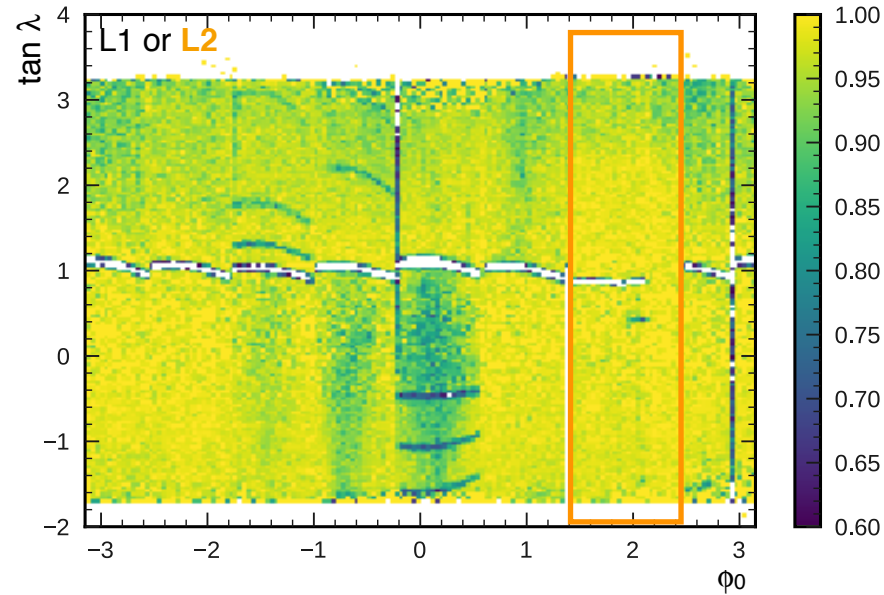


Issues of the Meeting

- Detector performance
 - reach next level in understanding to exploit full potential for physics
 - efficiency, reconstruction, alignment, resolution
- Readiness for coming autumn run period
 - establish sustainable operation scheme building on significantly improved online software
 - final goal: routine operation by CR shifter / PXD experts on-call
 - further optimise operation parameters $\Rightarrow$ improve overall availability and performance
 - establish routine operation with Gated Mode
- Radiation hardness
 - understand damage mechanisms during beam losses in May/June ($\rightarrow$ beam test in Mainz)
 - increase robustness against bursts & future accidents $\Rightarrow$ establish fast emergency ramp down
- PXD21
 - good progress but some delays in ladder assembly and sensor production (not yet critical)
 - very strong push from KEK management for early start of 2021 shutdown ($\sim$ February)
 - $\Rightarrow$ half shells have to be at KEK in a year from now
 - FWD: solve cable space issue and exploit options for improved shielding around bellows (CDC bkg)

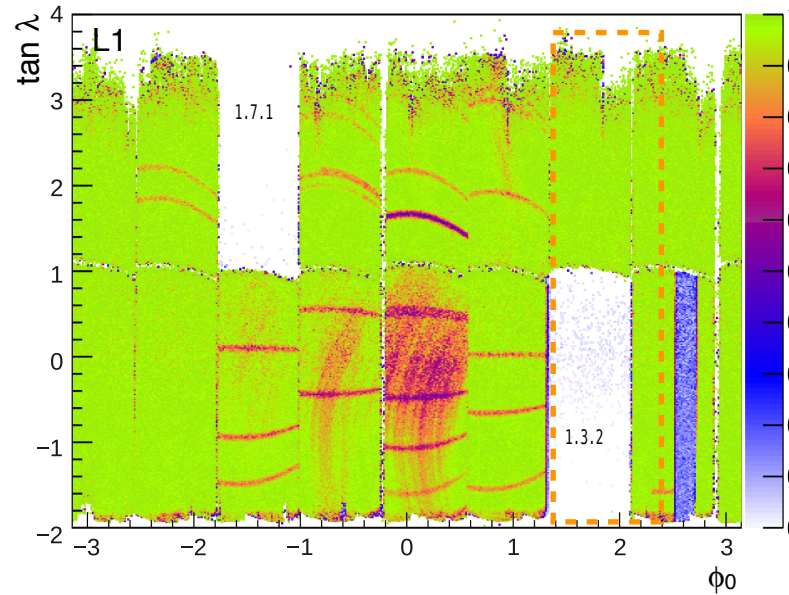
Evolution of PXD Status

May 21



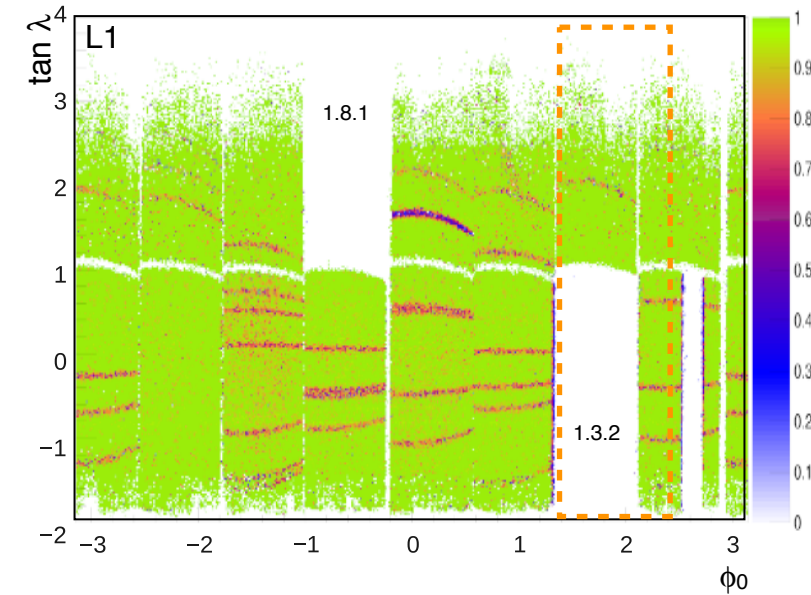
- Gaps between fwd & bwd modules and between half shells
- Several dead gates
- Few modules not yet at optimal working point
- Bad module 1.3.2 covered by module 2.4.2 in L2

After May 28



- 9 modules went into OVP
 - increased clear currents
- One module remained inoperable
 - 1.7.1 recovered only on Jun 7
- Many more dead gates
- Working point shifted further
- [Later lost one DHP link in 1.4.2]

After June 9

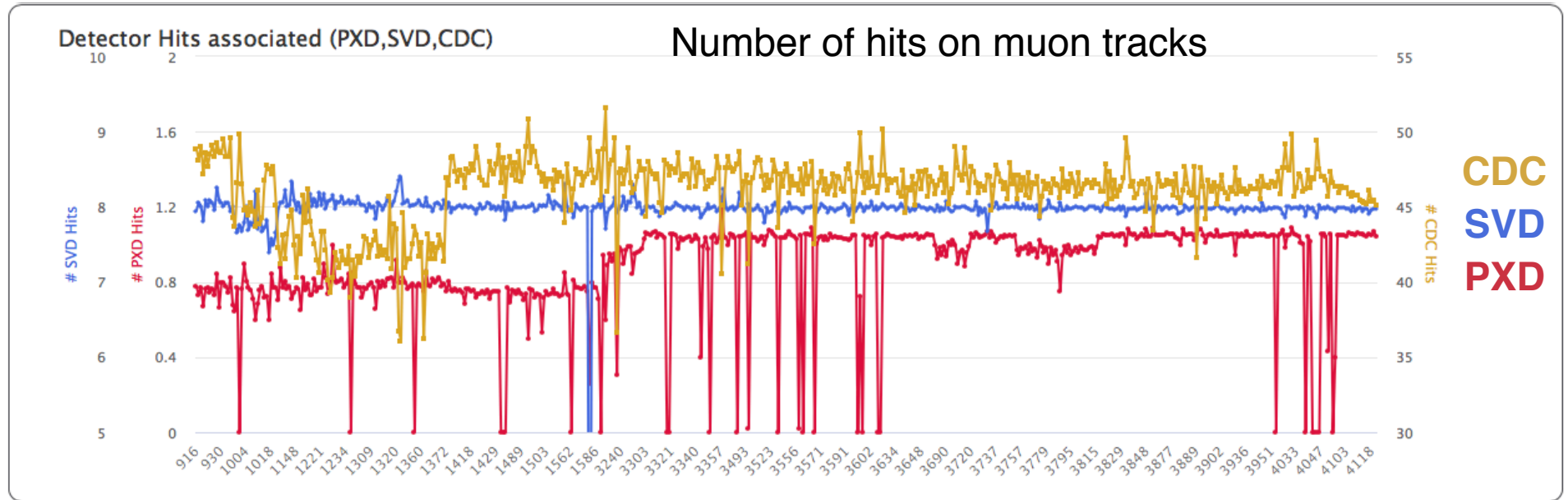


- LER lost ~ 150 mA within $40\mu\text{s} \Rightarrow$ damaged D02V1, QCSR quench and 3 rad accumulated dose
 - all modules triggered OVP
- Module 1.8.1 inoperable: current between clear and gate
- Many more dead gates (but a few were also recovered)

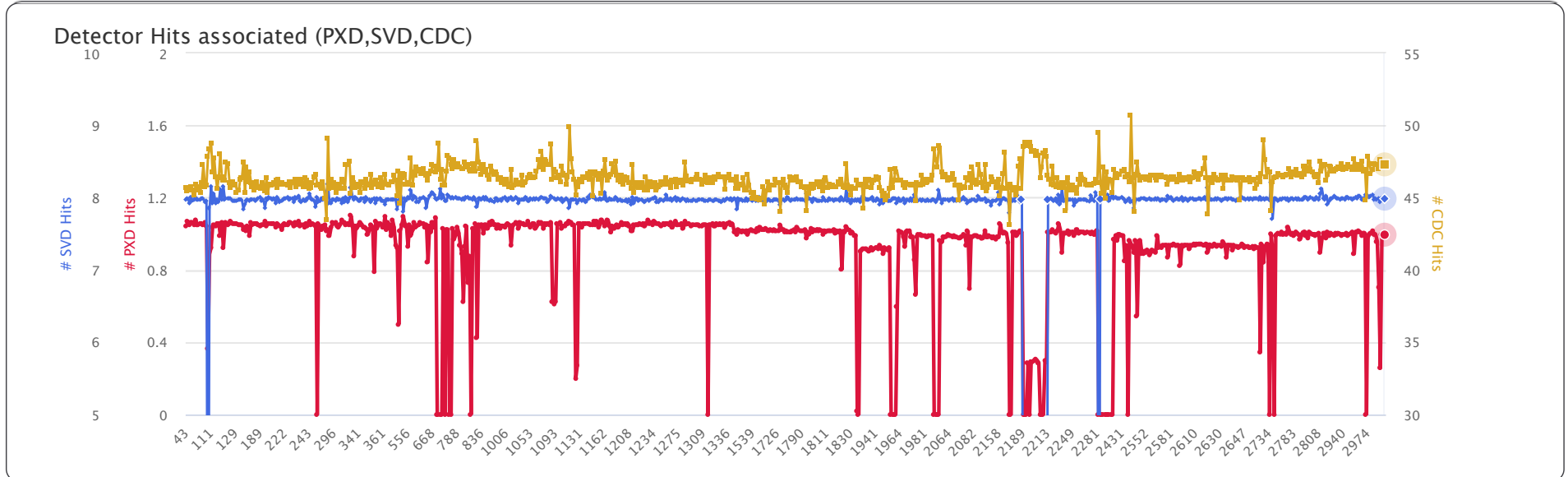
Evolution of PXD Performance in Phase 3.1

<https://mirabelle.belle2.org>

Experiment 7



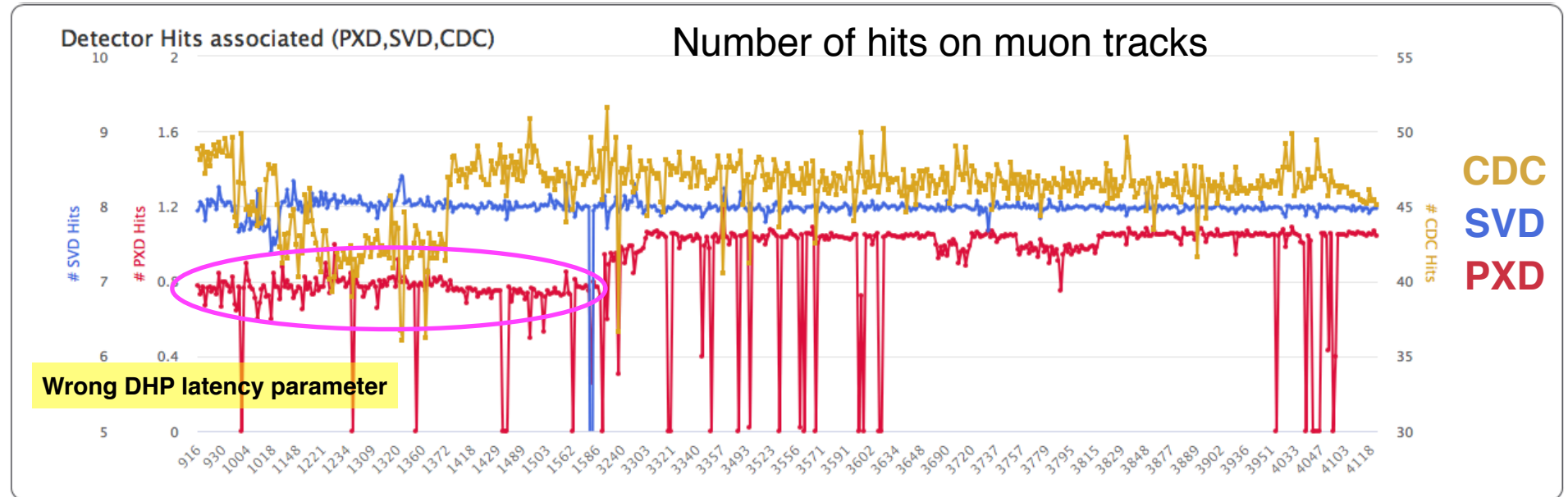
Experiment 8



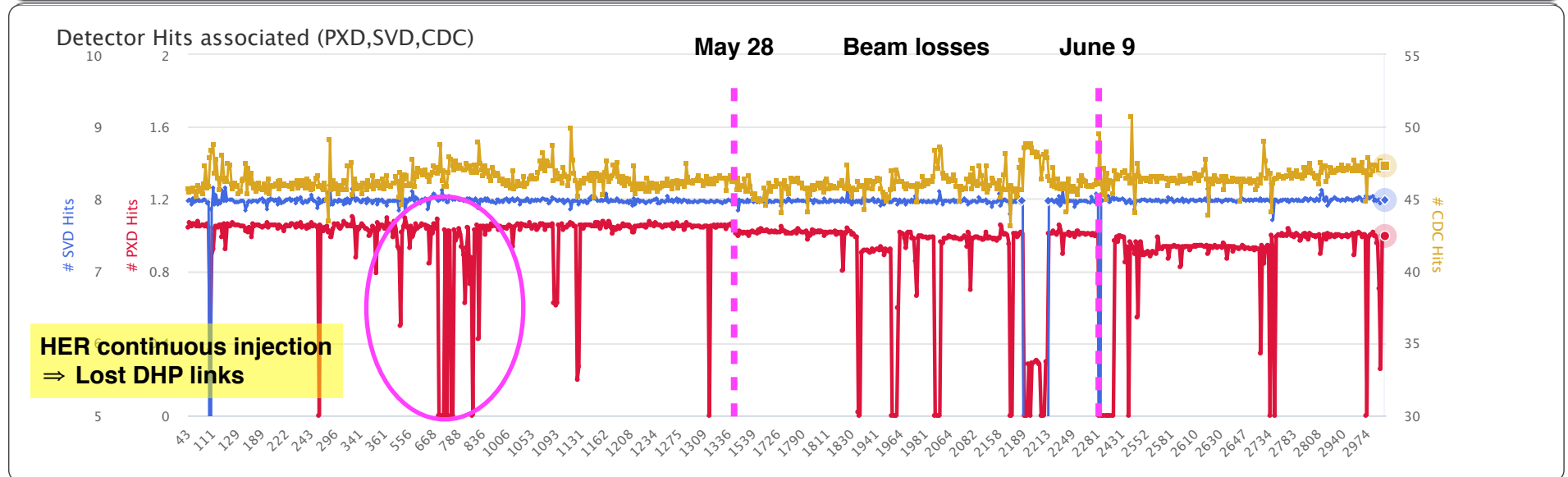
Evolution of PXD Performance in Phase 3.1

<https://mirabelle.belle2.org>

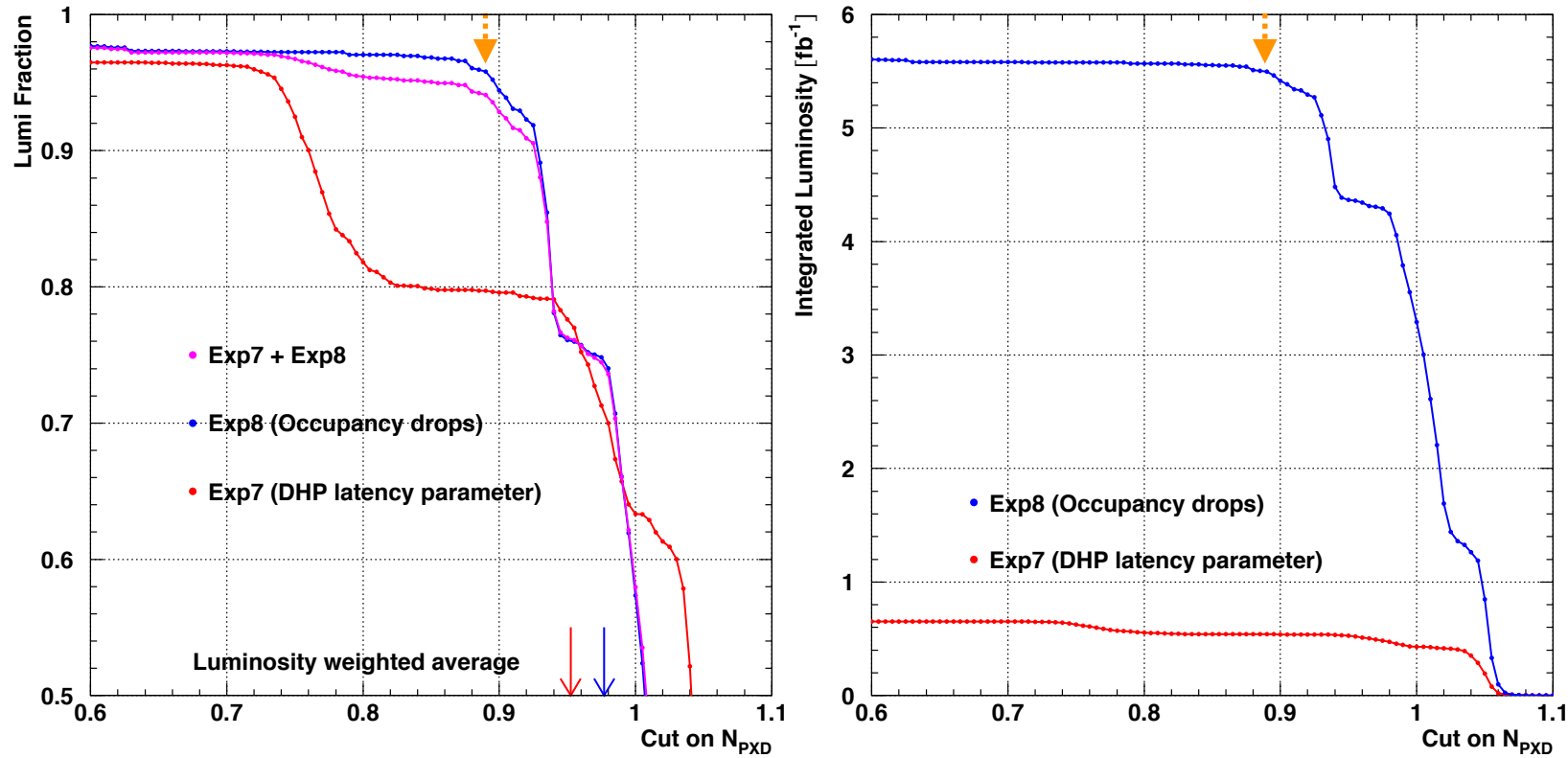
Experiment 7



Experiment 8



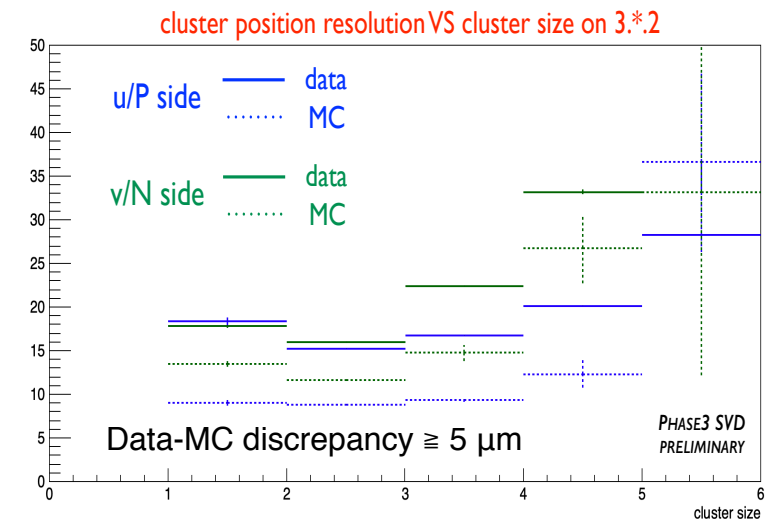
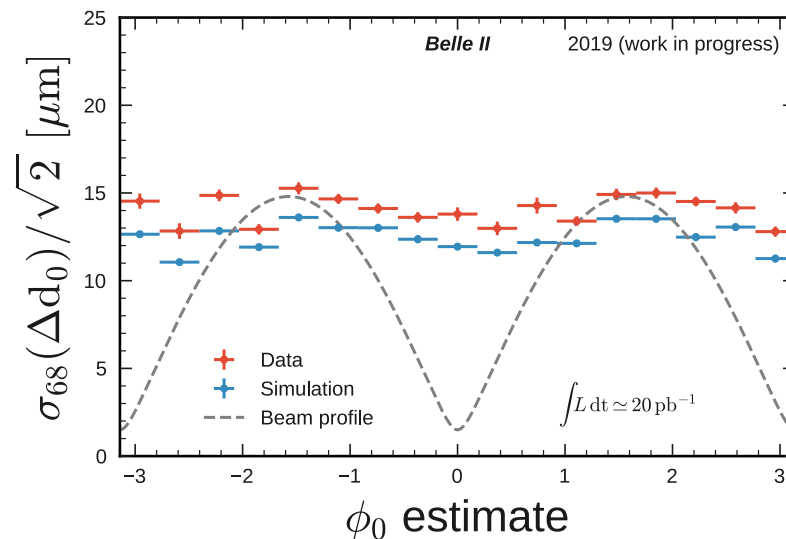
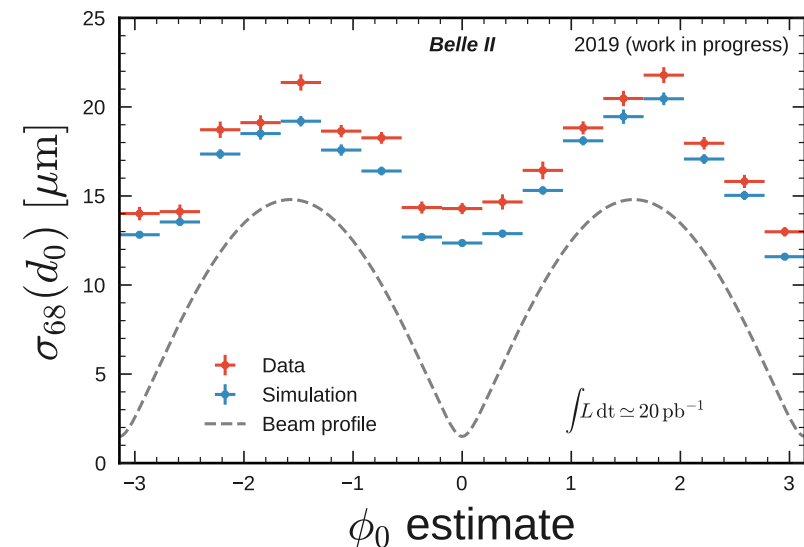
PXD Run Quality



Cut on NPXD	Experiment 7+8		Additional loss due to cut on NPXD	
	Lost Lumi	Fraction	Lost Lumi	Fraction
0	335,0	5,2 %	0,0	0,0 %
0,5	408,3	6,4 %	73,3	1,1 %
0,7	431,1	6,7 %	96,1	1,5 %
0,89	489,6	7,6 %	154,6	2,4 %
0,9	568,9	8,9 %	233,9	3,6 %

- Cut $N_{\text{PXD}} > 0.89$ leads to an additional loss of luminosity of 2.4% (relative + ~50%)
- Not a disaster but leaves room for improvement ...

Transverse Impact Parameter Resolution



LER: $\varepsilon_x = 2.1 \text{ nm}$, $\beta_x^* = 200 \text{ mm}$

HER: $\varepsilon_x = 4.6 \text{ nm}$, $\beta_x^* = 100 \text{ mm}$

Predicted horizontal beam spot size:

$$\tilde{\sigma}_x = \frac{\sqrt{\varepsilon_x^{\text{LER}} \cdot \beta_x^{\text{LER}} + \varepsilon_x^{\text{HER}} \cdot \beta_x^{\text{HER}}}}{2}$$

$\tilde{\sigma}_x = 14.8 \pm 0.5 \mu\text{m}$ (used for MC)

Measured ϕ_0 dependence:

$$\sigma_{d_0} = \sqrt{\sigma_i^2 + (\tilde{\sigma}_x \sin \phi_0)^2 + (\tilde{\sigma}_y \cos \phi_0)^2}$$

For 2-track (t- and t+) event,

$\Delta d_0 \equiv d_0(t-) + d_0(t+)$

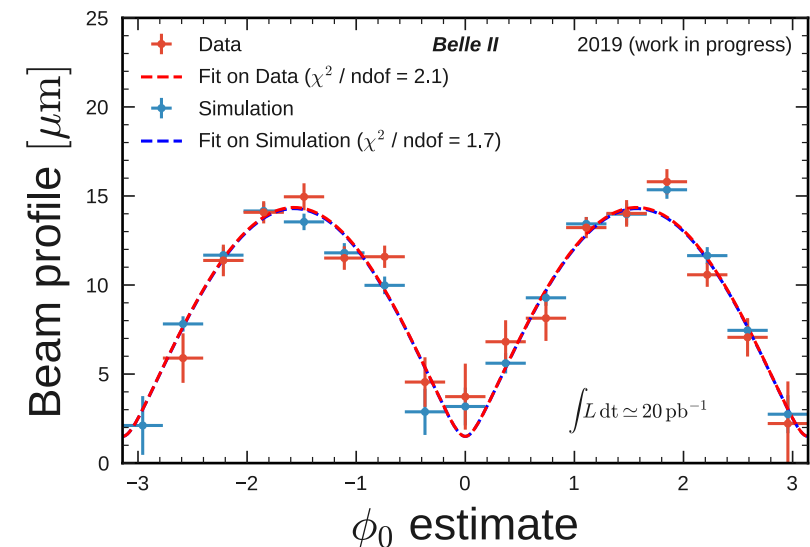
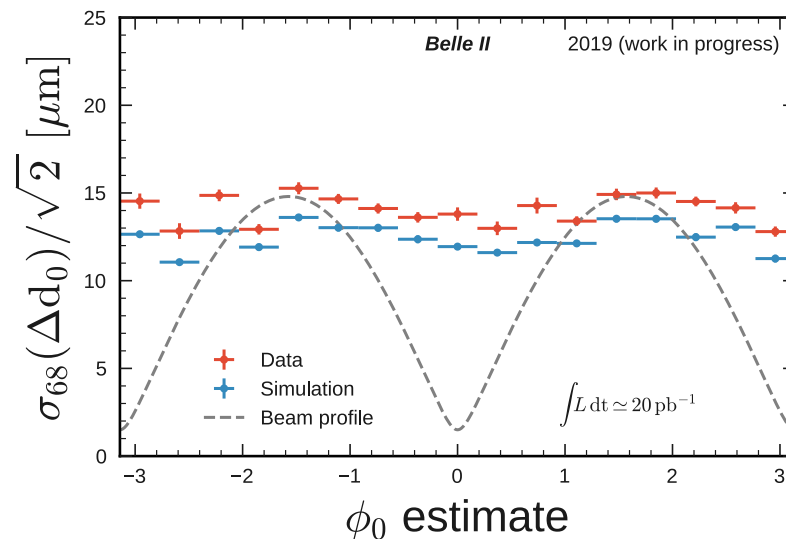
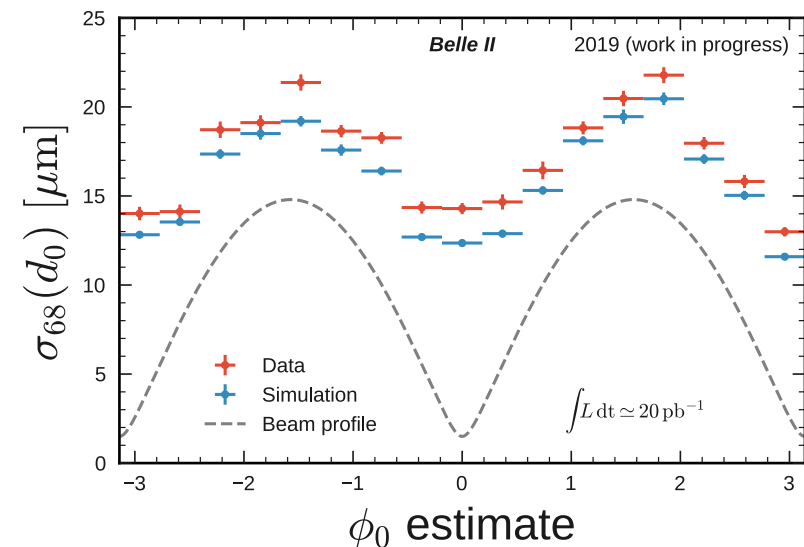
Width of $\Delta d_0/\sqrt{2}$ distribution used as estimate of **intrinsic** d_0 resolution σ_i

Data: $\sigma_i = 14.1 \pm 0.1 \mu\text{m}$

Simulation: $\sigma_i = 12.5 \pm 0.1 \mu\text{m}$

Difference affected by too optimistic MC expectation for SVD cluster position resolution.

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Simulation: $\sigma_i = 12.5 \pm 0.1 \mu\text{m}$

Difference affected by too optimistic MC expectation for SVD cluster position resolution.

Quadratically subtract σ_i from σ_{d_0} and fit beam profile separately for data and MC with fixed $\tilde{\sigma}_y = 1.5 \mu\text{m}$ determined from vertical beam scan.

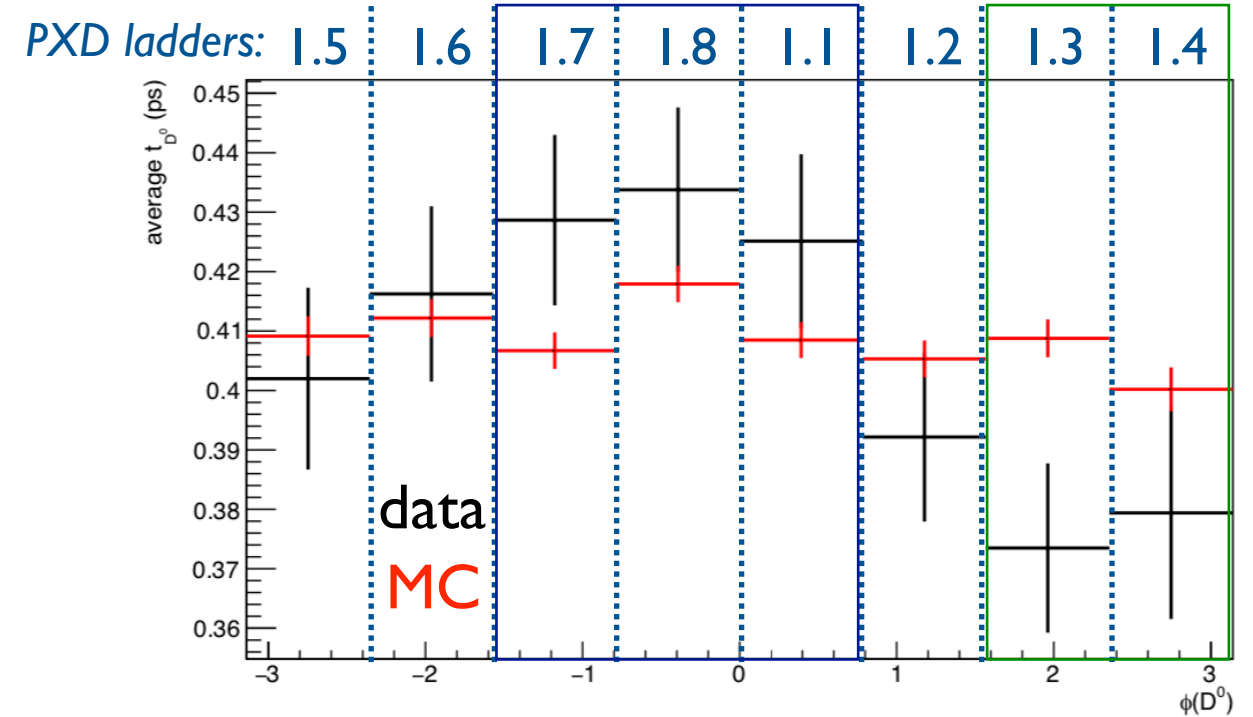
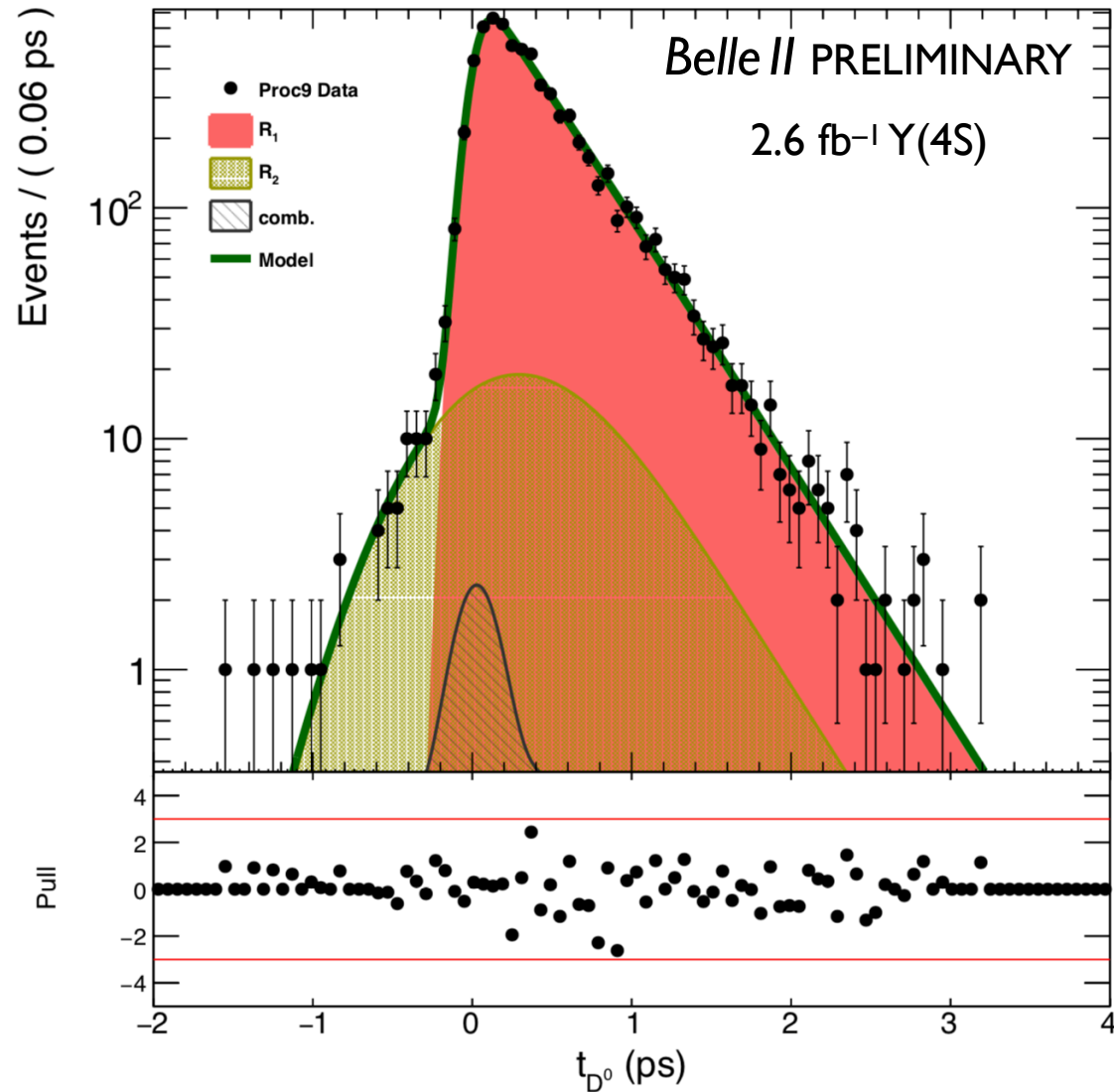
Data: $\tilde{\sigma}_x = 14.4 \pm 0.9 \mu\text{m}$

Simulation: $\tilde{\sigma}_x = 14.3 \pm 0.6 \mu\text{m}$

Excellent agreement between data and MC and with the prediction based on machine parameters.

VXD Performance for Physics

Gaetano de Marino, Giulia Casarosa

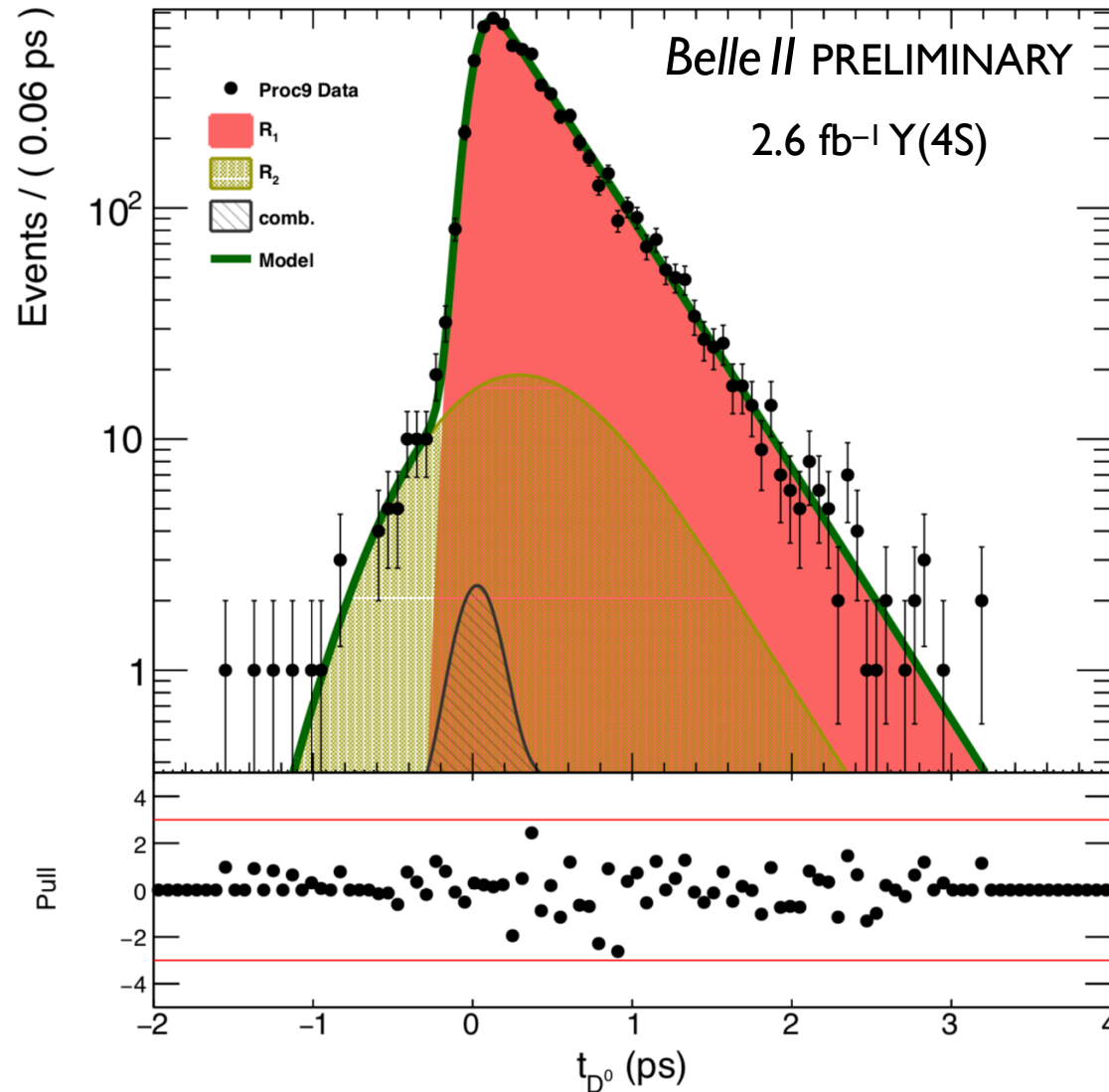


(a) Average proper time for each of the eight bins in which the range for the azimuthal angle ϕ of the D^0 is divided.

- Indication for remaining inconsistencies in alignment/reconstruction/run-vertex determination

VXD Performance for Physics

Gaetano de Marino, Giulia Casarosa

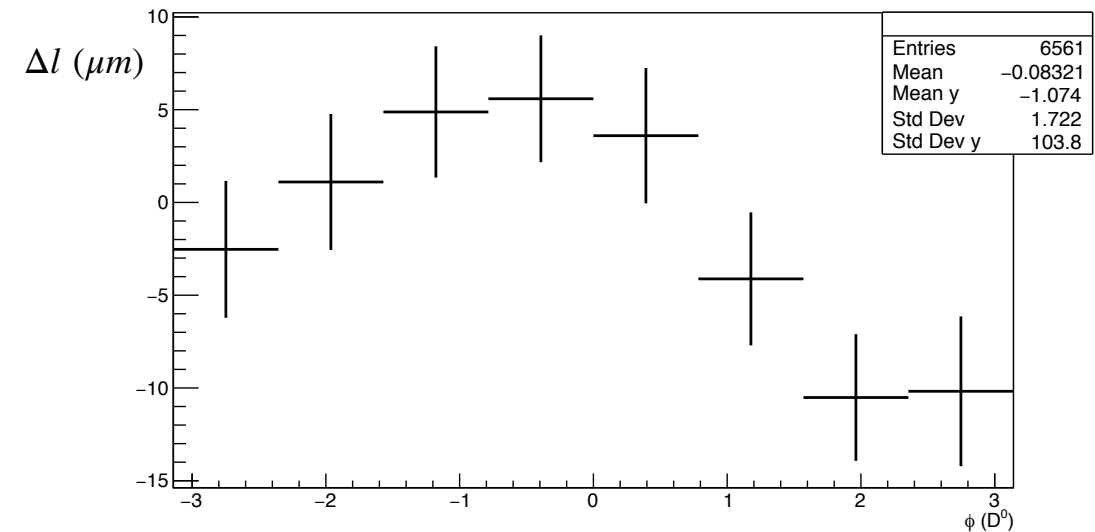


assuming that the lifetime can be estimated as the average of the proper time distribution

$$l = \beta\gamma c\tau \rightarrow \langle l \rangle = \beta\gamma c\tau$$

then we can compare the average flight length $\langle l \rangle$ with the one that we expect for D⁰ candidates with the nominal lifetime:

$$\Delta l \simeq l - \beta\gamma c\tau_{PDG} = \beta\gamma c(\tau - \tau_{PDG})$$



- Indication for remaining inconsistencies in alignment/reconstruction/run-vertex determination

PXD Expert Shifts & Shifter Training Plans for Fall Run

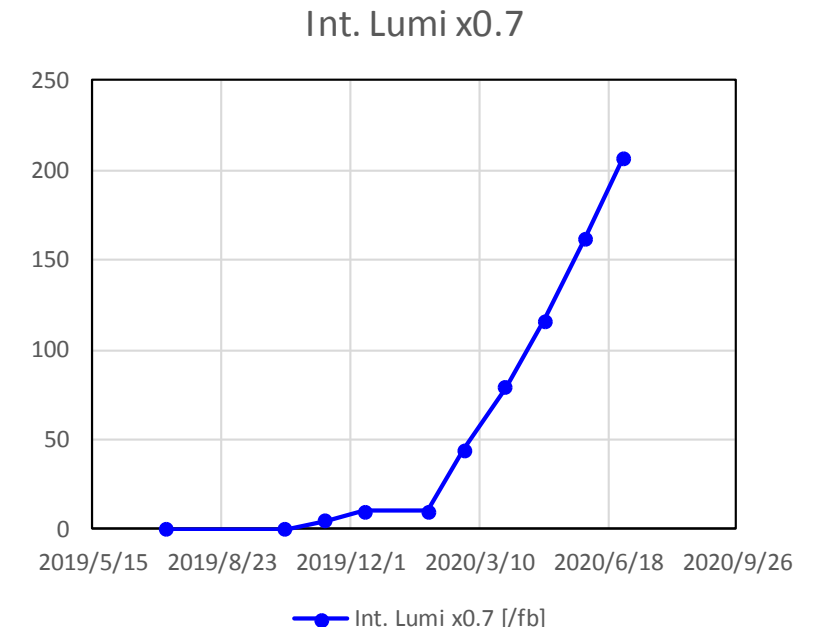
- PXD operation scheme similar as in spring run
- At least one PXD expert on site (not permanently at KEK)
- Remote shifts mainly from Europe
 - following SuperKEKB operation plan highest priority to fill owl shifts and weekends
 - request to all PXD groups to fill new list **PXD_SHIFTS** in B2MMS $\Rightarrow$ to be interfaced to ShifTool for registry and quota accounting
- Shift training
 - new people should sign up for shift training
 - require at least one shadow shift before taking first shift



Operation Plan

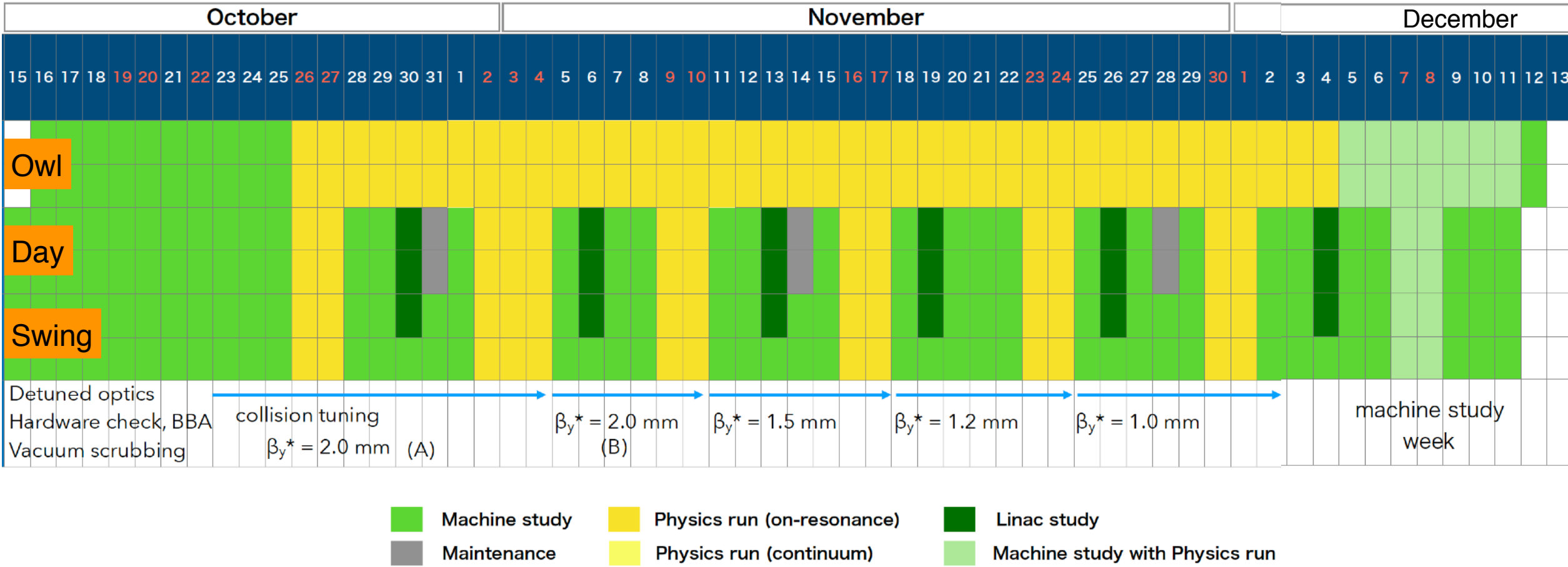


- Commissioning meeting at 6/Aug
- 2019 Autumn: Mainly focus on machine developments for increasing luminosity and reducing beam background.
 - Need vacuum scrubbing runs, especially around Oct., of course.
- 2020 Jan to Jun runs: Luminosity production run with target luminosity of 200/fb.
- Squeeze the beta* from 2 mm (achieved) to less than 1 mm (ex. 0.8mm) within two month.
 - Day and Swing shift will be used for machine tuning and background study
 - Owl shift and weekends will be used for the luminosity runs (with reduced beam currents and /or relaxed beta*_y)



Phase 3.2 Run Schedule

Y. Ohnishi



PXD Shifts

- New list PXD_SHIFTS in B2MMS

- to be interfaced to ShifTool for booking and quota accounting

× Robert Karl	× Felix Benjamin Mueller	
× Klemens Lautenbach	× Simon Reiter	
× Botho Paschen	× Lukas Bierwirth	× Hua Ye
× Varghese Babu	× Felix Johannes Müller	
× Hans Krüger	× Benedikt Wach	
× Thomas Michael Gerd Kraetzschmar		
× Felix Meggendorfer	× Boqun Wang	
× Christian Kiesling	× Navid Khandann Rad	
× Simon Kurz	× Carsten Niebuhr	
× Thomas Kuhr	× Thibaud Humair	
× Fabian Michael Krinner	× Bruno Deschamps	
× Florian Luetticke	× Patrick Ahlburg	
× Jochen Dingfelder	× Christian Wessel	
× Slavomira Stefkova	× Thomas Lueck	
× Hans-Günther Moser	× Philipp Leitl	
× Hendrik Windel	× Dennis Getzkow	
× Jens Sören Lange		

- Please start booking shifts NOW
- Order of priority for remote shifts:
 - weekend → owl → swing

September 2019						
	24 Tue	25 Wed	26 Thu	27 Fri	28 Sat	29 Sun
	OWL	OWL	Philip...	Philip...	OWL	OWL
	DAY	DAY	DAY	DAY	DAY	DAY
	SWING	Thomas...	Thomas...	Thomas...	SWING	SWING
30 Mon						
OWL						
DAY						
Thomas...						
October 2019						
	01 Tue	02 Wed	03 Thu	04 Fri	05 Sat	06 Sun
	OWL	Felix ...	Christ...	Philip...	OWL	OWL
	DAY	DAY	DAY	DAY	DAY	DAY
	Thomas...	Thomas...	Thomas...	Thomas...	SWING	SWING
07 Mon	08 Tue	09 Wed	10 Thu	11 Fri	12 Sat	13 Sun
OWL	OWL	Felix ...	Christ...	Felix ...	Felix ...	Felix ...
DAY	DAY	DAY	DAY	DAY	DAY	DAY
SWING	SWING	SWING	SWING	SWING	Hua Ye	SWING
14 Mon	15 Tue	16 Wed	17 Thu	18 Fri	19 Sat	20 Sun
OWL	Simon ...	Simon ...	Simon ...	Simon ...	OWL	OWL
DAY	DAY	DAY	DAY	Floria...	Floria...	DAY
SWING	SWING	SWING	SWING	SWING	Hua Ye	Hua Ye
21 Mon	22 Tue	23 Wed	24 Thu	25 Fri	26 Sat	27 Sun
OWL	OWL	OWL	Christ...	Philip...	OWL	OWL
DAY	DAY	DAY	DAY	DAY	DAY	DAY
SWING	SWING	SWING	SWING	Hua Ye	Hua Ye	Hua Ye
28 Mon	29 Tue	30 Wed	31 Thu			
OWL	OWL	OWL	Christ...			
Floria...	Floria...	Floria...	Floria...			
SWING	SWING	SWING	SWING			

November 2019						
				01 Fri	02 Sat	03 Sun
				Martin...	Simon...	Simon...
				Floria...	Floria...	DAY
				SWING	Hua Ye	SWING
04 Mon	05 Tue	06 Wed	07 Thu	08 Fri	09 Sat	10 Sun
Simon...	Simon...	Simon...	Simon...	Simon...	Carste... ✗	Carste... ✗
DAY	Qingyu...	DAY	DAY	DAY	DAY	DAY
SWING	SWING	SWING	SWING	Ladisl...	Hua Ye	Ladisl...
11 Mon	12 Tue	13 Wed	14 Thu	15 Fri	16 Sat	17 Sun
OWL	Philip...	Philip...	Christ...	Martin...	Martin...	Ladisl...
DAY	DAY	DAY	DAY	DAY	DAY	DAY
SWING	SWING	SWING	SWING	SWING	SWING	SWING
18 Mon	19 Tue	20 Wed	21 Thu	22 Fri	23 Sat	24 Sun
OWL	OWL	Felix...	Christ...	Martin...	Martin...	Ladisl...
DAY	DAY	DAY	DAY	DAY	DAY	DAY
SWING	SWING	SWING	SWING	SWING	Carste... ✗	Carste... ✗
25 Mon	26 Tue	27 Wed	28 Thu	29 Fri	30 Sat	
OWL	OWL	Felix...	Christ...	Martin...	Martin...	
DAY	DAY	DAY	DAY	DAY	DAY	
SWING	SWING	SWING	SWING	Ladisl...	Ladisl...	
December 2019						
						01 Sun
						OWL
						DAY
						SWING
02 Mon	03 Tue	04 Wed	05 Thu	06 Fri	07 Sat	08 Sun
OWL	Simon...	Simon...	Simon...	Simon...	Martin...	OWL
DAY	DAY	DAY	DAY	DAY	DAY	DAY
SWING	SWING	SWING	SWING	SWING	SWING	SWING
09 Mon	10 Tue	11 Wed	12 Thu	13 Fri	14 Sat	
OWL	Philip...	Philip...	Christ...	Martin...	Martin...	
DAY	DAY	DAY	DAY	DAY	DAY	
SWING	SWING	SWING	SWING	SWING	SWING	

Further shift trainings will be scheduled in the near future: please register!

Agenda

Monday, September 23, 2019		Tuesday, September 24, 2019	
09:00	Overview - Carsten Niebuhr (DESY)	09:00	Gated Mode Operation at KEK and DESY - Felix J. Mueller (DESY) (until 10:30)
09:15	Data/Background Analyses - Christian Wessel (University of Bonn) (until 10:30)	09:00	Summary of recent Gated Mode tests at DESY - Felix Müller (DESY)
09:15	PXD and Tracking - Christian Wessel (University of Bonn)	09:45	PXD Response to Gated Mode - Robert Karl (DESY) Slides 
09:35	Updates on PXD offline calibration - Qingyuan LIU (DESY)		
10:00	PXD efficiency in the phase 3 data - Navid Rad (DESY)	10:30	--- Break ---
10:30	--- Break ---	11:00	PXD21 - Laci Andricek (HLL) (until 12:30)
11:00	Operation at KEK - Hua Ye (DESY) Bjoern Spruck (Mainz) Simon Reiter (Giessen) (until 12:40)	11:00	Sensor and Module Situation Overview - Laci Andricek (MPG Halbleiterlabor)
11:00	Summary Phase3 - Bjoern Spruck	11:30	Ladder Assembly - Hans-Guenther Moser (MPP Munich)
11:20	Module & Calibration Summary - Hua Ye	12:00	Other Components - jigs, kaptons, tools - Hans-Guenther Moser (MPP Munich)
11:40	DHH status - Dmytro Levit	12:30	--- Lunch ---
12:05	ONSEN status - Simon Reiter		
12:10	DATCON status & plans - Bruno Deschamps		
12:15	Fast Emergency Shutdown - Michael Ritzert		
12:40	--- Lunch ---		
14:00	Operation at KEK - Hua Ye (DESY) Bjoern Spruck (Mainz) Simon Reiter (Giessen) (until 15:30)	14:00	Improvements/Ongoing Studies - Botho Paschen (Bonn) (until 15:30)
14:00	IBBelle status - Hans-Günther Moser	14:00	Radiation Burst Tolerance Studies at MaMi - Matthias Hoek (Uni Mainz)
15:30	--- Break ---	15:30	--- Break ---
16:00	IB - Jochen Dingfelder (Bonn) (until 17:00)	16:00	Preps for PXD21 Installation and Contingency - Carsten Niebuhr (DESY) (until 18:00)

Workshop Dinner „La Panetteria“ 18:30

