Towards high-power, multi-GHz waveguide lasers

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There has been a growing interest in the development of laser sources with high (> GHz) pulse repetition rates owing to their potential applications in areas such as non-linear microscopy, optical sampling, frequency metrology, optical communications, optical arbitrary waveform generation and for the calibration of astronomical spectrographs (astro-combs). Ultrafast lasers based on low-loss waveguide geometry offer a combination of features (low-threshold operation, high efficiency and moderate non-linearities) which make them attractive for development of compact, low-cost, multi-GHz femtosecond sources.

Towards this goal we have demonstrated mode-locked operation of an Yb^{3+}-doped waveguide laser with a repetition rate of 4.9 GHz, pulse duration of 740 fs and an output power of 80 mW [1] (Figure 1) around 1050 nm. Recently, by using even shorter cavity lengths, we have achieved a repetition rate of up to 15.2 GHz [2].

Currently, we are working on power-scaling of our 5 GHz waveguide sources using a fiber amplification setup as described in [3]. We believe that such a multi-watt, multi-GHz waveguide laser source could find many applications in laser science and technology areas.

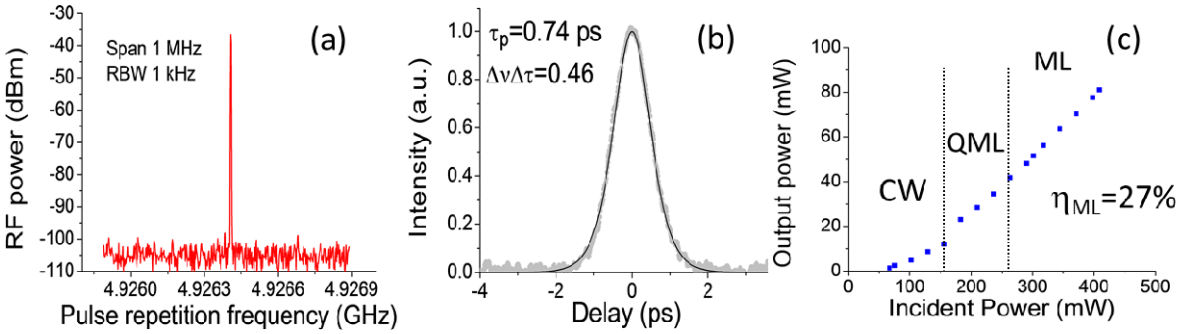

Figure 1. (a) Radio frequency spectra, (b) autocorrelation trace, and (c) input-output power characteristics for the 4.9 GHz mode-locked waveguide laser.

References

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