Istituto Nazionale di Fisica Nucleare
Laboratori Nazionali di Frascati

Status of the FLAME laser

M. Anania
On behalf of the SPARC_LAB collaboration

Outline

- FLAME status
- Bottlenecks toward EuAPS
- FLAME Scientific program
- FLAME Planning
- Conclusion

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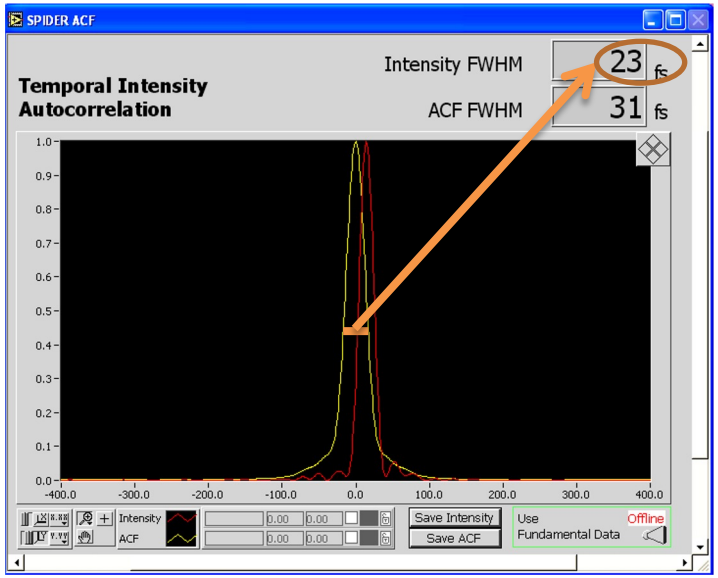
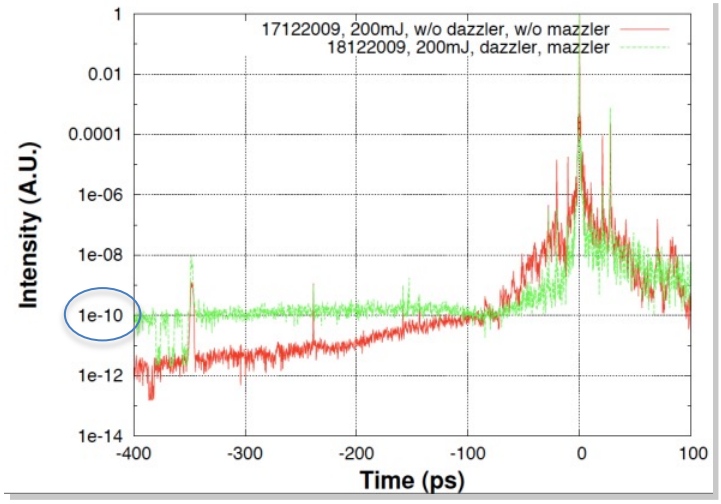
Status





BEST LASER PERFORMANCES:

Max energy before compression: 7J

Max energy on target: ~ 3.5J

Min bunch duration: 23 fs

Wavelength: 800 nm

Bandwidth: 60/80 nm

Spot-size @ focus ($1/e^2$): 20 µm

Max power: ~ 300 TW

Contrast ratio: 10^{10}

Status

In the last years, we have been able to solve most of the problems with the laser, which is now working with a good stability and reliability.

In particular, we have fix issues like:

- Temperature stability in clean room
- Temperature difference between different areas
- Transport beamlines movements
- Damages of pumping laser (new design of optical part)
- Compressor's alignment issues
- Replacement of interaction chamber for more flexibility in experiments…

And this has brought lot of results and publications!

But however we can still improve!

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Bottlenecks toward EuAPS

- Long transport with compressed beam
- Oscillator
- Last amplifier's power supplies

In order to be able to deliver laser beam at the interacion chamber in SPARC, with stability and reliability…

Bottlenecks

Long transport with compressed beam

This has to be avoid for instability and for optical damages.

We can move optical compressor very close to the experimental area.

To do so, we need to have a second compressor in the FLAME area.

Bottlenecks

Oscillator

New oscillator is essential: the one now in FLAME is not synchonizable at the fs level (we will need this option for EXIN).

Also, power is getting down and pump would need to be replaced.

Bottlenecks

Last amplifier's power supplies

Electronical boards of the power supply are geting old and the number of faults is growing esponentially.

We need to change all of them to be able to guarantee continuity and energy stability.

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Scientific Program

TWO MAIN GOALS:

1. External Injection test → fundamental for the choise of the FLAME oscillator. For this test, we need to install the SPARC oscillator on the FLAME laser chain. But oscillator has to go to Amplitude…….

2. Betaron Source study and optimization → requires quite long time (study and optimization, statistical study with different gas mixture…).

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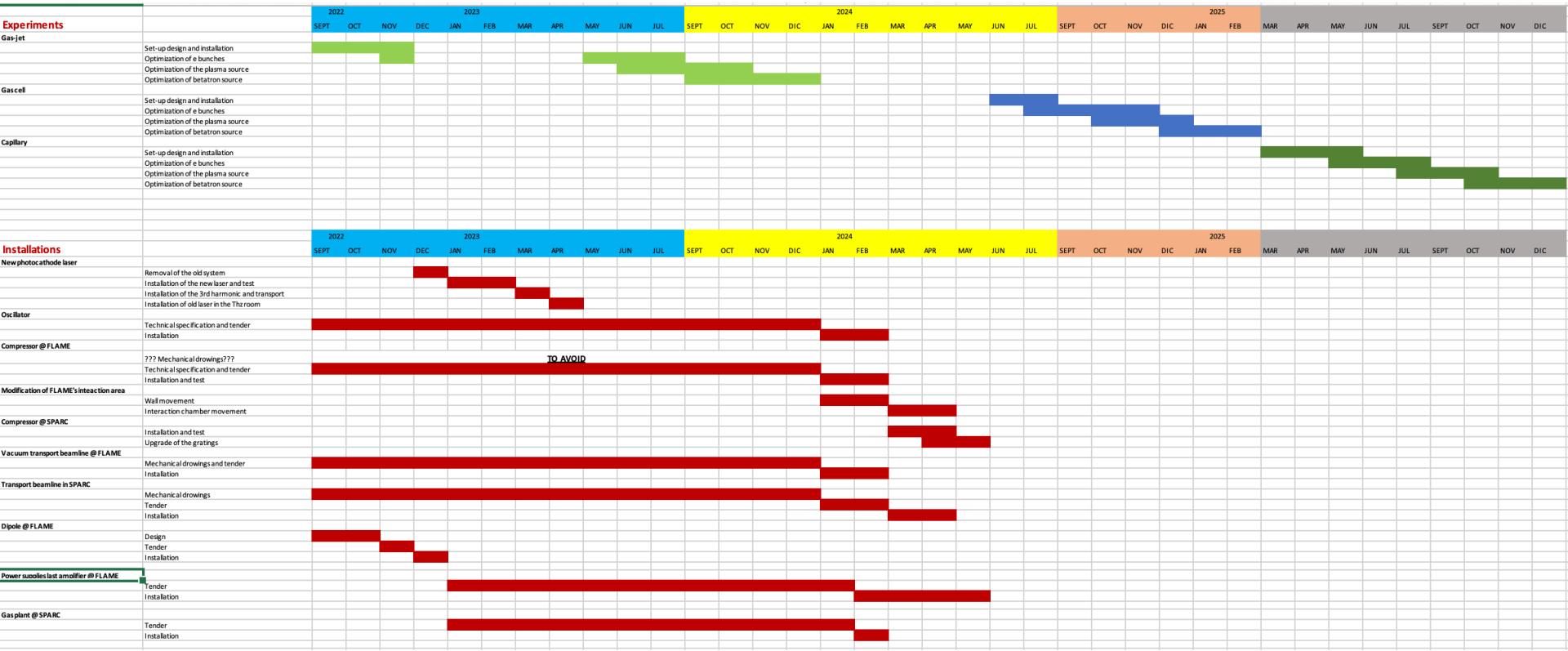
FLAME planning

EuAPS 30 months



FLAME planning

FLAME planning

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Conclusions

FLAME status is not bad in general, but there are several upgrade needed to be able to run the laser with continuity, stability and riliability.

FLAME has a very dense Scientific program, fundamental for the user's design of the user area.

Technical Program is very dense too, due to the large number of upgrade to be designed, ordered and finally installed along the beamline.

Thank you!