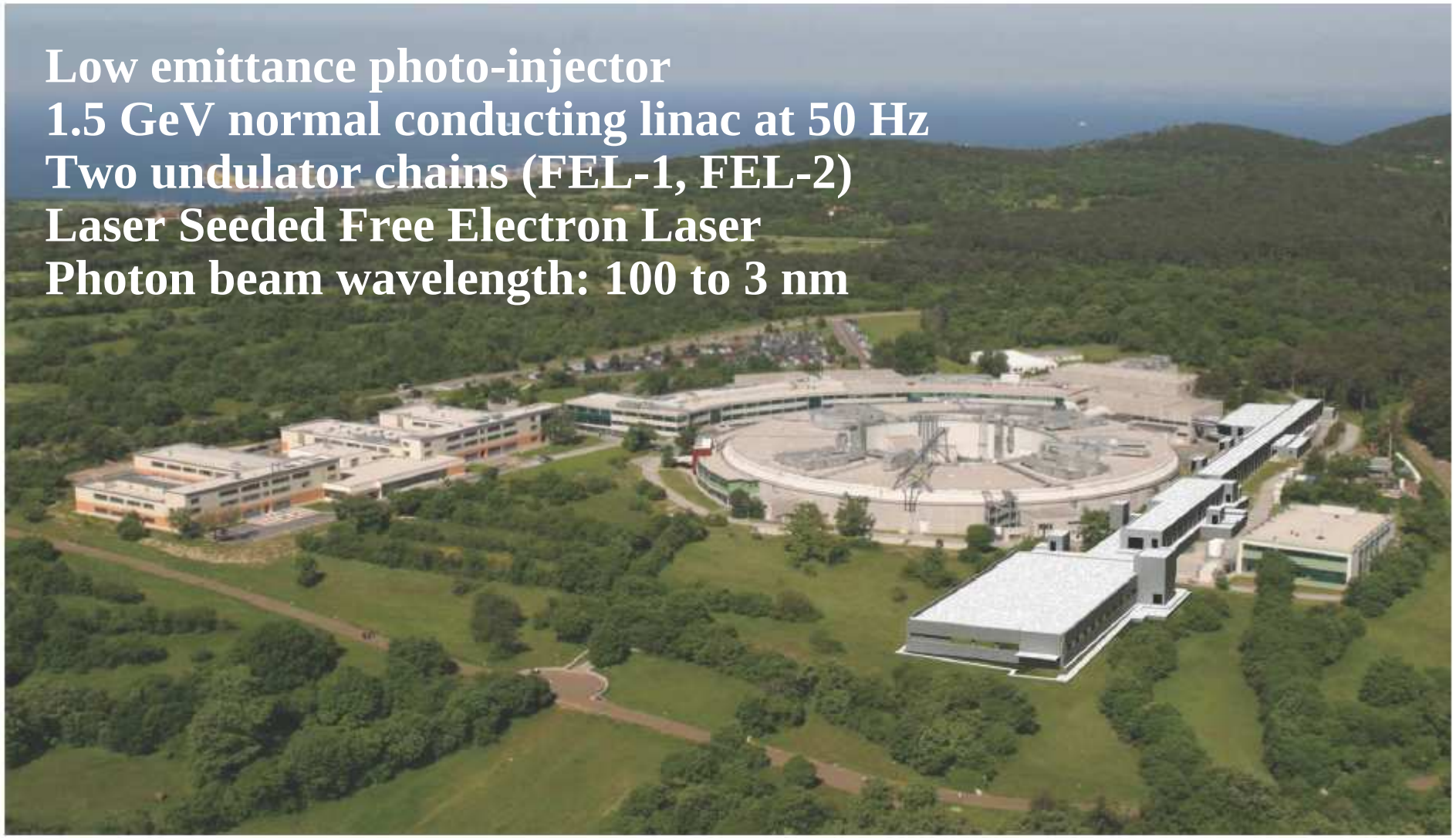
Libera@ELETTRA

Marco Lonza, Giulio Gaio, Stefano Cleva

Sincrotrone Trieste – ELETTRA

FERMI@Elettra Free Electron Laser



FERMI: Status and schedule

STATUS:

started positioning of machine components and technical racks of the firts part of the linac

COMMISSIONING SCHEDULE:

Firts phase (linac 230 MeV): 18th of August 2009

Second phase (whole linac): June 2010

Third phase (transfer line and spreader): August 2010

Fourth phase (FEL-1): October 2010

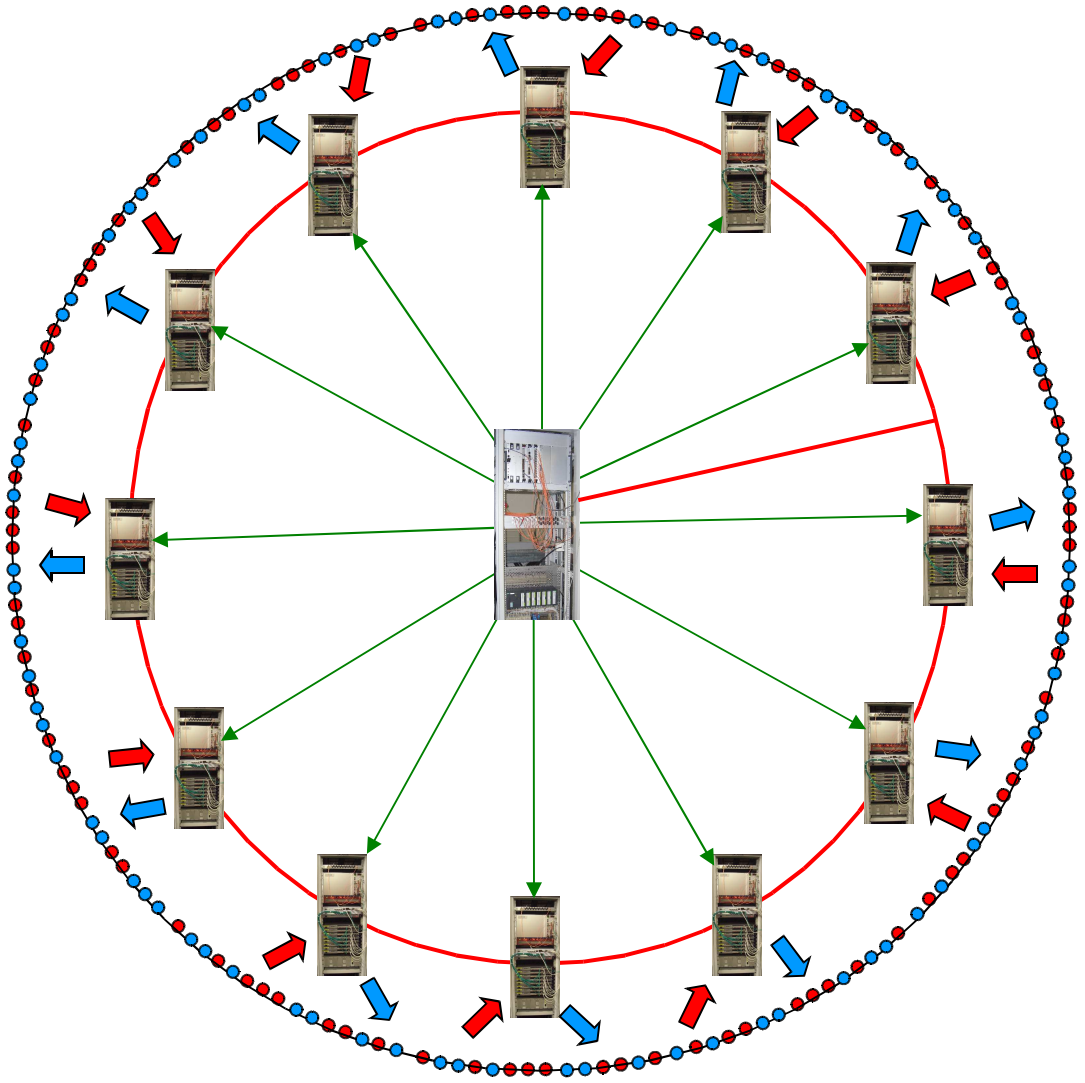
Operations: January 2011

FERMI: Libera

- Single pass machine (trigger required)
- Libera Brilliance devices will be used (~50 units)
- Release 2.03 (work in progress...)
- Embedded tango server
- Custom Gigabit Ethernet (Gbe) for real-time feedback purposes
- Increased charge sensibility (100 pC for FERMI commissioning)

Global Orbit Feedback Architecture

- 96 rohmboidal + 4 low-gap BPMs all equipped with Libera Electron (82 corrector magnets per plane)
- 12 VME stations with Motorola 6100 CPU boards running Linux (Tango) and RTAI (RT extension for feedback processing)
- feedback stations acquire position data at 10 kHz from Libera Electron through Gigabit Ethernet links
- data shared in real-time through Reflective Memory fibre optics
- 10 kSample/s D/A converters generate the analog correction signals
- Master Station connected to the reflective memory for feedback supervision and data acquisition
- Event system: 1 EVG, 12 EVR, Libera Clock Splitters and fibre optics to distribute MC, SC, PM and Trigger signals



Global Orbit Feedback Architecture

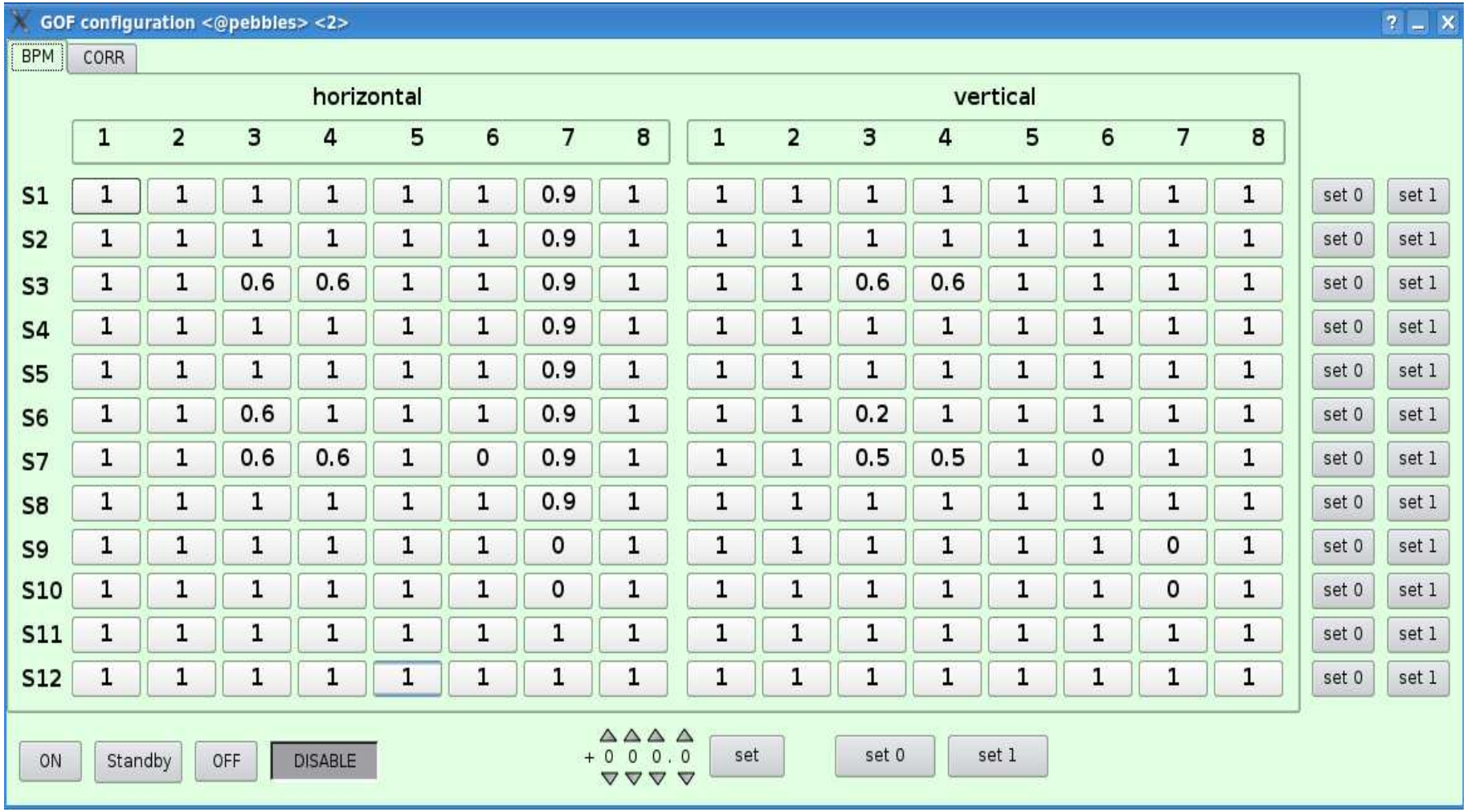
Milestones of the feedback project

- existing RF BPM detectors replaced with *Libera Electron:* March 2006-March 2007
- installation of the feedback system: February 2007
- loop closed: March 2007
- since beginning of September 2007 the feedback is routinely used during users shifts
- further developments suspended since Spring 2008 (FERMI has higher priority)
- still work to be done to integrate the feedback with other machine physics applications

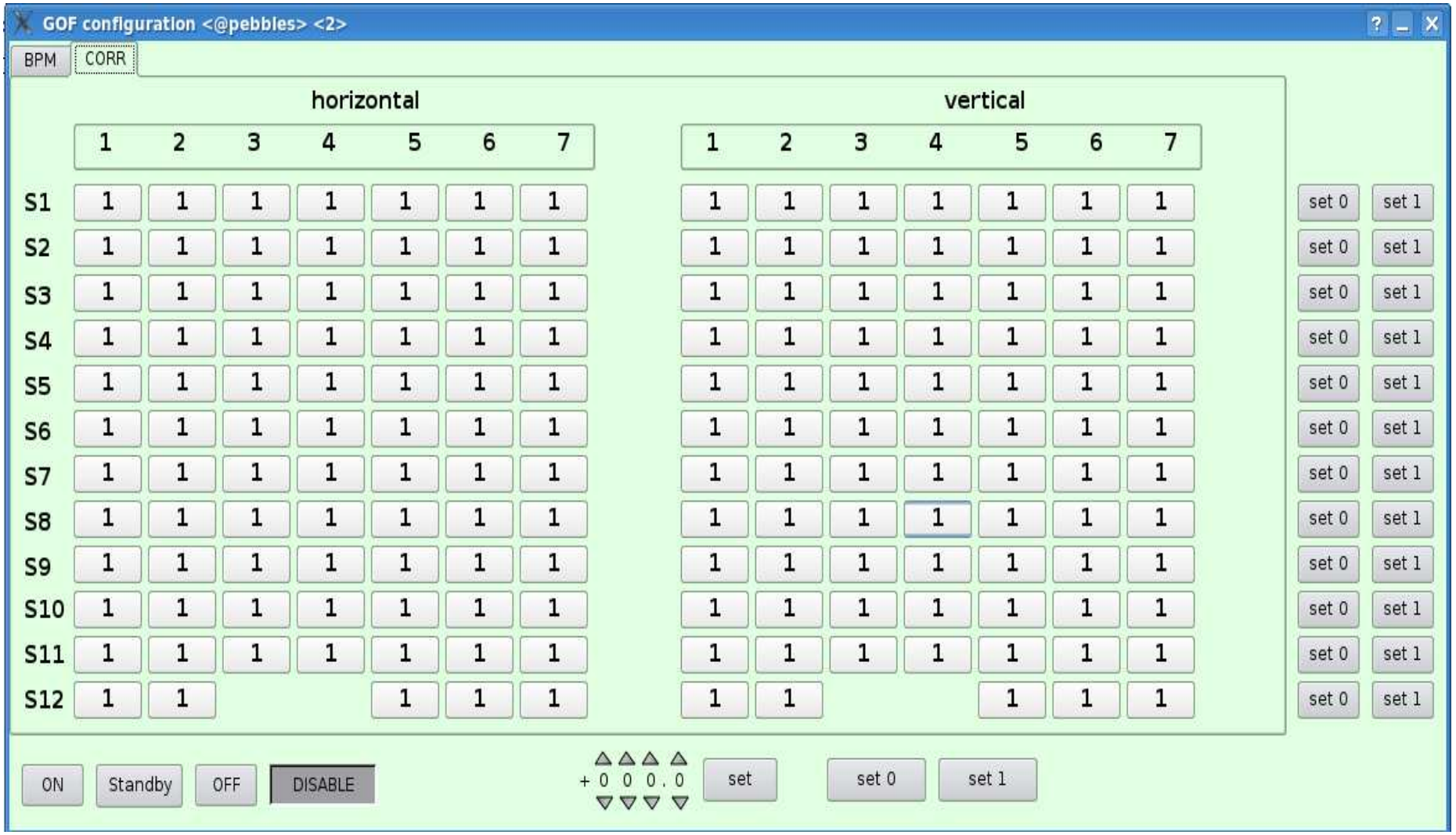
Feedback operation

- Operation procedure:
  - Full energy injection in the Storage Ring (2 or 2.4 GeV)
  - Local orbit correction after closing the IDs
  - Switch on the Fast Global Feedback
  - Exclude the correction in one section to permit local orbit adjustment if necessary
- correction algorithm: SVD with singular values reduction (21 s.v.)
- path length drift compensation by RF variation (operational but not routinely used)
- weighting of BPMs to privilege the correction at the IDs with respect to global one
- the response matrix can be changed on the fly when the feedback is running (ex. BPM/correctors weights, number of singular values, …)

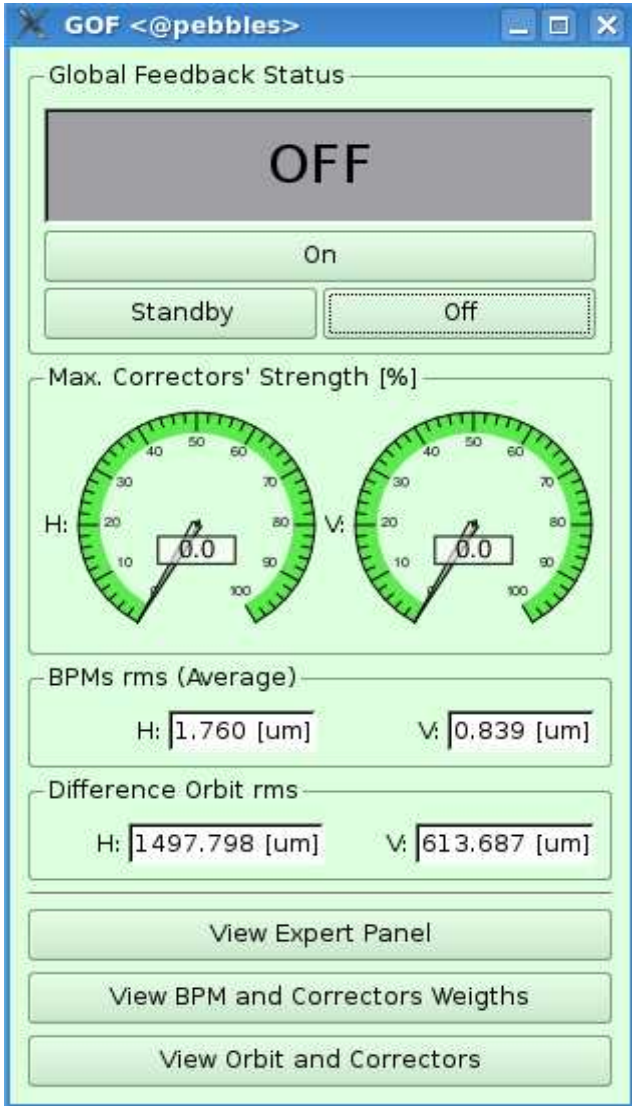
BPM Weights


GOF configuration <@pebbles> <2>
BPM
CORR
horizontal
vertical
1 2 3 4 5 6 7 8
S1 1 1 1 1 1 1 0.9 1 | 1 1 1 1 1 1 1 1 set 0 set 1
S2 1 1 1 1 1 1 0.9 1 | 1 1 1 1 1 1 1 1 set 0 set 1
S3 1 1 0.6 0.6 1 1 0.9 1 | 1 1 0.6 0.6 1 1 1 1 set 0 set 1
S4 1 1 1 1 1 1 0.9 1 | 1 1 1 1 1 1 1 1 set 0 set 1
S5 1 1 1 1 1 1 0.9 1 | 1 1 1 1 1 1 1 1 set 0 set 1
S6 1 1 0.6 1 1 1 0.9 1 | 1 1 0.2 1 1 1 1 1 set 0 set 1
S7 1 1 0.6 0.6 1 0 0.9 1 | 1 1 0.5 0.5 1 0 1 1 set 0 set 1
S8 1 1 1 1 1 1 0.9 1 | 1 1 1 1 1 1 1 1 set 0 set 1
S9 1 1 1 1 1 1 0 1 | 1 1 1 1 1 1 0 1 set 0 set 1
S10 1 1 1 1 1 1 0 1 | 1 1 1 1 1 1 0 1 set 0 set 1
S11 1 1 1 1 1 1 1 1 | 1 1 1 1 1 1 1 1 set 0 set 1
S12 1 1 1 1 1 1 1 1 | 1 1 1 1 1 1 1 1 set 0 set 1
ON
Standby
OFF
DISABLE
+ 0 0 0 . 0
set
set 0
set 1

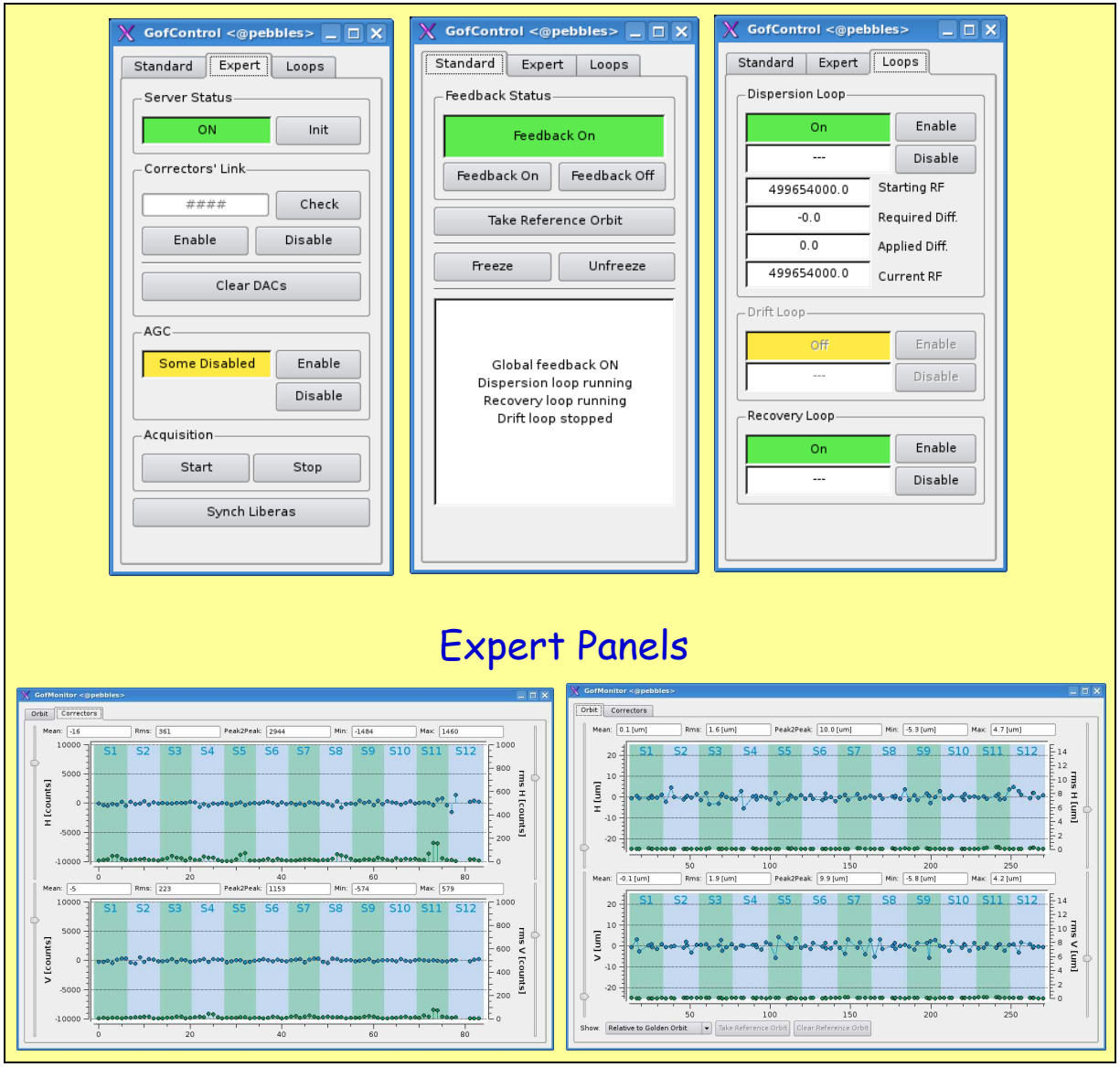
Correctors weights



Control Room Panels

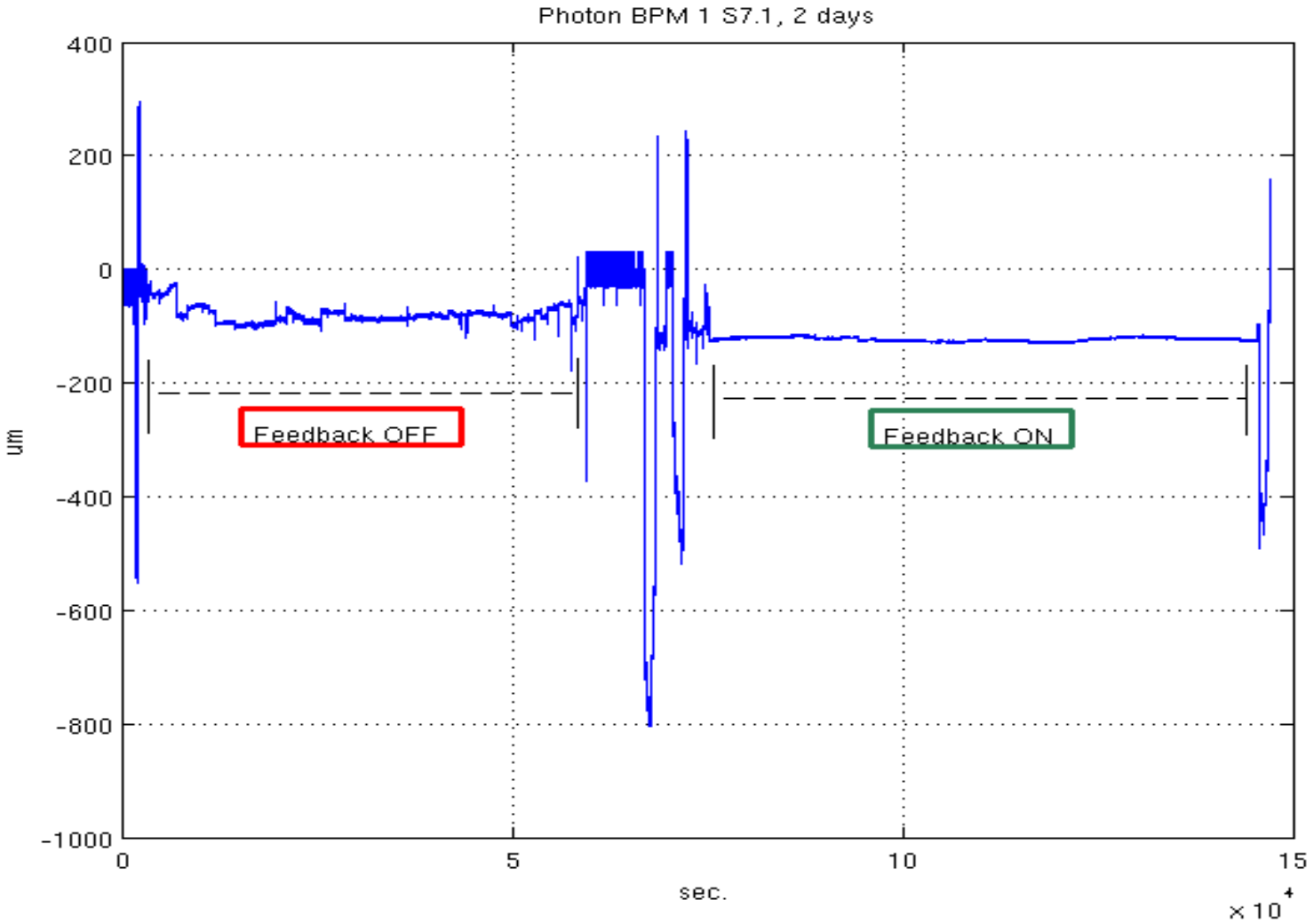


Operator Panel



Expert Panels

Long term photon beam stability



Libera Tango Device Server

- Embedded Tango Device Server (by Nicolas Leclercq - SOLEIL) running in the SBC on top of the Generic Server

- the Tango server is a modified version of the one developed for the 1.40 release

- need for a closer coordination and collaboration between Tango/Libera users with respect to the development and maintenance of the Libera Tango Server

- Tango Device "inside" or "outside" Libera? What about Soleil, ESRF, ALBA, ...? The behavior of the Tango Server seems different! Tango Server needs debugging directly in the SBC

Other considerations

- Electron vs Brilliance (spare parts)
- Reliability concerns
- Libera diagnostic in case of fault: need to define a common procedure for Libera testing
- JTAG and flash images (e.g. flash corruption or upgrade crash)
- Improve upgrade procedure (single step and not incremental)
- Development environment (common SW platform, Virtual Machine,...)
- CVS: is Tango development environment downloadable?
- Bugzilla