By John Champa,* K8OCL

Communicating Voice, Video, and Data with Amateur Radio

What is Happening to the HSMM Working Group?

At its January 2006 meeting, the ARRL BoD directed that the HSMM (High Speed Multi Media) Working Group summarize its accomplishments and submit its final recommendations by year's end. With that directive in mind, and with dissatisfaction within the Working Group regarding how its recommendations concerning permitted radio network protection methods (e.g., encryption) for the Amateur Radio Service are being communicated by the League, most of the group members simply left.

The ARRL HSMM website (http:// www.arrl.org/hsmm/), which has been in operation for the past five years, has been transferred to the Technical Information Services (TIS). However, the HSMM public discussion reflector (ARRL-80211B@listserv.tamu.edu) remains in full operation.

Some of the Working Group membership who left have since formed a new digital radio networks research organization, the Amateur Radio Broadband Alliance (ARBA) in association with Texas A&M University in College Station, TX. More on this new organization will be covered in this column in the next issue of *CQ VHF*.

What is 802.16 (WiMAX)?

According to its web page "The IEEE 802.16 Working Group on Broadband Wireless Access Standards develops standards and recommended practices to support the development and deployment of broadband Wireless Metropolitan Area Networks *[that's WMANs vs. WLANs covered by 802.11 standards, i.e., more range—ed.]*. IEEE 802.16 is a unit of the IEEE 802 LAN/MAN Standards Committee, the premier transnational forum for wireless networking standardization."

The following is a report from the HSMM Working Group Project Leader for 802.16 investigations, Gerry Creager, N5JXS (e-mail: <gerry.creager@tamu. edu>) of Texas A & M University:

We've installed a Solectek link here at TAMU. We're operating under both Part 97 and Part 15 for testing in the 5.7 GHz region. So far we've deployed a point-to-multipoint installation and are working with a point-to-point operation over a 3 mile path.

We're achieving data rates of up to 72 Mb/s on the point-to-multipoint configuration, and we're locking at 36 Mb/sec on the point-to-point link for political reasons. Note that this experiment is co-sponsored by the university's campus networking folks, so the Part 15 stuff is highly subject to politics.

The Part 97 aspect is being tested in concert with AG5GY. His was the first link up, at about 2.8 miles. The client end uses a panel antenna with 24 dBi gain and a 9 degree beamwidth. Power output on the clients is 100 mW. It's mounted about 14 feet off the ground. There's a clear line of sight to the base.

My house is 5.0 miles from the base, in a hole, and behind some 40 foot tall oak trees. This is a real test of non-line of sight (NLOS) wireless technology. I'm seeing marginal signal but we're getting 72 Mb/sec most of the time, and even with excessive retries, the performance is pretty good. I'll be expanding into voice-over-IP (VoIP) and video soon to see about packet loss, jitter, and congestion in the face of real applications.

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The base unit produces 400 mW. We're using a 27 dBi panel with a 90 degree beamwidth. All polarization is vertical. The base is mounted at approximately 240 feet AGL . . . and about 550 MSL. That places it at about 200–220 foot height above average terrain (HAAT).

The subtended angle between AG5GY's site and mine is on the ragged edge of 90 degrees. I've tweaked the antenna slightly to favor Tom. We're awaiting a 120 degree panel, which should improve both operations.

We're ordering in a pair of dedicated point-to-point radios (9 degree beamwidth, 17 dBi, 400 mW) for some link testing to two sites. Also, all of our additional client-side radios will be 200 mW or 400 mW ("medium" or "long" range clients) as there's not much purpose, based on testing so far, to have short range radios for paths of unknown distance.

Solectek has been pretty easy to work with, although they're a start-up and their software's pretty much in flux. I think I'm going to be able to forge a working relationship with them on both the university and amateur areas; I've already pointed out that their operation under Part 15 resides in our band, and we're now talking about getting the "secret" codes they do not release to Part 15 customers.

We've suffered a couple of failures. A power-line hit at AG5GY's house apparently fried a client. Solectek is revisiting that system and owes me a complete post-mortem . . . and another client. Their warranty is pretty good. *Also*, Solectek "upgraded" their firmware release and suggested we reflash the units. Things worked fine up until the reboot after we reflashed, then *nothing* worked. We lost a couple of days trying to figure that out, and finally suggested to Solectek they have a bad software release . . . reflashing to the previous release restored operation. And, to add insult to injury, a loaner system they'd sent needed to be reflashed. After rebooting it, it's doing a good impression of a recently sprayed cockroach . . . on its back with its legs in the air, not responding. That's going home for postmortem, too.

Over all, after a couple of weeks of playing, I think it's going to work. I intend to have high-speed Internet at my house and Tom's. I plan to link the hospitals and Emergency Operations Centers (EOCs) with 802.16. The university is already happy enough with the system to plan to employ it for a lot of our wireless dedicated link requirements. We're cooperating between the amateur and official interests to keep links orthogonal and manage frequencies. And, it helps to be the 802.16 "guy" on campus when the production folks need help.

Future plans:

1. Go from 20 MHz spreading to 40 MHz spreading and look at effects on range, bandwidth, and NLOS operations.

2. Go to higher power radios for similar evaluations.

3. Get the 120 degree sector antenna in and improve Tom's and my operations.

4. Continue evaluations and connectivity for the university side, to get more datapoints.

5. Hook up the EOCs and hospitals (and I'll admit that that's a total of six links, so it's pretty easy. We're a relatively small geographical entity) and enable Part 97 operations on the links from there, for Voice/Video, data, and Internet. These hookups will be made with appropriate controls.

6. Mobile tests, similar to those Solectek has on its Whitepapers section of the website, to see where we can and cannot put up instant links.

With the ending of the ARRL Working Group and the changes occurring in HSMM communications, it seems that amateur radio based HSMM communications is in a deep transition period. While change is always challenging, it is also a time when new, cutting-edge developments emerge. We are looking forward to reporting on new developments in future editions of this column.

73, John, K8OCL