UNIVERSITÉ DE MONTPELLIER

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Contents

1 Introduction

The continuous miniaturization of microelectronic components, driven by Moore's Law, has led to a significant reduction in transistor size and increased chip complexity. This rapid advancement has presented new challenges in the field of metrology, the science of measurement. Existing metrology techniques, such as Optical Critical Dimension (OCD) and Critical Dimension Scanning Electron Microscope (CDSEM), are reaching their limits in terms of resolution and accuracy as feature sizes shrink to the nanometer scale.

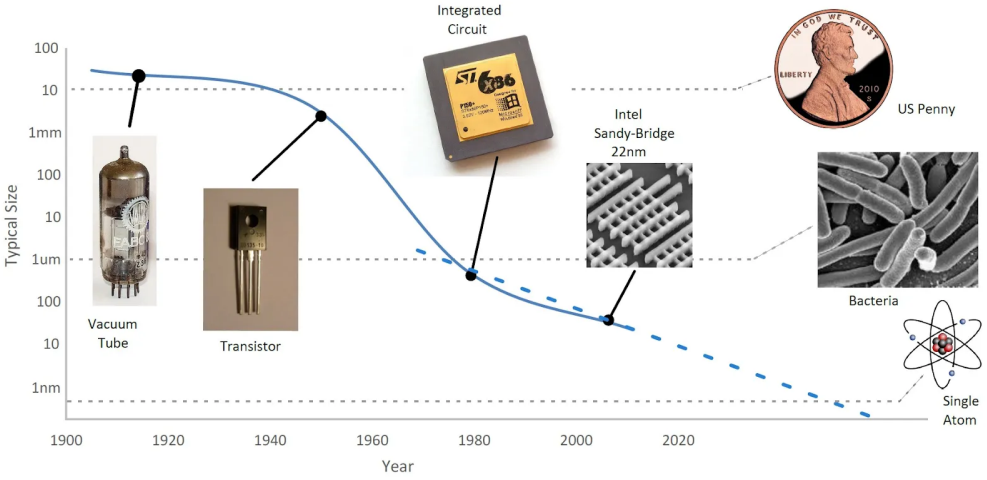

Figure 2: Evolution of microelectronics and the need for advanced metrology techniques [1].

To address these challenges, a new metrology technique called Critical Dimension Small Angle X-ray Scattering (CDSAXS) is being developed. CDSAXS utilizes short-wavelength X-rays ($\lambda \approx 0.05 - 5nm$), to probe the internal structure of materials, providing high-resolution measurements of critical dimensions (CDs) with greater accuracy than conventional methods. CEA-Leti, a leading research institute in microelectronics, is actively involved in the development of CDSAXS technology.

This work-study project focused on the development of a coherent software for the fit and analysis of CDSAXS data. The software aims to streamline the data processing workflow and enhance the accuracy of CD measurements. The project involved a comprehensive understanding of CDSAXS theory, data collection procedures, and fitting algorithms.

The report begins with an overview of the context of the project, highlighting the evolution of microelectronics and the need for advanced metrology techniques. It then delves into the CDSAXS technique, explaining the principles, data collection, fitting, and analysis. Then the subsequent section describes the software development process, outlining the software's functionalities and design. Finally, the report concludes with a summary of the project's achievements and outlines potential future directions.

References

[1] Soham Chatterjee. *Beginner's Guide to Moore's Law*. URL: https://medium.com/@csoham358/beginners-guide-to-moore-s-law-3e00dd8b5057 (visited on 07/01/2021).