Institut für Mikroelektronik Stuttgart
Stiftung des bürgerlichen Rechts

Master Thesis

Build up and characterization of an optical system with ultra-thin curved image sensors in foil

Field of work:
Advanced Packaging

Focus:
☒Entwicklung & Simulation
☐Layout
☒Charakterisierung
☐Programmierung
☐Hardware-Entwicklung
☒Messtechnik
☐Machbarkeitsstudie

Study program:
☒Elektro- und Informationstechnik
☒Physik
☐Biologie
☐Informatik
☒Maschinenbau

Start:
01.Nov.2022 or earlier

Duration:
6 Monate

Background Knowledge:
☐digitale circuit.
☐analoge circuit.
☒optical Simulation
☐Layout experience
☒Programming Skills
☒electro measuring technology

Contact:
Shuo Wang
Tel: 0711 21855-473
Björn Albrecht
Tel: 0711 21855-449

E-Mail:
shuowang@ims-chips.de
albrecht@ims-chips.de

Stand: 07.04.2022

Motivation

A conventional image sensor is in a planar shape and due to the field curvature aberration, a flat object cannot be properly focused on a flat image plane. A flexible and curved image sensor, not having to correct this curvature, is considered a possible solution for producing a compactible optical system. [1,2]

Scope of Work

Using a previously developed and manufactured flexible HySiF (Hybrid System in Foil) patch, the effects and image sharpness depending on the curvature of the image sensor are to be examined. For this purpose, optical and electrical measurements on the foil/printed circuit board system should be planned, prepared and carried out in the laboratory [3,4]. The structure of the optical system with chip film patch (CFP) and lens should be evaluated by simulation.
During the work, the following tasks should be scientifically examined and documented:

- ✓ Literature review focusing on curved image sensors
- ✓ Hardware and software solution for reading the image data from the CFP (board layout and control or data evaluation)
- ✓ Optical simulation of optical paths
- ✓ Optical design and construction
    - Evaluation of image depending on the curvature
    - Determine and investigate changes in sensor properties during bending

References

[1] F. Zuber, et al. "Tolerancing and characterization of curved image sensor systems," Appl. Opt. 59, 8814-8821 (2020)
[2] Guenter, Brian, et al. "Highly curved image sensors: a practical approach for improved optical performance." Optics Express 25.12 (2017): 13010-13023.
[3] S. Wang, et al. "Ultra-thin Image Sensor Chip Embeded Foil," 2021 IEEE International Conference on Flexible and Printable Sensors and Systems (FLEPS), 2021, pp. 1-4, doi: 10.1109/FLEPS51544.2021.9469747.
[4] S. Wang, J. D. S. Spüntrup, B. Albrecht, C. Harendt and J. N. Burghartz, "Processing and Characterisation of an Ultra-thin Image Sensor Chip in flexible Foil System," 2022 IEEE International Conference on Flexible and Printable Sensors and Systems (FLEPS), 2022, pp. 1-4, doi: 10.1109/FLEPS53764.2022.9781520.

Key Words

Flexible electronics, thin and bendable image sensor, HySiF, structure and characterization of the optical system, chip film patch (CFP).