Update on Kaon XS issue

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16.08.2016

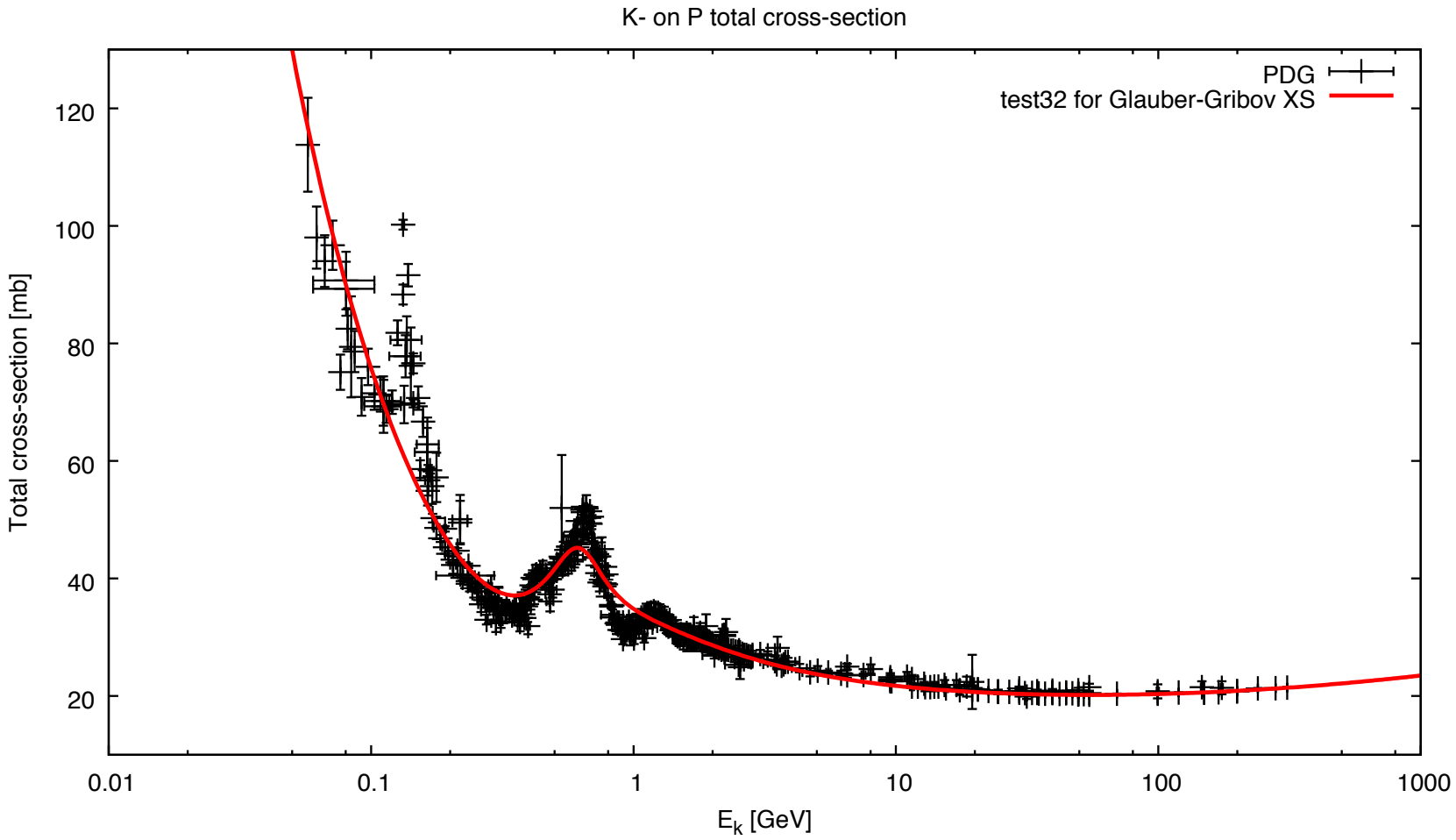
Introduction

- Hans pointed out (thanks!) that kaon cross-section were in not good agreement with PDG data
- Those findings were contradictory with old validation of cross-section parameterizations presented by V. Grishine
- Possible sources of problems were at the level of Physics List and/or G4ComponentGGHadronNucleusXsc class
  - both turned out to be the cause of the issue2

Tests used

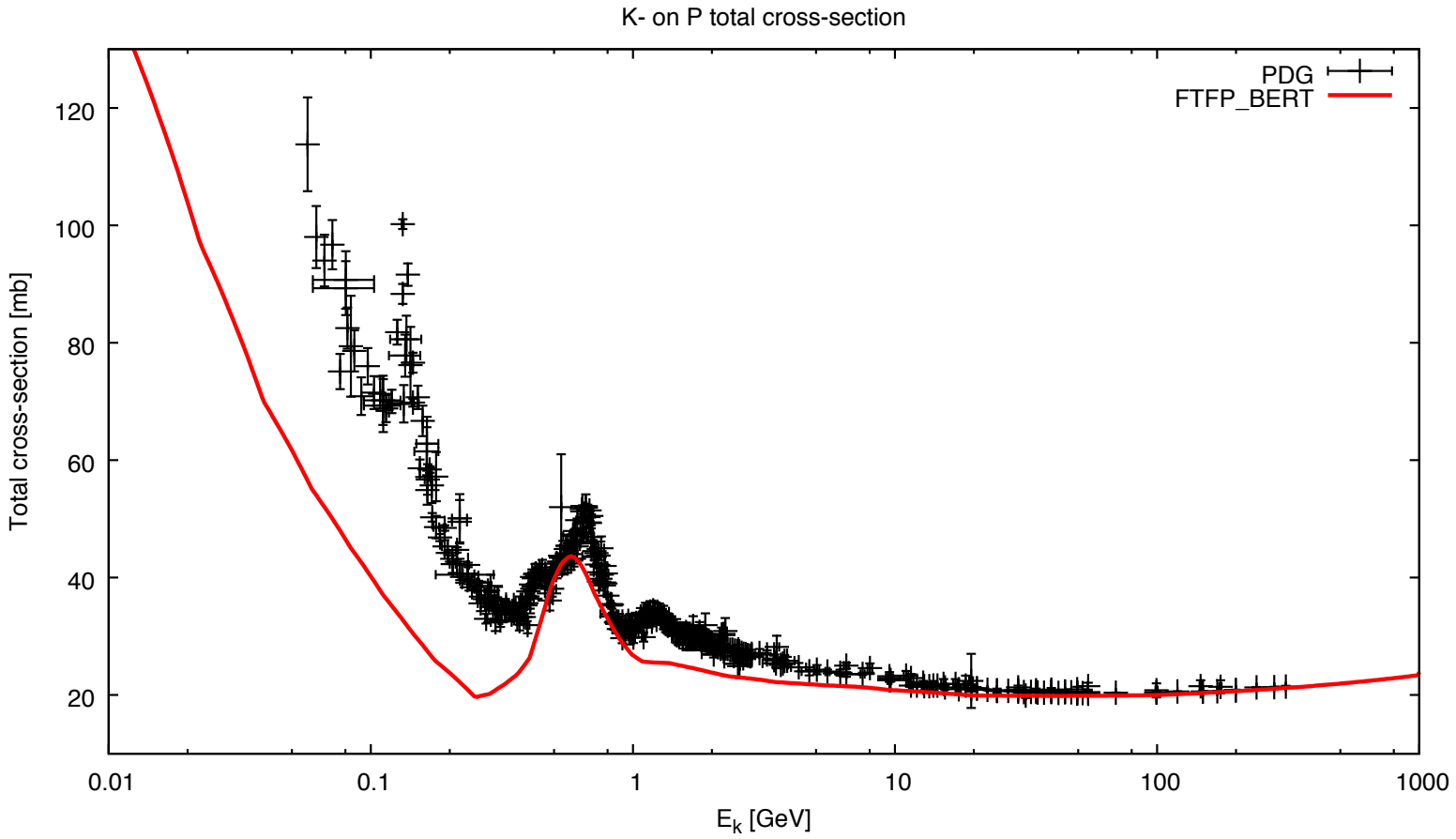
- test32 by V. Grichine
  - low-level test calling directly GetTotalElementCrossSection method of the cross-section class
  - used by developers for model-level testing
- Hadr00 example by V. Ivantchenko
  - high-level test calling G4HadronicProcessStore::Get(In)elasticCrossSectionPerAtom method
  - using actual physics list, testing XS assigned to given particles
    - part of geant-val.cern.ch mothly validation
      - but experimental data was missing…

Test32 result



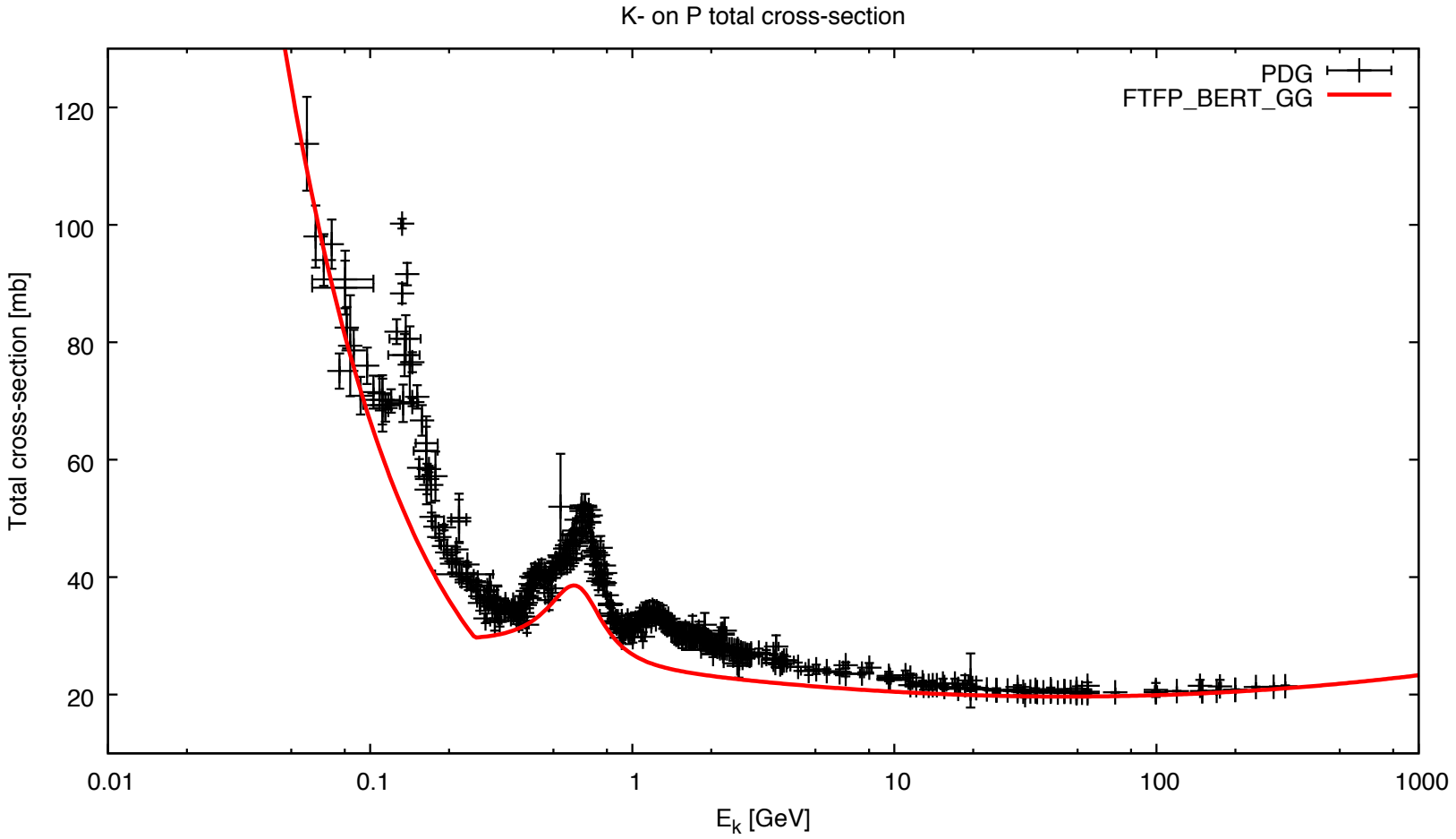
- certainly better agreement then what Hans reported
- but could be even better (see later)

Hadr00 result



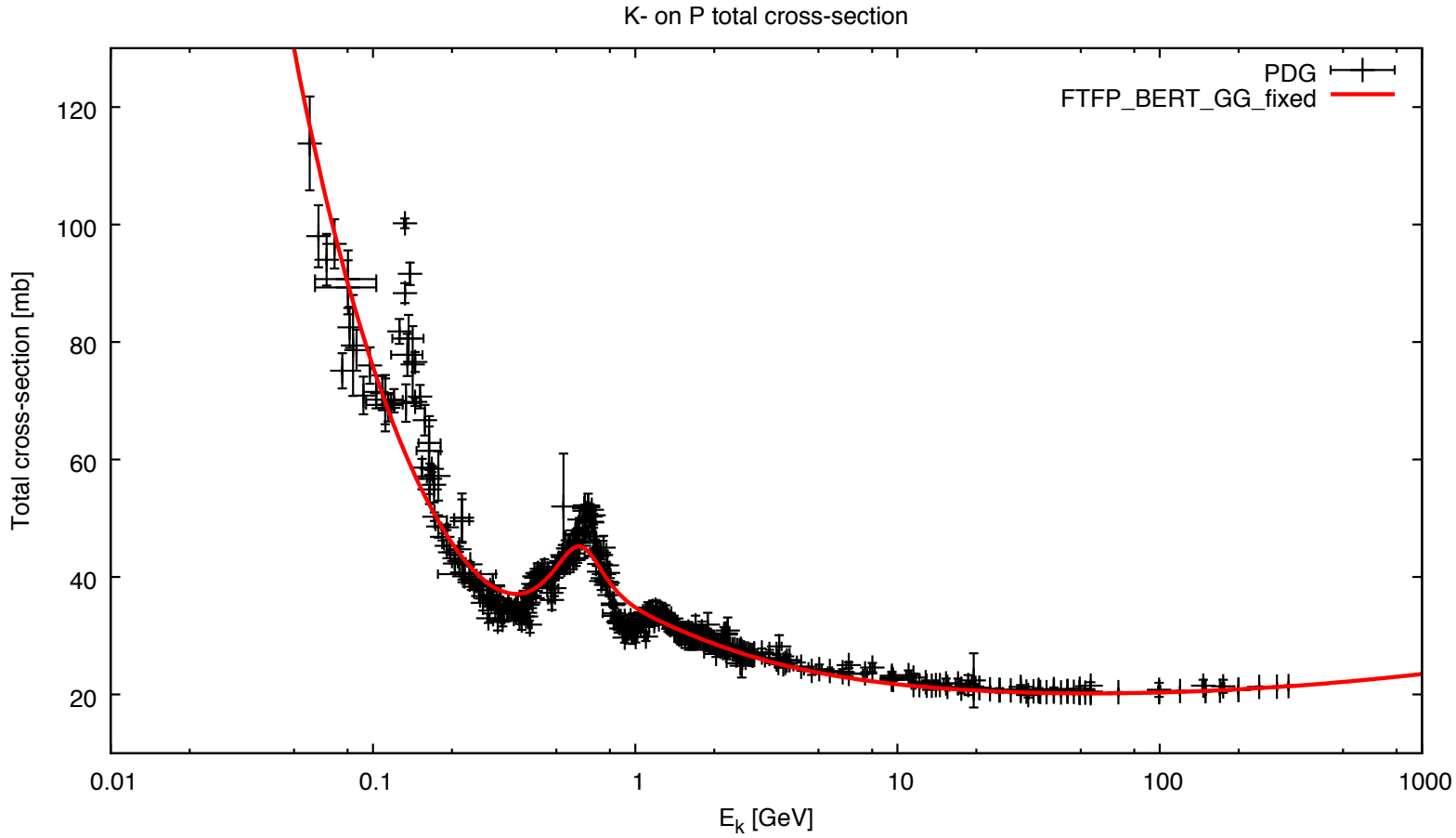
- reproducing the issue reported by Hans…
- first problem found: FTFP_BERT was using Gheisha XS for ELASTIC process

After fix to PL



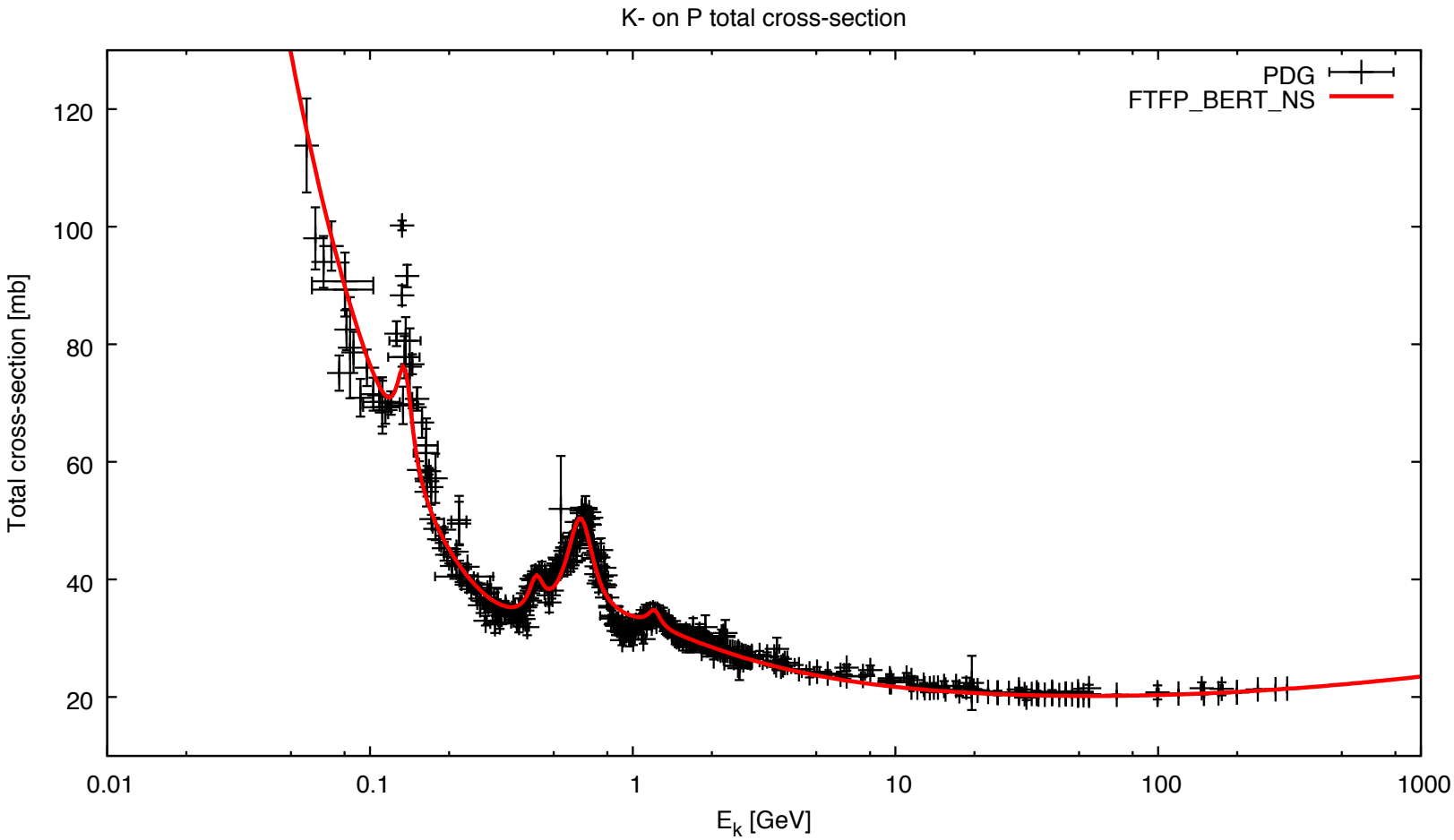
- better, but still not agreement with Test32 result
- second problem found: bug in G4ComponentGGHadronNucleusXsc for H

After fix to PL and to component XS class



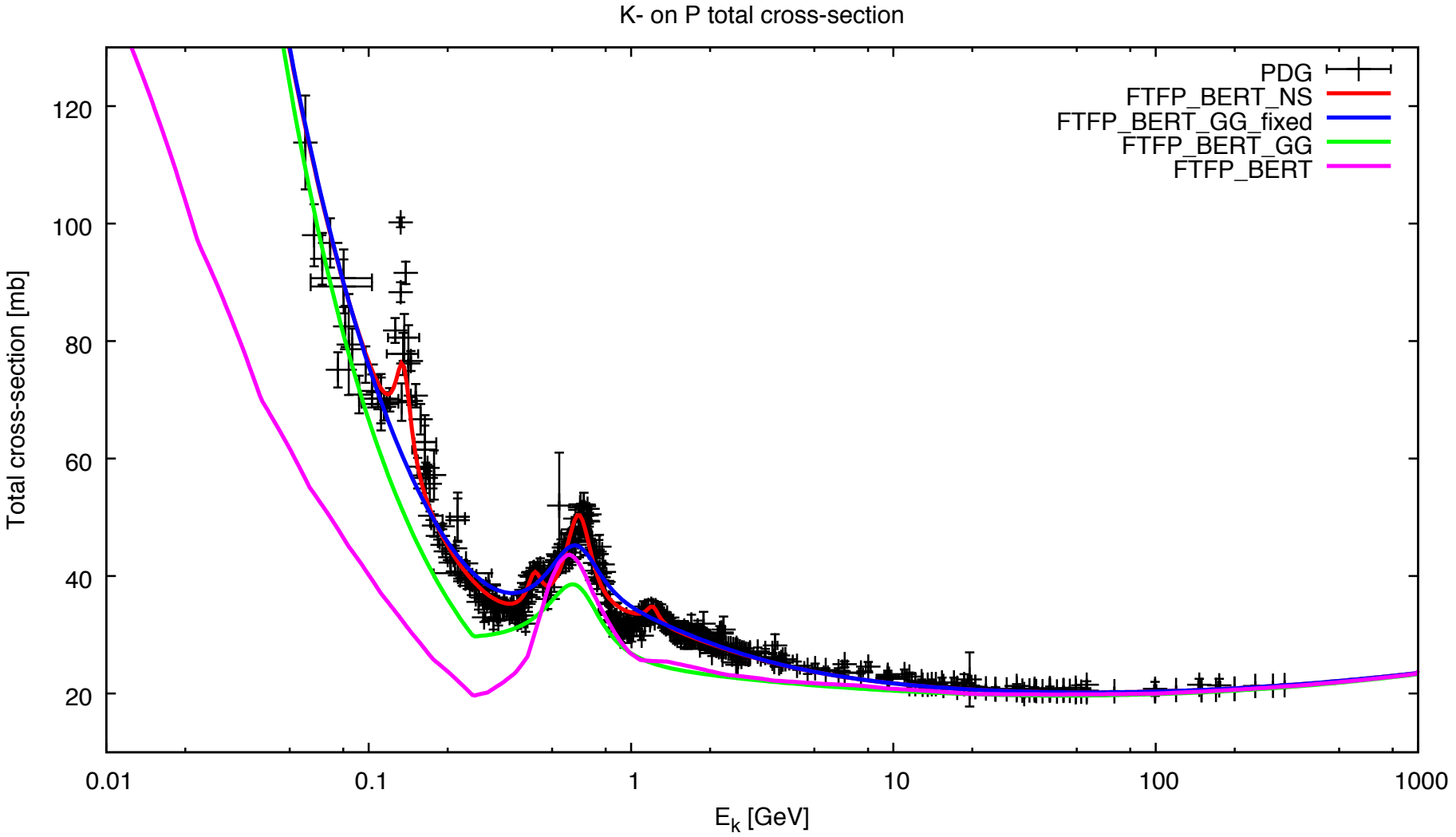
- agreement with test32
- bugs fixed

But…

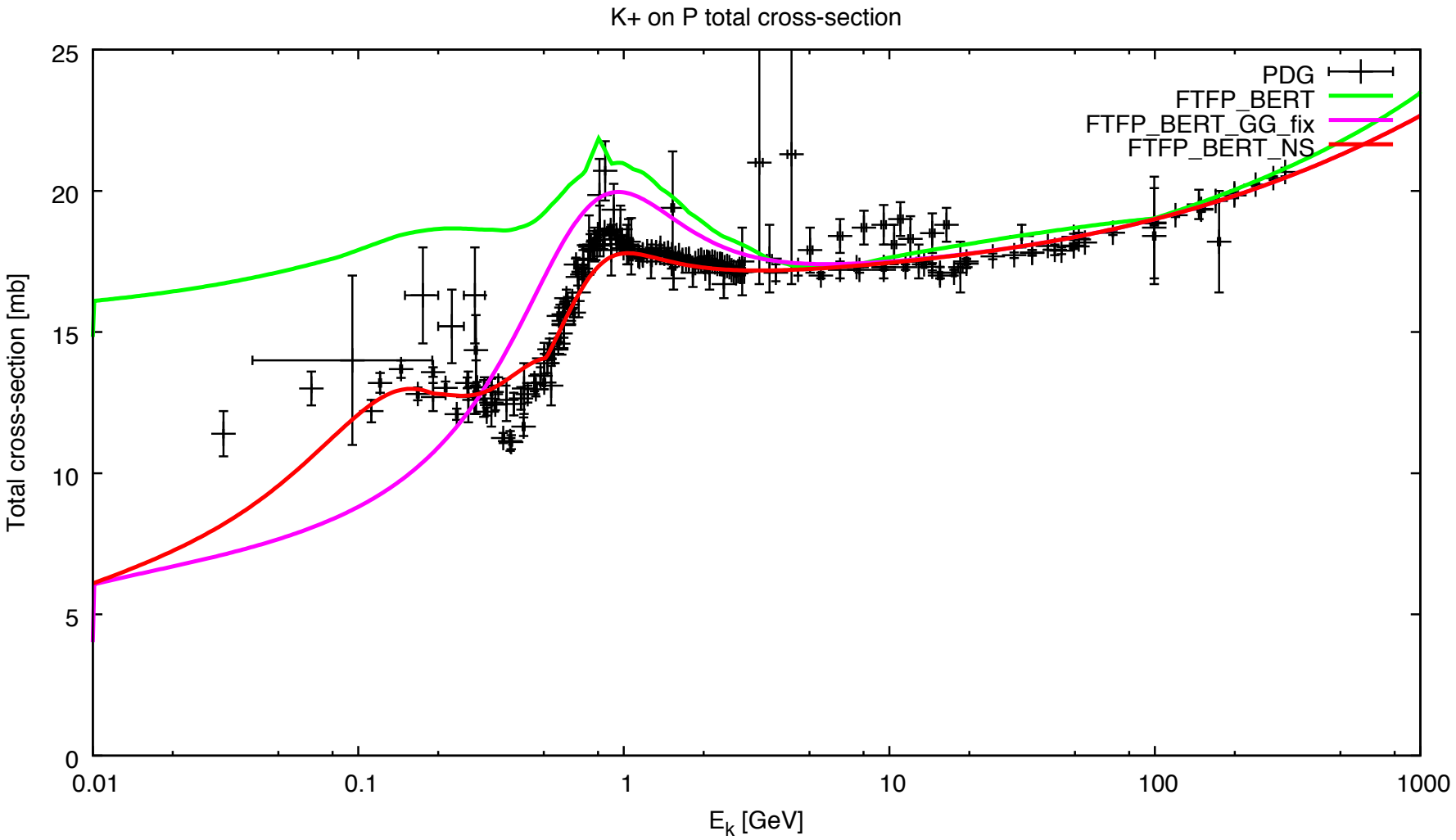


- could be even better if we use Starkov (NS) parameterisation for H
- proposal: to move to NS XS for kaons on H

All results


K- on P total cross-section
PDG
FTFP_BERT_NS
FTFP_BERT_GG_fixed
FTFP_BERT_GG
FTFP_BERT
Total cross-section [mb]
120
100
80
60
40
20
0.01
0.1
1
10
100
1000
E_k [GeV]

Kaon+ results



Conclusions

- big discrepancy observed by Hans due to usage of Gheisha elastic XS for kaons
- bug fixed in G4ComponentGGHadronNucleusXsc class
- even better agreement obtained by switching to Starkov (NS) parameterisation for K on H