Dear Dr. Brierley,

Thank you for sending us the reviewer comments for our manuscript (NCOMMS-18-29175-T) entitled “Revealing the emergence of classicality in nitrogen-vacancy centers”. The second reviewer recommends publication in Nature Communications (after some clarifications that we have now implemented). The first reviewer recommends an additional round of refereeing, a recommendation made in spite of what we feel is a biased view of the subject of our work – the transition from quantum to classical (see, e.g., the reviewer’s comment that our title “…sounds almost religious.”).

In particular, we believe the first reviewer is prejudiced against the subject and, as a consequence, misses the main point of the paper. The specific claims regarding quantum non-demolition (QND) measurements demonstrate this: He notes – correctly – that various quantum measurements generate redundancy (“to get a meaningful result all the ancillas have to « agree » about it”). However, the point of our work is not that one can create artificial scenarios that result in redundancy – i.e., implement QND measurements that have redundant information – but that redundant information arises naturally. This is crucial, as emergence of “objective reality” – the cornerstone of classicality – is, in our quantum Universe, an all-pervasive “fact of life” rather than an event that only happens in deliberate laboratory experiments.

In our paper, though, we do first demonstrate the novel control protocol by artificially creating a GHZ state. However, this was just that, a demonstration. We then use the technical advances to examine a system initially in a superposition decohering by the nuclear spin environment. This ***natural*** process gives rise to redundancy and has never before been directly observed and analyzed. The natural origin of redundancy is crucial to explain objectivity in everyday settings and, as we say, our work provides the first laboratory demonstration of the emergence of the classical world.

Please see the attached point-by-point response to the reviewers, as well as the changes to the manuscript that we made. Since one reviewer said to accept and the other to revise, we hope that you will consider the revised manuscript for Nature Communications.

On behalf of all the authors,

Thomas Unden