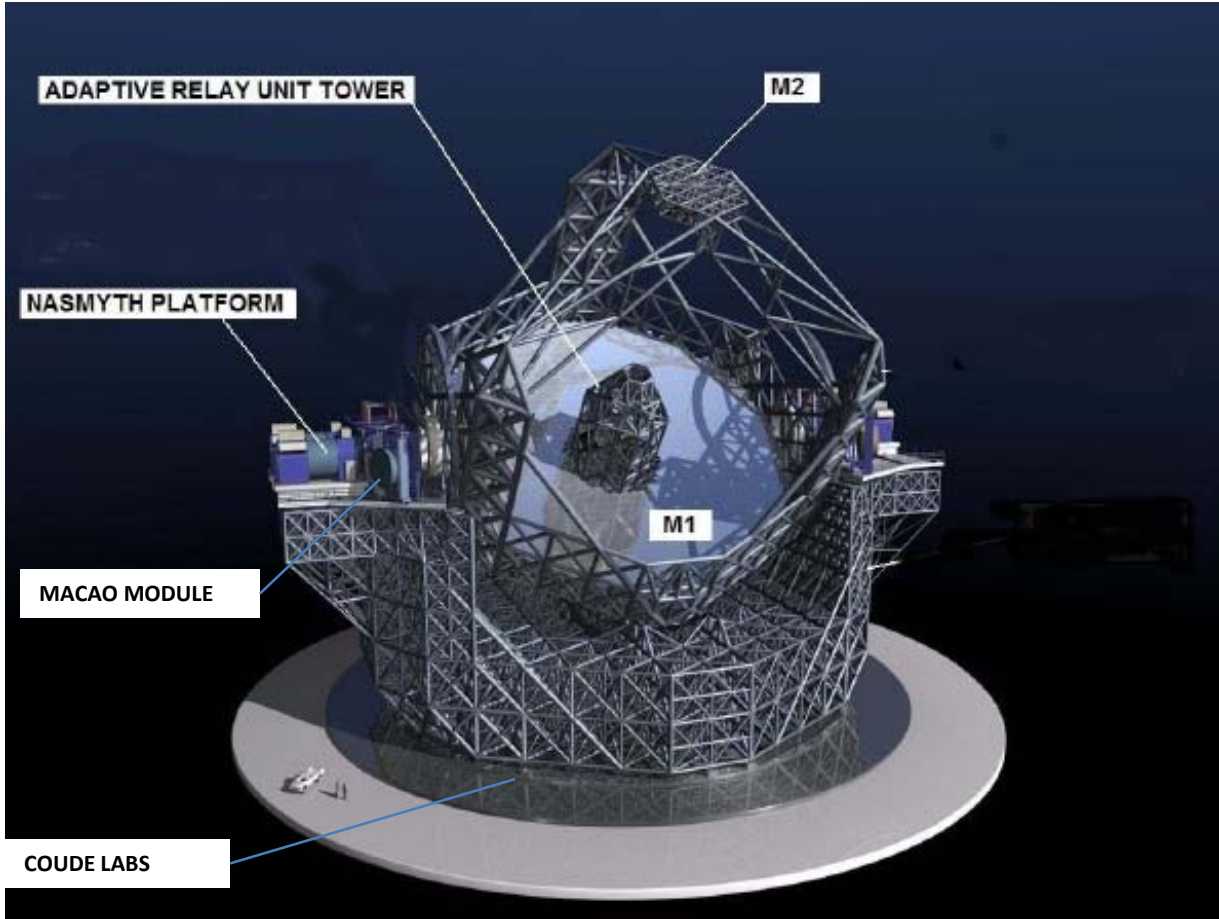


## SCOPE of WORK (from E-ELT Ins Study Plan, ESO/STC 430)

Within the telescope Phase B, to arrive by the end of 2009 to the definition of a *first generation instrument set*, to be included in the E-ELT construction proposal

- ❑ *Carry-out a suitable number of instrument studies to verify that instruments can be built at an affordable cost and that they properly address the scientific goals of highest priority*
- ❑ *Work with the ESO community in the instrument studies and to prepare for construction*
- ❑ *Work with telescope and operation POs to identify and define interfaces with the other subsystems and the observatory infrastructure*

# *Instrumentation Distribution at the Telescope*





# STATUS OF the 8 E-ELT INSTRUMENTS +2 Post Focal AO MODULE STUDIES – April 2008

<b>INSTRUMENT STUDY</b>	<b>MAIN OBSERVING MODES</b>	<b>PROCUREMENT MODUS / STATUS</b>
<i>EAGLE</i>	<i>WF, Multi IFU NIR Spectrograph. +AO</i>	<i>SSP / Agreement with Consortium of Institutes from France and UK</i>
<i>CODEX</i>	<i>High Resolution, High Stability Visual Spectrograph</i>	<i>ESO coordinates study with Institutes from Italy, Spain, Switzerland and UK</i>
<i>EPICS + XAO</i>	<i>Planet Imager and Spectrograph</i>	<i>ESO coordinates study with Institutes from France, Italy, Switzerland, UK</i>
<i>MICADO</i>	<i>NIR Camera sampling to the DF</i>	<i>Open Call/ Agreement with Consortium of Institutes from Germany, Italy, The Netherlands</i>
<i>HARMONI</i>	<i>Single IFU , Wide Spectral Band Spectrograph</i>	<i>Open Call/ Agreement with Consortium of Institutes from UK, France, Spain</i>
<i>MACAO Module</i>	<i>Provides DL images over a field up to 2 ' , with 2 additional DM</i>	<i>SSP/ Agreement with Consortium of Institutes from Italy and France</i>
<i>MIR Instrum.</i>	<i>Mid IR camera /spectrograph</i>	<i>Open Call/ Single proposal from METIS Consortium (Holland, Germany, Belgium, UK). Study agreement being negotiated</i>
<i>New Concepts</i>	<i>Left to the bidders to propose</i>	<i>Open Call for up to 2 fixed cost studies; deadline May 14</i>
<i>LTAO Module</i>	<i>Provides DL images over a field &lt;30''</i>	<i>Open Call for fixed cost study; deadline April 30</i>



# STATUS OF the 8 E-ELT INSTRUMENTS +2 Post Focal AO MODULE STUDIES

*Every instrument study to detail the science case, finalize the instrument requirements and develop an instrument concept including cost and construction schedule*

*6 instruments and 1 AO module studies under way at 25 Institutes (→ for a total of >80 FTEs) ; 3 more studies to come (Belgium France, Germany, Italy ,UK, Spain, The Netherlands,Switzerland)*

*For the most demanding Instruments/AO systems additional FP7 funding '08-'09*

- Further analysis & design work
- Breadboard & prototype of few key elements (CODEX, MAORY, EAGLE, EPICS)



# E-ELT INSTRUMENTATION STUDIES: **EAGLE**

<b>Instrument Initial Specs</b>	<u>Wide-field, multi IFU NIR spectrograph + AO</u> Wavelength range: 0.8-2.5 $\mu\text{m}$ / >20 arms , patrol field $\geq 5'$ / Spectral resolution: R=5000 (R>15000) / IQ: >30% EE in 100mas
<b>Location, AO mode</b>	GIF (tbc), MOAO (tbc)
<b>P.I. , Institutes</b>	<b>J.G.Cuby</b> ; France: LAM, OPM GEPI and LESIA, ONERA- UK: ATC, University of Durham
<b>Start, SpecsFreezing &amp; Delivery dates</b>	July 2007 July 2008 November 2009

# E-ELT INSTRUMENTATION STUDIES: **CODEX**

<b>Instrument Initial Specs</b>	<p style="text-align: center;"><u>High-resolution visual spectrograph</u></p> <ul style="list-style-type: none"> <li>• Wavelength range: 0.37-0.69<math>\mu\text{m}</math> (goal 0.35-0.72 <math>\mu\text{m}</math>)</li> <li>• Spectral resolution: <math>R &gt; 120000</math> (LowR <math>\sim 32000</math>)</li> <li>• Stability: 2 cm/sec over 30 years</li> </ul>
<b>Location, AO mode</b>	coudè, GLAO(tbc), active tip-tilt(tbc)
<b>P.I. , Institutes</b>	L. Pasquini, ESO, INAF Trieste & Brera, IAC, IoA Cambridge, Obs. Geneve
<b>Start, SpecsFreezing &amp; Delivery dates</b>	March 2008 March 2009 September 2009

# E-ELT INSTRUMENTATION STUDIES: EPICS

<b>Instrument Initial Specs</b>	<p style="text-align: center;"><u>Planet imager and spectrograph</u></p> <p>Wavelength range: 0.6-1.8 <math>\mu\text{m}</math> , Field D 2" (4"goal),          Contrast: NGS <math>V &lt; 9</math>, <math>10^{-9}</math> (100-800mas), etc</p> <ul style="list-style-type: none"> <li>➤ Spectroscopy <math>R &gt; 50</math>, Imaging in Y to H bands</li> <li>➤ Differential Polarimetry (R Band)</li> </ul>
<b>Location, AO mode</b>	Nasmyth, XAO ( 2-tbc- additional DM)
<b>P.I. , Institutes</b>	M. Kasper (ESO). ESO in collaboration with LAOG, LESIA, FIZEAU Lab., LAM, ONERA, Univ. Oxford, INAF Padova, ETHZ, NOVA
<b>Start, SpecsFreezing &amp; Delivery dates</b>	October 2007 (KickOff) July 2008 (end Phase 1) November 2009

# E-ELT INSTRUMENTATION STUDIES: MICADO

<b>Instrument Initial Specs</b>	<u>High angular resolution camera</u> <ul style="list-style-type: none"> <li>• Wavelength range: 0.8- 2.4 <math>\mu\text{m}</math></li> <li>• Field of view: =&gt;30"</li> <li>• sampling of DL</li> </ul>
<b>Location, AO mode</b>	Nasmyth, MCAO (LTAO or GLAO, tbc)
<b>P.I. , Institutes</b>	R. Genzel; MPE, MPIA, US Munchen, INAF Padova, NOVA (Leiden,Groningen)
<b>Start, Specs-Freezing &amp; Delivery dates</b>	February 2008 December 2008 September 2009





# E-ELT INSTRUMENTATION STUDIES: **HARMONI**

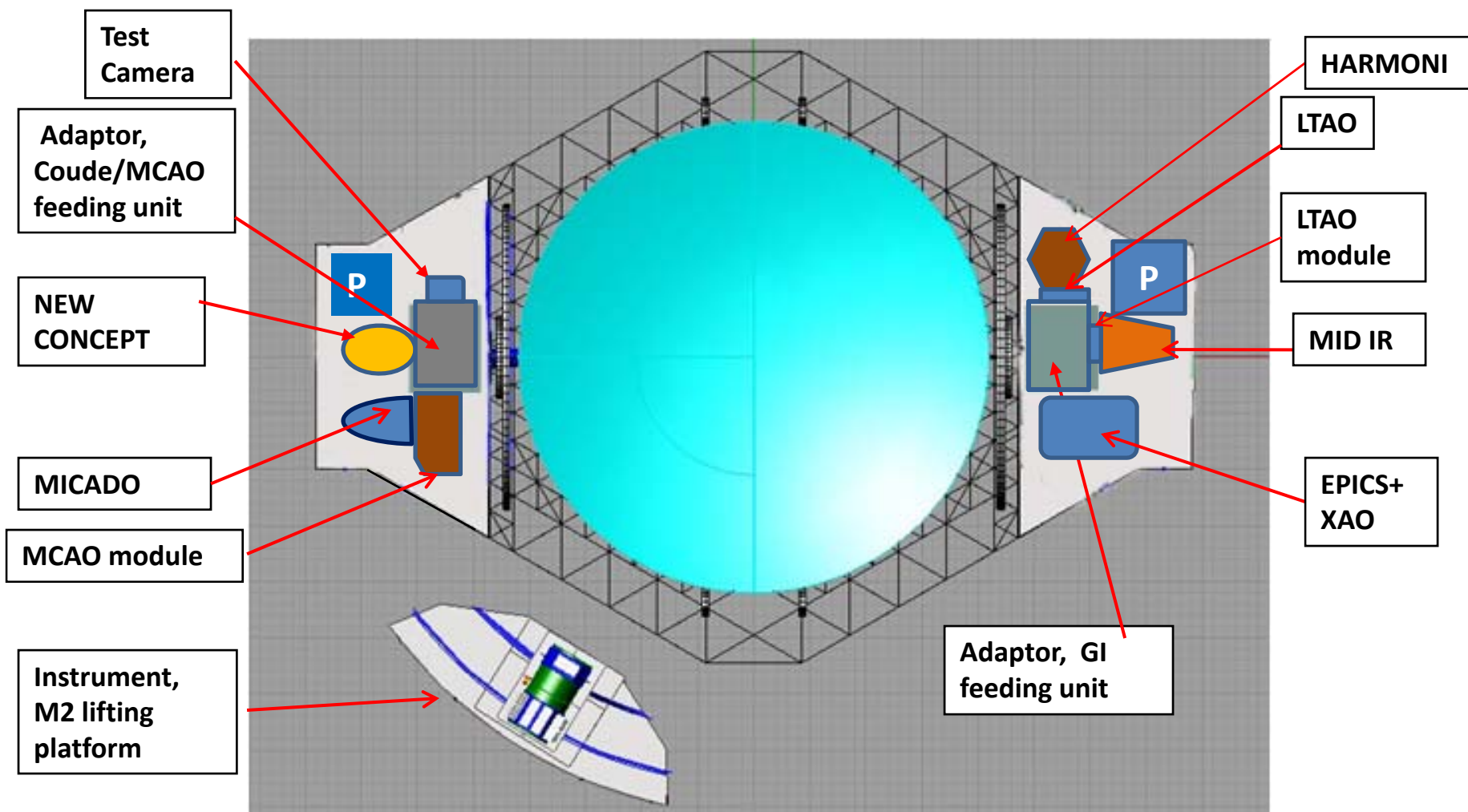
<b>Instrument Initial Specs</b>	<u>Single field, wide band spectrograph</u> <ul style="list-style-type: none"><li>• Wavelength range: 0.8-2.4 <math>\mu\text{m}</math> (0.5-2.4)</li><li>• Field of view: tbd</li><li>• Spectral resolution: R~4000 (option R~20000)</li></ul>
<b>Location, AO mode</b>	Nasmyth, LTAO (GLAO, MCAO tbc)
<b>P.I. , Institutes</b>	N.Thatte ; Oxford Univ., CRA Lyon, DAMI Madrid, UK ATC
<b>Study Start, Specs-Freezing &amp; Delivery dates</b>	March 2008 January 2009 December 2009

# E-ELT INSTRUMENTATION STUDIES: METIS

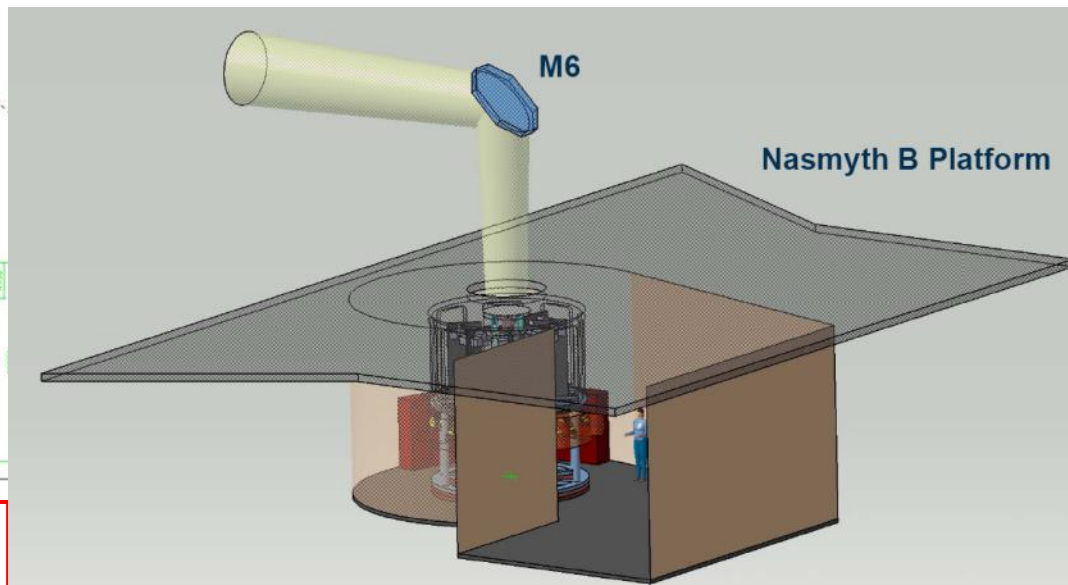
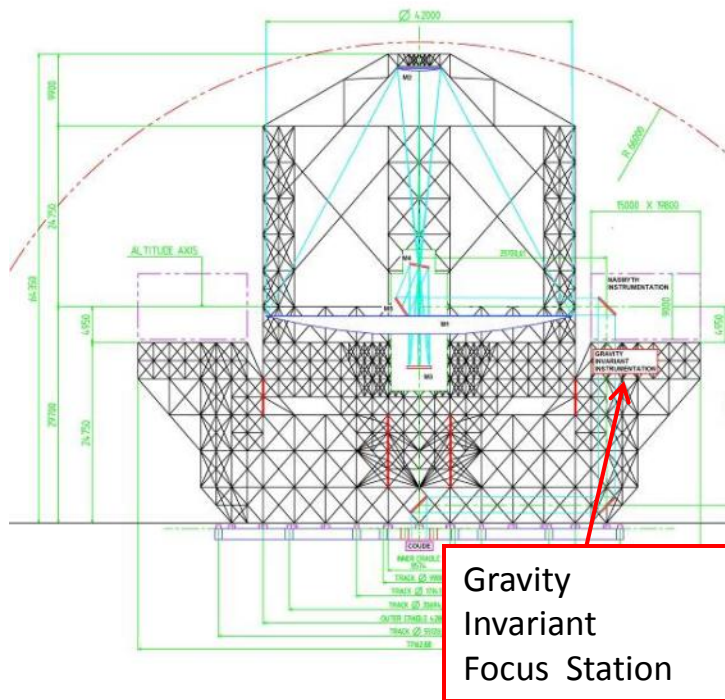
<b>Instrument Initial Specs</b>	<u>Mid-IR imager and spectrograph</u> Wavelength range: 3 - 13 $\mu\text{m}$ (L,M,N) ( Q,16-20 $\mu\text{m}$ , option) Imaging at DL and high Strehl, Field of view: => 30" diameter Spectroscopic modes to be considered: low (R=100 at N band), high (R=100000)
<b>Location, AO mode</b>	Nasmyth, By controlling M4 with an internal WS or in LTAO mode , additional cryogenic DM (tbc)
<b>P.I. , Institutes</b>	B. Brandl (Leiden), NOVA, MPIfA, UK Leuven, ATC, CE Saclay DSM/IRFU/SAP
<b>Study Start, Specs-Freezing &amp; Delivery dates</b>	April 2008 (pending agreement signature) December 2008 (tbc) October 2009 (tbc)

# “BASELINE” INSTRUMENT DISTRIBUTION (NASMYTH)- APRIL 2008

## MCAO & LTAO modules, MICADO, HARMONI, EPICS, MID IR , 1“NEW CONCEPT”



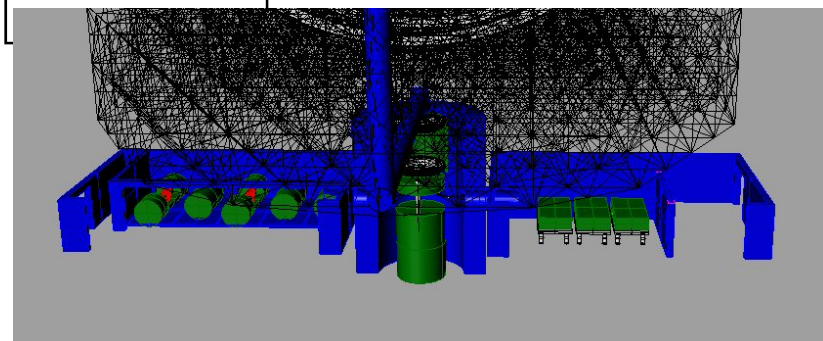
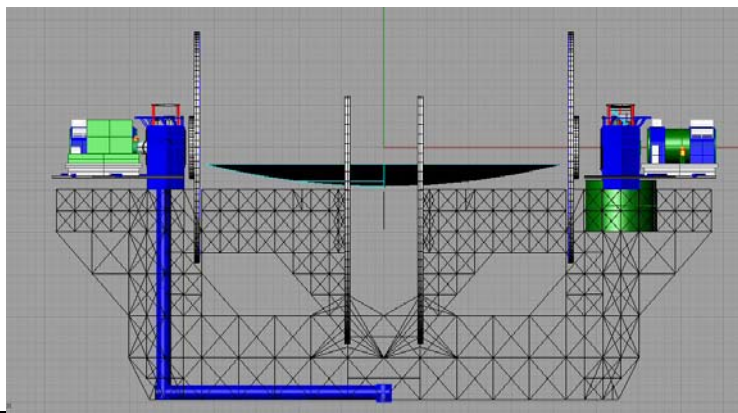
# BASELINE INSTRUMENT DISTRIBUTION (NASMYTH GI): EAGLE



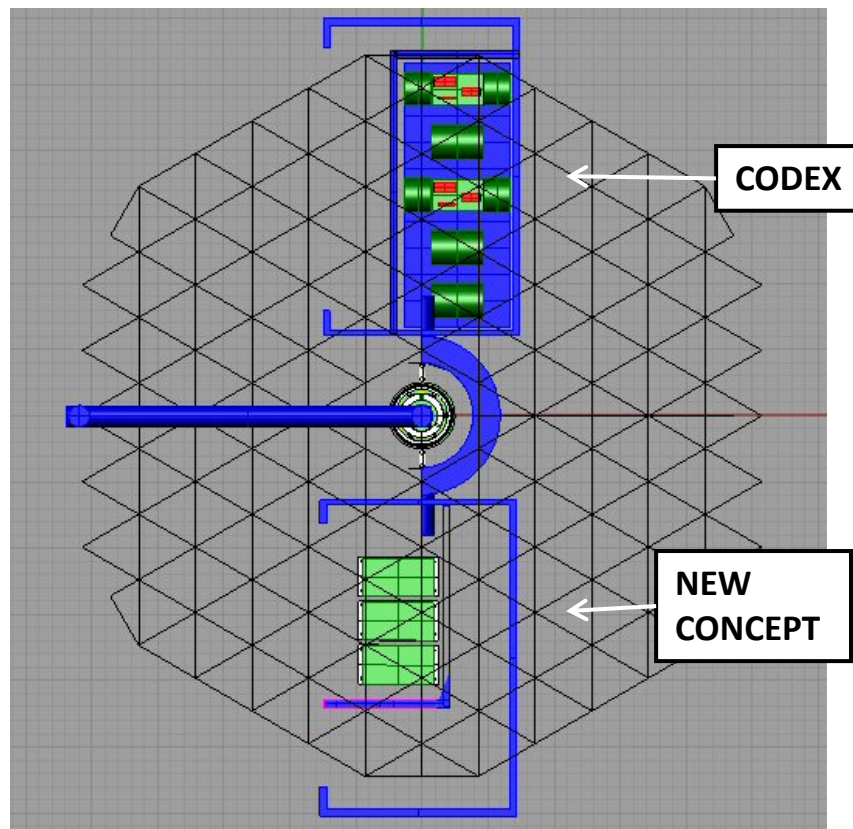
WIDE FIELD MOS, NIR SPECTROGRAPH supported by AO

# BASELINE INSTRUMENT DISTRIBUTION- APRIL 2008

## CODEX and possibly "NEW CONCEPT" at coudè Focus



**Coudé Focus environment provides stability to measure Rv to the accuracy needed for Earth-like planets and the expansion of Universe**





## Future Milestones

- **By the end of 2008** first phase of the studies mostly completed → firm specs , location at telescopes
- feedback used to consolidate interfaces to telescope and AO

- **By 4Q 2009** all studies completed (or advanced draft available) → updated science case, predicted capabilities, technical concept, interface to telescope and AO, cost, construction schedule

**ESO prepares proposal for 1<sup>st</sup> generation and sequence of implementation**

**1Q 2010 : instrumentation section of the E-ELT construction proposal is finalized**