**Interactive comment on** “Excitation of chorus with small wave normal angles due to BPA mechanism into density ducts” by Peter A. Bespalov and Olga N. Savina

**Anonymous Referee #1**

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Referee report on the paper, “Excitation of chorus with small wave normal angles due to BPA mechanism in density ducts” by P. A. Bespalov and D. N. Savina

I have read the above paper with interest, and I have come to the conclusion that this paper can be acceptable for publication in Angeo, but only after the authors will make the revisions listed below.

**General remark:** The idea of wave-particle interactions in a confined area such as whistler ducts is very acceptable, and this is theoretically investigated in this paper. Fundamentally it can be acceptable for publication, but only after the authors will make the appropriate revisions.

**Specific remarks:**

1. **English** The English of this paper is not good enough to be accepted in an international journal like Angeo. I strongly request the authors to polish their English with the help of an native English speaker. This will definitely enhance the quality of the paper.

2. **Title:** “into density ducts” is not good, and it is better to use “in density ducts”.

3. **Abstract,** line 4 beam pulse amplifier (BPA) mechanism

4. **Introduction,** line 14 Something is wrong, and I can suggest the following change: - somewhat lower than and just above half the minimum — in question (see a review by Sazhin and Hayakawa (1992)).


- Line 20; I can suggest one more paper, which is published in a not so popular journal. (Karpman and Kaufman, 1984; Ishikawa et al., 1990; Laird, 1992; ——) if you are interested in.


5. **Line 16:** in Bell et al. (2009). (6) Line 20ijMust be misspelling. Laird, 1992 (7) I am very unhappy with the first paragraph of p.2. Because you have cited only the recent papers on direction finding of chorus emissions, and it seems that you are not aware of earlier work before 1990. Previous papers should be properly described in the paper.

Page 2, line 4: (Muto et al., 1987; Hayakawa et al., 1990; Santolik et al., 2009)

(8) The authors mention that the direction finding by Taubenschuss et al. (2014) is based on the assumption of a single wave. However, the earlier DF works by Muto et al. and Hayakawa et al. are much more general, because they used the wave distribution function. We here compare the THEMIS results with earlier analyses based on a more general concept of wave distribution function. For the lower band chorus, the earlier work by Hayakawa et al. (1990) is very consistent with the THEMIS result. While, there is some discrepancy between Muto et al. (1987)’s result and THEMIS result for the upper band chorus. (9) Line 17: - beam pulse amplifier (BPA) mechanism of — - BPA concept appears firstly here in this paper, and you had better mention something about this BPA here. (10) Page 3, line 6: The depleted duct (e.g. Helliwell, 1965) (11) Line 7: enhanced duct (Helliwell, 1965; Karpman — (12) Line 18: well-known form (Laird, 1992) (13) Line 21: Gendrin velocity (14) Page 4, line 4: electron cyclotron (15) Page 6, line 4: recall the formation process of chorus frequency-time spectrogram in the implementation of the BPA mechanism (16) Line 9: classify the duct solutions (17) Page 7, line 7: Actually the number of — (18) Line 14: realization of the BPA mechanism (19) Line 26: the BPA mechanism (20) References: -Addional papers should cited here in References. -p8, line 27; should be Gurnett -Heliwell (1995) seems to be not cited in the text.

Please also note the supplement to this comment: https://www.ann-geophys-discuss.net/angeo-2019-83/angeo-2019-83-RC1-supplement.pdf