

# MEMSLand

Cost Effective MEMS to Develop a Sustainable High Tech Business

MEMS Oscillator

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Stan Ackermans Instituut



## NXP business carriers in MEMSLand

Starting with three business carriers:

- BAW filters
- RF Switches
- MEMS Oscillators

NXP continues MEMS Oscillator project

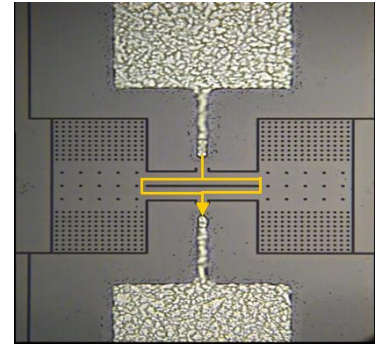
Aim: Replace Quartz crystals

## Results

- New partner created from RF Switch: EPCOS Netherlands
- BAW filters for sale
- MEMS Oscillators continued at NXP

### MEMS Oscillator result

- Due to MEMSLand work target application shifted from GSM to USB2: targets met!  
Market **2 billion pieces/yr**



## Partners

- Valuable collaboration with SME partners on 1 to 1 base
    - Bruco: system and circuit
    - Als: dustfree dicing of MEMS
  - 3-TU Stan Ackermans Instituut: DTI, ICT
  - Internal structure NXP:
    - research Eindhoven: concepts, patents
    - development Nijmegen: prototype, design
- + students from Chalmers Göteborg,, ESIEE Paris, Univ. Nantes, INPG Grenoble, TUD, TU/e

## Learnings from MEMSLand

- New competence: Industrial design methods for MEMS
- Business case: difficult to predict
- Large delays at subcontractor: focus remains important
- Industrial development needs to be close to fabrication and marketing
- **Netherlands lacks certain technology for industrialization**

Need for **Open Innovation to Integration center (I2I) in Nijmegen**

## Competitive position

**MEMSLand**  
Technology benchmark at 48 MHz

	NXP	SiTime	Discera	Mobius	quartz
Cost	😊 ?\$ct	😞 11\$ct	😞 17\$ct	😞 9\$ct	😞 ASP-15\$ct
Size	😊	😞	😞	😊	😞
Signal-to-Noise (dBc/Hz@1KHz)	😊 -100	😞 -70	😞 ?	😞 -65	😊 -120
Power (mW)	😞 6/20	😞 40	😞 30	😞 50	😊 4
Accuracy (ppm, ΔT=100°C)	😞 +/-300 +/-50	😊 +/-100	😊 +/-100	😊 +/-100	😊 +/-20
Maturity	😞	😊	😊	😞	😊😊

NXP's MHz MEMS-XO is only technology combining low cost, small size, low power, and low noise!