

# Experience with Pilot-Tone at ALBA

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Libera Workshop  
Remote

# PURPOSE



Explore different solutions for BPMs electronics and keep up with current technologies

## Libera Brilliance



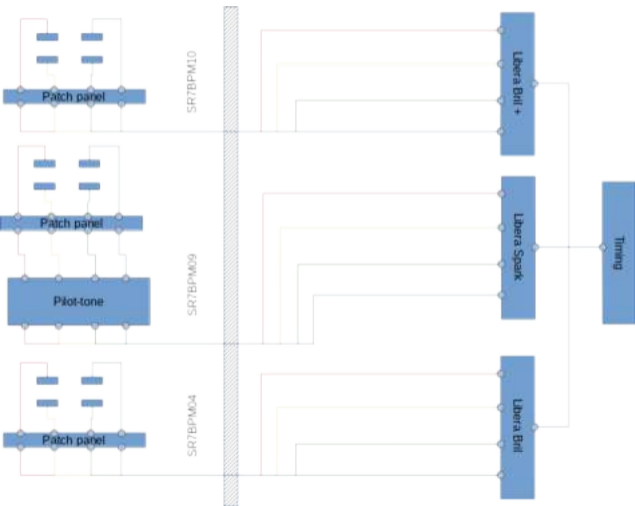
## Libera Brilliance+



## Libera Spark + Elettra PT



# CONFIGURATION



Measure the actual beam position and compare different electronics<sup>a</sup>:

- ▶ BPMs in same sector
- ▶ Similar cable length
- ▶ Same rack
- ▶ Not in FOFB loop

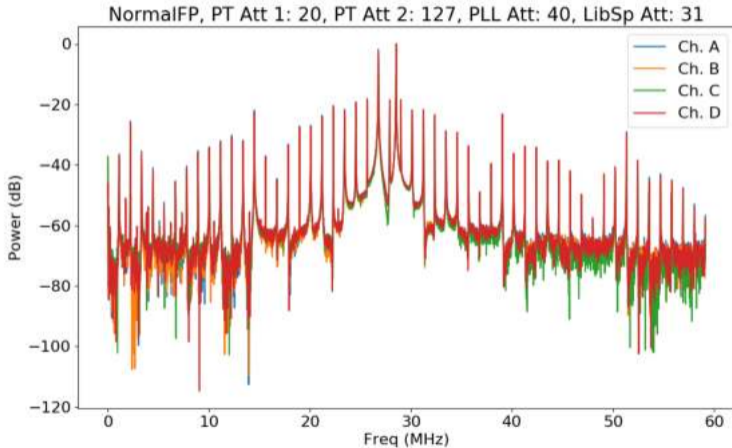


**Long Term Acquisition**  
**Different Filling Patterns**

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<sup>a</sup>The DSC mode of Libera Brilliance+ was not active during long term acquisition

# PILOT-TONE CONFIGURATION



$$f_{RF} = 499.654 \text{ MHz}$$

$$f_{intRF} = 26.76 \text{ MHz}$$

$$f_{intPT} = 28.52 \text{ MHz}$$

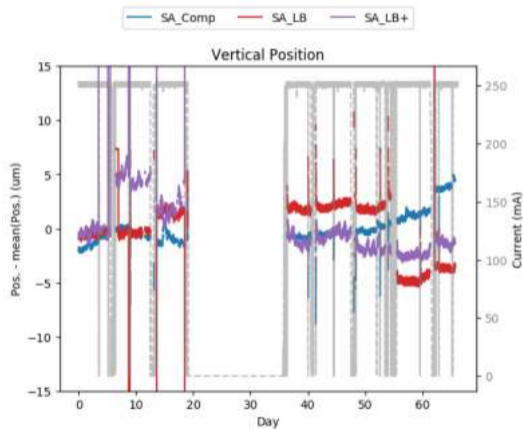
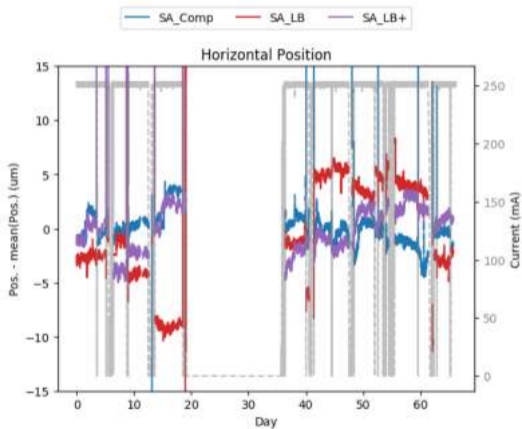
CH:T:0:104

PLL:N:3911

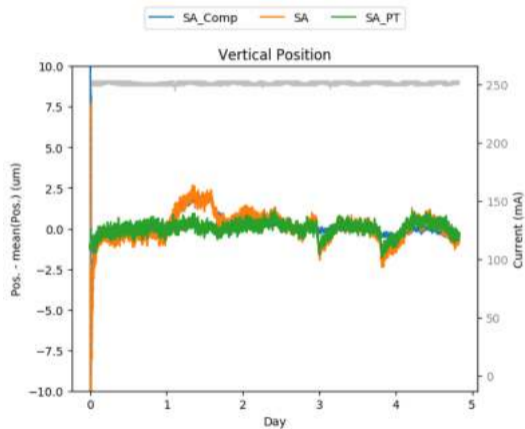
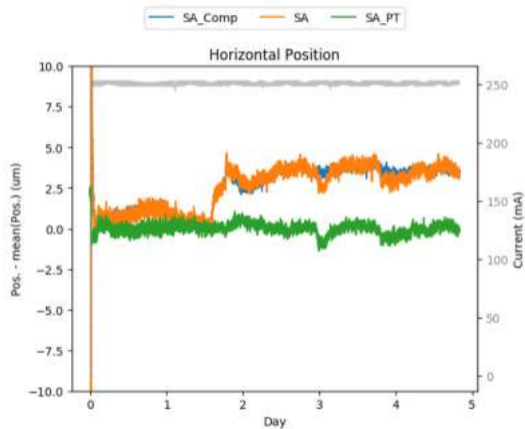
PLL:DIVGAIN:6

PLL:OUTTERM:6

# LONG TERM ACQUISITION, ONE RUN

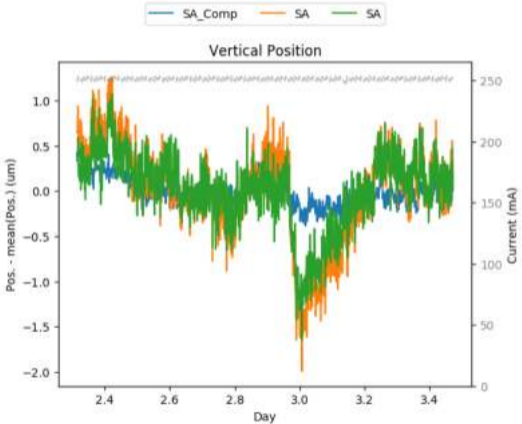


# LONG TERM ACQUISITION, PT+SPARK

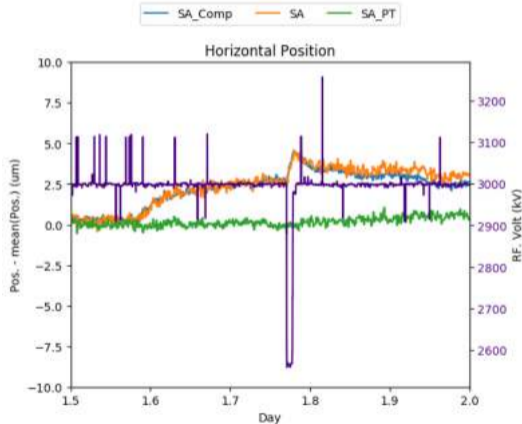


# LONG TERM ACQUISITION, DETAILS

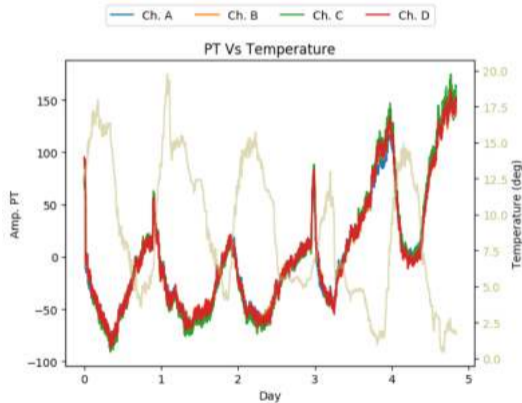
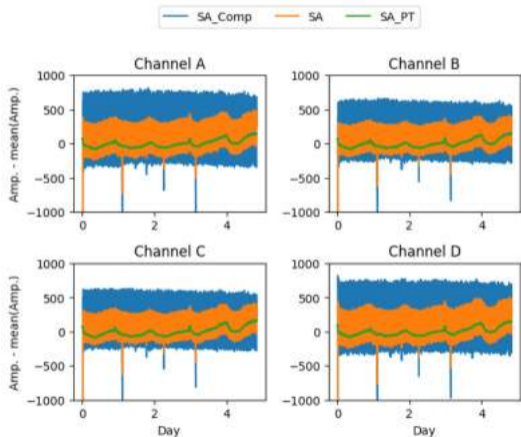
## Compensation



## RF Voltage Droop

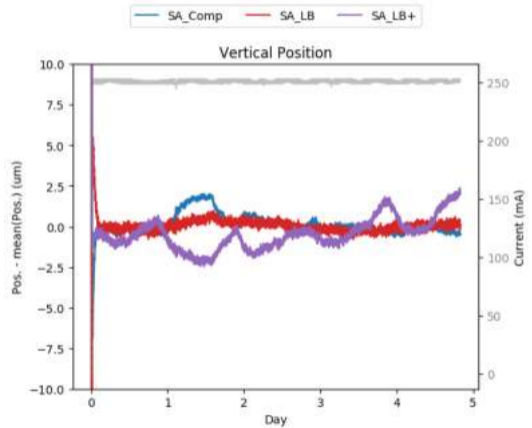
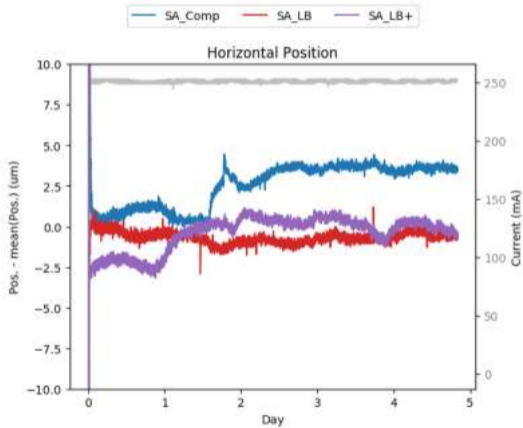


# LONG TERM ACQUISITION, TEMPERATURE COMPENSATION

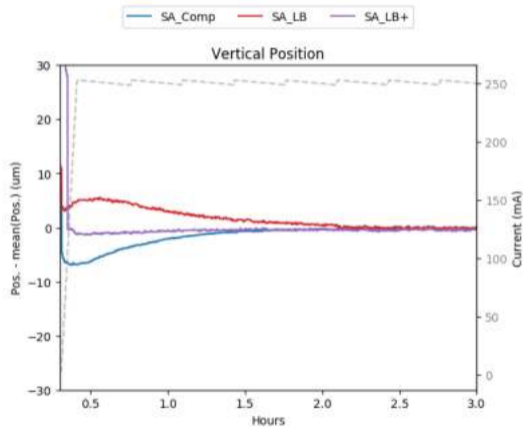
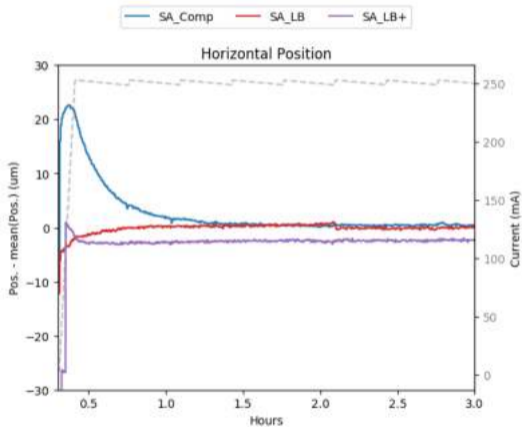




# LONG TERM ACQUISITION, DIFF. ELECTRONICS



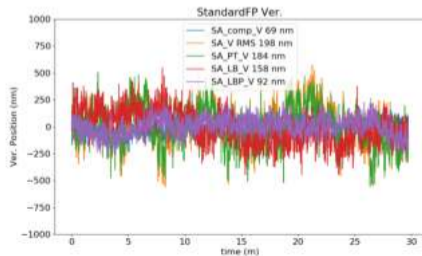
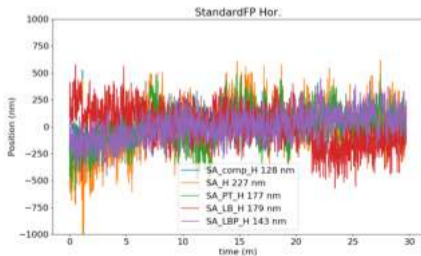
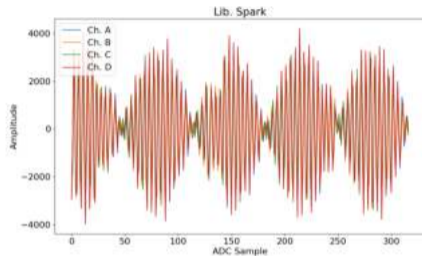
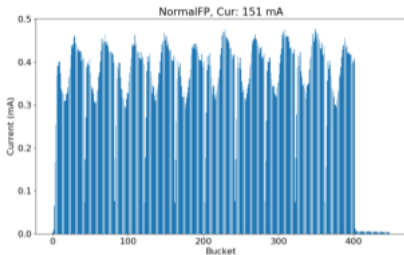
# LONG TERM ACQUISITION, STABILIZATION



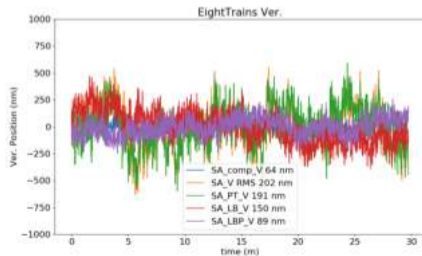
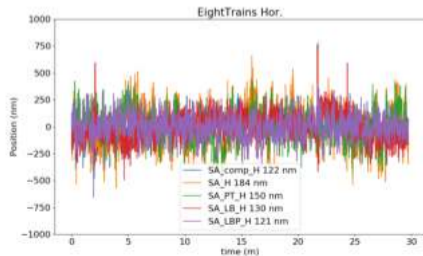
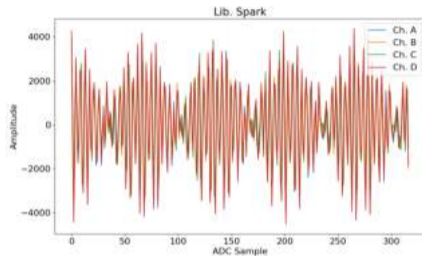
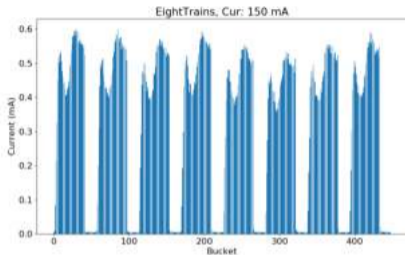
# DIFFERENT FILLING PATTERNS

- ▶ 2h acquisition
- ▶ Last 30 min considered
- ▶ 150 mA beam current

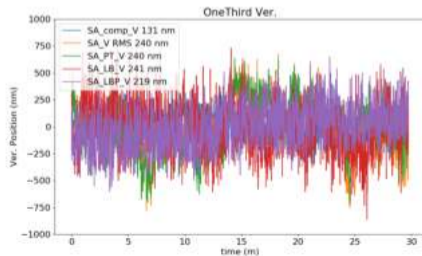
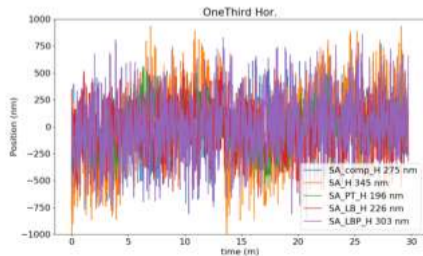
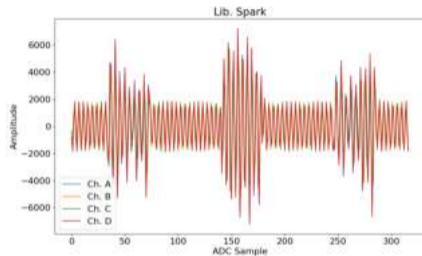
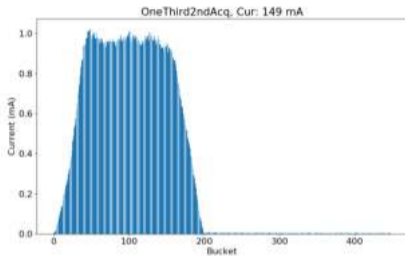
# STANDARD FILLING PATTERN



# EIGHT TRAINS FILLING PATTERN



# ONE-THIRD FILLING PATTERN

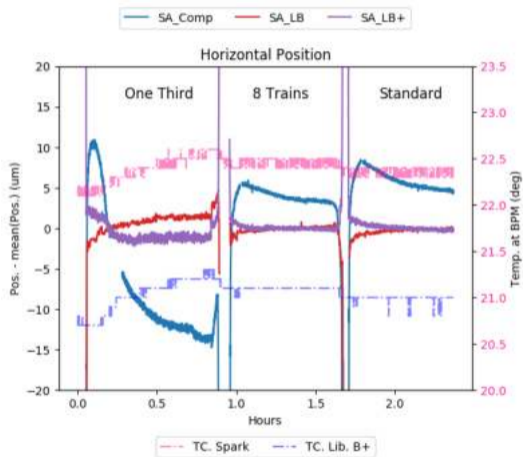


## DIFFERENT FILLING PATTERNS – RESULTS

Fill. Pattern	RMS (nm)			
	Spark	Spark+PT	Brilliance	Brilliance+
Standard Hor.	227	128	179	143
Standard Ver.	195	69	158	92
Eight Trains Hor.	184	122	130	121
Eight Trains Ver.	202	64	150	89
One-Third Hor.	345	275	226	303
One-Third Ver.	240	131	241	219

*The DSC mode of Libera Brilliance+ was **active** during different filling pattern acquisition*

# FILLING PATTERN DEPENDENCY



Temperature taken at the BPM buttons location.

Drift probably related to the small cables used to connect buttons and pilot-tone not attenuating reflection.

**6 dB attenuators** were added but no improvement observed.



# CONCLUSION

- ▶ Long term beam position measurement has been carried out at ALBA using a Libera Spark+Pilot-Tone system.
- ▶ Data has been compared with the one acquired by a Libera Brilliance and a Libera Brilliance+.
  - ▶ Results show a stability which in some case is better with respect of the one measured with other electronics.
  - ▶ Problems of repeatability of the position measurements at different filling pattern have been observed.

Many thanks to G. Brajnik and P. Leban for the technical support.