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A numerical-relativity gravitational-wave catalogue of spinning Proca-star collisions

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We have performed a systematic study of the dynamics and the emission of gravitational radiation in head-on collisions of dynamically robust spinning vector boson stars, aka Proca stars. We find that the wave-like nature of bosonic stars has large impact on the gravitational-wave emission. The energy emitted in gravitational waves critically depends on the difference between the oscillation frequencies of the primary and secondary stars $\Delta \boxtimes \boxtimes \boxtimes = (\boxtimes 1 - \boxtimes 2) / \boxtimes$ in a non-monotonic way. In the unequal-mass case we observe a periodic modulation of the radiated energy as a function of $\boxtimes 2 / \boxtimes$ of the secondary star with fixed $\boxtimes 1 / \boxtimes$ that we relate to constructive and destructive interference due to the interaction of the Proca field with itself.

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