4th International Workshop on Depfet Detectors and Applications

Main Subject:

PXD @ Belle-II

Agenda Monday

Breakfast 8:00

08:00

09:00 **Vertexing/Tracking Performance - Simulation and Parameter Definition**
Conveners: Prof. Christian Kiesling (MPI for Physics)
(Lecture Room: 09:00 - 10:30)

10:00

Coffee / Tea Break
(Foyer: 10:30 - 11:00)

11:00 **DEPFET Pixel Cell**
Conveners: Rainer Richter (MPI)
(Lecture Room: 11:00 - 12:30)

12:00

Lunch
(Dining Room: 12:30 - 14:00)

13:00

Lunch 12:30

14:00 **ASIC Design and Testresults**
Conveners: Prof. Peter Fischer (Heidelberg University)
(Lecture Room: 14:00 - 16:00)

15:00

16:00 **Coffee / Tea Break**
(Foyer: 16:00 - 16:30)

Interface to Belle II and Discussion
17:00 Conveners: Hans-Guenther Moser (MPI)
(Lecture Room: 16:30 - 18:00)

Dinner 18:30

18:00

19:00

20:00 [72] **IB-Meeting**
(Lecture Room 2: 20:00 - 22:00)

Agenda Tuesday

Breakfast 8:00

09:00 **Interconnection / Module Design / DHH**
Conveners: Laci Andricek (HLL Munich)
(Lecture Room: 09:00 - 10:30)

10:00

Coffee / Tea Break
(Foyer: 10:30 - 11:00)

11:00 **Thermal & Mechanical Investigations, PXD Support**
Conveners: Dr. Hans Jürgen Simonis (IEKP Uni-Karlsruhe)
(Lecture Room: 11:00 - 12:30)

12:00

Lunch
13:00 (Lecture Room: 12:30 - 14:00)

Lunch 12:30

14:00 **Testsystems**
Conveners: Jelena Ninkovic (MPP)
(Lecture Room: 14:00 - 15:30)

15:00

Coffee / Tea Break
(Lecture Room: 15:30 - 16:00)

16:00 **Test Beams - Results and Plans**
Conveners: Dr. Marcel Vos (IFIC Valencia)
(Lecture Room: 16:00 - 17:40)

17:00

Dinner 18:30

18:00

Agenda Wednesday

Breakfast 8:00

08:00	
09:00	**Discussion/Contingency** (Lecture Room: 09:00 - 11:00)
10:00	
11:00	**Coffee / Tea Break** (Foyer: 11:00 - 11:30)
12:00	**AOB** (Lecture Room: 11:30 - 12:30)
13:00	**Lunch** (Dining Hall: 12:30 - 13:30)

Lunch 12:30

PXD Simulations and Parameter Definitions

Mission:

Determine ladder arrangement, pixel geometries, sensor thickness

- use realistic simulations of the Belle-II tracking system (PXD, SVD, CDC)
- adapt ILC-framework to Belle-II (and Belle)
- set up a task force to improve low momentum tracking

Completed: (Barcelona, Prague)

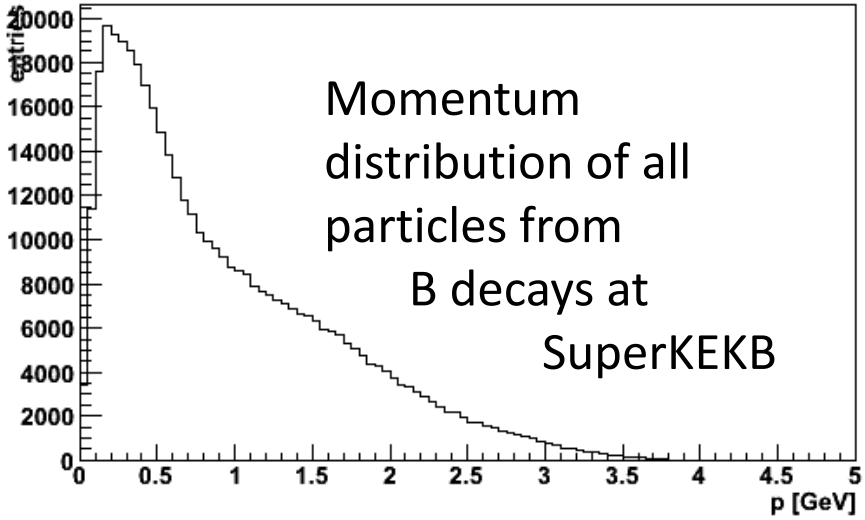
- ladder arrangement: 2 layers @ 1.4 & 2.2 cm radius, 8 & 12 ladders
- constant pixel size (50 µm x 50 µm, 50 µm x 75 µm)

To do in this Workshop:

- fix the sensor thickness (50 µm or more, if so how much?)

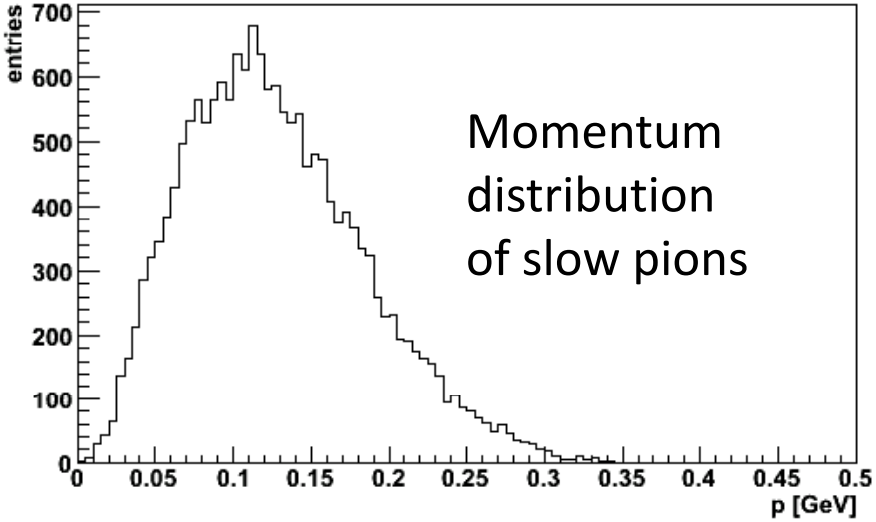
Which Physics to Optimize for?

Gen: Charged Particles ($e^{\pm}$, $\mu^{\pm}$, $\pi^{\pm}$, $K^{\pm}$, $p^{\pm}$)



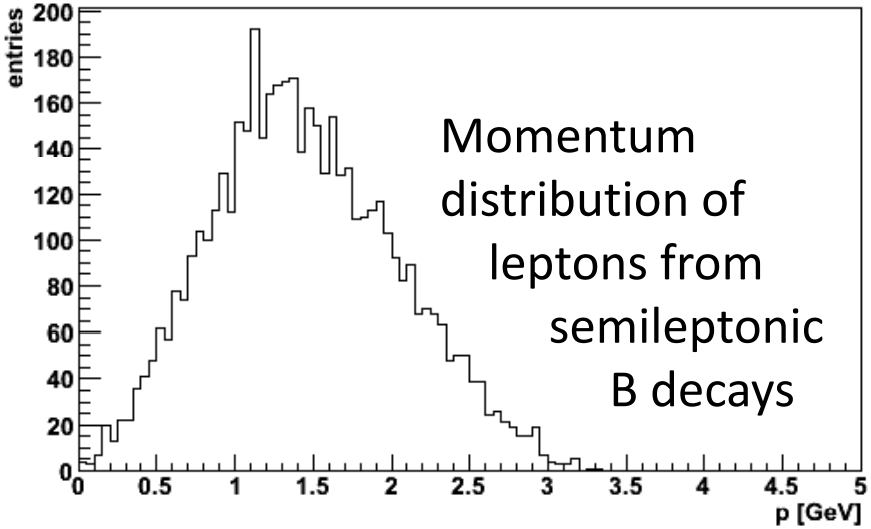
Momentum distribution of all particles from B decays at SuperKEKB

Gen: $\pi^{*\pm}(D^{*\pm})$



Momentum distribution of slow pions

Gen: $e^{\pm}(B^0)$



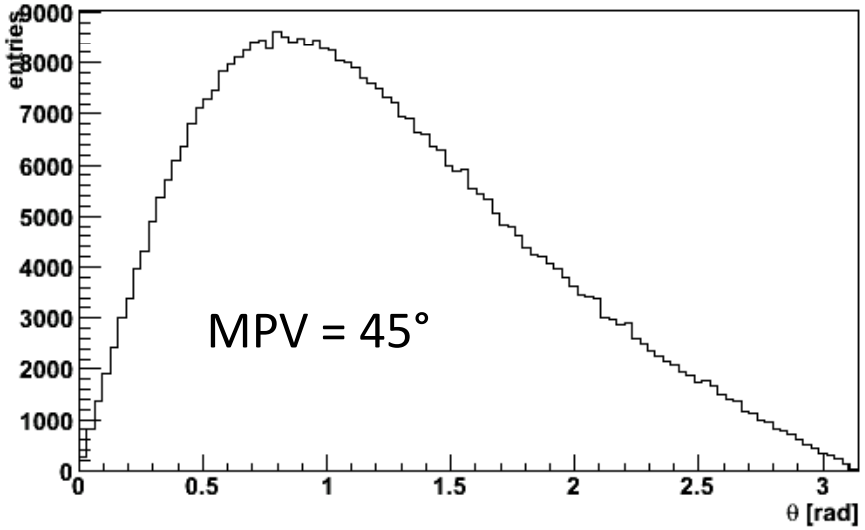
Momentum distribution of leptons from semileptonic B decays

Particles generally have low momenta (~ 500 MeV on average)

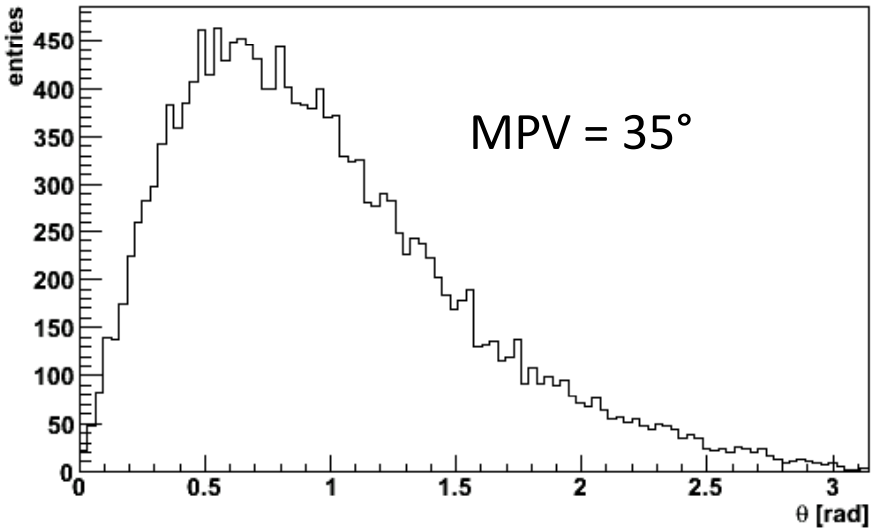
slow pions and leptons important for tagging the flavor of the B decays (CP measurements)

Which Physics to Optimize for? (cont.)

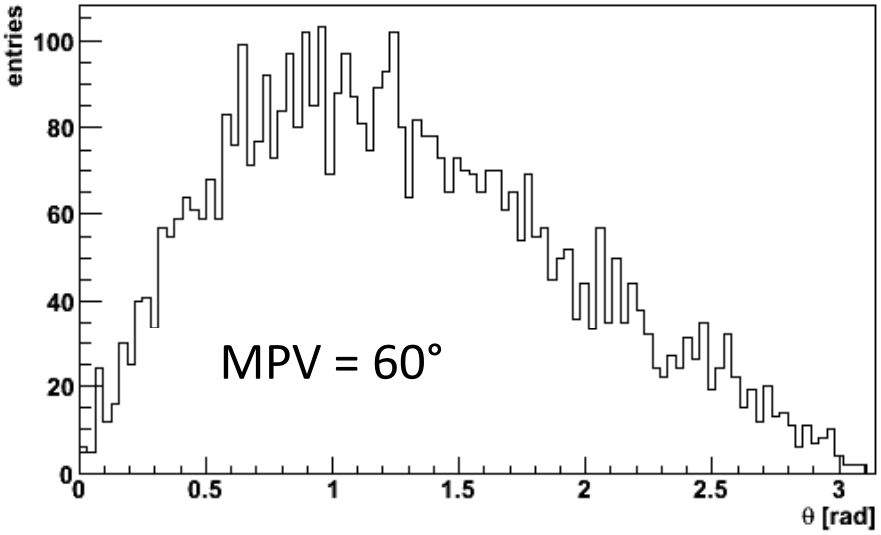
Gen: Charged Particles ($e^{\pm}$, $\mu^{\pm}$, $\pi^{\pm}$, $K^{\pm}$, $p^{\pm}$)



Gen: $\pi^{*\pm}(D^{*\pm})$



Gen:$e^{\pm}(B^0)$



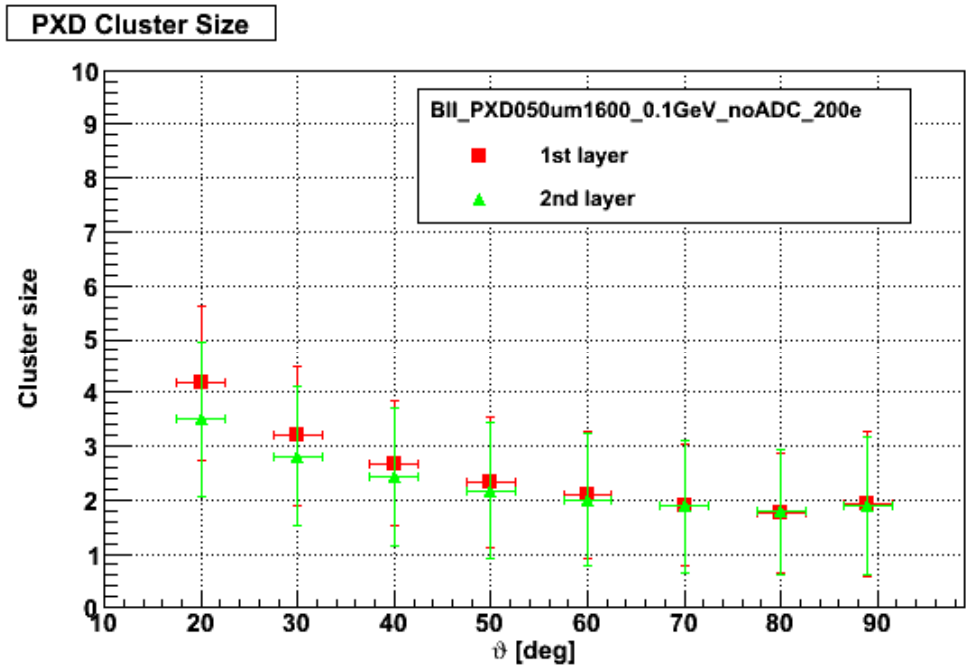
Particles generally go „forward“
(due to Lorentz boost)

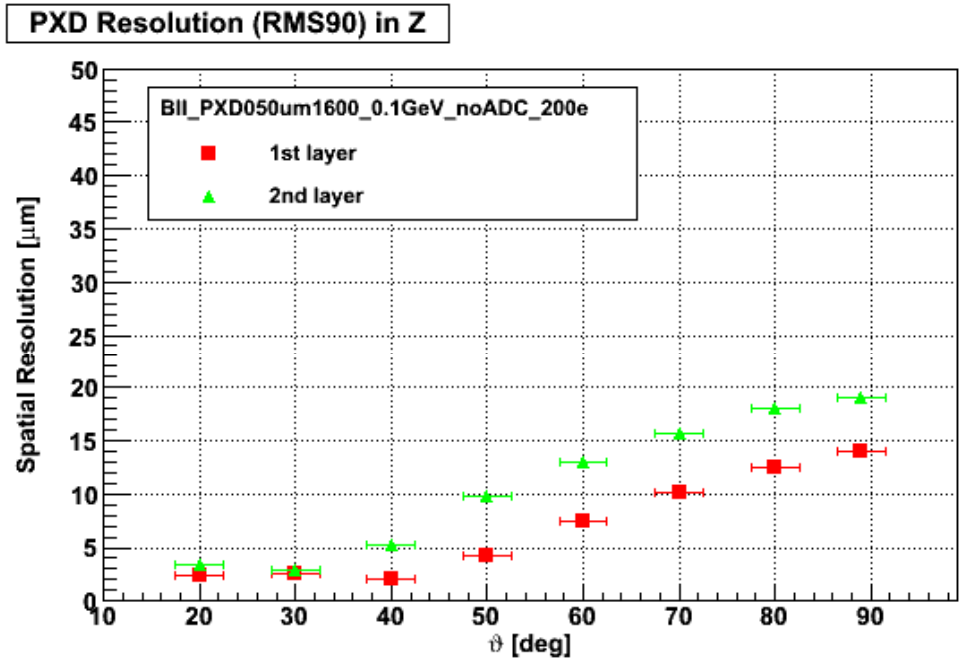
slow pions: MPV @ 35°
leptons: MPV @ 60°

Sensor Thickness

„thinner“ sensors: low multiple scattering, low occupancy

„thicker“ sensors: larger S/N (> 25 desired), better mechanical stability, less risk



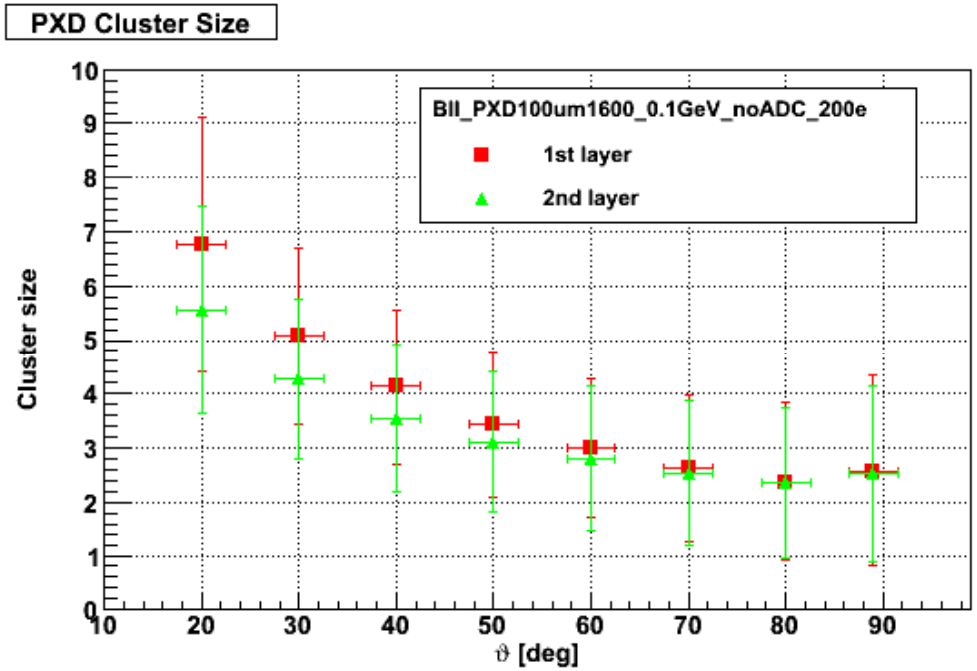


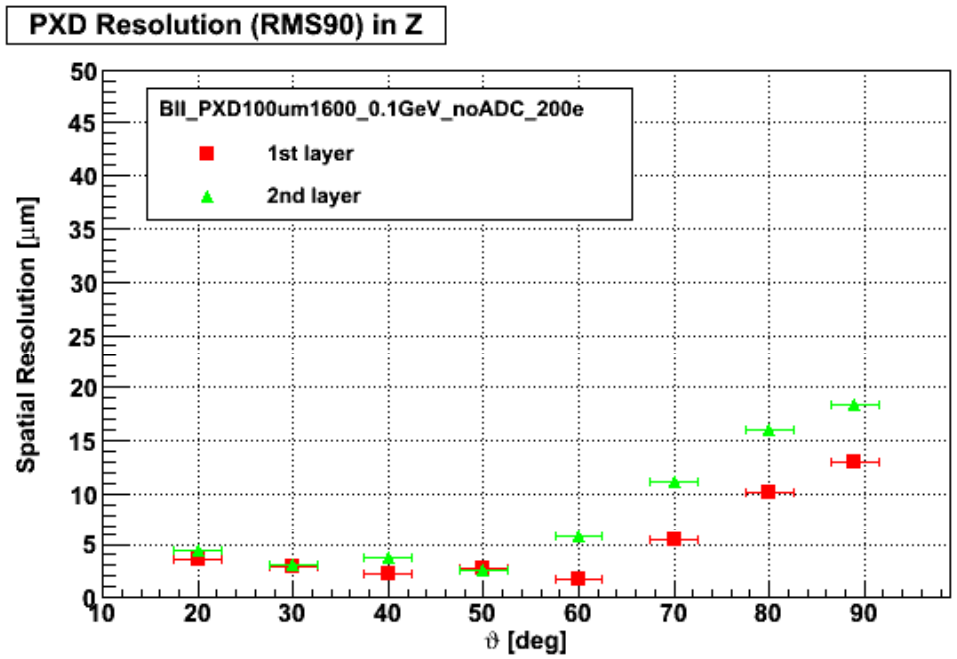
DEPFET thinned down to 50 µm

Sensor Thickness (cont.)

„thinner“ sensors: low multiple scattering, low occupancy

„thicker“ sensors: larger S/N (> 25 desired), better mechanical stability, less risk





DEPFET thinned down to 100 µm

see talks by Kolja, Burkard and Oksana

Occupancy is an Issue!

- SuperB QED simulations (Frascati workshop): 10MHz/cm^2

  they use the BDK generator

  yields 1.5 % occupancy for PXD (inner layer)

  this is dangerously close to the „limit“ of 2 %!

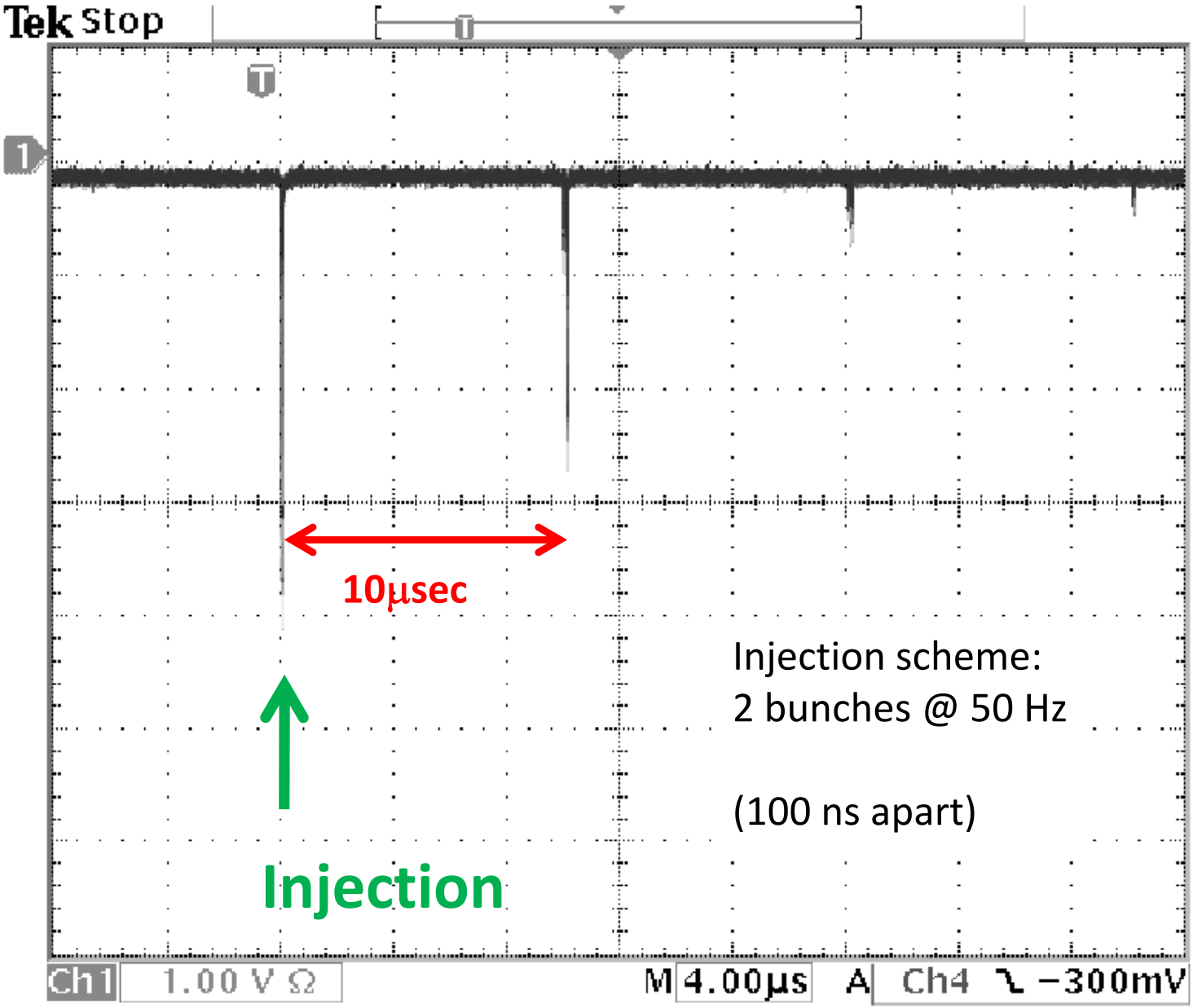
- Set of MCs studied:

  KoralW gives result inconsistent with SuperB simulations
  (~ order of magnitude smaller!)

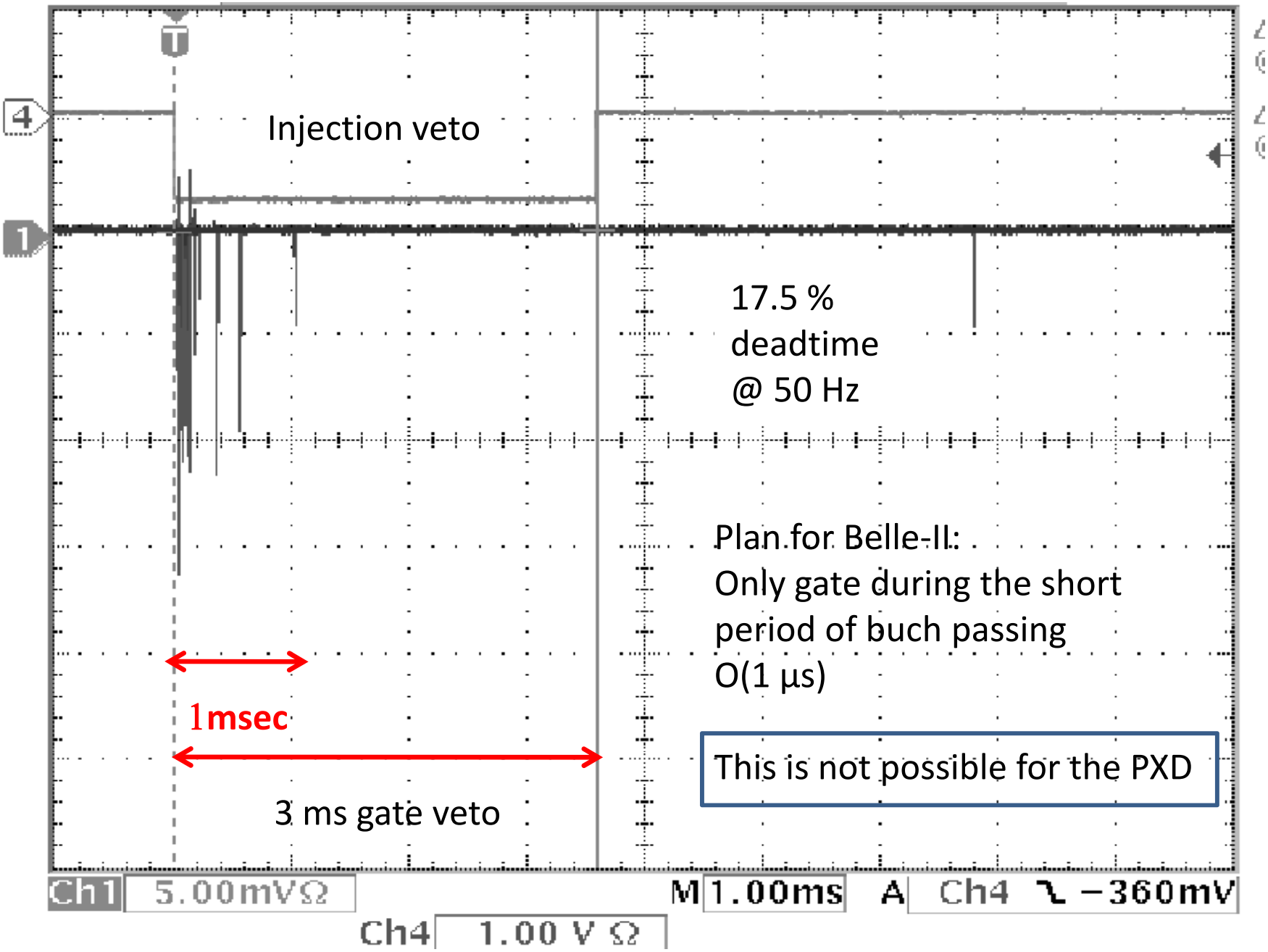
- Do beam tests with Belle to settle the question

see talk by Elena

Injection at SuperKEKB



Injection at SuperKEKB (cont.)



Backup

Proposal for Exp. A (colliding / separated beams)

Random trigger rate: 100 Hz

Bhabha trigger rate: 50 Hz

adjust prescale at nominal, but moderate luminosity.

It would be sufficient to run with 5 /nb s (normal running: ~ 15-20 /nbs)

Run unit: 200 k triggers at 100 Hz = 1hour

8 run units (4 with colliding, 4 with separated beams)

Together with setup for beams: 2 full shifts

Proposal for Exp. B (change beam size)

Random trigger rate: 100 Hz

Bhabha trigger rate: 50 Hz

adjust prescale at nominal, but moderate luminosity.

It would be sufficient to run with 10 /nb s

Run unit: 200 k triggers at 100 Hz = 1hour (including beam setup)

4 run units with decreasing lumi:

10, 8, 6, 4 /nb s
200 300 400 500

Together with setup for beams: 1 full shift

Proposal for Exp. C (change beam current)

Random trigger rate: 100 Hz

Bhabha trigger rate: 50 Hz

adjust prescale at nominal, but moderate luminosity.

It would be sufficient to run with 10 /nb s

Run unit: 400 k triggers at 100 Hz = 1.5 hours (including beam setup)

5 run units with decreasing beam current
(changing number of filled bunches, default optics):

full machine, 3/4, 1/2, 1/4 , 1/6, 1/8

Together with setup for beams: 1 full shift