Passively synchronized Q-switched and mode-locked dual-band Tm\(^{3+}\):ZBLAN fiber lasers using a common graphene saturable absorber

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Supplementary Note

When the cavity lengths are tuned for asynchronous operation (i.e., the length of the 1480 nm cavity is not matched to that of the 1845 nm cavity), the output characteristics from the laser are summarized below in Figs. 1 - 3.

**Fig. 1.** Characteristics of the dual-band laser when the cavity lengths are tuned for asynchronous mode-locked operation. Measured output power at 1480 nm when the 1845 nm cavity is off ($P_{1560} = 0$ mW, red dots) and on ($P_{1560} = 900$ mW, black squares) for $P_{1064}$ increasing (a) and decreasing (b). Measured output power at 1845 nm when the 1480 nm cavity is off ($P_{1064} = 0$ mW, red dots) and on ($P_{1064} = 682$ mW, black squares) for $P_{1560}$ increasing (c) and decreasing (d).
Fig. 2. Output from the dual-band laser when the cavity lengths are tuned for asynchronous mode-locked operation with $P_{1064} = 682$ mW and $P_{1560} = 900$ mW. (a) Optical spectra, (b) synchronized and combined temporal pulse train (the insets show the pulse trains at each wavelength operating independently), and (c) RF spectrum for the combined, synchronized output pulses (the insets show the RF spectrum at each wavelength operating independently).
Fig. 3. Autocorrelation traces of the output pulses from the dual-band laser when the cavity lengths are tuned for asynchronous mode-locked operation. (a) 1480 nm ($P_{1064} = 682$ mW and $P_{1560} = 0$ mW) and (b) 1845 nm ($P_{1064} = 0$ mW and $P_{1560} = 900$ mW).