F9 Strategic meeting

Krvavec, September 28-30, 2026

F9 – Research Infrastructure

September 29, 2026

Andrej Gorišek (Ljubljana)

Jožef Stefan Institute

F9 large experiment involvment

Jožef Stefan Institute

- Involved in ATLAS, Belle II, LHCb, Pierre Auger Observatory, CTAO
- We are very good and valued in developing new detectors,
- TRIGA Reactor is used as a irradiation facility (n and gamma) that has been successfully used for HL-LHC fluences and beyond
- We are contributing to number of QA and QC efforts. Examples:
  a. ATLAS ITk strip module QA
  b. ATLAS ITk petal bus tape testing robot. Dedicated robot developed to test large area flexible bus tapes in different stages of production (tape, tape on skin, core)
  c. ATLAS HGTD
  d. LHCb, Belle II RICH's

- Do we want to / are we obliged to contribute more to the **"production"** side of large experiment upgrade efforts?

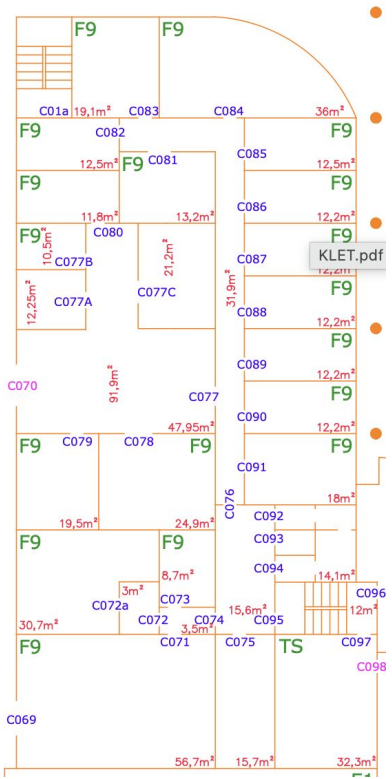
Current facilities

- We have limited lab space ~250 m2
  a. C077A – BCM lab, QA + Basir's office - 10.5 m2
  b. C077B – common tools space – 12.2 m2
  c. C077C – bonding lab, 2 bonding machines, 1 automatic probe station – 21.2 m2
  d. C069 – Si-lab, various setups, probe stations, QA for ITk strips – **56.7 m2**
  e. C072A – But Tape Testing Robot – **ATLAS ITk production** – 30.7 m2
  f. C073 – Noise isolated room – 8.7 m2
  g. C73 – Photon detector lab – **90.8 m2**
  h. C86 – TPA lab – 19.5 m2
  i. C078 – mechanical workshop – 24.9 m2

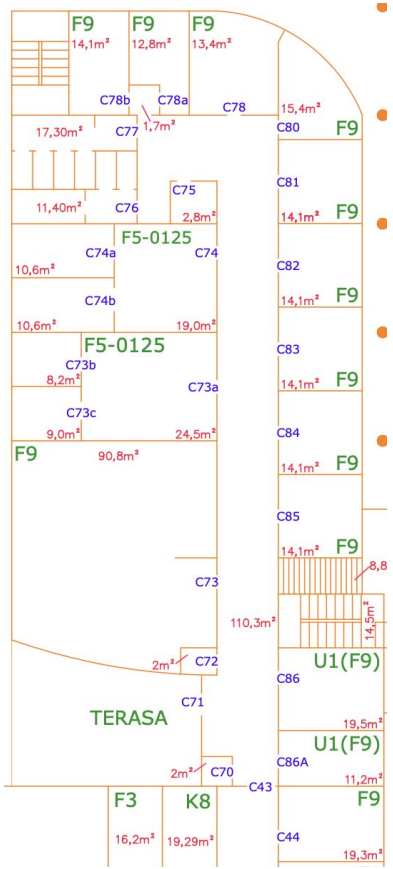
Current facilities

Tip prostora	Število prostorov	Kvadratura	Delovnih mest	Zasedenih	Prostih	m² / delovno mesto
Elektronska delavnica	1	19.5 m²	2	2	0	9.8 m²
Hodnik	2	48.0 m²	7	7	0	6.9 m²
Laboratorij	8	250.3 m²	2	2	0	125.2 m²
Pisarna	20	272.5 m²	48	46	2	5.7 m²
Seminarska soba	1	36 m²	0	0	0	
Strojna delavnica	1	24.9 m²	0	0	0	
Tajništvo	1	19.1 m²	1	1	0	19.1 m²
Skupaj	**34**	**670.3 m²**	**60**	**58**	**2**	**11.2 m²**

Current facilities



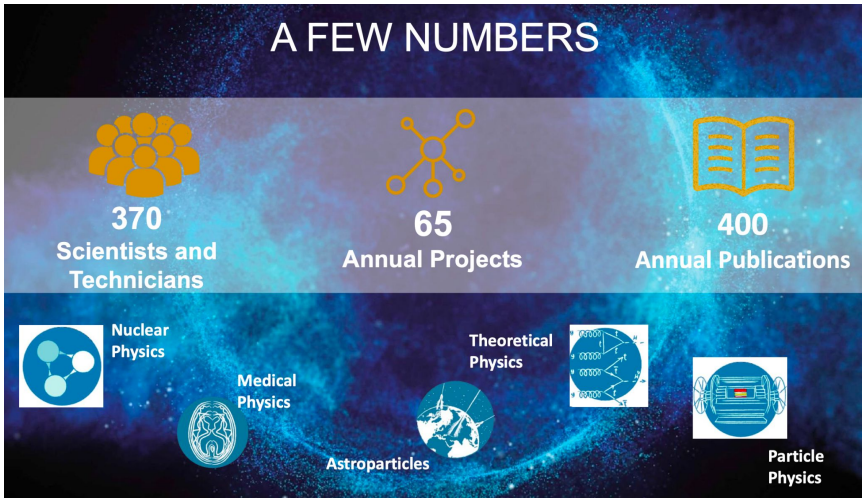
basement



1st floor

IFIC Valencia

- We (Rok, Samo, Andrej) have visited IFIC in Valencia one week ago to try to evaluate the state of their laboratory
  a. IFIC is involved in **module building** for ATLAS ITk strips and **module loading** to ATLAS ITk strips petals
  b. They are involved in future LHCb tracker upgrade
  c. Much larger than our group – grown ~3x in 20 years **~200 people** working in experimental HEP



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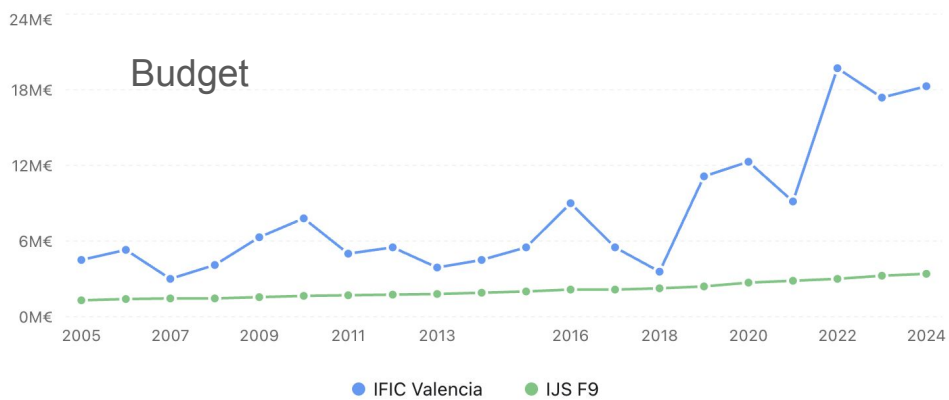
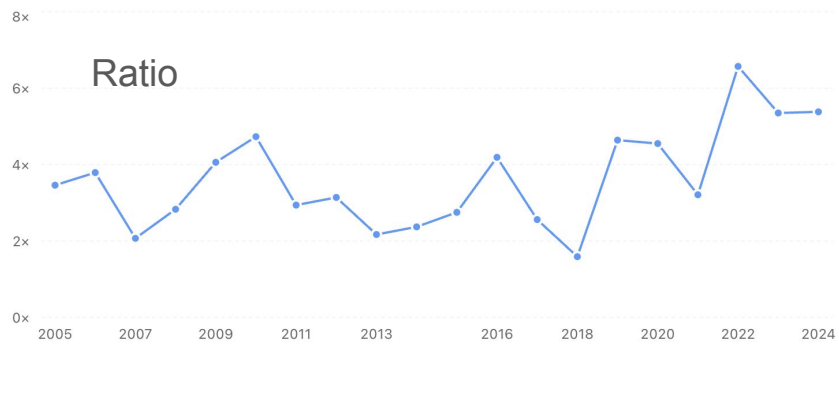
- 3 year rolling grants that can vary +/- 20% (currently ATLAS ITk is at -20% ~500kEUR/y)
- Total budget 3-4 x of F9 – last couple of years increase due to new beam injector construction at IFIC
- 1/3 of the staff administrative and technical 60-70% technicians
- E.g. "Dep. of electronics": permanent 7 engineers, 4 technicians + technicians hired on projects
- Have their own knowledge transfer department (3 physicists)
- Catalogue of infrastructure — industry comes to collaborate





IFIC Valencia – Clean Room's (~100m2)

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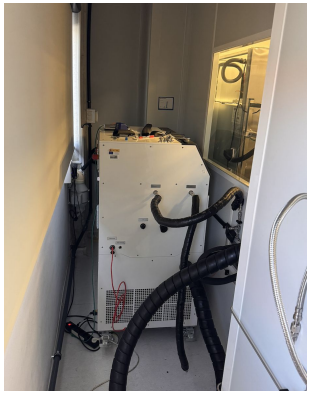
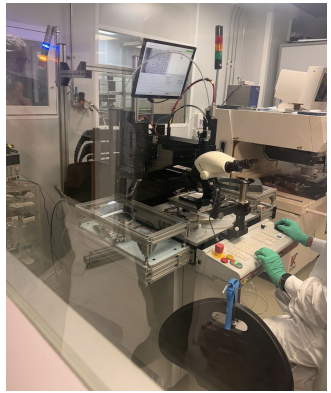
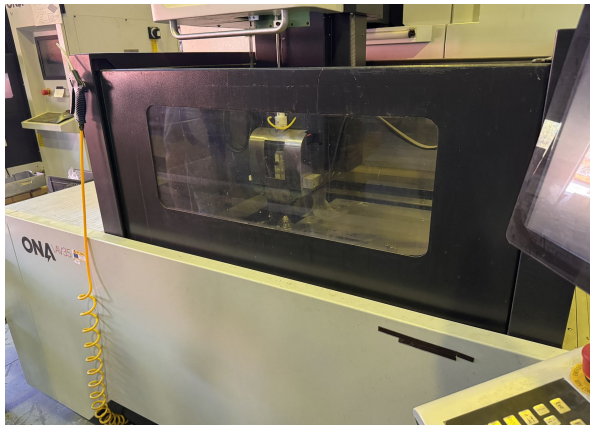




IFIC Valencia – Mechanical WS (~150m2)



IFIC Valencia – Electronics lab, Metrology,…

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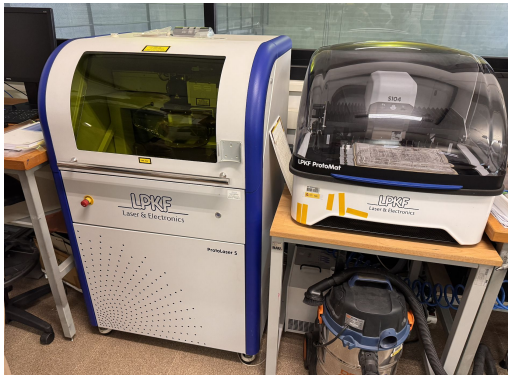

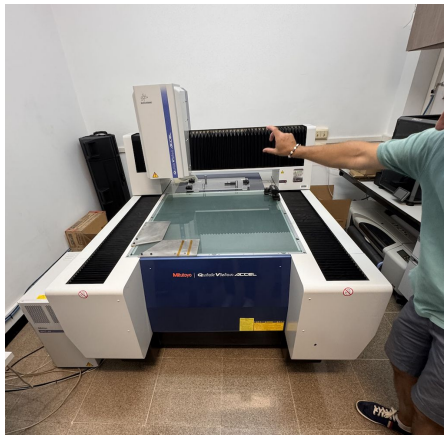

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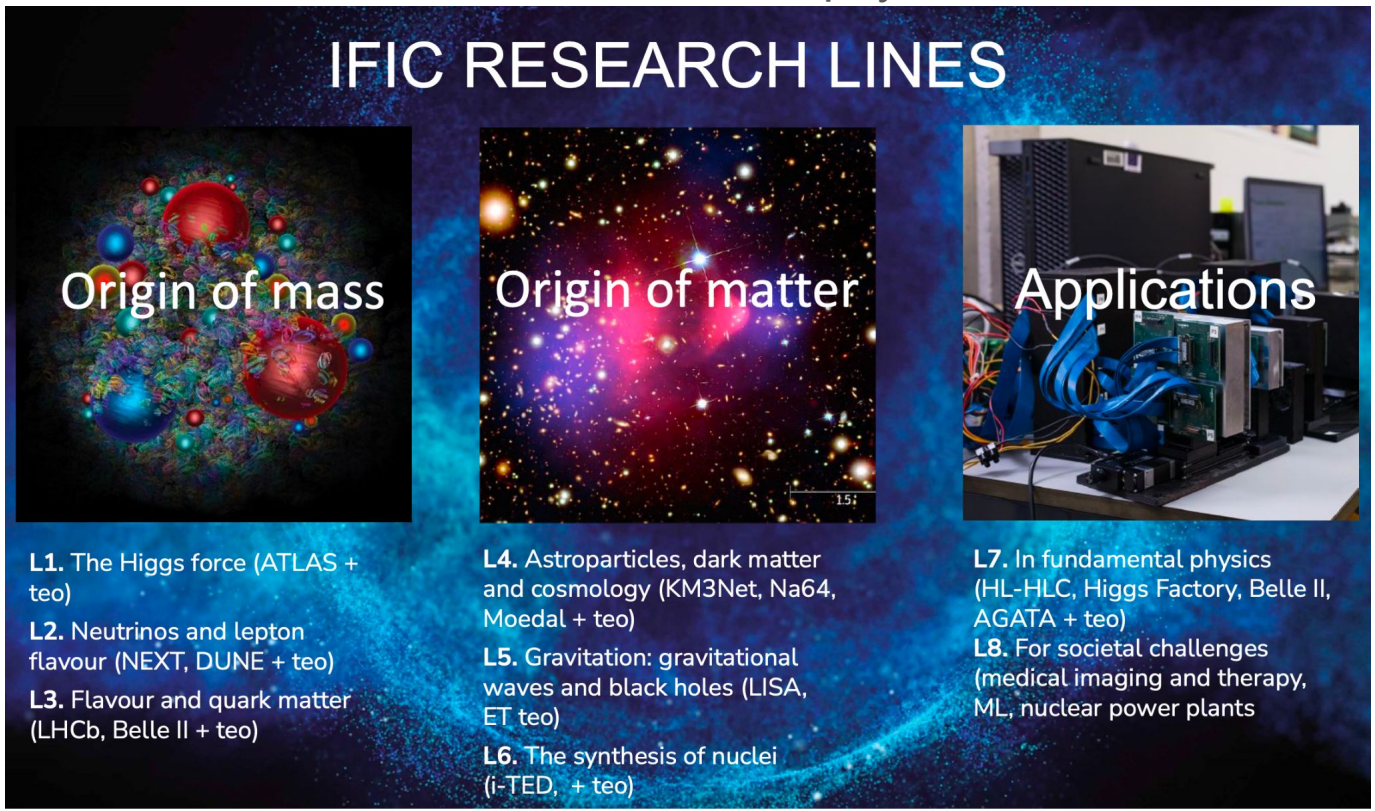
- IFIC Valencia also includes theorists, nuclear physics,



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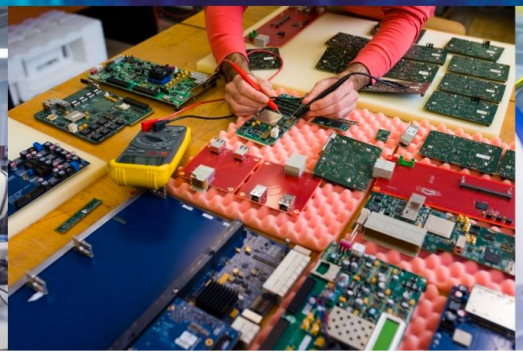
ELECTRONICS

- Design and production of electronics for data acquisition
- Mechanical and thermal characterization of components
- Experience with optical and electrical channels
- Processing at more than 100 Gpbs divided in several channels



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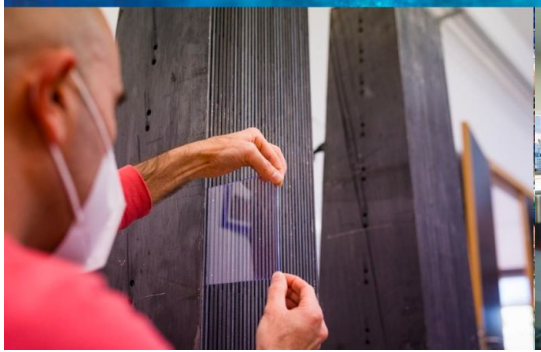
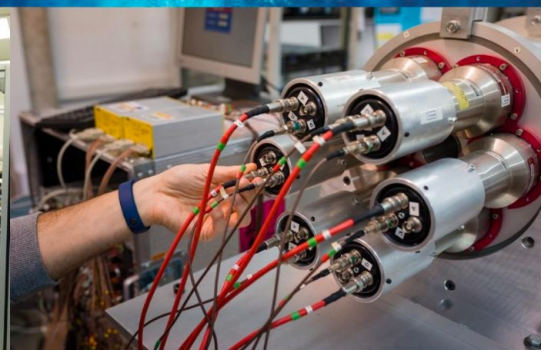
DETECTORS

- Detection of neutrons, gamma rays and charged particles
- High spatial and temporal resolution
- Experience with silicon, scintillators and gaseous detectors





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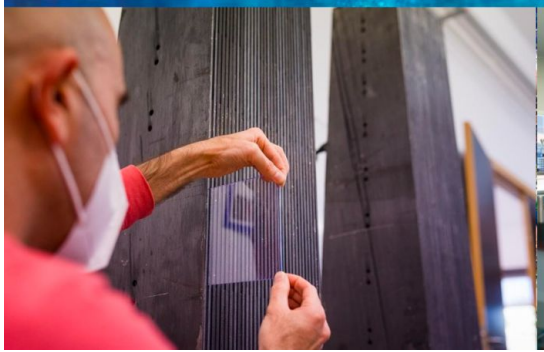
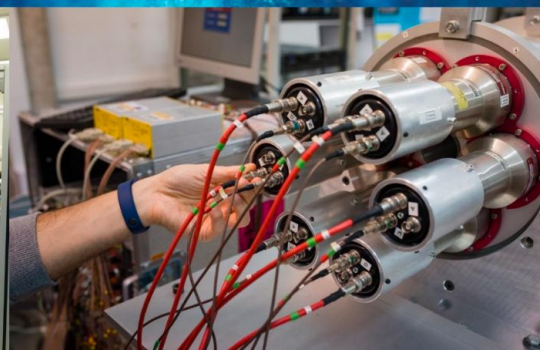
SEMICONDUCTORS

- **Design and development activities.** Design tools expertise. Chip design verification. Design and development of communication protocols. Development of CMOS detectors.
- **Electrical and thermomechanical characterization, quality control and post-processing.** X-rays inspection. Chips screening with tip table in cleanroom. Characterization IV and CV. Calibration. Bonding. Flip chip.





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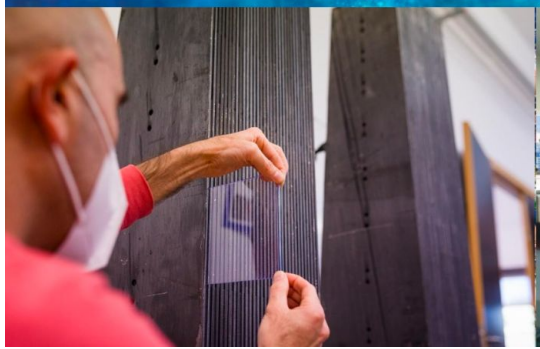
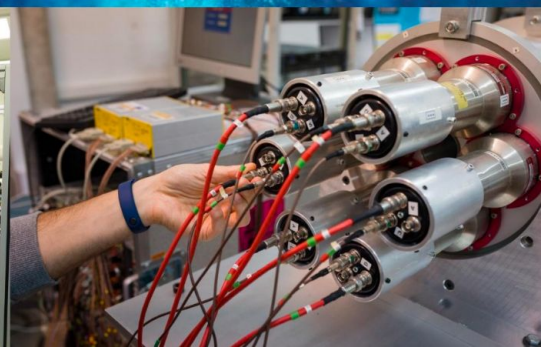
SEMICONDUCTORS

- **Infrastructures.** Cleanroom and equipment on-site, and access to infrastructures to analyze radiation damage. Development of protocols and mechanisms to evaluate silicon damage.
- **Highly skilled and specialized personnel.** On-site engineers, physicists and technicians
- **Spin off:** ALIBAVA, DAQ for semiconductors sensors





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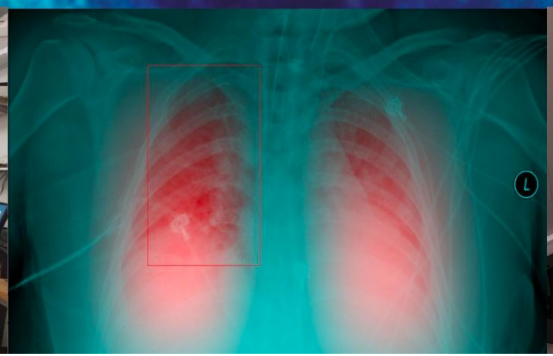
MEDICAL IMAGING

- Design and production of devices for PET imaging
- Compton camera with millimetric resolution
- Liquid Xenon detectors with high temporal resolution
- Reconstruction of TAC imaging using AI



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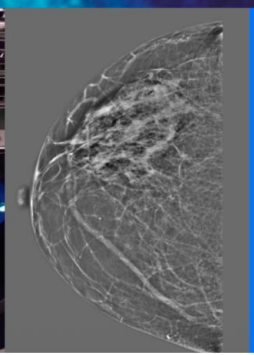
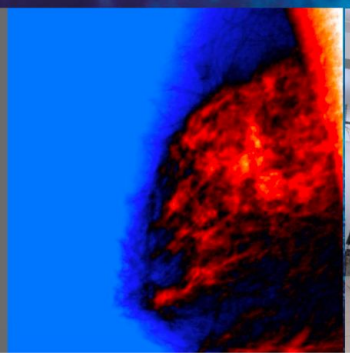
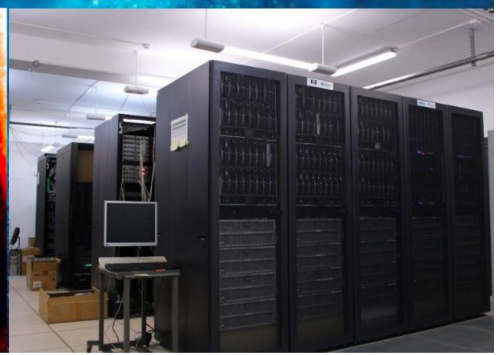
MACHINE LEARNING Y BIG DATA

- **Artemisa**: high performance infrastructure for artificial intelligence algorithms
- Machine learning applications to recognition and classification
- Image reconstruction using artificial intelligence using multiple sources

Conclusion

- Strategic question…:

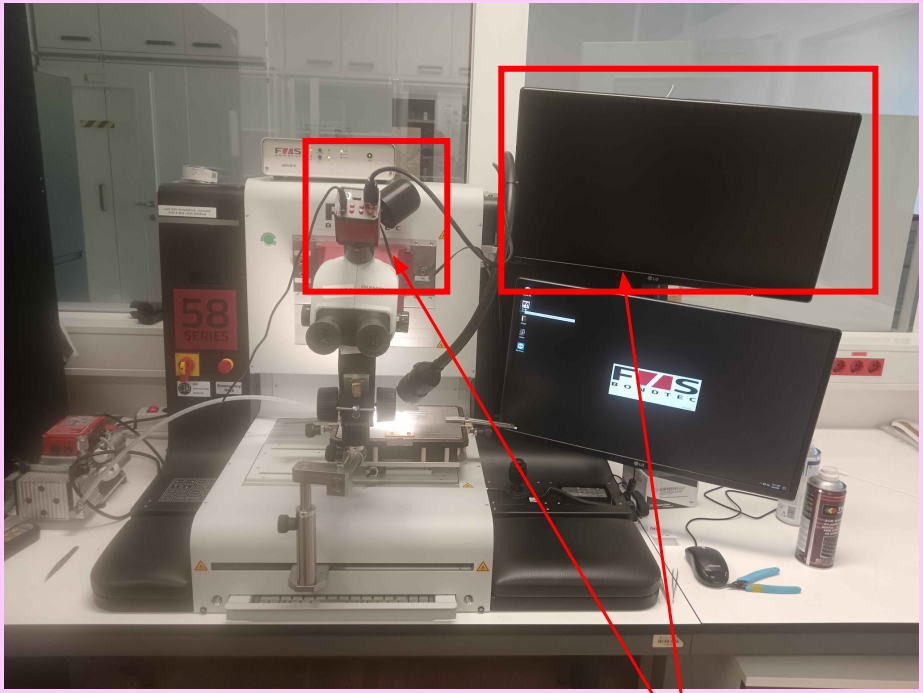
  Do we want to / are we obliged to contribute more to the **"production"** side of large experiment upgrade efforts?

Backup

Wire bonding

Idk napište kdo bo govoril

A tale of 2 bonders

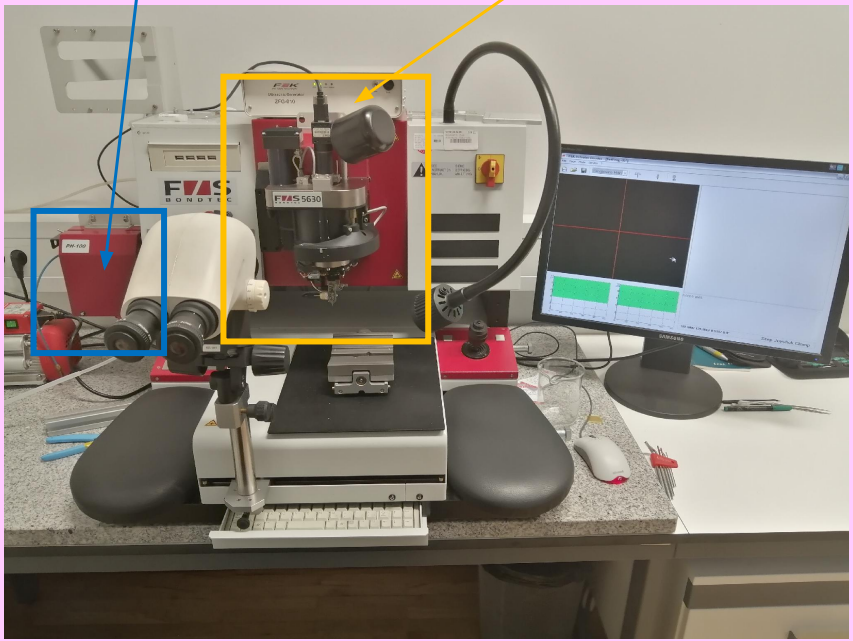


Baby

Fancy camera setup

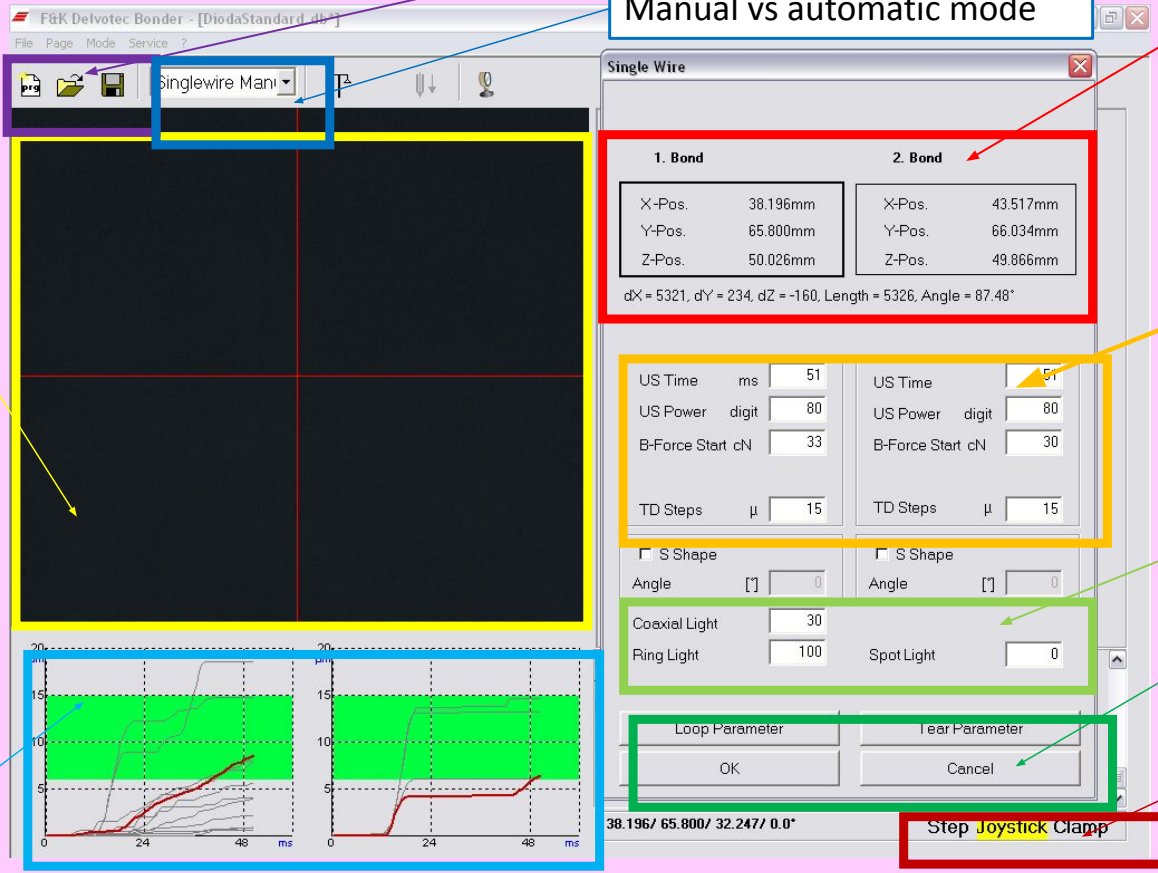
Pull test head

Bonding head



Old boy

Old bonder



Create, load & save bond program

Manual vs automatic mode

Bond position

Camera view

Bond parameters

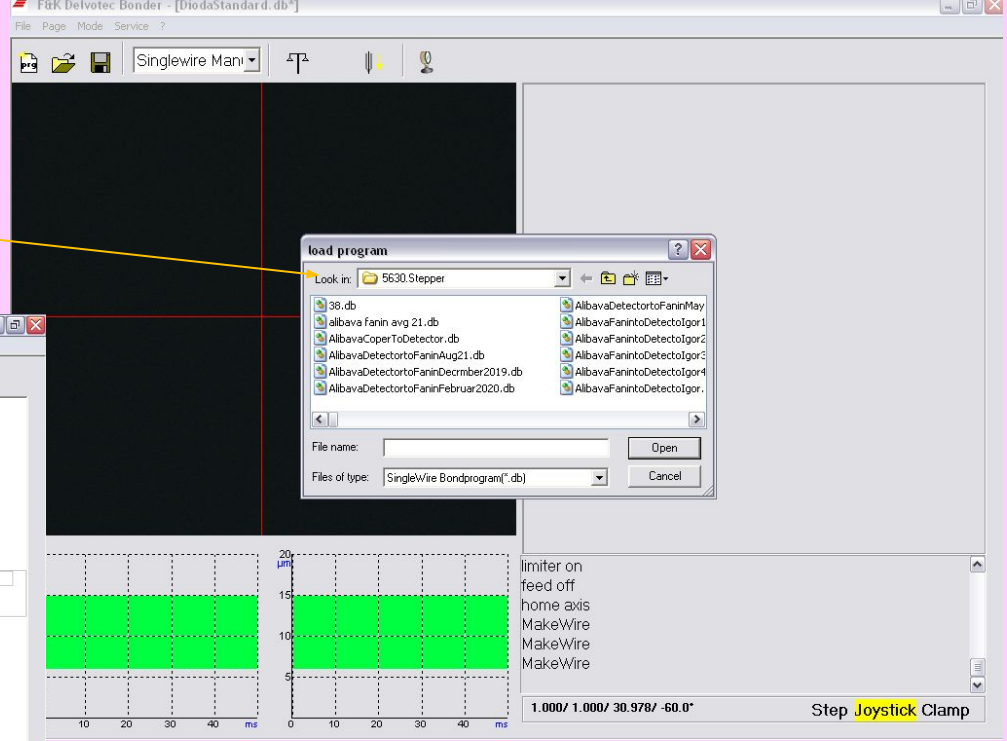
Light settings

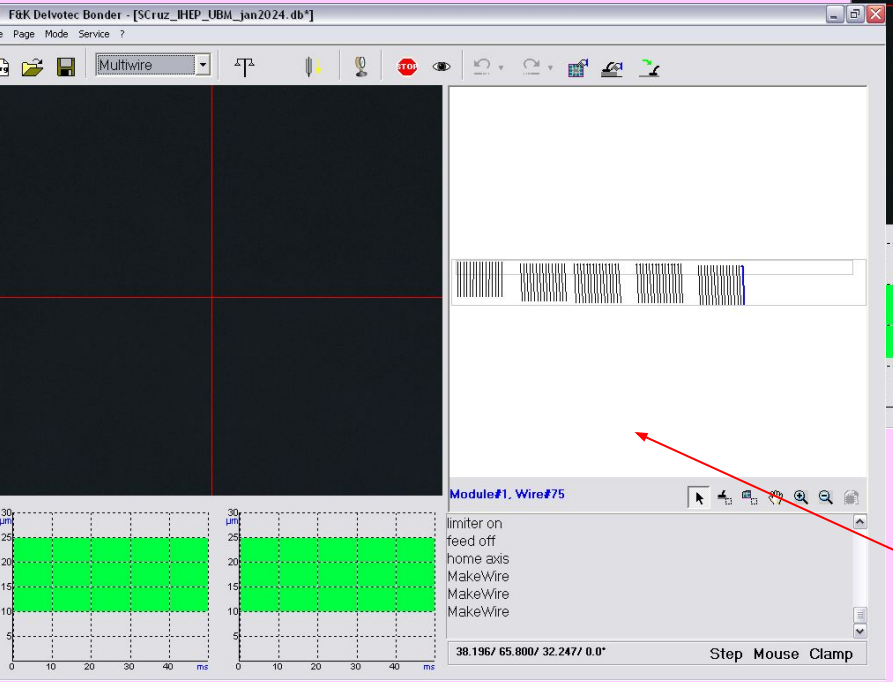
More options

Deformation curves

Indicators for step mode, joystick & clamp

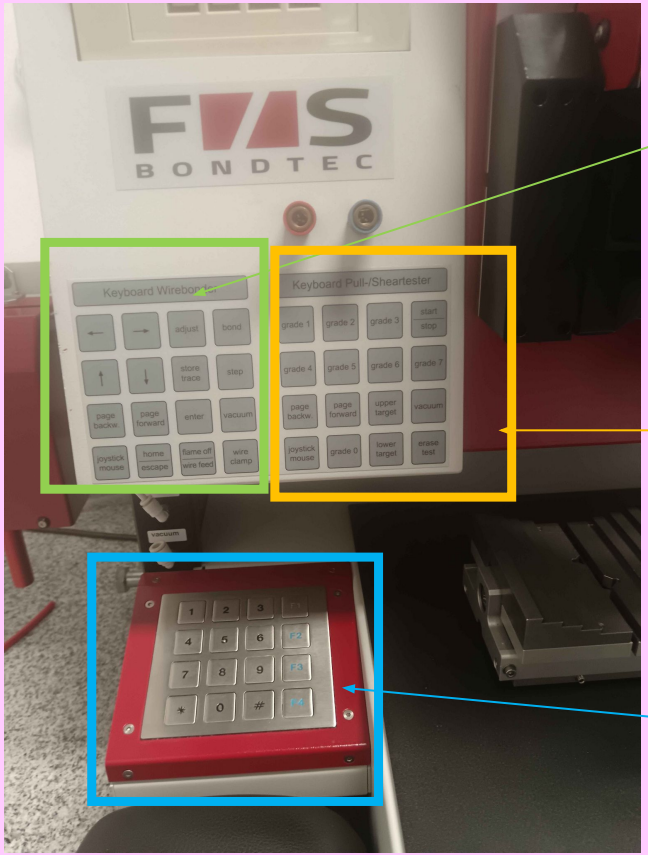
Saving and loading bonding programs





Multiwire mode – automatic bonding program
Very rigid, can move bonds but can't rotate them. Only good for samples with big surfaces & when accuracy is not needed (eg pull tests)

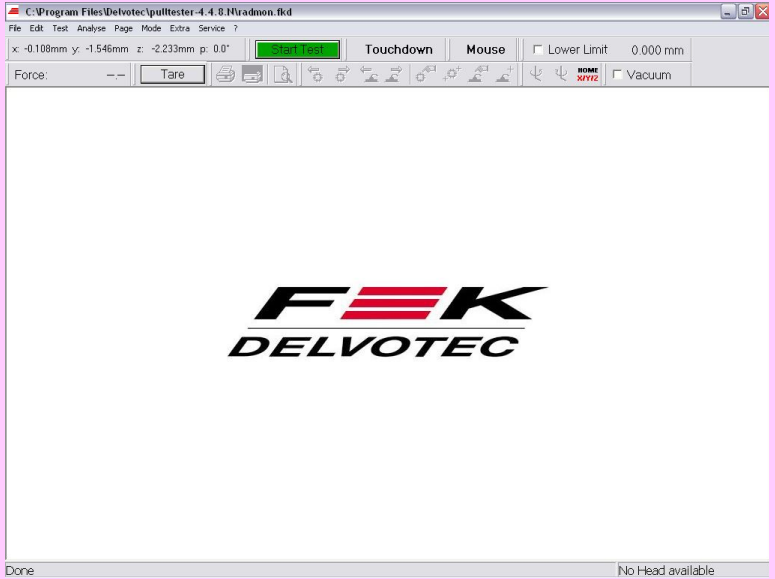
Switching between bonding & pull test mode



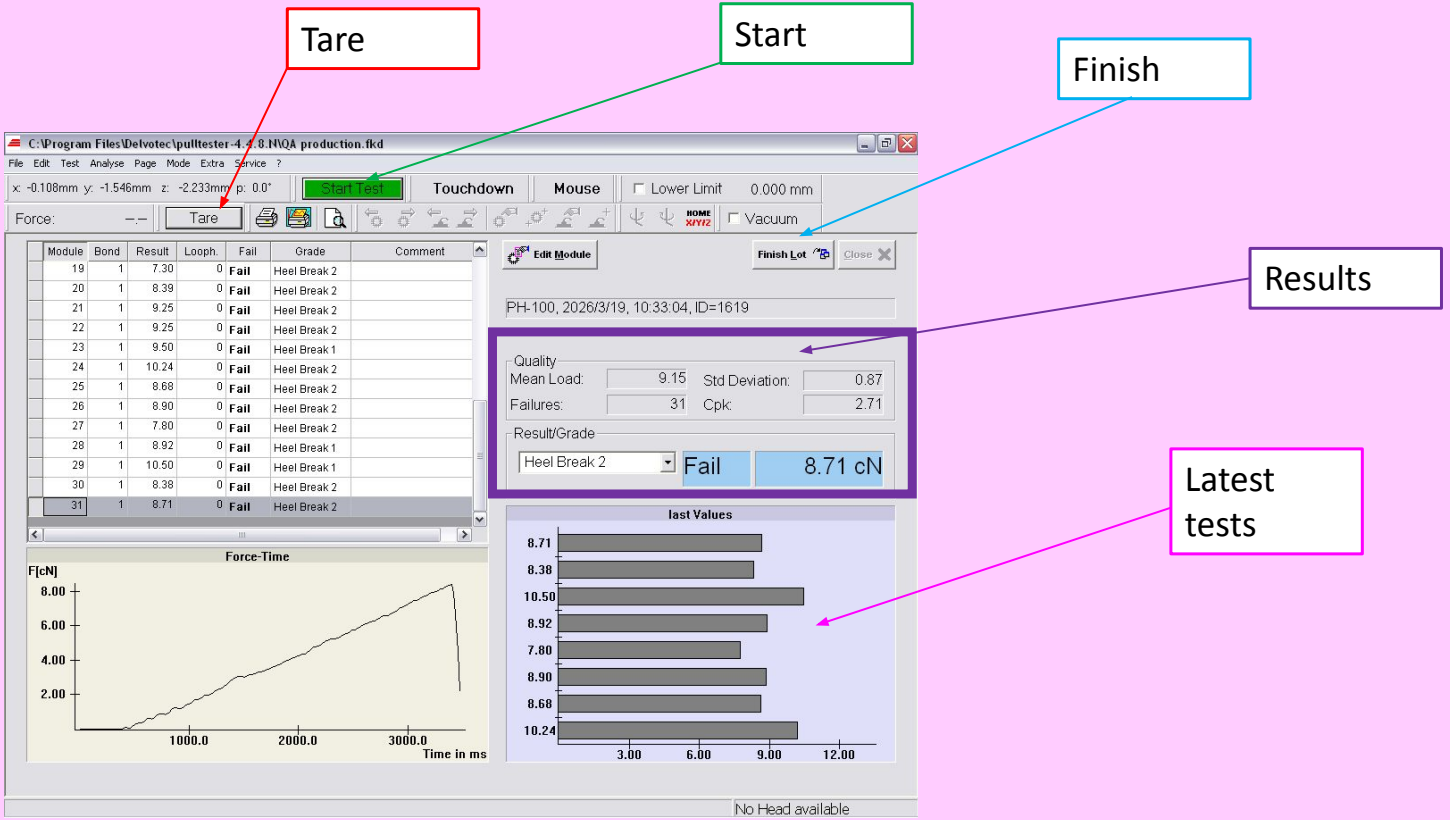
List of commands for wire bonding

List of commands for pull tests

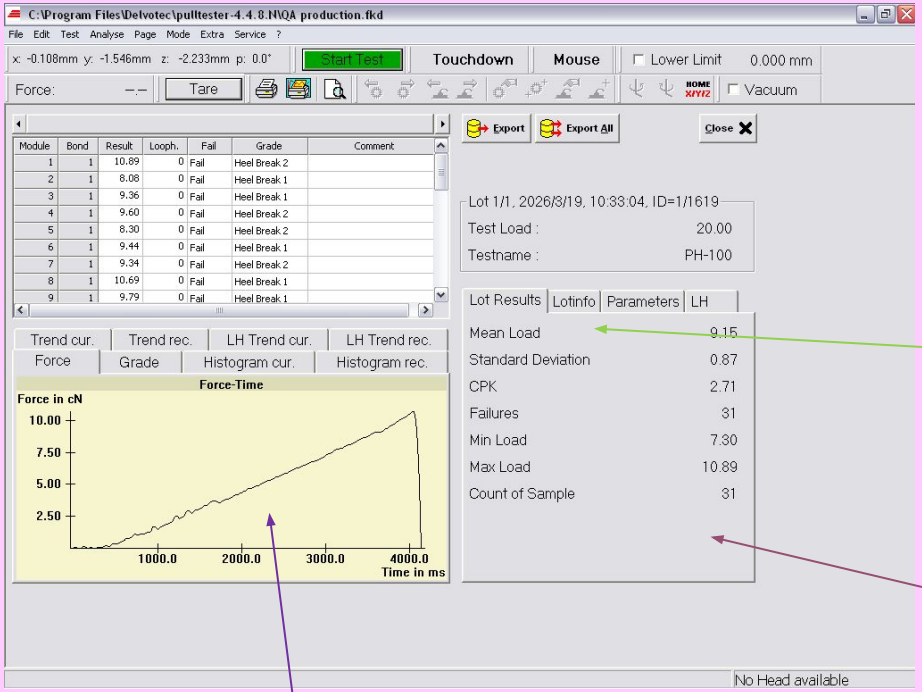
Keyboard



Conducting a pull test



Analysis of pull test

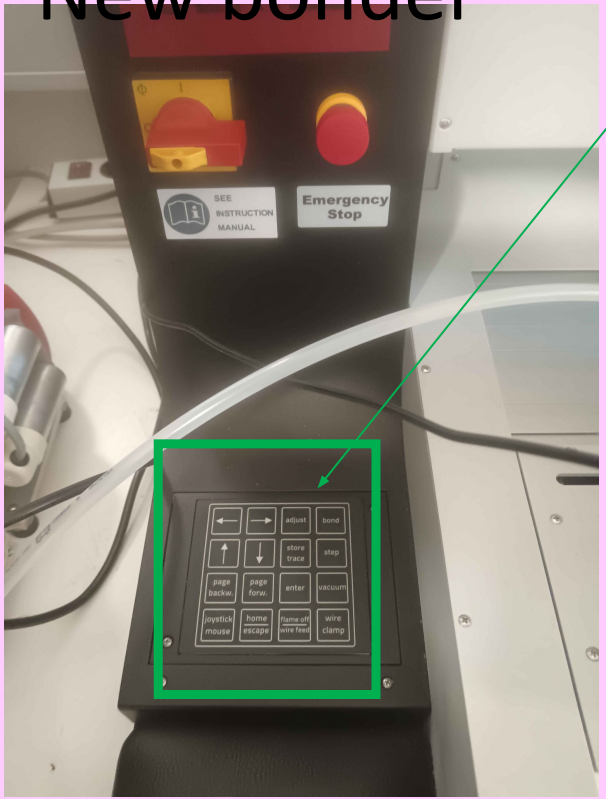


Information about the sample

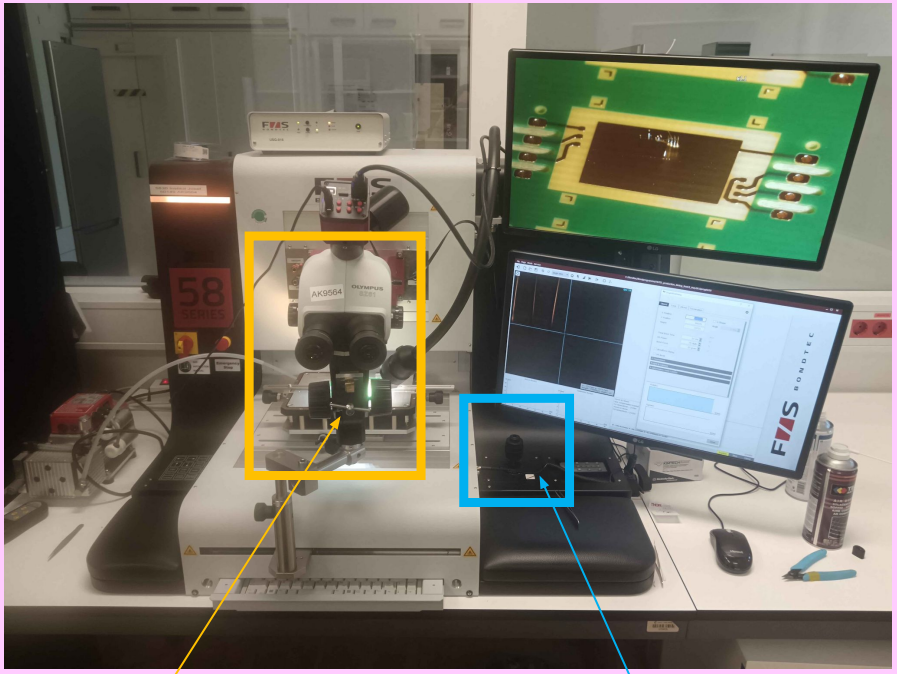
Results

Force graph for each test

New bonder



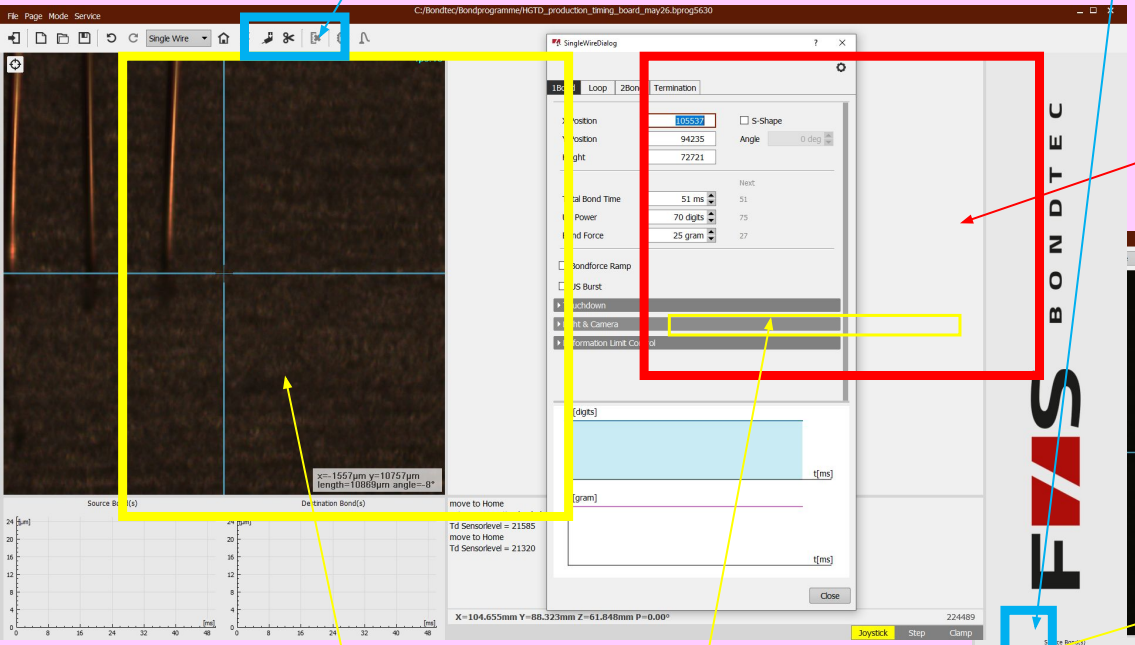
Same set-up as old bonder



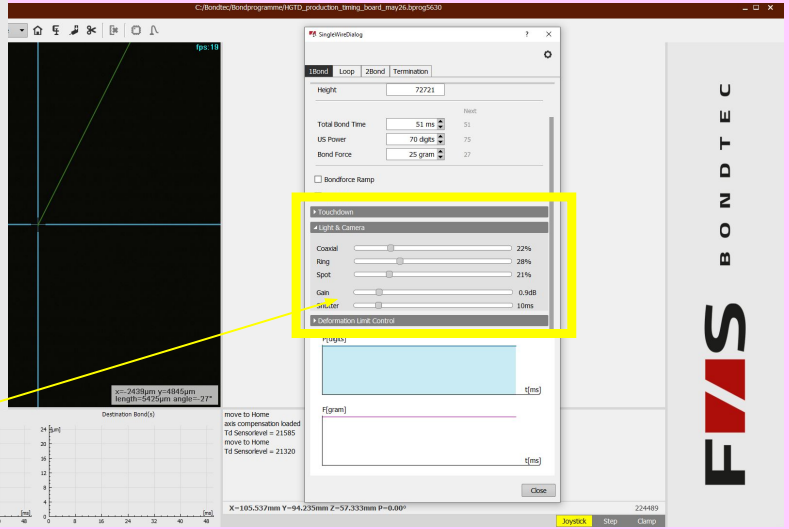
New bonder moves very fast. It's better to watch it work on the monitor

Joystick controls on the two bonders are inverted!

No manual mode – if you wish to bond manually you need to use step mode



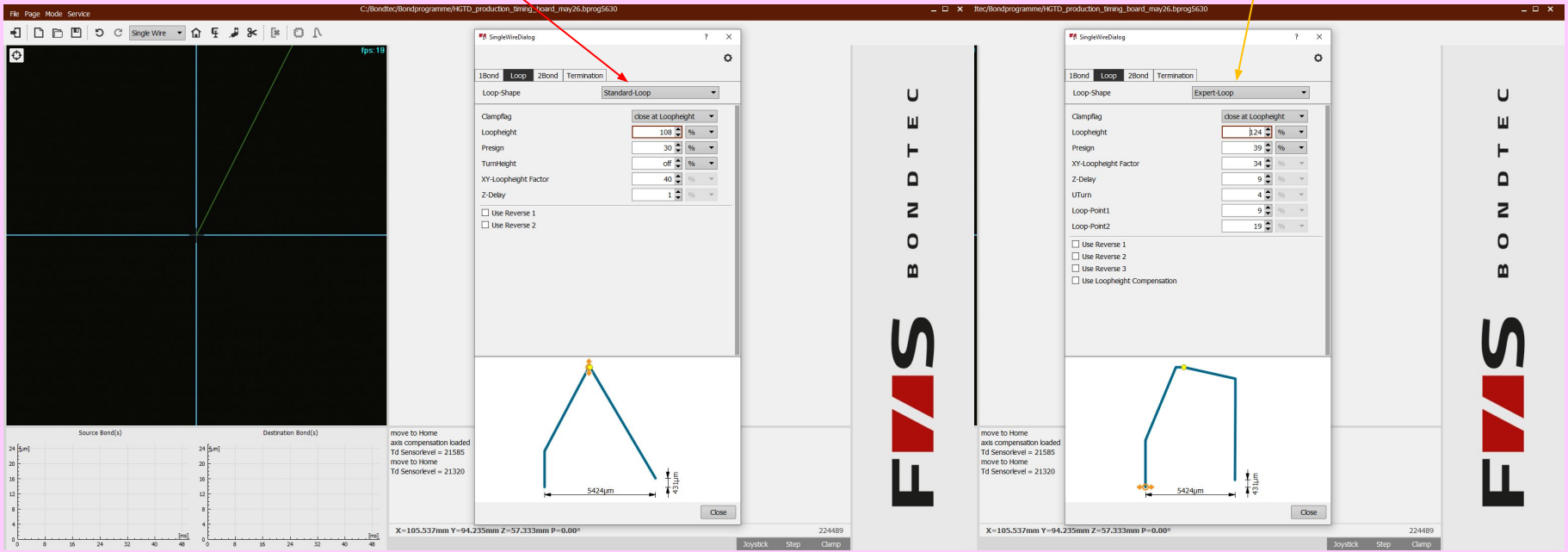
Works the same but the parameters are different



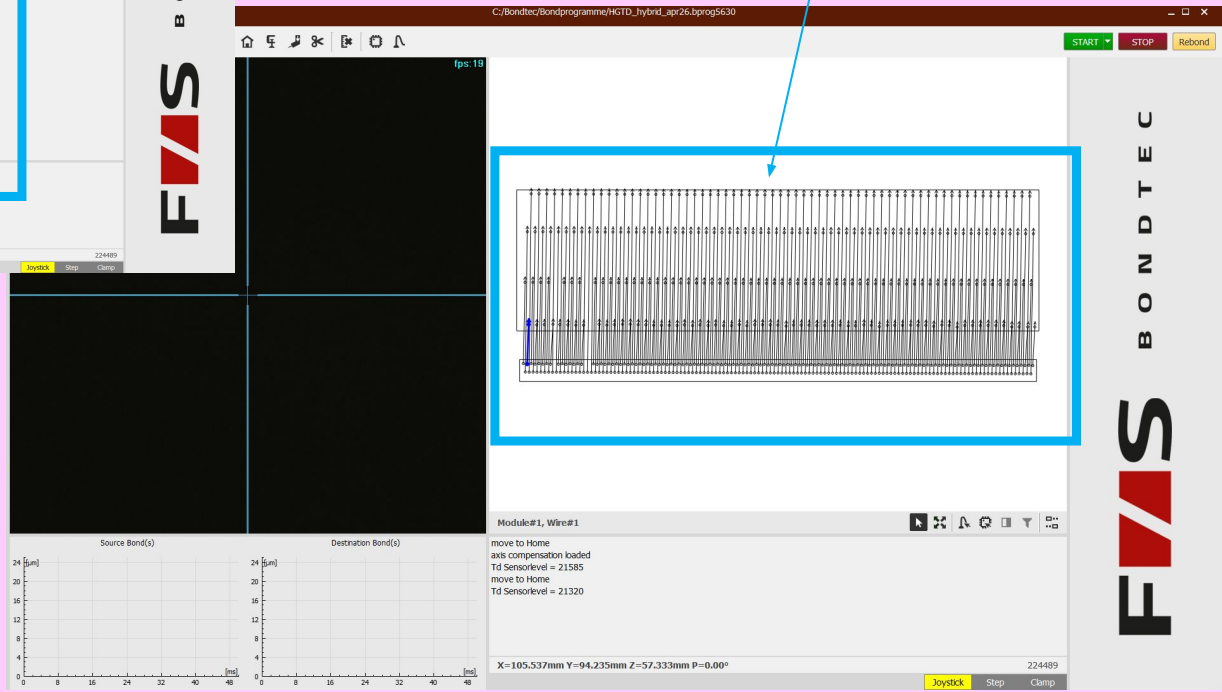
Top-down camera is sharper, better light settings

Simple loop setting, same as old bonder

Expert loop settings, more detailed, good for long & steep bonds



Programing is easier, you can freely move each side of a bond making it really good for multi use complex bonding



Creating, saving & loading programs works the same as old bonder