Measure I-V of Bonding Sensors

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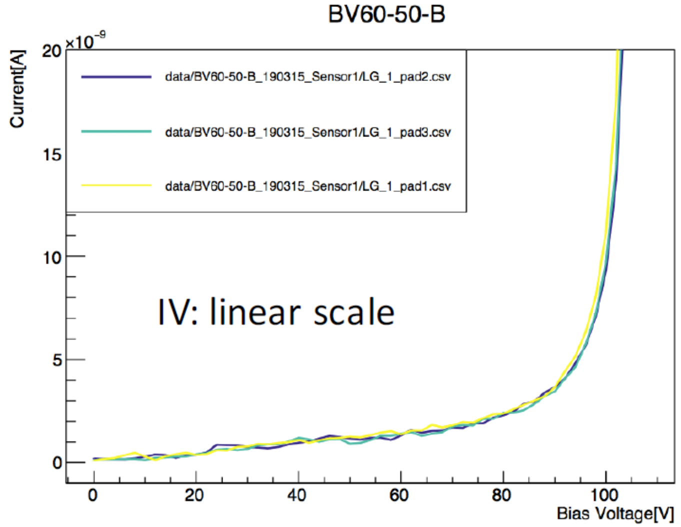
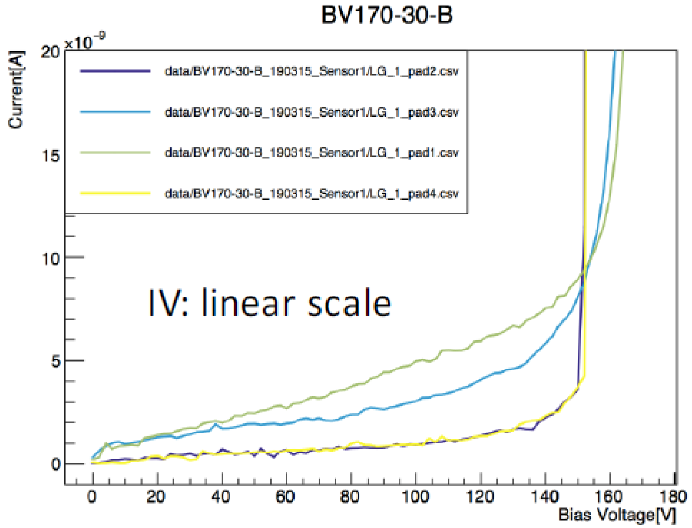
The I-V curve before and after bonding

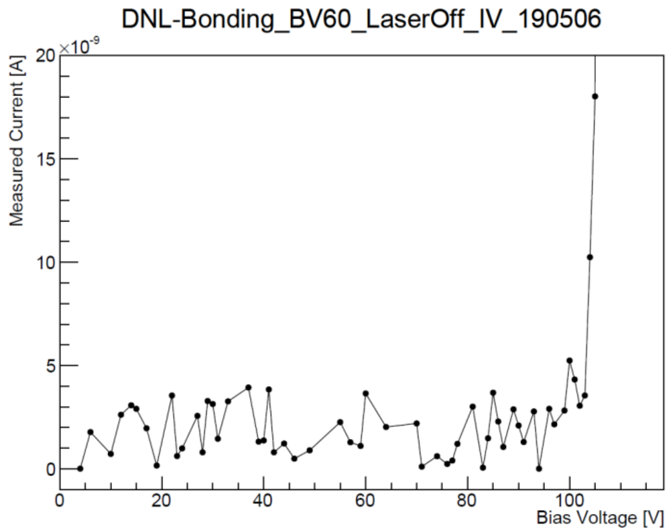
Before Bonding:

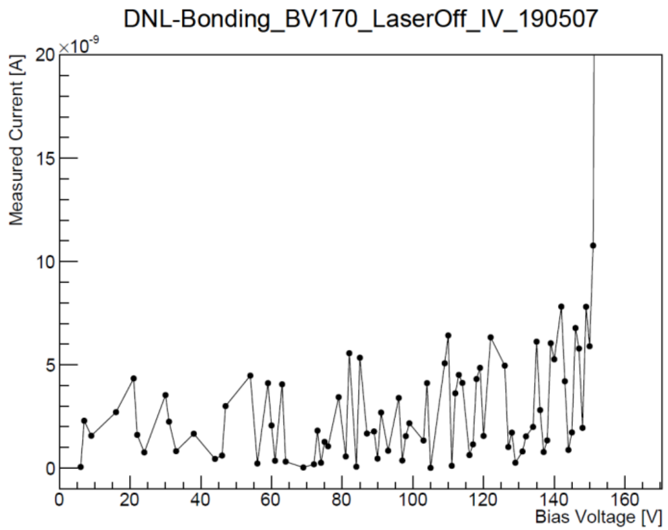




We use pad2 or pad4

After Bonding:



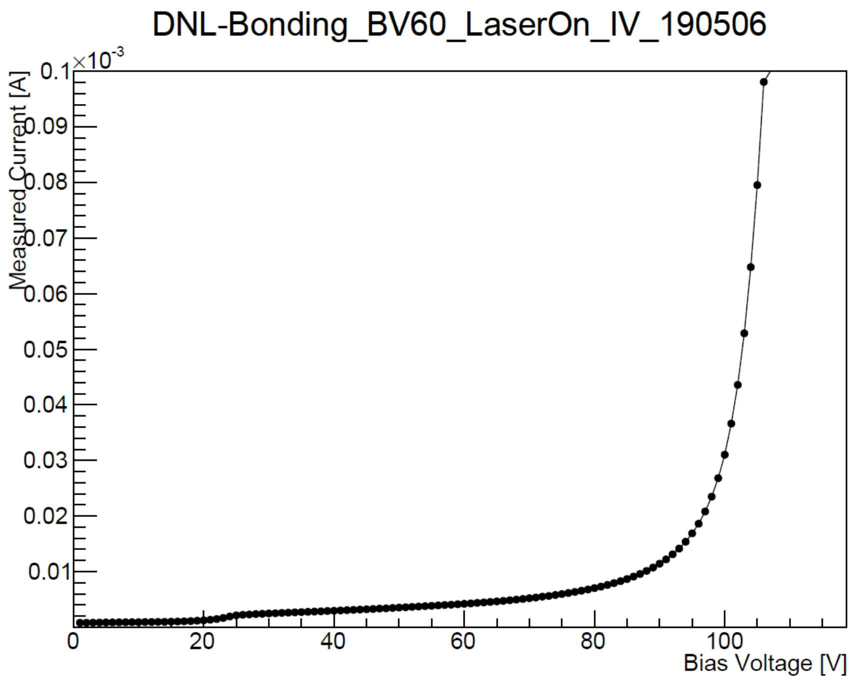


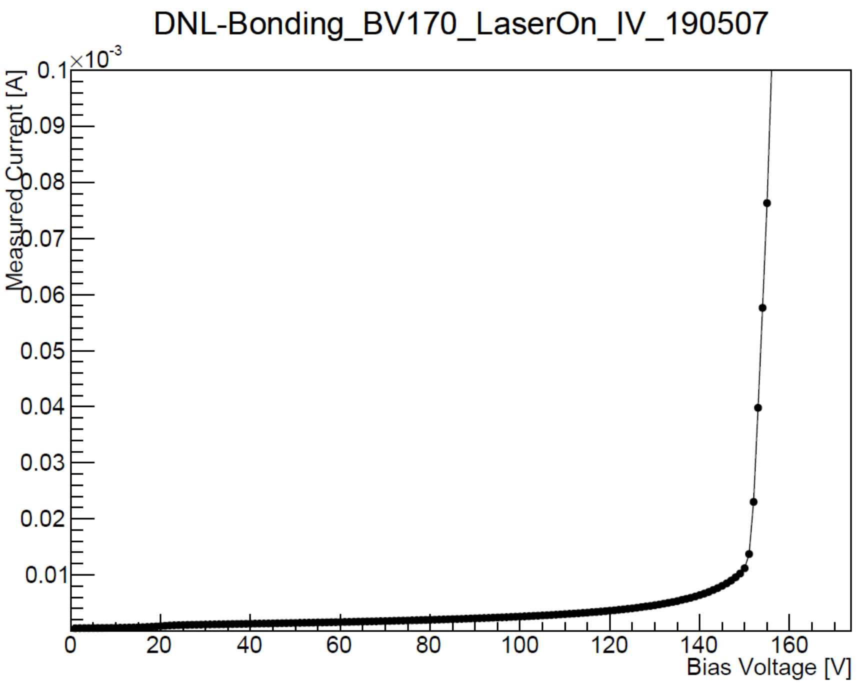
Breakdown voltage does not change.

BV60--105V

BV170--154V

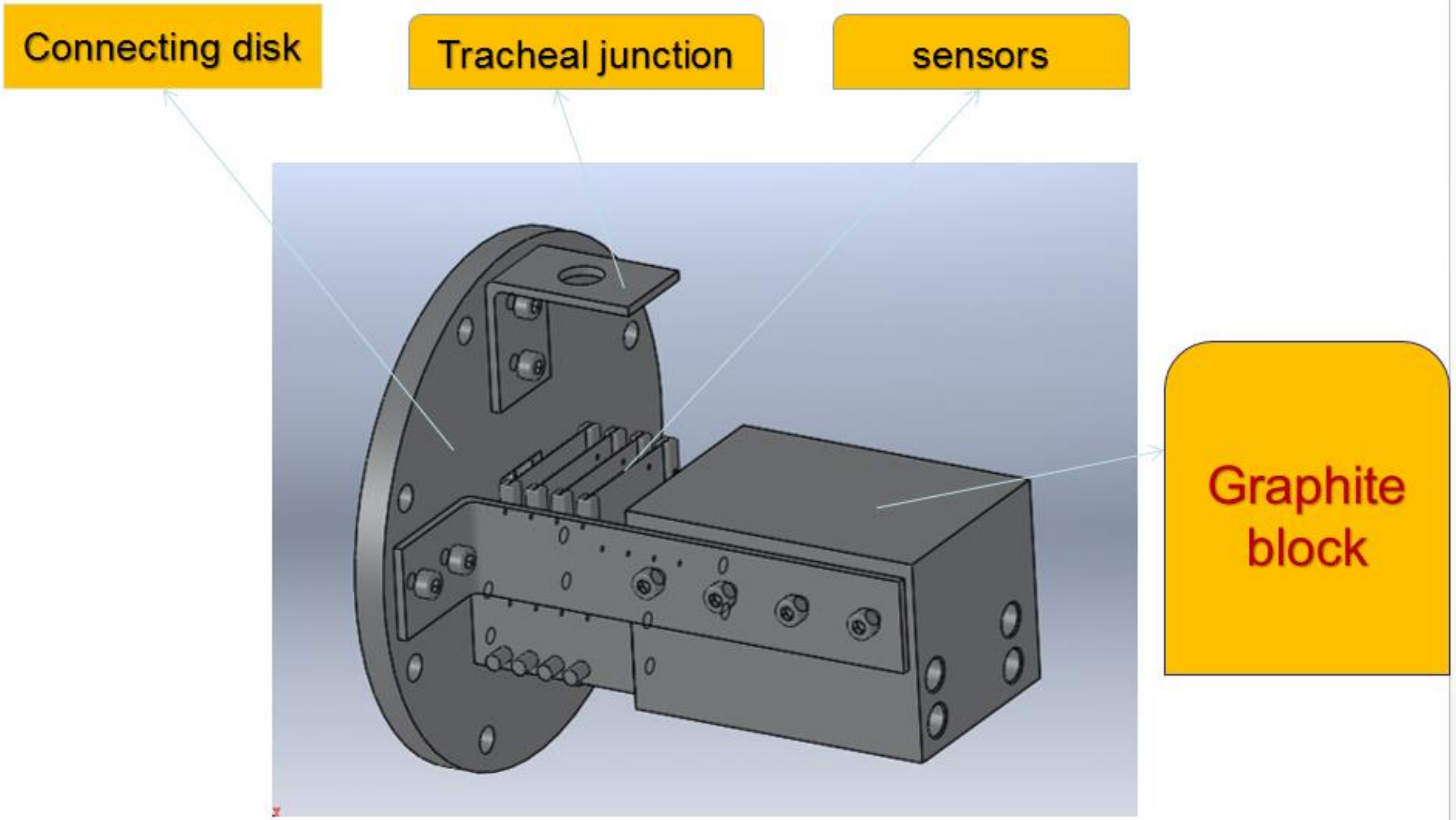
Measure I-V with laser:



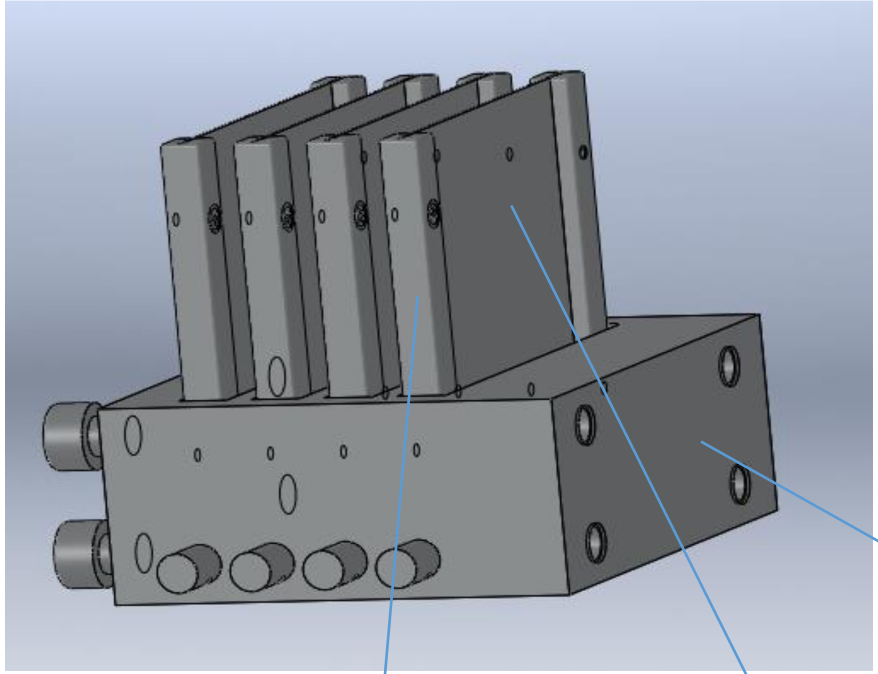


The current increases and the breakdown voltage remains the same.

100MeV Proton irradiation design by CIAE :



Irradiation field



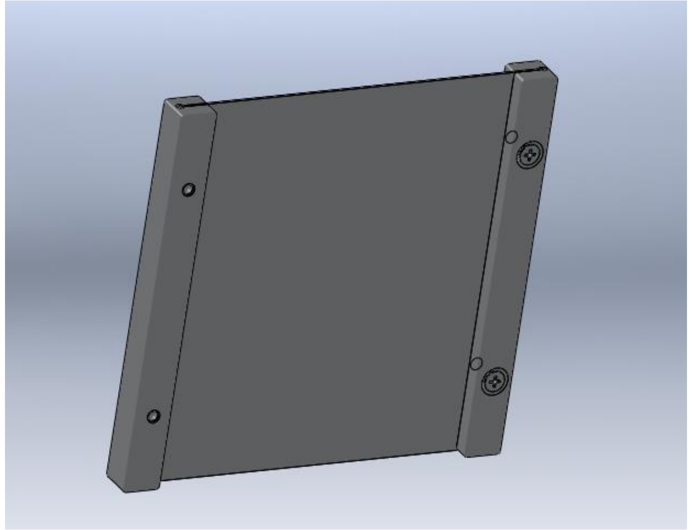
There are four irradiation plates in the working irradiation field. The irradiation plates are 0.3 mm thick. The experimental irradiation plates are pasted on the aluminum plates. The two ends of the aluminum plates are fixed by fixtures. Four groups of irradiation plates are placed in the slot at the same time.

Fixed parts

0.3mmAluminum plate

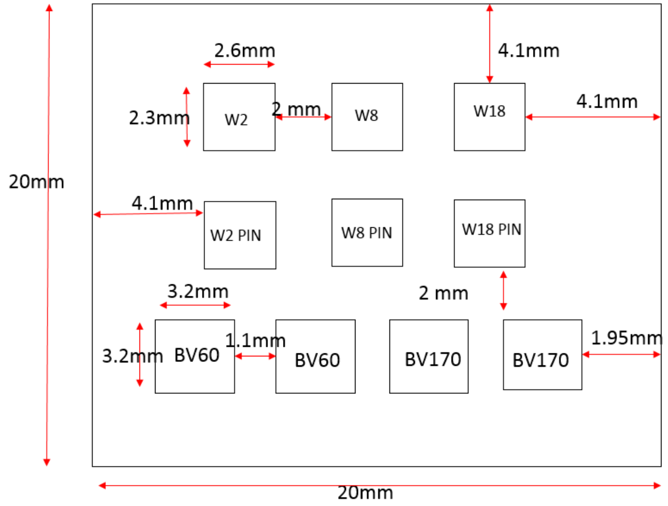
slot

Sensor placement



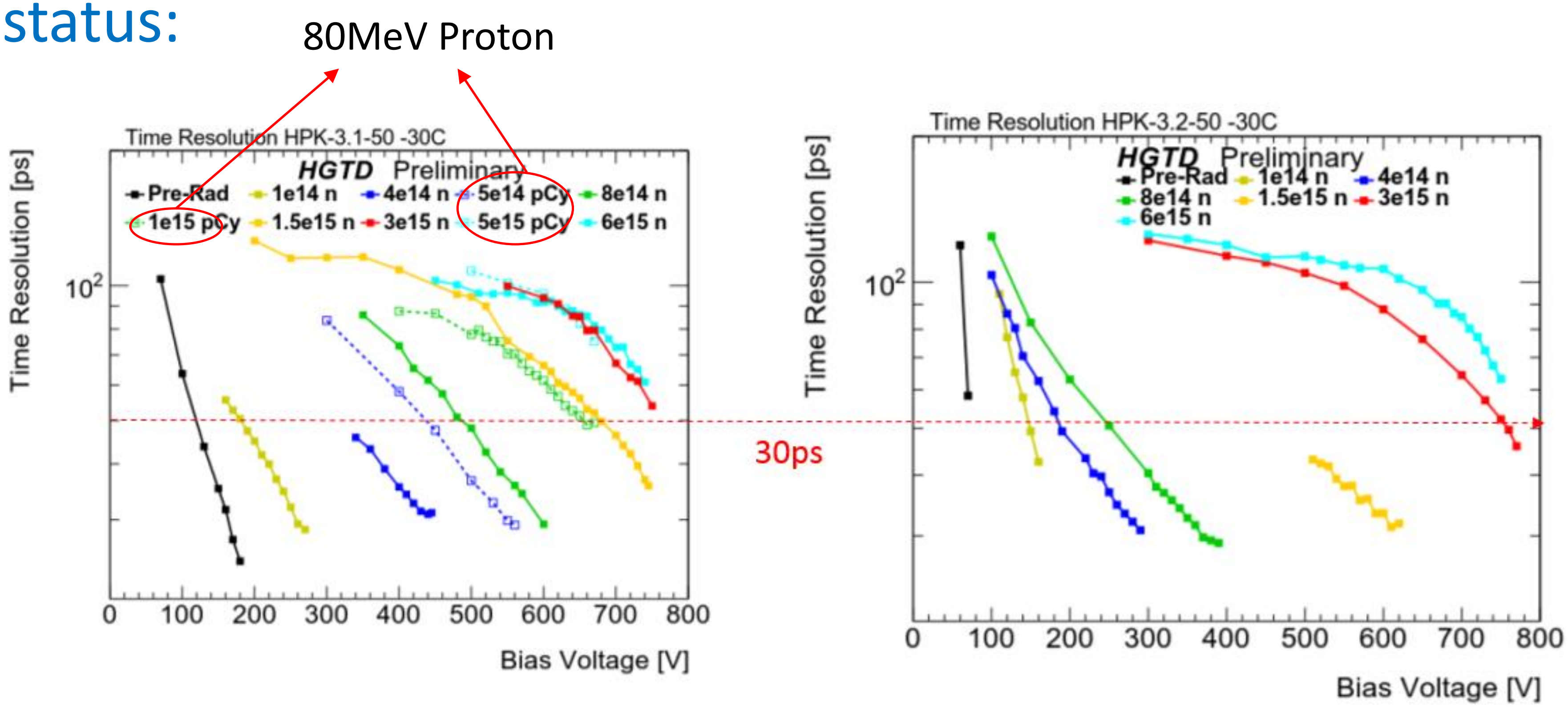
A piece of aluminum plate is fixed by two fixing members, and both ends of the fixing member are fixed by screws.

Preliminary sensors that we want to place.



Irradiation status:

Until now



Type 3.1:Irradiation testing is very complete.

Type 3.2: Largest neutron fluence have done: 1E15,2.25E15,3,4,5,6E15 neq/cm2

Proton: Irradiation at CYRIC in July 2019, result by end of year

New sensor: Type 1-1,Type 1-2,Type 2: Not irradiated

So: 1.We can choose Type 3.2 to do 100MeV proton irradiation. But we have only one single pad of type 3.2.

2.New sensor irradiation

Plan

1. Determine which sensor to use and some details

2. Irradiation or signing a contract at the end of May

Thank You

Calculate Irradiation dose:

0.71 is conversion of proton dose into neutron dose factor

$$\text{Irradiation dose}=\frac{\overbrace{beam\_current}^{\text{50nA}}\cdot time}{\underbrace{e}_{1.6\times 10^{-19}\text{C}}\cdot \underbrace{beam\_area}_{2\times 2\ cm^2}} = 6\times 10^{15}/0.71$$

Time=30h

Calculate temperature based on formula:

Bethe formula:

Atomic number per unit volume

Proton charge number

For a particle with speed v, charge z (in multiples of the electron charge), and energy E, t

$$-\left\langle \frac{dE}{dx} \right\rangle = \frac{4\pi}{m_e c^2} \cdot \frac{n z^2}{\beta^2} \cdot \left(\frac{e^2}{4\pi\varepsilon_0}\right)^2 \cdot \left[\ln\left(\frac{2 m_e c^2 \beta^2}{I \cdot (1-\beta^2)}\right) - \beta^2\right]$$

Electronic quality

v/c

Average equivalent ionization potential of silicon

$$\frac{dE}{dx} = 2.030\text{MeV/mm}$$

$$\Delta T = \frac{\frac{dE}{dx} \cdot sensor\_depth \cdot N\_proton}{sensor\_mass \cdot C\_Si} = 28\text{K}$$