CDFE in the Nuclear Reaction Data Centres Network at 2002 – 2003. P12

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Progress Report
to the IAEA Technical Meeting on "Coordination of the Network of Nuclear Reaction Data Centres" (17 - 19 June 2003, IAEA NDS, Vienna, Austria)

This report contains the **short review** of the works carried out by the CDFE concern the IAEA Nuclear Reaction Data Centres Network activities for the period of time from the IAEA Meeting on the "Network of Nuclear Reaction Data Centres" (27 - 30 May 2002, OECD NEA, Paris, France) till the middle of June 2003 and the description of the main results obtained.

1. Two **new** CDFE EXFOR **TRANSes M032 and M033** have been produced and transmitted to the IAEA NDS. The TRANSes contain (**Annex 1**) 16 retransmitted and 10 new (M0635 - M0644) ENTRYs with 151 new data SUBENTs.

2. The CDFE relational nuclear data databases have been put upon the Web-site (**http://depni.sinp.msu.ru/cdfe**) before were upgraded significantly by adding a new data and software improvement:
   - the "2001" and "2002" parts have been added to the "Photonuclear Data Index" (the "2003" and part is in processing) as whole the **"Photonuclear Data Index 1955 - 2002"** database was added by a significant amount of entries from /1/; data sets are available in forms of table for articles included into EXFOR;
   - the database **"Giant Dipole Resonance Parameters"** has been upgraded significantly: many new data sets were added;
   - the relational **"Nuclear Reaction Database (EXFOR)"** included now not only photonuclear data, but also data for neutron, charge particle and heavy ion reaction data has been improved (in cooperation with CAJaD, Dr.F.E.Chukreev) significantly by producing of advanced Search Engine giving to one the possibility (**Annex 2**) to find charge particle reaction data in so called "inverse geometry" (any "incident particle (a) – target nucleus (b)" combinations: "a + b" and "b + a" without fixing for REACTION SF1 - SF2 and correspondent recalculation of energy values).

3. New completely relational database "**ENSDF Relational**" has been developed (**Annex 3**) as the improved version of "**Relational Nuclear Spectroscopy Database NESSY"** /2, 3/ put upon the CDFE Web-site before; it includes practically all data from the ENSDF, is added by new flexible and powerful Search Engine, and give to one possibility to receive any part of initial file; new possibilities under construction are now

the graphical presentation of the schemes of levels, transitions, and decays and direct connection to references from the NSR (Nuclear Structure References) file.

4. New relational bibliography database has been developed on the base of international data file NSR (**Annex 4**).

5. The consitent evaluation (**Annex 5**) of partial photonuclear reactions (γ,n) and (γ,2n) cross sevtions has been carried out using the data obtained in the experiments with quasimonoenergetic annihilation photon beams at USA Livermore and France Saclay for 19 nuclei ^{51}V, ^{75}As, ^{89}Y, ^{90}Zr, ^{115}In, ^{116,117,118,120,124}Sn, ^{127}I, ^{133}Cs, ^{159}Tb, ^{165}Ho, ^{181}Ta, ^{197}Au, ^{208}Pb, ^{232}Th, ^{238}U. Data are published as MSU SINP Preprint /4/, included into EXFOR ENTRY M0635 (TRANS M032) and presented for publication to the journal Yadernye Konstanty /5/.

The main items of CDFE future short-term programmes, priorities and new tasks are listed in the **Annex 6**.

References

1. E.G.Fuller, H.Gerstenberg. Photonuclear Data - Abstracts Sheets 1955 - 1982. NBSIR 83-2742. U.S.A. National Bureau of Standards, 1986.
2. I.N.Boboshin, V.V.Varlamov. The New ENSDF Search System NESSY: IBM/PC Nuclear Spectroscopy Data Base. Nucl.Instr. and Meth., A369 (1996) 113.
3. I.N.Boboshin, V.V.Chesnokov, E.M.Ivanov, M.E.Stepanov, A.V.Varlamov, V.V.Varlamov. Photon and Charge Particle Reactions and Nuclear Structure Data Bases Upon the MSU INP CDFE Web-site. International Conference on Nuclear Data for Science and Technology. Embracing the Future at the Beginning of the 21st Century (October 7 - 12, 2001). Tsukuba, Japan, Abstracts, Japan Atomic Energy Research Institute, 2001, p. 13-P-1.
4. V.V.Varlamov, N.N.Peskov, D.S.Rudenko, M.E.Stepanov. Photoneutron Reaction Cross Sections in Experiments with Beams of Quasimonoenergetic Annihilation Photons. Preprint SINP MSU 2003-2/715.
5. V.V.Varlamov, N.N.Peskov, D.S.Rudenko, M.E.Stepanov. Consistent Evaluation of Photoneutron Reaction Cross Sections Using Data Obtained in the Experiments with Quasimonoenergetic Annihilation Photon Beams at USA Livermore and France Saclay. Voprosy Atomnoj Nauki i Tekhniki. Seriya: Yadernte Konstanty (to be published).

Annex 1.

The CDFE EXFOR TRANSes M032 and M033 contents (*old corrected* and new ENTRYs)

TRANS M032		**TRANS M033**	
ENTRY's Number	**SUBENT Amount**	**ENTRY's Number**	**SUBENT Amount**
L0001	*7*	*L0021*	*12*
L0002	*4*	*L0031*	*15*
L0003	*4*	*M0041*	*13*
L0005	*5*	*M0372*	*7*
L0015	*26*	*M0488*	*1*
L0024	*18*	*M0598*	*4*
L0031	*15*	*M0636*	*9*
M0056	*7*	M0639	1
M0188	*18*	M0640	1
M0420	*4*	M0641	1
M0635	114	M0642	3
M0636	9	M0643	4
M0637	1	M0644	5
M0638	12		
Total new: 4	**Total new: 136**	**Total new: 6**	**Total new: 15**
		Sum new: 10	**Sum new: 151**

Annex 2.

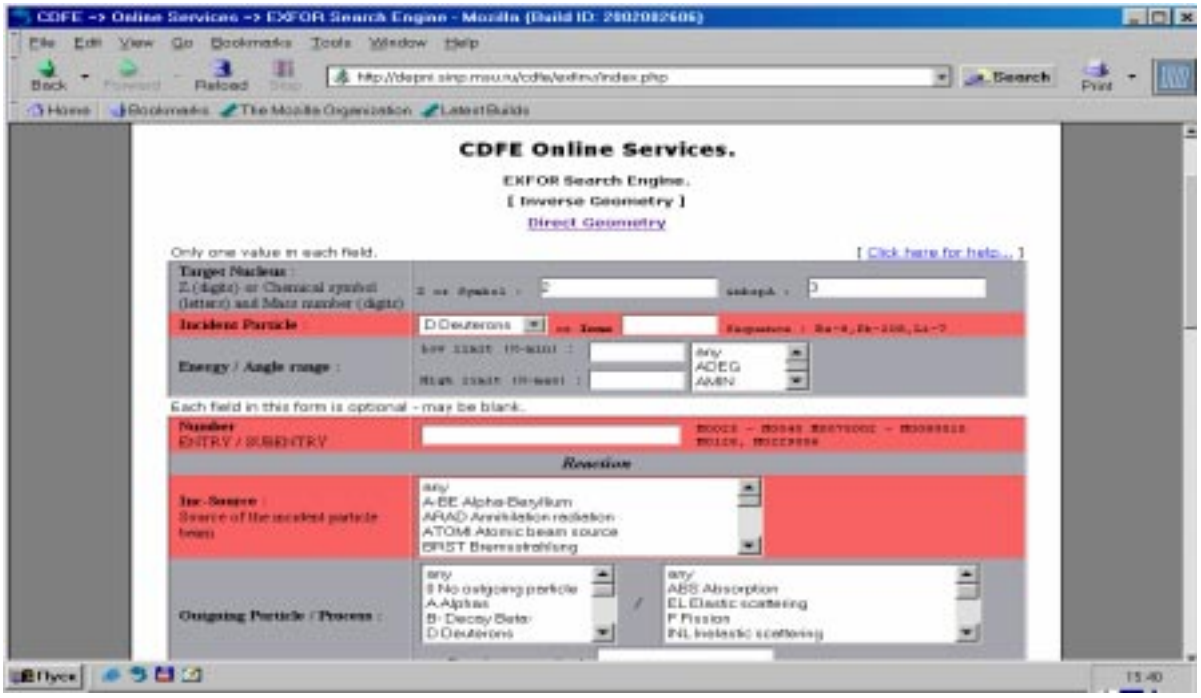
New version of Search Engine (**Inverse Geometry**) for the relational **"Nuclear Reaction Database (EXFOR)**" gives to one the possibility to obtain the data for different reactions with the same combination of incident particle and target nucleus, for example

$$d + {}^3He = p + {}^4He \text{ and } {}^3He + d = p + {}^4He$$

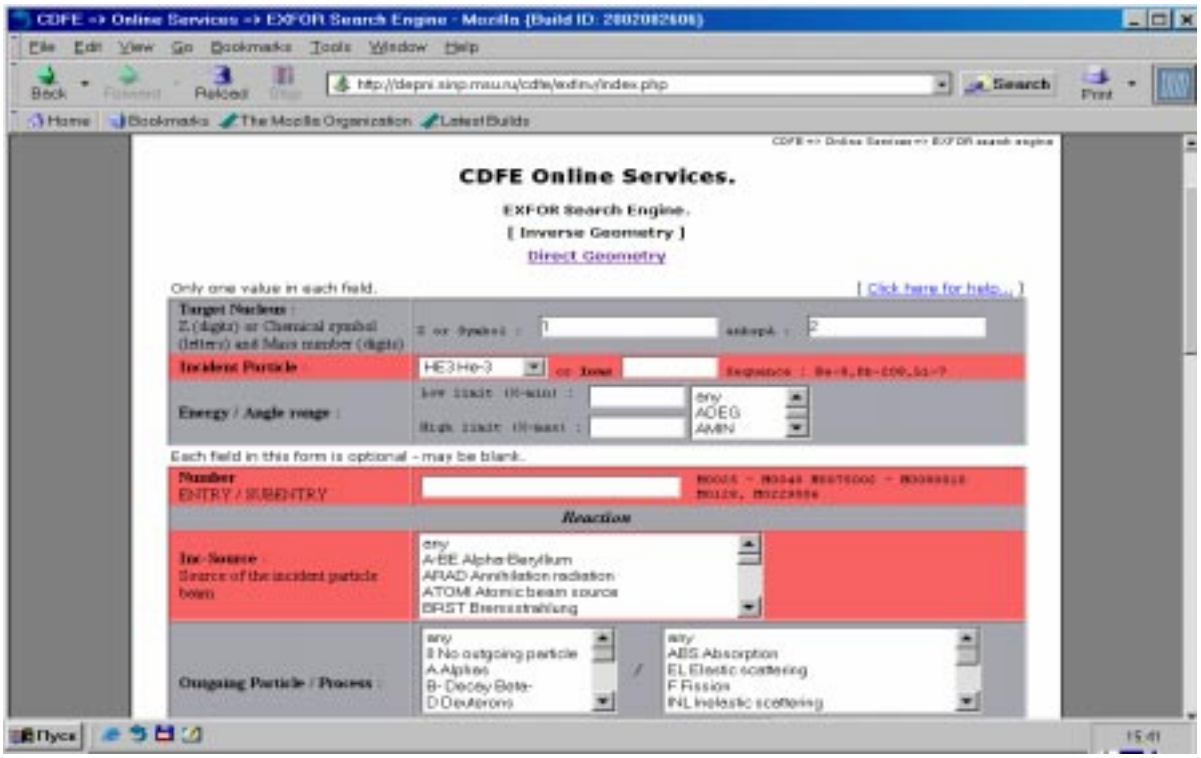
in one request and for energy recalculated from LAB-system to SCI-system

$$E_{SCI} = - (M_a + M_b) + ((M_a + M_b)^2 + 2 \bullet E_{LAB} \bullet M_b)^{1/2}.$$

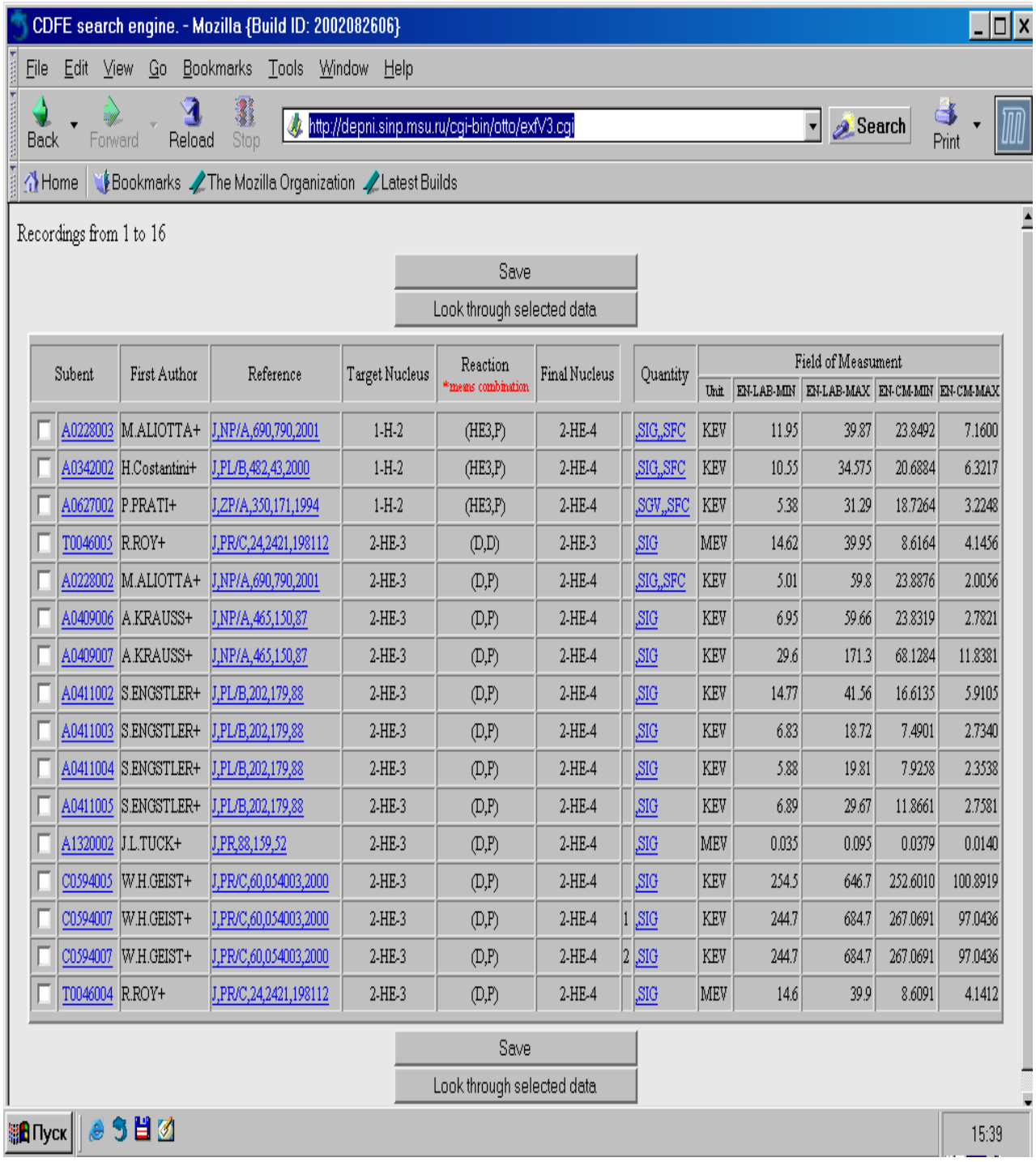
An example of result of data search for reaction $d + {}^3He = p + {}^4He$ – «Incident Particle: D (Deuterons), Target Nucleus: Z = 2, A = 3»



and for reaction $^3He + d = p + {}^4He$ – «Incident Particle: HE3 He-3, Target Nucleus: Z = 1, A = 2»



is presented as the one joint result table produced



Subent	First Author	Reference	Target Nucleus	Reaction *means combination	Final Nucleus		Quantity	Field of Measument				
								Unit	EN-LAB-MIN	EN-LAB-MAX	EN-CM-MIN	EN-CM-MAX
A0228003	M.ALIOTTA+	J,NP/A,690,790,2001	1-H-2	(HE3,P)	2-HE-4		,SIG,,SFC	KEV	11.95	39.87	23.8492	7.1600
A0342002	H.Costantini+	J,PL/B,482,43,2000	1-H-2	(HE3,P)	2-HE-4		,SIG,,SFC	KEV	10.55	34.575	20.6884	6.3217
A0627002	P.PRATI+	J,ZP/A,350,171,1994	1-H-2	(HE3,P)	2-HE-4		,SGV,,SFC	KEV	5.38	31.29	18.7264	3.2248
T0046005	R.ROY+	J,PR/C,24,2421,198112	2-HE-3	(D,D)	2-HE-3		,SIG	MEV	14.62	39.95	8.6164	4.1456
A0228002	M.ALIOTTA+	J,NP/A,690,790,2001	2-HE-3	(D,P)	2-HE-4		,SIG,,SFC	KEV	5.01	59.8	23.8876	2.0056
A0409006	A.KRAUSS+	J,NP/A,465,150,87	2-HE-3	(D,P)	2-HE-4		,SIG	KEV	6.95	59.66	23.8319	2.7821
A0409007	A.KRAUSS+	J,NP/A,465,150,87	2-HE-3	(D,P)	2-HE-4		,SIG	KEV	29.6	171.3	68.1284	11.8381
A0411002	S.ENGSTLER+	J,PL/B,202,179,88	2-HE-3	(D,P)	2-HE-4		,SIG	KEV	14.77	41.56	16.6135	5.9105
A0411003	S.ENGSTLER+	J,PL/B,202,179,88	2-HE-3	(D,P)	2-HE-4		,SIG	KEV	6.83	18.72	7.4901	2.7340
A0411004	S.ENGSTLER+	J,PL/B,202,179,88	2-HE-3	(D,P)	2-HE-4		,SIG	KEV	5.88	19.81	7.9258	2.3538
A0411005	S.ENGSTLER+	J,PL/B,202,179,88	2-HE-3	(D,P)	2-HE-4		,SIG	KEV	6.89	29.67	11.8661	2.7581
A1320002	J.L.TUCK+	J,PR,88,159,52	2-HE-3	(D,P)	2-HE-4		,SIG	MEV	0.035	0.095	0.0379	0.0140
C0594005	W.H.GEIST+	J,PR/C,60,054003,2000	2-HE-3	(D,P)	2-HE-4		,SIG	KEV	254.5	646.7	252.6010	100.8919
C0594007	W.H.GEIST+	J,PR/C,60,054003,2000	2-HE-3	(D,P)	2-HE-4	1	,SIG	KEV	244.7	684.7	267.0691	97.0436
C0594007	W.H.GEIST+	J,PR/C,60,054003,2000	2-HE-3	(D,P)	2-HE-4	2	,SIG	KEV	244.7	684.7	267.0691	97.0436
T0046004	R.ROY+	J,PR/C,24,2421,198112	2-HE-3	(D,P)	2-HE-4		,SIG	MEV	14.6	39.9	8.6091	4.1412

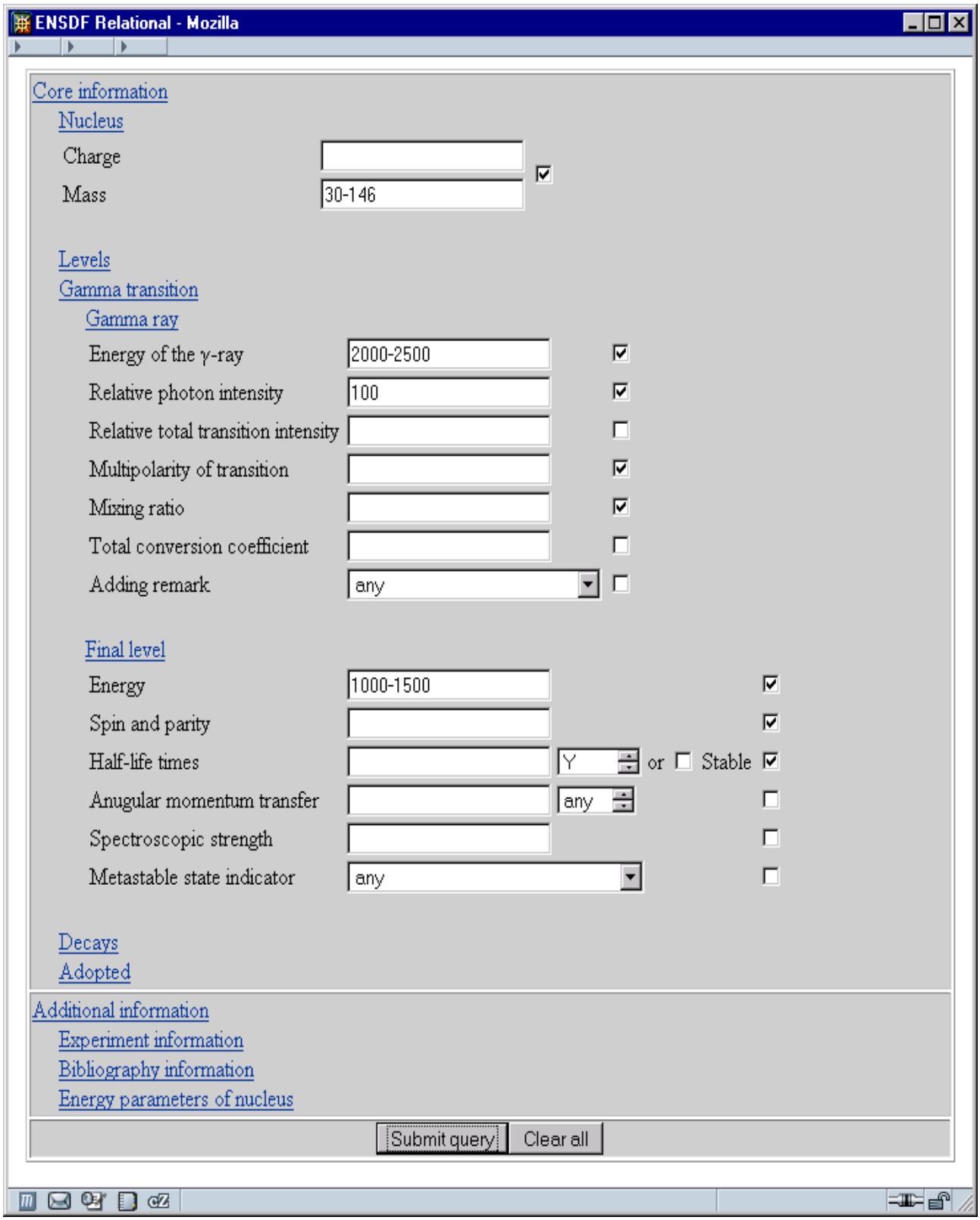
Save
Look through selected data

for all reactions of types mentioned 1-H-2 (HE3,…); 1-H-2(T,…); 2-HE3(D,…), etc.

The energy data for both pairs of nuclei and for both LAB-and SCI-systems are presented in the energy value columns of the table.

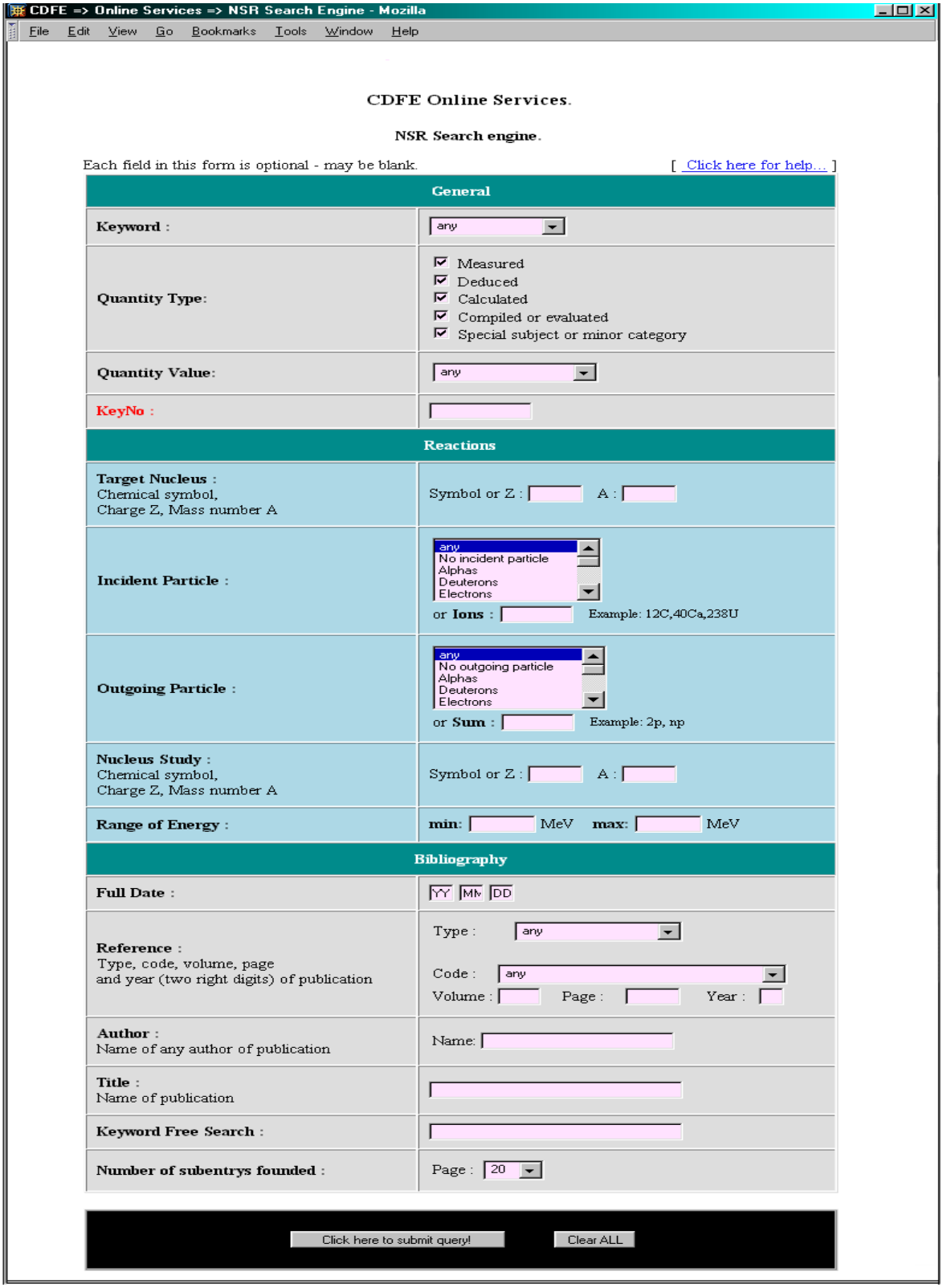
Annex 3.

New “ENSDF Relational” database interface.



Annex 4.

The new relational database NSR interface.



Annex 5.

V.V.Varlamov, N.N.Peskov, D.S.Rudenko, M.E.Stepanov. Consistent Evaluation of Photoneutron Reaction Cross Sections Using Data Obtained in the Experiments with Quasimonoenergetic Annihilation Photon Beams at USA Livermore and France Saclay.

The detailed system analysis of the (γ,xn), (γ,n) and (γ,2n) reaction cross section data obtained using quasimonoenergetic annihilation photon beems at Livermore (USA) and Saclay (France) was carried out for 19 (for 7 of them – at first) nuclei ^{51}V, ^{75}As, ^{89}Y, ^{90}Zr, ^{115}In, ^{116,117,118,120,124}Sn, ^{127}I, ^{133}Cs, ^{159}Tb, ^{165}Ho, ^{181}Ta, ^{197}Au, ^{208}Pb, ^{232}Th, ^{238}U. It was observed that the (γ,xn) reaction cross section data obtained at both laboratories without using neutron multiplicity sorting procedure disagree by 10 – 15 %. Additionally it was found out that the disagreement of partial reactions (γ,n) and (γ,2n) cross sections, obtained at both laboratories using neutron multiplicity sorting procedure are significantly more (till 30 – 40 %) and as a rule have opposite directions. These disagreements were interpreted as the result of difference of neutron multiplicity sorting procedures used in both laboratories: that is incorrect at Saclay with the result of incorrect transmission of the part of (γ,2n) reaction cross section into that of (γ,n) reaction. The special method was used to move the data into consistence. Its idea is that definite "false" part of (γ,n) reaction cross section was recalculated and transmitted back into that of reaction (γ,2n). For all 19 nuclei listed above the jointly corrected (γ,xn), (γ,n) and (γ,2n) reaction cross were evaluated and prepared for including into the EXFOR nuclear reaction database (TRANS M032, ENTRY M0635).

Annex 6.

The main items
of the CDFE future short-term programmes, priorities and new tasks

1. Upgrading and addition of the CDFE bibliographical data collection. Including the 2003 hotonuclear data into the relational database "Photonuclear Data Index" (PNI). Participation the joint (CDFE - NDS - NNDC - CNPD - CAJaD - CJD) program of development of the joint (EXFOR - CSISRS - CINDA - NSR - PNI - …) Relational Nuclear Reaction Database.

2. Continuation of photonuclear data compilation using EXFOR format. Addition and correction of the existed CDFE EXFOR relevant databases:
   - "Relational Nuclear Reaction Database (EXFOR)";
   - "Giant Dipole Resonance Parameters. Photonuclear Reaction Cross Sections".

3. Development of new complete database "ENSDF Relational" combined with another relational database NSR as bibliographical support, new software for graphics.