NOTES FROM THE END OF THE WORKSHOP DISCUSSION

Non-GBT Instruments:

- Pulsar Timing Array:
 - o At least 1 GBT of collecting area
 - o Instantaneous field of view needs to be fairly large
 - Scan the sky (much of the sky) daily
 - Dedicated to pulsar studies (24 hours/day)
 - Cost to build of \$10M-\$100sM;
- Solar Physics Array
 - Does not need a cryo system
 - Does not need very wideband
 - Only runs when sun is up (tracks sun)
 - Runs to <30 GHz
 - o <1,000 dishes</p>
- FRB array

GBT Instruments:

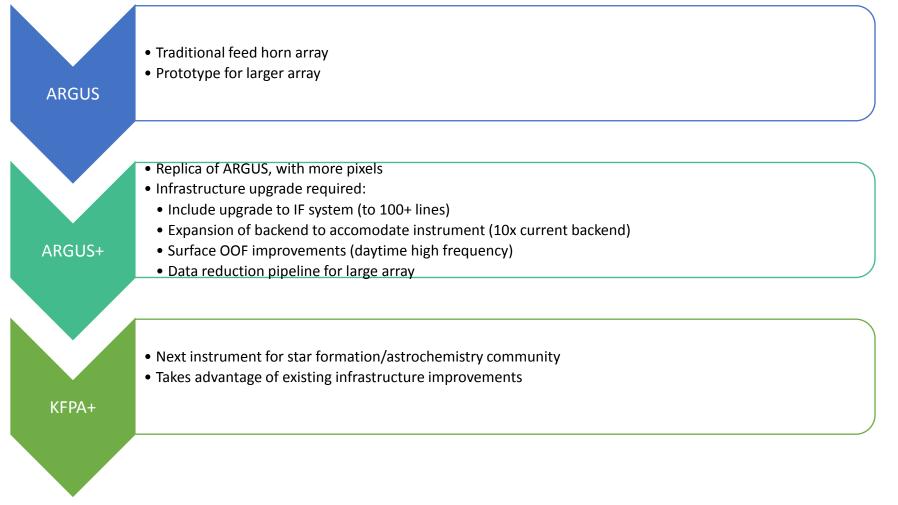
- Wideband Feeds:
 - Pulsars:
 - Ideal Center Frequency of 2-2.5 GHz;
 - Bandwidth as large as possible
 - 6x feed would be about 0.7 4.2 GHz (very roughly)
 - o SETI:
 - Ideally low end is >3-4 GHz
 - Maximize frequency span (3-18; 4-24; etc.)
 - Radio Recombination Lines:
 - 3-15 GHz range
 - Must have high baseline stability (over bandwidth)
 - Astrochemistry:
 - As wide as possible
 - 10-50 GHz would do well
 - Must have very high spectral resolution or the wide bandwidth is not worthwhile
- Arrays:
 - OH Survey:
 - At least the 1665/1667 MHz lines;
 - Prefer to also have 1720 MHz lines included
 - Needs narrow instantaneous bandwidth (just coving the lines of interest)
 - Deep HI Survey
 - Around 1 GHz
 - Roughly 1-1.4 would be good, but lower is better
 - Potentially could make one instrument with OH survey

- Both require very clean beam Its possible PAFS would not work
- Star Formation
 - K-band (Ammonia mapping)
 - W-band (many different molecular species, from 70-116 GHz)
 - Need good spectral resolution
 - W-band Need wide bandwidth
- o Astrochemistry
 - K, Q, and W band, ideally
 - Needs high spectral resolution over all else
- o Comets
 - W-band array with high spectral resolution, wide bandwidth
- Pulsars
 - 800 MHz PAF would fill a unique niche
- o HI Intensity
 - 800 MHz PAF may be ideal here
 - Questions arose as to what this provides over CHIME
- S-Z Clusters
 - MUSTANG-2 is ideal (for now!)
- Telescope Improvements/Concepts
 - \circ Commensal observations are important, and should be included whenever possible
 - High frequency telescope improvements are needed if we develop high frequency instruments
 - Pointing: Improve pointing to increase use of telescope at high frequencies in the wind
 - Surface: Rapid OOF holography would open up GBT to daytime high frequency observations
 - Combined, the GBT's time for high frequency could double
 - RFI Mitigation and improvements are necessary at all frequencies
 - Possible explore the idea of rearranging the receiver/cabin room

Possible Instrumentation Paths

Traditional Feed Horn Arrays:

Star & Galaxy Formation/Evolution, Astrochemistry, Solar System



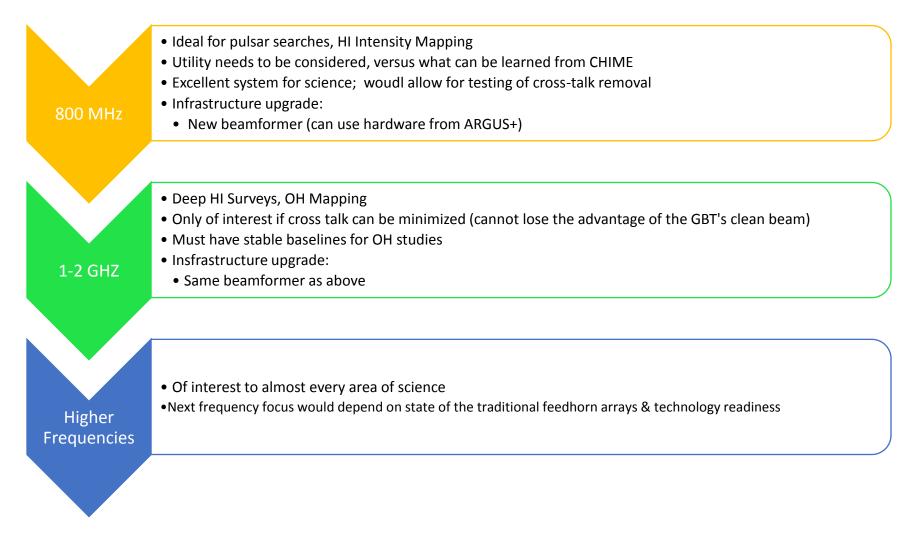
Wideband Feeds

Pulsars, Fundamental Physics, SETI, Astrochemistry

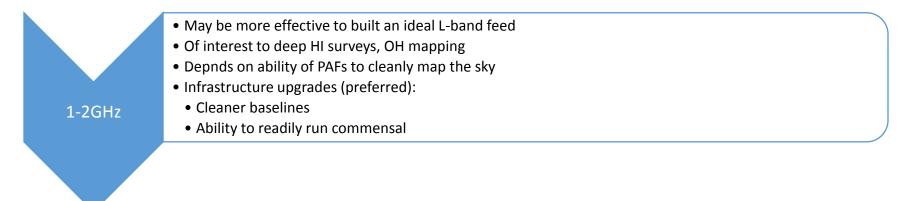
	Ideal for pulsar timing;
	• Can be used for SETI (non-ideal)
	 Not of significant interest for other science (due to higher system temperature)
	• Infrastructure upgrade:
0.8-4(ish) GHz	Backend expansion (double)
	Primary interest is radio recombination lines
	Also of interest to SETI, Astrochemistry
	must have stable baselines
	 Insfrastructure upgrade:
3-15(ish) GHz	• IF system (stable, wide enough bandwidth)
	Can use backend developed for .8-4 GHz feed
	Primary interest is Astrochemistry
	Also of interst to SETI
	Infrastructure upgrade:
	• IF system (use same system as ARGUS+)
10-50+ GHz	Backend developed for ARGUS+

Phased Array Feeds

Pulsar searches, HI Intensity Mapping, Deep HI Surveys, OH Mapping, More?



Idealized Instruments Deep HI Surveys, OH Mapping



	Telescope Upgrades
GBT Surface Improvements	 Realtime OOF Holography during the day (e.g. Leica Scanners) Increase the number of hours available fo rhigh frequency observations by and additional 25%-40% Of interest to: star & galaxy formation and evolution, clusters, S-Z effect, solar system, astrochemistry Desired by ARGUS, ARGUS+, MUSTANG-2, w-band
GBT Pointing Improvements	 Allow for high frequency observations in high winds May increase number of hours available by 10%-30% Of interest to: star & galaxy formation and evolution, clusters, S-Z effect, solar system, astrochemistry Desired byall>10G observers
RFI Mitigation/Improvements	 Could include: better RFI scans, RFI excision techniques, possible focus on reduced RFI in certain frequency bands Of interest to every area of science Needed by wideband feeds
Increased signal processing capability	 Increased capability for digital backend Needed by: ARGUS+, KFPA+, wideband feeds, next beamformer Could be used now by, e.g., astrochemistry community Of interest to every area of science Requires anything from 2-10x current capability
Increased signal transport capacity	 Increased capability for additional pixels Needed by: ARGUS+, KFPA+, possibly wideband feeds Of interest to every area of science Requires aoverhaul of system; Could inclue increased stability, commensal possibilities