

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







- Simulation with 2 Million rays per seed
- Automatic change of seed in loops
- \rightarrow improve statistic errors
- Absolute source spectrum included into ray-tracing

 \rightarrow Flux and power density distribution on every optical element and focus position

- Going away from IDL-macros

 \rightarrow Parametric scanning and power/flux calculations without knowledge of IDL



SMEXOS 2009

Bernd C. Meyer

Beam shape at focus (SCW)

CPT: 8keV



Hor.: 1400 μ m Vert.: 180 μ m Total Flux: 9.2*10¹² ph/s/cbw Flux density: 8*10¹⁴ ph/s/mm²/cbw



Hor.: 1050 μ m Vert.: 110 μ m Total Flux: 4.5*10¹³ ph/s/cbw Flux density: 6*10¹⁵ ph/s/mm²/cbw

CSC: 8keV





SMEXOS 2009

Sources

scw_bl_VCMCyl_DCM_VFMToroid_4keV.ws - Shat _ 🗆 🗙	
ShadowVUI Edit Run Results PreProcessors Util Tools Help	
Source:	lotal Flux: 1.7E+19 Ph/s
General Parameters Source Spectrum 🔟	
🗸 Geometrical 💸 BM 🗢 Wiggler 💸 Undulator 🏾 🍃	
Modify Run SHADOW/source Current Loop	
Total Power [W] [4997.8 Total Flux [Ph/s/0.1%bw] [1.65E+19	
PlotXY: - Histol: - InfoSh SourcInfo	
Optical System:	
içoe 1 içoe 2 içoe 3 i≜oe 4	
Add oe Modify oe Delete oe Delete all Run SHADOW/trace	
PlotXY: - Histo1: - Info on: - BLViewer	-
Macros:	10 ³ 10 ⁴ 10 ⁵ Photon Energy [eV]
1 2 3 4 5	
Add macro Edit Delete macro Run macro	
Working directory:	
Browser //home/bernd/xop2.3/SCW/	
	Mini





Power distribution

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

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

- 1) Graphically displayed
- \rightarrow 3D-plot of power distribution
- \rightarrow Power distribution through center planes
- 1) Ascii-file with coordinates and power density
- \rightarrow For use in FEA analysis
- Power is integrated over given energy bandwidth
- Many loops (different seed) result in better statistics
- Mesh density is changeable



SMEXOS 2009

Power distribution



Absorbed power on 1. filter (SCW)



Absorbed power on M1 (PGM)

Bernd C. Meyer





SMEXOS 2009

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	- 🗆 🗙
Close Plot Results Run Scan		
Paramter 1:		
MIN 3000.0 MAX 5000.0 STEP 1000.0) Set PAR 1 ENERGY PAR1 0.0E00 0E1 start.0	1 F SEL F SCAN
Paramter 2:		
MIN \$000.0 NAX \$000.0 STEP \$1000.0	Set PAR 2 ENERGY PAR2 0.0E00 DE2 start.0	1 J SEL J SCAN
Paramter 3:		
MIN 3000.0 MAX 5000.0 STEP 1000.0) Set PAR 3 ENERGY PAR3 0.0E00 0E3 start.0	1 J SEL J SCAN
Paramter 4:		
MIN \$000.0 MAX \$000.0 STEP \$1000.0	Set PAR 4 ENERGY PAR4 0,0E00 0E4 start.0	1 J SEL J SCAN
🛧 Source Parameter 🗸 OE Parameter		
Scan Parameter: Shadow file for r	esults: OE for scan parameter:	
Screen,0401	Start.01	
SIGMAX star.01 SIGMAZ star.02	start.02 start.03	
EPSI_X EPSI_Z star.03 star.04	stant.04	

Parameter scan tool



Flux at focus position vs. hor. Acceptance and high of M2 (SCWbeamline)





Bernd C. Meyer

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:

- Design group and beamline scientists at LNLS
- CNPq for financial support
- Manuel S. del Rio for his support on XOP/Shadow

