HRS Data Analysis Issues

Dustin McNulty
UMass
mcnulty@jlab.org

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HRS Data Analysis Issues

- VDC Checkout (s0 triggers, low current/thin target)

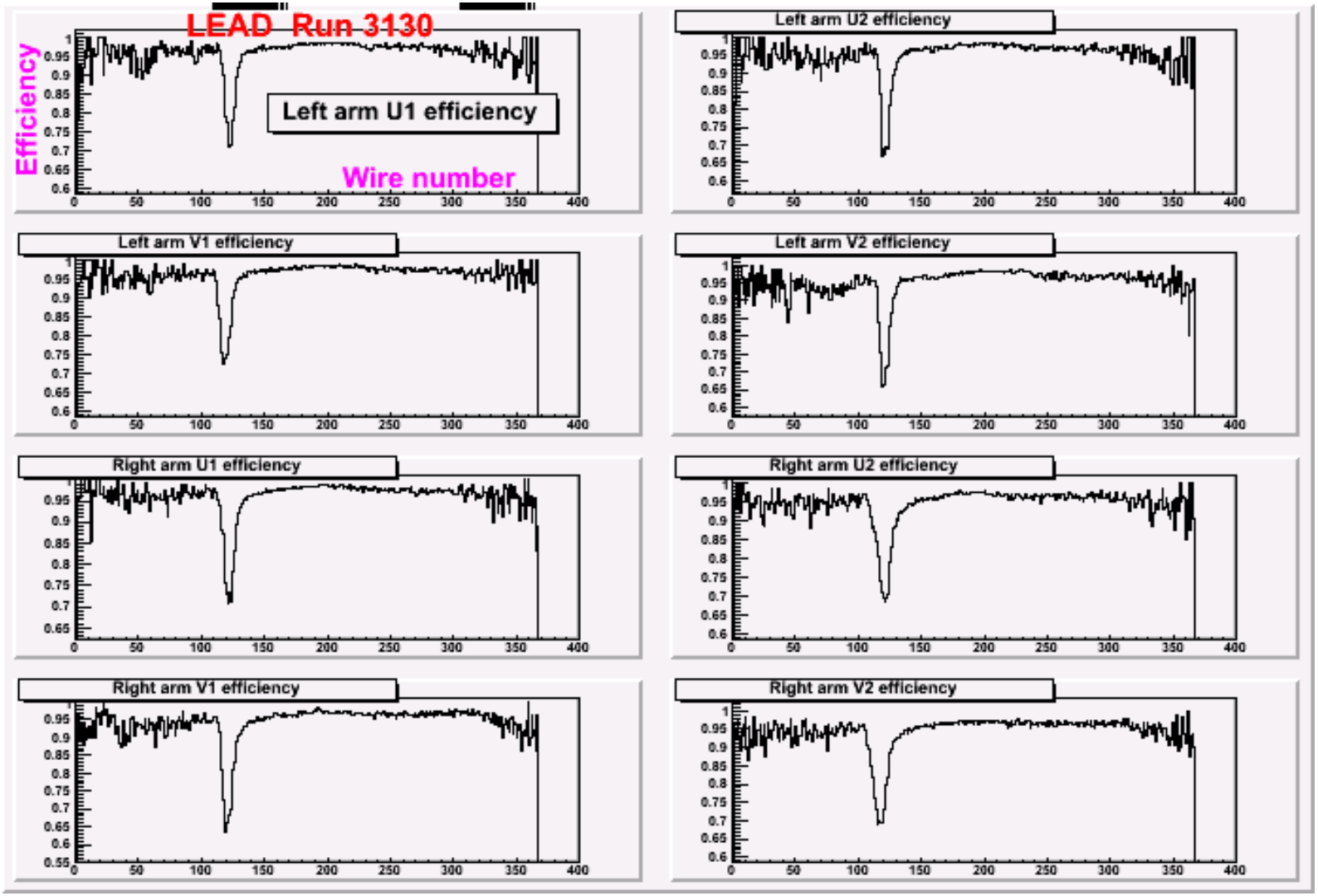
  →Use white spectrum and measure VDC wire hit occupancies: U,V planes in VDCs 1 & 2 (plots from standard analyzer)

  →Measure VDC rate dependence for different currents (simple macro uses total triggers/clock for normalization)

  →Examine VDC efficiencies for above rate measurements (plots from standard analyzer)

  →Characterize collimator (A_T hole unblocked): Examine target positions and angles using LeRose reverse transport matrices ...see outline of collimator shape (some questions here)

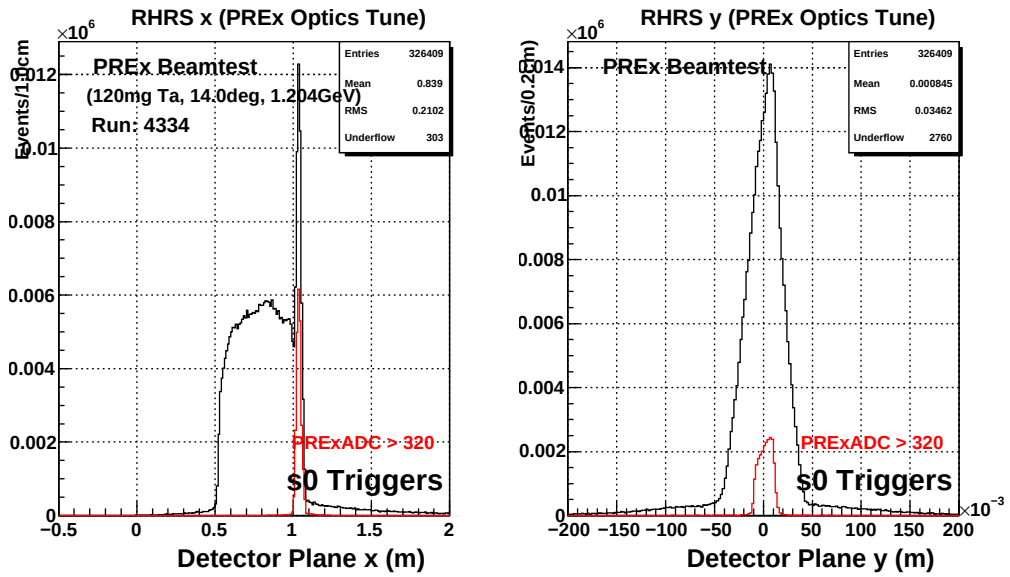
VDC Efficiencies (2005 Lead Test, cold septum)

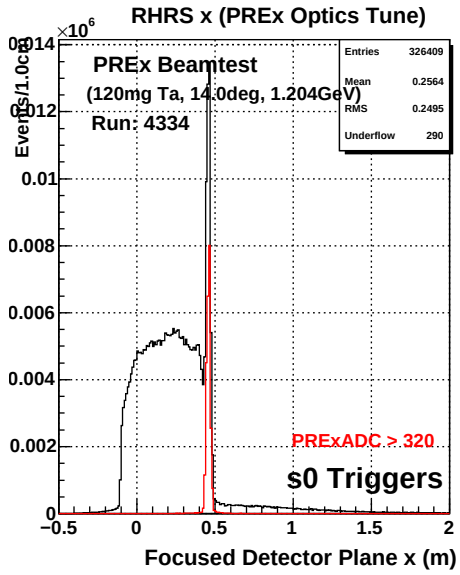


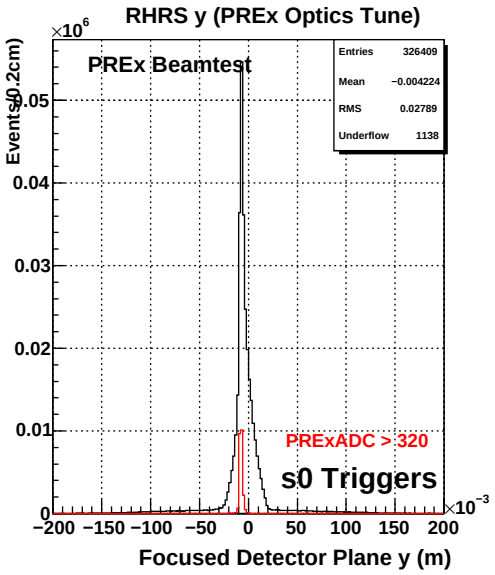
HRS Data Analysis Issues

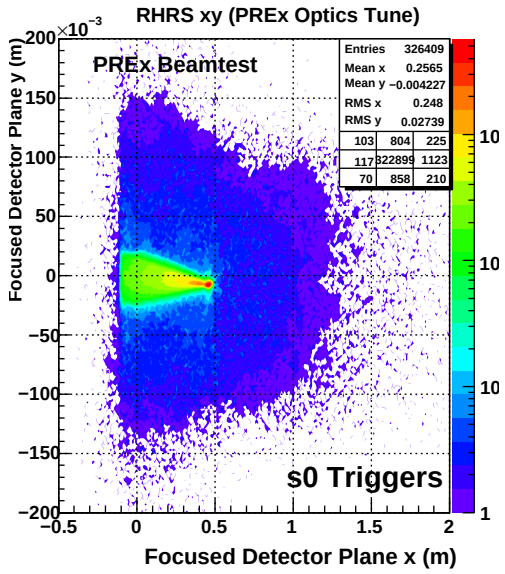
- PREx Optics Tune Characterization (s0 trigs, low current/thin tgts)

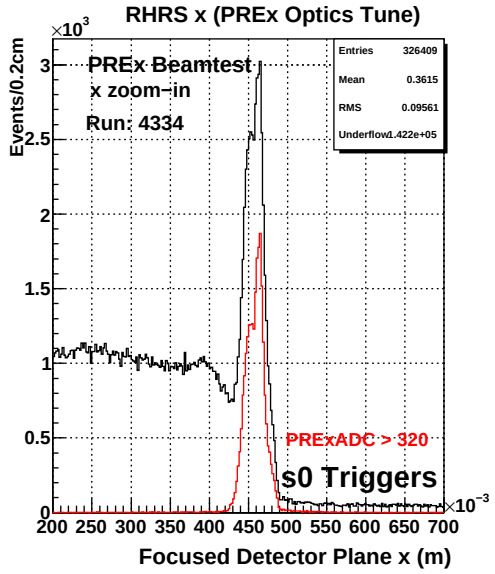
  →Examine VDC xy spectra at a few downstream z-transport locations – verify y-focusing effect and quantify xy size of elastic peak focus at primary quartz detector location (online macros in hand)


RHRS x (PREx Optics Tune)
PREx Beamtest
(120mg Ta, 14.0deg, 1.204GeV)
Run: 4334
Entries 326409
Mean 0.839
RMS 0.2102
Underflow 303
PRExADC > 320
s0 Triggers
Events/1.0cm
Detector Plane x (m)
RHRS y (PREx Optics Tune)
PREx Beamtest
Entries 326409
Mean 0.000845
RMS 0.03462
Underflow 2760
PRExADC > 320
s0 Triggers
Events/0.2cm
Detector Plane y (m)
RHRS xy (PREx Optics Tune)
PREx Beamtest
Entries 326409
Mean x 0.8389
Mean y 0.0008606
RMS x 0.2051
RMS y 0.03364
119 2184 340
83 317682 3241
101 2328 331
s0 Triggers
Detector Plane y (m)
Detector Plane x (m)
RHRS x (PREx Optics Tune)
PREx Beamtest
x zoom-in
Run: 4334
Entries 326409
Mean 0.9514
RMS 0.09186
Underflow 1.438e+05
PRExADC > 320
s0 Triggers
Events/0.2cm
Detector Plane x (m)


RHRS x (PREx Optics Tune)
PREx Beamtest
(120mg Ta, 14.0deg, 1.204GeV)
Run: 4334
Entries 326409
Mean 0.2564
RMS 0.2495
Underflow 290
PREx ADC > 320
s0 Triggers
Events/1.0cm
Focused Detector Plane x (m)


RHRS y (PREx Optics Tune)
PREx Beamtest
Entries 326409
Mean −0.004224
RMS 0.02789
Underflow 1138
PREx ADC > 320
s0 Triggers
Events/0.2cm
Focused Detector Plane y (m)


RHRS xy (PREx Optics Tune)
PREx Beamtest
Entries 326409
Mean x 0.2565
Mean y −0.004227
RMS x 0.248
RMS y 0.02739
s0 Triggers
Focused Detector Plane y (m)
Focused Detector Plane x (m)


RHRS x (PREx Optics Tune)
PREx Beamtest
x zoom−in
Run: 4334
Entries 326409
Mean 0.3615
RMS 0.09561
PREx ADC > 320
s0 Triggers
Events/0.2cm
Focused Detector Plane x (m)

HRS Data Analysis Issues

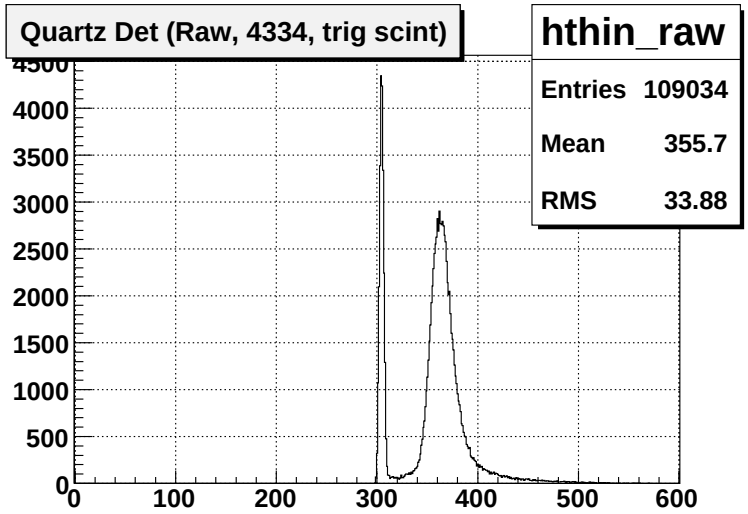
- Quartz Detector Checkout (s0 or s1m trigs, low current/thin tgts)

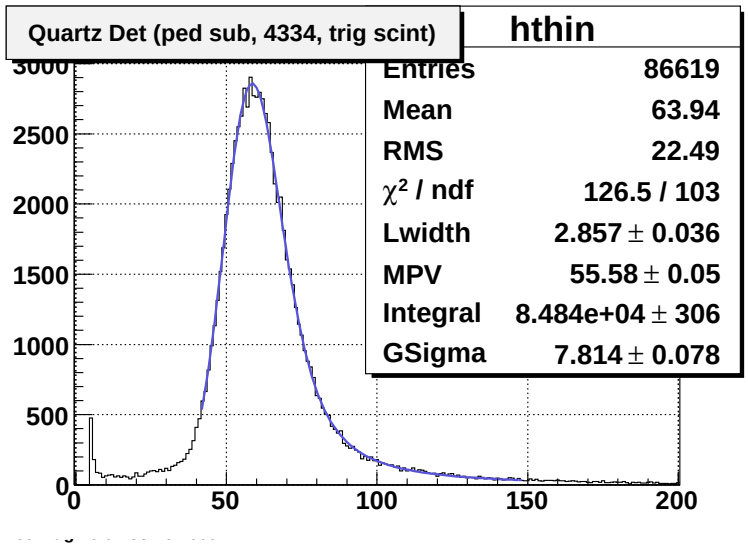
  →Measure pulse height distributions, perhaps for both 6mm and 10mm thick detectors (online macros in hand): Use Gaussian-Landau convolution fit to quantify high-energy tail and error inflation due to RMS blowup

  →Map shadows of quartz (both primarys and A_T detector) in VDCs (online macros in hand): Project VDC hit coords of full spectrum and quartz shadows (using ADC cuts obtained from PHDs) to detector locations – efficiency and alignment

  →Calibrate detector x-y movers in VDC coordinates. Use above macro combined with short data runs interleaved with discrete detector moves in x and y separately. Maybe use white spectrum here?

Pulse Height Dists from Aug09 PREx Tests)





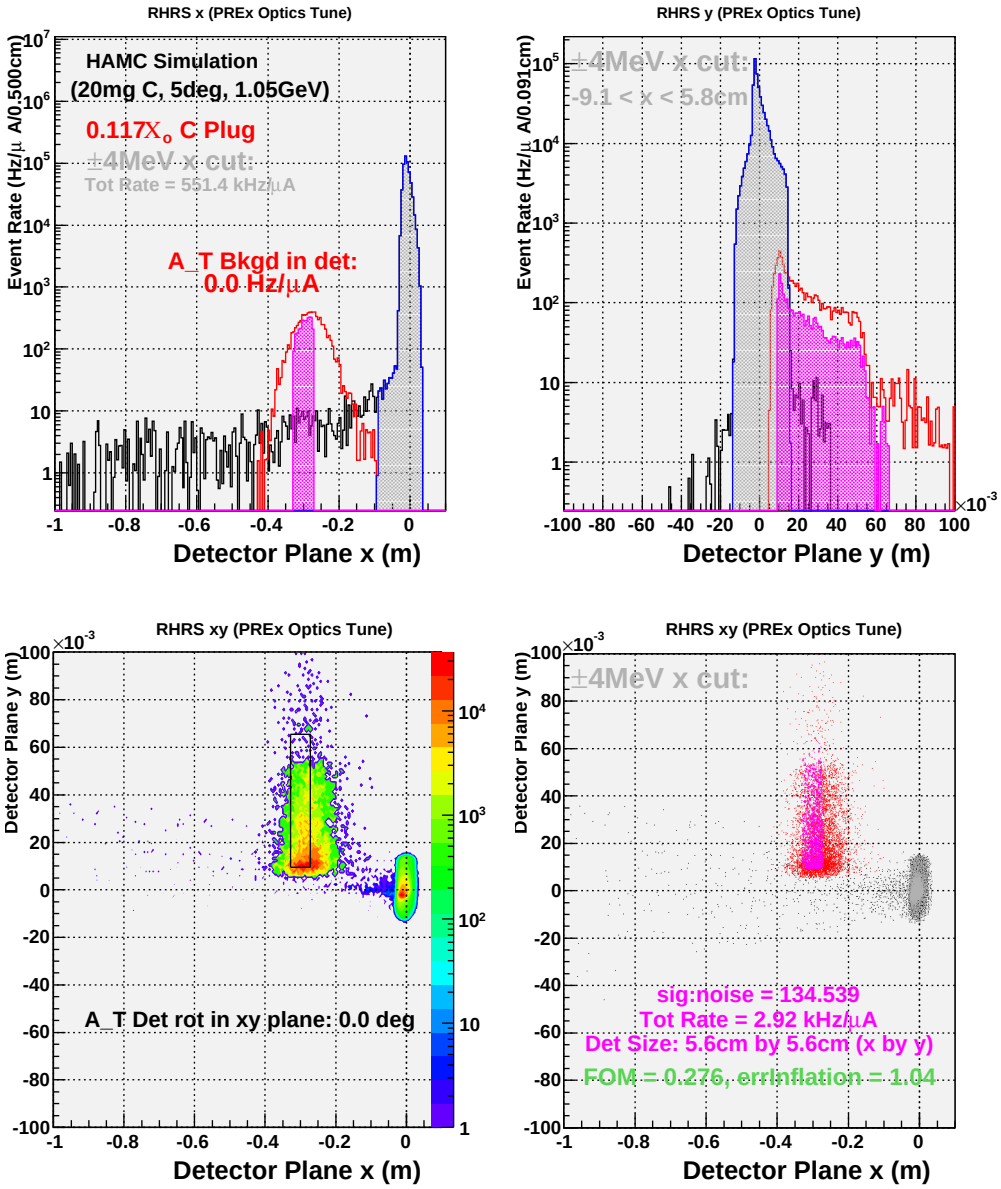
HRS Data Analysis Issues

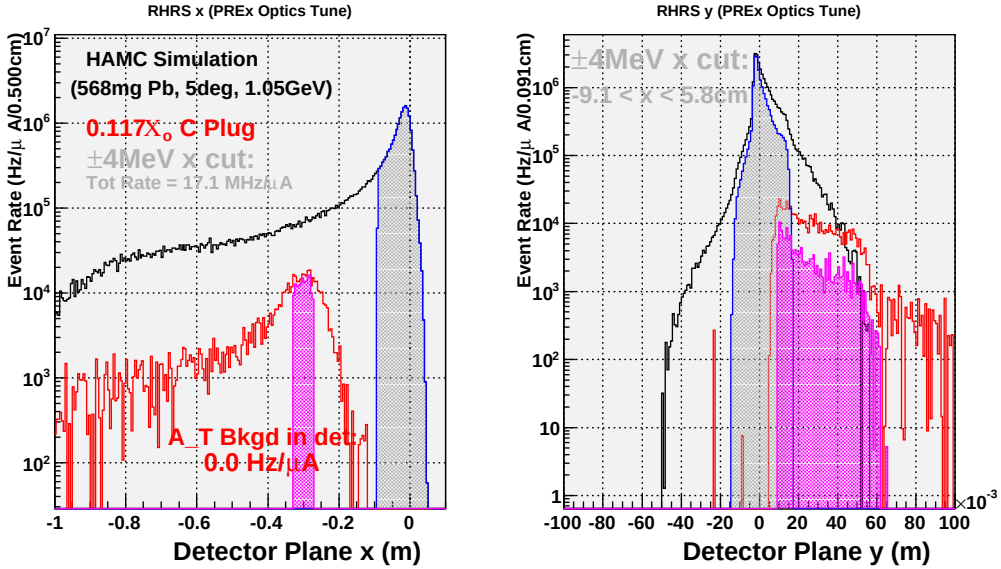
- A_T Hole Characterization (s0 or s1m triggers & quartz scalers)

  →Determine optimal placement of A_T detectors:
  Use low current/thin target; map out A_T hole peak using x-y movers and A_T det scaler rate readout (hole unblocked).
  Repeat using thick Pb (very low current, no cooling yet!)

  →Take 2 shift access to block A_T hole. Then:
  Map out thick Pb radiative tail in vacinity of A_T events using x-y movers and A_T det scaler rates – gives A_T det signal background needed for "sampling DAQ" FoM calculation (low currents, still no cooling)

  →Decide if we will use A_T hole unblocked for the run. If so, use Monte Carlo to translate optimal A_T det position for thin target to that for thick Pb (they are slightly different)


RHRS x (PREx Optics Tune)
HAMC Simulation
(20mg C, 5deg, 1.05GeV)
0.117X$_o$ C Plug
±4MeV x cut:
Tot Rate = 551.4 kHz/μA
A_T Bkgd in det:
0.0 Hz/μA
Event Rate (Hz/μ A/0.500cm)
Detector Plane x (m)
RHRS y (PREx Optics Tune)
±4MeV x cut:
-9.1 < x < 5.8cm
Event Rate (Hz/μ A/0.091cm)
Detector Plane y (m)
RHRS xy (PREx Optics Tune)
A_T Det rot in xy plane: 0.0 deg
Detector Plane y (m)
Detector Plane x (m)
RHRS xy (PREx Optics Tune)
±4MeV x cut:
sig:noise = 134.539
Tot Rate = 2.92 kHz/μA
Det Size: 5.6cm by 5.6cm (x by y)
FOM = 0.276, errInflation = 1.04
Detector Plane y (m)
Detector Plane x (m)


RHRS x (PREx Optics Tune)
HAMC Simulation
(568mg Pb, 5deg, 1.05GeV)
0.117X$_o$ C Plug
±4MeV x cut:
Tot Rate = 17.1 MHz/μA
A_T Bkgd in det.
0.0 Hz/μA
Event Rate (Hz/μ A/0.500cm)
Detector Plane x (m)
RHRS y (PREx Optics Tune)
±4MeV x cut:
-9.1 < x < 5.8cm
Event Rate (Hz/μ A/0.091cm)
Detector Plane y (m)
RHRS xy (PREx Optics Tune)
A_T Det rot in xy plane: 0.0 deg
Detector Plane y (m)
Detector Plane x (m)
RHRS xy (PREx Optics Tune)
±4MeV x cut:
sig:noise = 0.749
Tot Rate = 0.15 MHz/μA
Det Size: 5.6cm by 5.6cm (x by y)
FOM = 0.326, errinflation = 1.05
Detector Plane y (m)
Detector Plane x (m)

HRS Data Analysis Issues

- Q^2 Measurements (Primary Quartz trigger, low current, prod tgt)

  →Establish Q^2 meas. procedure: (this is a major operation)

  –Switch quartz detectors to HRS sampling DAQ (access)

  –Set proper HVs in quartz dets, turn on HV in scints and VDCs

  –Swing GEMs into place and set proper HV (LV, and gas?)

  –Switch Cavities to low current operation

  –Set trigger prescales, for example, set T2/PS2= 1.2 - 1.5 kHz

  –Take data

  –With proper optics DB for GEM tracking to target coords recon, calibrated beam energy and HRS angles, and proper quartz ADC cuts, can use stadard analyzer plots for ∼online Q^2 determination