Recent nuclear decay and structure data research at Jilin University

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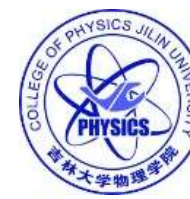
For last year, three relative works have been done under the funding support in China:

1. Decay data evaluation for CENDL-DDL database of CNDC

2. Systematics study for the ground states' spin of odd-Z nucleus;

3. Statistical analysis of half-lives measurement results (in process)
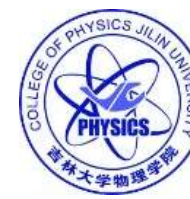
1. Decay data Evaluation for CENDL-DDL database

➢ **22 nuclides' decay data has reevaluated and submitted to the CENDL-DDL 1.0 decay database of CNDC.**

➢ **Some differeneces compared with the ENSDF for several nuclides:**
   1. New measurements;
   2. Adopted only the latest measurement from one laboratory;
   3. Not just used the newest measurement as the recommended value;
   3. Normalization factor: strong-intensity γ-rays feeding the ground state with large ICC will bring large uncertainty for calculation so the measured value is preferred;
   4. Other considerations about physics and measurement method.

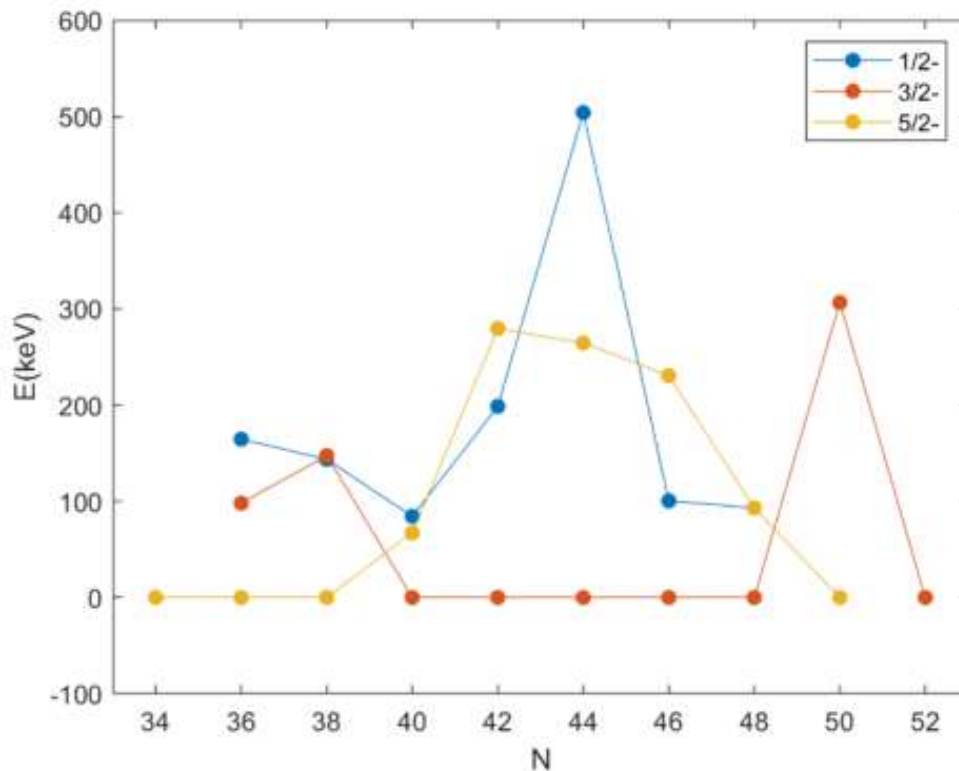## 2. Systematics study for the ground states' spin

Fig1. Low-lying levels of odd-Z As isotopes

➤ **Purpose：**

   1. Provide more informtion to support the spin assignment for which lackes the measurement;

   2. Help to get better understanding of the nuclear structure properties;

➤ **Target：odd-Z nuclides with Z=25 to Z=67;**

➤ **Work:**

   1. Systematical comparision as in Fig. 1;

   2. Physical analysis: orbitals of the valence particles and nulear deformation;

➤ **3. Theoretical calculation: Shell model and covariant density functional theory (CDFT) calculation.**

2. Systematics study for the ground states' spin

➢ **Conclusion: discussion finally focused on about thirty nuclides for spin assingment and physical invesitigation, and results have summarized for publications.**
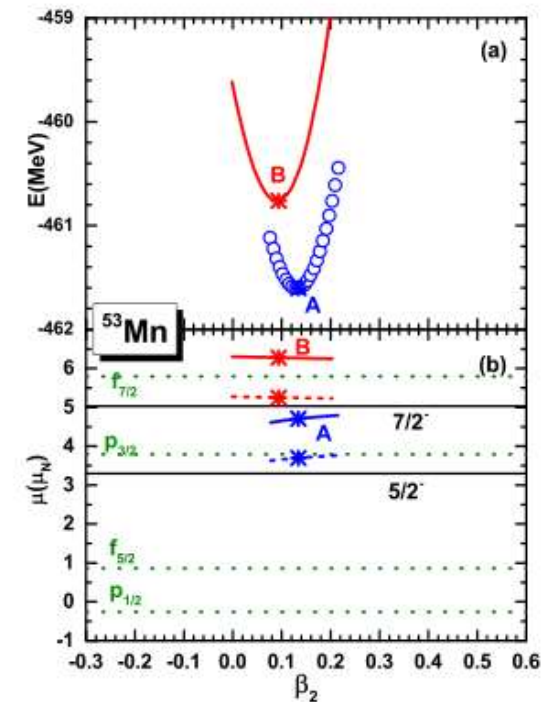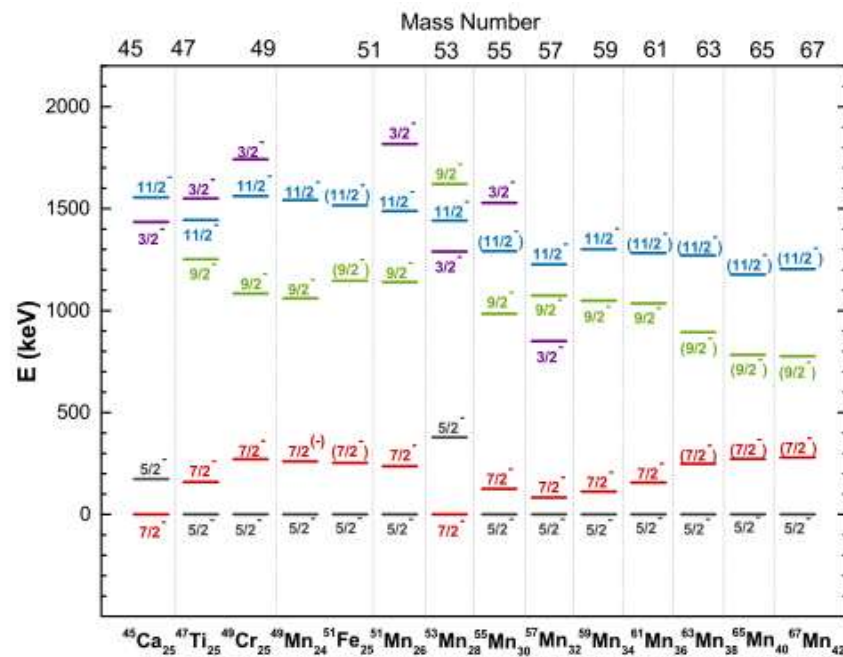
"Low-lying state investigations of odd-A Mn isotopes around N = 28", (Submitted to PRC)

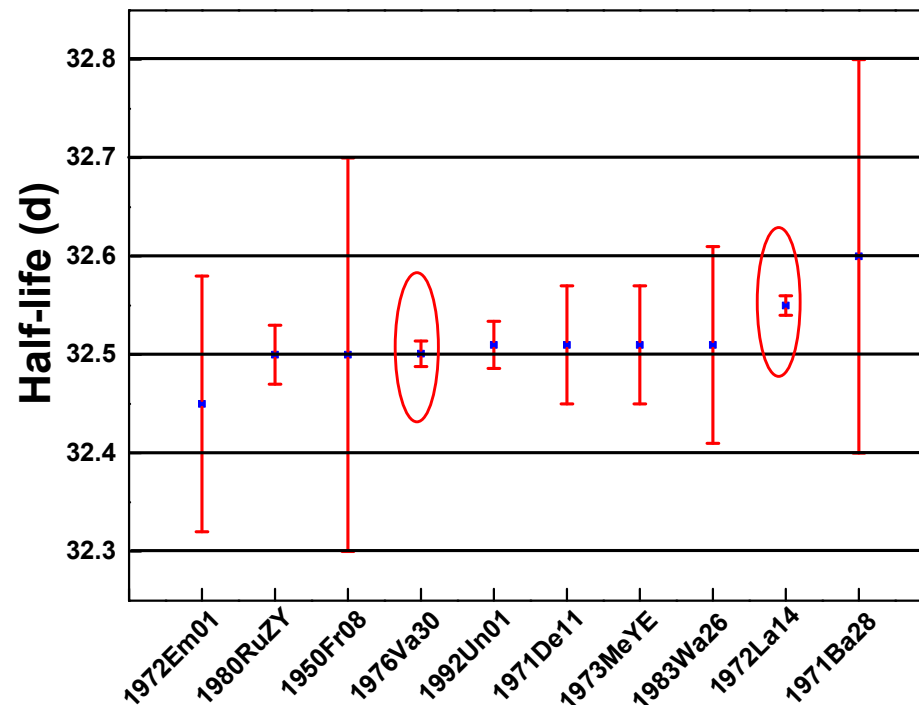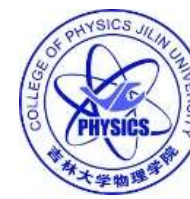# 3. Statistical analysis of half-lives measurement (in process)

Fig. Measured ^{141}Ce half-lives and uncertanties

Purpose：

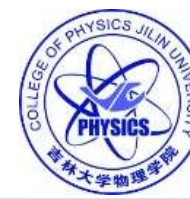➢ **The 1972La14 measurement is higher than most others and with a very small uncertainty. Thanks for the 1976Va30 measurement, the final calculated recommended value is consistent with the most measurements;**

➢ **Proper uncertainty can ensure the reasonable weight estimation, and hence more suitable recommended value;**

➢ **Underestimation of the uncertainty?**

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3. Statistical analysis of half-lives measurement (in process)

➢ **Idea:** To systematically review the half-life measurements and analyze the data by different analysis methods to check whether there is statistical character in measurement results;

➢ **target：** nuclides of half-lives ranging from nearly one days to a few years

➢ **work：**

1. build the proper sample set with the same distribution, considering method, equipment (detector and aquisition system), time, lab (time consuming but the data amount still not big enough!);

2. covariance analysis or machine learning.

➢ **What do we expect:**

1. a lower-limit of the systemaic error or a method separating the systemaic error and statistical uncertainty?

2. At least, getting better understanding of the half-life data measurement will definitely benifit for the evaluation.

Thank you