E-ALFA
Meeting Summary
15-17 March, 2003

Karen O’Neil
TOC chair
Participants

• 30/63 registered consortium members present

• 22 Institutions represented

• 9 Countries represented
Proposed Surveys

1. All Sky Survey
2. Galaxy Environment Survey
3. ZOA Survey
4. Deep Strip Survey
5. Very Deep Survey
Proposed Surveys

1. All Sky Survey
2. Galaxy Environment Survey
3. ZOA Survey
4. Deep Strip Survey
5. Very Deep Survey
All (Arecibo) Sky Survey

- Examine HIMF at the $10^6$-$6.5$ level

---

$\Phi$ (Mpc$^{-3}$) vs. $M_{\text{H}_2}/M_\odot$

Rosenberg & Schneider '02

Zwaan, etal '97
All (Arecibo) Sky Survey

- Examine HIMF at the $10^{6-6.5}$ level

Zwaan, et al. '03 [HIPASS]
All (Arecibo) Sky Survey

- Reaching $\leq 6 \text{ mJy/beam}$
All (Arecibo) Sky Survey

- Requires ~6-12 s/beam
- Drive at 2-3 times drift mode
- Drive in R.A., step in Dec
- Need repeated scans across each beam
- Need to further test stability for driven scans and to test for daytime observing
- Full Arecibo sky would take 1000-??? hours
Proposed Surveys

1. All Sky Survey
2. Galaxy Environment Survey
3. ZOA Survey
4. Deep Strip Survey
5. Very Deep Survey
Galaxies and Environment

• Examine the properties of galaxies within a variety of environments

• Includes groups, clusters, and isolated galaxies

• HIMF to \( \leq 5 \times 10^6 \ M_\odot \) within groups

• Detect HVCs with \( \Delta v = 25 \) km/s
Galaxies and Environment

Regions to be studied:

• Virgo Cluster
• Canes Venatici
• Around large, local galaxies
• Around dwarf groups
Galaxies and Environment

- Virgo Cluster
  - 200-300 sq. degrees
  - $4-5 \times 10^6 \, M_\odot$ limit at 15Mpc
  - 120-150 s/beam
  - Total = 300-600 hours
Galaxies and Environment

- Virgo Cluster
- Canes Venatici

- Two groups - 3 and 10 Mpc distance
- RA~12.5h, δ~30-40°
- HI rich environment
- 100 sq. degrees available
- 3-5x10^6 M_☉ limit
- ~300 s/beam
- Total = 200-300 hours
Galaxies and Environment

- Virgo Cluster
- Canes Venatici
- Large, local (<10Mpc) galaxies
  - Examine outer HI edges
  - Look for HVCs
  - Approximately 100 candidate galaxies
  - 1 sq deg./galaxy, 100 sq. deg. total
  - $4-5 \times 10^6 \ M_\odot$ limit (or less)
  - 300 s/beam
  - Total = 200-30 hours
Galaxies and Environment

- Virgo Cluster
- Canes Venatici
- Large, local (<10Mpc) galaxies
- Dwarf Groups

- Exploration of different environments
- Approximately 100 sq. deg. total
- $5 \times 10^6 \, M_\odot$ limit
- 300 s/beam
- Total = 200-300 hours
Galaxies and Environment

- Virgo Cluster
- Canes Venatici
- Large, local (<10Mpc) galaxies
- Dwarf Groups

- 500 sq. degrees surveyed in all
- Approx. 1000-1500 hours
- Survey could be driven or drift
Proposed Surveys

1. All Sky Survey
2. Galaxy Environment Survey
3. ZOA Survey
4. Deep Strip Survey
5. Very Deep Survey
ZOA

- Local, large-scale structure
- Want to reach at least $M_\star$ at 100 pc
- Possibly also including more distant survey

- Positional accuracy is critical
- Double drift scan with nyquist sampling
- 700 hours observation for entire Milky Way
  \[ \Rightarrow \sim 5 \text{ mJy with 5 km/s resolution} \]
- Must be compared with results from upcoming Parkes ZOA survey
Proposed Surveys

1. All Sky Survey
2. Galaxy Environment Survey
3. ZOA Survey
4. Deep Strip Survey
5. Very Deep Survey
Deep Strip Survey

Trace the HIMF to at least 1 magnitude less than previous surveys
($10\sigma = 10^7 M_\odot$ at $10\text{Mpc}$)

Trace the HIMF across a variety of environments
Deep Strip Survey

- 50-100 MHz (depending on RFI)
- 4096-8192 channels/ 2 Polarizations
- Cross-correlation preferred but 9-level sampling is enough

Total of 600-700 hours
Deep Strip Survey

• 1° x 300° strip, 80s/beam

• Drift Scan mode, stepping by 1 beam to provide uniform sensitivity

• Nighttime observations may be desired

• No declination chosen yet

Total of 600-700 hours
Very Deep Survey

How Does the Density of Cool Gas evolve with time?

• Models, based on multi-λ observations, (Madau plots etc), predict $\Omega_{\text{gas}} \propto (1+z)^{3.2}$ at low-z (Pei & Fall 1999).

• Damped Ly-α absorption lines suggest $dN_{\text{DLA}}/dz = 0.05(1+z)^{1.1}$, implying NO intrinsic evolution of $>2\times10^{20}$ cm$^{-2}$ absorbers - i.e. constant co-moving gas density (Storrie-Lombardi & Wolfe 2000).
Proposed Surveys

1. All Sky Survey
2. Galaxy Environment Survey
3. ZOA Survey
4. Deep Strip Survey
5. Very Deep Survey
Very Deep Survey

- To differentiate between evolving and non-evolving HI density, need to be able to discern a 50% change in density at $z=0.15$.
- Need $\sim 40$ galaxies with $M \sim 10^{9.5} \, M_\odot$ for detection at 99% CL.
Very Deep Survey

Required observing parameters

• 200 MHz, 2 pol, 7 beams (need high-z)
• Multi-bit (9-levels or more)
• Radar blanking, or v.fast dumping (1ms)
• 8192 channels (need 5 km/s resolution)
• Nighttime observations (willing to test days)
• Need calibration and beam parameters for all ZA
• Decl. near 17.5 deg or 19.5 deg, |b|>30 deg
• Could be near/within existing deep field
Very Deep Survey

- Possible survey parameters:
  - $\text{rms} \sim 0.05 \text{ mJy/beam}$ (260x deeper than HIPASS)
  - $0.36 \text{ deg}^2$ in 1000 hrs, or 70 hrs/beam
  - Volume = 8000 Mpc$^3$
  - 160 galaxies in range $10^9-10 M_{\odot}$. 
Survey Needs
Hardware

- 50 – 200 MHz coverage
- *Minimum* 9-level sampling
- Fast dump preferred or radar blanking
- *(Notch filters)*
- 2 Polarizations
- 25 kHz resolution at 200MHz
- Good positional accuracy
Software

- Fits data cubes desired
- Online data display
- Mapping algorithms
- Good positional accuracy
Other Needs

• Characterized beam pattern at all angles, positions for deconvolution
• Need baselines stability studies (day vs. night, drive rates, etc.)
• Good simulations (with beam patterns) for feasibility of projects