

Re: [External] Re: SPAN MRI

From: **Thedens, Daniel R** | dan-thedens@uiowa.edu Thursday, Mar 18, 2:39 PM

To: **Ayata, Cenk, M.D.** | CAYATA@mgh.harvard.edu

Cc: **Ryan Cabeen** | Ryan.Cabeen@loni.usc.edu, **Arbab, Ali** | AARBAB@augusta.edu, **Adnan Bibic** | adnan.bibic@jhmi.edu, **Joe Mandeville** | jbm@nmr.mgh.harvard.edu, **Fahmeed Hyder** | fahmeed.hyder@yale.edu

A couple related things come to mind. As I mentioned in my email, I did the tube measurement with a 'hard' threshold relative to background noise (i.e choosing a threshold slightly above the noise level rather than halfway along the intensity profile), so the measurement I made would be on the upper end of a defensible range. Here's a profile plotted along the horizontal attached. Choosing a different threshold would make the measured distance a couple pixels smaller.

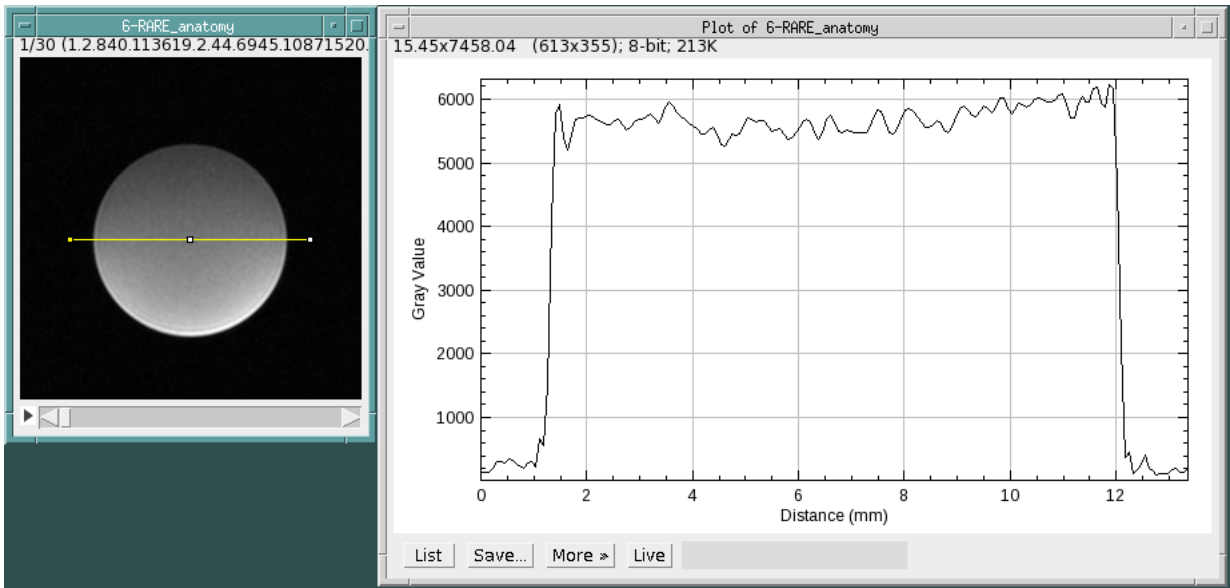
Related to that would be that while we acquire data with 128x128 matrix, the GE scanner interpolates to 256x256 at a minimum. This is presumably done by zero-filling the k-space prior to reconstruction. This would again yield some 'soft' edges (and potentially some truncation artifact) that may resolve differently depending on how the registration and thresholds treat those edges. If that resulted in, say, two pixels of the 256x256 matrix around the object, you're looking at on the order of a 4% reduction in area from that alone.

A minor effect might arise from the use of plain water with a long T2, yielding minimal T2 signal loss over the course of the echo train. A shorter T2 phantom might result in a blurrier point spread function that would also exacerbate the effects noted above.

I'm open to running another experiment of some kind with a more 'realistic' phantom in the tube if we can come up with one.

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Dan Thedens  
[dan-thedens@uiowa.edu](mailto:dan-thedens@uiowa.edu)



From: **Ayata** | CAYATA@mgh.harvard.edu To: **Thedens** Thursday, Mar 18, 4:15 PM

Dear Dan,

Thanks for checking the scale factor.

My understanding from your measurement below using Falcon tube, and some back of the envelope calculations based on the images you provided, is that your images only need a scale correction by only ~ +2%. However, the whole brain volumes from UI are about 10-12% smaller than all other sites (see site comparison figures below). The graph with larger volumes for each site is for day 2, the second graph for day 30. Yale volumes are not yet adjusted in these graphs; when we apply their scale factor (~8-9%), their average volume becomes nearly identical to the rest.

I find it highly unlikely that mice used at UI have smaller brains than those used elsewhere, especially given that all sites are using the same strain/substrain. Can you think of any other explanation for why UI mouse whole brain volumes are categorically smaller?

If we find no explanation, thus no way to know what the true correction factor will be, we will calculate the average difference between your site and all others and use that to scale the correction factor.

Looking forward to your thoughts...

Thanks!  
Cenk

Cenk Ayata, M.D., Ph.D.  
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From: **Ryan Cabeen** | Ryan.Cabeen@loni.usc.edu

Thursday, Mar 18, 2:37 PM

External Email - Use Caution

FYI

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Web: [urldefense.com/v3/\\_\\_\\_g9yZg\\$](http://urldefense.com/v3/___g9yZg$)

From: **Thedens** | dan-thedens@uiowa.edu

To: **RyanCabeen<Ryan.Cabeen@loni.usc.edu>** <<mailto:Ryan.Cabeen@loni.usc.edu>>

Friday, Mar 12, 2:36 PM

I have acquired the SPAN protocol in a Falcon 8 ml tube (352027) which has an inner diameter at the rim of 11.17mm according to [1]. Using the SPAN protocol RARE images, I measure a diameter on the images of 11.0 mm in the slice acquired closest to the cap end of the tube, probably 5mm from the rim. Measurements farther from the cap end are likely to be smaller as the tube tapers [1]. There is some uncertainty in the measurement depending on window level settings, but based on this experiment, I would assess that we do not need a correction factor for our image geometry.

The complete study is available at the link below. This used tap water, so T2 and ADC are very high.

[urldefense.com/v3/\\_\\_\\_s0TIA\\$](http://urldefense.com/v3/___s0TIA$)

[1] [urldefense.com/v3/\\_\\_\\_5GVGg\\$](http://urldefense.com/v3/___5GVGg$)

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Dan Thedens  
[dan-thedens@uiowa.edu](mailto:dan-thedens@uiowa.edu) <<mailto:dan-thedens@uiowa.edu>>

From: **Ayata** | CAYATA@mgh.harvard.edu

To: **Leira**

Monday, Mar 8, 6:33 AM

Good morning,

During the screening of MRIs we noticed that the total brain volumes significantly differed among the sites but were consistent within each site. Given that we are using the same strain, source and age/sex across the network, the cause is likely technical.

Fahmeed and Joe suggested the following solution: Acquire T2 images (identical SPAN protocol) of a well identified phantom (e.g., a falcon tube). Given the known FOV (e.g., 19.2mm), please measure the exact diameter of the tube (e.g., 13mm). If the tube appears different in size than expected, please send us the correction factor. Accuracy is critical.

The reason for site-difference may be related to gradient calibration. Please do not re-calibrate during the SPAN study. We will use your volume correction factor on our end to adjust image registration for each site.

We need this information from each site as soon as possible to finalize the automated image analysis pipeline (Yale has already performed this test). Please let us know if you have any questions, suggestions or concerns.

Regards,  
SPAN MRI group

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From: **Ayata, Cenk, M.D.** | CAYATA@mgh.harvard.edu

Thursday, Mar 18, 3:39 PM

To: **Thedens, Daniel R** | dan-thedens@uiowa.edu

Cc: **Ryan Cabeen** | Ryan.Cabeen@loni.usc.edu, **Arbab, Ali** | AARBAB@augusta.edu, **Adnan Bibic** | adnan.bibic@jhmi.edu, **Joe Mandeville** | jbm@nmr.mgh.harvard.edu, **Fahmeed Hyder** | fahmeed.hyder@yale.edu

All good thoughts, which makes me wonder whether we can ever be perfectly accurate no matter how many factors we compensate for. The more practical approach might be to just scale your site average up to match the other site averages. Can everyone/anyone please opine on whether this is an acceptable solution rather than sending Dan to a wild goose chase to discover the underlying factors?

C

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From: **Daniel R** | dan-thedens@uiowa.edu

Thursday, Mar 18, 5:39 PM

External Email - Use Caution

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[https://secure-web.cisco.com/1BFLL-OPW\\_9WRlajAa8AujB8YR10By7WzGt8g4ZyUD6Rq9tk1fjwY2FPpM3HCt6a2q8b3oSZOXB-C\\_yqZTf\\_MCDdibu7Ruy9lsQ2y2isyZWGPghQ6RxlL4pd0WheBjS\\_wwUg79v-Ekafm6yTyK8t33bqJ8zKM3nZrUdKpVuzwU3IEChOt2GjZf3amY7V-HlkY6t8F7\\_9Op\\_uUn76vFEhg8I7acVwtxrgCW9W1vTeCgFdZ0CrPOA2JwbyJQm4XO83ix/https%3A%2F%2Furldefense.com%2Fv3%2F\\_https%3A%2F%2Fiowa-my.sharepoint.com%2F%3A%2F%2Fpersonal%2Fdtthedens\\_uiowa.edu%2FEpnlHRpDME9KgrbNp7Ogfl4BwqH4HPPoegJRFYT8Dv\\_ywA%3Fe%3DA8MKl4\\_%3B%2](https://secure-web.cisco.com/1BFLL-OPW_9WRlajAa8AujB8YR10By7WzGt8g4ZyUD6Rq9tk1fjwY2FPpM3HCt6a2q8b3oSZOXB-C_yqZTf_MCDdibu7Ruy9lsQ2y2isyZWGPghQ6RxlL4pd0WheBjS_wwUg79v-Ekafm6yTyK8t33bqJ8zKM3nZrUdKpVuzwU3IEChOt2GjZf3amY7V-HlkY6t8F7_9Op_uUn76vFEhg8I7acVwtxrgCW9W1vTeCgFdZ0CrPOA2JwbyJQm4XO83ix/https%3A%2F%2Furldefense.com%2Fv3%2F_https%3A%2F%2Fiowa-my.sharepoint.com%2F%3A%2F%2Fpersonal%2Fdtthedens_uiowa.edu%2FEpnlHRpDME9KgrbNp7Ogfl4BwqH4HPPoegJRFYT8Dv_ywA%3Fe%3DA8MKl4_%3B%2)

[1] [https://secure-web.cisco.com/1wOxc9reIUlsWsABjp-V700pyvhXUGXEF7oUt-JC0EgY-9krLMclAhD\\_fmITITquxODoR49UnMo0BOxqlWoFXtTYe7XCr2sQ7GUorkFocnxMtgXmdT8ipJFGKFvD9qr8ff4Lt1v-A-rylOf-](https://secure-web.cisco.com/1wOxc9reIUlsWsABjp-V700pyvhXUGXEF7oUt-JC0EgY-9krLMclAhD_fmITITquxODoR49UnMo0BOxqlWoFXtTYe7XCr2sQ7GUorkFocnxMtgXmdT8ipJFGKFvD9qr8ff4Lt1v-A-rylOf-)

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Monday, Mar 8, 6:33 AM

<falcon\_1.png>