Authors' Response to the Referee Comments

We thank the referees for their detailed reading of the manuscript and their valuable comments. We have incorporated the changes that the referees have suggested into the revised manuscript. We list below the referees' comments, followed by our responses, denoted by AR.

Referee #1

- My only concern is the fact that the term H2 is used on time-domain function, which might be inappropriate from a mathematical point of view?
  AR: We thank the reviewer for this comment. Since the time domain and frequency domain functions are equivalent, we believe this notation is appropriate. Furthermore, since the infinite horizon, and finite horizon case appear to be connected, the notation $\mathcal{H}_2(t_f)$ illustrates this connection.

Referee #2

- The introduction of the paper does not allow to position the problem accurately even though valuable elements of this positioning are given in section 3.3.

  AR:

- Some particular application domains are cited in the beginning without justification.
  AR:

- What about the choice of the finite horizon tf ?

  AR: The choice of the finite horizon depends on the problem. We added a clarification for this issue at the end of section 3.2

- Justify the choice of simple poles for the reduced order model. AR: The choice of simple poles was motivated by the Iterative Rational Krylov Algorithm (IRKA). Since for many applications, the poles of the model are simple, we believe this choice is justified.

- What is the reference of the existing result given by Theorem 2.1 ?
  AR: We have added the citations immediately after the theorem in order to clarify any confusion.

- Notation are not fixed in the paper. For example H'(s) is the derivative of H with respect to s. This can be stated at the end of the introduction section (with all other notations...)
  AR: We have added a clarification for this notation immediately after Theorem 2.1, which corresponds to the first occurrence of $\mathbf{H}'(\mathbf{s})$.

- Section 2.2 : the 5 introduction lines are very important and can be used to state the purpose of the paper.
  AR: Should we move these lines to the introduction section?

- section 3 : the first 5 lines are a "useless repetition" and can be removed.

  AR: Should we remove these lines completely, or argue that it makes the paper easier to read for someone who is not as familiar with the concepts in the paper?

- Section 3 : lines 6 to 10 can be given as a Remark (important remark!)

  AR: How should we organize (reorganize?) this section?

- Remark 3.2 can be given after the proof of the main result and can be a part of the discussion of the given result.
  AR: We have moved the remark after the proof.

- Lemma 3.3 : "Let G(s) and Gr(s) be as defined in (3.5) and (3.7)" instead of "Let G(s) and Gr(s) be as defined in (3.5) and (3.5)"

  AR: We thank the referee for pointing out this issue. We have addressed it in the revised version.

- Page 8 : (3.18) is one equation no need to (3.19). AR: We thank the referee for pointing out this issue. We have addressed it in the revised version.

- The computation of (3.18) is not clear. One can give more details allowing to obtain such result.
  AR: What details? Should I include the trivial differentiations?

- Sentence after (3.19) : "...in the parentheses in (3.18) and (3.19)" instead of "...in the parentheses in (3.18) and (3.18)".

  AR: We thank the referee for pointing out this issue. We have addressed it in the revised version.

- 3.3 section can be a (concise) part of the introduction of the paper.
  AR: We thank the referee for the comment but we respectfully disagree???.

- Section 4 : should state how to use the main result in constructing the reduced order model which is not the case in the current version.
  AR: We thank the referee for the comment but it is the case in the current version???.

- The numerical examples try to show the "supremacy" of the proposed result which is obviously not the case. Instead, it will be useful to explain clearly the aim of each numerical experimentation before giving a clear figure (with only one comparison aim at each time).

The given figures are almost indecipherable !

AR: How should we proceed here?.

Referee #3

- As stated in Remark 3.2, the optimality condition is not directly expressed by H(s) and Hr(s), but by G(s) and Gr(s), defined by (3.5) and (3.7). The reviewer cannot find a physical interpretation of G(s) and Gr(s). The authors can comment on the interpretation.
  AR: We thank the referee for the insightful comment. We have addressed this issue on the revised version.

- In Numerical Simulation, the authors can add some time responses of the original and reduced-order models. For example, showing impulse responses of the models enables readers to understand "practical" importance of the proposed method.
  AR: What model should we use for this?

- There are some typos in the manuscript. For example, the statement "G(s) and Gr(s) be as defined in (3.5) and (3.5)" in Lemma 3.3 should be corrected.
  AR: We thank the referee for pointing out this issue. We have addressed it in the revised version.