

**Kirichenko, Elena V.; Garbaczewski, Piotr; Stephanovich, Vladimir; żaba, Mariusz**  
**Ultrarelativistic (Cauchy) spectral problem in the infinite well.** (English) Zbl 1371.42027  
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Summary: We analyze spectral properties of the ultrarelativistic (Cauchy) operator  $|\Delta|^{1/2}$ , provided its action is constrained exclusively to the interior of the interval  $[-1, 1] \subset \mathbb{R}$ . To this end, both analytic and numerical methods are employed. New high-accuracy spectral data are obtained. A direct analytic proof is given that trigonometric functions  $\cos(n\pi x/2)$  and  $\sin(n\pi x)$ , for integer  $n$  are not the eigenfunctions of  $|\Delta|_D^{1/2}$ ,  $D = (-1, 1)$ . This clearly demonstrates that the traditional Fourier multiplier representation of  $|\Delta|^{1/2}$  becomes defective, while passing from  $\mathbb{R}$  to a bounded spatial domain  $D \subset \mathbb{R}$ .

**MSC:**

42B35 Function spaces arising in harmonic analysis  
47A10 Spectrum, resolvent

**Full Text:** [DOI](#)