NATIONAL RADIO ASTRONOMY OBSERVATORY
GREEN BANK, WEST VIRGINIA

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Title: The NRAO Type-2B 1-2 GHz SIS Bias-T

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The NRAO Type-2B 1-2 GHz SIS Bias-T

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The type-2B bias-T is for use with SIS mixers with a 1-2 GHz IF. To provide a degree of electrostatic protection, we have followed the recent OVRO practice of including built-in resistors in series with all bias leads. Also, the amplifier port is internally connected to DC ground through a 10-kΩ bleeder resistor.

A six-wire bias scheme is used, as shown in Fig. 1, with separate pairs of conductors for junction voltage and current monitoring, and for the source current. The junction bias is developed across the 50-Ω resistor to ground, and the junction current is sensed by the 5-ohm nichrome film resistor. The DC and low-frequency impedance of the bias-T as seen by the SIS mixer is relatively low (~ 55 Ω), which should minimize bias stability problems.

The IF circuit design is similar to that of the older Type-2 four-wire bias-T, and uses a (parallel) self-resonant coil L_S and (series) self-resonant chip capacitor C_S. The layout of the IF circuit is shown in Fig. 2. The coil consists of 4.25 turns of #38 AWG (0.0039") enameled copper wire, with internal diameter 0.100" and length 0.040". The capacitors are ATC-100 type-A chips; C_S = 22 pF and C_G = 100 pF.

The dimensions of the bias-T are shown in Fig. 3. The male SMA connector connects to the SIS mixer, and the female SMA connector to the IF circulator and amplifier. The two holes "C" allow a copper heat strap to be attached to the body of the bias-T; this is particularly important if the IF isolator and amplifier are operated above 4 K.

The measured return loss and insertion loss are shown in Fig. 4 (room temperature) and Fig. 5 (at 77 K).

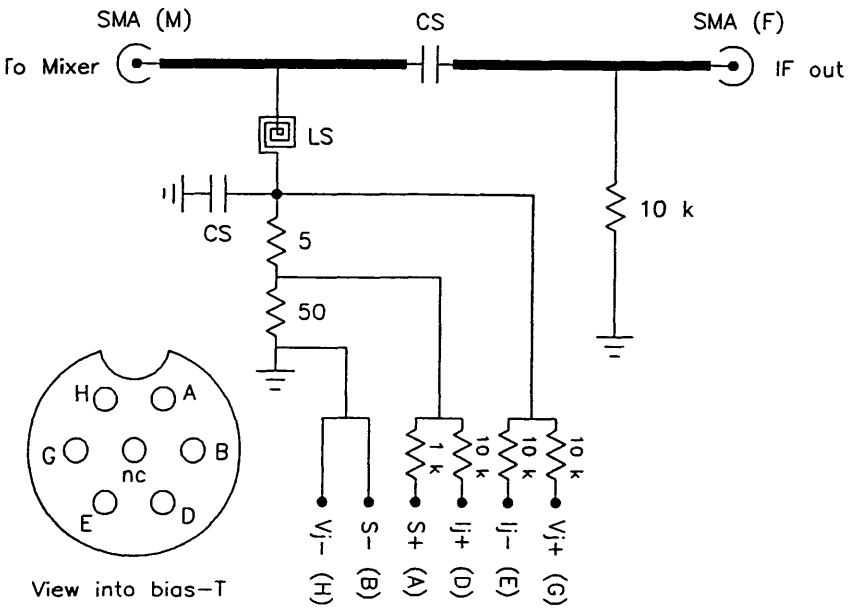

Fig. 1.

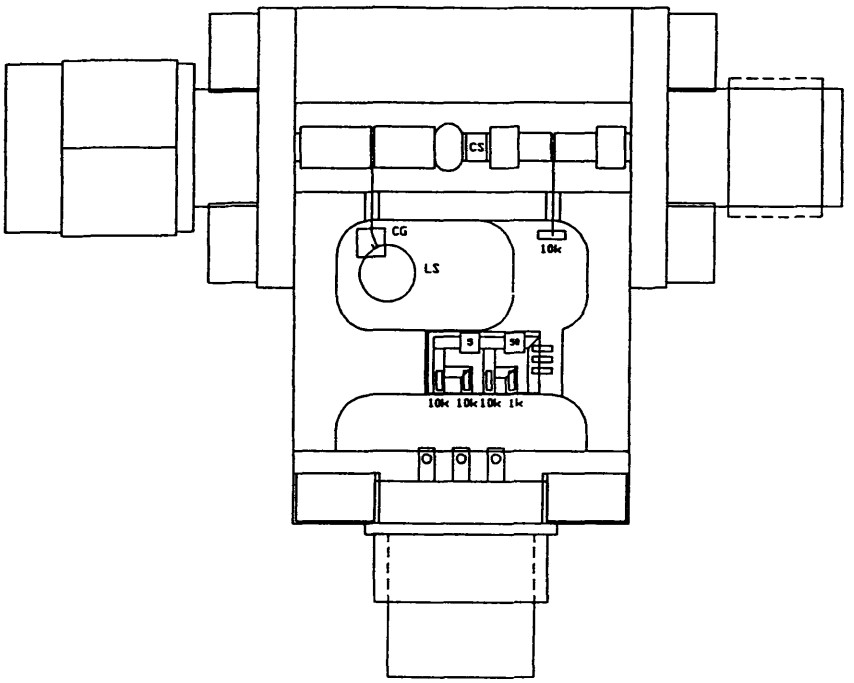

Fig. 2

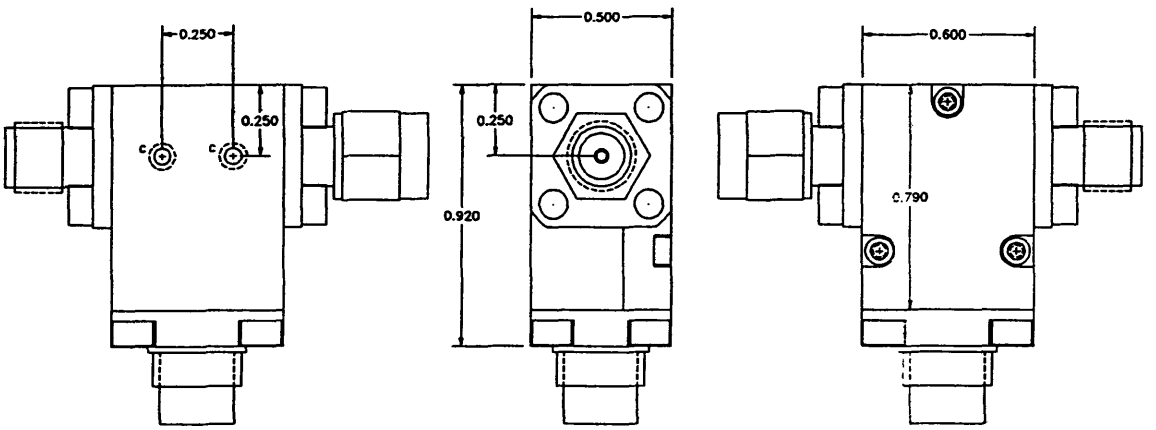

Fig. 3

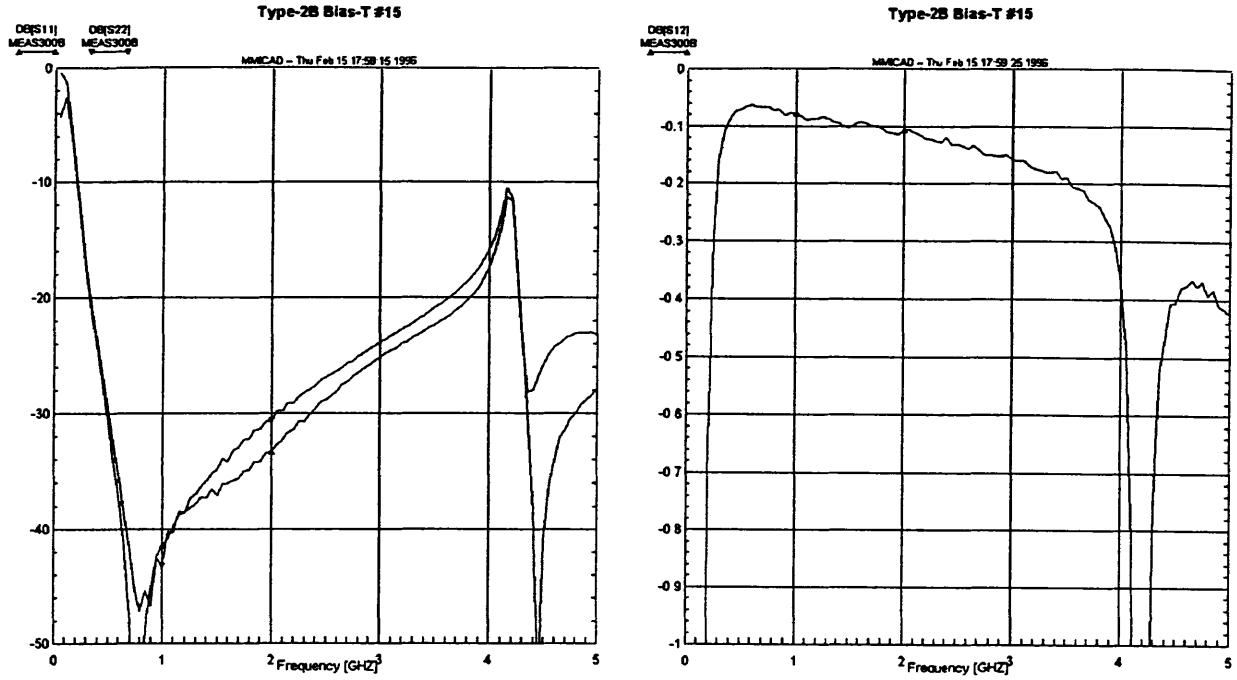

Fig. 4. Room Temperature return loss and insertion loss.

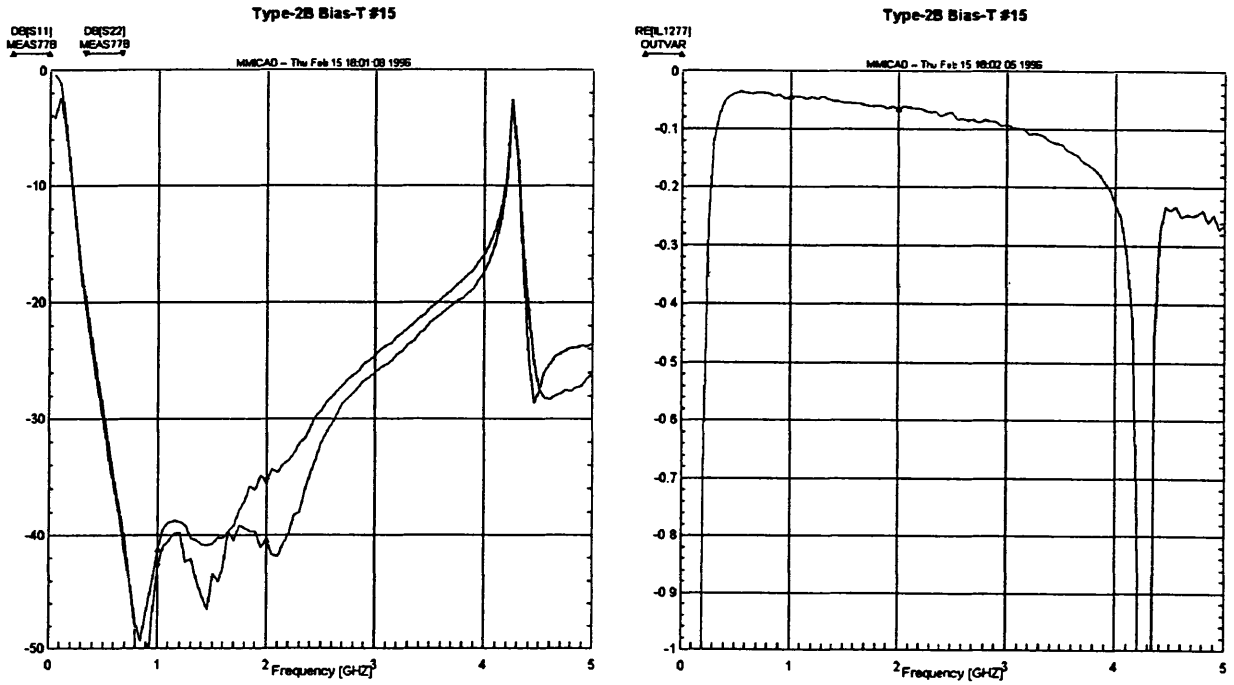

Fig. 5. Return loss and insertion loss at 77 K.