

Advanced Technologies for Microsurgery.

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EPSRC Network on **Microtechnologies for Surgery**

•Concerns devices as smart surgical tools.

•Multi-disciplinary group of engineers and surgeons identifying how micro-technologies could address real needs in practice.

•New technologies: Sensors, actuators, mechanisms, controls, manufacturing methods, user interface technologies.

The Context

Surgeons are attempting to work beyond the limit of human dexterity and perception and through difficult access and across lumen.

Precision of tool point with respect to tissues.

Discrimination of tissue type, behaviour and state at the tool point.

Increased perception and feedback.

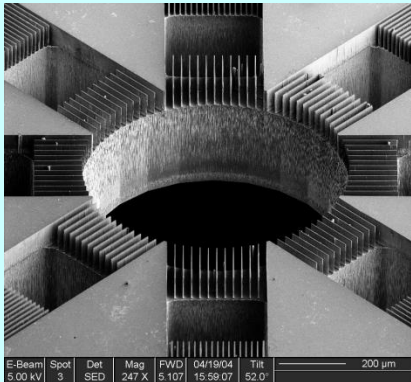
Cost effective and miniature size.

New Technologies



Rapid Prototyping Machines

- new opportunities for construction.



•Processing Speed.

-Advanced sensing schemes.

•Micro-fabrication technologies.

-New sensors, devices.



•Nano-technologies.

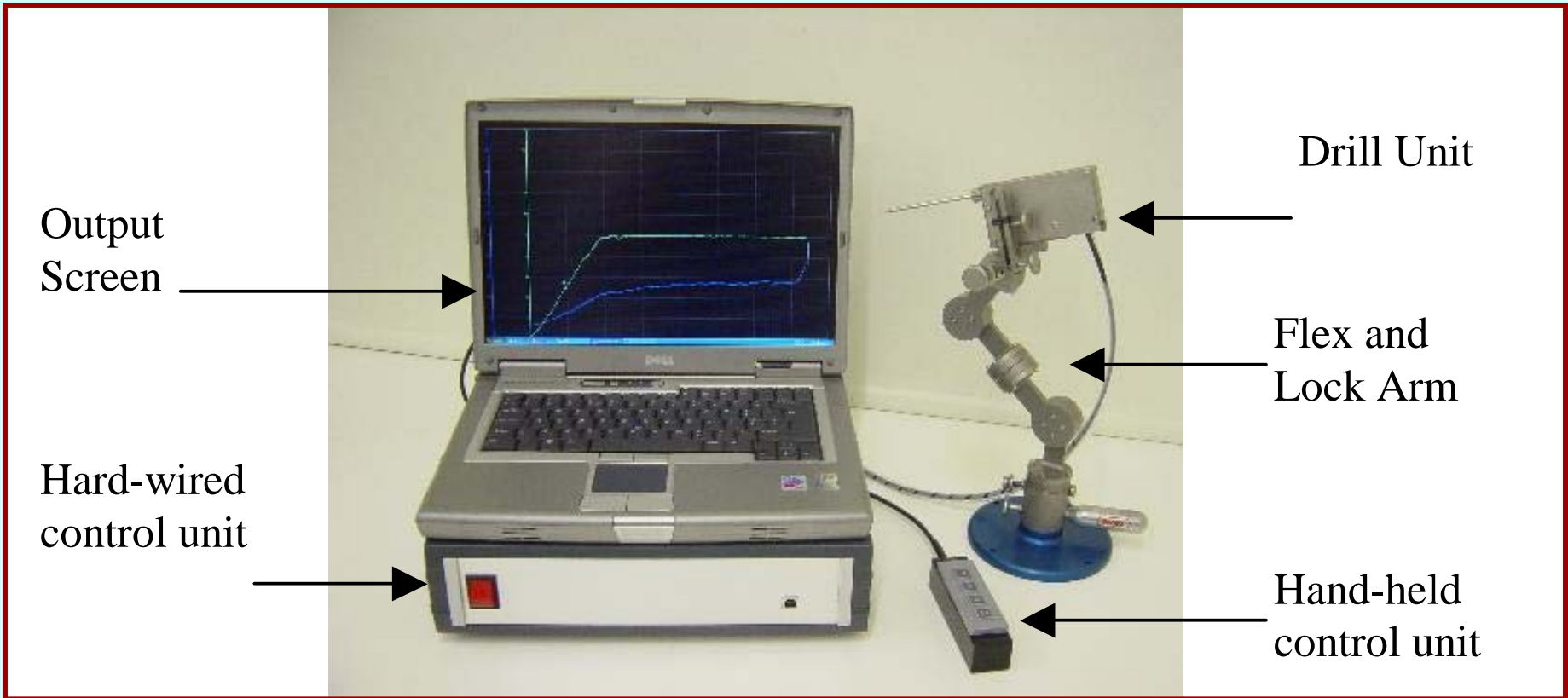
• -Custom surfaces, materials.

Example

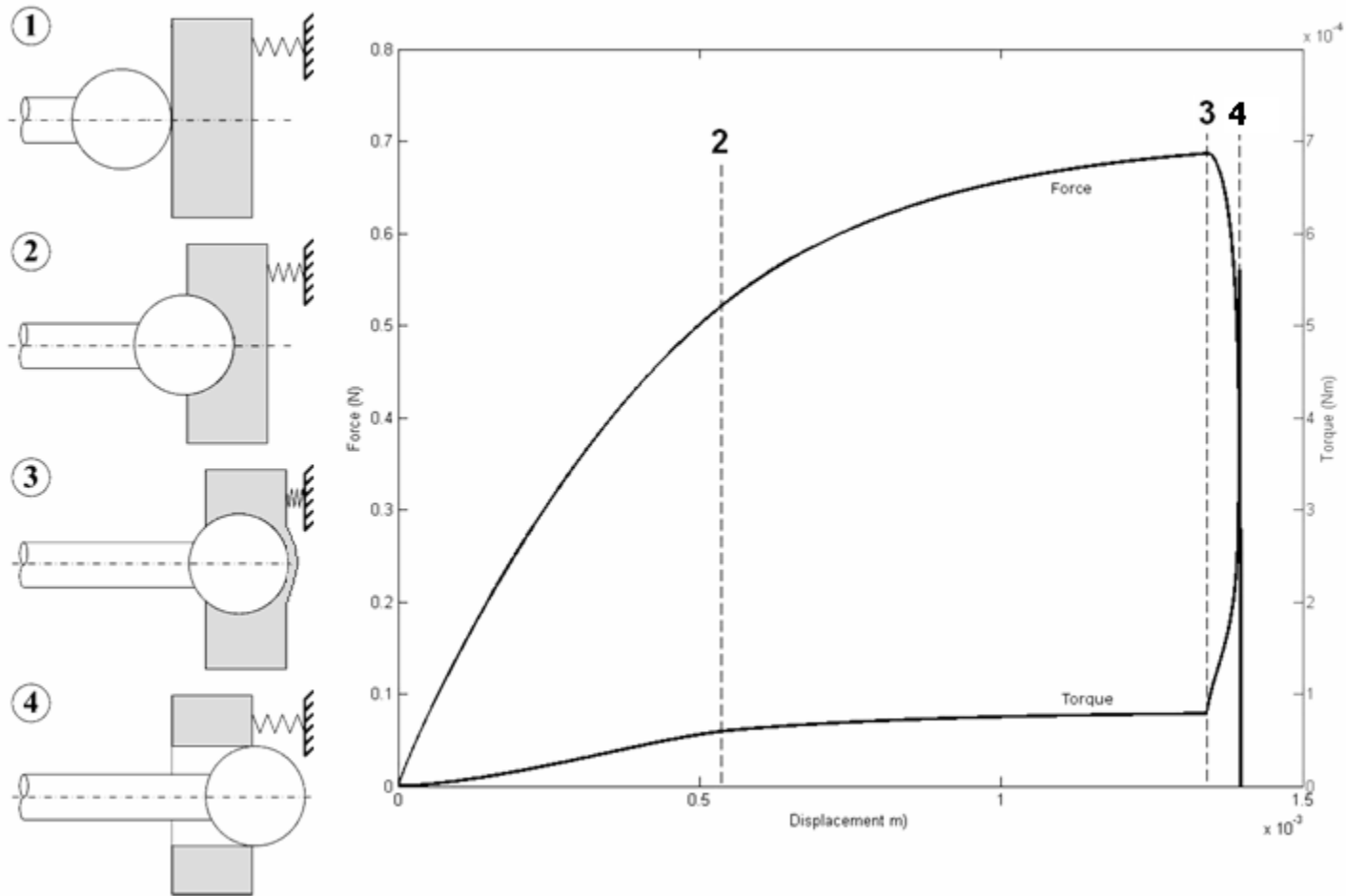
Smart Micro-drill for Cochleostomy



Micro-drilling Robot System



Breakthrough Detection





Conclusion

- **The Network is a National initiative that is providing a definition of the field of smart tool points for surgery.**
- **Discrimination of tool-tissue interaction, tissues, behaviour and state are sensing requirements.**
- **Tool point motion needs to be relative to tissues.**
- **Sensing systems, actuation systems & Feedback for users need development**

Conclusion on the smart micro-drilling tool.

- **New drilling device for microsurgery**
- **Precise control of tissue-toolpoint interaction**
- **Generic solution**
- **Device is a fully autonomous robotic tool point for surgery guided by state of tool-tissue interaction.**
- **Expected lower complication rate for cochleostomy**

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