

# Morawetz estimates for the wave equation at low frequency

András Vasy, Jared Wunsch

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We consider Morawetz estimates for weighted energy decay of solutions to the wave equation on scattering manifolds (i.e., those with large conic ends). We show that a Morawetz estimate persists for solutions that are localized at low frequencies, independent of the geometry of the compact part of the manifold. We further prove a new type of Morawetz estimate in this context, with both hypotheses and conclusion localized inside the forward light cone. This result allows us to gain a  $1/2$  power of  $\epsilon$  decay relative to what would be dictated by energy estimates, in a small part of spacetime.

Subjects: **Analysis of PDEs (math.AP)**; Mathematical Physics (math-ph)

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