FLEX MISSION: FLORIS Instrument

Primo Workshop su Data Exploitation della missione PRISMA, precursore delle missioni iperspettrali nazionali

ASI – Roma, 2 Marzo 2017

LEONARDO

FLEX: FLuorescence EXplorer

- An ESA Earth Explorer Mission to observe vegetation fluorescence (EE-8)

- Space Segment
  - Vega
  - A Recurrent Platform to be selected by ESA beginning 2018 through an open competition (ITT), with a single payload:

    FLORIS (high resolution **FL**u**OR**escence **I**maging **S**pectrometer)

  - Orbit sun synchronous at 815 Km, 50 to 100 km ahead of Sentinel-3

- Flight operation segment:
  - TT&C S-Band station KIRUNA
 - Flight operation control center ESOC

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- Ground Segment
  - Processing and archiving science data ESRIN
  - Auxiliary data from OLCI and SLSTR data (Sentinel -3)

- User segment:
  - Scientists and Research Centres in the field of Chlorophyll fluorescence products
  - Environmental services to study variations of actual photosynthesis, vegetation health status, and carbon uptake

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➤ Photosynthesis is a highly regulated process that involves a complex cascade of electron transfers

➤ Fluorescence is emitted from the cores of the photosynthetic machinery: Photosystems I and II

➤ Fluorescence changes reflect the functional status of the photosystems

➤ Leaf fluorescence emission has two main contributions:

  • Photosystem II: two peaks in red and far-red spectral regions

  • Photosystem I: one peak in the far-red
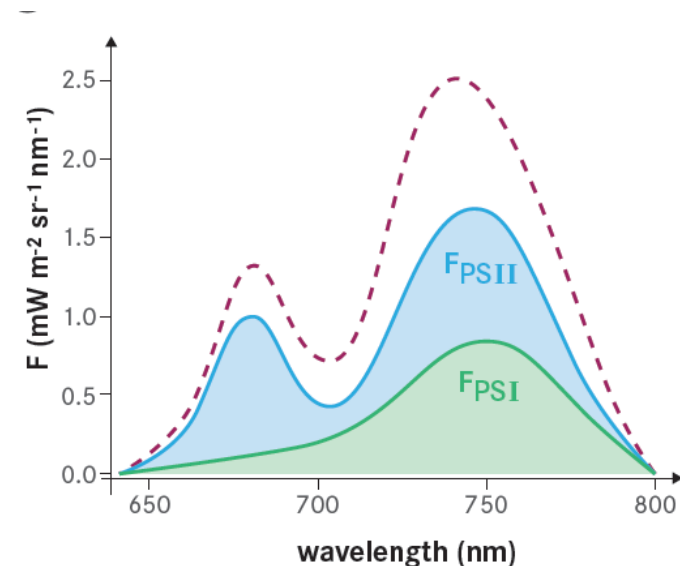
flex

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Fluorescence:
Information on both peaks is essential to separate contributions from PhotoSystem1 and PhotoSystem2.

Measurements in the absorption bands is the key source of information for fluorescence emission.
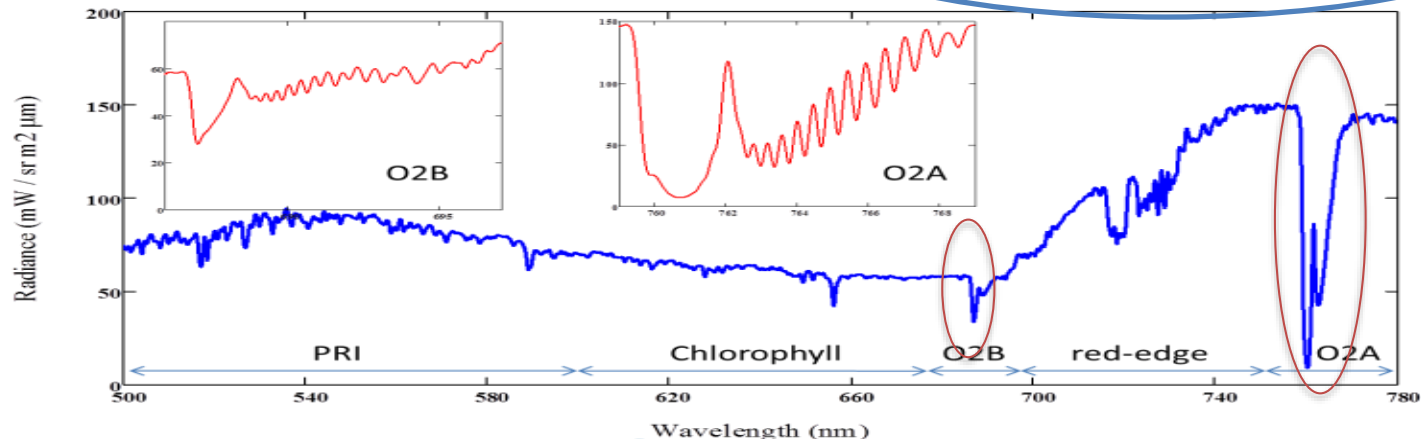
Information on the full spectrum is an additional constraint for the retrieval
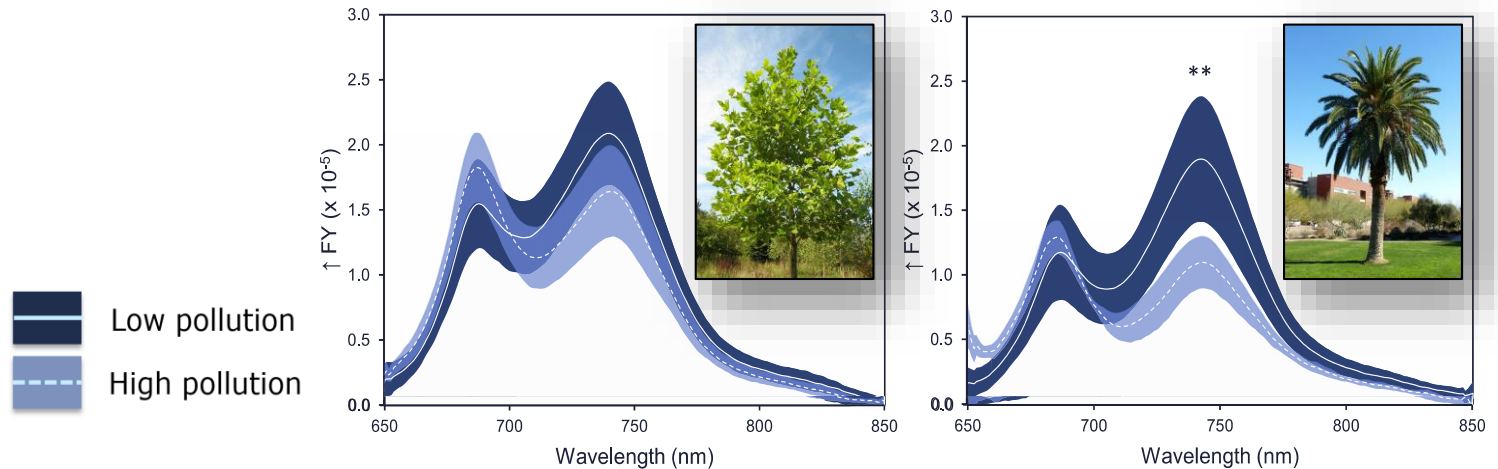
Reflectance:

Atmospheric correction is needed to infer top-of-canopy (TOC) radiances.

Reflected radiation is the dominant signal in the measurement.

Disentangling emitted and reflected radiation is the challenge in the retrieval.

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Low pollution

High pollution

Fluorescence is measured on a variety of vegetation types worldwide using ground instrumentation

➢ Fluorescence tracks environmental stress (e.g., air-pollution)

➢ Fluorescence magnitudes of peaks are variable for vegetation types & stresses

FLORIS shall provide direct measurements of **vegetation fluorescence** at the field globally

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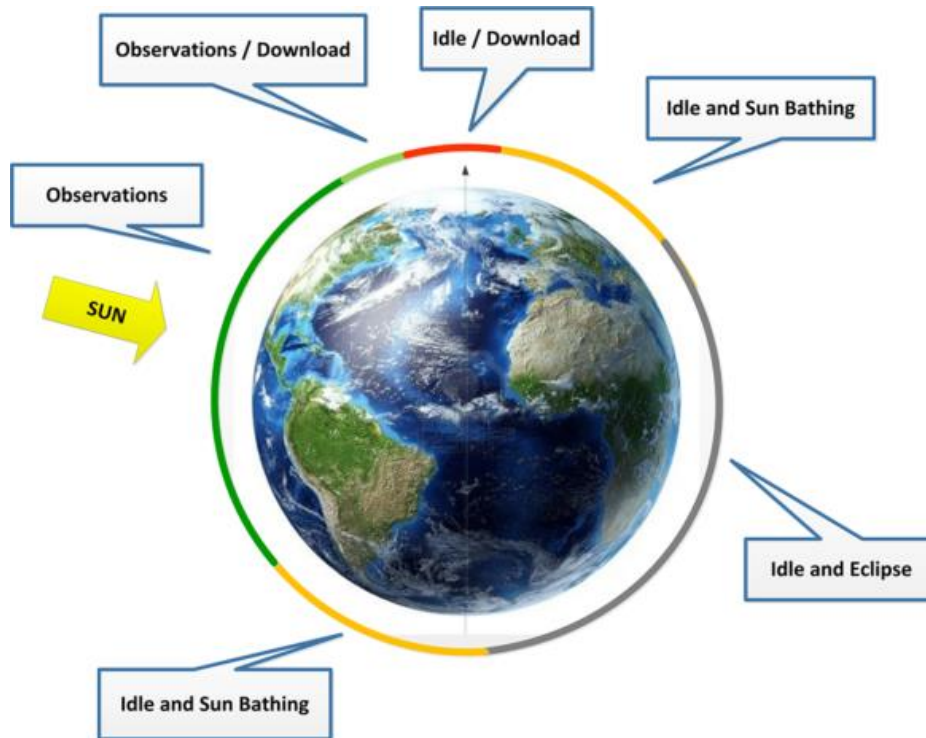
FLORIS Instrument is a push-broom imaging spectrometer with matrix detectors (two optical channels with different resolution)

- Orbit: 815 km (50-100 km ahead of Sentinel-3)
- Swath: 150 km (SSD 293 m)
- Orbital Period: 90 min
- 27 days repeat cycle
- Life time: 3,5 years

LAUNCH PLANNED IN 2022

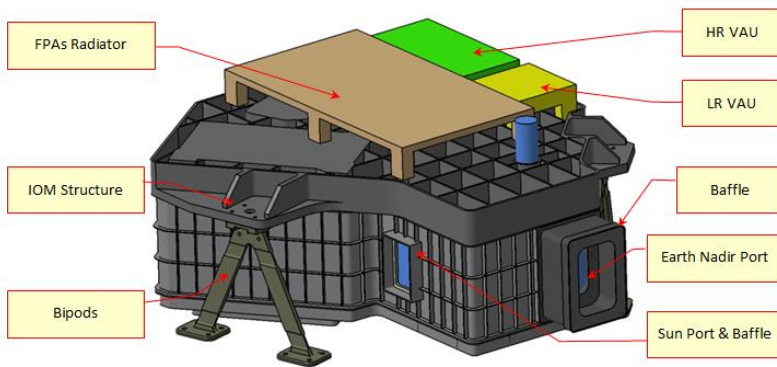| Spectral coverage	677-697 nm 740-780 nm	500-758 nm
Spectral resolution	0.28 nm	1.8 nm

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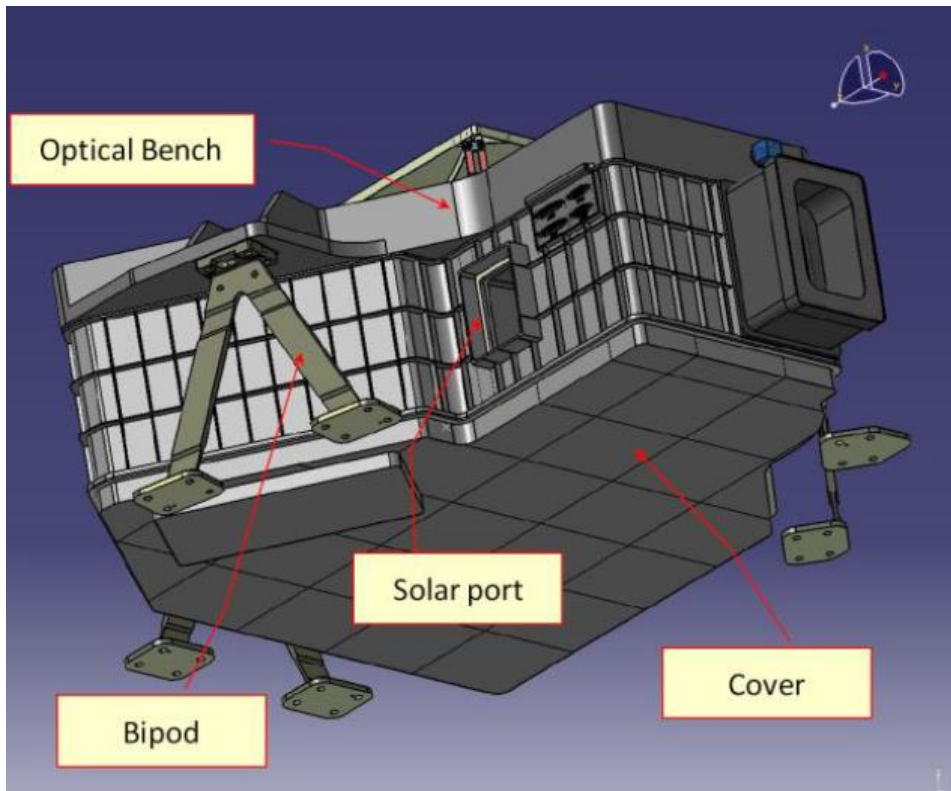Figure 2-31 : IOM functional blocks envelope allocation (external view)

Labels: FPAs Radiator, HR VAU, LR VAU, IOM Structure, Baffle, Earth Nadir Port, Bipods, Sun Port & Baffle
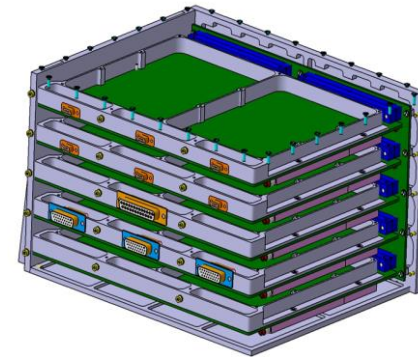
Instrument Optical module (IOM)

Instrument Control Unit (ICU)

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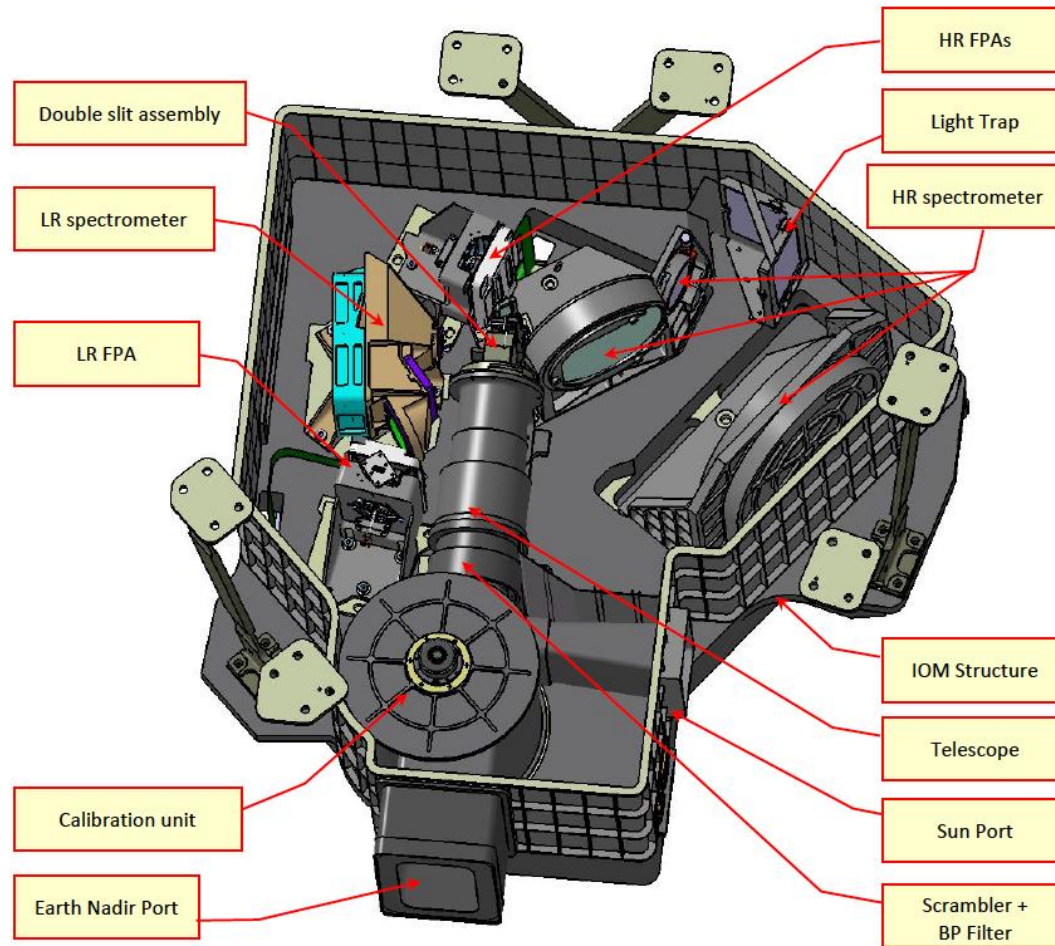
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Instrument Optical Module Structure

IOMS is based on a thermally stable Aluminium alloy optical bench (OB) and is interfaced to the Satellite by 3 bipods (for isostatic mount).

OB operative temperature is actively controlled by a Thermal Control System in the range 22°C ± 1°C

Instrument Envelope

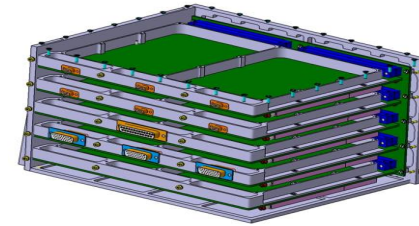|	LX_{SAT} [mm]	LY_{SAT} [mm]	LZ_{SAT} [mm]
FLEX IOM	975	1060	806
ICU	170	260	260

Total Mass : 130kg

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The **Instrument Control Unit**, including SW, is devoted:

- To manage power supply
- To receive telecommands (TC)
- To sent telemetry (TM)
- To acquire scientific data
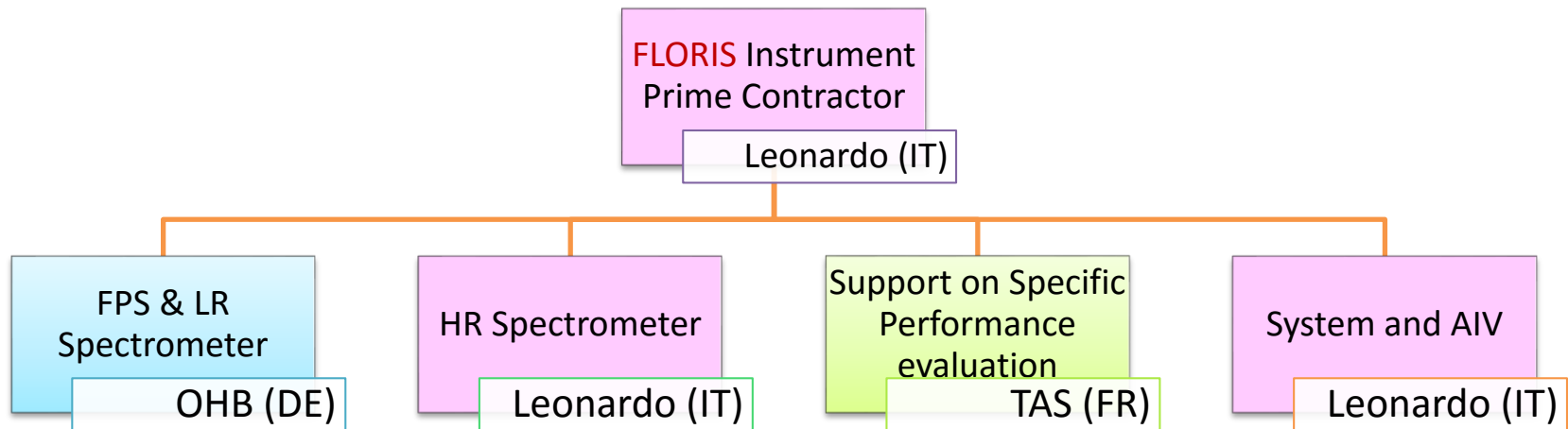- To manage IFs versus S/C units

Instrument Power consumption: 80 W (operative mode), 110 W (worst case)

(HR/LR) **Video Acquisition Units** (VAU), installed on the IOM, are devoted:
- To drive & bias the CCDs
- To read the detectors and provide digitized signal
- To perform binning
- To communicate with the Instrument Control Unit (ICU)

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> **FLORIS Core Team: 50%** (**25% Leonardo** as Prime Contractor, **24% OHB-D** as Co-Prime, **1% TAS-F)**

FLORIS Instrument Prime Contractor
Leonardo (IT)

FPS & LR Spectrometer	HR Spectrometer	Support on Specific Performance evaluation	System and AIV
OHB (DE)	Leonardo (IT)	TAS (FR)	Leonardo (IT)

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Work Share Partners 50%: Industries to be selected in open competition for the development of FLORIS subsystems.
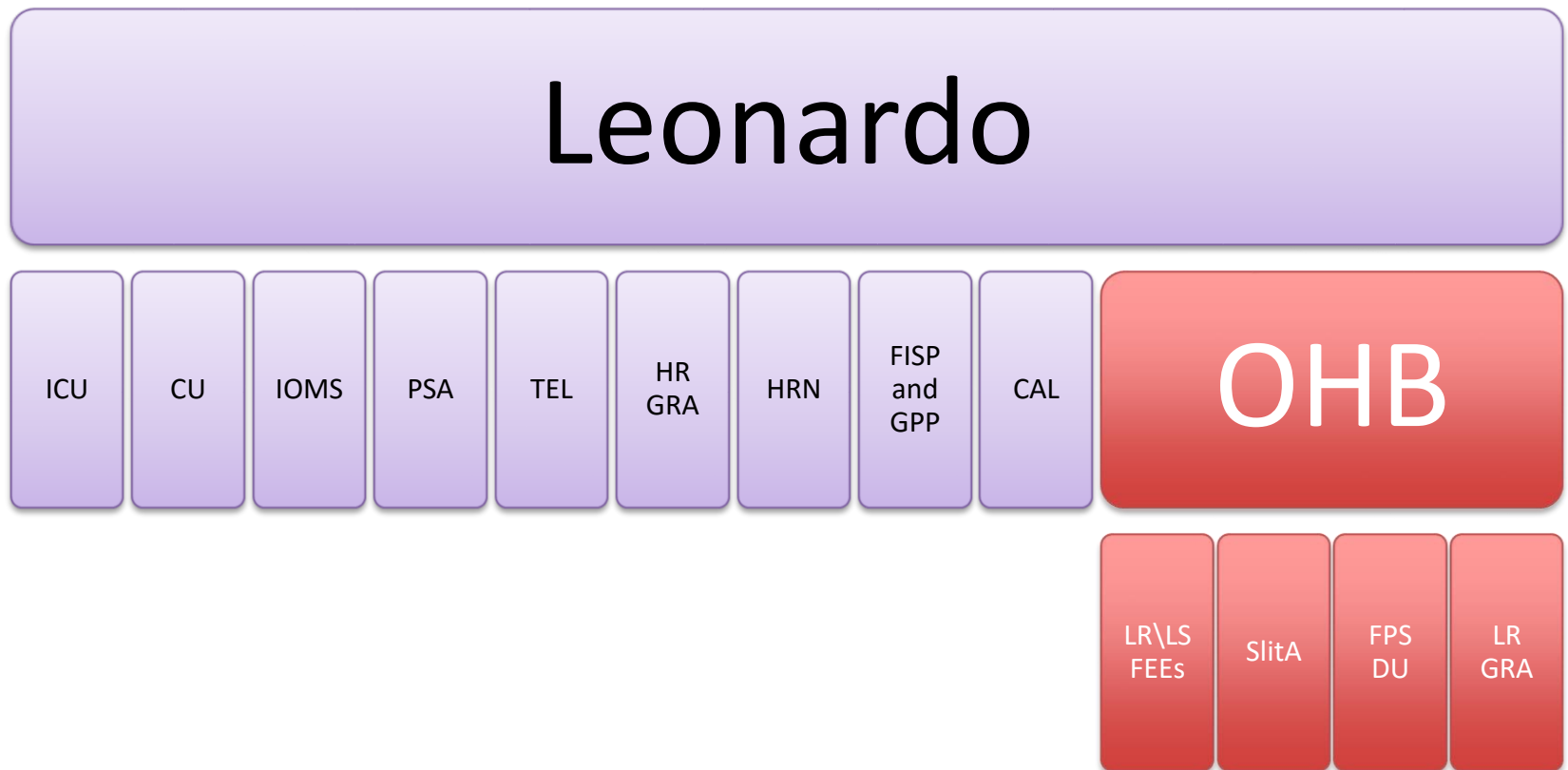
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THANK **YOU** FOR YOUR ATTENTION

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