**Repeatability and Reproducibility of Multiparametric Magnetic Resonance Imaging of the Liver**

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**Methodology**

- **Standardisation of T1 maps across the scanner** (cT1)
  - The same protocol was performed on phantoms and participants were scanned on at least two different scanner models and field strengths in a pseudorandomised order, with a maximum of 1 week between the scans. Two acquisition repeats were conducted for each scan, with participants leaving the scanner between.
  - The same protocol was performed on phantoms across 8 scanner models; the 5 previously mentioned plus 1.5T Phillips Achieva and Phillips Achieva Dstream (both 5.3.0, CardiacQuant) and a 1.5T Siemens Aera (VE11C, MyoMaps).
  - Standardisation of T1 maps across the scanner models and software versions was based on 90 previously acquired phantom datasets (Figure 1).

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**Background**

- LiverMultiScan\(^TM\) is a MRI based technology which produces quantitative analysis for hepatic fat, T2* and iron corrected T1 (cT1).
- cT1 has been shown to correlate with different stages of fibro-inflammatory disease [1] and predicts outcomes [2].
- LiverMultiScan\(^TM\) is used in NASH clinical trials and allows the safe and non-invasive characterisation of liver disease.
  - We tested LiverMultiScan\(^TM\)'s metrics for repeatability and reproducibility across different MRI manufactures, models and software versions and field strengths.

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**Results**

- Standardised cT1 in participants demonstrated high reproducibility across different scanner models, software versions and field strengths (CoV 3.3%; bias 6.5 ms, 95% LoA of -76.3 ms to 89.2 ms, comparing favourably to MRE's CoV of 10.7% [3] (Figure 2).
- T2* (CoV 6.6%; bias -1.7ms, 95% LoA of -6.6ms to 3.2ms) and PDFF measurements (CoV 17%; bias 0.06%, 95% LoA of -0.69% to 0.82%) showed excellent reproducibility across field strengths and scanner models (Figure 2).
- Bland-Altman analysis of the T1 phantom measurements showed a clear reduction in bias (from -20ms to -4.7ms), tightening of the 95% Limits of Agreement (LoA: from -59.2ms to 19ms, to -25.3ms - 15.9ms) and reduction in mean coefficient of variation (CoV: 2.5% to 1.0%) after standardisation (Figure 3).

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**Conclusions**

- We demonstrate standardised cT1 is a repeatable and reproducible metric independent of vendor (Phillips or Siemens) and field strength (1.5T or 3T).
- LiverMultiScan\(^TM\) is in full (cT1, T2*, PDFF) represents a robust and reliable non-invasive tool for liver tissue characterisation.

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**References**