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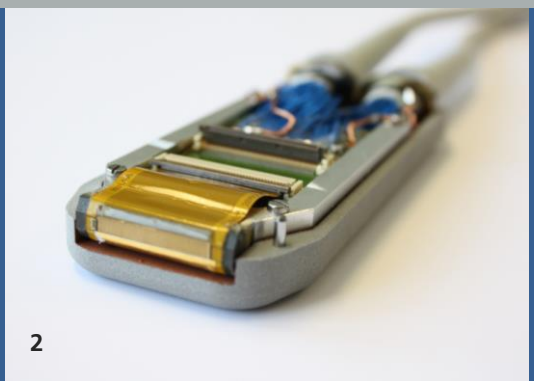
FRAUNHOFER-INSTITUT FÜR BIOMEDIZINISCHE TECHNIK IBMT



1 *2.5 MHz matrix probe, 1024 elements*
2 *20 MHz linear piezoceramic array with sandwiched PVDF receiving-array*
3 *5 MHz bi-plane imaging-array*

Certified Quality System mdc ISO 13485 ISO 9001

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MEDICAL TRANSDUCER TECHNOLOGY

Medical Ultrasound

Medicine is a very important field in the application of ultrasound. Close to the patient, ultrasound allows a non-invasive method for diagnosis with direct expressiveness as well as for therapy.

The probe of an ultrasound system is very important for the overall system performance. In most cases, it is necessary to adjust working frequency, beam pattern and sensitivity for the needs of an application.

Especially for medical probes, new transducer designs as well as special housings, predefined by new applications, are demanded by the market.

However, before a new idea or product can be placed on the market, a development of appropriate sensors or the modification of an existing sensor is necessary.

The groups Transducer Engineering and Manufacturing Technology assist you during the complete way of product development from the idea to the manufacturing with following services:

- Sensor development/optimization
- consulting services
- Feasibility studies
- Ultrasound measurements
- Manufacturing process development
- Sensor production technology

Scope of applications

We offer development services and production technologies for custom-designed medical sensors with frequencies up to 50 MHz. For example:

- Linear, curved and phased-arrays for 2D/planar-imaging
- Matrix arrays (3D-/volumetric-imaging)
- Doppler sonographie
- Catheter-based or intravascular probes
- Therapeutical applicators
- Medical cleaning devices
- Assistance devices for drug delivery

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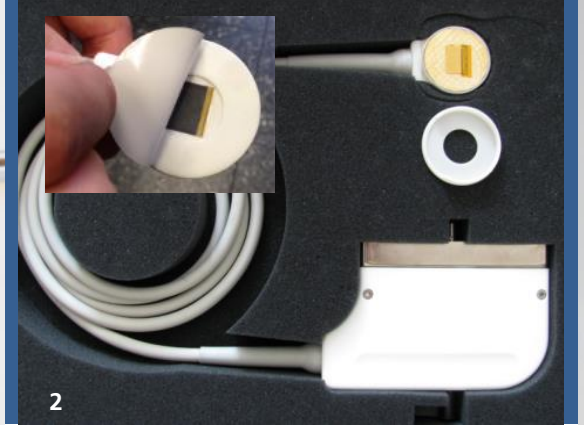

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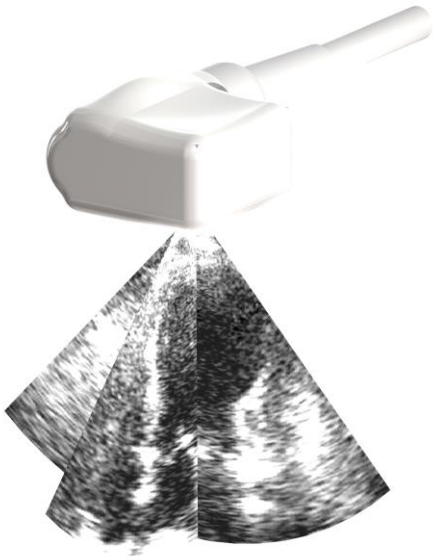
3

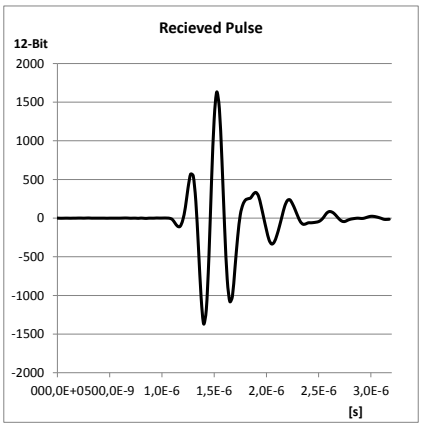
Transducer Example “T-Array”

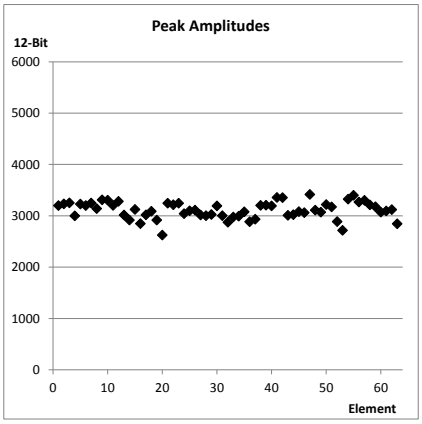
For the control of radiotherapy a customized ultrasound probe was needed. To fulfill the requirements, a special imaging probe with 2 phased-arrays was developed. The arrays were arranged perpendicular that information of two perpendicular planes from inside the human body was available.

The center frequency is 5 MHz and the dimension of the array was chosen to transmit and receive sound between two ribs. The elements of the arrays were spaced Lambda/2 (150 µm) which allows a wide opening angle of up to 120° (see also front-page, image 3).



Bi-plane 5 MHz phased-array, developed for real time positioning in radiotherapies

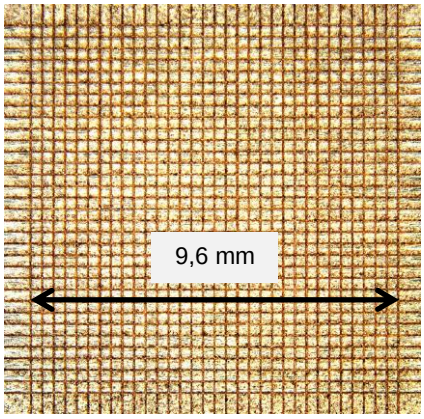




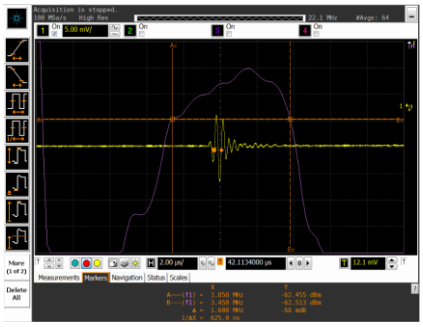
Transducer Example “2D-Matrix-Array”

For measuring volumes of interest without moving parts it is necessary to fully control the sound beam within this volume. For steering and focusing the sound beam a special matrix-array – a planar distribution of tiny transducer elements – is necessary. For this application a 32 x 32 element 2D-matrix-array with a center-frequency of 2,5 MHz and a pitch of 300 µm was developed. To increase bandwidth a 2-layer matching system was applied on the front.

The scalable concept of the acoustic block allows to varying the number of elements and pitch nearly free. So other sizes, frequencies and opening angles are easily realizable.



2D-matrix-array for volumetric measurements (1024 elements, pitch 300µm)



Pulse-Echo measurement of a single element of 2D-matrix-array (f_c= 2.5 MHz)

1 *16 MHz transducer for flow measurement in vessels by catheter*

2 *7.5 MHz adherable phased array*

3 *10 MHz (left) and 20 MHz (right) 16-element doppler-probe for blood flow measurement*