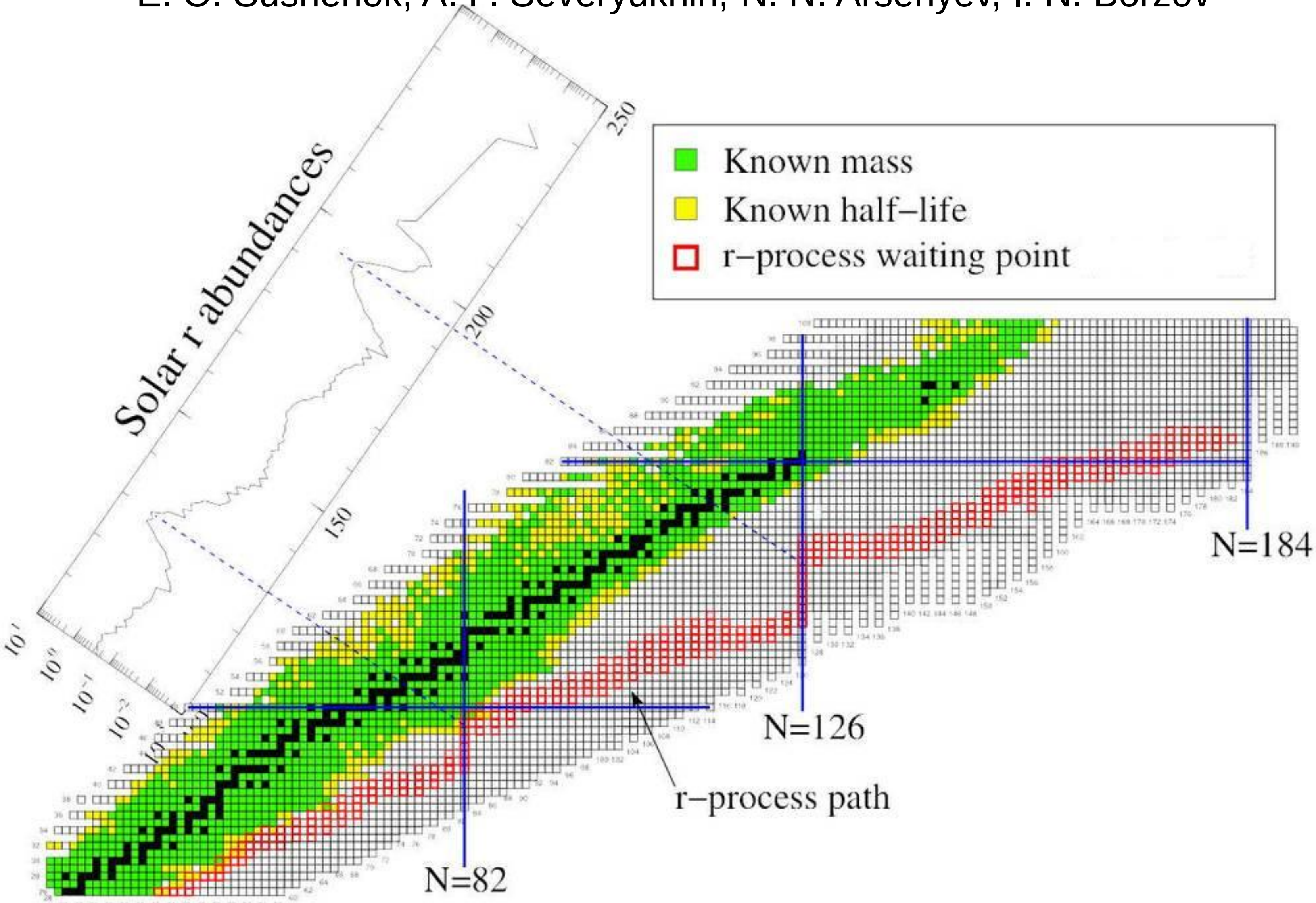
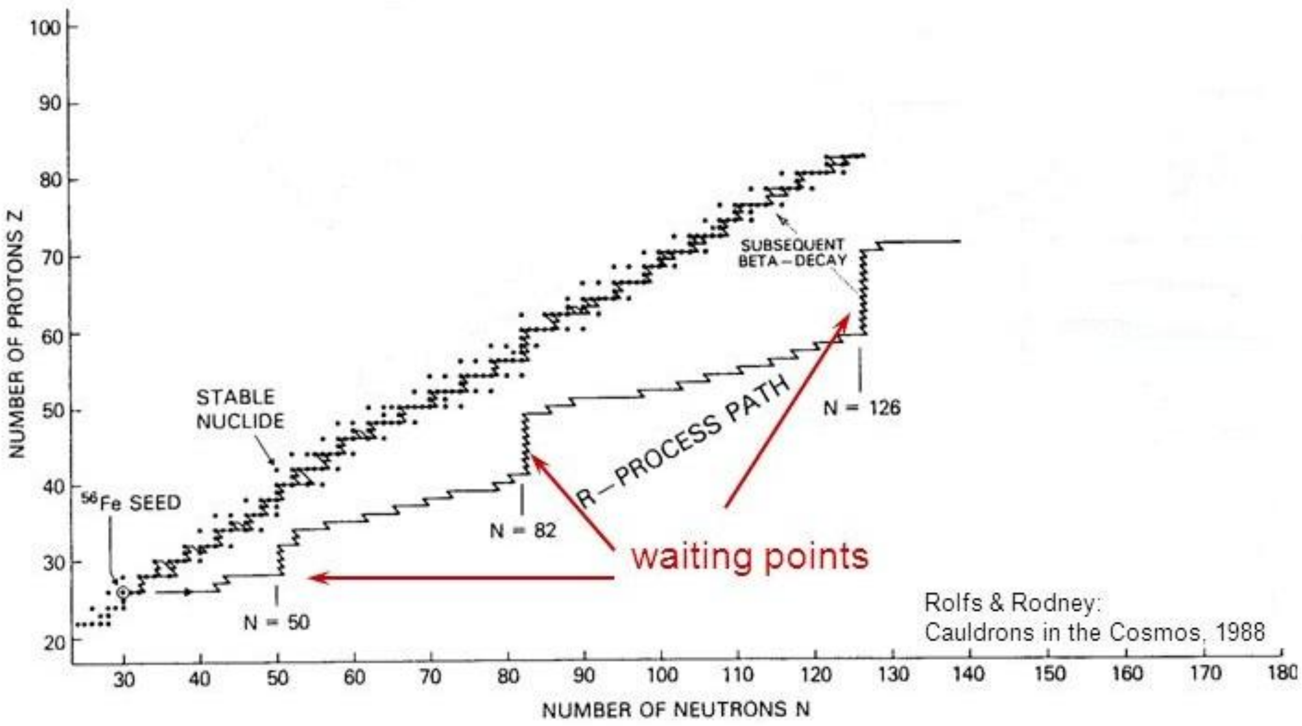
The pairing-interaction impact on the beta-decay characteristics and multi-neutron emission of the neutron-rich 126,128,130,132Cd

E. O. Sushenok, A. P. Severyukhin, N. N. Arsenyev, I. N. Borzov

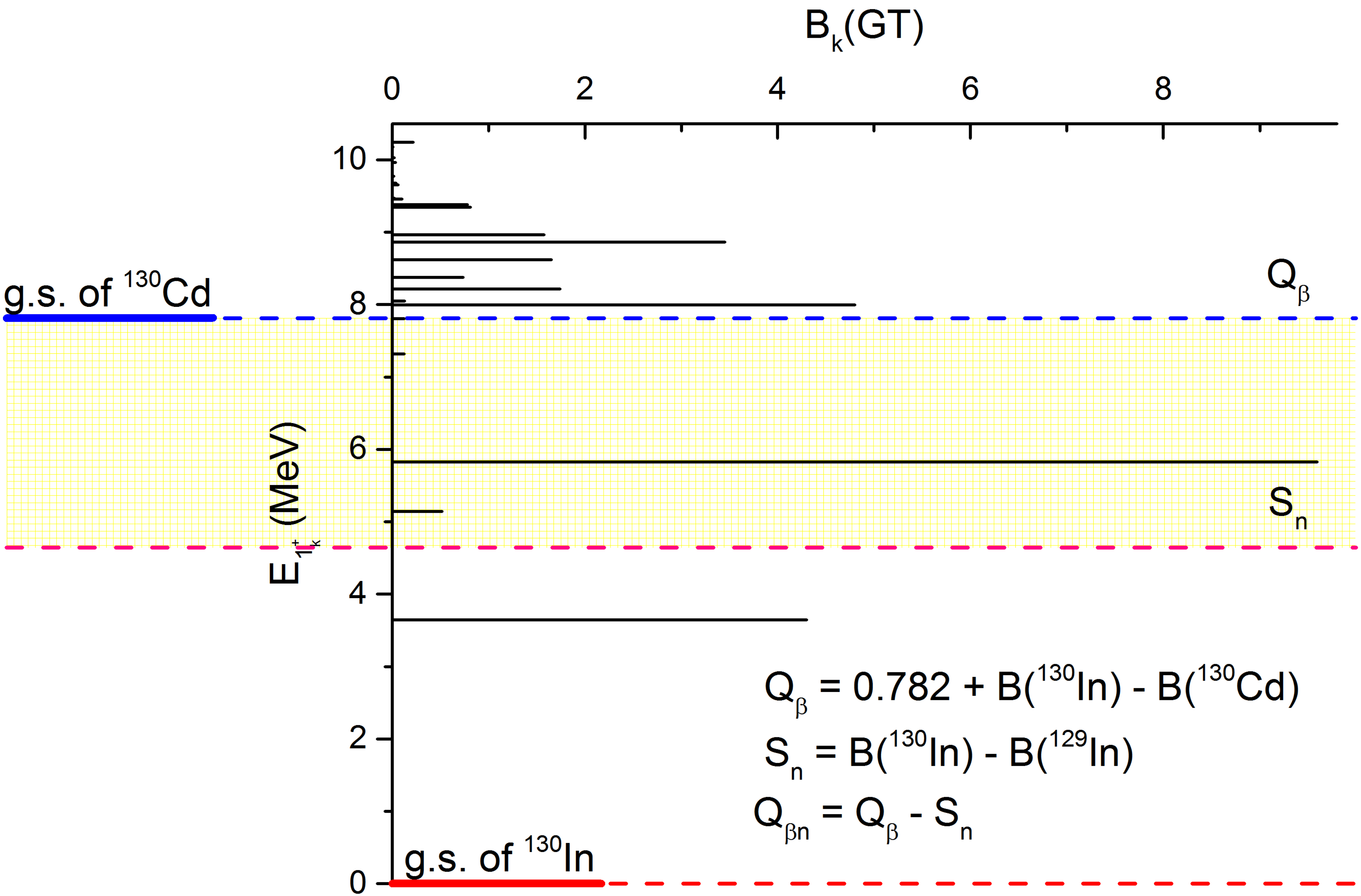


- The β-decay properties of r-process "waiting-point nucleus" ^{78}Ni[1], ^{130}Cd[2, 3] have attracted a lot of experimental efforts
- For the nuclei far from the stability-line, the integral quantities, as β-decay half-lives and β-delayed neutron emission probabilities often give us the only possible insight nuclear structure
- A redistribution of the GT strength has been found due to the impact of the tensor correlations and 2p-2h fragmentation of the GT transitions[4]



1) M. Madurga, S.V. Paulauskas, R. Grzywacz, D. Miller et al, Phys Rev Lett **117**, 092502 (2016)
2) A. Jungclaus, H. Grawe, S. Nishimura, P. Doornenbal et al, Phys Rev C **94**, 024303 (2016)
3) R. Dunlop, V. Bildstein, I. Dillmann, A. Jungclaus, Phys Rev C **93**, 062801(R) (2016)
4) A.P. Severyukhin, V.V. Voronov, I.N. Borzov, N.N. Arsenyev, Nguyen Van Giai, Phys Rev C **90**, 044320 (2014)

BETA-DECAY SCHEME



SKYRME INTERACTION

We use the Skyrme interaction, that consists of central, spin-orbit and tensor parts:

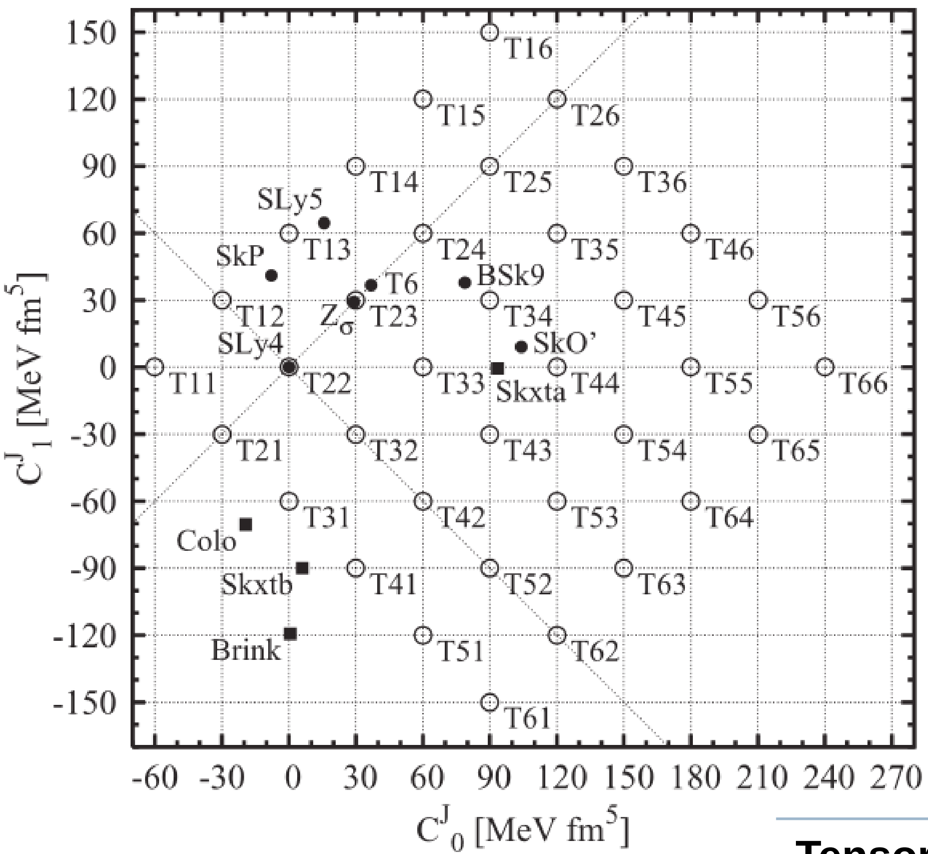
$$v^c(\boldsymbol{R},\boldsymbol{r}) = t_0(1 + x_0\hat{P}_\sigma)\delta(\boldsymbol{r}) + \frac{1}{6}t_3(1 + x_3\hat{P}_\sigma)\rho^\alpha(\boldsymbol{R})\delta(\boldsymbol{r}) + \frac{1}{6}t_1(1 + x_1\hat{P}_\sigma)[\boldsymbol{k}'^2 + \boldsymbol{k}^2]\delta(\boldsymbol{r}) + t_2(1 + x_2\hat{P}_\sigma)\boldsymbol{k}'\cdot\delta(\boldsymbol{r})\boldsymbol{k} + iW_0(\boldsymbol{\sigma}_1 + \boldsymbol{\sigma}_2)[\boldsymbol{k}'\times\delta(\boldsymbol{r})\boldsymbol{k}]$$

$$v^t(\boldsymbol{r}) = \frac{3}{2}T\{[3(\boldsymbol{\sigma}_1\cdot\boldsymbol{k}')(\boldsymbol{\sigma}_2\cdot\boldsymbol{k}') - (\boldsymbol{\sigma}_1\cdot\boldsymbol{\sigma}_2)k'^2]\delta(\boldsymbol{r}) + \delta(\boldsymbol{r})[3(\boldsymbol{\sigma}_1\cdot\boldsymbol{k})(\boldsymbol{\sigma}_2\cdot\boldsymbol{k}) - (\boldsymbol{\sigma}_1\cdot\boldsymbol{\sigma}_2)k^2]\} + 3U[3(\boldsymbol{\sigma}_1\cdot\boldsymbol{k}')\delta(\boldsymbol{r})(\boldsymbol{\sigma}_2\cdot\boldsymbol{k}) - (\boldsymbol{\sigma}_1\cdot\boldsymbol{\sigma}_2)\boldsymbol{k}\cdot\delta(\boldsymbol{r})\boldsymbol{k}']$$

$\boldsymbol{r} = \boldsymbol{r}_1 - \boldsymbol{r}_2$; $\boldsymbol{R} = \frac{1}{2}(\boldsymbol{r}_1 + \boldsymbol{r}_2)$; $\boldsymbol{k} = -\frac{i}{2}(\boldsymbol{\nabla}_1 - \boldsymbol{\nabla}_2)$ acts on the right; $\boldsymbol{k}' = \frac{i}{2}(\boldsymbol{\nabla}_1 - \boldsymbol{\nabla}_2)$ acts on the left

T.H.R. Skyrme, Nucl Phys **9**, 615 (1959)

TIJ PARAMETRIZATIONS



$$C_1^J = \frac{1}{2}(\alpha - \beta)$$

$$C_0^J = \frac{1}{2}(\alpha + \beta)$$

The inclusion of tensor terms modificates the spin-orbit potential in coordinate space:

$$U_{SO}^{(q)} = \frac{W_0}{2r}\left(2\frac{d\rho_q}{dr} + \frac{d\rho_{q'}}{dr}\right) + \left(\alpha\frac{J_q}{r} + \beta\frac{J_{q'}}{r}\right)$$

$$\alpha = 60(J-2)\ \text{MeV}\cdot\text{fm}^5$$

$$\beta = 60(I-2)\ \text{MeV}\cdot\text{fm}^5$$

The parameter sets T43 ($G_0' = 0.14$) and T45 ($G_0' = 0.1$) contain strong and weak neutron-proton tensor terms (with respect to like-particle tensor interaction).

Tensor force

	T43	T45
α	60	180
β	120	120
β/α	2.0	0.7

T. Lesinski, M. Bender, K. Bennaceur, T. Duguet, J. Meyer, Phys Rev C **76**, 014312 (2007)

HF-BCS

The canonical Bogoliubov transformation:

$$a_{jm}^{\dagger} = u_j \alpha_{jm}^{\dagger} + (-)^{j-m} v_j \alpha_{j-m}$$

The pairing correlations are generated by the zero-range force:

$$V_{T=1}^{(pp)}(\boldsymbol{r}_1, \boldsymbol{r}_2) = V_0 \left(\frac{1-P_\sigma}{2}\right)\left[1 - \eta \frac{\rho(r_1)}{\rho_0}\right]\delta(\boldsymbol{r}_1 - \boldsymbol{r}_2)$$

$$V_{T=0}^{(pp)}(\boldsymbol{r}_1, \boldsymbol{r}_2) = f V_0 \left(\frac{1+P_\sigma}{2}\right)\left[1 - \eta \frac{\rho(r_1)}{\rho_0}\right]\delta(\boldsymbol{r}_1 - \boldsymbol{r}_2)$$

The value of V_0 is fixed to reproduce the odd-even mass difference of the studied nuclei. The parameter f determines the ratio of $T = 1$ and $T = 0$ interactions in the pp-channel.

$f = 1$[1] – SU(4) Wigner symmetry

$f = 1.5$[2] – is adopted to analyze the T=0 pairing correlations in the N = Z *pf*-shell nuclei (^{48}Cr, ^{56}Ni, ^{64}Ge)

$\eta = 0$ – volume force

$\eta = 1$ – surface force

1) Yu. V. Gaponov, Yu. S. Lyutostansky, Sov J Part Nucl **12**, 528 (1981)
2) C.L. Bai, H. Sagawa, et al., Phys Lett B **719**, 116 (2013)

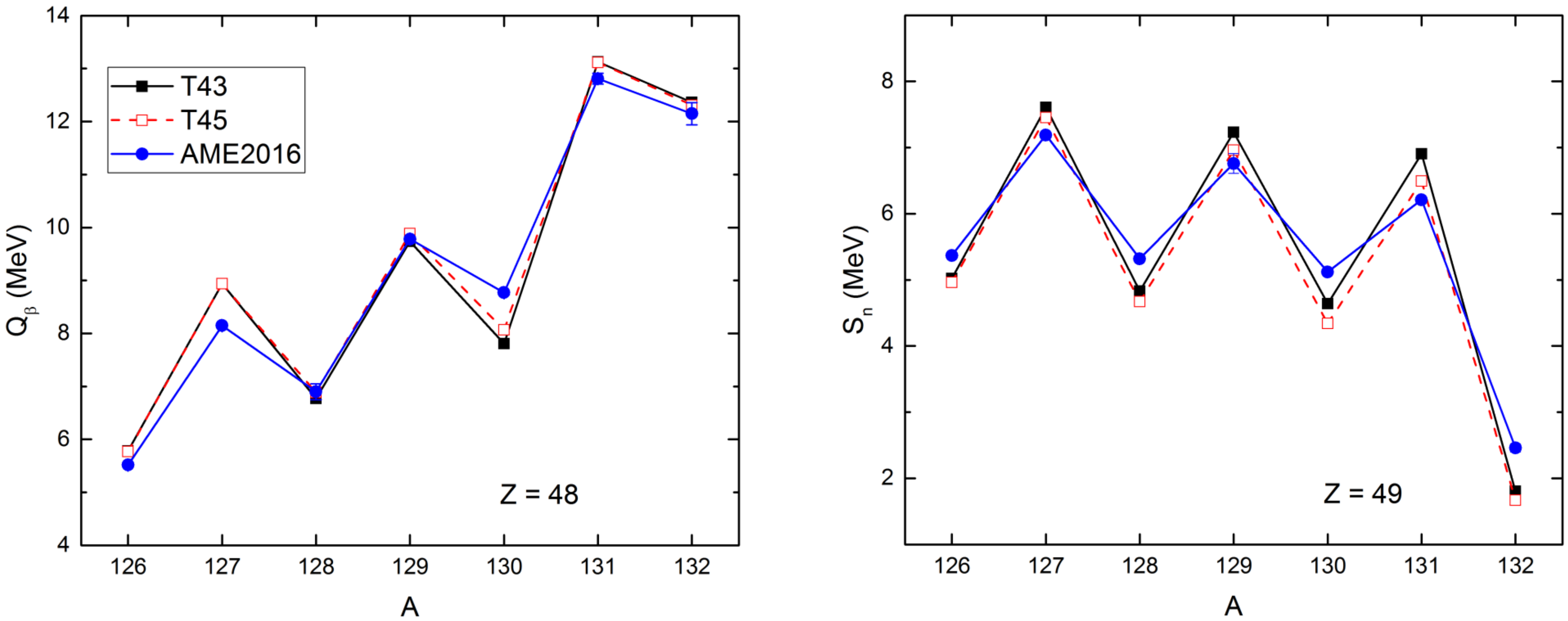
Ground state properties

Blocking effect

$$\Delta_j = \frac{1}{2}\sum_{j' \neq j_2} V_{jj'} \frac{(2j'+1)\Delta_{j'}}{\sqrt{\Delta_{j'}^2 + \left(E_{j'} - \lambda\right)^2}} + \frac{1}{2} V_{jj_2} \frac{(2j_2 - 1)\Delta_{j_2}}{\sqrt{\Delta_{j_2}^2 + \left(E_{j_2} - \lambda\right)^2}}$$

V. G. Soloviev, Kgl Dan Vid Selsk Mat Fys Skr **1**, 235 (1961)
V. G. Soloviev, Theory of Complex Nuclei (Pergamon Press, Oxford 1976)

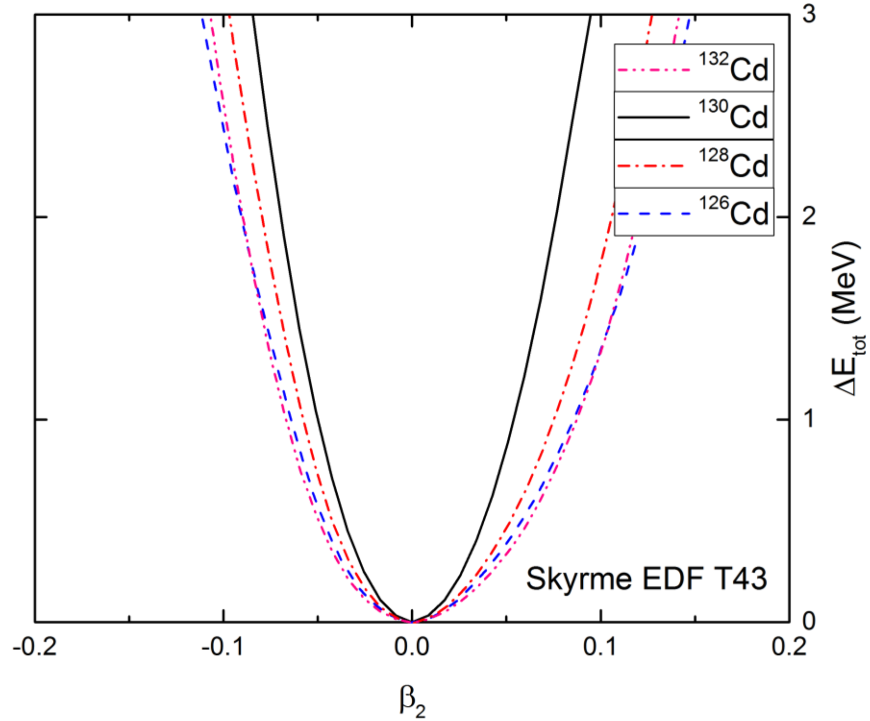
ODD-EVEN STAGGERING



The calculated Q_β values in the neutron-rich Cd isotopes are compared with the experimental data. There is a remarkable odd–even staggering. We find that the blocking effect results in a improvement of the Q_β description.

A.P. Severyukhin, N.N. Arsenyev, I.N. Borzov, E.O. Sushenok, Phys Rev C **95**, 034314 (2017)

DEFORMATION-ENERGY CURVES



the HF-BCS energy curve obtained with a constraint on the mass-quadrupole moment Q_2 as a function of the dimensionless quadrupole deformation β_2

HF-BCS equations are solved for the same EDF via a discretization of the quasiparticle wave function on a three-dimensional Cartesian mesh

$$\beta_2 = \sqrt{\frac{5}{16\pi}}\frac{4\pi Q_2}{3R^2 A}$$

$$R = 1.2A^{1/3}\ \text{fm}$$

A.P. Severyukhin, N.N. Arsenyev, I.N. Borzov, E.O. Sushenok, Phys Rev C **95**, 034314 (2017)
E.O. Sushenok, A.P. Severyukhin, N.N. Arsenyev, I.N. Borzov, in preparation (2018)
W. Ryssens, V. Hellemans, M. Bender, P.-H. Heenen, Comp Phys Comm **187**, 175 (2015)

NEUTRON-PROTON QRPA

The phonon creation operator:

$$Q_\nu^\dagger = \sum_{a\alpha} X_{a\alpha}^\nu A^\dagger(JM) - (-)^{J-M} Y_{a\alpha}^\nu A(J-M)$$

$a = \pi \quad \alpha = \nu$

$$A^\dagger(JM) = \sum_{m_a m_\alpha} C_{j_a m_a j_\alpha m_\alpha}^{JM} \alpha_{j_a m_a}^\dagger \alpha_{j_\alpha m_\alpha}^\dagger$$

$$\begin{pmatrix} A & B \\ -B & -A \end{pmatrix} \begin{pmatrix} X \\ Y \end{pmatrix} = E_k \begin{pmatrix} X \\ Y \end{pmatrix}$$

np-QRPA equations

$$A_{a\alpha,b\beta} = (u_a v_\alpha u_b v_\beta + v_a u_\alpha v_b u_\beta) V_{a\alpha b\beta}^{(ph)} + (u_a u_\alpha u_b u_\beta + v_a v_\alpha v_b v_\beta) V_{a\alpha b\beta}^{(pp)} + \epsilon_{a\alpha} \delta_{a\alpha} \delta_{b\beta}$$

$$B_{a\alpha,b\beta} = (u_a v_\alpha v_b u_\beta + v_a u_\alpha u_b v_\beta) V_{a\alpha b\beta}^{(ph)} - (u_a u_\alpha v_b v_\beta + v_a v_\alpha u_b u_\beta) V_{a\alpha b\beta}^{(pp)}$$

where the p-h matrix elements $V_{a\alpha b\beta}^{(ph)}$ and the p-p matrix elements $V_{a\alpha b\beta}^{(pp)}$ written in the separable form as a sum of N terms. Making use of the finite rank separable approximation for the residual interaction enables one to perform the calculations in very large configuration spaces. The eigenvalues of the QRPA equations are found numerically as the roots of the FRSA secular equation. The cutoff of the discretized continuous part of the single-particle spectra is performed at the energy of 100 MeV. This is sufficient for exhausting the Ikeda sum rule $S_- - S_+ = 3(N-Z)$.

Nguyen Van Giai, Ch. Stoyanov, V. V. Voronov, Phys Rev C **57**, 1204 (1998)
A.P. Severyukhin, V.V. Voronov, Nguyen Van Giai, Prog Theor Phys **128**, 489 (2012)
A.P. Severyukhin, H. Sagawa, Prog Theor Exp Phys **2013**, 103D03 (2013)

FINITE RANK SEPARABLE APPROXIMATION

Landau-Migdal form of the spin-isospin residual interaction

$$V^{a}_{res}(\vec{r}_1,\vec{r}_2) = N_0^{-1} G'^{a}_{0}(r_1)(\sigma_1\sigma_2)(\tau_1\tau_2)\delta(\vec{r}_1-\vec{r}_2)$$

$$G'^{ph}_{0} = -N_0\left[{}^1/_4\, t_0 + {}^1/_{24}\, t_3\rho^{\alpha} + {}^1/_8\, k_F^2(t_1 - t_2)\right]$$

$$G'^{pp}_{0} = \frac{1}{4} f V_0\left(1 - \eta\frac{\rho(r)}{\rho_0}\right)$$

Tensor p-h interaction is replaced by the two-term separable interaction. The strength is adjusted to reproduce the centroid energies of the GT and spin-quadrupole strength distributions calculated with the original tensor p-h interaction A.P. Severyukhin, H. Sagawa, Prog Theor Exp Phys **2013**, 103D03 (2013)

- integrating over the angular variables
- numerically calculation of one-dimensional radial integrals by using an *N*-point integration Gauss formula (large cutoff radius is required). $N = 45$ is enough for the electric and charge-exchange excitations in nuclei with $A \leq 208$. Matrix dimensions never exceed $8N+4$ x $8N+4$ independently of the configuration space size

The p-h and p-p matrix elements are written in a separable form

$$V^{(ph)}_{\alpha\alpha b\beta} = \sum_{n,n'=1}^{2N+2} \kappa^{(nn')} d^{(n)}_{\alpha\alpha} d^{(n')}_{b\beta}$$

$$V^{(ph)}_{\alpha\alpha b\beta} = \sum_{n,n'=2N+3}^{4N+2} \kappa^{(nn')} d^{(n)}_{\alpha\alpha} d^{(n')}_{b\beta}$$

$$T_{LJM}(\hat{r},\sigma) = [Y_L \times \sigma]_{JM}$$

n	$d^{(n)}_{a\alpha}$
1 ≤ n ≤ N	$\langle a\|T_{01}\|\alpha\rangle \omega_a(r_n)\omega_\alpha(r_n)$
N + 1 ≤ n ≤ 2N	$-\langle a\|T_{21}\|\alpha\rangle \omega_a(r_n)\omega_\alpha(r_n)$
2N + 1	$-\langle a\|T_{21}\|\alpha\rangle \int_0^\infty dr\, \omega_a(r)\omega_\alpha(r) r^2$
2N + 2	$\langle a\|T_{01}\|\alpha\rangle \int_0^\infty dr\, \omega_a(r)\omega_\alpha(r)$
2N + 3 ≤ n ≤ 3N + 2	$\langle a\|T_{01}\|\alpha\rangle \omega_a(r_n)\omega_\alpha(r_n)$
3N + 3 ≤ n ≤ 4N + 2	$-\langle a\|T_{21}\|\alpha\rangle \omega_a(r_n)\omega_\alpha(r_n)$

np-QRPA equations can be rewritten as follows $\begin{pmatrix} M_1 - I & M_2 \\ M_2^T & M_3 - I \end{pmatrix} \begin{pmatrix} D^{(ph)} \\ D^{(pp)} \end{pmatrix} = 0$

$$D^{(ph/pp)} = \begin{pmatrix} D_+^{(ph/pp,n)i} \\ D_-^{(ph/pp,n)i} \end{pmatrix}$$

$$D_\pm^{(ph,n)i} = \sum_{a\alpha} d_{a\alpha}^{(n)} u_{a\alpha}^{(\pm)} (X_{a\alpha}^i \pm Y_{a\alpha}^i)$$

$$D_\pm^{(pp,n)i} = \sum_{a\alpha} d_{a\alpha}^{(n)} v_{a\alpha}^{(\pm)} (X_{a\alpha}^i \mp Y_{a\alpha}^i)$$

$$X_{a\alpha}^i = \frac{1}{2} \frac{1}{\epsilon_{a\alpha} - E_i} \left[\sum_{n,n'=1}^{2N+2} \kappa^{(nn')} d_{a\alpha}^{(n')} \left(u_{a\alpha}^{(+)} D_+^{(ph,n)i} + u_{a\alpha}^{(-)} D_-^{(ph,n)i} \right) + \sum_{n,n'=3N+3}^{4N+2} \kappa^{(nn')} d_{a\alpha}^{(n')} \left(v_{a\alpha}^{(+)} D_+^{(pp,n)i} + v_{a\alpha}^{(-)} D_-^{(pp,n)i} \right) \right]$$

$$Y_{a\alpha}^i = \frac{1}{2} \frac{1}{\epsilon_{a\alpha} + E_i} \left[\sum_{n,n'=1}^{2N+2} \kappa^{(nn')} d_{a\alpha}^{(n')} \left(u_{a\alpha}^{(+)} D_+^{(ph,n)i} - u_{a\alpha}^{(-)} D_-^{(ph,n)i} \right) - \sum_{n,n'=3N+3}^{4N+2} \kappa^{(nn')} d_{a\alpha}^{(n')} \left(v_{a\alpha}^{(+)} D_+^{(pp,n)i} - v_{a\alpha}^{(-)} D_-^{(pp,n)i} \right) \right]$$

$$M_1 = \begin{pmatrix} M_{1+}^{nn'} & M_{10}^{nn'} \\ M_{10}^{nn'} & M_{1-}^{nn'} \end{pmatrix}$$

$$M_2 = \begin{pmatrix} M_{2+}^{nn'} & M_{2(+-)}^{nn'} \\ M_{2(\mp-)}^{nn'} & M_{2-}^{nn'} \end{pmatrix}$$

$$M_3 = \begin{pmatrix} M_{3+}^{nn'} & M_{30}^{nn'} \\ M_{30}^{nn'} & M_{3-}^{nn'} \end{pmatrix}$$

$$M_{1\pm}^{nn'} = \sum_{a\alpha} \chi_{a\alpha}^{nn'} \left(u_{a\alpha}^{(\pm)} \right)^2 \epsilon_{a\alpha} \qquad M_{10}^{nn'} = \sum_{a\alpha} \chi_{a\alpha}^{nn'} u_{a\alpha}^{(+)} u_{a\alpha}^{(-)} E_i$$

$$M_{2\pm}^{nn'} = \sum_{a\alpha} \chi_{a\alpha}^{nn'} u_{a\alpha}^{(\pm)} v_{a\alpha}^{(\pm)} E_i \qquad M_{2(\pm\mp)}^{nn'} = \sum_{a\alpha} \chi_{a\alpha}^{nn'} u_{a\alpha}^{(\pm)} v_{a\alpha}^{(\mp)} \epsilon_{a\alpha}$$

$$M_{3\pm}^{nn'} = \sum_{a\alpha} \chi_{a\alpha}^{nn'} \left(v_{a\alpha}^{(\pm)} \right)^2 \epsilon_{a\alpha} \qquad M_{10}^{nn'} = \sum_{a\alpha} \chi_{a\alpha}^{nn'} v_{a\alpha}^{(+)} v_{a\alpha}^{(-)} E_i$$

$$\chi_{a\alpha}^{nn'} = \sum_{n''} \frac{\kappa^{(n'n'')}}{\epsilon_{a\alpha}^2 - E_i^2} d_{a\alpha}^{(n'')} d_{a\alpha}^{(n)}$$

E.O. Sushenok, A. P. Severyukhin, N.N.Arsenyev, I.N. Borzov, JINR preprint №P4-2016-77 (Dubna, 2016)
E. O. Sushenok, A. P. Severyukhin, N. N. Arsenyev, I.N. Borzov, Phys. Atom. Nucl. **81** (1), 24–31 (2018)

PHONON-PHONON COUPLING

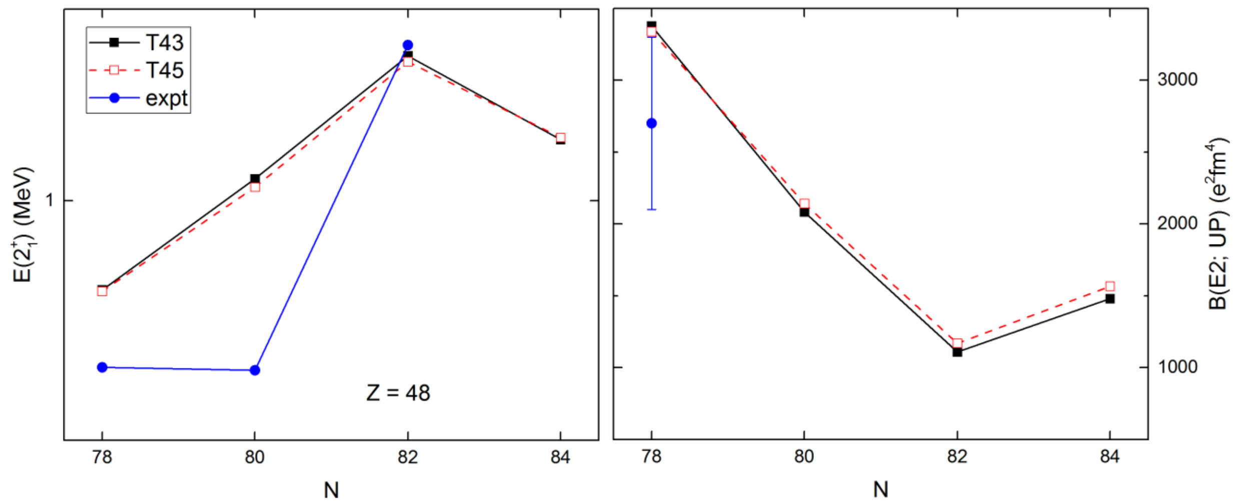
We construct the wave functions from a linear combination of one-phonon and two-phonon configurations

$$\Psi_\nu(JM) = \left(\sum_i R_i(J\nu) Q^\dagger_{JMi} + \sum_{\lambda_1 i_1 \lambda_2 i_2} P^{\lambda_1 i_1}_{\lambda_2 i_2}(J\nu)\left[Q^\dagger_{\lambda_1 \mu_1 i_1} \bar{Q}^\dagger_{\lambda_1 \mu_1 i_1}\right]_{JM}\right)|0\rangle$$

The normalization condition for the wave functions is $\sum_i R_i^2(J\nu) + \sum_{\lambda_1 i_1 \lambda_2 i_2} \left(P^{\lambda_1 i_1}_{\lambda_2 i_2}(J\nu)\right)^2 = 1$

The wave functions $Q^+_{\lambda\mu i}|0\rangle$ of the one-phonon Gamow-Teller states of the daughter $(N-1, Z+1)$ nucleus are described as a linear combinations of 2QP configurations; $\bar{Q}^+_{\lambda\mu i}|0\rangle$ is a one-phonon 2⁺ excitation of the parent (N, Z) nucleus.

All one- and two-phonon configurations with the excitation energy of the daughter nucleus up to 16 MeV are included



A.P. Severyukhin, N.N. Arsenyev , I.N. Borzov,, and E.O. Sushenok, Phys Rev C **90**, 044320 (2014)

BETA-DELAYED NEUTRON EMISSION

The β-decay rate is expressed by summing up the probabilities (in units of $^{G_A}/_{4\pi}$) of the energetically allowed transitions ($E_k^{GT} \leq Q_\beta$) weighted with the integrated Fermi function:

$$G_A/G_V = 1.25$$
$$D = 6147 \text{ s}$$

J. Suhonen, From Nucleons to Nucleus (Springer-Verlag, Berlin, 2007)

$$T_{1/2}^{-1} = D^{-1}\left(\frac{G_A}{G_V}\right)^2 \sum_k f_0(Z+1, A, E_k^{GT}) B(GT)_k$$

$$E_k^{GT} = Q_\beta - E_{1_k^+}$$

$$E_{1_k^+} \approx E_k - E_{2qp,lowest}$$

1_k^+ eigenvalues of the np-QRPA (PPC) eq.

1_k^+ state of (N-1, Z+1) daughter nucleus

The β-decay and subsequent neutron emission processes justifies an assumption of their statistical independence. The P_{xn} probability of the βxn emission accompanying the β-decay to the excited states in the daughter nucleus can be expressed as

$$P_{xn} = T_{1/2} D^{-1}\left(\frac{G_A}{G_V}\right)^2 \sum_{k'} f_0(Z+1, A, E_{k'}^{GT}) B(GT)_{k'}$$

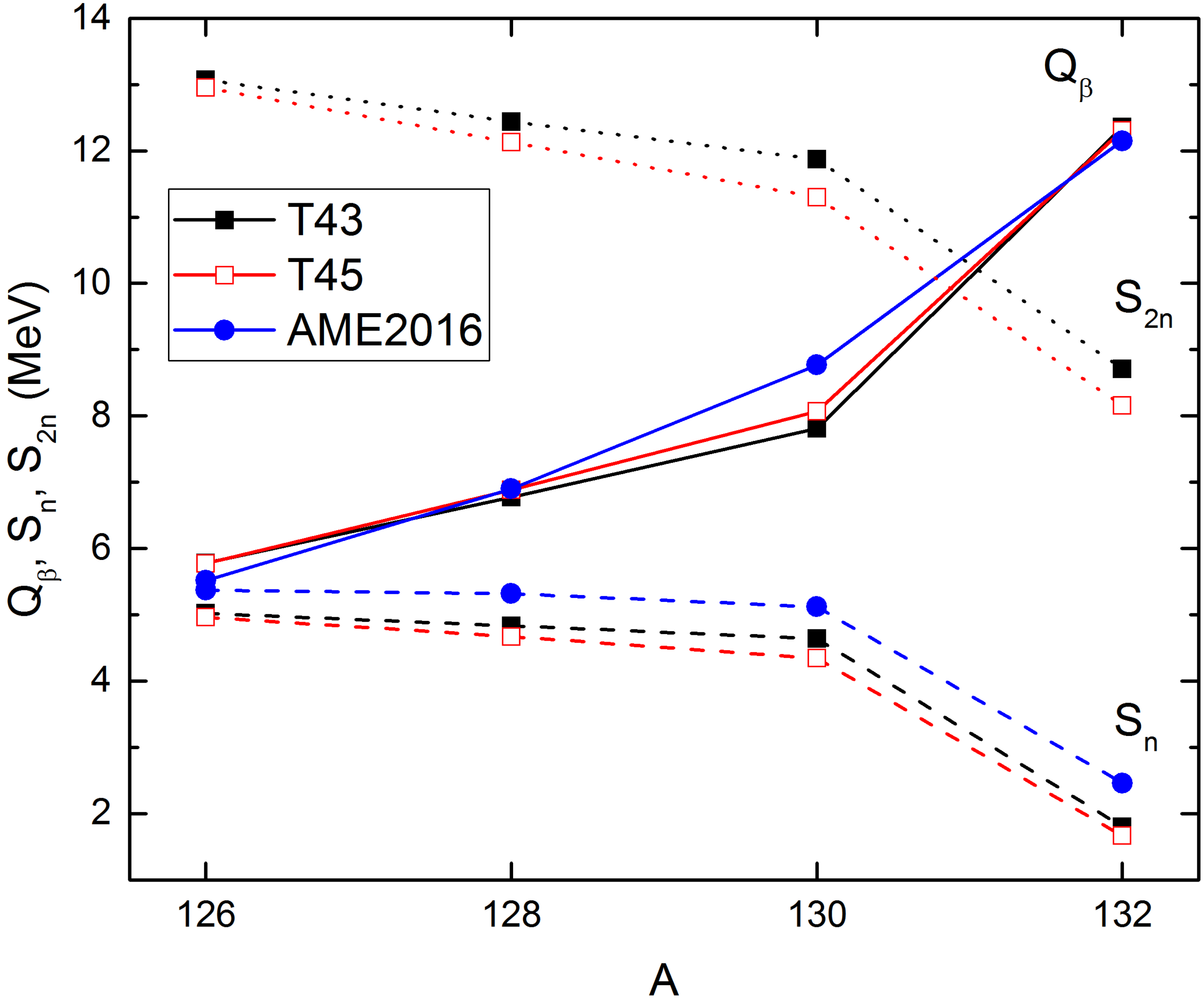
where the GT transition energy ($E_{k'}^{GT}$) is located within the neutron emission window

For one-neutron emission: $Q_{\beta 2n} \leq E_{k'}^{GT} \leq Q_{\beta n}$ where $Q_{\beta xn} \equiv Q_\beta - S_{xn}$

I.N. Borzov, Phys Rev C **71**, 065801 (2005)

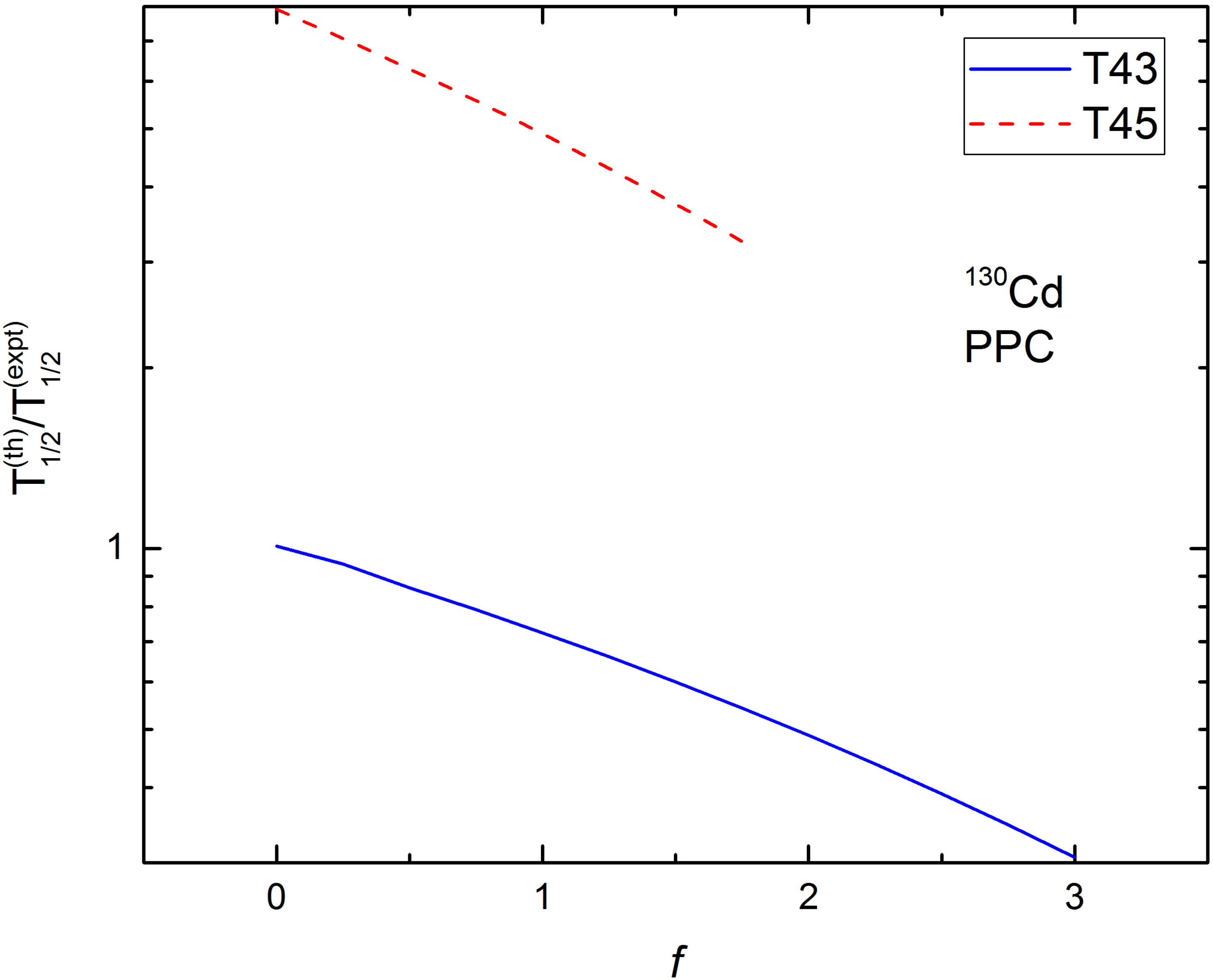
A.P. Severyukhin, N.N. Arsenyev, I.N. Borzov, E.O. Sushenok, Phys Rev C **95**, 034314 (2017)

Q_β-VALUES OF $^{126-132}$CD AND S_n, S_{2n} OF $^{126-132}$IN



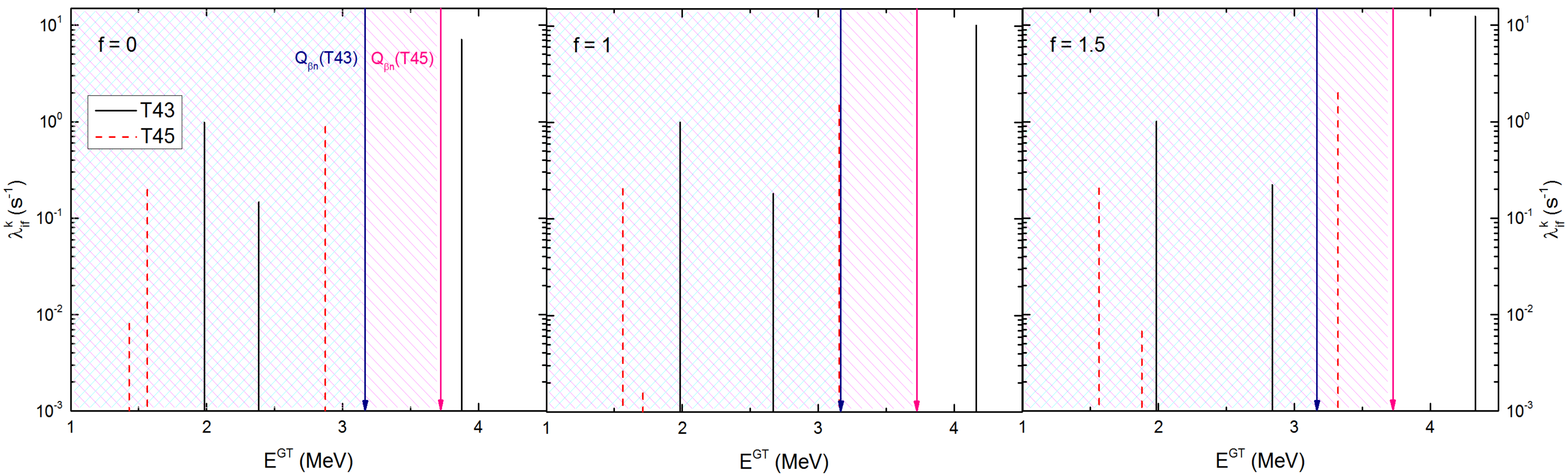
A.P. Severyukhin, N.N. Arsenyev, I.N. Borzov, E.O. Sushenok, Phys Rev C **95**, 034314 (2017)

THE IMPACT OF THE NEUTRON-PROTON INTERACTION IN PP CHANNEL ON HALF-LIFE



E.O. Sushenok, A.P. Severyukhin, N.N. Arsenyev, I.N. Borzov, in preparation (2018)

BETA-DECAY RATES OF ^{130}CD

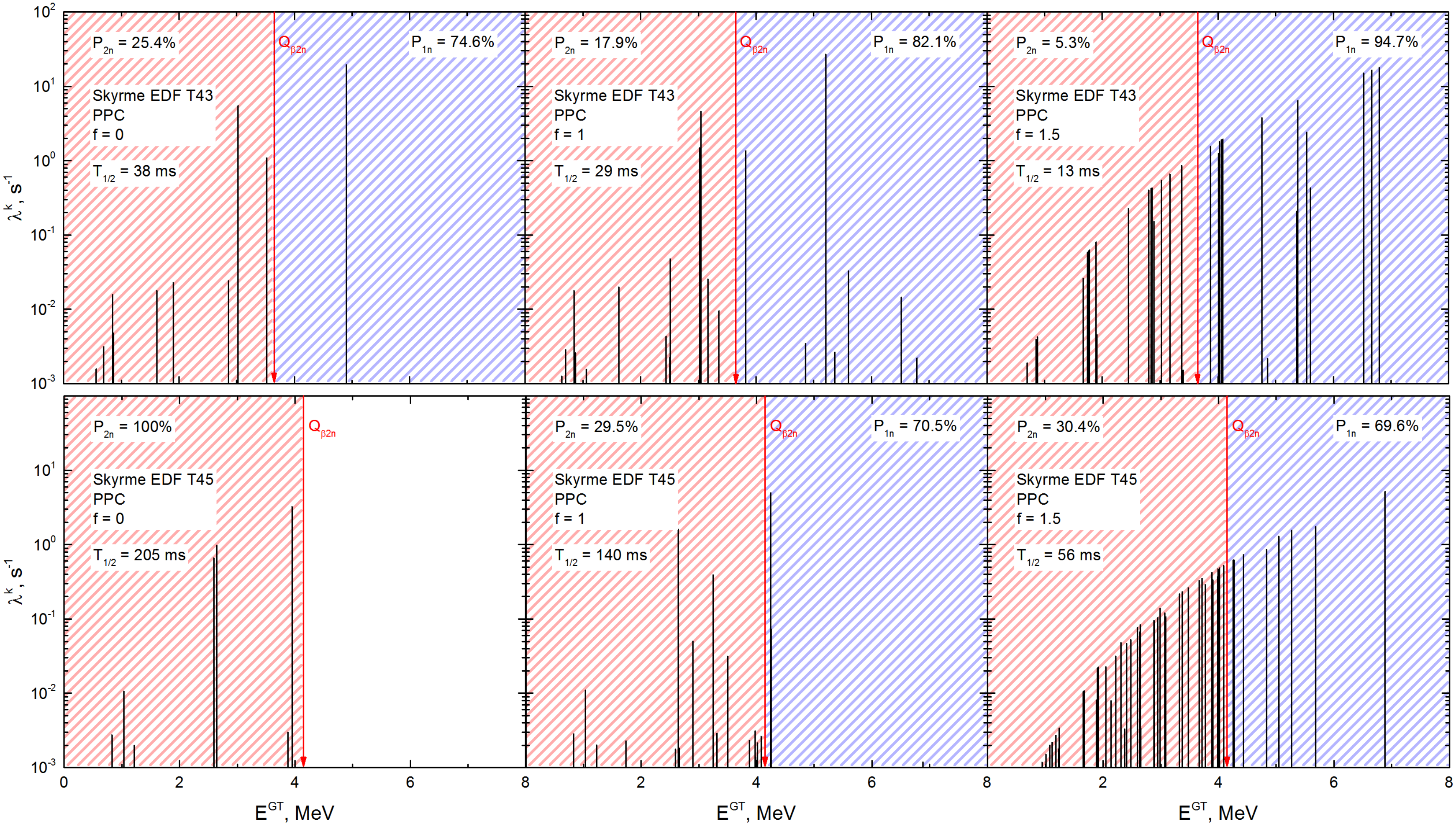


	T43		T45		Expt.	
	$T_{1/2}$, ms	$P_{n,tot}$, %	$T_{1/2}$, ms	$P_{n,tot}$, %	$T_{1/2}$, ms	$P_{n,tot}$, %
f = 0	121	13.5	921	100	127(2)	3.5(1)
f = 1	89	10.5	588	100		
f = 1.5	74	9.1	454	100		

Expt.: G. Lorusso, S. Nishimura, Z.Y. Xu, A. Jungclaus et al., Phys Rev Lett **114**, 192501 (2015)

E.O. Sushenok, A.P. Severyukhin, N.N. Arsenyev, I.N. Borzov, in preparation (2018)

BETA-DECAY REATES OF ^{132}CD



E.O. Sushenok, A.P. Severyukhin, N.N. Arsenyev, I.N. Borzov, in preparation (2018)

THE EFFECT OF PARTICL-PARTICLE CHANNEL

Cd	Without pp channel		With pp channel		Expt.	
	$T_{1/2}$, ms	$P_{n,tot}$, %	$T_{1/2}$, ms	$P_{n,tot}$, %	$T_{1/2}$, ms	$P_{n,tot}$, %
126	265	< 0.1	166	< 0.1	513(6) 476(60)*	0.015(4)*
128	181	7.1	123	3.7	245(5)	
130	121	13.5	88	10.5	127(2)	3.5±1.0
132	38	74.8	29	82.0	82(4)	60±15

Expt.: G. Lorusso, S. Nishimura, Z.Y. Xu, A. Jungclaus et al., Phys Rev Lett **114**, 192501 (2015)
* D. Testov et al., in preparation (2018)
E.O. Sushenok, A.P. Severyukhin, N.N. Arsenyev, I.N. Borzov, JINR preprint №P4-2017-40 (Dubna, 2017)

SUMMARY

- The role of the tensor and pairing interactions in the description of beta-decay characteristics and multi-neutron emission of the neutron-rich Cd isotopes is studied within QRPA with the Skyrme interaction. The coupling between one- and two-phonon terms in the wave functions of the low-energy 1^+ states of the daughter nuclei is taken into account.
- It is shown that the competition of taking into account tensor interaction and neutron-proton pairing interaction has a substantial effect on the distribution of the Gamow–Teller transition strength. Decrease of the strength of neutron-proton tensor interaction results in the increase of the effect of neutron-proton pairing on the beta-decay characteristics of neutron-rich nuclei

THANK YOU