

# PETRA Laserwire Laser

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😊 Longitudinal profile

😊 Summary

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# The Laser

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- 😊 The laser has been given to us by B. Dehning from CERN. It has been used at LEP to measure beam polarization
- 😊 It's a Nd:YAG Q-switched system, running with 30 Hz
- 😊 pulse energy measured: 40 mJ, power: 4 MW
- 😊 synchronization to PETRA beam by triggering the Q-switch Pockels-cell
- 😊 transvers beam quality is modest (multimode)
- 😊 measured spot size at IP:  $\sigma_L = (80 \pm 10) \mu\text{m}$

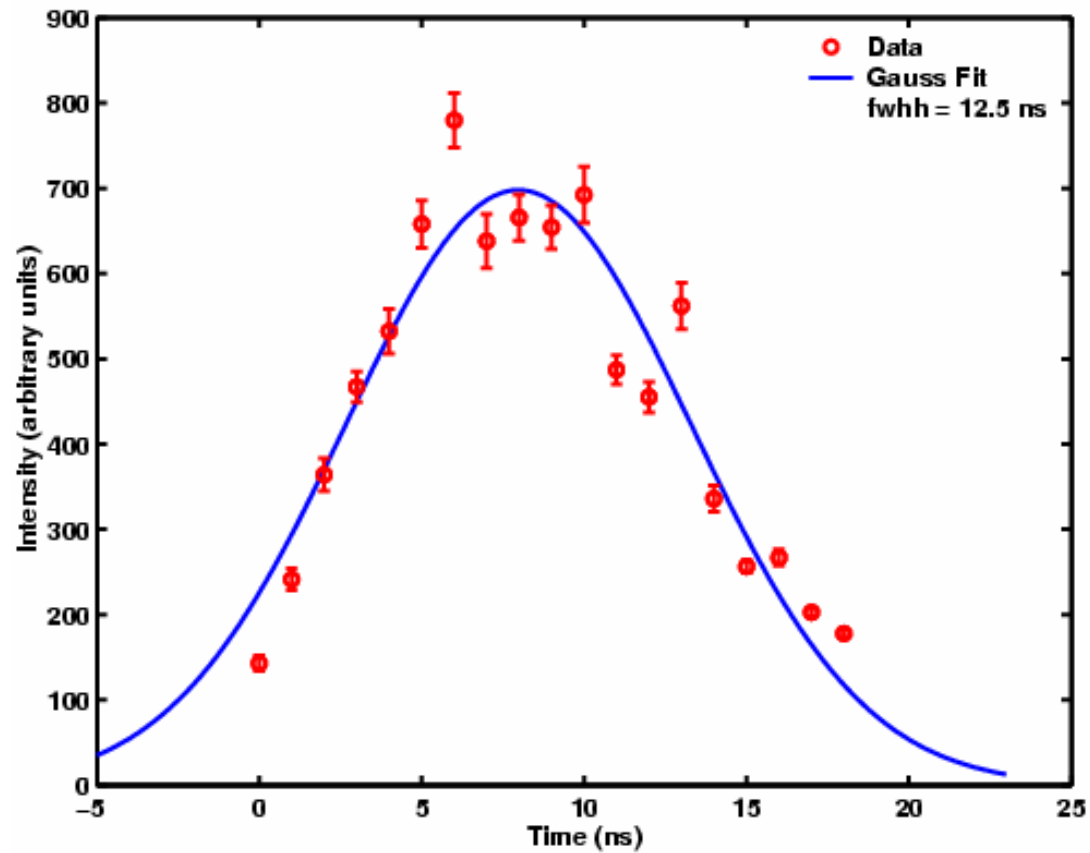
# Measurement of the longitudinal Profile

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- 😊 The longitudinal profile has been measured with a streak camera: FESCA 200 from Hamamatsu
- 😊 largest window of the camera: 500 ps with a resolution of 5 ps (fwhh)
- 😊 The camera was triggered with the laser via a fast photo diode
- 😊 Problem:  
stability of the trigger probably not better than 0.5 ns

# Averaged Profile

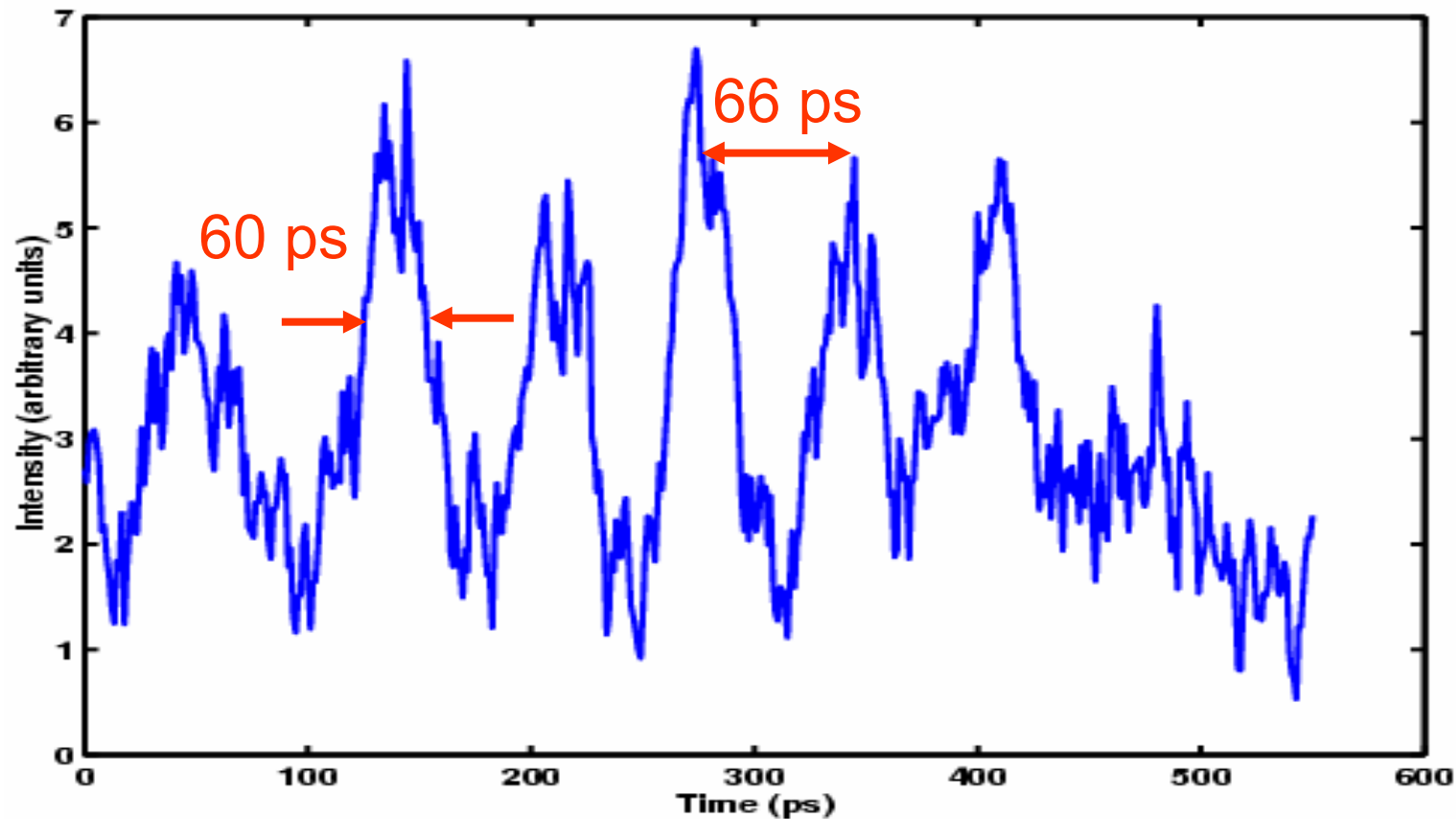
- 😊 Measured averaged profile:  
fits to gaussian with a width of 12.5 ns (as expected)



# Structure in the Longitudinal Profile

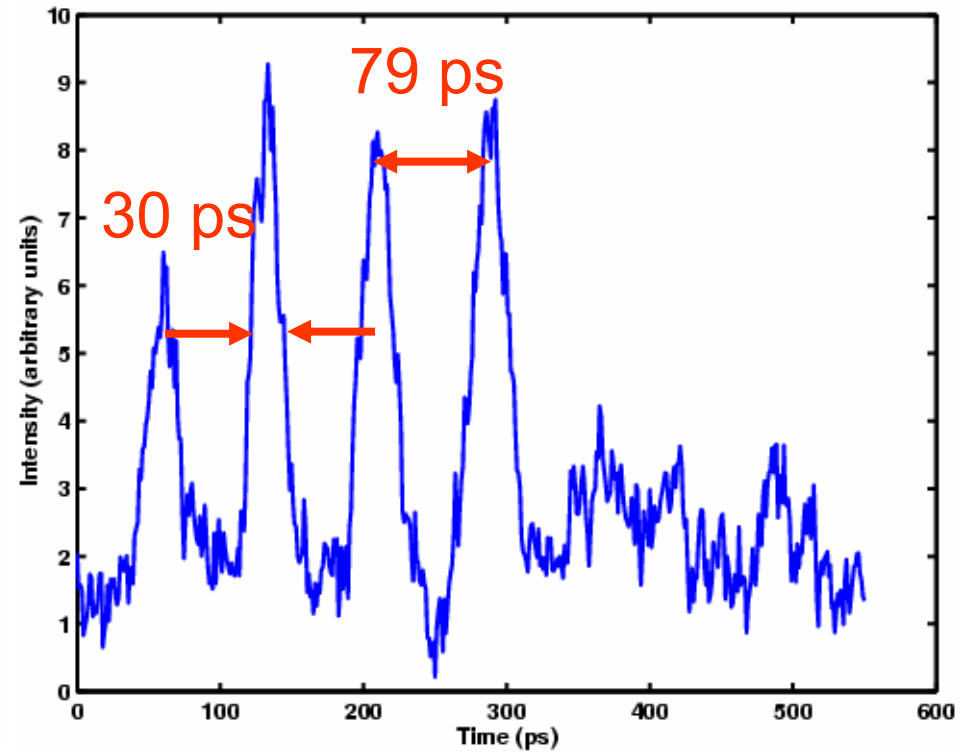
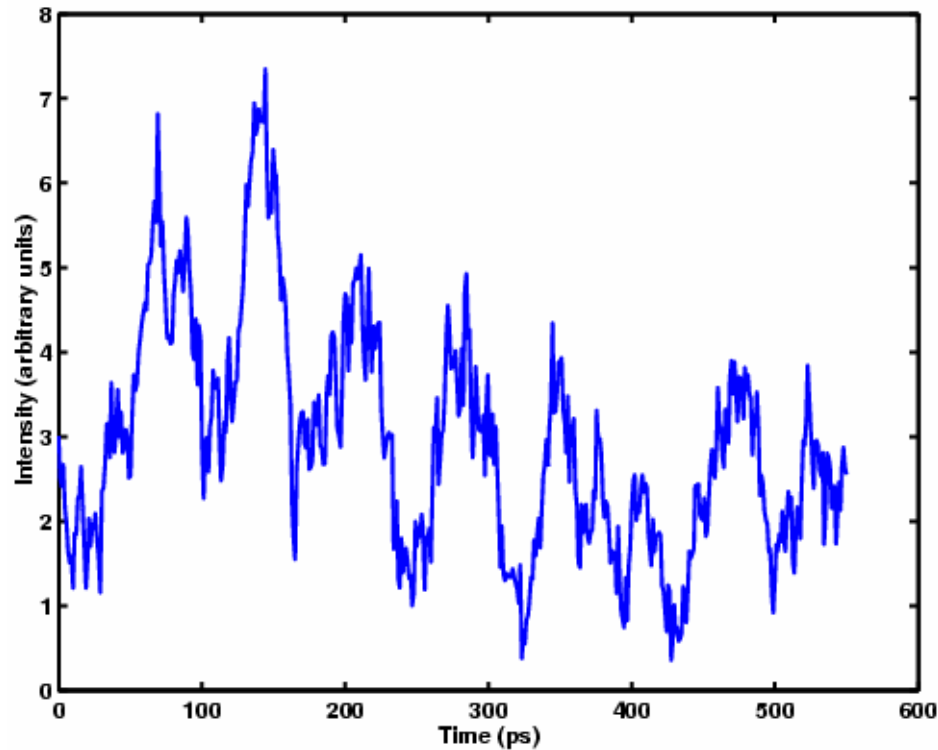
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- ☺ Example of a single shot measurement of the profile  
500 ps window, resolution 5 ps



# Unfortunately, the structure is not stable

- ☺ The longitudinal structure is due to longitudinal mode beating – this has been expected
- ☺ The beating changes from shot to shot



# Summary

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- 😊 As expected for a this type of laser, the longitudinal profile shows substructure due to mode beating
- 😊 The spikes have a width of 30 to 60 ps and a distance of 60 to 80 ps
- 😊 Unfortunately, the structure is not stable and changes from shot to shot
- 😊 To overcome this, the laser has to be equipped with a frequency stabilized seed laser or eventually with an Etalon