

This case study shows examples of several existing Labsmore systems with relatively small modifications to support infrared backside imaging. It demonstrates what can be imaged today, although several technologies may help extend the usable range of several of these systems.

In summary:

- LIP-VM1-IR is usable to floor plan 400 um thickness dies with a calibration tweak
- LIP-M2-IR (like LIP-X1) provided improved image quality. Recommend if higher resolution / more even images are required
- IR modified systems can reasonably image in conventional brightfield modes as well, although this wasn't extensively tested

Tested platforms include:

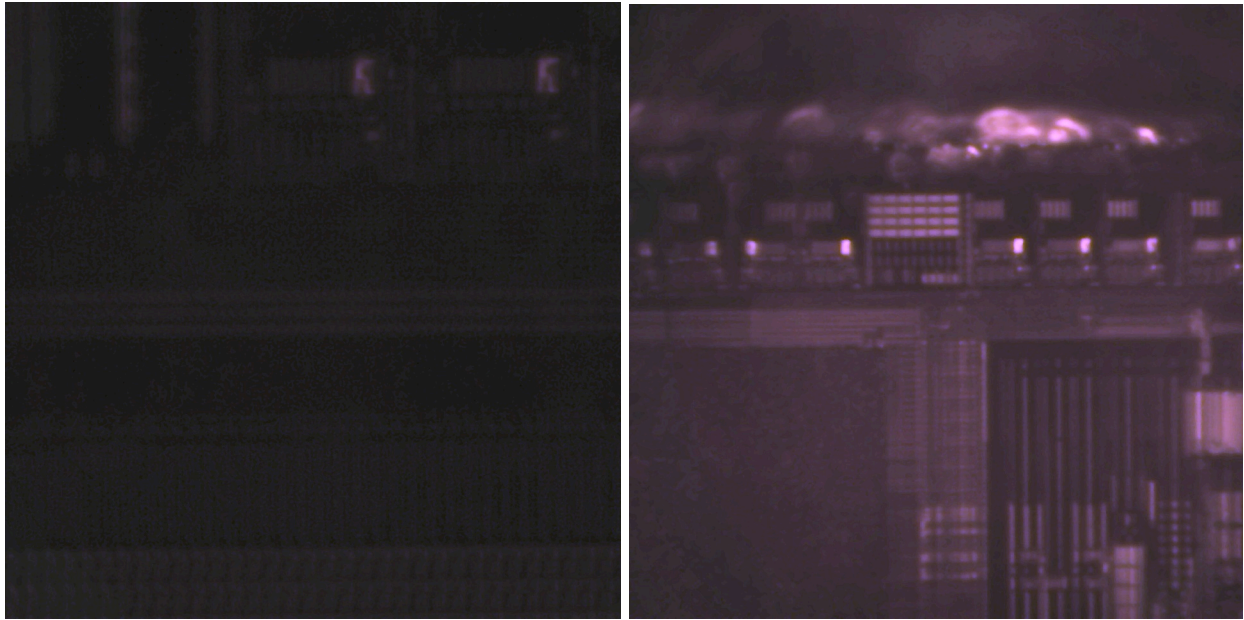
- LIP-VM1
 - Labsmore entry level metallurgical model
 - Camera sensor about 33.2 mm²
 - Stock camera has IR cut filter removed
- LIP-M2
 - Labsmore internal mid level metallurgical model
 - Very similar design to LIP-X1 mode
 - Camera sensor about 114 mm² and also back illuminated / thinned
 - TLDR: more sensitive than LIP-VM1 camera
 - Stock camera has IR cut filter removed



2 LED directional illuminator (above)

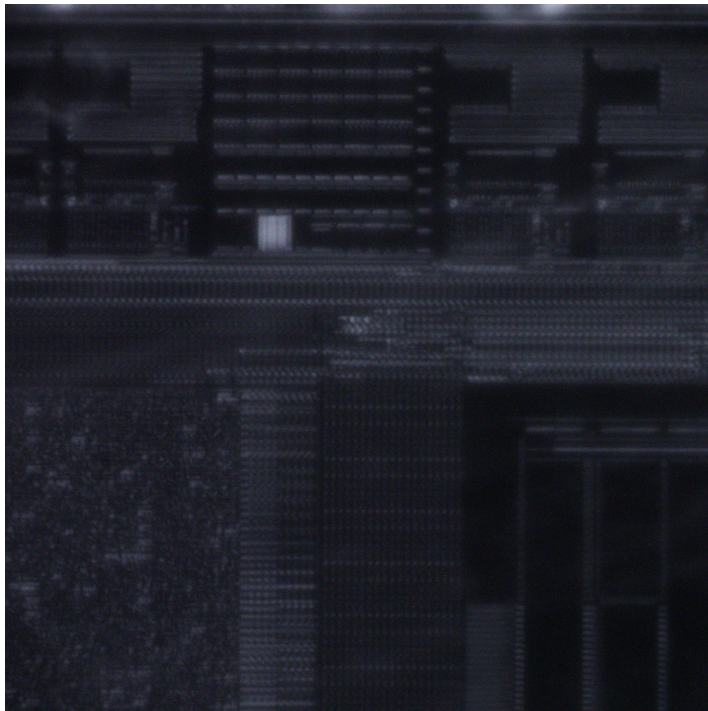
- Two LEDs 180 degrees apart
- 2x 10 mW 1060 nm LEDs => 20 mW max
- Rotated to die cut direction to minimize reflections
- Note: a halogen illuminator was also briefly explored but ultimately we focused on LED

STM32F107 (400 μm)



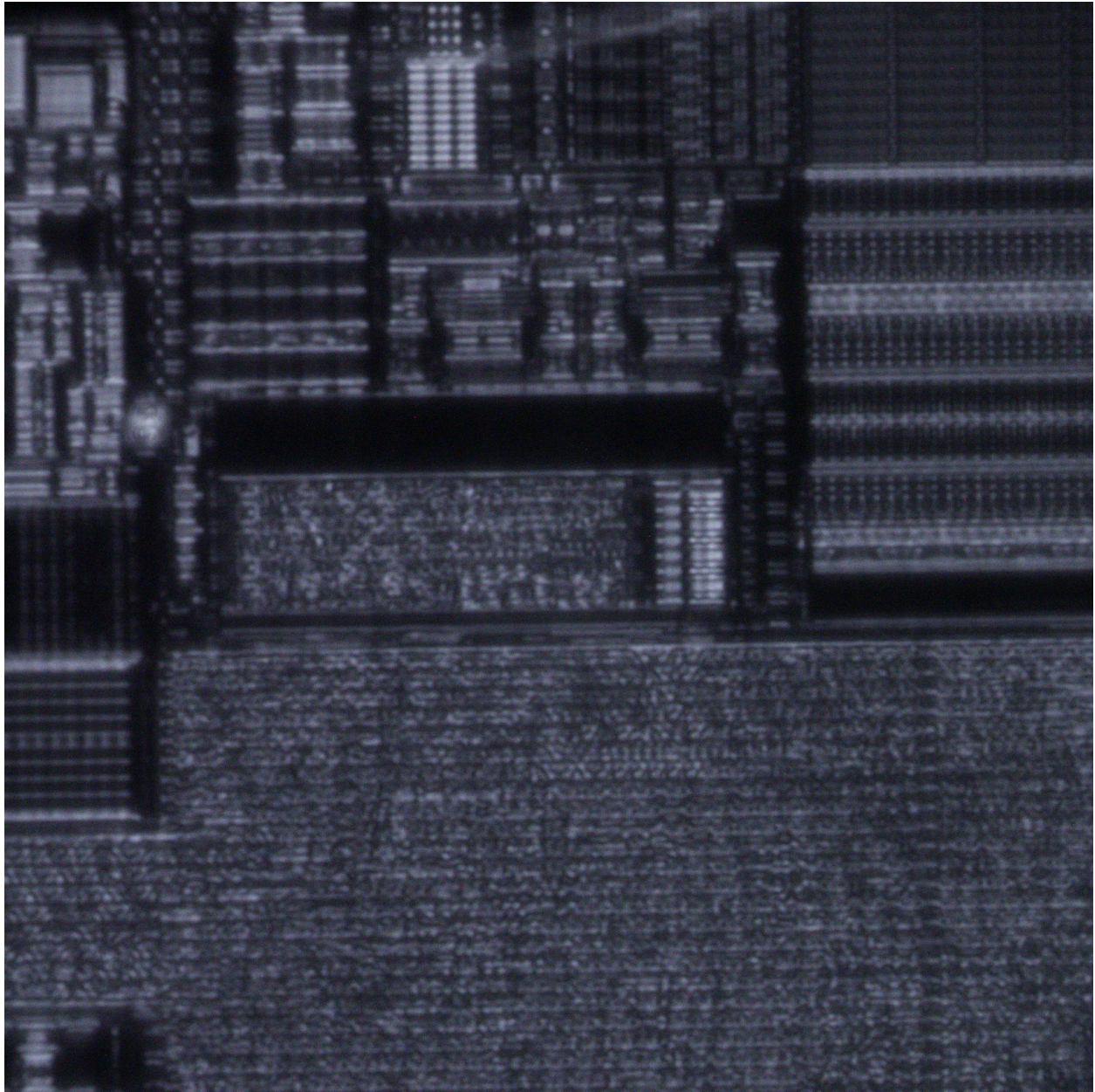
Above left: LIP-VM1 (2x relay) + I20x + 2xLED. Some features visible but hard to see / noisy

Above right: LIP-VM1 (1x relay) + I20x + 2xLED. Die is much easier to see as the field of view / light collection has increased $\sim 4\times$



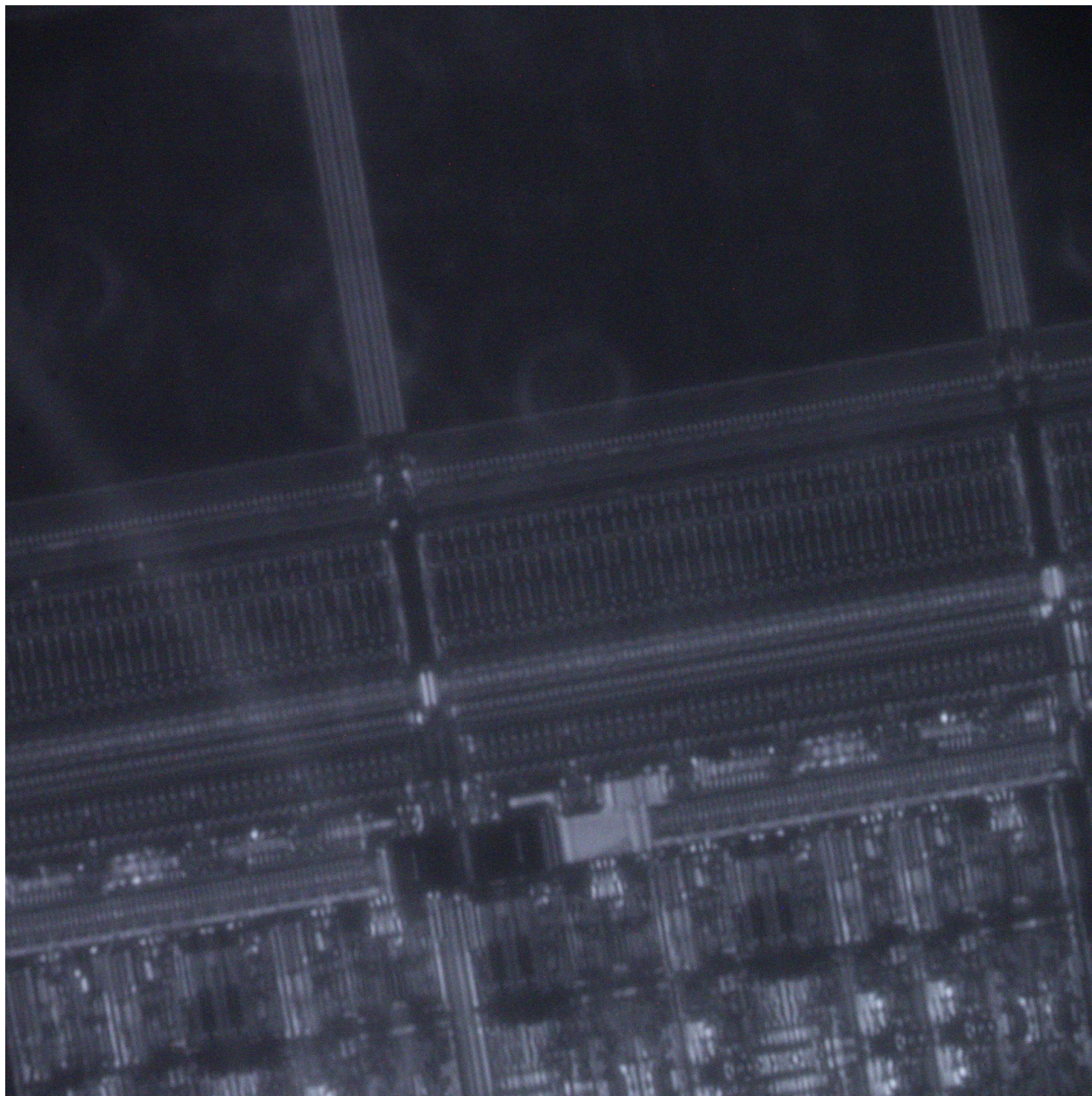
Above: LIP-M2 + I20x + 2xLED. Significantly more detail visible

LIP-M2 2xLED resolution vs thickness



Atmel ATSHA204: 140 μm

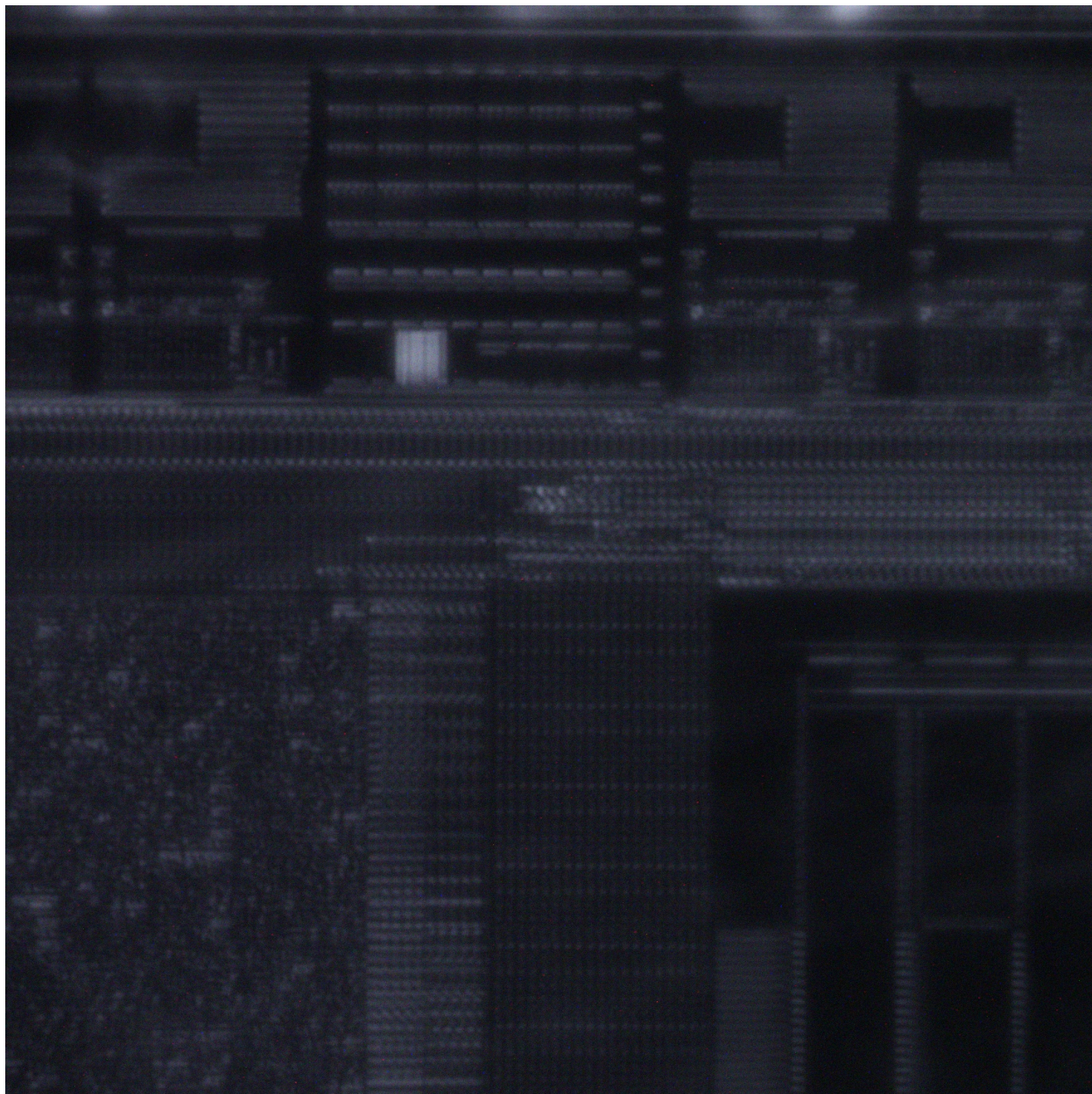
Gain and exposure relatively low (500 ms, 5x)



Samsung K4H560838D: 300 μm
Gain and exposure relatively low (350 ms, 5x)



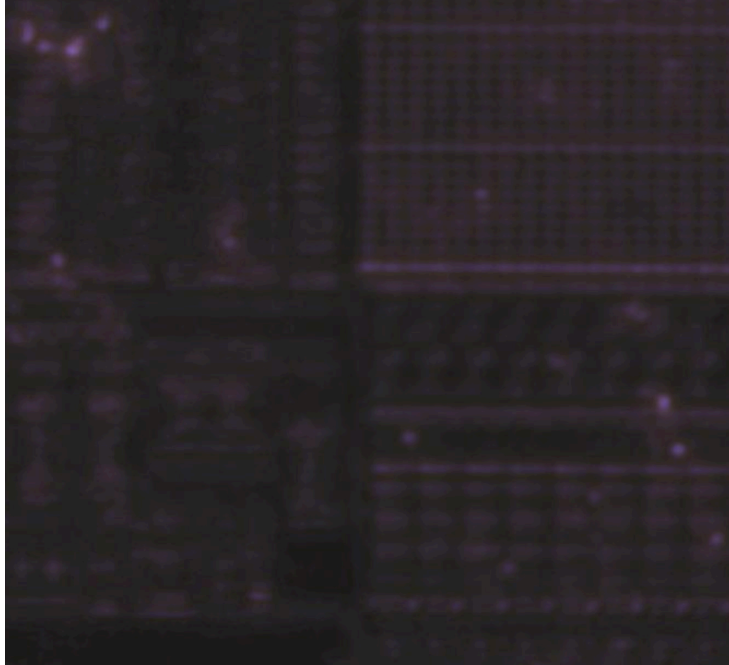
Securid 2C: 320 um
Gain and exposure not recorded



STM32F103: 400 μm
Gain and exposure high (1000 ms, 50x)

ATAES132

About 130 um thick



Above: LIP-VM1 (2x relay) + I20x + 2xLED



Above: LIP-M2 + I20x + 2xLED