Infrastructuri de cercetare stiintifica la IFIN-HH Bucuresti-Magurele

Livius Trache pt IFIN-HH

Conferința "Internaționalizarea Învățământului Superior și a Cercetării din România"

INS, Bucuresti, 26 iunie 2015

IFIN-HH in fapte - istorie si statistici

Portdrapel al cercetarii stiintifice romanesti

- din 1949: IFA – Institutul de Fizica al Academiei Romane
- din 1956: IFA - Institutul de Fizica Atomica (fizica nucleara: reactor de cercetare, ciclotron)
- din 1977: IFIN – Institutul de Fizica si Inginerie Nucleara (accelerator tandem, surse de neutroni, centru de productie radioisotopi, medicina nucleara, tratament deseuri radioactive, etc.)
- 2012: “The largest R&D institute in Romania – in terms of assets and personnel, *'Horia Hulubei' National Institute of Physics and Nuclear Engineering* (IFIN-HH) covers almost 10% of the national scientific output.” (evaluare institutionala, Mai 2012; evaluatorii internationali au dat nota 5.0 – din 5!)
- In suburbia Bucurestiului: Magurele, jud. Ilfov, cca 15 km de centru
- Personal: cca 800
  - 326 cercetatori: fizicieni, chimisti, biologi, ingineri…
  - 174 doctori in stiinte; 22 conducatori de doctorate
- Buget: cca. 155M RON/an ~ 35M euro/an (2013)
- Cercetare fundamentala in fizica nucleara si particule elementare
- Aplicatii ale fizicii nucleare si atomice: iradieri, tratament deseuri, analize …
- Fizica vietii si a mediului
- Retele avansate de calculatoare (Grid computing)
- Perfectionarea si specializarea personalului din domeniul nuclear (lucru cu radiatii)
- Coordonator de mari colaborari internationale: CERN Geneva, FAIR Darmstadt, JINR-Dubna
- Sediul noii investitii europene ELI-NP


IFIN-HH

Lista infrastructuri in IFIN-HH

“instalatii complexe care ofera (au potentialul sa ofere) servicii de cercetare grupurilor locale, nationale sau internationale”

A. Instalatii de Interes National (*nume - an, utilizatori; responsabil*)

1. **Complex acceleratoare tandem** - 1973, international, dr. Dan Ghita
2. **IRASM – IRAdiere cu Scopuri Multiple** - 2000, national/internat, dr. Vali Moise
3. **Centrul cercetare radiofarmaceutice (CCR) -** 2013, national, dr. Dana Niculae
4. **Statia tratare deseuri radioactive (STDR)** - 1974, national, dr. Felicia Dragolici
5. **Depozitul national de deseuri radioactive Baita-Bihor -** 1985, national, dr. Felicia Dragolici
6. **IFIN GRID** – 2014, international, dr. Mihnea Dulea

B. Altele

7. **RoSphere** – 2012, international, dr. Nicolae Marginean
8. **CEXMEXDIF** – 2014, international, prof. Mihai Petrovici
9. **MicroBequerel Laboratory** - 2002, national, dr. Romulus Margineanu
10. **Tritiulab** – 2014, national, dr. Cristian Postolache
11. **Centrul Local de Supraveghere Radiologica a Mediului Ambiant (CLSRMA) –** 1977, 1994, national, dr. Nicolae Mocanu
12. **Bioeval** – 2010, national, dr. Adriana Acasandrei

Instalatii din IFIN-HH

- **Domeniul** + caracteristici esentiale sau de unicitate ale infrastructurii
  - **Fizica nucleara si domenii conexe; instalatii unice in tara**
    - **Cercetari fundamentale**
    - **Analize elementale si izotopice: de mediu, materiale, pt patrimoniul cultural**
    - **Stiintele vietii si mediului**
  - **Stabilite intre 1974 – 2012**
  - **Valoare: ~**
- numarul de utilizatori interni/externi, calitatea mediului pentru acces la infrastructura ai utilizatorilor externi: transport, cazare, aspecte legale, etc…
  - **Utilizatori nationali si internationali**
    - De ordinul miilor de-a lungul anilor
    - **Avem ceva cazare. Fara transport; masa – da. Posibilitati locale oferite de domeniul privat pt cazare, masa.**
- Existenta unei politici si a unui mecanism pentru Open Access/Existenta unei politici si a unui mecanism pentru furnizare/comercializare servicii CDI
  - **Access deschis – selectie utilizatori cu PAC international (complex acceleratoare tandem)**
  - **Utilizatori externi asistati de grupuri gazda**
  - **Prestare de servicii de cercetare**
- Existenta si calitatea personalului de operare si support(ingineri – tehnicieni, etc…)
  - **Da**

1a

9 MV TANDEM Accelerator

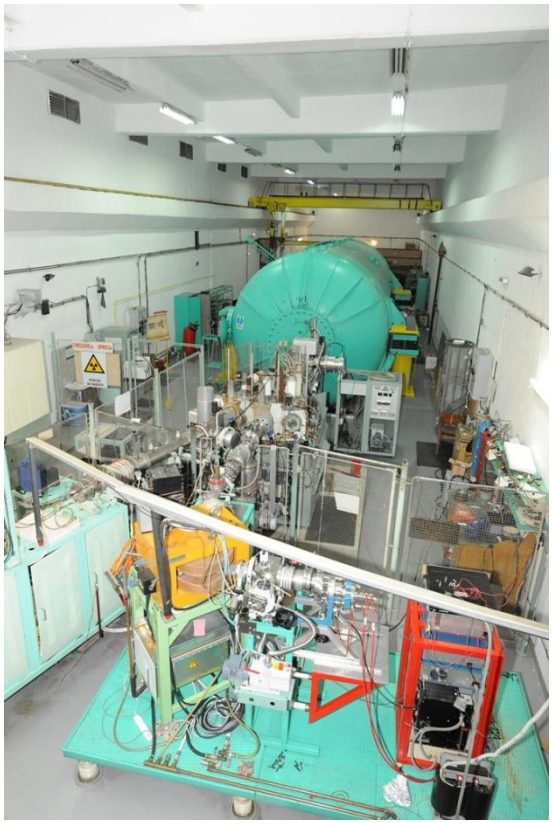
- since 1973
- 2007-2014 completely modernized - pelletron
- Earthquake protection system
- Duo-plasmatron alpha particles source (Li-exchange)
- Sputtering source
- “Fast” (nanoseconds) pulsing system
- “Slow” (>millisecond) pulsing system
- Very good transmission (>98%)
- 7 beamlines, equipped

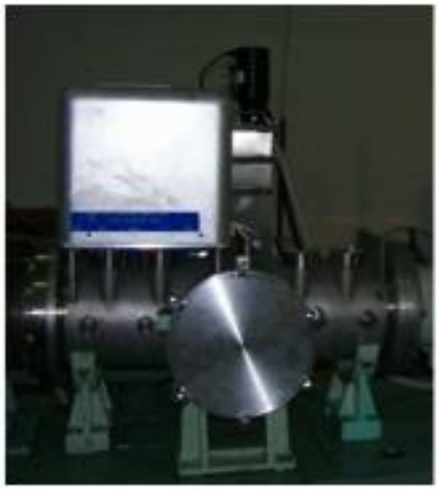
Ions from protons to S can be accelerated at energies above the Coulomb barrier

Works 24/7, ~ 6000hrs/year

International users >50%

PAC - Program Advisory Committee since 2009





1b

3 MV Tande

IBA, ion implantation

Ins

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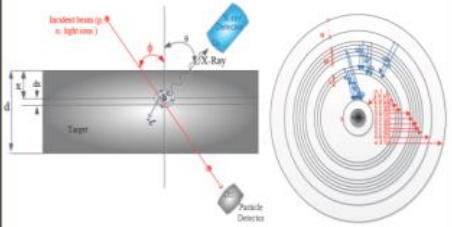
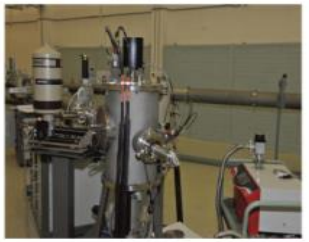
PIXE and µPIXE

IBA end station

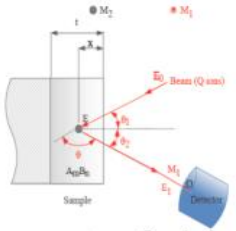


Collision geometry X-Ray Fluorescence

RBS



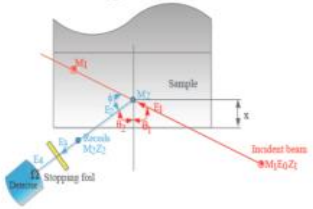
The IBA line



Collision geometry. Good for atoms heavier than the projectile (Z≥11).

ERDA

IBA target chamber



Collision geometry for ERDA. Good for atoms lighter (1≤Z≤9) than the projectile (energy ≈ 1 MeV/aum).

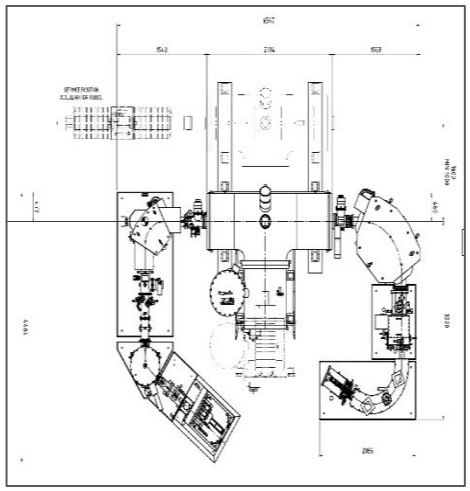
Ion Implatations Line

The ion implantation line together with its end station

The ultra modern equipped ion beam implantation system gives us the opportunity to investigate the effects induced by controlled doping processes on semiconductors and also for treatment of metal components in order to improve the surface durability.

1c

1c) AMS System – 1 MV Tandetron®
(AMS = Accelerator Mass Spectrometry)



Isotope ratios measured for:
- **Carbon (^{14}C, ^{13}C, ^{12}C)**
- Beryllium (^{10}Be, ^{9}Be)
- Aluminum (^{27}Al, ^{26}Al)
- Iodine (^{129}I, ^{127}I)

Sensitivity ~ 10^{-15}
2 chemistry labs

Applications in:
- **Cultural heritage studies (C14 dating)**
- Environmental studies,
- geochronology
- Homeland security, energetics, etc …

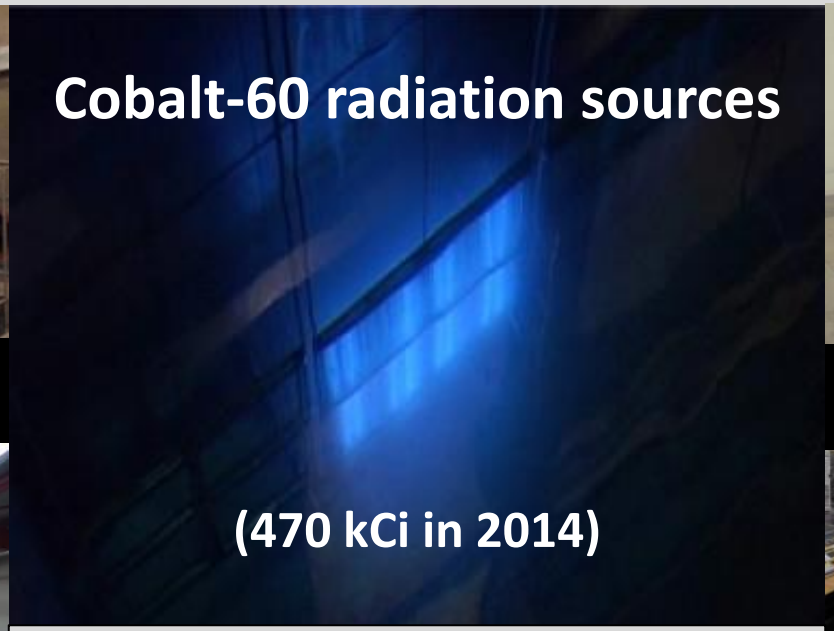
Utilizatori: vedeti foto seminar DAT, 26 Feb. 2015
104 in sala (capacitatea salii cca. 70)

2

IRASM MULTIPURPOSE GAMMA IRRADIATION FACILITY

Tote-box conveyor

500 sqm storage



Cobalt-60 radiation sources

(470 kCi in 2014)

Established in year 2000
(IAEA TC Project ROM/8/011)

- Sterilization — MED.DEV
- Bioburden reduction — PHARMA

Research irradiator
(IAEA ROM/8/015)

Materials testing

IRASM in studiul si conservarea patrimoniului

Lemn, hartie, film, etc.

Ex: Theodor Aman Museum, Bucharest (2010)


iRASM
Radiation Processing Center
Conservation
by Irradiation
Items from Moldova Museum and National Film Archive
IFIN-HH, Bucharest, ROMANIA


Conservation
by Irradiation
iRASM
Radiation Processing Center
IFIN-HH, Bucharest, ROMANIA
Izvoarele Church,
Prahova County

3

Horia Hulubei National Institute for Physics and Nuclear Engineering, Romania
Radioisotopes and Radiation Metrology Department

Interdisciplinary Research at

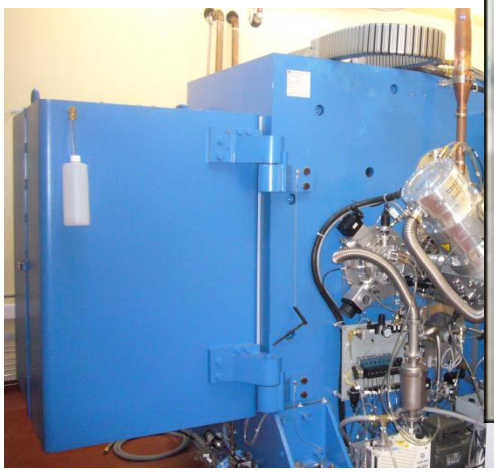
CENTRUL DE CERCETARE RADIOFARMACEUTICE
RADIOPHARMACEUTICALS RESEARCH CENTER

dr. Dana Niculae dana.niculae@nipne.ro

Premises and Equipments

From ~ 1974-7: Radioisotopes Production Center – with UK comp based on reactor (decommissioned now) and (VERY) old cyclotron

TR19 cyclotron (ACSI, Canada) – variable energy (14 - 19 MeV), max 300uA
Extension of the beam-line (6m) to the experiments room (solid target)
Gas and liquid targets (C-11, O-15, F-18) (solid target processing system, 2013)
Hot cells for radiopharmaceuticals preparation, 4 (+1, 2013)
Synthesis automated modules, 3 (GMP "closed" synthesis, "open" research synthesis)
Fully Automated Dispenser, class A
Radiochemistry Lab (radiochemistry hoods, analytical equipment: HPLC, GC, TLC, gamma spectrometry, calibrators, osmometers, radiation monitoring system)
Micro(radio)biology Lab (LAF hoods for sterile manipulation, incubators, autoclav, filter integrity measurements, particle counters, bacterial endotoxines determinations, etc)
MicroPET (preclinical studies for small animals)



4

Staţia de Tratare a Deşeurilor Radioactive

Ca in orice activitate umana, rezultatul nedorit este aparitia deseurilor, deseuri care in acest caz particular contin substante radioactive deosebit de periculoase pentru personalul operator, populatie si mediul ambiant pe o durata care poate atinge un milion de ani.

*)

5

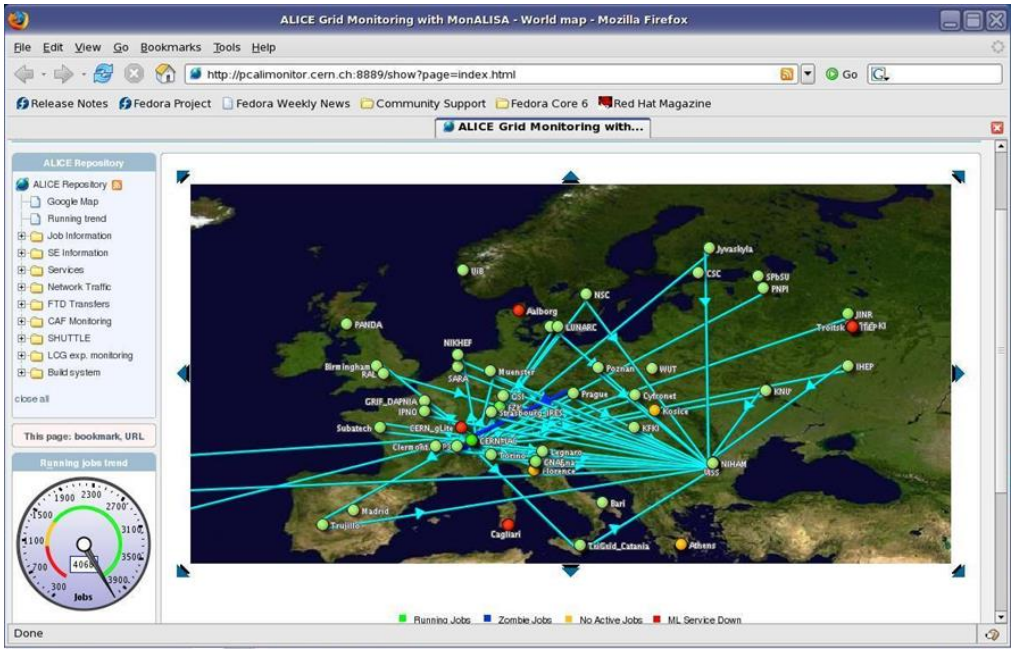
Depozitul Naţional de Deşeuri Radioactive de Joasă şi Medie Activitate Băiţa, jud. Bihor

Misiunea DMDR din IFIN-HH este gestionarea la nivel naţional a deşeurilor radioactive instituţionale

6

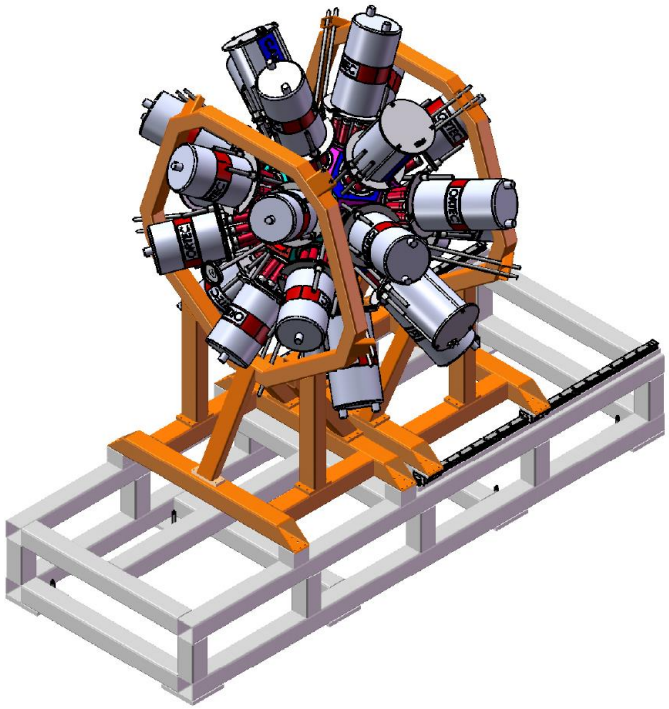
IFIN GRID - Grid Computing System for Research in Physics and Related Areas

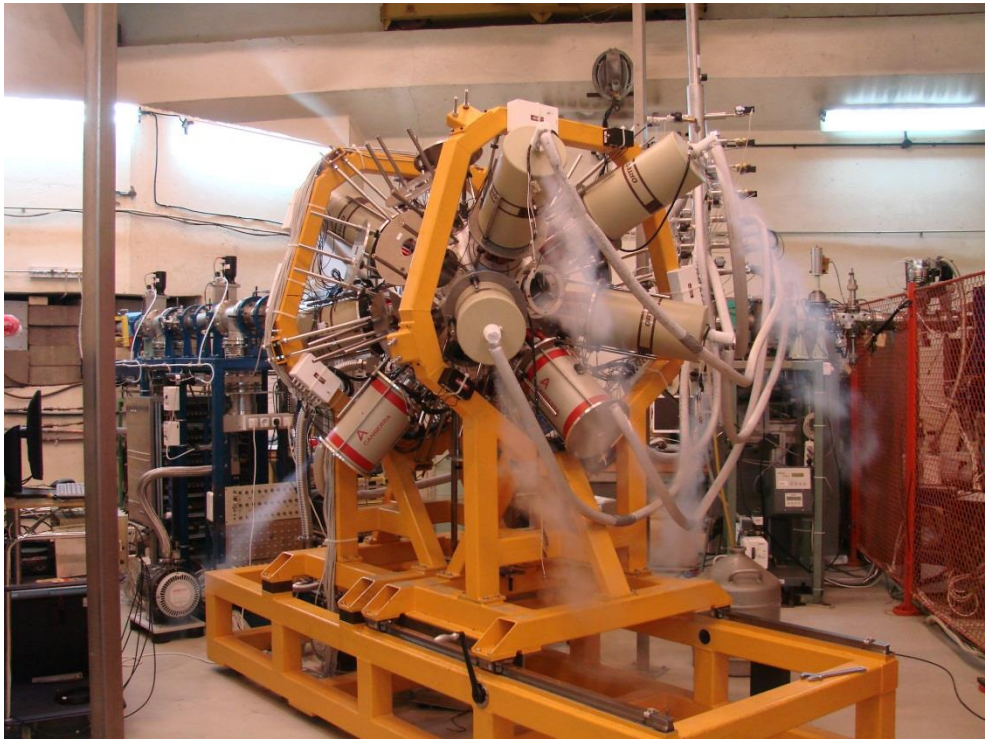
- IFIN GRID is a distributed e-infrastructure that consists of five grid sites located in three R&D departments of IFIN-HH. The four data centers that host the computing equipment are designed in accordance with internationally adopted standards. IFIN GRID currently provides more than 5300 cores and 2.6 PetaBytes disk storage capacity to the research community. The infrastructure also includes advanced network equipments, such as links to RoEduNet capable of providing 100 Gigabits/sec, and support systems like industrial air conditioning installations, professional uninterruptible power sources, two Diesel generators, monitoring, alarm and fire extinguisher devices. Four of the grid centers are dedicated to the offline computational support of the ALICE, ATLAS and LHCb experiments at LHC-CERN, within the WLCG collaboration. The fifth site, GRIDIFIN, provides service monitoring to the other four, and computing resources for the ELI-NP project and for the national communities of researchers in computational biology and condensed matter physics.



7

ROmanian array for SPectroscopy in HEavy ion REactions





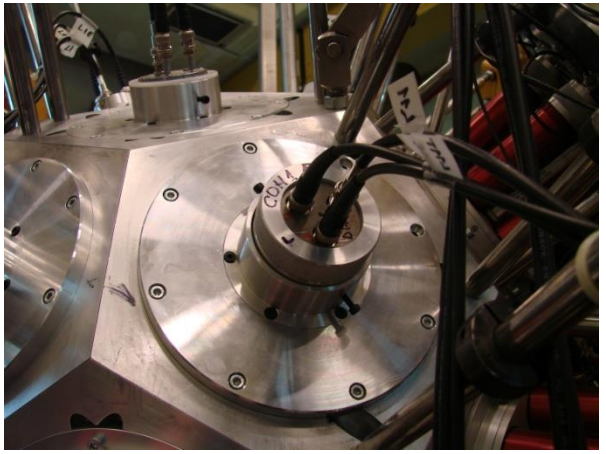
Mixed array with 15 50% HPGe detectors with BGO shields and 10-20 $LaBr_3(Ce)$ scintillators

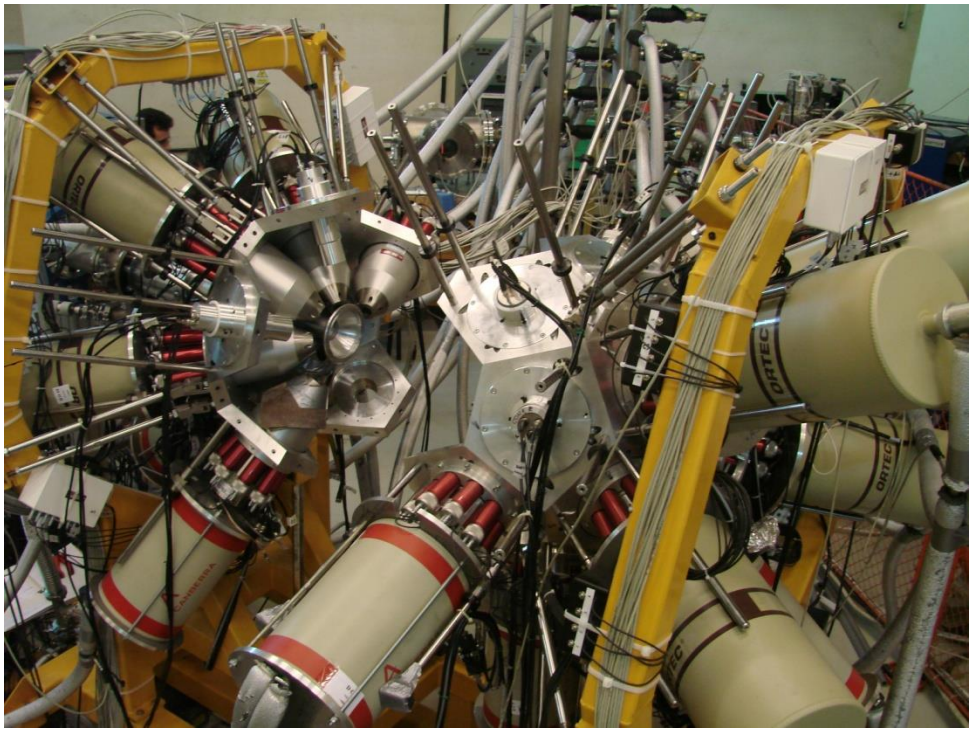
>200 international and national users

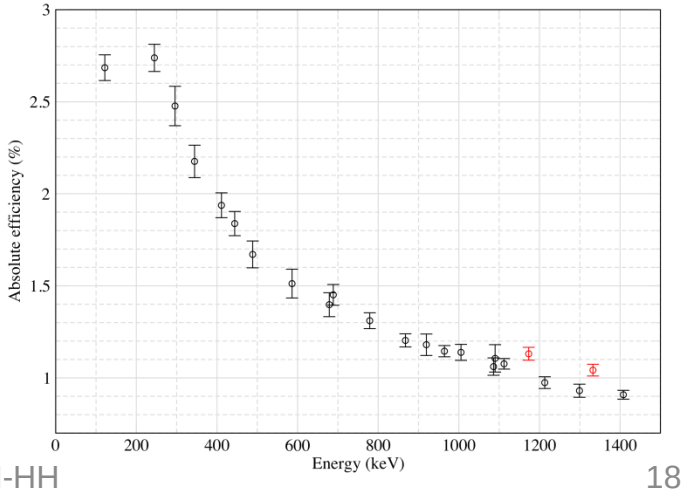
ROSPHERE with $LaBr_3(Ce)$

July 2012

14 HPGe detectors
11 $LaBr_3(Ce)$ detectors

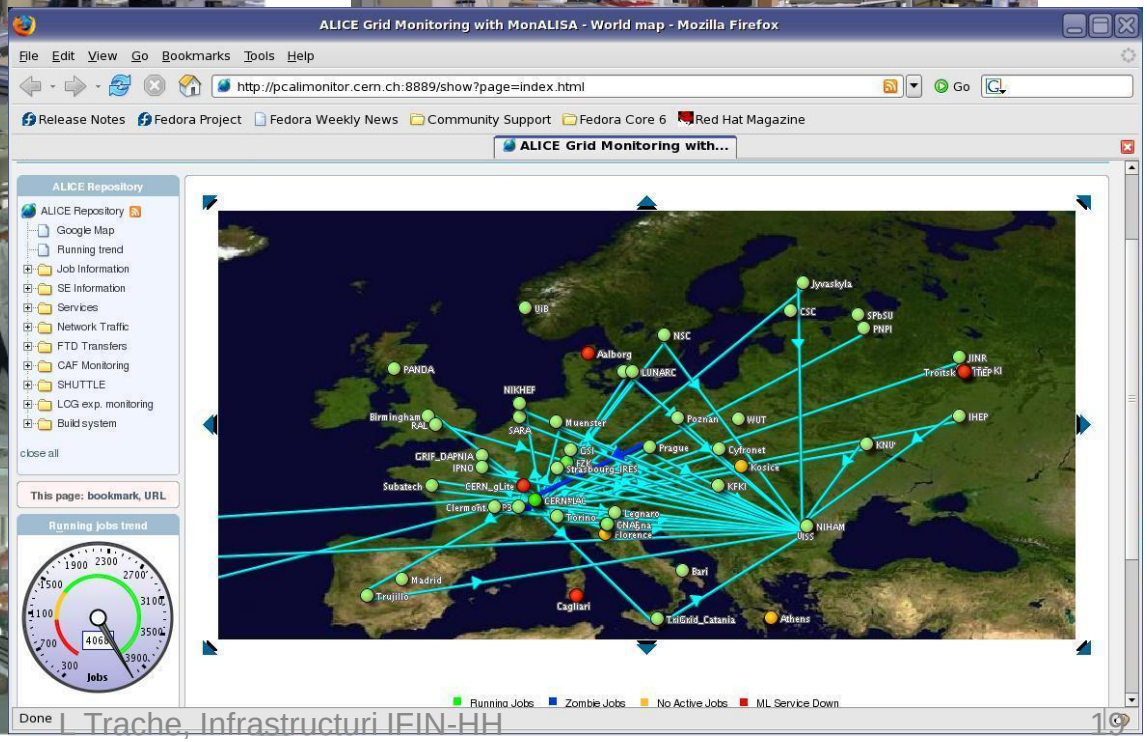






CEXMEXDIF: Hadron Physics Dept.

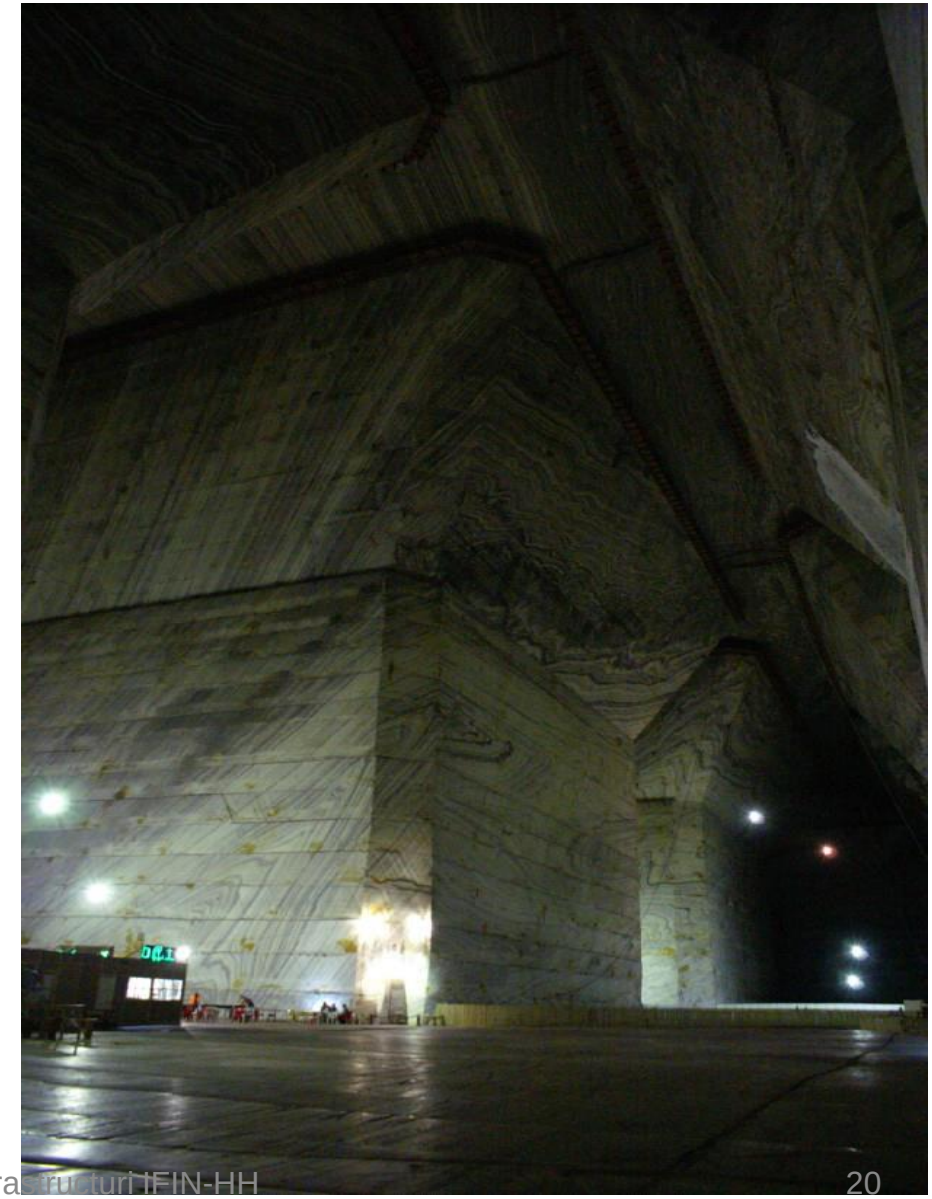
- Major contrib to detectors of ALICE at CERN
- CBM at GSI/FAIR
- Electronics (ASIC design) & GRID (tier 2 site)



9

MicroBequerel Laboratory

- In subteran in mina Unirea, Slanic-Prahova
- Situat intr-o mina de sare, la o adancime de 208 m sau ~600mwe;
- Fondul de radiatii debit al dozei de 100 de ori mai mic decat la suprafata (1.4 nSv/h); 4000 cu ecranare
- Experimente foarte fine d.p.d.v. al limitelor de detectie si de decizie
- Folosit in:
  - Masuratori de mediu – spectrometrie gama
  - Dozimetrie de radiatii
  - Astrofizica de particule
  - Astrofizica nucleara



10-11-12

Supraveghere de mediu si servicii cerc stiintele vietii

Vedeti descrierile de pe site pt:

Tritiulab – 2014, national, dr. Cristian Postolache

Centrul Local de Supraveghere Radiologica a Mediului Ambiant (CLSRMA) – 1977, 1994, national, dr. Nicolae Mocanu

Bioeval – 2010, national, dr. Adriana Acasandrei

In plan:

Centru de Excelenta pt Studiul and Conservarea Patrimoniului

- Based on existing facilities and personnel
- How to set up ?!
  - Virtual Center ?!
  - Distributed facility
- How to attract “all interested actors”?!
- How to finance it constantly and consistently?!
  - “Installations of national interest” – the two tandem accelerators and the irradiator will work at no cost for Romanian institutions

{Infrastructura}

- Domeniul + caracteristici esentiale sau de unicitate ale infrastructurii
  - E.g.: anul intrarii in operare/utilizare, valoarea de constructie/achizitie/.., unicitate ila nivel national/regional/…, numarul de utilizatori interni/externi, calitatea mediului pentru acces la infrastructura ai utilizatorilor externi: transport, cazare, aspecte legale, etc…
  - Existenta unei politici si a unui mecanism pentru Open Access/Existenta unei politici si a unui mecanism pentru furnizare/comercializare servicii CDI
  - Existenta si calitatea personalului de operare si support(ingineri – tehnicieni, etc…)

ERRIS pentru {Infrastructura}
O platforma win-win

- Cresterea gradului de utilizare/Cresterea calitatii utilizatorilor pentru echipamentele/serviciile introduse in ERRIS
- comentarii pe textul introdus in ERRIS: prin prisma experientei dobandite de promovare a infrastructurii si serviciilor oferite prin alte mijloace si modalitati, care au fost elementele esentiale avute in vedere la descrierea echipamentelor si serviciilor pentru a maximiza impactul acestei promovari prin ERRIS
- Facilitatrea cooperarii pentru educatie- cercetare-inovare
- Facilitarea recunoasterii si buna administrare a resurselor

Accesul la infrastructura

- Este planificat/Ad-hoc/… ; Existenta unei proceduri cu criterii si conditii transparente de acces
- Serviciile oferite sunt standardizate/presupun stabilirea parametrilor impreuna cu utilizatorul
- utilizatorul este implicat in experiment/ echipa tehnica
- Durata ciclului de la solicitarea accesului pana la incheierea experimentului
- Exemplu de costuri pentru furnizarea unui serviciu/acces la infrastructura

Utilizatorii/Beneficiarii vizati prin ERRIS

- care sunt tipurile actuale de utilizatori? Interni/Externi – nationali/ internationali/….

- ce alte categorii de utilizatori sunt vizate prin promovarea prin ERRIS?

-Care sunt asteptarile de la ERRIS cu privire la îmbunatatirea vizibilitatii, utilizarii si calitatii administrarii infrastructurii?

-Care sunt asteptarile de la ERRIS cu privire la sustenabilitatea/predictibilitatea finantarii operarii/exploatarii infrastructurii