FDA requires that intensity and safety parameters are measured for all imaging schemes for clinical imaging. This is often cumbersome, since the scan sequence has to be broken apart, measurements conducted for the individually emitted beams, and the final intensity levels calculated by combining the intensities from the individual beams. This paper suggests a fast measurement scheme using the multi-line sampling capability of modern scanners and research systems. The hydrophone is connected to one sampling channel in the research system, and the intensity is measured for all imaging lines in one emission sequence. This makes it possible to map out the pressure field and hence intensity level for all imaging lines in a single measurement. The approach has several advantages: the scanner does not have to be re-programmed and can use the scan sequence without modification. The measurements are orders of magnitude faster (minutes rather than hours) and the final intensity level calculation can be made generic and reused for any kind of scan sequence by just knowing the number of imaging lines and the pulse repetition time. The scheme has been implemented on the Acoustic Intensity Measurement System AIMS III (Onda, Sunnyvale, California, USA). The research scanner SARUS is used for the experiments, where one of the channels is used for the hydrophone signal. A 3 MHz BK 8820e (BK Medical, Herlev, Denmark) convex array with 192 elements is used along with an Onda HFL-0400 hydrophone connected to a AH-2010 pre-amplifier (Onda Corporation, Sunnyvale, USA). A single emission sequence is employed for testing and calibrating the approach. The measurements using the AIMS III and SARUS systems after calibration agree within a relative standard deviation of 0.24%. A duplex B-mode and flow sequence is also investigated. The complex intensity map is measured and the time averaged spatial peak intensity is found. A single point measurement takes 3.43 seconds and the whole sequence can be characterized on the acoustical axis in around 6 minutes.