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Experimental demonstration of epsilon-near-zero water waves focusing TOMASZ BOBINSKI, ANTONIN EDDI, PHILIPPE PETITJEANS, PMMH-ESPCI, AGNES MAUREL, Institut Langevin, VINCENT PAGNEUX, Laboratoire d'Acoustique de l'Université du Maine — We demonstrate experimentally the epsilon-near-zero (ENZ) analogue for water waves in the nonlinear regime. In the context of electromagnetic waves, ENZ media are known to realize super lensing effect, because they are associated to very large wavelength. A lens made of such material with, say, circular edge shape, produces focused waves at the center of the circle (focal point of the lens). In the context of water waves, we demonstrate the analog of these media by tuning the bathymetry of the bottom sea owing the analogy between electromagnetic waves and water waves in the shallow water regime. Experimentally, we obtain uniform phase of the water wave at the edge of the semicircular lens, resulting in the expected lensing effect. By using time space resolved measurement of the two-dimensional field of surface elevation, we are able to separate the linear component of the wave and the harmonics generated by nonlinearities. Interestingly, we observe a cascade of highly focused harmonics. These harmonic components are analyzed in term of free-waves and bound-waves.

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