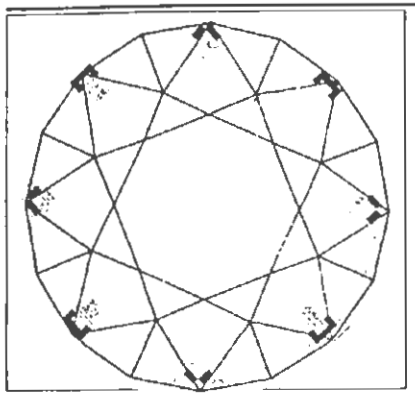

Figure 3 Brightness Plot for a 41P/34C Corundum 50% Table SRB

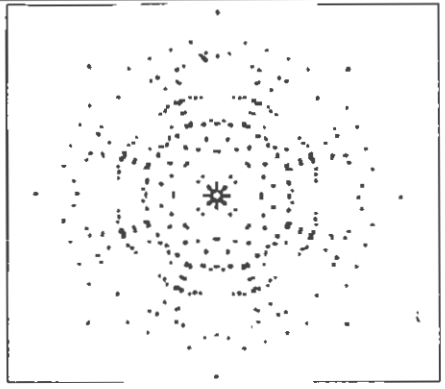

Figure 4 Reflection Pattern for a 41P/34C Corundum 50% Table SRB

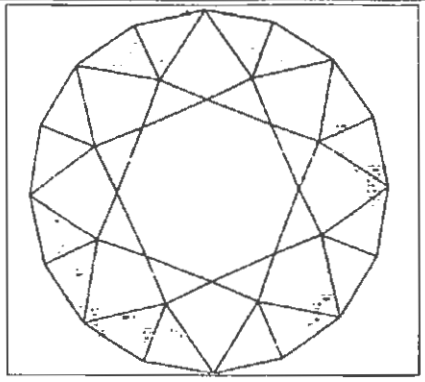

Figure 5 Brightness Pattern for a 39P/34C Topaz 50% Table SRB

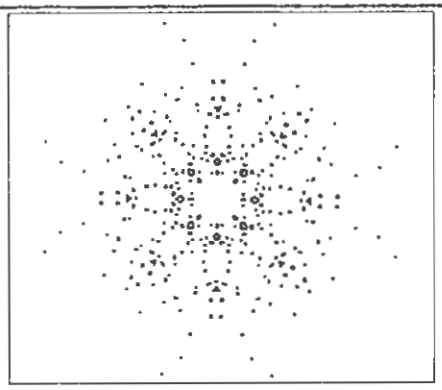

Figure 6 Reflection Pattern for a 39P/34C Topaz 50% Table SRB

lines". The "90 contour" represents all the combinations of crown/pavilion main angles that gave at least 90 brightness value in our brightness plots. Arbitrarily we are using the "90 Contour" as the dividing line between what we consider "preferred" and "not preferred" angle combinations. Theoretically brightness values between 0 and 100 are possible, but practically it is never as low as 0 or much greater than about 95. The area of the charts to the left of the "90 contour" (toward the Y-Axis) represents the preferred conditions for very bright stones. Note the difference between Topaz and Corundum shown in Figures 1 and 2. The Topaz chart (Figure 2) has a much smaller "preferred" area than Corundum (Figure 1)

There are many acceptable angle combinations according to Figures 1 and 2. For example : to take advantage of the usual relatively thin Corundum crystals from Montana it would be advantageous to keep both the pavilion and crown angles low to reduce overall thickness. Our charts indicate a 39P/34C design would be acceptable. But, to darken the very light colored Topaz we might choose to use 41P/31C. These choices would be within the "preferred" area and yield a thinner stone for Corundum and a thicker stone for Topaz.

Figure 3 thru 6 are BRIGHTNESS and REFLECTION patterns for two 50 % Table SRB designs. Figure 3 is the Brightness pattern and Figure 4 is the corresponding reflection pattern for a 41P/34C Corundum. It evaluates to 92 brightness and has good coverage on the Reflection pattern.

Figure 5 is the Brightness pattern and Figure 6 is the corresponding reflection pattern for a 39P/34C Topaz. It also evaluates to a 92 brightness. The reflection patterns are similar, but the Topaz seems to have a more definite concentration of reflections in the "Table" area of the design. For all practical purposes we should be satisfied with either material at these angle combinations.

Our measure of merit here is BRIGHTNESS VALUE. This is one, but not the only selection criterion for a complete stone ...an interesting Reflection Pattern is also desirable to make the design have scintillation and for materials capable of DISPERSION to have it combined with good brightness. In general whatever increases brightness tends to decrease DISPERSION. From other work we know that if one wants to add dispersion higher crown angles will be needed and designs that have light concentration points in the reflection pattern have more scintillation, but we do not have a quantitative measure for scintillation at this time. Therefore we recommend a compromise 39P/34C for Topaz and 41P/34C for Corundum.

Reflection patterns shown here are computer generated, however as we demonstrated in SFD July 1986 reflection patterns can be directly simulated and observed or photographed with the apparatus and technique (projector-screen) we described in the July 1986 article. We observe there are major differences in designs as compared by their reflection behavior, and we suspect they are related to concentration of light rays following preferred paths through the faceted stone however as yet we have no quantitative criterion for design selection.

Next month we will show the results for Quartz which is more complicated because the "Critical" angle is included within the range of the experiment. All of the materials discussed so far in this series have "critical" angles lower than the lowest pavilion angles selected. In a Standard Round Brilliant design this is equivalent to ensuring that the Table area will be bright because light rays entering thru the Table are almost completely returned thru the Crown. Quartz with a critical angle near 40.8 degrees is an entirely different situation.