

# Odderon: Lost or/and Found?

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# Forces of Nature

- **C-Even Forces: UNIVERSAL**

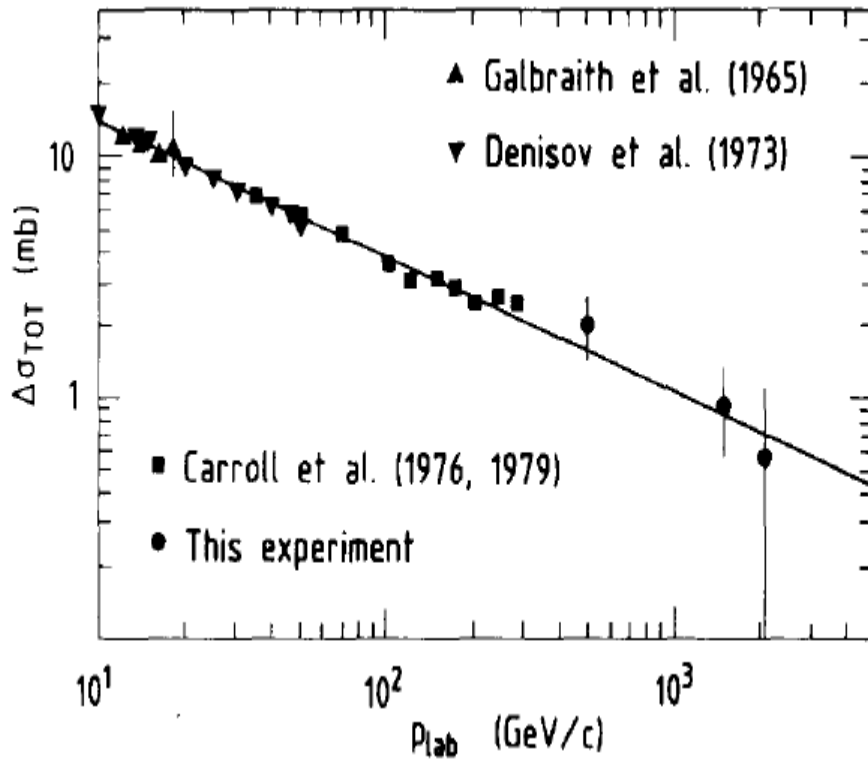
Gravitational, Pomeron, f-reggeon,...

- **C-Odd Forces: NON-UNIVERSAL**

Electroweak,  $\rho$ ,  $\omega$ ,  $\varphi$ -reggeons

+ Odderon?

# Where a $C$ -odd force can be detected in experiment?



$$\Delta\sigma_{TOT}(s) = \frac{1}{s} \text{Im} (T^{\bar{p}p}(s, 0) - T^{pp}(s, 0))$$

$$\Delta\sigma_{TOT}(s) \sim s^{\alpha_-(0)-1}$$

Results from TEVATRON experiments.

experiment	$\sigma_{tot}$ [mb]
CDF	$80.03 \pm 2.24$
E811	$71.42 \pm 2.41$
E710	$72.8 \pm 3.1$

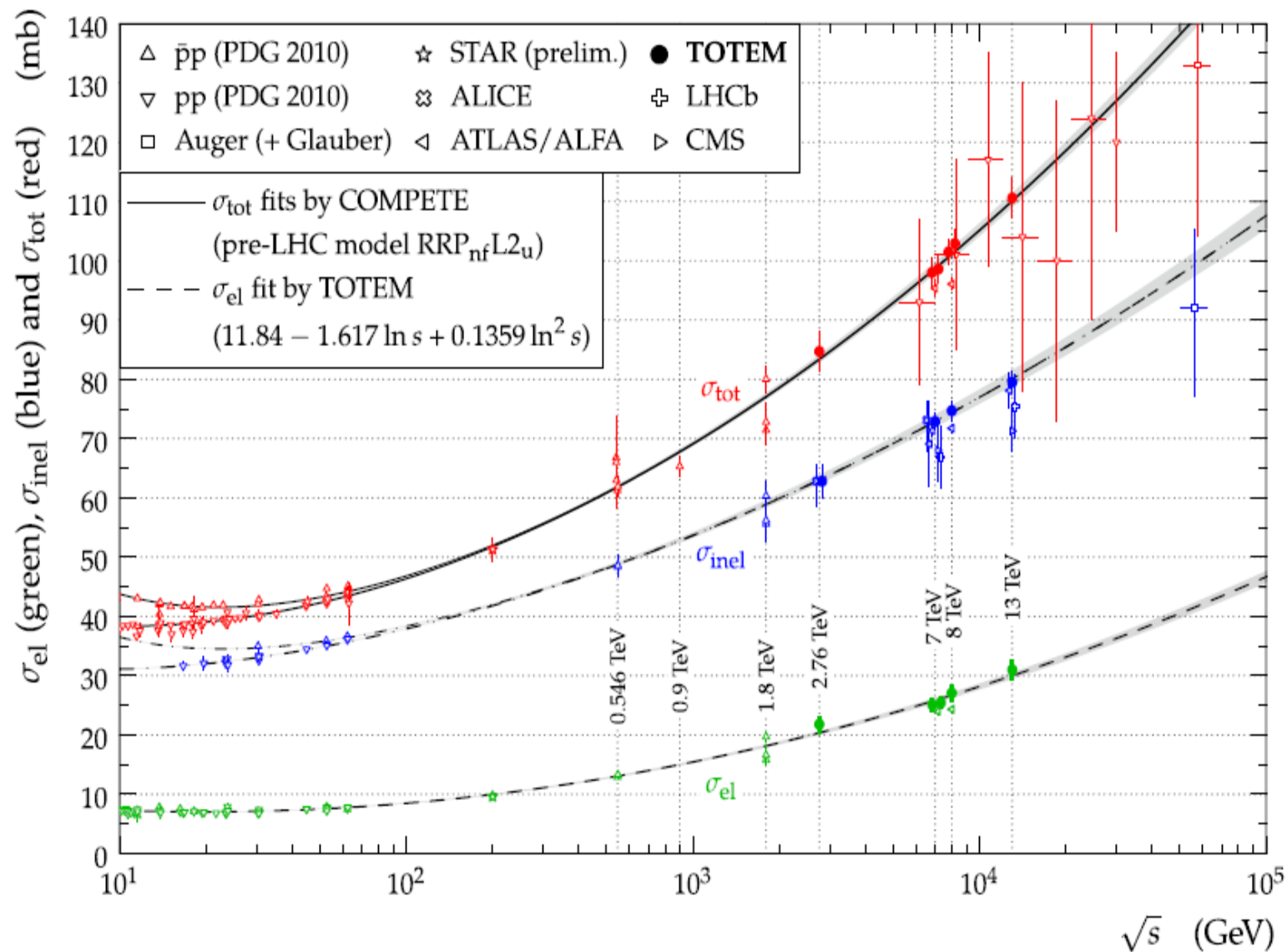
**TOTEM Data:  $\sigma_{TOT}(2,76 \text{ TeV}) = 84.7 \pm 3.3 \text{ mb}$**

$$\Delta\sigma_{TOT} \sim p_{lab}^{-1/2} \sim s^{-1/2}$$

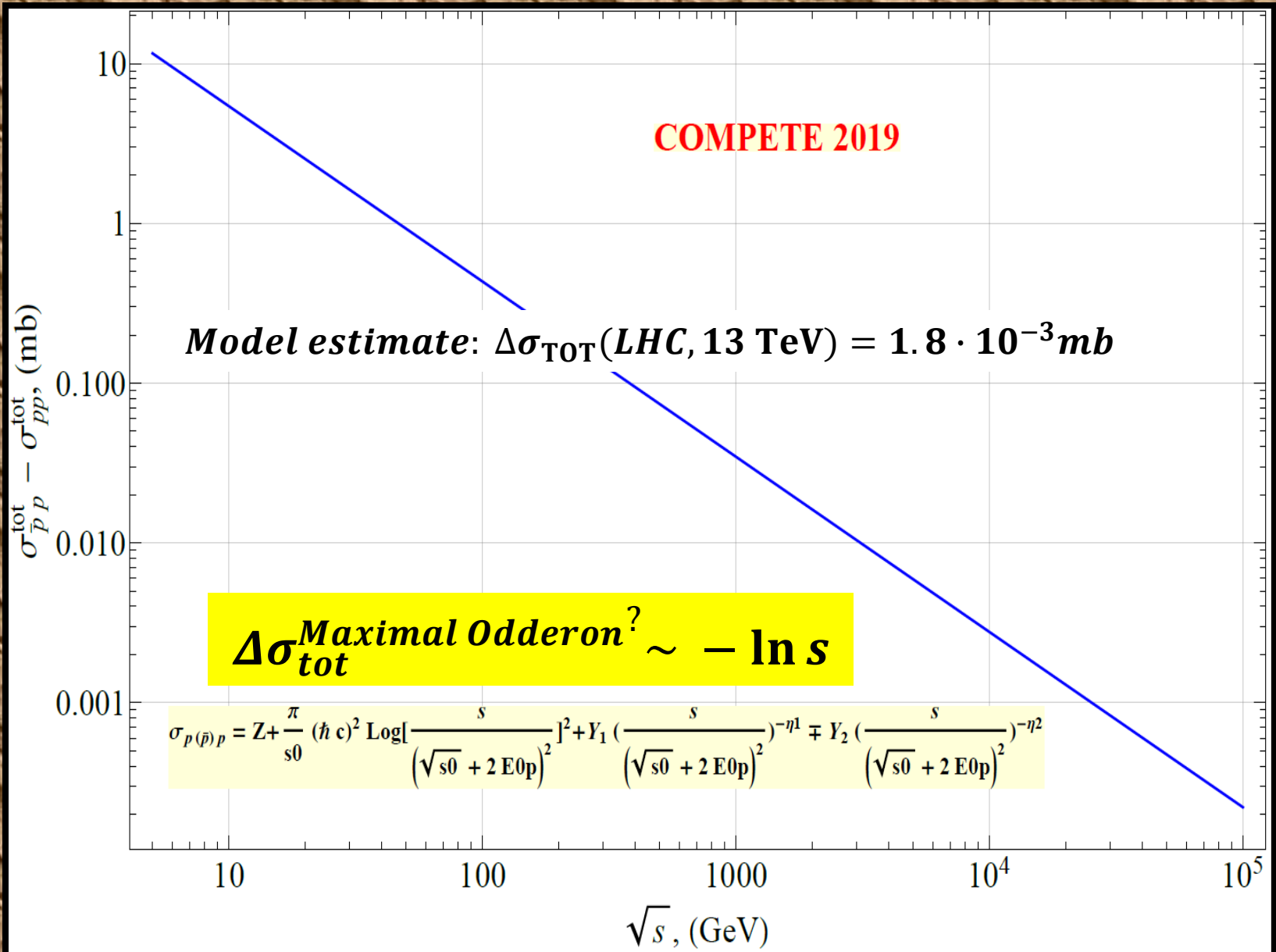
Standard expectation from  $\alpha_- = \alpha_\omega$

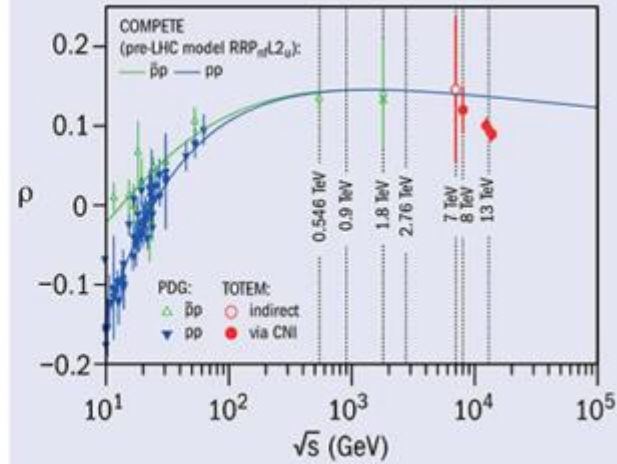


**0 ?**



# Theoretical estimate of $\Delta\sigma$ from the COMPETE model





## TOTEM:

First determination of the  $\rho$  ( $=\text{Re}T(s,0)/\text{Im}T(s,0)$ ) parameter at  $\sqrt{s} = 13$  TeV: probing the existence of a colourless C-odd three-gluon compound state

or

...slowing down of the total cross-section growth ?

# *World Market: Options for $\rho$ (phenomenology)*

“Maximal Odderon”

*B. Nicolescu & E. Martynov:  $\rho(8) = 0.106, \rho(13) = 0.098$*

No or different Odderon:

*L. Durand & P. Hu:  $\rho(8) = 0.131, \rho(13) = 0.126$*

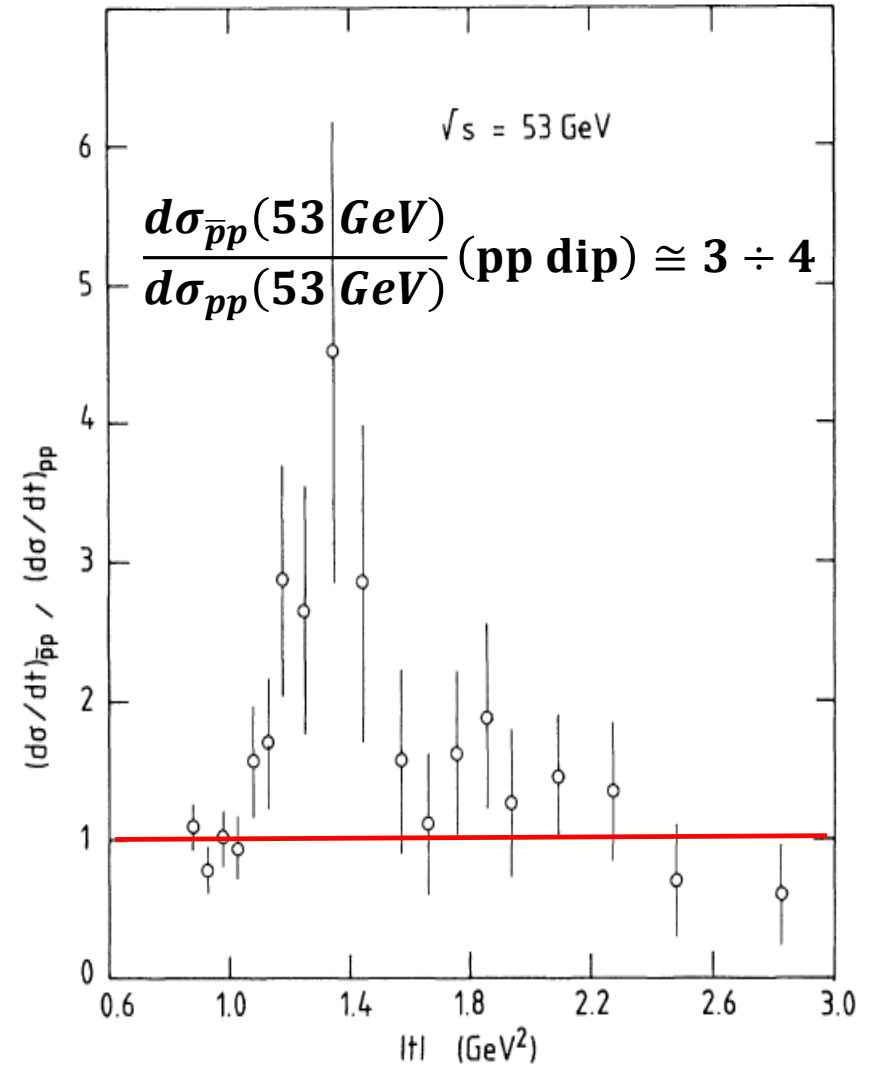
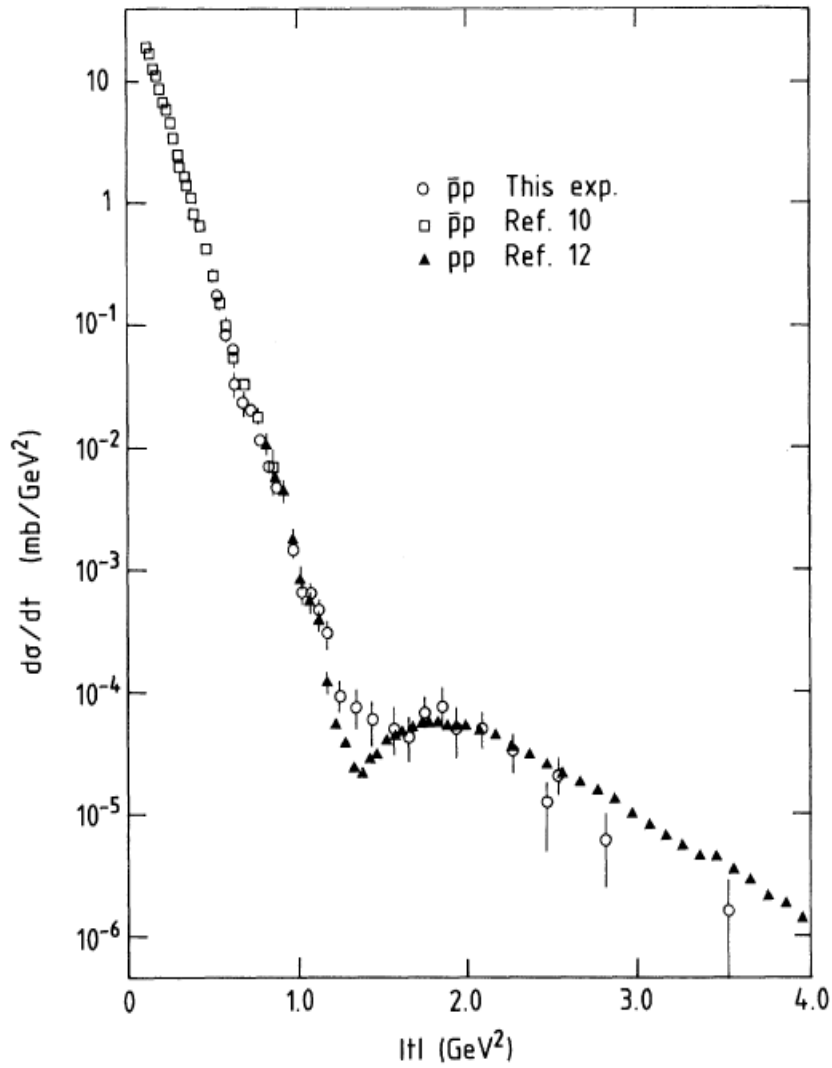
*S. Pacetti et al.:  $\rho(8) = 0.136, \rho(13) = 0.134$*

*O. Selyugin & J.-R. Cudell.:  $\rho(8) = 0.136, \rho(13) = 0.134$*

*A. Donnachie & P. Landshoff :  $\rho(13) = 0.14$*

*V. V. Ezhela, V. A. P. & N. P. Tkachenko:  $\rho(13) = 0.12$*

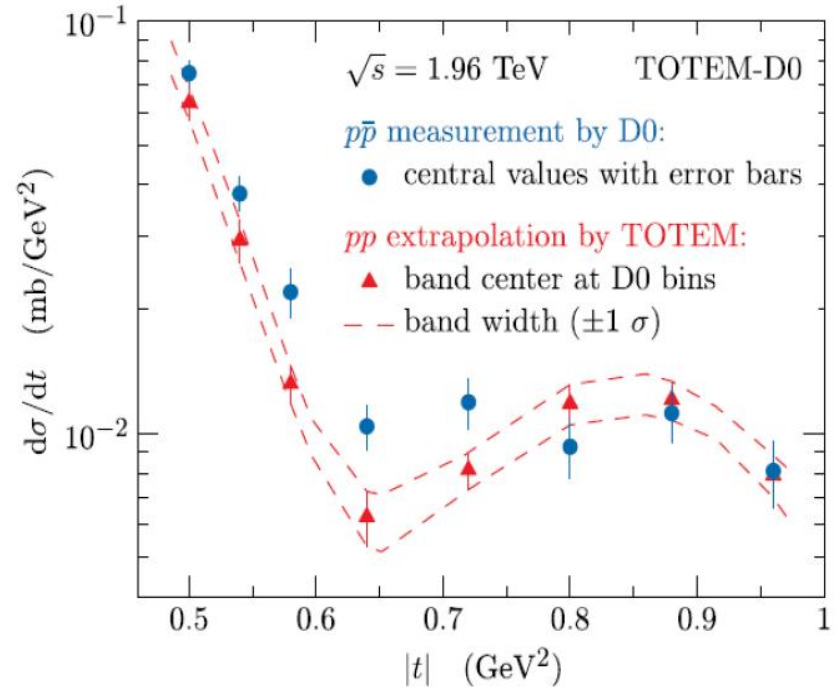
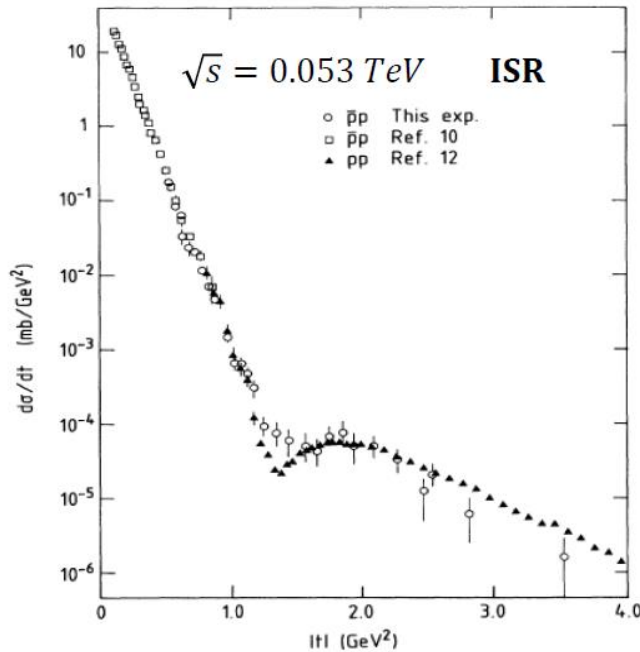
# C-odd $\bar{p}p/pp$ difference in angular distributions at 53 GeV



The First Coming of the Odderon?



# REPETTITIO EST MATUR STUDIORUM



$$\frac{d\sigma_{\bar{p}p}(53 \text{ GeV})}{d\sigma_{pp}(53 \text{ GeV})} (\text{pp dip}) \cong (3 \div 4) \pm 30\%$$

$$\frac{d\sigma_{\bar{p}p}(1.96 \text{ TeV})}{d\sigma_{pp}(1.96 \text{ TeV})} (\text{pp dip}) \cong 1.5 \pm \dots$$

**Dying odderon?**

# conclusions

Where have we come to and where are we?

1. Odderon (=  $\mathbb{C}$ -odd effect) is unequivocally observed in elastic scattering.

2. Mathematical nature and parameters of the Odderon?  
Pole, branching point, ..., intercept, slope...?

Unknown.

3. Physical excitations (on the Odderon trajectory):  
mass, width etc?

Unknown.

• All the more interesting life!