

L1 Muon Trigger-Rate for Run-2

~ EI/FI, Tile, Hot RoI mask ~

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Muon Trigger Signature Meeting

Introduction

- We require two coincidence in Run-2

1. BW & EI/FI
2. BW & TileCal

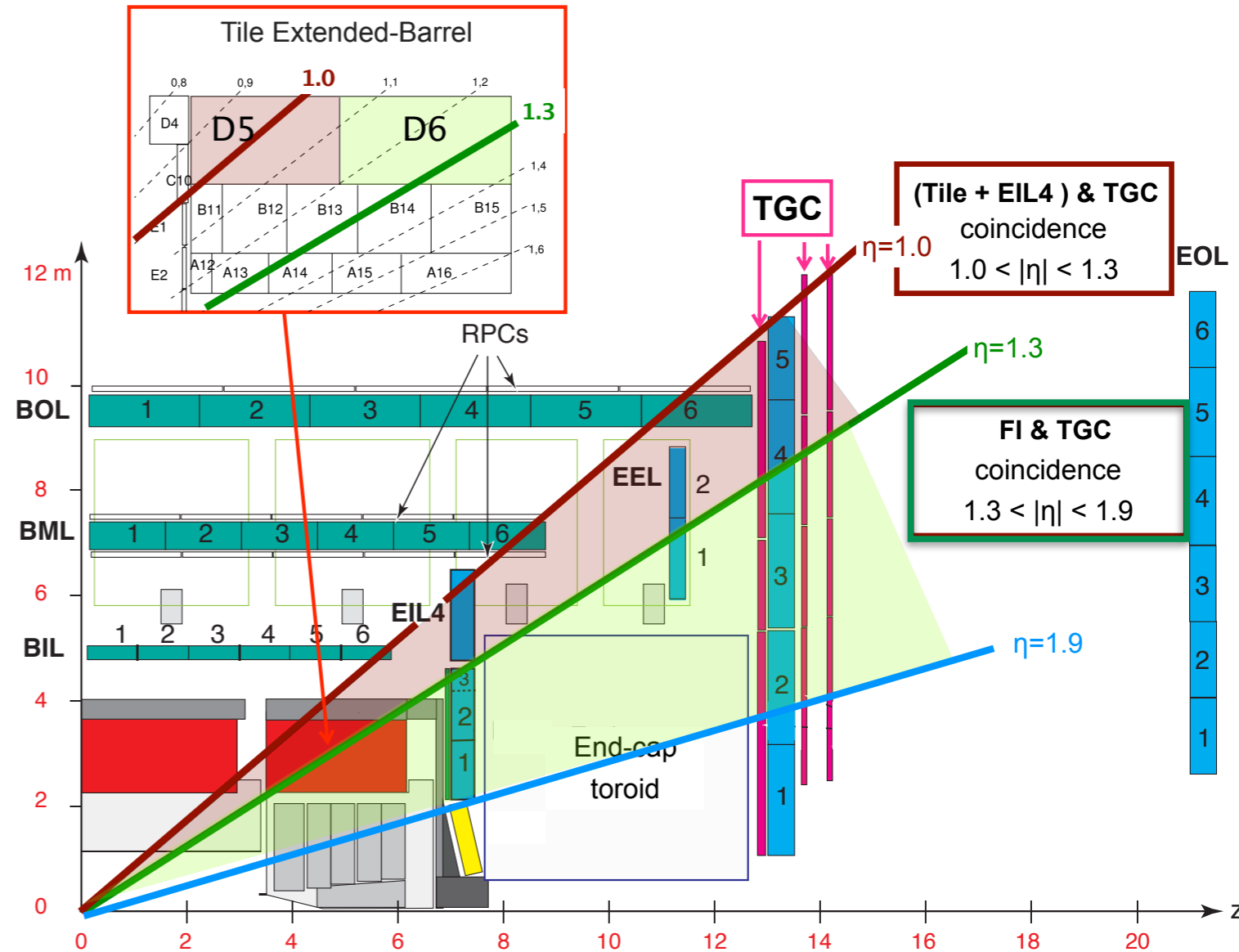
◆ $1.0 < |\eta| < 1.3$

BW & { **EIL4** || **Tile** }

◆ $1.3 < |\eta| < 1.9$

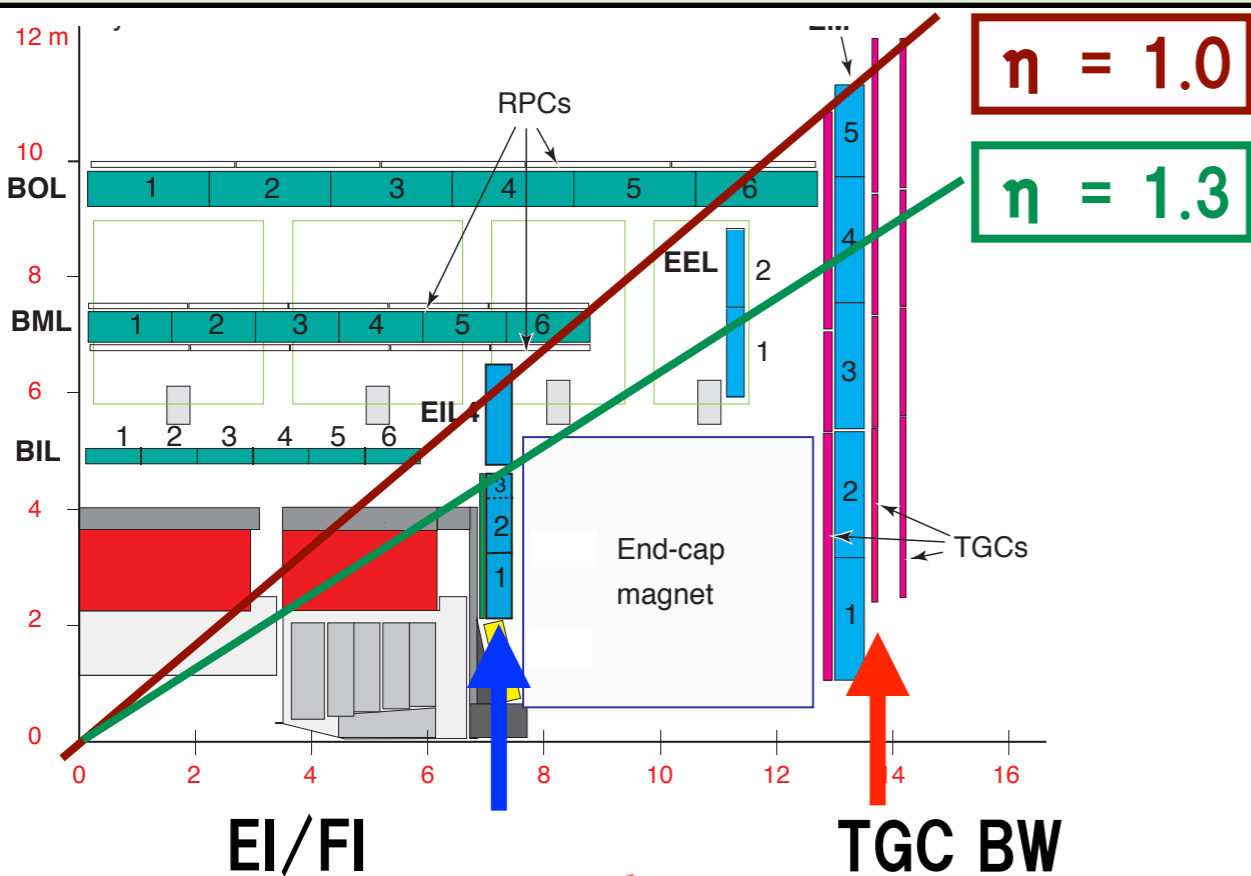
BW & **FI**

- Hot RoI mask



We updated L1 Muon Trigger Rate for Run-2

Coincidence, BW & EI/FI



• Position matching between hit and Coincidence Map

- ❖ Coincidence Map is tuned, so we can reject Fake-Trigger with high efficiency
- ❖ The method which we used to emulate trigger-rate for TDAQ-TDR is simpler than this method

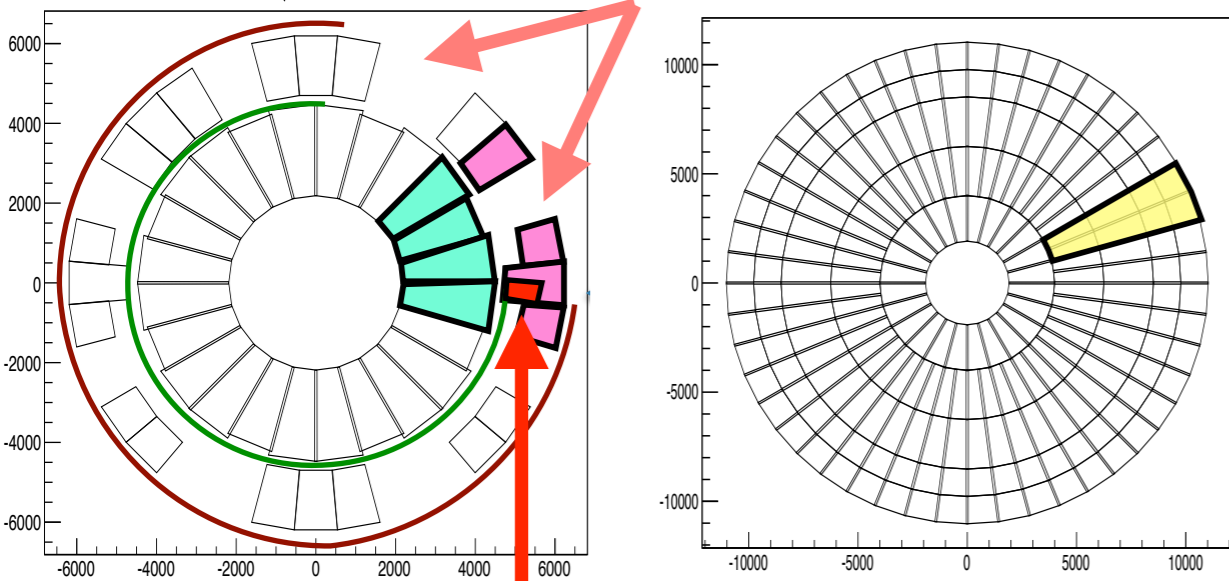
• We can require this coincidence using TrigT1TGC (TrigT1TGC-00-02-85)

- ❖ All of the functions in TGC Trigger Logic can be emulated in TrigT1TGC
- ❖ Validation of TrigT1TGC is done

• In $1.0 < |\eta| < 1.3$, Not all region is covered by EIL4

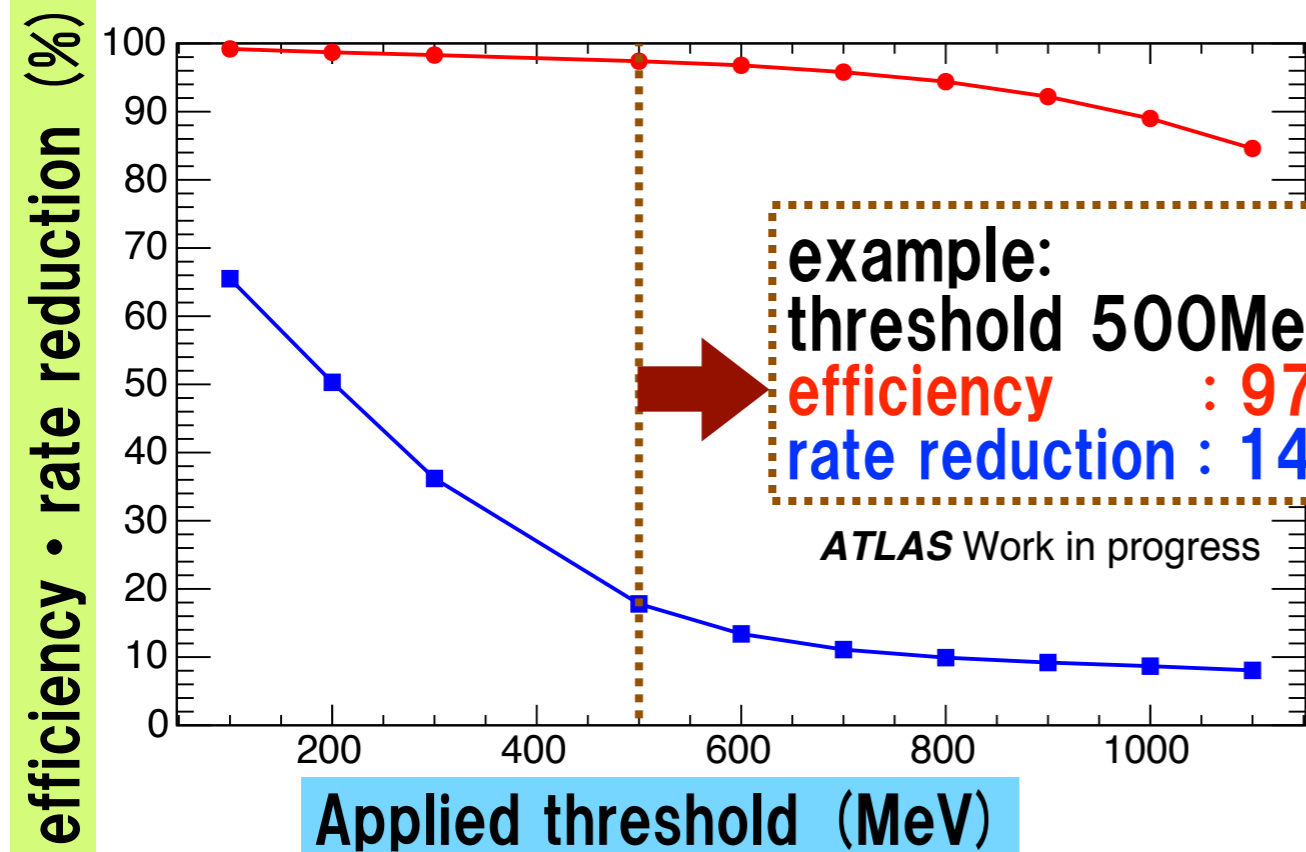
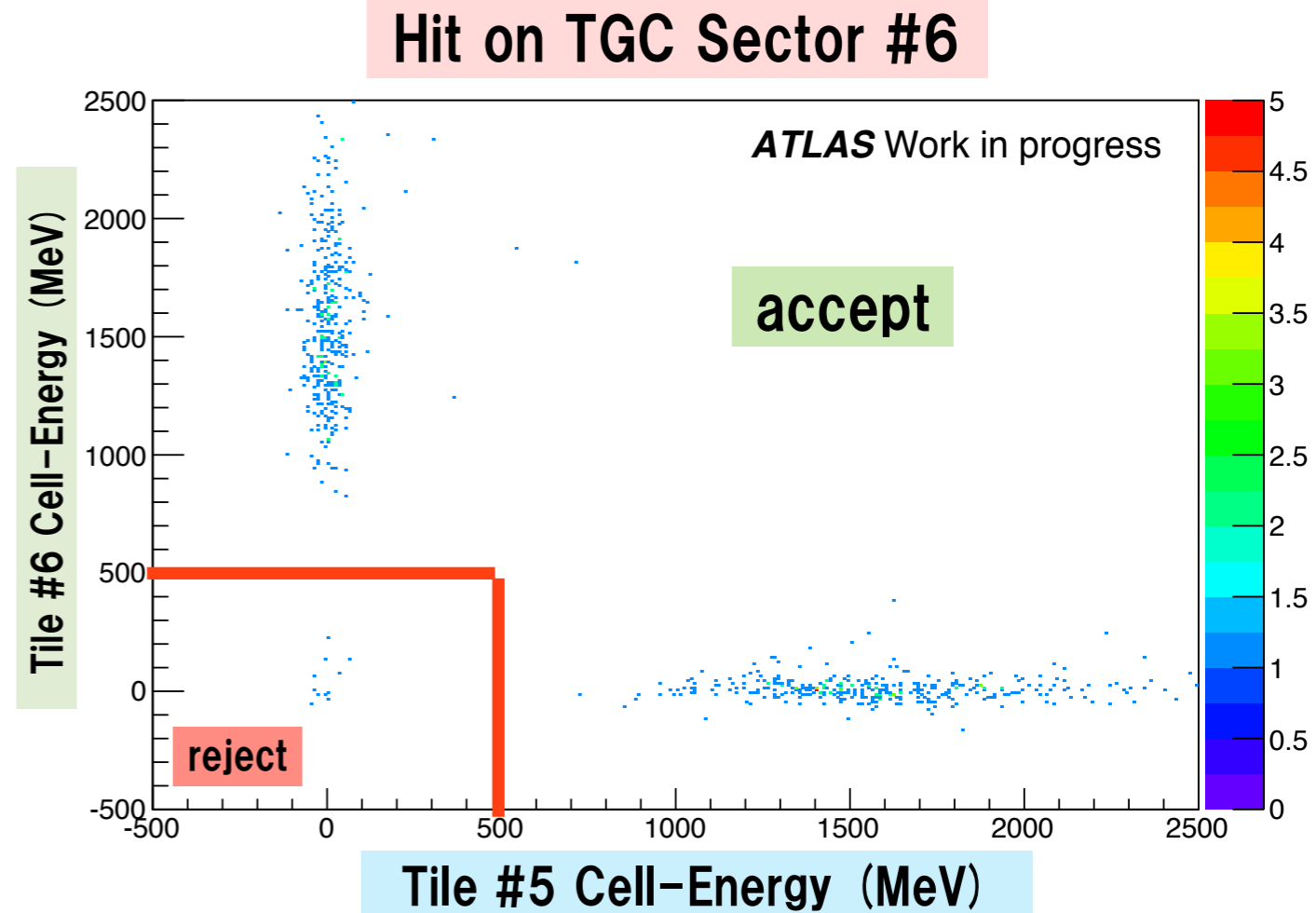
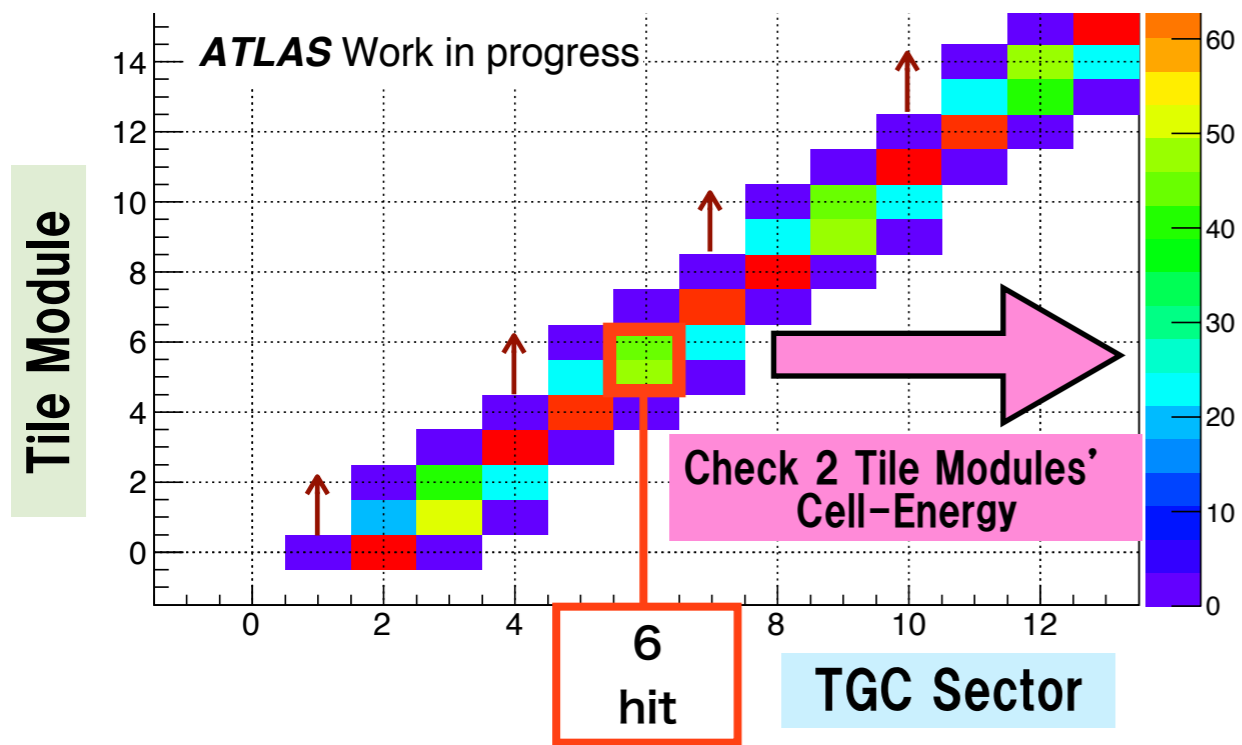
- ❖ This region is fully covered by Tile-D5, D6 Cell

➔ **Coincidence, BW & Tile**



Coincidence Map
muons from IP
should make hit in this region

Coincidence, BW & Tile





Check Cell-Energy of two Tile-Modules corresponding to the fired TGC Sector

❖ Tile coincidence is going to be installed in TrigT1TGC. This is being checked


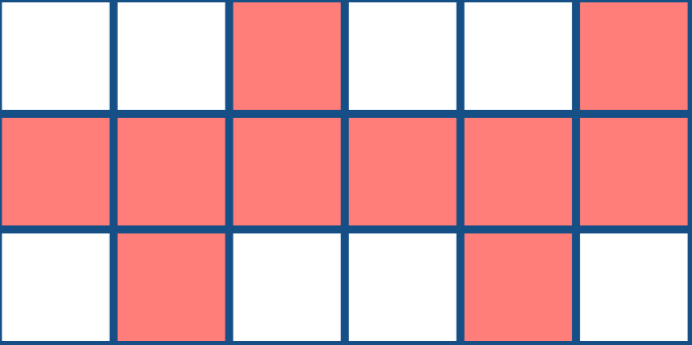
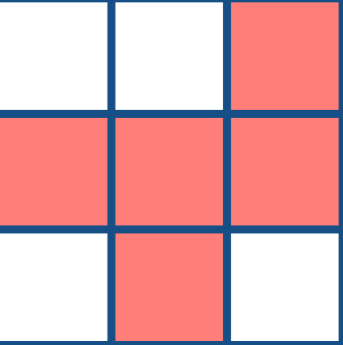
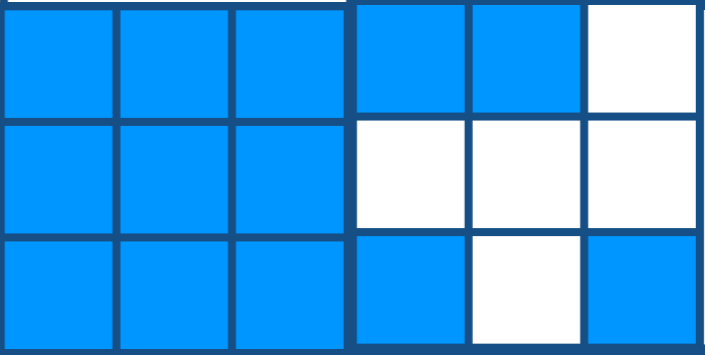
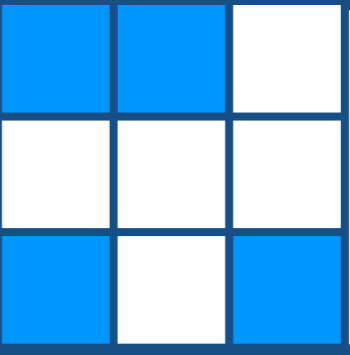

Operation Mode: $1.0 < |\eta| < 1.3$

- I studied operation mode in $1.0 < |\eta| < 1.3$.

- ❖ Exclusive-OR is slightly good, but Tile only is easy to operate.
- ❖ So Tile only is going to be installed for early runs in Run-2

	: RoIs (SSC)
	: EIL4
	: TileCal

threshold 500MeV

	Tile only	Exclusive-OR	EIL4 only
EIL4			
Tile			
efficiency (%)	97.4	97.8	99.5
rate reduction (%)	14.6	12.5	60.7

installed in Run-2

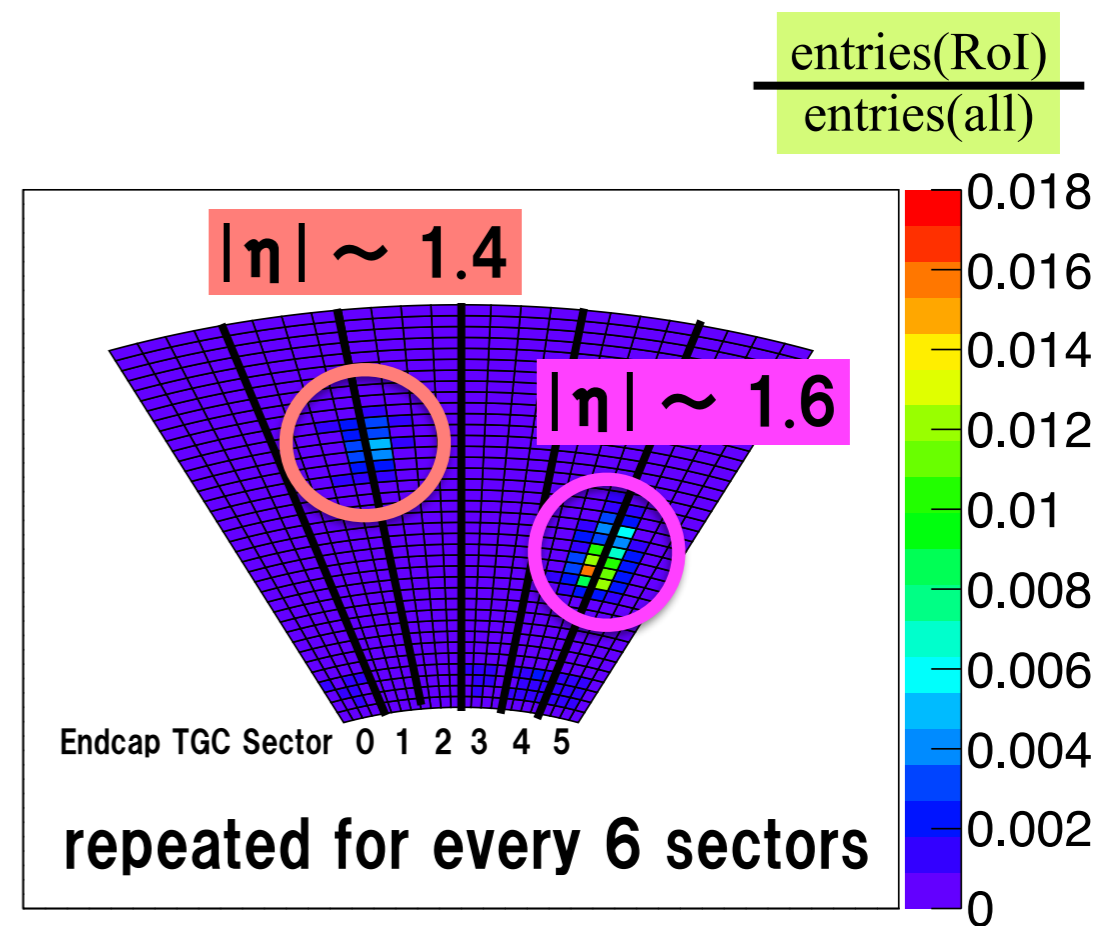
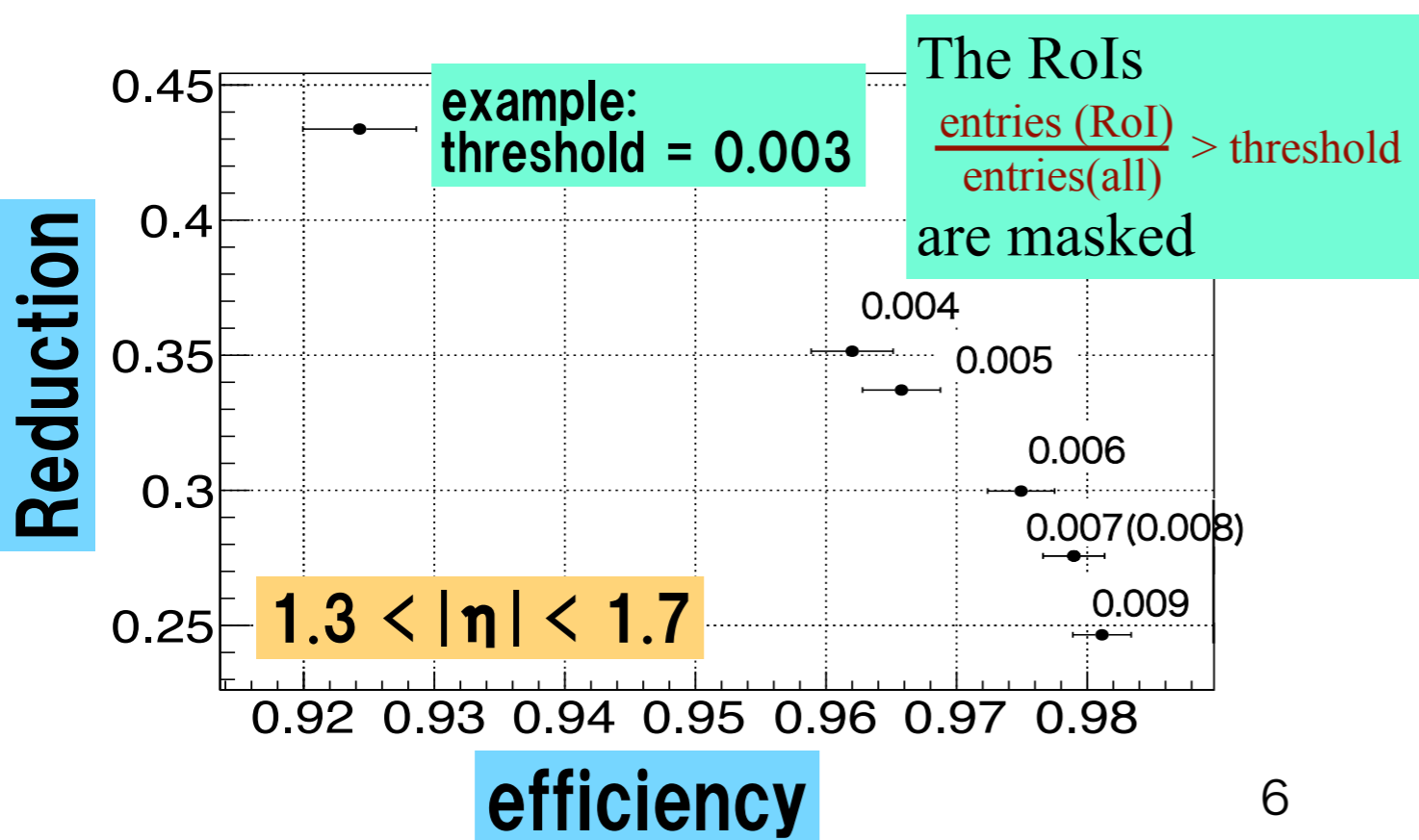
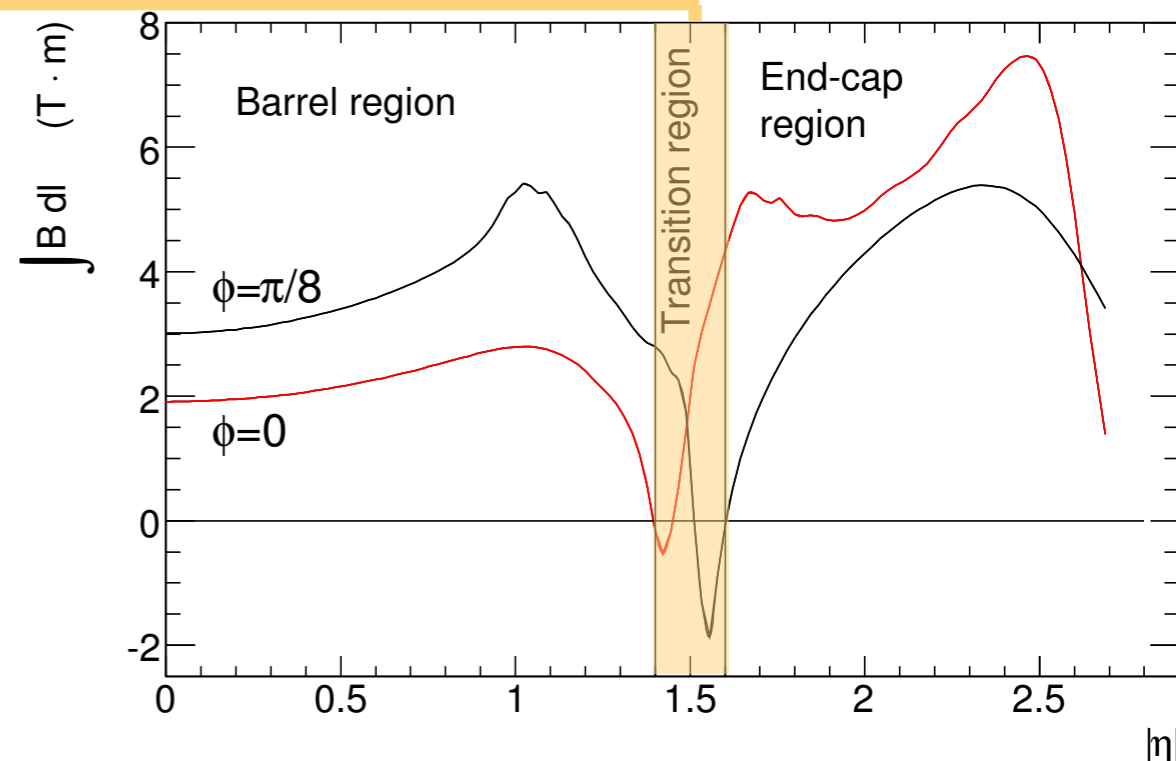
Hot RoI mask

- **Transition region**

- ❖ There is a transition region in magnetic field between barrel region and End-cap region
- ❖ In this region, magnetic field strength is not enough to bend muons, so muons' p_T can't be measured

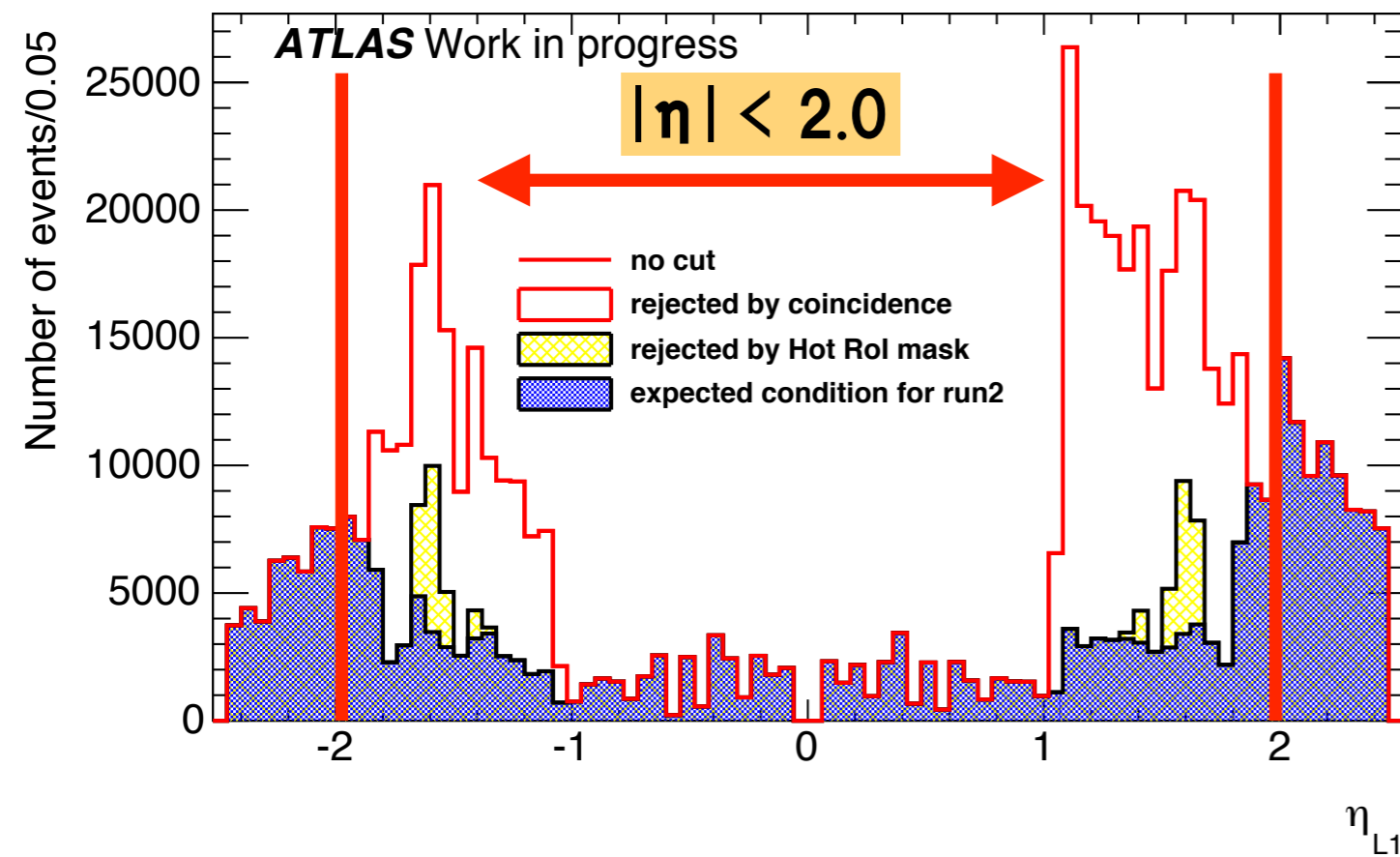
- **RoI mask**

- ❖ The Trigger-Rate in this region is quite high and makes Hot RoIs
- ❖ Hot RoIs will be masked



Results

$2.0 \times 10^{34} \text{ cm}^{-2} \text{ s}^{-1}$



	rate reduction (%)	efficiency (%)	Trigger Rate (kHz)
no cut	100.0	100.0	34
FI + Tile (Tile only)	53.4	98.1	21
Hot Rol mask	48.9	97.4	19
$ \eta < 2.0$	29.8	84.5	12

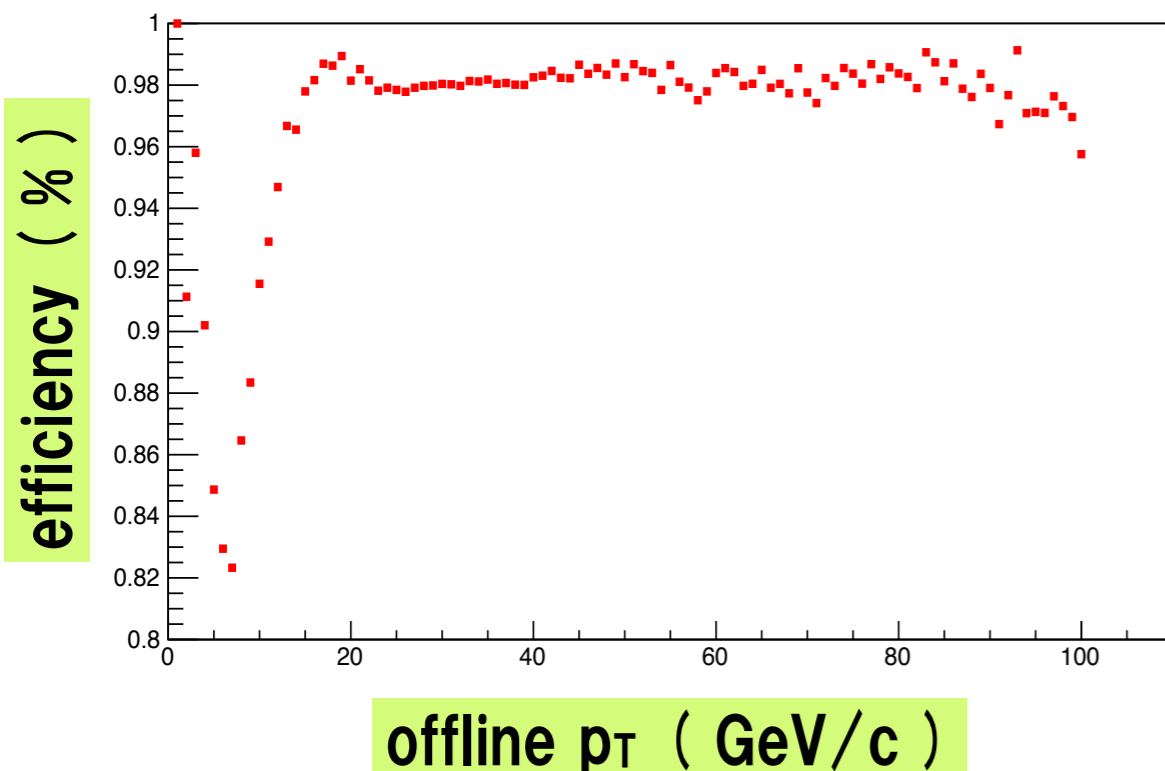
If luminosity is very high ...

efficiency vs. p_T

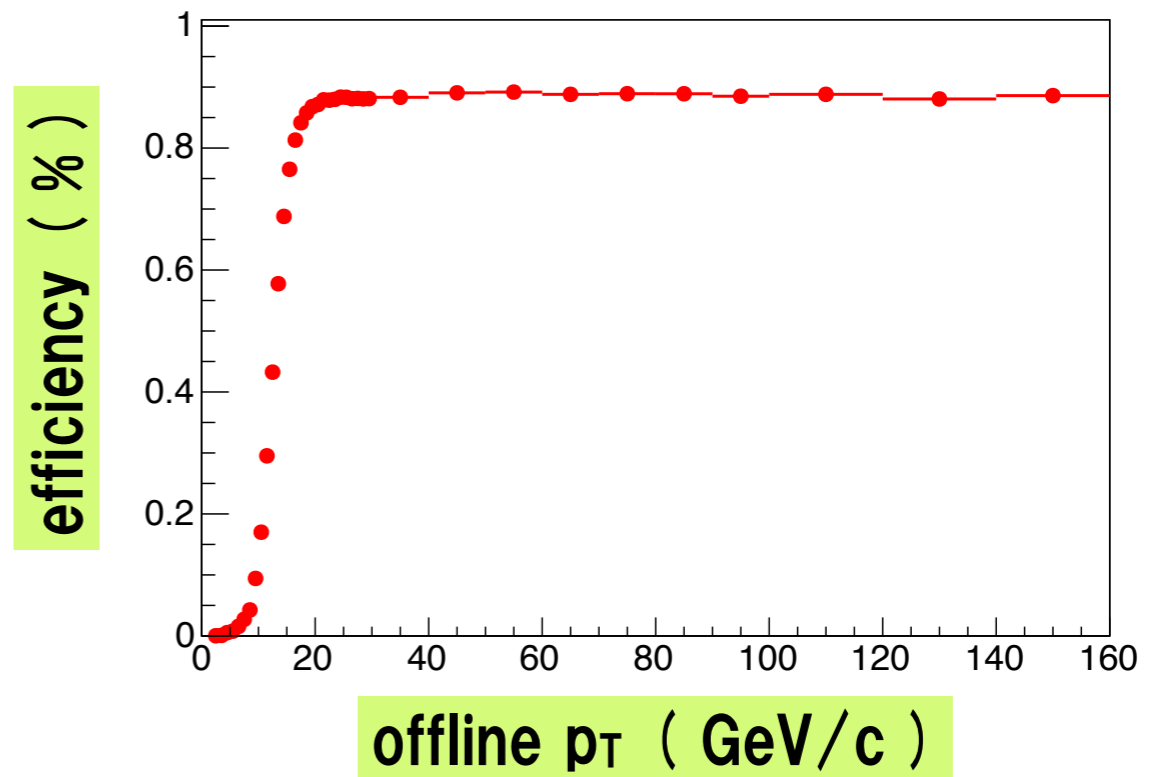
- The "efficiency" which I used in this talk means how many muons from IP were survived requiring additional coincidence
- We can compute absolute efficiency multiplying "efficiency" and efficiency computed from T&P

$$1.0 < |\eta| < 1.9$$

"efficiency"



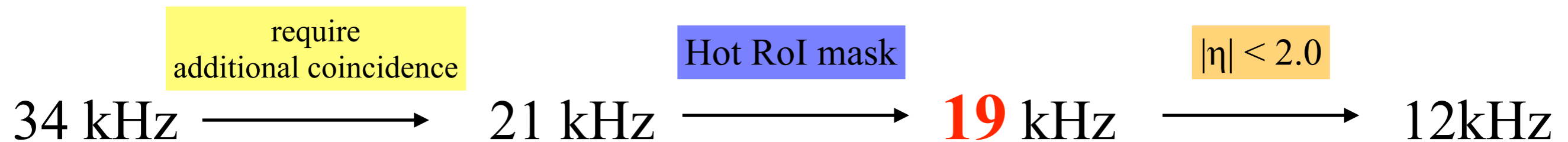
efficiency from T&P



Summary

- I precisely re-estimated Muon Trigger-Rate for Run-2
 - ❖ EI/FI Coincidence Map was optimized
 - ❖ Hot RoI mask will be installed

Run-2 ($2 \times 10^{34} \text{ cm}^{-2} \text{ s}^{-1}$)



We can control trigger-rate of L1_MU20 with sustaining efficiency within the allocated bandwidth