# High-Field NMR Study of the Spin Fluctuations in High-Tc Iron Based Superconductors

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## Introduction

Since the discovery of high transition temperature (Tc) superconductivity (SC) in iron pnictide superconductors, it has been an important issue to elucidate the relationship between the normal-state properties and superconductivity. The proximity of superconductivity to an antiferromagnetic (AF) phase strongly suggests the interplay between the two ground states. Previous nuclear magnetic resonance (NMR) proved that superconductivity can even arise in antiferromagnetically ordered state in underdoped regime.[1,2] In optimally-doped regime, although AF order disappears, there are strong AF spin fluctuations.[3] In this work, we perform high field NMR measurements to study how the spin fluctuations are affected by the magnetic field in order to gain insight into the relationship between spin fluctuations and superconductivity.

## Experimental

The single crystals of $Ba_{1-x}K_xFe_2As_2$ were grown by using the self-flux method. The sample with x=0.28 (Tc =36 K) was selected for NMR measurements. $^{75}$As-NMR measurements are carried out at high magnetic fields up to 45 T by using the Hybrid magnet in the National High Magnetic Field Laboratory, Tallahassee, Florida.

## Results and Discussion

Figure 1 shows the spin lattice relaxation rate as a function of temperature via $^{75}$As-NMR at 45T. Comparison to the results at low field reveals that the spin fluctuations are enhanced by the high magnetic field. It suggests that the energy of the spin fluctuations is much lower than in the cuprates where $1/T_1$ does not depend on the strength of the magnetic field. This paves a way to studying the normal state of this new class of materials with an additional control parameter, namely, the magnetic field.

## Conclusions

We performed high magnetic field NMR measurements on the hole-doped iron-based superconductor $Ba_{1-x}K_xFe_2As_2$. Our results indicate that high magnetic fields can be used to tune the electron correlations in this new class of materials.

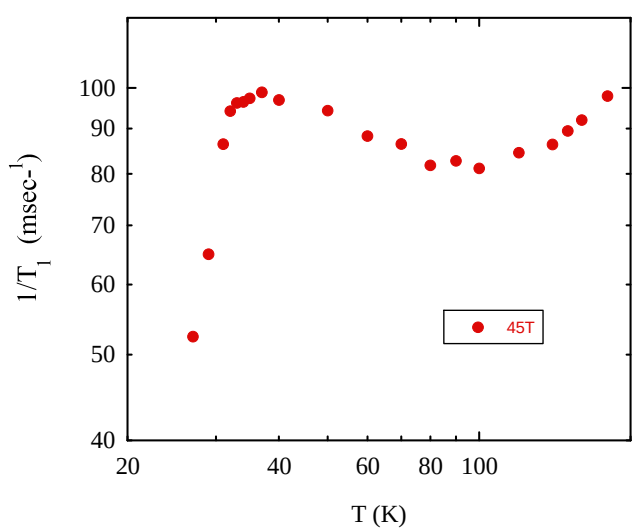


Fig.1 $^{75}$As spin lattice relaxation rate as a function of temperature at 45 T.

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## References

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