

DAΦNE status

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on behalf of the DAΦNE Team

The DAΦNE Team

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DAΦNE Operation Team

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Topics

- *KLOE-2: summary of the II run and data delivered*
- *DAΦNE performances*
- *Maintenance and consolidation program*
- *KLOE-2: summary of III run*
- *SIDDHARTA-2 study group and plans*
- *Conclusions*

Topics

- *KLOE-2: summary of the II run and data delivered*

II Run Program

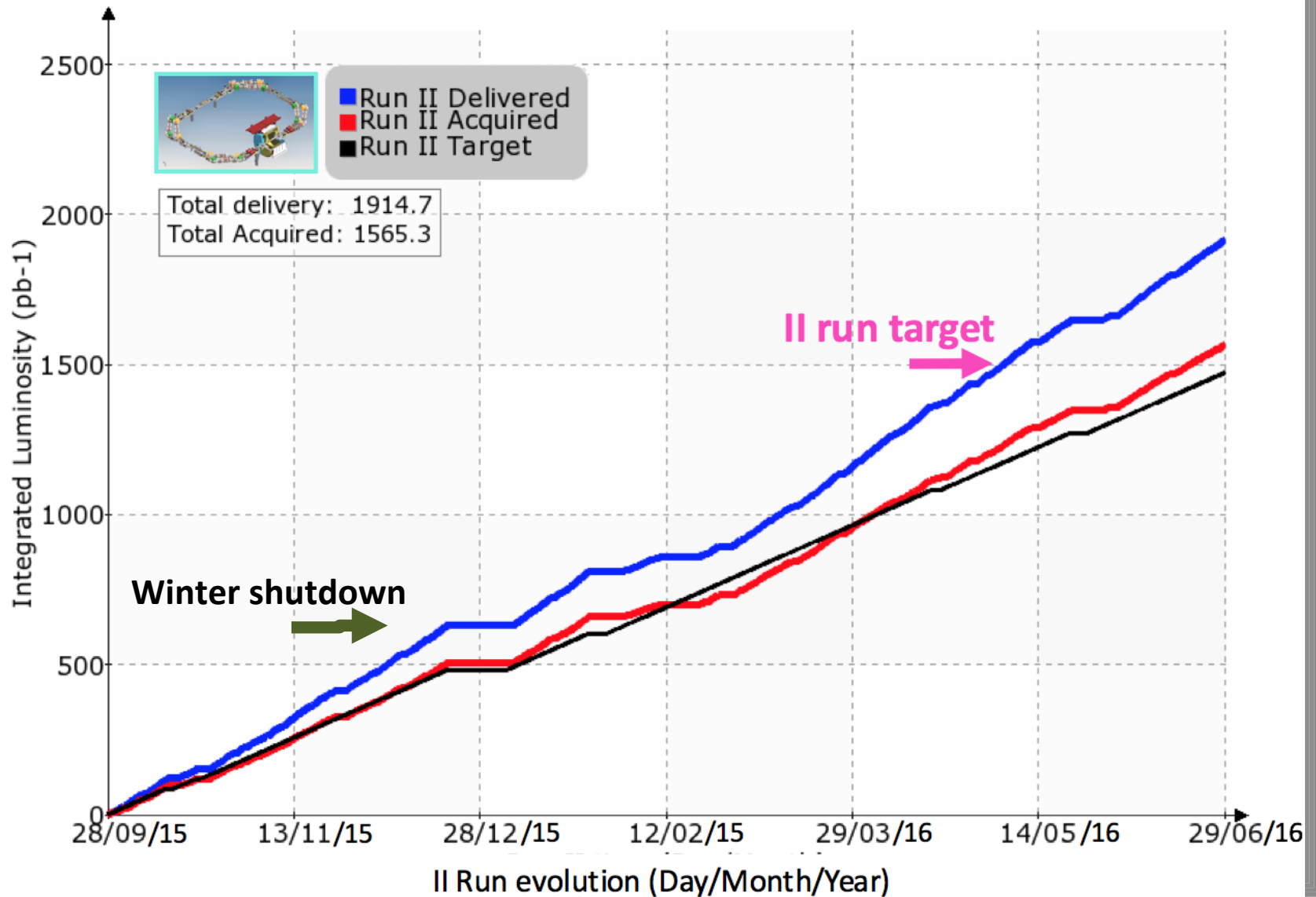
DAΦNE resumed operation on September 18th 2015

The second KLOE-2 data taking run, **II run**, started on September 28th and terminated on July 3rd 2016.

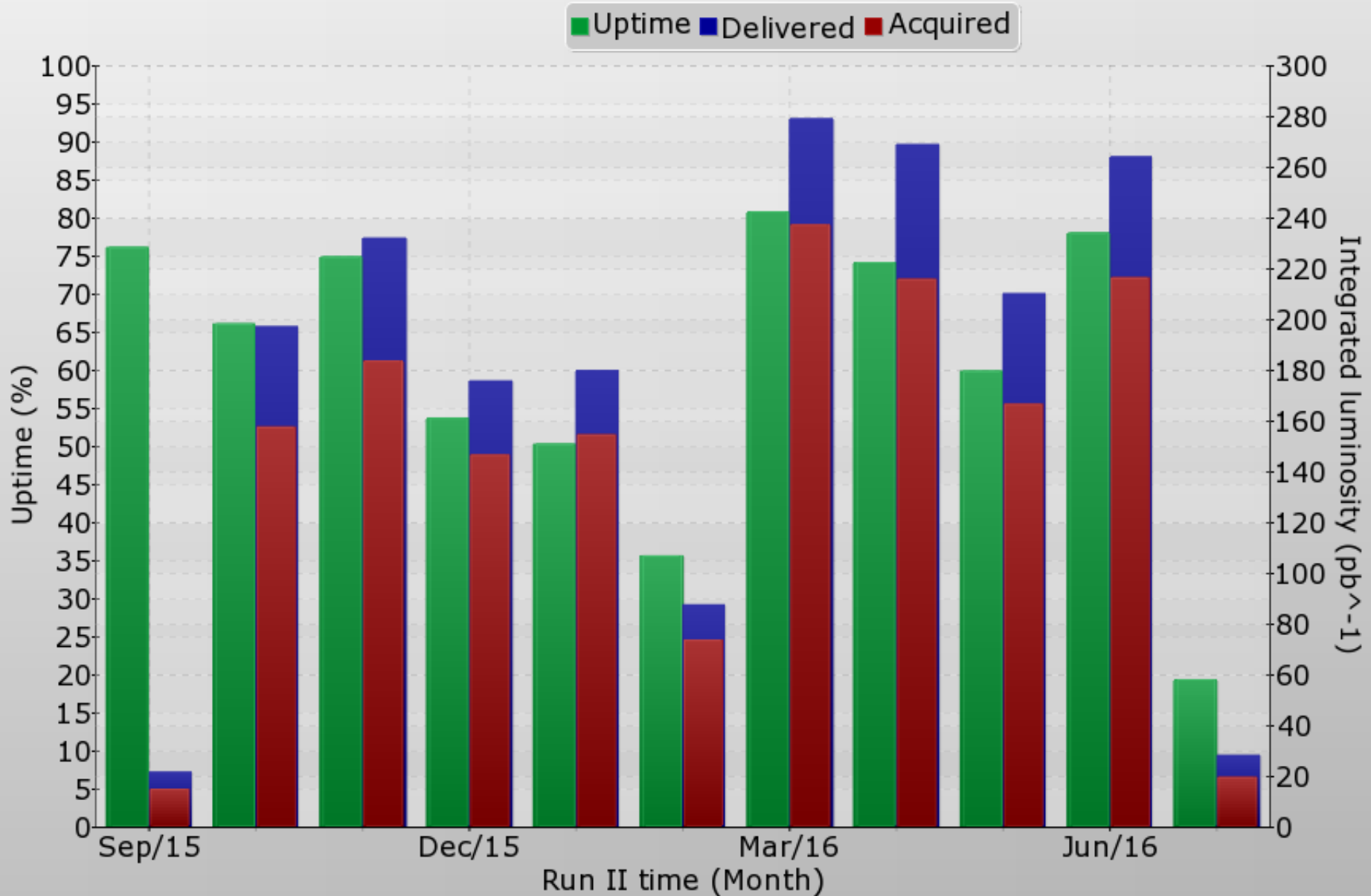
II run was aimed at delivering an integrated luminosity $\int L$
 $\int L$ *II run* = 1.5 fb⁻¹

And the goal has been achieved (see next slide).

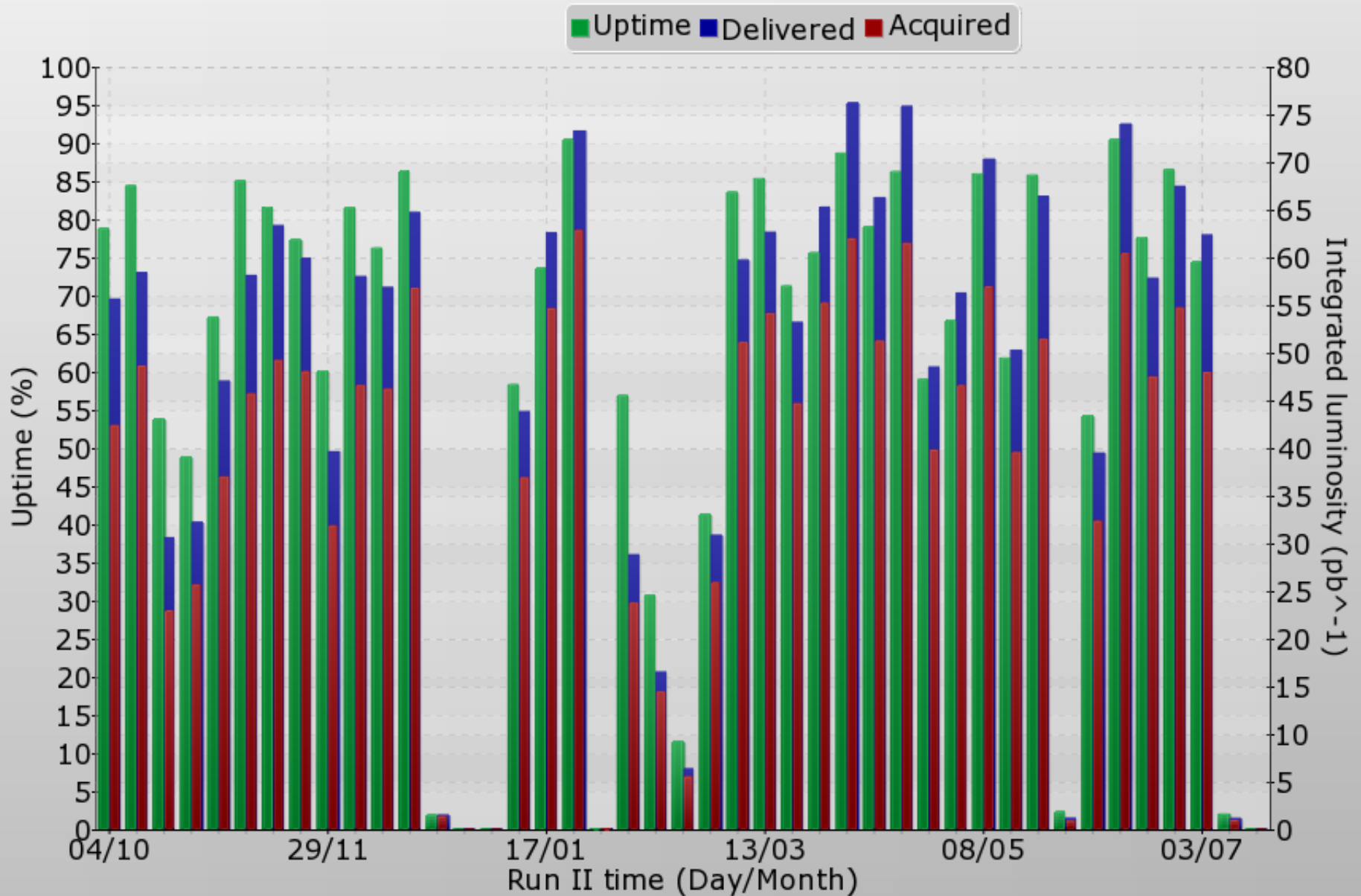
II Run Summary



II Run Monthly Performances



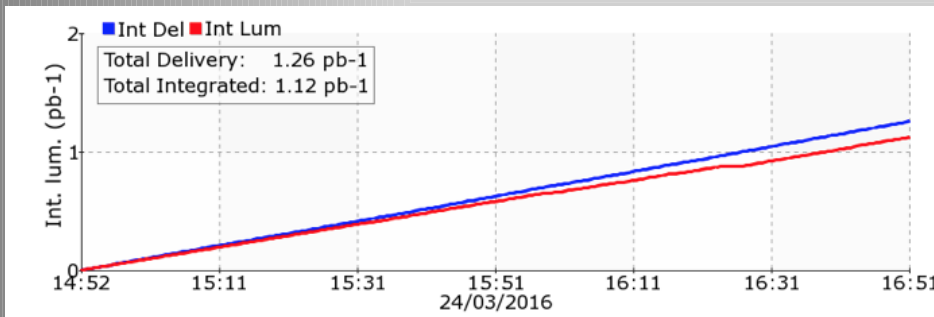
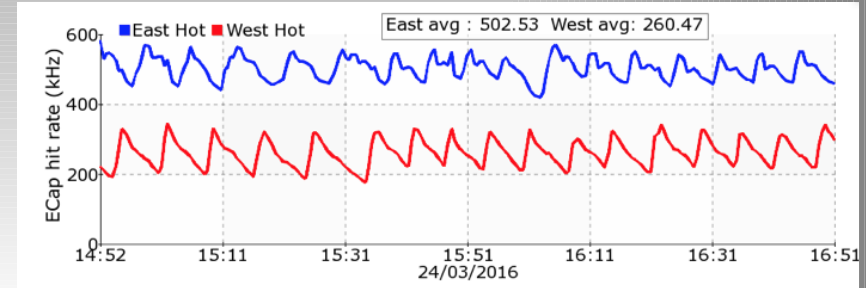
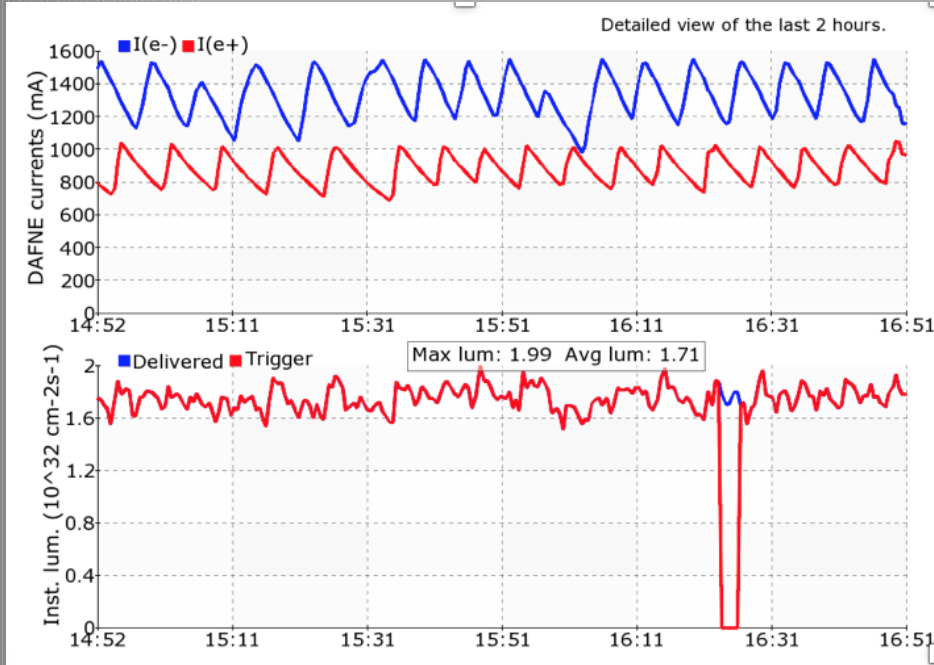
II Run Weekly Performances



Topics

- *KLOE-2: summary of the II run and data delivered*
- *DAΦNE performances*

Best Hourly Integrated Luminosity



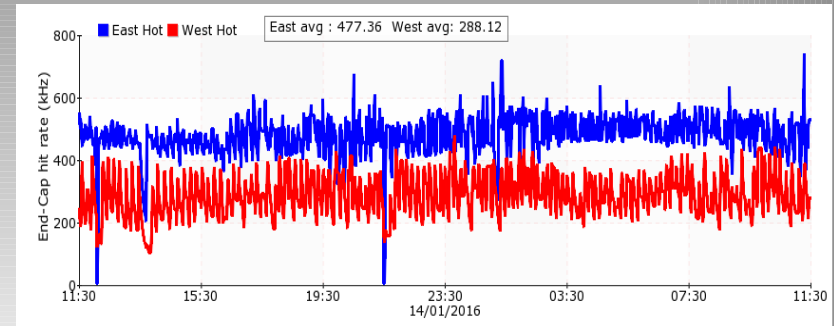
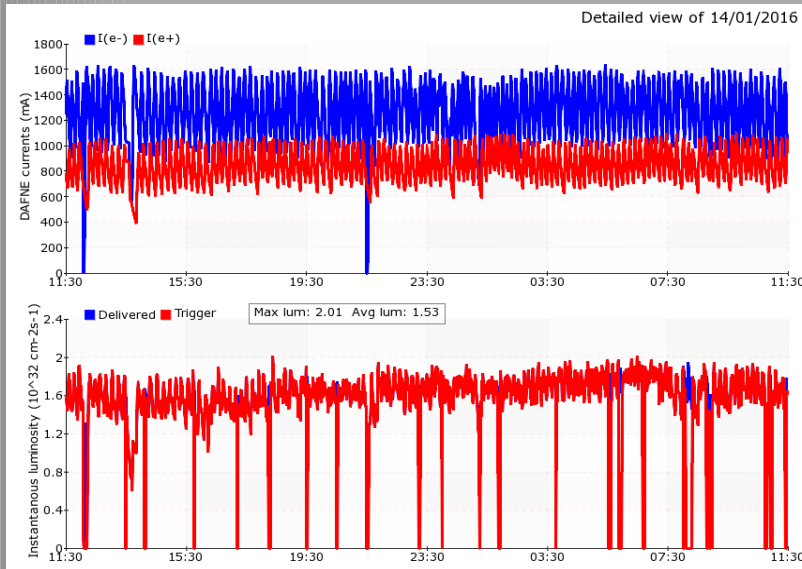
$$L_{f1h} \sim 0.63 \text{ pb}^{-1}$$



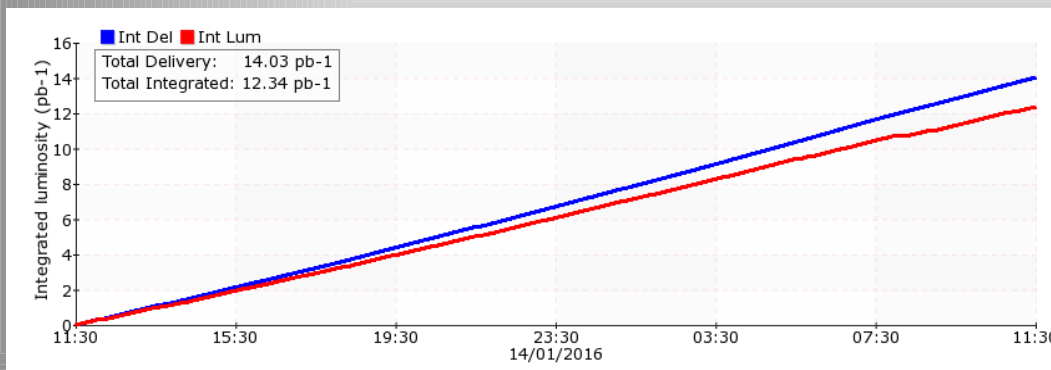
$$L_{f1day} \sim 15.1 \text{ pb}^{-1}$$

(no change from last SciCom)

Best 24 Hours Integrated Luminosity



- 2 beam losses due to PS faults
- 105 bunches
- I-MAX = 1.5 ÷ 1.6 A
- I+MAX = 1.0 ÷ 1.16 A
- Sustainable background

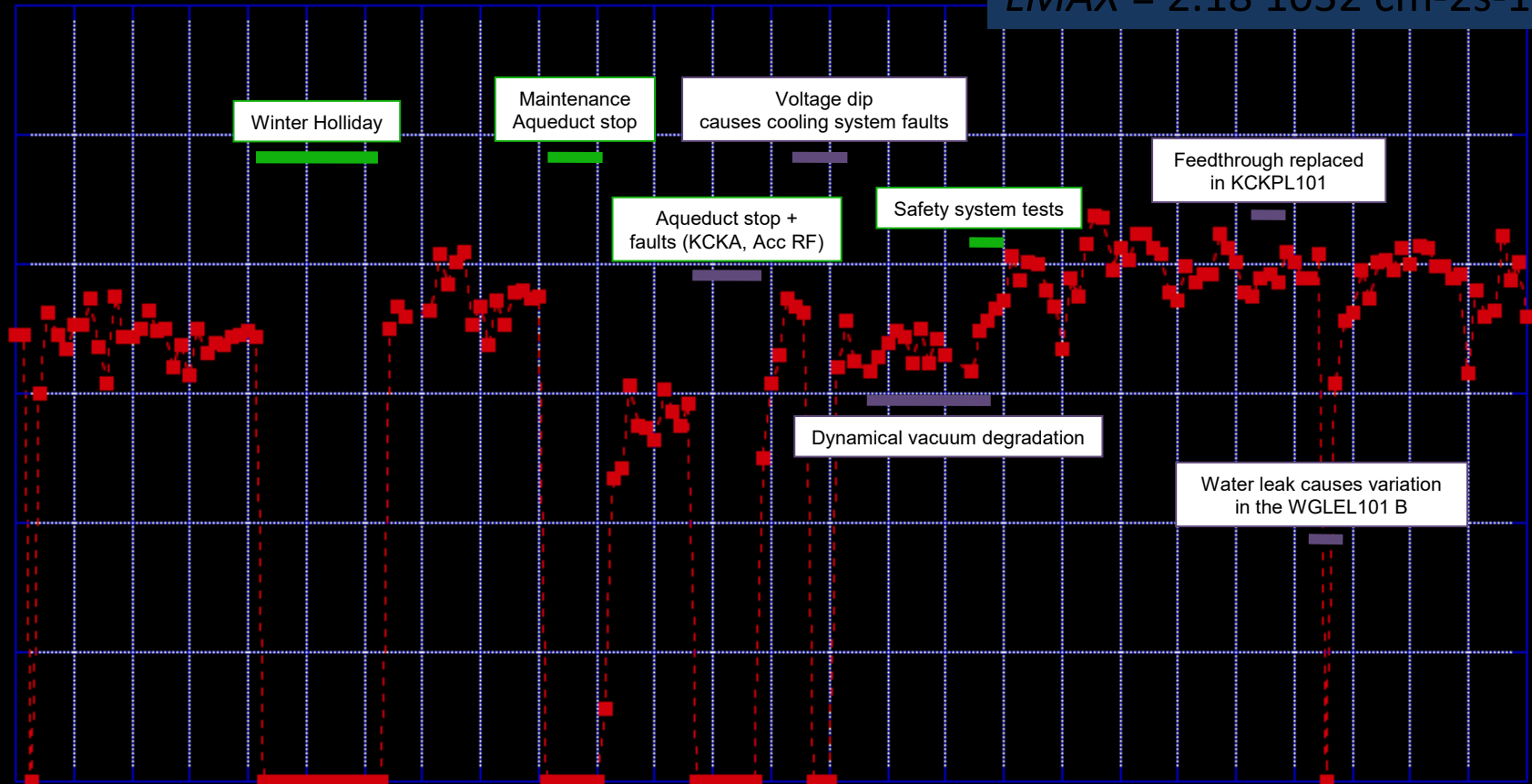


$$\int_{\text{del}} L \sim 14.03 \text{ pb-1}$$
$$\int_{\text{acq}} L \sim 12.34 \text{ pb-1}$$
$$\text{Uptime} \sim 98\%$$

(no change from last SciCom)

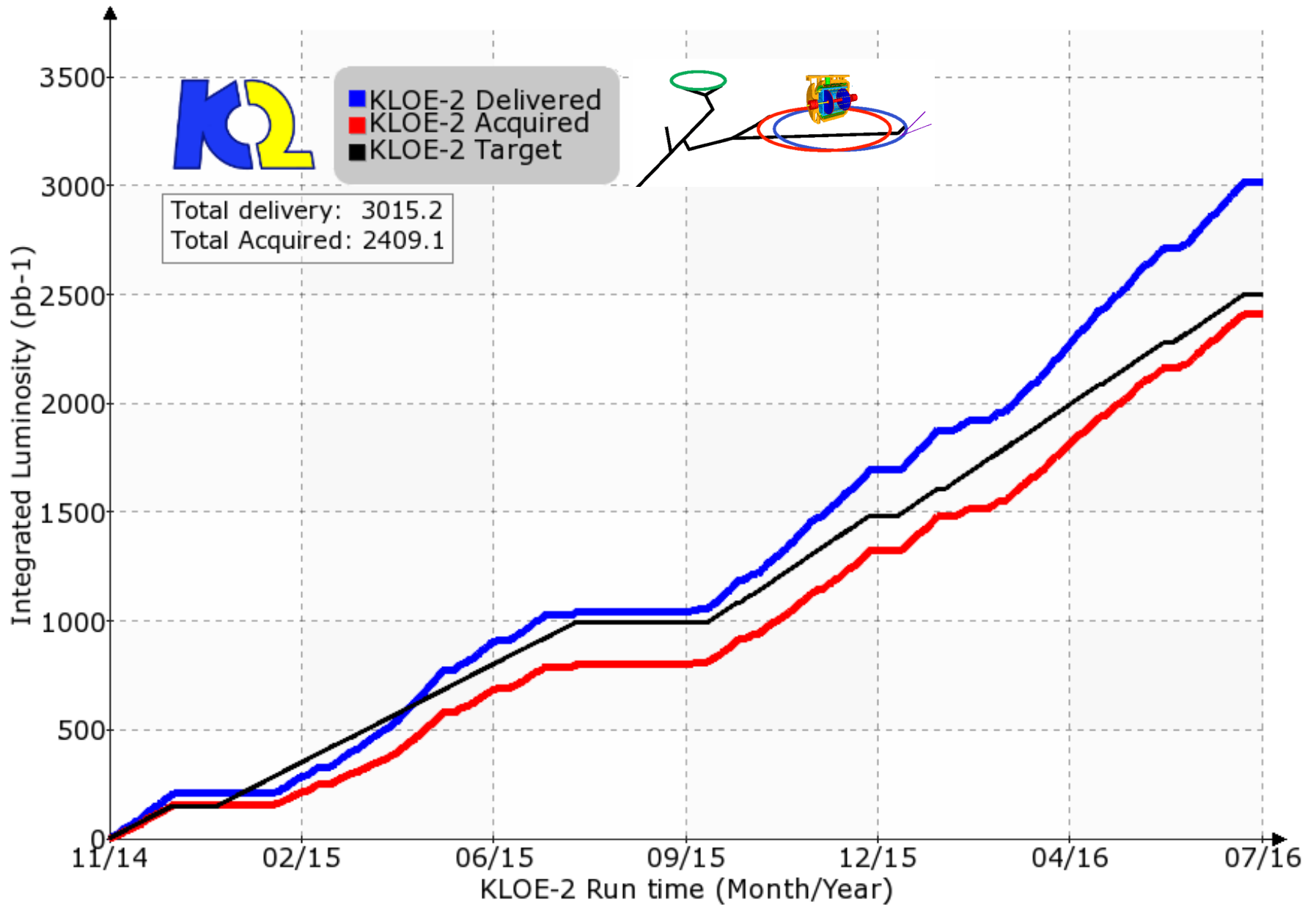
Peak Luminosity Trend

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



(no change from last SciCom)

Total Integrated Luminosity Run I and II



Topics

- *KLOE-2: summary of the II run and data delivered*
- *DAΦNE performances*
- **Maintenance and consolidation program**

Control System & diagnostics

New procedure have been implemented within the control system to:

- guarantee magnetic element setup stability after remote processors crash

- Improve reliability of the injection process

- Speed up procedure during routine operations

New virtualization system has been implemented for the front end processors

Some subtle bugs have been identified and cleaned up

Beam Diagnostics along the Transfer Lines has been enhanced by:

- adding beam loss monitor

- equipping Flag system with a frame grabber in order to save the beam profile and use it to determine optics parameters

Magnets & Power Supplies

The solenoidal windings installed in the positron storage ring have been equipped with new power supplies integrated in the DAFNE Control System

Cryogenic Plant

The original KAESER FS 440 has been working for 20 years hitting in excess of 120.000 hours, more than twice the limit of any other KAESER machine with the original compressing screw, just on scheduled maintenance. Lately, despite two substitutions of the rotating seal in 6 months, the compressor kept driving air in the plant, limiting cryogenic performances and requiring frequent stops for CB cleaning.

The new compressor model KAESER ESD 442 will allow considerable cost saving (20% estimated) in power supply thanks to:

1. 1:1 drive design that eliminates the transmission losses associated to V-belt driven systems, as the motor directly drives the helium end
1. The use of high efficiency IE3 drive motors (became mandatory in the EU and North America from the 1st of January 2015).

The new compressor will also allow heat recovery. The pay back period of this operation is two years and a half.



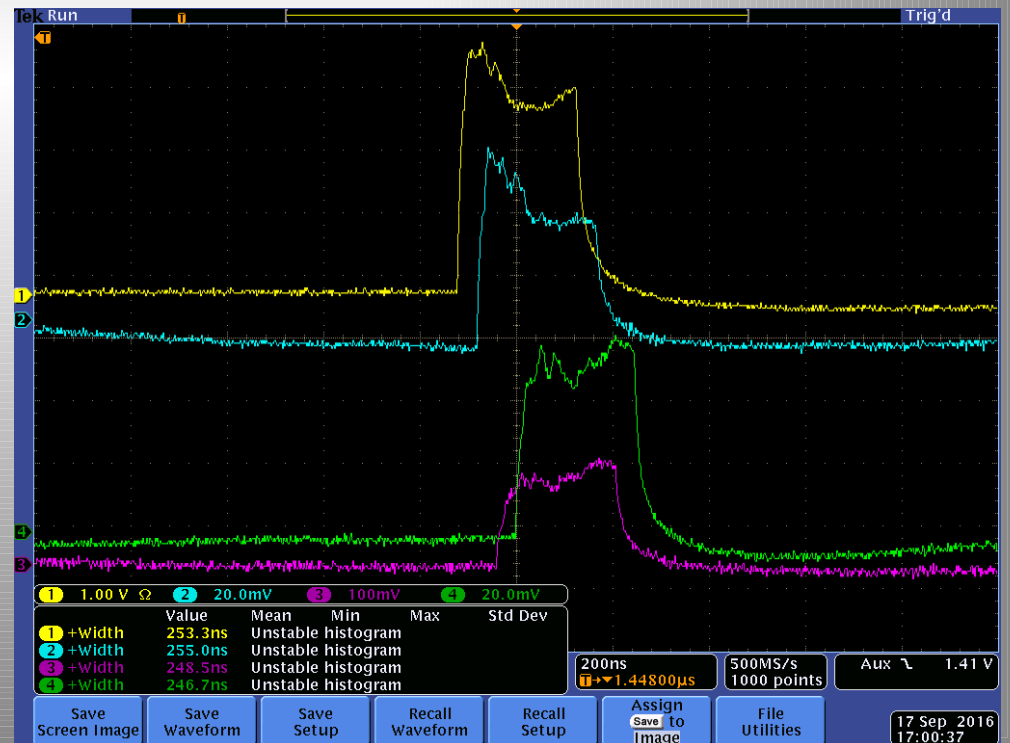
New Electron Gun Pulser

Amplitude -300 V ÷ -1000V in steps of 50V
Pulse shape rectangular
Pulse width 1.5ns ÷ 5µsecs, 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 ~20 ps rms
PW jitter ~20ps rms for PW ≤ 45ns
~500 ps for PW > 45ns
Flatness ±10%
Post pulse noise ±10%

Electron Pulse length evolution along the LINAC

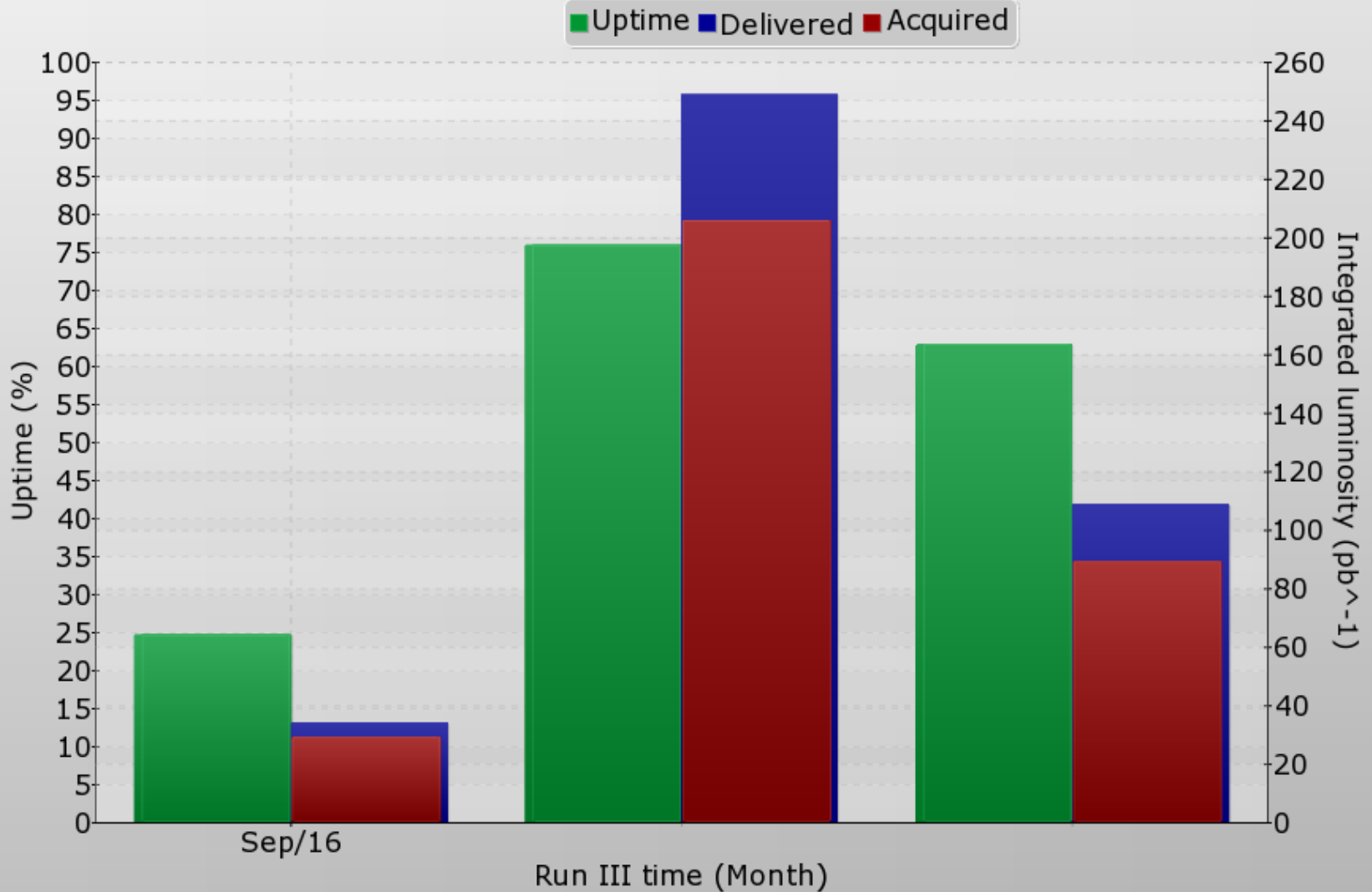
In this case the new Gun Pulser configuration provides a ~250 nsec long pulse at the LINAC end (pink line)



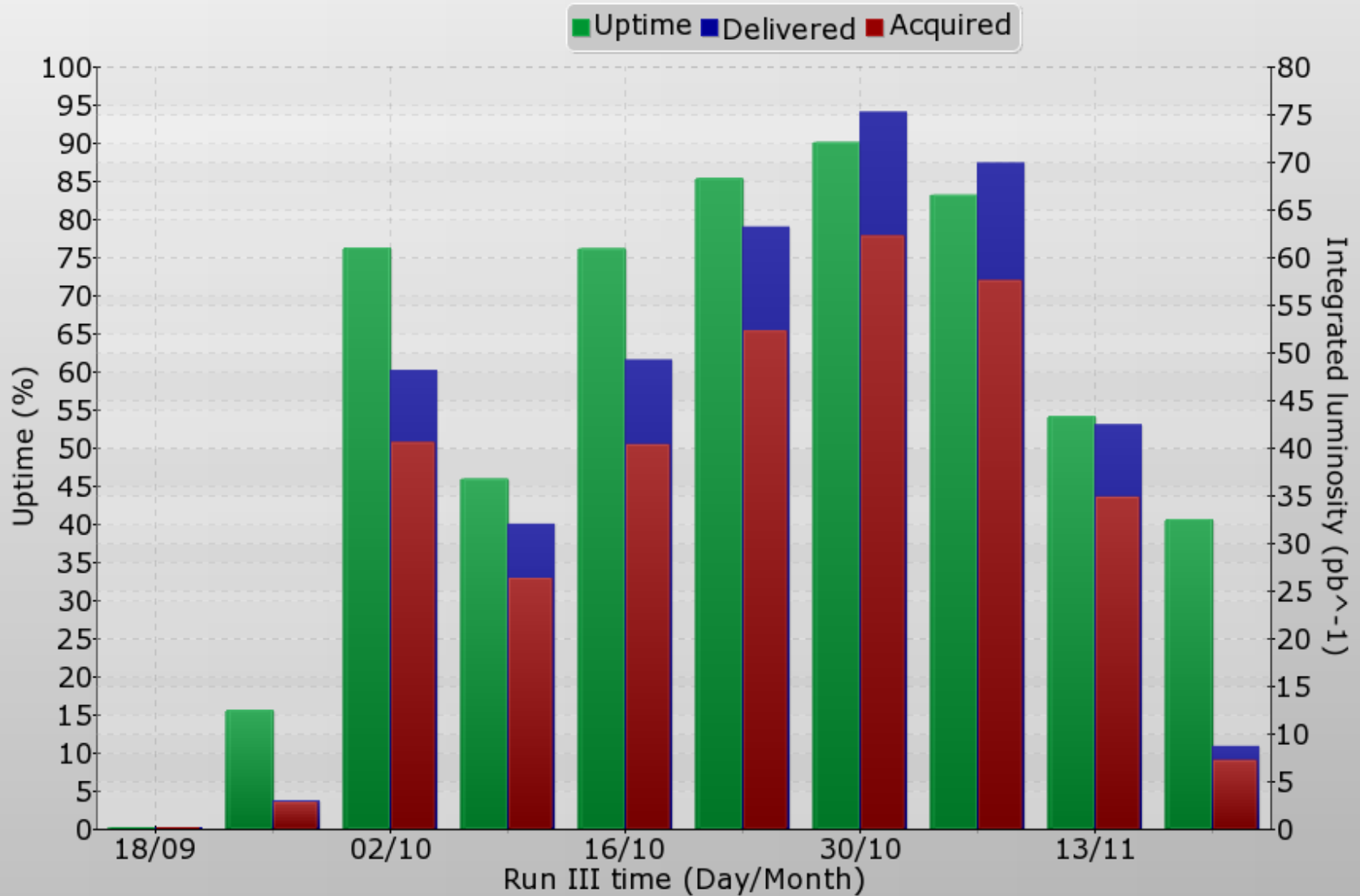
Topics

- *KLOE-2: summary of the II run and data delivered*
- *DAΦNE performances*
- *Maintenance and consolidation program*
- *KLOE-2: summary of III run*

III Run Monthly Performances



III Run Weekly Performances



Uptime during Fall Operations

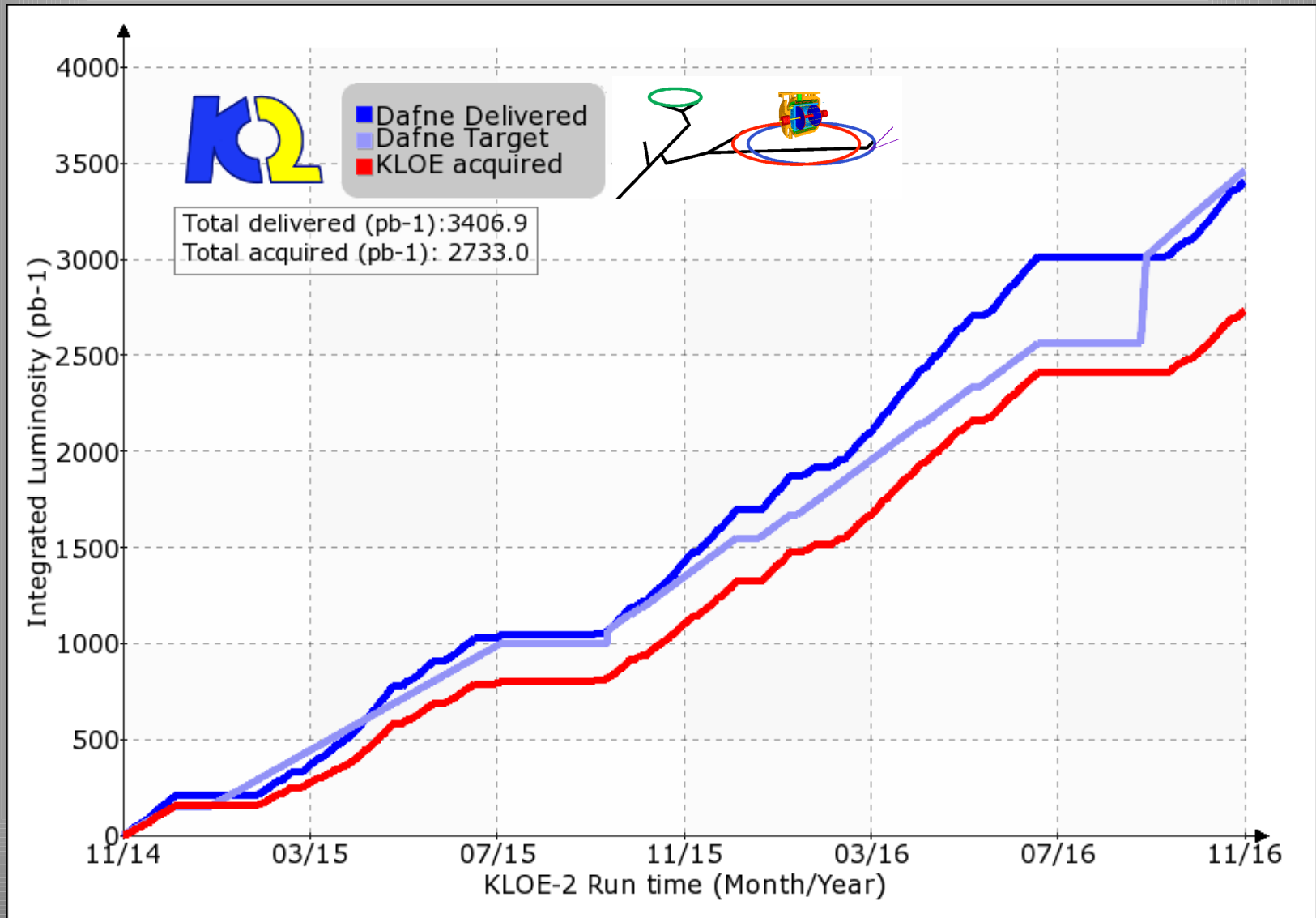
Resuming operations after summer shutdown has been delayed due to external troubles:

- The main power provider undertook a major maintenance of the LNF electric plant, causing delays, unexpected power interruptions and several faults on the collider subsystems.

Stable collision have been resumed on September 27th only since then downtime has been mainly caused by:

- Wiggler magnet cooling system
- power supplies of quadrupole magnets in the TLs
- cables powering the new compressor of the Cryo plant
- Linac (RF plants and electronic equipments)
- longitudinal feedback system (e-)
- bugs affecting upgraded injection system switch procedure

Total KLOE-2 integrated luminosity so far



DAFNE Schedule

Month	n _{days}	Other DAFNE activities	Extras
Nov 2016	27	Nov 14 th -16 th Safety controls	
Dec 2016	18	Dec 19 th -23 rd Maintenance	Dec 24 th -31 st Winter LNF closing
Jan 2017	15	Jan 2 nd – 13 th Maintenance	
Feb	28		
Mar	31		
Apr	29		Apr 3 rd visit (10 hours)
May	18	May 15 th – 17 th Safety Controls + May 18 th - 26 th Maintenance	May 27 th Open Day
Jun	30		
Jul	31		
Aug	0	Aug 21 st – 31 st Maintenance	
Sep	26	Sep 1 st – 4 th Maintenance	
Oct	30		Science Night 1 day
Nov	27	Nov 6 th – 8 th Safety Controls	
Dec 2017	19		
Total	329		

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- *KLOE-2: summary of III run*
- ***SIDDHARTA-2 study group and plans***

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 previous SIDDHARTA run

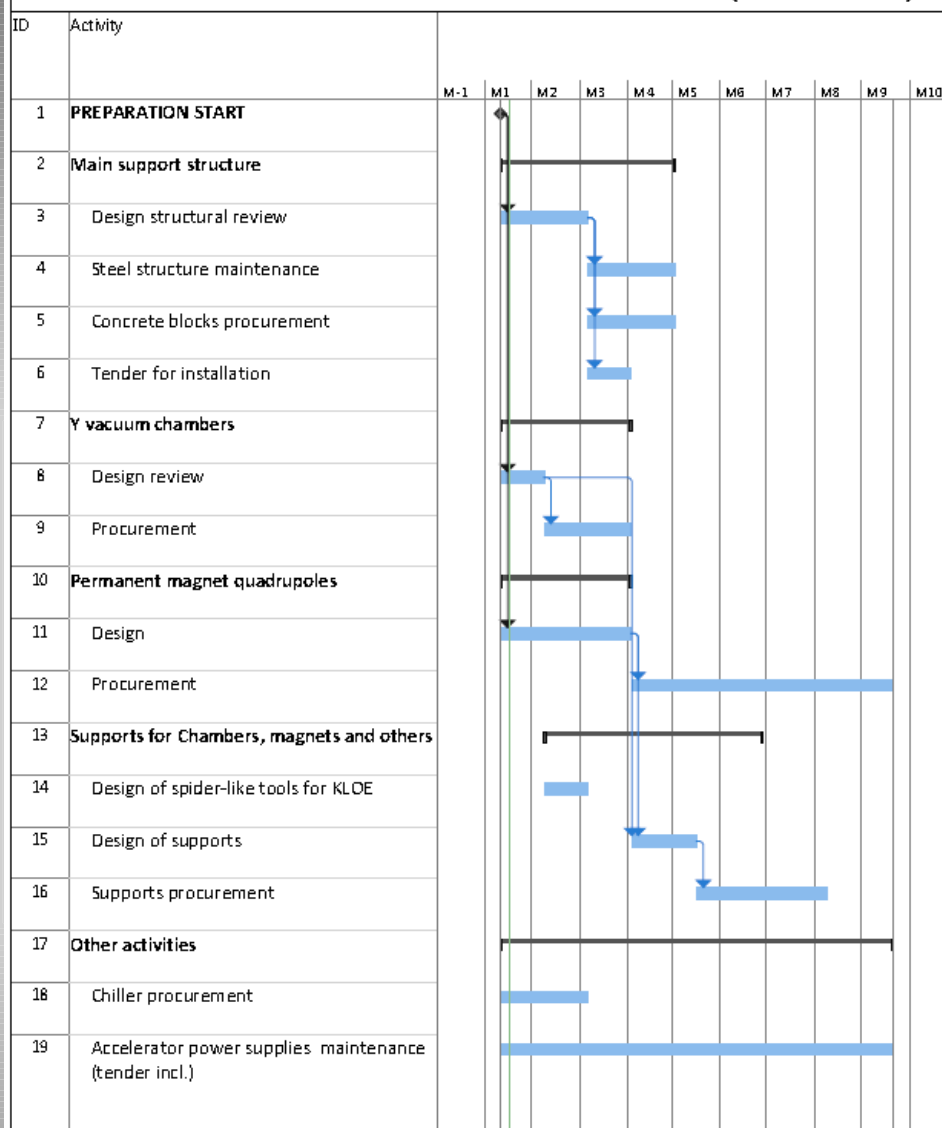
Study and definition of the following issues are in progress:

- KLOE-2 removal
- Inventory of the IR components used for the SIDDHARTA run
- Low- β permanent magnet quadrupoles
- IR diagnostics definition

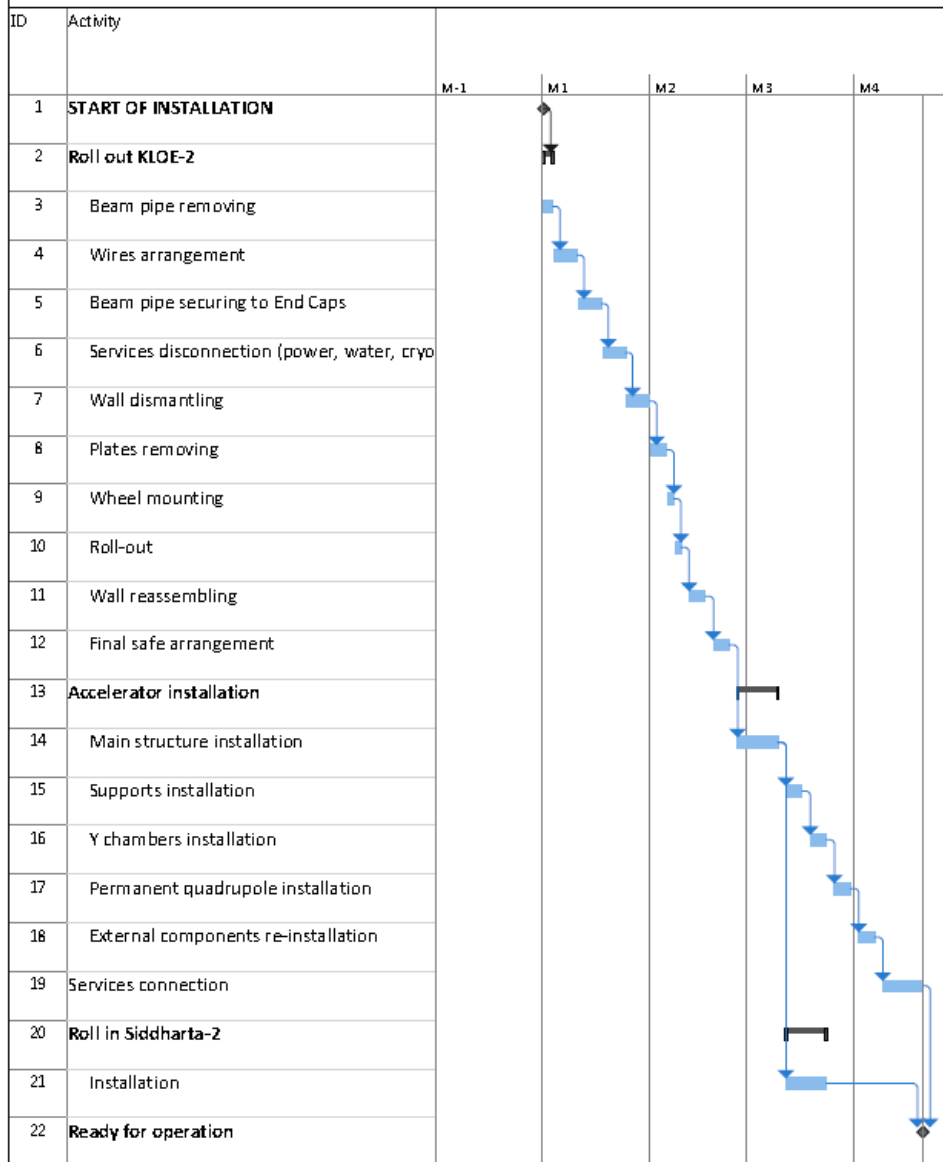
Study of the mechanical compatibility of the new detector setup with:

- IR layout
- Background shielding
- Collider diagnostics
- Possible main rings modification aimed at improving operation efficiency

SIDDHARTA-2 TIME SCHEDULE - PREPARATION PHASE (PRELIMINARY)



SIDDHARTA-2 TIME SCHEDULE - INSTALLATION PHASE (PRELIMINARY)



SIDDHARTA-2 INSTALLATION

ACCELERATOR PRELIMINARY ECONOMIC PLAN (L. Pellegrino 17-11-2016)

ACTIVITY	duration (w)	internal resources	men x days	Cost
KLOE2 setup roll out				
Beam pipe removing	0.6	3	9	
Wires arrangement	1	4	20	
Beam pipe securing to End Caps	1	4	20	
Services disconnection (power, water, cryo)	1	4	20	
Wall dismantling	1			€ 1,000.00
Plates removing	0.6	2	6	€ 500.00
Wheel mounting	0.4	2	4	€ 500.00
Roll-out	0.4	2	4	€ 500.00
Wall reassembling	1			€ 1,000.00
Final safe arrangement	1	2	10	€ 500.00
Main support structures				
Design structural review	8			€ 3,000.00
Steel structure maintenance	8			€ 1,000.00
Concrete blocks procurement	8			€ 20,000.00
Tender for installation	4	0.1	2	
Main structure installation	2			€ 15,000.00
Y vacuum chambers				
Design review	4	0.5	10	
Procurement	8			€ 30,000.00
Y chambers installation	1	3	15	
Permanent magnet quadrupoles				
Design	12	0.5	30	
Procurement	24			€ 200,000.00
Permanent quadrupole installation	1	3	15	
Supports for chambers, magnets and others				
Design of spider-like tools for KLOE	4			€ 2,000.00
Design of supports	6	0.5	15	
Supports procurement	12			€ 5,000.00
Supports installation	1	2	10	
External components re-installation	1	2	10	
Accelerator power supplies maintenance (tender in	36			€ 90,000.00
Services				
Wires	1	2	10	
Cooling hoses	1	2	10	
Chiller procurement and installation	8			€ 5,000.00
SIDDHARTA-2 setup installation				
Installation	2			€ 10,000.00
TOTAL			220	€ 385,000.00

Conclusions

DAΦNE performances:

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

KLOE-2 run is well established, total luminosity delivered so far is

$$iL \sim 3.4 \text{ fb}^{-1}$$

The present iL trend is compatible with the schedule.

The III run should deliver 2fb^{-1} by July 31st 2017.

A preliminary study aimed at evaluating time, costs and manpower necessary for a new run devoted to SIDDHARTA-2 detector has been completed and presented.

Thank you for your attention