Time-reversal mirror techniques in the regime of separation of scales

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A time-reversal mirror is, roughly speaking, a device able to memorize an ultrasonic signal and to resend a part of it back into the same medium in the reverse direction of time. We analyse the refocalization effect in the context of layered random media. This is done in the regime of high frequencies and ultra-short correlation lengths of the medium. Mathematically this translates into a system of PDE's with random coefficients depending on a small parameter representing the separation of scales. Diffusion-approximation results are used to perform an asymptotic analysis of this system.