



中国科学院高能物理研究所
Institute of High Energy Physics Chinese Academy of Sciences

Radiation test proposal for TaichuPix

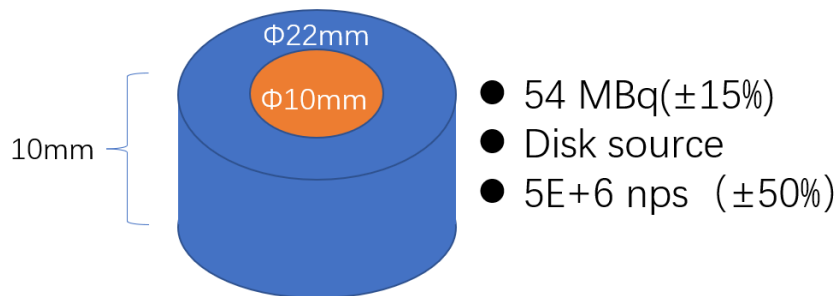
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Circular Electron Positron Collider



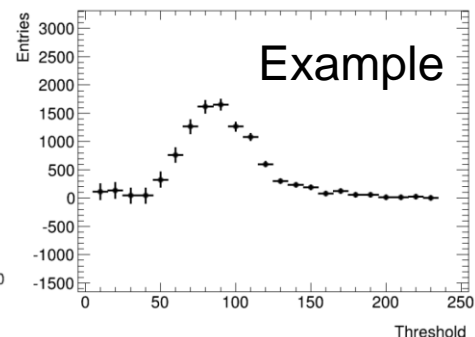
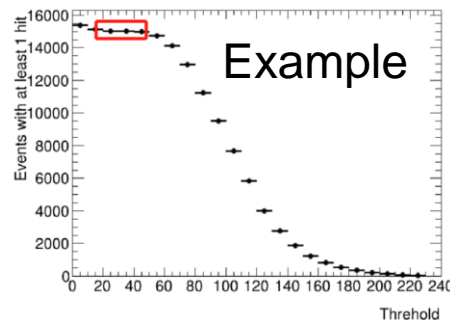
New beta source experiment



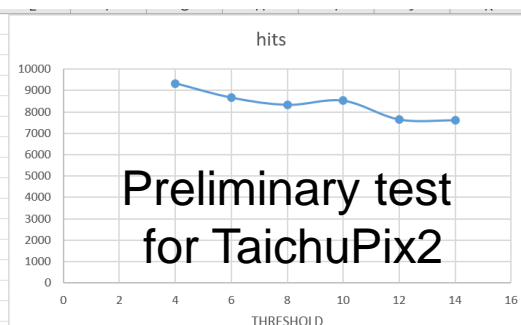
- $^{90}\text{Sr}/^{90}\text{Y}$ reaction
- $^{90}\text{Sr} \rightarrow ^{90}\text{Y} + e^- + \bar{\nu}_e$ half life 28.8 years/ 0.546 MeV
- $^{90}\text{Y} \rightarrow ^{90}\text{Zr} + e^- + \bar{\nu}_e$ half life 68 h/ 2.280 MeV

Becquerel: The becquerel is the SI derived unit of radioactivity. One becquerel is defined as the activity of a quantity of radioactive material in which one nucleus decays per second.

A Landau fit can be obtained with beta source threshold scan.



ITHR	threshold	hits
100	4	9326
110	6	8662
1000	8	8328
1010	10	8524
1100	12	7652
1110	14	7614

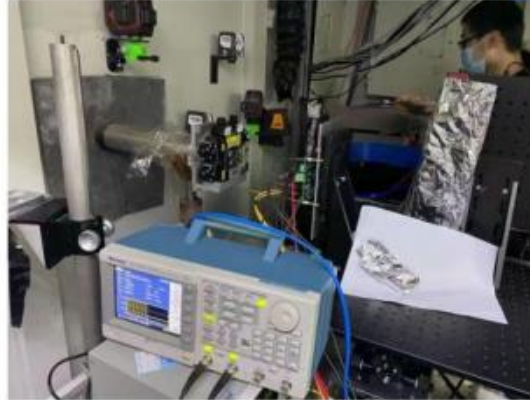




Preliminary results of TID



TID test setup



- TaichuPix2 was irradiated at Beijing Synchrotron Radiation Facility 1W2B beamline (6 keV X-ray)
- Dose rate ~ 17.63 krad/min for the first 2.5 Mrad, then 211.56 krad/min for 51min, then 1.24 Mrad/min for 15min
- Analog outputs (OUTA) was monitored by oscilloscope
- Chip survived after 30 Mrad irradiation dose

Ref: CEPC Physics and Detector Plenary meeting, Ying Zhang, 2021.1



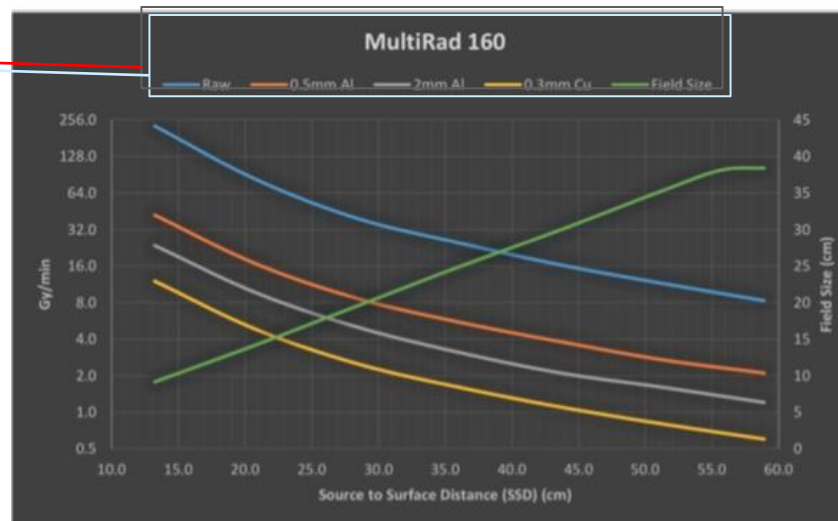
Optional experiment to double check TID



- MultiRad 160 Xray irradiator at IHEP(Same machine in CERN B161)
- Maximum dose rate is 250Gy/minute
- Expect to reach 10000Gy (1Mrad) within 40 minutes.



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TID test plan

- Chips: apply for 2 TaichuPix2 chips, one for major test, the other for comparison.
- Before irradiation: obtain enough data, draw a hitmap with Sr90 source.
- In radiation: increase the TID dose to 30Mrad and measure the same parameter as in BSRF to double check the performance.
- After irradiation: collect data again by Sr90 source, then analyze difference.



Thanks for your attention!