Author's response to reviews

Title: Acoustically detected Magnetic Particle Imaging

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Version: 2 Date: 22 September 2010

Author's response to reviews: see over
Dear Editor, dear Reviewers

Thank you very much for all the elaborate and very helpful comments. Please find below a list, addressing all reviewers’ comments point by point. All changes to the text are marked within the text (Word reviewing tool). Furthermore, each change is marked with a code referring to the particular reviewers comment.

Reviewer 1

Thank you very much for your comments, which helped to improve the text, as explained below comment by comment.

- **C1’1**: Thank you very much for pointing this out. Additional text has been inserted to explain what has to be added on top of the components that are already known from magnetic MPI. Please understand that we did not introduce extra schematics to illustrate the *in vivo* applicability, as this would go beyond the scope of our basic research and the intention of this submission, which is to report on the basic findings.

- **C1’2**: We agree that adding such experiments would strengthen the proposed method and the presentation of the findings and results. However, with SPIO materials as available today, it is not possible to construct experiments that would allow for a direct comparison of resolution between magnetic and acoustic MPI and a correlation of tracer material concentration and sensitivity. This kind of experiments would be possible, if mono-disperse tracer materials would be available.

- **C1’3**: Thank you very much for referring to this omission. We’ve added the frequency response from the microphones’ data sheet to the text. The microphone has been chosen, because of its considerably flat frequency response within the frequency range chosen. Although it is not directly clear, how an acoustic MPI system would look like in vivo, it can be assumed that it will use higher excitation frequencies compared to the reported work. Given these higher frequencies, bodily sources of acoustic emissions will most probably be out of range.

- **C1’4**: A way to overcome the limitation of limited signal intensity would be an increase of the speed of the FFP movement. Additional text has been added to make this clearer.

- **C1’5**: Thank you very much for pointing to this omission. The simulations for figure 5 have been performed in a similar way as those in figure 3. Additional text has been added to the caption of figure 5 to point this out. To further explain, how the simulation has been performed, we kindly highlighted text before equation 4, which contains the explanation in connection to figure 3.

- **C1’6**: Thank you very much for your comment. Ultrasound based elastic imaging is a very powerful and versatile method. However, as far as known to us, we would kindly like to point
out, that speed of sound and attenuation measurement is not possible with ultrasound
based elastic imaging.

• C1'7: Changed in text; thank you very much for the heads up!

Reviewer 2

Thank you very much for your valuable hints and comments. They helped to improve the text, as
explained below comment by comment.

• C2'1: Thank you very much for your comment. We have had the manuscript copyedited.

• C2'2: Again thank you very much for pointing this out. While Langevin himself never
published the theory named after him in close form, we assume that Chikazumi presented an
appropriate introduction --- we have thus added him as an additional reference.

• C2'3: Thanks for pointing this out --- additional text explaining the choice of frequency has
been added.

• C2'4: Thank you again for pointing this out, definitely a necessary comparison. The
comparison to MRI is present in the text. At the same location, additional text has been
inserted to compare it with magnetic MPI.

• C2'5: Thank you for this comment. Comparing the proposed method to ultrasound harmonic
imaging is of course possible and interesting. Nevertheless, one of the main characteristics of
the proposed method is the ability to determine the speed of sound. As far as we are aware,
it is not possible to determine the speed of sound with ultrasound harmonic imaging.
Therefore, such a comparison would be beyond the scope of our basic research and the
intention of this submission, which is to report on the basic findings and abilities of the
proposed method.

Reviewer 3

Thank you very much for your detailed and precise comments. Please find below a list of our changes
and additions.

• C3'1: Thank you for pointing this out; the text has been changed accordingly.

• C3'2: Thank you for pointing this out; an appropriate reference has been added in the text
• **C3’3**: Thank you for pointing this out; the text has been changed accordingly.

• **C3’4**: Thank you very much for pointing this out. It was indeed wrong. We corrected the figure 1, as well as the caption.

• **C3’5**: Thank you for pointing this out; the text has been changed accordingly.

• **C3’6**: Thank you very much for your comment. The text could indeed have been misunderstood. We added additional text for clarification.

• **C3’7**: Thank you for your comment. Again, the text could have been misunderstood. We adjusted the text for clarification.

• **C3’8**: Thank you again; we added a reference to figure 2 at an appropriate location.

• **C3’9**: Thank you for pointing this out; the text has been changed accordingly.

• **C3’10**: Thank you for pointing this out; we have added the numbering.

• **C3’11**: Additional text has been added to quantify characteristic of the tissue that ensure that the damping is low enough to be negligible.

• **C3’12**: Thank you for pointing this out; the text has been changed.

• **C3’13**: Thank you for pointing this out; we have added additional text and an extra reference, which provides more detail on the size distribution of the used magnetic materials.

• **C3’14**: Sorry ... typo changed!

• **C3’15**: As for reviewer 2: Thank you very much for your comment. We have had the manuscript copyedited.

• **C3’16**: Thank you for pointing this out; the text has been changed to be more specific.

• **C3’17**: Thank you very much for your comment. We agree that it would be interesting to discuss these aspects with respect to an in vivo implementation of the proposed method. As remarked in the context of reviewer 1s comments, we feel that laying out a complete
assessment of the in vivo applicability would go beyond the scope of our basic research and the intention of this submission, which is to report on the basic findings.