MODE BEATS AND THE SENSITIVITY LIMIT OF THE PULSED CAVITY RING-DOWN SPECTROSCOPY

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In a cavity ring-down experiment with pulsed lasers it is usually difficult to obtain *purely exponential* ring-down signals due to transverse mode beats. The mode beat patterns usually change randomly from pulse to pulse as a result of the transverse energy distribution fluctuations in the pulsed lasers. Each laser pulse excites a different linear combination of the transverse cavity modes. The mode beats would not be observed either in the case of single transverse mode excitation or in a case when all the energy leaving the cavity is detected. Good mode matching is very difficult with pulsed lasers. Vignetting of the output beam and the spatial nonuniformity of the detector response function, which has an effect similar to the vignetting, does not permit detection of all the light.
We present an analysis of the cavity mode beats and a method to greatly reduce their effect on the pulsed CRDS sensitivity.