

Accelerator Based Boron Neutron Capture Therapy in France

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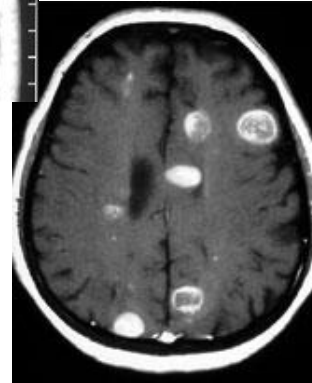
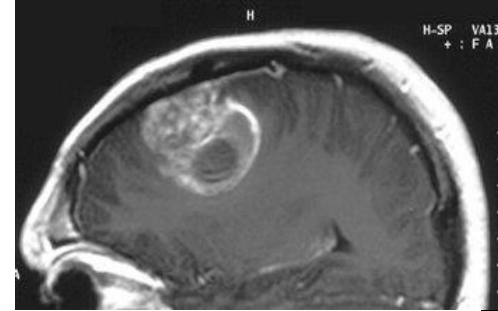
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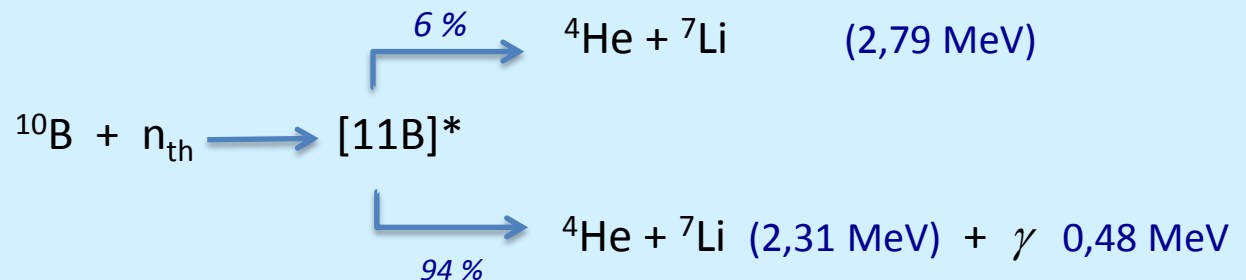
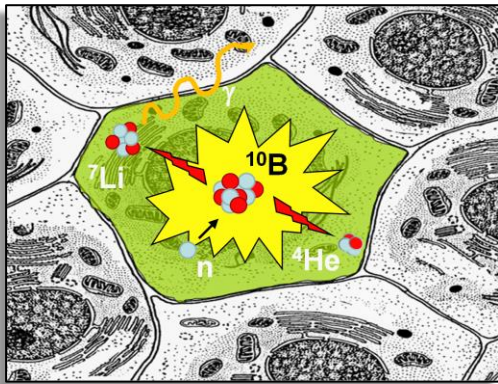
Tumors Treatments : limitations & BNCT

- *Standard Radiotherapies Limitations:*

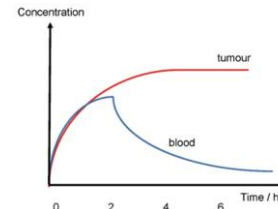
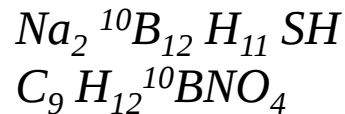
- Radio and chimio resistance tumours
(*ex. Glioblastome*)
- Non localized tumors (*ex. multiple metastasis*)
(*brain, liver,...*)



BNCT - Boron Neutron Capture Therapy



BSH : *sodium borocaptate*
BPA : *para-borophenylalanine*



Contrast = T/H ~ 3-4

FIRST CLINICAL CASE OF BORON NEUTRON CAPTURE THERAPY FOR HEAD AND NECK MALIGNANCIES USING ^{18}F -BPA PET

Teruhito Aihara, MD,¹ Junichi Hiratsuka, MD,² Norimasa Morita, MD,² Masako Uno, MD,¹ Yoshinori Sakurai, PhD,³ Akira Maruhashi, PhD,³ Koji Ono, MD,³ Tamotsu Harada, MD¹

Boron Neutron Capture Therapy

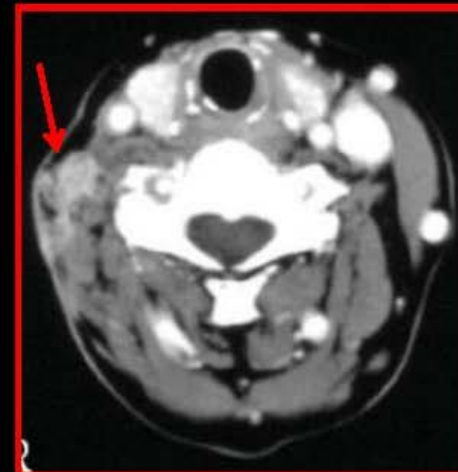
HEAD & NECK—DOI 10.1002/hed September 2006

A patients with recurrent submandibular gland cancer, underwent ^{18}F - ^{10}B -BPA PET before and after BNCT.

The tumor/normal tissue boron concentration ratio was 2.9.

The tumor was irradiated at the Kyoto University Research Reactor with epithermal neutrons 5 MW for 90 minutes.

Results. To date there has been continuous complete regression in the tumor and no acute and chronic complications for 1.5 years.



Before BNCT



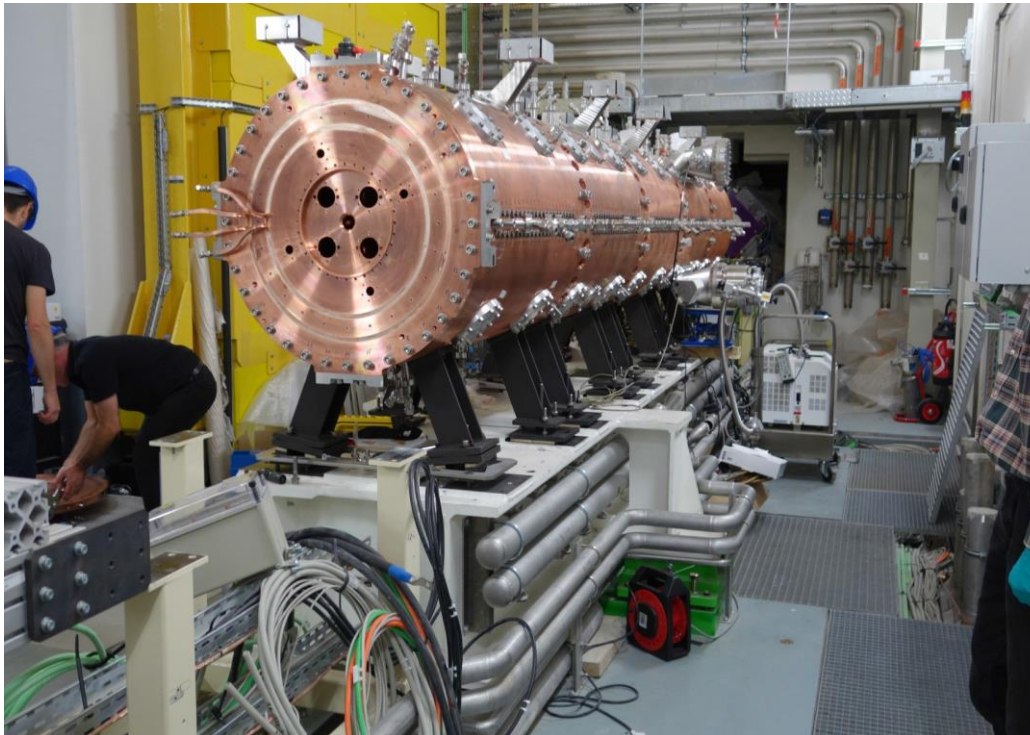
After 12 mo. from BNCT

ABNP 2014

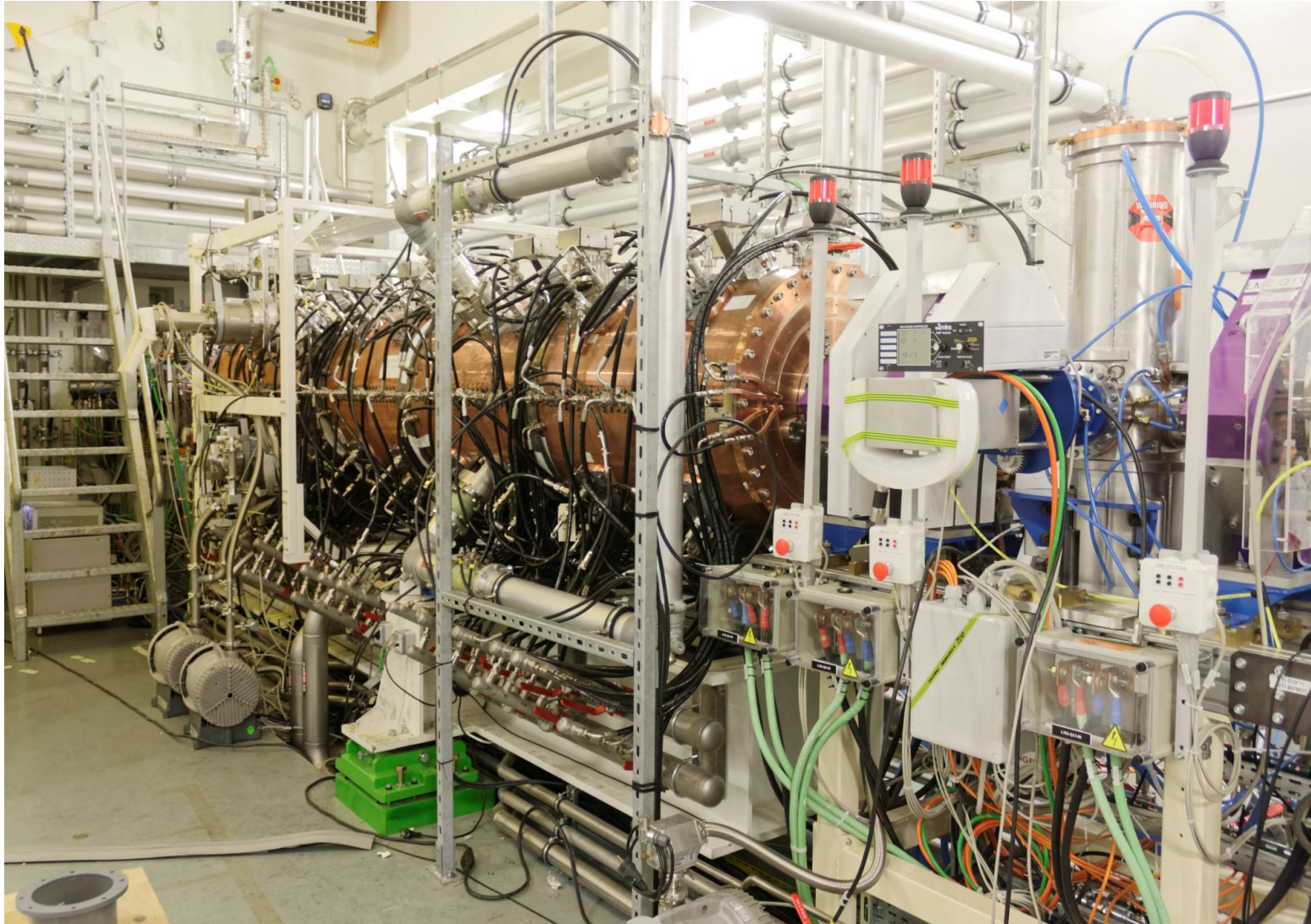


SPIRAL2 RFQ requirements

- ! From 20 keV/A at 0.734 MeV/A
- ! 5 mA H⁺, 5 mA D⁺, or 1 mA Q/A=1/3
- ! 88.05 MHz, 4 vanes, > 99% transmission



First beam (0.734 MeV/A , 5 mA) in December 2015



Target for deuteron beam on ^9Be layer

Current status :

Target material : Beryllium layer

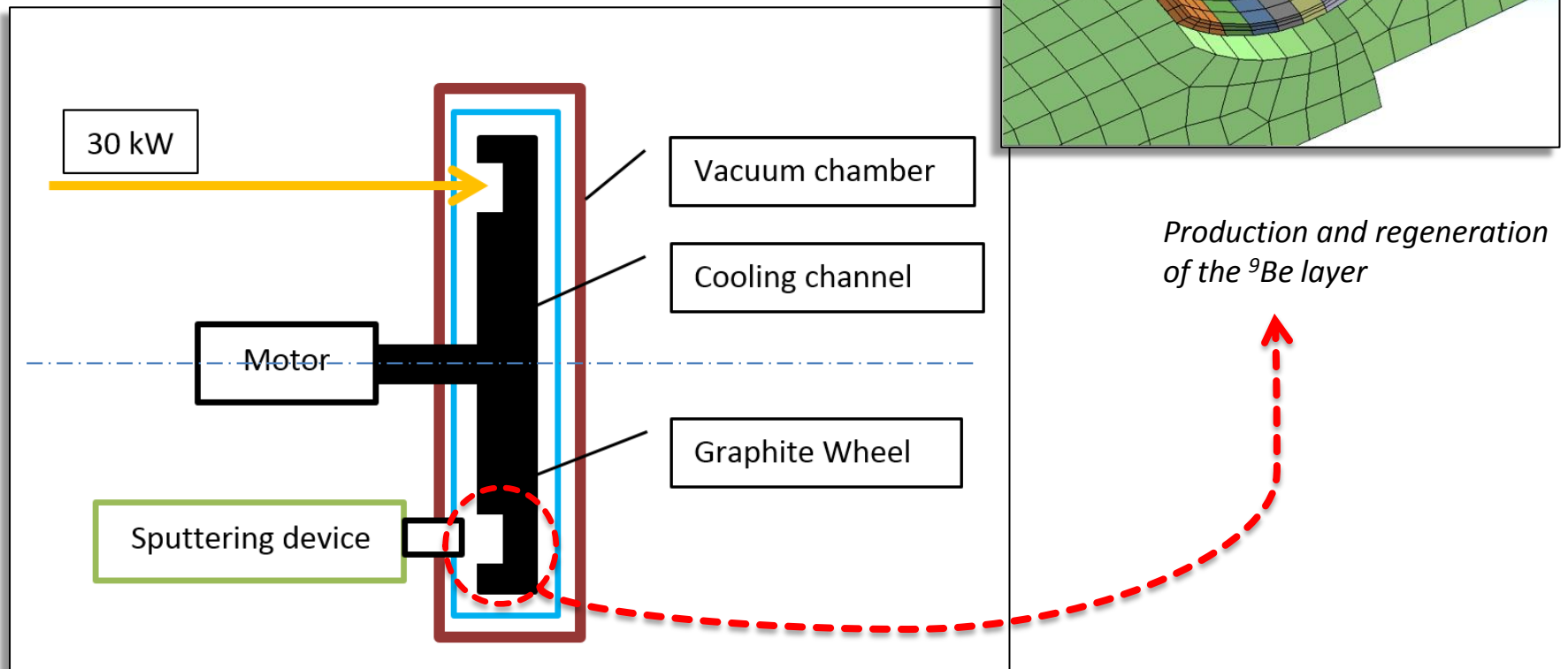
Backing material : Graphite

Backing diameter : 1000 mm

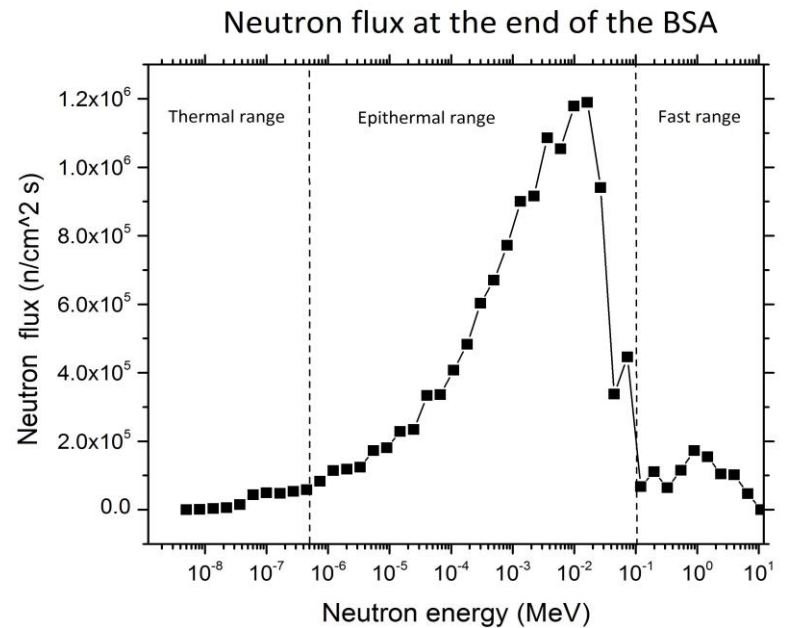
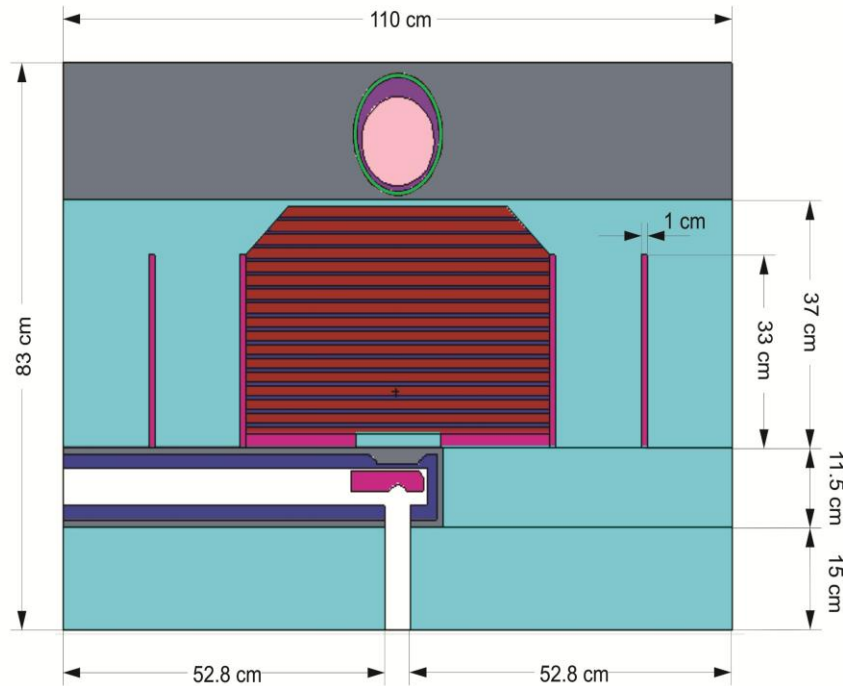
Thermal power dissipated : 30 kW

Cooling of the backing material : radiation mechanism

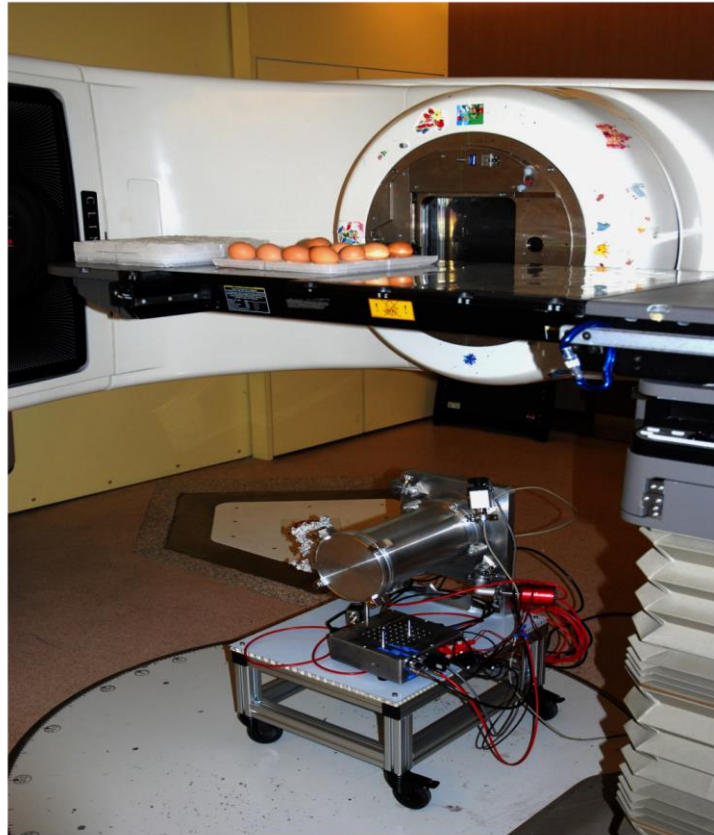
Regeneration of target



Simulation of a Beam Shape Assembly for the ^9Be target (I. Ferrari, D.S (LPSC,2016))



Directional Fast neutron spectrometer (10 keV – 600 MeV)



See oral presentation given
by Nadine Sauzet this morning



Workshop on Accelerator Based Neutron Capture Therapies (AB-NCT)

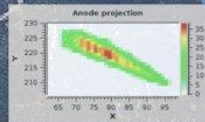
October 15-16th, 2015

Laboratoire de Physique Subatomique et de Cosmologie, Grenoble, France

<http://lpsc.in2p3.fr/ab-nct>

Neutron Capture Therapies (NCT) rely on the selective administration of carrying compound that preferentially accumulates in tumour cells. Irradiation with a neutron beam induces lethal doses delivered to tumour tissues by reaction on carriers.

Prospects of expanding NCT require the implementation of neutron sources suitable for in-hospital sitting; then Accelerator-Based (AB) neutron sources are the best choice for this purpose. The aim of this workshop is to gather specialists of scientific domains involved in these innovative therapies to discuss the opportunity to develop a dedicated project in France along with the possible strategies.



Local Organization Committee:

Denis Dauvergne, Véronique Ghetta,
Julien Giraud, Jean-François Muraz,
Jocelyne Riffault, Pablo Rubiolo, Daniel Santos

Workshop on AB-NCT

October 15th, 16th 2015

Grenoble (France)

More than 50 participants...

Wolfgang Sauerwein (Strahlenklinik Univ. Hospital, Essen)

Andrés Kreiner (Tandar- CNEA, Argentine)

Saverio Altieri (Pavia university)

François Lux (Univ. Lyon I)

Jérôme Schwindling (CEA Saclay)

Robin Ferdinand (Ganil, Caen)

Hanna Koivunoro (Helsinki University Hospital)

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France
HADRON



You are all welcome to participate in this challenge...

Covering different domains:

Physics (neutron detection and moderation, gamma detection, imagery)

Biology and chemistry (Boron vectorization, in vitro, in ovo, in vivo experiments)

Clinical (treatment protocols for different tumors)

Industrial (participate in the demonstrator)