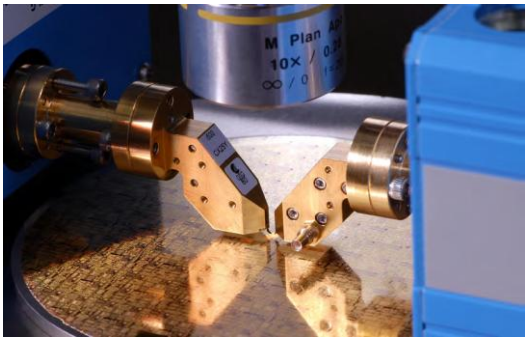
2nd PlanarCal Project Seminar

Venue : **Delft University of Technology**
Faculty of Electrical Engineering, Mathematics and Computer sciences
Mekelweg 4
2628 CD, Delft
The Netherlands

Date : **23 June 2016**

Time : **09:00 hours to 17:00 hours**



Registration is required!
For information and registration, please contact Marja Koster mkoster@vsl.nl

This event is sponsored by the European Metrology Programme for Innovation and Research (EMPIR) 'PlanarCal - 14IND02' Project (www.planarcal.ptb.de). The event is an informal seminar and is free to attend. The seminar features oral presentations and includes visit to some of the high-frequency electrical measurement facilities at Delft University of Technology.

AGENDA

09:00 - 09:30	**Coffee and registration**	
09:30 - 10:00	**Microwave measurements for planar circuits and components: State of the art and future directions** *This talk will give an overview of the background and the objectives of the EMPIR project 14IND02 (PlanarCal). The overall aim of the project is to enable industry to characterize components and devices in high-speed and microwave applications (e.g. wireless communications, automotive radar and medical sensing) with known measurement uncertainties. Recent contributions from PTB to the state of the art and future directions of research will be highlighted.*	*Uwe Arz* *Project Coordinator* *PTB, Germany*
10.00 – 12.00	**Morning Session**	
10:00 - 10.30	**Impact of piezoelectric nano-positioner displacement accuracy on On-wafer S-parameters uncertainties** *This paper presents an improved technique for monitoring and controlling the contact condition of on-wafer RF probes with nanometer accuracy to enhance the measurement repeatability. A repeatability study based on standard deviations of the measured data considering both conventional and proposed approaches is described.*	Gilles Dambrine Université Lille, France
10:30 - 11:00	**Towards development of a broadband measurement system for extreme impedance measurements** *Conventional VNA systems exhibit large measurement uncertainty for highly mismatched device measurements. A modified VNA measurement system utilizes interferometer based signal cancellation, resulting in substantial reduction of measurement uncertainties for highly mismatched devices. Initial experiment results will be presented and discussed.*	Faisal Mubarak VSL, The Netherlands
10:30 - 11:00	**Coffee break**	

11:00 - 11:30	**Wafer-level calibration, measurement and measurement uncertainties at the mm-wave frequency range** *Wafer-level S-parameter measurement at mm-wave and sub-mm wave frequencies plays a crucial role in the model development and IC design verification and debug of advanced semiconductor technologies. Accurate calibration of the entire wafer-level measurement system to the RF probe tip end or to the intrinsic device terminals is a critical success factor for extracting trustable device model parameters and characterizing true performance of a RF IC.* *This presentation will start with the basics of S-parameter measurement and calibration techniques at wafer-level. Special attention will be paid to how to choose the right calibration method for specific measurement application needs. Definition of the calibration reference plane and the measurement reference impedance of a calibrated system will be reviewed as well. Finally, the potential sources of calibration residual errors will be analyzed. Practical examples will be given on how to minimize the impact of such errors on the measurement accuracy of a calibrated probe system.*	A. Rumiantsev MPI Corporation
11.30 - 12.00	**Repeatability in on-wafer measurements** *This presentation shows the main uncertainty contributions for on-wafer measurements which arise during the measurement process. Experimental characterization of uncertainties and setting up of an uncertainty budget for on-wafer measurements with VNA Tools II will be shown.*	Johannes Hoffmann METAS, Switzerland
12.00 – 12.30	**On the extraction of characteristic impedance for transmission lines employed in mm-wave on wafer TRL calibration** *Due to the difficulty, especially at higher frequencies, in manufacturing accurate and predictable calibration standards (i.e., resistors) in commercial silicon technology, (multiline)-TRL calibration represents the standard employed technique in association with the few requirements on the knowledge of the calibration standards. However, in order to properly re-normalize the calibration reference impedance, the accurate knowledge of the characteristic impedance of the employed line is needed. So far, several measurement based techniques have been proposed for the accurate extraction of the characteristic impedance for lossy transmission lines. In this presentation, an overview of all currently employed techniques is presented, highlighting advantages and drawbacks, and finally proposing an alternative solution for an a-priori computation of the characteristic impedance of transmission line fabricated in commercial silicon BEOL.*	Luca Galatro Delft University of Technology The Netherlands
12:30 - 13:30	**Lunch**	
13.30 - 14.30	**Afternoon Session**	
13.30 - 14.00	**Numerical investigation of parasitic modes of CPW transmission lines beyond 110 GHz** -	Chong Li NPL, United Kingdom
14.00 - 14.30	**Interaction of EM fields with rough or coated surfaces** *The Gradient Model primary developed to describe skin effect in rough surfaces also allows to model stacks of thin layers with different conductivity. Due to its modeling approach, utilizing a location dependent conductivity, penetration of the magnetic field through layers of different conductivity can be precisely predicted. From that, impact on damping and propagation delay is calculated. In this presentation the skin effect in rough, layered conductors is calculated and the simulation results are compared to measurement data from a commercially available PC1.85mm precision air-line. The indicated method is not limited to coaxial transmission lines. It is applicable in field solvers as well as it is for analytical two-wire transmission line models. Therefore we introduce the concept of an equivalent circumference that allows applying the Gradient Model to planar calibration substrates.*	Gerard Gold FAU, Germany
14:30 - 15:00	**Round table discussion**	
15:30 - 17:00	**TUD Lab tour**	