Smart Sensor Systems for Invasive Pressure Monitoring

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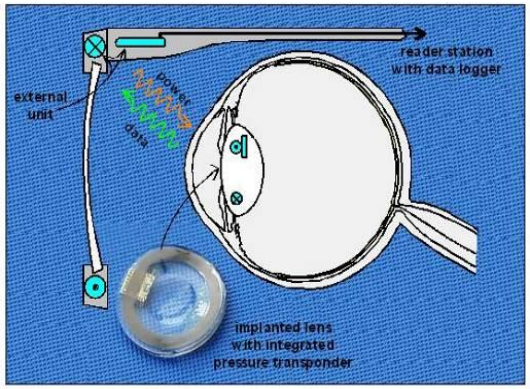
Intracorporal Pressure Measurement

intraocular pressure

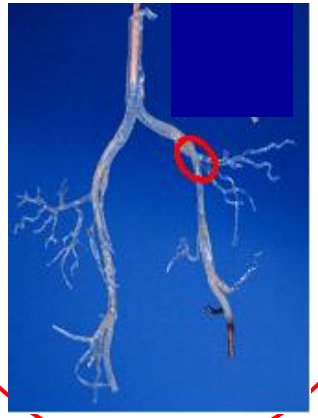


intracranial pressure

gastric/intestinal pressure

pressure in abdominal aortic aneurysm

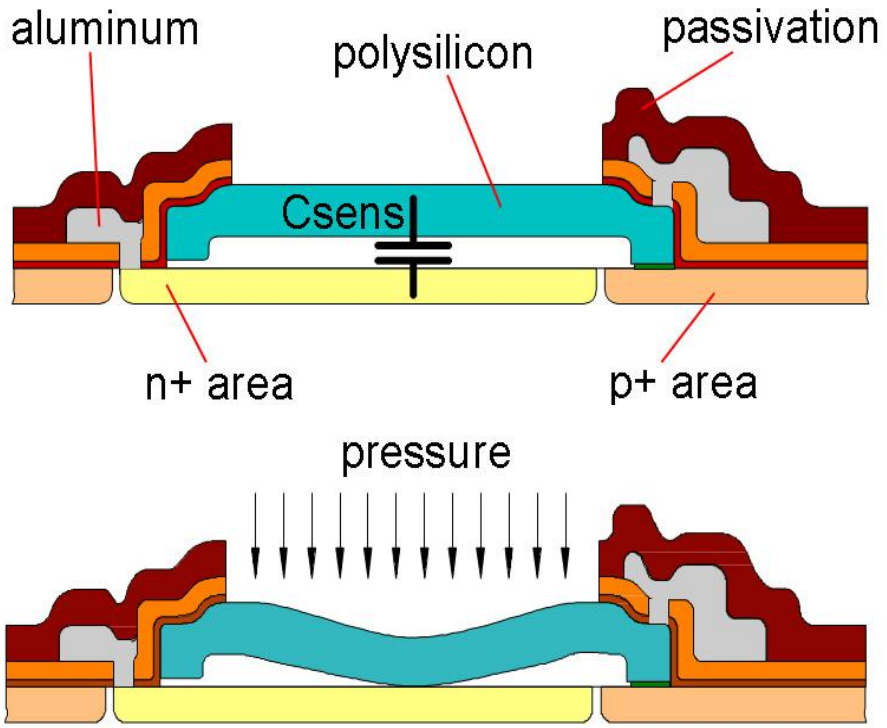
intravascular pressure

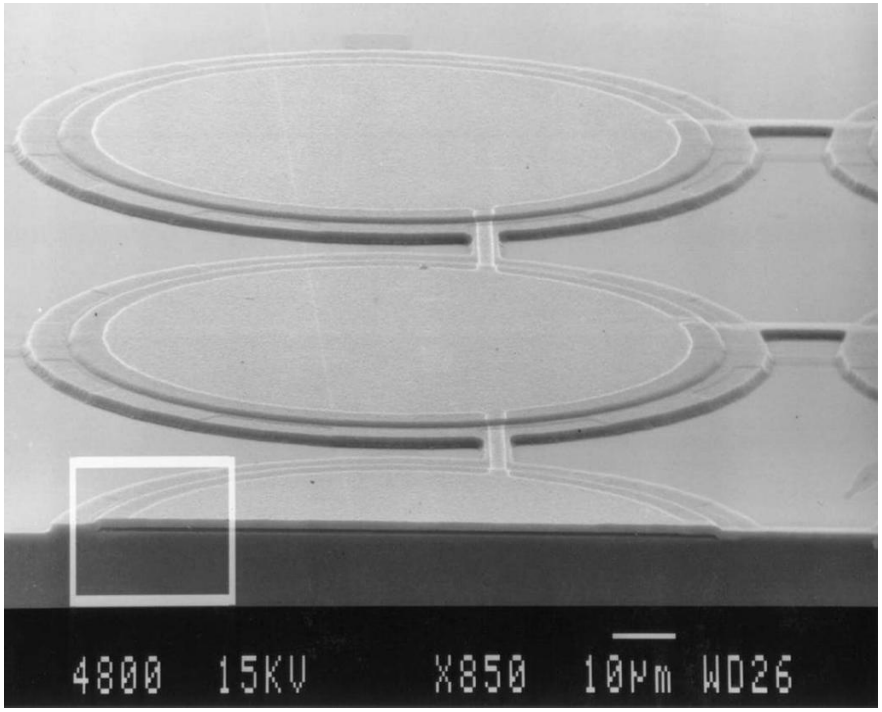


bladder pressure

Surface Micromachined Capacitive Pressure Sensor

A miniaturized plate capacitor for pressure measurement

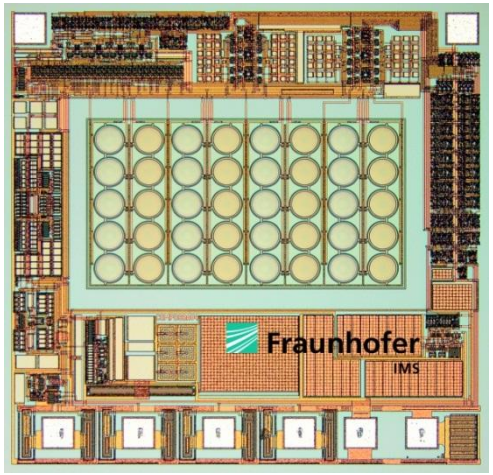


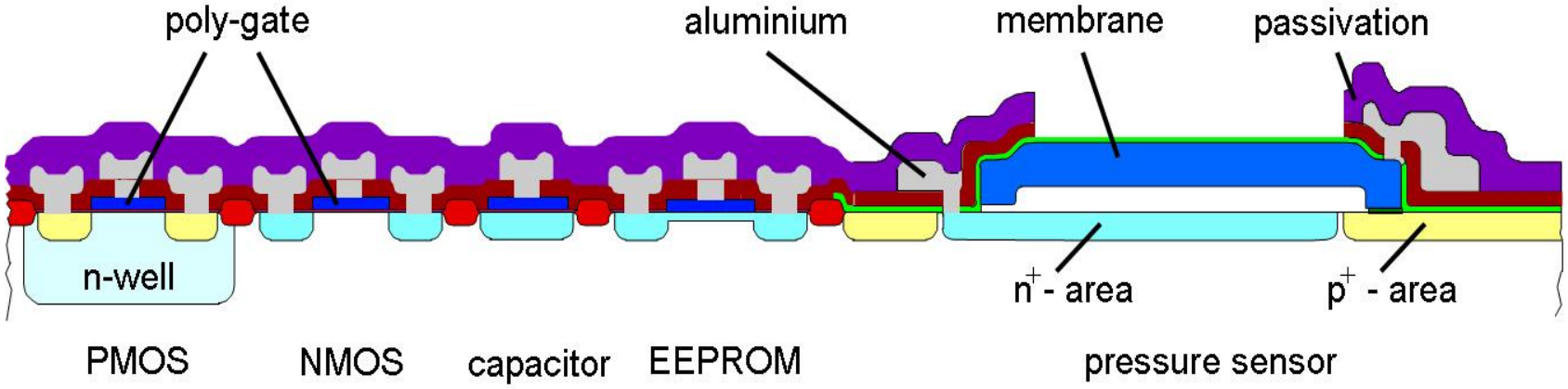


-> miniaturization and low power consumption

CMOS integration

- Integrated capacitive pressure sensor on 8“-wafer using surface micromachining





-> integrated single chip solution

Fraunhofer IMS

Intracorporal Pressure Measurement

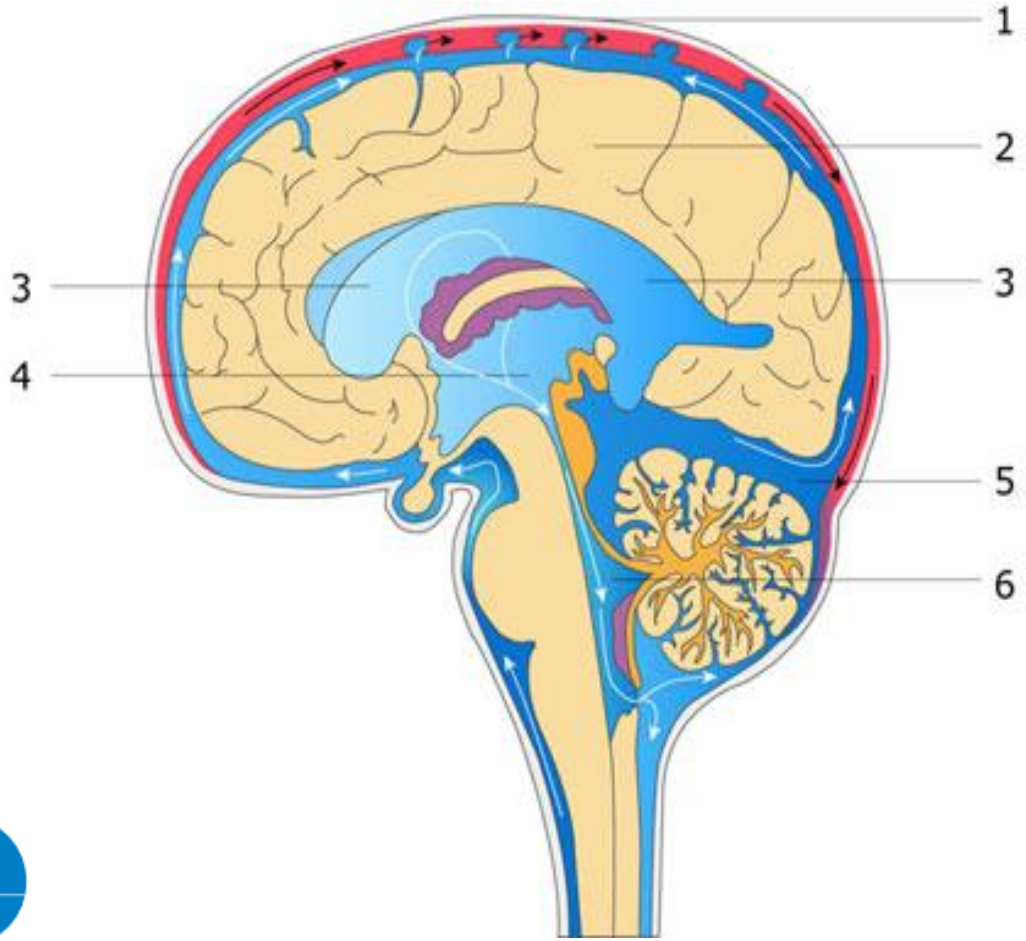
- **Intracranial Pressure Measurement**
- **Intravasacular Pressure Monitoring System**
- **Conclusions**

Intracorporal Pressure Measurement

- **Intra Cranial Pressure Measurement**
- **Intravasacular Pressure Monitoring System**
- **Conclusions**

Intracranial Pressure Measurement

Anatomy of the Brain



1 Cranium

2 Brain

3 Side ventricle

4 Third ventricle

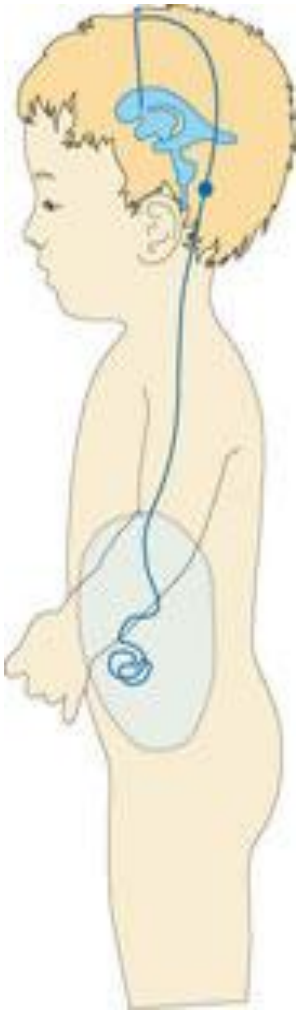
5 Cerebrospinal fluid

6 Fourth ventricle

Intracranial Pressure Measurement

healthy child

child with hydocephalus



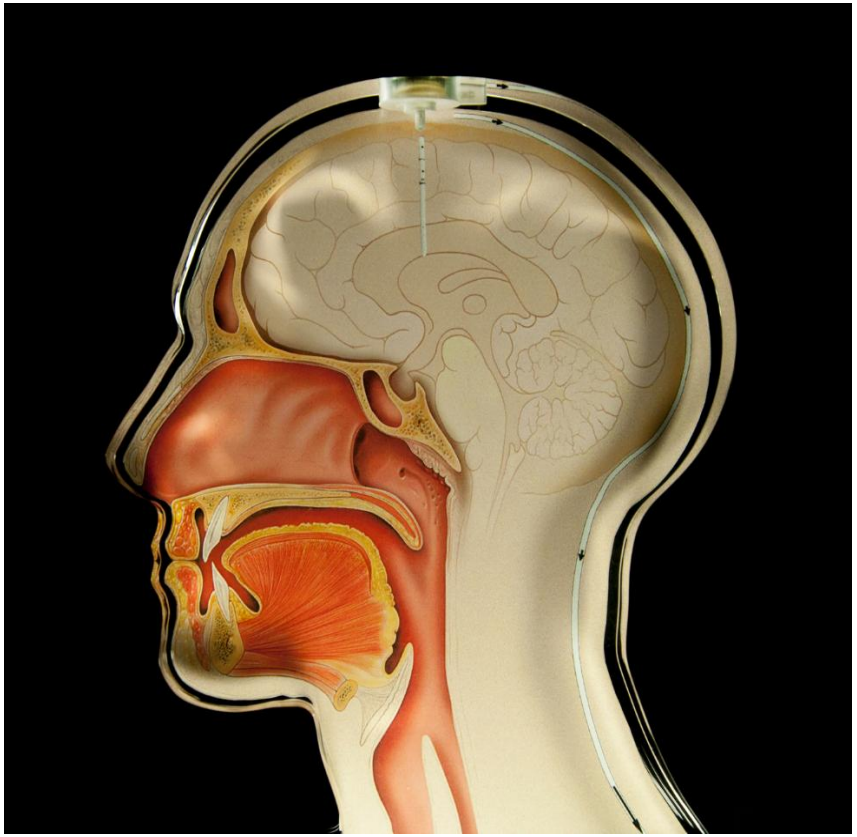
ventrikular-peritoneale shunt

Intracranial Pressure Measurement

ventricular-peritoneal shunt with externally adjustable valve

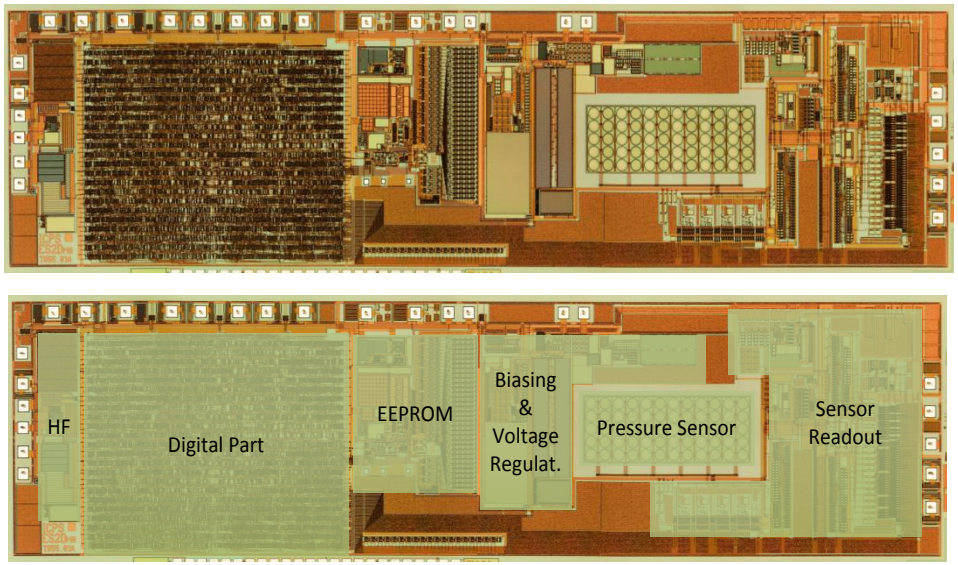
Christoph Miethke GmbH & Co. KG

Intracranial Pressure Measurement



ventricular shunt with externally adjustable valve and integrated pressure measurement

Monolithically integrated capacitive pressure sensors



Intracranial Pressure Measurement

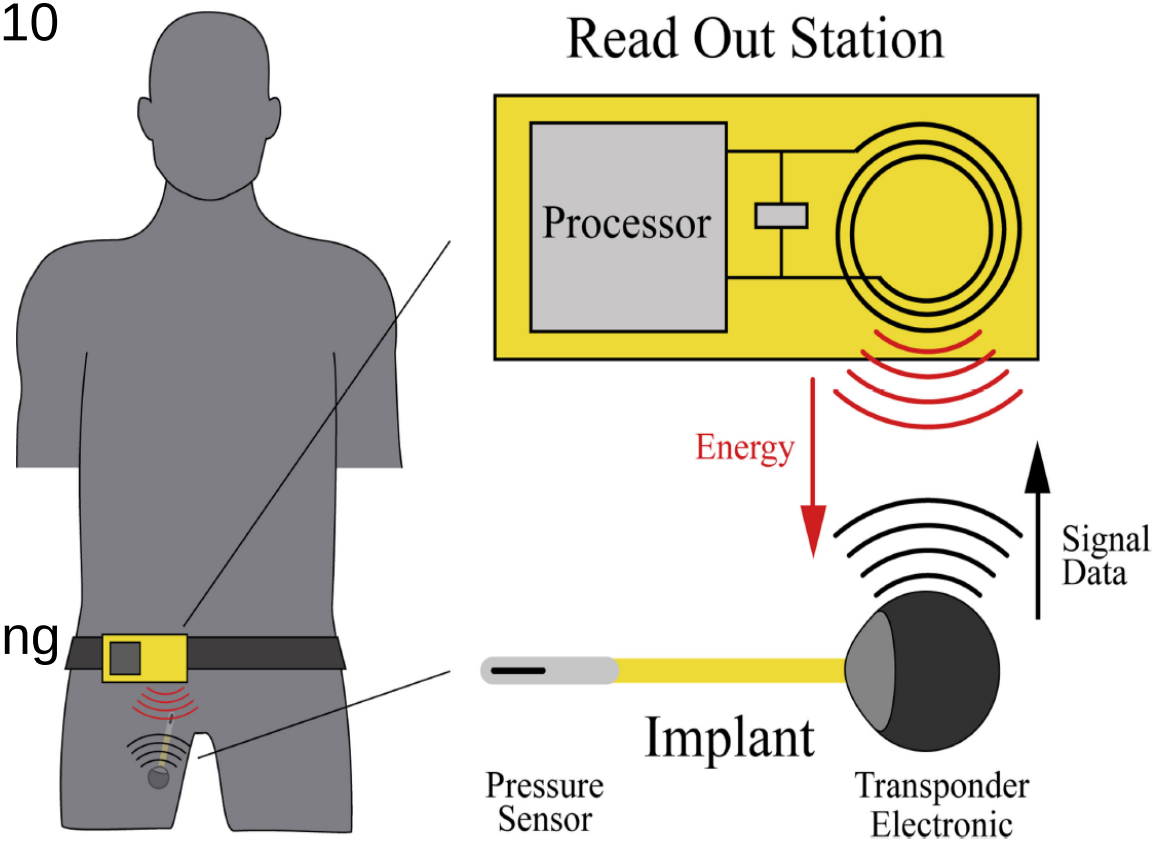
Telemetric read out system

Intracorporal Pressure Measurement

- Intra Cranial Pressure Measurement
- **Intravasacular Pressure Monitoring System**
- Conclusions

Intravascular monitoring system for hypertonia (HYPER-IMS)

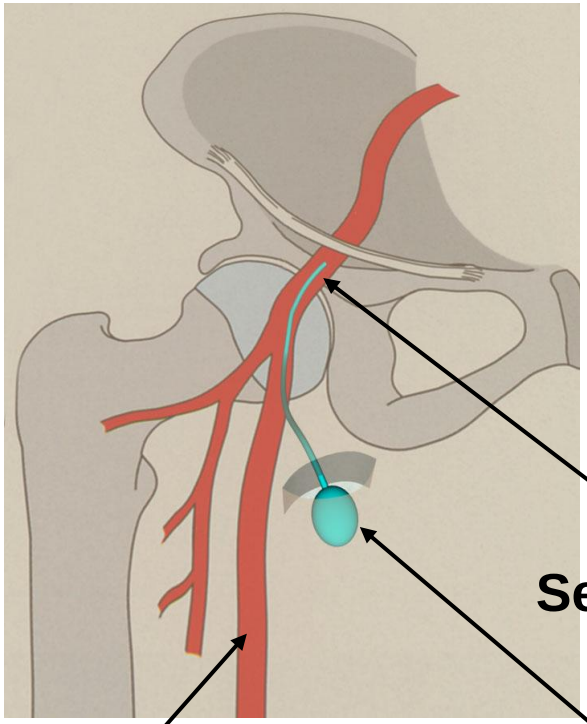
- In Germany approximately 10 million people suffer from hypertension (highly increased blood pressure)
- About 10% of them have problems to control their blood pressure
- Approximately 10% of this group are candidates for a longterm-pressure-monitoring



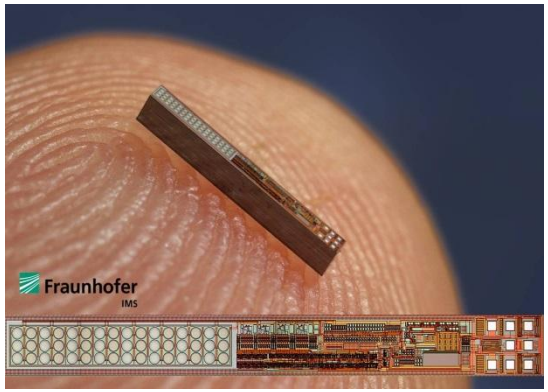
Intravascular monitoring system for hypertonia (HYPER-IMS)

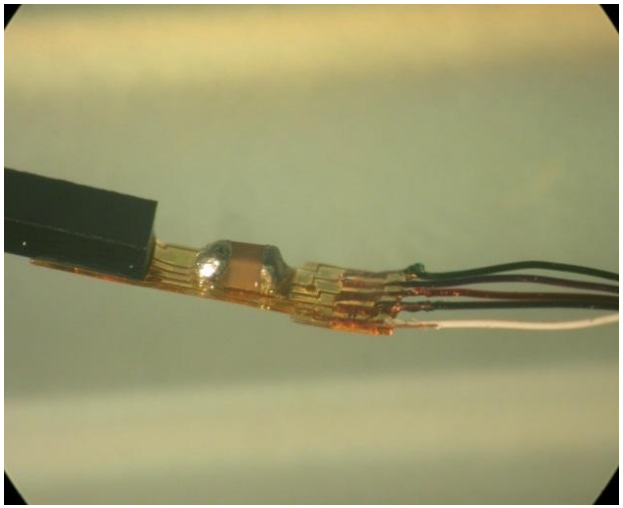
Implantable, wireless long-term monitoring system (24 hours / 7 days) for:

- **blood pressure**
- **heart frequency**
- **blood pulse**
- **cardiac rhythm**

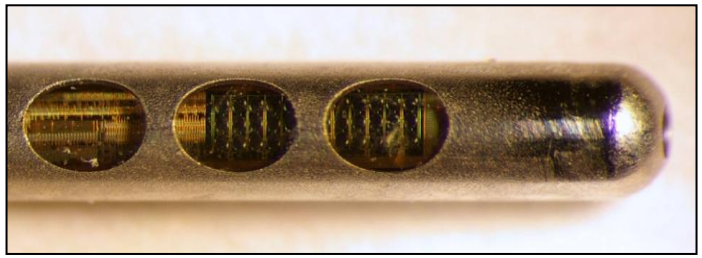


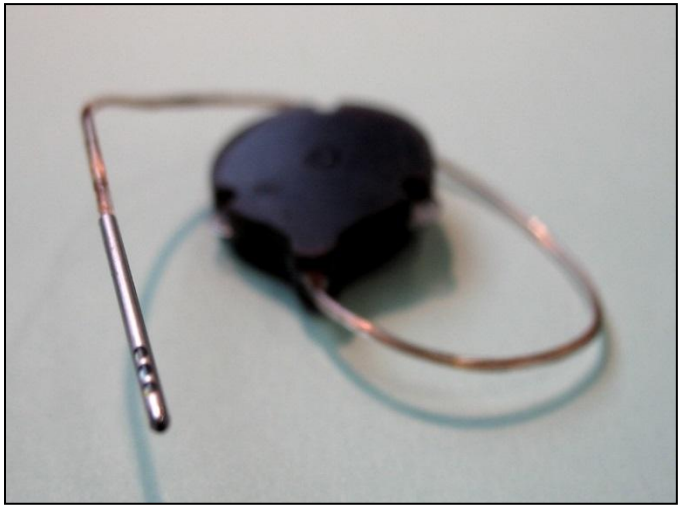
Intravascular monitoring system for hypertonia (HYPER-IMS)



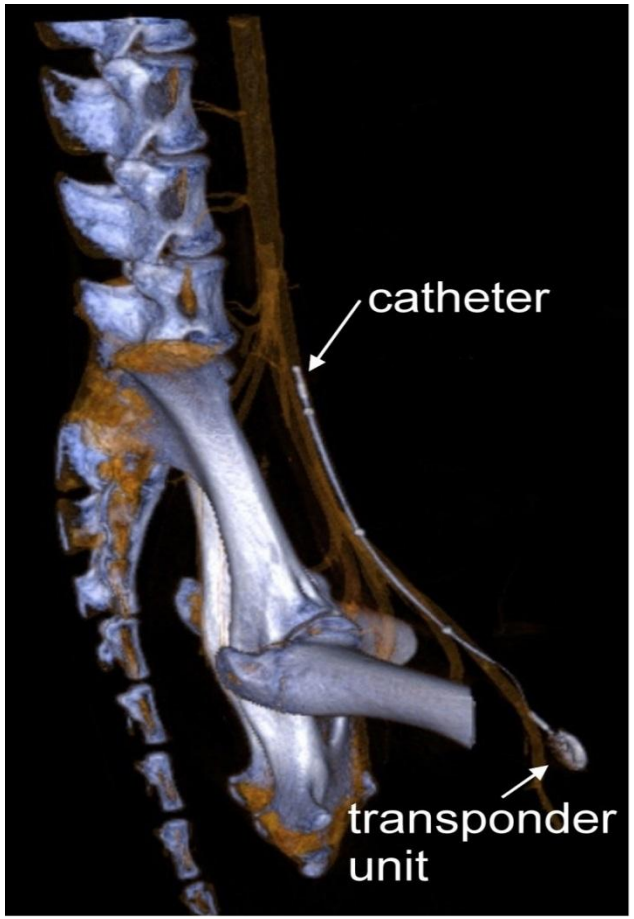


ø 3 F ≈ 1 mm





Intravascular monitoring system for hypertonia (HYPER-IMS)

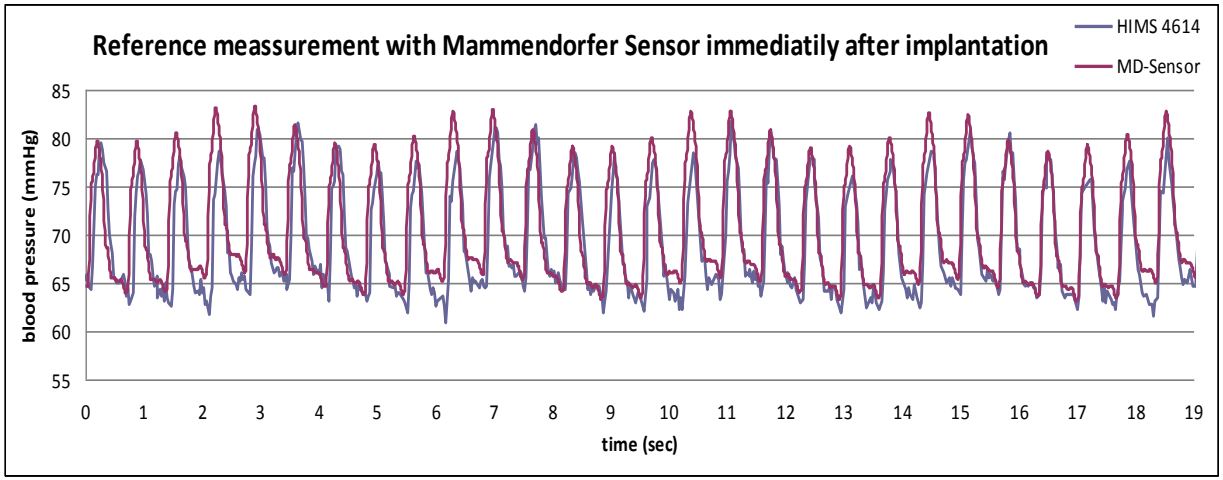


System test

→ *implantation of the sensor-tip into the arteria femoralis of a sheap*

→ *subcutaneous placement of the transponder unit*

→ *acute and chronic in-vivo testing*



Intracorporal Pressure Measurement

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- Intravasacular Pressure Monitoring System
- **Conclusions**

Conclusions

- **By microsystem technology systems can strongly be miniaturized so that implantation becomes possible**
- **New applications will be possible (e.g. implants to measure and regulate brain pressure as one example)**
- **In future intelligent implants and protheses will support strongly the field of "home care“**

Challenges

- **Long term stability of flexible “intelligent” implants**
- **Further miniaturization**
- **Energy harvesting**
- **Assumption of cost by health insurances**

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GEFÖRDERT VOM

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