Search for CDM isocurvature with large-scale structure: a forecast for MegaMapper

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Isocurvature perturbations with a blue power spectrum are one of the natural targets for the future large scale structure observations which are probing shorter length scales with greater accuracy. We present a Fisher forecast for the MegaMapper in its ability to detect CDM blue isocurvature perturbations. We construct the theoretical predictions in the EFTofLSS and bias expansion formalisms at quartic order in overdensities which allows us to compute the power spectrum at one loop order and bispectrum at tree level and further include theoretical error at the next to leading order for the covariance determination. We find that MegaMapper is expected to provide about 1 to 1.5 orders of magnitude improvement on the isocurvature spectral amplitude compared to the existing Planck constraints for a broad range of spectral indices. We also find features that are specific to the blue isocurvature scenario including the leading parametric degeneracy being with the Laplacian bias and a UV sensitive bare sound speed parameter.

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