Coaxial SHF-Connectors Constructed from Bicycle Tire Valves

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Professional microwave coaxial connectors for screw fitting such as SMA plugs and sockets are not readily accessible to most radio amateurs. Either the prices are very high, or they are not available at all. However, such connectors are very necessary and can hardly be avoided. One may have obtained, for instance, a circulator inexpensively, or a professional waveguide/coaxial transition is to be integrated into a circuit.

Of course, one is usually able to improvise and find some way around the problem. For instance, the author has used an inexpensive, readily available component for many years: bicycle tire valves ! It is even possible to remove these from defective inner tubes including the threaded shaft of the valve, together with the nut and other pieces after preparing them mechanically.

Of course, it is favorable to possess or have access to a small lathe.

The author uses tire valve components in his 10 and 24 GHz modules as follows:

- As case for chokes in the Gunn oscillator and mixer modules, and for detector diode mounts
- For waveguide/coaxial transitions
- For cavity antenna exciters
- Suitable cables for use with such connectors are the PTFE-cables type RG-141/142 which are available as flexible and semi-rigid cables.

CONSTRUCTION

The mechanical construction of a transition from 50 Ω coaxial cable to waveguide WR 90, or R 100 (10 GHz band) will be shown as an example (**Figure 1**, upper left).

This can be realized very simply:

The outer body of the valve (part 1) is drilled out to a diameter of 5.5 mm and shortened to the given length. The hole in the waveguide has the diameter of the cable dielectric. Part 1 is held centrically to the hole in the waveguide and is soft-soldered into place. Any residual solder on the inside should be carefully removed.

The collar (part 2 for semi-rigid cable) is soldered to the cable (4), as shown in the diagram, after preparing the cable as shown. If flexible coaxial cable is used, a collar similar to part 2a should be used.

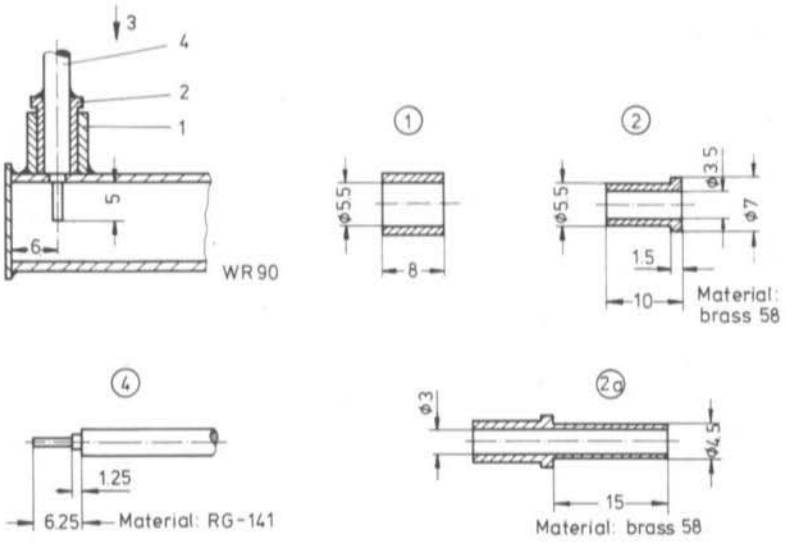

Fig. 1: SHF-connector constructed from bicycle tire valves

The sheathing of the cable is placed over the collar for approximately 5 mm and soft-soldered into place. For a better appearance, a piece of insulating tubing can be placed over the collar and cable for a length of approximately 30 to 50 mm.

If the given parts are to be used as diode holder (choke mount), the threading should be lathed down to 6 mm diameter for approximately 1.2 mm at the soldered end. It can then be placed into a suitable hole in the waveguide and soft-soldered into place.

A further example, which is not to be described in detail here, would be a cable connector between semi-rigid and flexible cable. It would then be possible, for instance, for a waveguide transition to be connected in a flexible manner with an antenna radiator.

EXPERIENCE

This form of connector does not, of course, represent a complete connector system (plug/coupling etc.). However, it can be used with advantage when the solid inner conductor of the cable is to be used directly to energize the waveguide.

However, the contact pressure must not be too great, otherwise it is possible that the soft-solder joint would be damaged. Of course, this could be avoided by hard (silver) soldering.

Matching measurements showed that VSWR-values of less than 1.1 were measured in a system comprising cavity antenna radiator for a X-band parabolic antenna, approximately 60 cm RG-141, one of the previously mentioned transitions, and a 3-screw tuner. Attenuation values were not measured; however, they are negligible according to the practical experience gained at X-band, and are mainly determined by the cable loss as given by the manufacturers.