

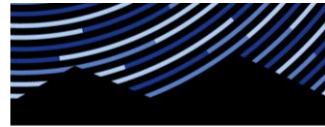
The Hobby-Eberly Telescope Dark Energy Experiment

Caryl Gronwall, Robin Ciardullo (PSU),
Karl Gebhardt, Gary Hill, Eiichiro Komatsu (UT),
Niv Drory (UNAM), & the HETDEX Team

HETDEX Consortium

University of Texas:

Josh Adams
Guillermo Blanc
John Booth
Mark Cornell
Taylor Chonis
Karl Gebhardt (PS)
Jenny Greene
Gary Hill (PI)
Eiichiro Komatsu
Hanshin Lee
Phillip MacQueen
Jeremy Murphy
Steve Odewahn
Marc Rafal (PM)
Richard Savage
Matthew Shetrone
Masatoshi Shoji
Sarah Tuttle
Brian Vattiat



McDonald Observatory
THE UNIVERSITY OF TEXAS AT AUSTIN

MPE/USM:

Ralf Bender
Maximillian Fabricius
Frank Grupp
Ulrich Hopp
Martin Landriau
Ariel Sanchez
Jan Snigula
Jochen Weller
Houri Ziaee pour

Others:

Carlos Allende-Prieto (IAC)
Viviana Aquaviva (Rutgers)
Niv Drory (UNAM)
Eric Gawiser (Rutgers)
Lei Hao (SHAO)
Donghui Jeong (Caltech)
Jens Niemeyer (IAG)
Povilas Palunas (LCO)



THE UNIVERSITY OF TEXAS AT AUSTIN

Department of Astronomy
1 University Station, C1400 • Austin, Texas 78712-0259

PENNSTATE



Texas A&M:

Richard Allen
Darren DePoy
Steven Finkelstein
Jennifer Marshall
Casey Papovich
Travis Prochaska
Nicolas Suntzeff
Vy Tran
Lifan Wang

Penn State University:

Robin Ciardullo
Caryl Gronwall
Ana Matkovic
Larry Ramsey
Don Schneider



AIP



AIP:

Svend Bauer
Roelof de Jong
Roger Haynes
Andreas Kelz
Volker Mueller
William Rambold
Martin Roth
Mathias Steinmetz
Christian Tapken
Lutz Wisotzki

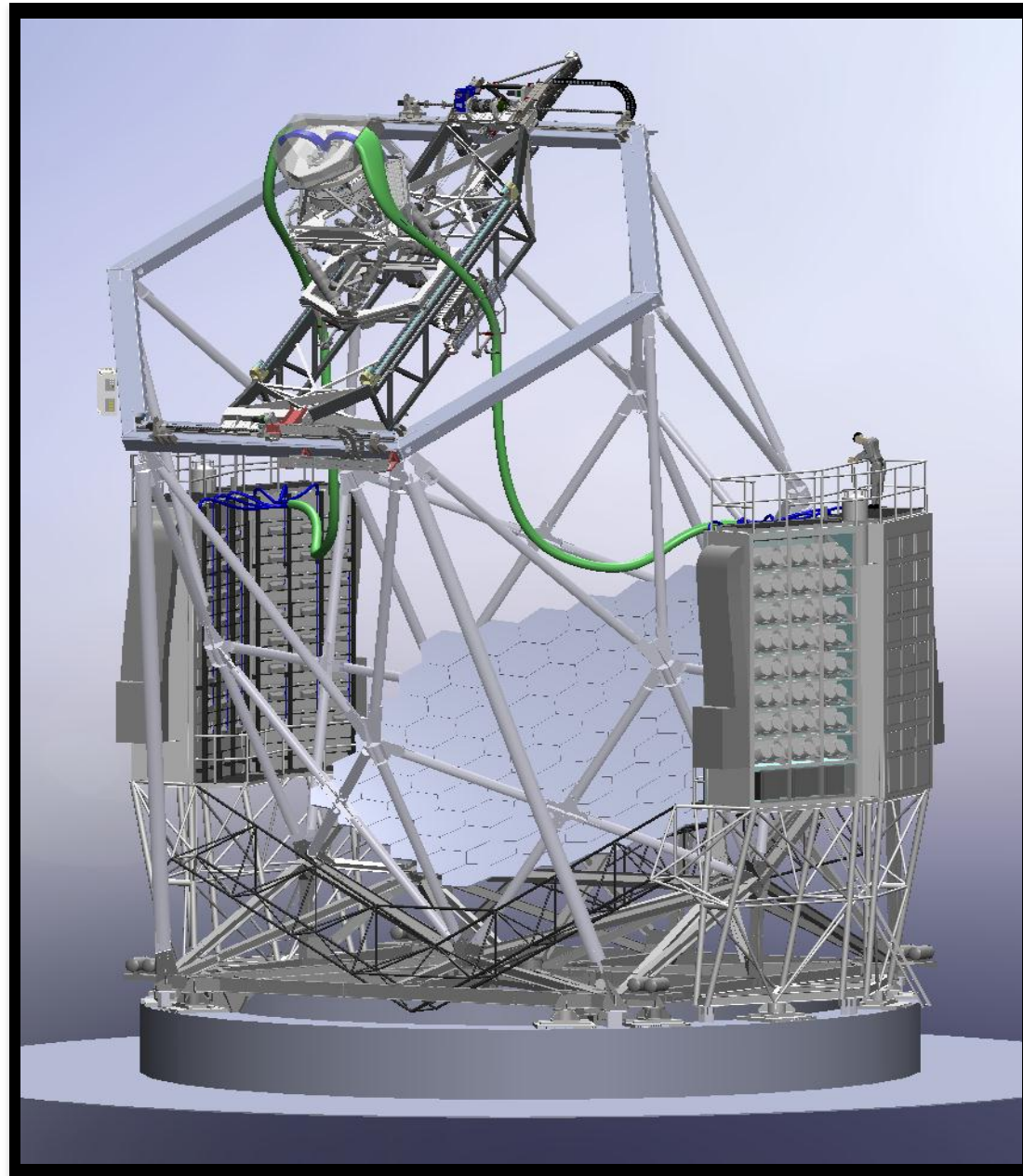


HETDEX is a spectroscopic survey to measure the **evolution** of Dark Energy via the Power Spectrum of **Ly α** Emitters between $1.9 < z < 3.5$.

The instrument for this project is **VIRUS**, the **V**isible **I**ntegral-field **R**eplicable **U**nit **S**pectrographs.

HETDEX is a 3-year Stage III DE experiment, which will begin in Fall 2012. It is extendable to 5 years (Stage IV).

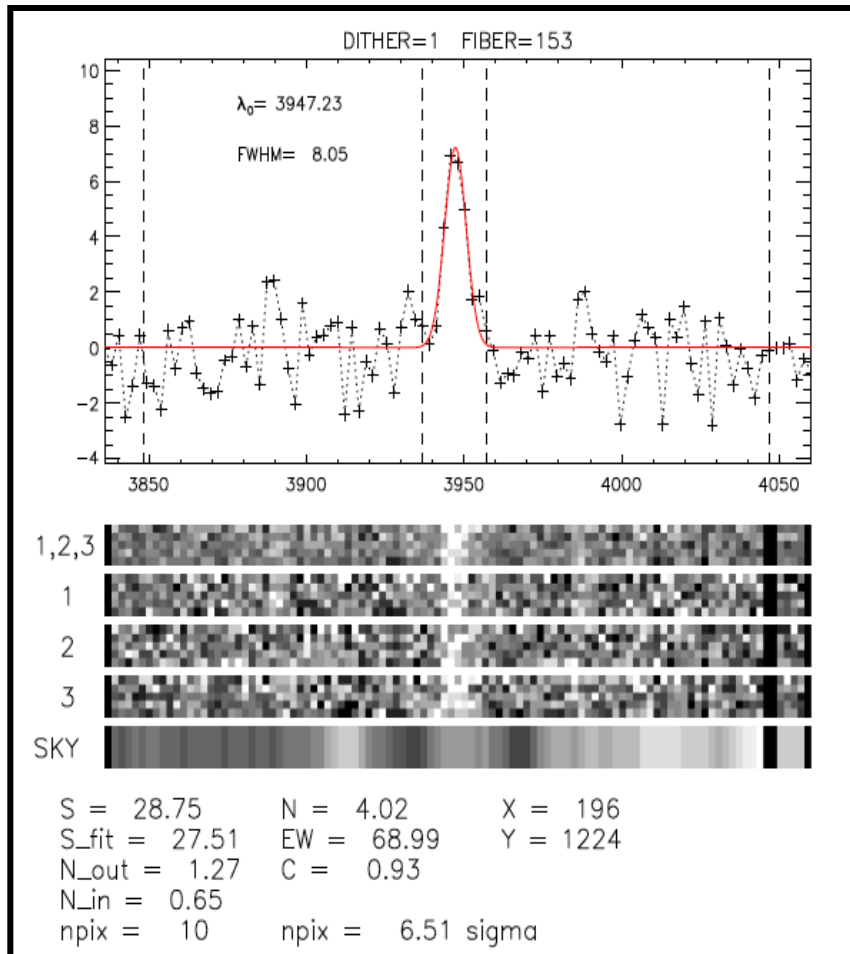
Total budget = \$37 Million including HET upgrade. Fully funded via private donations, institutions and the NSF.



Main **HETDEX** field will survey $\sim 300 \text{ deg}^2$ with a filling factor of 1 in 5. The primary field is in the north (42×7 degrees, centered at $RA=13 \text{ hr}$, $Dec=53 \text{ deg}$) to take advantage of the HET tracking.

There will also be a fall equatorial field which overlaps with part of Stripe 82 (28×4 degrees, centered at $RA=1.5 \text{ hr}$, $Dec=0 \text{ deg}$). 28 deg^2 (contiguous coverage) will be surveyed by Spitzer & HETDEX as part of the **SHELA** (Spitzer-HETDEX Large Area) survey.

HETDEX is a blind spectroscopic survey. Most of the fibers will fall on blank sky. But some will fall on $\text{Ly}\alpha$ emitters (and other galaxies and stars).



The **HETDEX** survey will consist of 20 min exposure time per field, divided into 3 dithers. The (5σ) survey limit is about $R \sim 22$ mag, or $F_\lambda \sim 3.5 \times 10^{-17}$ ergs cm^{-2} s^{-1} .

The Need for Imaging

Many objects will be single emission-line detections. Are they $\text{Ly}\alpha$ Emitters or foreground $[\text{O II}] \lambda 3727$ emitters? We need imaging to $g \sim 25$ mag to accurately measure EW in order to discriminate between $\text{Ly}\alpha$ and $[\text{O II}]$.

Deeper multi-color imaging enables additional science goals: (particularly grizY+IRAC in SHELA region) will enable additional science goals. The primary goal of SHELA is to measure the stellar masses and stellar mass functions of galaxies in the HETDEX redshift range, $1.9 < z < 3.5$, as a function of halo mass and environment. Valuable dataset for galaxy evolution, AGN, and LSS science.

Even deeper ugrizY imaging (to $\sim 27^{\text{th}}$ mag) would enhance legacy value of this dataset!

Expected Database

When completed, the **HETDEX** database will contain spectra for

- 0.75 million **Ly α** emitting galaxies between $1.9 < z < 3.5$
- 1 million **[O II] $\lambda 3727$** emitting galaxies with $z < 0.5$
- 0.4 million other galaxies
- 0.3 million **Milky Way stars** down to $R \sim 22$
- 2000 rich galaxy clusters (Abell class $R > 1$)
- $\sim 10^4$ **Quasars** ($z < 3.5$) + 10^5 **AGN**
- A bunch of asteroids, supernovae, intragroup **PN**, etc.

Numbers increase by substantially with parallel observations!

What HETDEX will do for DES/DECam community:

- provide blue ($< 5500 \text{ \AA}$) spectra for >0.5 million objects
- Help calibrate photo-z's
- Enable other science via spectroscopy
- Consider expanding equatorial coverage to all of Stripe 82

What DES/DECam will do for HETDEX:

- Provide deep u(?)griz imaging
- Help discriminate Ly α and [O II]
- Enable measurement of SEDs and stellar masses
- Consider even deeper ($\sim 27^{\text{th}}$ magnitude) ugriz imaging of SHELA imaging as a community legacy project. Make SHELA field one of the SNe fields?