

WIR SCHAFFEN WISSEN – HEUTE FÜR MORGEN



C. Vicario :: LNO:: PSI on behalf of the Gun Laser Team

# Laser for 2 bunch operation

**Athos Machine Commissioning Workshop**

*1 Feb. 2019*

# SwissFEL gun laser group::LNO



**A. Cavaliere**  
**LNO leader**  
**Group leader A. I.**

Many thanks to E. Divall



**A. Dax**  
**Engineer**



**M. Huppert**  
**Engineer**



**A. Trisorio**  
**Engineer**



**C. Vicario**  
**Engineer**



**R. Perrass**  
**Technician 50%**

*C. Vicario*

- Photocathode drive lasers for 2 bunch operation status and performances
- Second Yb: CaF<sub>2</sub> laser: Mizar
  - Laser specification
  - Production, installation and commissioning planning
  - Diagnostics, control and infrastructure
  - Laser availability for Athos commissioning

Binary star  
Ursa Major

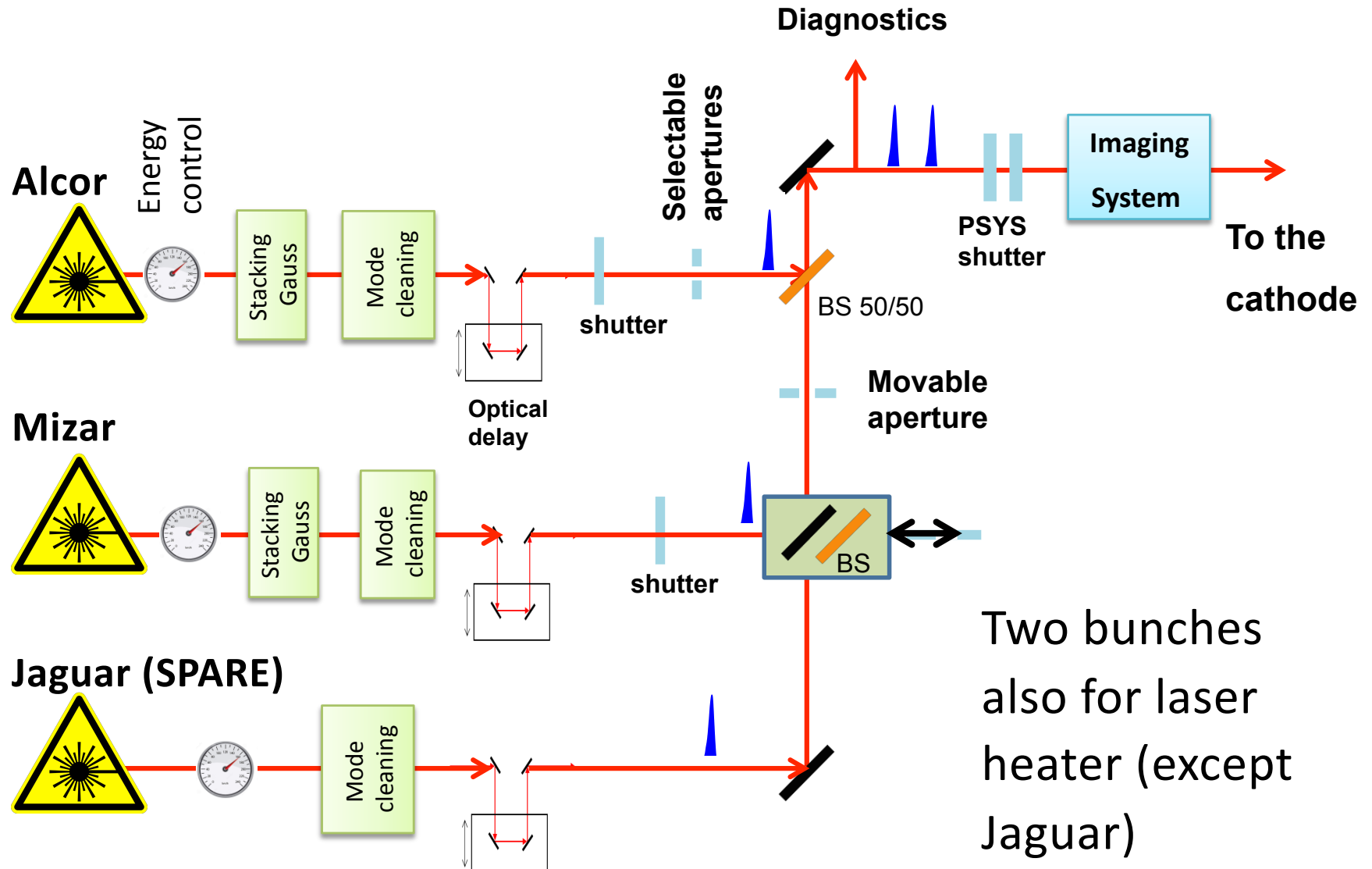




## Roadmap for two bunch operation

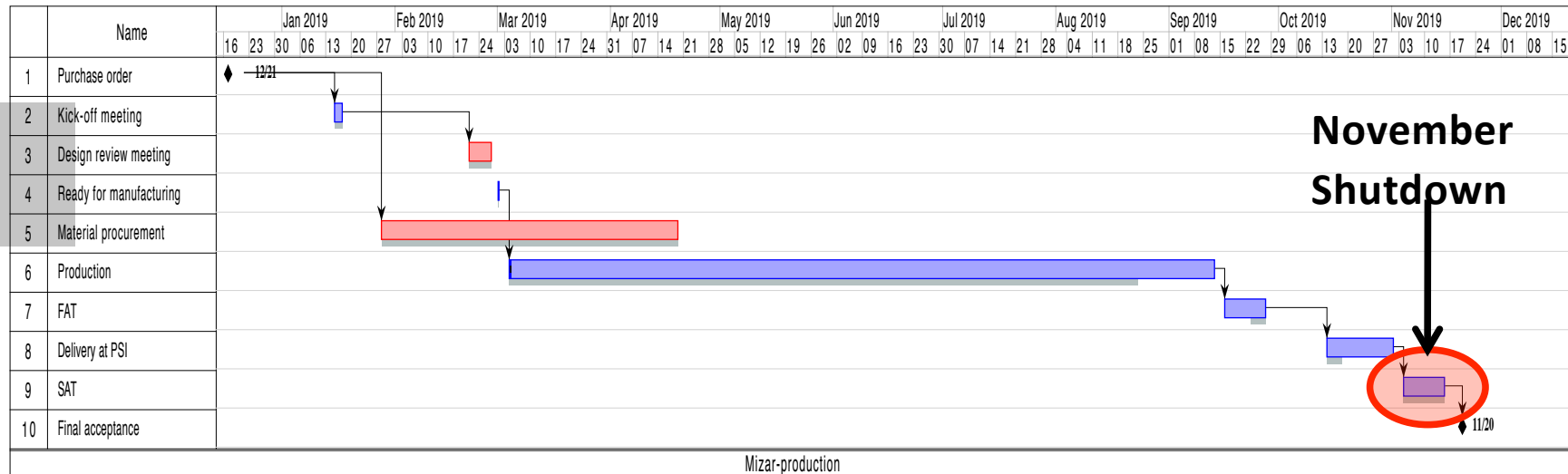
- In 2018, feasibility study and procedures for 2 bunches
- Alcor/Jaguar allow independent control of beam timing and charge
- Development foreseen for 2019 and 2020
  - High resolution/time resolved diagnostics R&D
  - Recombination optics for independent operation of the two FELs
  - MIZAR installation/commissioning
  - Feedbacks/running experience with two lasers is also crucial

# Final laser layout for 2 bunch



Two bunches  
also for laser  
heater (except  
Jaguar)

# Mizar: production and installation time plan



Mizar works  
Shutdowns

Infrastruct

Optics/ synch

SAT/Installation

Laser  
avialab.

Jaguar

Jaguar best effort

Jaguar best eff

Jaguar

**Spring shutdown in 2020 needed to complete transport to the cathode**  
**Commissioning of diagnostics and feedbacks**

# Shutdowns 2019 detailed activities

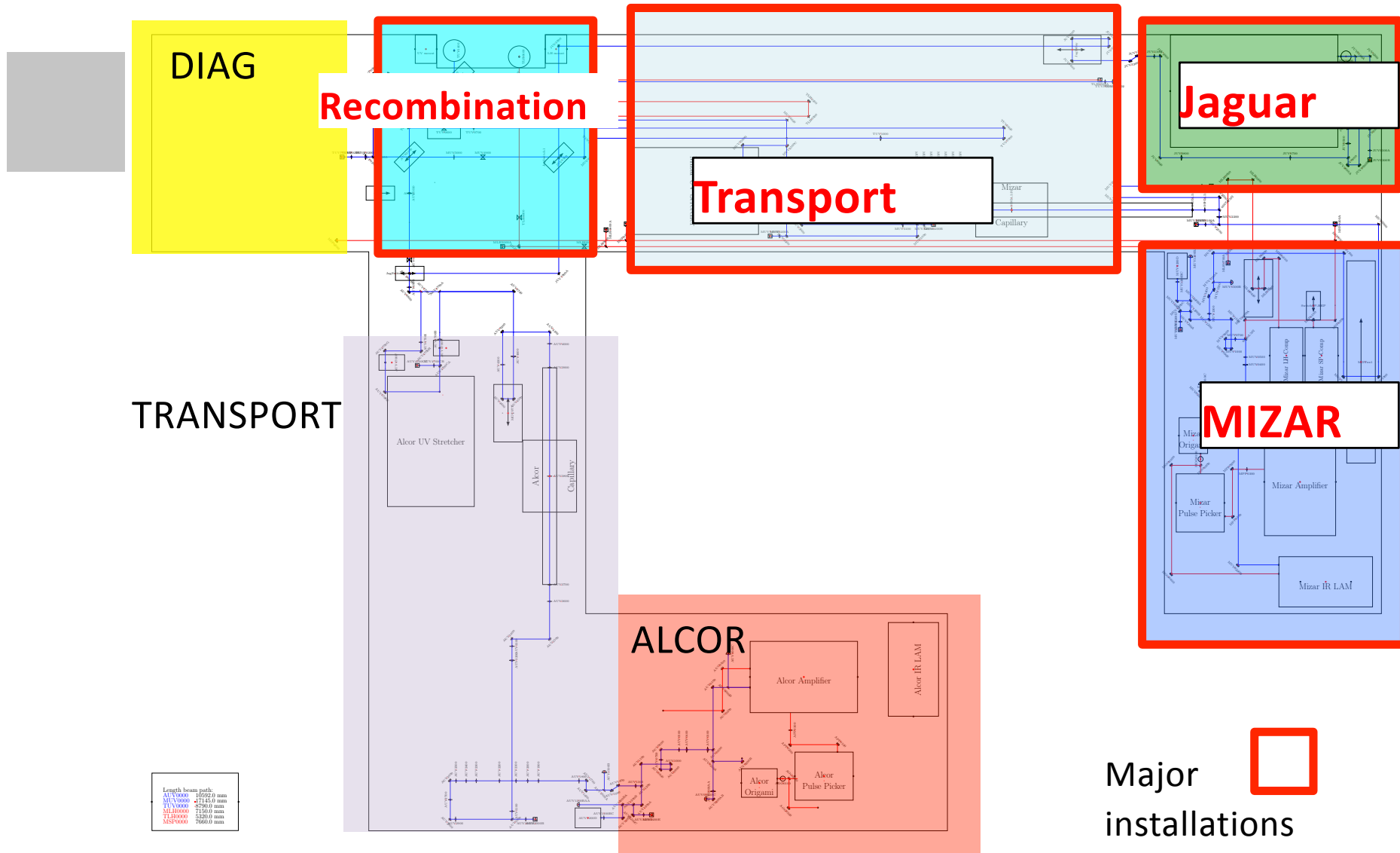
Shutdown	Activities	Support @ PSI	Comments
<b>April 1-22</b>	<b>Jaguar relocation</b>	T&S, cooling, Controls	Set the laser to the cathode
	<b>MIZAR infrastructure</b>	Water/ Electricians	Laminar flow box
<b>August 2-28</b>	<b>Recombination setup</b>	AMI	New apertur/optics
	<b>Transport for MIZAR pre-alignment</b>	Vacuum, Controls AMI	
	<b>Mizar IR-LAM</b>	T&S	Test with Alcor
<b>November 4-20</b>	<b>SAT, installation</b>		>2.5 weeks
	<b>Synchronization</b>	T&S	Ready
	<b>Integration</b>	Controls	Including 4-omega

Extension of Autumn shutdown by 1 week very helpful

MIZAR likely ready for Athos after spring shutdown 2020

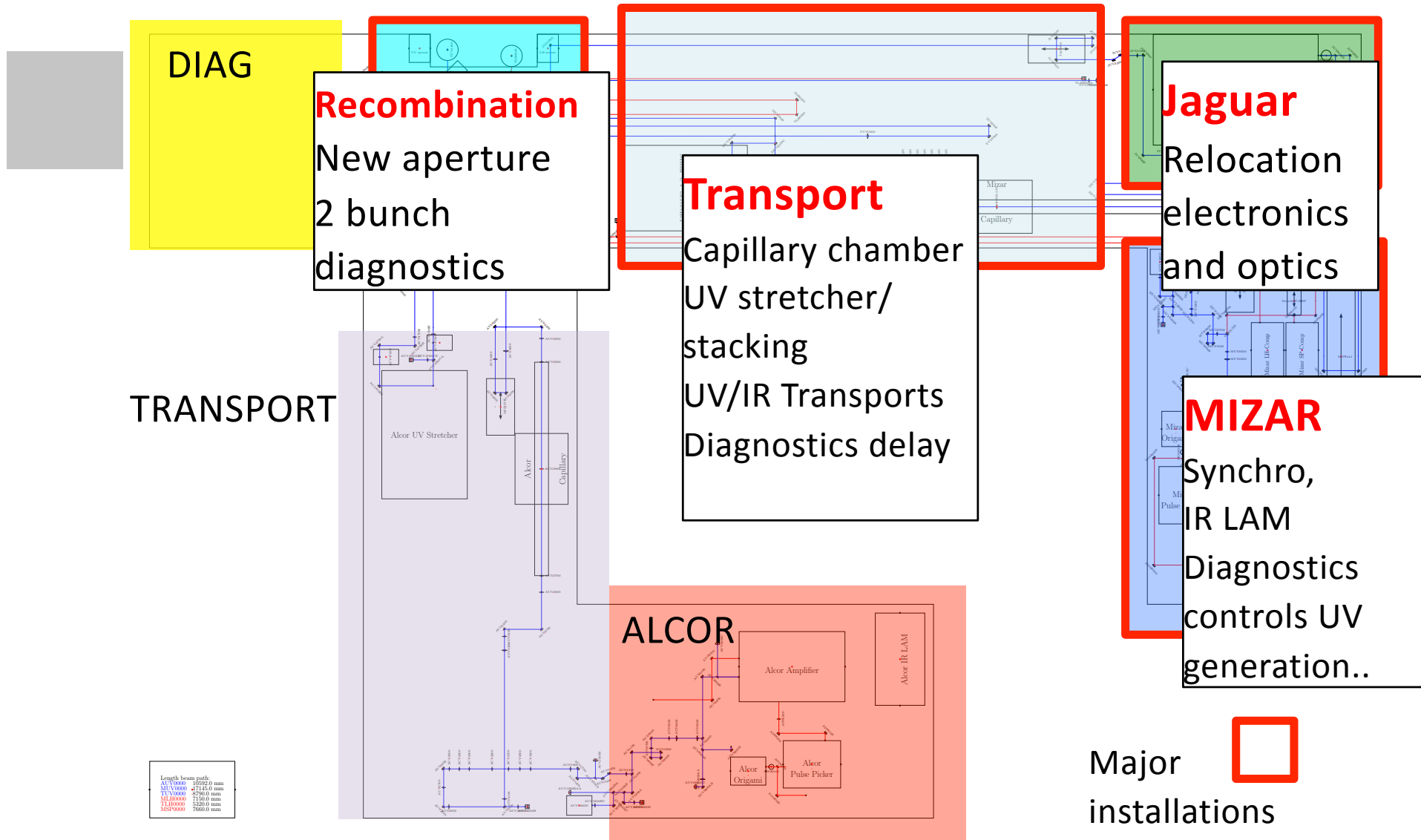
**Can any installation be done during the machine operation?**

# New laser lab layout





# New laser lab layout: detailed

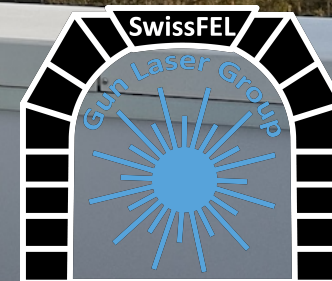


# Conclusion

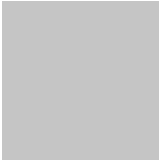
- Demonstration 2 bunch operation with two lasers
- Alcor/Jaguar for SwissFEL and for Athos commissioning also in 2019
- Procurements of new laser: Mizar
- Installation plan presented. Any chance to perform work during machine operation?
- Mizar ready for operation not before spring 2020



# Thanks for your attention



...the light at the  
beginning of the tunnel



- Extra-slides

# Alcor and Jaguar lasers: main features

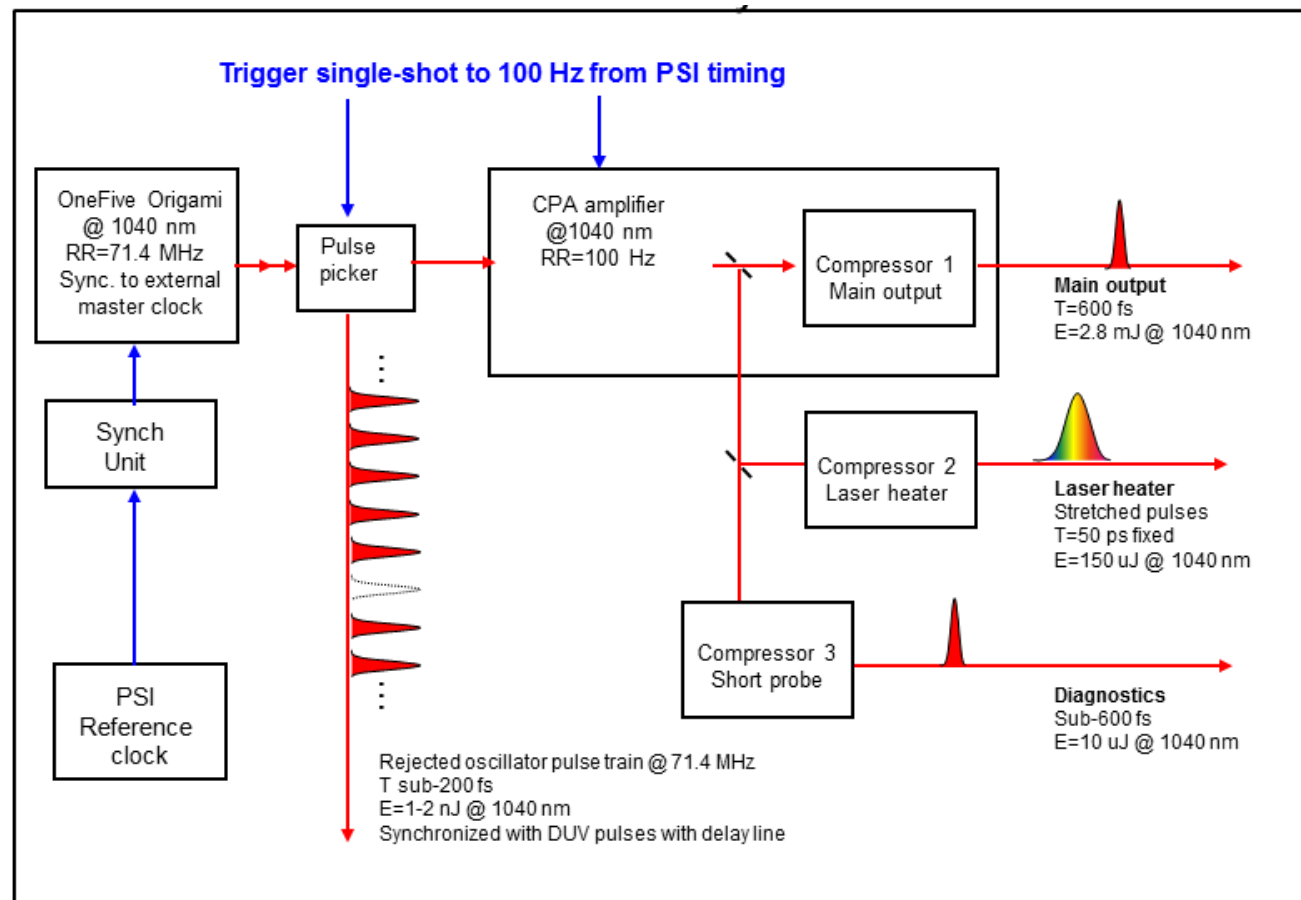
System	Alcor	Jaguar
Feedbacks	IR/UV Energy, pointing, IR LAM	UV energy and pointing
Temporal pulse shape	Gaussian 3.7-10 ps and flattop	Fixed duration and shape (Gaussian)
LH output	50 ps	10 ps
Support/spare parts	Ok	Not available service
Pump technology	CW pump	Pulsed diode

# MIZAR: layout and specifications

Laser required as replacement of Jaguar and for Athos

Specification and order for amplifier to Amplitude Systemes

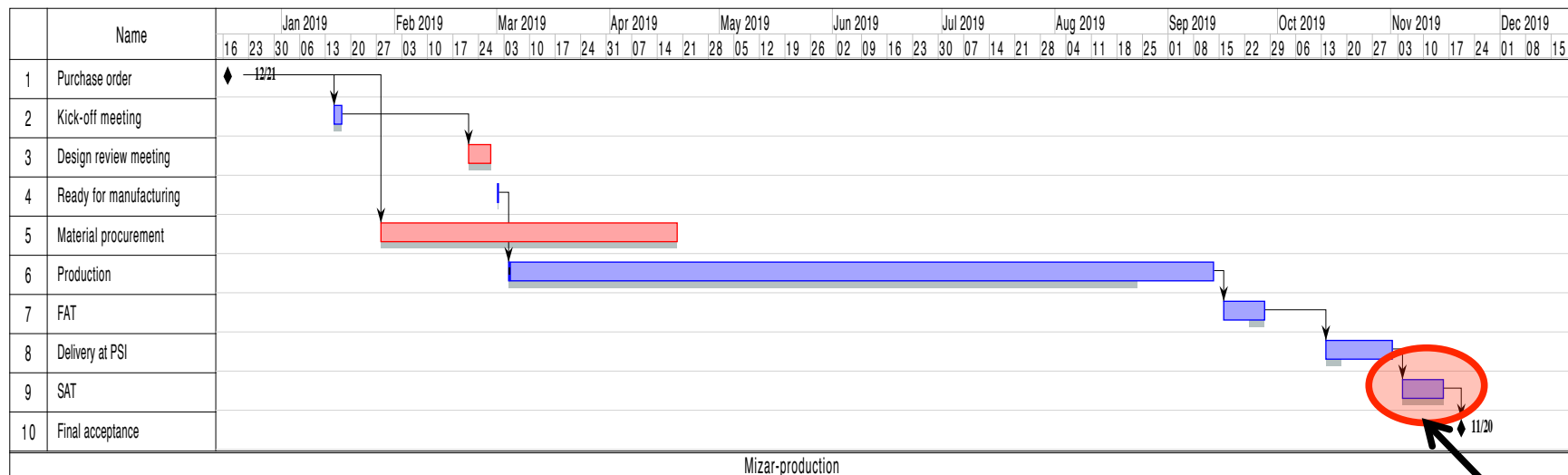
Similar architecture and performances as ALCOR





# Mizar laser: time plan

- Order placed to Amplitude Systemes at the end of 2018
- Project plan discussed at the Kick-off meeting
- Installation and SAT during November shutdown (consider to extend at least to 3 weeks)
- Access to the lab only during maintenance delays the commissioning/ installation of other subsystems



**November  
Shutdown**