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**Noise dynamics of a prism-based Cr:forsterite laser frequency comb** SHUN WU, BRIAN WASHBURN, KRISTAN CORWIN, Dept of Physics, Kansas State University, Manhattan, KS 66506, KARL TILLMAN, Applied Science Laboratory, Washington State University, Spokane, WA 99210 — Mode-locked Cr:forsterite lasers are of significant interest as infrared frequency combs due to their ability to generate stable high repetition rate femtosecond pulses. However, self-referenced Cr:forsterite frequency combs tend to exhibit wide carrier-envelope offset frequency ($f_0$) linewidths. These large $f_0$ linewidths can be attributed to significant frequency noise across the comb's spectral bandwidth and result in broad comb teeth. We have stabilized a prism-based Cr:forsterite frequency comb and observed narrowing of the $f_0$ linewidth from $\sim$1 MHz down to $<$100 kHz when a knife edge is inserted into the intracavity beam as a spectral filter. This can also be further reduced after phase-locking the comb to a low-phase noise rf oscillator. Thus, the introduction of an intracavity knife edge significantly reduces the frequency noise of the system and enables more effective stabilization of the entire comb. A theoretical model has been used to investigate the noise dynamics of the phase-stabilized comb system. It includes: the pump laser power (P), the frequency dependence of the $f_0$ response to pump power changes ($(\mathrm{d}f_0/\mathrm{dP})(\nu)$), and the frequency dependence of the femtosecond laser's relative intensity noise, RIN($\nu$). Supported by AFOSR FA9950-05-1-0304 and NSF ECS-0449295

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