

Integration of Wire measurements in the MD planning

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Thanks to Y. Papaphilippou, S. Redaelli, A. Rossi and
J. Wenninger

<https://md-coord.web.cern.ch>



2nd Wire BBLR workshop
March 19, 2017

MAC 2017 recommendations

Findings - High Luminosity Project (HL-LHC) - Status and planning

- All scope changes resulting from the re-baseline of Sept 2016 have been included in the physics model of the HL-LHC.
- The performance of the present collimation scheme, while meeting baseline requirements, is challenged. Adding two hollow beam lenses are considered and would remove significant risk.
- Electron cloud induced heat loads present one of the biggest challenges to the HL-LHC performance. Varying heat load by sector, various scrubbing techniques and a variety of other mitigation measures are under investigation.
- Long range Beam-Beam compensation with wires is crucial.
- Flat beam performance is essential to understand to mitigate risk of crab cavity performance.

2016 LHC MD schedule

	July			Aug				Sep					
Wk	27	28	29	30	31	32	33	34	35	36	37	38	39
Mo	4	11	18	25	1	8	15	22	29	5	12	19	26
Tu								MD 2					
We											TS2		
Th				MD 1						Jeune G			
Fr								beta* 2.5 km dev.					
Sa										MD 3			
Su				beta* 2.5 km dev.									

	Oct			Nov				Dec					
Wk	40	41	42	43	44	45	46	47	48	49	50	51	52
Mo	3	10	17	24	31	7	14	21	28	5	12	19	26
Tu	MD 4					ions setup					Extended year end technical stop		
We					TS3								
Th		ions setup						Ion run (p-Pb)				Lab closed	
Fr				MD 5									
Sa													
Su									Pb MD			Xmas	New Year

End of LHC run
[06:00]

20.5 packed MD days !

2017 LHC MD schedule

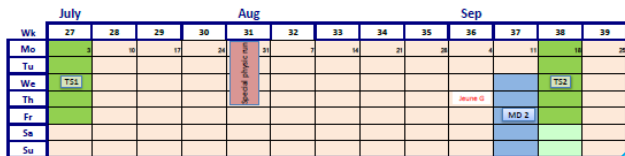
	Apr			May					June				
Wk	14	15	16	17	18	19	20	21	22	23	24	25	26
Mo			Special Mo		1st May					Whit			
Tu												Special physic run	
We				Machine checkout									
Th								Ascension					
Fr		G. Friday											MD 1
Sa													
Su													

	July			Aug					Sep				
Wk	27	28	29	30	31	32	33	34	35	36	37	38	39
Mo					Special physic run								
Tu													
We	TS1											TS2	
Th										Ascension G			
Fr											MD 2		
Sa													
Su													

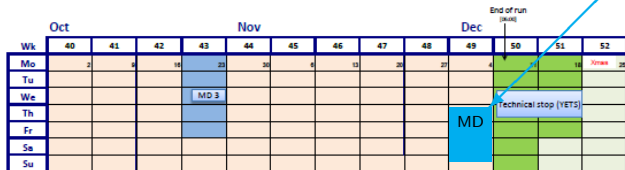
	Oct			Nov					Dec				
Wk	40	41	42	43	44	45	46	47	48	49	50	51	52
Mo													
Tu													
We				MD 3									
Th													
Fr													
Sa													
Su													

A shorter year but without ion run. 15 MD days...

2017 LHC MD schedule



MD4?



F. Bordry: 3 MD days could be added if performance is good.

Wire studies: Administrative alleys

- ★ **Commissioning:** Not MD, all instruments in LHC need to be commissioned first without beam (hardware commissioning) and with beam for MP and well functioning (orbit, Q, Q' and optics?)
- ★ **EoF MDs:** During intensity ramp-up or in physics. Request to MD coordinators, MPP approval and scheduled by machine and physics coordinators
- ★ **MDs:** During dedicated MD blocks. Request to MD coordinators and MPP approval.
- ★ **Physics:** When the wire becomes operational!

MD request deadlines for 2017

- ★ **EoF MDs for intensity ramp-up:** Apr 7
- ★ **MD block 1 requests:** May 19
- ★ **LSWG 2017#1:** May 23

Possible optics for wire studies

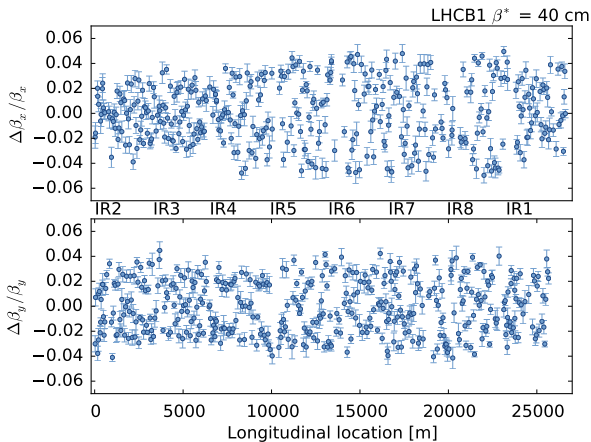
- ★ **Injection:** ready
- ★ **Nominal collision optics:** ready.
- ★ **Injection with lower β^* :** Relatively easy.
Synergy with other low priority MDs.
- ★ **Single IR squeeze:** Significant effort. Synergy with other MDs but needs good motivation.
- ★ **Flat:** High priority for 2017 but available only end 2017

2016 MD#1

	Mon 25/7	Tue 26/7	Wed 27/7	Thu 28/7	Fri 29/7	Sat 30/7	Sun 31/7
00			22:00 - 02:00 MD232 (ded): Longitudinal	17:00 - 03:00 MD1257 (ded): ATS	22:00 - 07:00 MD1447 (ded): Beta*- reach: IR7	22:00 - MD1429	23:00 - FCMC
01						01:00 - Trip of RO	01:00 - 07:00 MD1751 (ded): Instability Studies with a Single Beam
02			02:00 - 17:00 RF Cryo lost and RQD.A45 earth fault	03:00 - rampdown	Collimation Hierarchy Limit and Impedance	02:00 - 10:00 MD1429 (ded): Beta* Reach Long range limits Round optics	
03							
04				04:00 - 08:00 MD1414 (ded): DOROS BPMs for improved coupling			
05							
06							
07		07:00 - 22:00 Cryo in P2			07:00 - rampdown		
08				08:00 - 13:00 MD1242 (ded): Injection and emittance preservation of high	08:00 - MD144 (ded): Crystal collima		
09					08:00 - MD138 (ded): Active Halo Control		
10						10:00 - rampdown	
11							
12						11:00 - 19:00 MD1257 (ded): ATS	
13				13:00 - 21:00 MD1268 (ded): MKI pulse length and ripple definition			
14							
15							
16							
17			17:00 - 03:00 MD1257 (ded): ATS				
18							
19						19:00 - rampdown	
20							20:00 - 23:00 MD1751 (ded): Instability
21				21:00 - cleanup	21:00 - rampdown		
22		22:00 - 02:00 MD232 (ded): Longitudinal		22:00 - 07:00 MD1447 (ded): Beta*-	22:00 - 01:00 MD1429 (ded): Beta*	23:00 - FCMC	
23							

OMC software I

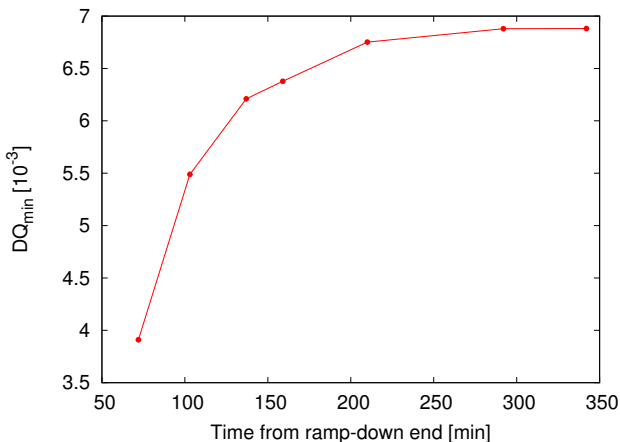
β -beating in difference mode with $\approx 1\%$ precision:



Precise wire calibration?

OMC software II

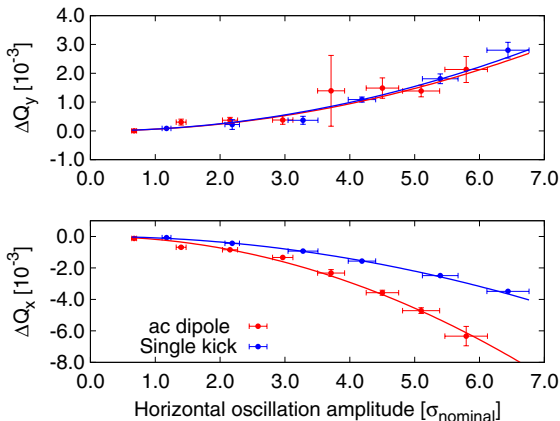
Coupling measurement precision of $\approx 10^{-4}$:



Precise wire alignment?

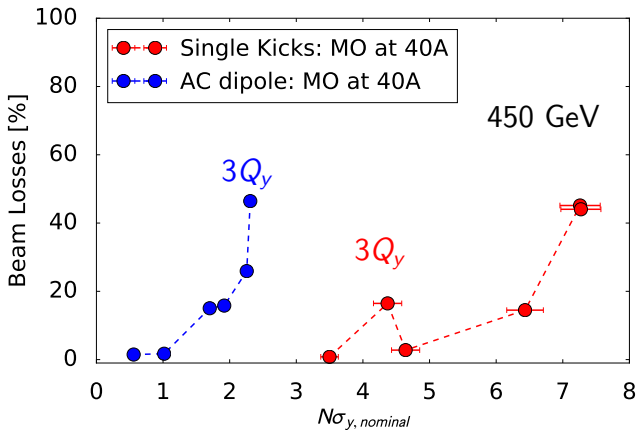
OMC software III

Amplitude detuning with kick or ac dipole:

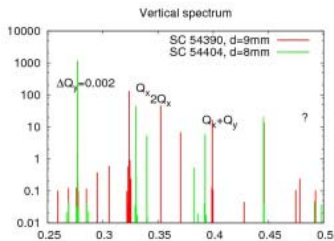


OMC software IV

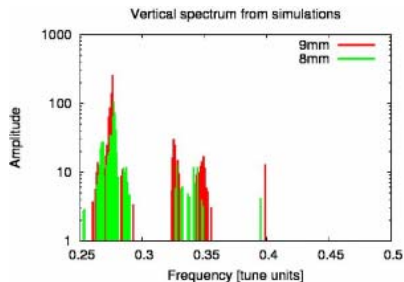
Dynamic aperture with kick or ac dipole:



SPS tests: Resonance driving terms



(a) Experimental data



(b) Tracking data

U. Dorda et al, EPAC08

See [E. Maclean, 1st wire workshop](#), for more details

March 31st: **LHC MD day** to review results,
requests and priorities

<https://indico.cern.ch/event/618556/>

Looking forward to a successful
2017!