

MD2901: Asymmetric collimator settings in IR7

Preliminary results

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MD motivation

- Investigate asymmetric settings for IR7 collimators
 - One jaw retracted on several collimators
 - Loss maps performed in first fill
 - Impedance measurement in second fill

MD procedure

- First fill: 18 pilots for loss maps and 1 nominal of $0.85 \cdot 10^{11} ppb$
- Second fill: 2 nominal $0.75 \cdot 10^{11} ppb$ and $1.75 \cdot 10^{11} ppb$
- In second fill: excite all bunches with the ADT to measure their individual tune.
- At the end of each fill, instability growth-rate was measured by switching off the damper

LHC Collimators | Beam: B1 | Set: HW Group:LHC COLLIMATORS 25-07-2018 04:22:09

L(mm) MDC	IP1	PRS R(mm)	5.15	TCLA.6R3.B1	-5.08	1.64	TCSG.A4R7.B1	-1.75
24.96	TCL4R1.B1	-24.98	2.62	TCLA.7R3.B1	-4.55	2.02	TCSG.B5R7.B1	-19.99
24.97	TCL5R1.B1	-24.96		IP5		2.09	TCSG.D5R7.B1	-1.81
25.01	TCL6R1.B1	-24.99	6.64	TCTPH.4L5.B1	-11.33	2.02	TCSG.E5R7.B1	-20
9.12	TCTPH.4L1.B1	-8.89	6.49	TCTPV.4L5.B1	-6.4	19.95	TCSG.6R7.B1	-2.8
5.35	TCTPV.4L1.B1	-7.62	25	TCL4R5.B1	-24.93	1.84	TCLA.A6R7.B1	-1.32
	IP2		24.99	TCL5R5.B1	-24.96	3.14	TCLA.B6R7.B1	-2.56
7.95	TCTPH.4L2.B1	-7.33	24.98	TCL6R5.B1	-24.97	4.35	TCLA.C6R7.B1	-1.17
6.97	TCTPV.4L2.B1	-9.93		IP6		3.7	TCLA.D6R7.B1	0.08
55	TDI.4L2	-55.02	4.38	TCDQA.A4R6.B1		1.67	TCLA.A7R7.B1	-2
20.45	TCDD.4L2	-20.51	4.3	TCSPA.A4R6.B1	-3.82		IP8	
27.93	TCLIA.4R2	-27.98		IP7		7.46	TCTPH.4L8.B1	-2.83
24.8	TCLIB.6R2.B1	-24.98	19.96	TCP.D6L7.B1	-0.99	4.46	TCTPV.4L8.B1	-7.01
	IP3		1.83	TCP.C6L7.B1	-19.98		TI2	
4.16	TCP.6L3.B1	-3.59	1.62	TCP.B6L7.B1	-19.9	10	TCDIV.20607	-9.99
3.31	TCSG.5L3.B1	-2.67	19.95	TCSG.A6L7.B1	-1.45	3.04	TCDIV.29012	-0.89
1.8	TCSG.4R3.B1	-2.33	1.92	TCSG.B5L7.B1	-19.98	2.73	TCDIH.29050	-5.33
2.26	TCSG.A5R3.B1	-3.11	19.99	TCSG.A5L7.B1	-1.76	1.25	TCDIH.29205	-4.25
2.79	TCSG.B5R3.B1	-3.25	19.96	TCSG.D4L7.B1	-1.49	2.28	TCDIV.29234	-4.28
6.11	TCLA.A5R3.B1	-5.8	19.99	TCSG.B4L7.B1	-0.93	3.17	TCDIH.29465	-2.65
4.95	TCLA.B5R3.B1	-6.12	2.29	TCSG.A4L7.B1	-19.98	7.52	TCDIV.29509	-5.72

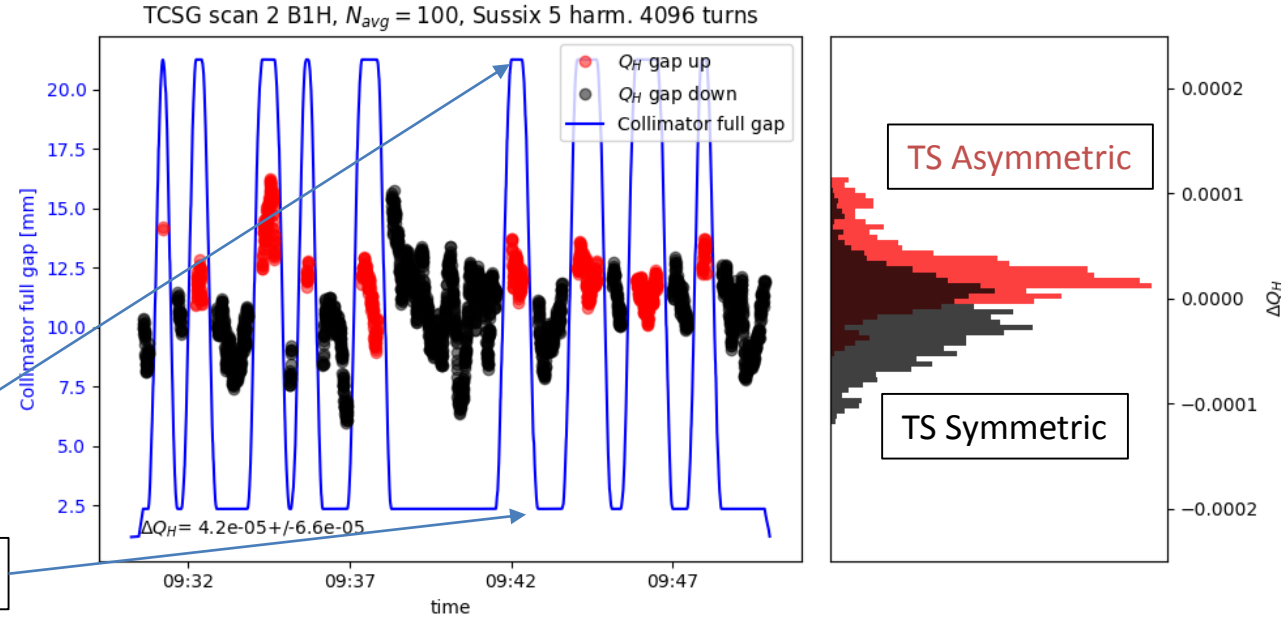
BETATRON_HOR BETATRON_VER OFFMOMENTUM_POS_DP OFFMOMENTUM_NEG_DP

MD results

- Impedance measurement during second fill
- Tried to apply the method used in previous MDs (TCSPM for example)
 - Coherent kicking of the bunch with the ADT while collimators are moved
 - Bunch-by-bunch, turn-by-turn position data saved with the ADT ObsBox
 - Online computation of tune with pySUSSIX
- Several difficulties encountered
 - Oscillations de-coherence too fast because of high chromaticity & octupole current & ADT gain
 - Erratic recording with the ObsBox
- Fall back on measurement with BBQ
 - Offline analysis
 - Visible tune-shift when collimators are moved from asymmetric to symmetric settings

Asymmetric gaps

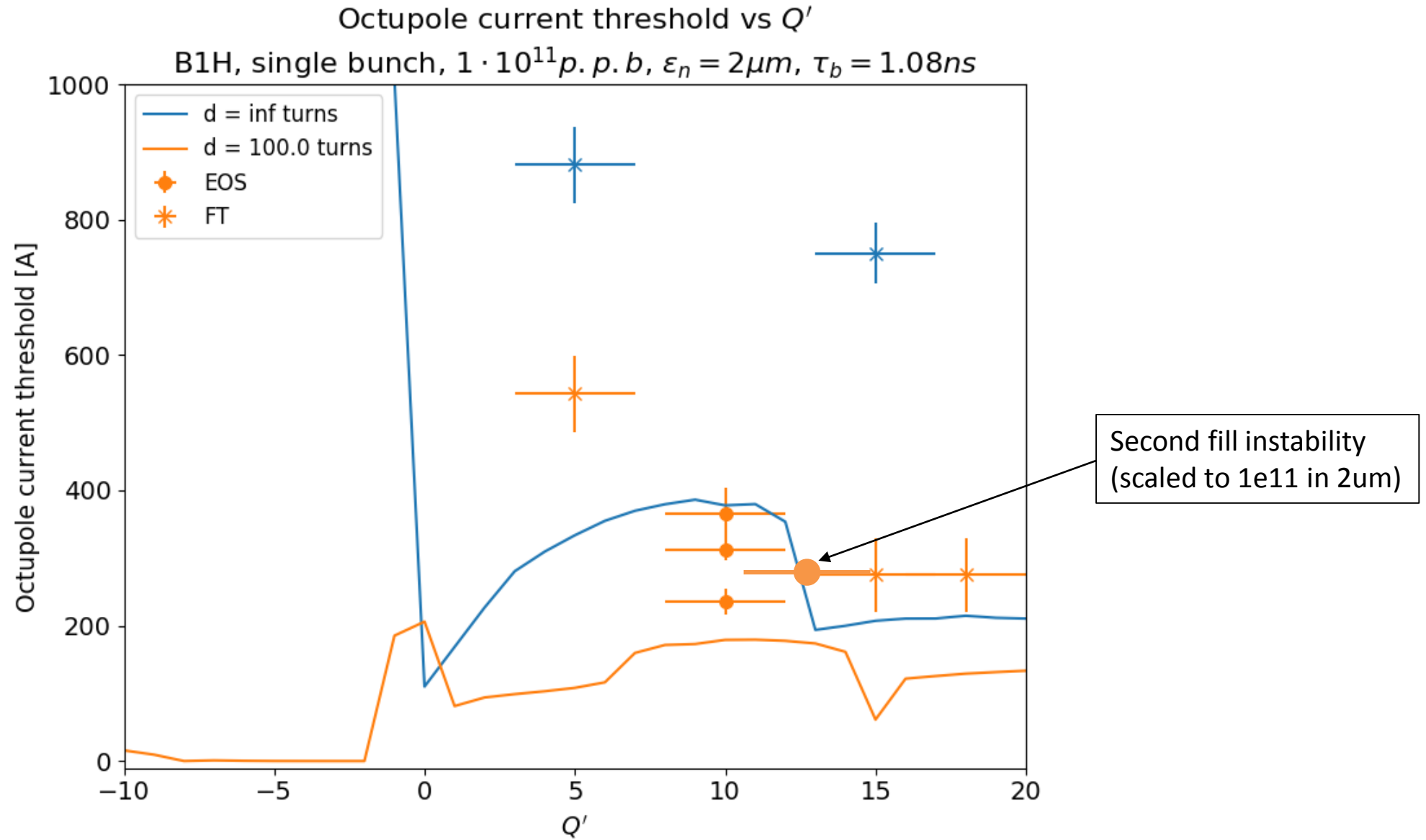
Symmetric gaps



MD results

- End of first fill: instability growth-rate measurement
 - Q' reduced to 5 units, octupoles at 300 A
 - $0.85 \cdot 10^{11} ppb$ (with $\sim 2\mu m$ emittance) became unstable when switching off ADT
- Second fill: high intensity bunch ($1.75 \cdot 10^{11} ppb$ in $1.8\mu m$) was very sensitive!
 - Octupoles were at 550 A
 - Tried to reduce Q' to 5 units (in two steps of 5 units): B1H and B2H unstable at $Q' \sim 10$
- Growth rate measurement with asymmetric settings:
 - With the low intensity bunch ($0.85 \cdot 10^{11} ppb$ in $1.5\mu m$)
 - Q' was reduced to 5/8 in B1/B2
 - Bunch unstable at 150A with ADT off
- Linear dependence of the instability growth-rate with intensity $1.5\mu m$

MD results



Second fill instability
(scaled to 1e11 in 2um)