UHF Connector Overview

Rev0 10/26/2025 w8ji

Before discussing connectors and connector ground paths we must understand:

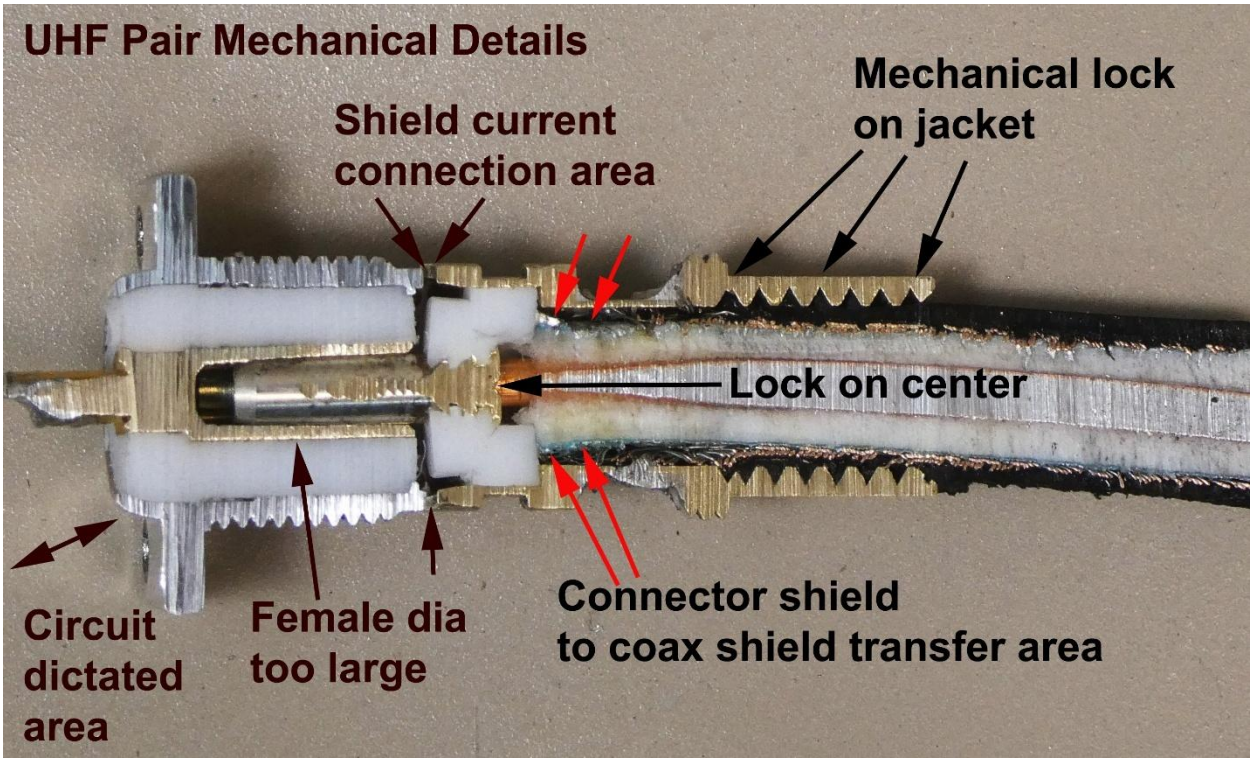
1.) RF current cannot go through a conductor wall more than several skin depths thick. When the wall is several skin depths thick RF current must go to an edge to get inside or outside the “wall”.

2.) The foil in standard LMR cables is several skin depths thick on 160 meters. It becomes electrically “thicker” at increased frequencies

3.) All transmission line mode current must flow on the inside of the aluminum foil. Transmission line currents cannot flow in the braiding

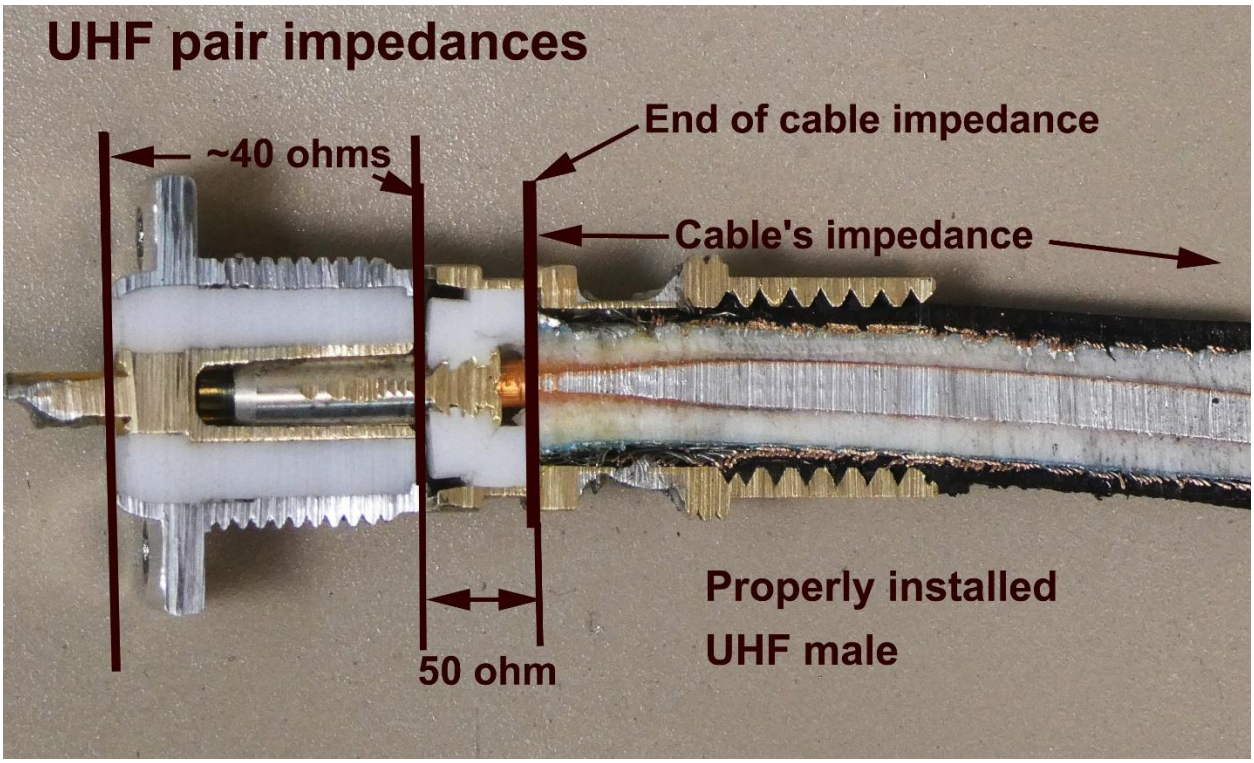
When installed correctly, solder style PL-259 UHF connectors offer a mechanically solid connector with almost no impedance problems below 200 MHz and only minor mismatch on 450 MHZ.

With proper cable and connectors, the UHF pair secures the jacket, the outer braiding, and the center conductor to the connector. This cut-away is with Teflon insulated Taiwanese connectors. These connectors are slightly better than Amphenol.



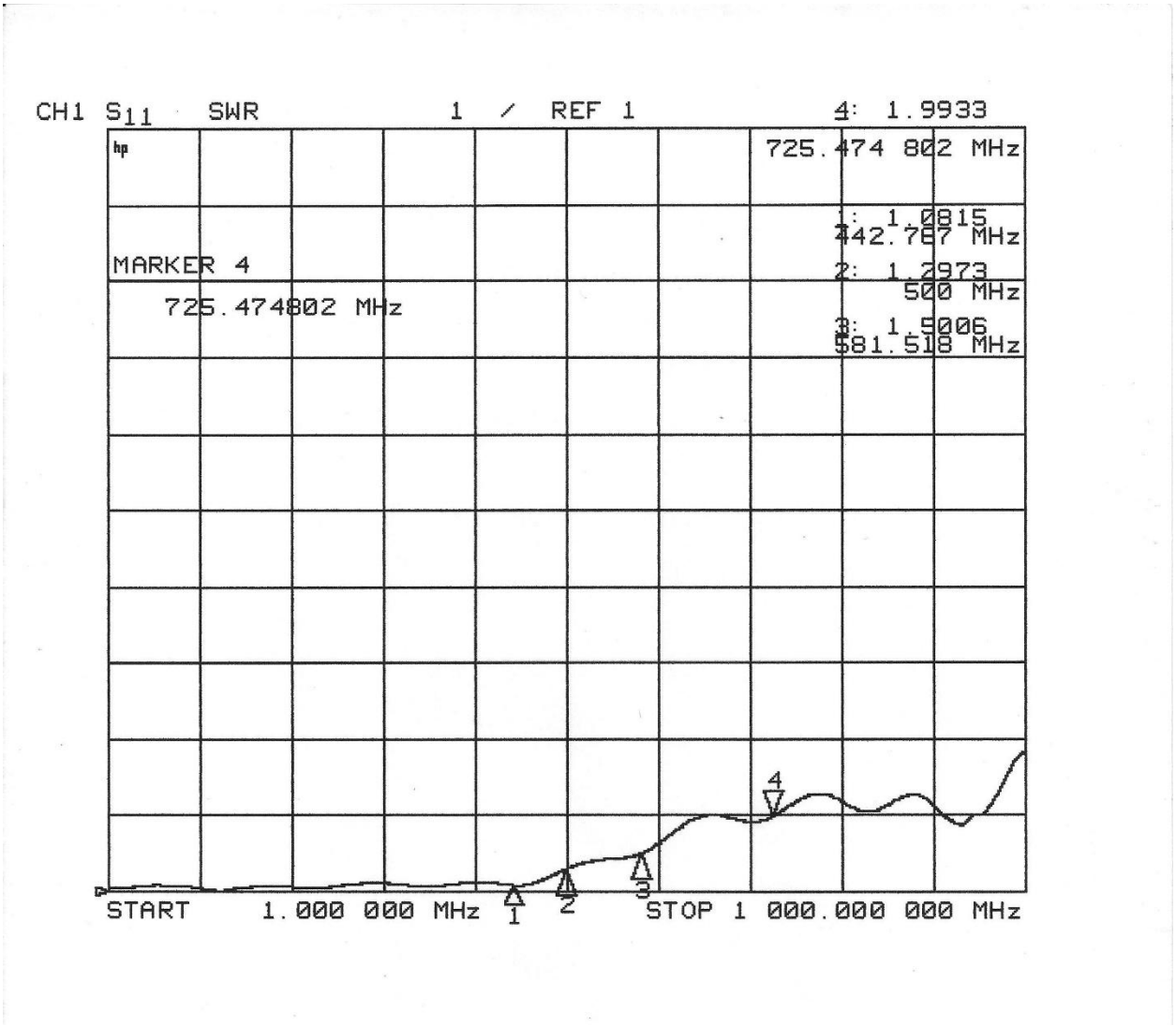
The transmission line mode shield currents get into the foil inside at the foil ends. This connector would have a transfer area very near the red area, but it might extend back to the mechanical lock area. A non-foil cable (braid only) would work better.

These are the UHF (PL-259 SO-239) connected pair important impedances:



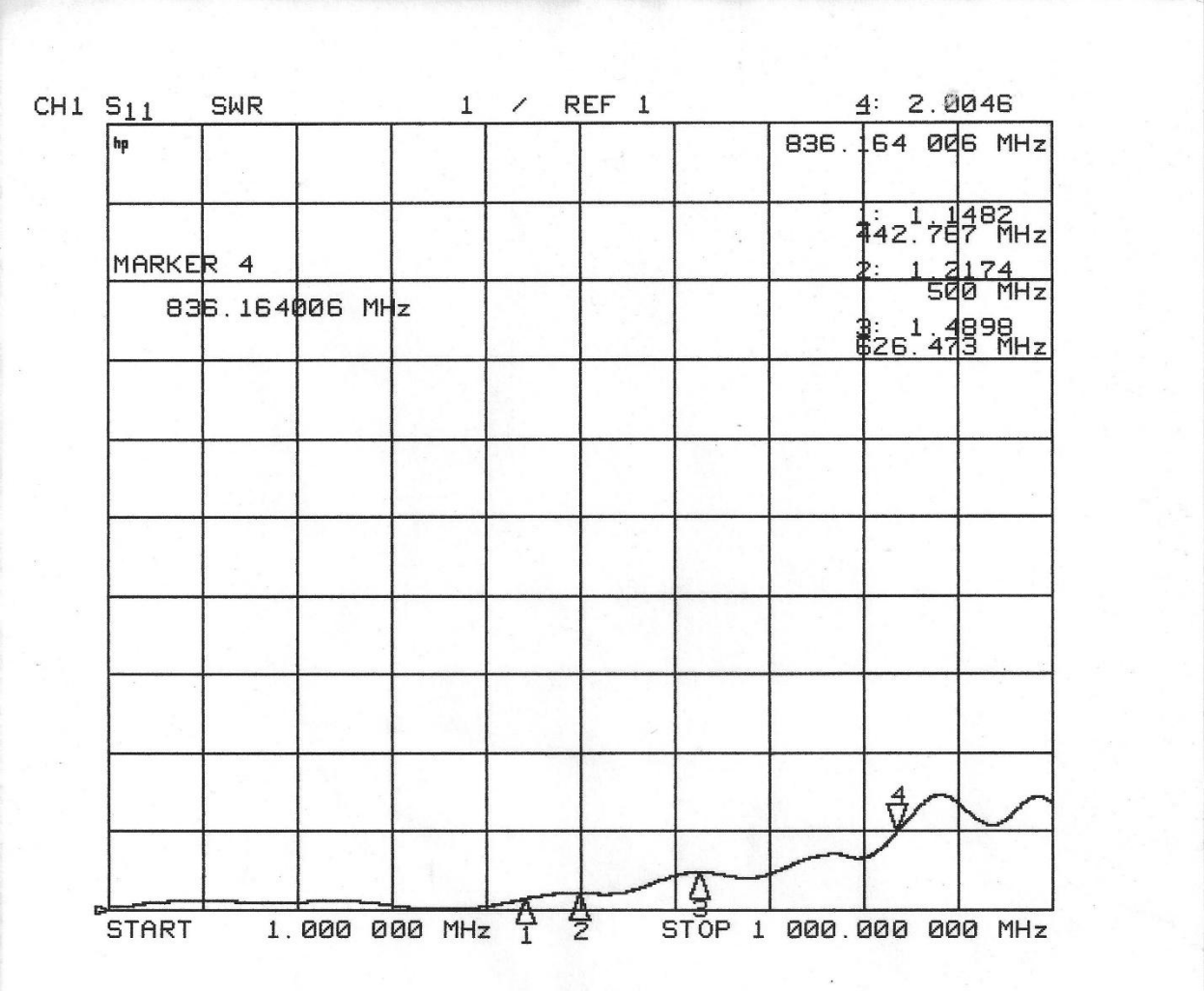
The popular impedance and loss criticisms of a UHF style connector are completely unwarranted. The mismatch area is too short to be important below mid to upper UHF. Weather proofing is not as good, but otherwise the UHF connector is one of the best for high power HF and lower VHF. The UHF connector is electrically and mechanically more robust than a type-N!

Here is a sweep comparison between an antenna switch I designed with UHF connectors and type N connectors:

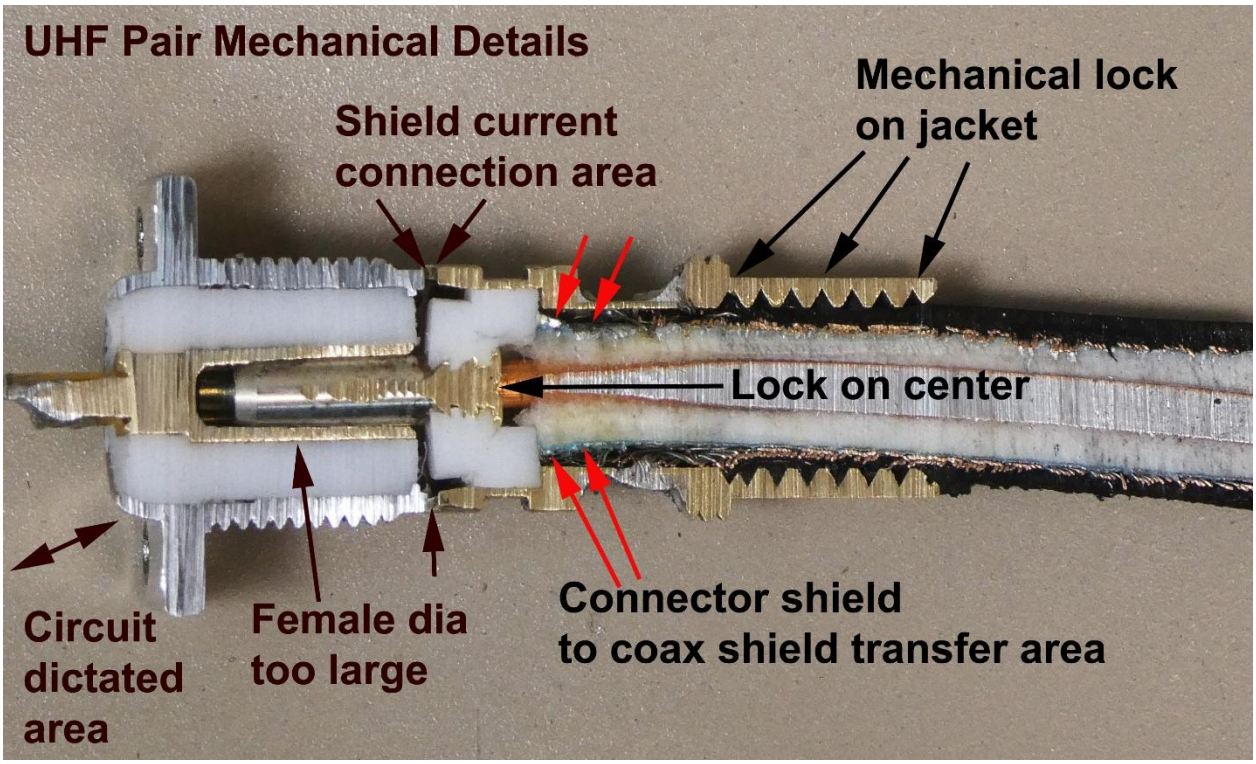


Above is the UHF connector sweep. Loss is almost immeasurable, about .05 dB through the switch system. Low loss allows the switch system to handle very high power with UHF connectors.

This is the same switch with type N connectors. Note there is very little difference in mismatch through the switch system with type-N compared to UHF connectors.

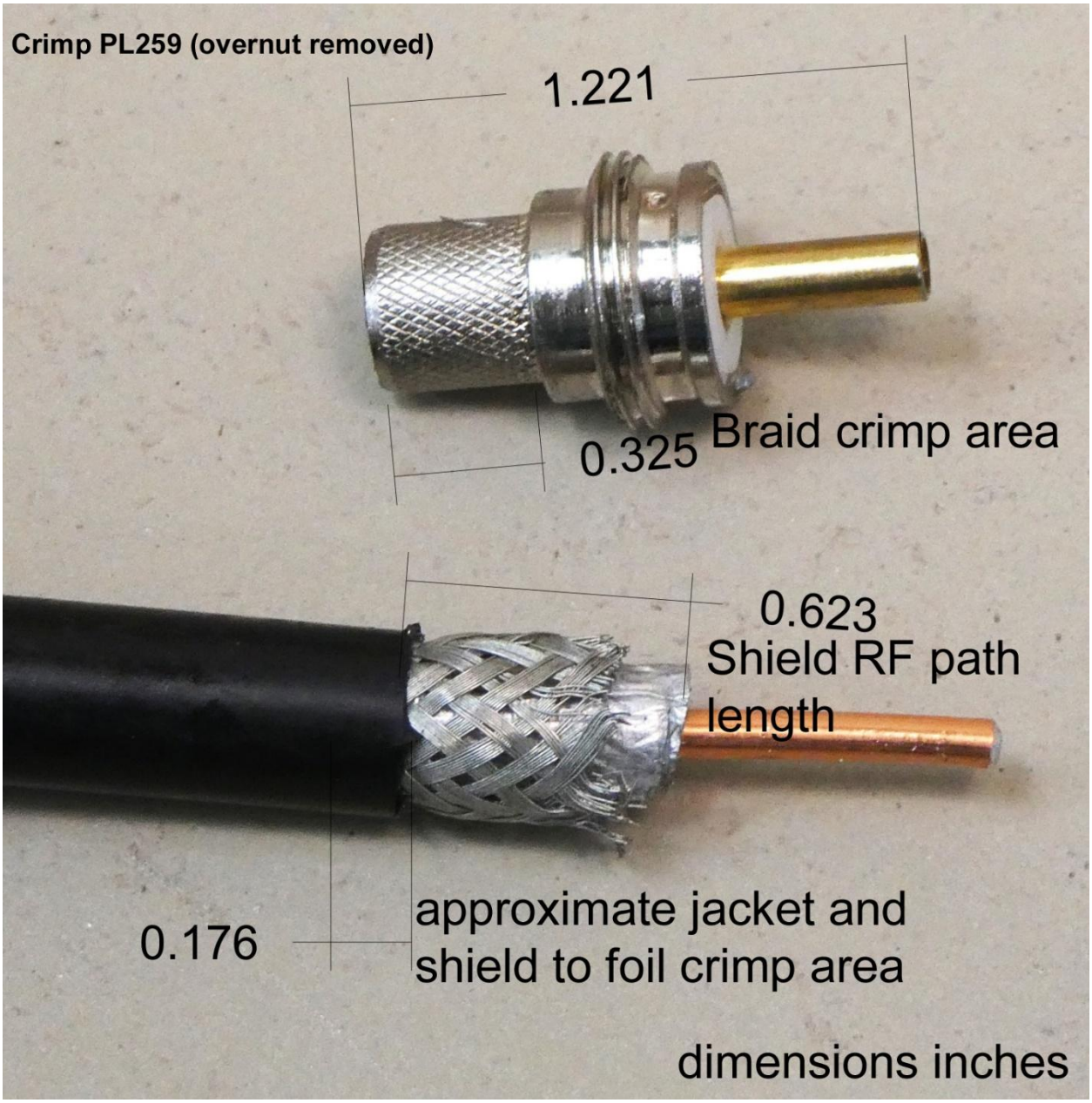


I must evaluate more crimp connectors but what I have seen so far outside of the CATV/MATV industry is not impressive. Electro-mMechanically the UHF solder connector is:



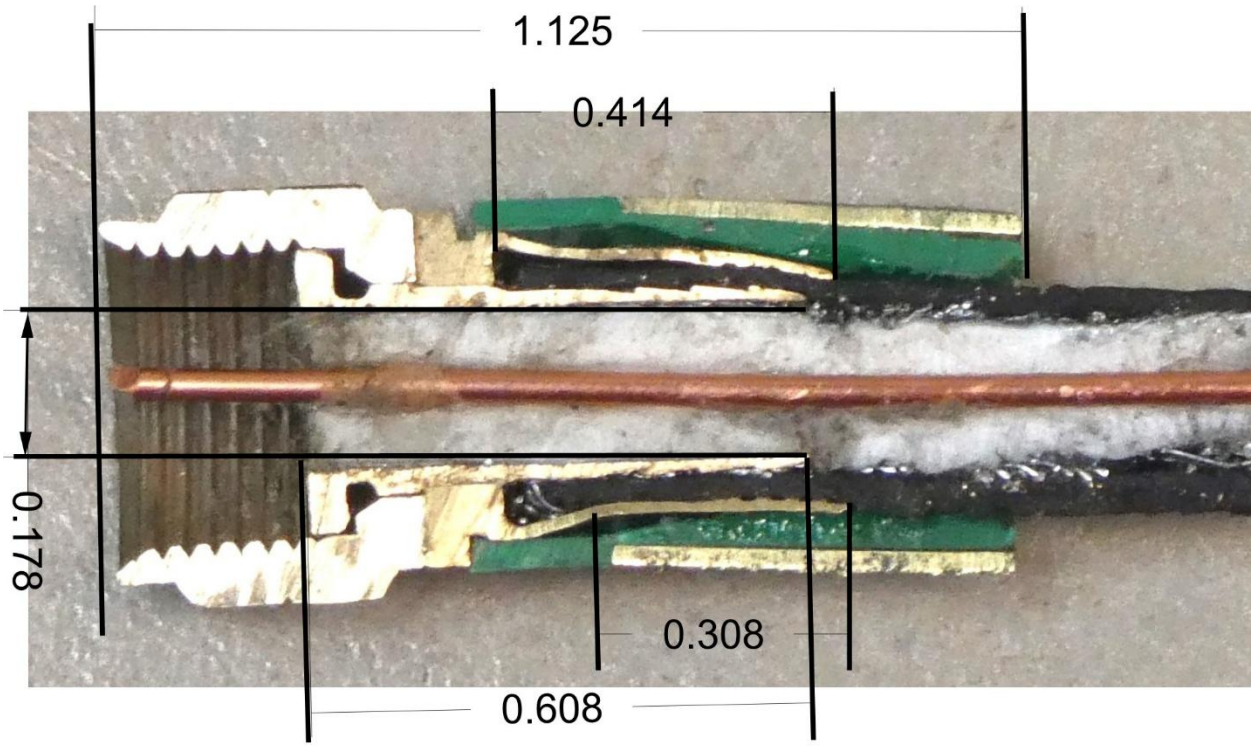
The standard UHF to an RG8/RG213/LMR400 has a good mechanical lock on the jacket, shield, and center. It has an excellent RF shield path in braid only cables. Foil lined cables were not nearly as good in any connector tested or examined. I've developed a dislike or mistrust of foil lined cables in my systems, especially the repeater.

Looking at a popular crimp:



The soldered center pin and the braid are the only areas with any significant mechanical hold. In one back-to-back test pull with a barrel connector the UHF male crimp was significantly weaker than a standard solder-on connector, but I only had one to test. Still we should remember that all connectors are not designed to hold significant cable weight.

The CATV MATV stye F-connector is a well-designed crimp. It is mechanically strong, mostly waterproof, and has an excellent foil-shield inner wall ground path. The braid and foil are compressed firmly against the F-connector RF ground path. Ground path loop backs to the braid and loose inner foil pressure contacts are virtually non-existent. F connectors are the engineering pinnacle of crimp and foil lined cable design.



Snap and Seal F connector and F-6 type ("RG-6") CATV cable

Virtually no loop back in inner shield ground path
High compression across entire foil area against the connector ground path
0.3 inches of jacket lock area with ribs for half of that
Constant impedance 75 ohms entire length