

The Watson 80Plus2 Antenna

The Watson 80Plus2 designed by G3OJV and sold by [Waters and Stanton](#) is a compact antenna measuring 52 feet in length that is designed to cover the 80, 40 and 20 metre bands. It is a full-sized dipole on 20m, a linear loaded dipole on 40m and an inductively loaded dipole on 80m, creating an antenna that is resonant on all three bands, does not require a tuner and is small enough to fit into gardens that could not otherwise accommodate an 80m antenna.



The antenna is supplied as a kit, comprising a Diamond BU-50 balun rated at up to 1.2kW, two air cored inductors wound on fibreglass formers, which function as traps on 40m and loading coils on 80m, plus lengths of 450 ohm ladder line and insulated copper wire to form the antenna elements.

Antenna design

The linear loaded part of each element is formed from a length of 450 ohm ladder line about 15 feet in length. The ends furthest from the balun are joined together, and to a wire stub 1 foot long which is adjusted to bring the antenna into resonance on 20m. One of the wires nearest the balun is connected to the feed point. The other is connected to a length of wire, which is woven through the middle of the ladder line between the existing two wires (holes having been punched in the centre of each 'rung' of the ladder for this purpose).

The wire is cut so that 45 inches extend beyond the last hole in the ladder. To this point is attached the trap / loading coil, together with another one foot stub that is used to adjust the 40m resonant point. Eight feet of antenna wire is attached to the other end of the loading coil.

Although holes have been pre-punched in the ladder line, the wire must be woven through the middle of it yourself. This takes about an hour. Terminals must be attached to the ends of the wire for connection to the coil. The supplied terminals are a crimp-on type. Lacking a suitable crimping tool, the terminals could be squeezed using a vice, but since they will be taking the strain of the antenna I felt it wise to solder them as well.

Tuning up

The antenna is very easy to tune, though the instructions suggest that the tuning is sensitive to location so that it should be tuned up at its operating position and height. First the 20m stubs are shortened (fold the wire back and twist it instead of cutting) to bring the centre of resonance to the desired point on 20m. The SWR is low across the whole band, so this adjustment is not critical.

Next, the procedure is repeated on 40m using the 40m tuning stubs. Finally, the 8ft tails are shortened to bring the resonant point to the desired part of the 80m band. This is the most critical part of the adjustment, as the Q of the loading coils is high and the bandwidth over which the

SWR is acceptable is narrow. You will have to decide whether you are most interested in the CW DX part of the band, data modes, the low end of the phone sub-band or the high.

Attic installation

If you have read other pages on this site you will know that I operate a [stealth amateur radio station](#). The 80plus2 is not ideal as an outdoor stealth antenna because the elements made from black 450 ohm ladder line are quite conspicuous. However, the short length of this antenna compared to other 80m designs make it possible to install even in my small attic.

The 80plus2 has been installed in the apex of the roof, with the balun at the centre and the linear loaded elements extending horizontally on each side. The linear loaded elements are bent at about the mid-point, and then extend diagonally down at right-angles to the central section, following the roof line. They are secured at this point, and the remaining part of each element, a single insulated wire including the trap/loading coil, runs back horizontally below the diagonal section, a few inches from the wall. In effect, each element is a Z formation, with the longer top element of the Z twisted through a right angle to face towards or away from you.

Installed in the attic, as built per the instructions, the antenna resonated below the bottom of each band. It was necessary to remove all but two inches of the 20m tuning stub, all of the 40m tuning stub and to fold back about two feet of each of the 80m 'tails' to achieve resonance close to the data modes segment of each of the three bands. This part of the band was chosen due to my interest in data modes, as well as being a compromise between CW and phone operation.

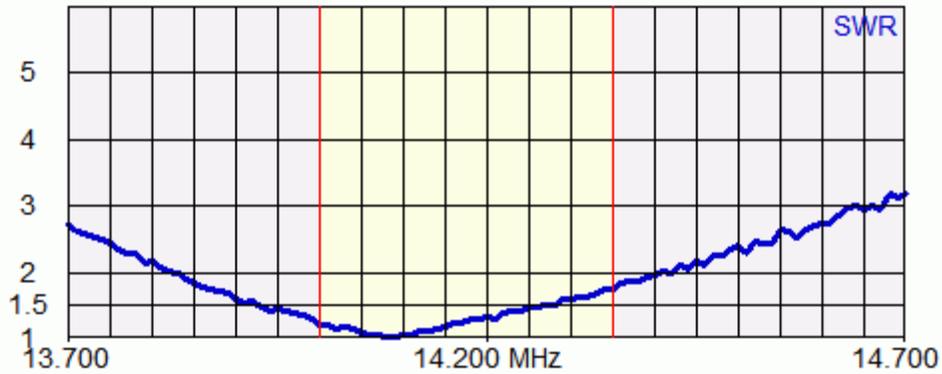
If I was interested solely in phone operation then it would probably have been necessary to shorten the ladder line section by a couple of inches, and shorten the section of wire from the end of the ladder line to the coil by a similar amount.

Performance

It must be emphasized that the performance results given below relate to the antenna installed as described in my attic, with the centre about 25 feet above ground, not outside in the clear. However I suspect, due to the fact that the antenna still gave a good match, that the performance is not unduly worse than would have been achieved with an outdoor installation at a similar height. Only the fact that the antenna resonated too low in frequency for optimum phone operation is likely to have been caused by the fact that it was installed in an attic.

20 metres

On 20m the 80plus2 functions as a full-sized dipole. It provides a very good match with a very low SWR over the entire band.

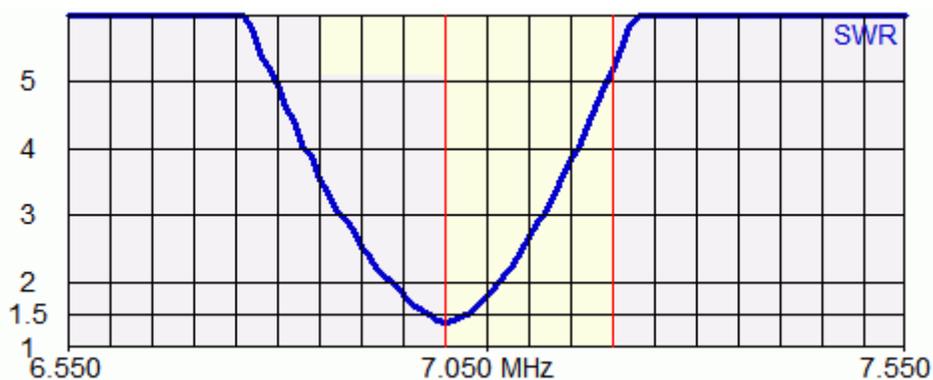


Performance is as you would expect from a 20m dipole at a fairly low height. The only other antenna available to me for direct comparison is the [MFJ magnetic loop](#), and the comparison shows just how good an antenna the loop is. I would say that the two antennas are about evenly matched, but switching between the two there can be as much as 2 S-points difference at times, with the loop sometimes returning a stronger signal than the dipole. Each antenna can have an advantage at times, even when receiving the same station! My guess is that this is due to polarization changes occurring as the signal is reflected by the ionosphere, with the magnetic loop favouring vertical polarization. More time is needed before coming to any conclusion about which antenna gives the best results for DX stations.

Where the 80plus2 does have the advantage is its broad bandwidth. On this band it doesn't even need an ATU, whereas the magnetic loop's very narrow bandwidth means that it needs constant adjustment.

40 metres

On 40m the manufacturer claims that the 80plus2 functions as a linear loaded dipole with an efficiency close to that of a full sized dipole and a bandwidth that covers the whole band.

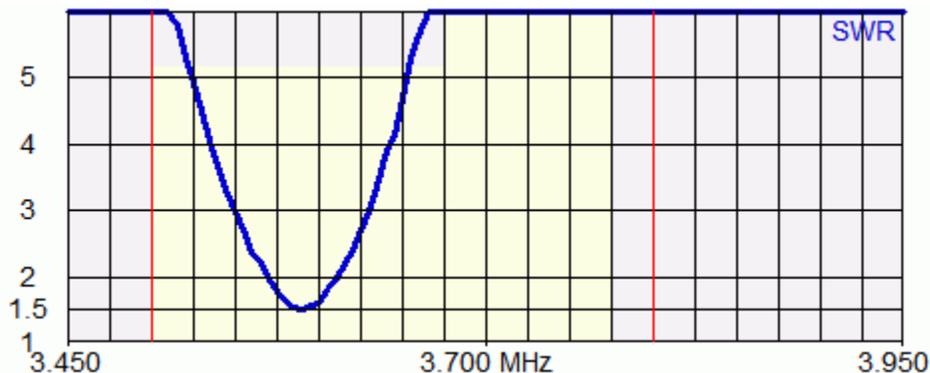


When that was written, the 40m band in Europe extended from 7.0 to 7.1MHz, and that is still where most European activity takes place. The bandwidth across a 100KHz segment is well below 2:1, which is acceptable for most transceivers without an ATU. Unfortunately even after removing the entire 40m tuning stub the resonance curve still favours the CW end of the band a bit more than I would have liked. Nevertheless the SWR is still below 3:1 at 7.1MHz, well within the capabilities of my Elecraft radios' tuners.

My initial impression is that performance is not as close to that of a full-sized dipole as the description would lead you to expect - unless the magnetic loop really is a miracle worker. In fact, I would put the magnetic loop as the better overall performer. Switching between the two, sometimes the received signal strengths are about the same, but sometimes the magnetic loop is up to a good two S-points stronger. It is early days, but I have yet to notice a case where the 80plus2 produces a stronger signal than the loop on 40m. Still, it's a pretty good performance for an attic antenna and the lower cost than the loop and the freedom from retuning will be seen as benefits by many.

80 metres

80m was my entire reason for getting this antenna, as my previous attempt to shoehorn a radiator for this band into my tiny attic - a Slinky dipole - had been disappointing. On this band the 80plus2 functions as a loaded dipole, with a claimed usable bandwidth of 70kHz. This should be better than other compact 80m antennas such as back-to-back mobile whips, but it's still pretty narrow.



The SWR bottoms out at 1.5 to 1, and the 3:1 bandwidth is more than 75kHz, meeting the manufacturer's specification. But even my K3's wide range ATU cannot produce an acceptable match at the top end of our 80m phone band. The usable range is between about 3.5 and 3.7MHz.

As for performance, never having had a "good" 80m antenna I don't have much experience to compare it with, so I will need more time before passing final judgement. I have heard strong signals on the data part of the band, louder than I heard on the Slinky dipole, suggesting that the 80plus2 will be a much better performer close to its resonant frequency.

Far from the resonant frequency, the antenna still seems quite lively, with plenty of signals heard. But it remains to be seen whether people will hear me when I call them any better than they did when I used the Slinky.

Other bands

The 80plus2 does not cover any other bands. However, it is easy to add other bands simply by attaching pairs of dipole elements to the balun terminals and fanning them away from the main antenna at a slight angle.

I have added dipoles for 10m and 6m. They do not appear to have any adverse effect on the performance or SWR of the existing bands, and work well and exhibit a low SWR in themselves. It is very convenient to have a five band antenna using a single coaxial feeder into the radio.

Conclusion

More time is needed to make contacts using the 80plus2 and get more reports before coming to a final conclusion. It works well on 20m and quite well on 40m, but so would simple dipoles for those bands, which can be accommodated in most attics and constructed at lower cost than this commercial antenna.

The main reason for purchasing the 80plus2 is likely to be as a way to get on the 80m band when this would otherwise seem impossible due to lack of space for a full sized antenna. It is clear that this antenna requires compromises to be made for its reduction in length, which may be hard to accept if your interests are not confined to one mode such as CW or data. However, at this point in time I still don't know of anything apart from a magnetic loop that could fit in to this attic and work on 80m any better.