



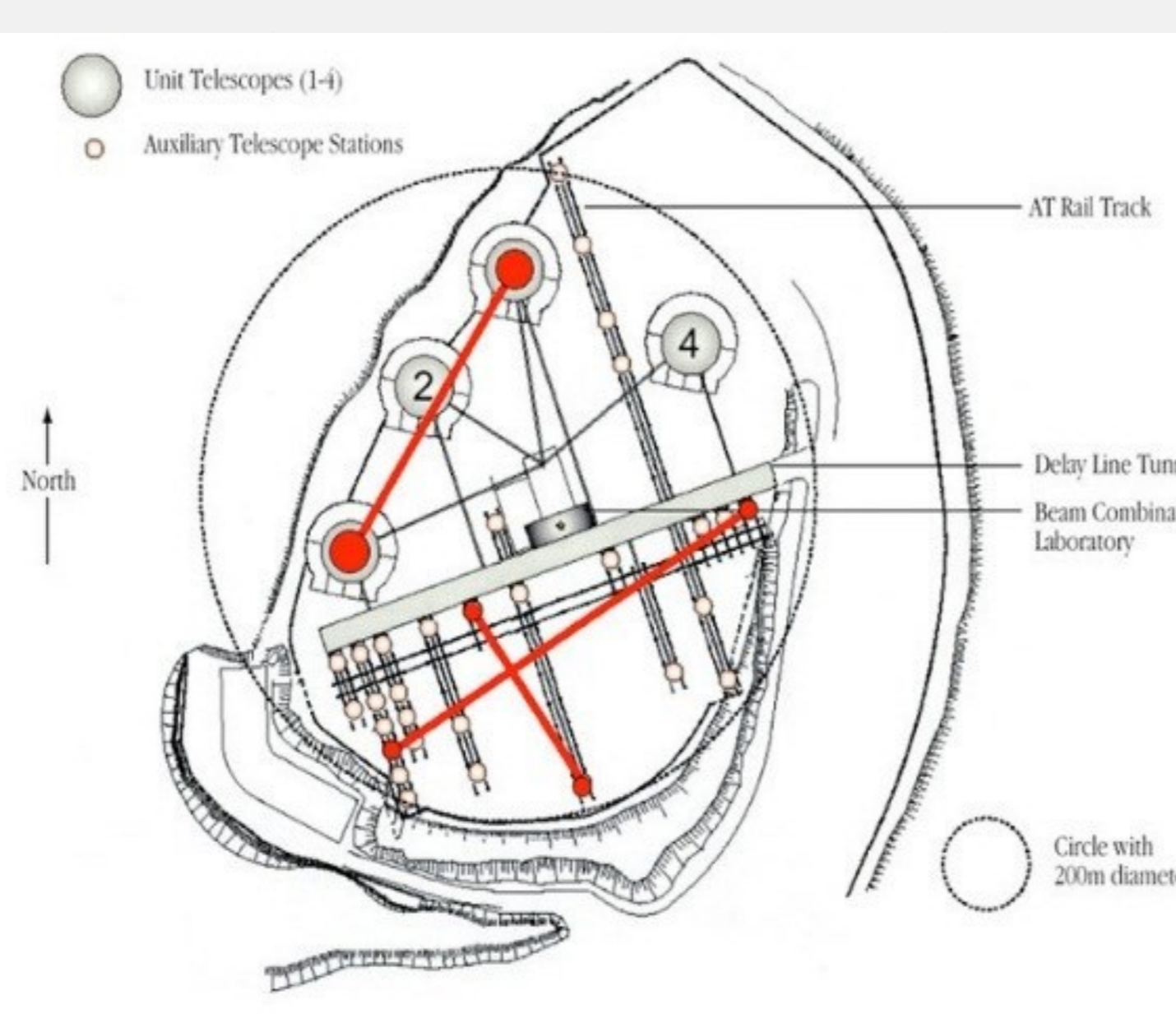
Remote refilling of LN2 cryostat for high sensitivity Astronomical application.

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Abstract

The most sensitive observation mode of the ESO VLT (Very Large Telescope) is the interferometric mode, where the 4 Units Telescope are directed to the same stellar object in order to operate as a gigantic interferometer. The beam is then re-combined in the main interferometry laboratory and fed into the analyzing Instruments. In order not to disturb the performance of the Interferometer, this room is considered as a sanctuary where one enters only in case of extreme need. A simple opening of the door would create air turbulences affecting the stability for hours. Any cold spot in the room might also cause convection which might change the Optical Path by fraction of micron.

Most of the instruments are operating at cryogenic temperatures using passive cooling based on LN2 bath cryostat. For this reason, dedicated strategy has been developed for the transfer of LN2 to the various instruments. The present document describes the various aspects and cares taken in order to guaranty the very high thermal and mechanical environmental stability.

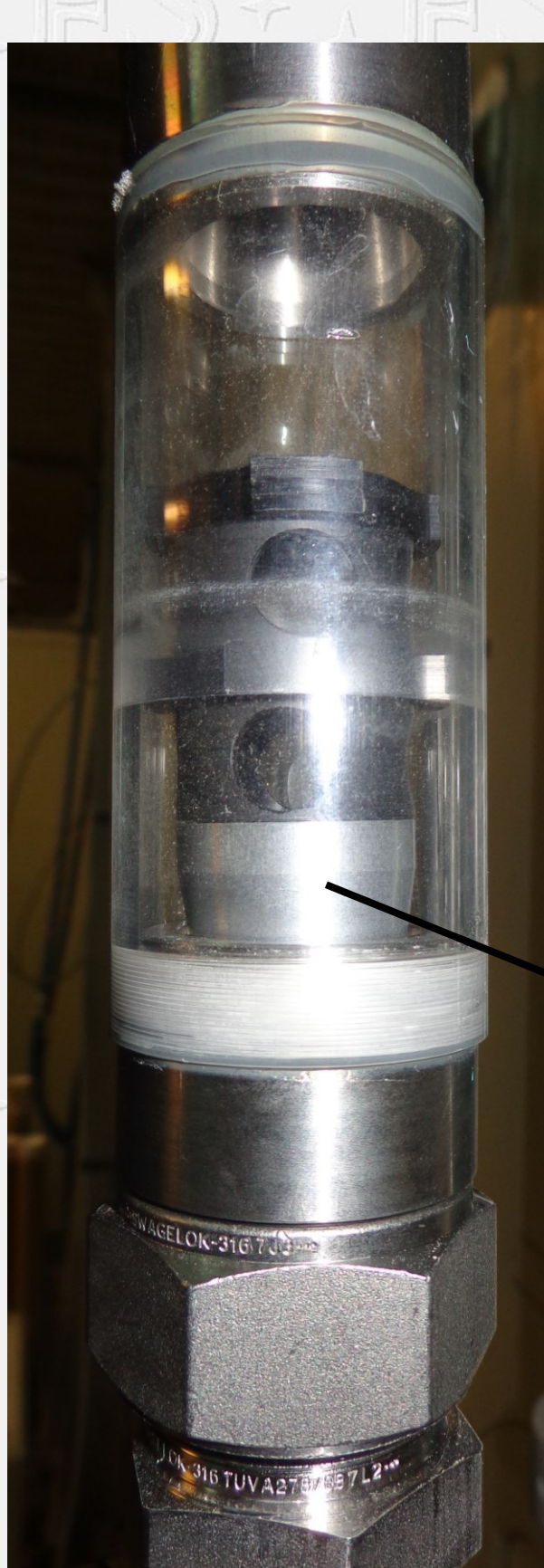
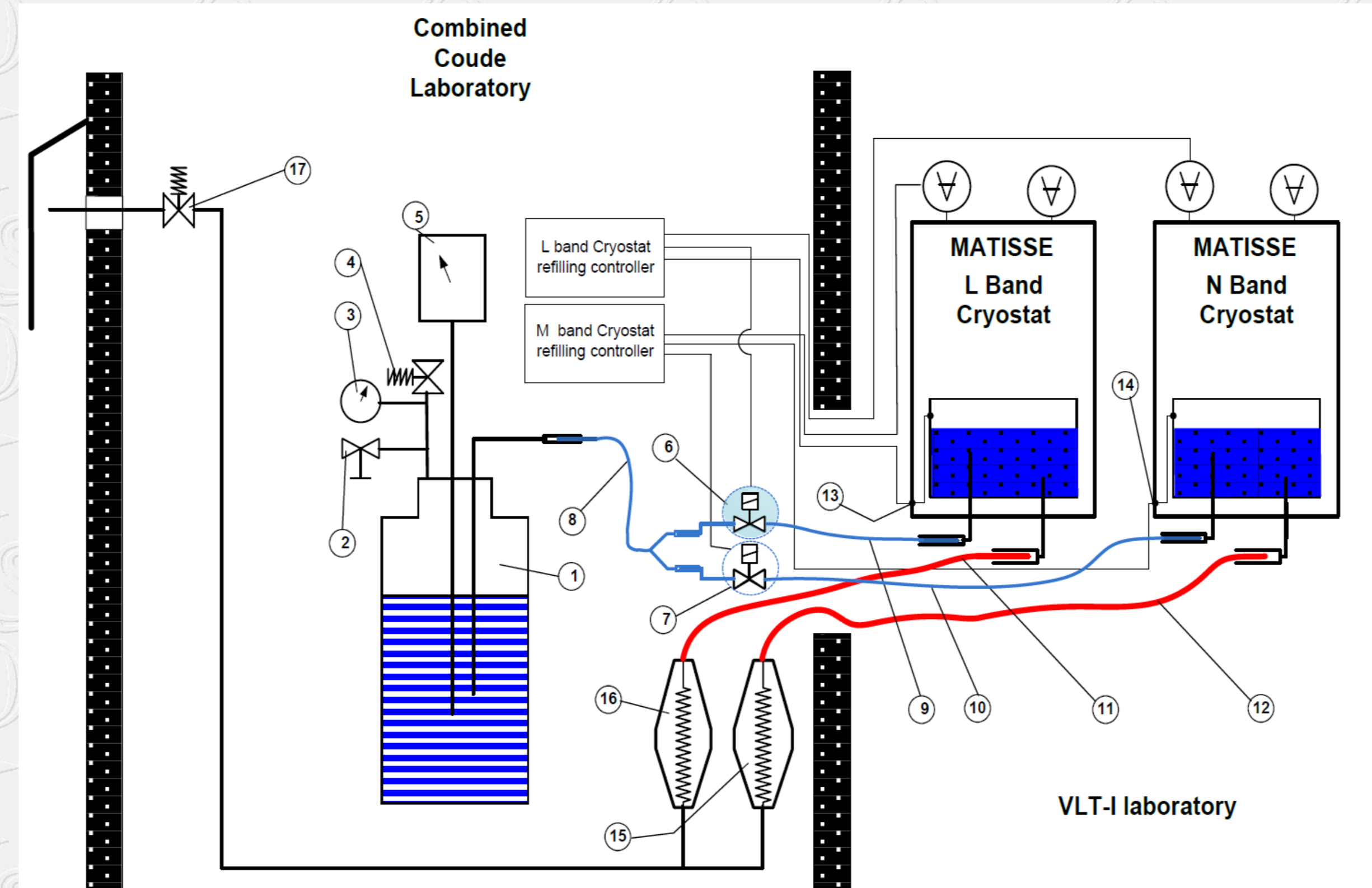
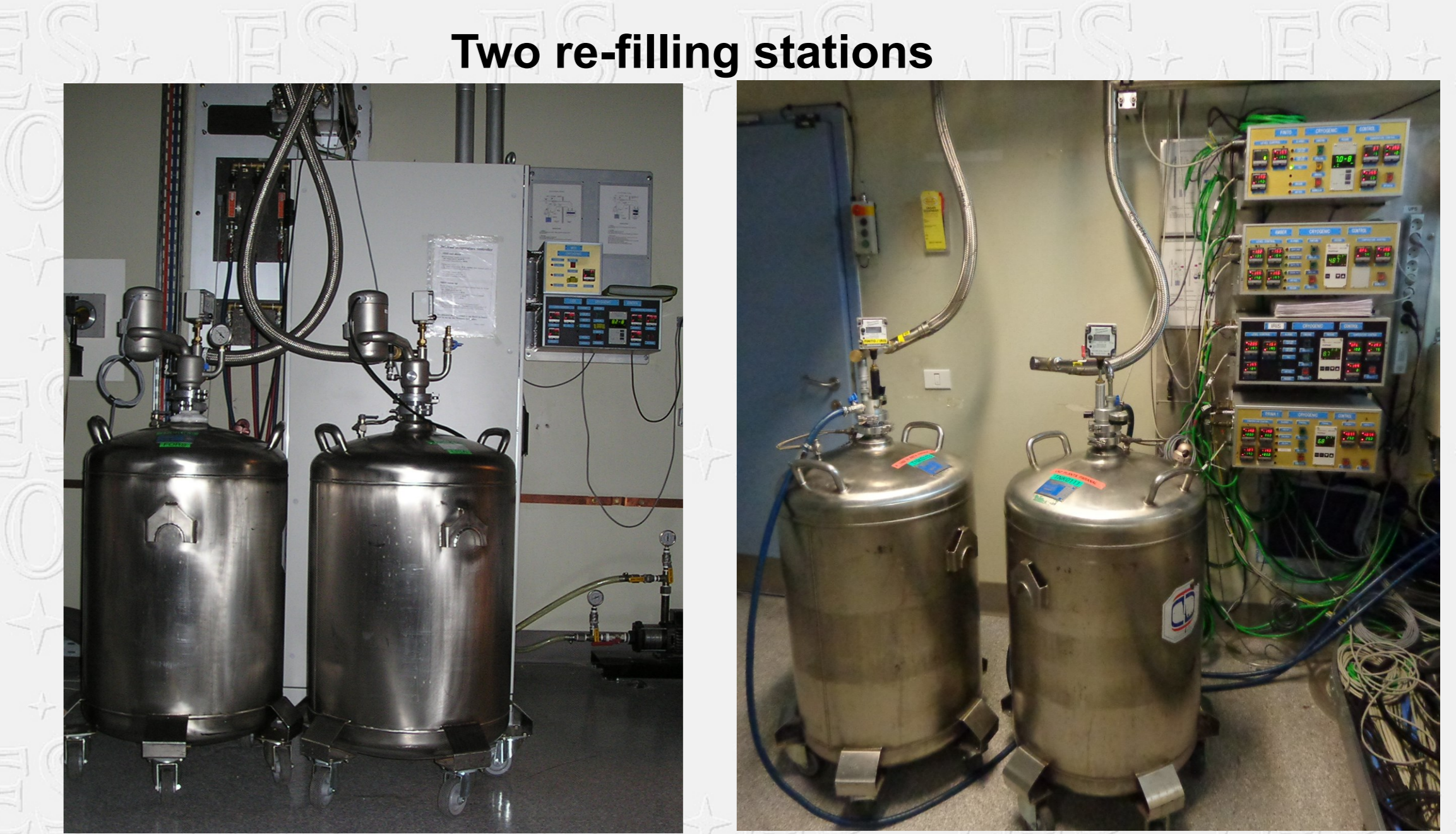
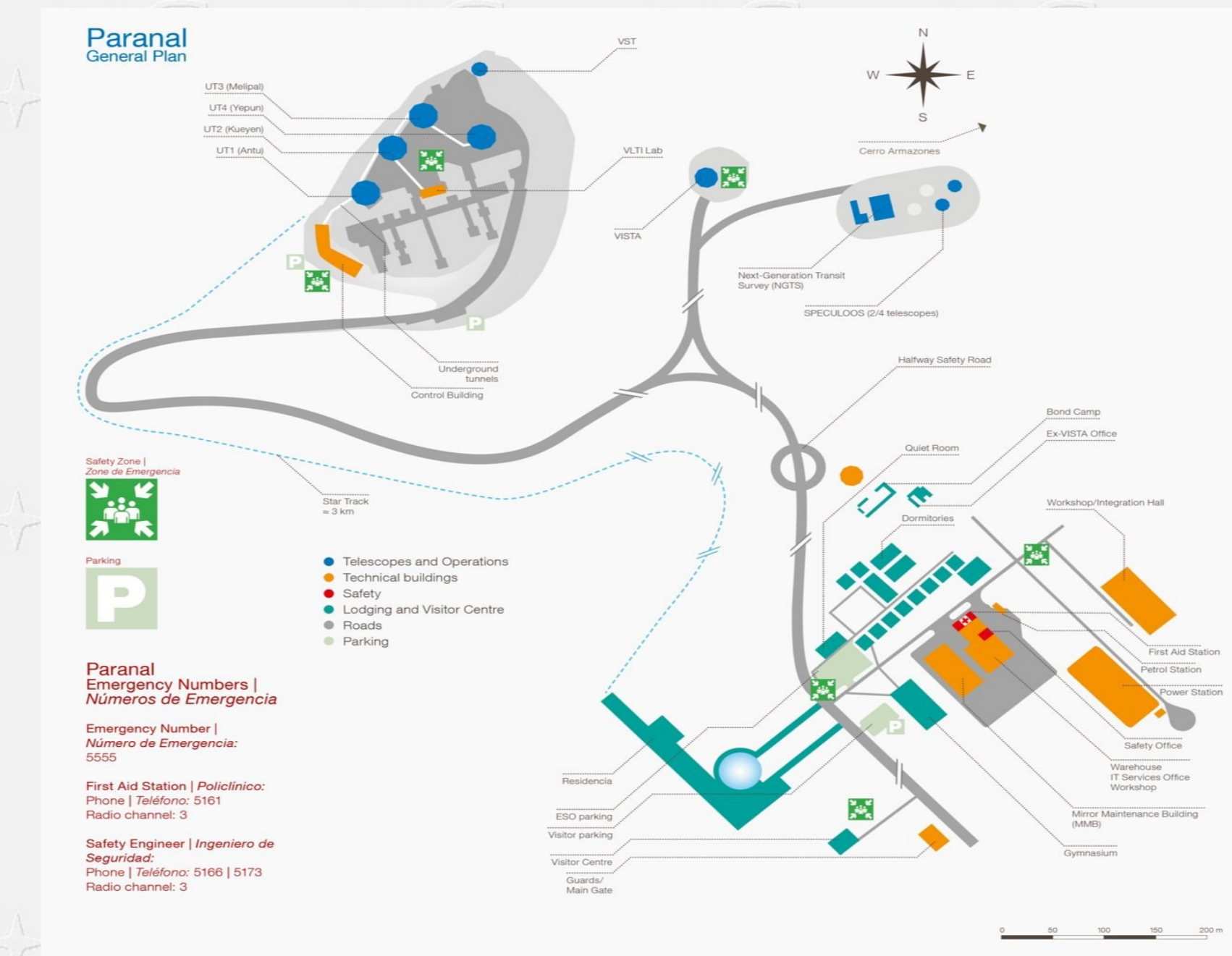


The VLT and VLT I

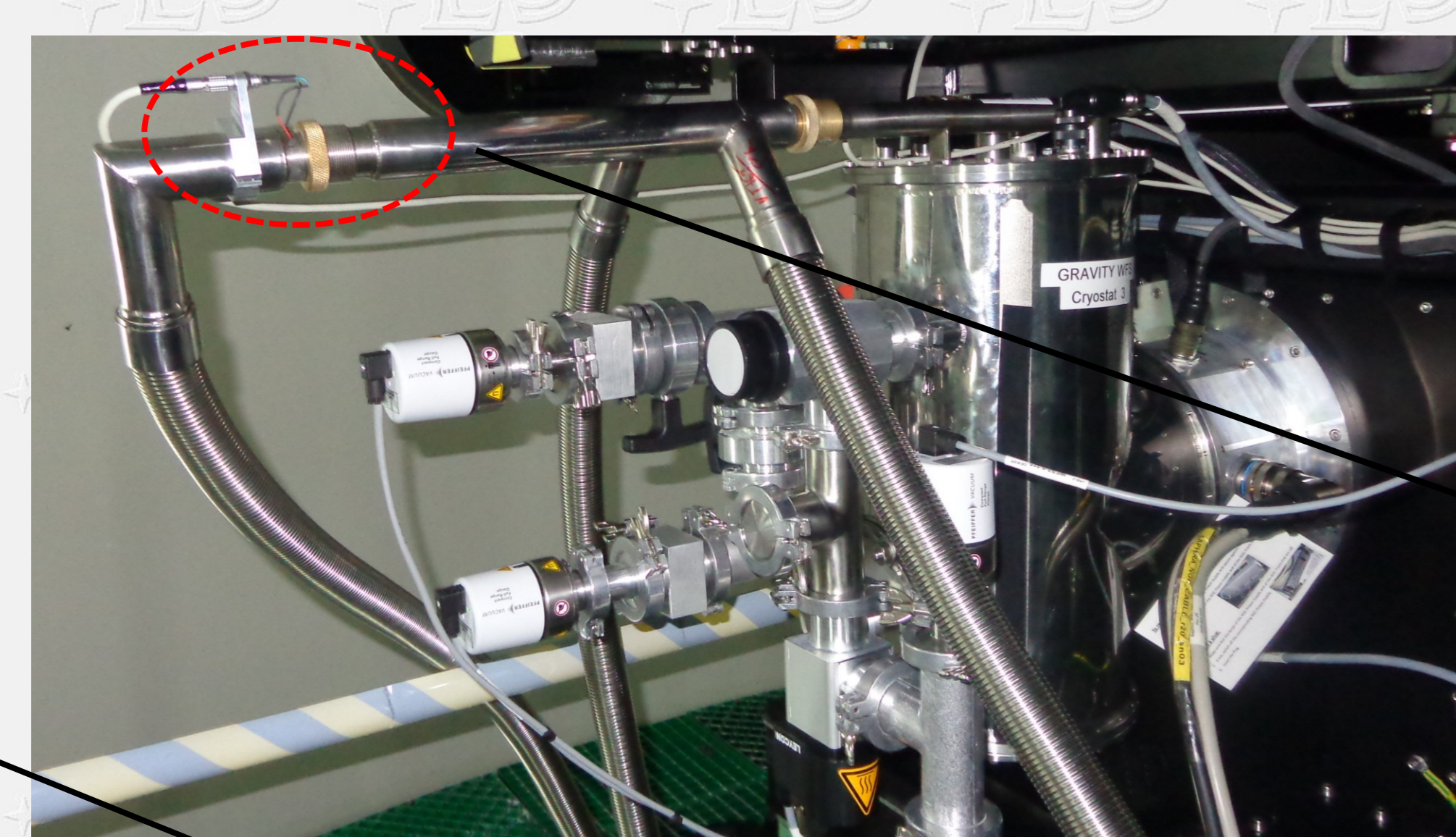
At 2635 meters above sea level in the Atacama Desert of Chile ESO's Paranal Observatory: one of the best astronomical observing sites in the world. It hosts several world-class telescopes; among them are the Very Large Telescope, the Visible and Infrared Survey Telescope for Astronomy, and the VLT Survey Telescope. The VLT is the world's most advanced optical instrument, consisting of four Unit Telescopes with main mirrors of 8.2m diameter and four movable 1.8m diameter Auxiliary Telescopes. The telescopes can work together, to form a giant 'interferometer', the **ESO Very Large Telescope Interferometer**, allowing astronomers to see details up to 25 times finer than with the individual telescopes. The light beams are combined in the VLTI using a complex system of mirrors in underground tunnels where the light paths must be kept equal to distances less than 1/1000 mm over a hundred meters. With this kind of precision the VLTI can reconstruct images with an angular resolution of milliarcseconds, equivalent to distinguishing the two headlights of a car at the distance of the Moon.



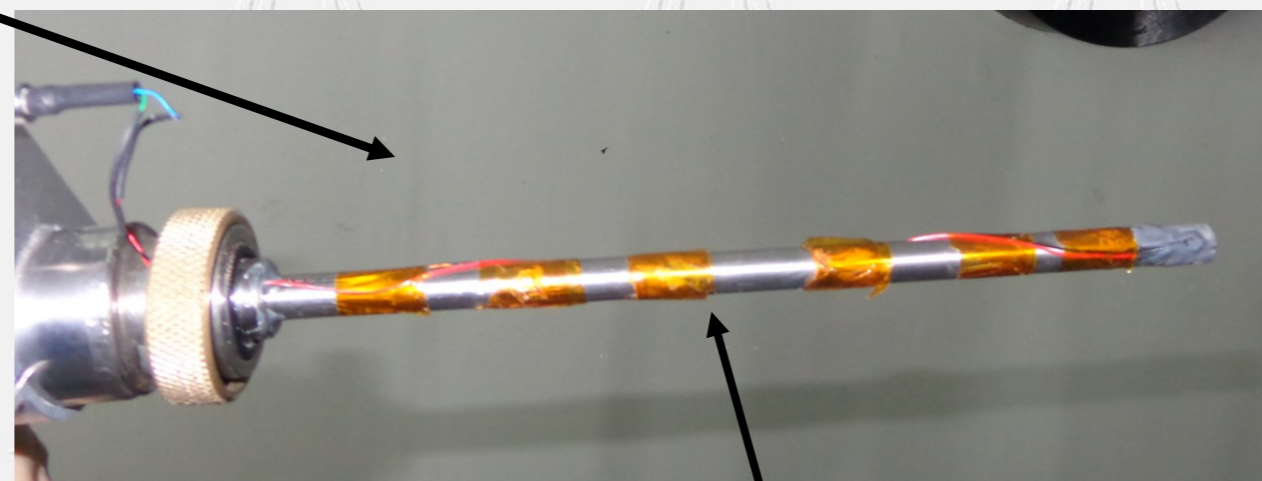
1201 tanks to deliver the LN2 toward the 60 cryogenic systems distributed over the telescope platform



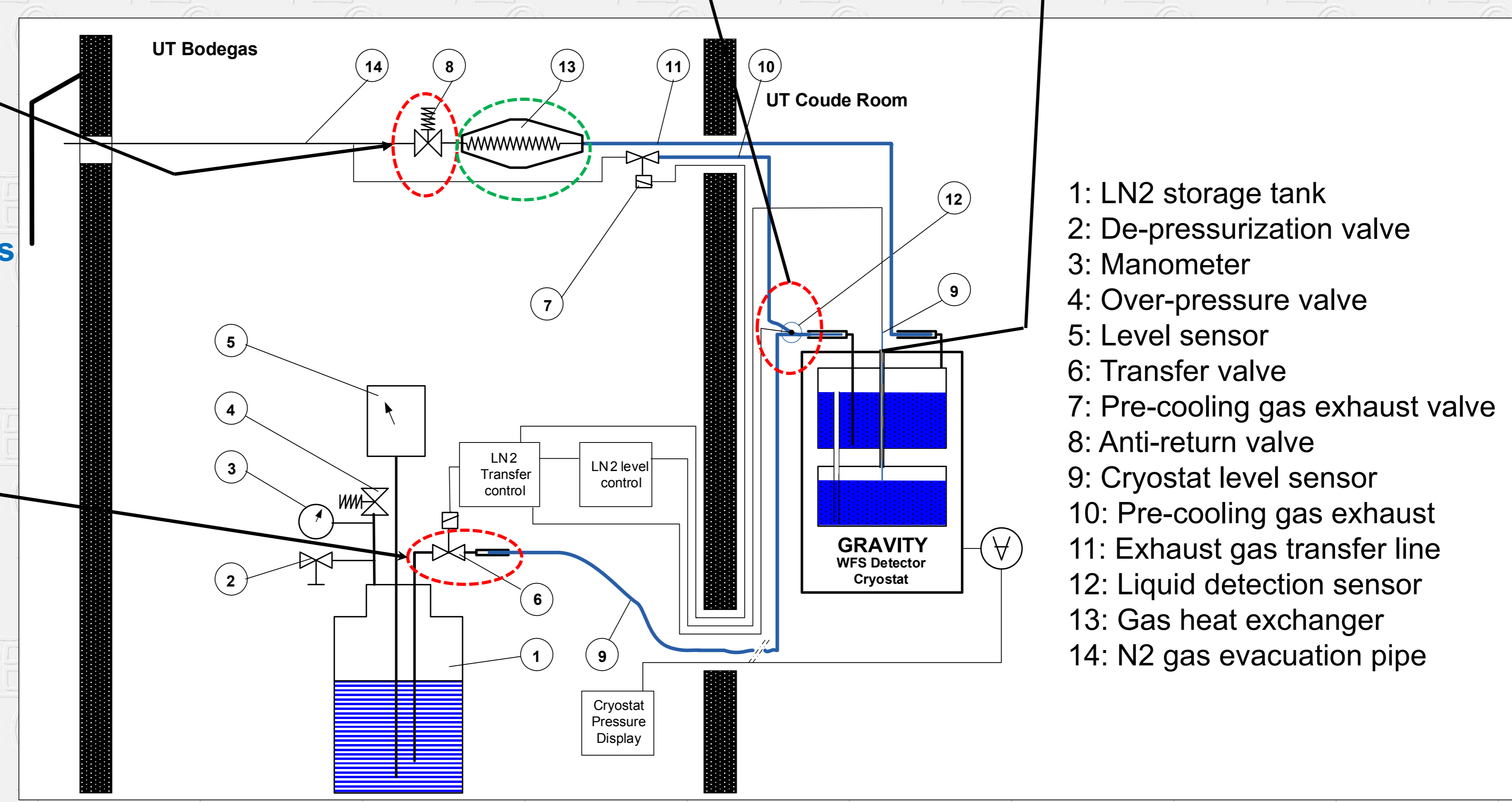
Vacuum insulated electro-magnetic valves



Liquid detection system
Close the vent line and initiate the real refilling



Full level sensor



- 1: LN2 storage tank
- 2: De-pressurization valve
- 3: Manometer
- 4: Over-pressure valve
- 5: Level sensor
- 6: Transfer valve
- 7: Pre-cooling gas exhaust valve
- 8: Anti-return valve
- 9: Cryostat level sensor
- 10: Pre-cooling gas exhaust
- 11: Exhaust gas transfer line
- 12: Liquid detection sensor
- 13: Gas heat exchanger
- 14: N2 gas evacuation pipe



Gas heat exchangers

