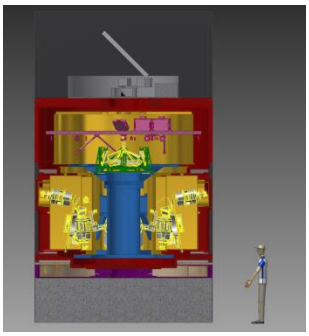

ESO E-ELT INSTRUMENT

INSTRUMENT ACRONYM and FULL NAME:

HARMONI - the first light integral field spectrograph for the E-ELT

SCIENTIFIC OBJECTIVES:

HARMONI is a visible and near-infrared integral field spectrograph that will be capable of working close to the diffraction limit of the telescope or in natural seeing mode. It targets are

Stars and planets: to study from giant to terrestrial exo-planets by direct detection via high-contrast imaging or indirect detection via radial velocity variations, to study circumstellar disks, young stellar clusters and the initial mass function, to follow-up in spectroscopy the candidate exo-solar planets seen by VLT.

Resolved stellar populations: to carry out imaging and spectroscopy of extragalactic resolved stellar populations, to study black holes and active galactic nuclei (AGN).

Galaxies at high redshifts: to measure the size, velocity & luminosity distribution of HII regions...

Ultra-luminous and luminous infrared galaxies, U/LIRGS: to measure the dynamical masses, to measure the rotation (kinematics), to studychemical composition (fraction of heavy metals), to study the modes of star formation...

SPECS & TECHNICAL CHALLENGES (R&D needed, procurement opportunities):

HARMONI is designed to work in conjunction with several different AO systems at the E-ELT: GLAO provided by the telescope, LTAO provided by the dedicated facility ATLAS, and SCAO incorporated within the instrument itself.
HARMONI is a first-light instrument, and so its baseline design is based on proven technologies as far as possible. However, regarding the spectrographs a new layout was considered to achieve most compact cryostat geometry. HARMONI specifications are

Spatial

- 4 spaxel scales of 30 × 60, 20 × 20, 10 × 10 and 4 × 4 milli-arcseconds/spaxel
- an instantaneous FoV of approximately 152 × 214 = 32528 spaxels. For the four spaxel scales, this corresponds to an FoV of 6.42” × 9.12”, 3.04” × 4.28”, 1.52” × 2.14” and 0.61” × 0.86”

Specifications - Spectral

• Wavelength range from 0.47µm to 2.45µm

- Operation at resolving powers of R(≡λ/Δλ) ≈400, ≈3500, R≈8000 and R≈20000 in the near-IR, and R ≈ 3500 at visible wavelengths
- Instantaneous wavelength coverage of at least one band at a time at R≈8000 (I,zJ,H,K), two at R≈3500 (VR,IzJ,HK)

Specifications - Sensitivity

- Instrument throughput >35% average over 0.8 - 2.4 µm
- Instrument thermal background less than 20% of telescope (goal is 10%)

The following assumptions underlie the computations of limiting magnitudes:

- Signal to noise of 5 per spectral pixel for pt. sources (averaged over all pixels lying between bright OH night sky lines) or per spectral and spatial pixel (extended source) in 5 hours
- 0.67" atmospeheric seeing at zenith, 30 degrees zenith distance, LTAO correction, 900 sec individual exposures, RON of 2.6e- (near IR), 2e- (visible)

POINT OF CONTACT:

Ian Bryson (Instrument PI)
Head of Strategic Development,
UK Astronomy Technology Centre
Royal Observatory
Blackford Hill Direct: +44 (0)131 668 8238
Edinburgh EH9 3HJ Fax: +44 (0)131 668 8464
EMAIL: ian.bryson@stfc.ac.uk

CONSORTIUM:

- University of Oxford
- UK Astronomy Technology Centre, UK (UKATC)
- Centre de Recherche Astrophysique de Lyon, France (CRAL)
- Instituto de Astrofísica de Canarias, Spain (IAC)
- Centro de Astrobiologia, Instituto Nacional de Tecnica Aeroespacial (CAB-INTA)
- recent: Laboratoire d'Astrophysique de Marseille (LAM)
- recent: Centre Français de la Recherche Aéronotique , Spatiale et de Défence (ONERA)

WEBSITE:

http://www-astro.physics.ox.ac.uk/instr/HARMONI/

TIMELINE:

Expected project Phase B kick-off: October 2015. Instrument delivery and commissioning: as required for E-ELT first light.