

Update on lifetime measurements



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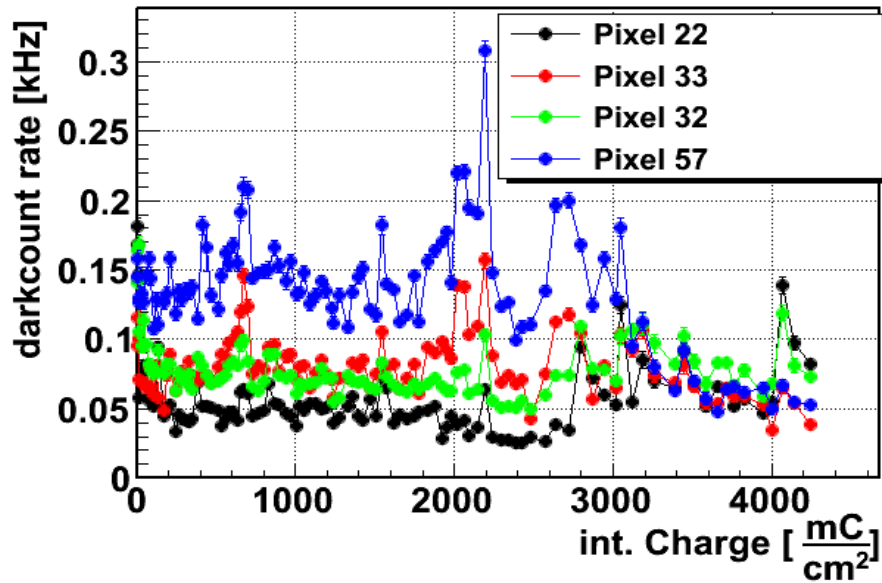
supported by BMBF and GSI

Overview

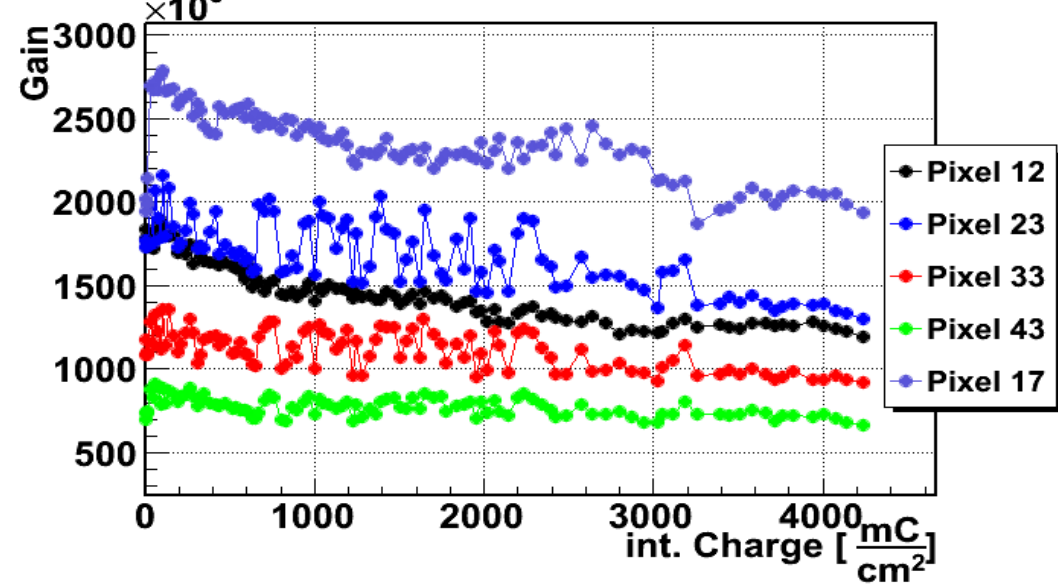
- Results of the latest lifetime measurements:
 - XP85112/A1-HGL 9001223 (long illuminated device)
 - XP85112/A1-D 9001332 (illumination started recently)
 - Gain measurements
 - QE measurements
- Summary and outlook

Aging of XP85112/A1-HGL 9001223

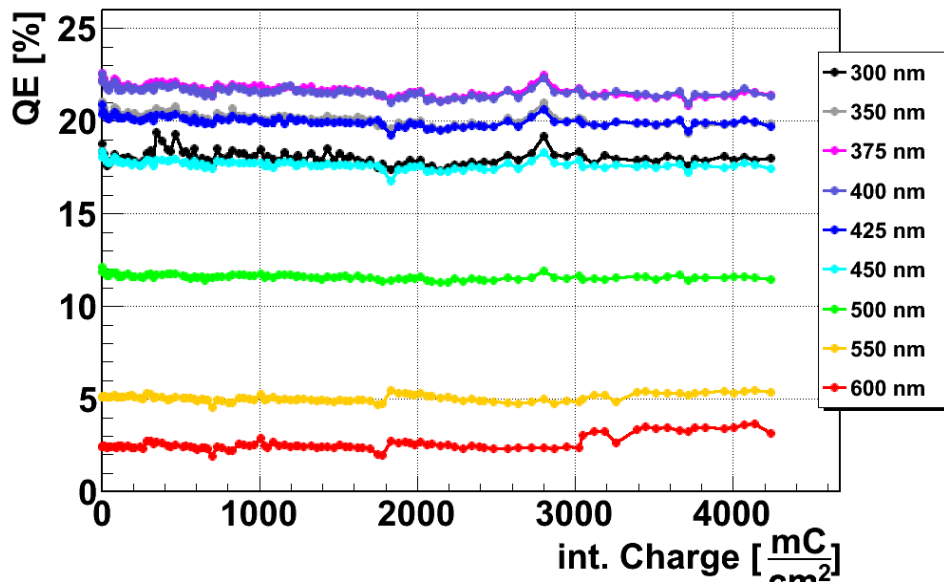
Darkcount vs Charge - PHOTONIS XP85112/A1-HGL 9001223



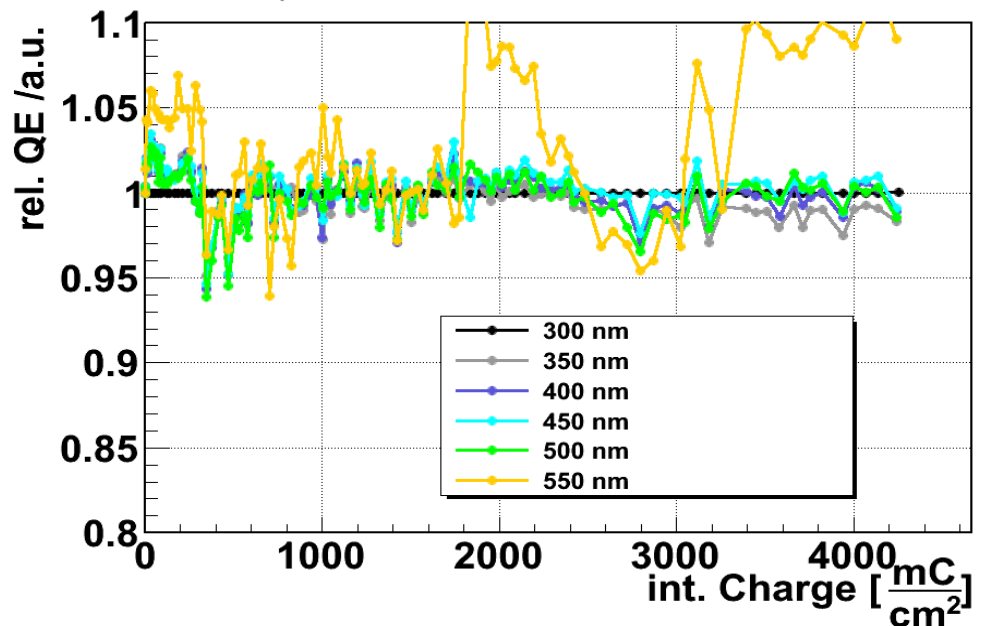
Gain vs Charge - PHOTONIS XP85112/A1-HGL 9001223



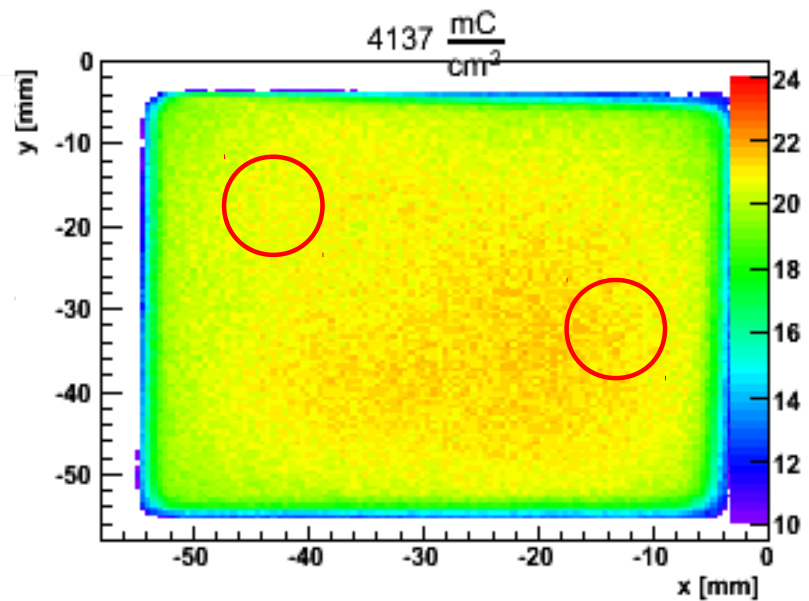
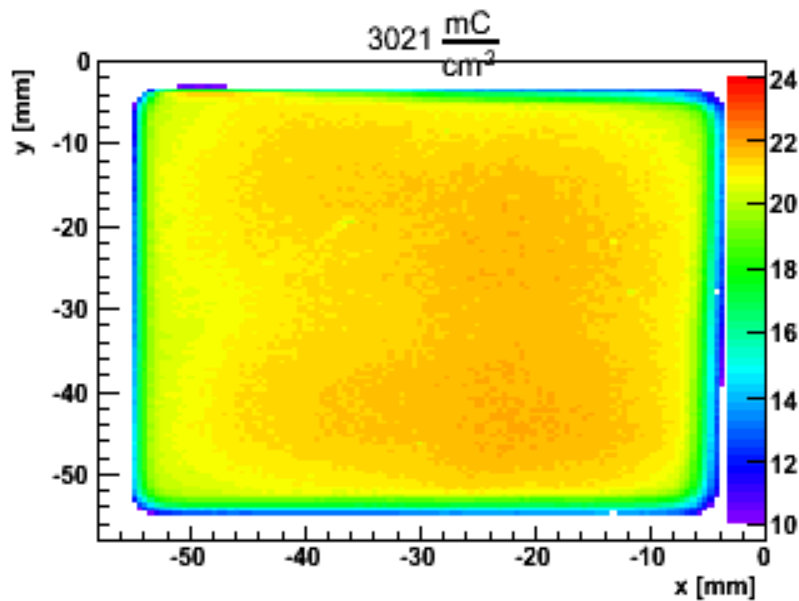
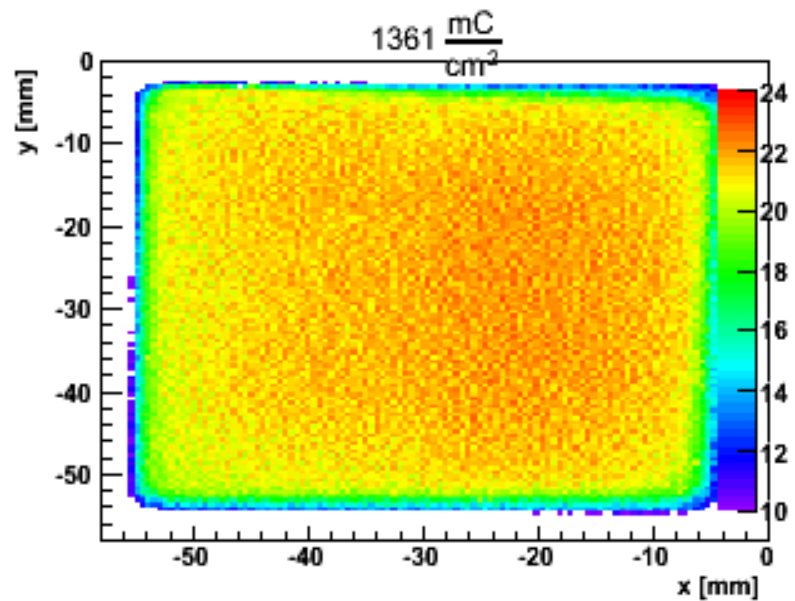
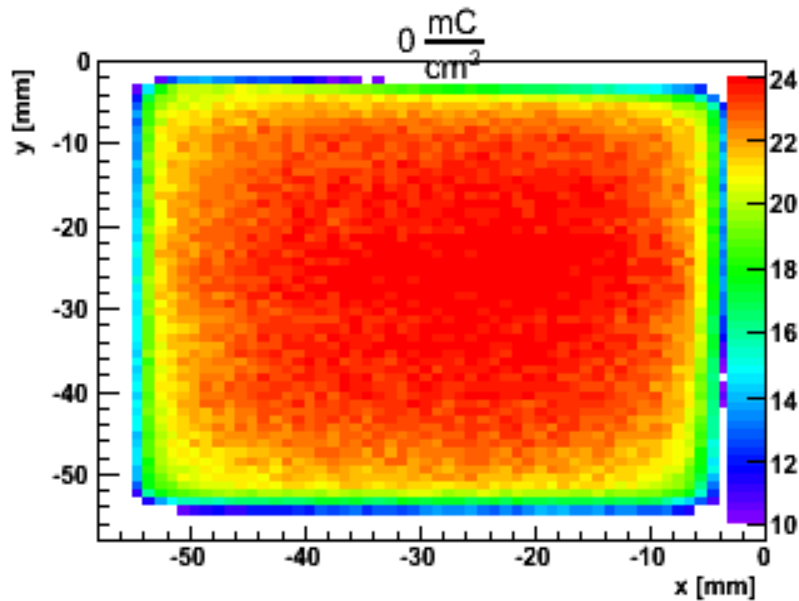
QE vs Charge - PHOTONIS XP85112/A1-HGL 9001223



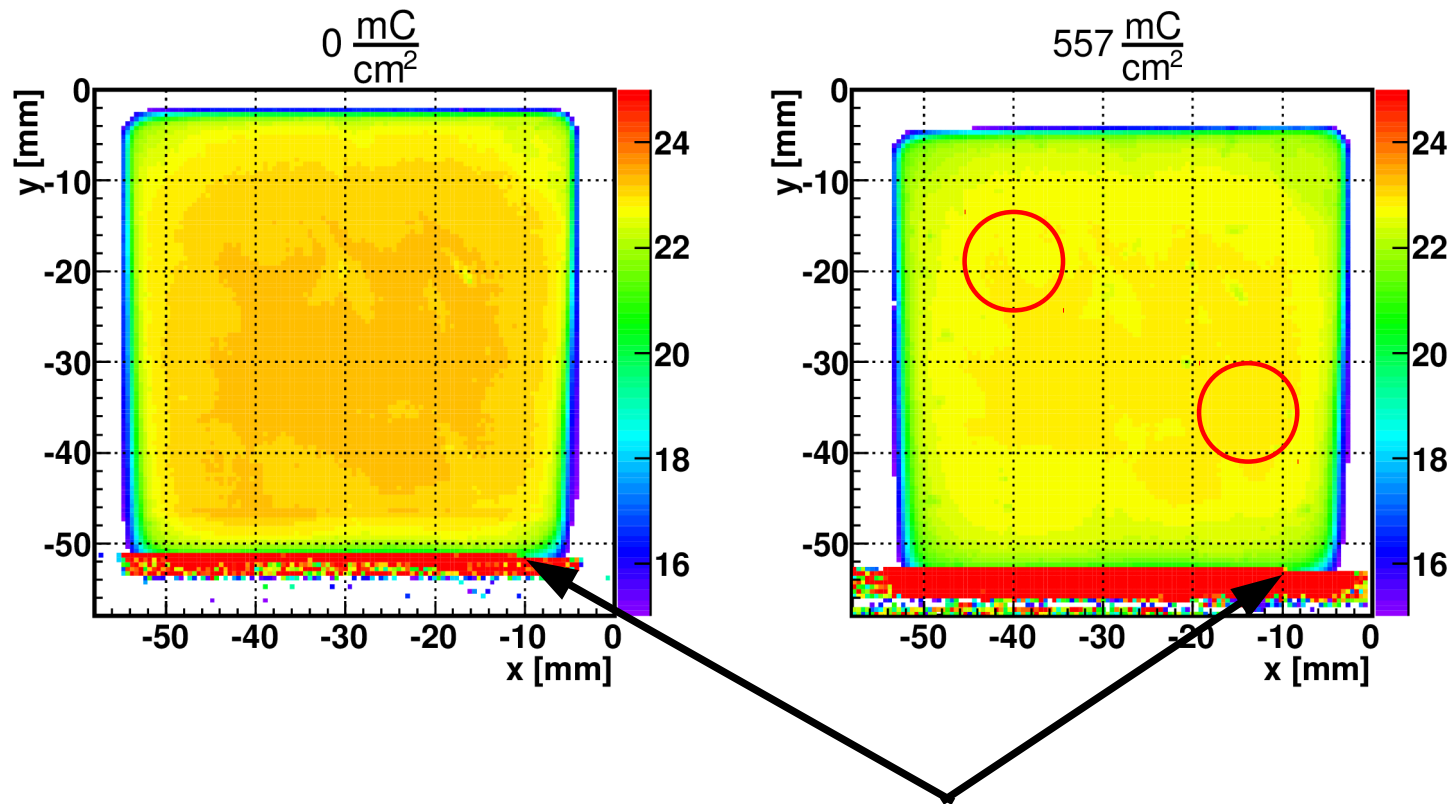
rel. QE - PHOTONIS XP85112/A1-HGL 9001223



QE-Scans 9001223

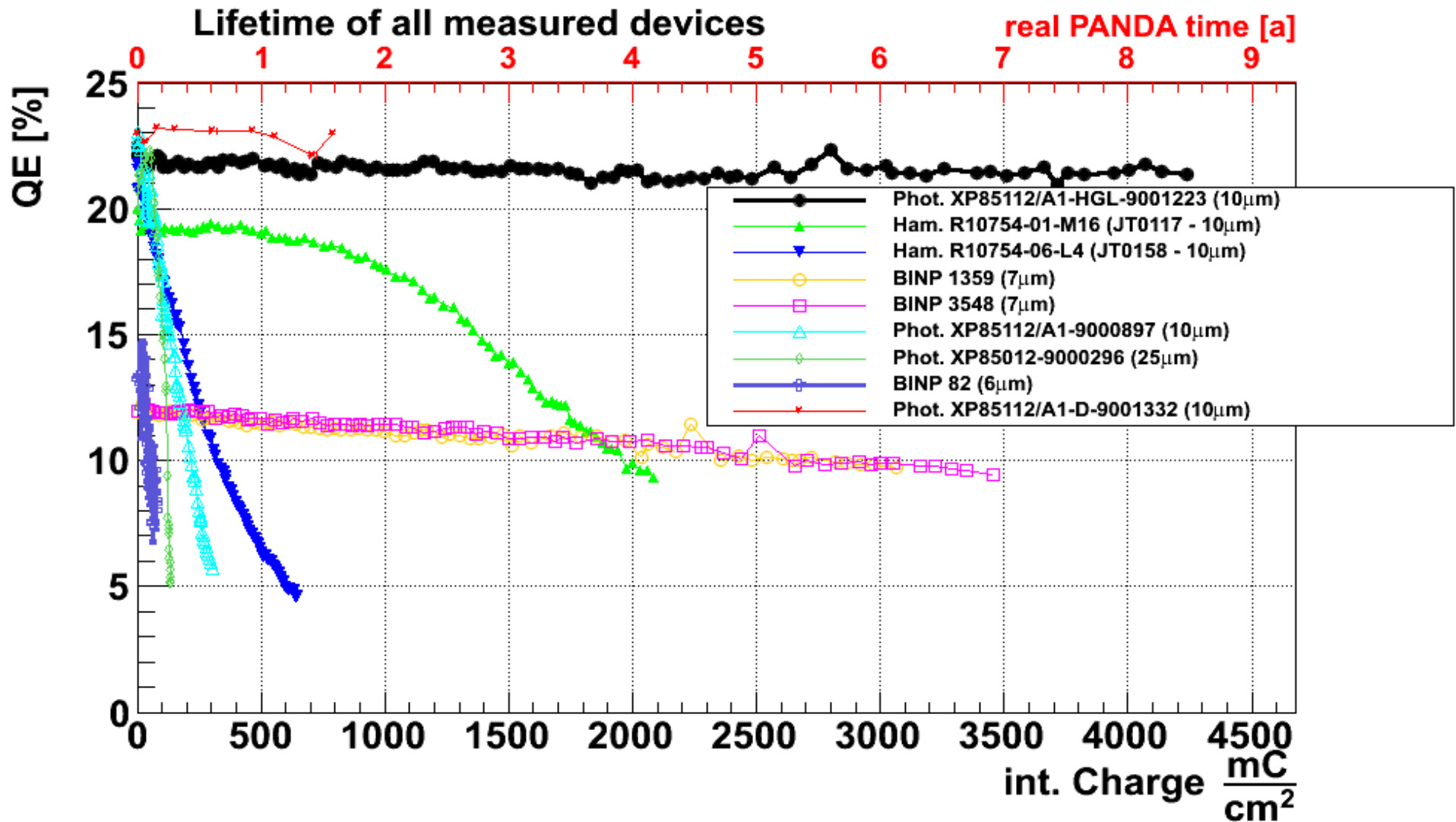


QE-Scans



Devices still gets instable after illuminating 'problematic area'

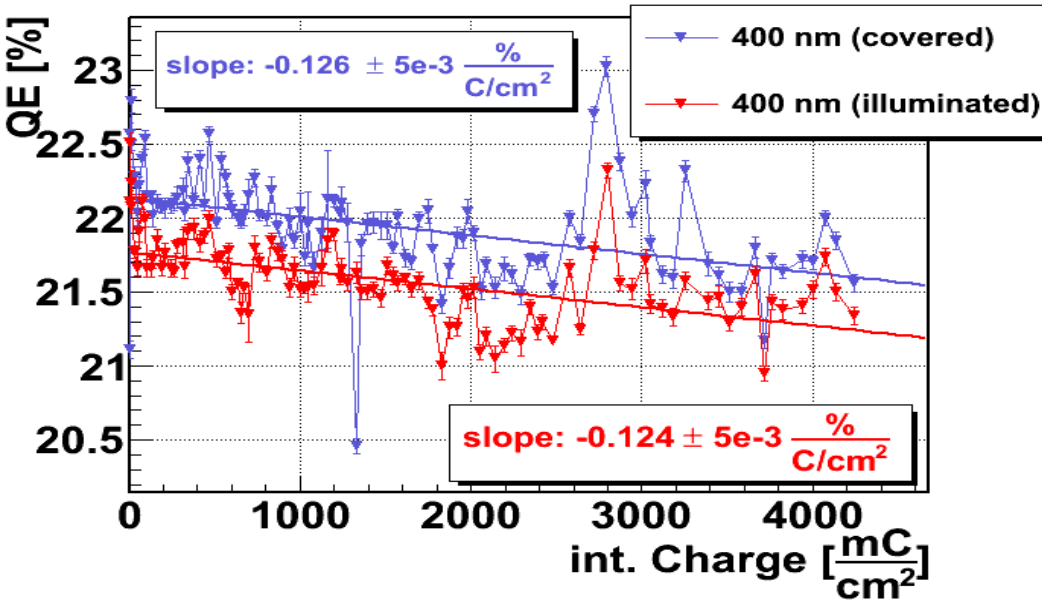
Comparison with older measurements



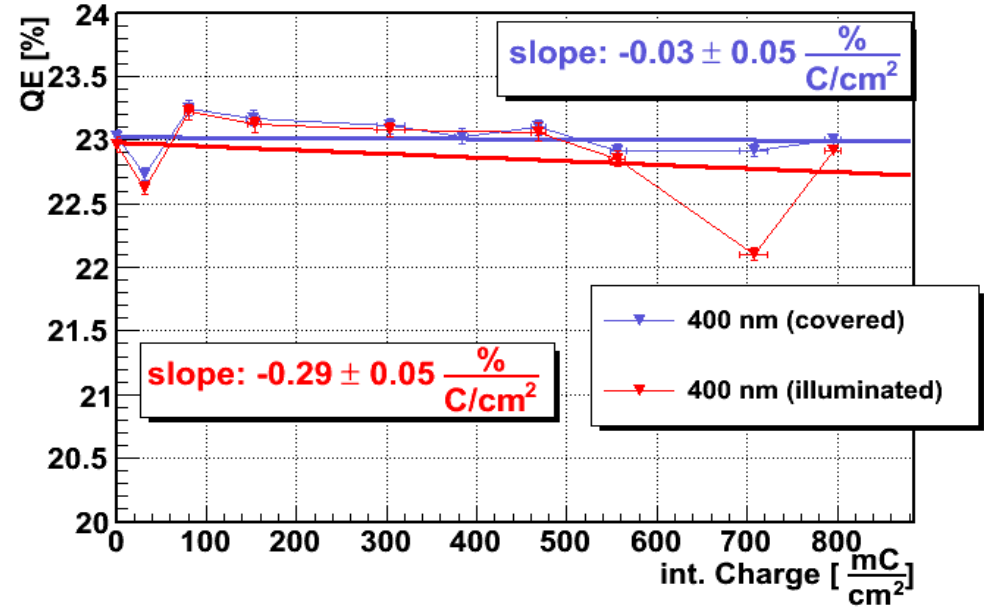
- Almost no degradation for XP85112/A1-HGL – 9001223, after 8.5 PANDA-Barrel-Years!
- XP85112/A1-D – 9001332 has already passed 1.5 PANDA-Barrel-Years!
- Performance of BINPs is still good

Comparison of QE (400nm)

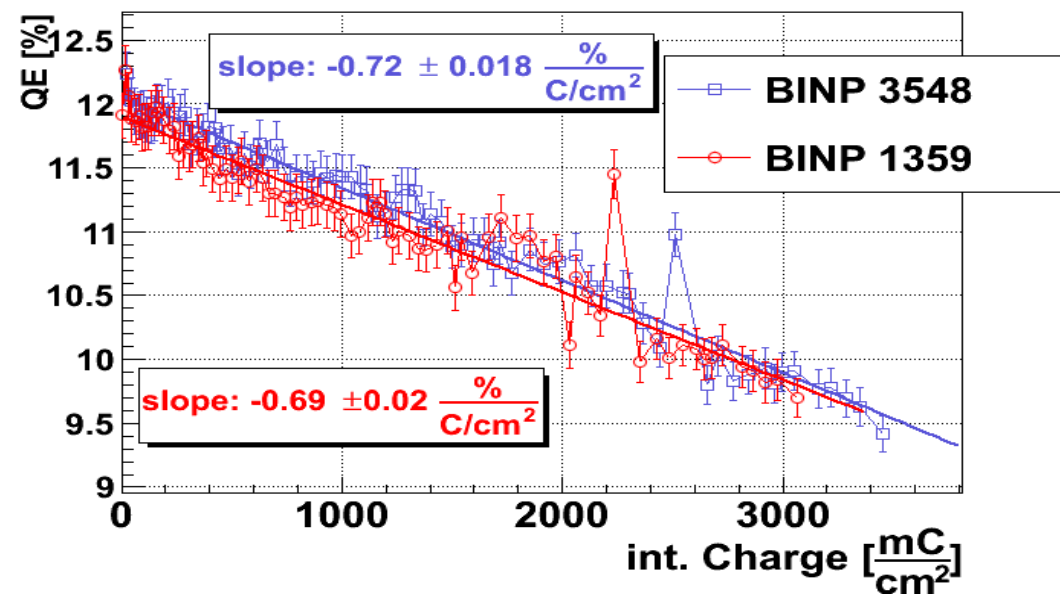
QE-Comparison: 9001223



QE-Comparison: 9001332



QE-Comparison BINPs at 400nm



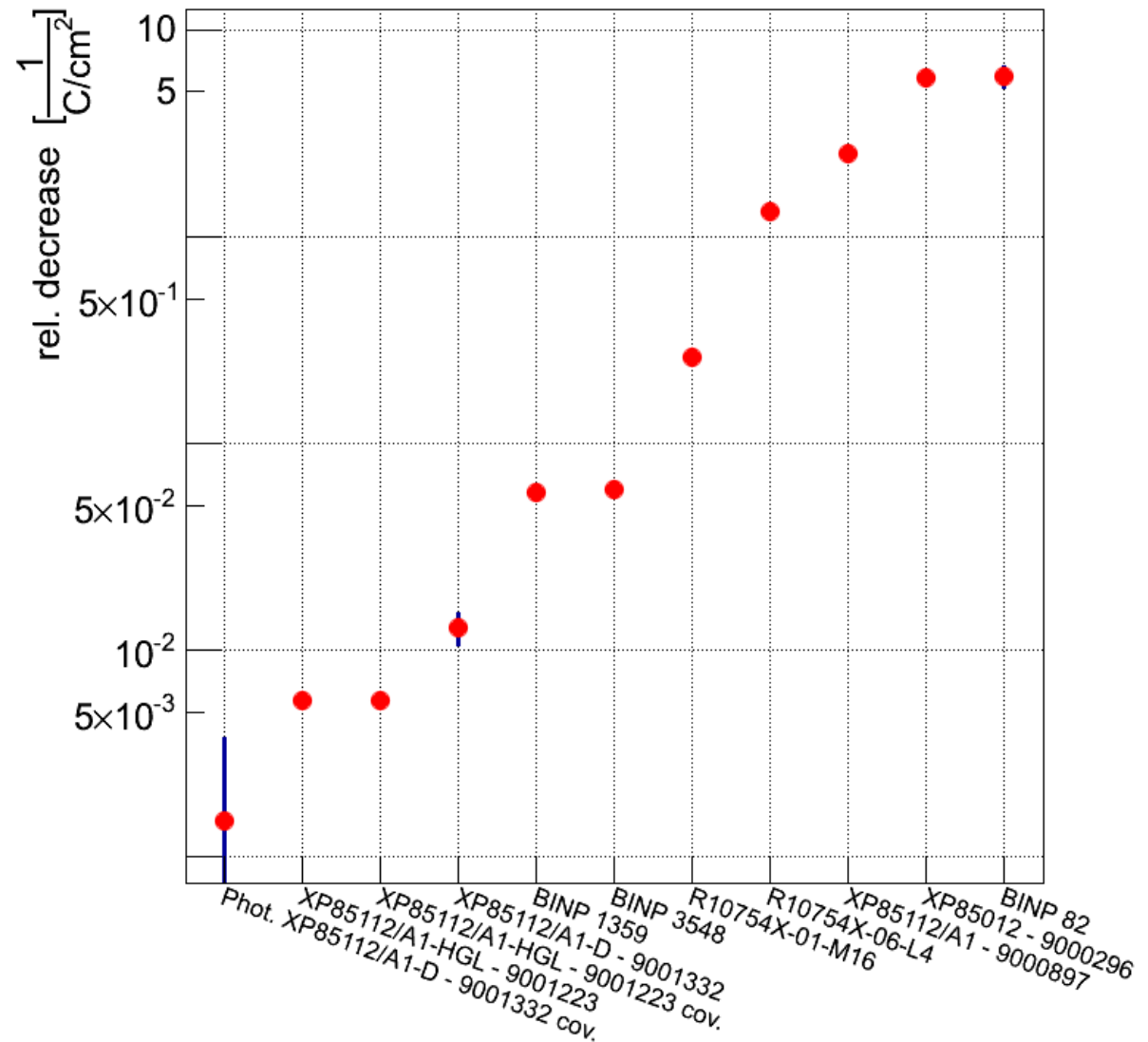
- Equal slopes for 9001223: Maybe hint for aging dominated by ionized neutral gas
- More data needed for 9001332
- Aging of BINPs about 10 times faster!

Relative Decrease of QE at 400nm

- Slope for normalized QE
- Lifetime of PHOTONIS 10 μ m devices:
$$t_{9000897}/t_{9001223} = 460$$

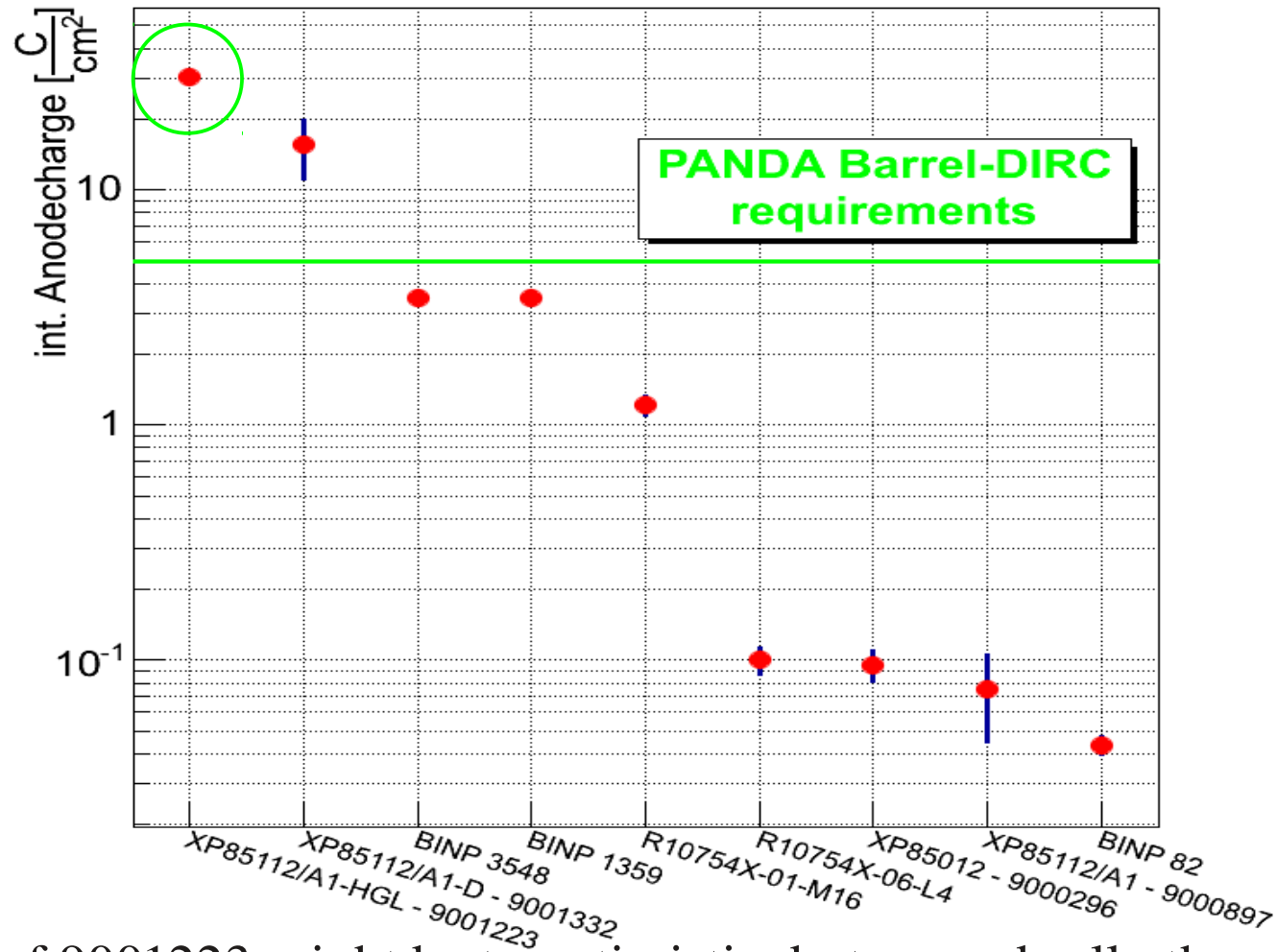
→ ALD impact!
- Lifetime of Russian devices increased by about 2 orders of magnitude
- Statistics for 9001332 not yet sufficient
- Higher polynomials needed for some devices (M16, 9000296)

Relative decrease of various MCPs



Lifetime

Lifetime - 80 % of original QE at 400nm



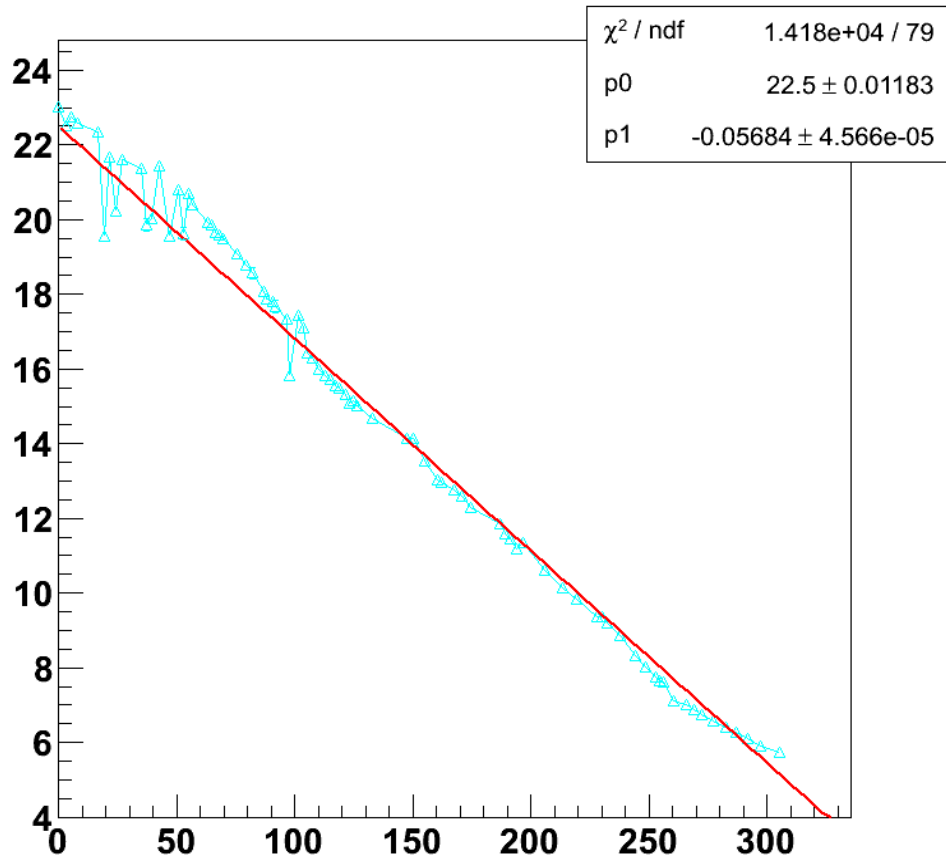
- Lifetime of 9001223 might be too optimistic, but exceeds all others → sufficient for PANDA Barrel-DIRC
- M16 and 9000296 are fitted with polynomial of 2. order

Summary and Outlook

- Lifetime measurements ongoing:
 - Photonis XP85112/A1-HGL - 9001223 has passed $\sim 4.3\text{C}/\text{cm}^2$, (~ 8.5 PANDA-Barrel-years!)
 - XP85112/A1-D - 9001332 has passed $\sim 700\text{mC}/\text{cm}^2$, (~ 1.5 PANDA-Barrel-years)
- Surface-Scans do not reveal any faster aging areas
- QE – degradation in illuminated and covered area of XP85112/A1-HGL – 9001223 equal → Hint for neutral gas aging?
- ALD has increased the lifetime of latest $10\mu\text{m}$ device by about a factor of 500!

Backup

Phot. XP85112/A1-9000897 (10 μm)



Phot. XP85112/A1-HGL-9001223 (10 μm)

