Test objects and filling solutions for QC in MRI

MRI-QC phantoms are useful for checking/calibrating clinical MRI systems, developing new MRI pulse sequences, and training of the MRI personnel. The goal of this presentation is: (a) to provide an overview of the existed test objects in MRI-QC and (b) to provide all needed information for the fabrication of simple MRI-QC phantoms.
The desired characteristics of the optimal MRI-QC phantom filling material include: (1): comparable relaxation times, Proton Density values and electrical conductivities to those of human tissues, (2): robustly processable, (3): non-hazardous, (4): stable for long periods of time, (5): readily available, (6): inexpensive, and (7) easy to handle.
The most commonly used phantom materials are: Hydatic paramagnetic solutions of (Gd,Ni and Cu) ions, Distilled water, and agar/agarose gels.
In hydatic paramagnetic solutions, both T1 and T2 are shortened when increasing paramagnetic ion concentration. In gel paramagnetic solutions, T1 is basically shortened when increasing paramagnetic ion concentration and T2 is basically shortened when increasing gel concentration.
The whole procedure for the fabrication of simple phantoms based on Gd-DTPA paramagnetically doped agarose gels is presented.

(Learning Objectives)

1. To present an overview of the existed test objects for QC in MRI.

2. To present the role of a qualified Medical Physicist as a designer and/or constructor of simple MRI-QC phantoms.