

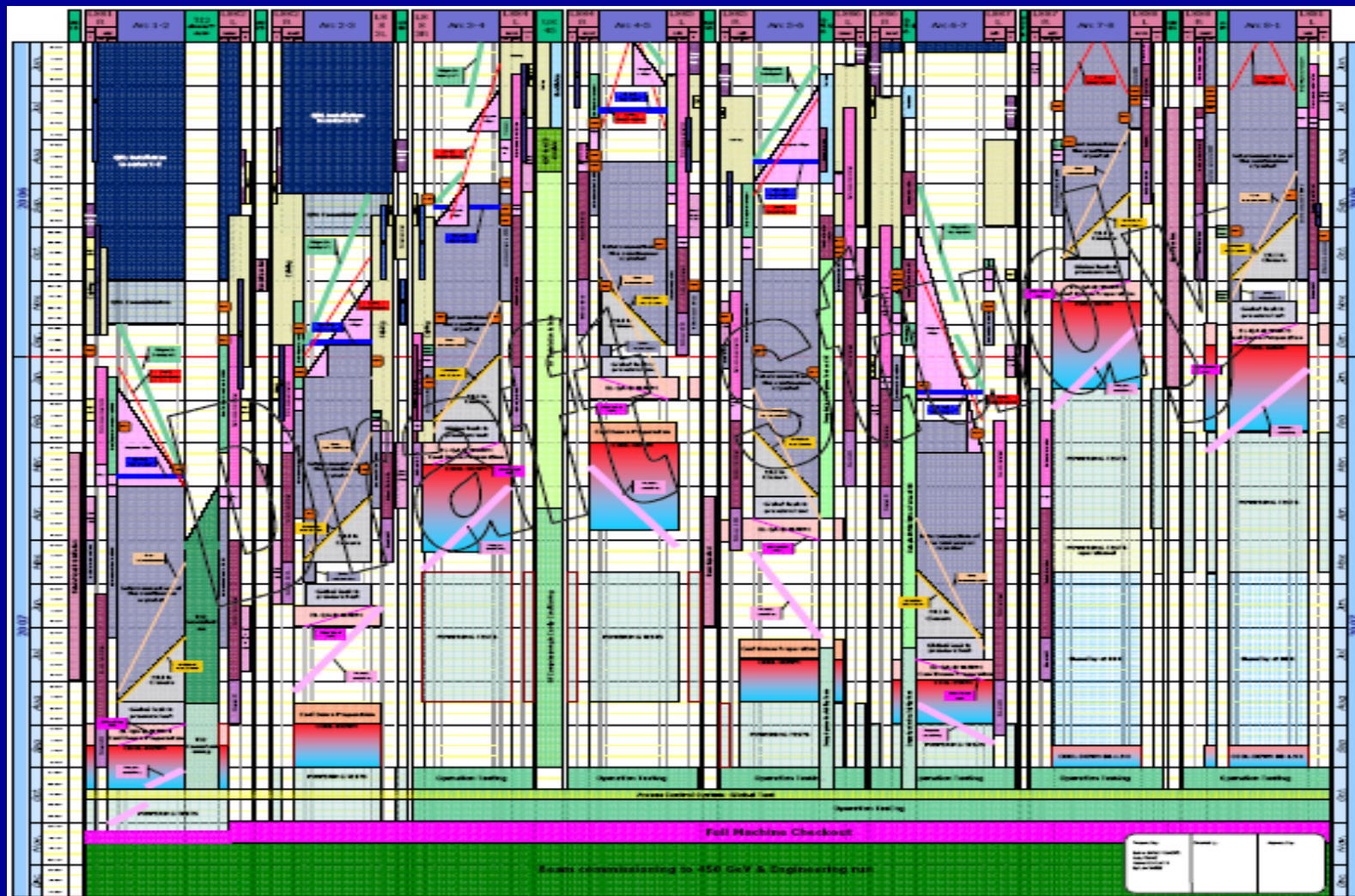
An overview of the LHC start-up

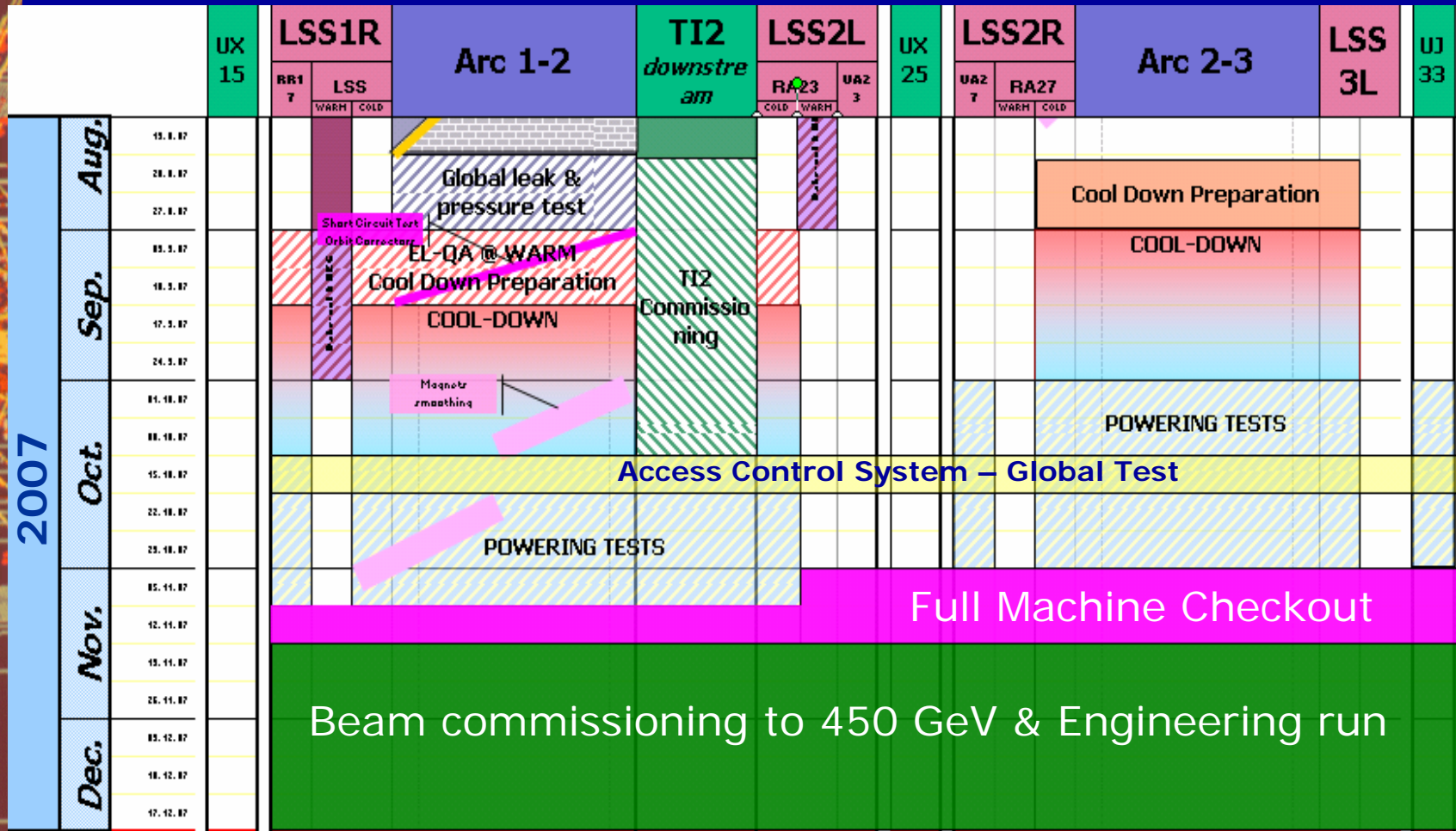
Maria Girone, CERN IT-PSS

(based on material from Roger Bailey, CERN AB-OP)

- Installation targets
- 2007 Planning
 - Main points
- Engineering run in 2007
- 2008 Planning

- Cryogenics lines finished well before end of 2006
- Last magnets tests through SM18 before end of 2006
 - Activity continues in 2007 for spares
- Sector 7-8 cold before end of 2006
- Last magnet lowered March 2007
- Vacuum closed August 2007
- Engineering run in 2007





- Average interconnect rate of 8 activities/week-team assumed
- Power tests on magnet circuits
 - Sectors 78, 81, 34, 45 fully hardware commissioned
 - Cycled to 7.2TeV with full protection systems
 - 7-8 8-1 kept on standby below 80K after HWC
 - 3-4 4-5 kept at nominal operating temperature after HWC
 - Sectors 56, 67 hardware commissioned for 450GeV
 - Cycled to ~1TeV with limited protection systems
 - Kept at nominal operating temperature after HWC
 - Sector 23, 12 hardware commissioned for 450GeV just in time
- All special function equipment has been tested to 450GeV and more
 - Transfer lines, Injection systems, Extraction systems
 - RF, BI, Collimators
 - RP systems, MP systems (users)
- Access system tested machine-wide
- Vacuum systems tested at the sector level

	56	67	78	81	12	23	34	45
Oct						Minimum HWC		
	Operations testing				Minimum HWC	Operations testing		
Nov	Full Machine Checkout (TI8 & TI2, Access, Vacuum, Equipment Tests, Cycle and Set, BIC and INB)							
	Beam Commissioning to 450GeV 16days estimated, 60%efficiency assumed							
Dec	Engineering run (Collisions at 450GeV + Ramp Commissioning)							

PSS Engineering run in 2007

CERN IT
Department

0

Installation
Hardware Commissioning

Hardware
Commissioning
450GeV

Engineering
Run
450GeV

Shutdown

Machine checkout 450GeV	Beam commissioning 450GeV		Collisions 450GeV Ramp commissioning	
K_b	43	43	156	156
$i_b (10^{10})$	2	4	4	10
$\beta^* 15 (m)$	11	11	11	11
intensity per beam	$8.6 \cdot 10^{11}$	$1.7 \cdot 10^{12}$	$6.2 \cdot 10^{12}$	$1.6 \cdot 10^{13}$
beam energy (MJ)	.06	.12	.45	1.1
Luminosity 15	$2 \cdot 10^{28}$	$7 \cdot 10^{28}$	$2.6 \cdot 10^{29}$	$1.6 \cdot 10^{30}$
event rate ¹ 15 (kHz)	0.7	2.8	10	65
W rate ² 15 (per 24h)	0.8	3	11	70
Z rate ³ 15 (per 24h)	0.08	0.3	1.1	7

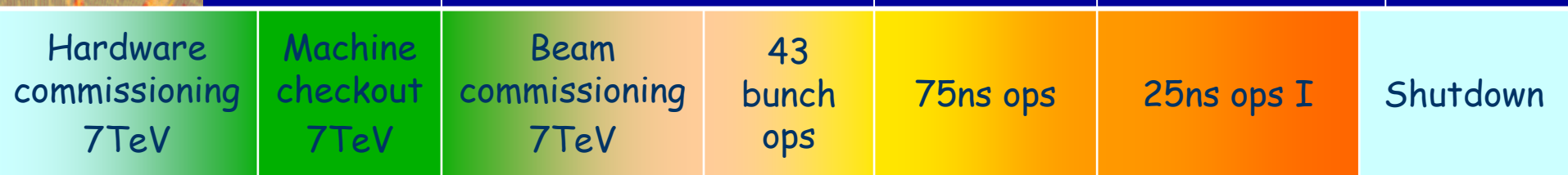
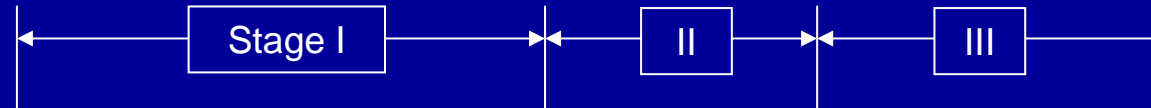


PSS

Commissioning Plan for Protons

CERN
IT
Department

2008



2009



2010/11

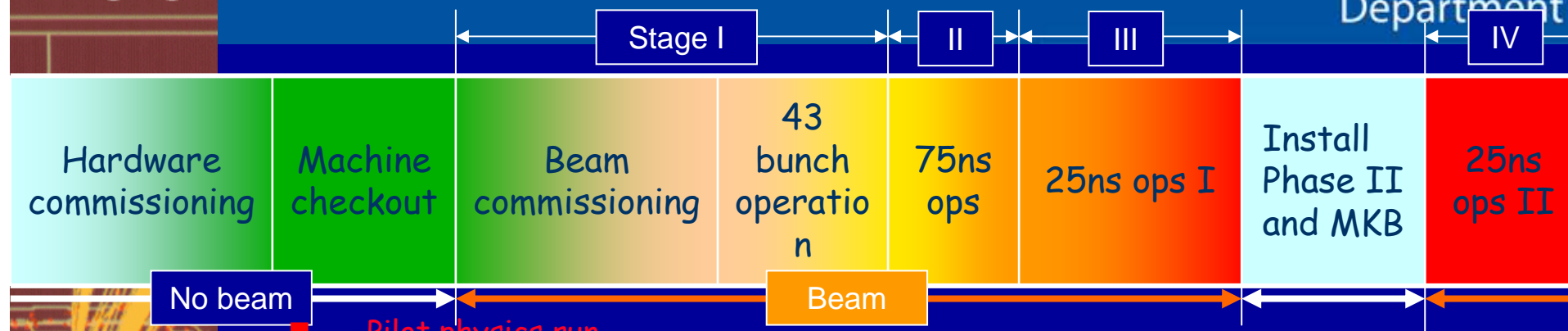
Maria Girone
CERN, IT-PSS

Overview of LHC start-up - 9

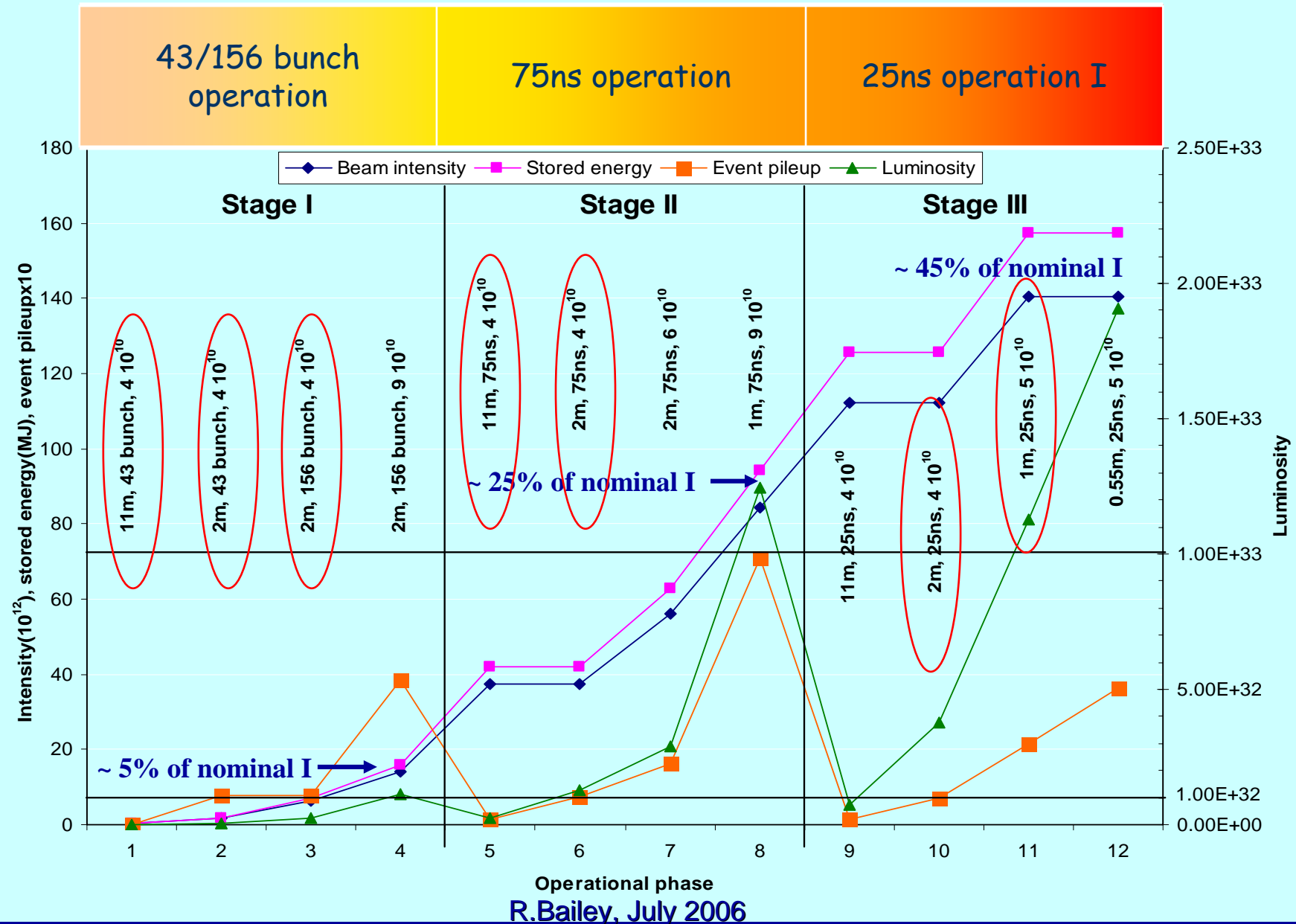


PSS Commissioning Plan for Protons

CERN IT
Department



- **Pilot physics run**
 - First collisions
 - 43 bunches, no crossing angle, no squeeze, moderate intensities
 - Push performance (156 bunches, partial squeeze in 1 and 5, push intensity)
 - Performance limit $10^{32} \text{ cm}^{-2} \text{ s}^{-1}$ (event pileup)
- **75ns operation**
 - Establish multi-bunch operation, moderate intensities
 - Relaxed machine parameters (squeeze and crossing angle)
 - Push squeeze and crossing angle
 - Performance limit $10^{33} \text{ cm}^{-2} \text{ s}^{-1}$ (event pileup)
- **25ns operation I**
 - Nominal crossing angle
 - Push squeeze
 - Increase intensity to 50% nominal
 - Performance limit $2 \cdot 10^{33} \text{ cm}^{-2} \text{ s}^{-1}$
- **25ns operation II**
 - Push towards nominal performance

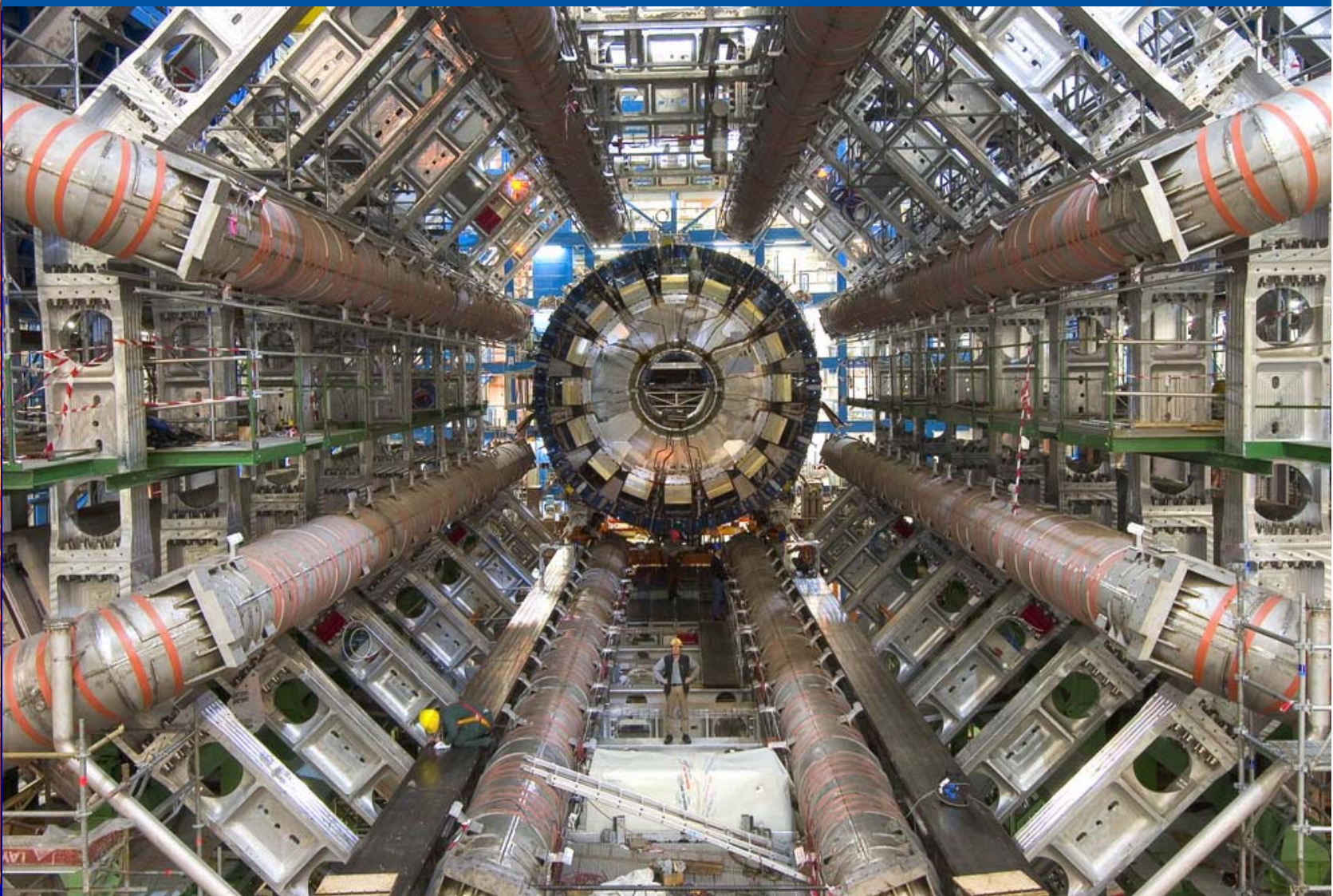
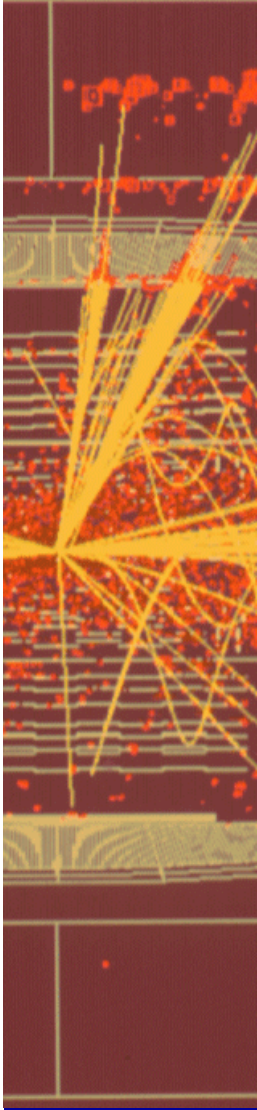


	56	67	78	81	12	23	34	45
Oct						Minimum HWC		
	Operations testing				Minimum HWC	Operations testing		
Nov	Full Machine Checkout (TI8 & TI2, Access, Vacuum, Equipment Tests, Cycle and Set, BIC and INB)							
	Beam Commissioning to 450GeV 16days estimated, 60%efficiency assumed							
Dec								

PSS

And now... ATLAS Visit!

CERN
IT
Department



Maria Girone
CERN, IT-PSS

Overview of LHC start-up - 13

