Moonraker GP2500 Vertical

PHOTO 1: The Moonraker GP2500 mounted on a 10ft pole, suitably guyed.

MULTIPLE HF BANDS. With antenna space often at a premium in the UK, the demand for an 'all-band' HF solution has never been higher. There are various solutions to this problem, but the antennas can often be a compromise on one or more bands. Moonraker's GP2500 vertical antenna is the company's attempt to give the radio amateur with little space access to all bands 3.5 – 52MHz in one simple package.

In fact, the antenna is designed for transmission from 3.5-57MHz and reception from 2-90MHz. Just how it does this I'll explain later.

WHAT YOU GET. The antenna comes in a thick plastic bag, which is characteristic of Moonraker's products. Inside you'll find four thick-walled aluminium tubes that make up the vertical, plus the mounting hardware and the aluminium securing rings and bolts that hold each section together.

You have to slide each antenna section into the next and secure them with the bolts. The antenna is then secured to its mounting post with two U-bolts. The fit and finish of the hardware was very good, but the ends of the tubes could do with a little dressing after machining as I took a chunk out of my thumb during assembly!

Once assembled the antenna stands 7.13m high.

ASSEMBLY. The instructions consisted of a single A4 data sheet showing you how to assemble the antenna, a typical SWR chart and the main specifications. I think this is a mistake as it gives no clue as to whether the antenna should be ground or pole mounted and no hint as to whether or not the antenna requires radials. Perhaps Moonraker could add some hints and tips.

I decided to try the antenna ground mounted first, with and without radials, and then elevated with the base at about 10ft.

But the question you want to know is how can it give a good match across such a wide frequency range?

HOW IT WORKS. At the bottom of the antenna is a sealed matching unit with an SO239 socket for connection to the coax. There is no clue in the literature or on the Moonraker website as to how this works, but it appears to be a broadband unbalanced-unbalanced impedance transformer or 'UnUn'.

The antenna is designed not to be resonant on any one of the amateur bands – neither offering a particularly high or low impedance. The step down Un-Un then transforms the various impedances found as you move down the bands into something more closely matching 50Ω. By the time you then add a length of coax (which will lower the SWR even more due to losses) you are now in a position to either match the antenna directly to your transmitter's 50Ω output, or use its internal ATU to reduce the final residual SWR down to 1:1.

In fact, when fed with 20m of Mini8 coax, the highest SWR seen on any of the amateur bands was only 1.8:1 (at 5MHz). More typically the SWR was below 1.7:1 across the whole spectrum, often less than 1:1.4.

Now this 'miracle' approach to antenna design does have its drawbacks. Yes, you see a low SWR, but the antenna will probably not perform as well as a dedicated, resonant antenna on each band.

But for the record then, how did the Moonraker perform?

PERFORMANCE. Back to back comparisons are always tricky as you can get antenna interactions. For the purposes of this review the antennas under test were kept as far apart as possible and all other purely vertically-polarised antennas were taken down.

The first test was with the Moonraker GP2500 ground mounted with no radials. This was a 'worst case' scenario.

On 80m the first reaction was that the antenna was quieter than my existing 132ft off centre fed dipole (OCFD). Noise levels were about S1 compared with S4. A vertical is not the best antenna for working around the UK as its pattern is not conducive to good Near Vertical Incidence Skywave (NVIS) or high-angle radiation.

Nevertheless, UK and European stations could be heard, but they were down around 3-4 S-points compared with both the 132ft OCFD and my 65ft Inverted L. This is not surprising as the antenna is way too short for 80m and its efficiency must be very low.

On 40m the antenna started to perform slightly better, although it is still shorter than a quarter wave. Near EU and Scottish signals were down about 1-3 S-points compared with the reference antennas. A check in with GM2OT in Scotland on the RAOTA net on 7.163MHz confirmed this (nearer English signals were inaudible on the vertical and barely audible on the reference antennas as the critical frequency was about 5.7MHz).

The conclusion here is that if you are looking for an 80m/40m antenna for chats around the UK don't buy a vertical – this doesn't just apply to the Moonraker GP2500: it's the same for *all* vertical antennas.

On longer paths the Moonraker was about 2-3 S-points down on the reference antennas.

On 30m (10MHz) the Moonraker GP2500 really starts to perform. This is not surprising as a quarter wave antenna on 10MHz is about 7.42m high – close to the Moonraker's 7.13m.

PHOTO 2: At the bottom of the antenna is a sealed matching unit with an SO239 socket for connection to the coax.

PHOTO 3: The various pieces of the Moonraker GP2500 antenna.

With an SWR below 1:1.5 on 10.1MHz, I was surprised to see that sometimes signals were on a par with the reference antennas.

On 20m (14MHz) the antenna was useful, its signals being either equal to or no worse than 2-3 S-points down on the comparison antennas. Noise levels were better too. Contacts into Germany, Ukraine and Italy on SSB were possible, although QSB made some of these difficult on the Moonraker where they were still possible on the reference antennas.

It was a similar story on 17m (18MHz) and 15m (21MHz) where noise levels were down, but so were some signals. Other signals were equal on all antennas. The OJ0B Market Reef DXpedition was on 17m CW during the test and it was interesting to switch between antennas while listening to both them and the other stations calling them. In many cases they were all either equal signals or no worse than 2 S-points down. Oh, and I made it into the log on the second call while on the Moonraker with the obligatory 599.

12m (24MHz) and 10m (28MHz) were typically fairly flat during the test period and only a few signals were heard. The antenna offered similar performance to 15m.

I then added eight 10m long radials to the antenna, laying them on the ground. This had minimal effect on the SWR readings across the band. These appeared to have little effect on 3.5 and 7MHz, where the short length of the vertical is the limiting factor. On 20m (14MHz) they seemed to offer a slight improvement in received signal strength. While the difference was not phenomenal, some signals were now equal to the 65ft Inverted L but still down on a dedicated horizontal dipole at 30ft.

It was a similar story on 17m and 21m (18MHz and 15m) where the antenna often got close to the performance of the 65ft Inverted L, but didn't quite match a reference dipole.

I then mounted the antenna on a 10ft pole, suitably guyed. The SWR readings were virtually the same as when ground mounted, but the antenna seemed noisier when mounted off the ground.

The 80m results were broadly similar, but on 40m European (German and French, lower angle) signals became similar to those on the reference antennas. In fact, some were better by about 1 S-point. It was a similar story on 30m (10MHz).

The added height didn't seem to make much difference on 20m (14MHz). Conversely on 17m and 21MHz the elevated GP2500 vertical sometimes matched the reference antennas again. Justin at Moonraker told me that some customers have experimented with elevated radials, but the jury is out on whether they make a big difference on the HF bands.

The antenna also offers a 1:1.5 SWR on 6m. The test period was outside of the Sporadic-E season, but I still able to hear and access the GB3EF repeater, which is about 30 miles from me, so it could be a useful 6m antenna when conditions permit.

CONCLUSION. There is no doubt that a no-tune, broadband vertical can be a useful tool. Not only do you get all the amateur bands, but it makes a good antenna for short wave listening, offering a good match across the whole HF spectrum.

But such convenience comes at a cost and the antenna generally doesn't perform as well as a dedicated antenna on each of the amateur bands. Sometimes the difference is quite small. On loud signals this may not matter, but the antenna may lose out on weaker signals and DX.

The GP2500 is also too short to be effective on 80m and 40m, but it starts to work better on 30m (10MHz) and above.

For optimum use I would recommend an extensive network of radials if mounting it on the ground. Or perhaps four elevated radials if mounting it in the air. These can't be resonant as the antenna covers too many bands, but anything will help. The elevated mount seemed to work better than ground mounting.

I was struck by how quiet the antenna was – often I could hear weak signals that were otherwise masked by noise on the reference antennas. This makes it an ideal SWL antenna.

Martin, G8JNJ (http://g8jnj.webs.com/) has done extensive work on how to make broadband HF verticals work well and if you are in the market for the GP2500 I recommend you read his comments. He agrees that pole mounting with a decent ground plane, radials or counterpoise is required for optimum performance. When mounting at height radials are recommended to stop the antenna using the coax as the counterpoise.

For use on HF, with the occasional trip down to 40m and 80m, the antenna may be a godsend for amateurs with little space for anything else. Moonraker also produce a glassfibre version of the antenna called the GP2500F. My thanks to Moonraker for the loan of the antenna, which costs £249.95.

Frequency range
TX: 3.5 - 57MHz
RX: 2 – 90MHz
Max power rating: 250W
Impedance: 50Ω
VSWR: less than 1.5:1
Connector: SO239
Length: 7.13m
Weight: 3kg
Rated wind velocity: 30m/sec
Mast diameter: 25-42mm