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Technical Paper

Laser Quantum's Noise Measurement:

How Laser Quantum measures and reports root mean square (RMS) % noise value.

One of Laser Quantum's goals has always been to create lasers with the lowest possible noise.

Intracavity frequency-doubled lasers have an inherent noise of about 3% RMS. Several techniques have been developed over the years to reduce this noise, known as the "Green Problem", and at Laser Quantum we have worked for many years to develop cavity innovations and electronic solutions to progressively reduce the noise level to below 0.02% RMS (figure 1). Our techniques are applied to all of our visible lasers and many have been patented.

All these advances in noise reduction have made it much harder to actually measure the noise using existing commercial systems, as it is a very small signal. We have, therefore, developed our own system to measure noise accurately.

There are three parts to the noise detection method:

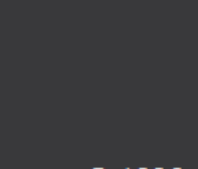
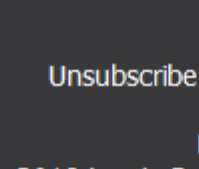
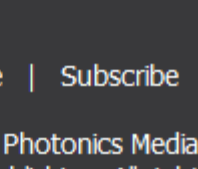
1) The detection
2) The fast analysis
3) The long-term computer analysis

The detection

Our detectors are specially made to measure 100% of the laser's power, with no ND filters or pick off wedges between the laser and our detectors. ND filters placed in the laser beam path can lead to unwanted interference effects which can result in spurious noise contributions.

To attenuate the laser power, we use a specifically designed ceramic plate of a thickness suitable for the measured power that diffuses the laser beam. This reduces its power and removes the need for an ND filter with parallel optical surfaces (Figure 2).

One of the applications for our lasers is Ti:Sapphire pumping. Ti:Sapphire crystals have a noise transfer function: laser noise occurring at frequencies beyond the frequency range of the transfer function is not seen in the output of the Ti:Sapphire laser beam. In the case of Ti:Sapphire, this is ~800 kHz (Figure 3), so it is imperative to minimise the amplitude noise of the pump source below this value.

www.laserquantum.com

How Laser Quantum Measures and Reports Root Mean Square (RMS) % Noise Value

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