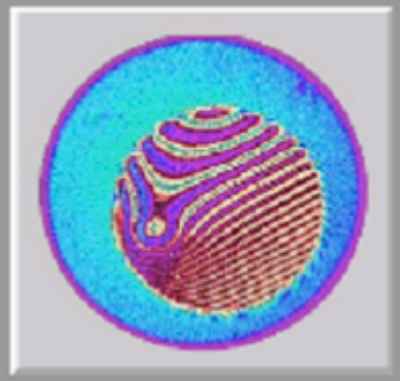
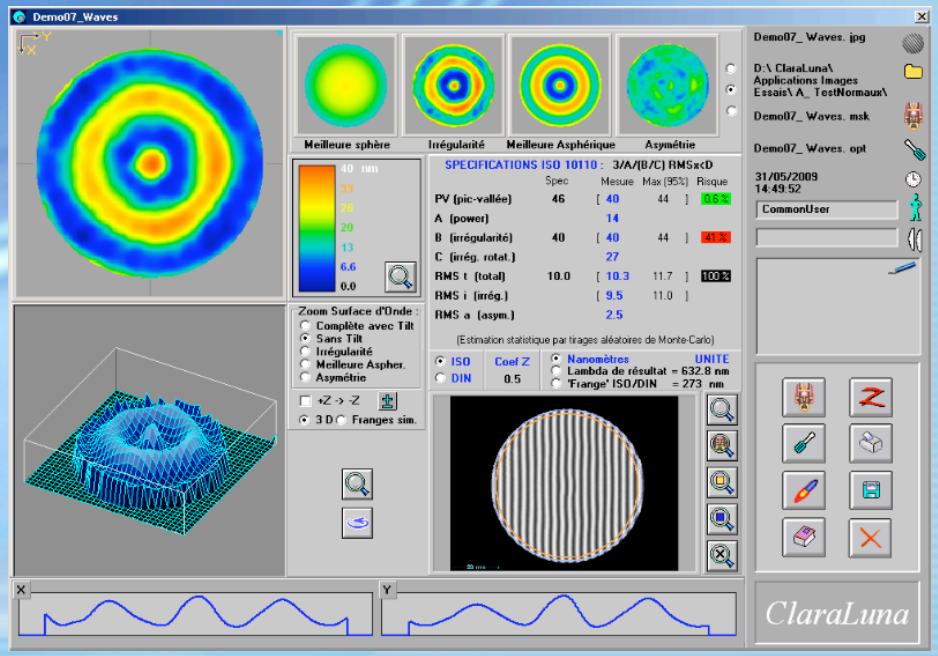


ClaraLuna

Interferometry software

ClaraLuna

Production and Quality Oriented



High performances

Low-cost

Section 1

Production and Quality Oriented

ClaraLuna

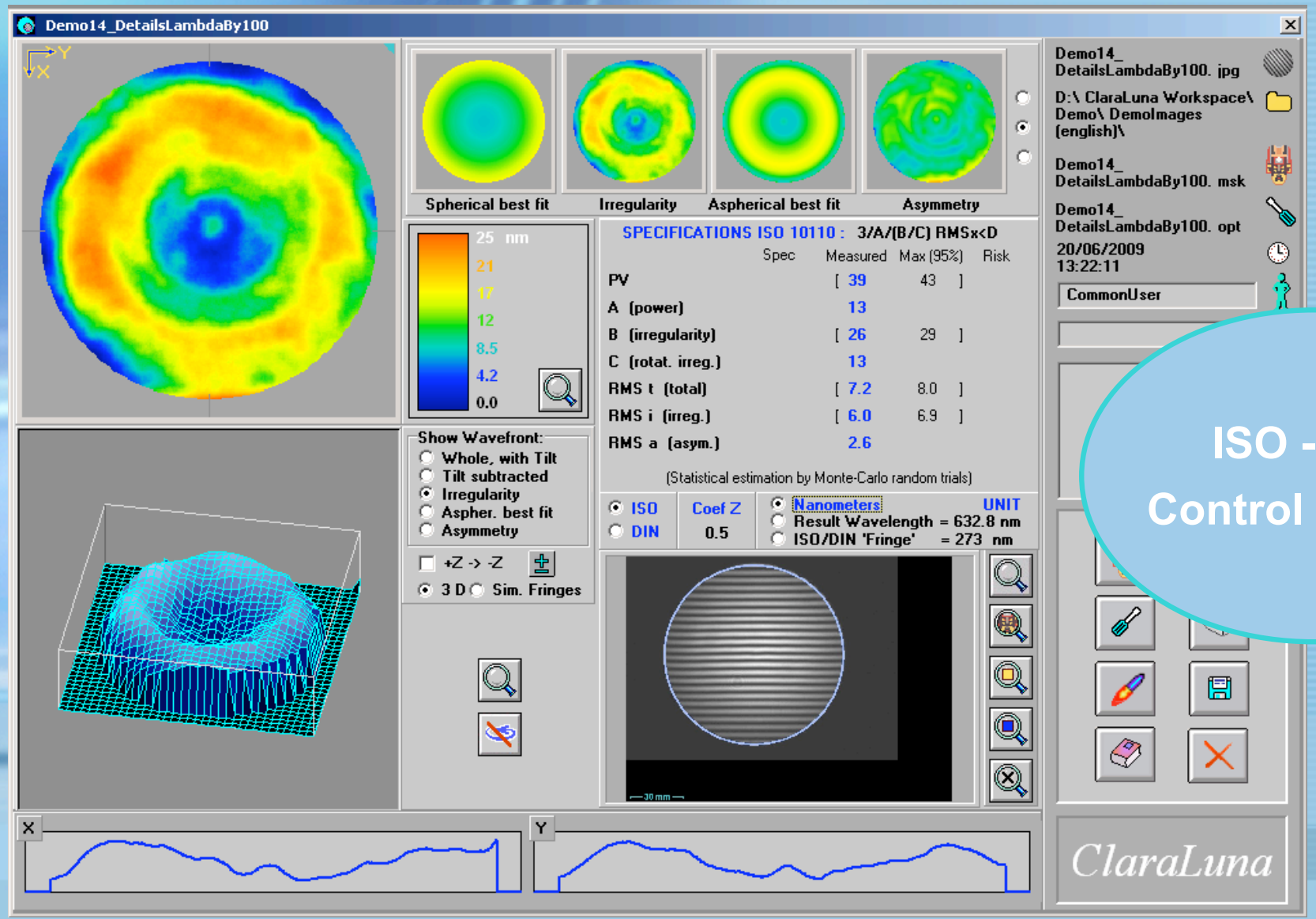
Production and Quality Oriented

Levels of use

- Advanced
- Easy
- Basic
- Production

ClaraLuna

Production and Quality Oriented



ISO - DIN

Control reports

ClaraLuna

Production and Quality Oriented

ISO specification

Measured value

Risk to be out of tolerance

Visualising the risk by color code

Upper bound of 95 % confidence interval

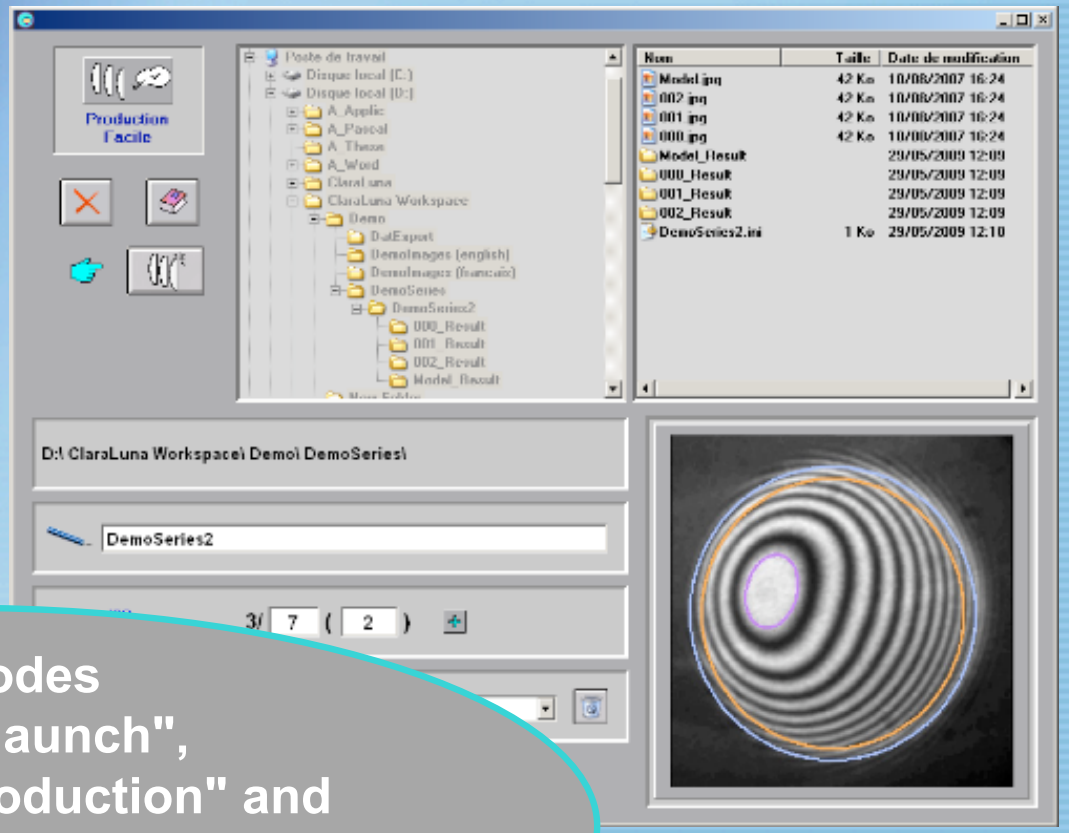
ISO 10110 SPECIFICATIONS : 3/A/(B/C) RMSx<D

	Spec	Measured	Max (95%)	Risk
PV (peak-valley)	40	[34	38]	0.5 %
A (power)		2		
B (irregularity)	37	[34	38]	9 %
C (rot. irreg.)		2		
RMS t (total)	6.0	[6.0	6.5]	30 %
RMS i (irreg.)	5.0	[5.9	6.4]	100 %
RMS a (asym.)		5.1		

ClaraLuna

Production and Quality Oriented

User-friendly interfaces



With Modes "Grab and launch", "Easy", "Easy Production" and "Advanced Production", ClaraLuna is highly easy and pleasant to use

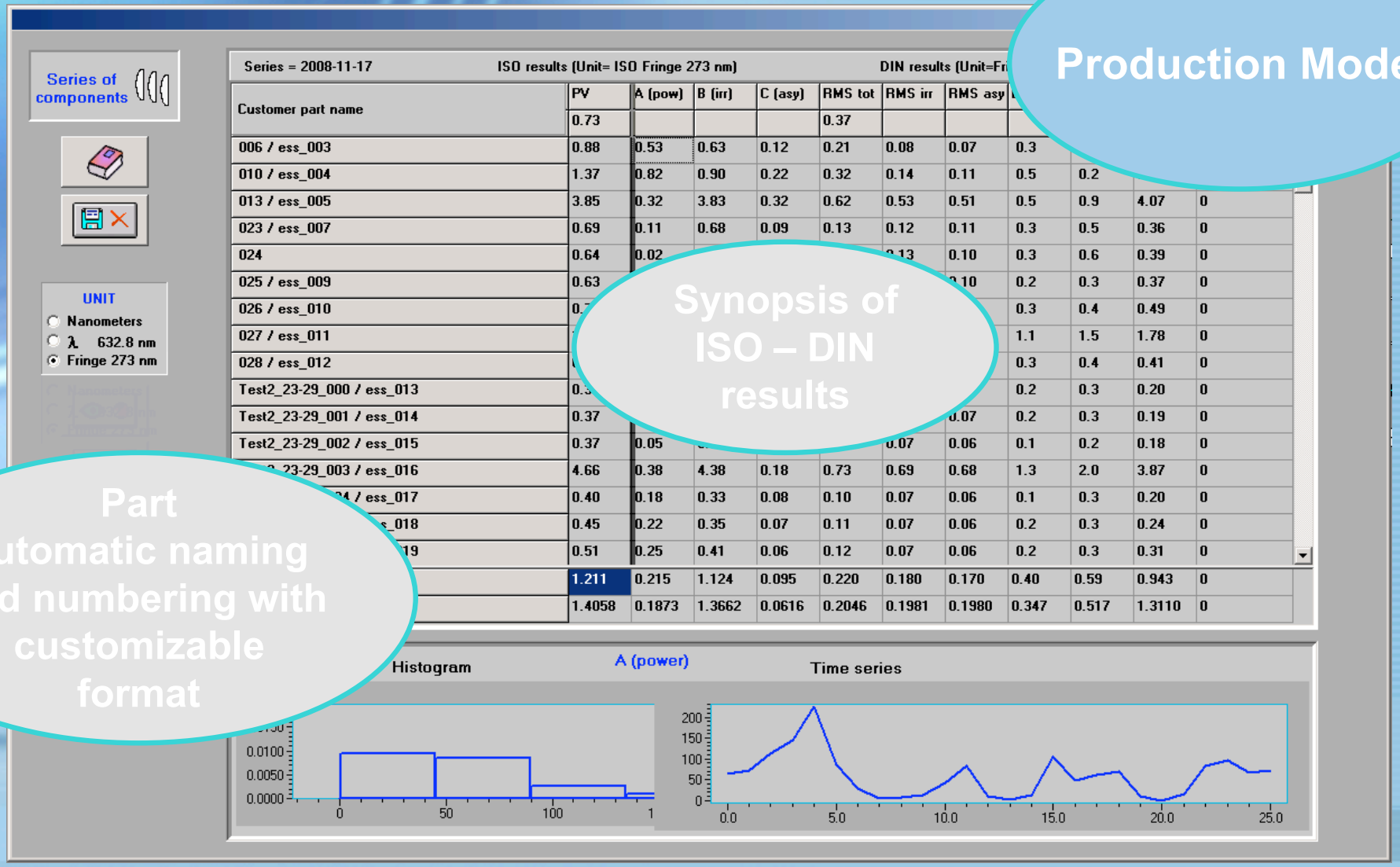
ClaraLuna

Traceability - Quality control
Production Oriented

Production Mode

Synopsis of ISO – DIN results

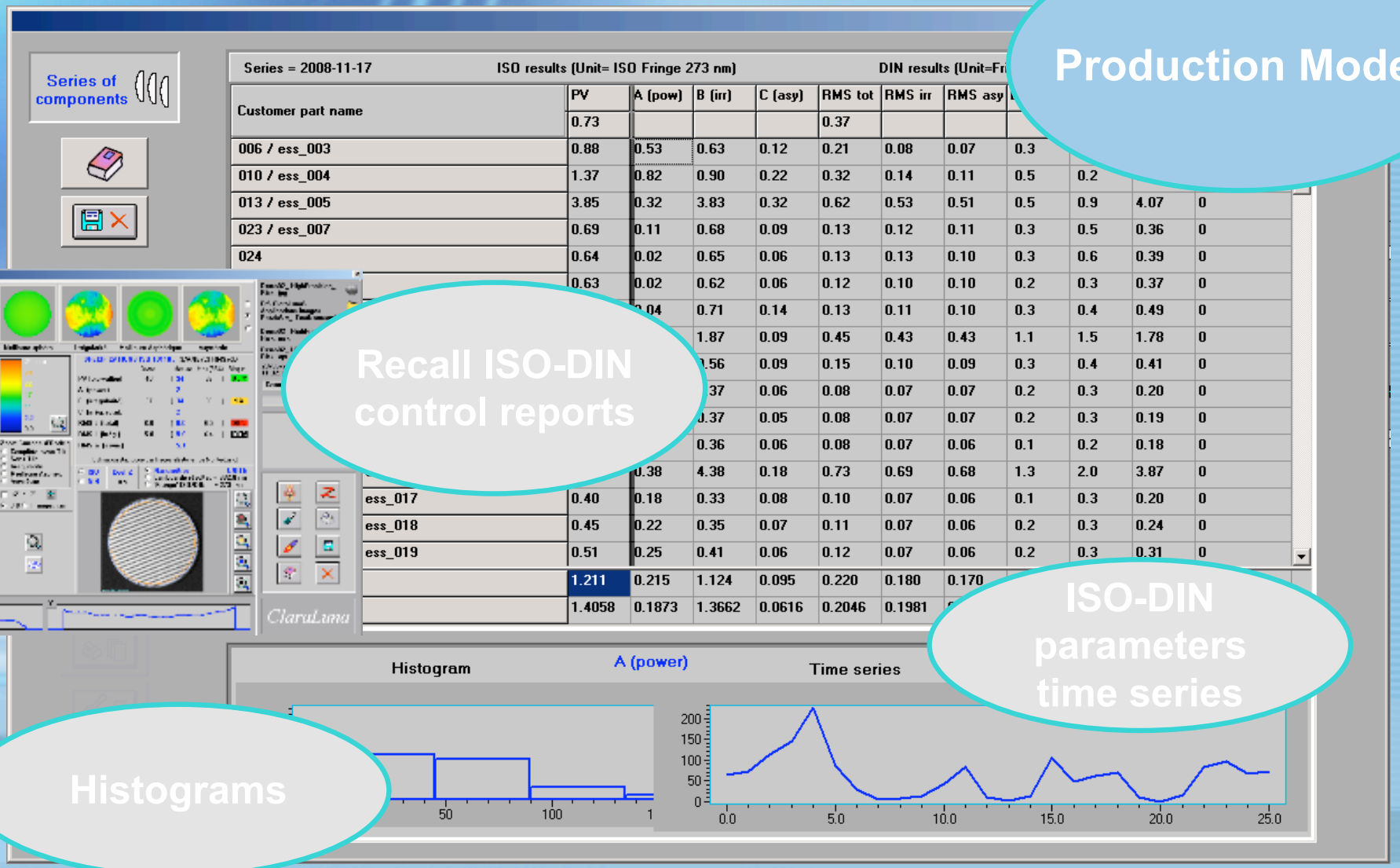
Part automatic naming and numbering with customizable format



Customer part name	PV	A (pow)	B (irr)	C (asy)	RMS tot	RMS irr	RMS asy				
	0.73				0.37						
006 / ess_003	0.88	0.53	0.63	0.12	0.21	0.08	0.07	0.3			
010 / ess_004	1.37	0.82	0.90	0.22	0.32	0.14	0.11	0.5	0.2		
013 / ess_005	3.85	0.32	3.83	0.32	0.62	0.53	0.51	0.5	0.9	4.07	0
023 / ess_007	0.69	0.11	0.68	0.09	0.13	0.12	0.11	0.3	0.5	0.36	0
024	0.64	0.02				0.13	0.10	0.3	0.6	0.39	0
025 / ess_009	0.63						0.10	0.2	0.3	0.37	0
026 / ess_010	0.7							0.3	0.4	0.49	0
027 / ess_011								1.1	1.5	1.78	0
028 / ess_012								0.3	0.4	0.41	0
Test2_23-29_000 / ess_013	0.3							0.2	0.3	0.20	0
Test2_23-29_001 / ess_014	0.37						0.07	0.2	0.3	0.19	0
Test2_23-29_002 / ess_015	0.37	0.05				0.07	0.06	0.1	0.2	0.18	0
23-29_003 / ess_016	4.66	0.38	4.38	0.18	0.73	0.69	0.68	1.3	2.0	3.87	0
24 / ess_017	0.40	0.18	0.33	0.08	0.10	0.07	0.06	0.1	0.3	0.20	0
s_018	0.45	0.22	0.35	0.07	0.11	0.07	0.06	0.2	0.3	0.24	0
19	0.51	0.25	0.41	0.06	0.12	0.07	0.06	0.2	0.3	0.31	0
	1.211	0.215	1.124	0.095	0.220	0.180	0.170	0.40	0.59	0.943	0
	1.4058	0.1873	1.3662	0.0616	0.2046	0.1981	0.1980	0.347	0.517	1.3110	0

ClaraLuna

Traceability - Quality control
Production Oriented



Production Mode

Recall ISO-DIN control reports

ISO-DIN parameters time series

Histograms

ClaraLuna

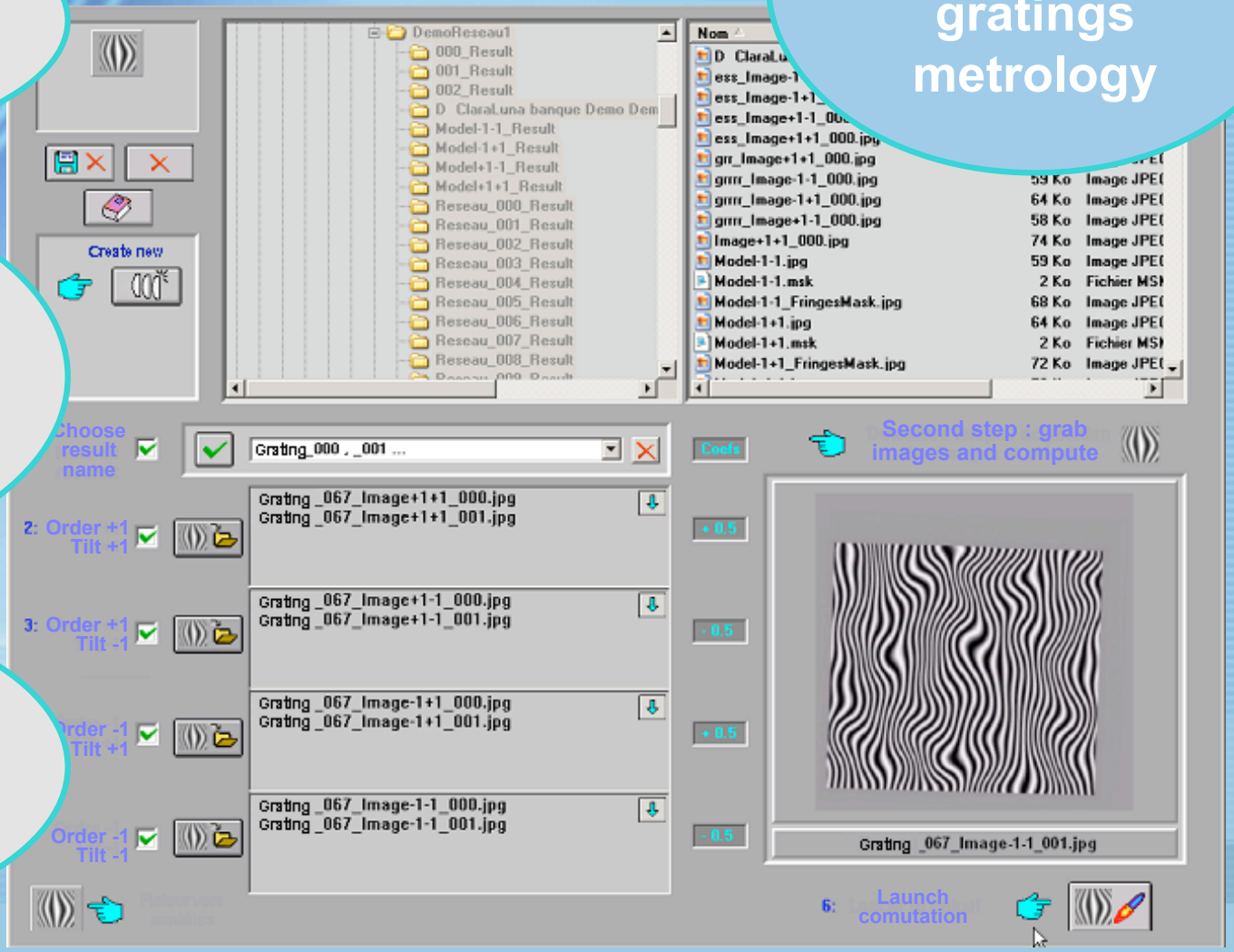
Traceability - Quality control
Production Oriented

Defining masks and acquiring nterferograms are guided by an assistant

Computing automatically realigns masks, averages wavefronts having same ordrer and tilt, and does the final linear combination

Working folder, masks, settings, interferograms, results: Everything is saved, checkable, reusable.

Assistant for diffraction gratings metrology

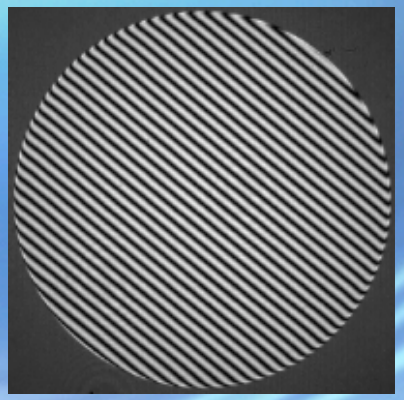


Section 2

Technical performances

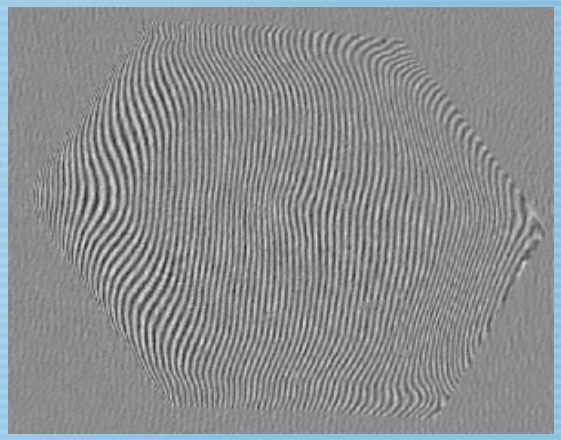
ClaraLuna

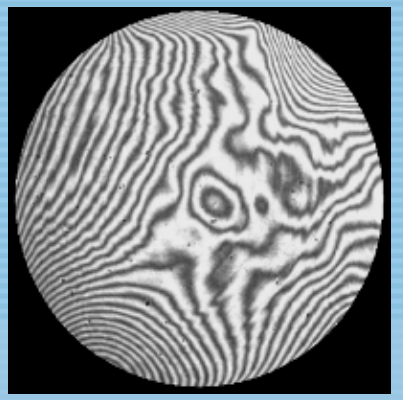
covers the whole range of situations
in optical components metrology

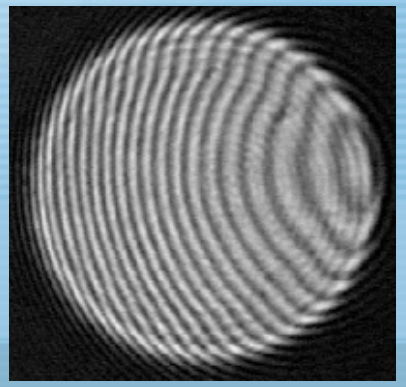


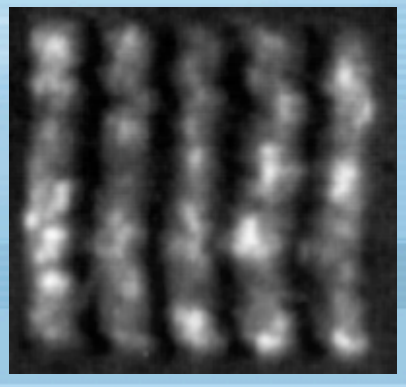
very high
precision
and
resolution

very high
robustness



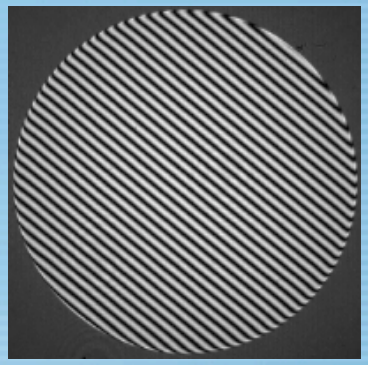






ClaraLuna

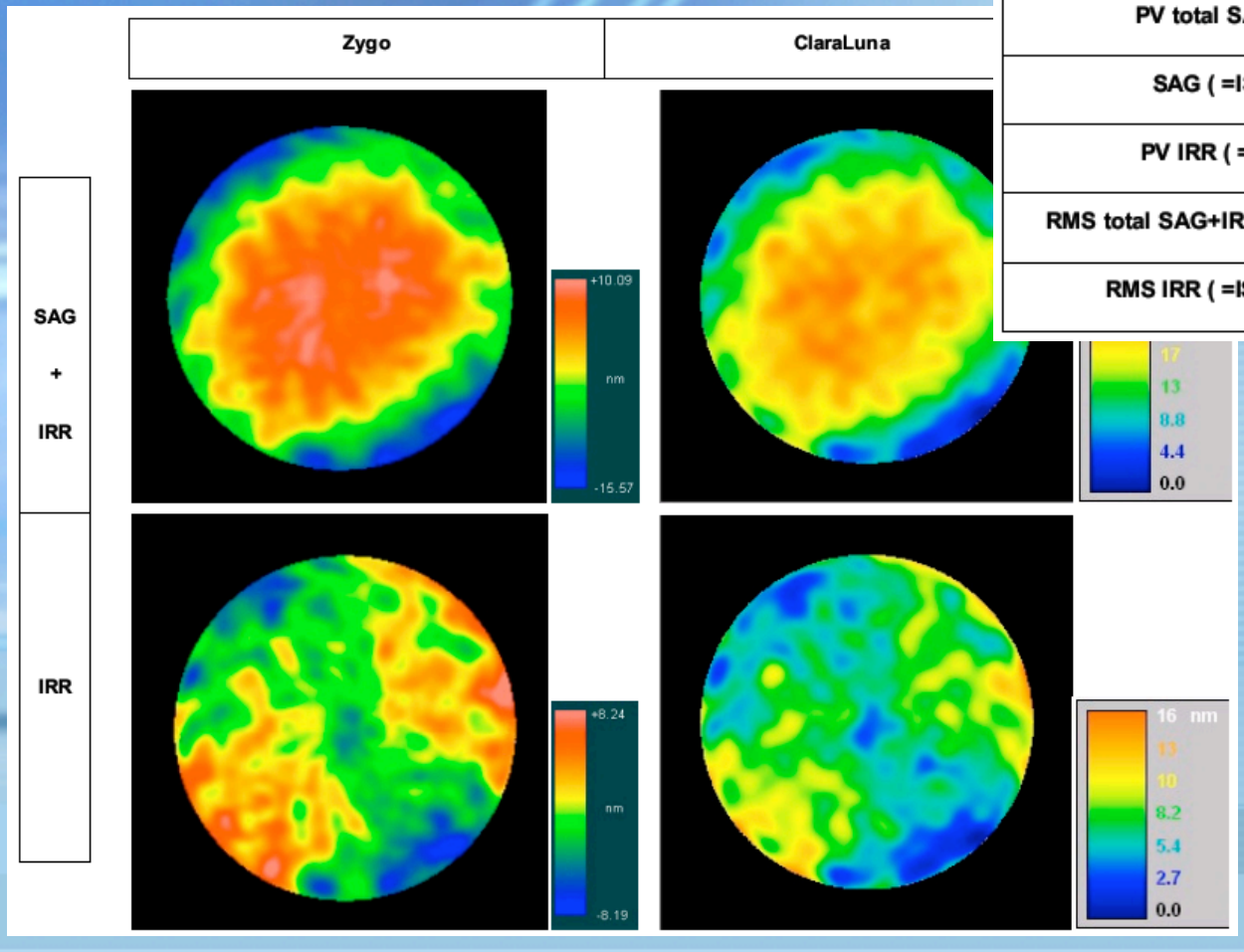
Very high precision



Comparing ClaraLuna vs Zygo :

λ/100 rms part

(nanometers)	Zygo	ClaraLuna
PV total SAG+IRR	25.6	26.0
SAG (=ISO A)	18.6	17.8
PV IRR (=ISO B)	16.4	15.0
RMS total SAG+IRR (=ISO Rms t)	6.0	6.1
RMS IRR (=ISO Rms i)	2.6	2.6

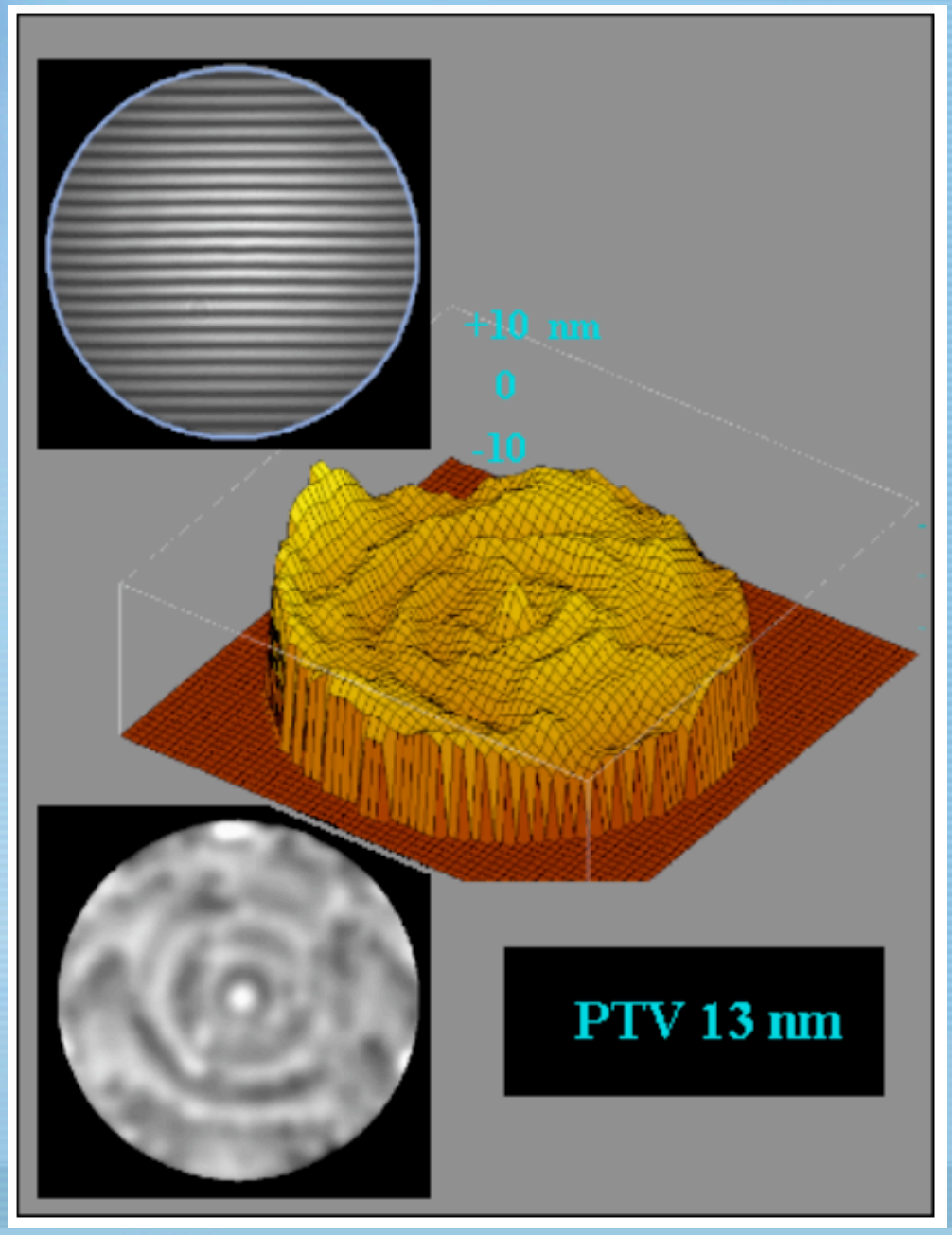


With suitable measuring conditions, ClaraLuna shows both a precision and a resolution close to that of a phase shifting device and software

ClaraLuna

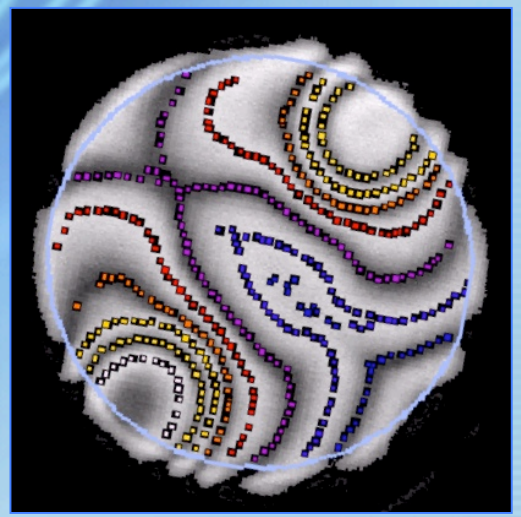
ClaraLuna can read details with λ /100 amplitude

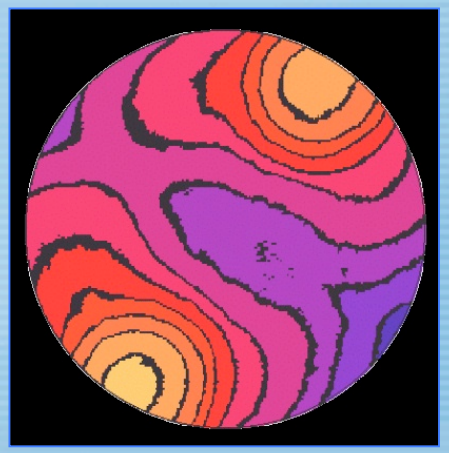
Its resolution is nanometric

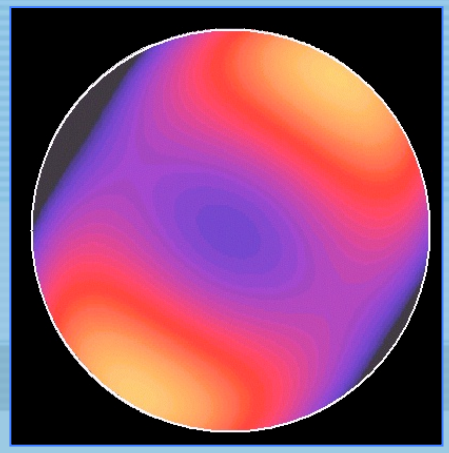


ClaraLuna

High robustness in tricky cases



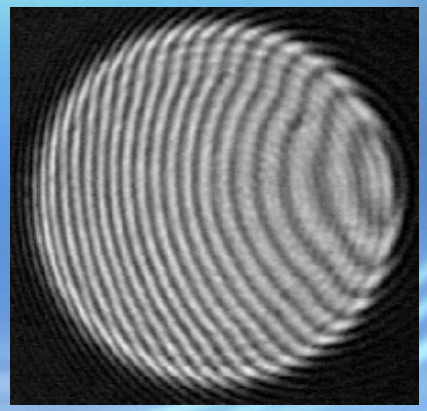
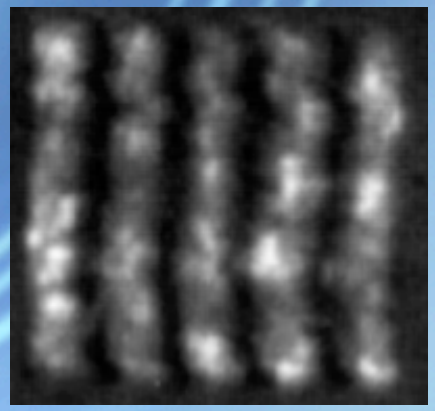
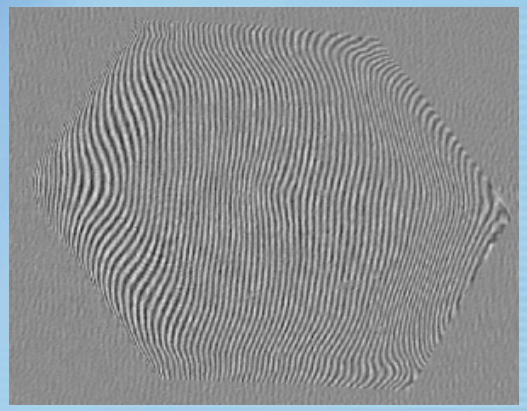
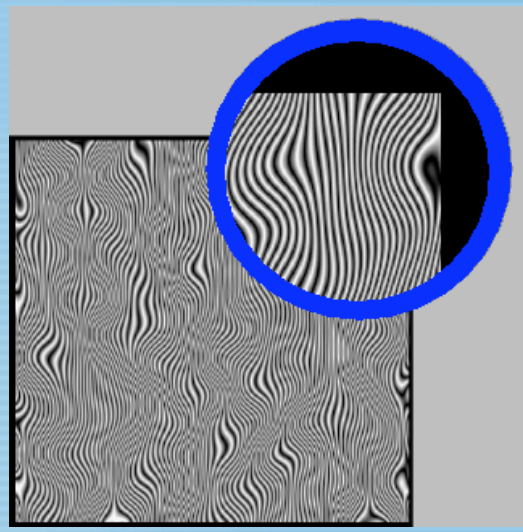
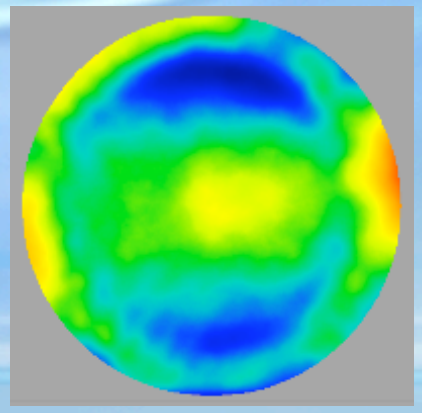
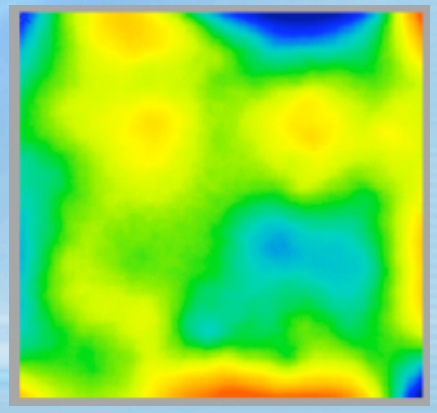
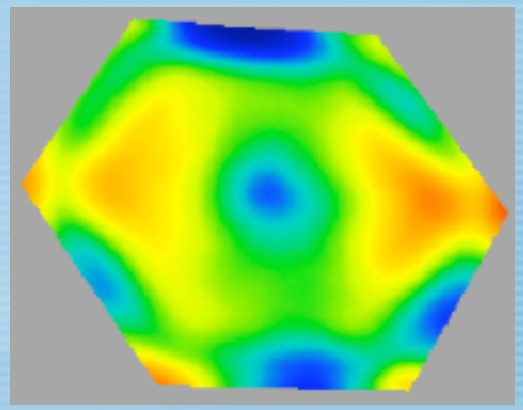
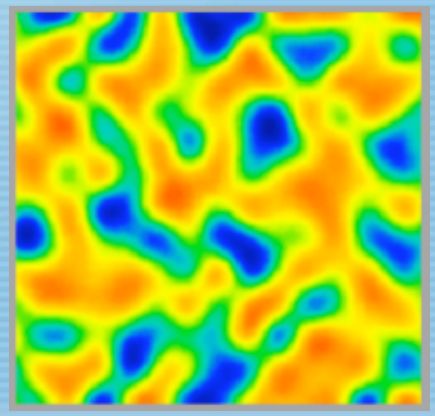




strongly deformed components,
closed fringes

ClaraLuna

High robustness in tricky cases

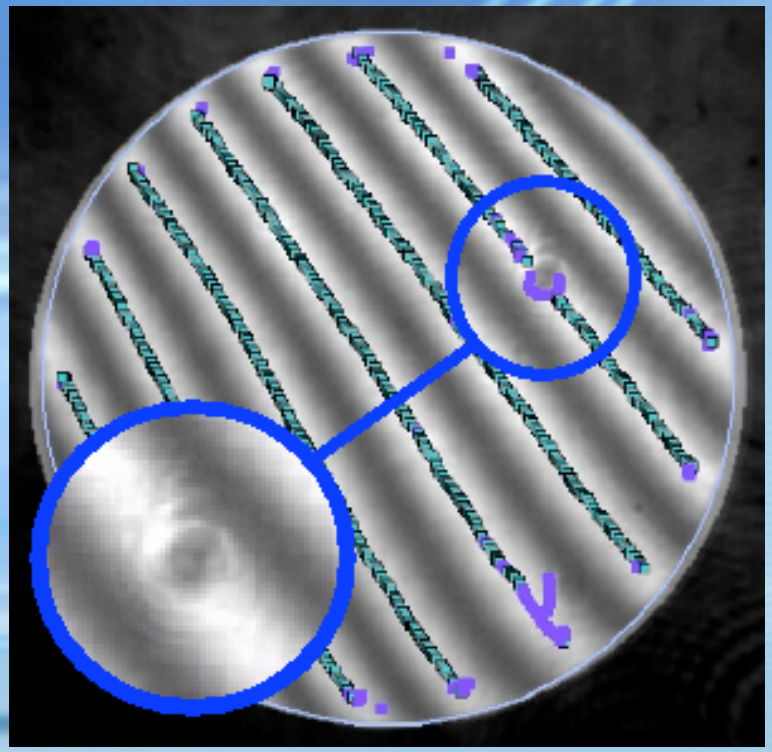
noisy or broken fringes, low contrast, vibrations, air turbulence,

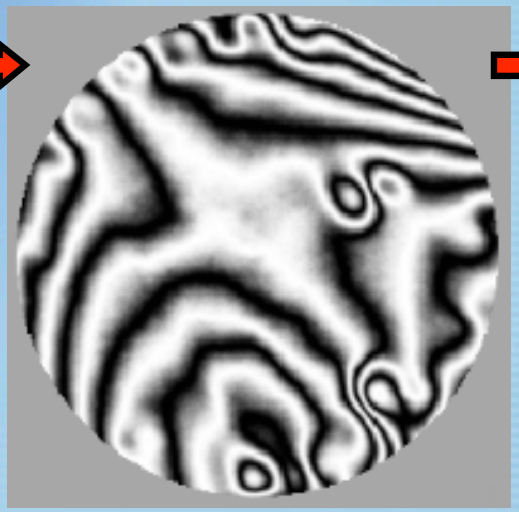
very high or very low number of fringes...

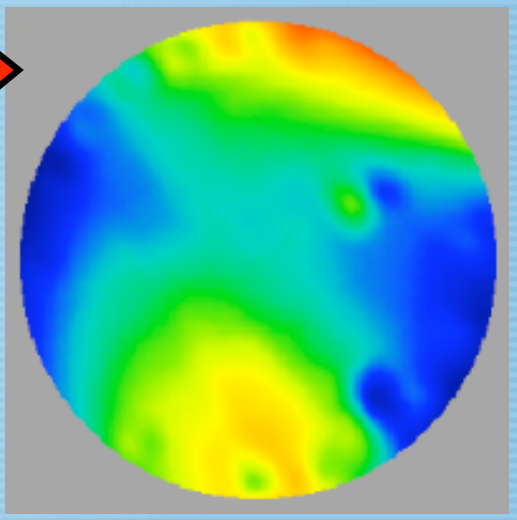
ClaraLuna

High robustness with respect to noise

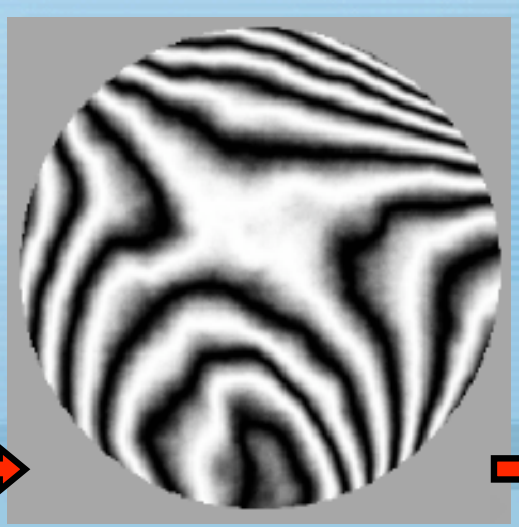
aberrant data

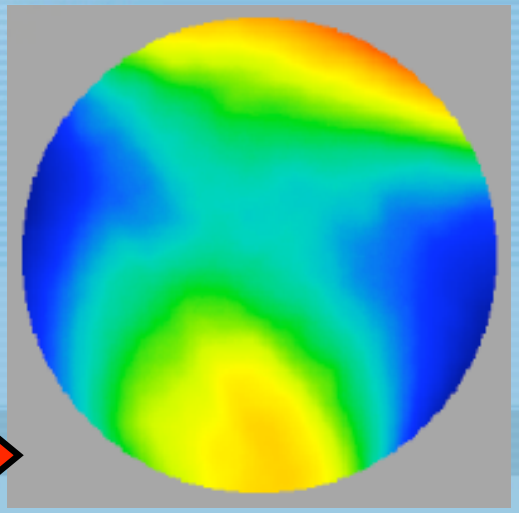






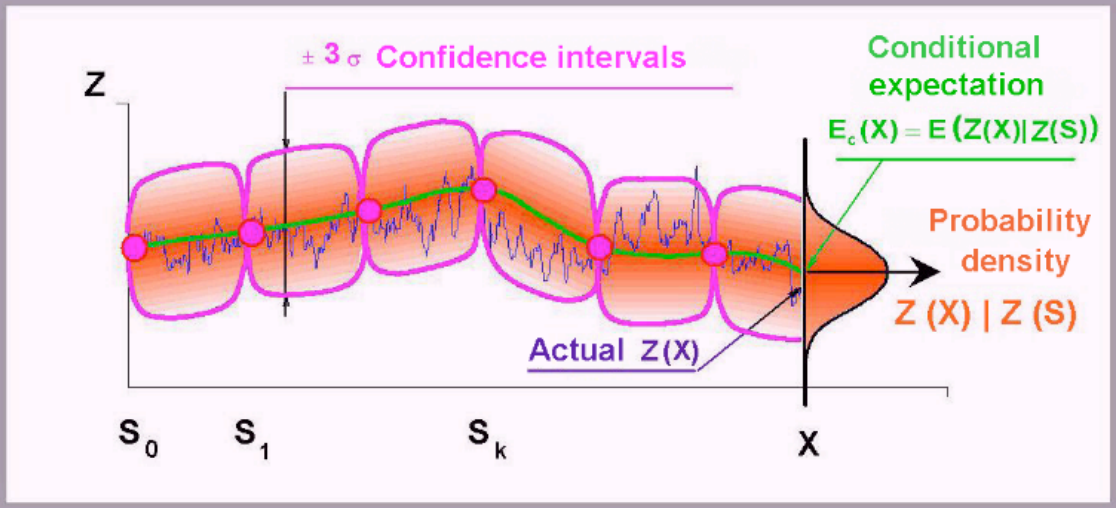
detection and correction





ClaraLuna

The main algorithms are novel worldwide



Linear Prediction
of a Random Function

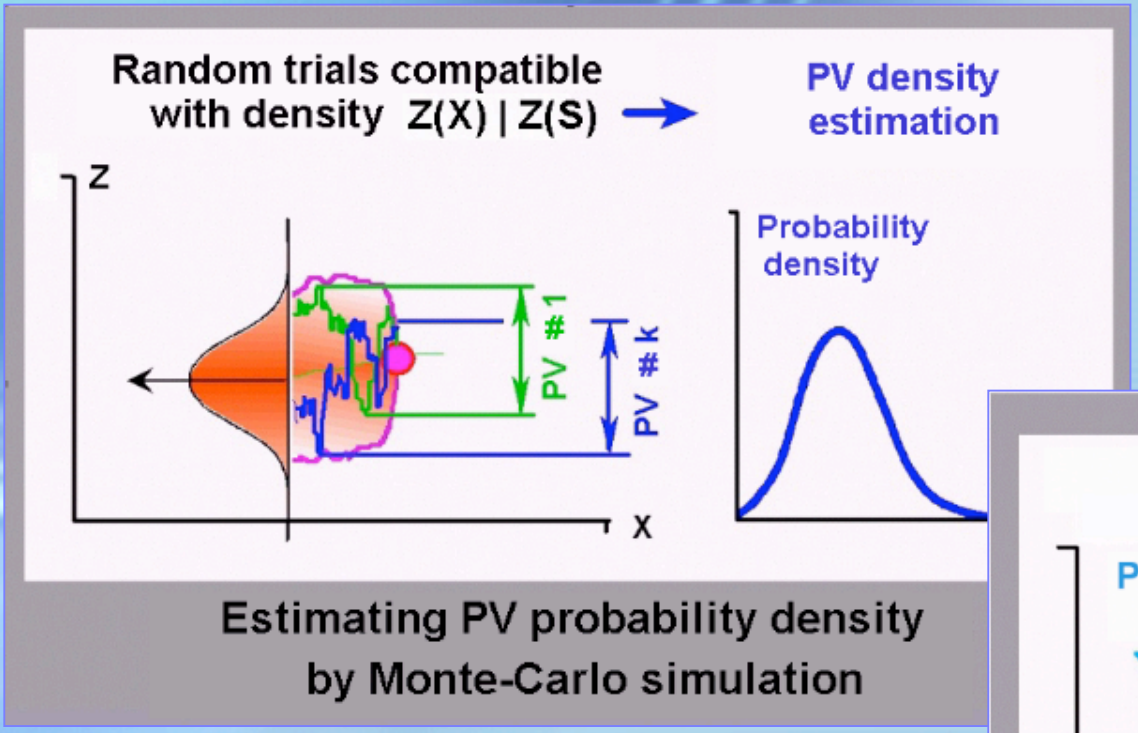
➔ Extracting **all information** contained in the data

Statistical optimisation by linear prediction :

Reconstucting the unknown data by its **most probable position** with respect to known data

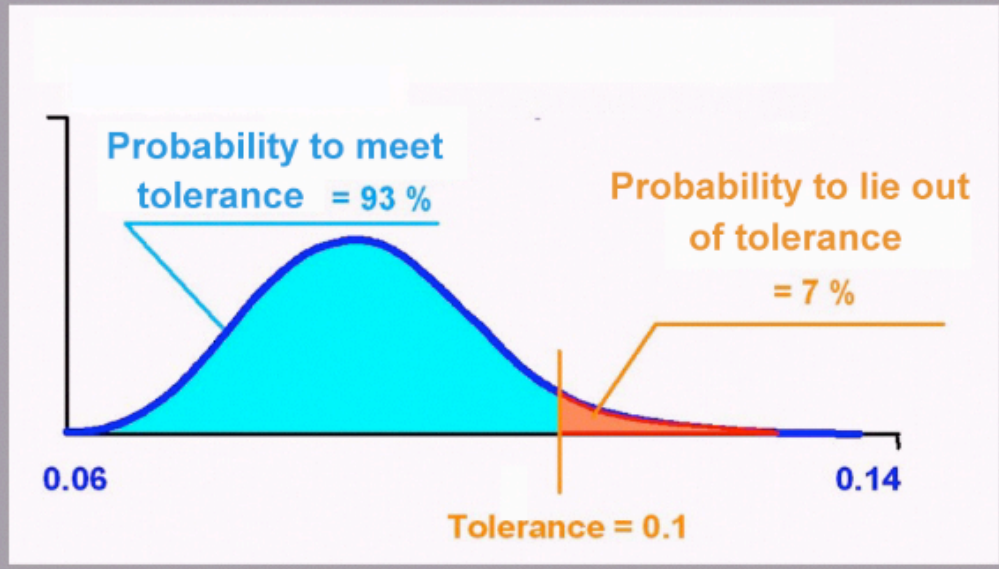
ClaraLuna

The main algorithms are novel worldwide



Estimating PV probability density by Monte-Carlo simulation

estimating PV and RMS confidence intervals



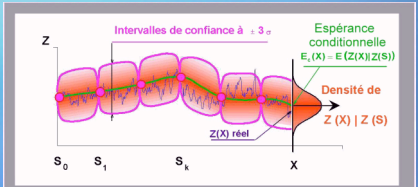
The PV confidence intervals are estimated from the simulated histogram

estimating the risk = probabilty to be out of tolerance for :

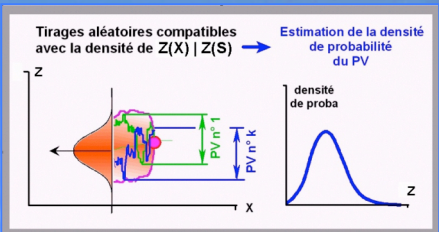
- rms, ptv of phase
- rms, ptv of slopes

The main algorithms are novel worldwide

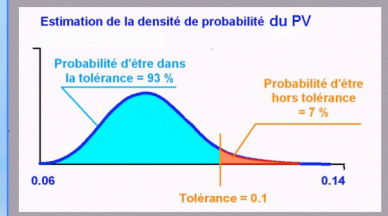
ClaraLuna



PREDICTION LINEAIRE
D'UNE FONCTION ALEATOIRE



ESTIMATION de la DENSITE du PV
par SIMULATION de MONTE-CARLO



Les Intervalles de Confiance du PV sont estimés
sur la ddp expérimentale simulée

ISO 10110 SPECIFICATIONS : 3/A/(B/C) RMSx<D

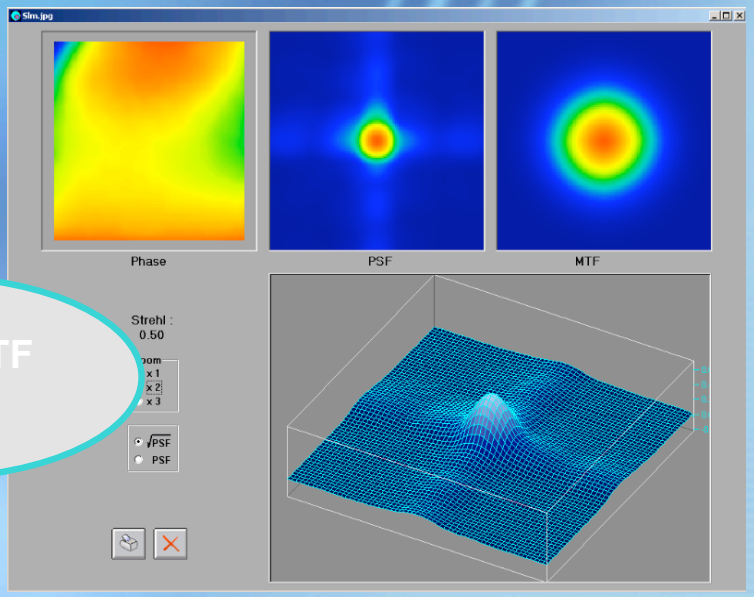
	Spec	Measured	Max (95%)	Risk
PV (peak-valley)	40	[34	38]	0.5 %
A (power)		2		
B (irregularity)	37	[34	38]	9 %
C (rot. irreg.)		2		
RMS t (total)	6.0	[6.0	6.5]	30 %
RMS i (irreg.)	5.0	[5.9	6.4]	100 %
RMS a (asym.)		5.1		

ClaraLuna is the unique software for optical components metrology providing the uncertainty of results and the risk to be out of tolerance

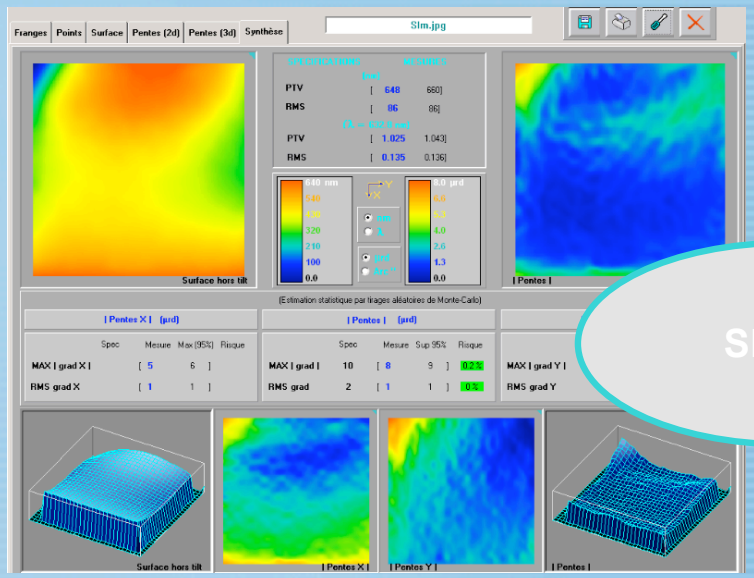
ClaraLuna

Classic analysis tools, easy and comfortable to use and read

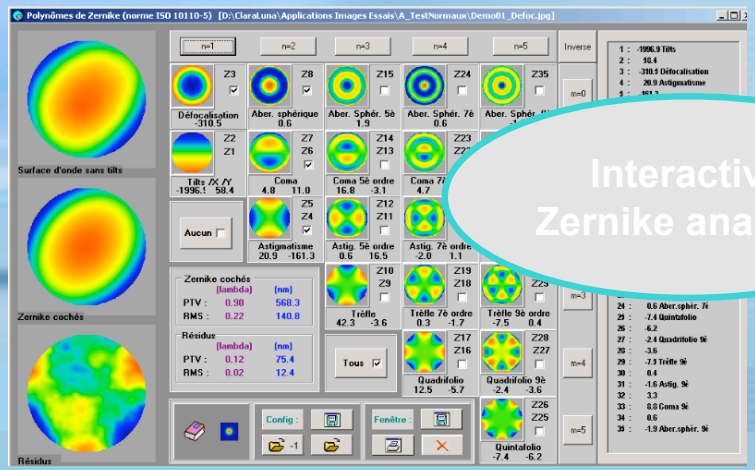
PSF – MTF
Strehl



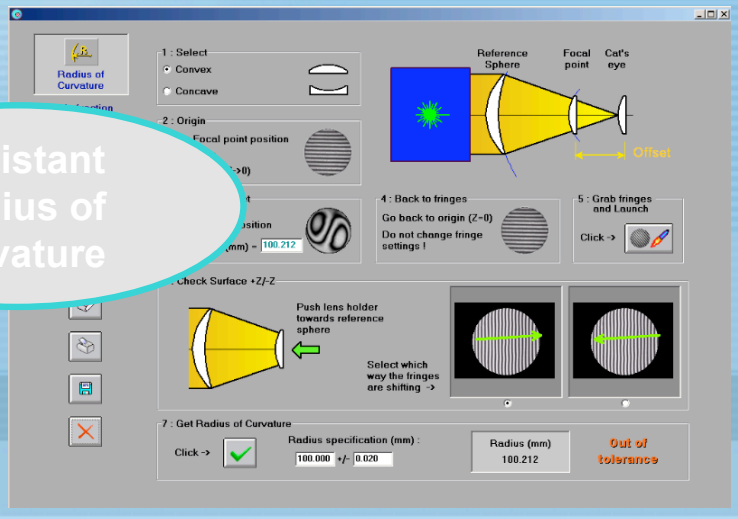
Slopes



Interactive
Zernike analysis



Assistant
Radius of
curvature



ClaraLuna

Industrial references

OPTICO AG

angénieux

Optique Maris-Delfour

BM Optik

SPANOPTIC

Tecnottica CONSONNI S.r.l.

fineoptix

EADS SODERN

ESO

umicore materials for a better life

ClaraLuna

Industrial references

ASM:
a scaled down Active Segmented Mirror for the Active Phasing Experiment

Christophe Dupuy*
Frédéric Gonté, Christoph Frank,
European Southern Observatory, Karl-Schwarzschild-Strasse 2, 85748 Garching bei München, Germany

ABSTRACT

The construction of extremely large telescope is only possible with a segmented primary mirror. The phasing of the primary mirror due to its size and its number of segments is a main concern at the European Southern Observatory. The European Southern Observatory has developed a test bench called Active Phasing Experiment to study new phasing technology and new telescope control system. The key subsystem of this experiment is a scaled down Active Segmented Mirror (ASM) composed of sixty-one hexagonal segments of seventeen millimeters side to side. Each hexagonal mirror can all be controlled in piston, tip and tilt. The integration of this jewel piece of opto-mechanic started after the successful results obtained with the manufacturing of a prototype composed of only seven modules.

Keywords: ESO, ASM, APE, ELT, hexagonal segments, development, scaled down, active optics, Claraluna.

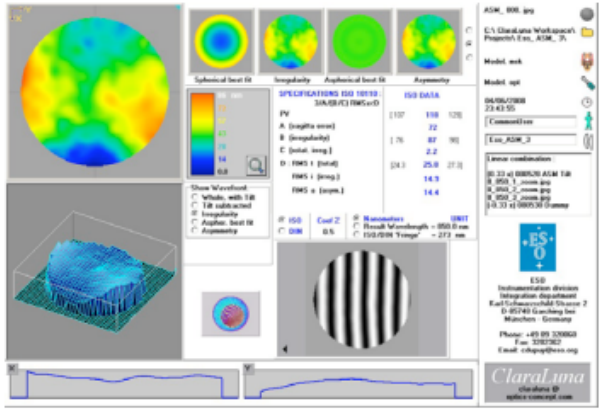
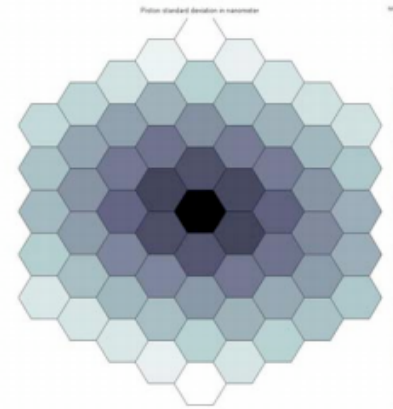


Figure 24 : ASM surface error after phasing



ESO Instrumentation Division used ClaraLuna to qualify the ASM (prototype of primary segmented for the future ELT)

ClaraLuna

is distributed by

OPTICS CONCEPT

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mestre.manuel@wanadoo.fr

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claraluna@optics-concept.com