Project: ***Space Qualification of High Q***

Micromachined Planar Filter Components

reinhardt MICROTECH

thin film technology for microelectronics

Activity Summary September 2008

1 Company Presentation

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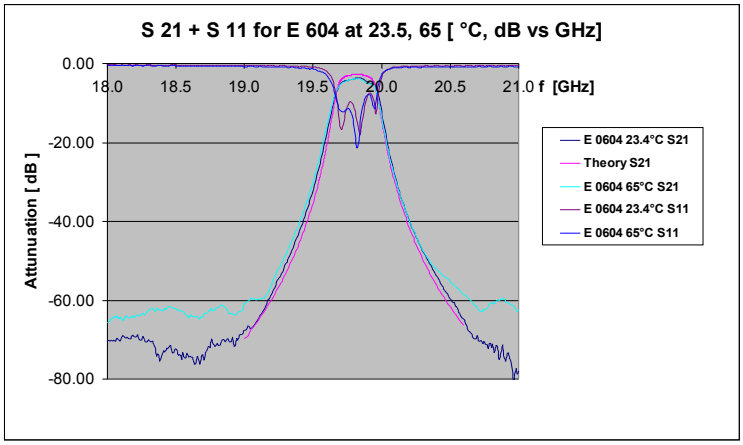
Created in 1984, RMT is a European manufacturer specialising in Thin Film Technologies for microelectronics and is an independent supplier of thin film coated substrates. RMT offers, for a wide range of applications, specific and individual consultation and the infrastructure for realising complex applications (mainly on alumina substrates).
Since May 2007 RMT is part of Cicor's Micoelectronics Division (http://www.cicor.ch/).

2 Overview / Scope of Project

This activity is part of the ESA GSTP-4 programme. The motivation for the project is to obtain an ESCC evaluated European source for custom RF-MEMS filters and, by this means, make such components broadly available to the European space industry. A first step towards this goal was made with the earlier project "Enabling of High Q micro machined planar filters" in which first devices fabricated in an industrial environment were shown to fulfil the required RF performance. One important effort was to perform all required process steps on a wafer level; only this guaranteed a sufficient throughput, reliable narrow process tolerances and the required process traceability. RMT developed a process flow which enabled a controlled and repeatable fabrication of the devices, up to the final separation process (dicing). Further progress, using the accumulated know-how and practical experience gained, is planned with a continuation programme aiming to come to a space evaluated fabrication process listed in the ESCC EPPL.

The basic interest for membrane supported micro machined filters is found for space applications within K_a (27-40 GHz) and Q/V (40-50 GHz) telecom satellite repeaters. The specifications of the high Q micro-machined filters are based on the following typical characteristics:

- Rejection of R_x - and T_x - Band > 50dB
- Minimise sideband effects
- Minimise temperature effects



Timescale

The overall project duration is planned to be 20 months starting from mid September 2008.

3 Activity approach and Work Structure

The continuation programme “Space Qualification of High Q Micromachined Planar Filter Components” is based on the ESA Statement of Work ref.: “TECQCT/2008SoW01/LM”. The work breakdown structure is divided into 3 major technical tasks and one management task.

Task 1: Space Evaluation Preparation

This task aims first at consolidating the fabrication process available at RMT. Final materials for the underfill and conducting adhesive will be selected and the Process Identification Document (PID) updated accordingly. For the integration of the filters into higher level modules several additional improvements will be made to the existing process (common ground at device top and bottom (to ease device interconnection testing), wire bondable, solderable, vacuum compensation).
As the fabrication process is to be ESCC evaluated, Task 1 will include a space evaluation programme definition. During this the tests to be carried out for the process evaluation as well as the test vehicles to be used for evaluation and the later industrial qualification by TAS-F (Task 3) will be pre-defined.
A process readiness evaluation meeting will take place at this stage to obtain ESA agreement on the proposed Evaluation Test Plan (ETP). Once ESA has approved the approach, Task 1 will proceed with the manufacturing of a first run of 80 devices to demonstrate the stability of the improved process and to be used for the space evaluation.
Finally, the 4th work package of Task 1 will be the definition and specification of a demonstrator, taking advantage of the RMT RF filter technology. It will be proposed to ESA via the delivery of Technical Note 1. Also, a process pre–industrial qualification meeting will be held and will close out Task 1.

Task 2: Space Evaluation and industrial pre-qualification

The ETP will be performed within task 2 using the 80 devices previously fabricated and tested in Task 1. The next WP will cover an industrial qualification programme definition, submitted to ESA for approval and to be performed by TAS. Once the programme is approved, a second batch of 80 devices will be fabricated to be used for the qualification exercise. A further WP consists of the detailed design of the demonstrator, previously outlined in TN1, and the distribution of a validation test plan for it. A qualification readiness review will be organised at the end of task 2 to obtain ESA authorisation to proceed with industrial qualification testing (Task 3).

Task 3: Industrial Qualification

Task 3 will start with the actual industrial qualification testing at TAS-F as agreed during the qualification readiness review. In a continuation of this task, the demonstrator will be manufactured using the devices available from the second batch. Finally, the demonstrator will be tested and benchmarked versus flight model (FM) product using non MEMS technology.

Task 4: Management
This will cover all required management activities such as reporting, documentation and meetings.