Weekly Quality Control

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Abstract

The weekly quality control at the Spinoza Centre REC evaluates the signal quality/performance of the 3T Philips Achieva TX (R5, v3.0).

Protocol

PIQT (spatial stability)
Step 1.

Duration: 20 minutes

This scan evaluates several internal parameters of the scanner, including the stability of the gradient coils. This is done by scanning a phantom from which the specs are known.

The protocol is as follows:

- Hook up the PIQT-headcoil (see picture below)

- Check whether the coil contains air (bubbles); shouldn't be larger than about a centimeter in width (in that case: email Lukas)
- Check whether the phantom is inserted correctly; it should be positioned as far back in the coil as possible (i.e. towards the bore) and it shouldn't be able to rotate sideways.
- Outline the phantom/coil in between the vertical and horizontal line.
- On the scan-computer: SPT → Batch Files → perform PIQT

N.B. For efficiency proceed to the QPI test (next Step) while PIQT is running. Also, check step 14 (updates & virus scan) and step 16 (misc.) for things you can do when the PIQT is

running!

➕ NOTES

What to do if the PIQT indicates problems?
If the PIQT shows any values marked in red, it means that some values/parameters are inconsistent with what the scan should contain (i.e. internally, we know what should come out of the PIQT scan). There are a couple of things that you should check before reporting PIQT issues to Lukas/Steven/Tinka.

1. Check whether the phantom is inserted correctly; it should be perfectly in the middle (no room to 'wiggle').
2. Check whether the headcoil ('kap') is closed correctly and check whether the cable from the coil into the table is inserted correctliy.
3. Is there too much air, i.e. a bubble, in the PIQT phantom (larger than ± 1 cm)? If so, let Lukas know.

In case of point 1 or 2, fix this. Then, redo the PIQT scan and report back to Lukas if there are still signs of scanner issues (red values). If this is the case, make sure to still perform the AGAR test (temporal stability), because the results from this test give us extra information about what might be wrong with the scanner. Crucially, if the AGAR test gives normal results (i.e. SNR/SFNR >300), then it is likely that something is wrong with the PIQT phantom and, probably, not with the scanner itself.

If the AGAR test also indicates SNR issues, analyze the fourth scan in the Quality control exam cards set (which is called: 'OnlyWhenSnrTooLow') using the StabilityTool as well. This scan is exactly the same as the original EPI-scan in AGAR test, but with a different phase encoding direction: instead of from anterior to posterior (AP foldover direction), it uses phase encoding from right to left (RL foldover direction). This gives us (or actually, Philips) more information about the cause of the SNR problem. Report the SNR scores for both the original (AP) and the extra (RL; 'OnlyWhenSnrTooLow') back to Lukas.

QPI check (spike detection)
Step 2.

QPI test

The QPI check evaluates whether there have been any abnormal spikes (abnormal measurements of signal) in the past week.

A chronological report is generated with Philips' Logging Application (this can be done during the PIQT scan).

Duration: 2 minutes.

- Start → Logging application
- Fill in the following:
  - Start date: date of previous weekly QC
  - End date: today's date
  - Free text: **qpi after correction**
- Press enter; an HTML-file should be generated with 'spike-values' across time.

In the QC excel-document ('QC_specs'), note down the number of spike-values above 1. Values above 1 may indicate artifacts in the scan(s), of which the researcher should be alerted (such that he/she can decide whether to throw away that data or not). In case of values larger than 1, note the date/time of the spike and check in Calpendo who was scanning at that time. Email Lukas the date/time/user during the spike.

For educational purposes, check the image below of what a spike in real MRI may look like.