We would like to thank the referee for providing such helpful comments on our manuscript. These comments have helped us to significantly improve the quality of our work. We have made major revision for our manuscript according to the referee’s comments and suggestions. In the following, we respond to the referee’s comments one by one, and show the changes made in the revised version.

Comment: In this paper, the authors used the simulated GW standard siren data to constrain the interacting dark energy models, from which they wished to investigate how the future standard siren observations could help improve cosmological parameter estimation for interacting dark energy models. They considered the Einstein Telescope (ET) as a representative of the third-generation ground-based GW observatories to make an analysis in this work, and they found that the future standard sirens observed by ET could effectively break the cosmological parameter degeneracies generated by the electromagnetic probes, such as CMB, BAO, and SN, for the interacting dark energy models. I think that the results and relevant analysis presented in this paper are of great interest, because from the paper the reader can learn that: the future standard siren observation can help greatly improve the constraint precisions for not only the Hubble constant but also other cosmological parameters including the equation of state of dark energy and the interaction strength between dark energy and dark matter; the future standard sirens can break the parameter degeneracies generated by not only CMB but also CMB+BAO+SN; and the standard sirens would be developed into a powerful cosmological probe in the future. The paper is basically well written (although there are still some minor problems), and is organized reasonably. I think that the paper deserves to be published. Nevertheless, before I recommend the paper for publication I think that some minor issues should be addressed.

Comment 1: In this paper, the authors only discussed about the ET, and took it as a representative of the third-generation ground-based GW observatories. However, to my knowledge, in addition to the ET in Europe, the Cosmic Explorer (CE) has also been proposed to be built in the US as another third-generation ground-based GW observatory. The CE project is not mentioned in the paper, which I think influences more or less on the completeness of the paper. Thus, I suggest that the author should add some discussions or comments on the potential of the CE project in somewhere of the paper (see e.g., 1710.05325).

Response 1: We thank the referee for such a helpful suggestion. According to the referee’s suggestion, we have added a paragraph to address this issue (Sec. 4, Page 14): “Note here that, as an another third-generation ground-based GW observatory in addition to the ET (in the Europe), the Cosmic Explorer (CE) has also been proposed to be built in the United States. This project is scheduled to start its observation in the mid-2030s. Some forecast studies on constraining cosmological parameters using the GW standard sirens observed by the CE have been made in the literature. The cosmological parameter constraining capability of the CE is slightly better than that of the CE, as shown in Refs. [155, 156].”

Comment 2: The interacting dark energy models consider some possible fifth force between dark energy and dark matter, which is modeled by assuming some forms of Q, as investigated in this paper. However, it is also well-known that in the modified gravity (MG) models the fifth force exists between effective dark energy and all other components, which is different from the case of interacting dark energy. Actually, the GW observations can also exert significant influences on the studies of the MG models. For example, the measurement of the propagation speed of GWs using the observation of GW170817 has immediately been used to exclude some MG models. The impacts of the future GW observations on the MG models have been recently intensively discussed, which can be found in, e.g., arXiv:gr-qc/9406022, 1711.08991, 1801.03208, 1804.03066, 1806.05674, and so on. I suggest that the relevant brief discussion is added in the introduction section.

Response 2: According to the referee’s comment, we have added relevant sentences in Sec. 1 (Page 3, the end of the first paragraph): “In addition to the DE models, the GW standard siren observations can also exert significant influences on the studies of the MG models. The impacts of the future GW observations on the MG models have been recently intensively discussed in the literature (e.g., Refs. [127–131]).”

Comment 3: In the introduction section, the authors mentioned that the IDE models can explain the 21 cm absorption signal of the EDGES experiment, but to my knowledge the IDE models actually cannot explain the result but can only alleviate the tension to some extent. So, I think that this statement should be rephrased. In addition, the authors stated that the main advantage of the standard siren method is that it avoids using the cosmic distance ladder, but I think that it should be stressed that it is for the measurement of the Hubble constant.

Response 3: We thank the referee for pointing out these problems. Following the referee’s comments, we have made changes in these two places: (1) “Recently, the models of interacting dark energy have been considered to help alleviate the Hubble constant tension between the early and late universe measurements [107], and it was also shown that they are helpful in partially explaining the excess of 21 cm absorption signal related to the epoch of cosmic dawn (at z ∼ 17) detected in the EDGES experiment [98, 108, 109].” (2) “For measuring the Hubble constant, the main advantage of the standard siren method is that it avoids using the cosmic distance ladder.”

Comment 4: In Eq. (20), the symbols phi and psi are not explained. Actually, the symbol psi is also used in Eq. (19) for the polarization angle. I think that psi in Eq. (20) should be replaced with some another form of it to avoid confusion.

Response 4: We thank the referee for pointing out this problem, and we have added the relevant explanations for the symbols. See Eqs. (3.7) and (3.8) in Page 7.

In summary, we have made major revision totally according to the referee’s comments and suggestions. After the revision, the quality of our manuscript has been greatly improved. We are very grateful to the referee for the great helps. We expect that our revision could make the referee satisfactory and recommend our paper for publication.