



DRUM: Data-repository for biomedical ultrasound metrology

Pre-submission Checklist

Data record metadata

Title:

Repeatability and reproducibility of hydrophone measurements of medical ultrasound fields

If possible, this should mirror the title of any related publications.

Authors:

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List of authors and affiliations (e.g., from the related publication).

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Keywords: Check all that apply.

Type of measurement:

- Hydrophone measurement
- Radiation force balance measurement
- Laser vibrometer measurement
- Acousto-optic measurement
- Thermal measurement

Type of source:

- Single element planar transducer
- Single element curved transducer
(includes transducers with lenses)
- Diagnostic imaging transducer
- Multi-element transducer *(all other arrays not including diagnostic arrays)*
- Lithotripter
- Optically generated source *(includes laser generated ultrasound)*

Type of field:

- Linear propagation
- Nonlinear propagation
- Shocked field

Scan area:

- Single point measurement
- Line scan
- Planar scan
- Volume scan

Type of medium:

- Homogeneous medium
- Heterogeneous medium
- Water
- Soft tissue mimicking material
- Bone mimicking material
- Soft biological tissue
- Bone biological tissue

Other descriptive keywords if missing from above:

Enter further keywords here if required.

Description: Provide the context, purpose and method of collecting the data and other information that will help others to understand and reuse the data.

This data was collected in order to study the repeatability and reproducibility of hydrophone measurements of ultrasound fields.

Sets of independent measurements were made with two probe (0.2 mm, 40 μ m) and two membrane hydrophones (0.4 mm, 0.2 mm differential) (all from Precision Acoustics) to examine the repeatability of measurements. The pressures measured by these hydrophones in three different ultrasound fields, with both linear and nonlinear, pulsed and steady state driving conditions, were acquired to assess the reproducibility of measurements between hydrophones.

Repeatability measurements: Sets of five independent measurements were made with each hydrophone of the field generated by a single element focusing bowl transducer (Sonic Concepts H151) driven at a frequency of 1.1 MHz, with both a 4 cycle burst and under quasi steady state conditions. Axial and lateral line scans passing through the focus were acquired at a drive level which generated a weakly nonlinear field.

Reproducibility measurements: Two single element focusing bowl transducers (H151 at 1.1 MHz, and H101 at 3.3 MHz, Sonic Concepts) and one diagnostic linear array (L14-5 at 5 MHz, Ultrasonix) sources were used. For the single element transducers, axial and lateral line scans passing through the focus were acquired with each hydrophone at two drive levels to generate both a linear and a weakly nonlinear field, with both a 4 cycle burst and under quasi steady state conditions. For the diagnostic linear array, lateral line scans were acquired passing through the beam axis at an axial distance of 40 mm. The transducer was driven with a 4 cycle burst at a power level that generated harmonics up to 30 MHz.

All measurements were acquired using an automated scanning tank filled with degassed, deionised water. The transducers mounted in a fixed xyz position with automated tilt, rotate adjustment. Hydrophones were mounted on an automated xyz stage, with manual tilt, rotate adjustment.

In total this study contains 12 datasets, the corresponding figure or table in the paper is given in brackets:

1-4: Repeatability and reproducibility - H151 x 4 hydrophones (Figs 1-4, Table 3)

Each dataset contains axial and lateral line scans at 2 drive levels, with a 4 cycle and a 40 cycle burst, with 5 sets of scans at the high drive level and one set of scans at the low drive level

5-8: Reproducibility – H101 x 4 hydrophones (Figs 4-5, Table 3)

Each dataset contains a single set of axial and lateral line scan at each of 2 drive levels, with a 4 cycle and a 120 cycle burst.

9-12: Reproducibility – L14-5 x 4 hydrophones (Fig 6, Table 3)

Each dataset contains lateral scans at 1 power level.

Total number of data files:

12

State the total number of data files, including zip files containing supplementary material.

Funding:

Engineering and Physical Sciences Research Council (EPSRC), UK, Grant Nos. EP/P008860/1 and EP/L020262/1.

Include all funding acknowledgments as necessary.

References:

doi: 10.1121/1.5093306

DOI of any publications from which the data derives.

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Please discuss with Elly Martin (elly.martin@ucl.ac.uk) or Bradley Treeby (b.treeby@ucl.ac.uk).

Publication:

Please choose one of the following options:

- I confirm that the data may be published immediately.
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Submission checklist:

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Date:

14/02/2020