

‘Facet Designer’ - Newsletter 05

HOW MANY REFLECTIONS ?

Here we will discuss the different numbers of reflections, which are selected via *View/Image/N of Reflections*.

Again we use Tolkowsky’s diamond as a study example.

All illustrations show the crown face-up with ‘normal’ lighting (black background, white front with *cos* gradation).

The choice of 1 reflection is absurd – try it. No light is returned to the viewer; it entered the gem and just bounced off the first side of the pavilion; it is still in the gem

2 REFLECTIONS

Most studies of gem reflections, before the application of complex 3-D analysis by computers, treated only double reflections – a ray entered the crown, bounced off both sides of the pavilion, and returned to the crown – to be partially refracted out or totally reflected back into the gem.

In addition, those studies were all two-dimensional = reflections in a single plane through the axis of the gem. Now we see effects not shown in these studies by rays approaching the gem in planes which are not through the gem axis.

Fig.1 shows the image with 2 reflections. The familiar edge wedges are there already (yellow arrows), so this is a simple phenomenon – not as complex as had been supposed. These are probably due to rays not in axial planes.

3 REFLECTIONS

This is VERY interesting. I am amazed at the difference caused by 3 reflections vs 2; I had expected no significant change until 4. The old simplified studies showed that 3 reflections occurred when a ray returning to the crown was totally reflected back into the gem (none of them considered partial reflections). That a ray passes out of the gem through the crown after 3 reflections is a new thought to me.

Note that the bright areas did not get brighter, but some dark areas got darker. In addition, a very dark area appeared which I call a ‘black hole’ (orange arrow). How can this be? We cannot add darkness, and we cannot delete light. I hope that Anton can explain this.

5 REFLECTIONS

There was no significant difference by 4 reflections vs 3, but 5 reflections suddenly brightens some areas, indicated by red arrows in Fig.3. Some of the rays which were reflected back into the gem earlier have finally found a way out toward the viewer.

12 REFLECTIONS

Successive reflections are progressively less powerful. The image with 12 reflections (Fig.4), is virtually the same as with 5 reflections (Fig.3).

This study has been done with a face-on view of the table. Anton says that the difference shows up in oblique views.

.SUMMARY

It seems that analysis of major ray paths can be simplified by studying the patterns of only 2 and 3 reflections.

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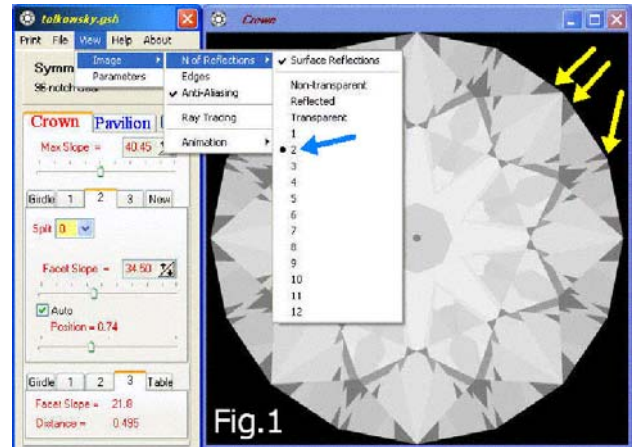


Fig.1

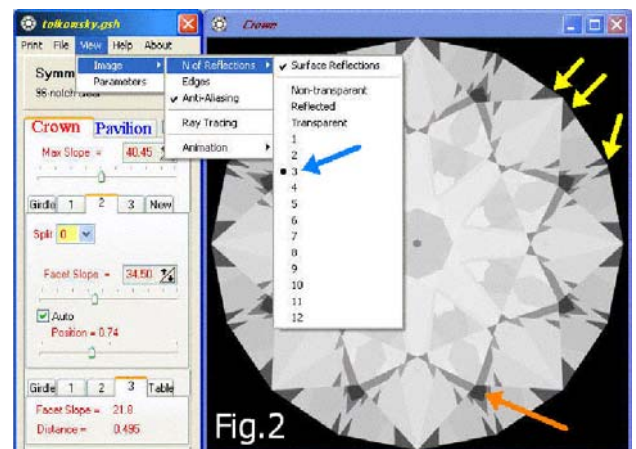


Fig.2

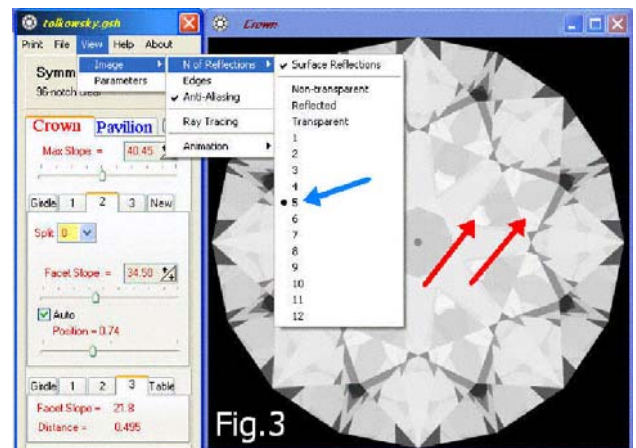


Fig.3

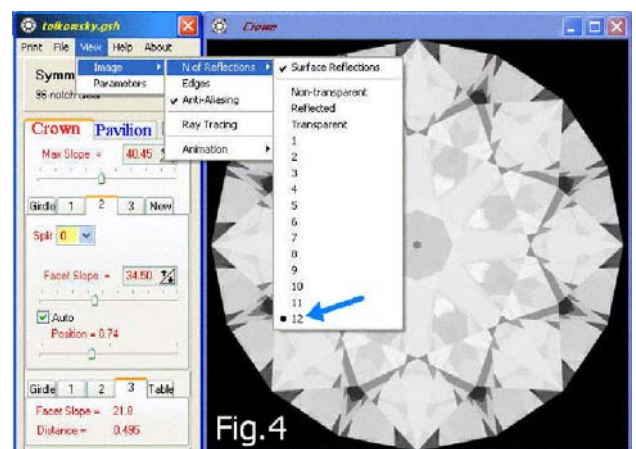


Fig.4