

Observational study on a free precession for a Magnetar.

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● Abstract

Recently, pulse-phase modulations of X-ray pulsation are found from some strongly magnetized neutron stars (Magnetars). This can be interpreted as the presence of free precession and thus they are deformed to prolate spheroid. We verify these results with independently developed software.

● Reasons and benefits of using JAXA Supercomputer System

In this analysis, we assumed that the X-ray light curve is phase-modulated with a sinusoidal function. An amplitude, period, phase, and some parameters are scanned with brute force to maximize the pulse significance which requires an enormous amount of computation.

Therefore, we aimed to reduce the computation time by using the supercomputer.

● Achievements of the Year

We performed a phase modulation analysis on a prototypical magnetar, SGR 1806-20, and obtained consistent results with those reported by another researcher. The calculation time was sufficiently reduced, and thus a phase-resolved spectrum with the phase modulation solved can possibly be calculated in the future.

● Publications

N/A

● **Usage of JSS**

● **Computational Information**

Process Parallelization Methods	N/A
Thread Parallelization Methods	N/A
Number of Processes	1
Elapsed Time per Case	3 Hour(s)

● **JSS3 Resources Used**

Fraction of Usage in Total Resources*1(%): 0.05

Details

Computational Resources		
System Name	CPU Resources Used (core x hours)	Fraction of Usage *2(%)
TOKI-SORA	1,436,426.67	0.06
TOKI-ST	3.21	0.00
TOKI-GP	0.00	0.00
TOKI-XM	0.00	0.00
TOKI-LM	0.00	0.00
TOKI-TST	0.00	0.00
TOKI-TGP	0.00	0.00
TOKI-TLM	0.00	0.00

File System Resources		
File System Name	Storage Assigned (GiB)	Fraction of Usage* ² (%)
/home	5.00	0.00
/data and /data2	50.00	0.00
/ssd	50.00	0.01

Archiver Resources		
Archiver Name	Storage Used (TiB)	Fraction of Usage* ² (%)
J-SPACE	0.00	0.00

*1: Fraction of Usage in Total Resources: Weighted average of three resource types (Computing, File System, and Archiver).

*2: Fraction of Usage : Percentage of usage relative to each resource used in one year.

● **ISV Software Licenses Used**

ISV Software Licenses Resources		
	ISV Software Licenses Used (Hours)	Fraction of Usage* ² (%)
ISV Software Licenses (Total)	0.00	0.00

*2: Fraction of Usage : Percentage of usage relative to each resource used in one year.