

---

# Friedel oscillations and chiral superconductivity in monolayer NbSe<sub>2</sub>

Magdalena Marganska<sup>\*1</sup>, Julian Siegl<sup>1</sup>, Anton Bleibaum<sup>1</sup>, Marcin Kurpas<sup>2</sup>, John Schliemann<sup>1</sup>, Miguel Ugeda<sup>3,4</sup>, and Milena Grifoni<sup>1</sup>

<sup>1</sup>University of Regensburg – Universitaetstr. 31, 93 053 Regensburg, Allemagne

<sup>2</sup>University of Silesia in Katowice – ul. Bankowa 12, 40-007 Katowice, Pologne

<sup>3</sup>Donostia International Physics Center – Paseo Manuel de Lardizábal 5, San Sebastián 20018, Espagne

<sup>4</sup>Ikerbasque - Basque Foundation for Science – Bilbao 48013, Espagne

## Résumé

Almost sixty years ago Kohn and Luttinger proposed a genuine electronic mechanism for superconductivity based on screening. Although the bare electrostatic interaction between two electrons is repulsive, electron-hole fluctuations in a metal can give rise to a Coulomb potential oscillating in space. Cooper pairing among the electrons then emerges when taking advantage of the attractive regions. To which extent superconductivity from repulsion provides the leading pairing mechanism in some two-dimensional transition metal dichalcogenides is still an object of debate. With focus on NbSe<sub>2</sub>, we show that superconductivity can be induced by purely repulsive Coulomb interaction when accounting for screening effects on the trigonal lattice. Using ab initio-based tight-binding parametrizations for the relevant d-bands near the Fermi energy, the screened interaction is evaluated microscopically, in a scheme which includes Bloch form factors and Umklapp processes. In the direct space, the screened potential exhibits pronounced long-range Friedel oscillations and alternates in sign. When solving the momentum-resolved linearized gap equations, two quasi-degenerate nematic solutions are found near the critical temperature  $T_c$ , signaling the unconventional nature of the pairing. Their complex linear combination, i.e. a chiral gap with p-symmetry, is expected to provide the ground state of the system. The presence of a gapped chiral phase well below  $T_c$  is in accordance with low temperature spectroscopy measurements.

---

\*Intervenant