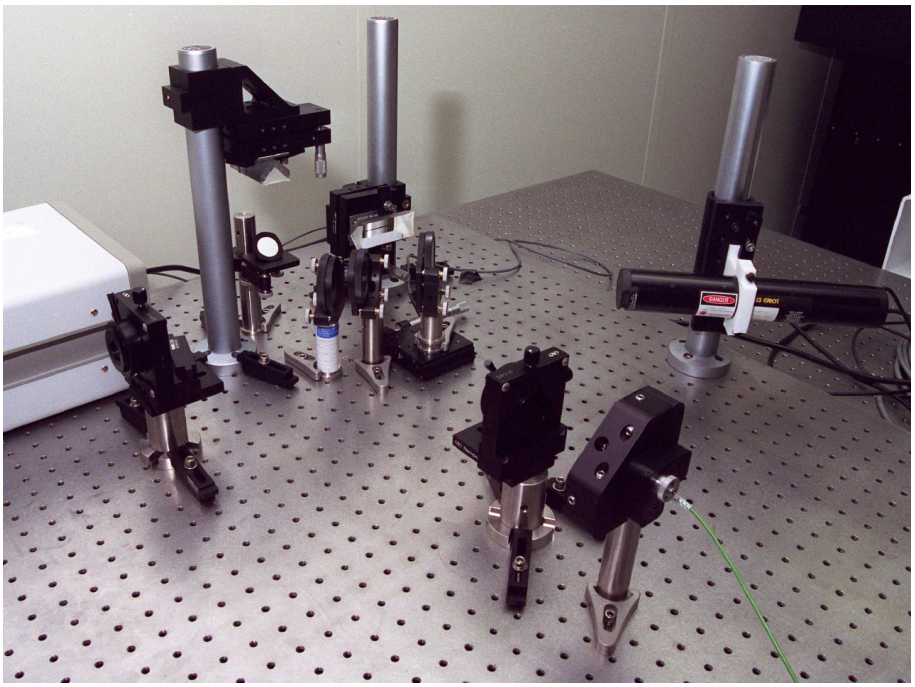

Figure 16.20: Experimental table-top fiber-coupled nuller developed at JPL. The orientation is similar to the previous figure. The input fiber and collimating lens are at the lower right, the two rooftops toward the center and upper left, and the output lens toward the left.

(Serabyn *et al.*, 1999a,b). Stabilization of the null to a part in 10^4 has also been achieved with simple path-length dithering (Serabyn *et al.*, 1999a), implying a path length stability of about 1 nm, or $\lambda/600$.

The white light nulls achieved to date in these ongoing experiments are already significantly deeper than a standard Michelson interferometer could provide, thus verifying the achromatic nature of the null provided by the field-flip approach. The experiments have also verified the need for spatially filtering the nulled output, as coupling to an output fiber indeed improves the null by several orders of magnitude. Finally, the requisite nanometer-level path-length stability (for 10^{-6} nulls in the mid-infrared) has also been demonstrated. Thus, these experiments have largely verified the viability of the fiber-coupled-RSI approach, with only simultaneous dual-polarization nulling remaining in need of demonstration. Of course, much work remains to be done, including broadening the band over which deep nulling occurs, deepening the nulls, stabilizing the nulls for much weaker input signal levels, and demonstrating all of the above in the mid-infrared.

The first nulling experiments to be carried out on a telescope were in fact in the infrared (Baudoz *et al.*, 1998b; Hinz *et al.*, 1998), because of the higher wavefront qualities available. Transient destructive interference of stellar light to residuals of about 5% was achieved