



HIRES at the E-ELT

Alessandro Marconi

*Dipartimento di Fisica e Astronomia
Università di Firenze*

INAF-Osservatorio Astrofisico di Arcetri

Livia Origlia, Stefano Cristiani, Paolo Di Marcantonio,
Tino Oliva, Marco Riva, Luca Valenziano, Filippo Zerbi

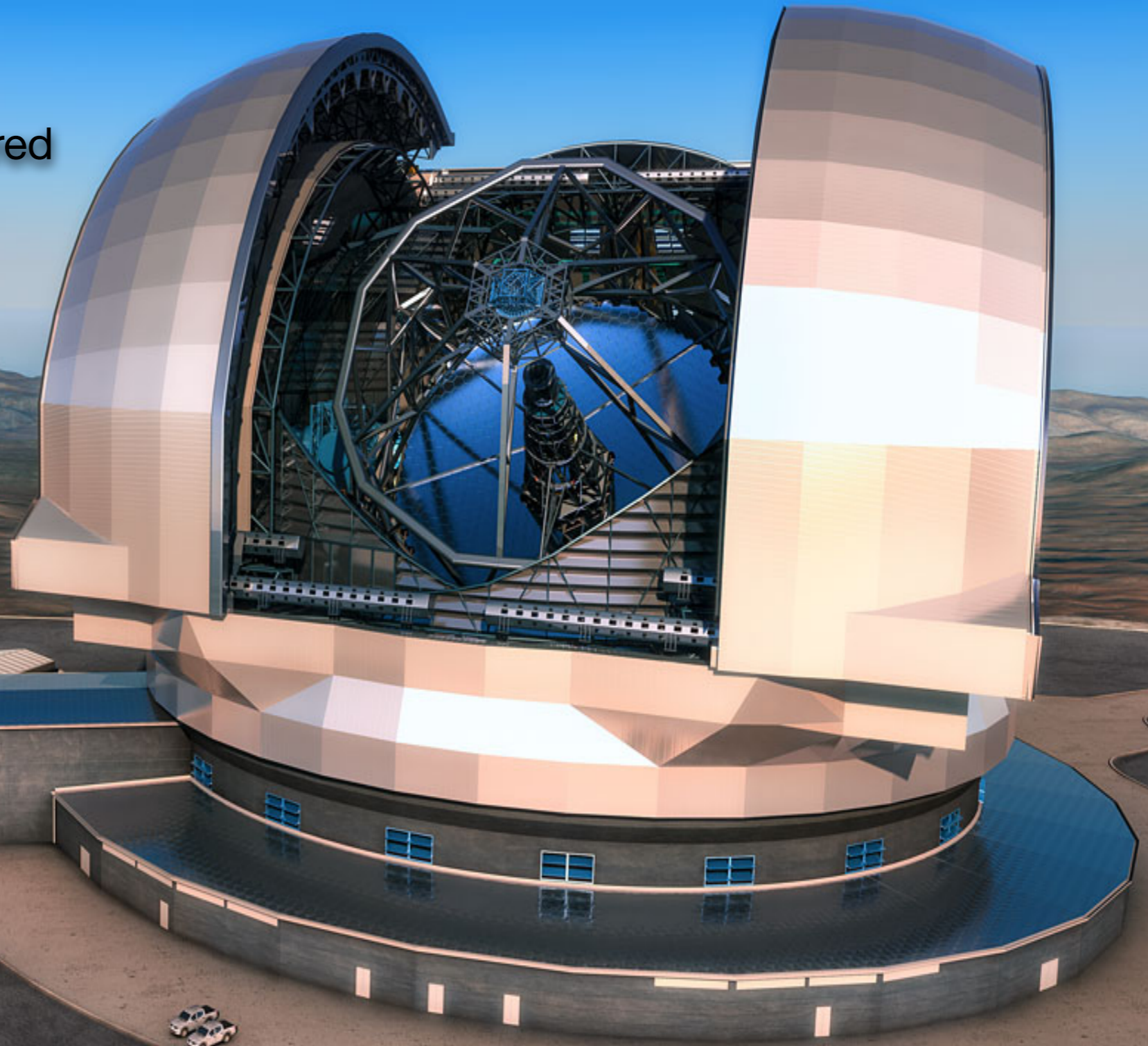
The European Extremely Large Telescope

★ ESO Program

- 39m class telescope
- optical (blue) to mid-Infrared
- Fully AO Telescope
(e.g. adaptive M4 mirror)
- 1.1 Billion EUR project

★ Instruments:

- MICADO (camera+spec.)
- HARMONI (IFU spec.)
- HIRES (high res spectr.)
- METIS (mid IR imag.+spectr.)
- MOS (multi object spec.)
- MAORY (AO module)



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■ Baseline plan, first light in 2024

MICADO, HARMONI first light; METIS, HIRES, MOS to follow

only 3 instrument in construction budget, others in operations budget

NEW: MICADO, HARMONI, METIS recommended for construction

■ If Brazil does not ratify by end of 2016, go to two-phase approach: first light in 2026 (or 2025)

MICADO(+MAORY), HARMONI(+SCAO), METIS in phase 1

HIRES, MOS, in phase 2

■ two-phase approach diverges from baseline only in 2017



- ★ HIRES is a high resolution spectrograph for E-ELT capable of providing a spectrum at $R \sim 100,000$ over $0.4-2.5 \mu\text{m}$
 - Modular concept: 4 arms, UBV, RI, YJH, K
 - Fiber injection: seeing-limited, AO assisted,
 - Possible main observing modes
 - UHR** $R=150,000$
 - HR** $R=100,000$
 - MR** $R=14,000 \times 10$ MOS capability
 - HR2** $R=100,000$ IFU with 69 spaxels
- ★ Merging of instruments which completed phase A studies in early E-ELT phases: CODEX (optical) and SIMPLE (near IR)
- ★ International consortium with 9+3 countries, led by Italy - INAF



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See Talk by Tino Oliva,
Paolo Di Marcantonio, Marco Riva

Science Cases to be addressed



- ★ **Exoplanets** (characterisation of Exoplanets Atmospheres: detection of signatures of life)
- ★ **Stellar Astrophysics** (abundances of solar type and cooler dwarfs in galactic disk bulge, halo and nearby dwarfs: tracing chemical enrichment of Pop III stars in nearby universe)
- ★ **Intergalactic Medium** (Signatures of reionization and early enrichment of ISM & IGM observed in high-z quasar spectra)
- ★ **Fundamental Physics** (variation of fundamental constants - α , m_p/m_e Sandage Test)
- ★ **Protoplanetary Disks** (dynamics, chemistry and physical conditions of the inner regions)
- ★ **Stellar Populations** (metal enrichment and dynamics of extragalactic star clusters and resolved stellar populations)
- ★ **Galaxy Evolution** (massive early type galaxies during epochs of formation and assembly)
- ★ **Supermassive Black Holes** (the low mass end)

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See Talk by
Livia Origlia, Stefano Cristiani
and contributed talks



- ★ **APR 2015** HIRES Consortium has answered to ESO Request for Information
 - Consortium proposed full HIRES (40+ MEUR), self funded
 - ESO will put a cost cap of ~20 MEUR in phase A, with subset of TLRs
- ★ **~JUL 2015** Call for Phase A studies
 - Consortium will likely propose a reduced version of HIRES with small extra contribution
 - 2 modules **VRI+YJH**, *UB & K to follow ...*
- ★ **~NOV2015** Deadline of call for Phase A studies
- ★ **2016-2017** Phase A Study
- ★ **>2018** Start of construction
- ★ **2024 (2026)** E-ELT First Light
- ★ *ESO money (construction budget) available ~3 YRs before first light*
- ★ *HIRES First Observations ~3 YRs after first light 2027/2029 (?)*



★ International Consortium

- **Italy** INAF lead technical institution, A. Marconi PI
- **Chile** (L. Vanzi, Pontificia Universidad Catolica+)
- **France** (F. Bouchy, Laboratoire d'Astrophysique de Marseille+)
- **Germany** (K. Strassmeier, Leibniz-Inst. for Astrophysics Potsdam+)
- **Portugal** (N. Santos, Institute of Astrophysics and Space Sciences)
- **Spain** (R. Rebolo, Instituto de Astrofisica de Canarias+)
- **Sweden** (N. Piskunov, Uppsala University+)
- **Switzerland** (S. Udry, Observatoire de Genève+)
- **United Kingdom** (R. Maiolino, University of Cambridge+)

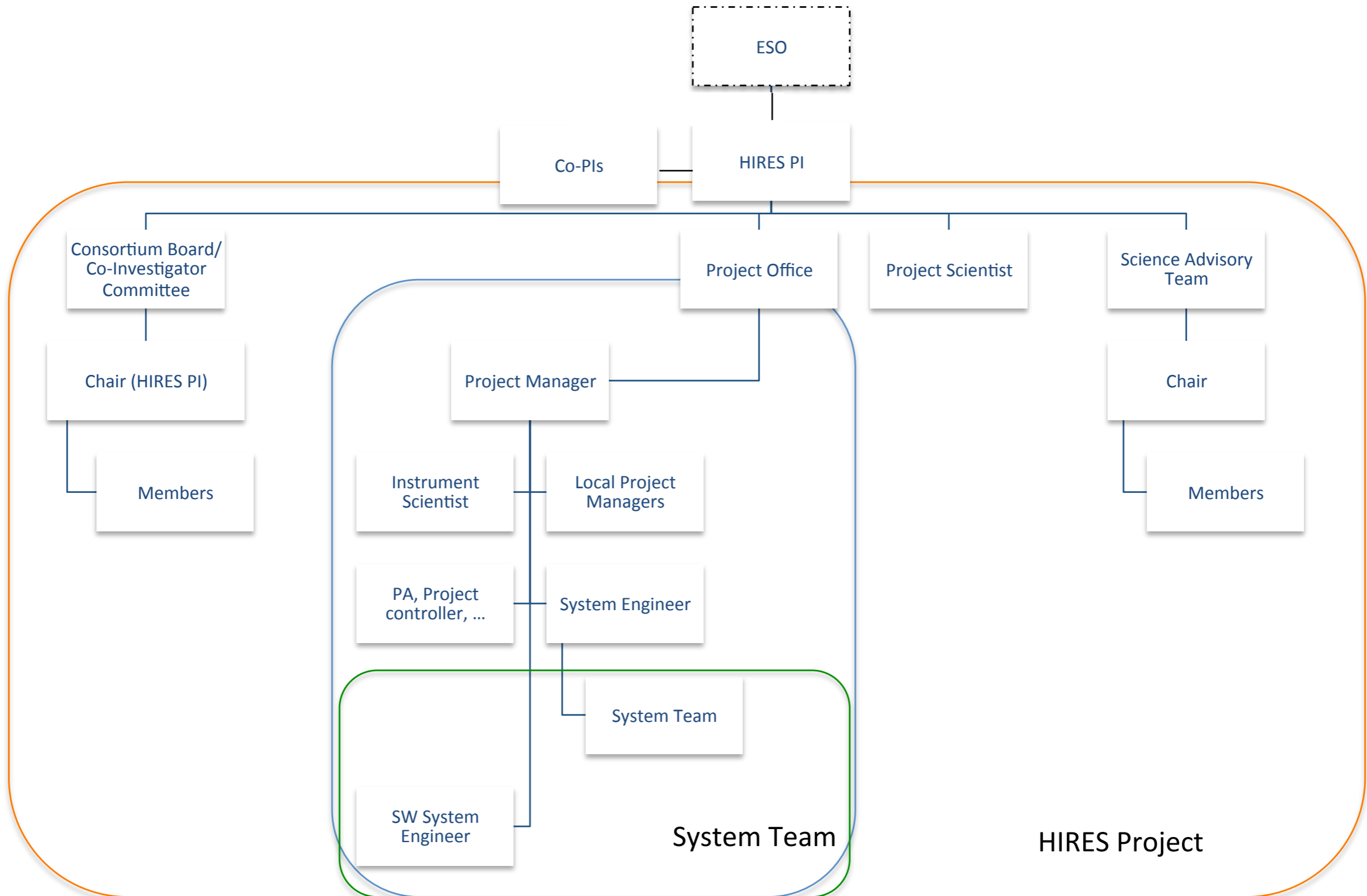
★ Interested:

- **Brazil** (J. Renan de Madeiros, Theoretical and Experimental Physics of the Natal University)
- **Denmark** (J. Fynbo, Niels Bohr Institute Copenhagen +)
- **Poland** (A. Niedzielski, Nicolaus Copernicus University Toruń +)

Management structure



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NATIONAL INSTITUTE FOR ASTROPHYSICS



- ★ Co-PIs → Sharing Consortium Strategy
 - ▣ Leading countries
- ★ Consortium Board → Steering Programme
 - ▣ Participating countries
- ★ Science Advisory Team → Coordinating Science
 - ▣ Core Team
- ★ Project Scientist
- ★ Project Office → Developing and Implementing the Project
 - ▣ HIRES Project Manager
- ★ Project Office
 - ▣ Instrument Scientist
 - ▣ System Engineer
 - ▣ System Team



- ★ It is integral part of the HIRES Project Office
- ★ It is lead by the HIRES System Engineer
- ★ It is composed by
 - Architects (depending on project phase)
 - Optical, Mechanical, Electrical, Thermal, (Software)
 - AIV manager
 - SW System Engineer and SW team
 - Sub-System Engineers



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- ★ International Consortium led by Italy for construction of HIRES, high resolution optical-NIR spectrograph
- ★ Phase A study beginning of 2016 ~ end 2017
- ★ First Light of HIRES at E-ELT First Light + 3 years (?)
- ★ Much scientific and technical work needed
- ★ Involvement of Italian community fundamental!

Conclusions



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