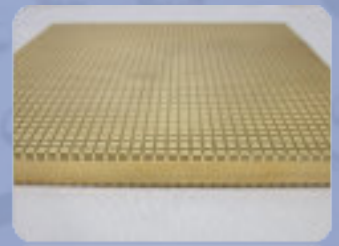
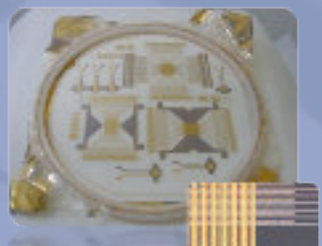


# TRANSDUCER DEVELOPMENT AND MANUFACTURING

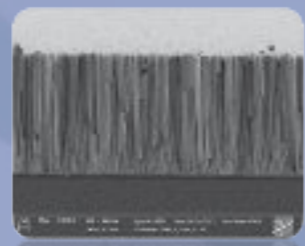
- Different applications: imaging, therapy, NDT
- Single element or array transducers (1D, 2D, special geometries)
- Different technologies (PZT, single crystal, composites)
- Wide frequency range from kHz to GHz
- MR-compatible transducer technology
- Scalable production technology from single prototypes to batches (certified according to ISO 13485)



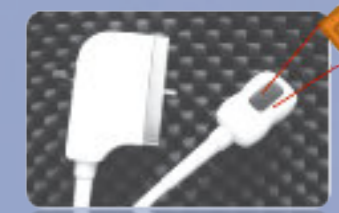
PZT Composite



PVDF foil



Gas flow sputtering of thick PZT layers



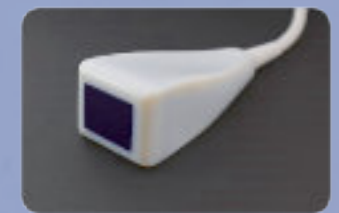
Bi-plane, 128E, 5 MHz



64E, 3 MHz



1024E, 2.5 MHz



121E, 0.6 / 2 MHz



1024E, 4 MHz



1024E, 1 MHz

# ULTRASOUND EXPERTISE & STRUCTURE

- 5 groups with expertise in ultrasound simulation, electronics, transducers, signal processing / algorithms and transducer production technologies (ISO 13485 certified)
- More than 30 years of experience in development of customized ultrasound hard- and software solutions
- More than 40 people of highly qualified staff
- More than 50 ultrasound R&D projects per year
- Excellent infrastructure for development & characterization of ultrasound hardware

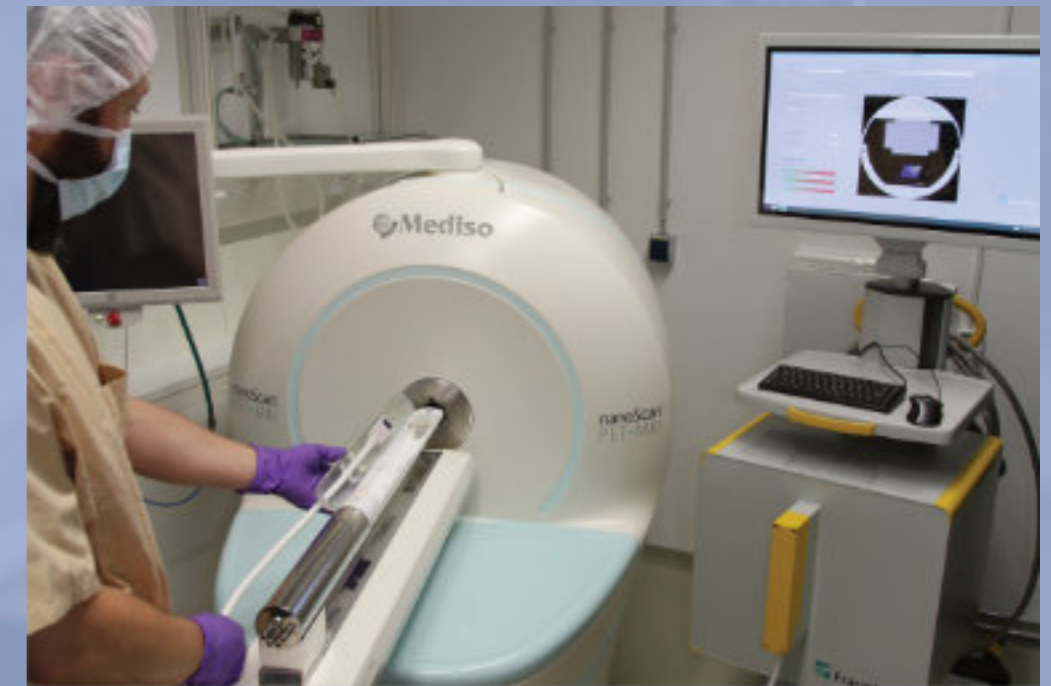


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FRAUNHOFER INSTITUTE FOR BIOMEDICAL ENGINEERING (IBMT)

# CUSTOMIZED SOLUTIONS FOR ULTRASOUND BASED CELL THERAPY, SMALL ANIMAL THERAPY AND NEUROSTIMULATION

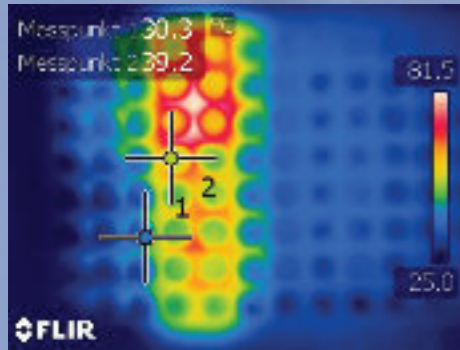


FROM FEASIBILITY TO CERTIFIED SYSTEMS

## TRANSLATIONAL THERAPEUTIC ULTRASOUND

### High-throughput cell therapy applicators:

- Applicators from 6 to 96 well plates
- Adjustable frequency range
- Defined sequences (PRF, DC, frequency, burst count)
- Different applications: ultrasound hyperthermia, ultrasound induced drug-delivery, BBB opening



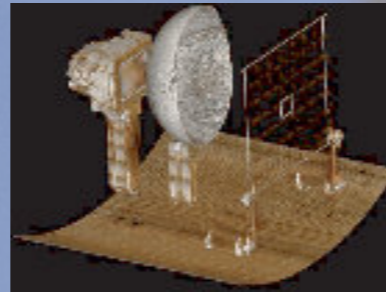
Hyperthermia measurement



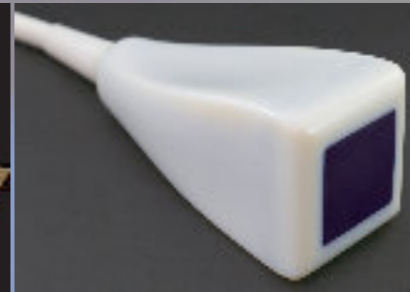
Ultrasound well applicator

### Ultrasound neurostimulation system:

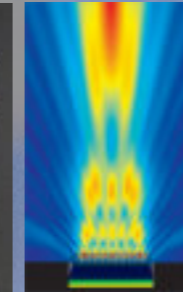
- Matrix array probes for 3D steering at different frequencies
- 128 channel electronics system, programmable pulse sequence
- Intuitive user interface for free 3D focus positioning
- Certified for clinical use (conformity to IEC 60601, 60601-2-37, 62304)



Skull bone compensation



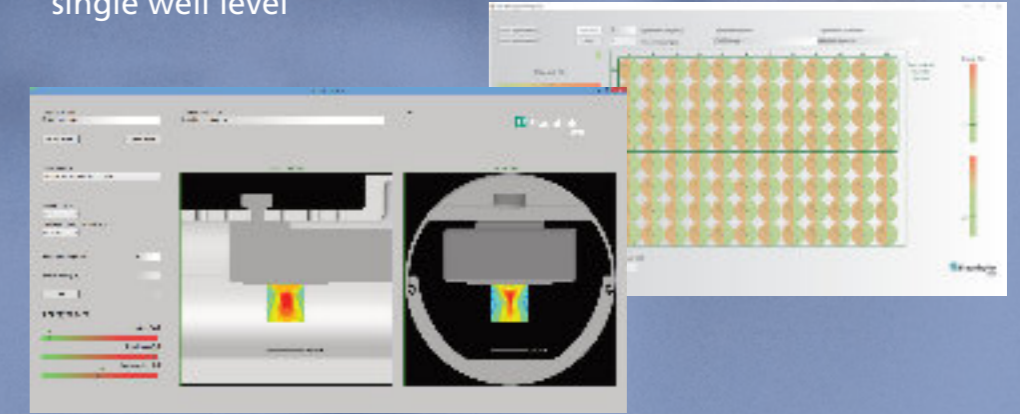
Matrix array transducer and its pressure distribution



## SOFTWARE SOLUTIONS

Customized solutions for therapy systems

- Control of ultrasound cell applicator with parametrization on the single well level

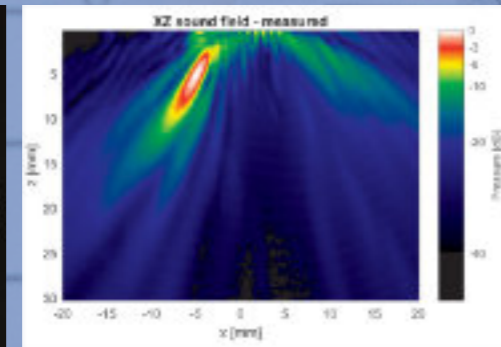


Planning software for small animal therapy (left) and cell therapy (right)

- Small animal system: definition of focus position (in 3D) and pulse patterns
- Availability of SDKs (C#, Matlab) for integration of hardware control in existing software structures
- Algorithms for therapy planning (using MRI and CT scans) and therapy monitoring (using ultrasound thermometry imaging)

### Small animal ultrasound therapy system:

- Integration in small animal PET-MR
- 11x11 matrix array for 3D beam steering, different frequencies
- MR-compatibility for low intermodality interferences



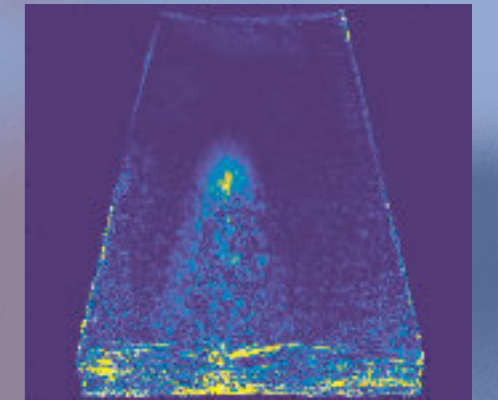
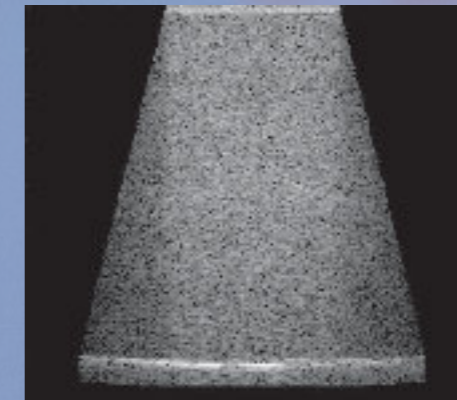
Small animal applicator with integrated ultrasound matrix array transducer (left) and its pressure distribution using volumetric beam steering (right)

## HIGH POWER ULTRASOUND BEAMFORMER

- Scalable ultrasound electronics, up to 1024 channels
- MR-compatible option
- Multi-channel booster option
  - 100% duty cycle
  - up to 100 seconds
  - up to 16W power per channel
  - Transmit amplitude up to 200Vpp



MR-compatible ultrasound system



Comparing ultrasound B-Mode imaging (left) to ultrasound thermometry (right)