

# The Photo Injector Test facility at DESY Zeuthen (PITZ):

Results of the first phase  
Recent developments  
Future plans



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# Results of PITZ

## RF conditioning

max. parameters reached 2003:

10 Hz, 900  $\mu$ s RF, 3.3 MW input peak power

→ max. gradient at cathode  $\sim$ 42 MV/m

→ 0.9% duty cycle

→ 27 kW average power

parameters reached 2004:

up to 1300  $\mu$ s RF → 1.3% duty cycle

max input peak power 4 MW

max. average power 33 kW

## Studies on

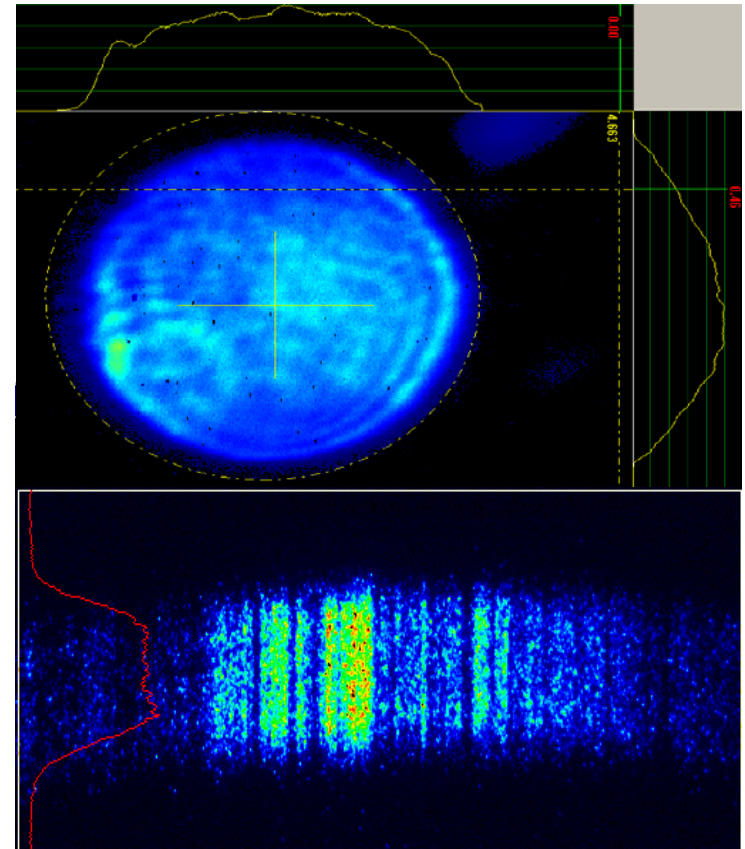
- dark current
- photo cathodes
- charge production

## Laser parameters

flat-top like longitudinal profile

$\sim$ 23 ps FWHM,  $\sim$ 6 ps fall/rise times,

homogeneous circular transverse profile

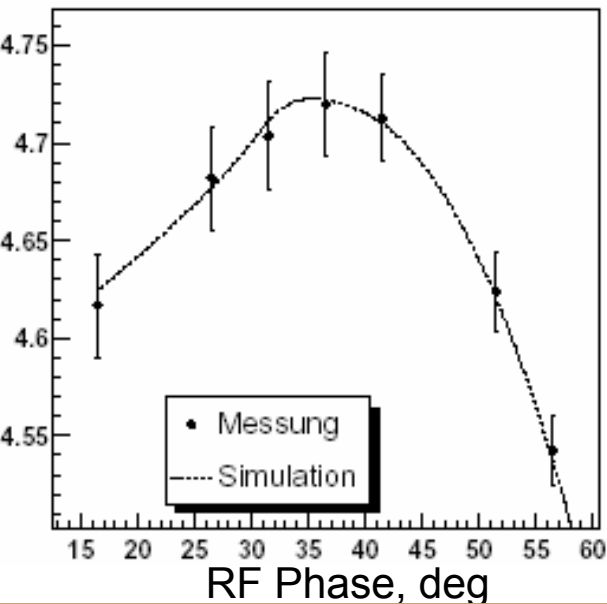




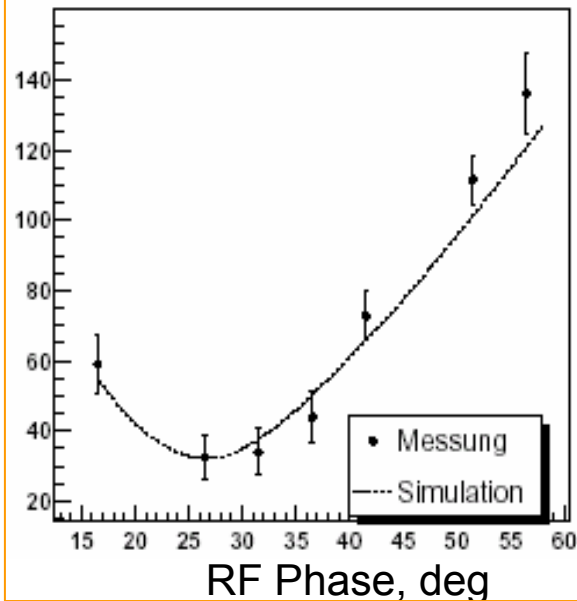
# Results of PITZ

## Longitudinal phase space measurements of 2003:

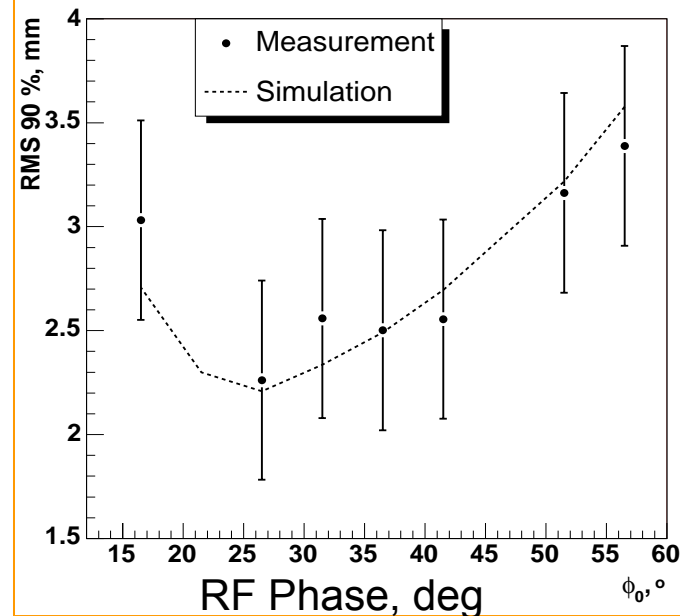
**Maximum mean momentum: 4.72 MeV/c**



**Minimum momentum spread: 33 keV/c**



**Minimum bunch length:  $(21.04 \pm 0.45_{\text{stat}} \pm 4.14_{\text{syst}})$ ps**



## Recent results (2004):

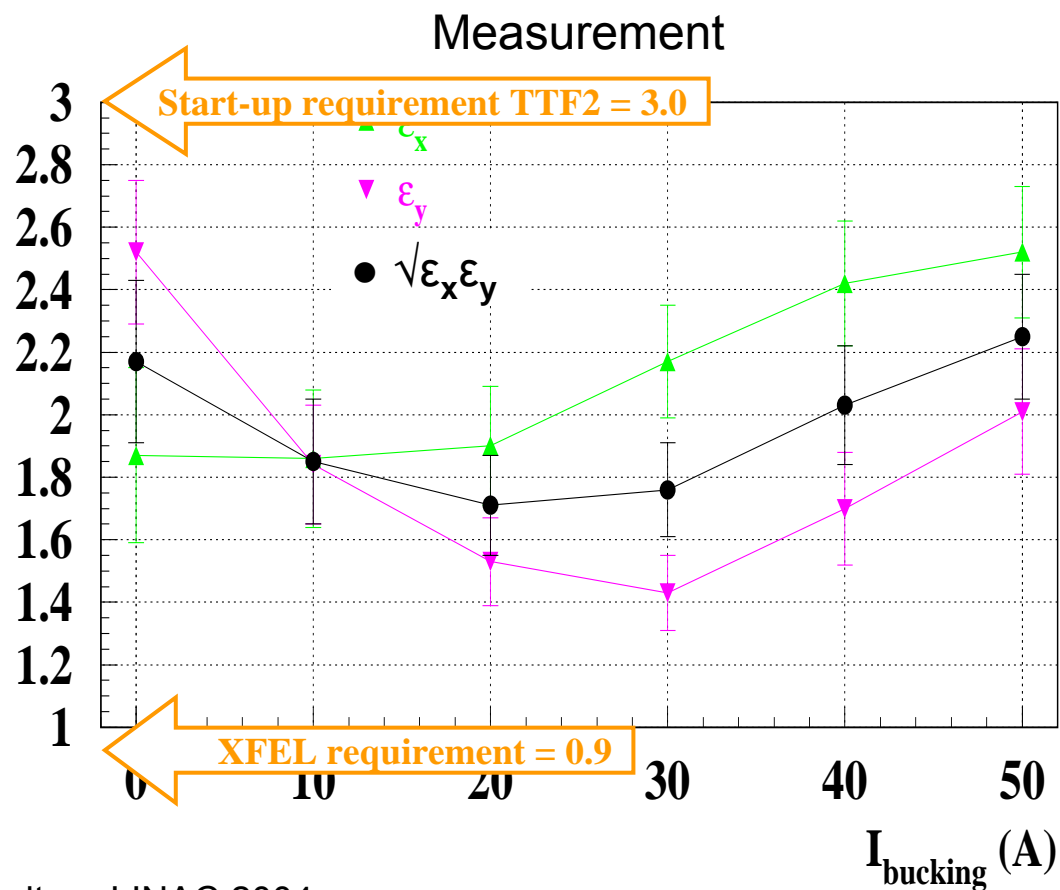
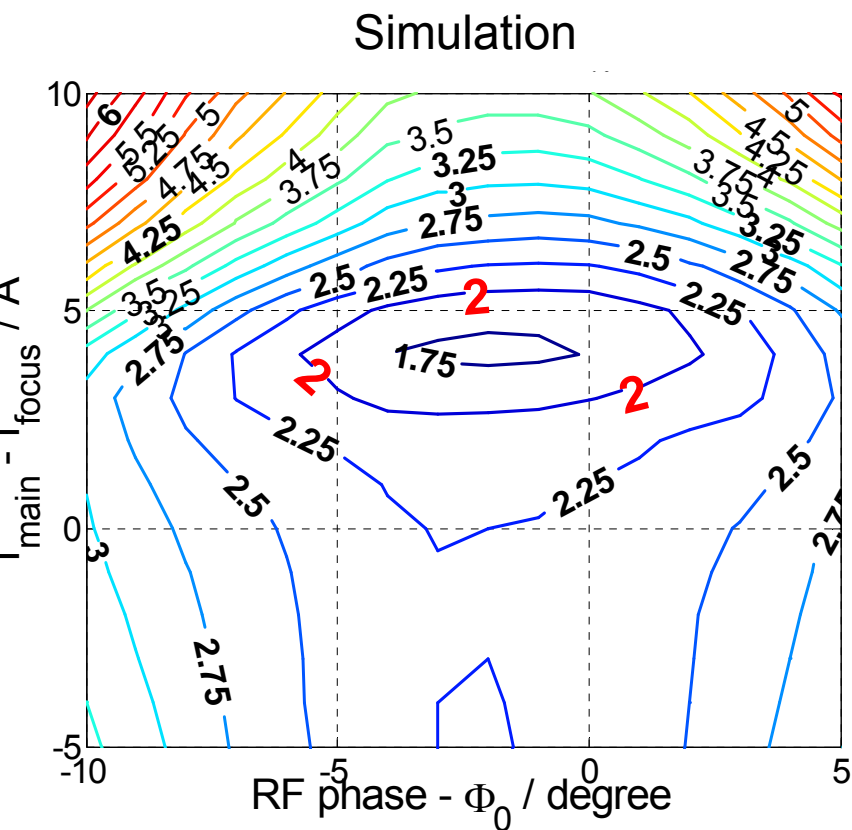
max. mean momentum: 5.22 MeV/c  
min. momentum spread reduced  
bunch length measurement ongoing

# Results of PITZ

## Emittance measurements:

2003 - min. normalized projected transverse emittance  $\sqrt{\epsilon_x \epsilon_y} = 1.7 \pi$  mm mrad

2004 -  $2.5 \pi$  mm mrad reached, parameter space optimization ongoing



# Future of PITZ

## PITZ2

study the emittance conservation principle

→ install a booster cavity and a new diagnostics beamline

optimization of the photo injector and all subsystems

→ laser development, new guns, photocathodes and BD simulation tools

