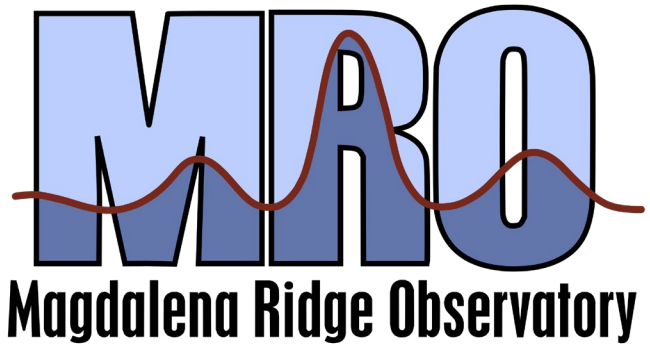
Current Status of the Magdalena Ridge Observatory Interferometer

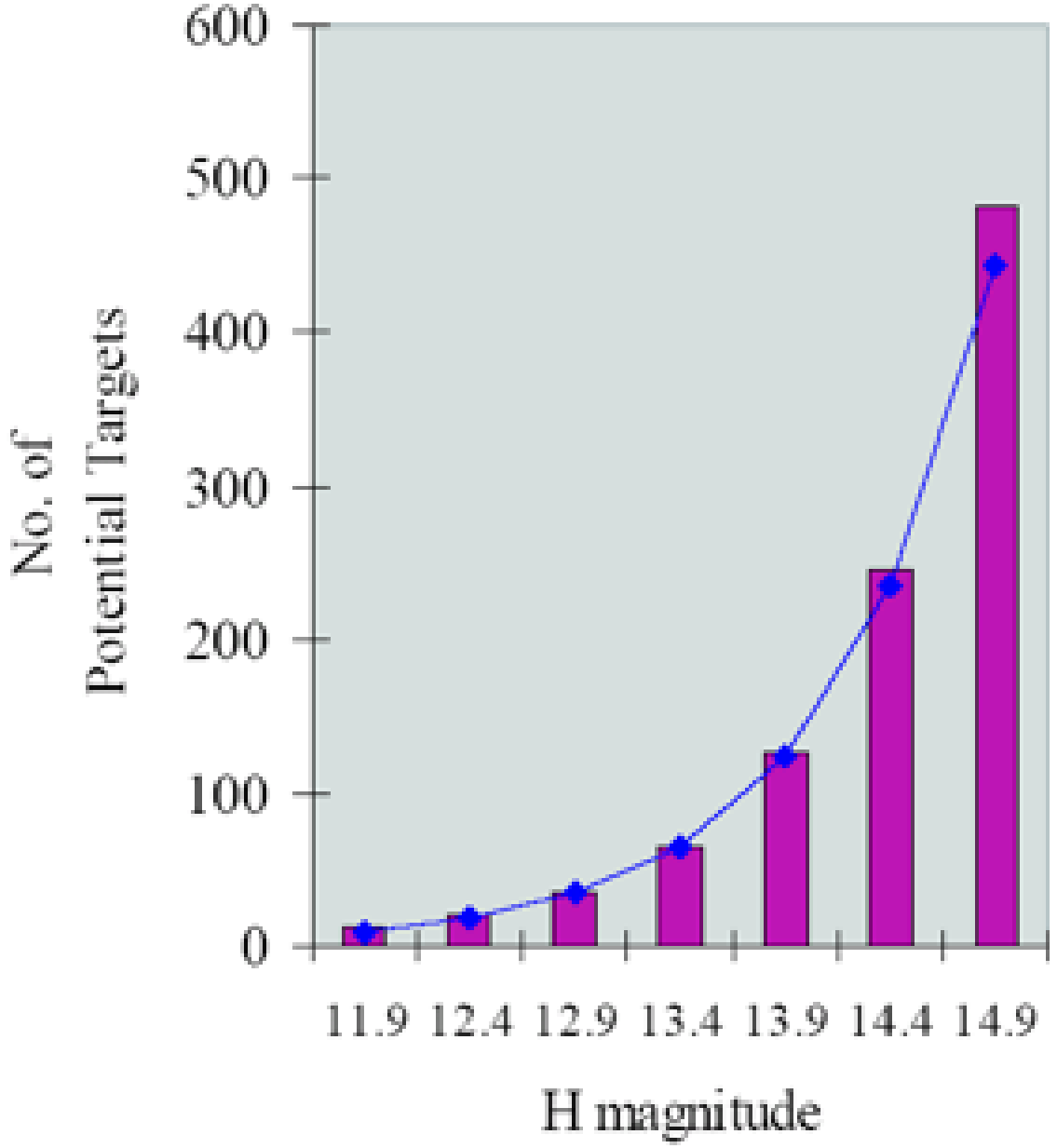
David Buscher & the MROI team

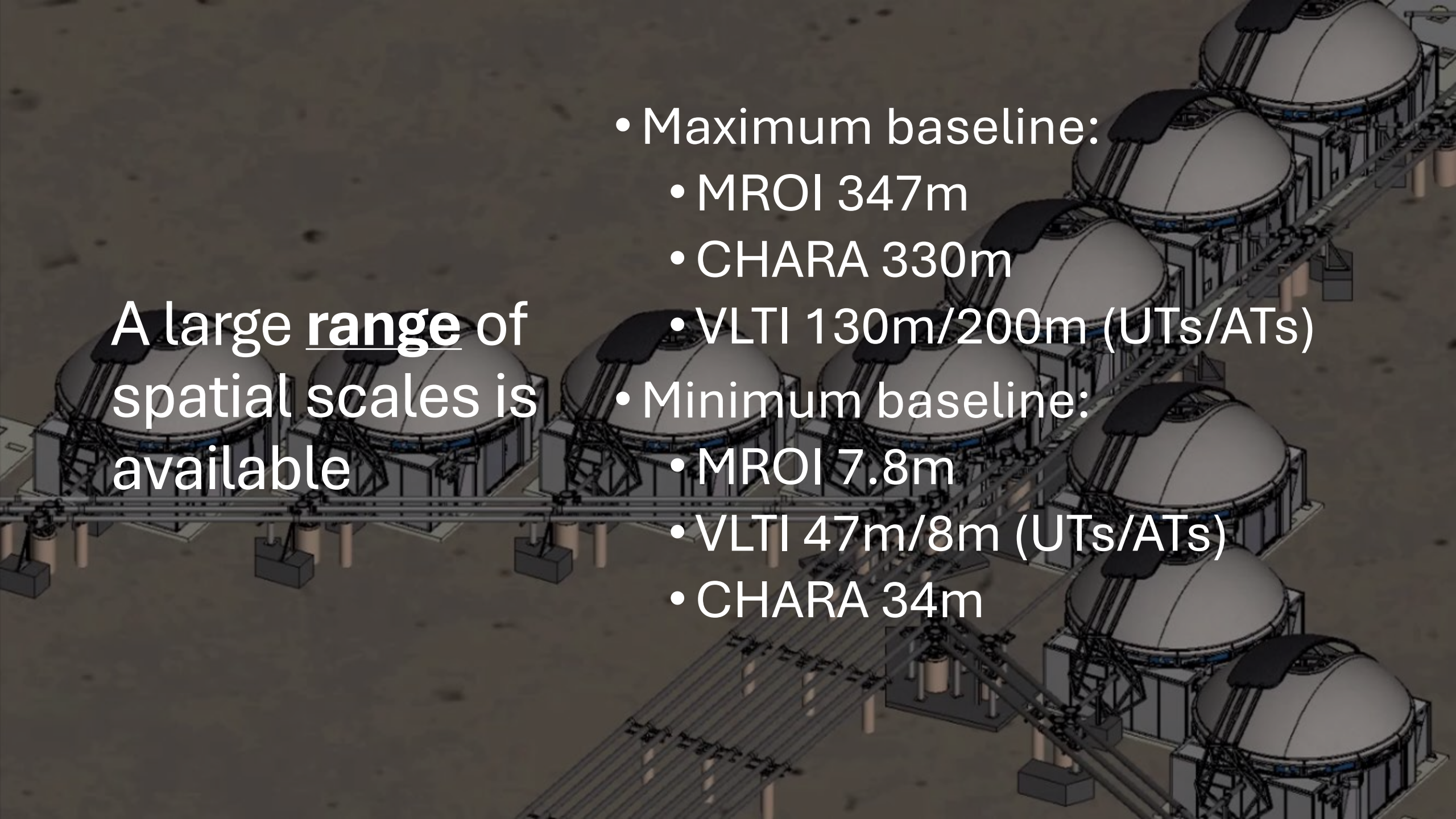


The MROI is designed to have an unchallenged **combination** of capabilities

The design prioritizes faint-object science

- MROI fringe tracking limiting magnitude: H=14, K=13
- Current VLTI/GRAVITY fringe tracker K=10.5/9.5 (UTs/ATs)
- CHARA K=9.2

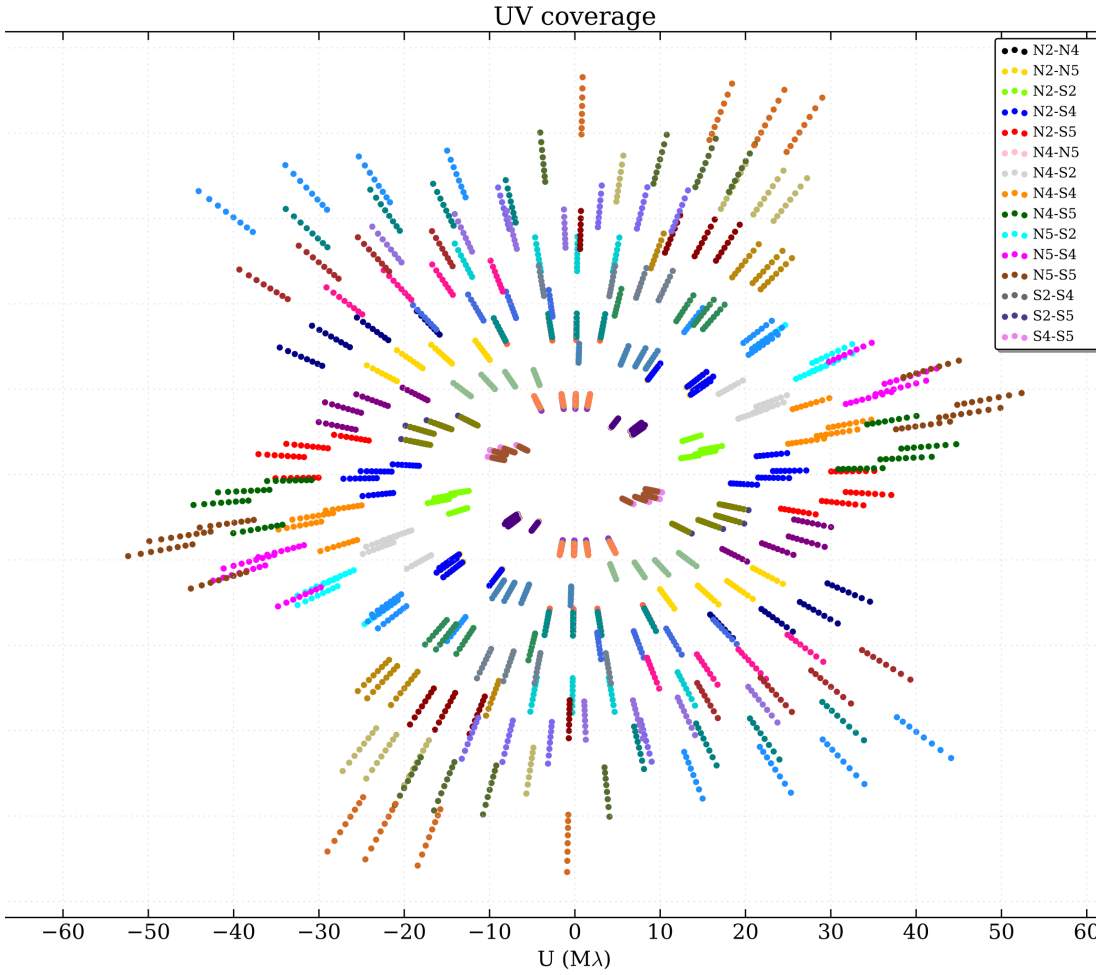


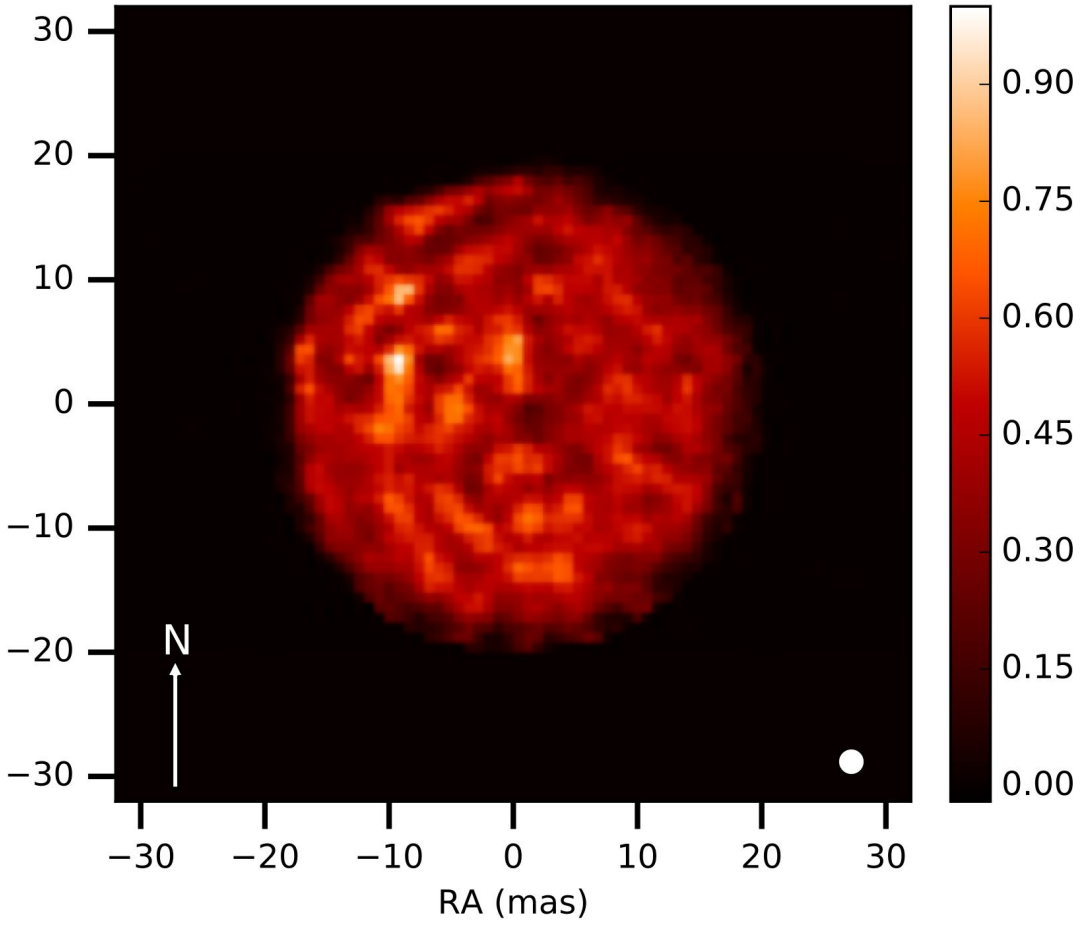


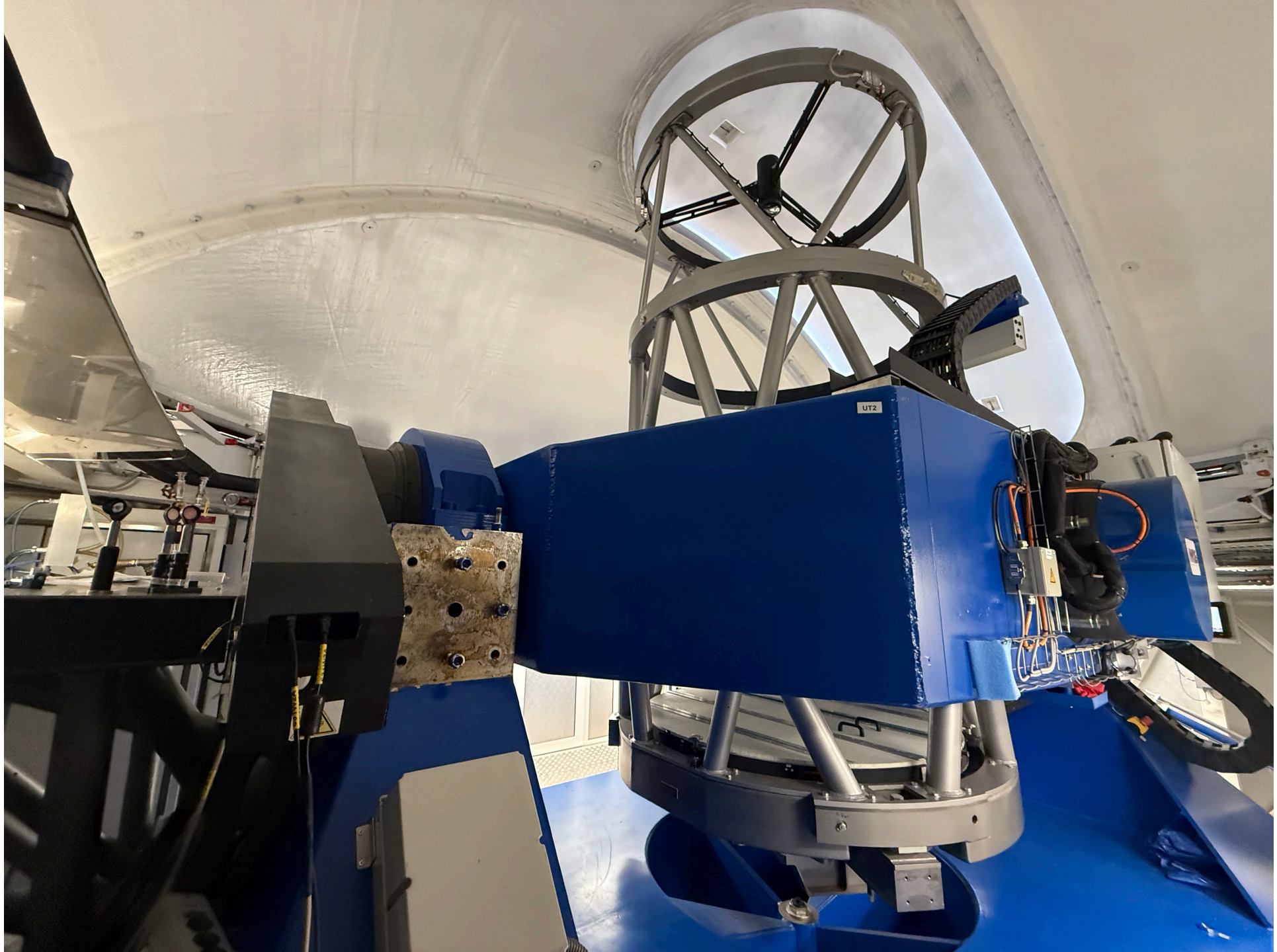
A large **range** of spatial scales is available

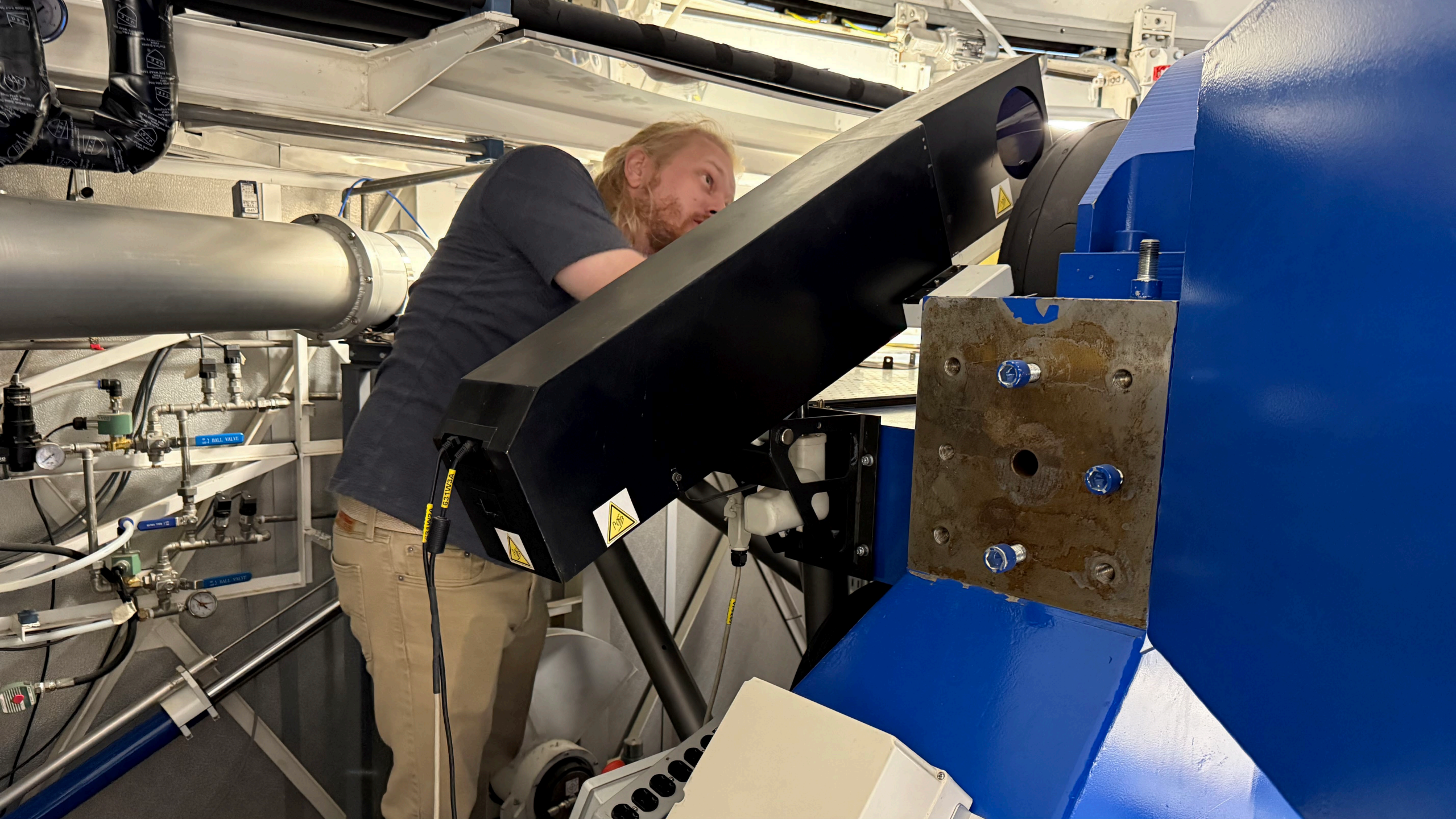
- Maximum baseline:
  - MROI 347m
  - CHARA 330m
  - VLTI 130m/200m (UTs/ATs)
- Minimum baseline:
  - MROI 7.8m
  - VLTI 47m/8m (UTs/ATs)
  - CHARA 34m

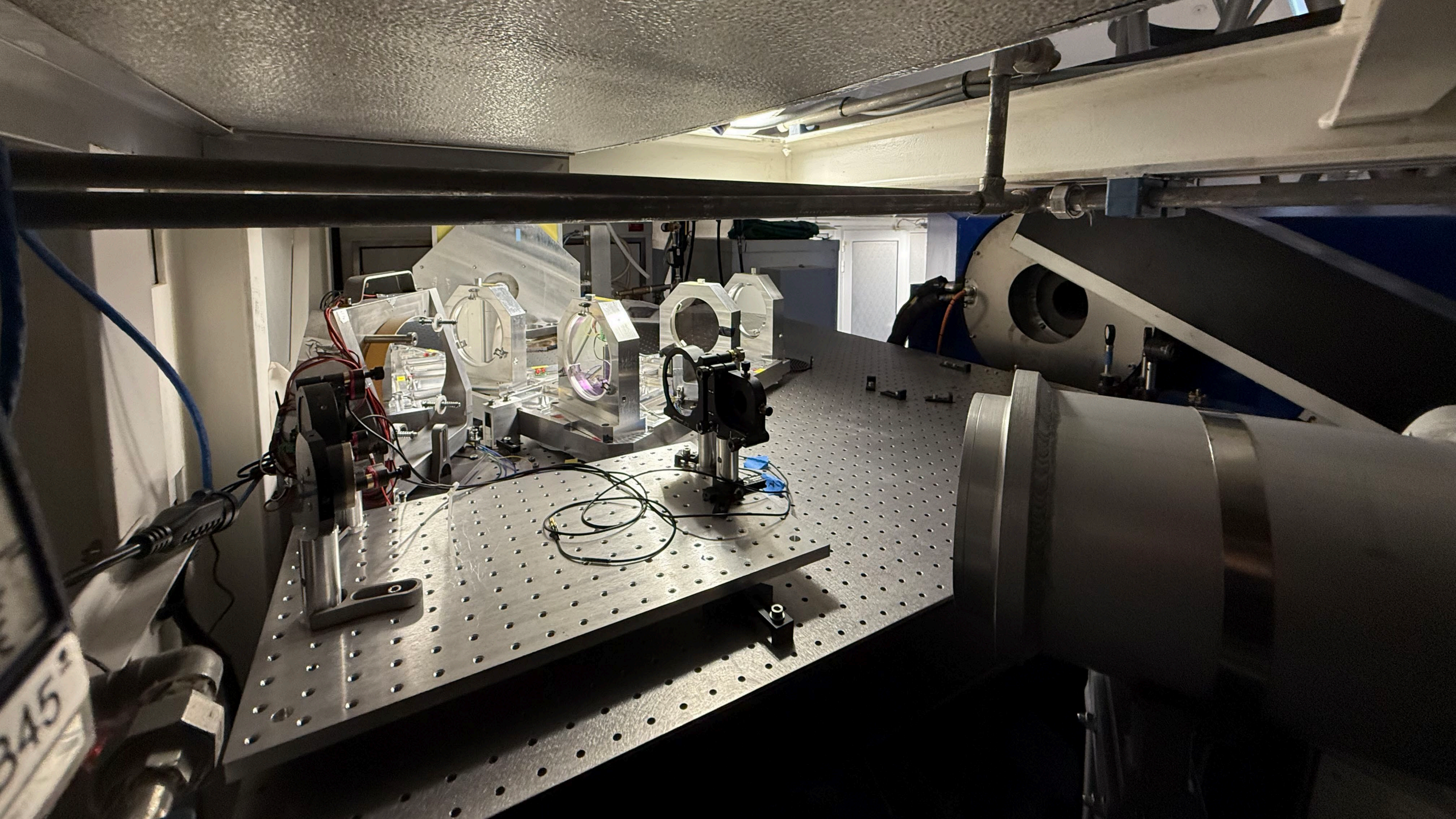
MROI will make a new model-independent image every 20 minutes

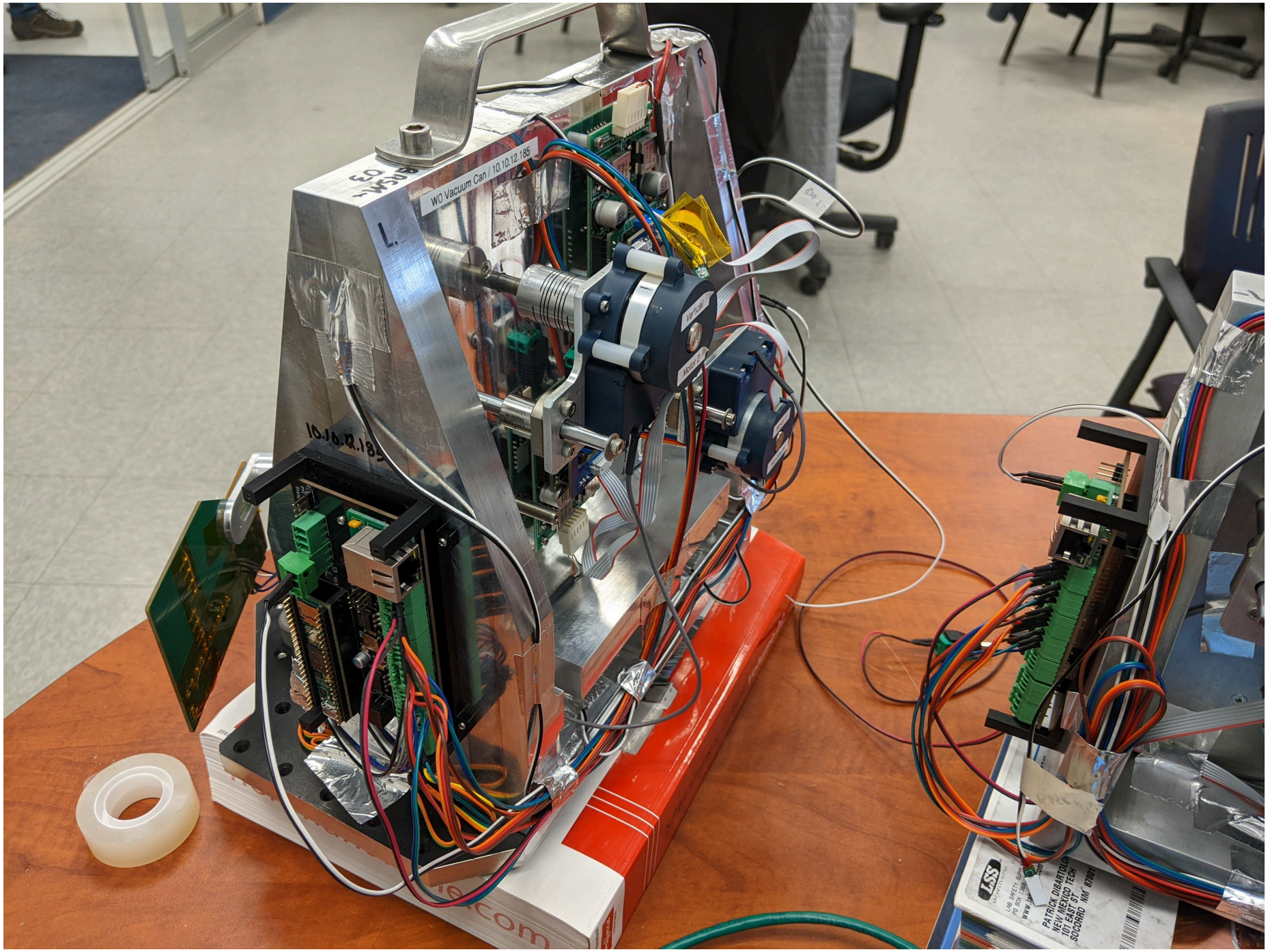





UT2


BALL VALVE
BALL VALVE
631W3A




WO Vacuum Can / 10.10.12.185
L.
R
Vertical
Master
10.10.12.185


10
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30
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70
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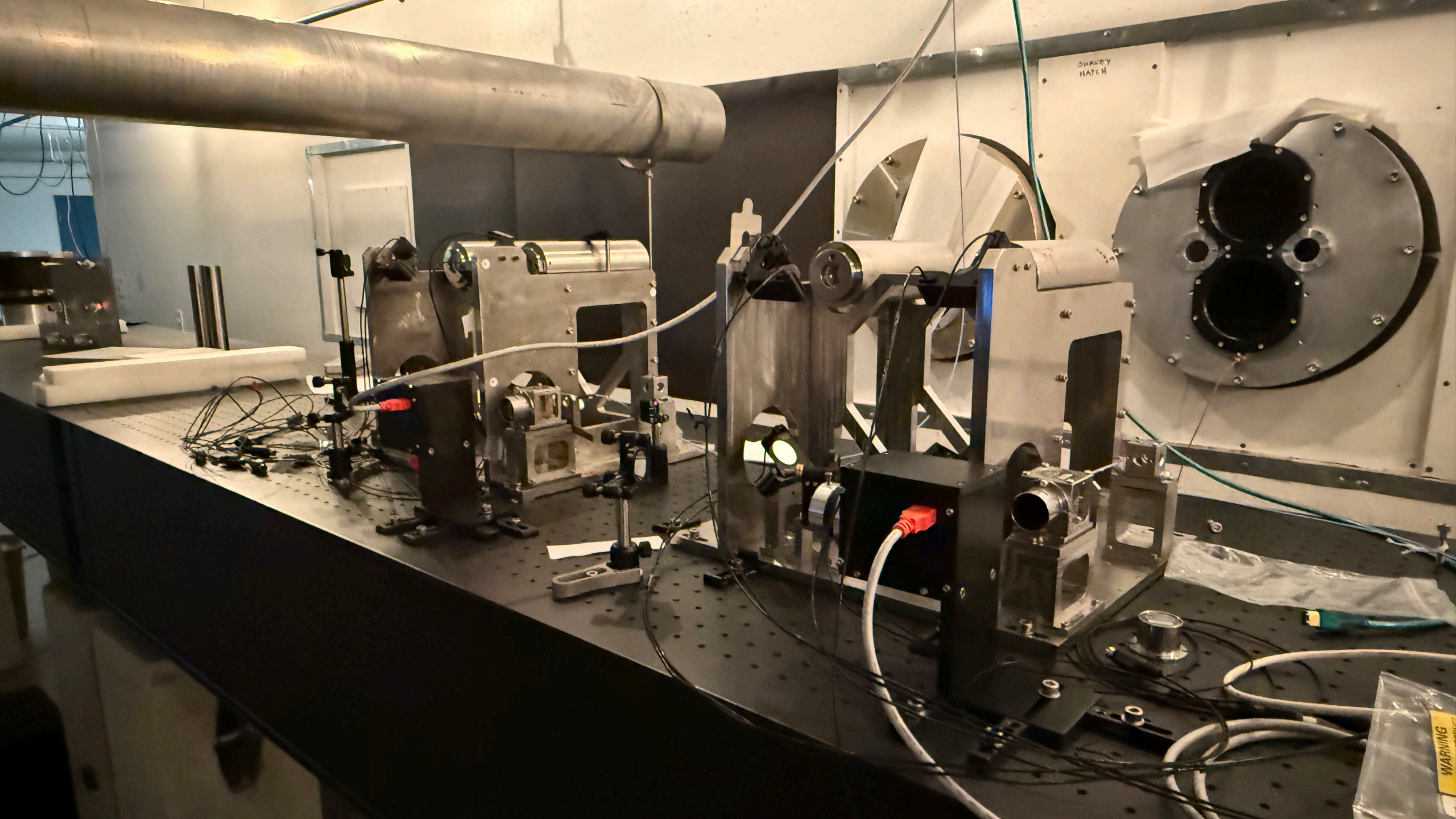
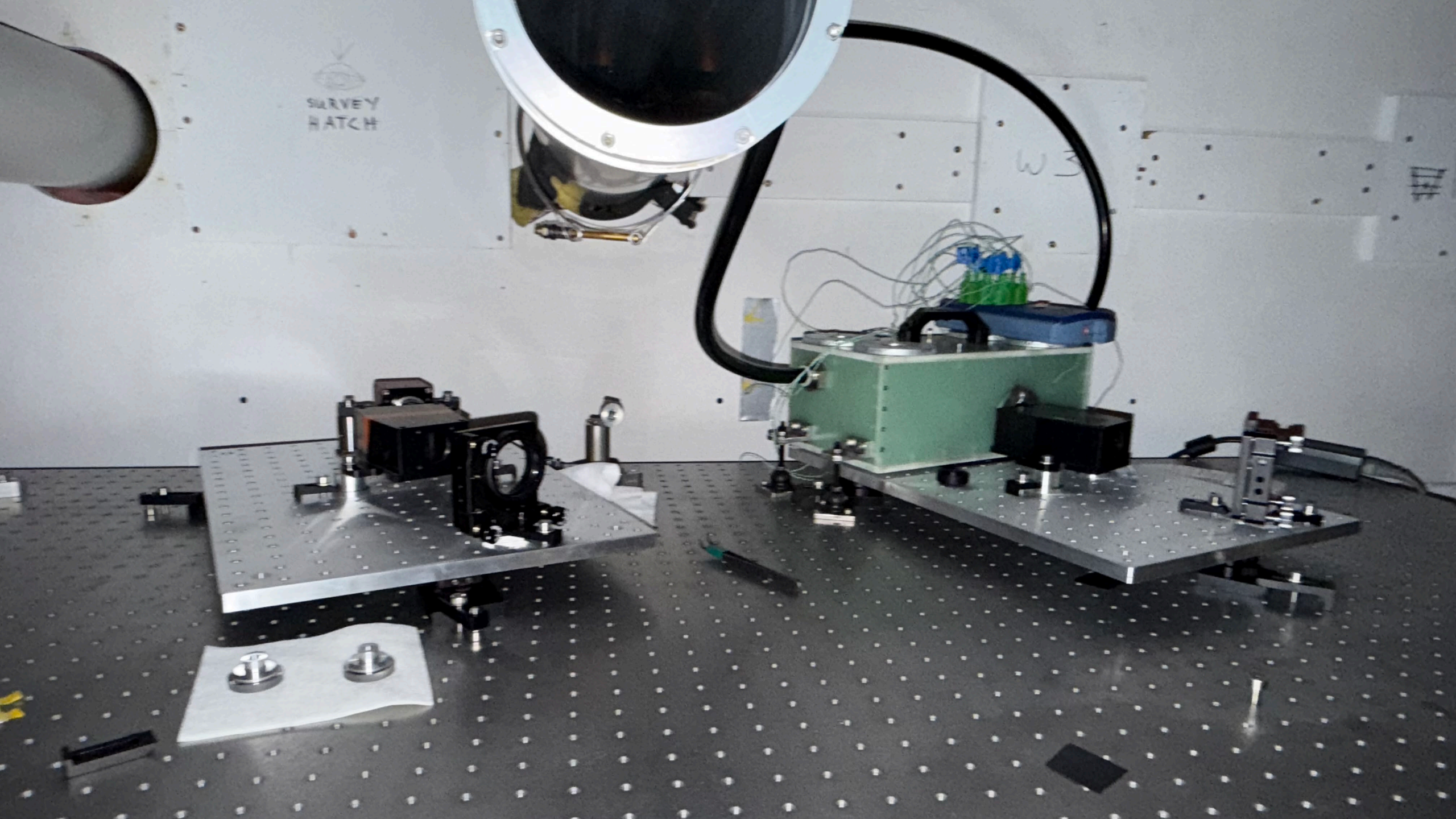
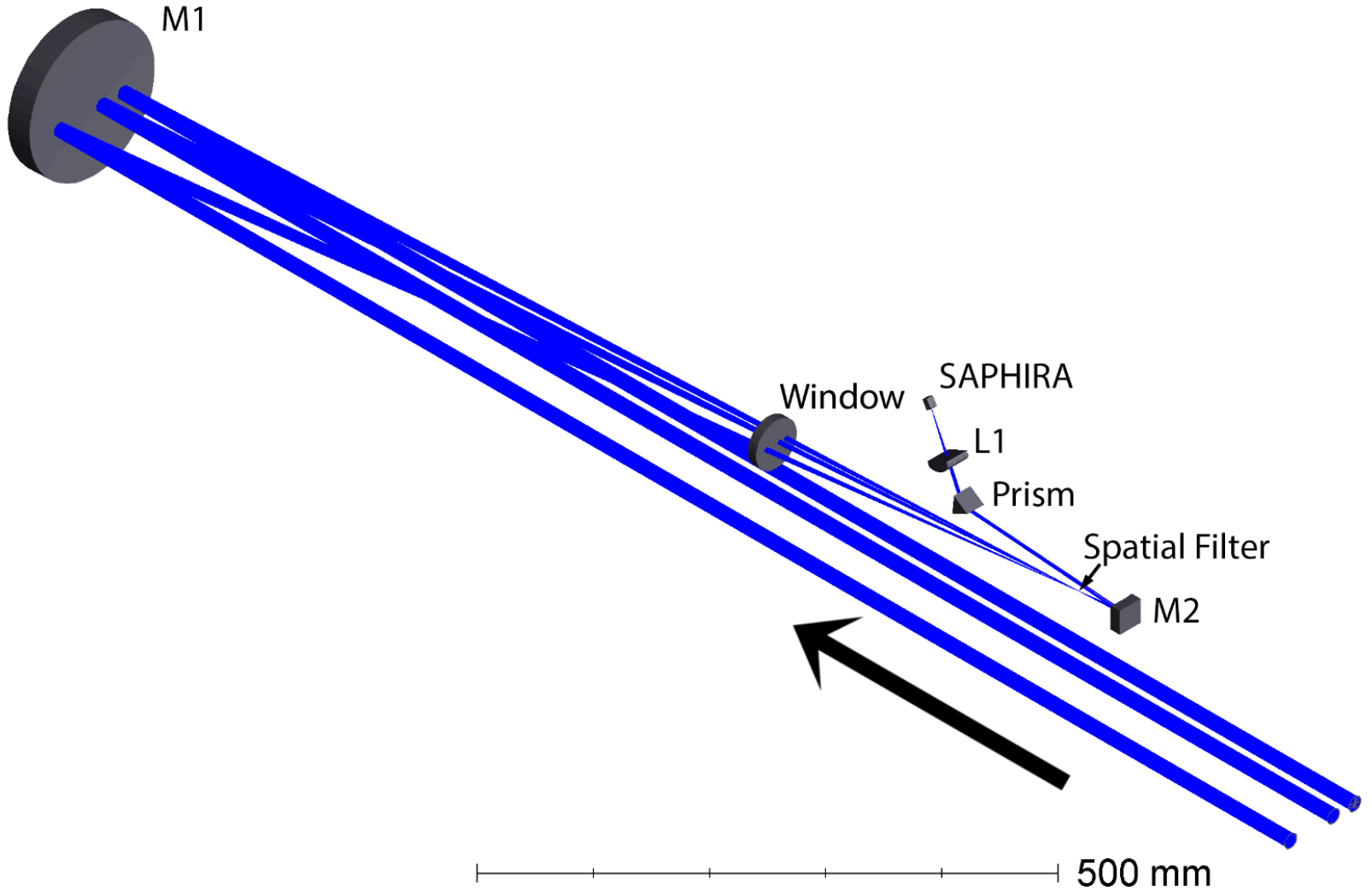
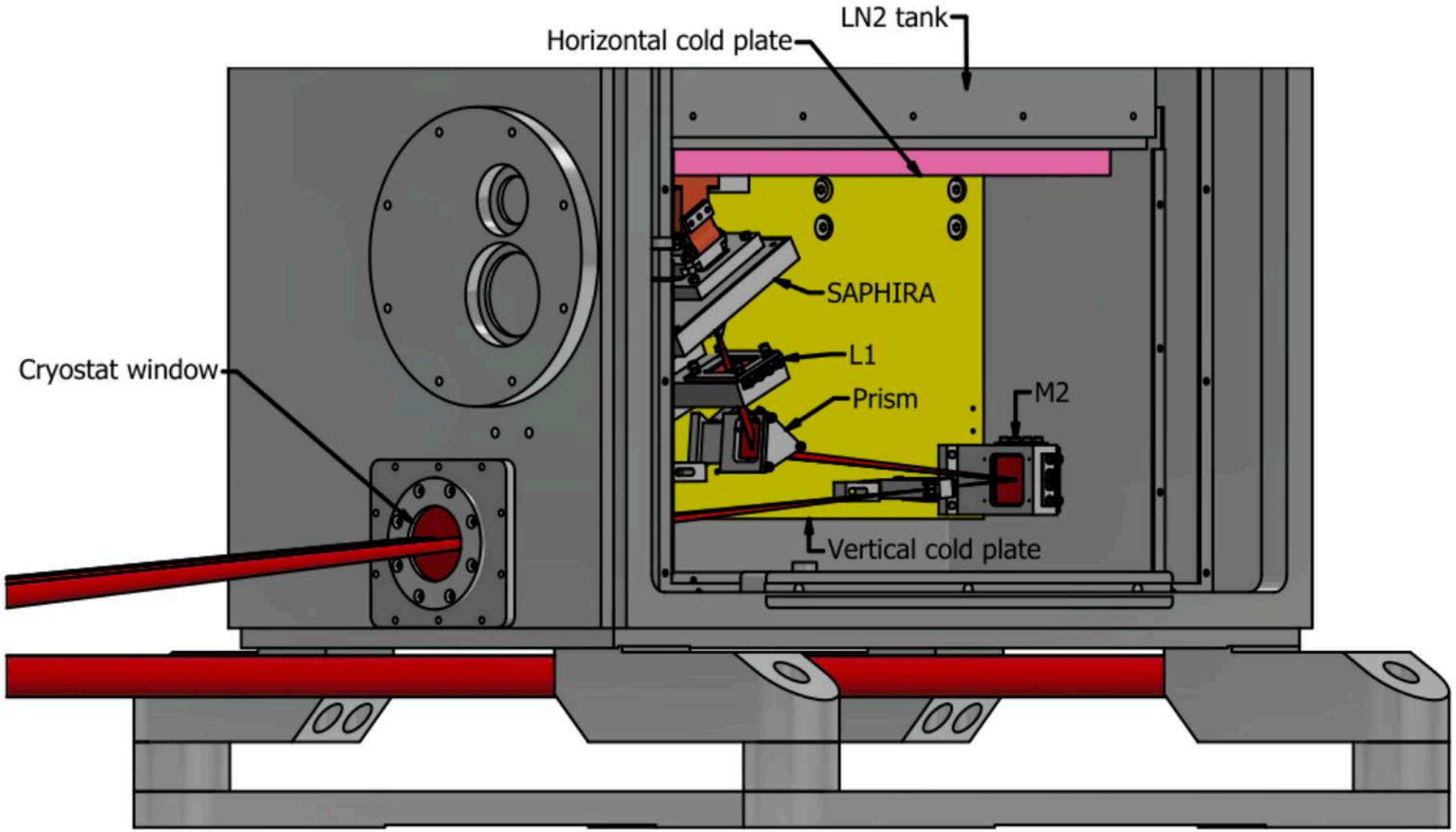

SHUTTY
HATCH
WARNING

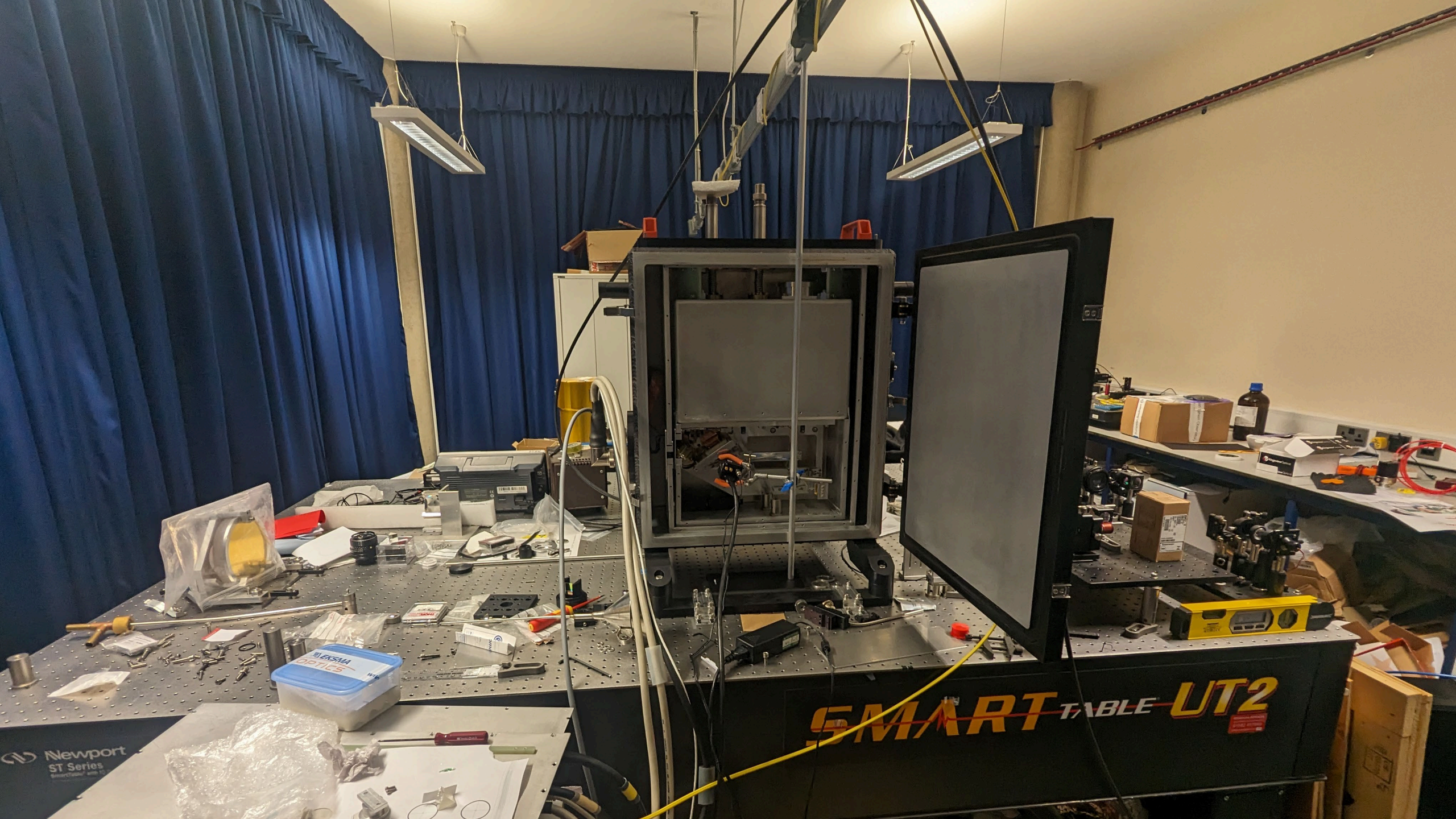

VERE


SURVEY
HATCH

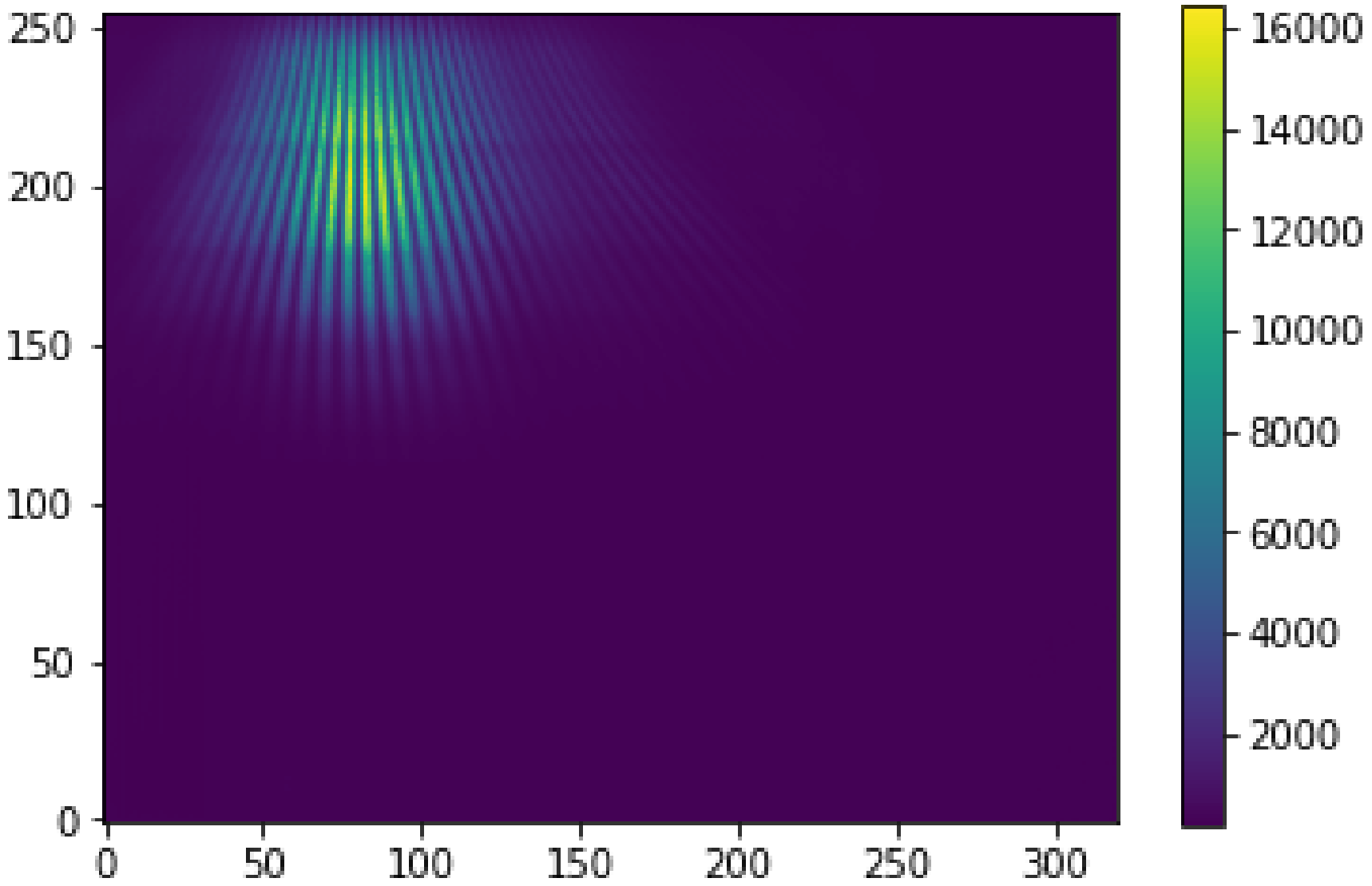
FOURIER is a 3-beam JHK combiner for MROI



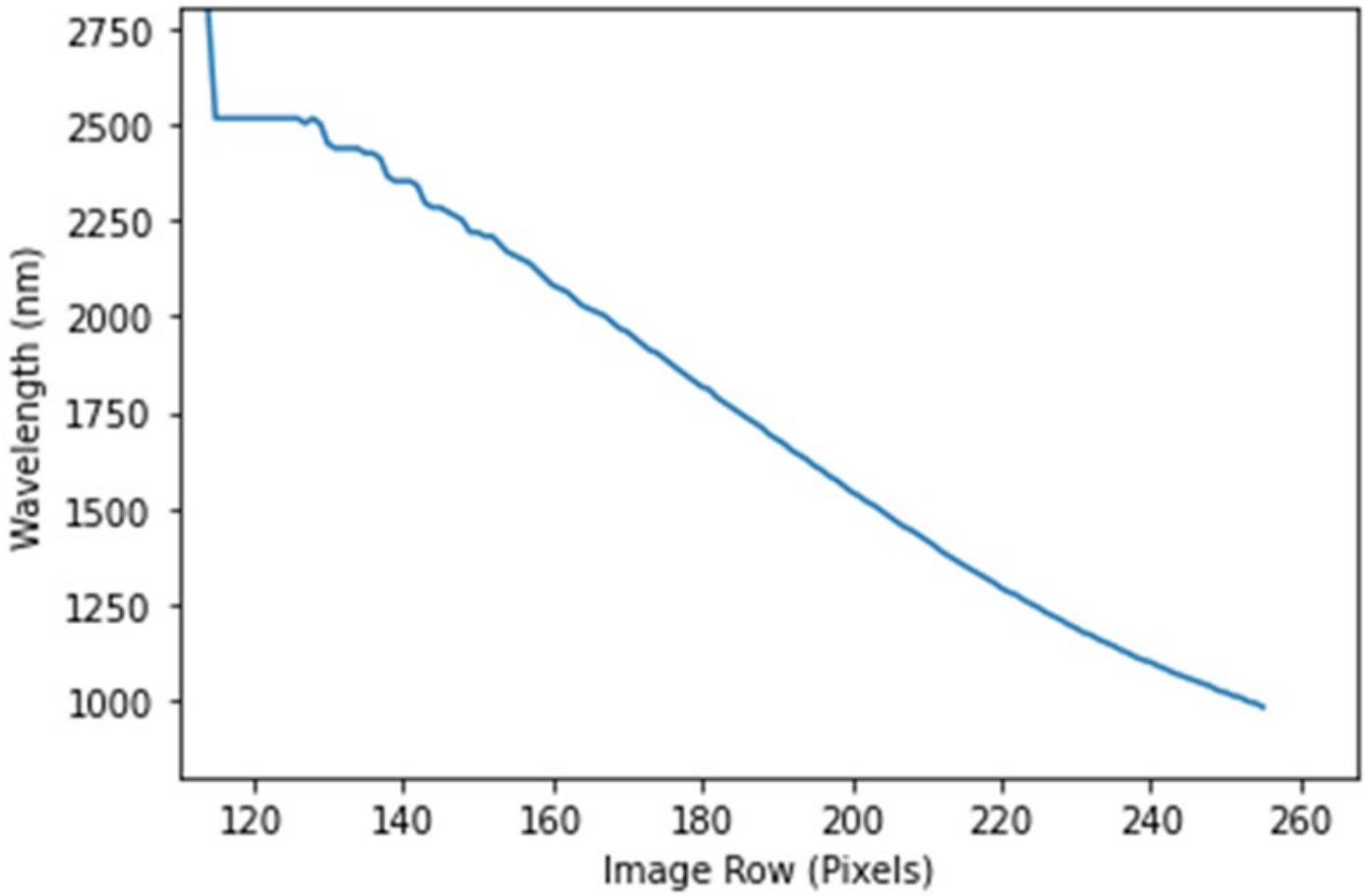

LN2 tank
Horizontal cold plate
SAPHIRA
L1
Prism
M2
Cryostat window
Vertical cold plate


Newport
ST Series
EKSMA
OPTICS
SMART TABLE UT2

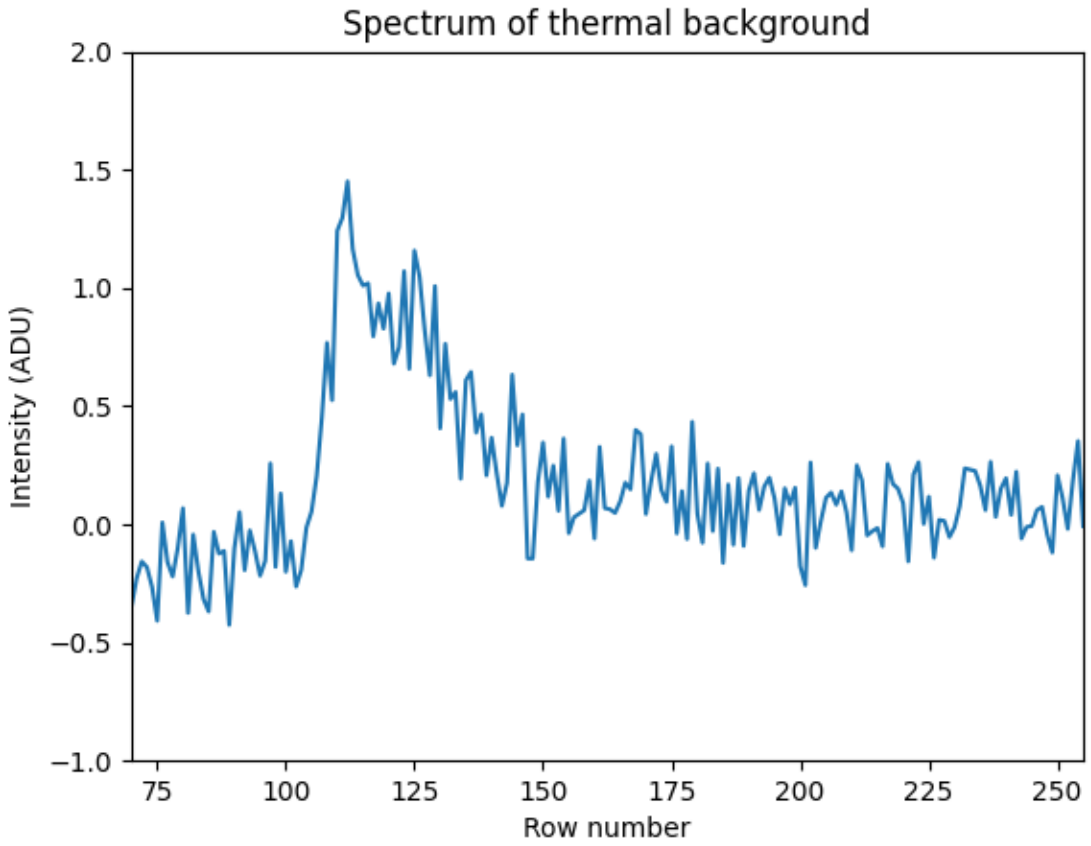
IN


250
200
150
100
50
0
0
50
100
150
200
250
300
16000
14000
12000
10000
8000
6000
4000
2000

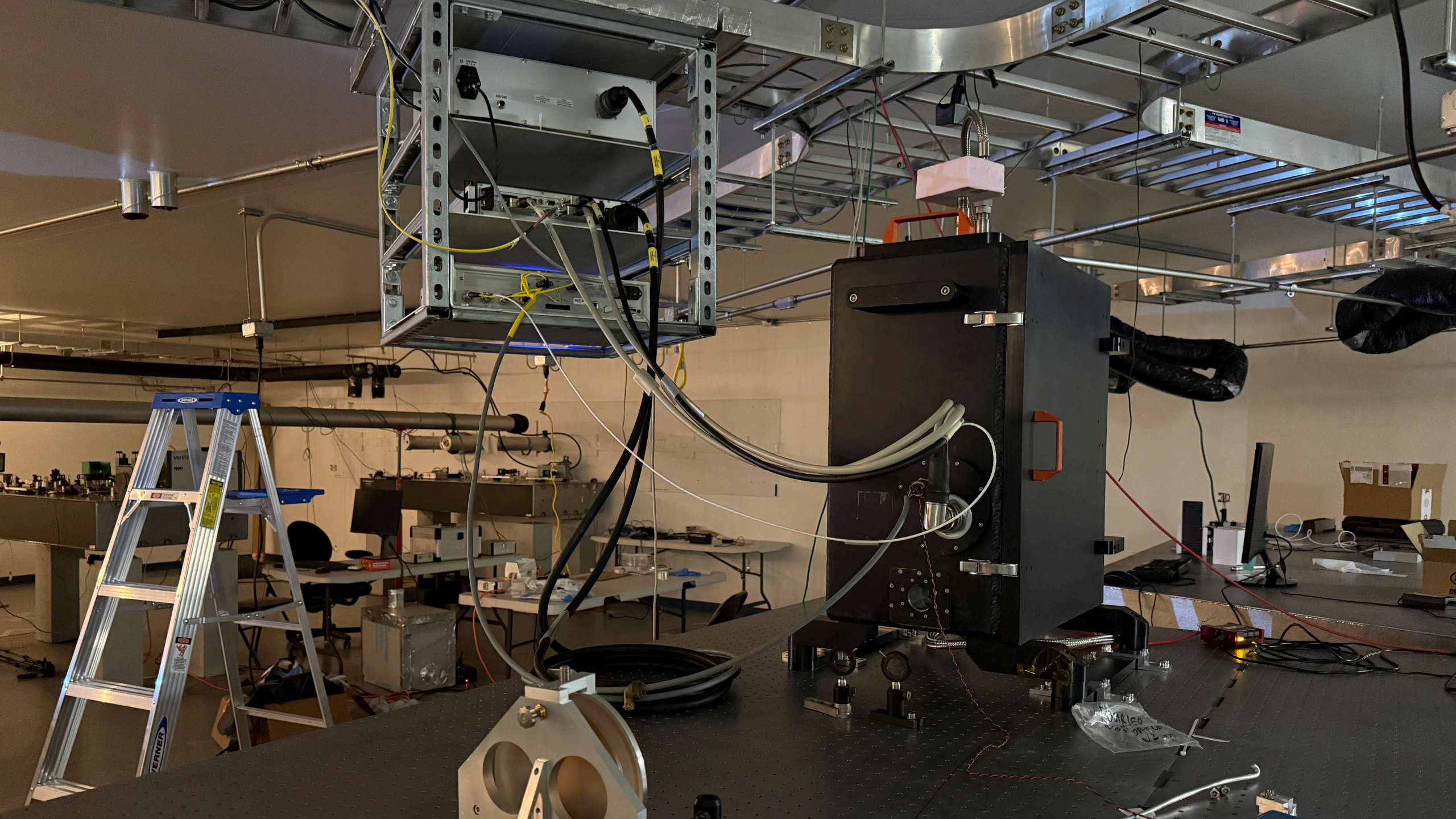
R~70, Nyquist sampled (11nm per pixel)

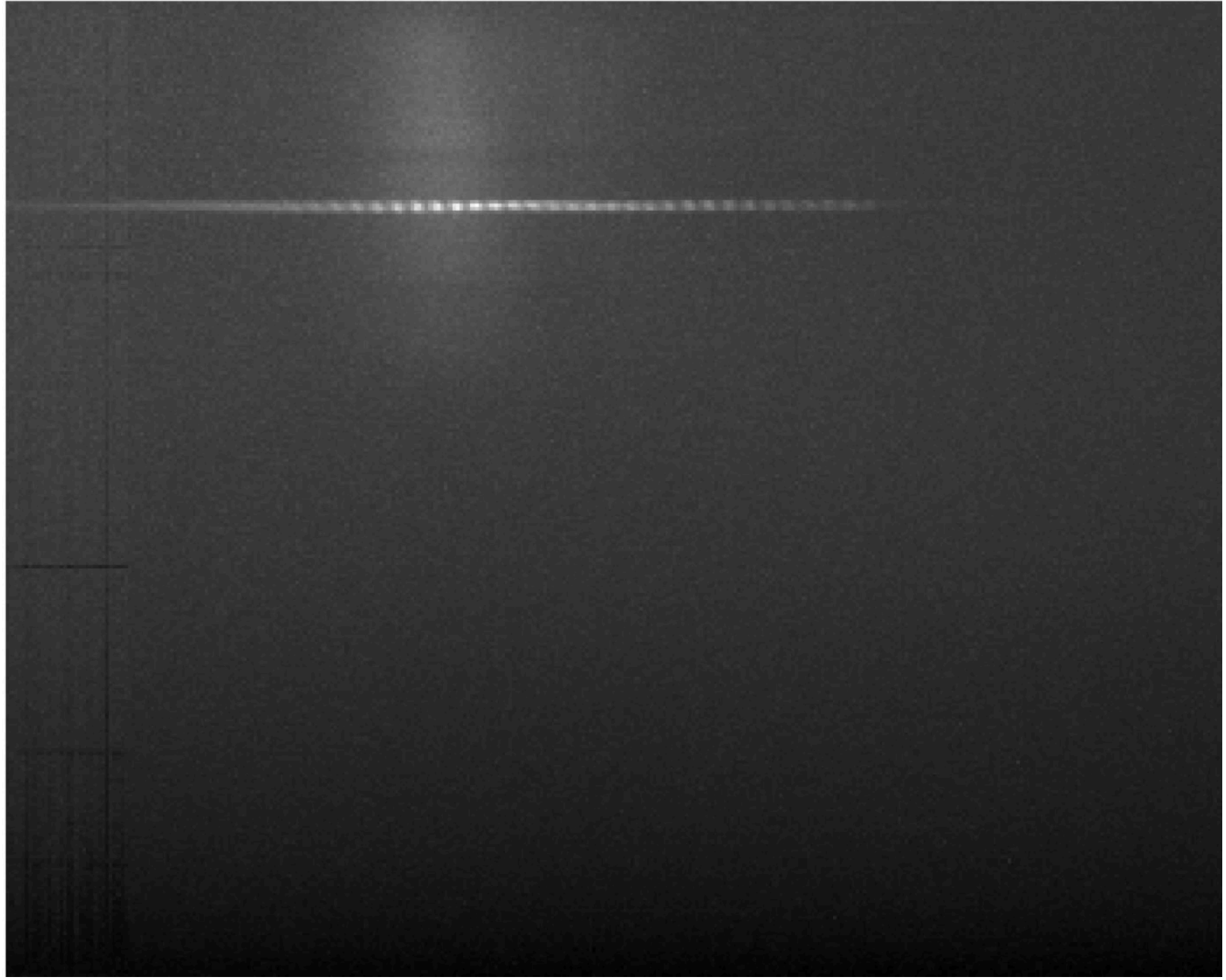


The thermal background is mostly confined to the long end of the K-band




Beech





Current FOURIER performance

- 0.1 electron read noise @ 0.7 millisecond frame time (CDS)
- But: ~400 electron/pix/sec “dark current” – should be less than 10 e/pix/sec at 80K – probably still leaking thermal radiation through gaps in radiation shield
- If we can plug these leaks, (conservatively) estimate group-delay fringe tracking at ~ H=10 mag in good seeing

Current outlook

- Managed to get $4M for MROI in most recent (April 2025) Congressional allocation
- Aiming to get another $14M in FY2026 – would allow completion of the 3-telescope array


FIRE
DO NOT BLOCK
FIRE
EXTINGUISHER

Spare slides