

HIGH FREQUENCY APPLICATIONS UTILIZING SOME ADVANCED FABRICATION LTCC TECHNIQUES

Timo Tick¹, Jani Peräntie¹, Mikko Komulainen¹, Jyri Jäntti¹,
Charles Free², K. M. Lum², Heli Jantunen¹

¹Microelectronics and Materials Physics Laboratories, Department of Electrical and
Information Engineering, University of Oulu, Oulu, Finland

²Advanced Technology Institute, University of Surrey, UK

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The telecommunications industry is constantly moving towards higher frequencies and smaller product sizes, thus creating many challenges for interconnection and packaging technology. Especially the microwave and millimeter wave (mm-wave) front ends are becoming more and more complex due to the increase in devices' operational frequency and number of used frequency bands. Multilayer low-temperature co-fired ceramics (LTCC) is an established technology employed in the creation of highly integrated components and modules for microwave and mm-wave applications. It has a capability to house integrated passive circuits and 3-dimensional transmission line structures as well as to act as a reliable platform for integrated circuit (IC) assembly. In addition to its excellent integration capacity, LTCC technology offers great potential in the manufacture of multi-material modules, where materials with different electrical properties are combined within one substrate /1/. Cavity and channel structures to form advanced mm-wave structures are another promising opportunity not yet widely researched. Development of multimaterial modules with air-filled mm-wave structures is able to offer e.g. front end integrations not possible in any other way than utilizing LTCC technology ideals. This also enables cost efficient module manufacturing with high level reliability. However, there are many technical challenges

still to overcome, before complex LTCC modules with truly 3 – dimensional structures and integrated functional materials can be effectively realized, most of which are related to the manufacturing process. This paper shows some recent solutions to overcome these challenges especially related to high frequency application. Some advanced sintering techniques /2/ as well as novel structures /3/ are proposed to integrate functional ceramic frequency tuning elements into a LTCC module. Additionally a method to fabricate air-filled cavities for waveguide and antenna applications without via fences is demonstrated /4-5/.

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*Timo Tick, Jani Peräntie, Mikko Komulainen,
Jyri Jäntti, Heli Jantunen*

*Microelectronics and Materials Physics Laboratories,
Department of Electrical and Information Engineering,
University of Oulu, PL 4500, FIN-90014 Oulu, Finland*

*Charles Free, K. M. Lum,
Advanced Technology Institute, University of Surrey, UK*

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