



# GIA®

## NEWS FROM RESEARCH

# NEW TOOL FOR DIAMOND APPEARANCE RESEARCH

By Al Gilbertson and Ilene Reinitz

In June of 2011, members of GIA's cut research team were invited to see stereo 3D movies of diamonds made using Cut Group's L-Box™ (the Cut Group consists of Lexus, OctoNus Softmac, Dr. Yuri Shelementiev and Garry Holloway).

The L-Box™ can be used as an instrument for comparison of two or more diamonds/gems that are stationary or in one of several movement patterns that mimic a wide variety of normal lighting and observation conditions. The gems are tilted and rocked by a software-controlled mechanical gimbal, using a predefined trajectory, allowing a controlled and repeatable relationship between the diamonds, light source and camera or human viewer. This allows demonstration of brightness, fire, and scintillation of one or more diamonds fixed together on the moving platform. The L-Box™ can be used to make visual observations, or can be fitted with a digital full-frame Canon camera to capture a series of photos while the objects are moving. The images could be also strung together to build a high-resolution movie or 3D movie.

### How the 3D works:

A special image splitter is mounted on the camera macro lens and records two sets of images: one pair for each scene. The software uses these dual images for left and right eye and creates stereo movies that can be seen with various modern stereo visualization methods, including stereo glasses on a 3D screen.

For our viewing, we wore liquid crystal shutter glasses (also called LC shutter glasses or active shutter glasses) used in conjunction with the 3D display screen to create the illusion of a three-dimensional image (stereoscopy). Each of the glasses' "lenses" contains an initially transparent liquid crystal layer which darkens when voltage is adjusted. The glasses are controlled by a transmitter that sends a timing signal that allows the glasses to alternately darken over one eye, and then the other, in synchronization with the refresh rate of the screen. Meanwhile, the screen alternately displays different perspectives for each eye, using a technique called alternate-frame sequencing, which allows each eye to see only the image intended for it. LC shutter glasses virtually eliminate "ghosting," a problem with other 3D display technologies. Unlike red/cyan color filter 3D glasses, LC shutter glasses are color neutral, enabling 3D viewing in the full color spectrum.

LC shutter glasses are shutting out light half of the time because they are polarized. This gives an effect similar to watching TV with sunglasses on; while seeing a darker picture there is a higher perceived contrast of images when paired with LCD displays.

The 3D movies of two different diamonds, side by side, provide a highly magnified comparison of the two diamonds moving synchronistically. The user can also freeze the frame to compare details between individual high-resolution images within the sequence.

As a result of the demonstration in June, GIA Research has recently obtained an L-Box™ for use in its research on diamond appearance. Figures 1 and 2 and the movie were taken with the L-Box™ in non-stereo mode.



Fig. 1: Image taken in Carlsbad using the new L-Box for one of GIA's research diamonds. Note that the dark and light areas of the reflection pattern are very similar to the pattern seen by the typical observer in a diffused lighting environment. The L-Box environment creates a good replication of how a diamond is viewed in real life.



Fig. 2: Image taken in Carlsbad using the new L-Box for one of GIA's research diamonds.