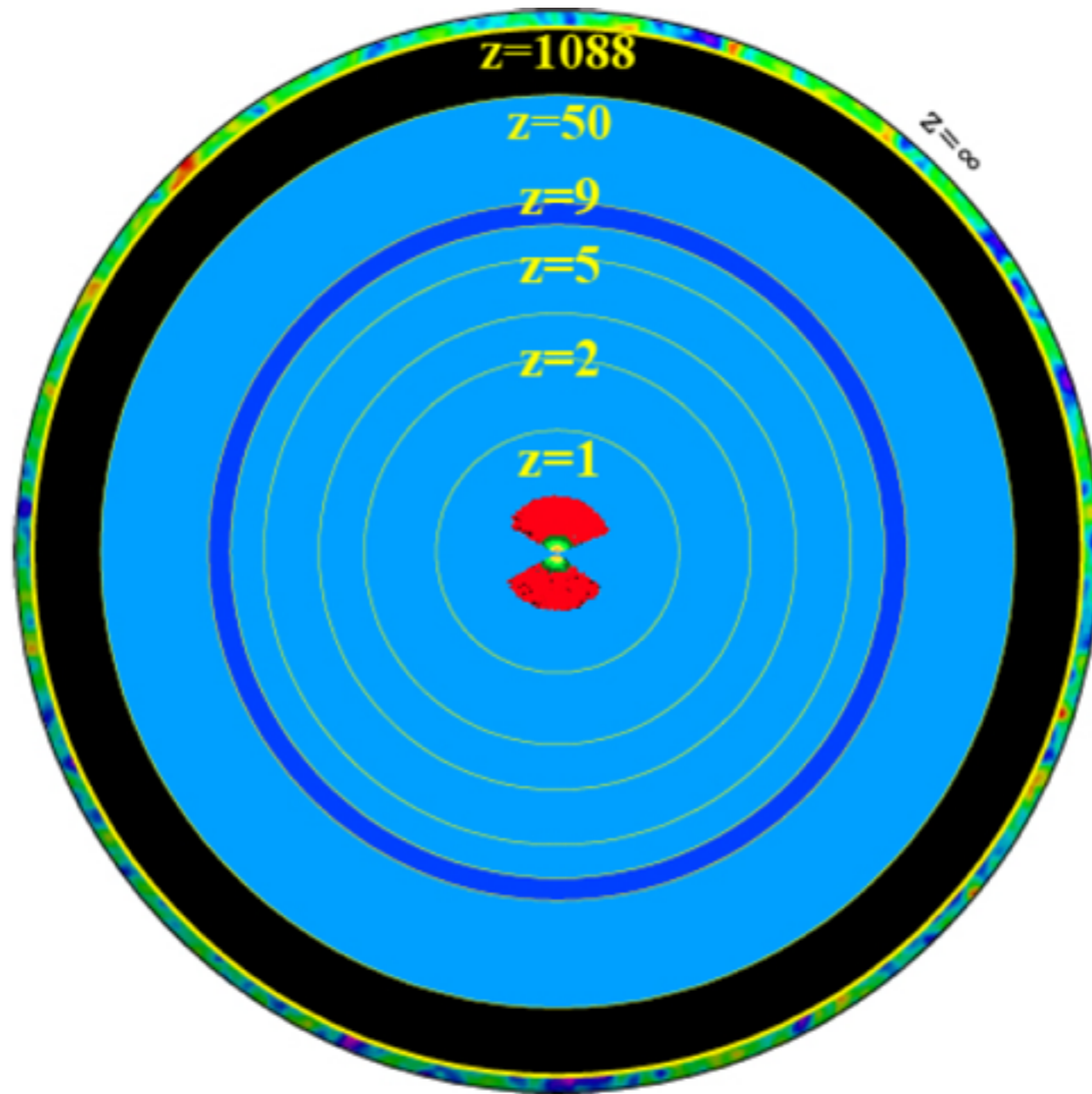


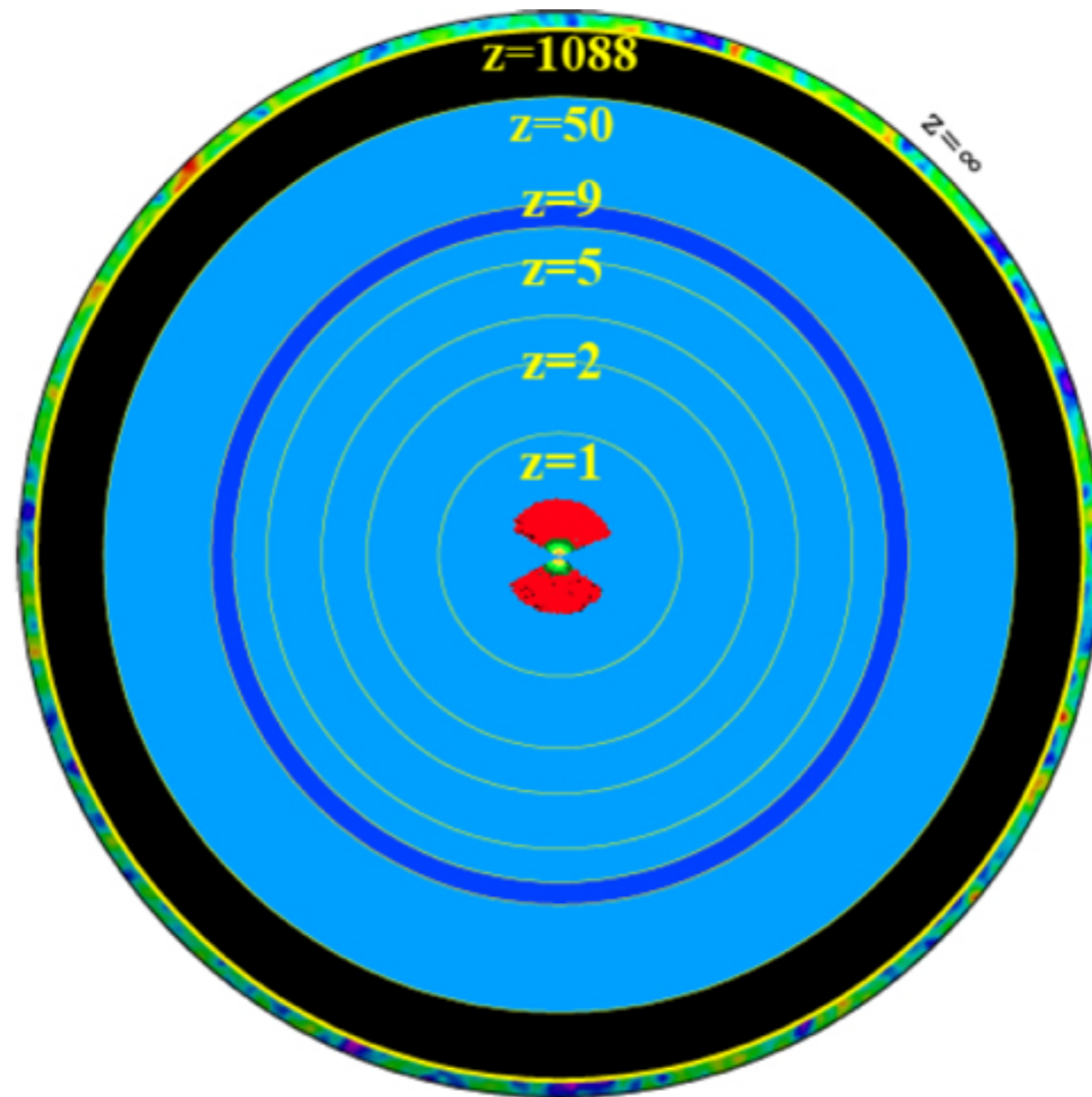
21cm / Intensity Mapping



Adrian Liu, UC Berkeley

“A new project cannot
be incremental...”

“Measure all the modes!”

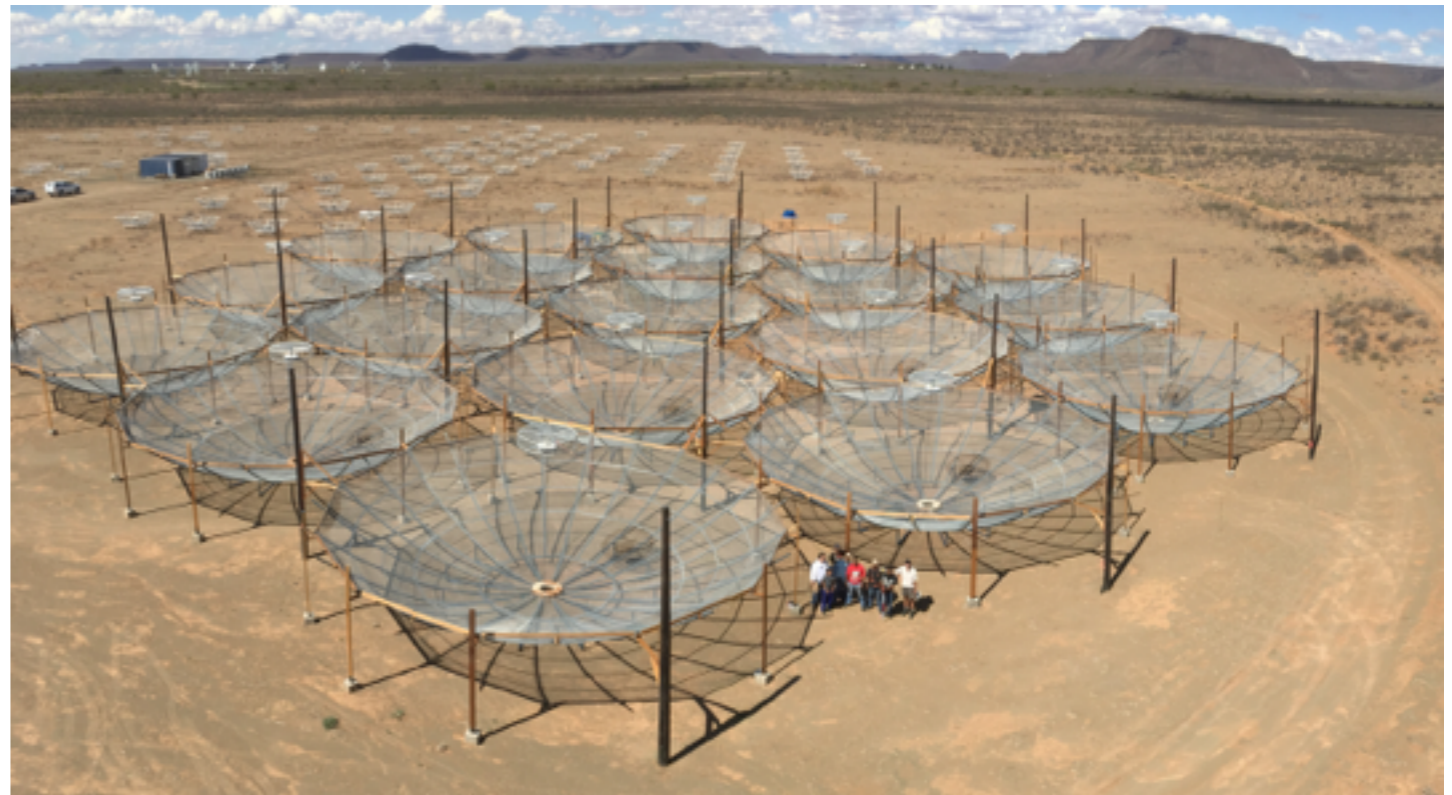


But how? And what
does that get us?

For now, a lot of the details
don't matter...



CHIME

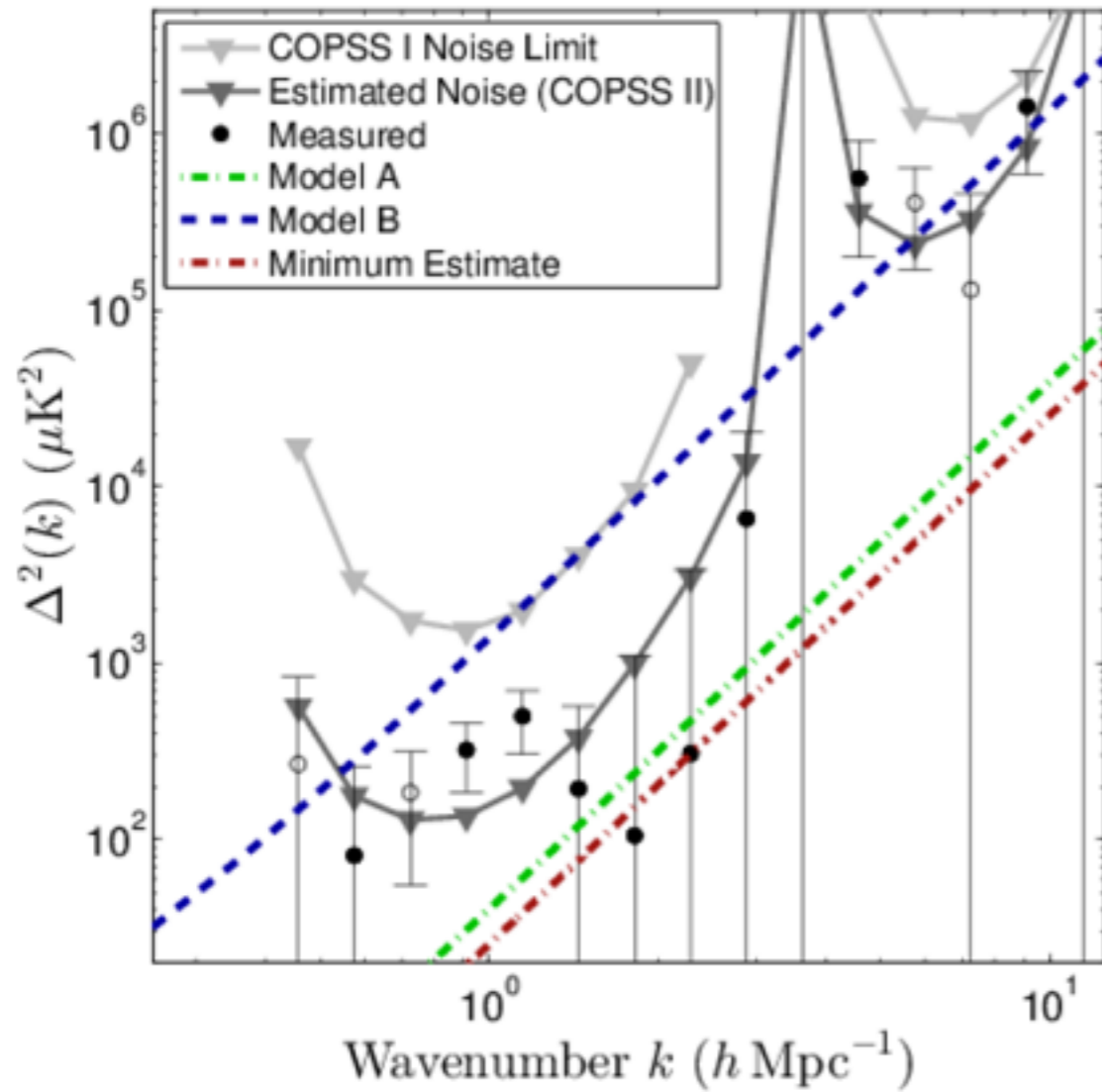


HERA

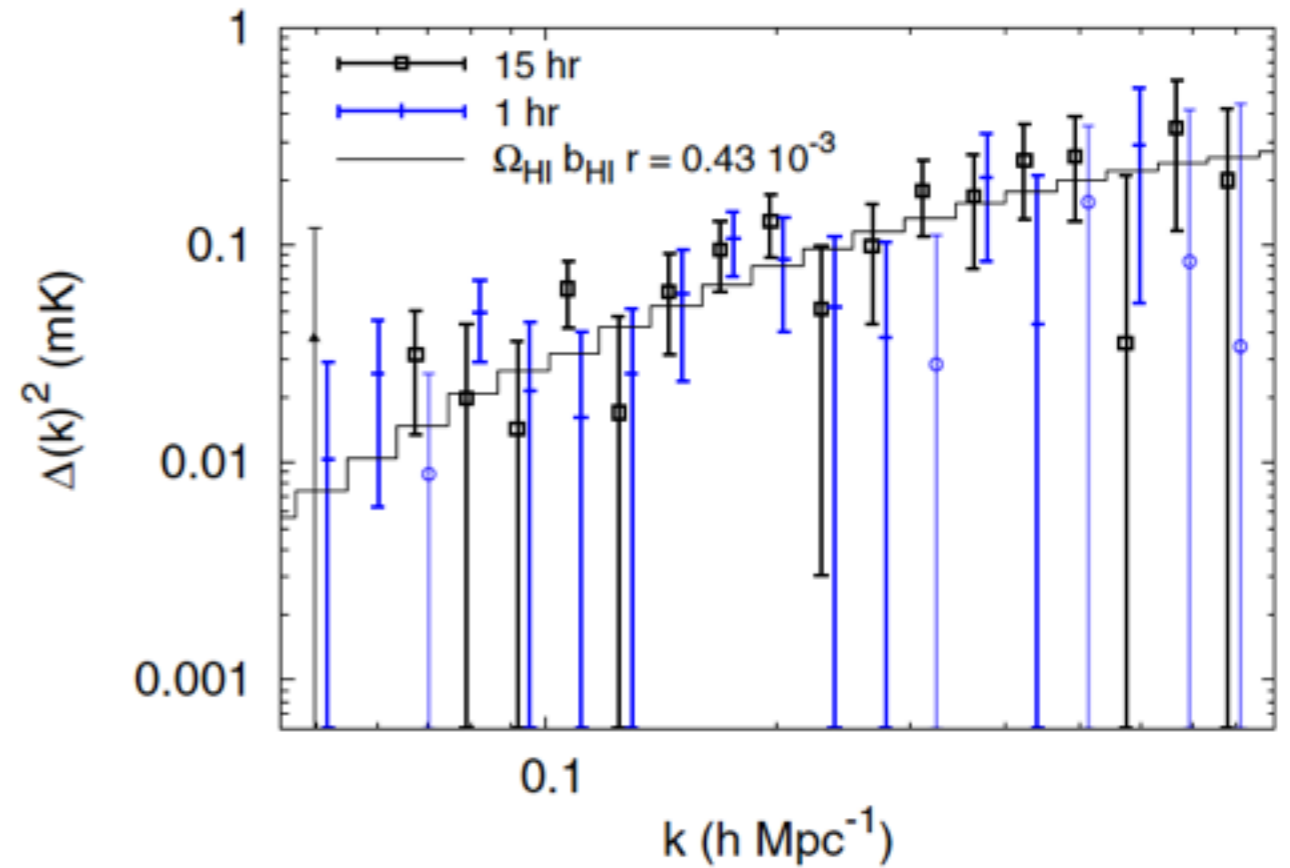


Next steps

Keep going with the current instruments



COPSS



GBT

R&D in conjunction with better understanding of systematics

- Enhanced simulations and hardware development
 - High data rates; high throughput computing leveraging DoE HEP expertise?
 - Next-generation correlator technology leveraging DoE understanding of radio frequency tech?
 - Real-time ionospheric calibration?

“Instrument agnostic” forecasts given unique properties of 21cm and intensity mapping

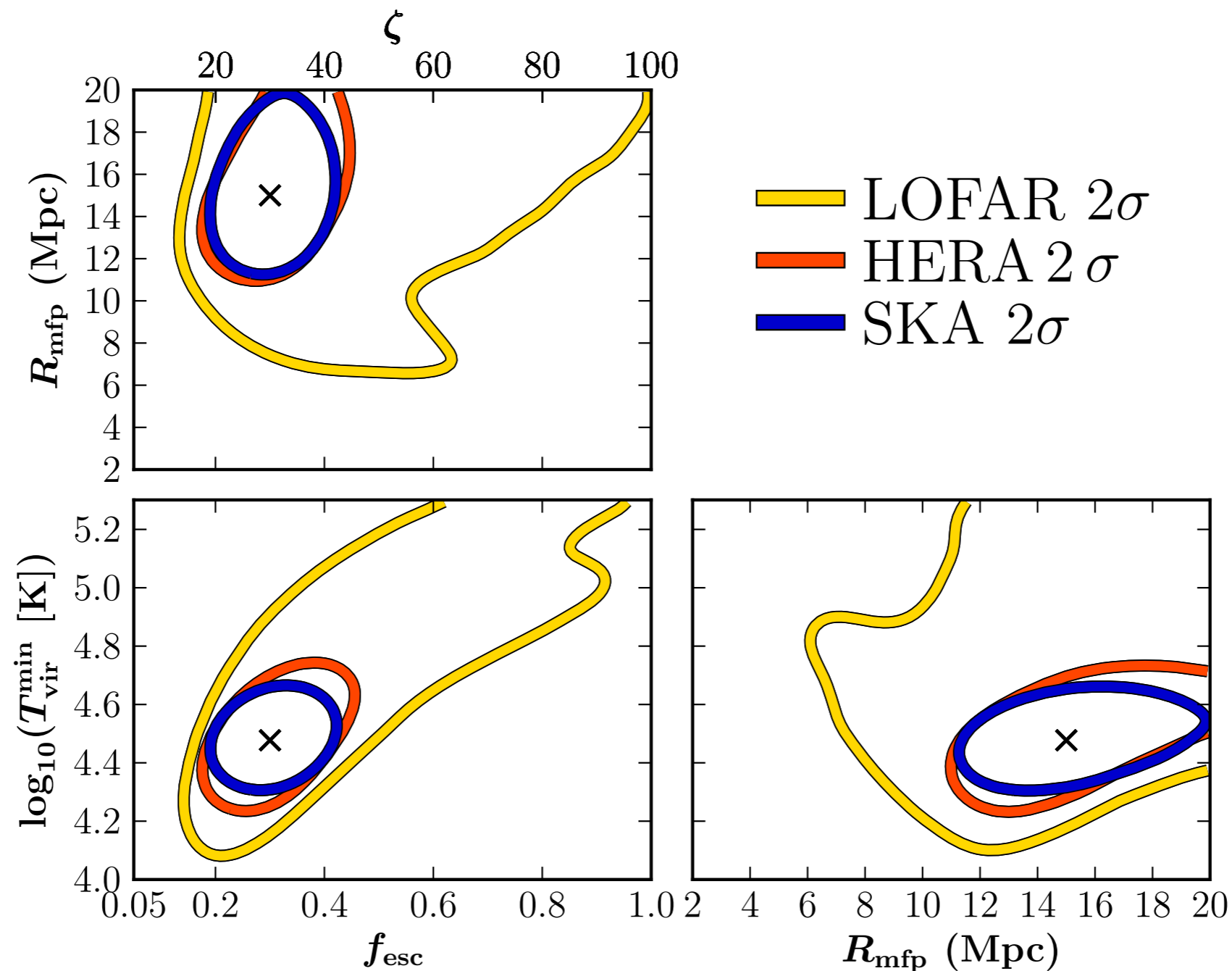
- Given a noisy map (from HI, CO, ...) with “infinite” radial resolution from $2 < z < 6$, what does that mean for our ability to measure power spectrum, bispectrum, ...
- Given specific measurements of $P(k)$ with no overall normalization, what can we say about early dark energy? About N_{eff} ? About f_{NL} ? What could we measure in conjunction with CMB-S4?

“Instrument agnostic” forecasts given unique properties of 21cm and intensity mapping

- Higher redshifts:
 - Is reionization/astrophysics actually irrelevant to cosmological science cases? HERA funded: primarily a reionization experiment, but could try for \mathcal{T}
 - Same “instrument agnostic” forecasts for pre-reionization redshifts. What’s the argument besides a new redshift regime and more modes?

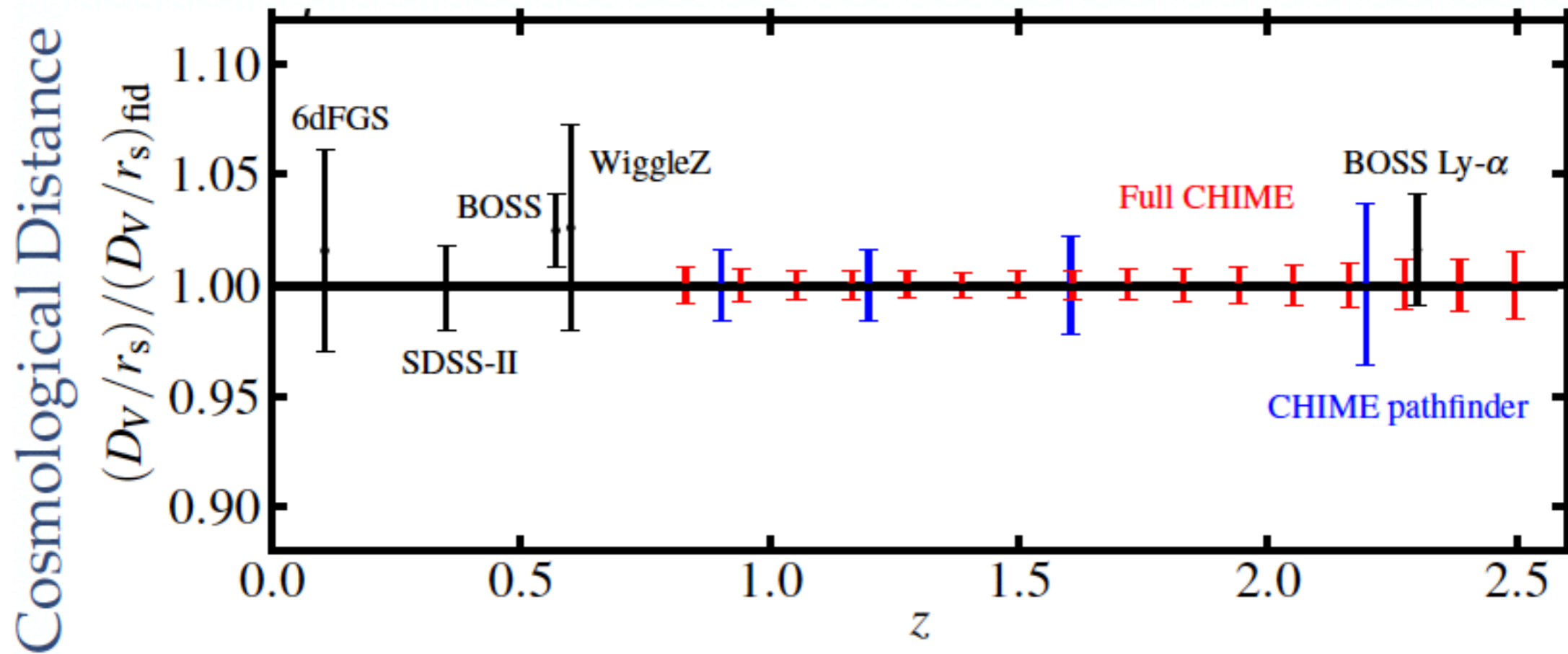
What about the SKA?

The SKA is an observatory, not an targeted experiment



Greig & Mesinger

The SKA is an observatory, not an targeted experiment



Summary

- 21cm / Intensity mapping has unique survey properties. Perform instrument-agnostic forecasts for now, respecting these properties.
- Near-term R&D efforts, particularly to understand systematics.
- Optimized instruments have the potential to get to science more quickly and precisely than the SKA.