



SIMULATION OF THE PET SYSTEM USING TWO SCINTILLATION DETECTOR CsI(Tl) BASED ON GEANT4/GATE SOFTWARE

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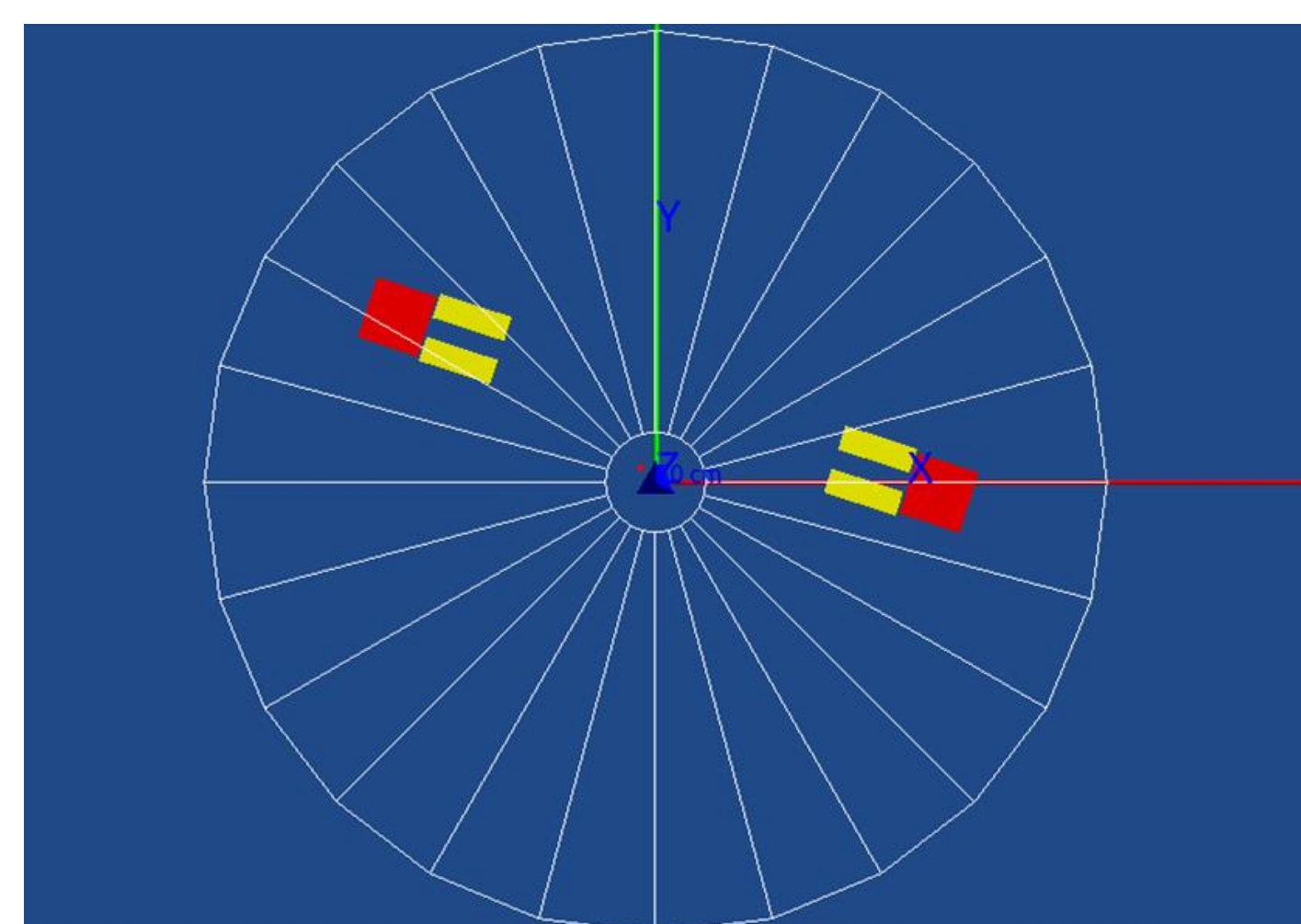
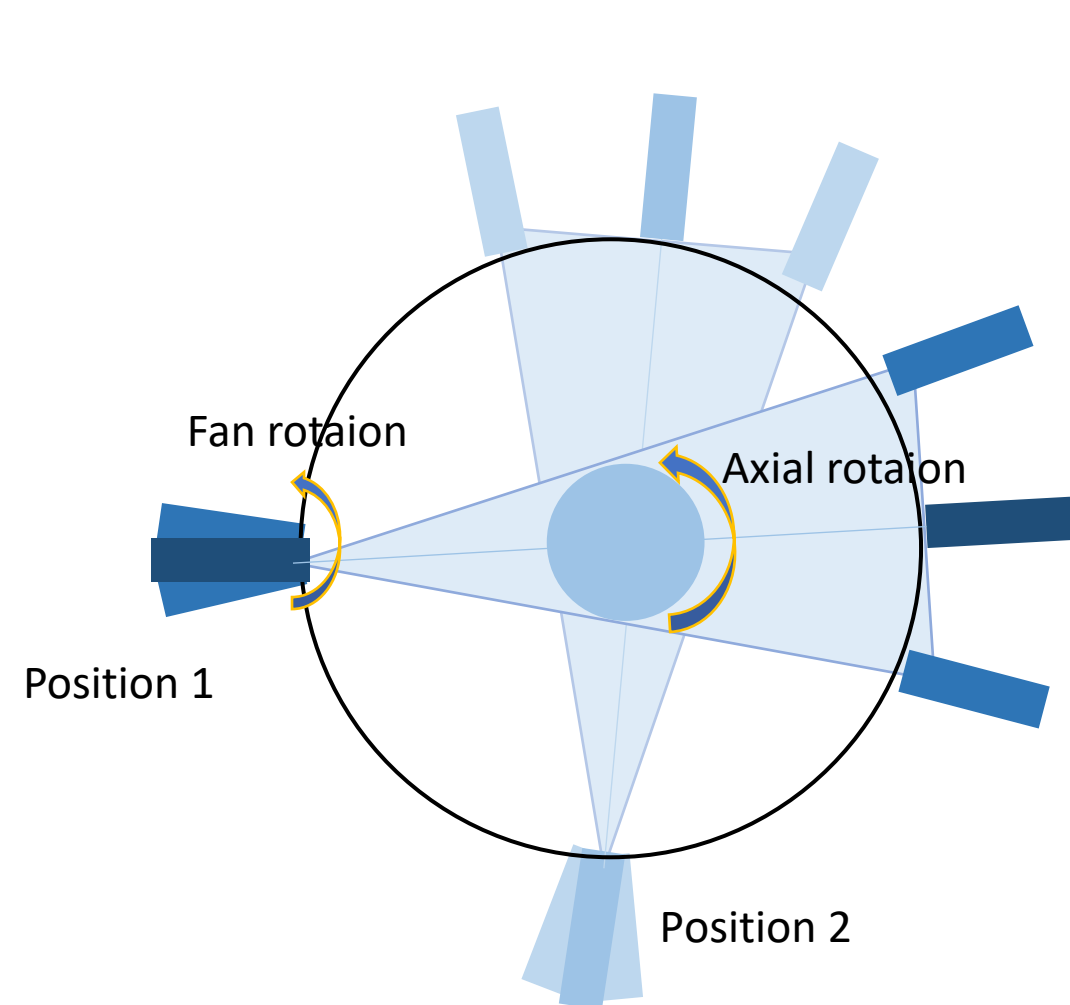
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Introduction

- Positron Emission Tomography (PET) is a powerful technique imaging in nuclear medicine. Nowadays, almost clinical diagnostics are used PET technology.
- This study is to develop a PET (Positron Emission Tomography) system using two scintillation detector CsI(Tl) by Monte-Carlo Geant4/Gate simulation software.
- Simulated data are analyzed by ROOT software.
- A 2D image reconstruction algorithm is based on Filtered-back-projection (FBP).
- Simulate for one RI source and two RI sources.

Two-detector PET system simulation

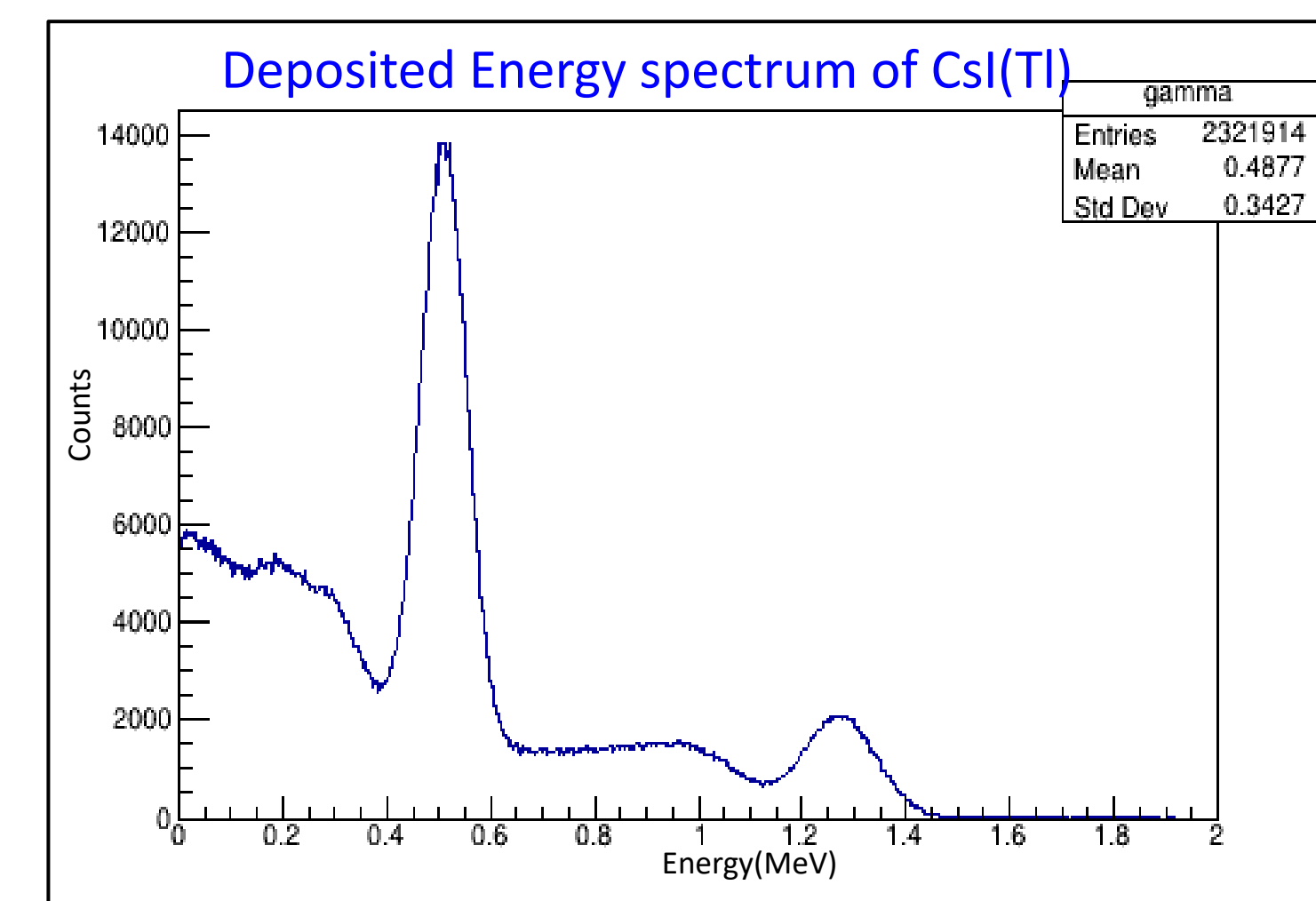
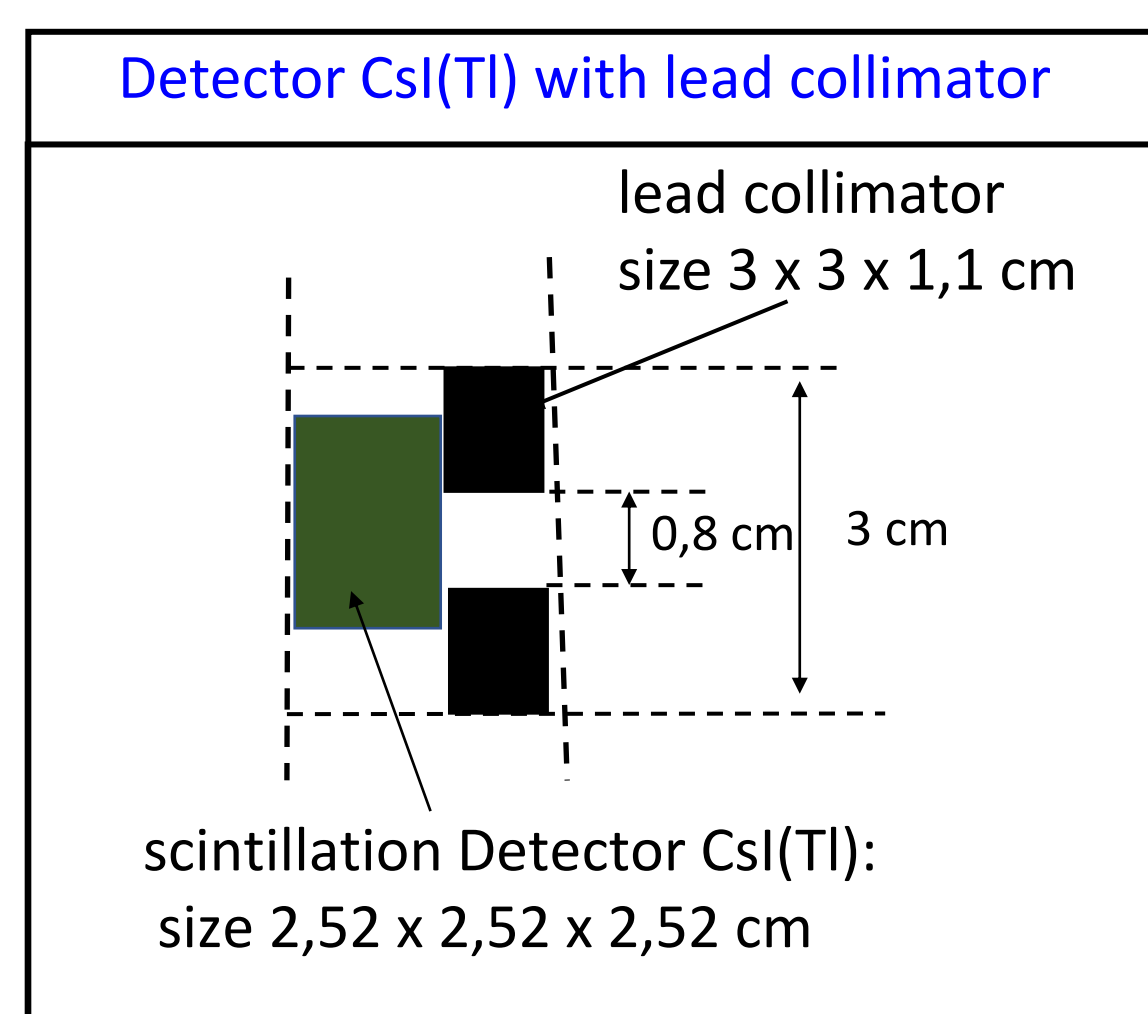


The PET system's design:
 Two CsI(Tl) scintillation detectors.
 Axial rotation: 360°; angle step: 9°.
 Fan rotation: 36°; angle step: 1.8°.

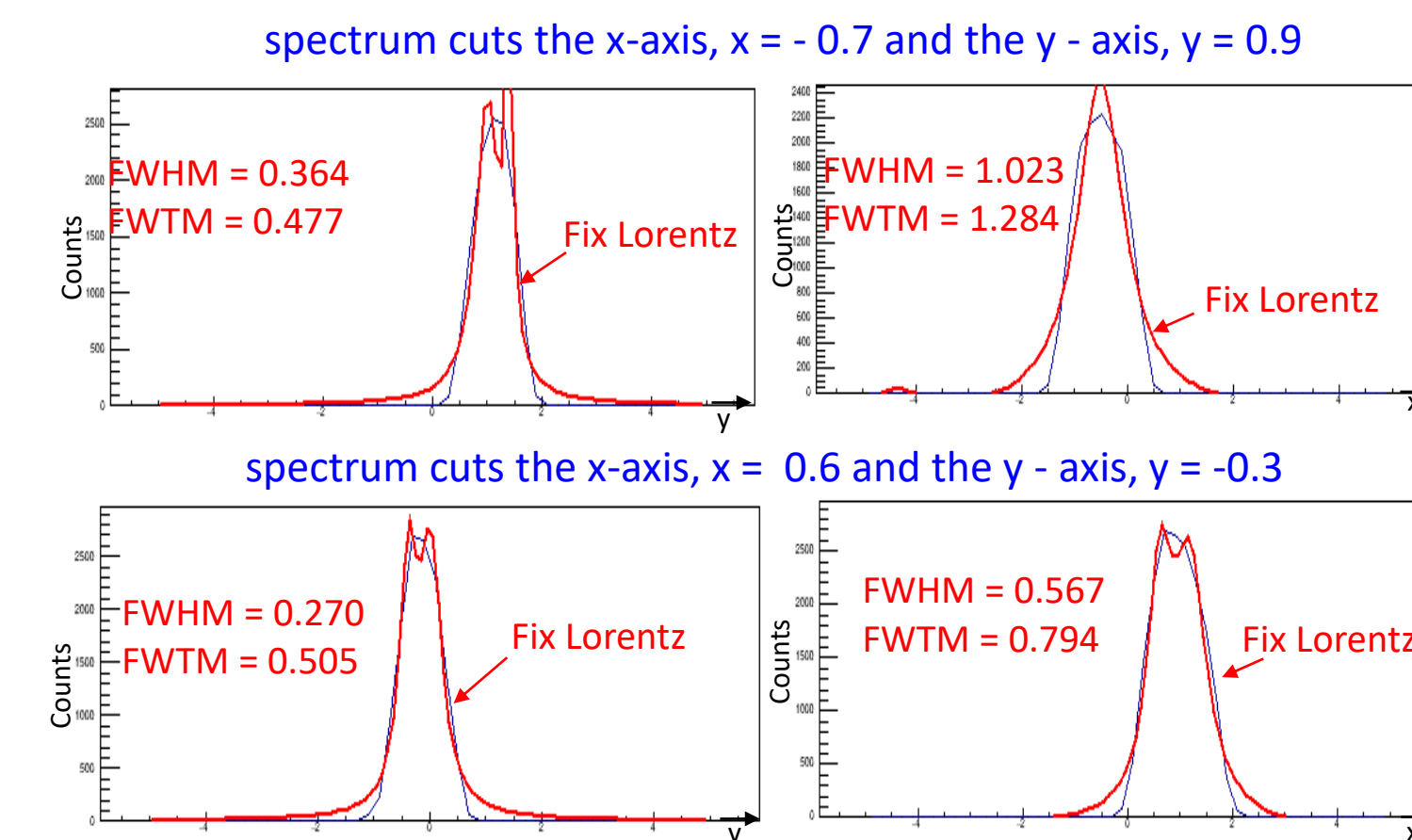
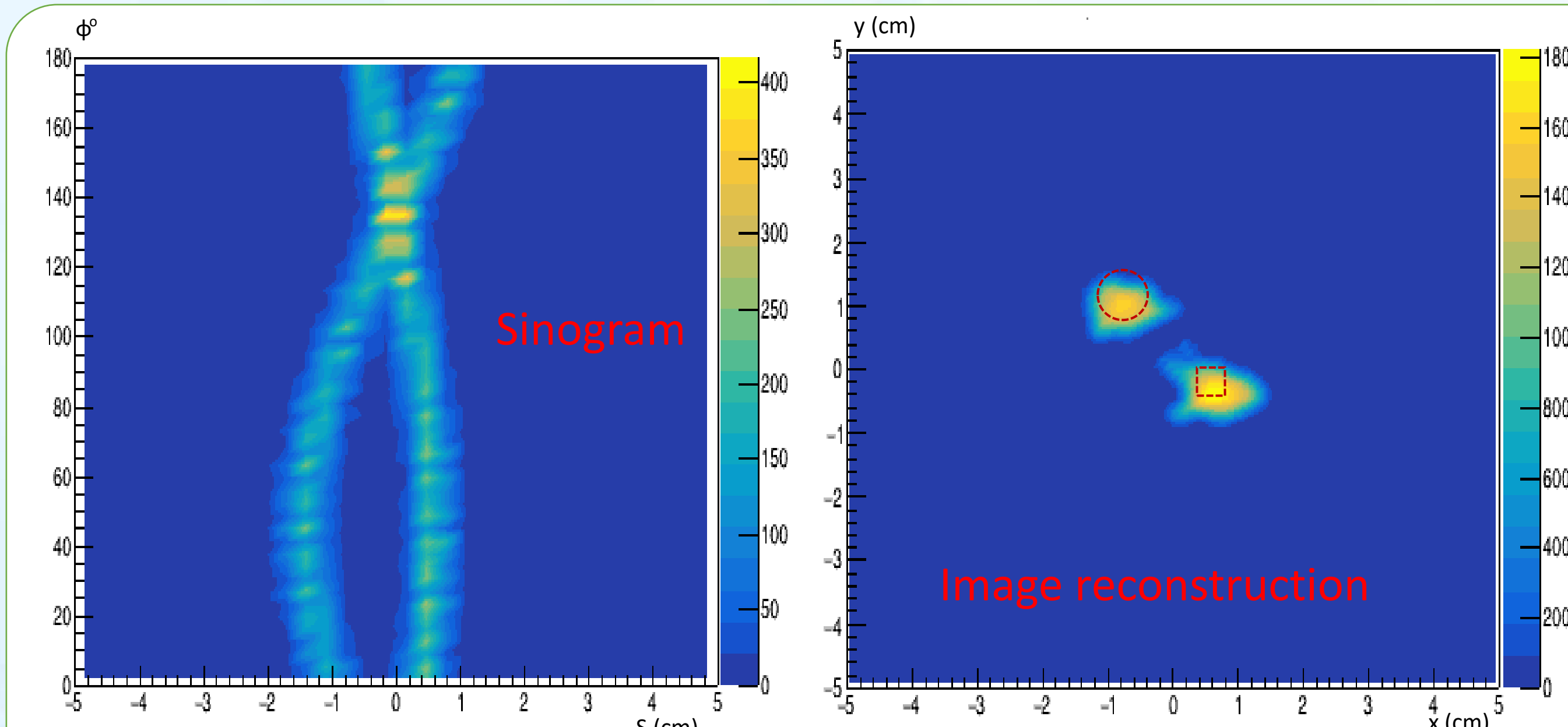
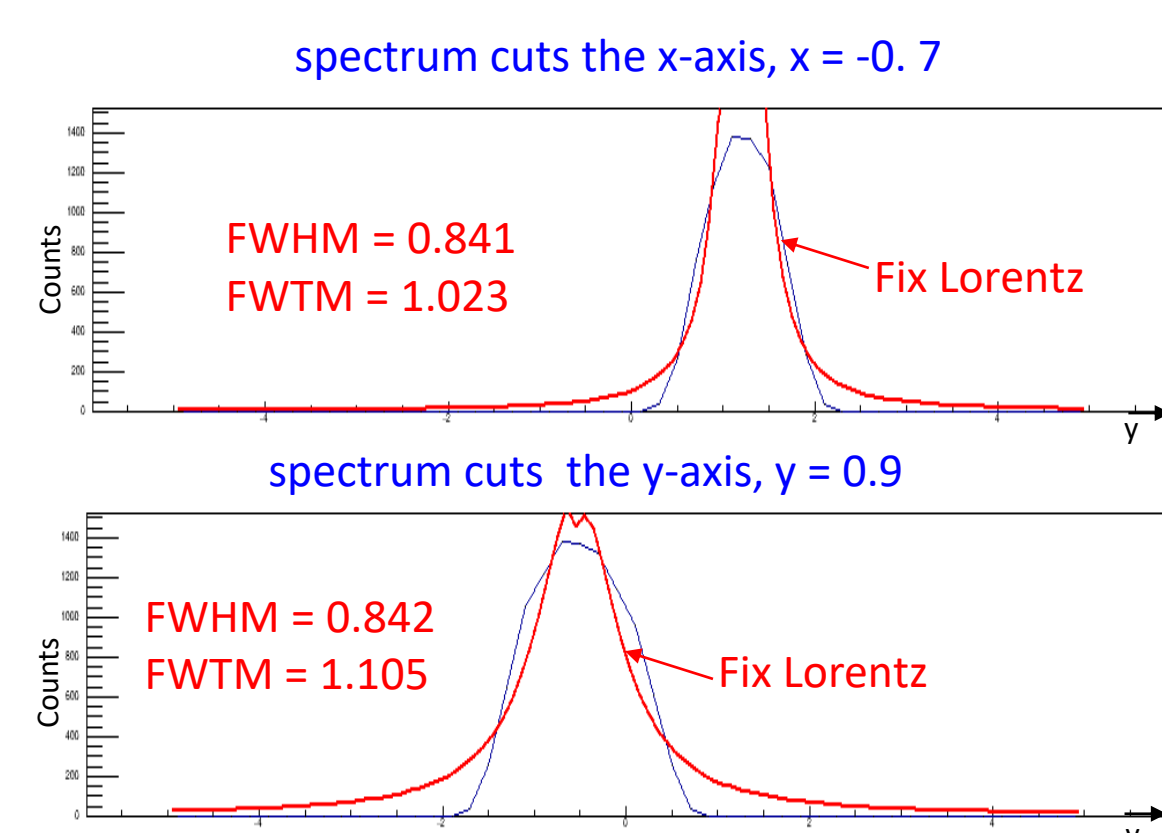
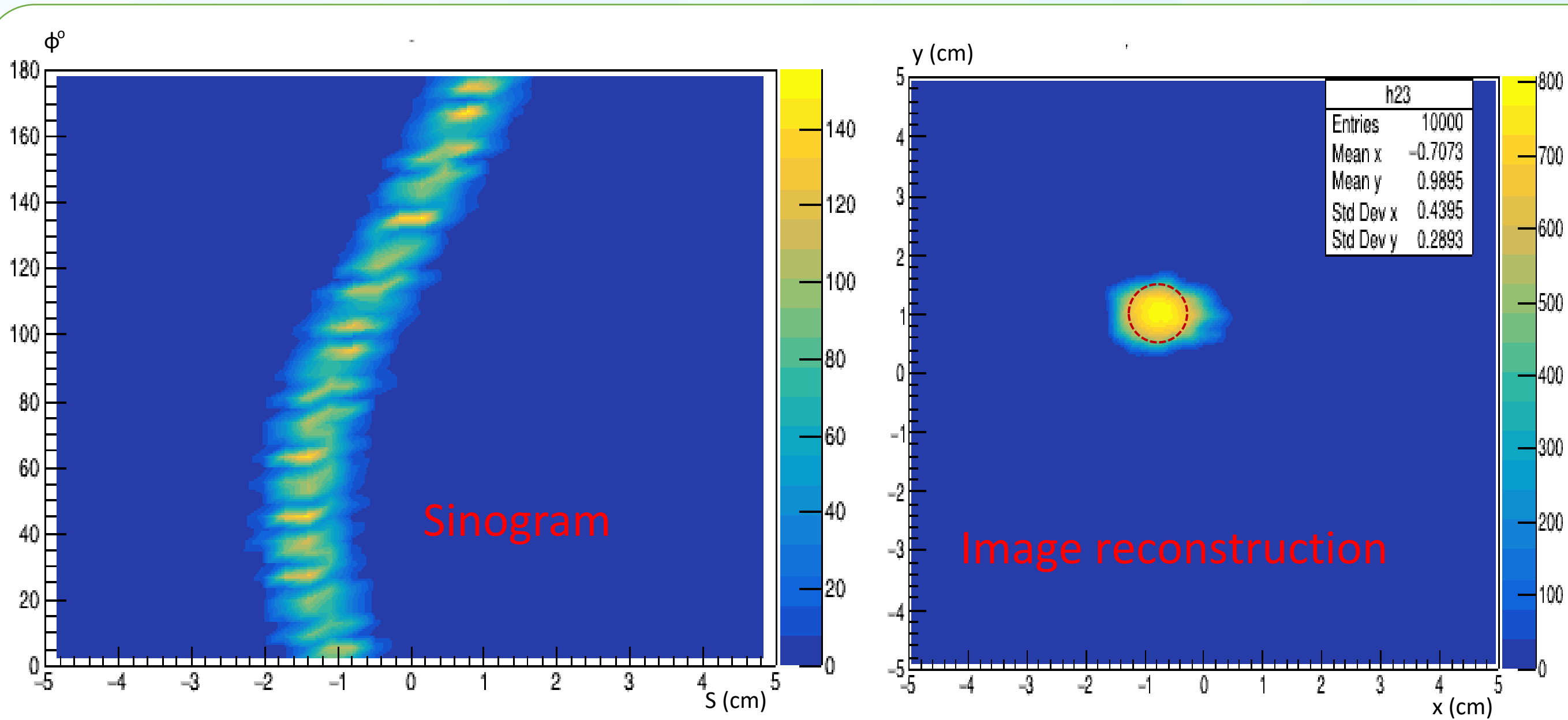
- + Radiation source: Na -22, 1 uCi.
- + Energy window: 350 KeV – 650 KeV
- + Time coincidence: 100 nsec
- + Time step: 20 sec
- + Total time meas.: 16.000 sec

CsI(Tl) detector:

- Energy resolution 20% at energy 511 KeV
- Time resolution: 10 nsec
- Lead collimator



Result and discussion



Conclusions

This PET system only using two detectors so it is simplicity, it is suitable for education purpose, to each about the PET technology and it basic concepts, from analogue pulse analysis to the coincidence sorting and imaging reconstruction.

We evaluate that it is possible to reconstruction images from this simple PET system using two scintillation detectors CsI(Tl).

References

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- [3] Michil Defrise, Paul E Kinahan and Christian J Michel FBPmethod.pdf.