

CHAPTER 16

630M STATION OPERATING ETIQUETTE AND BAND PLANNING

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WSPR FREQUENCY

630 m transmitting stations generally use the **same WSPR frequency night after night**. Not only are fewer retuning adjustments needed but also the frequency itself becomes a possible station identifier on long paths when decodes may not always occur. Moreover, appearance of an decoded WSPR trace can herald possible upcoming DX decodes. When all the WSPR stations in a given region establish nominal WSPR frequencies separated by about 10 Hz or more, mutual interference and unnecessary frequency-hunting to avoid potential interference is also reduced. In reality, this may not always be possible and a “live and let live” etiquette prevails. Some WSPR stations may also have a purpose in changing frequency from time to time, and they have a perfect right to do so. Sometimes a WSPR station may move frequency to allow same-region WSPR receiving stations to decode a DX station occupying the same frequency.

WSPR TRANSMIT PERCENTAGE

630m WSPR stations generally send about **5-15 slots/hour (15%-50% TxPct)**. This way, they can not only hear other WSPR transmitting stations but also those other stations take time to decode and thereby provide reports to each transmitting station.

It is also understood that DX receiving stations may need high TxPcT from a WSPR transmitting station to obtain a useful number of decode or to achieve a decode from the TX station at all. (For an example, see 11/20/16 WE2XPQ TP opportunity in *Chapter 17*.) Likewise, a WSPR station transmitting less than 1 watt EIRP may likewise need to employ a high TxPct rate.

WSPR AND REFLECTOR POST BEFORE USING QSO MODES

Because WSPR can be decoded at lower SNR than most QSO modes, it’s generally a good idea to send WSPR and make sure that you are being decoded prior to QSY and attempting a 630m QSO. Since WSPR transmissions generally lack any indication whether a mode change or QSY might be upcoming, it’s wise to post any non-WSPR operating plans for a night including mode, time (Zulu) and frequency. Because of your antenna type and station construction, you may need to omit WSPR and set up on a non-WSPR mode and operating frequency because of the convenience and time needed to do so. In that case, a reflector post beforehand is sufficient. <http://www.on4kst.org/chat/login.php?band=4> (Then select chat for 2000-630m).

11/15/16 PART 1. THE FUTURE: HOW TO FIT HUNDREDS OF HAMS INTO 630M?

Someday 630m will become a reality for amateurs in USA. It’s possible that hundreds of technically savvy USA amateurs will want to not only receive but also transmit on 630m. How will all these people fit into only 7 KHz? Today, let’s talk about some of the basic principles of 630m technology and operations insofar as they pertain to this topic.

First of all, 7 KHz – 472 to 479KHz – is not as impossibly narrow a bandwidth as a newcomer's HF-conditioned mental reflexes would suppose. If we think **one unit of bandwidth**

10 Hz that easily encompasses the bandwidth of one WSPR station, then **630m** spaciouly spans **700 units of bandwidth** if used entirely for WSPR beaconing.

JT9 fits in 3 ten-Hz units of bandwidth. Do the arithmetic for your other favorite **digimodes** too. Most 630m **CW** transmissions occupy about **5-10 units** of bandwidth when using good practice forming the keying waveshape.* **SSTV** employs perhaps 20-30 units of bandwidth.

Consider also **lower EIRP stations**, less than 27 dBm EIRP (500mw) for instance. For those stations, 630m most nights has a spatially limited range even during common darkness. That range comprehends perhaps one-half the area of the USA. On opposite coasts, 630m stations can ordinarily use the same frequencies for communication with other stations within their region without interfering inter-regionally. Such spatial multiplication of 630m band capacity to hold lower-EIRP stations can apply a factor of two or more. For stations running less than about 17 dBm EIRP (50 mw), the spatial multiplication of 630m capacity may be as much as 5-10.

Time-sharing the bandwidth for QSOs likewise multiplies the station capacity of 630m. **Simplex CW** is the norm for CW on 630m, whereby two stations use the same frequency alternately to do a CW QSO. Consequently, even though CW occupies several units of bandwidth, that bandwidth span applies to *pairs* of stations for band capacity purposes.

Daytime considerably shortens the range of even full-power 630m transmissions to a ground wave range of about 500km, except during unusual daytime 630m propagation events. Lower-48 USA has 8 million km² area. So the spatial multiplication of daytime 630m bandwidth is roughly a factor of 8, i.e., $8M/(2 \times 500)^2$.

When considering the subject of 630m band usage, one takes into account technological constraints and operating customs. Varying one's operating frequency on HF can be as simple as adjusting the transceiver dial. **630m ops change their frequency only for a very good reason** such as going from WSPR to JT9 or CW and back again. Changing one's frequency even half a KHz could require re-matching at some stations, say, in the middle of the night when you would prefer to avoid the inconvenience. Moreover, 630m WSPR practice often favors one relatively predictable frequency per station. When WSPR stations each use a predictable frequency, other stations can tentatively identify by the frequency of their trace on a waterfall display a station that is initially too weak to decode.

CW and QRSS can often be seen but not heard--an interesting special case. Either a real-time waterfall or a time-compressed QRSS display may readily show the signal down to -30dB SNR or more, but the audibility does not begin until roughly -13dB or stronger. Accordingly, these modes generally need to occupy 630m frequencies where they will not be confused with WSPR.

Design decisions built into the WSJT-X software default to 475.700+/-100 Hz for WSPR2, and 200 Hz or so lower for JT9. WSPR15 has 25 Hz just above the WSPR2 band. These defaults have shaped operating customs on 630m. **WD2XSH band planning** has interacted with 630m operating practice as well.

Whatever the technological facts and customs may be, I regard them as the ingredients out of which we will "bake" 630m band planning either by unplanned evolution or by some deliberate band plan process. Tomorrow, let's talk about the band plan thinking and customary practice we have on hand already and where the technological facts might lead us if and when more densely packed 630m band usage becomes imminent. Educate us with your experience and best wisdom too. TU & GL!

* For CW bandwidth info and discussions, see:

http://www.w8ji.com/cw_bandwidth_described.htm

https://www.google.com/?gws_rd=ssl#q=CW+necessary+bandwidth (scroll 50%)

<http://www.eham.net/articles/16649> (scroll 5%).

11/17/16 PART 2. THE FUTURE: HOW TO FIT HUNDREDS OF HAMS INTO 630M?

In yesterday's blog, I observed that 630m spans 700 ten-Hertz units if one thinks of WSPR bandwidth roughly that way. JT9 fits in 3 ten-Hz units and CW occupies 5-10 such units. Low EIRP spatially multiplies 630m band capacity by a factor of 2 or more. Daytime spatially multiplies 630m bandwidth by about 8 times--think about station allocations and daytime operation of AM BCB stations. CW is simplex, so it time-shares pairs of stations in QSOs.

In the realm of 630m customs and technology, design decisions built into the WSPR and WSJT-X software have interacted with 630m operating practice. 630m ops using some station designs need to re-match the antenna on QSY from WSPR to JT9 or CW. WSPR stations tend to stay on a frequency they've established. CW can be seen but may not get heard because of disparate visibility and audibility thresholds. So 630m ops generally move away from the WSPR band to do CW or QRSS after WSPR reaches audibility SNR levels.

What do these observations mean for the future of 630m band planning, whether deliberate or de facto? Today, let's first look at what's already been thought out!

In IARU Region 1, see this 2014 recommendation: <http://www.472khz.org/pages/on-the-air/band-plan.php>. You can see some detailed background thinking from Australia hams by clicking on the endnote links here, below.*

'472.0-475.0 CW

475.3-475.6 Weak signal "QSO" digimodes (JT9-1, WSQ)

475.6-475.8 WSPR

476.1-476.3 QRSS/DFCW (Europe)

477.6-477.8 QRSS/DFCW (North America)

478.5-478.8 Opera'

IARU Region 2** and Region 3*** documents do not attempt frequency details within the 630m band, insofar as I've been able to find them.

WD2XSH band planning is posted at <http://www.500kc.com/>. Look under "Band Plan and Station Frequency Assignments for the 'Low Band' of 465 - 478 KHz." Scroll 20% to link to "WD2XSH Band Plan for 461 - 478 kHz" by Fritz Raab W1FR, Rev. B, Oct. 14, 2012. I've excerpted the section covering 475-478 KHz for particular focus:

' 476 - 478 WD2XSH CW/data beacons (40 x 50-Hz spacing)

475.6 - 475.8 WSPR

475.3 - 475.35 QRSS 50 x 2-Hz spacing

475 Calling '

Also, see the WD2XSH 2010 495-515KHz band plan at <http://www.500kc.com/rules.htm>. This includes a two 200Hz wide DX windows spaced about a KHz apart. While this band plan was created with WD2XSH project stations in mind, its implicit concepts are nevertheless worth considering.

I'll say more in another blog post. Point us to other pertinent documents that I might have missed. And share your experiences and views on 630m wise usage with this blog too!

* See Wireless Institute of Australia update: <http://www.wia.org.au/members/bandplans/data/>
See also an earlier report by Wireless Institute of Australia leading up to the Region I plan:

<http://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&ved=0ahUKEwiepta73qjQAhUG3yYKHeT7BBQQFggbMAA&url=http%3A%2F%2Fwww.wia.org.au%2Fmembers%2Fbandplans%2Fdata%2Fdocuments%2F630m%2520BAND%2520PLAN%2520REPORT%25202014-09-22.pdf&usq=AFQjCNFZW7ELoFsAKDXpkN5wmgBFP5CEiA&bvm=bv.138493631,d.eWE>

** In the recently adopted 10/14/16 IARU Region 2 bandplan for 472-479 KHz, CW and digital modes are entered. <http://www.iaru-r2.org/new-band-plan-for-region-2/> A note on careful band usage by automatically controlled data stations is included.

*** In Region 3, the 472-479 band plan recognizes narrow bandwidth modes including CW, RTTY, Packet and modes with similar bandwidth not exceeding 2 kHz. <http://iaru-r3.org/documents/> (Scroll & download “R3-004 Region 3 - Band Plan.”)

11/18/16 PART 3. THE FUTURE: HOW TO FIT HUNDREDS OF HAMS INTO 630M?

The Nov. 15 blog discussed some bandwidth concepts of spatial multiplication and time-sharing on 630m. 630m customs and technology were considered. The November 17 blog surveyed 630m band planning in IARU Regions 1, 2, 3 and the WD2XSH band planning.

Today’s **illustration** shows my speculation what a 630m band plan might look like a few years from now in Region 2. WSPR will continue to usefully aid 630m propagation reporting and operators’ decisions when to change from WSPR to a digital QSO mode or CW. I presume that 630m QSY will continue to be somewhat inconvenient for many stations. So let’s put space for QSO modes close to the WSPR band.

Moreover, in a scenario of hundreds of hams on 630m, I think it makes sense to **band plan every kilohertz with JT9, WSPR2, & WSPR15** (purple, red, blue) in the same relative frequency positions every kilohertz. That way, hams operating in each kilohertz segment or “neighborhood” of 630m can change frequency by as little as about 80 Hz (47x.790 QSY to 47x.870) or as much as about 750 Hz (47x.790 QSY to 47x.040) depending on what WSPR frequency they start from. Of course they can QSY further into other kilohertz neighborhoods as they wish, subject to the bandplan recommendations there.

This imagined **repetition every kilohertz** assumes that RX antenna systems and receivers are much more robust across the whole 472-479 band than post-TX couplers and TX antenna systems often are. **TX frequencies would tend to stay moderately anchored** in their neighborhoods due to the technologically-imposed inconvenience of QSYS, moderate and extreme.

In a future context of high amateur usage of 630m, the **RX side** of the station should be able to **upload spots of WSPR and other digimodes decoded from anywhere in the band** and to **detect a response to one’s CQs from anywhere in the band**. Among other things, kilohertz repetition motivates possible **extensions of SDRs and WSJT-X to conveniently decode WSPR from multiple kilohertz neighborhoods**. You may already have information to share about your experimentation with multiple receivers and SDRs, and you may have already set up CW spotter software and/or multiple instances of the WSPR2-15 & JT9 decoders on your computer(s). Help us blog your techniques!

Customary usage would continue on the 630m band. WSPR and JT9 in the historic **475 “Kilohertz Center”** of today’s 630m would spread out to the kilohertz neighborhoods on either side as the band fills up with hams in future years. Current CW calling and QSOs in the 474-5 and 476-7 full kilohertz neighborhoods would also continue.

Indeed, CW and all QSO modes would find **plenty of QSO capacity in the dashed-line “wings”** of every kilohertz neighborhood astride the WSPR bands. The **international CW calling frequency** would continue 472.5. Entire 472 and 478 full kilohertz neighborhoods would be especially appropriate for transoceanic nighttime DXing as a specialty. **CW DXing would rule top and bottom:** 300 Hz seated at 472 KHz and likewise the top 175 Hz nudging 479 KHz.

Operation at 630m’s extreme ends is not common today due to antenna retuning and QSY difficulty from Kilohertz Center. But in a highly active future, the 472-3 and 478-9 kilohertz neighborhoods would attract aficionados. That said, **DX is welcome on any mode, and any power anywhere in the 630m band**, subject only to the governing regulations of applicable country and regional bandplan there.

Beyond the suggested legends, I leave whatever may be the mutual interference possibilities between modes to be ironed out by compliance with governing regulations, evolving custom, and plain old good sportsmanship in the ham spirit.

I would reserve 473.000-.999 for transmissions only by stations having **EIRP less than 27 dBm (500mw)**. This **473 single-kilohertz** neighborhood would inherently enjoy spatial bandwidth multiplication by a factor of at least two. Low-power stations could still transmit anywhere in the 472-479 KHz band along with higher power stations subject to modes recommended in the band plan. **SSTV’s 200 Hz bandwidth and low EIRP density in mw/Hz** easily fits into two channels in **477.825-478.3 KHz** in local “greater nighttime” and all dashed areas 472-478.3 KHz in local daytime. If a digital voice mode can fit where SSTV is shown, that’s fine to use too.

“Short Daytime” would abrogate the recommended 27 dBm power limitation in the 473 neighborhood. Short Daytime would mean the interval beginning one hour after local sunrise and ending one hour prior to local sunset. (Thanks to various websites, every station can quickly determine the times of their local sunrise and local sunset.) That way, time for stations to **explore the post-sunrise and pre-sunset propagation regimes** would be assured.

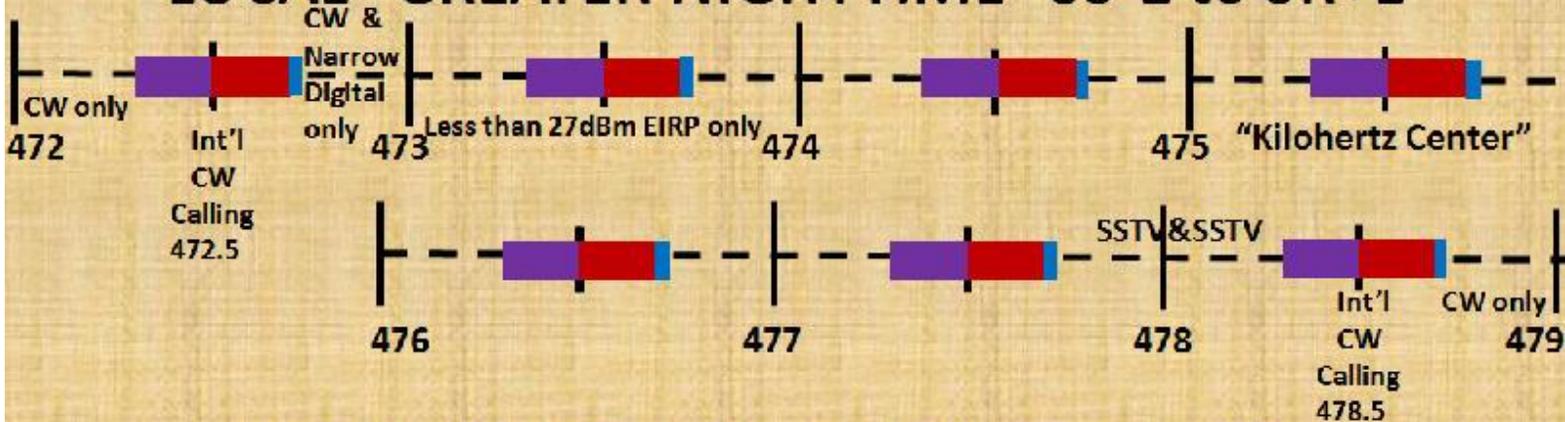
Because of the 8x spatial multiplication of band capacity in Short Daytime, wideband modes like USB and LSB single sideband and experimentation with any other modes up to similar bandwidth would be invited in the range 476.825-479.000 KHz. Long-distance daytime propagation events would be wide open to amateurs all over the band. Such 630m daytime prop events are particularly frequent in late fall and mid-winter and occur more occasionally all year long.

This post represents just my attempt at thinking about the topic, of course. I recognize that others have deeper experience. Readers, **tell us your insights and better bandplan wisdom** for IARU Region 2. If you live in another IARU region especially, do suggest what improved provisions you think band planning in your region should consider. TU!

ONE MORE 😊 630M BANDPLAN IDEA

“” : JT9, WSPR2, WSPR15. CW and other modes: “”

LOCAL “GREATER NIGHTTIME” SS-1 to SR+1



LOCAL “SHORT DAYTIME” SR+1 to SS-1

