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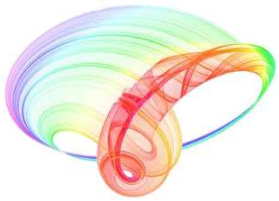

PHOTONICA2021

VIII International School and Conference on Photonics

& HEMMAGINERO workshop

23 - 27 August 2021,

Belgrade, Serbia

Editors

Mihailo Rabasović, Marina Lekić and Aleksandar Krmpot

Institute of Physics Belgrade, Serbia

Belgrade, 2021

ABSTRACTS OF TUTORIAL, KEYNOTE, INVITED LECTURES, PROGRESS REPORTS AND CONTRIBUTED PAPERS

of

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Measuring the Spectrally-Resolved Linewidth Enhancement Factor

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Semiconductor frequency comb lasers are gaining more and more attention in the last two decades due to their various applications such as high-precision spectroscopy for medical and chemical sensing. The devices are compact and electrically pumped - ideal for miniaturization and integration. The linewidth enhancement factor (LEF) plays a key role in the description of these devices and understanding the dynamic processes like laser linewidth broadening, modulation response and frequency comb formation [1]. Therefore, knowing its value in a real device is of utmost importance. However, as of yet, experimental schemes to determine the LEF were limited to measurements below the lasing threshold or single-mode laser operation. Here we present a novel and universally applicable modulation technique, capable of measuring the LEF of a laser source during operation [2]. For a frequency comb we can infer the LEF over the whole laser spectrum, for each comb mode, in a single-shot measurement. The technique utilizes "Shifted Wave Interference Fourier Transform Spectroscopy" (SWIFTS), a phase-sensitive measurement scheme [3]. Fig. 1a shows a sketch of the experimental setup.

Extensive Maxwell-Bloch simulations are applied to investigate the theoretical model [4]. Then an experimental demonstration is performed on a quantum cascade laser frequency comb. The frequency comb spectrum and the corresponding extracted LEF values are depicted in Fig. 1b.

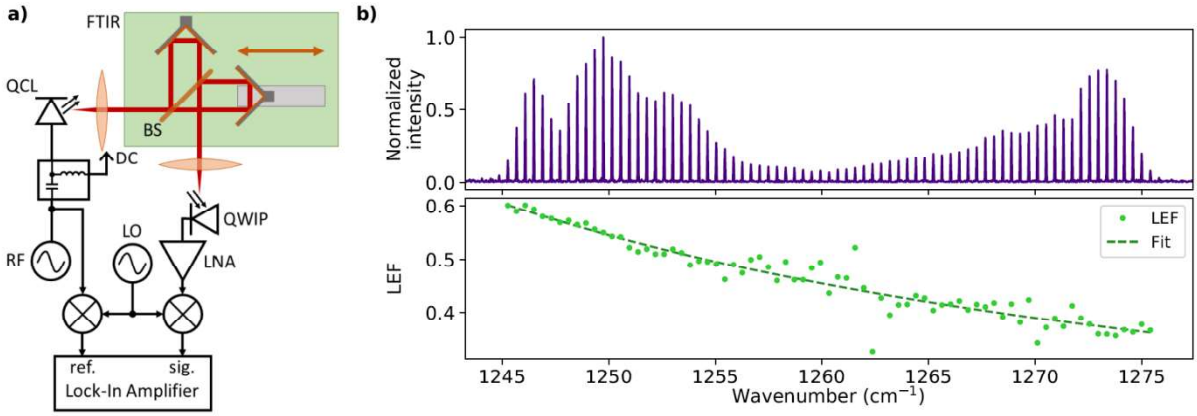

Figure 1. a) Sketch of the experimental setup, b) Intensity spectrum of the laser frequency comb (top), Spectrally-resolved LEF for each comb mode with fit (bottom).

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