NCPA Downlink

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Serving Amateur Radio Digital Communications in Northern California

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OFDM all but ends problems with multipath in high-speed digital.

by Gary Mitchell, WB6YRU

One of the problems with very high speed digital transmissions is multipath. It isn't much of a problem at very slow speeds, but at high speeds multipath can result in different symbols being receive simultaneously. I recently attended a talk on this subject, here is an abstract from the announcement:

*OFDM, **Orthogonal Frequency Division Multiplexing**, has recently burst onto the broadband wireless data scene. OFDM enables very robust high-speed digital communications even in the presence of severe multipath. It is now in commercial use for broadband point-to-point and wide-area point-to-multipoint data networks where its robust qualities improve network coverage reliability, enable the design of high-capacity WLL networks with cellular architectures, and reduce deployment and maintenance costs. Additionally, OFDM has been adopted as the modulation of choice for digital audio broadcasting in Europe for the emerging 802.11a and Hiperlan2 high-speed wireless-LAN standards.*

The basic idea is to transmit digital so slowly that multipath isn't a problem, but many channels are used to get the through-put back up.

Orthogonal means independent and Multiplexing means one high-speed data stream is converted into many slow-speed data streams. So, Orthogal Frequency Division Multiplexing (ODFM) is the transmission of a high-speed digital stream over many independent channels, each of which is slow.

In the version we heard about, they use a multiple-tone modem--with a whopping 1024 tones, or channels. This means such a transmission can have 1000 baud on each channel, yet have a through-put of 1 Mb/sec.

It's possible for some of the channels to drop out completely with no loss of data. The data is spread over the channels and FEC (forward error correction) is used to reduce the error count. Furthermore, since the error correction scheme works better with random errors, the data is not encoded sequentially on a tone.

This technique has the benefits of direct sequence spread spectrum, but with significantly reduced bandwidth.

Fading can be reduced with multiple antennas. This can provide from 3 to 14 dB gain over the fade.

One way to have a multi-tone transmitter is to literally have many oscillators. This can get expensive and complex. One way around that is to encode the data onto all tones completely in software. This broad-banded signal is then put through a FFT transform, converted to analog, and transmitted. This replaces the need for many separate local oscillators. At the receiver, the reverse of this process recovers the original signal.

One company, WiLan, that specializes in this technology has more information available on their web page:
http://www.wi-lan.com/library/whitepaper_wofdm_general.pdf
and
http://www.wi-lan.com/library/whitepaper_wofdm_technical.pdf.

{If there is enough interest, I can look into getting permission to reprint these in the Downlink. – Ed.}

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In This Issue

President's Message

Gary Mitchell, WB6YRU

Which Band Plan?

As you know, the NCPA and NARCC are working on the general band plan for our region. The ARRL has a band plan too. If you ask the ARRL, they will readily admit that local band plans takes precedence. The problem is that often people will follow the ARRL plan and not bother to find out if there is a local plan. If someone isn't involved in repeaters or packet, they may not even be aware of anything except the ARRL plan.

Recently there was a discussion on the national coordinator's remailer regarding this basic issue in the Repeater Directory. The ARRL says (in the R.D.) that local plans take precedent, but that isn't enough. If the ARRL put all the local band plans in the Repeater Directory, it would be ten times larger, that's not the solution. It seems to me that even giving a list of regions where a local band plan is in effect may not be enough.

There is a case of interference currently going on in the San Jose area. While working on that, it came to my attention that some of the people involved don't seem to be aware of the local band plan.

I'm not sure how big of a problem this really is nor am I claiming to have *the* solution here, but I believe this is something that we need to give some thought to.

Update

I had thought we were finished with the general band plan from ten meters through 70 cm, but apparently not quite.

Some people in NARCC are concerned about packet stations being installed near sites with six meter repeaters. On that band, adjacent signals are evidently more of a problem. I proposed we put a note to that effect in the six meter digital band plan, advising that new six meter packet installations should check with NARCC about any nearby repeaters. This doesn't mean six meter packet stations need a NARCC coordination, but some "coordination" in the general sense of the word would be a good idea.

In the 70 cm band, NARCC has discovered a few Auxiliary/Link stations in their database located in the digital segments. They suggested we grandfather them in. Needless to say, that didn't go over too well. It's not even clear if these are real stations or merely old entries in their database. This will be investigated further. The consensus so far on the NCPA board is that those stations should be encouraged to move rather than grandfather them in.

Also in the 70 cm band, evidently some on NARCC's board aren't comfortable with ATV sharing spectrum with Aux./Link (425-426 MHz) and they proposed moving the ATV channel up to 426.5-431.8x MHz. The NCPA wondered out loud if 426-432 might be better, since it would match the ARRL plan. Further, NARCC would like to make that ATV channel simplex only. It's not clear what they have in mind regarding existing ATV 70 cm repeaters, but they've mentioned eliminating all ATV repeaters at 70cm. My feeling is that there isn't too much 70 cm ATV activity and perhaps the repeaters could share with smiplex. This one is still in a state of flux.

The NCPA Downlink is published quarterly by the Northern California Packet Association, P0 Box K, Sunnyvale CA 94087, for the entertainment and education of amateur Radio operators using digital modes, and those with an interest in them. A one-year membership in the NCPA, including a subscription to the NCPA Downlink, is $10.00 in the U.S. and its possessions.

The digital band plan as well as other information about the NCPA, are available on the Web at: http://www.n0ary.org/ncpa

The NCPA Board of Directors meets electronically in order to transact association business and meet with members and interested amateurs. The address for the board mailing list is: ncpa@qth.net. E-mail to majordomo@qth.net with the text "subscribe ncpa" in the body of the message to subscribe to the discussions.

If anyone has information or opinions on this, now would be the time to mention them.

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Relaxing of rules for using 219-220 MHz

{The NCPA has been looking into submitting a proposal to the FCC to modify the rules regarding the restrictions on 219-220 MHz. Specifically, 97.303(e)5. It looks like the ARRL may have beat us to it... – Ed.}

From *The ARRL Letter*, March 2, 2001

LEAGUE SEEKS GREATER FLEXIBILITY AT 219-220 MHz

The ARRL is urging the FCC to retain the 219-220 MHz shared Amateur Radio allocation and says it wants the Commission to make it a bit easier for hams to use the segment. In comments filed February 6 in an FCC rulemaking proceeding, the ARRL said it believes the 219-220 MHz band "must be maintained and enhanced."

The League commented in PR Docket 92-257, released last November. The Third Further Notice in that proceeding proposed to designate licensing regions for the Automated Maritime Telecommunications System (AMTS) facilities at 216-220 MHz and to authorize a single licensee for each unassigned AMTS frequency block on a geographic basis. The current AMTS system uses a site-based licensing structure.

Current rules require that amateurs planning to operate within 80 km (50 miles) of an AMTS facility get written permission from the AMTS licensee, but getting that consent has been difficult to impossible for hams in coastal areas. "The Commission's intended flexibility in amateur station operation at 219-220 MHz has not, in general, been realized," the League commented.

The ARRL suggested letting amateurs seeking to use 219-220 MHz submit computer-generated field strength contours that demonstrate a lack of interference potential at the relevant AMTS boundaries in lieu of having to get written permission.

"It is ARRL's intention that the Amateur Service be provided a practical opportunity to make substantial, flexible use on a secondary basis of the 219-220 MHz allocation, taking into account expanded development of AMTS stations," the League said. The FCC should "provide some flexibility in the engineering of amateur systems in that band, to the extent consistent with avoidance of interference to AMTS stations."

The 219-220 MHz amateur segment was created in 1995 as a result of an ARRL petition for rulemaking. The FCC has designated the band on a secondary basis for amateur fixed point-to-point digital message forwarding systems.

While the ARRL said it's unaware of any amateur interference to AMTS stations, attempts by hams to use the band to construct digital backbone systems "have been largely thwarted to date" because of the inability to get consent from AMTS licensees within 50 miles of the proposed operation, as rules now require.

A copy of the ARRL's comments is available at http://www.arrl.org/announce/regulatory/pr92-257/.

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WWV Survey Planned

From the *ARRL Letter*, February 23, 2001

The National Institute of Standards and Technology plans to survey users of WWV and WWVH later this year. The time and frequency-standard stations have been airing occasional announcements about the upcoming poll in order to start building a mailing list of survey recipients. The announcements state that NIST "is seeking information on how listeners use the broadcast services offered on the WWV broadcast," but the survey will not begin for at least several weeks.

WWV Station Manager John Lowe says the announcements are being broadcast now as a heads up and to encourage early mailing list sign-ups. The survey itself will not be released until approved by the Office of Management and Budget, Lowe said, and he doesn't expect that to happen until May, although it could be sooner. The survey period likely would extend through the summer, he said.

According to Lowe, the last WWV-WWVH user survey was done in 1985. "We just don't know who our user base is anymore," he said. Lowe confirmed that the data collected ultimately could be used to determine whether WWV and WWVH remain on the air--especially given the popularity of NIST's other outlets, including its Web-based time server that gets in excess of 3 million hits a day.

"If we get only two people who say they're using WWV, then we've got a problem," he said. Lowe added that he does not think WWV and WWV will be shut down, and he vowed to "fight for the radio stations," if it came down to that. "But the ultimate decision is not in my hands," he said. "We have to look at our budget and our users."

Lowe strongly encouraged WWV users to get on the mailing list and to send in a survey when the time comes. He suggested, however, that more weight will be given to survey responses from corporate and institutional users of the radio service as opposed to individual users.

To be added to the NIST WWV-WWVH survey mailing list, send your name and postal address to the NIST Radio Station WWV, 2000 E County Road 58, Ft Collins, CO 80524, or e-mail the information to nist.radio@boulder.nist.gov. Lowe urged WWV-WWVH users to hold their fire until the survey begins.

WWV in Ft Collins, Colorado, and WWVH on Kauai, Hawaii, broadcast continuous time and frequency information to millions of listeners worldwide. For more information, visit the NIST Web site, http://www.nist.gov.

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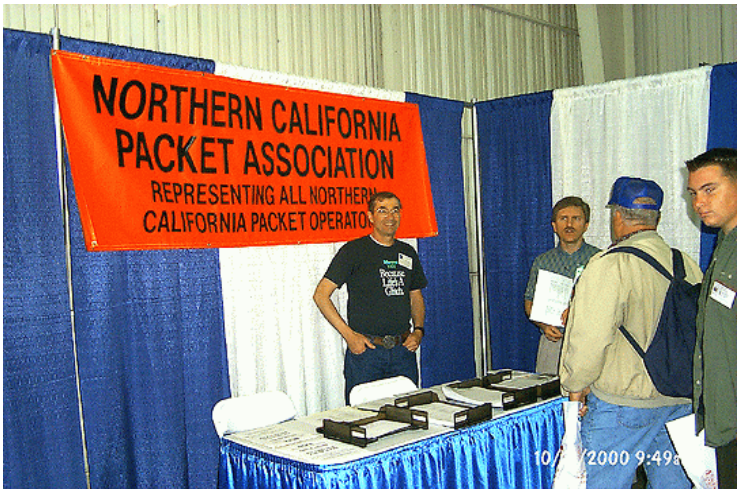
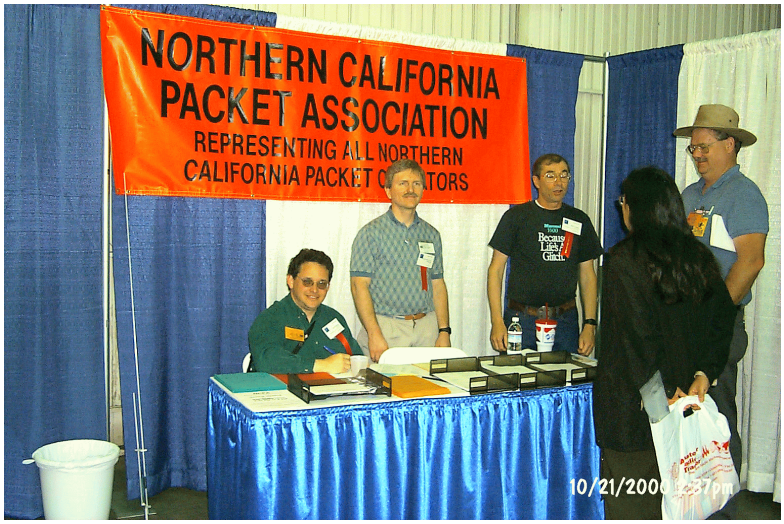
NCPA at Pacificon

Photos by Howard N6HM

{Due to technical problems, the following photos did not appear in the previous issue. Apologies to Howard N6HM for the delay. – Ed.}

The annual meeting at Pacificon 2000





Our information booth

Board of Directors Electronic Meeting

Excerpts of the NCPA board remailer traffic, November 28, 2000 through February 12, 2001. Compiled by Gary Mitchell WB6YRU (full text of traffic is available).

Wed, 20 Dec 2000
Cathryn Mataga:
Is there a SSTV frequency?

WB6YRU:
Not specifically at 70 cm. But this sort of thing would be OK in the "Experimental/Mixed" segments: 431.0-432.0 and 434.0-435.0 MHZ. There is a SSTV channel specifically recognized at 10 meters, 28.68 MHz.

WB6YRU:
(Posted latest general band plan)

Thu, 21 Dec 2000
Cathryn Mataga:

It'd be better just to specify an SSTV channel than have us guess.

WB6YRU:
When we were working on that part, we had no information about any SSTV activity.

The idea is to leave those segments open to anything not specified elsewhere and see how people use it. If there is a significant amount of SSTV and it seems to be a semi-permanent usage, then we can always carve out a couple of channels later.

N6UOW:

So, the SS in SSTV stands for Slow Scan...and at 10 meters, I think the digital data was being sent at 300 bps...but I don't think it needs a full 100 kHz channel at 430.

My main concern was to think about how wide a carrier might be needed for some of the "new, high-speed" technologies...if we put an a low-speed channel in the 430 segment, we could be making it too crowded to host 2-4 high-speed channels.

I understand that the 802.11 wireless technologies are well above the 1 GHz mark, but I'd like to see us investigate how much room some newer modulation techniques will need.

There was a recommendation that the 430 segment be reserved for 9600 bps and above, and I think I like that proposal. How fast are the Kenwood SSTV portables capable of transmitting?

N6HM:
SSTV is only 3 kHz. It's a cross between digital and analog. The picture data is actually transmitted in an analog signal that swings between 500 Hz (white) and 1500 Hz, (1200 Hz is black and 1500 Hz is line sync.

Some of the suggested SSTV frequencies for international and national use are:
28.680 MHz
21.340 MHz
14.230 MHz
14.233 MHz

In Sunnyvale on 2 meters we are using 147.405 MHz a simplex channel.

WB6YRU:
I'd like to see medium speed TV, maybe 100 kHz to 1 MHz bandwidth.

Wed, 17 Jan 2001
WB6YRU:
If anyone has something for the next issue of the Downlink, please get it to me by February 1.

Mon, 12 Feb 2001
WB6YRU:
ATV at 70 cm

The latest general band plan (that NCPA and NARCC worked out) has ATV at 425-431 MHz. There is some sharing with links between 425 and 426.

Packet Sysops of Northern California
Packet Bulletin Board Systems
November 2000

Call-SID	Location	User Ports
WH6IO	Benica	144.99, 145.71&+, 145.75&, 433.43&+
N6EEG	Berkeley	144.97
KE6I	Berkeley	145.01&, 433.43&
N2THD-1	Citrus Heights	145.07, 441.50
WA6YLB	Exeter	145.69
N6QMY-1*	Fremont	144.31, 441.50
N6CKV	Gilroy	144.99
N6LDL	Los Gatos	144.97, 145.71&, 441.50
WA6NWE-1	North Highlands	144.93, 145.09, 145.75, 441.50
KD6DG	Redding	145.09
WD6CMU	Richmond	144.97
W6CUS-1	Richmond	145.63
N0ARY-1	San Jose	144.93, 433.37&
KD6JZZ	Sonora	144.97
WA6EWV-1	South Lake Tahoe	144.97
W6YX-9	Stanford Univ	145.75+
W6SF	Stockton	144.99
K6MFV	Walnut Creek	144.31, 145.71&+
K7WWA*	Willits	144.31*, 145.69*

Keys:
& = 9600 Baud Port
+ = TCP/IP Port
* = Currently Inactive

NARCC has proposed shifting the ATV channel up a little to 426.50-431.8xx and only recognizing it for simplex. This will take a big bite out of the mixed/experimental segment at 431-432, but there is another mixed/experiment segment at 434-435 MHz.

Digital segments at 70 cm

NARCC's board just noticed a few Aux/links in their database 433.05, 433.975, 438.625, and 438.640) and would like to "grandfather" those into the digital segments. 433.975 probably wouldn't be a problem since it's at the edge of that digital channel; however, the ones at 438 may be more of a problem. I mentioned that 433.05 shouldn't be there at all and NARCC played a major hand in making that a digital channel back in the late 1980's. It's not clear yet if these currently active stations.

N6UOW:
If the 438 users are not current, they should not be grandfathered. If the 438 users are current, they should be encouraged to move. If NARCC feels the need to take 80 percent of one allocation, I'd feel much happier about the encroachment if they tried to remove the old users from the second segment.

Mon, 12 Feb 2001
WB6YRU:
An ATV station showed up around 433.17 a few weeks ago. Since the BBS backbone is on 433.15, the nodes are having trouble hearing each other. The culprit has been identified as Ben Carlucci W2NYC/K6BEN in San Jose.

Ben has been contacted by N6IYA, but he seems reluctant to change frequencies. We're working on it (the ARRL SCV SM and NARCC have been notified).

NARCC has yet to update/correct the band plan on their web page, but I'm told they're working on it.

Mon, 12 Feb 2001
Steve Rubin, KG6DFV:
There are a lot of satellite downlinks between 435-437 MHz that I have had an terrible time receiving lately due to some ATV activity in the 433 MHz area (it basically covers most of 433-439 MHz). Working most of the sat's in the evening has been next to impossible some days.

WB6YRU:
A while back we debated whether ATV at 434 would interfer with satellite operations at 435-438. This just confirms that my suspicions were correct, evidently it does. It probably also bothers the weak signal folks at 432-433.

The ARRL plan has ATV at 426.0-432.0 MHz. Should we counter propose to NARCC the ATV channel be made to agree with the ARRL plan instead of 426.5-431.8x MHz?

N6UOW:
I'm in favor of the ATV channel matching the ARRL frequency.

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DX Spotting Nodes

June 2000

Location	Call	Alias	Frequency	Coverage
California City	K6ZZ		144.490	Antelope Valley area
	EARN8		144.490	Oak Peak
Castro Valley	W6RGG	DXCV	145.770	East, West, South SF Bay area
Chico	K6EL	DXC	145.670	Chico
	K6EL	DXW	145.670	Oroville, Red Bluff
	K6EL	DX	144.950	South Fork Mtn - Redding area
Hanford	K6UR	DXFRES	144.950	Bear Mtn, Fresno area
	K6UR	DX7	145.770	Mt. Adelaide, Bakersfield area
	K6UR	DX16	145.770	Oakhurst
Livermore	NF6S	DXL	145.770	Tri-Valley area
Los Gatos	N6ST	DXLG	146.580	Santa Cruz Mtns, Monterey Bay
	N6ST	DXF	146.580	Santa Cruz/Los Gatos
Mountain View	K6LLK	DXMV	144.950	Mountain View, San Jose area
Oakdale	K6OQ		146.580	Modesto area
Penngrove	K6ANP	DXANP	145.670	Sonoma County
Reno, Nevada	N7TR	RENODX	144.950,146.58,441.500 (2400 baud), 51.7	
	N7TR	PCDX1	146.580	Low Level in Reno
	N7TR	PCDX	144.950	Virginia City, NV
	N7TR	DX2400	441.500 (24OO baud)	
Rio Linda	K6NP	DXRL	144.950	Sacramento, Woodland, Davis

Bob Vallio - W6RGG wsixrgg@crl.com

Northern California Packet Band Plan

N C P A October 2000

50 MHz

50.60-50.80 (20 kHz channels, non-specific at this time)
51.12 SCA backbone
51.14 BBS
51.16 Keyboard to Keyboard
51.18 Experimental
51.62 TCP/IP, 9600 baud
51.64-51.68 (20 kHz channels, non-specific at this time)

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144 MHz

144.31 BBS
144.33 Balloon & experimental
144.35 Keyboard to Keyboard
144.37 BBS LAN forwarding
144.39 APRS (U.S. and Canada)
144.41 duplex, lower half (145.61 upper half, 1.2 MHz split)
144.43 TCP/IP (OK to run duplex with 145.65)
144.91 Keyboard to Keyboard
144.93 BBS
144.95 DX Spotting
144.97 BBS
144.99 BBS
145.01 User access
145.03 Keyboard to Keyboard
145.05 Keyboard to Keyboard
145.07 BBS
145.09 BBS
145.61 duplex, upper half (144.41 lower half)
145.63 BBS
145.65 TCP/IP 9600 bps (OK to run duplex with 144.43)
145.67 DX Spotting
145.69 BBS
145.71 9600 bps
145.73 BBS
145.75 TCP/IP
145.77 DX Spotting
146.58 DX Spotting

NOTES:
• Allocations from 144.31 through 144.43 are relatively close to the weak-signal sub-band--watch your deviation.

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220 MHz

219.05-219.95 100 kHz channels, Backbone
223.54 LAN
223.56 LAN
223.58 LAN, Gilory (GARLIC)
223.60 LAN, Sacramento Valley (SACVAL)
223.62 LAN, South Bay (SBAY)
223.64 TCP/IP
223.66 Keyboard to Keyboard
223.68 DX Spotting Backbone
223.70 LAN, Monterey Bay & North Coast (MRYBAY)
223.72 LAN, North Bay (NBAY)
223.74 Backbone, DX Spotting

NOTES:
• 219 channels are by coordination only. There are currently political problems with using 219-220, making them unavailable in most of northern CA.
• On 223.58, TCP/IP interlink (Sacramento) is secondary, not to interfere with node uplink.

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440 MHz

433.05 TCP/IP backbone (100 kHz)
433.15 BBS backbone (100 kHz)
433.25 DX Spotting backbone (100 kHz)
433.33 Experimental (60 kHz)
433.37 BBS, 9600 baud
433.39 DX Spotting
433.41 BBS LAN
433.43 9600 baud TCP/IP
433.45 BBS LAN
433.47 Keyboard Interlink
433.49 TCP/IP
433.51 Keyboard
433.53 Keyboard
433.55 BBS LAN
433.51 - 433.70 (20 kHz channels non-specific at this time)
433.75 / 438.45 Duplex (100 kHz)
433.85 / 438.55 Duplex (100 kHz)
433.95 / 438.65 Duplex (100 kHz)
441.50 Any digital

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900 MHz

903.500 1 MHz wide, TCP/IP
904.500 1 MHz wide, TCP/IP
915.500 1 MHz wide, experimental
916.100 200 kHz wide, experimental
916.300 200 kHz wide, experimental
916.500 200 kHz wide, experimental
916.650 100 kHz wide, experimental
916.750 100 kHz wide, experimental
916.810 20 kHz wide, experimental
916.830 20 kHz wide, experimental
916.850 20 kHz wide, experimental
916.870 20 kHz wide, experimental
916.890 20 kHz wide, experimental
916.910 20 kHz wide, experimental
916.930 20 kHz wide, experimental
916.950 20 kHz wide, experimental
916.970 20 kHz wide, experimental
916.990 20 kHz wide, LAN links (Contra Costa County only)

900 MHz activity is on a non-interference basis to vehicle locator

service. This sub-band is not considered suitable for omnidirectional systems. Use for point-to-point links only.

1296 MHz

1248.500 1 MHz wide, experimental *
1249.000-1249.450 Unchannelized, experimental
1249.500 100 kHz wide, experimental
1249.600 100 kHz wide, experimental
1249.700 100 kHz wide, experimental *
1249.800 100 kHz wide, experimental*
1249.870 20 kHz wide, experimental
1249.890 20 kHz wide, DX Packet Spotting
1249.910 20 kHz wide, experimental*
1249.930 20 kHz wide, experimental*
1249.950 20 kHz wide, experimental*
1249.970 20 kHz wide, experimental*
1249.990 20 kHz wide, experimental*
1250.500 1 MHz wide, experimental
1251.500 1 MHz wide, experimental
1297.000-1298.000 Unchannelized, experimental
1298.500 1 MHz wide, experimental*
1299.000-1299.450 Unchannelized, experimental
1299.500 100 kHz wide, experimental
1299.600 100 kHz wide, experimental
1299.700 100 kHz wide, experimental*
1299.800 100 kHz wide, experimental*
1299.870 20 kHz wide, BBS LAN
1299.890 20 kHz wide, DX Packet Spotting
1299.910 20 kHz wide, BBS LAN
1299.930 20 kHz wide, experimental*
1299.950 20 kHz wide, experimental*
1299.970 20 kHz wide, experimental*
1299.990 20 kHz wide, experimental*

* Full duplex channel pairs at 50 MHz separation, example:
1249.910 1299.910

Definitions

9600 BPS Stations using 9600 baud with direct FSK (G3RUH, TAPR, etc.) modems.

Backbone No uncoordinated stations. These channels are for specific purposes as defined by the NCPA and/or affiliated groups. These are frequencies where the various BBS, nodes, and networks forward traffic and are very high volume channels. Please use the normal user entry points of the network you want to access rather than these channels.

BBS These frequencies are for user access to a full-service BBS. Keyboard-to-keyboard is tolerated. Please don't put high level nodes or digipeaters on these channels since they are local. A low-level direct link or node that links into a backbone on another frequency is the proper implementation.

Duplex Simultaneous transmit and receive by a single station, including digital repeaters. Duplex channels are intended for high-volume applications. 9600 baud or higher is encouraged, but not required at this time.

DX Spotting Northern California DX packet spotting network. No other activity should be on these channels.

Experimental Anything goes except full service BBS or any 24 Hr/Day services (nodes, gateways, etc). This is where you can test new gear, programs, etc. These channels may be reassigned in the near future, so no permanent activities please.

Forwarding same as *backbone*

Keyboard to Keyboard Primarily chat channels. These are also the primary emergency channels. No high-volume activity such as full service BBS, DX Spotting, TCP/IP, etc.

Interlink same as *backbone*

LAN Local Area Network. BBS's are grouped into LAN's for more efficient forwarding. A LAN frequency is the forwarding channel within a LAN and to the backbone. Please do not attempt to access the BBS network on these channels.

Personal mailbox/maildrop A BBS-like system, often running entirely within a TNC, with a small number of users that handles information of a personal, local or special-purpose nature. A mailbox is allowed on keyboard-to-keyboard channels ONLY if it does not forward with other BBSs. Mailboxes may forward with full-service BBSs on LAN channels at the discretion of the BBS SYSOP.

TCP/IP Stations using TCP/IP protocol on top of AX.25. Some AX.25 tolerated to communicate to TCP/IP stations if a compatible p-persistence access method used.

User Access User access to a network. This is for the next generation of packet which is expected to operate like the internet. Users would access such a network on these frequencies. The load on these channels may be rather high, like BBS channels. The activity may be any combination of BBS, keyboard, TCP/IP, or
other modes.

Procedure for changes

Send requests for changes to either the frequency coordinator or the NCPA board. The frequency coordinator will then present the request to the board along with suggested assignments. The NCPA board, elected by you, the packet user, makes all assignments.

Misc. Info.

Packet tends to splatter if the deviation is set too high. Please keep your deviation to less than 5 kHz.

Except for the 219-220 MHz segment, the NCPA currently does not coordinate individual stations, nodes, etc. leaving that to the special interest groups. BBS station coordination is done by the PSNC in Northern CA. DX spotting is coordinated by DXPSN. Some digital has bee coordinated on auxiliary channels by NARCC.

The NCPA board conducts most of its meeting activity electronically by internet e-mail remailer, ncpa@qth.net. As with face-to-face board meetings, interested persons are welcome. Subscribe to the remailer by sending e-mail to majordomo@qth.net with "subscribe ncpa" as the message. Subscribing to the remailer is like attending a continuous NCPA board meeting.

Overall Band Plan in Northern California

ten meters and above **November 2000**

Notes:
This band plan is a joint effort by NARCC (www.narcc.org) and the NCPA (www.n0ary.org/ncpa). As of this printing, ten meters through 70 cm are pretty much settled. The bands 33 cm and above are in progress, what appears here is tentative. There is still some question regarding the ATV channel at 70 cm. NARCC is proposing it be moved up slightly and be made simplex. It's not yet clear what they intend to do about existing ATV repeaters.

Individual channels are 20 kHz wide, unless otherwise noted.

Simplex – FM voice
RC – Remote Control

Other sources:
Weak Signal: WSWSS (Wester States Weak Signal Society) www.wswss.org.
Satellites: AMSAT www.amsat.org.
ARRL: www.arrl.org.

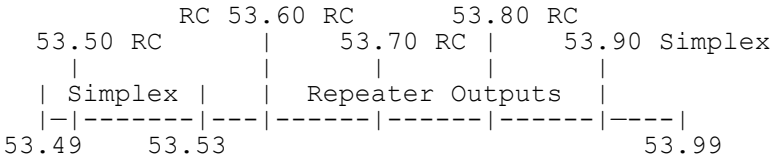
TEN METERS ==========

```
                                    SSTV 28.68  29.0   29.2
                                                |      |- AM -|
  | CW          | CW and  | CW & beacon |    |      |      |
  | Weak Signal | Digital | Weak Signal |  Phone (no FM)   |
  |-------------|---------|-------------|---|------|------|-|
28.0          28.07     28.190        28.3               29.3


      National simplex 29.60
                       |
              | Repeater | Repeater |
  | Satellite | Inputs   | Outputs  |
  |-----------|----------|----------|
29.30       29.51      29.60      29.70
```

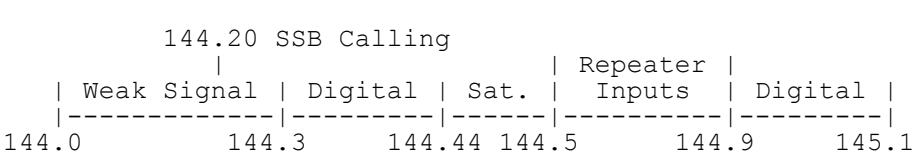
Note: Automatic beacons are limited to 28.20 - 28.30

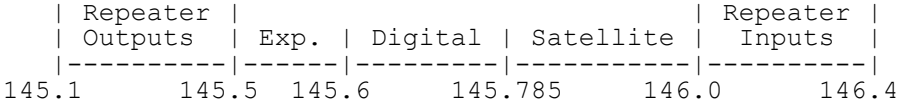
SIX METERS ==========

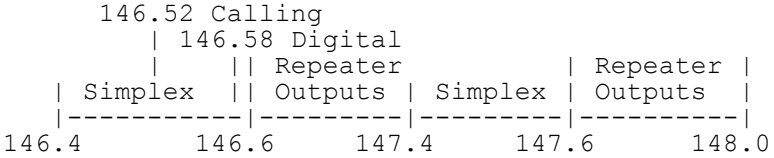
```
      50.12 SSB Calling
        |         50.40 AM Calling
        |           |                 | Remote  |  Weak  |
  | Weak Signal | All Mode | Digital | Control | Signal | Digital |
  |-----|-------|--|-------|---------|---------|--------|---------|
50.0          50.3       50.6      50.8      51.0     51.11     51.19


  | Repeater |                   | Repeater |         | Repeater |
  |  Inputs  | Simplex | Digital | Outputs  | Simplex |  Inputs  |
  |----------|---------|---------|----------|---------|----------|
51.19      51.49     51.61     51.69      51.99     52.05      52.49


                                  RC 53.20       RC 53.40
                              RC 53.10  |  RC 53.30    |
           | Repeater |           |    |       |      |
  | Simplex | Outputs  | Simplex | |  Repeater Inputs  |
  |---------|----------|---------|-|----|-------|------|---|
52.49     52.55      52.99     53.03                     53.49
```



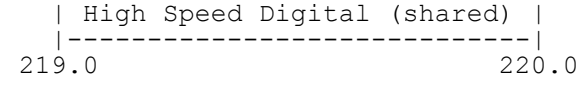
TWO METERS ==========

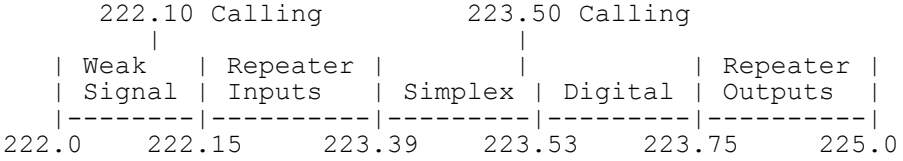




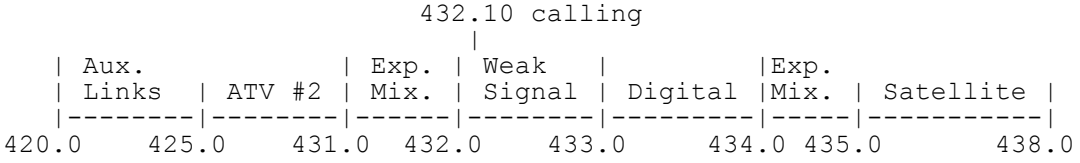


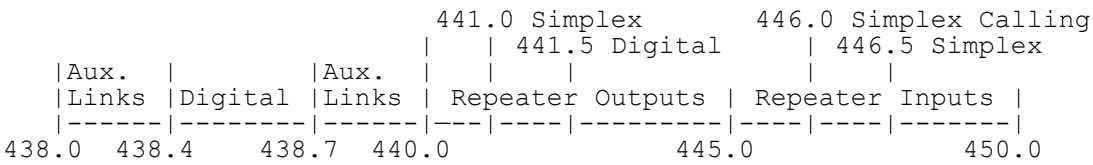
1.25 METERS ==========



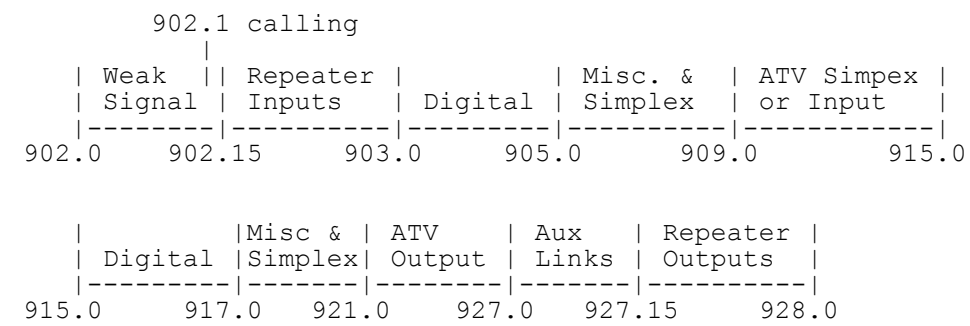


70 cm ==========



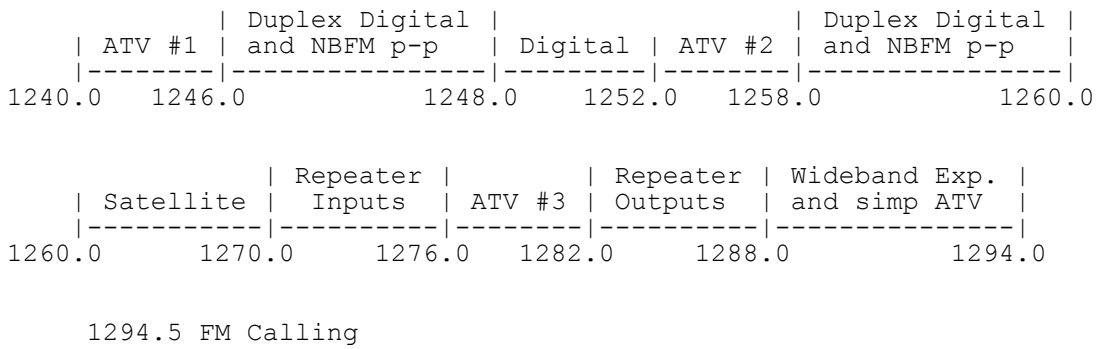


33 cm ==========

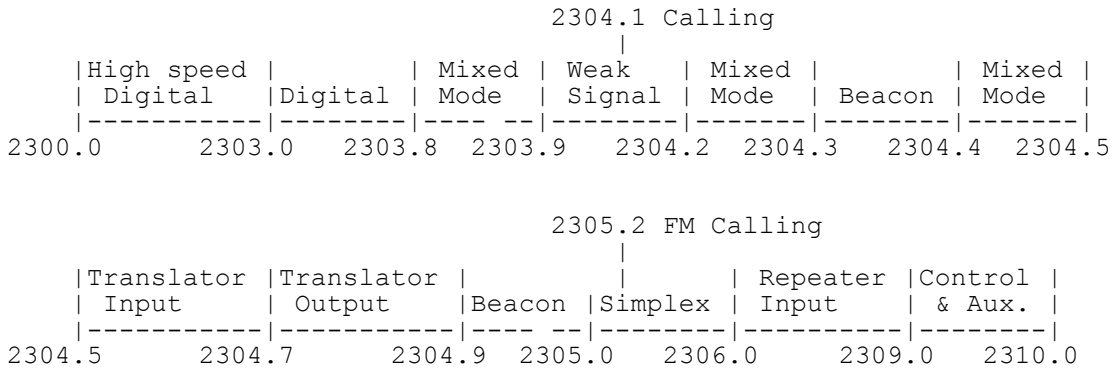


Amateur is secondary in this band.

23 cm ==========



13 cm ==========



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