# Observation of Naturally Canalized Phonon Polaritons in $LiV_2O_5$ Thin Layers

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Polariton canalization is characterized by intrinsic collimation of energy flow along a single crystalline axis. This optical phenomenon has been experimentally demonstrated at the nanoscale by stacking and twisting van der Waals (vdW) layers of $\alpha$-$MoO_3$[1-5], by combining $\alpha$-$MoO_3$ and graphene, or by fabricating an h-BN metasurface. However, these material platforms have significant drawbacks, such as complex fabrication and high optical losses in the case of metasurfaces. Ideally, it would be possible to canalize polaritons "naturally" in a single pristine layer. Here, we theoretically predict and experimentally demonstrate naturally canalized phonon polaritons in a single thin layer of the vdW crystal $LiV_2O_5$. In addition to canalization, PhPs in $LiV_2O_5$ exhibit strong field confinement ($\lambda_p \sim \frac{\lambda_0}{27}$), slow group velocity (0.0015c), and ultra-low losses (lifetimes of 2 ps). Our findings are promising for the implementation of low-loss optical nanodevices where strongly directional light propagation is needed, such as waveguides or optical routers.

**Figure**

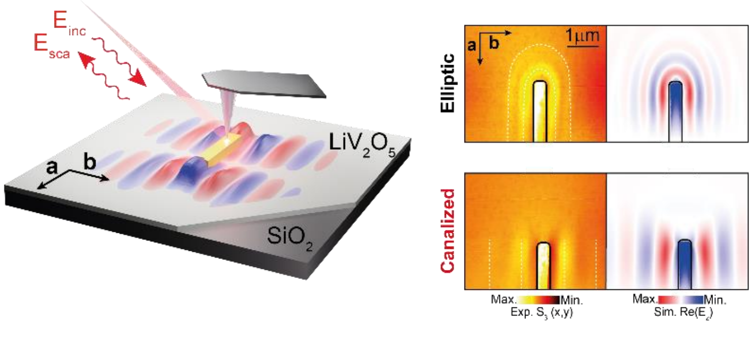


**Figure 1:** Observation of naturally canalized PhPs in thin $LiV_2O_5$ layers.

## References

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