

Answer from the Authors to the Referee report for:

New modelling capabilities to support the ITER EC H&CD System optimisation and preparation of plasma operation

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The authors would like to thank the referee(s) for the review of the paper. Please find below the answer to the questions raised in the report.

In this manuscript, the authors present different numerical tools that are being used to optimise the ITER EC system and to predict its performance. The paper represents a useful snapshot of the present modelling capabilities and should be published in the proceedings of the EC21 workshop once the amendments listed below have been implemented.

1) *In Sec. 1.2.2, Fig. 4 is quoted in the text before Fig. 3: consider swapping.*

→ Figures have been swept.

2) *End of Sec. 1.2.2: could the authors briefly comment on the compatibility of more powerful gyrotrons (> 1 MW) with the rest of the EC system (transmission lines, mirrors, etc.)?*

→ a comment has been added into the text.

3) *The English in Sec. 2.3 is difficult to read. Please proofread it carefully. Some formulation issues are listed at the end of this report. Here I have three questions on the physics.*

(1) Could the authors add a sentence clarifying better how higher-order modes are mimicked in the Zemax calculations? Do I infer correctly that the initial electric-field distribution must be initialized as a Gaussian?

→ additional information has been added in the text. Yes the referee is right, the initial electric field in Zemax Non-Sequential Mode must be initialized as circular Gaussian beam

(2) Is it possible to give some numbers characterizing the spillover after mirror M4? How do these results compare to those reported by P. Platania, EPJ WoC 87 (2015), 02018?

→ Number characterizing spillover at the last mirror of the upper launcher, M4, are mentioned before figure 5. A comparison with GRASP analysis performed by P. Platania is not presented in this paper because of the limitation in the paper length. Results obtained using GRASP and Zemax give the same range of percentage of losses at the mirrors.

(3) Was the analysis extended to the propagation of the beam in the vacuum vessel?

→ Yes, the analysis was extended to the propagation of the vacuum vessel in the frame of the First Plasma Configuration.

4) In Sec. 3.2.2, “heating sources” is probably better than “suprathermal sources”. Just below Fig. 8: “the geometry of the EC launchers stored in the MD database is described at the level of the mirrors”. Please specify which mirrors.

→ Thank you to the referee to point out unclear statements. They have been corrected in the text.

5) Is the IMAS architecture supposed to provide also “real-time” support to machine operation, e.g. within the plasma control system? The author could add a comment on this at the end of Sec. 3.2.

→ IMAS is only used for off-line analysis so it will not be used as part of the PCS.

6) Some cosmetic suggestions and typos: In Sec. 1.2.1 “This necessitates a set of mirrors” is probably better than “This forces a set of mirrors”. Just before Fig. 1 it looks like there is an undefined reference to the Hamiltonian adiabatic formalism []. In Sec. 1.2.2: “balancing co and counter” (rather than “con and counter”). Three lines later, please add “each” after “can launch up to 8 beams”. Sec. 2.3: the second sentence seems to lack the verb; “place behind the mirror” should be “placed behind the mirror”; “carrefully” → “carefully”; “to be taken properly” → “to be taken properly into account”. Sec. 3.2.2: “combine such a transport suite to” → “combine such a transport suite with”. A few lines above Fig. 7 there is an empty bullet (just before the sentence beginning with “As an example”). In the last sentence in the Conclusions, it is unclear to me what “it” refers to in “it leads to a modification”.

→ Thanks to the referee for the corrections you proposed to improve the text, they have been implemented.