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Summary of issues related to ISTC Project #2573 Laser Separation of Lead Isotopes

General comments on“Isotope Separation for Application in Nuclear Energy Production”

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ISTC Project #2573 Issues (I)

- **ISTC Project #2573 was presented at CEG Meeting in Karlsruhe, Jan 31-Feb 1, 2002, processed and approved by ISTC.**
- **Project Agreement #2573 between ISTC and "D.V. Efremov" was signed on June 29, 2004 to start project on July 1, 2004.**
- **Only partially funding was approved: ≈ 25% of requested sum (175.2 k$ of 800 k$) for 12 month period. Information by letter of project manager A. Yudin.**
- **Main requirement: "EU finance the first stage of the study during which the author will demonstrate the support and interest of the EU Community on this subject"**
- **Interest by FZK, SCK-CEN (MYRRHA, XT-ADS) and PSI (MEGAPIE follow-up) was expressed in common letter of 22.06.2005**

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ISTC Project #2573 Issues (II)

- **Detailed work plan was prepared and distributed. The project was touched at last CEG Meeting Brussels, but not discussed in details.**

- **In subsequent communication with Dr. Sanders, EC, I made following statement: "*The project is from my point of view of high interest if considerable amounts of selected Pb206 and Pb208 isotopes can be produced in a cost effective way in a time scale of five to ten years. A MEGAPIE follow-up target at SINQ at PSI Würenlingen could gain direct benefit of such production. However, personly I can not really judge the probability to reach this goal. The prototype installation I could visit last summer is only raedy for small production rates. The theoretical support is well executed, but not unique.*"**

- **There were no positive decisions for our projects at all on ISTC Governing Board Session March 30, 2006. A few days ago I got knowledge about letter "*OPP-CIS-003, 10 april 2006 Project # 2573.2*" with following decision: "*Unfortunately, your project was rejected and it can not be submitted to the next sessions of the ISTC Governing Board. The information on the ISTC project # 2573.2 cannot be presented in the ISTC databases.*"**

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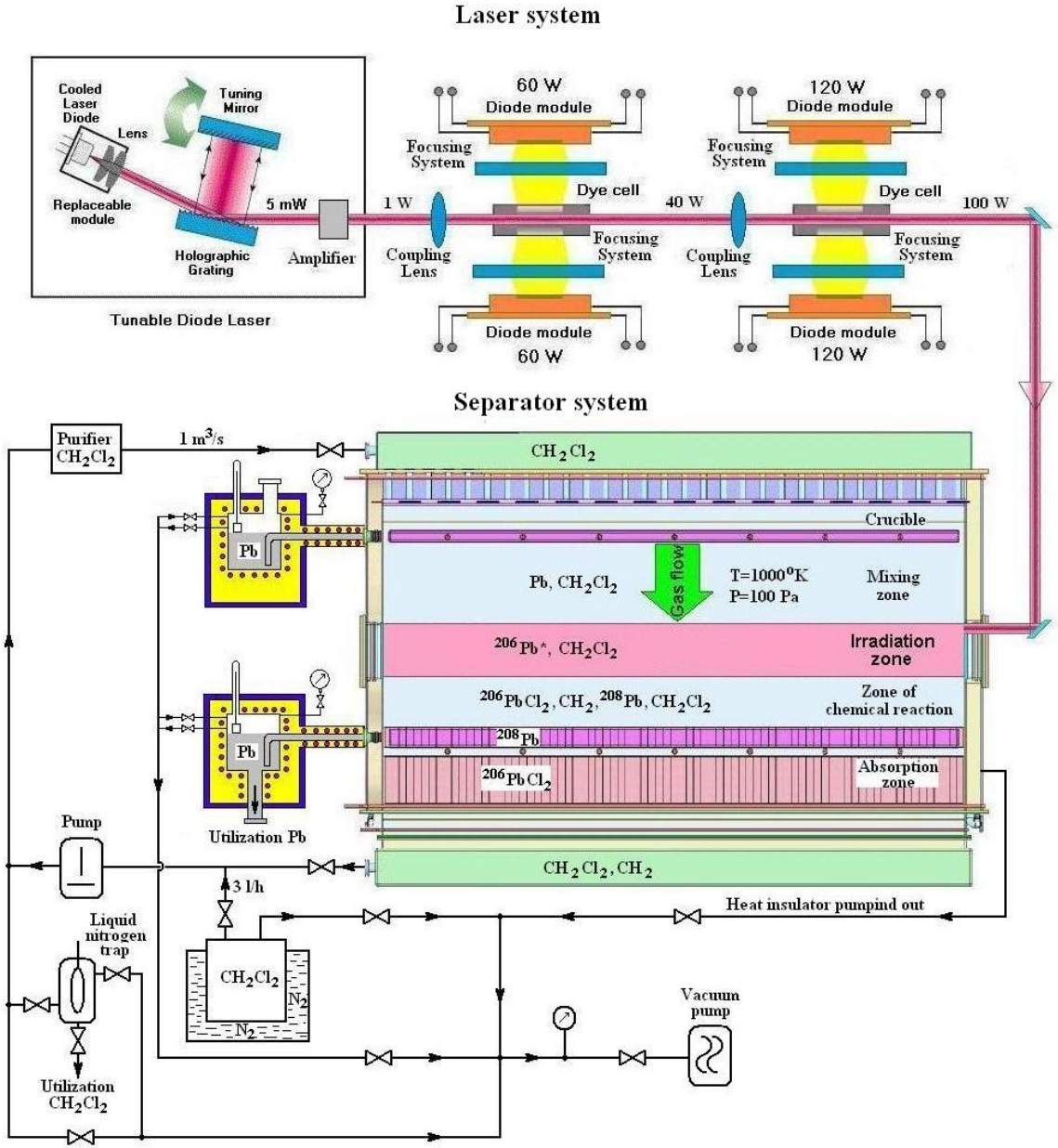
ISTC Project #2573 Issues (III)

Outcome of first phase of ISTC Project #2573:

- **Comprehensive "Final Project Technical Report of ISTC 2573", dated August 2005 with both substantial results for experimental work and theoretical analyses:**
  - **More than 20 publications on theoretical analyses**
  - **One publication on experimental work**
- **Project activities report of ISTC 2573**
- **Project summary for unrestricted distribution of ISTC 2573**
- **Technical Implementation Plan TIP for Project #2573**
- **Substantial interest by FZK, SCK-CEN (MYRRHA, XT-ADS) and PSI (MEGAPIE follow-up) was expressed in common letter of 22.06.2005. Also for EFIT interesting**
- **Project goals Phase I fulfilled!**



Proposal of “Operating diagram” for an experimental facility for Lead separation.

Taken from:

Final

Project Technical Report

of ISTC 2573

Investigation of processes of high - performance laser separation of lead isotopes by selective photoreactions for development of environmentally clean perspective power reactor facilities

(From 1 July 2004 to 30 June 2005 for 12 months)

Aleksandr Mihailovich Yudin

(Project Manager)

FSUE “D.V. Efremov Scientific Research Institute of Electrophysical Apparatus”

August 2005

Conclusions from ISTC #2573 analysis work

- **Lead isotope, Pb-206, is the best low activated ADS target coolant among the liquid heavy metal coolants.**

- **From the neutronic characteristics point of view, another lead isotope, Pb-208, is better than Pb-206 or Pb-nat. In using such the isotope the target neutron spectrum is enriching with fast neutrons, En>1 MeV, which can penetrate into the subcritical core with less losses.**

- **The lead isotope, Pb-208, is also the ideal coolant for the ADS subcritical core due to its low neutron absorbing features. In its using as the core coolant, instead of Pb-nat, the required proton beam power, for delivering about 80 MW thermal capacity, can be reduced by 1.55 times.**

- **It will be required about 56 tons of Pb-208, as a minimum, for the ADS blanket of 80 MW thermal capacity. Charges for it obtaining can be recovered at the expense of the economy of the proton beam cost.**

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Spin-off from ISTC #2573 analysis work; summary Ni-58 reduction in steel

International Conference "Fifty Years of Nuclear Power–the Next Fifty Years", 27.6-2.7.2004, Obninsk /Moscow,
G.L.Khorasanov, A.P.Ivanov, A.I.Blokhin, N.A.Demin

- **With the aim of helium and hydrogen accumulation in the irradiated austenitic steels it is proposed to enrich nickel with its isotope, Ni-64, and thus to exclude a source of creating nickel isotope, Ni-59, which is responsible for helium and hydrogen production in steels.**

- **Calculations performed confirm the possibility of essential decreasing of gaseous product creation in austenitic steels that are commonly used as materials for FR fuel rods claddings.**

- **It is done a very important conclusion that nickel enriched with its isotope, Ni-64, generates less helium and hydrogen than natural iron and chromium do it in the austenitic steels grade TchS68 and EK164 with 15 –20 % of nickel content.**

- **It is pointed the possibility of obtaining large quantities (several kilograms) of nickel enriched with nickel isotope, Ni-64.**

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General comments (from non-specialist) on "Isotope Separation for Application in Nuclear Energy Production":

- **Increasing number of application proposals may be observed:**
  - **Lead 208 enrichment: spectrum hardening, low absorption (ISTC2573)**
  - **Lead 206 enrichment: low activation in ADS target (ISTC2573)**
  - **Austenitic Steel with depleted Nickel 58: reduction of Helium production (proposed topic for ISTC2573 follow-up)**
  - **Molybdenum isotope separation; Mo-92 enrichment, Mo-99 depletion, …**
  - **Fuel-, coolant isotopic separations, ...**
- **Generally, isotopic separation is complicated expensive task, e.g. by gas diffusion and centrifuge techniques**
- **Proposed innovative laser technology in ISTC #2573 seemed to be promising, especially in view of cost estimates.**
- **Abrupt stop of ISTC Project #2573.2 not well understandable for me**