

Frquency- momentum representation of soliton-breathers in a 2D hexagonal crystal lattice

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In this work we study spectral properties of exact travelling waves in a 2D hexagonal crystal lattice model of muscovite mica [1]. The theory of exact traveling waves [2] is extended to two dimensions and can also be easily extended to three [3]. Generically, these waves are composed of a localized solution and a wing, that is, an extended solution of constant amplitude. In the $\omega - k$ representation, they are within resonant planes, each plane corresponding in the moving frame to a single frequency. These frequencies are integer multiples of a frequency called the fundamental frequency. A discrete breather is within a resonant plane called the breather plane and has a single frequency in the moving frame. The spectral representation of a soliton-breather can be seen in the figure.

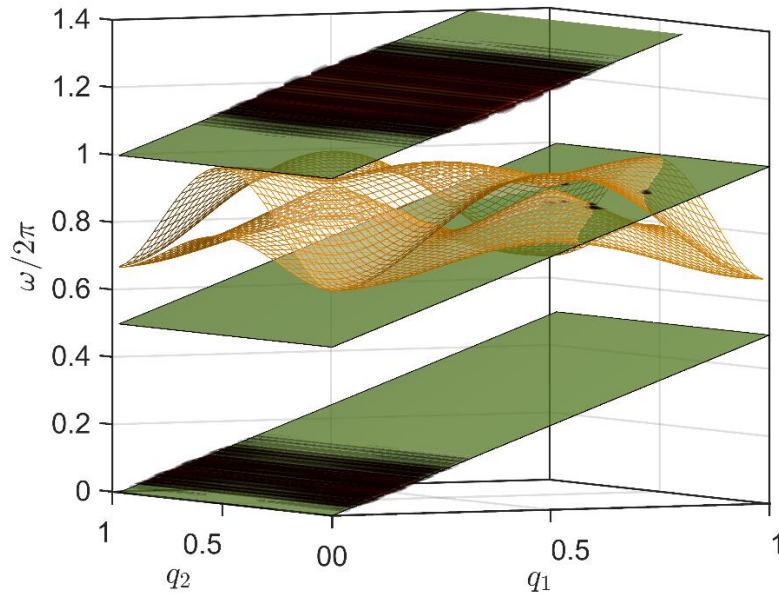


Fig. 1. Isosurface of the XYTFT of an exact soliton-breather, together with the resonant planes and the phonon surfaces.

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References

- [1] J Bajārs, JC Eilbeck, B Leimkuhler, Physica D 301-302 (2015) 8.
- [2] JFR Archilla, Y Doi, M Kimura, Phys. Rev. E 100 (2019) 022206.
- [3] J Bajārs, JFR Archilla, arXiv:2201.03207 (2022).