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**Van Vleck paramagnets – new features in comparison of LiTmF₄
and Li(Tm_{0.02}Y_{0.98})F₄: NMR study**

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Both of the Li(Tm_{0.02}Y_{0.98})F₄ and LiTmF₄ are Van Vleck paramagnets (VVP). They have a singlet ground state and the nearest excited doublet state of the ground multiplet in a paramagnetic rare-earth ion [1]. Van Vleck paramagnets could be researched by NMR method due to a gigantic induced magnetic field at the rare-earth nucleus as a consequence of strong hyperfine interaction. We reported the study of ¹⁶⁹Tm nucleus in diluted single crystal VVP Li(Tm_{0.02}Y_{0.98})F₄ in comparison with our the newest obtained data of LiTmF₄.

Van Vleck paramagnets LiTm_{0.02}Y_{0.98}F₄ and LiTmF₄ both have a tetragonal structure of scheelite (CaWO₄) with a space group C_{4h}⁶ [2]. NMR studying of VVP single crystals were carried out by pulse home-built spectrometer. Magnetic field range was 0–0.8 T, working frequencies were 14.15 MHz, 8.43 MHz and 8.16 MHz, temperature range was 2–4.2 K.

As a result of a series of experiments, an anisotropy of the spin-spin relaxation rate (T_2^{-1}) close to the direction [001] were measured and calculated for both VVP single crystals Li(Tm_{0.02}Y_{0.98}F₄) and LiTmF₄. Angular dependence of a spin-lattice relaxation rate (T_1^{-1}) were measured for a diluted VVP Li(Tm_{0.02}Y_{0.98}F₄). The inhomogeneous linewidth was obtained for the Li(Tm_{0.02}Y_{0.98}F₄) and compared with a results for concentrated VVP LiTmF₄.

Temperature dependencies of T_1^{-1} and T_2^{-1} were measured for the Li(Tm_{0.02}Y_{0.98}F₄). Energy interval between the singlet ground state and first excited doublet state was obtained from approximation of experimental results and reached 25.9±0.2 cm⁻¹ in approach of two-phonon Aminov-Orbach relaxation process. It is markedly different from previously known value for the concentrated LiTmF₄ which was 31 cm⁻¹ [3]. According to this result, we assumed different roots of correlation time in cases of diluted Li(Tm_{0.02}Y_{0.98}F₄) and concentrated Van Vleck paramagnets LiTmF₄.

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TABLE OF CONTENTS

Table of contents

Program	3
Proceedings	5
<u>G.A. Bochkin</u>, E.B Fel'dman, S.G.Vasil'ev , MQ NMR dynamics in an inhomogeneous spin chain.....	5
S.I. Doronin, E.B. Fel'dman, <u>I.D. Lazarev</u> , Skew Wigner-Yanase information and its extensions in MQ NMR spectroscopy.....	6
<u>S.A. Lopatina</u>, A.R. Khisameeva, G.A. Nikolaev, A.V. Shchepetilnikov, I. V. Kukushkin , Spin and isospin properties of two-dimensional semiconductor structures.....	7
<u>G.A. Nikolaev</u>, A.R. Khisameeva, S.A. Lopatina, A.V. Shchepetilnikov, I.V. Kukushkin , Anomalous spin resonance around even fillings in a strongly correlated 2D electron system.....	8
<u>M. Smirnov</u>, R. Khrolenko, G. Kupriyanova , Application of high-resolution ¹ H NMR for the research of various types of vegetable oils.....	9
<u>M.V. Stepushkin</u>, A.V. Zdoroveishchev, A.G. Temiryazev, M.P. Temiryazeva , Influence of a change in the domain structure on the Hall effect in CoPt thin films.....	11
<u>N. Snegirev</u>, I. Lyubutin, M. Chuev, S. Starchikov, S. Yagupov, M. Strugatsky , Singularity of a hyperfine structure in Mössbauer spectra under combined magnetic dipole and electric quadrupole interaction.....	12
<u>A.Yu. Germov</u>, D.A. Prokopyev, K.N. Mikhalev, S.P. Savchenko, E.V. Suvorkova , Hyperfine fields in ferromagnetic nanoparticles according to NMR data in a local field...14	14
<u>Yu. N. Koemets</u>, N. V. Kazantseva, I. V. Ezhov, D. I. Davydov, D. A. Shishkin , Effect of strain rate on magnetic transformation of L-Pbf medical steel 316L.....	15
<u>A.A. Seryapina</u>, A.A. Malyavko, Y.K. Polityko, A.L. Markel , Search for metabolic markers of essential arterial hypertension in rats.....	16
<u>Yu. Slesareva</u>, Yu. Kandrashkin, R. Zaripov, T. Ruffer, E. Vavilova , Transient phenomena in multi-pulse protocols in solid-state ¹ H NMR in Cu- and Ni--oxamidato complexes.....	17
<u>D.V. Shurtakova</u>, F.F. Murzahanov, G.V. Mamin , Calculated and experimental the EPR spectra parameters of impurity centers in tricalcium phosphate.....	18
<u>K. R. Mirsalimova</u>, A. M. Kusova, Yu. F. Zuev , Crowding-agents influence on BSA translational diffusion by pulsed field gradient NMR.....	20
<u>A.S. Parfishina</u>, A.V. Egorov, A.G. Kiiamov, S.L. Korableva, D.S. Nuzhina, A.A. Rodionov, I.V. Romanova, K.R. Safiullin, M.S. Tagirov , Van Vleck paramagnets – new features in comparison of LiTmF ₄ and Li(Tm _{0.02} Y _{0.98})F ₄ : NMR study.....	21
<u>R.F. Likerov</u>, R.B. Zaripov, V.A. Shustov, I.V. Yatsyk, K.B. Konov, R.M. Eremina , The CW EPR and pulsed EPR studies of the ⁵¹ V ⁴⁺ ions in Sc ₂ ²⁸ SiO ₅	22
<u>D.V. Popov</u>, I.V. Yatsyk, E.M. Moshkina, R.M. Eremina , ESR measurements of ludwigite Mn _{1.17} Co _{1.83} BO ₅	23