System knowledge – CMIV MR6

This document gives and overview of the systems and component of MR6 at CMIV.

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1. The MR scanner

A MR scanner contains several advance and fine-tune equipment for creating MRI-images. Here we give an overview of the most important ones.

1.1. Scanner hardware

The figure below is showing the main hardware components included in an MRI scanner: The main magnet creating the static magnetic field (B0), the gradient coils creating small variation in x,y and z directions (G) and the radiofrequency coil responsible for the excitation field (B1).

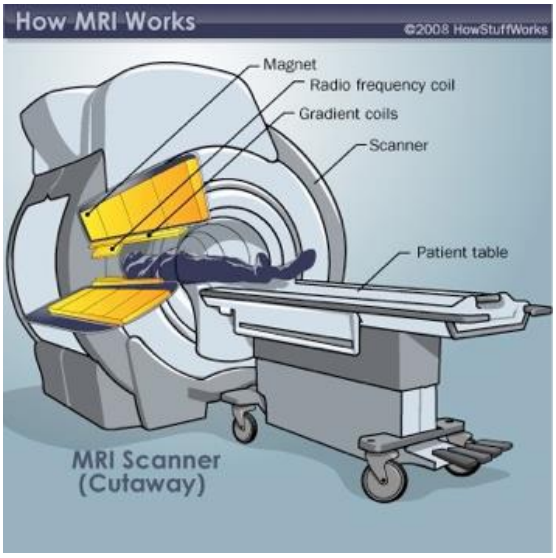

Fig. 1 *Hardware components in the MRI scanner.*

The static magnetic field is created by a electromagnet that needs to be cooled down by Helium (4 Kelvin) to maintain a superconductive state. About two cubic meters of liquid Helium is needed. The gradient are also electromagnets but are constructed to be rapidly turned of and on.

1.2. Coils

The coils in a MR scanner are responsible for creating the image signal (transmit) and sequentially reading out the response (receive). Coils can also be used for both transmitting and receiving, the integrated body coil in the scanner is for example a transmit/receiver coil. The most used receiver coils at MR6 are:

- Head / Neck coil (20 ch and 64 ch)
- Body 18
- Flex Large 4
- Spine 32 (integrated in the patient table).

Fig. 2 *Scanning a patient in MRI where body 18 coil is used [1].*

1.3. Computers

Several computers work to together to control and process the data from the scanner:

- A *Host computer* which controls the scanner, including the gradients and RF-coil.
- A *Reconstruction computer* which performs the necessary calculations and preprocessing to compute images from raw data.
- A *Console computer* from which a user interacts with the system and plans scans.

2. MR6 control room

The MR6 control room is where the system is being monitored and controlled. It also contains additional components used in various MR imaging protocols. You will probably not be using all of them, but it is important to know what equipment exists, so you know what to touch and what **not to touch**. In the figure below we have listed the available equipment in the control room.

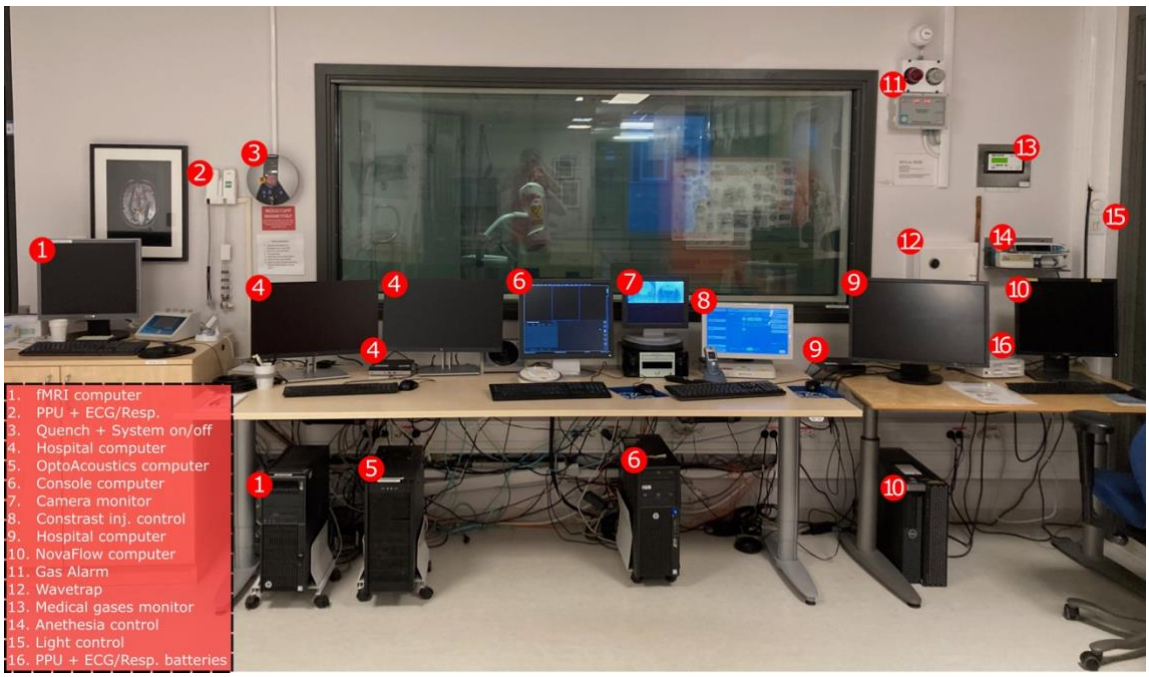

Fig. 3 *MR control room, listing all components.*

3. MR6 technical room

The technical room is a room located next to the magnet room and which houses several pieces of equipment that are needed for the MR scanner to function properly.

3.1. Gradient, Power supply and Cryo cabinet

The figure below is showing three cabinets, and these are (from left) gradient cabinet, power supply cabinet and cryo pump cabinet.

Fig. 4 *From left: Gradient cabinet, power supply cabinet and cryopump cabinet*

The Cryo pump is an important piece equipment in an MR scanner, and is responsible for keeping the cooling Helium at high pressure. It is this pump that makes the repetitive noise *('hm-tjuk-hm-tjuk-hm-tjuk…*'). If not, please advise the MR-manager, or other staff that can take care of the condition.

3.2. Climate control

The climate in the scanner room is closely regulated by equipment in the technical room.

Fig. 5 *Climate control cabinets, left: dehumidifier, right: humidifier*

3.3. Electrical cabinets

Safety and main power switches sit in two cabinets, one from Siemens equipment and one for the building.

Fig. 6 *Electrical cabinets, left: Siemens, right: Building*

4. CMIV floor plan

The figure below shows an overview of the MR5/MR6 floor plan at CMIV, including Quench button, Electric stop, Fire extinguisher etc.

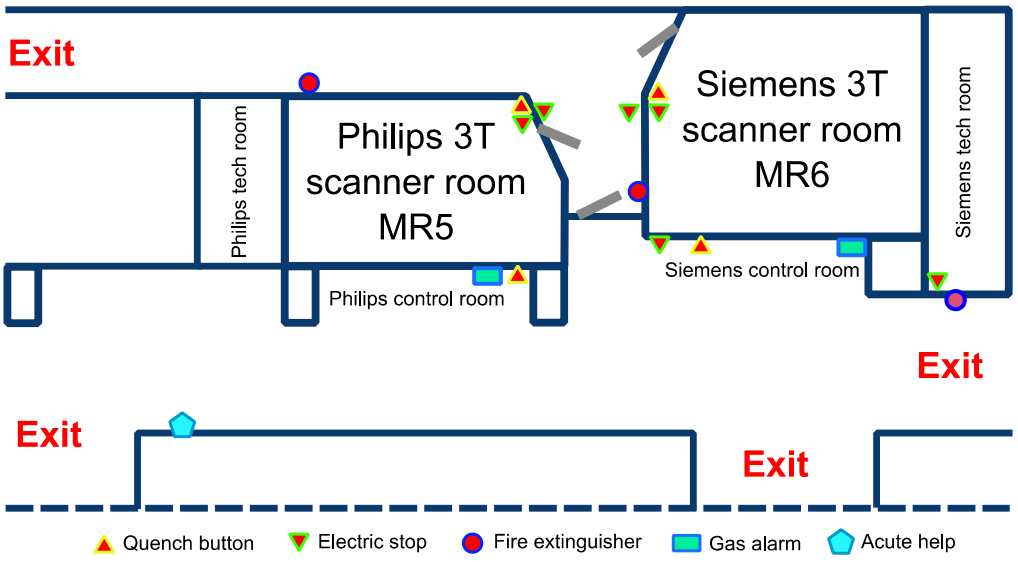

Fig. 7 *Overview of MR5/MR6 floor plan at CMIV.*

References

1. https://www.siemens-healthineers.com/magnetic-resonance-imaging/options-and-upgrades/coils/body-18 [2023-10-18].