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Lasing Reporting Summary

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	Experimental design					
Ρle	ease check: are the following details reported in t	he manu	script?			
1.	Threshold					
	Plots of device output power versus pump power over	Yes	State where this information can be found in the text.			
	a wide range of values indicating a clear threshold	No	Explain why this information is not reported/not relevant.			
2.	Linewidth narrowing					
Plot	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	Yes	State where this information can be found in the text.			
	easurements	☐ No	Explain why this information is not reported/not relevant.			
3.	Coherent emission					
Measurements of the coherence of the emission	Measurements of the coherence and/or polarization	Yes	State where this information can be found in the text.			
	of the emission	☐ No	Explain why this information is not reported/not relevant.			
4.	Beam spatial profile					
	Image and/or measurement of the spatial shape and	Yes	State where this information can be found in the text.			
	profile of the emission, showing a well-defined beam above threshold	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	Yes	State where this information can be found in the text.			
	or J cm ⁻²) taking into account the area of the device	No	Explain why this information is not reported/not relevant.			
ŝ.	Alternative explanations					
	Reasoning as to why alternative explanations have been ruled out as responsible for the emission characteristics e.g. amplified spontaneous, directional scattering;	Yes	State where this information can be found in the text.			
		No	Explain why this information is not reported/not relevant.			
	modification of fluorescence spectrum by the cavity					
7.	Theoretical analysis					
Theoretical analysis	Theoretical analysis that ensures that the experimental	Yes	State where this information can be found in the text.			
	values measured are realistic and reasonable e.g. laser threshold, linewidth, cavity gain-loss, efficiency	No	Explain why this information is not reported/not relevant.			
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3.	Statistics	□ Vas	Control of the contro			
	Number of devices fabricated and tested	Yes No	State where this information can be found in the text. 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).

