Progress on GTC Engineering Operations

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Scope

- Operations
  - Statistics

- Maintenance
  - Telescope Instruments

- Projects & Activities
  - Folded Cassegrain Rotators
  - Helium for FRIDA & MIRADAS
  - GOI Activities
Slight increase in technical issues:

- The evolution by all subsystem (hours lost in each semester) is shown in the upper graph.

- The evolution of lost time per semester for scientific instrumentation is shown in the graph below.

- The tendency to fail of the Main Axes (MACS) is clear in recent times. Emir has been controlled but remains high in lost time. Focal station F has had instability. Finally, there has been a rebound in incidents of M1, M2 and mal function of the GCS software.
- **Technical losses:** Accumulated average (April 1st, 2019 – July 23th, 2019) 6.58%  
- **Optical Quality of the Telescope:** Global Reflectivity (650nm – M1·M2·M3) > 64.0%  
- **Replacing Primary Mirror Segments:** (Segments Changed February – July, 2019) 8 units (18 in 2017) (36 in 2018 !!!)
Maintenance – Telescope

• Problems & Incidents
  ▪ **Azimuth:** We detected a subtle oil leak contaminating encoder. Several lost nights.
  ▪ **M1:** Power supplies of positioners and electronic control connections of these.
  ▪ **EMIR:** DAS (image loss), DETECTOR, CSU, General Configuration, etc.
  ▪ **OSIRIS:** General power failure causes breakage of power supplies and other issues in OSIRIS.

**NOTE:** All these incidents have been solved or mitigated. Regarding MACS (Azimuth) and M1, there are ongoing projects to control obsolescence. There is a serious problem in azimuth ring. It loses oil and can contaminate the encoder. But no such event has been repeated. We are observing the place of the escape weekly. For a total correction, a long stop of the operation is required. A power failure in MACS (elevation axis) caused a lost night recently.

• Operation & Maintenance
  ▪ Strong maintenance of azimuth and elevation encoders.
  ▪ Reinforcement of maintenance (all types) for scientific instruments.
  ▪ New software release of the GCS (patch consolidation).
  ▪ Preparing and launching tenders (spare parts coatings chamber, vehicles, compressor...)

• **Staff:**
  - Incorporation of 4 new Engineers to ICTS projects (2) and in the context of FDCAN program (2).
  - Two Engineers finish the FDCAN program with satisfactory results.
  - Selection for a new SW Engineer in progress.
OSIRIS: We have performed a strong maintenance, disassembling the cryostat and camera-head in the laboratory.

- Satisfactory cryogenic cycling was performed without removing the cryostat. The venting with Nitrogen gas removed particles that we did not expect were inside and some were deposited in optics and detector. Even so, the scientific operation was viable.

- It is decided, after a few weeks, to perform a complete service, disassembling the cryostat in the laboratory. Defects of the previous cycle and other historical ones are corrected. The result is that the cryostat hold-time is now very good, and we have removed the particles and cleaned the optics.
Maintenance – Instruments #2

HiPERCAM: Satisfactory operation and little daily impact.

• We installed in FC-E this semester again, we used it satisfactorily. The instrument remains in focal station FC-E. The system of acquisition and guidance for Miradas (and Canaricam) is already available in the focal-station.

• The HiPERCAM team made improvements to the instrument, such as the installation of a "on board" vacuum pump.

MEGARA: The observations are made regularly (very stable).

• STATUS: We still have some unresolved issues before the instrument is delivered, but we are already working with new contractors and our own staff to solve them.

• Robotic Positioners (MOS): We detected that 6 of the 10 spare-parts did not work. We have been able to diagnose the system, and almost everyone has a fault in a motion vector (R2) due to a failure in their gearboxes or encoders. The rest are operational and usable.

Instrument is operational, while we work hard to correct all problems.
EMIR:

Several bugs this semester. Future plans.

- **ONGOING**: Works has been organized for September on the Window, PLC control improvements and replacement of a critical pressure sensor. The current software versions will also be consolidated in production (some currently in engineering mode). A strong maintenance of the cold heads will be carried out, in October. This implies a stop of one month.

- **FUTURE**: The disassembly of EMIR to correct the tilt of the detector and maintain the CSU is scheduled for October 2020. The Engineering Operations Group suggests the purchase of a new detector (H2RG type) and funding is requested recently for GRANTECAN. We are studying whether it is convenient to refactoring the EMIR software or not.

HORuS:

Is operative. Physical improvements

- **ONGOING**: An intervention was carried out in July to install the cover, replace the acquisition computer and solve problems with the electronics cabinet insulation.
Projects #1

FOLDED CASS. ROTATORS

• We have assembled and put into operation, not without many problems with encoders and the electrical system, the FC-E acquisition and guidance system (mechanisms).

• We can say that the FC-E focal station is 95% functional and ready for Canaricam and Miradas, and is currently in use by HiPERCAM. Real fast-guiding tests are missing (it works but we have not been able to validate this part with an instrument) that we will perform with the help of HiPERCAM in its next run. We have not detected problems in the load and stress tests that have been performed so far.

• We are currently making a fine adjustment for communications (field buses) and low-level control (motor phase control)

NEXT STEPS: Complete tests with HiPERCAM, fine tuning and tests after the integration of Canaricam. Improvement of the electrical system, after containing major electrical problems. Document to finalize this project.

HELIUM FOR FRIDA & MIRADAS

• We have a partial deployment of Helium infrastructures for Frida & Miradas (and Canaricam).
• Completed the new electrical cabinet for the helium system. A cut will be made shortly to integrate it.
• The power and control line order (compressor and cold head) has been placed. It will be sent shortly to Florida.
• The tender is prepared for the remaining helium hoses and for the modification of the UPS.

NEXT STEPS: Integrate remaining helium hoses in the coming months. Close UPS purchase (not critical for MIRADAS)
Projects #2 (GOI Activities)

• **M1 NODAL BOX & SENSORS:** Presented project to correct obsolescence of M1. We already have funds and resources for this.

• **NEW ACTIVITIES & PROJECTS:** New obsolescence control projects to begin: IT system, Interlock & Safety System, laboratory equipment and test benches for maintenance.

• **SUSTAINABILITY:** Purchases for new hazardous waste stores and proposal for a photovoltaic system close to 70 or 75 KWp in order to cool the telescope with minimal environmental impact and cost.

• **BPM Improvement Project:** Business Process Management improvement to adapt it to Industry 4.0 paradigms and reduce costs, optimizing business processes.