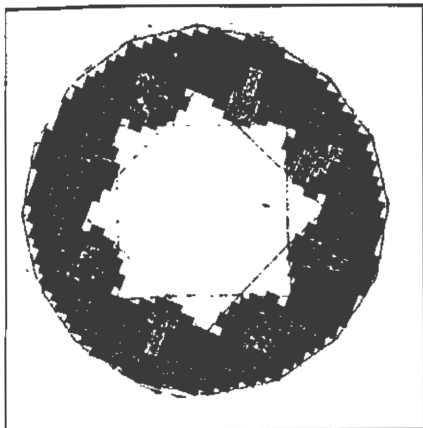

Figure 4 Brightness Plot for a 43P/32C Quartz 50% Table SRB. Brightness Value 45

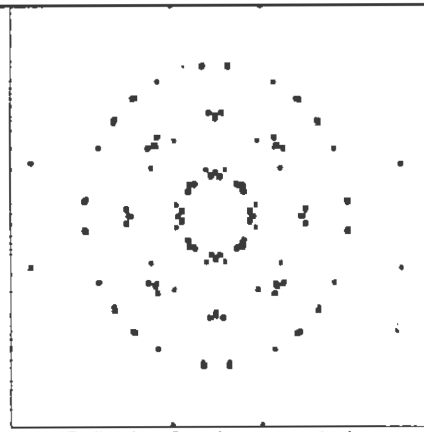

Figure 5 Reflection Plot for same design as Figure 4. Typical eight symmetry, light concentrated in center.

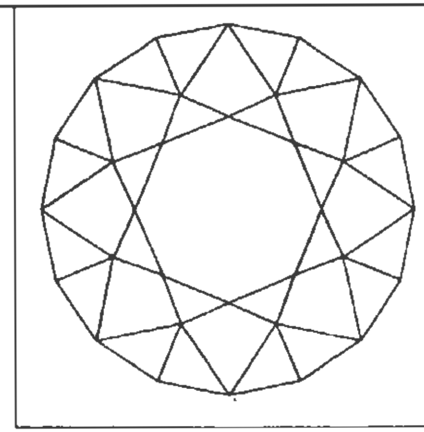

Figure 6 Brightness Plot for a 41P/24C Quartz 50% Table SRB. No dark areas visible. Brightness value 95

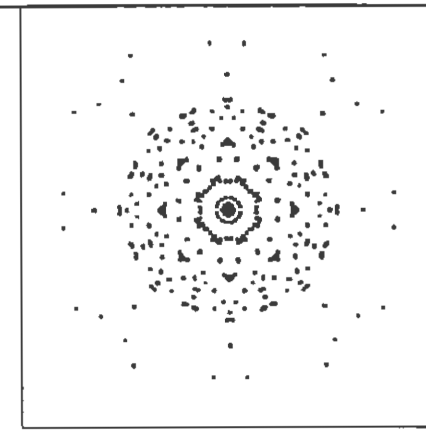

Figure 7 Reflection Plot for same design as Figure 6. Typical eight symmetry , light concentration points distributed in a definite pattern

for materials in previous articles , range of Crown angles for Quartz is greatly extended downward, because the angle combinations that give 90 average brightness or better with Quartz proved to be outside the limits used for the other materials. We had to extend the "Crown" main values downward below 30 degrees to locate a true optimum. Theoretically average Brightness values between 0 and 100 are possible, but practically it is never as low as 30 or much greater than about 97. With Quartz we never reached "90+" within the parameters we had originally selected, however with the extended Crown Main Angle range we were able to define a 90+ region for Quartz. The area of the charts to the left of the "90 contour" (toward the Y-Axis, labelled ">90 REGION") represents the preferred conditions for very bright stones. Previously there had been rumors that low angle crowns were good for Quartz, but this use of Brightness plots provided us with numerical confirmation.

A significant difference between Quartz and all other materials included in these tests is the presence of the "Critical Angle" limit line. In Figure 1 it is the horizontal line at 40.5 degrees on the Y-axis. Any pavilion angle below the critical angle will cause the light entering the Table area to be immediately lost thru the pavilion facets, giving a dark center or "fisheye" stone. Figure 3 shows this phenomenon. Figure 2 a Quartz 41P/32C SRB (above the "critical angle" line) shows a bright center and dark rim. Whereas Figure 3 a Quartz 39P/32C SRB (below the "critical angle") shows a dark center and a bright rim. For good brightness we would like to have a design with both a bright center and rim.

Figure 1 offers suggestions for where to look for the super bright stones...in the ">90 region". A Brightness Plot for one such design ,a Quartz 41P/24C SRB, is shown in Figure 6 along side its Reflection Plot Figure7. The 41 degree pavilion main is above the critical angle line and the 24 degree crown main is well within the >90 region in Figure 1. As expected both center and rim are bright in the design. Average brightness for this combination at 95 was one of the highest we actually observed. Considering that most designs for Quartz we have seen from the published literature give 40 to 60 brightness values this is an exceptional design for Quartz.

At the opposite extreme Figure 4 is a Quartz 43P/32C brightness pattern and Figure 5 is the corresponding reflection pattern. This design only has a 45 average brightness value although pavilion angle is above the critical angle which permits rays entering the table and star facets to return a bright center, the break facets leak so much the entire rim is dark.

From Figure 1 we observe lowering pavilion main angle tends to reduce average brightness if we are below the critical angle line. Individual Brightness Plots show that lower brightness is related to more dark area in the rim. What is needed is a design which allows low pavilion main angles, yet does not have a "fisheye". Figure 8 is a Quartz 39P/34C design modified with apex facets and an extremely small "Table" just enough to keep the apex itself from being a point. The function of this facet is like a "culet" on the other end, to give more durability by reducing the possibility of damage to the point that would be exposed when the stone is mounted. Brightness value is a respectable 93. Figure 9 is corresponding reflection pattern. Apex facets effectively change the relationship between the crown and pavilion facets so that pavilion mains