Abstract Submitted for the MAR15 Meeting of The American Physical Society

Subsurface Imaging with the Scanning Microwave Microscope JOSEPH KOPANSKI, LIN YOU, JONATHAN MICHELSON, EMILY HITZ, YAW OBENG, Semiconductor and Dimensional Metrology Division, National Institute of Standards and Technology, BACK END OF THE LINE RELIABILITY & METROLOGY PROJECT TEAM — The scanning microwave microscope (SMM) forms images from the reflected amplitude and phase of an incident RF (~ 2.3 GHz) signal. The reflected signal is a function of the properties of the tip-sample contact, but can also be influenced by buried interfaces and subsurface variations of the sample permittivity. This mechanism allows limited imaging of conductors buried within dielectrics, voids within metal, or multiple metal layers with different permittivity. Subsurface SMM data acquisition modes include passive and various active data acquisition modes. The theory of sub-surface imaging with SMM and COMSOL multi-physics simulations of specific situations will be presented. Measurements of specifically designed test structures and correlation with simulations show the sensitivity and resolution of the technique applied to imaging subsurface metal lines embedded in dielectric. Applications include metrology for back end of the line (BEOL) multi-level metallization and three-dimensional integrated circuits (3D-ICs).

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