



Photon detectors functional specifications

Gamma Factory meeting on the Proof of Principle
LAL, Paris, 3-5 June 2019

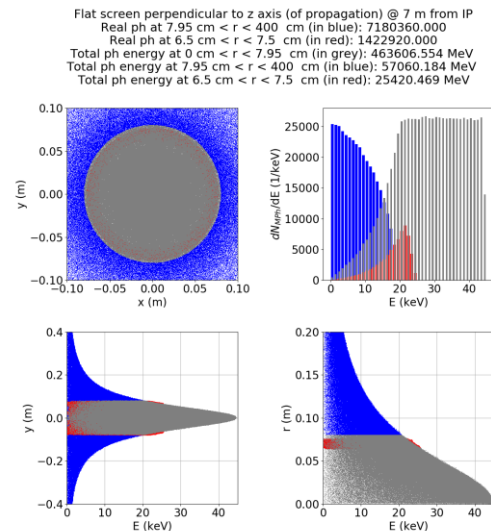
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Photon detection system considerations

- Needed for finding and demonstrating the excitation of the circulating ions
- Requirements
 - Measurement of 10^{-4} of the maximum flux with 10ms (500 turns)
- Constraints
 - Mechanical integration/design compatible with proton operation (Impedance)
 - Aperture preserves the stay-clear region
 - Radiation resilience
 - Background suppression if sensitive to beam losses

Detector Xrays : Forward detector, C.Curatolo

- Ring detector
 - 7m downstream of the IR, inner radius 65mm and 10mm thick, $\sim 4000\text{mm}^2$
 - 5sigma below resonance $1.3\text{E}5$ photons or 33 photons/ mm^2
 - 2sigma below resonance $1\text{E}6$ photons or 250 photons/ mm^2
 - On resonance, $1.4\text{E}6$ photons or 350 photons/ mm^2
 - Range required from 0.035 to 350 photons/ mm^2
- Numbers per bunch crossing, SPS revolution frequency $\sim 43\text{kHz}$
- Photon energy up to $\sim 35\text{keV}$
- Flux can be changed and placing detectors at different radius could effectively increase the dynamic range



At resonance

Detector visible : Below IR, C. Curatolo

- Detector
 - Square 80x80mm 30mm above/below
 - Using photons between 1.7 and 3.2eV
 - Flux optimized with detector downstream the interaction by ~10cm
- Flux
 - Up to ~10 photons per crossings (at 2sigma below resonance) and per crossing
 - Scales up to ~15 photons for on-resonance and per crossing (12/8 factor)
 - With revolution frequency of 43kHz and 10 bunches
 - Around up to 6.5E6 photons per second

C. Curatolo : <https://indico.cern.ch/event/819820/contributions/3427122/>



Conclusion

- 2 detector positions were identified and photon flux quantified from C. Curatolo simulations

- Next steps :
 - Agree on detector technologies considering the photon characteristics
 - Possibly iterate on the detector positions
 - Cross-check simulations with Alexey's on the chosen geometry
 - Write everything on the YR

Thank you

