ATTACHMENT - STA for LMDS Hardware Testing

Name:
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Purpose of Operation:
Two-way Local Multi-Point Distribution System (LMDS) connectivity tests of equipment designed for export purposes.

Description of Equipment:
The upstream (Sub-to-Hub) and downstream (Hub-to-Sub) equipment provides a wireless connection between the Subs (or Customer Premise Equipment (CPE)) and the Hubs that would normally communicate with a cable router over CATV cable. The Hubs also transmit a pilot signal, which is used by the equipment to obtain the system frequency reference.

Station Location:
Tempe, AZ.
NL 33-20-18 WL 111-53-48

Frequency Information:

Frequency	Station Class	Emission Designator	Authorized Power	Two-way Direction
24.6 – 24.75 GHz	FX	3M20G1W	193 W (ERP)	Upstream
26.3 – 26.7 GHz	FX	6M00D1W	1.0 W (ERP)	Downstream
26.3215 GHz	FX	3M00F1W	1.4 W (ERP)	Pilot

Requested Duration:
180 days

2. Location

The pilot, downstream, and upstream transmitters will be located on the Motorola campus in a rectangle of approximately 25 square miles centered on Tempe, AZ, at 33-20-18 / 111-53-48.

3. Antennas

The transmitting equipment uses directional antennas.

Hub Antennas

Beam Width (3dB): 90 degrees, 10 degree elevation beamwidth. The antenna pattern azimuth coverage is +/-45 degrees off boresight. The antenna pattern elevation coverage is +/-5 degrees off boresight. The antenna will be oriented so as to aim the boresight in the vicinity of the transceiver antenna on the user's premises. It is likely that the Customer Premises Equipment transceiver antenna will be at the same height as the Hub antenna, so that the boresight elevation angle with respect to level will be zero.

Beam Width(3dB): 2.4 degrees using a parabolic dish.

4. Test Program

Test Objective

The objective of this test is to explore the feasibility of providing wideband data connectivity to very large numbers of individual subscribers using wireless interfaces operating in the 24-26 GHz frequency range. The continued growth in demand for data connectivity, specifically internet connectivity, will exceed the current limited capacity of telephone modems, particularly overseas where telephone facilities are generally fewer per capita. Cable television systems which already have a large base of connected customers are beginning to use those systems to provide data connections at much higher speeds than telephone modems with good success. Telephone companies are also exploring new methods of using their existing wire facilities to provide wideband data service. A natural competitor to the wired system is the wireless system where connectivity is provided by an RF link. Frequency allocations in the vicinity of 30 GHz for this wireless service have already been made in anticipation of its viability. The requested STA will allow Motorola to establish a test system for the purpose of investigating wideband data connectivity that could potentially support consumers using wireless 24-26 GHz links. As a result of this investigation, Motorola expects to establish the requirements for modems, transceivers, system layout and system operating parameters. Motorola also expect to establish performance expectations and limits for the system. This information will be used in the development of equipment that will be sold to the commercial market for the purpose of providing a competing solution for wideband data connectivity, particularly overseas but in the United States as well.

Equipment Description

The equipment used under this STA will endeavor to duplicate the operational configuration of a cable data system. Data modems and system protocols are already established for the cable environment so they are a natural starting point for a wireless system investigation. By treating the cable modem's cable interface as the IF interface to a transceiver operating in the vicinity of 24-26 GHz, a system that significantly emulates that of a cable system can be achieved. That is the approach to be undertaken by the proposed system for which the STA is requested.

The test system will implement a limited wireless network consisting of a maximum of seven "users" who are linked to one central site or hub. The hub is the "head-end" which provides the gateway to the Internet. The connectivity achieved must provide each user with full time access to the Internet gateway.

The head-end equipment is Motorola's cable router, configured to provide one downstream channel and a maximum of four upstream channels. The downstream channel is the 30 Mbps channel from the headend to the customer premises equipment. It is time-shared among all of the users assigned to that channel. In this case, all seven users will be assigned to that channel. The upstream channel is the link from the customer equipment back to the hub site. This channel is also time shared among a few users.

The headend equipment sets up and manages the network. It generates the downstream channel that provides network synchronization and performance parameters to the customer equipment. Each customer premises modem responds to specific instructions in the downstream channel regarding its inbound channel, e.g., when to transmit, how much data is expected, etc. In this manner, the headend equipment can dynamically change channel assignments, transmit levels and control data flow to efficiently manage the network connections.

The interfaces to the headend equipment are 100BaseT (high-speed Ethernet protocol with data rates up to 100 Mbps) for interface to the Internet gateway and cable frequency IF interfaces to the transceiver equipment. The cable interface frequencies are 500 MHz to 570 MHz for the downstream interface and 17 MHz to 42 MHz for the upstream. The cable IF interfaces connect directly to the hub transmitters and receivers.

Hub and user transceivers are experimental prototypes. The hub provides a fixed “upconversion” from the downstream cable IF frequency band to the 26.3-26.7 GHz band. The user transceiver provides fixed upconversion from the upstream cable IF frequency band to the 24.6-24.75 GHz band. The hub antenna is a 90 degree sector horn, Nurad p/n 092-00104. the user transceiver antenna is a parabolic dish, Nurad p/n 948-00322.