

Magnetic Resonance Imaging

Week 6; Lecture 12; Section 3: Random motion artefacts

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Section 3

Random motion artefacts

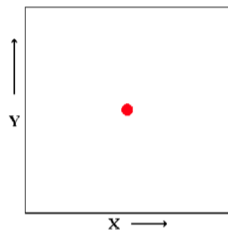
Motion artefacts; general comments

Motion artefacts most commonly observed in the phase-encoding direction

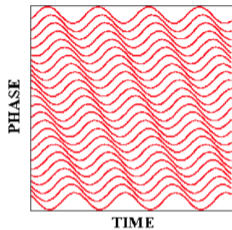
This is because:

- Motion along any field gradient results in the abnormal integration of phase, which is then incorrectly mapped onto the phase-encoding direction
- Frequency encoding is performed while G_x gradient pulse is on; typically for around 10 ms. Only very modest displacements can occur in such a short time. The result is that random displacements in the frequency-encoding direction lead to blur
- By contrast, displacements due to motion can build up between phase-encoding pulses, G_y , as these occur at intervals of TR ... and TR can range from, e.g. 500 ms to a second or so

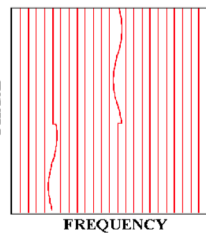
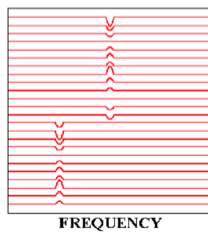
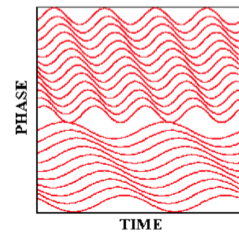
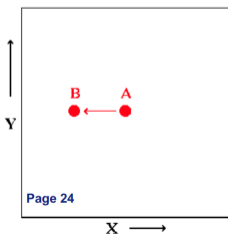
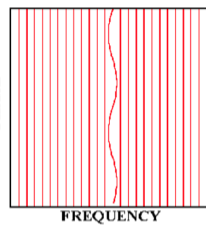
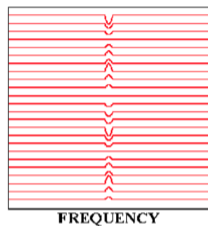
Example: displacement along x



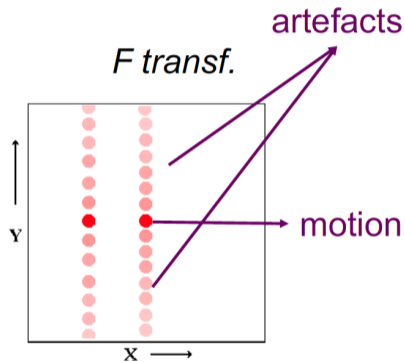
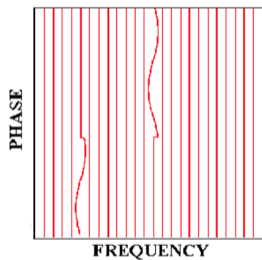
Real space



K-space

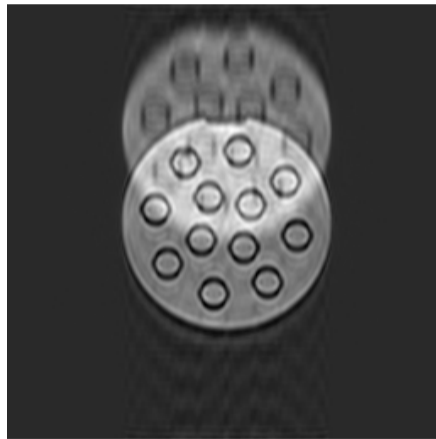


Example: displacement along x – continued



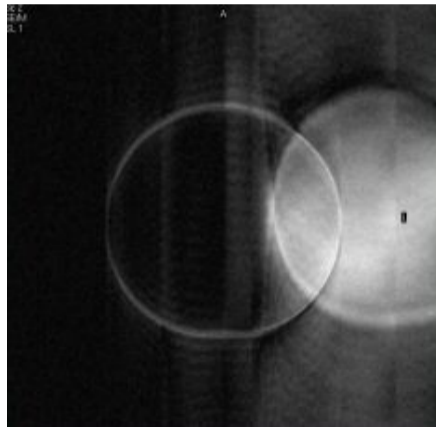
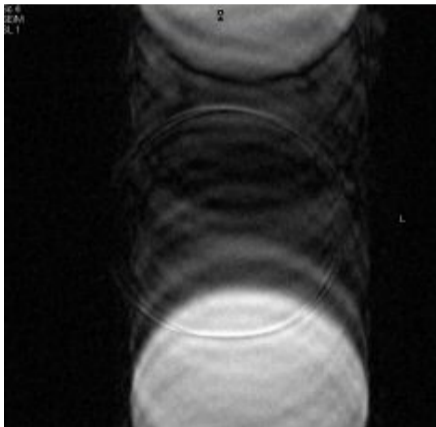
Displacement artefacts: questions 1

What causes the artefacts seen in the following images?



Displacement artefacts: questions 2

What causes the artefacts seen in the following images?



Summary of section 3

Random motion causes:

- Blur frequency-encoding direction
- Erroneous response in phase-encoding direction leading to multiple images and ghosting