

Modification/Renewal Request
Experimental Radio License
Call Sign: KQ2XAX
File Number: 4577-EX-MR-94
Effective: January 18, 1995
Expire: July 1, 1997

EXHIBIT #1

FCC FORM 442

¶ 3 This is a request for a **Modification/Renewal** of the Experimental License issued to Northern Telecom, Inc. (hereinafter called "NT") authorization.

Authorization is requested for:

- §5.202(i) of the Regulations: Development of radio technique, equipment, operational data or engineering data related to an existing or proposed radio service;
- §5.202(d) of the Regulations: Technical demonstrations of equipment or techniques, and;
- §5.202(f) of the Regulations: Demonstrations of equipment to prospective purchasers for proposed stations in existing services by persons engaged in the business of selling radio equipment.

7.
Modification consists of increasing maximum terminal power (4b) for the frequency bands 1930-1990 MHz from 20 watts to 40 watts. The fixed station output power will not exceed 40 watts and the antenna power will not exceed 1000 watts.

Additional modification is requested for the correction of a mistake on the license. The frequency bands 869-894 MHz maximum terminal power should be 45 watts and maximum antenna power should be 40 (EIRP). The frequency bands 824-849 MHz maximum terminal power should be 3.0 watts and maximum antenna power should be 3.0 watts. ✓

¶4(a)
Table 1 Frequency
 Operational Parameters

4A	4B	4C	4D	4E	4F	4G
Frequency MHz	Max Terminal Power Watts	Max Antenna Power Watts	Mean or Peak Power Watts	Emission Type	Signal Modulation	Bandwidth kHz
US PCS						
1850-1910	1.2	2.0 (EIRP) 1.22	Peak	W7W	TDMA-US GSM	200 (200K)
1930-1990	40	[REDACTED]	Peak	W7W	TDMA-US GSM	200 (200K)
CDMA						
1850-1910	1.2	[REDACTED] 1.22	Peak	A7W	CDMA- IS95	1250 or 2500 1M25 or 2M50
1930-1990	40	[REDACTED] (RP)	Peak	A7W	CDMA- IS95	1250 or 2500 1M25 or 2M50
NA Cellular						
869-894	45	40 (en)	Peak	F7W	EIA/TIA Is- 553, IS-54 TDMA, CDPD	30 per channel (30K)
824-849	3.0	3.0(EIRP) 1.82(en)	Peak	F7W	EIA/TIA Is- 553, IS-54 TDMA, CDPD	30 per channel (30K)

- The initial test program for outdoor transmissions anticipate using up to eight (8) channels, 200 kHz wide, for the PCS-1900 system
- NT will use 80 MHz separation between the up link and the down link in all testing programs
- The test will initially use Northern Telecom TRX 1900 radio units that have a maximum RF output of the transmitter terminal of 40 watts (+46 dBm).
- The maximum ERP at the antenna will be at or below 1000 watts (+60 dBm) peak power.
- The maximum EIRP at the mobile/handset will be at or below 2 watts (+33 dBm) peak power.

¶4(g)

Operation will be conducted on specific channels whose spectral characteristics are defined by standards of the GSM-based PCS-1900 or CDMA technology employed.

In the case of the GSM-based PCS-1900 system, channel spacing of 200 kHz will be employed in conformance with evolving PCS-1900 standards.

In the case of CDMA-based system, channel width is not yet defined and will probably be 1.25 MHz or 2.5 MHz.

Regardless of the channel width and spacing, the specific channels selected for use will be selected within the above-defined frequency bands. The specific channels employed for the experimental operation will be selected to avoid interference to or from existing authorized microwave users in the area and licensed PCS operators. NT will coordinate with existing microwave operators and licensed PCS providers and future other experimental permittees and licensees.

¶5(b), 6

The test location is to be centered in Bonham, Texas (see Exhibit 3). At the test location, there shall be two cell sites, one of which will be configured to operate as a 120° sector cell. The second site will also be configured to operate as a 120° sector cell. The elevation of the highest point of the antenna structures at both sites will not exceed 65 feet (19.812meters) above local ground level.

The location of the two cells will be:

Site #1

Latitude	33° 38' 21" N
Longitude	96° 09' 58" W
Elevation	665 ft. ASL (202 meters)

Site #2

Latitude	33° 35' 01" N
Longitude	96° 10' 10" W
Elevation	605 ft. ASL (184 meters)

Site #1 when configured as a 120° sector cell will utilize directional antennas of the following description:

- a) Width of beam at the half power point = 105°
- b) Orientation in horizontal plane = 78°, 198° and 318° (three sectors)
- c) Orientation in the vertical plane = 90° (no down-tilt)

Site #2 when configured as a 120° sector cell will utilize directional antennas of the following description:

- a) Width of beam at the half power point = 105°
- b)) Orientation in horizontal plane = 18°, 138° and 258° (three sectors)
- c) Orientation in three vertical plane = 90° (no down-tilt)

Exhibit Number #2

FCC Form #442

10. (a)

The proposed experimental operation is a necessary part of NT/BNR's comprehensive program for development of a complete family of network equipment for use by system operators under the standards and rules to be ultimately established at the conclusion of the Commission's PCS proceedings.

The applicant proposes to establish test sites for comparative investigation, demonstration, and refinement of the characteristics and performance of equipment implementing the various air interfaces and network architectures now under consideration for Cellular and PCS service. These tests will include GSM-derived PCS-1900, OmniPoint, CDMA, TDMA and other technologies.

For these tests, a new complete operational PCS system will be established initially using GSM-derived PCS-1900 technology. This system will include a Northern Telecom MSC (Mobile Switching Center), BSC(s) (Base Station Controller(s)), and BTS(s) (Base Transceiver Stations(s)) with Northern Telecom TRX-1900 radio units, CellPlus antennas, and in the future, NT Smart Antennas (SAM). Northern Telecom PCS-1900 handsets will be employed during initial tests, with handsets from other vendors to be included in the tests when available.

Future tests will also be conducted using a system of similar functionality based on an implementation of CDMA technology.

10. (b)

Through these tests, Northern seeks to satisfy a number of objectives:

- 1) To establish relevant performance and design criteria for Cellular and PCS systems utilizing the various technologies, including identifying and quantifying important variables such as: propagation losses associated with outdoor propagation, building and vehicle

penetration; interference effects in a real-life environment; and the like;

- 2) To validate and optimize RF and network-related performance of system hardware, including radio, transmission, switching, and inter-system networking elements of the Cellular and PCS systems, as a necessary part of hardware and software development;
- 3) To evaluate and validate performance of various handsets and subscriber equipment in a real-world environment;
- 4) To provide live demonstrations of Cellular and PCS technologies to prospective operators, appropriate representatives of regulatory agencies, and others, to provide a forum for collecting user observations and developing a body of information to be used in further defining operator and user expectations for performance and features.

10. (c)

The proposed program of experimentation is a necessary part of development and validation of the Cellular and PCS systems which Northern Telecom intends to manufacture for use by a wide range of Cellular and PCS operators. The program will facilitate this development and will therefore directly contribute to the social and economic benefits that have already proven by demand for new Cellular products, and expected from the new PCS service for the public.

The Experimental Radio License Modification request proposes to use Effective Radiated Power (ERP) of the fixed PCS stations up to 1000 watts ERP for future testing of the NT Smart Antenna. We recognize that the requested power exceeds the power currently envisioned for many commercial PCS fixed stations in urban locations, but the requested power will permit testing for systems where the 1000 watts will be needed by operators to serve less dense portions of their service areas. Further, Northern will limit the transmitter output power of the fixed PCS stations to 100 watts. The 100 watt transmitter output power limitation was adopted by the Commission in its Opinion and Order, Released June 13, 1994, to promote the use of high gain directional antennas. The Modification Request is needed to test NT's Smart Antenna, which is a high gain directional antenna that the Commission seeks to promote in the new rules for PCS.

Northern Telecom has developed the Smart Antenna, a unique application of antenna technology which could substantially reduce

the costs of providing PCS service in areas where the density of users is low. The Smart Antenna uses adaptive phased array technology originally developed for military applications to add several decibels of additional gain to the radio link. This gain produces benefits both from fixed station to Subscriber, and from Subscriber to fixed station. It also provides additional benefits in discriminating against interference at the fixed station, even in environments where additional gain is not required. The ERP of a PCS fixed station with the Smart Antenna will not exceed +60 dbm, 1000 watts.

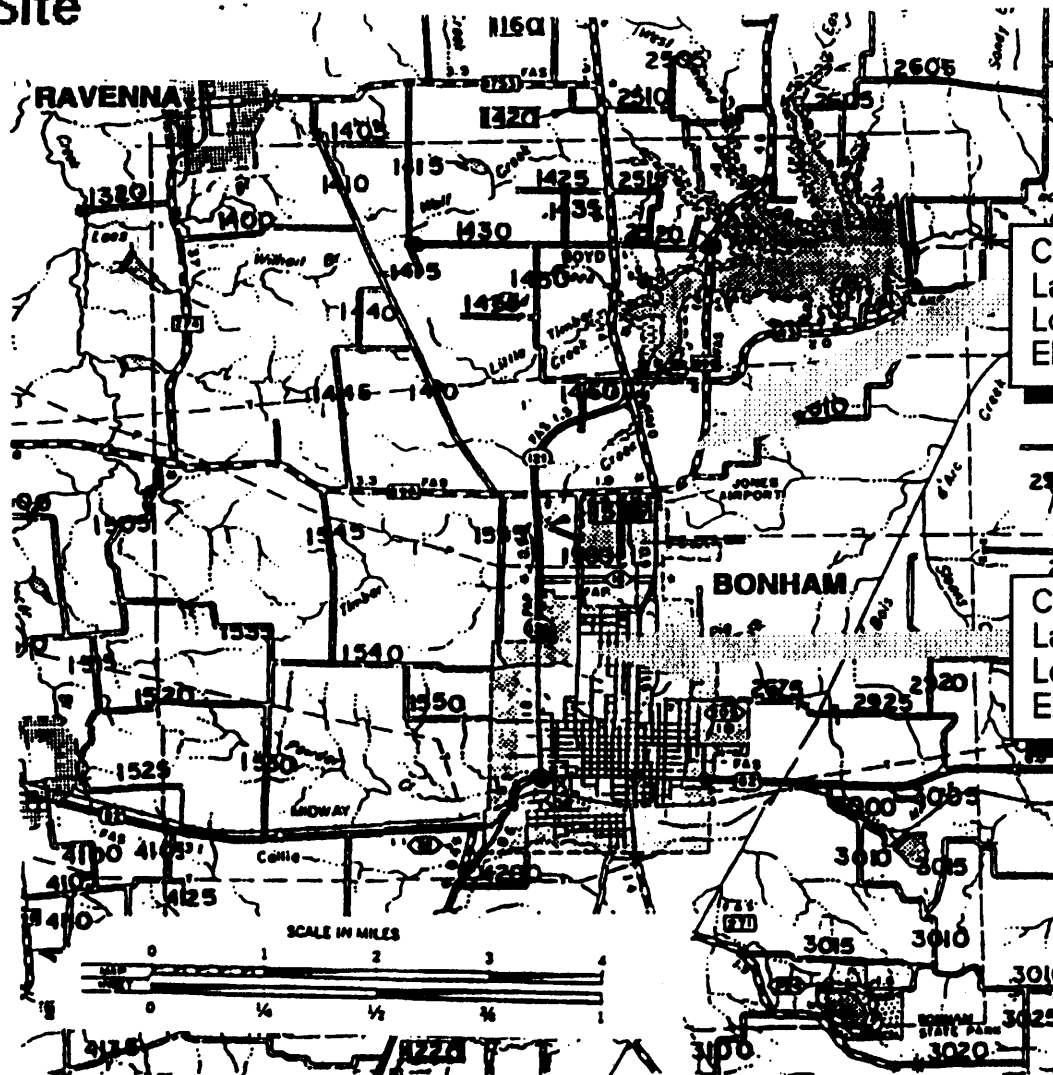
The application of the Smart Antenna has significant implications for reducing the cost of providing PCS service in two ways.

First, it will allow coverage of large rural and suburban areas with a smaller number of fixed stations than otherwise required using conventional antennas. This carries the promise of reducing capital requirements and expanding the areas for which PCS coverage is economically feasible in the near term. This issue is critical to public acceptance of PCS, since the existing competing cellular systems are already much farther along the path of development to ubiquitous coverage of the bulk of the United States.

Second, the Smart Antenna enhances the ability of the PCS fixed station to discriminate against co-channel and adjacent channel interference. This factor improves the carrier-to-interference ratio and holds promise of allowing more dense frequency reuse, thereby increasing the capacity and quality of PCS systems in urban areas.

Northern Telecom recognizes and accepts the requirement to coordinate its experimental operation with existing users including microwave users, Cellular operators, as well as with soon to be licensed PCS operators for operation in the area, to avoid interference. Northern Telecom will comply with this requirement during all of its experimental operations under the requested license, both using conventional antennas and using the Smart Antenna. Northern's analysis and coordination activities will include appropriate consideration both of its fixed station and of the mobile or portable subscriber equipment used in the experimental operations.

Exhibit #3
NT
Bonham, TX Site



Cell Site #1
Latitude: 33°N 38' 21"
Longitude: 96°W 09' 58"
Elevation: 665' ASL (202m)

Cell Site #2
Latitude: 33°N 35' 01"
Longitude: 96°W 10' 10"
Elevation: 605' ASL (184m)

Exhibit #4

NT Towers

Bonham, TX Site

Both Northern Telecom towers are identical in height:

- tower height 65' AGL (includes lightning rods)
- antenna height 50' AGL

