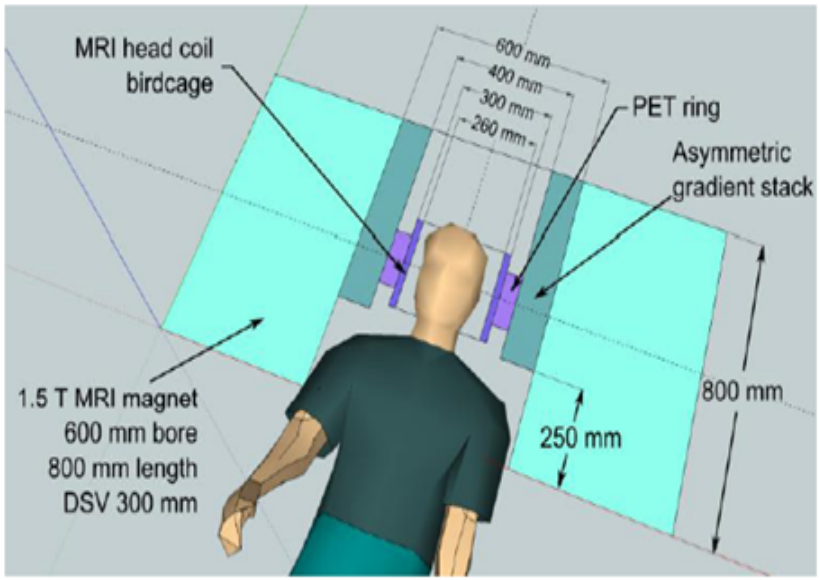
EU-TRIMAGE

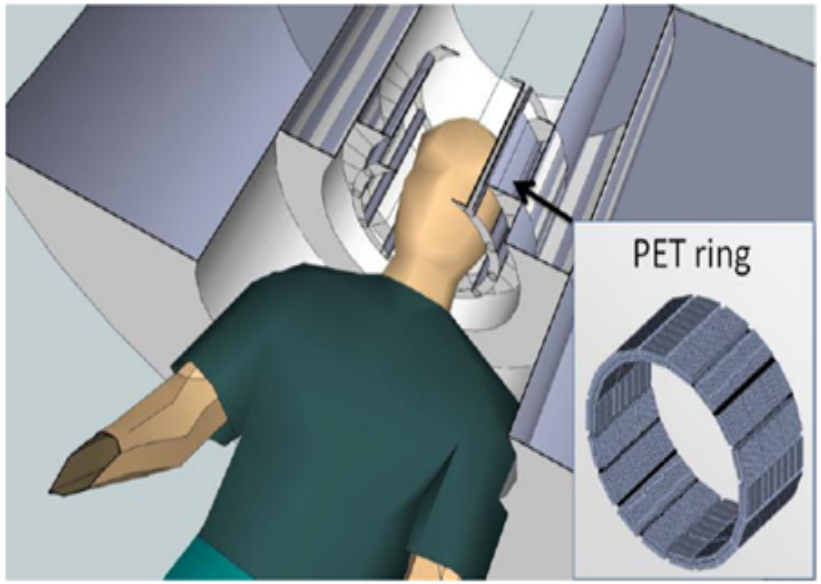
INFN
Istituto Nazionale
di Fisica Nucleare

the TRIMAGE Project

GOAL: development of an **optimized trimodality** (PET/MR/EEG) imaging tool for early diagnosis of schizophrenia

- **European Project** under the FP7 programme
- Involves **11** participants



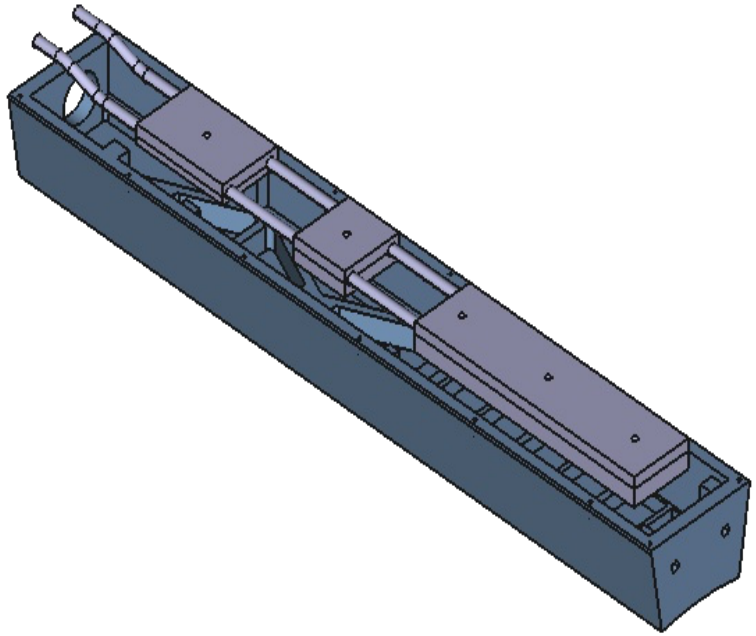


Tasks: INFN Sezione di Torino

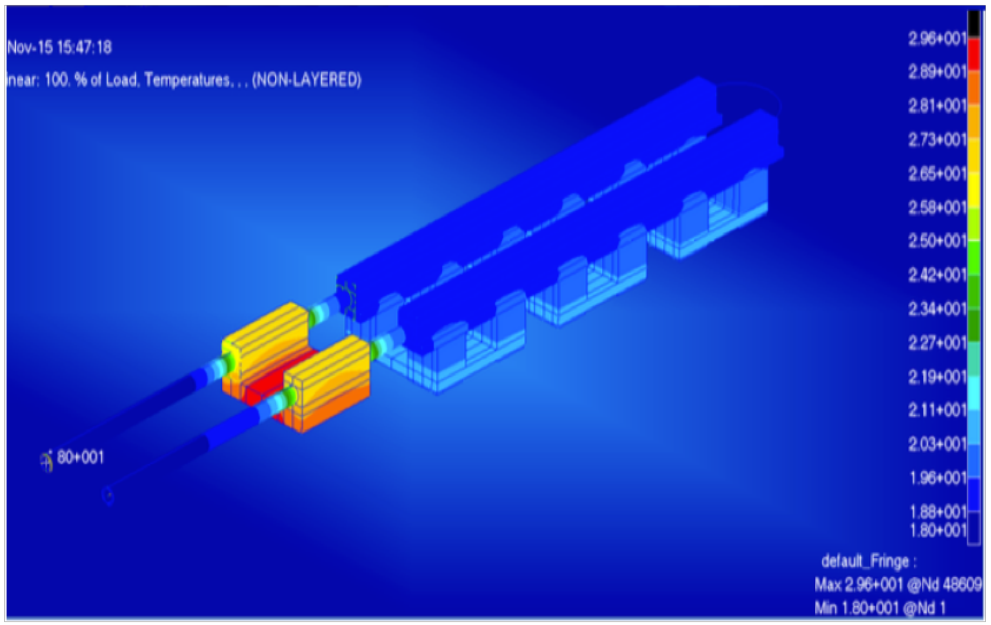
- **Mechanical** Design and prototyping of the PET cassette
- Development and prototyping of the **water cooling system** of the PET cassette
- Design and prototyping of the **EM shield** of the PET cassette

Mechanical Design & Cooling System

Development of the cooling system and mechanical design
Construction of the **18 (+2) cassettes of the PET ring**



Mechanical design compatible with a 3D-printer



Water cooling system based copper pipes and copper blocks to dissipate **> 45W**

EM-Shielding Concept

A shield is required to avoid possible electromagnetic (EM) **interaction** between the PET and MR systems

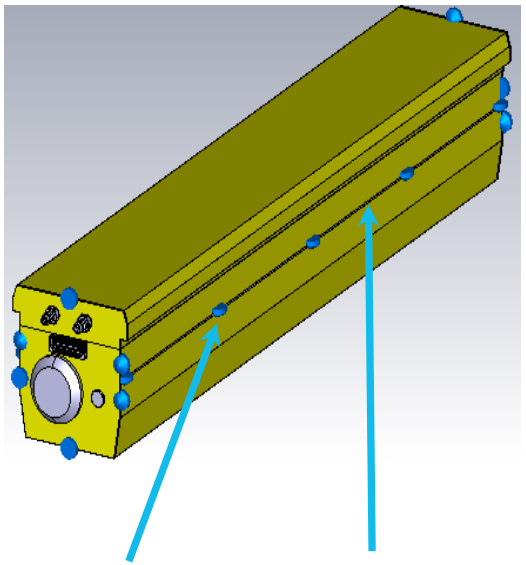
- the MR scanner is very compact
- Induced **eddy-currents** on the shield during the gradient switching generate **MR image artifacts**

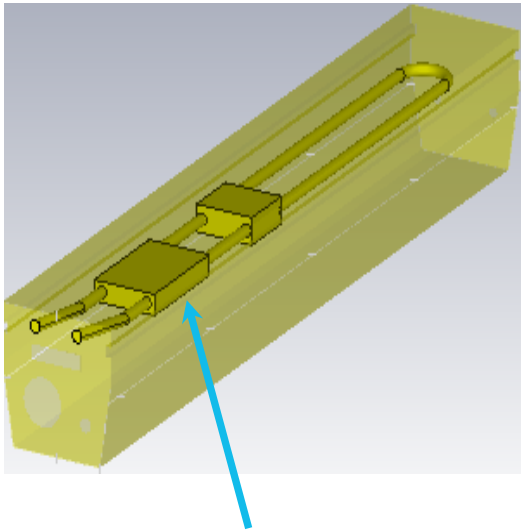
The shield of the TRIMAGE PET cassette must be optimized and designed to provide a **frequency-selective behaviour**:

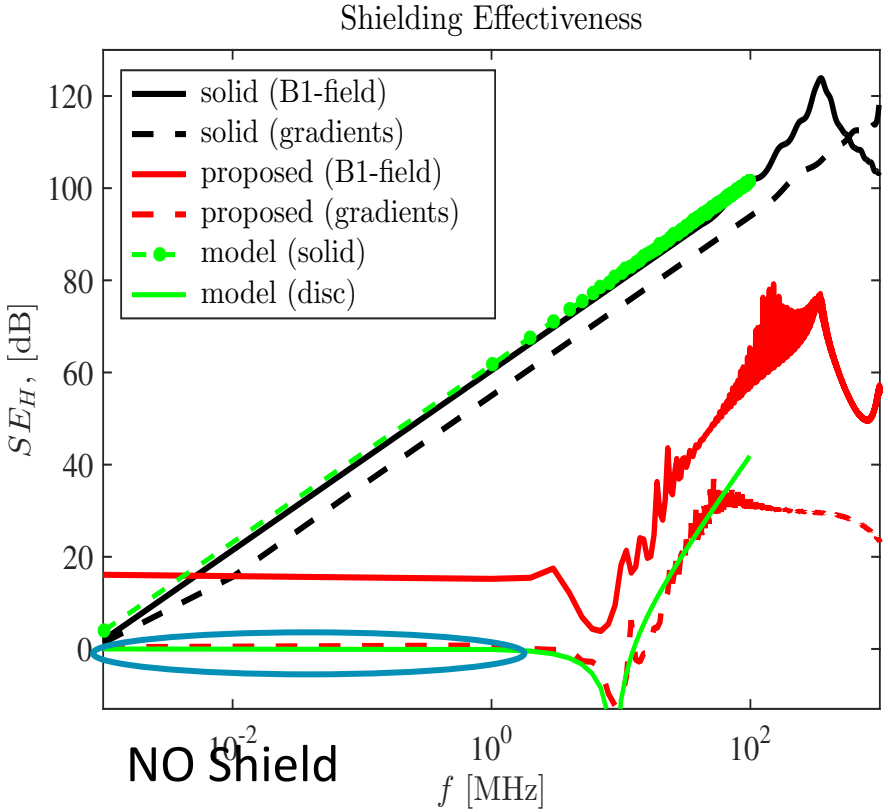
- **minimizing** its interaction with the low frequency **gradient switching**
- providing a **high attenuation at the RF**

Shielding Configuration & EM-Simulations

- The **frequency-selective** shield is obtained from a solid shield by adding **longitudinal slits** and **capacitors**
- Interaction between the shield including the cooling system and the **MR fields** is evaluated via **EM simulations**





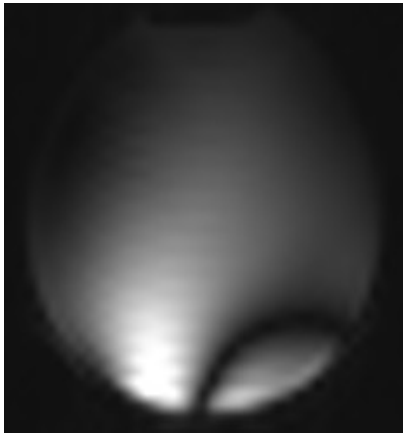


Experimental Validation

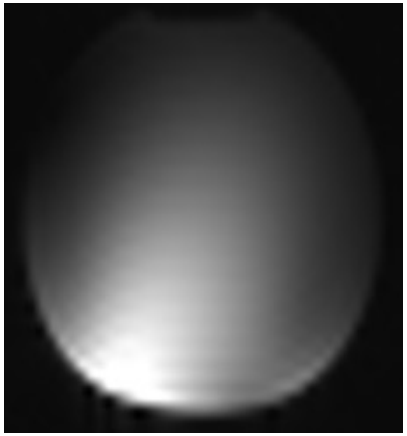
The **advantages** of the proposed shield with respect to the standard shield configuration were verified by **comparing** MR images with the 2 shields

MRI

Reference
(NO Shield)



Standard
Shield



Proposed Solution

Richieste Servizi 2017

- I partecipanti
  - P. Cerello
  - S. Coli
  - E. Fiorina
  - G. Giraudo
  - F. Pennazio
  - A. Rivetti
  - R. Trinchero
  - R. Wheadon

- Costruzione di 20 cassette PET, comprendenti sistema di cooling e EM shielding
- Test in assenza e successivamente in presenza di campo magnetico
- 6 mesi tecnologo meccanico