



## MSU SINP CDFE 2003 – 2004 Progress Report.

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Progress Report  
to the IAEA Technical Meeting on the Network of Nuclear Reaction Data Centres (04 - 07  
October 2004, NNDC, BNL, Brookhaven, USA)

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 Technical Meeting on “Coordination of the Network of Nuclear Reaction Data Centres” (17 - 19 June 2003, IAEA NDS, Vienna, Austria) till the fall of 2004 and main results obtained.

1. **Two new CDFE EXFOR TRANSES M034 and M035** have been produced and transmitted to the IAEA NDS. The TRANSES contain (**Annex 1**) 6 retransmitted and 13 new (M0645 - M0657) ENTRIES with 148 new data SUBENTs.
2. In cooperation with CAJaD (Dr. Feliks E.Chukreev) the CDFE relational nuclear data databases “Relational ENSDF” and “Nuclear Reaction Database (EXFOR)” and with very kind assistance of NNDC (Dr. David Winchell) the CDFE database “Nuclear Physics Publications (“NSR” Database) have been put upon the Web-site (<http://cdfe.sinp.msu.ru>) before were **upgraded** by adding a new data and software improvement.
3. At first time **nuclei levels isospin data** produced “by hands” using text parts (CONTINUATION etc.) of ENSDF data sets were included into the CDFE “**Relational ENSDF**” database. Now isospin values could be included into all possible queries.
4. The new advanced version of complete relational database “**Relational ENSDF**” **Search Engine** has been developed (**Annex 2**). This is very flexible and powerful system – informational “Russian matreshka”: the user can open sequentially each needed part yourself, in parallel he can form the output table content. Now any fields of any ENSDF cards could be found in any combinations (several examples of Search Engine possibilities: **Annex 3 - Annex 11**).
5. All three complete CDFE databases EXFOR, ENSDF and NSR are combined now into unified information system:
  - after processing of any queries to “**Relational ENSDF**” and “**Nuclear Reaction Database (EXFOR)**” one can obtain correspondent complete NSR documents;
  - after processing of any query to “NSR” one can obtain an access to appropriate documents of both databases “EXFOR” and “ENSDF”:

- for EXFOR (**Annex 12**) the intermediate table “NSR => EXFOR” gives to one a list of full article Subentries and opportunity to obtain NSR documents for that article (come back to NSR);
  - for ENSDF (**Annex 13**) the intermediate table gives to one general description of article content including “Nucleus”, “Experimental information”, “ENSDF Source” set CDFE internal numbers and “References” to other NSR document codes concern the article content; these codes are links to correspondent NSR documents and therefore search process could be cycled.
6. As an continuation of consistent evaluation of total and partial photonuclear reactions cross sections obtained in the experiments with quasimonoenergetic annihilation photon beams at USA Livermore and France Saclay for 19 nuclei  $^{51}\text{V}$ ,  $^{75}\text{As}$ ,  $^{89}\text{Y}$ ,  $^{90}\text{Zr}$ ,  $^{115}\text{In}$ ,  $^{116,117,118,120,124}\text{Sn}$ ,  $^{127}\text{I}$ ,  $^{133}\text{Cs}$ ,  $^{159}\text{Tb}$ ,  $^{165}\text{Ho}$ ,  $^{181}\text{Ta}$ ,  $^{197}\text{Au}$ ,  $^{208}\text{Pb}$ ,  $^{232}\text{Th}$ ,  $^{238}\text{U}$  (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, 1 – 2 (2003) 48 – 89) joint evaluation of cross sections for reactions  $(\gamma, n)$ ,  $(\gamma, 2n)$ ,  $(\gamma, 3n)$ ,  $(\gamma, Xn)$ ,  $(\gamma, sn)$  and  $(\gamma, \text{abs})$  has been carried out. Data are in preparation n to including into EXFOR.
7. The CDFE “Atlas of Giant Dipole Resonances. Parameters and Graphs of Photonuclear Reaction Cross Sections” published by A.V.Varlamov, V.V.Varlamov, D.S.Rudenko, M.E.Stepanov at 1999 as INDC(NDS)-394, IAEA NDS was put upon the CDFE Web-site as the pdf-document.

The main items of CDFE future short-term programmes, priorities and new tasks are listed in the **Annex 14**.

**Annex 1.** The CDFE new EXFOR TRANSes M034 and M035 contents (*old corrected* and new ENTRYs)

<b>TRANS M034</b>		<b>TRANS M035</b>	
<b>ENTRY's Number</b>	<b>SUBENT Amount</b>	<b>ENTRY's Number</b>	<b>SUBENT Amount</b>
<i>L0031</i>	<i>15</i>	<i>M0524</i>	<i>5</i>
<i>M0093</i>	<i>3</i>	<i>M0541</i>	<i>11</i>
<i>M0644</i>	<i>5</i>	<i>M0542</i>	<i>14</i>
M0645	10	M0651	12
M0646	1	M0652	6
M0647	3	M0653	4
M0648	31	M0654	2
M0649	15	M0655	5
M0650	9	M0656	38
		M0657	12
<b>Total new: 6</b>	<b>Total new: 59</b>	<b>Total new: 7</b>	<b>Total new: 79</b>
		<b>Sum new: 13</b>	<b>Sum new: 131</b>

## Annex 2. The new database “Relational ENSDF” search form (“Russian matreshka”).

The image displays several overlapping screenshots of the "Relational ENSDF" search form, illustrating its "Russian matreshka" (nesting doll) structure. The main search page at the top shows the site header "CENTRE FOR PHOTONUCLEAR EXPERIMENTS DATA" and the title "EVALUATED NUCLEAR STRUCTURE DATA FILE (ENSDF) Complete Nuclear Spectroscopy Database 'Relational ENSDF'". It includes a search bar and a "Submit query" button.

The screenshots show various search forms, each with its own set of query parameters and output selection options:

- Gamma transition (Gamma ray, Final level):** Query parameters include Energy of the  $\gamma$ -ray (keV), Relative photon intensity, Relative total transition intensity, Multipolarity of transition, Mixing ratio, Total conversion coefficient, and Adding remark. Output options include Energy (keV), Spin and parity, Half-life times, Angular momentum transfer, Spectroscopic strength, Metastable, Isospin, and Adding remark.
- Final level (E, JPI, T1/2, etc.):** Query parameters include Energy (keV), Spin and parity, Half-life times, Angular momentum transfer, Spectroscopic strength, Isospin, and Metastable state indicator. Output options include Energy (keV), Spin and parity, Half-life times, Angular momentum transfer, Spectroscopic strength, Metastable, Isospin, and Adding remark.
- Decays:** Query parameters include target, charge, mass, incident, and particle. Output options include Decays, target, charge, mass, incident, and particle.
- Bibliography information (Date, Reference, Publication information):** Query parameters include Date, Reference, and Publication information. Output options include Date, Reference, and Publication information.
- Energy parameters of nucleus (E, Alpha energy, N, P separation energy):** Query parameters include Total energy available for  $\beta$  decay (keV), Neutron separation energy (keV), Proton separation energy (keV), Total energy available for  $\alpha$  decay (keV), and Reference citation for the Q-values. Output options include Total energy available for  $\beta$  decay (keV), Neutron separation energy (keV), Proton separation energy (keV), Total energy available for  $\alpha$  decay (keV), and Reference citation for the Q-values.

Each form includes a "Submit query" button and a "Clear all" button. The browser window shows the URL "http://cdfe.sinp.msu.ru/services/ensdfr.html".

...etc.

**Annex 3.** The new database “Relational ENSDF” query for:  
 A = 50 - 150,  
 level energies 10 - 12 MeV,  
 $\gamma$ -quanta energies 1000 - 1030 keV.

**Complete Nuclear Spectroscopy Database "Relational ENSDF"**

Construct your query and output by sequential openings of needed fields.  
 One output field must be selected (not be blank) at least. [ Help ]

**Core information (Nucleus, Levels, Gamma transition, Decays, Data type)**

Data type (any, adopted, experimental)

**Nucleus (Z, A)**

Query parameters:  "Be,Zr,Fe-Zn"  Select for output

Charge Number (Element)

Mass Number

Stable

**Levels (E, JPI, T1/2, etc.)**

Query parameters:  "100-500", "1550,7000-10000"

Energy (keV)

Spin and parity

Half-life times

Angular momentum transfer

Spectroscopic strength

Metastable

Isospin

Adding remark

**Gamma transition (Gamma ray, Final level)**

Gamma ray (E, Int, Mult, Mix, Convers.)

Query parameters:

Energy of the  $\gamma$ -ray (keV)

ENSDF Source	Nucleus	Level energy	Spin parity	Reference	Photon energy	Photon intensity (rel.)	Level energy (fin.)	Spin parity (fin.)
68.53	32-GE-68	11994.8 (7)	18+		1006.4 (10)	36	10988.5 (7)	16+
68.57	32-GE-68	11995.0 (7)	18+	2001WA02, 1992HE16, 1990HEY	1006.4 (10)	1.73 (5)	10988.6 (17)	16+
118.49	52-TE-118	10538		1987CLEY	1002		9536	
118.56	52-TE-118	10538			1002		9536	
119.53	53-I-119	10724.9 (4)	59/2-		1003.9 (2)	100	9721.0 (4)	55/2-
119.55	53-I-119	10724.8 (4)	59/2-		1003.9 (2)	2.29 (9)	9720.9 (4)	55/2-
122.50	54-XE-122	10001.4 (12)	(23-,24-,25-)		1024 (1)	5.1 (10)	8977.4 (6)	(21-,22-,23-)
122.50	54-XE-122	10198 (3)	(25+)		1027 (1)		9171.2 (16)	(23+)
122.53	54-XE-122	10001.4 (12)	(23-,24-,25-)	1987HA03	1024 (1)	5.1 (10)	8977.4 (6)	(21-,22-,23-)
122.53	54-XE-122	10198 (3)	(25+)	1987HA03	1027 (1)		9171.3 (16)	(23+)
134.52	60-ND-134	11337.0 (10)	(29-)		1007.4 (2)	1.02 (4)	10328.4 (10)	(27-)
134.58	60-ND-134	11335.8 (10)	(29-)		1007.4 (2)	1.02 (4)	10328.4 (10)	(27-)
136.57	60-ND-136	10190.6 (7)	(26+)		1018.4 (2)		9172.1 (6)	(24+)
136.57	60-ND-136	10638.0 (17)	(27+)		1020		9618.0 (15)	(25+)
136.61	60-ND-136	10190.9 (7)	26+	1996PE08, 1996PE06, 1999FE1	1018.4 (2)		9172.5 (7)	24+
136.61	60-ND-136	10638.2 (19)	27(+)	1996PE08, 1996PE06, 1999FE1	1020		9618.2 (17)	25(+)
143.67	64-GD-143	11942.8 (23)	(65/2+)		1007 (1)		10935.8 (20)	(61/2+)
143.69	64-GD-143	11942.8 (23)	(65/2+)	2000LI14, 1998SU04	1007 (1)		10935.8 (20)	(61/2+)
148.25	62-SM-148	10609.1 (4)	(30)		1007.9 (2)		9601.2 (4)	29
148.55	62-SM-148	10609.1 (4)	(30)	1979HA19, 1985SI16, 1991VU0	1007.9 (2)		9601.2 (4)	29
149.58	64-GD-149	10510.0 (7)	(63/2)		1008.3 (3)	100	9501.6 (7)	(61/2-)
149.62	64-GD-149	10509.4 (8)	(63/2+)	1991FL02, 1995FL01, 1998BY0	1008.3	10.9 (4)	9501.1 (8)	(61/2-)
150.59	66-DY-150	10327	(29-)		1021.4		9305	(27+)
150.63	66-DY-150	10327	(29-)	1987DE23	1021.4		9305	(27+)

**Annex 4.** The new database “Relational ENSDF” query for:  
 levels with  $J^\pi = 69/2^+$   
 and energies 9 - 10 MeV  
 (energies of gammas  
 and final level energies  
 and  $J^\pi$  are requested also).

**EVALUATED NUCLEAR STRUCTURE DATA FILE (ENSDF)  
 Complete Nuclear Spectroscopy Database "Relational ENSDF"**

Construct your query and output by sequential openings of needed fields.  
 One output field must be selected (not be blank) at least. [\[ Help \]](#)

**Core information (Nucleus, Levels, Gamma transitions)**

Data type (any, adopted, experimental)

**Nucleus (Z, A)**

Charge Number (Element)  
 Mass Number  
 Stable

**Levels (E, J $\pi$ , T $1/2$ , etc.)**

Energy (keV)  
  
 "100-500", "150-200", "200-300", "300-400", "400-500", "500-600", "600-700", "700-800", "800-900", "900-1000", "1000-1100", "1100-1200", "1200-1300", "1300-1400", "1400-1500", "1500-1600", "1600-1700", "1700-1800", "1800-1900", "1900-2000", "2000-2100", "2100-2200", "2200-2300", "2300-2400", "2400-2500", "2500-2600", "2600-2700", "2700-2800", "2800-2900", "2900-3000", "3000-3100", "3100-3200", "3200-3300", "3300-3400", "3400-3500", "3500-3600", "3600-3700", "3700-3800", "3800-3900", "3900-4000", "4000-4100", "4100-4200", "4200-4300", "4300-4400", "4400-4500", "4500-4600", "4600-4700", "4700-4800", "4800-4900", "4900-5000", "5000-5100", "5100-5200", "5200-5300", "5300-5400", "5400-5500", "5500-5600", "5600-5700", "5700-5800", "5800-5900", "5900-6000", "6000-6100", "6100-6200", "6200-6300", "6300-6400", "6400-6500", "6500-6600", "6600-6700", "6700-6800", "6800-6900", "6900-7000", "7000-7100", "7100-7200", "7200-7300", "7300-7400", "7400-7500", "7500-7600", "7600-7700", "7700-7800", "7800-7900", "7900-8000", "8000-8100", "8100-8200", "8200-8300", "8300-8400", "8400-8500", "8500-8600", "8600-8700", "8700-8800", "8800-8900", "8900-9000", "9000-9100", "9100-9200", "9200-9300", "9300-9400", "9400-9500", "9500-9600", "9600-9700", "9700-9800", "9800-9900", "9900-10000", "10000-10100", "10100-10200", "10200-10300", "10300-10400", "10400-10500", "10500-10600", "10600-10700", "10700-10800", "10800-10900", "10900-11000", "11000-11100", "11100-11200", "11200-11300", "11300-11400", "11400-11500", "11500-11600", "11600-11700", "11700-11800", "11800-11900", "11900-12000", "12000-12100", "12100-12200", "12200-12300", "12300-12400", "12400-12500", "12500-12600", "12600-12700", "12700-12800", "12800-12900", "12900-13000", "13000-13100", "13100-13200", "13200-13300", "13300-13400", "13400-13500", "13500-13600", "13600-13700", "13700-13800", "13800-13900", "13900-14000", "14000-14100", "14100-14200", "14200-14300", "14300-14400", "14400-14500", "14500-14600", "14600-14700", 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"67500-67600", "67600-67700", "67700-67800", "67800-67900", "67900-68000", "68000-68100", "68100-68200", "68200-68300", "68300-68400", "68400-68500", "68500-68600", "68600-68700", "68700-68800", "68800-68900", "68900-69000", "69000-69100", "69100-69200", "69200-69300", "69300-69400", "69400-69500", "69500-69600", "69600-69700", "69700-69800", "69800-69900", "69900-70000", "70000-70100", "70100-70200", "70200-70300", "70300-70400", "70400-70500", "70500-70600", "70600-70700", "70700-70800", "70800-70900", "70900-71000", "71000-71100", "71100-71200", "71200-71300", "71300-71400", "71400-71500", "71500-71600", "71600-71700", "71700-71800", "71800-71900", "71900-72000", "72000-72100", "72100-72200", "72200-72300", "72300-72400", "72400-72500", "72500-72600", "72600-72700", "72700-72800", "72800-72900", "72900-73000", "73000-73100", "73100-73200", "73200-73300", "73300-73400", "73400-73500", "73500-73600", "73600-73700", "73700-73800", "73800-73900", "73900-74000", "74000-74100", 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"80700-80800", "80800-80900", "80900-81000", "81000-81100", "81100-81200", "81200-81300", "81300-81400", "81400-81500", "81500-81600", "81600-81700", "81700-81800", "81800-81900", "81900-82000", "82000-82100", "82100-82200", "82200-82300", "82300-82400", "82400-82500", "82500-82600", "82600-82700", "82700-82800", "82800-82900", "82900-83000", "83000-83100", "83100-83200", "83200-83300", "83300-83400", "83400-83500", "83500-83600", "83600-83700", "83700-83800", "83800-83900", "83900-84000", "84000-84100", "84100-84200", "84200-84300", "84300-84400", "84400-84500", "84500-84600", "84600-84700", "84700-84800", "84800-84900", "84900-85000", "85000-85100", "85100-85200", "85200-85300", "85300-85400", "85400-85500", "85500-85600", "85600-85700", "85700-85800", "85800-85900", "85900-86000", "86000-86100", "86100-86200", "86200-86300", "86300-86400", "86400-86500", "86500-86600", "86600-86700", "86700-86800", "86800-86900", "86900-87000", "87000-87100", "87100-87200", "87200-87300", "87300-87400", "87400-87500", "87500-87600", "87600-87700", "87700-87800", "87800-87900", "87900-88000", "88000-88100", "88100-88200", "88200-88300", "88300-88400", "88400-88500", "88500-88600", "88600-88700", "88700-88800", "88800-88900", "88900-89000", "89000-89100", "89100-89200", "89200-89300", "89300-89400", "89400-89500", "89500-89600", "89600-89700", "89700-89800", "89800-89900", "89900-90000", "90000-90100", "90100-90200", "90200-90300", "90300-90400", "90400-90500", "90500-90600", "90600-90700", "90700-90800", "90800-90900", "90900-91000", "91000-91100", "91100-91200", "91200-91300", "91300-91400", "91400-91500", "91500-91600", "91600-91700", "91700-91800", "91800-91900", "91900-92000", "92000-92100", "92100-92200", "92200-92300", "92300-92400", "92400-92500", "92500-92600", "92600-92700", "92700-92800", "9

**Annex 5.** The new database “Relational ENSDF” query for:  
 levels with  $J^\pi = 7/2^-$ ,  
 isospin  $T = 3/2$ ,  
 energies  $E = 1 - 13$  MeV and  
 photon energies  $E_\gamma = 2 - 5$  MeV  
 (final level energy and  $J^\pi$  are requested).

The screenshot shows the CDFE Relational ENSDF web interface. The search parameters are as follows:

- Nucleus (Z, A):** Charge Number (Element) is "5,20,4-36", Stable is "any".
- Levels (E, J $\pi$ , T $1/2$ , etc.):** Energy (keV) is "1000-13000", Spin and parity is "7/2-".
- Gamma transition (Gamma ray, Final level):** Energy of the  $\gamma$ -ray (keV) is "2000-5000".
- Final level (E, J $\pi$ , T $1/2$ , etc.):** Energy (keV) is "2000-4000".

The search results table is as follows:

ENSDF Source	Nucleus	Level energy	Spin-parity	Half-life	Isospin	Photon energy	Level energy (fin.)	Spin-parity (fin.)
39.26	19-R-39	6546 (2)	7/2-	14 FS	3/2	3732	2814.3 (2)	7/2-
41.47	20-CA-41	7146	7/2-		3/2	4186	2959.3 (6)	7/2-
51.78	25-MN-51	4451 (2)	7/2-		3/2	2141	2310.0 (5)	5/2(-)
51.78	25-MN-51	4451 (2)	7/2-		3/2	2194	2255.7 (1)	(5/2-)
51.81	25-MN-51	4451 (2)	7/2-		3/2	2141	2310.0 (5)	5/2-
57.61	28-NI-57	5238 (7)	7/2-		3/2	2194	2255.7 (1)	(5/2-)
57.61	28-NI-57	5238.8 (7)	7/2-		3/2	2008.7	3230.1 (7)	7/2-
59.70	29-CU-59	5897 (4)	7/2(-)		3/2	2661.4	2577.4 (5)	7/2-
59.70	29-CU-59	6493 (4)	7/2(-)		3/2	2782	3114.1 (5)	5/2-
59.70	29-CU-59	6493 (4)	7/2(-)		3/2	2563	3930.0 (24)	5/2+
59.70	29-CU-59	6493 (4)	7/2(-)		3/2	2587	3905.2 (18)	3/2-
59.70	29-CU-59	6493 (4)	7/2(-)		3/2	2606	3885.5 (21)	3/2-
59.70	29-CU-59	6493 (4)	7/2(-)		3/2	2794	3699 (4)	7/2-
59.70	29-CU-59	6493 (4)	7/2(-)		3/2	2919	3573.9 (8)	5/2,7/2
59.70	29-CU-59	6493 (4)	7/2(-)		3/2	2942	3550.6 (13)	5/2-
59.70	29-CU-59	6493 (4)	7/2(-)		3/2	3059	3434 (4)	5/2
59.70	29-CU-59	6493 (4)	7/2(-)		3/2	3184	3309.0 (20)	7/2(-)
59.70	29-CU-59	6493 (4)	7/2(-)		3/2	3378	3114.1 (5)	5/2-
59.70	29-CU-59	6493 (4)	7/2(-)		3/2	3451	3042.71 (17)	9/2+
59.70	29-CU-59	6493 (4)	7/2(-)		3/2	3565	2928.2 (16)	5/2(-)
59.70	29-CU-59	6493 (4)	7/2(-)		3/2	3777	2715.01 (13)	7/2(-)
59.70	29-CU-59	6493 (4)	7/2(-)		3/2	3784	2706.04 (22)	5/2(-)
59.70	29-CU-59	6493 (4)	7/2(-)		3/2	3829	2664.50 (17)	(9/2-)
59.74	29-CU-59	5897	7/2-		3/2	2782	3115	5/2-





**Annex 7.** The new database “Relational ENSDF” query for:  
 $\gamma$ -transitions with changing  
of isospin value from 2 to 1  
(photon energy and multipolarity values requested).

The screenshot shows the CDFE search engine interface. The main window displays search filters and a table of results. The filters include:

- Angular momentum transfer: [ ]
- Spectroscopic strength: [ ]
- Metastable: any
- Isospin: 2
- Adding remark: any

The search results table is as follows:

ENSDF Source	Nucleus	Level energy	Isospin	Photon energy	Multipolarity	Level energy (fin.)	Isospin (fin.)
<a href="#">20.17</a>	10-NE-20	18430 (7)	2	6208 (21)	[M1]	12221 (4)	1
<a href="#">24.20</a>	12-MG-24	15436.4 (6)	2	4723.7	M1	10712.2	1
<a href="#">24.20</a>	12-MG-24	15436.4 (6)	2	5467.9	M1	9857.8 (3)	1
<a href="#">32.23</a>	16-S-32	12049 (1)	2	2840 (1)	M1	9208.1 (7)	1
<a href="#">32.23</a>	16-S-32	12049 (1)	2	3922 (1)	M1	8126.5 (6)	1
<a href="#">32.23</a>	16-S-32	12049 (1)	2	5046 (1)	M1	7002.5 (10)	1
<a href="#">40.67</a>	20-CA-40	11988 (2)	2	1669	M1	10318.8 (4)	1
<a href="#">40.67</a>	20-CA-40	11988 (2)	2	2223	D	9865.15 (11)	1
<a href="#">44.68</a>	22-TI-44	9298 (2)	1+2	2082	M1	7216 (2)	1
<a href="#">44.68</a>	22-TI-44	9338 (2)	2	2122	M1	7216 (2)	1

The interface also includes a search filter for the final level, set to 1, and a 'Query p' button. A red arrow points from the Isospin filter to the 'Isospin' column, and a blue arrow points from the Final level filter to the 'Isospin (fin.)' column.

**Annex 8.** The new database “Relational ENSDF” query for:  
nuclei with levels having isospin value  $T \geq 10$ .

The screenshot shows the CDFE Relational ENSDF web interface. The main page is titled "EVALUATED NUCLEAR STRUCTURE DATA FILE (ENSDF) Complete Nuclear Spectroscopy Database 'Relational ENSDF'". It contains a search form with the following fields:

- Charge Number (Element): "5,20,4-36", "Be,Zr,..."
- Mass Number: "any"
- Stable:
- Energy (keV): "100-500", "1550,70...10000"
- Spin and parity:
- Half-life times:  Y or  Stable
- Angular momentum transfer:  any
- Spectroscopic strength:
- Metastable:
- Isospin: "10-99999"
- Adding remark:

Three red arrows point from the search form to the resulting data tables. The first arrow points to the "Isospin" column in the top table. The second arrow points to the "Isospin" column in the middle table. The third arrow points to the "Isospin" column in the bottom table.

The top table shows the following data:

ENSDF Source	Nucleus	Level energy	Spin-parity	Isospin
117.18	49-IN-117	14945 (6)		21/2
117.18	49-IN-117	15075 (6)	(3/2+)	21/2
117.18	49-IN-117	15315 (6)	(1/2+)	21/2
117.18	49-IN-117	15605 (6)	(3/2+)	21/2
120.40	51-SB-120	10204 (30)		10
120.40	51-SB-120	11354 (30)		10
120.40	51-SB-120	11994 (30)		10
120.40	51-SB-120	12314 (30)		10
120.40	51-SB-120	12504 (30)		10
120.40	51-SB-120	12604 (30)		10
120.40	51-SB-120	12784 (30)		10
120.40	51-SB-120	12914 (30)		10
120.40	51-SB-120	13034 (30)		10
120.40	51-SB-120	13124 (30)		10

The middle table shows the following data:

ENSDF Source	Nucleus	Level energy	Spin-parity	Isospin
128.30	53-I-128	11944 (22)	(0+)	12
135.42	57-LA-135	12815	(3/2+)	23/2
135.42	57-LA-135	13053	(1/2+)	23/2
135.42	57-LA-135	14222	(7/2-)	23/2
135.42	57-LA-135	14360	(3/2-)	23/2
135.42	57-LA-135	14767	(1/2-)	23/2
135.42	57-LA-135	14936		23/2
135.42	57-LA-135	15514	(1/2-, 3/2-)	23/2
135.42	57-LA-135	15773		23/2
143.14	58-CE-143	0.0	3/2-	27/2
143.14	58-CE-143	808.2 (3)	3/2-	27/2
143.14	58-CE-143	862.1 (3)	(1/2-)	27/2
143.14	58-CE-143	1172.5 (3)	3/2-, (1/2-)	27/2
143.14	58-CE-143	1195 (10)	(5/2-)	27/2
143.14	58-CE-143	1298 (5)	(5/2-)	27/2
149.46	63-EU-149	14287	(7/2-)	25/2
149.46	63-EU-149	14635	(3/2-)	25/2
149.46	63-EU-149	14804	(3/2-)	25/2
149.46	63-EU-149	15002	(1/2-, 3/2-)	25/2
149.46	63-EU-149	15449	(5/2-)	25/2
170.14	69-TM-170	15492 (7)	0+	17
170.35	71-LU-170	12855 (20)	0+	15
192.42	79-AU-192	14124 (16)	0+	35/2
207.15	82-PB-207	19300 (40)	1/2+	45/2
207.15	82-PB-207	19660 (30)	3/2+	45/2
207.15	82-PB-207	20640 (30)	11/2-	45/2
207.15	82-PB-207	21000 (30)	5/2+	45/2
207.15	82-PB-207	22890 (80)		45/2
208.59	83-BI-208	15165 (6)	(0+)	22
209.67	84-PO-209	16324 (13)	(9/2-)	43/2
209.75	85-AT-209	35E+3 (1)	(9/2-)	43/2

The bottom table shows the following data:

ENSDF Source	Nucleus	Level energy	Spin-parity	Isospin
128.30	53-I-128	11944 (22)	(0+)	12
135.42	57-LA-135	12815	(3/2+)	23/2
135.42	57-LA-135	13053	(1/2+)	23/2
135.42	57-LA-135	14222	(7/2-)	23/2
135.42	57-LA-135	14360	(3/2-)	23/2
135.42	57-LA-135	14767	(1/2-)	23/2
135.42	57-LA-135	14936		23/2
135.42	57-LA-135	15514	(1/2-, 3/2-)	23/2
135.42	57-LA-135	15773		23/2
143.14	58-CE-143	0.0	3/2-	27/2
143.14	58-CE-143	808.2 (3)	3/2-	27/2
143.14	58-CE-143	862.1 (3)	(1/2-)	27/2
143.14	58-CE-143	1172.5 (3)	3/2-, (1/2-)	27/2
143.14	58-CE-143	1195 (10)	(5/2-)	27/2
143.14	58-CE-143	1298 (5)	(5/2-)	27/2
149.46	63-EU-149	14287	(7/2-)	25/2
149.46	63-EU-149	14635	(3/2-)	25/2
149.46	63-EU-149	14804	(3/2-)	25/2
149.46	63-EU-149	15002	(1/2-, 3/2-)	25/2
149.46	63-EU-149	15449	(5/2-)	25/2
170.14	69-TM-170	15492 (7)	0+	17
170.35	71-LU-170	12855 (20)	0+	15
192.42	79-AU-192	14124 (16)	0+	35/2
207.15	82-PB-207	19300 (40)	1/2+	45/2
207.15	82-PB-207	19660 (30)	3/2+	45/2
207.15	82-PB-207	20640 (30)	11/2-	45/2
207.15	82-PB-207	21000 (30)	5/2+	45/2
207.15	82-PB-207	22890 (80)		45/2
208.59	83-BI-208	15165 (6)	(0+)	22
209.67	84-PO-209	16324 (13)	(9/2-)	43/2
209.75	85-AT-209	35E+3 (1)	(9/2-)	43/2

**Annex 9.** The new database “Relational ENSDF” query for:  
 levels with energy more  
 than neutron separation energy  
 (requested also) in region 4 – 5 MeV.

The screenshot shows the CDfE search engine interface. On the left, there is a search form with the following fields and values:

- Energy (keV): 5000-99999999
- Spin and parity: (empty)
- Half-life times: (empty)
- Angular momentum transfer: (empty)
- Spectroscopic strength: (empty)
- Metastable: any
- Isospin: (empty)
- Adding remark: any
- Neutron separation energy (keV): 4000-5000

The search results are displayed in a table with the following columns: ENSDF Source, Nucleus, Level energy, Spin, and Energy (keV). The table shows several results, including:

ENSDF Source	Nucleus	Level energy	Spin	Energy (keV)
9.4	5-LI-9	5380 (60)		4143.33 (21)
9.4	5-LI-9	6430 (15)	GE	4180 (50)
13.4	5-B-13	5024 (6)		4303.58 (9)
13.4	5-B-13	5106 (10)		4303.58 (9)
13.4	5-B-13	5388 (6)		4303.58 (9)
13.4	5-B-13	5557 (7)		4303.58 (9)
13.4	5-B-13	6167 (6)		4303.58 (9)
13.4	5-B-13	6425 (7)		4303.58 (9)
13.4	5-B-13	6934 (9)		4303.58 (9)
13.4	5-B-13	7516 (8)		4303.58 (9)
13.4	5-B-13	7859 (20)		4303.58 (9)
13.4	5-B-13	8133 (7)		4303.58 (9)
13.4	5-B-13	8683 (7)		4303.58 (9)
13.4	5-B-13	9440 (30)		4303.58 (9)
13.4	5-B-13	9500		4303.58 (9)
13.4	5-B-13	10220 (20)		4303.58 (9)
13.4	5-B-13	10890 (20)		4303.58 (9)
13.4	5-B-13	11800		4303.58 (9)
13.11	6-C-13	6864 (3)	5/2-	4025.5 (3)
13.11	6-C-13	7492 (10)	7/2-	4025.5 (3)
13.11	6-C-13	7547 (3)	5/2-	4025.5 (3)
13.11	6-C-13	7686 (6)	3/2-	4025.5 (3)
13.11	6-C-13	820E+1 (10)	3/2+	4946.313 (2)
13.11	6-C-13	8860 (20)	1/2-	4946.313 (2)
13.11	6-C-13	9499.8 (1)	9/2+	4946.313 (2)

**Annex 10.** The new database “Relational ENSDF” query for:  
data from all reactions with incident A = 40 nuclides.

The screenshot shows the CDFE search engine interface in a Mozilla browser. The search form on the left is titled "Nucleus (Z, A)" and includes fields for "Charge Number (Element)", "Mass Number", and "Stable". The search results are displayed in a table with the following columns: ENSDF Source, Nucleus, and Experiment. A red arrow points from the text above to the search results table.

ENSDF Source	Nucleus	Experiment
<a href="#">41.19</a>	18-AR-41	40AR(T
<a href="#">41.24</a>	19-K-41	2
<a href="#">41.61</a>	20-CA-41	40CA(T
<a href="#">46.50</a>	22-TI-46	12C
<a href="#">47.31</a>	22-TI-47	10B(40CA, 44CA(7LI,
<a href="#">47.50</a>	23-V-47	10B(40CA,N 31P(19F,P2 40
<a href="#">47.60</a>	24-CR-47	10B(40CA,P 4C
<a href="#">48.7</a>	24-CR-48	10B(40CA,P
<a href="#">48.9</a>	24-CR-48	12C(40CA,2
<a href="#">48.86</a>	25-MN-48	12C(40C
<a href="#">49.45</a>	23-V-49	12C(40CA, 27AL(28SL,
<a href="#">49.58</a>	24-CR-49	12C(40CA,N (14N,AP
<a href="#">49.65</a>	25-MN-49	12C(40C
<a href="#">49.68</a>	26-FE-49	9BE(58N
<a href="#">60.69</a>	28-NI-60	60I
<a href="#">73.55</a>	35-BR-73	40C
<a href="#">73.59</a>	36-KR-73	40CA(36AR
<a href="#">75.61</a>	37-RB-75	40C
<a href="#">77.62</a>	37-RB-77	40C
<a href="#">77.64</a>	38-SR-77	40C
<a href="#">95.68</a>	46-PD-95	58NI(40CA,N2P)
<a href="#">95.69</a>	47-AG-95	58NI(40CA,P2N)
<a href="#">96.70</a>	45-RH-96	64ZN(40CA,A3PNG)
<a href="#">96.74</a>	46-PD-96	60NI(40CA,2P2NG)
<a href="#">97.75</a>	46-PD-97	64ZN(40CA,A2PNG)
<a href="#">99.73</a>	47-AG-99	64ZN(40CA,3P2NG)
<a href="#">126.55</a>	58-CE-126	92MO(40CA,2PAG)
<a href="#">126.57</a>	59-PR-126	92MO(40CA,APNG)
<a href="#">128.59</a>	59-PR-128	94MO(40CA,APNG)
<a href="#">128.61</a>	60-ND-128	92MO(40CA,2P2NG)
<a href="#">130.75</a>	59-PR-130	94MO(40CA,3PNG)
<a href="#">130.82</a>	60-ND-130	92MO(40CA,2PG),96RU(40CA,2PAG)
<a href="#">130.83</a>	60-ND-130	94MO(40CA,2P2NG)
<a href="#">131.57</a>	60-ND-131	94MO(40CA,2PNG)
<a href="#">132.59</a>	62-SM-132	96RU(40CA,2P2NG)
<a href="#">133.56</a>	61-PM-133	96RU(40CA,3PG) E=180 MEV
<a href="#">133.59</a>	62-SM-133	96RU(40CA,2NPG)
<a href="#">133.60</a>	62-SM-133	96RU(40CA,2PNG)
<a href="#">144.68</a>	64-GD-144	108PD(40AR,4NG)
<a href="#">145.67</a>	64-GD-145	110PD(40AR,5NG)
<a href="#">150.63</a>	66-DY-150	114CD(40AR,4NG)
<a href="#">161.50</a>	72-HF-161	126TE(40CA,5NG)
<a href="#">162.55</a>	72-HF-162	126TE(40CA,4NG), 116SN(48TI,2NG)
<a href="#">180.48</a>	78-PT-180	144ND(40AR,4NG)
<a href="#">181.41</a>	78-PT-181	144ND(40AR,3NG)
<a href="#">181.50</a>	80-HG-181	144SM(40AR,3NG)
<a href="#">192.64</a>	82-PB-192	182W(16O,6NG), GD(40AR,XNG)
<a href="#">206.70</a>	88-RA-206	170YB(40AR,4NG)

**Annex 11.** The new database “Relational ENSDF” query for:  
 $\gamma$ -transitions between the levels  
 with definite  $J^\pi$  values  
 (in one case -  $20^+ \rightarrow 20^+$ , in another -  $20^+ \rightarrow 22^+$ )

**Table 1: Search results for  $J^\pi = 20^+$  transitions**

ENSDF Source	Nucleus	Level energy	Spin parity	Photon energy	Level energy (fin.)	Spin parity (fin.)
86.61	40-ZR-86	10918	(20+)	776	10142.9 (11)	(20+)
86.66	40-ZR-86	10918	20+	776	10142	20+
116.83	54-XE-116	7467.0 (5)	(20+)	319.2 (3)	7147.8 (5)	(20+)
116.86	54-XE-116	7467	(20+)	319.2 (3)	7147.8	(20+)
168.33	70-YB-168	4786	(20+)	450	4336	(20+)
168.44	70-YB-168	4786	(20+)	450	4336	20+
182.35	76-OS-182	5358.4 (4)	(20+)	334.0 (5)	5024.5 (5)	20+
182.35	76-OS-182	5358.4 (4)	(20+)	334.0 (5)	5024.5 (5)	(20+)
182.40	76-OS-182	5357.8 (6)	20(+)	334.0 (5)	5023.9 (6)	20+
182.40	76-OS-182	5357.8 (6)	20(+)	334.0 (5)	5023.9 (6)	20+
182.44	78-PT-182	4918.9 (7)	(20+)	154.1 (1)	4728.5 (5)	(20+)
182.44	78-PT-182	4918.9 (7)	(20+)	154.1 (1)	4728.5 (5)	(20+)
192.42	78-PT-184	4815.4	20(+)	322.7	4493.5	20+
192.47	80-HG-192	5587.1 (8)	(20+)	270	5316.5 (6)	(20+)
192.49	80-HG-192	5587	(20+)	270	5317	20+
212.25	86-RN-212	6167.4 (6)	(20+)	741.9	5427.2 (5)	(20+)
212.28	86-RN-212	6167.3	(20+)	741.9 (2)	5427.1	(20+)
238.6	92-U-238	3502	(20+)	882	2619.1 (8)	(20+)
238.6	92-U-238	3773	(20+)	1154	2619.1 (8)	(20+)
238.15	92-U-238	3502	(20+)	882	2619.0 (8)	(20+)
238.15	92-U-238	3773	(20+)	1154	2619.0 (8)	(20+)

**Table 2: Search results for  $J^\pi = 22^+$  transitions**

ENSDF Source	Nucleus	Level energy	Spin parity	Photon energy	Level energy (fin.)	Spin parity (fin.)
194.34	80-HG-194	6789.7 (6)	(20+)	757.8 (2)	6031.9 (5)	(22+)
194.37	80-HG-194	6789.5 (6)	(20+)	757.8 (2)	6031.6 (6)	(22+)

**Text Box:** The only one level with  $J^\pi_{\text{final}} = 22^+$  for  $20^+ \rightarrow 22^+$  transition.

**Annex 12.** Way from document 1985RE02 of NSR (query = Author: Endt) to EXFOR document F0558 and back to correspondent document of NSR.

<KEYNO >1985RE02  
 <HISTORY >A19850513  
 <CODEN >JOUR NUPAB 435 333  
 <REFERENCE>Nucl.Phys. A435, 333 (1985)  
 <AUTHORS >J.P.L.Reinecke, F.B.Waanders, P.Oberholzer, P.J.C.Janse Van Rensburg, J.A.Cilliers, J.J.A.Smit, M.A.Meyer, P.M.Endt  
 <TITLE >The Energy Levels of (+30)P  
 <KEYWORDS>NUCLEAR REACTIONS (+29) Si(p,g),E=0.3-2.3 MeV; measured |s(E(p),E(g)),Q,E(g),I(g)(a),DSA. (+30)P levels deduced resonance,g branching,T(-1/2),J,p. Enriched targets.  
 <SELECTRS>T:29SI;A. R:(P,G);A. N:30P;A. MDSIGMA;A. M:Q;A. M:G-SPECTRA;A. M:DOPPLER;A. N:30P;B. D:RESONANCE;B. D:G-SPECTRA;B. D:T1/2;B. D:LEVEL-PROP;B.  
[link to EXFOR](#)

Recordings from 1 to 3

Subent	First Author	Reference (+NSR)	Target Nucleus	Reaction <i>*means combination</i>	Final Nucleus	Quantity	Field of Measurement		
							Unit	Minimum	Maximum
<a href="#">F0558002</a>	J.P.L.REINECKE+	<a href="#">J,NP/A,435,333,1985</a>	14-SI-29	(P,G)		1	EN		
<a href="#">F0558002</a>	J.P.L.REINECKE+	<a href="#">J,NP/A,435,333,1985</a>	14-SI-29	(P,G)		2	WID/STR		
<a href="#">F0558003</a>	J.P.L.REINECKE+	<a href="#">J,NP/A,435,333,1985</a>	14-SI-29	(P,G)	15-P-30		PAR,DA,,LEG/RS	MEV	324 2241

JNP/A,435,333,1985

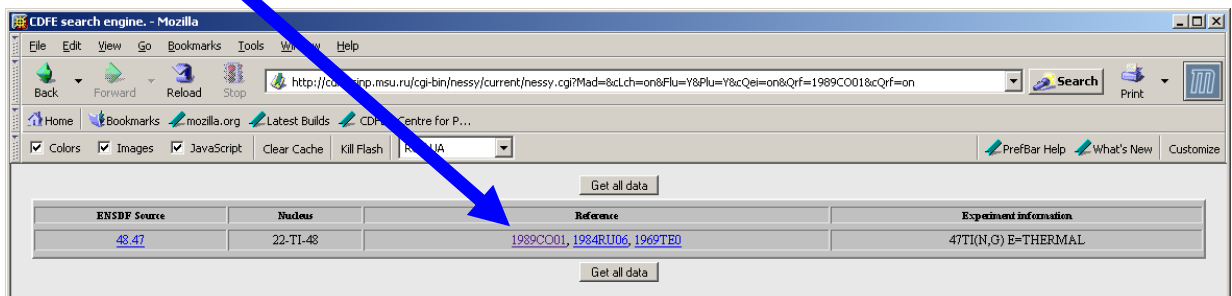
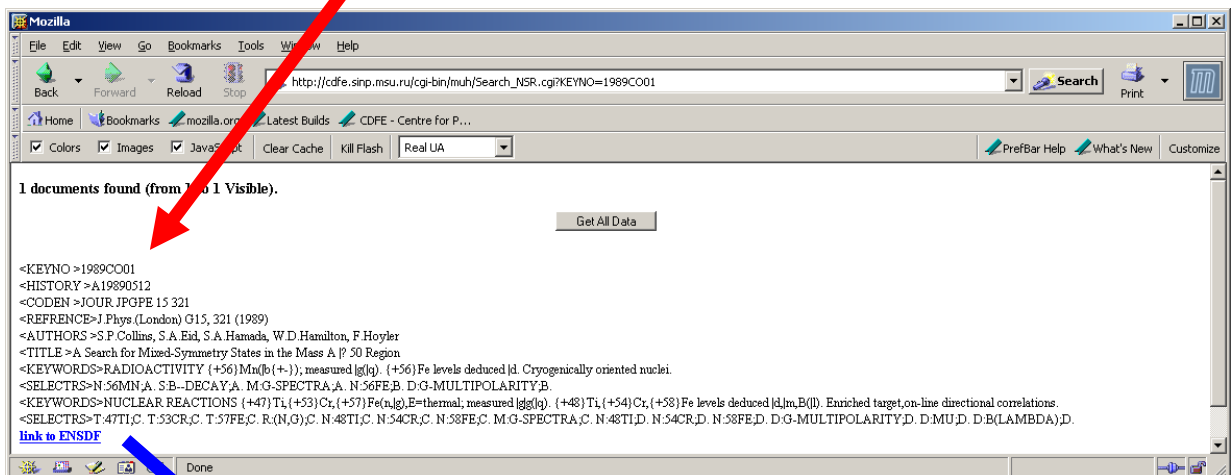
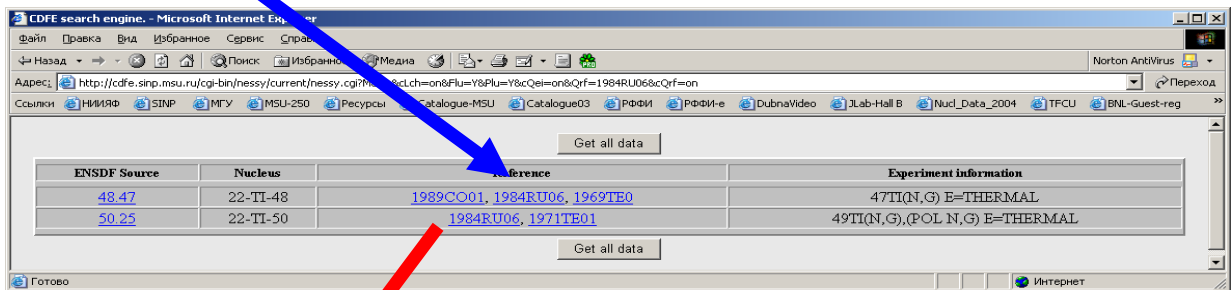
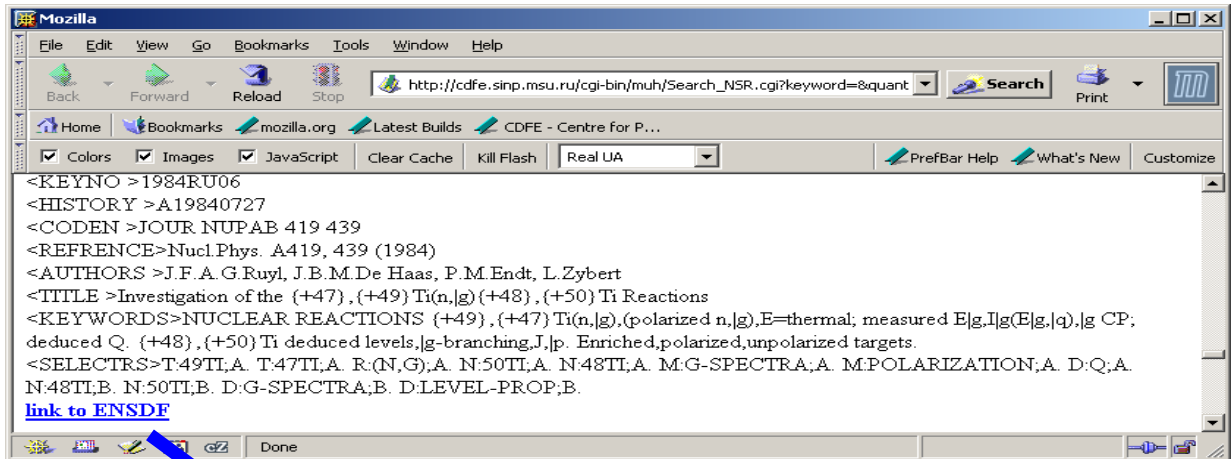
type Journal  
 code Nuclear Physics, Section A  
 volume 435  
 page 333  
 date 1985

Data from NSR:

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<KEYNO >1985RE02
<HISTORY >A19850513
<CODEN >JOUR NUPAB 435 333
<REFERENCE>Nucl.Phys. A435, 333 (1985)
<AUTHORS >J.P.L.Reinecke, F.B.Waanders, P.Oberholzer, P.J.C.Janse Van Rensburg, J.A.Cilliers, J.J.A.Smit, M.A.Meyer, P.M.Endt
<TITLE >The Energy Levels of (+30)P
<KEYWORDS>NUCLEAR REACTIONS (+29) Si(p,g),E=0.3-2.3 MeV; measured |s(E(p),E(g)),Q,E(g),I(g)(a),DSA. (+30)P levels deduced resonance,g branching,T(-1/2),J,p. Enriched targets.
<SELECTRS>T:29SI;A. R:(P,G);A. N:30P;A. MDSIGMA;A. M:Q;A. M:G-SPECTRA;A. M:DOPPLER;A. N:30P;B. D:RESONANCE;B. D:G-SPECTRA;B. D:T1/2;B. D:LEVEL-PROP
  
```

**Annex 13.** Way from document 1984RU06 of NSR (query = Author: Endt) to ENSDF data sets (CDFE internal numbers 48.47 and 50.25) and back to another document 1989CO01 of NSR for founded  $^{47}\text{Ti}$  data.





**Annex 14.** The main items of the CDFE future short-term programmes, priorities and new tasks.

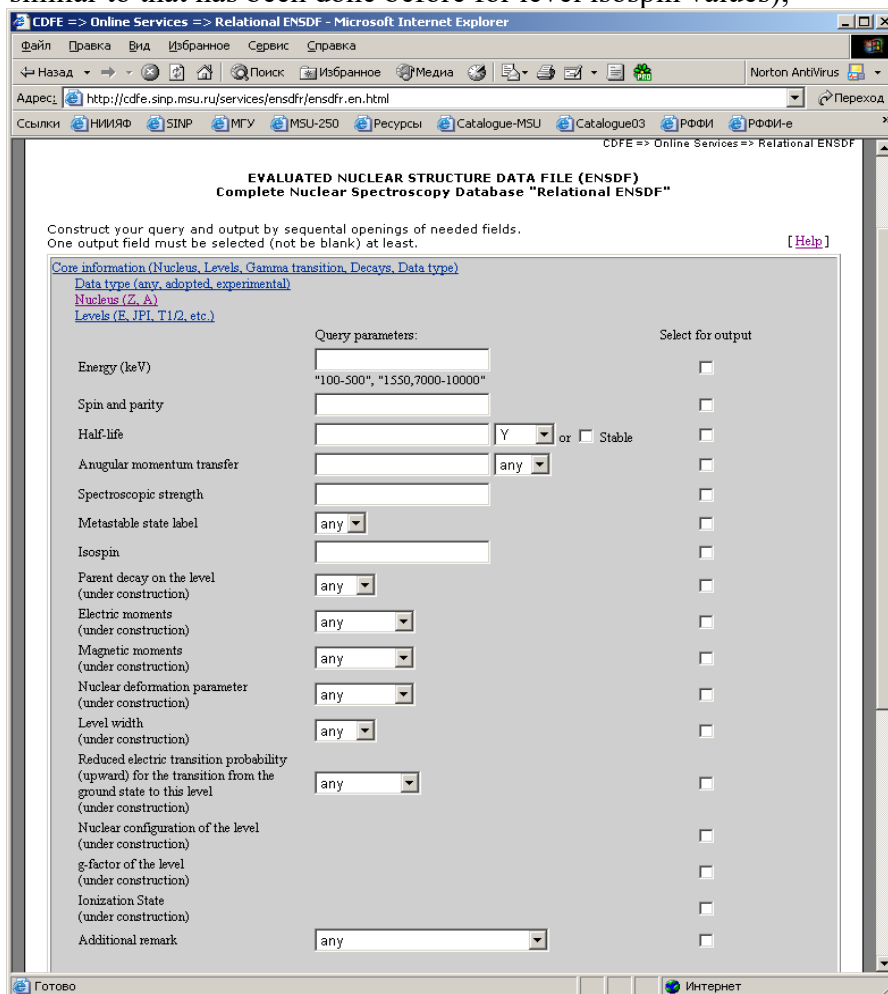
1. Upgrading and addition of the CDFE bibliographical data collection. Including the 2004 photonuclear data into the relational database “Photonuclear Data Index” (PNI).

2. Continuation of photonuclear data compilation using EXFOR format, new TRANSES (M036, M037,...) production.

3. Continuation of joint evaluation of photonuclear reaction cross sections obtained using various methods, first of all in experiments with bremsstrahlung and quasimonoenergetic annihilation photons, with the aim of definition and excluding of systematical discrepancies.

4. Upgrading, addition and correction of the existed CDFE EXFOR relevant databases, improvement of Search Engines:

- “Giant Dipole Resonance Parameters. Photonuclear Reaction Cross Sections”;
  - “Relational Nuclear Reaction Database (EXFOR)”;
  - “Relational ENSDF”:
- Including into the search form additional data (electric and magnetic moments, widths, deformations etc. for levels, reduced probabilities, conversion intensities and coefficients etc. for gamma-rays, etc.) from ENSDF “CONTINUATION” records similar to that has been done before for level isospin values);



- Full ENSDF data set presentation (comments, graphycs) in the output form;
- Development of the “quick up-dating” procedures.

5. Development of new unified joint interface for all three complete databases “NSR”, “EXFOR” and “Relational ENSDF”. It will give to one possibility of working with all three systems at the same time.