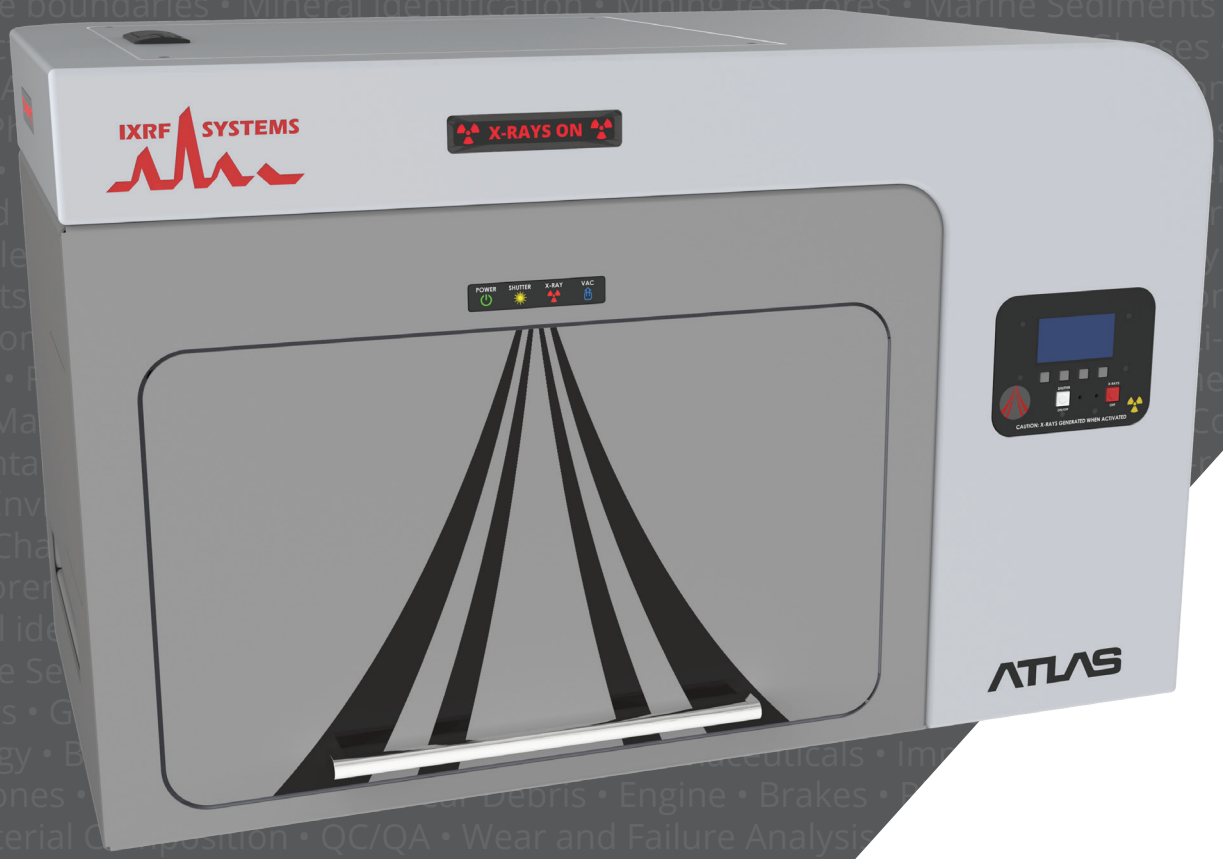


SEMICONDUCTOR TESTING APPLICATIONS

IXRF SYSTEMS

Semiconductor Testing Applications

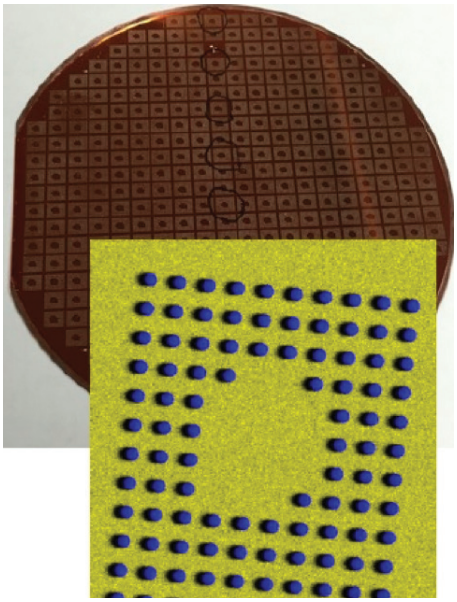
Electronic components are everywhere in our modern world. It is imperative that these components are reliable, as they control extremely important systems from every day items, to electronically controlled military equipment as well as a variety of aerospace equipment. To assure this reliability components must go through a battery of tests. XRF analysis is an irreplaceable tool for the semiconductor industry to not only guarantee but to also certify their products.

Electrical or photonic circuits are one of these components that are the foundation for so many other products. These circuits begin their lives on silicon wafers. As the wafers and associated circuits and boards become more specialized they require different types of testing.

IXRF Systems' ATLAS X can analyze for:

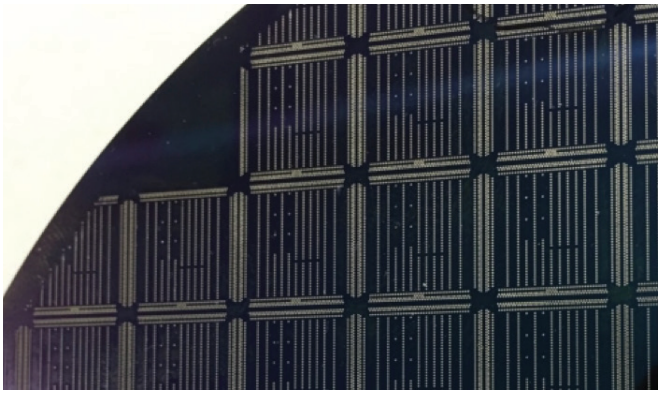
- Thin Film/Coating thickness measurements
- Sn/Ag Bump/Pillar measurements
- Pb measurement for Whiskers

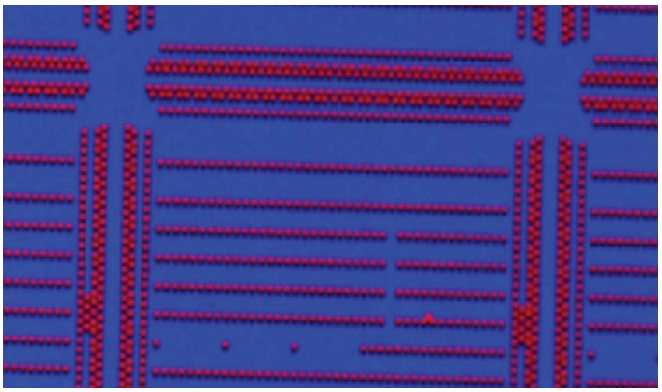
IXRF Systems has the largest chamber on the market, which can easily map a 300mm wafer.



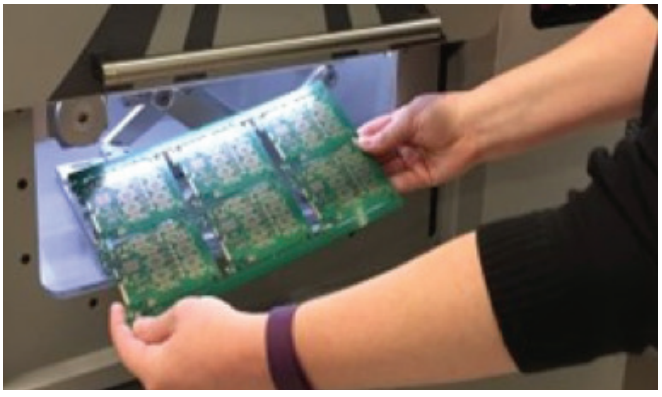
IXRF Systems offers a 5µm spot size, the smallest on the market, allowing for extremely high resolution maps, analysis of small leads or pillars.

Though SnPb solder has its place in technology, there is now a shift to use SnAg due to environmental, health and safety concerns. These solder points must also be tested.





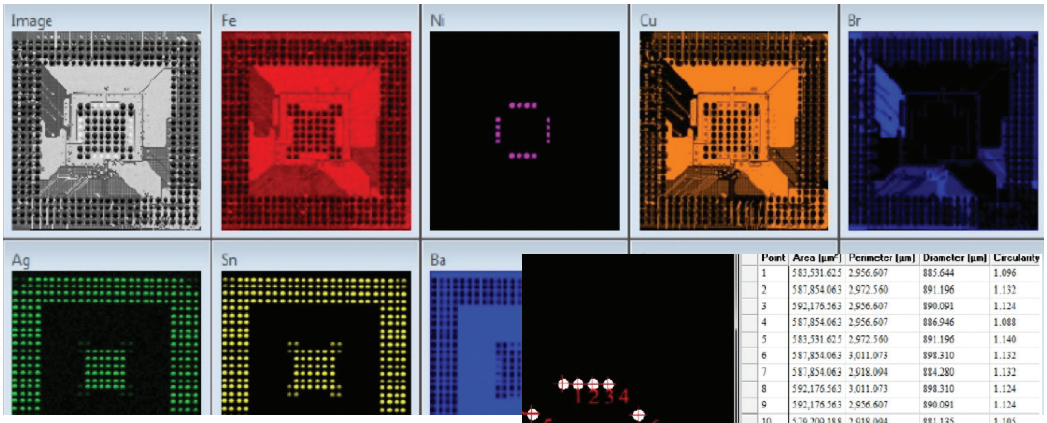
Current technologies include Pb-free bumps of SnAg, as well as Pb-free SnAg pillars on Cu seed. Current bump / pillar and seed sizes are about 50 to 150µm. However next generation technology is pushing towards smaller pillar/ seed sizes of 20- 30µm.



Leads on electronic components cannot fail, less the whole system will fail. There is a well known phenomenon, known as 'whiskers' that can cause these components to fail. The whiskers come from tin used in electronic component surfaces.

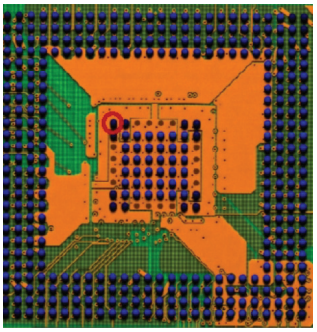
It has been found that adding lead to the tin can prevent the growth of whiskers. This addition of lead must be analytically measured to assure expected and required concentrations. Most aerospace companies require a minimum of 3% Pb to prevent tin whiskers

XRF is the preferred method for lead testing in tin. XRF has been found to be more accurate than EDS based on the larger area and depth of measurement.



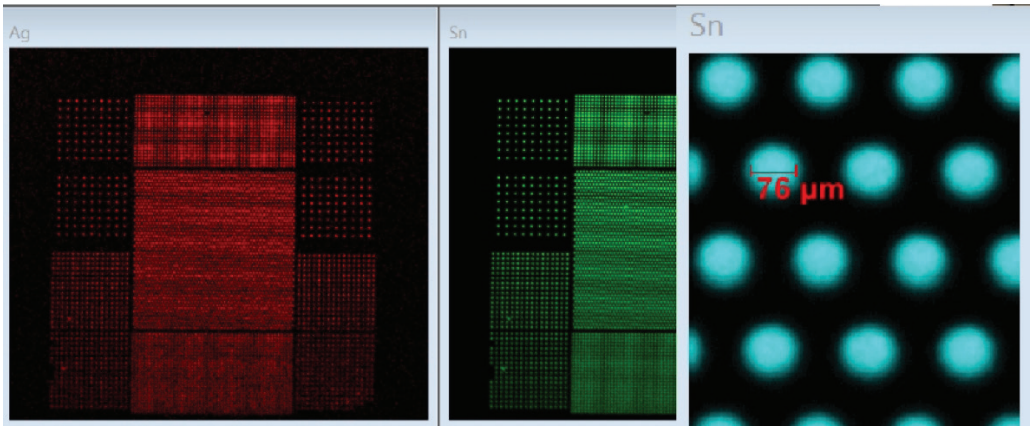
Point	Area (µm²)	Perimeter (µm)	Diameter (µm)	Circularity
1	583,531.625	2,956.607	885.644	1.096
2	587,854.063	2,972.560	891.196	1.132
3	592,176.563	2,956.607	890.091	1.124
4	587,854.063	2,956.607	886.946	1.088
5	583,531.625	2,972.560	891.196	1.140
6	587,854.063	3,011.973	898.310	1.132
7	587,854.063	2,918.094	884.280	1.132
8	592,176.563	3,011.973	898.310	1.124
9	592,176.563	2,956.607	890.091	1.124
10	579,209.188	2,918.094	881.135	1.105
11	579,209.188	2,879.582	878.469	1.149
12	574,885.750	2,918.094	877.990	1.113
13	570,564.250	2,918.094	874.845	1.121
14	592,176.563	2,934.047	891.135	1.124
15	587,854.063	2,956.607	890.091	1.132
16	587,854.063	2,918.094	884.280	1.132

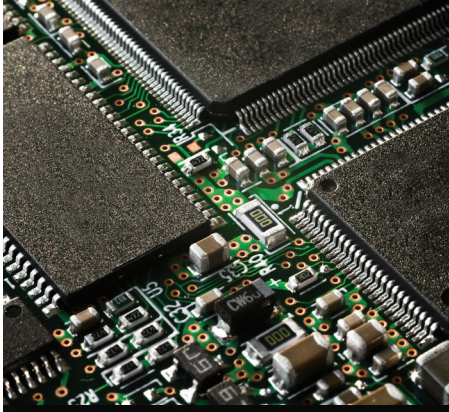
IXRF Systems' powerful software can be used to quickly identify, measure, and analyzed multiple solder bumps on a board.

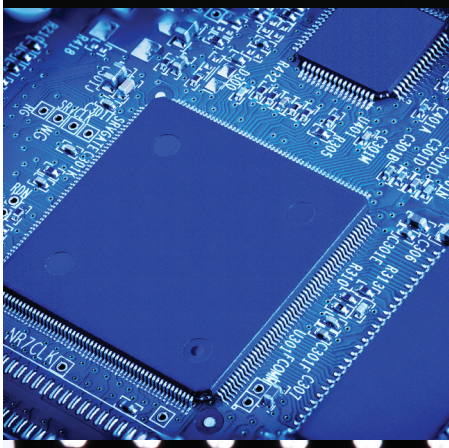


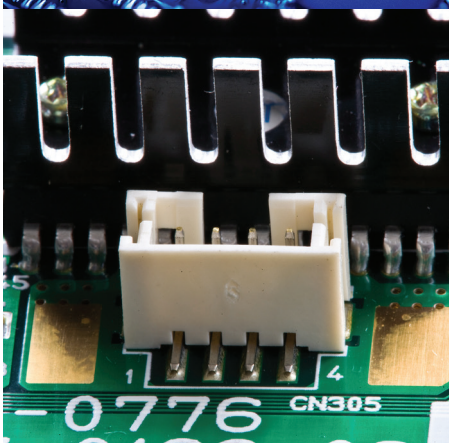
Quantitative analysis was done on one of the SnPb solder bumps in the center trio section, circled portion in the elemental map to the left.

Below is an elemental map of a large area of a wafer with pillars, collected with a 5µm spot size.









IXRF SYSTEMS
10421 Old Manchaca Rd.,
Suite 620
Austin, TX 78748
Telephone: 512.386.6100
www.ixrfsystems.com