HNS License Sub, LLC
Attachment A
Application for Modification of
Experimental STA
Call Sign: WC9XET
Date: 23 September 2005

Attachment A

DirecWay on the Move

HNS License Sub, LLC ("HNS") hereby submits this application to modify HNS's existing Experimental Special Temporary Authority ("Experimental STA"), Call Sign WC9XET, to permit domestic testing, demonstration and training operations of up to two mobile terminals using Ka-band frequencies specified below.

Background

On June 3, 2005, the FCC granted HNS's application for an Experimental STA, Call Sign WC9XET, authorizing HNS to operate, for a period of six months, satellite terminals mounted on a High Mobility Multipurpose Wheeled Vehicle ("HMMWV") using Ku-band frequencies. These test vehicles are equipped with a 60 cm antenna, a 15 Watt amplifier, the accompanying baseband equipment and an automatic antenna pointing system. The vehicles were developed by General Dynamic as advanced communication resources for the US Department of Defence (DoD).[1] As explained in HNS's original WC9XET application, HNS sought an Experimental STA in response to DOD requirements for small, high throughput terminals that can be used by military commanders for command, control communications, computers and intelligence surveillance and reconnaissance (C^4ISR).

Request for Modification

By this application to modify Experimental STA WC9XET, HNS requests permission to operate up to two HMMWV terminals using Ka band frequencies. While the current Ku-band testing and demonstration program has been and continues to be successful, there is only a limited amount of Ku-band satellite capacity suitable for this type of experimental program. However, a number of recently launched spacecraft have brought commercial Ka-band spectrum into use.

HNS requests authority to use any Ka-band satellite capacity that may be made available by a U.S. Ka-band satellite operator for the testing of an HMMWV-mounted terminal. Since commercial satellite operators are in the process of launching new

[1] *See* application of General Dynamics for Experimental STA, File No. 0640-EX-ST-2004, Call Sign WC9XAP, granted November 24, 2004.

networks in the Ka-band, many have set aside capacity for testing and validation of new products and services. HNS, at the time of this application, has yet to identify a specific spacecraft upon which testing will be conducted. However, even if such information were available, it likely would be subject to frequent changes because of the evolving testing requirements and priorities of the different satellite operators. Allowing HNS to access any operational Ka-band satellite with available capacity would eliminate (for HNS and the FCC) the need for frequent modification to this STA in order to gain access to different satellites with the same equipment.[2]

No change is proposed to this Experimental STA other than to allow the HMMWV to transmit in the frequency band 29.5-30.0 GHz towards a U.S.-licensed Ka-band GSO satellite and to receive in the frequency band 19.7-2-.2 GHz. The transmission from the hub to the satellite is currently licensed under HNS's Experimental authorization, Call Sign WD2XFP.

A grant of this license would allow HNS to continue the development of small, high throughput terminals that can be used by military commanders for command, control communications, computers and intelligence surveillance and reconnaissance (C^4ISR).

Equipment

The RF equipment currently consists of a 60 cm transmit/receive antenna that is mounted on a gyro-stabilized platform. The mount and antenna are enclosed in a radome which is connected to the frame of the prototype HMMWV. The previously-authorized Ku-band transmitter, which is attached to the boom arm of the antenna, will be replaced by a Ka-band 10 Watts RF amplifier. The current Ku-band LNA and feed assembly will also be replaced by similar equipment designed to operate in the Ka band. All other components will remain unchanged.

Ka-band Frequencies

The terminal will transmit in the frequency band 29.5-30.0 GHz and receive in the frequency band 19.7-20.2 GHz. The terminal will transmit a QPSK signal that can vary in bandwidth between 200 kHz and 1.6 MHz. The specific bandwidth to be used for the carrier will be assigned by the satellite operator depending on the availability of the space segment.

Radiation Hazard Analysis

Enclosed in Attachment B to this STA is a radiation hazard analysis based on the methodology described in OET Bulletin 65.

[2] The FCC has granted similar authority to HNS in the past. See HNS Experimental License Call Sign WD2XFP, which authorized HNS to conduct tests over any visible satellite having Ka-band capacity.

As described in General Dynamics' experimental license application, OET File No. 0640-EX-ST-2004, the terminal antennas have a very small signal beam area. Moreover, the terminals are mounted on the roof of vehicles and pointed upward, away from areas where personnel could enter the beam. Further, the mobile terminals are designed to cease transmission when the signal from the hub is lost due to signal fading or blockage, or due to a mis-oriented antenna. This antenna design mechanism ensures that the terminal does not accidentally illuminate persons that might be in the boresight of the terminal, while the vehicle on which the antenna is mounted is either stopped or in motion.

Adjacent Satellite Interference

The earth station proposed for use in this application complies fully with Part 25.138(a) of the FCC's rules. The antenna however, does not comply with FCC Part 25.209(b). As can be seen in Attachment D to this application, the antenna gain exceeds the mask by as much as 8 dB in the angular range from 2.2 to 5 degrees from boresight. In order to comply with the EIRP mask as defined in Part 25.138(a), HNS must not exceed a flange power in 40 kHz of -18.5 dBW/40 kHz. In actual fact, HNS intends to operate at a nominal value of -22 dBW/40 kHz, a value that is in fact 3.5 less than the maximum allowed (see link budget in Attachment C). The corresponding power flux density on the downlink is of -122.9 dBW/m^2/MHz, which is less than the downlink limit of -118 dBW/m^2/MHz.

While HNS intends to conduct most of its testing at the nominal power levels given above, authorization is sought to operate at a power density that is 3.5 dB higher, which is still within the levels authorized under 25.138(a). This would allow HNS to characterize the performance of the terminal (e.g. conduct bit error rate measurements) at power levels both above and below the nominal operating levels.

Since the testing being proposed will be limited to a few hours of intermittent use over the term of the STA requested here, HNS will advise the operation center of the satellite operator of the exact time periods during which the testing of these mobile terminals will be conducted. The satellite operator will be provided with the contact information of the engineer responsible for the prototype testing so that transmissions can be immediately stopped in the event of any interference.

Geographic Area

HNS expects to conduct testing of the prototype in the same limited number of controlled test ranges identified in it existing Experimental STA. The list of locations set forth below includes sites where the terminal's performance can be adequately assessed as well as locations of a number of military bases and headquarters where demonstrations are expected to take place.

These sites, which are identical to those previous requested, consist of the following areas:

a. Within a 55 kilometer radius around HNS headquarters, located at N39 10' 49" 77 14' 47";

b. Within a 55 kilometer radius around Ft. Huachuca, Arizona, located at N31 33' 09", W110 20' 50";

c. Within an 80 kilometer radius around Ft. Monmouth, New Jersey, located at N40 18' 25" W74 02' 24";

d. Within a 5 kilometer radius around the Vertex RSI Richardson, Texas facility, located at N32 58' 27", W096 42' 15";

e. Within a 5 kilometer radius around the General Dynamics facility in Tauton, Massachusets, located at N41 57' 05", W071 07' 48";

f. Within a 5 kilometer radius around Fort Gordon, Georgia, located at N33 24' 36", W082 08' 24";

g. Within a 5 kilometer radius around VertexRSI facility in Duluth, Georgia, located at N33 55' 10", W084 16' 12"; and

h. Within a 5 kilometer radius around Coherent Systems, Fredricksburg, Virginia facility, located at N38 19' 50", W077 28' 56".