Dear Editor,

Thank you for sending us the referee’s report. We also thank the referee for the helpful comments which have enabled us to improve our manuscript. Our responses to the referee’s comments and a list of changes are as follows.

Comment from editor: Units are needed unless quantities plotted are dimensionless. The ideal format for units in figures is to set them in parentheses, following the quantity being plotted. Alternatively the units can be included in the figure caption.

Response: Thank you for reminding us the units in the figures. The quantities in all figures are dimensionless in this paper.

Comments from referee:

Comment: I miss a small discussion from the end of the paper on how feasible  
is to experimentally realize such a system.

Response: This population-inversed system is experimentally feasible since the arbitrary ratio of the two transitions' decay rates can be effectively controlled by different waveguide structure, and the experiments on the broadband squeezed vacuum coupled to the artificial atom in a 1D cavity have been widely conducted.

Comment: How difficult is to create a squeezed vacuum described by Eq.(8)?

Response: Eq.(8) in the previous manuscript is now Eq.(9) in the revised manuscript. In principle, we can split the squeezed vacuum into two beams by a triangular prism and inject them into opposite ends of the waveguide. In this case, the correlation of the squeezed vacuum can be described by Eq. (9). We have added this discussion in the paragraph between Eq. (9) and Eq(10) in the revised manuscript.

Comment: The result that "the final state is just the direct product of the  
steady state of independent atoms" suggests that dipole-dipole  
interaction plays no role. Does this stem from a special property of  
the squeezed vacuum?

Response: This is a very good question. The dipole-dipole interaction can significantly affect the evolution of the system, which can be seen from Fig. 4. With different atom separation, the dipole-dipole interaction is different and their dynamics are quite different. However, it is very interesting to find that for all cases the final states converge to the direct product state of the steady state of single atom which we have proved mathematically and numerically. This can occur if the squeezed vacuum has the correlations shown in Eq. (9). Actually, in the normal squeezed vacuum with correlation shown in Eq. (3), the steady state of the atoms can be also direct product of the steady state of a single atom if all the atoms are at the nodes of the standing wave. This is one of the most interesting phenomena we find in this paper and its physical insight still needs more studies. We have added these discussions in the paragraph below Eq.(16) and the summary.

Comment: What justifies the usage of the rotating wave approximation in  
Eq.(10)?

Response: Eq.(10) is now Eq.(11) in the revised manuscript. In our model, we assume that is significantly different from , i.e., Under this condition, we can apply the secular approximation to remove the highly oscillating terms in Eq. (4) and obtain Eq. (11). We have clarified this point in the sentence before Eq. (11).

Comment: What does the following expression mean after Eq.(15)? "k = 1 ∼ N"

Response: Eq. (15) is now Eq. (16) in the revised manuscript. The expression after Eq. (15) is a identity which can be proved by plugging the expressions of A, B, C and Eq. (10). Here, k is the index number of atoms. We use mathematical induction to prove that direct product of the steady state of a single atom is also the steady state of Eq. (11). First, we assume that the steady state of N atom is direct product of the steady state of a single atom. Then we plug the similar product state for N+1 atoms into the right hand side of Eq. (11). Comparing with the N atom case, there are some extra terms due to the (N+1)th atom, for example, the terms with the atom index i= N+1 and k=1~ N, k= N+1 and i=1~ N, or k= N+1 and i= N+1. In Eq. (16) we prove that the terms with i= N+1 and k=1~ N are zero. We have clarified these in the paragraph below Eq. (11) and the paragraph below Eq. (16).

All changes are written in bold.