Endcap Hit Study

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Motivation

Hit rate and distribution are crucial when designing the sensor

- For safety, Z pole is considered for it is the mode with most events.
- At Z pole, the background with most events is pair production.

Pair production beam background:

- Positrons and electrons
- Events moving from both –z to z and z to –z
- Small theta, will mainly hit endcap
- Low momentum, most can only reach inner endcap

Simulation

Tool: CEPCSW

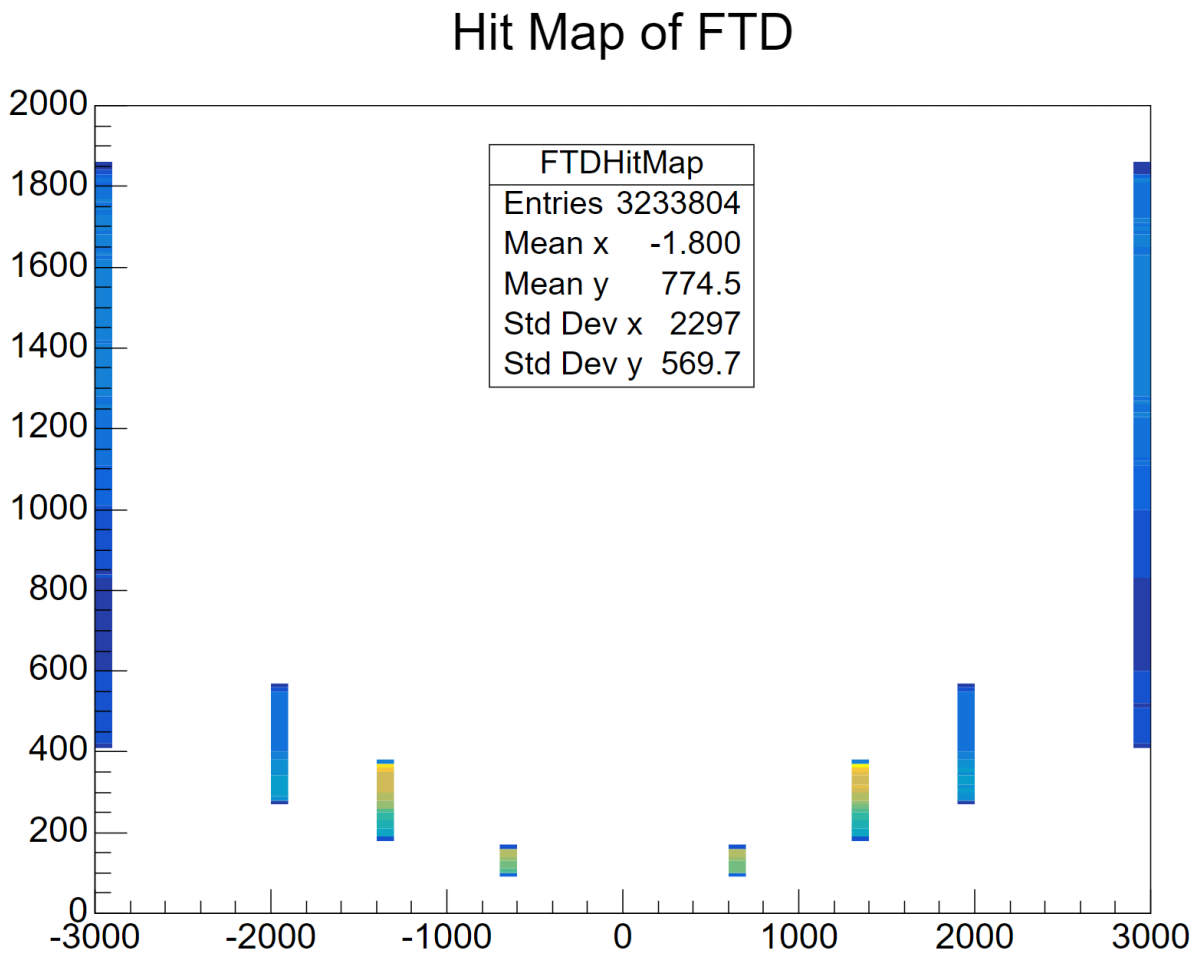
Geometry:

- TDR_o1_v01

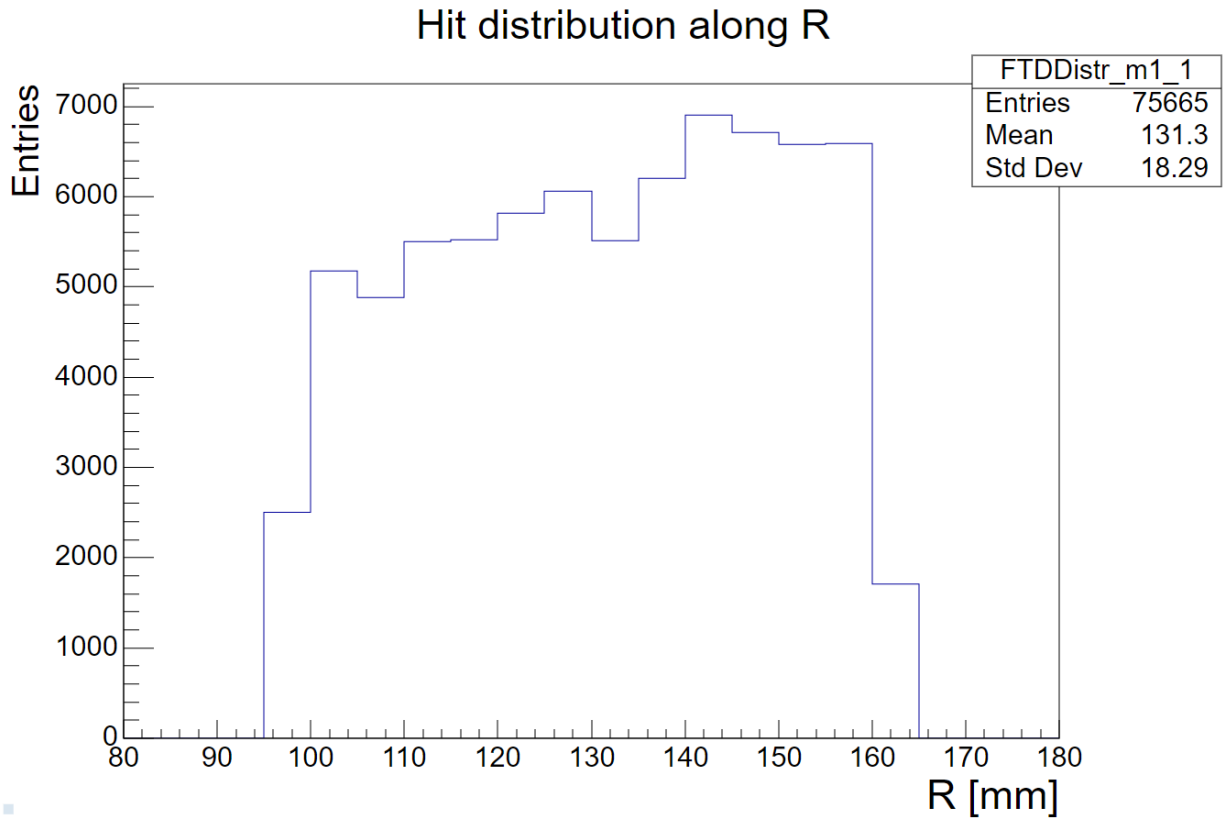
Background: Pair Production

4k bunches used

- About 3e7 evts



Results – 1st layer

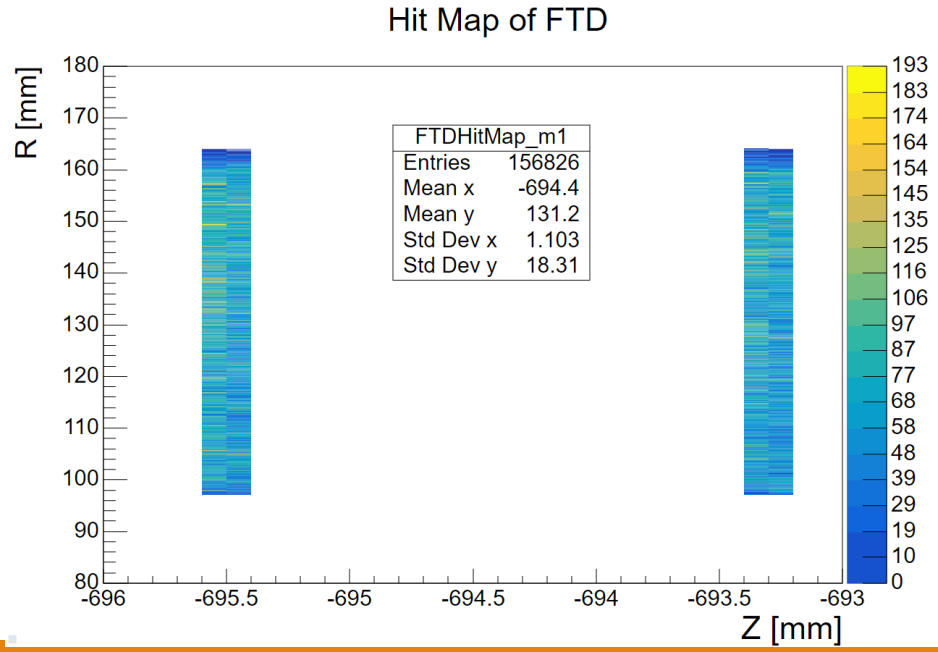


The hit distribution along R on the sensor [-693.5,-693] (The right one in the hit map figure)

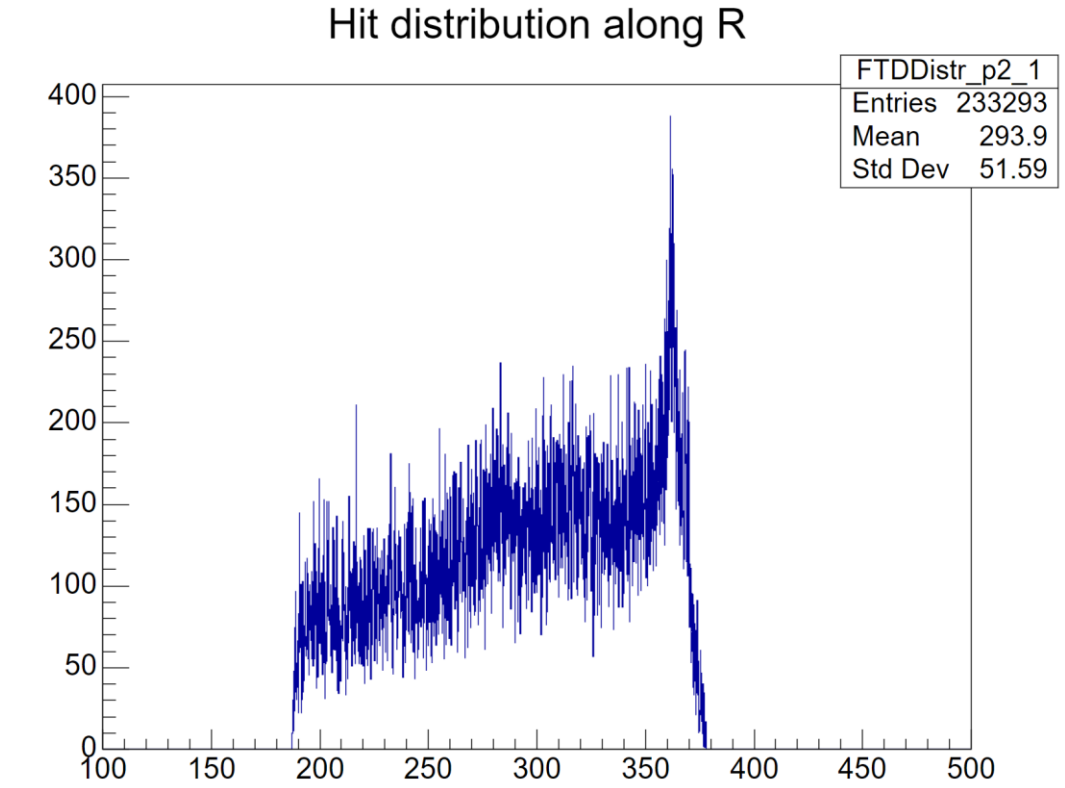
Z=695mm

4k BX ~76k hit, 3.8e-2 hit/cm2 per BX

4e7 BX (1s) ~7.6e5 khit, Hit rate: 1500 kHz/cm2



Results – 2nd layer

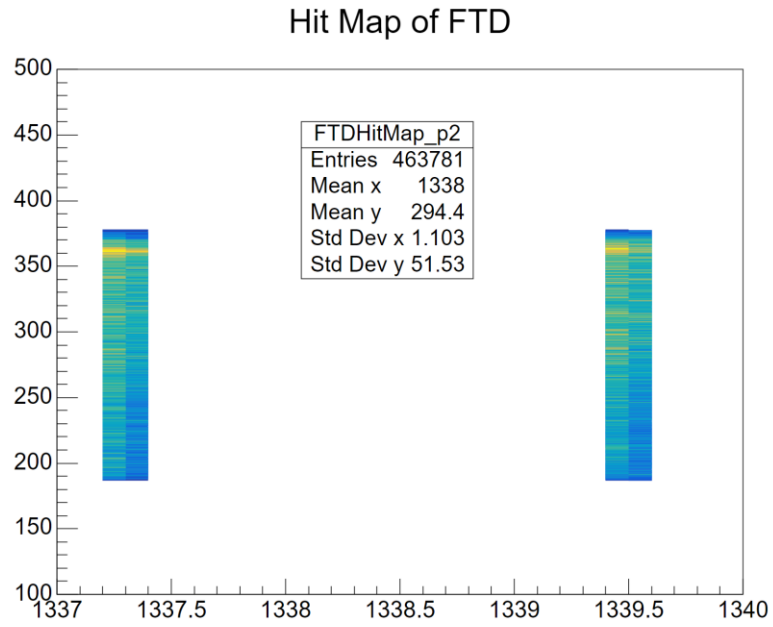


The hit distribution along R on the sensor [1337,1337.5] (The left one in the hit map figure)

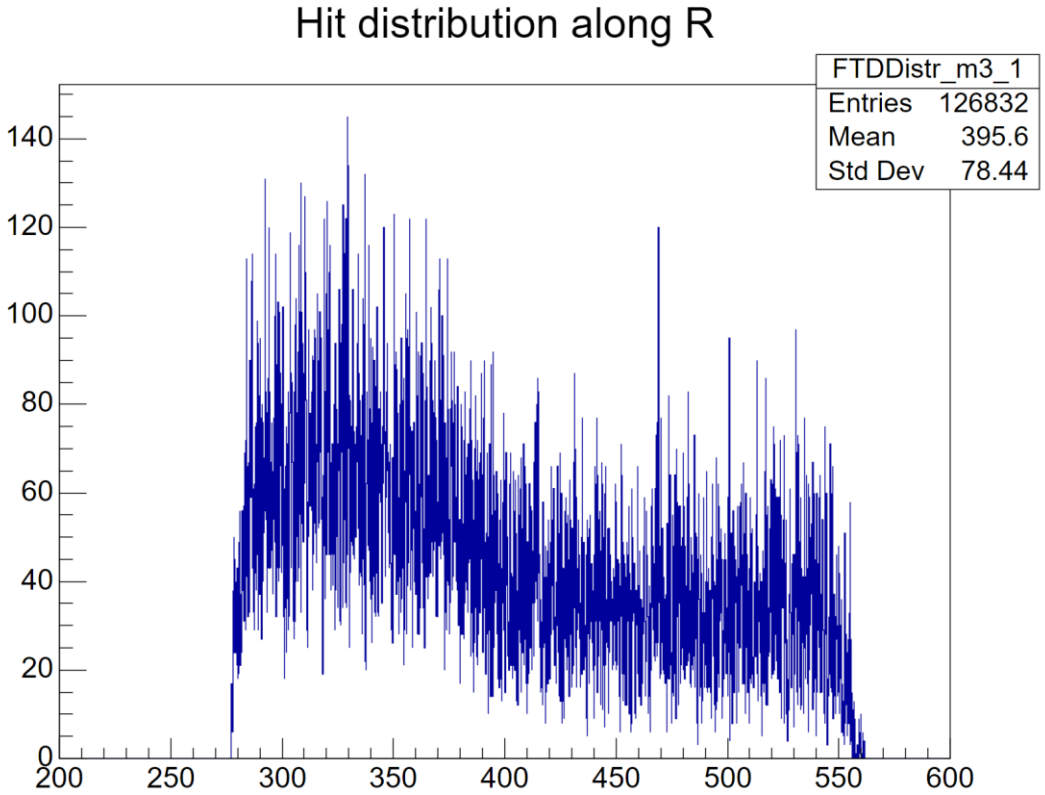
Z=1339mm

4k BX ~464k hit, 3.62e-2 hit/cm2 per BX

4e7 BX (1s) ~4.7e6 khit, Hit rate: 1450 kHz/cm2



Results – 3rd layer

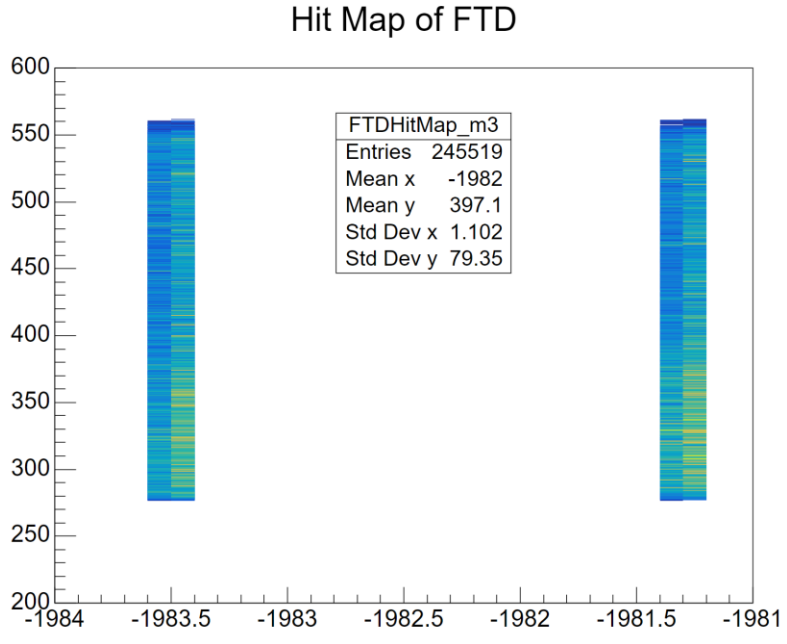


The hit distribution along R on the sensor [-1981.5,-1981] (The right one in the hit map figure)

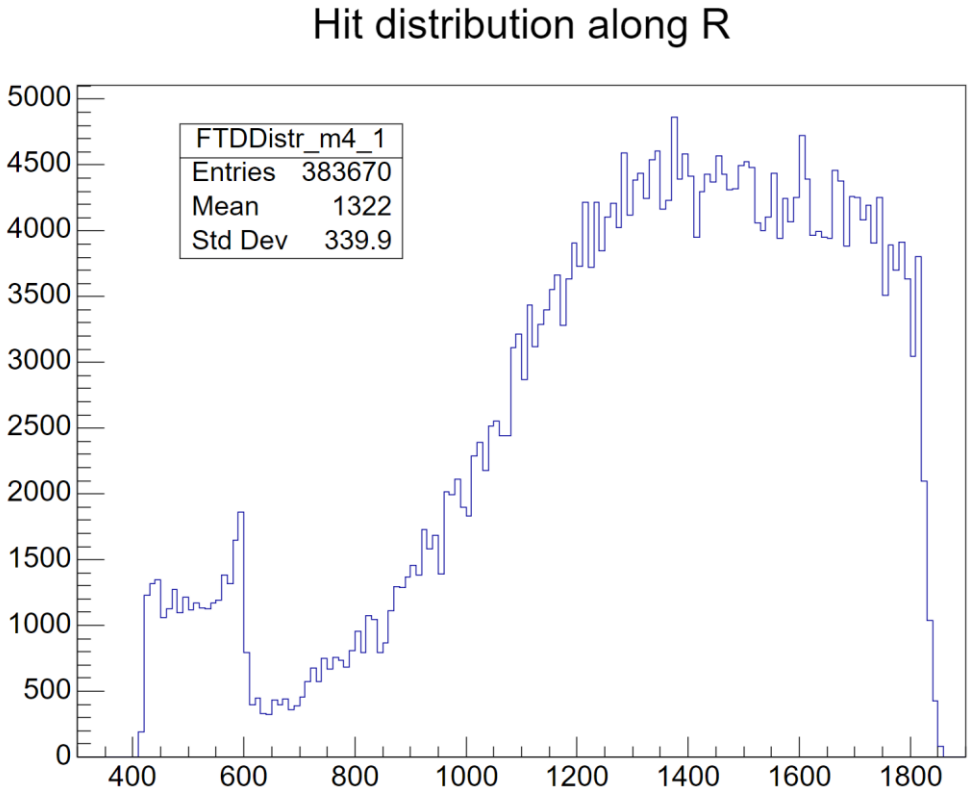
Z=1983mm

4k BX ~127k hit, 4.5e-3 hit/cm2 per BX

4e7 BX (1s) ~12.7e5 khit, Hit rate: 179 kHz/cm2



Results – 4th layer

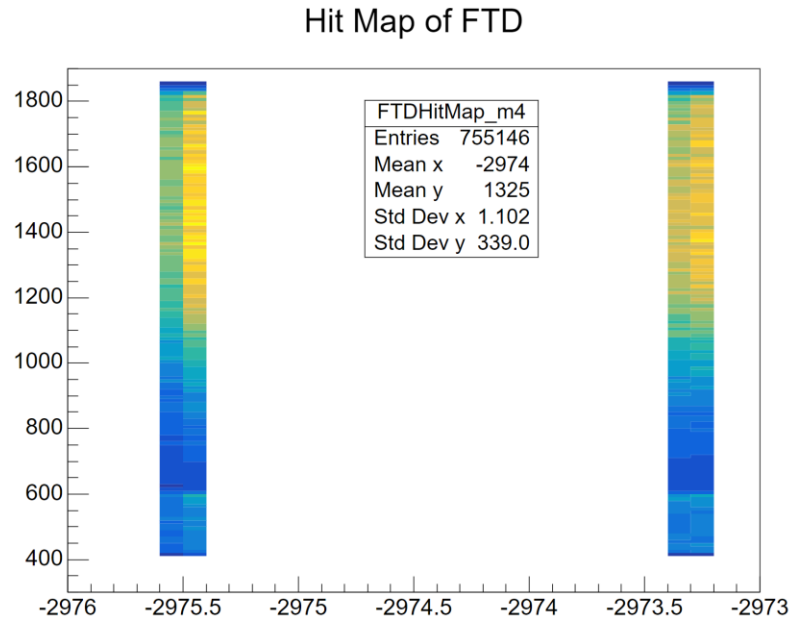


The hit distribution along R on the sensor [-2973.5,-2973] (The right one in the hit map figure)

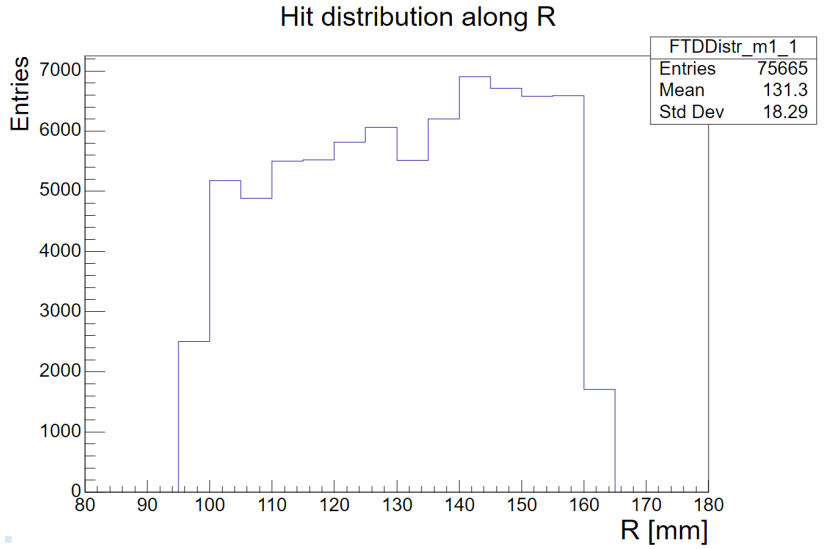
Z=2975mm

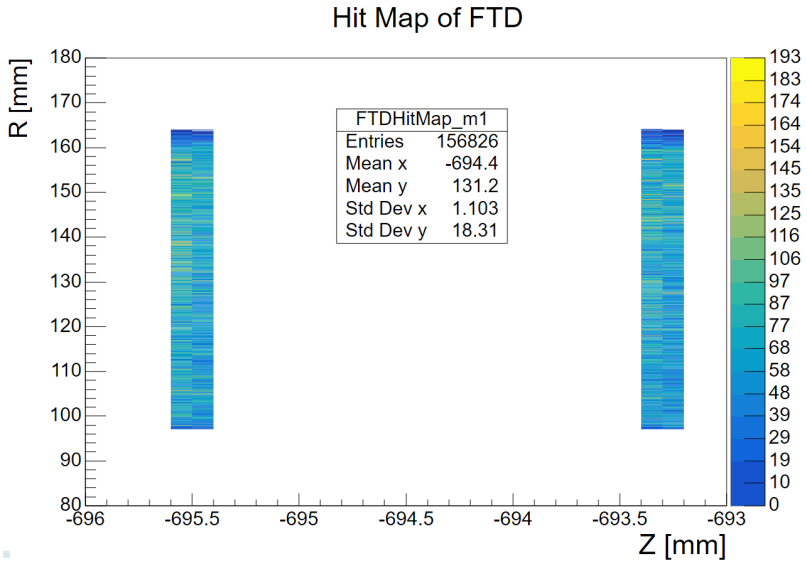
4k BX ~384k hit, 1e-3 hit/cm2 per BX

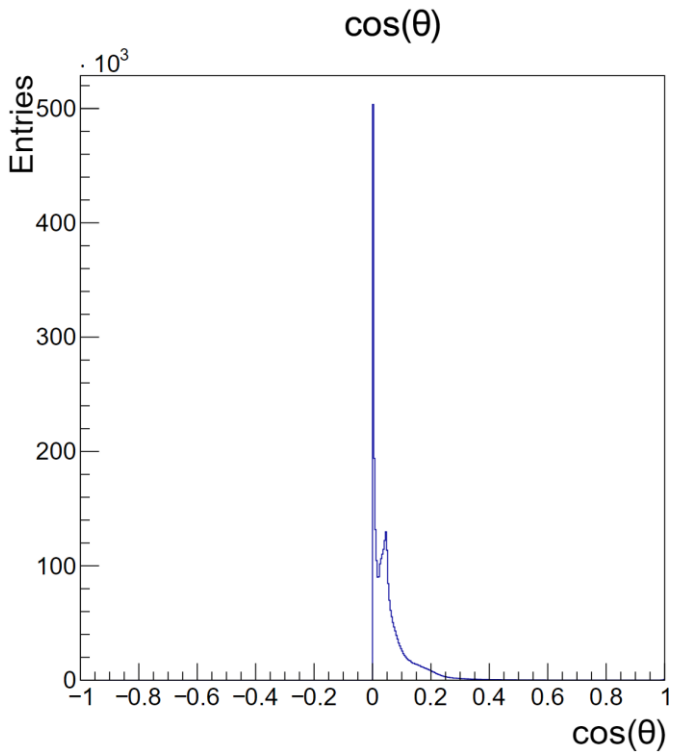
4e7 BX (1s) ~38.4e5 khit, Hit rate: 38.9 kHz/cm2



Results – Innermost Layer







Initial direction

With R increasing, the number of hits slightly increased

But we expect more hits in lower R region