EIC Far-Backward Component Radiation Damage Study

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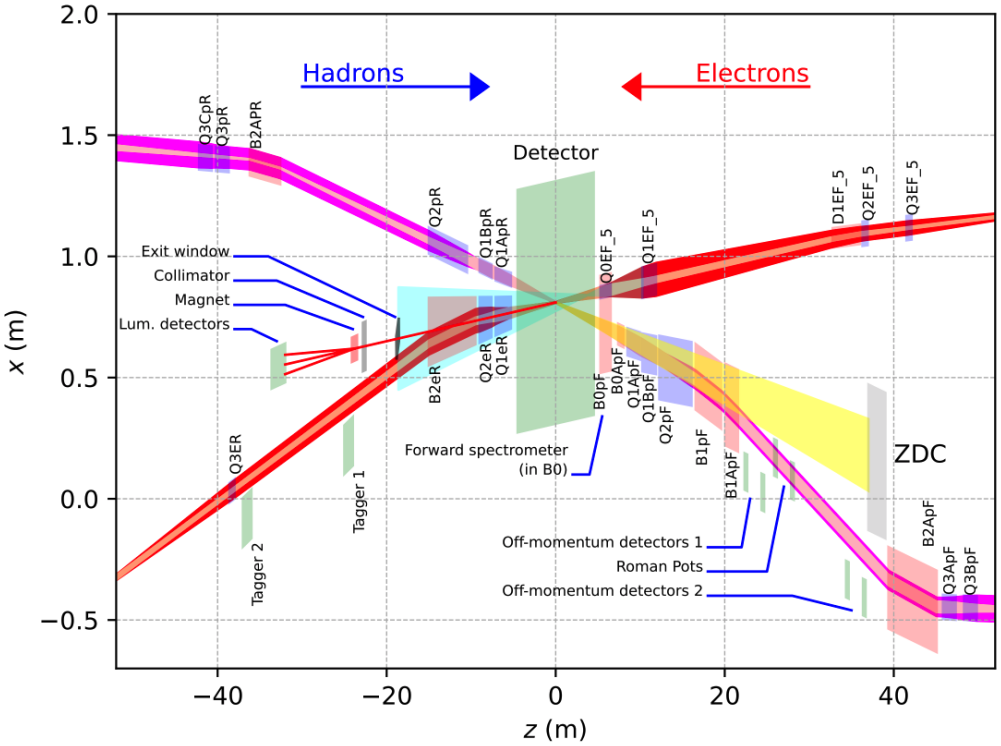
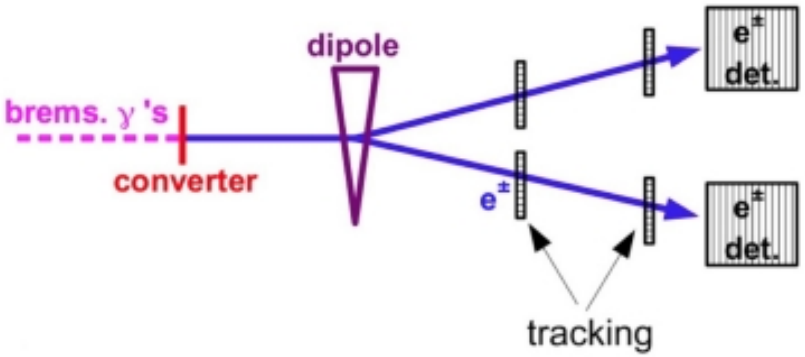
Overview

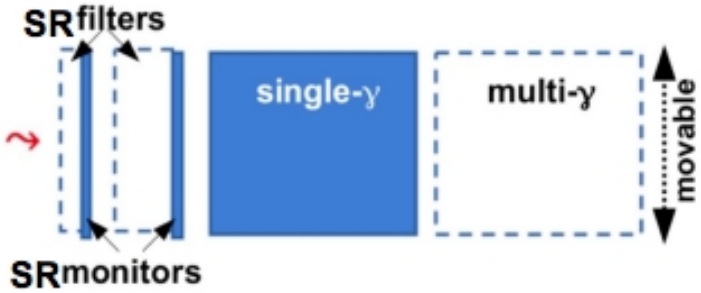


- **Motivation**
  - Study radiation dose in the luminosity monitor subsystems.
  - Test power distribution of synchrotron radiation.
    - Estimate specifications for SR filter
  - Test responses from different configurations.
    - Homogenous crystal / Fused silica spaghetti

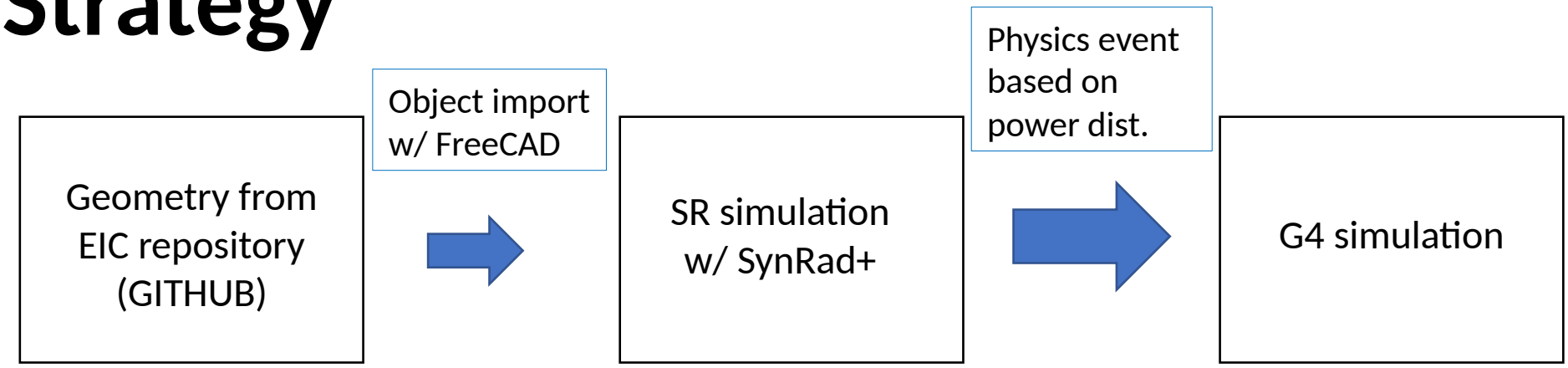
Pair spectrometer: measure e±



Photon calorimeter



Strategy

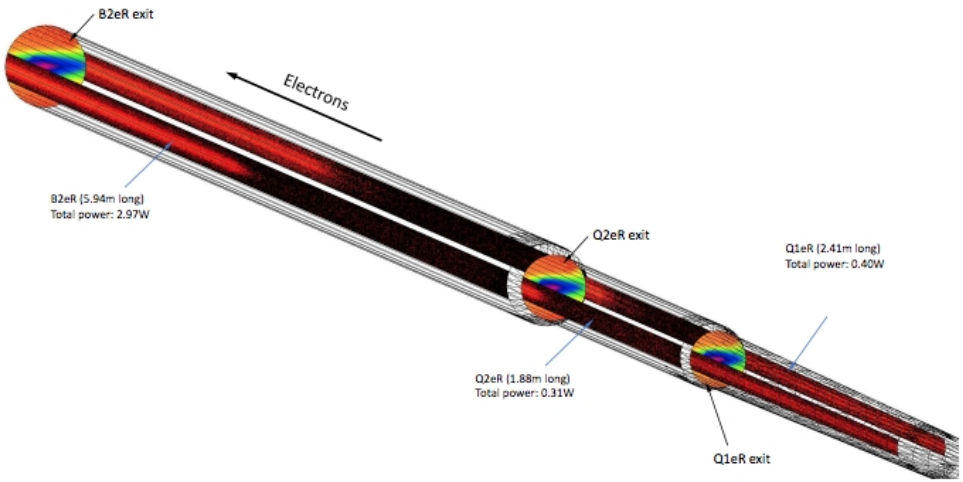


- SynRad+
  - http://cds.cern.ch/record/2694236?ln=en
  - MC simulator developed by CERN to simulate synchrotron radiation (SR).
  - Traces photons originating from particles traversing through magnetic regions.
  - Calculates flux and power distribution/spectrum of SR incident on geometric surfaces.
  - Geometry can be generated with built-in GUI tools or imported from CAD software (STL format).
- FreeCAD
  - https://www.freecadweb.org/
  - Convert SynRad+ object (STL) to G4 object (GDML) and vice versa.
- DD4hep/DDG4 interfaced with DDsim
  - Integrated into standard EIC SW framework.
  - Generate geometry as input to SynRad+
  - Handles G4 simulation.

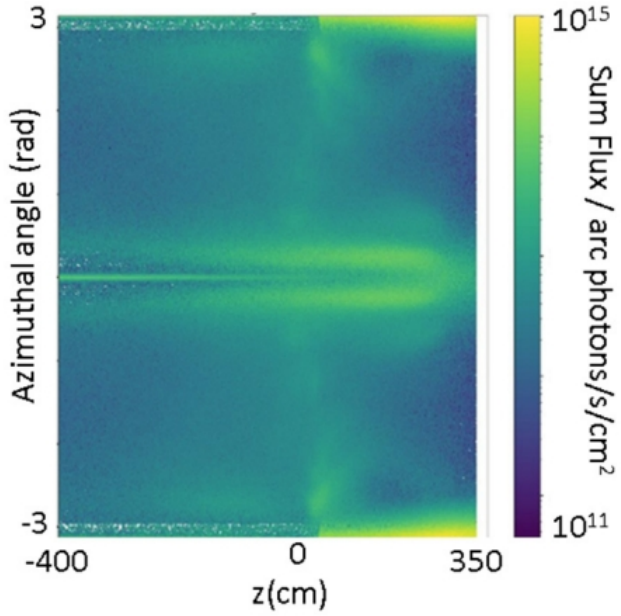
Previous study

- Studies of SR in the beam pipe exist
  - M. Stutzman, DOI: 10.18429/JACoW-IPAC2021-WEPAB340
  - H. Witte et al, DOI: 10.18429/JACoW-IPAC2021-WEPAB002
  - Follows similar strategy focusing on SR backward beampipe.
    - In an effort to optimize beam line spacing, material, conditioning time, pumping configuration.

H. Witte et al, IPAC2021

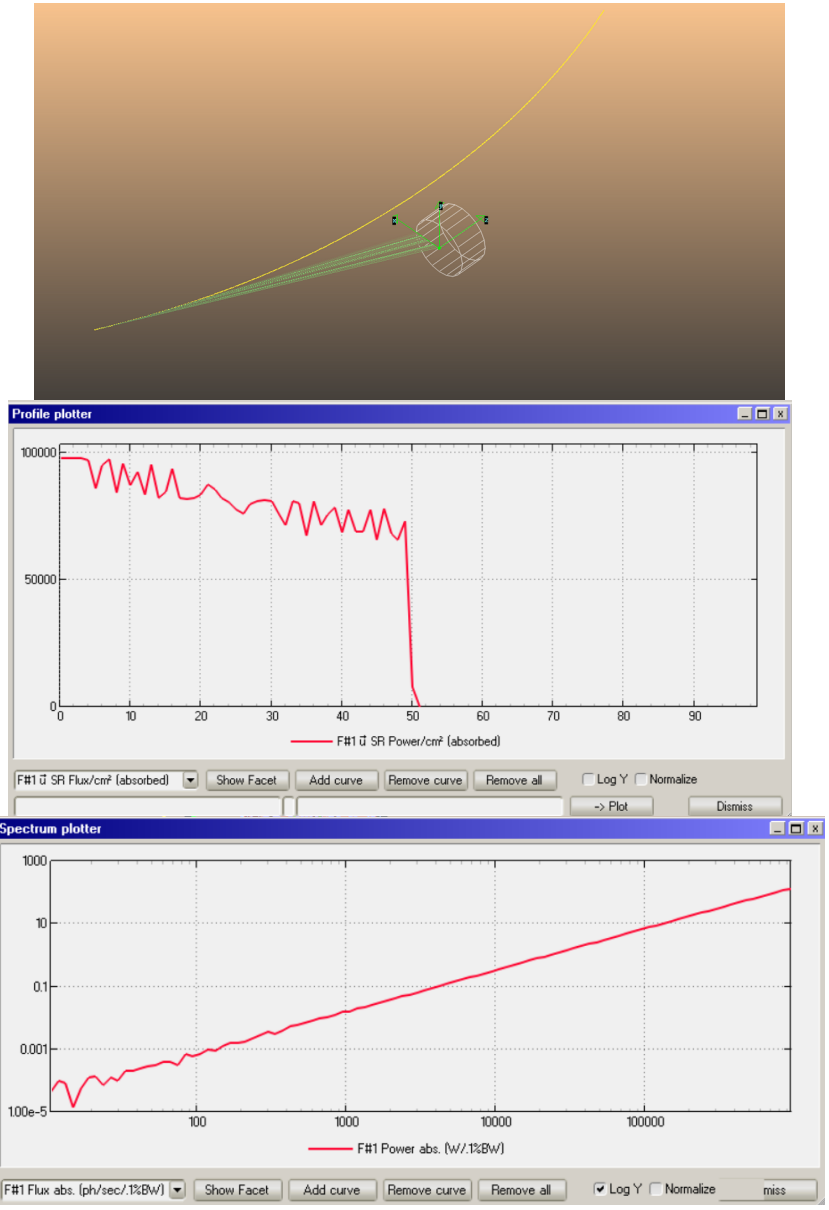


M. Stutzman, IPAC2021

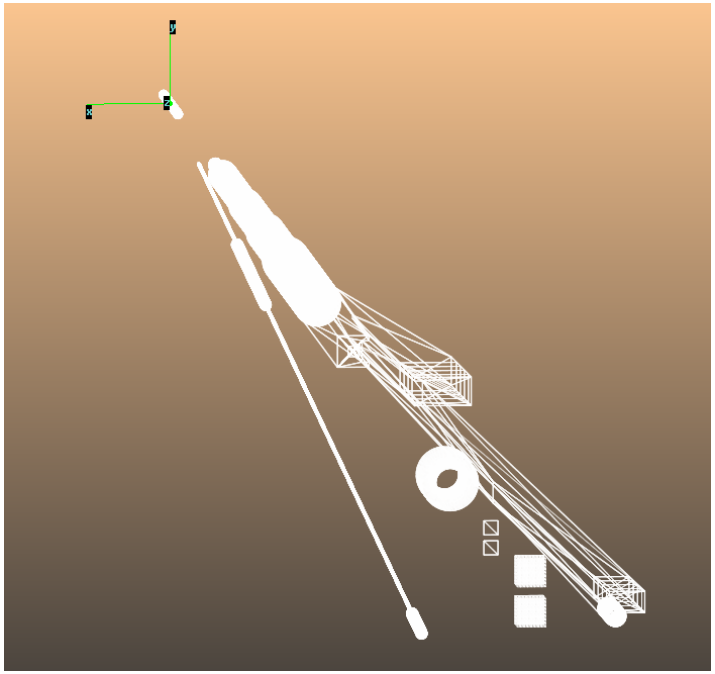


Status

Simple test



Far-Backward Beam Pipe in SynRad+



- SynRad+ capabilities tested with a simple geometry/beam/field configuration.
- EIC backward beam pipe + detector geometries imported in SynRad+.
- Magnetic field info needs to be configured.
  - Input from community.
  - H. Witte et al., DOI: 10.18429/JACoW-IPAC2021-WEPAB003