

# Muon Spin Relaxation Study on Superconducting Gap Structure of Pr<sub>3</sub>Cr<sub>10-x</sub>N<sub>11</sub>

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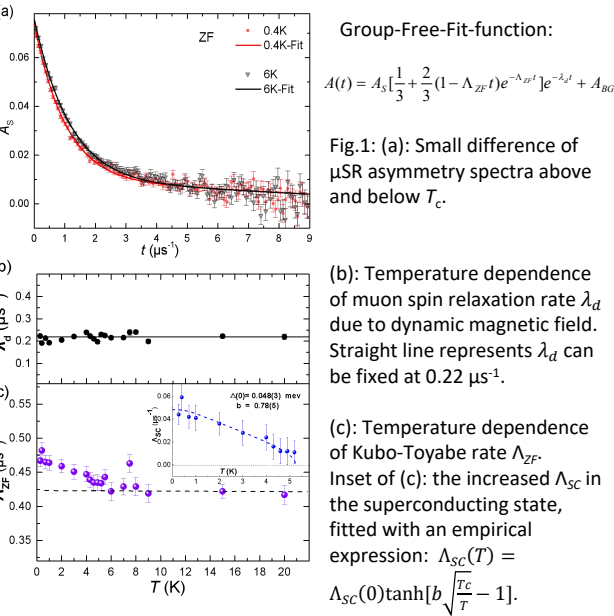


## Motivation

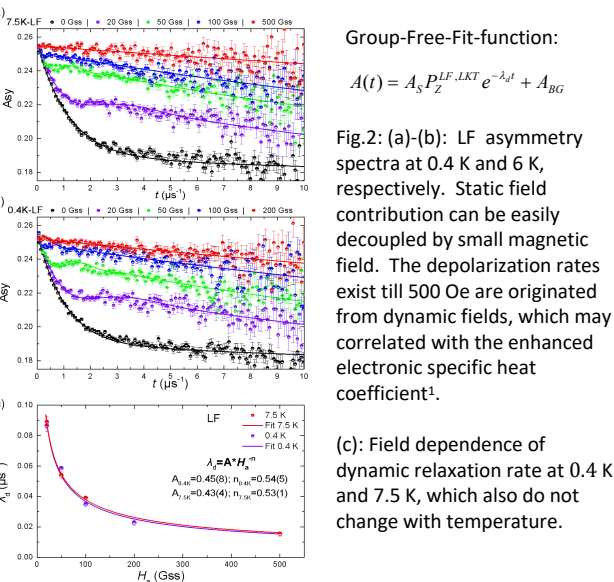
- Cr-based superconductors are rare and all exhibit unconventional properties.
- Recent discovered Pr<sub>3</sub>Cr<sub>10-x</sub>N<sub>11</sub> shows interesting properties, high H<sub>c2</sub> exceeds the Pauli paramagnetic limit, large electronic specific heat coefficient 170 mJ\*K<sup>-2</sup>\*mol<sup>-1</sup> which may correlated with quantum fluctuations.
- Further study on superconducting pairing symmetry of Pr<sub>3</sub>Cr<sub>10-x</sub>N<sub>11</sub> is necessary and the previous-reported novel properties can be crossed-verified.

## ZF/LF μSR experiment

ZF (zero-field) μSR experiments were performed on polycrystals of Pr<sub>3</sub>Cr<sub>10-x</sub>N<sub>11</sub> down to 0.027 K.

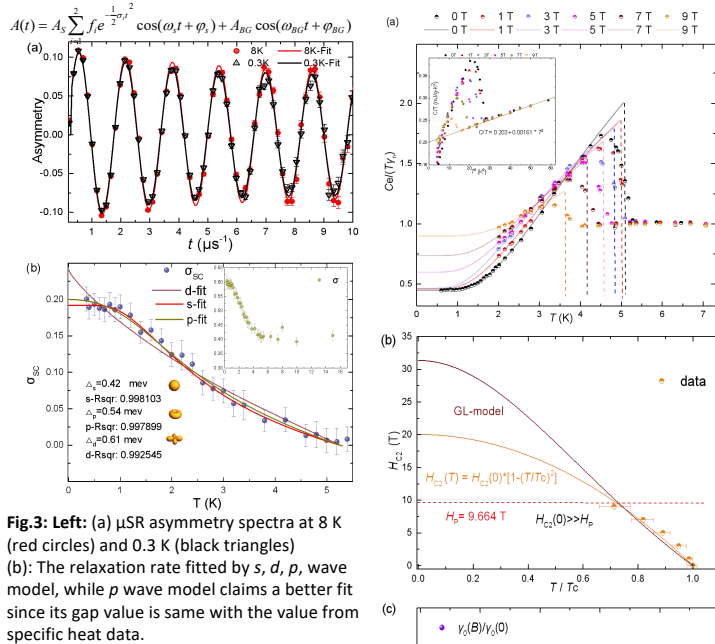


LF (longitudinal-field) μSR experiments were performed at 0.4 K and 7.5 K with different fields.



## Gap Structure Exploration

TF (transverse-field) μSR experiments were measured down to 0.35 K with applied field μ<sub>0</sub>H = 500 Oe.



## Conclusions

- ZF experiments indicate a spontaneous static magnetic field appearing below T<sub>c</sub>, support TRSB in the superconducting state of Pr<sub>3</sub>Cr<sub>10-x</sub>N<sub>11</sub>.
- LF experiments indicate temperature-independent fluctuations exist, which can be related to the enhanced ν<sub>n</sub>.
- TF and specific heat measurements tend to support the p wave parity. The unusual field dependence of ν<sub>0</sub> also indicates a non-BCS mechanism<sup>2</sup>.

### References:

- W Wu, *et al.* "Superconductivity in chromium nitride Pr<sub>3</sub>Cr<sub>10-x</sub>N<sub>11</sub> with strong electron correlations." National Science Review 7.1 (2020): 21-26.
- V K Anand, *et al.* "Specific heat and μSR study on the noncentrosymmetric superconductor LaRhSi<sub>3</sub>." Physical Review B 83.6 (2011): 064522.