

DAΦNE operation for the KLOE-2 data taking

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on behalf of the DAΦNE Team

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The DAΦNE Team

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II Run Program

DAΦNE resumed operation on September 18th 2015

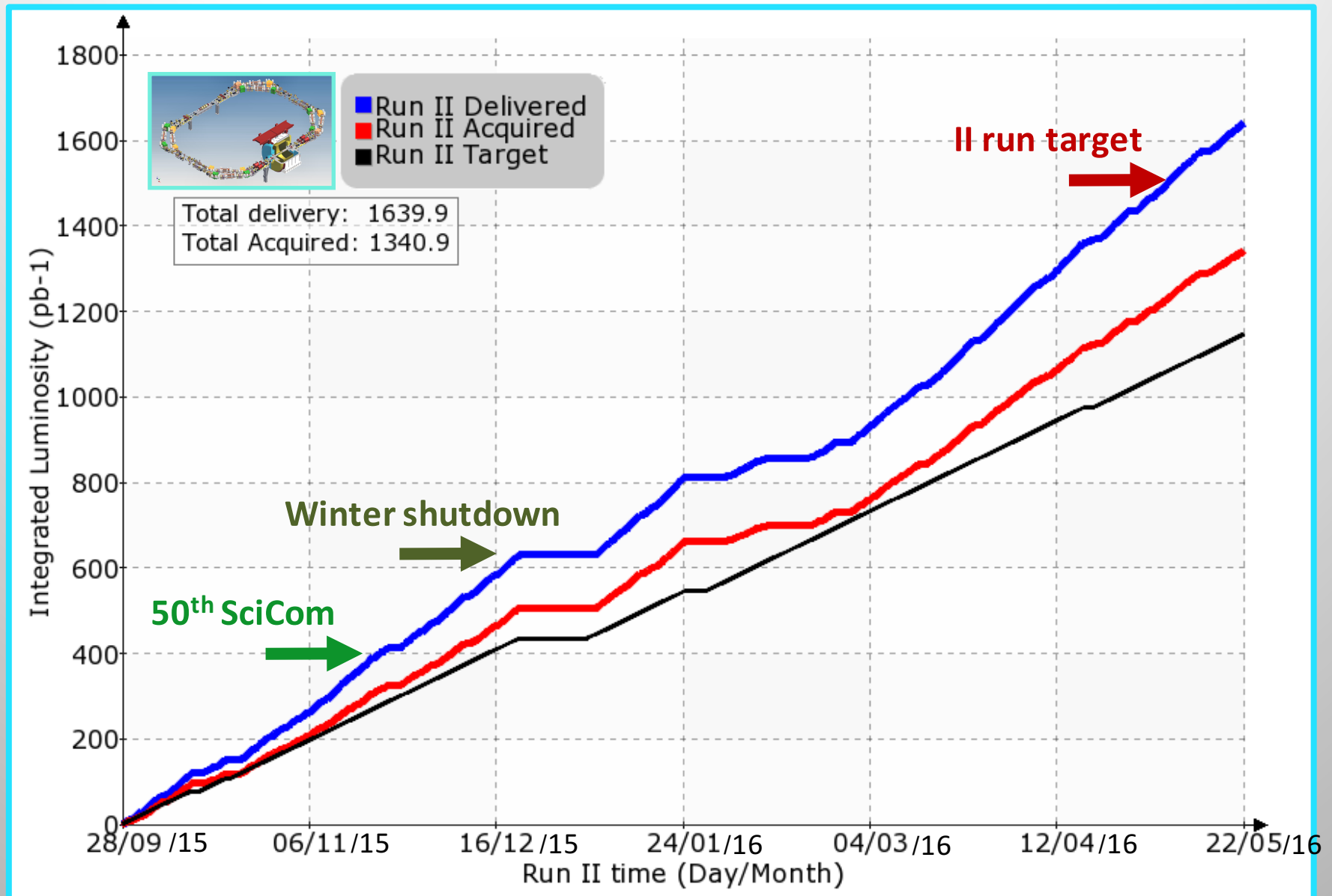
The second KLOE-2 data taking run, **II Run**, started on September 28th.

II run was aimed at delivering an integrated luminosity L_I

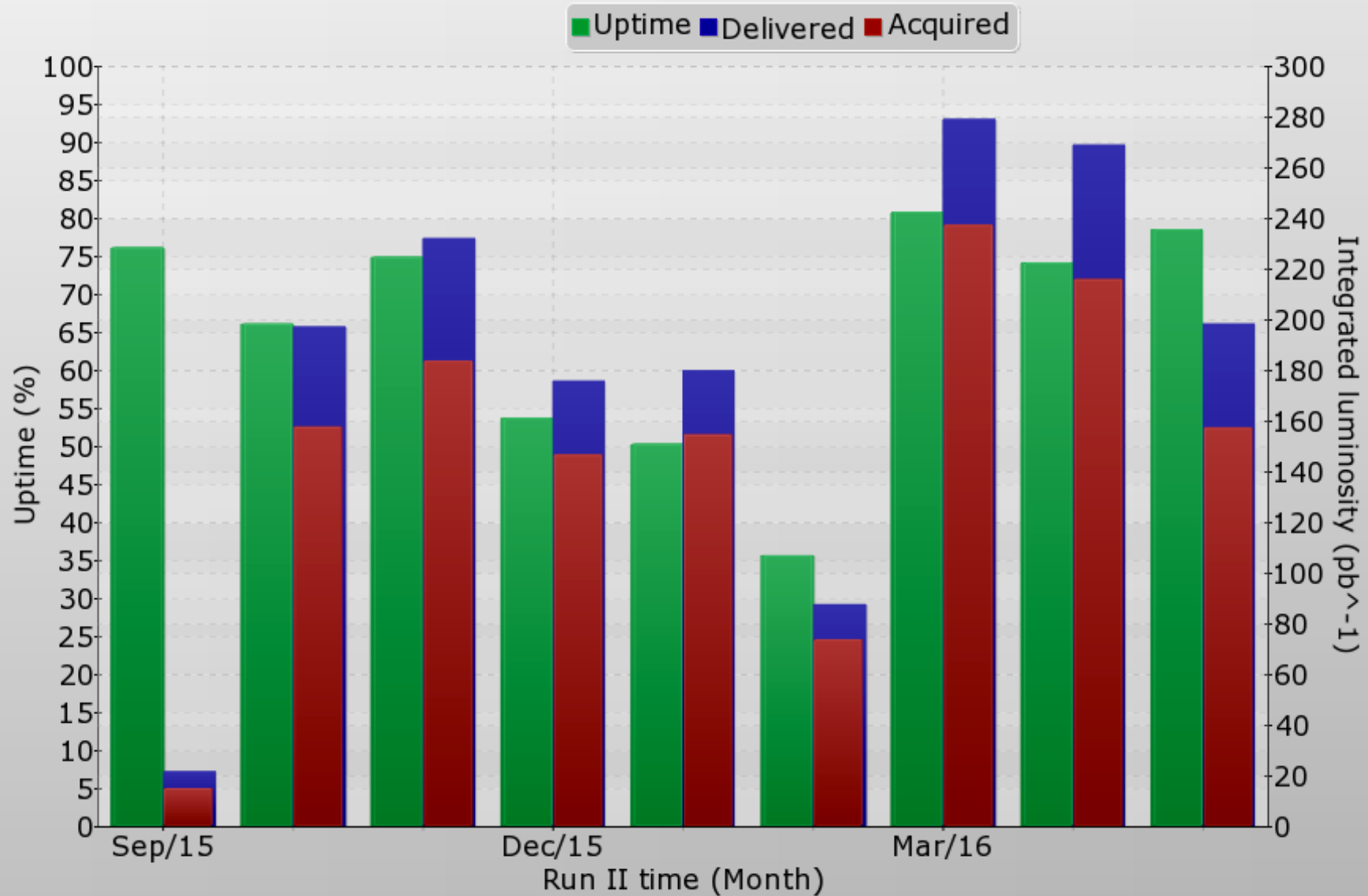
$$L_{\text{II run}} = 1.5 \text{ fb}^{-1}$$

by the end of July 2016

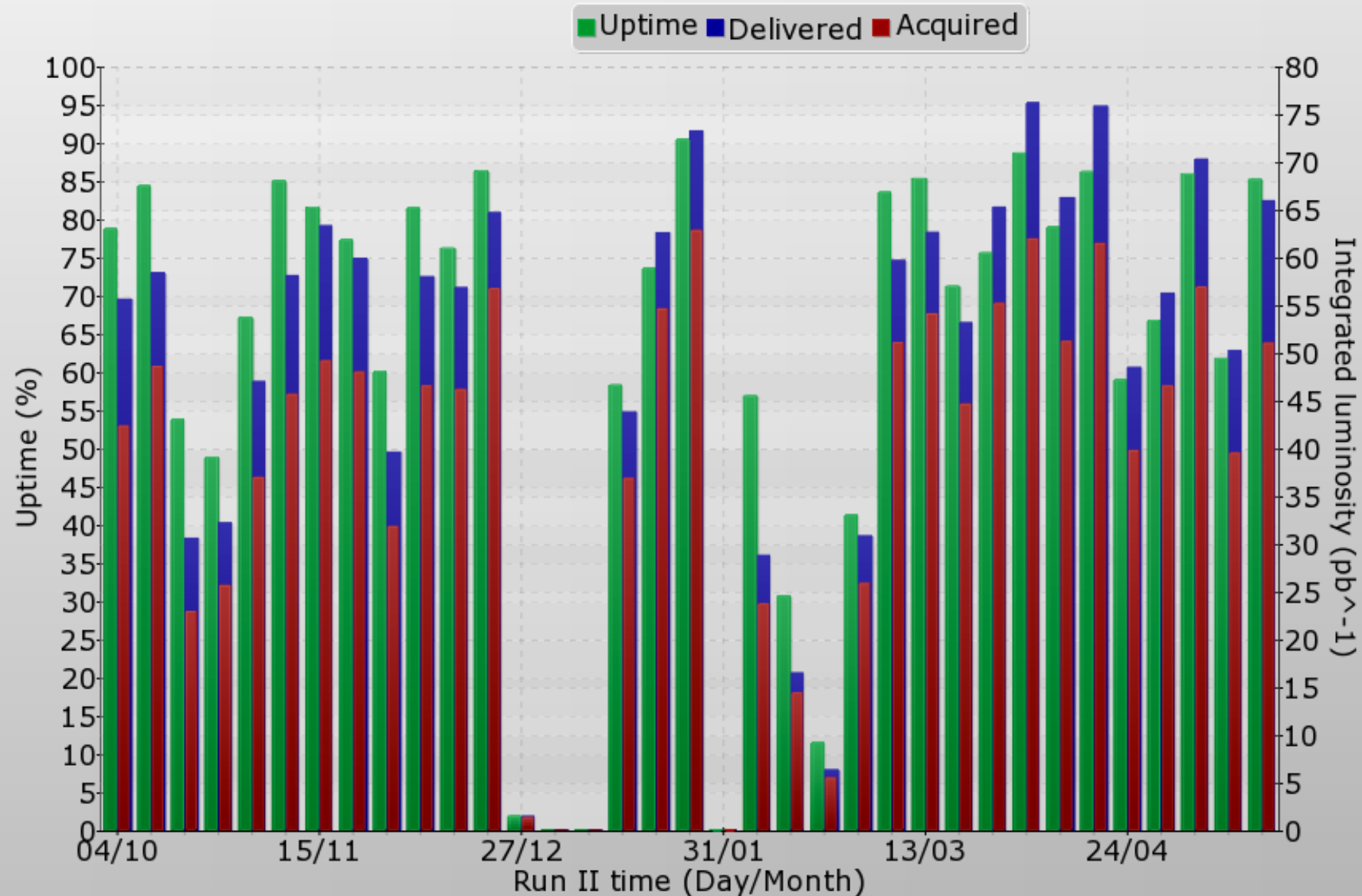
II Run Summary



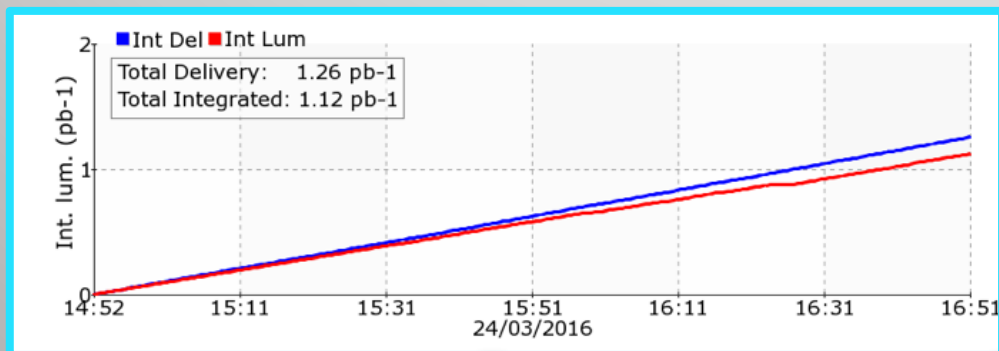
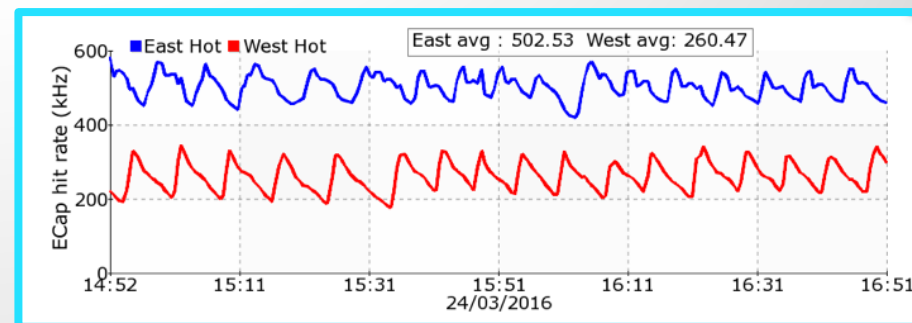
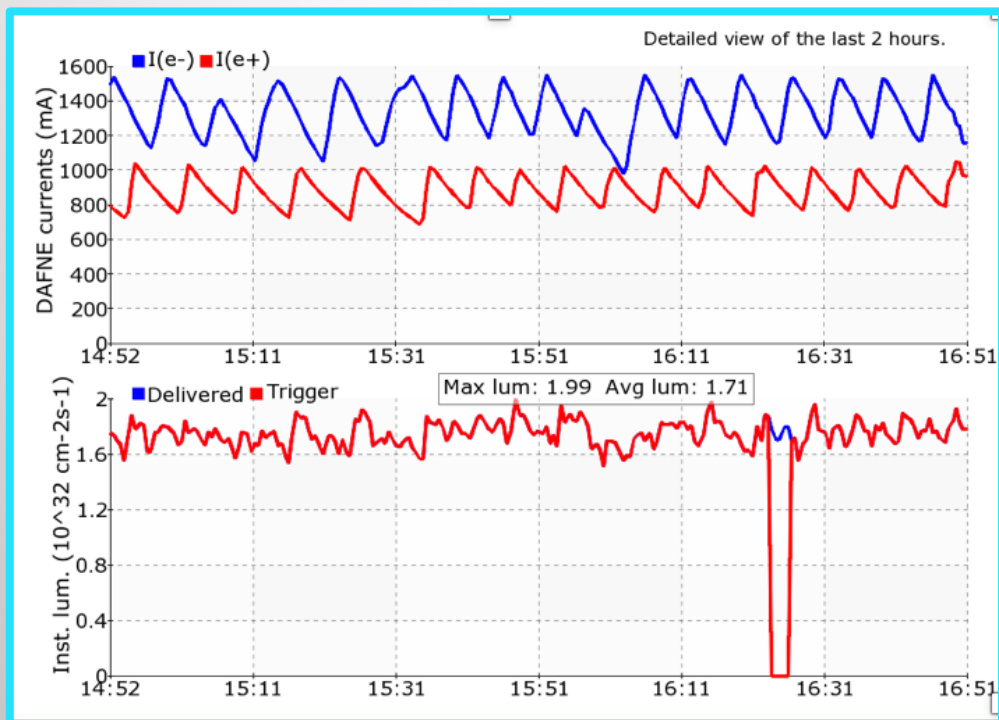
Monthly Performances



II Run Weekly Performances



Best Hourly Integrated Luminosity

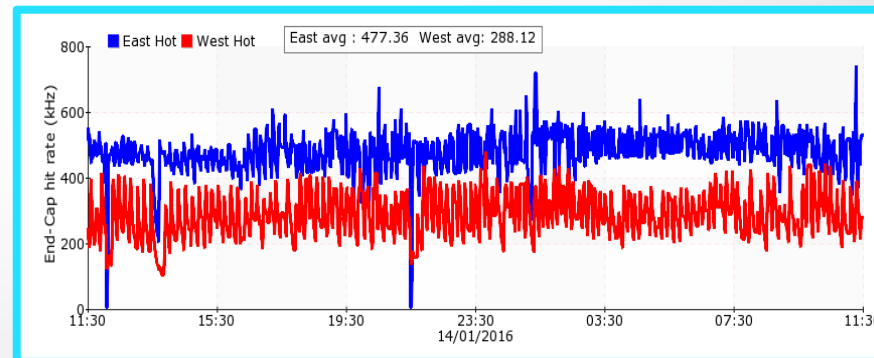
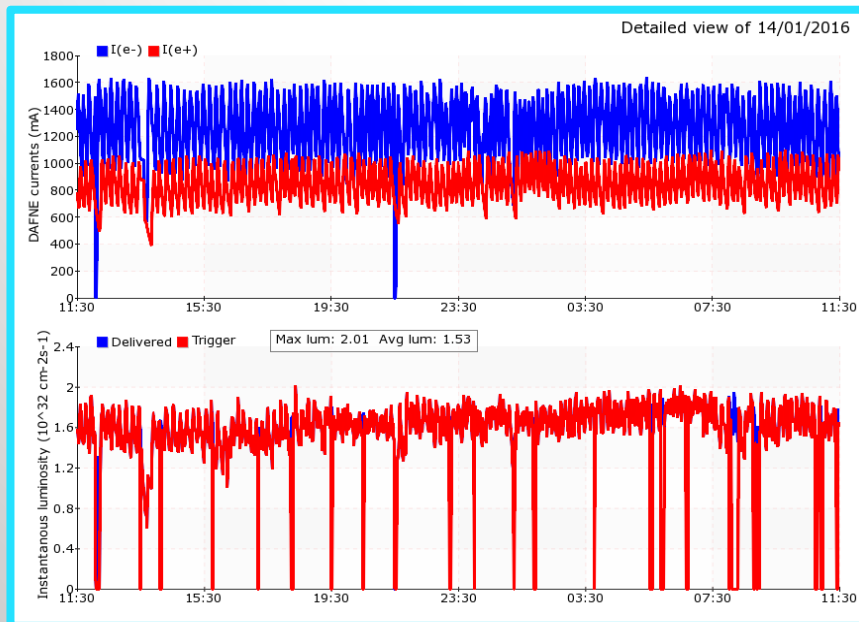


$$L_{f1h} \sim 0.63 \text{ pb}^{-1}$$

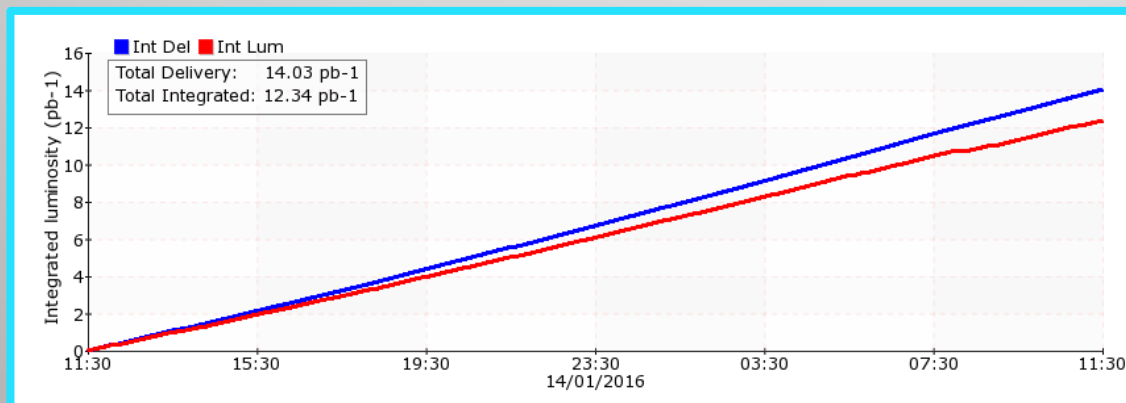


$$L_{f1day} \sim 15.1 \text{ pb}^{-1}$$

Best 24 Hours Integrated Luminosity



- 2 beam losses due to PS faults
- 105 bunches
- $I_{\text{MAX}}^- = 1.5 \div 1.6 \text{ A}$
- $I_{\text{MAX}}^+ = 1.0 \div 1.16 \text{ A}$
- Sustainable background



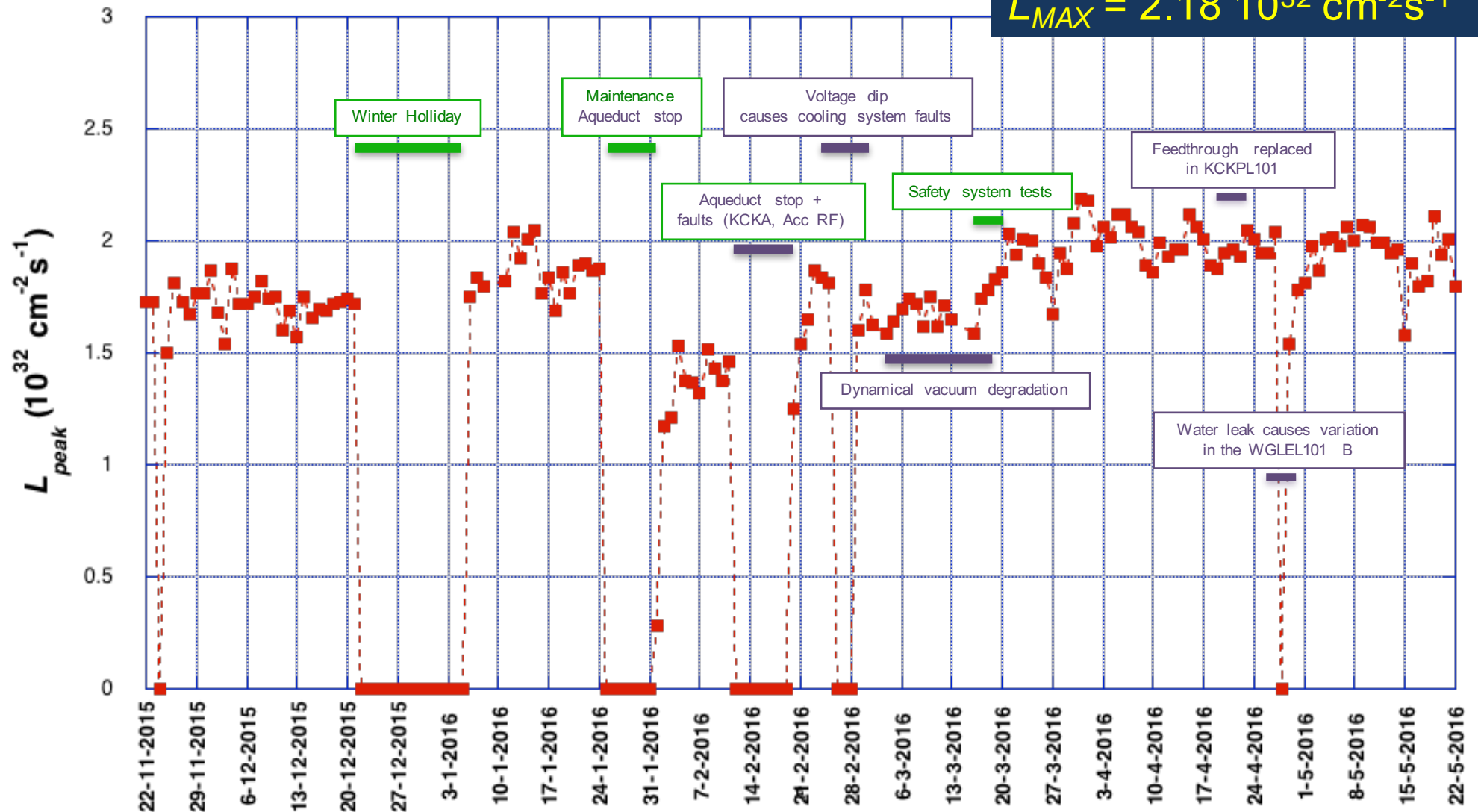
$$\int_{\text{del}} L \sim 14.03 \text{ pb}^{-1}$$

$$\int_{\text{acq}} L \sim 12.34 \text{ pb}^{-1}$$

Uptime ~98%

Peak Luminosity Trend

$$L_{MAX} = 2.18 \cdot 10^{32} \text{ cm}^{-2}\text{s}^{-1}$$



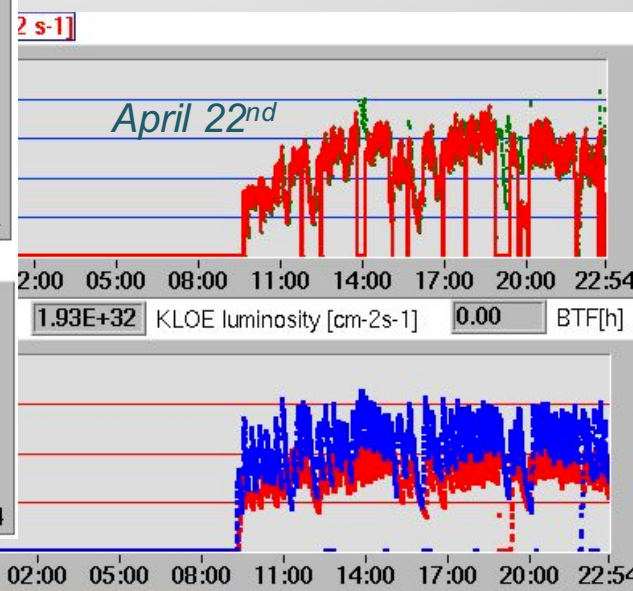
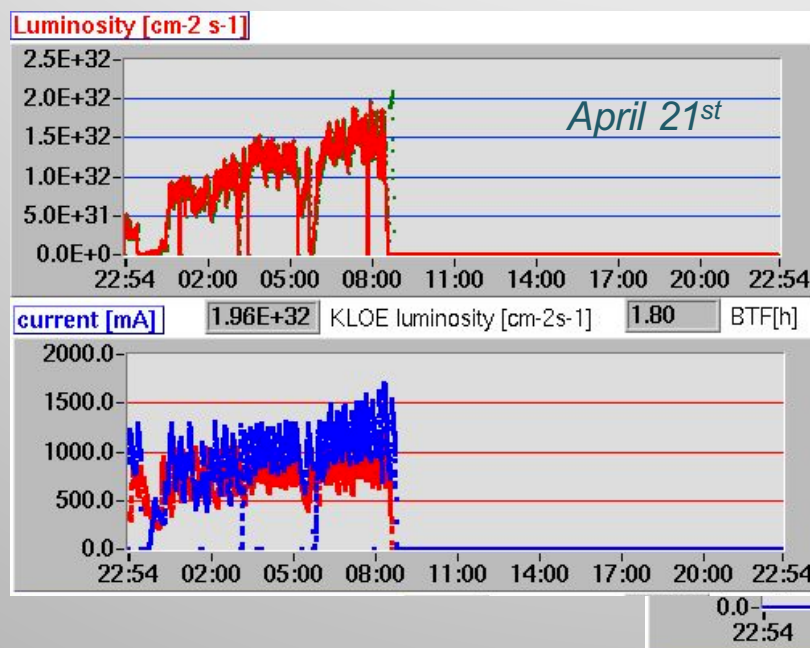
Feedthrough replacement

A feedthrough of the KCKPL101 injection kickers in the MRp has broken causing a vacuum leakage, thus had to be replaced

Operation took 15 minutes and after 24 hours it was possible to reach:

$$I^+ \cong 1 \text{ A}$$

$$L = 1.8 \cdot 10^{32} \text{ cm}^{-2} \text{ s}^{-1}$$



Energy Scan

C.M. energy has been studied by varying the frequency of the main ring RF cavities

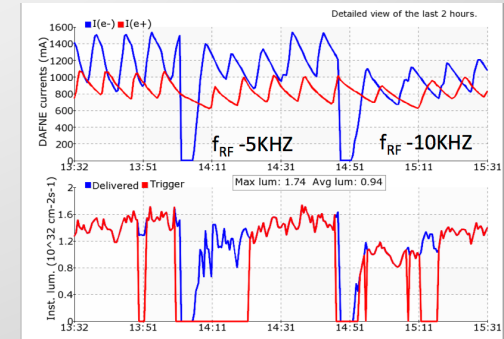
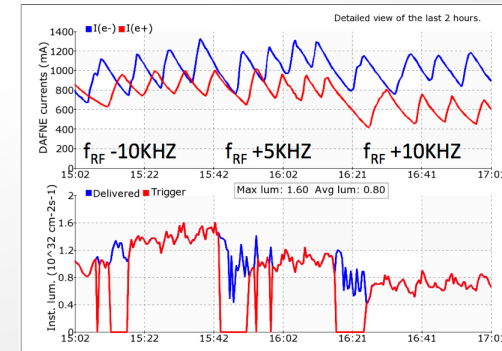
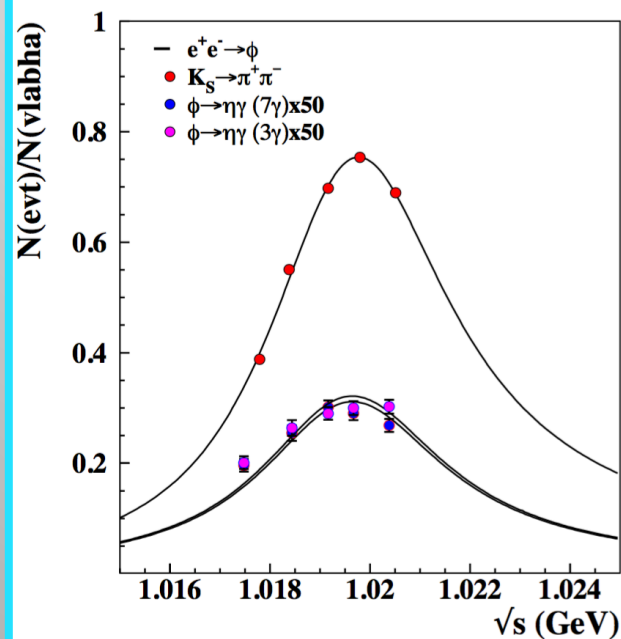
$$-\alpha_c \frac{\Delta p}{p} = \frac{\Delta f_{RF}}{f_{RF}}$$

In the range

$$-10 \text{ KHz} \leq f_{RF} < 10 \text{ KHz}$$

Corresponding to an energy variation per beam

$$-1.5 \text{ MeV} \leq E < 1.5 \text{ MeV}$$

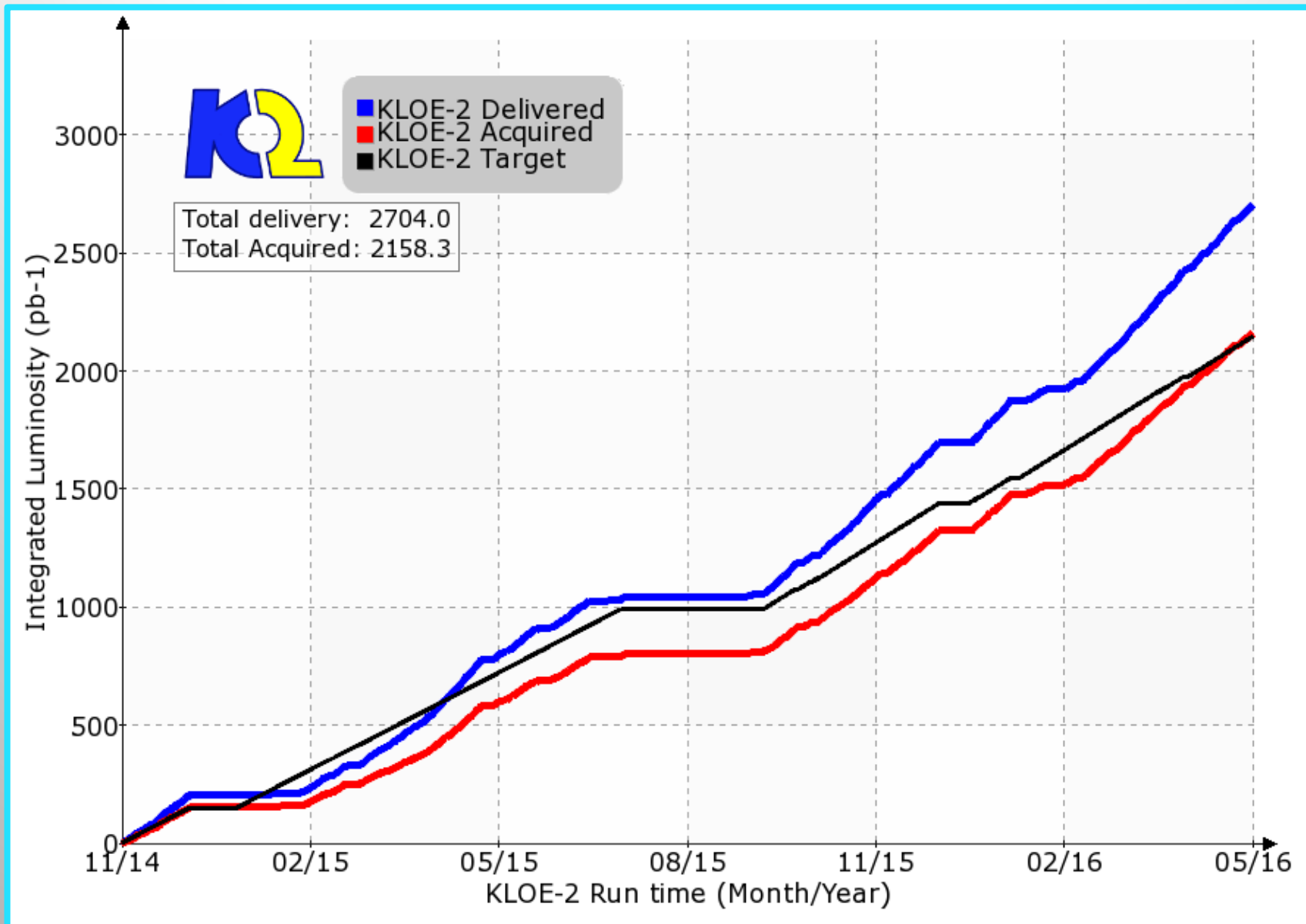


On May 16th the c.m. energy of the colliding beams has been changed

$$\Delta E_{CM} = + .5 \text{ MeV}$$

by varying the main ring bending magnets maintaining the same performances in terms of luminosity and background

Total Integrated Luminosity



Maintenance shutdown (23-27 May)

Ordinary periodical maintenance of all the main DAFNE subsystems.

The sources of the experienced faults have to be removed therefore refurbishing interventions are going to be implemented, regarding mainly:

- magnet PSs
- linac RF plants
- cryo plant components

Replacement of some vacuum equipment in the Main Rings
Measurements to check vacuum level in some critical area

Reinstatement of repaired parts on the Accumulator RF system
Tests on the main rings RF plants

Ancillary plants control system will be upgraded in order to:
provide a more efficient alarm notification
Include other important parameters

Maintenance shutdown (23-27 May)

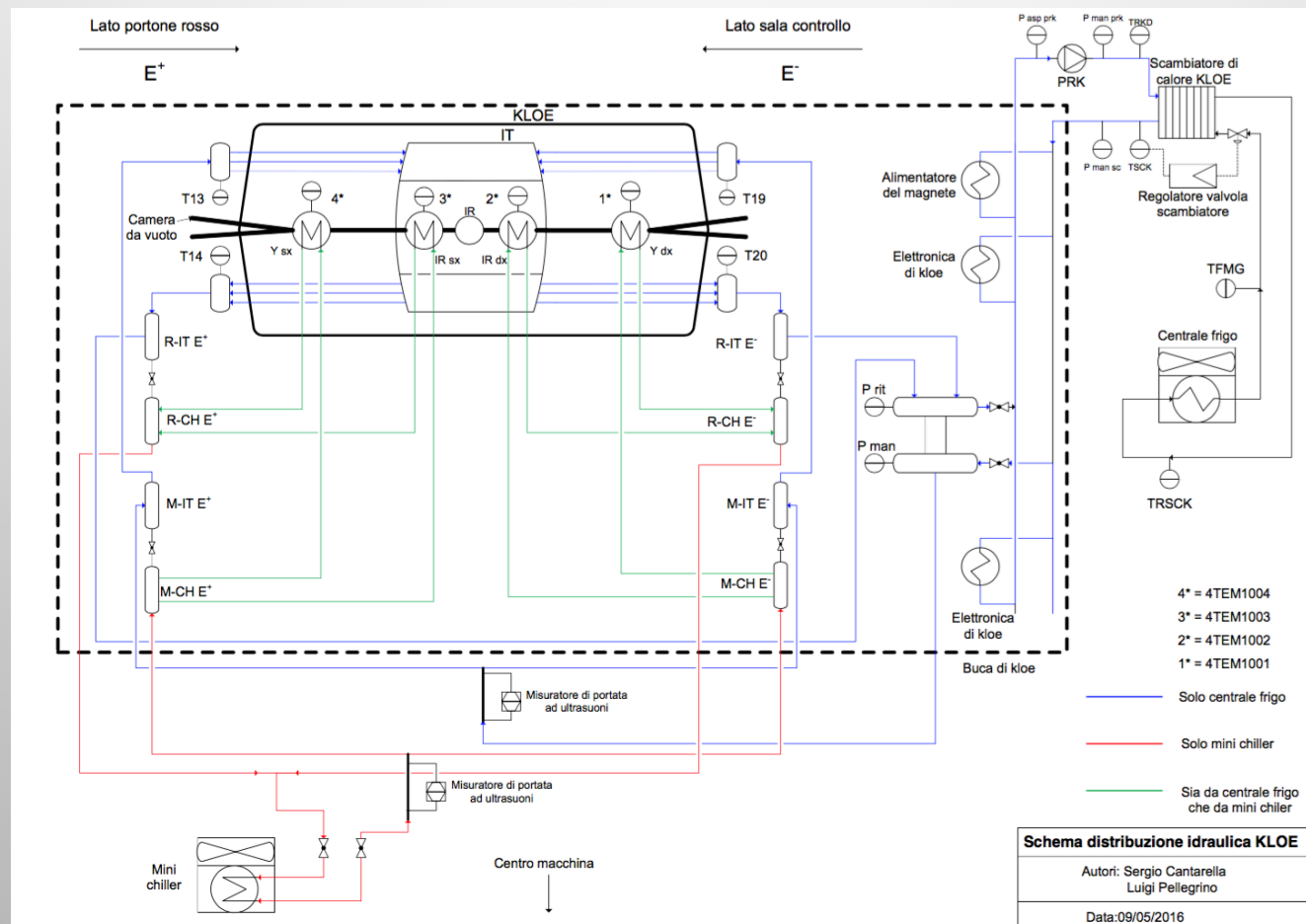
Cooling circuit serving:

KLOE PS and electronics

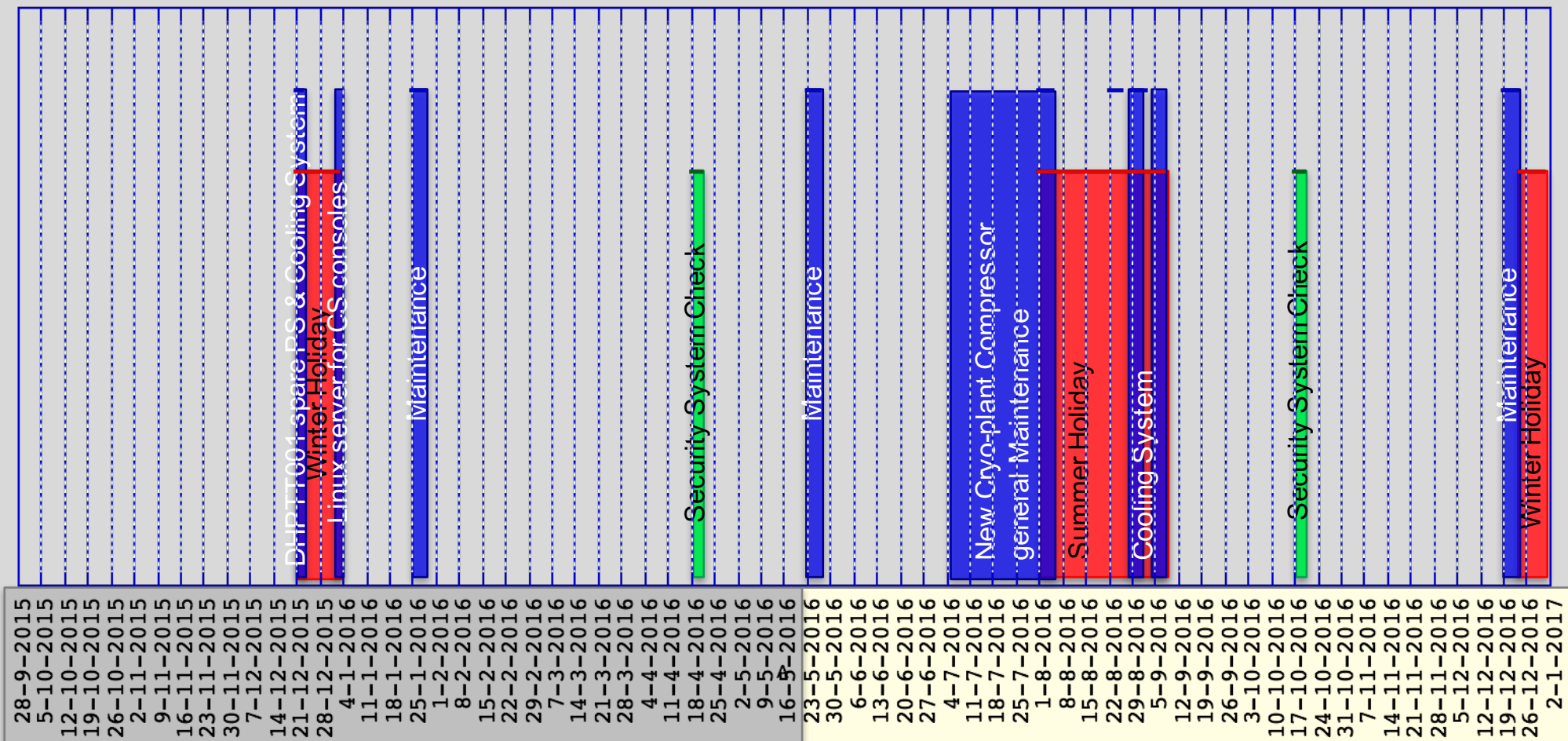
IT CALT and QCALT

IR vacuum chamber

is going to be revised in order to improve its efficiency and to disentangle the temperature of the water going to the vacuum chamber circuit to the one circulating in the new KLOE-2 detectors



DAΦNE Activity Plan



In 2016 DAΦNE is expected to run for 270 days

Summer shutdown activities

In addition to the ordinary maintenance program several major interventions have been planned on the DAFNE hardware

Cryogenic plant



New Compressor

Linac



New Linac gun pulser

Control System



Extraordinary maintenance
(under definition)

Power Supplies



New Linux servers for the consoles

DAΦNE Cryo System upgrade: Compressor

Since 1998 compressor type Kaeser FS 440 has been run in excess of 100.000 hours! More than twice any other compressor installed by Linde/Kaeser

- New compressor is on the way, nominal 20% more efficiency (motor/screw drive) with heat recovery option
- Activities for new compressor integration include High P and low P lines modification and leak/pressure tests.
- Commissioning of the new compressor are scheduled to start on 18th of July

Low P



High P



DAΦNE Cryo System upgrade: S-Magnets

KLOE:

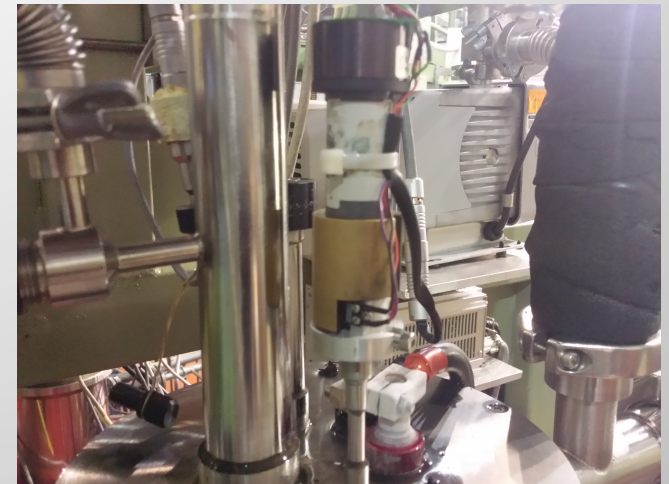
Replacement of the electronics for current lead temperature read out

Compensators:

modification/rufurbishing of JT valves

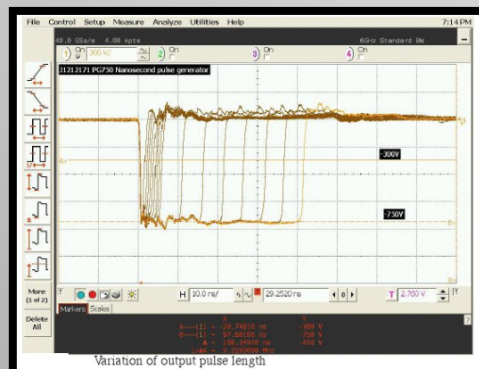
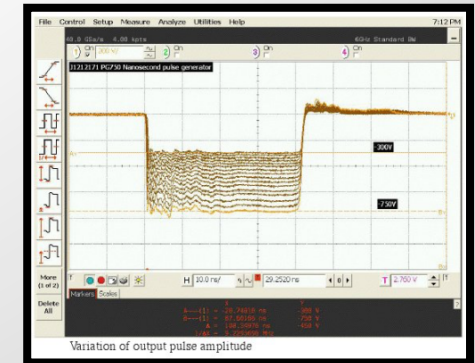
Options:

- Feasability study and manufacturing of a new stem with free rotating needle
- Restoring of thread actuator inside the magnet



Upgrade of the electron gun pulser

Amplitude	adjustable from -300 to -1000V in steps of 50V
Pulse shape	Rectangular
Pulse width	1.5ns to 5usecs, FWHM
Rise time	<1ns (both modes)
Fall time	<1.5ns for PW ≤45ns (short pulse mode) 8ns for PW >45ns (long pulse mode)
Maximum rep rate	≥ 50Hz
Start jitter	approx 20ps rms
PW jitter	approx 20ps rms for PW ≤45ns 500ps for PW > 45ns
Flatness	+/-10%
Post pulse noise	+/-10%



SIDDHARTA-2 study group

This group has the duty to evaluate the design effort and the resources necessary to undertake a new run of DAΦNE for the SIDDHARTA upgraded detector: SIDDHARTA-2

Relying on the assumptions:

- SIDDHARTA-2 installed in place of the KLOE-2 detector
- IR design as much as possible the same as the one implemented for the SIDDHARTA run

It's necessary to study and to define the following issues:

- KLOE-2 removal
- Inventory of the IR components used for the SIDDHARTA run
- Low- β permanent magnet quadrupoles
- IR diagnostics definition
- Study of the mechanical compatibility of the new detector setup with:
- IR layout
- background shielding
- collider diagnostics
- Possible main rings modification aimed at improving operation efficiency

Conclusions

DAΦNE performances:

- operation are stable and reproducible*
- peak and integrated luminosity are growing*
- background is compatible with an efficient data-taking*

The II KLOE-2 run has been already completed delivering

$$\int L \sim 1.5 \text{ fb}^{-1}$$

in advance w.r.t. the schedule

Instantaneous luminosity is a 45% higher than the best ever measured with the KLOE detector although beam currents are still lower than in 2005

Maximum daily integrated luminosity is comparable with the best achieved during the Crab-Waist test run with SIDDHARTA and has been measured while KLOE-2 was taking data

Well defined studies are under way to realize a new DAFNE run for the SIDDHARTA-2 detector

Acknowledgement

I like to thank all the Colleagues of the OPERATION GROUP:

Baldini G., Battisti, Beatrice, Belli, Bolli, Ceccarelli G., Ceccarelli R., Cecchinelli, Clementi, Coiro, De Biase, Ermini, Fontana, Fusco, Gaspari, Giacinti, Iungo, Marini, Martelli, Mencarelli, Monteduro, Pellegrini, Piermarini, Quaglia, Rossi, Sardone, Scampati, Sensolini, Sorgi, Sperati, Spreccacenero, Strabioli, Tonus, Zarlenga, Zolla.

for their precious and excellent work!

Thank you for your attention

Spare Slides

Crab-Waist collision scheme and SIDDHARTA

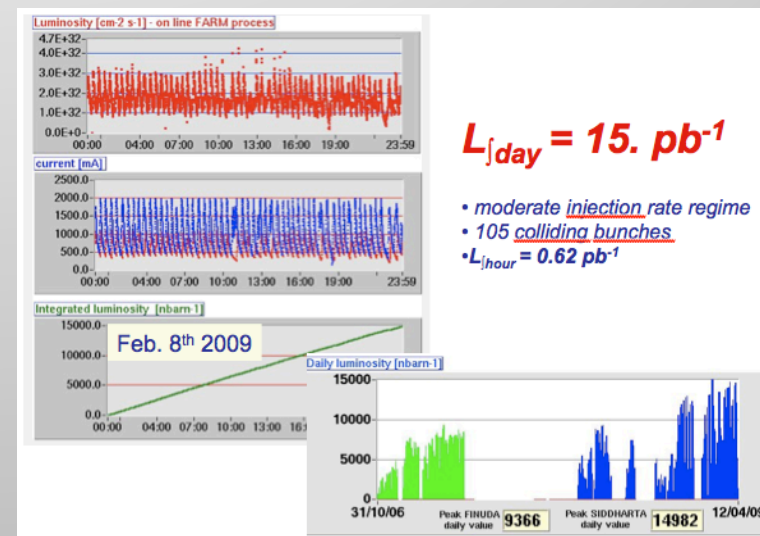
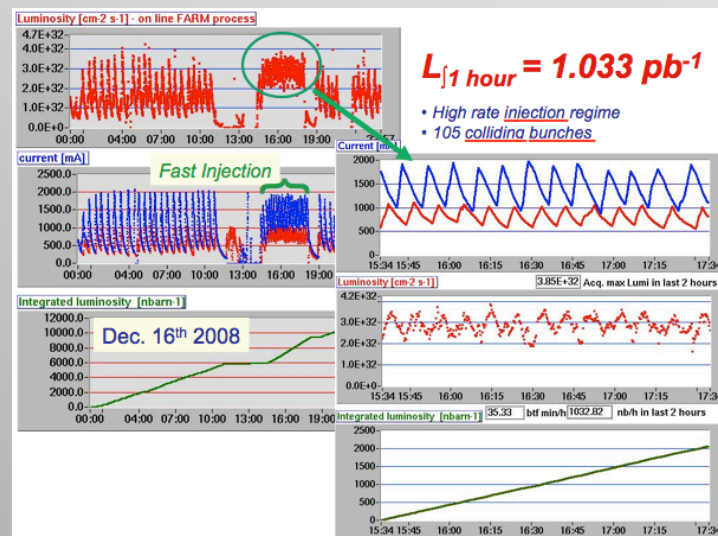
- Large crossing angle and Crab-Waist scheme proved to be effective in increasing luminosity, a factor 3 higher than in the past
- The DAΦNE collider, based on a new collision scheme including Large Piwinski angle and Crab-Waist, has been successfully commissioned and has delivered:

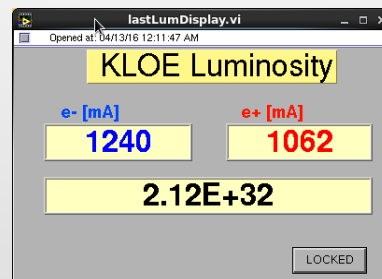
$$L_{\text{peak}} = 4.5 \cdot 10^{32} \text{ cm}^{-2} \text{ s}^{-1}$$

$$L_{\text{f1 day}} = 15.0 \text{ pb}^{-1}$$

$$L_{\text{f1 hour}} = 1.033 \text{ pb}^{-1}$$

$$L_{\text{f run}} \sim 2.8 \text{ fb}^{-1} \text{ (SIDDHARTA detector)}$$





15/4/2016