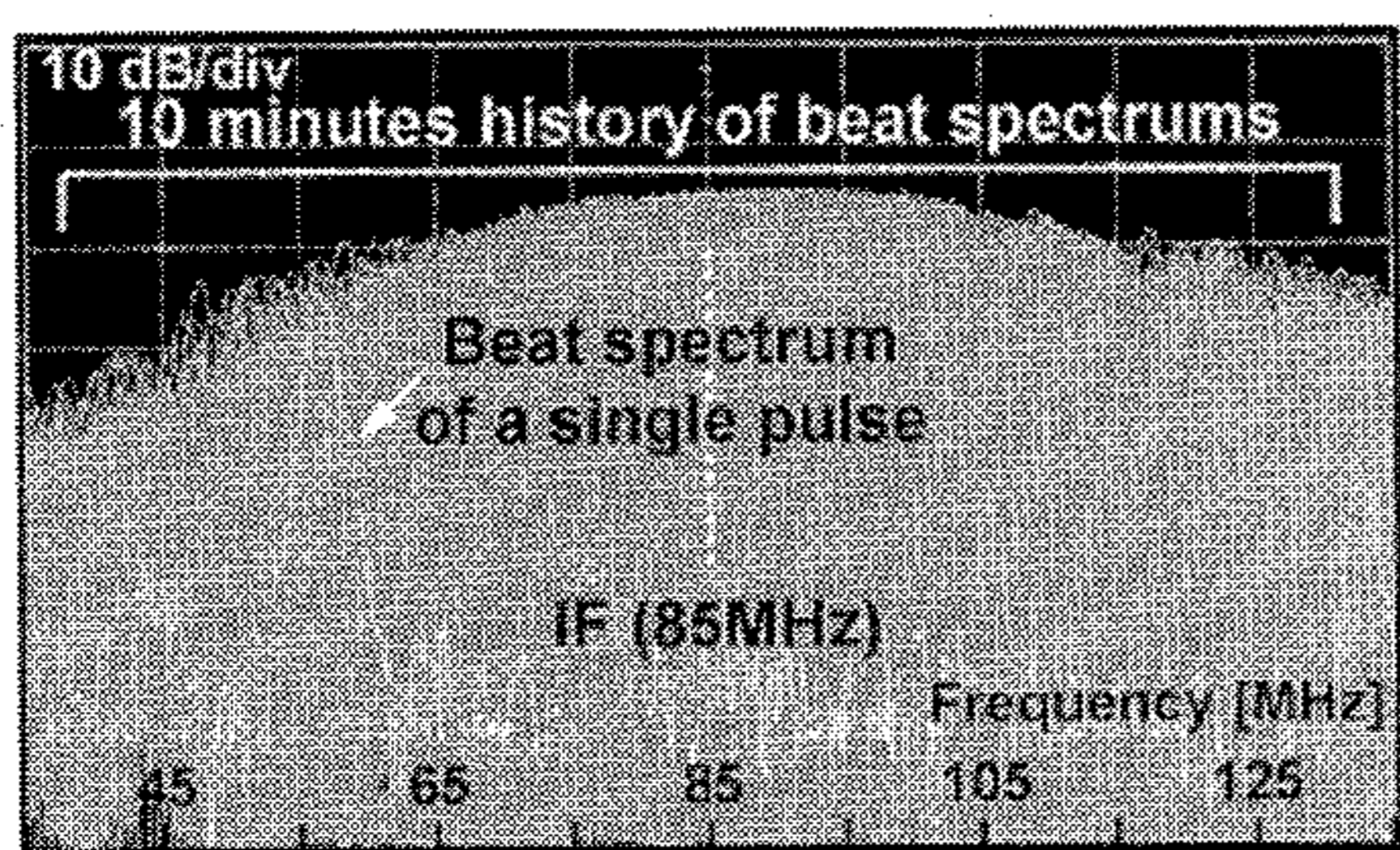
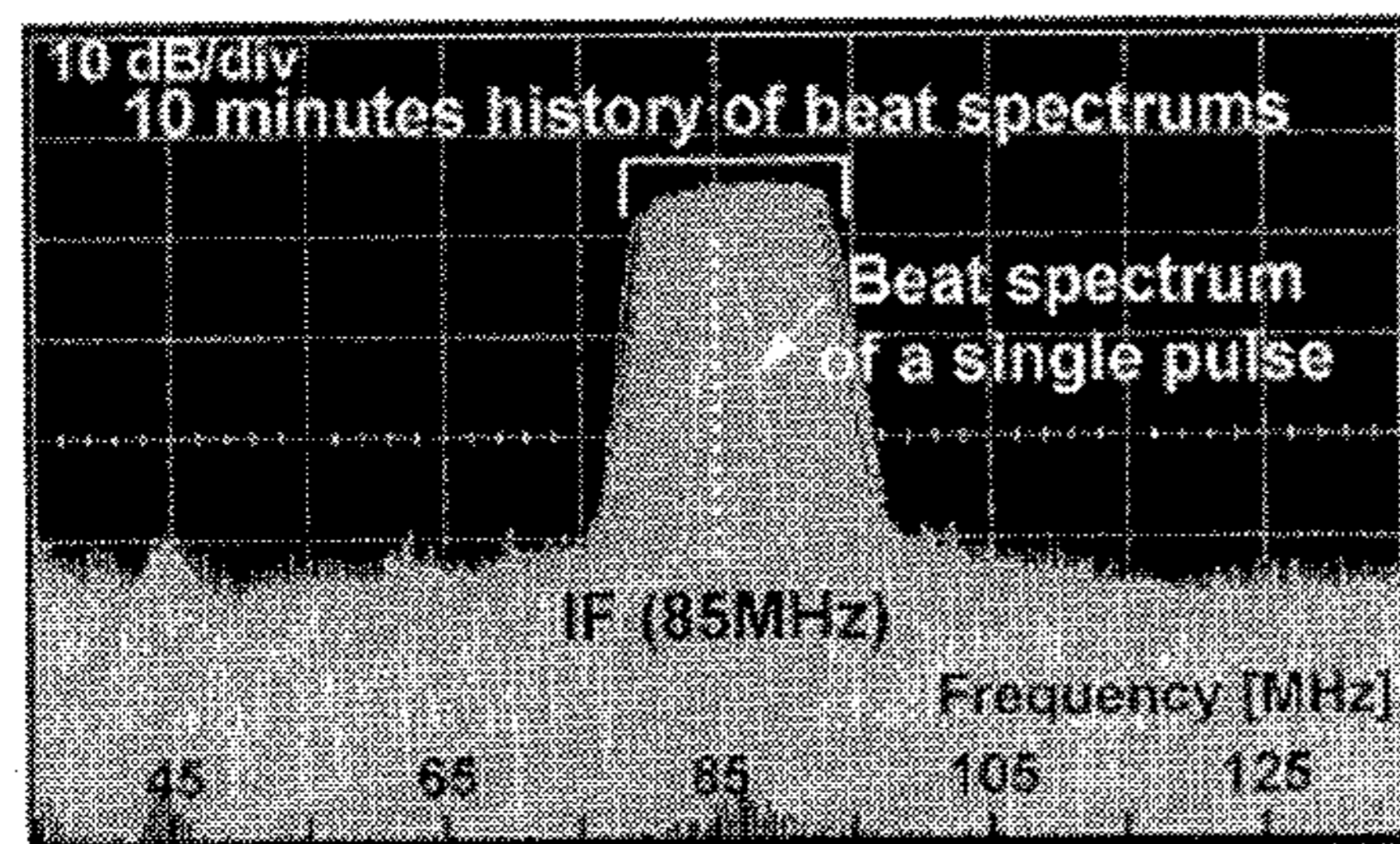


Fig. 4. TEM₀₀-mode laser output at the wavelength of 1.54 μm as a function of laser diode output power for free-running operation (open squares) and Q-switched operation (filled squares).



(a)



(b)

Fig. 5. 10-min history of the beat spectra that were obtained by means of a Fourier transform of the beat signal between the pulsed laser output and the seeded light (a) without and (b) with the cavity-length control.

energies were 20.1 mJ in free-running operation and 10.9 mJ in Q-switched operation at a maximum pumping energy of 1.27 J. A beam propagation factor M^2 (Ref. 17) of less than 1.4 was roughly estimated from the beam divergence. A kink in the free-running operation appeared at pumping energy of 1.03 J, owing to the cavity's unstable range. A long pulse width of 228-ns was obtained in Q-switched operation. The resonator's sensitivity to misalignment of mirror HR1 to reduce the output energy by 10% was measured to be 580 μrad . Figure 5 shows a 10-min history of the beat spectra that were obtained from Fourier transforms of the beat signal [Fig. 5(a)] without and [Fig. 5(b)] with the cavity-length control. As shown in Fig. 5(a), the beat frequencies were not stabilized without the cavity-length control. However, with

the cavity-length control shown in Fig. 5(b), the beat frequencies were stabilized near the intermediate frequency. A stability of the beat frequency of ± 1.9 -MHz standard deviation and a side-mode suppression ratio of more than 30 dB resulted. The measured linewidth of the pulsed laser of 1.4 MHz FWHM coincided with the value estimated from the Fourier-transform limit of the measured temporal pulse shape.

In summary, we have developed a single-frequency diode-pumped Q-switched Er, Yb:glass laser for use in a CDL system. A maximum TEM₀₀-mode Q-switched output energy of 10.9 mJ and a relatively long pulse width of 228 ns were obtained at a repetition rate of 15 Hz.

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