VLBA ACQUISITION MEMO #215

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To: VLBA Data Acquisition Group

From: Alan E.E. Rogers

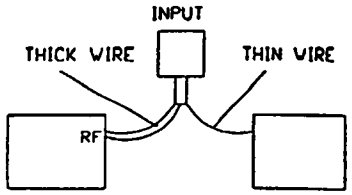
Subject: Use of unequal wire sizes to match mixers in BBC

When the mixer outputs can be matched at 750 MHz but not at 950 MHz, a simple method of reducing the output of the more efficient mixer is as follows:

> Use unequal wire sizes from the SSB module input to each mixer. A good choice in practice is a thick wire of 24 awg and a thin wire of 30 awg. The difference in wire lengths changes the mixer phases, while increasing the length of both wires increases the loss mixer fed by the thinner wire.

Notes on tuning up Mixers

Use of the thick and thin wire on input:



1] Run separate (initially with equal length and size) wires from input to each mixer.

2] Check mixer amplitude balance at 750 MHz.

2.a] Mixer amplitudes should be balanced at 750 MHz with resistor across one or the other IF output. Use 1K ohm resistor to test if one mixer is significantly more efficient at 950 then use the thin wire to this mixer - the thin wire will attenuate the signal more at 950 MHz than at 750 MHz.

3] If thin wire is not reducing the output of the more efficient mixer enough at 950 MHz - make both thick and thin wires longer.

4] When amplitudes are matched then proceed to fine-tune phases by making lengths of thick and thin different - use a ferrite bead tuning stick to sense.

5] By now, image rejection should be getting quite good. Do final adjustments by testing for:

a) Extra capacitance (in the form of a little copper pad) one or the other IF output.

b) Added resistance on hybrid - reducing load from 50 ohms to 40 ohms.

c) Re-check for minor changes:
1) Input line lengths - use ferrite tuning stick.
2) Mixer balance - resistor across either IF output or changing length of both input leads - if problem is at 950 MHz.

Set-Up used

SSB Mixer in converter

Sweeper plus both USB and LSB on scope

Pre-programmed frequencies and levels in sweeper

BBC set at Nominal gains plus 16 MHz BW

24 dB attenuator test of scope levels -

i.e., make wanted sidebands = 4 div peak-peak

with 24 dB extra attenuation -

than 24 dB image rejection = 4 div without attenuator.