

Dear Editor and reviewers,

First of all, thank you very much for your kind report. It was quite helpful to improve our paper.

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Paper assessment *ref #82*

Dear Tokihiko,

A judge has requested some **changes** to your paper **Recent developments of ECE radiometer and ECEI for low magnetic field operation on LHD**.

Comment:

Dear Tokihiko Tokuzawa,

Thanks for your contribution to EC21. Please see the comments from the reviewer as bellow:

This paper reports the design, characterization, and experimental measurement results of a Q and V-band ECE radiometer on LHD. The results presented are comprehensive. The paper is well written and clear. It is qualified for publishing in the EPJ Web of Conferences. Whereas, this reviewer would be very much appreciated if some points can be clarified further.

- Resolution of Figure 2 is a bit low. In addition, it would be better marking the locations of the mirrors.

→ Figure 2 has been corrected. Mirrors are now shown in the figure.

- This sentence might be misleading. “z is defined as the distance from the M1 mirror.” If the reviewer’s understanding is correct, the correct text should be something like “z is defined as the distance to the location of the beam waist, and the location of the mirror M1 is set as the reference point.”

→ Thank you for pointing this out. We have corrected it.

- What is the advantage introducing a mixer unit in the IF section as shown in Fig. 8? Does this increase or reduce the cost? Does this have something to do with the system performance?

→ There are two reasons.

Reason 1: we want to use the same BPF set.

Reason 2: Initially, we planned to use the 8 GHz signal (LO2) for mixer 3 LOCAL as well. If this could have been used, cost reduction would have been possible. In the end, we decided not to do so.

We add a note about Reason 1 here.

“On the other hand, the 10-17 GHz component is down converted to 2-9 GHz by Mixer3 using the 19 GHz signal (LO3), and signal detection is performed in the similar filter bank.”

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“On the other hand, the 10-17 GHz component is down converted to 2-9 GHz by Mixer3 using the 19 GHz signal (LO3), because we want to align the characteristics using a similar filter bank set for signal detection.”

- Seems that the uncertainty is proportional to the output as shown in Figure 10. How it is defined?

→ Noise components appearing in the detector output voltage are represented as error bars. By opening the attenuation, the input signal from the noise source is made stronger. Since this test uses the noise source as a source, the noise (variation / uncertainty) may have increased as the intensity increased of the "noise" source. We believe that the so-called signal-to-noise ratio is not so changed. When the input (in this case the "noise source") is weak, the variability (generally noise) is small, and when the input "noise" signal is large, the variability is also large.

- It appears the description of the Figures 12 and 13 is not consistent. It is obvious seeing from Figure 12 that all ECE channels respond to NBI modulation. However, it stated, “It is found that the difference in T_e due to modulation is arisen in the edge region.”

→ Thank you for your careful reading.

As shown in Figure 12, the electron temperature change due to NBI covers

a wide region in the ECE observations. On the other hand, the Thomson scattering measurement in Figure 13(a) shows that the change is only in the peripheral region (the change in the core is not well understood). Figure 13(b) shows how heating is taking place in this peripheral region. Although the detailed analysis results are not shown, the phase of the temperature change differs depending on the location (it does not increase or decrease at the same time). The heating position exists somewhere locally, and it is thought that heat transport is taking place. This is the purpose of what I am saying here. We have changed the expression as follows.

“It is found that the difference in T_e due to modulation is arisen in the edge region.”

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“It shows the difference in T_e due to modulation seems to be arisen the region around $R=4.5m$ ”

“In contrast to local heating by ECH, NBI heating is generally considered to affect a wider radial region from the outside of the plasma at the same time. The present measurements reveal that NBI heating can be accompanied by localized changes in the plasma.”

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“In contrast to local heating by ECH, NBI heating is generally considered to affect a wider radial region from the outside of the plasma at the same time. The present measurements revealed that the heating of NBI may be accompanied by localized changes in the plasma. The ECE measurements also show a different response in the core region than the Thomson scattering measurements. Further analysis is needed to integrate and understand these results, and this is an issue for the future.”

- Better to define the abbreviations such as RASE, GAM, etc when they appear for the first time.

→ Thank you for pointing this out. The abbreviation is correctly described.

“In particular, modes identified as frequency chirp-up (RSAE), GAM oscillations around 20 kHz [19, 20] ...”

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“In particular, modes identified as frequency chirp-up reversed shear Alfvén eigenmode (RSAE), geodesic acoustic mode (GAM) oscillations around 20 kHz [19, 20]...”

- A few typos. The harmonic numbers are missing in the caption of Figure

1. For example, it should read as “the third harmonic $3f_{ce}$ ”. On page 5, Figure 11(b) should read as Figure 12 (b). “The time variation of the electron temperature T_e obtained with this radiometer is shown in Figure 11(b)”

→ Thank you for pointing this out. We have corrected it.

That's all.

Thank you very much.