MEMS for IoT

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MEMS sensors are the first/basic block of key enablers to build the IoT pilots.
Consumer Motion MEMS Roadmap
Ultra-low-power for the consumer Markets

Ultra-low-power, low-cost evolution

High Accuracy
Low-noise, low-thickness
4x Higher Accuracy

Gaming and gesture devices

Optical Image Stabilization (OIS)

New Markets penetration
Cost effectiveness

Toys and gaming appliances

Low-cost, low-thickness

Wearable
Always-on for tracking

New Markets penetration
Cost effectiveness

Gaming and gesture devices

Cost effectiveness

Always-on for tracking

Ultra-low-power, low-cost evolution

Low-cost, low-thickness
MEMS Microphones, Environmental and Motion sensors

Microphones
- Focus on High Performance Microphones
- Always-on feature
- Audio fidelity required by Social Media
- Proliferation of analog and digital microphones designs across the customer base in mobile and PC

Pressure
- Introduced world’s smallest pressure sensor in tiny package (2x2x0.76mm)
- Applications
  - Altimeter
  - Indoor navigation
  - Weather station

Automotive MEMS
- Motion MEMS for Navigation & Telematics
- Motion MEMS for Passive and Active Safety

UV
- Introduced and ramped the world’s first sensor to provide a direct digital output of the Ultraviolet Index (UVI)
Thin-film Piezo MEMS Actuators and Micro-mirror
New Technologies for the next Wave

Thin-film Piezo MEMS
- Camera Autofocus
- High-speed inkjet print head for commercial and industrial applications

MEMS Micro-mirror
- A Heads-up display (HUD) projects on speed, hazards, GPS on windshield
- A similar principle applies to the Head-mount display (HMD) which projects information onto connected glasses
- Image Projection from a mobile device such as a smartphone
- 3D rendering, gesture and user interface (UI)
- Light pattern projection: various patterns of light can be projected and analyzed to render 3D imaging and gesture recognition applications

ST is the world leader with a Piezo MEMS technology on 8" silicon wafers

What next:
- Micro mirror piezo actuated
- Piezoelectric Energy Harvesting
- 3D Scanning for 3D Printing,
- Accurate Gesture Control for Immersive Gaming
- Face Recognition
- Object Avoidance in autonomous devices
<table>
<thead>
<tr>
<th>Supply side or demand side</th>
<th>Supplying technological development solution for MEMS</th>
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<tbody>
<tr>
<td>IoT Large Scale Pilot (LSP) addressed</td>
<td>Pilots: Smart living environments for ageing well, Wearable for smart ecosystems</td>
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<tr>
<td>Which part of the LSP is addressed?</td>
<td>for supply side: MOTION SENSORS (Accelerometer, gyroscope, Magnetic sensor), MICROPHONES (Analog &amp; Digital), ENVIRONMENTAL SENSORS (Pressure, UV index sensor), ACTUATORS (Fluidics MEMS, Micro-Mirror and new Technologies based on Thin-film Piezo MEMS Actuators), TOUCH (FingerTip) And RF (Bluetooth, SubGhz, Wi-Fi).</td>
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<td>Description of technology or solution offered / requested</td>
<td>Offered: MEMS fab foundry or partnership with other actors in IoT value chain in order to provide incremental technological solution for smart sensor in the pilots frame. Requested: Partnership with other actors to develop new solutions for Energy Harvesting based on piezoelectric systems for application IoT</td>
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<td>Description of the proposed approach and contribution to the LSP</td>
<td>Provide new MEMS sensors that are the first/basic block of key enablers to build the IoT pilots</td>
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<td>Partners already involved (supply side / demand side)</td>
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<td>Partners needed (supply side / demand side)</td>
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<td>Estimated budget for LSP</td>
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<td>Expected duration of the LSP</td>
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