

PITZ Physics Seminar

Low-charged bunch profile measurements as temporal laser pulse diagnostics: A brief comparison

Raffael Niemczyk
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TDS laser diagnostics

Tackling lack of temporal laser diagnostics

> Claim:

‘Low-charged (~ 5 pC) TDS measurement with Gun @ MMMG-6deg yields temporal laser profile’

- > AFAIK, this credo was believed since I joined PITZ¹
- > When OSS broken (unfortunately, most of time): TDS measurement for laser characterisation
 - > This number was then used in RC meetings, therefore in M-Meeting, in PhD thesis/theses
- > James’ defense: FG: ‘I like having a simulation curve next to it’
 - > I went on and simulated this measurement, to verify this

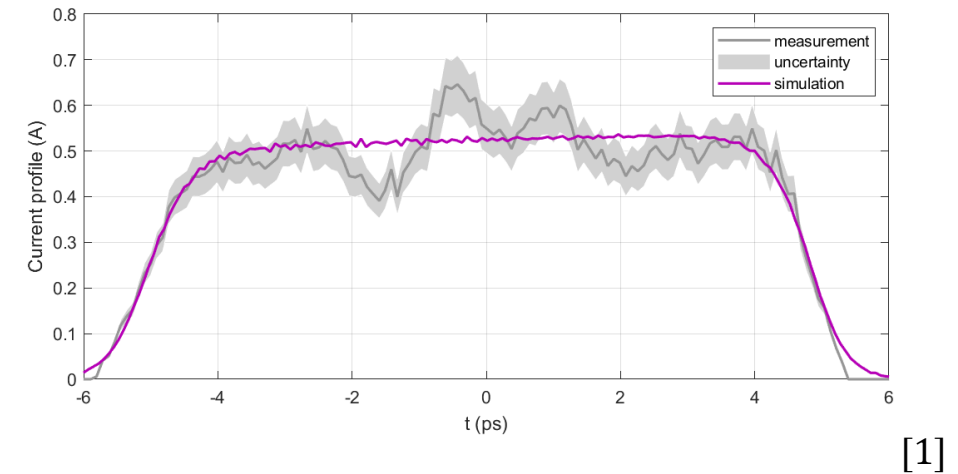
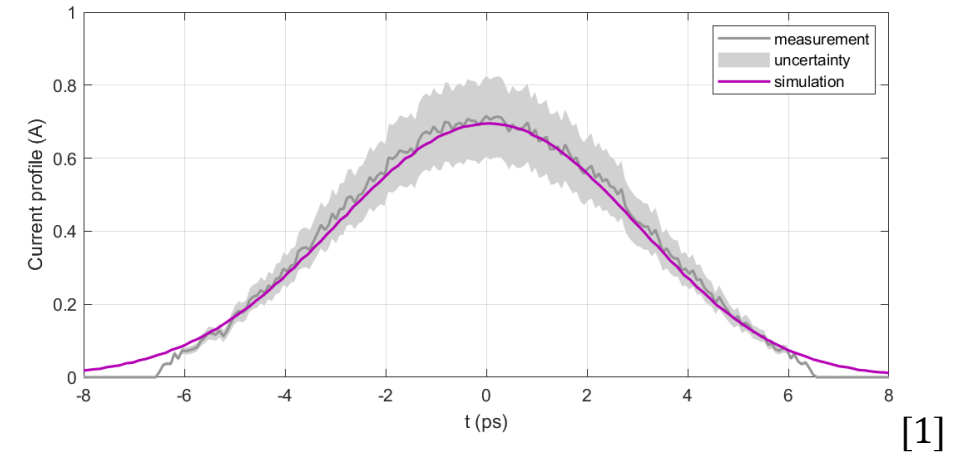
¹ May 2017

Simulation of low-charged TDS measurement

Is the temporal laser pulse shape and length conserved with low charge?

- > First case: Temporal Gaussian laser pulse
 - > Measured at MMMG phase, with 5 pC
 - > Bunch undergoes rf compression
 - > Electron bunch length = (6.9 ± 0.1) ps FWHM
 - > Matching laser pulse length = 7.9 ps FWHM
 - > Pulse length are NOT matching

- > Second case: Temporal flattop laser pulse
 - > Measured at MMMG – 6 deg, with 5 pC
 - > Electron bunch length = (9.3 ± 0.1) ps FWHM
 - > Matching laser pulse length = 10.4 ps FWHM
 - > Pulse length still NOT matching



→ It is not okay to say the numbers are same, we need to do a simulation.
But: Method can be used for laser pulse characterisation

[1] R. Niemczyk, PhD thesis (2021)