• 21.9-m effective aperture
  – 7 mirrors / 8.4-m
  – 20’ FoV
• Early science mid-2019
  – With 4 mirrors
• All 7 mirrors and AO ~2022
• Located at Las Campanas

• First instruments
  – Optical MOS
  – Optical Echelle
  – Near-IR AO IFU/Imager

• Queue / Remote / Classical operating modes
GMT Partners

LSST Members
• Harvard
• SAO
• Texas A&M University
• University of Arizona
• Chile

Not LSST Members
• University of Chicago
• University of Texas - Austin
• Carnegie – DTM
• Carnegie – Observatories
• Australia
• South Korea
LSST Science Area

- Cosmological Parameters
- Weak Lensing
- Large-Scale Structure
- Strong Lenses
- Supernovae
- AGN
- Galaxies
- Transients
- Milky Way & Local Group
- Stellar Populations
- Solar System/NEA

Synergy with GMT

0% 10% 20% 30% 40% 50% 60% 70% 80% 90%
GMT Instrumentation Timeline: 1st Gen

- **G-CLEF** High resolution spectroscopy: **late-2019** [Andrew Szentgyorgyi]
  - $R = 100,000 / 40,000 / 25,000$ [S/N ~ 10 for $1^h$ at $r=22$]
  - Modes: Precision radial velocity / precision abundance / high throughput
  - 0.36 – 1 um (full coverage with dual-beam design)

- **GMACS** Multi-object optical spectroscopy: **mid-2020** [Darren DePoy]
  - $R = 1250$ (blue) and 2500 (red) [S/N ~ 10 for $1^h$ at $r=25$]
  - >80 slitlets per mask
  - FoV: >8 arcmin
  - 0.38 – 1 um (full coverage, dual-beam)

- **GMTIFS** AO near-IR IFU spectrograph / imager: **2021** [Peter McGregor]
  - $R = 5,000$ and 10,000
  - Image slicer IFU: 6, 12, 25, 50 mas spaxels (45 slits x 88 spatial x 4096 $\lambda$)
  - ZJHK coverage
  - Imager: 20” FoV; 5 mas pixels
Facility fiber feed: 2022 [Matthew Colless]

- FoV: 20 arcmin
- Single fibers / small deployable IFUs / image slicer fiber bundles
- Feeds for G-CLEF
  - 6 objects with full spectral coverage
  - 40 objects with limited order coverage
- Feed for GMACS
  - 200-300 objects
  - Image slicers to improve resolution (to 10,000)
  - Some deployable IFU bundles
- Minimum spacing < 10”
- Configuration in 2 min
ToO: Time Needed to Get on Target

- 5-15 minutes: depends on active instrument and desired instrument
- Best case: Use current instrument (but assume large slew)
  - Slew (2), Active Optics (3) = 5 min
- Intermediate:
  - Add AO setup time when AO needed (~5) = 10 min
- Worst case: Switch to AO instrument from large natural seeing instrument
  - Go to zenith (1), insert M3 (5), slew (1), Act Optics (3), AO (5) = 15 min
Exposure Time Calculators

- **G-CLEF:**

- **GMACS:**
  - [http://snagglepuss.as.utexas.edu/cgi-bin/gmacs.cgi](http://snagglepuss.as.utexas.edu/cgi-bin/gmacs.cgi)

- **GMTIFS (spectrograph):**
GMACS Conceptual Design

- Faint Object Spectrograph for the GMT
  - Wide-field
    - More than 100 arcminute$^2$
  - Multi-object
    - Direct slit plates
    - 1000 simultaneous targets at low resolution
  - Moderate resolution
    - 200-5000
  - Optical
    - 380nm to 1000nm simultaneous coverage
  - Seeing limited (0.7 arcsec slit)
- MANIFEST fiber feed allows access to entire 20 arcmin diameter GMT field
GMT

GMACS Conceptual Design

Expected S/N in 1 hr for R=2000

S/N per resolution element

$\frac{S}{N}$ vs. $i'$ [AB mag]

GMT + GMACS
Keck + DEIMOS

$10^2$
$10$
$1$

20 22 24 26 28
GMT

GMACS Conceptual Design

Galaxy at $z=5$
$i'' = 25.1$ AB mag
2 hrs. with Keck/DEIMOS

2 hrs. with GMT/GMACS

$F_\lambda [10^{-19}$ erg s$^{-1}$ cm$^{-2}$ Å$^{-1}]$

Wavelength [Å]
Example: CH$_4$ surrounded by LN$_2$ ice
END

www.gmto.org

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