

Back end microlenses deposition process evaluation for CMOS image sensors - Objectives

Microlenses are widely used within consumer imaging products, not only in order to compensate for non 100% fill factor but also in view of improving MTF (e.g. for back side illuminated devices). Such Microlenses are manufactured within the standard flow of CIS foundries. They are mainly directed at pixel pitch in the 1 to 5 μm range and are unable to efficiently address the usual space applications pitch range which is about 5 to 100 μm , while there is a need for such devices for performance improvements (fill factor, MTF, Parasitic Light Sensitivity). It is therefore proposed to evaluate European capability for Microlenses deposition processes at back end manufacturing level. The processes used can in addition be more robust with respect to space environment through to the use of non-organic material. This due to the undesirable by-products through outgassing that can occur with organic material in vacuum.

The objectives of this activity are therefore to perform the following:

- To Review existing European processes dedicated to Microlenses deposition.
- To Review and consolidate requirement Specification and Components Production Process Identification as well as reliability analysis.
- To draft an Evaluation Test Plan.
- To Plan and procure a selected CMOS image sensor that will be used to evaluate the Microlens technology chosen.
- To design, manufacture/deposit Microlenses on a CIS.
- To perform a test campaign to evaluate Microlenses and their enhancement of the CIS based on the ETP plan.

In summary, the first step of this study is to review the existing European processes dedicated to Microlenses deposition in terms of technological capabilities (pitch, available geometry), performances (dead zone/fill factor, transmission, deposition accuracy, uniformity) and achieved space qualification. Based on the selection of the most appropriate process, the second part of the study will consist in the design and manufacturing of a demonstrator which specifications will take full benefit of Microlenses deposition for performance improvements. In particular the Microlenses deposition on the prototype CIS will need to be consistent with space applications, above 5 micron. This is due to the fact that most space born image sensors pitch size is more than 5 micron.