

OUR STRENGTHS

- ▷ Locate the defects: tools and techniques
- ▷ Perform an expert analysis for the corresponding physical defect
- ▷ Define the origin of the defect and offer another solution

COMMUNICATIONS & SECURITY

COMPONENT FAILURE ANALYSIS

Understand & implement corrective actions





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Thanks to its Component Engineering Laboratory (CEL), THALES offers a wide range of services in terms of component expert analysis, ranging from the electrical test to the technological analysis.

The CEL, jointly with the French Space National Research Center (CNES), has developed know-how skills in the spatial field for 15 years. Both teams share a common platform regrouping facilities over more than 700 m² including an area dedicated to electrical tests and a laboratory dedicated to component physical analysis.

Due to an increasing number of customer feedbacks or of system faults caused by electronic component failure, our laboratory offers an analysis service which aims at understanding the origin of the defect. Thanks to this analysis, corrective actions, which require often a moderate investment and prevent generally the system from being completely requalified, can be quickly implemented.

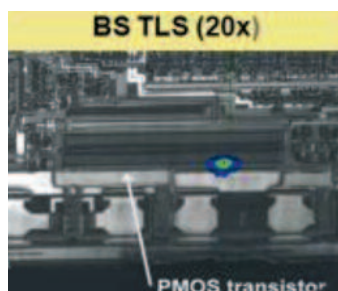
Locating the defect

It is mandatory to locate and look for the electrical defect of a component in order to identify its cause. Thales laboratory has a wide range of location tools adapted to each type of failure.

The Emission Microscopy (EMMI) technique consists in locating the defects by light emission, on forward and aft faces, on static or a dynamic polarized component. This technique can be used to detect the presence of defects in active areas (junctions) of integrated circuits.

The thermal laser stimulation method (OBIRCH, TIVA) is used to locate the defects on forward and aft faces, in interconnection areas of a static polarized component.

Thales also developed laser dynamic stimulation tools which are used to locate soft type defects in functional or parametric analysis (current, frequency, duration, etc.) caused by a photoelectrical or thermal laser type stimulation.



Physical analysis of the defect

The final goal of the failure analysis consists in understanding the physical origin of the defect. After identification of the defect, necessary corrective actions are implemented at system level or at the component level to make it reliable.

Once the defect has been located on the surface of the integrated circuit, it is generally necessary to peel the different layers of the circuit in order to be able to see the physical defect.

Aluminum and copper chips as well as highly integrated components, which can be made of up to eight layers of metal, are peeled. This expertise is based on the plasma and chemical etching control, combined with smoothing techniques.

A cross section view of the defect can also be obtained by mechanical smoothing or with Focused Ion Beam (FIB) cross section. The various observations are performed using high resolution Scanning Electron Microscopes (SEM) with Energy Dispersive X-ray (EDX) detectors and automated plates.

Observations with Scanning Transmission Electron Microscope (STEM) are also performed on slides with a thickness of several dozens of nanometers which are prepared in the failure area by FIB.

The defects resulting from installation problems can be highlighted by 'scanning capacitance' techniques performed with an Atomic Force Microscope (AFM).

Application to optoelectronics

Our laboratory successfully transferred the classical failure analysis techniques from the microelectronics to the optoelectronics, while developing techniques for specific characterization such as the cathodoluminescence and the reflectometry.