EXHIBIT 1

The area of operation for Endgate's program of research and experimentation will be a rectangle bounded on the west by longitude 122° 30' W, on the south by latitude 37° 10' N, on the east by longitude 121° 45' W and on the north by latitude 37° 50' N. Endgate's factory, located at 37° 23' 14" N, 122° 1' 45" W, lies approximately in the center of the southern half of this rectangle and will serve as the location of at least one terminal for links established throughout the area. Also most of the short haul and production testing will be within or in the vicinity of Endgate's factory. The other terminals for three links currently being considered are at 37° 13' 41" N, 122° W and at 37° 20' 20" N, 122° 4' 38" W and at a to-be-determined site in downtown San Francisco (37° 47' N, 122° 25' W).

EXHIBIT 2

TEST PROGRAM:

- Engineering Development: In order to evaluate the performance of the various versions of the *Syrah 38* transceiver, a number of test links will be established between a fixed base terminal at Endgate Corporation's building in Sunnyvale and multiple sites within a 15 mile radius with a special extension to downtown San Francisco. Links will be needed for characterizing the transceiver's performance in each of the 14 frequency bands being developed, for operation at low and high data rates and for a long term reliability demonstration. Additionally, a variety of antennas will be mixed and matched with these links in order to ascertain their impact on the transceiver's performance. This effort will be on-going for approximately 24 months.
- Customer Demonstrations: As the opportunity arises, the engineering test links described above will also be employed to demonstrate system performance to prospective customers. Demonstrations will be both of existing products and of enhanced versions tailored to satisfy a specific customer's requirements.
- Production Testing: The *Syrah 38* transceiver will enter production in November of 1995 and will be continuously undergoing test in all of its frequency bands. A number of the final tests on the transceiver will necessitate radiation from a transmitter to a receiver within the Endgate manufacturing facility.

EQUIPMENT DESCRIPTION: The specific equipment to be evaluated consists of pairs of Endgate *Syrah 38* transceivers using either of two antenna types. The transceiver pairs are band specific and will be transmitting in 14 frequency bands in the range of 37 to 40 GHz. Eight of the bands within the range of 38.6 to 40 GHz are 200 MHz wide with 700 MHz separation between the transmit and receive frequencies. The remaining six bands are within the range of 37 to 39.5 GHz and are 420 MHz wide employing 1260 MHz separation between transmit and receive frequencies. Each transceiver is capable of full duplex operation and can supply a minimum of +16 dBm to the antenna input port. The modulation scheme employed is 4FSK at rates up to 45 Mbits/sec. Maximum occupied bandwidth by any one transmitter will be 50 MHz.

One of the two antenna types to be concurrently evaluated is a shrouded reflector type, varying from 1 to 2 feet in diameter, having a directive gain of 38 to 44 dBi and a half-power beamwidth of .7 to 1.5 degrees. The other antenna type is a 4 inch square microstrip patch array providing a net directive gain of approximately 22 dBi and a half-power beamwidth of 4 degrees.

THEORY OF OPERATION: The Endgate *Syrah 38* transceiver constitutes the millimeter wave portion of a 38 GHz digital radio. It accepts a bipolar base band input to frequency

modulate a 1320 MHz or 2020 MHz oscillator whose output is upconverted in a single sideband mixer to 38 GHz, amplified and fed through a diplexer to the antenna. The receiving section accepts the incoming signal from the antenna through the diplexer and amplifies it in a low noise amplifier. After amplification, the receive signal is downconverted in a image reject mixer to an intermediate frequency of 620 MHz or 740 MHz where it is filtered, amplified and further downconverted to the output IF of 140 MHz. Further filtering and demodulation occur in a radio processing module supplied by the digital radio manufacturer.

The transceiver local oscillator, which is common to both the transmit and receive sections of the transceiver, consists of a varactor-tuned, fundamental GaAs FET synthesizer locked to a 12 MHz reference oscillator. All oscillators within the transceiver are also phase locked to this same reference.

The antenna used by the transceiver will depend on the purpose and nature of the link. For maximum distance and link margin a high gain reflector antenna will be needed while for short hauls the smaller, lower gain "campus antenna" will suffice. The high gain antennas employ a splash plate feed for a 1 to 2 foot, shrouded, parabolic reflector. For these antennas the design objective was to realize low cost, high gain, low loss and low sidelobe antennas to complement the transceiver. The "campus antenna" was designed for less demanding installations where convenience, small size and very low cost are desirable. The campus antenna consists of an 16 by 16 array of microstrip patches printed on a soft microwave substrate. The 256 patches are fed in phase via a coplanar corporate feed to yield a uniformly illuminated aperture. The directive gain of 22 dBi is net of feed losses.

OBJECTIVES:

- Test transceivers and antennas to determine performance margins and limits.
- Test transceivers and antennas to customers specifications in a manufacturing environment.
- Test reliability and availability during continuous operation subject to fades due to weather, intermittent obstructions and multipath.
- Evaluate performance at maximum bandwidth and determine bit error rate (BER) versus bit rate.
- Evaluate and characterize performance of a variety of the two antenna types to include gain, beamwidth and sidelobes.
- Develop a knowledge base from data gained from above to facilitate future, higher performance, more cost effective transceiver and antenna designs.
- Demonstrate transceivers and antennas to prospective customers.

CONTRIBUTIONS TO RADIO ART: Endgate Corporation is committed to applying state-of-the-art GaAs devices and millimeter wave design techniques to commercial millimeter wave products. The overall goal is to transform this previously expensive technology into cost-effective solutions for commercial applications. Lower cost, smaller and higher performance 38 GHz radios will enable an expansion of the market by providing backbone interconnection of PCS cells, bypass networks, interfacility networks, etc. Endgate's contribution will be in bringing the benefits of advanced millimeter wave technology to the commercial communications market place.