Programme
"School of MRI" of the ESMRMB
Advanced Course
September 23-25, 2010 – Ljubljana/SI

Thursday, September 23, 2010

	Topic/Item	Speaker/Teacher
7:30 – 8:15	**Registration**	
8:15 – 8:30	**Opening**	**I. Kocijancic, J. Bittoun**
8:30 – 9:30	**Topic 1**	**S. Kwiecinski, Krakow/PL**

Reminder of the Basic principles

- Magnetic field - Magnetic moment
- Nuclear spin and nuclear magnetic moment
- Magnetization of a spin population
- Nuclear Magnetic Resonance (NMR)
- Precession and relaxation – relaxation times
- The NMR signal and its parameters
- Discrimination of space by a magnetic field gradient
- Selective Excitation
- Frequency Encoding

9:30 – 10:30	**Topic 2**	**J. Bittoun, Paris/FR**

Theory of k-space

- Fourier transformation of a time signal
- Notion of spatial frequency
- 2D-Fourier transform of an image
- Definition and properties of k-space
- Rules of k-space scanning
- Examples of k-space scanning
- Frequency and phase encoding

10:30 – 11:00	**Coffee break**
11:00 - 13:00	**Repetition of topic 1 and 2 in groups in the seminar rooms**
13:00 - 14:00	**Lunch**

14:00 – 15:00	**Topic 3** **J. Tintera, Prague/CZ** **Basic Sequences and contrast** • Spin-echo phenomenon • Spin-echo sequence, equation and parameters • Proton density, T1 and T2 weighting • Gradient echo techniques and steady state free precession (SSFP) • Spoiling techniques and T1 contrast • Contrast-enhanced-SSFP and T2* contrast • Saturation pulses
15:00 – 16:00	**Topic 4** **D. Pickuth, DE** **Whole Body MRI** • Dedicated coils for Whole-Body Imaging • Dedicated sequences for Whole-Body Imaging • Whole-Body imaging with diffusion weighting • Clinical applications of Whole-Body Imaging
16:00 – 16:30	**Coffee break**
16:30 - 18:30	**Repetition of topic 3 and 4 in groups in the seminar rooms**
19:30	**Welcome dinner:** all participants are invited

Friday,September 24, 2010

8:30 – 9:30	**Topic 5** **S. Malik, London/UK** **Ultrafast Imaging : Theory of Sequences** • RARE sequences and contrast • Hybrid sequences (Half-Fourier, single shot RARE) • Singleshot and segmented ultrafast sequences • (Echoplanar, spiral...) • Parallel imaging: parallel coils, calibration, reconstruction in real space or k-space, acceleration factor and signal-to-noise ratio

9:30 – 10:30 **Topic 6** **R. Muller, Mons, B**

Contrast agents

- Basic principles of T1 and T2 modification
- Different classes of contrast agents
- Molecules and chelates
- Doses and effects
- Main classes of application

10:30 – 11:00 **Coffee break**

11:00 - 13:00 **Repetition of topic 5 and 6 in groups in the seminar rooms**

13:00 - 14:00 **Lunch**

14:00 – 15:00 **Topic 7** **M. Markl, Freiburg, DE**

MR angiography

- Flow phenomena in MRI: Time of Flight, Phase contrast
- Time of flight (TOF) MR angiography
- Phase contrast MR angiography and velocity mapping
- MR angiography using contrast agents:
  - Principles
  - Fast 3D imaging
  - Synchronization of imaging and injection
  - Methods of bolus chasing
  - Optimization and k-space

15:00 – 16:00 **Topic 8** **I. Berry, Toulouse/FR**

Diffusion and perfusion

- Principles of diffusion imaging
- Significance of the diffusion tensor
- Main applications of diffusion imaging (Fibril orientation, stroke…)
- Principles of perfusion imaging
- Methods of perfusion imaging using a contrast bolus
- Methods perfusion imaging using saturation pulses

- Main applications of perfusion imaging

16:00 – 16:30 **Coffee break**

16:30 - 18:30 **Repetition of topic 7 and 8 in groups in the seminar rooms**

19:00 - 20:00 **Demonstration of MR acquisitions (still to be confirmed)**

Saturday, September 25, 2010

8:30 – 9:30 **Topic 9 Ch. Windischberger, Vienna/AT**
Functional Brain MRI

- Physiological bases of brain activation
- Hemoglobin and T2* : BOLD contrast
- Block and event-like paradigms of activation
- Image processing methods
- Overview of the main results obtained by fMRI of the brain
- Using the BOLD-effect for pharmacological research

9:30 – 10:30 **Topic 10 R. Sinkus, Paris/FR**
Perspectives: Overview of other contrast techniques

* Magnetization transfer
* Elasticity imaging
* Imaging of hyperpolarized gases
* Imaging of other nuclei
* Interventional MRI
* MR imaging and spectroscopy at 3T and above

10:30 – 11:00 **Coffee break**

11:00 – 12:00 **Repetition of topic 9 or 10 in groups in the seminar rooms**

12:00 - 13:00 **Examination (optional)**
13:00 **End of course**