Update on lifetime measurements

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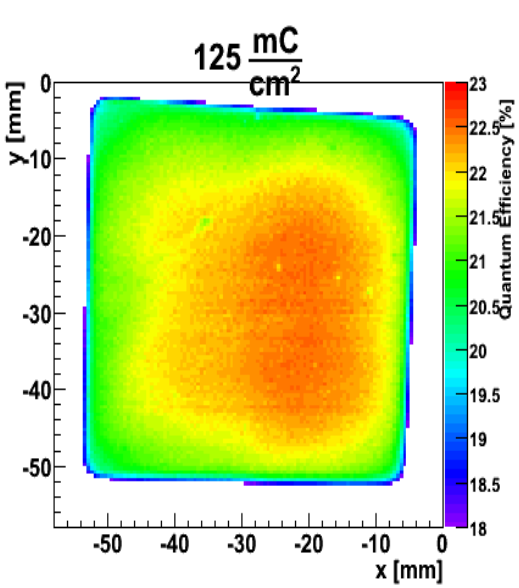
supported by BMBF and GSI

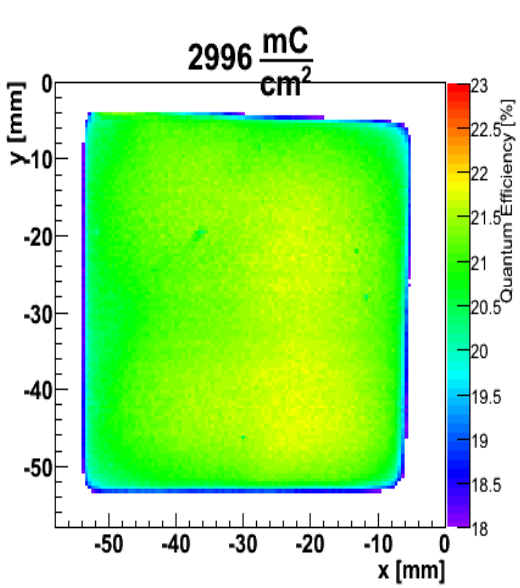
Overview

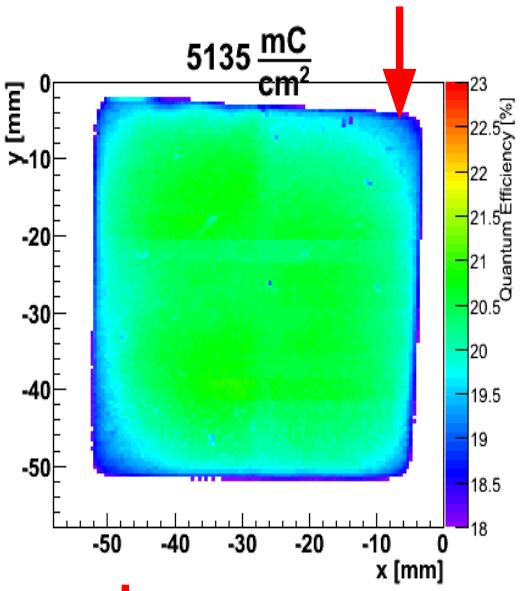
- Lifetime measurement of Hamamatsu R10754X-07-M16M KT0001 and KT0002 has started
- Recent results of the latest lifetime measurements:
  - QE surface scans:
    - PHOT. XP85112/A1-HGL 9001223 (long illuminated device)
    - PHOT. XP85112/A1-HGL 9001332
    - BINP 3548
    - Hamamatsu R10754X-07-M16M KT0001/KT0002
  - Gain/QE/DC
- Summary and outlook

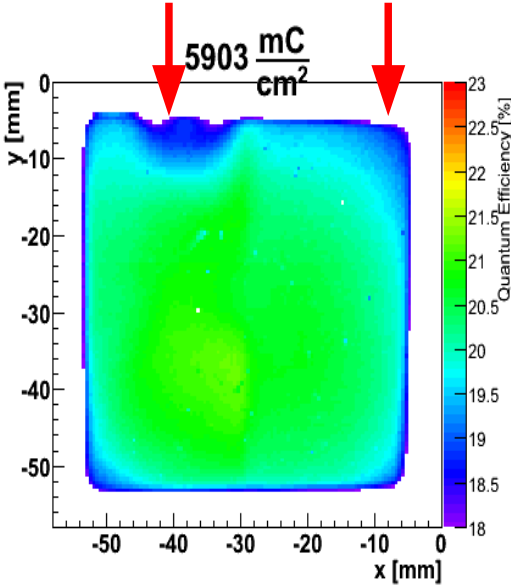
QE surface scans

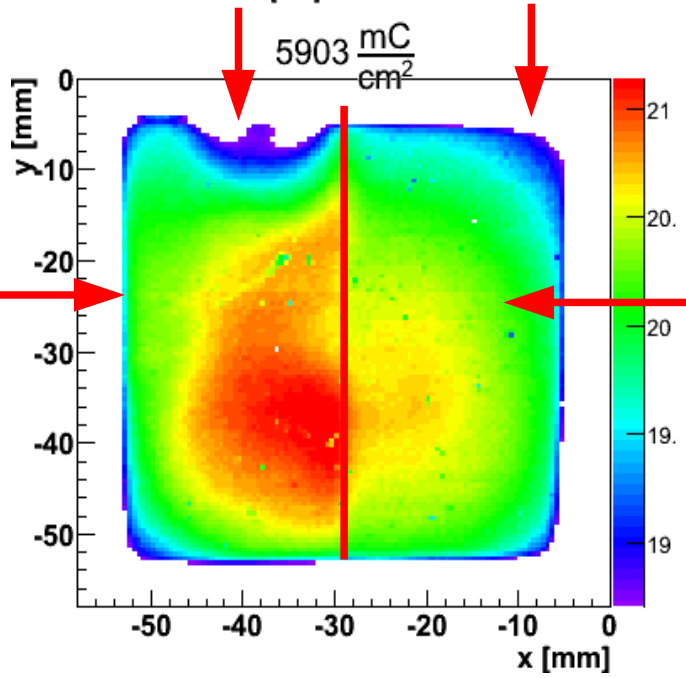
PHOTONIS XP85112/A1-HGL 9001223







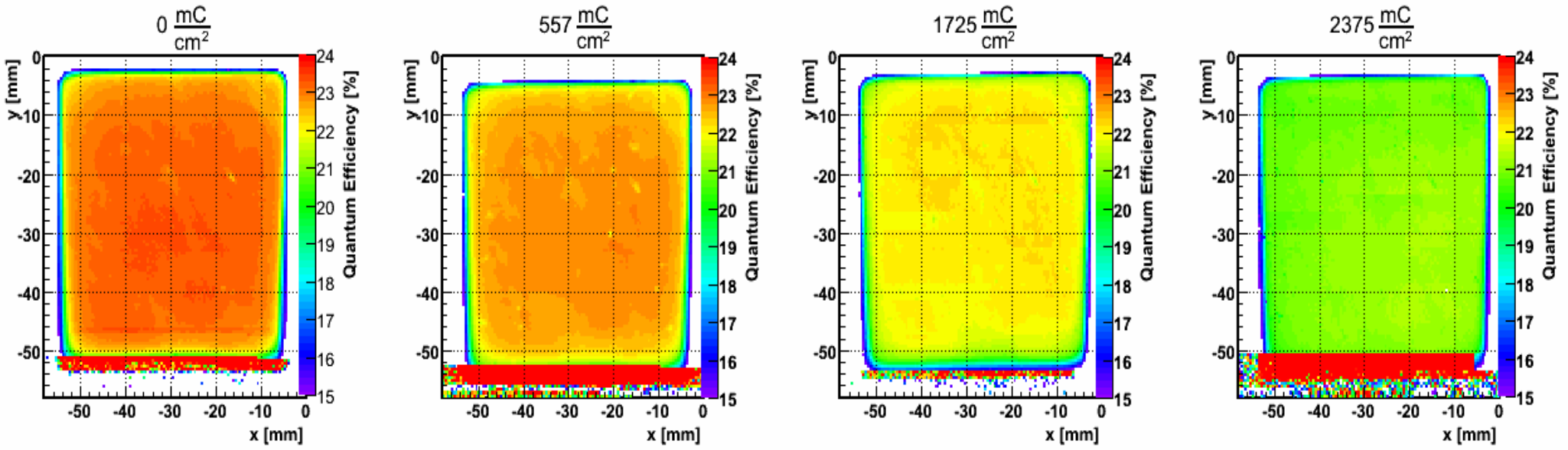




Illuminated

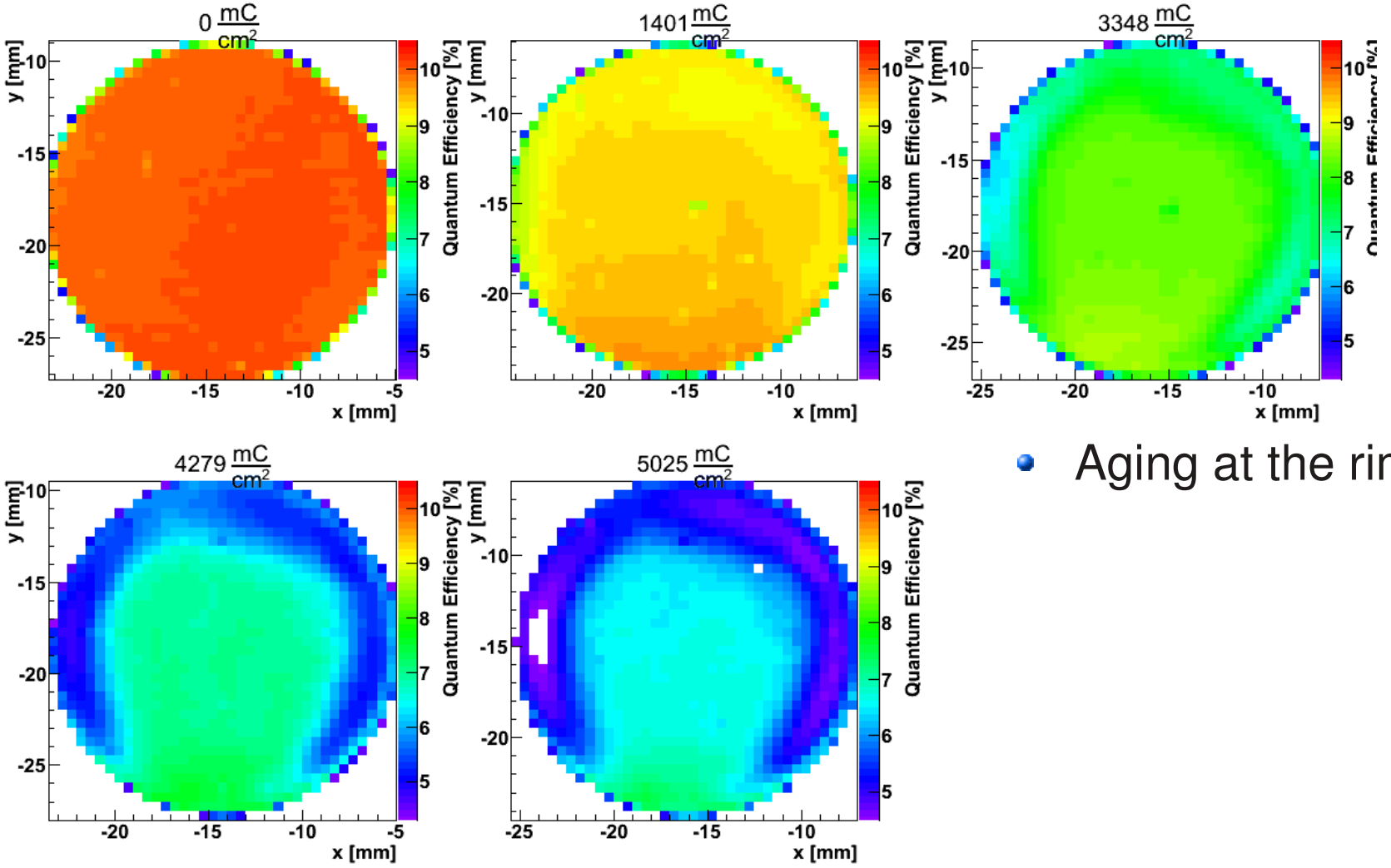
covered

QE surface scans
PHOTONIS XP85112/A1-D 9001332



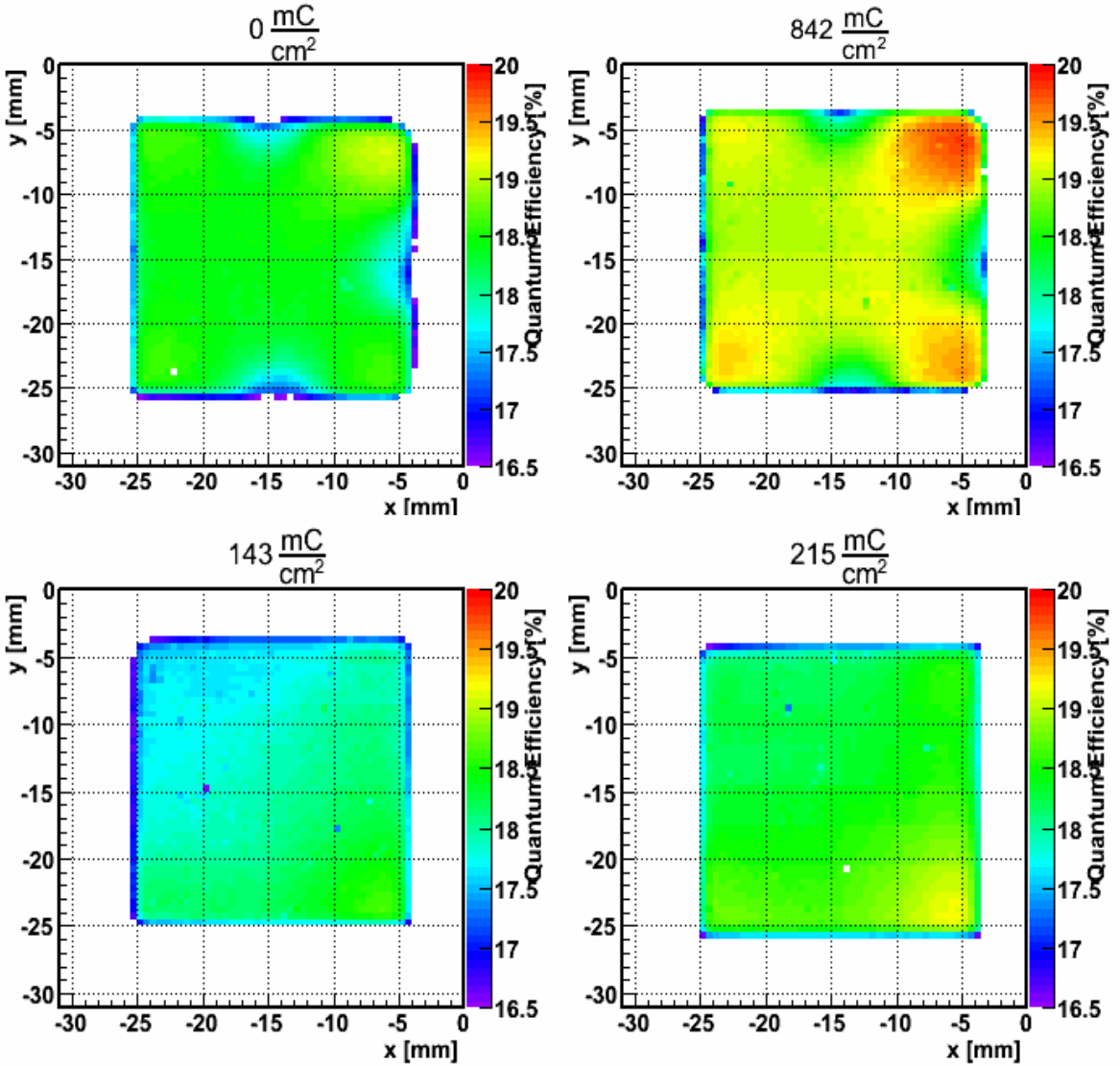
- No deviation along surface visible
- Drop of total value might be an artefact due to saturation effects

QE surface scans
BINP #3548



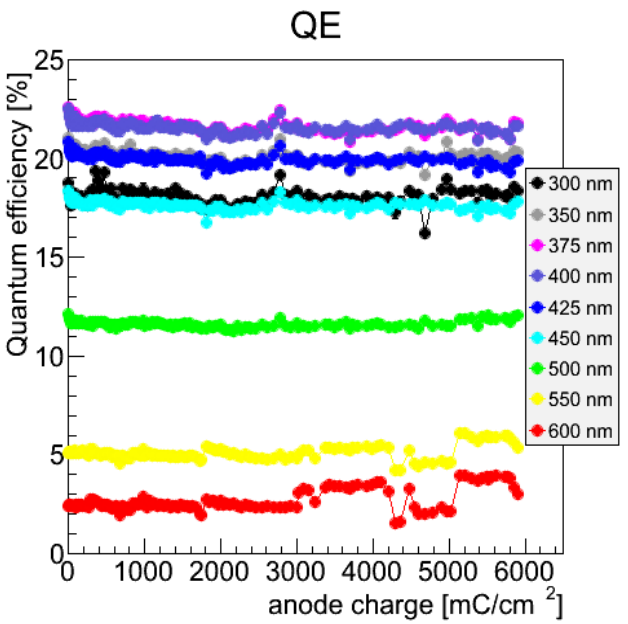
- Aging at the rim continues

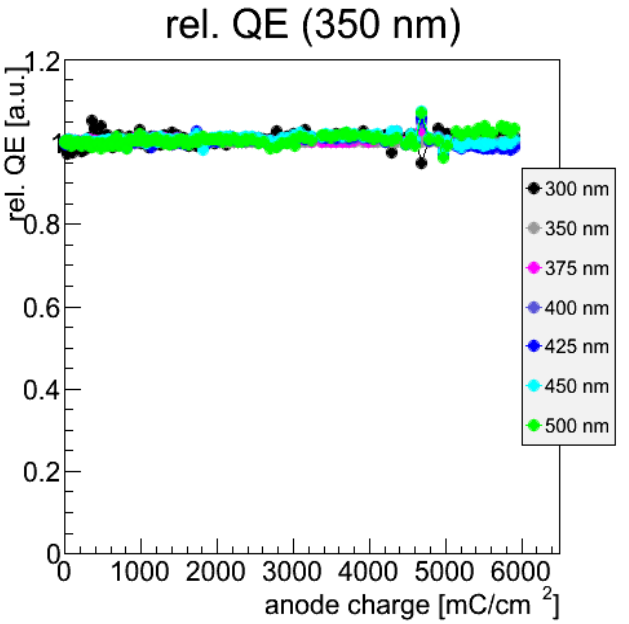
QE surface scans
Hamamatsu R10754X-07-M16/M

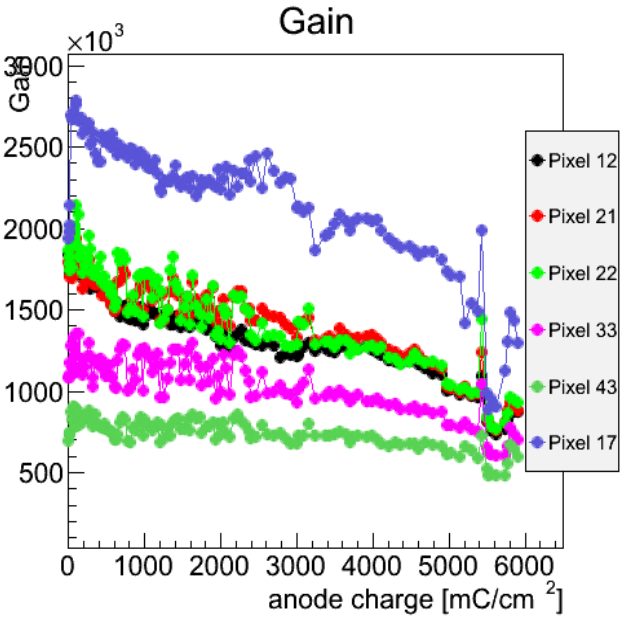


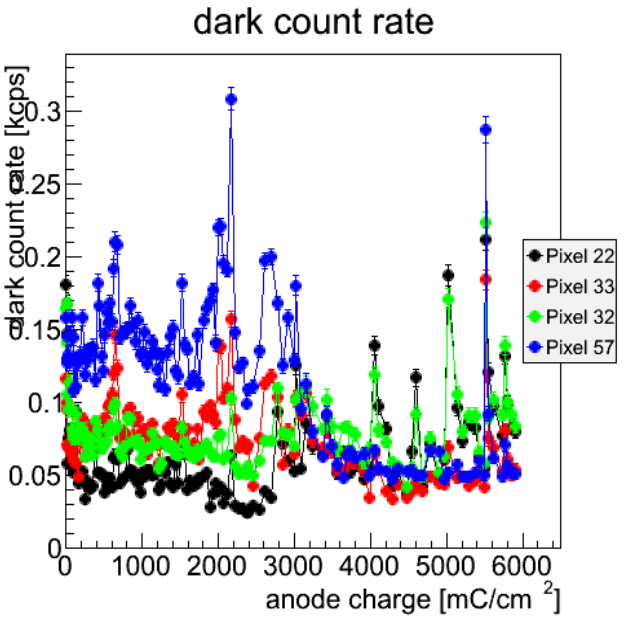
- KT0001
- Higher QE at the corner
  → indication for better ”corner” protection?
- KT002

PHOTONIS XP85112/A1-HGL 9001223

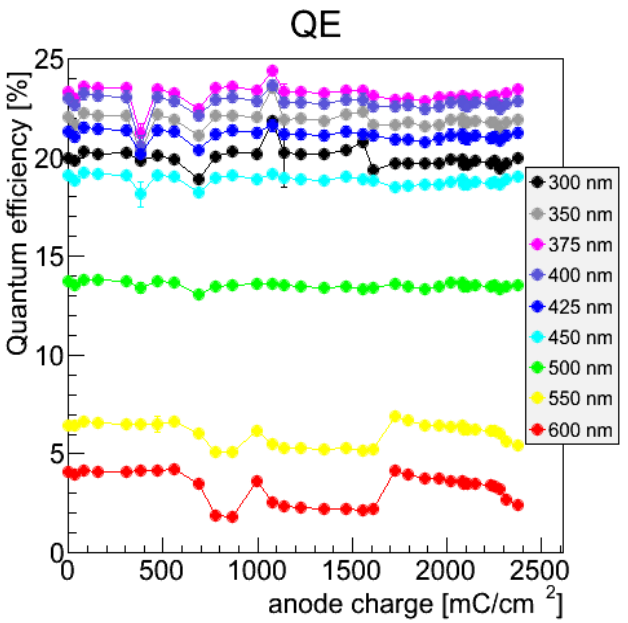


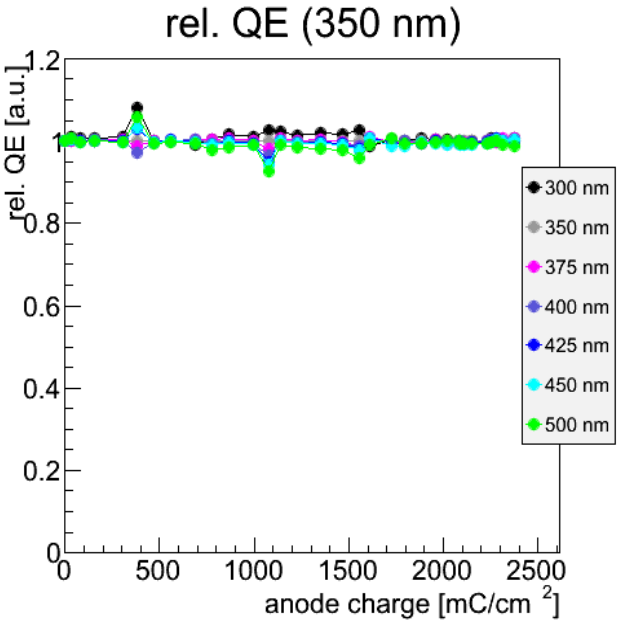


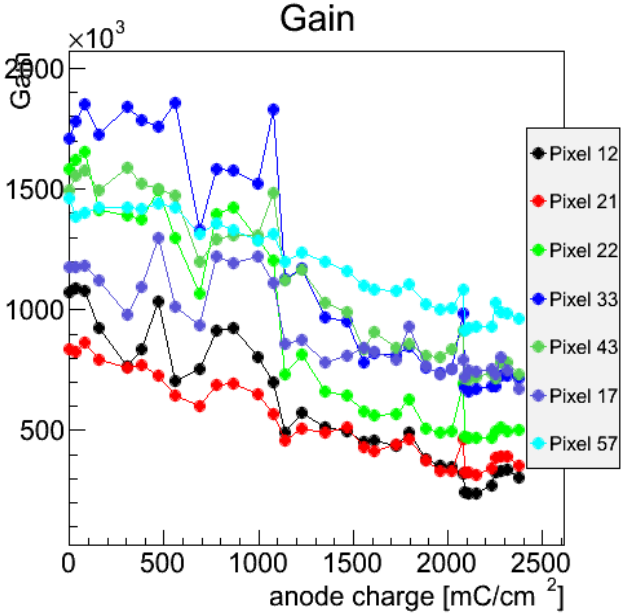


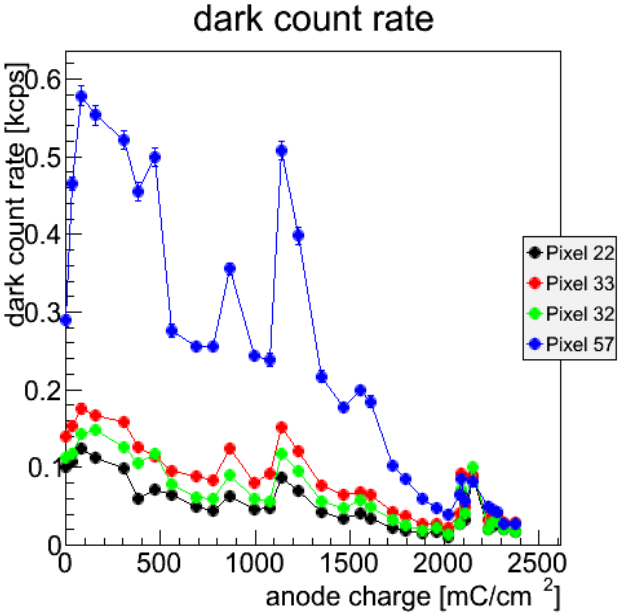


PHOTONIS XP85112/A1-D 9001332

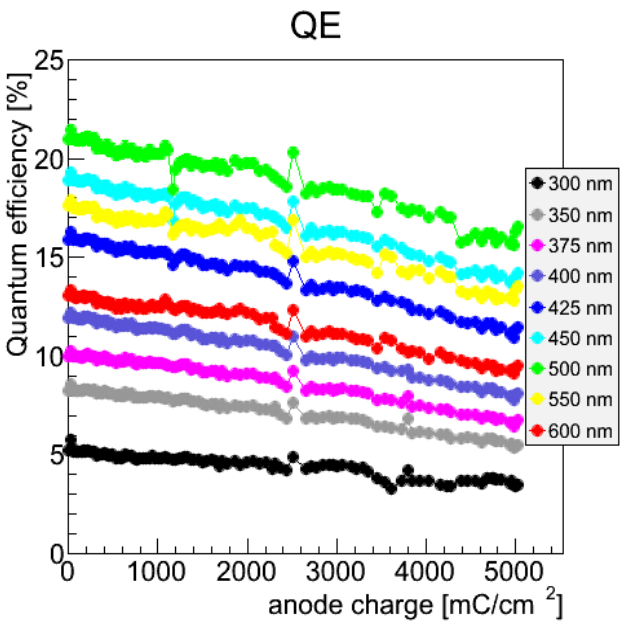


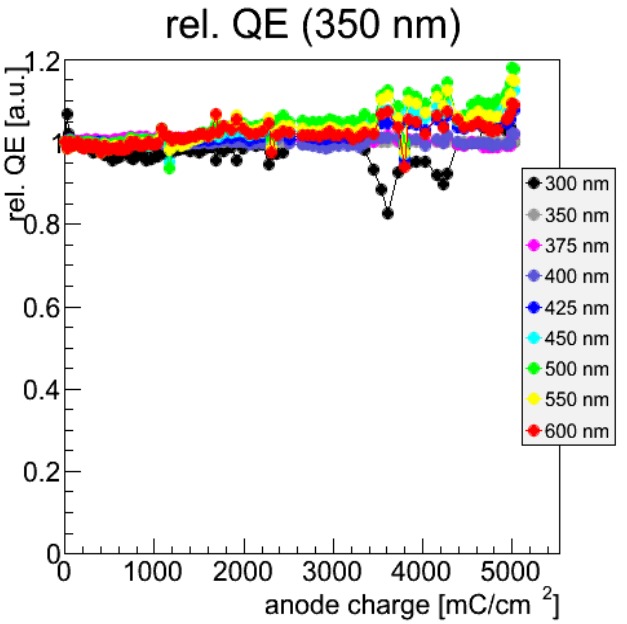


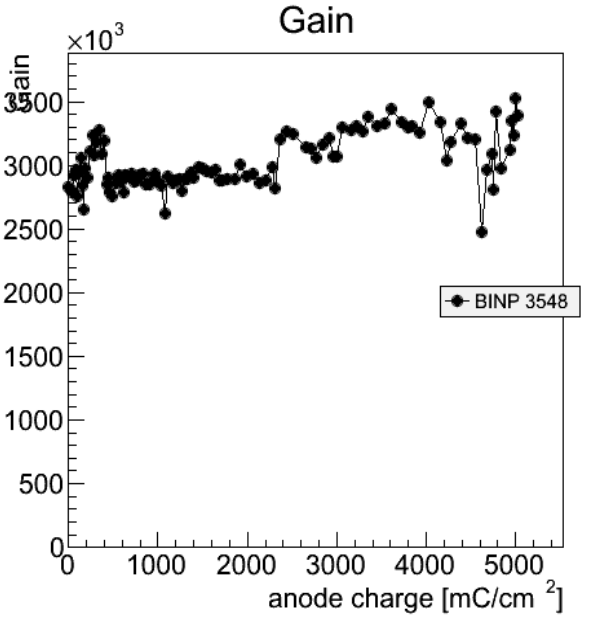


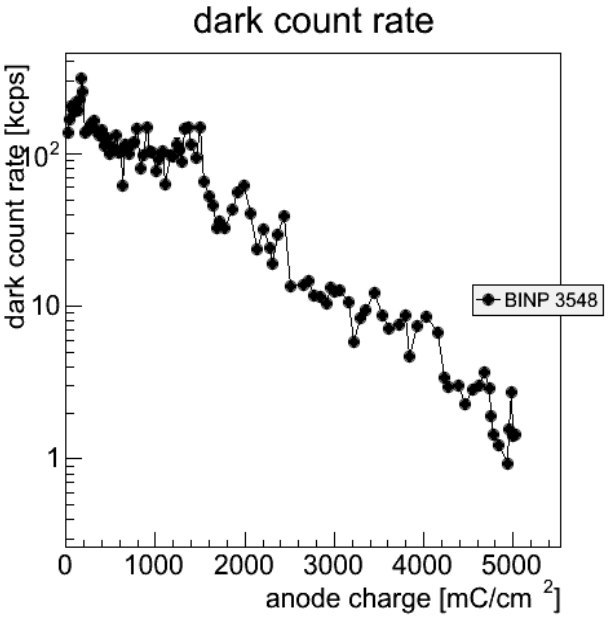


BINP 3548

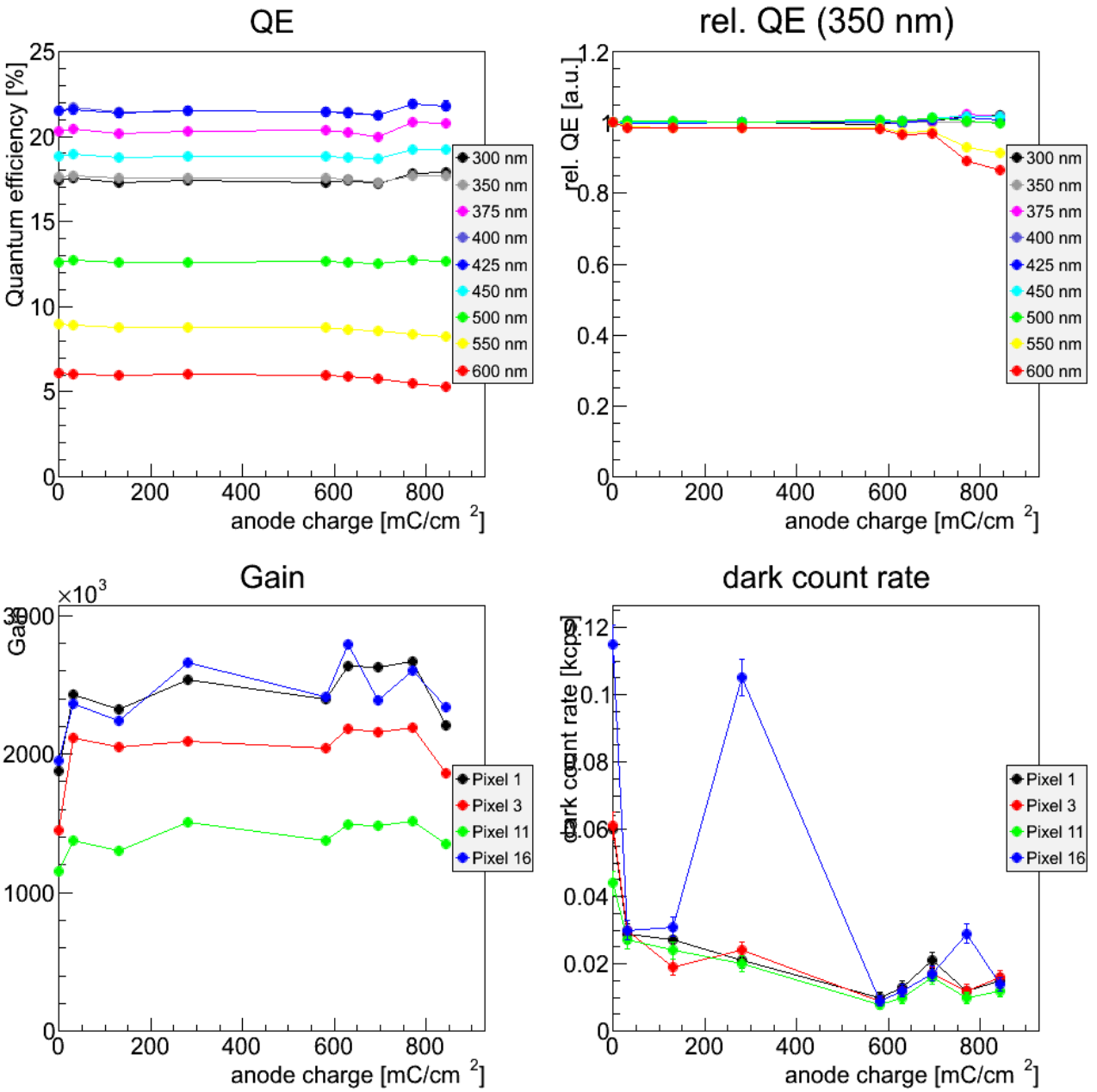

QE
Quantum efficiency [%]
anode charge [mC/cm 2]
300 nm
350 nm
375 nm
400 nm
425 nm
450 nm
500 nm
550 nm
600 nm


rel. QE (350 nm)
rel. QE [a.u.]
anode charge [mC/cm 2]
300 nm
350 nm
375 nm
400 nm
425 nm
450 nm
500 nm
550 nm
600 nm

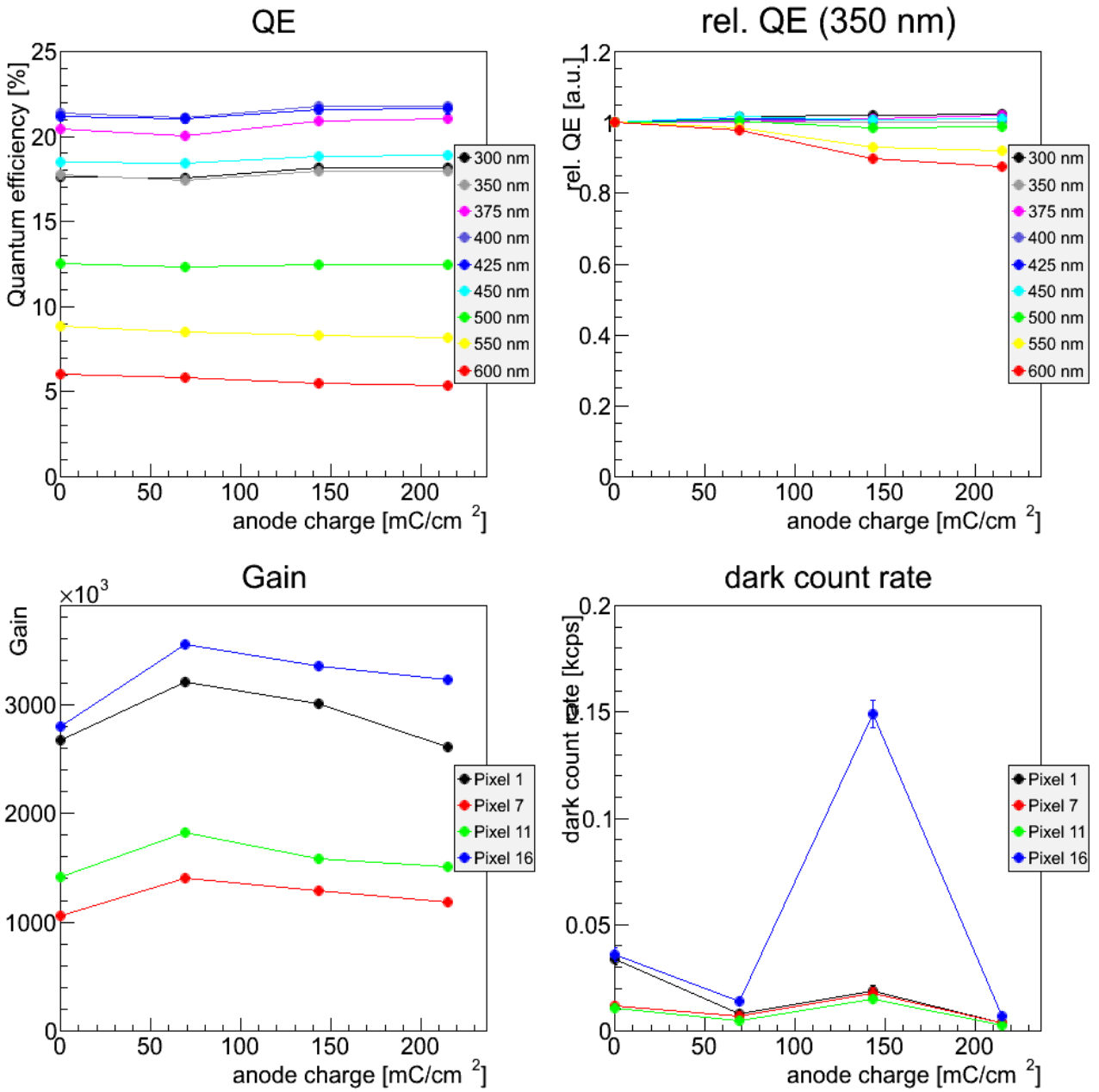

Gain
×10 3
Gain
anode charge [mC/cm 2]
BINP 3548


dark count rate
dark count rate [kcps]
anode charge [mC/cm 2]
BINP 3548

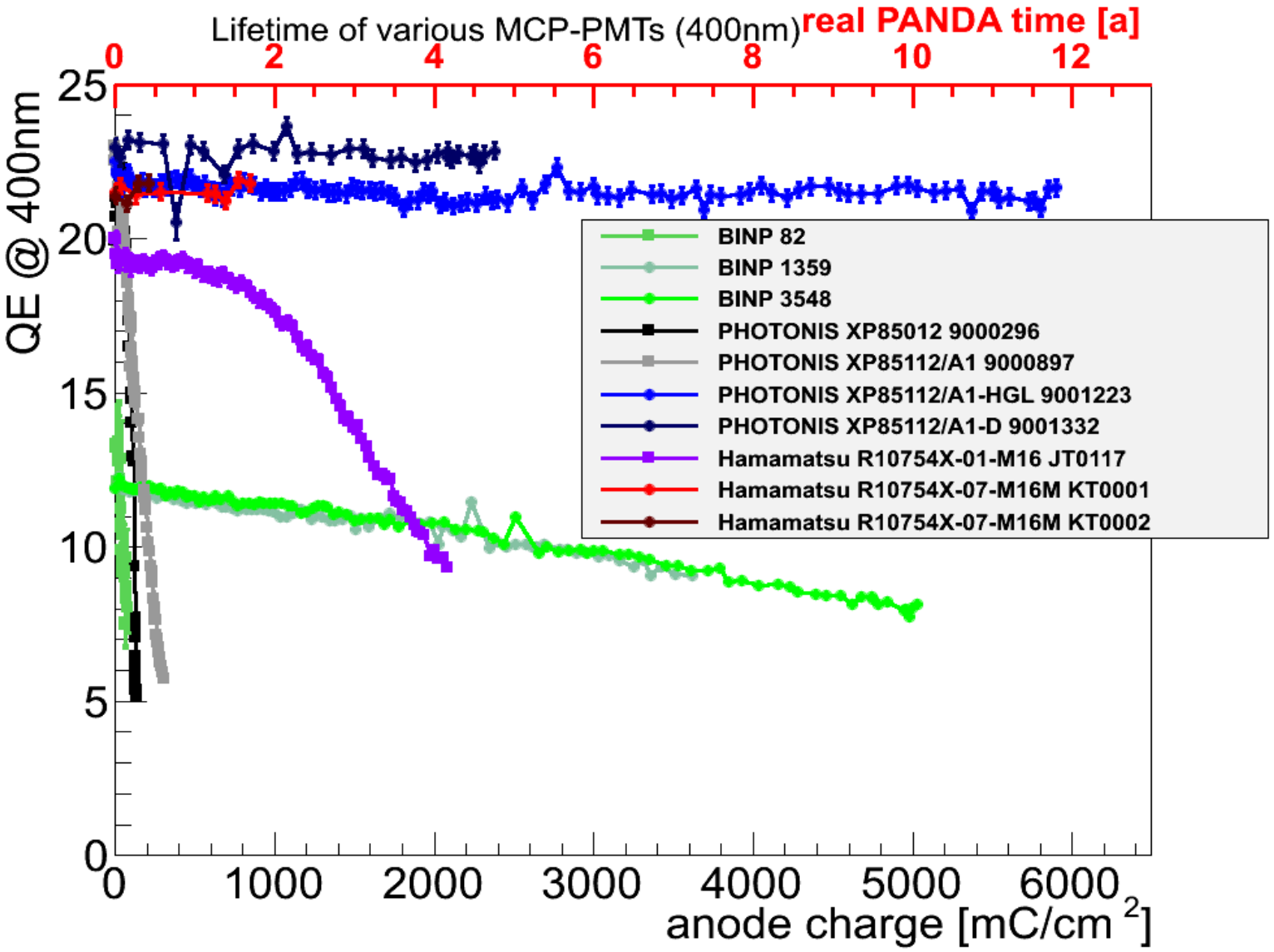
Ham. R10754X-07-M16M - KT0001



Ham. R10754X-07-M16M - KT0002



Lifetime


Lifetime of various MCP-PMTs (400nm)
real PANDA time [a]
0
2
4
6
8
10
12
QE @ 400nm
25
20
15
10
5
0
0
1000
2000
3000
4000
5000
6000
anode charge [mC/cm 2]
BINP 82
BINP 1359
BINP 3548
PHOTONIS XP85012 9000296
PHOTONIS XP85112/A1 9000897
PHOTONIS XP85112/A1-HGL 9001223
PHOTONIS XP85112/A1-D 9001332
Hamamatsu R10754X-01-M16 JT0117
Hamamatsu R10754X-07-M16M KT0001
Hamamatsu R10754X-07-M16M KT0002

Summary and Outlook

- Lifetime measurements ongoing:
  - 9001223 passed **~5.9C/cm²** (~ 11.8 PANDA-Barrel-years!):
    - **First sensor fulfilling Barrel-DIRC requirements!**
    - Aging has recently started
  - 9001332 passed **~2.4 C/cm²** (~ 4.8 a) → no aging
  - QE of BINP 3548 still decreases faster at the rim
    → QE ~65% of starting value (5C/cm²)
- Illumination of Hamamatsu R10754X-07-M16M KT0001 (0.84C/cm²) and KT0002 (0.22C/cm²) has started → more data/time needed
- **New PHOTONIS sensors arrived:**
  - ”Unfired”: functionalized using thin films on unfired lead silicate substrates (MCP glass)
  - Standard MCP → will be exchanged with borosilicate MCP