



Figure 2 Hits on Unpolished Girdle Facets for a Standard Round Brilliant Design

### RAYTRACE and UNPOLISHED FACETS

The current modification of the "Raytrace" program we use has been upgraded to account for unpolished facets as well as the perfectly polished facets we have up to now assumed. Figure 2 is a summary of an experiment which recorded the number of times rays struck an unpolished girdle facet as the tilt angle was varied from 0 to 30 degrees and Refractive Index (RI) was varied from 1.54 (Quartz) and 2.42 (Diamond). Other variables which were included in the tests (but not reported in detail here) were the Table size (50 to 60%), Crown Main Angle (26 to 38 degrees, and Pavilion Main Angle (41 to 43 degrees).

If we consider that several thousand hits are made on the *polished* facets of any particular stone during a "Raytrace" run, none of these counts are high enough to get very excited about unpolished facets affecting average brightness very much. In the normal position (0 tilt) the effect of girdle facets is practically nil.

There is a slight increase in "hits on the girdle facets" for higher refractive index materials and this effect is greater as the tilt angle is increased, but compared to the total sample rays in a normal Raytrace it has essentially no practicable effect on the average brightness. At the highest tilt shown in Figure 2, the average brightness decreased by only one unit. No new dark areas were created in the brightness patterns in this series of tests - - - even when the count increased they seemed to fall into contiguous areas that were already dark.

A polished girdle takes more time and effort to make. Many commercial cutters have never made a faceted and polished girdle on their stones. From a brightness standpoint it does not matter; however in as much as the smoother surface on a polished facet reduces the likely sources for cracks to begin and the existence of the Beilby layer makes the surface harder thus contributing to a longer useful life of the stone, we think polishing the girdle is still a good idea for any facetor who wants his work to be considered well done.

In summary we think the following listed conclusions are suggested by our analysis of the data:

1. Unpolished girdle facet "hits":
  - increase with stone tilt angle.
  - increase with refractive index
  - are not affected by crown or pavilion main angles
  - increase as L/W is increased >1.0
2. Unpolished girdle facets
  - do not create new dark areas in the Brightness Pattern
  - do not significantly affect average brightness