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Synrad2d and synrad3d comparisons of the 3.2km ILC DR

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Acknowledgments

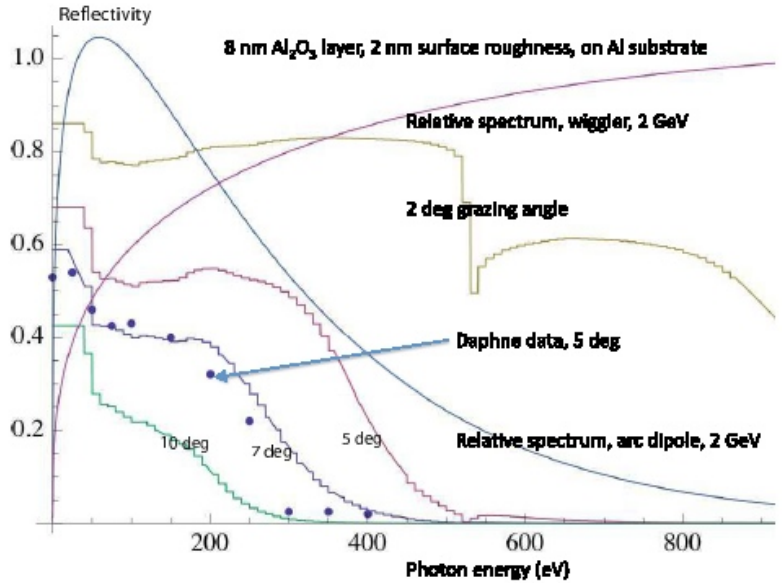
- Everyone in the Cornell Ecloud group
- David Sagan
- Gerry Dugan
- Kiran Sonnad
- Jim Crittenden

Introduction

- ILC 3.2 km Damping Ring
  - Lattice file converted from Mad to Bmad by Kiran Sonnad
  - Wiggler modeled as a series of bending magnets and drifts (Plan to compare with realistic wiggler model with Kiran Sonnad and David Sagan)
  - Round chambers with no antechambers
- The synrad2d simulations were carried out by Kiran Sonnad and presented in March 2010
- Reproduced synrad2d plots in synrad3d to make comparisons

Background on Synrad3d

- Written by David Sagan and Gerry Dugan
- Synrad3d is a photon tracking program
  - Uses radiation integrals to to generate macro-photons
- Follows the photons as they move in the chamber
  - Uses photon reflectivity to determine if the photon is reflected or absorbed
  - All scatters are specular and elastic
  - Follows the photon until it is absorbed

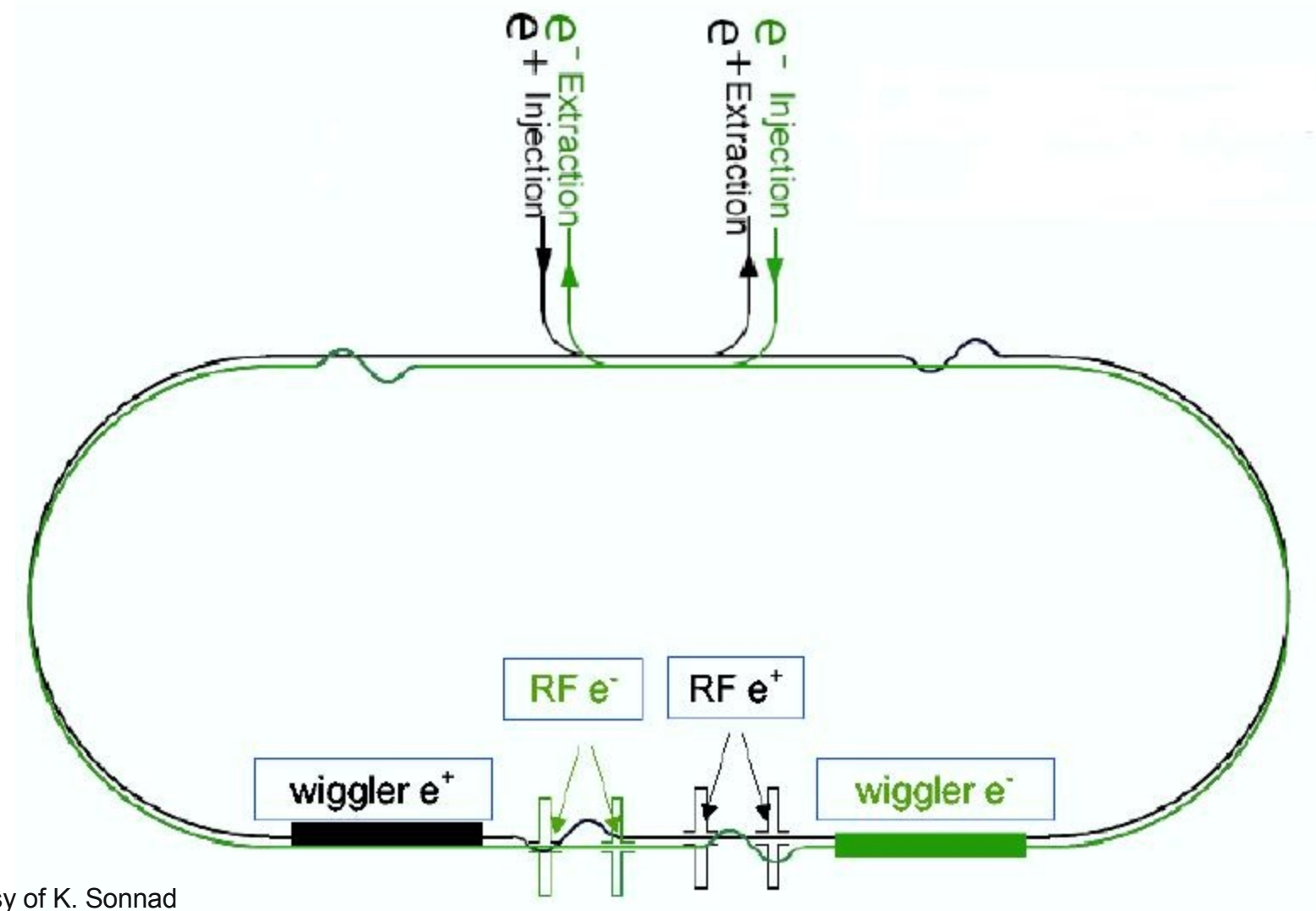


Data from http://henke.lbl.gov/optical_constants/mirror2.html
Graph courtesy Gerry Dugan

Synrad3d parameters and assumptions

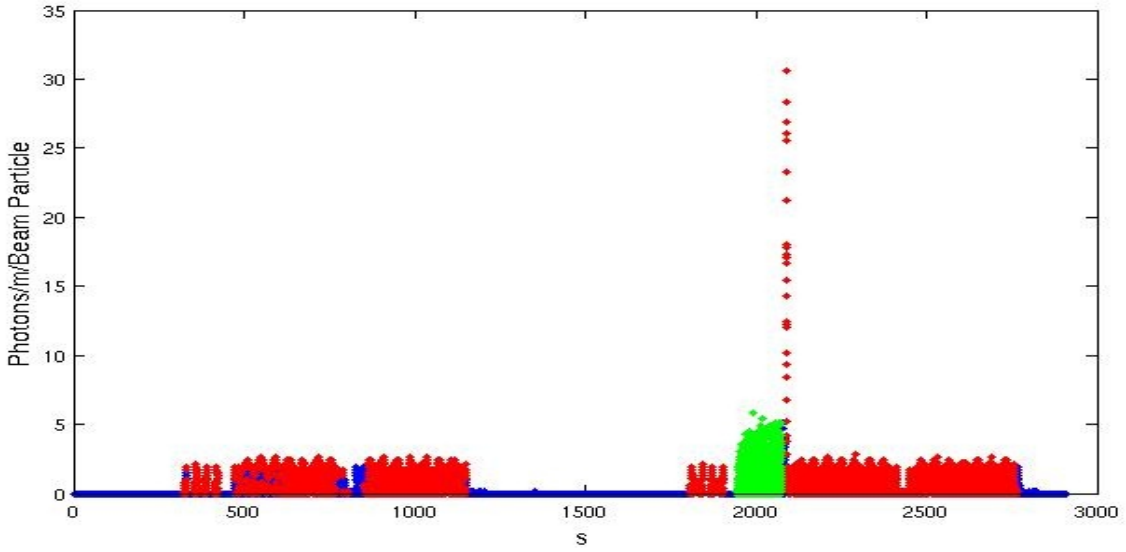
- Normalization
  - photons/m/beam particle = N_L*I/L
  - For these graphs L= .1m
  - There were 60,000 photons generated
- No photon energy cut
- Reflectivity turned off

Lattice top view

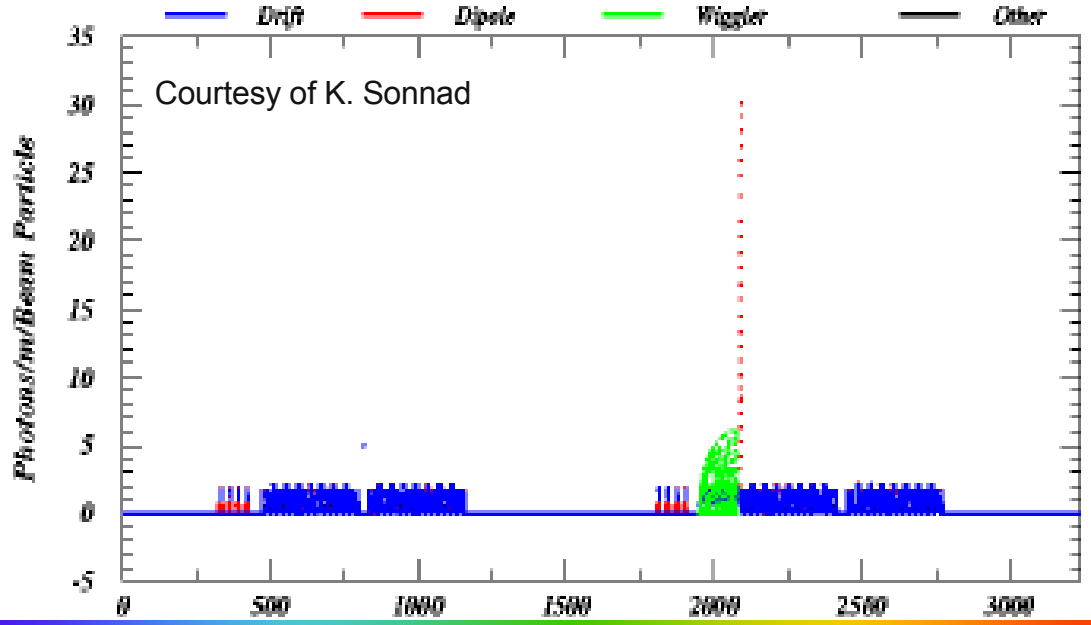


Courtesy of K. Sonnad

Synrad3d Results +x side



Synrad2d Results +x side



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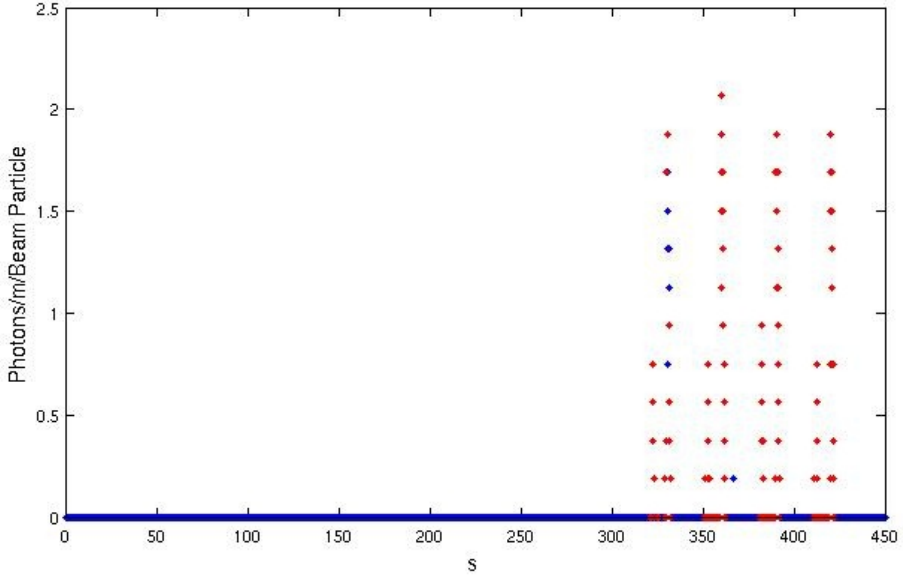
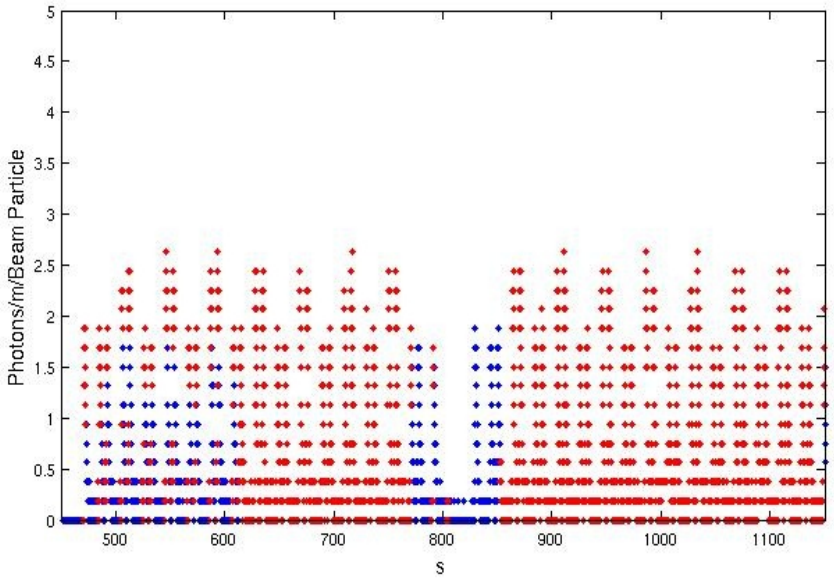
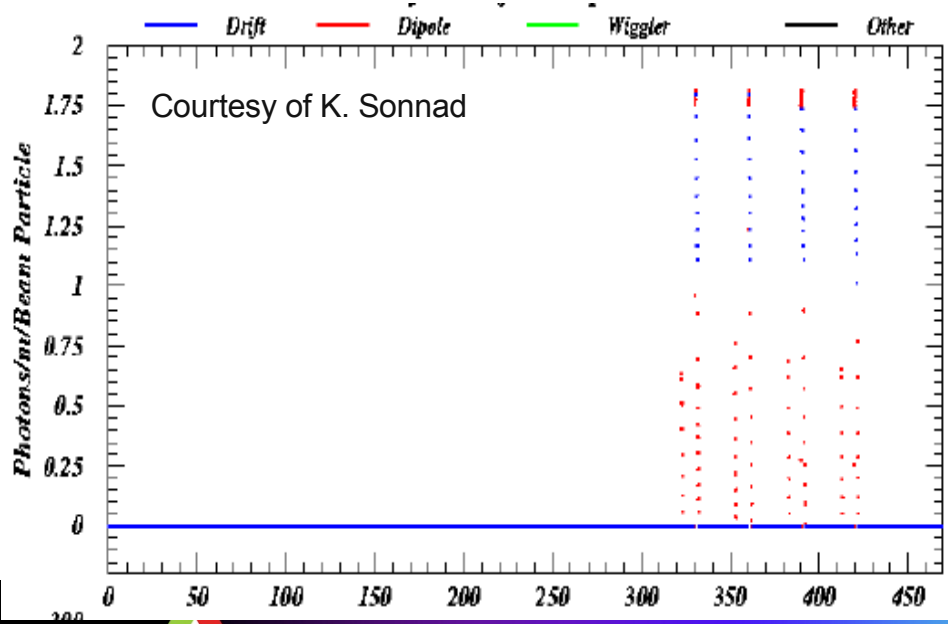
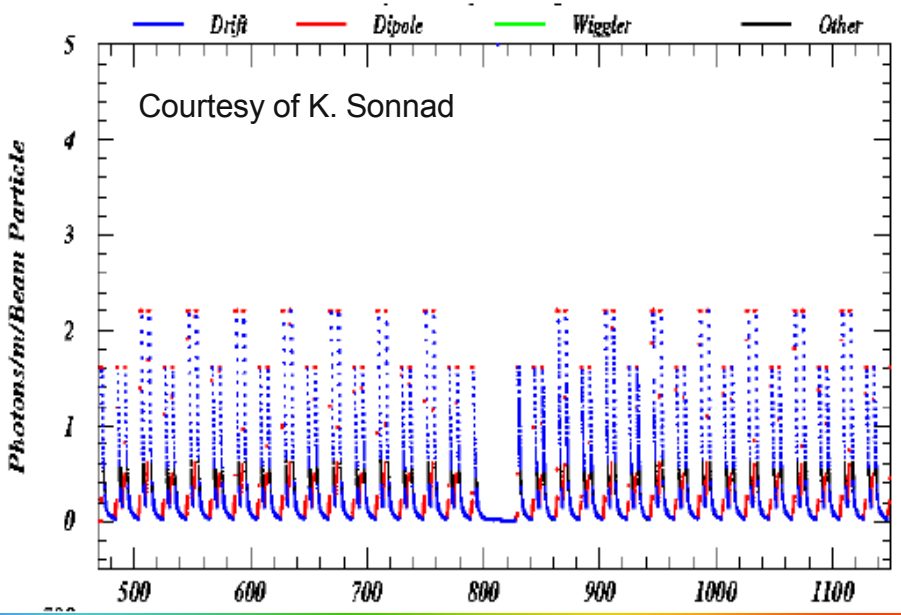


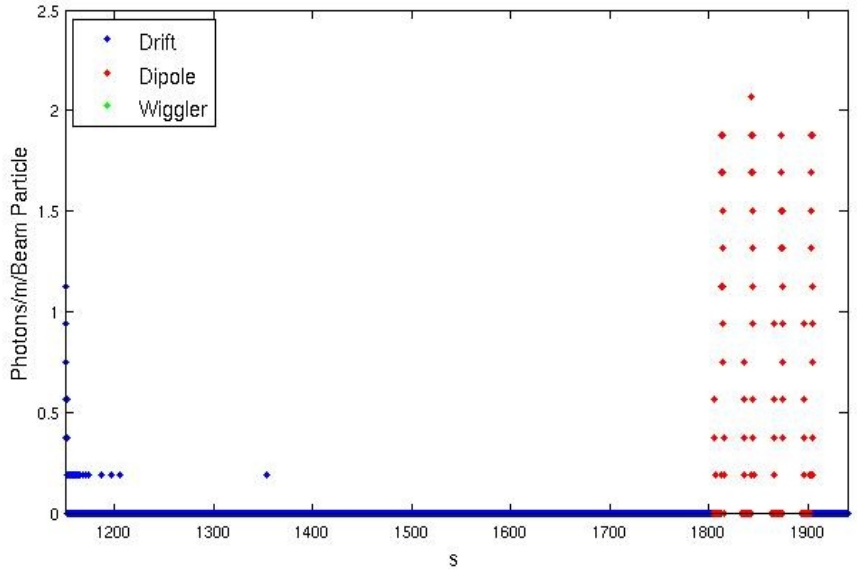


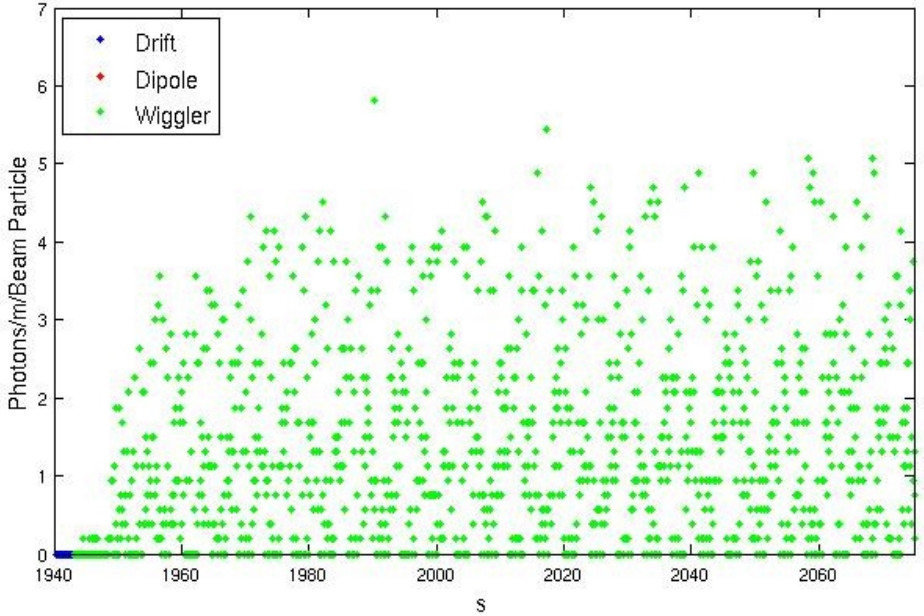
Synrad2d +x side



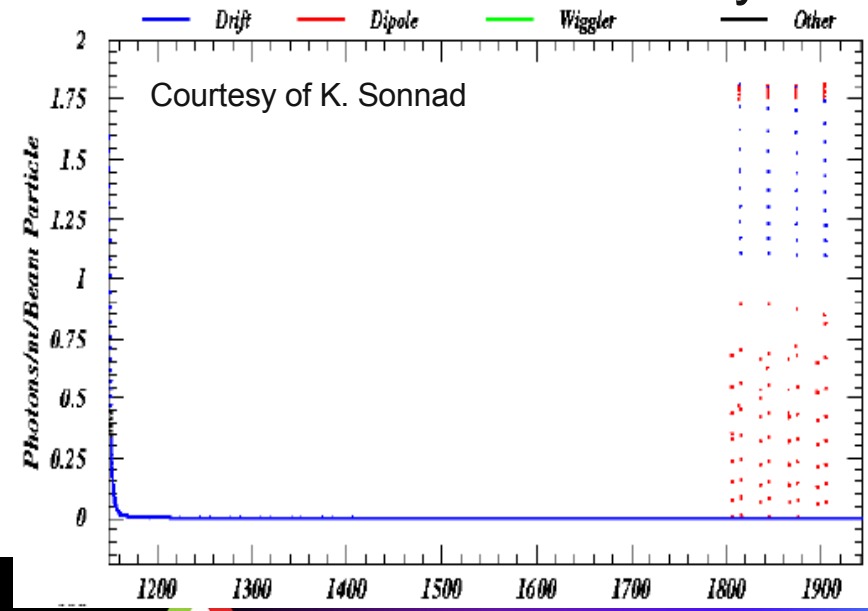


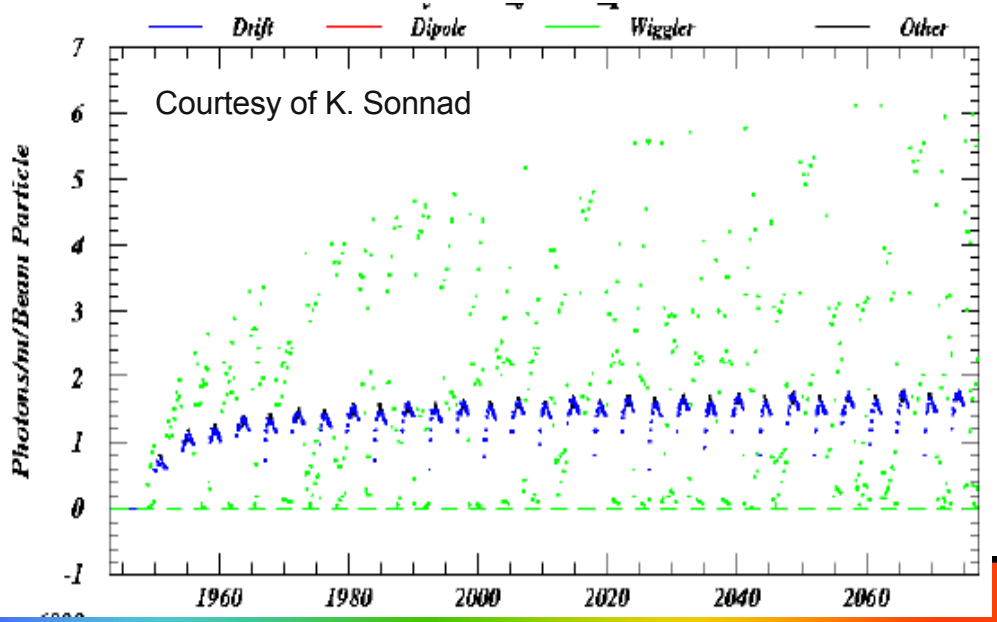
Synrad3d +x side



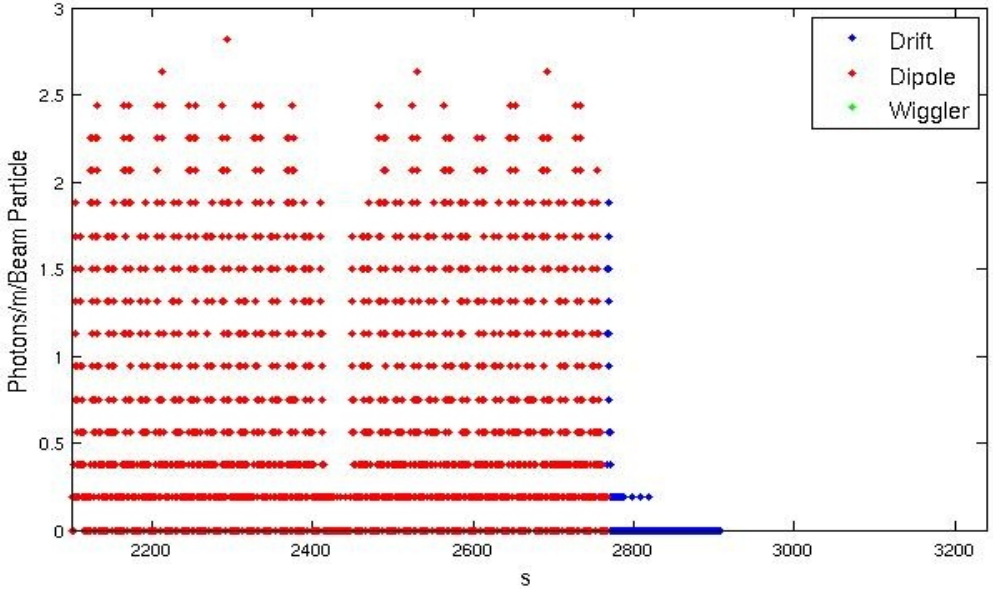


Synrad2d +x side

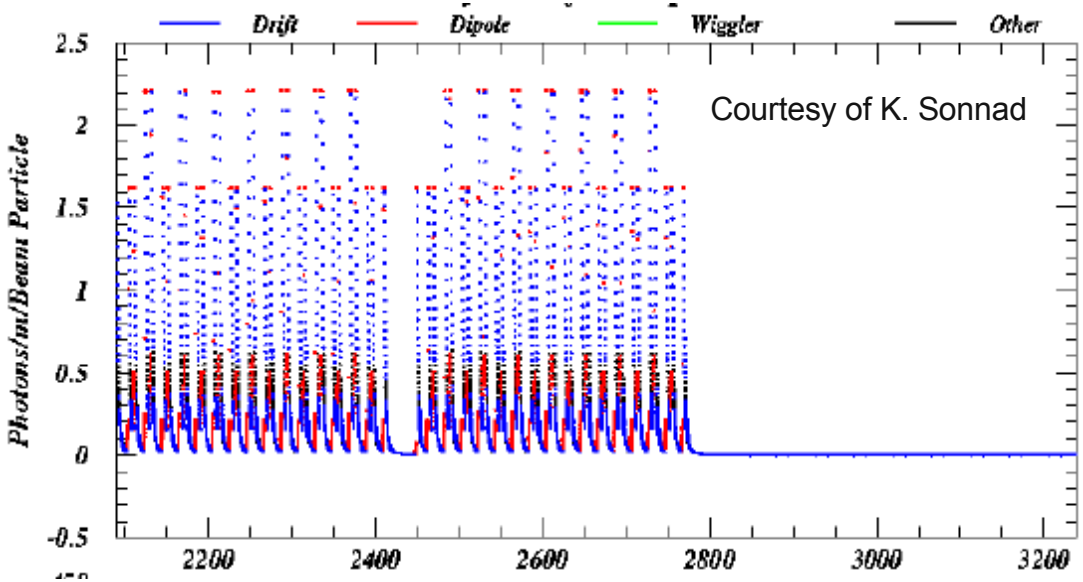


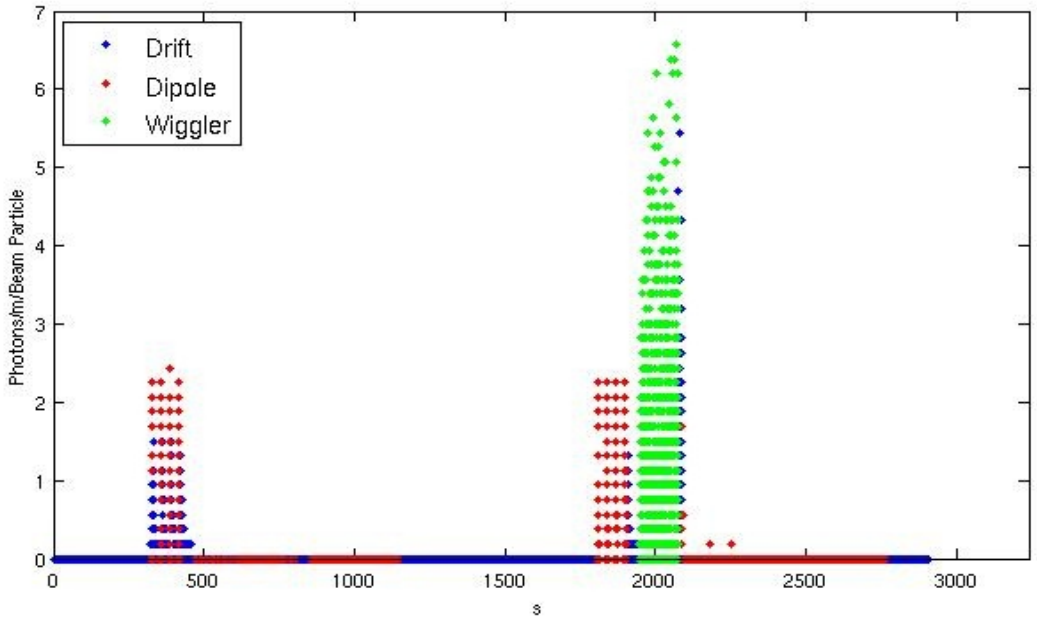


Synrad3d +x side

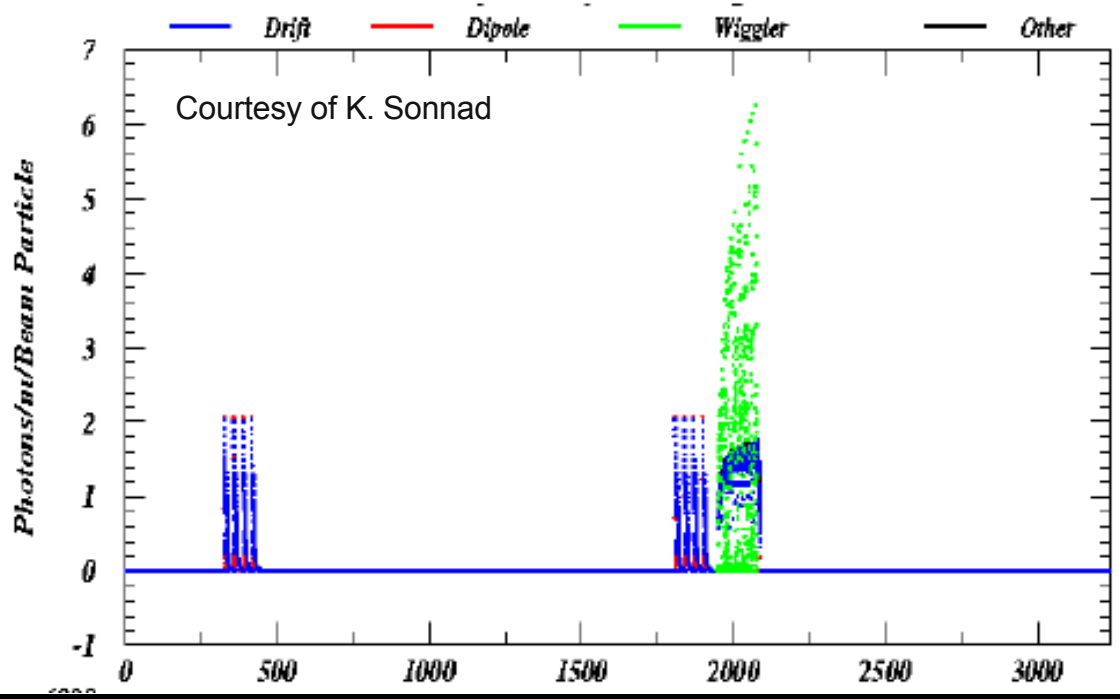


Synrad2d +x side

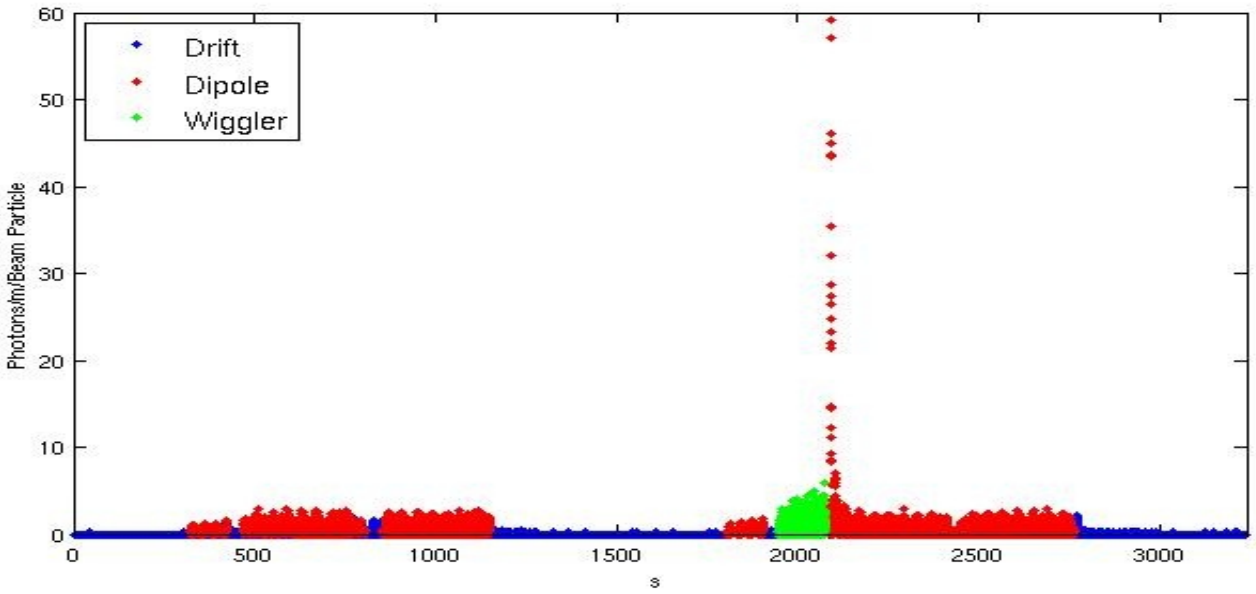




-x side
Photon distribution
around the full ring

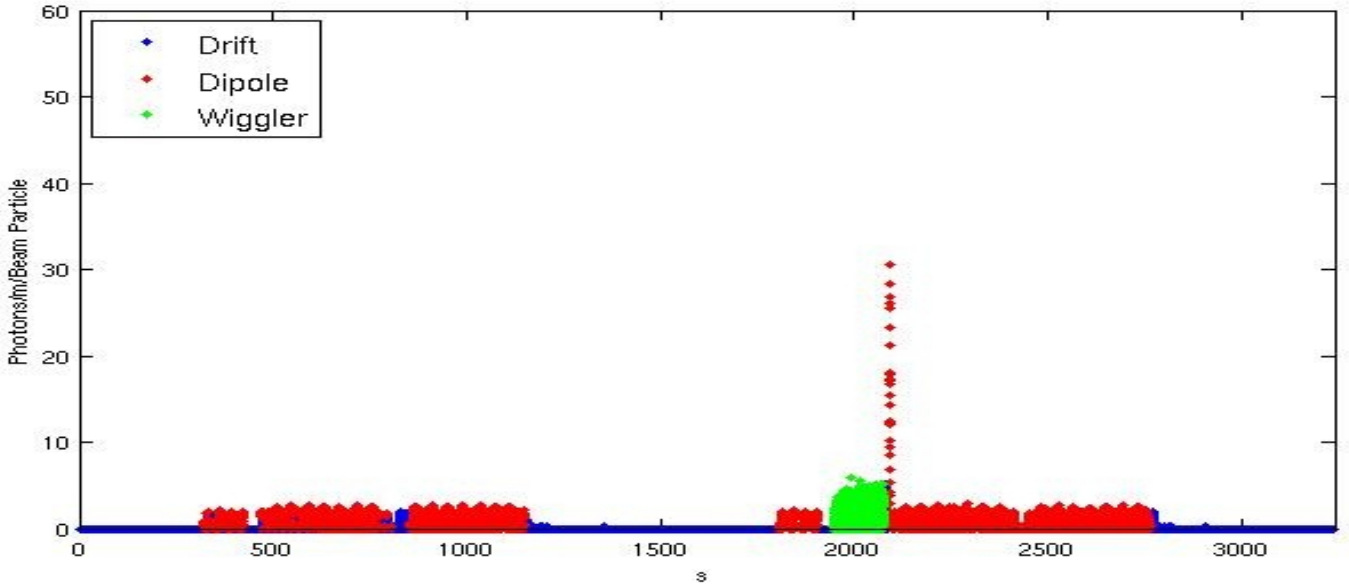


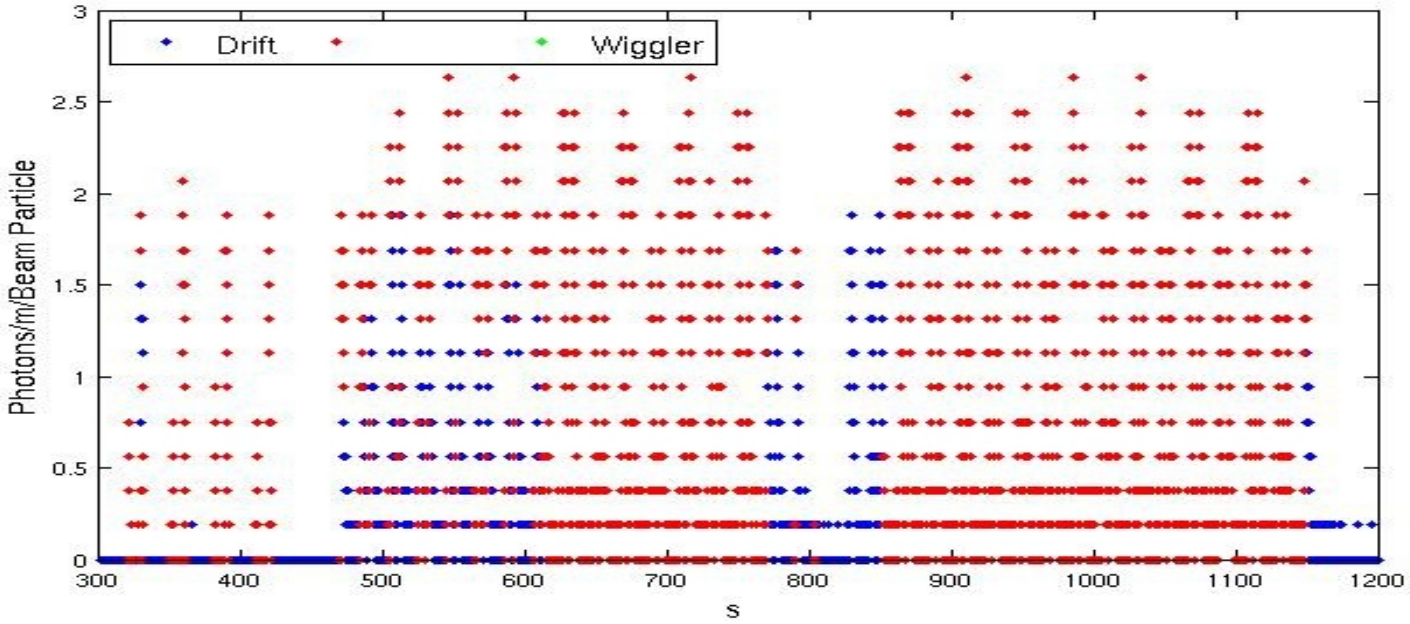
With Reflections



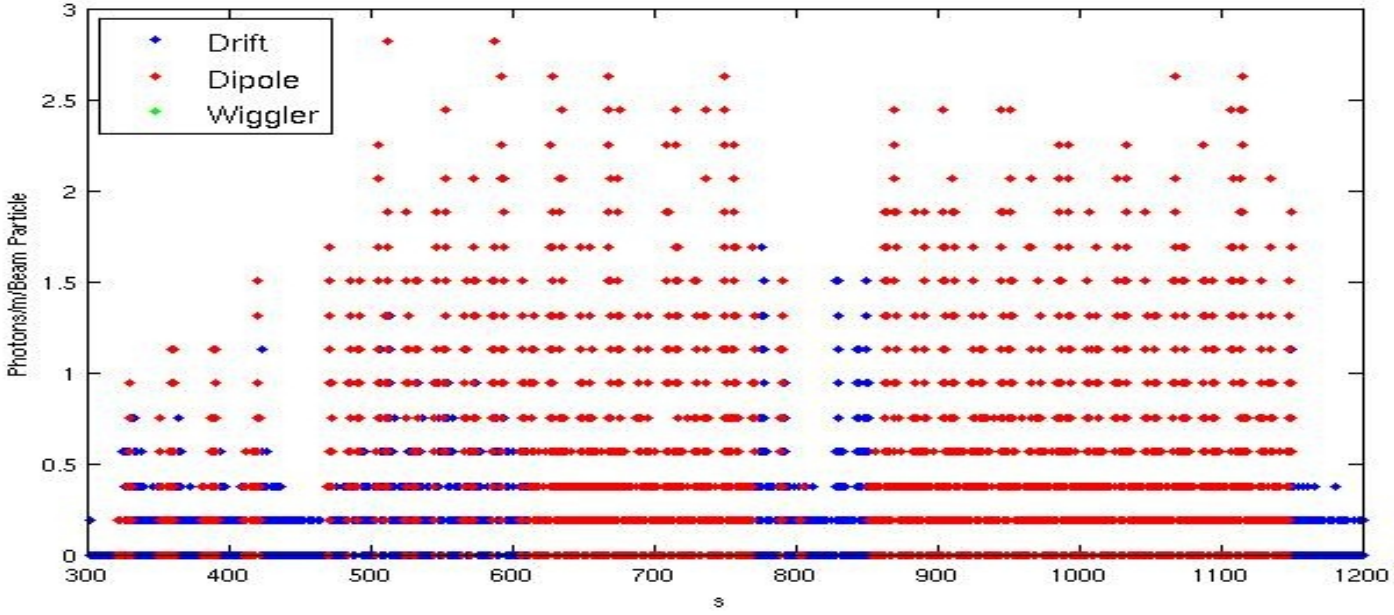
Comparison of synrad3d with and without reflections allowed, and an energy cut of 4eV.

Without Reflections



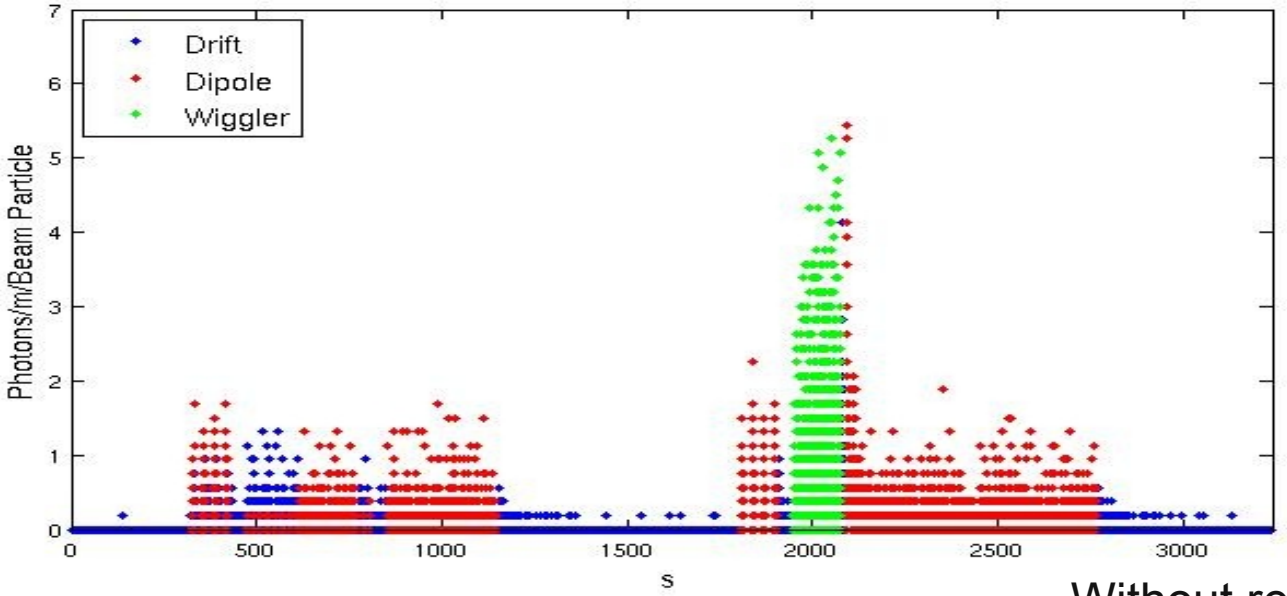


Without reflections



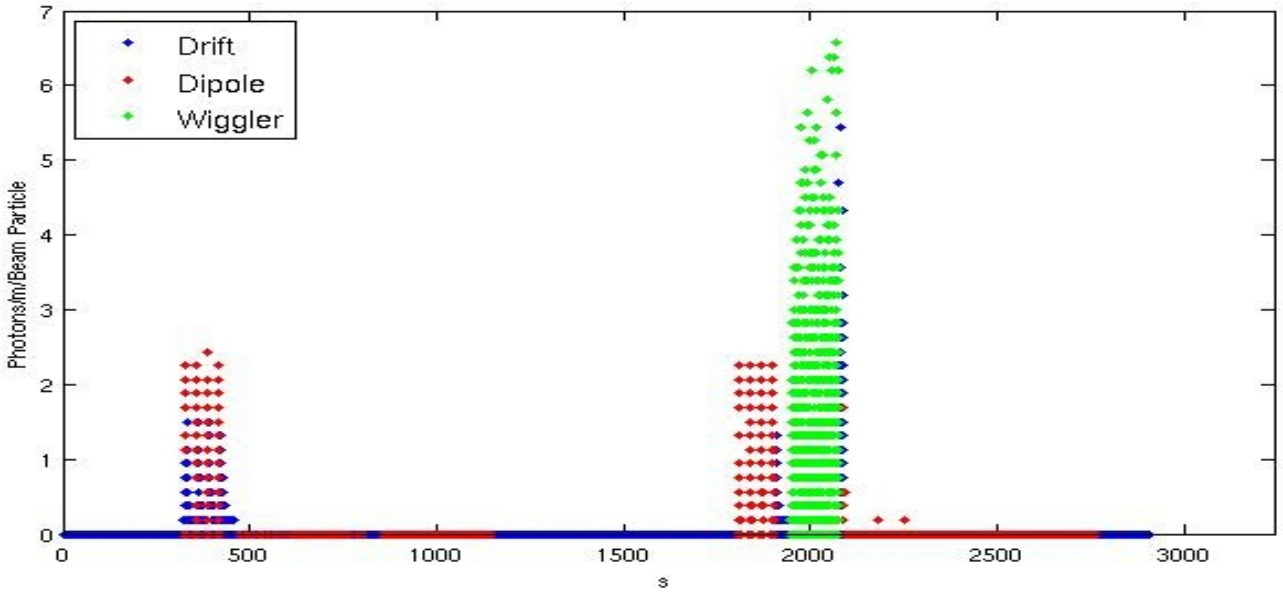
With reflections

With reflections



Comparison of synrad3d with and without reflections allowed, -x

Without reflections



Conclusions

- Without reflections:
  - Synrad3d gives a photon flux 10% higher than synrad2d in the arc regions.
  - Synrad3d gives a photon flux that rises more rapidly than synrad2d at the beginning of the wiggler section.

- Allowing reflections in synrad3d:
  - ~2x the photons absorbed immediately downstream of the wigglers (s=2091m) on the positive x side of the chamber.
  - Now photons absorbed on the negative x side of the chamber in the arc sections.
  - Wiggler photons scatter downstream(>50m) into the arc region.