Diamond Color Optimization

Process flow

Today available:

Colored diamonds on the market usually have many negative phenomena: dark zones and pale zones. Sometimes diamond cutters have no idea now to optimize color by smart cutting.

Optical phenomena modeling

Photos in Lab conditions

Approximate DC models

It was not possible to remove these diamonds from their settings. However an approximate 3D modeling clearly shows that a saturated princess cut and a worse radiant cut can be polished from a diamond with the same spectrum.

Process flow

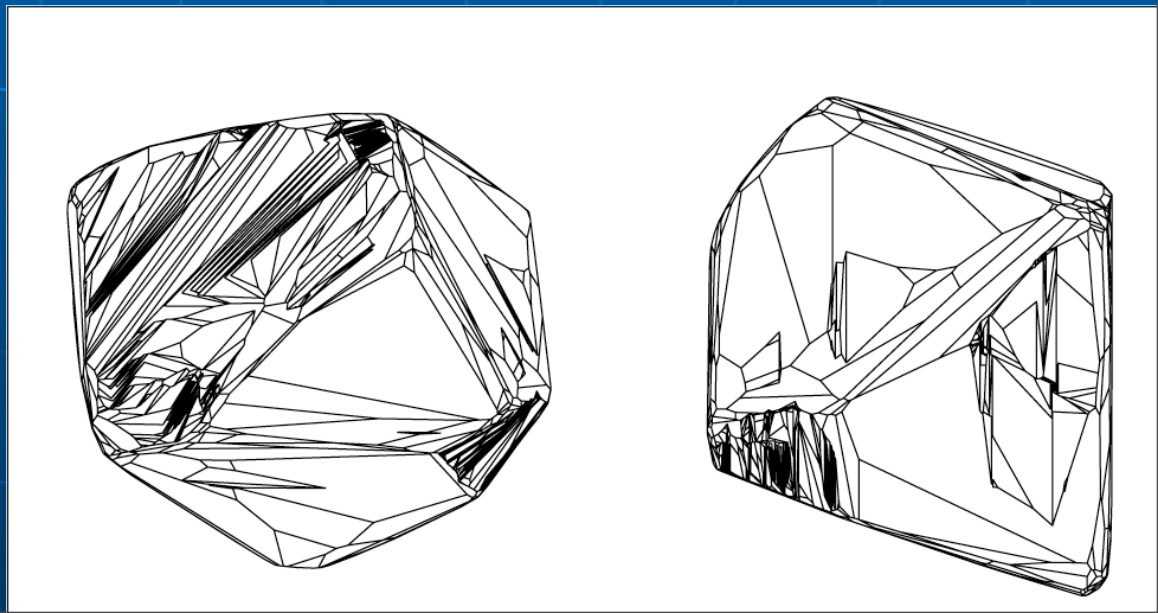
1. Preparation of a rough diamond
2. Rough scanning and allocation
3. Shape and size preliminary considerations
4. Taking pictures and obtaining their RGB data
5. Recording transmission spectra
6. Calculations of absorption spectra
7. Importing spectrum into DiamCalc. Spectrum adjustment
8. Preliminary shapes color check
9. Optimization by color metrics
10. Expert consideration of optimization results
11. Final allocation and final decision
12. Documenting of the final stone

Preparation of a rough diamond

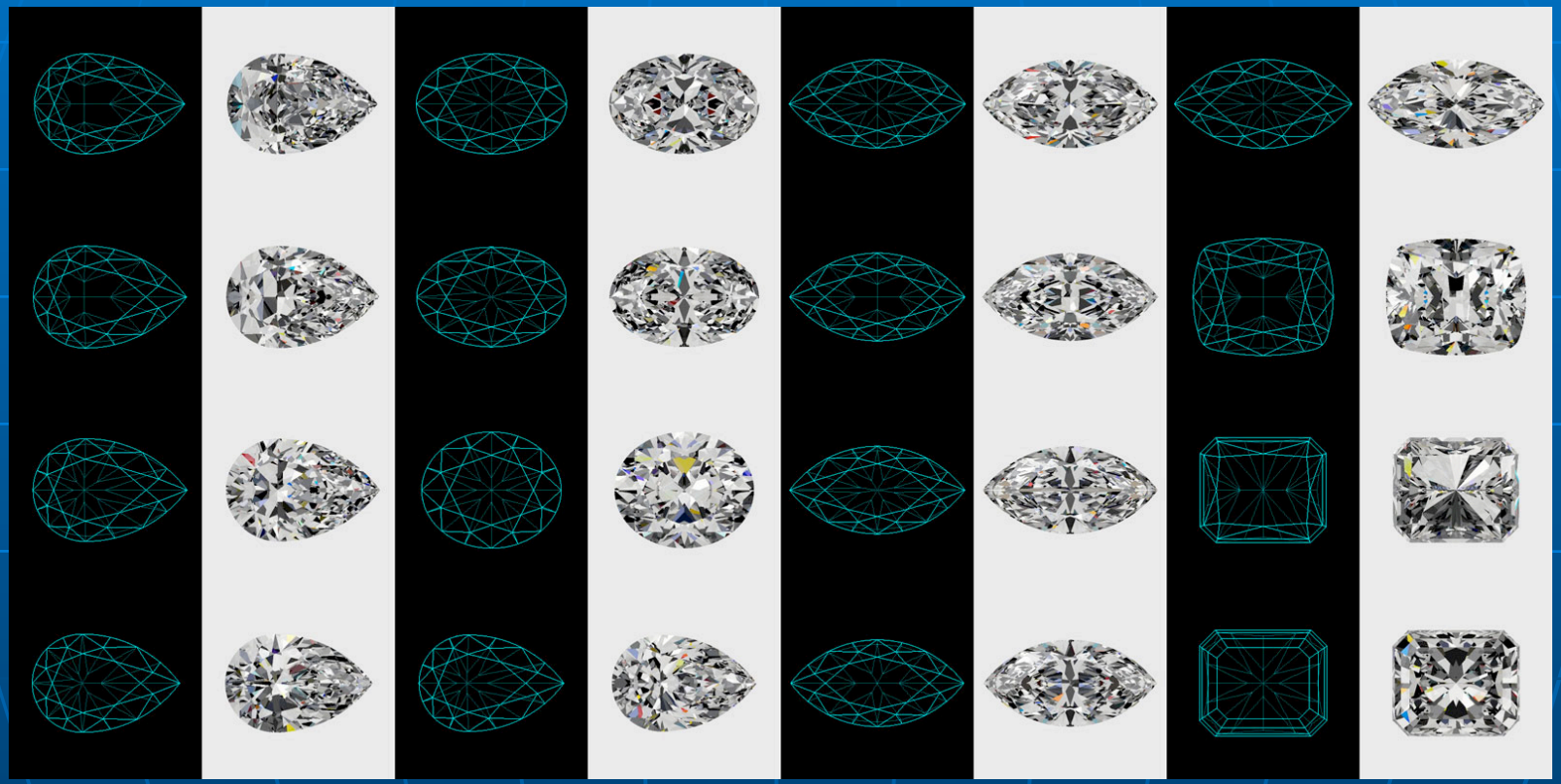
- Visual observation
- Color distribution study
- Polishing windows
- Control of windows

Rough scanning and allocation

- Helium diamond model construction
- Check of model accuracy
- Inclusions allocation
- Polished diamonds allocation
- Choosing one or two prospective shapes



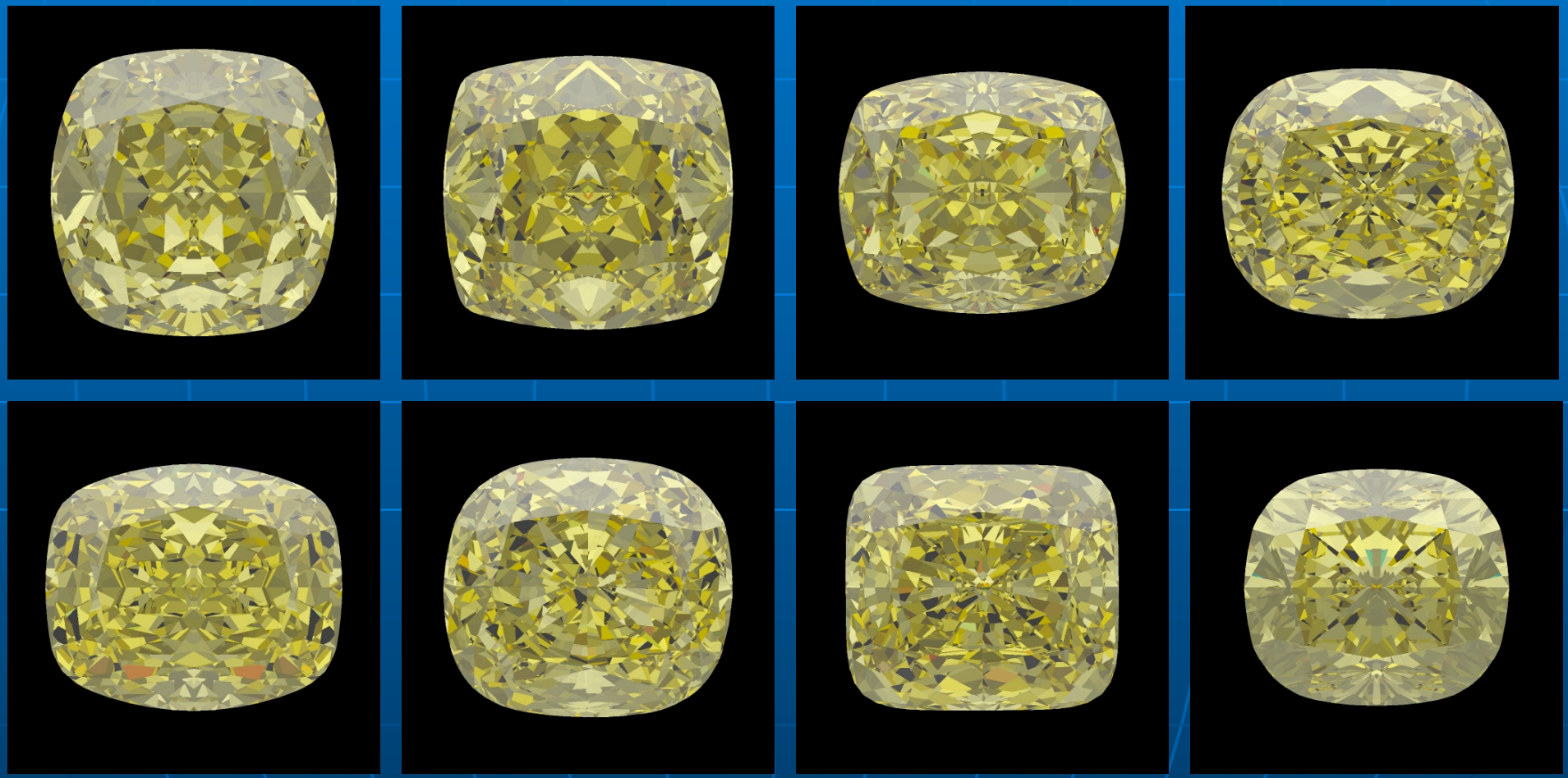
Library of shapes



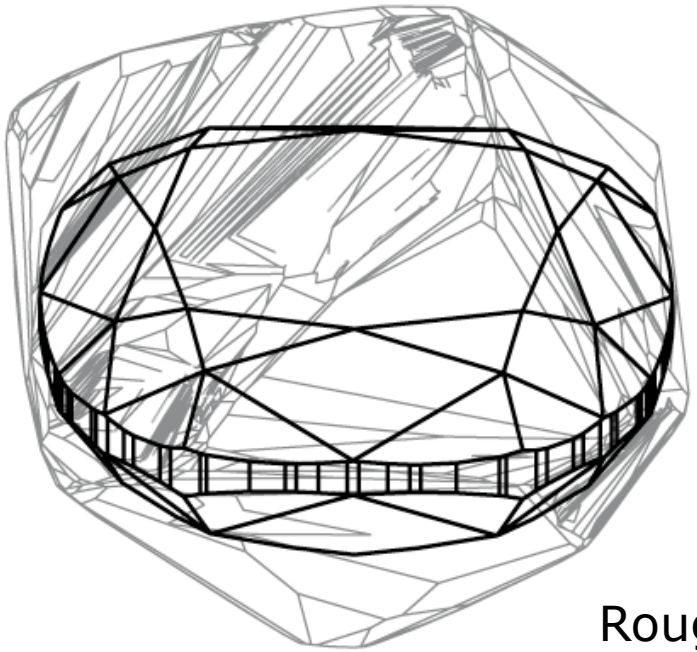
Designer Cuts gallery DiamCalc Internal Cuts gallery External Cuts gallery (Dll)

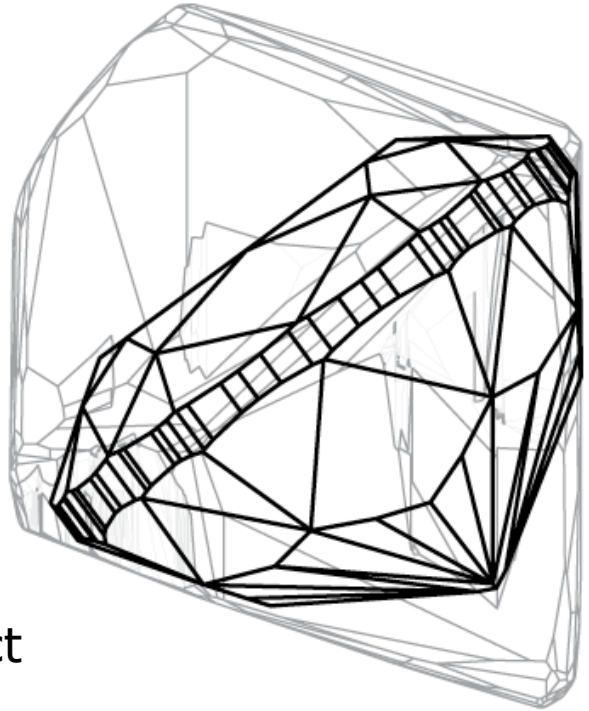
http://www.octonus.com/oct/gallery/external.php

Cushions examples



Polished diamonds allocation



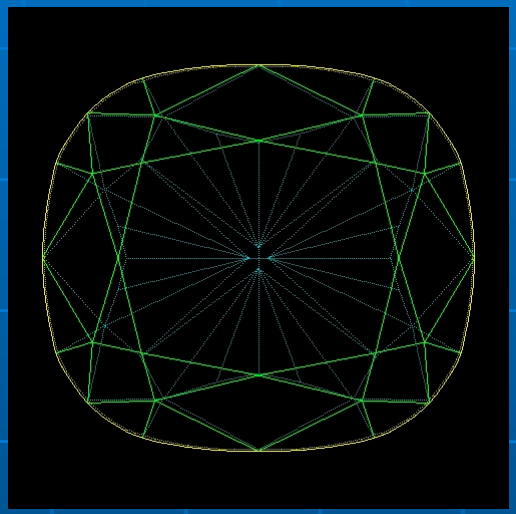


Rough 5.00 ct

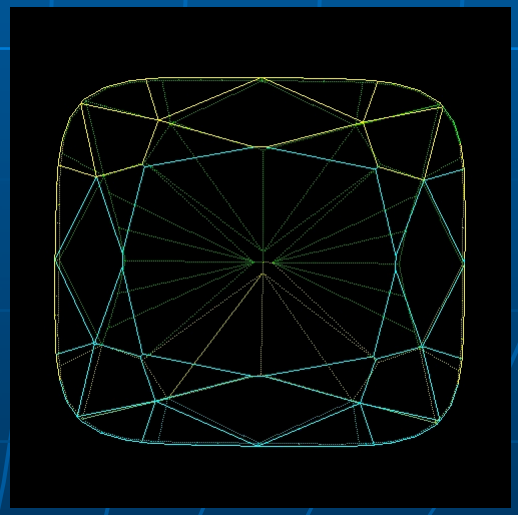
Polished 2.93 ct

Two different cushions

Cushion
2.93ct



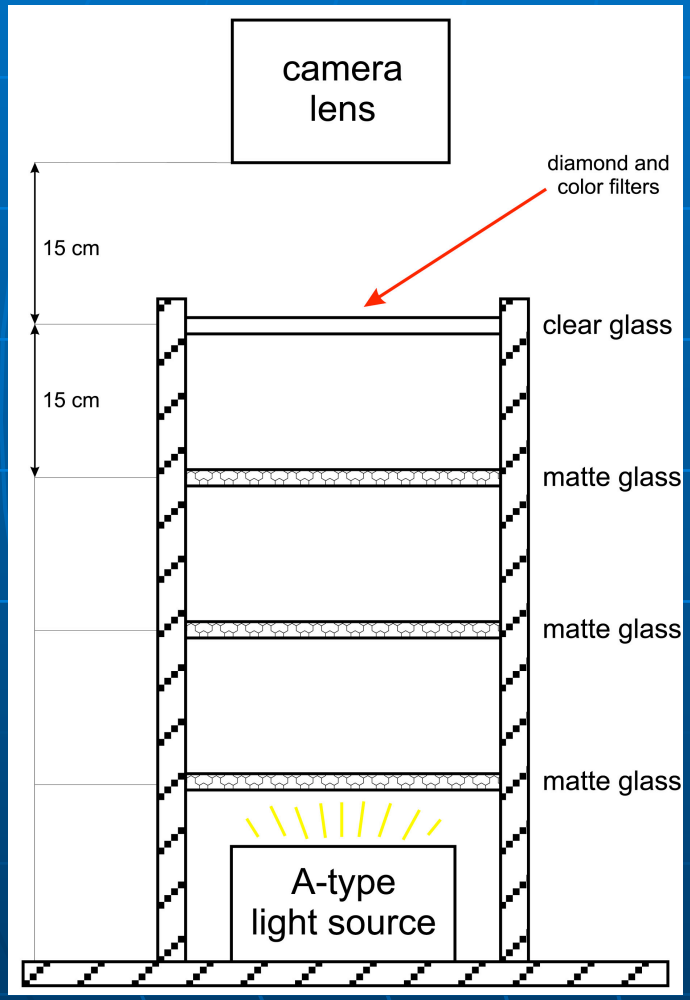
Cushion
3.00ct

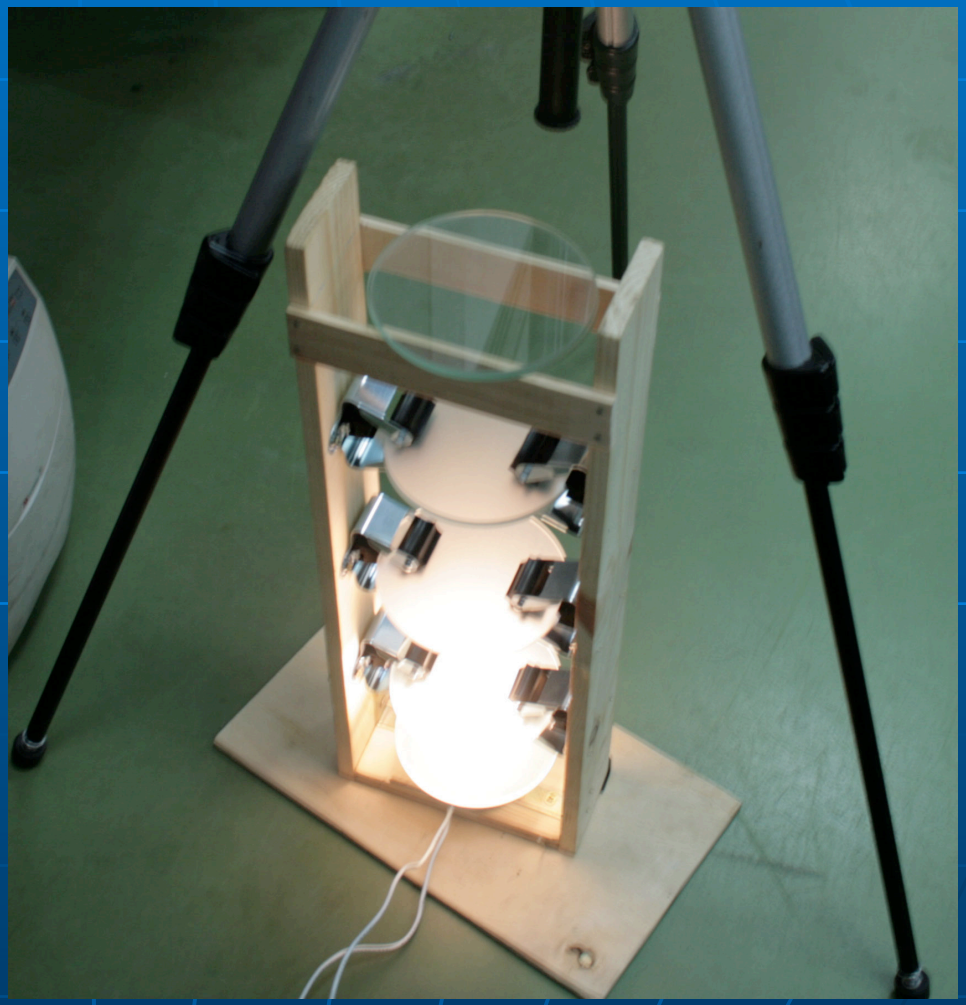


Taking pictures and obtaining their RGB data

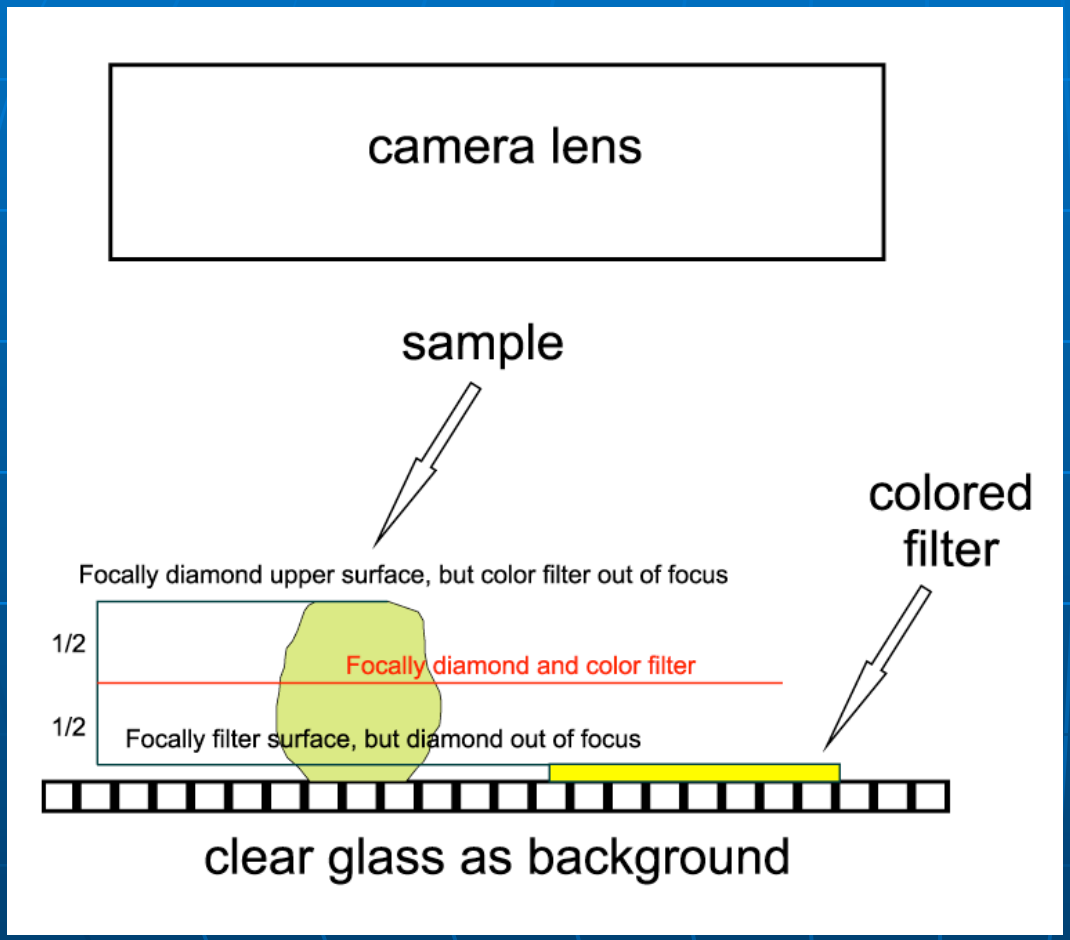
- Use of a light table
- Stone and camera positions
- Background color correction
- Camera settings
- Picture quality check
- Obtaining stone/background RGB pairs in Adobe PhotoShop

Use of light table

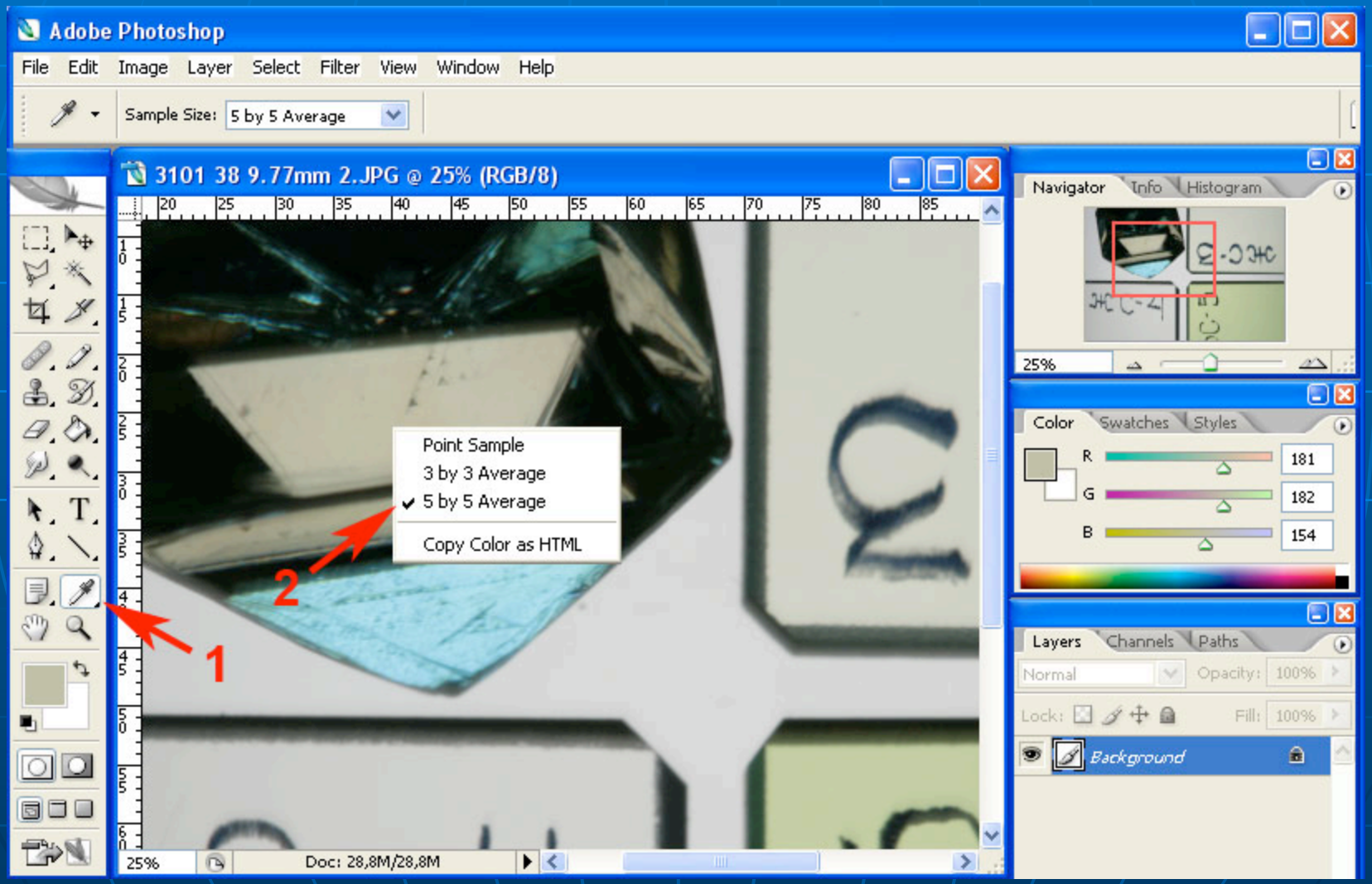




Stone and camera positions



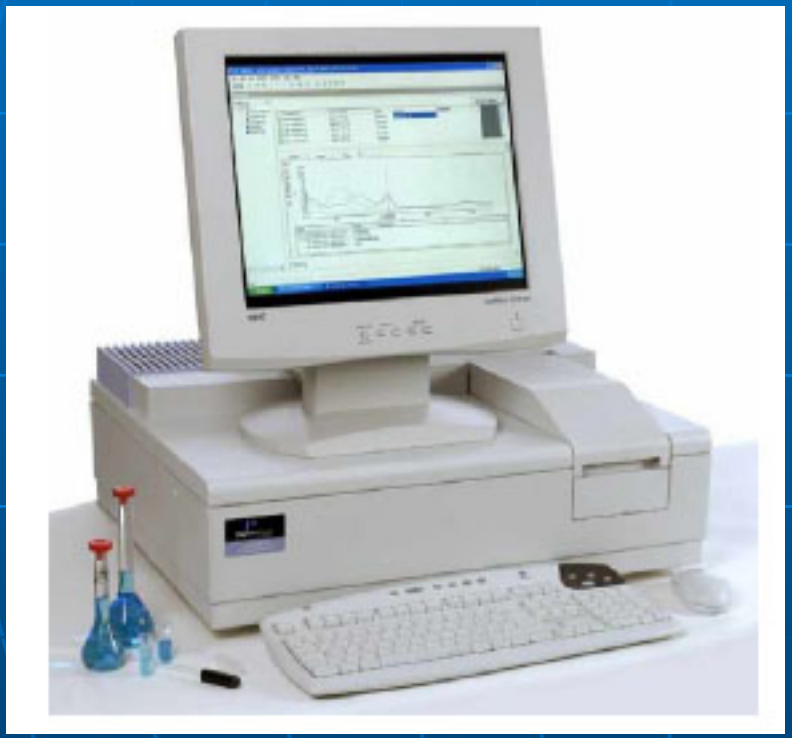
Stone/background RGB pairs



Recording transmission spectra

- Spectrometer settings
- Reference spectrum recording
- Sample directions 1 and 2 transmission spectra recording
- Calculation of sample transmission 1 and 2 spectra
- Visual check of spectral curves

Visible range spectrometers

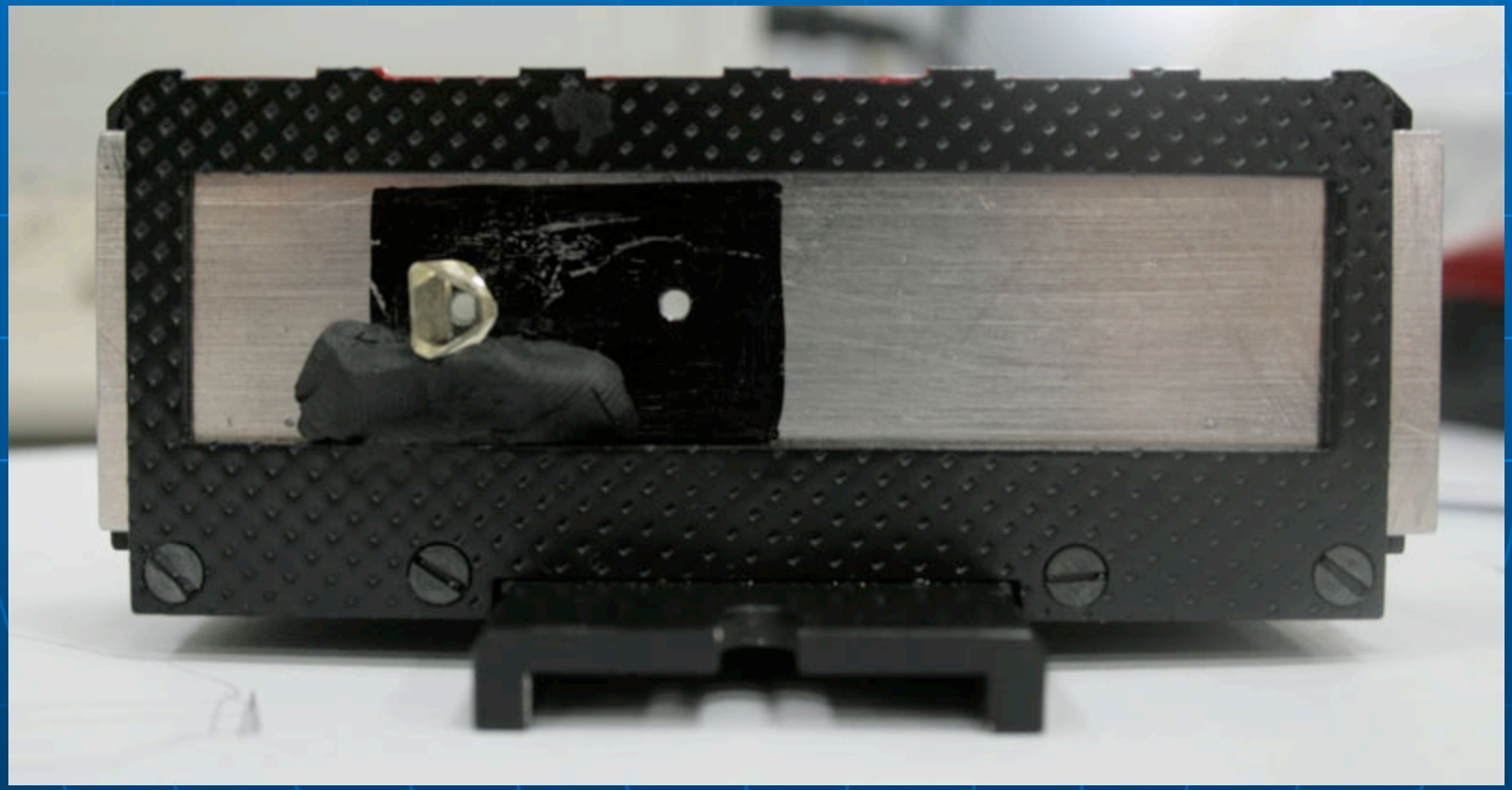


Lambda 35

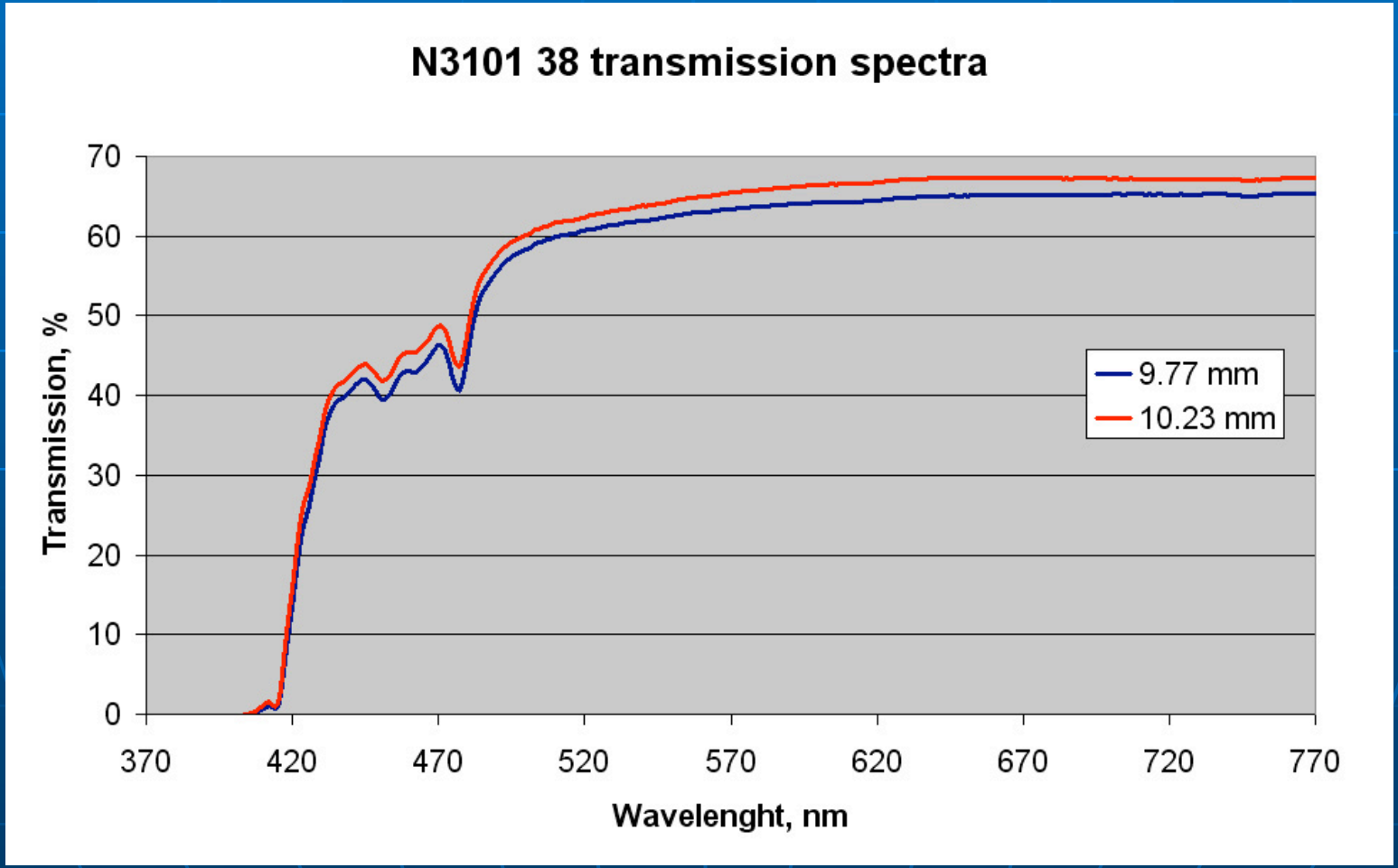
or

SF-56A

Sample position on the holder



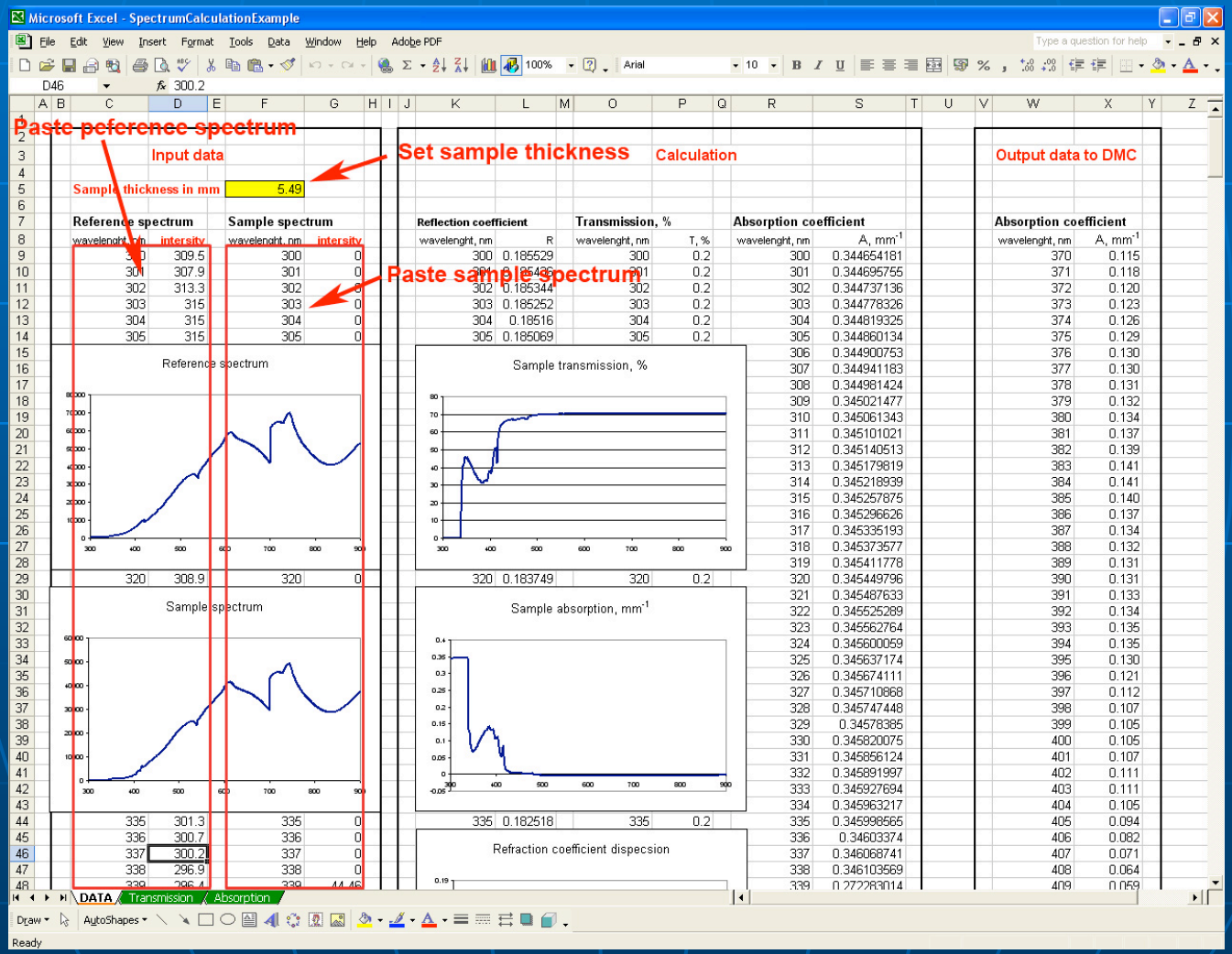
Sample directions 1 and 2 transmission spectra recording



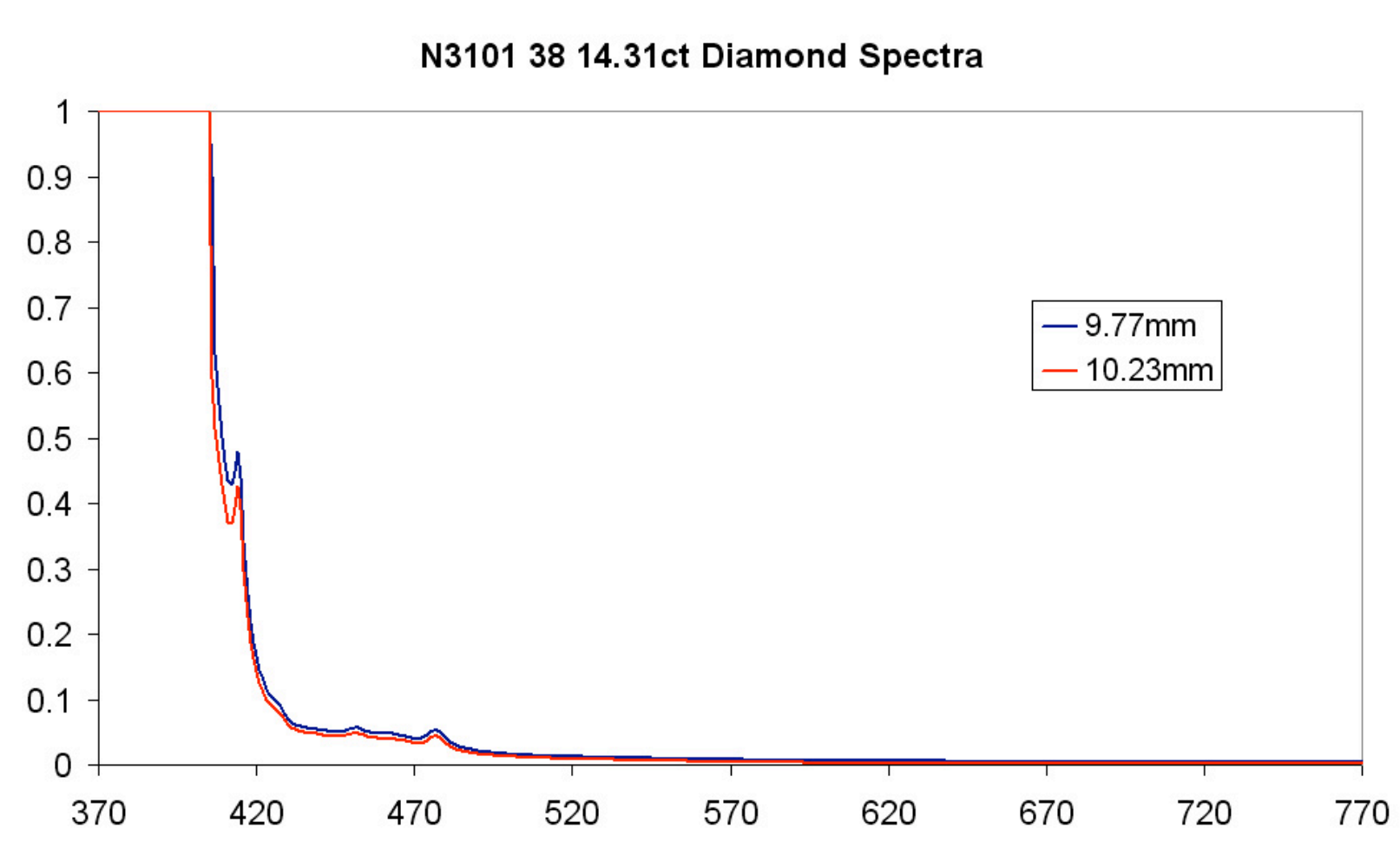
Calculations of absorption spectra

- Import transmission file to the Microsoft Excel template
- Input sample thickness
- Visual check and comparison of absorption spectra
- Saving .txt absorption files
- Importing spectrum into DiamCalc

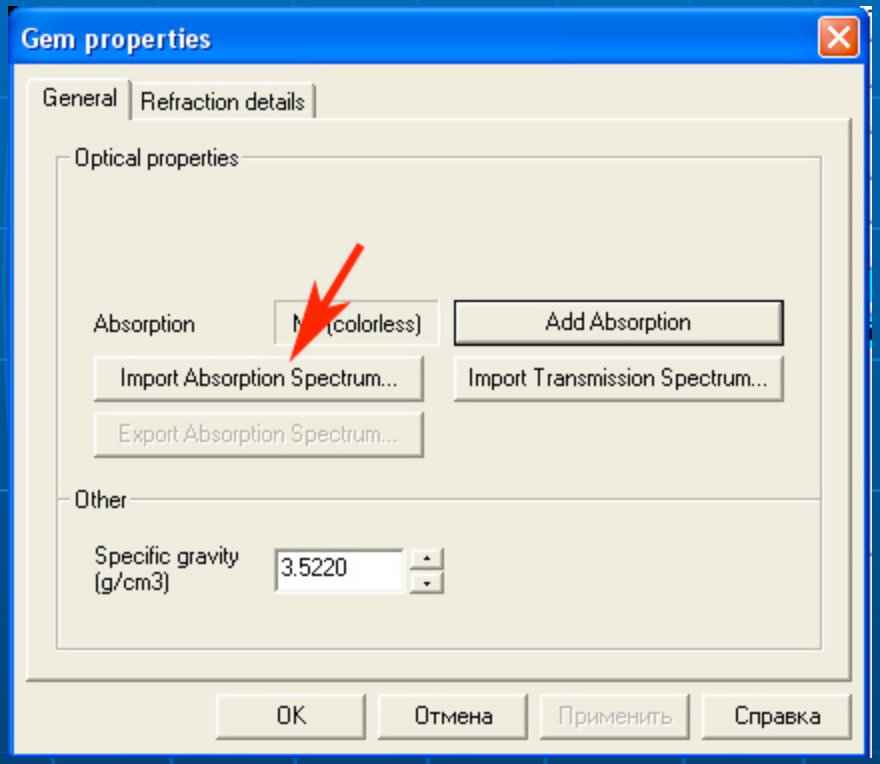
Calculation of sample absorption 1 and 2 spectra



Visual check and comparison of absorption spectra



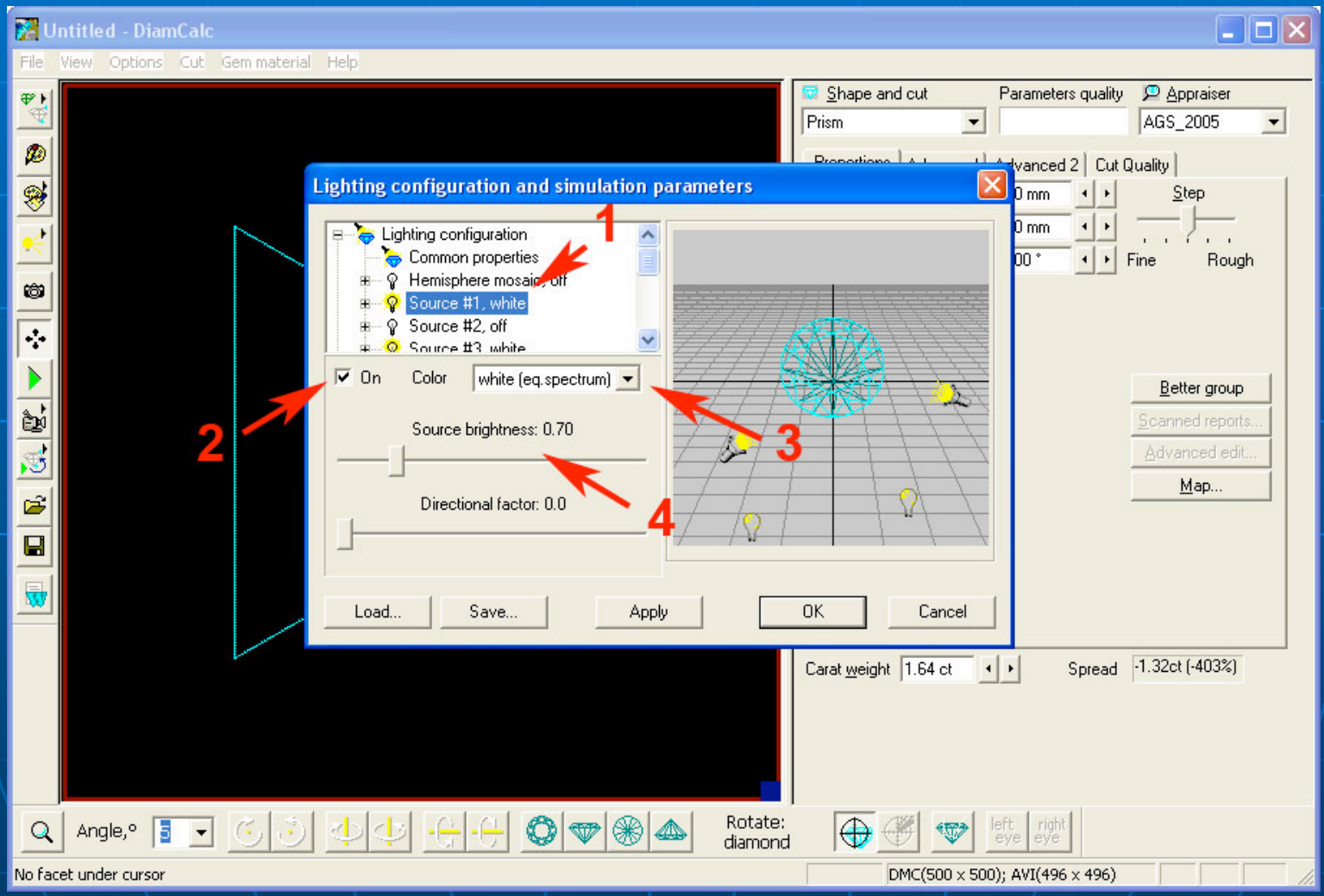
Importing spectrum into DiamCalc



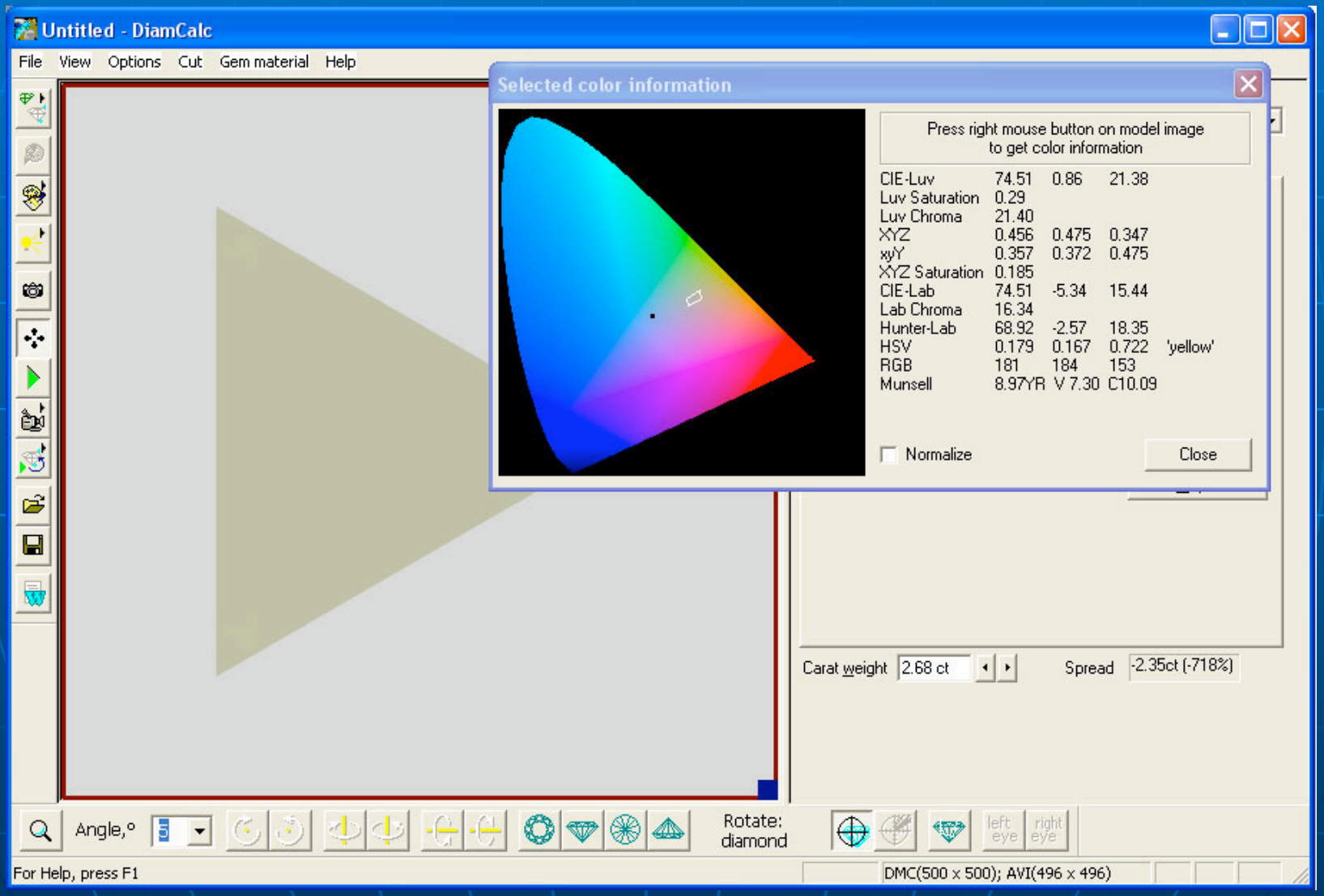
DiamCalc plate model verification. Spectrum adjustment

- DC transmission illumination mode
- Lighting conditions and eye color adaptation
- Prism thickness
- Color information panel
- Plate and background RGB coordinates
- Light brightness adjustment with photo RGB
- Spectrum adjustment
- Prism and photo color verification
- Selecting between spectra 1 and 2

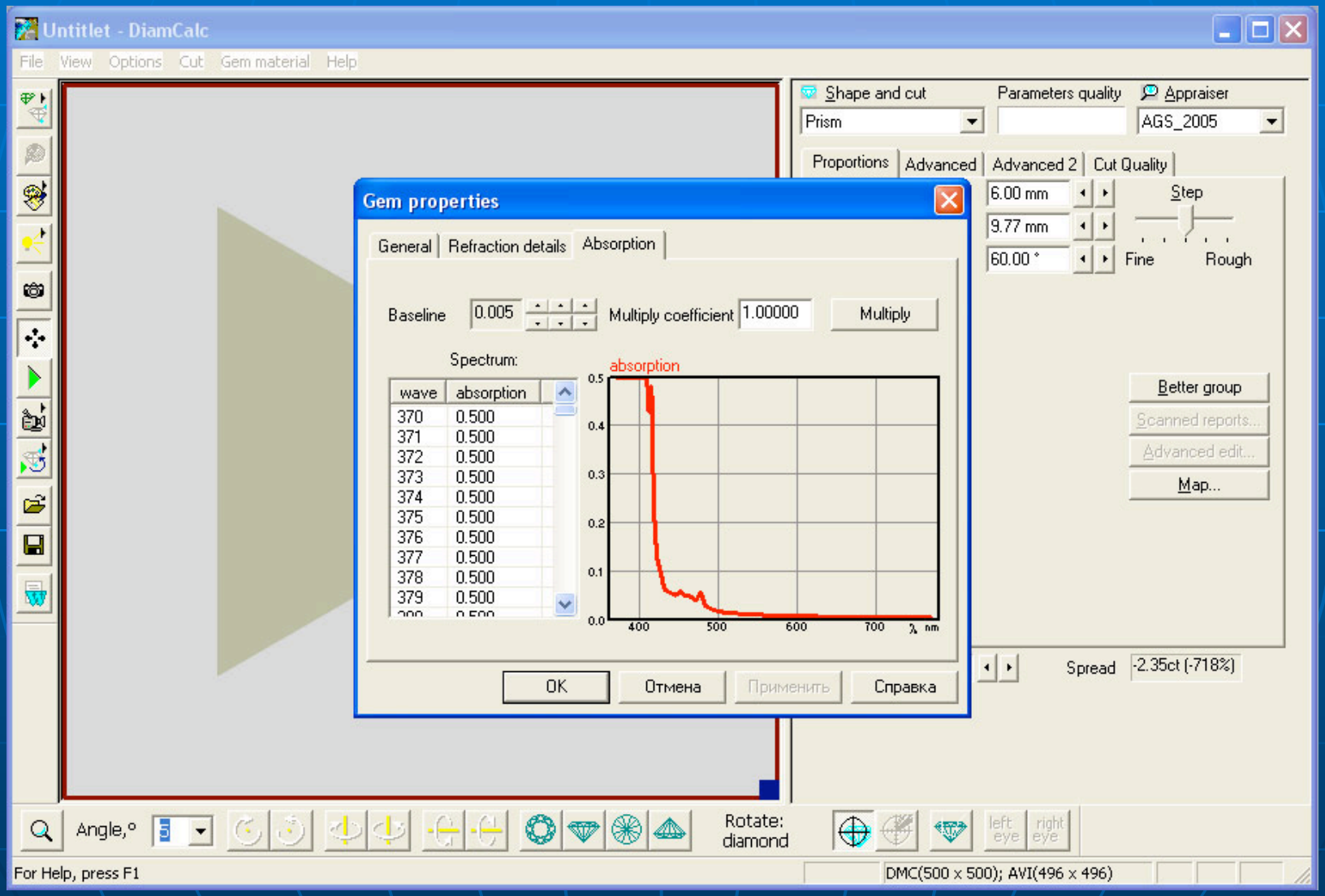
DC transmission illumination mode



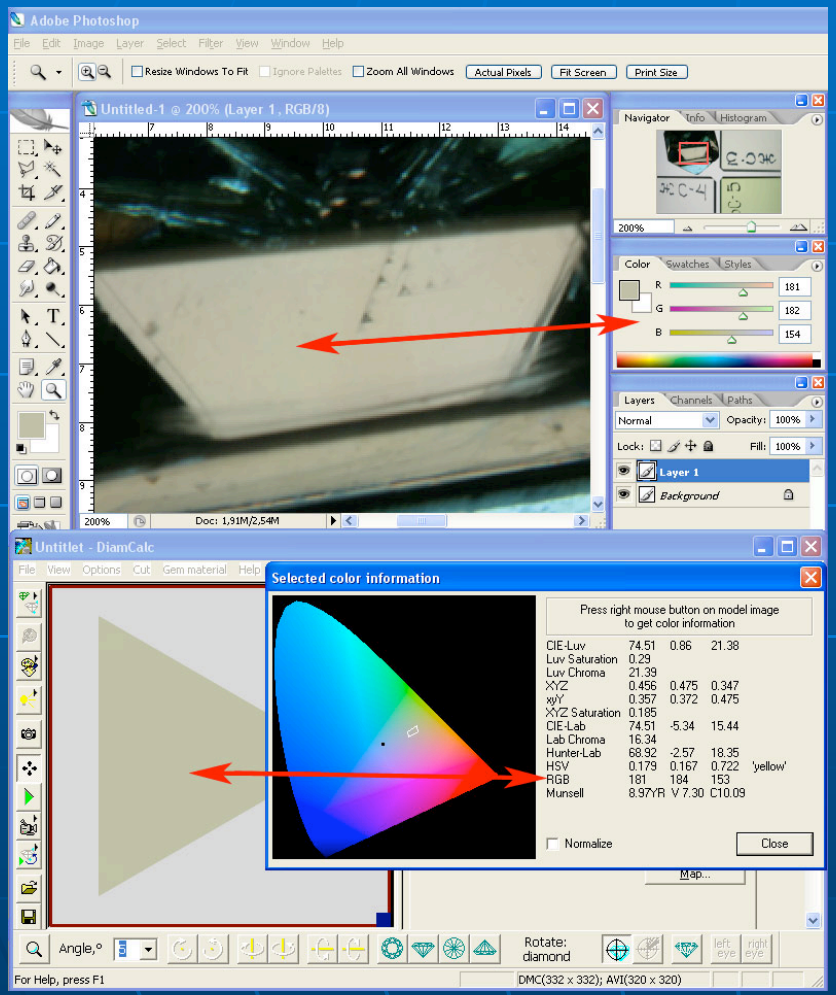
Color information panel



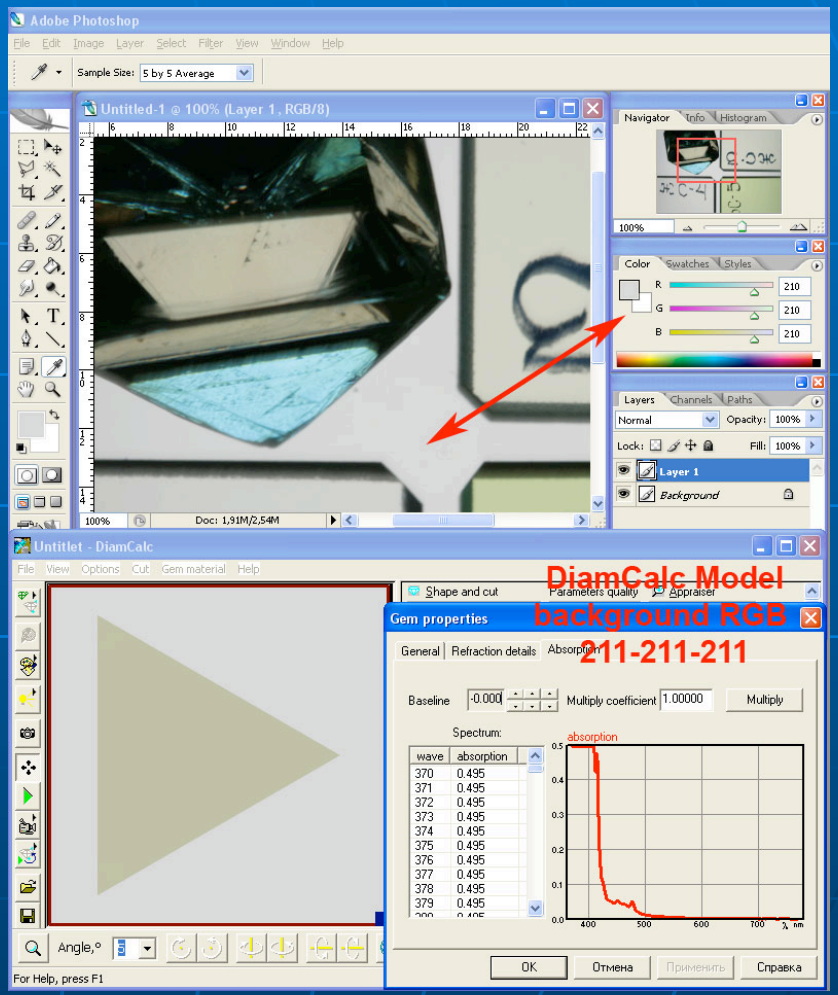
Spectrum adjustment



Prism and photo color verification



Prism RGB verification

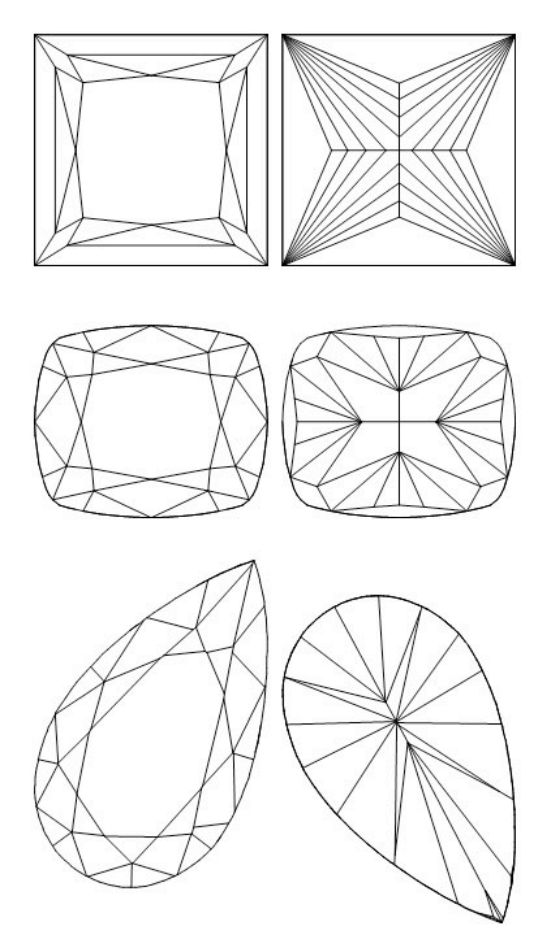


Background RGB verification

Preliminary shapes color check

- Standard and external parametrical cuts
- ASCII cuts import
- Standard lighting conditions
- DiamCalc color statistics panel
- Manual proportions adjustment
- Selecting cuts for computer optimization

Standard, external parametrical cuts and ASCII cuts



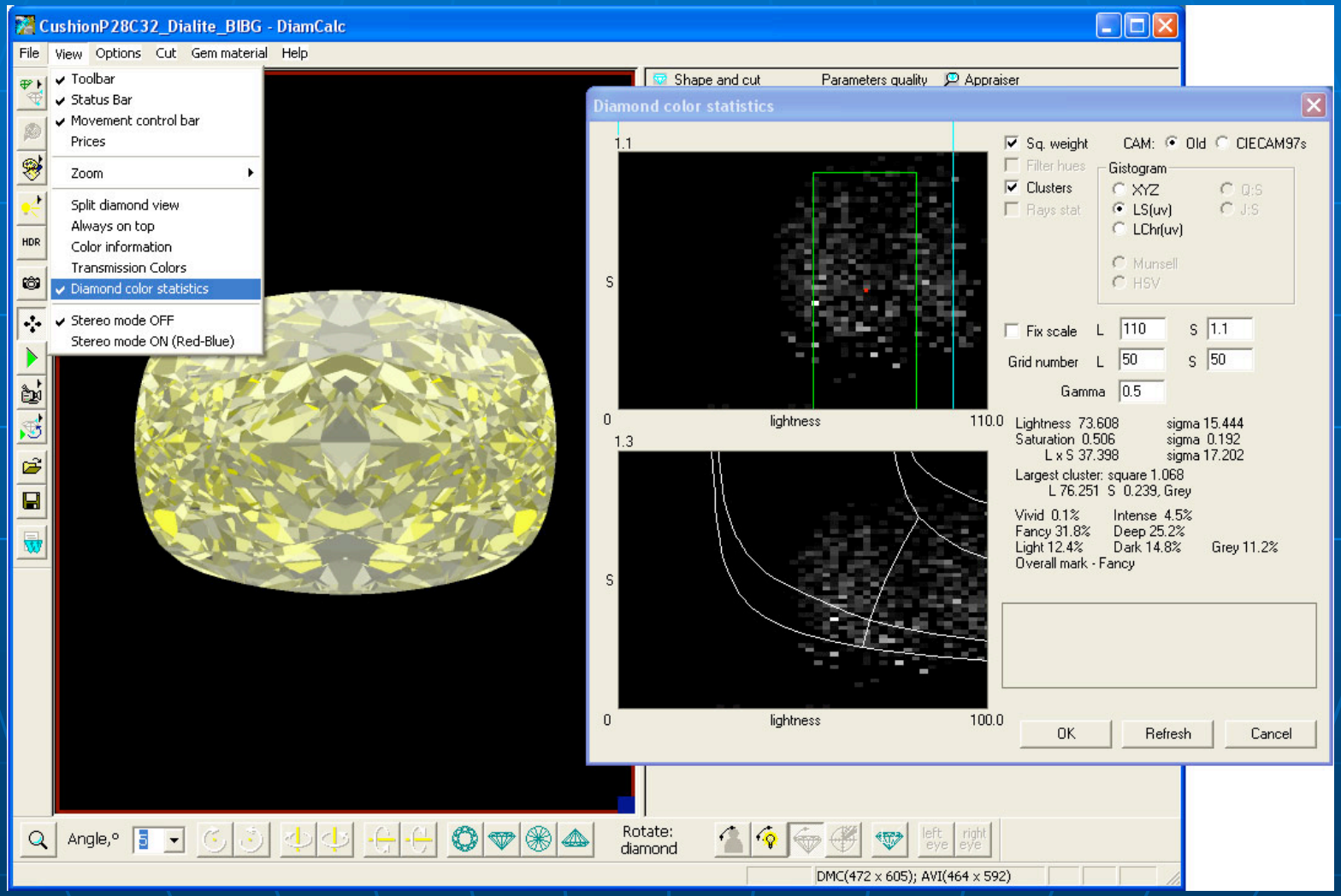
standard

external

ASCII

Standard lighting conditions

DiamCalc color statistics panel



Choosing proportions to be optimized

- For parametrical cuts
- For ASCII cuts
- Selection of optimization ranges and steps

Choosing proportions to be optimized and to be fixed for parametrical cuts

For internal DiamCalc cuts main proportions for optimization are:

- pavilion angle
- crown angle
- table diameter
- lower facets depth

For external DiamCalc cuts:

- pavilion front angle and pavilion flank angle (or Moon facet angle and Moon rotate angle for Oval cut)
- pavilion angle
- crown angle
- table diameter
- lower facets depth

Choosing proportions to be optimized and to be fixed for ASCII cuts

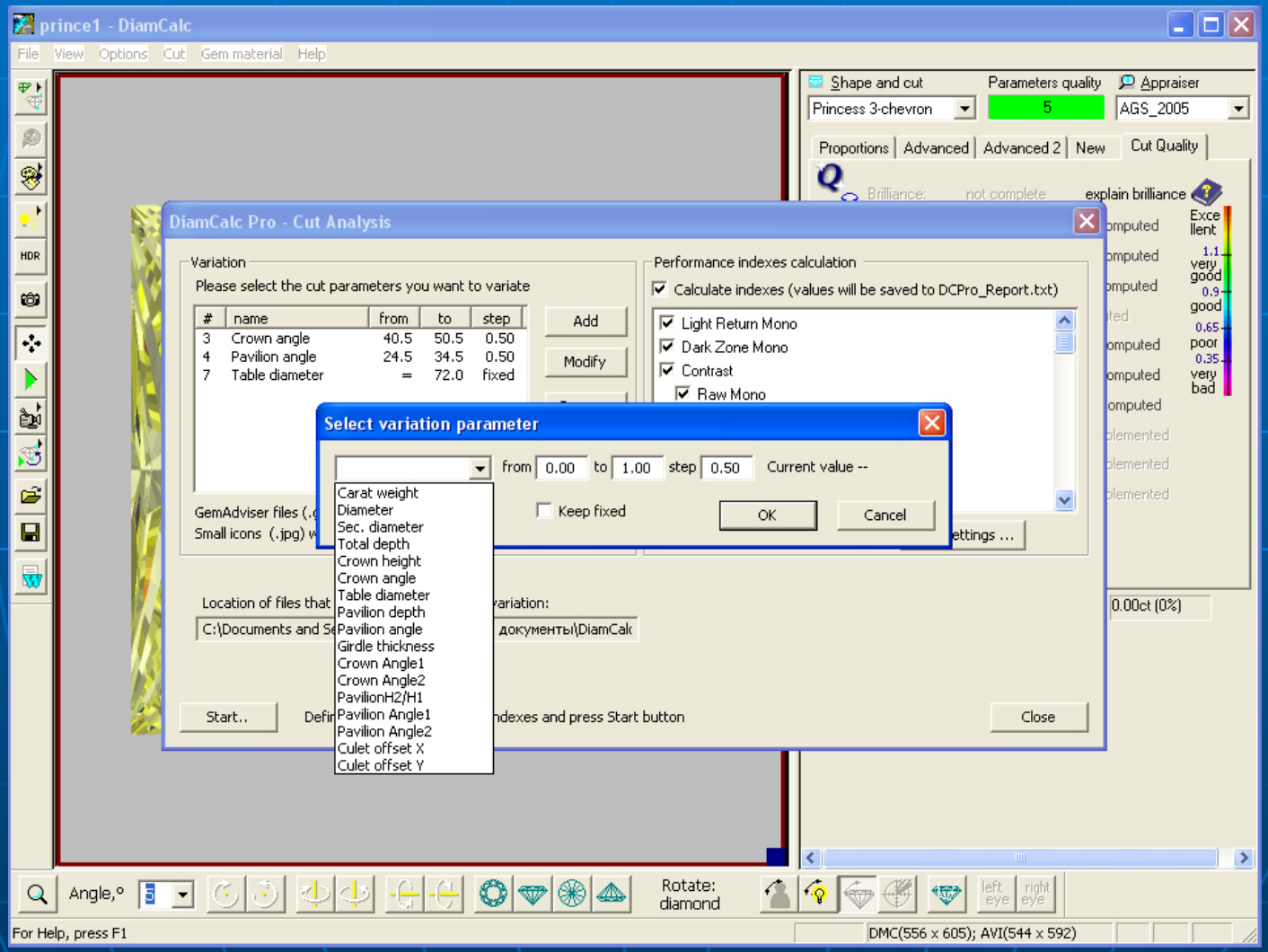
ASCII cuts are not parametrical and DiamCalc allows changing:

- pavilion height
- crown height
- girdle thickness

Optimization by color metrics

- DiamCalc optimization panel settings
- DiamCalc color metrics
- Optimization time
- Optimization results table
- Graphical representation of optimization results

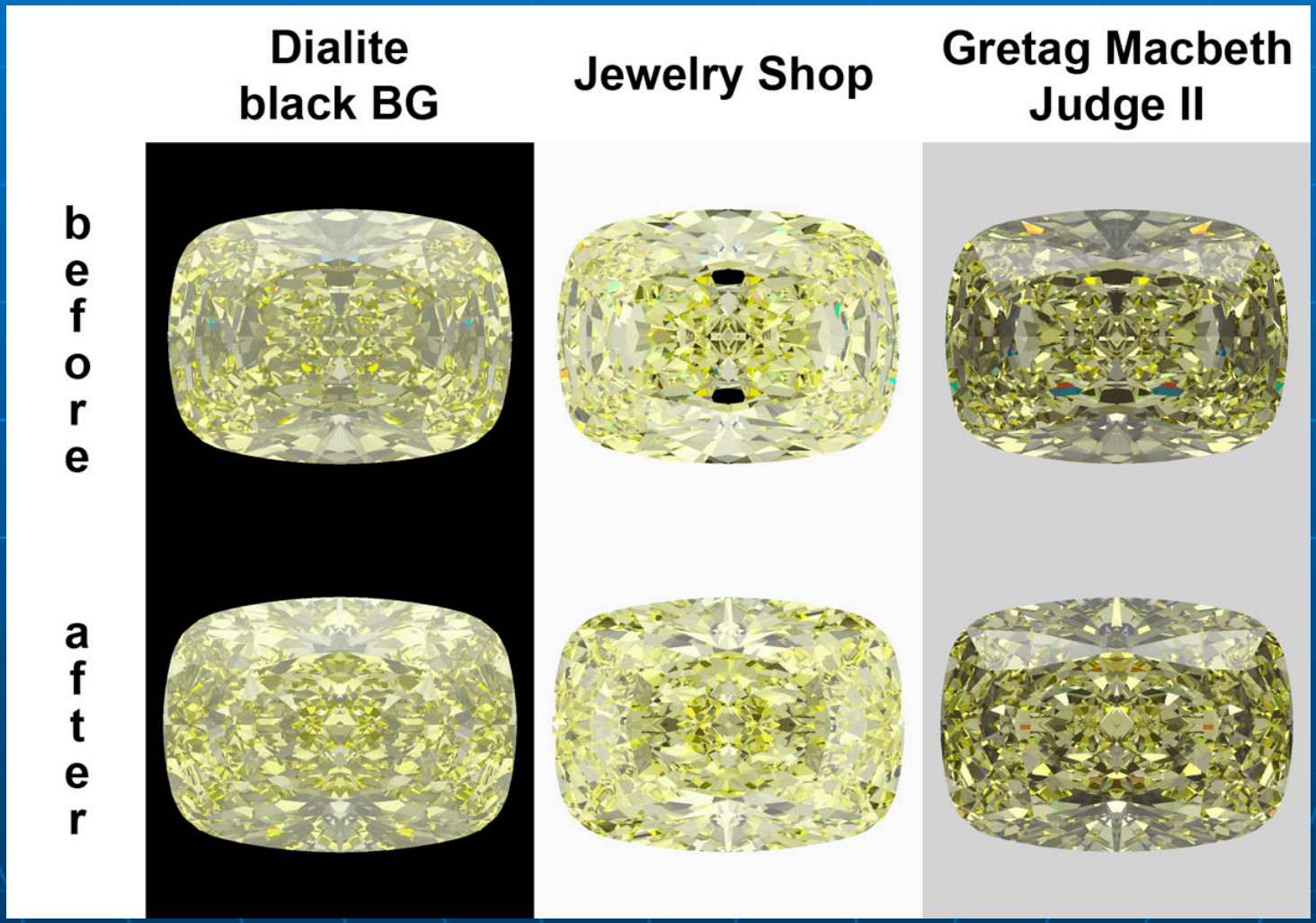
DiamCalc optimization panel settings



Expert consideration of optimization results

- Selecting extremum points of optimization results
- Work with rendering images
- Check in various standard lighting conditions
- Tilting and movie options
- Negative optical effects
- New parameters for computer optimization

Lighting conditions



Second stage of computer optimization

- Microanalyses parameters
- Graphical representation of optimization results
- Work with rendering images

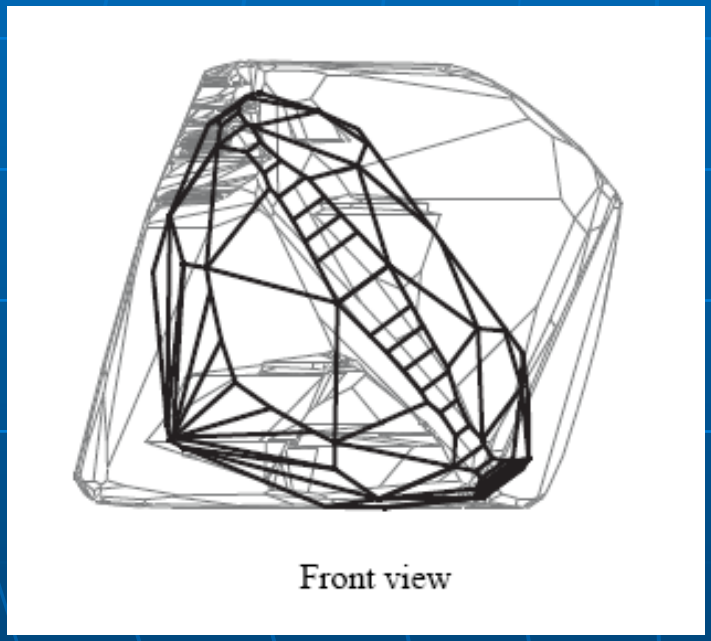
Fixing one proportions set

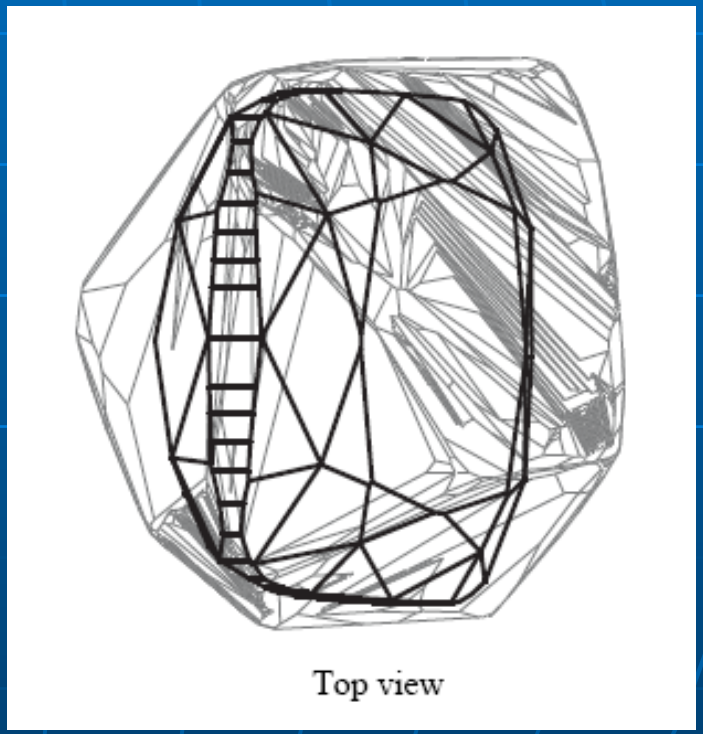
- Check in different lightings
- Check movie and tilting
- Check optical phenomena
- Check proportions, angles and azimuths
- Export to ASCII file

Final allocation

- Rough optimization with fixed proportions
- Expert check of the new plan
- Cutting instructions and final plan report

Importing optimized DiamCalc cut to Pacor Client





Rough 5.00 ct
Optimized cushion 3.03 ct

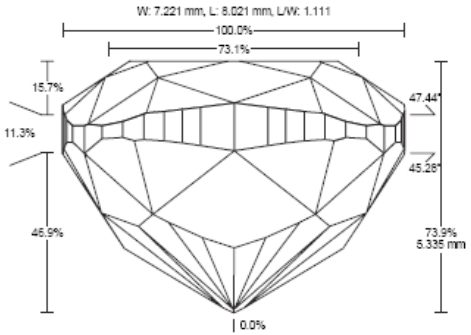
Final cutting report

60002 2 5.00ct
General information

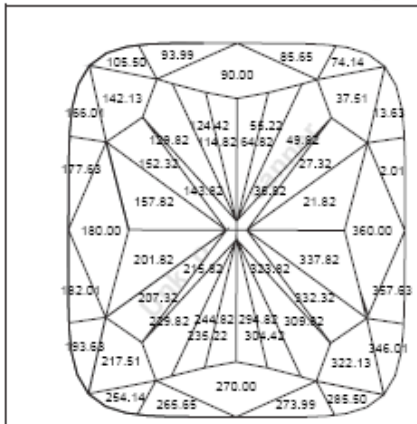
Model	Cushion
Report date	11.12.2007
Weight, ct	3.00, 3.0000
Width, mm	7.221
Length, mm	8.021
L/W ratio	1.111
Total height	5.335 mm, 73.87 %

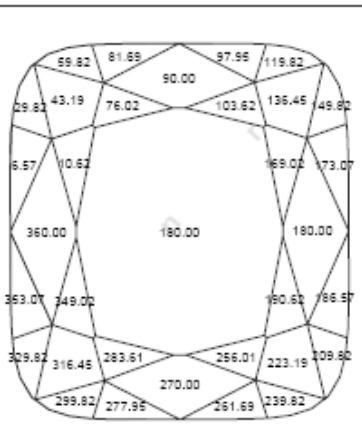
Main parameters

Pavilion depth	%	46.93
	mm	3.389
Crown height	%	15.67
	mm	1.131
Table	%	73.06
	mm	5.538
Culet	%	0.00
	mm	0.000
Girdle thickness: Bezel	%	11.27
Girdle thickness: Valley	%	3.74
Girdle thickness: Bezel	mm	0.814
Girdle thickness: Valley	mm	0.270

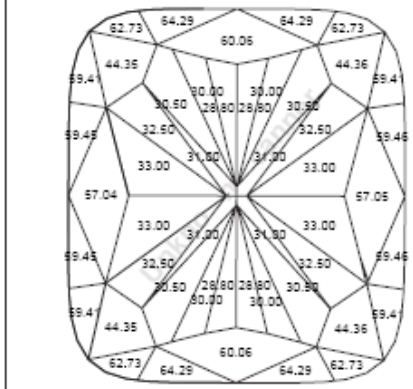


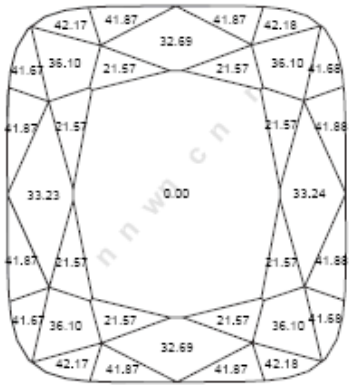
Facets' azimuths and slope angles





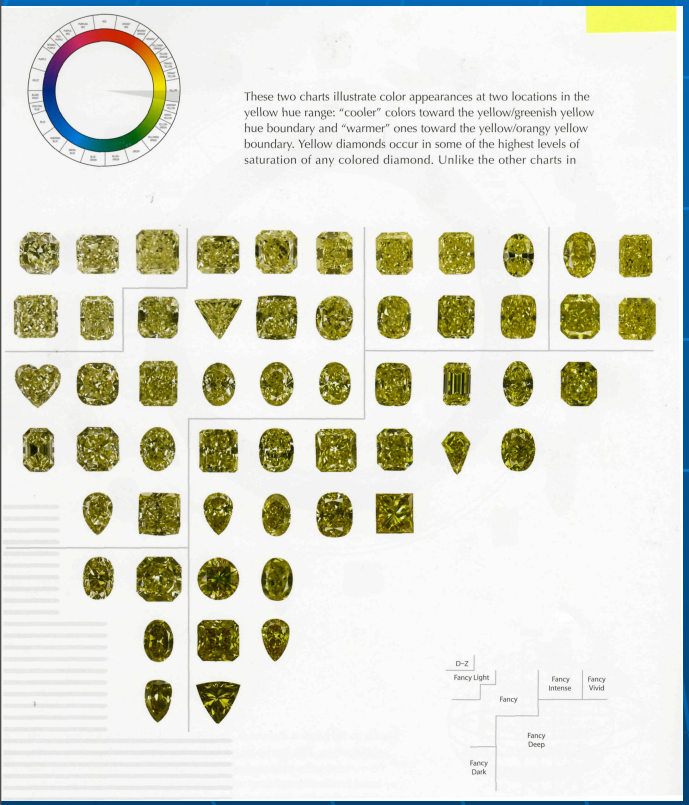
Pavilion and crown views of the diamond with indication of facets' azimuth angles

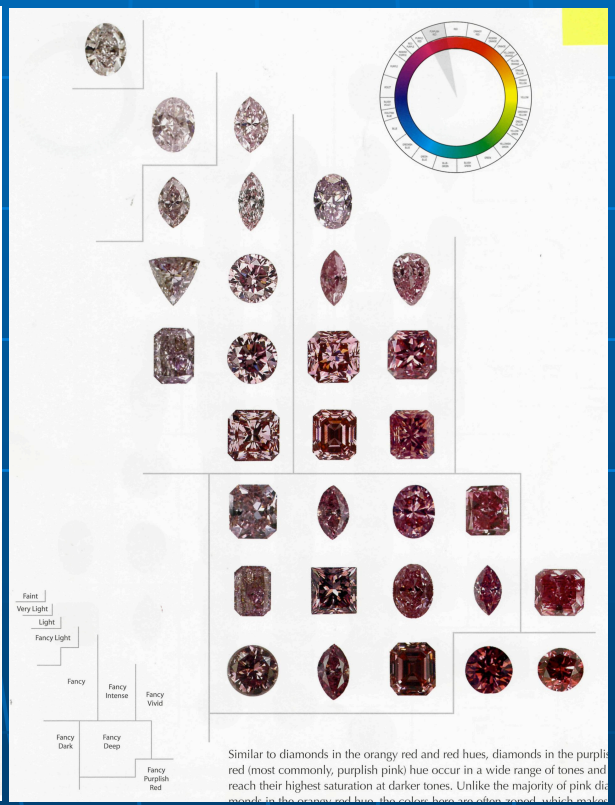


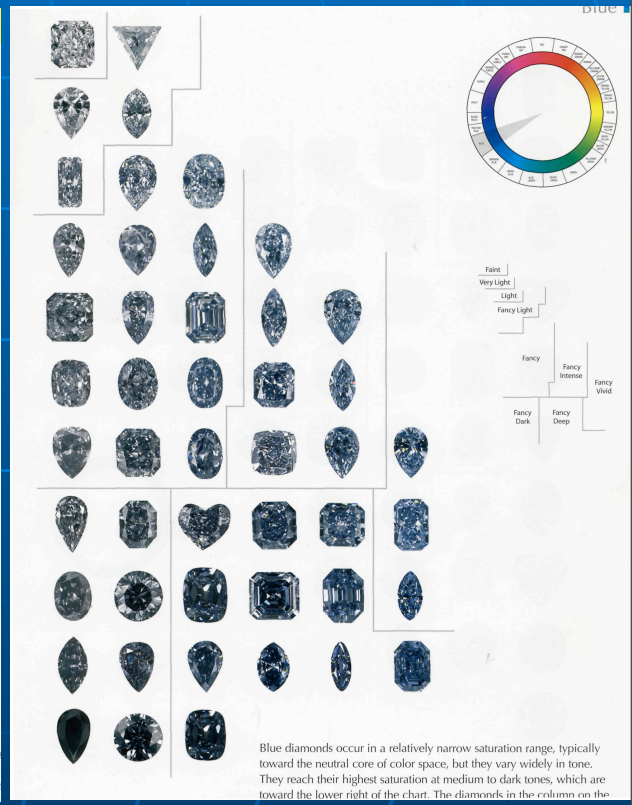


Pavilion and crown views of the diamond with indication of facets' slope angles

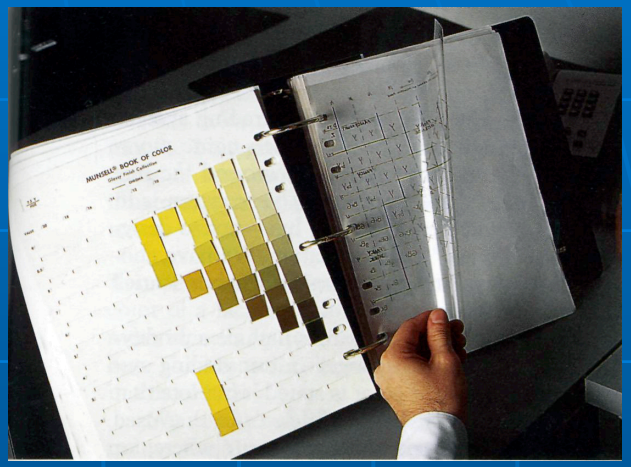
Principles of diamond color grading

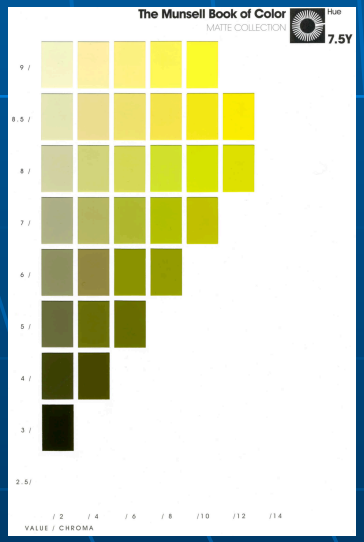


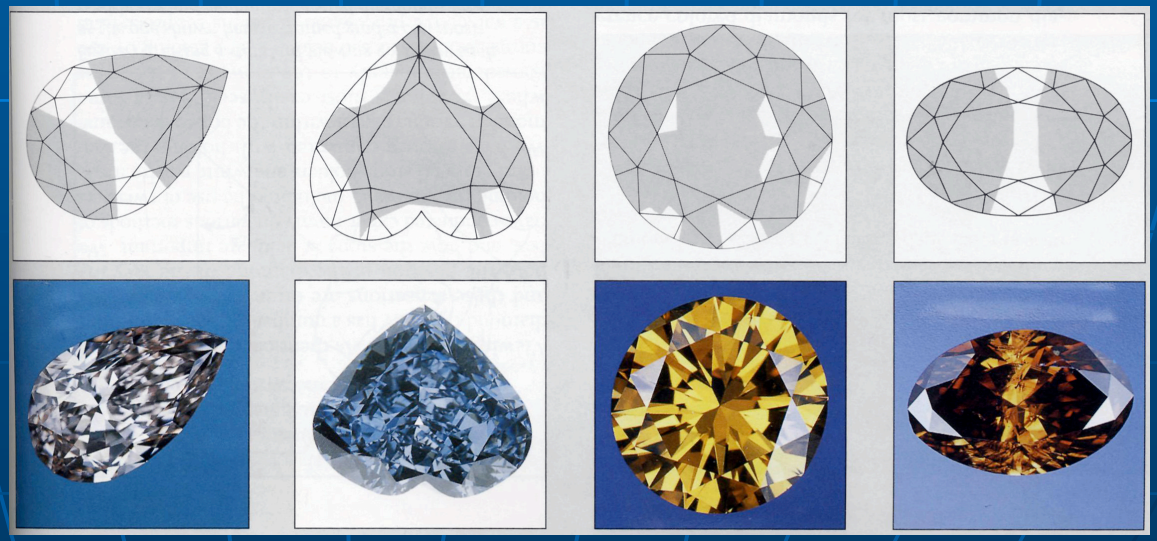




Color grading in a Lab







Documenting of the final stone

- Polished stone scan
- Photo in the light box
- Polished stone DiamCalc model
- Gemological laboratory report
- Documenting all deviations from the plan

Final stone at different lights

Meda lightbox

G M Judge II black BG

G M Judge II white BG

G M Judge II black BG

Main advantages of color optimization

- Better color appearance
- Avoid negative optical phenomena
- Better color grade
- Better yield
- Predictable results
- Control from planning to final stage
- Modeling of existent negative phenomena