

# HSM

Communicating Voice, Video, and Data with Amateur Radio

## The Hinternet on UHF

### Digital Video Coming to the 440-MHz Band

In our previous column we wrote about the use of typical HSM (high-speed multimedia) gear (IEEE 802.11 modulation operated under Part 97 regulations and power limits) in helping to deal with last year's tsunami and other natural disasters. We listed the elements of a survival kit recommended by Oklahoma Baptist hams. An old high school classmate, Thomas Barnes, reviewed the list and recommended some additions. Tom is a military historian and a Vietnam veteran who was with the First Infantry Division—"The Big Red One"—so we thought we should pass along these additions:

1. Duct tape. It makes a great way to seal long pants over boots to keep out mosquitoes, not to mention its value for the temporary repair of nearly everything else. One roll can be shared, so not everyone needs to take a roll.

2. Scissors. Take a good pair made of stainless steel, which will not rust in a wet tropical climate.

3. Personal sewing kit.

4. Repair kit for eyeglasses.

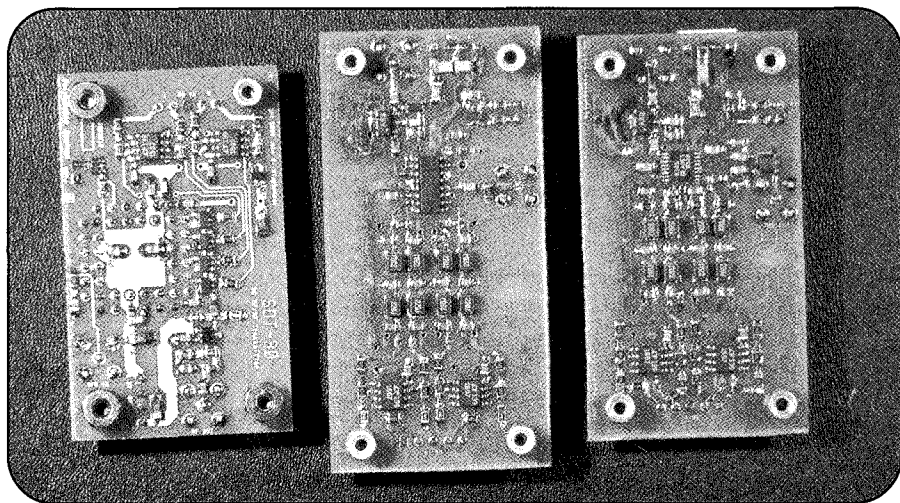
5. Maglite® brand flashlight. This is the type that will continue to work even if it is run over by a tractor/trailer.

6. A lot of batteries for the flashlight. If not used, they can be bartered.

7. An emergency supply of toilet tissue.

#### HSM Testing

Until now all of our discussions regarding HSM radio within amateur radio have been about the use of inexpensive COTS (commercial-off-the-shelf gear) used for RLANs (radio-based local area networks). This gear is one of the IEEE 802.11 standard radios with the addition of an outside antenna and perhaps a BDA (bi-directional amplifier, usually in the 1.8-watt range made especially for



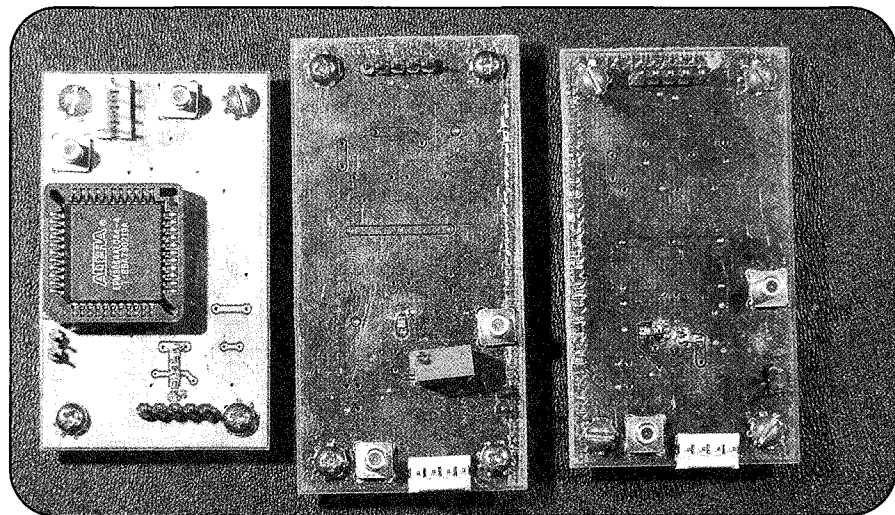
Bottom view of the Orthogonal Frequency Division Multiplexing (OFDM) modem.  
(Photos courtesy of John, KD6OZH)

HSM by the FAB Corporation (<http://www.fab-corp.com/>).

Some linked HSM radio repeaters now cover an entire community. However, what is clearly needed for amateur radio's national high-speed digital network ("The Hinternet") to continue to grow are other methods of getting better

range than the 2.4-GHz ham band normally allows. How do we do that and still get the high-speed data rates we need?

During one of the periodic teleconferences held by the ARRL HSM Working Group it was decided to form several RMAN (Radio Metro Area Network) project teams within the



Top view of the OFDM modem.

\*Chairman of the ARRL Technology Task Force on High Speed Multimedia (HSM) Radio Networking; Moon Wolf Spring, 2491 Itsell Road, Howell, MI 48843-6458  
e-mail: <k8ocl@arrl.net>

Working Group to answer this question. Two of these teams have made great progress: the RMAN-VPN Team, which will be featured in our next column, and the RMAN-UHF Team, which uses the lower ham bands, such as 440 MHz, for much longer range network links.

The Working Group's RMAN-UHF Team project leader is John Stephensen, KD6OZH. John has developed a modem designed to use OFDM (Orthogonal Frequency Division Multiplexing) modulation, which can be used with conventional ham gear (amplifiers and antennas) in the 440-MHz ham band. Technical details regarding the OFDM modem design can be found in the March/April 2005 issue of *QEX* (pp. 26-35) and at <<http://www.ar1.org/hsmm/>>. The alpha test equipment photos of the OFDM modem included with this article were provided by John.

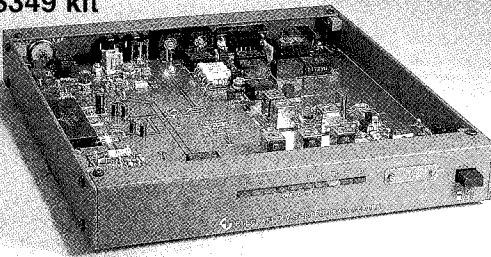
OFDM modem testing is expected to begin this summer at four locations in the United States:

- Livingston County, MI—HSMM Experimenters team leader Jon Harris, KC8WAZ (jonharris2@comcast.net)
- Emmaus, PA—HSMM Experimenters team leader Carl Stevenson, WK3C (wk3c@wk3c.com)
- College Station, TX—Hinternet infrastructure specialist Gerry Creager, N5JXS (N5JXS@ar1.net)
- Fresno, CA—RMAN-UHF Team project leader John Stephensen, KD6OZH (KD6OZH@verizon.net).

What does all of this have to do with digital video on the 440-MHz band? The OFDM modem is expected to be able to operate at a maximum data rate of 2.4 megabits per second (M/bps). Initially, we will be doing link quality testing. Later, to push the outside of this envelope for the tests, the open-source ITU-T standard software video and audio CODEC (coder-decoder) of H.323 will be used. This should produce excellent full-color and full-motion video for some wonderful two-way high-speed digital QSOs with outstanding audio quality, too. In addition, the OFDM modulation will only occupy 2 MHz of a local ATV channel. This compares favorably with the present 6 MHz used by analog ATV, so the spectrum efficiency is much better. We have designated this test mode as ADV (Amateur Digital Video) to distinguish it from DATV (digital ATV), which is mostly an image mode based on MPEG CODECs used by European ATV experimenters. 73, John, K8OCL

## NEW! High Performance Transverters

50, 144, 222 MHz  
20 - 25 W  
\$349 kit



Our new XV Series transverters work with any transceiver that covers the 28-MHz band, including our K2 and K2/100 (which display the actual operating frequency). Multiple transverters can easily be daisy-chained to a single IF transceiver.

- Low Receive NF (typically 0.8 dB)
- High dynamic range front end (+17 dBm mixer)
- Single-port and dual-port IF connections
- From -20 dBm to 8 W Drive
- Sequenced keying output
- Built-in 10-segment LED wattmeter
- Stackable, low-profile cabinet (1.3"H x 7.8"W x 8.3"D)

XV50, XV144 and XV222 kits: (\$349)

Optional crystal oven, XVOVN: (\$45)

Visit our web site for details on all of our products.

**ELECRAFT**  
www.elecraft.com

sales@elecraft.com  
Phone: (831) 662-8345  
P.O. Box 69, Aptos, CA 95001-0069



# Be an FCC LICENSED ELECTRONIC TECHNICIAN

## GET YOUR FCC COMMERCIAL LICENSE!

No costly school. No commuting to class. The Original Home-Study course prepares you to be an "FCC Commercial Licensed Technician" at home in your spare time! You don't need a college degree to qualify, but you do need an FCC License. No need to quit your job or go to school. This proven course is easy, fast and low cost!  
**NO PREVIOUS EXPERIENCE NEEDED!**

This valuable license is your "ticket" to thousands of exciting jobs in:

- Communications
- Radio-TV
- Broadcasting
- Avionics
- Radar
- Maritime
- and more...

Earn up to \$100 an Hour and More!

even start your own business!

### GUARANTEED TO PASS

You get your FCC License or your money refunded.

Get your **FREE** facts now. Call Today!

**800-932-4268** Ext. 105

or go online at

**www.LicenseTraining.com**

COMMAND PRODUCTIONS • FCC License Training  
P.O. Box 3000 • Sausalito, CA 94966-3000

