

# Update on Lifetime Measurement

ERLANGEN CENTRE  
FOR ASTROPARTICLE  
PHYSICS

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## Outline

- Picoamp for lifetime measurement improvement
- Properties of Hamamatsu JS0035 (2 inch 8x8 Pixel)
- Results of latest measurements

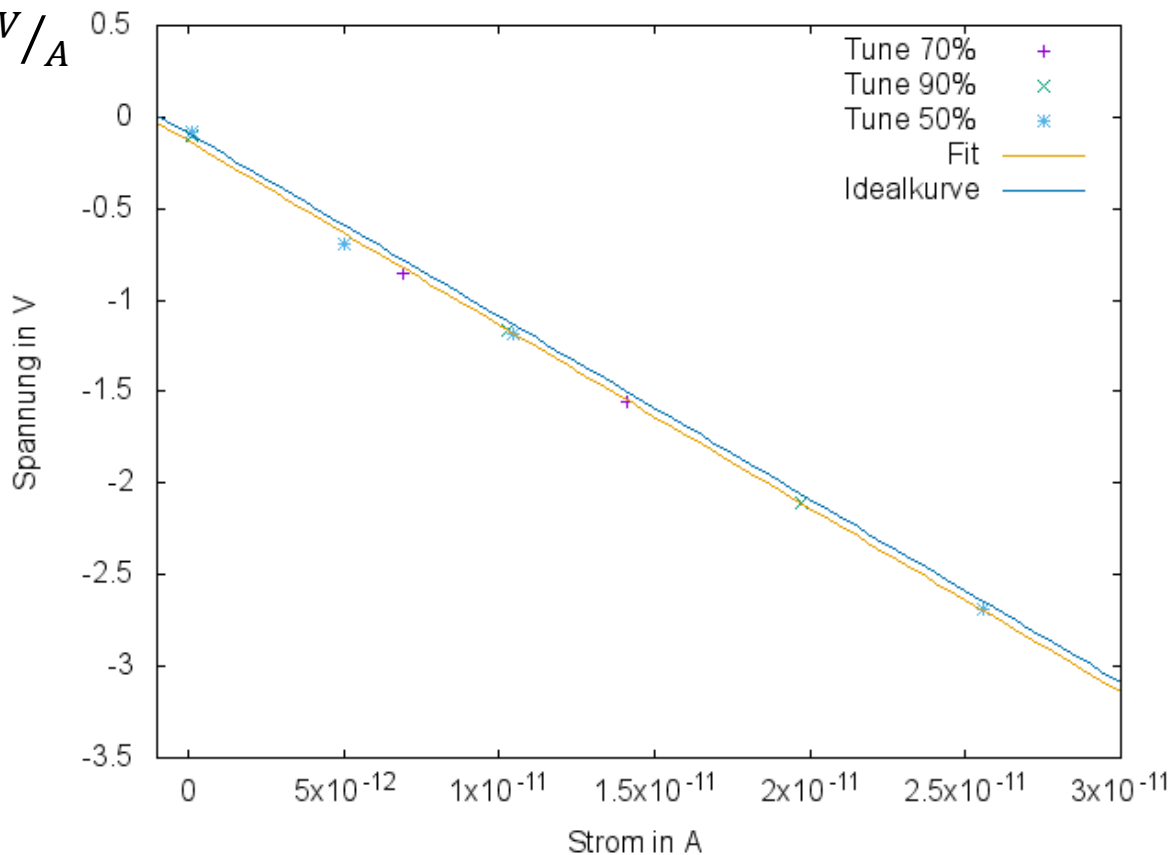
# Picoamp for lifetime measurement improvement





## Calibration of picoamp

- Adjustable range  
 $10^9 V/A$ ,  $10^{10} V/A$ ,  $10^{11} V/A$
- Calibrated with PiLas laser and photodiode
- Example measured at  $10^{11} V/A$
- Problem:
  - only up to 15V output voltage

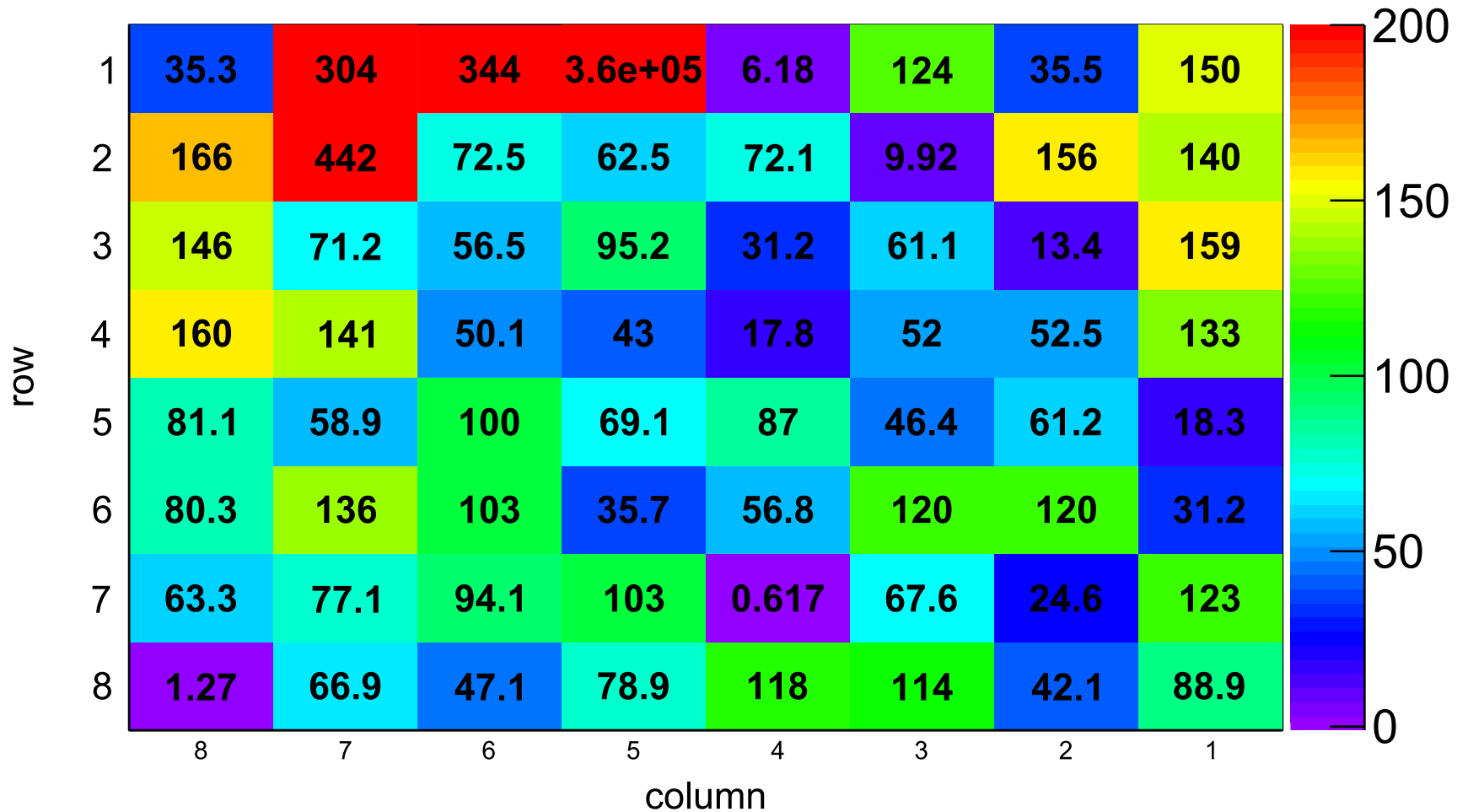


## Further improvements

- High dark currents on photocathode  $\sim 5$  nA
  - Need offset correction to stay in range
- Adjustable offset up to 1.2 nA (can be increased)
- New calibration and further investigation will be done

# Properties of Hamamatsu JS0035 (2 inch 8x8 Pixel)

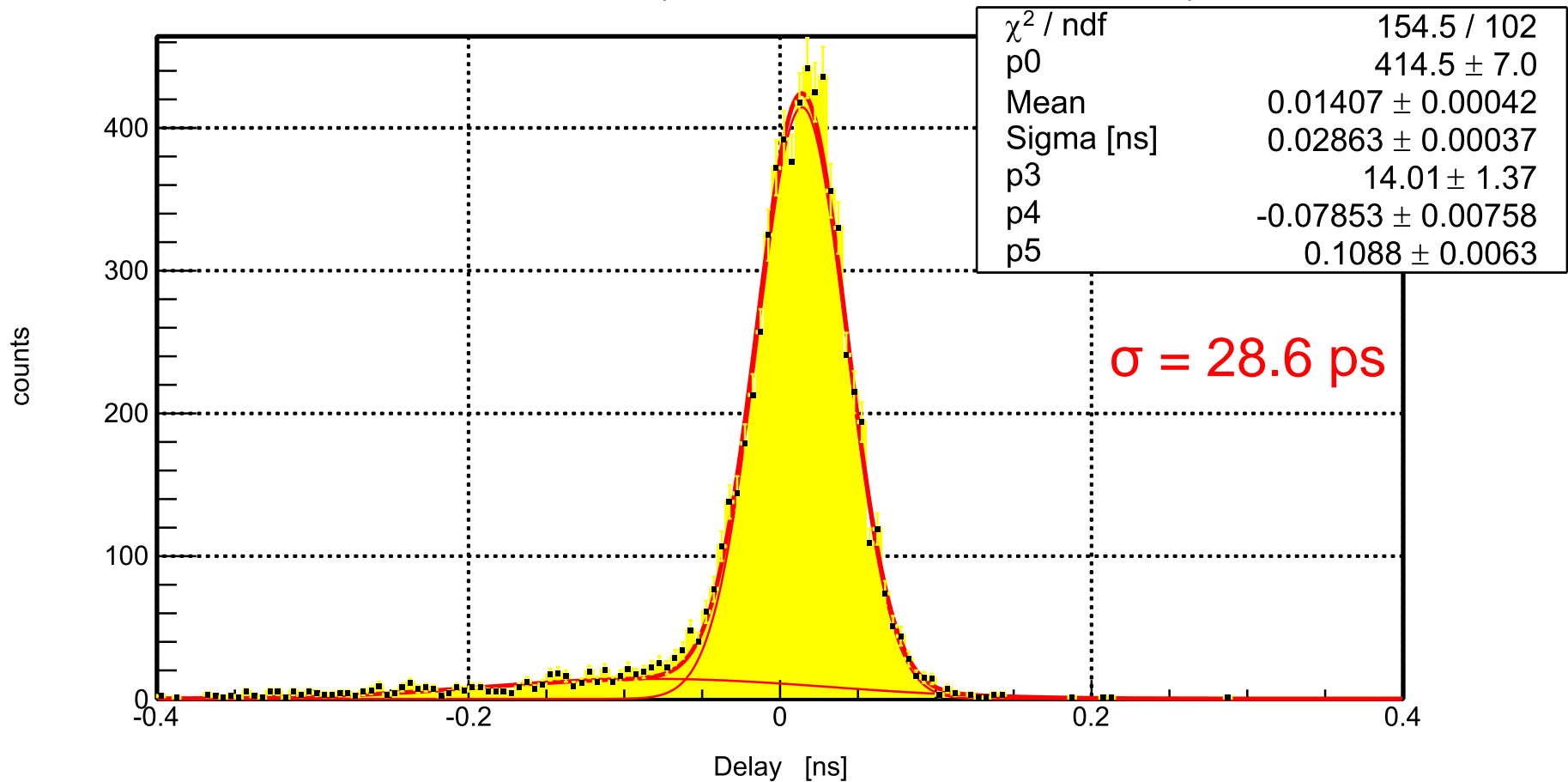
## Dark count at 2.9 kV [Hz]



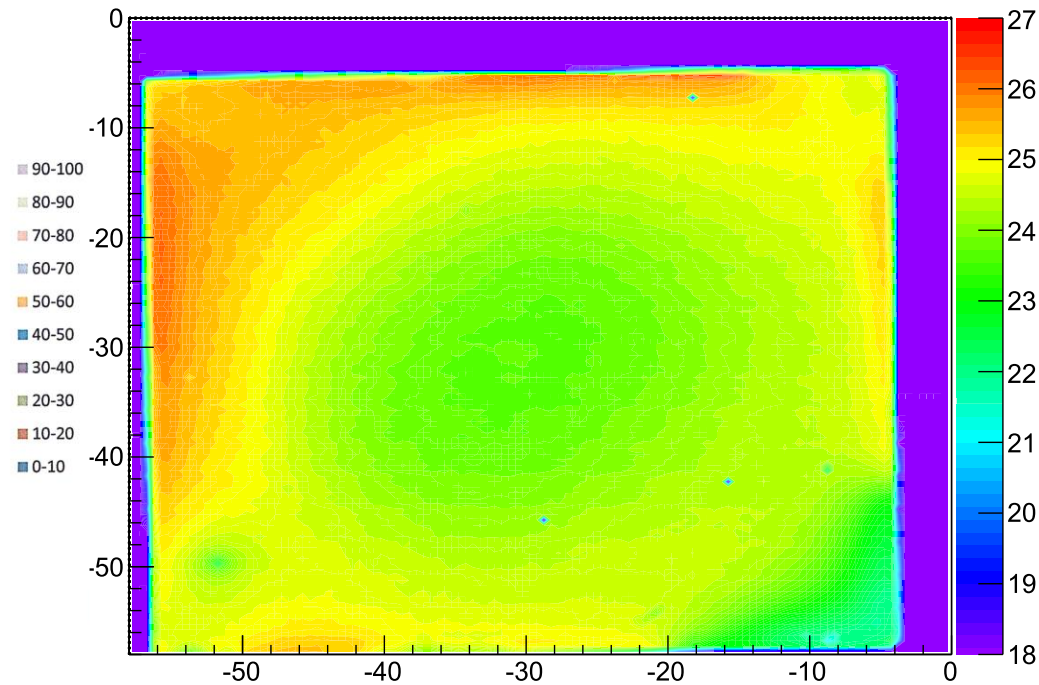
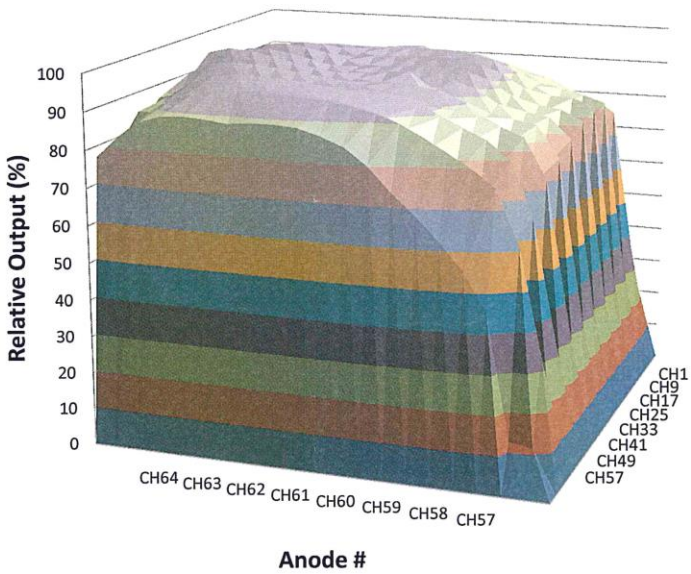


# Timeres 2.879 kV 200 mV threshold Pixel 19 (20x20 amp.)

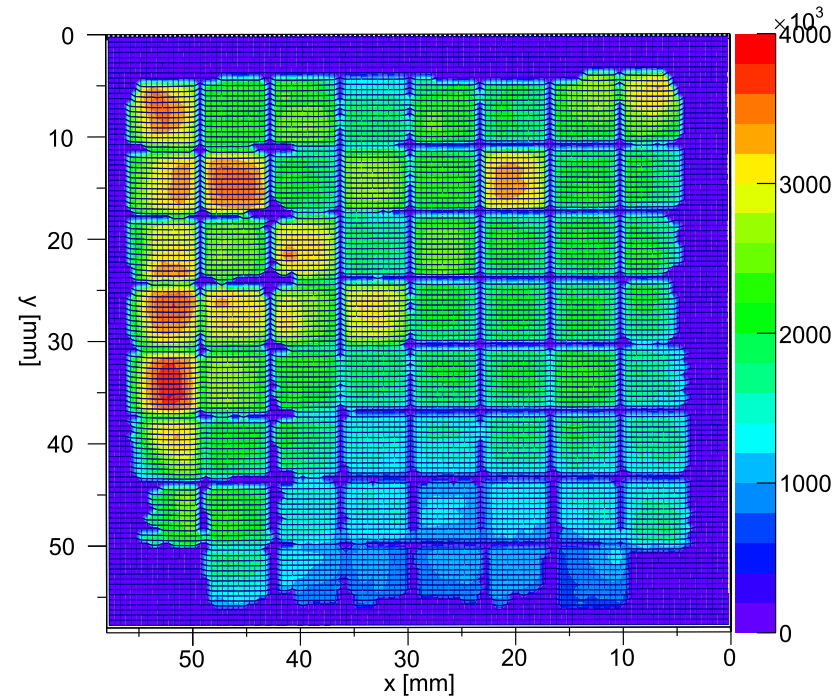
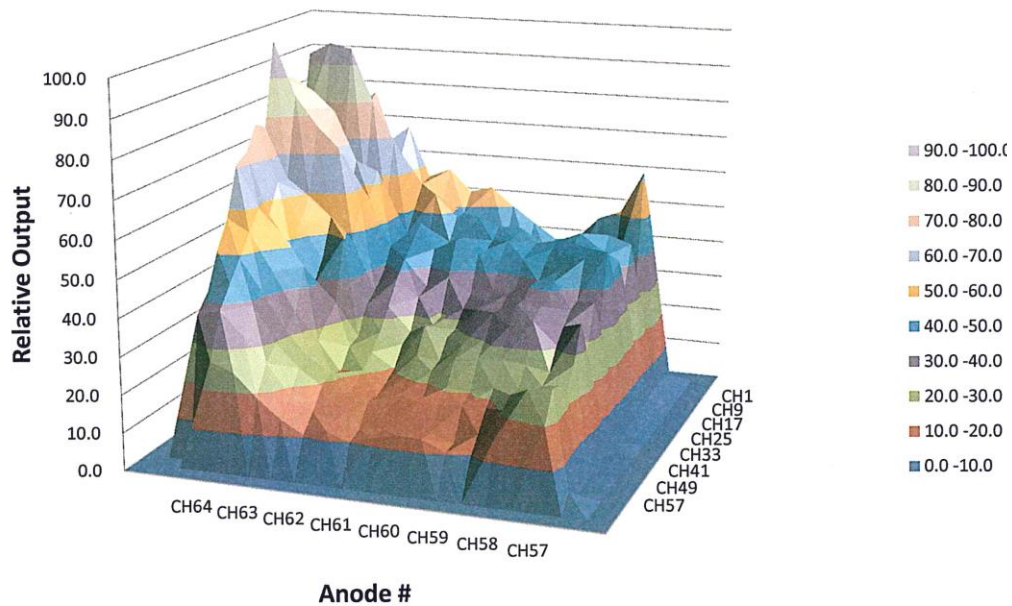
Time Resolution ( $Q > -0.34$  pC &  $Q < -0.15$  pC)



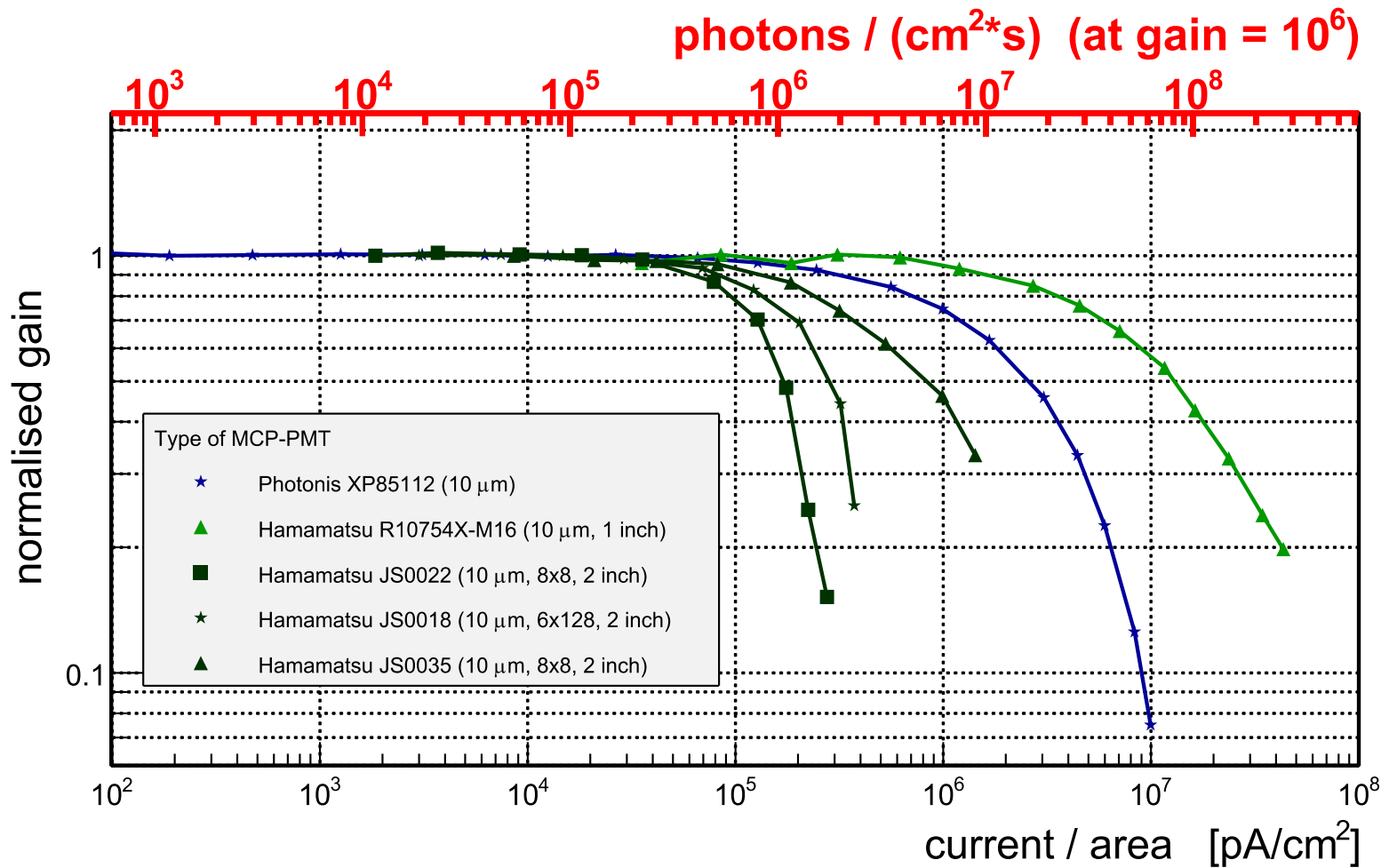
# QE scan of JS0035



# Gainscan JS0035 (2.9 kV, ND 4.0, 5 kHz)



# Rate stability



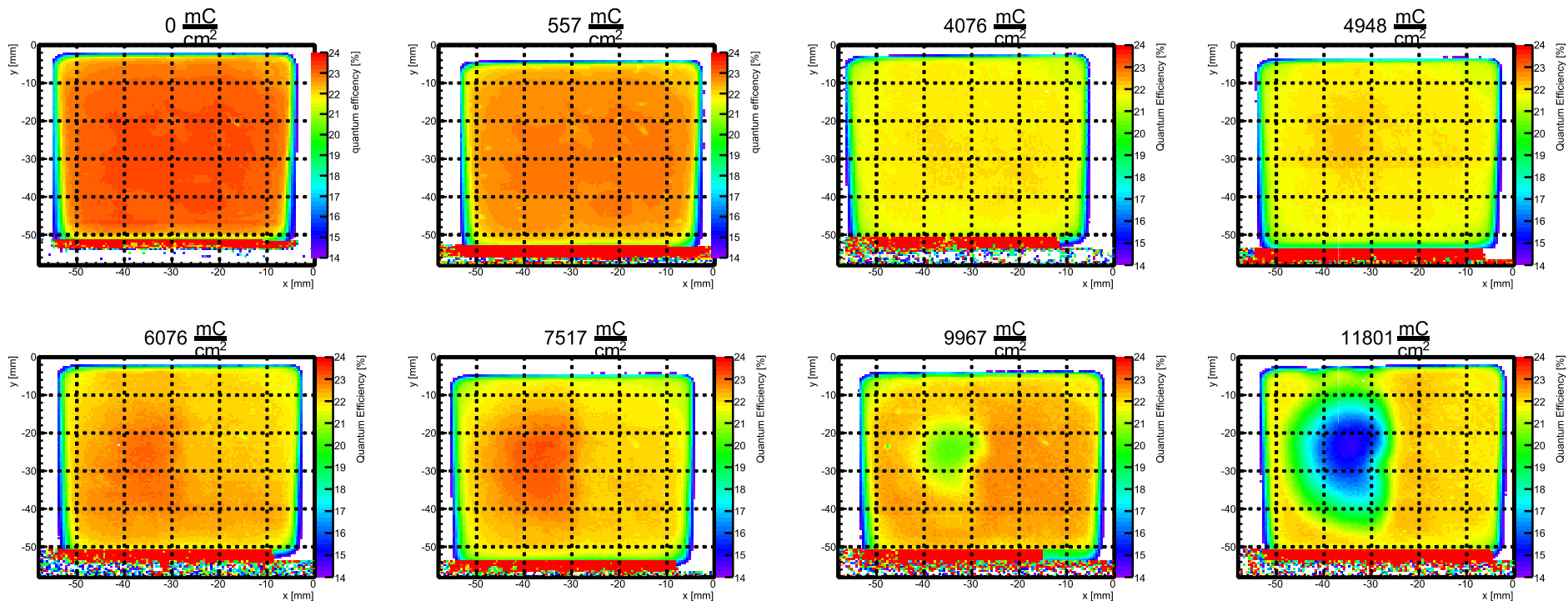
# Results of latest measurements

# Illumination Overview QE (all sensors with ALD)

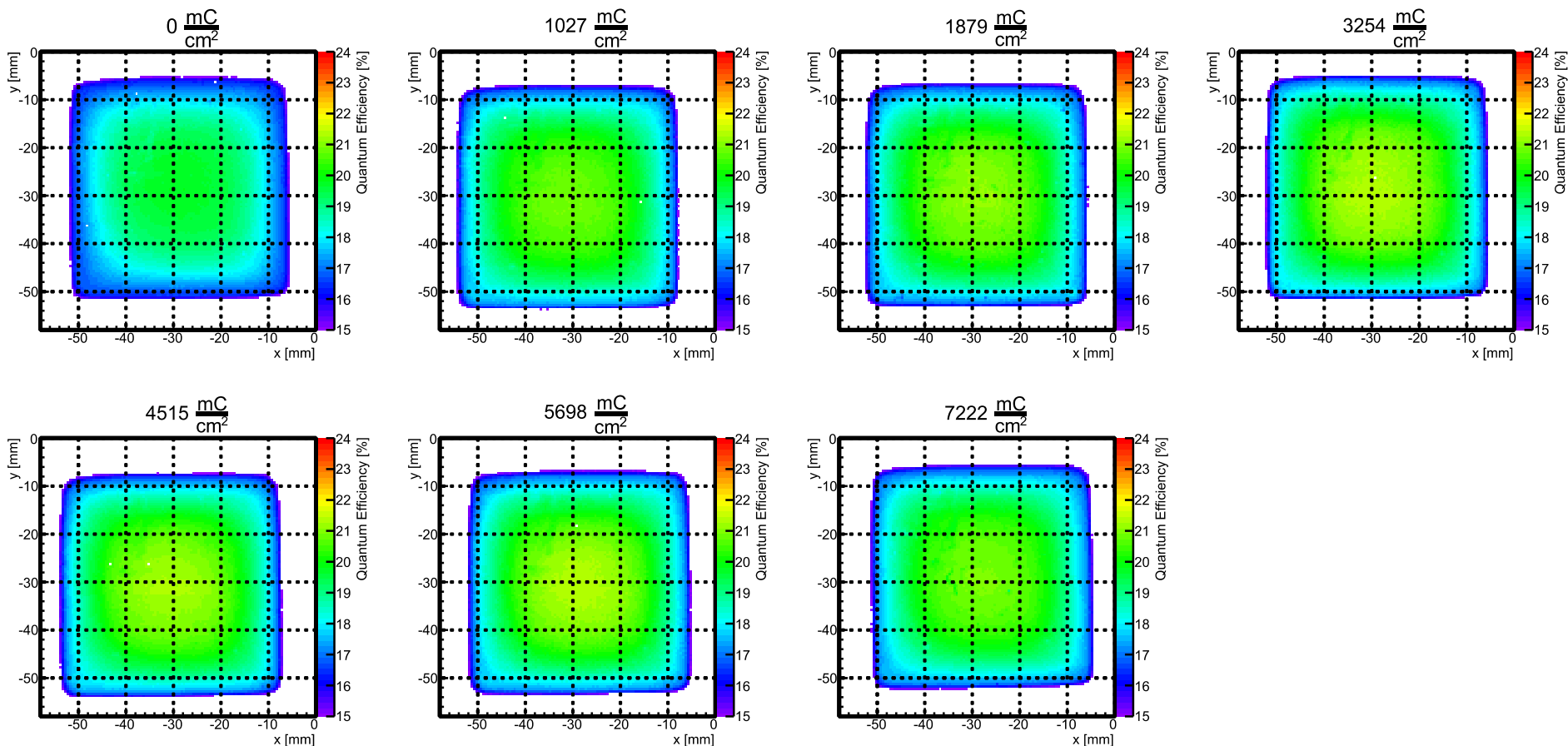
Film between MCP    Two ALD layers

	Manufacturer	Sensor ID	Integral Charge [mC/cm <sup>2</sup> ]	QE start [%]	QE latest [%]	QE latest/QE start [%]
2 inch	Photonis XP85112	9001223	9234	22.1	5.3	24
		9001332	12128	23.0	17.8	77
		9001393	7700	19.1	19.3	101
1 inch	Hamamatsu R10754X	KT0001 (M16M)	12486	21.7	12.3	57
		KT0002 (M16M)	8097	21.1	13.0	62
2 inch	Hamamatsu R13266-07-M64	JS0022 (64 pix.)	650	17.4	17.1	98

# QE scan of Photonis 9001332 (ALD)

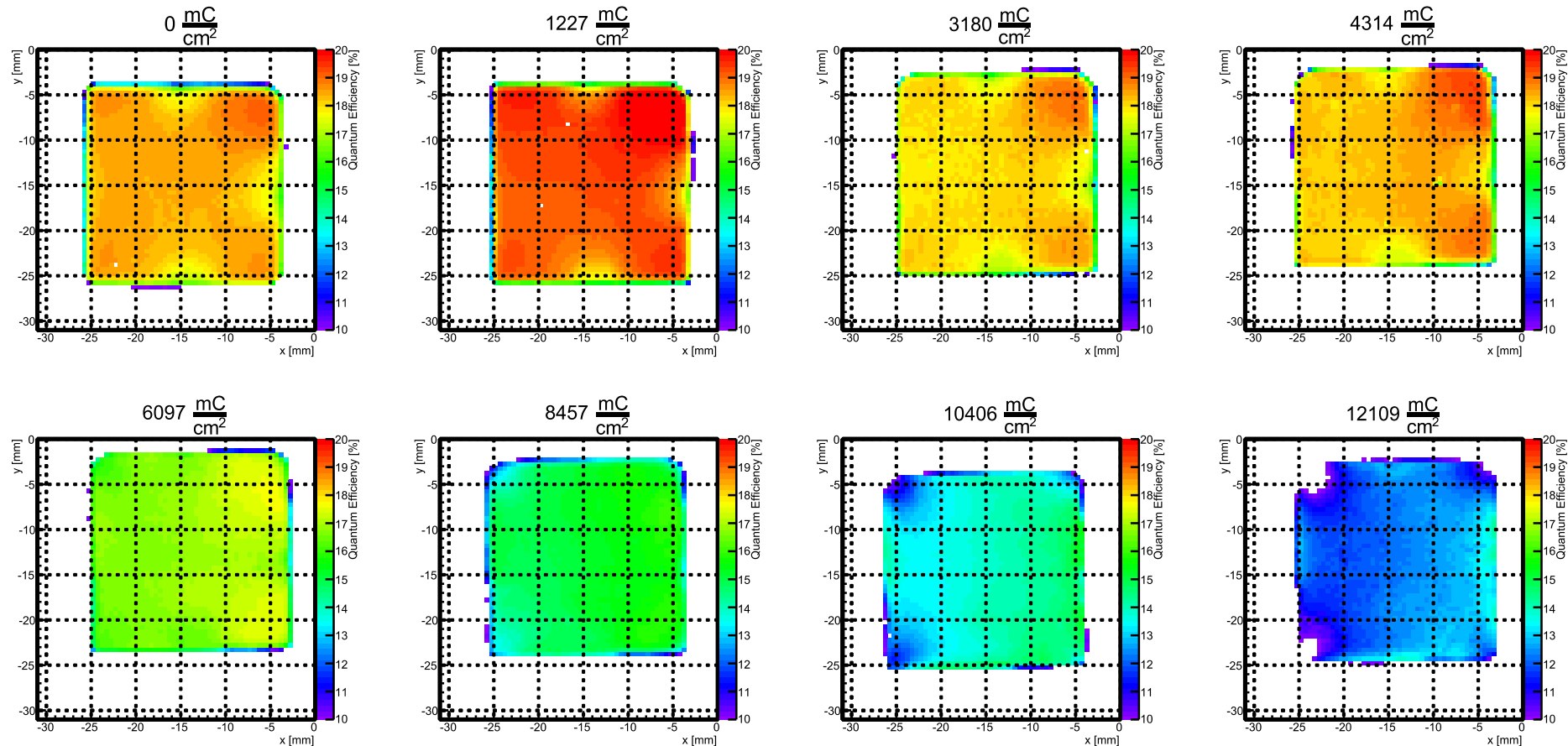


# QE scan of Photonis 9001393-URD (ALD)

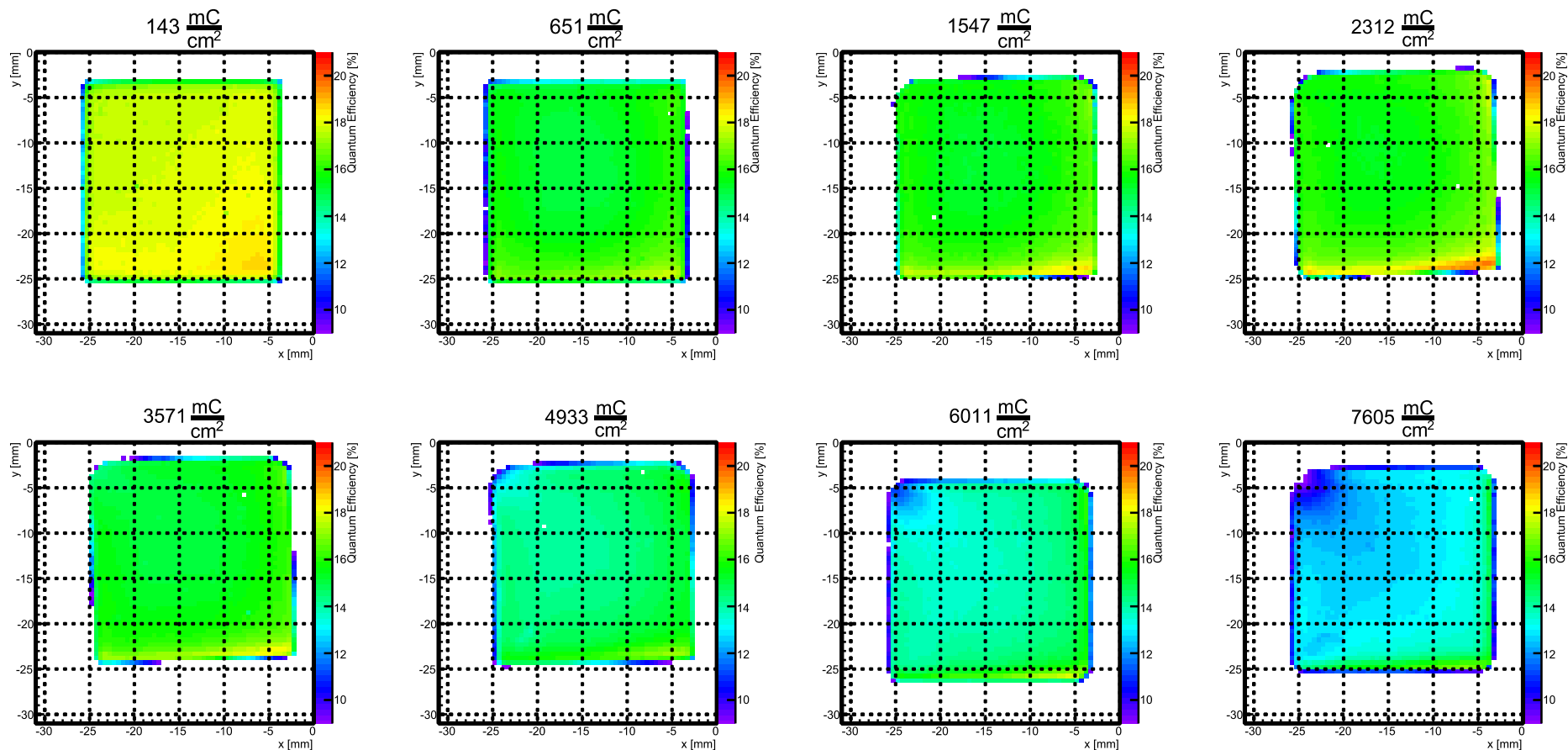




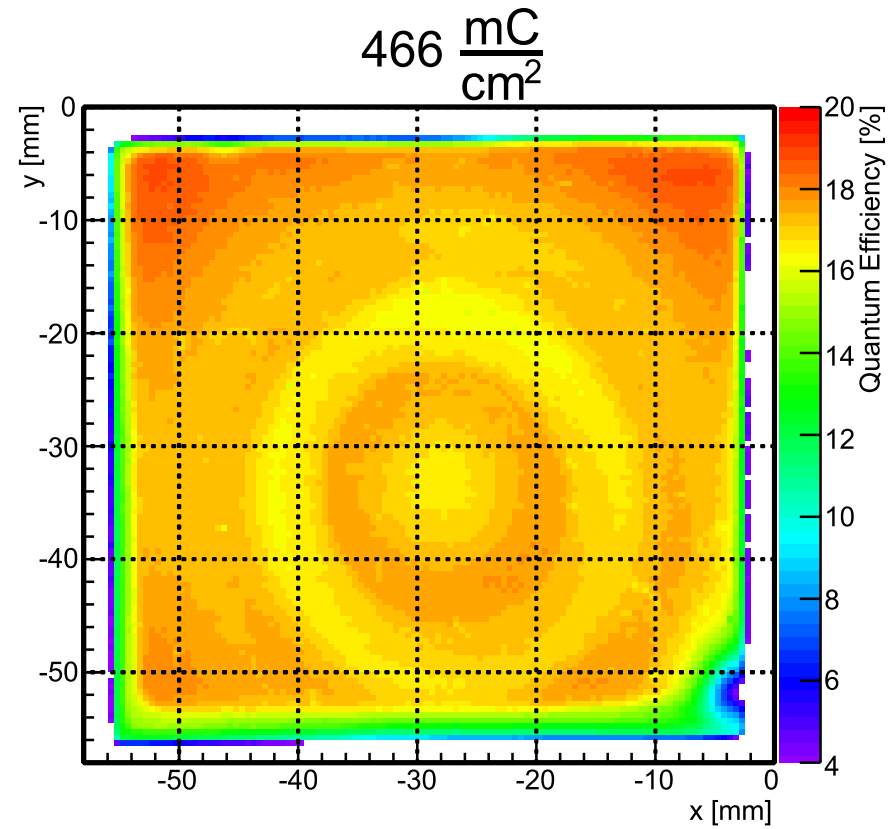
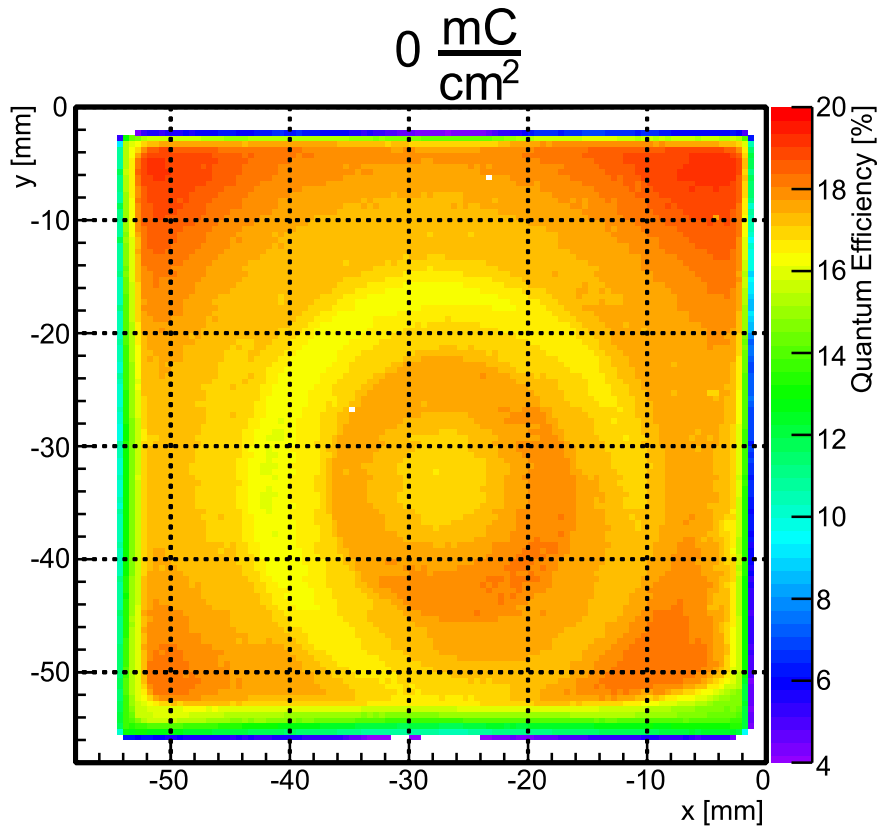
# QE scan of Hamamatsu KT0001 (ALD)



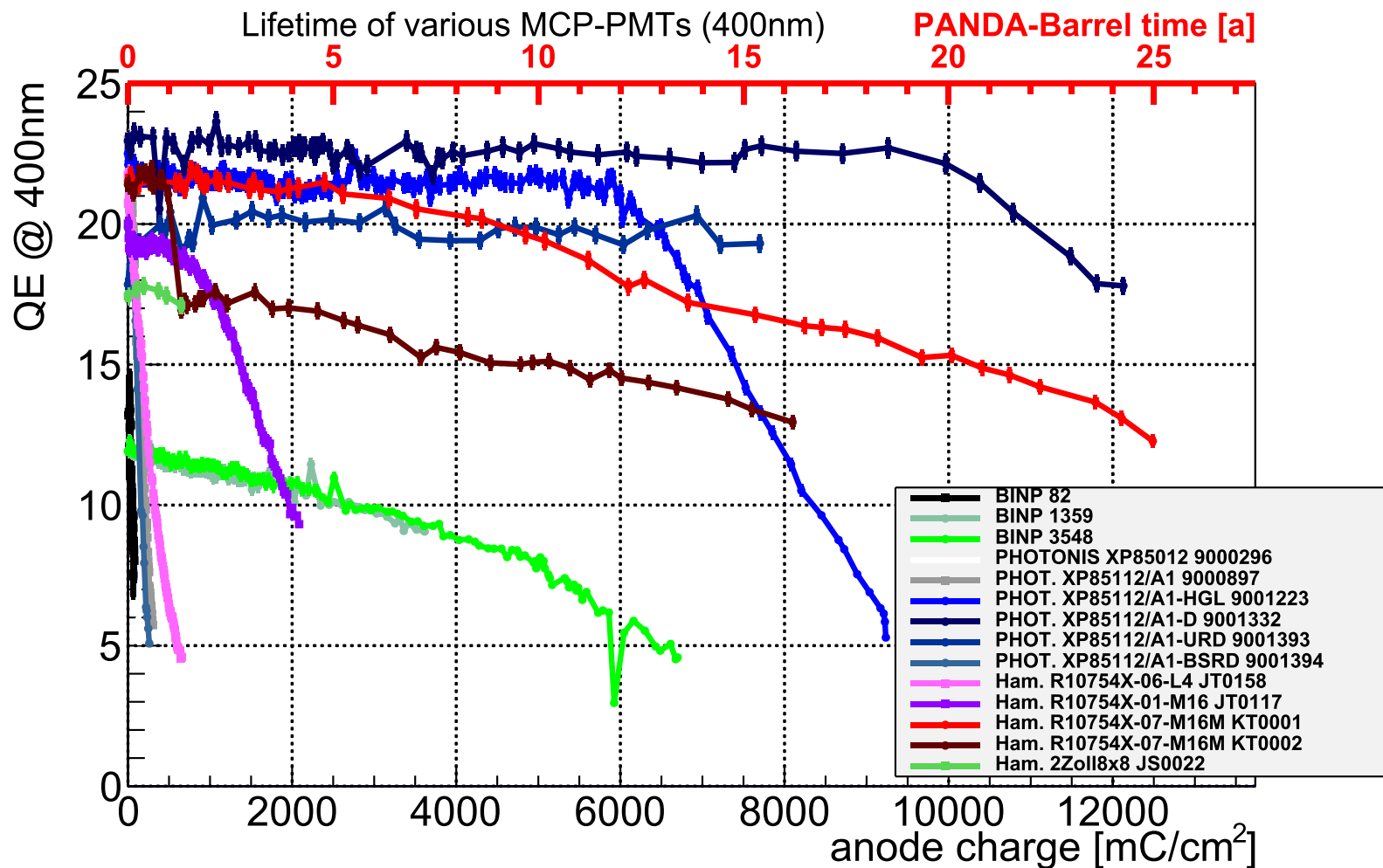
# QE scan of Hamamatsu KT0002 (ALD)



## QE scan of Hamamatsu JS0022 (8x8, ALD)



# Lifetime of MCP-PMTs (May 2016)



## Summary and outlook

- New JS0035 better than JS0022
- JS0022 seems to have Problems in one corner
- Integration of new Hamamatsu sensors in Lifetime measurement
- Measurements in magnetic field
- Further testing of Picoamp

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# Thank you for your attention!

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# Backup



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# Picoamp

