The particle angular correlation measurements in small colliding systems, such as p+Pb[1], d+Au and 3He+Au at RHIC and the LHC, have recently attracted significant interest. In particular, high-multiplicity events from such collisions exhibit a very similar pattern of long-rapidity-range azimuthal correlations (the "ridge") as in Au+Au and Pb+Pb collisions. In AA collisions it is widely accepted that the ridge reflects various harmonic flow components arising from strong hydrodynamic response to fluctuating initial conditions. Hence, it is natural to ask whether the ridge observed in small colliding systems may also be interpreted as hydrodynamic flow plus fluctuating initial conditions. Quite interestingly, the CMS experiment exhibited the ridge like feature even a smaller system as small as p+p by selecting very high multiplicity events: >110 charged tracks in their rapidity coverage of 4 (Fig. 1) in 2010[2] . However, this is the only observation so far which indicates the collective behavior in p+p system after 5 years. It is highly demanded to confirm the collectivity feature in p+p system by the other experiment or even at a different collision energy. A new high multiplicity trigger was developed and implemented to the FVTX detector to challenge this observation at the collision energy of 200GeV. The online coarse tracking algorithm was implemented to FPGAs on the existing FVTX readout electronics. A realtime track counter in FPGA counts the number of tracks per event and the trigger is issued when the count exceeds a preset track multiplicity threshold. Shown in Fig. 2 is the correlation matrix of the number of (coarse) online and (reconstructed) offline tracks from the Run15 200 GeV p+p data. The trigger turn on curves shown in Fig. 3 exhibit the expected shift of the turn on position towards the higher multiplicity as the higher preset threshold values. The turn on curve is diluted due to the difference of the definition between online and offline tracks as indicated in the correlation matrix in Fig. 2 .

The 110 charged tracks in 4 units of rapidity in CMS can be translated to be the average tracks of $\sim$23 per unit rapidity. Since FVTX covers approximately rapidity unit of 1 per arm, the track multiplicity of $\sim$23 in the FVTX acceptance per arm can be a good reference to mimic the similar event selection of the CMS experiment. The online track multiplicity threshold was thus set to 12 per arm in Run15 of which turn on appears just round offline number of tracks $\sim$ 23 as shown in Fig. 3. We have accumulated about 350M triggers of high multiplicity trigger as of now (April 16, 2015).

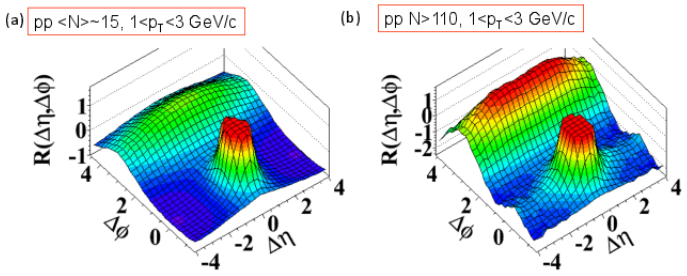

Figure 1: The long range "ridge" effect observed in p+p collision at CMS experiment by selecting high multiplicity events (right) compared to no ridge feature seen for low multiplicity events (left).

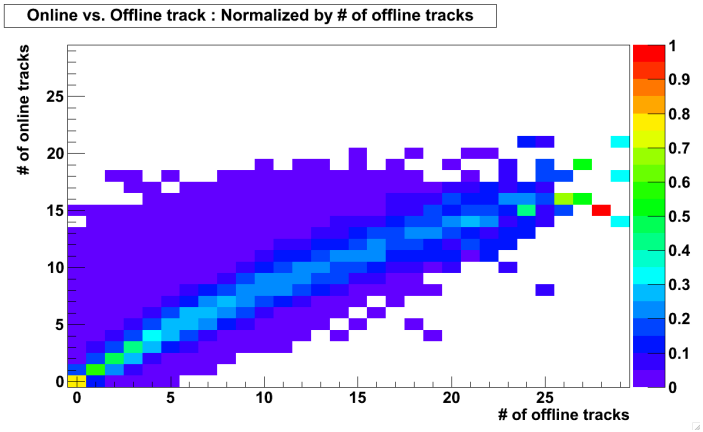

Figure 2: The correlation matrix between number of online (vertical axis) and offline (horizontal) tracks.

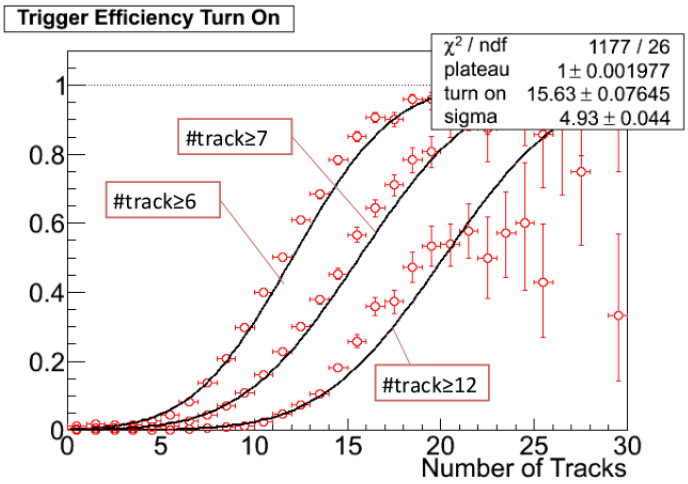

Figure 3: The trigger turn on curves of the high multiplicity trigger for different preset multiplicity thresholds. Horizontal axis is the number of offline tracks and vertical axis is the trigger efficiency.

Bibliography

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