JEDEC
STANDARD

Standard Test Method Utilizing X-Ray Fluorescence (XRF) for Analyzing Component Finishes and Solder Alloys to Determine Tin (Sn) – Lead (Pb) Content

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Foreword

This document is intended to be used by Original Component Manufacturers who deliver electronic components and Original Equipment Manufacturers who are the platform system integrators. It is intended to be applied prior to delivery by the OCMs and may be used by OEM system engineers and procuring activities as well as U.S Government Department of Defense system engineers, procuring activities and repair centers. This document was drafted in cooperation between JEDEC JC-13 and TechAmerica G-12 committees. This document does not cancel or replace in whole or in part any other standard but was released with the intention that the initially released document and subsequent revisions be referenced by MIL-STD-202, MIL-STD-750 and MIL-STD-883. Release and publication of this document constitutes approval by the JEDEC Board of Directors.

Standard Test Method Utilizing X-Ray Fluorescence (XRF) for Analyzing Component Finishes and Solder Alloys to Determine Tin (Sn) – Lead (Pb) Content

(From JEDEC Board Ballot JCB-17-04, formulated under the cognizance of the JC-13 Committee, Government Liaison.)

1 Scope

This Standard establishes the instrumentation, techniques, criteria, and methods to be utilized to quantify the amount of Lead (Pb) in Tin-Lead (Sn-Pb) alloys and electroplated finishes containing at least 3 weight percent (wt%) Lead (Pb) using X-Ray Fluorescence (XRF) equipment.

2 Normative references

The following normative documents contain provisions that, through reference in this text, constitute provisions of this standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies.

MIL-STD-1916, Department of Defense Test Method Standard – DoD Preferred Method for Acceptance of a Product.

3 Terms and definitions

For the purposes of this standard, the following terms and definitions apply.

Alignment: The adjustment of an object in relation with other objects, or a static orientation of some object or set of objects in relation to others.

Focusing: The action of directing rays toward a point where the rays converge.

Beam Collimation: The process of restricting and confining an x-ray beam to a given area.

Scanning Electron Microscopy-Energy Dispersive Spectroscopy (SEM-EDS): Measures the number of x-rays produced by a solid sample when bombarded by electrons versus the energy of these x-rays.

NOTE The EDS technique identifies and quantifies the element constituents of the sample when performed using appropriate standards.

Spatial Resolution: The minimum distance between two adjacent features or the minimum size of a feature that can be detected by a remote sensing system.

X-Ray Fluorescence (XRF): The process of emissions of characteristic x-rays.

NOTE Analysis using x-ray fluorescence is called "X-ray Fluorescence Spectroscopy."

4 Apparatus

4.1 XRF Instrumentation

The XRF instrument shall be capable of qualitatively identifying the metals present in a complex sample and providing quantitative accuracy sufficient to insure at least 3 wt% Lead (Pb).

4.2 X-Ray Detector

The detector resolution shall be sufficient to quantify lead (Pb) with +/- 2 wt% accuracy, in the range from 0 to 10 wt%, in combination with interfering energy lines from elements such as bismuth (Bi). An x-ray tube potential of 40kV or greater shall be used to support the detection of higher energy lines.

4.3 Alignment, Focusing System, and Scanning Capability

XRF systems shall have an alignment and focusing system. The alignment and focusing system must provide visual identification of the desired surface being analyzed. A surface scanning capability may be necessary, depending on component size, X-ray beam size, and presence of surface composition irregularities, to achieve average quantitative composition during scanning of very small surfaces.

4.4 Spatial Resolution

The spatial resolution of the instrument must be sufficient to identify the material composition of the area under analysis, excluding adjacent materials. The spatial resolution of the instrument shall be verified on a periodic basis. This requires an X-ray beam size smaller than the surface analyzed. See Appendix for typical instrument capabilities.

4.5 Positioning Fixtures

Positioning fixtures or sample trays shall be made of materials that do not interfere with the accuracy of the analysis, e.g., commercially pure aluminum.

4.6 Verification Standards

For tin – lead (Sn-Pb) alloys, a tin-lead composition standard with a lead content of 3.0 wt% is required. The values for the standards shall be traceable to values provided by the National Institute of Standards and Technology (NIST). If surface finish thickness is a concern, a foil or layered standard consistent with the component design is required.

NOTE For guidance on traceability to values for NIST Standard Reference Materials or other certified reference materials, refer to the NIST Policy on Traceability at http://ts.nist.gov/traceability/.