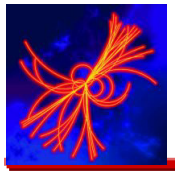
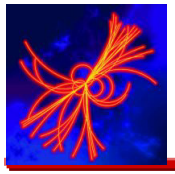


Diamond measurements

K. Afanaciev



Things done

New setup properly installed
Calibration tail made for the old setup – 10 pF precision (1%) C
Calibrations done for both setups
Cross-check of the setups with the same sample.
Old CCE ~ 97%, New CCE ~ 98% => Good agreement
Also, good calibration.
New Keithley => we can go up to 1.1 kV for both setups
Scripts for parsing hundreds of .res files and plotting nice pictures

Work on Transient Current setup (TCT) started, amplifiers tested
Prototype setup is plagued by noise => probably needs proper shielding.

Diamond on iridium measured => results reported @ BCM and FCAL

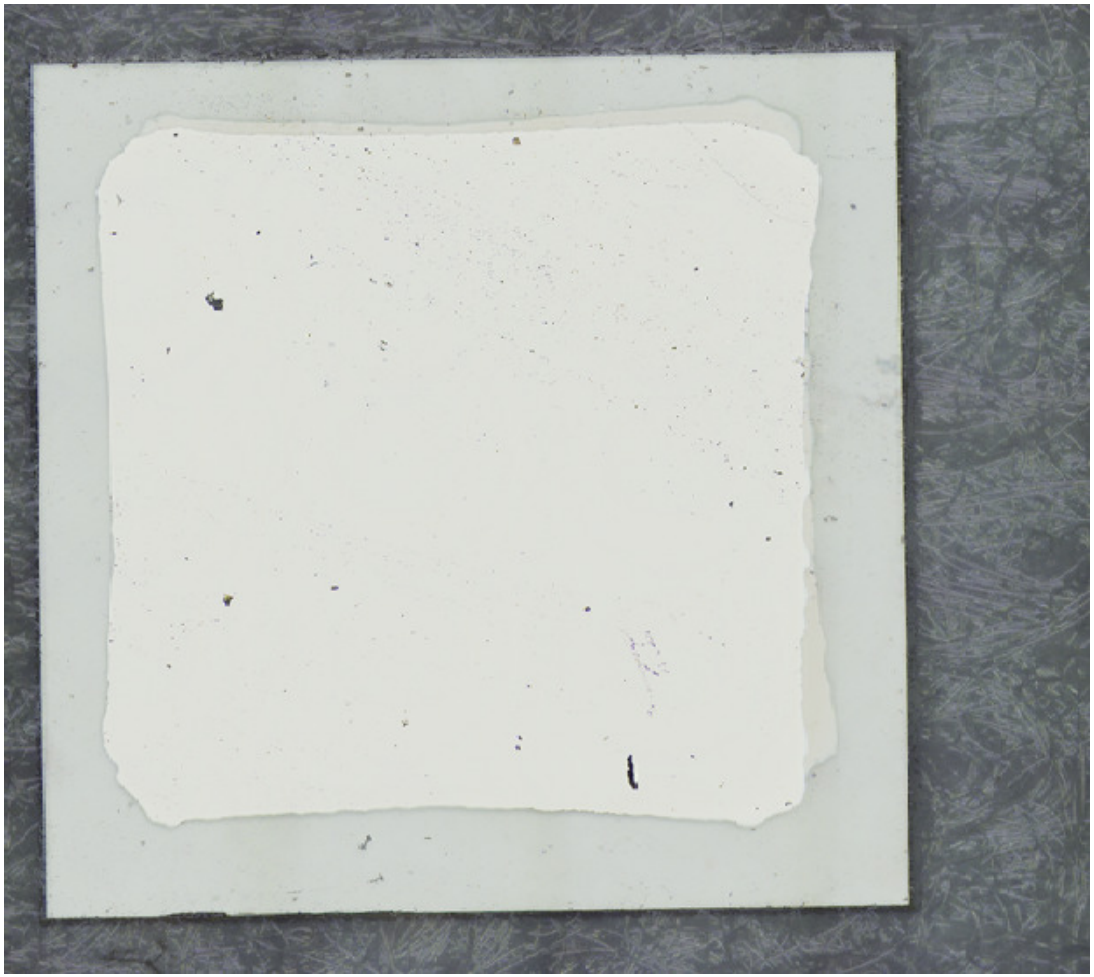
1st batch BCM diamonds

First batch – 6 single crystal diamonds
Plate # 145-500-0060
Characterization on the new setup

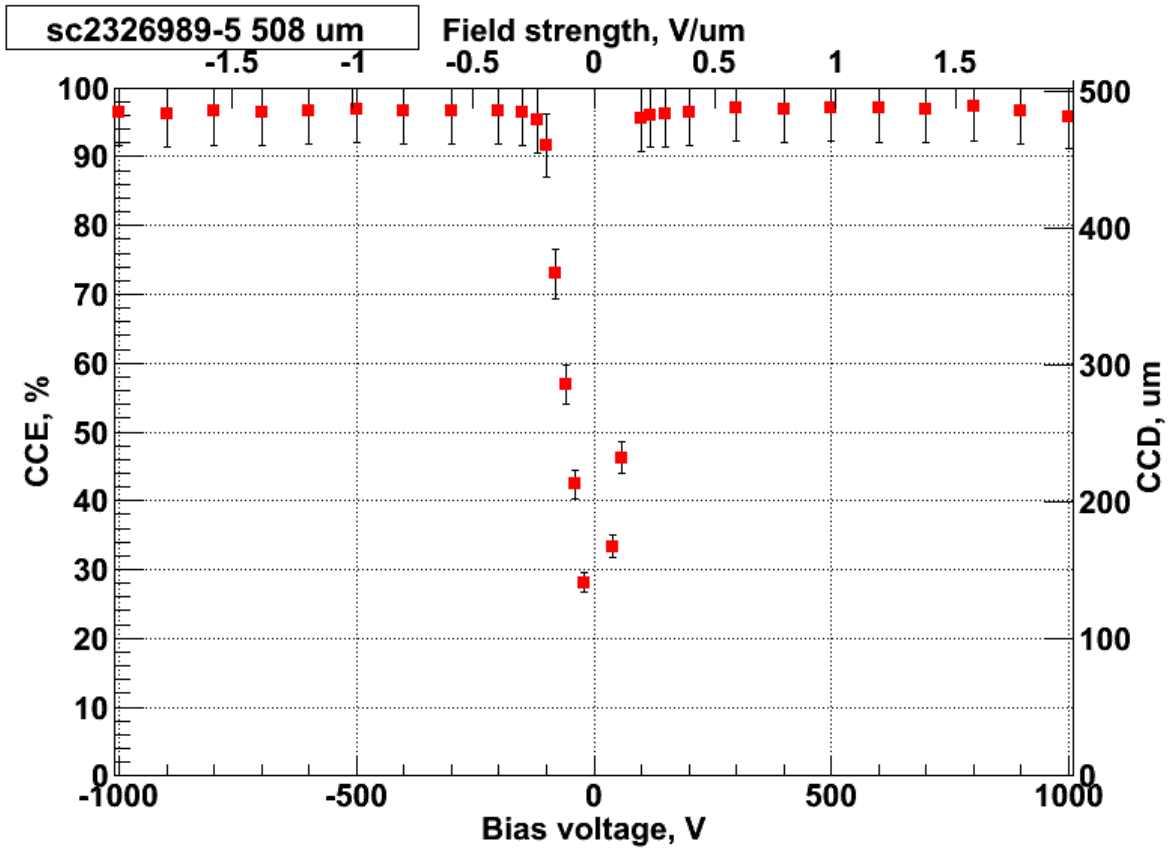
Lot #	thickness	size top	size bottom
23352753	533µm	3993µm x 4000µm	4074µm x 4078µm
23382591	491µm	3992µm x 3994µm	4070µm x 4077µm
23269895	508µm	3994µm x 4000µm	4060µm x 4065µm
23410953	473µm	4080µm x 4088µm	3976µm x 3981µm
23352024	501µm	3999µm x 3990µm	4071µm x 4057µm
23397281	530µm	3993µm x 3990µm	4067µm x 4063µm

Metallisation done in Princeton
W/Ti alloy 90% tungsten, 10% titanium

Geometry

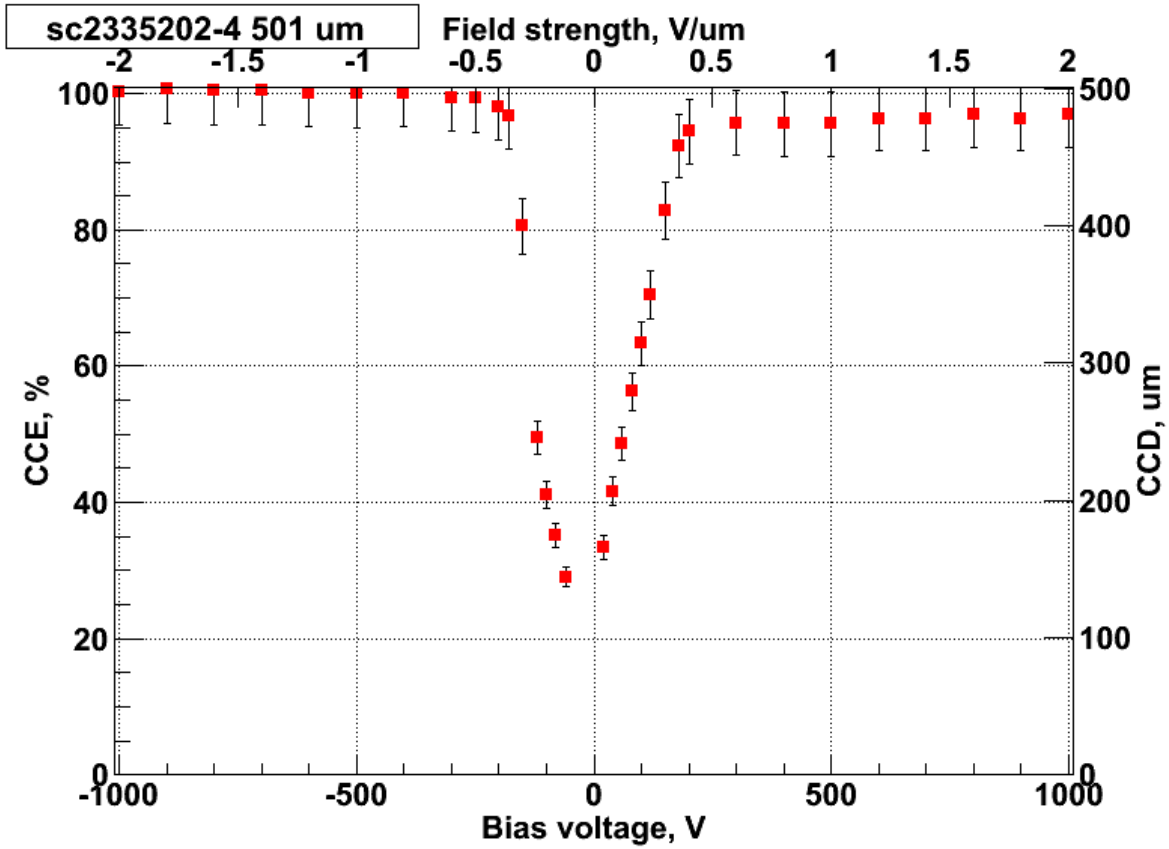


CCE



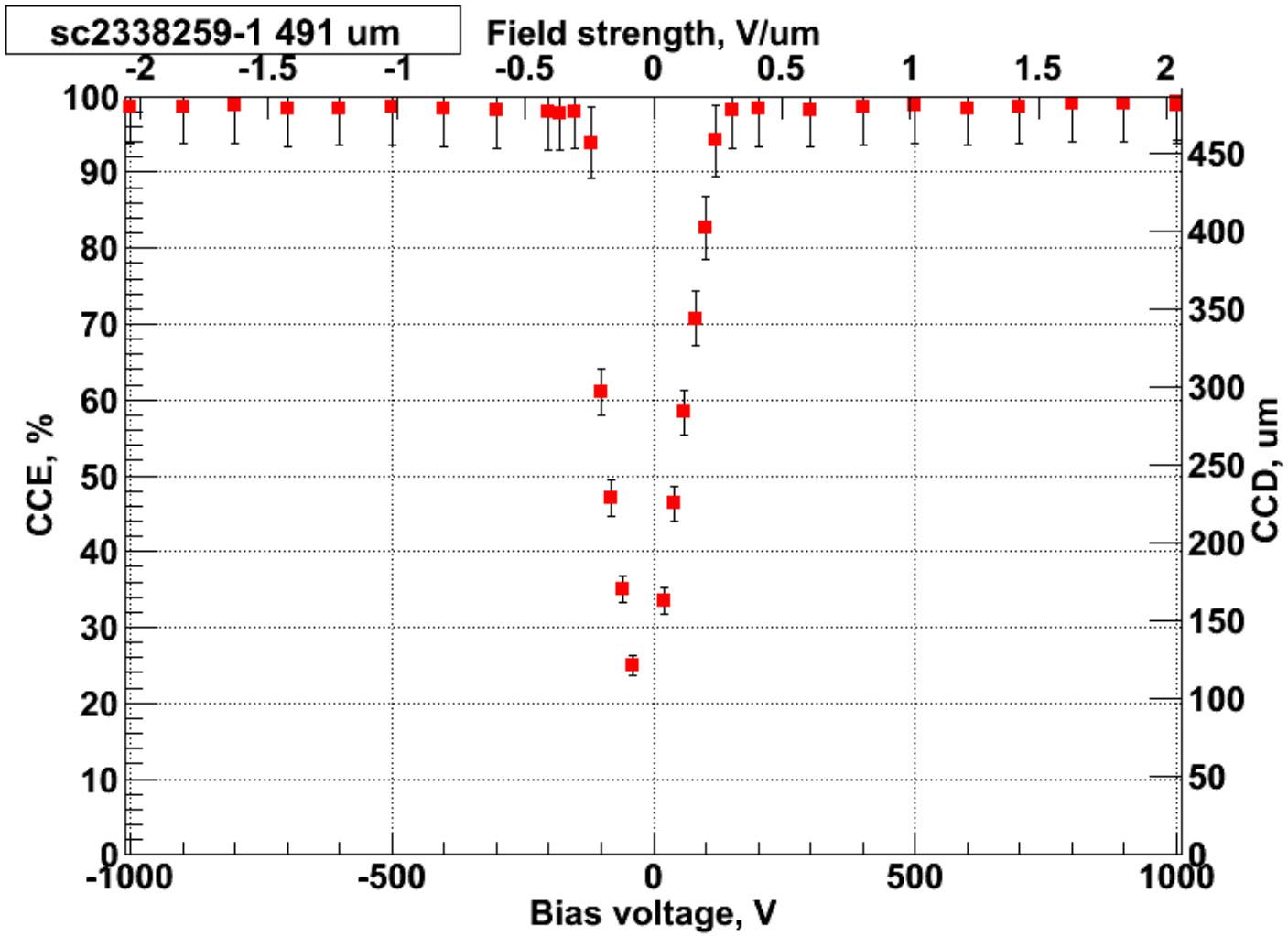
Works up to 1kV both polarities

CCE



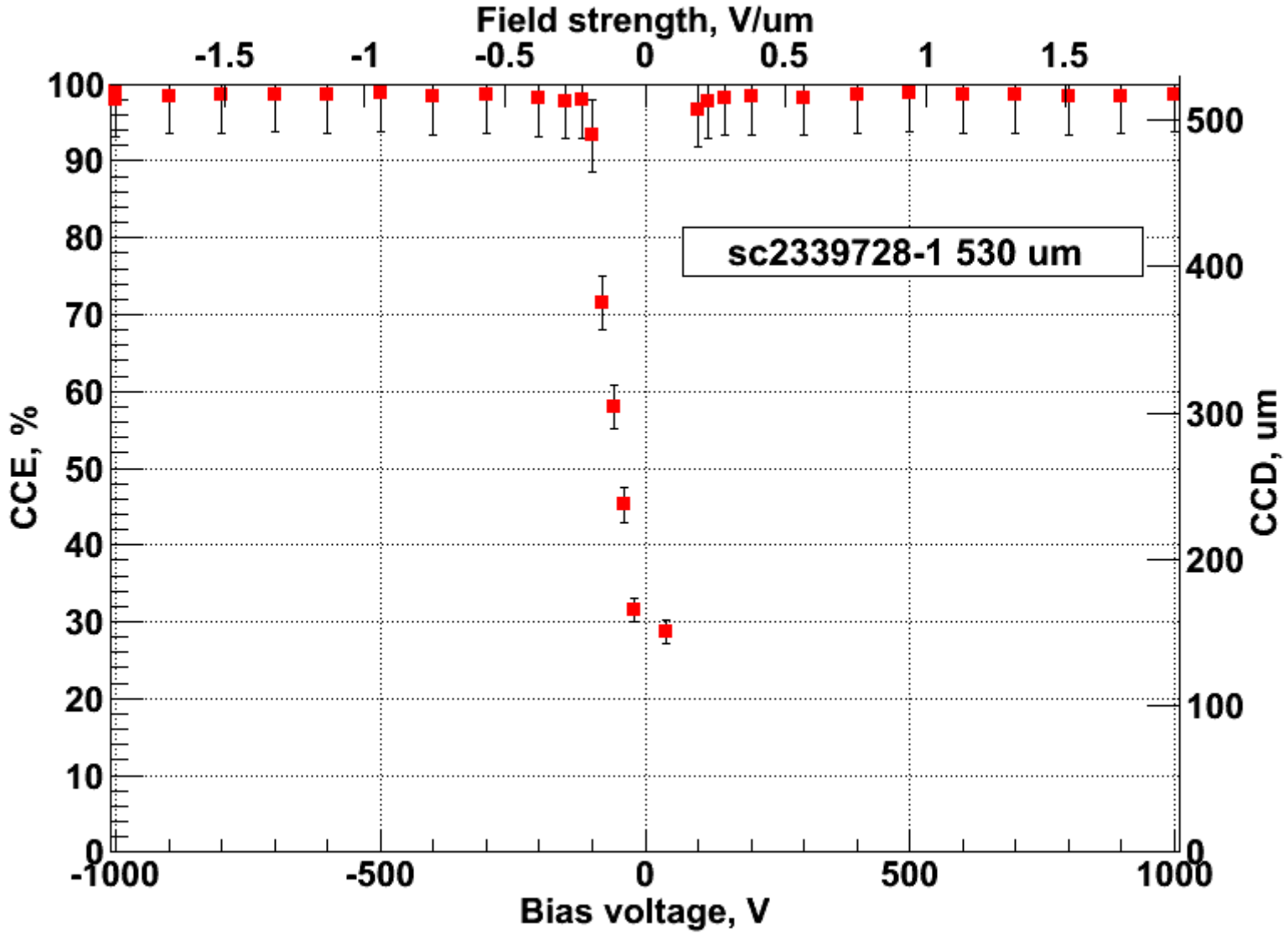
Contact problems? Remeasured twice.

CCE


sc2338259-1 491 um
Field strength, V/um
-2
-1.5
-1
-0.5
0
0.5
1
1.5
2
CCE, %
CCD, um
Bias voltage, V
-1000
-500
0
500
1000

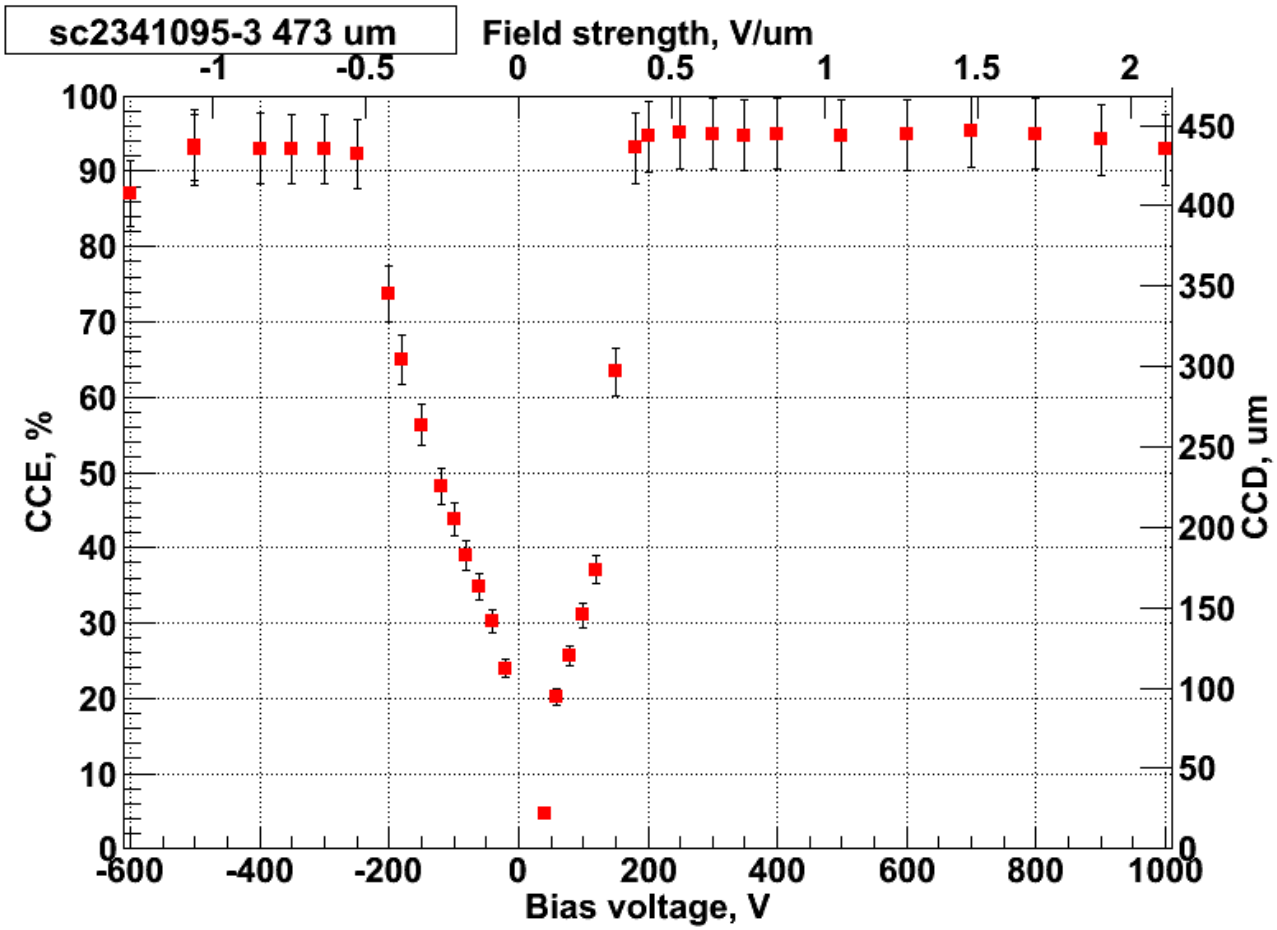
OK

CCE


Field strength, V/um
-1.5
-1
-0.5
0
0.5
1
1.5
sc2339728-1 530 um
CCE, %
CCD, um
Bias voltage, V
100
90
80
70
60
50
40
30
20
10
0
500
400
300
200
100
0
-1000
-500
0
500
1000

OK

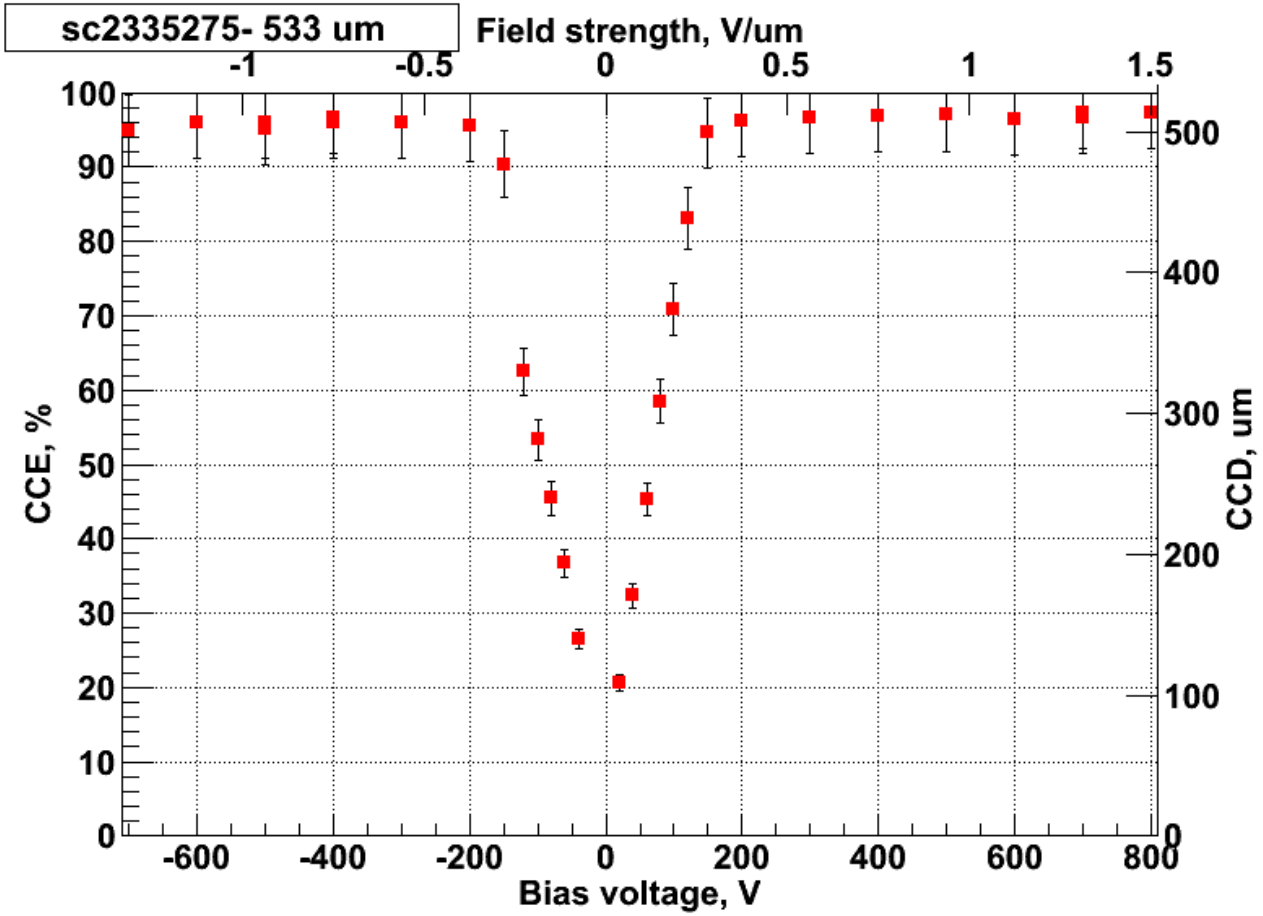
CCE



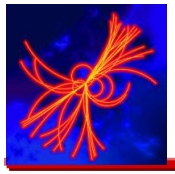
neg. polarity – noise @ 700V, critical

pos. polarity noise @ 800V but not critical

CCE



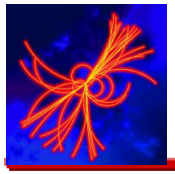
High noise for both polarities, candidate for erratic current check



Summary

6 samples measured
4 work fine up to 1 kV
All work fine up to 500V
CCE saturation around 200V
CCE vs V slightly asymmetric, seems to be some kind of build-in E field
IVs to be done
Erratic current check for 1 sample to be done

Thanks to Sergey's new CCE setup measurements could be done much faster
Charge sharing to calibration C – do not forget to disconnect
Possible influence of contacts => should be checked



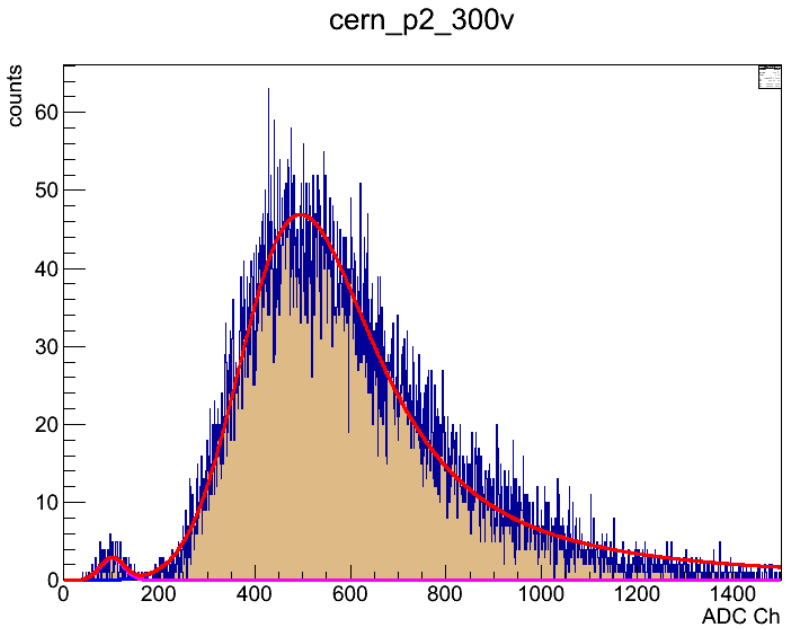
Things to do

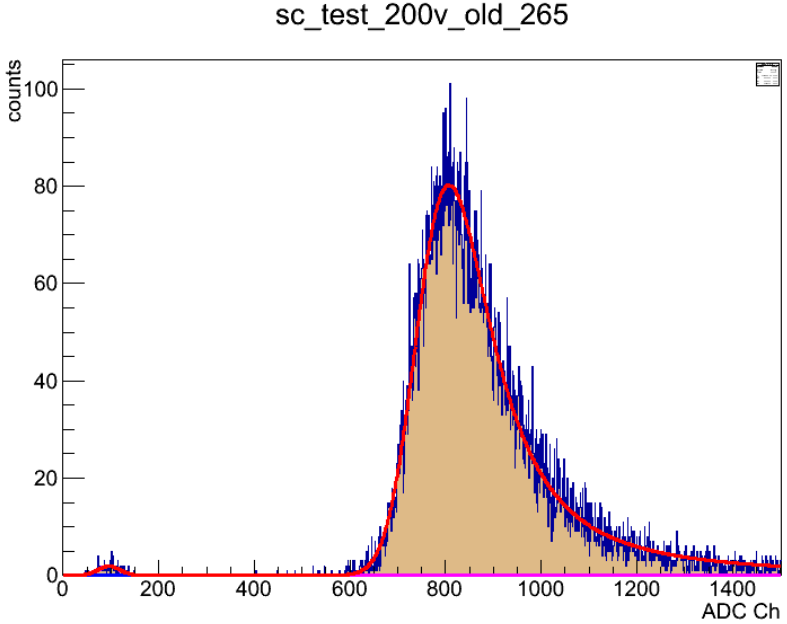
IV measurements for unbonded diamonds => manual probestation (2^{nd} floor lab) – should be setup for the measurements.
Using Sr source in the probestation lab – is it an option?

Testing the effect of red light and comparing with alternating HV
Cross-calibration with gammas from Am source and Si sensor.
DOI measurements with alpha source
Generally measurements in self-triggered mode
TCT setup

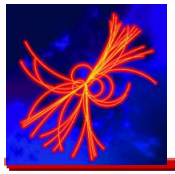
Discussion – errors in CCE plots

Calibration: capacitance, voltage, attenuation – known more or less
Fitting – how to estimate?





MPV[MeV]	1.9334564684e+02	3.7456272669e-02
#sigma_{G}	4.8339656059e+01	5.4071585705e-03
#mu_{ped}	4.7949148651e+01	1.7633251953e+00
#sigma_{ped}	1.8885201228e+01	2.0689923125e+00



Erratic currents

We need some kind of methodology to check for this
Preliminary check during CCE measurements?
What is the threshold of “bad” current? At what voltage to look?