

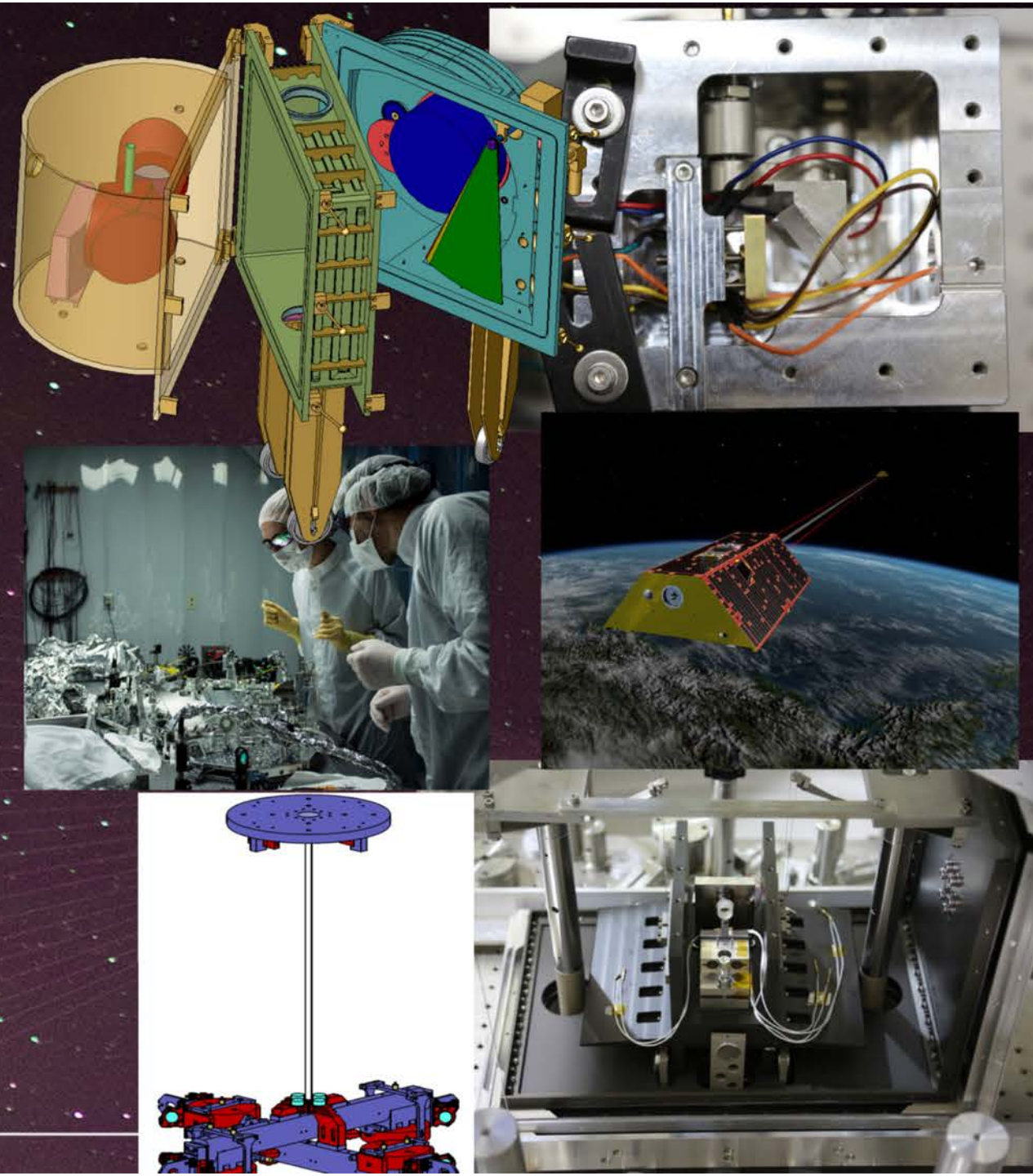
# Third Generation R&D Facilities

- The Amaldi Research Center ET Cryogenic Lab in Rome (Piero Rapagnani) 11:59
- ET-Pathfinder (Jan-Simon Hennig) 10:46
- The Sar-Grav Laboratory (Domenico D'Urso) 6:41
- Mariner: LIGO Voyager Prototype at the Caltech 40m Lab (Christopher Wipf) 13:15
- Next generation gravitational wave detector research at ANU (Bram Slagmolen) 6:36
- Glasgow 10m facility (Giles Hammond, Eric Oelker) 9:51



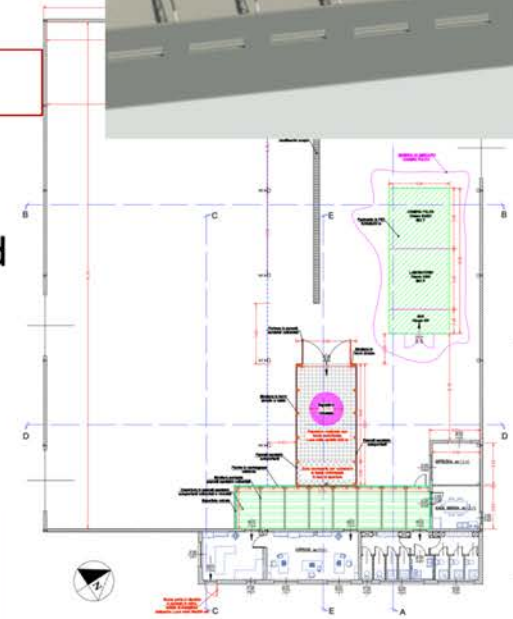
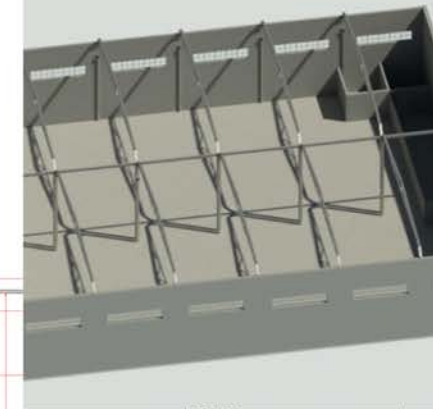
# ANU 3G Research Topics

- Coating Facility
- Cryogenics Thermal Noise
- Newtonian Noise
- Squeezing
- Space

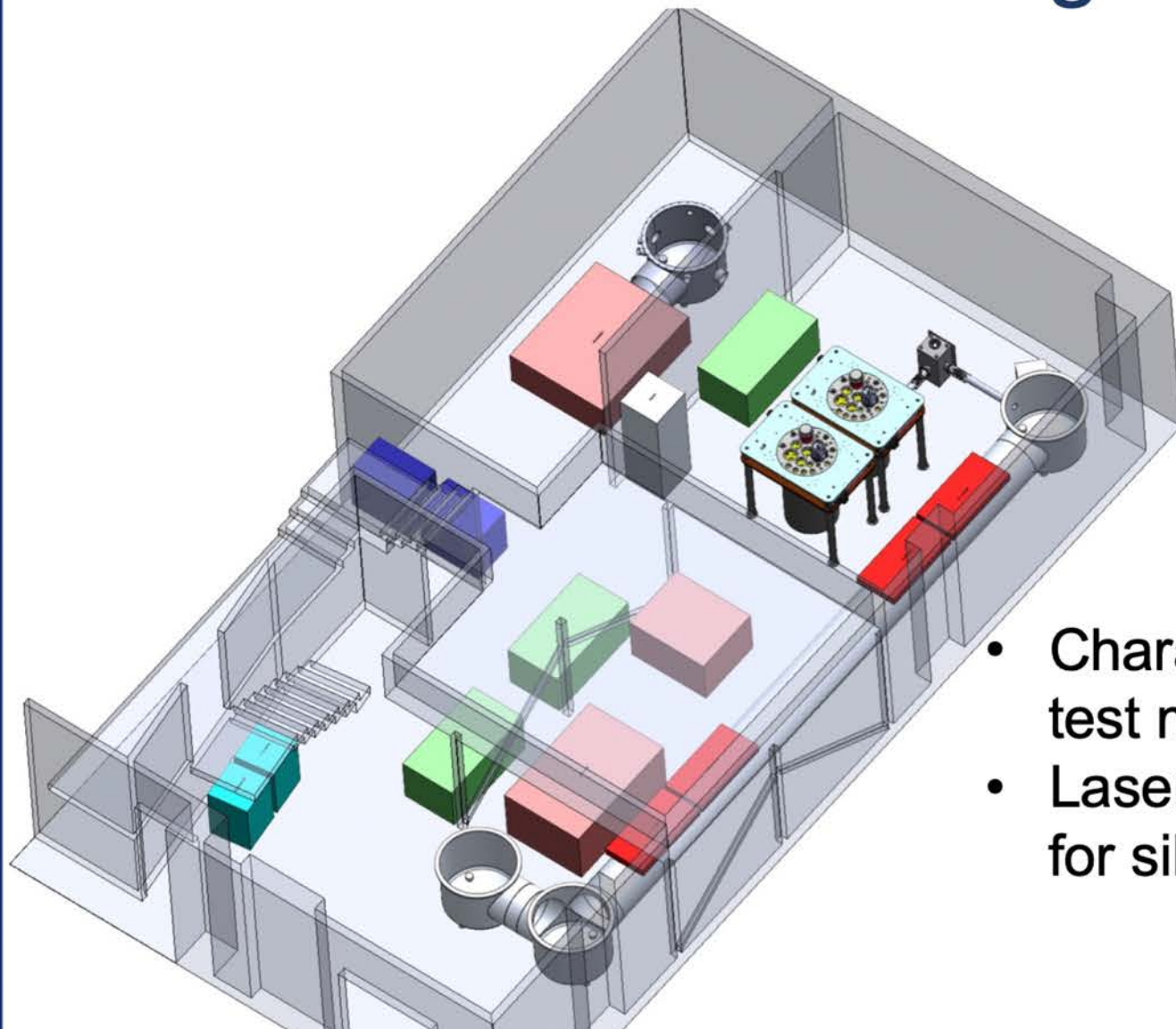


# The SarGrav Laboratory - Summary

- Very low noise infrastructures, designed to host low seismic noise experiments, cryogenic payloads, low frequency and cryogenic sensor development (as confirmed by already published data) See talk by **L. Naticchioni**
- Archimedes the first experiment to be hosted (prototype balance under test). Site quality test by means of a fundamental physics experiment. Possibility to verify how to implement underground cryogenic and vacuum systems without degrading the site
- Large area on surface available for experiments. Additional facilities will be added in the forthcoming months.
- Several underground stations available for site monitoring. Small underground area available for experiments. Plan to realize a large underground lab (250 m<sup>2</sup>), feasibility study completed. See talk by **C. Rossini**
- Strong synergy with ET candidature activities: site monitoring, support in terms of logistics and manpower, mechanics and masonry services.
- SarGrav may host ET technology prototypes to test them in the ET expected noise conditions



# Cryogenic Upgrade of the Glasgow 10m



## New Layout:

- Single 10 m arm – Laser pre-stabilization
- Cryogenic arm – Two commercial cryostats with silicon test masses.

## Facility Goals:

- Characterize monolithic silicon suspensions, test masses, and cryogenic coatings.
- Laser sources and lock acquisition schemes for silicon cavities.



# Summary



- ETpathfinder is a technology development and integration platform for the next-generation(s) of gravitational wave detectors
- As such ETpathfinder will provide a low-phase noise, easy access, fast turn-around interferometer testbed
- Good progress on all fronts; infrastructure will be handed over very soon
- Everybody is welcome to join the ETpathfinder team, please get in touch!
- For more information check out the [ETpathfinder Design Report \(ET-0011A-20\)](#)





With funds from Amaldi Research Center (ARC)  
[https://www.phys.uniroma1.it/fisica/arc\\_amaldi\\_research\\_center](https://www.phys.uniroma1.it/fisica/arc_amaldi_research_center)  
 we are building a lab dedicated to cryogenic R&D for ET LF-Payload

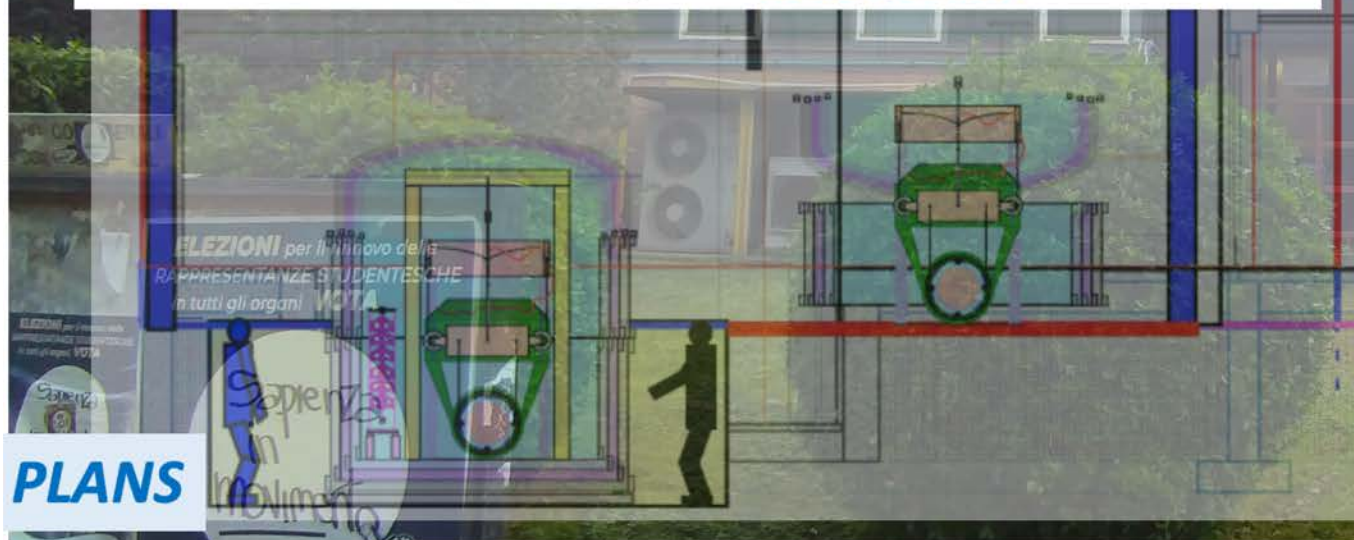


AMALDI  
RESEARCH CENTER



## Construction of Lab underway, end in first half of 2022.

In the meantime, we are building a **Prototype Pulse Tube Cooling Station** and testing thermal links in Al5N and Al6N.  
 We are also starting to design the **test cryostat**.



## PLANS

2021

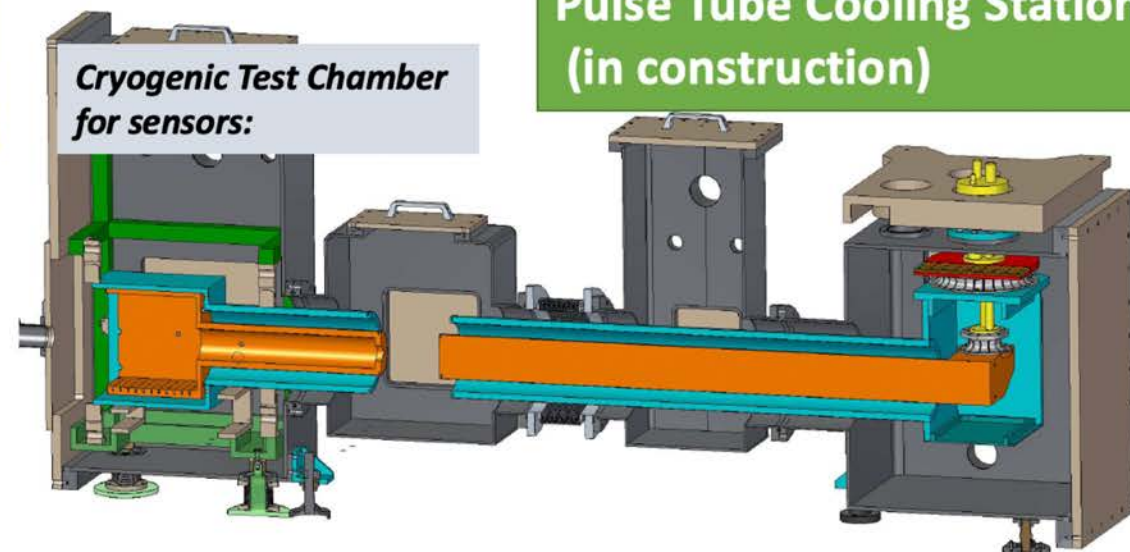
- Tests on high conductivity thermal links (ongoing)
- Construction of prototype PT Cooling Station (call for tender started)
- Design of test cryostat (starting)

2022

- Tests on dummy ET-LF payload at room temperature:
  - frequencies, sensing & actuation, assembly procedure

2023

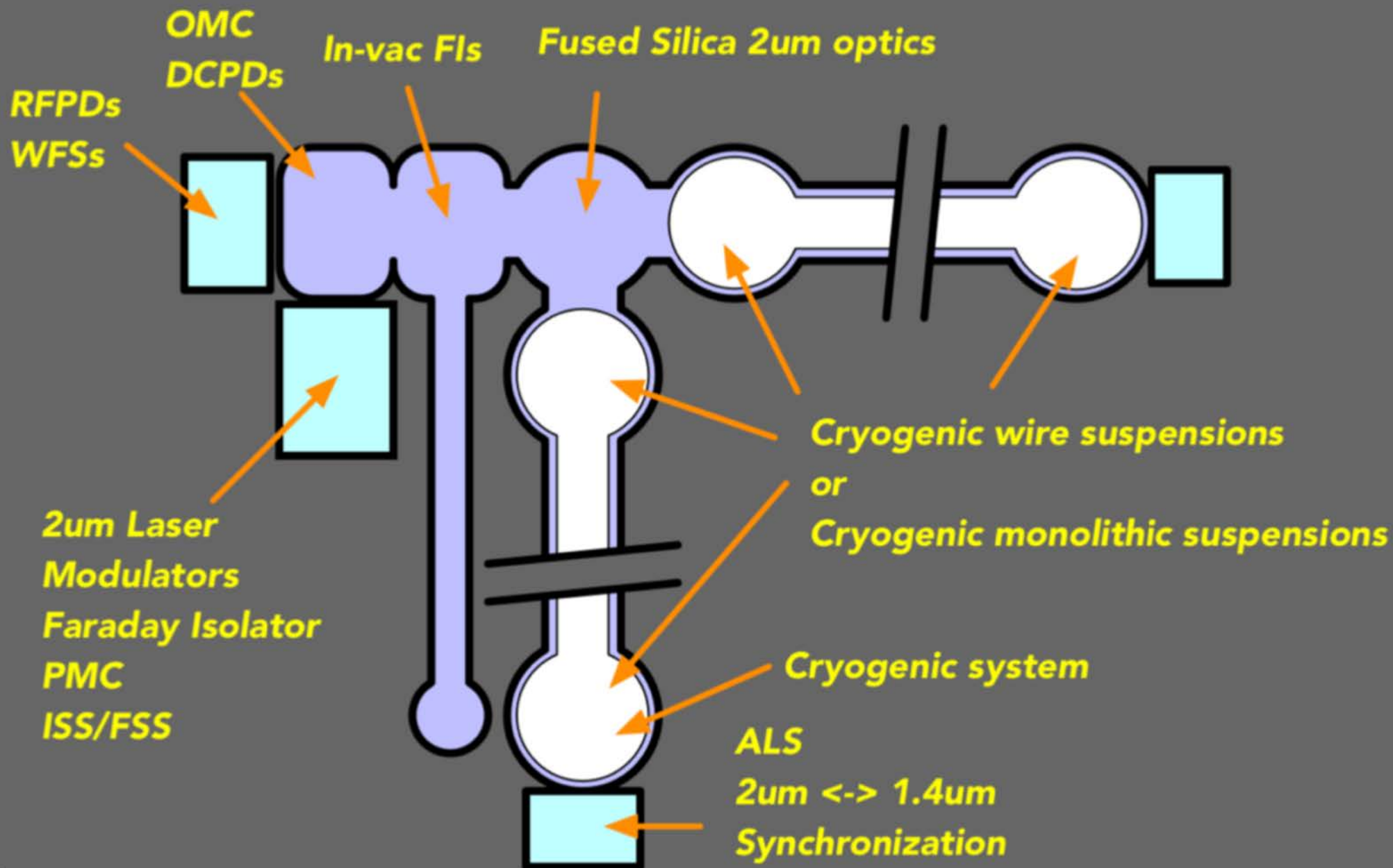
- Construction of test cryostat begins
- - Tests on prototype payload at low temperature in test cryostat



## Pulse Tube Cooling Station (in construction)

Cryogenic Test Chamber  
for sensors:

# Components for Mariner



# Discussion (backup-questions)

- Do you see any R&D topic that is relevant for future GWD, but that is not covered by any of the R&D facilities we have heard about?
- What are the difficulties that you are facing or will face along with the transition from table top R&Ds to a prototype class facility?
- How can the community ensure to get the most out of these R&D facilities? Or the other way around: How can the teams working on the R&D facilities ensure their findings make their way into the designs of future detectors?
- Spooling 5 years forward: What measurements, results would you like to see from your facility so that you say the work was a success?