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## Polarization Creation in Proton-Rich $^{28}\text{P}$ via Charge Exchange Reactions and Measurement of Its Electric Quadrupole Moment

$\beta$ -NQR of  $^{28}\text{P}$

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oral

### Summary

The degrees of polarization of proton rich nucleus  $^{28}\text{P}$  produced in charge exchange reactions  $^{28}\text{Si} + ^9\text{Be} \rightarrow ^{28}\text{P} + \text{X}$ , and  $^{28}\text{Si} + ^1\text{H} \rightarrow ^{28}\text{P} + \text{X}$  have been observed at 100A MeV. Utilizing thus obtained polarized nuclei,  $\beta$ -nuclear quadrupole resonance ( $\beta$ -NQR) of  $^{28}\text{P}$  implanted in  $\text{Al}_2\text{O}_3$  have been observed for the first time.  $^{28}\text{P}$  is of our present interest, since this nucleus may develop proton halo structure, which may be possible from the rather shallow proton separation energy of 2.065 MeV, and was suggested from the rather large reaction cross section compared with the neighboring nuclei [1]. In our previous study, the magnetic moment of  $^{28}\text{P}$  was determined precisely [2], which showed at least the dominance of the configuration with the  $s_{1/2}$  proton, which may develop proton halo. In the present work, we tried to measure the electric quadrupole moment of  $^{28}\text{P}$ .

The experimental procedure is similar to the previous work [2], the proton-rich  $^{28}\text{P}$  nuclei were produced and were polarized through charge exchange reactions  $^{28}\text{Si} + ^9\text{Be} \rightarrow ^{28}\text{P} + \text{X}$ , and  $^{28}\text{Si} + ^1\text{H} \rightarrow ^{28}\text{P} + \text{X}$ , at 100 A MeV, and were separated by a separator. They were then implanted in a Pt catcher cooled down to 15 K. The degree of polarization was measured by means of NMR utilizing  $\beta$ -ray asymmetric emission. Then the  $^{28}\text{P}$  nuclei were implanted in a single crystal  $\text{Al}_2\text{O}_3$  and the NQR were observed as shown in Fig. 1. The polarization mechanism in these reactions and the quadrupole moment of  $^{28}\text{P}$  will be discussed at the meeting.

#### References

- [1] Liu, Z.Z., Ruan, M., Zhao, Y.L., et al.: Phys. Rev., C 69, 034326 (2004).
- [2] D.M. Zhou et al., Hyperfine Interact. 180, 37(2007); K. Matsuta et al., Nucl. Phys. A805, 359(2008).

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