Modification of parabolic dish feed for 24 GHz amateur band



Copyright by Andrzej SP8XXN and Tom SP5XMU December 2019 The following description concerns the adaptation of the parabolic antenna feed originally operating at about 26-28 GHz to the 24 GHz amateur band.

The feed is a part of a 26 cm diameter parabolic antenna. Due to the solidity of the structure, modifications have been limited to a minimum.



Figure 1. Feed before modification

The feed is made of a flange screwed to the dish and a section of a circular waveguide with an internal diameter of 7.5 mm, terminated with a secondary reflector made of plastic covered from above with aluminum foil.

The cutoff frequency is about 23.4 GHz and is too close to the 24 GHz band. Therefore, it is necessary to reduce the cut-off frequency by reaming to a diameter of 8.5 mm.



Figure 2. Flange and reamed waveguide



Figure 3. Reamed waveguide - view from the side of the secondary reflector

The end of the waveguide from the flange side should be ground with a file so that the circular waveguide smoothly turns into a rectangular one.

Originally, the flange hole spacing complies with the WR28 standard, so it should also be modified so that the feed fits the WR42 flange. The new holes will be too close to the old ones, which can be troublesome when drilling, so the original holes should be plugged. For this purpose, a little super glue is inserted into the holes and screws are quickly screwed in. After the glue dries, the protruding parts of the screws are cut and grinded.



Figure 4. The filed end of the waveguide, the holes are already glued with screws



Figure 5. Flange after grinding

Now you need to drill 4 new holes with a spacing according to the WR42 standard, and then thread them (M2,5 or M3).



Figure 6. Flange with holes spacing according to WR42

Copyright by Andrzej SP8XXN and Tom SP5XMU December 2019 The secondary reflector should be wrapped several times with kapton tape (width 5 mm) so that it tightly enters the drilled waveguide and does not fall out.



Figure 7. Secondary reflector thickened with kapton tape

After this conversion, the feed has a matching (RL) from -14.0 dB to -10.3 dB (SWR from 1.50 to 1.88). The measurements were made on 4 converted feeds. The above results are quite good, considering the fact of adaptation without tuning using a vector analyzer.

With the vector analyzer operating in the 24 GHz band, it is possible to improve the matching. To do this, shorten the waveguide with a file by about 1mm, and then by sliding the secondary reflector in and out, aim for the best SWR. After tuning, protect the reflector with a drop of paint against repositioning.

At the end, mount the modified feed to the parabolic dish.



Figure 8. Improving the matching by adjusting the position of the secondary reflector



Figure 9. Parabolic antenna with the modified feed

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