TOTEM

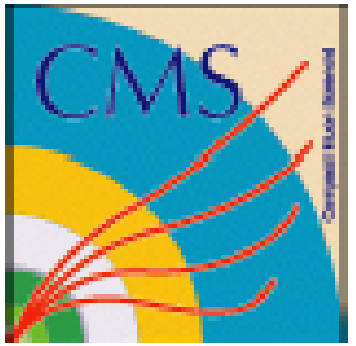
RRB

CERN-RRB-2017-114

S.Giani

24 October 2017

CTPPS 2016



Available on the CERN CDS information server

CMS PAS PPS-17-001
TOTEM-NOTE-2017-003

CMS Physics Analysis Summary

Contact: @cern.ch

2017/05/24

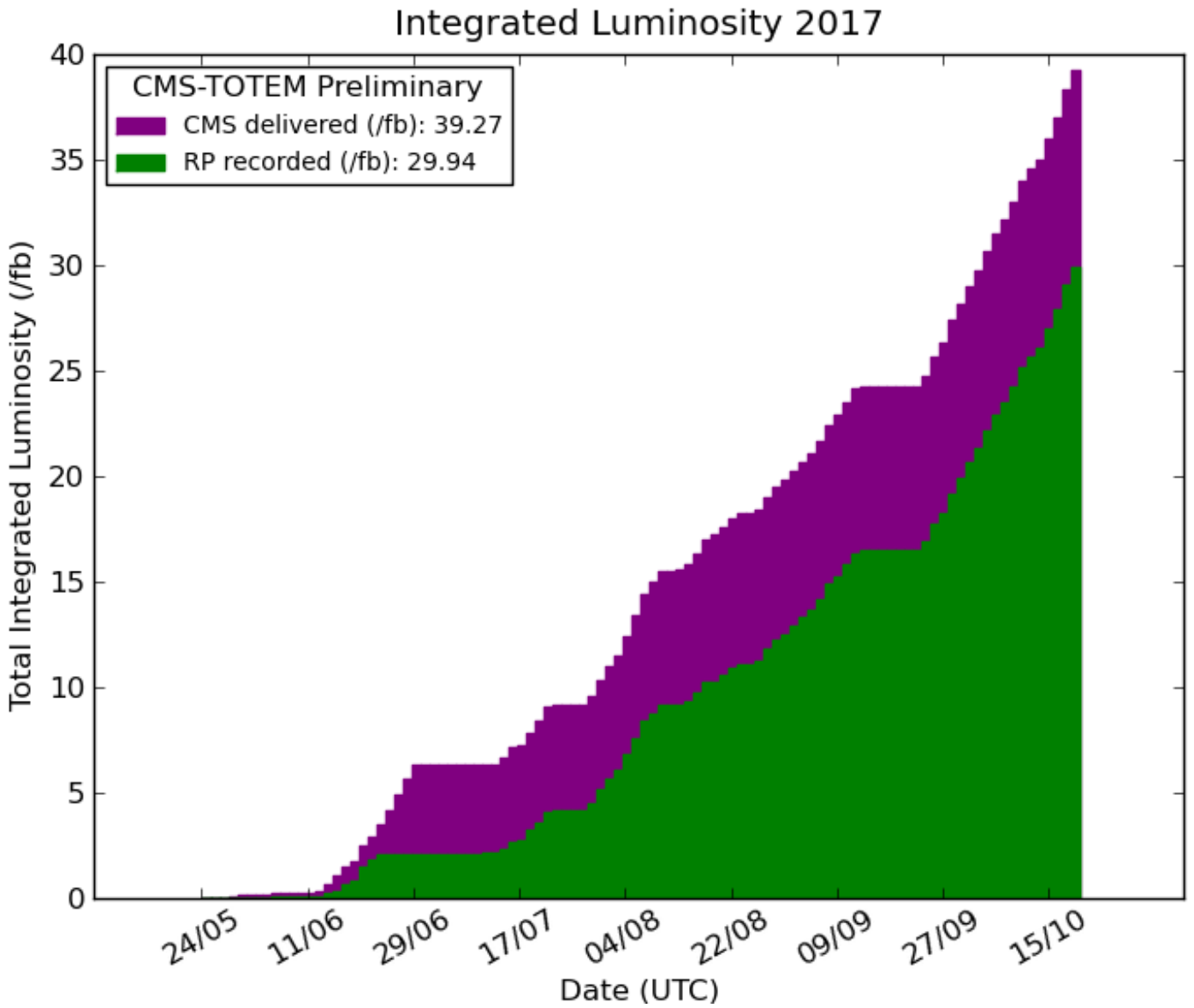
Evidence for proton-tagged, central semi-exclusive production of high-mass muon pairs at 13 TeV with the CMS-TOTEM Precision Proton Spectrometer

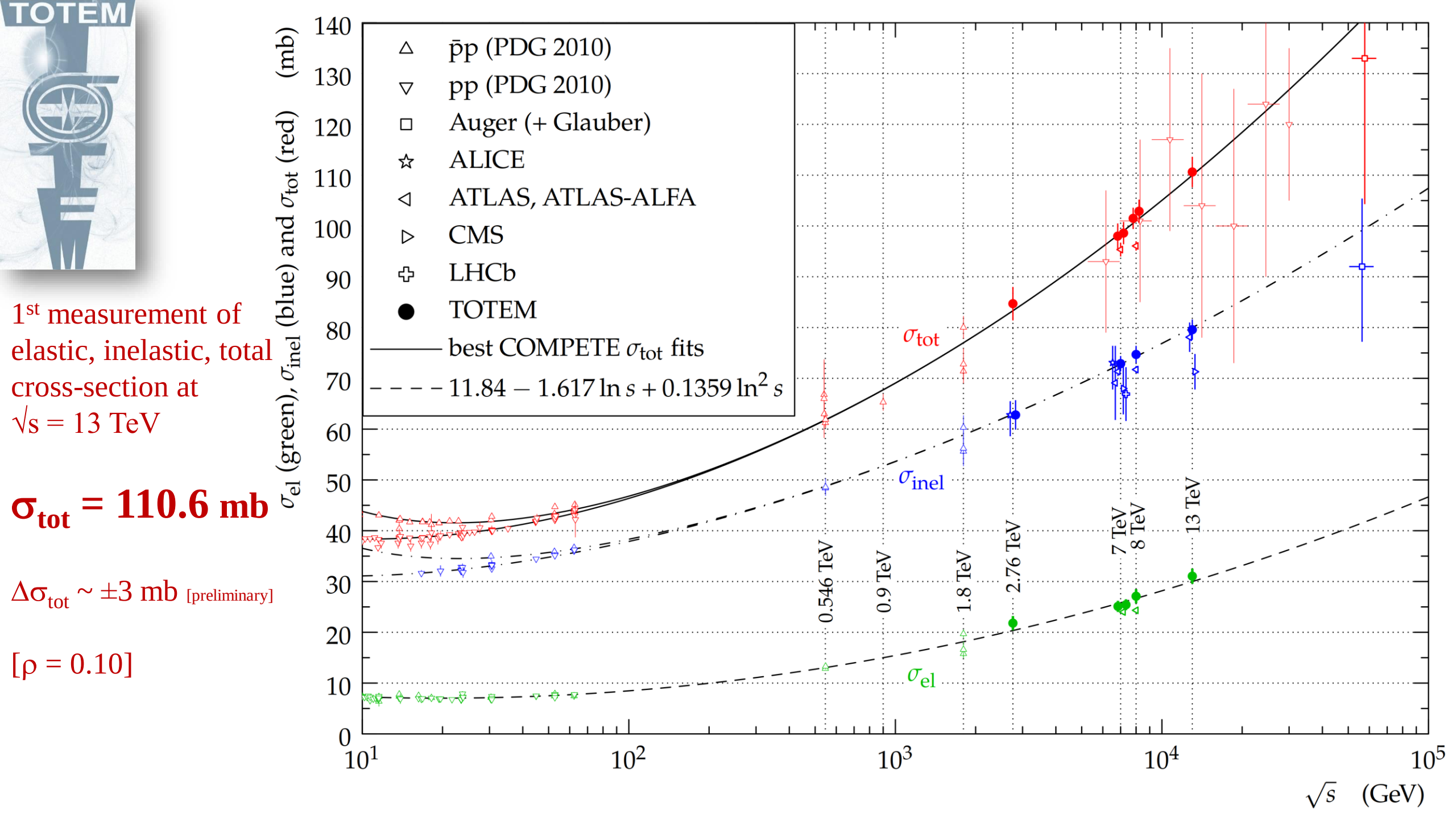
The CMS and TOTEM Collaborations

Abstract

The process $pp \to p\mu^+\mu^- p^{(*)}$ has been observed at the LHC for dimuon masses larger than 110 GeV in pp collisions at $\sqrt{s} = 13$ TeV. Here $p^{(*)}$ indicates that the second proton is undetected, and either remains intact or dissociates into a low-mass state p^*. The scattered proton has been measured in the CMS-TOTEM Precision Proton Spectrometer (CT-PPS), which operated for the first time in 2016. The measurement is based on an integrated luminosity of approximately 10 fb^{-1} collected in regular, high-luminosity fills. A total of 12 candidates with $m(\mu\mu) > 110$ GeV, and matching forward proton kinematics, is observed. This corresponds to an excess of more than four standard deviations over the background. The spectrometer and its operation are described, along with the data and background estimation. The present results constitute the first evidence of this process at such masses. They also demonstrate that CT-PPS performs as expected.

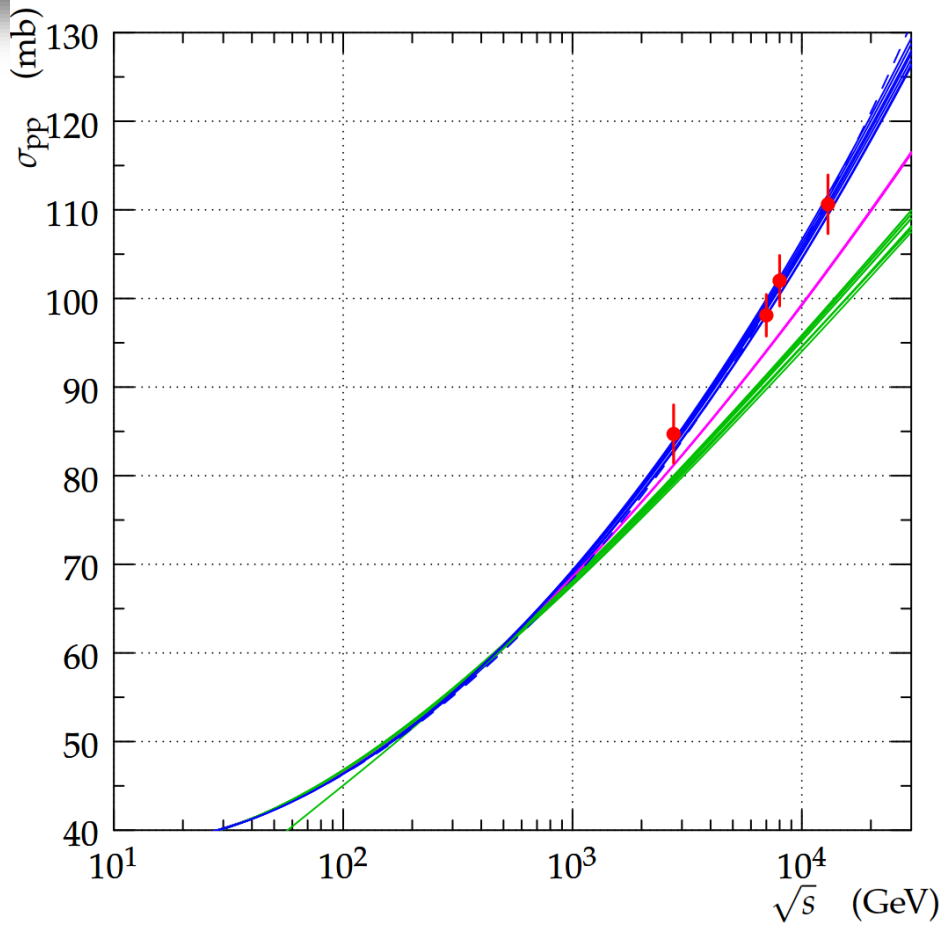
CTPPS 2017

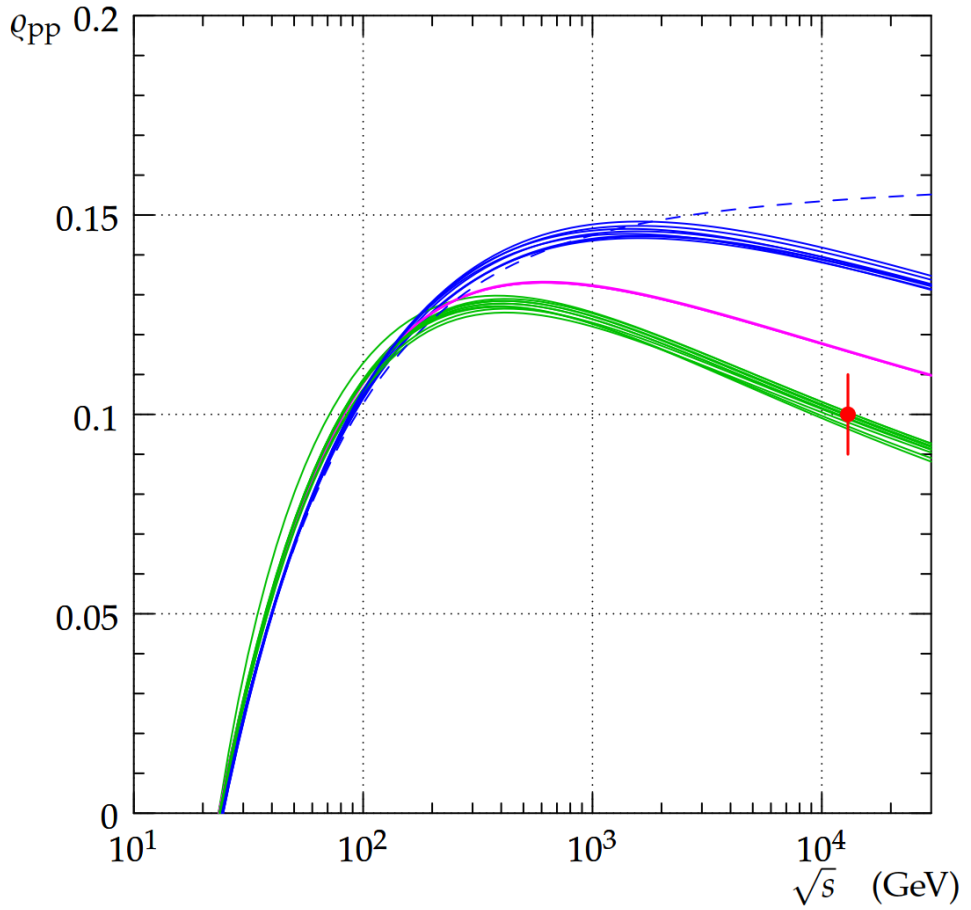

Integrated Luminosity 2017
CMS-TOTEM Preliminary
CMS delivered (/fb): 39.27
RP recorded (/fb): 29.94
Total Integrated Luminosity (/fb)
0
5
10
15
20
25
30
35
40
24/05
11/06
29/06
17/07
04/08
22/08
09/09
27/09
15/10
Date (UTC)

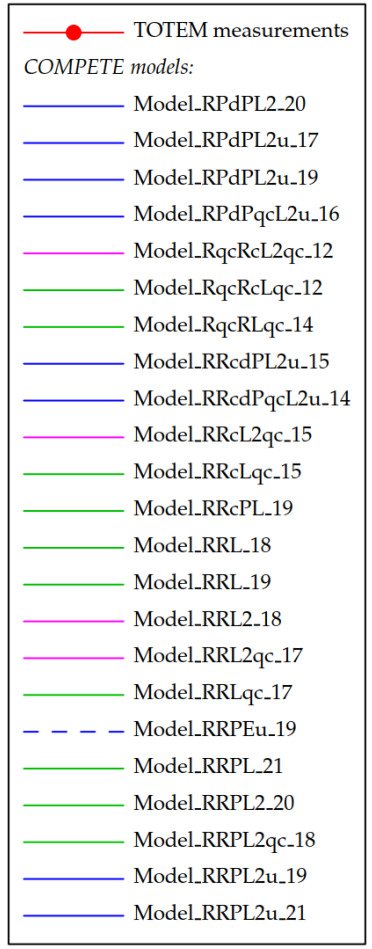

TOTEM
1st measurement of elastic, inelastic, total cross-section at √s = 13 TeV
σtot = 110.6 mb
Δσtot ~ ±3 mb [preliminary]
[ρ = 0.10]
σel (green), σinel (blue) and σtot (red) (mb)
p̄p (PDG 2010)
pp (PDG 2010)
Auger (+ Glauber)
ALICE
ATLAS, ATLAS-ALFA
CMS
LHCb
TOTEM
best COMPETE σtot fits
11.84 − 1.617 ln s + 0.1359 ln² s
σtot
σinel
σel
0.546 TeV
0.9 TeV
1.8 TeV
2.76 TeV
7 TeV
8 TeV
13 TeV
√s (GeV)

1st measurement of ρ at √s = 13 TeV **ρ = 0.10 ± 0.01** [preliminary]

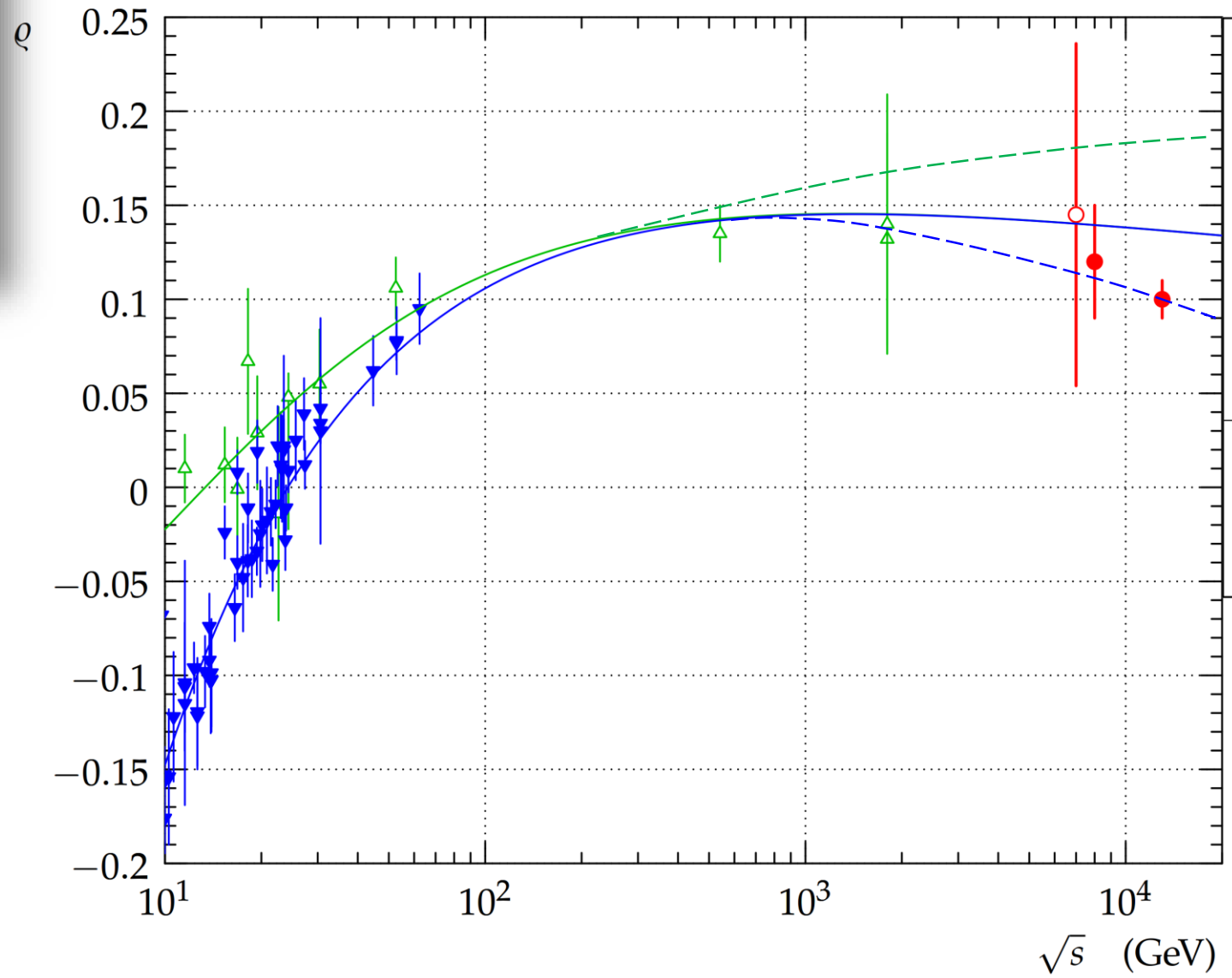
1) Theoretical framework :
current models [COMPETE] cannot describe measured total cross-section and ρ simultaneously at √s 13 TeV ;
dispersion relation requires derivative of total cross-section to decrease in next decade(s) of √s ;
extrapolations to high-E LHC and/or FCC .







1st measurement of ρ at √s = 13 TeV **ρ = 0.10 ± 0.01** [preliminary]



2) Theoretical framework:
Regge [Nicolescu, Gauron, Avila] ;
QCD [Lipatov, Vacca, Ewerz] ;
t-channel ;
experimental evidence of 3g 1^{--} state .