$^7$Li NMR Study of Magnetic Defects in Heavy Fermion LiV$_2$O$_4$\(^1\)
($n \approx 0.7$ mol\%) of magnetic defects within the normal spinel structure of heavy
fermion LiV$_2$O$_4$ was recently found to have a strong effect on the $^7$Li NMR at low
temperatures $T < 4.2$ K.(1) The $^7$Li nuclear magnetization relaxation versus time
after saturation, $M(t)$, changed from a pure exponential in a pure sample with $n = 0.01$ mol\%
to a stretched exponential for $n = 0.7$ mol\%. Here we present a systematic
study of the variations of the $^7$Li NMR versus $n$ for additional $n$ values from 0.05
to 0.8 mol\%. Non-exponential $M(t)$ recovery was consistently obtained for samples
with $n \geq 0.2$ mol\% and the nuclear spin lattice relaxation rate versus temperature
evolved monotonically with increasing $n$, consistent with the interpretation in Ref.
(1). In addition, we obtained relaxation data for much shorter times than studied
in Ref. (1), which indicate a previously unknown initial $M(t) \propto \sqrt{t}$ dependence for
all samples with $n \geq 0.5$ mol\%, for times $t < 20$ ms. At present, there exists no
microscopic theory for the influence of magnetic defects on our $^7$Li NMR results.
Phenomenological models that may help to understand the data will be discussed.

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