Options with no MS10

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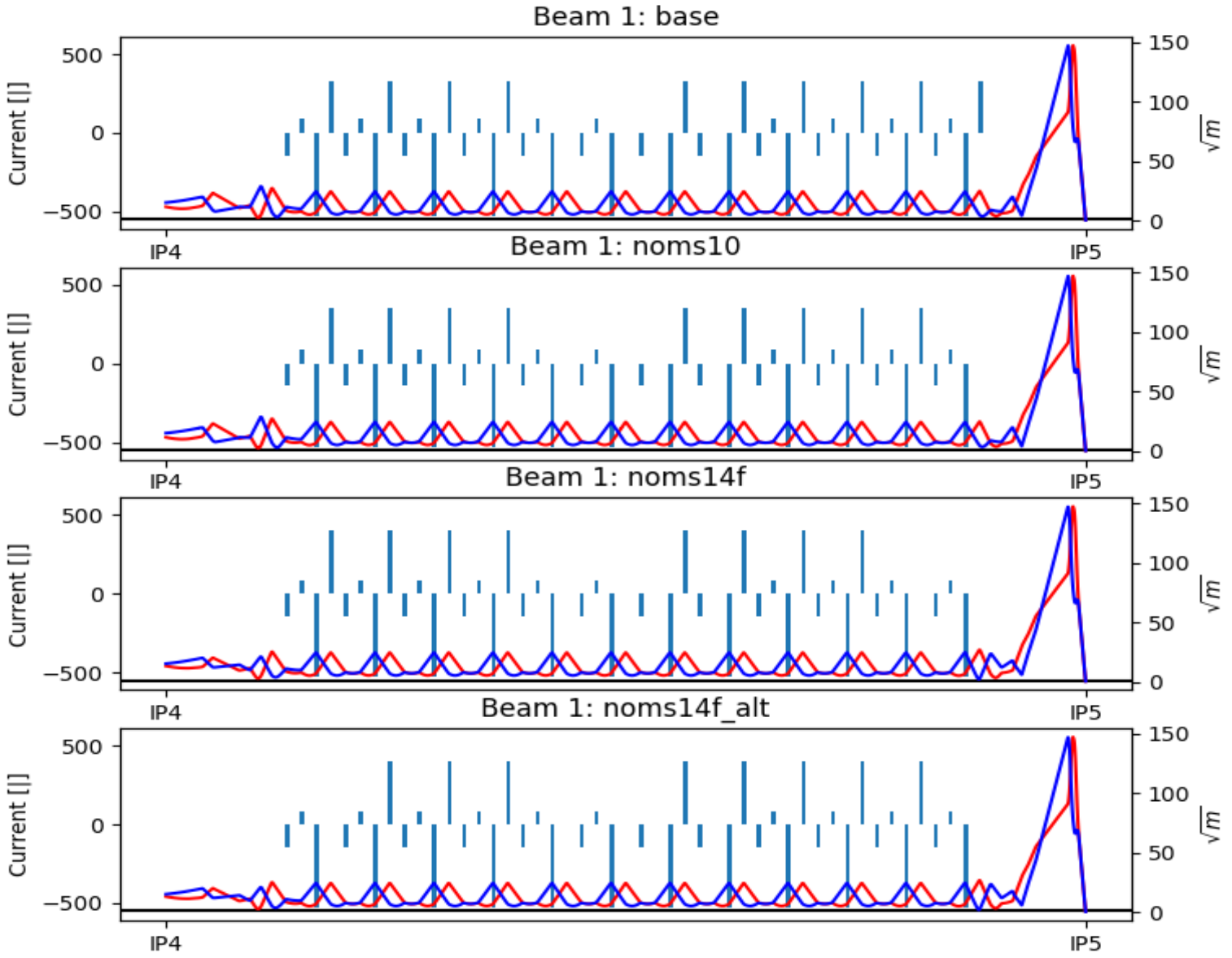
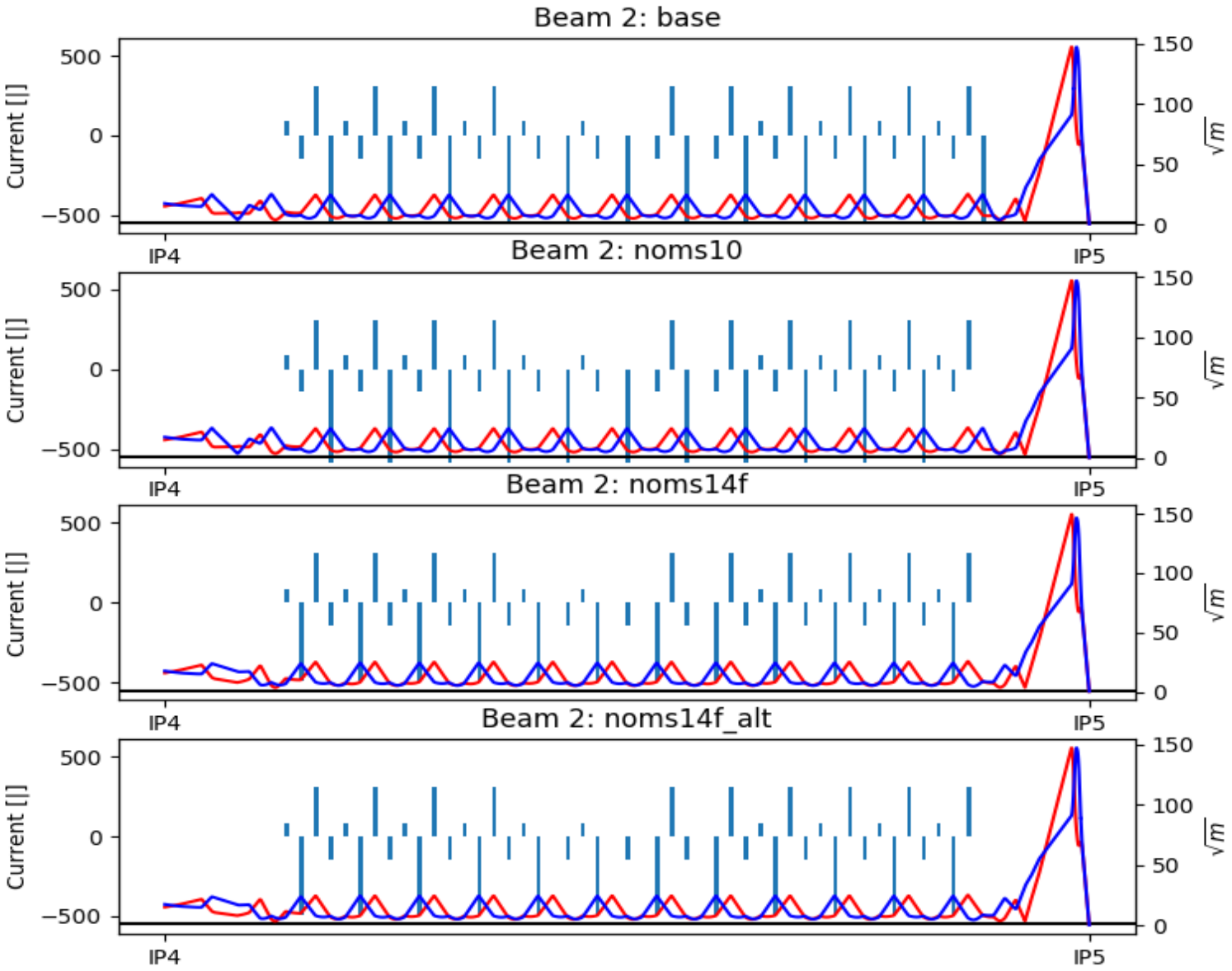
F. Van Der Veken. Thanks to S. Fartoukh

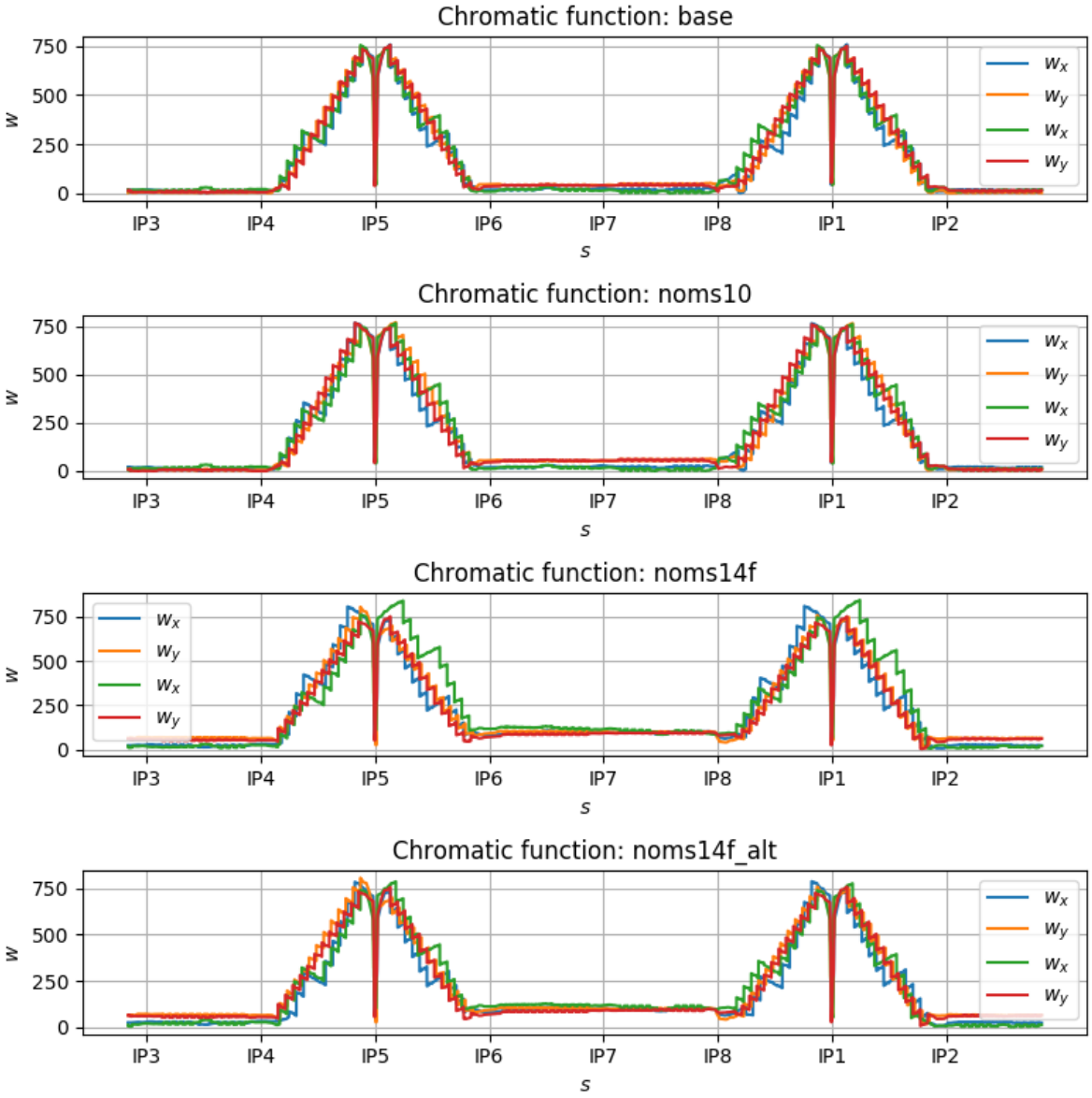
Why MS10


Beam 1: base
Beam 1: noms10
Beam 1: noms14f
Beam 1: noms14f_alt
Current [I]
500
0
−500
150
100
50
0
√m
IP4
IP5

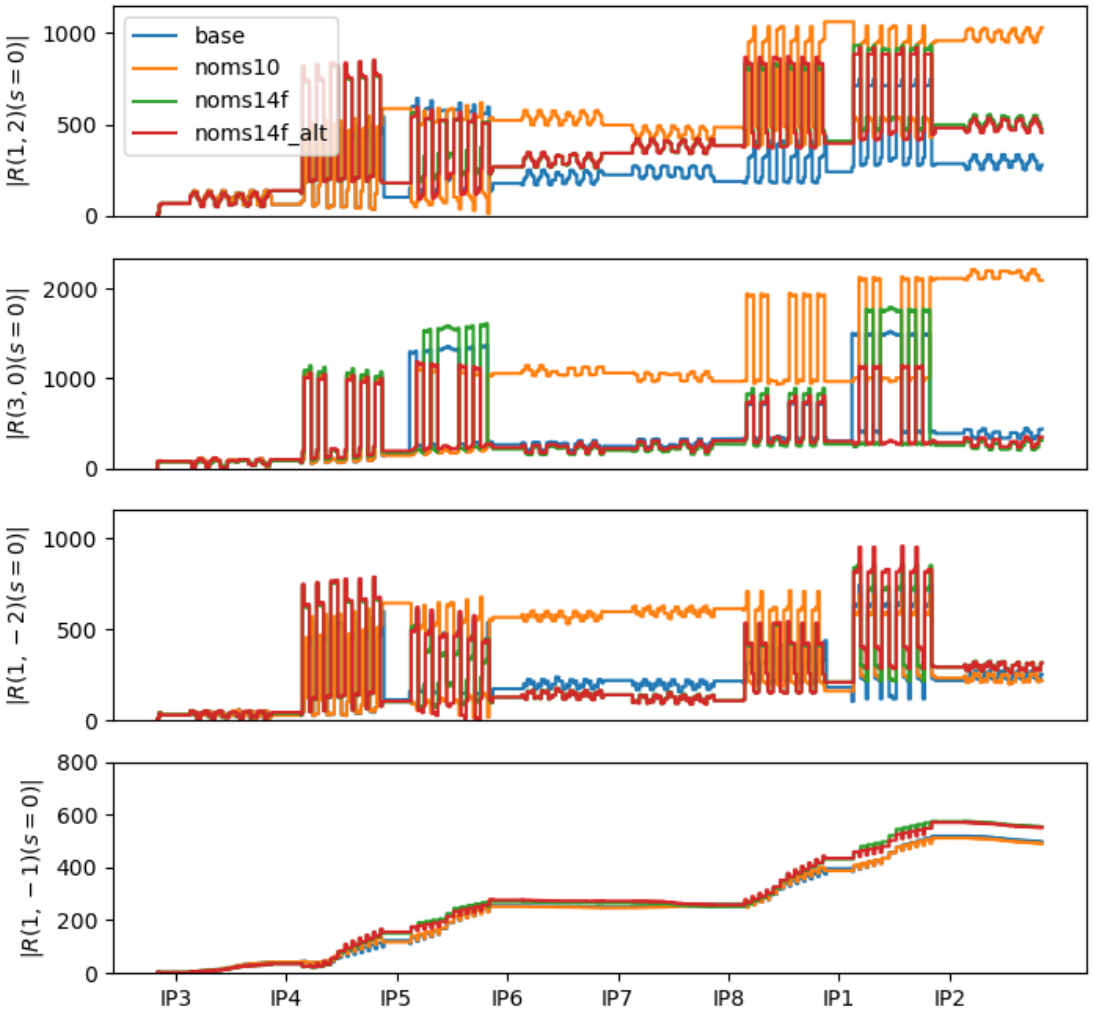
Why MS10


Beam 2: base
Beam 2: noms10
Beam 2: noms14f
Beam 2: noms14f_alt
Current [I]
500
0
−500
150
100
50
0
√m
IP4
IP5

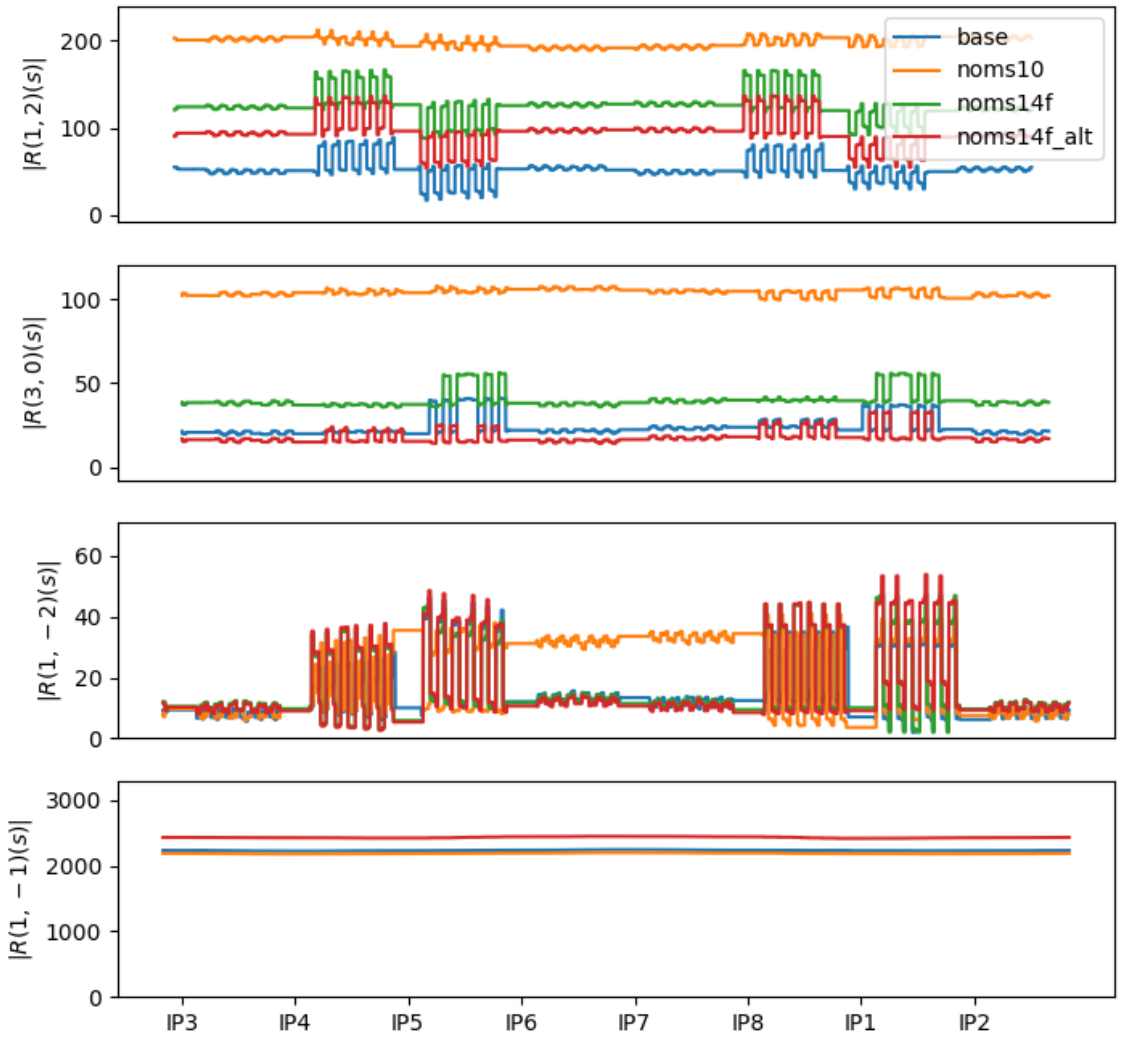
Why MS10


Chromatic function: base
Chromatic function: noms10
Chromatic function: noms14f
Chromatic function: noms14f_alt
w
s
750
500
250
0
IP3
IP4
IP5
IP6
IP7
IP8
IP1
IP2
w_x
w_y
w_x
w_y

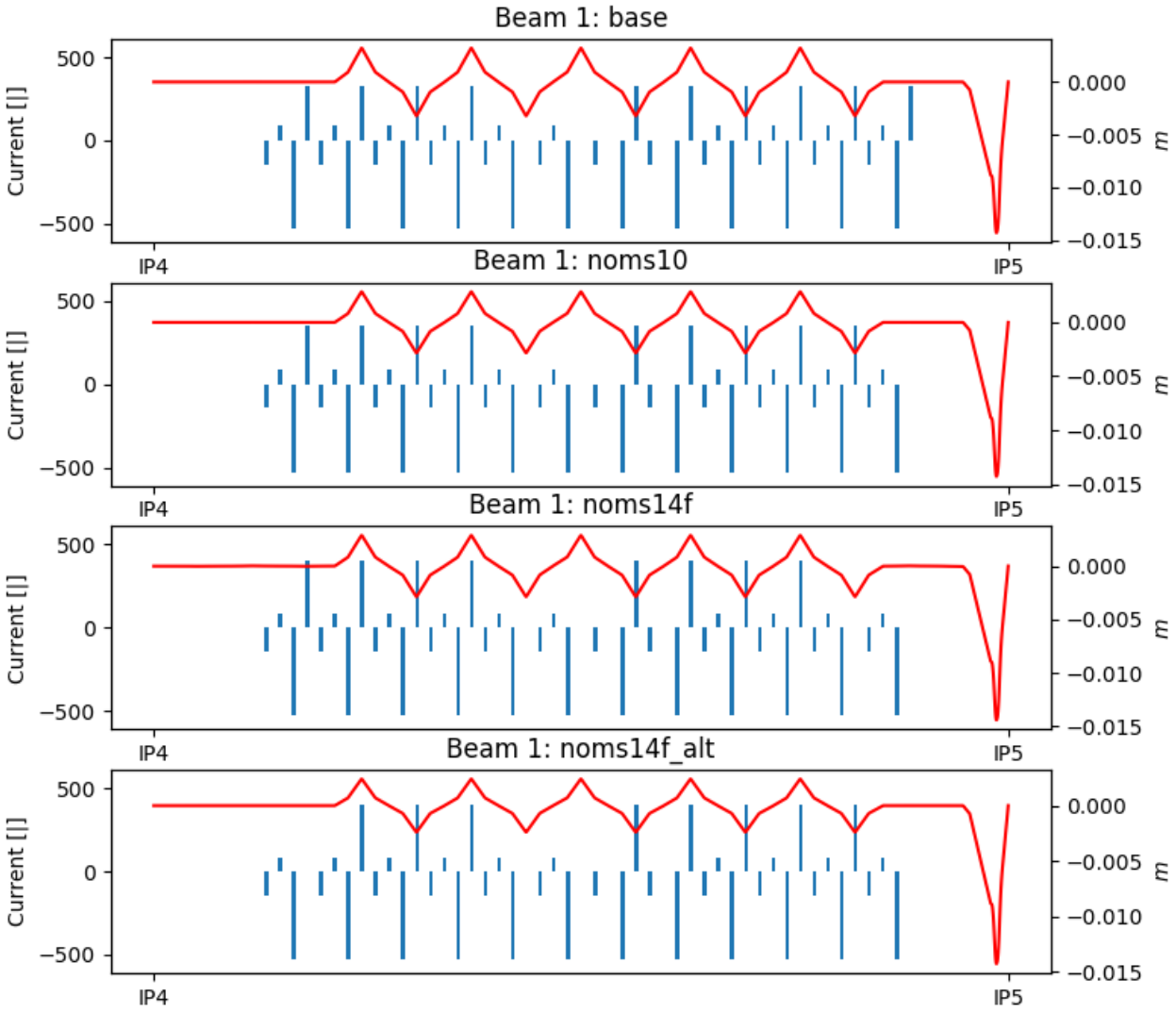
Why MS10


base
noms10
noms14f
noms14f_alt
$|R(1,2)(s=0)|$
$|R(3,0)(s=0)|$
$|R(1,-2)(s=0)|$
$|R(1,-1)(s=0)|$
IP3
IP4
IP5
IP6
IP7
IP8
IP1
IP2

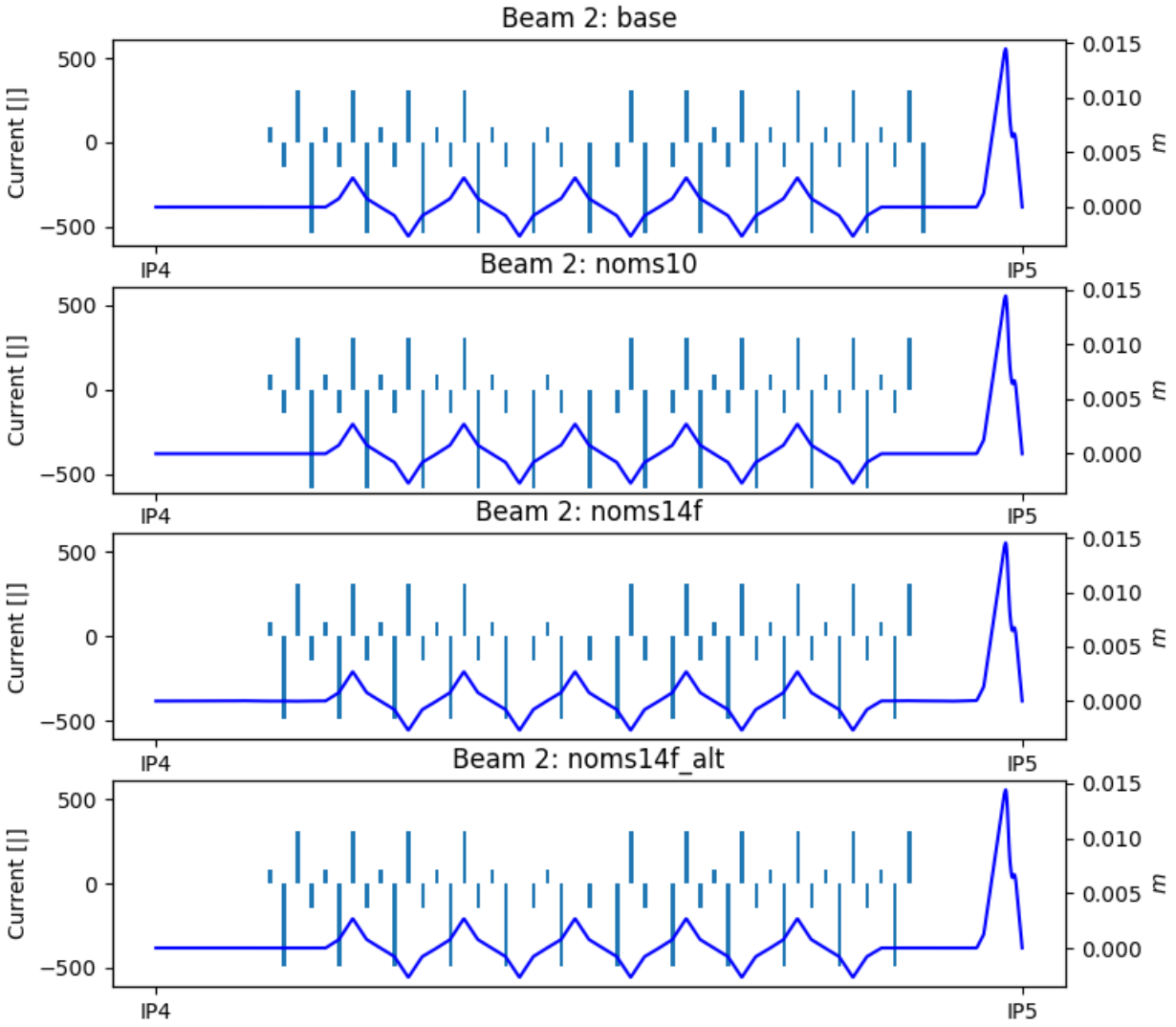
Why MS10


base
noms10
noms14f
noms14f_alt
$|R(1,2)(s)|$
$|R(3,0)(s)|$
$|R(1,-2)(s)|$
$|R(1,-1)(s)|$
IP3
IP4
IP5
IP6
IP7
IP8
IP1
IP2

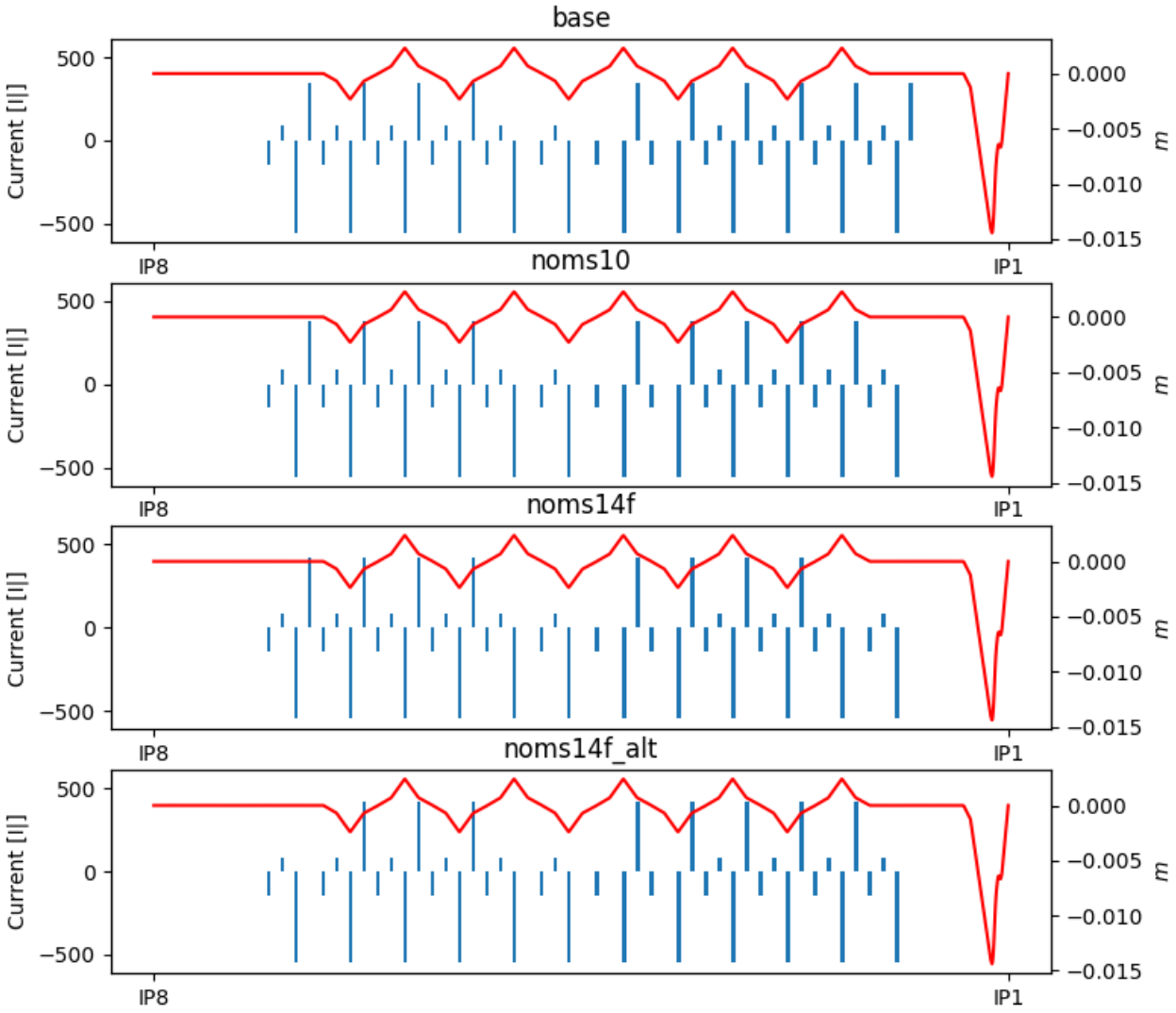
Why MS10


Beam 1: base
Beam 1: noms10
Beam 1: noms14f
Beam 1: noms14f_alt
Current [I]
500
0
−500
IP4
IP5
0.000
−0.005
−0.010
−0.015
m

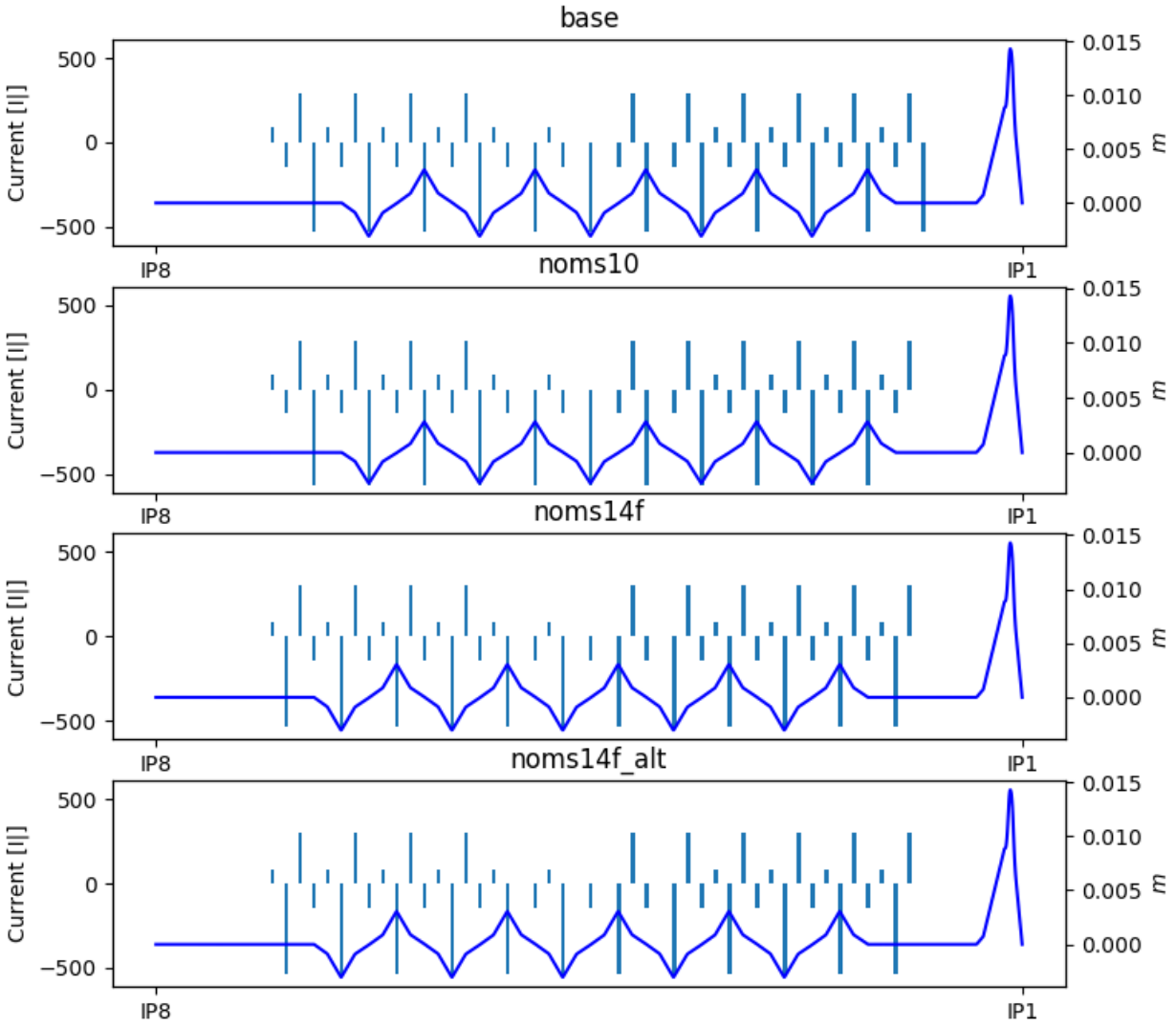
Why MS10


Beam 2: base
Beam 2: noms10
Beam 2: noms14f
Beam 2: noms14f_alt
Current [I]
500
0
−500
IP4
IP5
0.015
0.010
0.005
0.000
m

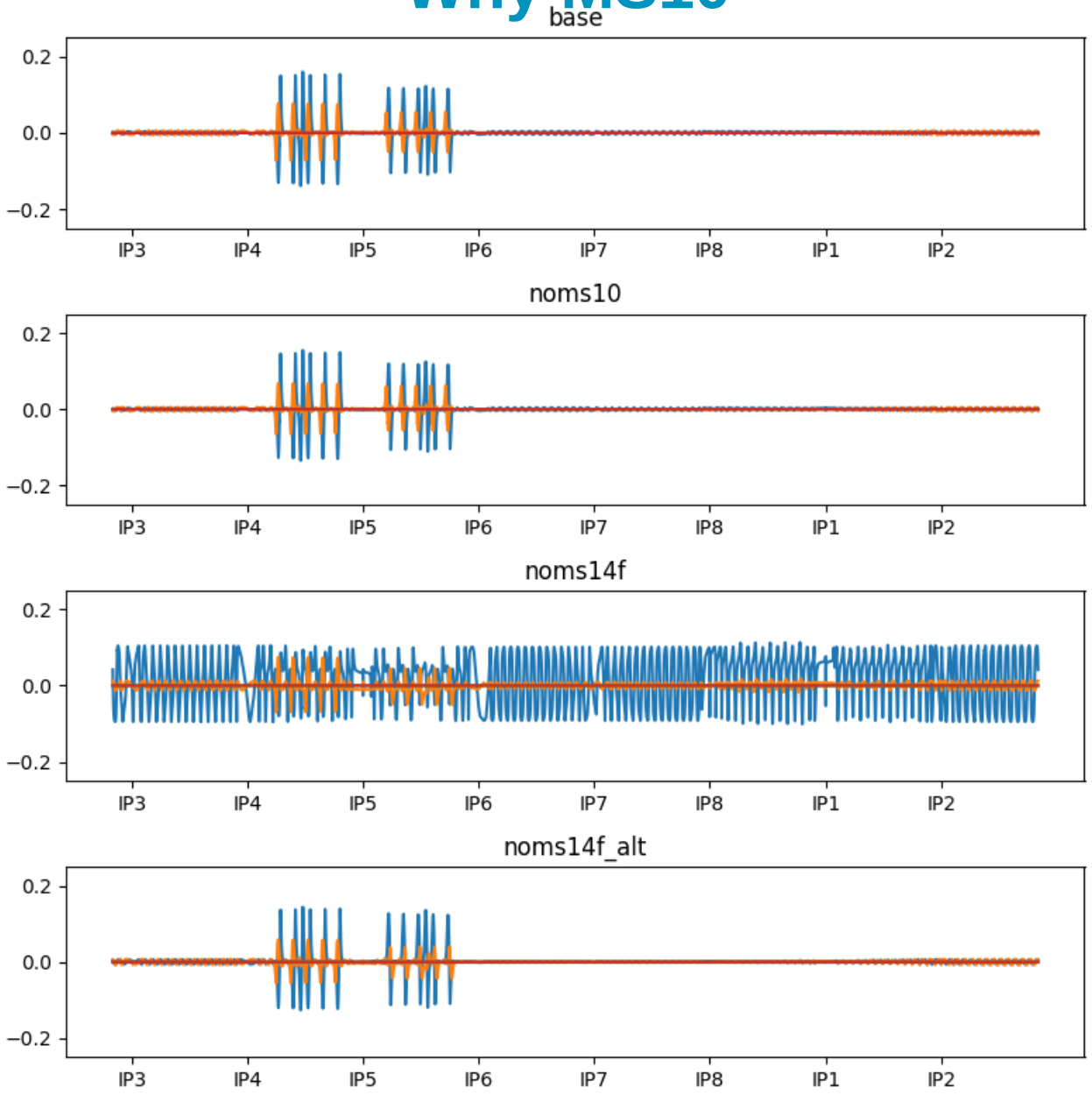
Why MS10


base
noms10
noms14f
noms14f_alt
Current [I]
500
0
−500
IP8
IP1
0.000
−0.005
−0.010
−0.015
m

Why MS10


base
noms10
noms14f
noms14f_alt
Current [I]
500
0
−500
IP8
IP1
0.015
0.010
0.005
0.000
m

Why MS10



HiLumi HL-LHC PROJECT

Options

Baseline

- Adding MS+MCB to replace MCBC in Q10 IR1/5
- Same length but different interfaces
- MS at 551A

Arc	MS14	MS13	MS12	MS11
B1: 81,45	F1(10)	D1(12)	F2(10)	D2(12)
B2: 81,45	D1(12)	F1(10)	D2(12)	F2(10)
B1: 12,56	D2(12)	F2(10)	D1(12)	F1(10)
B2: 12,56	F2(10)	D2(12)	F1(10)	D1(12)

NoMS10:

- Same as in LHC.
- Smaller impact since either ATS squeeze is low or sextupoles are low
- MS up to 581A (11 vs 12 MSD)

Arc	MS14	MS13	MS12	MS11
B1: 81,45	F1(9)	D1(12)	F2(10)	D2(12)
B2: 81,45	D1(11)	F1(10)	D2(12)	F2(10)
B1: 12,56	D2(11)	F2(10)	D1(12)	F1(10)
B2: 12,56	F2(9)	D2(12)	F1(10)	D1(12)

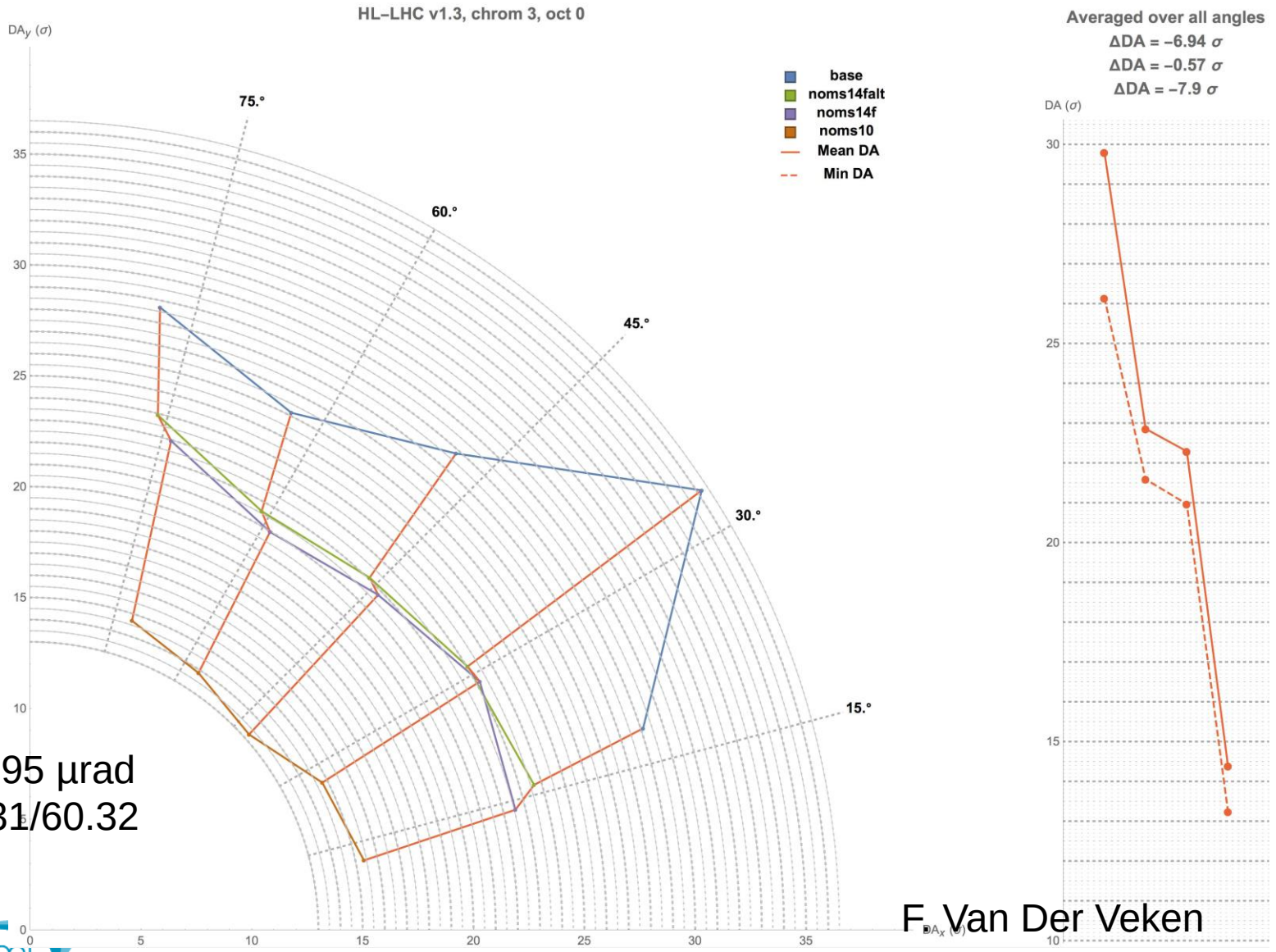
NoMS14f:

- New phase for IR1/5: μ_y 2.642 –> 2.392.
- Remove MS14 in IR15LR or IR84R/26L
- Redo all optics in IR1/5/2/4/6/8
- MS up to 527A

Arc	MS14	MS13	MS12	MS11
B1: 81,45	F1(8)	D1(12)	F2(10)	D2(12)
B2: 81,45	D1(11)	F1(10)	D2(12)	F2(10)
B1: 12,56	D2(11)	F2(10)	D1(12)	F1(10)
B2: 12,56	F2(8)	D2(12)	F1(10)	D1(12)

Strong sextupoles, weak sextupoles; (F)ocusing, (D)efocusing; Familiy (1)(2)

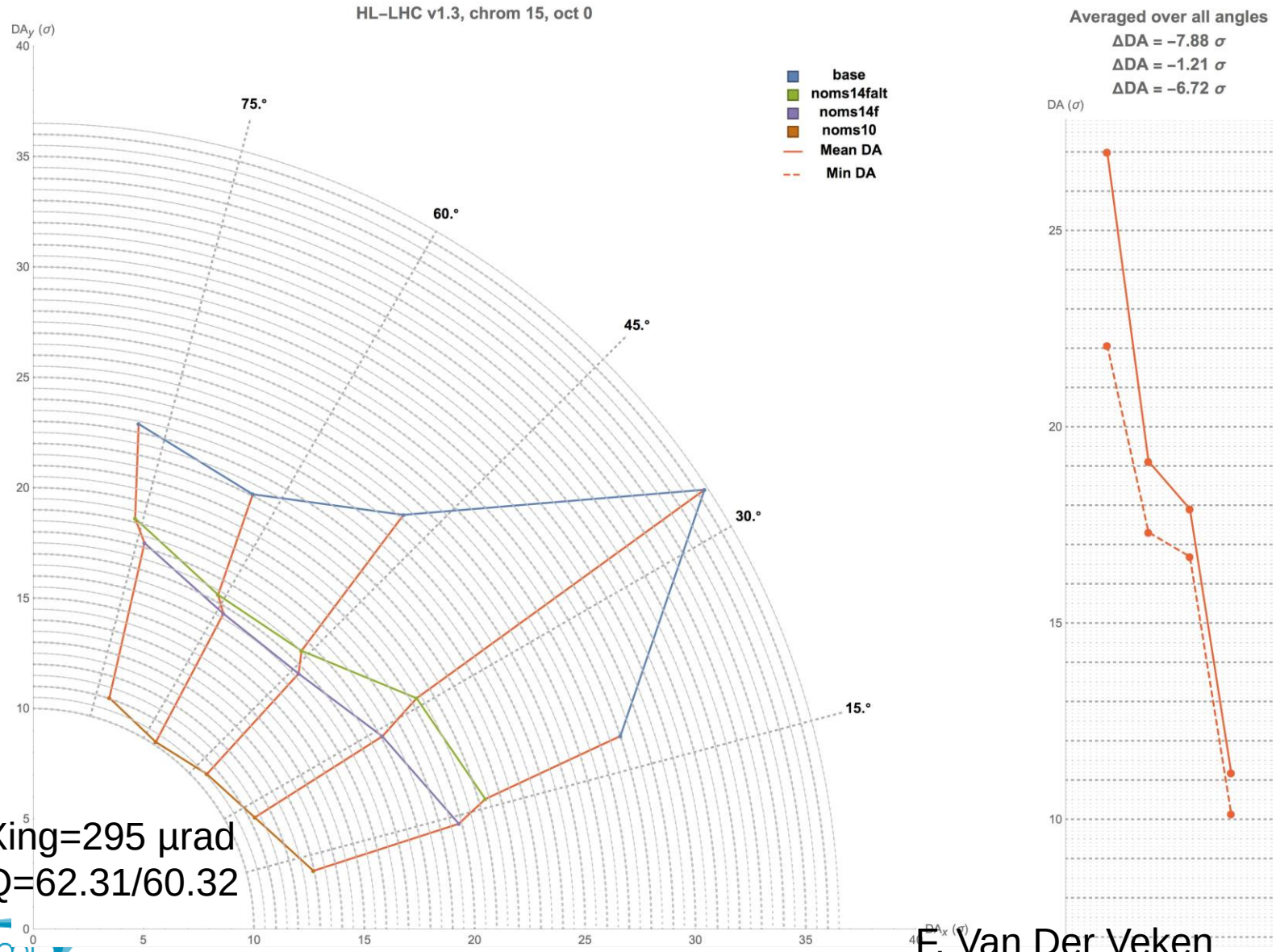
Da Sextupole only Q'=3



Xing=295 µrad
Q=62.31/60.32

F. Van Der Veken

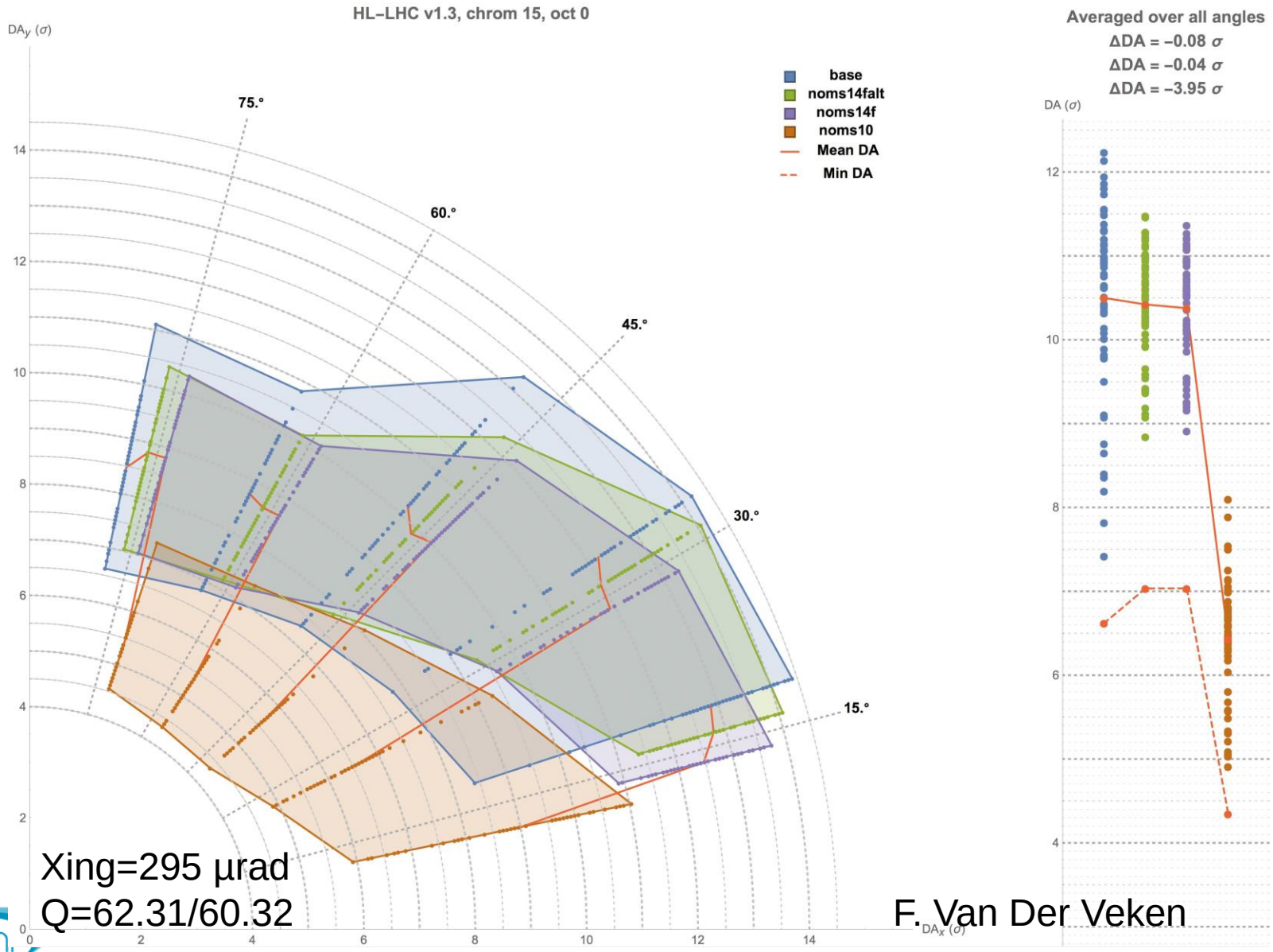
Da Sextupole only Q'=15



Xing=295 µrad
Q=62.31/60.32

F. Van Der Veken

DA with imperfection Q'=15

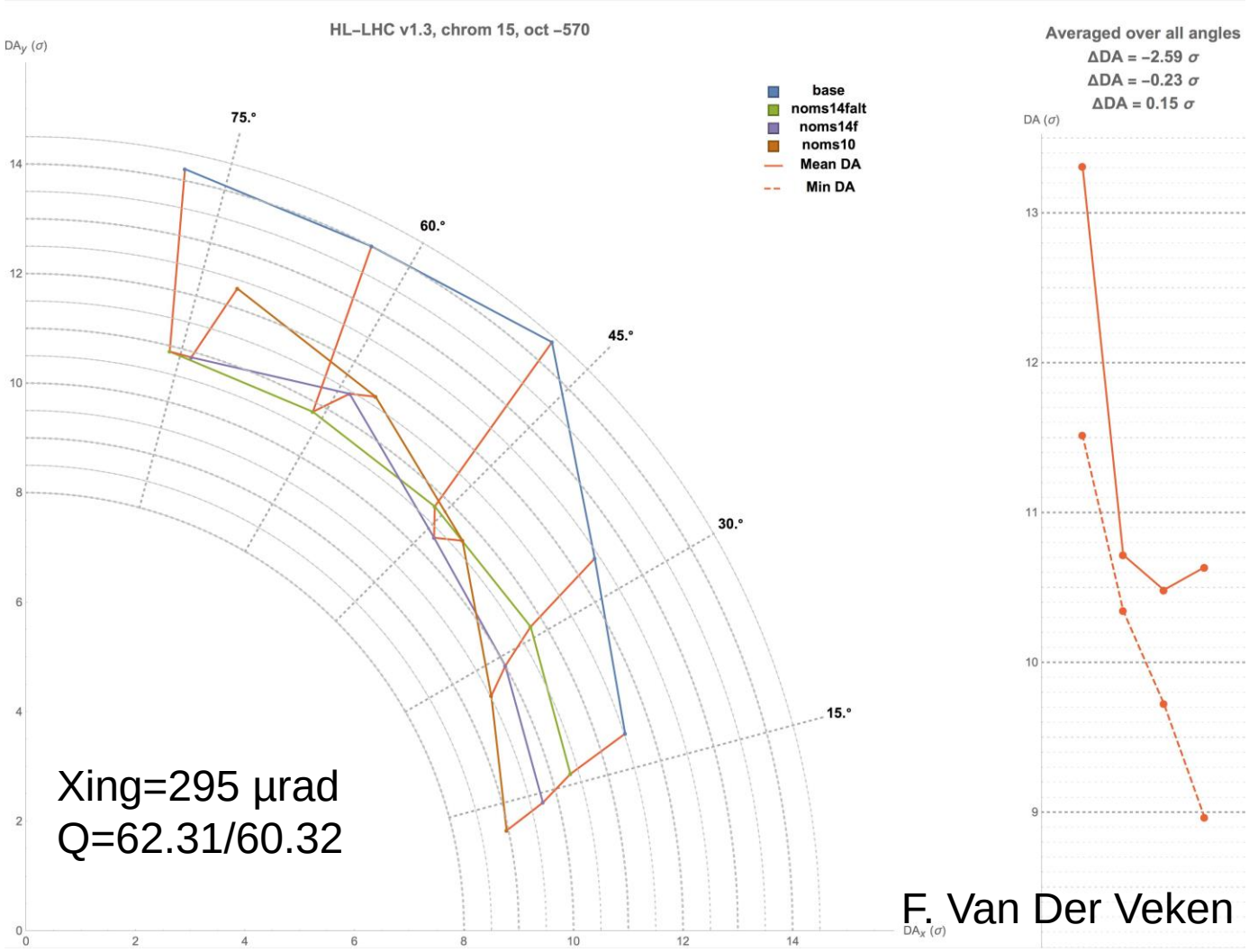


Xing=295 µrad

Q=62.31/60.32

F. Van Der Veken

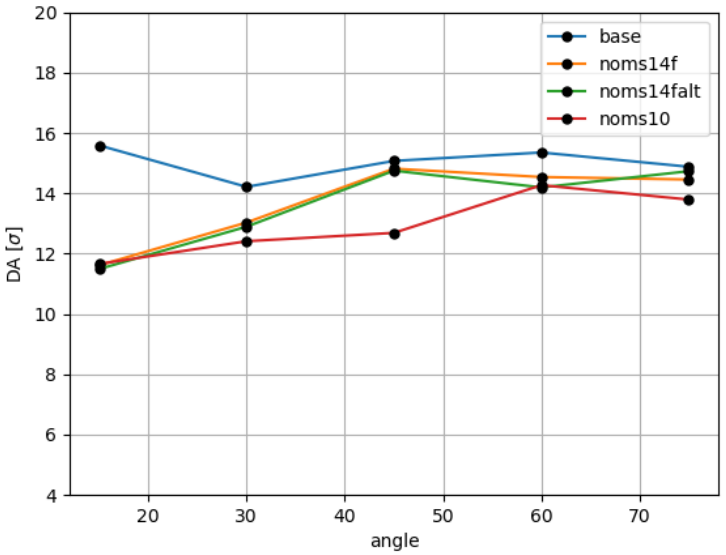
Da Sextupole only and MO



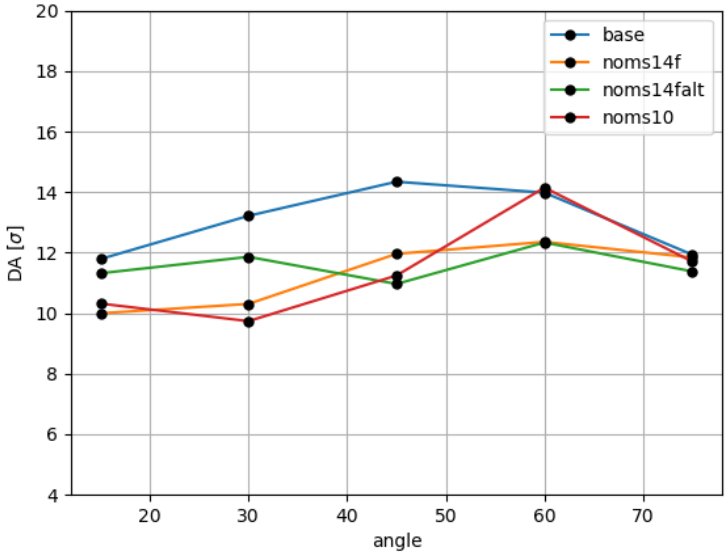
Xing=295 µrad
Q=62.31/60.32

F. Van Der Veken

DA sextupole and octupoles



NO dispersion correction



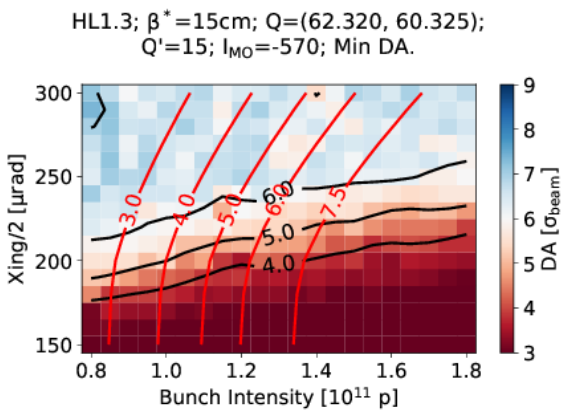
With dispersion correction

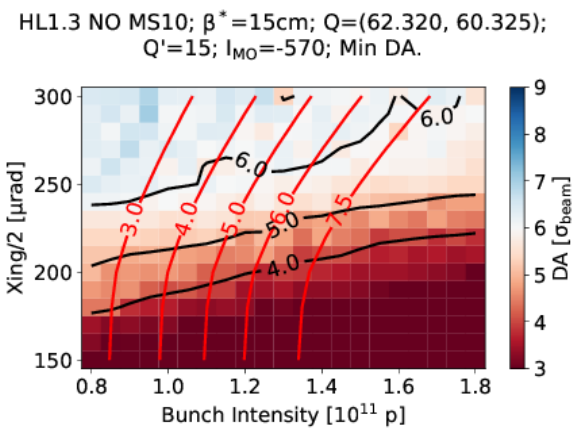
MO=-570, Xing=250, 62.31/60.32 tune, δ=2.7 10^{-4}

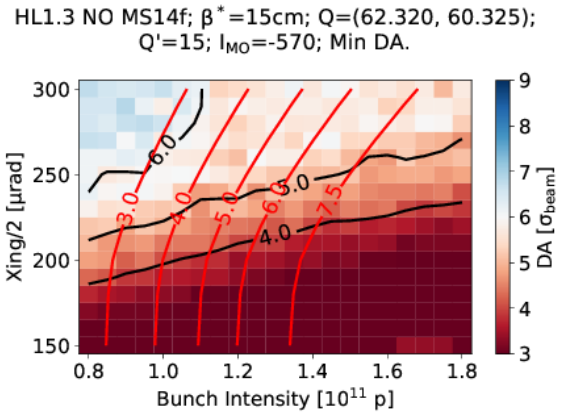
Dispersion correction with strong MO reduce DA by about 2 σ.

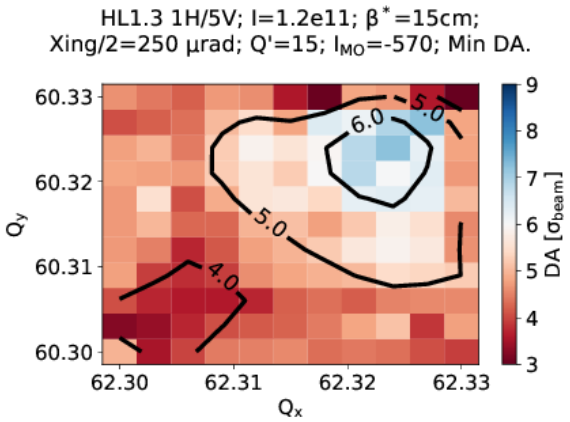
MO feed-downs likely cause (a3, b3, a2).

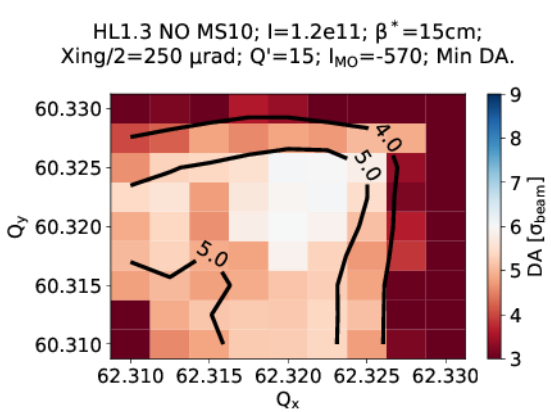
DA with BB

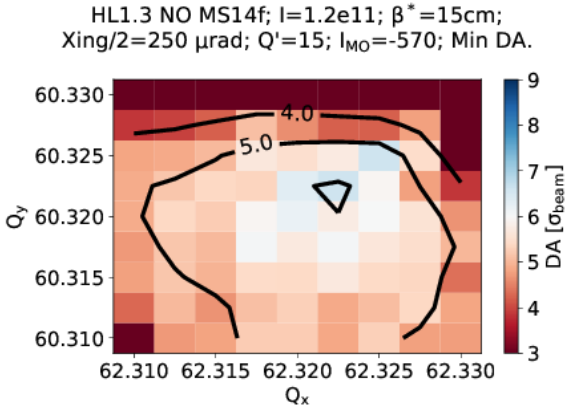












Q'=13.2/8.0
$|D_{max}|$=7.3/6.8 m

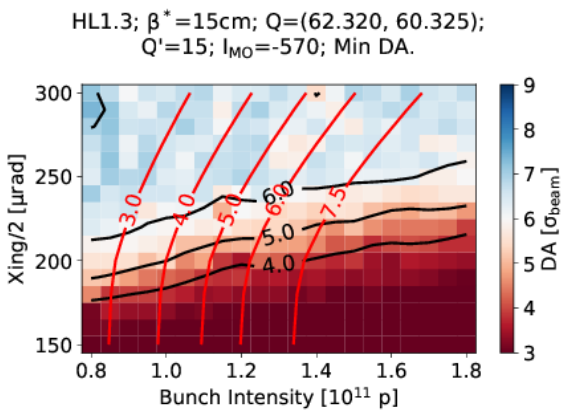
Q'=12.7/7.2
$|D_{max}|$=7.3/7.2 m

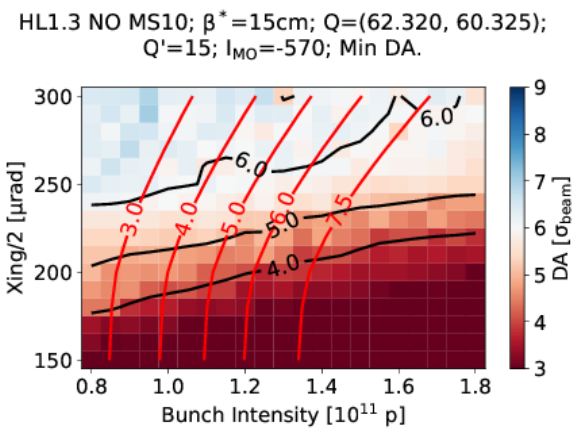
Q'=18.9/182
$|D_{max}|$=6.6/9.1 m

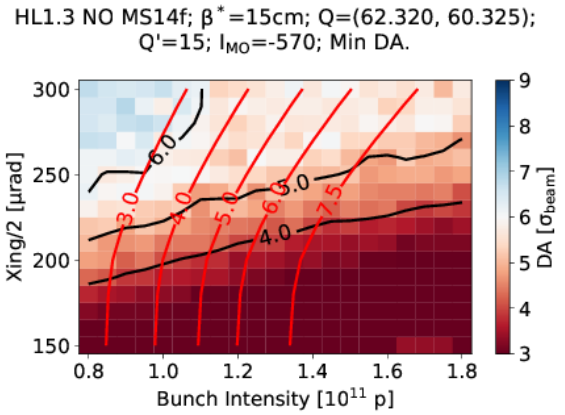
No dispersion correction.

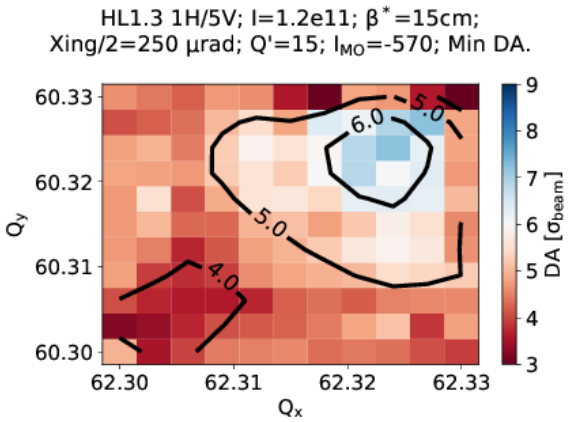
D. Pellegrini

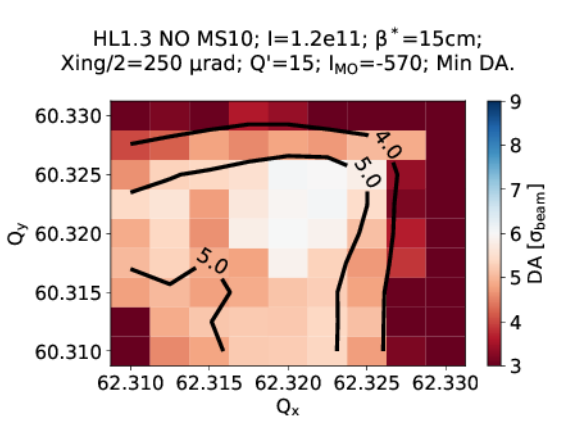
DA with BB

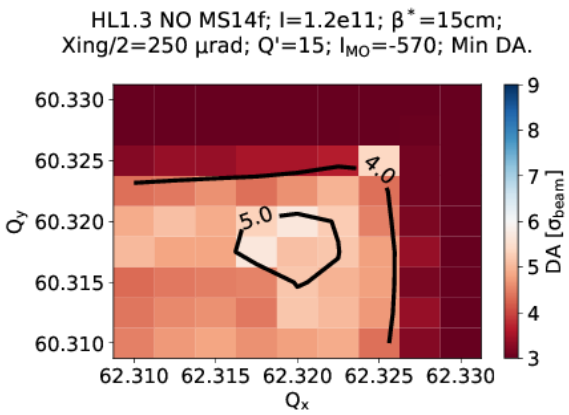












Q'=13.2/8.0
$|D_{max}|$=7.3/6.8 m

Q'=12.7/7.2
$|D_{max}|$=7.3/7.2 m

Q'=14.9/14.8
$|D_{max}|$=2.9/0.6 m
with disp. correction

No dispersion correction.

D. Pellegrini

Computing issues

Last week experience:

- Credential error preventing submission most of the time
- 40% jobs takes too long; 15% jobs disappear silently
- Using new version of script from Alessio reducing I/O with AFS:
  - 5% taking too long on sixtrack (fully isolated)
  - 15% failure or taking too long madx jobs (needs only read-only AFS)

After several helpdesk tickets, calling Ben Jones:

- Most of the problems seems related to authentication errors, the authentication server does not reply to the scheduler and/or batch nodes
- new patch to overcome under testing (it uses the automatic renewal of the tokens that last one week)

Conclusion

- Baseline gives better performance.
- Removing MS10 results in strong DA degradation.
- Alternative without MS10 and also removing MS14F:
  - restore DA only in simple scenarios
  - with octupoles and beam-beam beam-beam is comparable if not worse than simple MS10 removal.
  - Mechanism behind to be understood.
- Additional DA simulations needed complete the cases and improve the understanding of DA degradation for a possible cure.
- With the available results, the MS14f is not equivalent to the baseline