

ESTEC's Materials and Electrical Components laboratory capabilities on testing passive components



1. Introduction to the lab

2. X-ray testing

3. CT scan

4. IR techniques

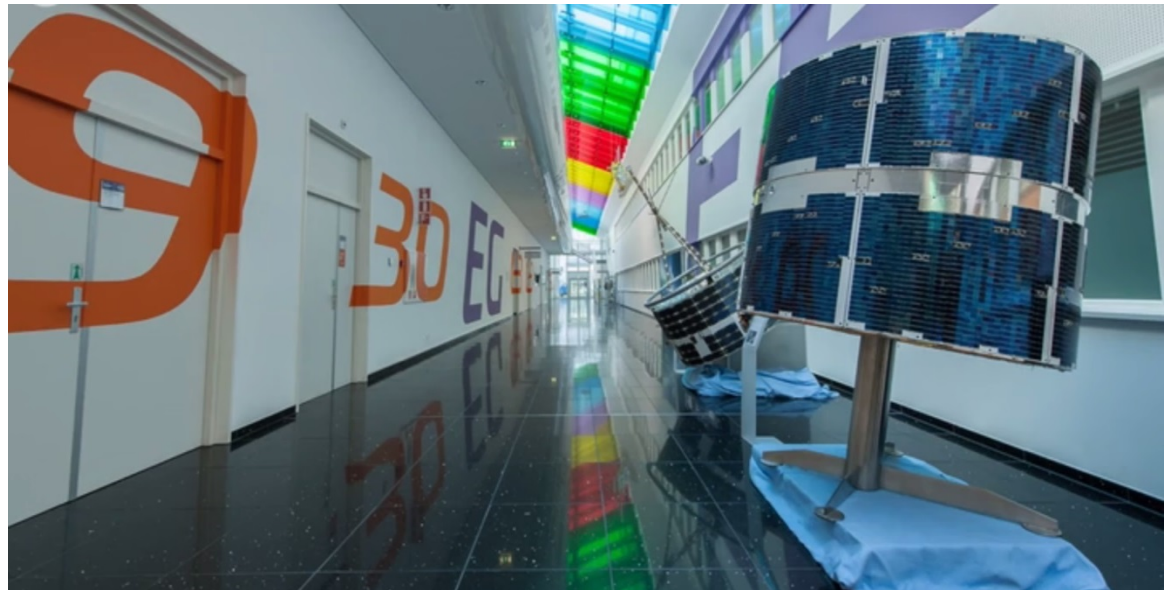
5. C-SAM

6. Sectioning

7. SEM

8. FIB

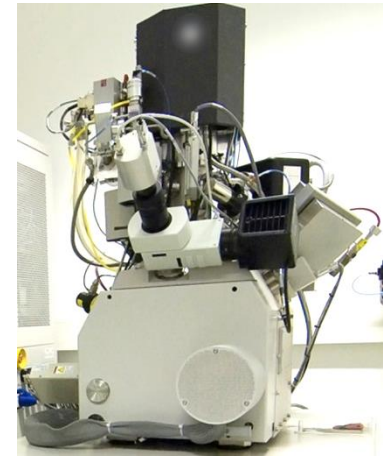
9. Other techniques



INTRODUCTION TO THE LAB



- Support to ESA projects
- Support to ESA technology programs
- Standardization and qualification activities
- Collaborative activities with the space community
- Customer focus:
 - Time critical
 - Non-routine
 - Impartial/independent approach
 - Special confidentiality constraints
- Core functions
 1. Failure analysis (FA)
 2. Constructional analysis (CA)
 3. Destructive physical analysis (DPA)
 4. Miscellaneous investigations (MI)
 5. Radiation testing



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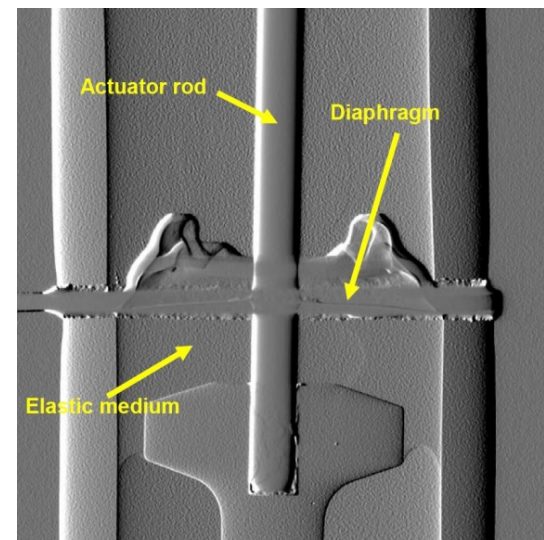
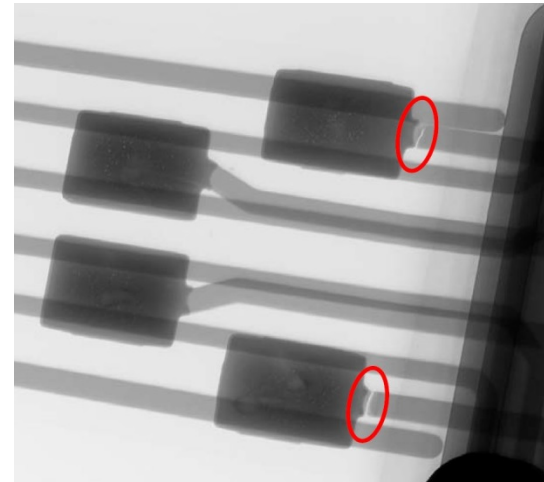
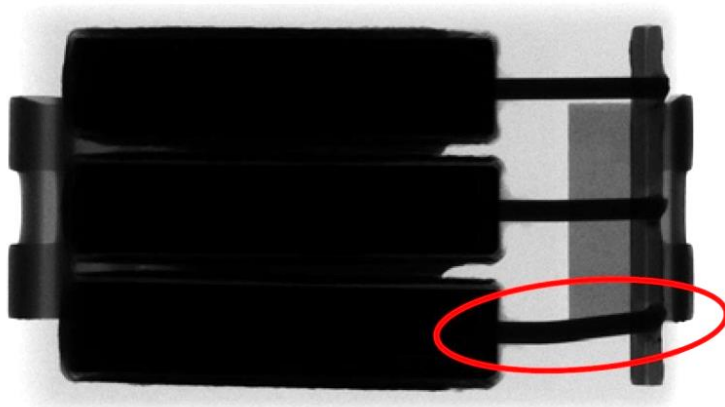
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1. X-ray testing

2. Examples of applications:

- Broken pad in flex circuit
- Internal features of tantalum capacitors
- Internal structure of relays



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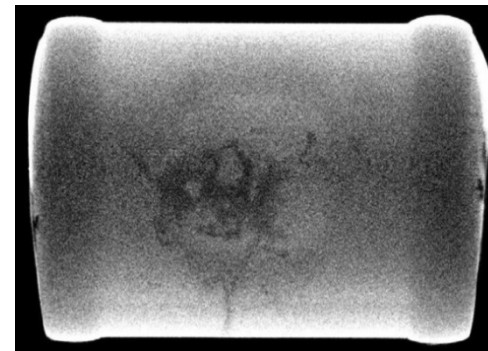
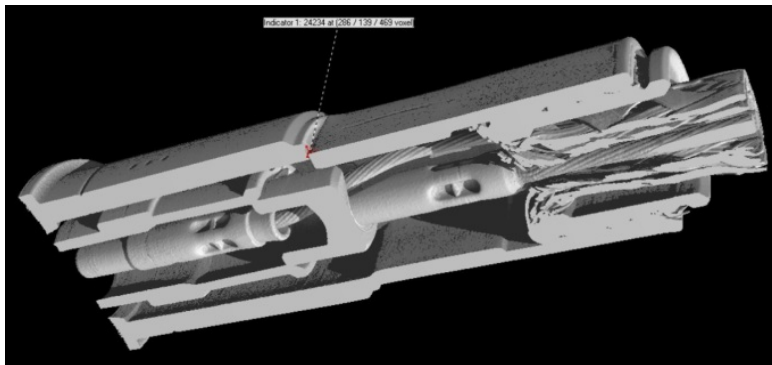
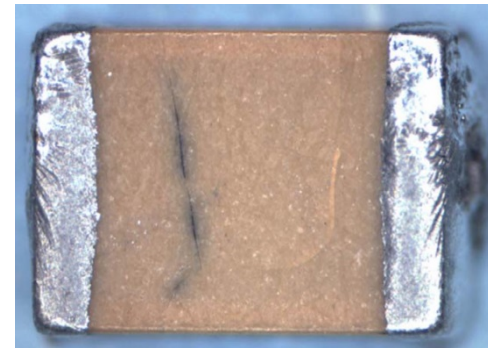
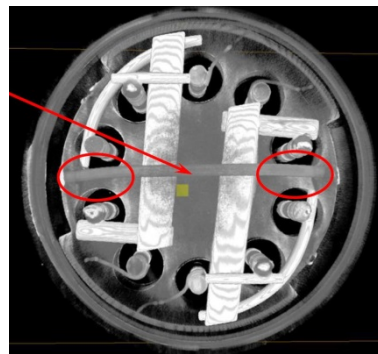
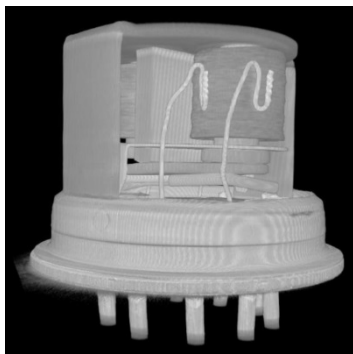
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Computerized Tomography (CT) scan

- Currently, two CT scan X-ray instruments at the laboratory
 - Single beam instrument: 160kV x-ray tube with CT scan tray
 - Double beam instrument: 180kV (high res) / 300kV (high density samples)
- Examples of applications
 - a) Features in relays / connectors
 - b) Cracks in multilayer capacitors



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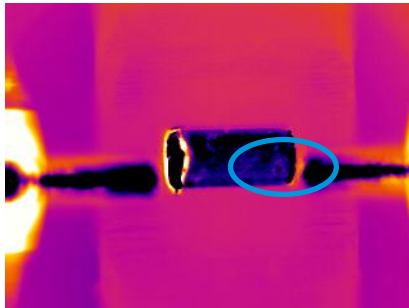
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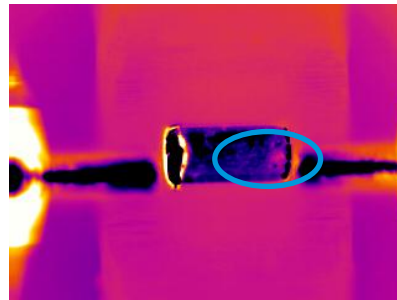


IR (Infra Red) techniques

- Infrared camera
- Examples of applications:
 - a) Failure location in chip capacitors

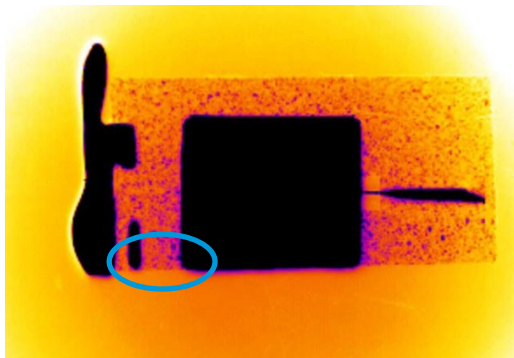


unbiased

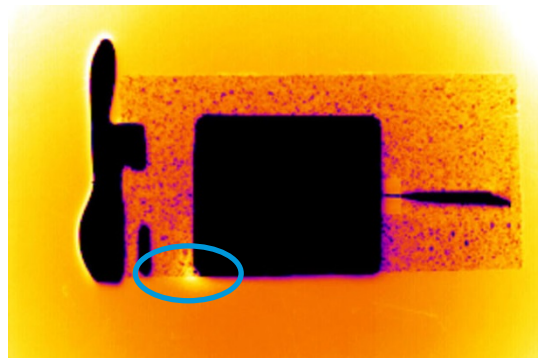


biased

- b) Failure location in tantalum capacitor



unbiased



biased



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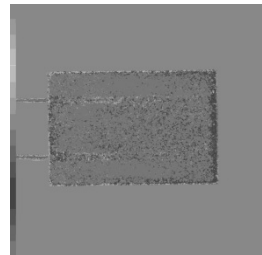
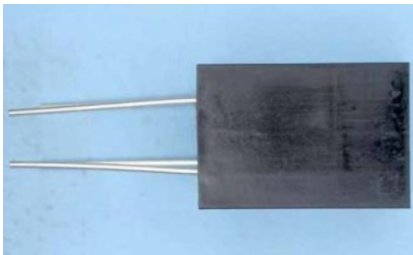
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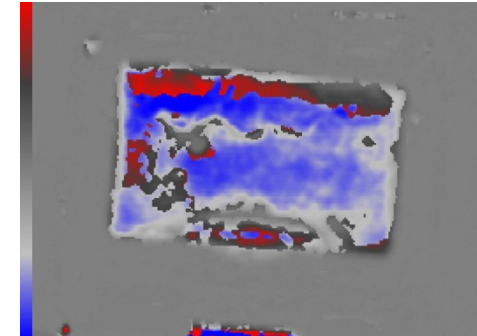
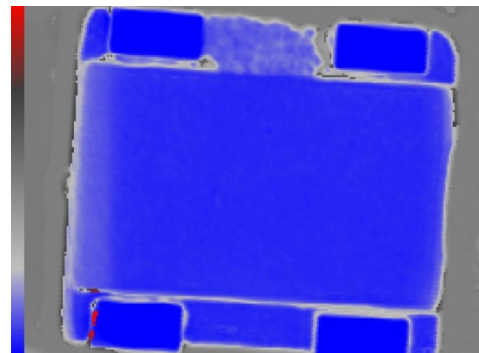
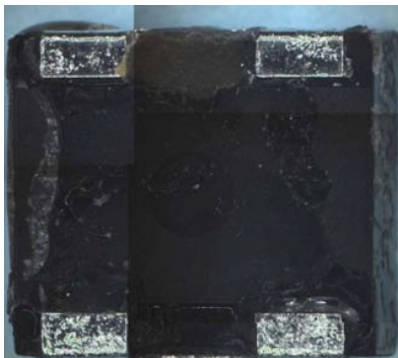
9. Other techniques



- C-mode Scanning Acoustic Microscopy
- Examples of applications:
 - a. Delamination in polyester capacitor



- a. Delamination in tantalum capacitor



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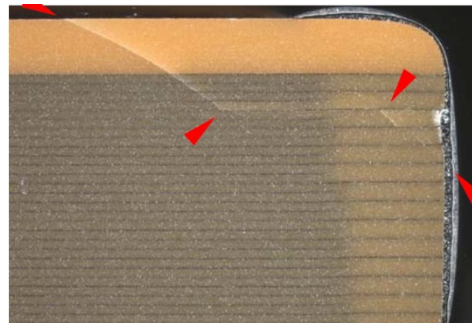
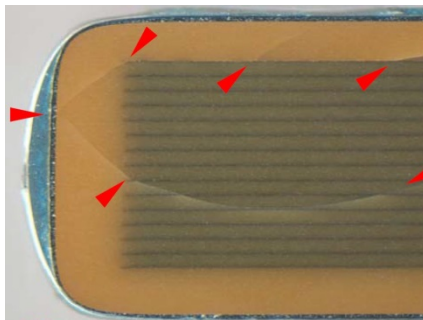
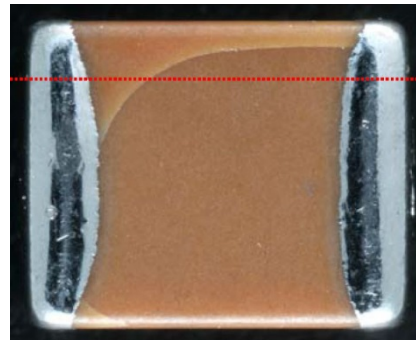
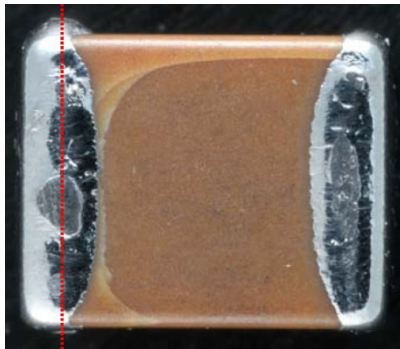
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1. The objective is to expose features of interest, usually failure locations
2. Examples of applications:
 - Expose cracks in multilayer capacitors



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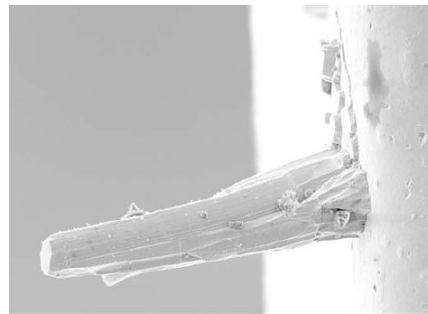
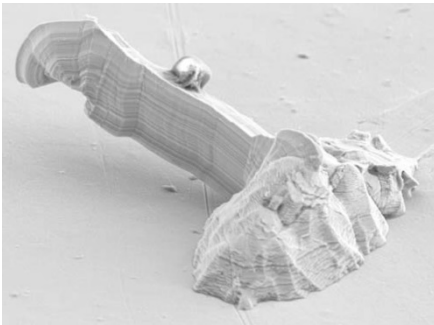


SEM (Scanning Electron Microscope)

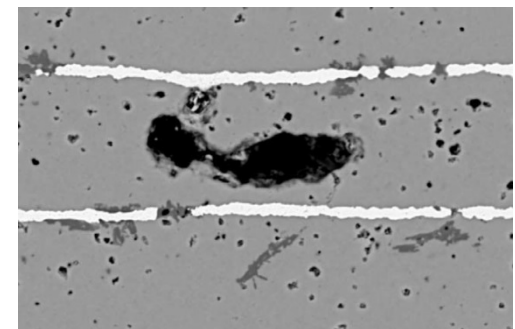
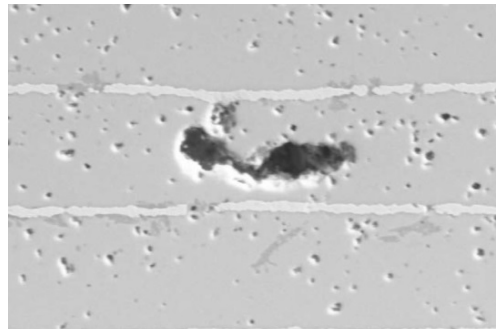
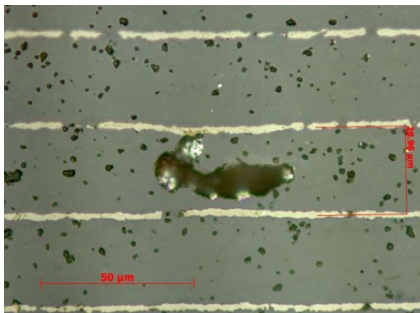
Scanning Electron Microscope (SEM): four instruments currently at the lab

Examples of applications:

1. Exposing tin whiskers



2. Exposing internal voids



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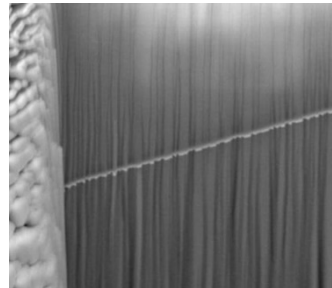
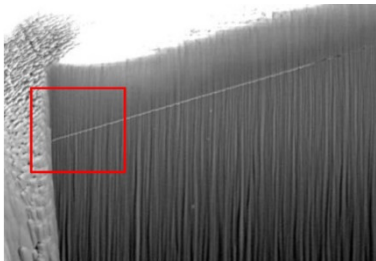


FIB (Focused Ion Beam)

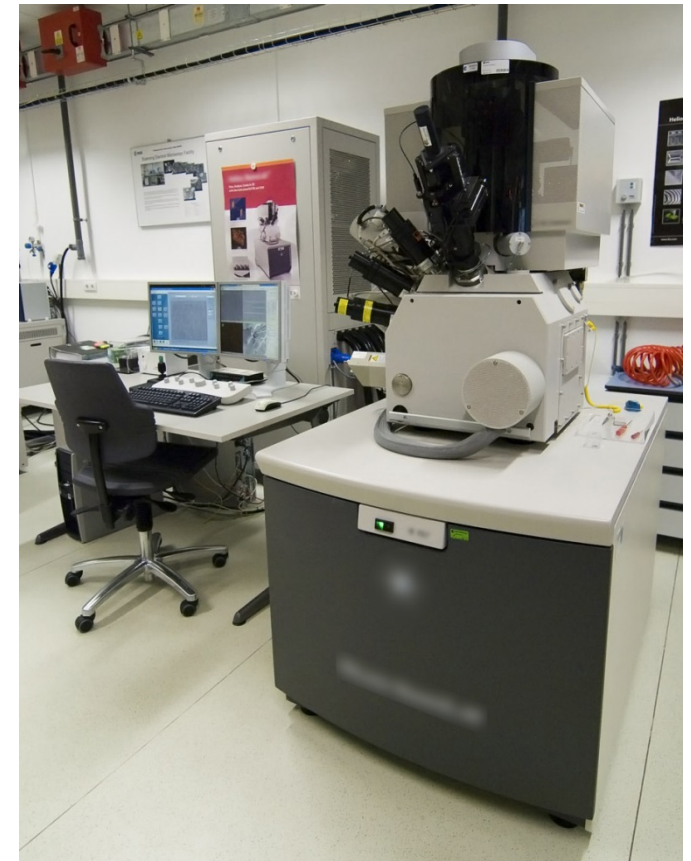
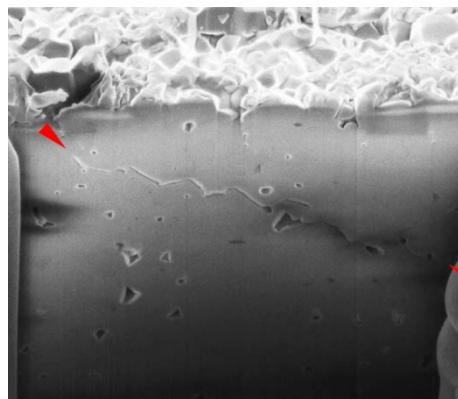
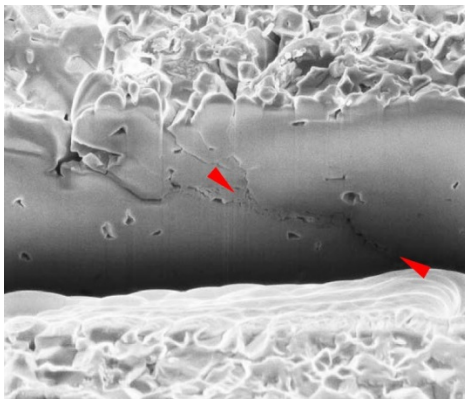
Focused Ion Beam: one **plasma FIB** and one **dual beam FIB** currently at the lab

Example of applications:

1. Exposing dendrites



2. Exposing internal cracks



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- Vibration testing
- Mechanical shock
- PIND
- Leak testing
- RF/MW measurements
- DC electrical measurements
- Emission microscopy
- Co-60 gamma source
- Bond pull testing
- Sputter coating
- XRF
- Visual inspection
- Laser decapsulation
- Chemical decapsulation
- Metal packages decapsulation
- Precision milling backpolisher



QUESTIONS?



ESTEC's Materials and Electrical Components Laboratory



Thank you very much
for your attention!

More info about the laboratory
available at www.esa.int

The screenshot shows the ESA website interface. At the top, there are navigation links: EUROPEAN SPACE AGENCY, ABOUT US, OUR ACTIVITIES, CONNECT WITH US, FOR MEDIA, FOR EDUCATORS, FOR KIDS. The main header features the text 'space engineering & technology' and the ESA logo. Below this, there are tabs for 'ESA', 'SPACE ENGINEERING & TECHNOLOGY', and 'PREPARING FOR THE FUTURE'. The main content area is titled 'MATERIALS & ELECTRICAL COMPONENTS LABORATORY' and includes a large image of a scientist in a lab coat and safety glasses. To the left of the main content is a sidebar with a 'What we do' section containing a list of categories: Directorate of Technical and Quality Management (TQC), Engineering, Cross-cutting initiatives, Electrical, Mechanical, Systems, Product Assurance, Standards, Technology, Strategy and harmonisation, and Directorate Technology programmes. Below this is a 'Technology in domain programmes' section and a 'Services' section listing 'ESA Conferences'. To the right of the main content is a 'Related article' section with a link to 'Improved gallium nitride transistors could spark space communication revolution'. At the bottom of the page, there is a small image of the laboratory and the text 'Materials and Electrical Components Lab'.