

What I would still like to understand about SrTiO_3 (as of Sunday evening, May 3rd 2020)

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What is Quantum Paraelectricity?

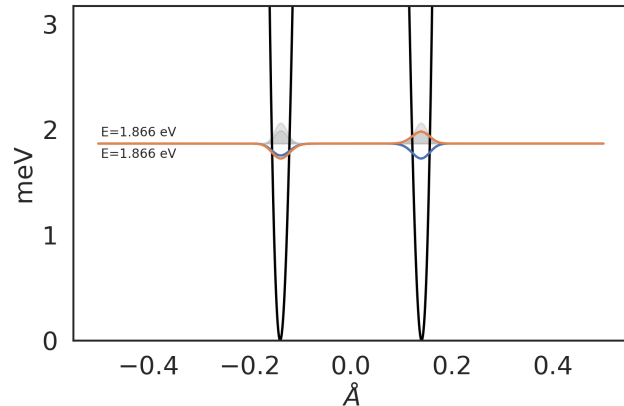
Do the oxygen ions really *tunnel*? (They are a bit heavy).

What does that even mean?

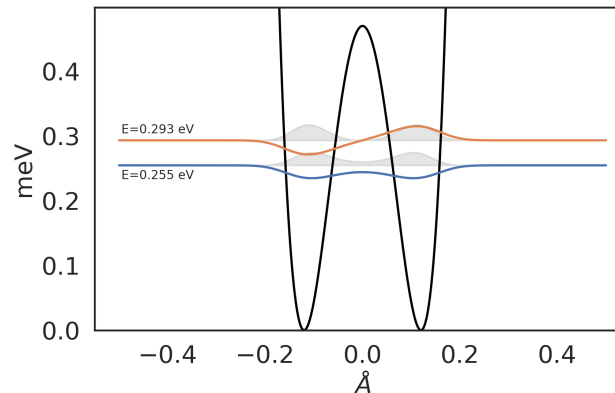
Here are some “FE double wells” calculated using DFT, with the energies of the lowest quantum states:

BaTiO₃

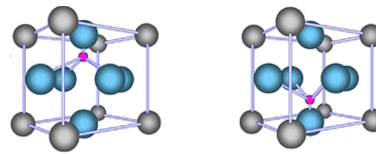
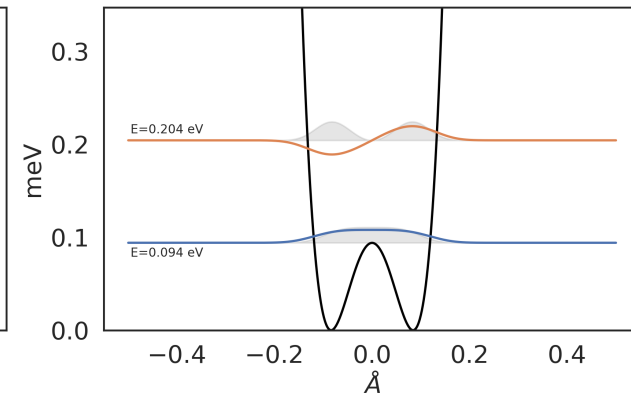
barrier: 31.000 meV - width: 0.140 Å

SrTiO₃

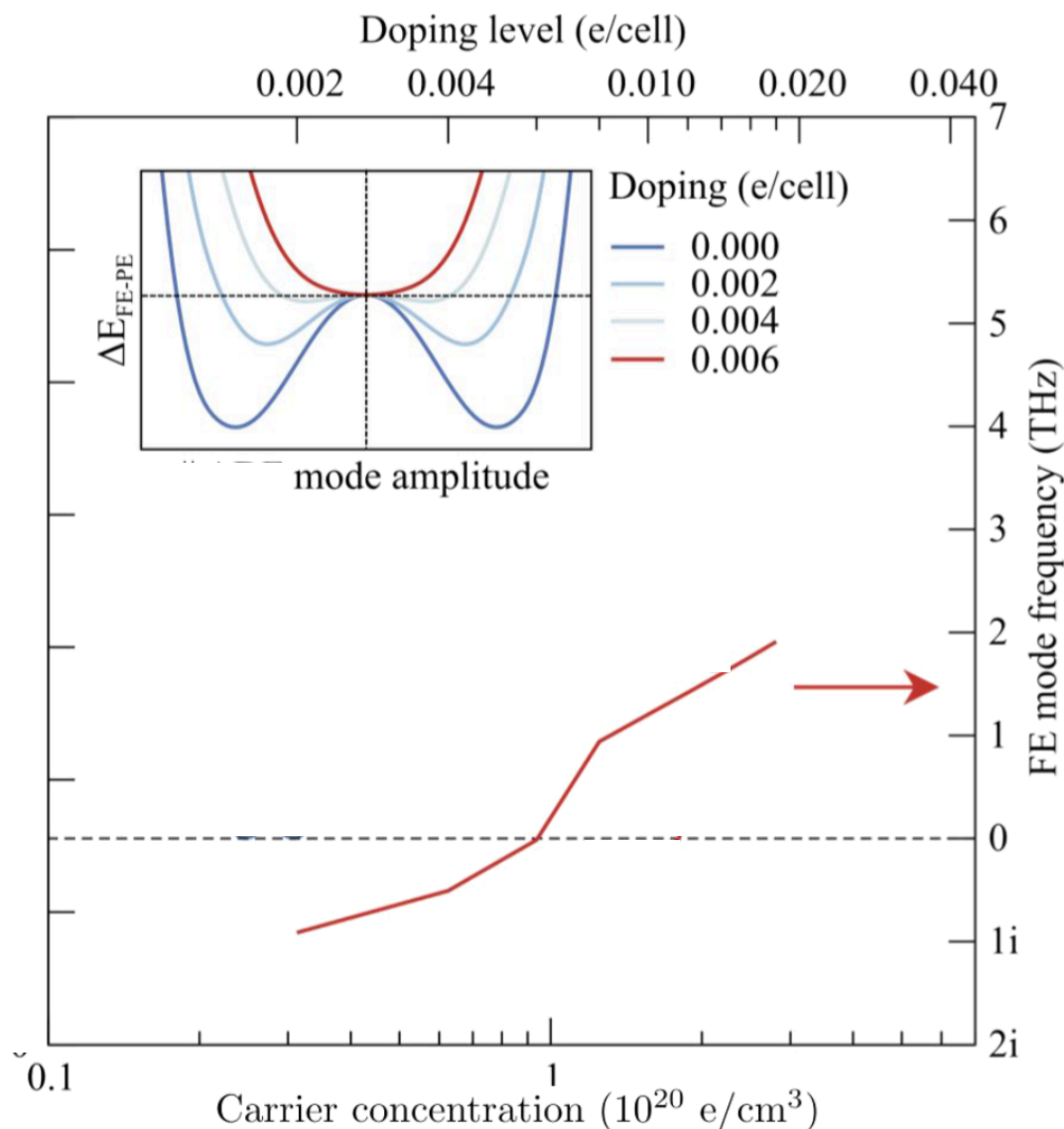
barrier: 0.470 meV - width: 0.120 Å

KTaO₃

barrier: 0.094 meV - width: 0.084 Å



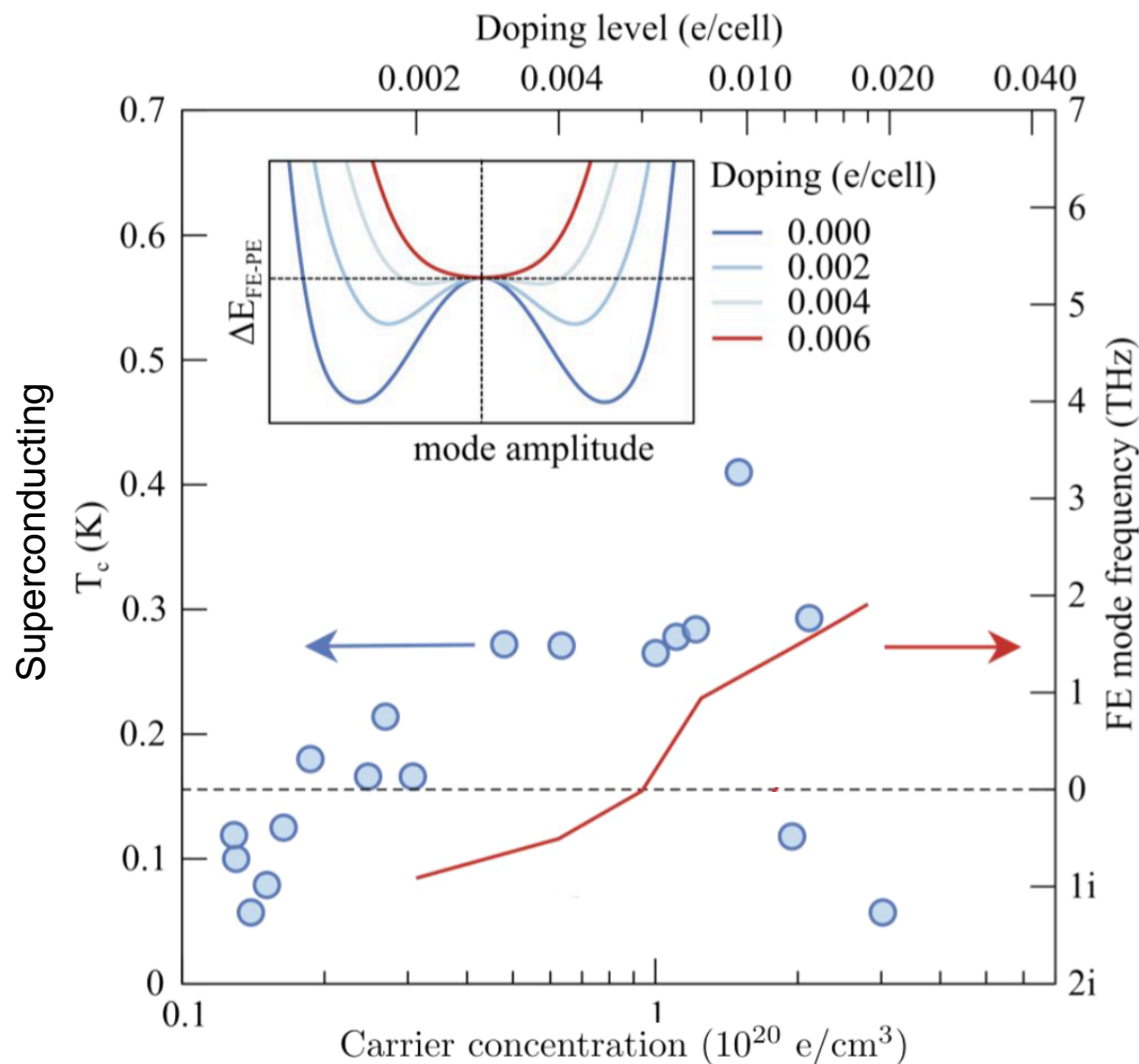
Are FE quantum fluctuations relevant for superconductivity?



Uli Aschauer



Or is the coincidence a coincidence?



Uli Aschauer

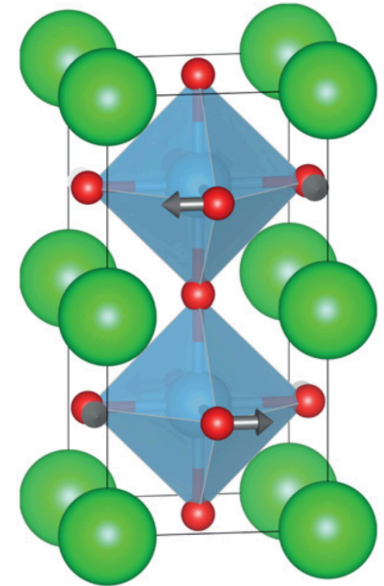


Are the antiferrodistortive rotations relevant?

Transition from high-temperature cubic to low-temperature tetragonal structure at $\sim 100\text{K}$

$a^0a^0c^-$ tilts

→ alternating rotations around c axis



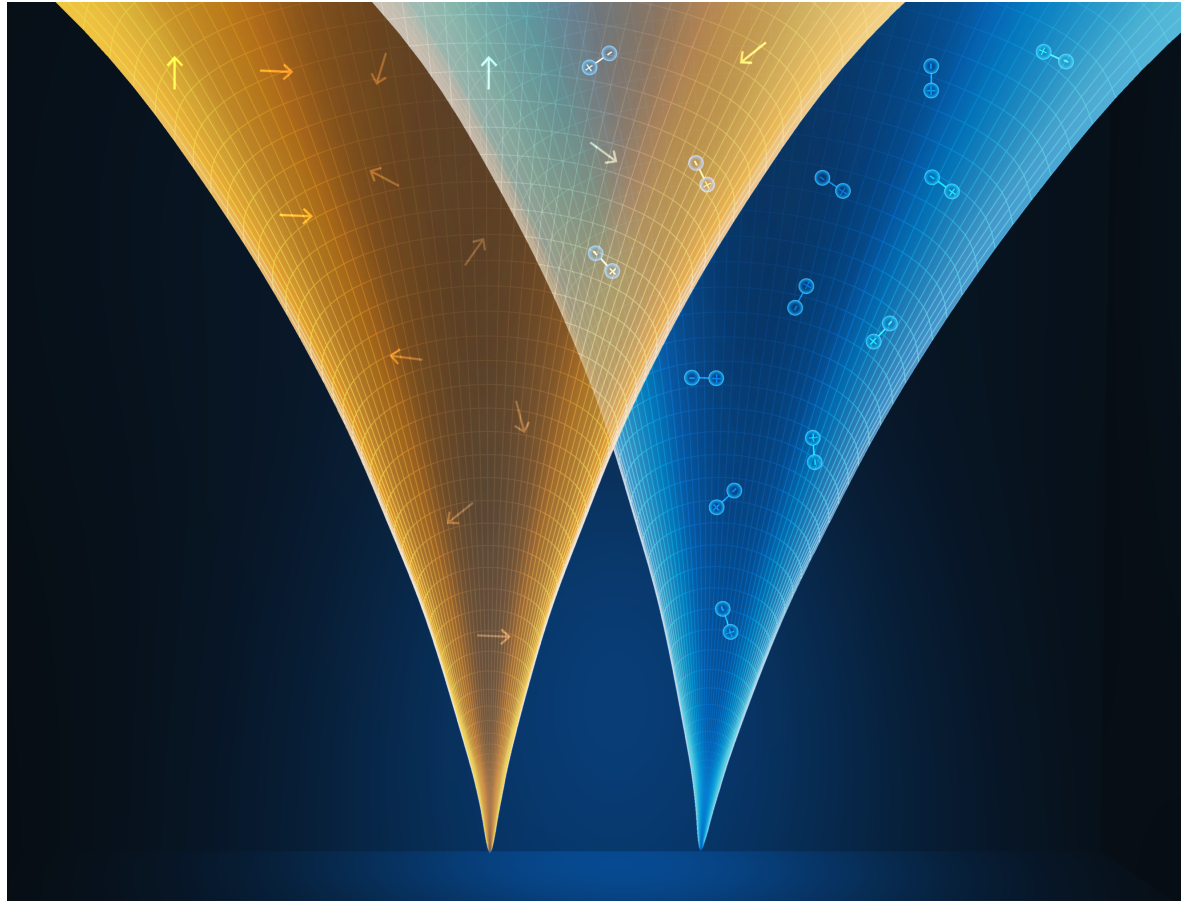
Is how we introduce the electrons relevant?

La (or other *magnetic* rare-earth ions) on the A site

Nb on the B site

O vacancies

Can we achieve multiferroic quantum criticality?



Awadhesh
Narayan



And if so would it do anything interesting?