cryoBLM: a few comments…

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Cryogenic irradiation 2012-15 → **scCVD** and **p^+-n-n^+ silicon** operational after 10^{16} p cm^{-2} , but Charge Collection Efficiency (CCE) decreases by a factor ~= 10.

scCVD

1. Erratic discharges observed at bias voltages > 100V:
    - Limits CCE → can’t exploit superior radiation hardness compared to silicon.
    - Stability at bias voltages < 100V?
2. Polarisation due to asymmetric trap filling:
    - Reduction of CCE → can be prevented by i) switching bias polarity (period?) or overcome by increasing bias voltage (limited by erratic discharge).
3. Charge per particle depends on flux rate.

pcCVD

Compared to scCVD:

- Erratic discharges not seen in 0.5T magnetic field.
- Charge per particle independent of flux rate.
- Less prone to polarisation than scCVD.
- Charge per particle ~ 1/2 that of scCVD.

p^+-n-n^+ silicon pad detectors

- CCE(300um p^+-n-n^+ silicon sensor) ≃ CCE (scCVD with V_{bias}=100V).
- Promising results for 100um sensors.
- Polarisation effect also reported to have been seen in silicon at low temperatures.

Open questions:

1. How to solve erratic discharge of diamond sensors to enable superior radiation hardness of diamonds to be fully exploited?
    - Study dependancy of erratic discharge of pcCVD on magnetic field strength & angle.

2. Can diamond CCE be improved by addressing the polarisation effect?
    - Switching polarity, increasing bias voltage.

3. Study dependancy of the charge per particle on the flux rate.

4. Quantitative comparison of 100um p^+-n-n^+ silicon sensor vs. svCVD at V_{bias}=100V.