iNEMI 5G Materials Characterization Project Update

December 22, 2021
Motivation:
- 5G Solutions require ultra-low loss laminate materials and PCBs/substrates for efficient design of 5G communications equipment
- The existing transmission loss or Df/Dk measurement methodology lacks consistency, especially for higher frequency measurements (such as 30-100GHz)
- Many different test methods currently in the industry, require different fixtures and test methods/sample preparation/data analysis/extraction
- Industry needs standardized measurement methods and reference materials

Objective:
- Develop consistent Df/Dk measurement methodologies for characterizing ultra low loss laminate materials in the range of 30 – 100GHz
- Provide guidelines and best practices to the industry

Strategy/Approach:
- Benchmark existing measurement methodologies and reference materials
- Develop guideline of standardized method of Dk, Df measurement based on round robin testing
- Propose “standard” test coupons for industry wide application (Phase 2)

Status:
- Project kicked off in Jul’20: 27 members
- Benchmarking tasks (1, 2): Completed, Nov’20. Two comprehensive reports issued
- 2 Round robin measurement using 4 different resonators and two reference materials across 10 global companies. Complete
- Commercial Materials testing and Validation: In progress

https://community.inemi.org/content.asp?contentid=639
5G Materials Project: Industry Collaboration Brought Together by iNEMI

Project Team

- 3M
- AGC-Nelco
- Ajinomoto USA
- AT&S
- Centro Ricerche FIAT-FCA
- Dell
- Dupont
- EMD Electronics (Co-Chair)
- Flex
- Georgia Tech
- Showa Denko Materials
- IBIDEN Co Ltd
- IBM
- Intel
- Isola
- ITRI (Co-Chair)
- Keysight (Co-Chair)
- MacDermid-Alpha
- Mosaic Microsystems
- NIST
- Nokia
- Panasonic
- QWED
- Shengyi Technology Company
- Sheldahl
- Unimicron Technology Corp
- Zestron
### Project Goals & Status

- Gather industry experts to understand needs and address these problems
- Development of **traceable material references** by standards organizations
- Linkage between end to end supply chain: materials suppliers, equipment manufacturers and end users

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<th>Task 1</th>
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| **Benchmark**  
- Current techniques  
- Typical material samples  
- Potential reference materials  
- Common practices & issues  

Report complete | **Benchmark**  
- Emerging techniques  
- Possibilities beyond 100GHz  

Report complete | **Round Robin Tests**  
- Create reference samples  
- Test metrology differences  
- Study lab to lab variations  

Experiment complete  
Report in progress |

Commercial Materials used in the electronics and automotive products testing in progress: Validate test methodology across various market segments