

Safety Assessment of Advanced Imaging Sequences I: Measurements - DTU Orbit (08/11/2017)

Safety Assessment of Advanced Imaging Sequences I: Measurements

A method for rapid measurement of intensities (Ispta), mechanical index (MI), and probe surface temperature for any ultrasound scanning sequence is presented. It uses the scanner's sampling capability to give an accurate measurement of the whole imaging sequence for all emissions to yield the true distributions. The method is several orders of magnitude faster than approaches using an oscilloscope, and it also facilitates validating the emitted pressure field and the scanner's emission sequence software. It has been implemented using the experimental SARUS scanner and the Onda AIMS III intensity measurement system (Onda Corporation, Sunnyvale, CA, USA). Four different sequences have been measured: a fixed focus emission, a duplex sequence containing B-mode and flow emissions, a vector flow sequence with B-mode and flow emissions in 17 directions, and finally a synthetic aperture (SA) duplex flow sequence. A BK8820e (BK Medical, Herlev, Denmark) convex array probe is used for the first three sequences and a BK8670 linear array probe for the SA sequence. The method is shown to give the same intensity values within 0.24% of the AIMS III Soniq 5.0 (Onda Corporation, Sunnyvale, CA, USA) commercial intensity measurement program. The approach can measure and store data for a full imaging sequence in 3.8 to 8.2 s per spatial position. Based on Ispta, MI, and probe surface temperature, the method gives the ability to determine whether a sequence is within US FDA limits, or alternatively indicate how to scale it to be within limits.

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