High Multiplicity Trigger Operation Status

RIKEN/RBRC
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On behalf of
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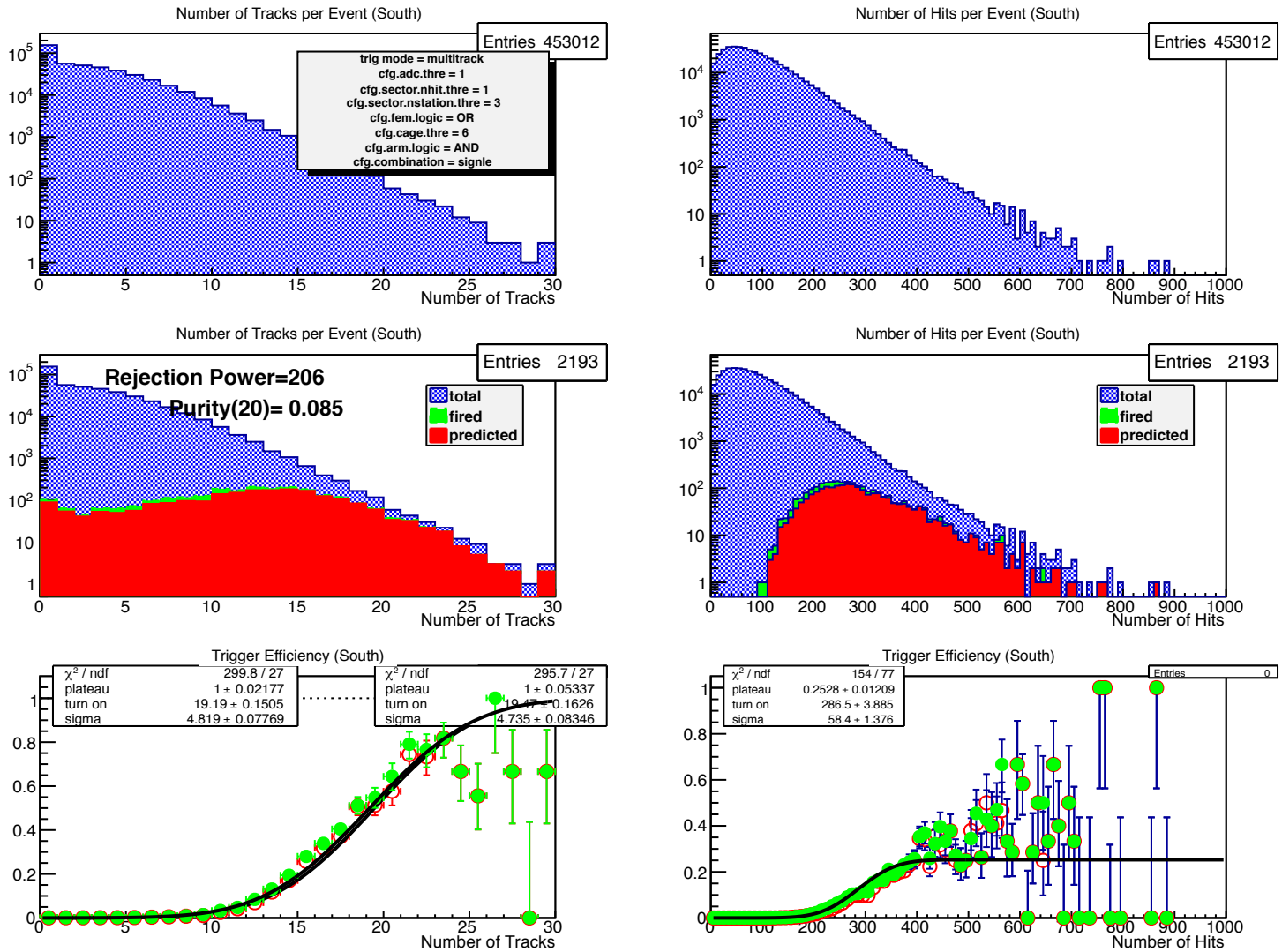
TRIGGER TURN ON

Turn On Curve (South)

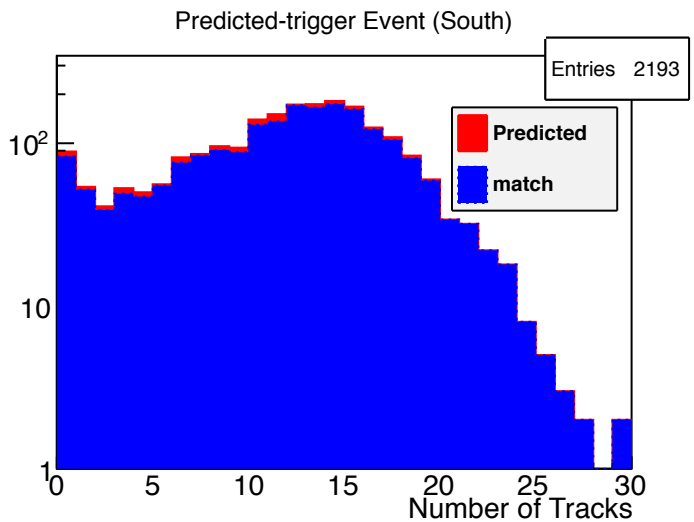
Run# 425692

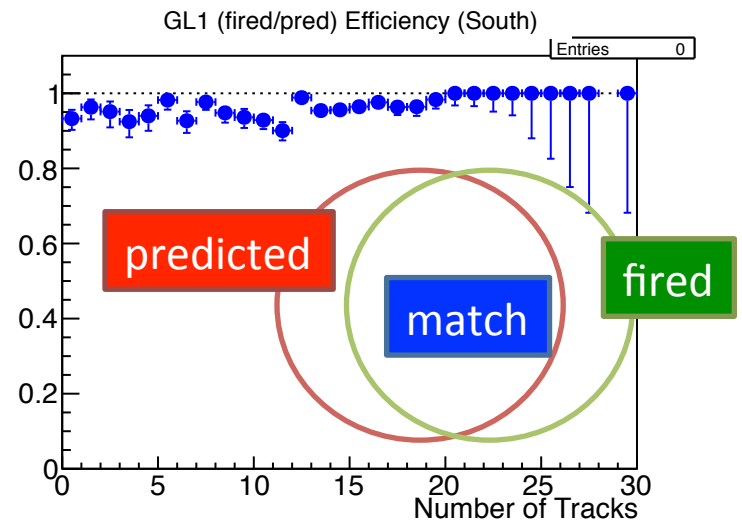


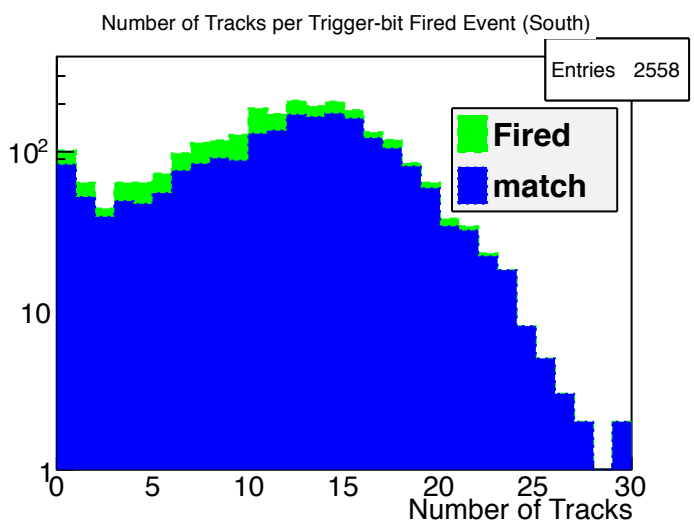
Rejection power w.r.t MUID1D

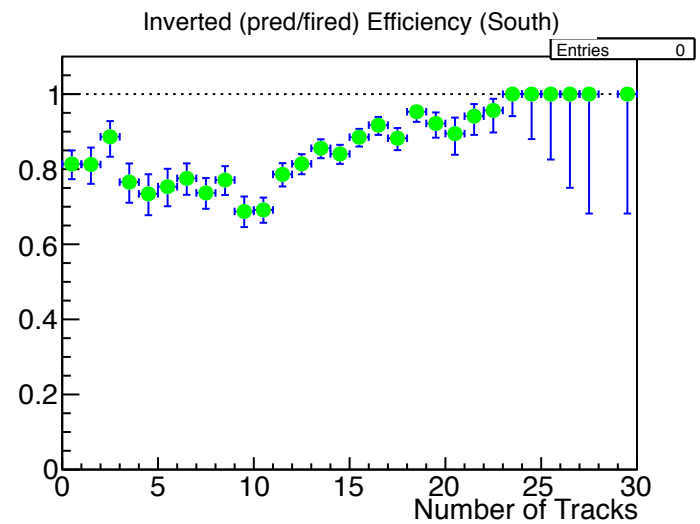
GL1 Efficiency (South)

Run# 425692

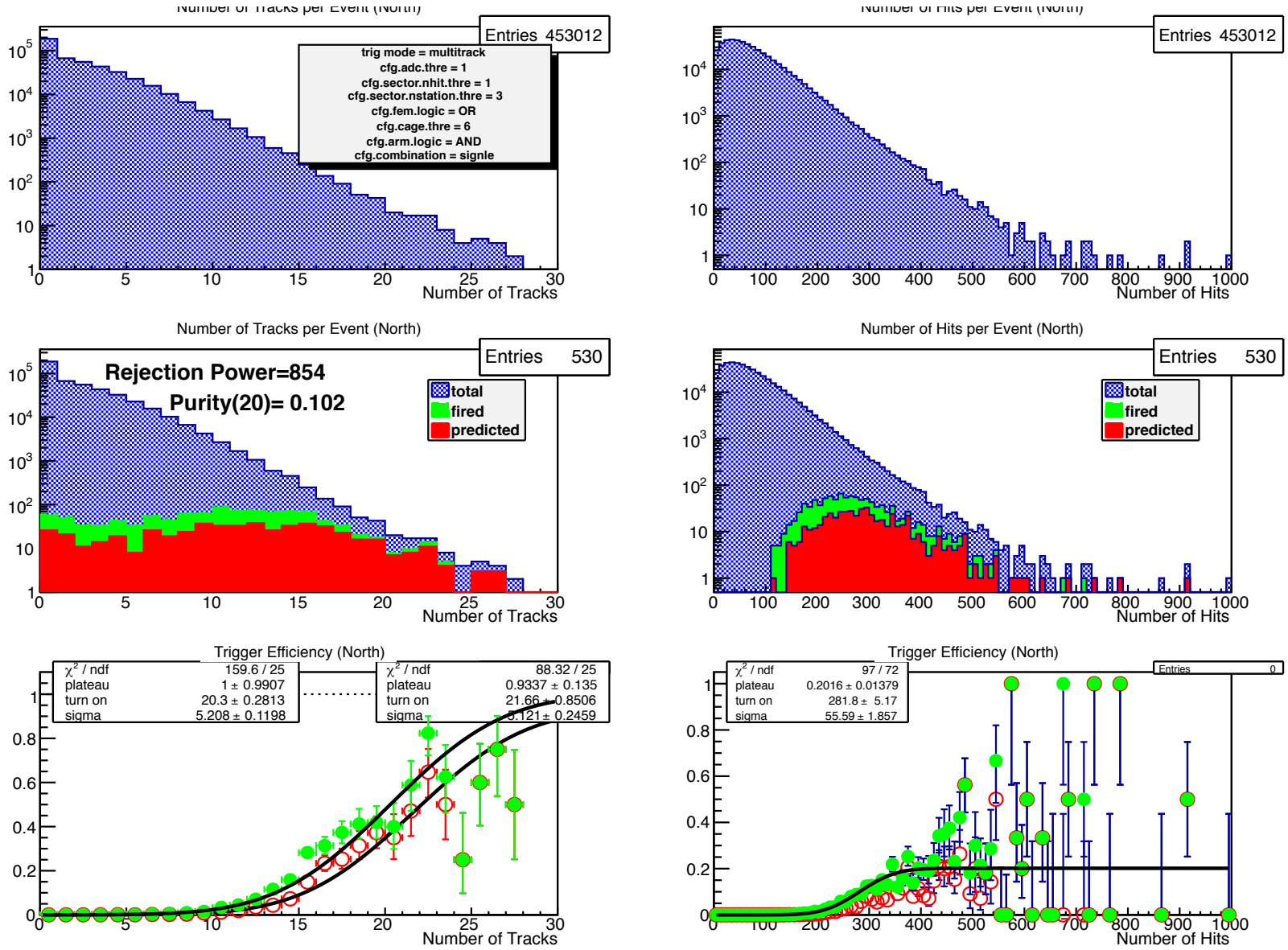








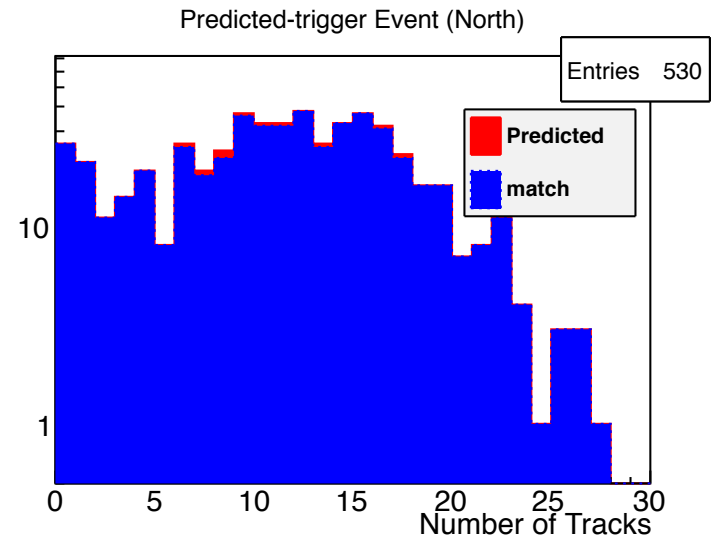
Turn on Curve (North)

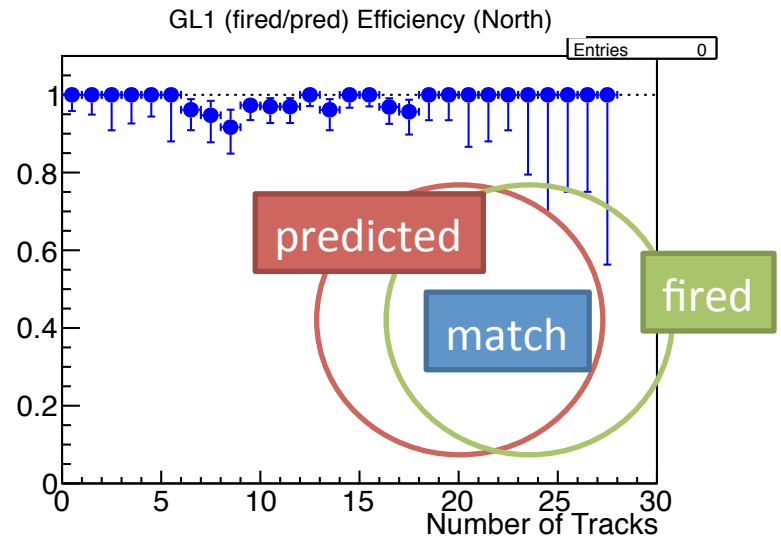


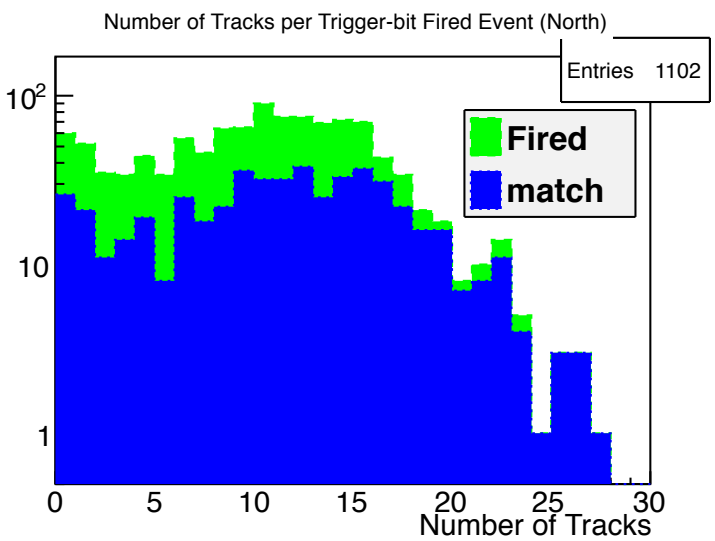
Somehow contamination of 40% fake trigger

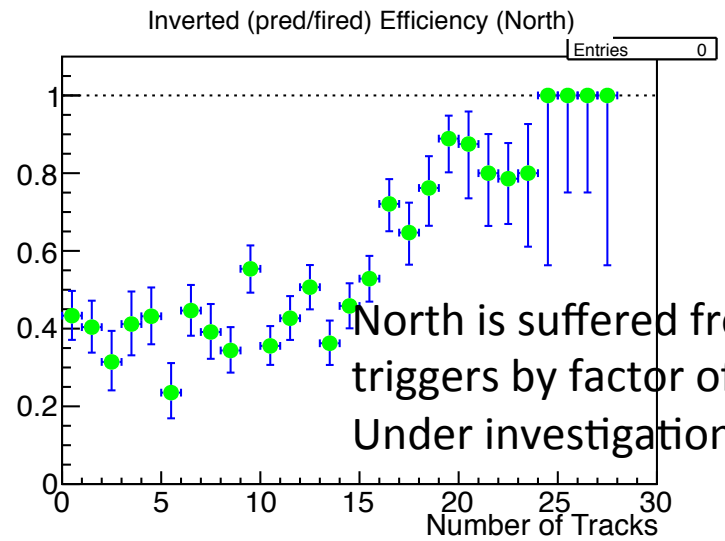
GL1 Efficiency (North)

Run# 425692





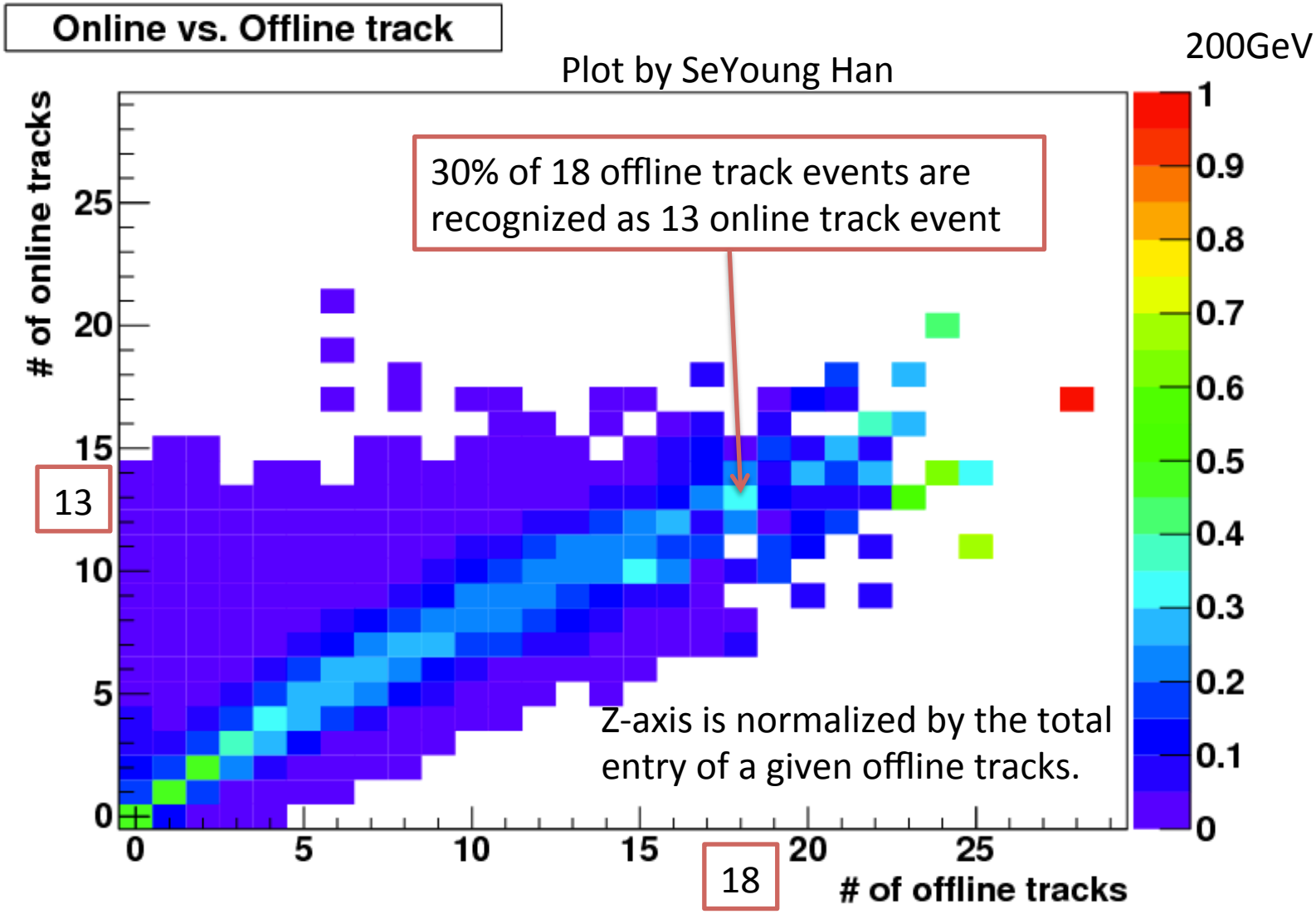




North is suffered from fake triggers by factor of 1.4 or so. Under investigation

ONLINE TRACK VS OFFLINE TRACK

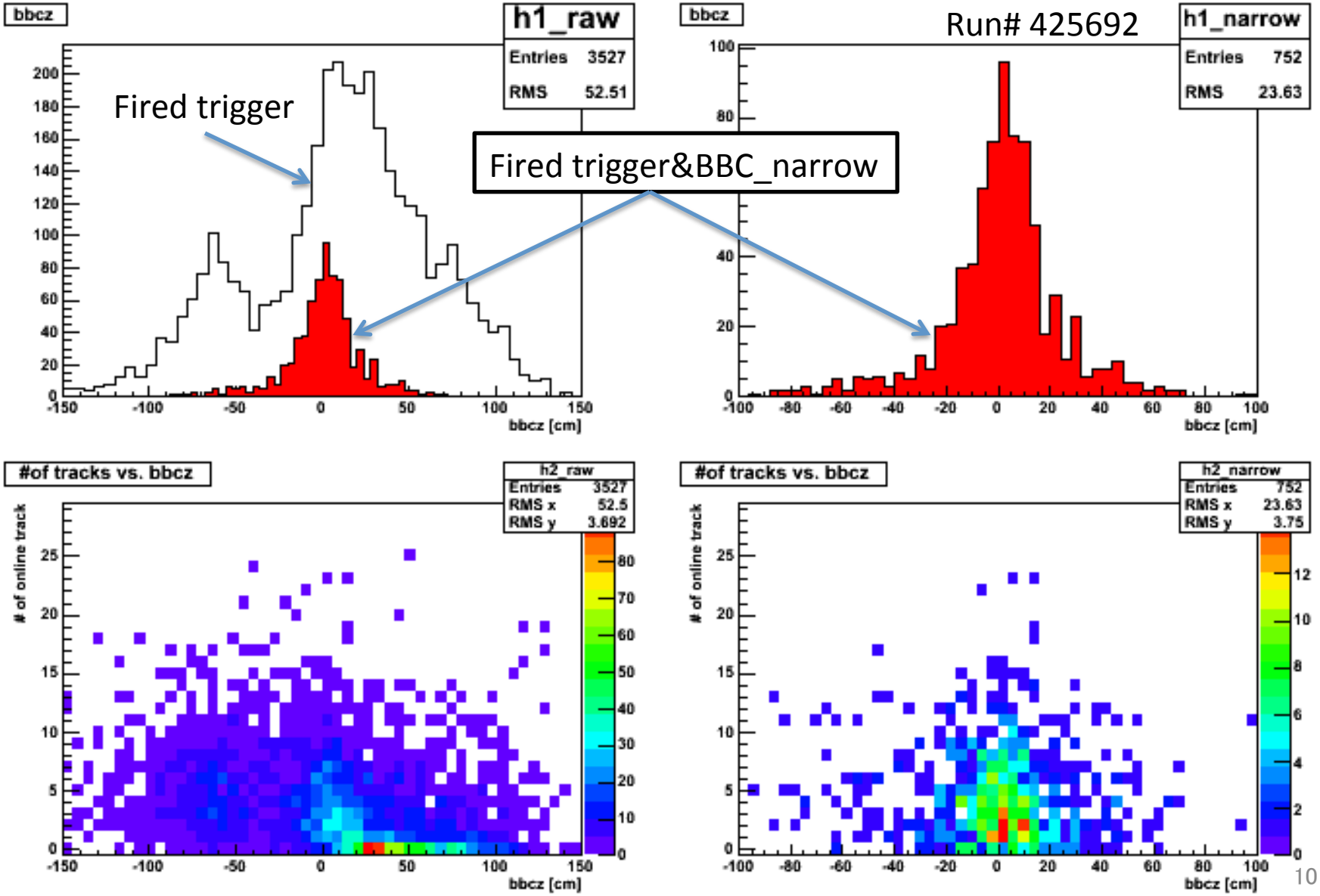
Online vs. Offline Track Correlation



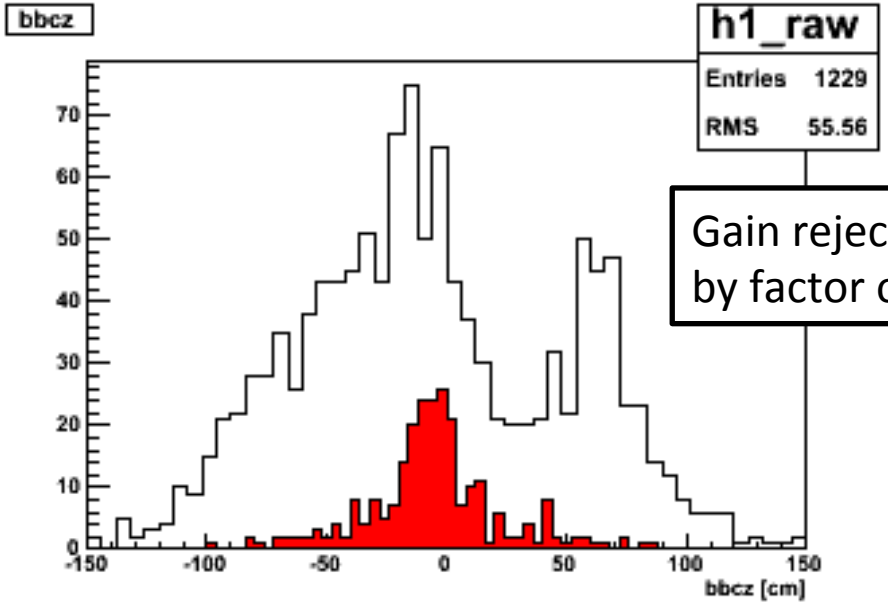
Online track (=active FEMs) is limited upto 24/arm. Therefore the curve saturates at higher #of tracks

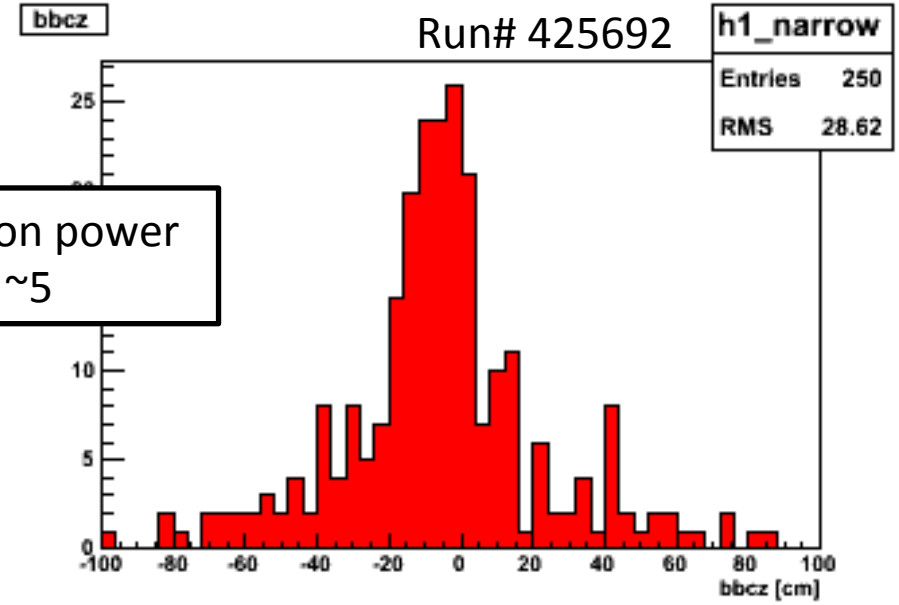
BBC-Z VERTEX DEPENDENCE

FVTX_HighMult_S bbcz dependence

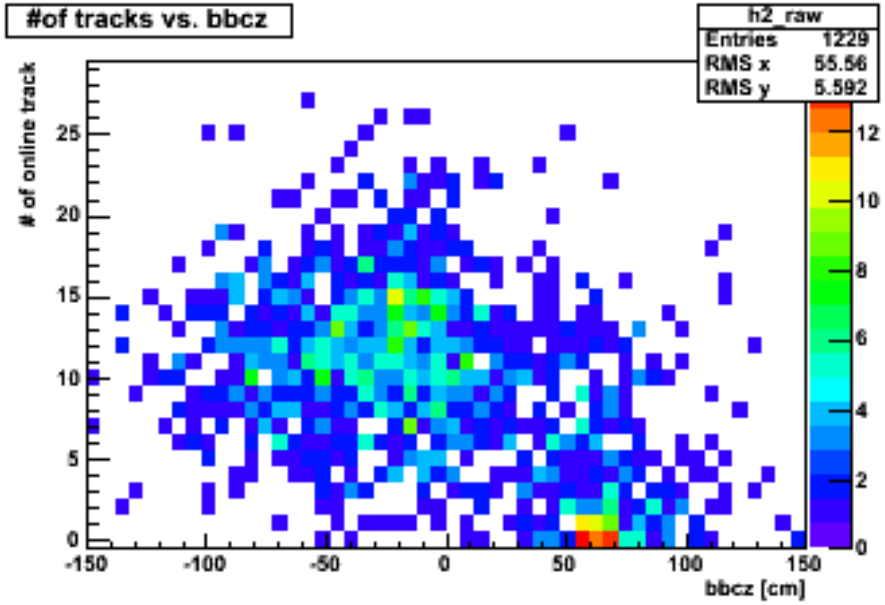


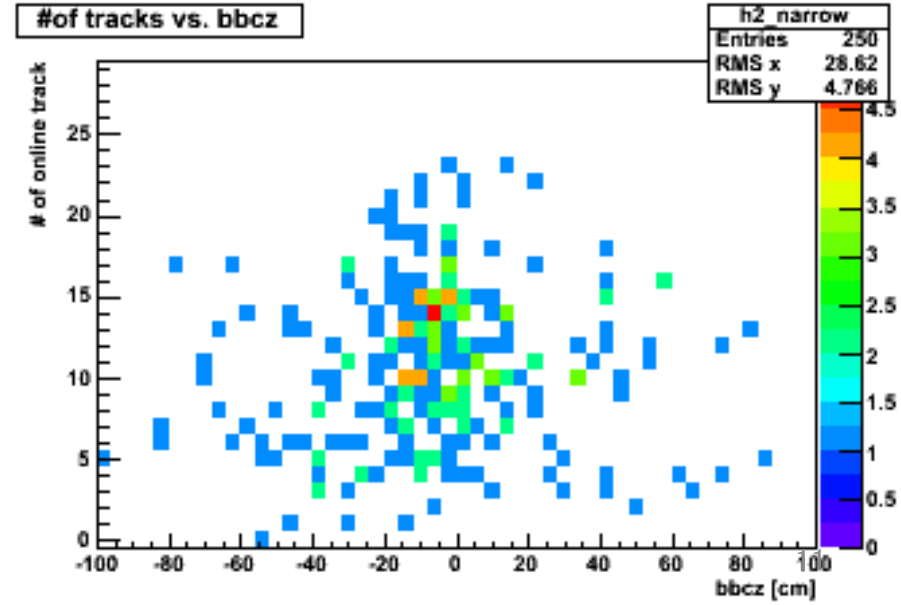
FVTX_HighMult_N bbcz dependence





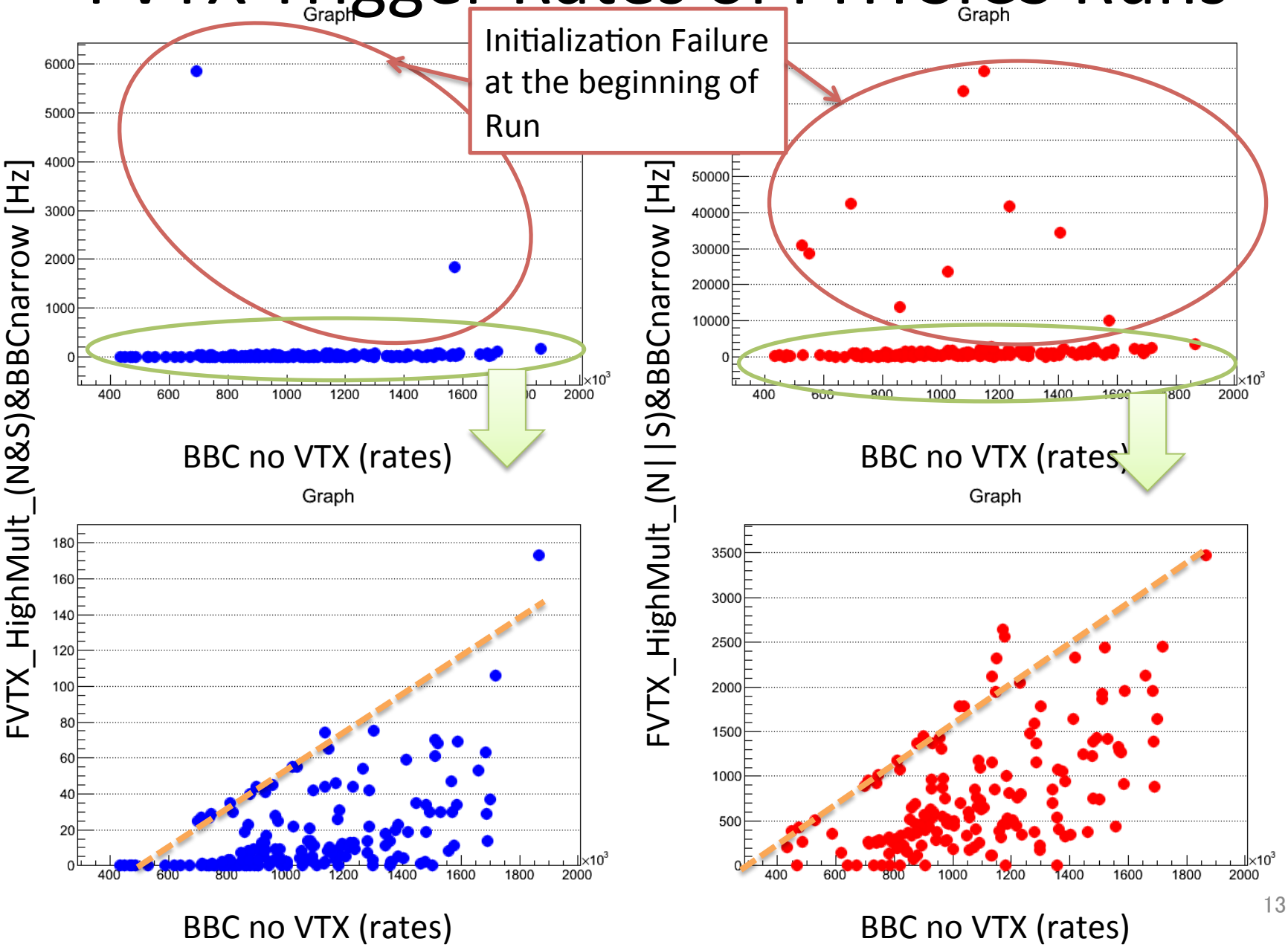
Gain rejection power by factor of ~5



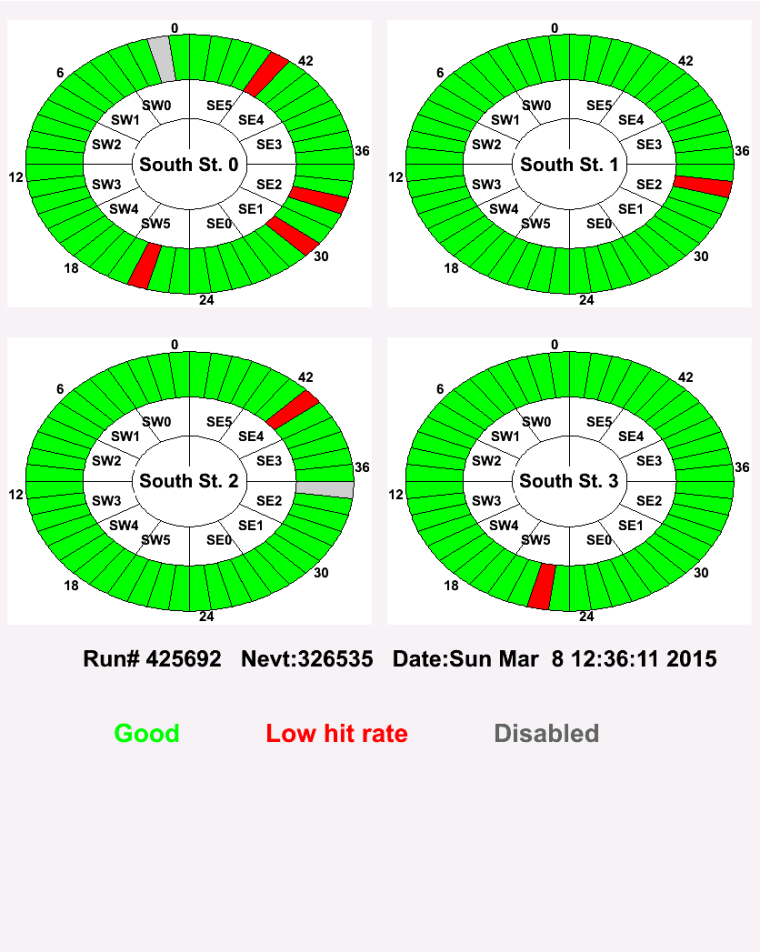


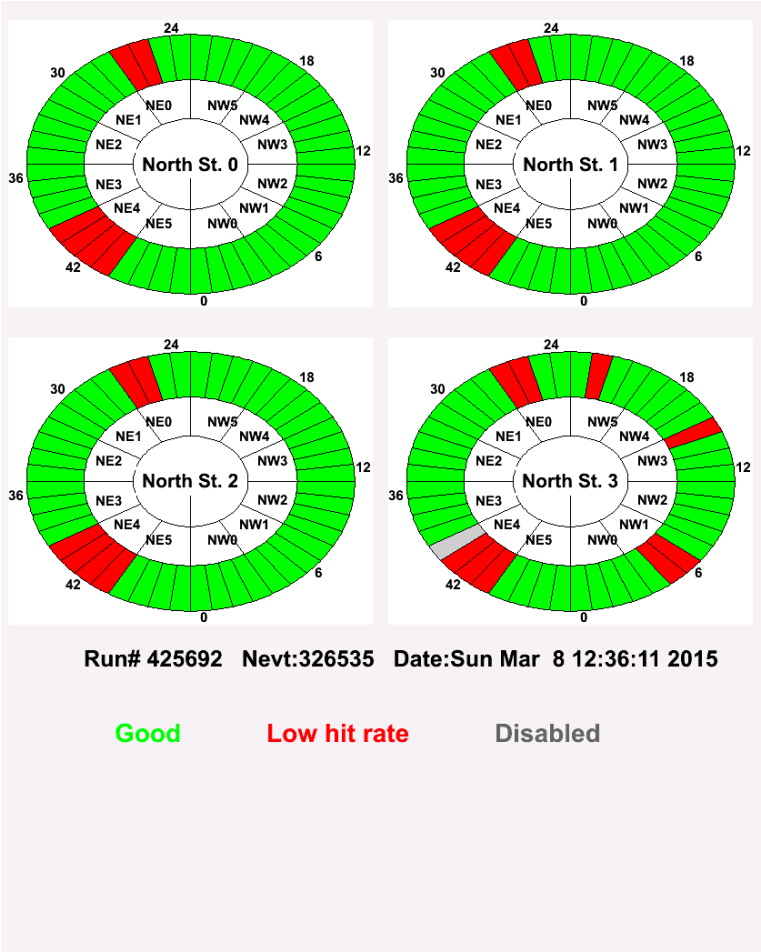
TRIGGER RATES

FVTX Trigger Rates of PHYSICS Runs

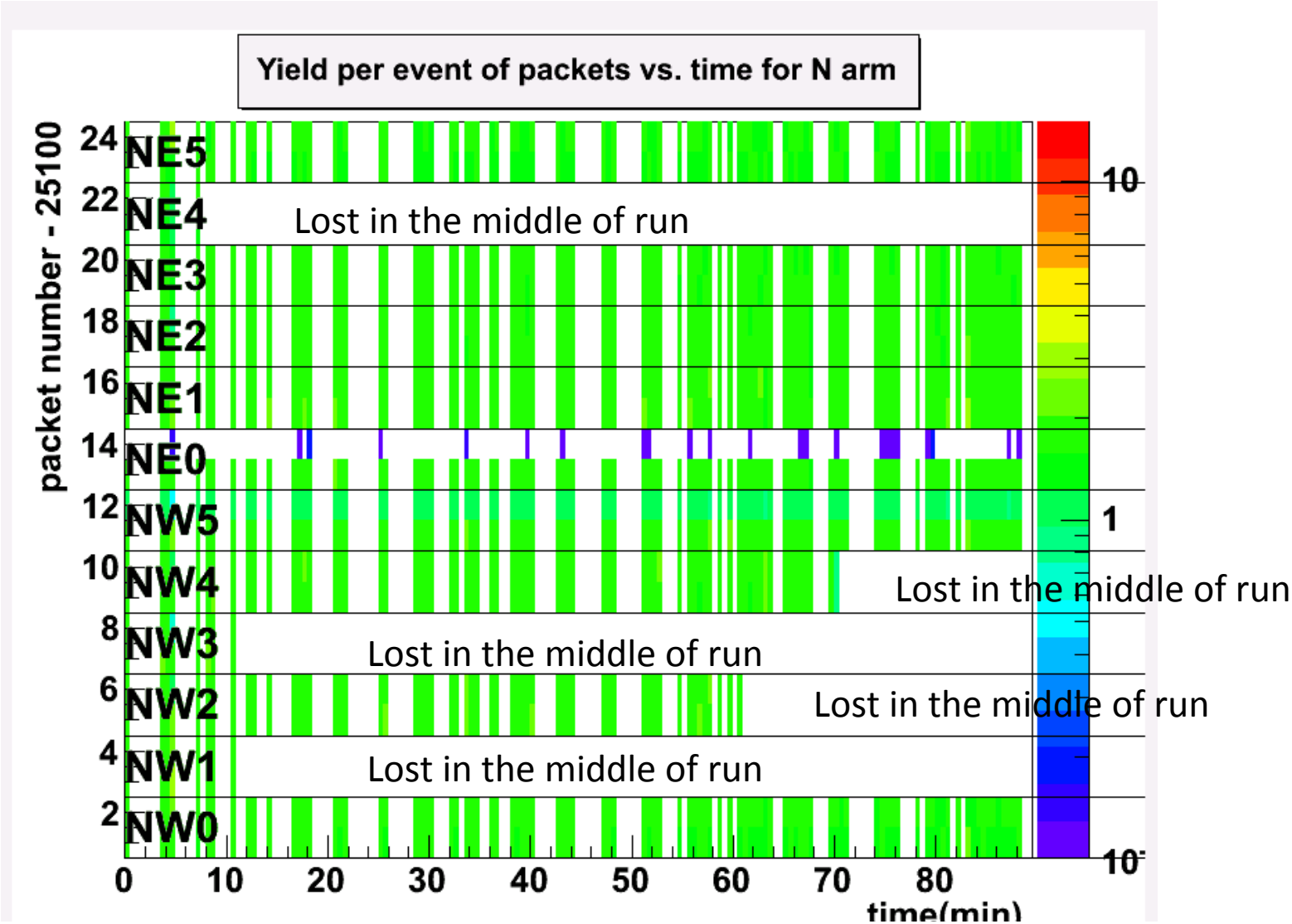


FVTX Packet Drop Off Issue

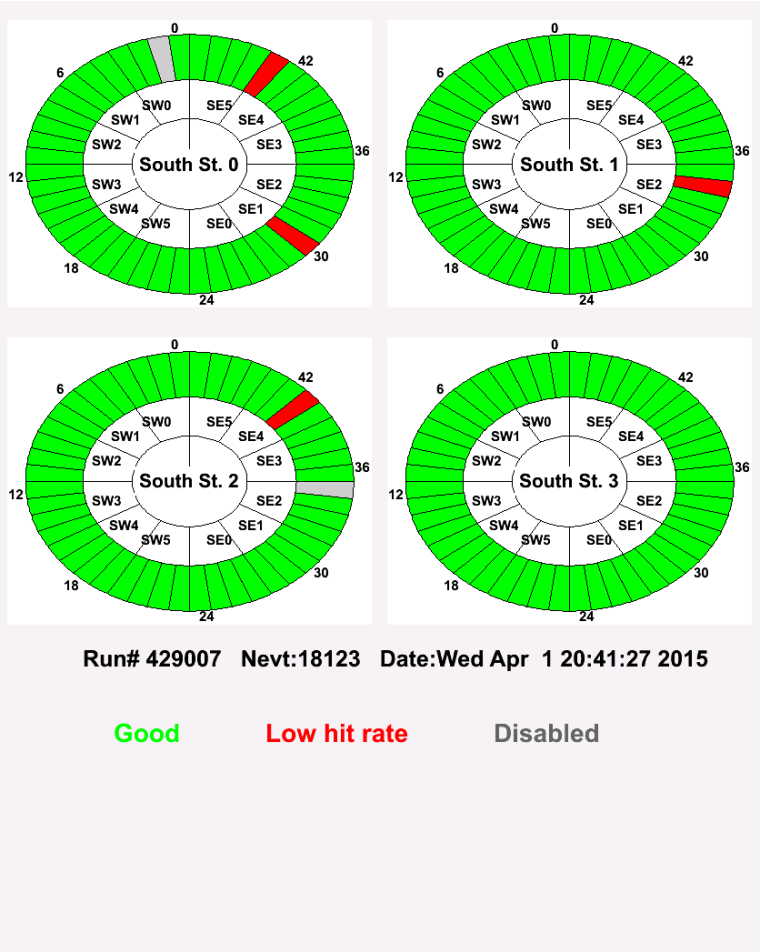


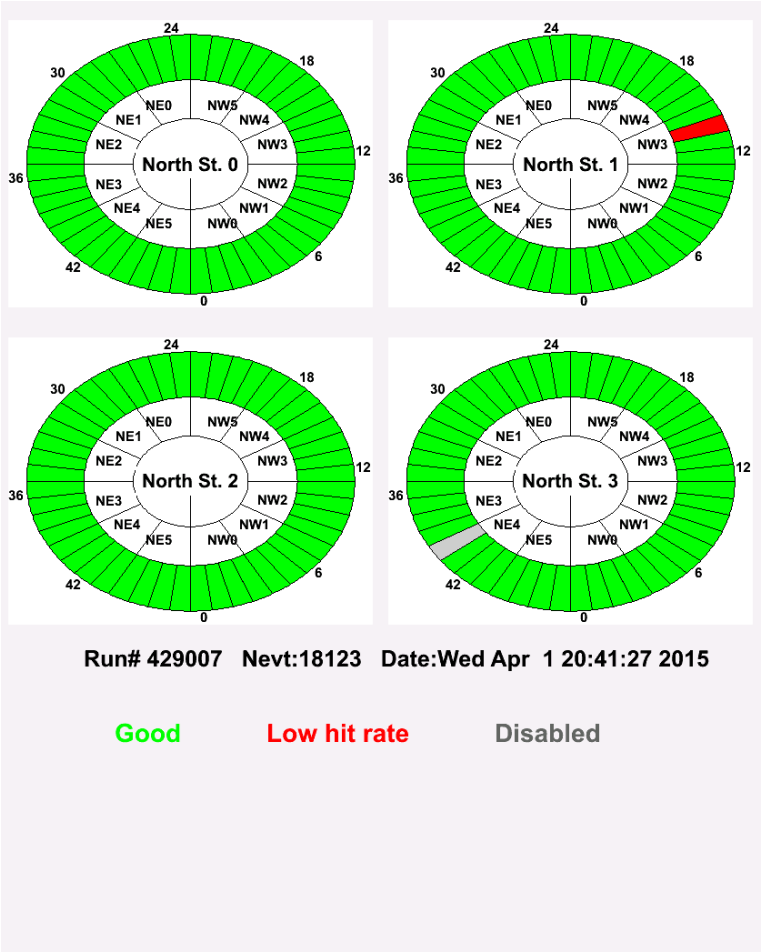


Packet Drop Off



Latest Physics Run





Situation is better lately. However, we don't know the real cause of this, so it may come back any time.

FVTX TRIGGER PARAMETER OPTIMIZATION

MB vs. FVTX_S Purity

Run#425397

> # of Tracks	MB	FVTX_S
5	31.3%	74.8%
10	4.1%	35.7%
15	0.037%	11%
20	0.03%	2.3%
25	0.004%	0.70%
30	0.0005%	0.18%

Constraints and Options

- Suppose 400 Hz total band width
- 2 trigger bits are available. Following 2 options are available:
  1. North & BBC_narrow + South & BBC_narrow
     - Optimize thresholds to satisfy 200Hz for each trigger
  2. (North&South)&BBC_narrow + (North|| South)&BBCnarrow
     - How much fraction better be assigned to AND and OR trigger mix, respectively?

Single Trigger Optimization

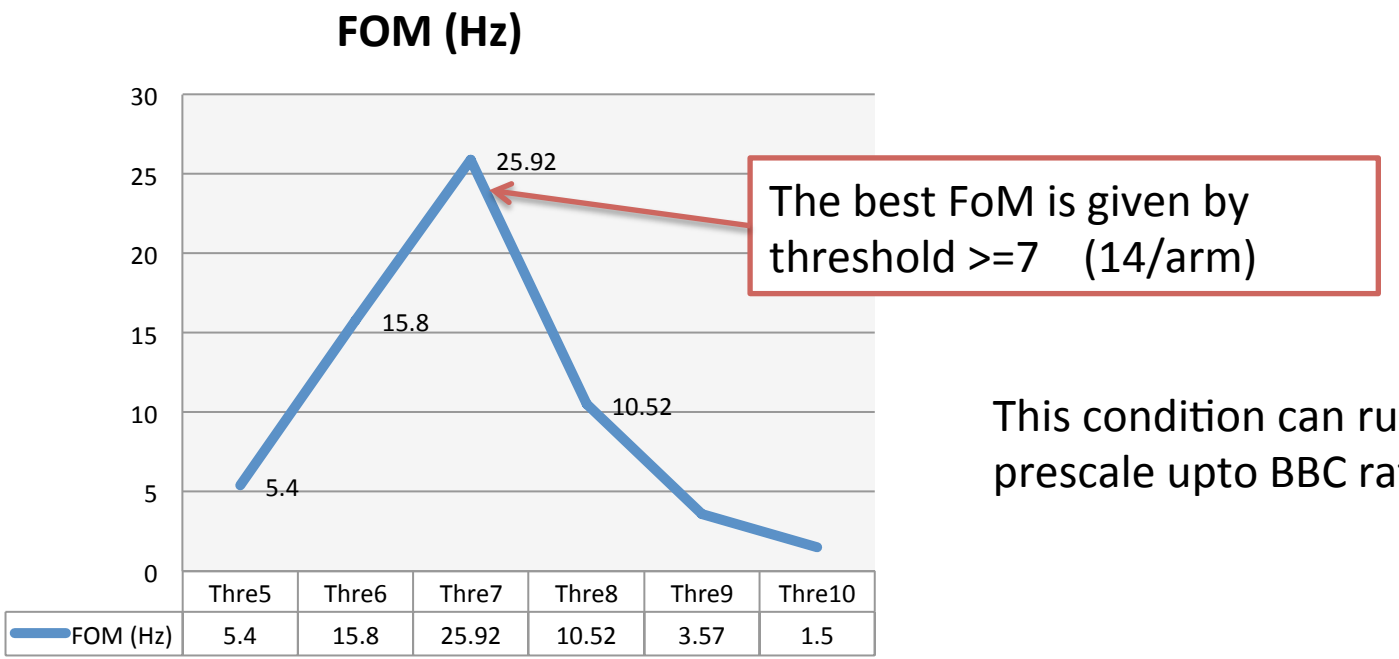
BBC rate ~ 1MHz.

Threshold/cage	5	6	**7**	8	9	10
Purity >= 20	0.027	0.079	**0.162**	0.263	0.357	0.6
Efficiency*	1	1	**1**	1	1	1
Rates (Hz)	2560	640	**160**	40	10	2.5
Prescale**+1	12.8	3.2	**1**	1	1	1
FOM*** (Hz)	5.4	15.8	**25.92**	10.52	3.57	1.5

*Efficiency was assumed ~ 1 due to insufficient statistics.

** Prescale factor was calculated assuming 200Hz/arm

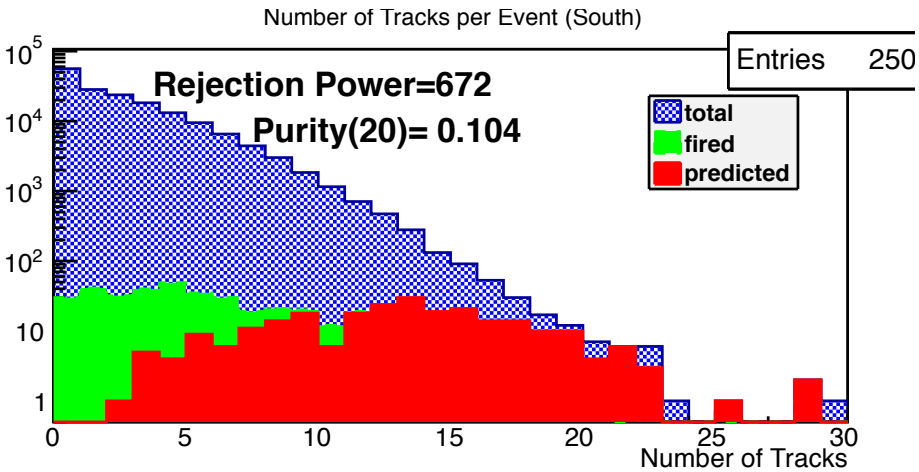
*** FoM = Purity * Efficiency/ (Prescale+1) * rates [Hz] (rates of >20 tracks)

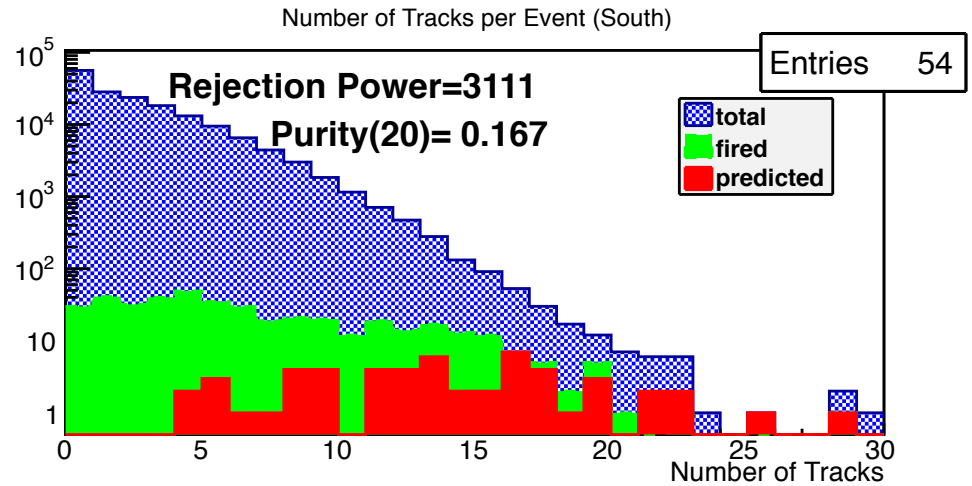


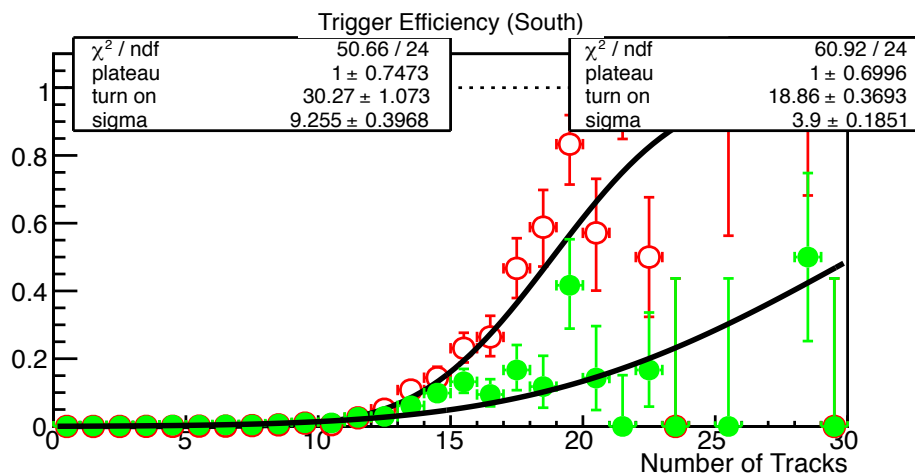
This condition can run without prescale upto BBC rate ~ 1MHz

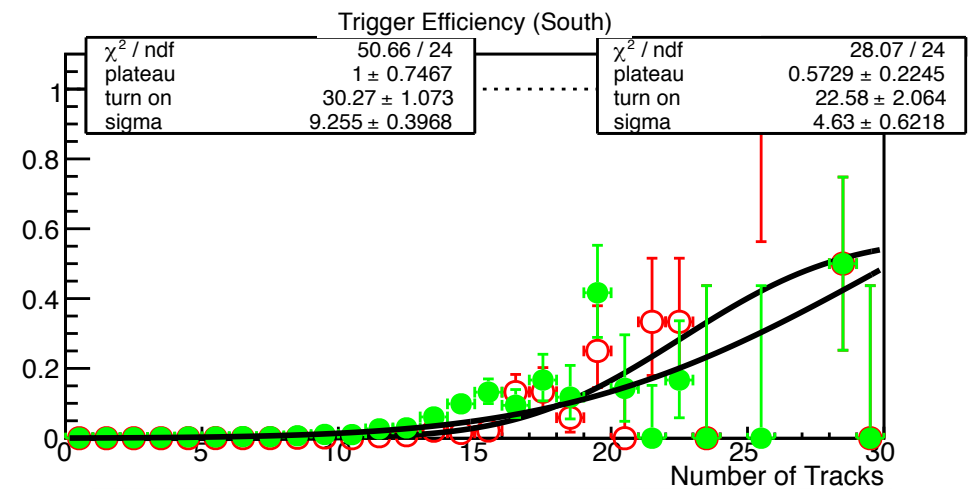
Single Trigger Turn On Curve

See only red predicted dots and hists. Ignore green dots/hists. The data was taken in different condition.









 # track ≥ 12/arm

 # track ≥ 14/arm

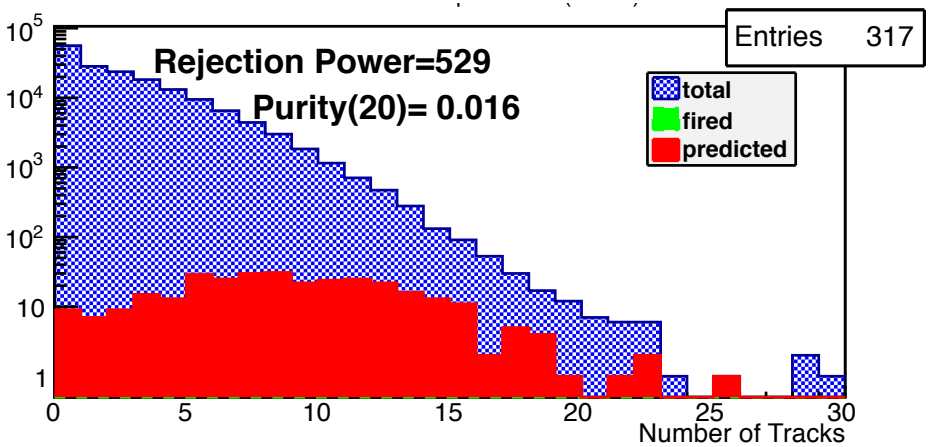
North&South Coincidence

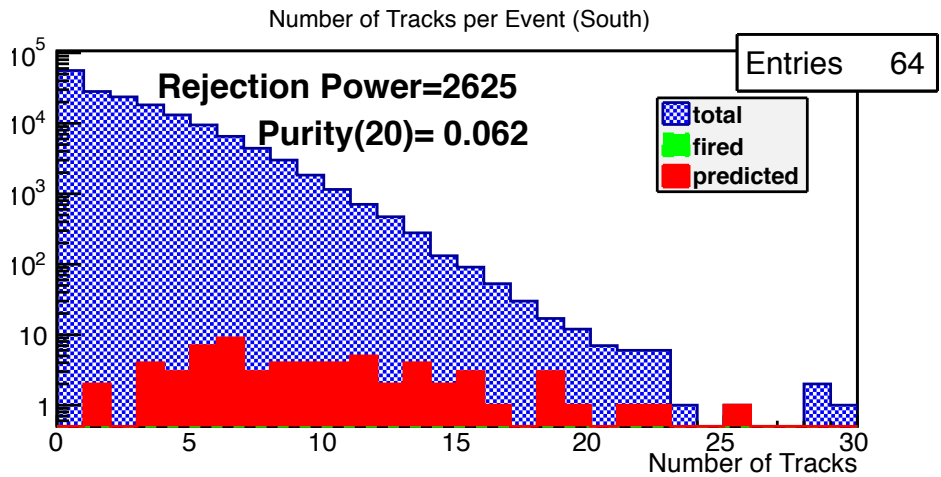
Threshold/ cage	Coinc Counts	Coinc Rates [Hz]	Precale	Efficiency	Purity>20	FoM [Hz]
4	317	500	2.25	1	0.016	3.56
5	**64**	**100**	**1**	**1**	**0.062**	**6.20**
6	16	27	1	1	0.188	5.08
7	1					

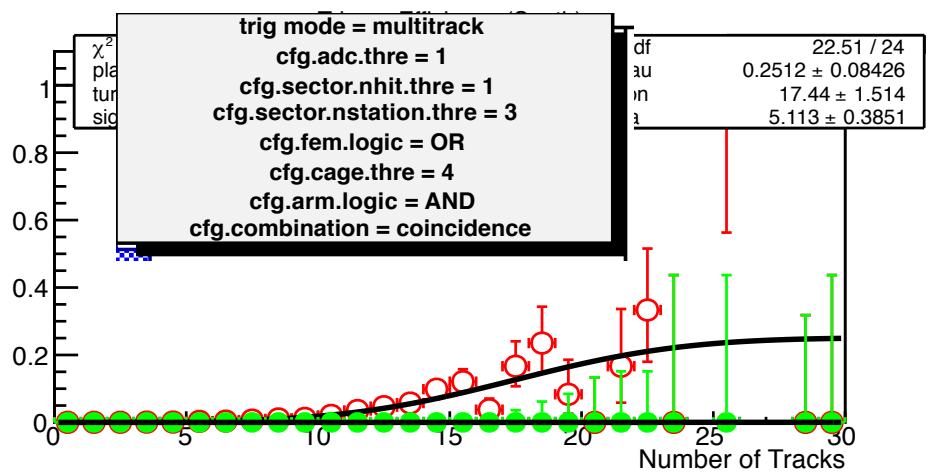
- The best parameter is the threshold>=5 (10/arm) which provide 6.2Hz trigger rates of greater than 20 tracks/arm (40tracks/both_arm) event.
- The coincidence rates is 100Hz at BBC~1MHz. Rest of 300Hz can be assigned to North or South trigger (2.5kHz/arm @ BBC rate of 1MHz).

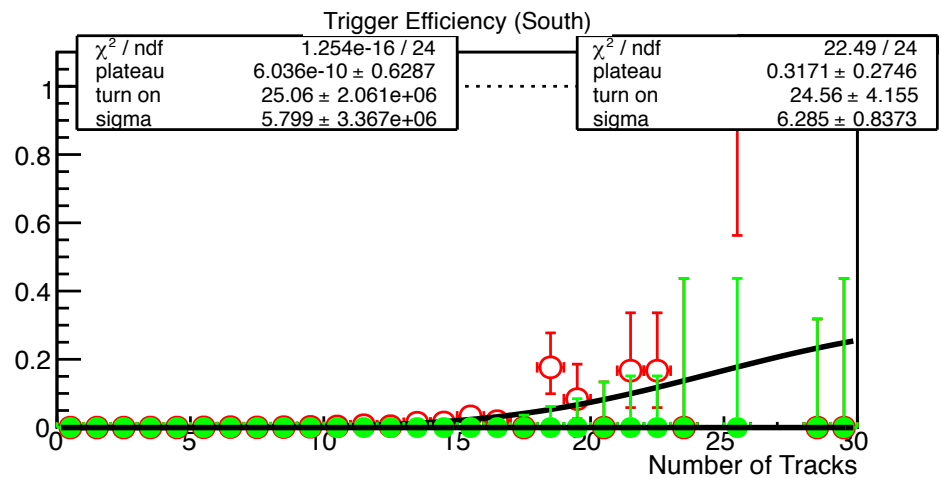
Coincidence Trigger Turn on

Run#425931 (MB Samples)









# of track Threshold >= 8/arm

# of track Threshold >= 10/arm

Summary

1. North & BBC_narrow + South & BBC_narrow option:
   - Run with threshold>=14/arm
   - Accumulate >20 track/arm events about ~ 25Hz.
1. (North&South)&BBC_narrow + (North|| South)&BBCnarrow
   - Run with threshold >=10/arm
   - Accumulate > 40 track/both_arm events about ~6Hz
   - Accumulate > 20track/arm events about 4~5Hz.

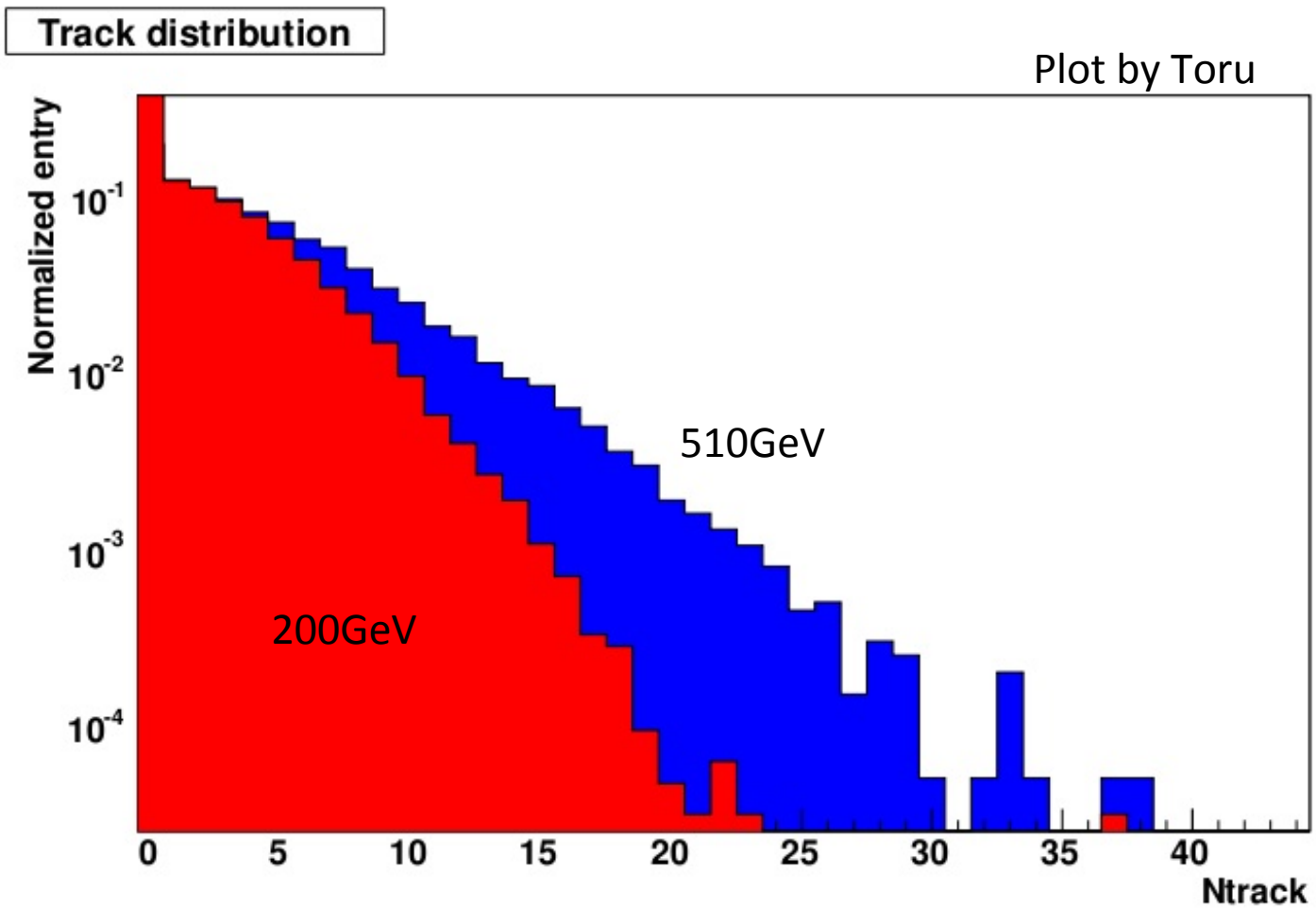
Statistics Estimate

- 400Hz x 6/9 weeks ~ 300M x 0.66 = 400Mevents
- 400M x 0.08 purity = 32 Mevents

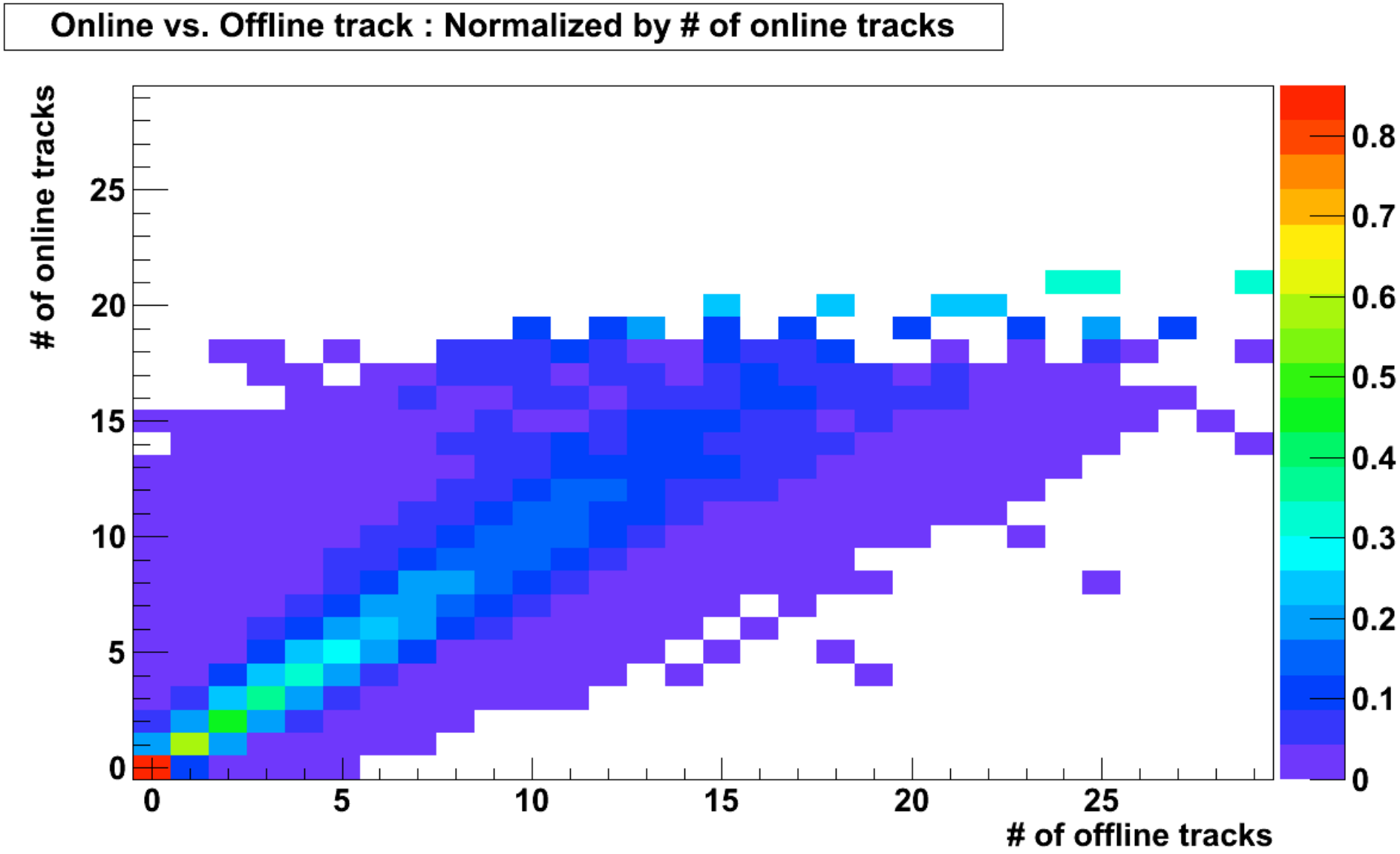
80M events 0-5% Central dAu in Run8

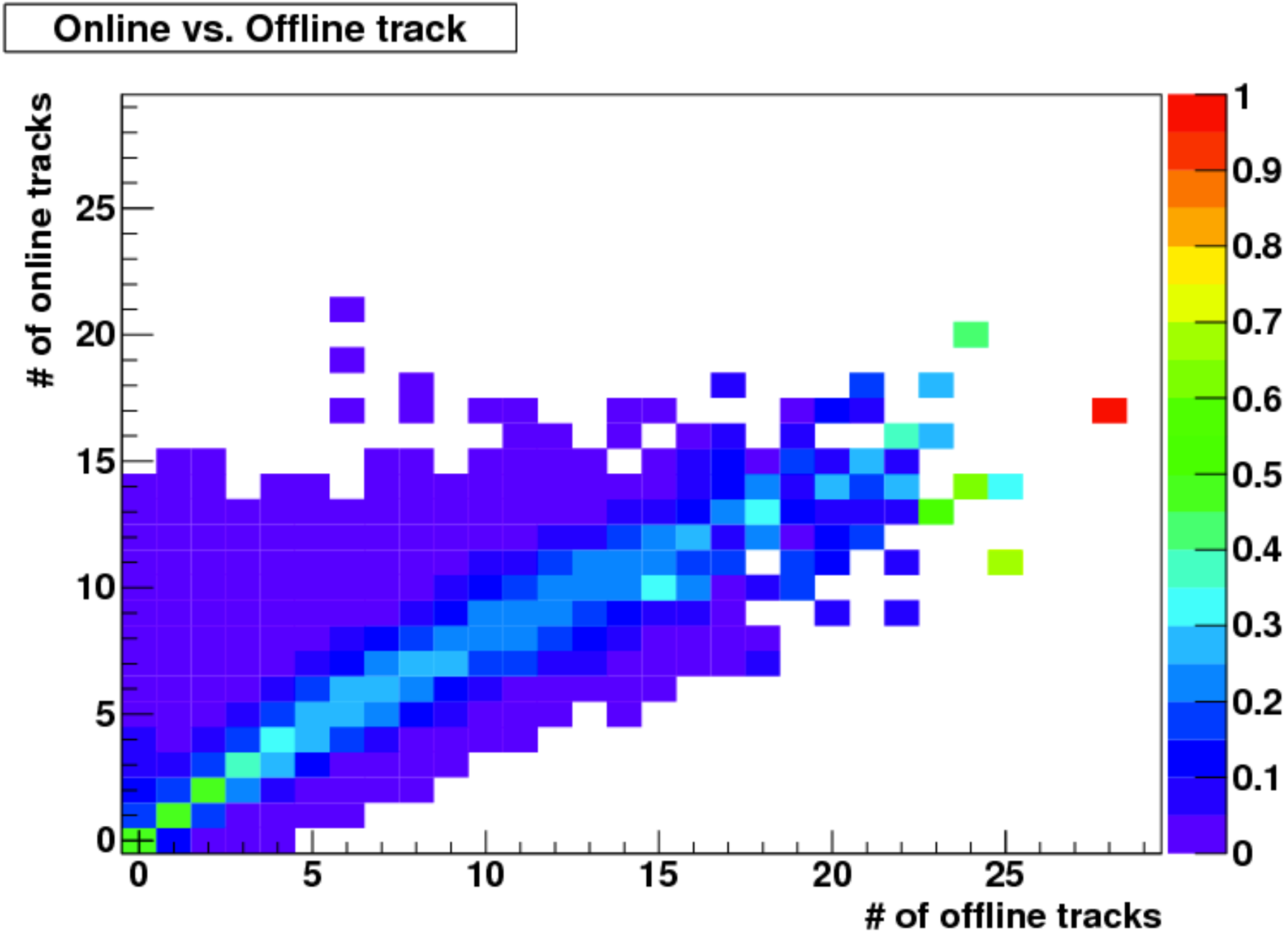
BACKUP

200GeV vs. 500GeV

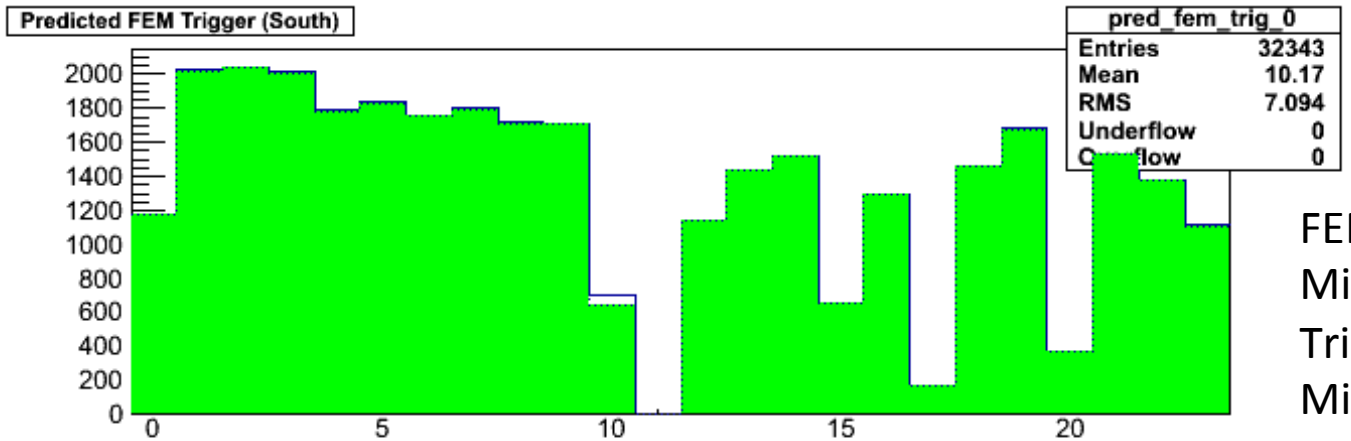


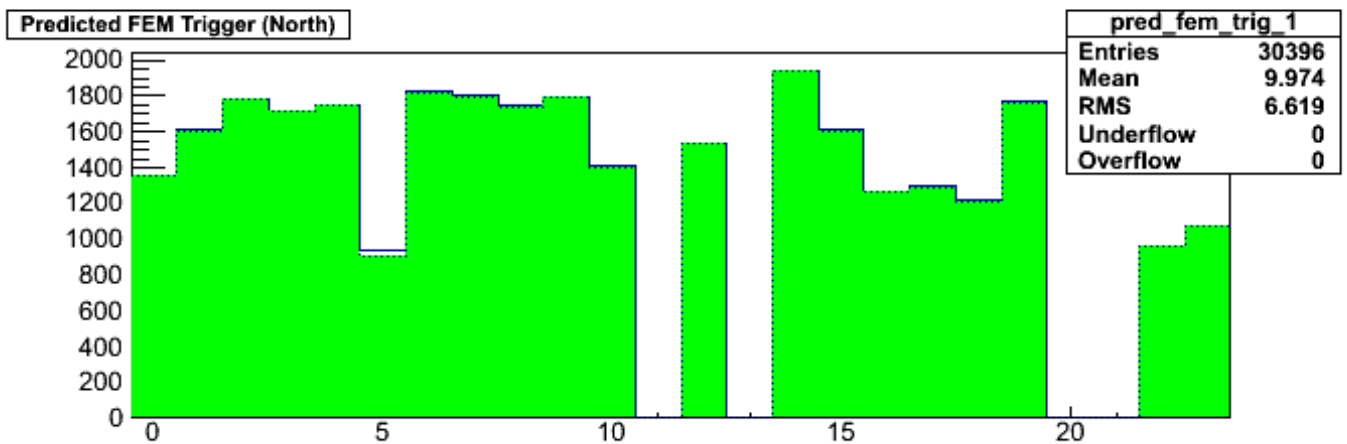
Normalized by Online Track




Online vs. Offline track
# of online tracks
# of offline tracks
0
5
10
15
20
25
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1

Trigger Efficiency FEM by FEM





FEMIB Logic : OR
Minimum FEMs : 1
Trigger config logic : AND
Minimum hits : 4
Minimum wedges : 3

Run425571 (2015-03-07 22:16:25)
South GL1 Eff = 0.995, Inv Eff=0.914
North GL1 Eff= .996, Inv Eff=0.858

North event rate : ~ 5.0k
South event rate : ~ 5.3k