

**QUACO**

**MAGNETS FOR A  
BRIGHTER FUTURE**

**QUACO**



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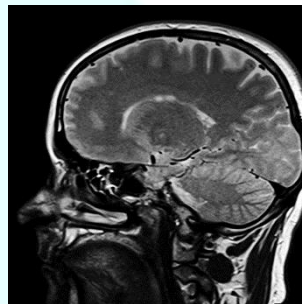
## Magnets, magnets, magnets, where are you?

Magnets are the key components of particle beam accelerators, but a variety of applications beyond High Energy Physics (HEP) make up a significant part of their use. Applications of superconducting magnets are found for example in the fields of medicine, energy and materials science with Magnetic Resonance Imaging (MRI) application dominating the market.



### MRI – Magnetic Resonance Imaging

Magnetic Resonance Imaging (MRI) was discovered in the mid 1940's and the first MRI exam on a human was performed in 1977. MRI allows doctors to see what is happening inside the human body without any harm. Today MRI scans are used every day as one of the most important and accurate methods to detect diseases such as tumours and oedemas.



#### *Want to know more?*

*General public:* [What is MRI?](#) (EN), [IRM, c'est quoi?](#) (FR) | *Scientific:* [Low-Cost MRI](#) (EN), [MRI Journal](#) (EN)

### NMR – Nuclear Magnetic Resonance



Nuclear Magnetic Resonance (NMR) is one of the most important analysis tools for contemporary biomedicine, chemistry and materials science. NMR tools incorporate superconducting magnets and are effectively used to characterize the content and purity of all kind of matter.

#### *Want to know more?*

*General public:* [NMR explained](#) (EN), [RMN définition](#) (FR) | *Scientific:* [Magnet in NMR](#) (EN), [Journal of Biomolecular NMR](#) (EN)

### MSS – Magnetic Surgery System

MSS is a medical procedure that uses superconducting magnets to deliver drugs and other therapies directly into deep brain tissues. Magnetic systems for brain surgery are still under development and have the potential to be a safer and less invasive way for neurosurgery.



#### *Read more:*

[Magnetic Surgery System](#) (EN), [Magnetic System in Brain Surgery](#) (EN)

## Maglev Train

The fastest train in the world is the Japanese maglev with a record speed of 603km/h. The train levitates 10cm above the tracks by way of using strong magnetic fields created by superconducting coils. The commercial operation of maglevs is planned to start between Tokyo and Nagoya by 2027.



**Want to know more?**

[How Maglev Trains Work](#) (EN), [Trois questions sur le maglev](#) (FR), [World speed record](#) (EN)

## Hybrid Electric Aircraft “E-Thrust”

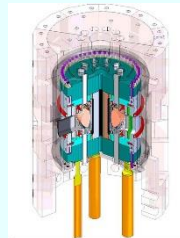
Rolls Royce and EADS are developing a commercial aircraft, E-Thrust, that works with a hybrid/electrical distributed propulsion system. E-Thrust will use clusters of electrical fans along the wings to propel the aircraft forward. The electric motors powering these lightweight fans are extremely potent because they use superconducting electromagnets. The technology of E-Thrust would decrease fuel consumption, noise pollution and emissions and thus the environmental impact of air travel. The project is estimated to be complete in 2050.

**Read more:**

[E-Thrust Plan](#) (EN), [A Concept for future e-aircraft propulsion](#) (EN)

## Fusion energy

Thermonuclear fusion devices such as the Tokamak use magnetic fields to confine and heat plasma, creating the conditions for sustained fusion reactions to be able to produce energy. Superconducting magnet technology is the best way to achieve strong enough magnetic fields necessary both for confinement and for heating the plasma. Used fuel is abundantly available, and fusion energy – when produced – will be fundamentally clean and economical, which makes it an excellent replacement for traditional energy.



**Want to know more?**

General public: [Fusion for Energy](#) (EN), [Qu'est-ce qu'un Tokamak ?](#) (FR)

[Nuclear fusion within reach \(YouTube\)](#) (EN) | Scientific: [Journal of Fusion Energy](#) (EN)

## SMES – Superconducting Magnetic Energy Storage

In SMES energy is stored in a coil made of superconducting wire in magnetic and electric form. Because there is no loss, electric current stays in a closed coil forever producing a magnetic field. Because SMES technology prevents and reduces the effects of power disturbances, it is a great solution for improving power quality for its different applications in commercial, industrial or military use.

**Want to know more?**

[SMES Energy Storage](#) (EN), [SMES Stockage d'énergie](#) (FR), [SMES explained \(YouTube\)](#) (EN)

## What will QUACO do?

The QUACO PCP project will attempt to enlarge the market for superconducting magnets beyond the HEP community, encouraging cooperation with industries, in particular SMEs, working on the different applications. QUACO will contribute to strengthening technological innovation in Europe.

The QUACO project could also open doors to new industrial applications, such as high power accelerators for nuclear applications, material testing, for water depuration or exhaust gas cleaning from energy plants. More generally, different technology and industrial sectors will benefit directly from the development of a new generation of superconductive magnets.

The areas, which are currently making use of the NbTi technology at different level, could benefit from the advancements resulting from the QUACO project, in terms of product reliability, cost and process of procurement and manufacturing, manufacturing technology of superconducting magnets, and quality and performance of magnets.

## Benefits of PCP

Through its deployment in three distinctive phases Pre-Commercial Procurement (PCP) endeavours the participation of SMEs allowing a more effective allocation of resources and reducing risks for smaller enterprises. It boosts innovation and offers SMEs the possibility to enhance their business capacity enabling competition with main players in the field. By gathering the ownership of the Intellectual Property Rights and the subjected right to commercially exploit the results after the finalisation of the PCP, SMEs can enter new markets. Furthermore PCP boosts innovation resulting in the development of several innovative solutions by the different participating companies.

## Life after QUACO

The companies participating in QUACO expect that the technologies developed in the framework of the project will find applications not only for the next generation of accelerators for High Energy Physics but also in the medical and energy sectors. Some of the anticipated uses include fusion energy, medical diagnosis systems, radio pharmacy, and proton therapy. With the development of superconducting technology, new applications that will benefit the whole society are expected to emerge.