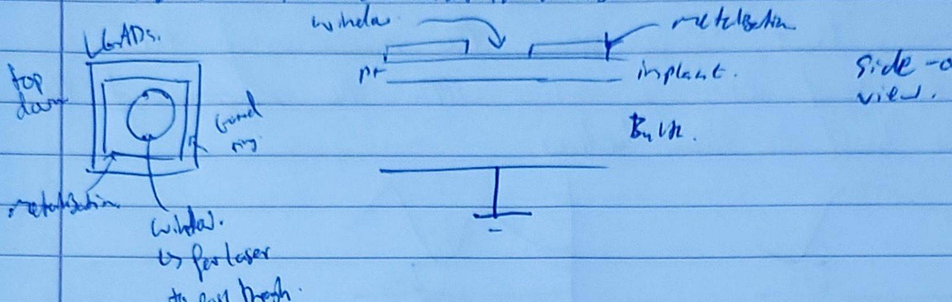
25/10/24.

MALTA Meeting.

$I(t) = -q v \cdot E_w$ → Find numerically? might not be possible analytically

- SJ Bonn → Weighting field calculation tool

Electrons is what we are about in MALTA.



- Jonathan's thesis section on this → variation in the band gaps. "Indirect Semiconductors".
- Standa library/website for interacting with the stages.
- Bilal gitlab for tct code → Jonathan.

- Jonathan mulvey PSI. → jonathan.mulvey@psi.ch.
  ↳ Ask for password for windows.

- Thursday 12:30 in lab. → test interlocks. → not plug laser into lens. ↳ cap laser, check.

→ Get laser & beam monitor on scope.
  ↳ See if the beam monitor system & trigger show the same. + slight delay.

- Oscilloscope aquisition software.

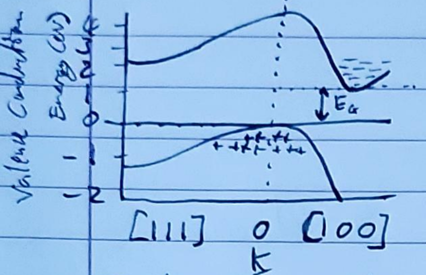
Bilpa meeting 11 Tuesdays. → 17th for MALTA.

Laser photon energy → $E = \frac{hc}{\lambda} = 1.17eV$
λ = 1064nm.

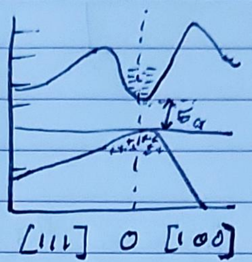
Energy required to produce e-h pair in Silicon $\approx$ 3.6eV.
So how does laser promote e-h pairs in silicon?

<u>Indirect Semiconductors.</u>

Silicon is an indirect semiconductor.
This means, that, in $\underline{k}$ space, the minimum of the conduction band does not align with the maximum of the valence band. As shown bellow.



Indirect semiconductors
e.g Si, Ge



Direct semiconductors.
e.g GaAs

E_G in Silicon <u>is</u> ~ 1.12eV, <u>but</u> since the minima & maxima don't match up in $\underline{k}$ space, there is extra energy required to alter the momentum of the electron / hole. (as $p = \hbar \underline{k}$) ∴ average energy required for eh pair ~ 3.6eV.
However, it is possible for this momentum change to come from phonons in the crystal lattice, & therefore it is possible for the transition to occur for $E_\gamma < 3.6eV$ & $E_\gamma > 1.12eV$. Phonon energy is dependent on the Bose-Einstein distribution, ∴ the probability of this indirect transition is temperature dependent.