

New toolkit for the X-ray optics simulation tool ShadowVui

- General improvements / Sources
- Power on optical elements
- Parameter scan
- Deformation tool

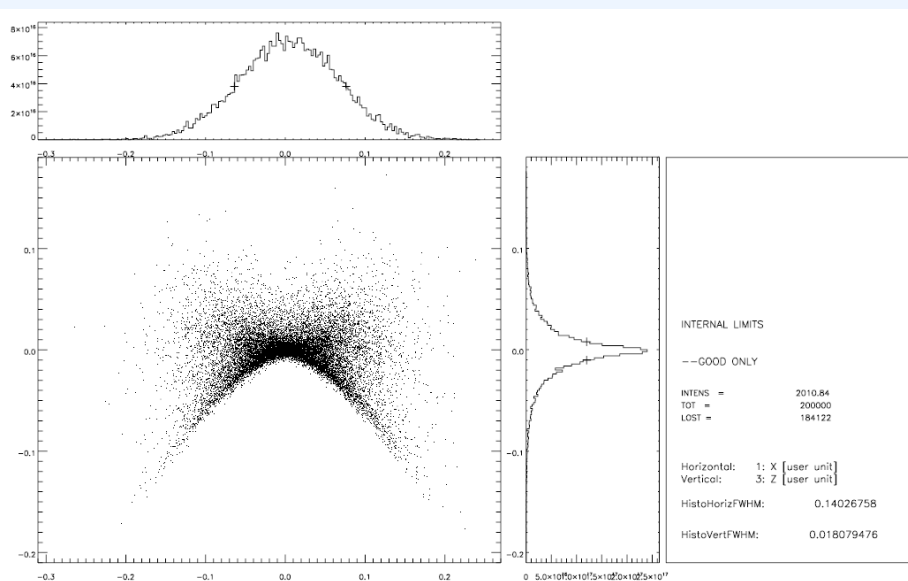
Bernd C. Meyer, Projetos mecânicos @ LNLS

General improvements

- Simulation with 2 Million rays per seed
- Automatic change of seed in loops
 - improve statistic errors
- Absolute source spectrum included into ray-tracing
 - Flux and power density distribution on every optical element and focus position
- Going away from IDL-macros
 - Parametric scanning and power/flux calculations without knowledge of IDL

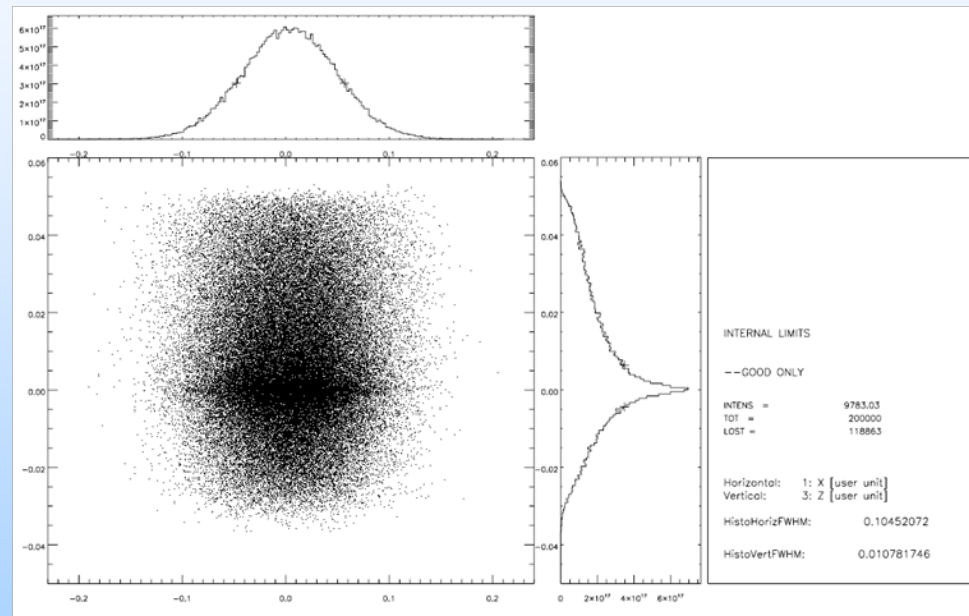
Beam shape at focus (SCW)

CPT: 8keV



Hor.: 1400 μm
 Vert.: 180 μm
 Total Flux: $9.2 \cdot 10^{12}$ ph/s/cbw
 Flux density: $8 \cdot 10^{14}$ ph/s/ mm^2 /cbw

CSC: 8keV



Hor.: 1050 μm
 Vert.: 110 μm
 Total Flux: $4.5 \cdot 10^{13}$ ph/s/cbw
 Flux density: $6 \cdot 10^{15}$ ph/s/ mm^2 /cbw

Sources

scw_bl_VCMCyl_DCM_VFMToroid_4keV.ws - Shad

ShadowVUI Edit Run Results PreProcessors Util Tools Help

Source:

General Parameters Source Spectrum

Geometrical BM Wiggler Undulator

Modify... Run SHADOW/source Current Loop 1

Total Power [W] 4997.8 Total Flux [Ph/s/0.1%bw] 1.65E+19

PlotXY: Histo: InfoSh SourcInfo

Optical System:

oe 1 oe 2 oe 3 oe 4

Add oe Modify oe... Delete oe Delete all Run SHADOW/trace

PlotXY: Histo: Info on: BLViewer

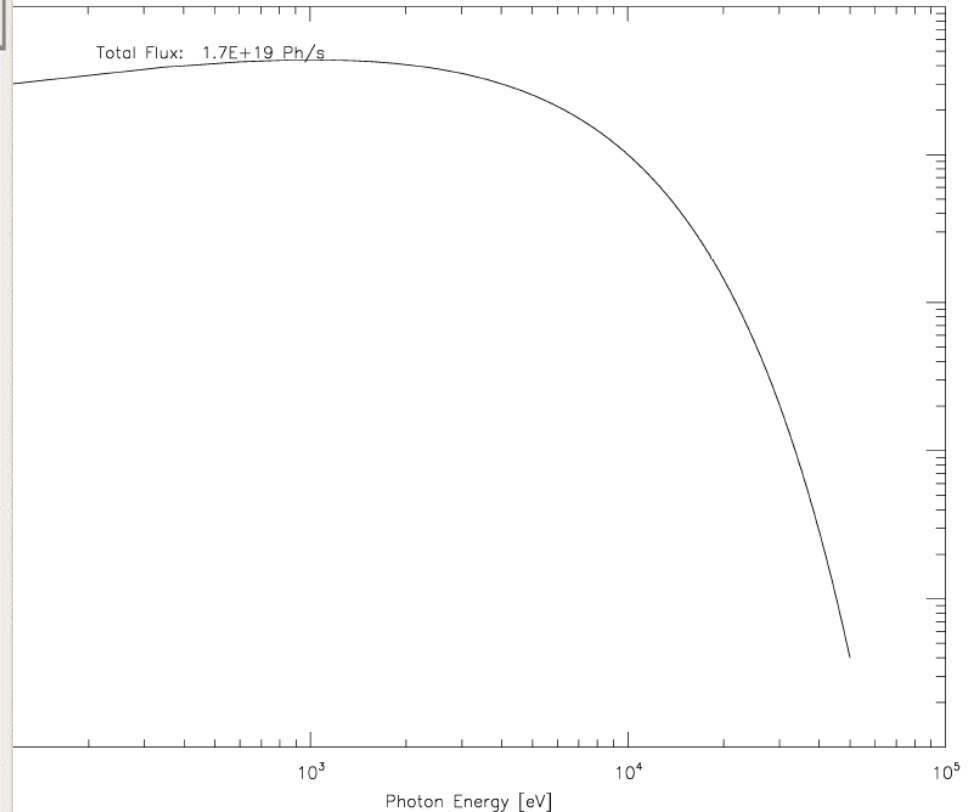
Macros:

1 2 3 4 5

Add macro Edit Delete macro Run macro

Working directory:

Browser... /home/bernd/xop2,3/SCW/



Power distribution

- Calculate power density distribution on every optical element (mirror, screen)

- Results:

Absorbed, transmitted, incoming, incoming (incl. outside slit)

- 1) Graphically displayed

- 3D-plot of power distribution

- Power distribution through center planes

- 1) Ascii-file with coordinates and power density

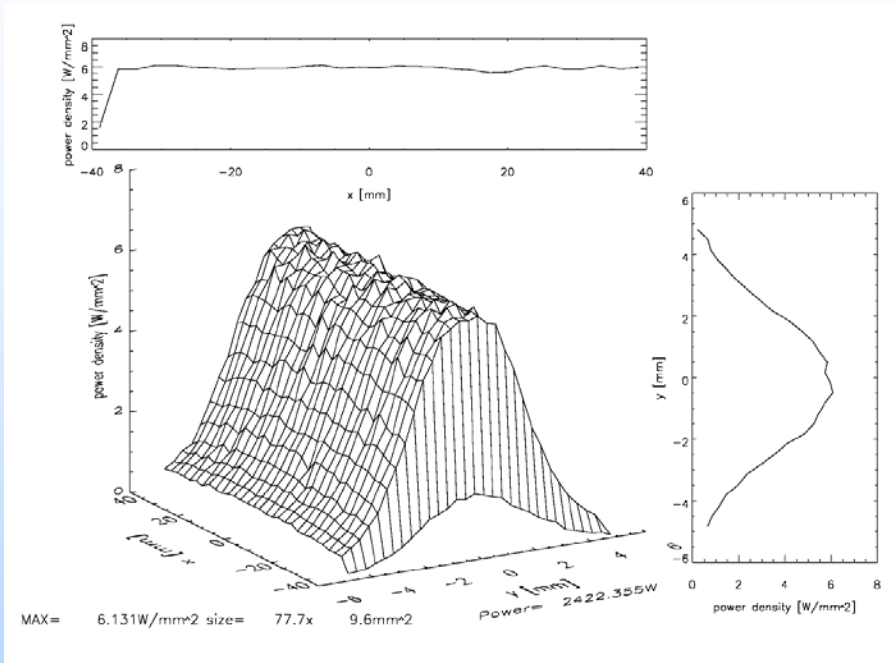
- For use in FEA analysis

- Power is integrated over given energy bandwidth

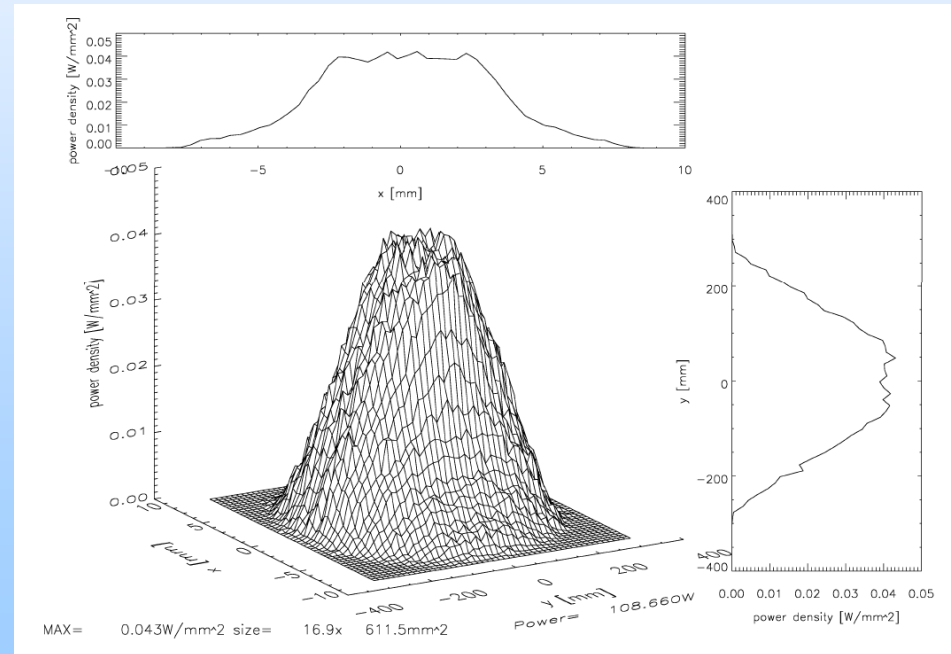
- Many loops (different seed) result in better statistics

- Mesh density is changeable

Power distribution



Absorbed power on 1. filter (SCW)

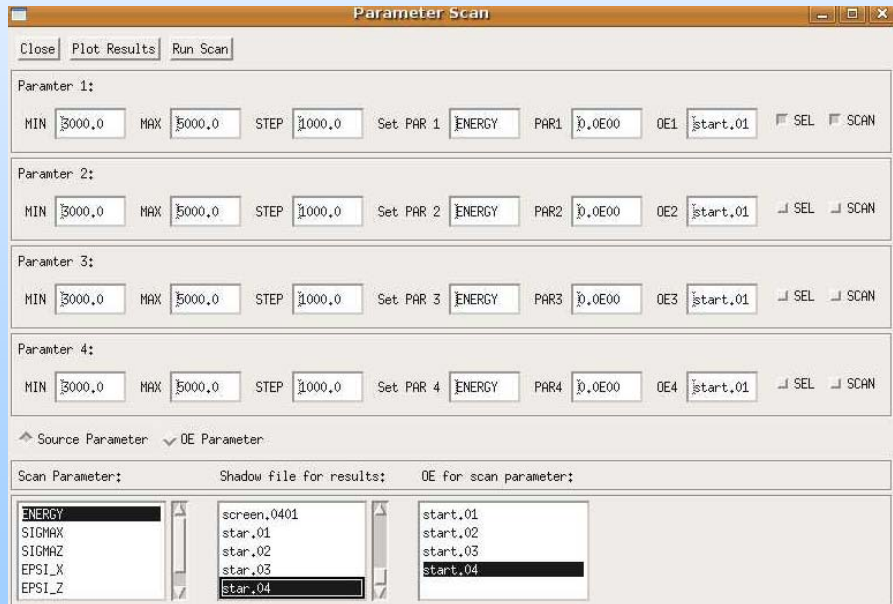


Absorbed power on M1 (PGM)

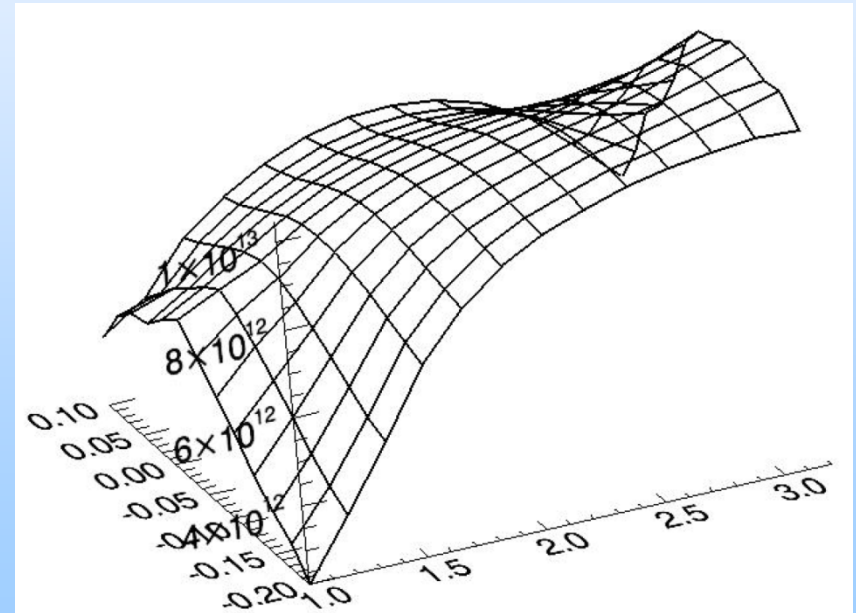
Parameter scan

- “Scan” of 1-4 parameters, listed in start.XX + Energy
- Result:

Ascii-file with parameter, flux0, flux, energy resolution, beam size, beam divergence at selected optical element

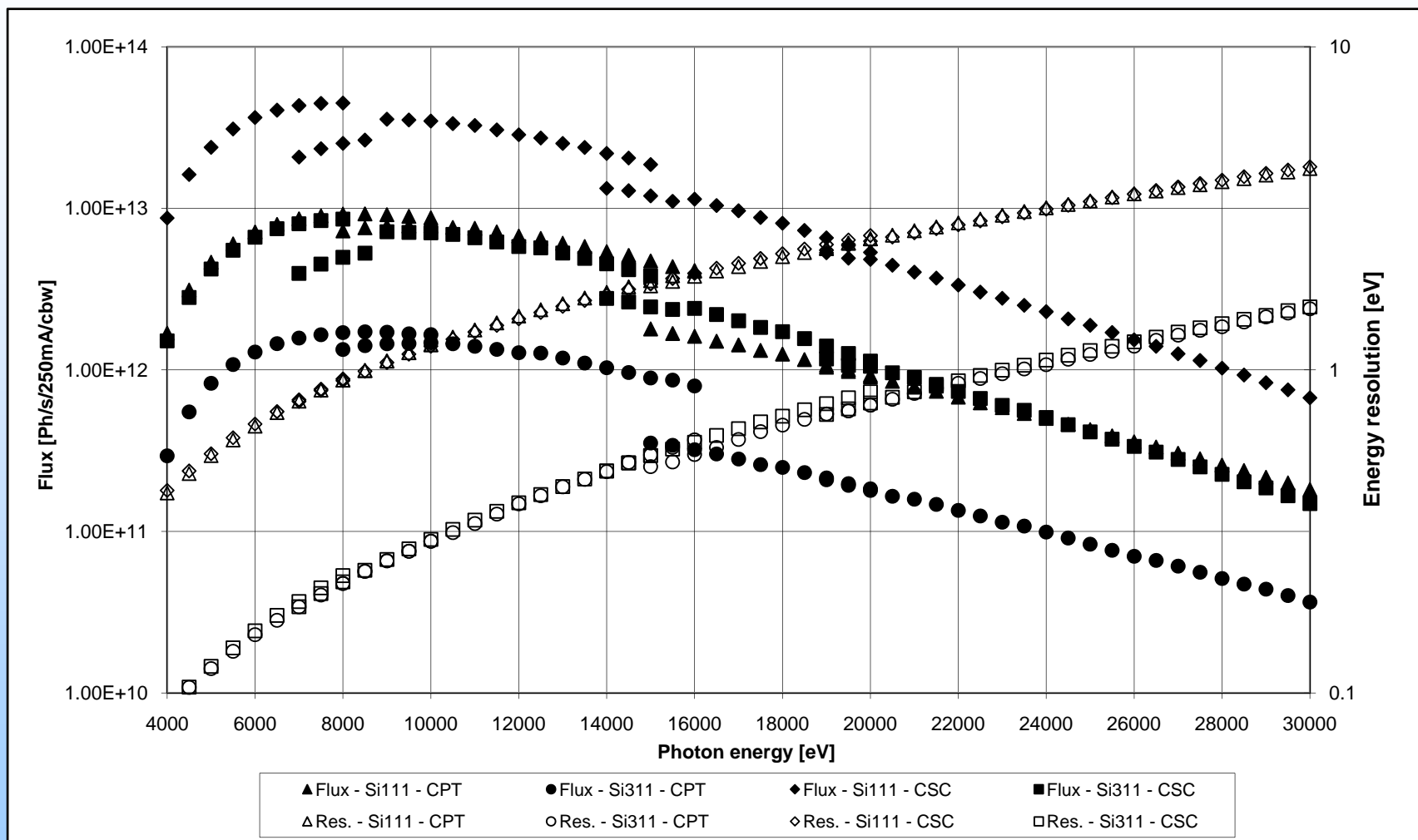


Parameter scan tool



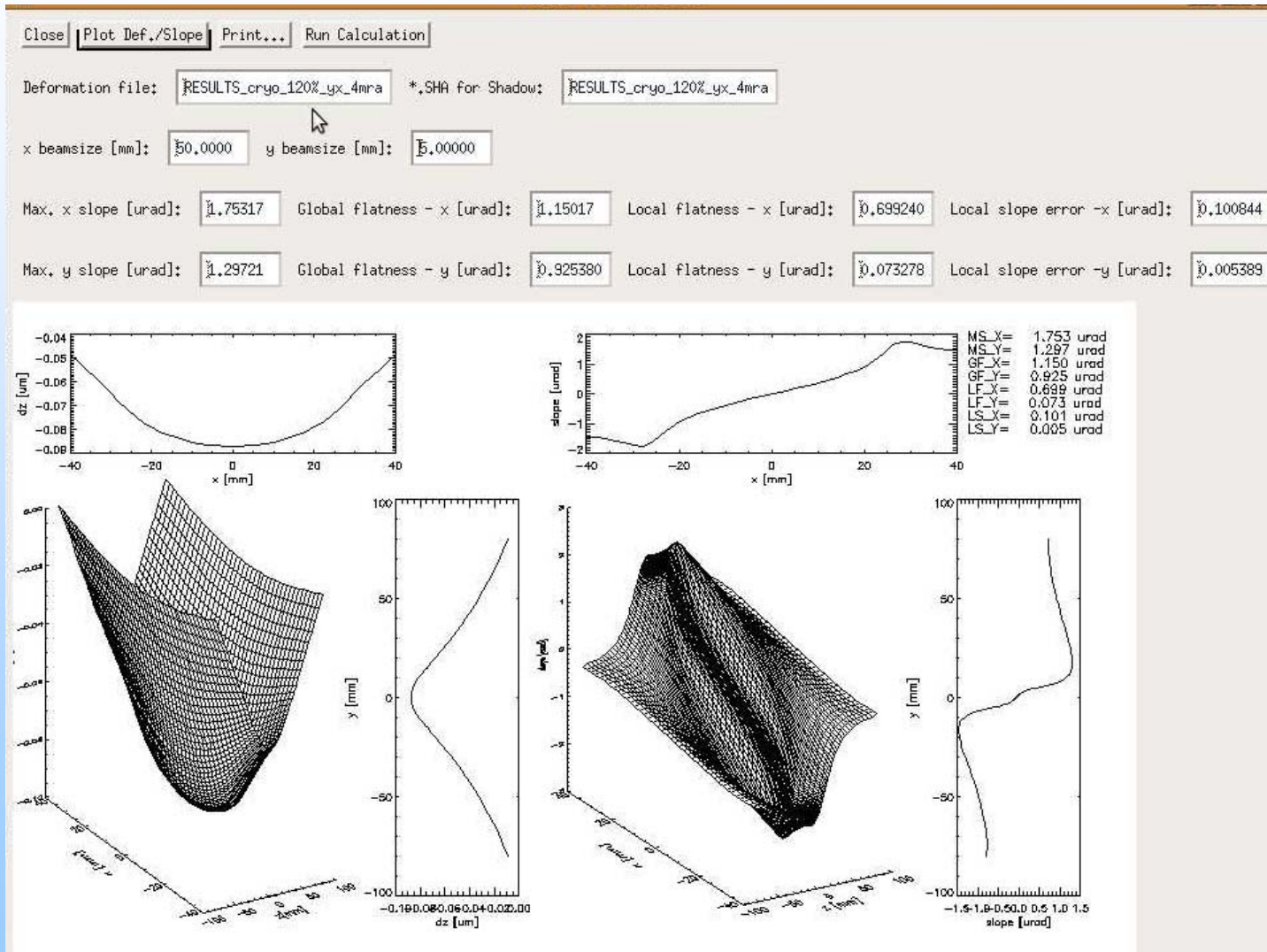
Flux at focus position vs. hor. Acceptance and high of M2 (SCW-beamline)

Parameter scan

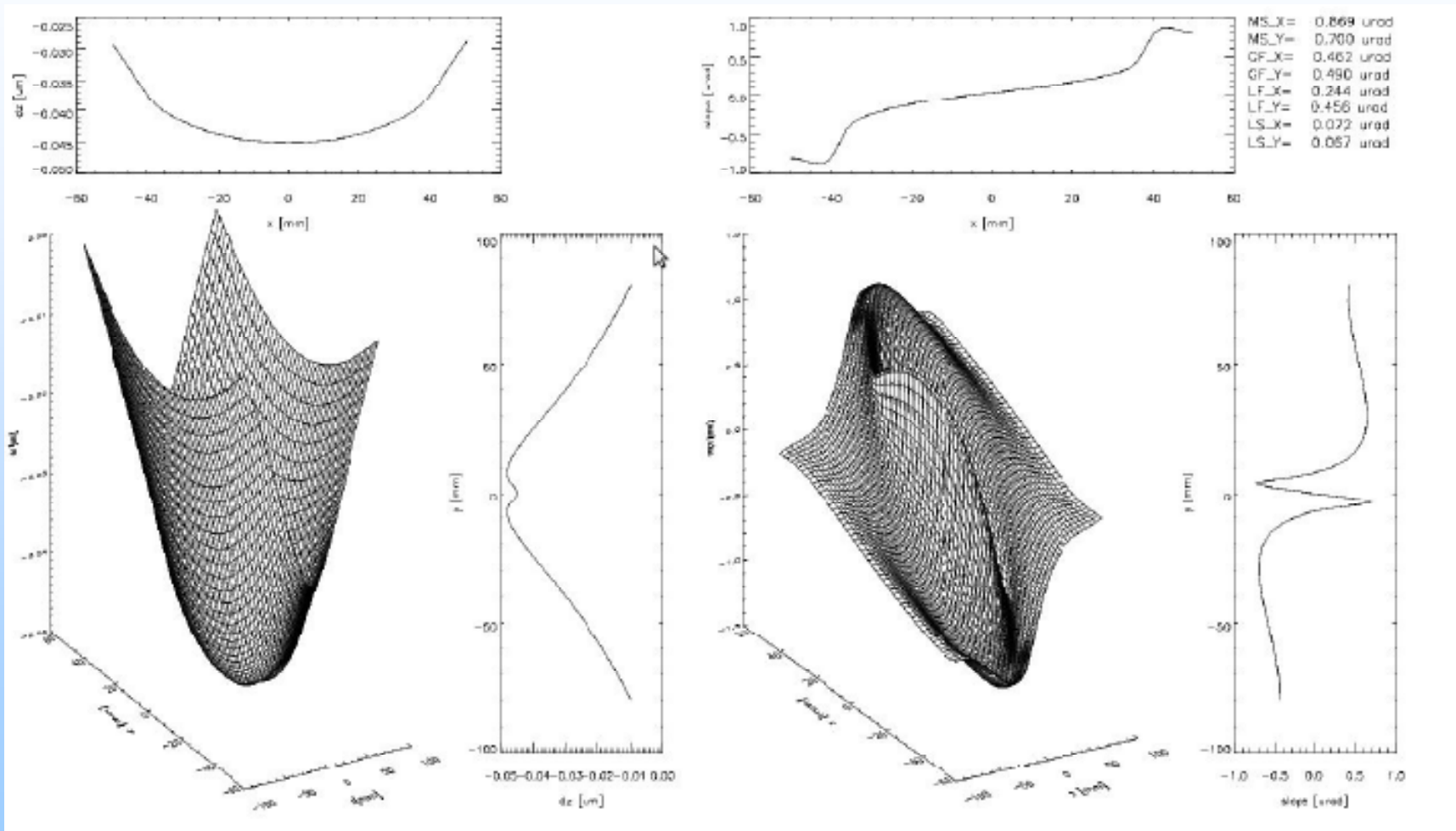


Photon flux and energy resolution for different operation modes of the new superconducting wiggler beamline

Deformation



Deformation



Conclusion

- Absolute source included into ray-tracing
- 2M rays per seed
- Power is calculated on every element; ascii-files for FEA analysis
- Parameter scan allows interchange and comparison with real experiment
- Deformation tool provides fast analysis of deformed surface
- Only with LINUX

Acknowledgement:

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