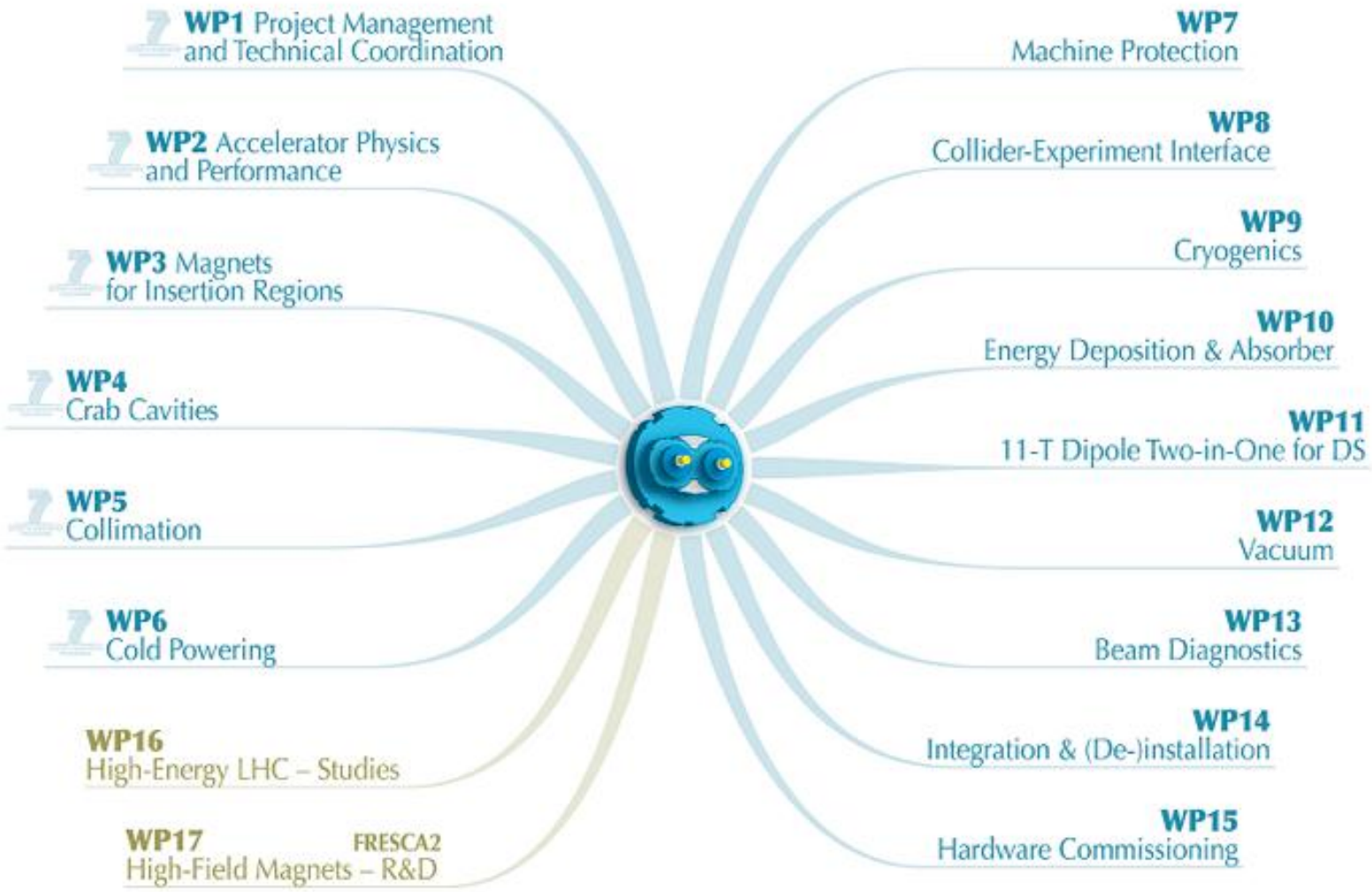
HL-LHC PLC

- PLC page under High Lumi Project Intranet (Cecile):

https://espace.cern.ch/HiLumi/default.aspx

https://espace.cern.ch/HiLumi/PLC/default.aspx

HL-LHC Structure



HL-LHC PLC Core Membership

-Oliver Bruning (PLC chair & BE-ABP)	Alternates:
-Markus Zerlauth (PLC scientific secretary & TE-MPE))	
-Lucio Rossi (HL-LHC PL)	
-Mike Lamont (LHC operation & BE-OP)	
-Stephane Fartoukh (WP2 leader)	Bernhard Holzer
-Ezio Todesco (WP3 leader)	
-Erk Jensen (WP4 leader & BE-RF)	
-Stefano Redaelli (WP5 leader)	
-Jorg Wenninger (WP7 leader)	
-Roberto Kersevan (WP12 &TE-VSC)	Vincent Baglin
-Rhodri Jones (WP13 leader & BE-BI)	
-Sylvain Weisz (WP14 leader)	
-Hermann Schmickler (Technical Board)	
-Samy Chemli (EN-MEF-DC)	
-Gijs de Rijk (TE-MSC-LMF)	Ezio Todesco
-Anne-Laure Perrot (EN-MEF)	Dorothea Pfeiffer
-Volker Mertens (TE-ABT)	Brennan Goddard
-Jean-Paul Burnet (TE-PO)	Quentin King

HL-LHC PLC Information List

-Steve Myers (ATS)
-Roland Garoby (LIU)
-Francesco Broggi (WP6)
-Marzio Nessi, Austin Ball, Helmut Burkhard (WP8)
-Laurent Tavian (WP9)
-Francesco Cerutti (WP10)
-Mikko Karpinen (WP11)
-Mirko Pojer (WP15)
-Frank Zimmermann (WP16)
-Gijs de Rijk (WP17)
-Paul Collier, Frederik Bordry and Roberto Saban (ATS Department heads)
-Luca Bottura (TE-MSC)
-Laurent Tavian (TE-CRG)
-Andrej Siemko (TE-MPE)
-Mauro Nonis (EN-CV)
-Francois Duval (EN-EL)
-Katy Foraz (EN-MEF)

HL-LHC PLC

- Parameters agreed on at the 2nd HL-LHC Coordination Group Meeting:

-maximum of 140 events per crossing

➔ $L = 5\ 10^{34}\ cm^{-2}\ sec^{-1}$ for 25ns

➔ $L = 2.5\ 10^{34}\ cm^{-2}\ sec^{-1}$ for 50ns

Pile-up density leveling

➔ Leveling options?

-goal for integrated annual luminosity:

➔ 250 fb^{-1} per year

-Total luminosity for HL-LHC project

➔ 3000 fb^{-1} total

HL-LHC Performance Estimates

'Stretched' Baseline Parameters following 2nd HL-LHC-LIU:

Parameter	nominal	25ns	50ns		
N	1.15E+11	**2.2E+11**	**3.5E+11**		
n_b	2808	2808	1404		
beam current [A]	0.58	**1.12**	**0.89**		
x-ing angle [μrad]	300	590	590		
beam separation [σ]	10	12.5	11.4		
β^* [m]	0.55	**0.15**	**0.15**		
ε_n [μm]	3.75	2.5	3.0		
ε_L [eVs]	2.51	2.5	2.5		
energy spread	1.20E-04	1.20E-04	1.20E-04		
bunch length [m]	7.50E-02	7.50E-02	7.50E-02		
IBS horizontal [h]	80 -> 106	**20.0**	**20.7**		
IBS longitudinal [h]	61 -> 60	**15.8**	**13.2**		
Piwinski parameter	0.68	**3.1**	**2.9**		
geom. reduction	0.83	**0.35**	**0.33**		
beam-beam / IP	3.10E-03	**3.9E-03**	**5.0E-03**		
Peak Luminosity	1 10^{34}	**7.4 10^{34}**	**8.5 10^{34}**		
Virtual Luminosity	1.2 10^{34}	**21 10^{34}**	**26 10^{34}**		
Events / crossing (peak & leveled L)	19	**210**	**475**	**140**	**140**

6.2 10^{14} and 4.9 10^{14} p/beam

➔ sufficient room for leveling (with Crab Cavities)

Virtual luminosity (25ns) of
$L = 7.4 / 0.35\ 10^{34}\ cm^{-2}\ s^{-1}$

$= 21\ 10^{34}\ cm^{-2}\ s^{-1}$ ('k' = 5)

Virtual luminosity (50ns) of
$L = 8.5 / 0.33\ 10^{34}\ cm^{-2}\ s^{-1}$

$= 26\ 10^{34}\ cm^{-2}\ s^{-1}$ ('k' = 10)

(Leveled to 5 $10^{34}\ cm^{-2}\ s^{-1}$ and 2.5 $10^{34}\ cm^{-2}\ s^{-1}$)

2012 – canonical (long) year

	Days
Machine check-out	
Commissioning with beam	
Machine development	
Technical stops	
Scrubbing (25 n	
Technical st	6
Initial i	~21
P	~126
	~8
	4
	24

~150 days for pp collisions

- Required efficiency is independent of parameter choice:
- efficiency = target lumi / (leveled-luminosity * scheduled time)
- ca 40% for $L_{lev} = 5\ 10^{34}\ cm^{-2}\ s^{-1}$, 250 fb^{-1} and 150 days
- independent of run length and Turnaround time!

HL-LHC PLC

Future topics:

-Review of the HL-LHC Layout in the insertions

➔ We could cover perhaps two IRs in one meeting

➔ TAS & TAN space, space for additional components (e.g. Octupoles)

-IR layout with CC

-Vacuum beam pipes for experiments and report from LEB

-Required corrector circuits

➔ required octupole strength

➔ triplet corrector package

-Generation of a common Glossary with the experiments

(Availability, efficiency, Turnaround time, pile-up etc.)

-DS collimators

-Places for higher harmonic RF system and new BI

HL-LHC PLC

Future meetings:

-Regularity of the PLC meeting

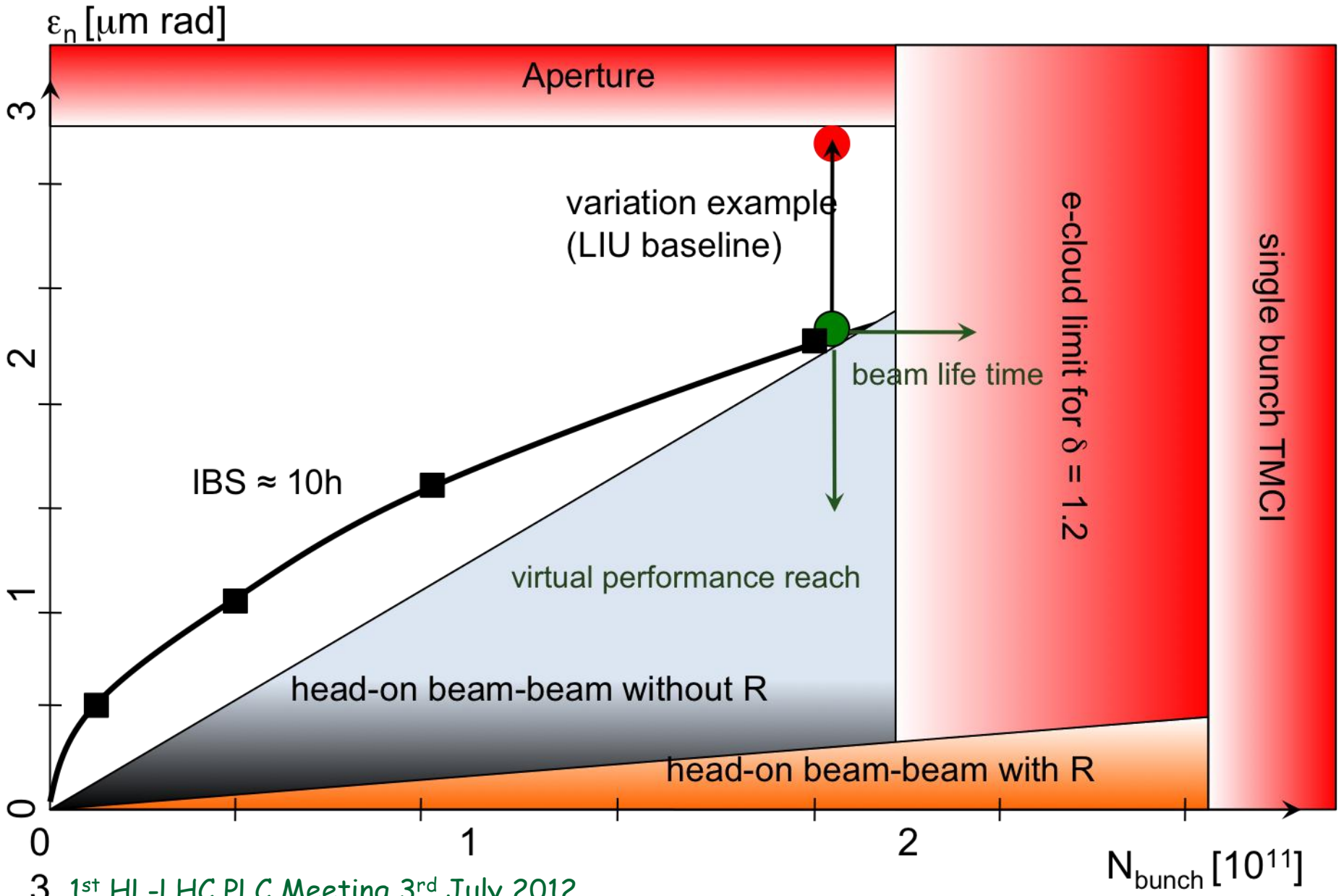
➔ once per month to start with?

➔ should we aim at another meeting before summer?

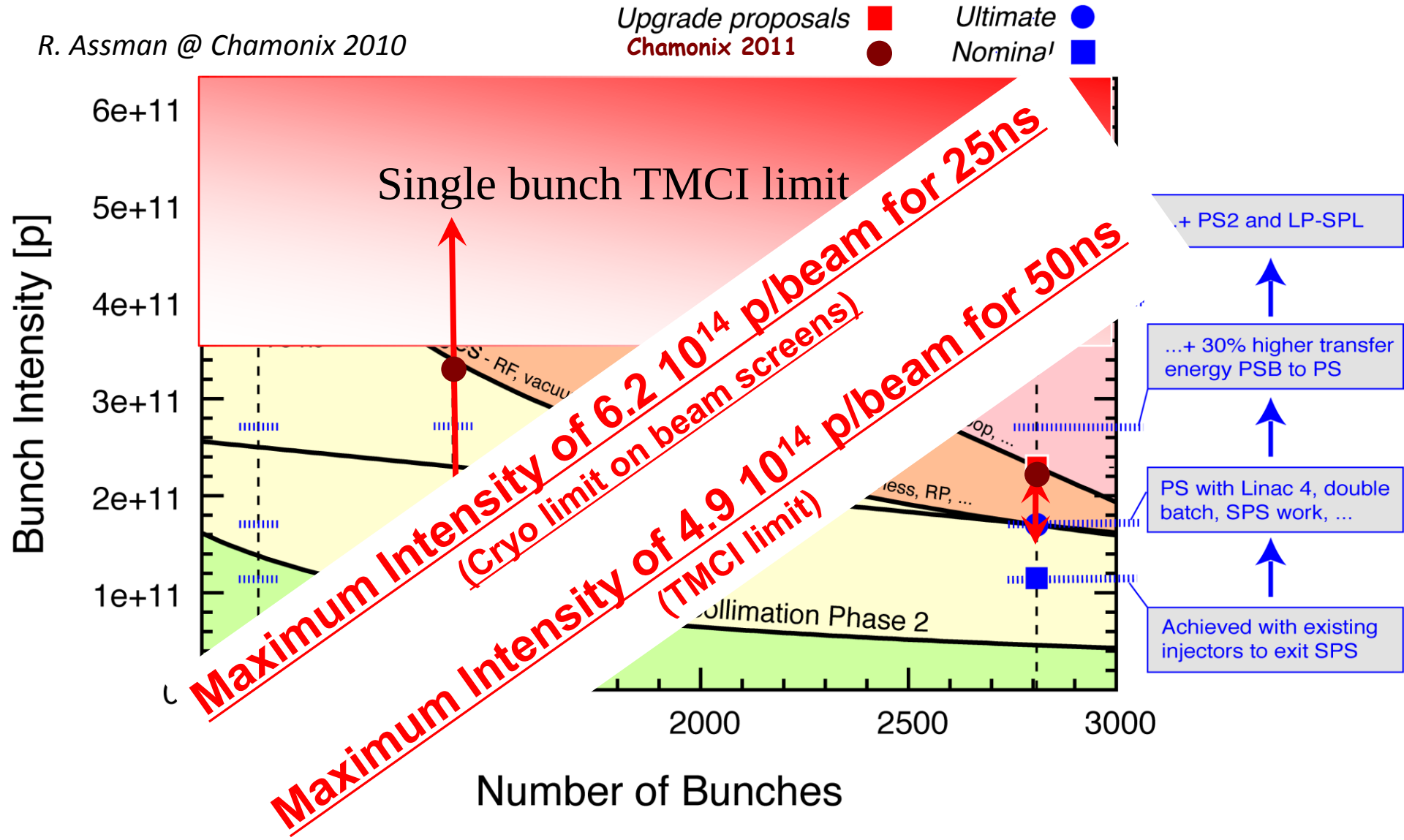
-Time slot confirmation

➔ Tuesday mornings from Doodle?

HL-LHC parameter space



Summary of LHC Intensity Limits (7 TeV)



Ideal scenario: n mperfections included!

Note: Some assumptions and conditions apply…