Available online at http://www.journalijdr.com

IJDR

ISSN: 2230-9926

International Journal of Development Research
Vol. 08, Issue, 02, pp.19010-19011, February, 2018

ORIGINAL RESEARCH ARTICLE OPEN ACCESS

THEORETICAL STUDY OF NEUTRON STARS USING CYCLOTRON RESONANCE SCATTERING FEATURES

***Pratyush Ranjan**

Near Buddha Dental College M.G. Nagar Kankarbagh, India

ARTICLE INFO

Article History:

Received 13th November, 2017
Received in revised form
06th December, 2017
Accepted 23rd January, 2018
Published online 28th February, 2018

Key Words:

Neutron stars, CRSF,
Cyclotron Resonance Scattering.

ABSTRACT

Neutron stars and black holes are among the most exotic objects in the universe. Neutron stars are ancient remnants of stars that have reached the end of their evolutionary journey through space and time. Neutron stars comprise one of the possible evolutionary end-points of high mass stars. Neutron stars are thought to form by the gravitational collapse of the remnant of a massive star after a supernova explosion. Magnetic field strength is one of the most important physical parameters of neutron star. In Present paper we have done a comparative study to measure the magnetic field strength of a neutron star. Present Paper is the theoretical Study of Neutron Stars using Cyclotron Resonance Scattering Features (CRSF) as cyclotron re-emitting processes is equal to scattering and one might expect Cyclotron Resonant Scattering Features as absorption in the spectrum.

Citation: Pratyush Ranjan, 2018. "Theoretical Study of Neutron Stars using Cyclotron Resonance Scattering Features", *International Journal of Development Research*, 8, (02), 19010-19011.

INTRODUCTION

Generally a neutron star consist of mass 1.5 to 2 mass of the sun and it's radius range is about 10−15 km. the spin frequency range is up to 1 kHz and a magnetic field up to 10^{15} G or more (Baym *et al*., 1971). Its surface gravity is around 2-3× 10^{14} cm s−2, so mountains of even perfect crystals can't be higher than < 1 mm, meaning that these are the smoothest surfaces in the universe (Clayton, 1982). Neutron stars comprise one of the possible evolutionary end-points of high mass stars. Neutron stars are thought to form by the gravitational collapse of the remnant of a massive star after a supernova explosion. Magnetic field strength is one of the most important physical parameters of neutron star(Iwazaki, 2005). In this conference present paper deals the theoretical Study of Neutron Stars using Cyclotron Resonance Scattering Features (CRSF) as cyclotron re-emitting processes is equal to scattering and one might expect Cyclotron Resonant Scattering Features as absorption in the spectrum (Trumper, 1978)

Theory and analysis

In past years there are lot of observation and measurements are taken by the physicists.

****Corresponding author:*** **Pratyush Ranjan,**
Near Buddha Dental College M.G. Nagar Kankarbagh, India.

According to measurement analysis on a X-ray observation, in which the star's spectrum shows 3 different features, regularly spaced at .7, 1.4 and 2.1 keV, plus a fourth, lower significance one, at 2.8 keV. Such features vary in phase with the star rotation (Hercules, 1978; Mori, 2003) Cyclotron resonant absorption is their logical interpretation, yielding a magnetic field strength of about 8 to10^{10} G for electrons. This is the first direct measure of an isolated neutron star magnetic field. As per previous work the cyclotron re-emitting processes is equal to scattering and one might expect Cyclotron Resonant Scattering Features (CRSF) as absorption in the spectrum(Bignami *et al*., 2003). In this work, we focused on 4U0115+63 to find CRSFs on its spectrum.We have analysed the spectrum, using approach high-energy cut-off with power-law on previously available data (White *et al*., 1983).

Adding only one CRSF with Lorentz profile (Makishima *et al*., 2002)

$$exp^{\left[-D\frac{(WE/E_{cyclotron})^2}{(E-E_{cyclotron})^2+W^2}\right]}$$

We compared the different values for X-Ray Transient say X-Ray pulsar. The comparative values are as given below in Table1 (White, 1983, Coburn, 2002).

In this table we have shown different CRSFs. Some of these sources, their spin period, orbital period, fundamental CRSF $E_{cyclotron}$

Table 1.

S. No.	X-Ray Transient	P_{Spin}	P_{Orbit} (Day)	Cyclotron Energy(KeV)	$B(1+Z)^{-1}(10)^{12}$ G
1	4U0115+63	3.6	24.3	11.5	1
2	4U0352+309	837	250	28.6	2.5
3	4U1538−52	529	3.73	20.7	1.8
4	4U1626−67	7.67	0.0298	39.3	3.4
5	4U1907+09	439	8.37	18.3	1.6
6	V0332+53	4.37	34.25	25.2	2.2
7	A0535+26	103	111	48.5	4.2
8	J1946+274	15.8	169.2	34.9	3
9	GX304−1	275.5	132.5	53.7	4.6
10	Cep X-4	66.3	20.8	30.7	2.6
11	Her X-1	1.24	1.7	34.7	3

RESULTS AND DISCUSSION

These inharmonic features may not be interpreted as cyclotron lines because they scale too far from 1 : 2 . these features also in good agreement when relativistic e□ect has been taken into account.

Table 2.

Model Parameter	Value
Photon index	0.363± 0.013
E_{cutoff} (keV)	13.81±0.30
Efold(keV)	5.59±0.53
D1	0.94±0.16
Ecyclotron,1(keV)	13.63±0.33
W1(keV)	4.80±0.38
D2	0.59±0.18
Ecyclotron,2(keV)	20.59±1.06
W2 (keV)	5.29±2.27

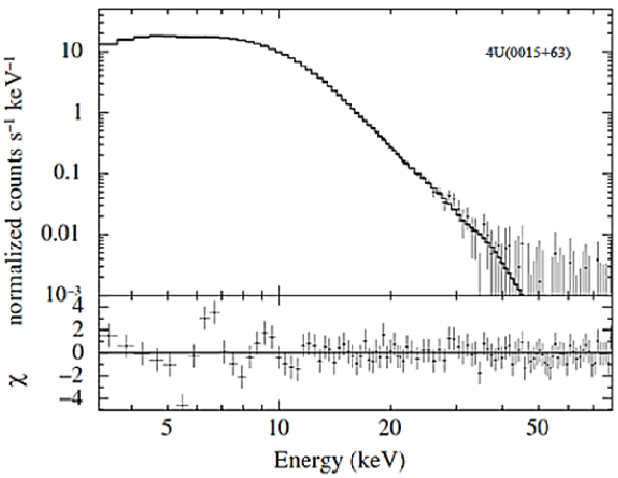

Figure 1.

As per previous studies in the analysis of the data the insu□ciency of the detected photons can a□ect the analysis. The measured magnetic field of neutron star 4U0115 + 63. This *Figure 1*is consistent with the observations during the past decades which can be fitted well using absorption features depending on a proper continuum model, though only less than thirty sources, including one isolate.

REFERENCES

Baym, G., Pethick, C.J. Sutherland, P., 1971, Astrophys 170, 299.

Becker, P. A. and Wol□, M. T. 2007. Astrophys. J. 654 435.

Bignami, G. F., Caraveo, P. A., De Luca, A. and Mereghetti, S. 2003. Nature 346 250

Clayton, D.D. 1982. Q.J.R. Astron. Soc. 23

Coburn, W. *et al*. 2002. Astrophys. J. 580 394.

Hercules X-1 Astrophys. J. 219, L105-L110 (1978)

Iwazaki A., 2005, Phys. Rev. D 72, 114003

Kouveliotou, C., Strohmayer T., Hurley K., *et al*. 1999, Ap J., 510, L115

Kreykenbohm, I. *et al*. 2002. Astronomy & Astrophysics 395 129.

Makishima, K., Mihara, T., Nagase, F. and Tanaka, Astrophys, Y. 1999. J. 525 978.

McBride, V. A. *et al*. 2007. Astronomy & Astrophysics 470 1065.

Mihara, T. *et al*. 1990. Nature 346 250.

Mori, K. *et al*. 2003. X-ray spectroscopy of the isolated neutron star 1E1207.4-5209: Atmospheric composition and equation of state. submitted to Astrophys. J. astro-ph/0301161

Trumper, J. *et al* Evidence for strong cyclotron line emission in the hard X-ray spectrum of

White, N. E., Swank, J. H. and Holt, S. S. 1983. Astrophys. J. 270 711.

****