

Plans and prospects: high lumi

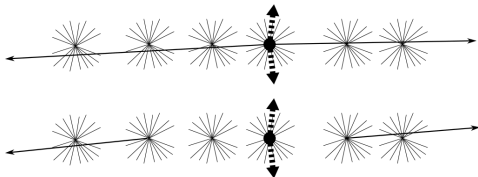
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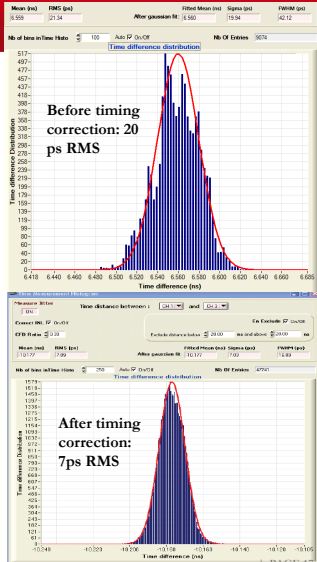
Forward detectors measurement



- **Proton missing mass** measurement within 3% in case of double tag
- It has to match the central mass for signal. Can match as well for pile-up backgrounds as statistical fluctuations
- Double tag probability from pile-up protons on forward detectors (no mass requirement) :
0.32 ($\mu = 50$) 0.66 ($\mu = 100$) 0.93 ($\mu = 200$)

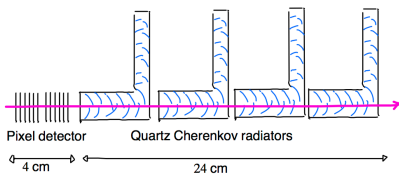
TIMING RESOLUTION

- First measurement: 2 pulses with 10ns distance. 3 kHz rate
- Measurement performed for 6.4 GPSPS sampling
- **20 ps RMS resolution on Delta T before any correction**
- **7 ps RMS after INL timing correction only**
- No tail in the distribution.
- No hit “out of time” due to metastabilities, etc...



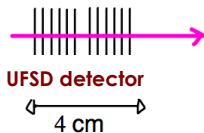
Conclusion

Pixel + Quartic



$$\sigma_T = \frac{30 ps}{\sqrt{4}}$$

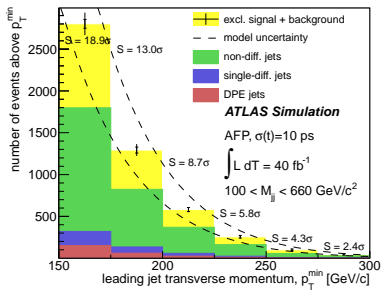
UFSD:
one single device



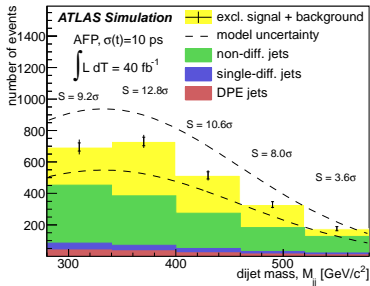
$$\sigma_T = \frac{20 ps}{\sqrt{12}}$$

1. Silicon detector with gain of ~ 10 are well suited for combining excellent position and timing resolution
2. First prototype very promising

Number of Events ($\langle \mu \rangle = 23$)



leading jet transverse momentum
distribution above a given threshold



mass of the jet system distribution

- Double tag requirement → central mass > 300 GeV → leading jet $p_T > 150$ GeV → relatively small cross section → inverse femtobarns of data needed → high pileup environment is a must
- Very challenging measurement.
- Impossible without forward proton detectors.
- Improvement of uncertainties coming from the Tevatron CDF measurements by about one order of magnitude.

Forward proton tagging potential to probe anomalous gauge couplings at the LHC energies



- Previous work on $WW\gamma\gamma$, $ZZ\gamma\gamma$ and $WW\gamma$ couplings: E. Chapon, C. Royon, O. Kepka, Phys. Rev. D **81** (2010)
 - Sensitivities on QGC **improved by more than four orders of magnitude** compared to LEP studies and **more than two compared to D0/CMS results**

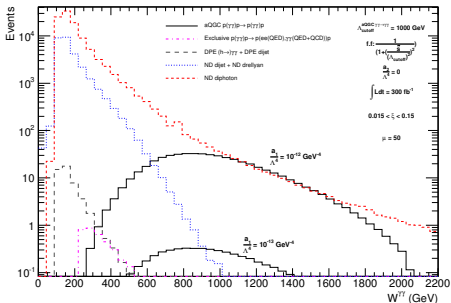
Conclusions



- Forward proton tagging at the LHC seems promising to probe **aQGC**
 - $WW\gamma\gamma$ and $ZZ\gamma\gamma$ couplings already studied with positive outputs (constraints improved by a factor > 100)
E. Chapon, C. Royon, O. Kepka, Phys. Rev. D **81** (2010)
 - A first look at the $\gamma\gamma \rightarrow \gamma\gamma$ couplings shows that we will be able to probe them down to a few $10^{-13} \text{ GeV}^{-4}$
 - Waiting for final outputs from theorists (Discussions with S. Fichet and G.von Gersdorff)

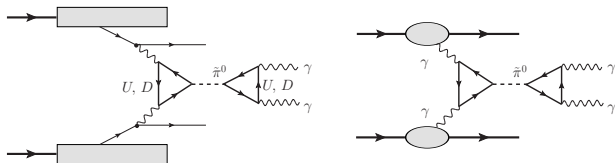
Mass distribution of signal and backgrounds

- $0.015 < \xi < 0.15, |\eta| < 2.37, p_{T1,2} > 50 \text{ GeV}$



- By requesting $W^{\gamma\gamma} > 600 \text{ GeV}$, Only pile-up backgrounds remain

Production of technipions



- $\gamma\gamma$, WW , ZZ and mixed terms in the intermediate state in inclusive processes.
- $\gamma\gamma$, (γZ , $Z\gamma$ and ZZ not included) in exclusive process.

