

Deliverable Report

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Executive summary:

The document illustrates and briefly describes the second-generation 895 nm VCSEL sample delivered to project partner VTT for incorporation into atomic clock demonstrators. In addition, two out-of-specification VCSEL samples have been delivered to test the gold stud bumping process and the far-field emission characteristics.

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Document Approvals

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1. VCSEL sample description and delivery

1.1 Second-generation 895 nm VCSEL

A VCSEL sample with surface gratings for polarization control and the flip-chip-bondable design (sample F) has been manufactured and delivered to project partner VTT. The sample has 3 mm x 4 mm size and contains several 894.6 nm wavelength lasers which fulfill the MAC-TFC specifications at elevated temperatures of 65 to 80 °C. The substrate is thinned to less than 200 µm. After dicing the VCSELs can be bonded to LTCC submounts as part of the MEMS atomic clock demonstrators.

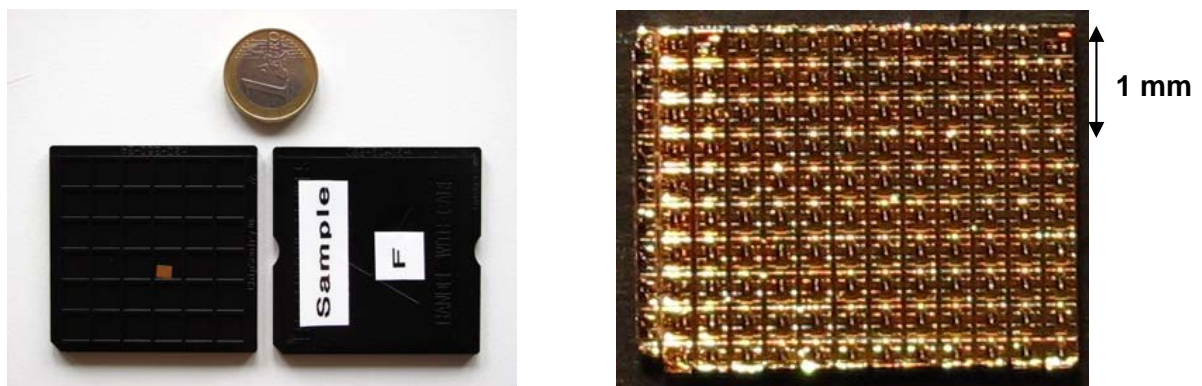


Figure 1: Photograph of the flip-chip-bondable VCSEL sample F (left) and enlarged view (right).

Moreover, two test samples (D, 2 x 5 mm² size and E, 3 x 3 mm²) from different wafer material have been delivered to VTT for continued tests of the gold stud bumping process and verification of the far-field emission characteristics. The emission wavelengths of these lasers do not coincide with the Cs D1 resonance.