Amanda Camacho Novaes de Oliveira
27/11/2018

TMDB in the Long Barrel

Preliminary efficiency studies

On behalf of TileMuon project

Context

- TMDBs running in the LB
- TMDB channel outputs analyzed
- Matched filter weights and calibration coefficients calculated

Necessary an analysis of the efficiency of the detection of muons

Context

- Study here presented:
  - Validation of the efficiencies of the TMDBs in the LB for the environment of the Run 2

Analysis data

- L1TGCntuple
- Selection of events in trigger:
  - Events passed by L1Mu detection
  - In RPC chambers
  - Threshold cut of L1Mu20
  - Events with only one muon detected

Analysis data

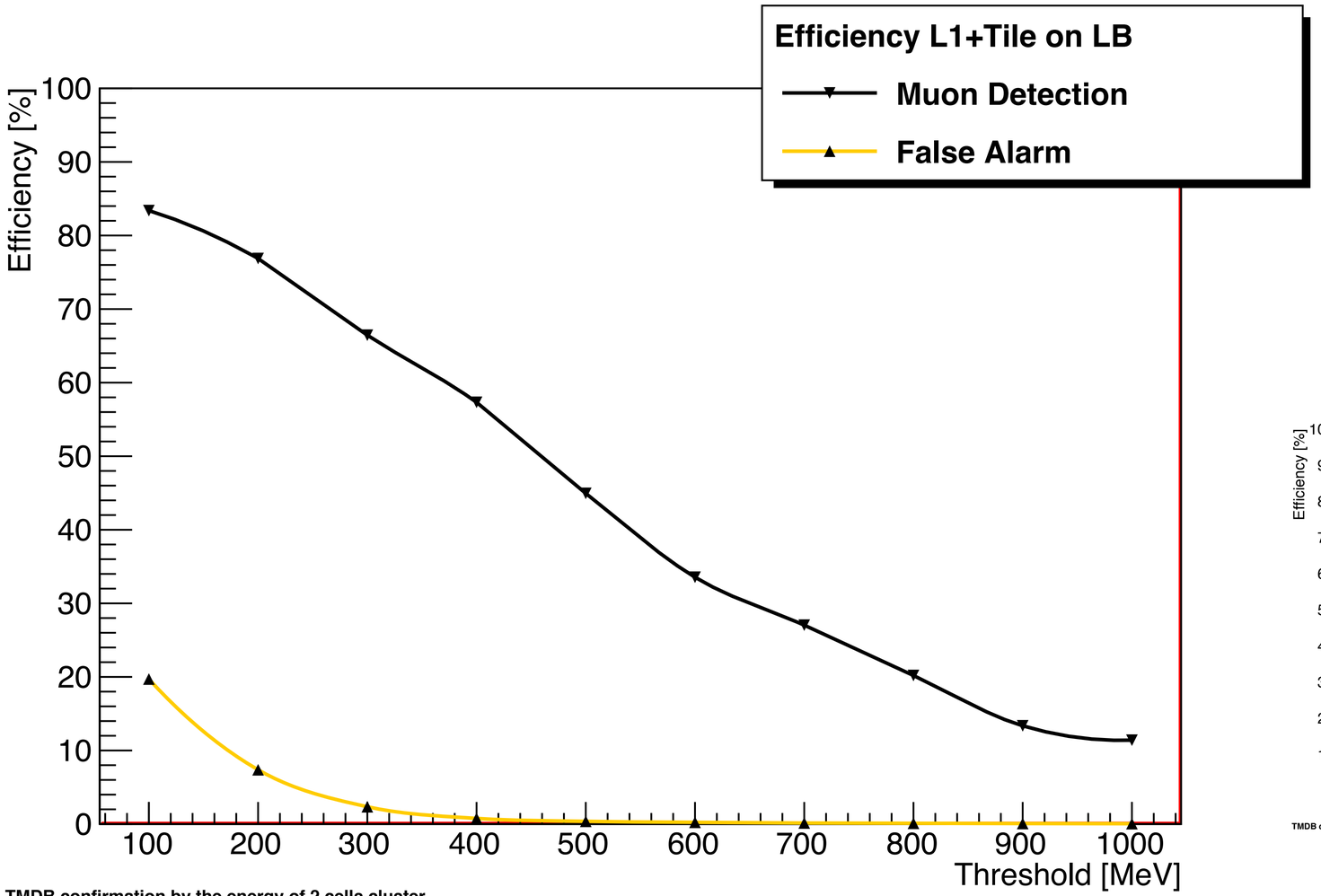
- Confirmation by offline :
  - Minimum P_T of 15GeV
  - Same position as the trigger candidate (given uncertainties involved)
  - Is combined muon
  - Is author muon

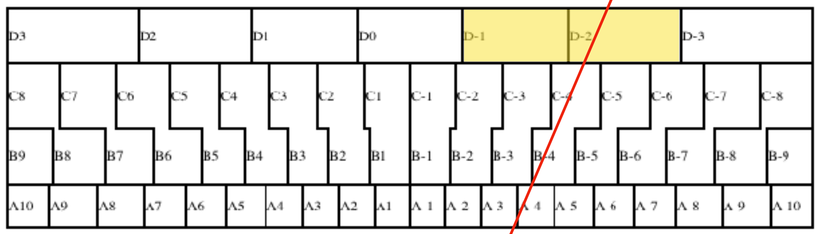
Detection algorithms

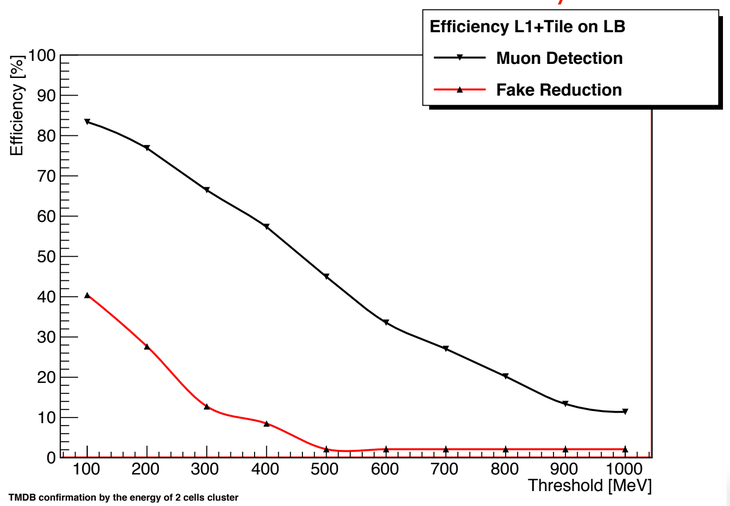
- 4 algorithms implemented:
  - Type 1: Confirmation by the energy in 2 cells in module hit
  - Type 2: Confirmation by the energy in a single cell from module hit
  - Type 3: Confirmation by the energy of single cell within a 2 modules X 2 cells cluster
  - Type 4: Confirmation by the energy in the 2 cells of higher energy module within a 2 modules x 2 cells cluster

Results

Type 1: Confirmation by the energy in 2 cells in module hit

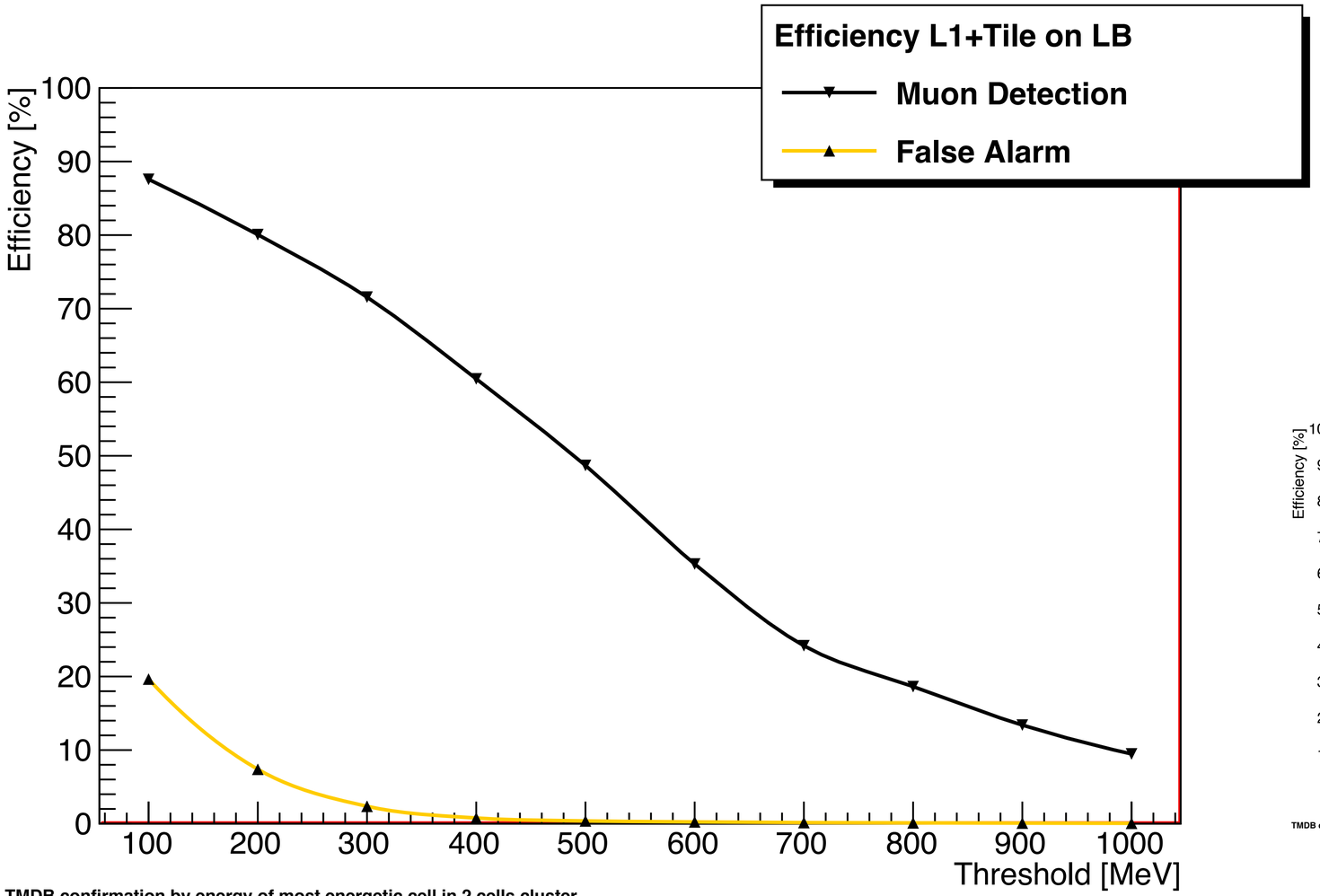


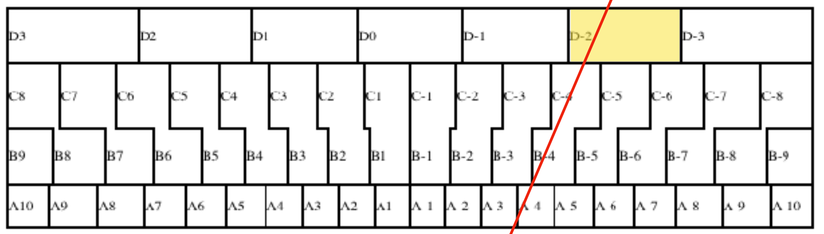


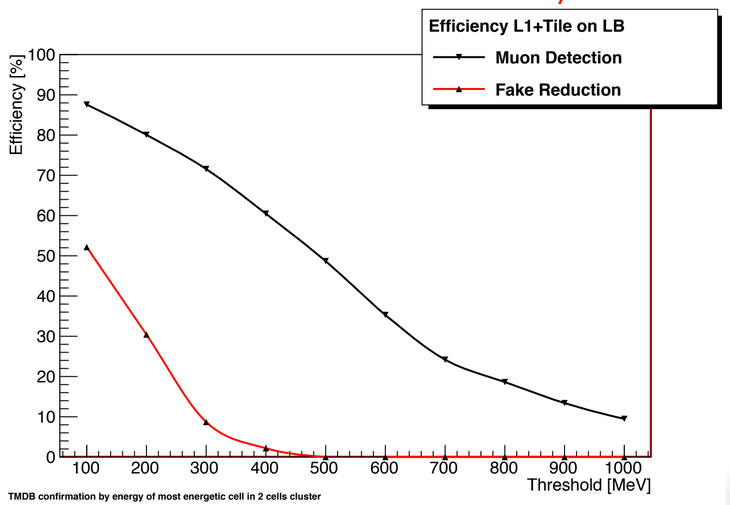


Results

Type 2: Confirmation by the energy in a single cell from module hit

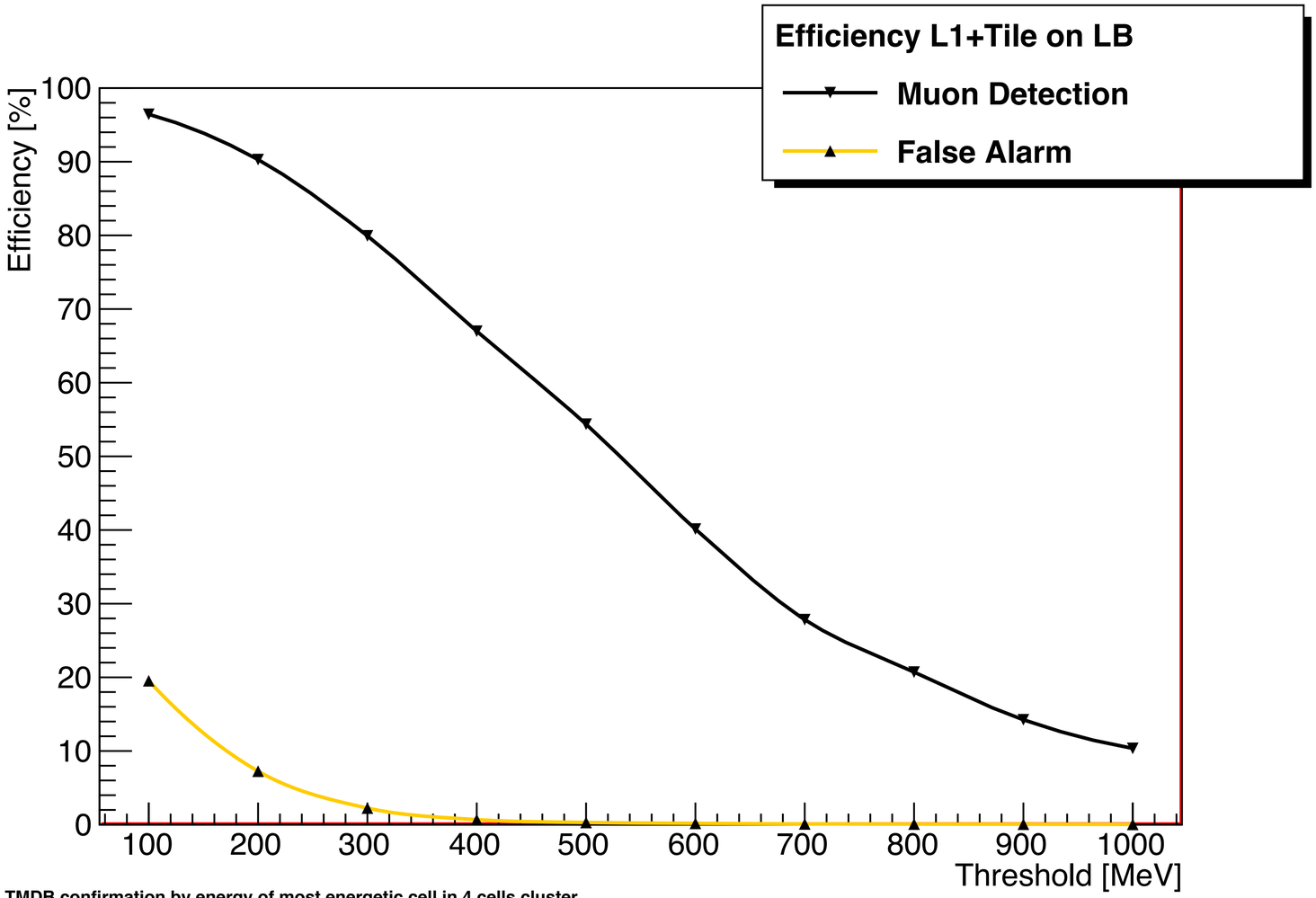




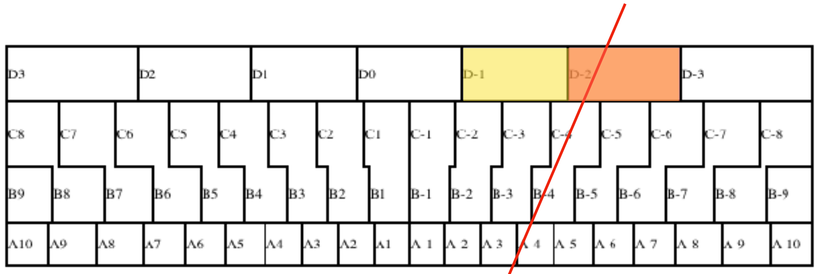


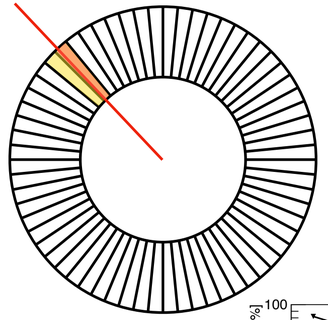
Results

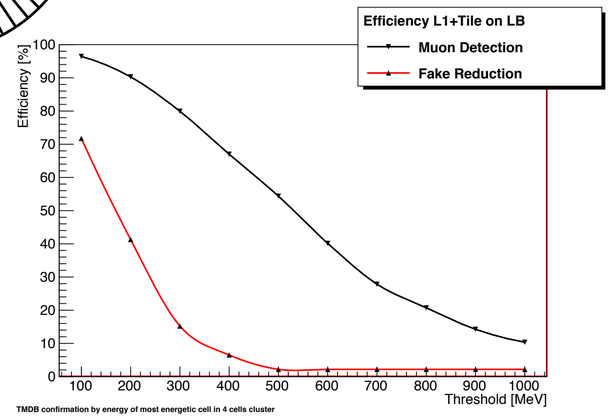
Type 3: Confirmation by the energy of single cell within a 2X2 cluster



TMDB confirmation by energy of most energetic cell in 4 cells cluster



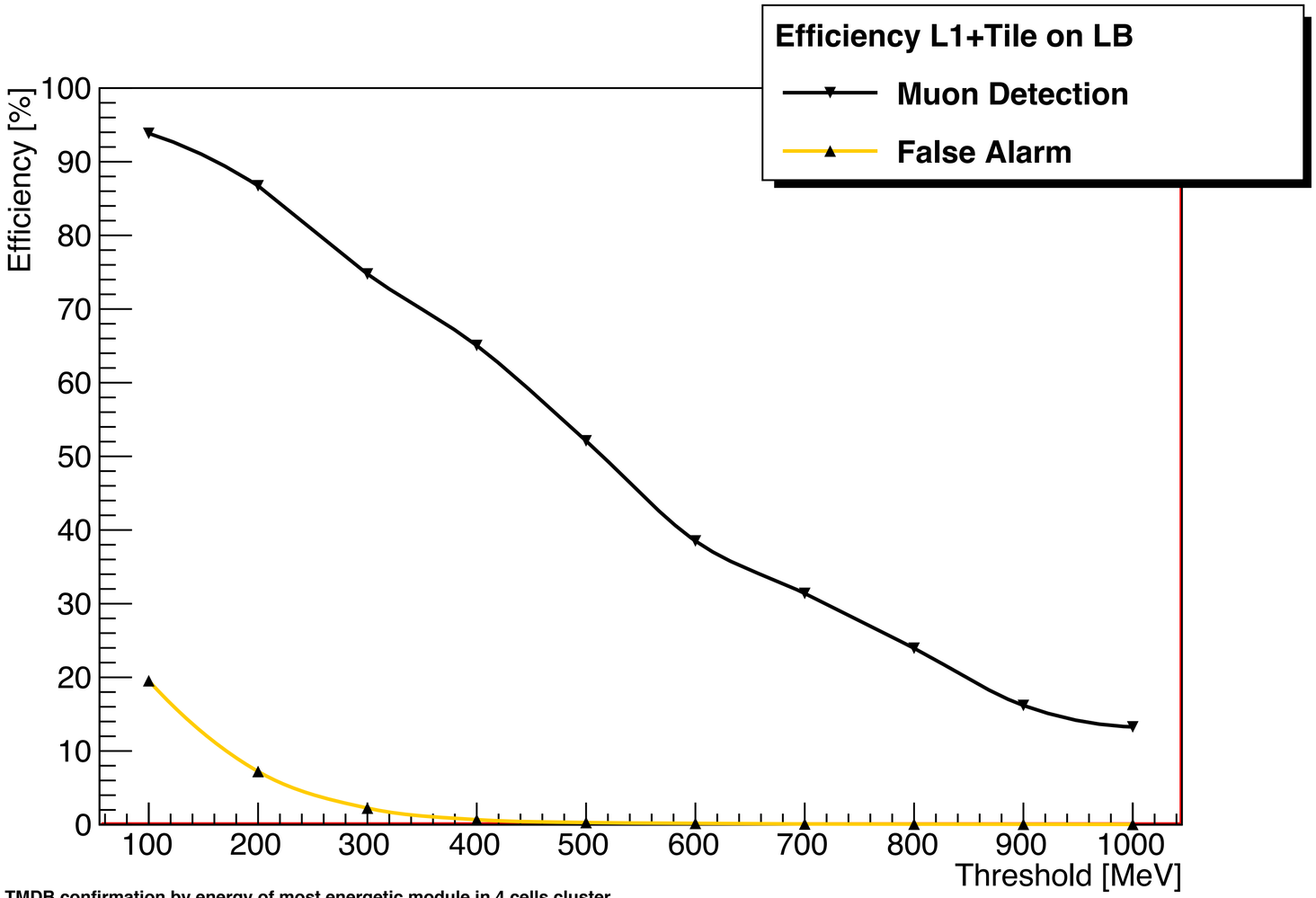




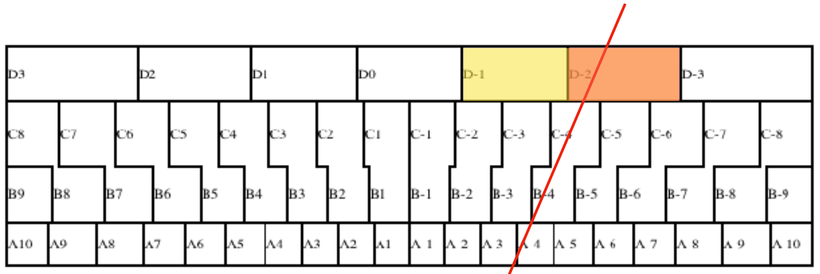
TMDB confirmation by energy of most energetic cell in 4 cells cluster

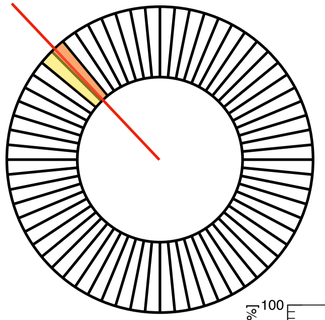
Results

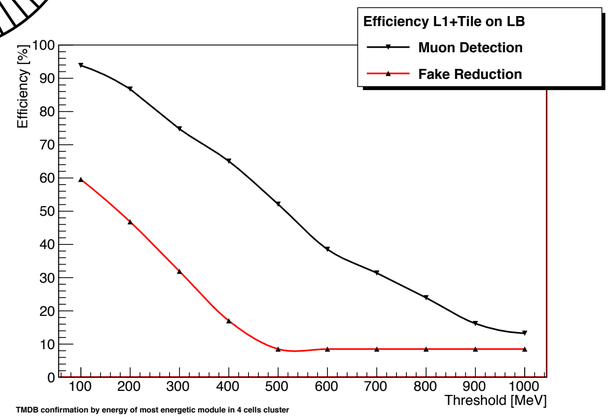
Type 4: Confirmation by2 cells of higher energy module of 2x2 cluster



TMDB confirmation by energy of most energetic module in 4 cells cluster







TMDB confirmation by energy of most energetic module in 4 cells cluster

Amanda Camacho Novaes de Oliveira
27/11/2018

Backup

On behalf of TileMuon project

Numerical efficiency values

Type 1

Total true muons: 307
Total L1 muon candidates: 354
Total noise samples: 25420

Threshold of 100MeV
- Detection = 83.3876%
- Fake reduction = 40.4255%
- False alarm = 19.7089%
- SP = 81.832%

Threshold of 200MeV
- Detection = 76.873%
- Fake reduction = 27.6596%
- False alarm = 7.37608%
- SP = 84.5649%

Threshold of 300MeV
- Detection = 66.4495%
- Fake reduction = 12.766%
- False alarm = 2.35248%
- SP = 81.2968%

Threshold of 400MeV
- Detection = 57.329%
- Fake reduction = 8.51064%
- False alarm = 0.767113%
- SP = 76.8397%

Threshold of 500MeV
- Detection = 44.9511%
- Fake reduction = 2.12766%
- False alarm = 0.369788%
- SP = 69.5543%

Threshold of 600MeV
- Detection = 33.5505%
- Fake reduction = 2.12766%
- False alarm = 0.236035%
- SP = 62.1%

Threshold of 700MeV
- Detection = 27.0358%
- Fake reduction = 2.12766%
- False alarm = 0.141621%
- SP = 57.4165%

Threshold of 800MeV
- Detection = 20.1954%
- Fake reduction = 2.12766%
- False alarm = 0.102282%
- SP = 51.9334%

Threshold of 900MeV
- Detection = 13.355%
- Fake reduction = 2.12766%
- False alarm = 0.0708104%
- SP = 45.4888%

Threshold of 1000MeV
- Detection = 11.4007%
- Fake reduction = 2.12766%
- False alarm = 0.0511408%
- SP = 43.3517%

Numerical efficiency values

Type 2

Total true muons: 306
Total L1 muon candidates: 352
Total noise samples: 25730

Threshold of 100MeV
- Detection = 87.5817%
- Fake reduction = 52.1739%
- False alarm = 19.6502%
- SP = 83.9268%

Threshold of 200MeV
- Detection = 80.0654%
- Fake reduction = 30.4348%
- False alarm = 7.38826%
- SP = 86.2244%

Threshold of 300MeV
- Detection = 71.5686%
- Fake reduction = 8.69565%
- False alarm = 2.35911%
- SP = 84.0981%

Threshold of 400MeV
- Detection = 60.4575%
- Fake reduction = 2.17391%
- False alarm = 0.765643%
- SP = 78.642%

Threshold of 500MeV
- Detection = 48.6928%
- Fake reduction = 0%
- False alarm = 0.369219%
- SP = 71.8712%

Threshold of 600MeV
- Detection = 35.2941%
- Fake reduction = 0%
- False alarm = 0.237077%
- SP = 63.3011%

Threshold of 700MeV
- Detection = 24.183%
- Fake reduction = 0%
- False alarm = 0.143801%
- SP = 55.2059%

Threshold of 800MeV
- Detection = 18.6275%
- Fake reduction = 0%
- False alarm = 0.104936%
- SP = 50.5603%

Threshold of 900MeV
- Detection = 13.3987%
- Fake reduction = 0%
- False alarm = 0.0738438%
- SP = 45.5337%

Threshold of 1000MeV
- Detection = 9.47712%
- Fake reduction = 0%
- False alarm = 0.0505247%
- SP = 41.0356%

Numerical efficiency values

Type 3

Total true muons: 309
Total L1 muon candidates: 355
Total noise samples: 25730

Threshold of 100MeV
- Detection = 96.4401%
- Fake reduction = 71.7391%
- False alarm = 19.5336%
- SP = 88.2724%

Threshold of 200MeV
- Detection = 90.2913%
- Fake reduction = 41.3043%
- False alarm = 7.25612%
- SP = 91.5135%

Threshold of 300MeV
- Detection = 79.9353%
- Fake reduction = 15.2174%
- False alarm = 2.25029%
- SP = 88.6184%

Threshold of 400MeV
- Detection = 66.9903%
- Fake reduction = 6.52174%
- False alarm = 0.68014%
- SP = 82.3581%

Threshold of 500MeV
- Detection = 54.3689%
- Fake reduction = 2.17391%
- False alarm = 0.295375%
- SP = 75.3122%

Threshold of 600MeV
- Detection = 40.1294%
- Fake reduction = 2.17391%
- False alarm = 0.174893%
- SP = 66.551%

Threshold of 700MeV
- Detection = 27.8317%
- Fake reduction = 2.17391%
- False alarm = 0.0971628%
- SP = 58.0321%

Threshold of 800MeV
- Detection = 20.712%
- Fake reduction = 2.17391%
- False alarm = 0.0777303%
- SP = 52.3831%

Threshold of 900MeV
- Detection = 14.2395%
- Fake reduction = 2.17391%
- False alarm = 0.0621842%
- SP = 46.4067%

Threshold of 1000MeV
- Detection = 10.356%
- Fake reduction = 2.17391%
- False alarm = 0.0388651%
- SP = 42.1272%

Numerical efficiency values

Type 4

Total true muons: 309
Total L1 muon candidates: 356
Total noise samples: 25420

Threshold of 100MeV
- Detection = 93.8511%
- Fake reduction = 59.5745%
- False alarm = 19.5397%
- SP = 87.0268%

Threshold of 200MeV
- Detection = 86.7314%
- Fake reduction = 46.8085%
- False alarm = 7.21873%
- SP = 89.7308%

Threshold of 300MeV
- Detection = 74.7573%
- Fake reduction = 31.9149%
- False alarm = 2.24626%
- SP = 85.8697%

Threshold of 400MeV
- Detection = 65.0485%
- Fake reduction = 17.0213%
- False alarm = 0.676633%
- SP = 81.2776%

Threshold of 500MeV
- Detection = 52.1036%
- Fake reduction = 8.51064%
- False alarm = 0.291109%
- SP = 73.9672%

Threshold of 600MeV
- Detection = 38.5113%
- Fake reduction = 8.51064%
- False alarm = 0.177026%
- SP = 65.4869%

Threshold of 700MeV
- Detection = 31.3916%
- Fake reduction = 8.51064%
- False alarm = 0.0944138%
- SP = 60.6336%

Threshold of 800MeV
- Detection = 23.9482%
- Fake reduction = 8.51064%
- False alarm = 0.0747443%
- SP = 55.0442%

Threshold of 900MeV
- Detection = 16.1812%
- Fake reduction = 8.51064%
- False alarm = 0.0590087%
- SP = 48.3205%

Threshold of 1000MeV
- Detection = 13.2686%
- Fake reduction = 8.51064%
- False alarm = 0.0393391%
- SP = 45.4075%