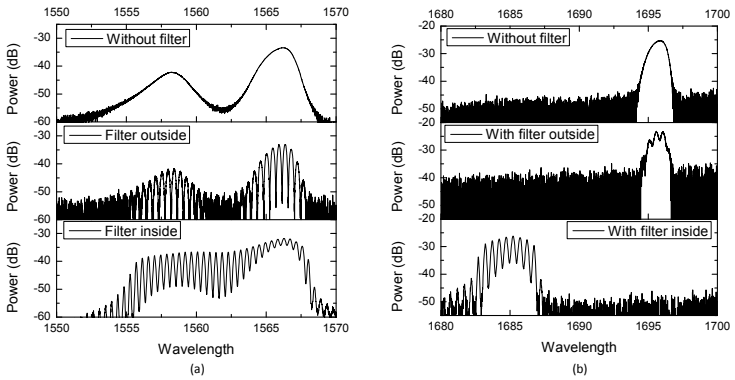

Fig. 4. Generation spectra in random lasers in different configurations: upper row – without any filter, middle row – with Lyot filter placed at the laser output, bottom row – with a Lyot filter placed in the middle of fiber span. (a) first Stokes wave (b) second Stokes wave.

One can control the properties of the generated radiation by managing the all fiber Lyot filter properties: spacing between the generated lines can be controlled by adjusting the length of the PM fiber in the filter. Linewidth of the individual lines can be controlled by employing a cascade of such Lyot filters. This is a significant advantage over existing Brillouin-Raman fiber lasers, where there is a minimal control over the width of the individual lines [33,34]. Previously, the random DFB fiber laser has been demonstrated to sustain picometer order linewidth [26], hence the above Lyot based system can be potentially used to obtain narrow-linewidth multiwavelength generation. It is also possible to control generation properties in a different way, as the PM fiber in the Lyot filter can be replaced by any suitable birefringent device, allowing room for possibility of wavelength and spacing tuning.

3. Summary

Here we have demonstrated a robust multiwavelength random DFB fiber laser based on Lyot all-fiber filter. The laser generates multiple lines both in first and second Stokes waves. The separation between lines is defined by the transmission profile of Lyot filter. However, the individual linewidth of the generated lines is found to be less than the spectral width of Lyot filter transmission profile. Nonlinear interaction between different lines could play an important role in formation of multiwavelength random DFB fiber laser generation properties.

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