THE UNIVERSITY OF WARWICK

LEBT Alignment Data

John Back
University of Warwick

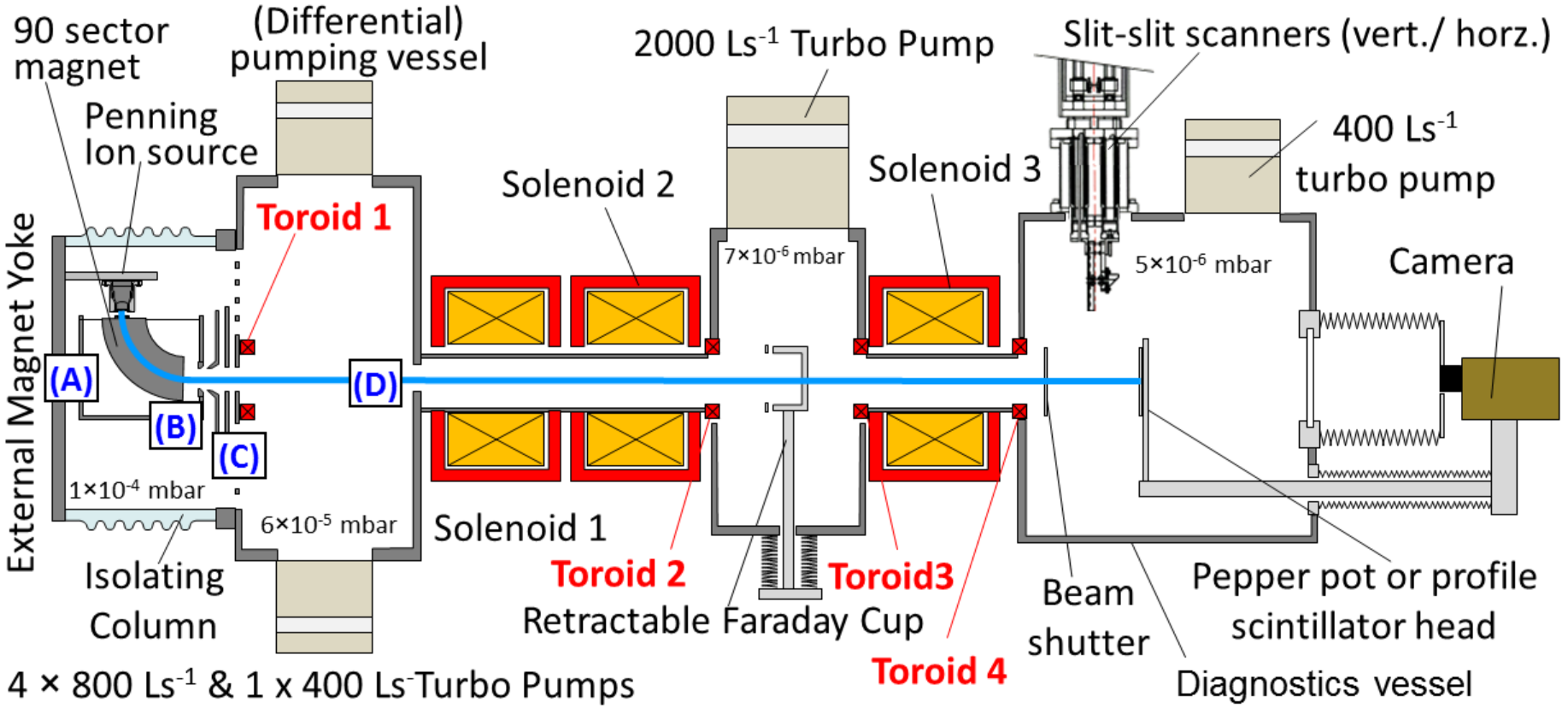
25th Sept 2013, FETS Mtg

Introduction

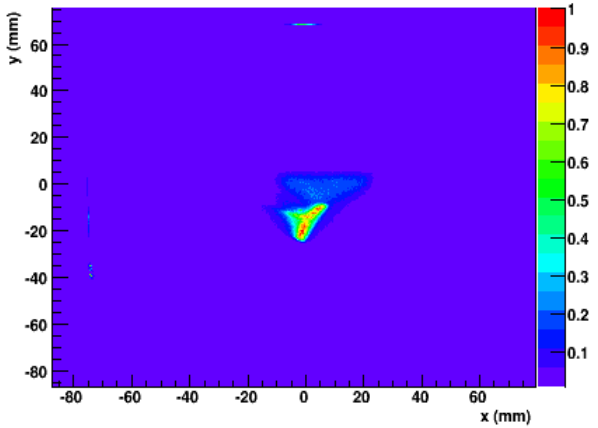
- Plots showing the beam core (x,y) and width at end of LEBT:
  - Investigation of effect of solenoids and dipoles using pencil beam:
    - 3 mm radius aperture inserted into post-acceleration section
  - 2D profile images from Quartz scintillator & CCD camera 240 mm from end of LEBT: fit Gaussian functions to get μ & σ
  - Results from August (& June) data alignment campaigns:

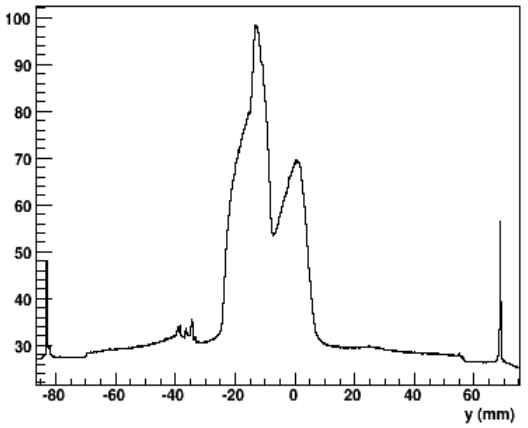
    Christoph, Dan and Scott
- Some comparisons with GPT simulation
  - Need to tilt B field maps in x and y ($\phi \sim \pm 10$ mr)
  - Using measured FETS field map (x-z plane): x-y symmetry
- Some of these results shown at ICIS'13 conference
- Labels on plots:
  - S1 = Solenoid 1, DV1 (DH1) = vertical (horizontal) dipole 1 etc...
  - Solenoids & dipoles current in Amps; minus sign = reversed polarity

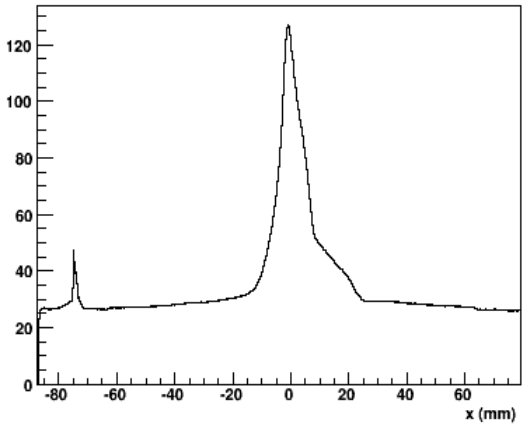
Ion source + LEBT set-up

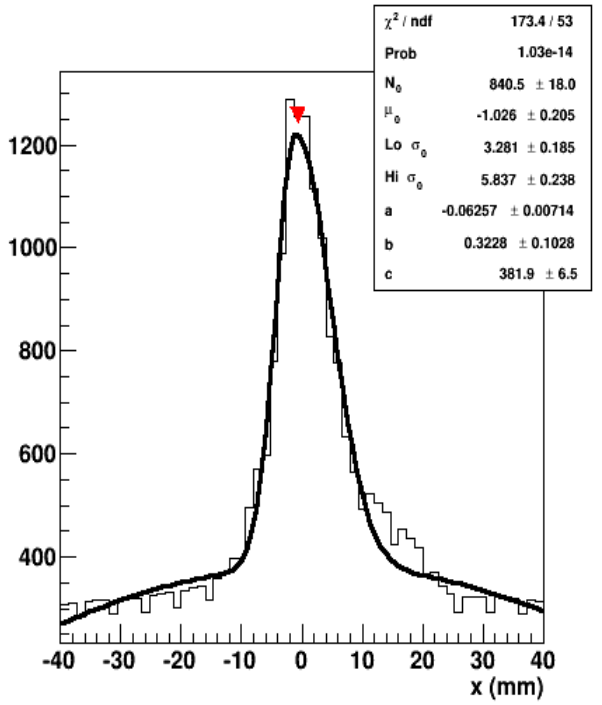


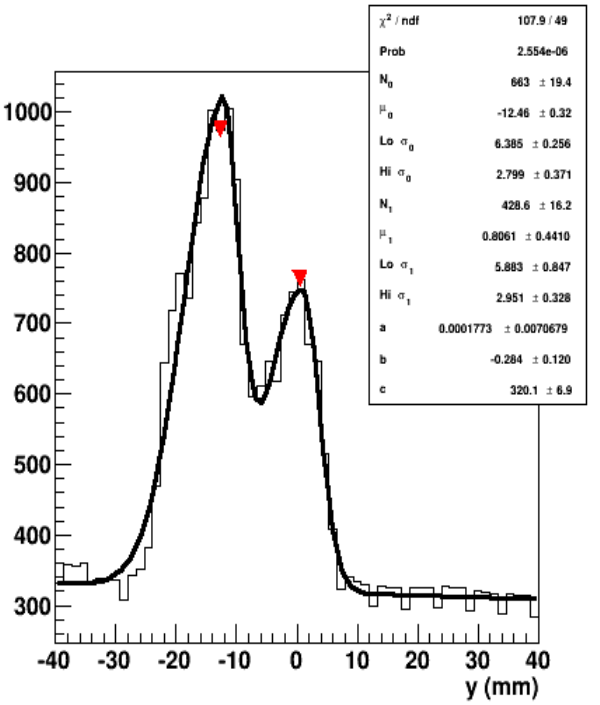
Example beam profile fit procedure





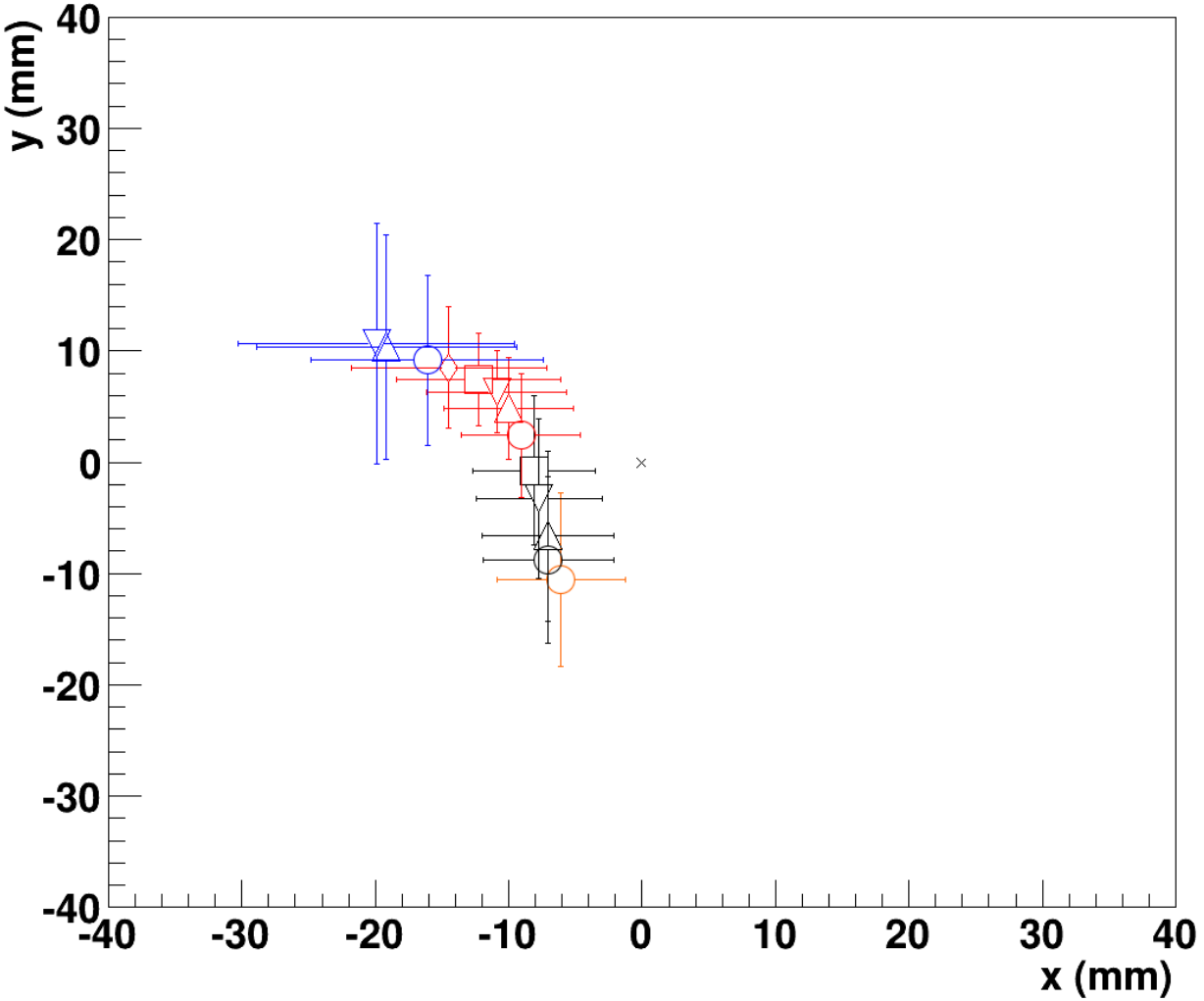


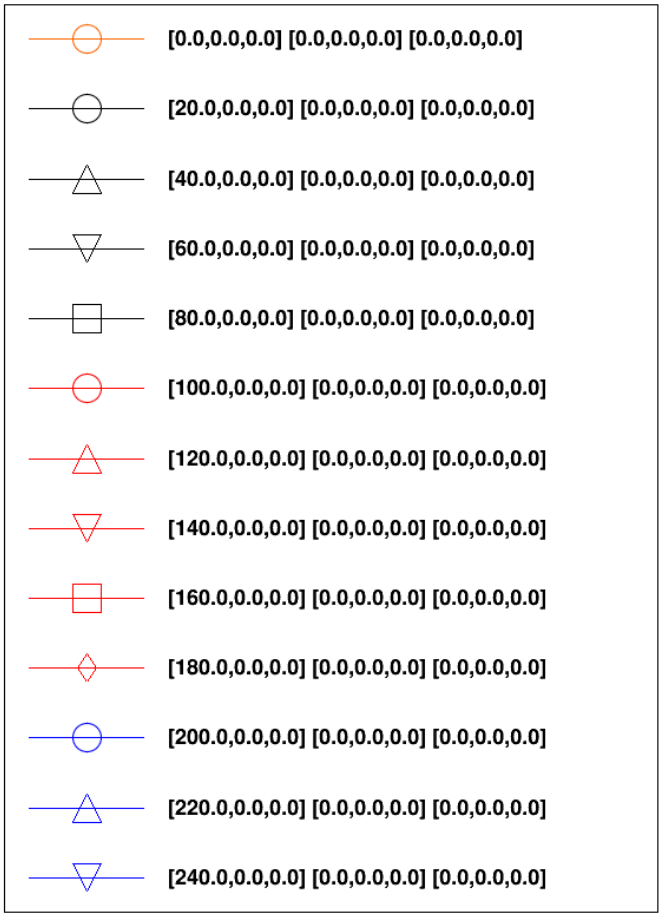




S1, 50 keV (August Data)

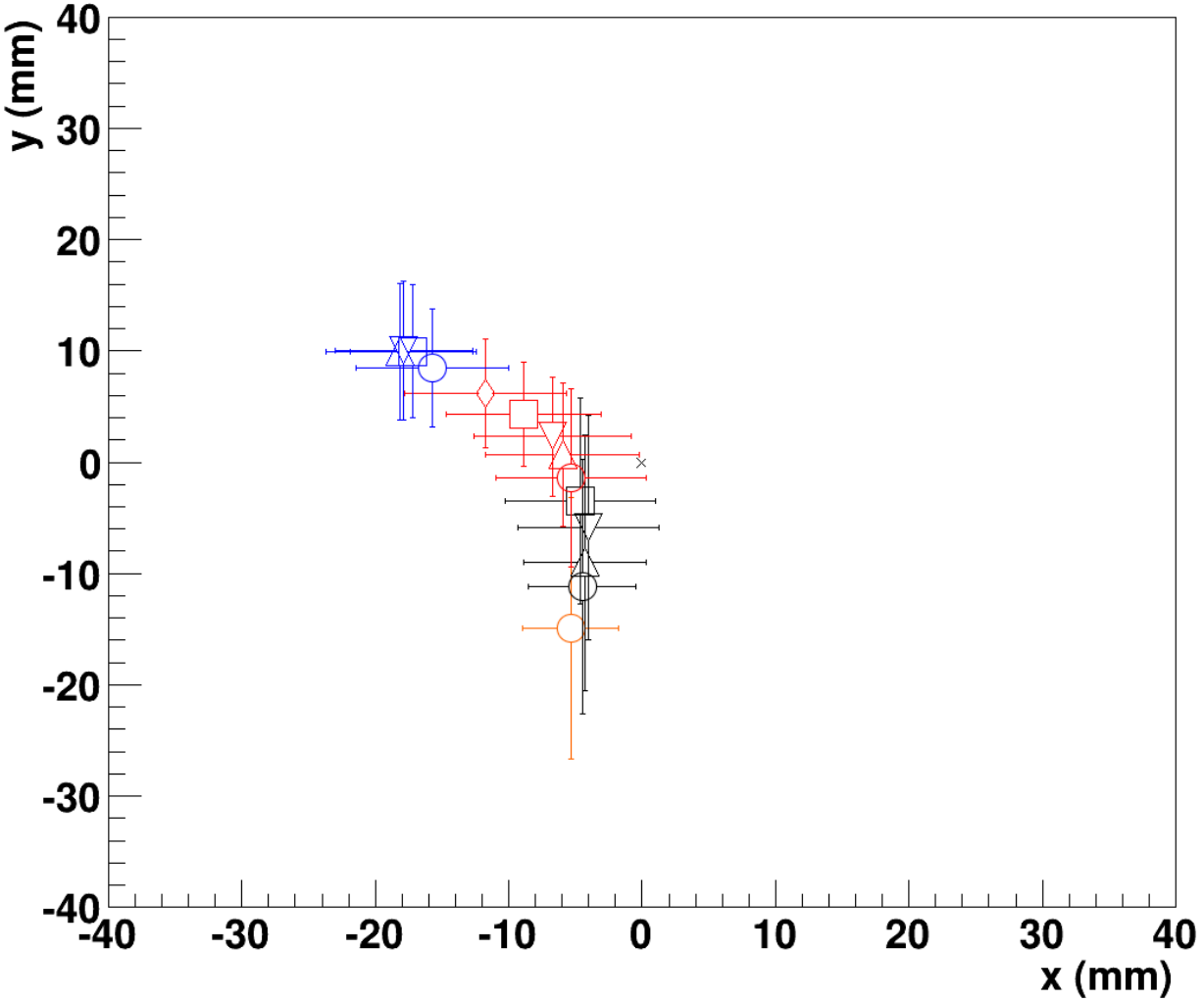
[Solenoid, Horiz Dipole, Vert Dipole]

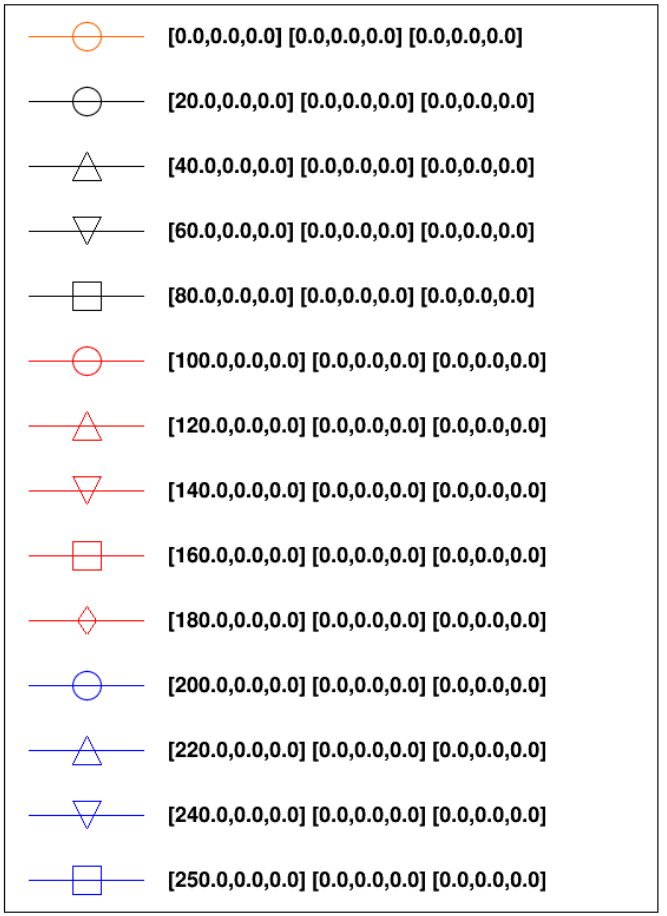




S1, 65 keV

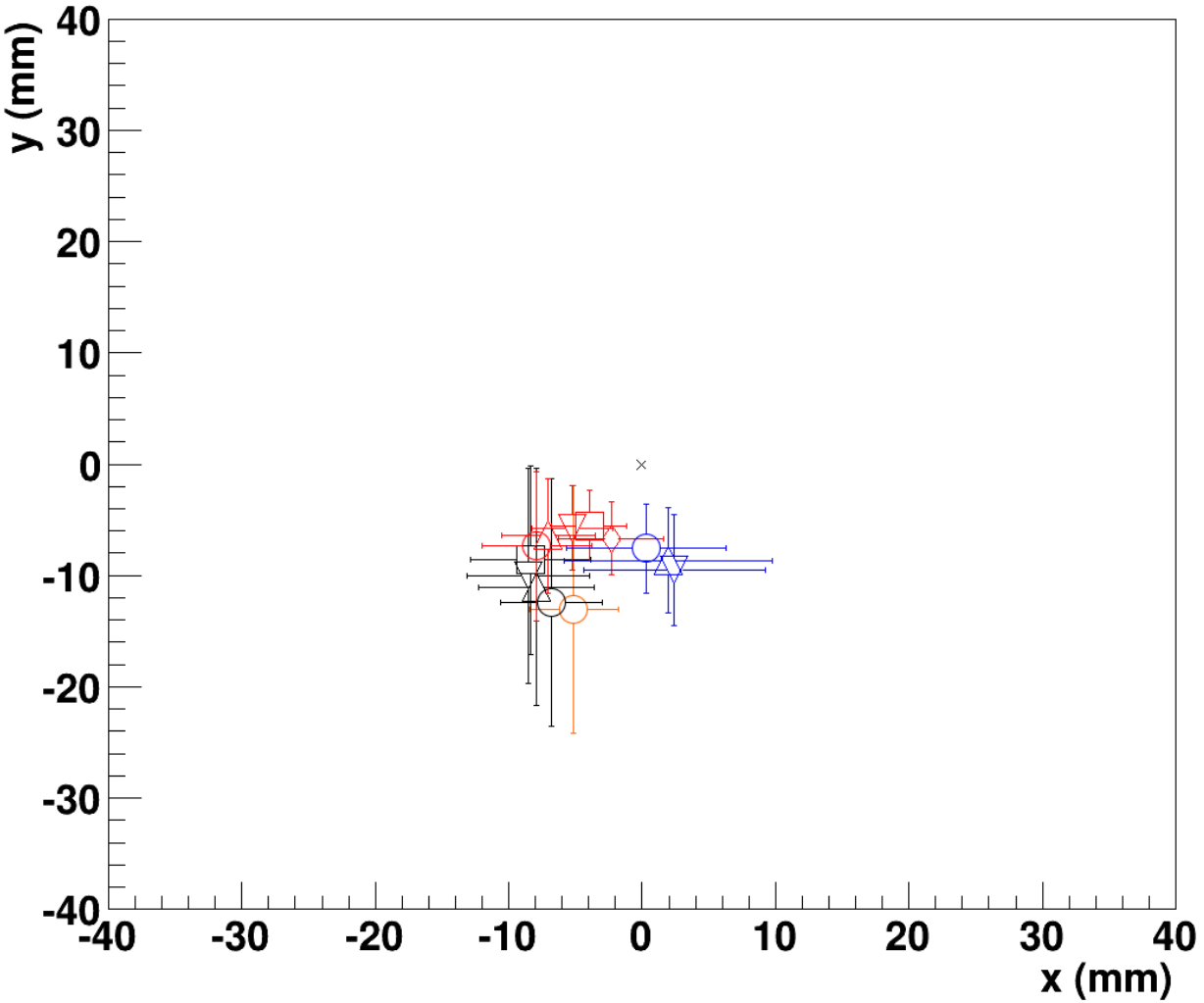
[Solenoid, Horiz Dipole, Vert Dipole]

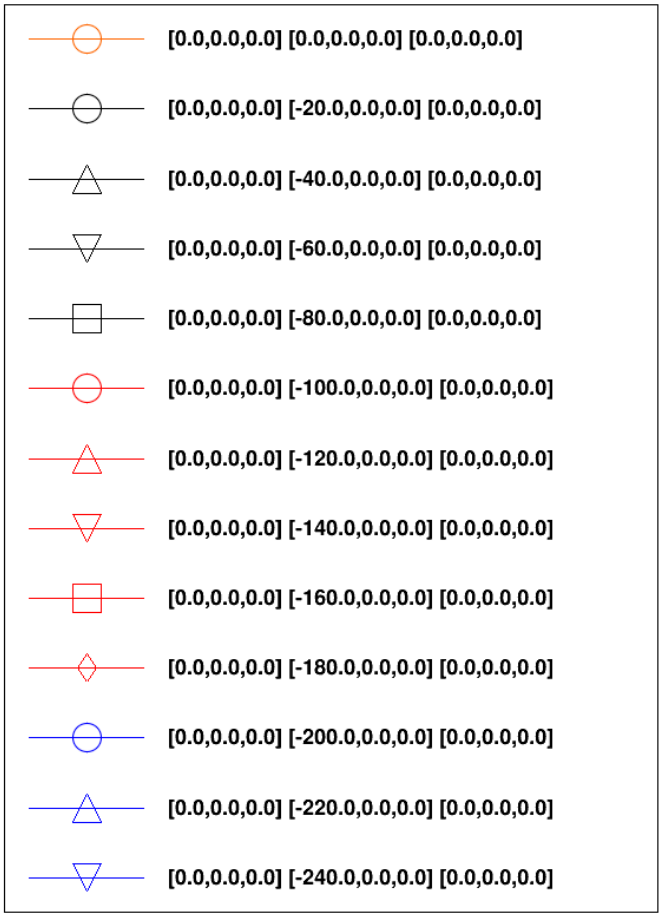




-S2, 65 keV

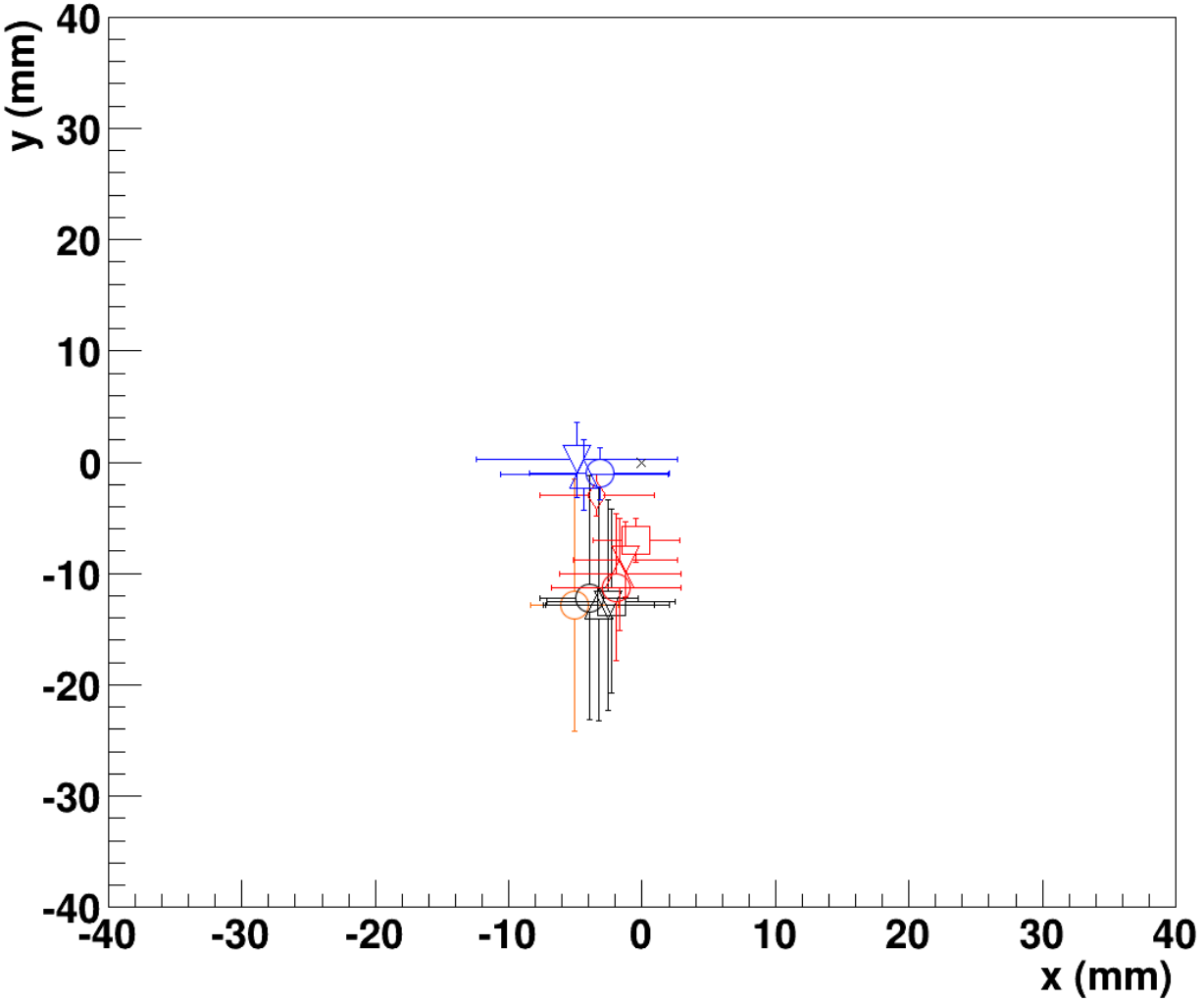
[Solenoid, Horiz Dipole, Vert Dipole]

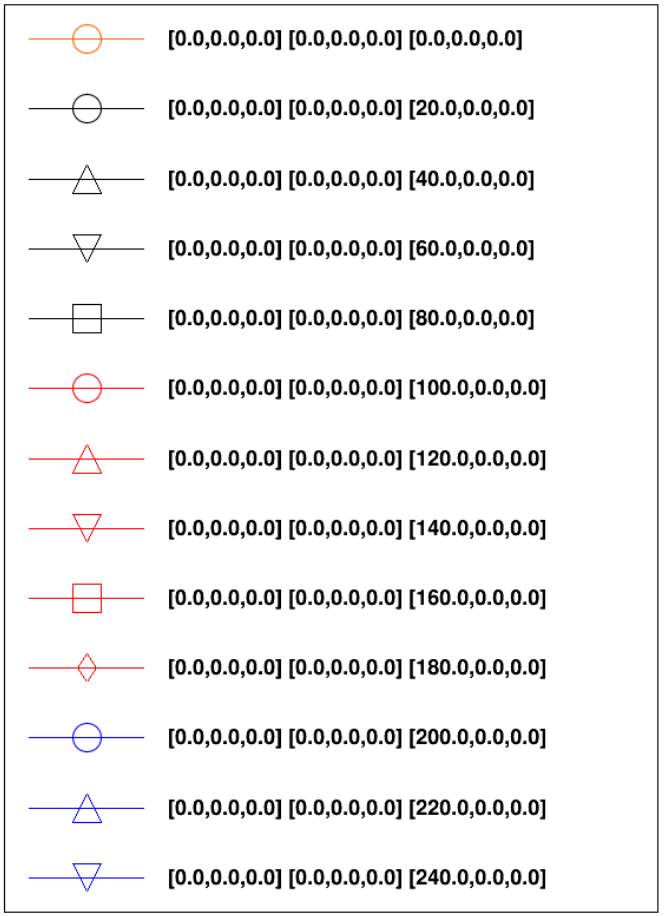




S3, 65 keV

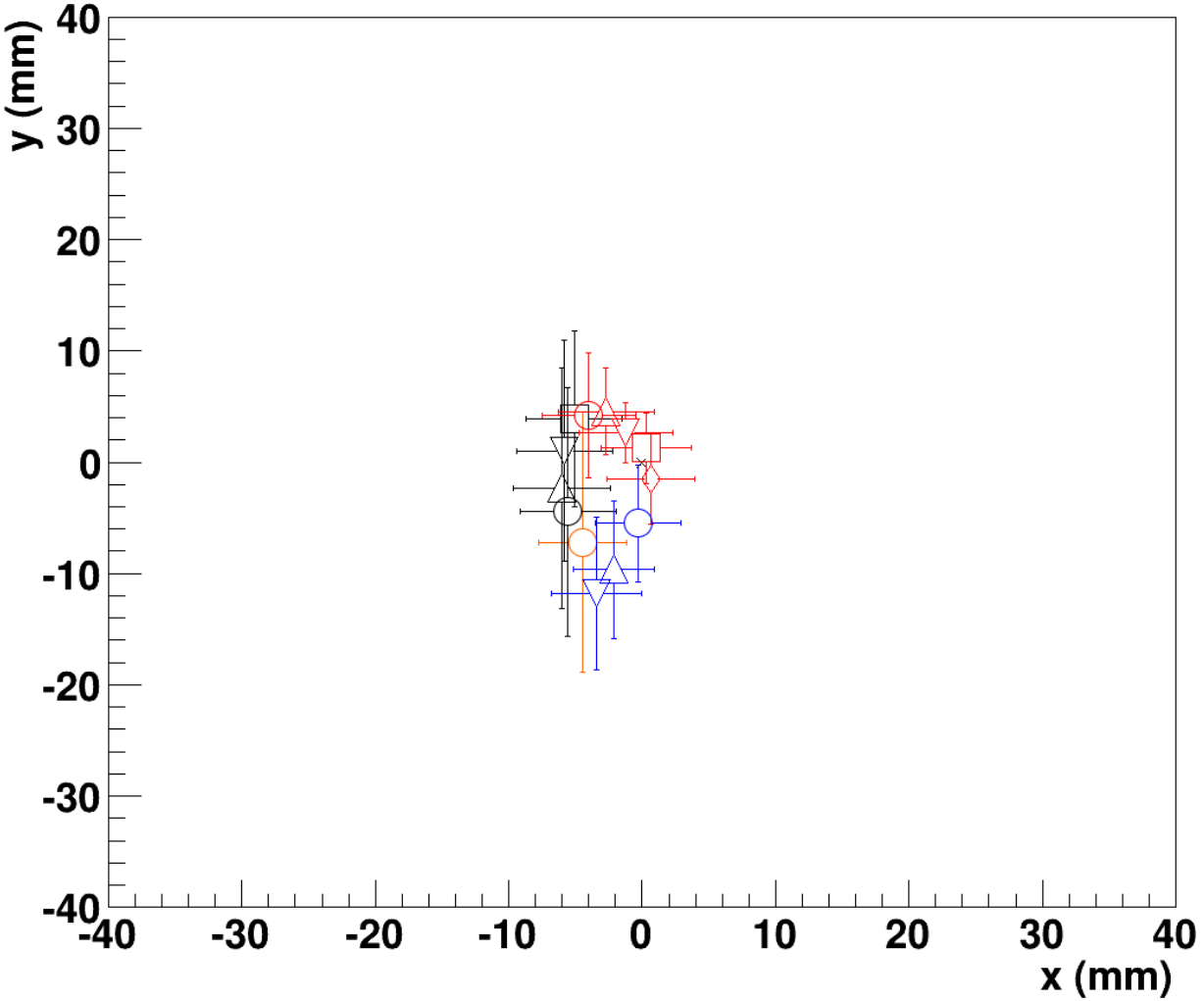
[Solenoid, Horiz Dipole, Vert Dipole]

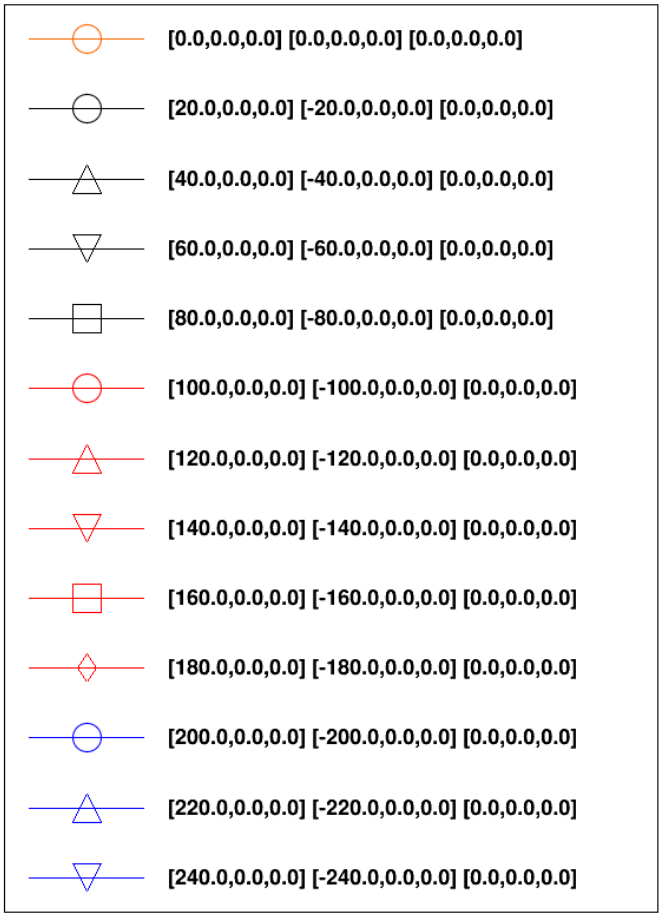




S1 -S2, 65 keV

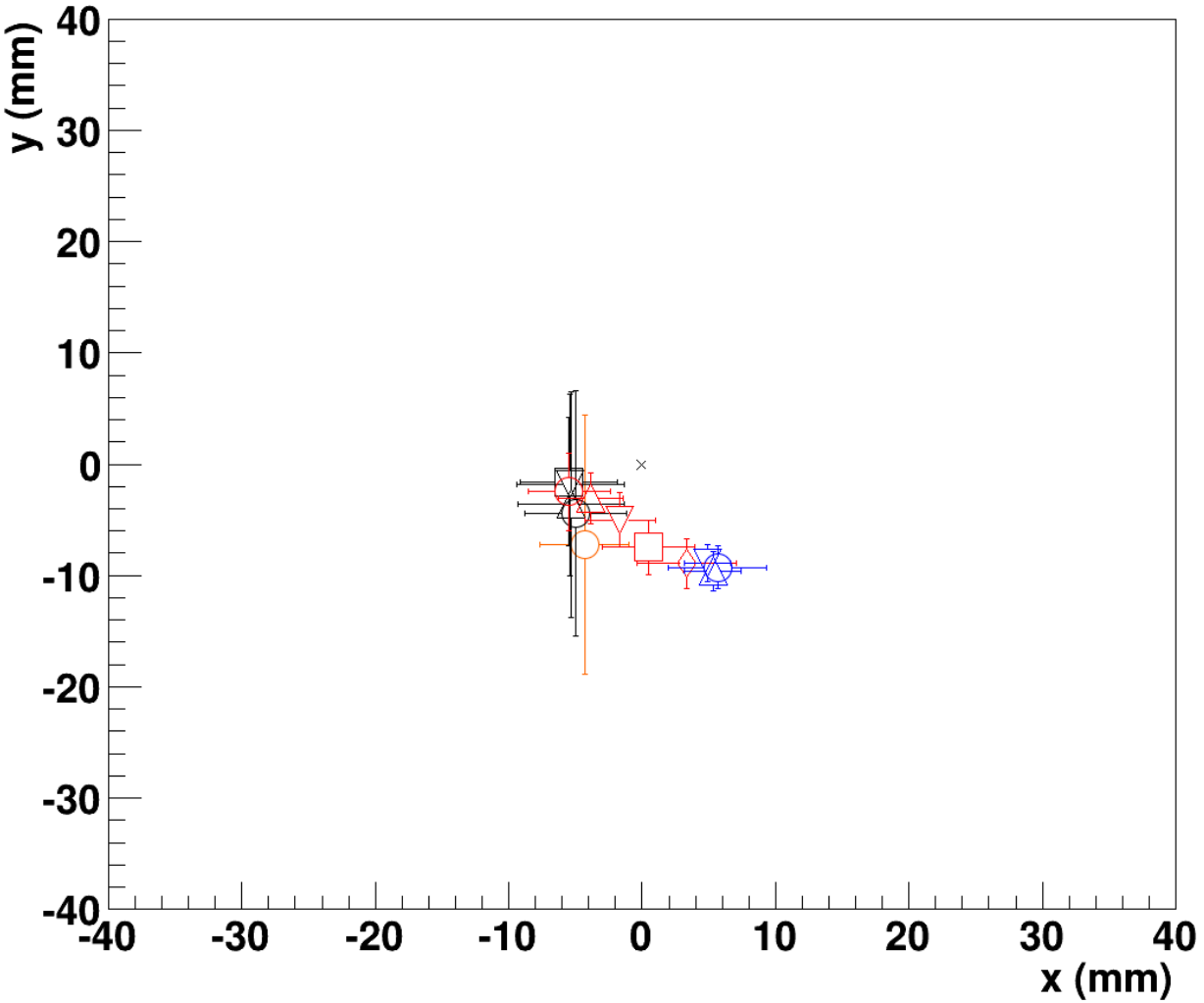
[Solenoid, Horiz Dipole, Vert Dipole]

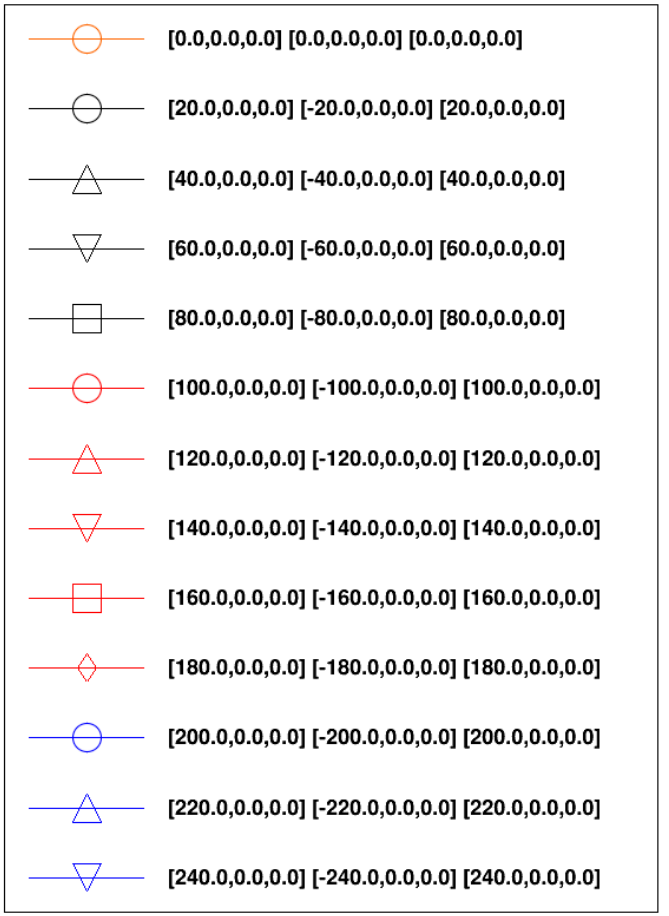




S1 -S2 S3, 65 keV

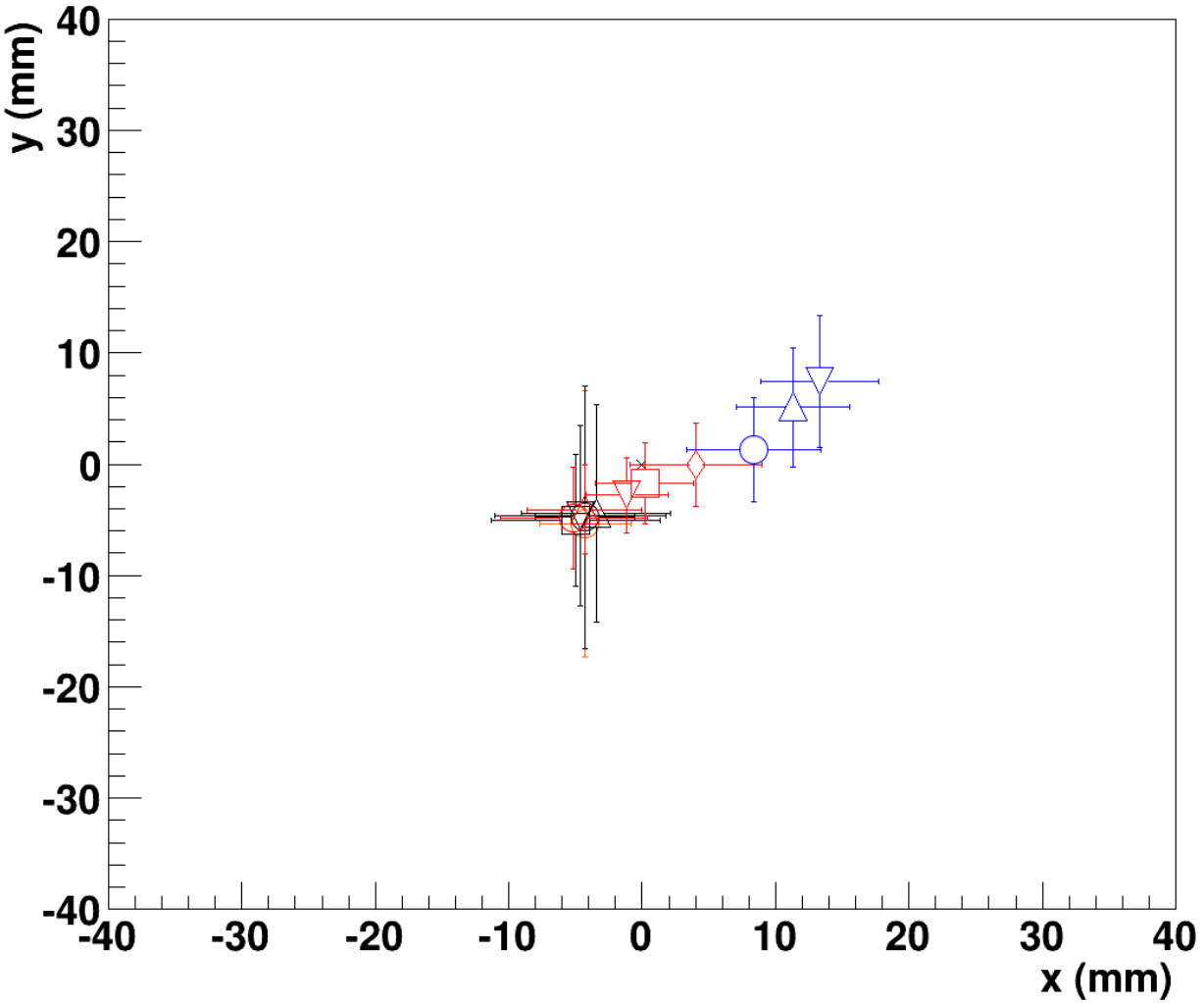
[Solenoid, Horiz Dipole, Vert Dipole]

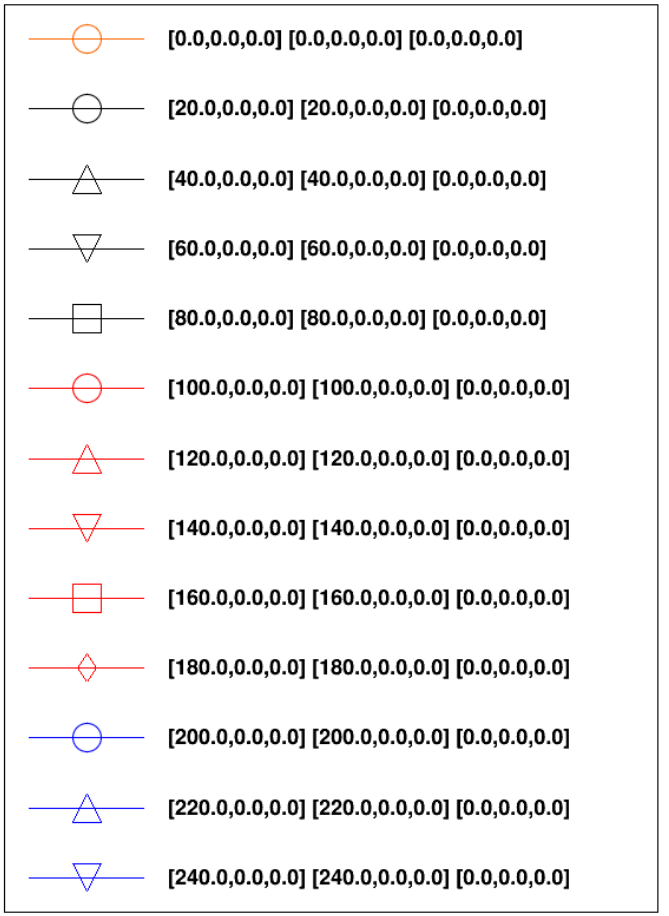




S1 +S2, 65 keV

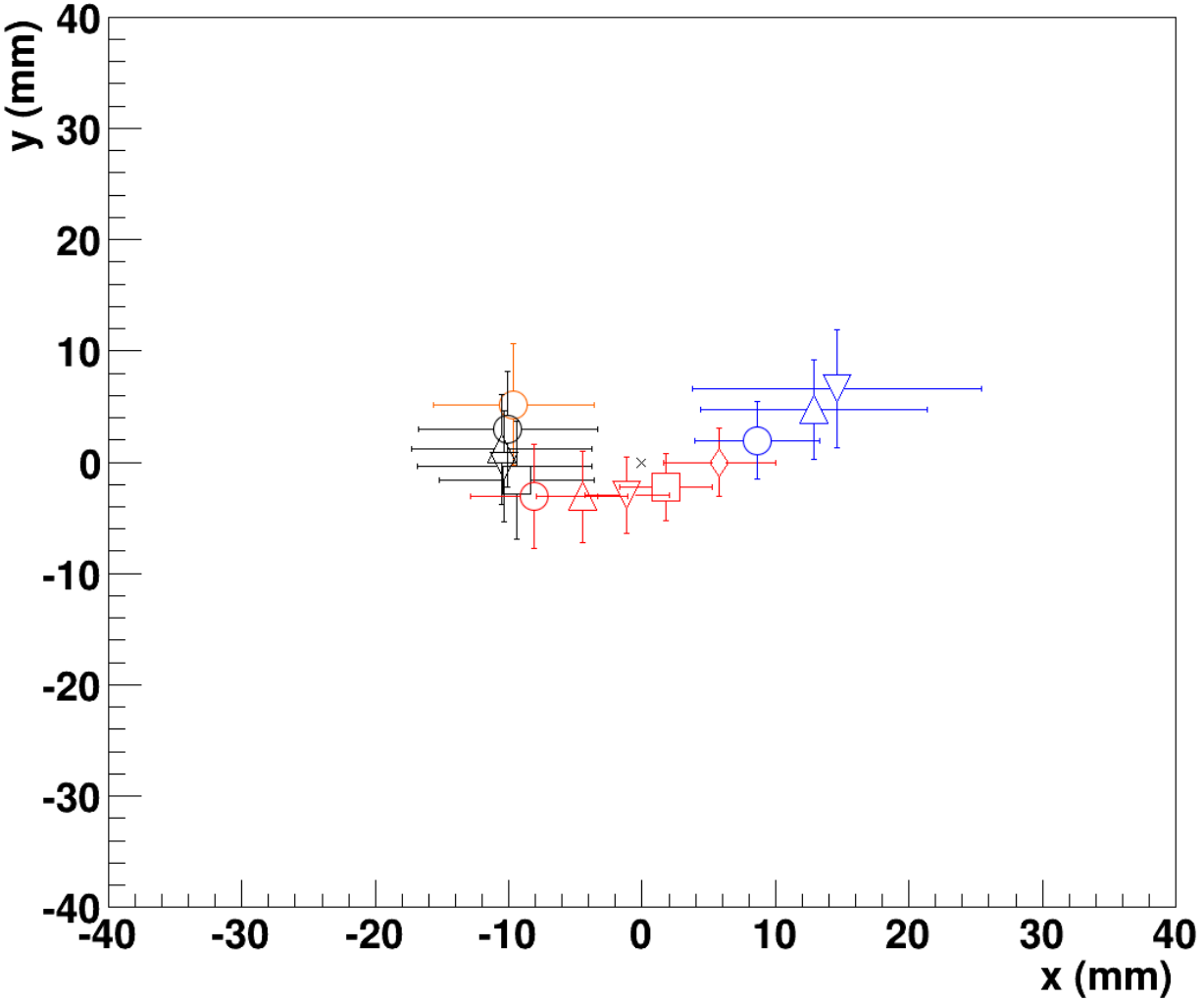
[Solenoid, Horiz Dipole, Vert Dipole]

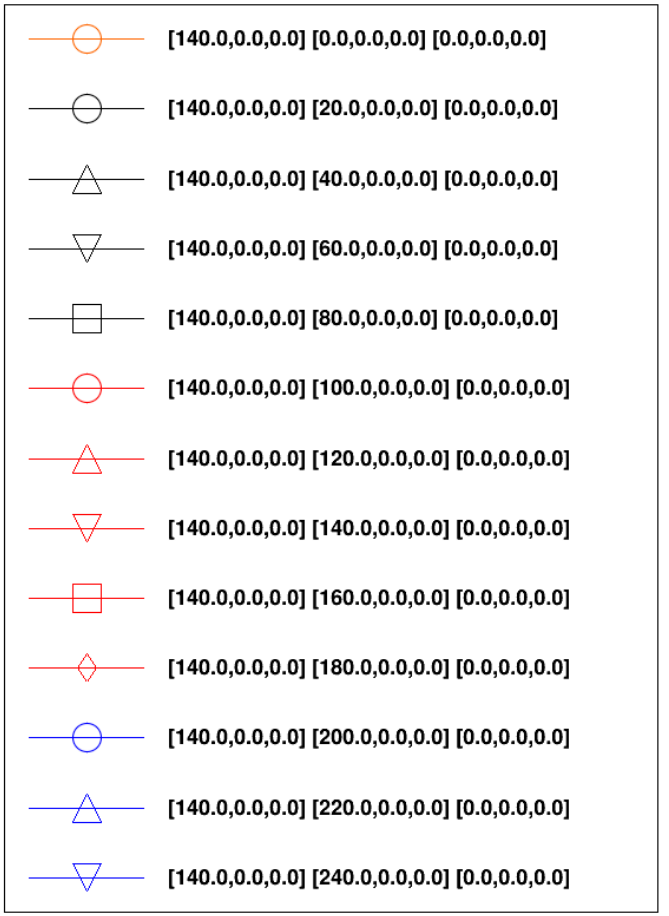




S1 140A +S2, 65 keV

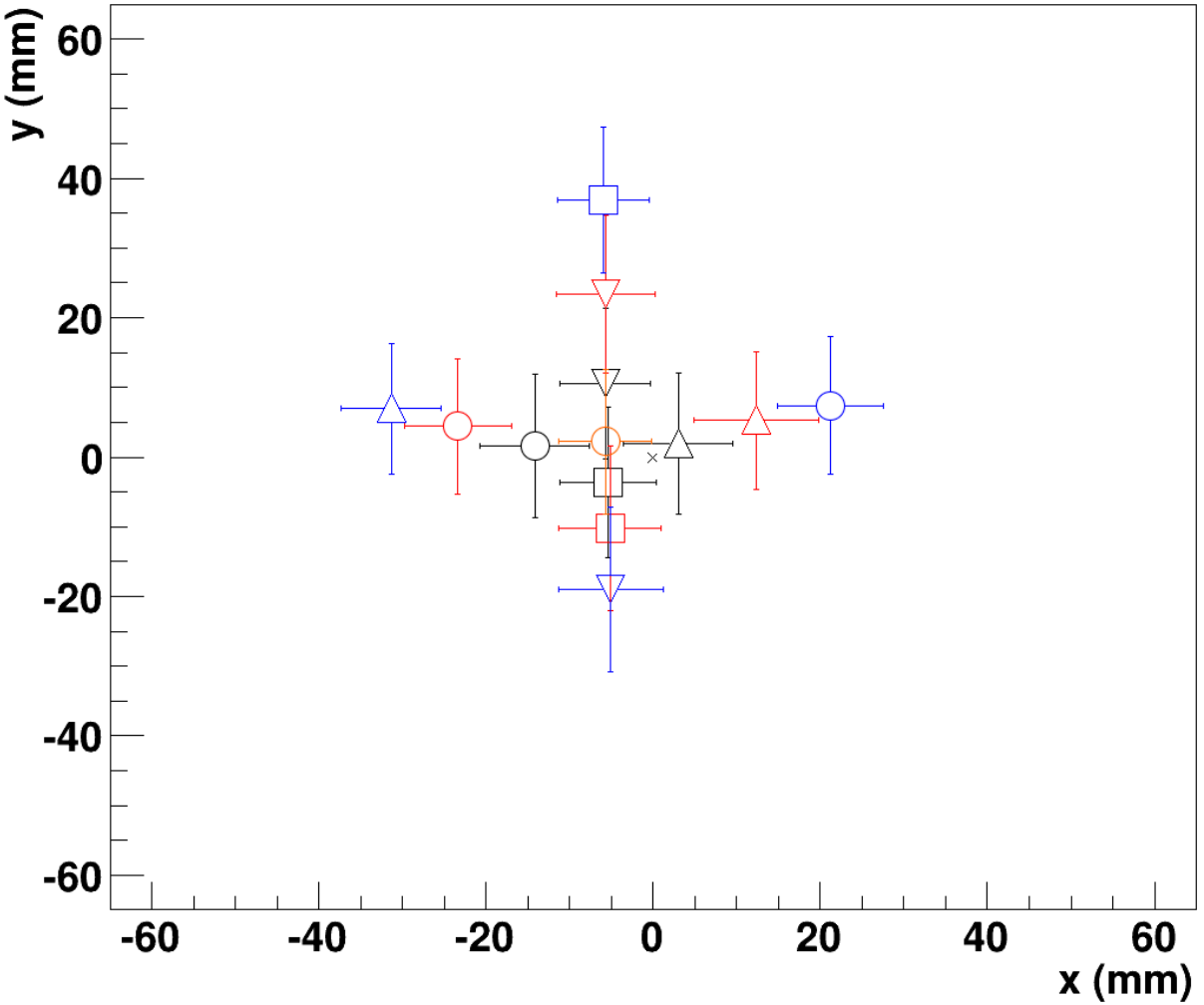
[Solenoid, Horiz Dipole, Vert Dipole]

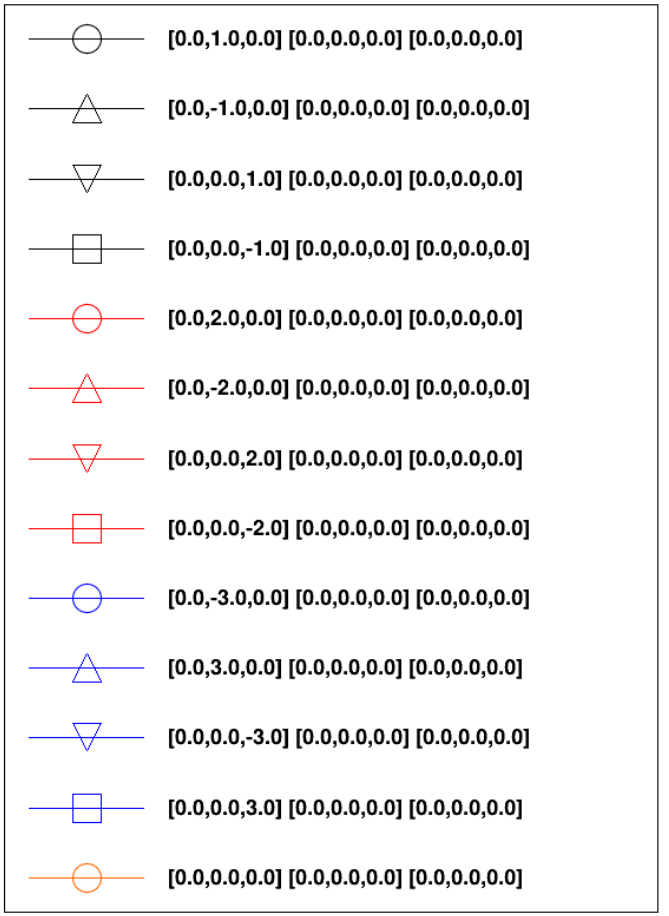




Dipole S1, 65 keV

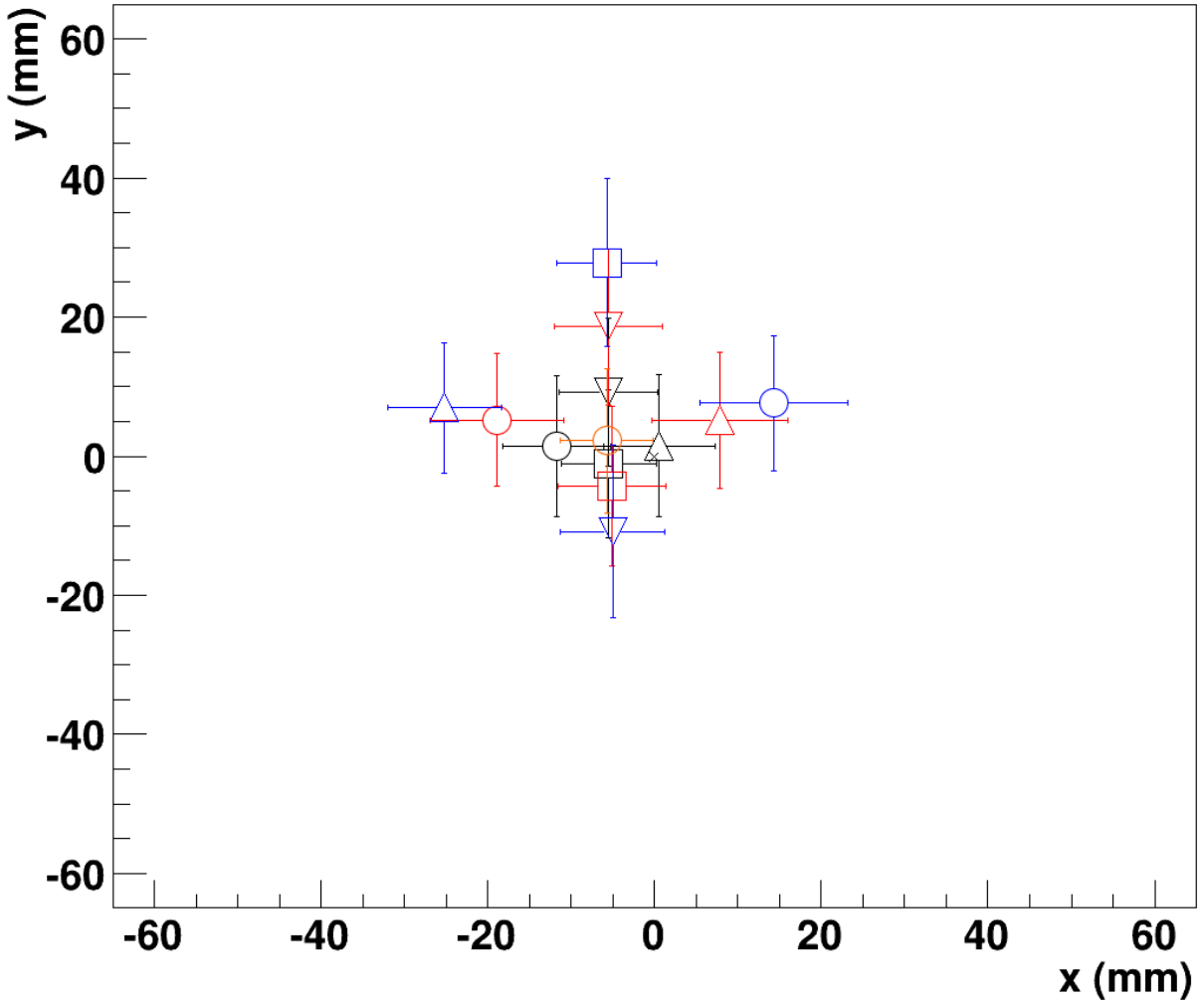
[Solenoid, Horiz Dipole, Vert Dipole]

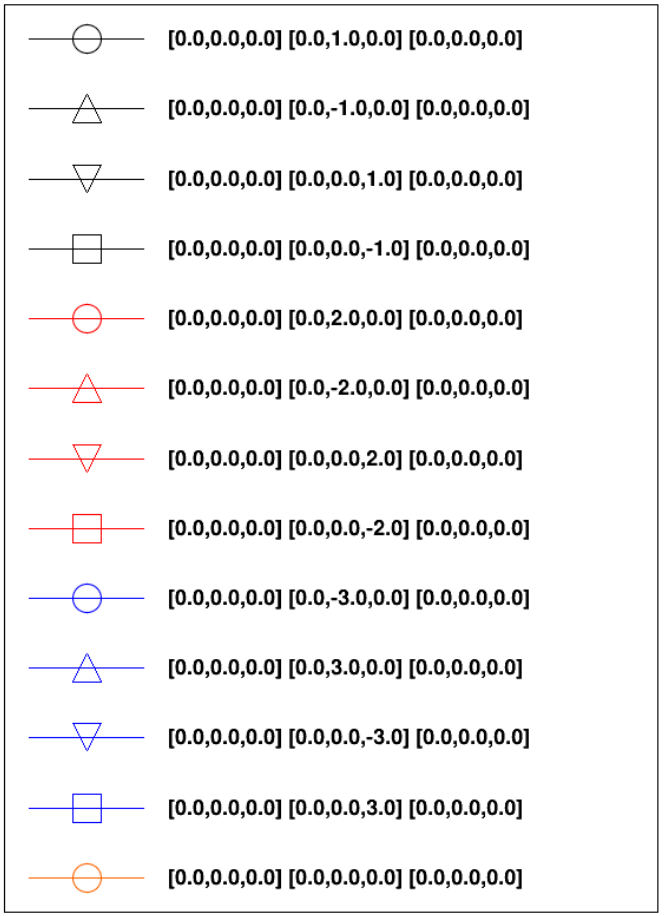




Dipole S2, 65 keV

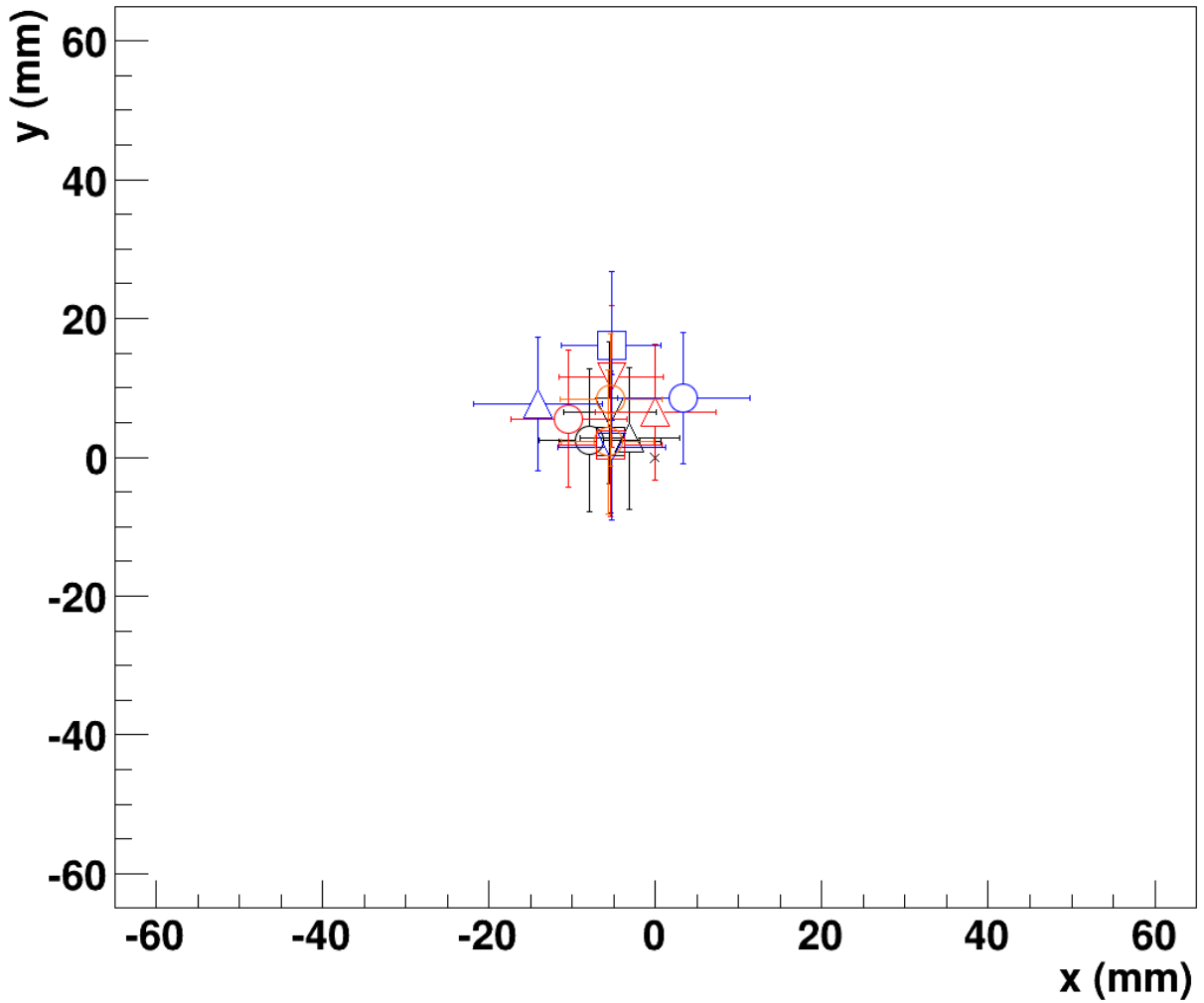
[Solenoid, Horiz Dipole, Vert Dipole]

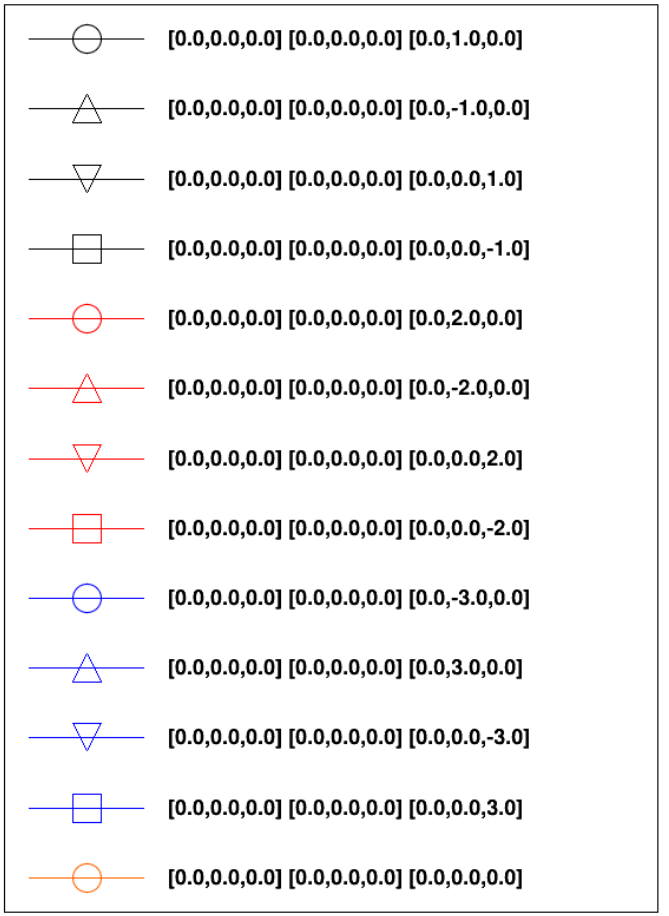




Dipole S3, 65 keV

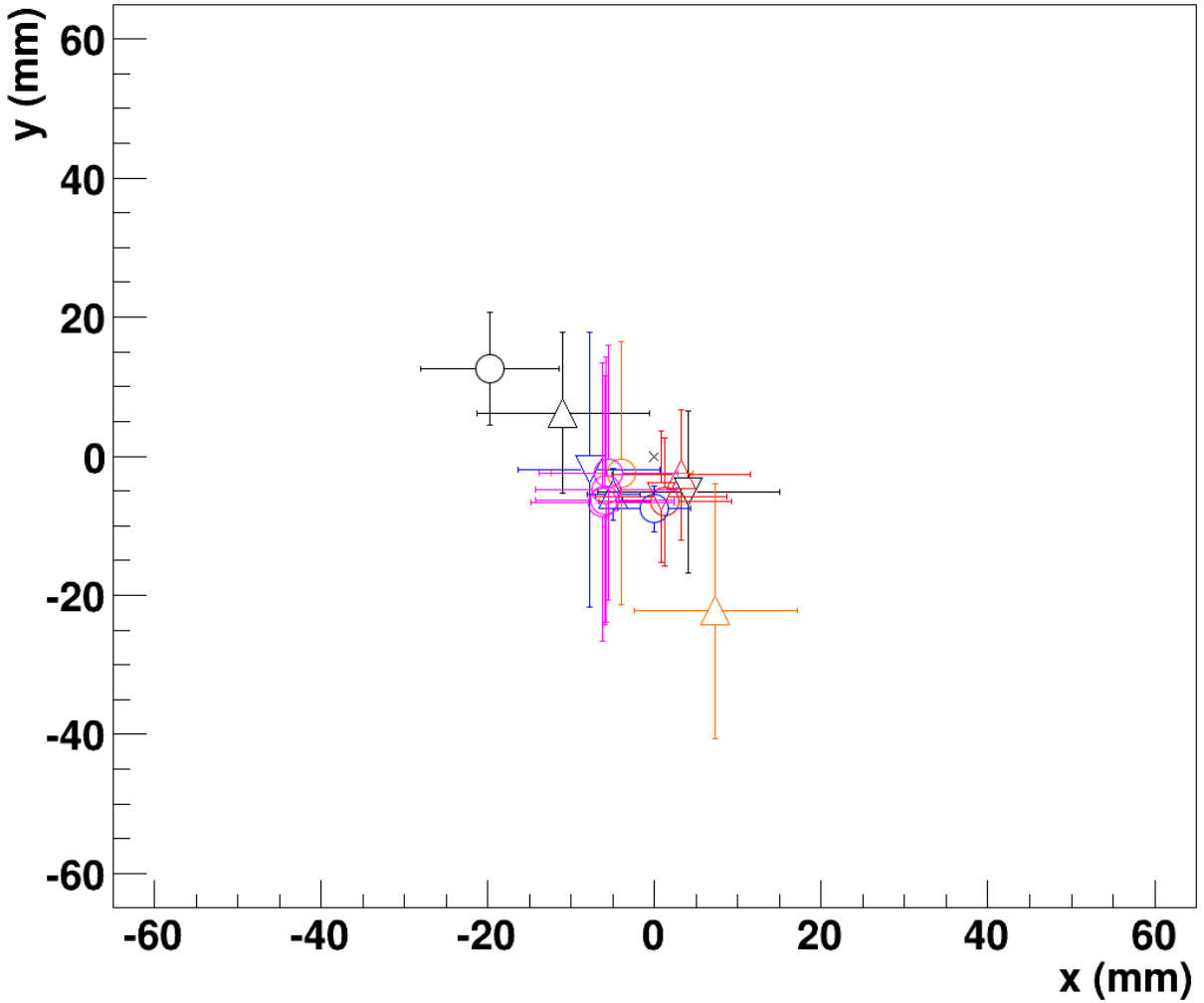
[Solenoid, Horiz Dipole, Vert Dipole]

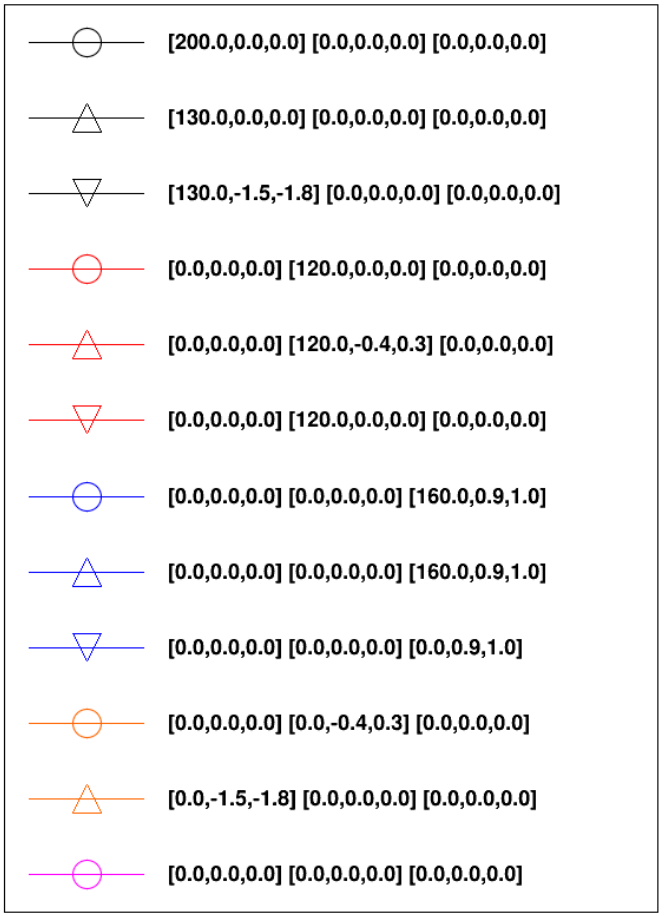




Dipole runs 048-061, 65 keV

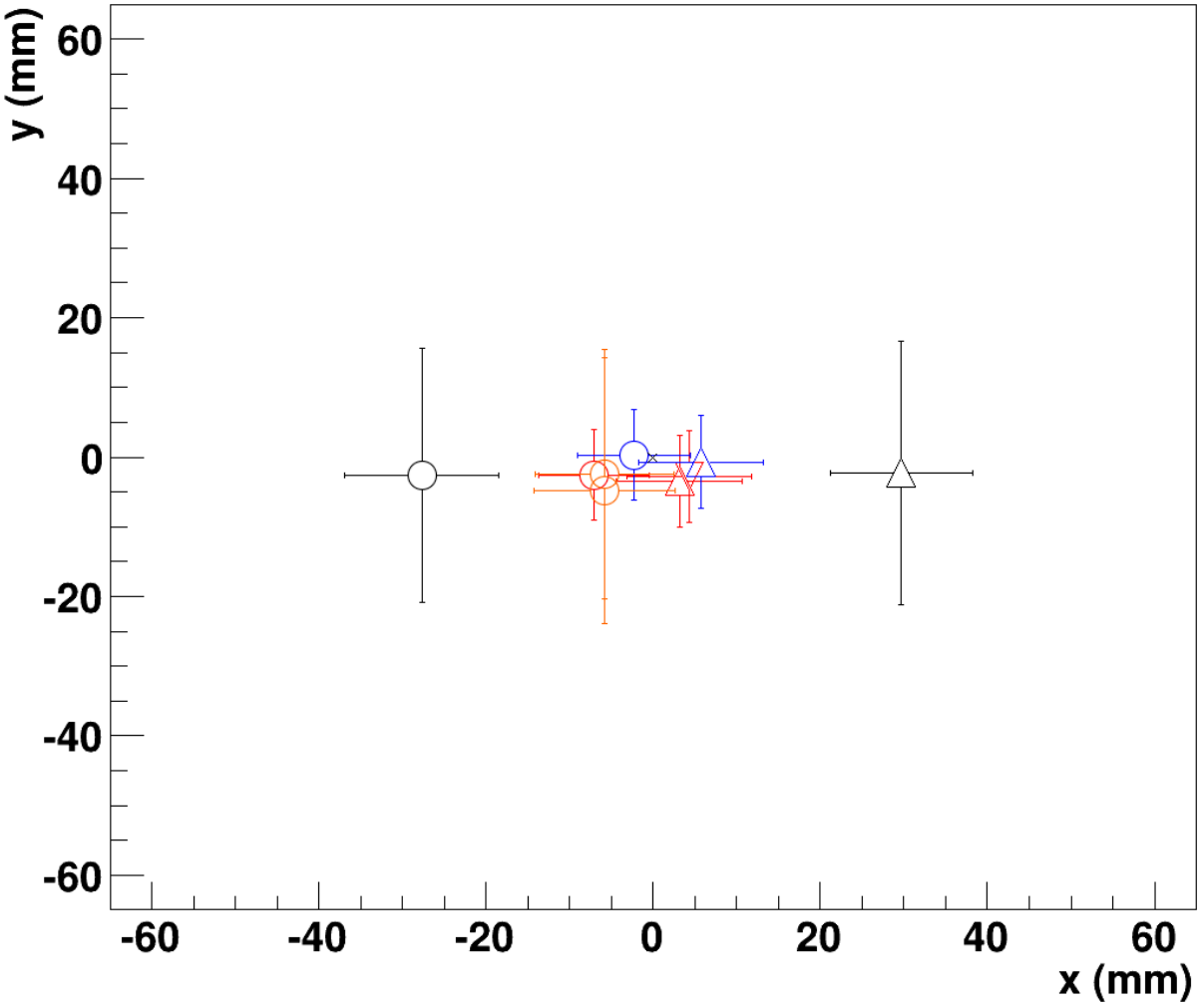
[Solenoid, Horiz Dipole, Vert Dipole]

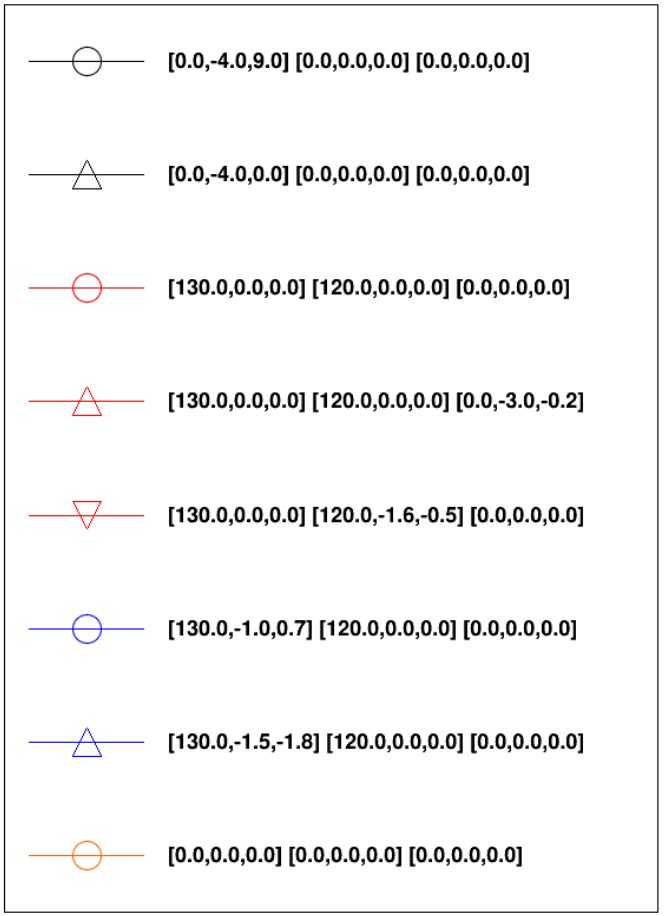




Dipole runs 062-069, 65 keV

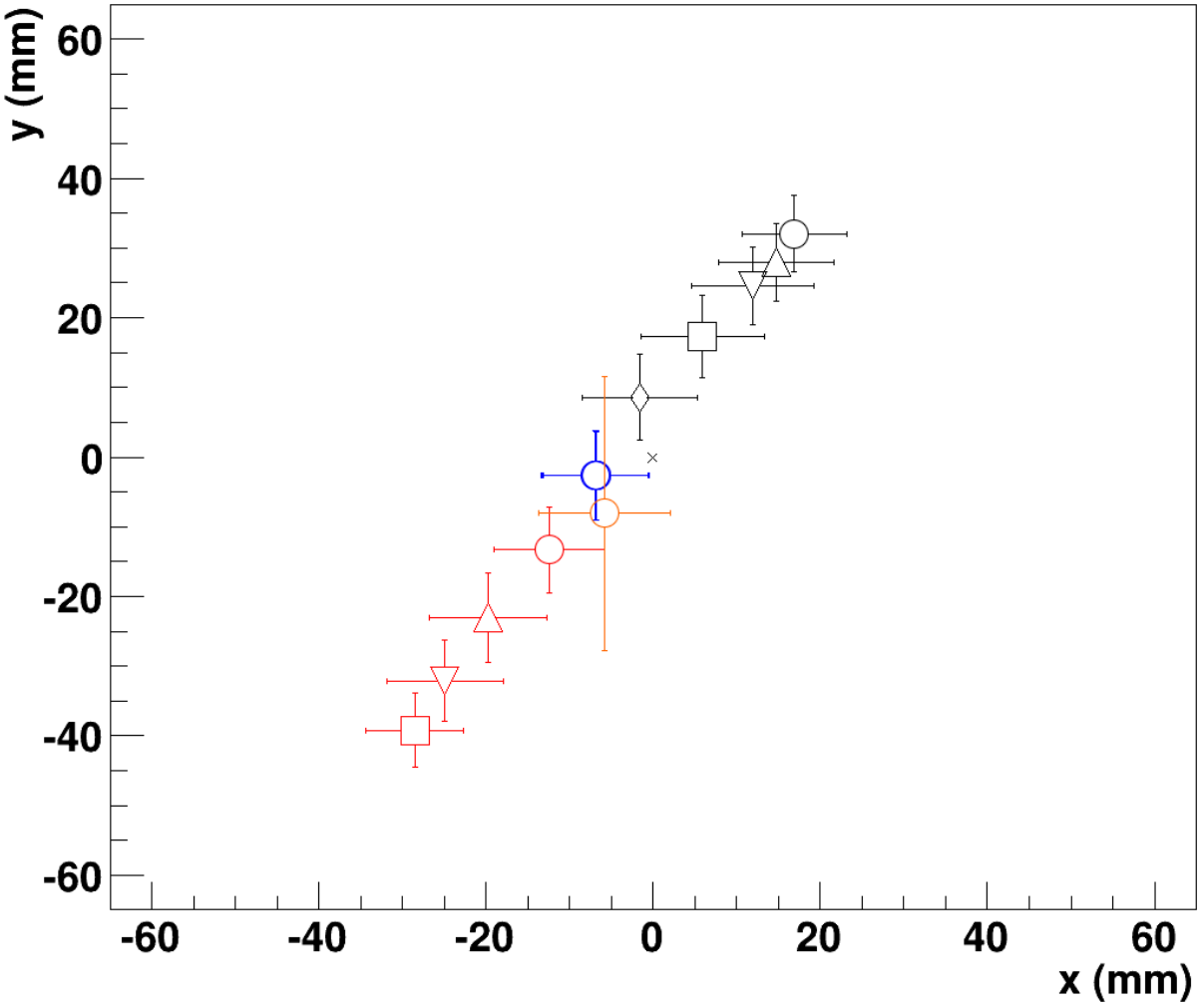
[Solenoid, Horiz Dipole, Vert Dipole]

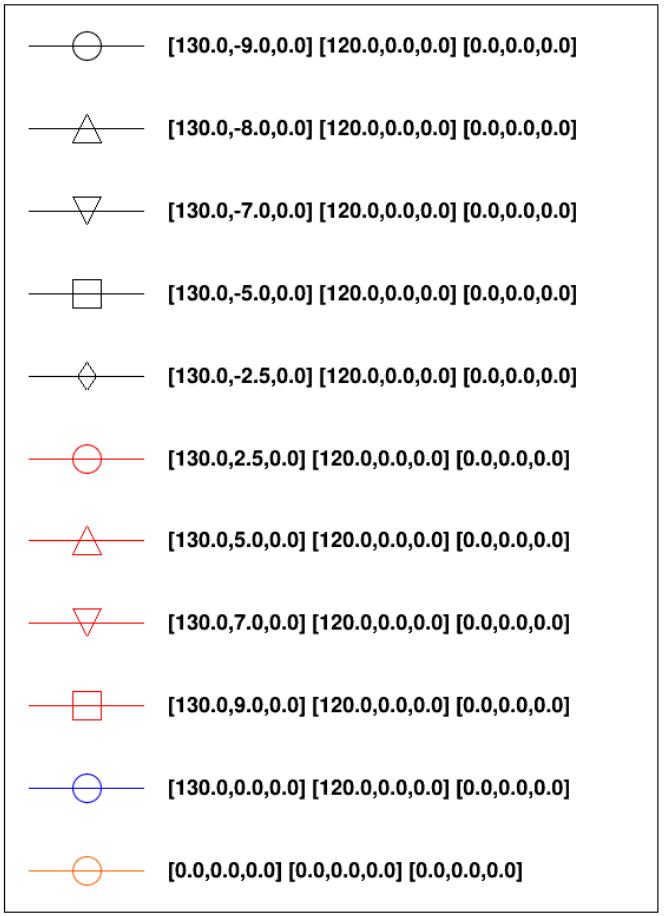




S1 130A + S2 120A, DH1, 65 keV

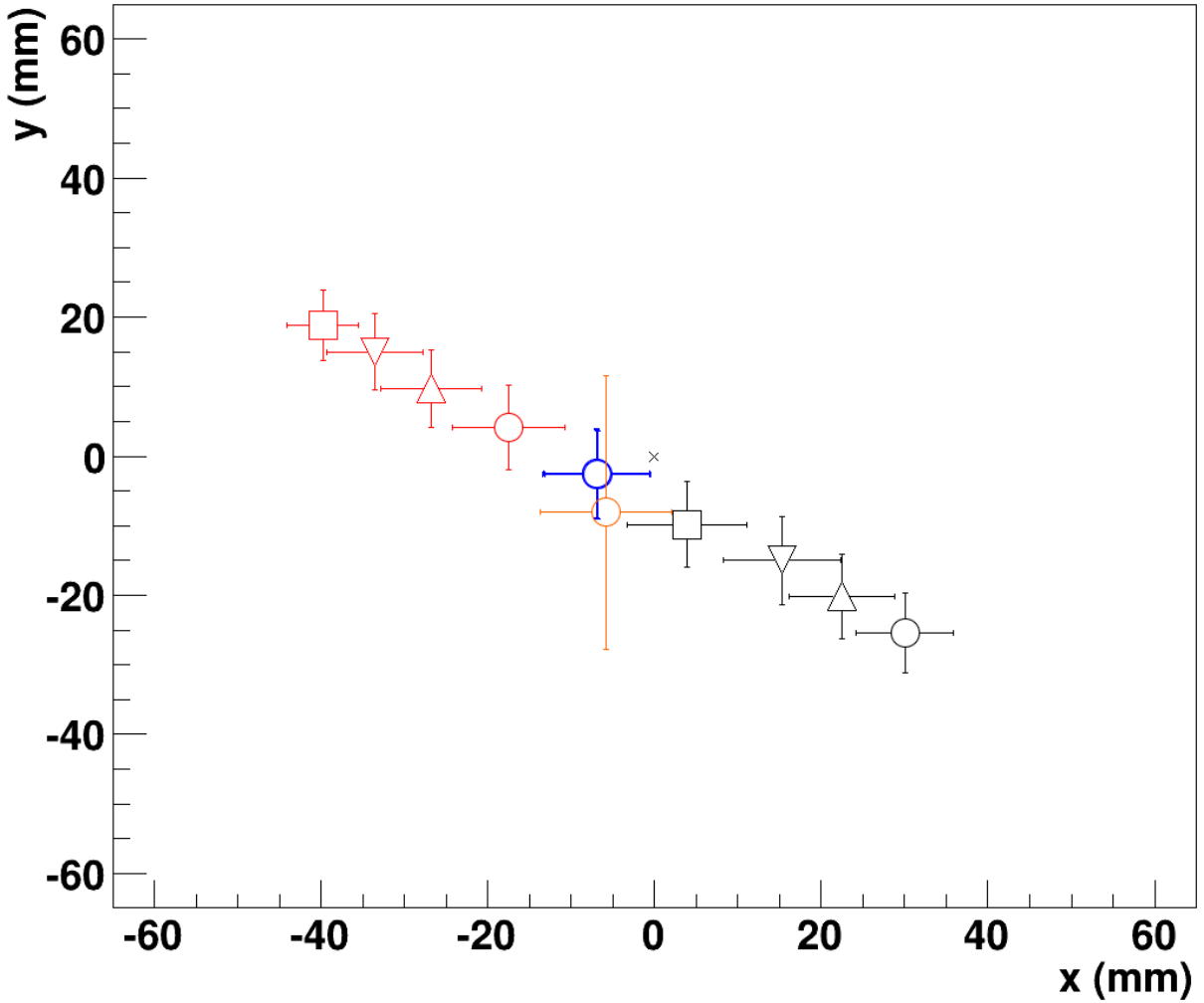
[Solenoid, Horiz Dipole, Vert Dipole]

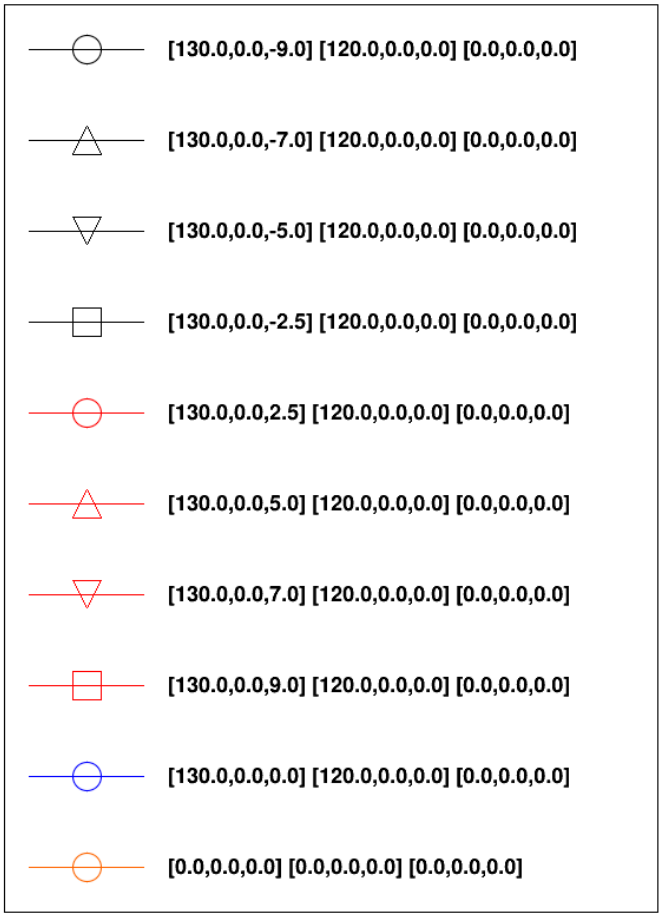




S1 130A + S2 120A, DV1, 65 keV

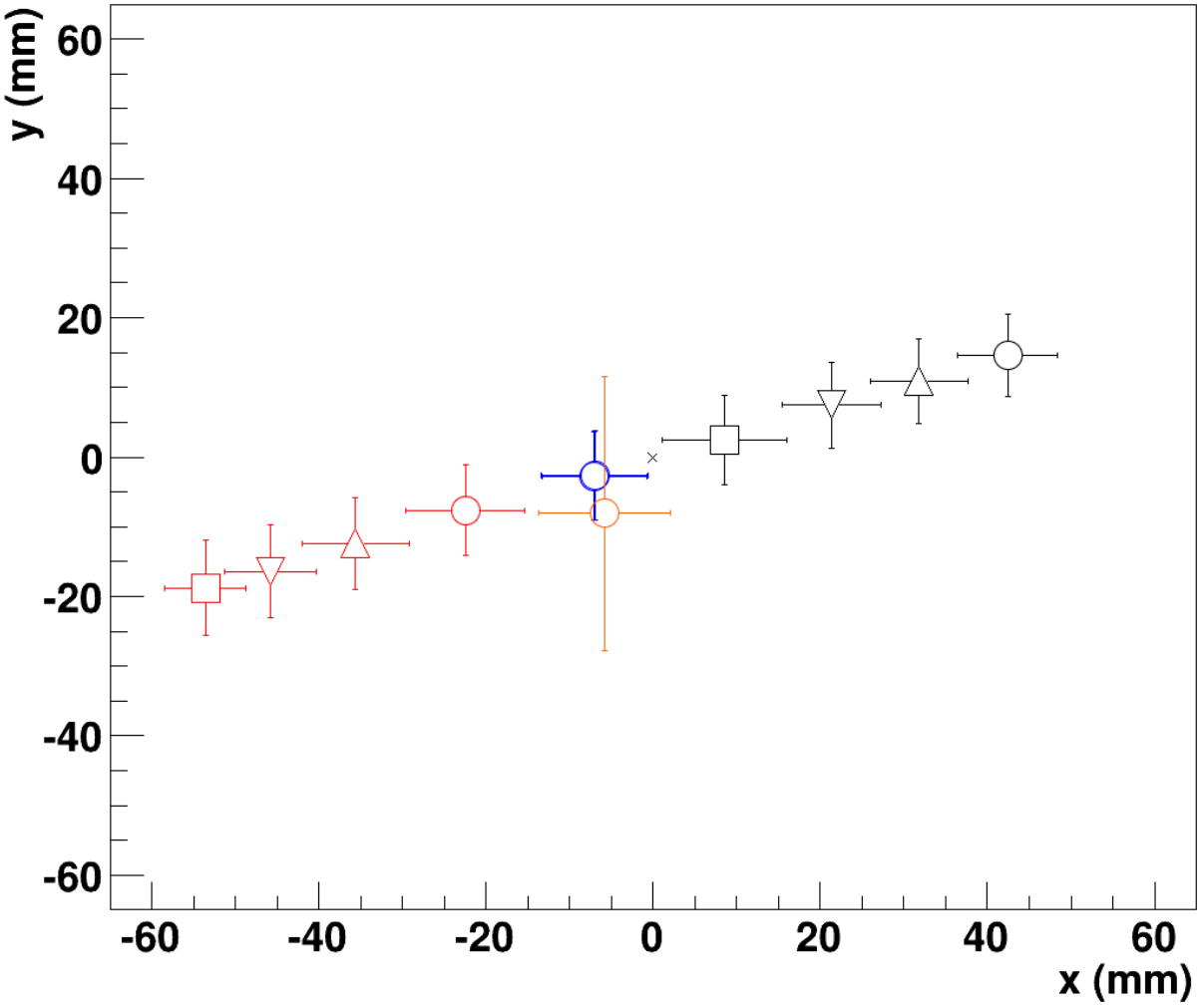
[Solenoid, Horiz Dipole, Vert Dipole]

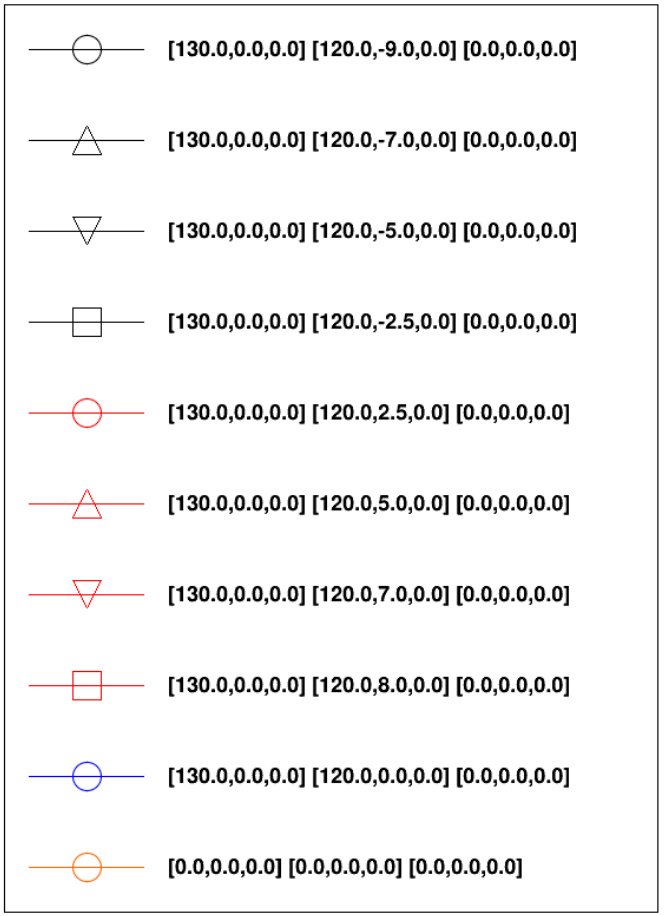




S1 130A + S2 120A, DH2, 65 keV

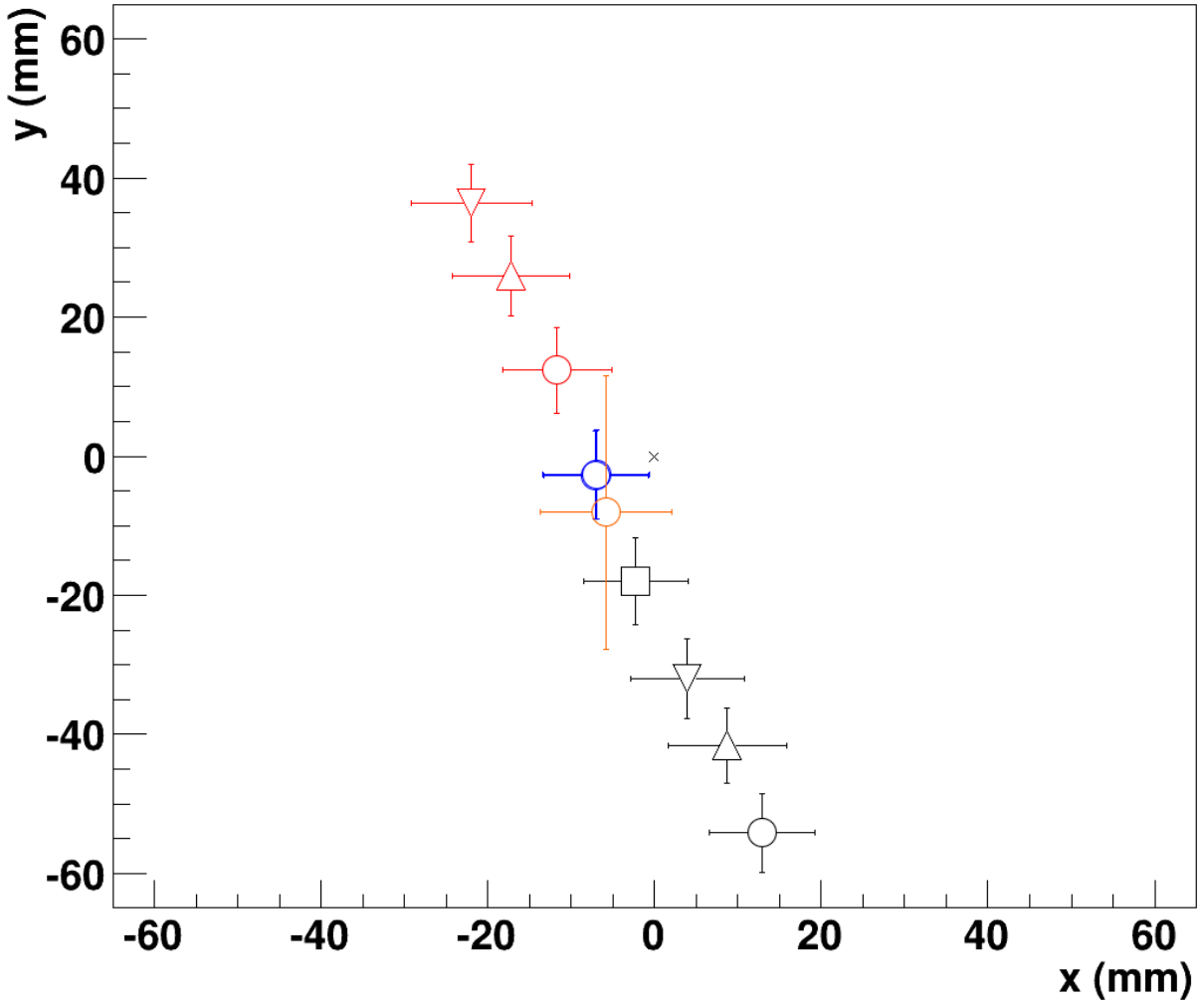
[Solenoid, Horiz Dipole, Vert Dipole]

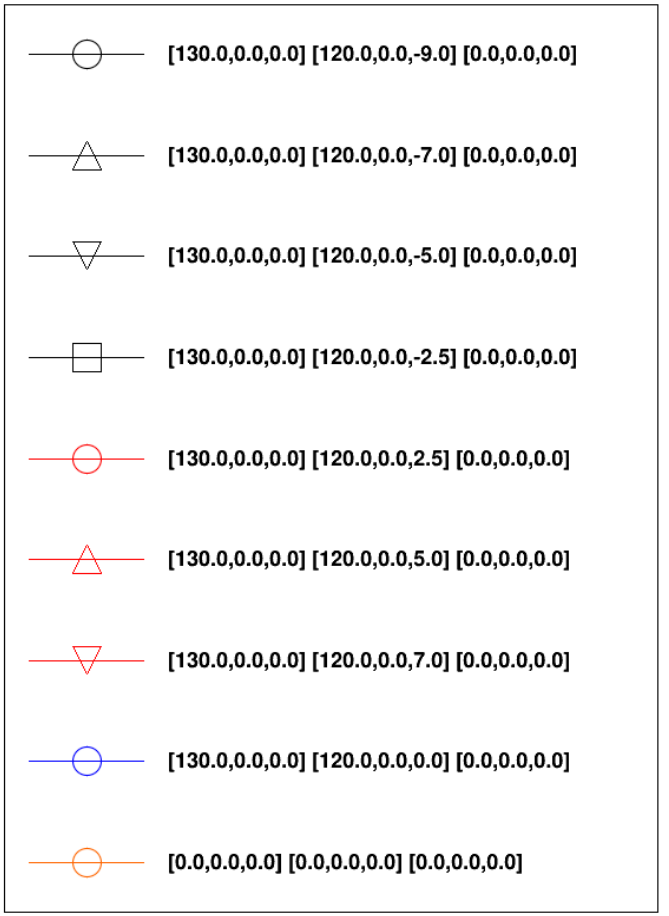




S1 130A + S2 120A, DV2, 65 keV

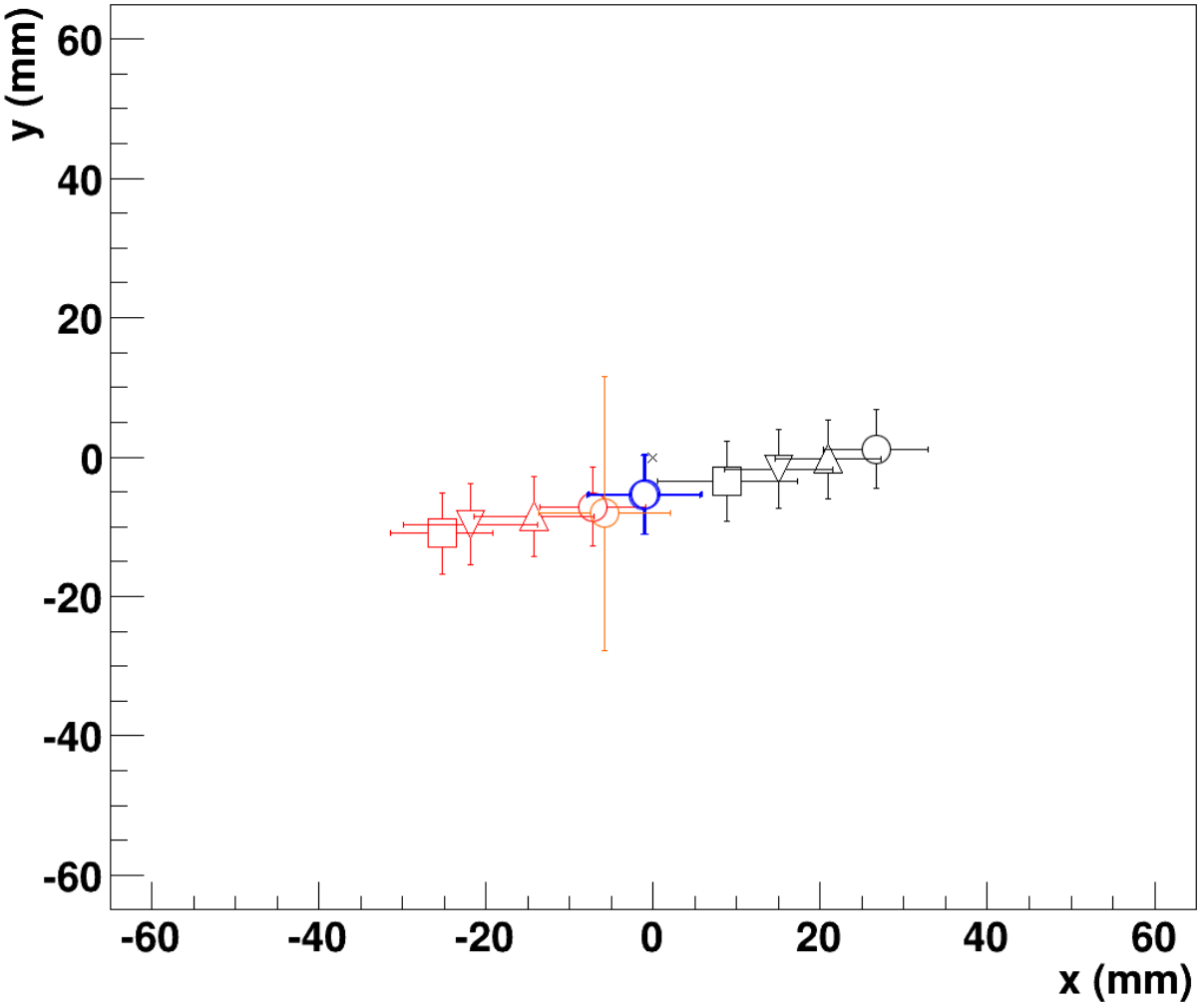
[Solenoid, Horiz Dipole, Vert Dipole]

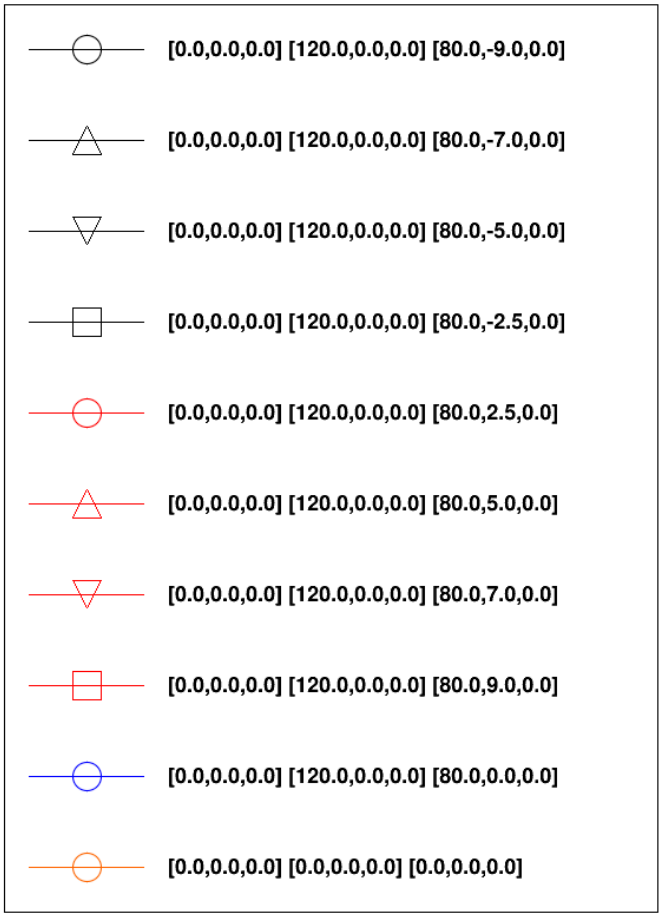




S2 120A + S3 80A, DH3, 65 keV

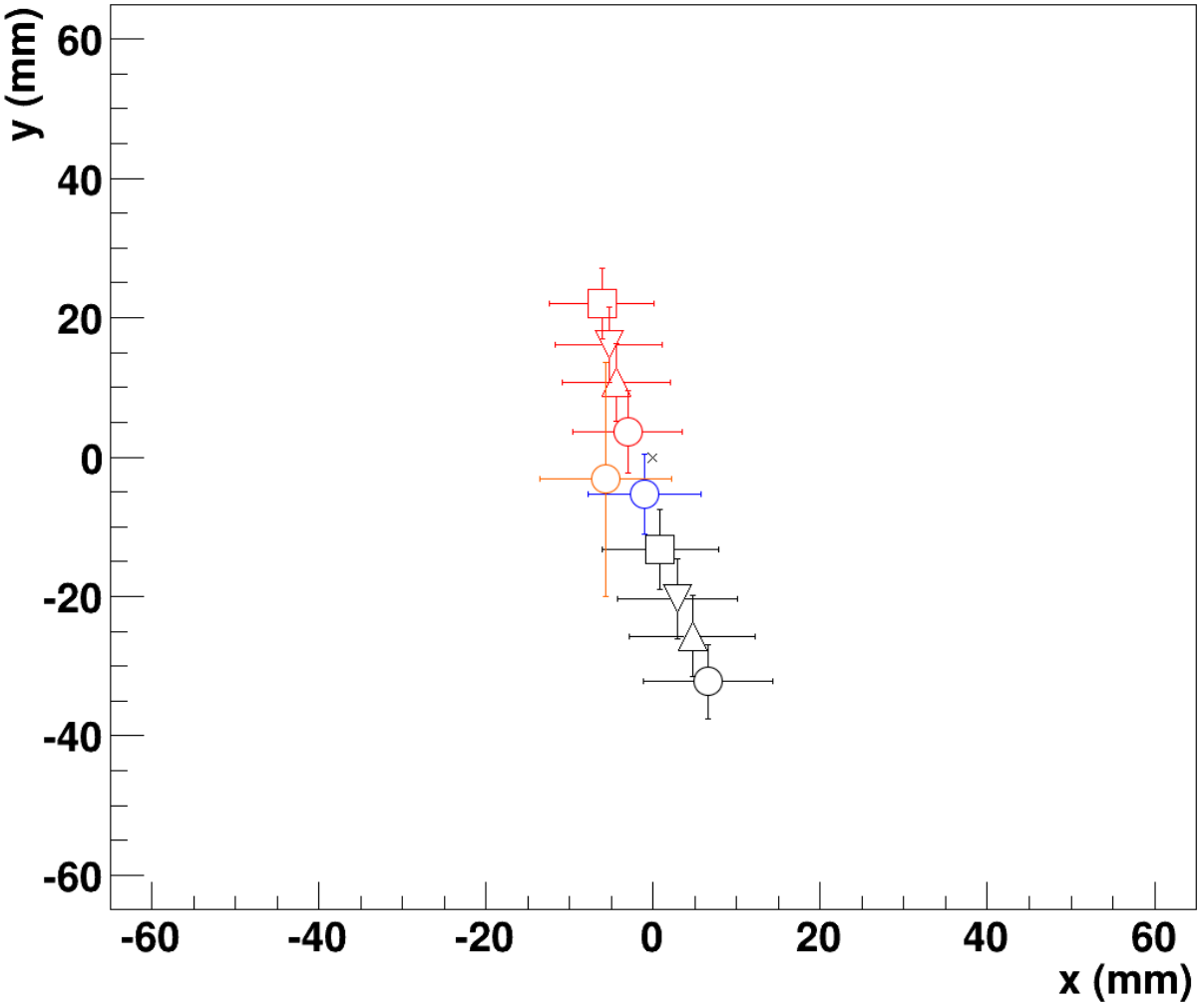
[Solenoid, Horiz Dipole, Vert Dipole]

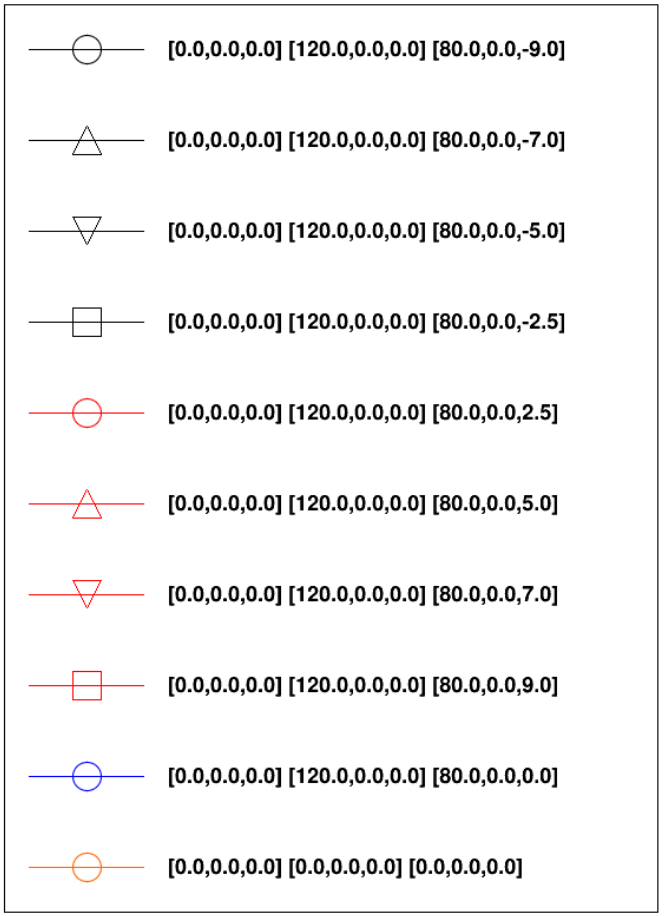




S2 120A + S3 80A, DV3, 65 keV

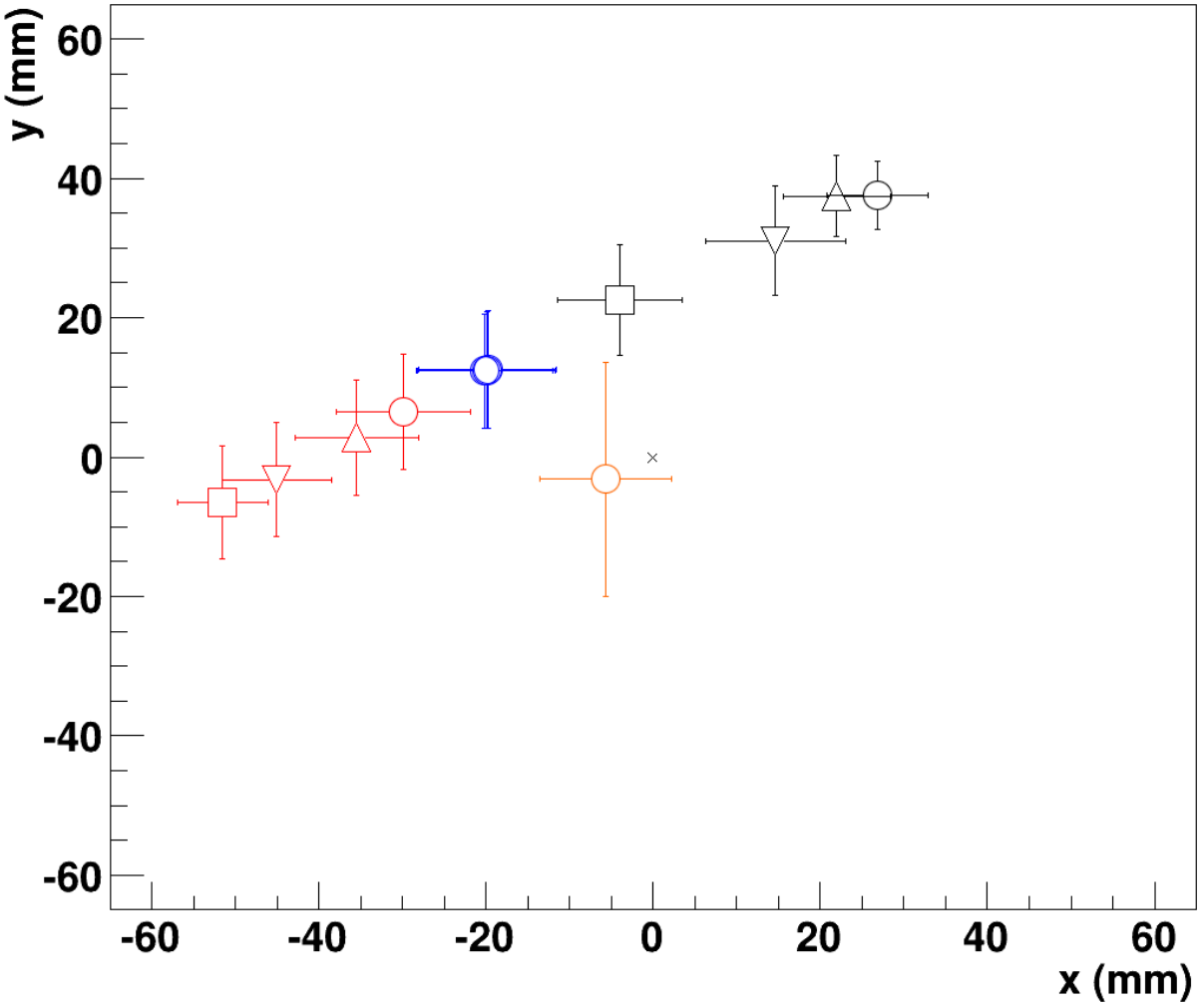
[Solenoid, Horiz Dipole, Vert Dipole]

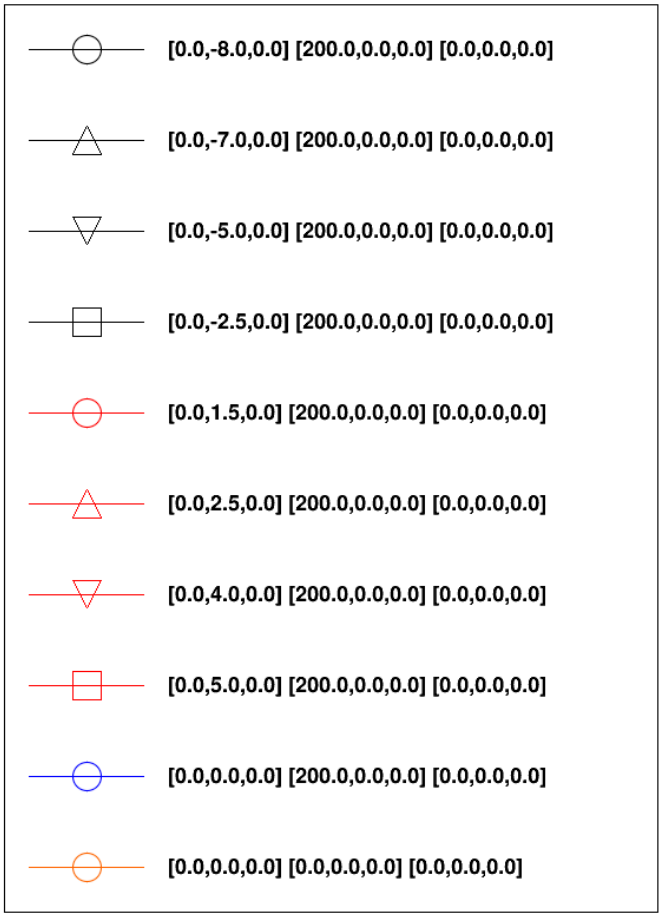




S2 200A, DH1, 65 keV

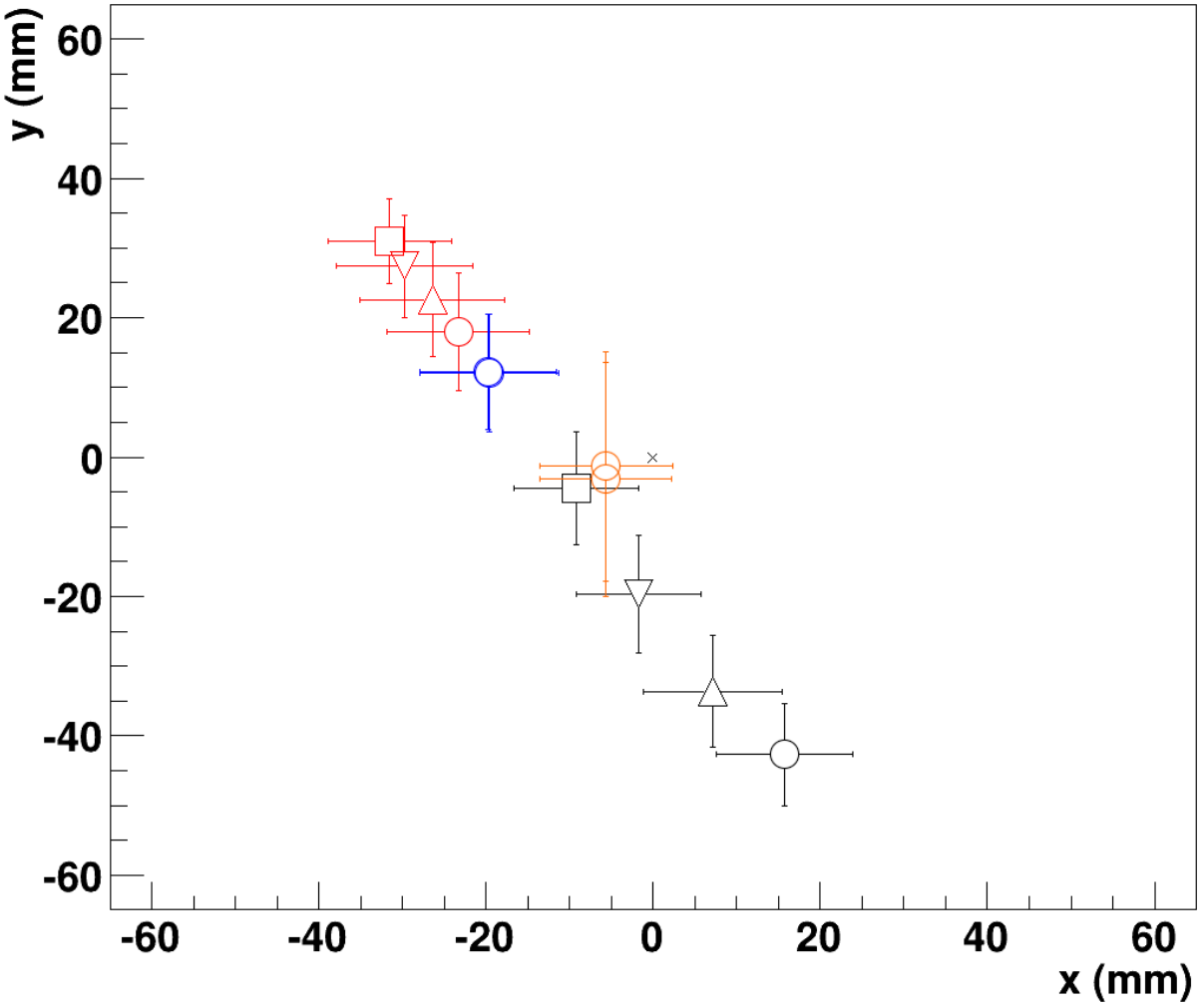
[Solenoid, Horiz Dipole, Vert Dipole]

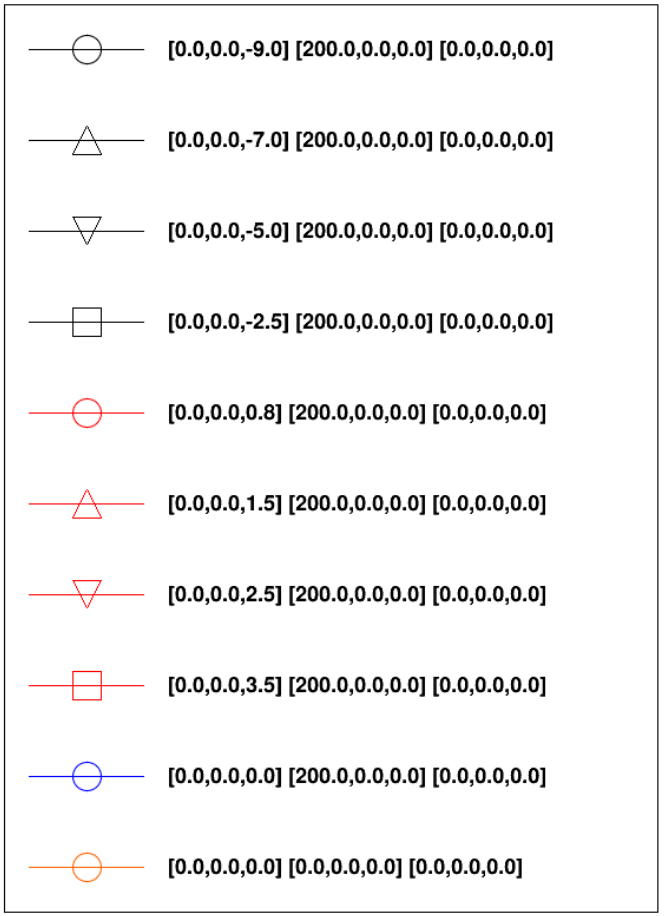




S2 200A, DV1, 65 keV

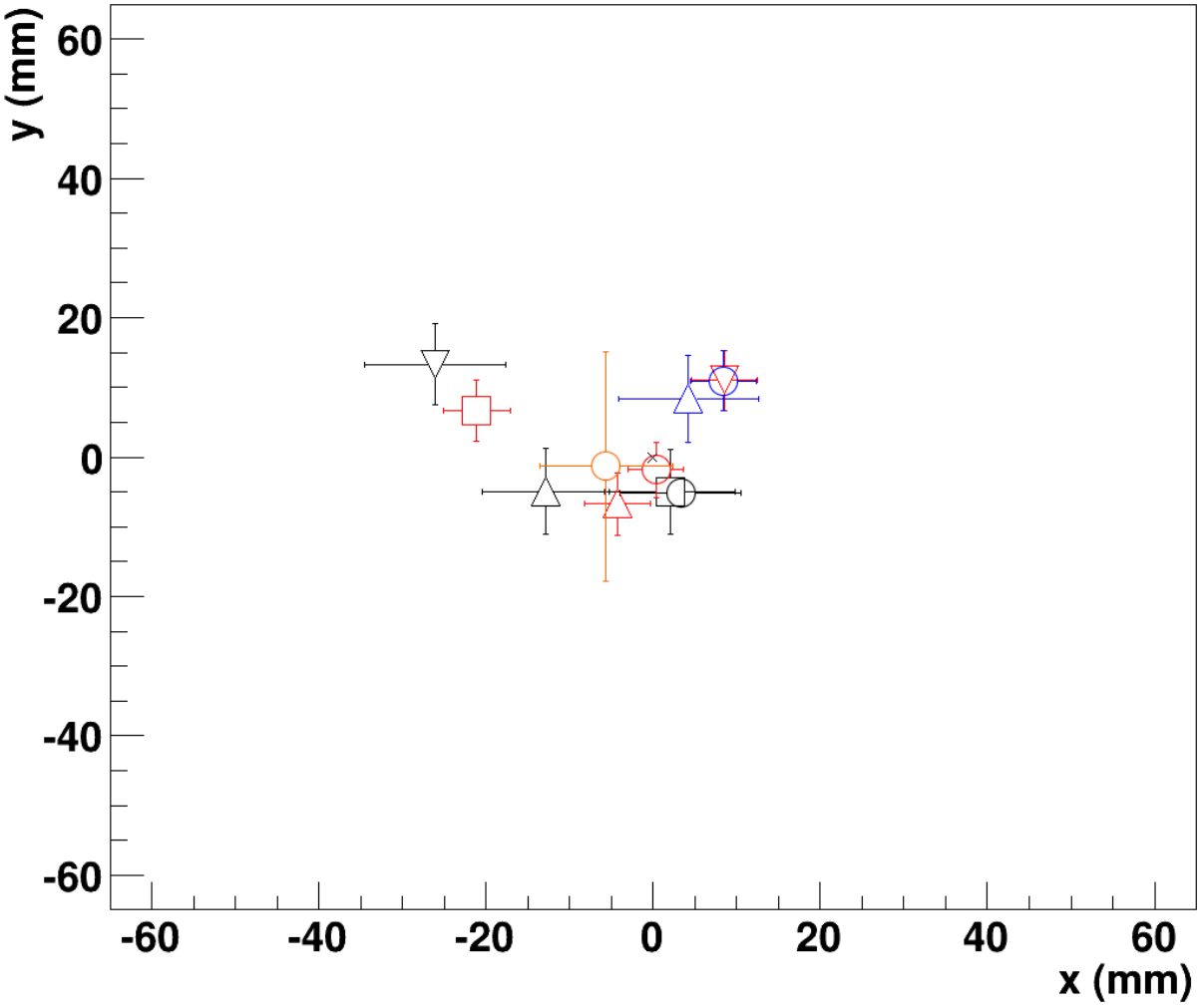
[Solenoid, Horiz Dipole, Vert Dipole]

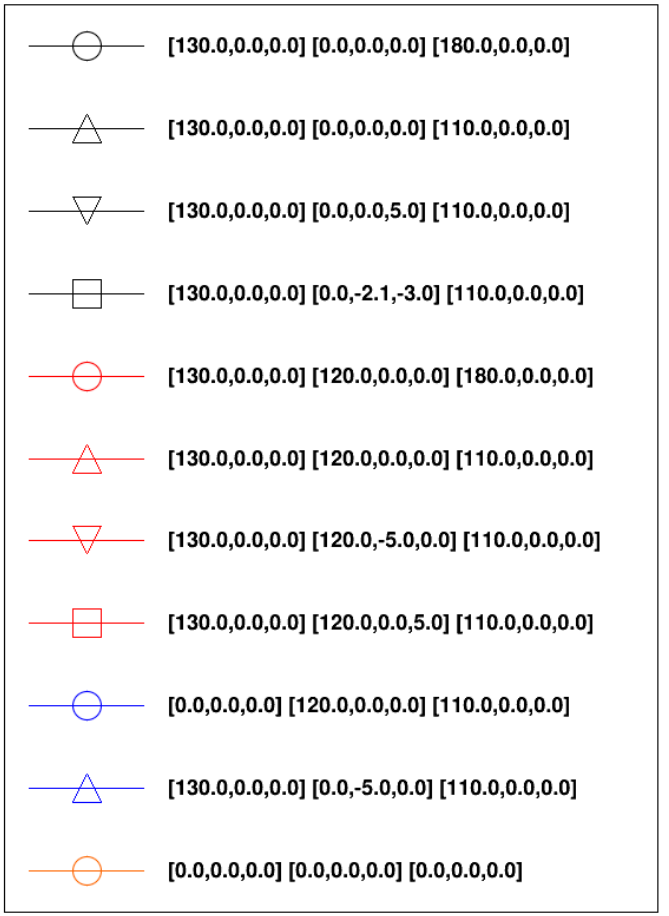




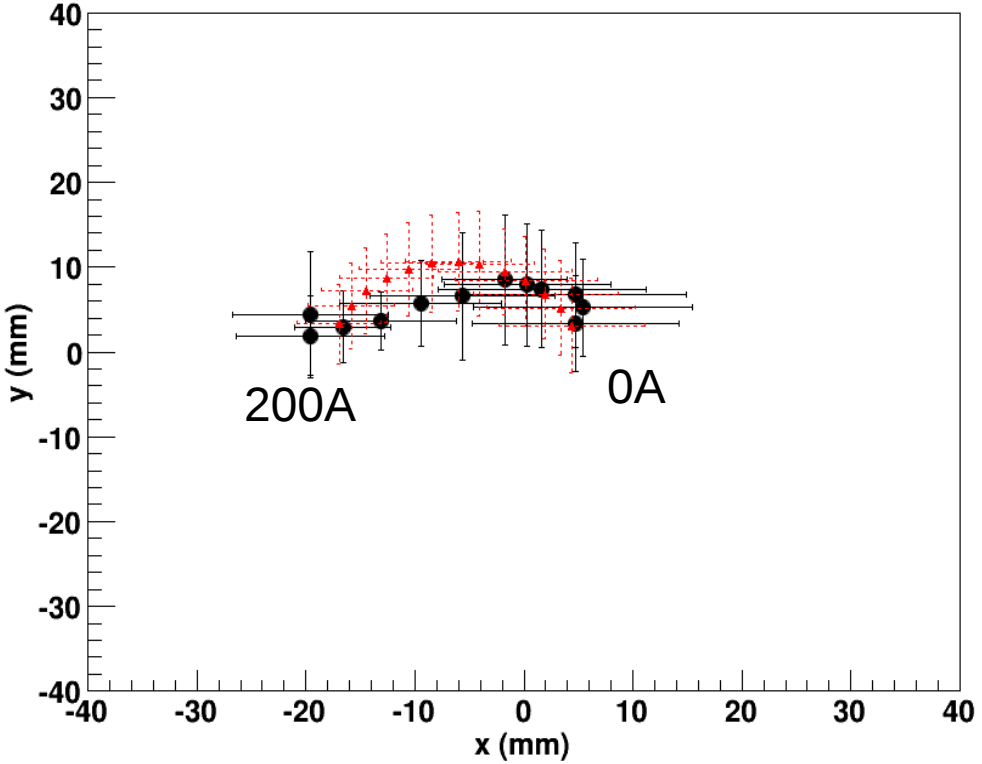
Dipole runs 154-163, 65 keV

[Solenoid, Horiz Dipole, Vert Dipole]



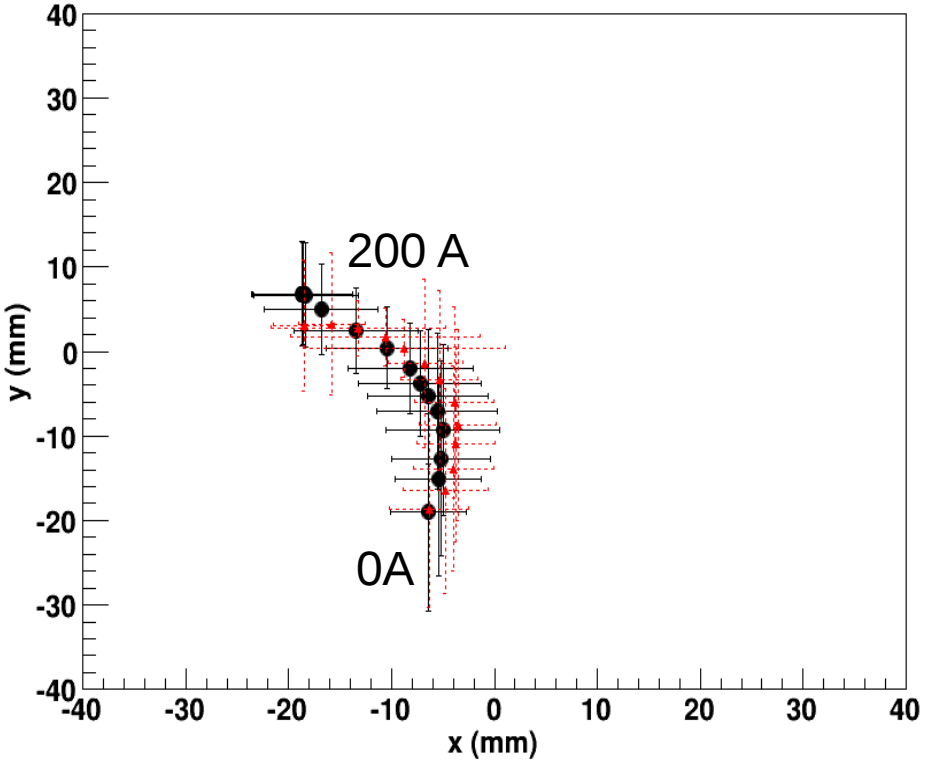


S1, 65 keV: Data & GPT



June Data

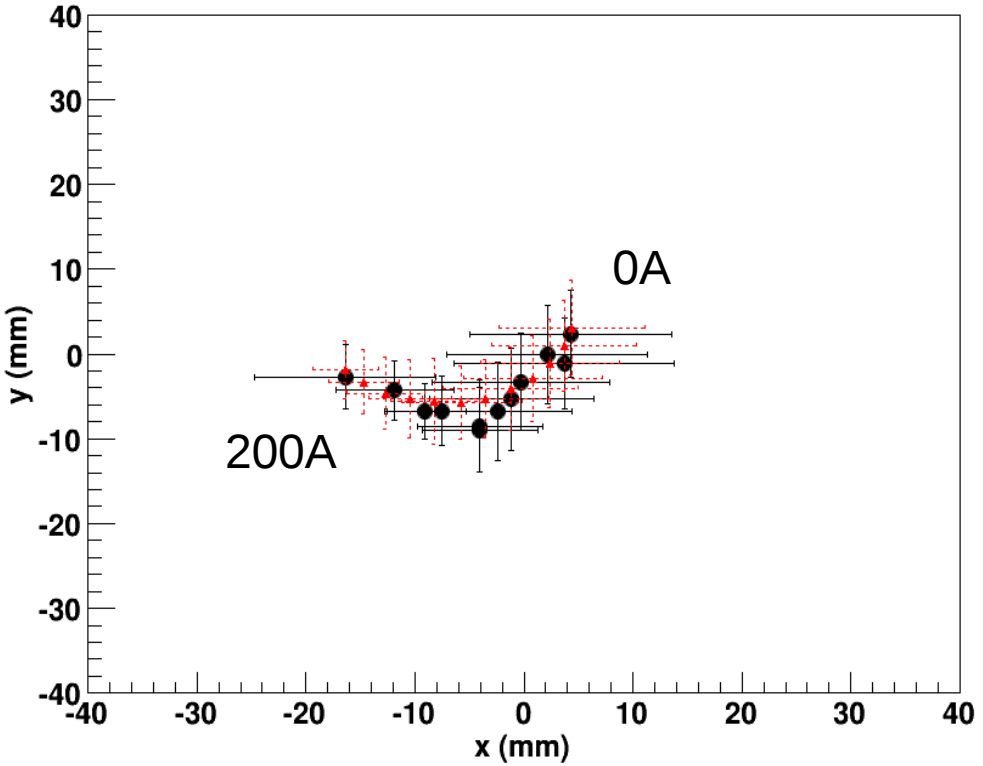
GPT: ϕ_{x1}=+2mr, ϕ_{y1}=-5mr



August Data

GPT: ϕ_{x1}=+5mr, ϕ_{y1}=-10mr

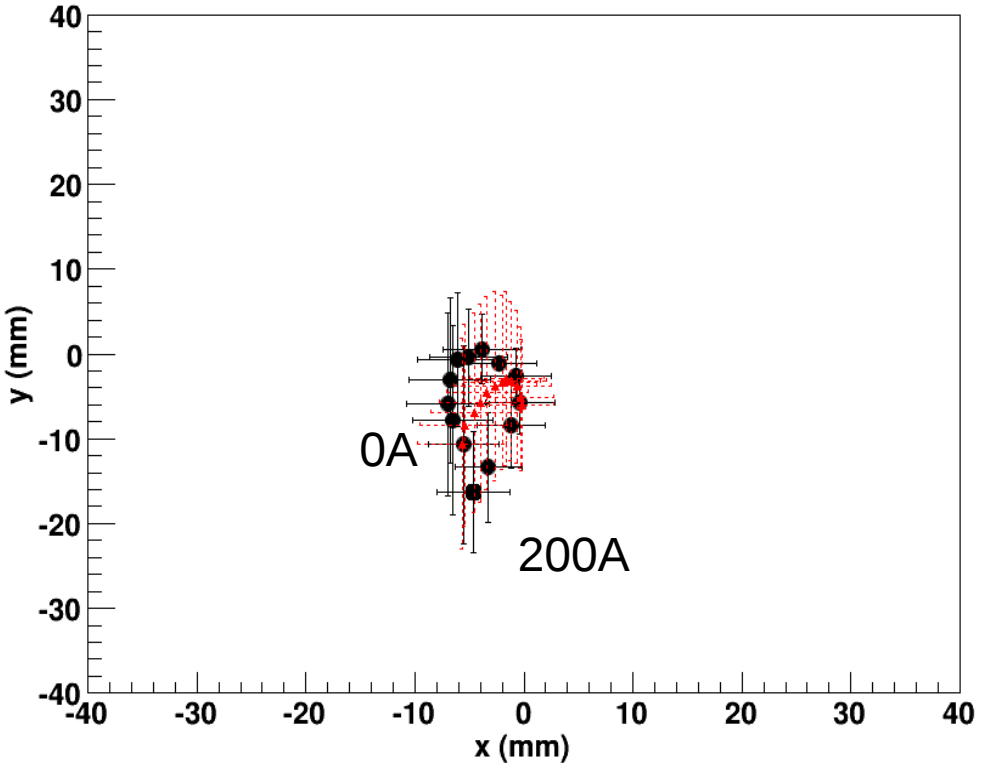
-S2, 65 keV: June Data & GPT



June Data

GPT: ϕ_{x1}=-3mr, ϕ_{y1}=-8mr

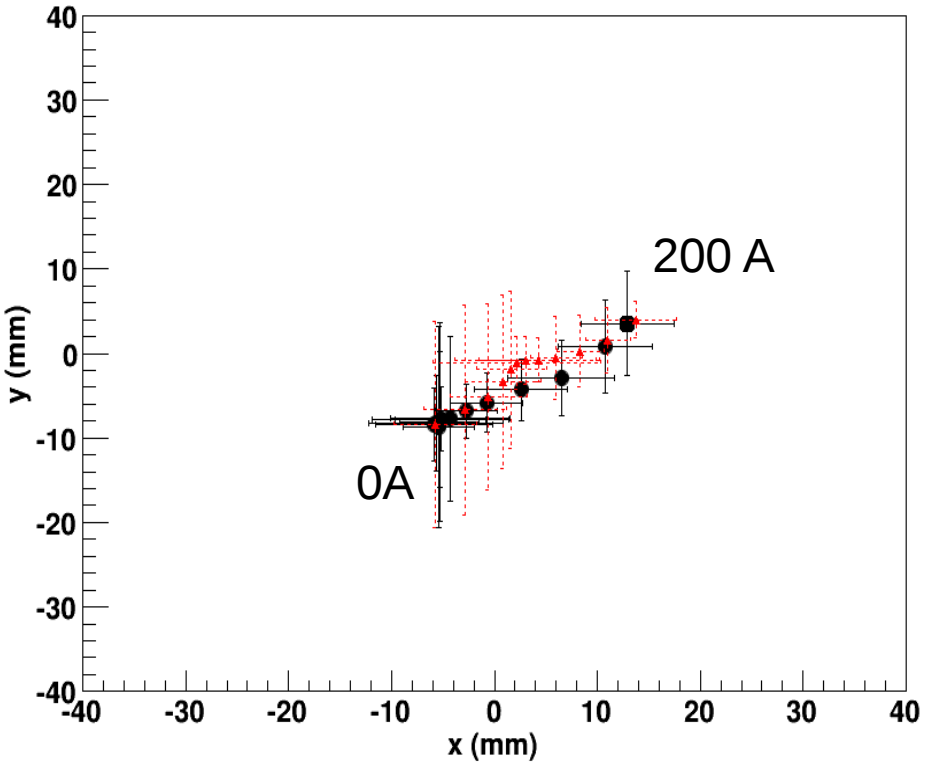
S1 and S2, 65 keV, August Data & GPT



S1 - S2

GPT: ϕ_{x1}=+7mr, ϕ_{y1}=-11mr

ϕ_{x2}=+9mr, ϕ_{y2}=-6mr



S1 + S2

GPT: ϕ_{x1}=+5mr, ϕ_{y1}=-10mr

ϕ_{x2}=-9mr, ϕ_{y2}=0mr