Stainless steel connectors …. good or what?

…some notes by Peter Blair, G3LTF

This may only be of interest to microwave EME people! Some days back I asked the following question…. "Does anyone out there have any real data on the difference in loss between a standard gold plated SMA connector and a stainless steel one at frequencies of 1296MHz and 2304 MHz. I have a built in prejudice against using them at these frequencies but it is only that, I don't have any data."

Chris,G4DGU, made the following sensible comment: "My qualitative view is that there's not a huge penalty - perhaps 0.02 - 0.05dB extra loss at 10GHz. My reasoning is that the centre conductor (which has the highest current density, of course) is gold-plated anyhow, and that losses in the outer are mitigated by the much lower current density. I've not seen any evidence of excessive temperature rise in a pair of mated s/s SMAs carrying 40W at 10.3GHz."

It proved difficult to find one for one comparisons and most SMAs are in fact stainless steel plated with gold. I found two manufacturers websites quoting figures for stainless steel gold plated of (0.03x square root of frequency in GHz) dB... but I couldn't find any figures that were clearly and definitely for non plated stainless steel. For comparison, 10cm of 0.141" coax is (0.038 x square root of the frequency in GHz) dB

I found some other interesting data however. A hermetically sealed connector is (0.05 x square root of the frequency in GHz)dB and brass SMA connectors are quoted as (0.06x square root of the frequency GHz)dB, clearly these are to be avoided. (If you can't tell the difference between brass and gold then try "Alchemist" in your Yellow Pages).

The Radiall website at

www.radiall.com/vdocportal/radiall.jsp

(then follow SMA and Literature, page 11-12)... has some interesting data . It quotes straight SMA connectors as 0.02dB flat from 1 to 10GHz (which doesn't seem right, it must vary as the square root of frequency) but quotes a right angle connector as 0.04dB at 1GHz, 0.05dB at
2.4 GHz and 0.09dB at 12.4 GHz. I suspect that much of this is a VSWR contribution but it would seem that a minimum length 0.141" cable with two straight connectors is a better solution than a right angle connector. Also in the Radiall data is a useful chart of power rating vs frequency for SMA connectors.

Now you might think that none of this really matters but at 1296/2320MHz with a low noise dish and feed then, if you have a NF of 0.35dB, changing the loss in front of it from 0.1 to 0.2dB will worsen the receive sensitivity by 0.5dB (see VK3UM eme calc programme at:
web.telia.com/~u92010241download.htm)

73 from Peter G3LTF