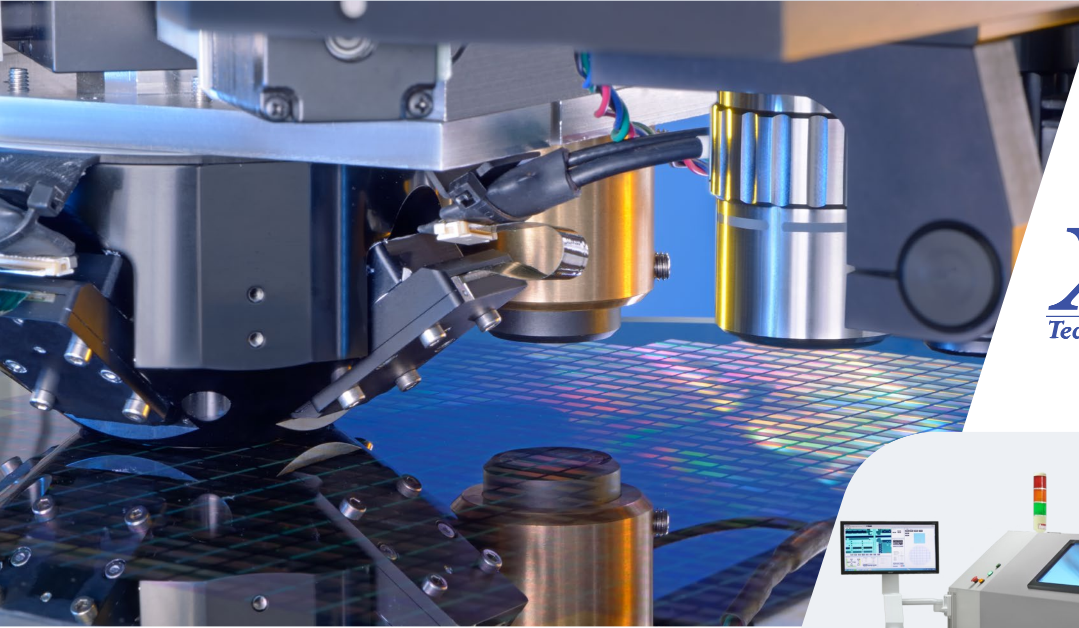

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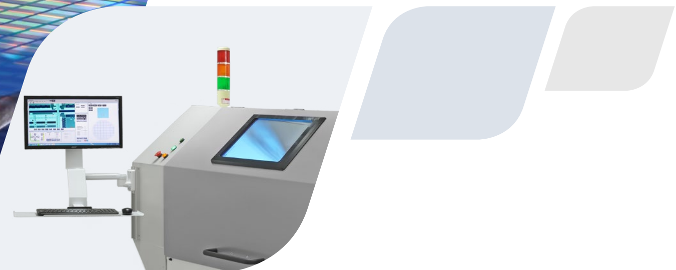


XRF measurements for flat Panel Printed Circuit Boards (PCB)

PCB Manufacturing process

Printed Circuit Board Panels are made by bonding a layer of copper, with a certain accurate thickness, over the entire substrate, sometimes on both sides. Multi-layer boards are made from the same base material with copper foil on the top & bottom and one or more “inner layer” cores. Etching process must be done to remove unnecessary copper after applying a temporary mask, leaving only the desired copper traces.

XwinSys Solution

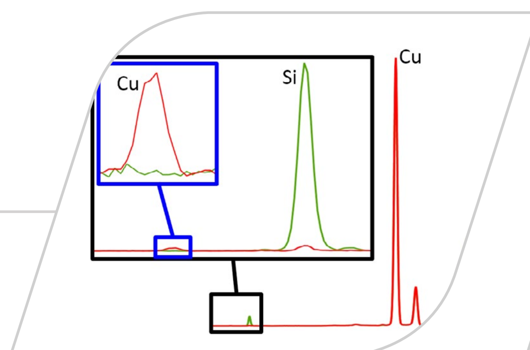
XwinSys unique solution integrates enhanced ED-XRF micro-spot analysis, 3D scanning and 2D microscope technologies and an integrative software to operate in one fully automated system. Serving in-line and non-destructive applications, the XwinSys PCB process system monitors copper layers' thickness of a multi-layer PCB board, using a synergic unique technique that enables dealing with complex multi stack applications. XwinSys PCB system can report copper layer thickness, even for ultra-thin layers and provide in-line process monitoring.

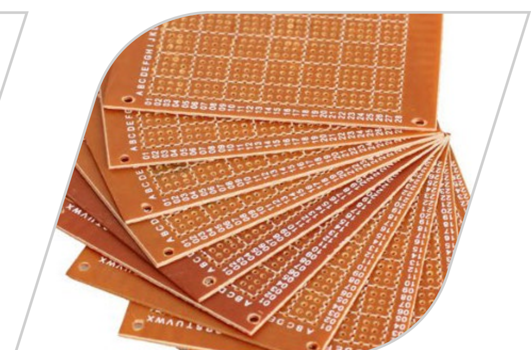
XwinSys hybrid metrology system for PCB - EDXRF Analysis

System Measurements Throughput:
XRF (1 min per site), 3D Scanner (1 sec per site), 2D Microscope (1 sec per site).
System engineered to hold PCB sample to the chuck using vacuum nipples.

- **XRF:** Employed to measure a wide range of atomic elements, from Carbon (6) through Fermium (100), with low detection limits and high precision. EDXRF spectroscopy is the most accurate and economical analytical method for determination of the elemental composition of many types of materials. This technique is non-destructive, requiring no sample preparation, and is suitable for almost all sample types and shapes,

Distinguishing between Cu layer and Seed Cu layer





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XwinSys hybrid metrology system for PCB - Optical Analysis

System configuration

- **3D scanner:** Enables three dimensional geometrical measurements supplemented with dedicated algorithms and software packages to specialize on automate machine-vision solutions for quality control and hands-free 3D geometrical measurements, including roughness measurements in industrial applications.

- **2D Microscope & Image Processing:** Providing advanced optical features, mainly used for efficient inspection purposes, as well as an accurate navigation tool. The high level of image processing and pattern recognition allows defect inspection, color inspection, feature dimension, centralization feature, contour extraction and more.

XwinSys PCB System features

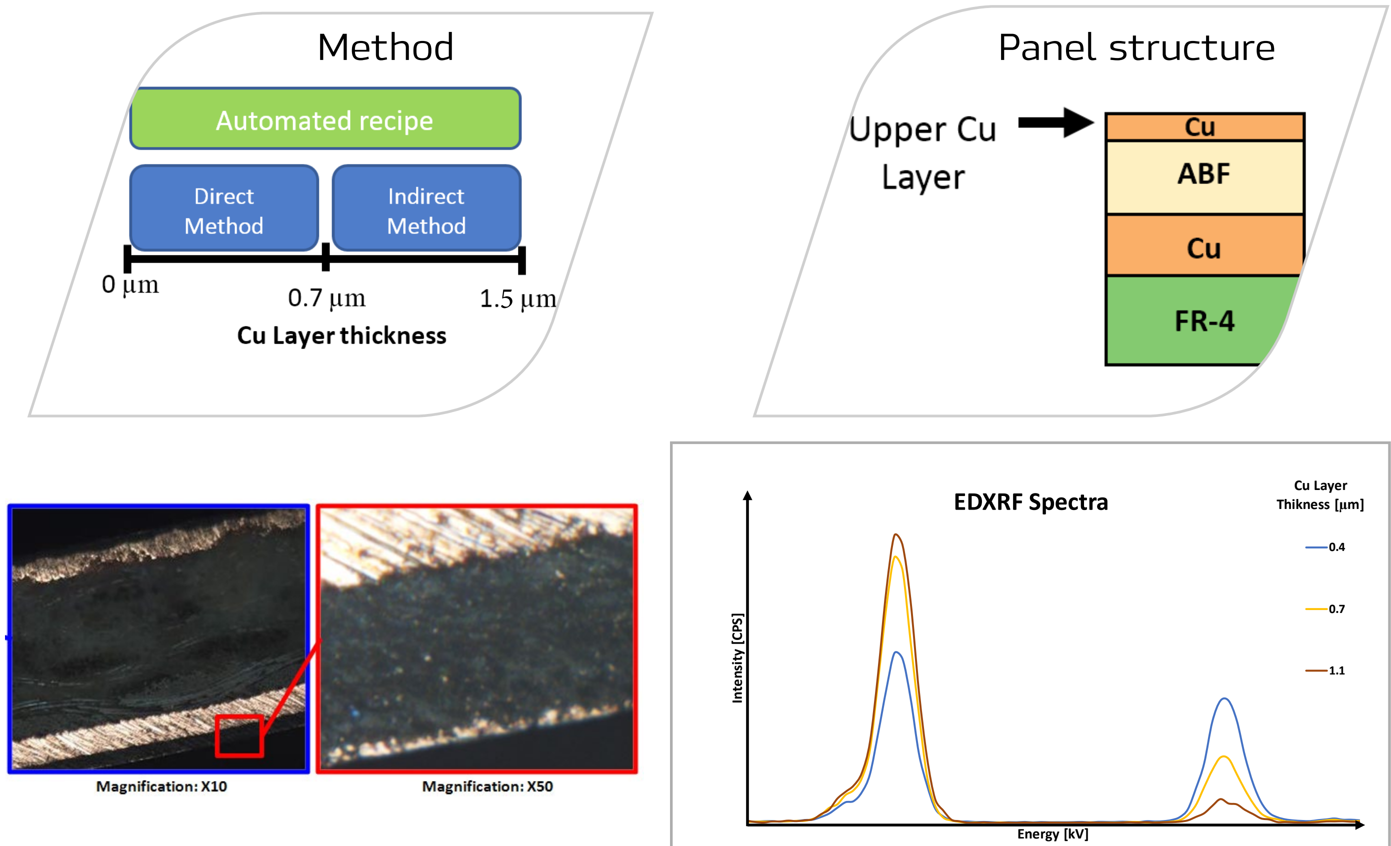
XwinSys EDXRF system has high sensitivity to Cu layer thickness and variation

Measure thin Cu Seed layer thickness

Seed (upper) Cu Layer thickness varies from 0µm to 1.5µm.
Cu Layer thickness is measured by automated algorithm using two methods
Direct method (0-0.7 µm) by measuring *Cu(Lα)* peak and calculating Cu layer thickness using linear regression.
Indirect method (0.7-1.5 µm) by measuring *Si(Kα)* peak and calculating Cu layer thickness using exponential regression, using the Si from the ABF layer.

XRF scan Results

- Thin Cu seed layer can be monitored from 0 to 1.5µm with precision <0.005 µm.



Magnification: X10 Magnification: X50

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