APD News

Motivation

Background/Motivation:

- 2 main different kinds of dark current distribution observed during screening of APDs after gamma irradiation
  - Assumption: Difference originates from different voltage conditions under irradiation

Test irradiation study performed depending on dose:

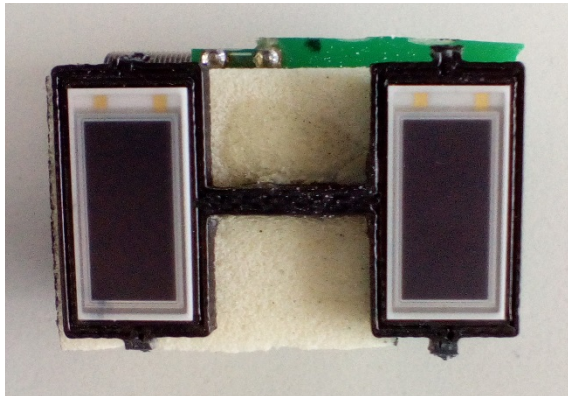
- Irradiation of several APDs w/o HV applied @ different gamma doses

Setup in India

Gamma Irradiation @ VECC, India

Supported by Vinod Singh Negi and Ajit Kumar

Setup of one sample



Sample consists of:

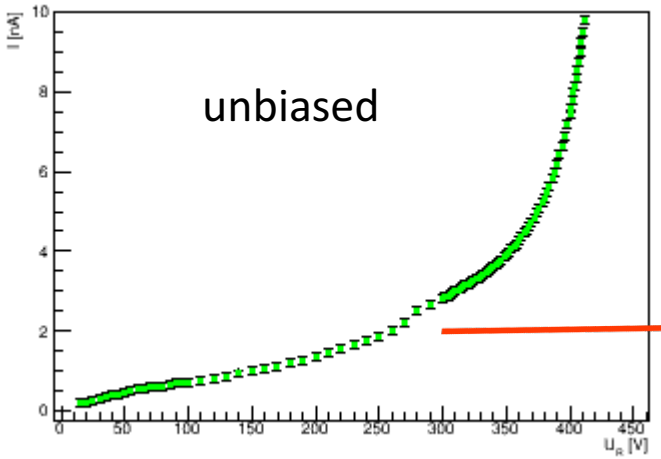
- One APD unconnected
- One APD connected, to be biased under irradiation (M =100)
- *both APDs matched in terms of bias, breakdown, etc…*

APD sample number	Dose [Gy]	y/n
1	20	n
2	50	n
3	100	y
4	200	y
5	500	y
6	1000	y
7	1500	y
8	2200	y
9	3750	n
10	5000	n

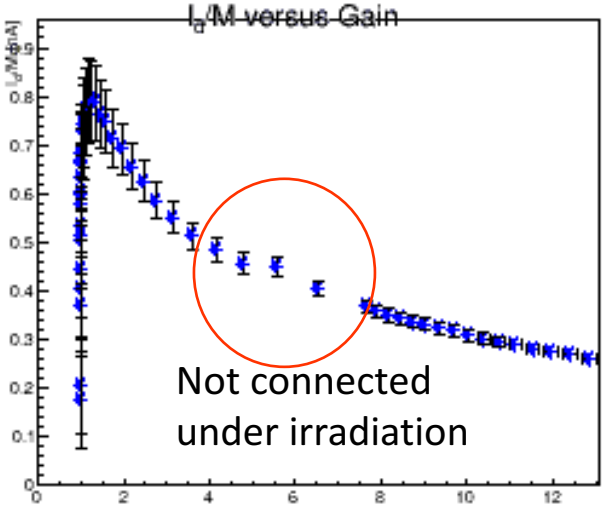
Bias voltages/corresponding gain values

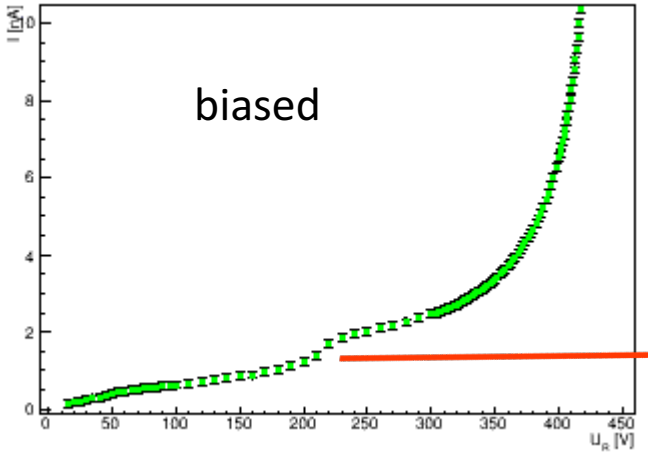
example: D* = 100 Gy measured after gamma irradiation @ T = 20°C, without annealing

Dark current

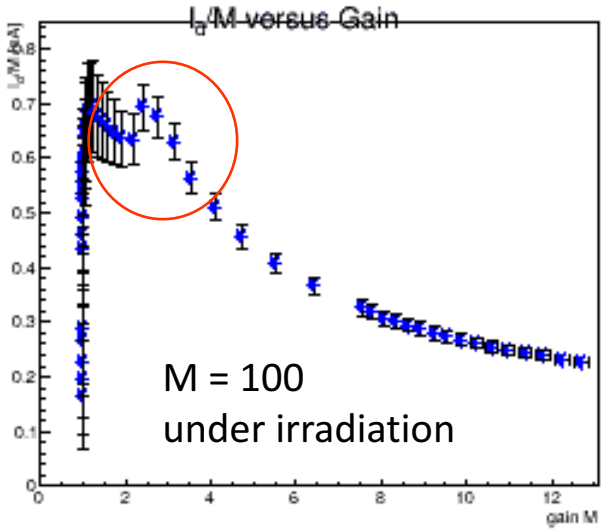


Corresponding gain value





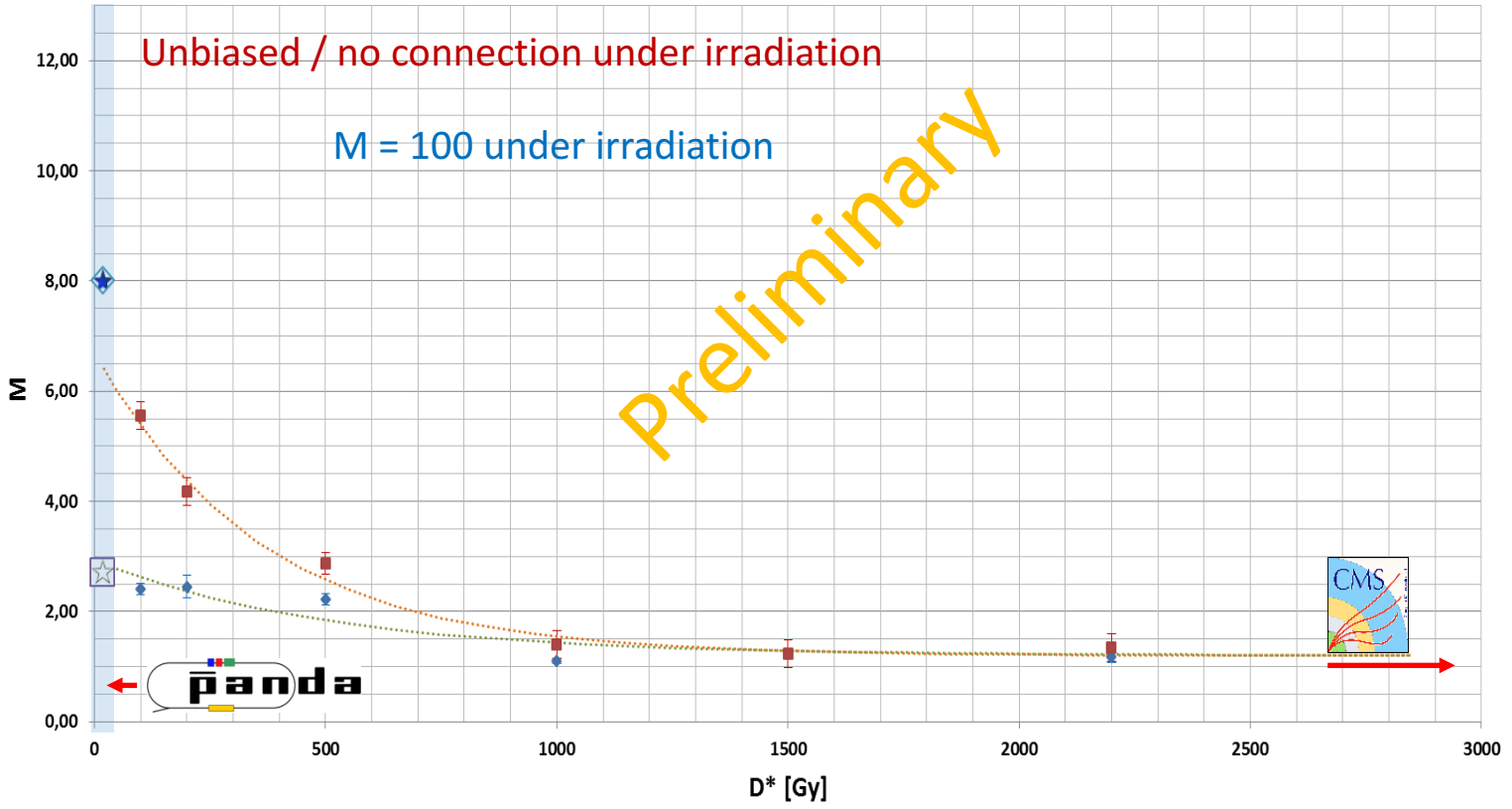
Corresponding gain value



Local maxima locations depending on dose

Results of characterization @ T = 20°C
after irradiation, before thermal annealing

I_d/M local maxima
depending on dose @ 20°C



Summary & Outlook

Summary:

- Different dark current behavior observed originates from different bias voltage applications during irradiation
- Irradiation setup @ Giessen has been modified and repaired (see last CM report of Hans in September)
  - Application of individual bias voltages (i.e. M = 100) for each APD possible and functional now

Outlook:

- Analysis of 'India data' ongoing:
  - Influence of bias voltage application under irradiation on changes in QE, C and M(λ): to be investigated

Thanks to:

- **Bochum colleagues:** for setup of new HV control system of the existing irradiation setup (mainly Tobias) & for providing us with the necessary devices for R & D purposes (Fritz-Herbert)
- **Indian CBM colleagues:** for opportunity/support and realization of gamma irradiation study on such a short time scale (i.a. Vinod & Ajit)