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**P2822**

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**Submitter Email:** a.rumiantsev@gmail.com

**Type of Project:** New IEEE Standard

**Project Request Type:** Initiation / New

**PAR Request Date:** 24 May 2019

**PAR Approval Date:** 05 Sep 2019

**PAR Expiration Date:** 31 Dec 2023

**PAR Status:** Active

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**1.1 Project Number:** P2822

**1.2 Type of Document:** Recommended Practice

**1.3 Life Cycle:** Full Use

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**2.1 Project Title:** Recommended Practice for Microwave, Millimeter-wave and THz On-Wafer Calibrations, De-Embedding and Measurements

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**3.1 Working Group:** Recommended Practice for Microwave, Millimeter-wave and THz On-Wafer Calibrations, De-Embedding and Measurement(MTT/SCC/On\_Wafer Calibration)

**3.1.1 Contact Information for Working Group Chair:**

**Name:** Andrej Rumiantsev

**Email Address:** a.rumiantsev@gmail.com

**3.1.2 Contact Information for Working Group Vice Chair:**

None

**3.2 Society and Committee:** IEEE Microwave Theory and Techniques Society/Standards Coordinating Committee(MTT/SCC)

**3.2.1 Contact Information for Standards Committee Chair:**

**Name:** Ronald Ginley

**Email Address:** rginley@ieee.org

**3.2.2 Contact Information for Standards Committee Vice Chair:**

None

**3.2.3 Contact Information for Standards Representative:**

**Name:** Michael Janezic

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**4.1 Type of Ballot:** Individual

**4.2 Expected Date of submission of draft to the IEEE SA for Initial Standards Committee Ballot:** Dec 2020

**4.3 Projected Completion Date for Submittal to RevCom:** Oct 2021

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**5.1 Approximate number of people expected to be actively involved in the development of this project:** 20

**5.2 Scope of proposed standard:** This Recommended Practice describes best-practice procedures for performing accurate on-wafer calibrations, de-embedding and measurements at microwave, millimeter-wave and THz frequencies. Recommendations are given for designing and performing both accurate on-wafer calibrations in coplanar waveguide and microstrip lines fabricated directly on a user's wafer and off-wafer "probe-tip" working calibrations.

**5.3 Is the completion of this standard contingent upon the completion of another standard?** No

**5.4 Purpose:** This Recommended Practice will improve calibration and measurement strategies and accuracy throughout the microwave and semiconductor industry.

**5.5 Need for the Project:** Currently available guidance in the field of on-wafer measurements is limited almost entirely to scholarly articles and industry technical notes. Industry technical notes only treat the use of off-wafer probe-tip calibrations. Information on performing the most accurate on-wafer calibrations are only available in scholarly articles, which are difficult to find and take significant time to understand. Moreover, published material is usually semiconductor-process specific and thus, it is either not directly applicable broadly or/and lacks for key specific (proprietary) information. Addressing both calibration and pad parasitic de-embedding steps at once, the project will help to clarify common industry misconceptions. Poor on-wafer calibrations may cause unnecessary "extrinsic" parasitics. These may also not be physical, making it more difficult to compensate for them. Thus, there is a link between calibration quality and the approach used to address these parasitics.

**5.6 Stakeholders for the Standard:** Semiconductor manufacturers and the large segments of the computer, telecommunications and electronics industry dependent on high-frequency integrated circuits depend on on-wafer measurements to characterize their technologies and products, and are important stakeholders for this Recommended Practice.

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**6.1 Intellectual Property**

**6.1.1 Is the Standards Committee aware of any copyright permissions needed for this project?**

No

**6.1.2 Is the Standards Committee aware of possible registration activity related to this project?**

No

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**7.1 Are there other standards or projects with a similar scope?** No

**7.2 Is it the intent to develop this document jointly with another organization?** No

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**8.1 Additional Explanatory Notes :** Item #3.2 Sponsoring Society and Committee:

- Microwave Theory and Techniques Society
- Standards Coordinating Committee
- MTT-11 Microwave Measurements Committee

Item #5.3: Is the completion of this standard contingent upon the completion of another standard?

- No.

However, this Recommended Practice is expected to lay the foundation for Recommended-Practice documents addressing the extraction of extrinsic parasitics of passive and active devices (e.g. inductors, transistors, etc.) and the development of measurement uncertainties for on-wafer measurements and parameter-extraction for device modeling tasks.