Wavelength-agile fiber amplifiers for quantum technology

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The progress of quantum science in laboratory has led to advanced technologies which will impact our everyday life. The development of quantum technologies such as computing, communication, sensing and imaging has become greatly attractive even for private sectors. Lasers are key tools in quantum science and technology. For example, high power single frequency lasers at various wavelengths, usually not easy to obtain, are required in laser cooling of atoms, optical standards, precision measurement etc.

In this talk, we discuss the advantage of fiber amplifiers for quantum technology application, which includes power scalability, robustness, and high beam quality, etc. We report our progress in developing high power low noise single frequency Yb, Er, and Raman fiber amplifiers for various quantum applications, usually including frequency doubling to visible and ultraviolet regime. High power single-frequency single-mode linearly-polarized Yb fiber amplifiers were developed for optical lattice generation, cooling of Hg atoms, and cesium Rydberg atoms [1-3]. High power single-frequency single-mode linearly-polarized Raman fiber amplifiers at various wavelengths were developed for different applications in atomic physics study [4-5]. And high power single-frequency single-mode linearly-polarized Er fiber amplifiers at 1560 nm was developed for atom interferometer with Rb atoms after frequency doubling to 780 nm [6]. Technical challenges in wavelength tuning, power scaling stimulated Brillouin scattering suppression, amplified spontaneous emission suppression, and second harmonic generation will be presented.

References

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