



Quartztof

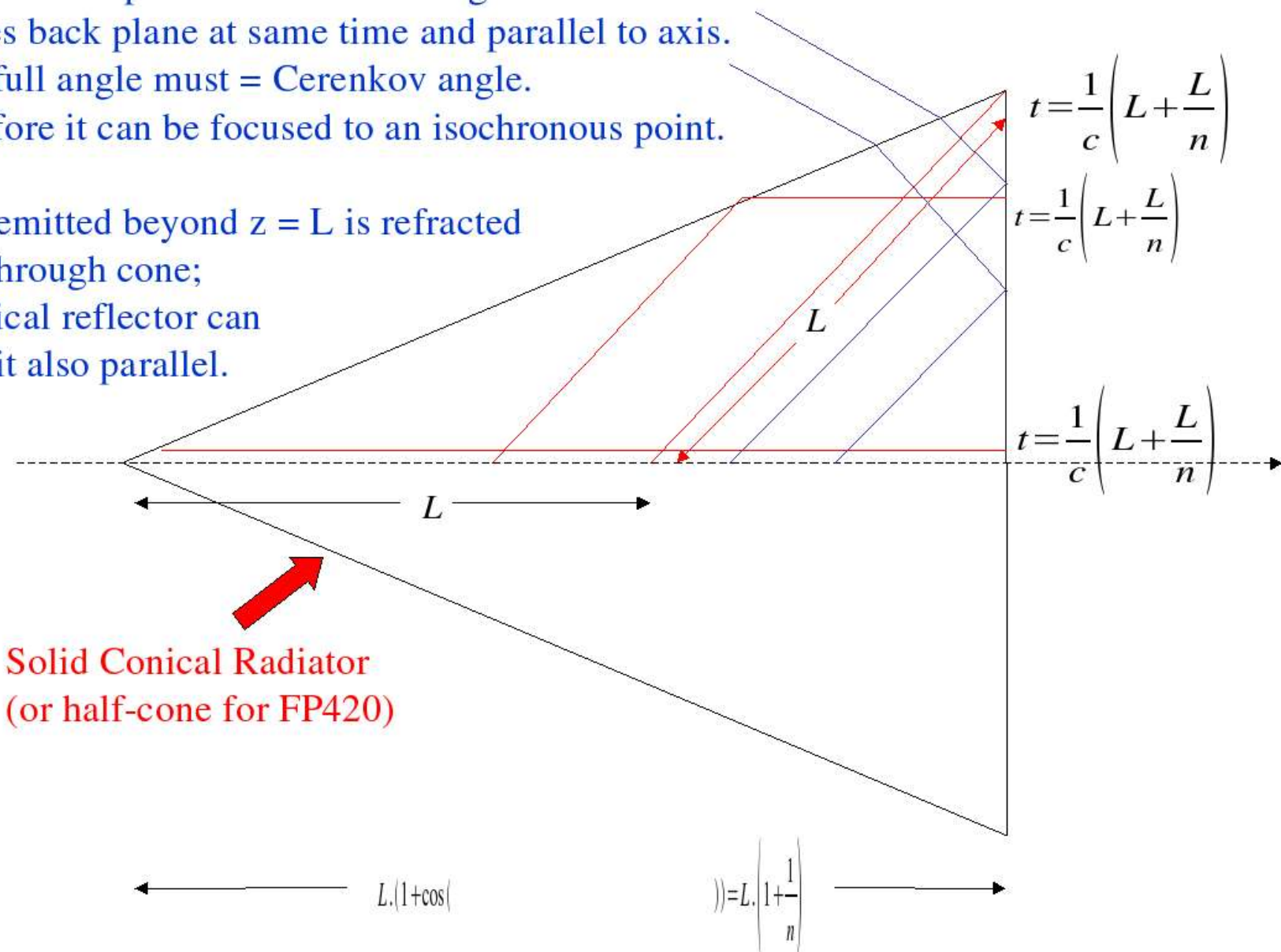
by Kristina Yancey (SULI intern under Hans Wenzel)

Outline

- The idea behind the project
- Programming the detector
- Updated geometry for detector
- Results from on-axis proton beam
- Results from off-axis proton beam
 - Plan of action

Geometrical optics: All Cerenkov light from $z = 0$ to $z = L$ reaches back plane at same time and parallel to axis.
 Cone full angle must = Cerenkov angle.
 Therefore it can be focused to an isochronous point.

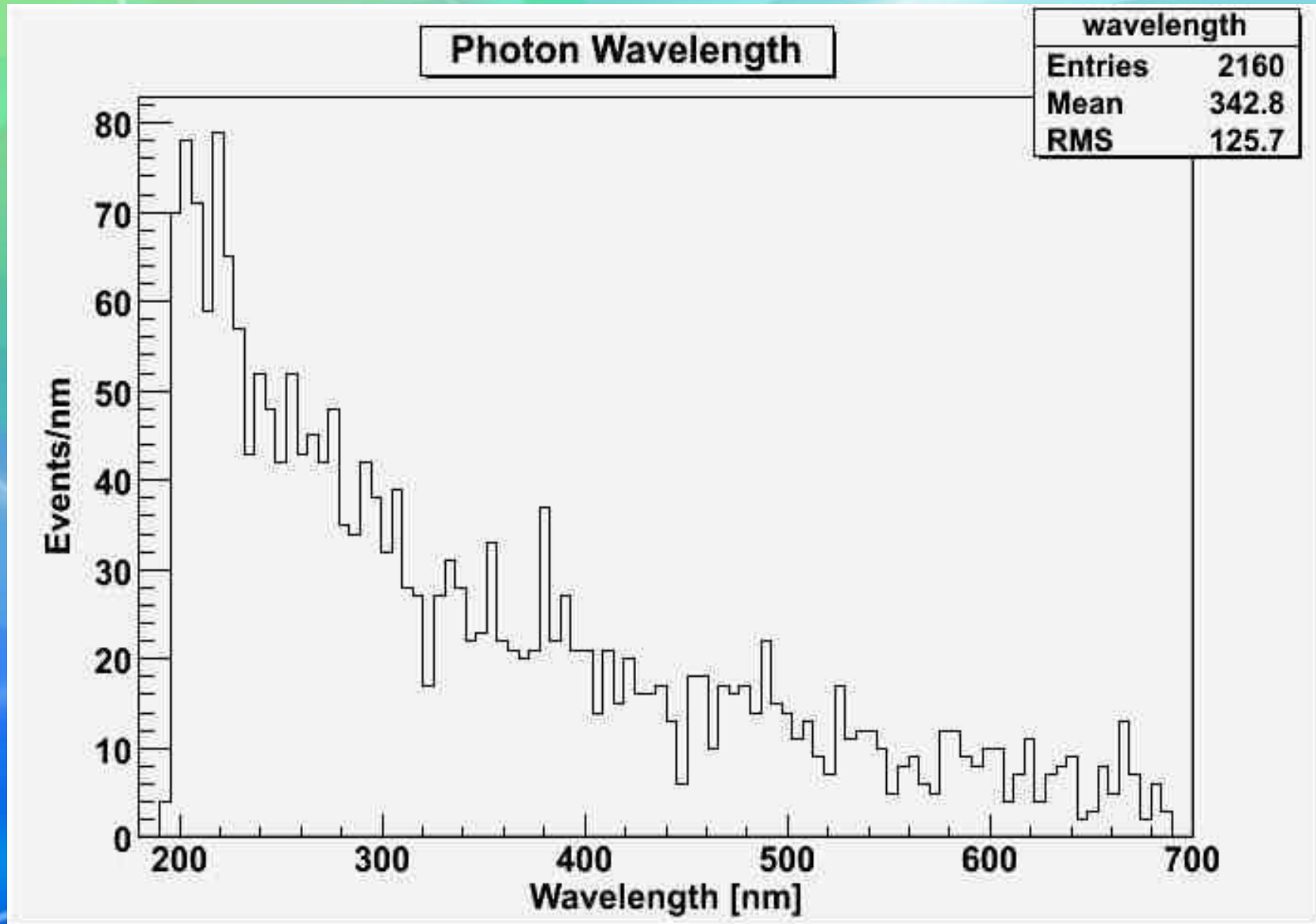
Light emitted beyond $z = L$ is refracted back through cone;
 A conical reflector can make it also parallel.



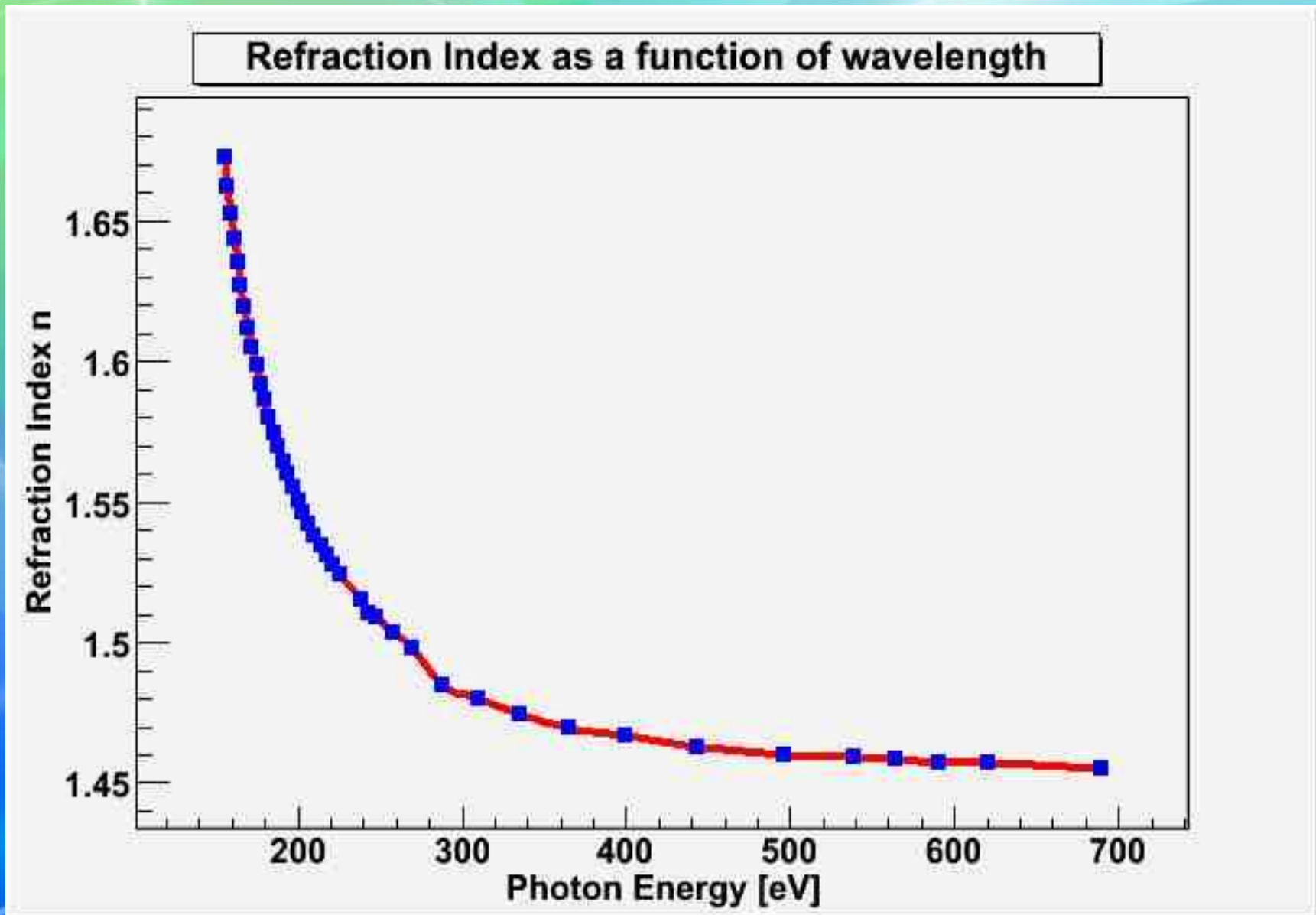
Toolbox

- Framework= Geant4
- Code Development = Netbeans
 - Analysis = Root
- Documentation = CVS

Spectrum of Light Created



Refraction for Quartz

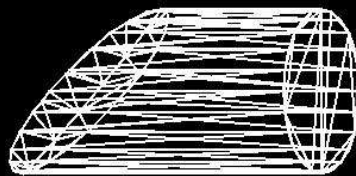


New Geometry

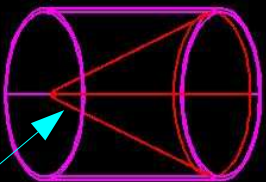
Silicon Detector



Off-axis
Parabolic
Mirror



Absorbing Cylinder



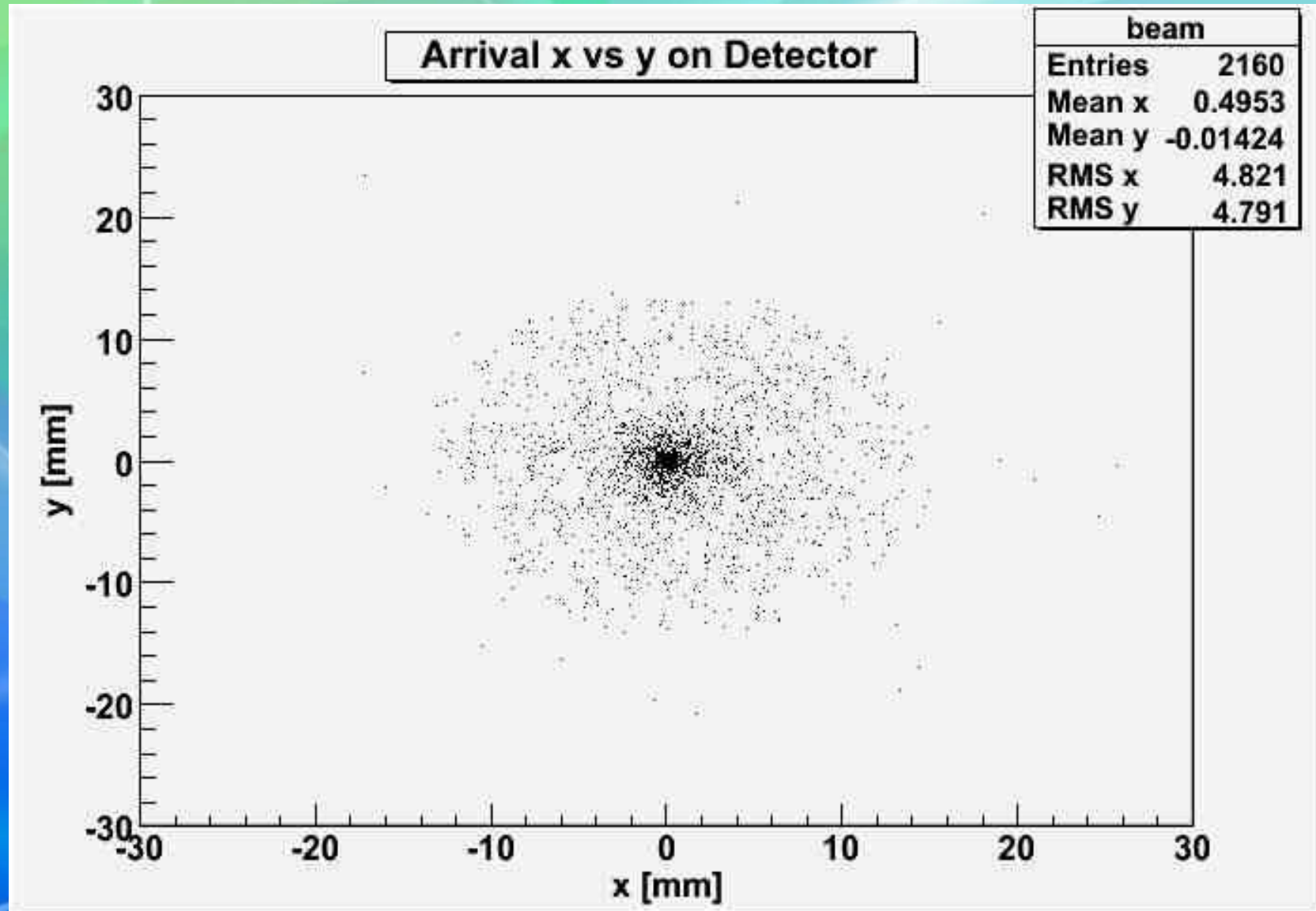
Quartz Cone

- Cone optimized for 689 nm (1.8 eV)
 - Cone angle 23.3°
- Off-axis Parabolic mirror
 - Focal Length = 76.2 mm

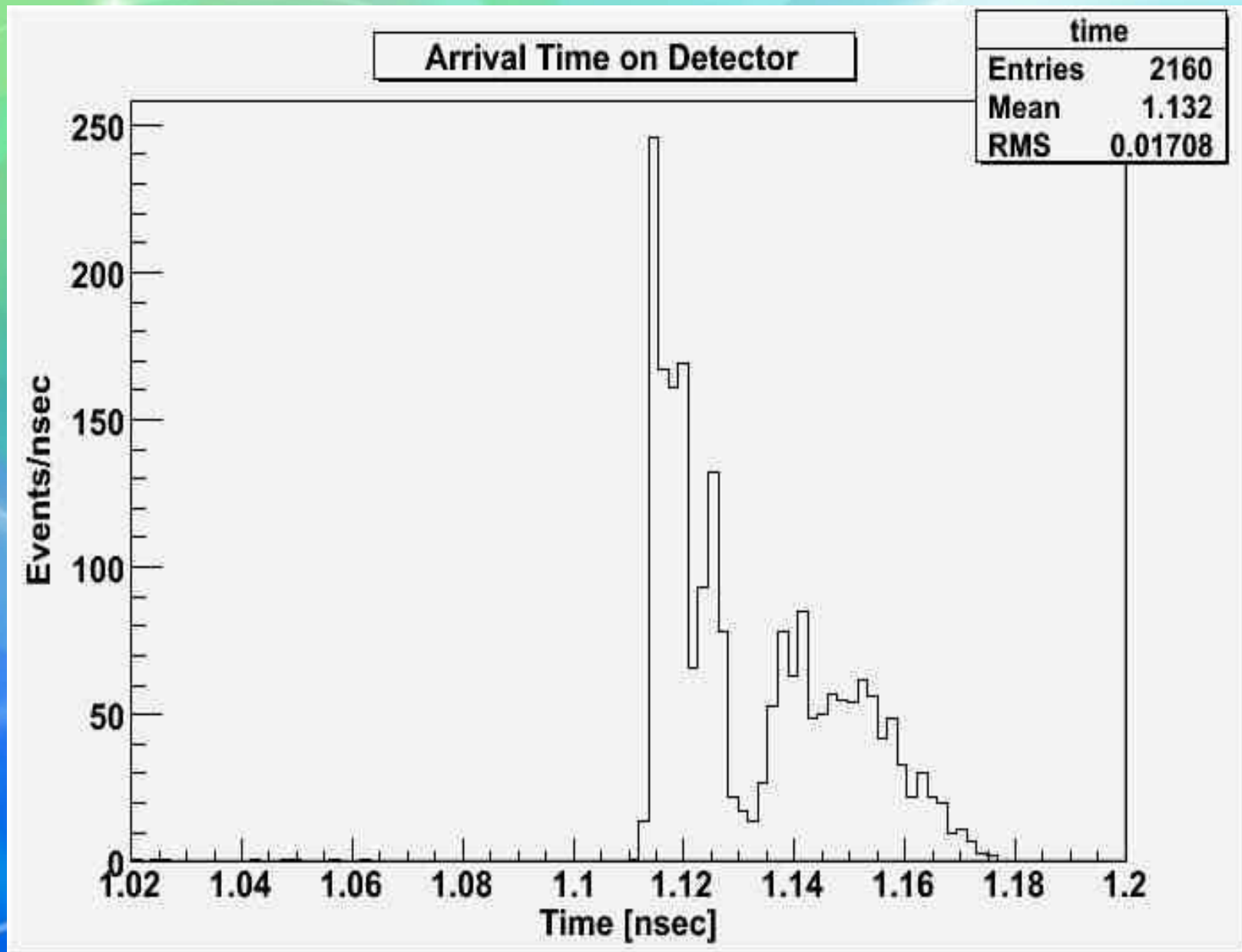


Results using on-axis proton beam

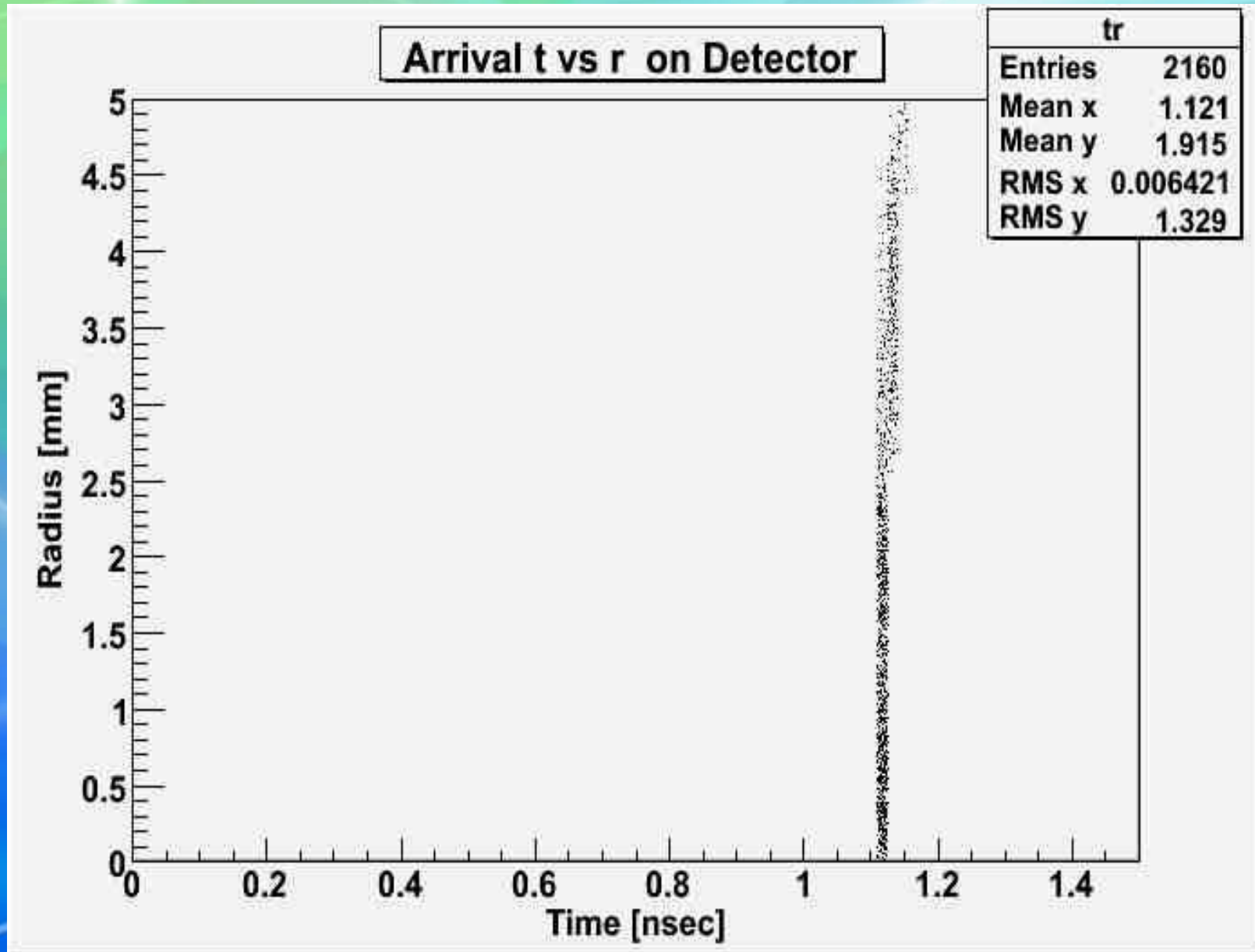
Beam position on Detector



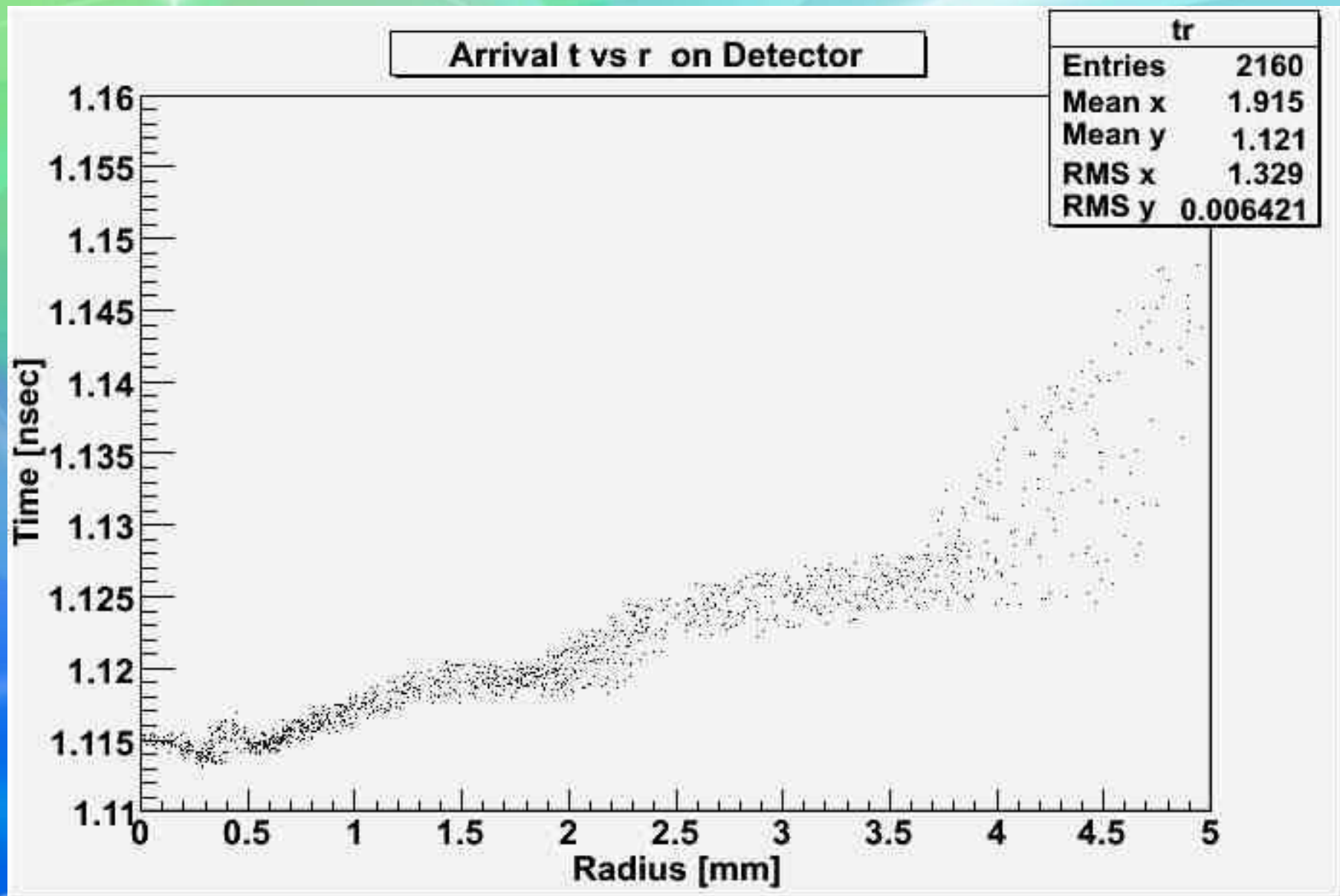
Arrival of Beam on Detector



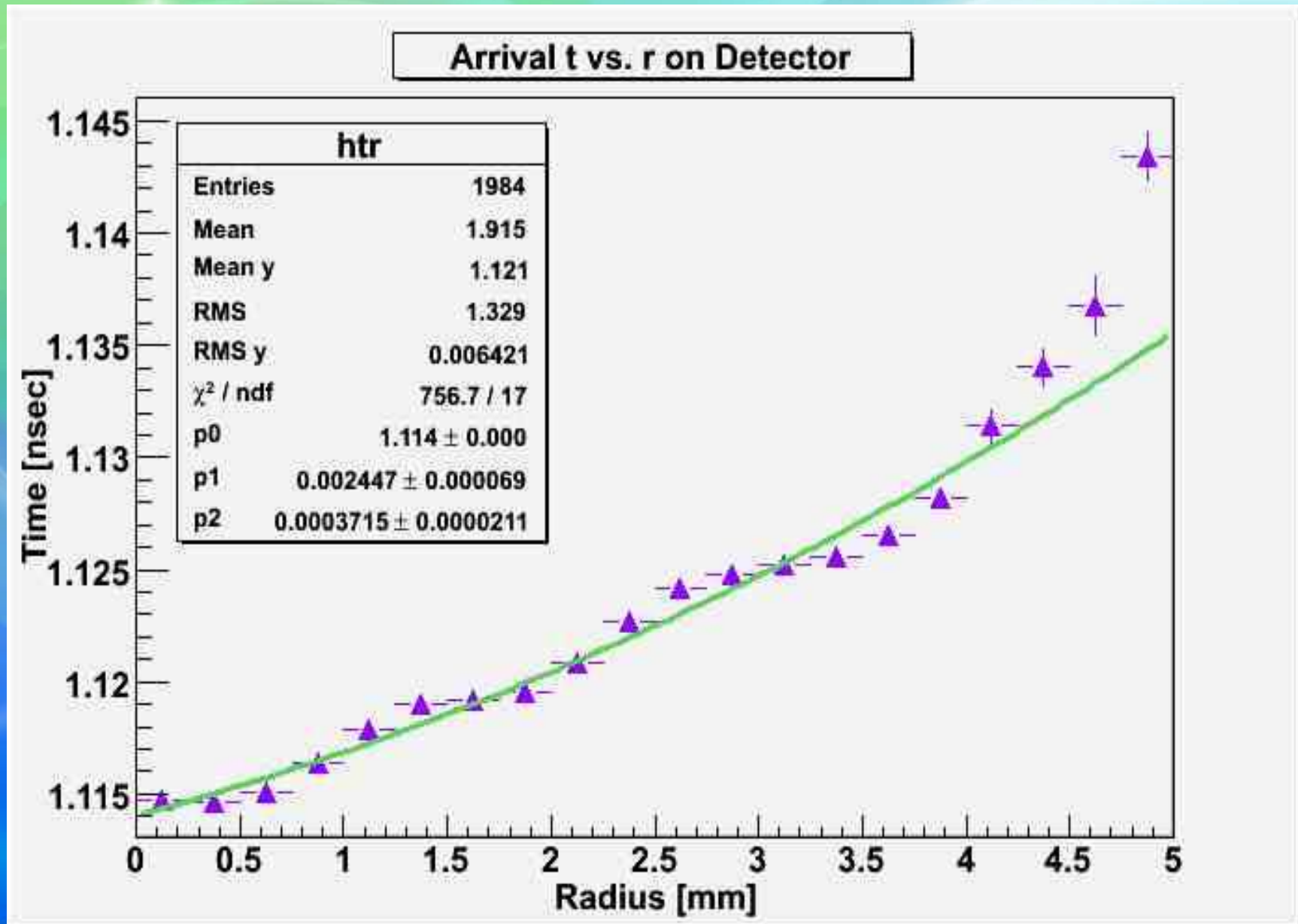
Radius vs. Time



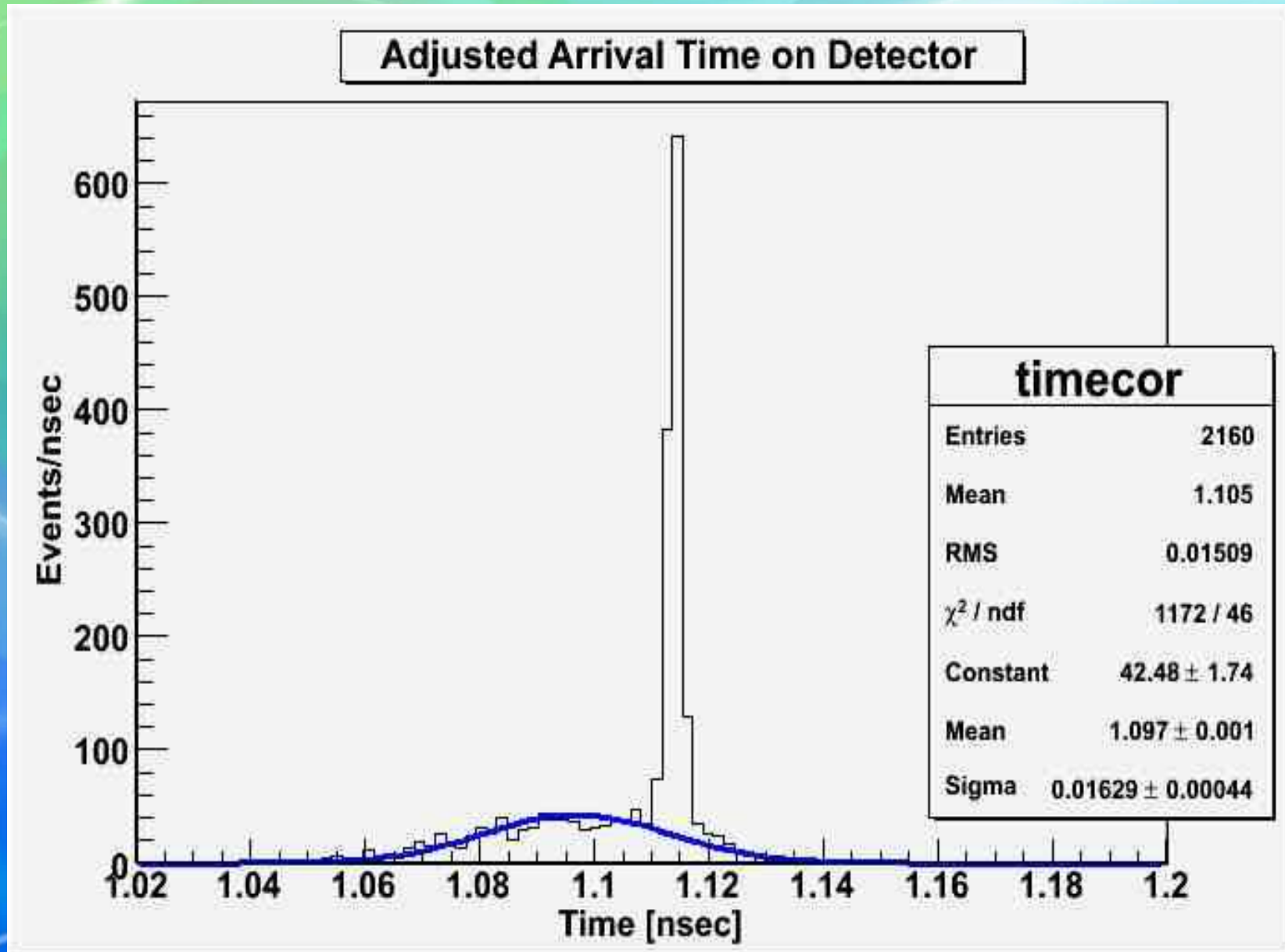
Time as a function of radius



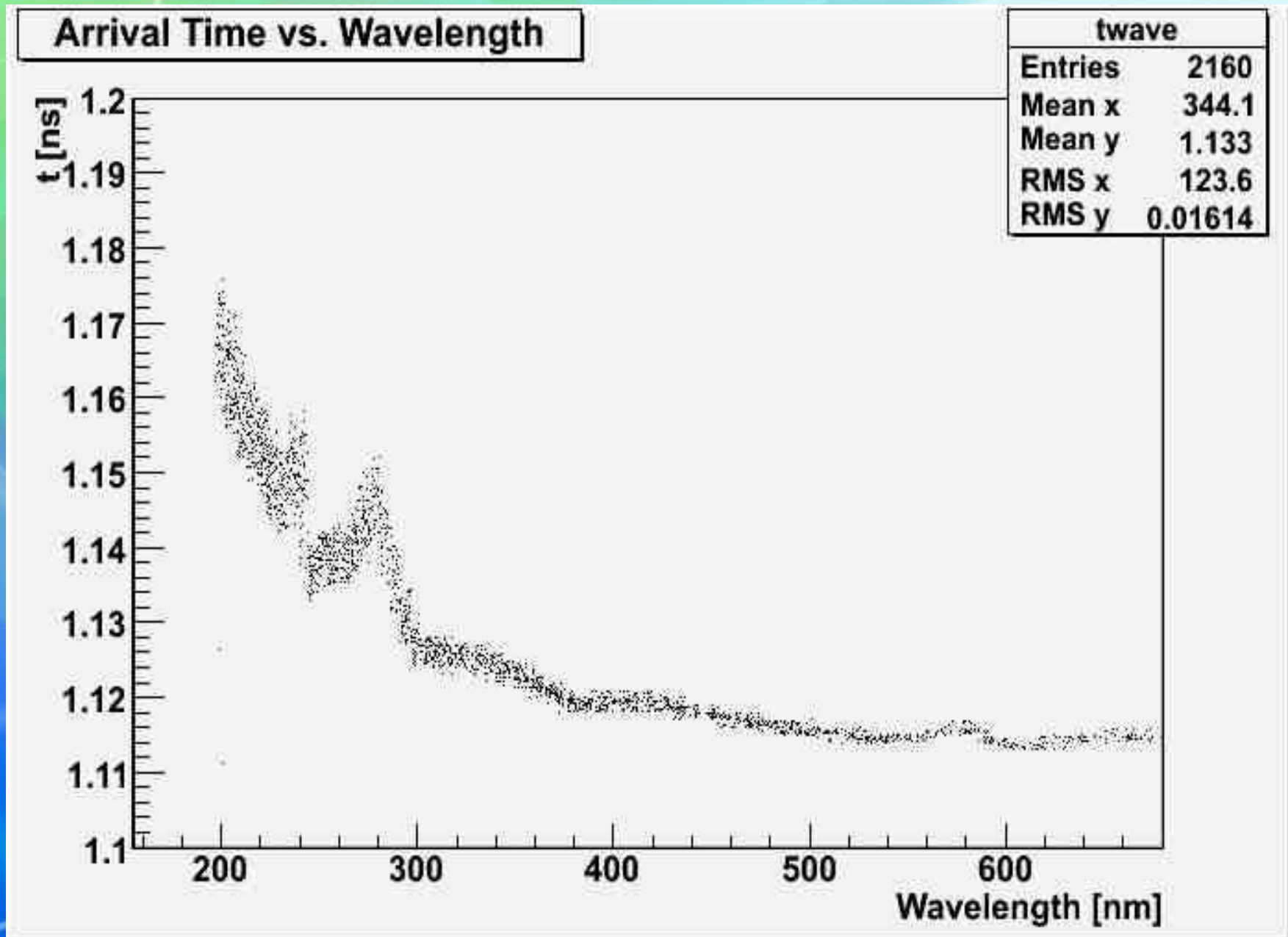
Profile plot w/ fitted quadratic of $t(r)$



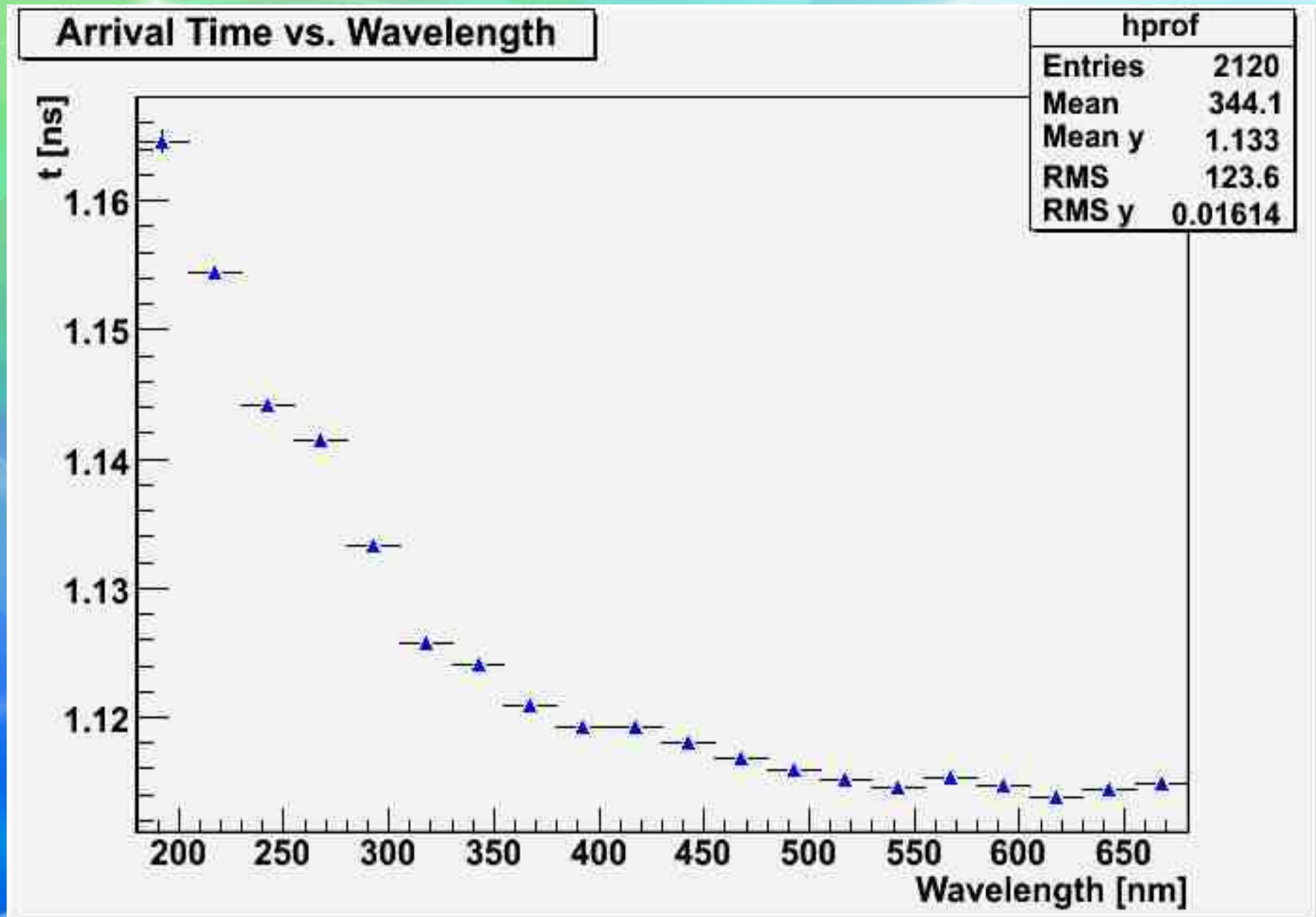
Arrival Time adjusted by $t(r)$



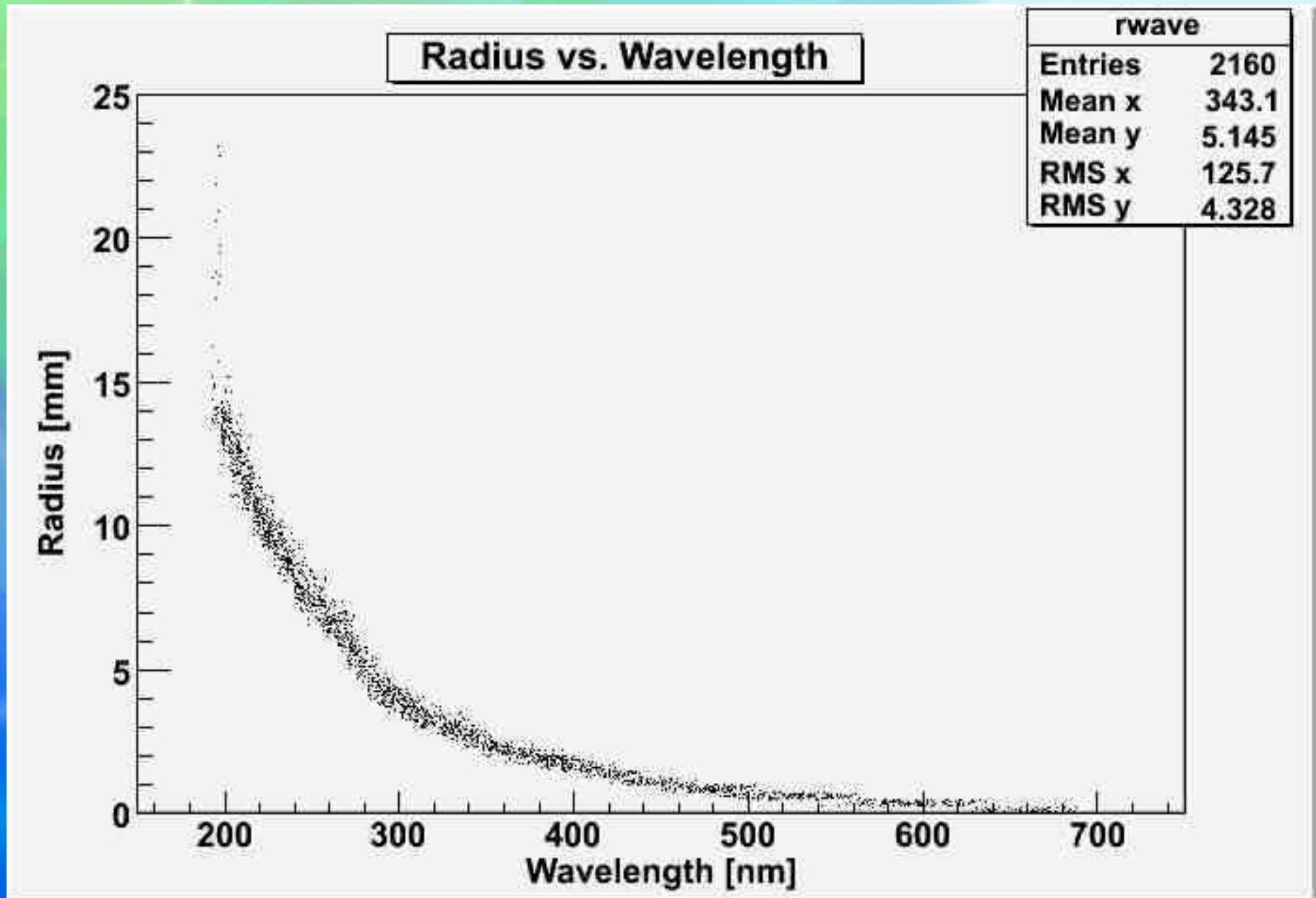
Time as a function of wavelength



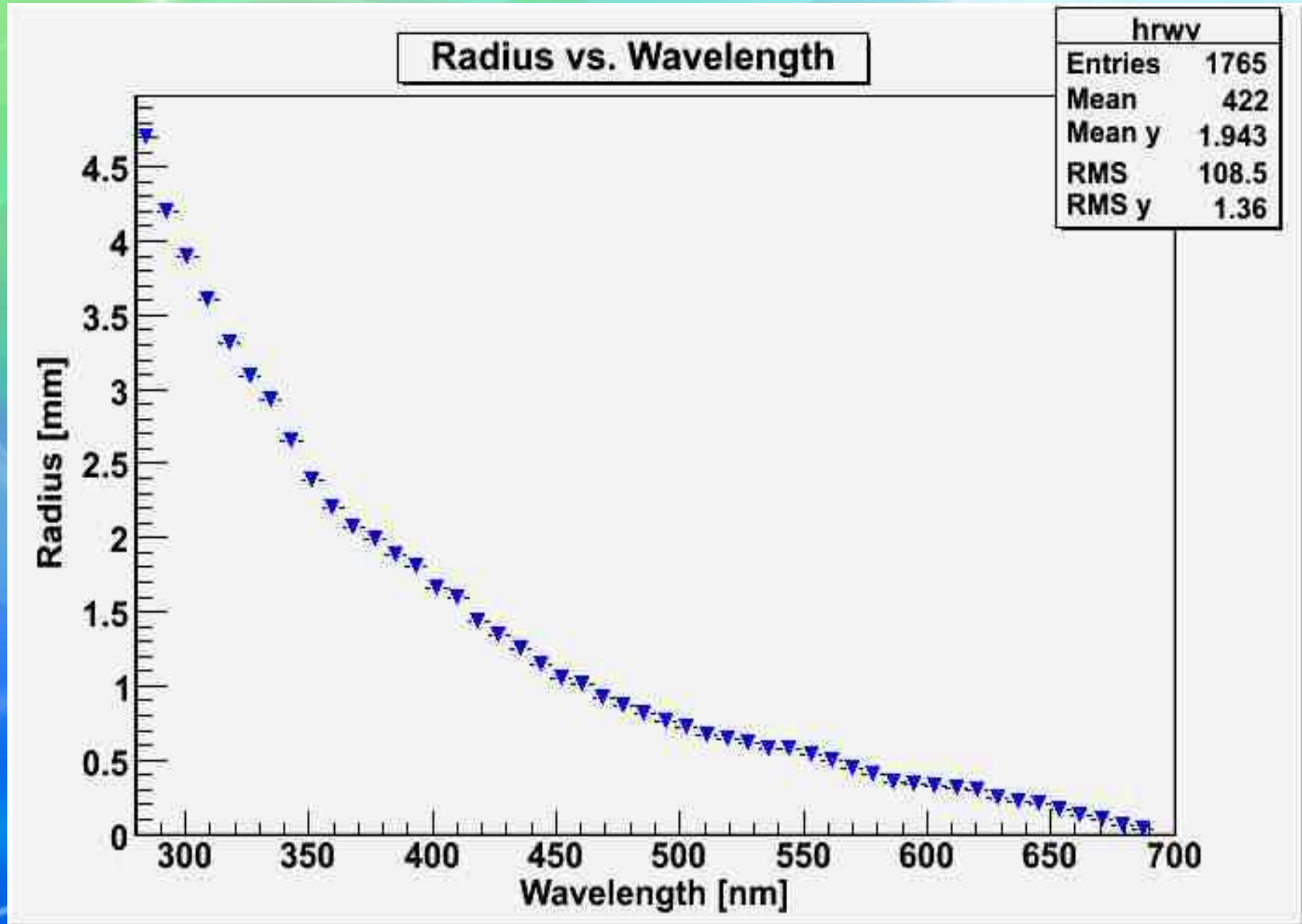
Profile plot of $t(\text{wavelength})$



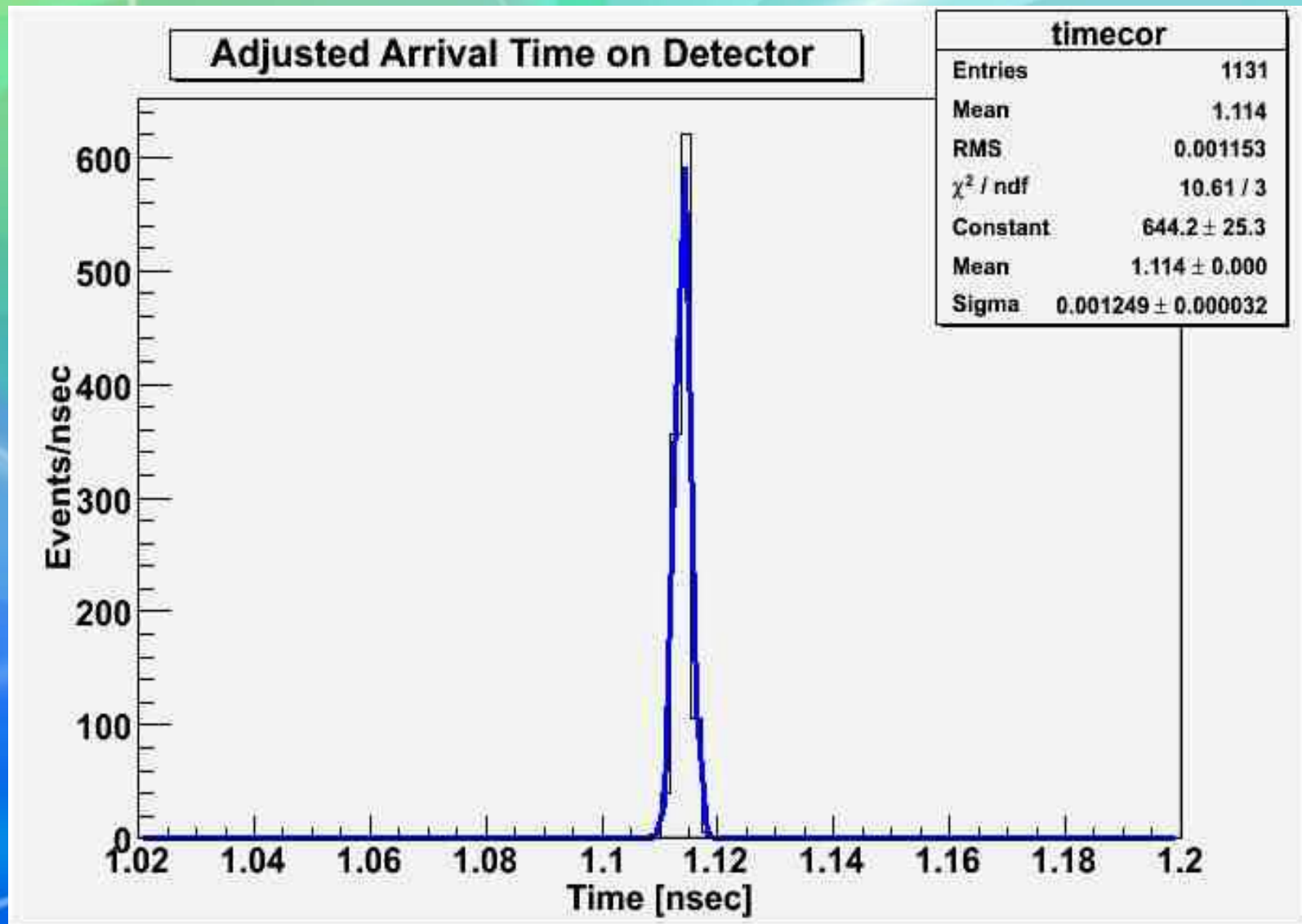
Radius as a function of wavelength



Profile plot of previous graph

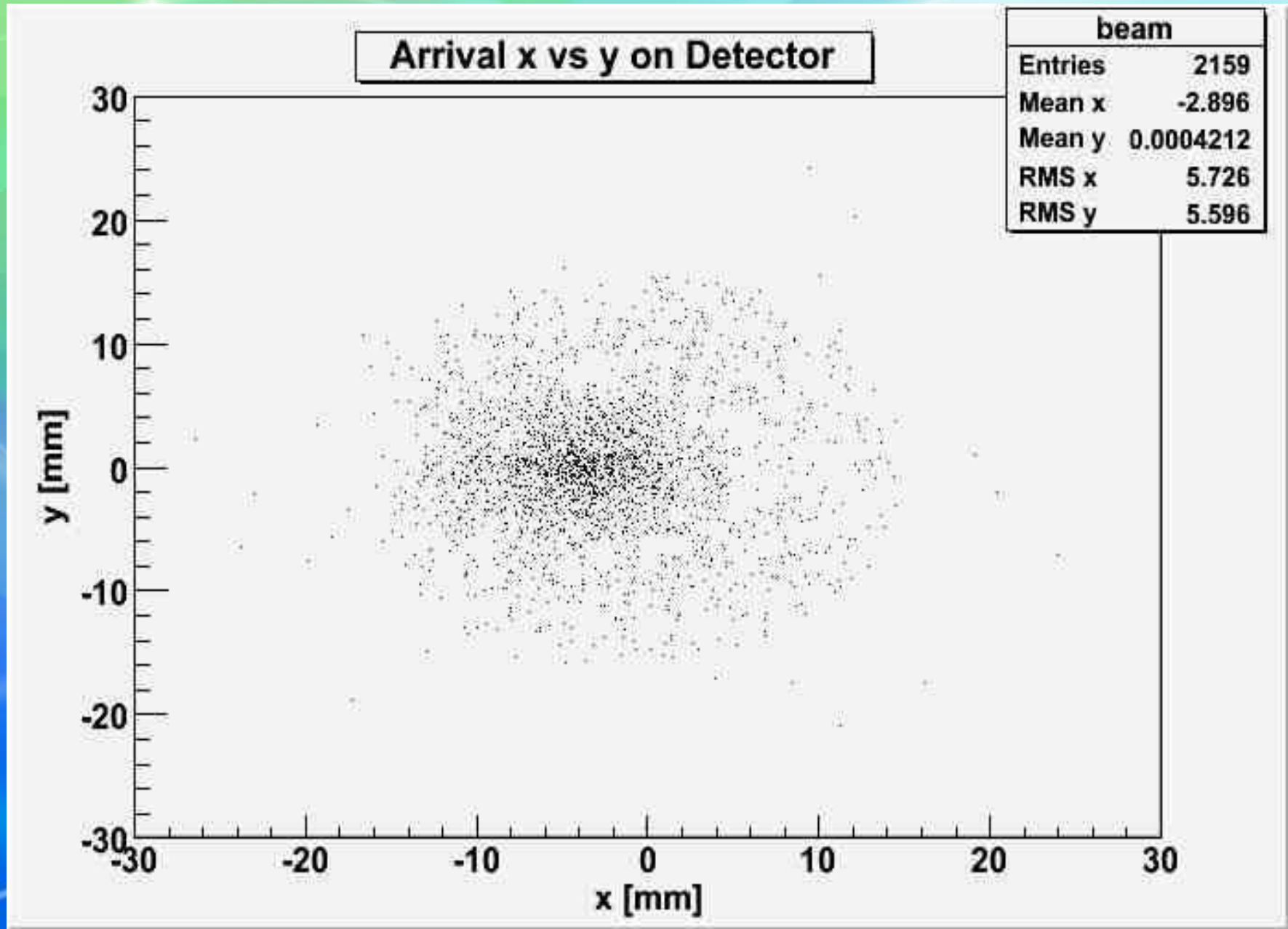


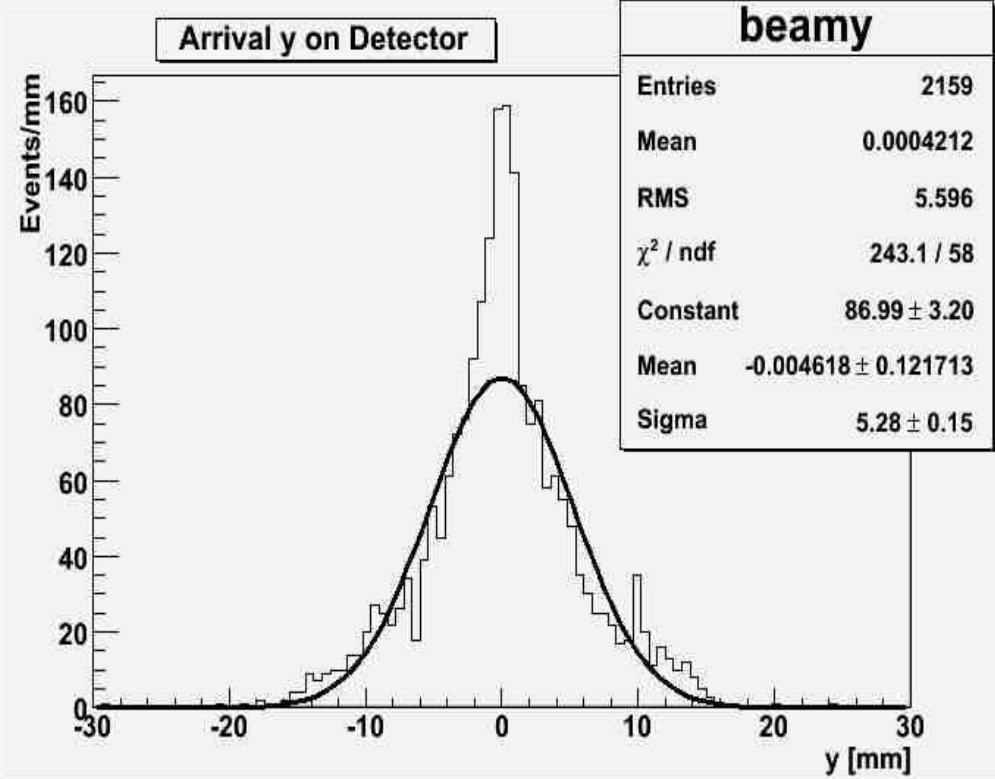
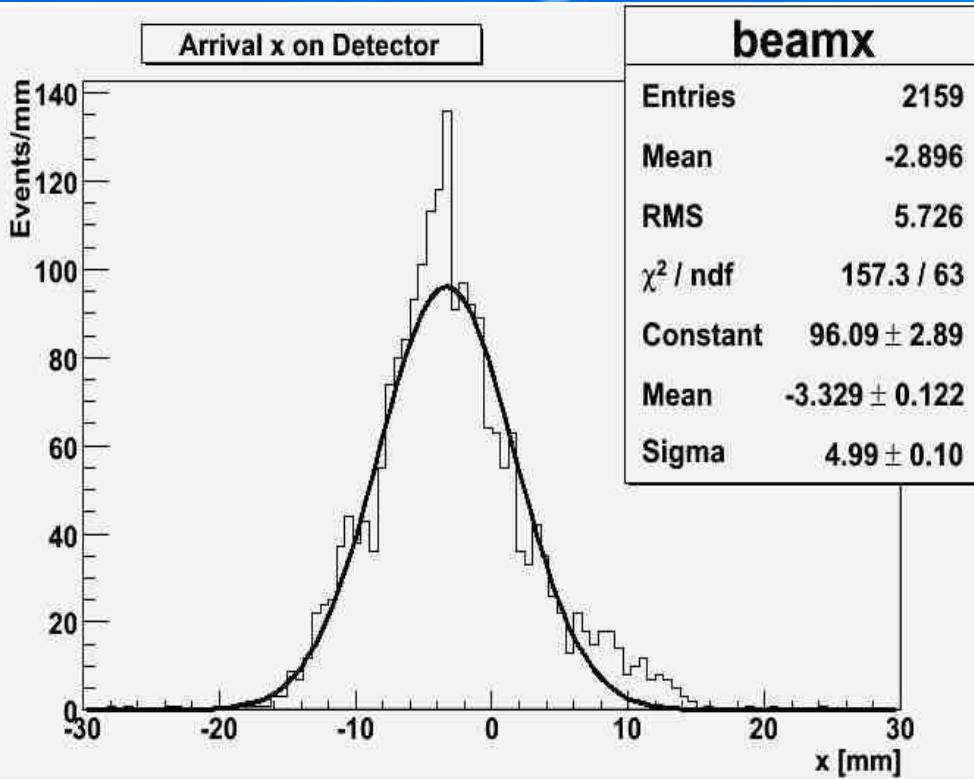
Arrival Time within $r=4$ mm, adjusted by $t(r)$



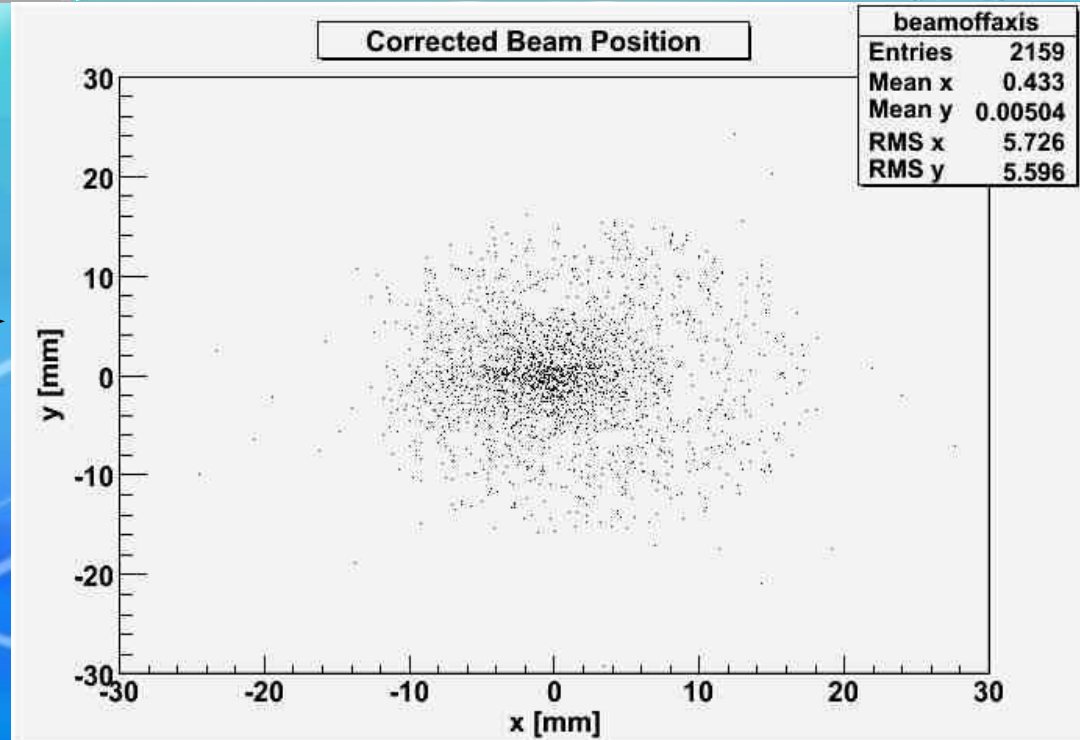
First Results using off-axis beam
0.5 mm up from origin

Beam Position on Detector

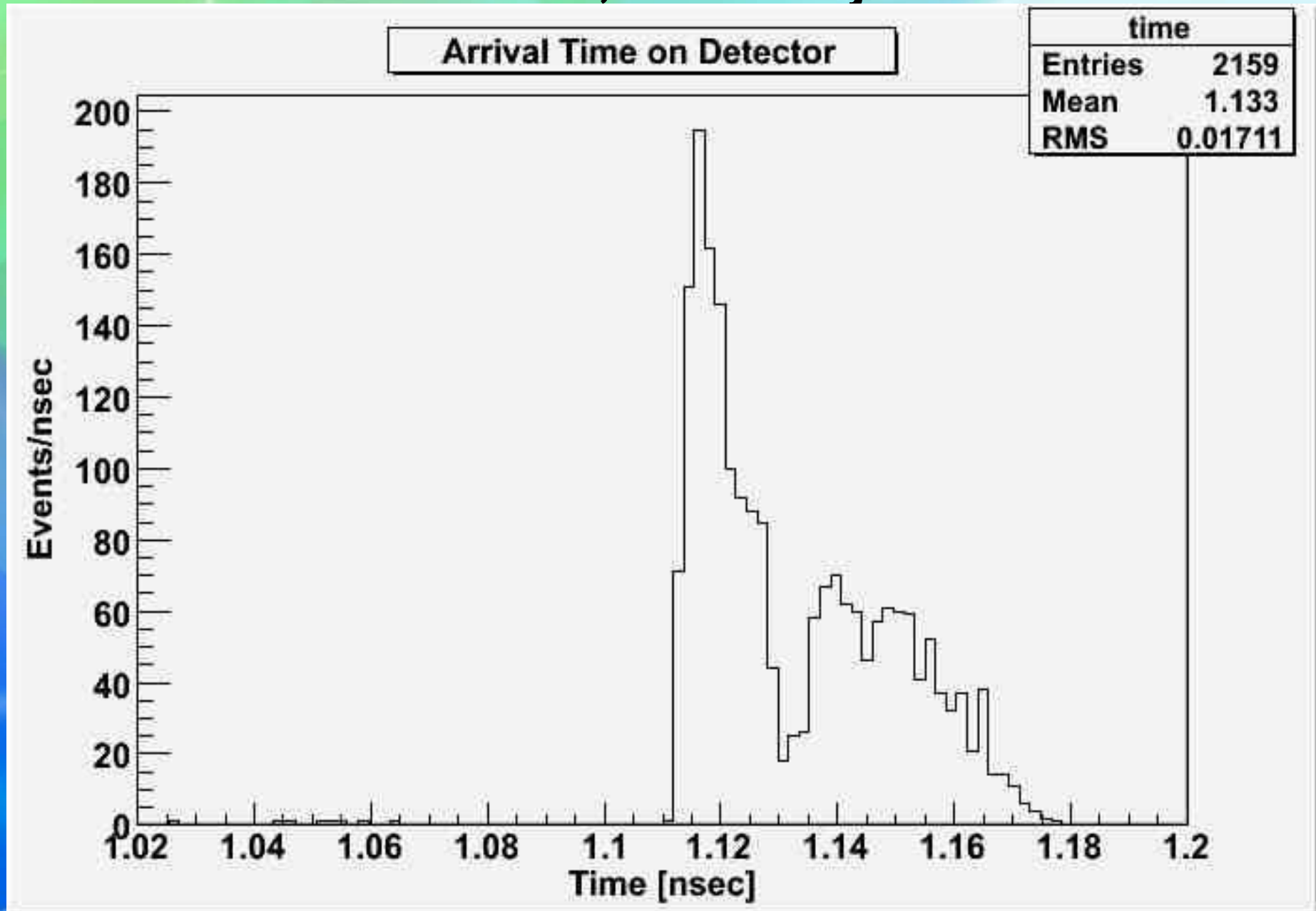




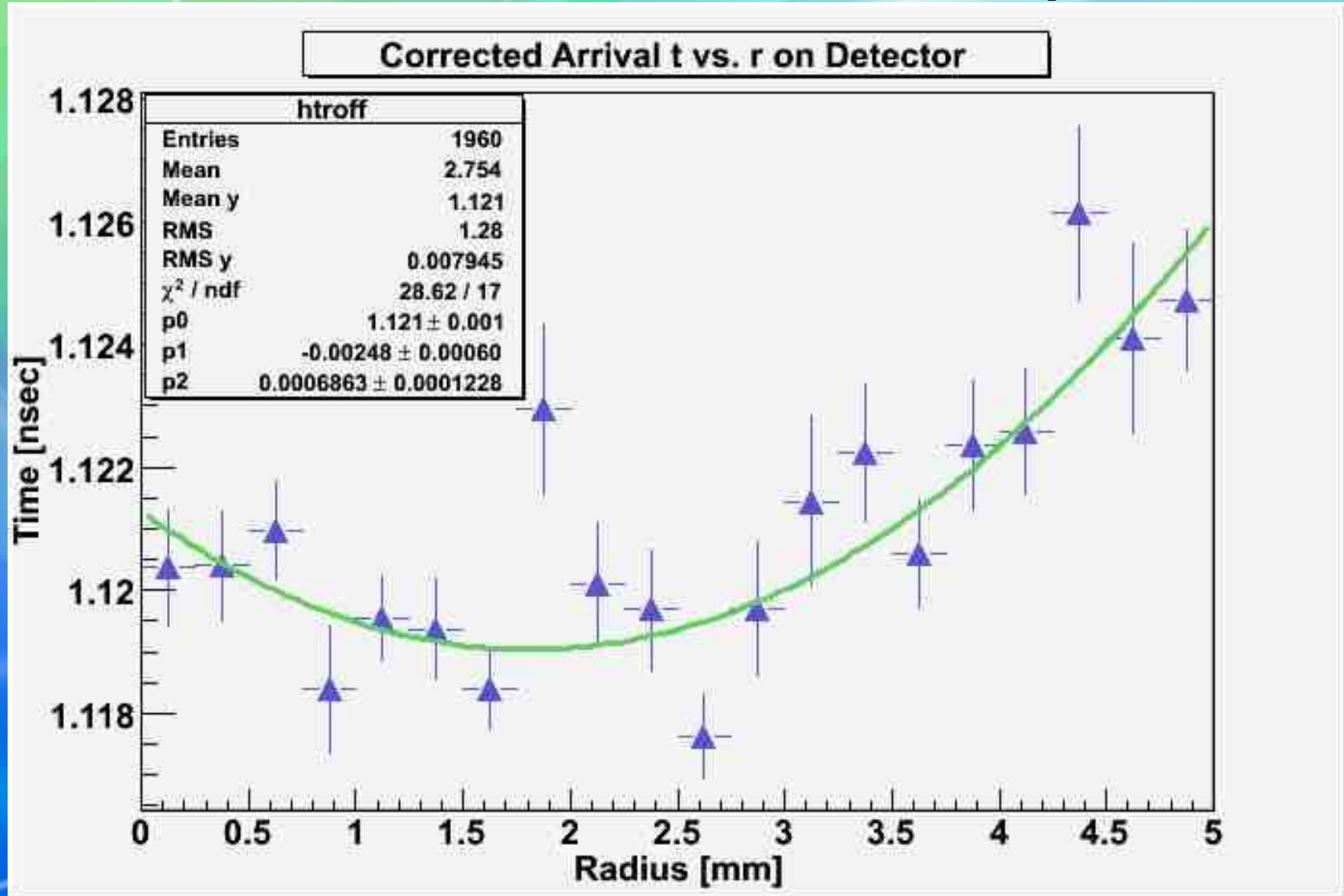
New position = (x,y) -
 (Gaussian mean of x,
 Gaussian mean of y)



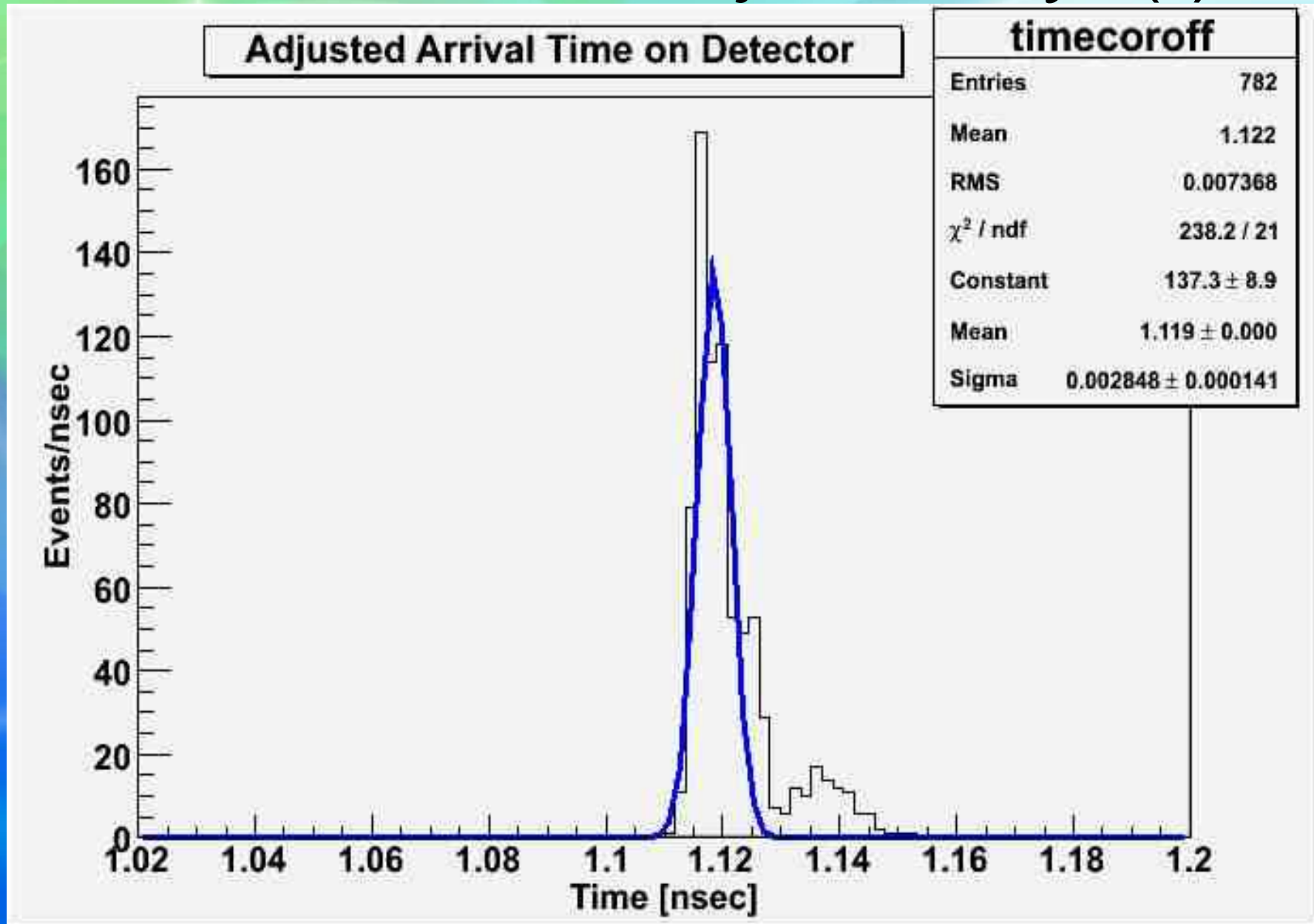
Arrival Time, no adjustments



Arrival time as a function of r (radius corrected for beam position)



Arrival Time adjusted by $t(r)$



To Do List

- Understand off-axis behavior
- Change full-cone to half-cone
- Automate root files (graphs, histograms)
- Intern presentation either July 28 or 29