

**American Radio Relay League
Technology Task Force**

**Report to the Board
From
The High Speed Multimedia Working Group -- 2003**

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EXECUTIVE SUMMARY: This was an extremely productive year for the High Speed Multimedia (HSMM) Working Group. The amateur radio application of high speed digital radio networks evolved as never before, and more amateurs than ever started viewing digital radio as the future of their service. In the past year alone over two dozen presentations were made and more than a dozen articles were published. There are now better than four web pages dedicated exclusively to HSMM research and development.

EXTENSIVE PRESENTATIONS: On behalf of the League and the TTF the HSMM Working Group made the following presentations regarding our research into high-speed amateur radio digital networking:

Ken Cuddeback, KT7K-

- The ARRL / TAPR DCC -- 2003 in Newington, CT. The WG was able to provide one of our most distinguished members, Professor Ken Cuddeback of Weber State University, as a speaker and to get our HSMM paper into the DCC proceedings.
- New HSMM World Record -- A group of Weber State University Network Engineering students under Ken's leadership set a new world's record for distance worked using 802.11 spread spectrum modulation. Prior to this accomplishment the distance record was held by a Polish commercial organization. Personal congratulatory messages were received from Jim Weaver, K8JE, the Great Lakes Division director and the Michigan Section Manger!

Neil Sablatzky, K8IT-

- Dayton Hamvention TTF Forum <http://www.hamvention.org/>
- Dayton Hamvention ATVN get together <http://www.hamvention.org/>
- Monroe, MI Amateur Radio Club <http://mcrca.org>
- Plymouth, MI Museum Amateur Radio Club <http://www.qsl.net/kc8swr/>
- Milford, MI Amateur Radio Club <http://www.qsl.net/w8ydk/index.html>
- Howell, MI Livingston Amateur Radio Club <http://www.qsl.net/milark/>
- McMath-Hulbert Observatory Members <http://www.mcmathhulbert.org/index.htm>

- Additionally the presentation was emailed to various HSMM members and (7) copies were sent to requesting amateurs, asking for presentation slides for their local amateur clubs.

Jeff King, WB8WKA --

- Obtained 802.11x HSMM designator on APRS.
- Helped design HSMM online database in conjunction with James Jefferson.
- Presentation of an HSMM overview and spread spectrum technology to Hillsdale Amateur Radio Club.
- Presentation, HSMM field day station, Hillsdale County Fairgrounds.
- Informal Presentation, Hillsdale County Chamber Of Commerce and others, on Part 15 wireless freenets.

Walt DuBose, K5YFW & Gerry Creager, N5JXS-

- In June, Gerry, N5JXS, and Walt, K5YFW, participated in HamCom 2003 at Arlington, TX. The HQ ARRL Staff assisted in getting an invitation and the WG was asked to "man" the Elmer's Booth and give a seminar on HSMM activity. There were many hams stopping by the HSMM booth to learn about what the WG is doing. At the HSMM booth, there was a server on IEEE 802.11b operating under Part 97. HamCom also provided the WG with table space to set up an HSMM Repeater (Access Point) on 802.11b also operating under Part 97. This provided the WG with a great opportunity to demonstrate 802.11b operation under Part 97.
- During the forum, Gerry held the standing room only crowd spellbound as he explained how we envision HSMM operation and especially running wireless networks using IEEE 802.11b operating under Part 97.
- Gerry also gave a presentation to the WISP convention in FT. Worth/Dallas this fall.
- In October, Walt traveled to the Baton Rouge Hamfest and gave an HSMM presentation to that group which was attended by local ARES members as well as Louisiana State ARES members. The presentation was well attended for the size of the hamfest.

Alex Fraser, N3DER-

- In July, Alex made a presentation of an HSMM overview at the Woodbridge Wireless Inc. meeting.
- Informal presence, wearing HSMM name tag at local CAWnet WiFi event (Capitol Area Wireless). This was fairly well attended. He talked up HSMM till he got a hoarse throat.
- For Field Day Alex toured three sites while running mobile (N3DER 1C). He wore the HSMM name tag and talked and talked. The FD sites he visited were W4IY Woodbridge Wireless, who won their class nationally (IIRC 13 A), Old Virginia Hams who were a friendly medium sized site (4 A?) and the behemoth W3AO site (51 A!!!)

Kris Mraz, N5KM-

- Presentation of an HSMM overview and spread spectrum technology to the Alcatel Amateur Radio Association.
- Presentation of HSMM overview to 802.11 technology class.

Tony Gallucci, N8VR-

- Produced and edited a video tape of the first HSMM Experimenter's Workshop held in Howell, MI. Clips from the video tape will be used in enhancing future HSMM presentation materials.

NUMEROUS PUBLICATIONS:

Kris Mraz, N5KM-

- April, QST Article on HSMM titled *High Speed Multimedia Radio*.
- Handbook 2005 Drafts for Spread Spectrum & Multimedia Section.

Neil Sablatzky, K8IT-

- QST April (Antenna Sidebar)
- CQ VHF HSMM column (Spring 2003) Intro to HSMM.
- CQ VHF HSMM column (Summer 2003) A Low Cost Horizontal Polarized Omni Directional Antenna for \$15 4.
- CQ VHF HSMM column (Fall 2003) Is Gaming Data Legal on HSMM?

Jeff King, WB8WKA-

- Contributor to *High Speed Multimedia Radio*, QST, April 2003.
- Author, APRS and HSMM sidebar, QST, April 2003.
- Jeff also has the responsibility for HSMM WG Regulatory Liaison. In this specialized role he helped draft and approve the "APC letter" with Chris Imlay. Jeff was also involved with the "Use of WEP as Authentication" memo for record, and he answered questions on the HSMM-Regulatory reflector.

Alex Fraser, N3DER-

- Contributor to *High Speed Multimedia Radio*, QST, April 2003.
- *Field Day, New Rules for an Old Favorite* published electronically at <http://www.qsl.net/n3der/new/fd.html>. Revision in progress.
- Work-in-progress: A paper on proposed rule changes for Field Day and other contests with the aim of making the contest's training aspects relevant to today's digital communication needs.

John Champa, K8OCL-

- CQ VHF (Summer 2003) OpEd contribution regarding dealing with 802.11 interference.
- CQ VHF (Fall 2003) feature article titled *How to Get on HSMM* (with Ron Olexa, KA3JII. Note: Ron also published 802.11 articles CQ, June and July).
- Anomalous Propagation (Midwest VHF-UHF Society) Newsletter article titled *What is HSMM Microwave Radio?*
- Contributions to TAPR and AMRAD Newsletters.

ADVANCED TRAINING: Just as in any rapidly changing area, the WG members have to run to stay ahead. Here are some leading examples.

Kris Mraz, N5KM-

- Completed training for the prestigious Certified Wireless Network Administrator (CWNA). Note: Three of the 10 students were hams as well as the instructor. A lot discussions were about how 802.11 technologies can be used by amateur radio operators.

Jeff King, WB8WKA-

- Wireless systems conference, February 2003 San Jose CA
- Xemics XE1202 900mhz ISM transceiver training, Jan 2003 St. Louis MO
- Informal Part 15 certification training, University of Michigan Radiation lab, Willow Run Airport, MI Nov 2003.

Alex Fraser, N3DER-

- Attended lectures at CAWnet event in August. Most informative was on the "hidden node" problem with very nice simulations.

All WG members did extensive reading, and study both paper and online!

RESEARCH AND DEVELOPMENT PROJECTS

Microsoft Windows Media 9 Applications within HSMM, a sub-report.

John Champa, K8OCL, our Chairman, inquired about possible HSMM applications of the Windows Media Player technology. Since then I have investigated the Application Programming Interfaces (or APIs) and associated SDKs for the Windows Media Player. I have created a very basic proof-of-concept that demonstrated to me how to use the media player component from C# (a .NET programming language).

Before I proceed further, I have gathered up a couple of high-level requirements as John suggested in his reply to my posting. They are as follows:

- A small image window in one corner of the GUI application that provides a digital-still image of a picture of the amateur radio operator. In this way you could see an image of the operators face (although still) while he is showing you something else. Or, you could view a digital still image of the site where the broadcast is occurring.
- The majority of the GUI application area would be devoted to the display of a live streaming video from a web cam feed. This feed display would have an associated text banner display area above or below it (location, description, etc.).
- A small portion of the GUI application area would include an IRC-style text messaging area for real-time text-based communications.
- (New) a separate tab with a map that shows you where the live web feed is occurring.

Additional requirements or comments are welcome.

Thanks,

Respectfully submitted to the HSMM WG,
Kevin Wittmer, KB8VME

The HSMM-HF Project, a sub report

In the last seven months extensive investigations of the newer digital modes have been conducted and several are still under evaluation. One of the most interesting is Q15X25 as it has similar characteristics to a proposed high speed network. Tuning and general operating practices for this mode is still hard to find, and several members of the WG are planning to do some on the air testing in the coming weeks. This evaluation will assist us in selecting the best form of modulation for our network.

On the air testing of several modulation possibilities between amateur experimenters has been restricted due to current FCC regulations. However, some bench testing with point to point coax connected the rigs, have been achieved. This setup employed a function generator feeding voltage controlled pin diode coaxial attenuators in an effort to simulate QSB on HF bands. Of

course this test illustrated the need for a good RF link; however approximately 30dB of signal fade resulted in no degradation of the data link. The basic modulation consisted of OFDM, with a bandwidth of approximately 25KHz wide, and data rates exceeding 70Kbps. Efforts to conduct similar testing for different modes (such as PSK31) still need to be conducted.

Respectfully submitted,
Neil Sablatzky, k8IT

Bi-Directional Amplifier (BDA) Design, a sub report

NOTE: HSMM modes such 802.11b require the use of special fast switching amplifiers known as BDAs.

I have designed a 40 dBm bi-directional amplifier to include schematics, parts list-

vendors and samples. At the request of an HSMM member, I am reworking the RSSI instead for Eb/No and verifying this against the specs. I hope to soon be able to obtain the MESFET (10W) as soon as it is available for shipping (sample).

I am starting to do the layout of the PCB and investigate thermal requirements.

I'd like to know if it would be possible to have Ed Hare, W1RFI, at the ARRL Lab test and verify this unit once I am able to populate the board and once everyone has had the opportunity to evaluate the design?

Respectfully, submitted,
John Ingram, KA3LIE

Other HSMM WG Member Projects

Jeff King, WB8WKA: Low power 76Kbps XE1202 based 900 MHz ISM transceiver; Thermal testing on Dlink DWL-810 and DWL-810+ 802.11b client; Built and Modified BiQuad antenna; Built Warbler 80meter data transceiver, placed on air late Dec 2003.

FINDINGS, CONCERNS, AND RECOMMENDATIONS TO THE BOARD

1. The HSMM Working Group strongly recommends to the Board that any band planning efforts, especially above 902 MHz, include a qualified HSMM WG representative.
2. The ARRL needs to alter QST policy to allow publishing of equipment reviews relating to HSMM operation. This will assist in the growth of this mode.
3. The ARRL needs to propose experimental digital sub bands where new digital modes can be evaluated over the air. While it has been suggested that 10M and especially 6M might be useful for these types of tests, propagation characteristics such as HF QSB is difficult to test over such

short paths. It is proposed that the ARRL consider the Novice band segments to allow data transmissions with relaxed symbol rate and bandwidth conditions.

4. That we can work within the existing rules to (largely) accomplish our goals is not a universal feeling of the HSMM WG members. There is a difference of opinion as to what we should be doing here, so needed regulation changes are frequently discussed.

5. We are trying to sell refrigerators to Eskimos! It is felt that too many hams are not that interested in HSMM. They don't have the vision. This vision is held by the Part 15 community networking folks. These are the folks we need to reach out to and make ham radio attractive to them. We have taken steps to do this, but we must not lose sight of this.

6. ANY computer logging network should be recognized as an embryonic basis of a broader ham computer network. The fact that hams have already started using wireless in their logging networks is very encouraging. We recommend that any FD organization using a single Part 97 computer logging network be freed from the physical limitations on their site (1000 feet diameter rule).

7. There is not enough emphasis being placed on mobile routing technology. There's a lot of IETF work being done in this area we believe the Internet-free ham networks will have some unique requirements that are not being considered by the IETF.

ACKNOWLEDGEMENTS

Our WG report would not be complete without thanking the many loyal and dedicated members of the ARRL Headquarters staff for their strong support for our all our efforts throughout the year: Dave Sumner, K1ZZ; Mary Hobar, K1MMH; Steve Ford, WB8IMY; Rick Linquist, N1RL; Bob Inderbitzen, NQ1R; and Paul Rinaldo, W4RI. We owe special thanks to our Staff Liaison, Ed Hare, W1RFI, who has assisted and guided use in more ways than we can count.

A special thanks also to our TFF Leader, Howard Huntington, K9KM.

Finally, the WG expresses its strong appreciation to the FAB Corp for its support and encouragement of our R&D efforts, and the special recognition it provides for the HSMM effort.