Our Metrics

Understanding PDFF

Perspectum Diagnostics provide a comprehensive assessment of liver health based on a range of MRI-derived biomarkers, using our flagship product Liver*MultiScan*™. We use MRI-PDFF to provide a metric of hepatic fat.

What is MRI-PDFF?

Liver fat is quantified using state-of-the-art proton density fat fraction (PDFF) calculations, which exploit the chemical-shift in water and fat separation to estimate hepatic fat concentration.

MR exploits the difference in resonance frequencies of the protons in water and fat to provide estimates of tissue fat fraction. All techniques work by separating the signals from water and fat, and then calculating the percentage of the combined signal that comes from fat:

$$\text{FAT FRACTION (\%)} = \frac{\text{FAT}}{\text{WATER + FAT}}$$

Proton Density Fat Fraction (PDFF) has been widely shown to correlate with the degree of hepatic steatosis, with a cut-off of 5% being indicative of NALFD.

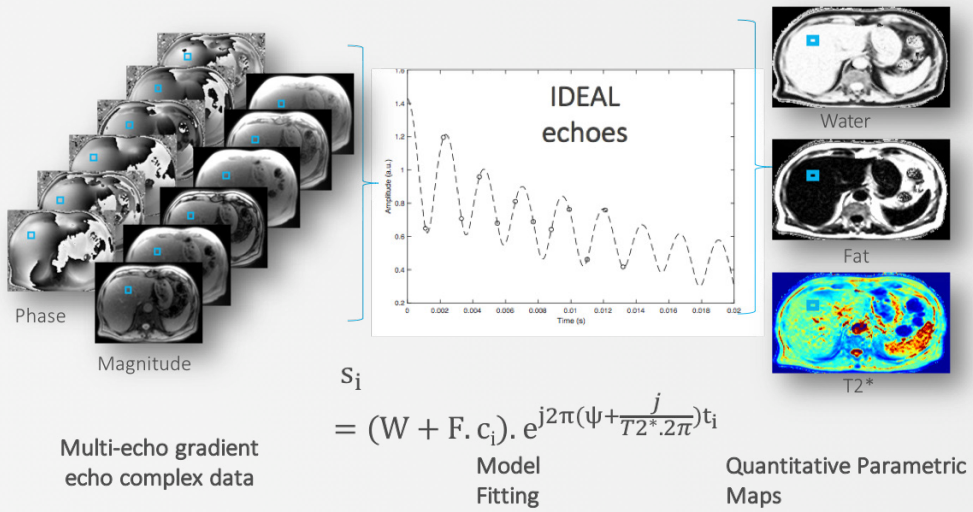
Perspectum's Choice: LMS IDEAL

IDEAL *(Iterative Decomposition of water and fat with Echo Asymmetry and Least squares estimation)* is a novel, confounder-corrected chemical shift-based water-fat separation technique.

It has been shown to reliably separate fat from water, for excellent image quality and shorter protocol times[3]. T2*-IDEAL builds on this technique and corrects for the effects of both fat and shortened T2*, in the presence of liver iron[4].

LMS IDEAL, based on the best-in-class model, is more than just an algorithm;

It's a framework of data acquisition, software, QC, and quality processes built around our algorithms
Enhanced analysis and customizable reports
Standardized on all leading MR platforms
Demonstrates excellent reproducibility across all manufacturers, and across the whole range of fat values.



LMS IDEAL: Standardization

MRI manufacturers offer optional add-on software packages and protocols for assessing MRI-PDFF. Each implementation differs, and whilst comparisons within individual subjects can be made, changes between subjects may be difficult to interpret.

Quantitative Imaging Biomarkers Alliance (QIBA), a society committed to advancing quantitative imaging and the use of imaging biomarkers in clinical trials and clinical practice, funded meta-analysis on 425 subjects gives +/- 5.5% between different hardware and software.

PDFF can be standardized across MR platforms, scanners and field strengths to provide a reproducible and robust measure of liver fat.

Perspectum has invested heavily in standardizing the acquisition, training, and interpretation of MRI-PDFF (and other LiverMultiScan biomarkers) across scanner models, manufacturers and field strengths.

LMS IDEAL has been shown to have a +/- 1.8 between different hardware.

Meta Analysis (QIBA):

Reproducibility coefficient: Between Scanner: **+/- 5.5 %**

Repeatability coefficient: Within Scanner: **+/- 4.7%**

Perspectum's LMS-IDEAL:

Reproducibility coefficient: Between Scanner: **+/- 1.8 %**

Repeatability coefficient: Within Scanner: **+/- 1.9%**

Why LMS-IDEAL?

Key publications

Wilman, H.R., et al. (2017). Characterisation of liver fat in the UK Biobank cohort. PLOS One, 12(2):e0172921

Reeder, S., McKenzie, C. & Penada, A., 2007. Water-fat separation with IDEAL gradient-echo imaging. J Magn Reson Imagging, Volume 25, pp. 644-652.

Repeatability and reproducibility of multiparametric magnetic resonance imaging of the liver
Wilman, H. et al. Journal of Hepatology , Volume 68 , S562

Chloe, H. et al. (2018) Validation of a standardized MRI method for liver fat and T2* quantification. PLOS One,13(9), p.e0204175.

References

1 Reeder, et al., 2005;
2 Meisamy, et al., 2011
3 Kijowski, et al., 2014
4 Yu, et al., 2007