

Validation of kaon-proton elastic scattering

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Abstract

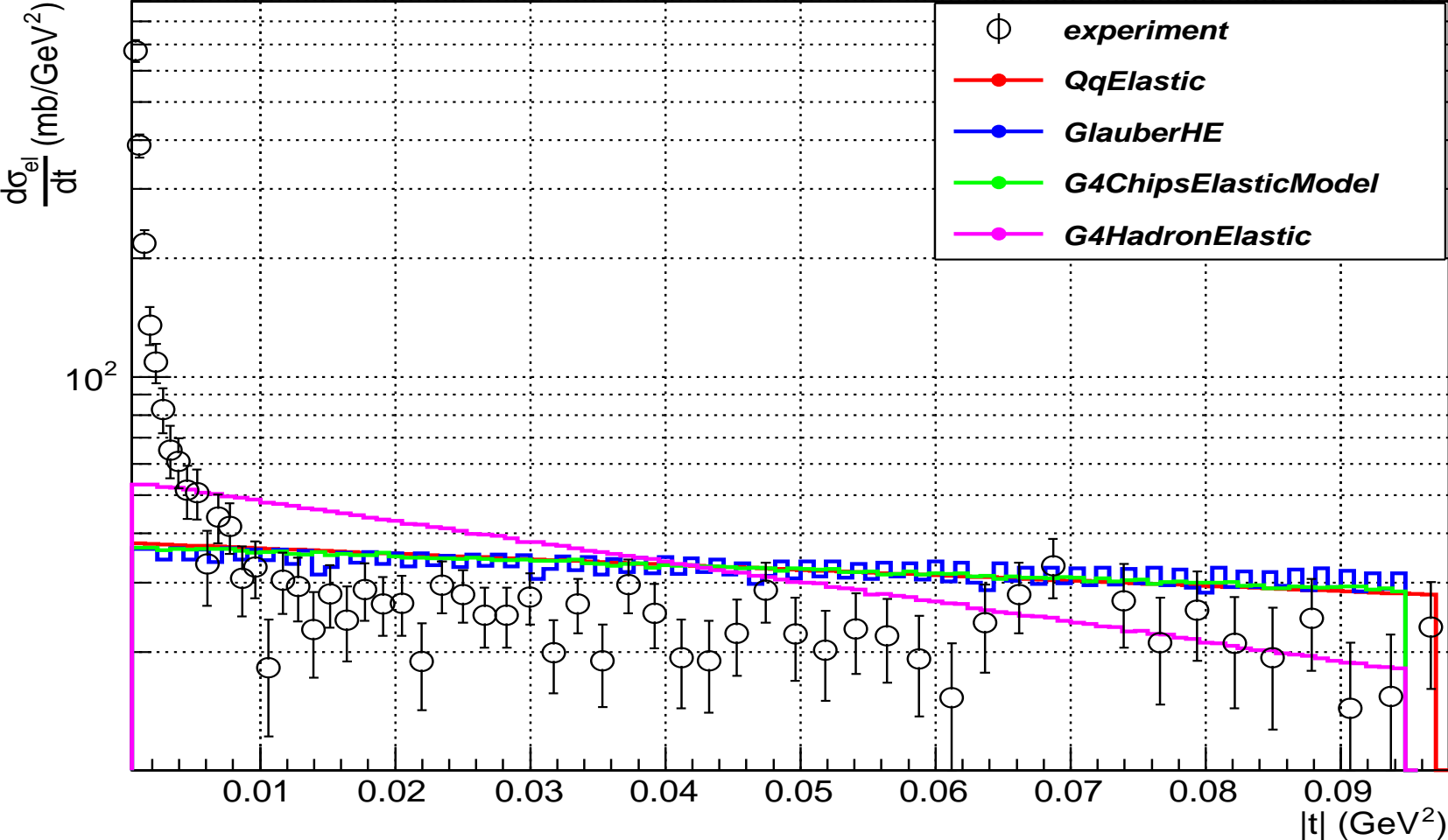
The GEANT4 hadronic models for kaon-proton elastic scattering generation are compared with experimental data in the energy range of approximately 1.2 - 250 GeV. Quark-diquark model was extended to the case of kaon-proton elastic scattering and was tested versus the experimental data.

1 Models for kaon-proton elastic scattering

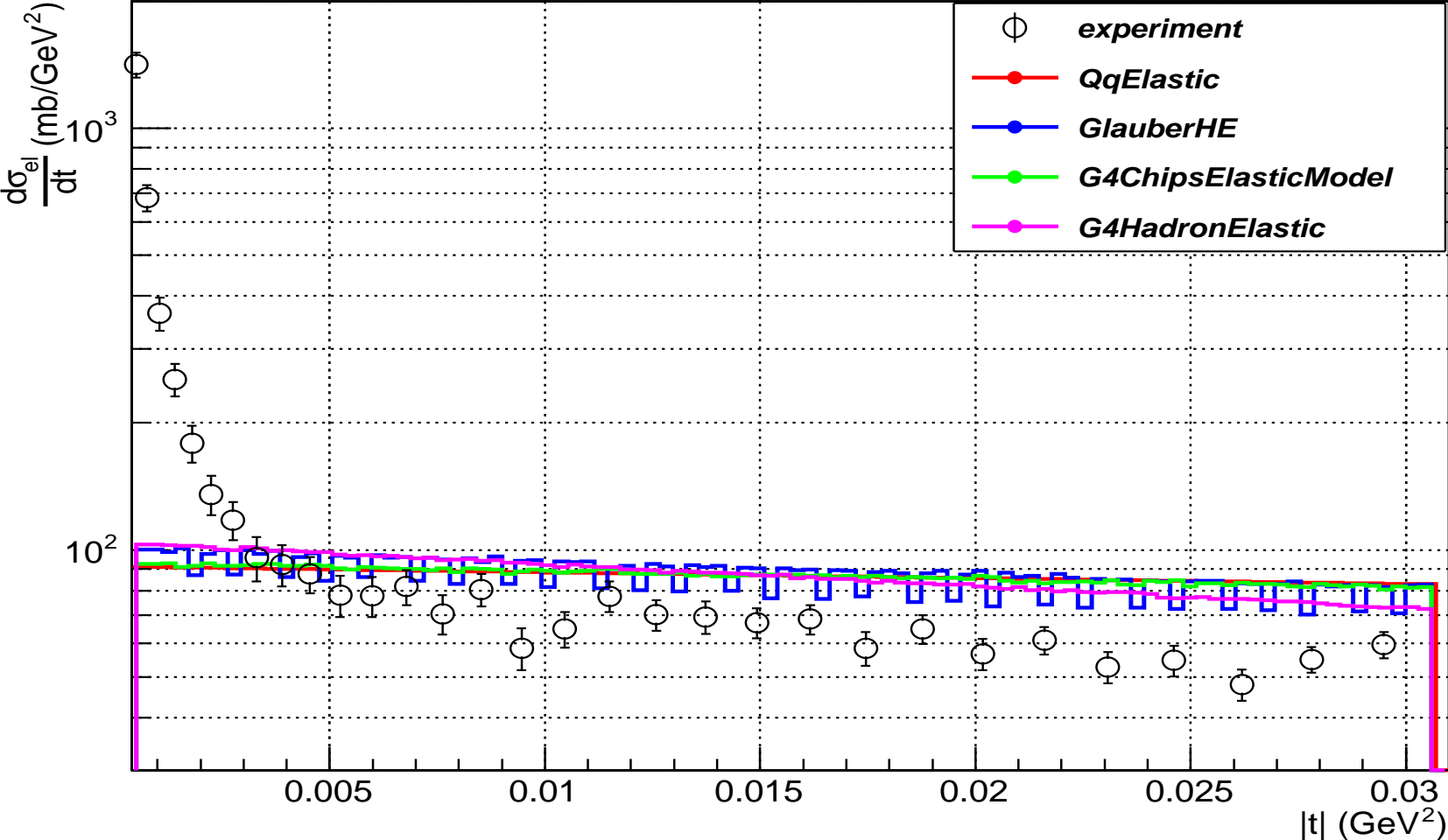
1. G4ChipsElasticModel class as mirror of old CHIPS.
2. G4ElasticHadrNucleusHE Glauber based model.
3. G4HadronElastic base class with GHEISHA elastic generator implemented as default angular distribution.
4. Recently proposed quark-diquark model for proton-proton elastic scattering generation at the LHC energies was extended to the case of kaon-proton scattering and tested as candidate.

The GEANT4 and additional models were compared with experimental data in terms of $d\sigma/dt$, invariant elastic differential cross-sections (t is the invariant momentum transfer squared). The momentum range covered was 1.2 GeV - 250 GeV.

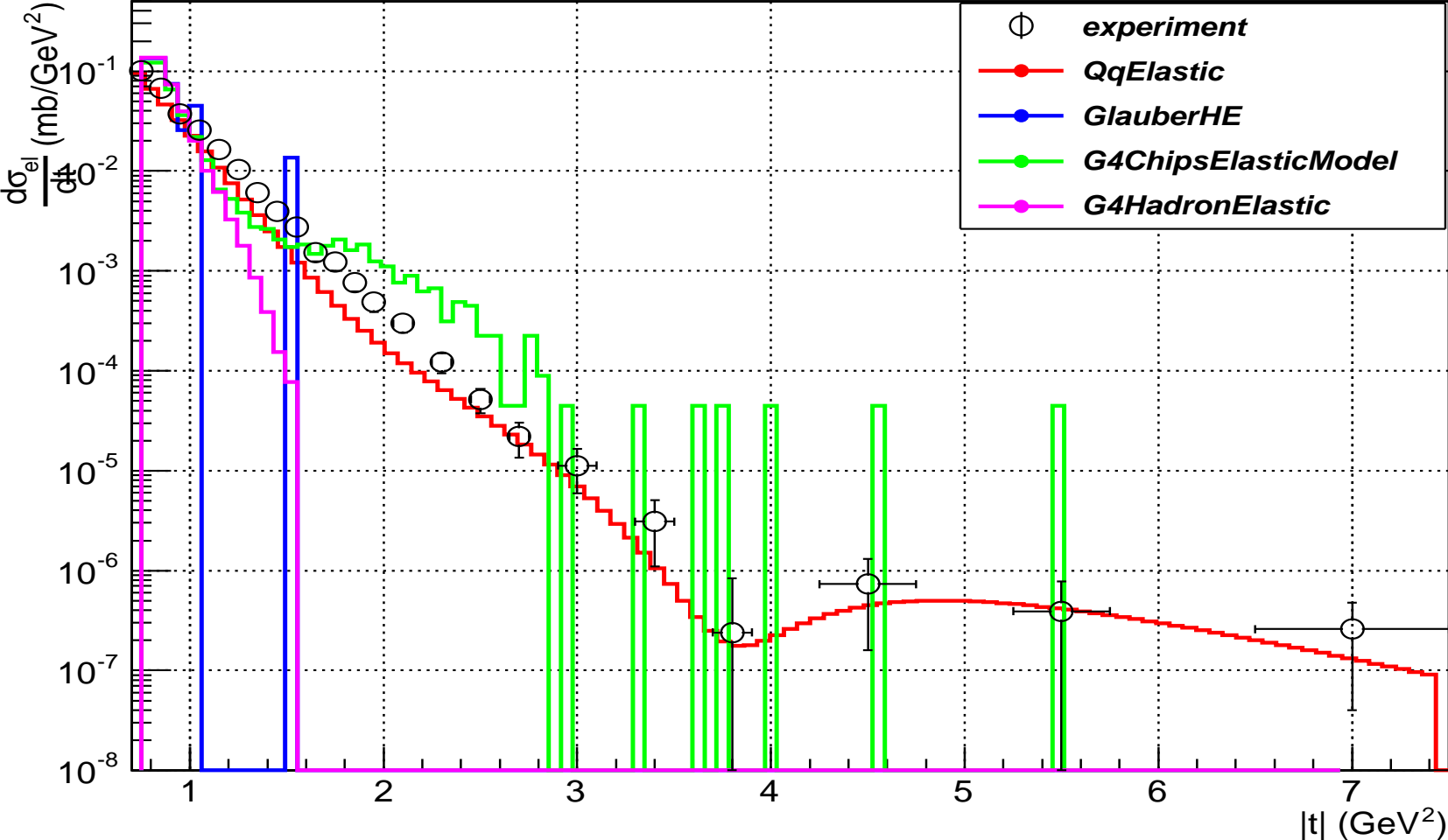
Differential elastic cross-section of 1.209 GeV/c K⁺ on hydrogen



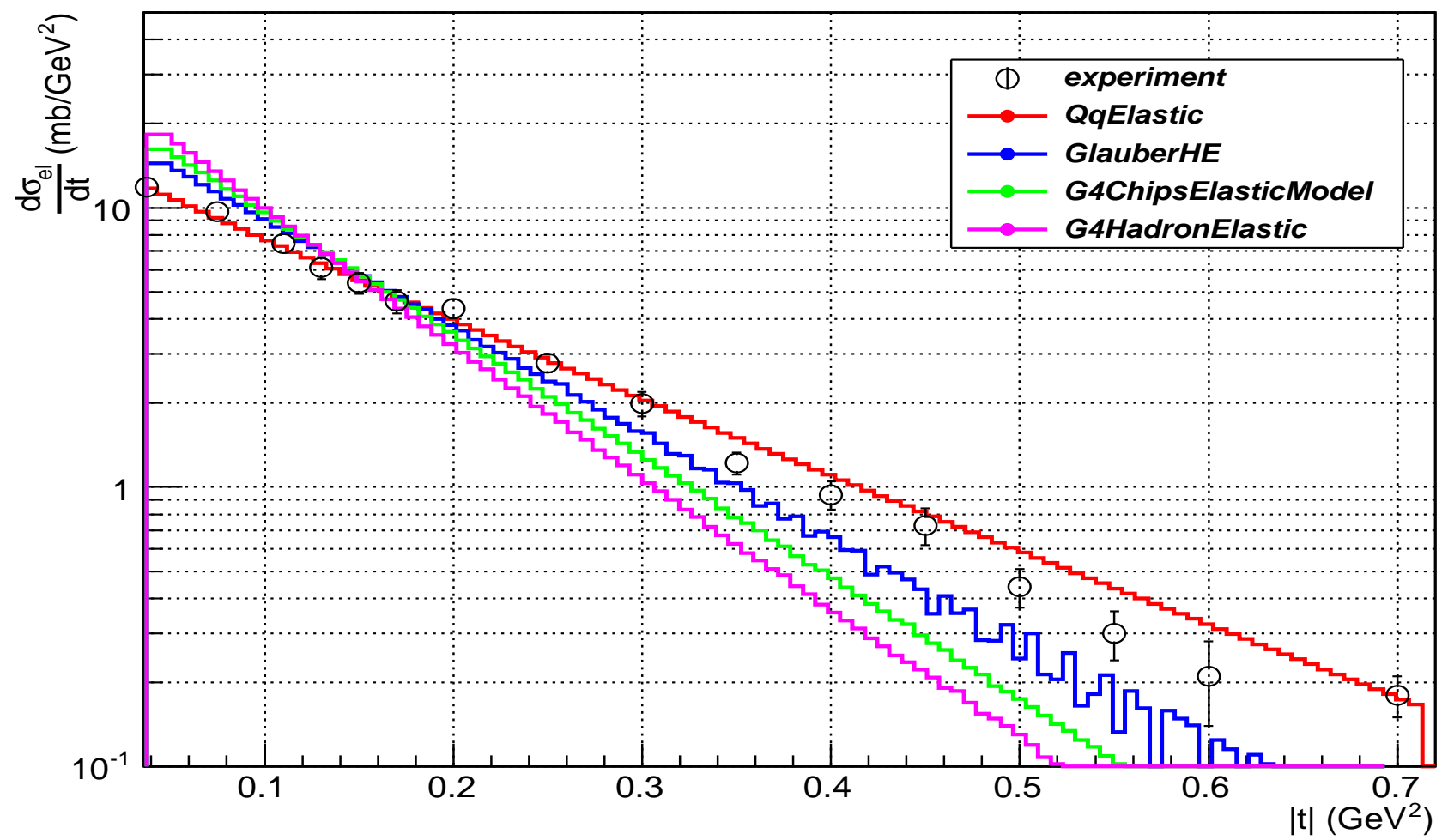
Differential elastic cross-section of 1.62 GeV/c \bar{K} on hydrogen



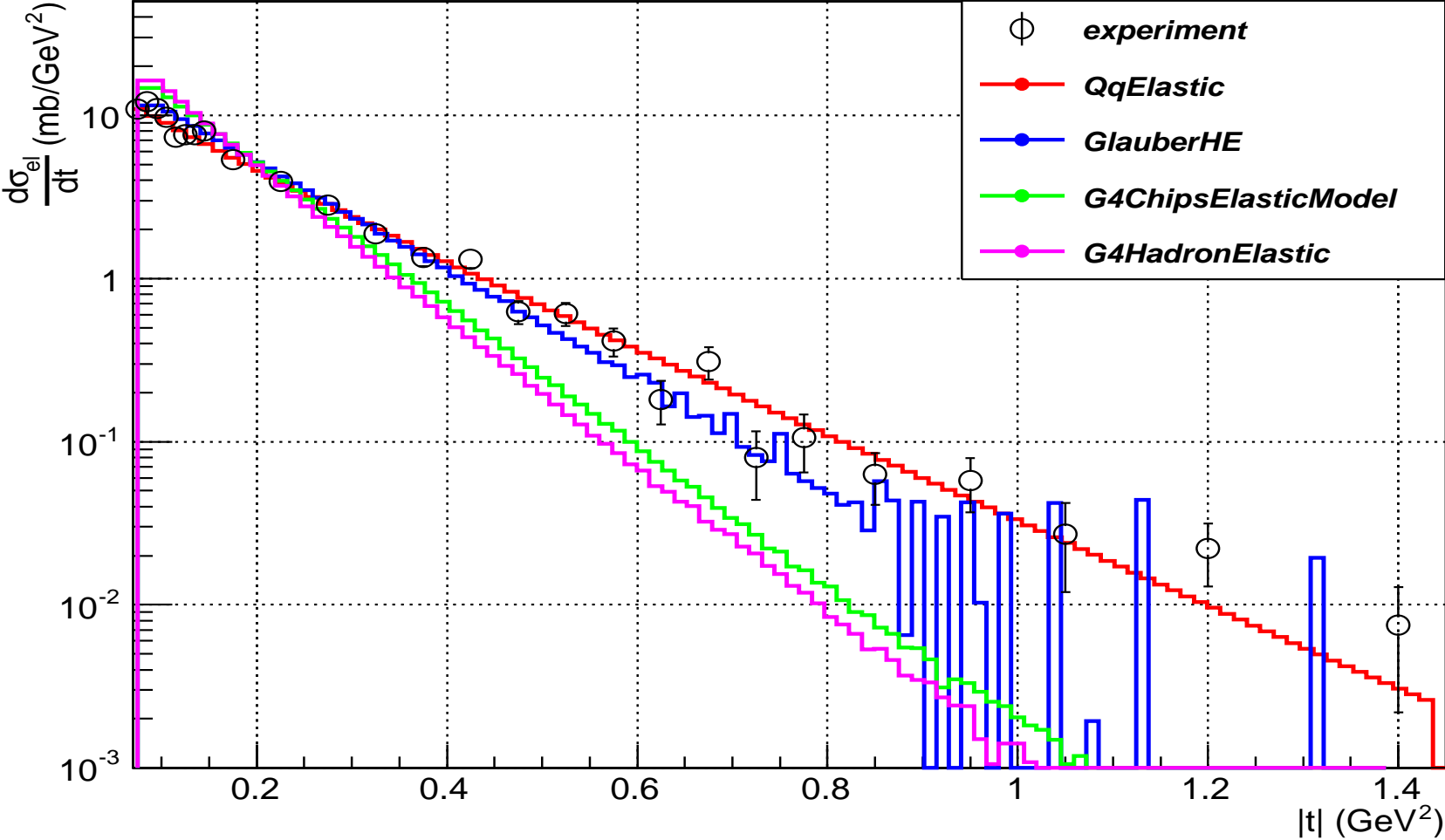
Differential elastic cross-section of 50 GeV/c K⁺ on hydrogen



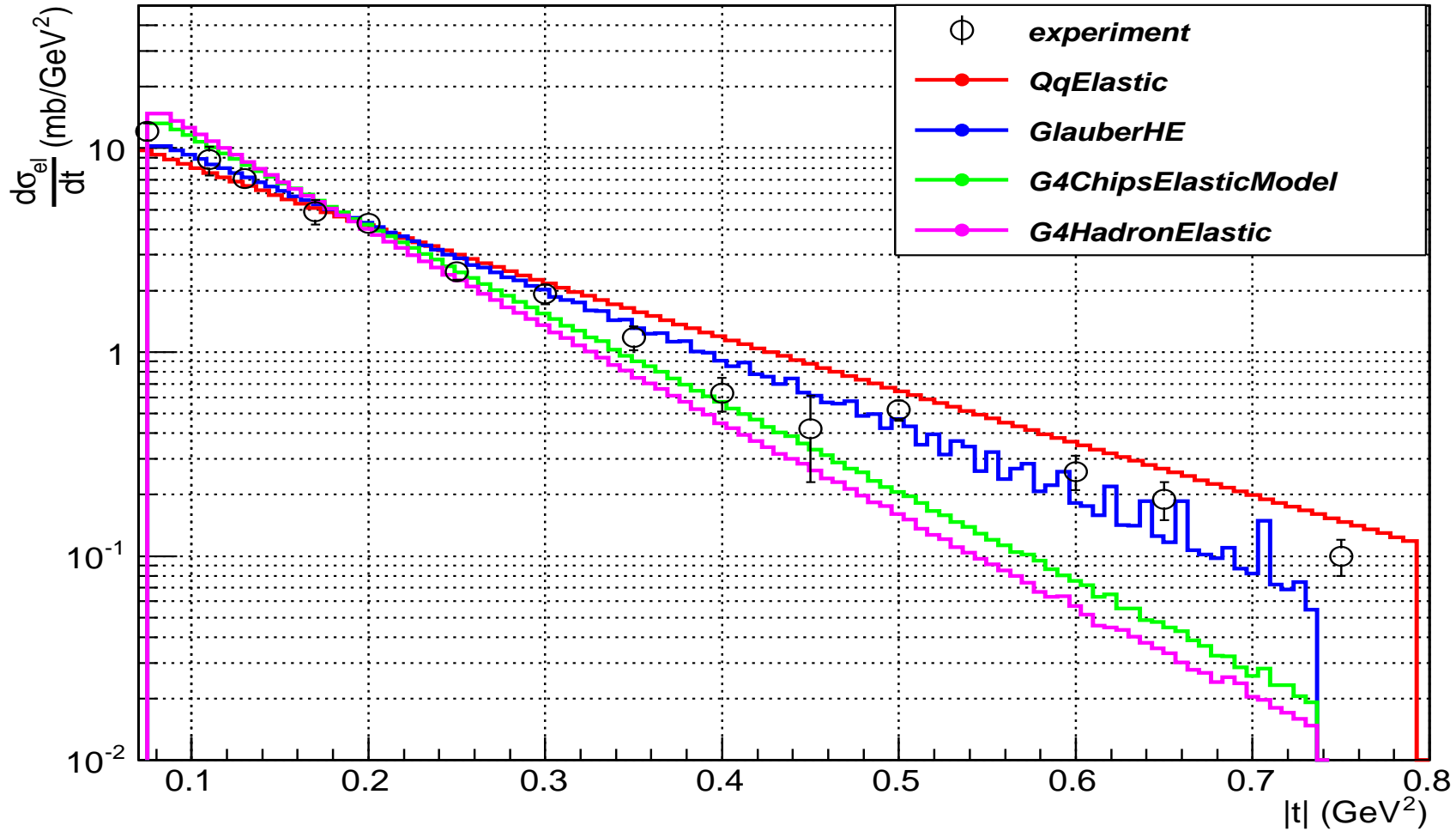
Differential elastic cross-section of 50 GeV/c K⁺ on hydrogen



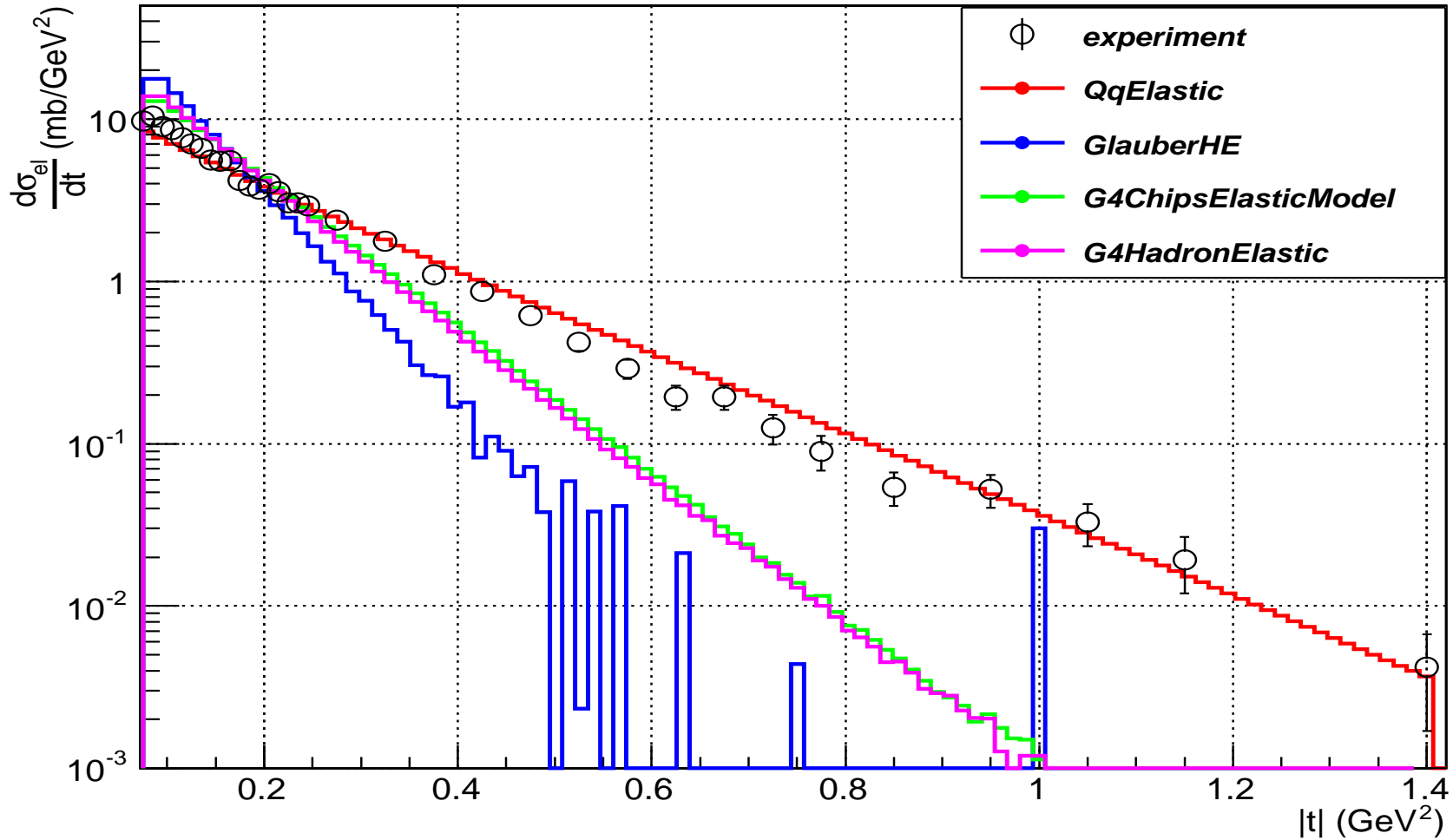
Differential elastic cross-section of 50 GeV/c K⁻ on hydrogen



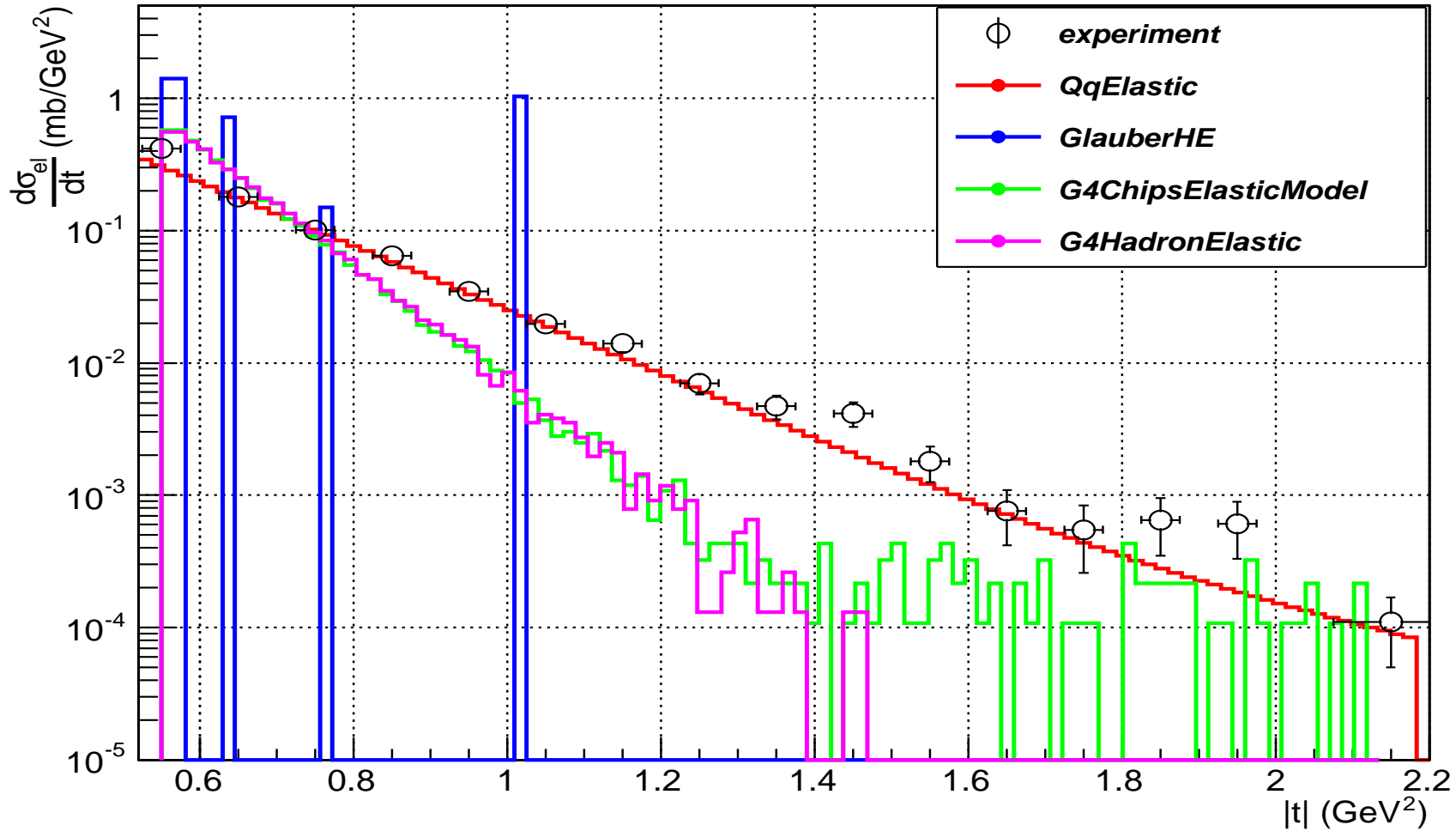
Differential elastic cross-section of 50 GeV/c K^- on hydrogen



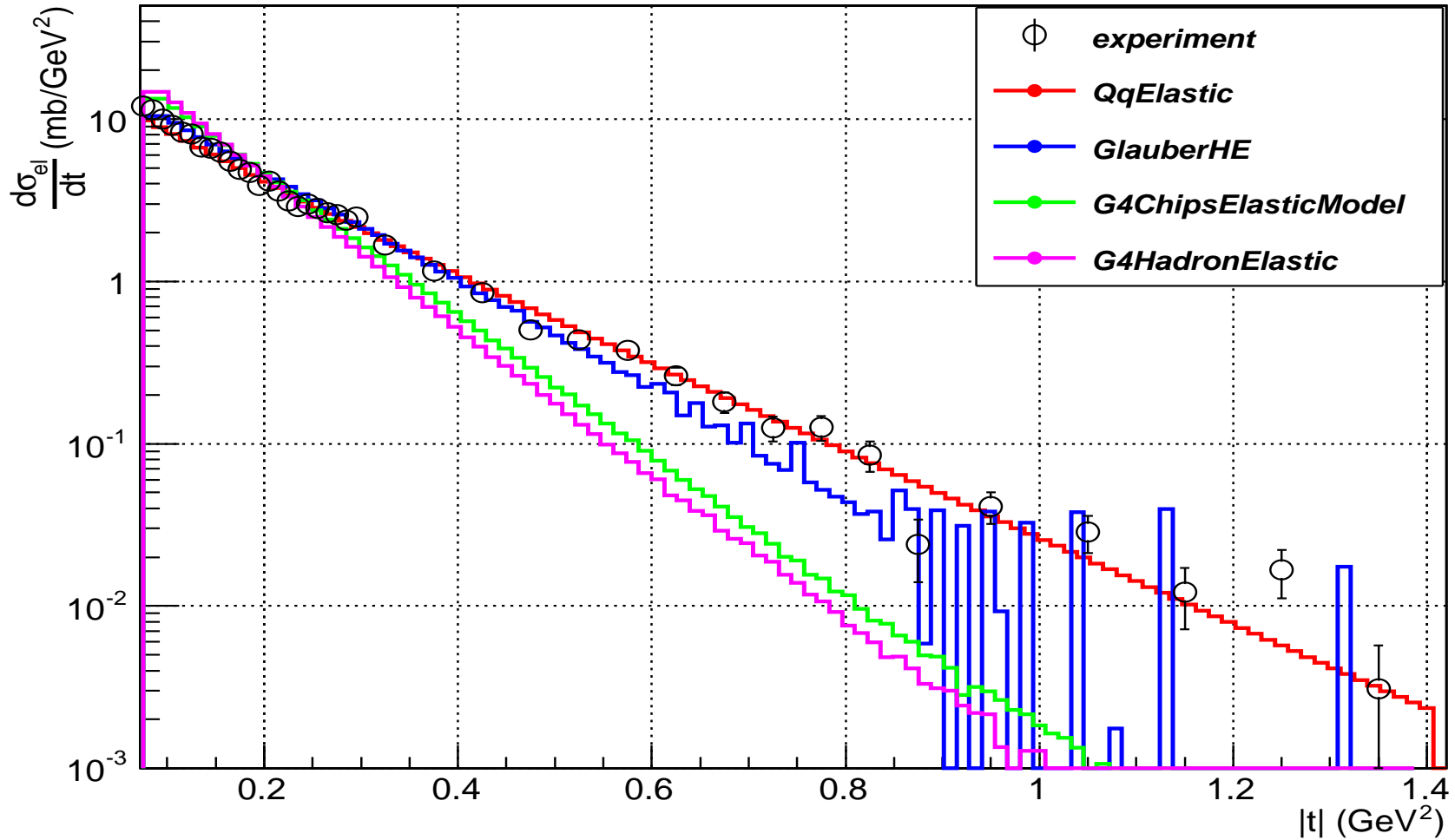
Differential elastic cross-section of 100 GeV/c K^+ on hydrogen



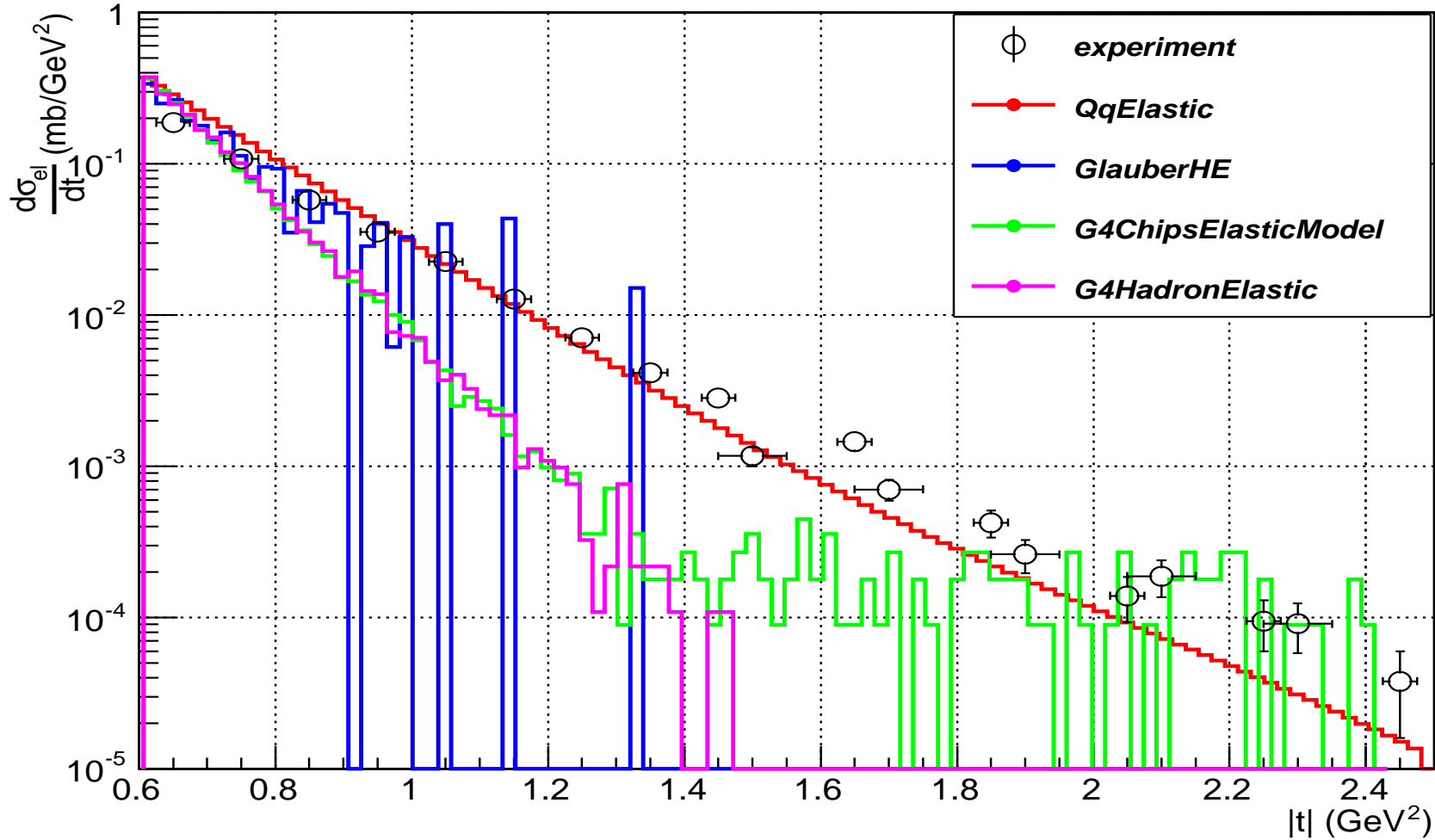
Differential elastic cross-section of 100 GeV/c K^+ on hydrogen



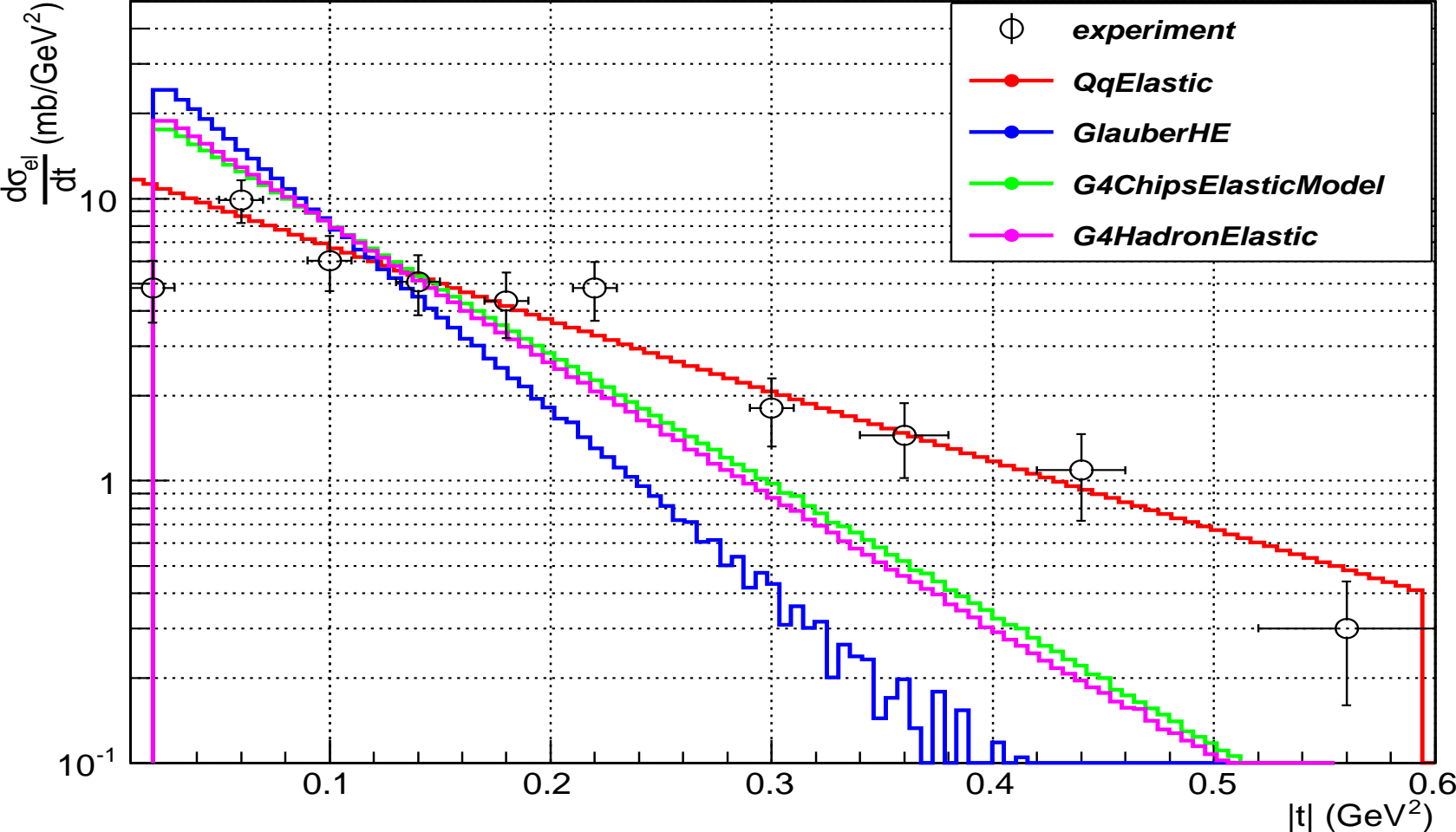
Differential elastic cross-section of 100 GeV/c K⁰on hydrogen



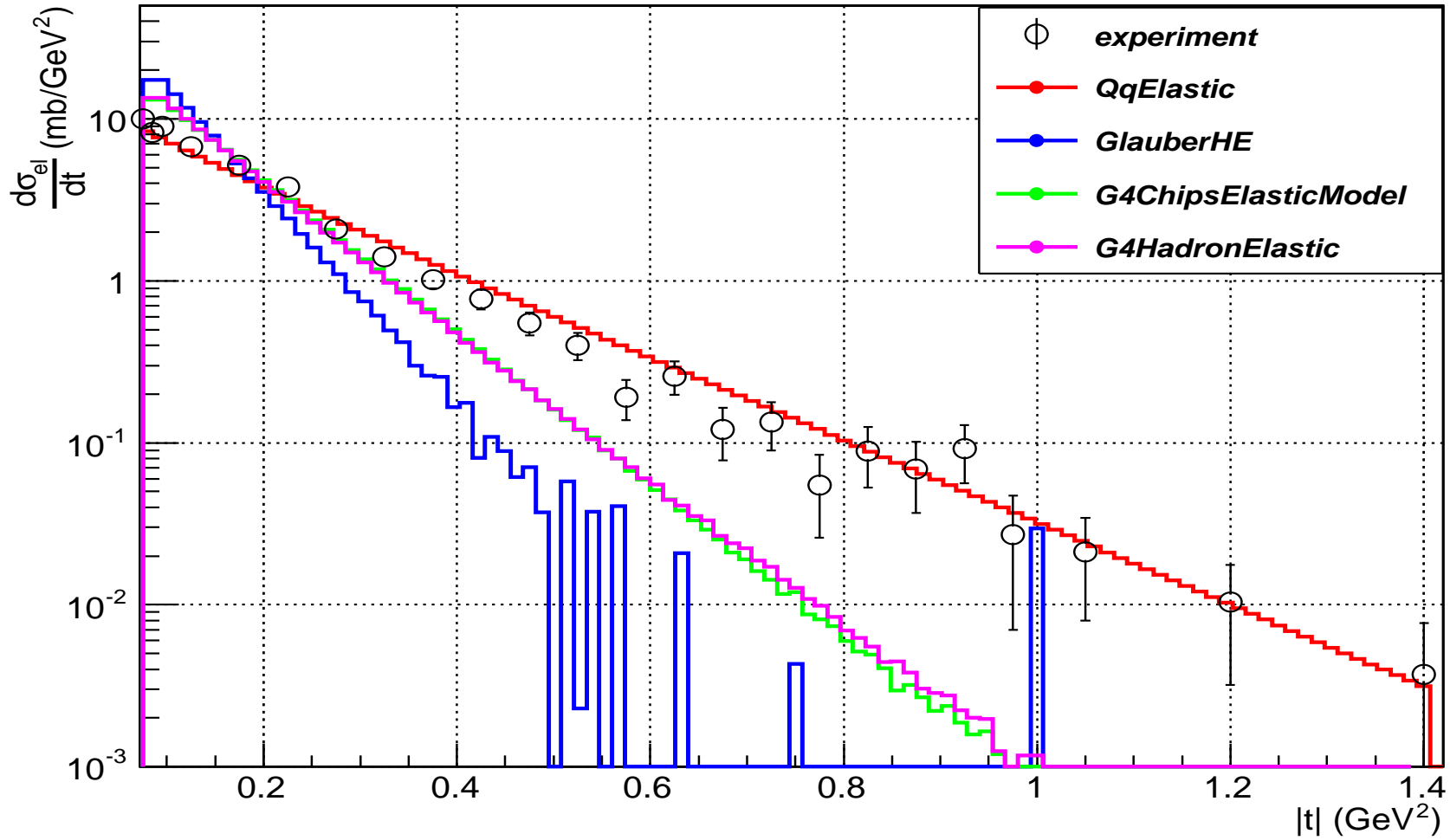
Differential elastic cross-section of 100 GeV/c K⁰n hydrogen



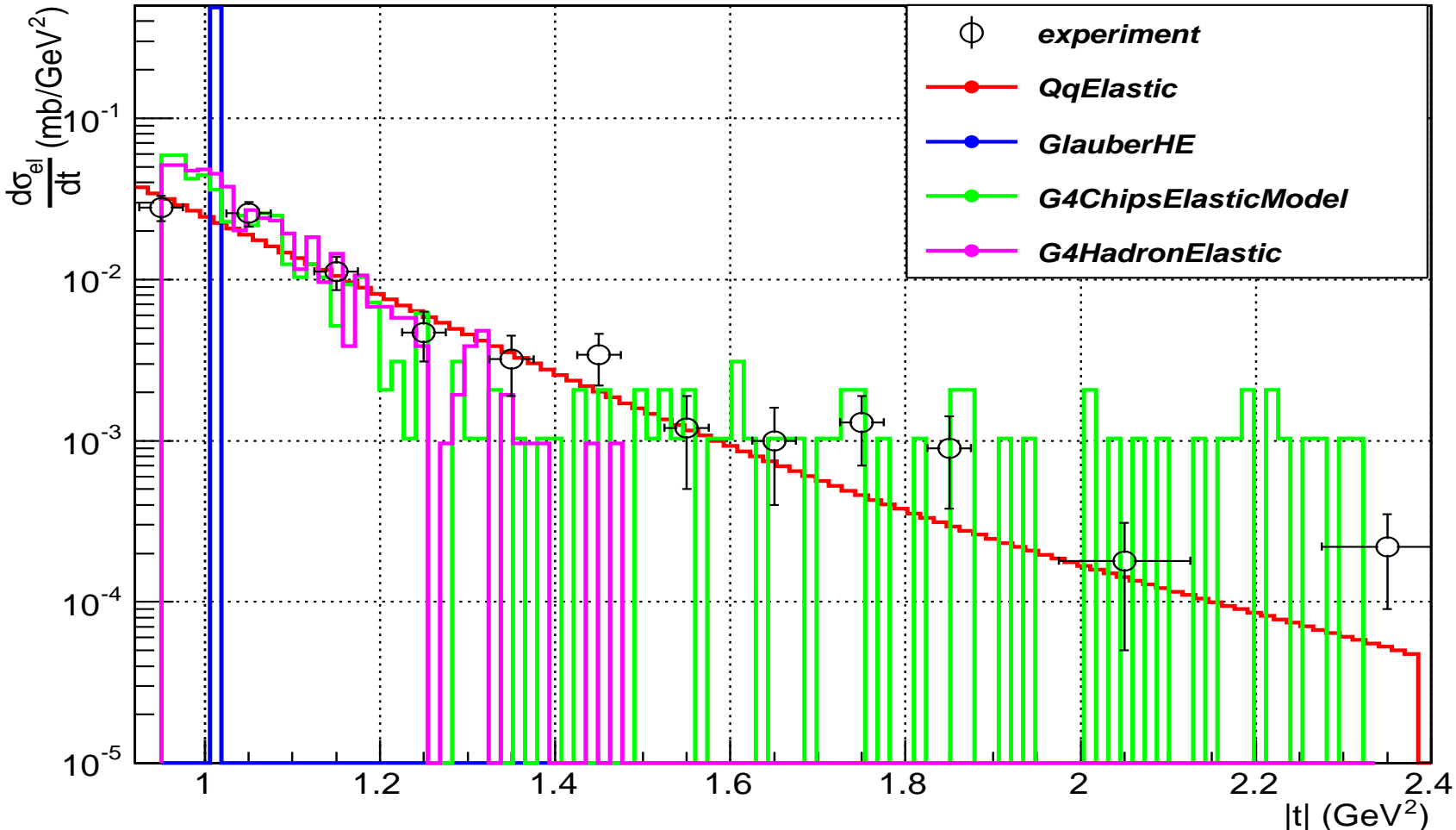
Differential elastic cross-section of 147 GeV/c K^+ on hydrogen



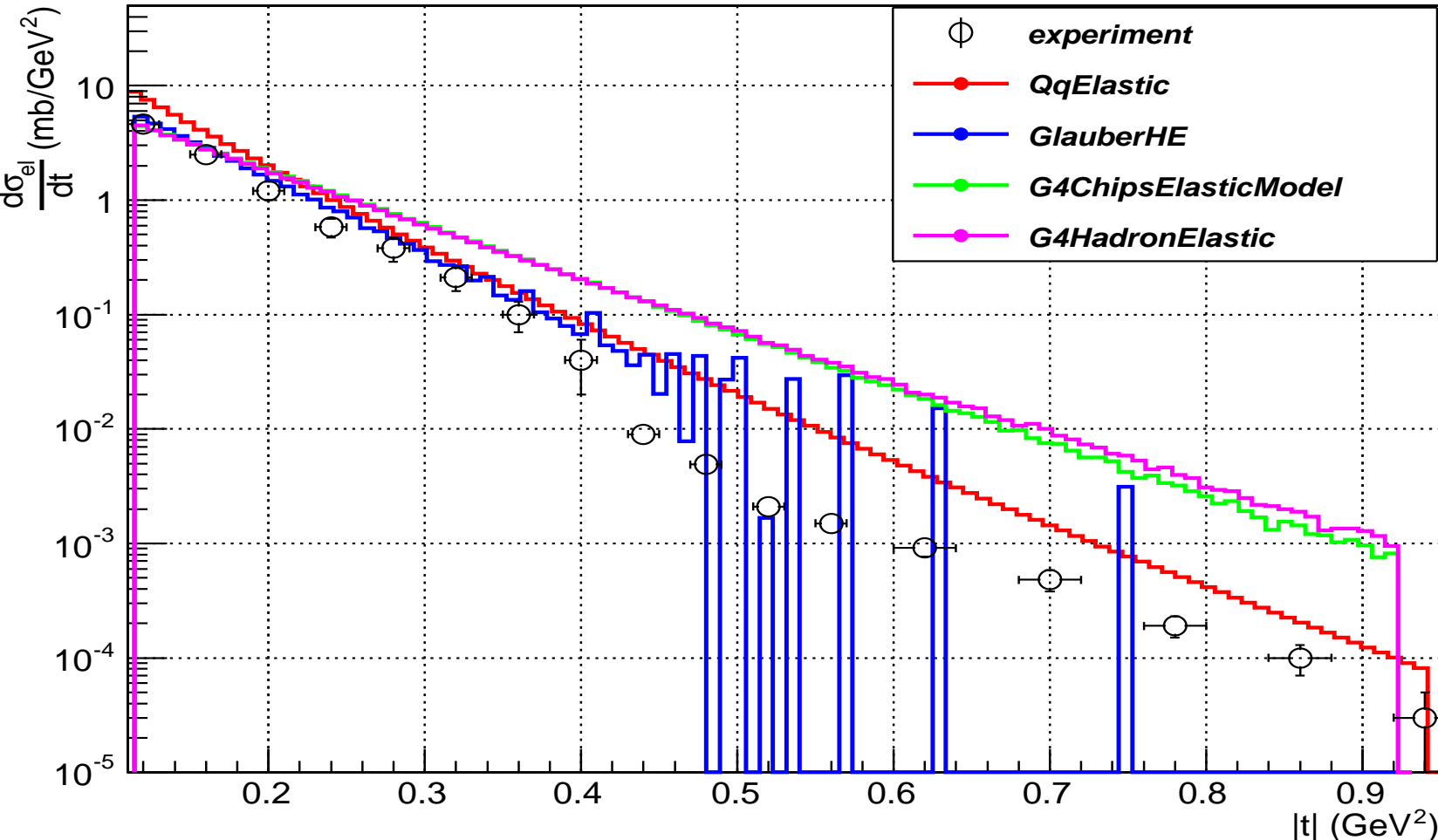
Differential elastic cross-section of 200 GeV/c K^+ on hydrogen



Differential elastic cross-section of 200 GeV/c K^+ on hydrogen



Differential elastic cross-section of 250 GeV/c K^+ on hydrogen



2 Summary

1. The current GEANT4 models can describe satisfactory the kaon-proton elastic scattering for energies more than 100 GeV only. The CHIPS and GHEISHA parametrisations look to be close.
2. The Qq-model can be considered as candidate to describe satisfactory energies higher than 3 GeV. The model requires additional efforts to optimise parameters.