

Lasing Reporting Summary

Nature Research wishes to improve the reproducibility of the work that we publish. This form is intended for publication with all accepted papers reporting claims of lasing and provides structure for consistency and transparency in reporting. Some list items might not apply to an individual manuscript, but all fields must be completed for clarity.

For further information on Nature Research policies, including our [data availability policy](#), see [Authors & Referees](#).

► Experimental design

Please check: are the following details reported in the manuscript?

1. Threshold

Plots of device output power versus pump power over a wide range of values indicating a clear threshold

☐ Yes
☒ No

In this study the laser is used only as a photon source for detection and not as the main subject of study. A pulsed laser with a maximum intensity of ~1 mJ per pulse was used to generate photons for the detection process. The laser was operated above threshold to ensure stable emission.

2. Linewidth narrowing

Plots of spectral power density for the emission at pump powers below, around, and above the lasing threshold, indicating a clear linewidth narrowing at threshold

☐ Yes
☒ No

In this study the laser is used only as a photon source for detection and not as the main subject of study.

Resolution of the spectrometer used to make spectral measurements

☐ Yes
☒ No

In this study the laser is used only as a photon source for detection and not as the main subject of study.

3. Coherent emission

Measurements of the coherence and/or polarization of the emission

☐ Yes
☒ No

In this study the laser is used only as a photon source for detection and not as the main subject of study.

4. Beam spatial profile

Image and/or measurement of the spatial shape and profile of the emission, showing a well-defined beam above threshold

☐ Yes
☒ No

In this study the laser is used only as a photon source for detection and not as the main subject of study.

5. Operating conditions

Description of the laser and pumping conditions
Continuous-wave, pulsed, temperature of operation

☒ Yes
☐ No

Described in the methods section.

Threshold values provided as density values (e.g. W cm⁻² or J cm⁻²) taking into account the area of the device

☐ Yes
☒ No

In this study the laser is used only as a photon source for detection and not as the main subject of study.

6. Alternative explanations

Reasoning as to why alternative explanations have been ruled out as responsible for the emission characteristics
e.g. amplified spontaneous, directional scattering; modification of fluorescence spectrum by the cavity

☐ Yes
☒ No

In this study the laser is used only as a photon source for detection and not as the main subject of study.

7. Theoretical analysis

Theoretical analysis that ensures that the experimental values measured are realistic and reasonable
e.g. laser threshold, linewidth, cavity gain-loss, efficiency

☐ Yes
☒ No

In this study the laser is used only as a photon source for detection and not as the main subject of study.

8. Statistics

Number of devices fabricated and tested

☐ Yes
☒ No

In this study the laser is used only as a photon source for detection and not as the main subject of study.

Statistical analysis of the device performance and lifetime (time to failure)

☐ Yes
☒ No

In this study the laser is used only as a photon source for detection and not as the main subject of study.

