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Reduction of laser diode intensity noise in optical beam deflection systems

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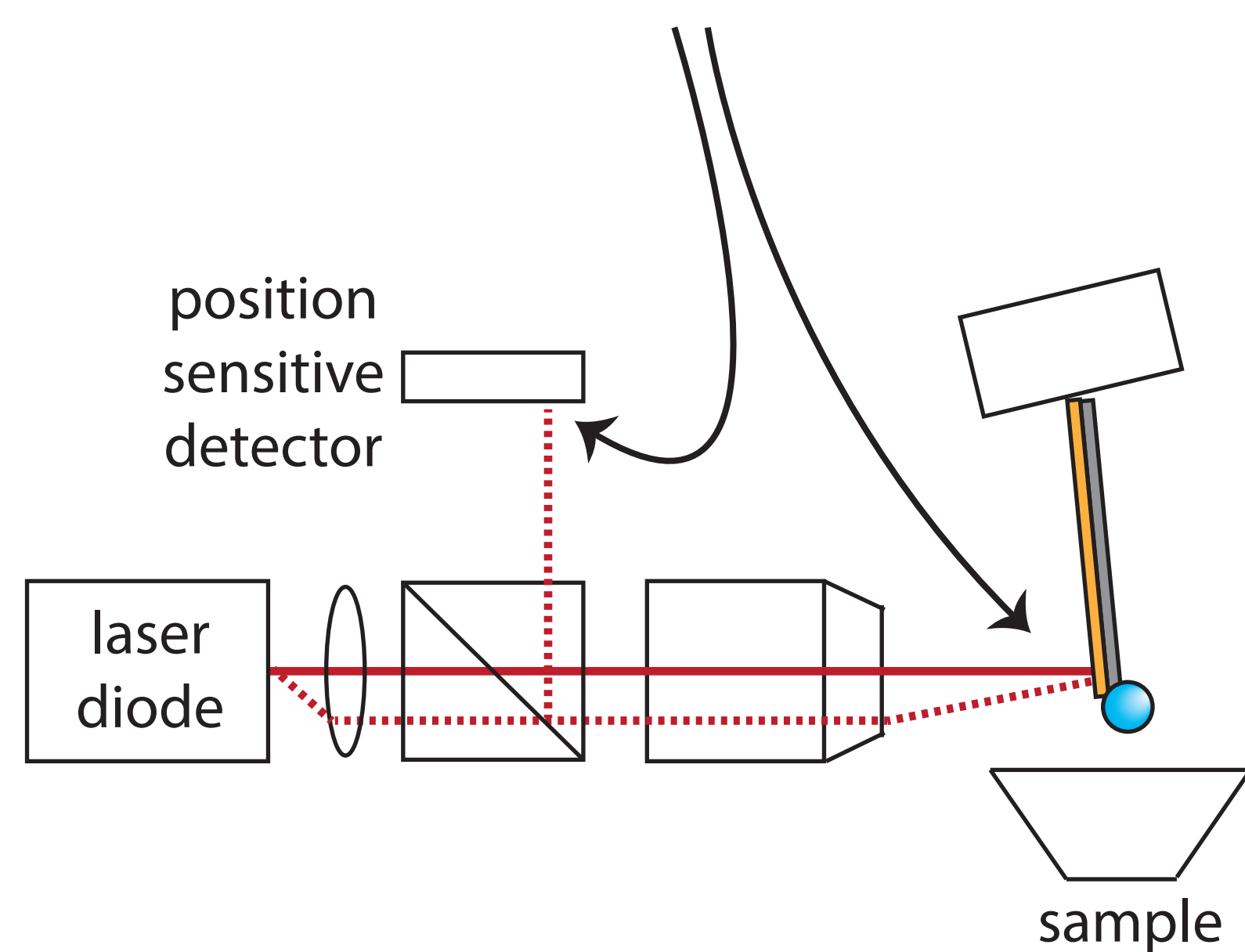
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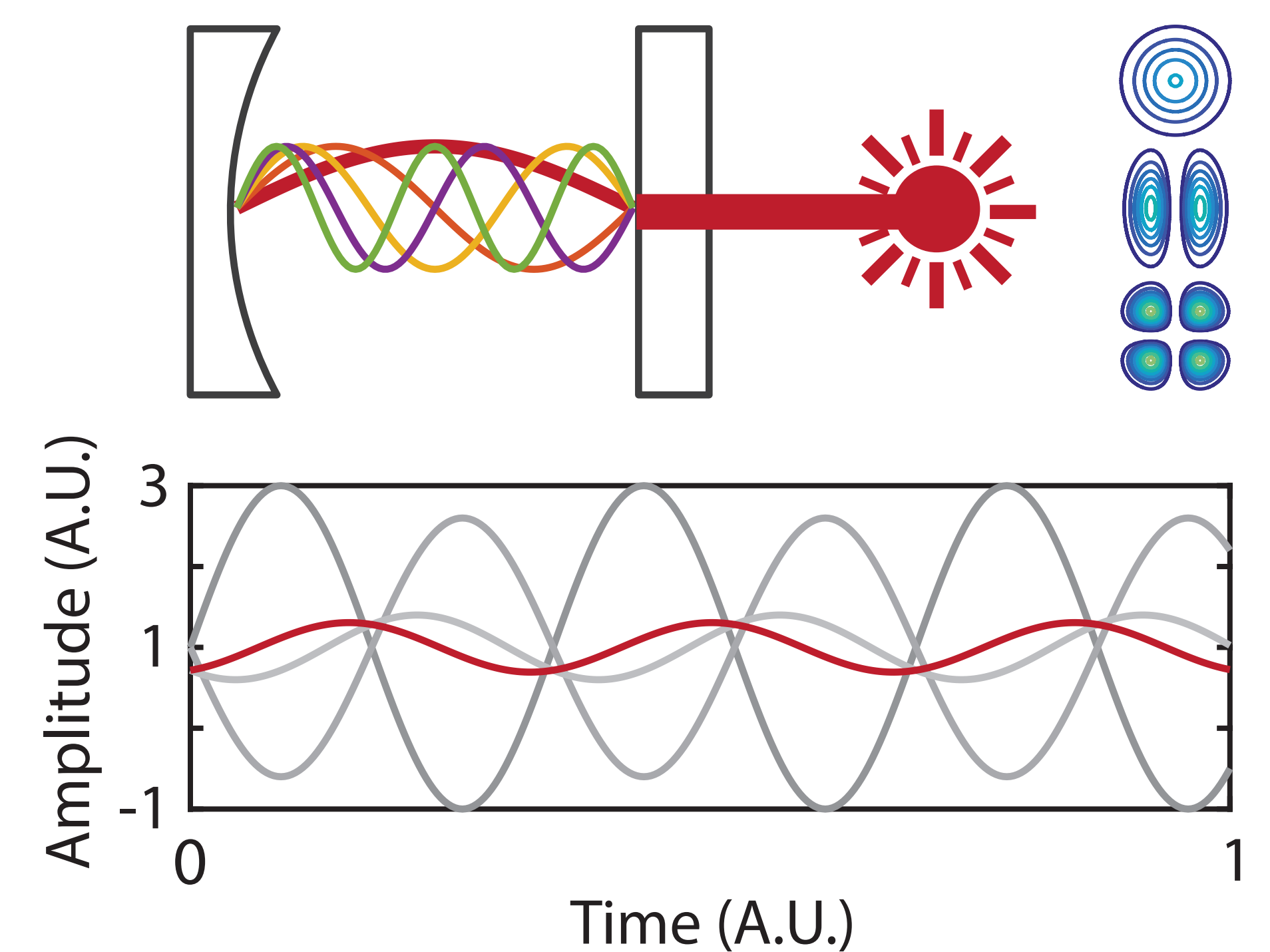
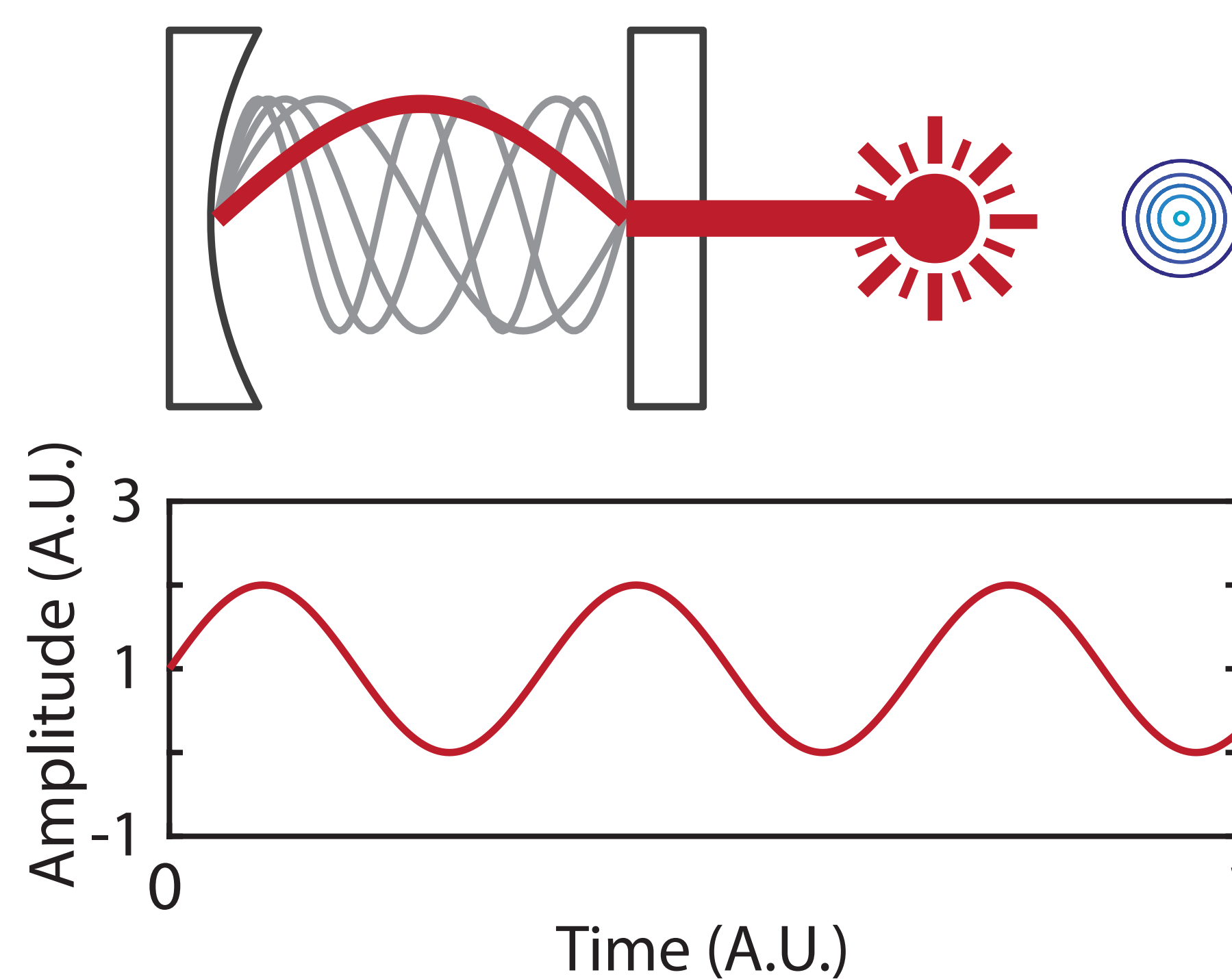
Problem

Intensity fluctuations introduce noise here.

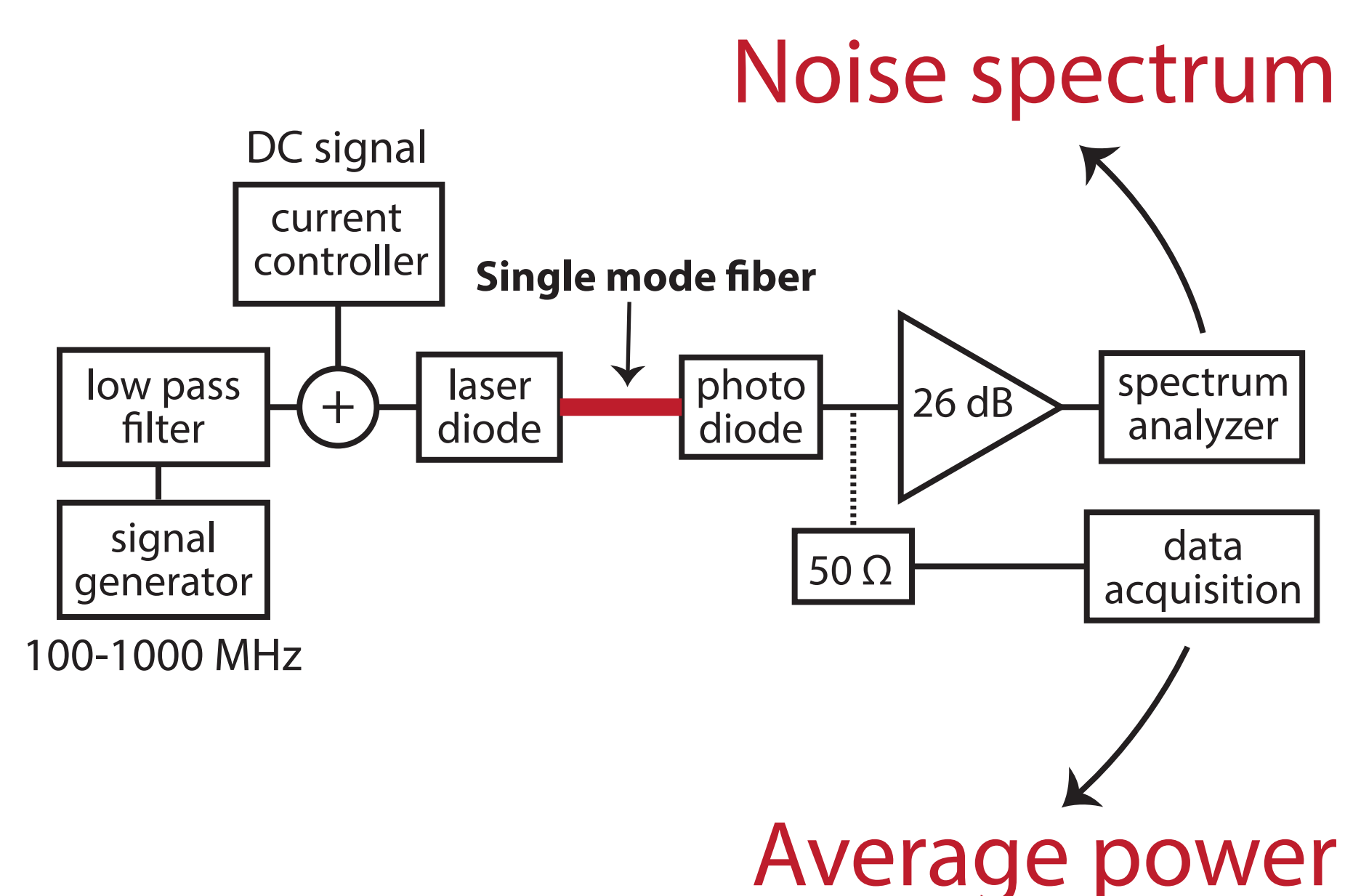


Is high frequency injection the solution?

Injection of a high frequency signal, excites the laser in a multimode state. Mode partition then reduces the total noise.

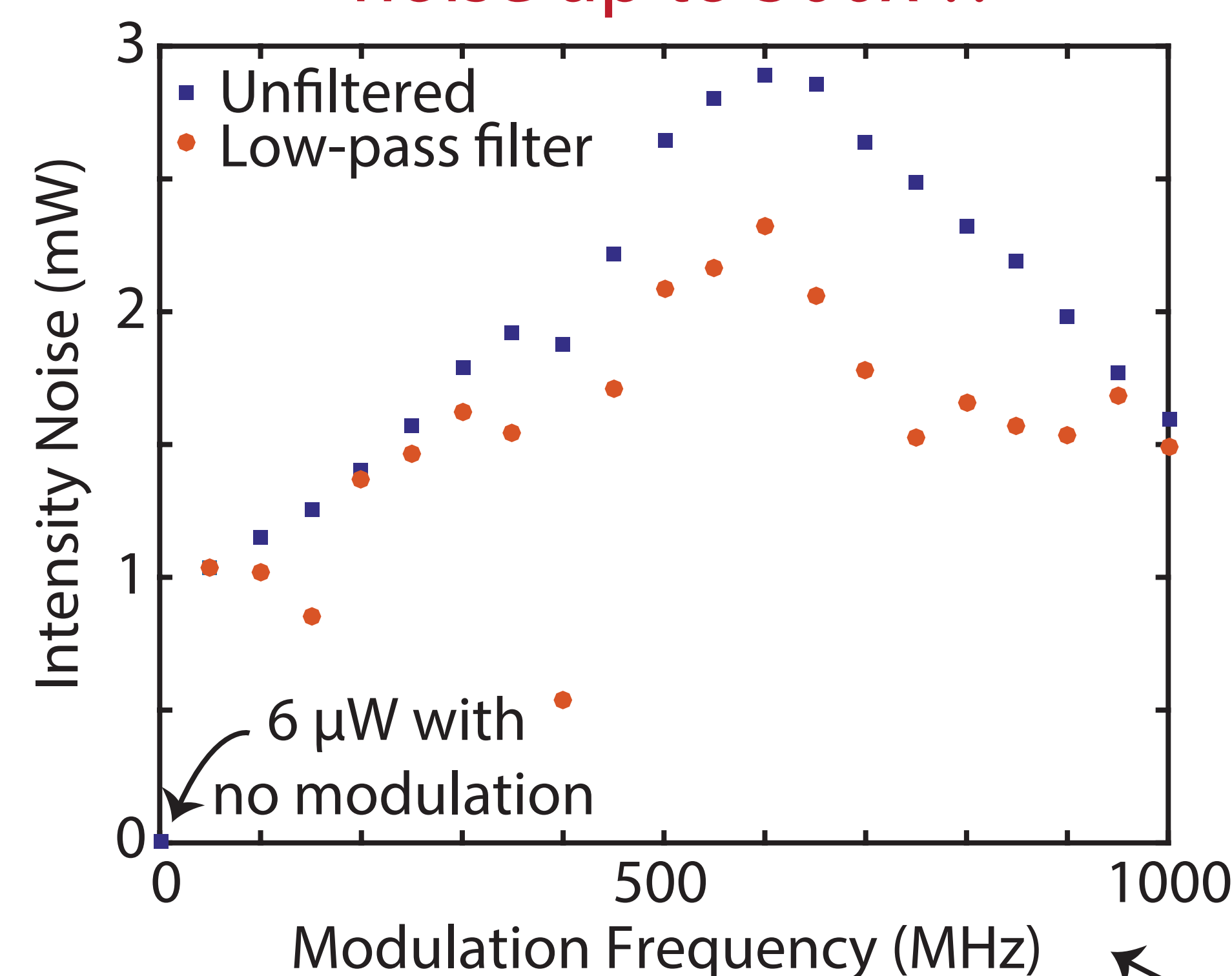


Method



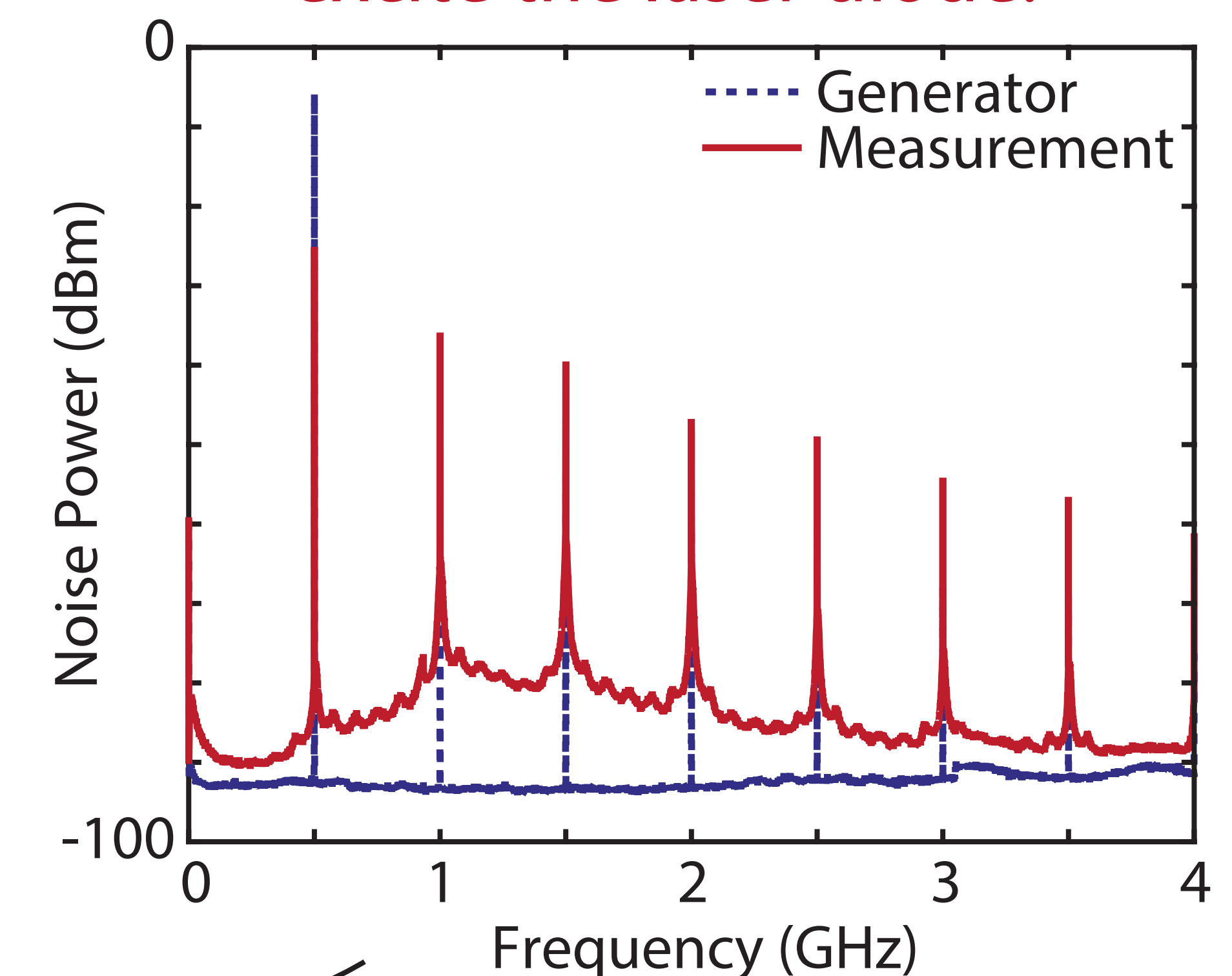
Results

Modulation increases the noise up to 500x ?!



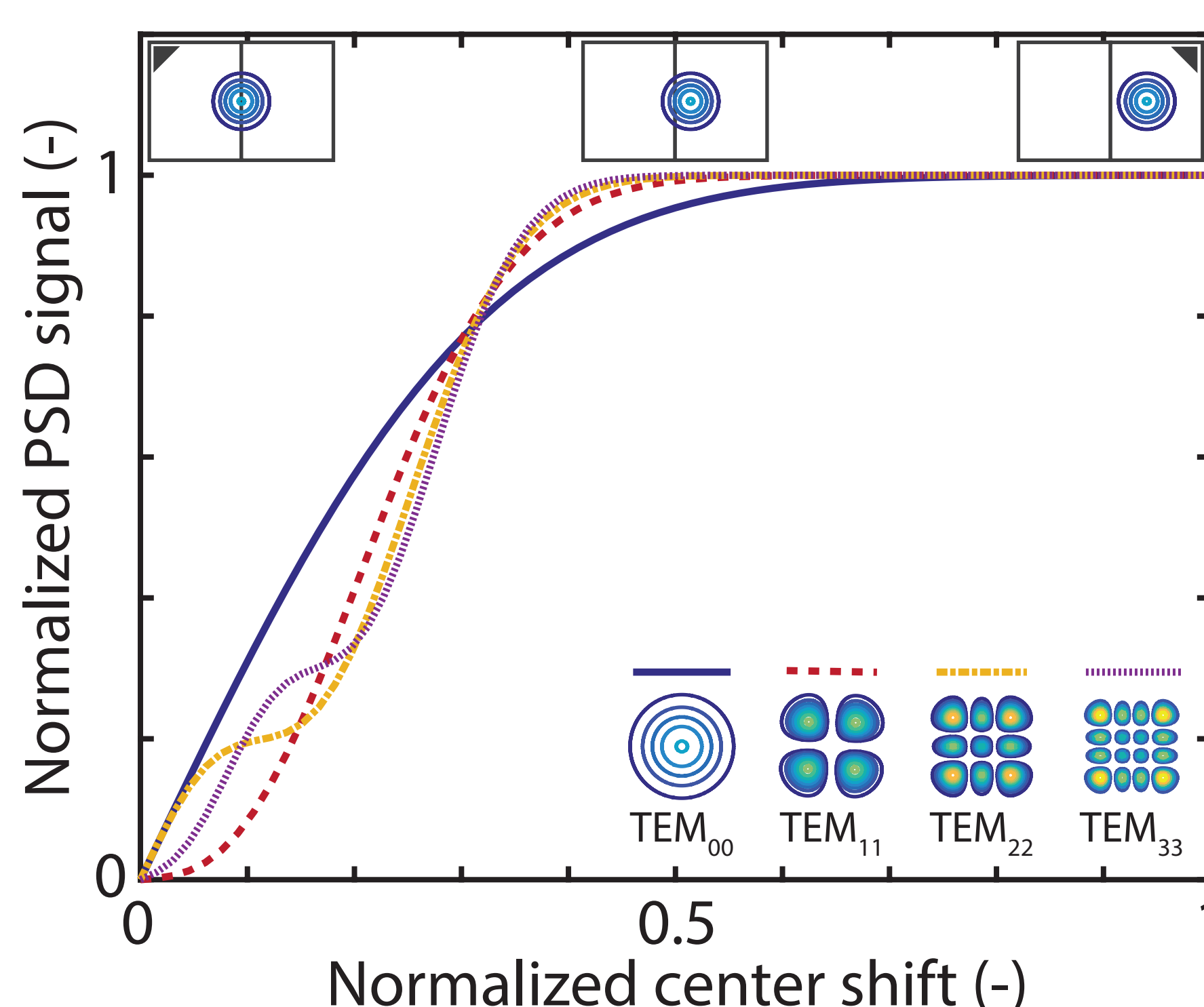
The culprit

The higher harmonics also excite the laser diode!



Modehopping

A change in mode shape causes a change in PSD output, w/o moving the laser! We need a single mode.



Conclusion

Is high frequency injection the solution?

Not in this application, because
1) higher harmonics from the signal generator also excite the laser diode;
2) mode hopping and the superposition of transverse modes introduce additional noise at the position sensitive detector.
This implies the use of a single mode fiber, but this interferes with the action of the high frequency injection.

A low-pass filter after the signal generator helps a bit.



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