Re: LR15465

    Recovering lost 21cm radial modes via cosmic tidal reconstruction

    by Hong-Ming Zhu, Ue-Li Pen, Yu Yu, et al.

Dear Mr. Zhu,

The above manuscript has been reviewed by our referees.  A critique

drawn from the reports appears below.  On this basis, we judge that

while the work probably warrants publication in some form, it does not

meet the Physical Review Letters criteria of impact, innovation, and

interest.

The paper, with revision as appropriate, might be suitable for

publication in Physical Review.  If you submit the paper to Physical

Review, the editors of that journal will make the decision on

publication of the paper, and may seek further review; however, our

complete file will be available.

If you submit this manuscript or a revision of it to Physical Review,

be sure to respond to all referee comments and cite the code number

assigned to the paper to facilitate transfer of the records.

Yours sincerely,

Kevin Dusling

Associate Editor

Physical Review Letters

Email: [prl@aps.org](mailto:prl@aps.org)

<http://journals.aps.org/prl/>

IMPORTANT: Editorial "Review Changes"

<http://journals.aps.org/prl/edannounce/PhysRevLett.111.180001>

P.S. Another referee was consulted but we now assume that no

     report will be received.  If a useful report is received,

     we will contact you.

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Report of Referee A -- LR15465/Zhu

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This paper is well-written, clear and nearly ready for publication. It

presents new results that seem scientifically sound, and interesting

to the larger community. My comments are listed below:

Minor concerns:

1. The introduction jumps right into jargon that is not so familiar

outside the large scale structure community (in particular k\_\parallel

and k\_\perp); a practice discouraged by the PRL editorial guidelines.

I suggest an an additional sentence or two describing these since the

entire paper hinges on understanding these!

2. Fig 3 should show the units for C\_\ell on the y-axis, even if they

are arbitrary units.

Re: Rad^2 units?

Discussion section:

3. In the description of why this technique works, despite being

non-intuitive, more specifically, isn't it true that the higher order

statistics (the tidal shear) are coherent on large scales, despite

being computed on small scales? It might be helpful to explicitly say

that.

Re: I’m not quite understand this … shall we just add one comment?

4. While a 60% reconstruction is impressive, since it seems to come

from nothing, it's still not 100%, so in applying this technique to

real data, presumably you'd need to use simulations to estimate this

suppression factor if you want to obtain an accurate cross-spectrum

against the other tracer. Can you say a few words about how you would

do this in practice? I worry that the results would depend somewhat on

the assumptions going into simulations you use to calibrate.

Re: In 3D reconstruction, the results are much better. Some new understanding about this method to be added…

Major concerns:

5. Are cross-correlations between 21-cm data and large scale structure

really limited by Galactic and extragalactic foreground removal of the

21cm data? It seems that there would be additional instrumental

considerations (glow from over the horizon sources, etc) that make

large scales difficult to access from the ground. The references in

this paper didn't answer my question, so a sentence or two or a

reference to another paper would be needed.

6. This manuscript refers heavily to methodology and concepts from Pen

et al. (2012) and Zhu et al (2015), available on [arxiv.org](http://arxiv.org/) but neither

appears to have appeared in a peer-reviewed journal. Obviously, I am

not tasked with refereeing either of these papers, but what is the

status of these? I'd like to know that these previous papers have been

vetted by the community in some way.

Re: One has been published on PRD.

7. In the simulations, I'd like to be more convinced that applying a

k-space high-pass filter is a reasonable proxy for foreground removal.

In practice, foreground removal must involve some kind of a template

fit of an external tracer of free-free and synchrotron to the 21 cm

data. While I understand that the dynamic range is such that

uncertainties in this template fit on large scales will make it nearly

impossible to trust the cleaned 21cm data, so high-passing is fine,

can't there also be an effect on smaller scales in the 21cm data?

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Report of Referee B -- LR15465/Zhu

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As the authors have shown in the Ref. [10], the tidal reconstruction

method can be in principle used to extract the long-wavelength density

modes along the line-of-sight direction, which is lost during the

foreground cleaning process. In Ref. [10], the authors have

demonstrated this from N-body simulation: the recovered tidal field is

strongly correlated with the radial modes of the N-body simulation.

In this paper, the authors have presented yet another demonstration of

the methods using different tracers of the radial modes: CMB lensing,

photometric-z samples, and ISW. In particular, the authors show the

cross-correlation coefficients and the angular power spectrum and show

that these signals can be detected if we have a quarter-sky survey of

21cm fluctuations.

Although this method is a brand new idea due to the authors, the

referee does not agree that the information content in the current

manuscript significantly exceeds the authors’ previous paper (ref.

[10]). Even though the authors have demonstrated that the signature is

in principle out there to be measured, no theoretical models were

presented for the observed cross-correlation. Given that the observed

cross correlation is biased in Ref. [10], the cross correlation

presented here must also be biased from the ideal cross correlation

between “radial density mode” and three observables that the authors

studied.

Re: We add the theoretical curve of the cross correlation signal. We solved the biasing problem in the tidal reconstruction method. See for a brief view.

Therefore, present manuscript is not suitable for publication in PRL.

The authors may consider resubmitting to PRD after scrutinizing the

arguments of the manuscript. For example, the statements such as “Due

to the similar treatments of CMB lensing field and the ISW field” need

more explanation. Presumably the authors failed to squeeze everything

into four pages, but I strongly suggest the authors to expand the

discussion when resubmitting to PRD.

Re: The similar treatment is easy to understand. … This is a very new brand idea. …