

Figure 8 Brightness plot for a 39P/34C SRB with apex facets.

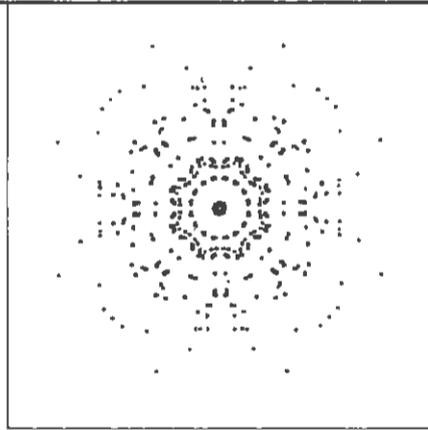


Figure 9 Reflection plot for same design as Figure 8. To be compared with Figure 7.

act like they are steeper than they really are. Whereas the 39 degree pavilion would give a dark center with a regular flat Table, it is still bright with apex facets except for the very small center area. On the basis of these observations, we recommend low pavilion angles with shallow crown angles and apex facets for low RI materials such as Quartz and Beryl.

Our measure of merit here is AVERAGE BRIGHTNESS VALUE, but brightness is only one of the parameters which should be measured to evaluate a design. Total "optical performance" would include brightness, scintillation, and dispersion (fire). For most colored stones brightness and scintillation are most critical since dispersion is inherently low in the material. Our studies presented here include only a very limited Brightness evaluation using zero degree viewing angle (head on view) and uniform lighting.

Even though we are using uniform lighting, reflection patterns show distribution of light channels through the stone is definitely non uniform. Figure 7 and 9 are examples. This probably accounts for the scintillation, or twinkle, we see in a stone when we move the stone relative to a point light source. We feel that analysis of Reflection patterns will eventually give a quantitative measure of "scintillation potential" of a design, however our present state of knowledge is not sufficient to say what reflection pattern is best, except we think it has something to do with light concentration paths through the stone. The contrast of bright areas next to less bright areas adds sparkle and twinkle (scintillation?) to otherwise bright but uninteresting designs.

We have extended most of this work to modifications of the SRB, primarily Table size

variations, and find that although details differ slightly the general conclusions are the same. We used the Brightness plot criterion to come up with a recommendation for Sammy Fangrath's design 21.143 APEX OCTAGON (see page 4). Here was a design that has a central facet combination similar to the Standard Round Brilliant. After trying a number of computer generated combinations of pavilion/crown mains (not as many over the total range as used for the SRB) we selected 39P/34C as the choice for Corundum and 39P/24C as the choice for Quartz. The progression of bright centers and dark rims was comparable to the SRB design. We also have applied this technique to non-symmetrical designs, but here the problem is more complicated because without the complementary "mirror facet" arrangement that exists in the SRB (and other symmetrical designs) the general conclusion that low pavilion and crown mains are desirable is not always true. We have to search for optimum brightness conditions that are specific to the design.

Use of lower angles than previously recommended and apex facets for the SRB design have been confirmed by actually cutting stones in a very light (Rose de France) amethyst material. Actual angles chosen for a stone should be influenced by available rough depth and other esthetic considerations, but the BRIGHTNESS CONTOUR diagram (Figure 1) correctly indicates acceptable pavilion/crown main combinations for the SRB 50% Table design.

Some people may not like the appearance of the very shallow crown, because it is not common it may look strange. Our data does show that very shallow crowns are not only permissible, but actually preferred from a brightness standpoint. "Native cutters" have known about this for years although their motive has been to utilize rough in an efficient manner rather than beauty. Low crown angles have an adverse effect on dispersion (or fire), but most colored stones have inherently low dispersion anyway. Scintillation is probably most dependent on the relative placement of the crown and pavilion facets. In our study this was not changed since we used Tangent-Ratio transformation for all designs the plan view was identical.

For Quartz 50% Table SRB we recommend pavilion angle 41 degrees and crown angles from 15 to 28 degrees. If a thinner stone is needed reduce the pavilion main angle to 39 degrees and add 6 degree apex facets to a 34 degree crown.

We believe Brightness/Reflection plots offer a means to select optimum angles for other facet designs as well as the SRB. If we can interest other facetors in this "computer" approach perhaps the work can be speeded by sharing the calculation load. Anyone who wants to "give it a go" can contact either Robert Long or Norman Steele thru Seattle Faceting Books or see us in person at the conferences we attend.