

Corresponding author(s):

Initial submission Revised version Final submission

Lasing Reporting Summary

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► 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

State where this information can be found in the text.

No

Explain why this information is not reported/not relevant.

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

State where this information can be found in the text.

No

Explain why this information is not reported/not relevant.

Resolution of the spectrometer used to make spectral measurements

Yes

State where this information can be found in the text.

No

Explain why this information is not reported/not relevant.

3. Coherent emission

Measurements of the coherence and/or polarization of the emission

Yes

State where this information can be found in the text.

No

Explain why this information is not reported/not relevant.

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

State where this information can be found in the text.

No

Explain why this information is not reported/not relevant.

5. Operating conditions

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

Yes

State where this information can be found in the text.

No

Explain why this information is not reported/not relevant.

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

Yes

State where this information can be found in the text.

No

Explain why this information is not reported/not relevant.

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

State where this information can be found in the text.

No

Explain why this information is not reported/not relevant.

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

State where this information can be found in the text.

No

Explain why this information is not reported/not relevant.

8. Statistics

Number of devices fabricated and tested

Yes

State where this information can be found in the text.

No

Explain why this information is not reported/not relevant.

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

Yes

State where this information can be found in the text.

No

Explain why this information is not reported/not relevant.

► Further reading

We also suggest that authors read the following literature, which describes the important principles and signatures of laser emission and discusses some of the common mistakes that can occur during laser characterization.

1. Samuel I.D.W., Namdas, E.B. & Turnbull, G.A. [How to recognize lasing](#). *Nat. Photon.* **3**, 546-549 (2009).
2. Siegmann, A.E. *Lasers*. (University Science Books, 1990)
3. Svelto, O. *Principles of Lasers*. 5th edn. (Springer 2010)
4. Blood, P. *Quantum Confined Laser Devices: Optical Gain and Recombination in Semiconductors*. (Oxford Univ. Press, 2015)
5. Koxlov, V.G. *et al.* [Laser action in organic semiconductor waveguide and double-heterostructure devices](#). *Nature* **389**, 362-364 (1997).

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