MOSAIC

THE HIGH MULTIPLEX AND MULTI-IFU SPECTROGRAPH FOR THE ELT

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MOSAIC

WHERE

THE 39M ELT
CERRO ARMAZONES, CHILE

WHY

MOSAIC
A MULTI-PURPOSE INSTRUMENT FOR THE ELT

RESOLVED STELLAR POPULATIONS BEYOND THE LOCAL GROUP

FIRST GALAXIES & REIONISATION

GALAXY MASS ASSEMBLY

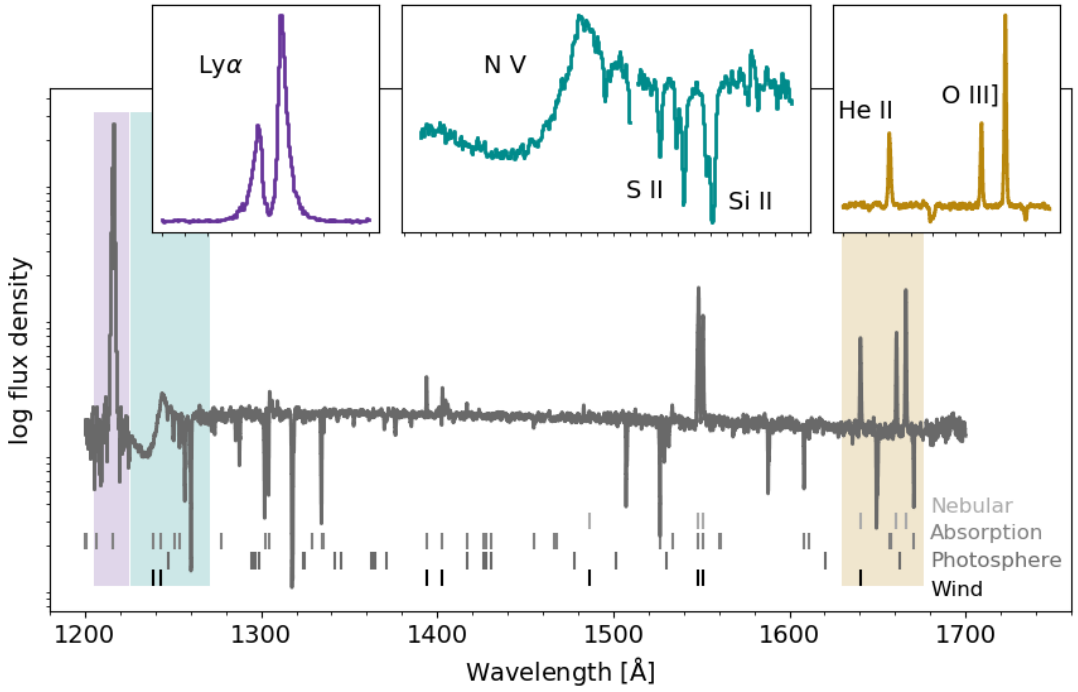
GALACTIC ARCHAEOLOGY

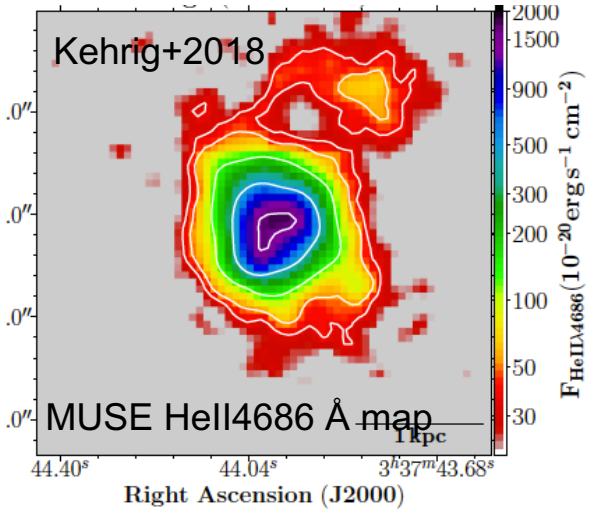
INVENTORY OF MATTER

TRANSIENTS & MMA

MOSAIC WHITE PAPER: EVANS+15
MOSAIC SURVEYS: PUECH+18

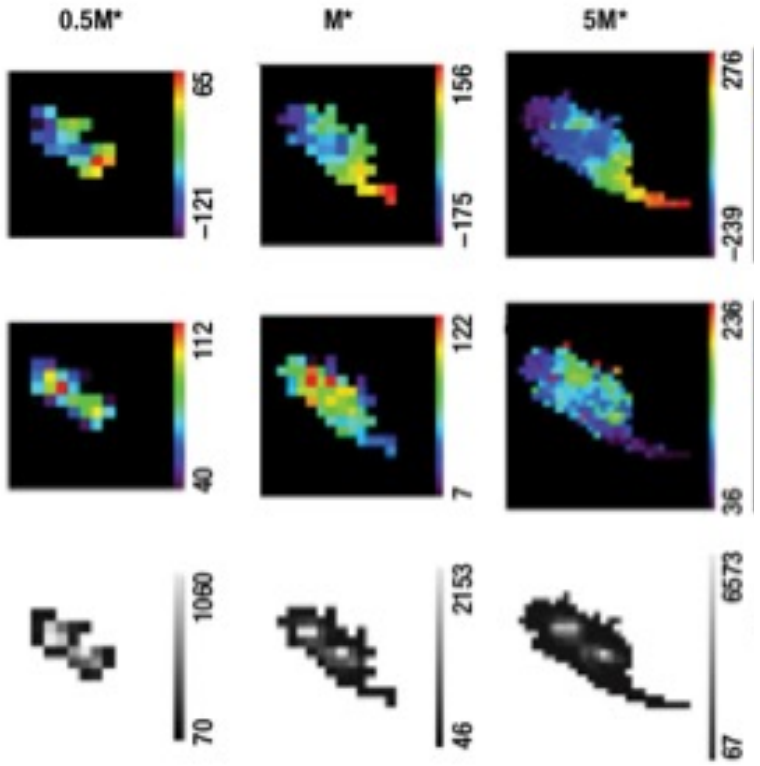
REST-UV SPECTROSCOPIC SURVEYS OF THOUSANDS OF GALAXIES AT Z > 6





GALAXY MASS ASSEMBLY

- ENVIRONMENT AND LARGE-SCALE STRUCTURE
- ISM PROPERTIES & EVOLUTION OF STELLAR POPULATIONS
- EMPHASIS ON SUB-L* GALAXIES: ~1000 GALS 2 < Z < 4

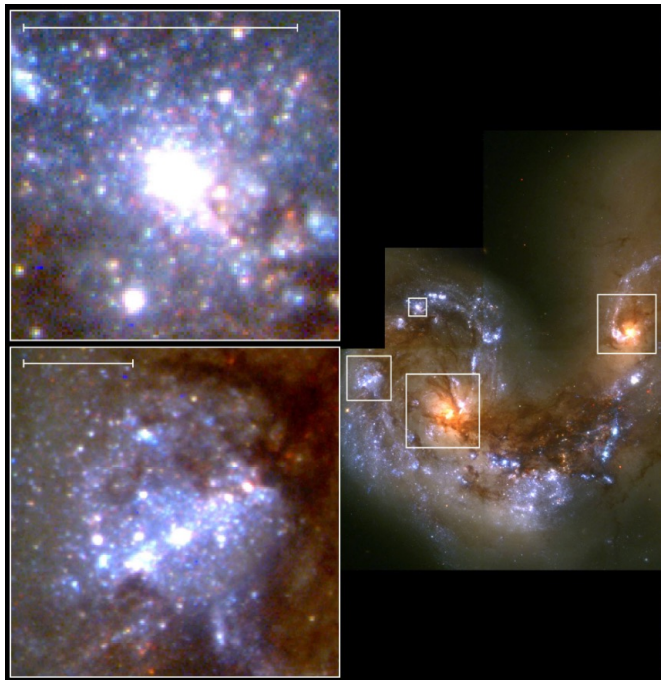


STELLAR POPULATIONS BEYOND THE LOCAL GROUP

EXTREMES OF STAR FORMATION:

- CHEMICAL ABUNDANCES AND PHYSICAL PROPERTIES OF O STARS OUT TO 5-6 MPC
- RED SUPERGIANTS UP TO 10s OF MPC
- YOUNG SUPER STAR CLUSTERS TO D >100 MPC

Antennae galaxies (NGC 4038/39)
(B. Whitmore, STScI / NASA)

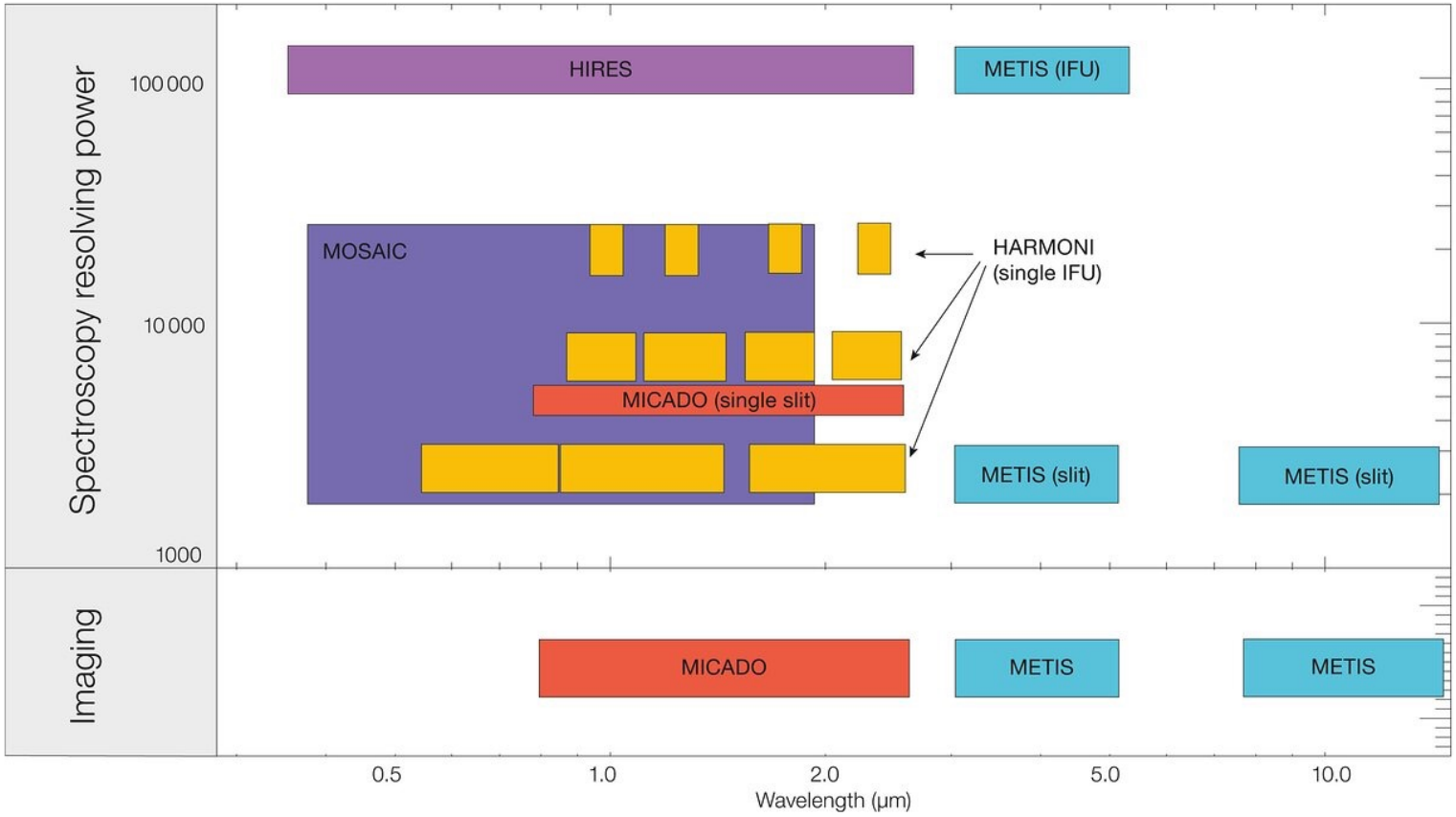


MOSAIC
TOP-LEVEL REQUIREMENTS

- VIS AND NIR SPECTRAL COVERAGE
- A RANGE OF RESOLVING POWERS
- EXPLOIT THE LARGE FOV AND COLLECTING POWER OF THE ELT
- A MIXTURE OF MODES, PROVIDING EITHER HIGH MULTIPLEX OR HIGH SPATIAL RESOLUTION

COMPLEMENT THE FIRST GENERATION OF ELT INSTRUMENTS & ENABLE UNIQUE SPECTROSCOPIC SURVEYS IN THE 2030s

MOSAIC
A MULTI-PURPOSE INSTRUMENT FOR THE ELT



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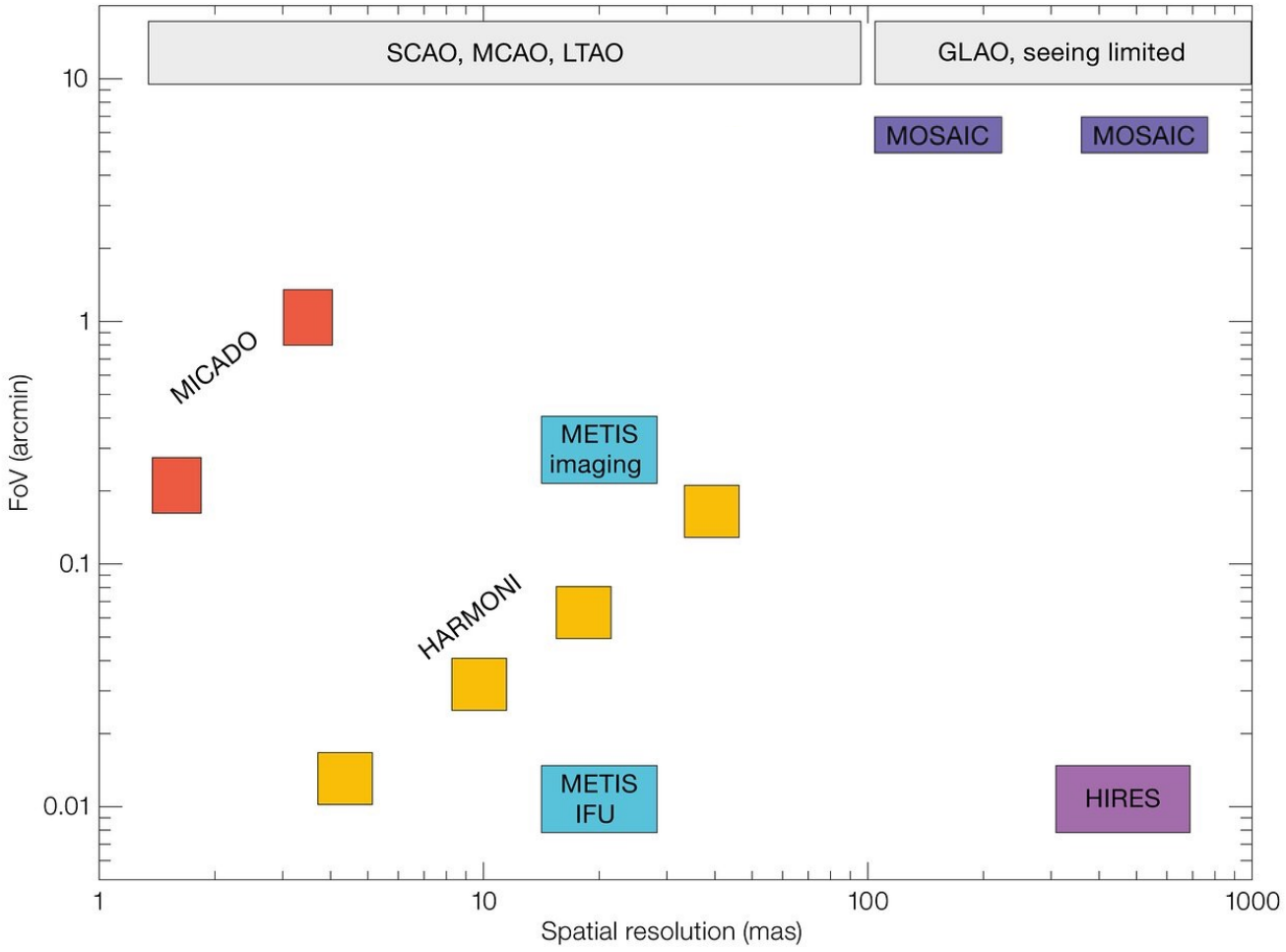
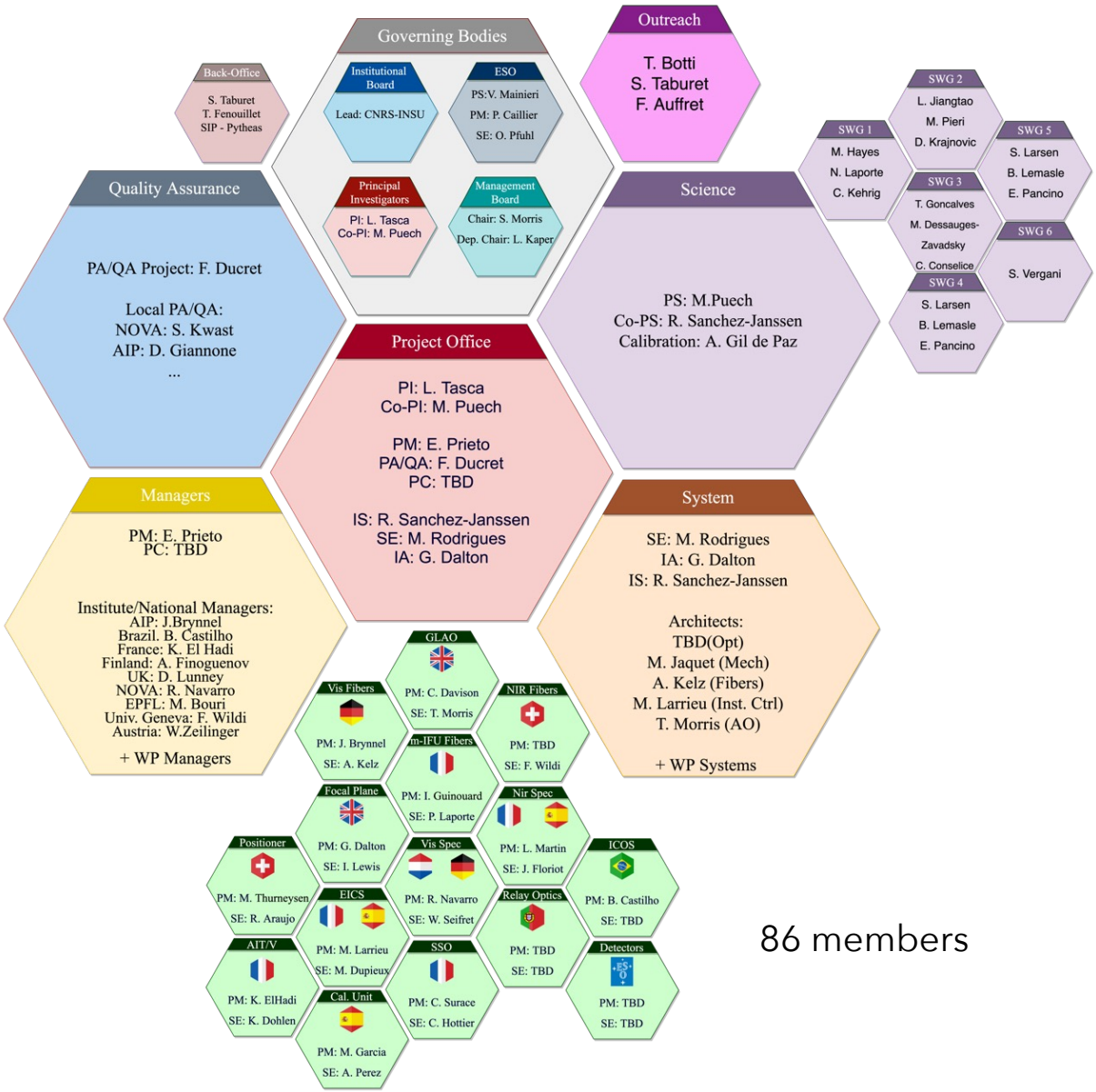


WHO

MOSAIC

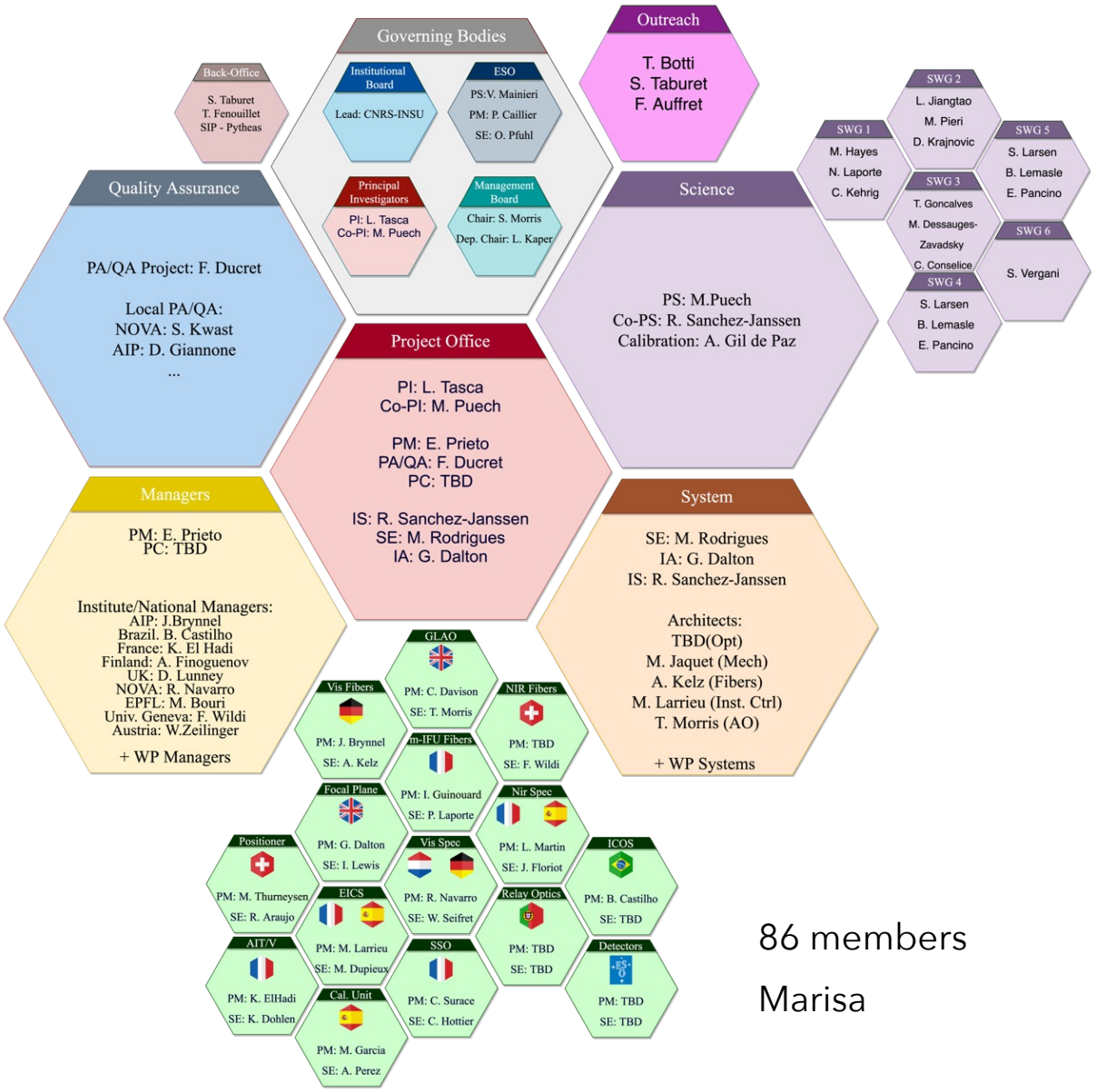


171 members

86 members

- France
- UK
- Netherland
- Germany
- Swiss
- Spain
- Brazil
- Portugal

MOSAIC



171 members

Jorge, Pepe, Polis, **Carol**

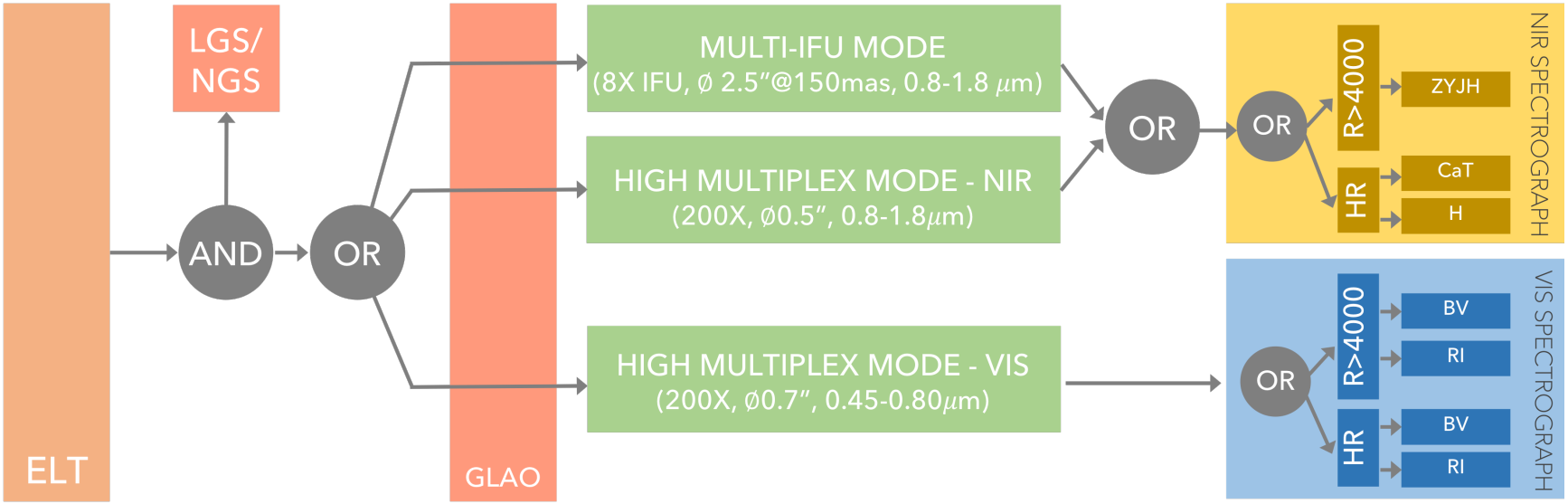
86 members

Marisa

- France
- UK
- Netherland
- Germany
- Swiss
- Spain
- Brazil
- Portugal

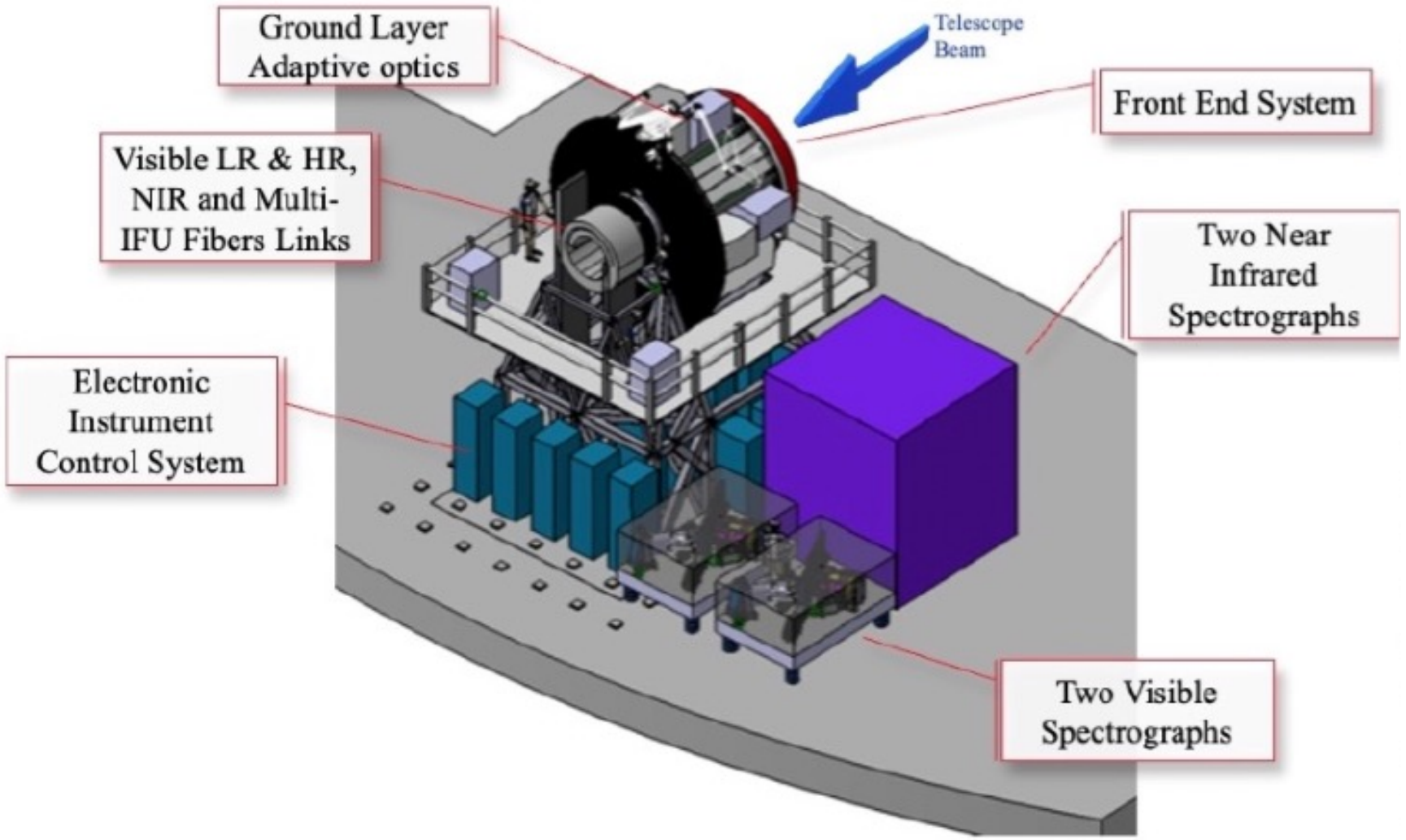
WHAT

AN EXTREMELY MODULAR ARCHITECTURE
DELIVERS THREE VIS/NIR OBSERVING MODES

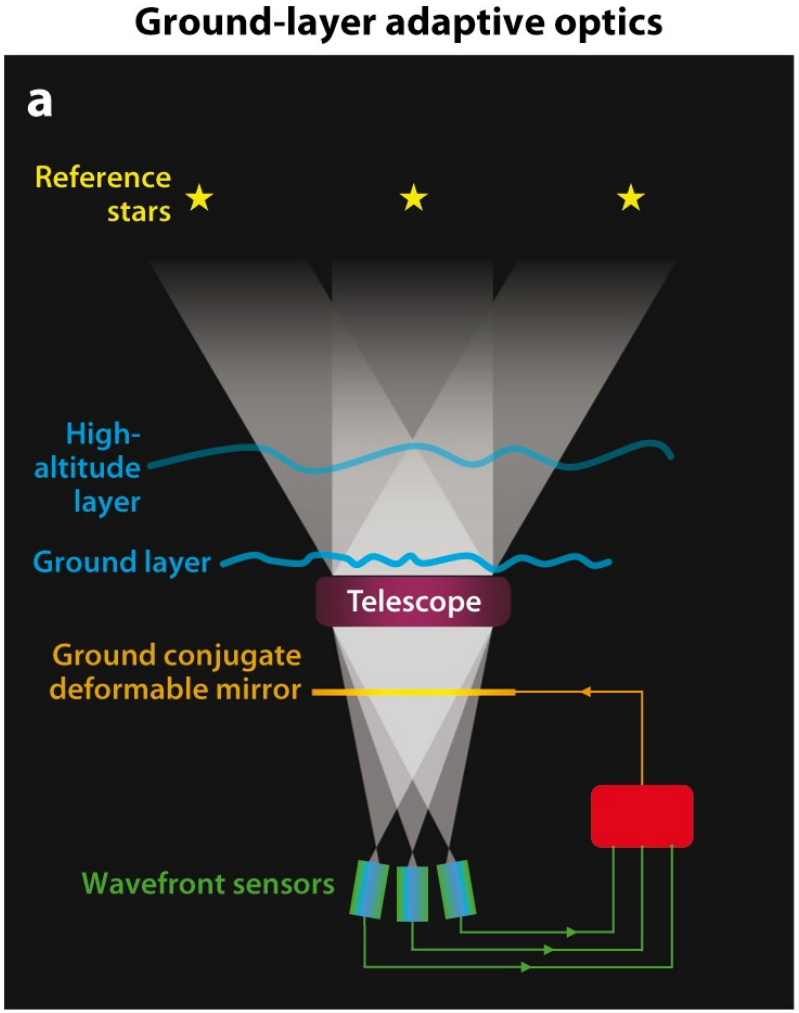


MOSAIC COMBINES THE ADVANTAGES OF A HIGHLY-MULTIPLEXED INSTRUMENT TARGETING NUMEROUS UNRESOLVED SOURCES, WITH ONE HAVING A MORE MODEST MULTIPLEX BUT THAT CAN RESOLVE SOURCES AT HIGH SPATIAL RESOLUTION (IFU). CAFFAU+11

MOSAIC IN A NUTSHELL

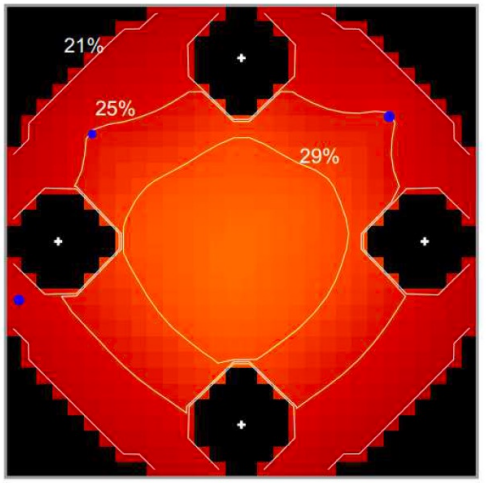


GOOD NEWS, EVERYONE! THE ELT IS *ADAPTIVE*
BUT M4 IS NOT CONJUGATED TO THE GROUND



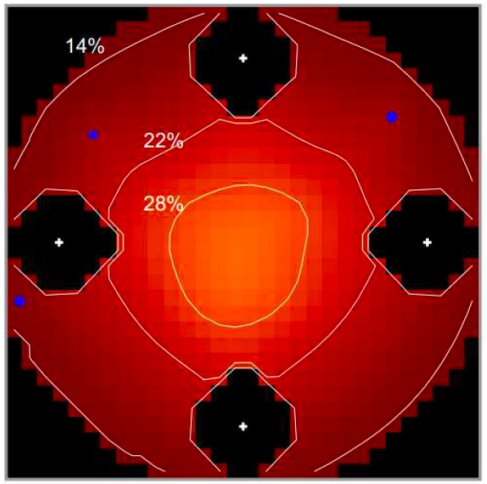
DAVIES & KASPER (2012)

0M CONJUGATION



4 LGS
3 NGS

600M CONJUGATION



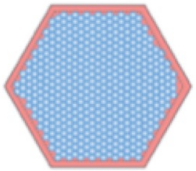
POSITIONERS & PICK OFFS

MOS apertures

Mode	VIS LR	VIS HR	HMM
Multiplex	200	100	200
Aperture ⌀	0.7”	0.7”	0.6”
Apertures density	6 /arcmin^2	4 /arcmin^2	6 /arcmin^2

IFU aperture

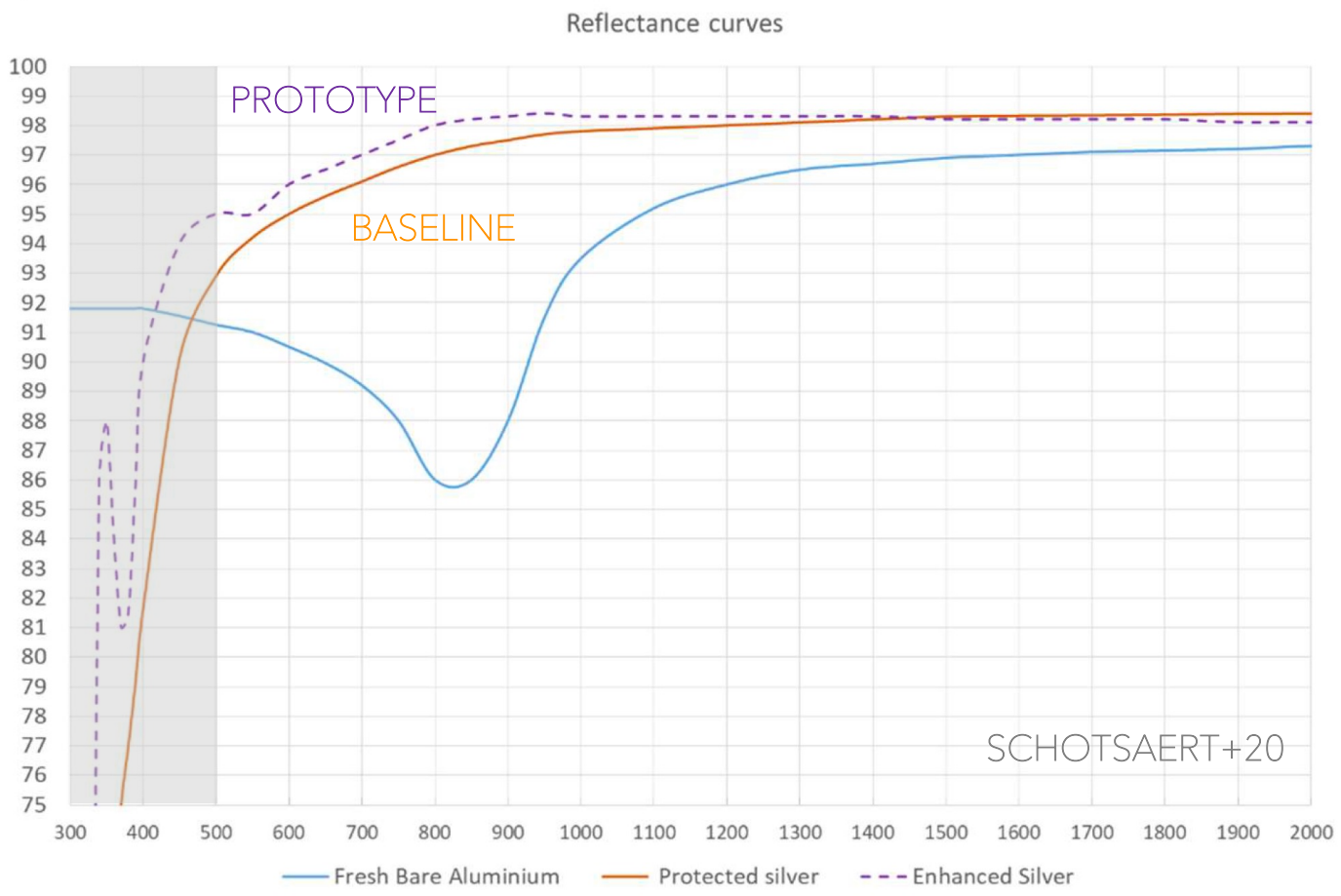
A Pick-off mirror in the focal plane redirect light toward NGS and IFU receiver that image the target into a IFU aperture



Multiplex	8
Aperture ⌀	2.5”
Spaxel size	150 *mas*
Apertures density	6 /arcmin^2

FIELD FRAGMENTATION IS REQUIRED TO COPE WITH ELT’S LARGE PLATE SCALE, WHICH WOULD OTHERWISE CALL FOR VERY LARGE AND FAST SPECTROGRAPHS

GOOD NEWS, EVERYONE! THE ELT IS *BIG*
BUT ALSO HAS 5 IR-OPTIMISED MIRRORS



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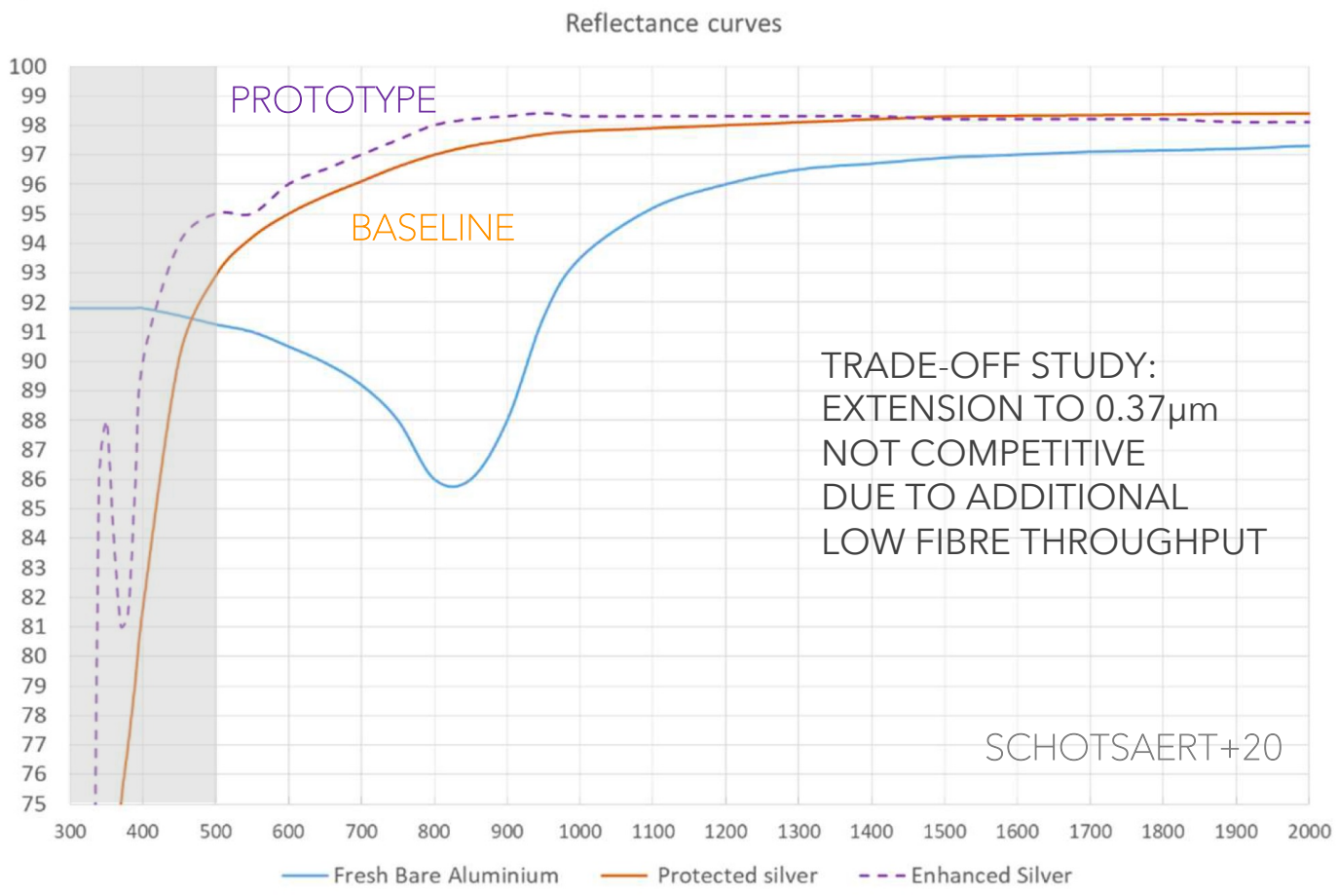


TOP-LEVEL REQUIREMENTS

REQUIREMENTS

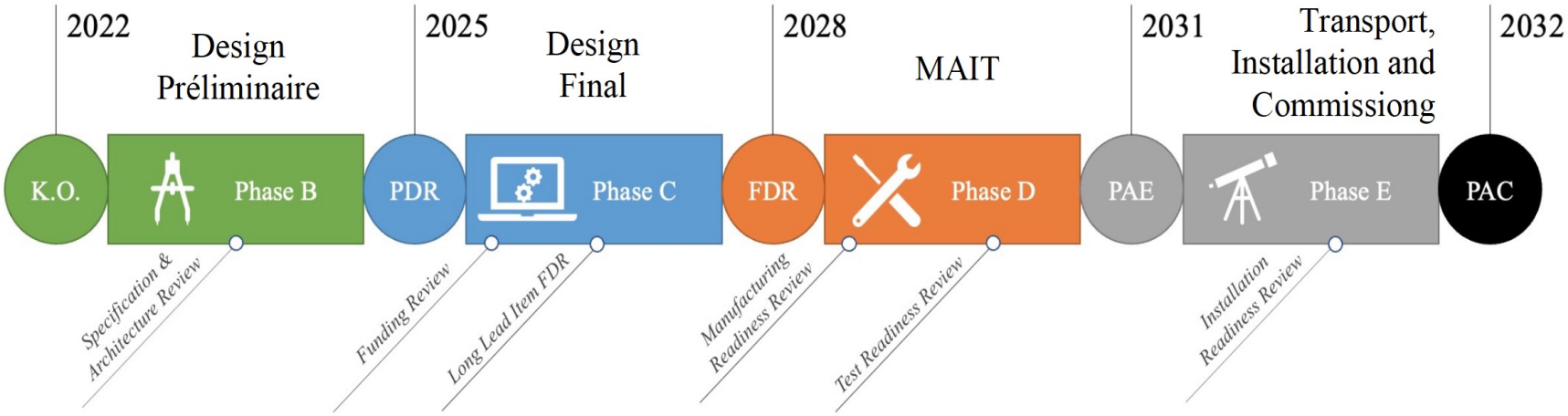
PARAMETER	MOS-VIS		MOS-NIR		mIFU	
	LR	HR	LR	HR	LR	HR
Multiplex	200	70	140	140	8	8
Wavelength coverage	0.39-0.77 μm	0.51-0.57μm 0.61-0.67μm	0.77-1.80μm	0.77-0.89μm 1.52-1.62μm	0.77-1.80μm	0.77-0.89μm 1.52-1.62μm
Resolution	4000	18,000 18,000	4000	9000 18,000	4000	9000 18,000
Aperture	0.7″	0.7″	0.6″	0.6″	2.5″	2.5″
Spaxel	N/A	N/A	N/A	N/A	0.150″	0.150″

NOTE: In the VIS the full wavelength range is covered in 3 exposures (cf 1 exposure in the NIR).

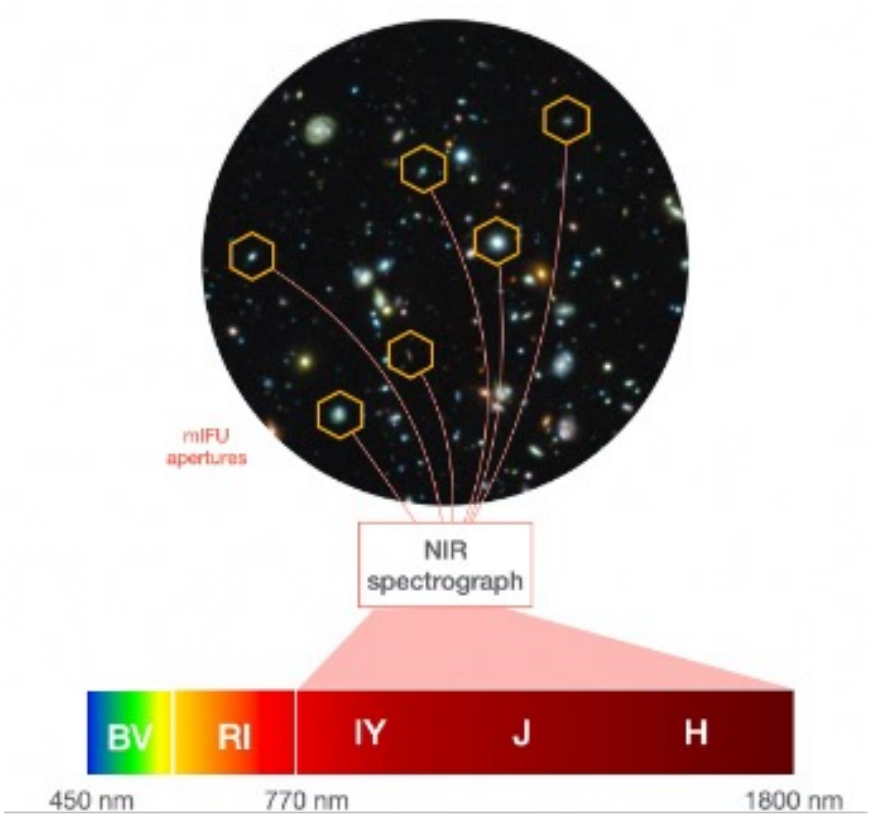
TYPICAL SPECTRAL SAMPLING IS 3-4 PIX PER RESOLUTION ELEMENT

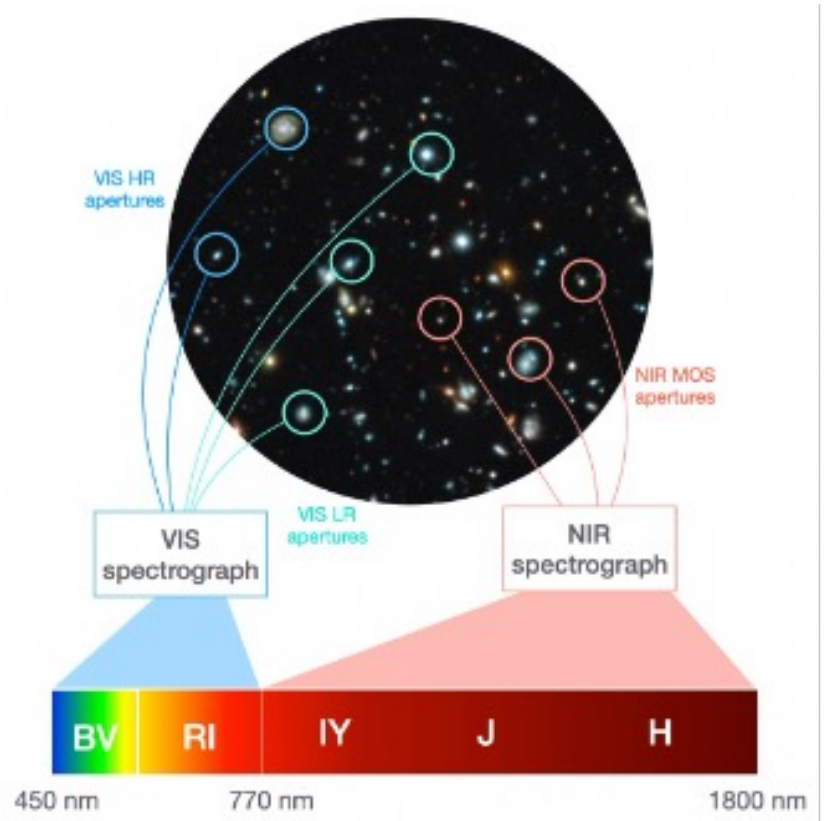
WHEN

TECHNICALLY-PACED SCHEDULE



MOSAIC IN THE 2030s

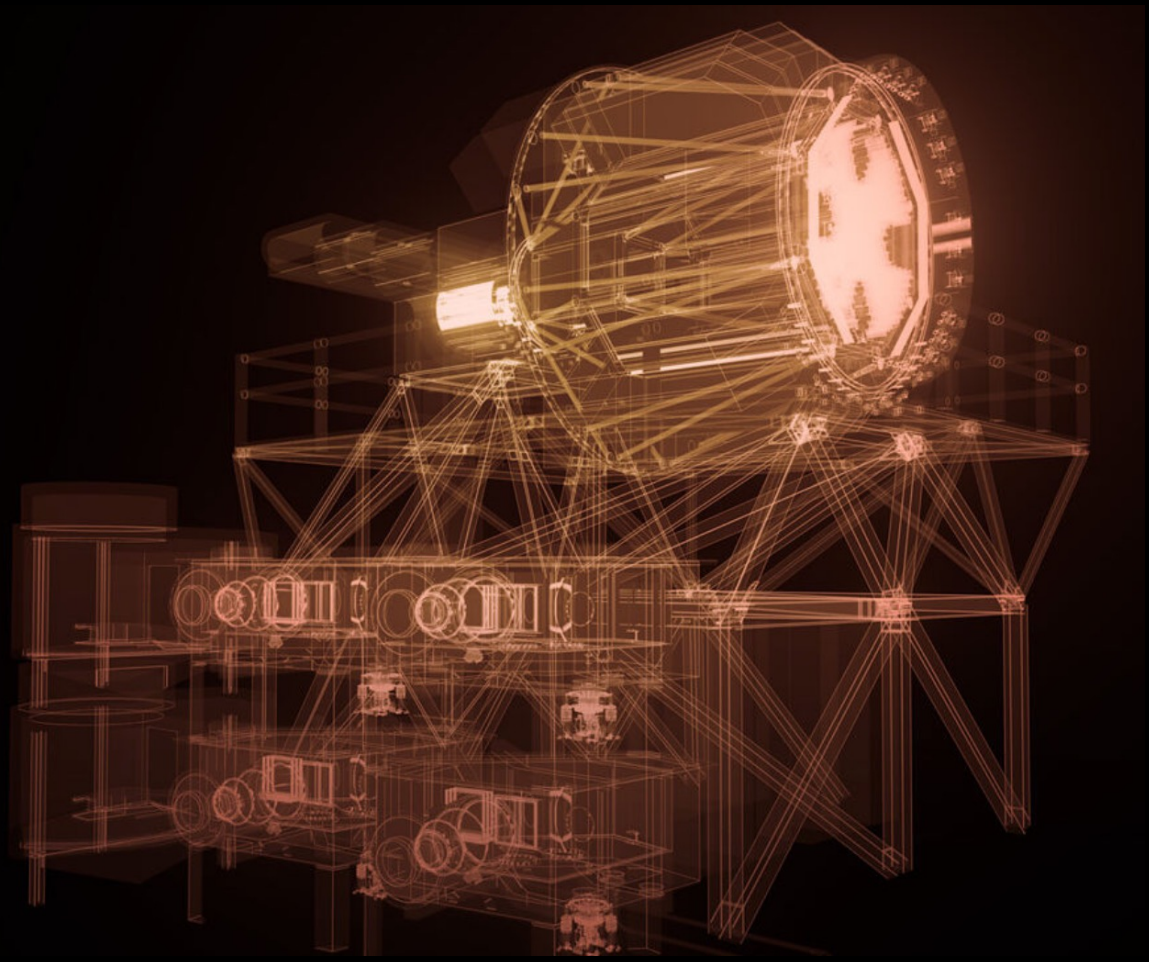




MOSAIC WILL EXCEL AT DEEP, PENCIL-BEAM SURVEYS OF FAINT SOURCES, PROVIDING HIGH SURVEY SPEEDS AND UNIQUE OBSERVING MODES – THUS OPENING A LARGE DISCOVERY SPACE FOR SCs WHERE STATISTICS PLAY A KEY ROLE

MOSAIC

THANKS!



MOSAIC
TOP-LEVEL REQUIREMENTS

GOALS

PARAMETER	MOS-VIS		MOS-NIR		mIFU	
	LR	HR	LR	HR	LR	HR
Multiplex	200	100	200	200	10	10
Wavelength coverage	0.39-0.87μm	0.39-0.44μm 0.51-0.57μm 0.61-0.67μm 0.83-0.87μm	0.77-1.80μm	0.76-0.90μm 1.52-1.63μm	0.77-1.80μm	0.76-0.90μm 1.52-1.63μm
Resolution	5000	20,000 20,000	5000	10,000 23,000	5000	10,000 23,000
Aperture	0.9″	0.9″	0.6″	0.6″	4″	4″
Spaxel	N/A	N/A	N/A	N/A	0.120″	0.120″

NOTE: In the VIS the full wavelength range is covered in 3 exposures (cf 1 exposure in the NIR).

SURVEY SPEED COMPARISON W/ HARMONI

- THE BETTER AO CORRECTION PROVIDED BY LTAO MAKES HARMONI FASTER FOR ALL OBSERVATIONS OF POINT SOURCES

- FOR EXTENDED SOURCES, MOSAIC'S ADVANTAGE IS ∝ # IFUs