

HI Intensity Mapping: Discussion session

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Biggest open questions from on-going IM experiments?

MeerKAT: Software tools missing; more team members; help for beam from other teams; RFI at SKA site (propagation into science), satellite (-reflections), RFI from 'other exp', talk to MeerTRAP for transient contaminants

HIRAX: how dish embed in array affect on beam;

HERA: Beam model: how to measure; sparse basis for beam, em simulations, self-induced RFI

ALL: foregrounds: Blind or model (power spectrum or maps), better templates (North)

Others: standing waves (comap), cross-corr with other lines, cross-corr of HI between telescopes

Biggest surprises from on-going IM experiments?

MeerKAT: RFI much bigger than expected, gains are non-linear, foundations

HIRAX: more expensive, foundations

HERA: reflections!, mutual coupling, engineer carefully

COMAP: standing waves? Coupling

All: soil;

What should we be starting NOW for SKA observations based on lessons from on-going IM experiments?

Not considered so far: RFI, satellites, map-making, $1/f$ noise, gain response, better foreground simulations

Pipeline design/details/consistency

Foregrounds: joint analysis with EoR

Beam?

Commensality/OTF

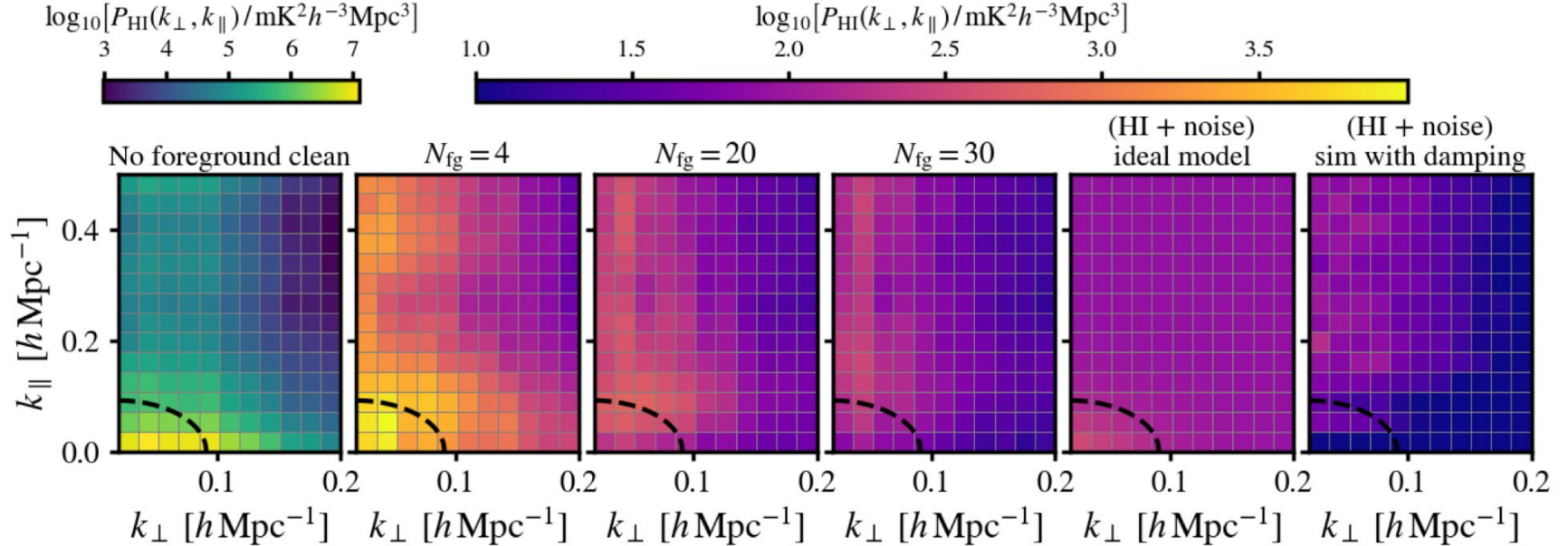


Figure 4. MeerKAT HI auto power spectra at $0.400 < z < 0.459$ decomposed into k_{\perp} and k_{\parallel} modes for different foreground cleans indicated by N_{fg} (the number of PCA modes removed). The fifth panel shows a predicted level for the HI signal plus purely Gaussian thermal noise, in an ideal case assuming no signal loss. The thermal noise is predicted to be ~ 2 mK for this survey (estimated in W21). The far-right panel shows a simulation of HI plus Gaussian noise including signal damping from the beam, additional resmoothing and foreground cleaning. As in Figure 3, the black-dashed line marks a characteristic scale of $|k| = 0.08 h \text{ Mpc}^{-1}$ (approximately the scale of the first BAO wiggle maximum) at which, from our modelling, we would expect the HI power to be $P_{\text{HI}} \sim 100 \text{ mK}^2 h^{-3} \text{ Mpc}^3$, i.e. $\log_{10}[P_{\text{HI}}] = 2$. None of these power spectra have had signal loss reconstructed by the transfer function.