

Geant4 physics validation  
10.0.beta-cand02 GRID  
validation

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# Cases investigated

	<b>Seq. Geant4</b>	<b>MT. Geant4</b>
<b>MT. SC</b>	Locally (few cases)	Locally (few cases) with <b>1 thread</b> and <b>4 threads</b>
<b>Seq. SC</b>	GRID	GRID

# Multithreaded Simplified Calorimeter

# Physics validation with sequential Geant4

- **Runs**

- 20GeV / kaon0L / TileCal (Fe-Sci)
- 20GeV / pi- / AtlasHEC (Cu-LAr)
- 20GeV / proton / AtlasFCAL (W-LAr)
- 20GeV / n / AtlasECAL (Pb-LAr)
- 20GeV / k- / CmsECAL (PbWO4)

- **20 GeV was selected to:**

- exercise all the models (especially high-energy string model)
- have small energy to run simulations fast

- **Physics lists:**

- FTFP\_BERT
- FTFP\_BERT\_HP

- **# of events**

- 5000

# Physics validation with Geant4 MT

- **Same as with sequential**
  - with 4 threads:  $5000 * 4 = 20,000$  events

# Physics validation conclusions

- **Results were statistically compatible**
  - w.r.t.: sequential SC on sequential or MT Geant4

# Physics validation conclusions

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# Weak reproducibility

- **Definition:** Run twice, starting from the same seed
  - checking that results are the same
- **Same runs**
  - except only for *FTFP\_BERT*
- **All the cases were OK**



# Strong reproducibility

- **Definition:** Save the random generator of each event (=thread)
  - and re-run the event with seq. SC - seq. G4
  - checking that results are the same
- Only with SCMT-G4MT running on 4 threads
  - FTFP\_BERT
  - 1000 events
- **Results**
  - **91%** were OK
  - **9%** with violations

# Sequential Simplified Calorimeter

# GRID stats

- **10.0.beta-cand02**
  - 3080 jobs submitted
  - 3032 successfully executed
  - 8 KIA
  - 40 Lost
  - No crashes!
- **10.0.beta-cand02-MT**
  - 3080 jobs submitted
  - 3068 successfully executed
  - 5 KIA
  - 7 Lost
  - No crashes!

# G4Exception messages

9.6.p02/10.0.beta-cand02/10.0.beta-cand02-MT

- **had012**: Bad energy non-conservation detected, will re-sample the interaction
  - FTFP\_BERT: 22/0/0
  - QGSP\_BERT: 0/0/10
  - FTFP\_BERT\_HP: 30/0/0
  - FTFP\_BERT\_TRV: 10/0/0
  - QGSP\_FTFP\_BERT: 10/0/0

# Warning messages

9.6.p02/10.0.beta-cand02/10.0.beta-cand02-MT

- **G4Fragment::CalculateExcitationEnergy():**

- FTFP\_BERT: 201/14/11, FTFP\_BERT\_HP: 182/21/8, FTFP\_BERT\_TRV: 194/10/10
- QGSP\_BERT: 70/13/2, QGSP\_FTFP\_BERT: 160/15/6, QGSP\_BERT\_HP: 68/11/10, QGSP\_BIC: 60/12/4

- **G4HadronElastic:**

- QGSP\_BERT: 0/1/0
- QGSP\_FTFP\_BERT: 1/0/0

- **NeutronHP warning:**

- FTFP\_BERT\_HP: 29434/29755/29929
- QGSP\_BERT\_HP: 28471/29629/29678

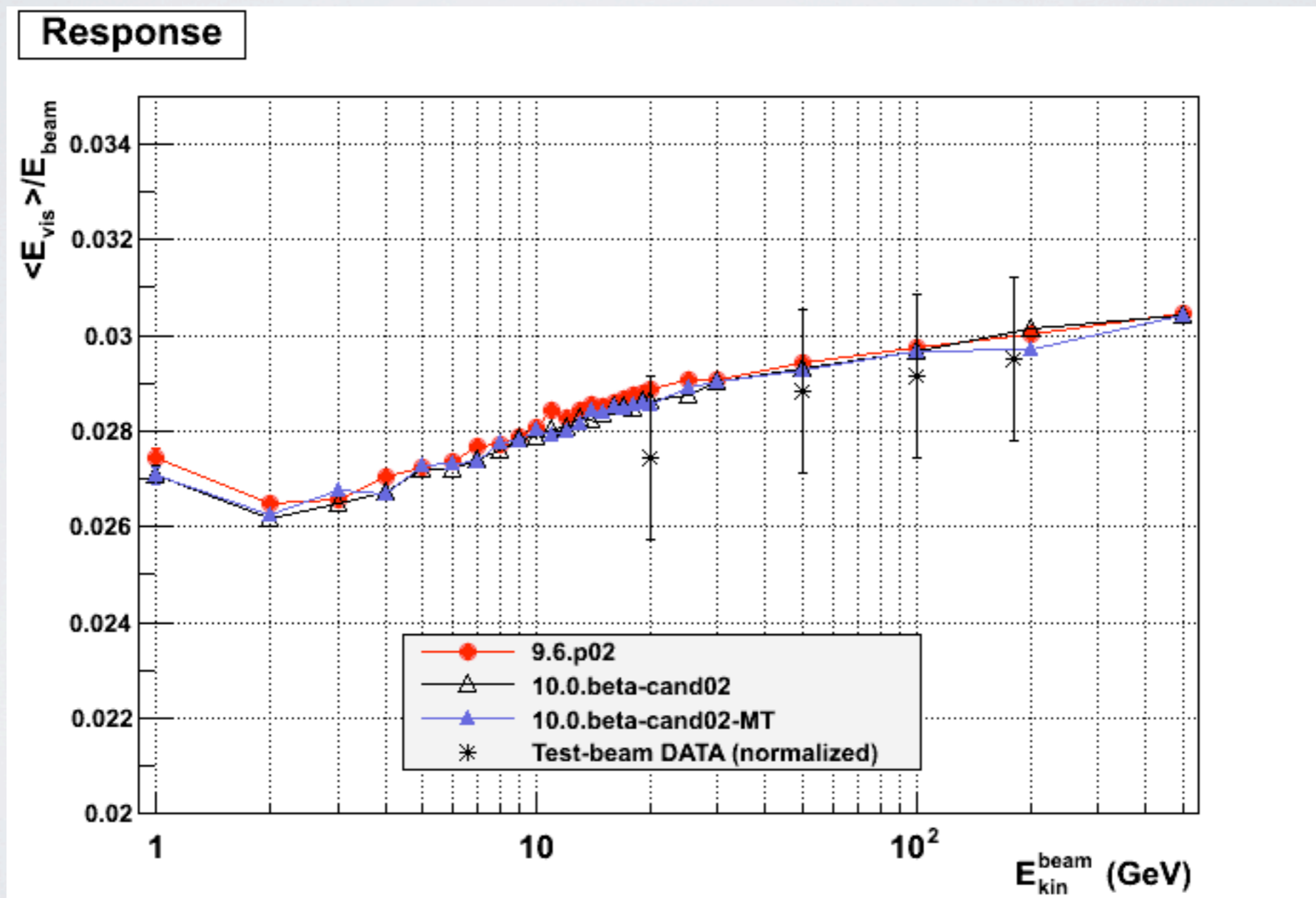
- **###G4MuPairProductionModel::SampleSecondaries:**

- QGSP\_BERT: 0/0/5
- QGSP\_BIC: 0/1/0

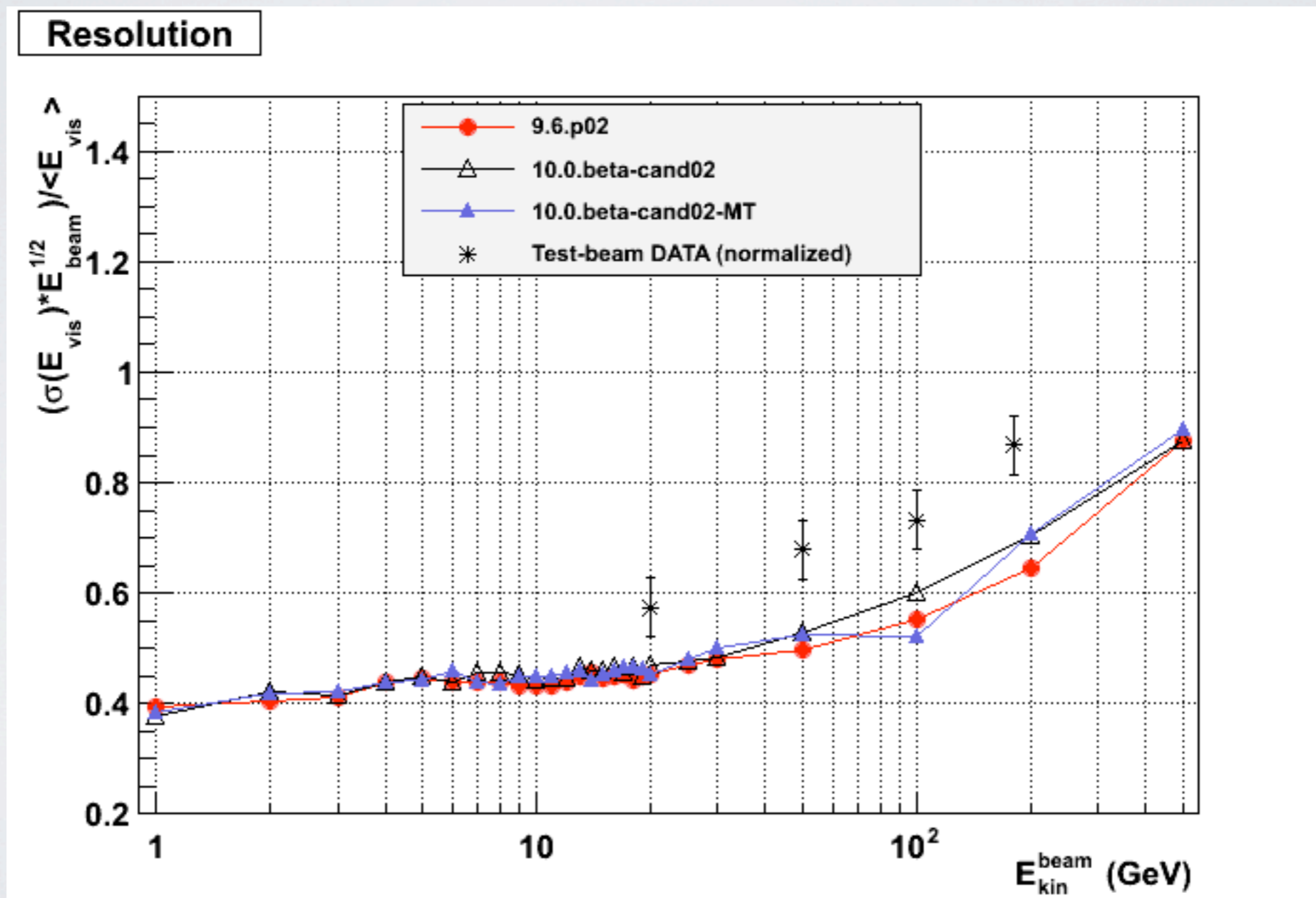
# Pion Shower - FTFP\_BERT

9.6.p02/10.0.beta-cand02/10.0.beta-cand02-MT

# FTFP\_BERT: pi- on Fe-Sci

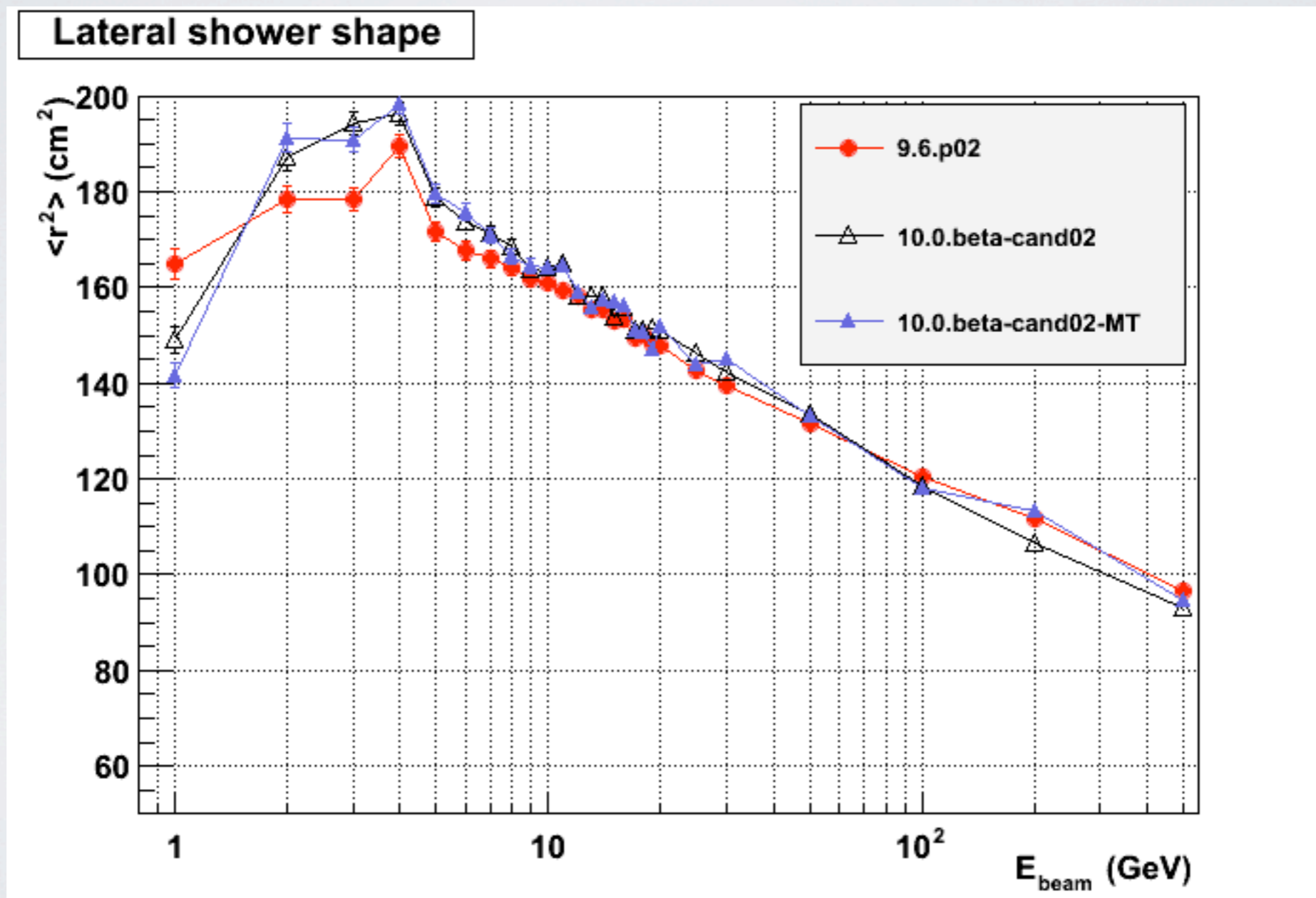


# FTFP\_BERT: pi- on Fe-Sci

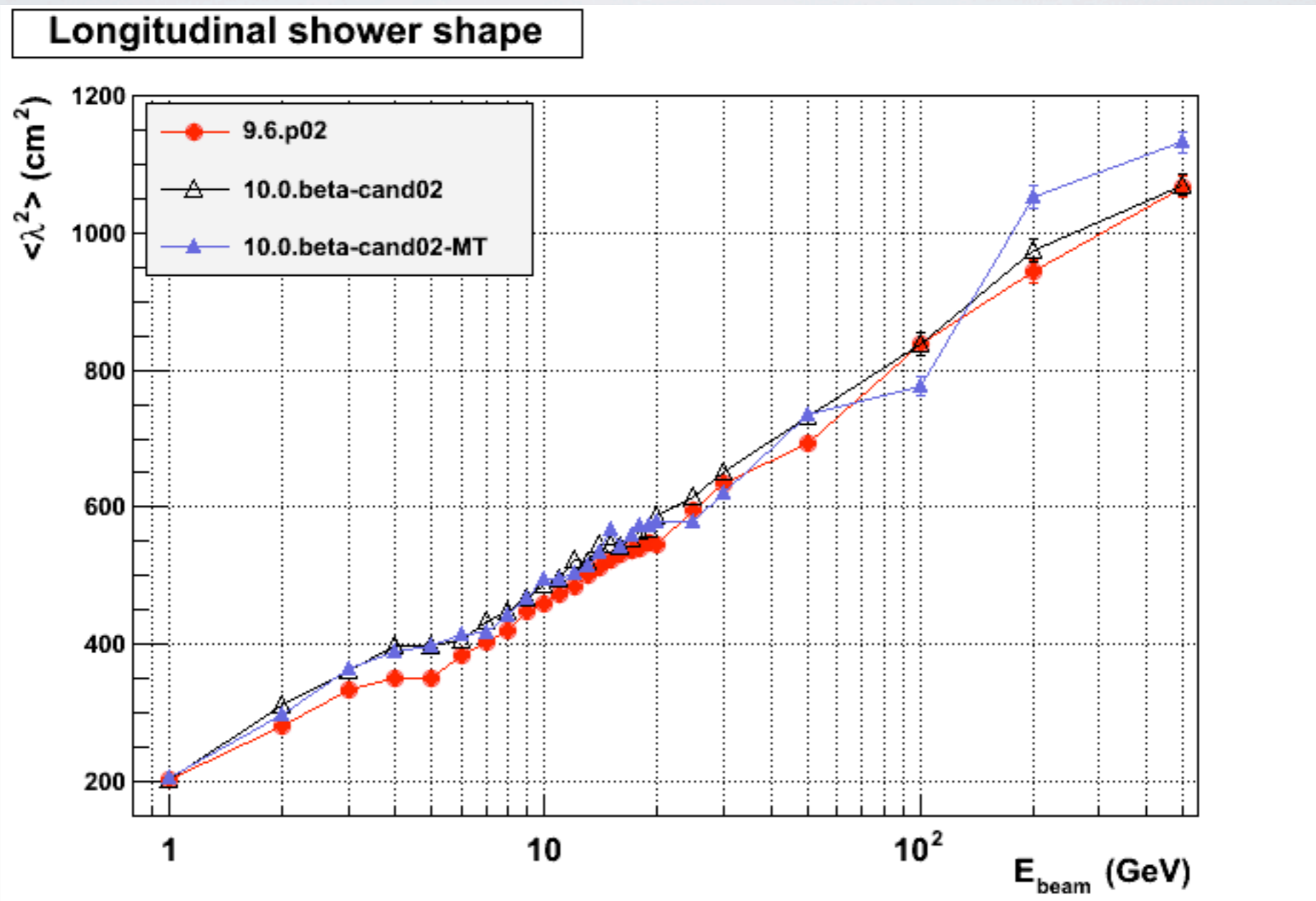




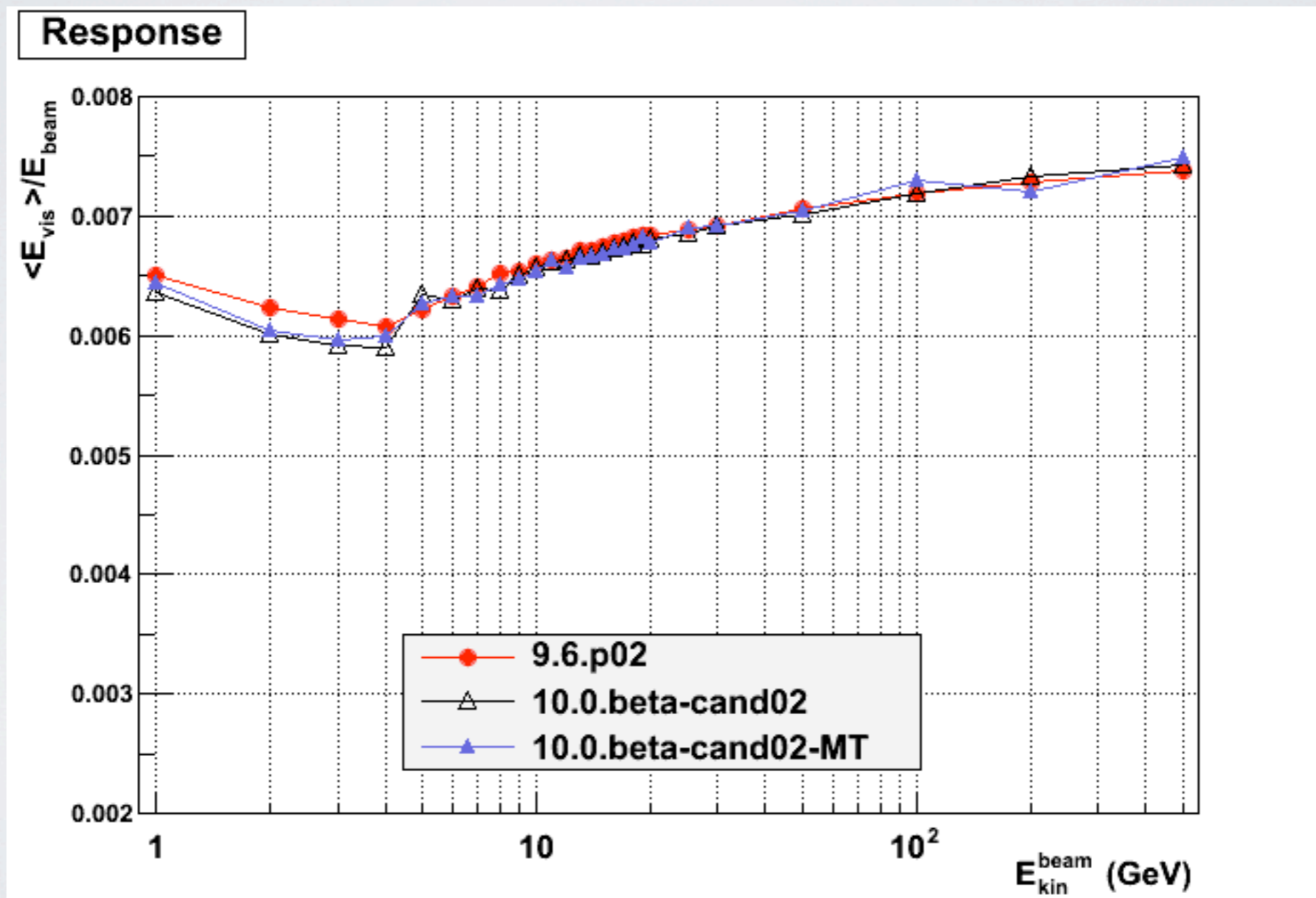
# FTFP\_BERT: pi- on Fe-Sci



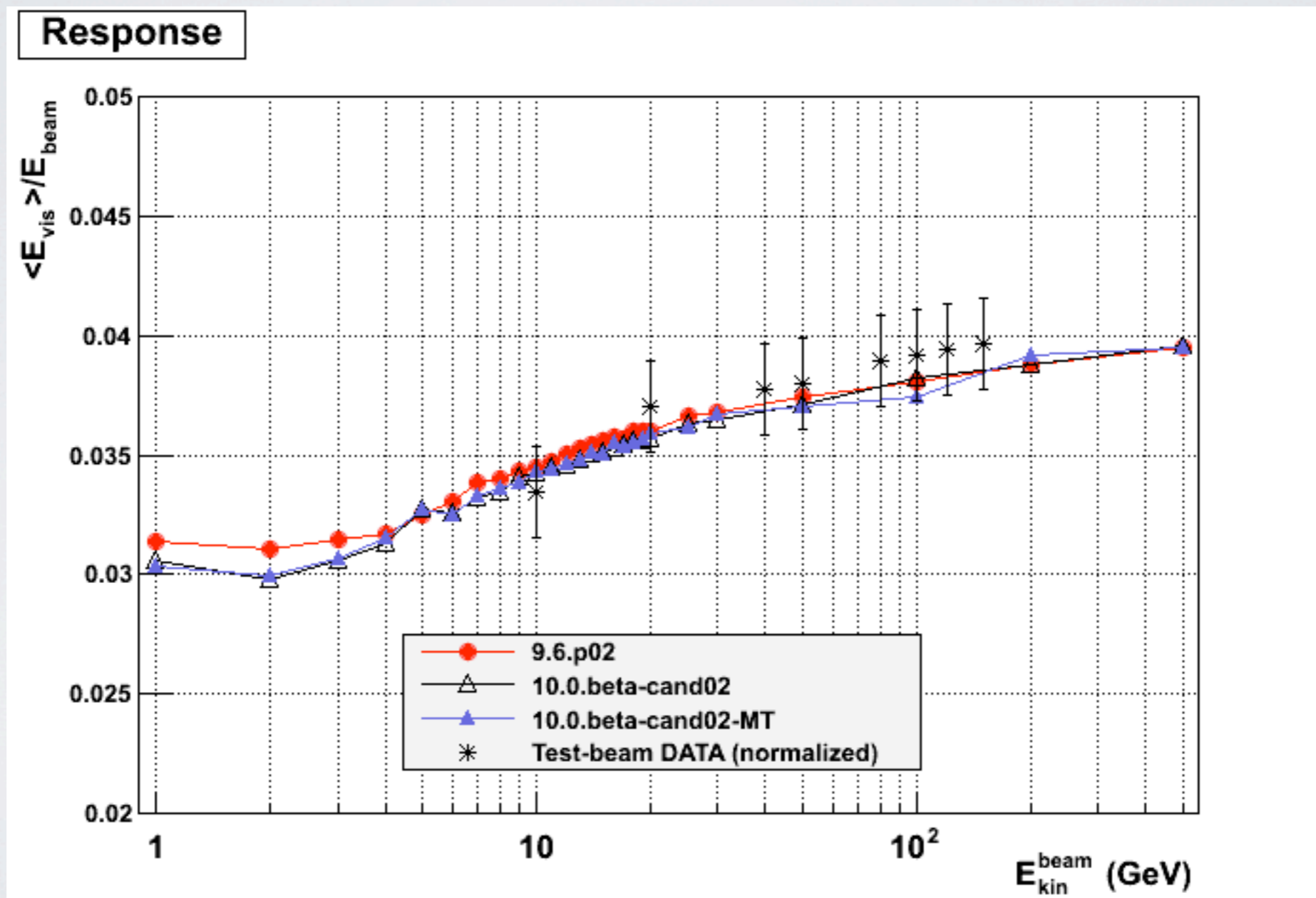
# FTFP\_BERT: pi- on Fe-Sci



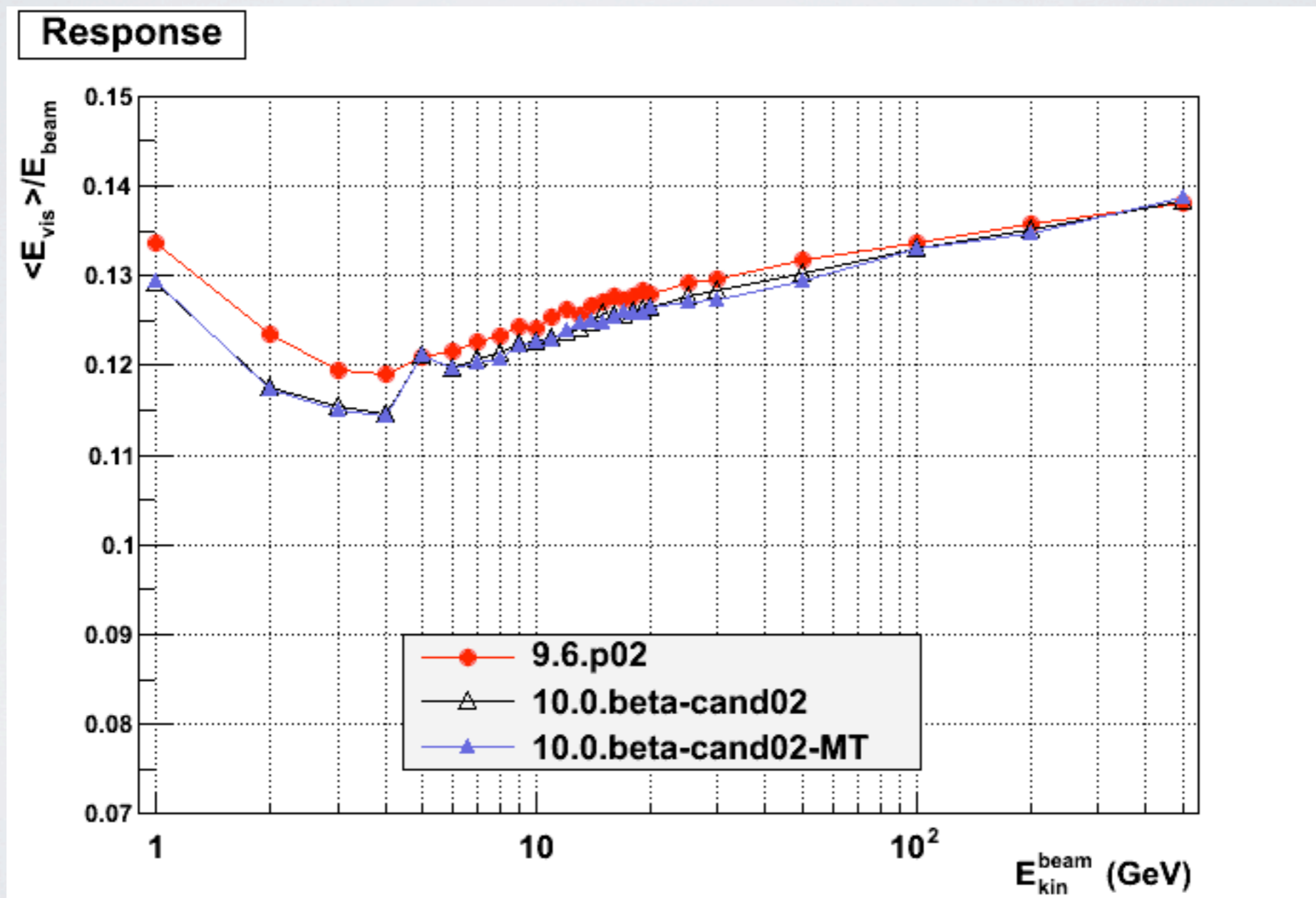
# FTFP\_BERT: pi- on W-LAr



# FTFP\_BERT: pi- on Cu-LAr



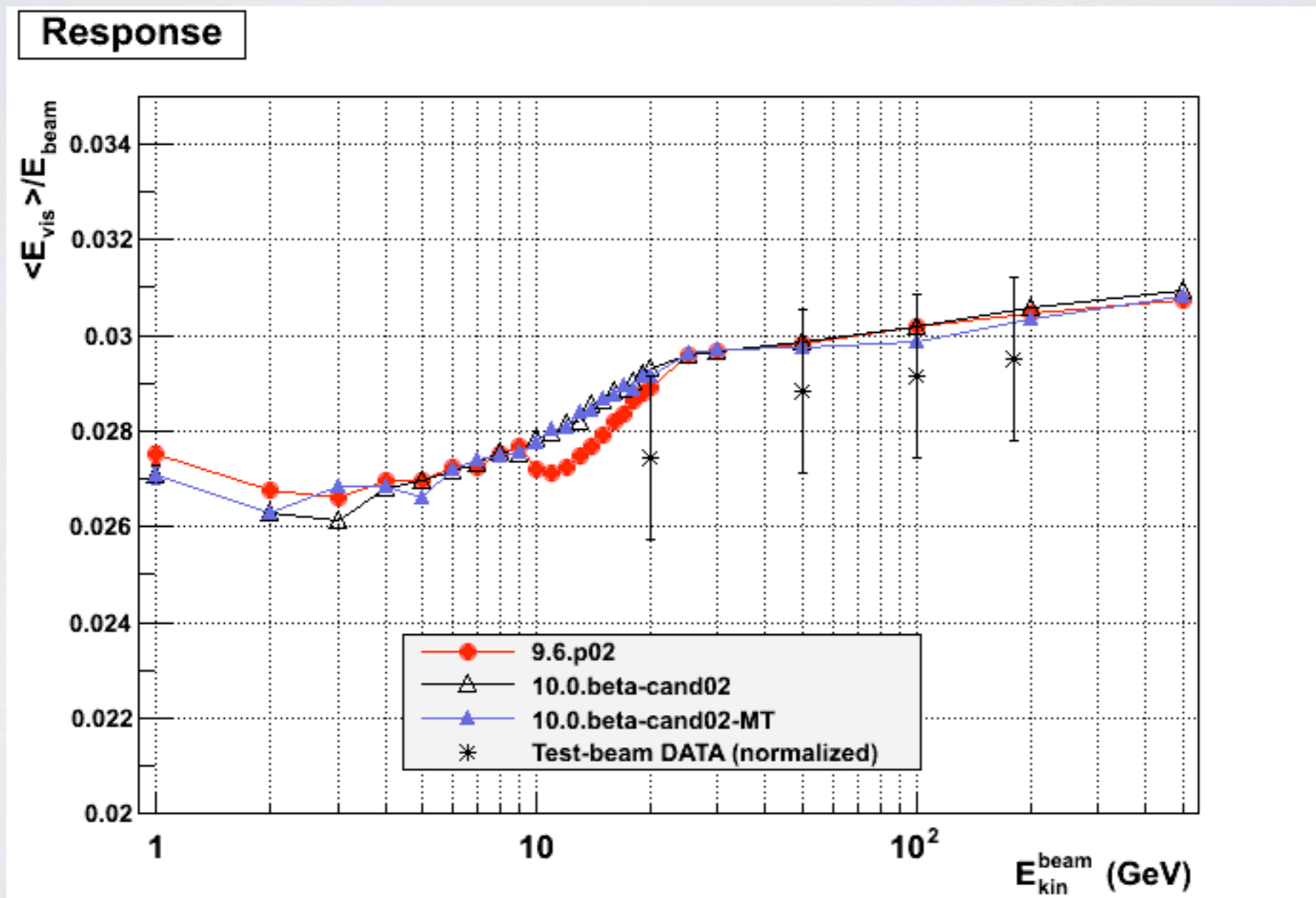
# FTFP\_BERT: pi- on Pb-LAr



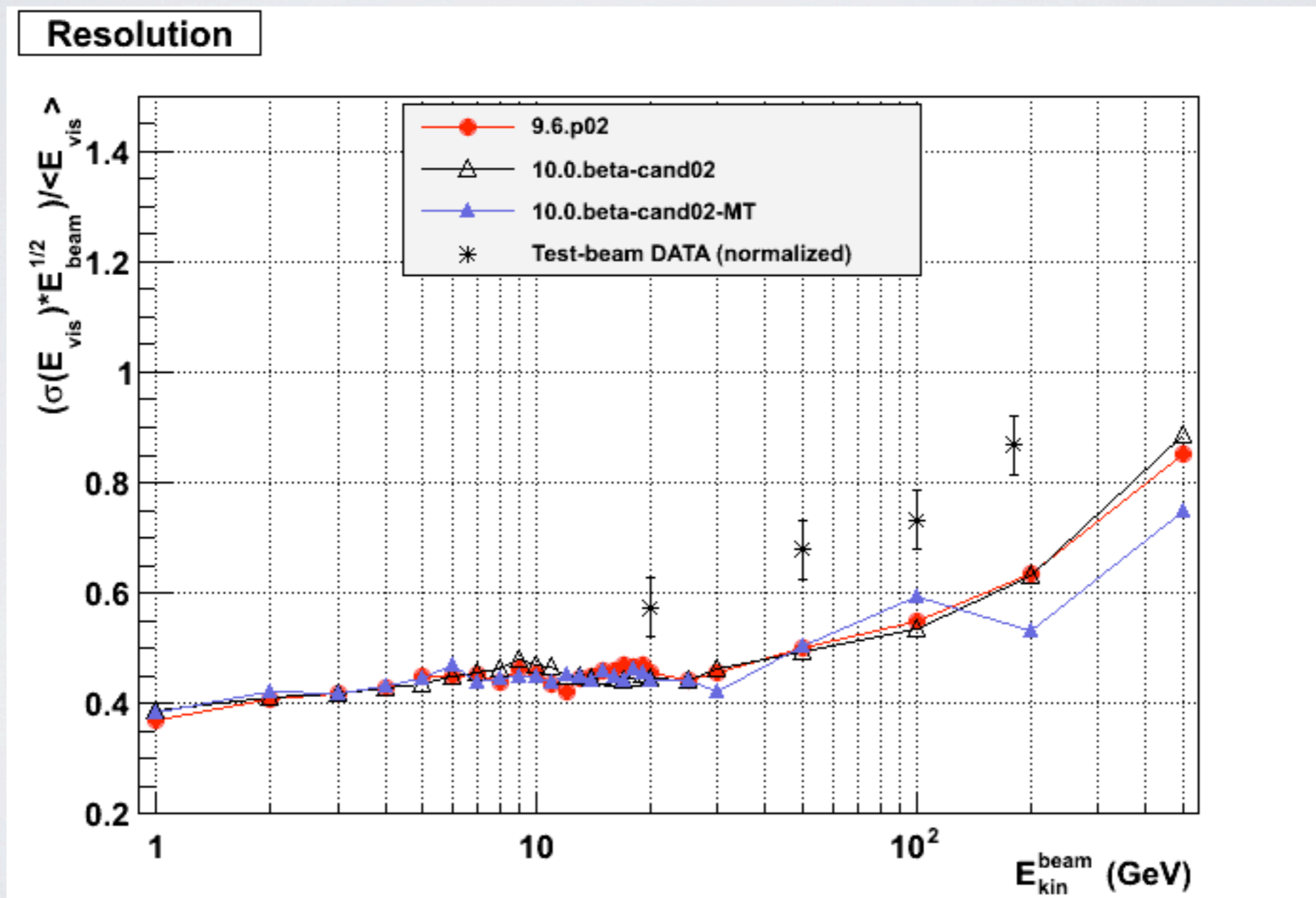
# Pion Shower - FTFP\_BERT

9.6.p02/10.0.beta-cand02/10.0.beta-cand02-MT

# QGSP\_BERT: pi- on Fe-Sci

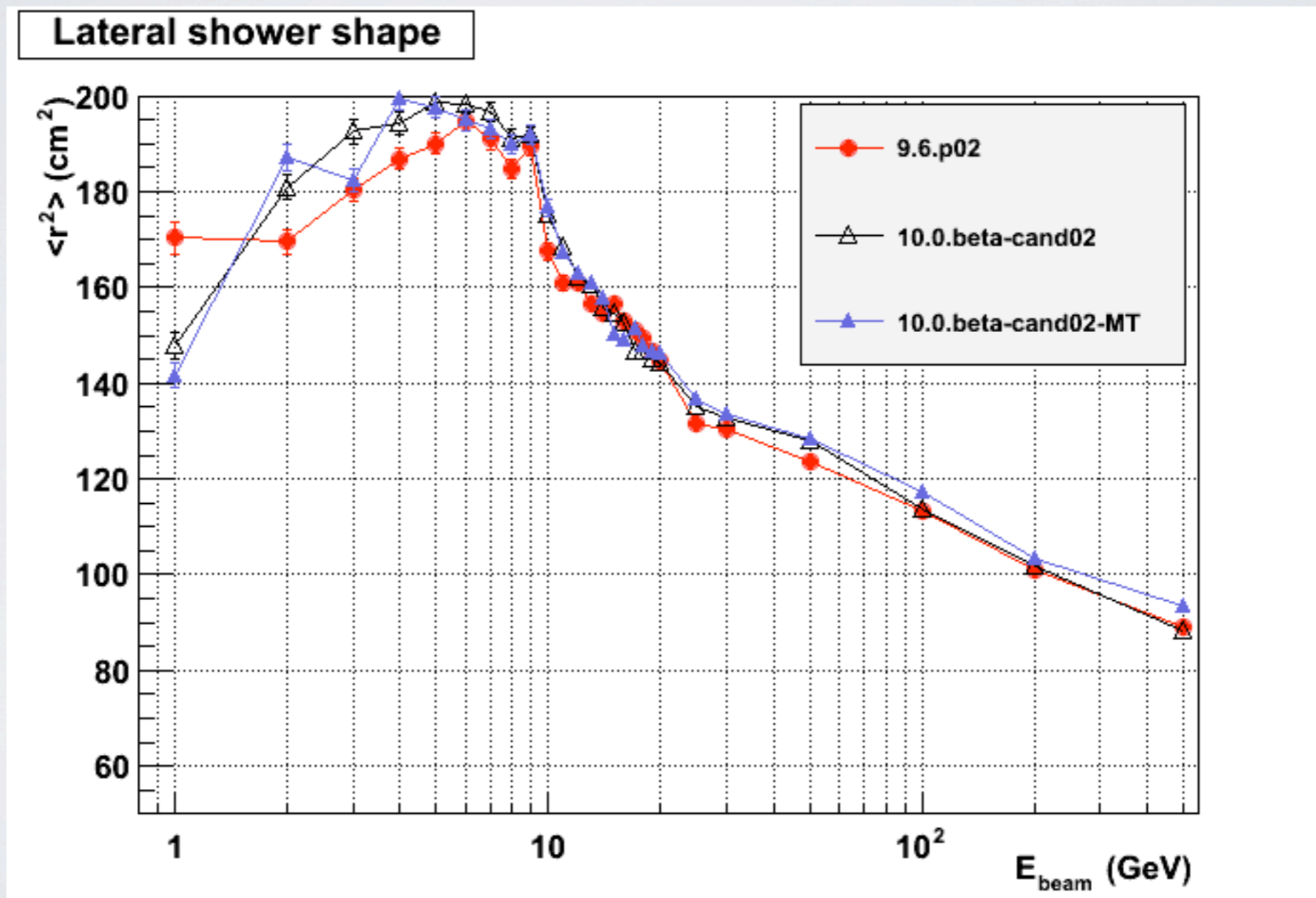


# QGSP\_BERT: pi- on Fe-Sci





# QGSP\_BERT: pi- on Fe-Sci



# QGSP\_BERT: pi- on Fe-Sci

