PerCon as 39 dB.

We next assume a noise figure for the MicroNet receiver of 10 dB, a typical value. A final assumption is that the link operates with a margin of 35 dB above the noise, a figure not atypical of point-to-point microwave systems.

At 20 MHz IF bandwidth, a noise power of -121 dBW is easily computed. The path loss at 18 miles is 134 dB. The following equation is solved for P(t), transmitter EIRP:

$$P(t) = 134 \text{ dB} - 121 \text{ dBW} + 35 \text{ dB} + 39 \text{ dB} = 9 \text{ dBW}$$

Now, if TRI's transmitter is aimed directly at the MicroNet receiver, its level at the receiver antenna will be 9 dB below the main signal. (TRI testbed is comparable distance from receiver as MicroNet transmitter.) But the TRI signal enters at 27 deg. off boresight, and a calculation similar to that above shows that sidelobes are 36 dB down at 27 deg. So the power level of the TRI signal is (9 + 36) dB = 45 dB below the desired signal. It's in the noise, so there will be no conflict with MicroNet.

## 3.0 Summary

Our analyses to this point show that there should be no interference either to or from existing operations in these frequency bands. TRI will continue to investigate the issue and will conduct RF measurements to validate these results before any transmissions are made.