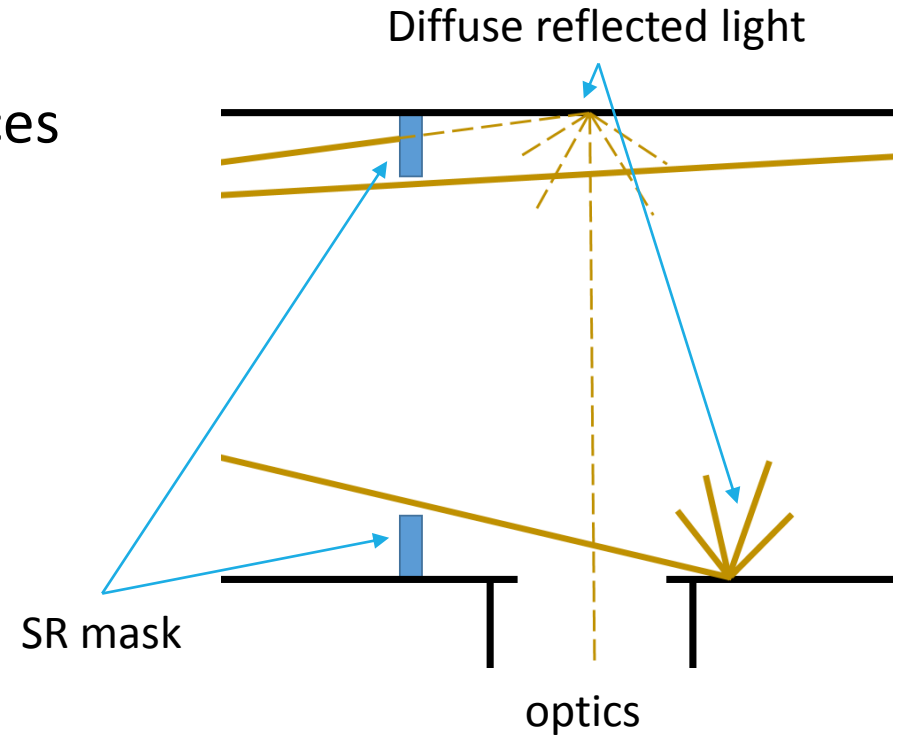
Synchrotron Radiation: Simulation, Stoppers and Blackening

BGC Collaboration Meeting – 27.11.2018

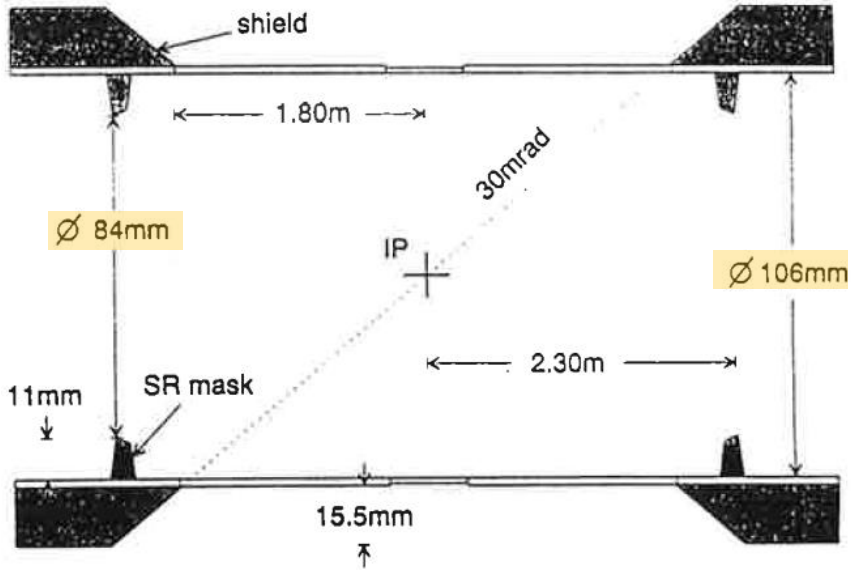
Principle of SR Masks/Stoppers

- The SR masks should stop SR and prevent it from reflecting on surfaces in the optical path



Experience from the LEP

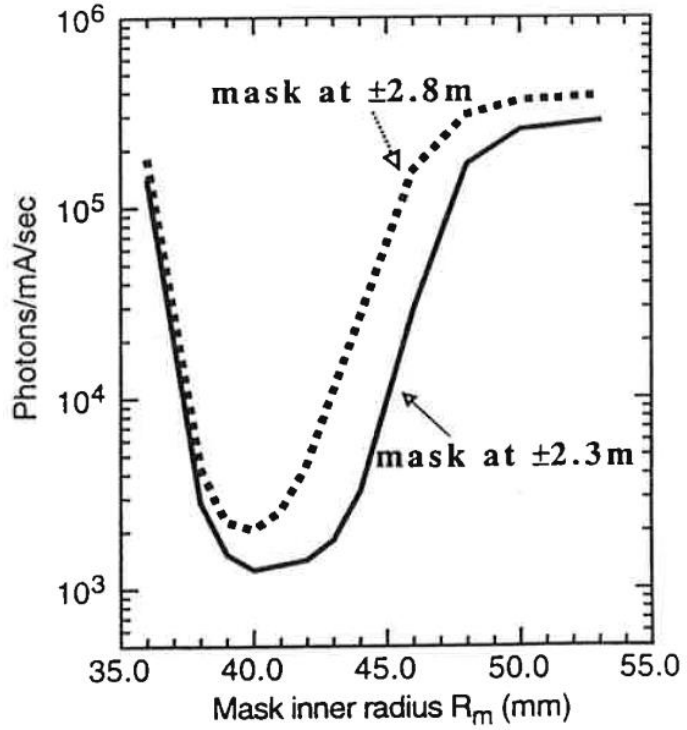
- Purpose: Decrease of the photon background in the detectors at the interaction points
- The photon rates at a detector without SR masks was 25-30 times higher than at the detector with SR mask



Syncrotron Radiation Mask for LEP2 – CERN – SL/Note 93-23 (EA)
Test of Syncrotron Radiation Masks in LEP – CERN – SL-MD Note 144

Experience from the LEP Simulations

- Simulation of different aperture diameters and distances
- Masks could lower the photon rates by 2 orderes of magnitude (in the simulation)



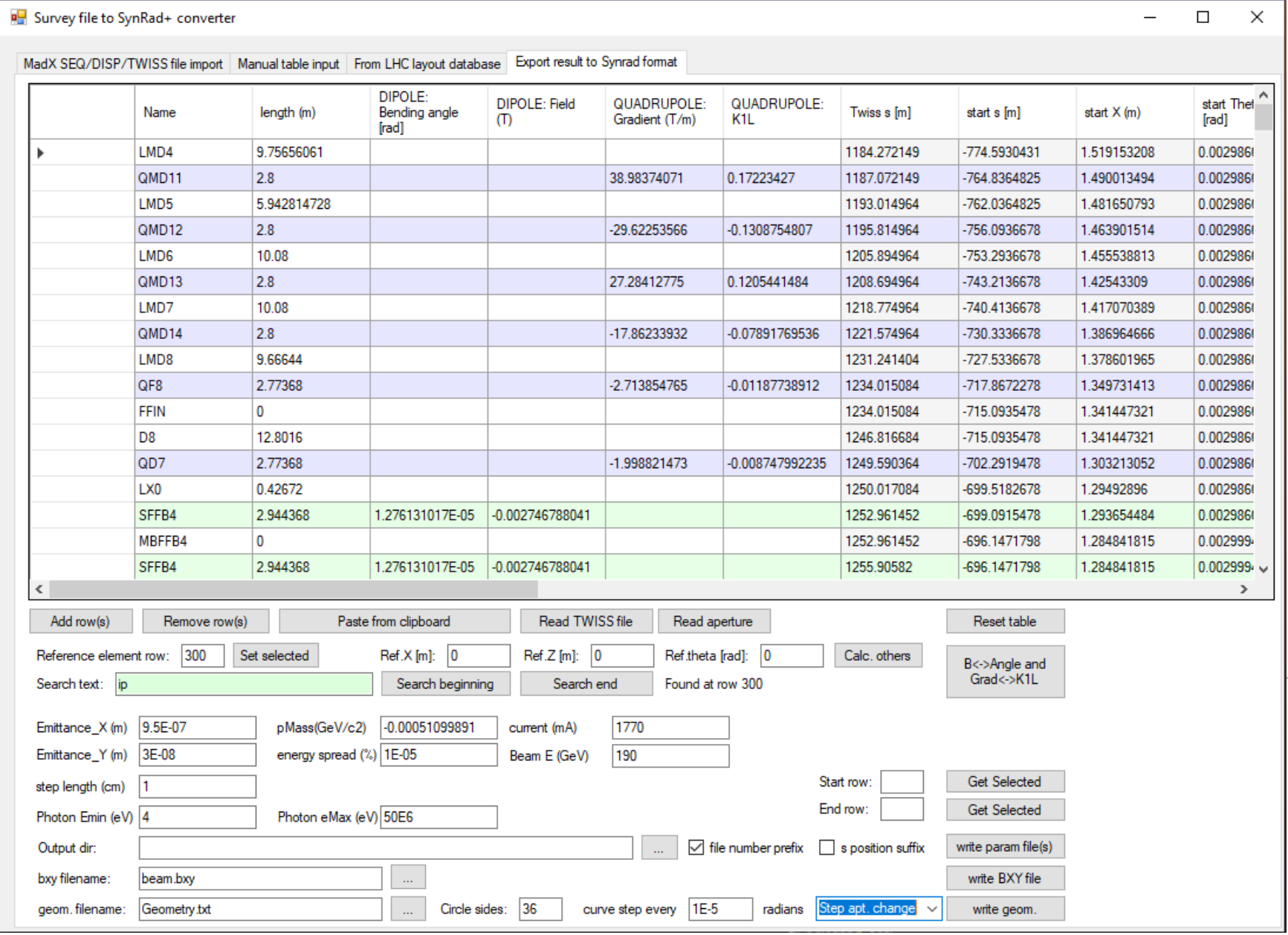
Syncrotron Radiation Mask for LEP2 – CERN – SL/Note 93-23 (EA)
Test of Syncrotron Radiation Masks in LEP – CERN – SL-MD Note 144

Syncrotron Radiation (SR) Sources

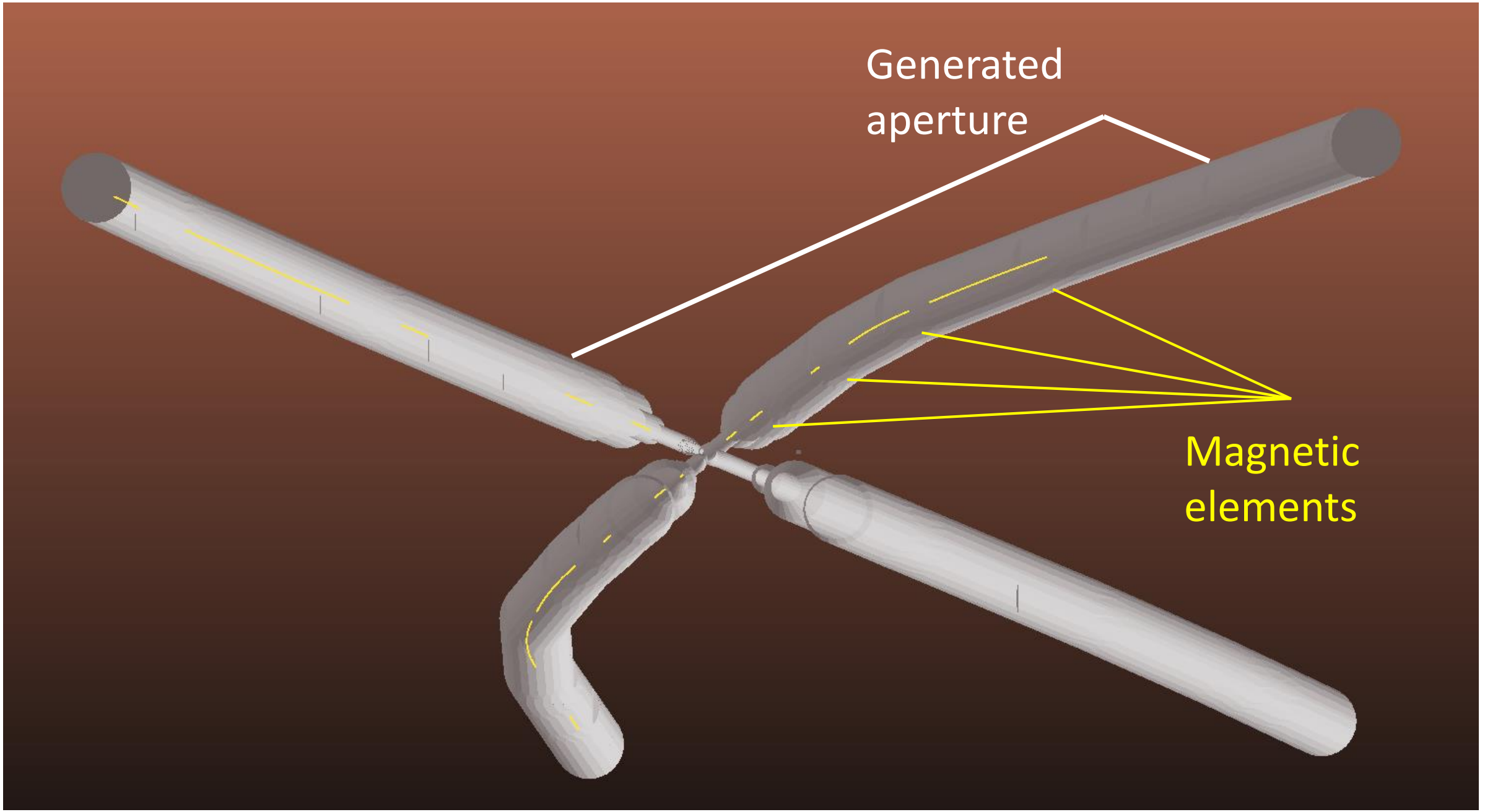
- Bending Magnets (D3 and D4)
- The HEL? (not relevant for demonstrator)
- The wiggler is on the outer beam (not relevant)

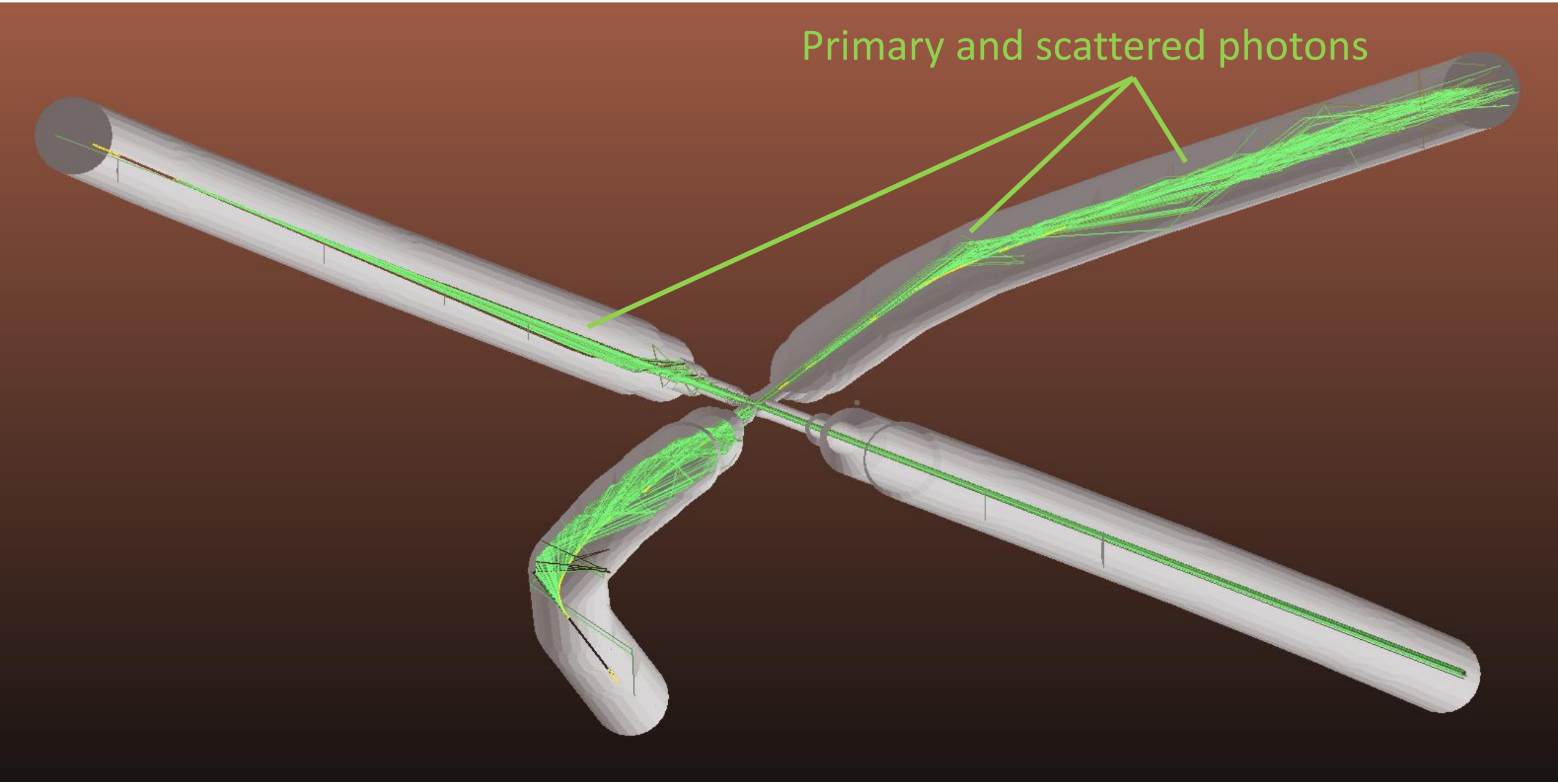
Basis of Simulations

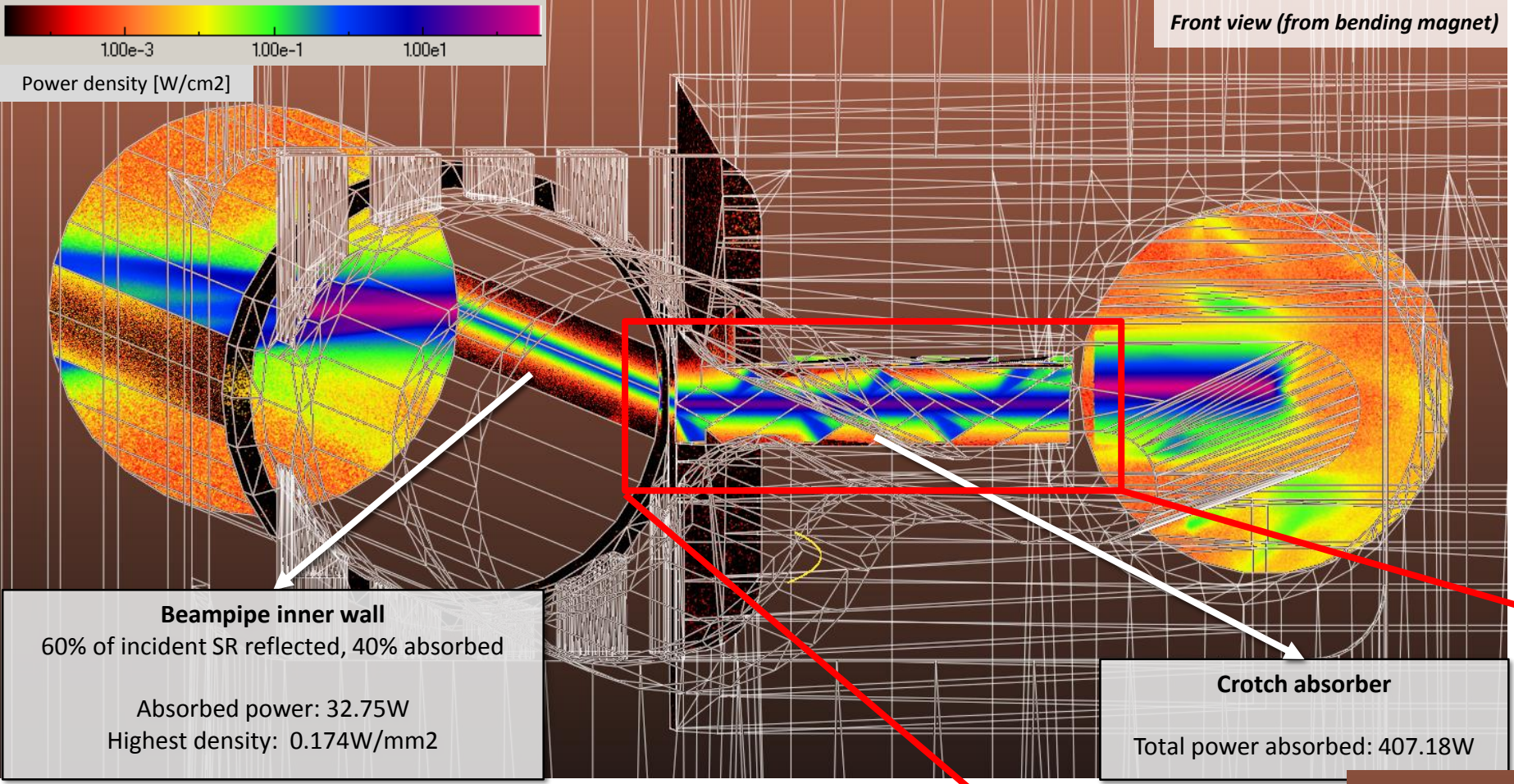
- List of apertures in the beam pipe
  → Source is the layout data base
- MADX survey for the magnetic elements
  → Synchrotron radiation sources



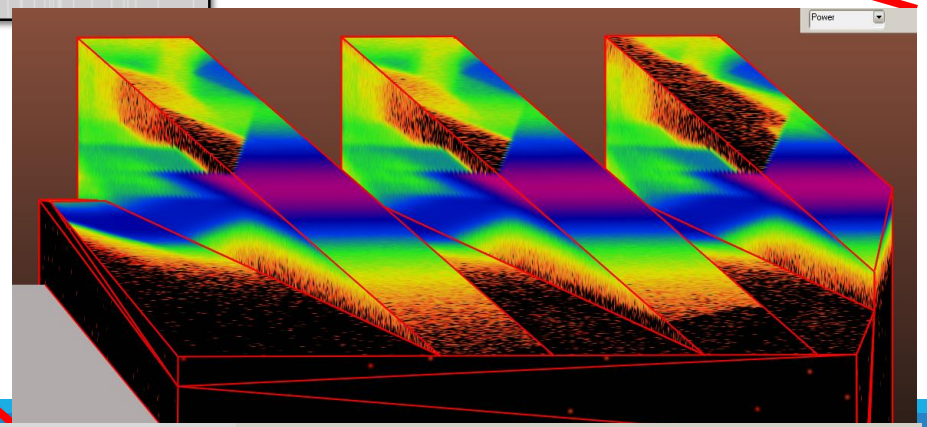
- Tool reads elemnt and aperture list
- Calculates X,Y,Z positions
- Generates input files for Synrad
- Generates polygonised vacuum chambers


Generated
aperture
Magnetic
elements


Primary and scattered photons



Flux visualized at absorption locations



Feasibility for the Demonstrator

- SR mask has to be on the copper liner
- Total liner length is 500mm
- Inner diameter Ø80mm

- Stopper on the liner
- Or in the gasket