Centrality estimation using FHCal and Hodo in Xenon run

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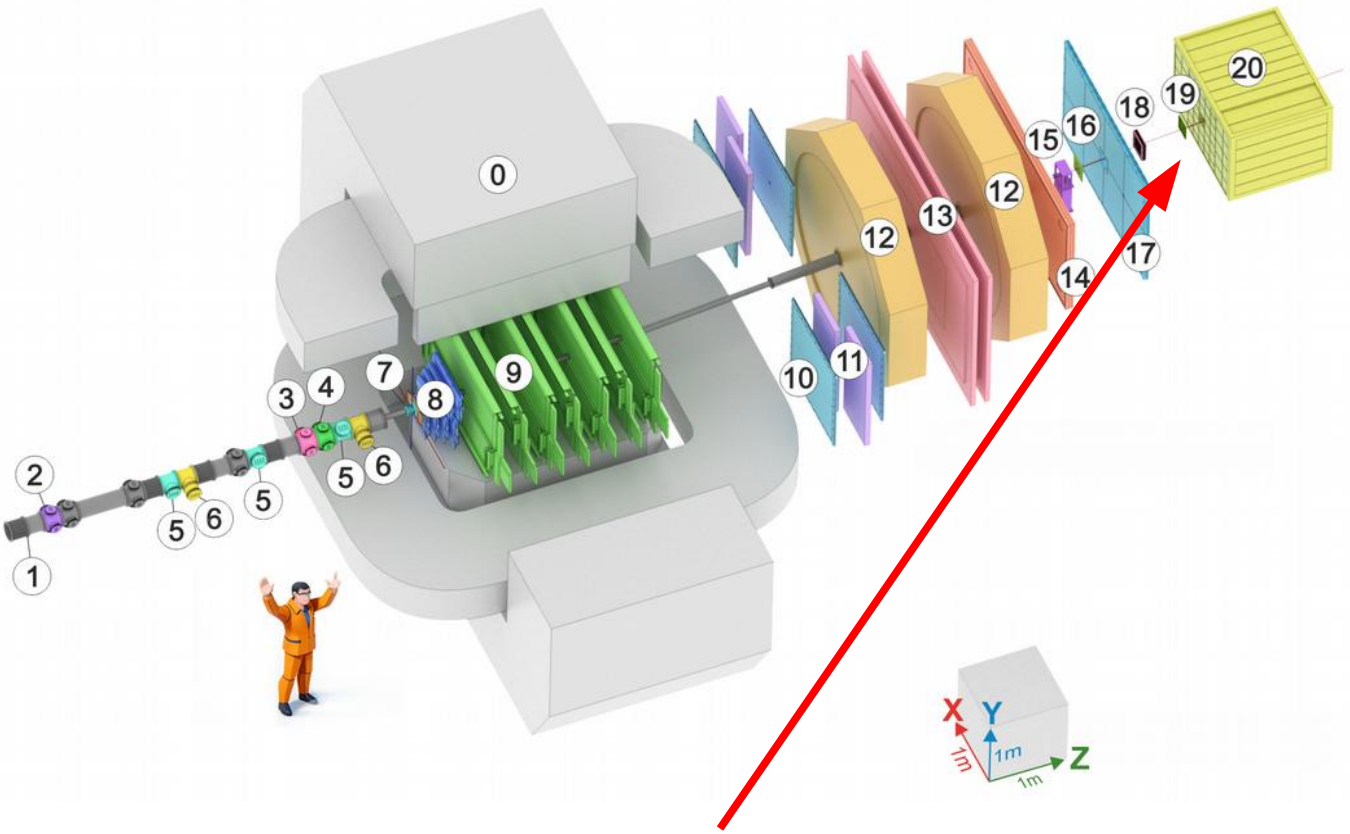
Outline

1. FHCal and Hodo positions
2. Event selection cuts
3. Z^2_{Hodo} for Exp vs MC
4. E_{FHCal} for Exp vs MC
5. Centrality intervals
6. Probability of belonging to one of the centrality intervals
7. Plans

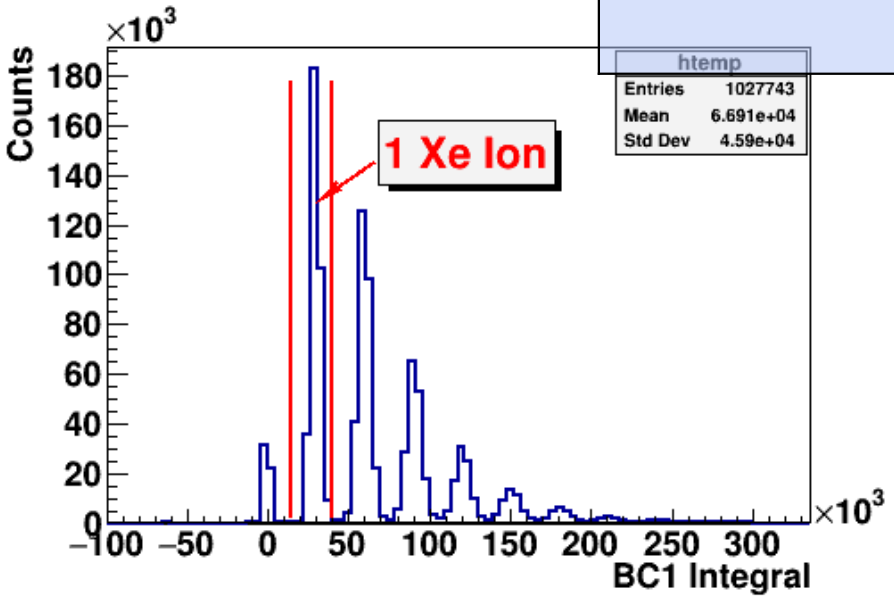
FHCal and Hodo positions



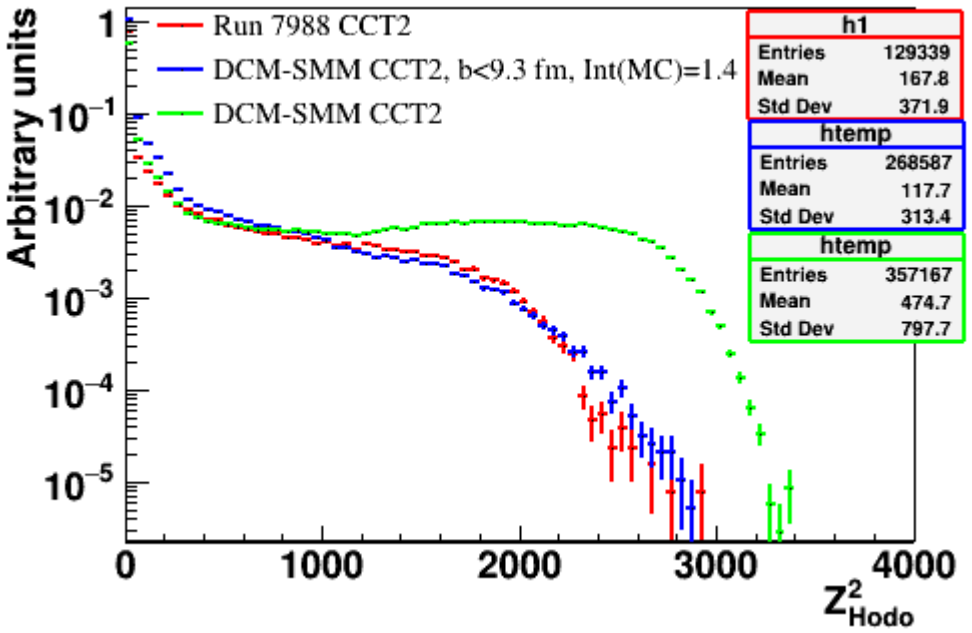
19) Forward Quartz Hodoscope (Hodo),
20) Forward Hadron Calorimeter (FHCal)

Event selection cuts

Exp	MC (DCM-SMM)
One Xe ion (BC1 Integral)	
CCT2 bit in the trigger's mask	
PrimaryVertex.fNTracks > 1	
PrimaryVertex from the target	
0.1<PrimaryVertex Chi2/NDF<10.	
BD Multiplicity > 4 (CCT2 trigger)	
	b < 9.3 fm (trigger efficiency)

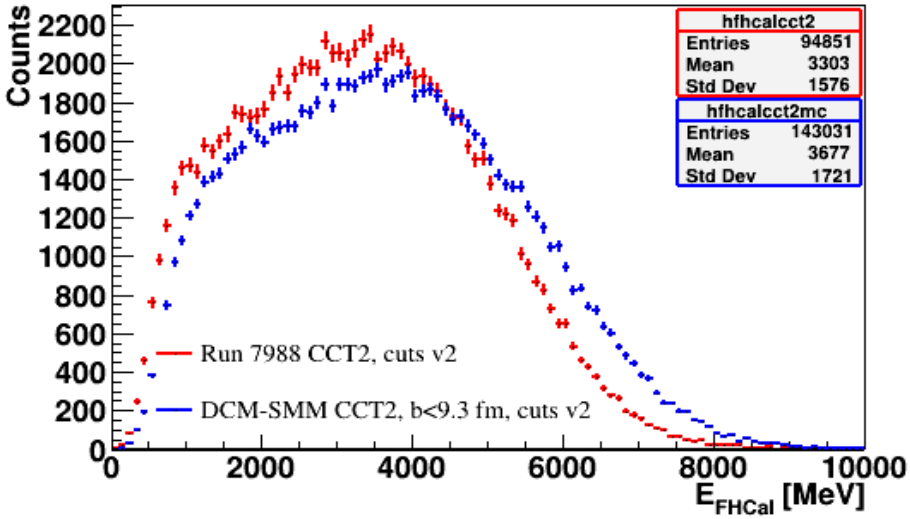


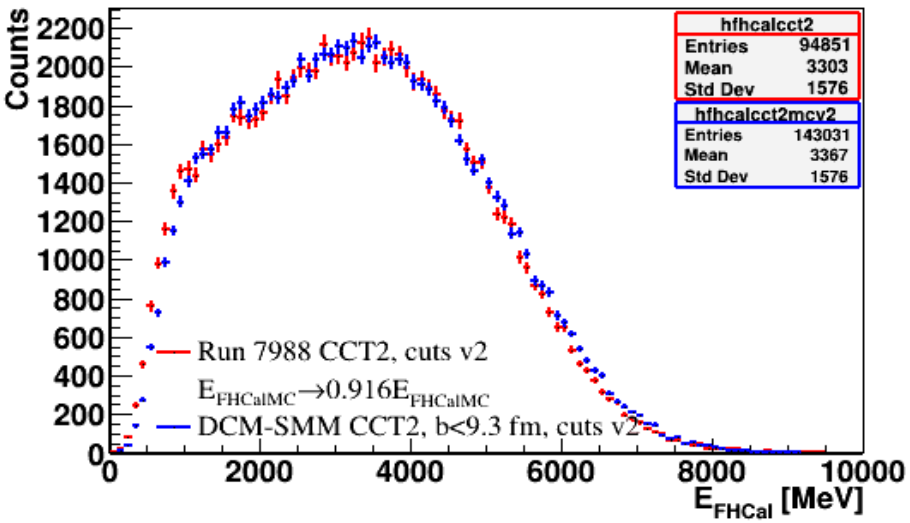
Z^2_{Hodo} for Exp vs MC



- ✓ Nikolay Karpushkin's commits with realistic Hodo effects over the past month
- ✓ For Z^2_{Hodo}>300, **MC** is close to **Exp**
- ✓ For Z^2_{Hodo}<300, **MC** and **Exp** are different
- ✓ Hodo detector group only explains the difference when Z^2_{Hodo}<50
- ✓ **MC** without **b<9.3 fm** cut does not match **Exp**

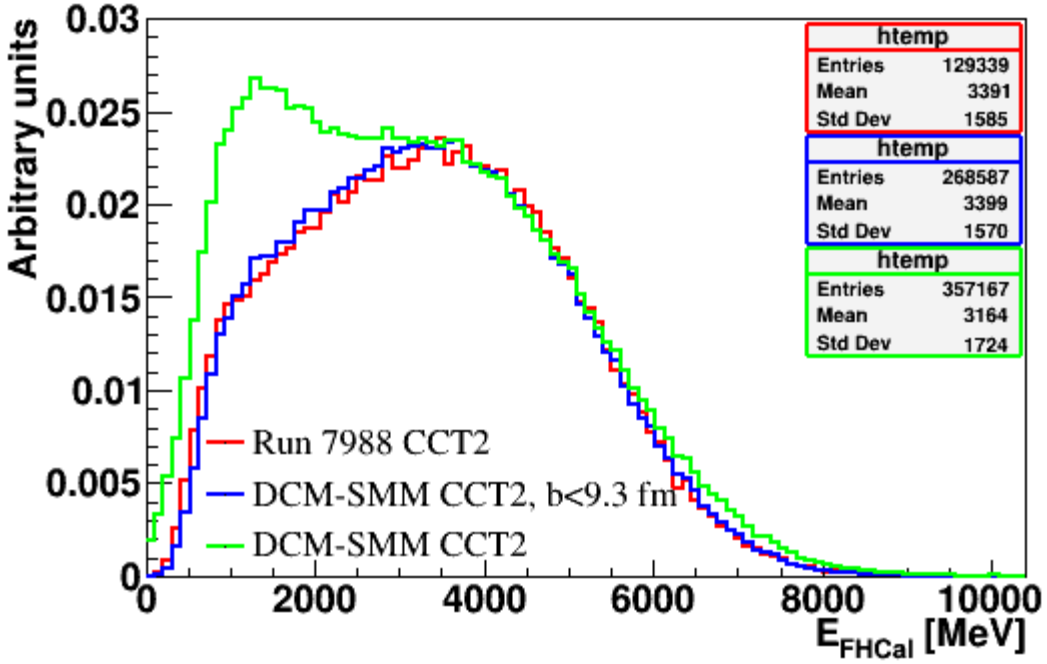
E_{FHCal} for Exp vs MC





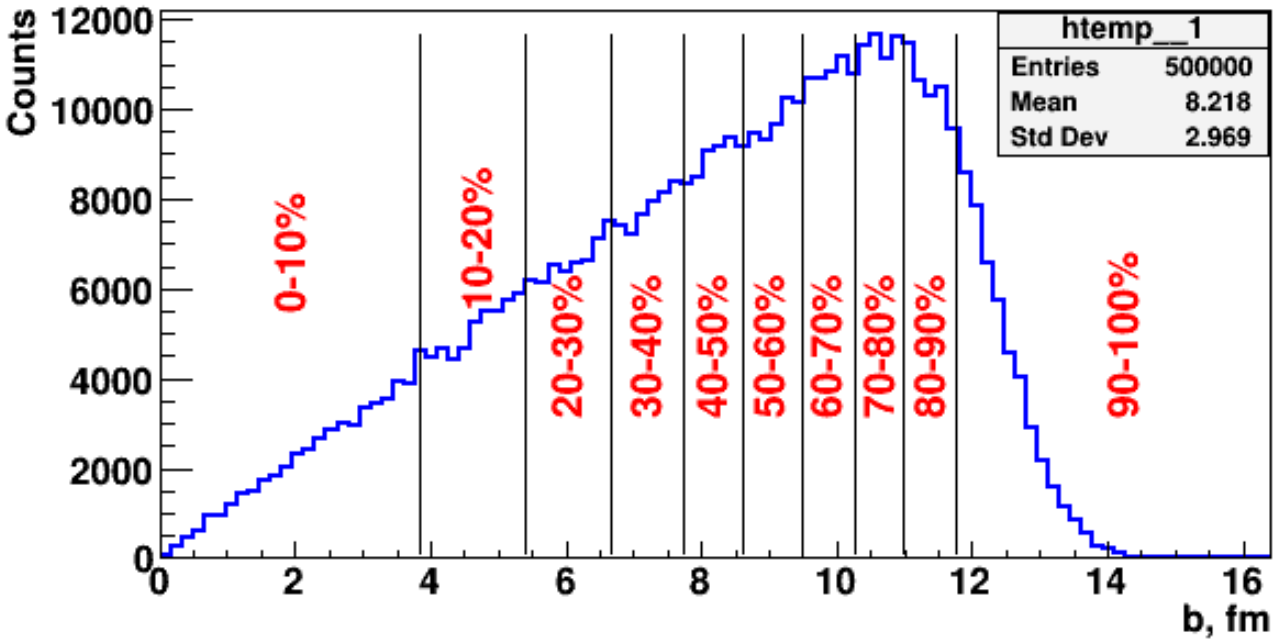
- ✓ Left figure: E_{FHCal} **MC** distribution is wider than **Exp**
- ✓ Right figure: $0.916 \cdot E_{FHCal}$ **MC** distribution is close to **Exp**

E_{FHCal} for Exp vs MC



- ✓ **MC** without **b<9.3 fm** cut does not match **Exp**

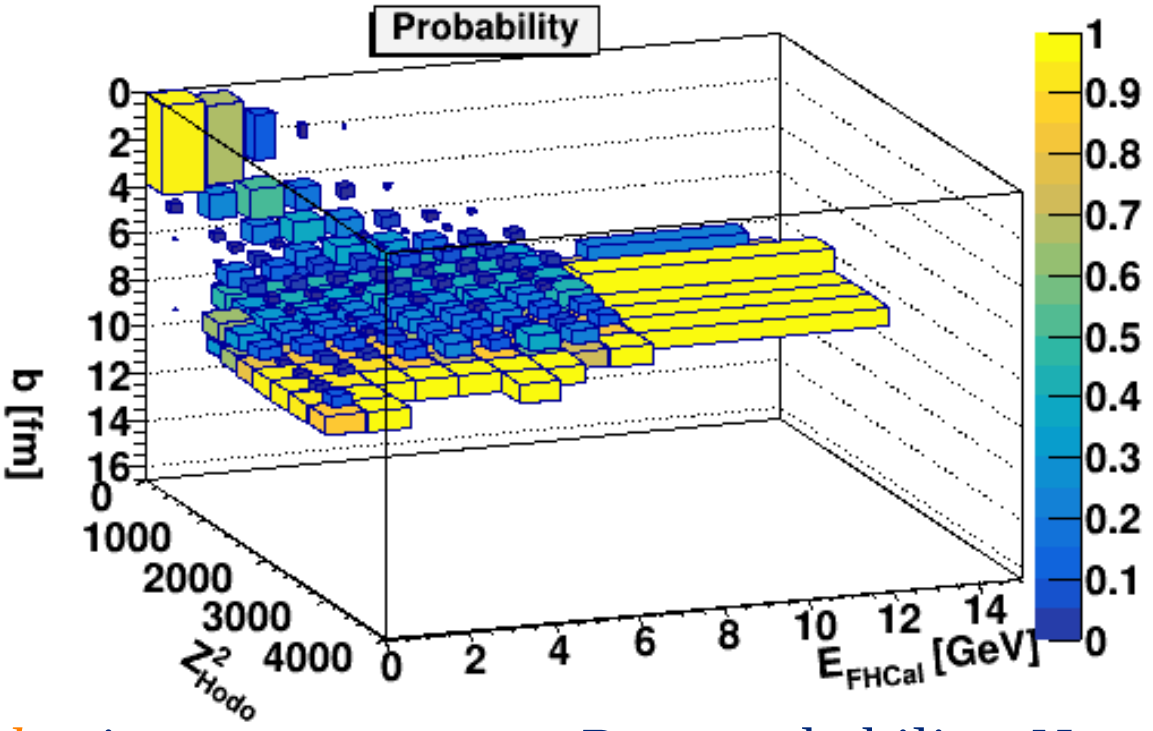
Centrality intervals



- ✓ Impact parameter **b** distribution from DCM-SMM for all events without any cuts (500k events)
- ✓ Each centrality interval contains 50k events

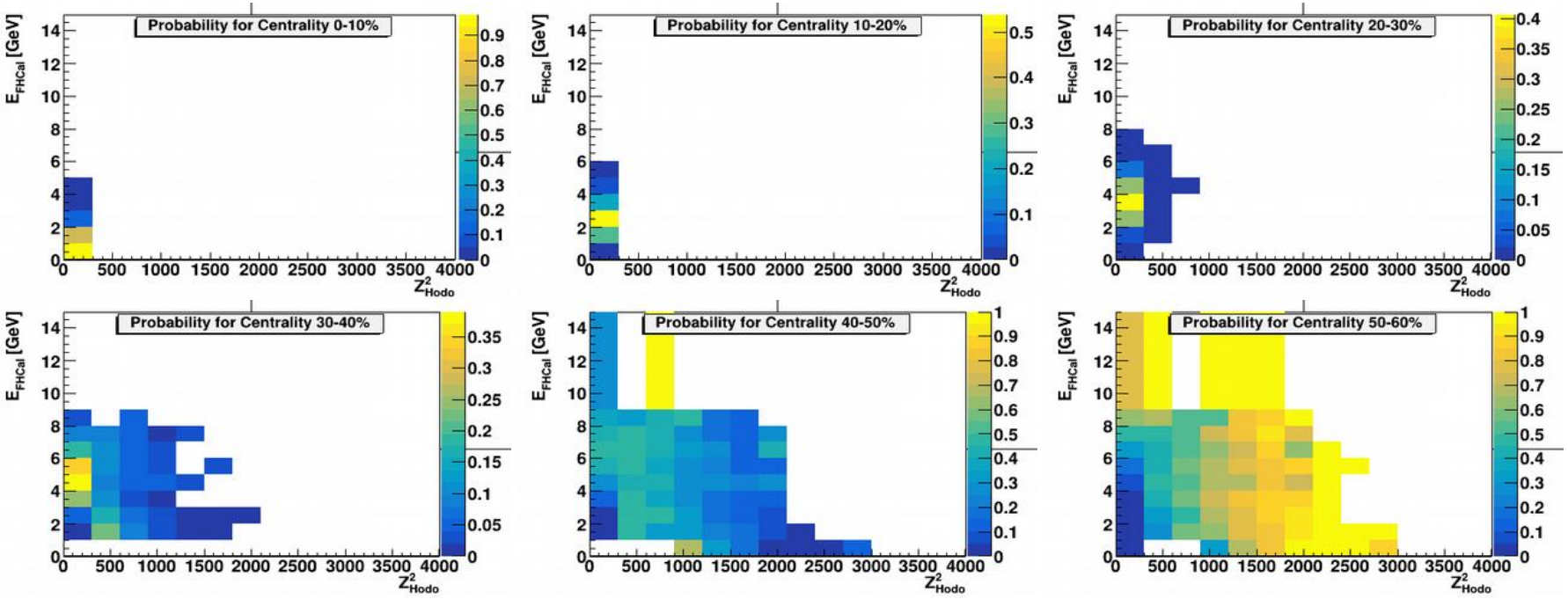
Probability of belonging to one of the centrality intervals

$$P_{ijk} = \frac{N_{ijk}}{\sum_k N_{ijk}},$$



- ✓ i – E_{FHCal}, j – Z^2_{Hodo}, k – impact parameter, P_{ijk} – probability, N_{ijk} – number of events in the 3D bin
- ✓ For each **Exp** event we have (i, j) and can obtain P_{ijk} for each centrality interval
- ✓ To estimate the binning systematic uncertainty, use 3 different binnings

Probability of belonging to one of the centrality intervals



- ✓ Events with centrality 0-20% belong to Z^2_{Hodo}<300, where Hodo does not perform as well
- ✓ As the centrality increases, the range of values accessible by E_{FHCal} and Z^2_{Hodo} expands
- ✓ Centrality intervals > 60% are not filled due to the cut **b<9.3 fm**

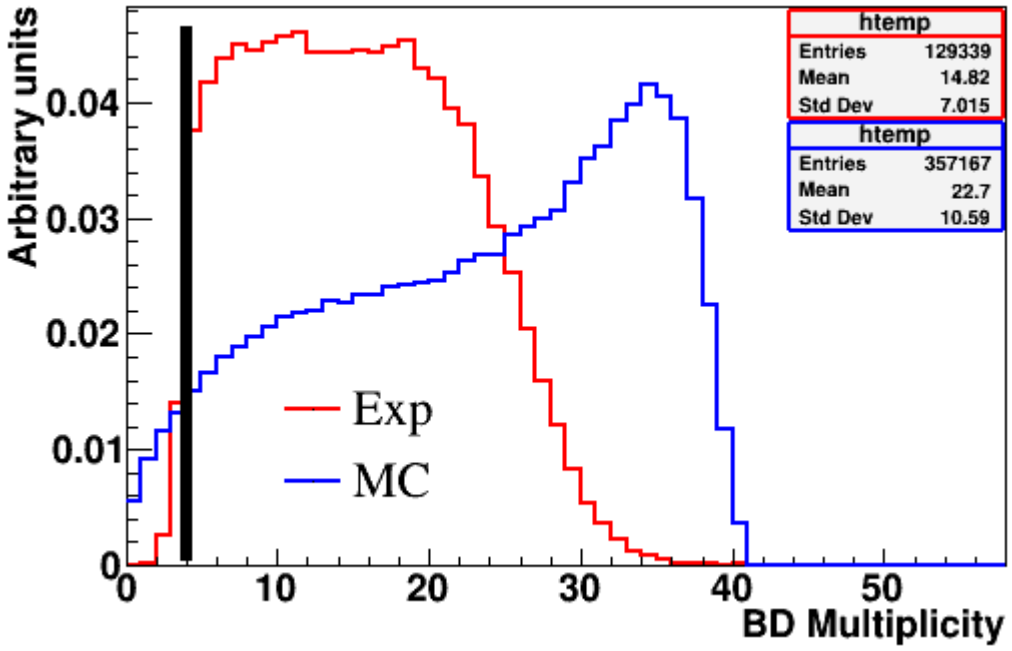
Plans

1. Develop more realistic method that take into account the trigger efficiency
2. To elaborate an approach to the analysis of events with two or more Xe ions

Thank you for attention!

Backup

BD Multiplicity for Exp vs MC



- ✓ **MC** and **Exp** BD multiplicity distributions are very different