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PHILIPS

Fully Organic Integrated Arrays on Flexible Substrates for X-Ray Imaging

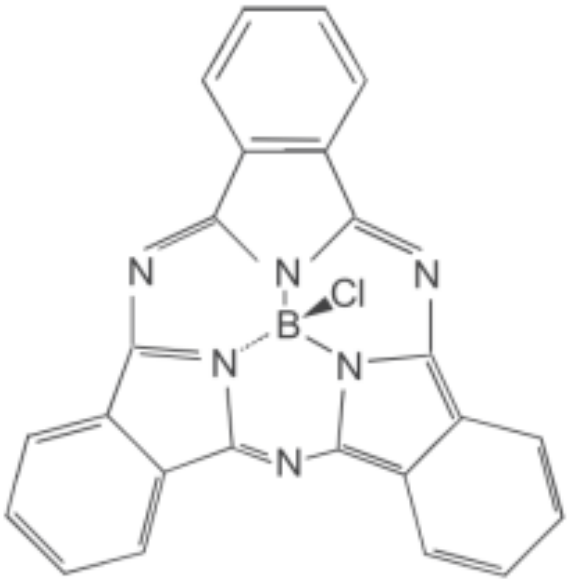
IISW
Snowbird, 13th June 2013

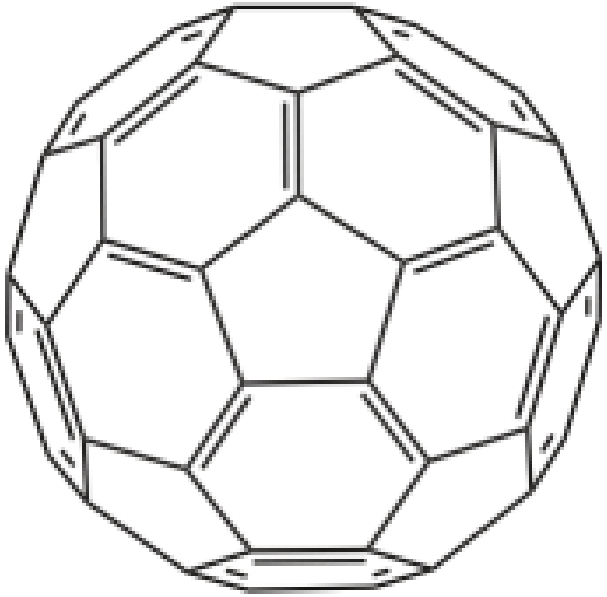
FLEXIBLE ORGANIC IMAGERS: MOTIVATION

light-weight flexible robust

compatible with x-ray scintillators

FLEXIBLE ORGANIC IMAGERS: MOTIVATION





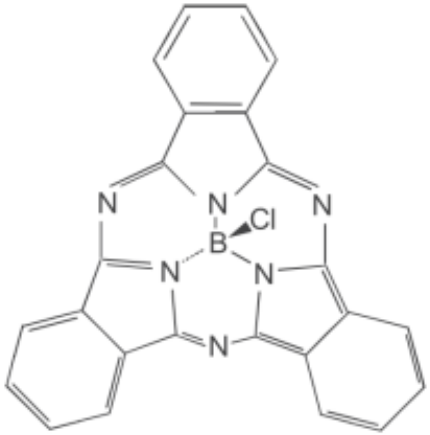
FLEXIBLE ORGANIC IMAGERS: MOTIVATION

- *organic photodetectors (OPD)*
- *integration of imagers*
- *imaging results*

organic photodetectors (OPD)

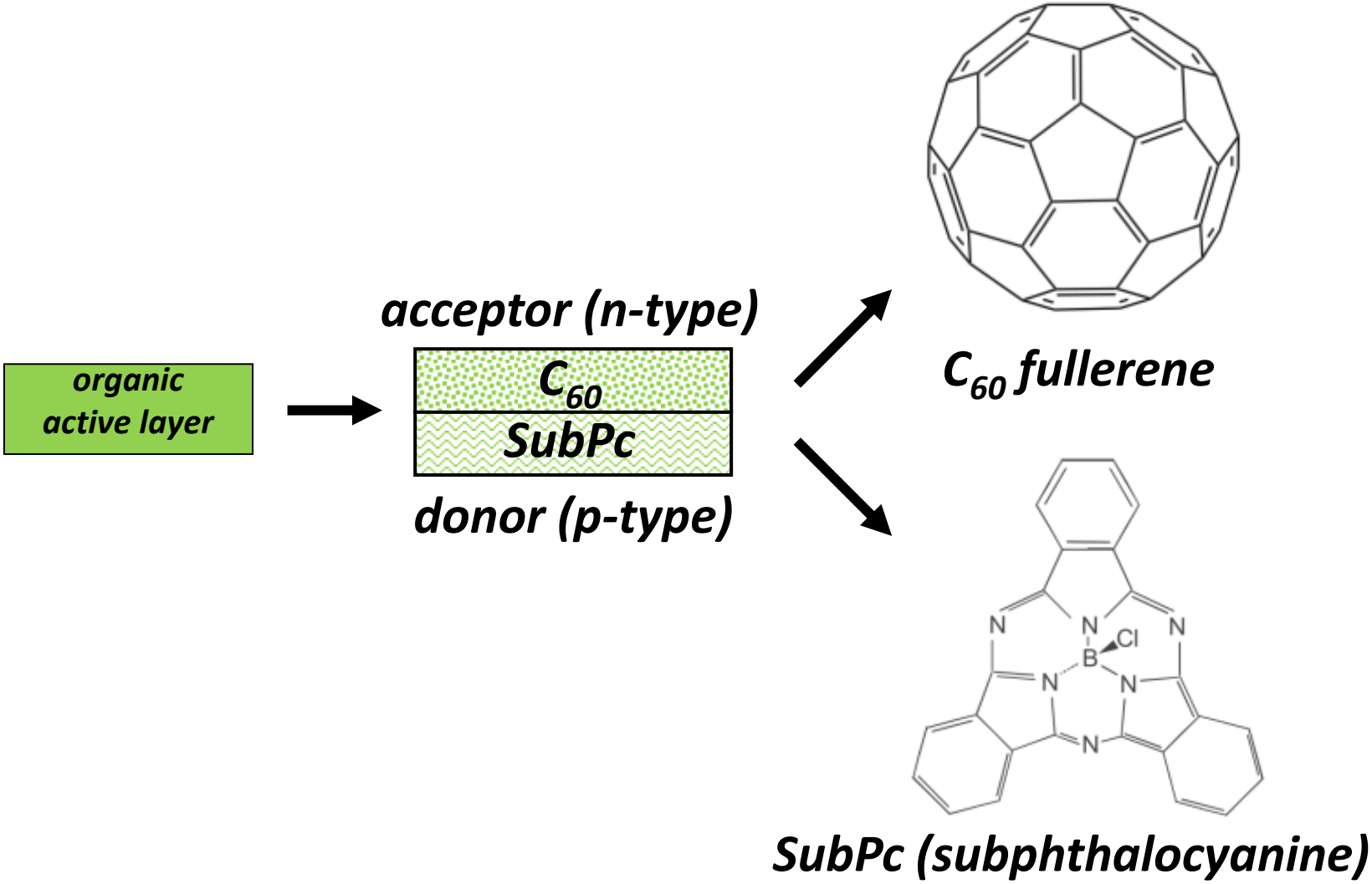
PHOTODETECTOR MADE WITH MOLECULES

C_{60} fullerene



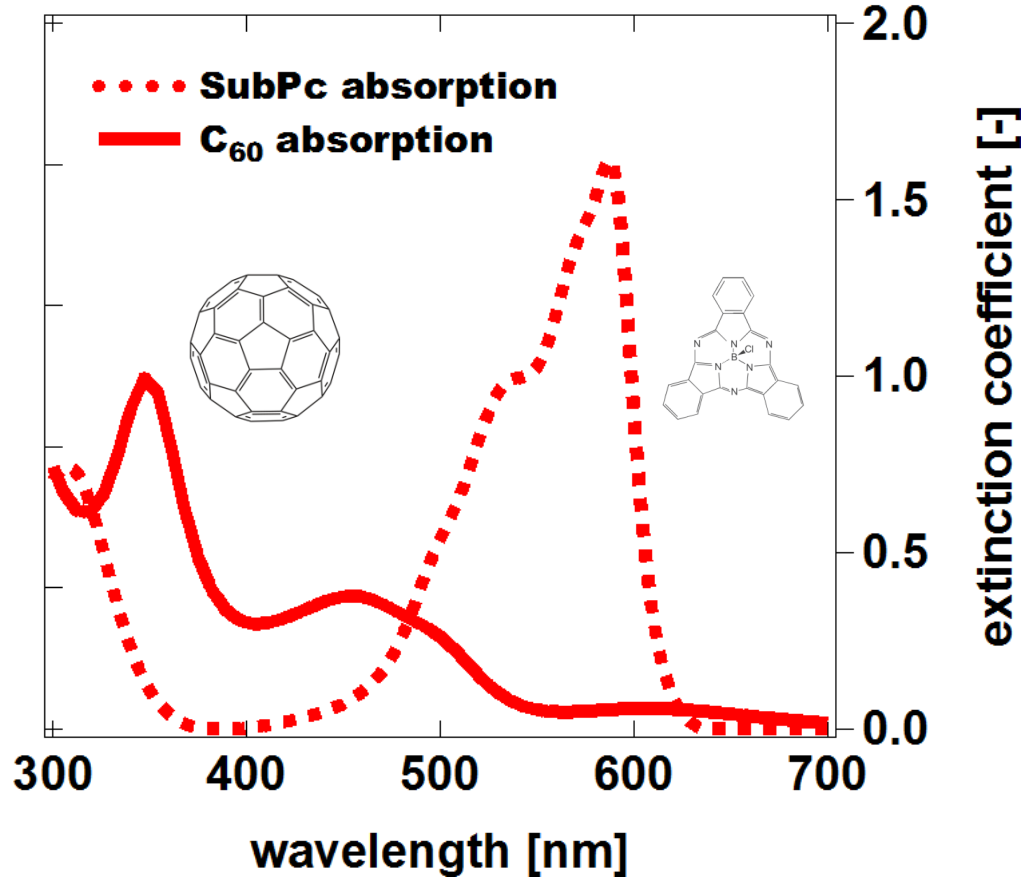
SubPc (subphthalocyanine)

PHOTODETECTOR MADE WITH MOLECULES



HIGH ABSORPTION OF ULTRATHIN LAYERS

organic active layer



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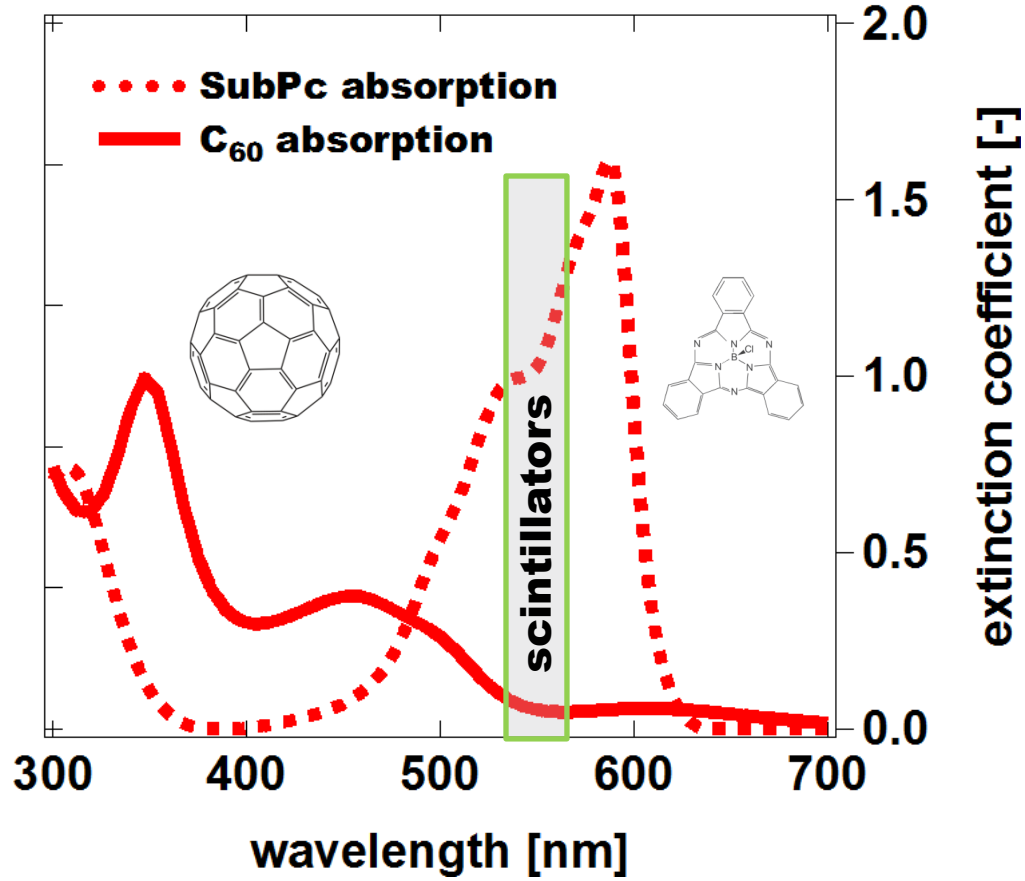
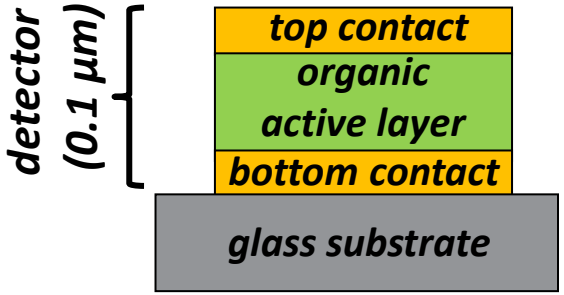
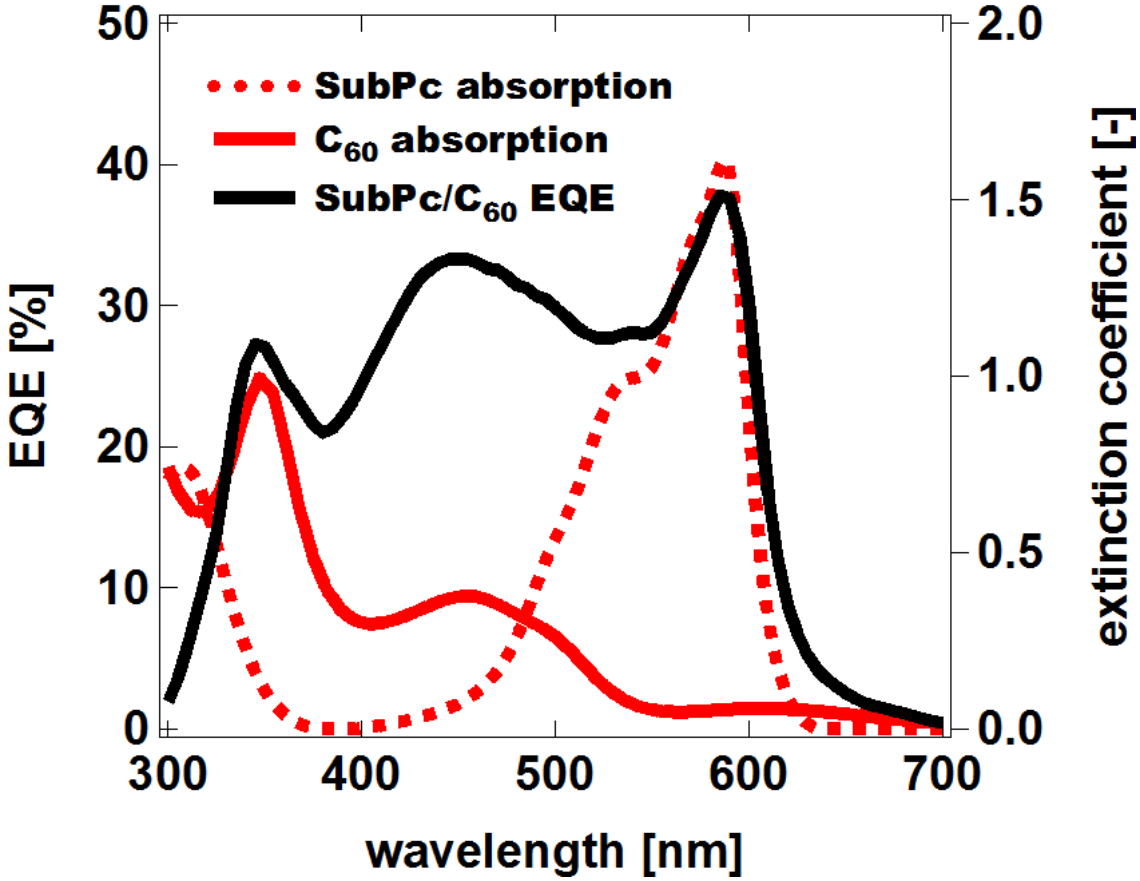


OPD Spectrum = Spectrum of Molecules

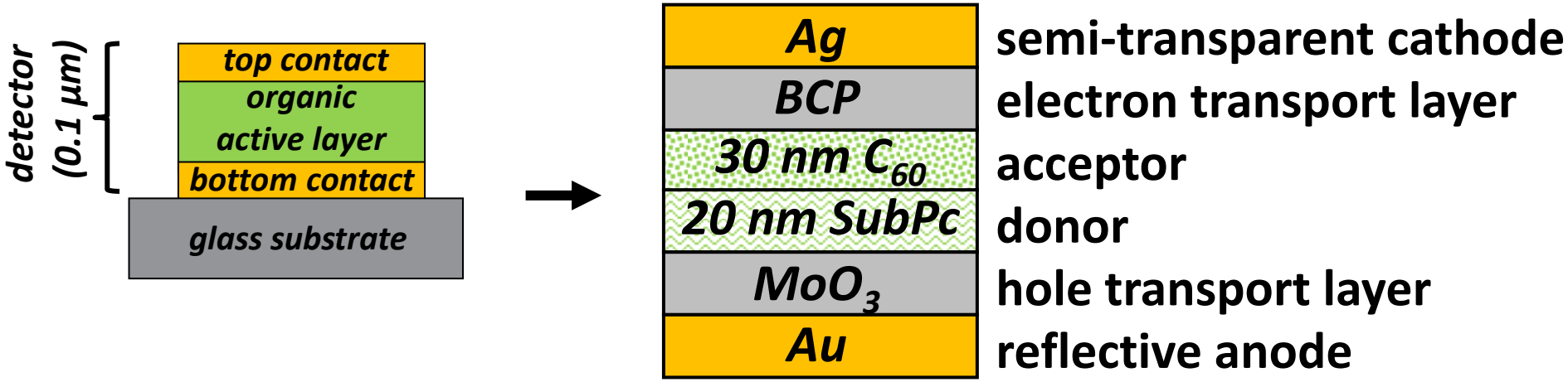


SubPc: 20 nm thick

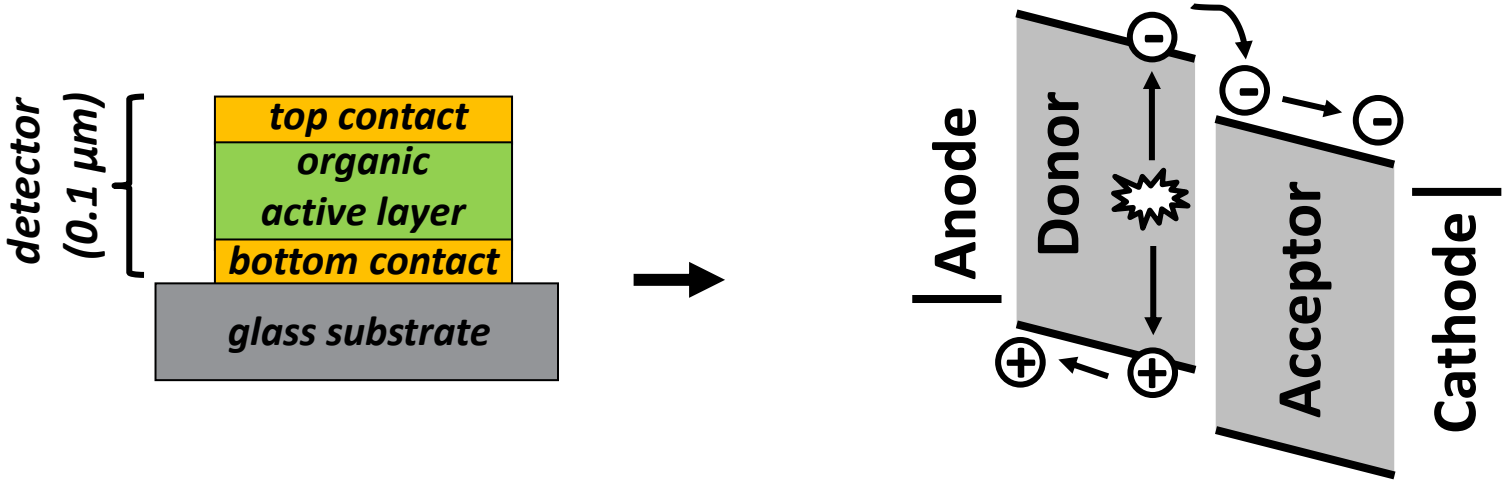
C_{60}: 30 nm thick



FROM ORGANIC THIN FILMS TO PHOTODETECTORS

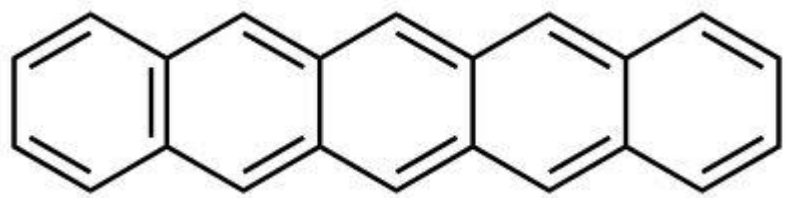


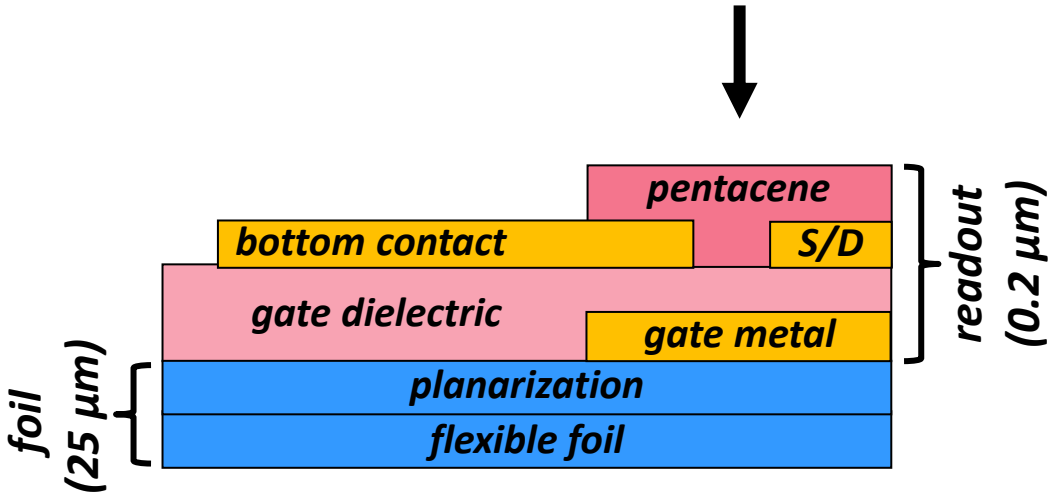
ORGANIC PHOTODETECTOR IN ACTION



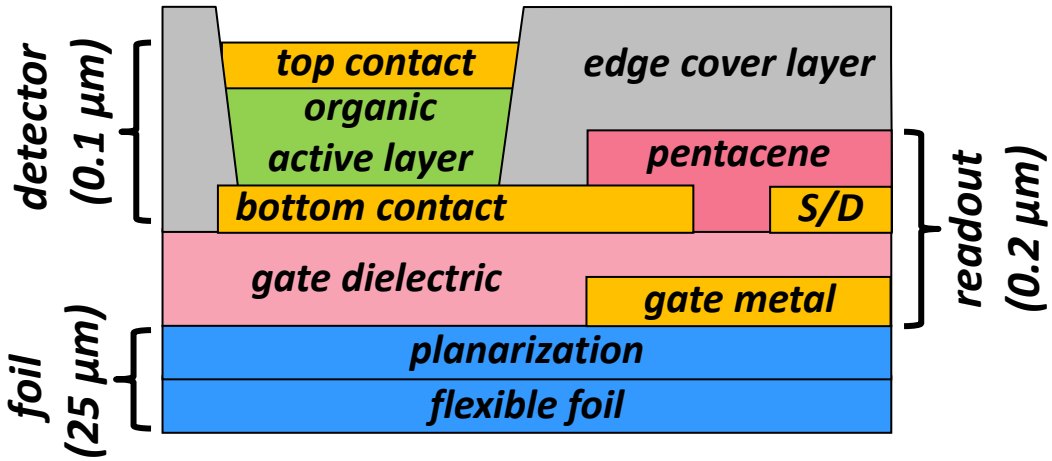
integration with organic ROIC on foil

PENTACENE-BASED OTFT ROIC

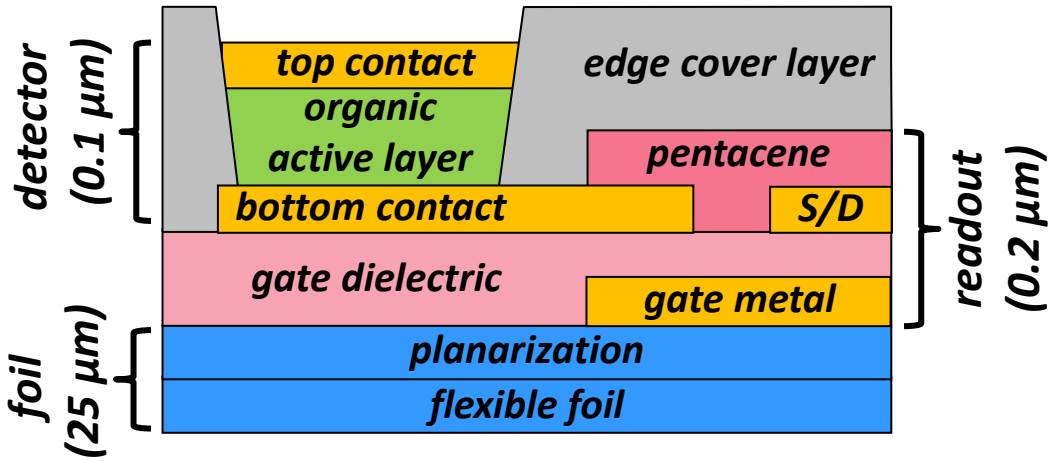


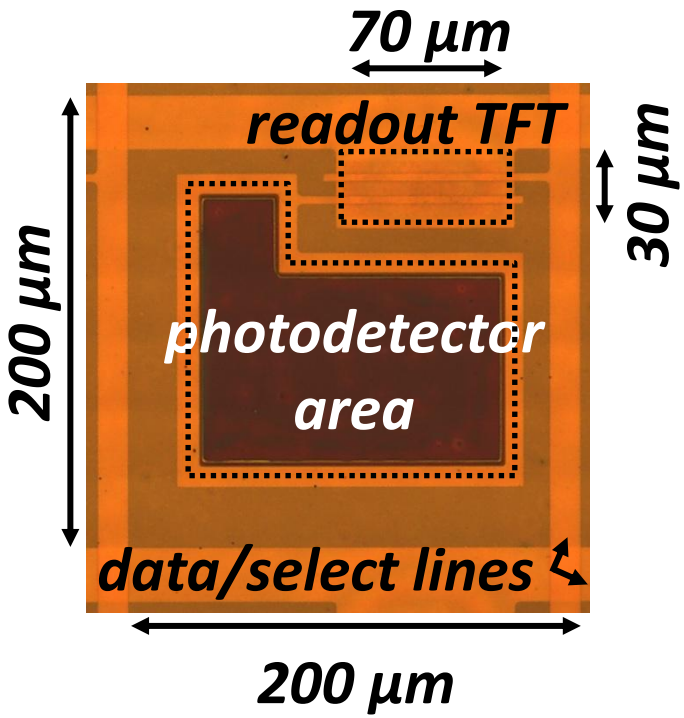


INTEGRATION OF OPD AND OTFT

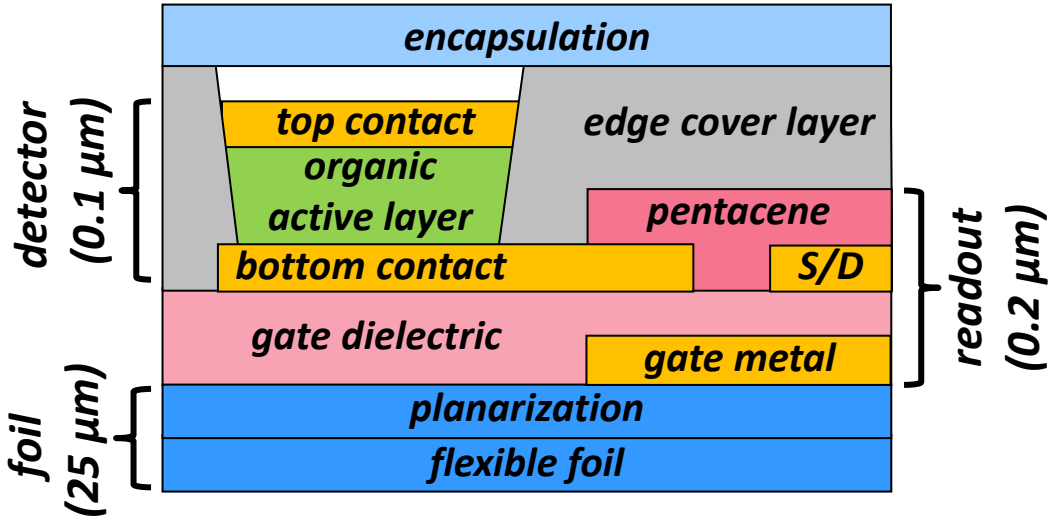


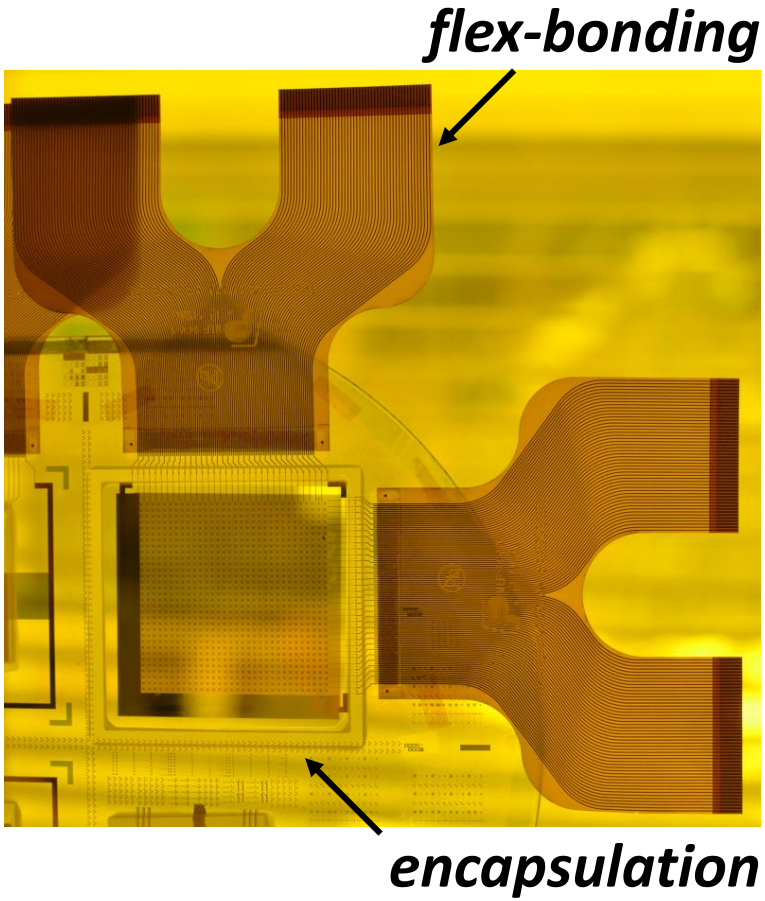
INTEGRATION OF OPD AND OTFT



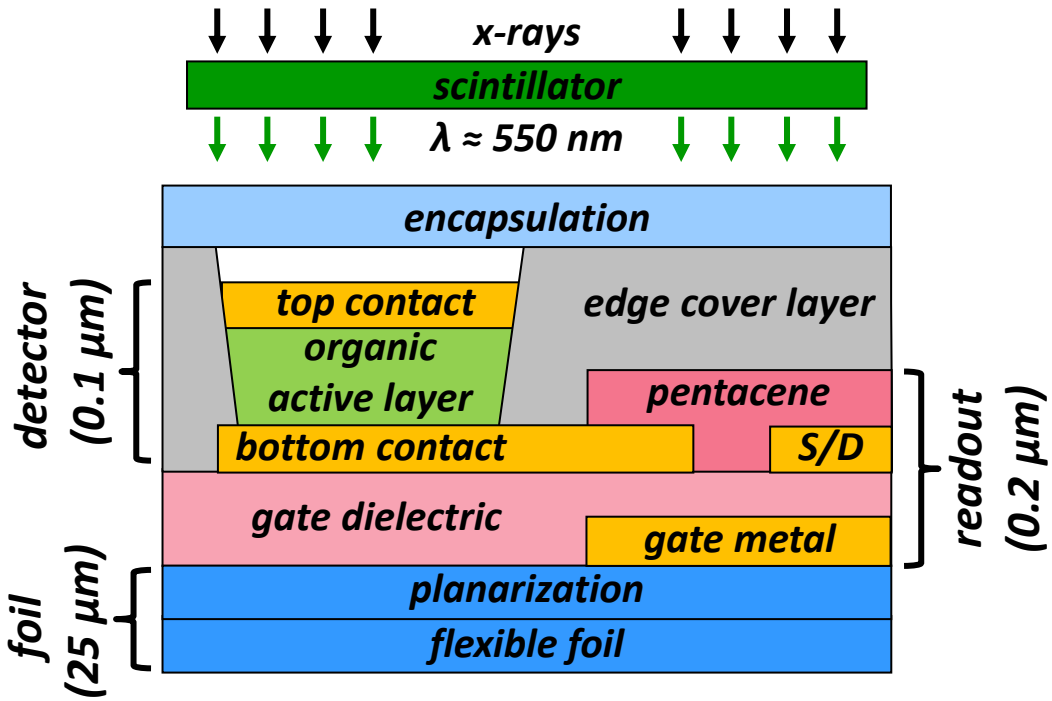


ENCAPSULATION: PROTECTION AGAINST O_2/H_2O





READINESS FOR SCINTILLATOR INTEGRATION

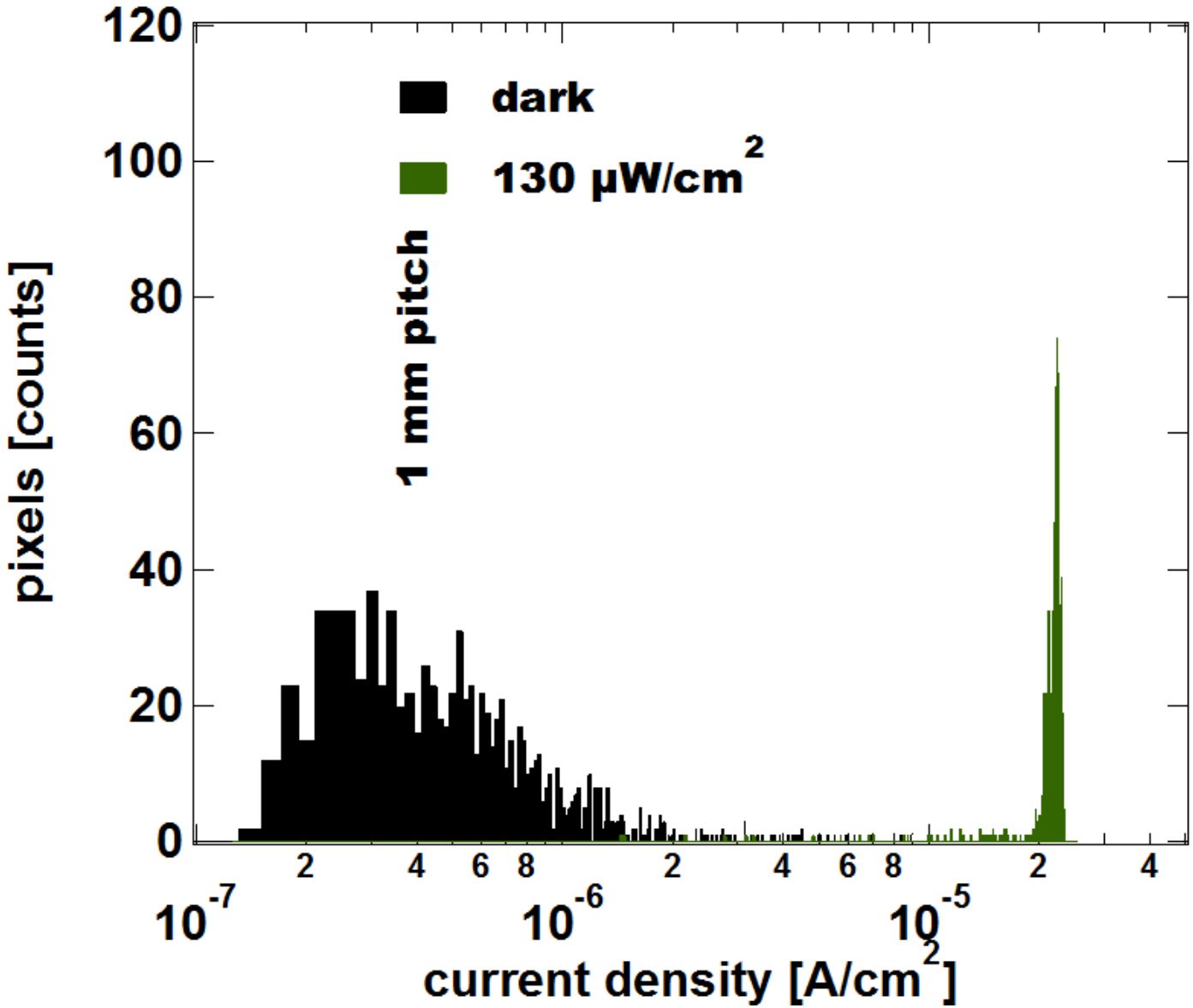


processing on foil

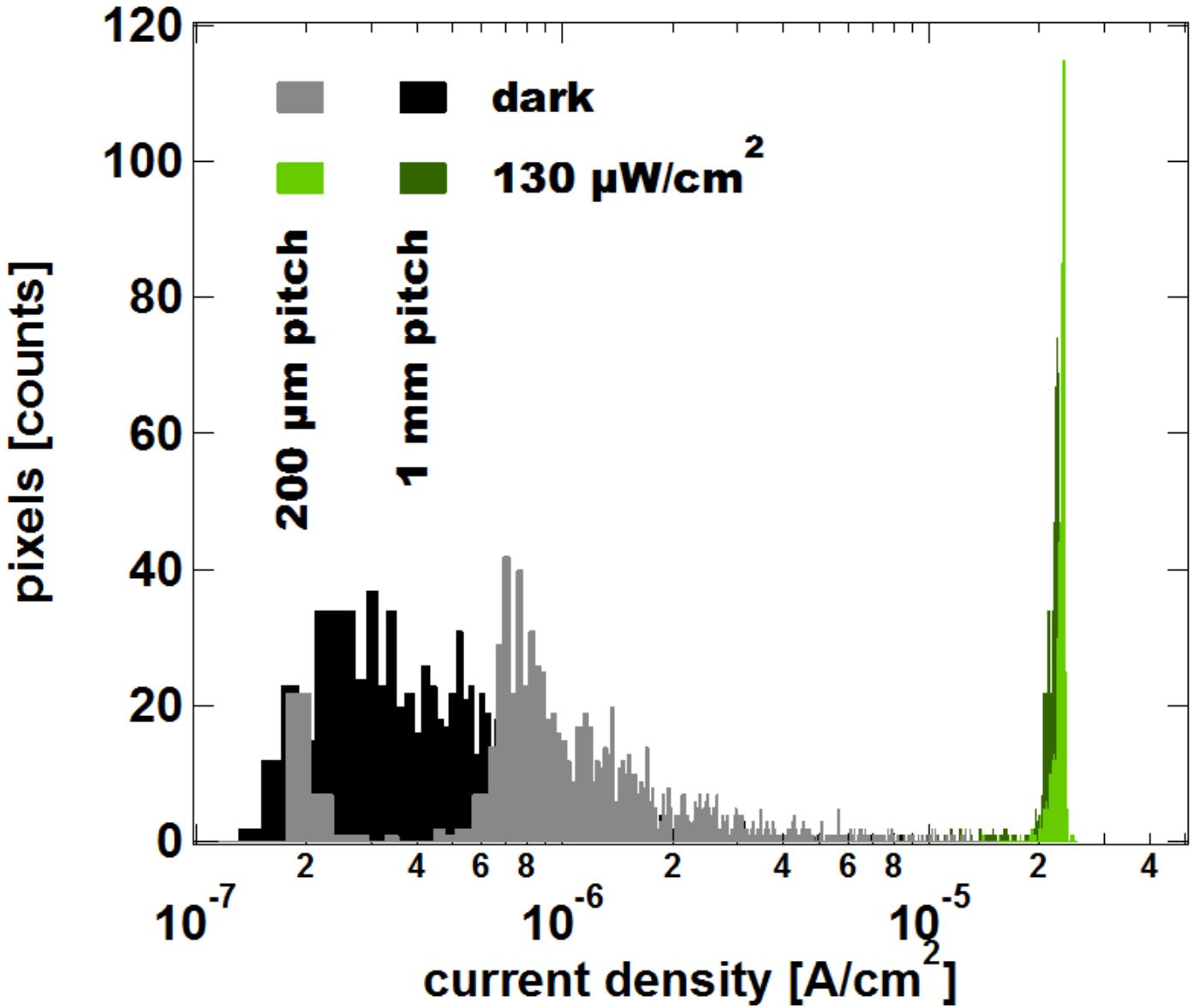
- → ***flexibility***
- → ***light weight***
- → ***unbreakableness***
- → ***upscalability***

imaging results

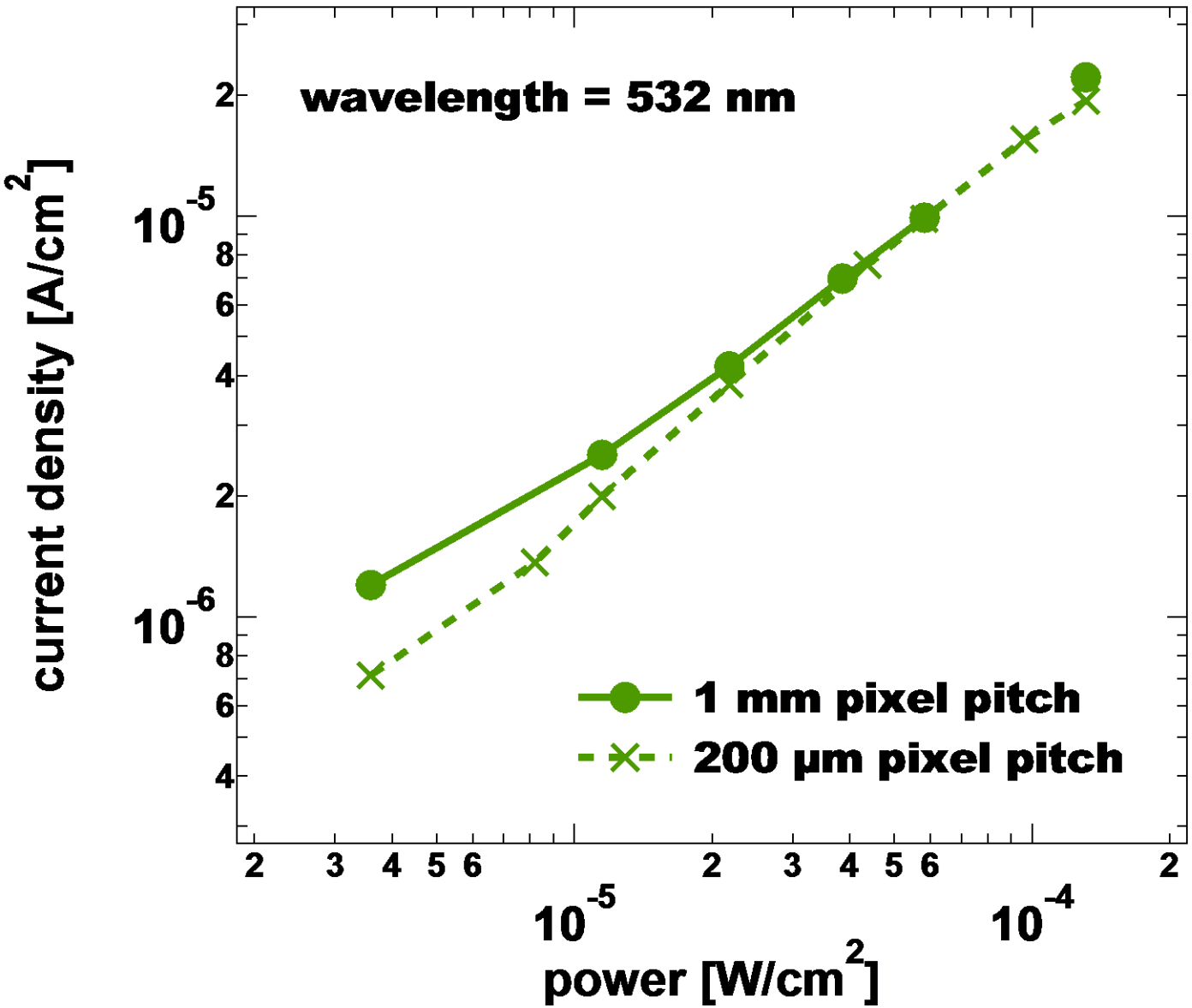
CLEAR SIGNAL UNDER ILLUMINATION



CLEAR SIGNAL UNDER ILLUMINATION

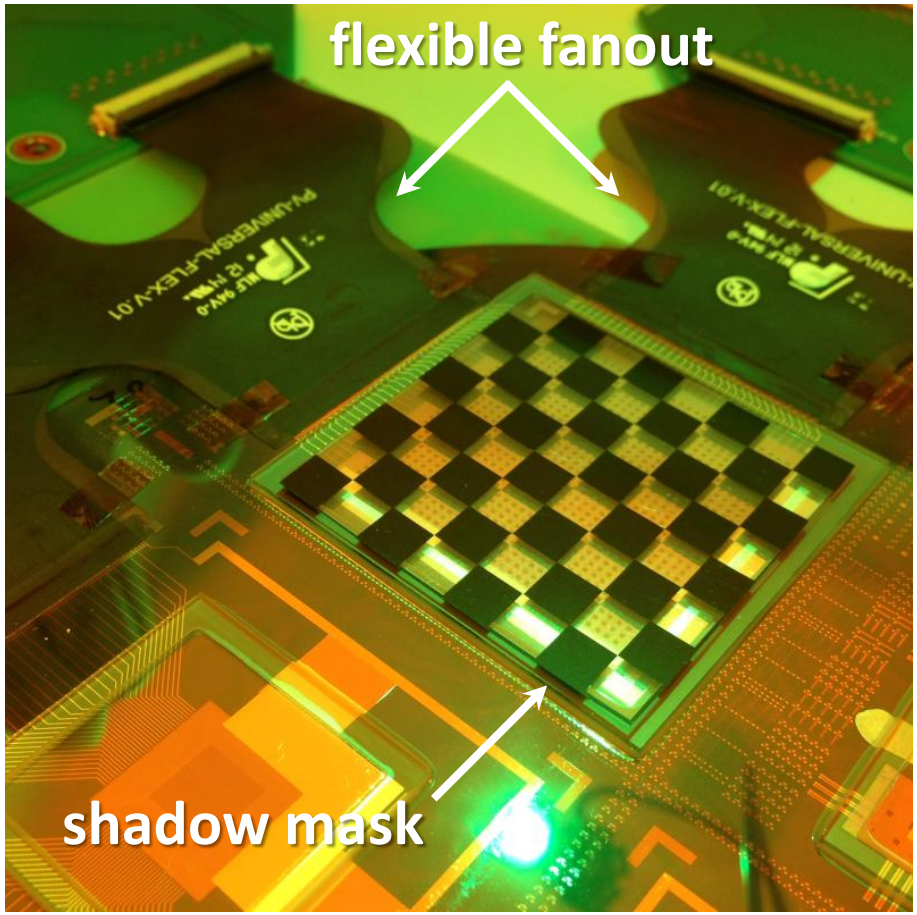


PHOTOCURRENT LINEAR FROM μW/CM²



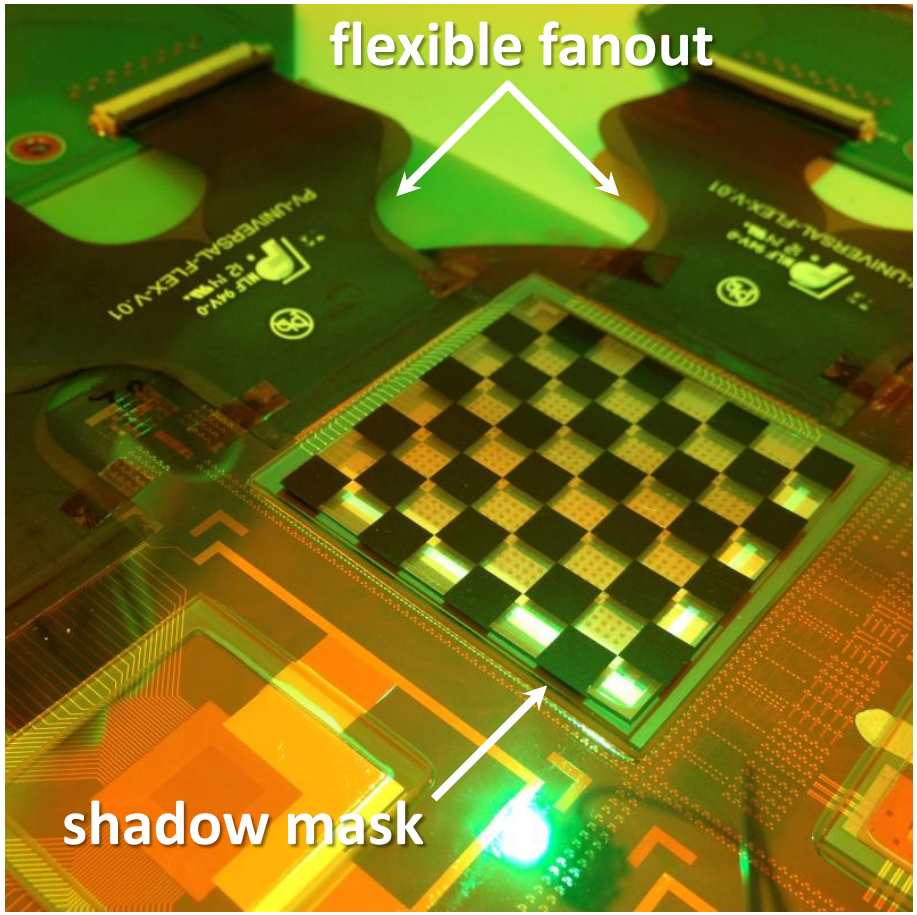
IMAGING WITH 1 MM PITCH IMAGER

imager with shadow mask

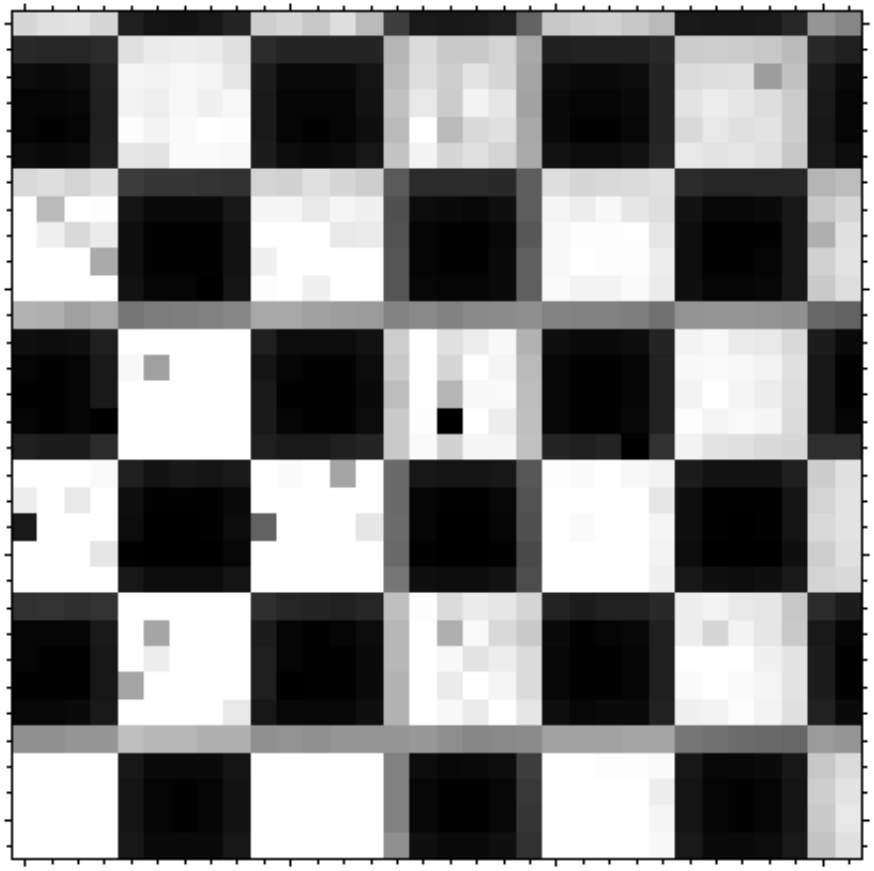


IMAGING WITH 1 MM PITCH IMAGER

imager with shadow mask

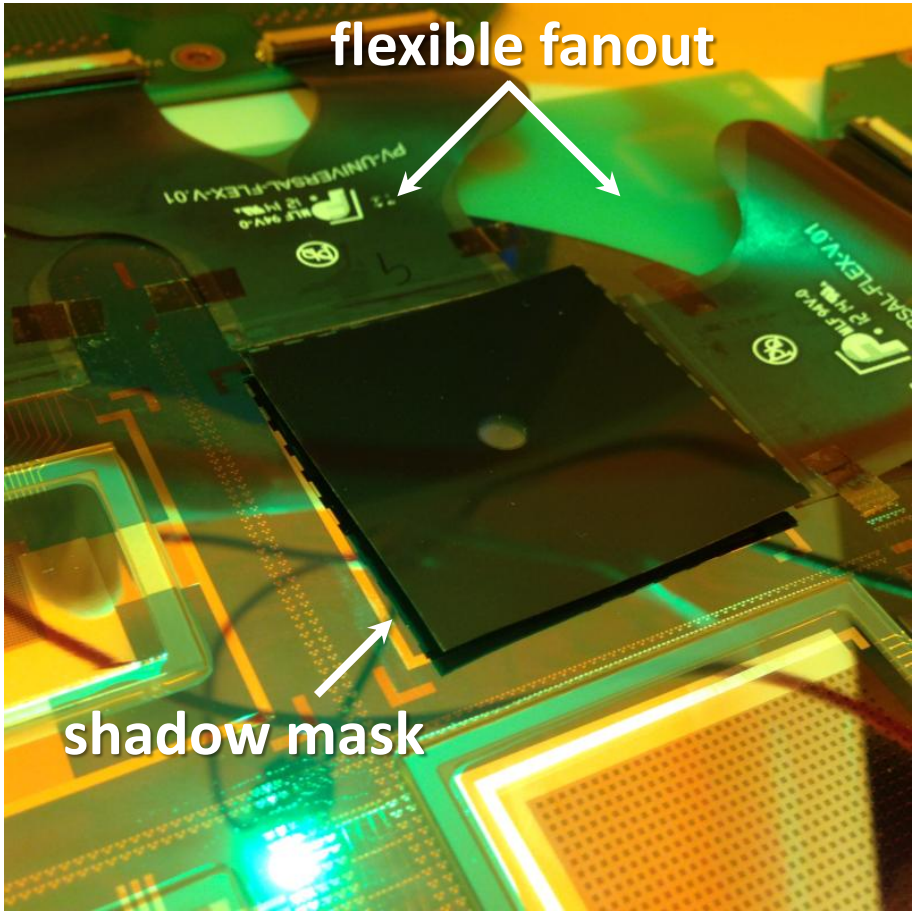


resulting image

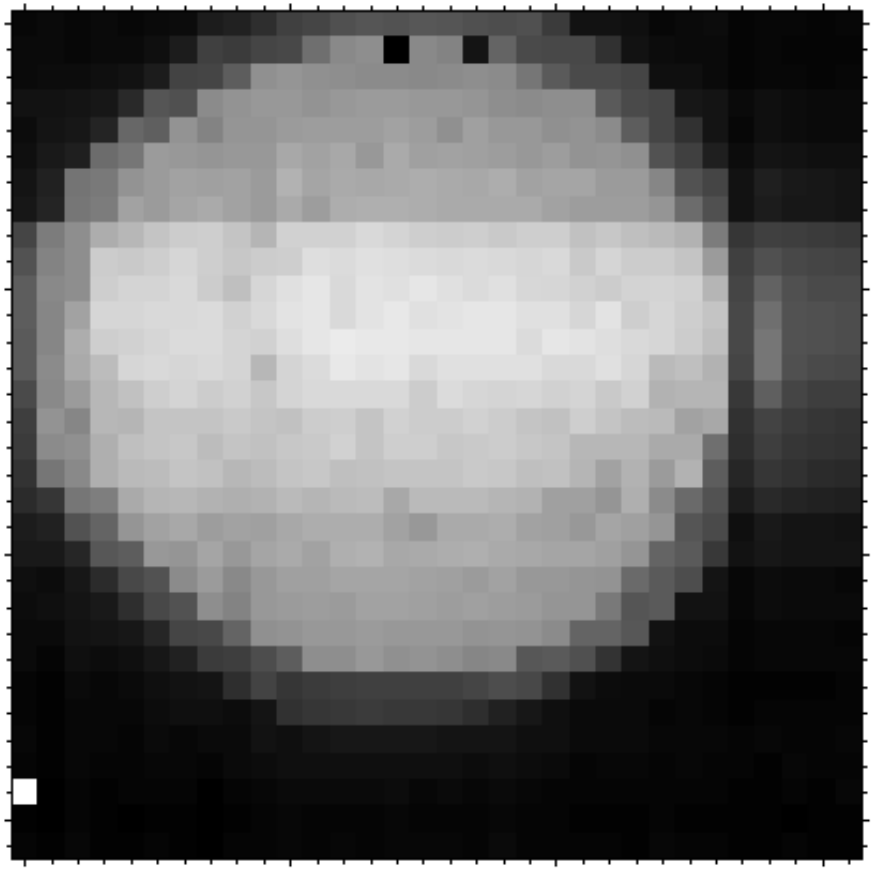


IMAGING WITH 200 μm PITCH IMAGER

imager with shadow mask

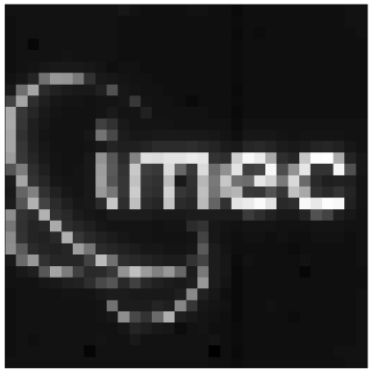


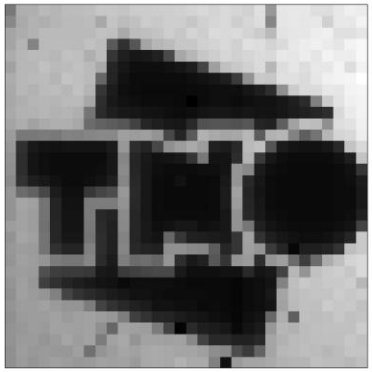
resulting image



CONCLUSIONS

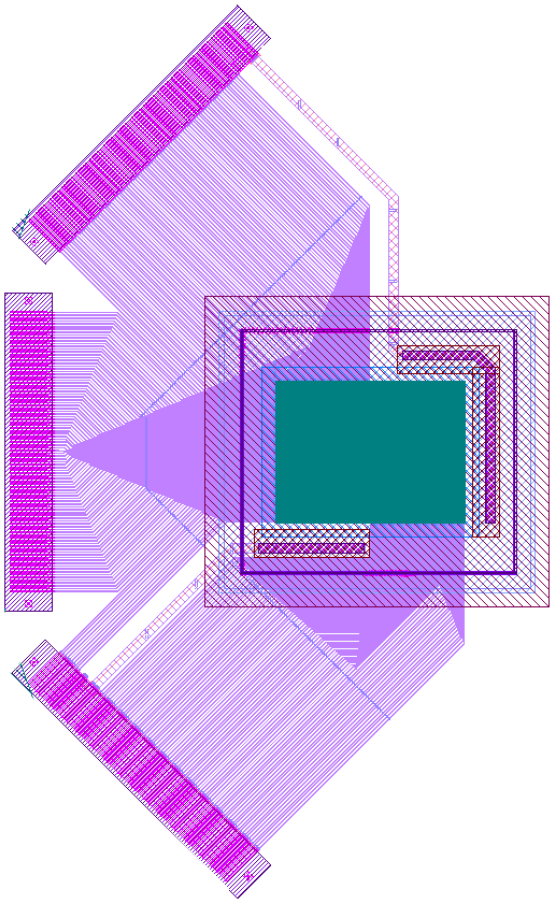
- *OPD integrated with OTFT*
- *32x32 px imagers on foil*
- *imaging with shadow masks*





OUTLOOK

- *more aggressive pitch*
- *larger array sizes*
- *x-ray → visible*



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