Effect of Dead Channels on the DTBX LV1 Trigger

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- **Dead drift tubes in the superlayers**
- **Dead BTIs**
- **Effect on the Local Trigger, DTBX and Global Muon Trigger (GMT)**

Studied with ORCA 8_7_3 and single muons in the Pt range 3 - 100 GeV

Effect of Dead Wires on the DTBX Trigger

So far a list of cells with problems is available only for wheels +1 and +2, excluding all chambers from sector 1 and 7 (the orizontal diameter of the wheel).

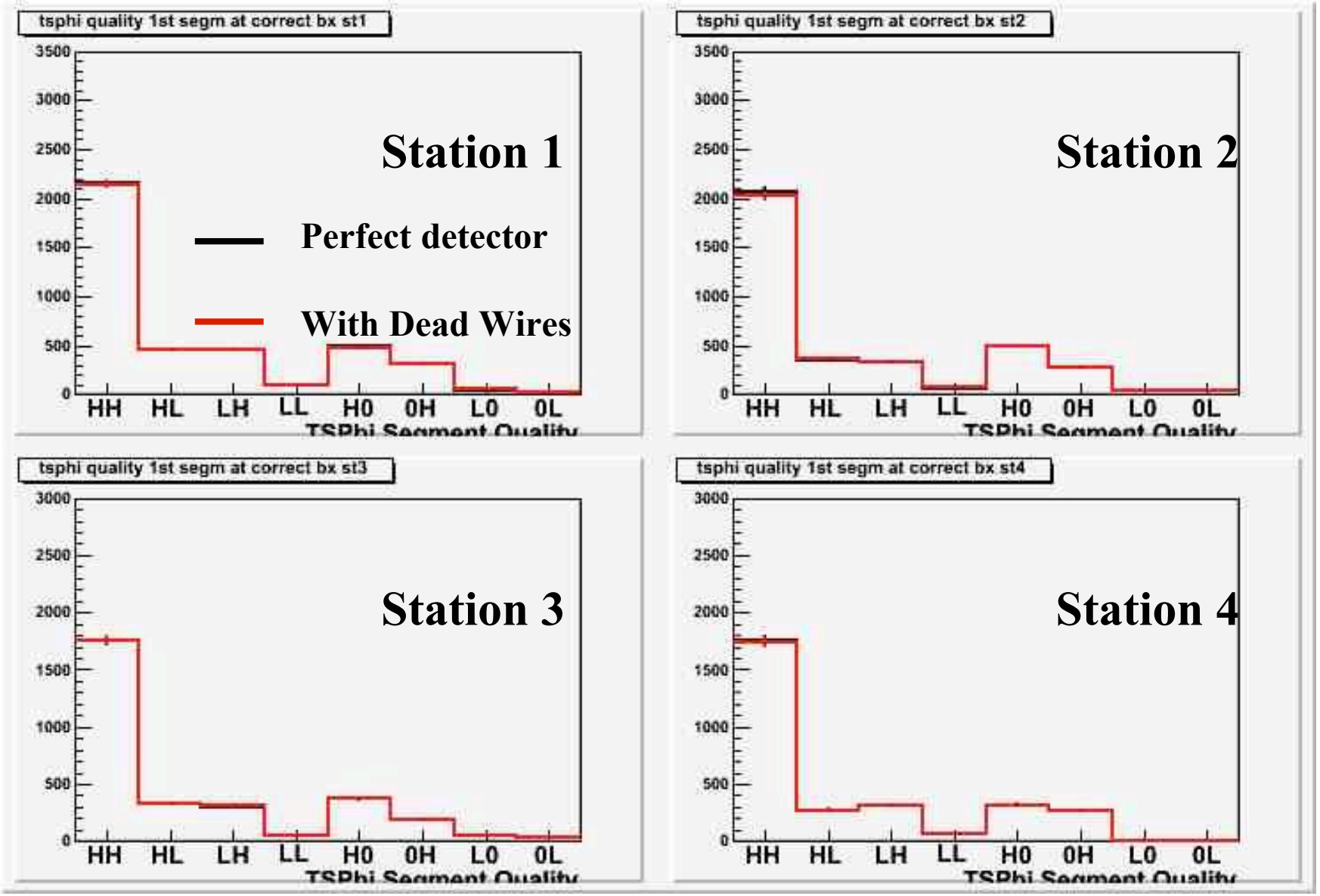
Problems include broken wires, big currents, dead channels, sparks, strip and I-beam problems.

Of the order of 100 cells with some kind of problem, over 2 wheels. It corresponds to ~ 0.5 dead cells/SL.

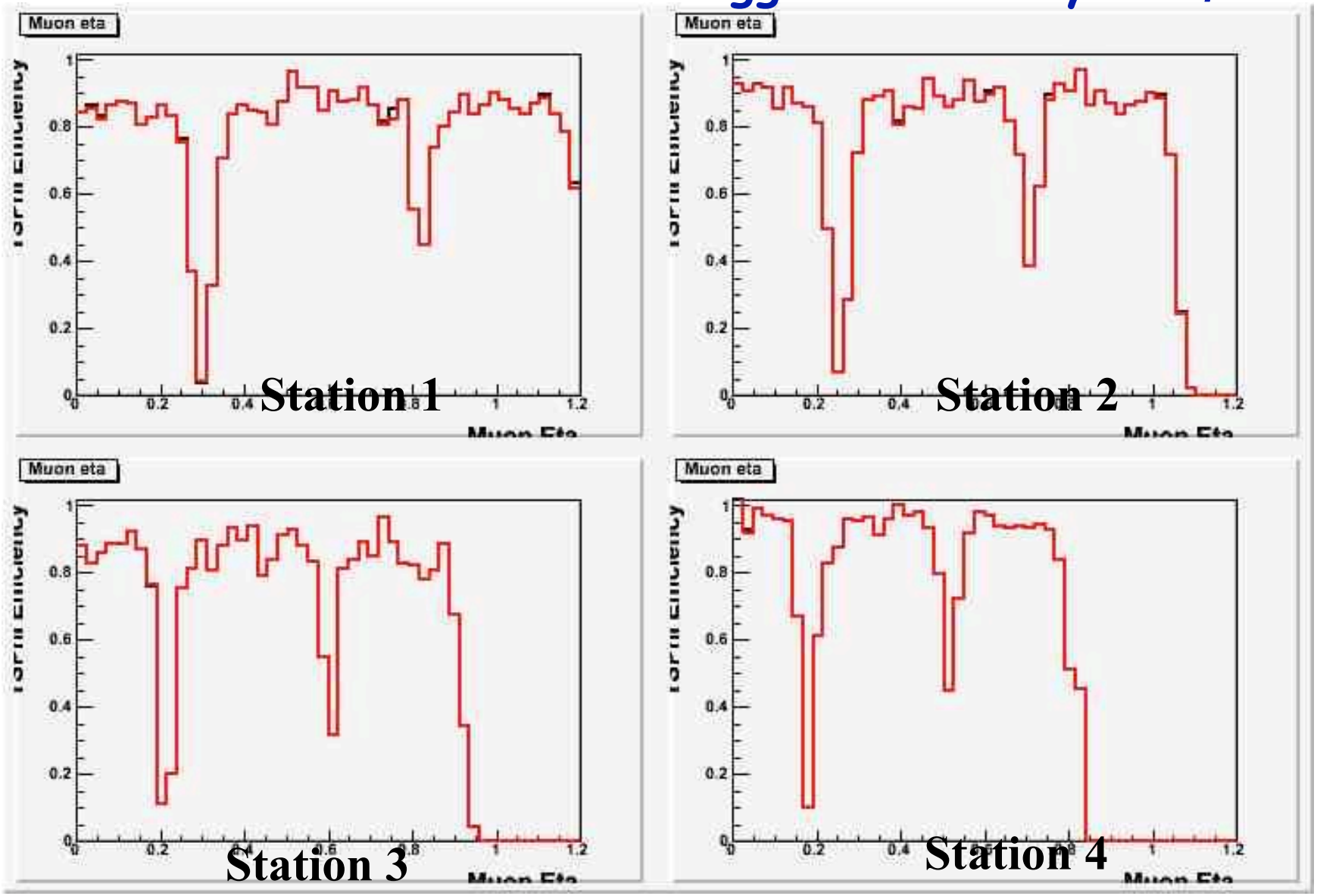
I assumed all of them as dead cells (i.e. the worst case)

I also assumed that the same pattern of dead cells will occur also in the other wheels of the detector.

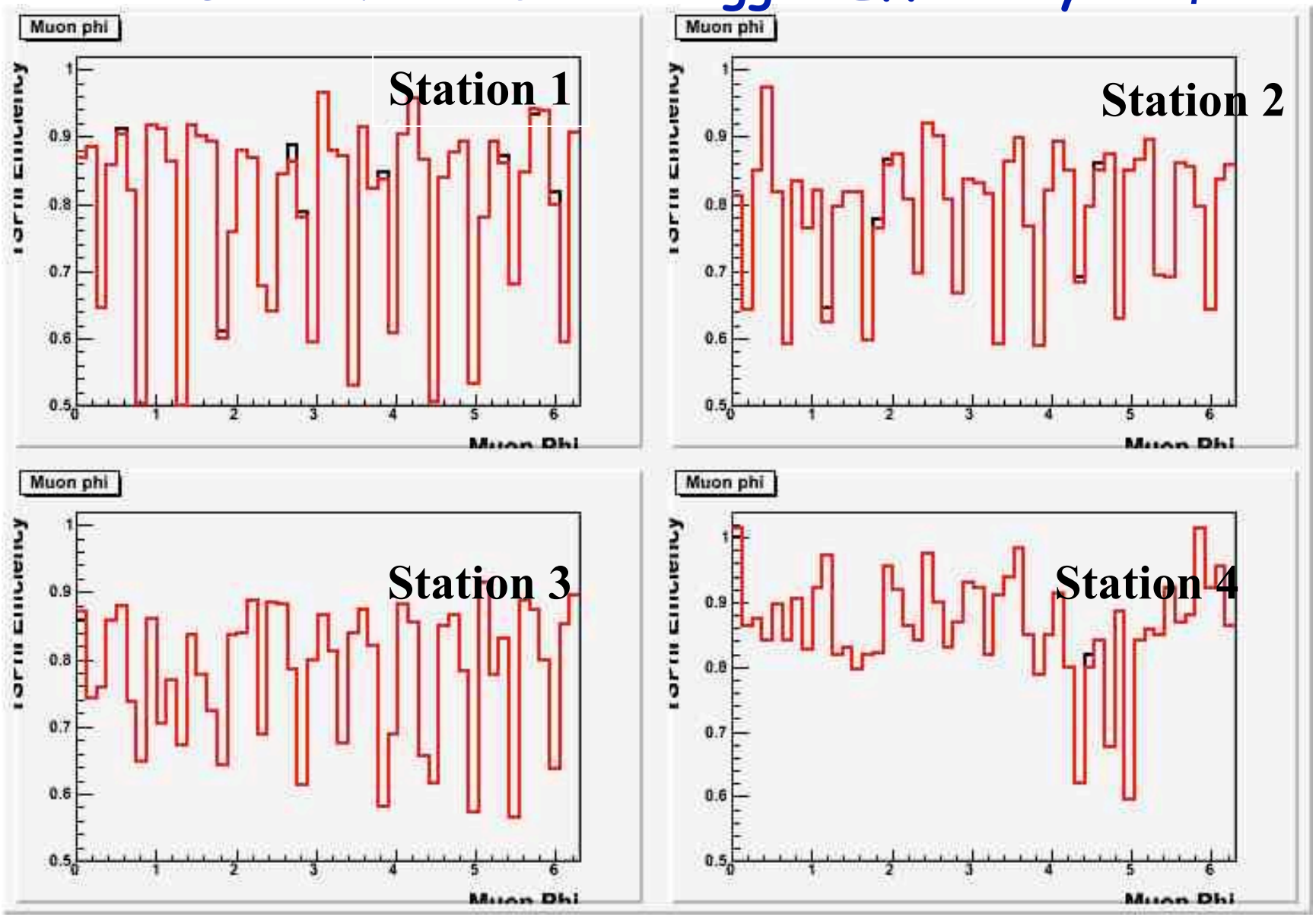
Dead Wires: Quality of the Local Triggers



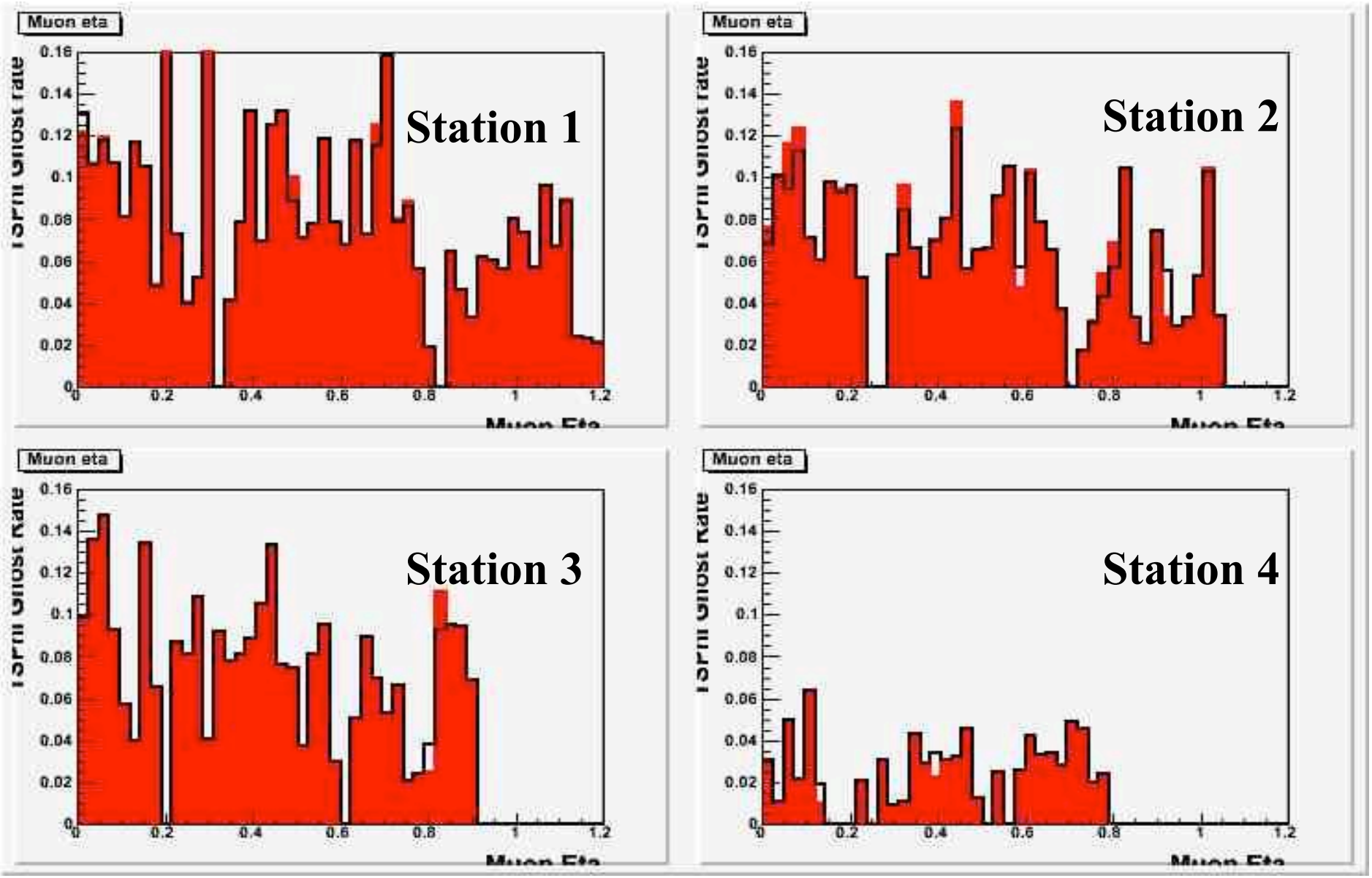
Dead Wires: Local Trigger Efficiency vs η



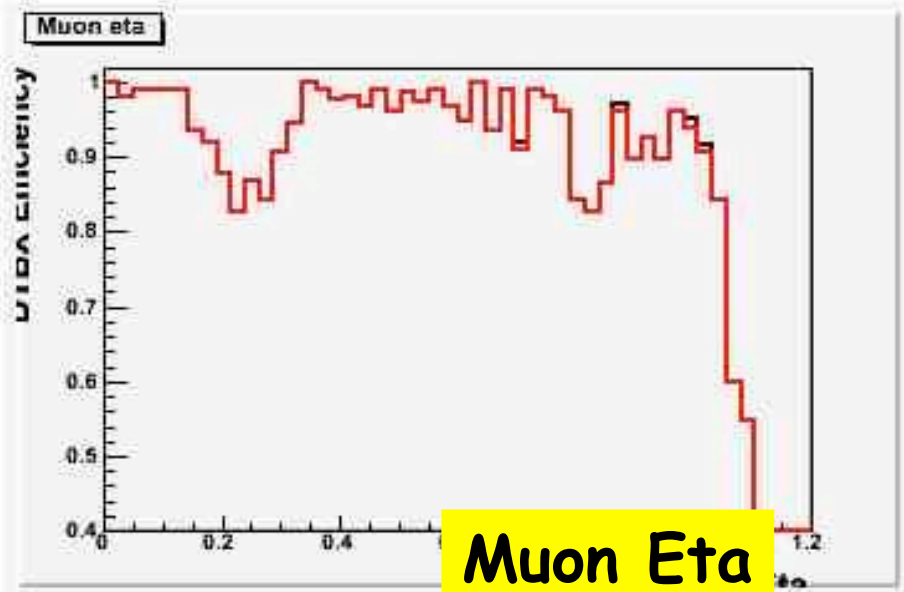
Dead Wires: Local Trigger Efficiency vs ϕ



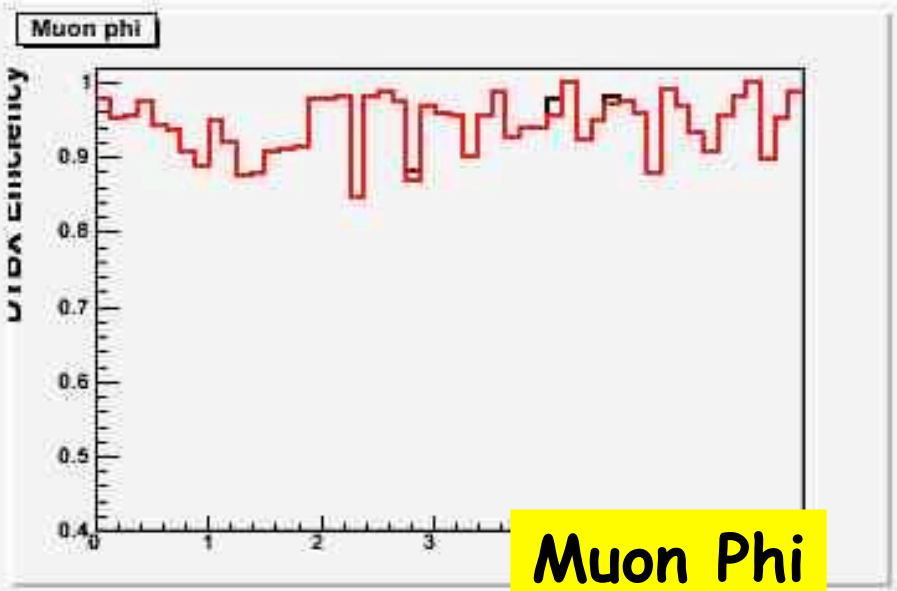
Dead Wires: Local Trigger Ghost Rate at Correct BX vs η



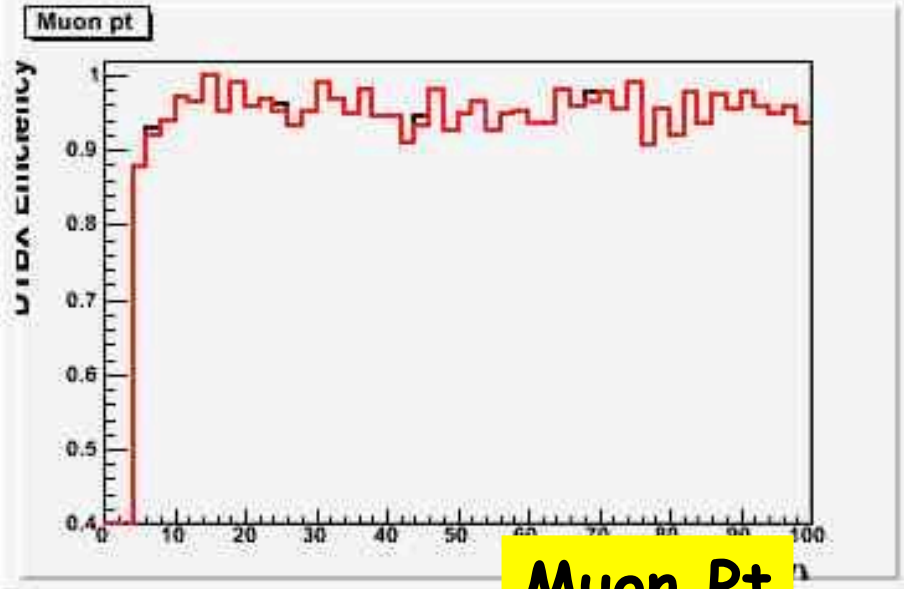
Dead Wires: DTBX Trigger Efficiency



Muon Eta



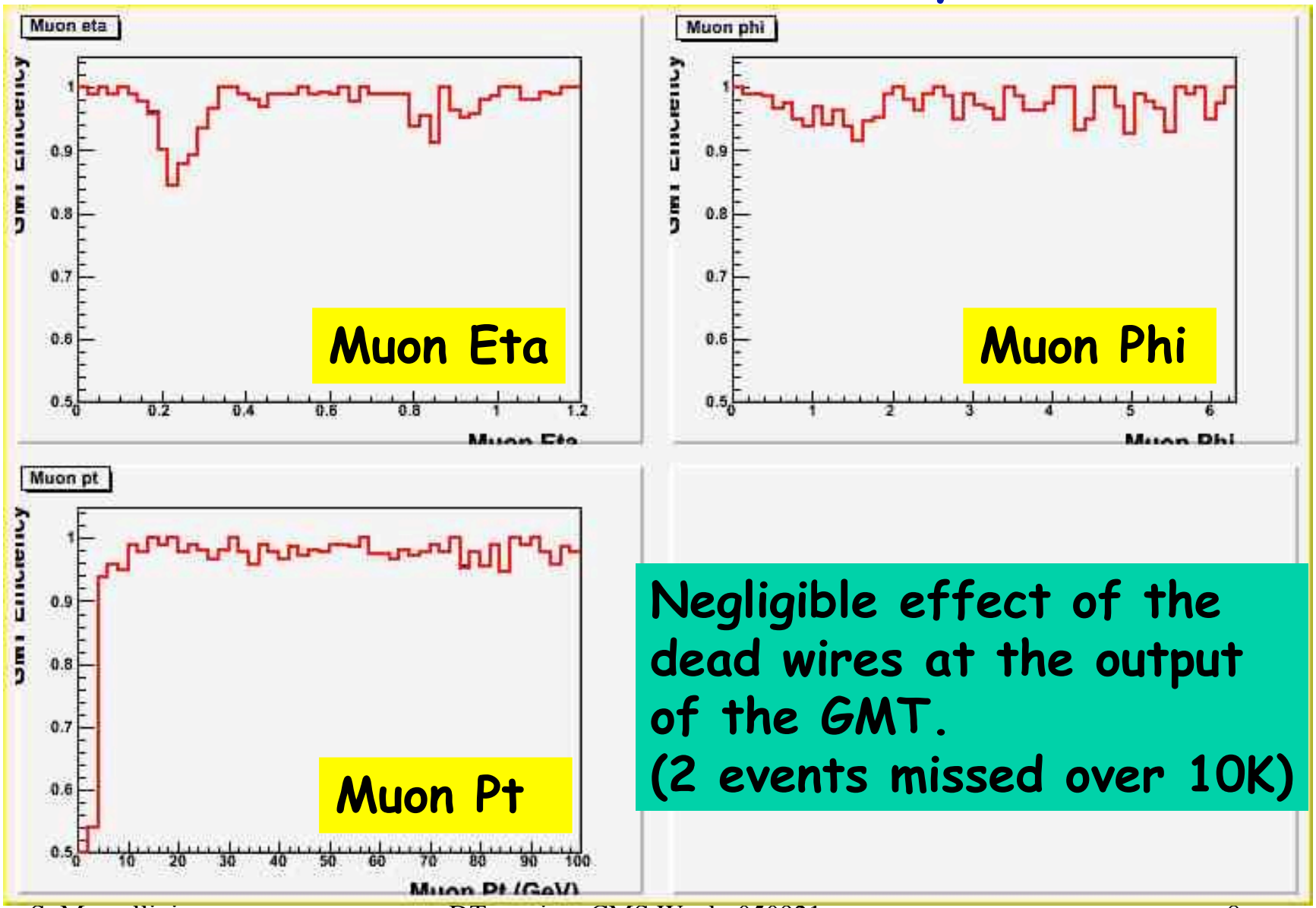
Muon Phi



Muon Pt

DTBX Efficiency Loss due to dead wires: ~ 0.1 %

Dead Wires: GMT Efficiency



Negligible effect of the dead wires at the output of the GMT.
(2 events missed over 10K)

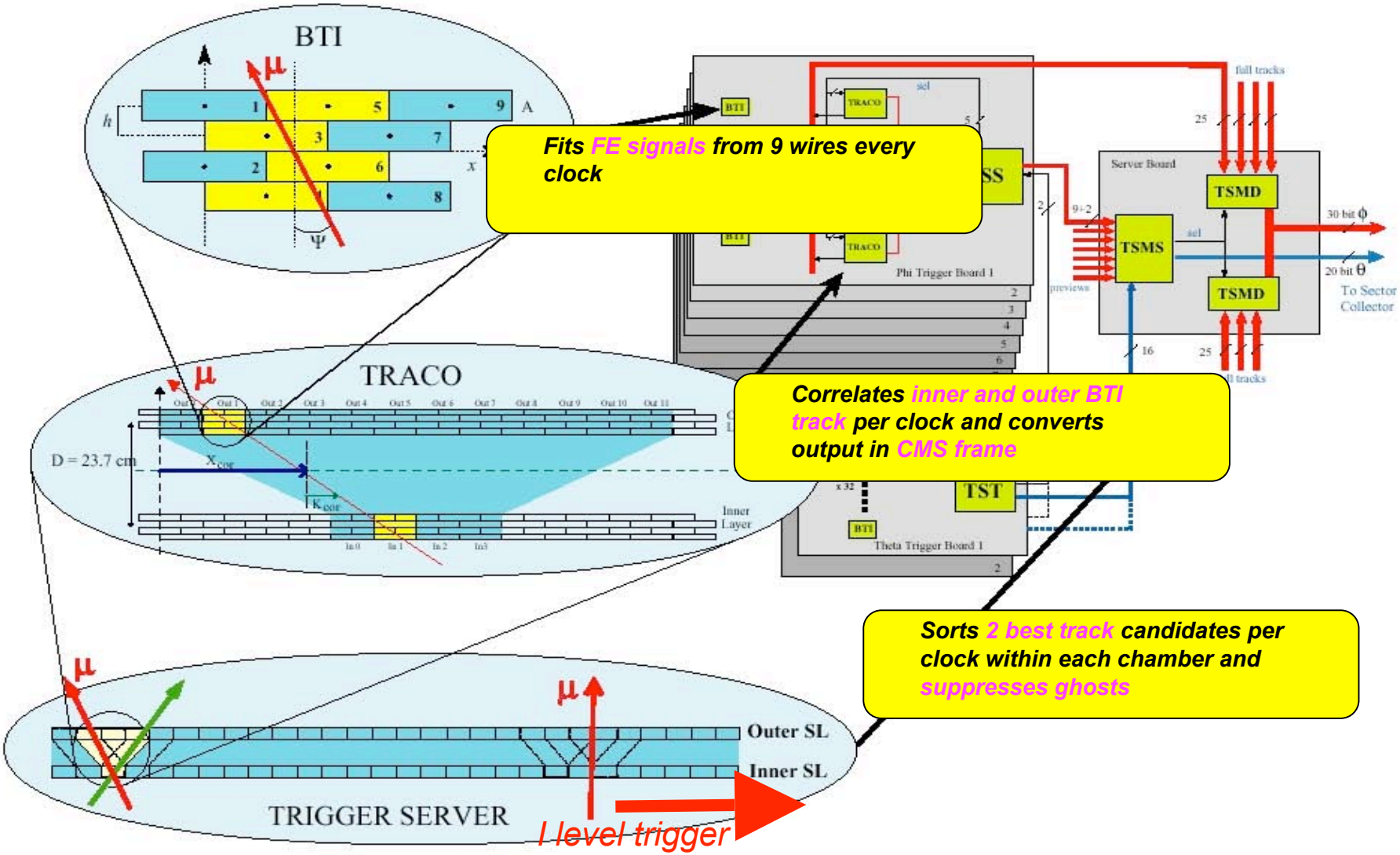
Dead Wires: assume 2 dead wires/layer (8 dead wires/SL) placed random in the whole detector)
This corresponds to about 15 times more dead wires than the real case.
DTBX Trigger Efficiency loss: ~ 1.7 %

GMT Efficiency loss: ~ 0.3 %

Conclusions for *Dead Wires*: With the present cells failure rate (~ 0.5 dead cells/SL) the effect on the DTBX trigger efficiency is ~ 0.1 % and on GMT it is negligible.

With a much higher (about a factor 15) failure rate (8 dead cells/SL) the effect on the DTBX efficiency is ~ 1.7 % whereas the overall effect on GMT efficiency is ~ 0.3 %
DTBX efficiency loss ~ 0.2 · <dead cells/SL> %

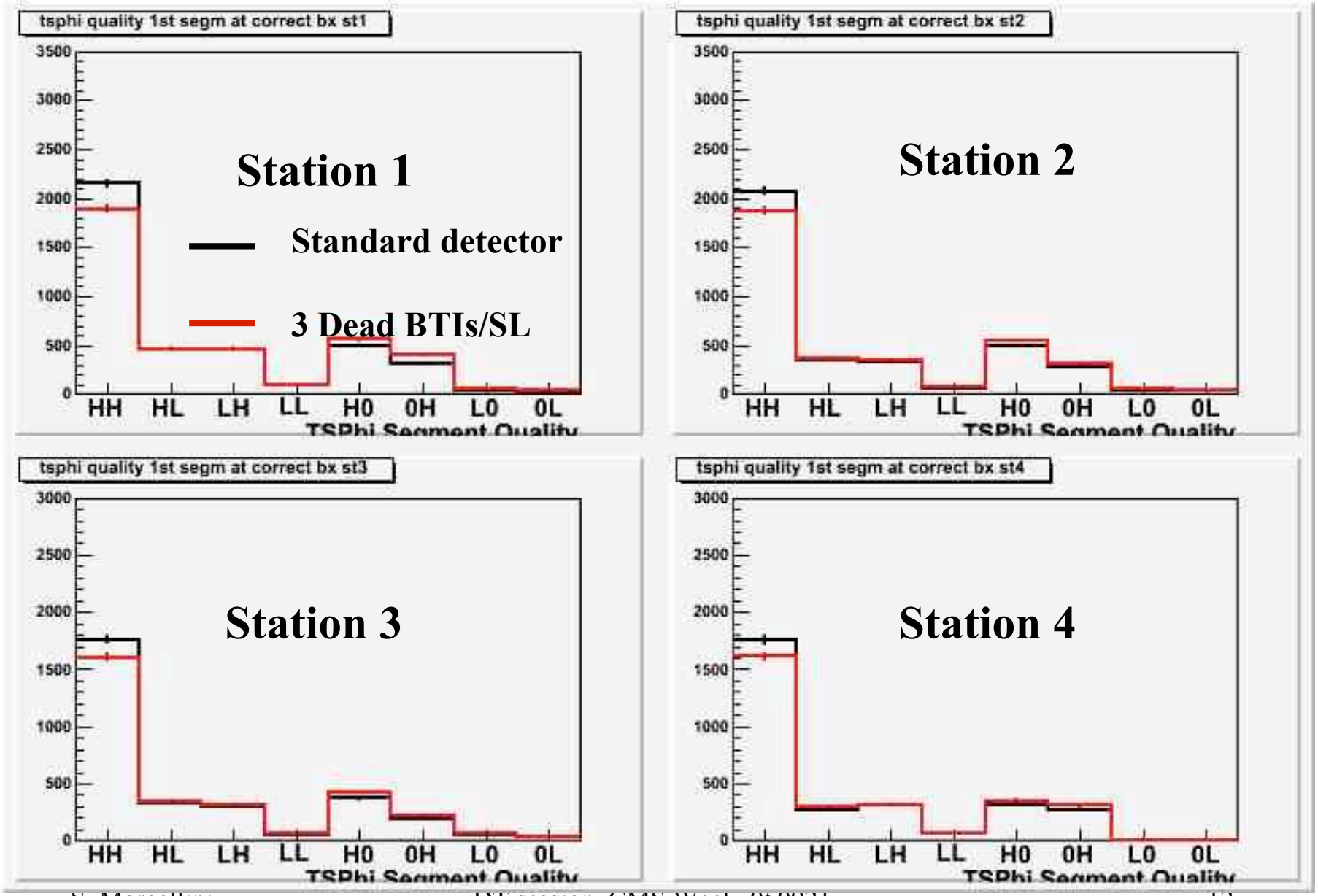
Effect of Dead BTIs



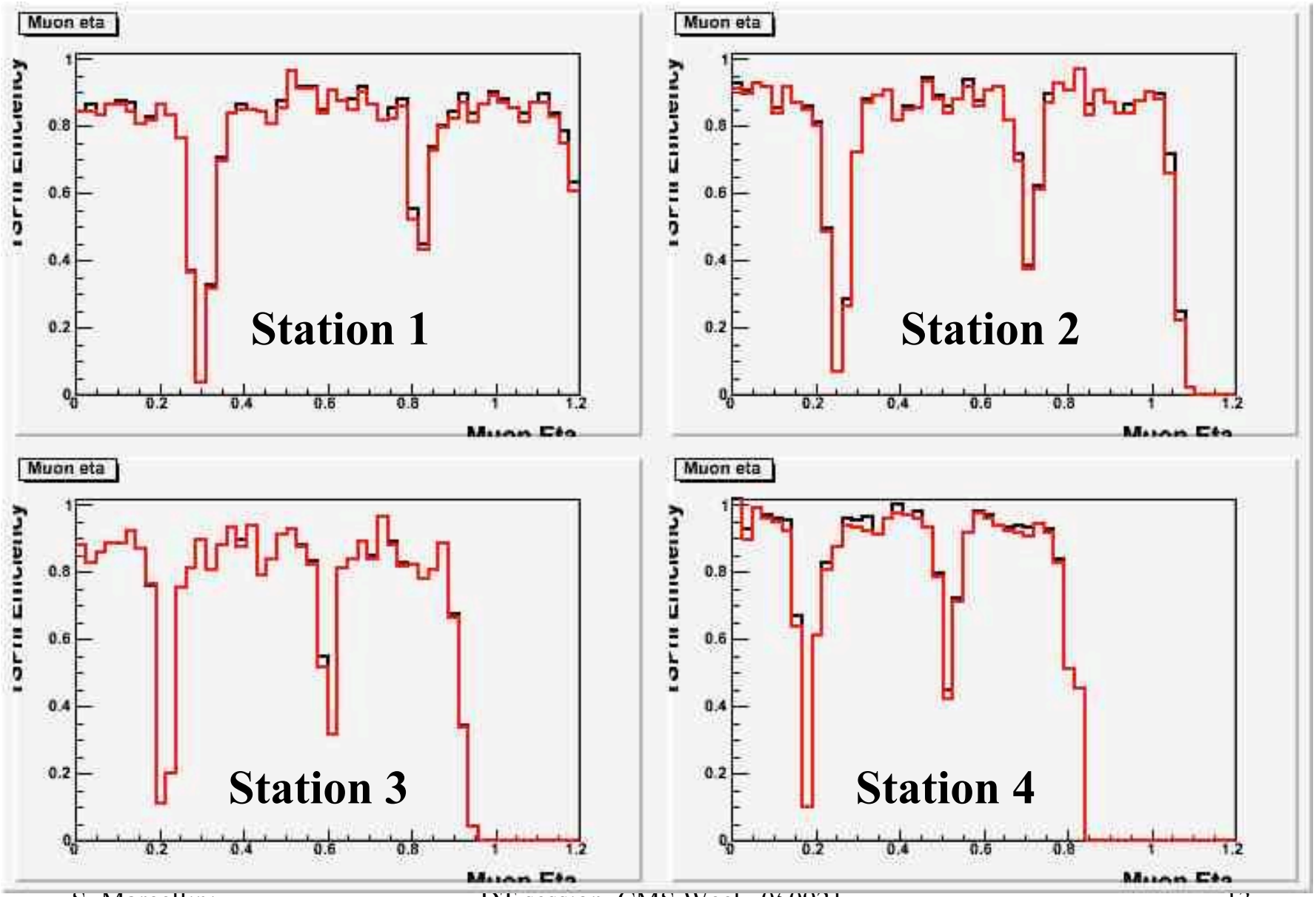
Test performed with 3 dead BTIs for each superlayer, in each barrel chamber, and also 2 dead BTIs, and compared with the "perfect" detector.

NB. So far no dead BTIs exist in the installed chambers, and therefore such bad conditions are quite extreme.

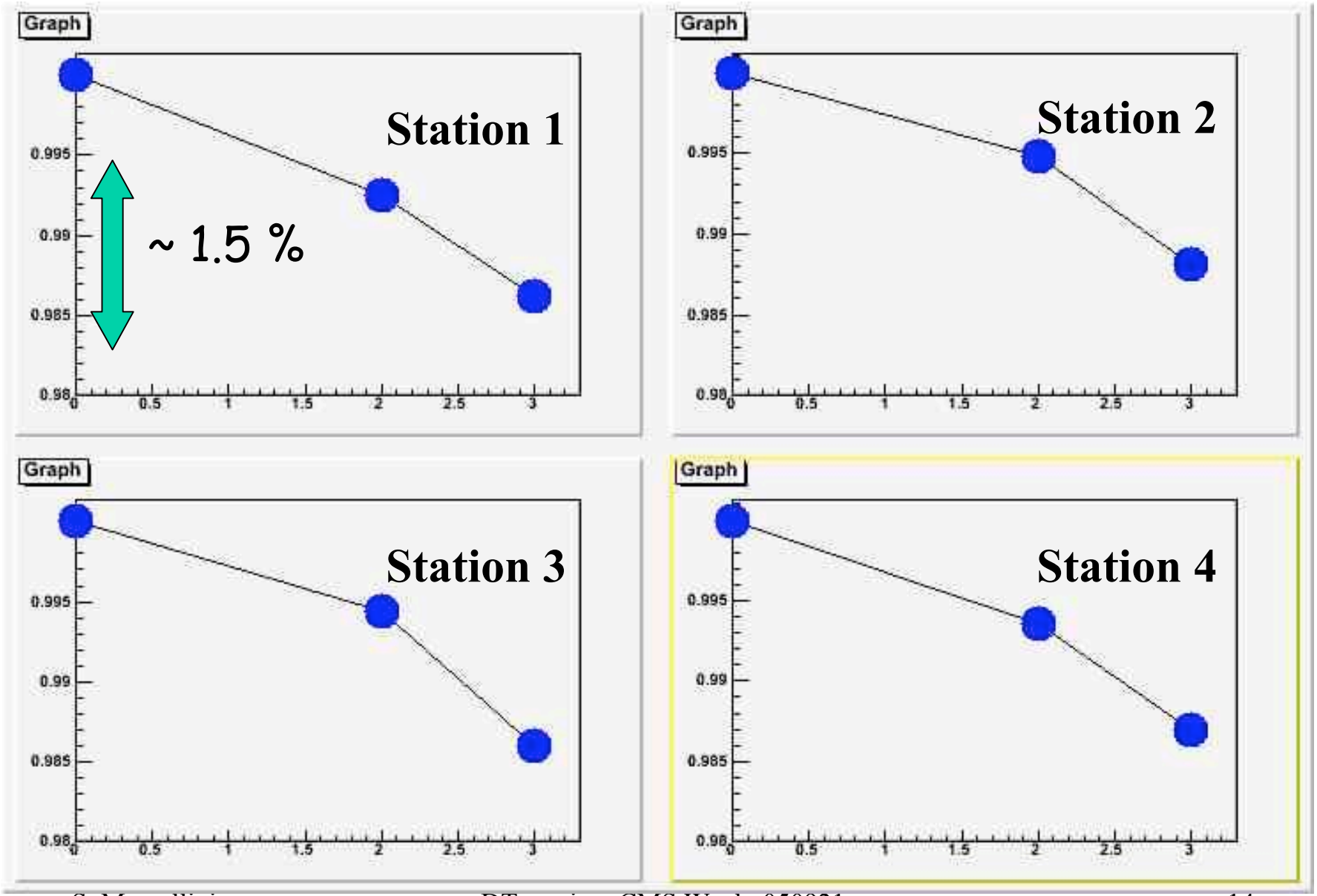
3 Dead BTIs/superlayer: Local Trigger Quality



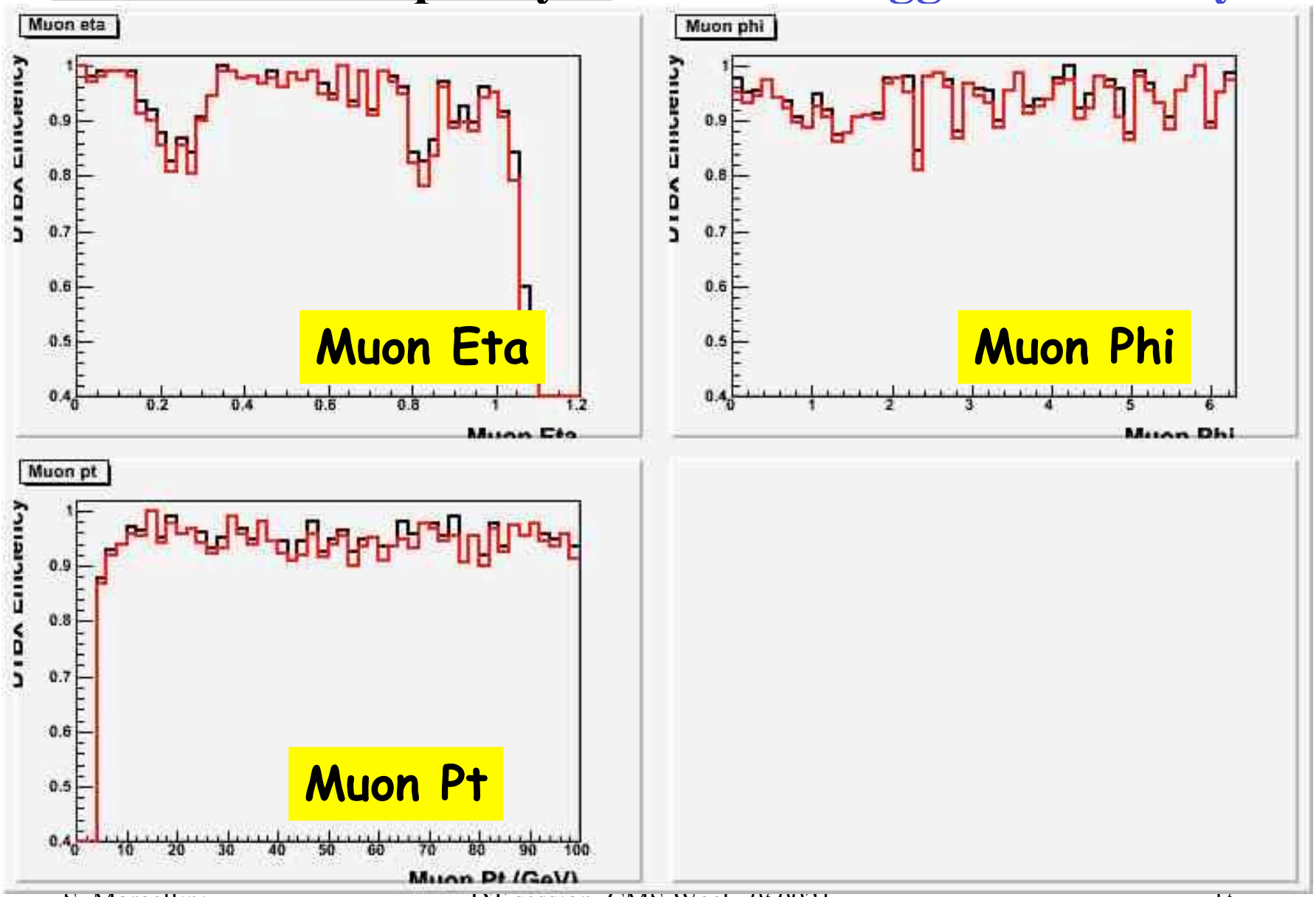
3 Dead BTIs/superlayer: Local Trigger Effic. vs η



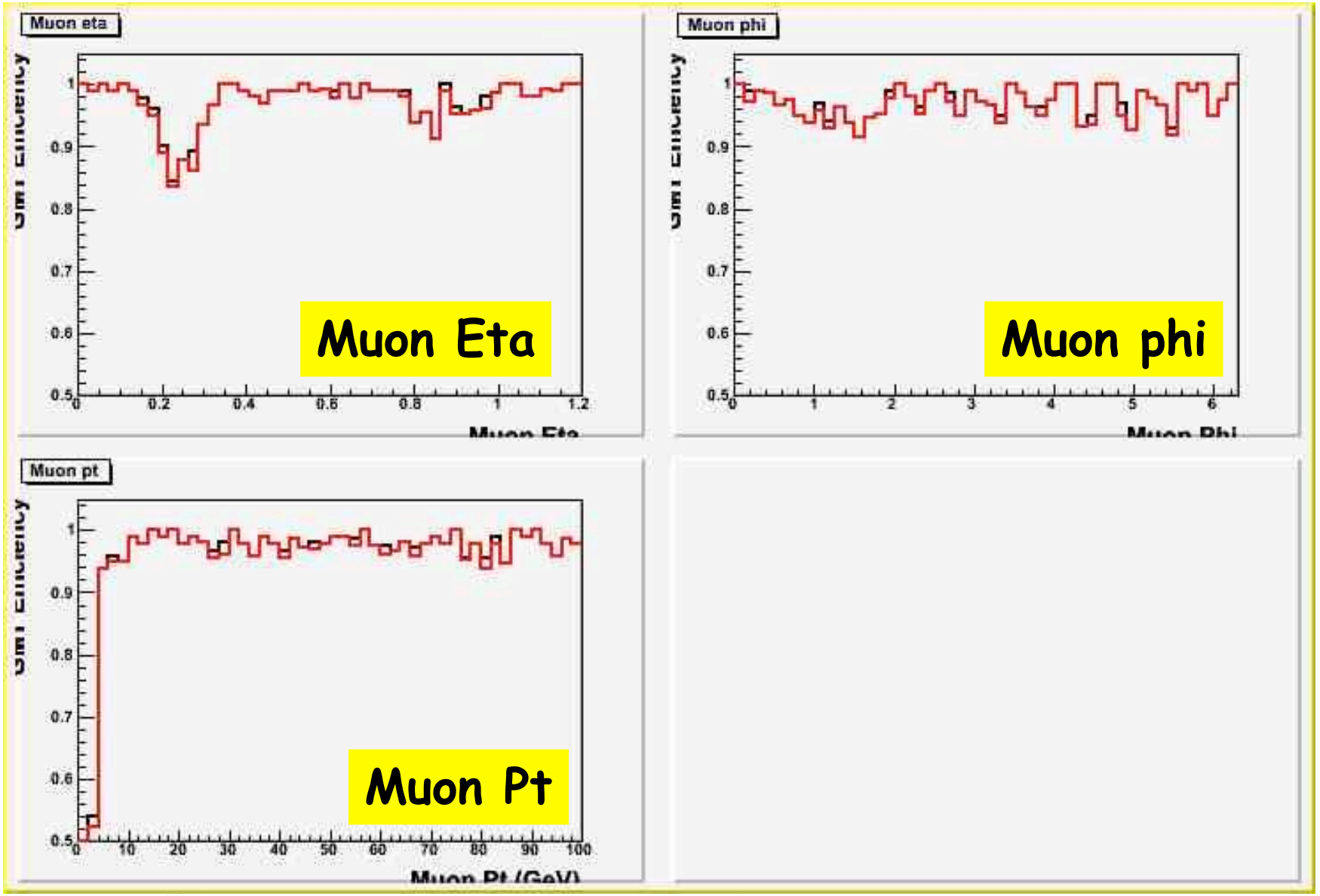
Local Trigger Effic. Drop vs Number of Dead BTIs/SL



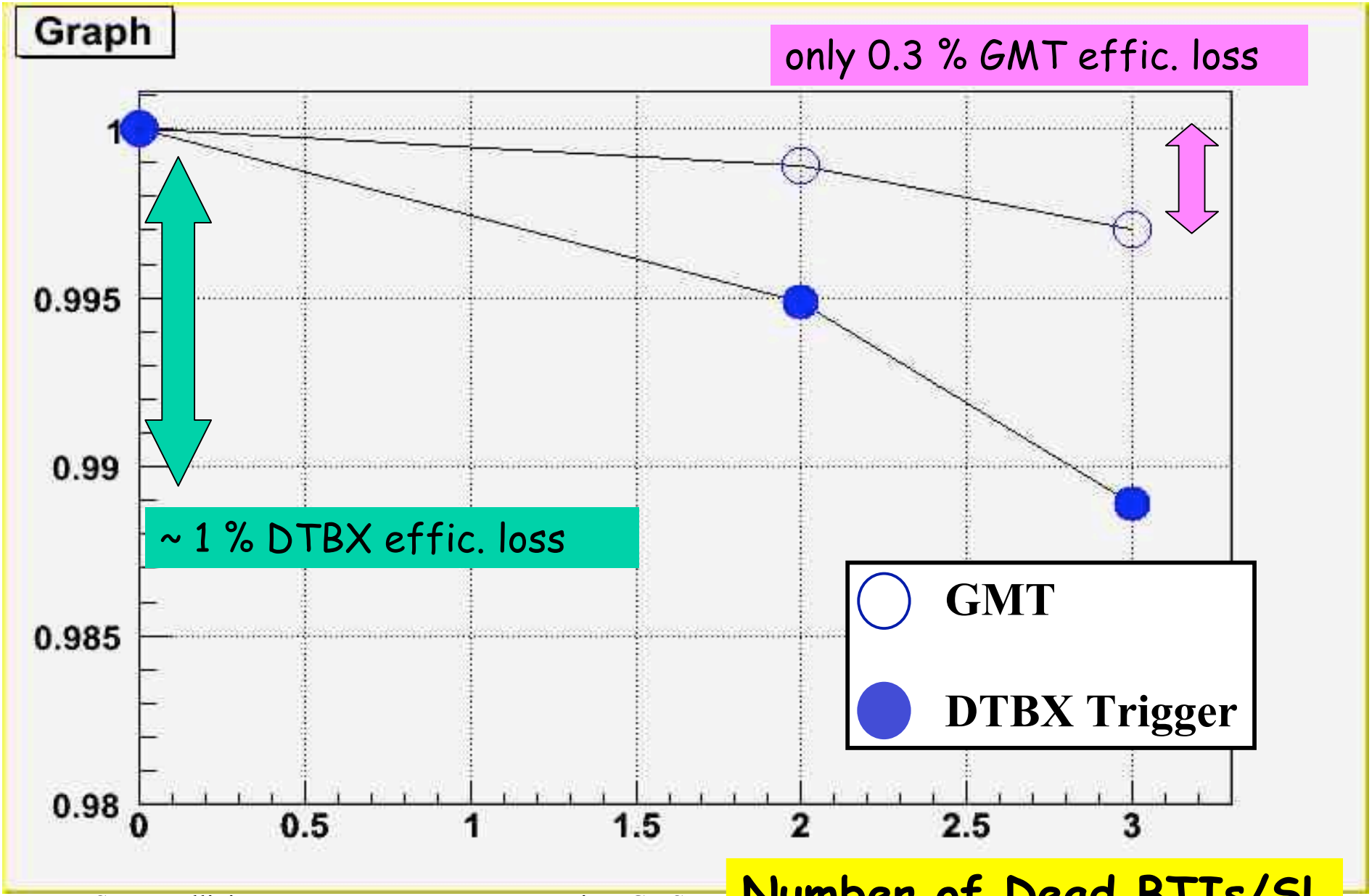
3 Dead BTIs/superlayer: DTBX Trigger Efficiency



3 Dead BTIs/superlayer: GMT Efficiency



GMT and DTBX Trigger Efficiency loss



Conclusions

With the present channels failure rate the effect on DTBX LV1 trigger is essentially negligible.

Even if such rate should slightly increase (by a factor of 2 or 3) the effect on the trigger performance would be very small.

Rather sizeable effects (O(1 %)) are expected with a failure rate an order of magnitude larger than the present one