

3-D Imaging Using Row-Column-Addressed Arrays With Integrated Apodization - DTU Orbit (08/11/2017)

3-D Imaging Using Row-Column-Addressed Arrays With Integrated Apodization: Part II: Transducer Fabrication and Experimental Results

This paper demonstrates the fabrication, characterization, and experimental imaging results of a 62+62 element $\lambda/2$ -pitch row-column-addressed capacitive micromachined ultrasonic transducer (CMUT) array with integrated apodization. A new fabrication process was used to manufacture a 26.3 mm by 26.3 mm array using five lithography steps. The array includes an integrated apodization, presented in detail in Part I of this paper, which is designed to reduce the amplitude of the ghost echoes that are otherwise prominent for row-column-addressed arrays. Custom front-end electronics were produced with the capability of transmitting and receiving on all elements, and the option of disabling the integrated apodization. The center frequency and -6-dB fractional bandwidth of the array elements were 2.77 ± 0.26 MHz and $102 \pm 10\%$, respectively. The surface transmit pressure at 2.5 MHz was 590 ± 73 kPa, and the sensitivity was 0.299 ± 0.090 V/Pa. The nearest neighbor crosstalk level was -23.9 ± 3.7 dB, while the transmit-to-receive-elements crosstalk level was -40.2 ± 3.5 dB. Imaging of a 0.3-mm-diameter steel wire using synthetic transmit focusing with 62 single-element emissions demonstrated axial and lateral FWHMs of 0.71 mm and 1.79 mm (f-number: 1.4), respectively, compared with simulated axial and lateral FWHMs of 0.69 mm and 1.76 mm. The dominant ghost echo was reduced by 15.8 dB in measurements using the integrated apodization compared with the disabled configuration. The effect was reproduced in simulations, showing a ghost echo reduction of 18.9 dB.

General information

State: Published

Organisations: Department of Micro- and Nanotechnology, MEMS-AppliedSensors, Department of Electrical Engineering, Biomedical Engineering, BK Medical Aps

Authors: Christiansen, T. L. (Intern), Rasmussen, M. F. (Intern), Bagge, J. P. (Ekstern), Moesner, L. N. (Ekstern), Jensen, J. A. (Intern), Thomsen, E. V. (Intern)

Number of pages: 13

Pages: 959-971

Publication date: 2015

Main Research Area: Technical/natural sciences

Publication information

Journal: I E E Transactions on Ultrasonics, Ferroelectrics and Frequency Control

Volume: 62

ISSN (Print): 0885-3010

Ratings:

BFI (2017): BFI-level 2

Web of Science (2017): Indexed yes

BFI (2016): BFI-level 2

Scopus rating (2016): CiteScore 2.73 SJR 1.154 SNIP 1.473

Web of Science (2016): Indexed yes

BFI (2015): BFI-level 2

Scopus rating (2015): SJR 0.82 SNIP 1.537 CiteScore 2.43

Web of Science (2015): Indexed yes

BFI (2014): BFI-level 2

Scopus rating (2014): SJR 1.064 SNIP 1.624 CiteScore 2.18

Web of Science (2014): Indexed yes

BFI (2013): BFI-level 2

Scopus rating (2013): SJR 0.84 SNIP 1.473 CiteScore 2.18

ISI indexed (2013): ISI indexed yes

Web of Science (2013): Indexed yes

BFI (2012): BFI-level 2

Scopus rating (2012): SJR 0.793 SNIP 1.461 CiteScore 1.87

ISI indexed (2012): ISI indexed yes

Web of Science (2012): Indexed yes

BFI (2011): BFI-level 2

Scopus rating (2011): SJR 0.738 SNIP 1.318 CiteScore 1.95

ISI indexed (2011): ISI indexed yes

Web of Science (2011): Indexed yes

BFI (2010): BFI-level 2

Scopus rating (2010): SJR 0.935 SNIP 1.611
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 2
Scopus rating (2009): SJR 1.298 SNIP 1.804
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 2
Scopus rating (2008): SJR 1.332 SNIP 1.58
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 1.355 SNIP 1.896
Web of Science (2007): Indexed yes
Scopus rating (2006): SJR 1.228 SNIP 2.07
Web of Science (2006): Indexed yes
Scopus rating (2005): SJR 1.151 SNIP 1.825
Web of Science (2005): Indexed yes
Scopus rating (2004): SJR 1.134 SNIP 1.992
Web of Science (2004): Indexed yes
Scopus rating (2003): SJR 1.408 SNIP 1.837
Web of Science (2003): Indexed yes
Scopus rating (2002): SJR 1.514 SNIP 1.593
Web of Science (2002): Indexed yes
Scopus rating (2001): SJR 1.699 SNIP 1.555
Web of Science (2001): Indexed yes
Scopus rating (2000): SJR 1.268 SNIP 1.925
Scopus rating (1999): SJR 0.769 SNIP 1.371
Original language: English

DOIs:

10.1109/tuffc.2014.006819

Source: FindIt

Source-ID: 2265317890

Publication: Research - peer-review › Journal article – Annual report year: 2015