Characterising the Nonlinear Optical Properties of Silicon and Germanium-Based Semiconductors

Measuring semiconductor nonlinear properties with Radiantis Femtosecond IR OPO, Oria IR

Radiantis femtosecond IR OPOs have been successfully used to measure nonlinear absorption coefficients and to generate nonlinear effects such as SPM, XPM or supercontinuum generation on semiconductor materials.

As an example, Radiantis IR femtosecond OPO was used at the Optoelectronics Research Center (ORC) in Southampton (UK) to measure the nonlinear absorption of an a-Si:H optical fiber at different wavelengths with the experimental set-up shown below.

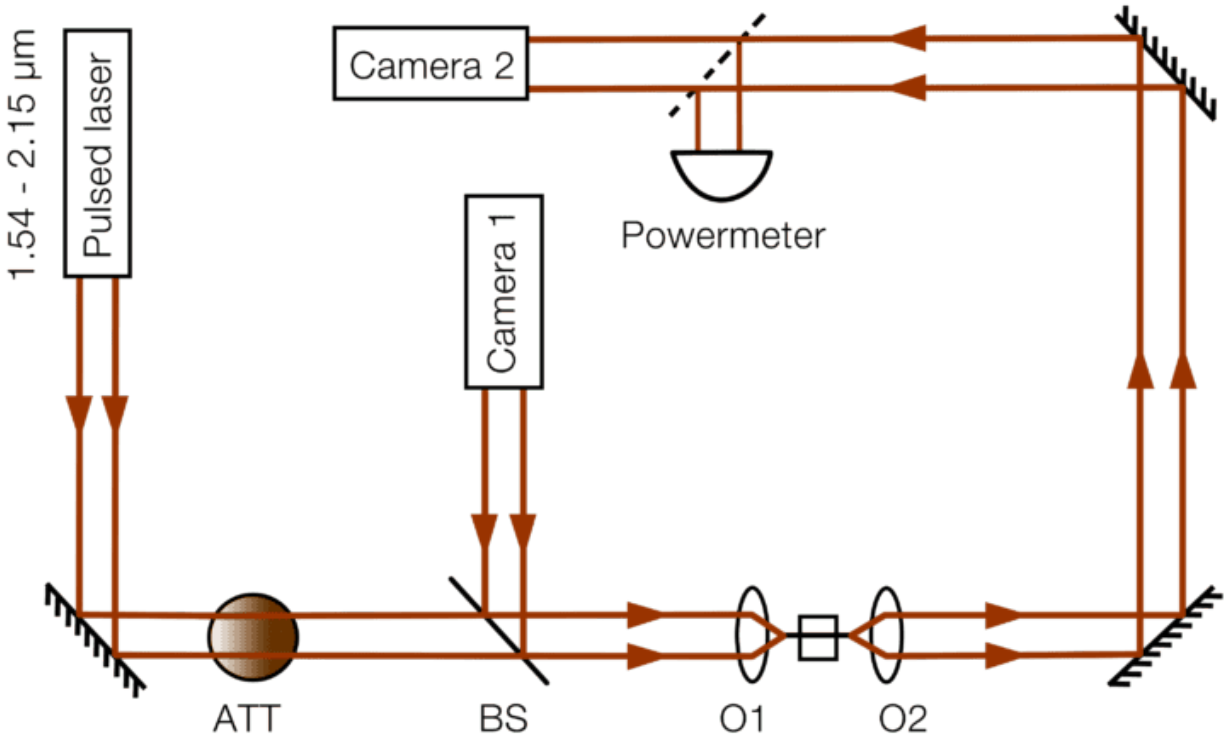
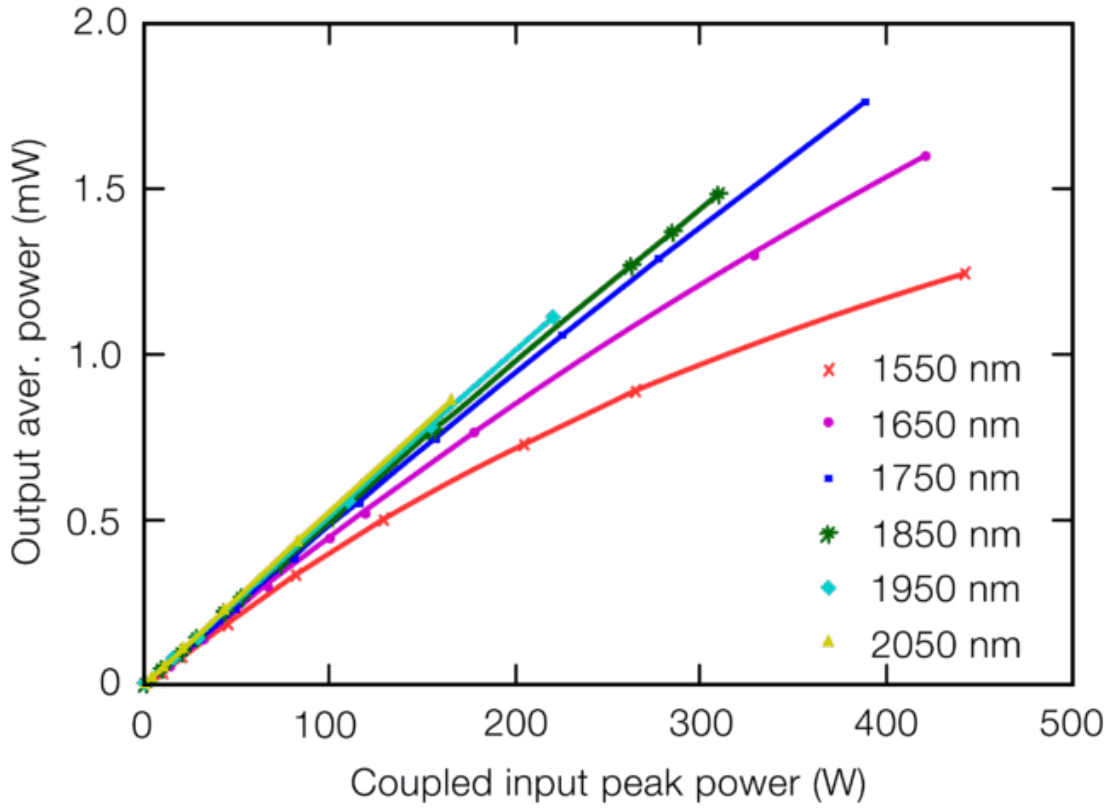


Figure 1: Experimental setup for nonlinear absorption characterization. Pulsed Laser: Radiantis IR Femtosecond optical parametric oscillator (OPO).
With thanks to Dr. Li Shen, PhD Thesis, Semiconductor Waveguides for Mid-IR Photonics, ORC, Southampton, UK

And the results illustrated in the following graph show that the nonlinear two-photon absorption (TPA) initially drops as the wavelength increases through the telecom window (1.55 – 1.65 µm) and eventually begins to plateau at a negligible value as the wavelength approaches the mid-IR regime (1.95 – 2.15 µm).



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Semiconductor technology moves faster than ever as the semiconductor industry reached record sales in 2021. New materials such as Tin Oxide, Graphene, Pyrite amongst many others are being explored. Scientists are revisiting the use of Germanium for transistor technology as electrons move faster than on Silicon, to increase speed. The opportunities are countless.

At Radiantis we would like to do our bit to advance semiconductor Oria IR Femtosecond OPO technology by supporting scientists and technologists with our flexible broadly tunable laser sources based on optical parametric oscillators.