



## **Proiect ID-180**

### ***Noi evidentieri experimentale ale simetriilor dinamice in sistemele mezoscopice nucleare***

***Contractor :Institutul National pentru Fizica si Inginerie Nucleara “Horia Hulubei” – IFIN-HH***

***Director de Proiect : Dr. Nicolae Victor Zamfir, mcAR***

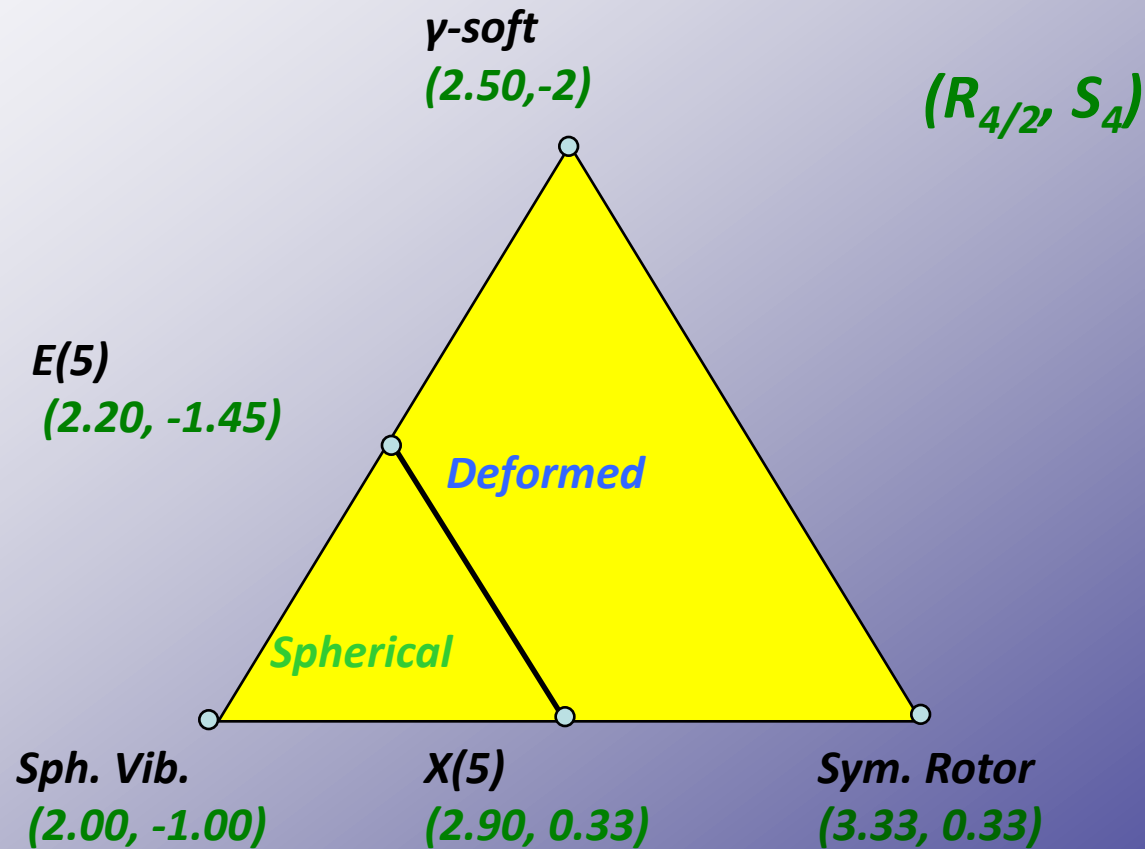
## *Plan de Realizare a Proiectului*

<b>2007</b>	Corelarea marimilor spectroscopice S4 si R4/2 cu alte marimi nucleare in caracterizarea proprietatilor colective a nucleelor atomice	<b>47.276lei</b>
<b>2008</b>	Realizarea unui sistem multidetector gamma pentru masuratori "off-line", Investigarea experimentală a realizării simetriei dinamice E(5) in zona A~100.	<b>330.251 lei</b>
<b>2009</b>	Testarea metodelor de separare a produsilor de reactii de viata scurta; Investigarea experimentală a tranzitie de faza U(5)-O(6) in zona A~70	<b>219.385 lei (493.000 lei)</b>

# *Evolutia colectivitatii, observabile empirice*

$R_{4/2}$ - Deformare cuadrupolara

$S_4$ -  $\gamma$ -softness



# Nuclei candidate $E(5)$ si $X(5)$

$$R_{4/2} \approx 2.20$$

$$S_4 \approx -1.45$$

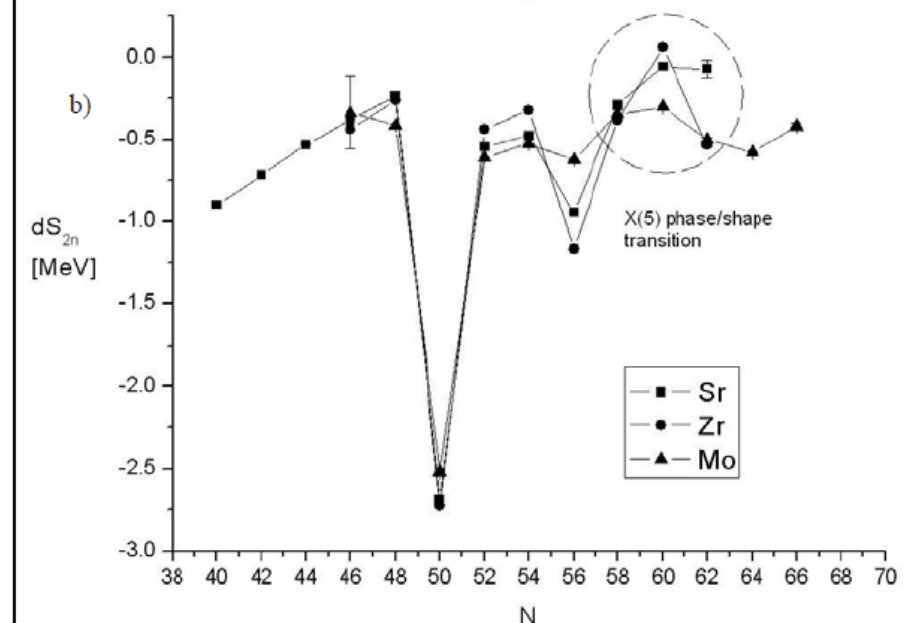
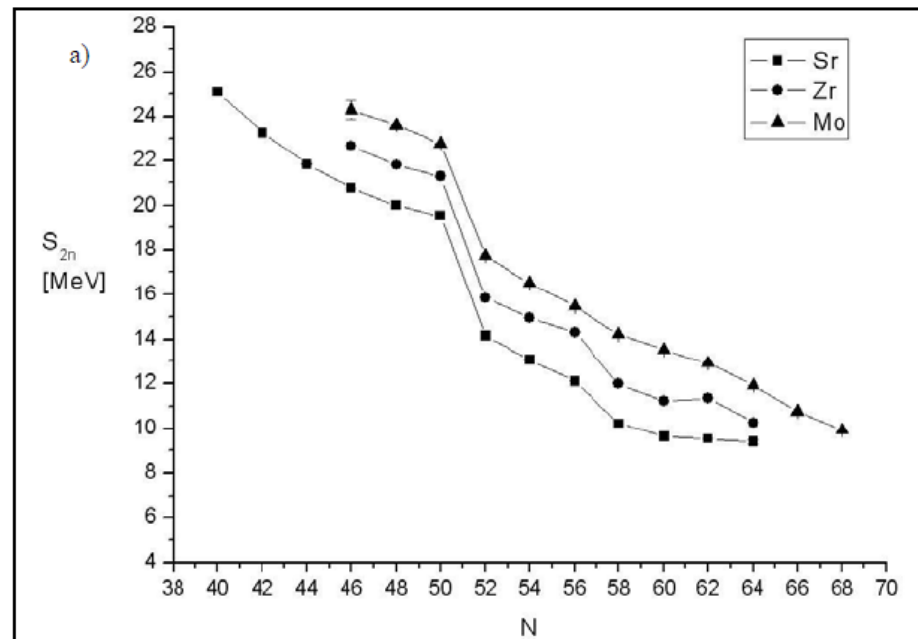
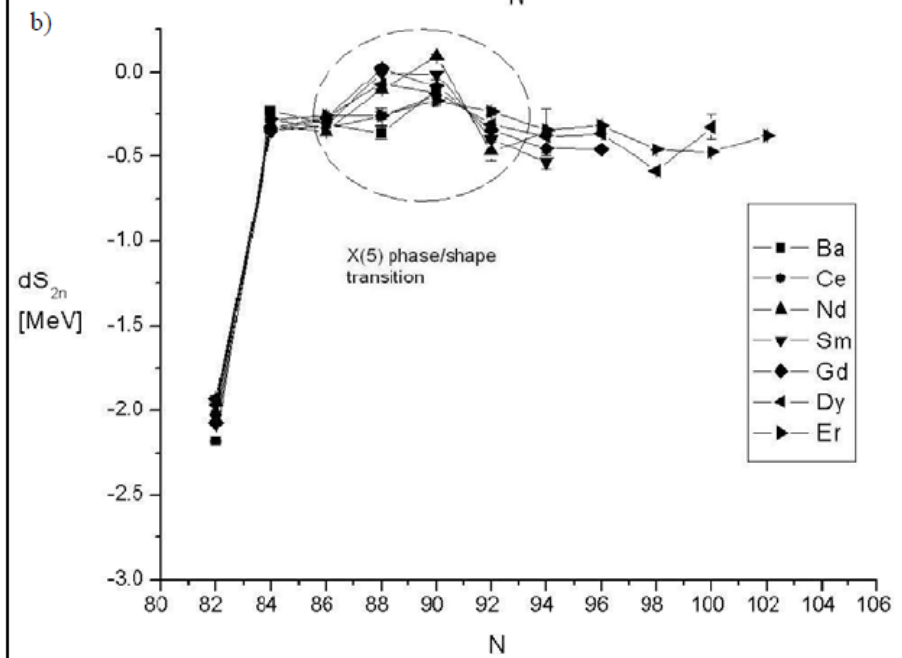
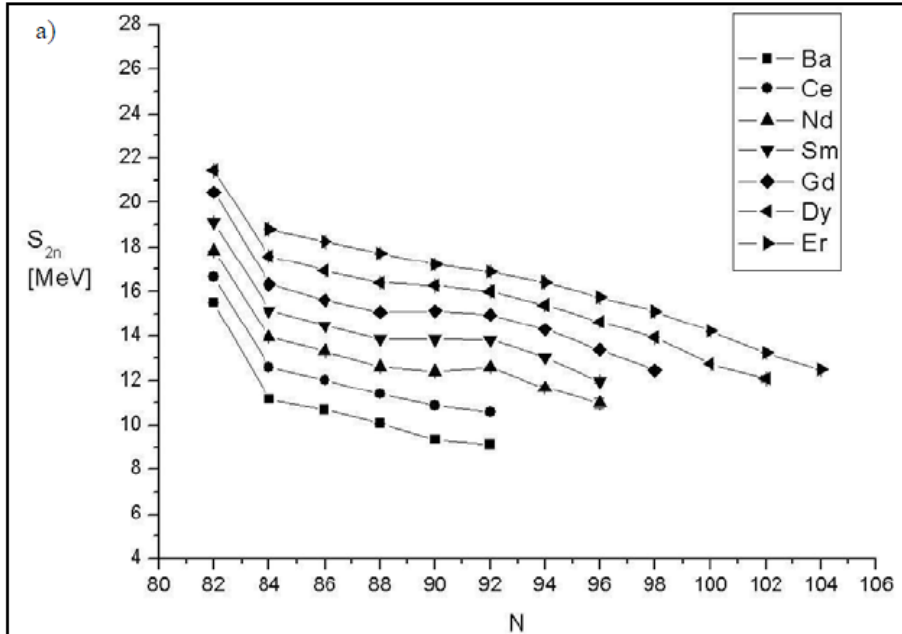
$$R_{4/2} \approx 2.90$$

$$S_4 \approx 0.33$$

Z	N	82	84	86	88	90	92	94	96	98	100	102	104
82	Pb												
80	Hg								2.23	1.63	1.74	1.78	
78	Pt				<b>2.30</b>		<b>2.26</b>	<b>2.13</b>	(2.51)	2.68	2.70	2.67	
76	Os			<b>(2.20)</b>			2.62	2.66	2.74	2.92	3.02	3.09	
74	W		-	2.07	-	2.48	2.68	2.82	2.95	3.06	3.15	3.21	3.24
72	Hf	(1.85)	(2.17)	2.31	2.56	2.79	2.97	3.11	3.19	3.25	3.27	3.28	
70	Yb	(1.84)	<b>2.13</b>	2.33	2.62	2.92	3.13	3.23	3.27	3.29	3.31	3.31	
68	Er	1.83	2.07	<b>2.31</b>	2.74	3.10	3.23	3.28	3.29	3.31	3.31	3.31	
66	Dy	1.81	2.05	<b>2.23</b>	2.93	3.20	3.27	3.29	3.30	(3.31)	(3.31)		
64	Gd	1.80	2.02	<b>2.19</b>	3.01	3.24	3.29	3.30	3.29	(3.30)			
62	Sm	1.84	<b>2.14</b>	<b>2.31</b>	3.01	3.25	3.29	(3.30)	3.29				
60	Nd	1.89	<b>2.29</b>	2.49	2.92	3.26	3.29	3.32					
58	Ce	1.90	2.36	2.59	(2.86)	(3.15)	(3.23)						
56	Ba	1.87	2.32	2.66	2.83	2.98							
54	Xe	1.82	<b>2.21</b>	2.40	(2.55)								
52	Te	1.70	(2.04)										
50	Sn												
Z	N	82	84	86	88	90	92	94	96	98	100	102	104

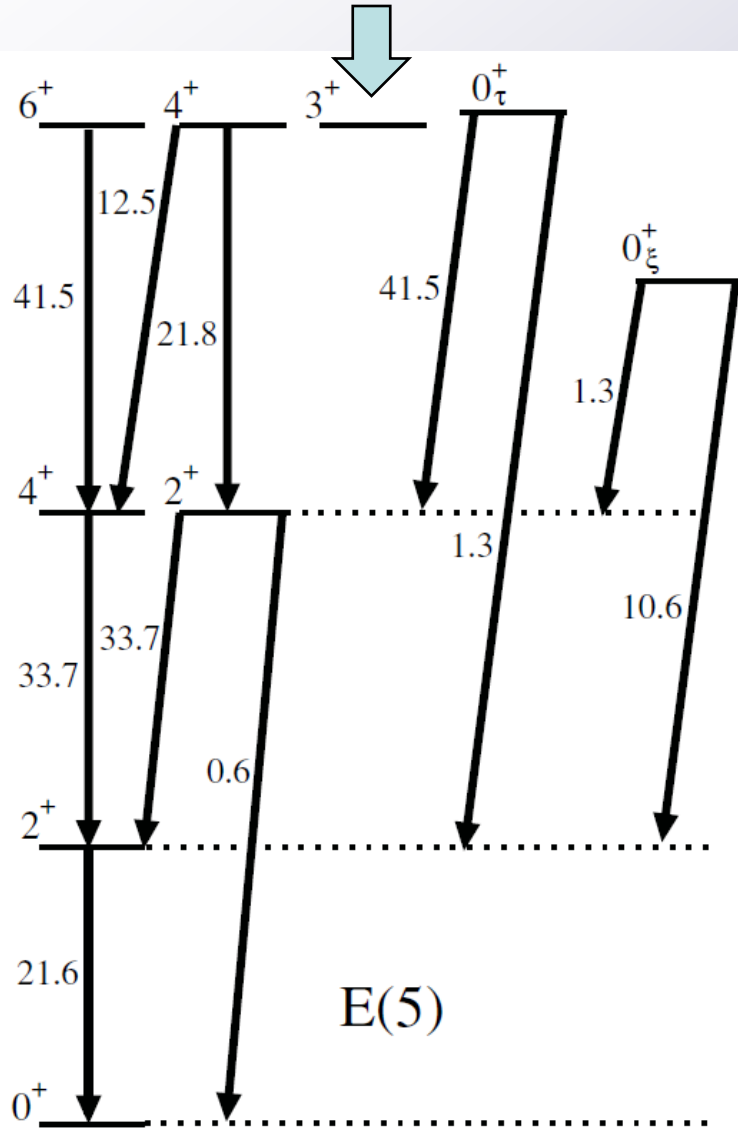
Z	N	50	52	54	56	58	60	62	64	66
50	Sn									
48	Cd	1.79	<b>2.11</b>	<b>2.26</b>	2.36	2.38	2.34	<b>2.29</b>	<b>2.3</b>	
46	Pd	1.78	<b>2.12</b>	<b>2.29</b>	2.38	2.40	2.41	2.46	(2.53)	
44	Ru	1.82	<b>2.14</b>	<b>2.27</b>	2.32	2.48	2.64	2.74	2.75	
42	Mo	1.80	2.09	1.91	<b>2.12</b>	2.51	2.91	3.04	2.92	
40	Zr	1.60	1.60	1.57	(1.50)	(2.65)	-	3.22	-	
Z	N	50	52	54	56	58	60	62	64	66

PHYSICAL REVIEW C 75, 044302 (2007),

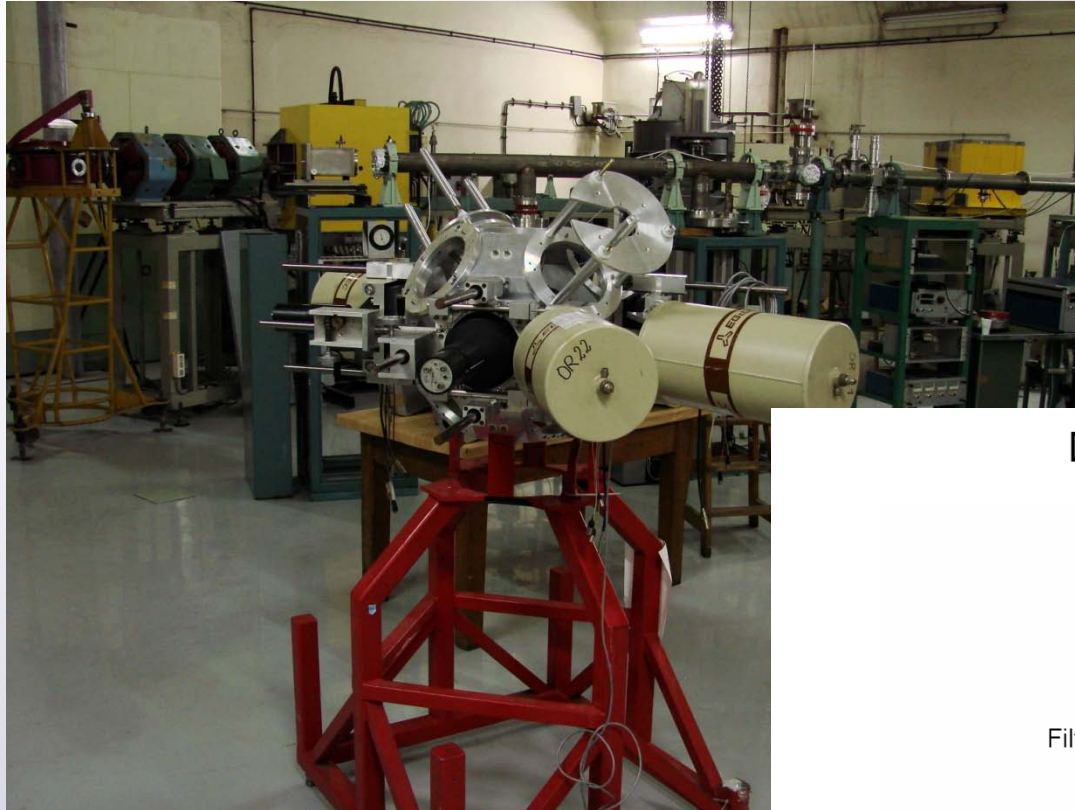


Reactii induse  
de particule  
usoare

Dezintegrarea  $\beta$



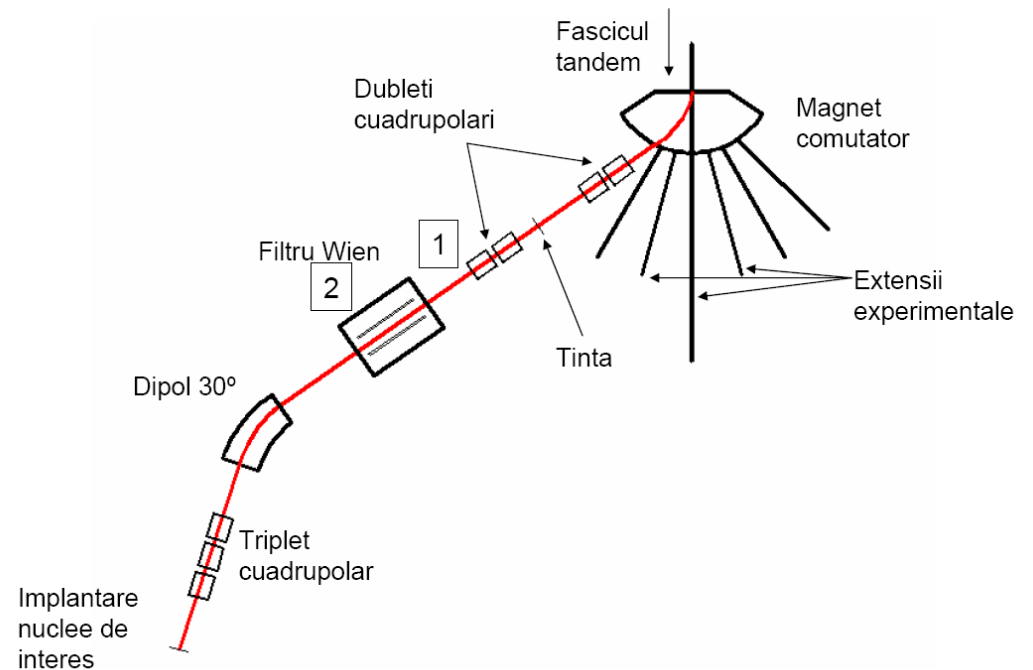
# Sistemul Multi-Detector OSIRIS si Sistemul de Separare Rapida a produsilor de reactie de viata scurta



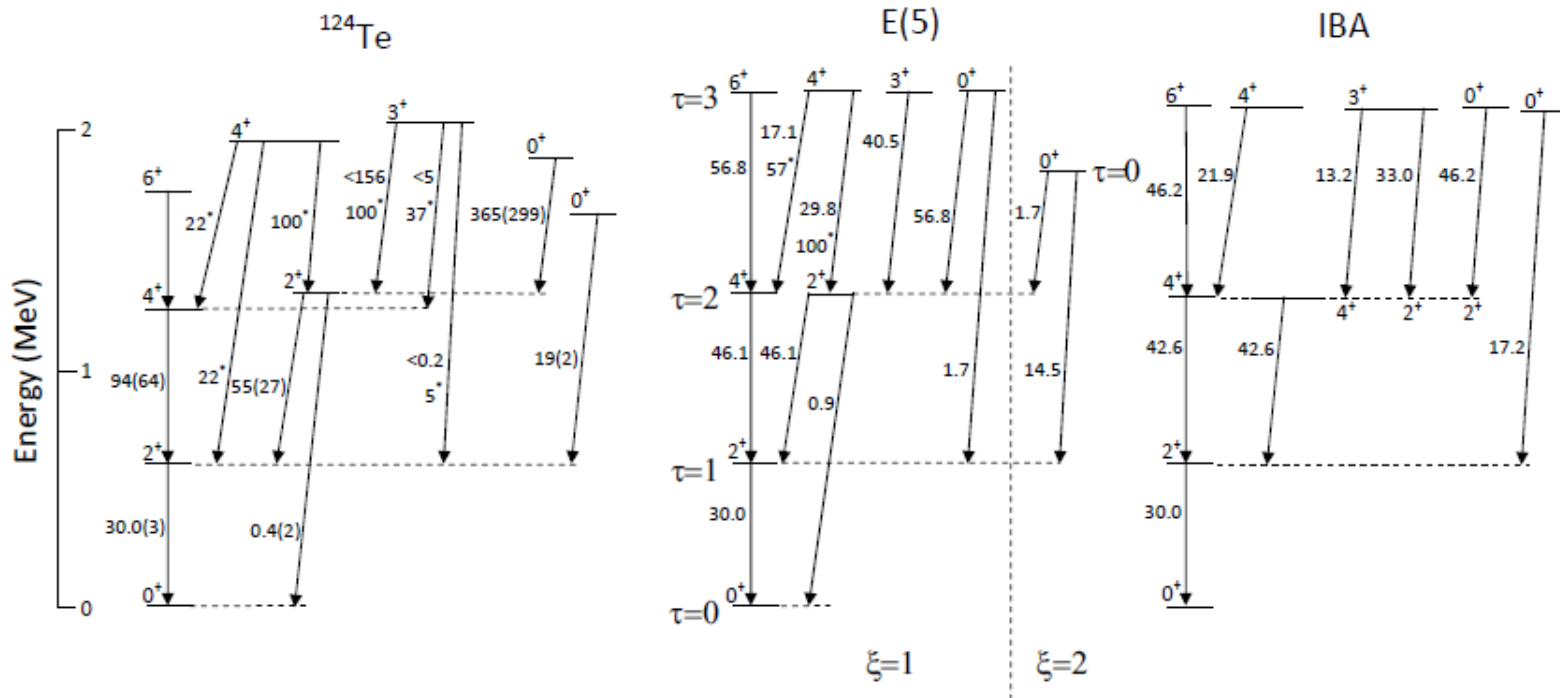
6 Detectori GeHP  
25% eff.

6 scuturi BGO

## Design-ul spectrometrului

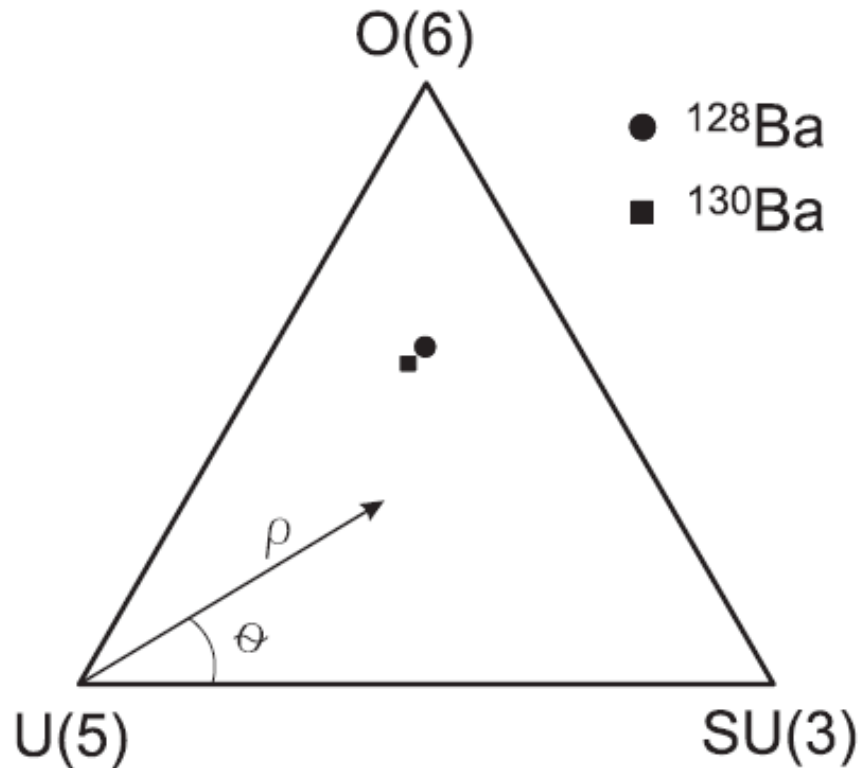






**INTERNATIONAL JOURNAL OF MODERN PHYSICS E-NUCLEAR PHYSICS**  
**17 (8):1453-1466 2008**





*PHYSICAL REVIEW C* 79(2009)064323, (2009), "Investigation of the  $^{128}\text{Ba}$  nucleus with the  $(p,t)$  reaction"

## **11 articole stiintifice publicate in cadrul proiectului:**

- **PHYSICAL REVIEW C 75, 044302 (2007), “ $\gamma$ -band staggering and E(5)-type structure:  $^{64}\text{Zn}$ ”**
- **INTERNATIONAL JOURNAL OF MODERN PHYSICS E-NUCLEAR PHYSICS 17 (8):1453-1466 2008, “Te-124 and the E(5) critical point symmetry”**
- **ROMANIAN JOURNAL OF PHYSICS , 301-319 (2009), “Structure features revealed from the two neutron separation energies”**
- **ACTA PHYSICA POLONICA B, Vol. 40, 503-511 (2009), “Correlations of energy ratios for collective nuclear bands”**
- **PHYSICAL REVIEW C, Volume 80, 021301(R),(2009), “Evolution of deformation in the neutron-rich krypton isotopes: the  $^{96}\text{Kr}$  nucleus”**
- **PHYSICAL REVIEW C79(2009)064323, (2009), “Investigation of the  $^{128}\text{Ba}$  nucleus with the (p,t) reaction”**
- **PHYSICS LETTERS B 672 (2009), 116-119,” Proton-hole excitation in the closed shell nucleus  $^{205}\text{Au}$  “**
- **AIP CONFERENCE PROCEEDINGS Vol. 1090 ,122-129 (2009), “New insights into the structure of exotic nuclei using the RISING active stopper”**
- **ACTA PHYSICA POLONICA B, Vol. 40 , 457-465 (2009) ”Heavy ion transfer reactions studied with PRISMA plus CLARA”**
- **ACTA PHYSICA POLONICA B , Vol. 40 ,867-870 (2009) ,” Beta-delayed gamma-ray spectroscopy of heavy neutron rich nuclei "south" of lead”**
- **ACTA PHYSICA POLONICA B, Vol. 40 , 875-878 (2009), “ Beta(-)-delayed and isomer spectroscopy of neutron-rich Ta and W isotopes”**

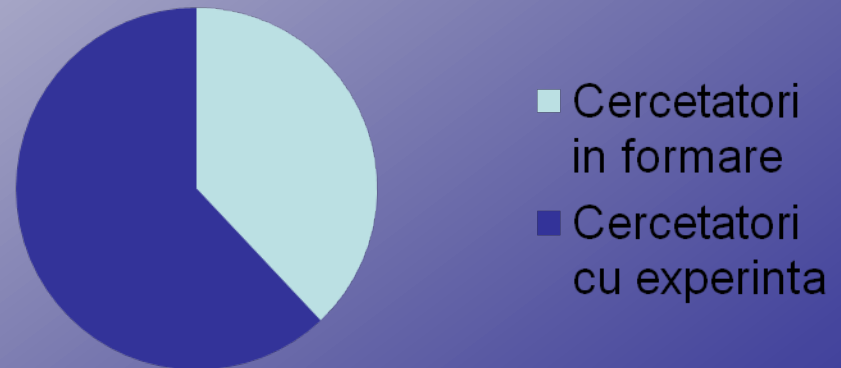
## **2 articole stiintifice trimise spre publicare**

- **Isomerism of low-lying states in  $^{86}\text{Y}$ , trimis spre publicare in European Physical Journal A**
- **Structure investigation with the (p,t) reaction on  $^{132};^{134}\text{Ba}$  nuclei , trimis spre publicare in PHYSICAL REVIEW C**

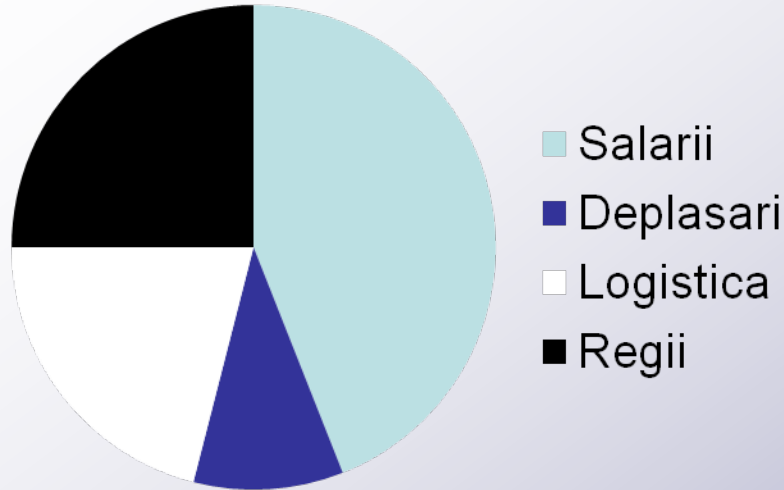
## ***Lista de personal a proiectului:***

- ***Dr. Nicolae Victor Zamfir, mcAR, Director de proiect, “cercetator cu experienta”***
- ***Dr. Gheorghe Cata-Danil, “cercetator cu experienta”***
- ***Dr. Dan Filipescu, “tanar cercetator (postdoctorand)”***
- ***Dr. Dan Gabriel Ghita, “doctorand”(2007-2008), “tanar cercetator (postdoctorand)”(2008)***
- ***Tiberiu Sava, “doctorand”***
- ***Constantin Mihai, “doctorand”***

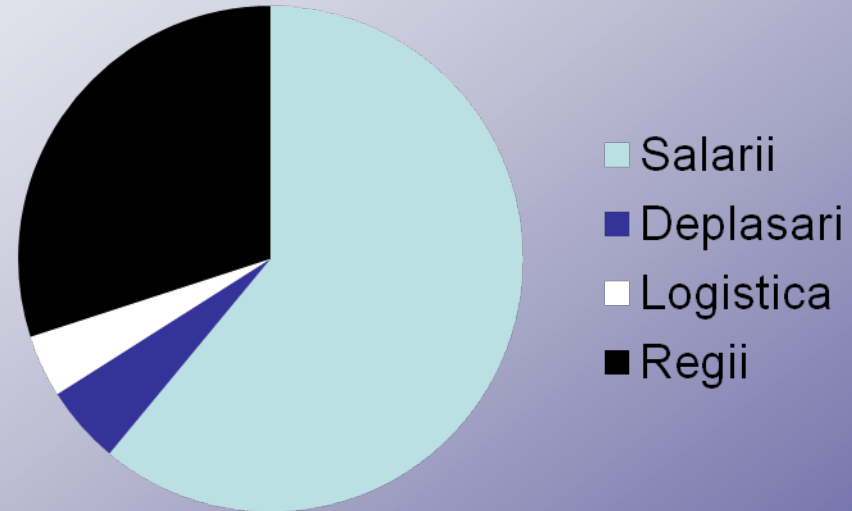
**Cheltuieli Salariale 2007-  
2009: 354.436 lei**



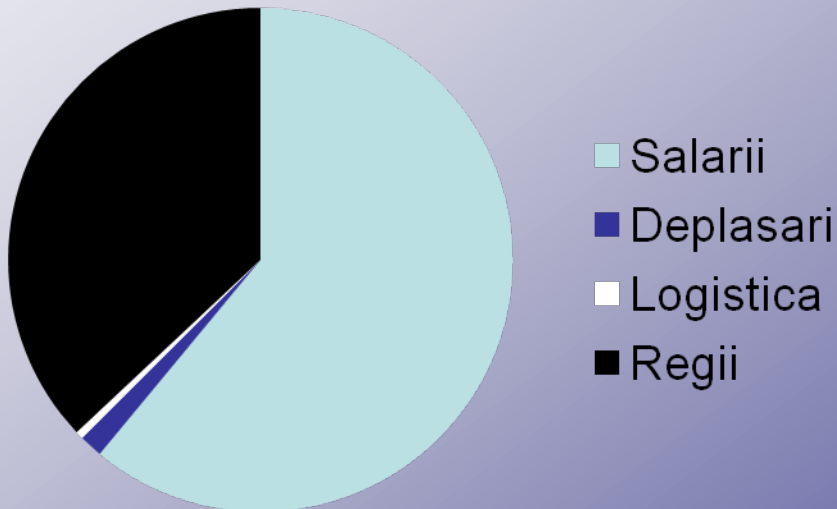
**Deviz Etapa 1/2007**  
**(47276 lei)**



**Deviz Etapa 2/2008**  
**(330.251 lei)**



**Deviz Etapa 3/2009**  
**(219.385 lei)**



**Deviz 2007-2009**  
**(569.912 lei)**

