3.5.2. Target Preparation for Plate Slap Experiments

As shown in Fig. 3.1, the target consisted of a 15.24-cm-diameter aluminum ring (g), a 5.08-cm-diameter aluminum ring (j), the iron sample (e), mirrors (i), and epoxy (h). The 15.24-cm-diameter aluminum ring (target ring g) served to house the rest of the components and as part of the vacuum chamber. A 0.64-cm-thick piece of plate glass which served as the top of the vacuum chamber allowed mirrors to be viewed by the streak camera. The target ring was machined so that there was a small angle between the top glass and the iron surface to insure that light reflections from glass surfaces would not reach the camera. The target ring also had inserted through its wall a copper tube with 1.27-cm inner diameter to allow pumping of a vacuum. Pressures of less than 0.03 bar were obtained.

To insure reproducibility of the shock system, all dimensions of the component parts were maintained from shot to shot within 0.005 cm. Brass plate, aluminum flier plate, and spacing ring surfaces were parallel to within 0.0038 cm. The brass plate and aluminum flier plate faces were flatter than 2 light fringes as measured with sodium light using an optical flat. Mirrors were cut from a large, optical quality, front-silvered mirror, flat to 1 light fringe as measured using sodium light and an optical flat.

Tilted mirrors were placed on the iron samples with one edge of the silvered side in contact with the iron surface. A contact where no transmitted light was visible was considered

satisfactory. The contact edge of the mirror was placed far enough away from the edge of the iron sample to avoid interference from edge effects. The opposite end of the mirror was propped up by a jeweler's drill to obtain the desired angle (typically 2 deg) with the iron surface. The jeweler's drill was removed after the mirror was fixed securely in place with epoxy. Mirrors with small angles of inclination were used to insure that the gap between iron and mirror surfaces closed before wave interactions in the mirrors could affect the measurements.

The angle between tilted mirror and iron surface was measured with a shadowgraph instrument which is accurate to 1 min of arc. The iron impact surface opposite the surface with mirrors was used as a reference plane for the angle measurement. Since iron surfaces were parallel to better than 12 μ, any errors in the measured angle due to this lack of perfect parallelism were smaller than could be measured. Some tilted mirror angles were also measured, using a spectrometer table, by observing with a telescope the superimposition of a cross-hair and its image reflected alternately from the tilted mirror and the flat mirror against the iron surface. Angles could be measured in this way to within 0.5 min of arc. The remeasured angles agreed within 1.5 min of arc with shadowgraph measurements.

The target assembly of Fig. 3.1 was similar to that for precursor experiments discussed elsewhere.[41] A target blank was built by wringing the target ring (g) down against a flat plate.