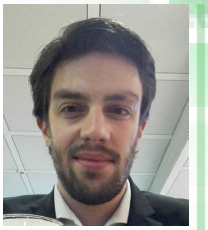
# Top-down contacting of single InAs quantum dots using AFM & SEM





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**Keywords** Quantum dots, contacting, AFM, SEM

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## Context

InAs quantum dots are interesting for novel terahertz applications due to their energy level spacing [1]. This research is performed as an internship project of three months as part of a master's program in applied physics. In this work a method to align electrodes made with electron beam lithography to 50-100 nm wide InAs quantum dots with a contact yield of approximately 60% is demonstrated.

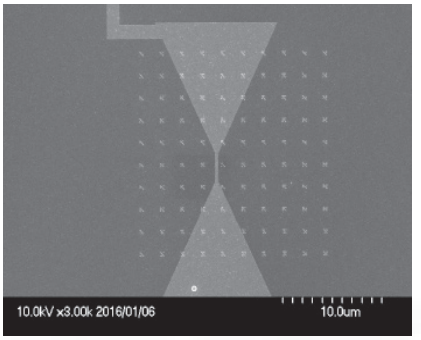


*Fig. 1. SEM image of contacted InAs quantum dot*

## Objectives & Methods

The goal is to deliver a reliable top-down method of contacting quantum dots for research purposes as currently the contacting of dots relies largely on luck [2]. Both SEM and AFM are employed. Quantum dot positions are determined relative to an existing bitmarker structure, see figure 1, from which a mask is designed to deposit electrodes in a standard lithography process using both electron beam and photolithography

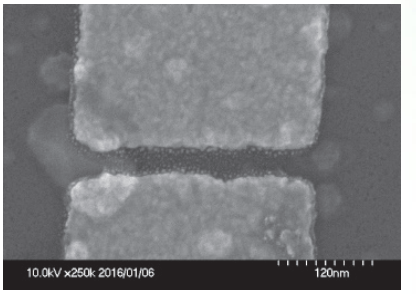


*Fig 2. Bitmarker structure with electrode*

## Results

A successful contact yield of approximately 60% is demonstrated, where the results using an AFM are superior to those using an SEM. An example of a successful contact is shown in figure 2.

## References

[1] P. M. Petroff, Phys. Today, Vol. 52, 2001.
[2] M. Jung, Applied Physics Letters, Vol. 87, 2005.