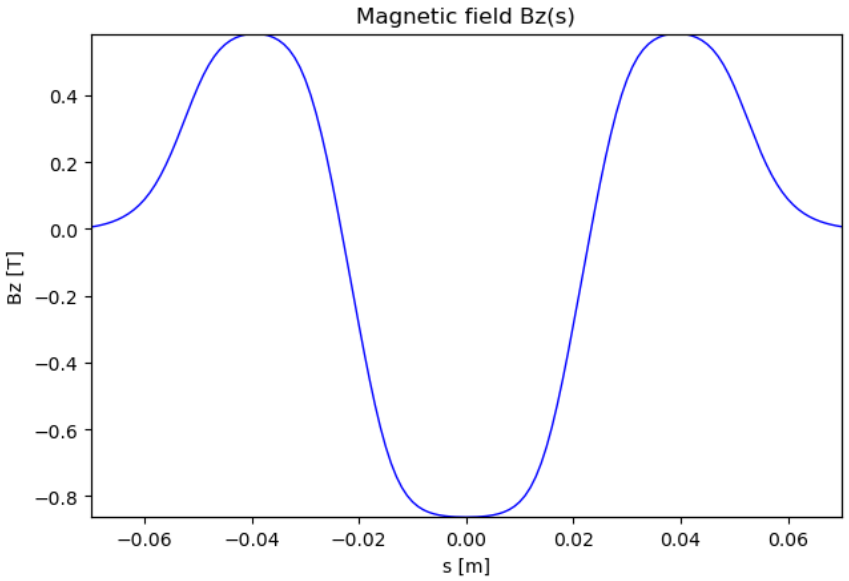

ESRF
The European Synchrotron

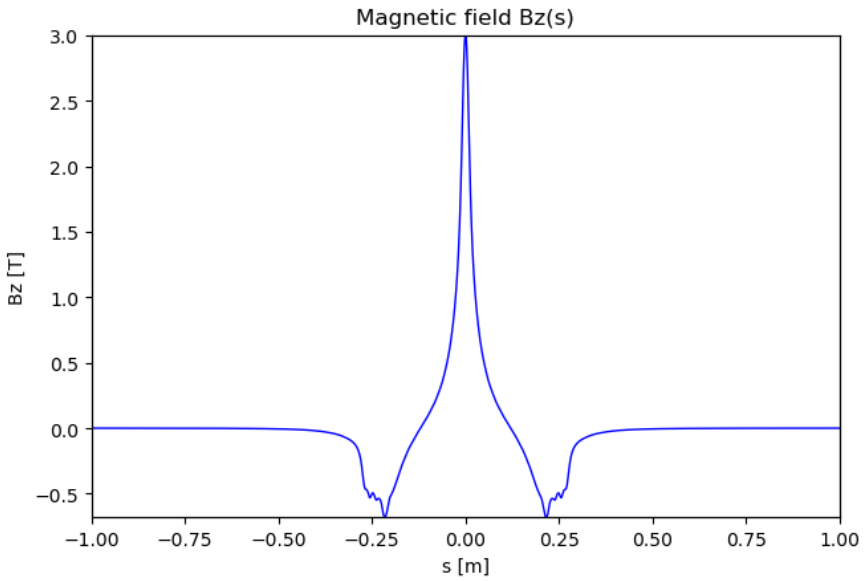
TEST OF XOPPY: WIGGLER RADIATION WIDGET

The new widget to calculate the power density distribution in function of the energy has been tested. Since the beginning, the tool worked fine for Wiggler with a periodic magnetic field, however some modifications to the code have been done to improve the calculations accuracy regarding Wigglers with non-periodic magnetic fields, for example for the following 3 pole Wigglers:

ESRF - BM18: 3PW



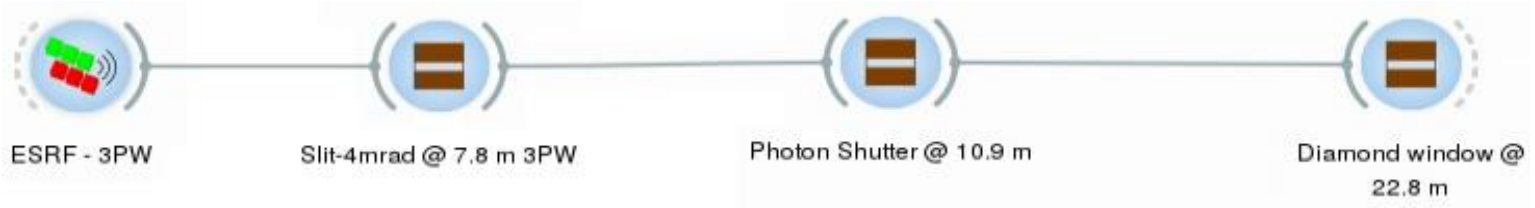
SESAME - BEATS: ALBA-3PW



OASYS WORKFLOW

ESRF - BM18: 3PW

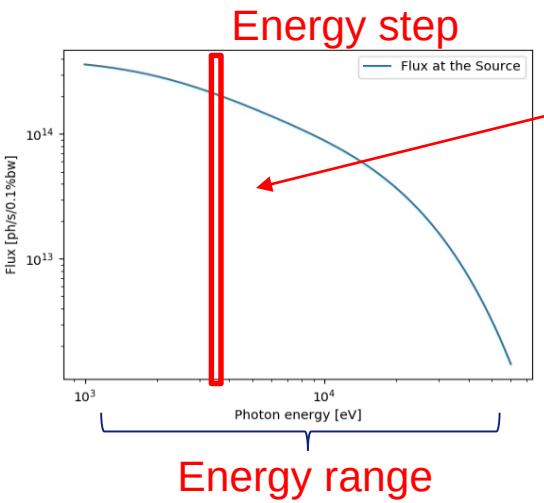
For this case, calculations were done to obtain the power density at the diamond window at 22.8 m, considering the EBS storage ring parameters.



SESAME - BEATS: ALBA-3PW

Calculations to obtain the power density at 30 m from the source, SESAME storage ring parameters.

POWER DENSITY BY RAY TRACING: XOPPY + SHADOW -- PYTHON SCRIPT --



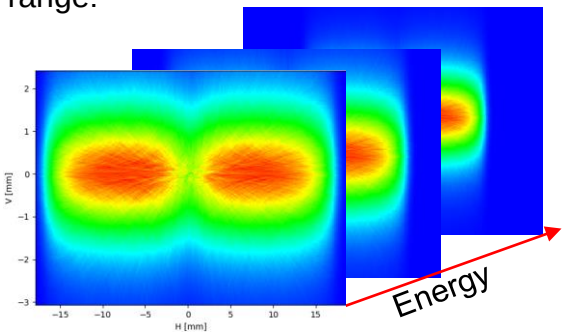
1. XOPPY: Flux (f) and Power (w) for each energy step (e)

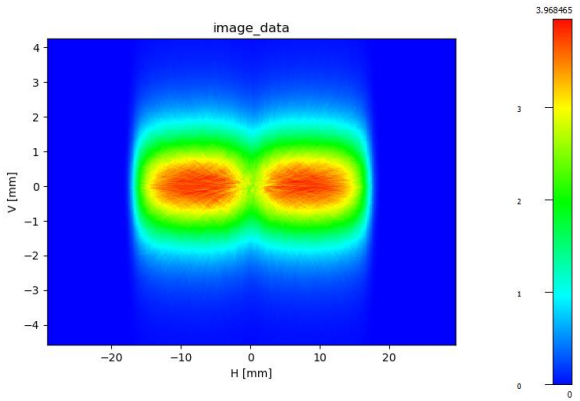
2. SHADOW, ray-tracing for each energy: Get the Intensity and its ray distribution.

3. Weights the power by the rays transitivity ratio (Initial Intensity/Final Intensity) and assigns it to the corresponded ray cross-section beam. Getting a power distribution for each energy step.

4. Energy Scan Loop

5. Finally, the scripts adds all the energy dependent distribution power to get the total power density for the given energy range:





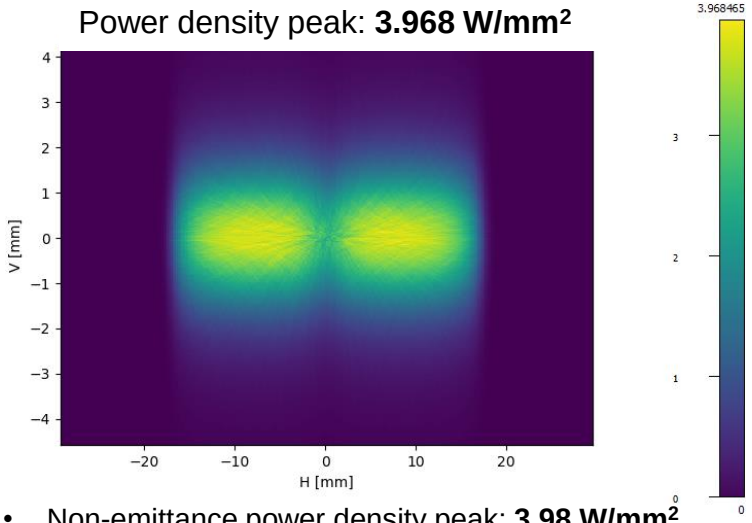
COMPARISON WITH THE WIGGLER RADIATION WIDGET

Wiggler Radiation

ESRF - BM18: 3PW

- SHADOW3: ray-tracing script (emittance) ~4 h

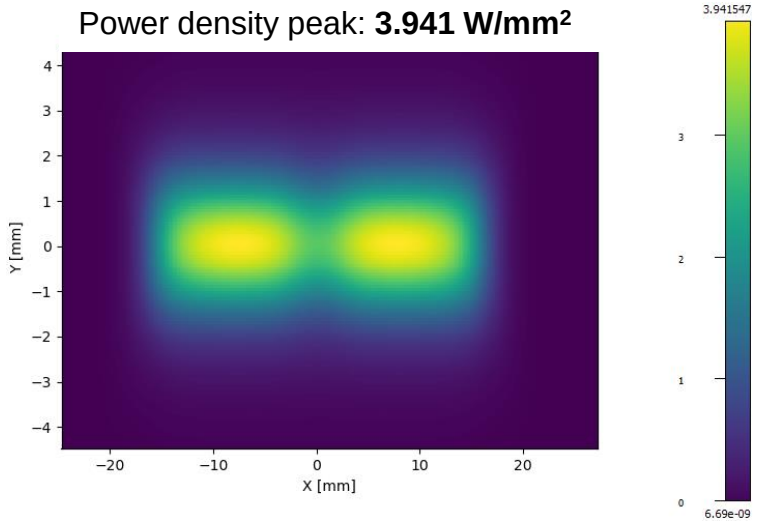
  Power density peak: **3.968 W/mm²**



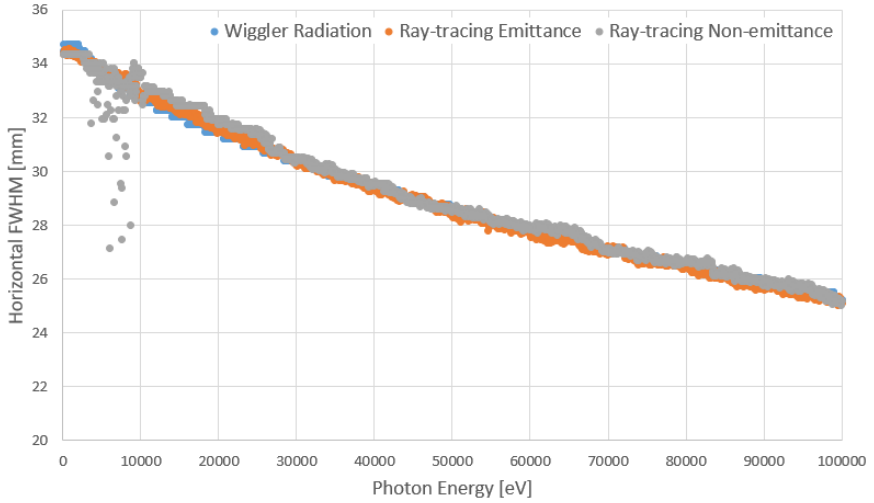
- Non-emittance power density peak: **3.98 W/mm²**

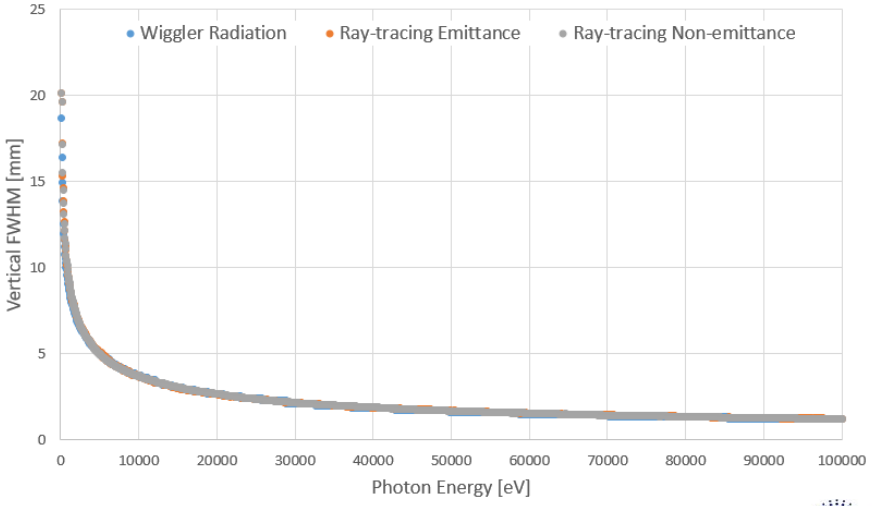
- Wiggler Radiation widget: ~4 min

  Power density peak: **3.941 W/mm²**



Beam size in function of the energy:





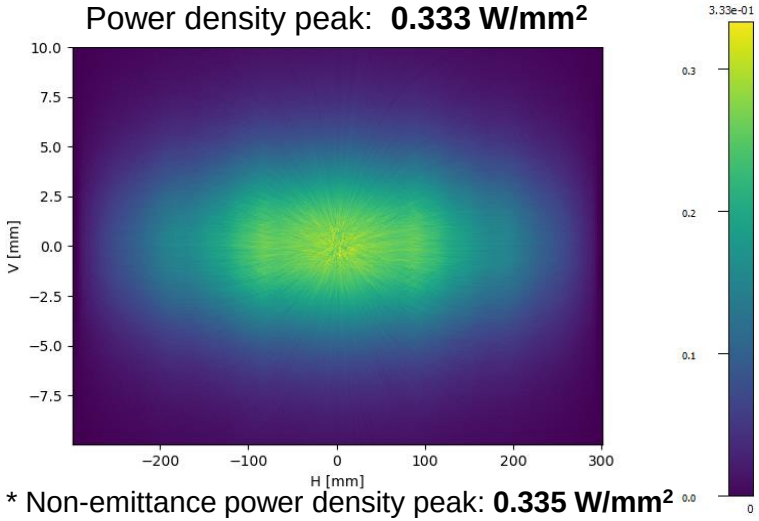
COMPARISON WITH THE WIGGLER RADIATION WIDGET

Wiggler Radiation

SESAME - BEATS: ALBA-3PW

- SHADOW3: ray-tracing script (emittance) ~4 h

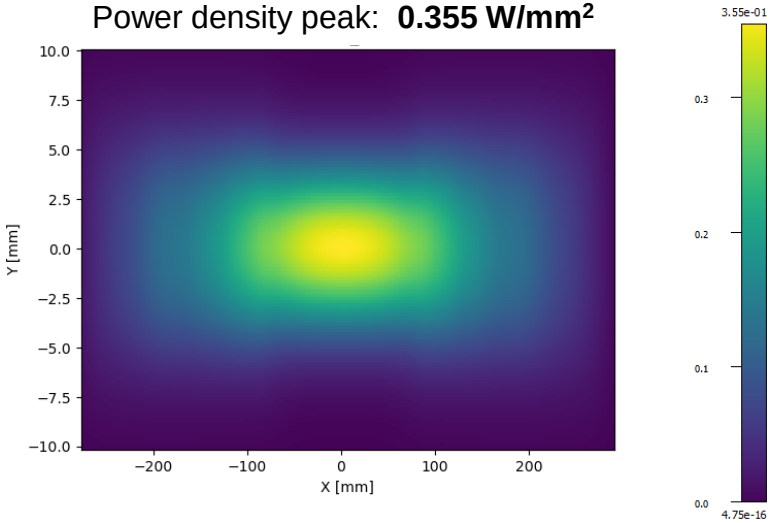
Power density peak: **0.333 W/mm²**



* Non-emittance power density peak: **0.335 W/mm²**

- Wiggler Radiation widget: ~4 min

Power density peak: **0.355 W/mm²**



Beam size in function of the energy: