Transverse and longitudinal bunch profiles for MD2202(1/7/17): BBLR compensation using DC wires

M. Fitterer, A. Poyet, S. Papadopoulou, Y. Papaphilippou, G. Sterbini

Acknowledgements: E. Bravin, M. Hostettler, H.Timko, G.Trad

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- **MD overview**
- **Transverse bunch profiles (BSRT)**
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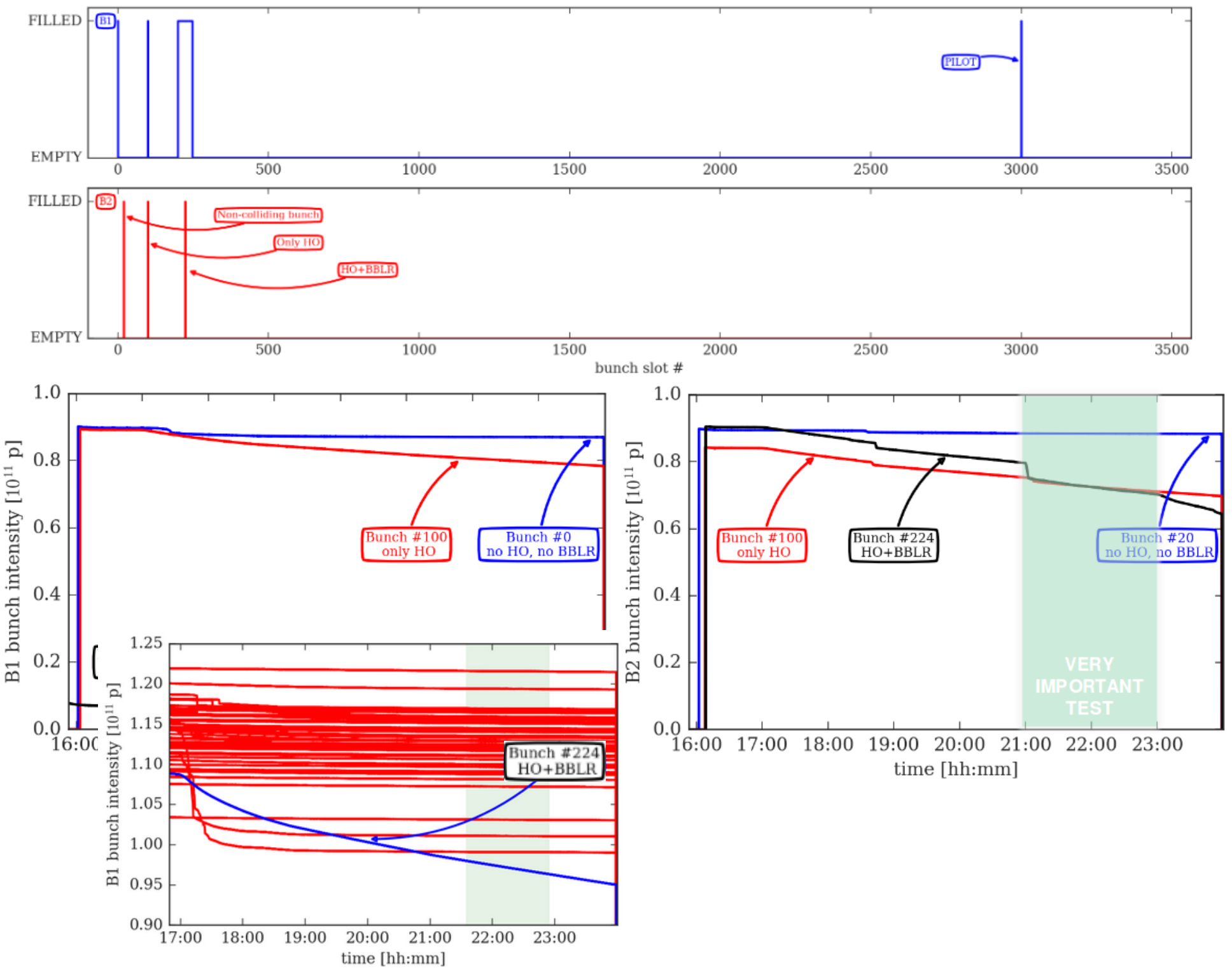
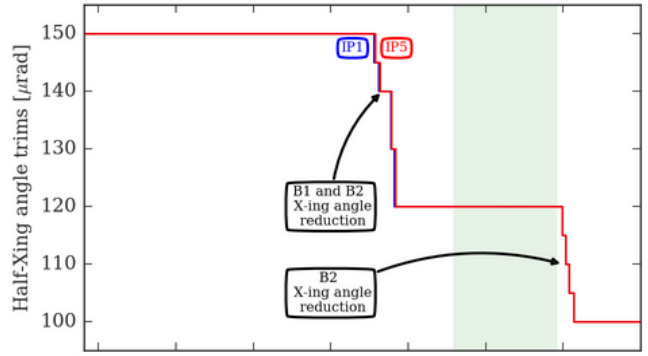
- **Longitudinal bunch profiles**
- **Summary and next steps**

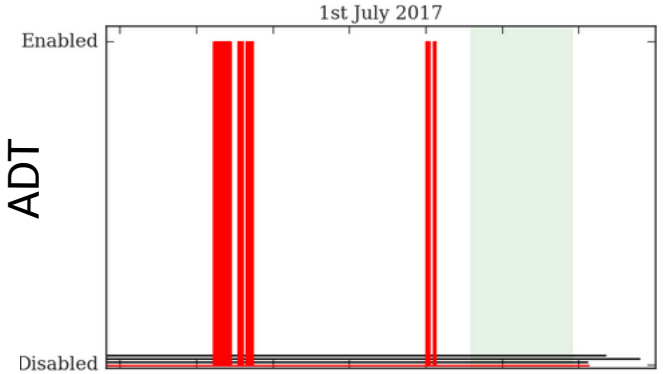
MD2202
BBLR compensation using DC wires
Summary and preliminary results
(almost a collection of plots to discuss together)

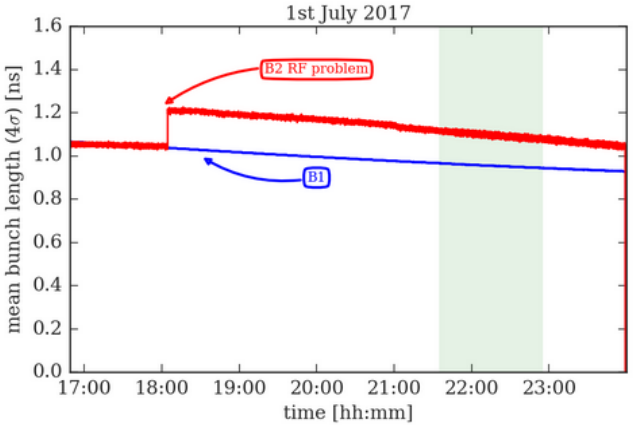
K. Skoufaris, Y. Papaphilippou, A. Rossi, S. Fartoukh, D. Pellegrini, K. Karastatis, A.Poyet, A. Valishev, S. Kostoglou, G. Sterbini, S. Papadopoulou, M. Fitterer, M. Solfaroli, M. Pojer, M. Hostettler, B. Salvachua, L. Carver, X. Buffat, P. Zisopoulos, H. Bartosik, N. Fuster, S. Redaelli, R. Bruce, M. Gonzales, G. Trad, M. Gasior, C. Zamatzas, J. Olexa, T. Levens, C. Xu, A. Gorzawski, D. Valuch, D. Amorim, I. Lamas Garcia, G. Cattenoz, E. Effinger, L. Poncet, D. Mirarchi, R. Tomas, D. Kaltchev, R. Jones, F. Schmidt [random order ;), sorry if I forgot someone]

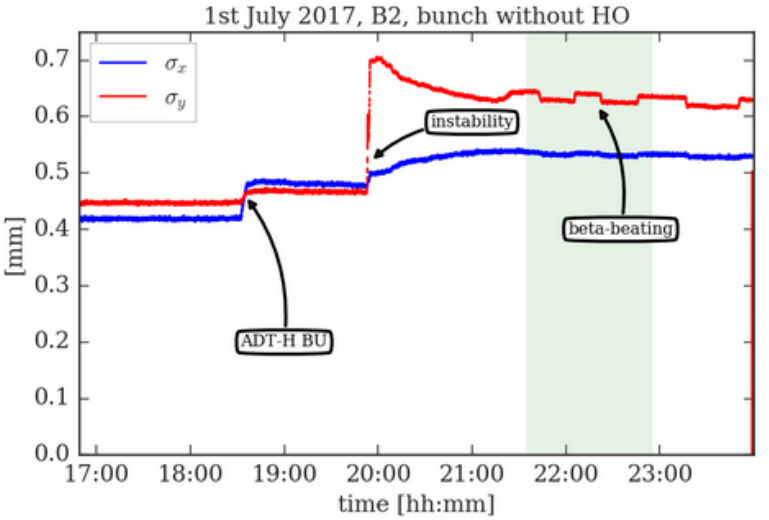
- We had two fills as foreseen ;) but we could use only FILL5900 (B2 weak beam).
- SPOILER: **a clear beneficial effect of the wire could be observed**.
- The analysis is only started: **comments/contributions are really appreciated!**
- Let us proceed per steps: we the MD earlier (1 h) so we could schedule an fast access to have the dBLM histogram on B2.

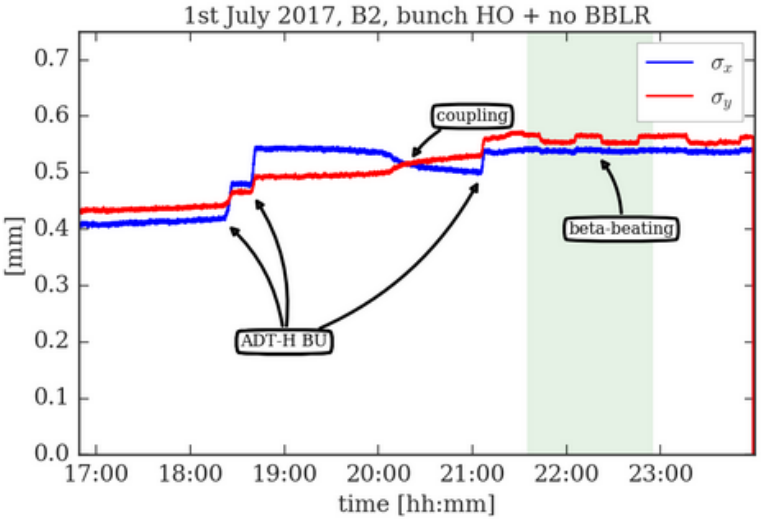

FILLED
EMPTY
B1
PILOT
0
500
1000
1500
2000
2500
3000
3500
FILLED
EMPTY
B2
Non-colliding bunch
Only HO
HO+BBLR
bunch slot #
B1 bunch intensity [10^11 p]
Bunch #100
only HO
Bunch #0
no HO, no BBLR
Bunch #224
HO+BBLR
B1 bunch intensity [10^11 p]
time [hh:mm]
B2 bunch intensity [10^11 p]
Bunch #100
only HO
Bunch #224
HO+BBLR
Bunch #20
no HO, no BBLR
VERY
IMPORTANT
TEST
time [hh:mm]

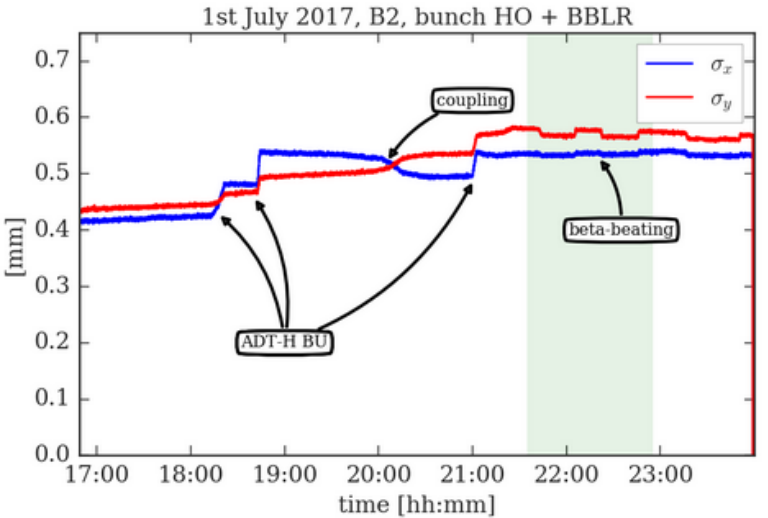

Half-Xing angle trims [μrad]
IP1
IP5
B1 and B2 X-ing angle reduction
B2 X-ing angle reduction

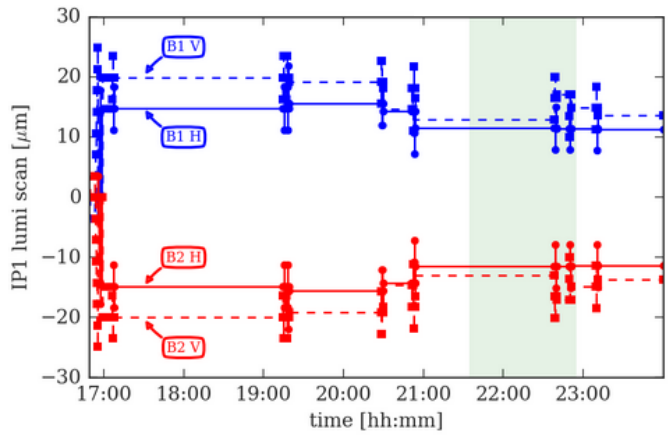

1st July 2017
ADT
Enabled
Disabled

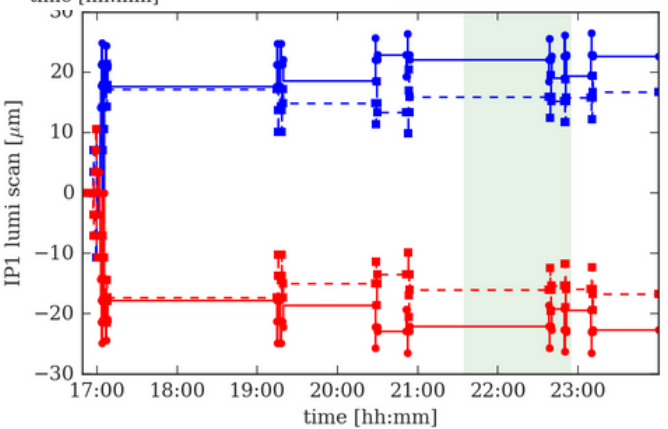

1st July 2017
mean bunch length (4σ) [ns]
B2 RF problem
B1
time [hh:mm]


1st July 2017, B2, bunch without HO
σx
σy
instability
beta-beating
ADT-H BU
[mm]
time [hh:mm]

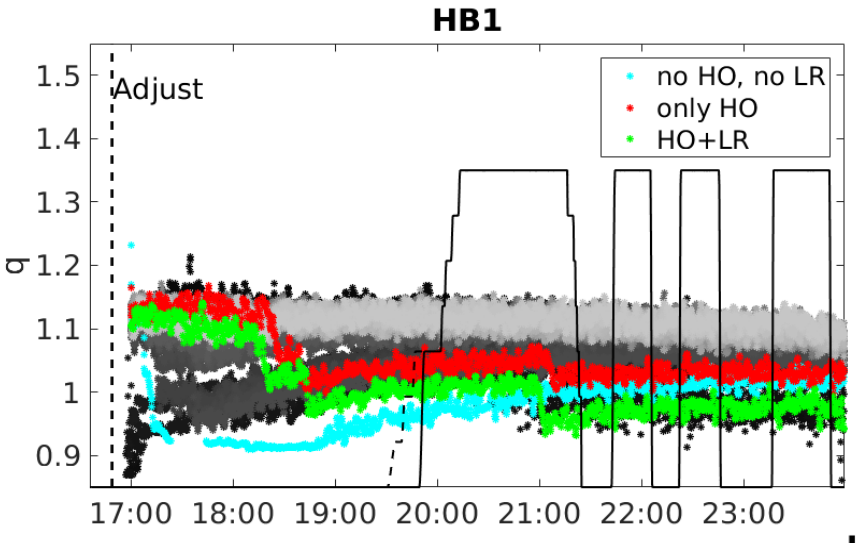

1st July 2017, B2, bunch HO + no BBLR
σx
σy
coupling
beta-beating
ADT-H BU
[mm]
time [hh:mm]

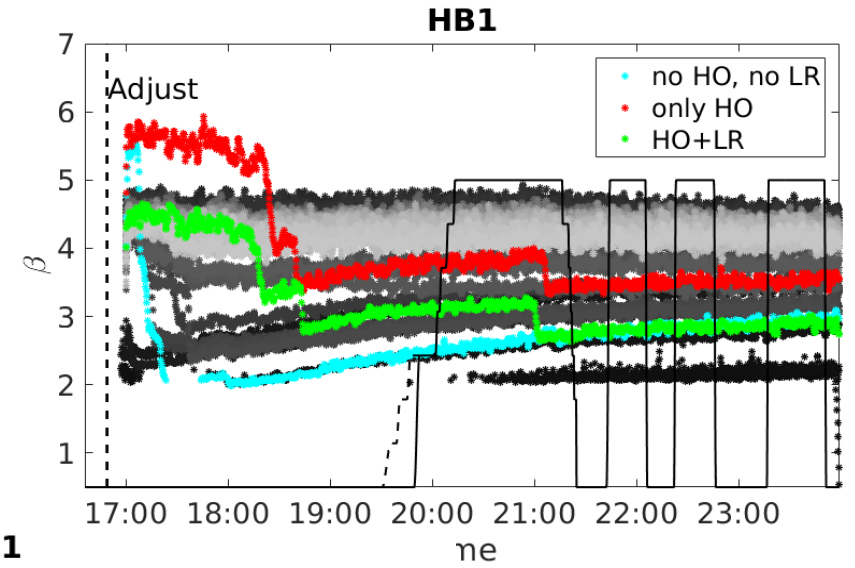

1st July 2017, B2, bunch HO + BBLR
σx
σy
coupling
beta-beating
ADT-H BU
[mm]
time [hh:mm]


B1 V
B1 H
B2 H
B2 V
IP1 lumi scan [μm]
time [hh:mm]

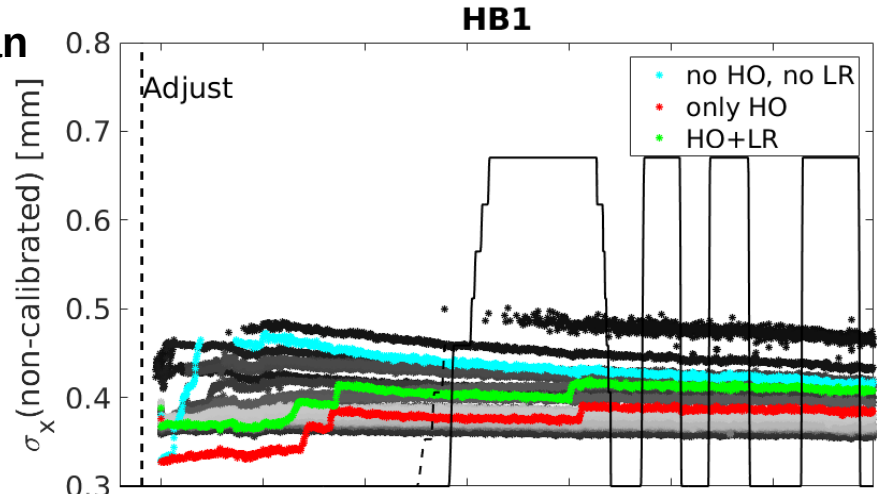

IP1 lumi scan [μm]
time [hh:mm]

Transverse profiles





q-Gaussian



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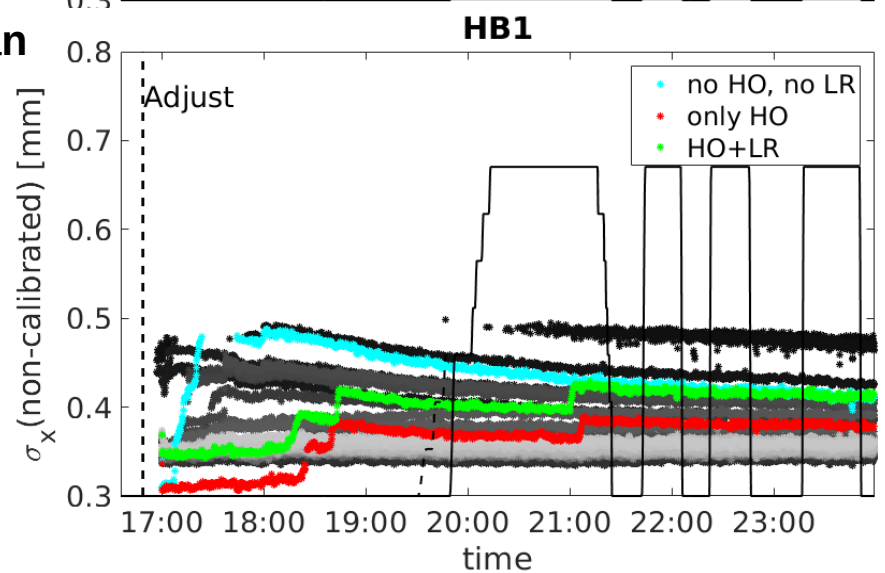

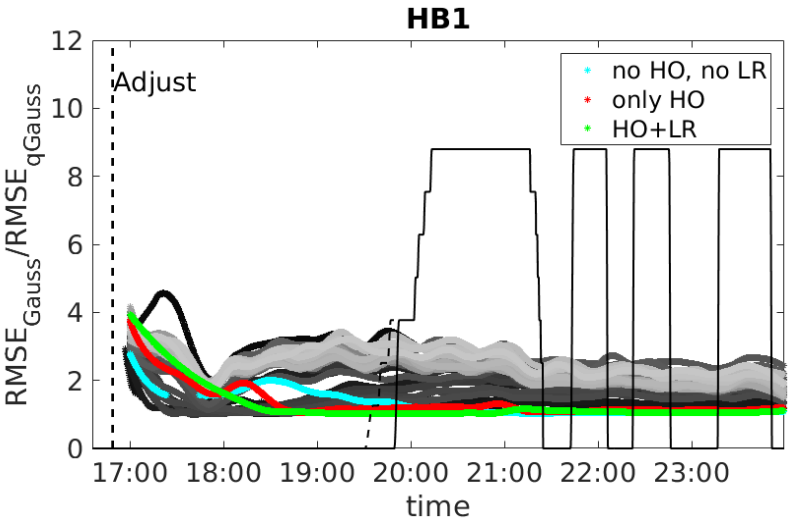

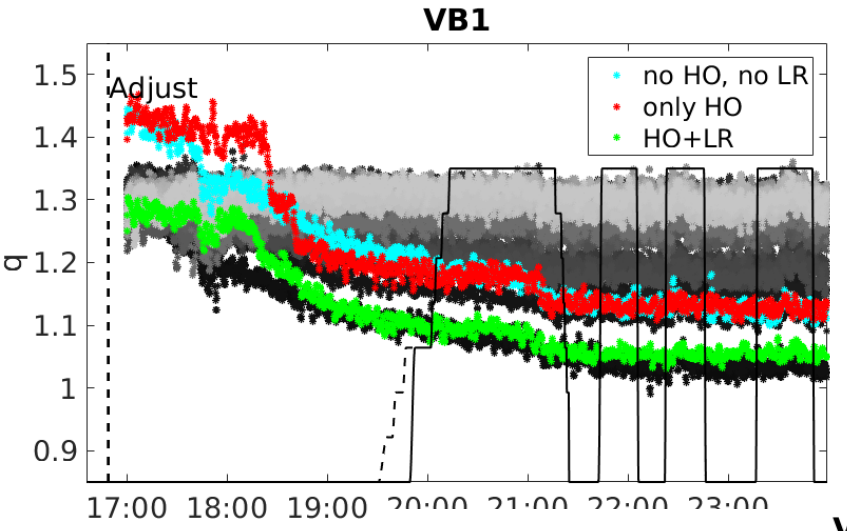

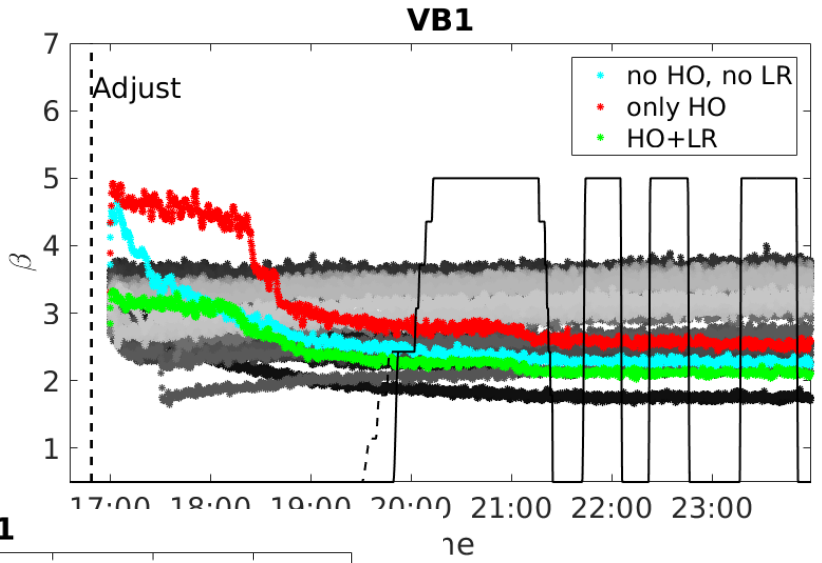

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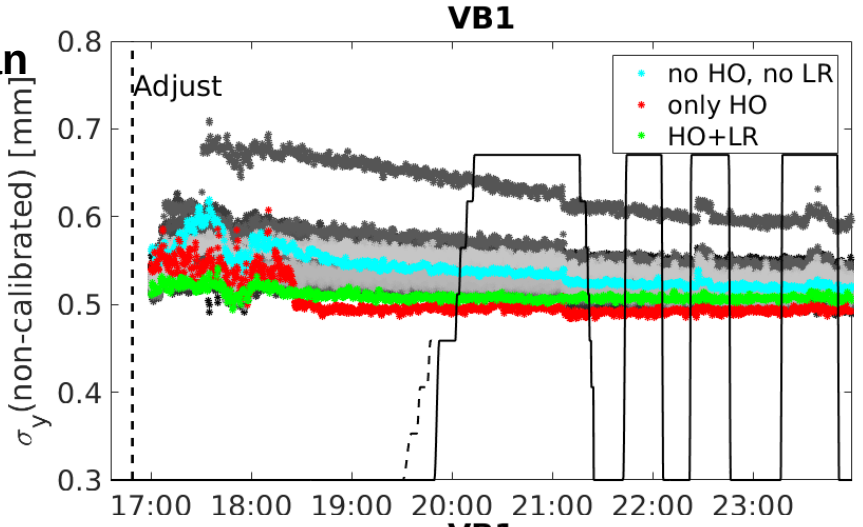

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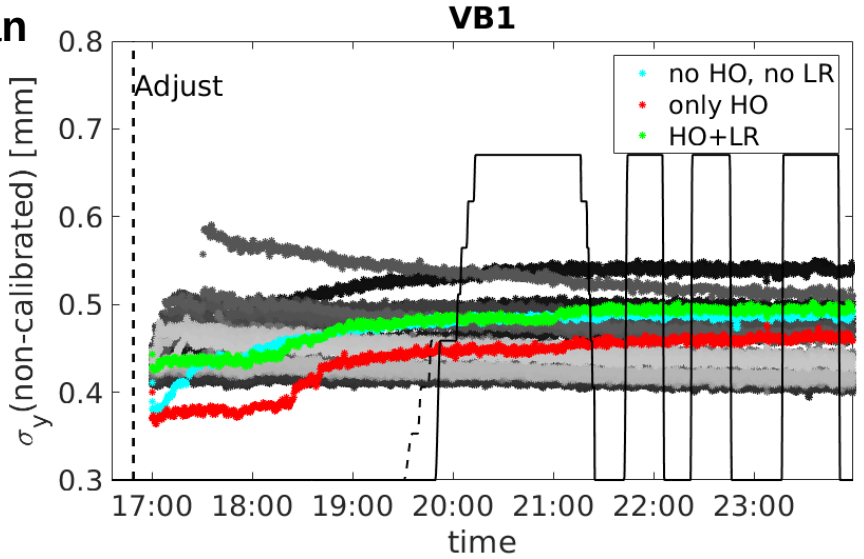

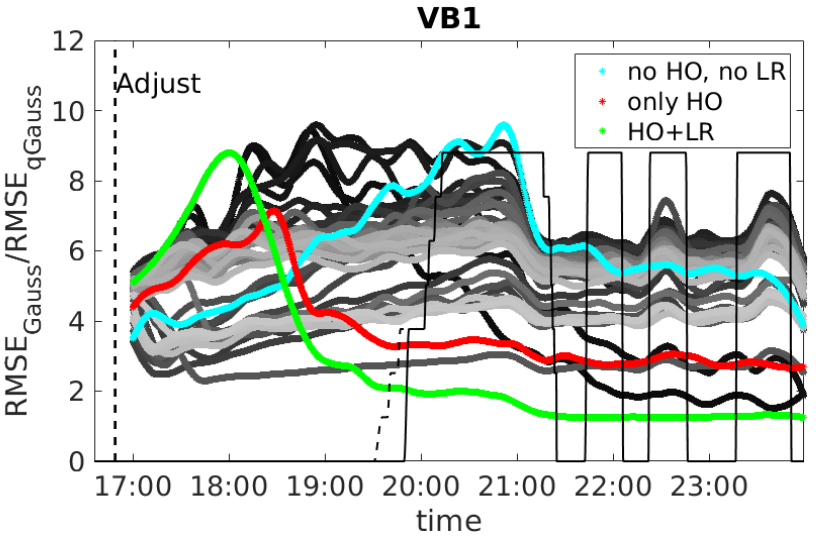

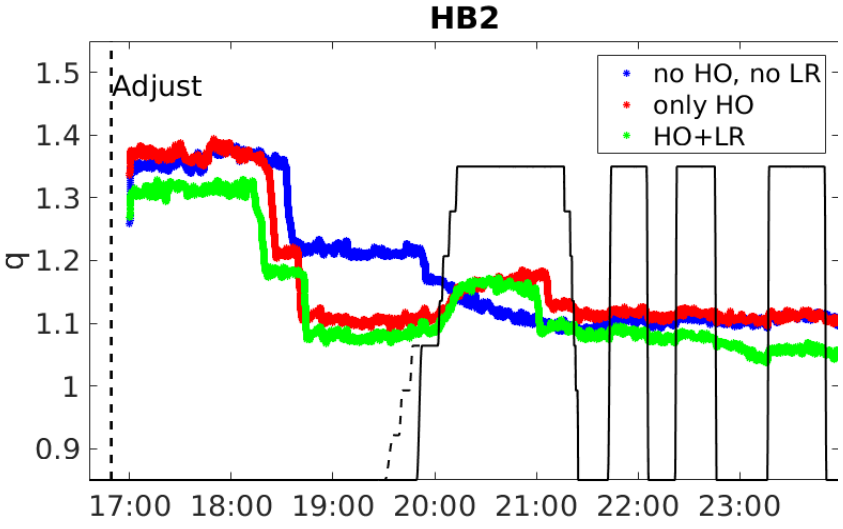

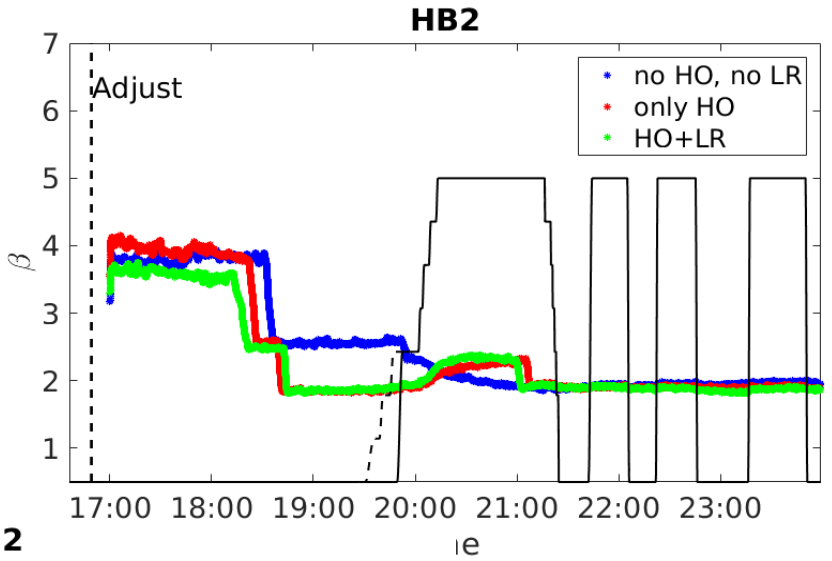

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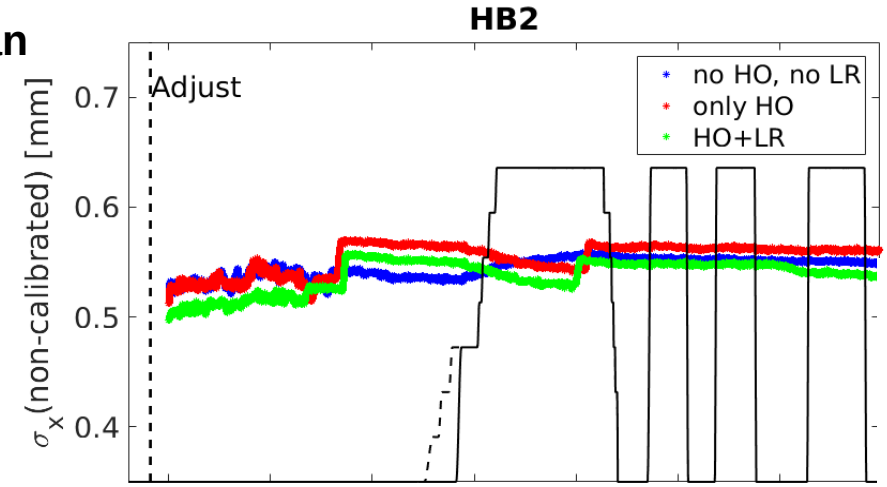

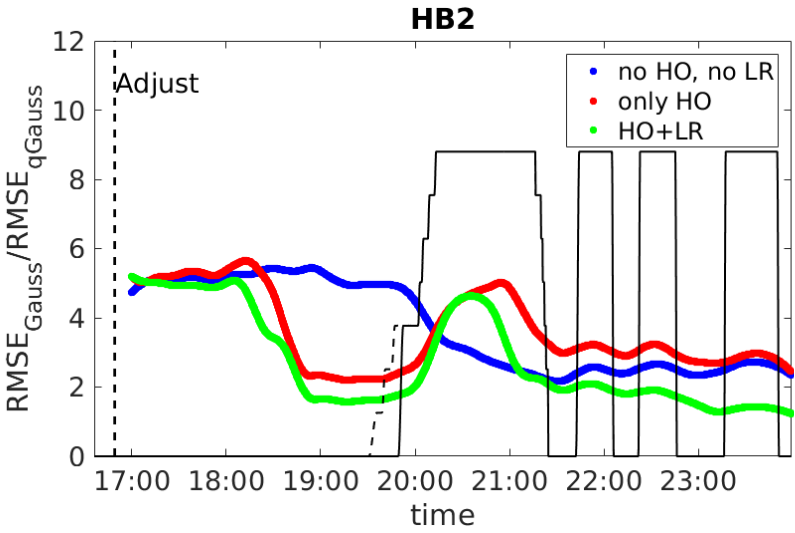

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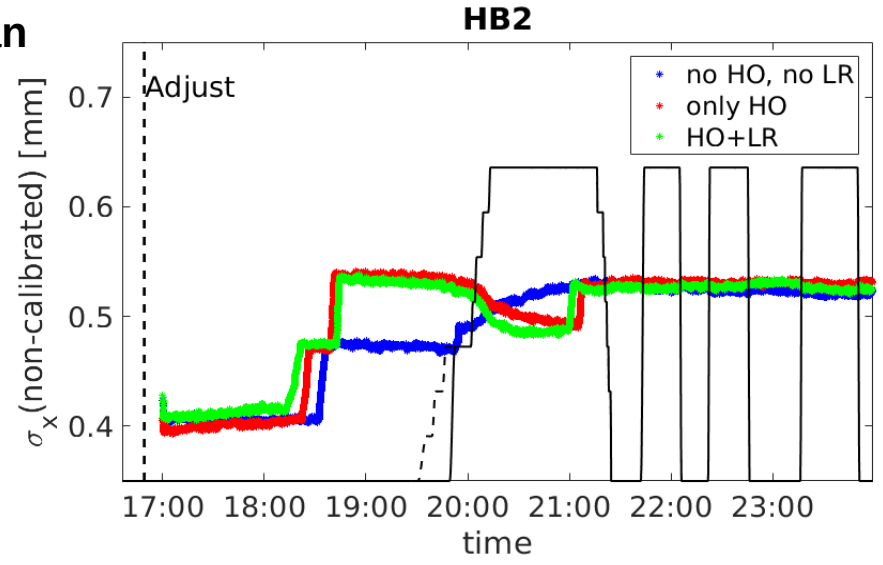

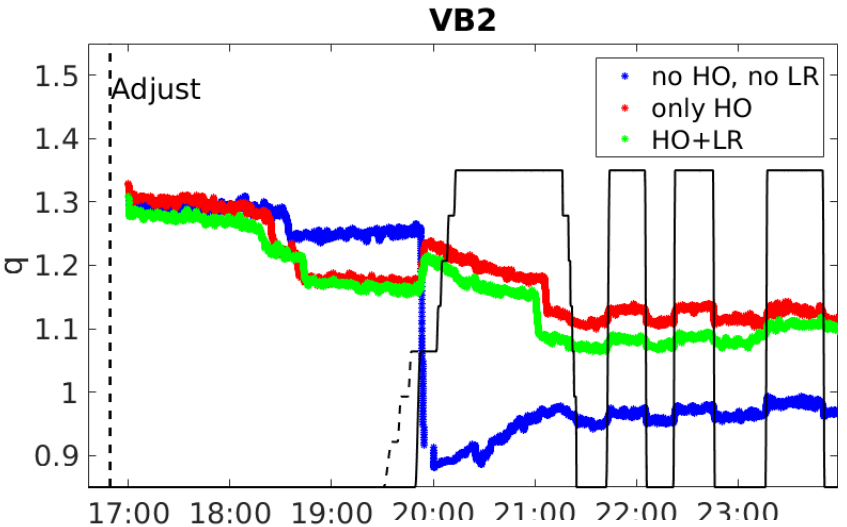

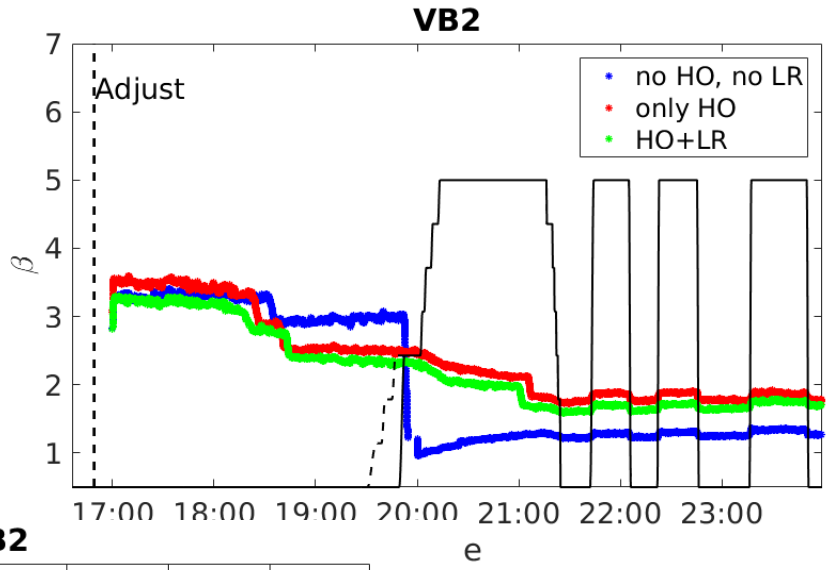

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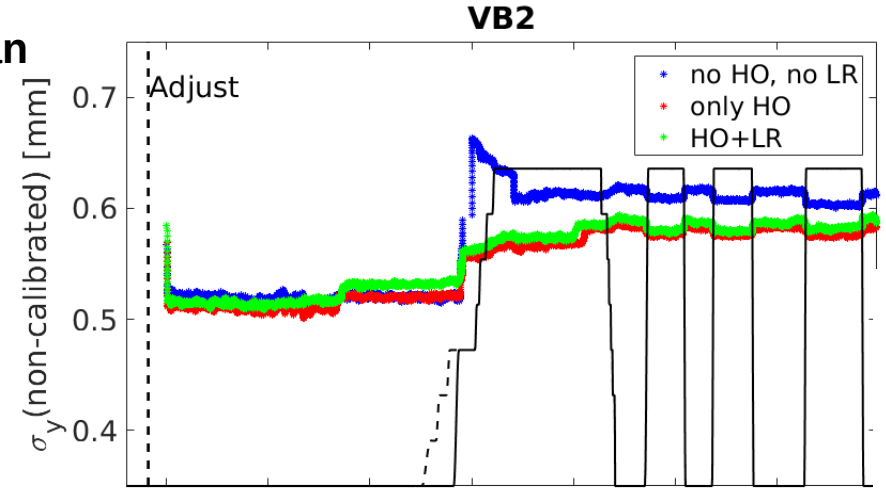

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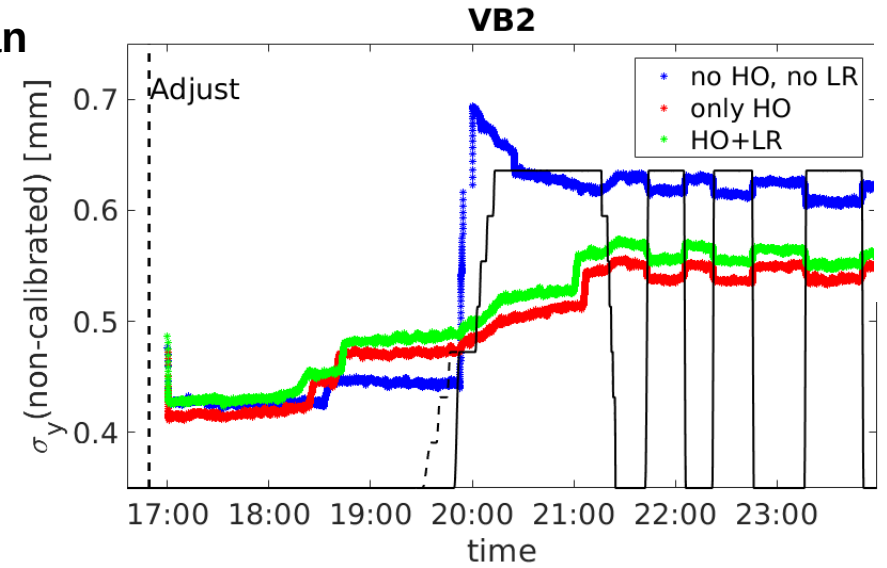
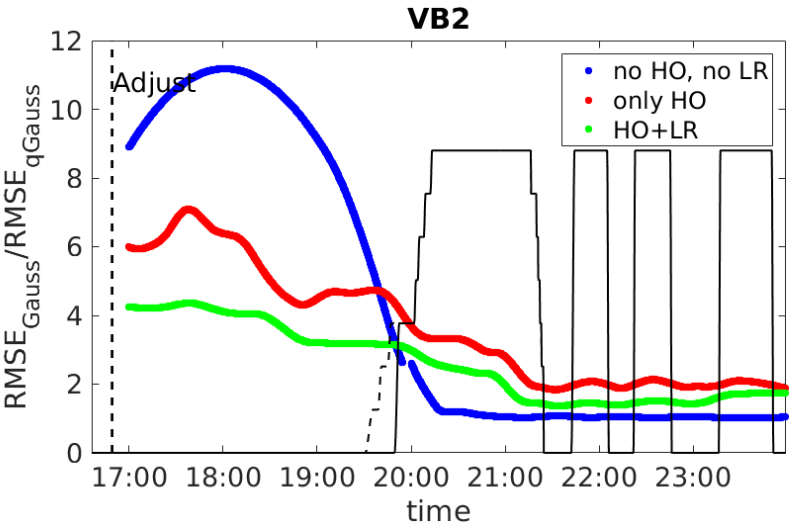
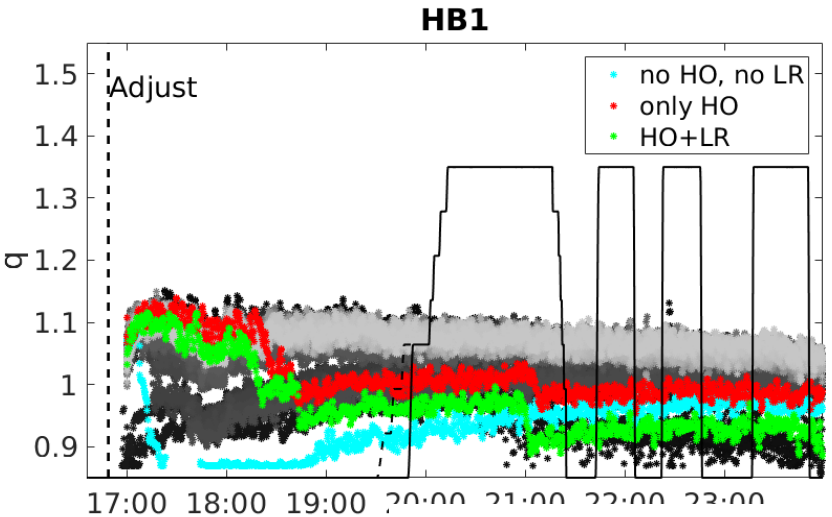
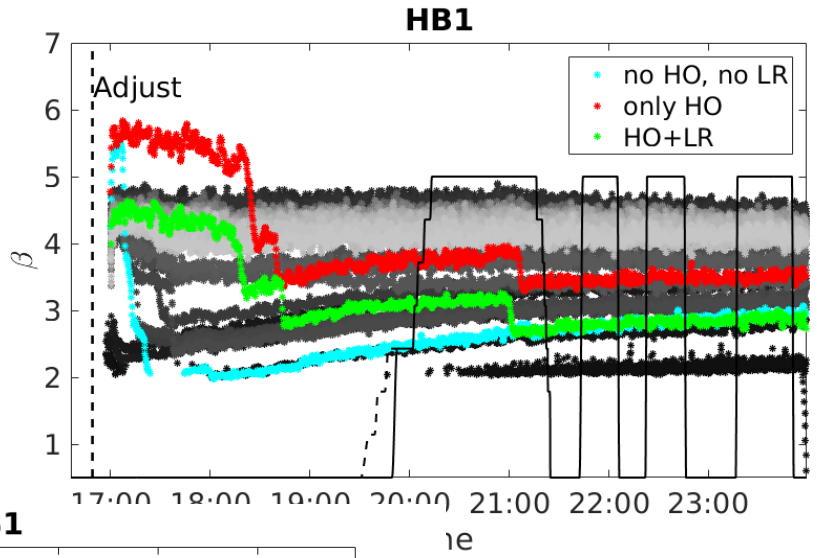




Transverse profiles
(2 sigma cut)





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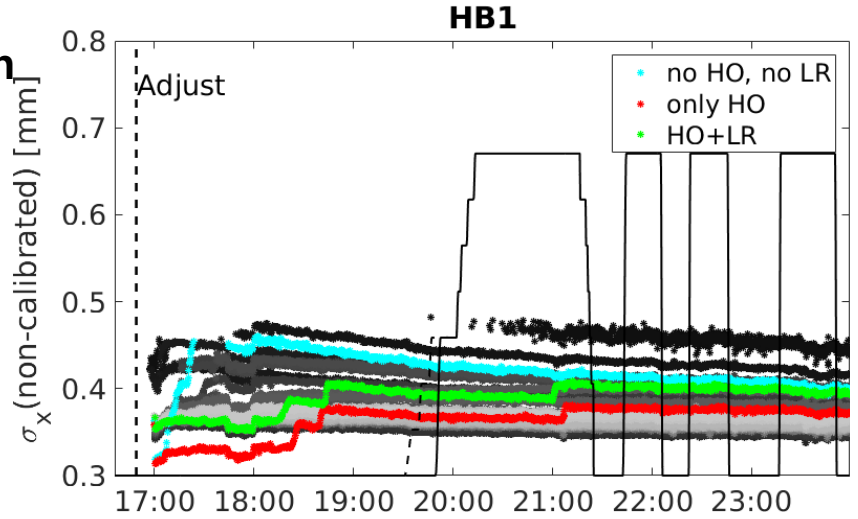

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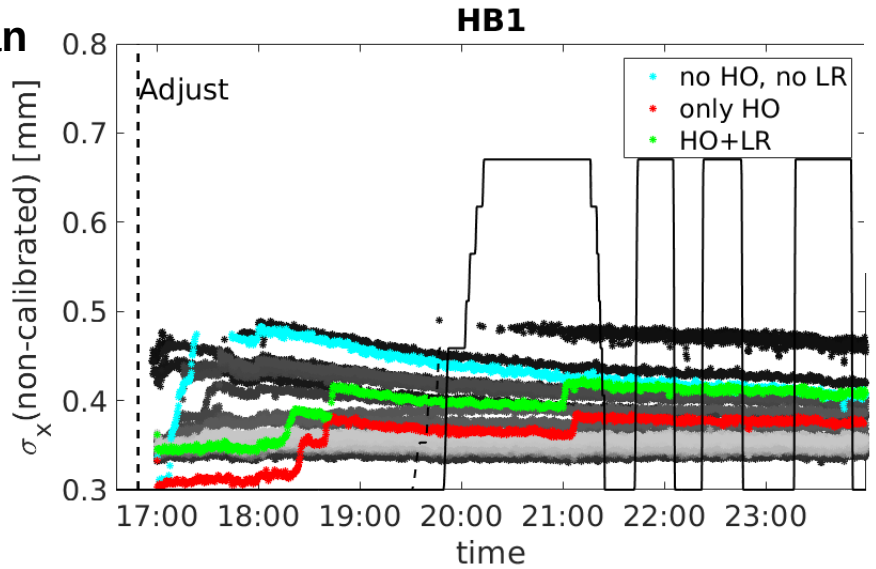

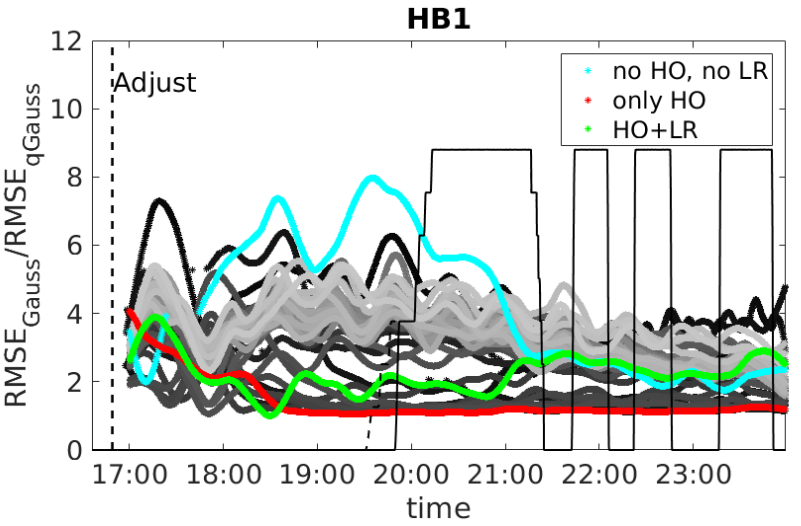

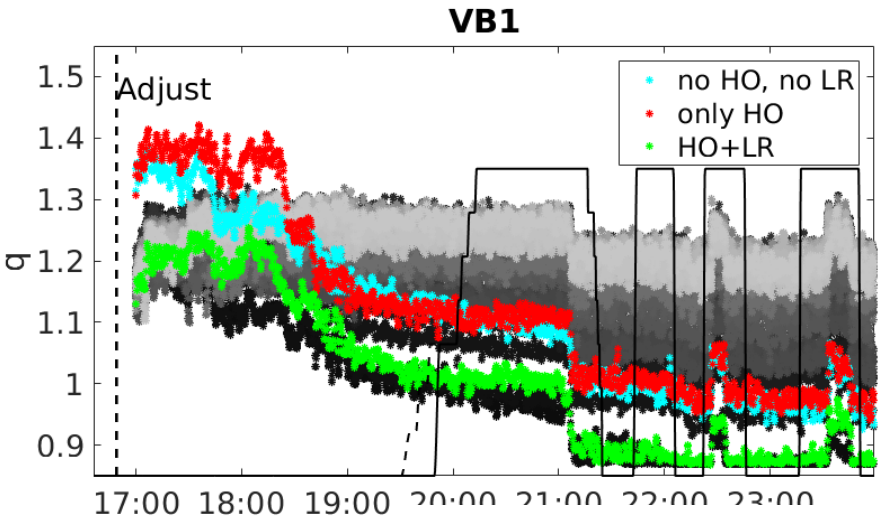

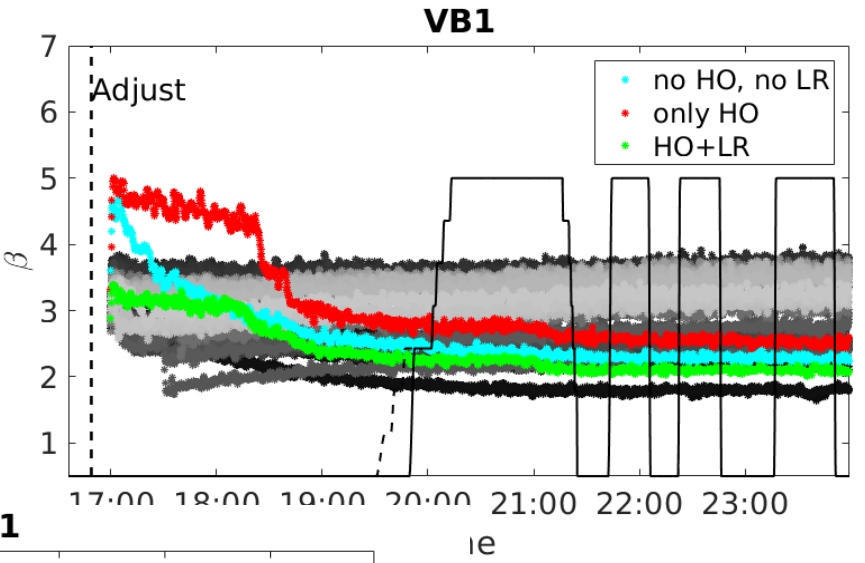

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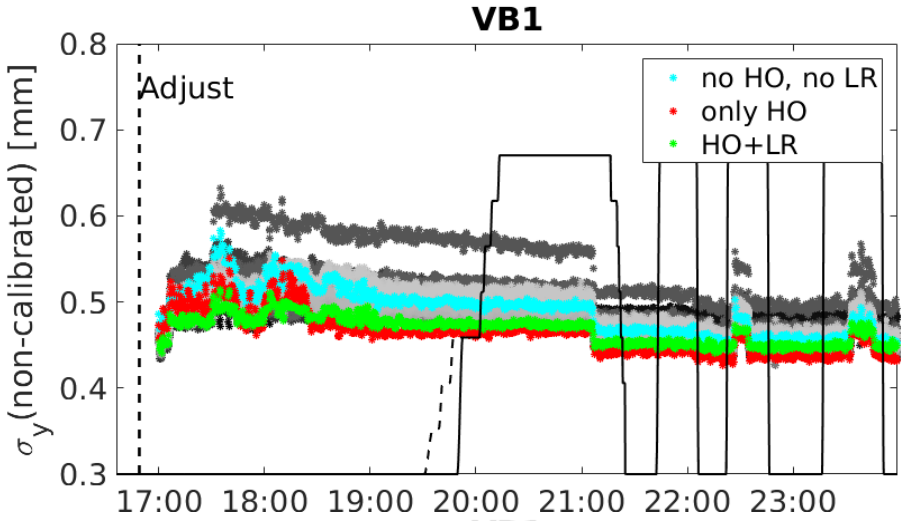

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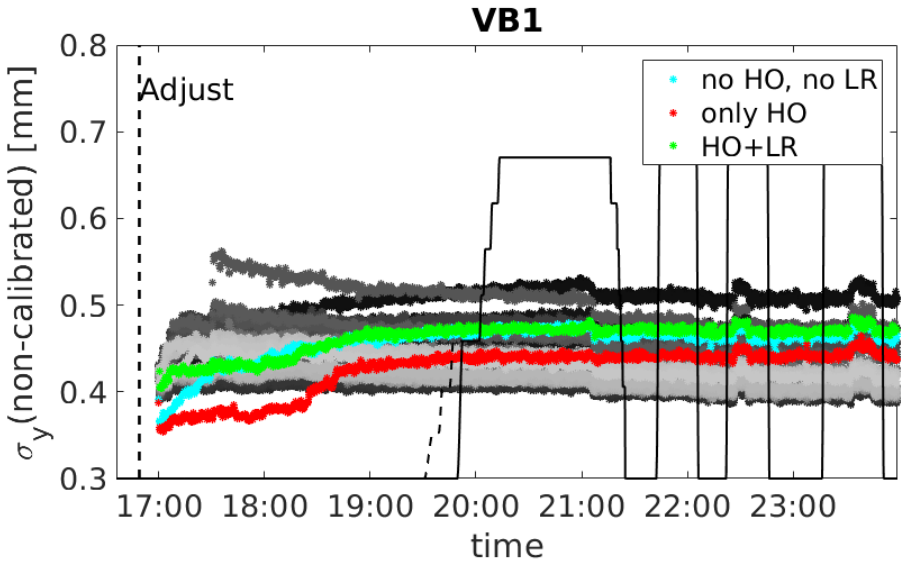

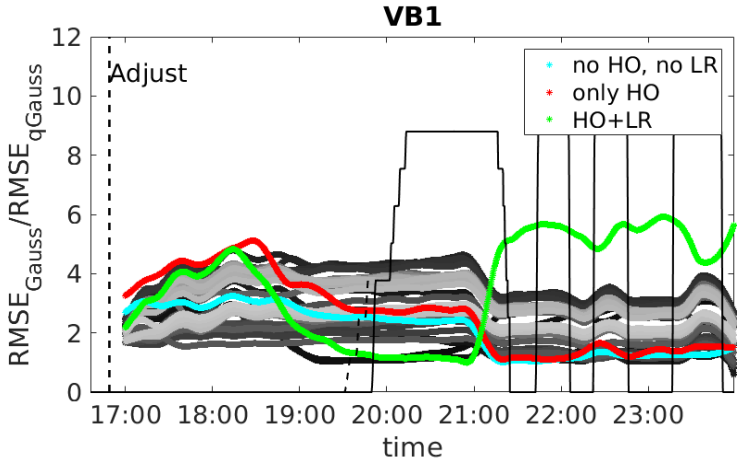

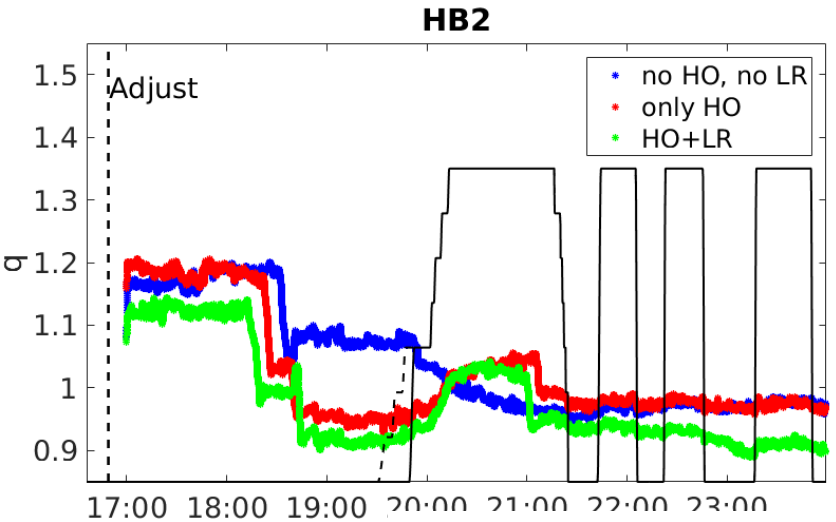

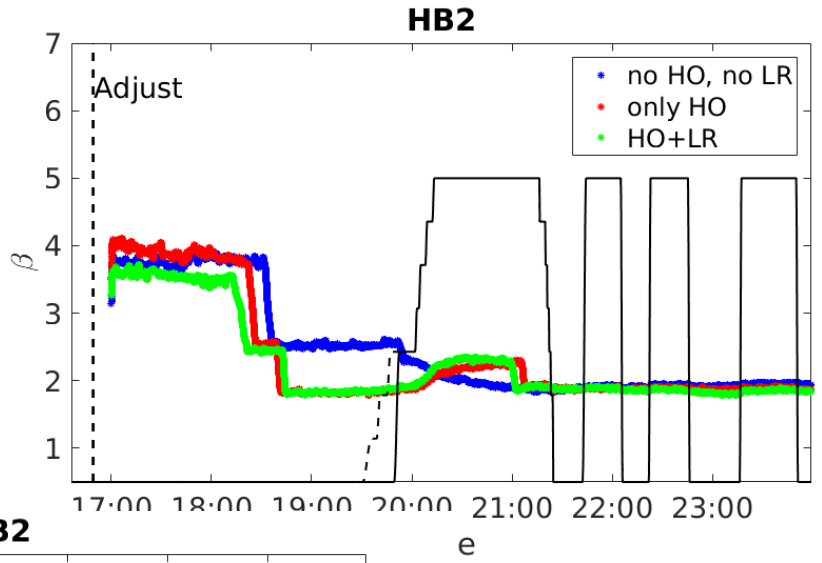

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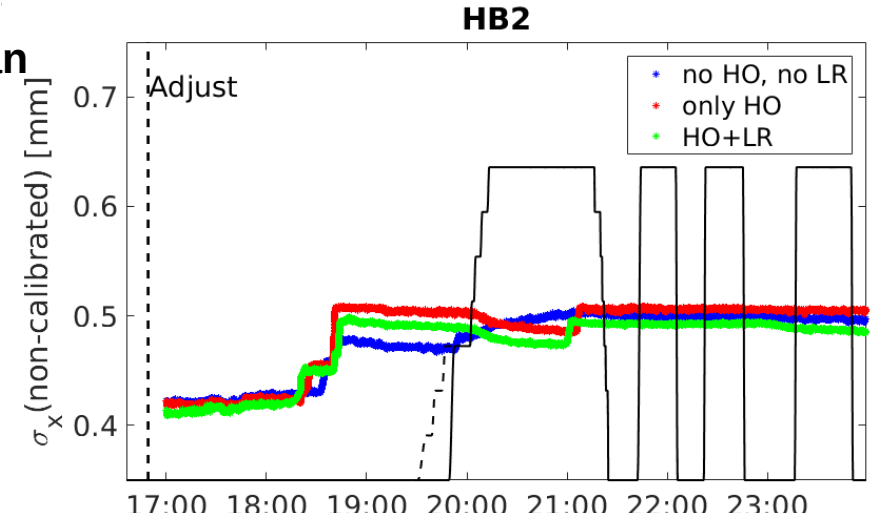

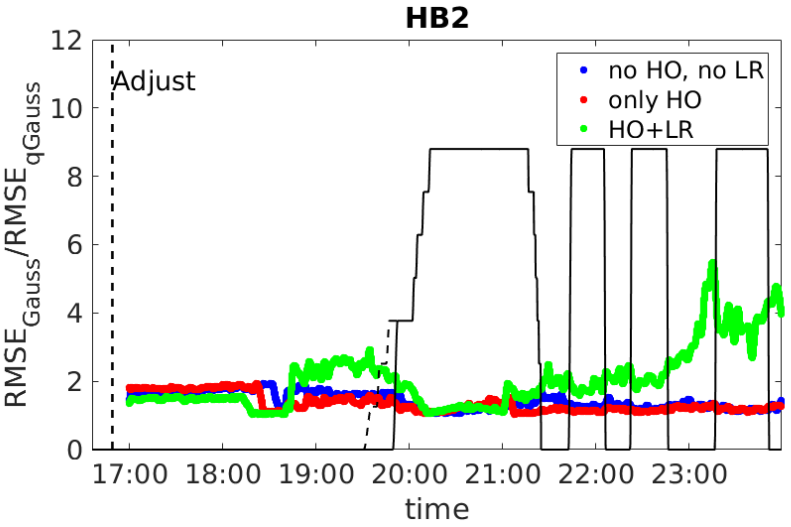

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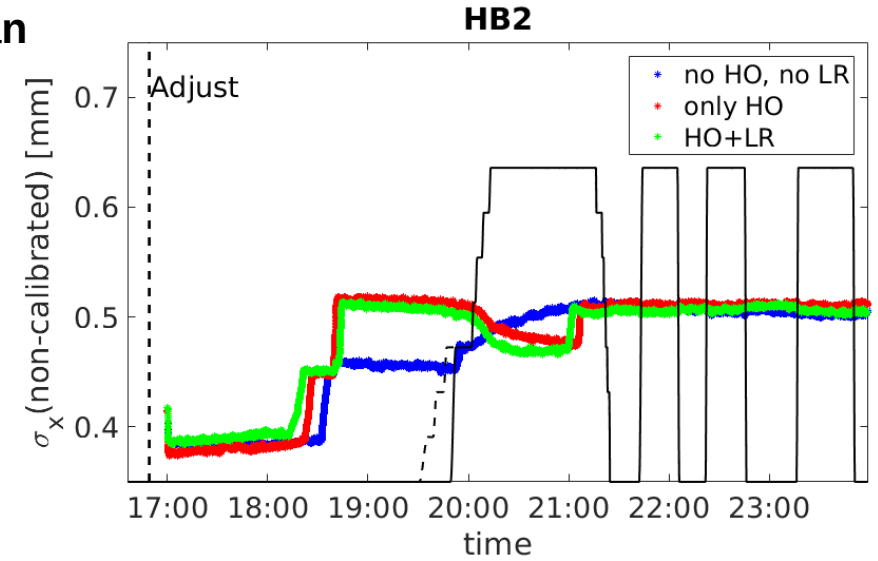

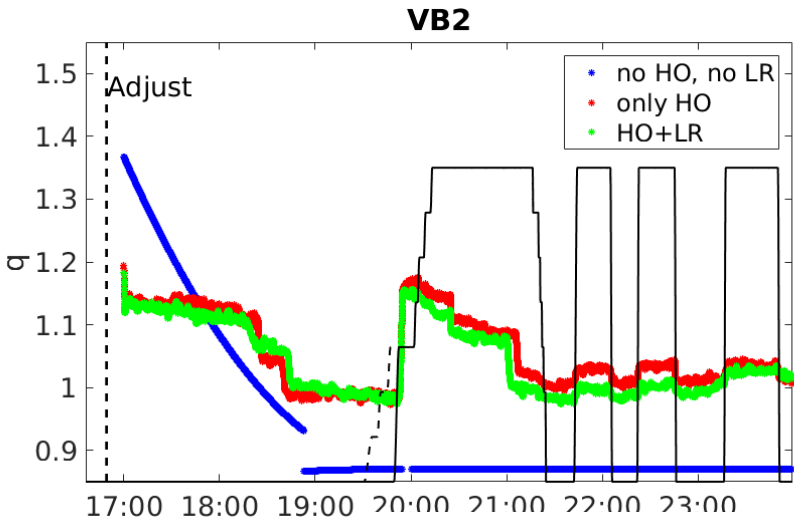

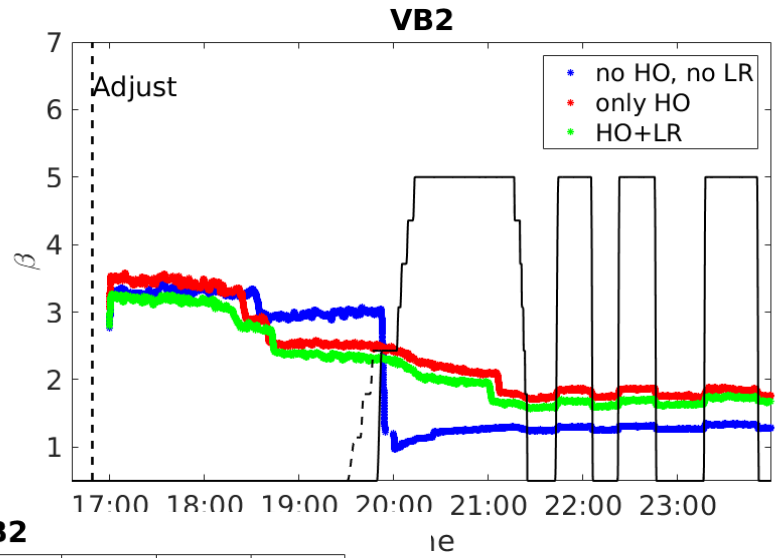

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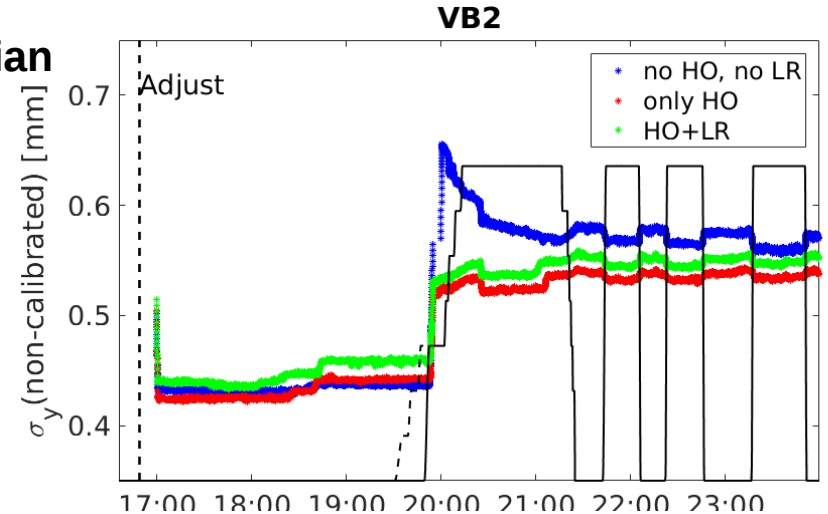

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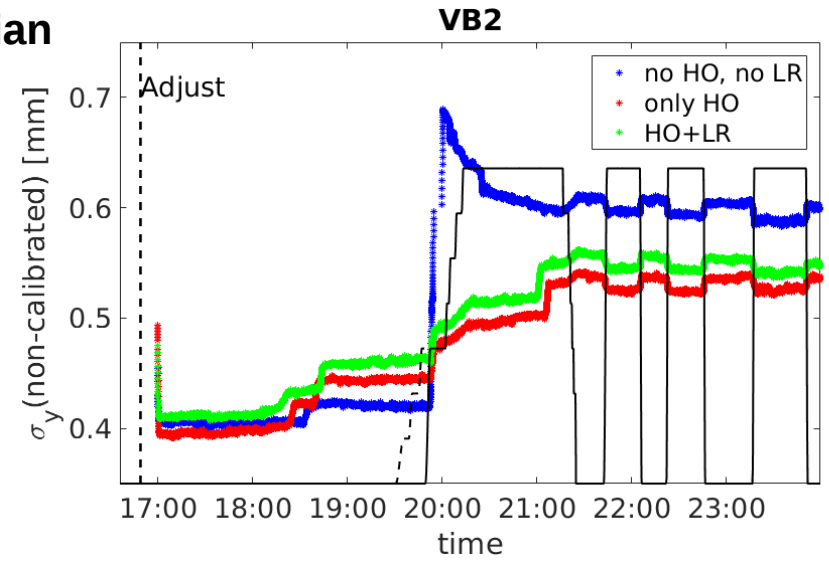
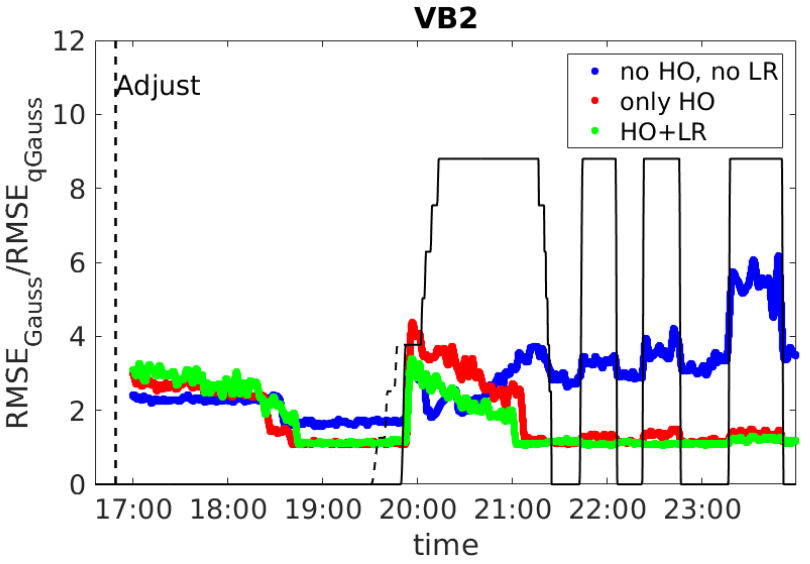
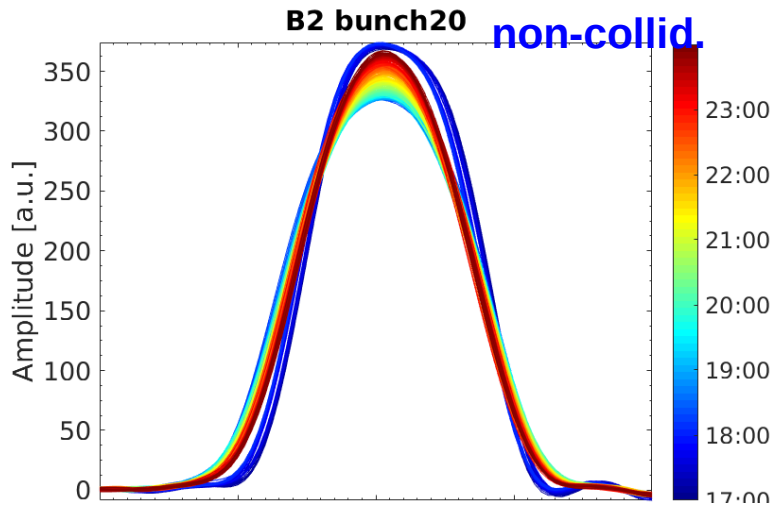
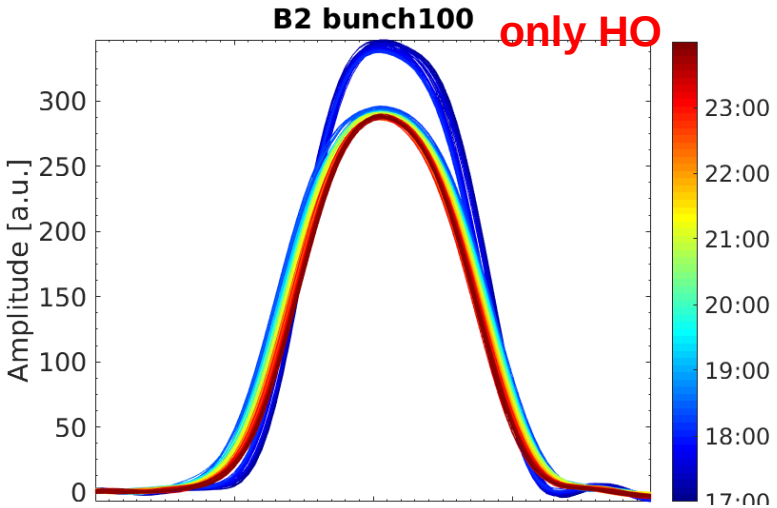
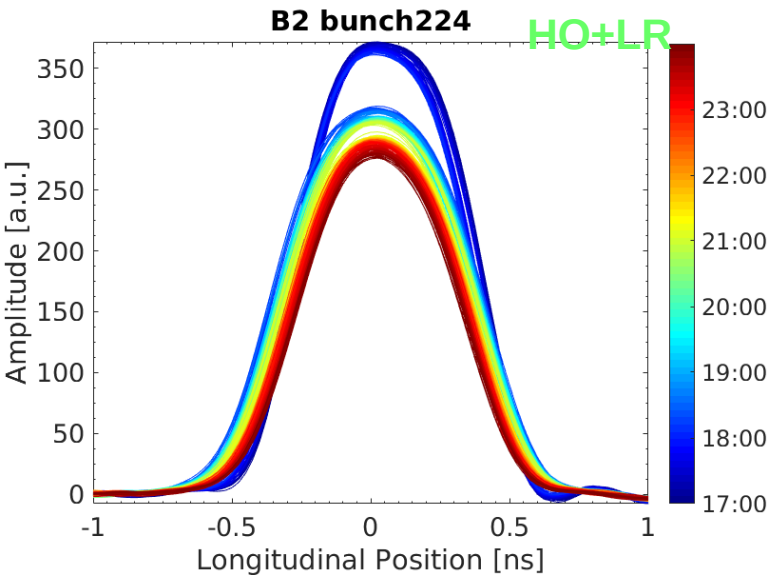


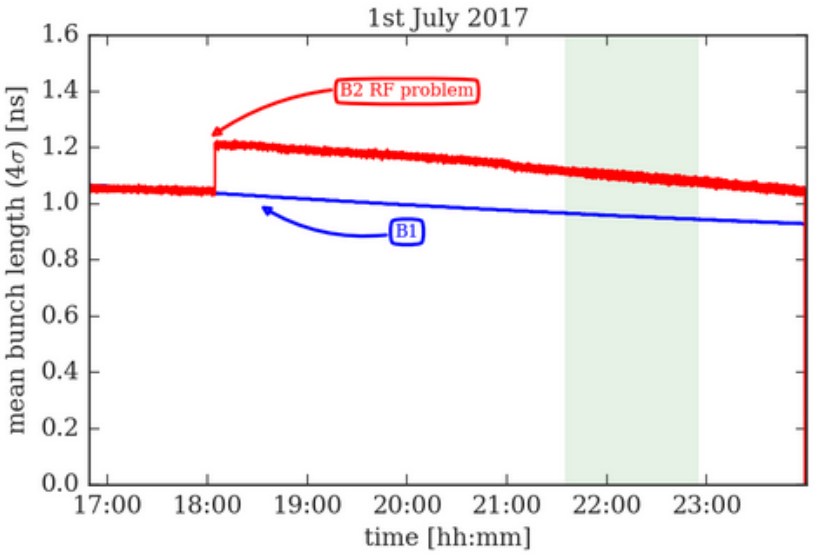


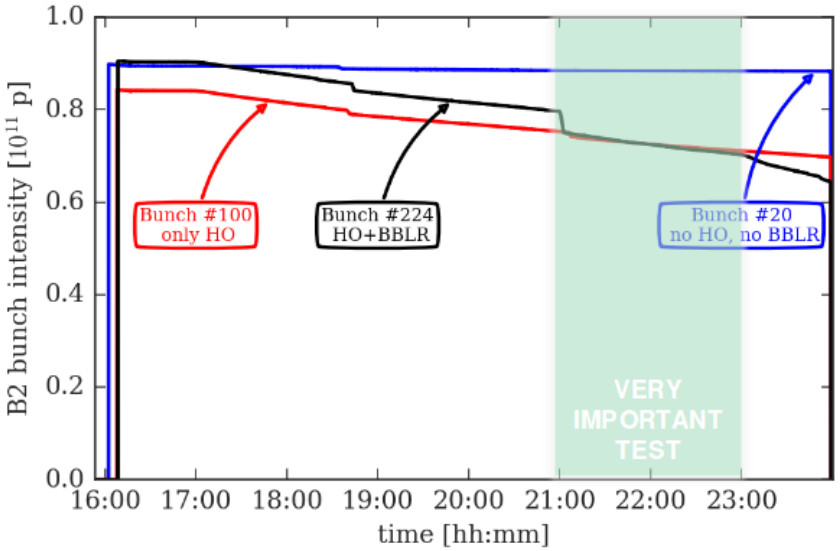
Longitudinal profiles
(only for B2, because the B1 scope was broken)

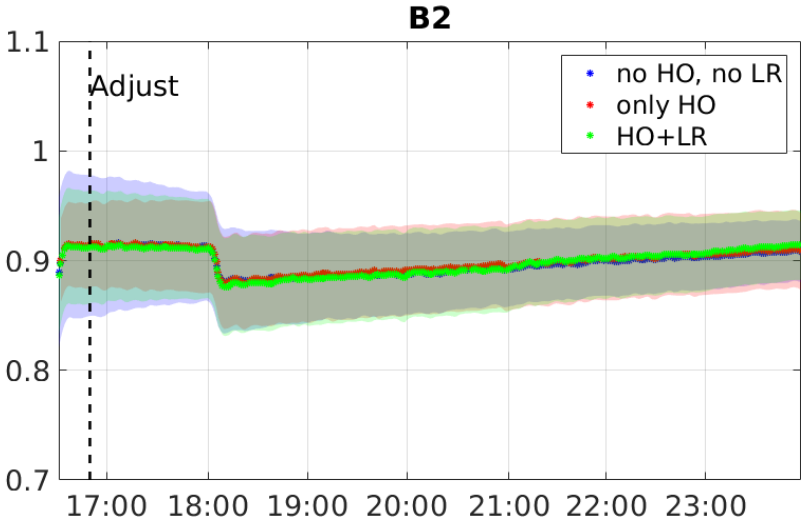

B2 bunch20
non-collid.
Amplitude [a.u.]
0
50
100
150
200
250
300
350
23:00
22:00
21:00
20:00
19:00
18:00

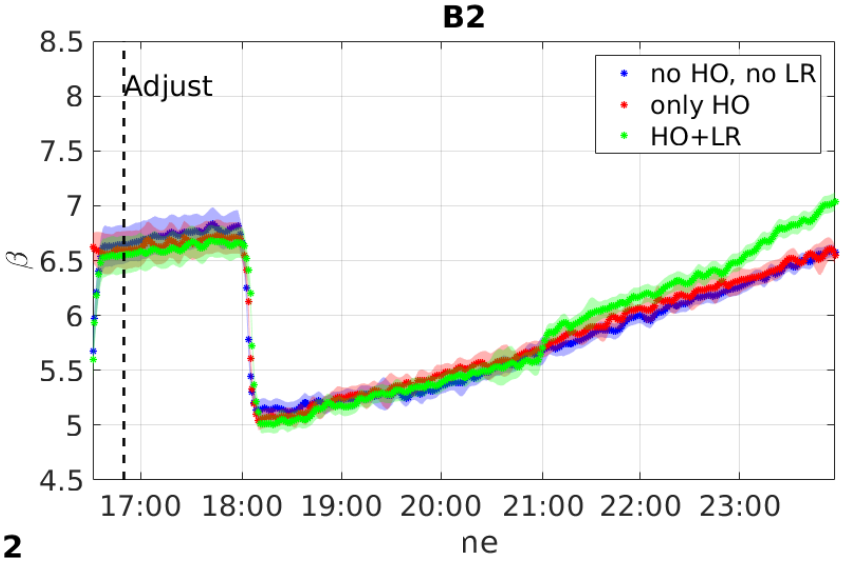

B2 bunch100
only HO
Amplitude [a.u.]
0
50
100
150
200
250
300
23:00
22:00
21:00
20:00
19:00
18:00


B2 bunch224
HO+LR
Amplitude [a.u.]
0
50
100
150
200
250
300
350
-1
-0.5
0
0.5
1
Longitudinal Position [ns]
23:00
22:00
21:00
20:00
19:00
18:00
17:00

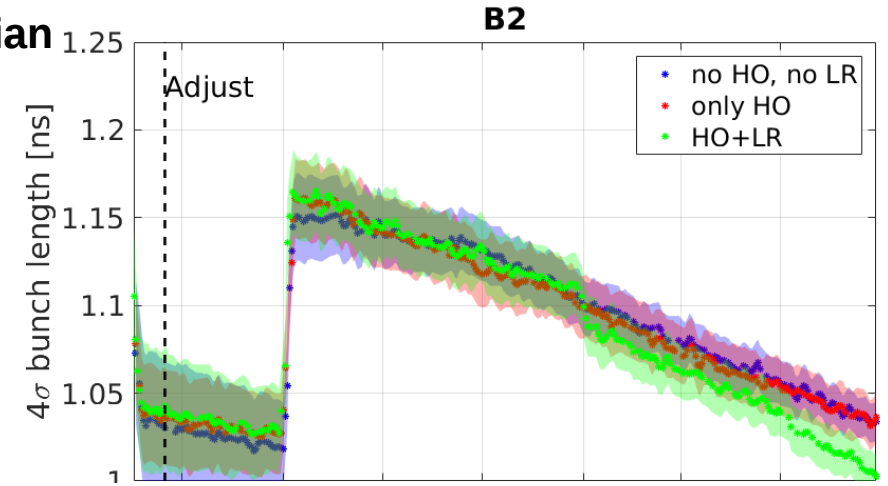

1st July 2017
mean bunch length (4σ) [ns]
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
1.6
B2 RF problem
B1
17:00
18:00
19:00
20:00
21:00
22:00
23:00
time [hh:mm]


B2 bunch intensity [10¹¹ p]
0.0
0.2
0.4
0.6
0.8
1.0
Bunch #100
only HO
Bunch #224
HO+BBLR
Bunch #20
no HO, no BBLR
VERY
IMPORTANT
TEST
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
time [hh:mm]

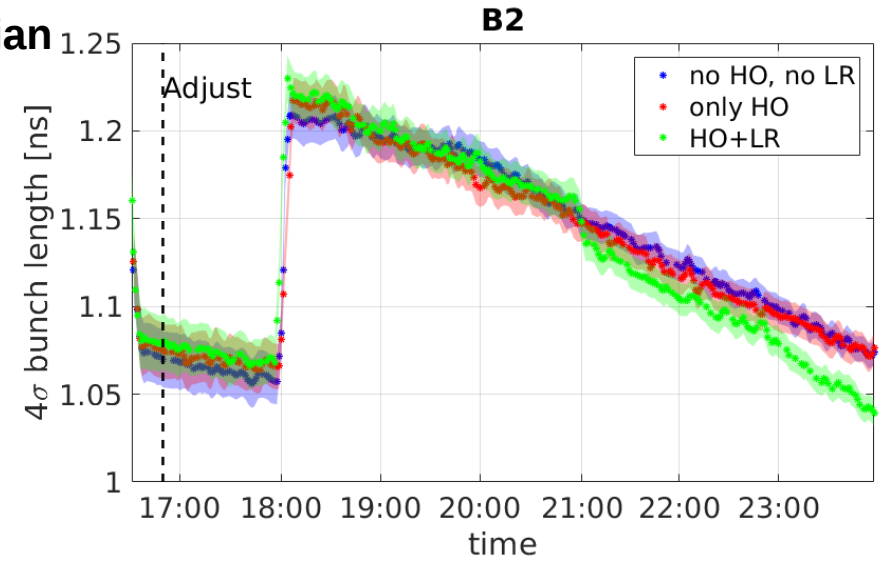


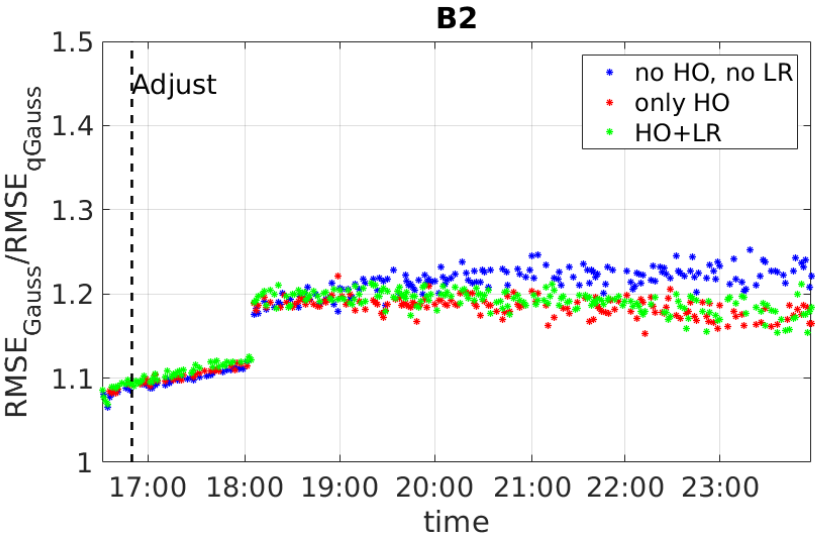


q-Gaussian



Gaussian





Summary and next steps

MD2202

Transverse profiles (BSRT):

-Change of VB2 profiles when wire is switched on/off.

-What happens to VB1 around 21:10, 22:30 and 23:45?

-The profile analysis is done for the full transverse profiles and for a 2 sigma cut. Using the 2 sigma cut to avoid the tails (diffraction or other instrument effects), the Gaussian and q-Gaussian results have in general a better agreement ($q \rightarrow 1$) for HB1, HB2 and VB2. This is not the case for VB1, specially during the first 1 h after the Adjust.

Longitudinal profiles (only B2):

-B2 RF problem.

-A drop in the HO+LR bunch length due to losses (at ~21:00).

Transverse bunch profiles; BSRT and WS

-The LSF factor that is used to calibrate the beam size, is just a value to get the same emittance as for the WS. Even if it assumed to be a Gaussian for simplicity, in reality it is not. The BSRT and the WS profiles should be compared using the same fitting function, this is the only way to get an alternative LSF factor to be used for non-Gaussian distributions.

-The BSRT beams sizes at FT come from profiles that are fitted till the ~50% height of the right side of the distribution. Is that always true?

Longitudinal bunch profiles

-Discussions with Helga to use updated transfer functions for high intensity bunches.