Direct detection of MeV-scale dark matter utilizing germanium internal amplification for the charge created by the ionization of impurities

Speaker: Chih–Hsiang Yeh[1]

Department of Physics and Center for High Energy and High Field Physics[1]

National Central University(NCU)

Mechanism-The big picture

- Dark Matter(DM)

Impurity Ge detector
(Band gap shifted by doping)

Internal amplification

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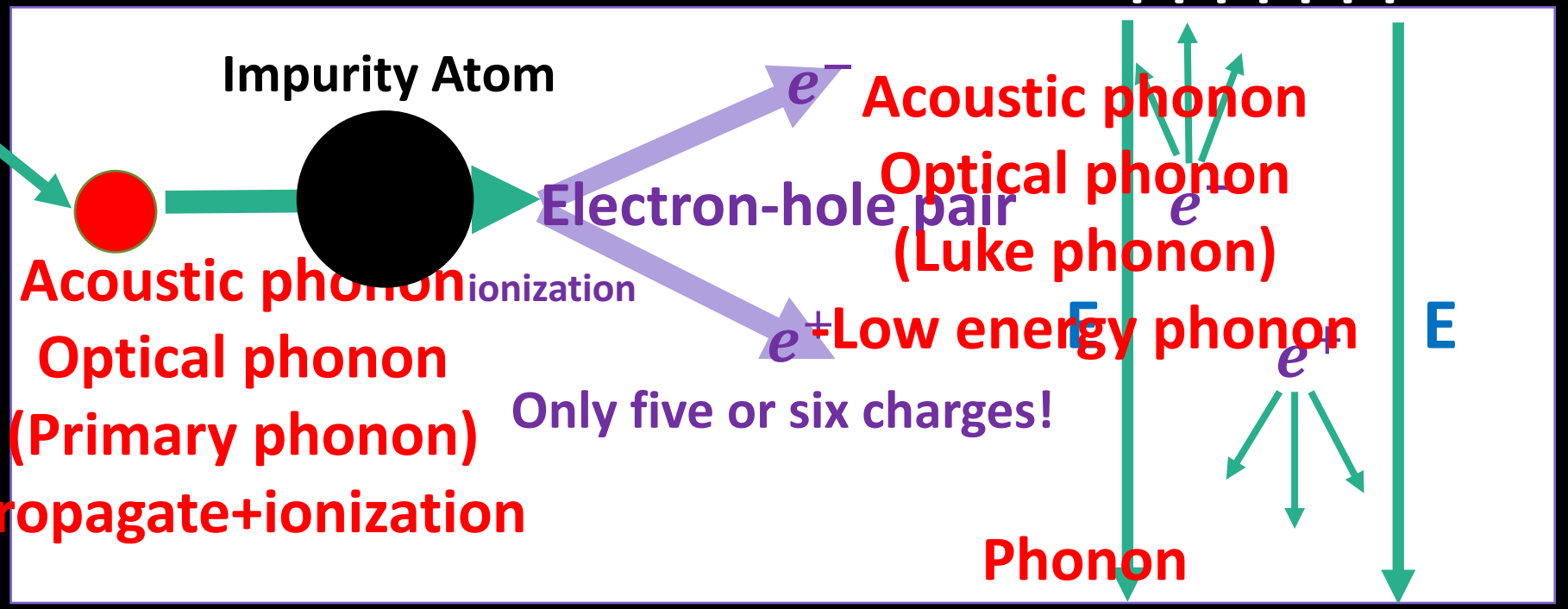
Weak interaction
(Electron recoil)
(Nuclear recoil)



Questions from report

- 1. What's the different between "bulk leakage current" and "Surface leakage current"?
- → We want the signal is "inner" the detector
- →bulk leakage current
  - Thermal excitation (Inner)
  - Injection leakage current(Multiplication) from surface
- → Surface leakage current
  - Current go through the surface to the opposite side.

- → Why "Surface leakage current" will be the dominant term?

Questions from report

- 2. How do we check the temperature in detector is uniform?
- → I heard that we will use one kind of detector attach on the top and bottom.
- → What's the principle we will use to check it?

- We have the temperature on the top and bottom
- → See the gradient of the temperature
- → if a little bit different→ Ok
- → If much different→ No good!

Questions from report

- 3. It seems like the problem is:

- When the particle interacts with the crystal on the surface, it will be amplified by the voltage, and too big will physically destroy the crystal and can’t recover back to the original type, on the other hand, too small that can’t achieve to the expected performance.
- ➔ Maybe the optimized voltage is related to the phonon and Internal amplification.

The different between our experiment and other experiment

- SuperCDMS
- They used only “the phonons” to measure the energy
- ➔ Under the low temperature (mili-Kelvin) and very small signal
- ➔ Not easy to control!

- Our experiment
- We use only “Charge multiplication” (Energy from those phonon)
- ➔ Can operate under the higher temperature compared with SuperCDMS
- ➔ Could be the better way to do it!

- Quantum effect
- → Give out the electron-hole pair