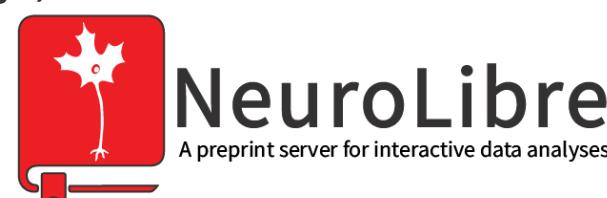


PHANTOM RESULTS OF THE ISMRM JOINT RRSG-QMRSG REPRODUCIBILITY CHALLENGE ON T₁ MAPPING

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Challenge Pitch

The 2020 ISMRM reproducibility challenge posed the following question: will an imaging protocol **independently-implemented** at multiple centers reliably measure what is considered one of the **fundamental MR parameters (T₁)** using the most robust technique (**inversion recovery**) in a **standardized phantom** (ISMRM/NIST system phantom)?

Full details: bit.ly/3qeXLP



Results

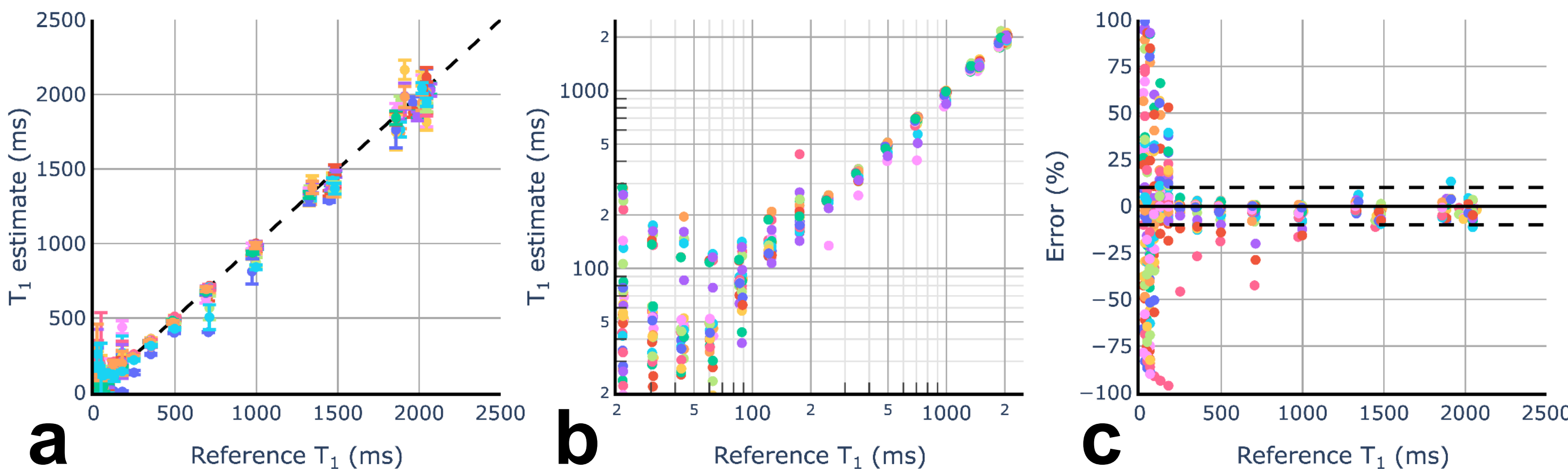


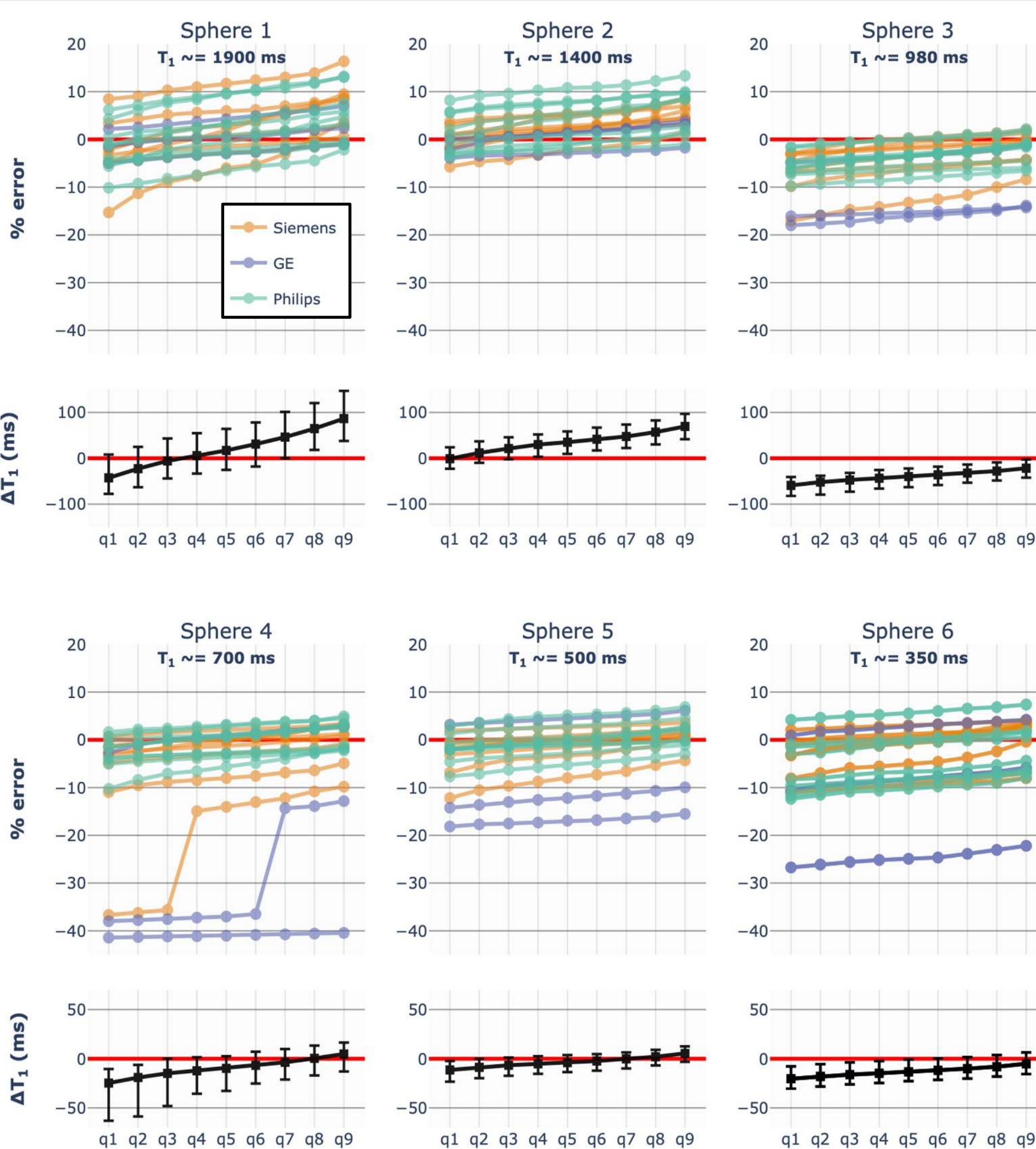
FIGURE 2 Measured mean T₁ values vs. temperature-corrected NIST reference values of the phantom spheres presented as a linear plot (a), log-log plot (b), and plots of the error relative to reference T₁ value of all submitted datasets (c).

FIGURE 3 Hierarchical analysis of T₁ estimation error across voxel-wise distributions in spheres 1-6, using 20 measurements split into 9 quantiles (q1-q9).

Each panel shows individual shift functions for each measurement (colored by vendor) in the top row, which characterize the percent measurement error as either over- or under-estimation.

The bottom row in each panel (gray markers) displays the average trend of bootstrapped differences at each decile in milliseconds.

Straight lines in the top row indicate a homogeneous measurement error across voxels. High-density intervals not intersecting the zero crossing indicate a significant trend at the respective decile.



Methods

Pulse Sequence	Spin-echo inversion recovery
Repetition Time (TR)	2550 ms
Inversion Time (TI)	50, 400, 1100, 2500 ms
Echo Time (TE)	14 ms
In-plane resolution	1x1 mm ²
Slice thickness	2 mm

TABLE 1 Imaging protocol for inversion recovery T₁ mapping proposed to the participants and used in Barral et al. 2010 (DOI: 10.1002/mrm.22497).

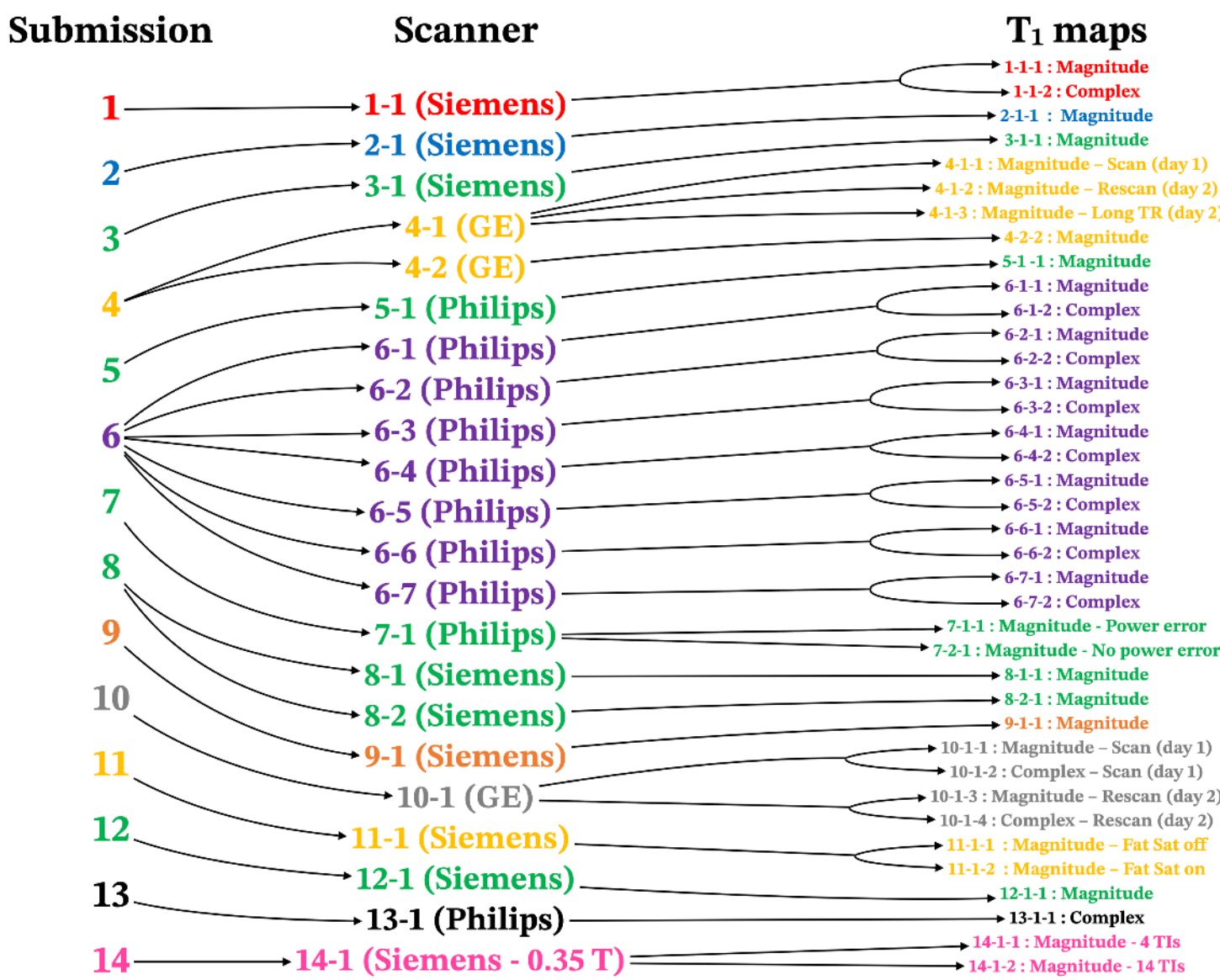
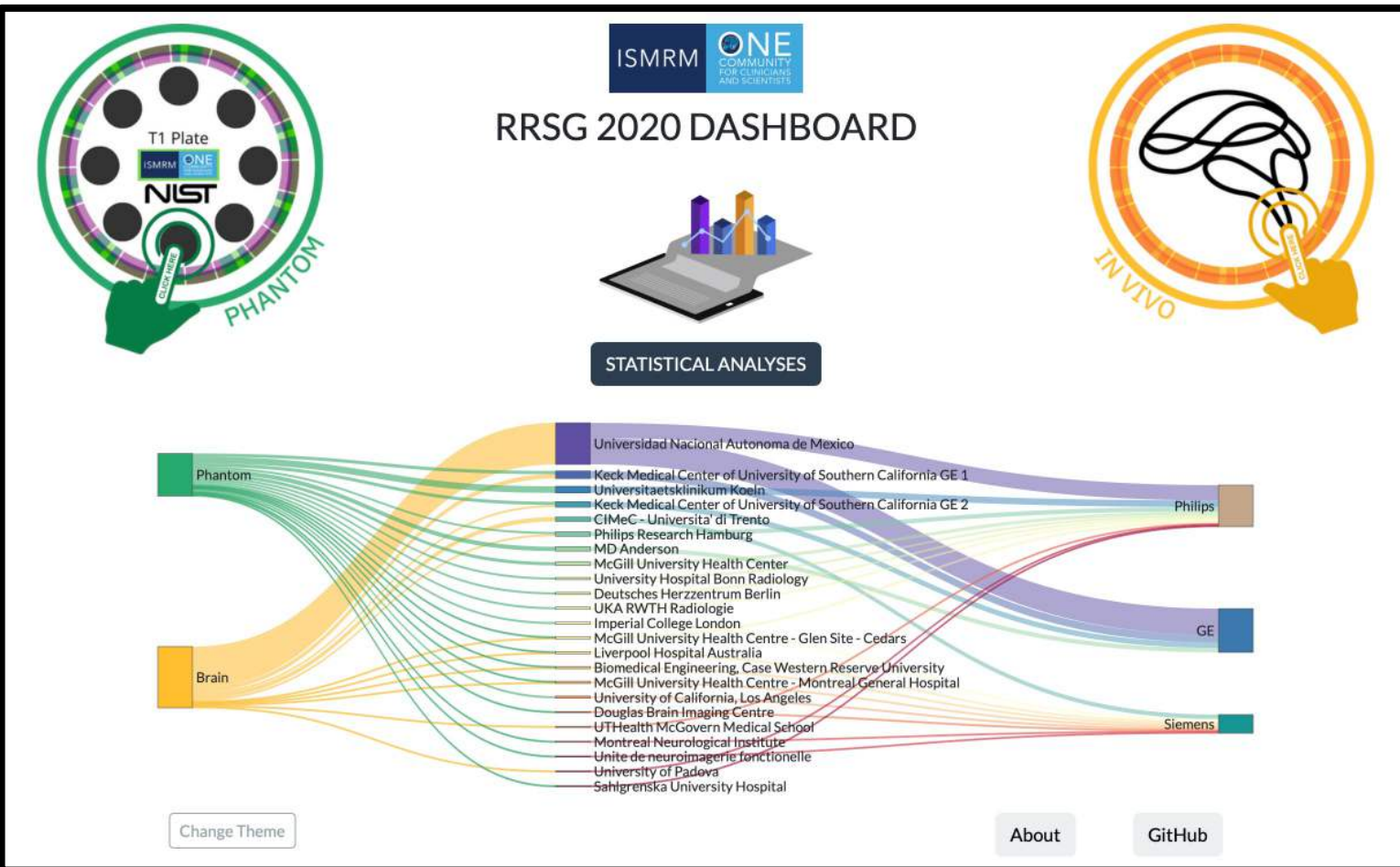


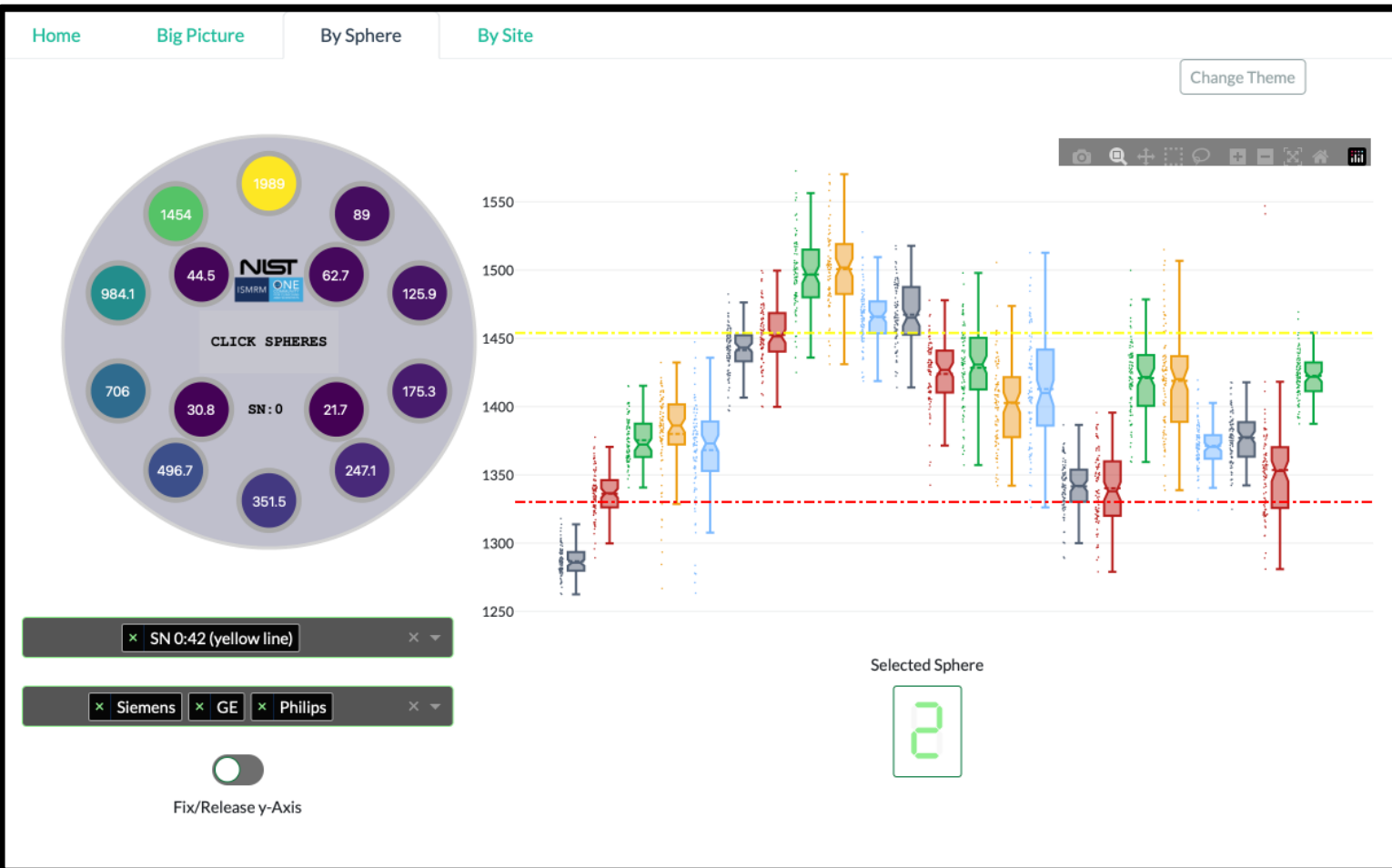
FIGURE 1 List of the datasets submitted to the challenge. MRI scanners were all 3T except submission 14. Each submission acquired their data using a single phantom, however some submissions shared phantoms with each other (same color).

Dashboard

rrsg2020.dashboards.neurolibre.org



Landing page of dashboard. Provides additional details about sites/scanners/datasets, and navigation links to phantom or human data tabs, and statistical analyses tab.



Sample phantom analyses tab. Displays the distributions of T₁ values in a specified sphere.

Conclusion

Most submissions resulted in good T₁ agreement with reference values for the human range of T₁ values.

Inter-participant mean CoV: 6.1 %

Intra-participant mean CoV: 2.9 %

Datasets

osf.io/ywc9g/



Submission Process

github.com/rrsg2020/data_submission



Fitting Pipeline

github.com/rrsg2020/t1_fitting_pipeline



Analyses (Jupyter Notebooks)

github.com/rrsg2020/analysis



Abstract 0396

Tuesday June 6, 8h55am
Oral, room 714A/B