Ten metres for the newcomer

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Introduction

Ten metres (28.000 - 29.700 MHz) is one of the most interesting bands available to the radio amateur. No band supports a greater variety of amateur activity than ten metres - you will hear SSB, AM, CW, FM, repeaters, satellites, DX, award-chasing, contesting and local nets at various times.

Local, interstate, and international contacts are all possible on 28 MHz. Portions of ten metres may be used by all licence grades. The band's wide open spaces and spectacular openings win it many adherents during the peak years of the sunspot cycle.

Ten metres is the HF band most prone to variations due to the eleven year sunspot cycle. During the bottom years, it is possible to go for months without hearing any overseas stations on ten, but long-distance contacts are an everyday

occurrence when sunspot activity is high.

We are currently (2012) approaching the peak of sunspot cycle 24. This is good news to ten metre operators, as openings will become more frequent and produce stronger signals as we approach the sunspot peak.

A propagation mode known as sporadic-E provides contacts on ten metres during all phases of the sunspot cycle. Sporadic-E can occur at any time but is most prevalent in summer. Distances covered typically range between 500 and 1500 kilometres, making sporadic-E a useful (but not reliable) propagation mode for contacts within Australia. Signals are often very strong. Mobile stations can do as well as home stations during a good opening.

When there is no long-distance propagation, ten metres is a good band for local operating. Noise levels are lower than on 80 or 160 metres, and antenna requirements are less (particularly for mobile stations). The lack of crowding makes also makes operating easier. The range and variety of contacts possible is enhanced if your area is lucky enough to be within range of a ten metre FM repeater or simplex gateway linked to VHF or UHF.

Beacons and Repeaters

Because ten metres is 1.7 MHz wide, there is room for modes and activities that would cause interference if carried out on the lower HF bands.

One such activity is beacons. Local clubs have installed beacons to let overseas stations know when ten metres is open to their area. These beacons transmit continuously and send their callsign in Morse. Beacons can normally be found between 28.200 and 28.300 MHz. The WIA website and callbook lists Australian ten metre beacons.

A special worldwide network of beacons operates on 28.200 MHz as part of the International Beacon Project (IBP). All beacons share the one frequency and are timed so that only one transmits at a time. Australia's IBP beacon is VK6RBP in Perth. IBP beacons also operate on 20, 17, 15 and 12 metres.

Ten metres is most similar to the VHF/UHF amateur bands when it comes to FM and repeater activity. However, ten metres has the added advantage of providing international FM contacts via repeaters during high sunspot years. To use the repeaters, you need a 10 metre FM transceiver that can be set up to transmit and receive on different frequencies to accommodate the repeater's 100 kHz frequency offset.

Repeaters permit contacts that would not ordinarily be possible. For example, a station in Sydney may not be able to hear a station in Canberra, but both may be able to communicate via a repeater in Brisbane. Repeater operation gets more interesting if the repeater is also able to retransmit signals from other bands. The four standard ten metre repeater channels in use around the world are listed below:

Input 29.520, Output 29.620 MHz
Input 29.540, Output 29.640 MHz
Input 29.560, Output 29.660 MHz
Input 29.580, Output 29.680 MHz

Commercial equipment

All current-model HF transceivers cover the entire ten metre amateur band. However, before buying, check that FM is offered (as some budget HF-only transceivers do not include it).

Those whose budget does not extend to the price tag of a new multiband transceiver may wish to consider buying a 28 MHz-only set (sometimes available secondhand). Transceivers like these would be particularly suitable for mobile/portable operation or as a second rig for the 10 metre enthusiast. However, their cost is not much less than a basic used multiband SSB transceiver on the second-hand market, which makes them poor value. The newcomer to amateur radio

should consider the extent to which they will want the other HF bands before buying a 10 metre-only set.

Be careful when buying secondhand gear. Some very old valve transceivers did not cover ten metres at all. Other models did include ten metres, but had deaf receivers and/or put out reduced power on 28 MHz.

Some older (1970s) sets covered only a single 500 kHz segment of ten metres. A 28.000 - 28.500 MHz range is not a great limitation as it includes coverage of CW, digital, beacon and popular SSB frequencies. However a set that tunes 28.500 - 29.000 MHz only is severely disadvantaged and should be avoided.

Converted equipment

If you have sufficient technical knowledge and the required information, it is possible to convert some models of 27 MHz SSB CB transceivers to operate on 28 MHz. If the modification is done properly, the results obtained are well worth the small cost involved. Some of the older AM-only sets can also be converted to ten metres, but this is not usually worthwhile unless you want local contacts only or have a special interest in AM operating.

It is also possible to convert sets to operate on 29 MHz FM. Either some types of AM-only 27 MHz CB radios or 30-50

MHz FM two-way radios can be converted. The need for coverage of the correct frequency range and inclusion of a 100 kHz repeater offset are complicating factors here.

You probably shouldn't attempt any but the very simplest modifications if you are a newcomer - it is very easy to mistakenly 'butcher' the set and render it permanently inoperative. If you still need a small cheap ten metre set, get someone else to do the modification for you, look for a used, already-converted CB.

Homebrew equipment

For some reason, there are few homebrew designs around for 10 metre amateur equipment. However, constructing one's own equipment on ten metres is certainly possible for the technically-inclined operator. VHF/UHF operators who wish to use 29 MHz FM but see no point in buying an HF rig should consider building a transverter to use in conjunction with a six or two metre FM transceiver.

Building an entire transceiver for ten metres is also practical. However, circuits for 28 MHz are usually more complicated than those for lower frequencies.

This is because: (a) the gain of power amplifier transistors falls as frequency is increased, so more stages are needed to achieve a given output power+ADs- (b) 28 MHz variable frequency oscillators are not as stable as lower frequency VFOs, hence the need for a PLL frequency synthesiser or premix VFO+ADs- (c) Because fundamental crystals are not common on 28 MHz, and overtone crystal oscillators are difficult to pull over a worthwhile frequency range, frequency multipliers are needed to obtain output from a lower frequency VXO+ADs- and (d) receiver gain needs to be higher on 10 metres than on other HF bands because noise levels are lower.

Nevertheless, for the constructor curious about what ten metres has to offer, a five to ten watt VXO-controlled CW or double sideband transmitter or transceiver should not be too hard to put together.

Antennas

Devoted ten metre enthusiasts often use a three to six element monoband yagi or quad. This type of installation allows you to work stations that cannot be heard on a simple dipole or vertical.

However, this does not mean that if you lack high power and big beams, you should give up on ten metres. It's quite the reverse - ten metres is often better than the lower bands if output power or antenna gain is restricted.

With 10-30 watts SSB and a small vertical (eg a mobile whip), it is possible to have dozens of satisfying contacts. During years of low solar activity, these contacts will be mainly within Australia and New Zealand, but the proportion of international contacts will rise with the sunspot count. The stations with the big beams generally have excellent receive capabilities, and can often hear the operator using a converted CB and a cut-down mobile whip.

A mobile whip mounted on a metal railing or balcony is ideal for omnidirectional coverage. Use a whip reasonably close to a full quarter wavelength (2.5 m) for best results. For the last three years, the author has successfully used a 1.8 metre 27 MHz CB whip cut down to resonate on 10 metres. A 90 cm whip has also been tried but its performance was well down on the larger whip.

The best antenna gain for the least expenditure is probably obtained from lightweight beams such as the VK2ABQ, Moxon Rectangle or even just a plain 2-element yagi made from wire.

Operating frequencies

All amateur licencees can use all frequencies on ten metres. However band plans should be observed to lessen interference to those using other modes.

In particular, never transmit between 28.198 - 28.300 and 29.300 - 29.500 MHz. The reason for this is that these segments are reserved for beacons and amateur satellites respectively. Following the 10 metre bandplan (see WIA website or callbook) maximises the chances of getting contacts and reduces the risk of causing interference.

Operating on ten metres

There are many times that ten metres is open, but you would not know about it by just tuning across the band. Beacons can help in monitoring propagation, but have their limitations - the band can be wide open to places where there are no beacons. If you suspect the band may be open, but no beacons can be heard, tune across the 27 MHz CB band (particularly 27.355 LSB) and the 29 MHz FM segment to get a better picture of propagation patterns.

If 27 MHz is busy, but there is nothing on 10 metres, it's up to you to create some activity. Several CQ calls in a popular part of the band (28.400 - 28.500 MHz) will often yield results, even when no beacons can be heard. If no results, change

frequency and resume calling - your original frequency may have been in use by people who you can't hear, but could be interfering with your transmission in some parts of the world.

As noted before, the stations with the best antennas are those best placed to receive weak DX signals. When conditions are marginal, you will still have contacts, but it will be only with the stations using the bigger antennas. As propagation improves, you will start to hear more stations using dipoles and verticals in addition to the 'big-gun' operators with the big beams and high towers.

Possessing a powerful transmitter and large antenna array may give you a big signal on ten metres, but does not in itself make you a successful operator. Operator persistence and 'being there' are the main determinants of success on ten metres. If you are listening and are not calling, everyone will think the band is dead and switch off. If you are keeping the band alive by calling CQ, the activity will come to you, and you will work DX, no matter how modest your station is.

Of course, all this calling requires both time and patience. However, technology can be used to automatically call CQ, leaving time for the operator to attend to other tasks while waiting for calls. In its simplest form, an automatic CQ caller can be a tape recorder with a 30 second endless loop cassette placed in front of the rig's microphone (transceiver set to

voice-operated transmit (VOX) mode). Other options include the use of a 20 second digital message recorder set up with a special timing circuit or even a suitable computer with sound capabilities. Whatever method is used, the switching between transmit and receive should be automatic - having manual switching detracts from the labour-saving benefits of an automatic CQ caller.

Of course, all this calling requires both time and patience. However, technology can be used to automatically call CQ, leaving time for the operator to attend to other tasks while waiting for calls. In its crudest form, an automatic CQ caller can be a tape recorder with a 30 second endless loop cassette placed in front of the rig's microphone (transceiver set to voice-operated transmit (VOX) mode). Other options include the use of a 20 second digital message recorder set up with a special timing circuit or a computer set up to play an endless loop. Whatever method is used, the switching between transmit and receive should be automatic - having manual switching detracts from the labour-saving benefits of an automatic CQ caller.

Conclusion

This article has given the reader a brief tour of ten metres, to many people HF's most interesting band. The band is set to explode with activity in the next few years. Will you be a part of it?

Acknowledgments

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Notes

This article is an abridged and updated version of a full-length article that appeared in *Amateur Radio,* October 1998.

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