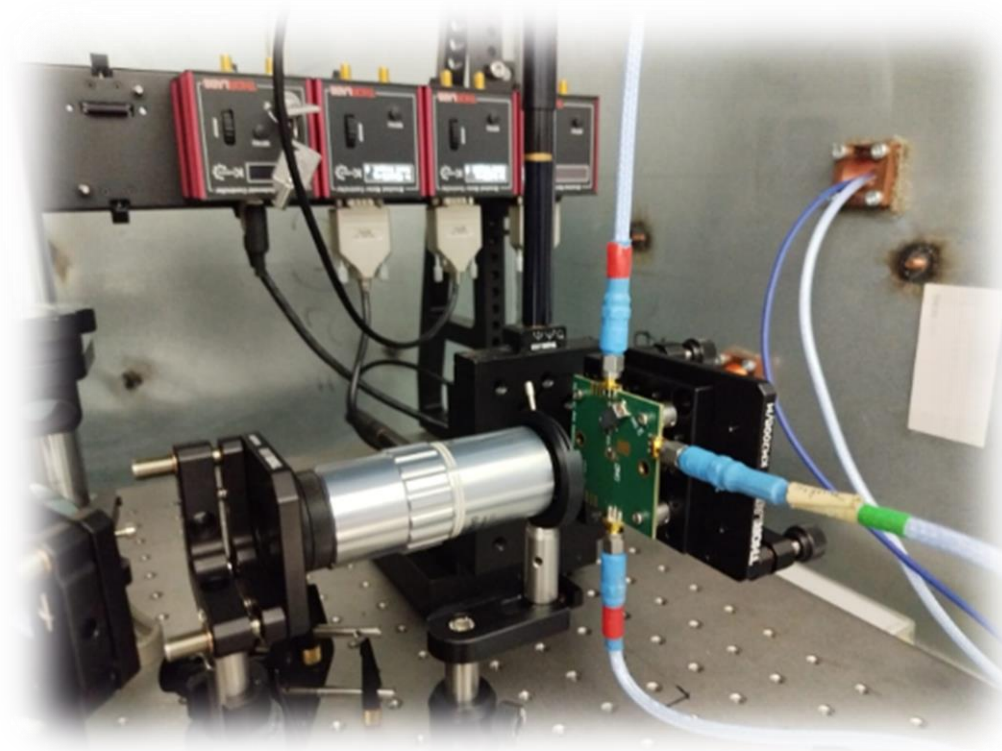


Summary of WG5 laser activities

4th DRD3 workshop

Nov 13th 2025



I. Vila Álvarez, Bojan Hiti

Review of laser characterization activities in WG5



- 2nd DRD3 School on Transient Current Techniques.
- WG5 TPA-TCT characterization campaign on SiC.

2nd DRD3 TCT School

23–25 Sept 2025
CERN
Europe/Madrid timezone



Overview


Timetable

Contribution List

Registration

Payment Instructions

Contact

 drd3-tct-school-organize...

2nd TCT School organized by DRD3 will take place at CERN on 23-25 September 2025.



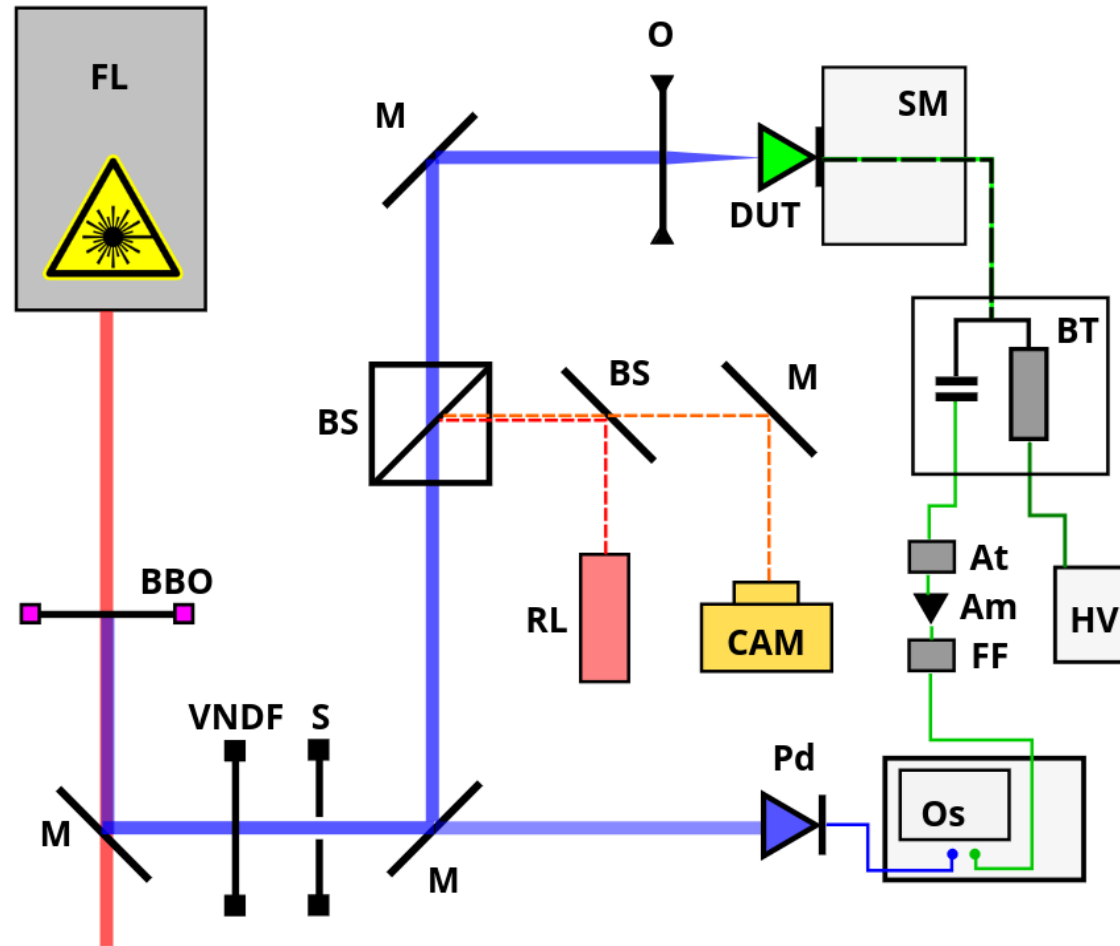
19 students selected
(more than 30 applicants)

Other DRD3-wide proposal for
characterization training actions
are welcome

WG5 TPA-TCT Characterization Campaign: Setup

Ti-Sapphire fs laser

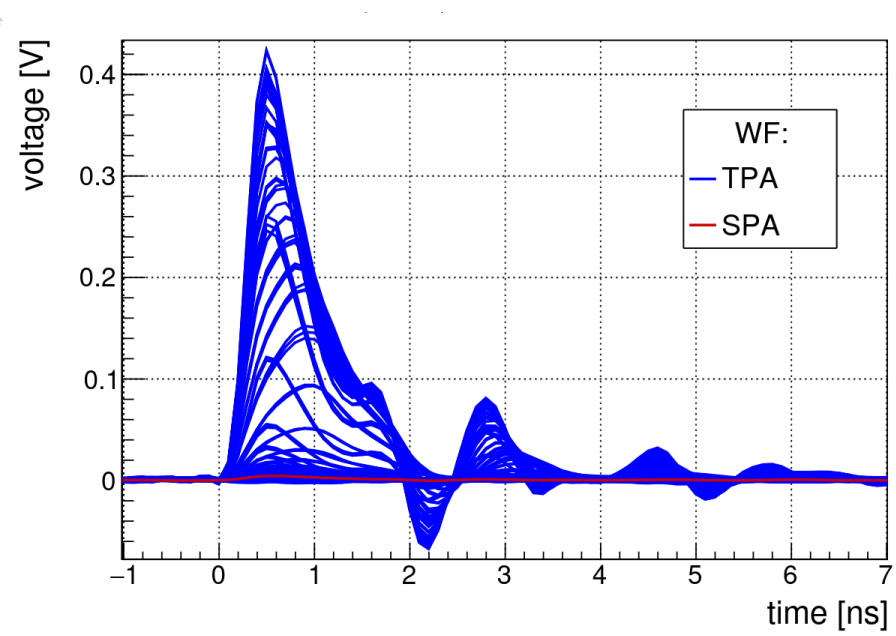
- Operating $\lambda \sim 401 \text{ nm}$
- $T \sim 400 \text{ fs}$
- Laser power 20-200 pJ
- [Objective](#)
- Variable NA
- Max NA = 0.5 (x100)
- $R_L \sim 3 \text{ um}$
- [TCT](#)
- Several amplifiers
- 2.5 GHz scope



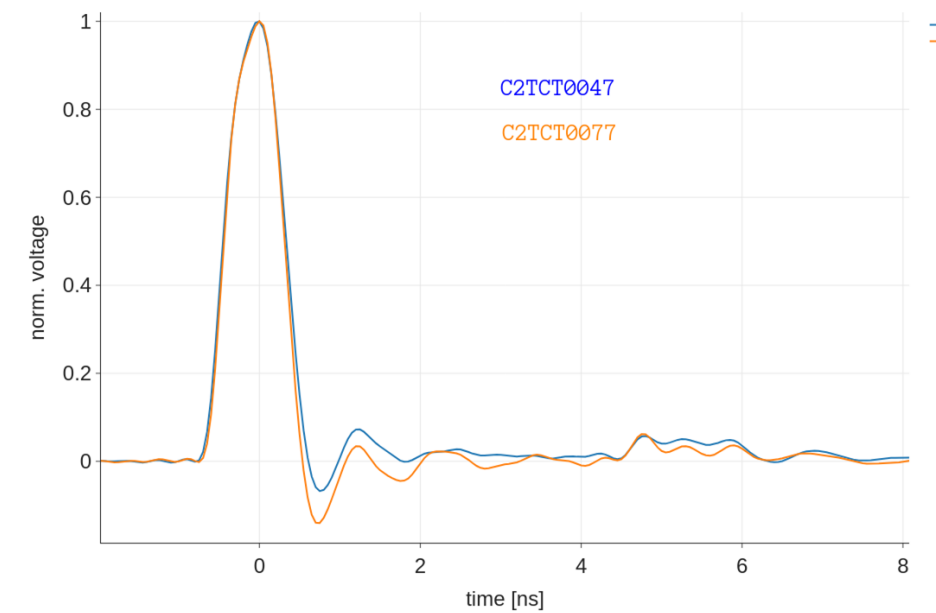
- Am: Amplifier
- At: Attenuator
- BBO: Nonlinear crystal
- BS: Beam splitter
- BT: Bias tee
- CAM: CCD camera
- DUT: Device under test
- FF: High pass filter
- FL: Femtosecond laser
- HV: High voltage source
- M: Mirror
- O: Objective
- Os: Oscilloscope
- Pd: Photodiode
- RL: Red laser
- S: Shutter
- SM: 3-axis stepper
- VNDF: Variable ND filter

Signal comparison between campaigns

Previous campaigns



This campaign



Silicon carbide samples



Producer	DUT	Type	Amplifier	Irradiation
CNM	CNM13575 1MW2	PIN	CIVIDEC TCT 2GHz	-
	CNM13575 F2W1	PIN	CIVIDEC TCT 2GHz	1e15 n/cm ² ATI Vienna
	CNM13575	PIN	LGAD board UCSC	5e14 n/cm ² ATI Vienna
	W2_DR131	PIN	HEPHY HF amplifier	-
IHEP	Sicar_3T0	PIN	UCSC HF amplifier	-
	Sicar1_4_32	PIN	CIVIDEC TCT 2GHz	-
	Sicar1_4_40	PIN	CIVIDEC TCT 2GHz	-
OnSemi	CTU_SiC_LGAD1_41	LGAD	CIVIDEC TCT 2GHz	-
	CTU_SiC_LGAD2_35	LGAD	CIVIDEC TCT 2GHz	-
	CTU_SiC_PIN_24	PIN	CIVIDEC TCT 2GHz	-

CNM samples

Samples: 1MW2, F2W1

- RD50 samples, already studied in previous campaigns
- Goal: Obtain very fine electric field profiles vs depth and vs voltage
- Low step (0.5um) zscans, max. NA
- XY, XZ scans to characterize surface attenuation
- Low voltage intensity scans (try to see plasma)

■ Sample: CNM13575

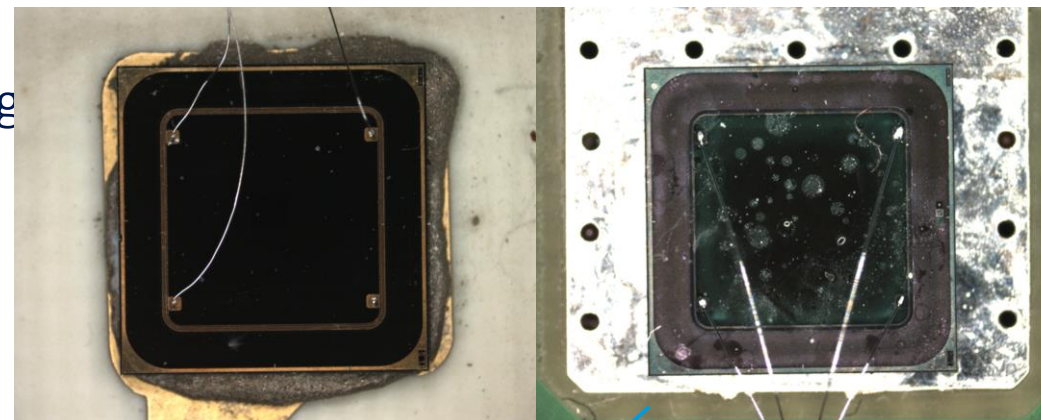
- Goal: Basic depletion study and charge multiplication study
- Low resolution zscans
- Intensity scans at different positions

■ Sample: W2 DR131

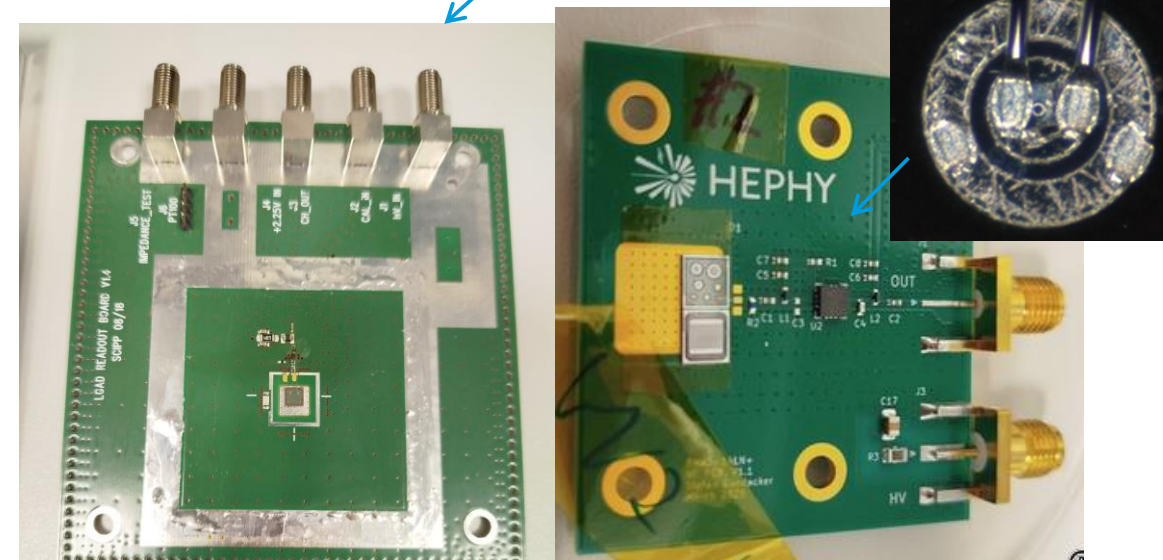
- zscans and XY scans

1MW2

CNM13575

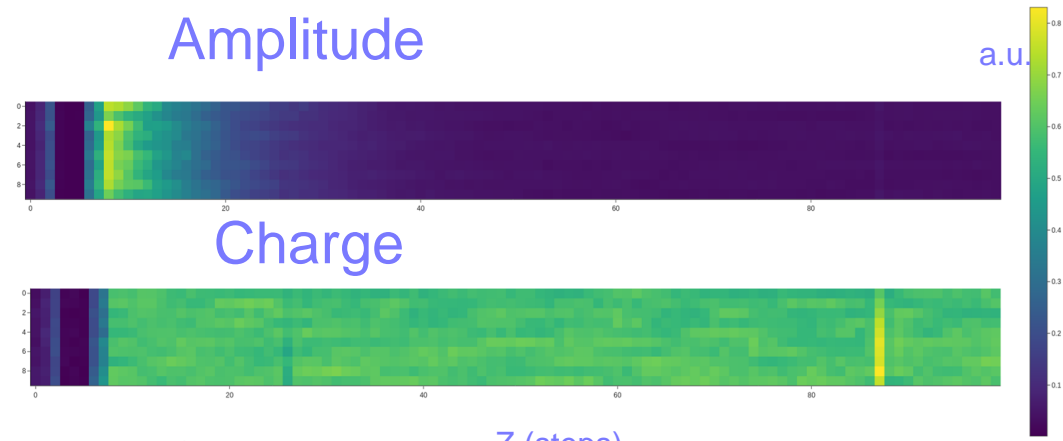


DR131



CNM samples

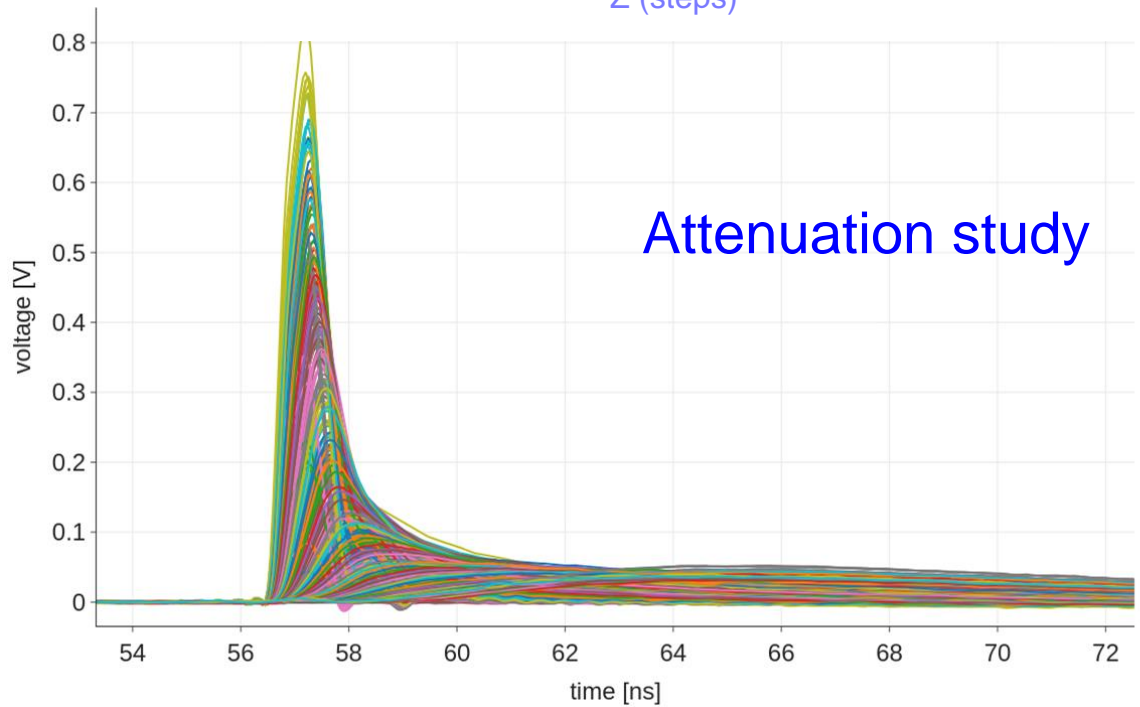
Amplitude



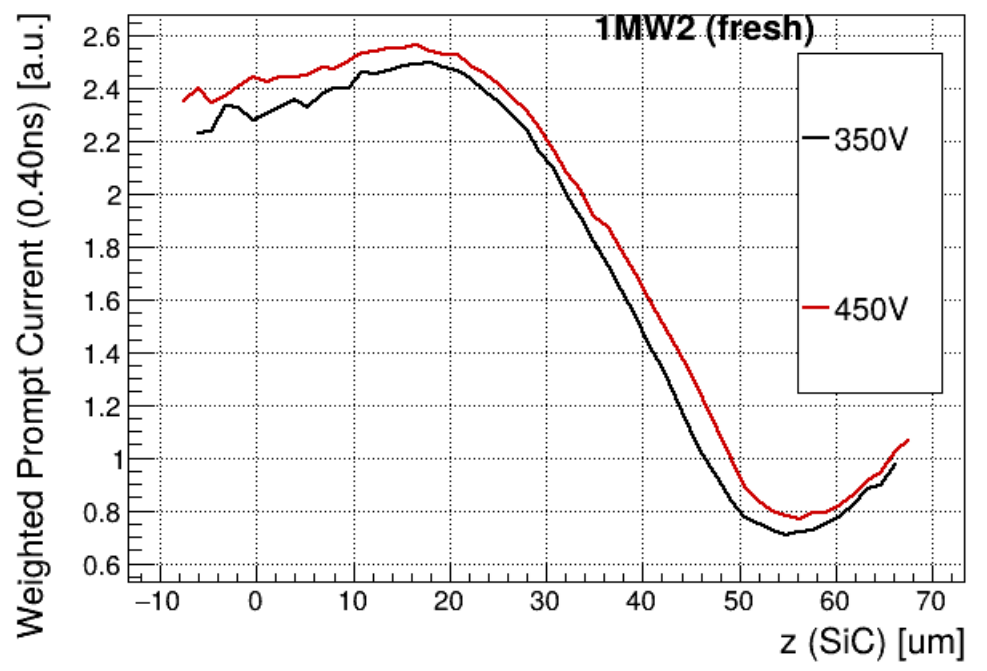
Charge

Z (steps)

Attenuation study



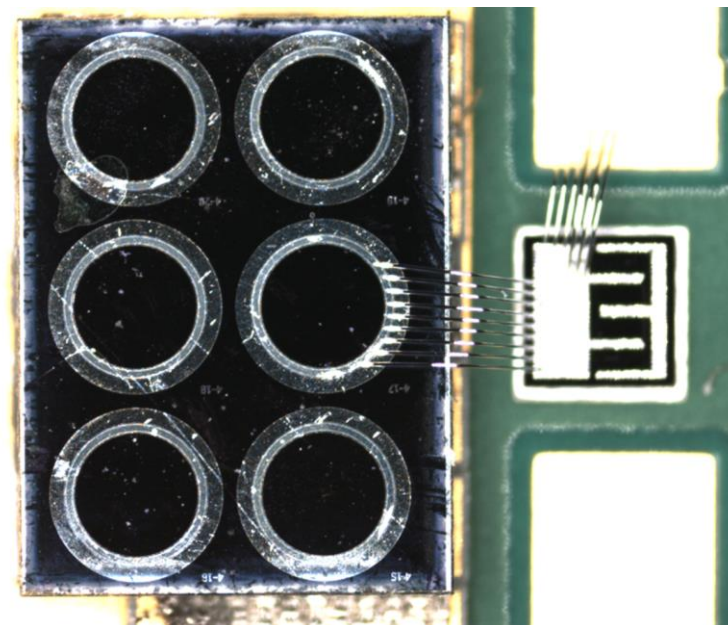
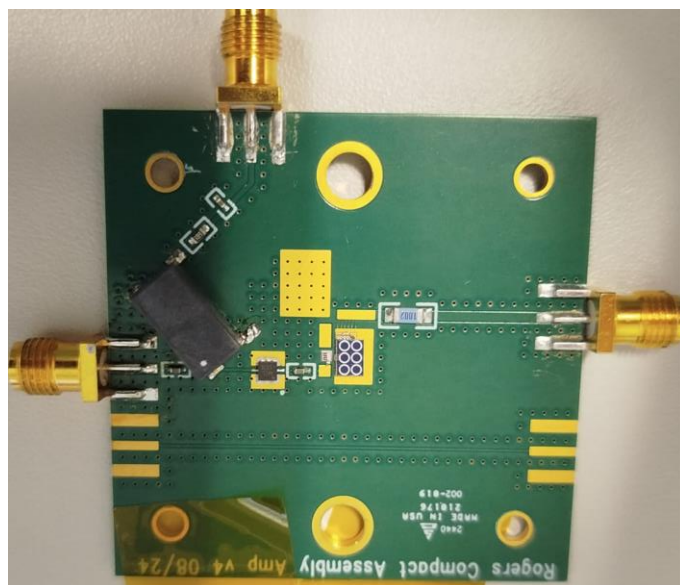
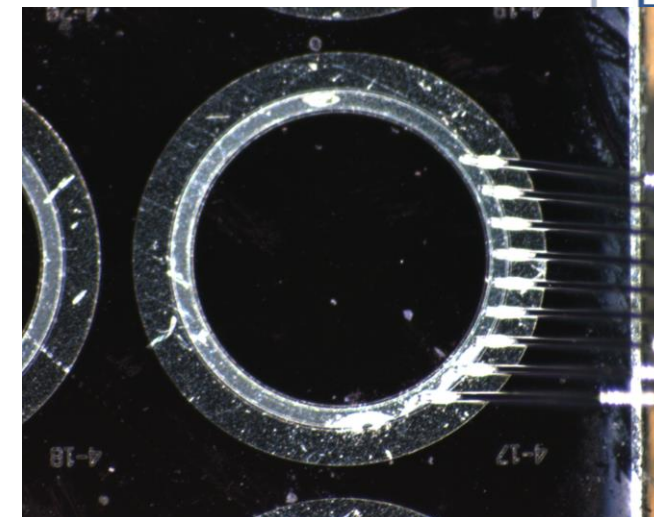
E. field study



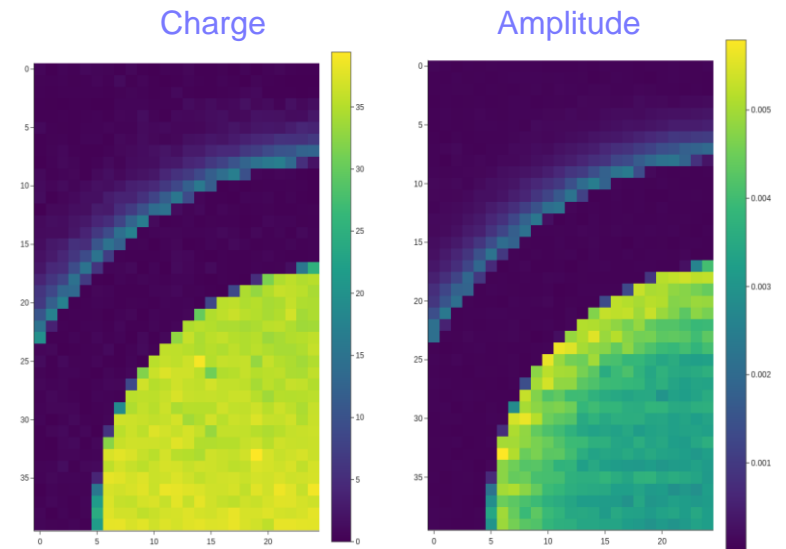
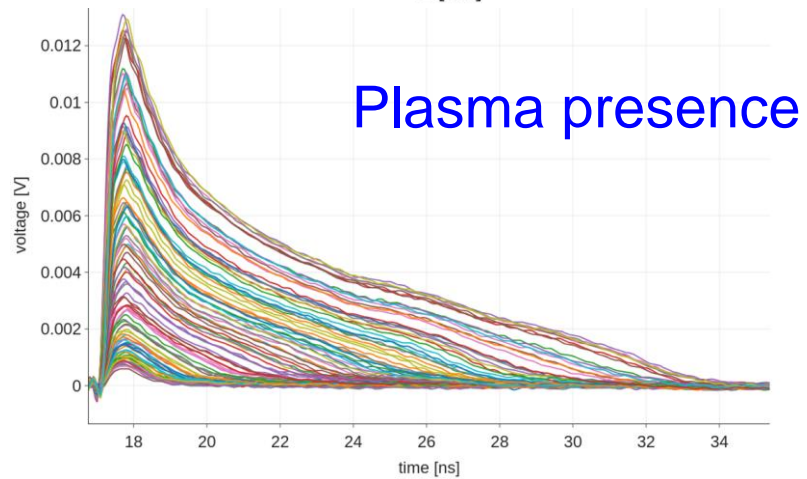
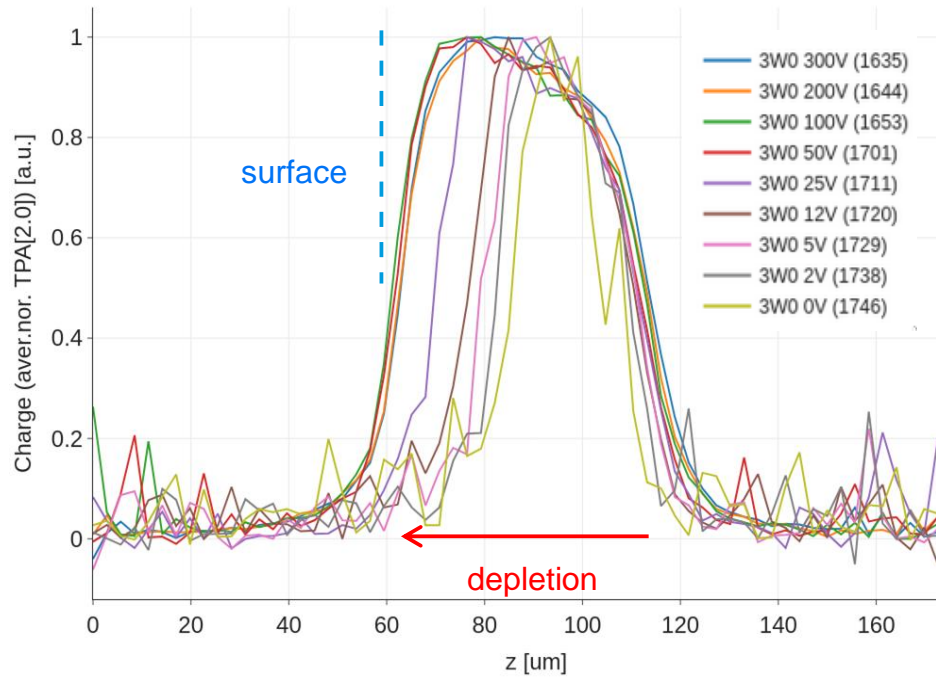
IHEP samples

Samples: Sicar_3T0, Sicar1_4_32, Sicar1_4_40

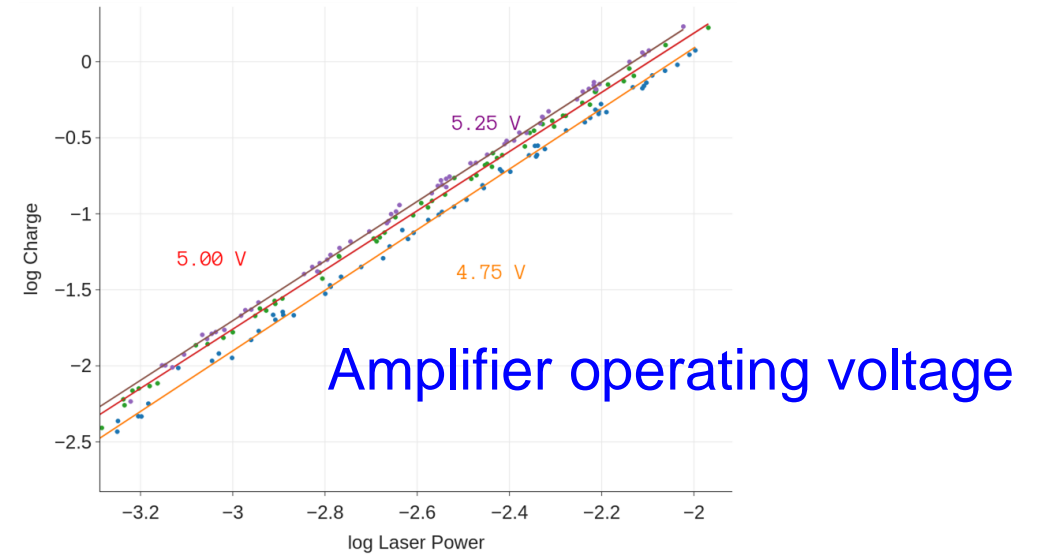
- Measurements:
- High NA zscans for electric field study
- Low NA zscans for depletion studies (effective dopping)
- XY scans for homogeneity response study
- LV scans to check HF amp. gain



Back-side depletion



Signal attenuation



OnSemi samples

- Samples: CTU_SiC_LGAD1_41, CTU_SiC_LGAD2_35 CTU_SiC_PIN_24
- Measurements:
 - High resolution zscans vs voltage (depletion, electric field)
 - XY scans (uniformity)
 - Intensity scans at different positions vs voltage (gain study, spa contribution, plasma)
 - Goals:
 - Gain comparison between PIN and LGAD samples
 - Gain effects like gain suppression and gain dependence with bias voltage
 - Characterize depletion and doping profiles
 - Electric field studies

LGAD SiC from OnSemi – Gain suppression study

Intensity scans at 2 positions



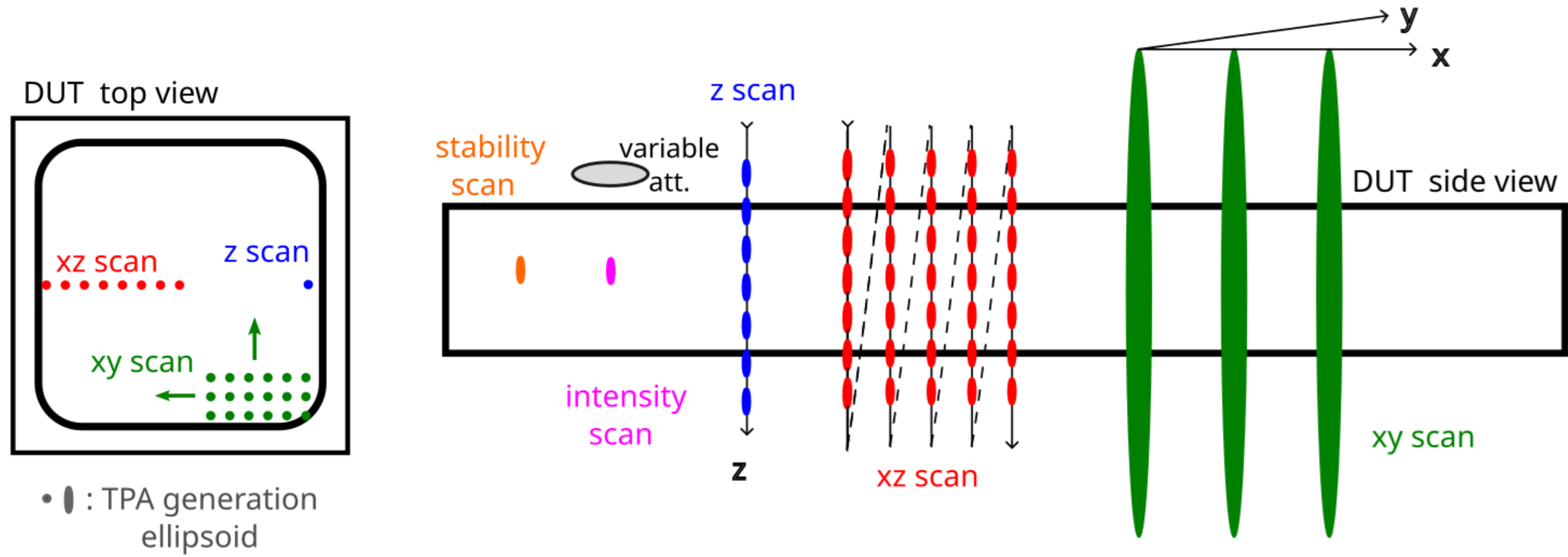
This preliminary study shows:

- Bias-voltage gain dependence
- → Gain increases with higher voltage
- Gain differences depending on injection depth
- → Gain reduction near multiplication layer
- Non-linear (log) dependence between laser power and generated charge
- → Compatible with gain suppression
- → More noticeable as voltage increases.

Summary

- The 2nd DRD3 TCT School remained very popular (significant oversubscribed)
- The TPA-SiC campaign was highly successful, significant number of samples were measured from all the producers.
- In addition with the samples different fast amplifiers were used.
- Participating groups were provided with the raw data and data analysis training is being organized.

Types of TPA-TCT scans



• | : TPA generation ellipsoid

- I will not indicate in the next slides but scans like the stability, intensity and z scans are usually performed as diagnosis tools.