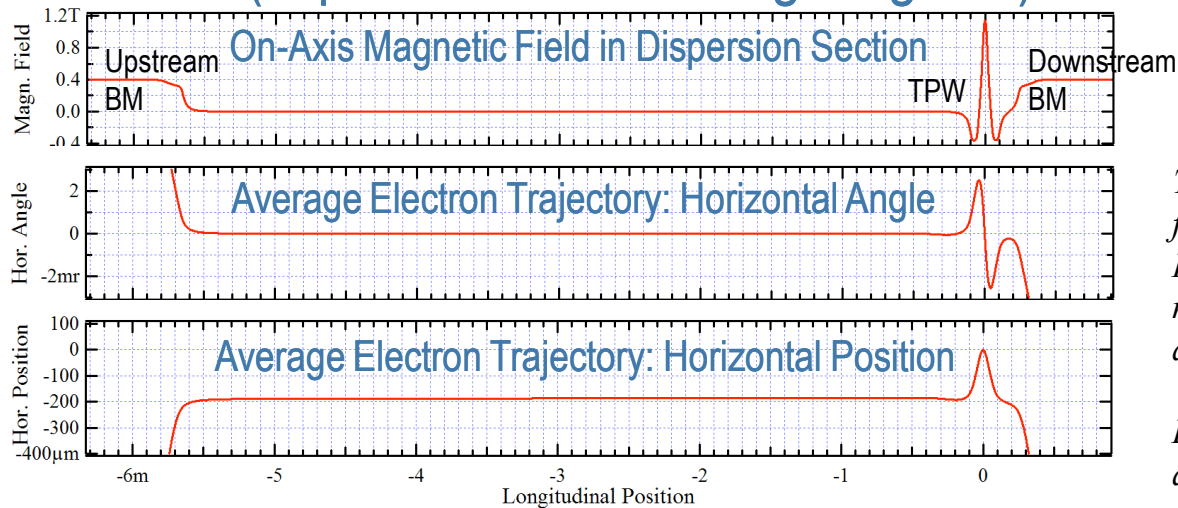
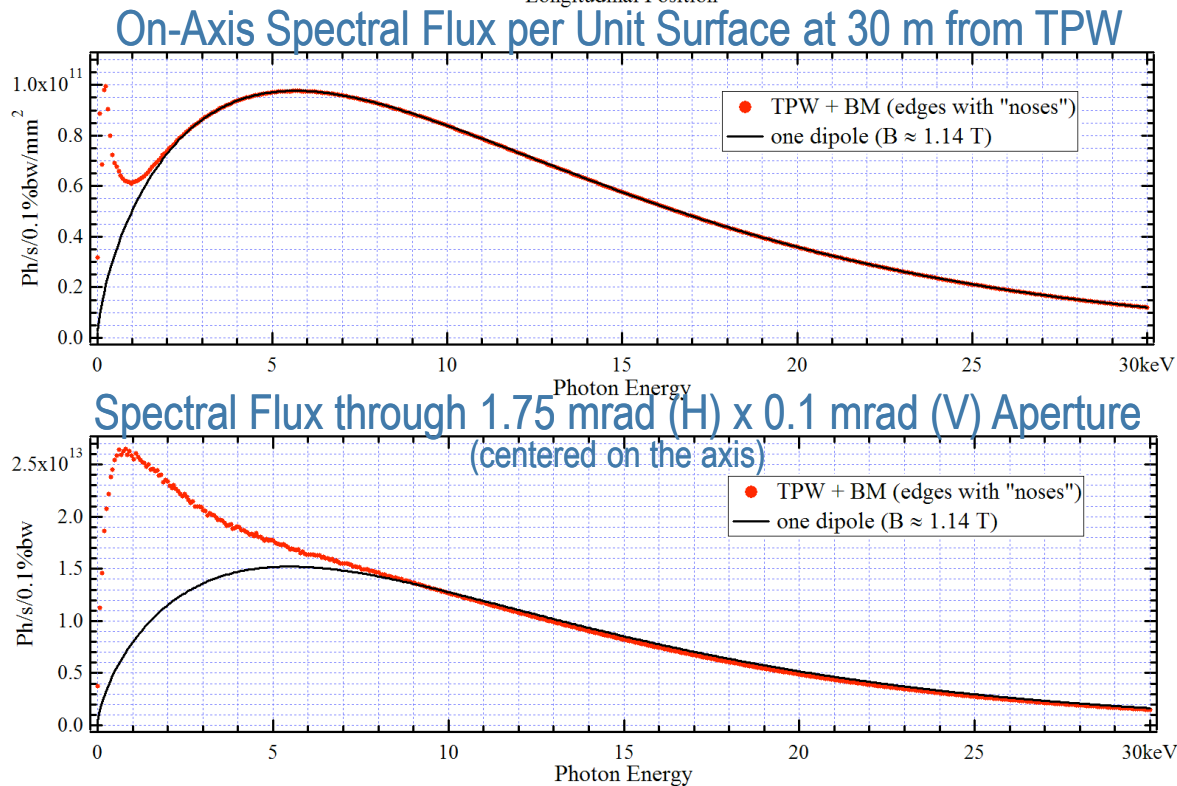


# TPW: Magnetic Field, Electron Trajectory and Spectra (in presence of Bending Magnets)



*TPW Field taken from magnetic simulations  
BM Field is taken from magnetic measurements on a prototype BM with "nose"*

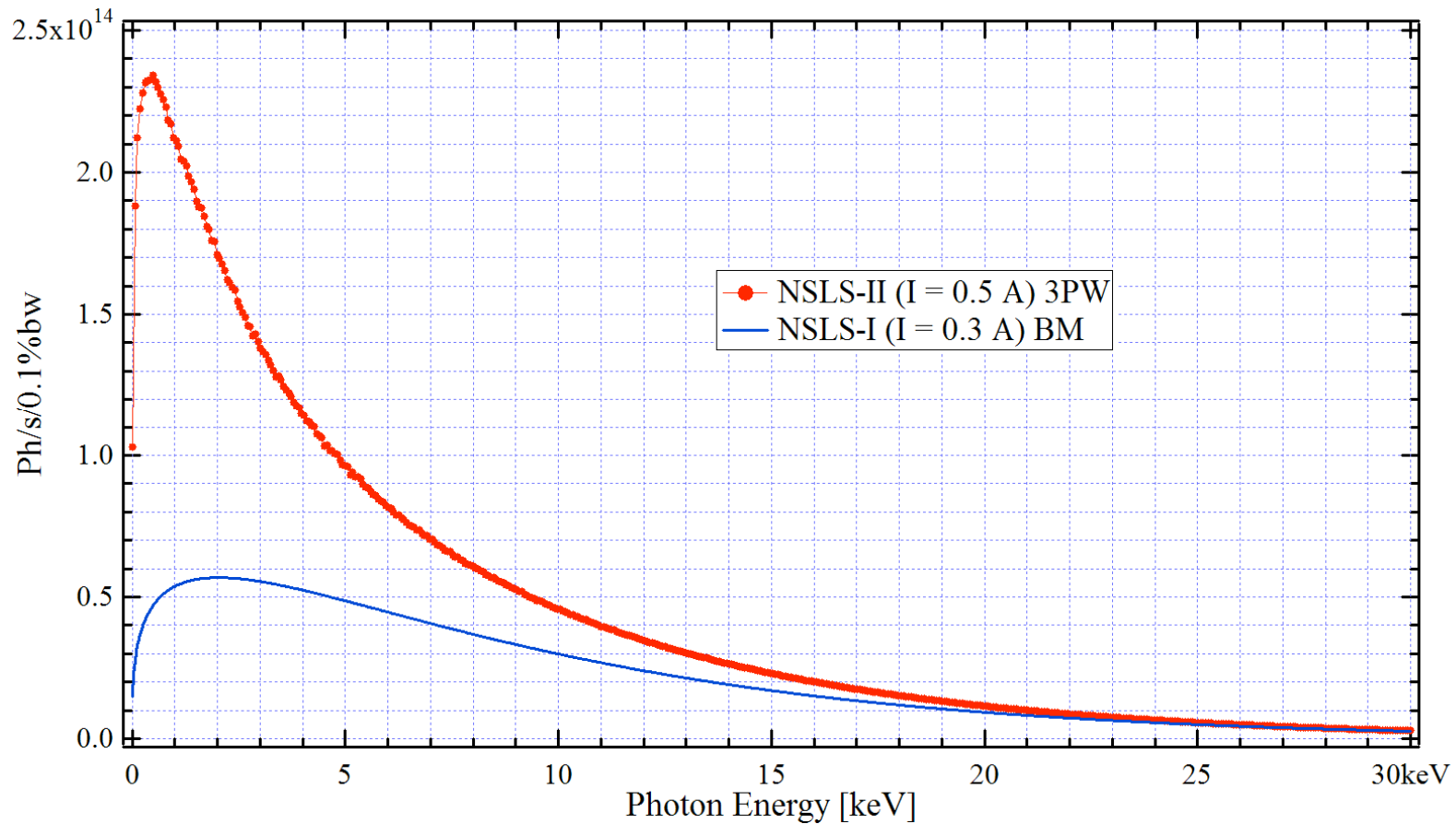
*Longitudinal Position  $s$  are approximate*



*Electron Energy: 3 GeV  
Current: 0.5 A  
Hor. Emittance: 0.9 nm  
Vert. Emittance: 8 pm*

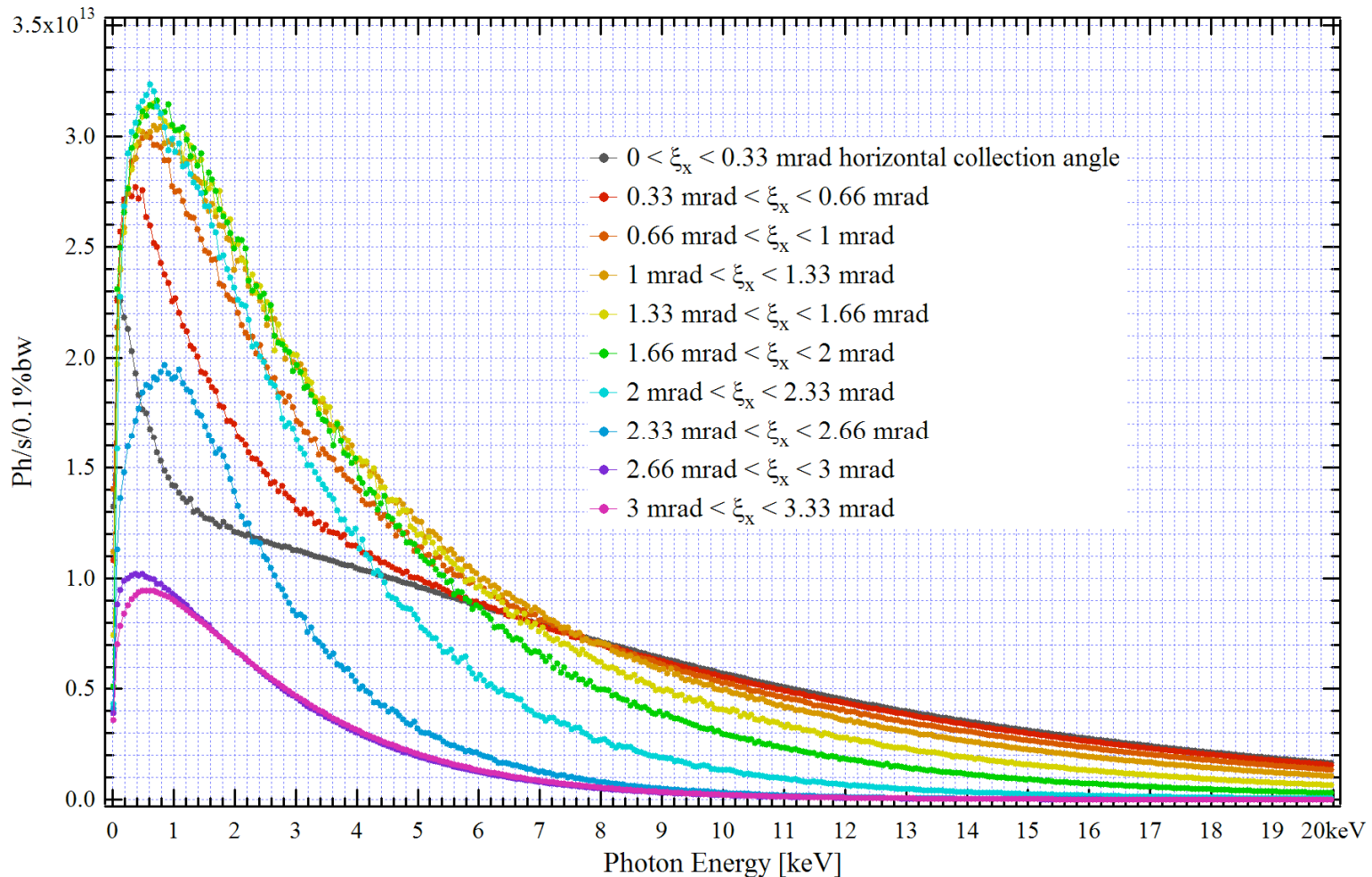
*Initial Conditions:  
 $\langle x \rangle = 0, \langle x' \rangle = 0$  in TPW  
Center*

# TPW (+ BM) Spectral Flux collected by Finite Aperture (~3 mrad H x 2 mrad V) Centered on the Axis



NOTE: "Reference" modeling TPW magnetic field was used in the simulations; changes are still possible (!)

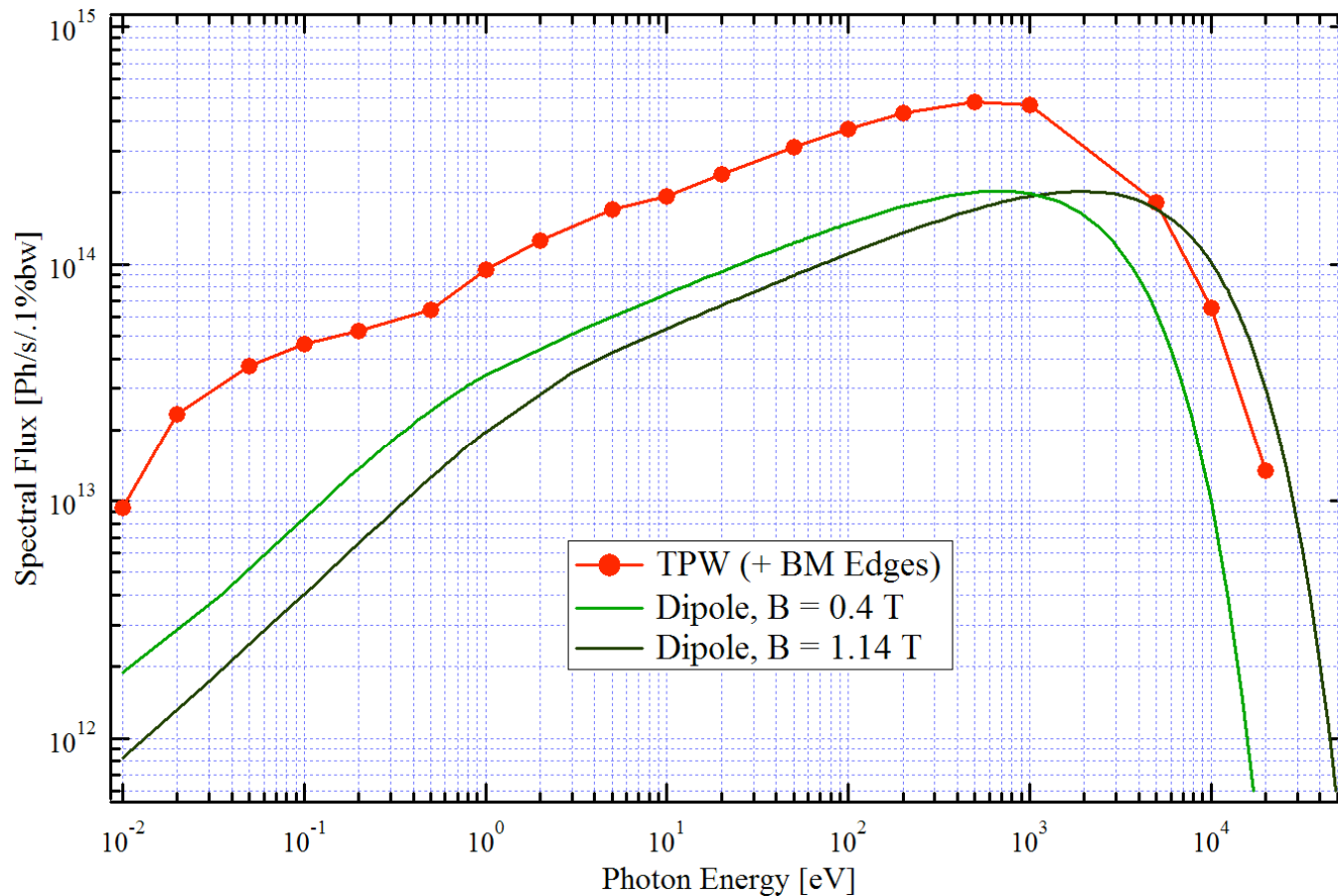
# TPW (+ BM) Spectral Flux collected by Finite Aperture (0.33 mrad H x 2 mrad V) at Different Horizontal Angles



## NOTES:

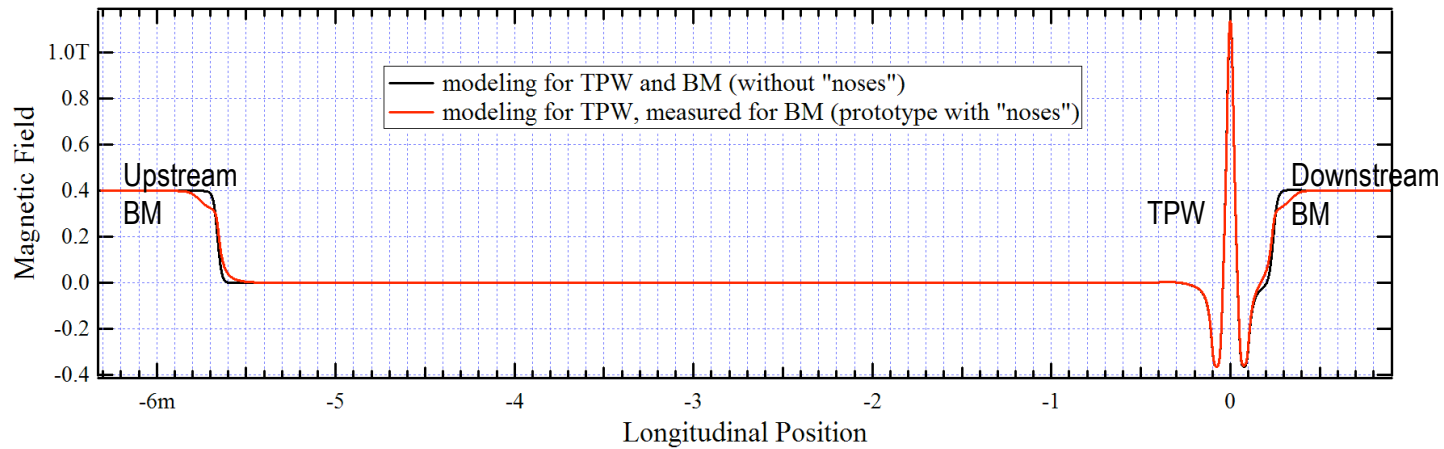
- Horizontal angle  $\xi_x$  is calculated from straight section axis “towards the storage ring”; the frame origin is in TPW center
- “Reference” modeling TPW magnetic field was used in the calculations; changes are still possible (!)
- Some numerical noise is present in the calculations

# Approximate TPW (+ BM) Radiation Spectral Flux Collected through 6 mrad x 6 mrad Angular Aperture

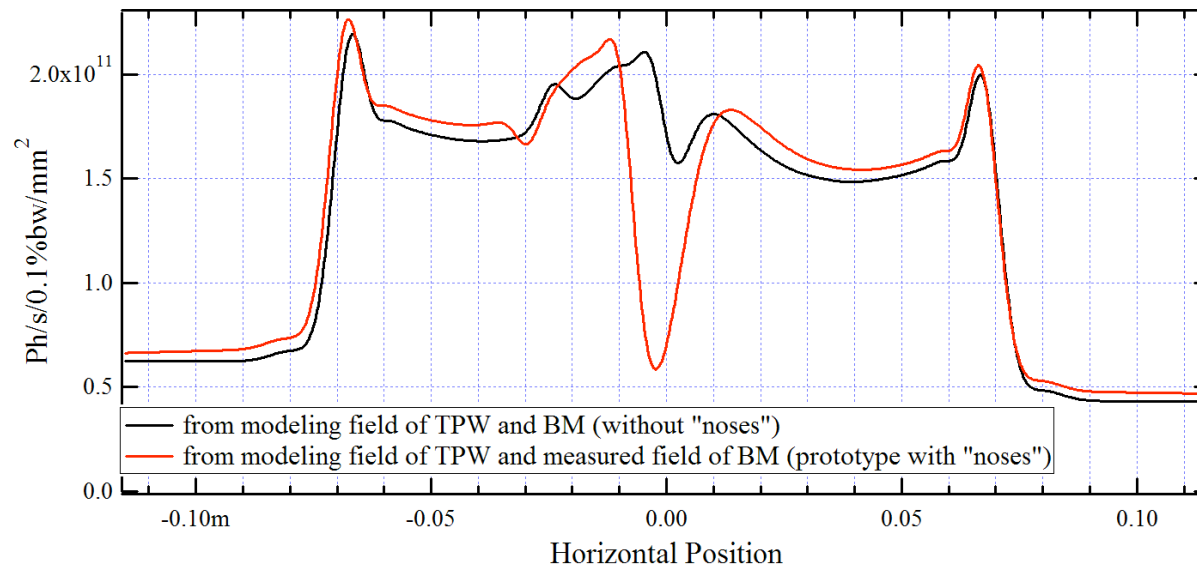


# TPW and BM: Effect of BM Edge Field Profile on Soft X-Ray Radiation Intensity Distributions

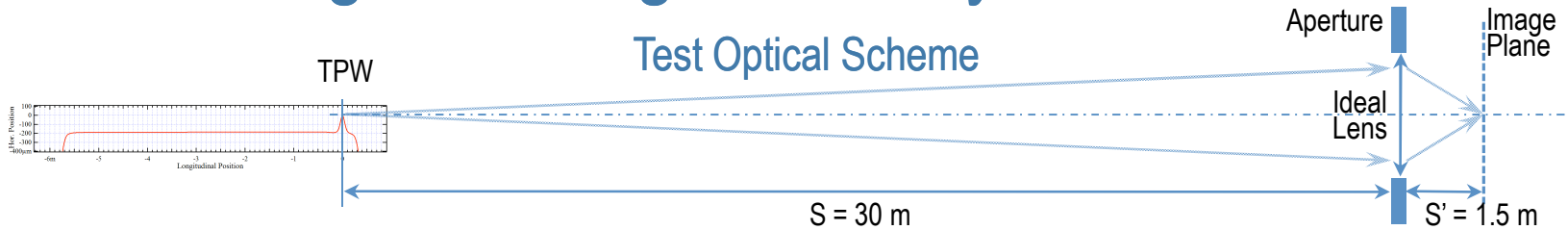
## On-Axis Magnetic Field in Dispersion Section



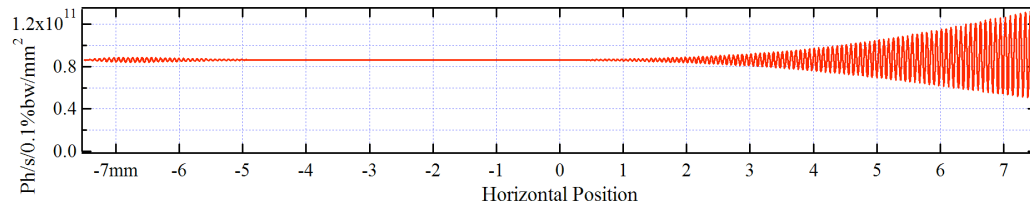
## Intensity Distributions in Horizontal Median Plane at 500 eV at 30 m from TPW



# Estimating Focusing Efficiency of TPW Radiation

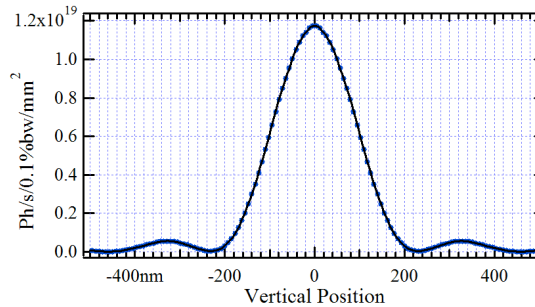
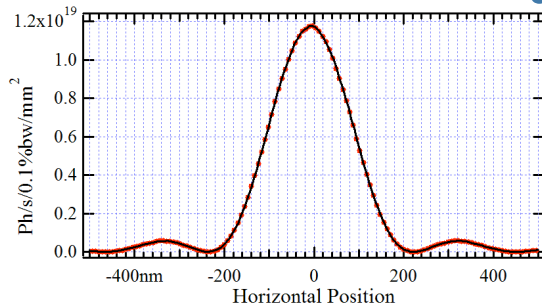


Single-Electron TPW Radiation Intensity Distribution at the Lens (horiz. cut at  $y = 0$ ),  $E_{ph} = 3\text{ keV}$

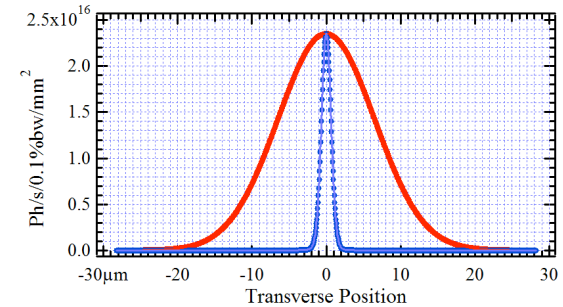


- In X-ray domain, intensity distributions in the image plane are dominated by transverse e-beam size
- At  $E_{ph} > 3\text{ keV}$ , for horizontal aperture  $< 0.5\text{ mrad}$  (centered on straight section axis), no important contributions from TPW side poles can be noticed in the image plane

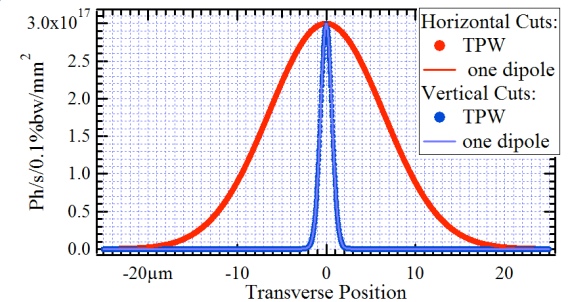
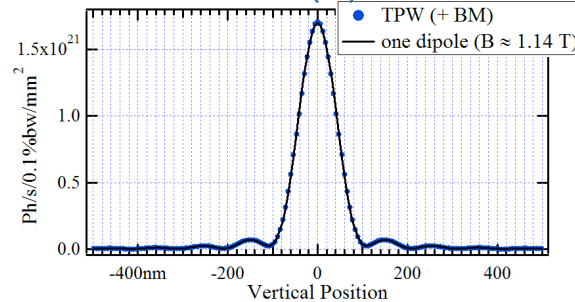
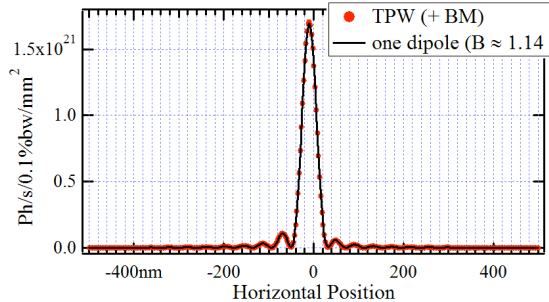
Intensity Distributions in the Image Plane  
Aperture: 90 rad (H) x 90 rad (V)  
“Single-Electron”



“Multi-Electron”

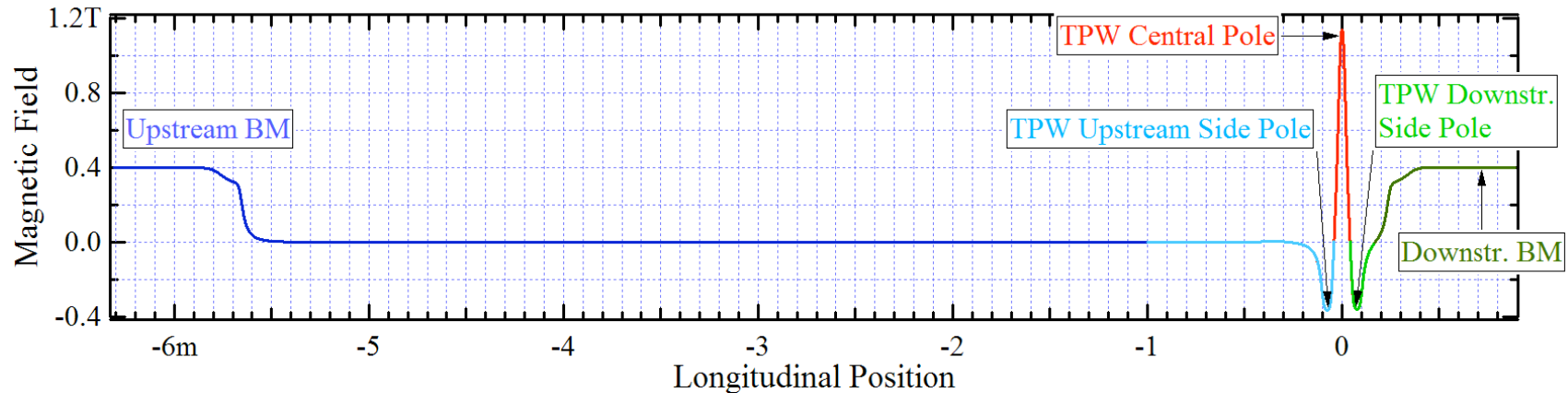


Aperture: 500 rad (H) x 200 rad (V)

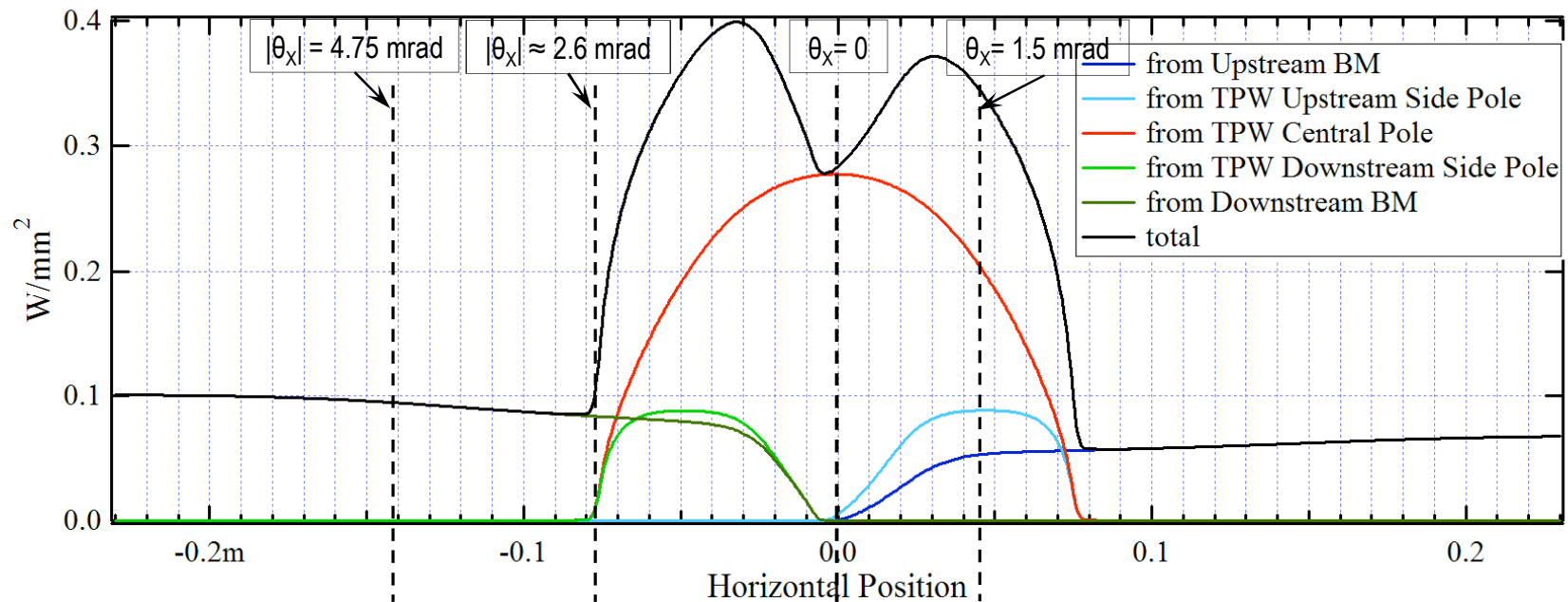


# Analyzing TPW and BM Power Density Distributions

## Magnetic Field

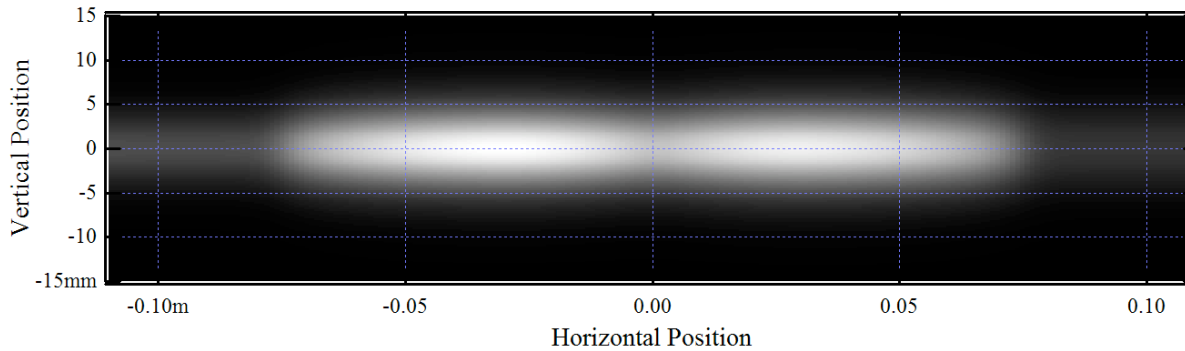


Power Density Distribution from different parts of TPW and BM at 30 m  
(single-electron emission, integral over all photon energies, horizontal cuts at  $y = 0$ )



# TPW and BM Power Density Distributions

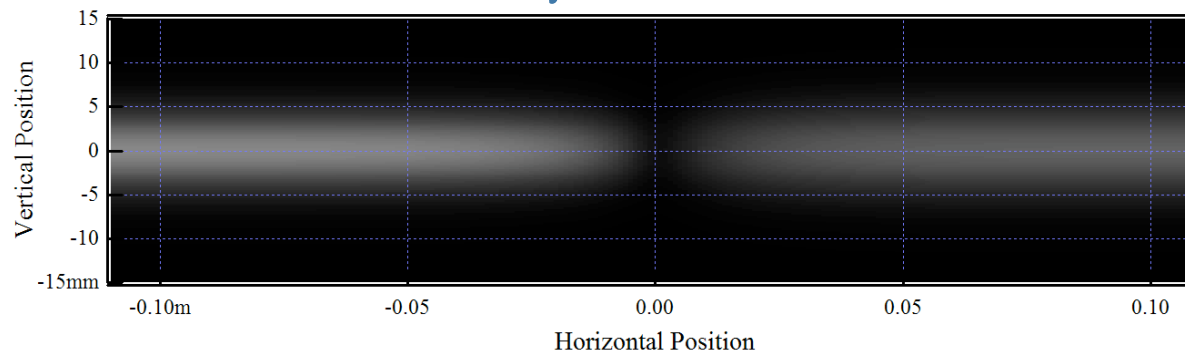
Power Density Distribution (integral over all photon energies) from TPW and BM at 30 m



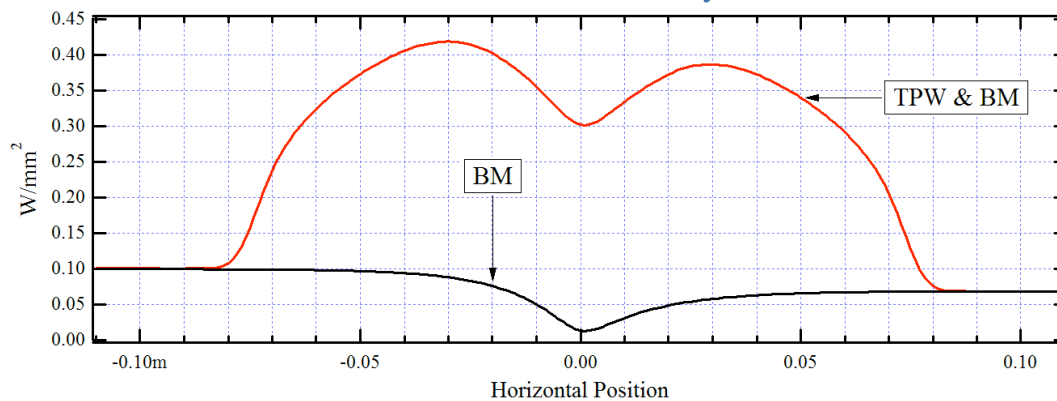
NOTE: modeling TPW magnetic field and BM edge field (without “noses”) were used in these simulations; changes are possible (!)

Electron Current: 0.5 A

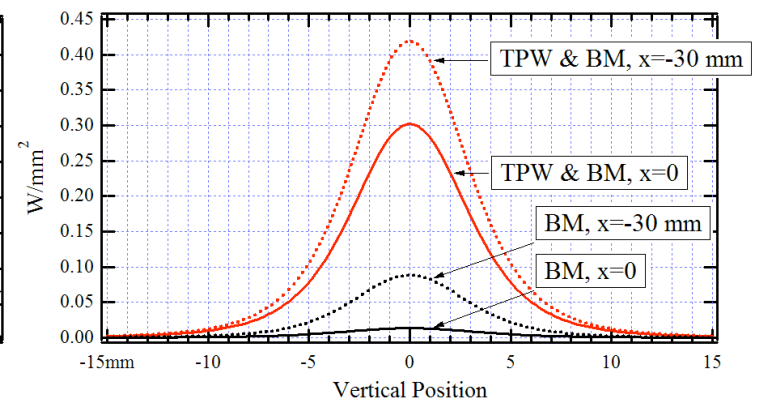
## Power Density Distribution from BM



## Horizontal Cuts at $y = 0$



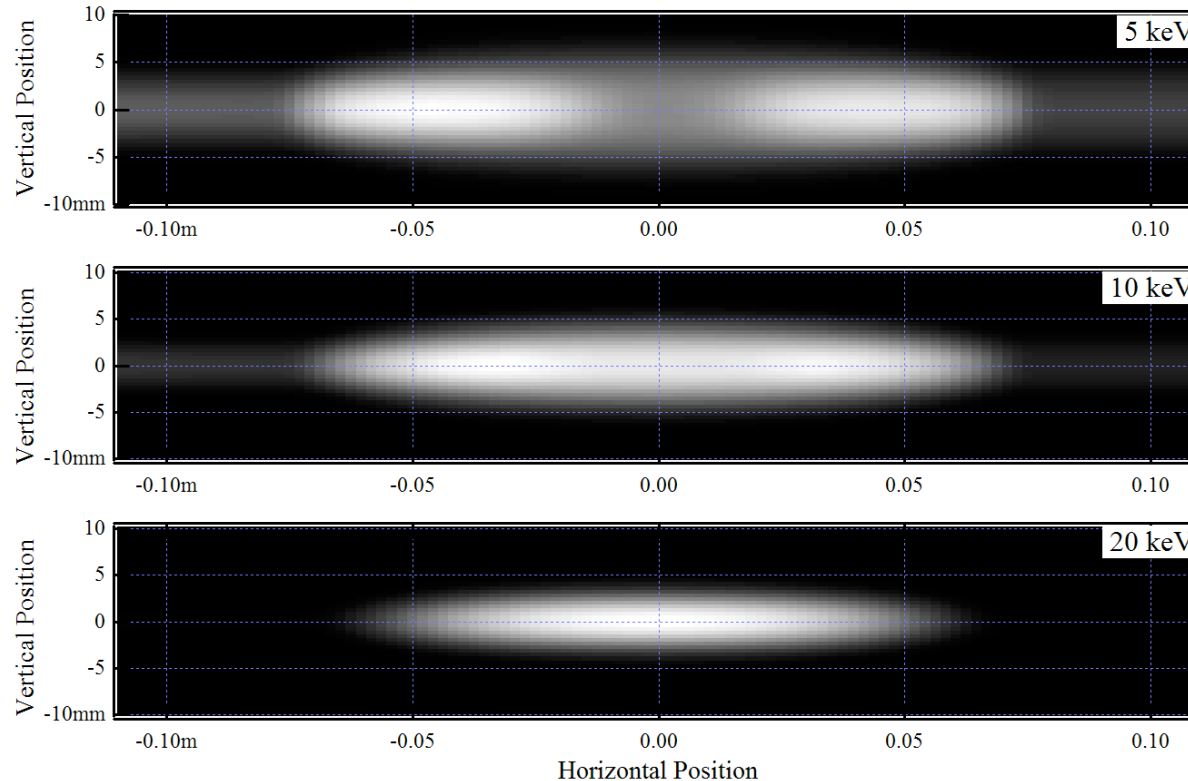
## Vertical Cuts





# TPW and BM Radiation Intensity Distributions (Hard X-rays)

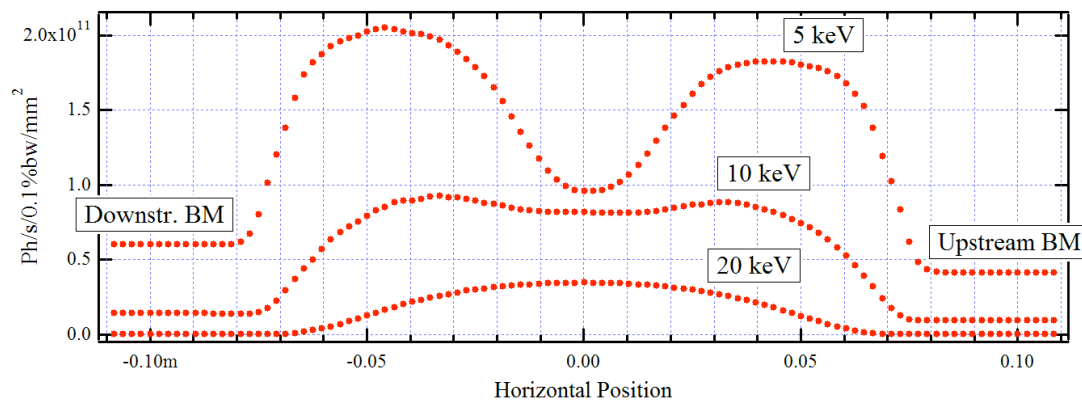
## Intensity Distributions at Different Photon Energies at 30 m from TPW



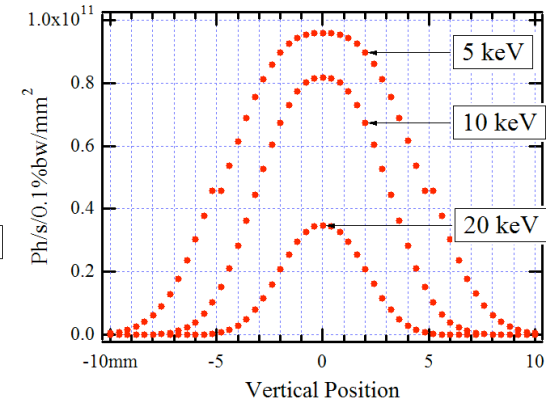
NOTE: modeling TPW magnetic field and BM edge field (without “noses”) were used in these simulations; changes are possible (!)

Electron Current: 0.5 A

### Horizontal Cuts at $y = 0$

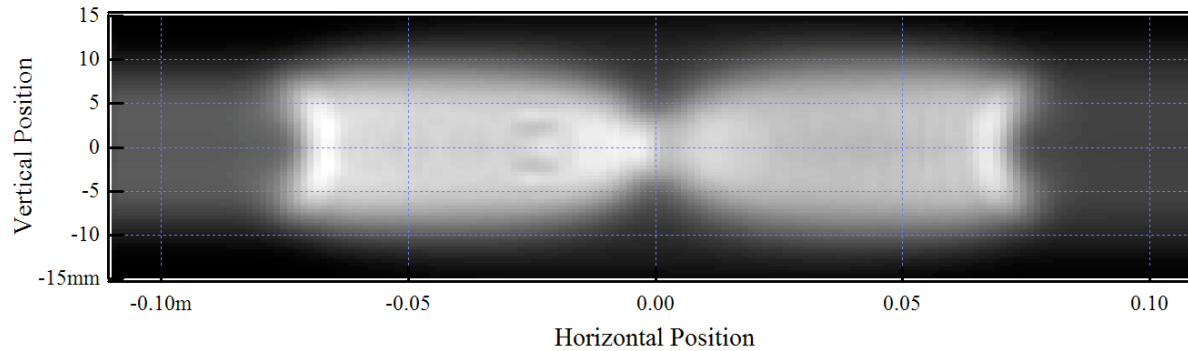


### Vertical Cuts at $x = 0$



# TPW and BM Radiation Intensity Distributions (Soft X-rays)

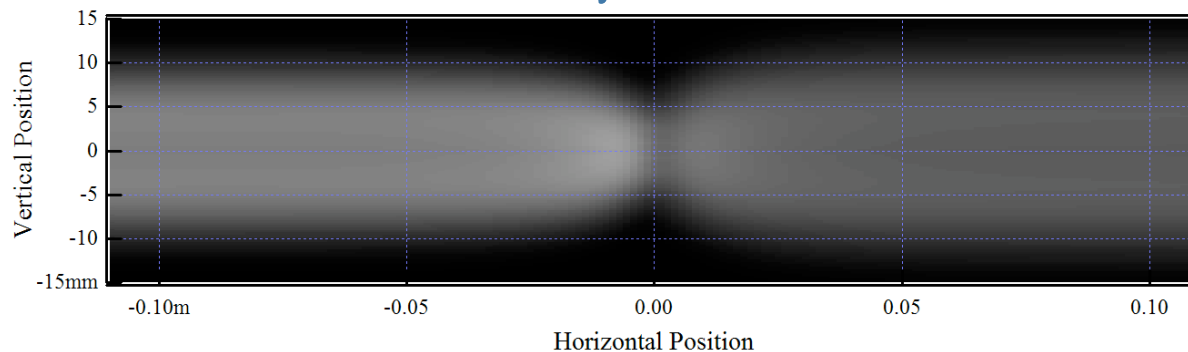
Radiation Intensity Distribution from TPW and BM at 500 eV Photon Energy at 30 m



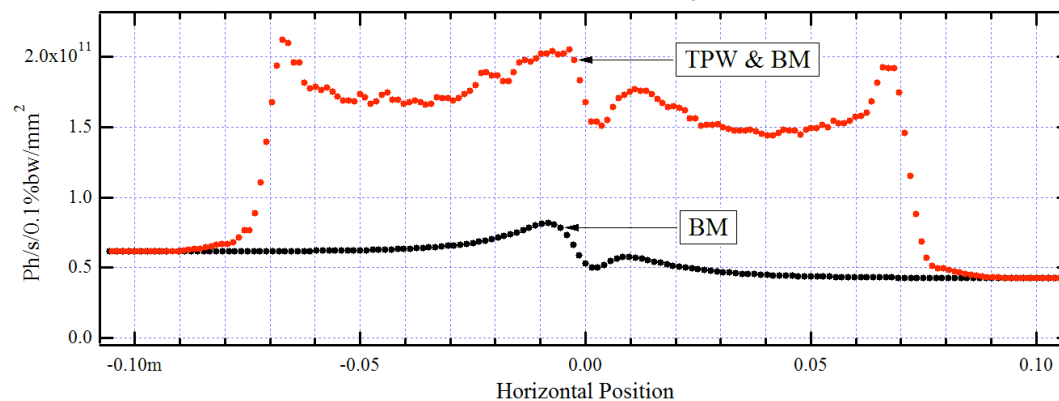
NOTE: modeling TPW magnetic field and BM edge field (without "noses") were used in these simulations; changes are possible (!)

## Radiation Intensity Distribution from BM

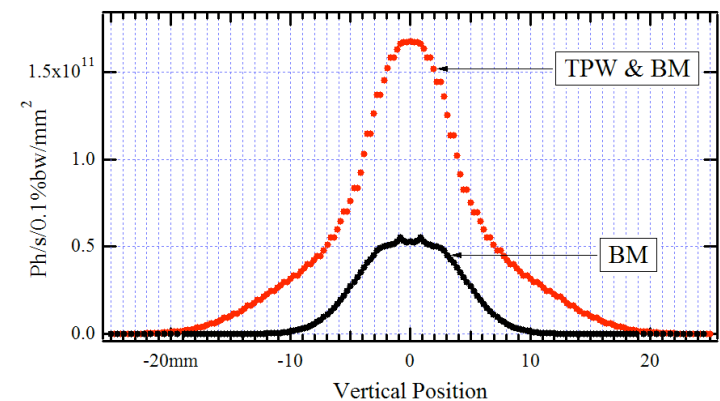
Electron Current: 0.5 A



## Horizontal Cuts at $y = 0$

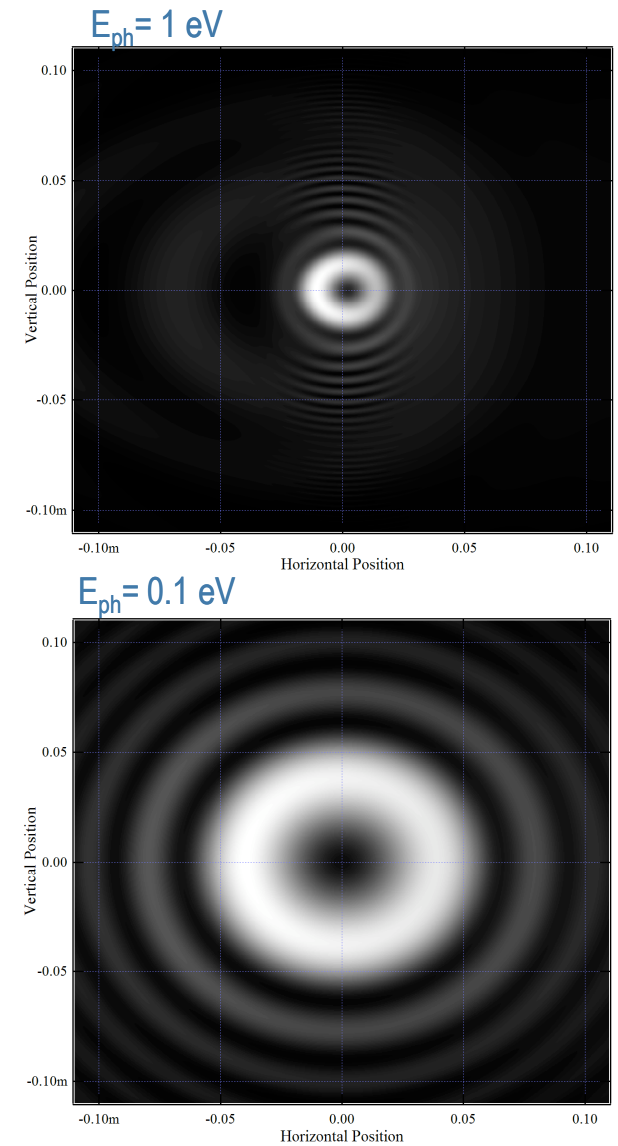
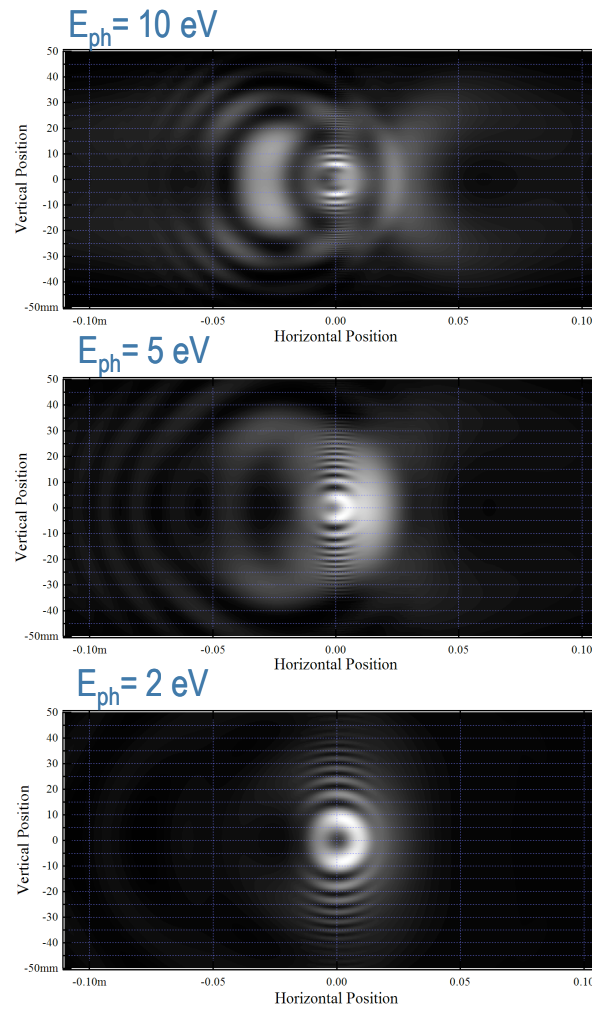
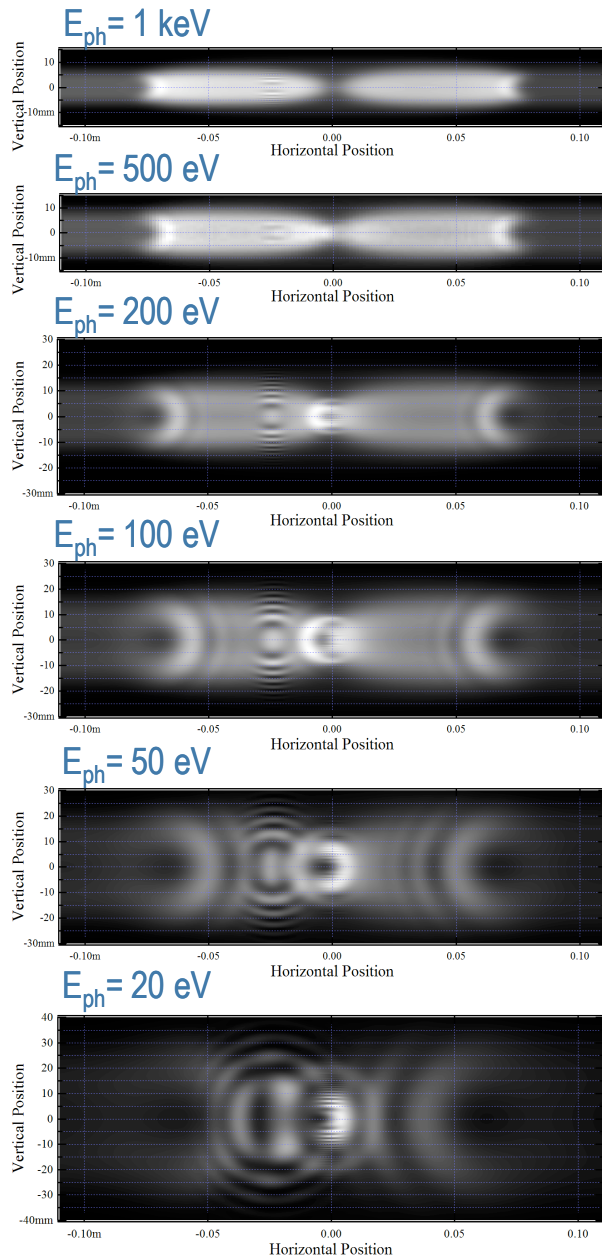


## Vertical Cuts at $x = 0$



# TPW+BM Radiation Intensity Distributions (Soft X-Rays to IR)

Observation Distance: 30 m



NOTE: modeling TPW magnetic field and BM edge field (without "noses") were used in these simulations; changes are possible (!)