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Tailoring the Spectral Properties of the Random Distributed Feedback Fiber Laser

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Abstract: The emission wavelength of random lasers is determined by an interplay of the gain profile and the physical characteristics of the medium. Thus, to obtain lasing at a pre-defined wavelength, one resorts to rather meticulous procedures like spectral engineering of gain or absorption, temperature tuning, or even engineering the microscopic structure of the medium. At telecom-wavelengths, the random distributed feedback fiber laser (RDFB-FL) offers a technically robust and simpler alternative for obtaining such pre-defined emission wavelengths [1]. By use of conventional fiber Bragg gratings (FBGs) and other fiber based devices, sub-nanometer linewidth emission (~10-2 nm) can be easily obtained [2]. Further, even multiple wavelength generation can be obtained by using individual FBGs [3], or by using interferometric devices like tilted-FBG based all fiber Lyot filter [4] (Fig 1c). Much of the dynamics of the RDFB-FL remains to be understood. Particularly, partial coherence could play a very important role, and a better understanding of the underlying dynamics would allow tailoring of spectral properties of such systems via nonlinearity management.

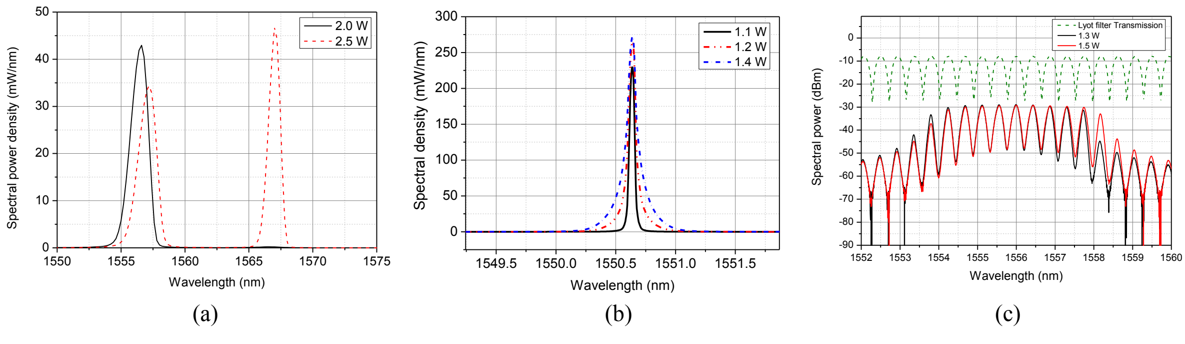

Fig.1 (a). Spectral characteristics of unfiltered RDFB-FL. (b). Sub nanometer linewidths obtained in the RDFB-FL using fiber Bragg gratings. (c). Multiwavelength generation obtained using all fiber based Lyot filter

References

[1] S. K. Turitsyn et al, Nat. Photonics **4**, 231 - 235 (2010)
[2] S. Sugavanam et al, Opt. Express 21, 16466 (2013)
[3] A. E. El-Taher et al, Opt. Lett. 36, 130–132 (2011)
[4] S. Sugavanam et al, Opt. Express 22, 2839-2844 (2014)