Status of the Efinion brochure

Karl Johnston

EFINION: The European Forum for Innovative Applications of Nuclear ION beams and tools

Feedback from all the TNA labs: EFINION questionnaire

EFINION QUESTIONNAIRE #1

please submit a Word file, including everything – not a PDF!

A.1	Name person filling the questionnaire	dr. E.R. van der Graaf
A.2	Affiliation	KVI-CART (Center for Advanced Radiation Technology)
A.3	Email	vandergraaf@kvi.nl

B.1	Activities presented here refer to institution:	KVI-CART (Center for Advanced Radiation Technology)
B.2	Contact person of your institution for EFINION matters	dr. M.A. Hofstee, head cyclotron operations
B.3	Email	m.a.hofstee@rug.nl

In the following table(s) please describe as clear as possible the application(s) running at your lab that, in your view, deserve to be included in the EFINION catalogue. Though, EFINION's goal is to document all applications running at ENSAR institutions, some major criteria for the final composition of the catalogue will be the following:

1. Innovative aspects of the application
2. Socio-economic impact
3. Multi-disciplinary character
4. Existing links with "end-users"
5. Involvement of radioactive beams in the application
6. Uniqueness
7. Sustainability beyond ENSAR's termination
8. Potential for patents
9. European added-value
10. Potential for public awareness

Deliverable Number [61]	Deliverable Title	Lead beneficiary number	Estimated indicative person-months	Nature [62]	Dissemination level [63]	Delivery date [64]
D6.1	Preliminary survey of past and present multidisciplinary and application-oriented research within EN	16	2.00	R	PU	12
D6.2	Report on the Workshop on "ENSAR applications - oriented research"	16	6.00	R	PU	36
D6.3	"Catalogue of multidisciplinary applications-oriented research activities of ENSAR"	16	5.00	R	PU	36
D6.4	"Synergies and collaboration opportunities in applications-oriented research with and within ENSAR".	16	6.00	R	PU	36
D6.5	The EFINION's website	16	5.01	O	PU	6
D6.6	"Nuclear scientists and policy makers communicate"	16	6.00	R	PU	48
		Total	30.01			

Efinion “Pre-workshop” CERN 20th Feb

Overview of the received information (at the time missing many labs)

Presentation and overview of similar projects from DidweDo agency (Lausanne)
Schedule laid out….

Initial plan was finalising by ~ 16th June….this has slipped

Structure of Brochure

Brochure structure:

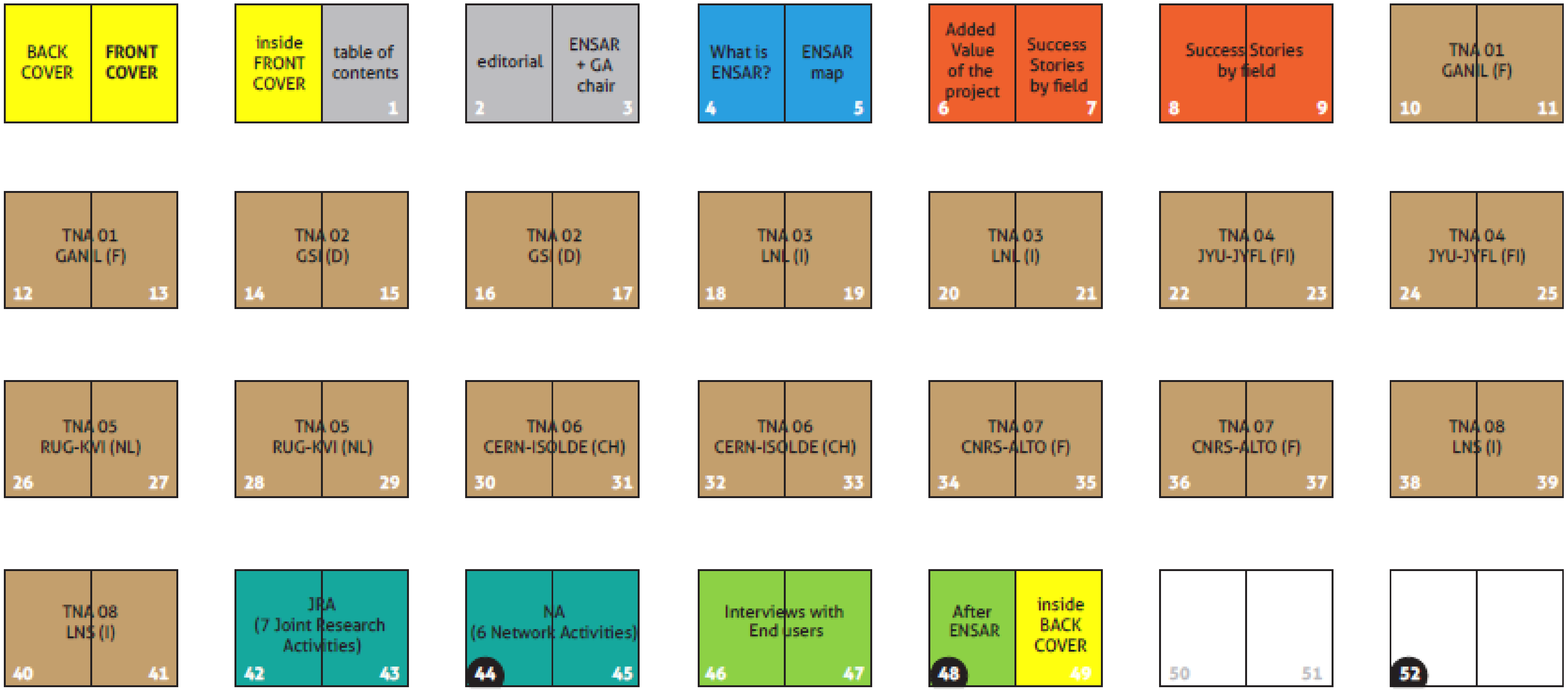
- Editorials of ENSAR coordinator and GA chair – 1 page (videos on the digital edition)
- What is ENSAR – 1 page
- ENSAR response to Society + **top success story** – 2 pages
- Map with facilities/beneficiaries (similar to NuPECC brochure) - 1 page
- Table/Map with labs vs. application fields – 1 page
- TNA facilities: success stories – 7x4=28 pages
- JRA & NA – 4 pages
- Interviews with “end-users” – 2 pages
- Forward look and future plans – 2 pages

Main structure and content sections (option B – recommended)

according to 21/02/2014 CERN meeting

INFORMATION: The interior number of pages of a publication (excluding the 4 cover pages, here in yellow) must be a multiple of 4.

- *Cover*
- *Introduction*
- *ENSAR + Benefits of the project*
- *Partners description*
- *Conclusion*
- 44 *> the document must finish on one of these pages*



“Flavour of content…”

INTERNATIONAL OLYMPIC COMMITTEE

FINAL REPORT OF THE IOC COORDINATION COMMISSION

GAMES OF THE XXX OLYMPIAD, LONDON 2012

DID WE DO*

This vision – to use the power of the Games to inspire lasting change – went far beyond simply hosting a memorable 17-day event: it aimed to capture the imagination of young people, while also creating physical, sporting and social legacies.

This compelling vision for the London 2012 Olympic Games provided a clear direction for the Organising Committee, guiding its decisions and inspiring its stakeholders throughout the planning and preparation phase.

London's vision also helped the Organising Committee to create its Games masterplan, which shaped the image of the Games and provided the foundations for its various achievements and innovations, which included delivering a unique Games-time experience for all key client groups, including athletes and spectators.

LOCOG also successfully and consistently repeated key messages in a very disciplined and coordinated way, using every member of its organisation, every possible ambassador and every programme or activity deployed by the organisers. It communicated its Games vision to all key stakeholders, including the public and the media, which was crucial to spreading the message of the Games to young people around the world.

By consistently delivering against its vision throughout the planning phase, LOCOG was able to successfully deliver during the Games themselves and also looks set to realise its legacy ambitions.

Sebastian Coe, Chairman, London 2012 Bid Limited.

London 2012 – Delivering on a vision video

Digital Edition: Content can be embedded…


sportaccord
sportaccord
sportaccord


MEMBERS AND
ASSOCIATE MEMBERS
ALL OVER
THE WORLD
SportAccord is the
umbrella organisation
for 105 international
sports federations
and organisations.
Its mission is to support
and protect the
common interests of
the sports movement.

Topics received

Socio-economic benefit
Space electronics
Ion sources

GANIL
GRAND ACCELERATEUR NATIONAL D'IONS LOURDS
LABORATOIRE COMMUN DSM/CEA-IN2P3/CNRS

Space electronics
Atomic collision physics: astrochemistry

ALTO
Accélérateur Linéaire et Tandem à Orsay

INFN L.N.L.

Ion beam writing
Diamond biosensors
Particle beam channelling
Materials for Gamma/neutron detection

RADEF(mostly)
Pelletron

UNIVERSITY OF JYVÄSKYLÄ

AGOR-FIRM

university of groningen
kvi - center for advanced radiation technology

INFN LNS

Hadron therapy
Medical imaging

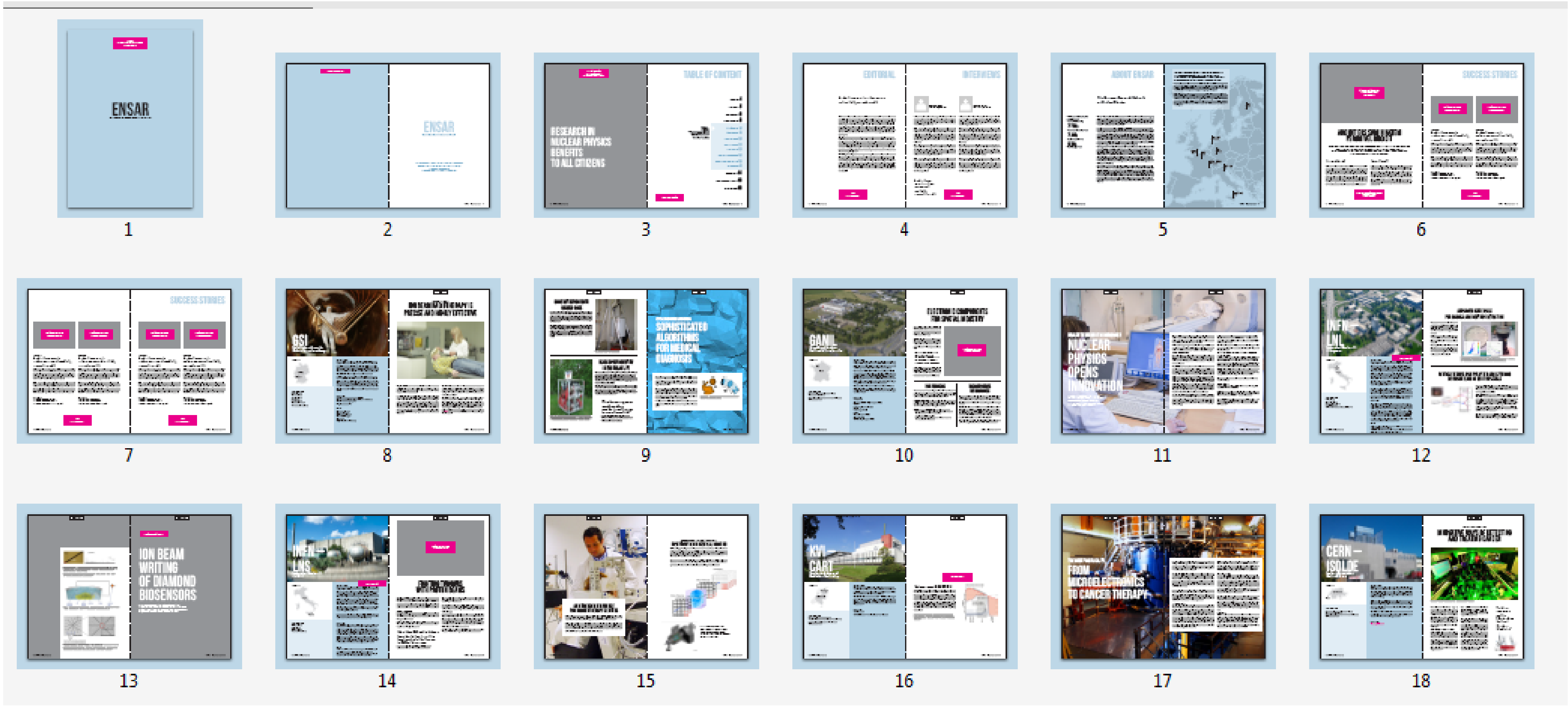
Solid state physics/biophysics
Medicine

ISOLDE

Ion beam radiotherapy
Mass spectroscopy in everyday life
Mine detection
Algorithms: "bunny"

GSI

Following some digestion, snapshot of a first look….



ABOUT ENSAR

The European Research Network on Nuclear Physics

The European ENSAR is divided in 20 sub-projects, also called work packages.

7 TNAs
Transnational Access Activities

7 JRAs
Joint Research Activities

6 NAs
Networking Activities

Nuclear Physics is the study of the properties and behaviour of nuclei and particles, ranging from tiny quarks to giant explosions deep in space. Nuclear physics is important in a vast variety of situations, from understanding how the Sun provides the energy for life on this planet, to nuclear power plants and radiation therapy. Without nuclei, we simply would not exist, and it is important to understand why!

In order to carry out research at the forefront of fundamental nuclear science, our community of nuclear scientists profits from the diverse range of large research infrastructures existing in Europe. These infrastructures are particle accelerators that can supply different species of ion beams and energies. In this way we can learn how the nuclear forces arising from the interaction between the building blocks of neutrons and protons manifest themselves in the rich structure of atomic nuclei, and how different isotopes of elements are synthesised in primeval stellar processes. Our community also has a long tradition of applying state-of-the-art developments in nuclear instrumentation to other research fields (e.g. archaeology, and to benefit humanity (e.g. medical imaging).

The large nuclear research infrastructures that exist in Europe are complementary in their provision of beams and address different aspects of nuclear structure. These European nuclear physics facilities are world-class and excel in comparison with facilities elsewhere in the world. Furthermore, the vibrant European nuclear physics community has made great efforts in the past to make the most efficient use of these facilities by developing the most advanced and novel equipment needed to pursue the excellent scientific programmes proposed for them. This has been done under the auspices of NuPECC (Nuclear Physics European Collaboration Committee) and the strong support from previous framework programmes of the European Commission.

This community strives to do the same in the future and has delineated the steps needed to pursue coherent research programmes at these facilities. This was done within the framework of the recent Long-Range Plan (LRP) of NuPECC "Perspectives for Nuclear Physics Research in Europe in the Coming Decade and Beyond" which has been published in 2010. In this LRP, NuPECC addressed future perspectives in six major subfields of research in nuclear physics and re-emphasised the role of the European Network of complementary, large-scale facilities where past achievements and future perspectives for research in nuclear physics are excellent. In this LRP are also recommendations for future Pan-European facilities.

ENSAR is the scientific project for European nuclear scientists who are performing research in three of these major subfields: Nuclear Structure, Nuclear Astrophysics and Applications of Nuclear Science.

Its core aim is to provide access to seven of the complementary world-class large-scale facilities: GSI (Germany), GANIL (France), joint LNL-LNS (Italy), JYFL (Finland), KVI (Netherlands), CERN-ISOLDE (Switzerland) and ALTO (France). These facilities provide ion beams of excellent qualities ranging in a large range of energies.

These facilities are offering access to a very large, wide and diverse user community. The size of this community of physicists in nuclear structure, nuclear astrophysics, and applications of nuclear science in addition to the staff that is involved in accelerator and detector development and in running the facilities ranges between 2100-2300 scientists and highly qualified engineers according to a recent survey by NuPECC. The facilities will provide an increased amount of beam time for applications of nuclear techniques.

GSI
Helmholtzzentrum fur Schwerionenforschung

LOCATION

DESCRIPTION

The goal of the scientific research conducted at GSI Helmholtzzentrum fur Schwerionenforschung is to reach a better understanding of the structure and behavior of the world that surrounds us. GSI operates a unique large-scale accelerator for heavy ions. More than 1,000 researchers from around the world and 200 master and doctoral candidates use the facility each year for experiments that help them make fascinating discoveries in basic research.

In addition, they continually develop new and improved applications. Probably the best-known results are the discovery of six new chemical elements and the development of a new type of tumor therapy using ion beams. In the coming years, a new international accelerator center called FAIR (Facility for Antiproton and Ion Research) – one of the largest research projects in Europe – will be built adjacent to GSI. The GSI accelerators will serve as an injector for FAIR.

APPLICATIONS

ESA Laboratory
Nuclear Physics
Atomic Physics
Biophysics
Plasma Physics
Materials Research
Accelerator Development

FACILITIES

120 metres long linear accelerator UNILAC
Ring accelerator SIS with a circumference of 216 metres
Experimental storage ring ESR
Fragment separator FRS

LABS

Detector Laboratory
Target Laboratory
Technology Laboratory
Vacuum Technology
Cryogenics
High-Performance Computing

CANCER THERAPY

ION BEAM RADIOTHERAPY IS PRECISE AND HIGHLY EFFECTIVE

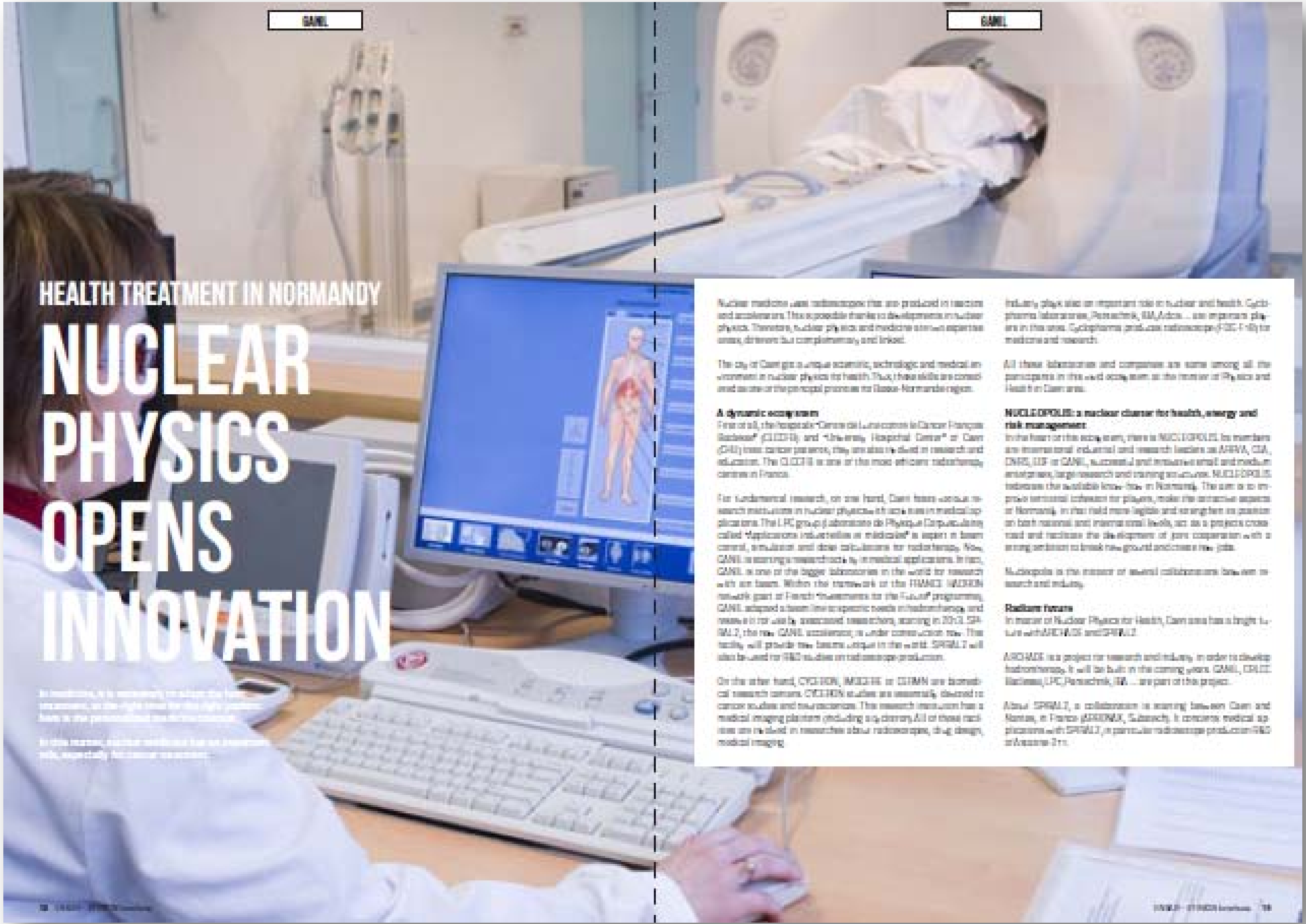
Together with physicians, scientists at GSI developed a revolutionary new form of cancer treatment with carbon ions. The development was the result of many years of research in conjunction with GSI's large ion beam accelerator system.

Ion beam radiotherapy at GSI has been used to treat more than 440 patients for tumors in the head and neck region. The advantage of the new treatment modality is that the ion beam selectively damages tumor tissue while sparing the surrounding healthy tissues. The therapy with ion beams is precise, highly effective and very gentle for the patients. Subsequent monitoring of these patients over a five-year period revealed that the growth of the irradiated tumors was stopped in up to 90 percent of the patients, depending on the type of tumor. Side effects requiring treatment occurred only in very few cases.

Since 2009, this type of cancer therapy is in routine clinical use at the Heidelberg Ion Beam Therapy Center (HIT). There, up to 1,000 patients can be treated annually. The accelerator facility and the technique for irradiation at HIT was developed and built by scientists and technicians of GSI.

Further developments aim to treat tumors which change their position constantly due to body movements, like breathing. Experiments show that it is possible to follow a movement of the tumor inside the body by adapting the ion beam's stopping position in three dimensions. The implementation could expand the treatment to inner organs like the lung or the liver. The method is continuously improved by GSI scientists and their cooperation partners. Up to today XXX patients connected with this novel therapy technique has been issued.

GANIL



HEALTH TREATMENT IN NORMANDY

NUCLEAR PHYSICS OPENS INNOVATION

In medicine, it is necessary to adapt the best treatment, at the right time for the right patient: here is the personalized use of the isotope.

In this matter, nuclear medicine has an important role, especially for cancer treatment.

Nuclear medicine uses radioisotopes that are produced in reactors and accelerators. This is possible thanks to developments in nuclear physics. Therefore, nuclear physics and medicine are two expertise areas, different but complementary and linked.

The city of Caen got a unique scientific, technologic and medical environment in nuclear physics for health. Thus, these skills are considered as one of the principal promises for Basse-Normandie region.

A dynamic ecosystem

First of all, the hospitals "Centre de Lutte contre le Cancer François Baclesse" (CLCCFB) and "University Hospital Center" of Caen (CHU) treat cancer patients, they are also involved in research and education. The CLCCFB is one of the most efficient radiotherapy centres in France.

For fundamental research, on one hand, Caen hosts various research institutions in nuclear physics which are seen in medical applications. The LPC group (Laboratoire de Physique Corpusculaire) called "Applications industrielles et médicales" is expert in beam control, simulation and dose calculations for radiotherapy. Now, GANIL is starting a research activity in medical applications. In fact, GANIL is one of the bigger laboratories in the world for research with ion beams. Within the framework of the FRANCE HADRON network (part of French "Investments for the Future" programme), GANIL adapted a beam line to specific needs in hadrontherapy, and research for use by associated researchers, starting in 2013. SPIRAL2, the new GANIL accelerator, is under construction now. This facility will provide new beams unique in the world. SPIRAL2 will also be used for R&D studies on radioisotope production.

On the other hand, CYCERON, IMOGERE or CERMN are biomedical research centers. CYCERON studies are essentially devoted to cancer studies and neurosciences. This research institution has a medical imaging platform (including a cyclotron). All of these facilities are involved in researches about radioisotopes, drug design, medical imaging.

Industry plays also an important role in nuclear and health. Cyclopharma laboratories, Pantechnik, IBA, Advacs... are important players in this area. Cyclopharma produces radioisotope (FDG F-18) for medicine and research.

All these laboratories and companies are some among all the participants in this vivid ecosystem at the frontier of Physics and Health in Caen area.

NUCLEOPOLIS: a nuclear cluster for health, energy and risk management

In the heart of this ecosystem, there is NUCLEOPOLIS. Its members are international industrial and research leaders as AREVA, CEA, CNRS, EDF or GANIL, successful and innovative small and medium enterprises, large research and training structures. NUCLEOPOLIS federates the available know-how in Normandy. The aim is to improve territorial cohesion for players, make the attractive aspects of Normandy in that field more legible and strengthen its position on both national and international levels, act as a projects crossroad and facilitate the development of joint cooperation with a strong ambition to break new ground and create new jobs.

Nucleopolis is the initiator of several collaborations between research and industry.

Radiant future

In matter of Nuclear Physics for Health, Caen area has a bright future with ARCHADE and SPIRAL2.

ARCHADE is a project for research and industry, in order to develop hadrontherapy. It will be built in the coming years. GANIL, CLCC Baclesse, LPC, Pantechnik, IBA ... are part of this project.

About SPIRAL2, a collaboration is starting between Caen and Nantes, in France (ARRONAX, Subatech). It concerns medical applications with SPIRAL2, in particular radioisotope production R&D of Astatine 211.

INFN — LNL

Laboratori Nazionali di Legnaro

Text is TOO LONG

LOCATION

DESCRIPTION

The Italian Institute of Nuclear Physics (INFN) main mission is the study of the fundamental constituents of the matter, conducting theoretical and experimental research in the field of subnuclear, nuclear and astroparticle Physics. INFN has a key role in the European framework as it regards particle accelerators and detectors developments. Moreover, it is strongly involved in the application of the developed technology in several fields, as for instance medicine, superconductivity, cultural heritage and computing science. All these activities are carried out in collaboration with the academic world. Research activities at INFN are carried out within two complementary types of facilities: the Divisions, located at the Physics Department of Universities, and the four National Laboratories, housing the major facilities.

The Laboratori Nazionali di Legnaro (LNL) is one of the four national laboratories of INFN. The mission is to perform basic research in nuclear physics and nuclear astrophysics, together with applications of nuclear technologies. Five accelerating machines are currently in operation at LNL: AN2000, CN, TANDEM, ALPI and PIAVE. These facilities deliver in total some 4000 hours of beam time per year.

APPLICATIONS

Radiobiology
Micro-dosimetry
Detector developments
Ion Beam Analysis
Advanced materials and micro-fabrication

FACILITIES

Several facilities at the INFN-LNL in Legnaro are devoted to applied and interdisciplinary physics projects. In particular, the micro-beam facility at the AN2000 accelerator used for ion beam micro-writing and for elemental analysis of geological, archaeological and environmental samples, the horizontal single-ion micro-beam facility for radiobiological single cell irradiations installed at the 7MV CN accelerator, and the irradiation facilities at the Tandem and CN accelerators for radiation damage studies (bulk damage, total dose and Single Event Effects) for detector development, micro-electronic devices and space applications.

LABS

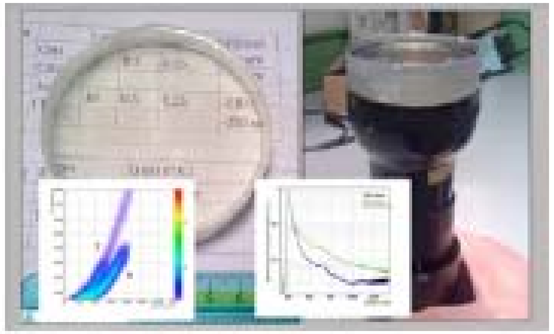
A biology laboratory for the preparation of the cell cultures to be used in radiobiology experiments.
A machine laboratory supports the user groups for the preparation of the samples to be studied by Ion Beam Analysis.

ADVANCED MATERIALS FOR GAMMA AND NEUTRON DETECTION

Transparent polysiloxane-based scintillators are analyzed by TOF methods at the LNL-CN. A 4 MeV proton pulsed beam (3 MHz, 7 ns) impinges on a thin LiF target to obtain nearly mono-energetic 2.3 MeV neutrons.

The sensitivity to fast and thermal neutrons and the scintillation pulse shape for the n-gamma discrimination capability is analyzed.

Doping with boron for the detection of thermal neutrons preserved the scintillator transparency, while with suitable dye concentrations a good pulse shape discrimination has been obtained.



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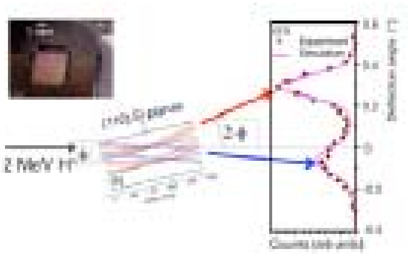
PARTICLE BEAMS MANIPULATION AND STEERING BY CHANNELING IN BENT CRYSTALS



Channeling of MeV charged particles has found wide application as a powerful tool for ion beam analysis. In recent years, channeling in bent crystals opened up new schemes for beam manipulation and steering of GeV particle beams.

At the LNL-AN2000 accelerator, it has been recently demonstrated that beam trajectory manipulation can also be performed at MeV energy by means of beam interaction with a thin nano-crystal. A 57 nm thick silicon membrane was realized by micromachining. A 2.0 MeV proton beam interacts with the (110) planes along the membrane thickness with an incident angle α ≈ 0 mrad. The channeled particles make on average half an oscillation into the 57 nm crystal, therefore they are reflected by the lattice planes at the membrane exit [illegible] trajectories.

Over barrier particles are slightly deflected in the opposite direction [illegible] trajectories. Angular deflection distribution of the particles has been measured and perfectly agrees with Monte Carlo model.

Image quality….

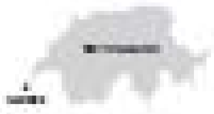
Background info etc.

THE AGORFIRM FACILITY

FROM MICROELECTRONICS TO CANCER THERAPY

Need to harmonise the editorial...

LOCATION



DESCRIPTION

APPLICATIONS

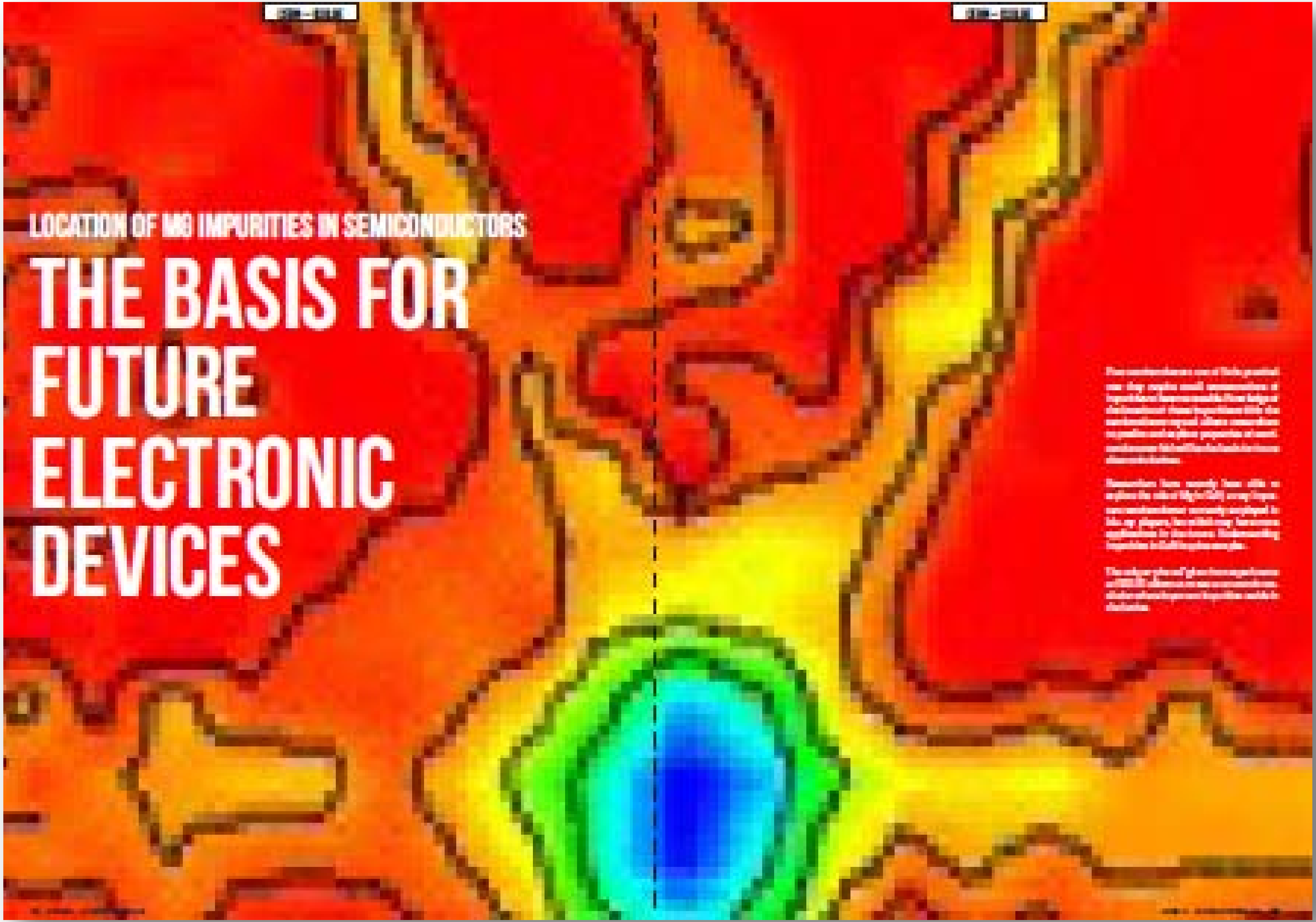
FACILITIES

INNOVATIVE WAYS OF DETECTING AND TREATING CANCER

Terbium can serve as the "Swiss Army knife of Nuclear Medicine"

LOCATION OF MG IMPURITIES IN SEMICONDUCTORS

THE BASIS FOR FUTURE ELECTRONIC DEVICES



TB ISOTOPES IN MEDICINE

Innovative ways of detecting and treating cancer

[illegible]

What is so great about terbium?

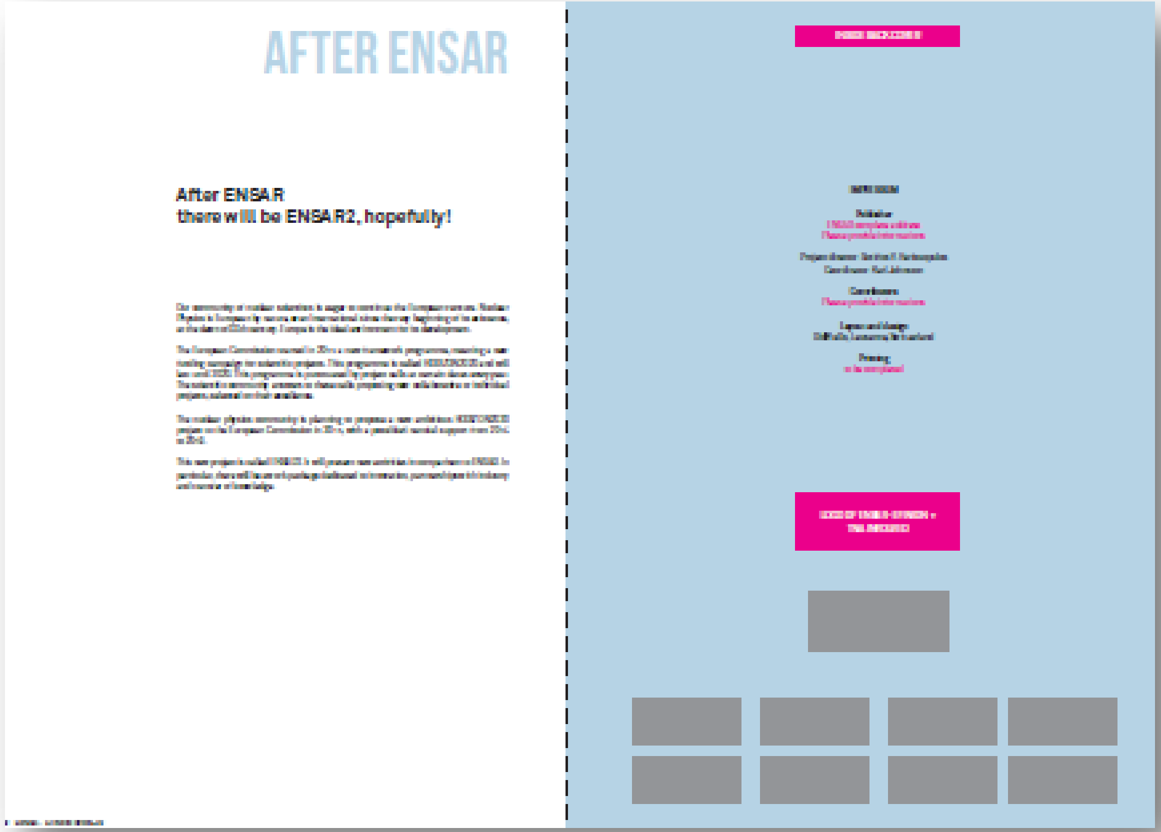
[illegible]

Terbium can serve as the "Swiss Army knife of Nuclear Medicine"

[illegible]

RESEARCH IN NUCLEAR PHYSICS BENEFITS TO ALL CITIZENS

JRAs & NAs



AFTER ENSAR

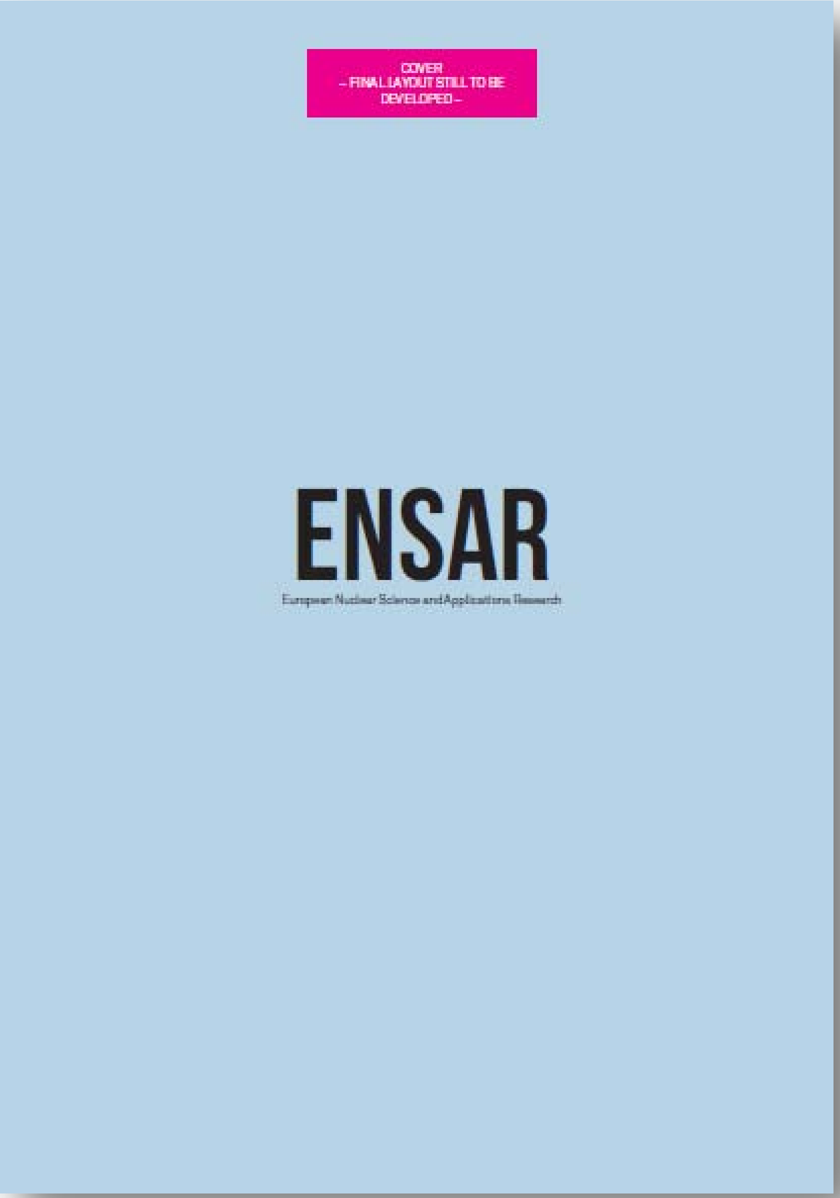
After ENSAR
there will be ENSAR2, hopefully!

STRONG MESSAGE
AT THE BEGINNING
WITH BACKGROUND IMAGE

RESEARCH IN NUCLEAR PHYSICS BENEFITS TO ALL CITIZENS

TABLE OF CONTENT

LAYOUT MAY CHANGE



To be thought about!
Cover

From our side……

What is still missing

- editorial and interviews (p.4-5)
- success stories – introduction text + 6 examples by theme (p.8-11)
- end users experience/interviews (p.46-47)

High quality images…..we need original jpgs (ideally 300dpi if possible)
Also, some more pictures would allow for more varied output, or at least choice…

Presentation of the TNAs: the core of the brochure

To be decided…- the order of the 7 TNAs → Alphabetical?

Italy…separate or together….- the two Italian facilities are separate, which may be confusing (8 TNA or 7?)

Layout presentation of each TNA (4 pages):

- 1 page is dedicated to "Facts & figures"
- 3 pages are dedicated the the presentation of success stories. One story is usually presented in a more important way. → choose the most successful success story

More info from KVI? Good description of facility, but no specific success stories…

Cover image and text: this is NOT a final version: we have to discuss together at the end about the image of the cover.

Logos/Contributors: where to locate logos and contributors etc. All collected at the end?

Typical delivery time….

About 3-4 weeks from final "finalising" of the text…

Printing takes about 2 weeks…