Authors' Replies to Comments by Reviewer 3

First of all, the authors would like to thank you, Reviewer 3, very much for your thorough review and valuable suggestions. Below we respond to your specific comments point by point.

***COMMENT 3.1**: Did you use data containing a real target or did you add a simulated target to the data?*
Reply: We utilize real data that includes real targets in our paper. We have described the data and the target in more detail in Section 4.1 Experimental Settings.

***COMMENT 3.2**: If these are real targets, can you indicate what kind of target they are?*
Reply: The actual radar data recorded a flying Boeing-787 airliner, flying at roughly Mach 0.85, and flying altitude is about 11.3 km. The approximate location of the radiation source, the receiving device and the target type have been illustrated in the paragraph above Fig. 9.

***COMMENT 3.3**: Figure 7 a) and b) seem to show an aerial target with a credible Doppler corresponding to a target moving away from the radar. On the other hand, c) and d) shows a zero Doppler target, which is a rather singular case for an aerial target. Can you comment on this point?*
Reply: A considerable number of frames of radar data have been collected in the experiment. Yes, the range-Doppler map of certain data frames represents a target with zero Doppler frequency. A zero Doppler shift for an aerial target is indeed an interesting and somewhat unusual case, as it implies that there is no radial velocity component between the target and the bistatic radar system. In the passive bistatic radar scenario, bistatic Doppler is proportional to the sum of the rates of change of the slant distance of the target relative to the transceiver station:

$$f_D = \frac{1}{\lambda}\left[\frac{d\left\|\vec{R}_T\right\|}{dt} + \frac{d\left\|\vec{R}_R\right\|}{dt}\right]$$

$$f_D = \frac{v}{\lambda}\left[\cos\left(\delta - \frac{\beta}{2}\right) + \cos\left(\delta + \frac{\beta}{2}\right)\right]$$
$$= \frac{2v}{\lambda}\cdot\cos(\delta)\cos\left(\frac{\beta}{2}\right)$$

where the angle between the target-transmitter and target-receiver segments, denoted with β, is called the bistatic angle. The angle between the target velocity vector and bistatic bisector, denoted with δ.
If the target is moving along a bistatic ellipsoid where the two foci are at the transmitter and receiver locations, the bistatic range does not change, and the bistatic

velocity is zero.
The above discussion has been included in Section 2.1. Radar System Analysis.

COMMENT 3.4*: It would be useful to add a Z scale so that we have a precise view of the levels respect to the background noise, which would be useful for making a precise judgment on what you are proposing. It would also be useful to present the intermediate results before and after the removal of the direct signal (eq. 1 and 2).*
Reply: Thank you for this good suggestion. Due to the very limited time to amend the paper, we will present these results in our future work.

Finally, the authors are again grateful to you, Reviewer 3, for your time and effort to make this paper a much better one.