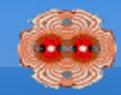


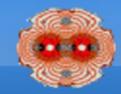
Observation of losses and instabilities during collision X. Buffat on behalf of the BBWG and G. Arduini

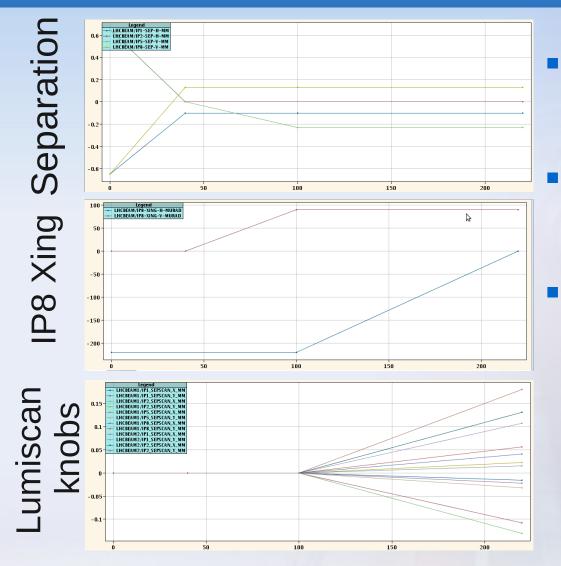


- Lifetime during PHYSICS beam process
 - Fill 2533 to 2536
- Instabilities during stable beam
 - Fill 2488, 2535



PHYSICS Beam Process

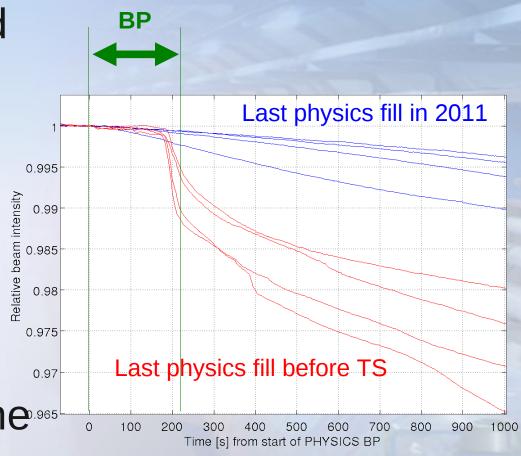


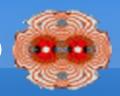


- Collapse separation bumps
 - Increase VXing in IP8
- Simulatenously
 - Remove HXing in IP8
 - Go head on

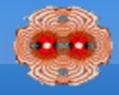
Lifetime during PHYSICS BP

- Many things changed since last year
 - β* (IP1,5 and 2)
 - Xing
 - Collimator settings
 - Intensity
- Do they explain the 0.97
 very bad lifetime at the 965
 end of physics BP ?



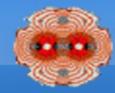


Footprint with full // separation CĚRN



≝		Beam-beam tune footprint viewer	- ~ x	
≝ File Control Help	_	Beam-Beam tane rootprint viewer		
Beam Mackine Track	🔯 Views 🔳 🖶	0 8 8 🧔 📰 More 🗾 🖂 🖴		
Select optic :	B1b922 [04/05]		ន ស	
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A150C150A1000L300_THIN A100C100A1000L300_THIN A100C100A100L300_THIN A060C060A300L300_THIN	0.325-	// sep = 0.65 mm In all IPs	Full LR in IP2 (most bunch	ies)
	0.32-		No LR in IP2	
Collisions : IP1 IP2 IP5 <mark>IP8</mark>	වි 0.315-			
Selected collision configuration : State [on/off] on Half HXing [urad] 0.0 Half VXing [urad] 90.0 Half Hxing [urad] 0.0 Half Hxing [urad] 0.0 Half Hxing [urad] 0.0 Half Hxing [urad] 0.0 Half Hxing [urad] 0.0	0.31-			
Spectr. Pol. (± 1) 1.0	0.305-			
	0.3-			
Beam number : 1 Slot numbers $\in [0;3564]$:		0.275 0.28 0.285 0.29 0.295 Qx	0.3 0.305 0.31 0.315	
922,995		Resonance lines	Remove footprint	

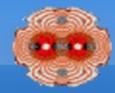




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<u>8</u>			Beam-b	peam tune fo	otprint view	er				Ŀ	
ile Control Help											
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A110C110A200L200_THIN		B1b922									
200C200A200L200_THIN 350C350A350L350_THIN											
055C055A1000L1000_THIN	0.33-										
1100C1100A1000L1000_THIN 055C055A010L050_THIN	0.00										
150C150A1000L300_THIN											
100C100A1000L300_THIN 100C100A100L300_THIN		3σ	sep								
A060C060A300L300_THIN	0.325-		-								
								A			
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ollisions :	0.315-										
P1 IP2 IP5 IP8											
elected collision configuration :									/		
tate [on/off] on											
lalf HXing [µrad] 0.0	0.31-										
lalf VXing [µrad] 90.0 lalf Hsep [mm] 0.0											
lalf Vsep [mm] 0.125 pectr. Pol. (±1) 1.0								/			
JECH. POI. (± 1) 1.0	0.305-										
	0.303										
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	0.3-										
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nt numbers ∈ [0;3564] :		0.275	0.28	0.285	0.29	0.295 Qx	0.3	0.305	0.31	0.315	0.32
2											
Run simulation			Resonance li	nes				Remove	e footprint		
36:06 - Tracking job done										_	

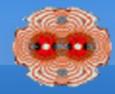
5





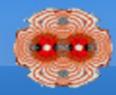
<u>4</u>		_	Beam-l	beam tune fo	otprint view	er 📐	_		-		,
File Control Help						4					
Beam Machine Track				More 🕽 🛂 🗃							
Select optic: A080C080A200L200_THIN A110C110A200L200_THIN A200C200A200L200_THIN A350C350A350L350_THIN	0.335	05/12 16:10:39 egend B1b922 B1b995]								(; C
A055C055A1000L1000_THIN A1100C1100A1000L1000_THIN A055C055A010L050_THIN A150C150A1000L300_THIN A100C100A1000L300_THIN	0.33-	20	con								
A100C100A100L300_THIN A060C060A300L300_THIN	0.325-	20	sep				<		2		
	0.32-								•	/	
Collisions : IP1 IP2 IP5 IP8 Selected collision configuration :	වි 0.315-								/		
State [on/off] on Half HXing [µrad] 0.0 Half YXing [µrad] 90.0 Half HXep [mm] 0.0 Half HXep [mm] 0.0 Half Ysep [mm] 0.084 Spectr. Pol. (±1) 1.0	0.31-							/			
	0.305-						/				
	0.3-					/					
Beam number :		0.275	0.28	0.285	0.29	0.295 Qx	0.3	0.305	0.31	0.315	0.32
Run simulation			Resonance li	nes				Remov	e footprint		





<u>\$</u>	_	Beam-l	beam tune foo	tprint viewe	r	_	_	_		
File Control Help				_						
Beam Machine Track			More 🚽 🛃 🖨							
Select optic :	B1b922 [07/05/12	12:08:15]								្រស្ន
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A055C055A010L050_THIN A150C150A1000L300_THIN A100C100A1000L300_THIN A100C100A100L300_THIN A060C060A300L300_THIN	0.325-	1σ sep								
	0.32-				_	Å				
Collisions : IP1 IP2 IP5 IP8	ලි 0.315-									
Selected collision configuration : State [on/off] on Half YXing [µrad] -90.0 - Half Hsep [mm] 0.042 Spectr. Pol. (± 1) -1.0	0.31 -								/	
	0.305 -					/	A CONTRACT OF A CONTRACT.			
	0.3 -				,					
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922,995		Resonance li	nes				Remove	footprint		



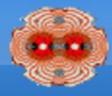


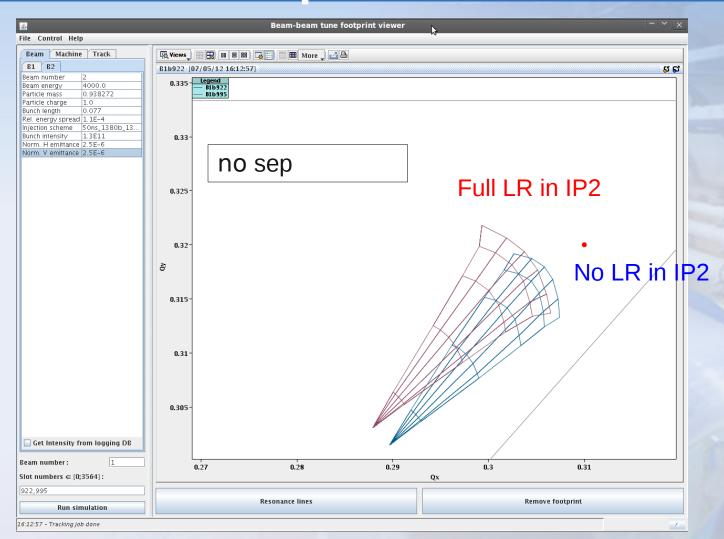
2			Beam-	beam tune fo	otprint view	er				l	
le Control Help											
Beam Machine Track	🙀 Views 🚽 🔠		🗔 📰 🔳 🔳	More 🚽 🛃 🖨							
Select optic :		05/12 12:35:28	1								្រ ស្ត្
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A110C110A200L200_THIN		B1b995									
200C200A200L200_THIN 350C350A350L350_THIN											
055C055A1000L1000_THIN											
1100C1100A1000L1000_THIN	0.33-										
055C055A010L050_THIN 150C150A1000L300_THIN						_					
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	0.305-										
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	0.3-										
am number : 1		0.275	0.28	0.285	0.29	0.295	0.3	0.305	0.31	0.315	0.32
ot numbers $\in [0; 3564]$:		0.2.0	0.20	0.200	0.2.5	Qx		0.000	0.01	0.010	0.52
2,995											
Run simulation			Resonance li	ines				Remove	footprint		
Run Sinuración										_	

8



Footprint with no separation





9



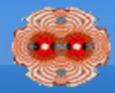
Footprint when HO

Beam-beam tune footprint viewer 4 File Control Help Beam Machine Track 🕵 Views_ 🗄 🖶 🚥 🛢 🎫 🏹 🚍 🔳 More _ 🛃 🖴 B1 B2 B1b0 [04/05/12 10:44:11 ស្រី 🔂 Beam number 1 Legend B1b0 Beam energy 4000.0 Particle mass 0.938272 B1b995 B1b816 Particle charge 1.0 B1b922 B1b1816 Bunch length Rel. energy spread 1.1E-4 0.33-Injection scheme 50ns_1380b_13. Bunch intensity 1.3E11 No sep Norm. H emittance 2.5E-6 Norm. V emittance 2.5E-6 0.325 HO in IP8 Full LR in IP2 0.32ð 0.315-0.31 No LR in IP2 0.305-HO in IP1,5 and Get Intensity from logging DB Beam number: 0.275 0.28 0.285 0.29 0.295 0.3 0.305 0.31 0.315 Slot numbers $\in [0;3564]$: Qx 0.816.922.995.1816 **Resonance lines Remove footprint** Run simulation 10:44:11 - Tracking job done

.

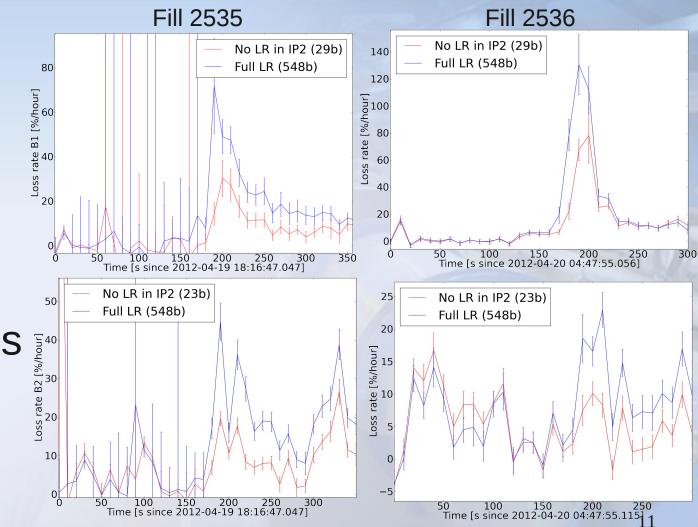


Loss rates



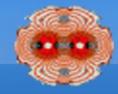
 Clearly the one colliding LR in IP2 suffer the most

Most bunches have full LR in IP2









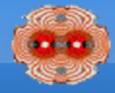
LR in IP2 are no longer negligible compared to IP1 and 5 (smaller β^* and Xing)

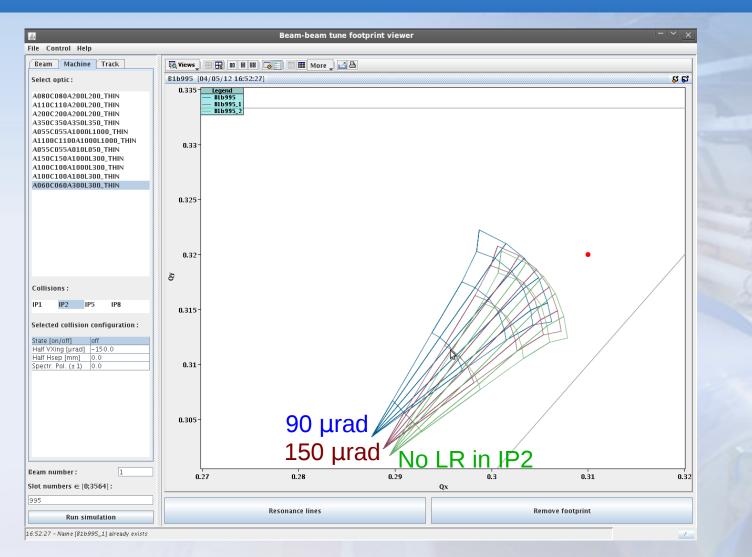
→Most footprints are shifted up

- Increase of losses
- Effect very worse for selected bunches
- Can be cured by opening Xing in IP2
 - 150 µrad (ok with aperture, R. Bruce)
- An improvement is expected with optmimized tune, easy to test



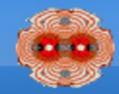








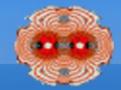
Observation of losses and instabilities during collision X. Buffat on behalf of the BBWG and G. Arduini

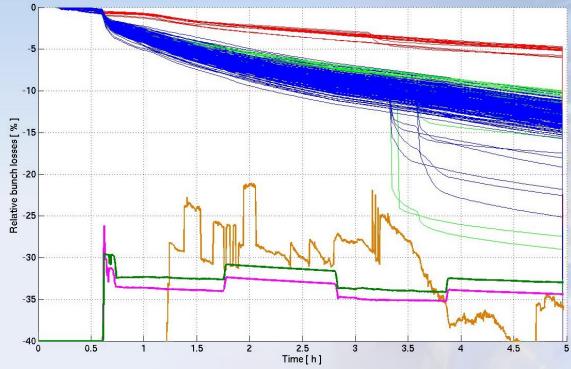


- Lifetime during PHYSICS beam process
 - Fill 2533 to 2536
- Instabilities during stable beam
 - Fill 2488, 2535



Levelling test (2488)



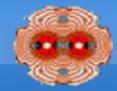


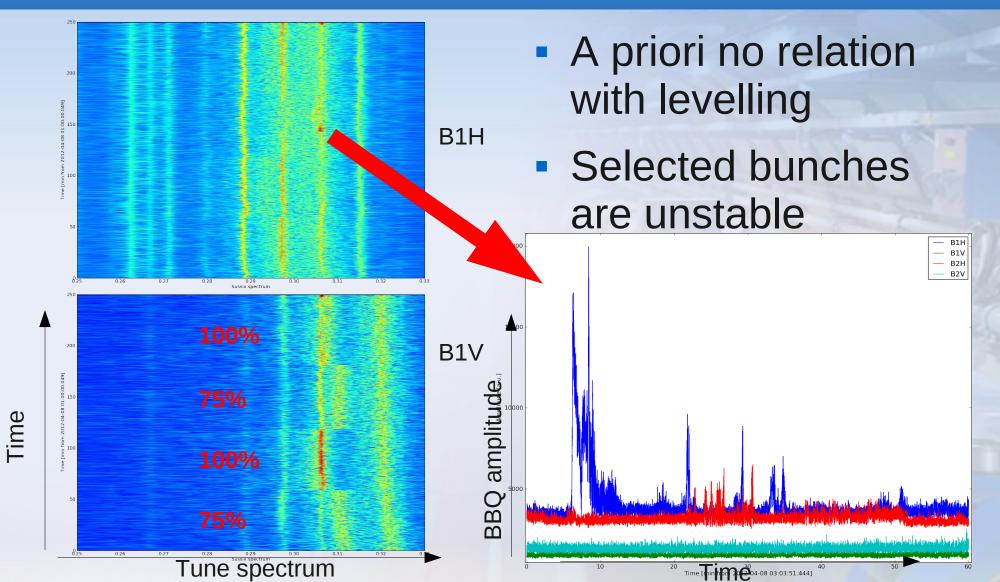
Leveling Test: Machine Experience Preliminary Results, T. Pieloni, LBOC 17.04.2012

- No optimization in IP8
- Not caused by an orbit change
- Cause is unknown



Levelling test (2488)





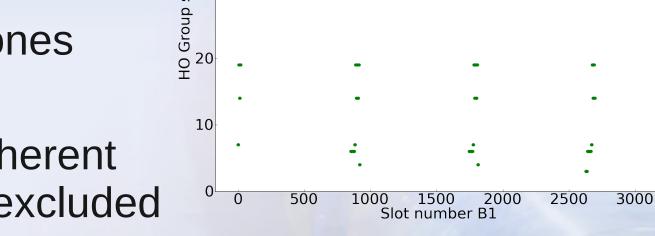


Collision group

40

size 06

- The collision pattern of some bunches are very simple
- These are the ones losing
- Beam-beam coherent motion are not excluded

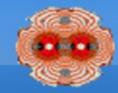


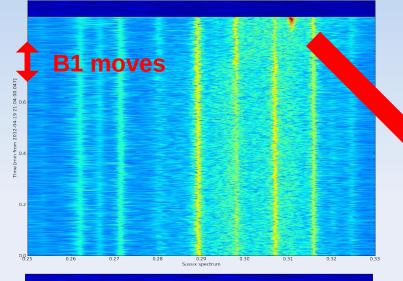
50ns 264b 249 0 240 36bpi8inj

 The spectrum of individual bunches will be investigated using the damper pickups

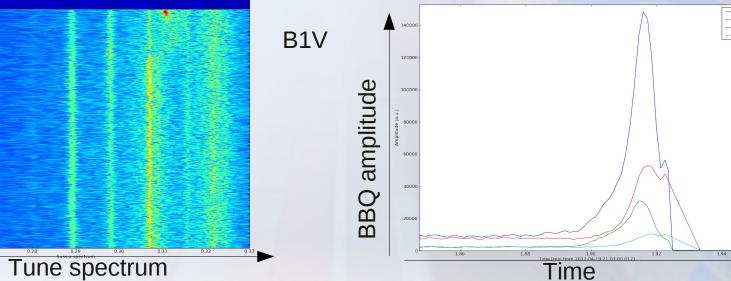


Length scale calibration (2535)





Beams went unstable when moving IP1 to 2.5σ



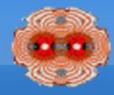
Time

18

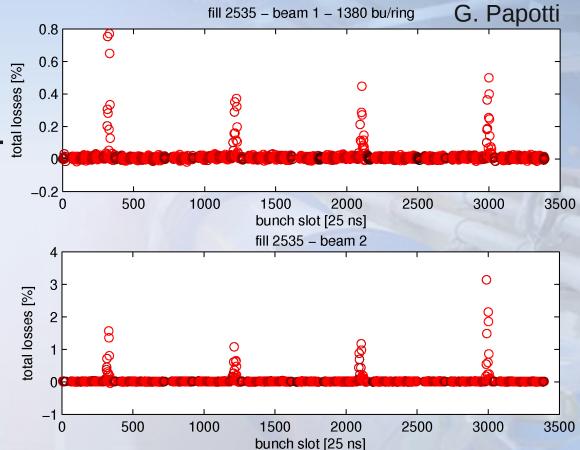
B1H B1V B2H



Loss pattern

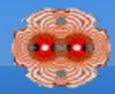


- Few bunches are unstable
- They collide together
- Nothing different from other stable bunches

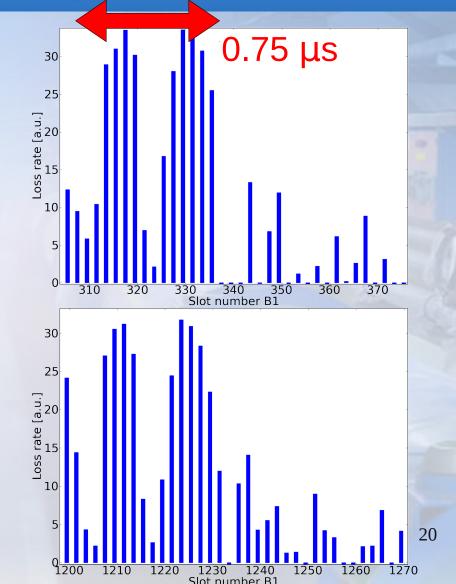


CERN

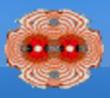
Loss pattern



- Repeating pattern suggest that two bunches may be unstable
 - The instability is transmitted to others via BB
- Any idea welcome







- By trying to cure the problem :
 - Open Xing in IP2
 - Optimize the working point
- By hiding the problem :
 - Increase damper gain

 Note : for a better unserstanding, we should avoid to do all at once...