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Key proposal

Panel: For office use.

Category: High Z Galaxies

Galaxy Formation in the Reionization Era

PI: Mark Dickinson — NOAO
 950 N. Cherry Ave., Tucson, AZ 85719 USA
 Phone: +1-520-318-8531

med@noao.edu

FAX: _____

CoI: Duncan Farrah — Virginia Institute of Technology farrah@vt.edu
CoI: Mauro Giavalisco — University of Massachusetts mauro@astro.umass.edu
CoI: Nimish Hathi — Laboratoire d'Astrophysique de Marseille mhathi@gmail.com
CoI: Akio Inoue — Osaka Sangyo University akinoue@las.osaka-sandai.ac.jp
CoI: Nobunari Kashikawa — NAOJ n.kashikawa@nao.ac.jp
CoI: Crystal Martin — U.C. Santa Barbara cmartin@physics.ucsb.edu
CoI: Masami Ouchi — University of Tokyo ouchims@icrr.u-tokyo.ac.jp
CoI: V. Tilvi — Arizona State University tilvi@asu.edu
CoI: Vivian U — U.C. Riverside vivianu@ucr.edu

Summary of observing runs requested for this project

Run	Instrument	No. Nights	Moon	Optimal months	Accept. months
1	IRMS	26	any		
2	IRIS	10	any		
3					
4					
5					
6					

Project goals:

- Constrain the process of reionization through measurements of Ly α emission and its correlation with galaxy properties and galaxy clustering
 - Survey galaxies at $7 < z < 19$ (??) to measure the evolution of the EW distribution down to lower luminosities and weaker EWs than is possible with JWST. Correlate Ly α emission with clustering and other galaxy properties.
- Constrain metallicity and excitation through observations of high-ionization UV emission lines (e.g., CIII], CIV, OIII], etc., $5.0 < z < 11.6$)
- Measure HeII 1640A ($4.9 < z < 13.7$) as a signature of primordial star formation
- Measure galaxy kinematics and of ISM velocity structure due to winds and outflows (also CIII], etc.)
- Map galaxy sizes and morphologies for a large galaxy sample, for comparison to models of early galaxy growth.

Predicted $N(z)$ for galaxies for 20 IRMS fields (63 arcmin^2)

Based on evolving UV LF parameters
from Finkelstein 2016.

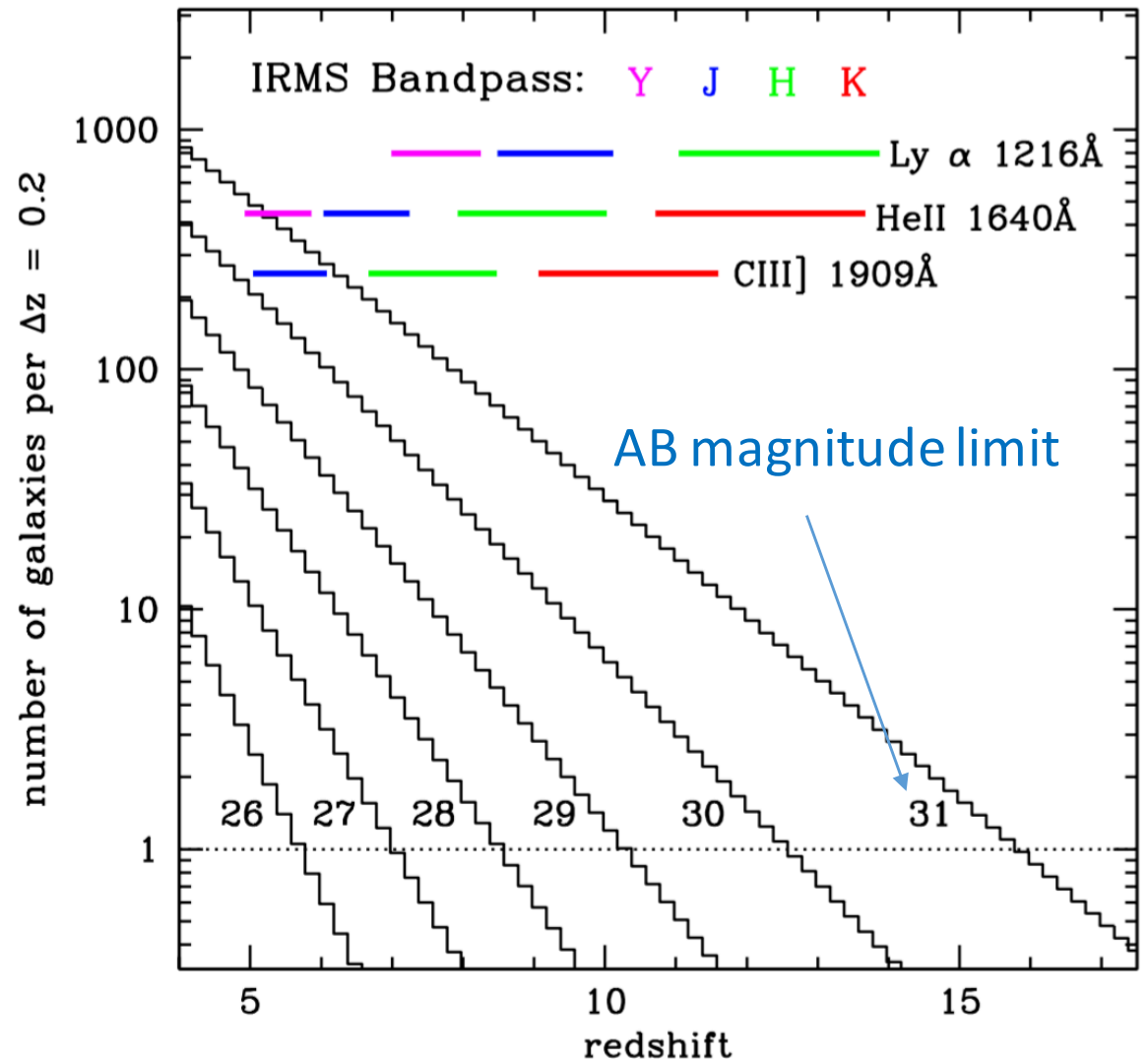
Samples will likely come from
previous JWST surveys of fields like
CANDELS.

Exposure time $\approx 10 \text{ ksec/band/mask}$
Line fluxes $> 1e-19 \text{ cgs}$:

- CIII] w/ $EW_0 > 10\text{\AA}$ @ $m < 29$
- Ly α w/ $EW_0 > 25\text{\AA}$ @ $m < 30.9$ -
30.4 @ $7 < z < 12$

20 fields $\rightarrow \sim 400$ galaxies

20 x 10 ksec x 4 bands x overhead
 ≈ 26 nights



Components of the survey

- IRMS survey of ~ 400 galaxies with $m < 29$ at $z < 13.5$ ($\text{Ly}\alpha$ @ $z < 19??$)
 - Spectroscopic redshifts and emission line measurements fainter than JWST
 - UV absorption lines fainter than JWST
 - $\text{Ly}\alpha$ emission to test reionization history, topology, correlations with galaxy properties
 - Hell for 'primeval' galaxies
 - UV metal lines for excitation, metallicity, kinematics ($\Delta v < 90$ km/s)
- IRIS IFU spectroscopy for spatial and velocity mapping of ionized gas for ~ 20 bright galaxies at $6.7 < z < 11.6$
 - 5h / target \rightarrow 20 nights
- IRIS imaging (in parallel with IFU) to measure sizes and detailed morphologies of a significant sample
 - 4.6x better diffraction limit than JWST