Advanced Software Features for the LA-950

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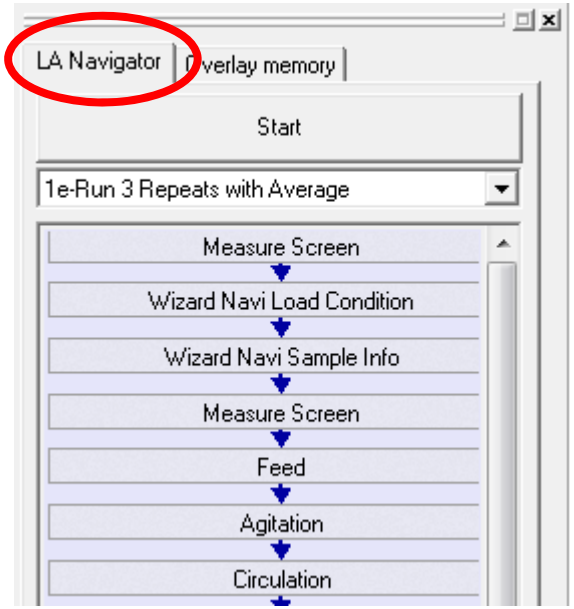
What we'll talk about

- Measurement tools
- Data analysis tools
- Data verification tools
- Q&A

One-button Measurement

- Use the Navigator or Method Expert to create Sequence (.seq) files
  - Manual: Navigator
  - Auto: Method Expert



LA-950 Method Expert

- Unique guided method development
- Optimize parameters
- Choose the best refractive index
- Create “one button” SOPs
- Webinar TE004 for Method Expert

Collecting and Calculating

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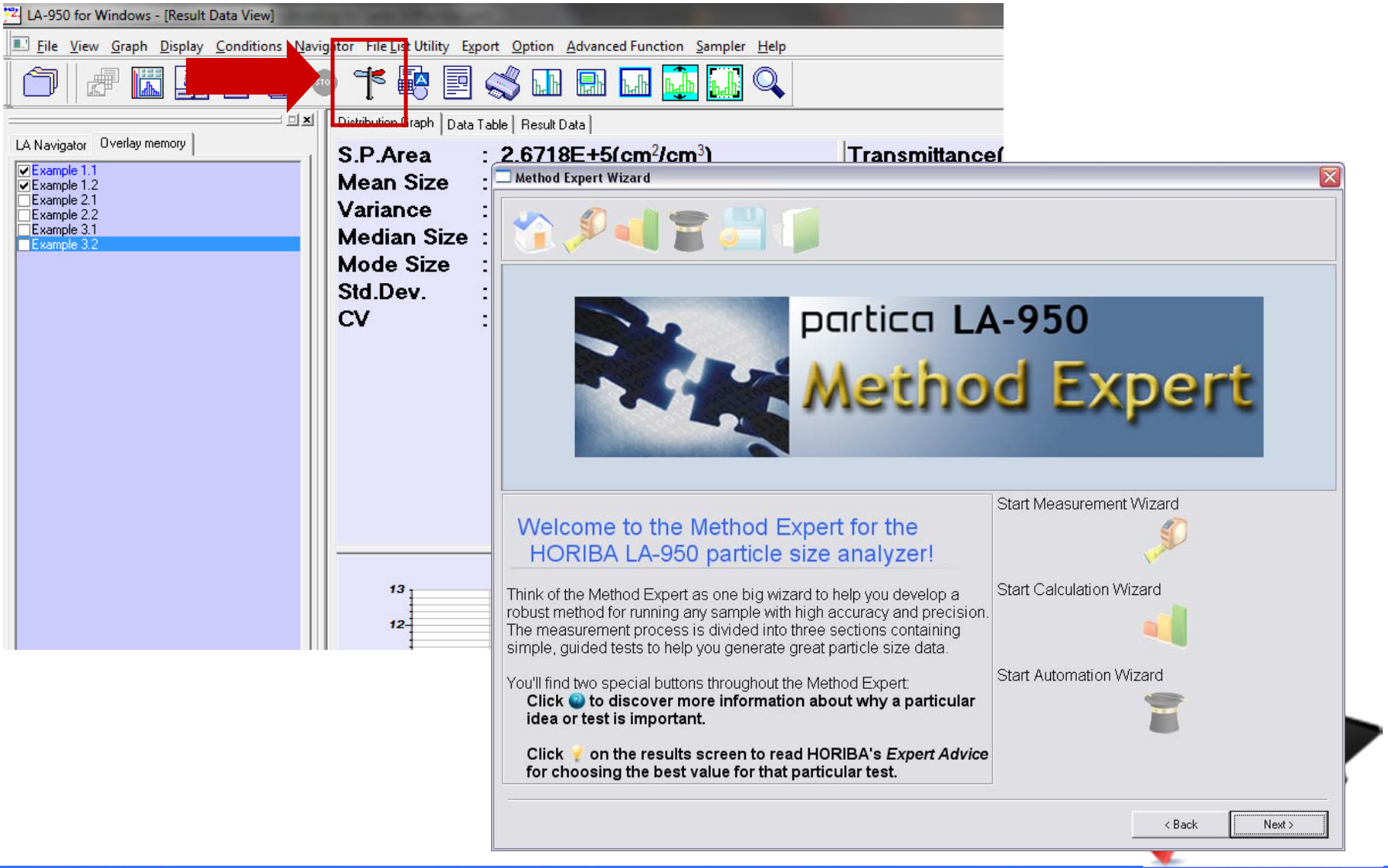
The LA-950 *hardware* collects scattered light data

The LA-950 *software* calculates the particle size distribution using that scattered light data

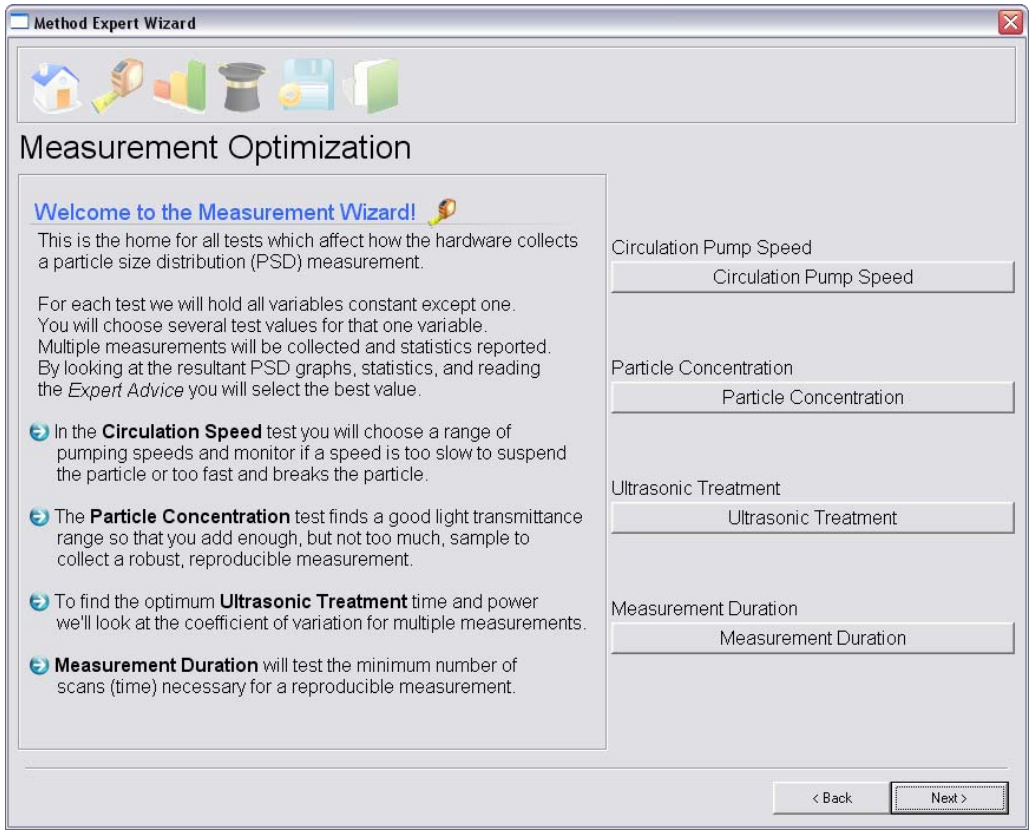
Both must be optimized to maximize data quality

LA-950 Method Expert



Method Expert Hardware

There are four important tests…



Circulation

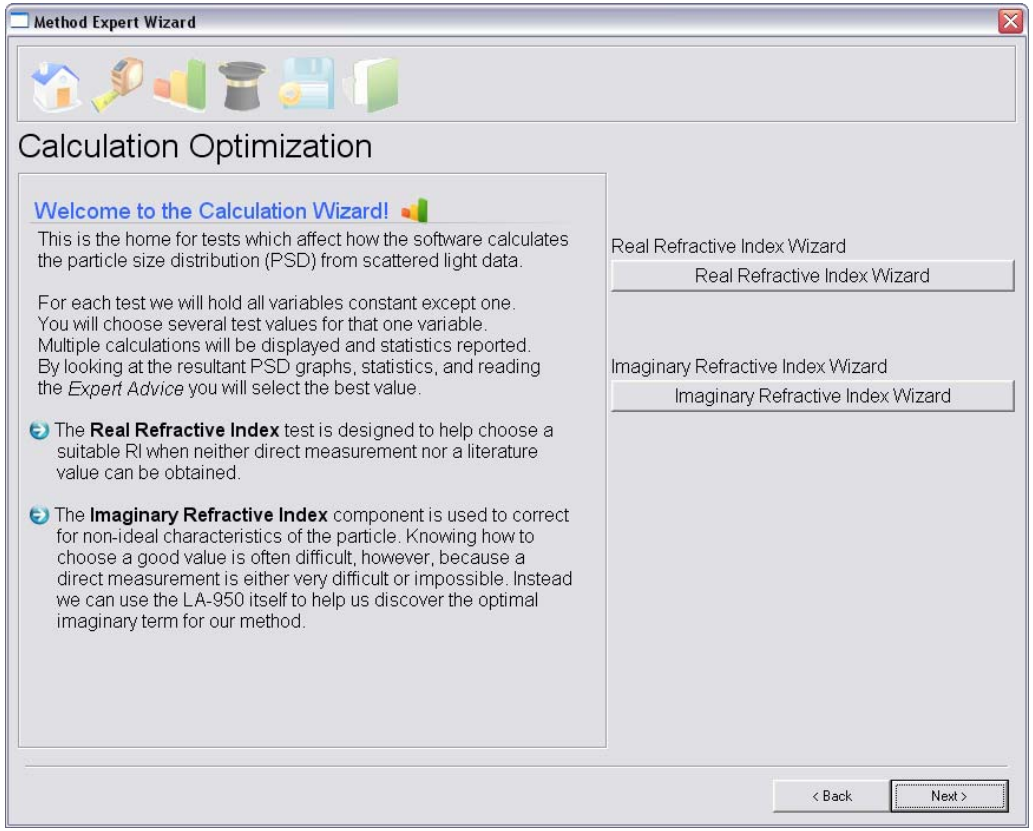
Concentration

Dispersion

Duration

Method Expert Calculation

There are two important tests…



Real RI

Imaginary RI

LA-950 Method Expert

Why is the test important?

What does the test do?

How will the results be displayed?

What is the best value?

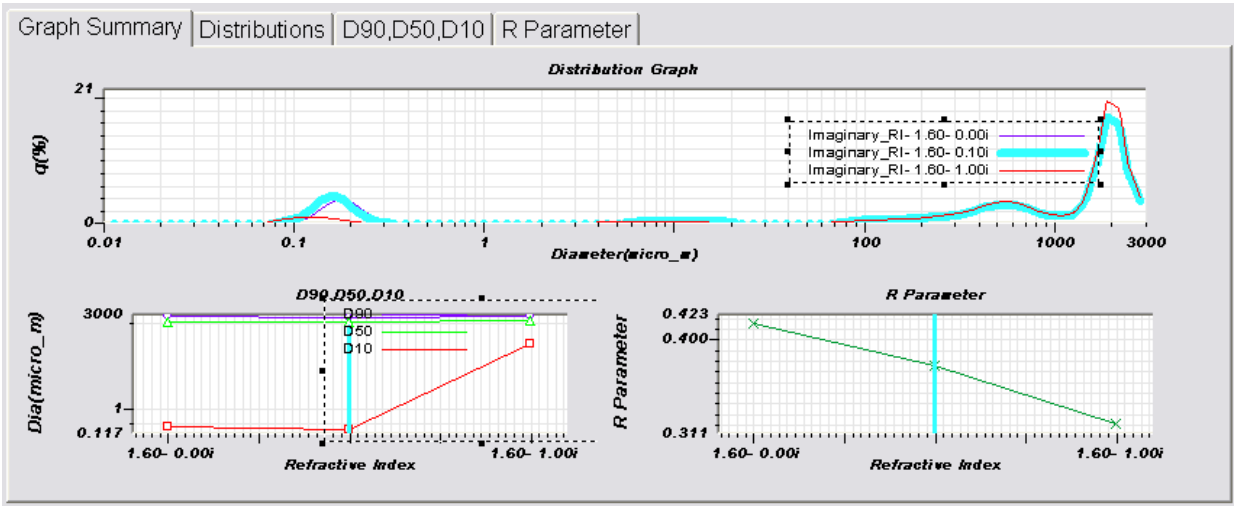
User selects up to 5 values for testing

LA-950 Method Expert

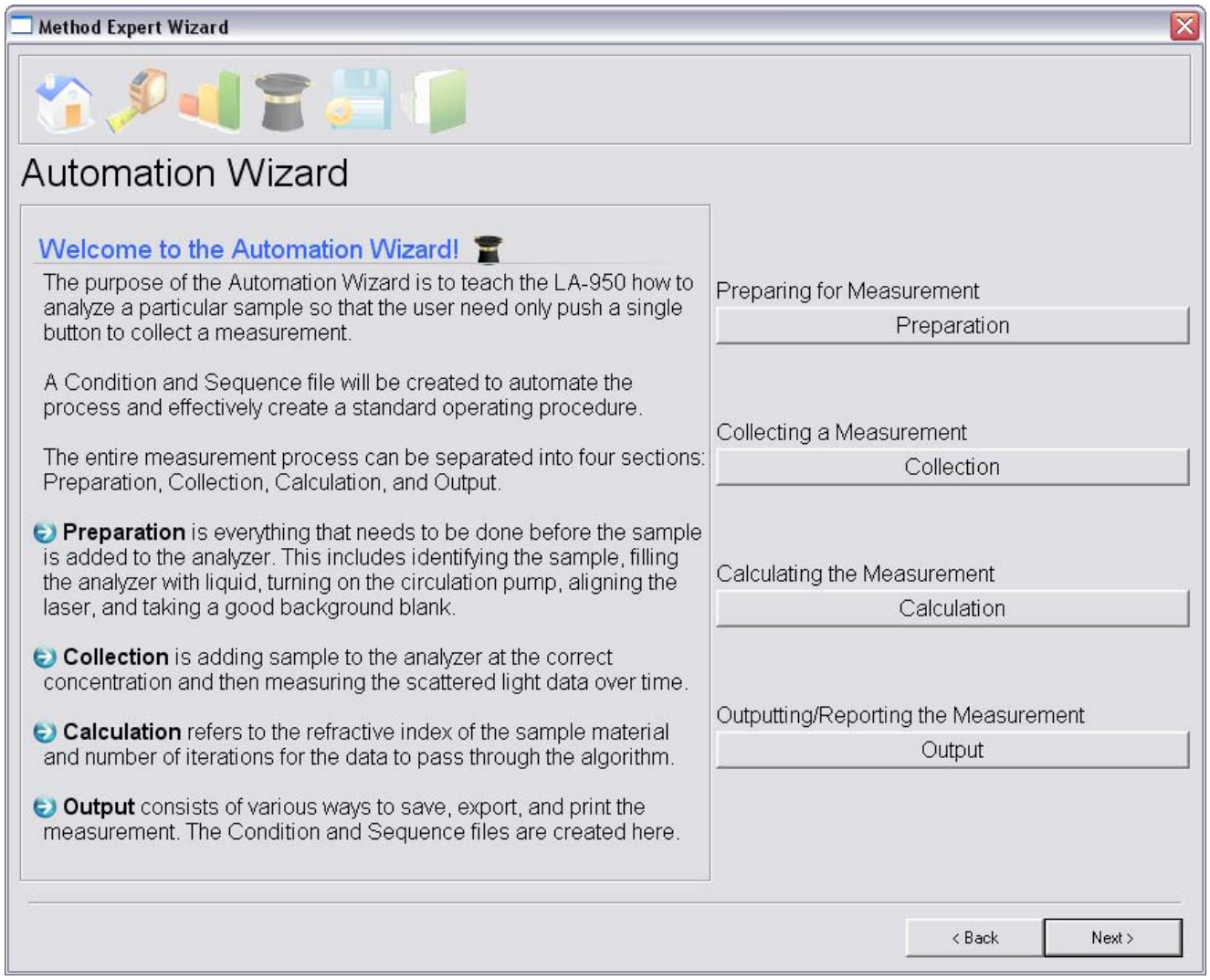
Method Expert guides user to prepare the LA-950 for each test

Results displayed in multiple formats:

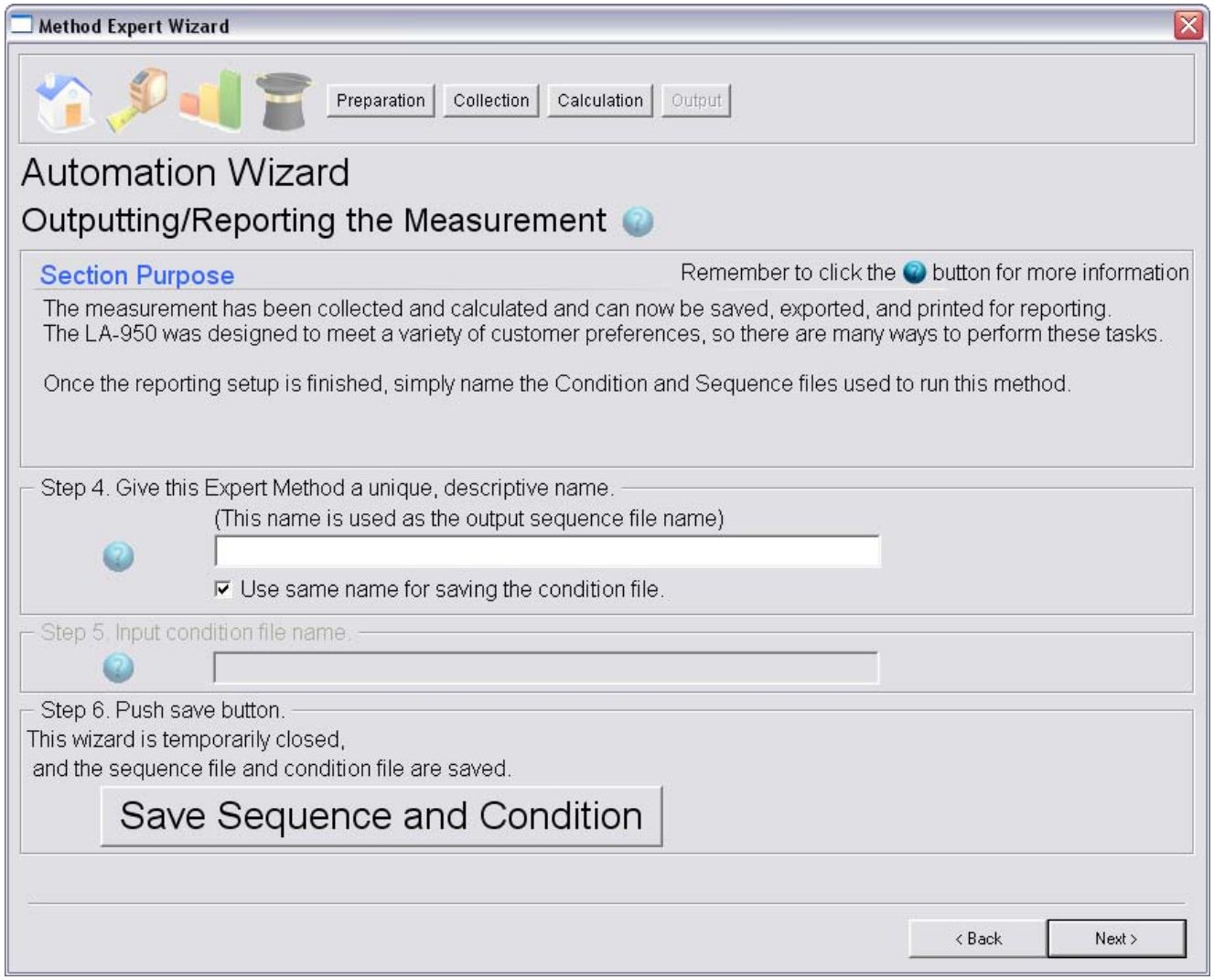
PSD, D50, R-parameter



LA-950 Method Expert



LA-950 Method Expert

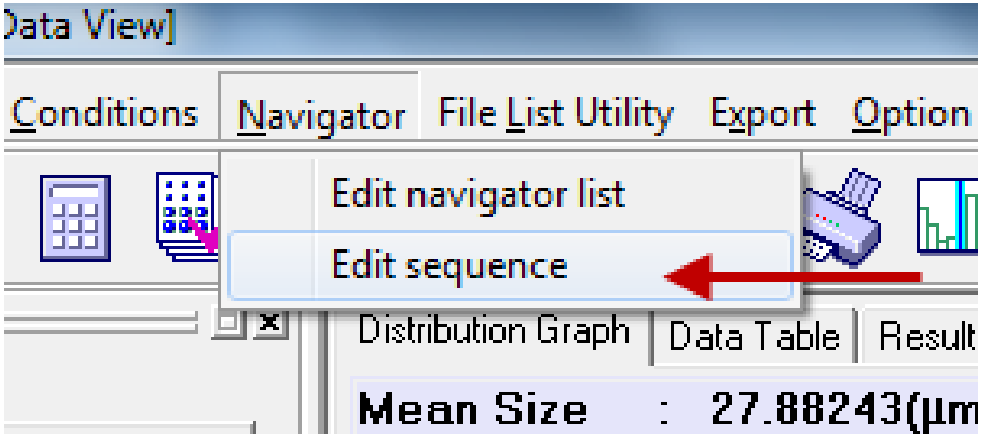


Dry Measurement

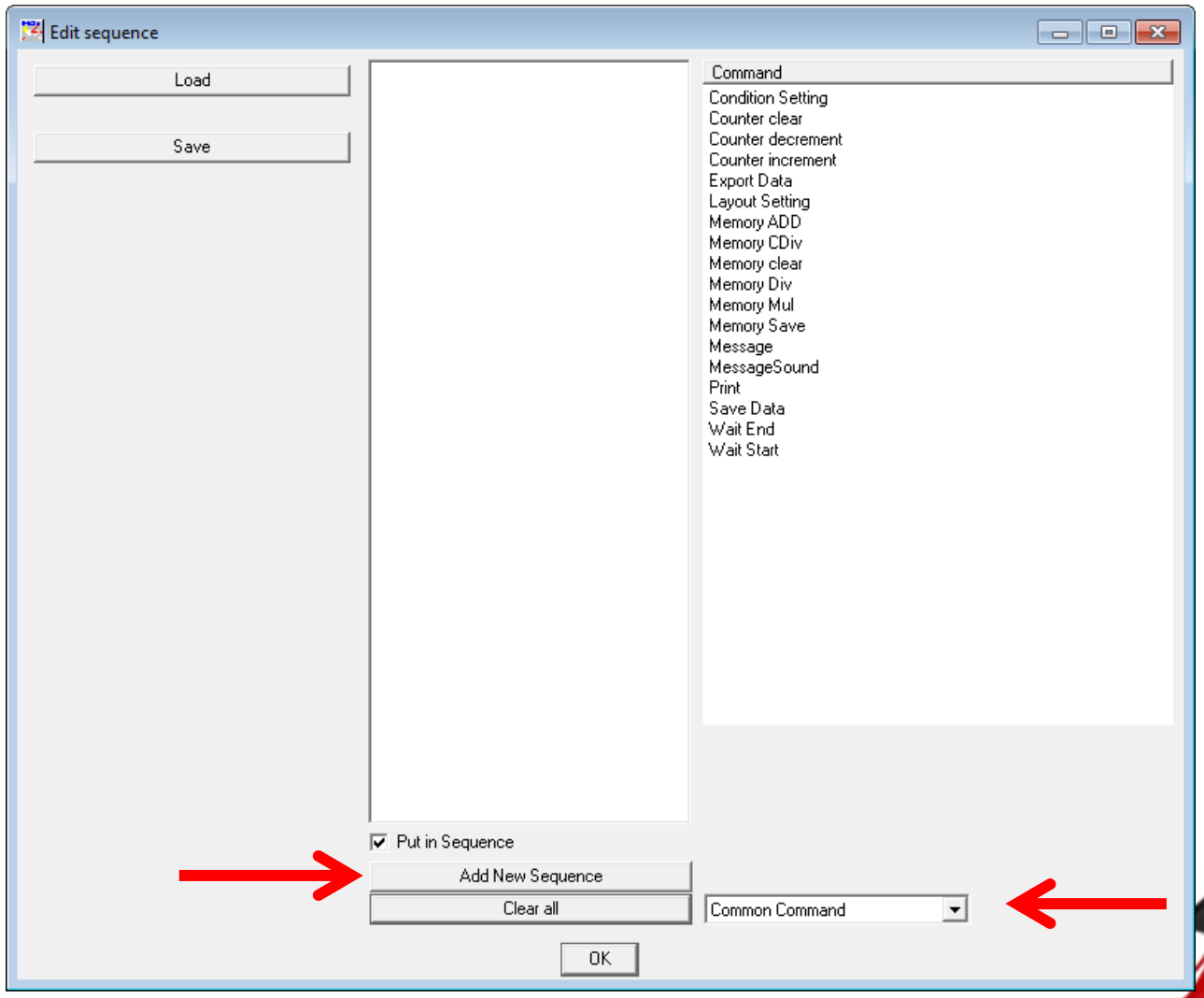
- Method Expert currently wet only
- Use “Auto Measurement” for dry
- Webinar TE016: Optimizing Dry Powder Measurements

Navigator

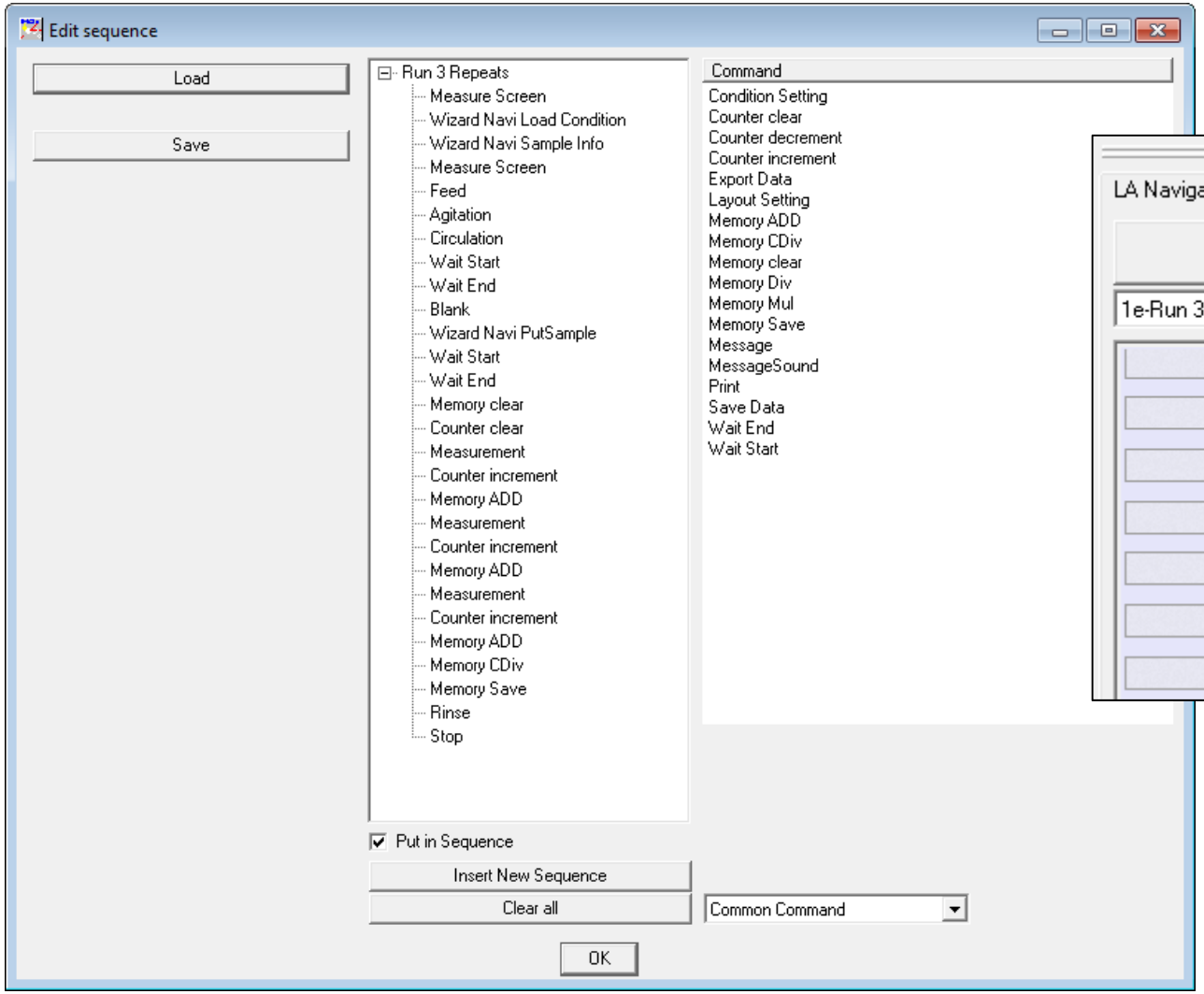
- LA Navigator function creates Sequence programs to operate the LA-950
- Maximum flexibility

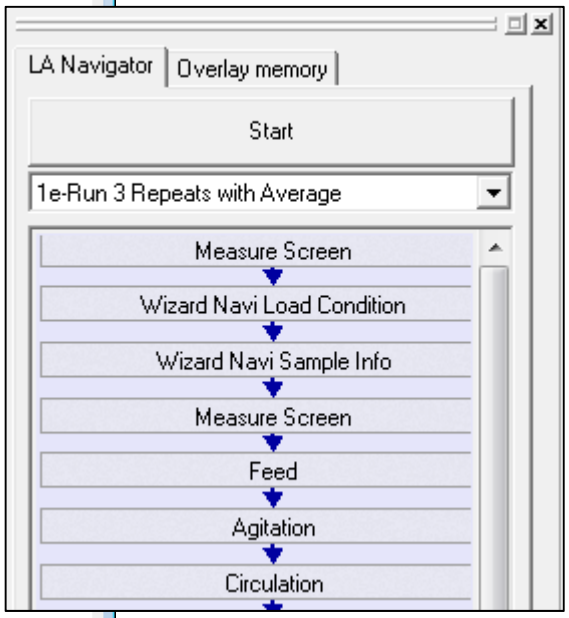


Navigator



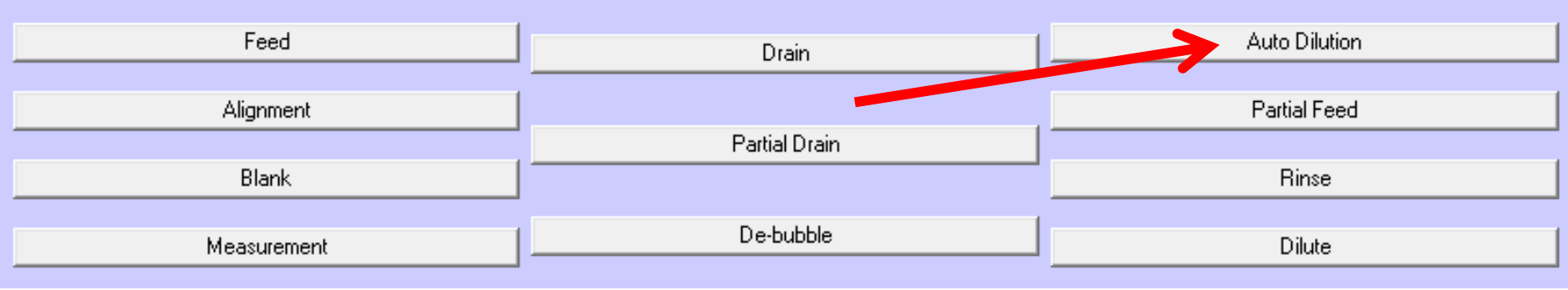
Navigator



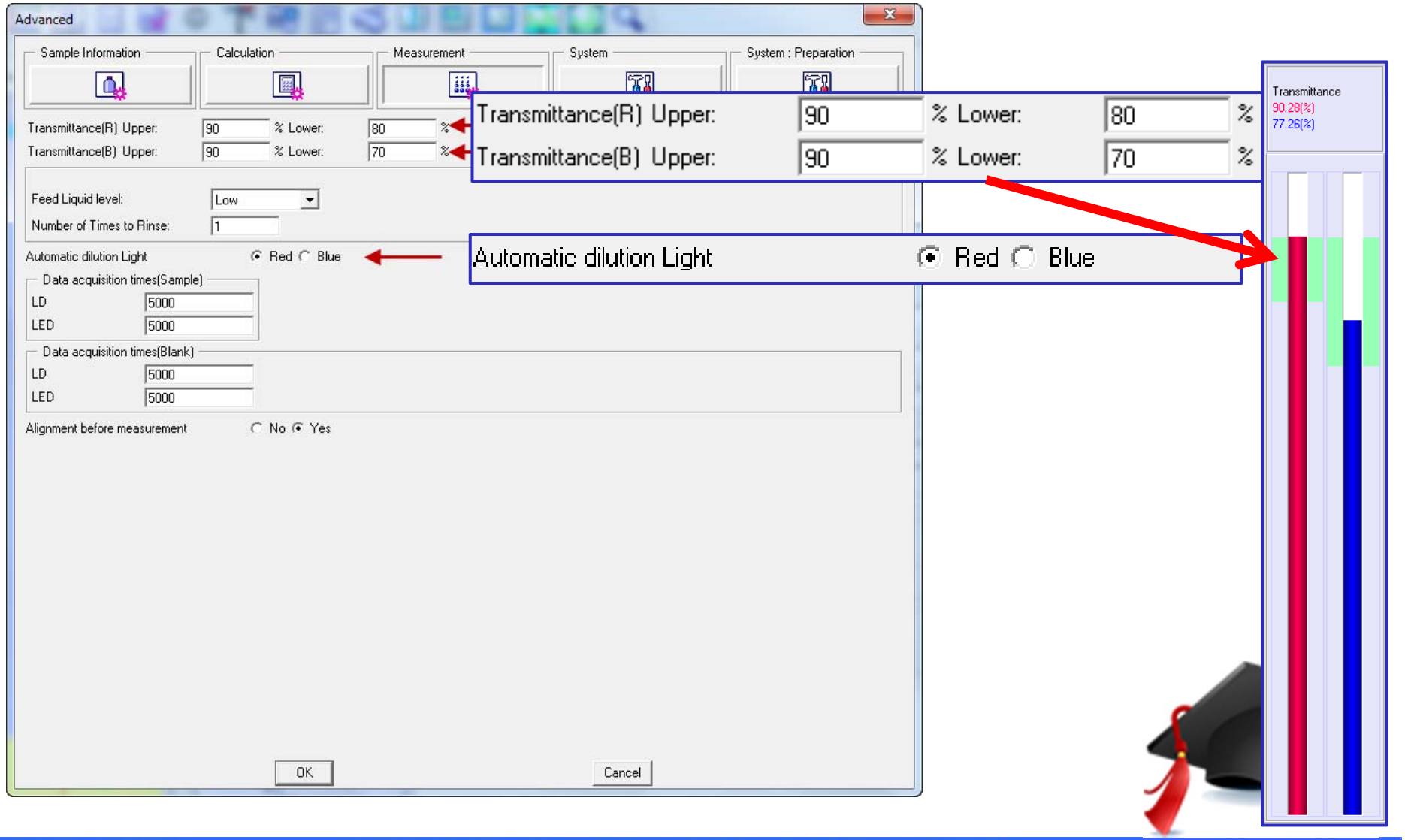


Automatic Dilution

- Concentration control
- Adds dispersant, drains, repeat
- Is not possible without fill pump



Automatic Dilution



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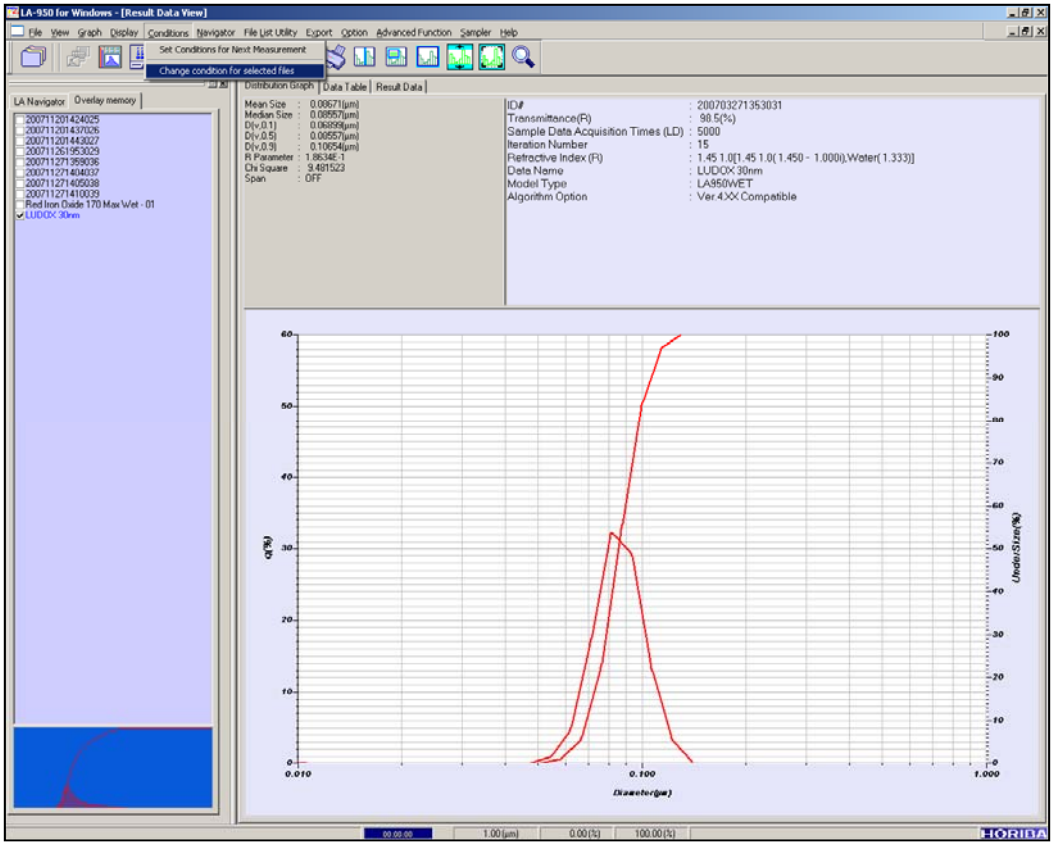
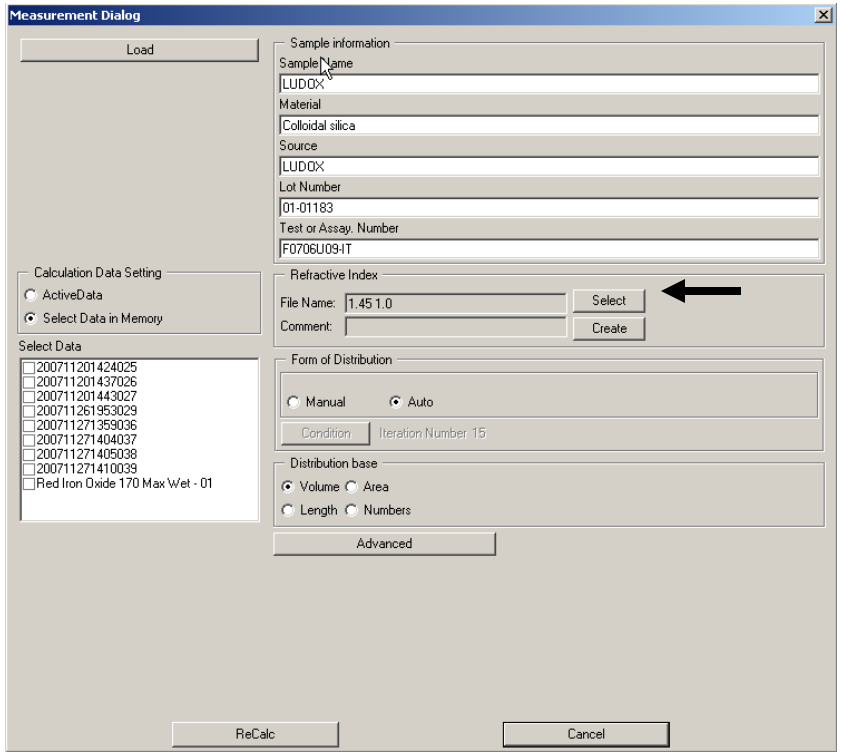
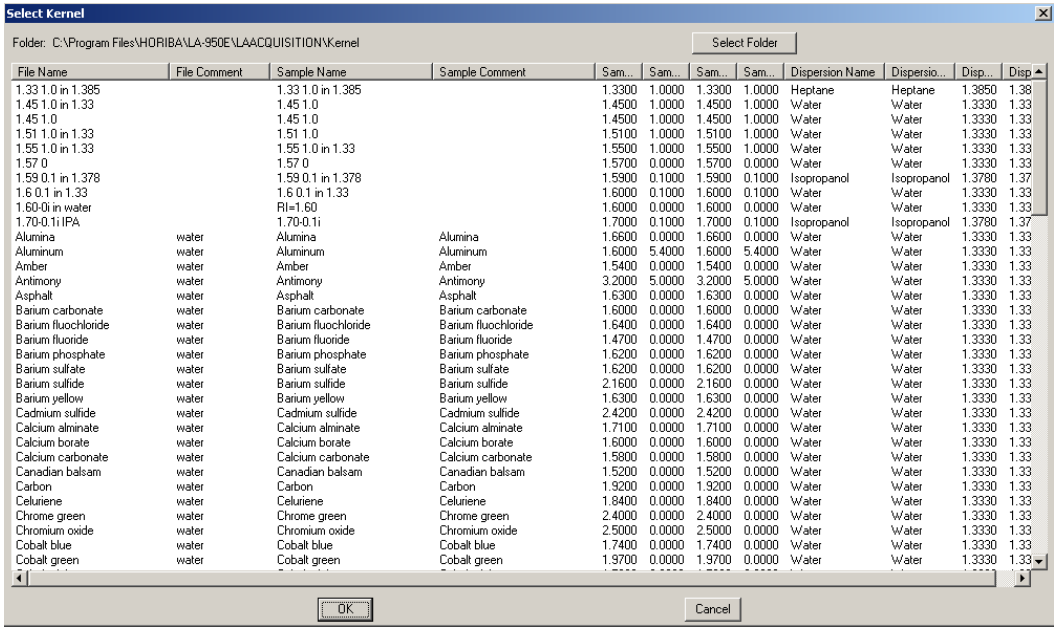
Refractive Index

- Many, many resources on website
- Webinar TR009: Optimization of RI

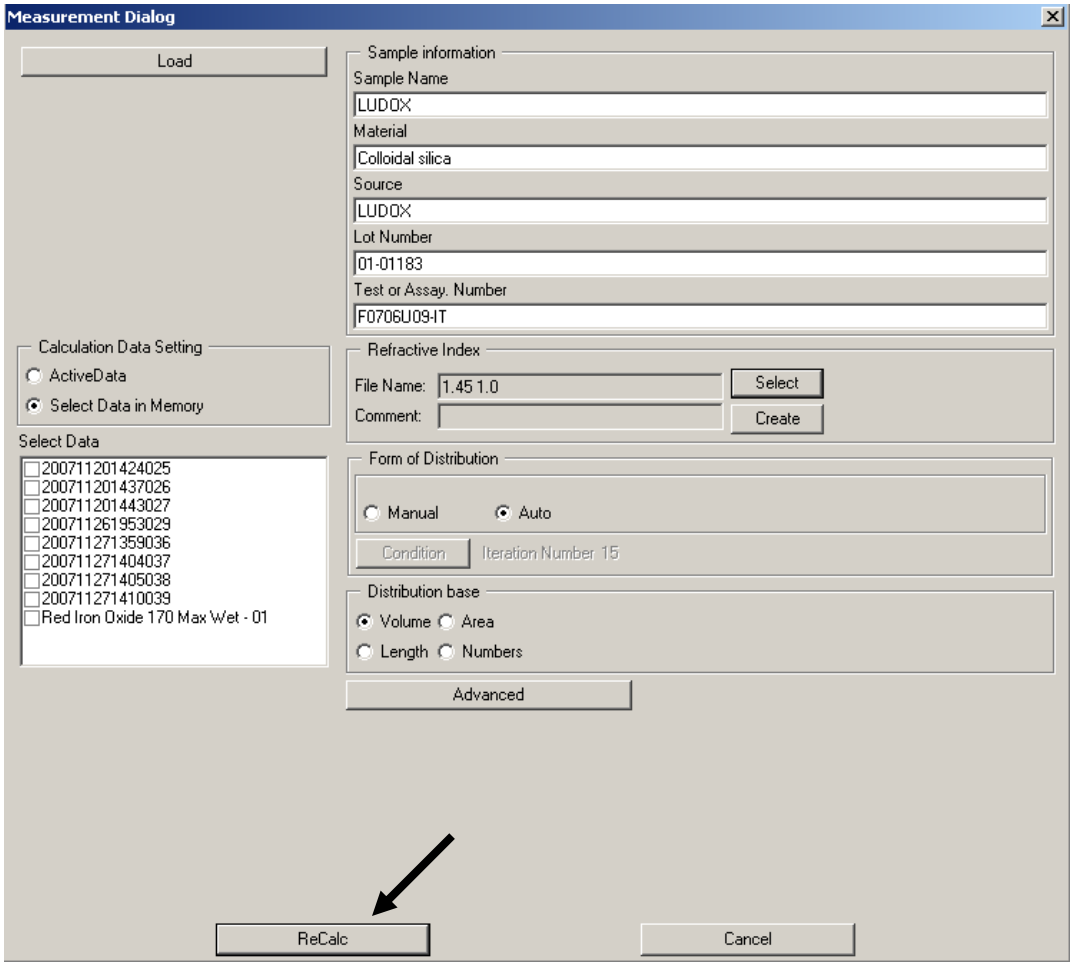


Manually Changing RI

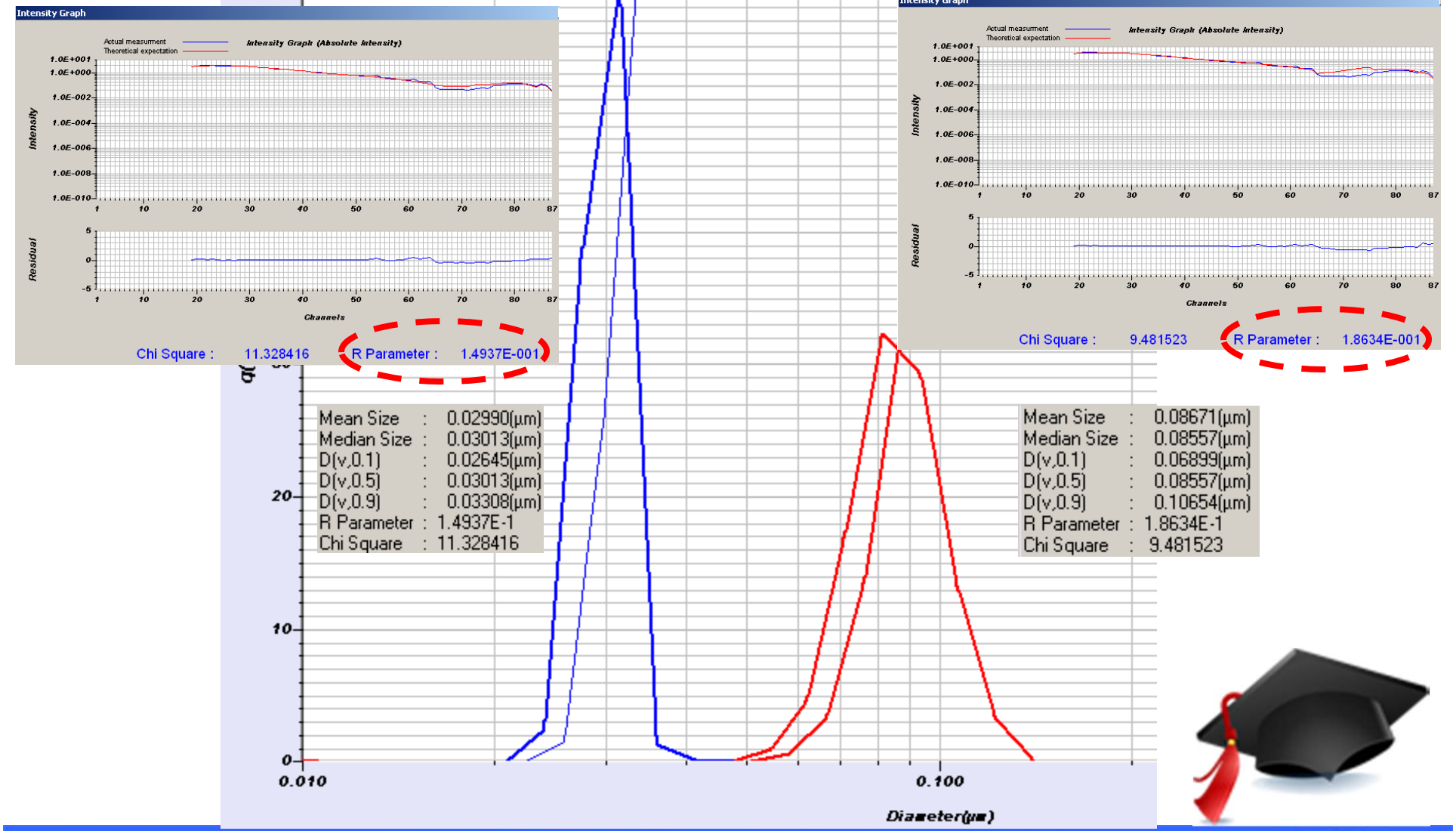




Manually Changing RI



Manual Optimization



Automated RI Computation

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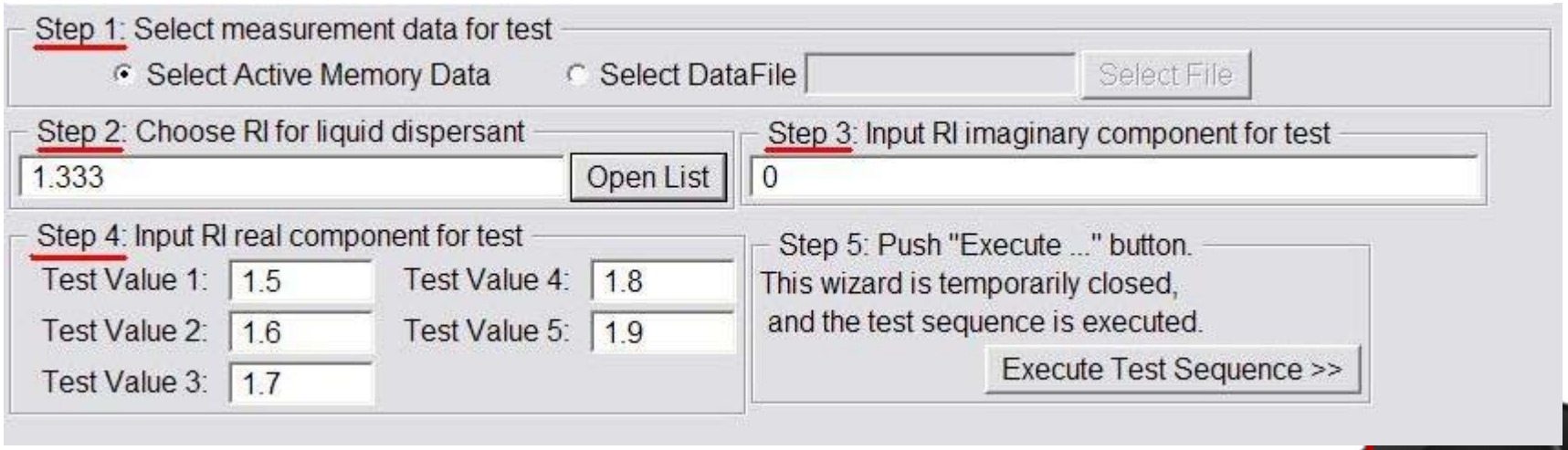
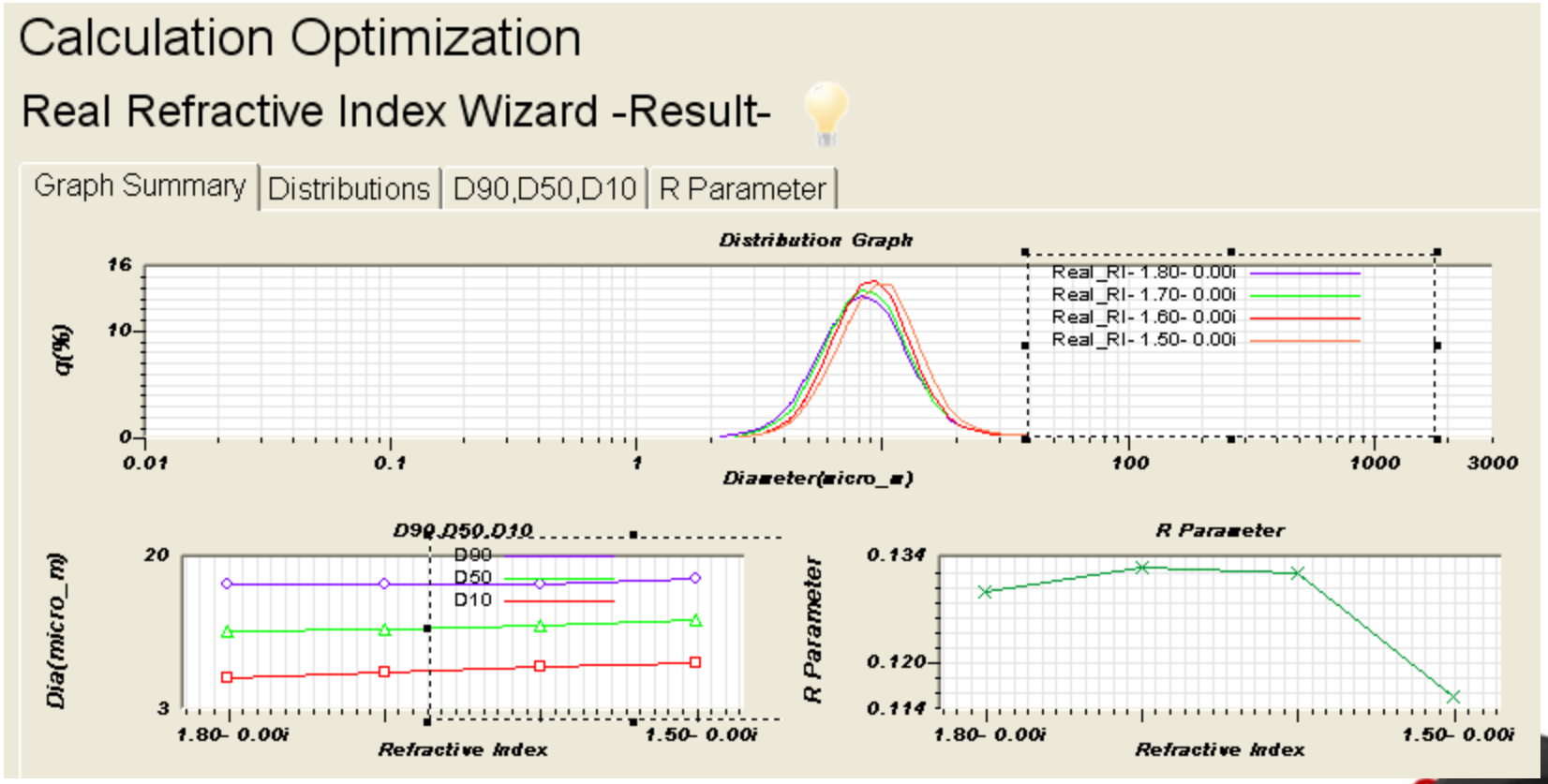
Real part study

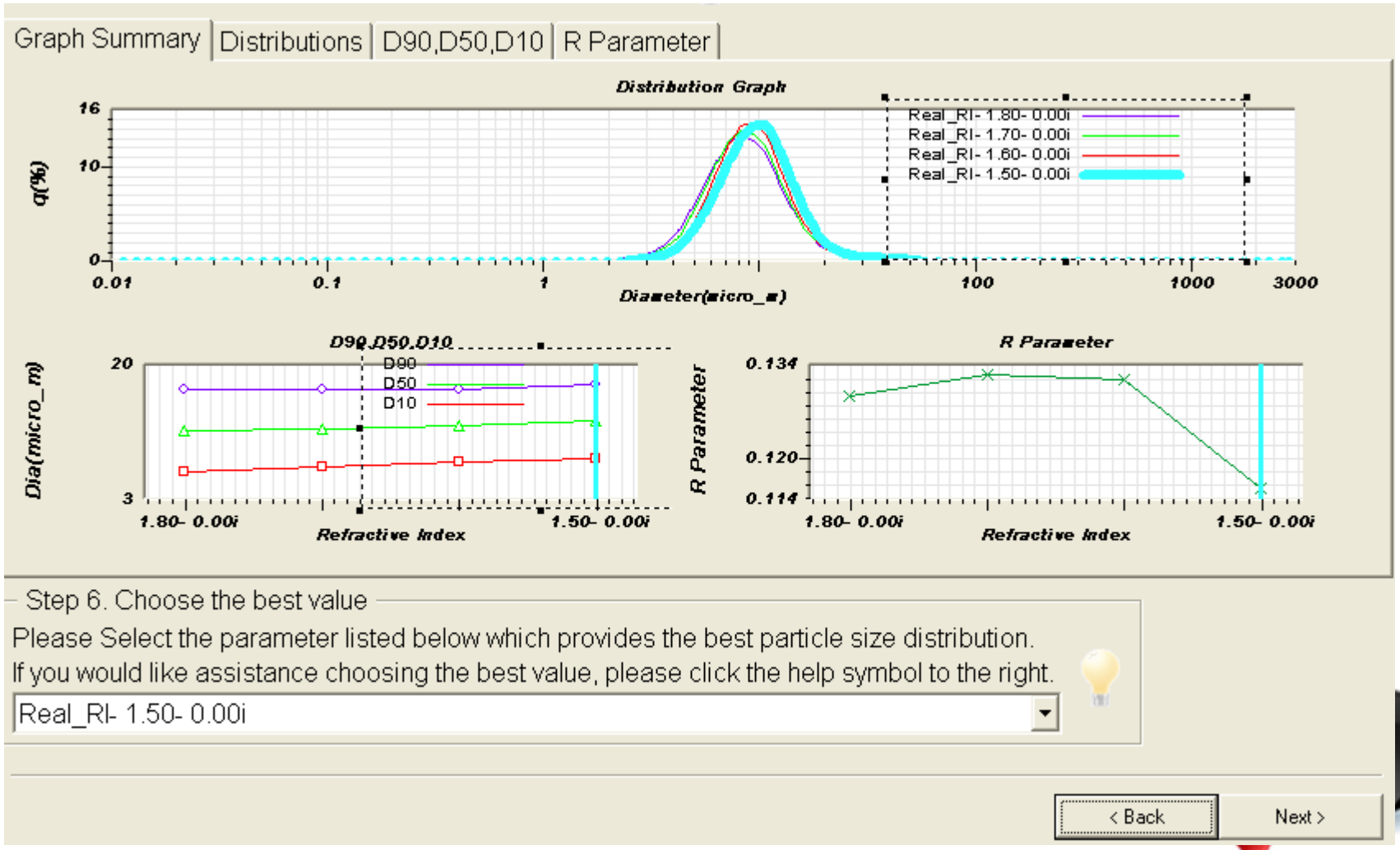
- Need to fix imaginary part
- Set up to 5 real parts
- Software will compute all RI and display R parameter variation with RI selection



Automated RI Computation



Automated RI Computation

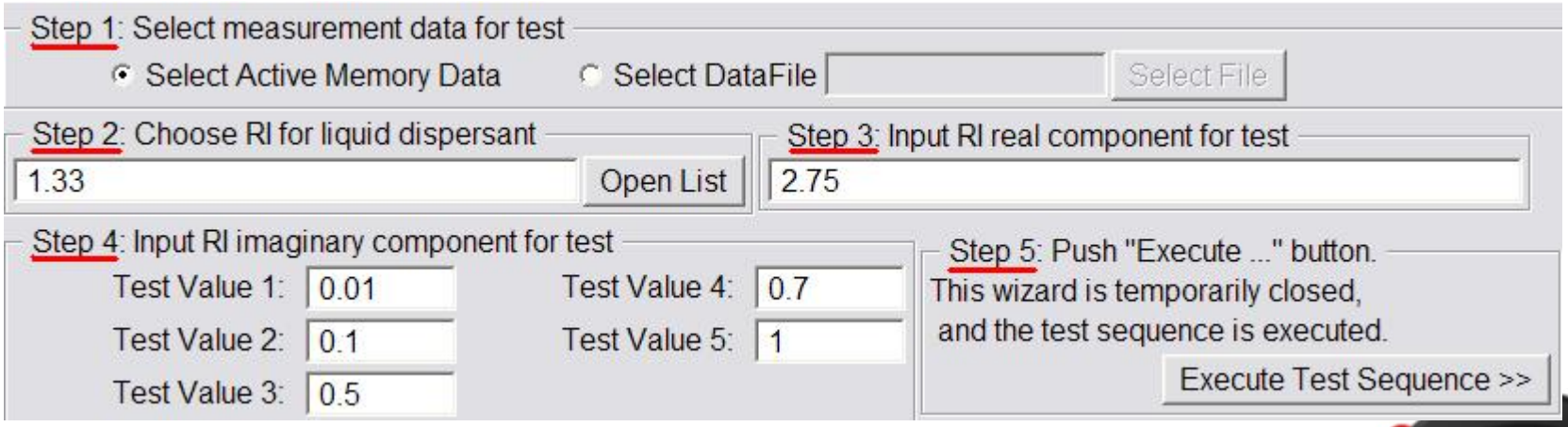


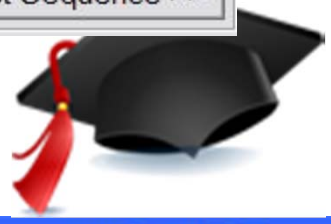
Automated RI Computation

HORIBA

Imaginary part study

- Need to fix real part
- Set up to 5 imaginary parts
- Software will compute all RI and display R parameter variation with RI selection





Automated RI Computation

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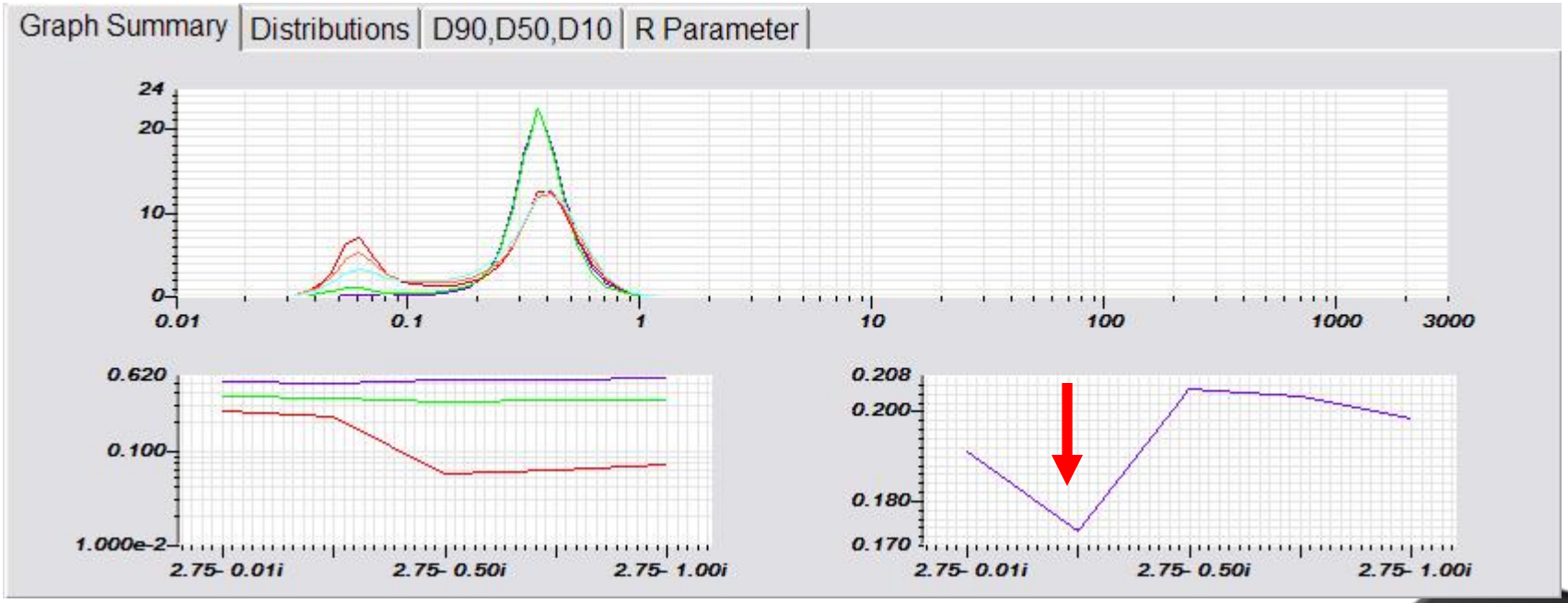
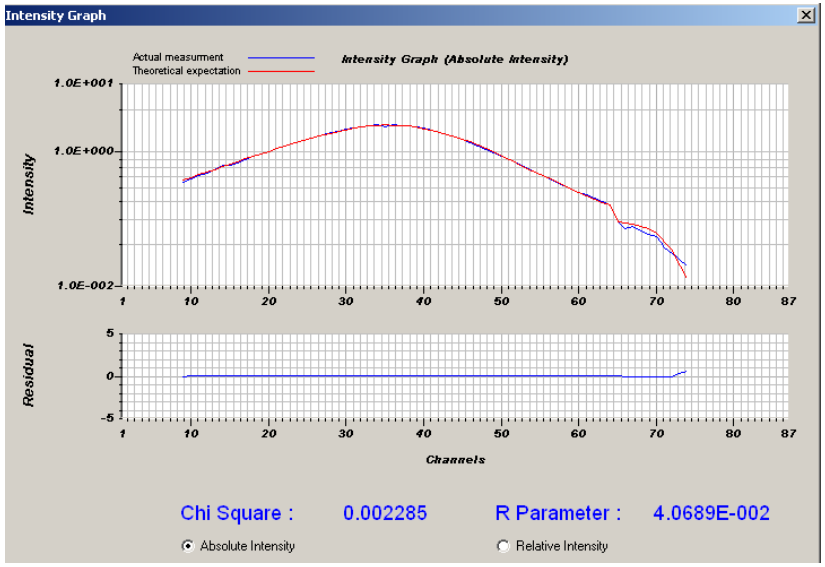
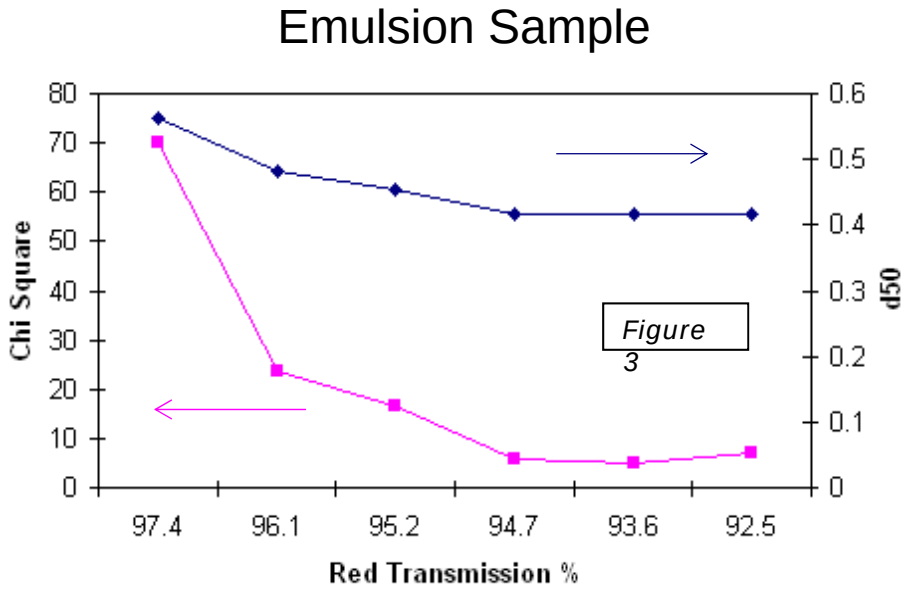
Imaginary study



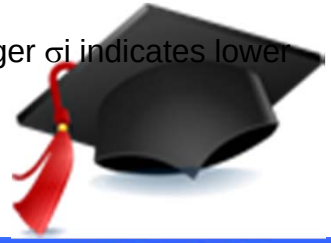
Error Calculations





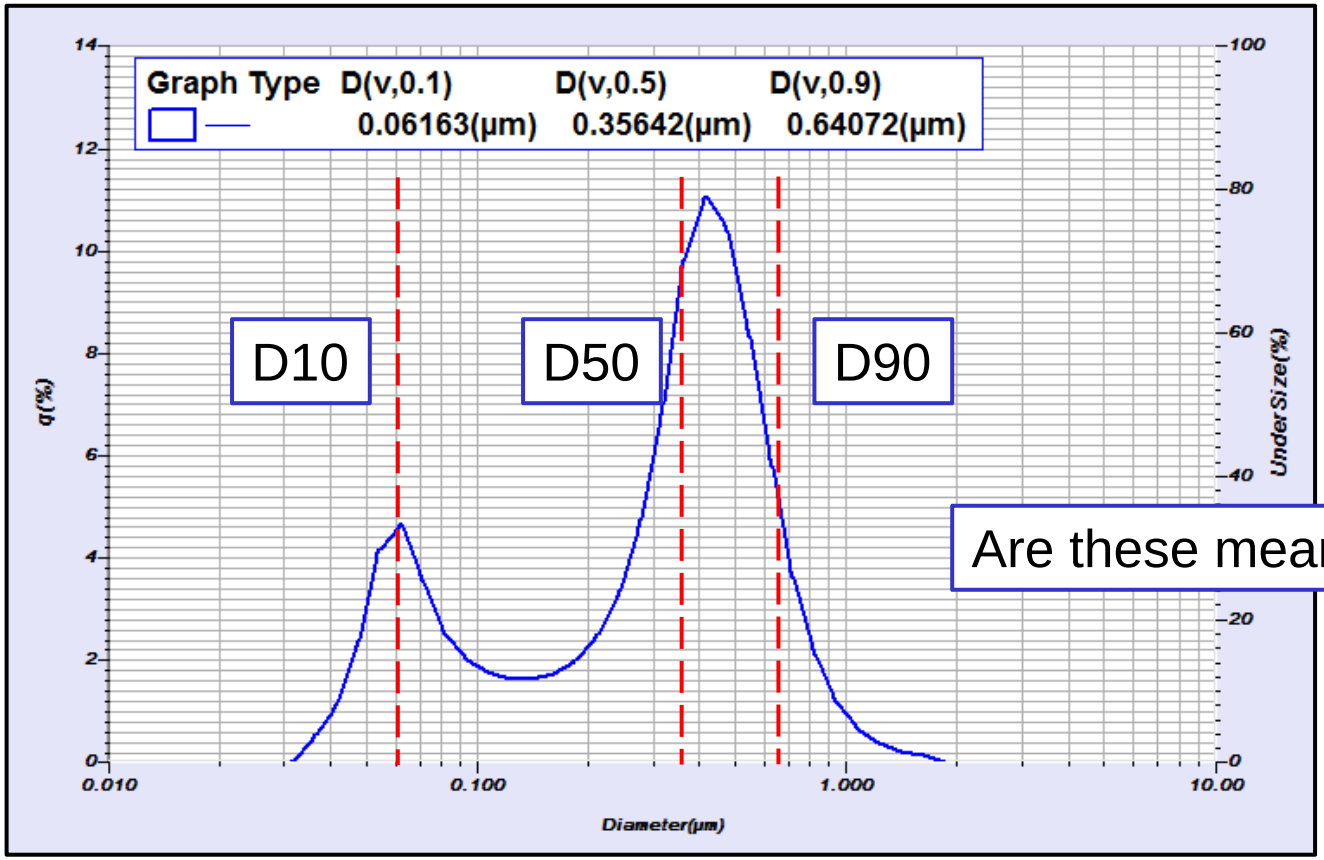
$$\chi^2 = \sum \left\{ \frac{1}{\sigma_i^2} [y_i - y(x_i)]^2 \right\} \qquad R = \frac{1}{N} \sum_{i=1}^{N} \left\{ \frac{1}{y_{(x_i)}} |y_i - y(x_i)| \right\}$$

yi	The measured scattered light at each channel (i) of the detector.
y (xi)	The calculated scattered light at each channel (i) of the detector based on the chosen refractive index kernel and reported particle size distribution.
σi	The standard deviation of the scattered light intensity at each channel (i) of the detector. A larger σi indicates lower reliability of the signal on a given detector.
N	The number of detectors used for the calculation



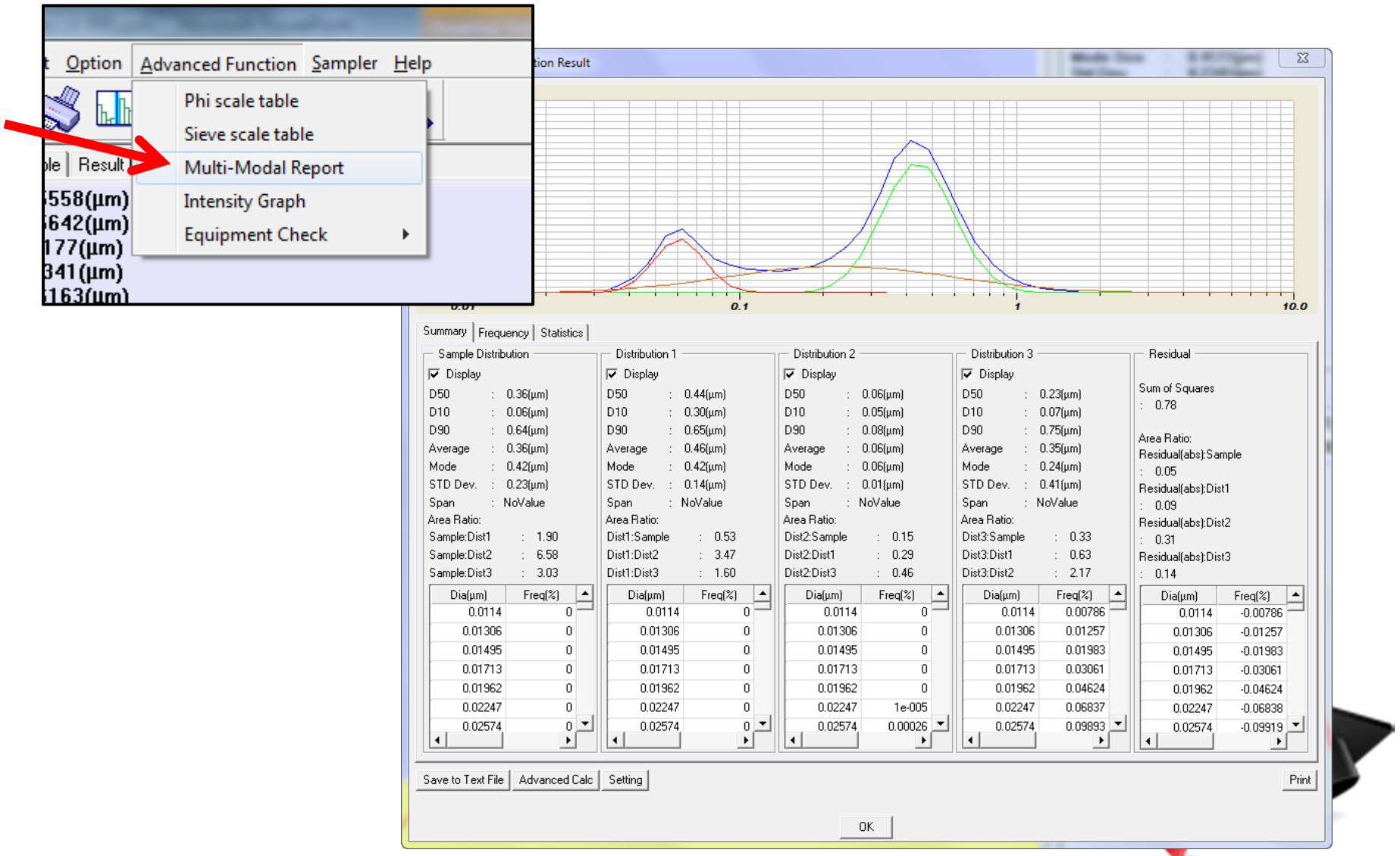
Multimodal Report

- Hard to use full-distribution metrics to describe multimodal results



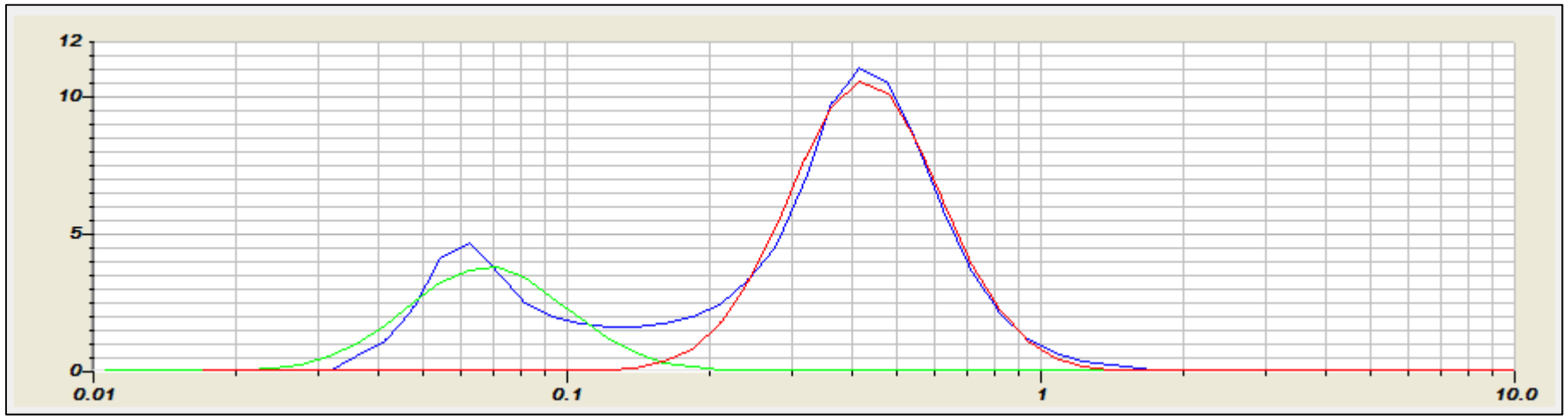
Are these meaningful?

Multimodal Report



Multimodal Report

- Deconvolute distribution into components



Multimodal Report

- Statistics for each distribution mode

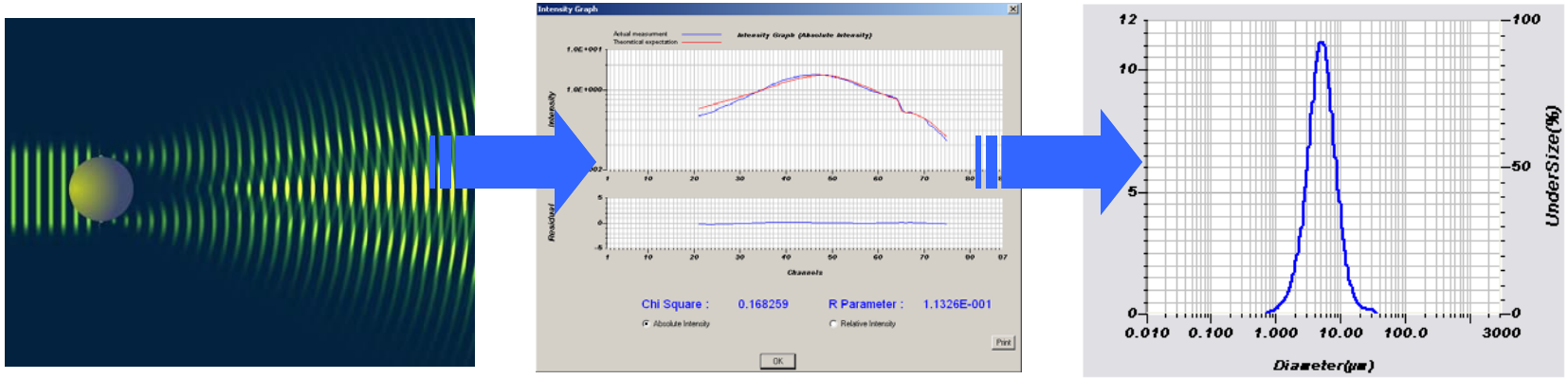
Summary | Frequency | Statistics

Sample Distribution		Distribution 1		Distribution 2		Distribution 3		Residual	
☑ Display		☑ Display		☑ Display		☑ Display			
D50	: 0.36(µm)	D50	: 0.07(µm)	D50	: 0.43(µm)	D50	: ---.--(µm)	Sum of Squares	
D10	: 0.06(µm)	D10	: 0.04(µm)	D10	: 0.27(µm)	D10	: ---.--(µm)	: 9.49	
D90	: 0.64(µm)	D90	: 0.11(µm)	D90	: 0.69(µm)	D90	: ---.--(µm)	Area Ratio:	
Average	: 0.36(µm)	Average	: 0.07(µm)	Average	: 0.46(µm)	Average	: ---.--(µm)	Residual(abs):Sample	
Mode	: 0.42(µm)	Mode	: 0.07(µm)	Mode	: 0.42(µm)	Mode	: ---.--(µm)	: 0.14	
STD Dev.	: 0.23(µm)	STD Dev.	: 0.03(µm)	STD Dev.	: 0.17(µm)	STD Dev.	: ---.--(µm)	Residual(abs):Dist1	
Span	: NoValue	Span	: NoValue	Span	: NoValue	Span	: ---.--(µm)	: 0.52	
Area Ratio:		Area Ratio:		Area Ratio:		Area Ratio:		Residual(abs):Dist2	
Sample:Dist1	: 3.72	Dist1:Sample	: 0.27	Dist2:Sample	: 0.72	Dist3:Sample	: ---.--	: 0.19	
Sample:Dist2	: 1.39	Dist1:Dist2	: 0.37	Dist2:Dist1	: 2.67	Dist3:Dist1	: ---.--	Residual(abs):Dist3	
Sample:Dist3	: ---.--	Dist1:Dist3	: ---.--	Dist2:Dist3	: ---.--	Dist3:Dist2	: ---.--	: ---.--	

Better understanding of entire distribution

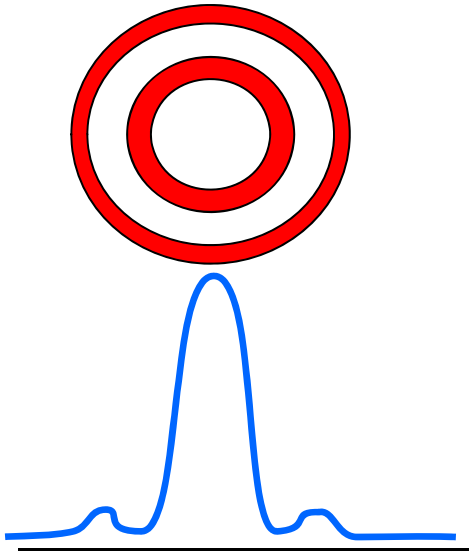
Intensity Graph

- Diffraction analyzer measures light scattering pattern, algorithm transforms this into a particle size distribution

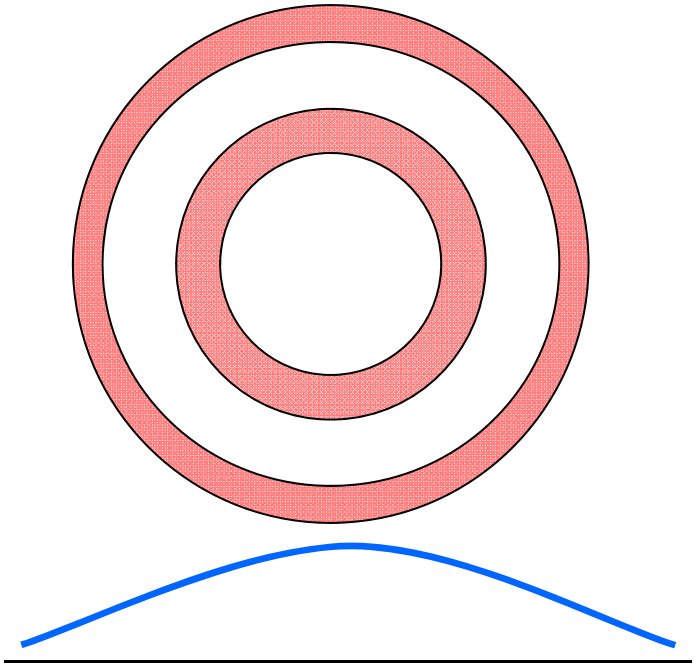


Size affects intensity

- LARGE PARTICLE:
  - Low angle scatter
  - Large signal



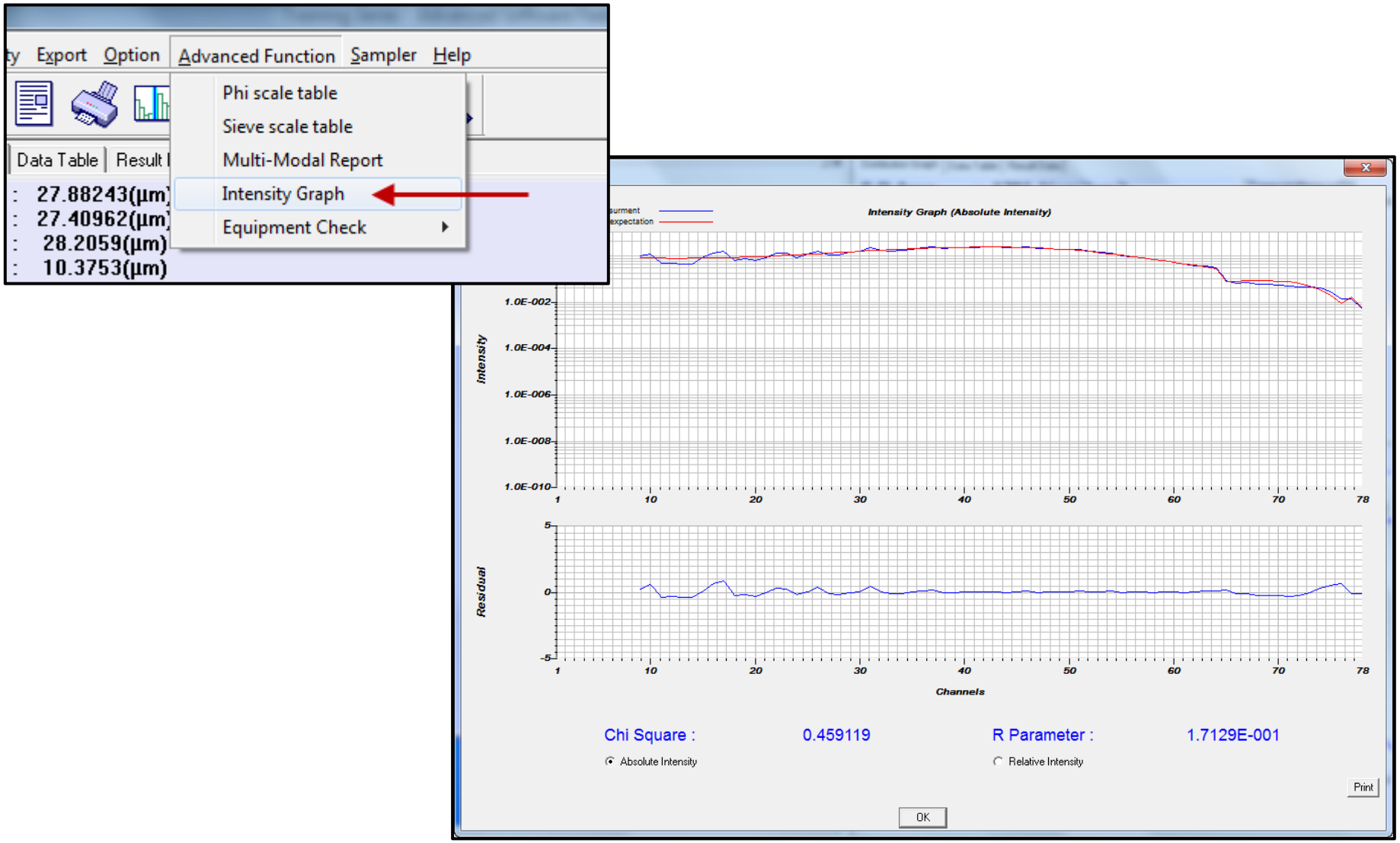
Narrow Pattern - High intensity



Wide Pattern - Low intensity

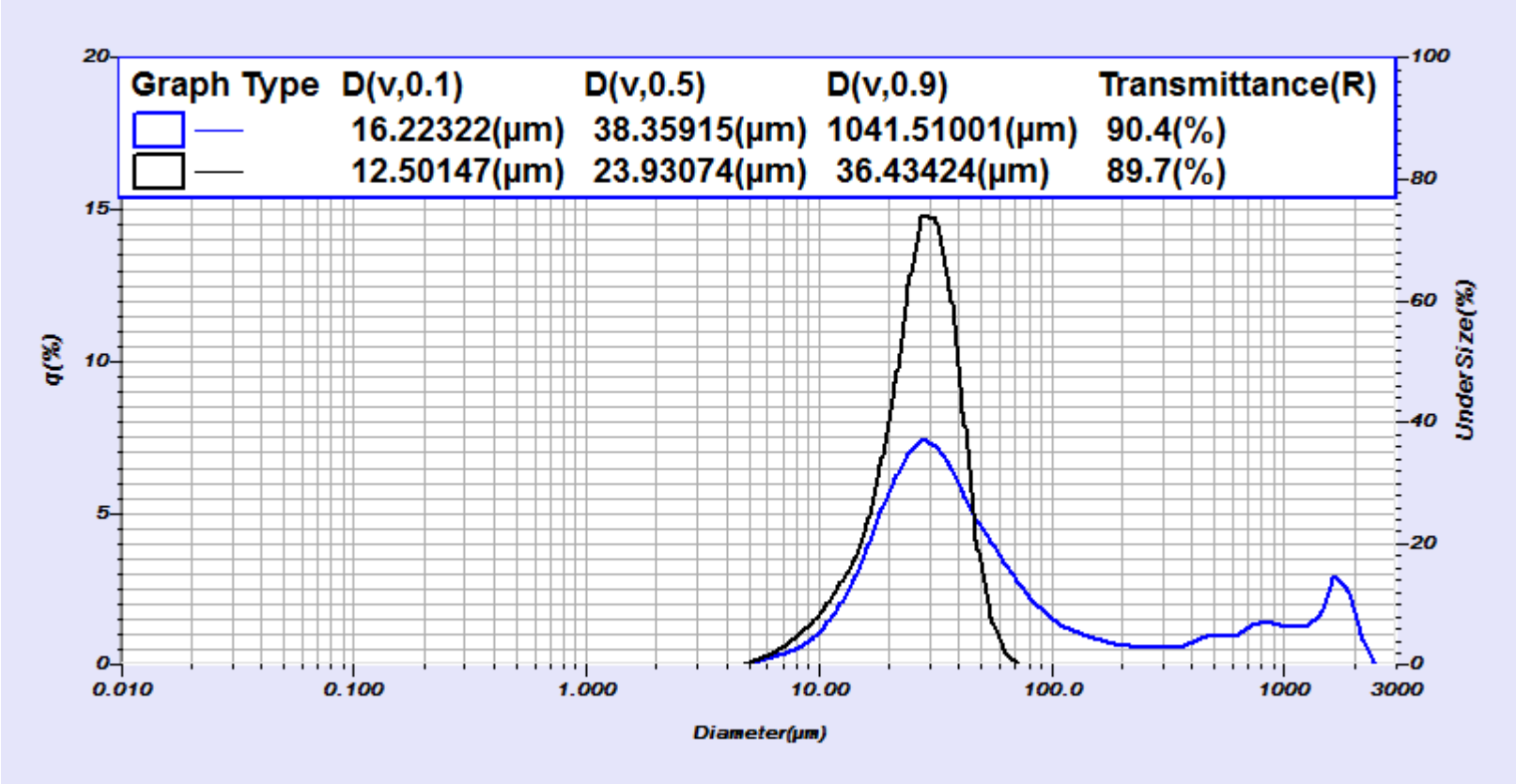
- SMALL PARTICLE:
  - High Angle Scatter
  - Small Signal

Intensity Graph

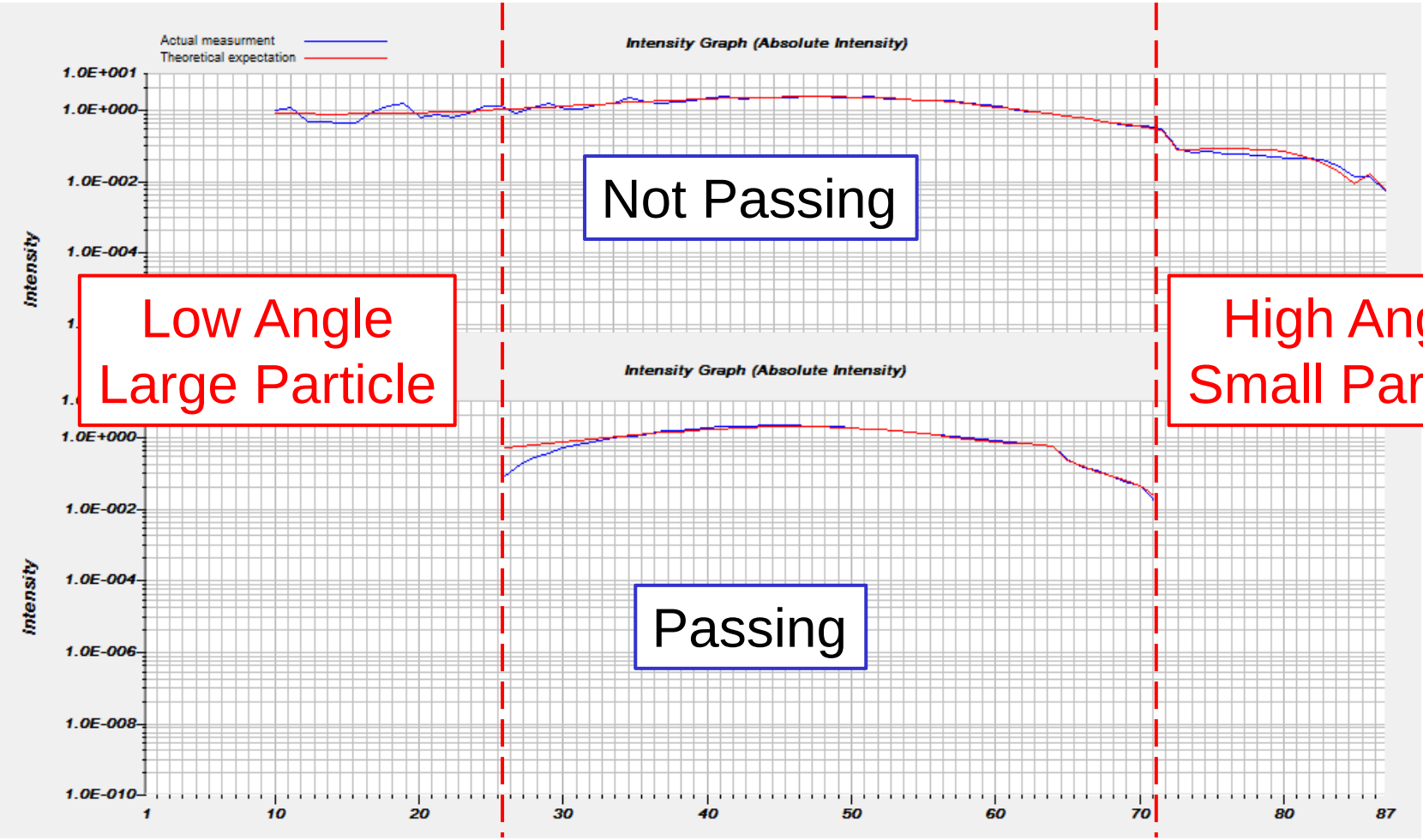


Intensity Graph

- One way to use the Intensity Graph
  - Two results, one good and one bad

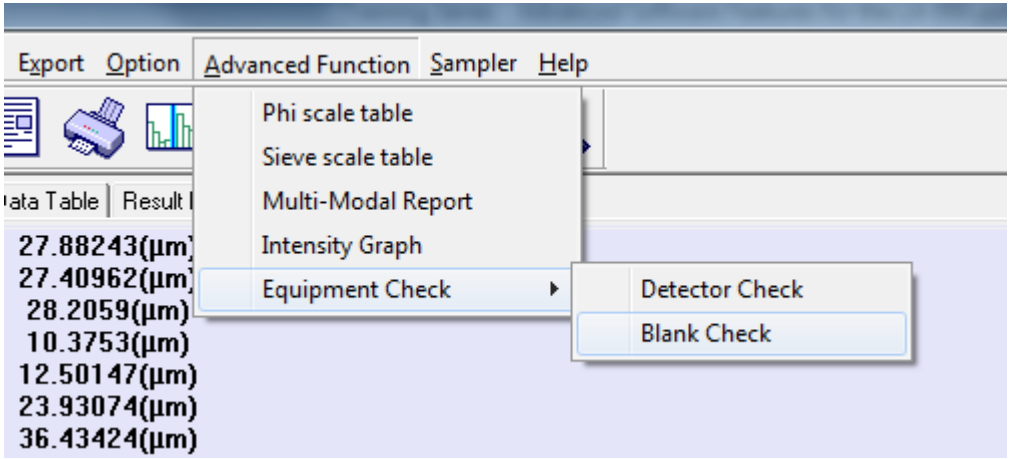


Intensity Graph

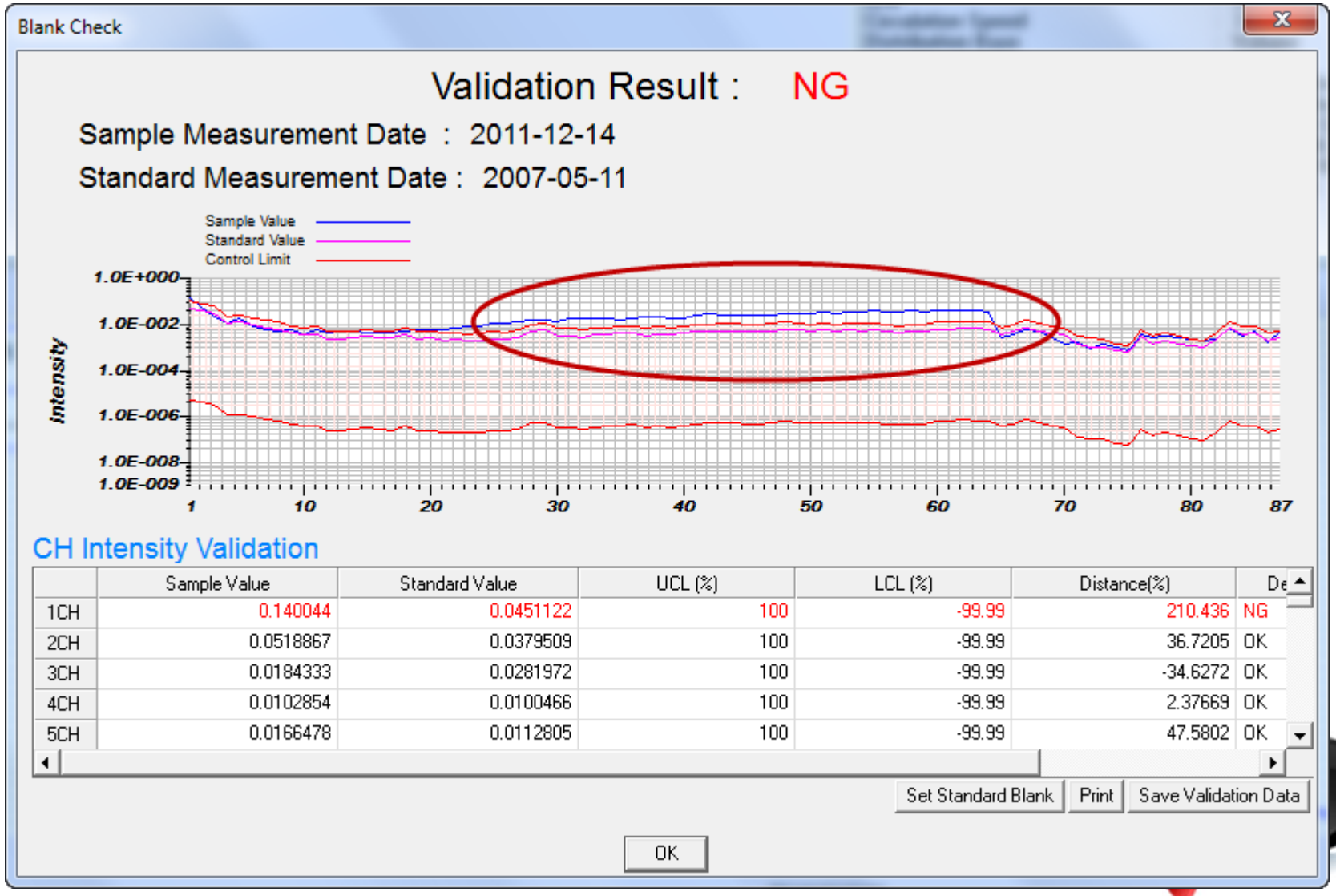


Blank Check

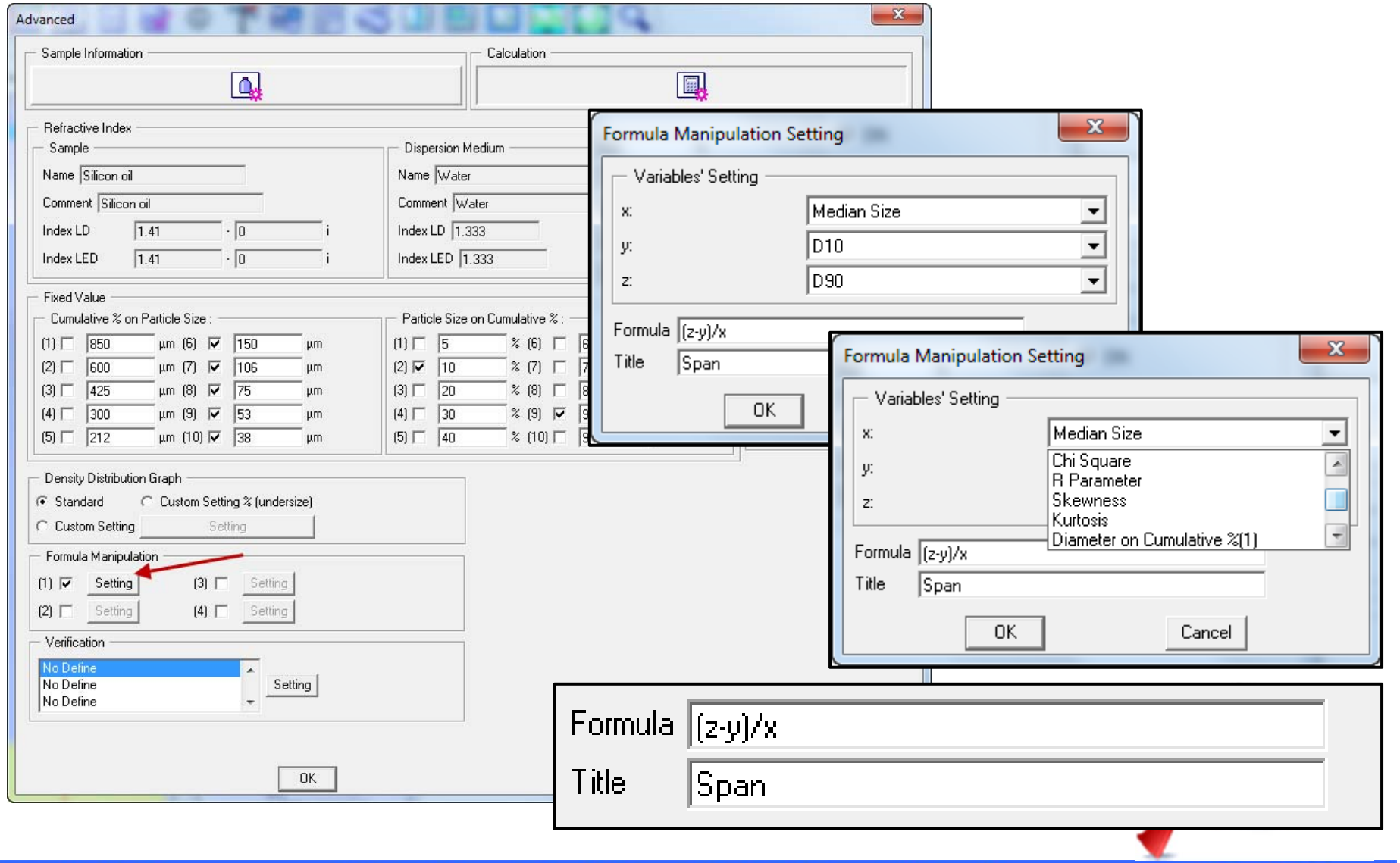
- Need to explain difference in scattering
- Try other tools, i.e. Blank Check



Blank Check



Custom Calculations



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Automate COV Calculation

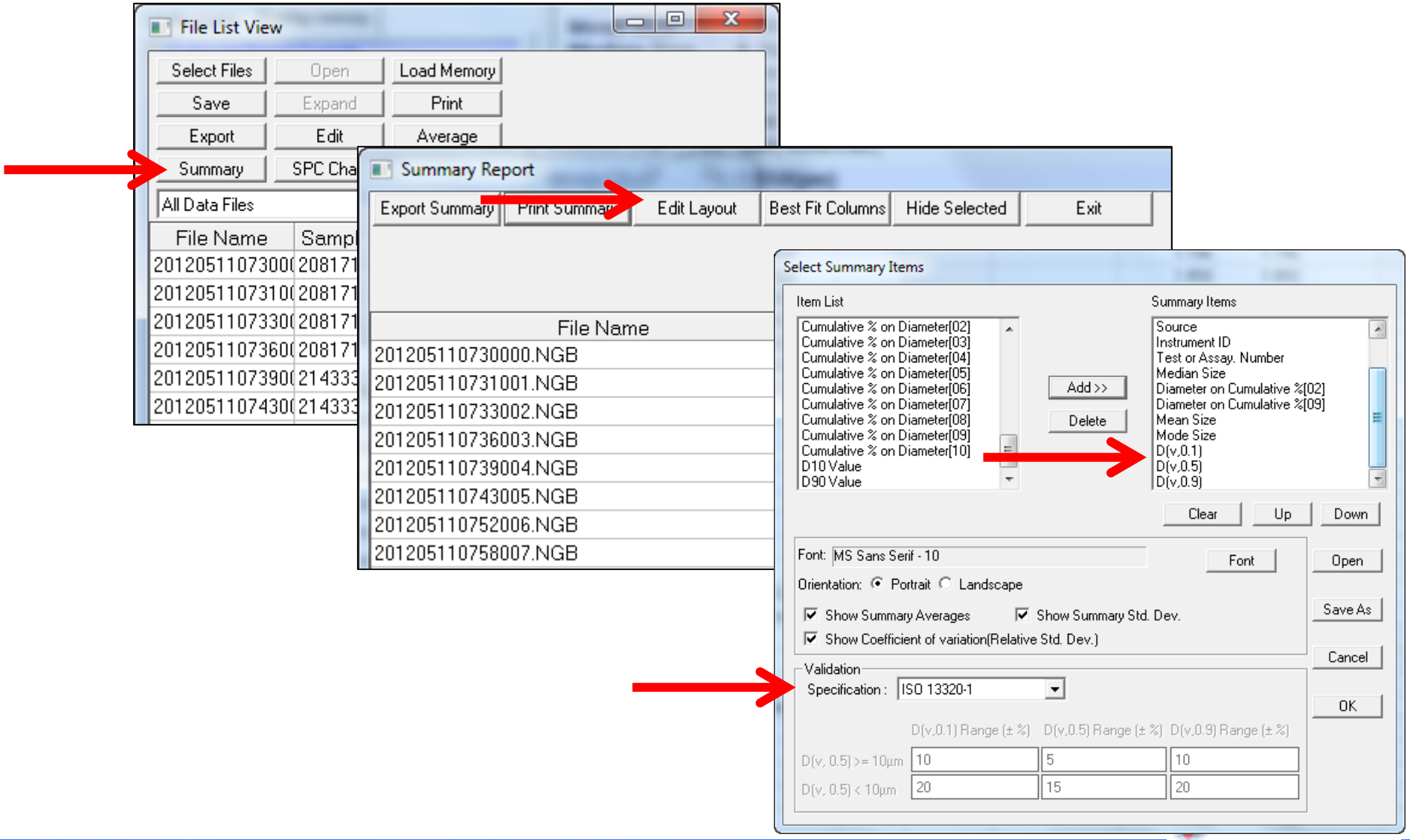
- Coefficient of Variation indicates precision of multiple measurements
- ISO 13320 and USP <429> make recommendations using COV

Summary Report

Export Summary | Print Summary | Edit Layout | Best Fit Columns | Hide Selected | Exit

File Name	Sample Name	D(v,0.1)	D(v,0.5)	D(v,0.9)
200811061138068.NGB	Zircoa Slurry	0.065	0.107	0.185
200811061140069.NGB	Zircoa Slurry	0.071	0.145	11.896
200811061144070.NGB	Zircoa Slurry	0.069	0.129	3.838
Average		0.068	0.127	5.306
Std. Dev.		0.003	0.019	5.992
CV (%)		4.471	15.023	112.921
ISO 13320-1 (20.0, 15.0, 20.0)		PASSED	FAILED	FAILED

Automate COV Calculation



Automate COV Calculation

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Summary Report

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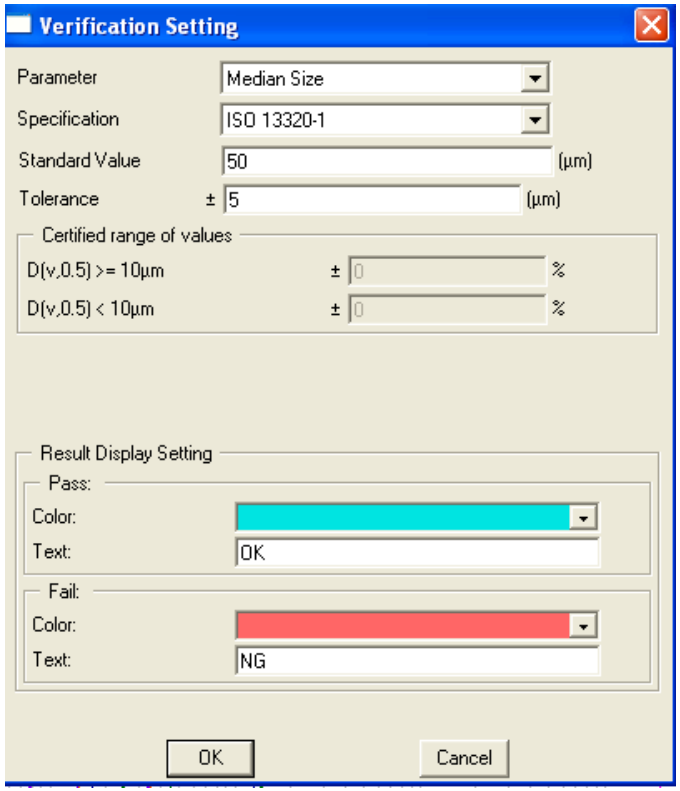
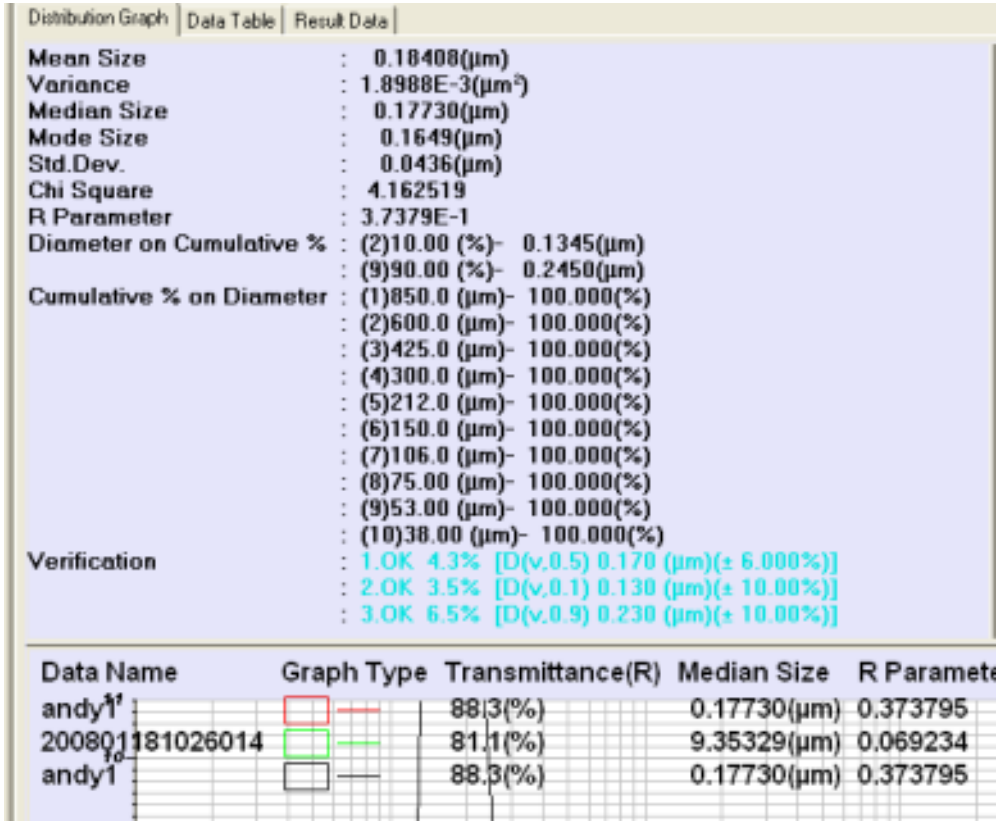
File Name	Sample Name	D(v,0.1)	D(v,0.5)	D(v,0.9)
20081106113806 8.NGB	Zircoa Slurry	0.065	0.107	0.185
20081106114006 9.NGB	Zircoa Slurry	0.071	0.145	11.896
20081106114407 0.NGB	Zircoa Slurry	0.069	0.129	3.838
Average		0.068	0.127	5.306
Std. Dev.		0.003	0.019	5.992
CV (%)		4.471	15.023	112.921
ISO 13320-1 (20.0, 15.0, 20.0)		PASSED	FAILED	FAILED

Result Verification





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Thank you

ありがとうございました

ขอบคุณครับ

谢谢

اشكُرْ

Gracias

Grazie

Σας ευχαριστούμε

धन्यवाद

நன்றி

Tacka dig

Danke

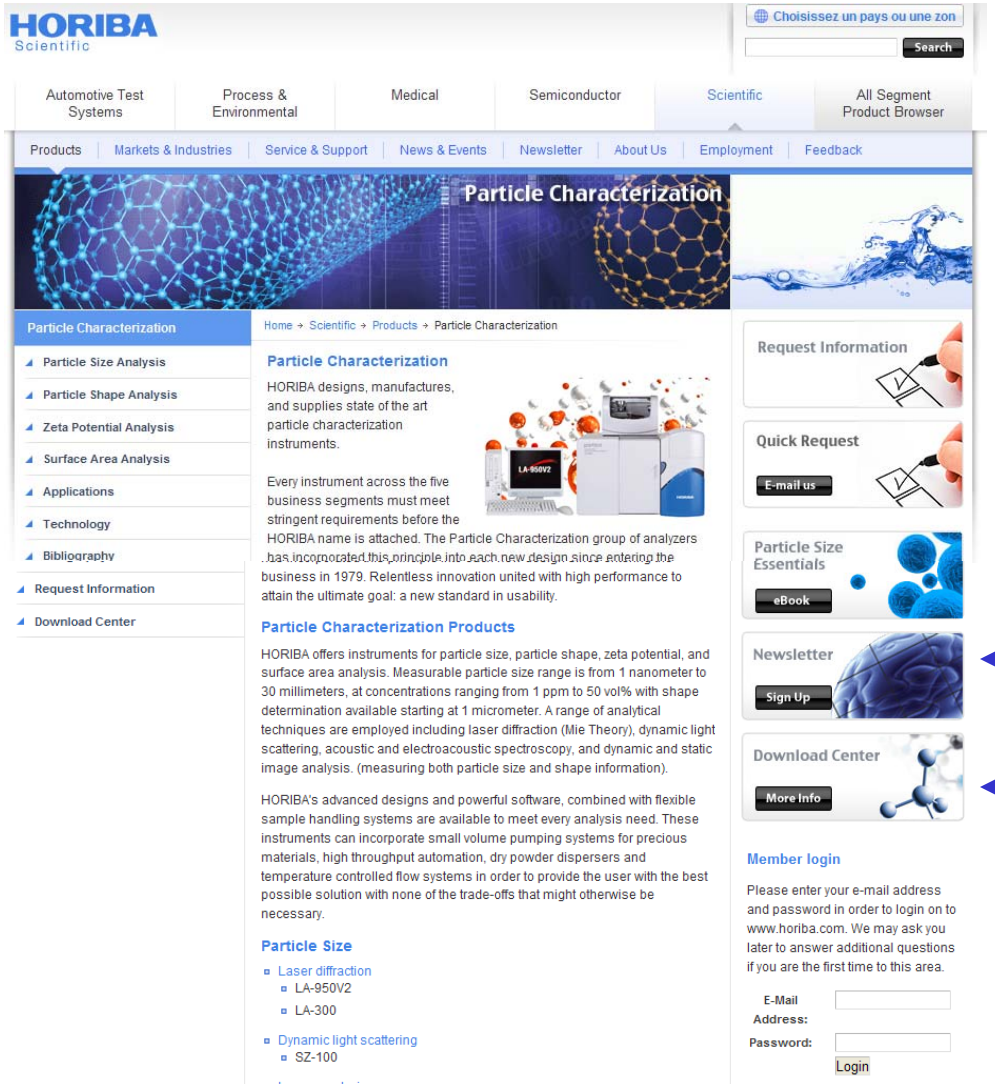
Merci

Obrigado

감사합니다

Большое спасибо

To Learn More: www.horiba.com/particle



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