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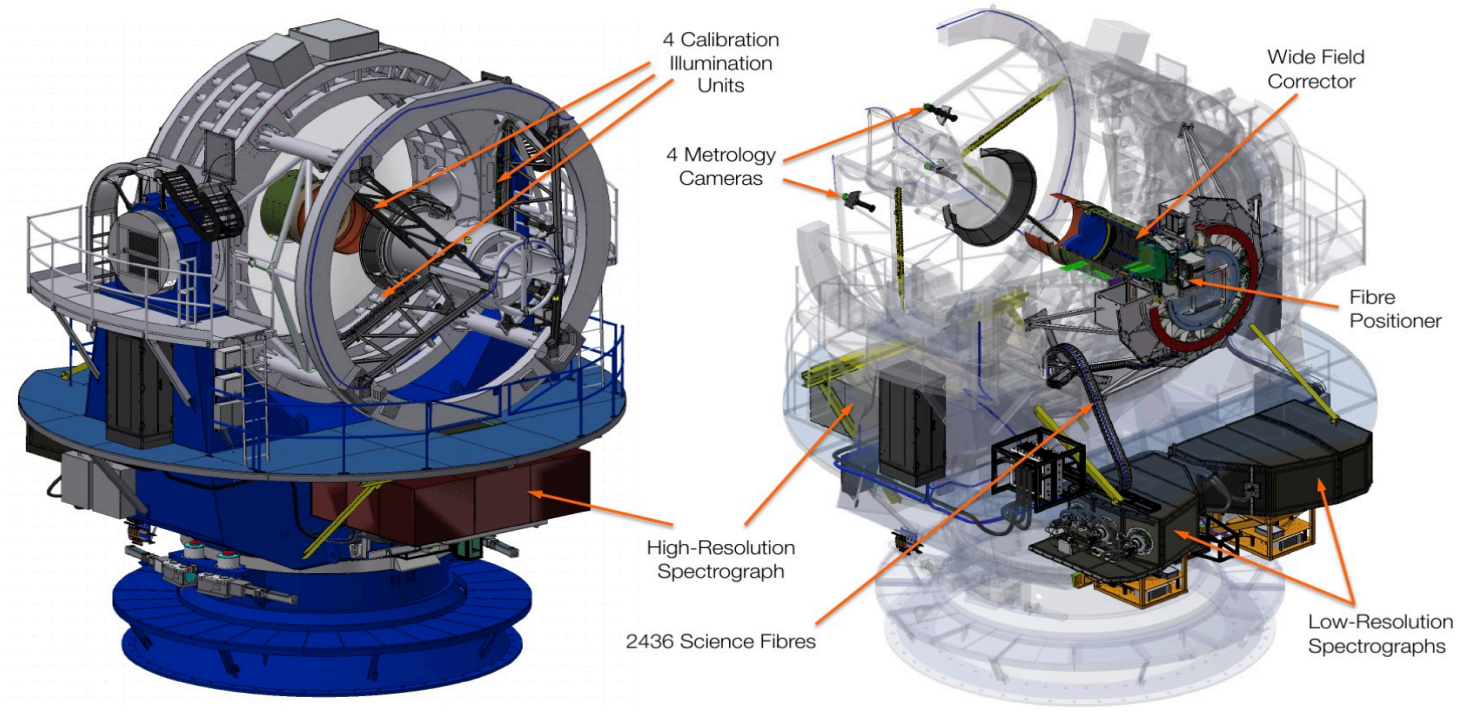
on behalf of the team

The 4MOST Survey of Stellar Clusters

4MOST



- Fibre-fed spectroscopic survey facility at VISTA@ESO, 2400 fibers, FoV 4.2 deg^2, simultaneously observes in HR (~20K) and LR (~7K)
- Currently under construction, first light ~Q2 2024
- 4MOST consortium, led by AIP, includes 15 institutes (not INAF or IT)

4MOST: Surveys

- GTO 5yrs, essentially all sky coverage
  - 70% Consortium, time split between 10 large Surveys, 5 stellar and 5 extra Galactic;
  - 30% Community Surveys
- LoI in early 2020, 50+ received, ~20 invited for full proposal, submitted in late 2020, outcome in Dec 2021:
  - 8 selected as full surveys;
  - 7 selected as subsurveys of Consortium survey
- Consortium Surveys and Community Surveys together are part of the cumulative 4MOST survey and they all share the focal plane at any time during the GTO period
- Community Surveys members participate in infrastructure work (e.g. overall survey planning, software, incl pipelines, commissioning, QA)

Why Stellar Clusters?

- SCs formation and disruption: Study of SCs key step to understand how star form and populate the Galaxy;
- Stellar Evolution: Ideal benchmarks for more detailed models;
- SCs and the Galaxy: allow constraints on timescales and insight on the Galactic components and their buildup;
- Gaia has led to the discovery of many hundreds of new Galactic OCs and accurate membership information on Galactic GCs
- Upcoming high-multiplexing HR spectroscopic surveys (e.g. WEAVE, 4MOST, SDSSV, DESI) will lead to the next major step ahead

Survey in a nutshell

- High legacy value, sample of unprecedented accuracy and size, homogeneously analyzed.
- LR => RVs, atmospheric parameters, some chemical ration (e.g. alpha)
- HR => RVs, atmospheric parameters, full chemistry (probing all relevant nucleosynthetic channels, Fe peak, alpha, n-capture etc)
- Resolved Stellar Clusters in the Milky Way and Magellanic Clouds :
  - 150+ Globular Clusters in the Milky Way and the Magellanic Clouds (FGK targets, ~7K in HR 12<G<17, ~40K in LR 15.5 < G<20) ~5X previous samples
  - Essentially all visible Southern MW Open Clusters and Star Forming Region (2000+) (FGK stars with Av < 2, 40K in HR 10 < G < 15.5 in HR, ~80K 14 < G < 19 in LR) ~10X previous samples
  - Nearby very young clusters (~5 HR targets, 10<G<15.5 and ~8K in LR 15<G<18) ~3-5X previous samples

Science aims

- Fill metallicity/age distribution: [Fe/H] = −2.5 of GCs to super-solar OCs, a few Myr to 13.5 Gyr
- Through coordination with the planned Consortium Surveys
  - Understand how clusters form, evolve, dissolve, and populate the MW
  - Calibrate complex physics that affect stellar evolution (on which our ability to measure ages ultimately stands)
  - Measure the contribution of star clusters to the formation and evolution of the individual Galactic components
  - Derive a thorough and homogeneous chemo-dynamical picture (constraints on models of Galaxy formation)

Planning and timeline

- Overall timeline is regulated by agreements between ESO and the Consortium, however details are being discussed.
- The Stellar Cluster Survey was approved in December 2021 for ~210K fh(three INAF led proposals were approved, two as surveys and one as subsurvey);
- Process to integrate community surveys started in Q2 2022;
- Q2 2022-Q2 2024 Survey preparation (design, target selection, calibration, pipeline development etc)
- Q3 2024- Q3 2029 Data collection
- Q2 2025 - ~2032 Scientific exploitation

Team and Leadership

- Large international team (62 scientists from 10+ countries)
- 5 INAF institutes involved (19 staff members), 4 Universities (5 staff members) in Italy. About 2FTE/yr from INAF & INAF affiliated scientists.
- PI SL (INAF OAPd), co-PIs Angela Bragaglia (INAF OAS) and Antonella Vallenari (INAF OAPd)
- INAF staff are in several other key positions within the survey (steering committee, targeting coordination, pipeline development)

Funding & Critical issues

- No funding has been allocated to the project at this time;
- Applications planned or pending;
- Crucial to have a funding channel flexible enough to accommodate the needs of this kind of long term projects
- Need for highly specialised skills, e.g. development of software tools which require external expertise and hired workforce
- Long term investment on big data tools: connection with external experts (from informatics), new hires, training of early career scientists etc