

**Application of BNR Inc.  
For Experimental License  
Exhibit 1**

**1. General Description of Experiments**

BNR Inc. ("BNR"), the research subsidiary of Northern Telecom Inc. ("Northern Telecom"), requests grant of an experimental radio license to gain experience with personal communications systems and develop concepts of Northern Telecom's personal communications services ("PCS") vision. This vision has been described to the Commission in Northern Telecom's comments in Docket 90-314, the Notice of Inquiry related to PCS. A copy of Northern Telecom's filing is attached as Appendix A.

Key to Northern Telecom's PCS vision is the recognition of the need for near-term solutions while working towards the resolution of long term issues. This is both to allow equipment manufacturers and service providers the opportunity to gain experience with this technology, and also to satisfy an existing consumer market demand for PCS. The technology proposed by Northern Telecom as a standard for low power PCS is Personal Communications Interface ("PCI"). This technology is an enhancement of CT2, adapted to the North American market. The technical specification of the PCI protocols is contained in an Annex to the Northern Telecom's PCS comments in Appendix A hereto.

BNR plans to conduct technical tests in the 864-868 MHz and 930-960 MHz bands to assist in the development of the PCI concept. Experiments will use equipment and technology based on

the CT2 standard and the proposed PCI protocols. These laboratory tests will be conducted in several BNR and Northern Telecom sites and their surrounding areas, as specified below.

BNR also requests permission to conduct technical and market research tests using CDMA/spread spectrum technology using the Part 15 901-929 MHz ISM bands, the 1850-1990 MHz band, the 2400-2483.5 MHz band, and the 5725-5850 MHz band. The granting of this license will allow BNR to evaluate CDMA technology in a variety of controlled environments and applications. The proposed experiments will provide BNR with valuable data on PCI and PCS capabilities. A description of the proposed CDMA/spread spectrum experiments is included in Section 4 of this exhibit.

Equipment used in conducting these tests will be primarily developed by BNR in conjunction with Northern Telecom. BNR will also use some other manufacturers' equipment for measurements and evaluations. BNR will coordinate its use of the spectrum with existing users of the spectrum and other experimental license operators in the area.

## **2. Particulars of Operation**

BNR provides the following information on the particulars of operation as per Item 4 of the application.

| Frequency       | Power (C) | Emission (E) | Modulating Signal | Necessary Bandwidth (kHz) |
|-----------------|-----------|--------------|-------------------|---------------------------|
| 864-868 MHz     | 10 mW     |              | Audio             | 100 kHz/Channel           |
| 930-960 MHz     | 10 mW     |              | Audio             | 100 KHz/Channel           |
| 902-928 MHz     | 1 watt    | *            | Voice/Data        | 2 MHz/Channel*            |
| 1850-1990 MHz   | 1 watt    | *            | Voice/Data        | 2 MHz/Channel*            |
| 2400-2483.5 MHz | 1 watt    | *            | Voice/Data        | 2 MHz/Channel*            |
| 5725-5850 MHz   | 1 watt    | *            | Voice/Data        | 2 MHz/Channel*            |

\* CDMA/Direct Sequence Spread Spectrum

### 3. Locations of Sites for Experiments and Equipment to be Installed

As per Items 5 and 13 of the application, the following information is provided.

CT2/PCI experiments will be conducted at the following BNR and Northern Telecom sites using equipment developed by Northern Telecom and other vendors. In addition, field trials may be conducted at selected customer premises located within a 30 mile radius of the BNR and/or Northern Telecom facilities.

BNR Inc.  
1150 E. Arapaho Road  
Richardson, TX 75081

Equipment: 100 Base Stations  
50 Handsets

Northern Telecom Inc.  
2100 Lakeside Boulevard  
Richardson, TX 75082

Equipment: 10 Base Stations  
20 Handsets

Northern Telecom Inc.  
685A E. Middlefield Road  
Mountain View, CA 94039

Equipment: 30 Base Stations  
40 Handsets

Northern Telecom Inc.  
4001 Chapel Hill-Nelson Highway  
Research Triangle Park, NC 27709

Equipment: 75 Base Stations  
75 Handsets

BNR Inc.  
35 Davis Drive  
Research Triangle Park, NC 27709

Equipment: 25 Base Stations  
25 Handsets

The CDMA spread spectrum experiments will be conducted at the following sites BNR sites, and potentially at customer premises located within a 30 mile radius of these facilities, using equipment developed by Northern Telecom and other vendors.

BNR Inc.  
1150 E. Arapaho Road  
Richardson, TX 75081

Equipment: 500 Experimental units

BNR Inc.  
35 Davis Drive  
Research Triangle Park, NC 27709

Equipment: 500 Experimental units

#### **4. Description of CDMA/Spread Spectrum Tests**

##### **Technical Evaluation**

The technical evaluation planned will be a two phase process. The first phase will be a laboratory evaluation and measurement process to determine propagation properties and robustness of CDMA radios inside buildings. The second phase will be field experiments to verify the laboratory results for both in-building environment and the urban/suburban environments.

The purpose of these measurements and analysis is to determine how spread spectrum technology will perform in a crowded user environment. Environments such as tall buildings, business and shopping complexes, and airports all differ in unusual interference patterns and properties. The natural radio propagation conditions of the Richardson and Research Triangle Park areas, as well as the effects of such natural conditions, such as rain, storms, foliage, etc., will also be taken into effect.

BNR also intend to evaluate the use of CDMA/Spread Spectrum technologies for low power microcell communications in the frequency bands requested. The usable range for different power levels and propagation characteristics, as well as performance of hand-held personal communications devices, will be evaluated.

### Laboratory Evaluation

BNR will undertake a series of laboratory measurements before conducting any field trials. These lab measurements will assess the effect of various interfering signals on signal bit-error-rate and the radio performance as a function of the power of the desired signal and the power of the interference signals. These tests will be conducted both inside buildings and outside in a typical urban environment. Measurements relating to multipath, shadowing, propagation and attenuation through walls, building structures, foliage, trees, etc., will be made in both settings.

### Field Measurements

These measurements will concentrate on the actual interference effects of other active users of the requested radio bands in the Richardson, Texas and Research Triangle Park, North Carolina areas. The field measurements made will be similar to those conducted in the laboratory environment, including bit error rates, signal propagation, fading and attenuation, and multipath interference.

In conducting these tests, BNR will coordinate its use of the spectrum with existing users of the spectrum and other experimental license applicants operating in the area. Most of these tests will be conducted in and around the Richardson and Research Triangle Park areas, with the majority centering around the BNR office complexes at the addresses noted above.

In addition, portable laboratories in five vans (at both Richardson and Research Triangle Park), equipped with the appropriate transmitters, receivers and test equipment will be used. This will allow multiple field test locations to be used for gathering results. BNR also believes that it will be necessary to do some limited tests with moving handsets to understand the effects of fast changing propagation conditions and the Doppler effects on the robustness of the CDMA technology and the communication channel.

The results from all our lab and field measurements will be documented, and will be used by the company as a basis for characterizing and predicting the performance of our CDMA technology.

#### Field Testing

Additional field trials under this license will be conducted within our company premises as in-house trials. These trials will consist of microcell wireless access to the company telephone equipment in the Part 15.247 bands. Microcells will be developed and placed at various locations, allowing a limited number of users to have wireless access. Northern Telecom's customers located near Northern Telecom or BNR facilities will also be given the opportunity to participate with us on an experimental trial basis in the microcell CDMA wireless links.

BNR anticipates that there will be at least 3 customer trial sites, where BNR will install up to 24 microcells per site,

with a maximum of 200 portable handsets per site. To develop wireless networking capabilities, and to evaluate them, BNR plans to link these trial sites with point-to-point 5.7 GHz radio links, using Spread Spectrum technology. This will allow BNR to investigate personal communication networks to a greater depth.

This field testing phase will allow BNR to complete its customer testing and evaluation of this technology. It will give BNR sufficient technical and customer perception data to determine the market needs and acceptance of its CDMA technology.

The sites for these market trials have not yet been determined. In selecting these sites, BNR will coordinate its spectrum usage with existing licensed users. When they have been determined, the locations of the sites for the tests in the field trial phase will be supplied to the Commission prior to any installation or operation of equipment at the customer sites.

Appendix A

Northern Telecom's Comments on the FCC NOI  
Related to PCS Evolution  
Gen. Docket No. 90-314