11th RD50 Workshop PDC discussion

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24 GeV proton irradiated samples

	MCz-n Cz-n	MCz-p	Epi-n	STFZ-n STFZ-p	DOFZ-n DOFZ-p
β_{eq} [$10^{-3}cm^{-1}$]	-4.2 to -6.5 [1,2,7] -5.4 [3]	|3| to |7.5| [1,4]	-3 to -10 [6] ****	24 [5] 4[7]	6-7 [5] 4[7]
g_Y [$10^{-2}cm^{-1}$]	3.8 [2] * 4 [3]	>3 [1,4]***	2.9 [6] (first component)	4.8	2.3*
τ_{ra}	~80 min@80C (1st component)	>100 min@80C	~120min@80C	~50 min@80C	~200min@80C

Negative space charge

Positive space charge

[1] N. Manna, 8th RD50 workshop
[2] A.G. Bates and M. Moll, *Nucl. Instr. and Meth. A555* (2005) 113.
[3] E. Fretwurst, 3rd RD50 workshop
[4] H. HödelMoser, RESMDD06
[5] Rose RD48 status report
[6] G.Lindström, NIMA ()
[7] G. Pellegrini et al., NIM A552 (2005) 27.
[8] N. Manna, 7th RD50 workshop
[9] Lozano et al, NIMA A 552 (2005) 27–33.
[10] V Cindro, 8th RD50 Workshop

*saturation at $\Phi_{eq}>5\cdot10^{14}$ cm^{-2}
***annealing not fully completed
**** depends on thickness

Neutron irradiated samples

MCz-p,n ; DOFZ-n ; STFZ-n type:

- $\beta_{eq} \sim g_c \sim 20 \cdot 10^{-3}$ cm^{-1} [5,8,10]
- $g_Y = 4 \cdot 10^{-2}$ cm^{-1}
- $\tau_{ra} = \sim 80$ min@80C

Epi-Si:

- ρ>150 Ωcm (75 and 150 μm samples)
  - $g_c \sim 5 \cdot 10^{-3}$ cm^{-1} [8,11]
- ρ=50 Ωcm (75 and 150 μm samples)
  - $g_c \sim -5 \cdot 10^{-3}$ cm^{-1} [8,11]

[1] N. Manna, 8th RD50 workshop
[2] A.G. Bates and M. Moll, *Nucl. Instr. and Meth. A555* (2005) 113.
[3] E. Fretwurst, 3rd RD50 workshop
[4] H. HödelMoser, RESMDD06
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[7] G. Pellegrini et al., NIM A552 (2005) 27.
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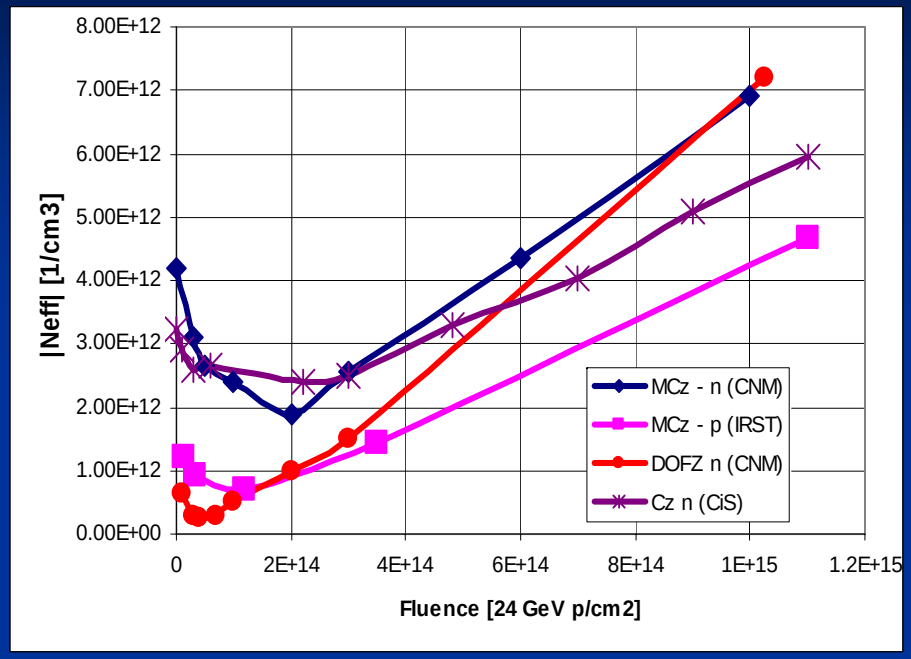
[10] V Cindro, 8th RD50 Workshop
[11] G. Kramberger, 8th RD50 Workshop

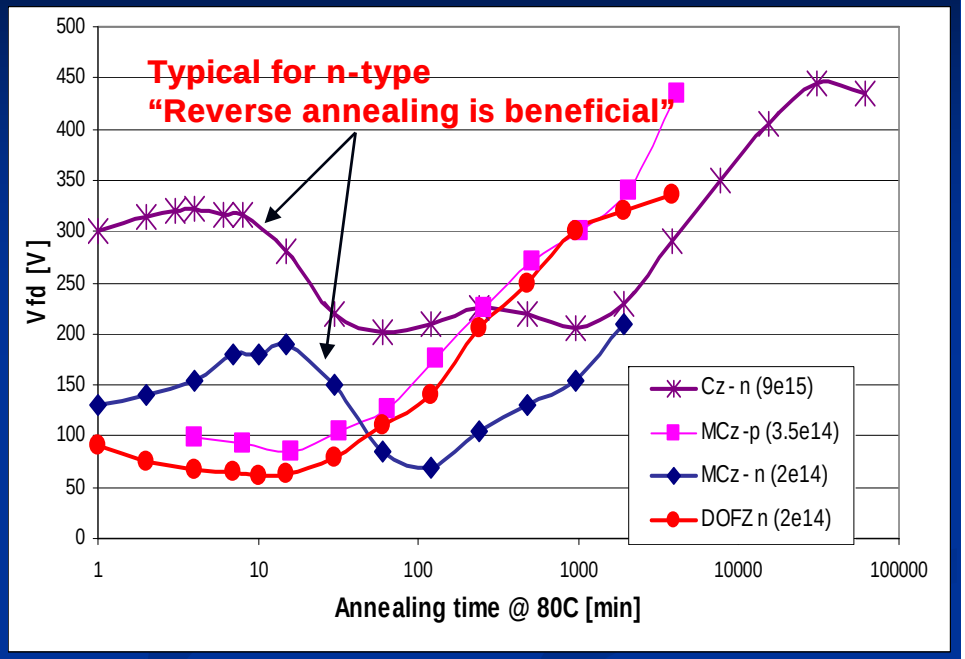
26 MeV proton irradiated samples

Type inversion is observed for all materials (SMART, HH)!
How does that fit to our picture?

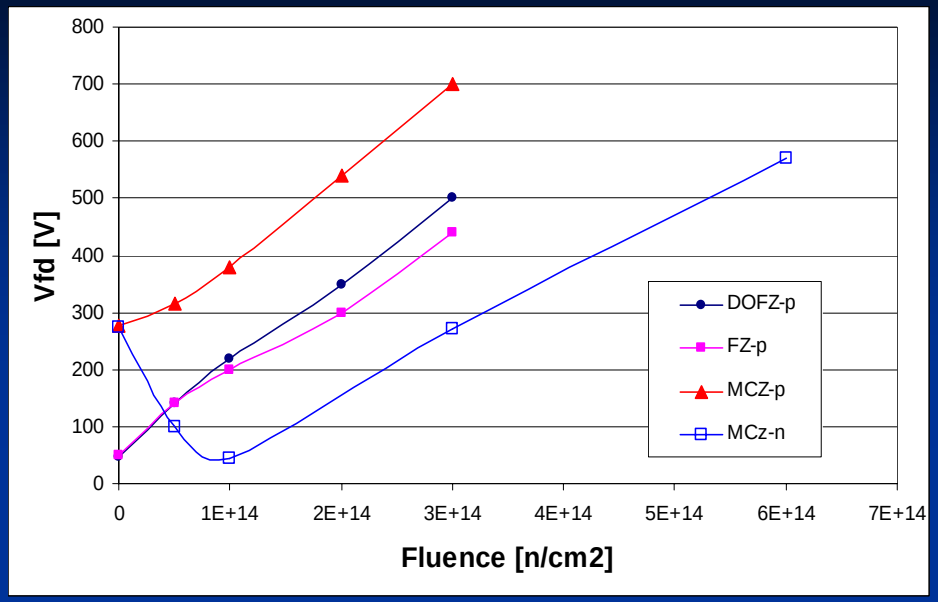
Mobility at high Fluence – doesn't depend or ?
Acceptor removal
Gc vs. thick
Thickness
Irr. Under bias

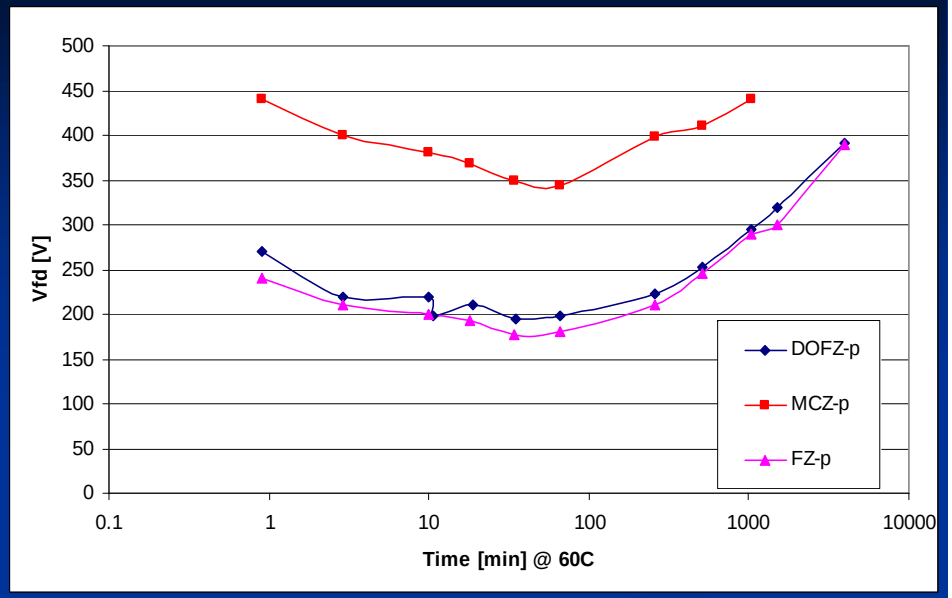
24 GeV proton irradiated samples

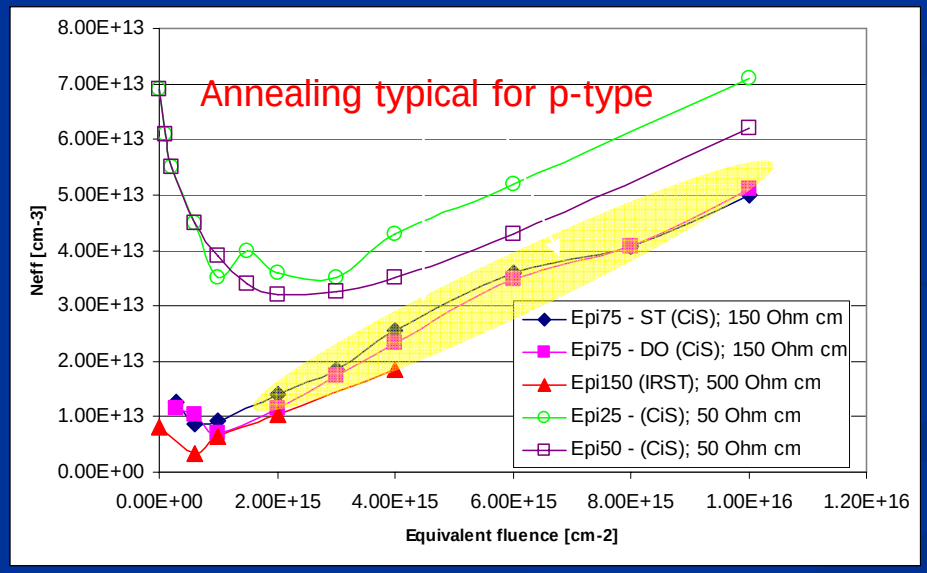




Neutron irradiated samples







Probing of material type

- Probing material type
  - TCT
  - Annealing curve shape
  - Neutrons introduce negative space charge, so adding them to
    - p-type material -> V_{fd} increases
    - n-type material -> V_{fd} decreases

We also need to do some mixed irradiations to check for any surprises and simulate SLHC detector!
(are there any fully annealed MCz-p type that you can miss?)

To do

- Mixed irradiations (list of samples)
- Isochronal annealing (60,80,100,120,140 °C...) measurement of trapping !
- Conversion list pad detector -> different segmented devices (shaping times of amplifiers)
- Bistability with ^{90}Sr
- C(V) Neff profile
- Irradiation under bias?
- H in Si (ongoing devterium implantation)
- tau_r during 9 MeV p irr.!

MCz p,n puzzle with 24 GeV p

- [C] [O]=3.8e17cm-3 in MCz-Okmetic?
  - Sumitomo [O]=1e18;
- Free carriers during irr.
- Other impurities in MCz-(p,n) Fe?
- Campaign with MCz n,p
- Epi-p evalutation and comparisson

26 MeV protons

- Question about irr. T (8 min @ 80C)

Irradiations