τ mass measurement
at
BES III

Niklaus Berger

Institut für Kernphysik, Johannes-Gutenberg Universität Mainz

JG|U

Particle Physics
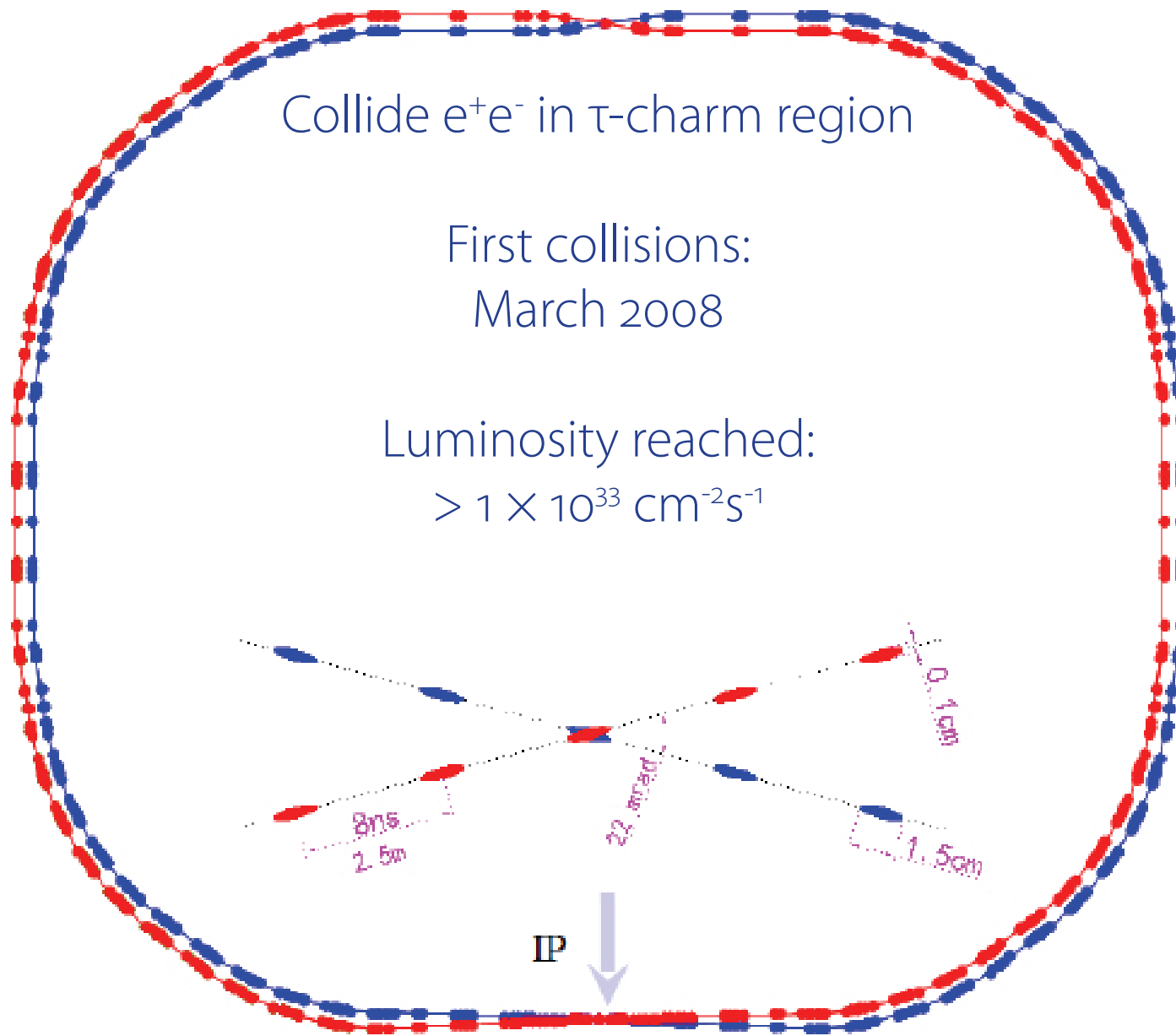Summer 2016

Cluster of Excellence Precision Physics,
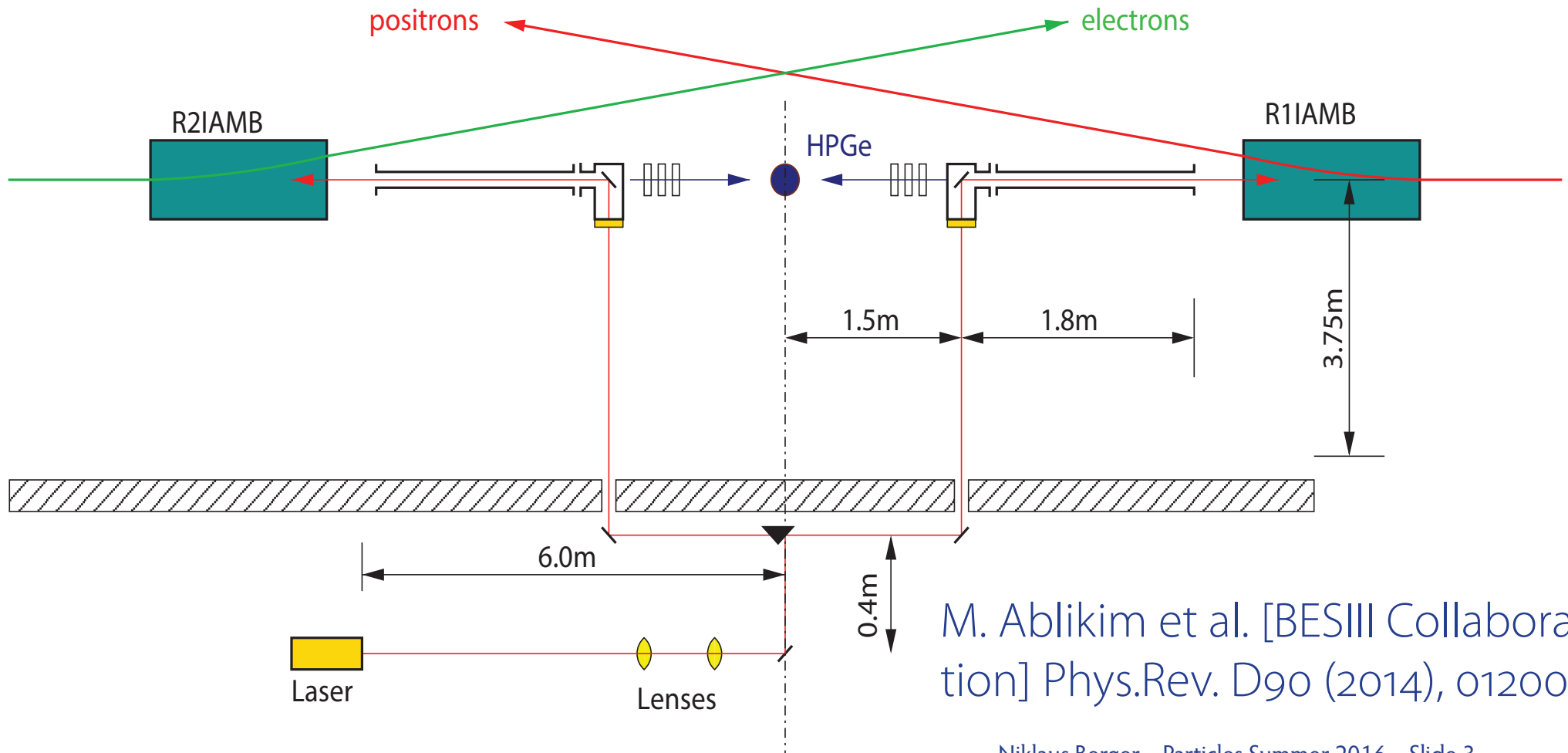Fundamental Interactions and Structure of Matter

PRiSMA

BEPC II

Collide e^+e^- in τ-charm region

First collisions:
March 2008

Luminosity reached:
$> 1 \times 10^{33}$ cm^{-2}s^{-1}

IP

0.1cm

22.mrad

8ns
2.5m

1.5cm

Beam energy measurement

- Compton scattering of laser light by beam particles
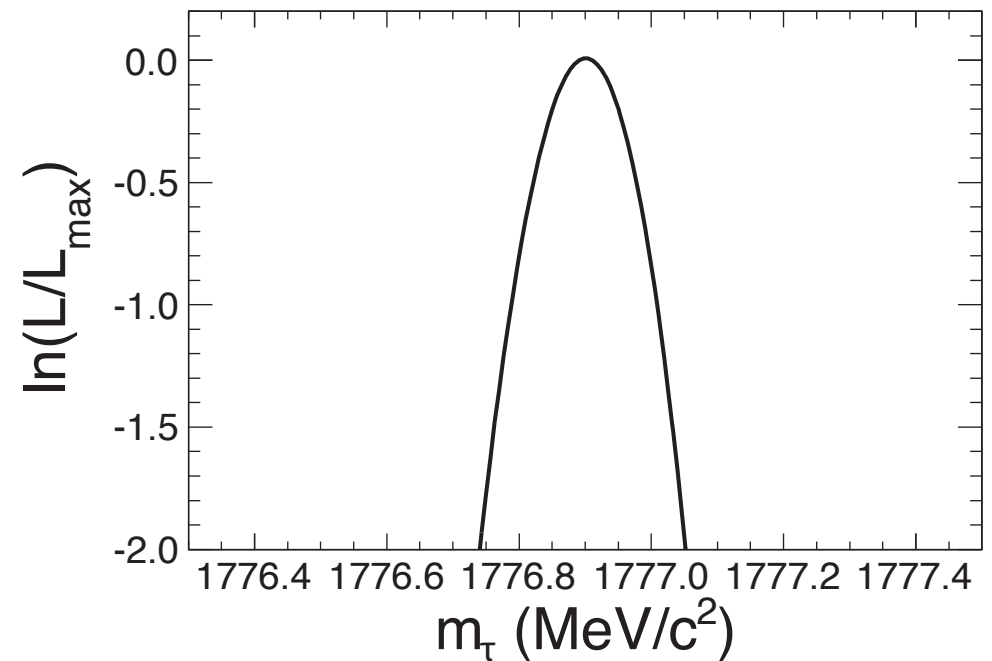
- Detection of high energy γs with germanium detector

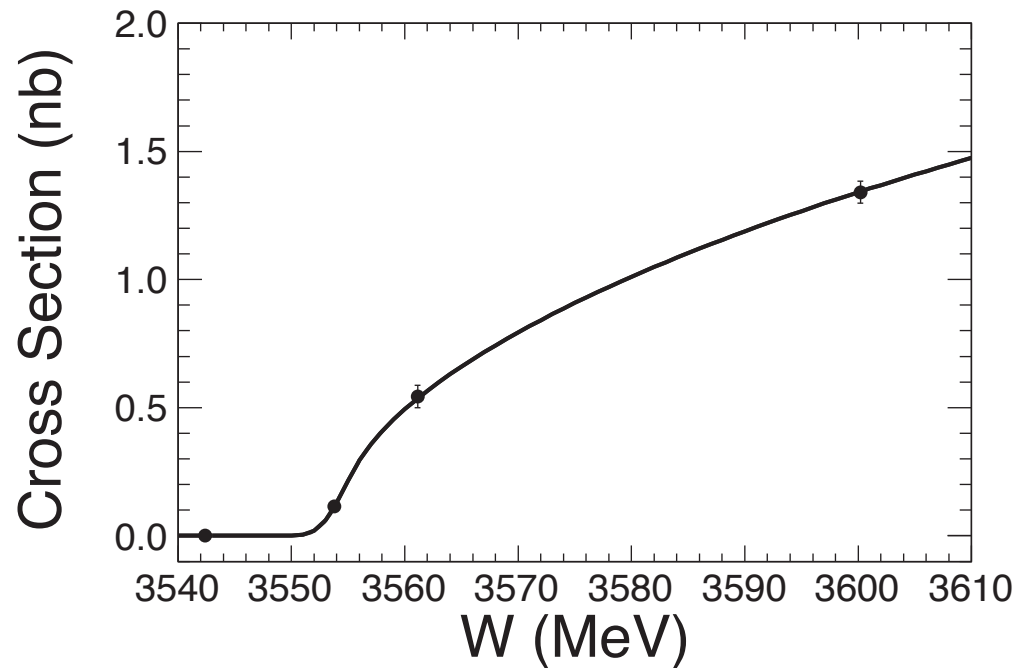M. Ablikim et al. [BESIII Collaboration] Phys.Rev. D90 (2014), 012001

τ mass measurement

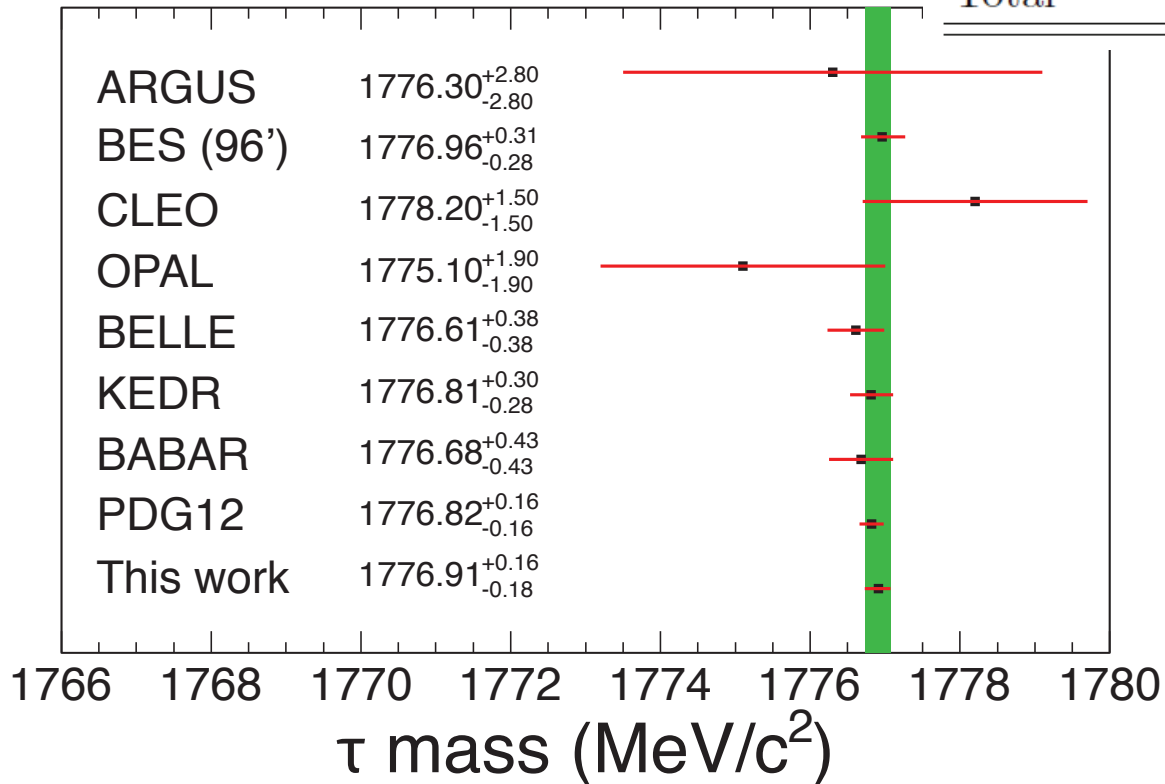- Count τs as a function of W = √s

- Fit theoretical curve

M. Ablikim et al. [BESIII Collabora-
tion] Phys.Rev. D90 (2014), 012001

Uncertainties

TABLE VIII: Summary of the τ mass systematic errors.

Source	Δm_τ (MeV/c^2)
Theoretical accuracy	0.010
Energy scale	$+0.022$ -0.086
Energy spread	0.016
Luminosity	0.006
Cut on number of good photons	0.002
Cuts on PTEM and acoplanarity angle	0.05
mis-ID efficiency	0.048
Background shape	0.04
Fitted efficiency parameter	$+0.038$ -0.034
Total	$+0.094$ -0.124

ARGUS	$1776.30^{+2.80}_{-2.80}$
BES (96')	$1776.96^{+0.31}_{-0.28}$
CLEO	$1778.20^{+1.50}_{-1.50}$
OPAL	$1775.10^{+1.90}_{-1.90}$
BELLE	$1776.61^{+0.38}_{-0.38}$
KEDR	$1776.81^{+0.30}_{-0.28}$
BABAR	$1776.68^{+0.43}_{-0.43}$
PDG12	$1776.82^{+0.16}_{-0.16}$
This work	$1776.91^{+0.16}_{-0.18}$

τ mass (MeV/c^2)

M. Ablikim et al. [BESIII Collaboration] Phys.Rev. D90 (2014), 012001