Japan Geoscience Union Meeting 2010
(May 23-28 2010 at Makuhari, Chiba, Japan)

PEM030-P05 Room: Convention Hall Time: May 26 17:15-18:45

Towards the Experimental Verification of Kerr Black Hole-Observation Results of Decimeter Radio Wave Pulses

Asuka Nishizaka[1*], Hiroshi Oya[2], Takayuki Ono[2]

[1]Geophys Sci, Tohoku Univ, [2]Department of Astronomy and Geophysics,

1. Introduction
General trend of observation studies of black holes are focused on X-ray which are believed to be effectively generated by the high energy plasma in the accreting disk of the black hole. Contrary to this trend, unique approach of the observations has been made by using decameter radio wave pulses (Oya and Iizima, 1999). The observation results, of the decameter wave radiation, which show 24 kinds of periods from 0.327214sec to 129.992sec are considered to be generated from the Kerr black holes coinciding with the rotation periods of black holes. After observation in 2002 and 2004 for confirmations of decameter radio wave pulses from the center of our Galaxy, the studies were further extended to observations of the pulses from the black holes in the center of our Galaxy, in the decimeter radio waves in 1.4GHz range. The present study is purposed to analyze data of decimeter radio wave pulses carried out in 2007 and 2008, using the observation system of Fukui University of Technology where the receiving systems for decimeter radio waves with 10m dish antenna are facilitated.
2. Purpose of the Analyses
The detailed analyses of the decimeter radio wave in the present studies are motivated by the guide line towards the experimental verification of Kerr black holes. Key subjects has been presented by Oya(In the abstract of the JpGU Meeting 2010) who proposed the possibility of the experimental verification of the Kerr black hole by comparison of the pulse periods and levels between the decameter and decimeter radio pulses from the black holes. In general, it is suspected that rotating black holes may not reveal definitely defined rotation periods because of variety of rotation periods of the ergo-sphere. For this point, Oya(see the same of JpGU Meeting in 2010) has pointed out that the rotating black holes radiate definitely defined pulse with period of the region near the event horizon (RNEH) where energetic particles rotate with period close to that of space in RNEH. Calculated rotation periods start to shift from the exact rotation period of event horizon with shift rate more than 20% when the deviation rate (DR) of the source position apart from EH exceeds 0.1 where the source position of decimeter radio waves are supposed to exist while the rotation period show little shift from the rotation of EH around the source regions of decameter radio waves with DR around 1/ 50000. That is, from time-space characteristic near the event horizon of Kerr black hole the difference of the radiation frequency such as decameter radio waves and decimeter radio waves is caused by the red-shift rate or reduction rate of the radiated wave frequencies.
3. Methods and Results of analyses
Levels of decimeter radio wave pulses are in range from 1/1000 to 1/10000 of the background level of the decimeter radio waves from the center part of our Galaxy. To search for the pulse shape, then, 1200000 times of accumulations of box-car method have been applied, after the coarse decision of the pulse periods by applying FFT method. That is, the data during 21 days observations are utilized. To carry out the box-car method, the periods for analyses have been swept with step of 1/10000 of the center periods. The obtained wave forms are evaluated defining the index which gives quick identification of the quality of the detected pulse forms.

4. Comparison with the case of the decameter radio wave pulses
When we compare the pulse form with the case of decameter radio wave pulses such as Gaa, Gab, Gac, and Gad, the distribution of the index versus the analyzed periods show fairly wide characteristics, i.e., the wave forms can be observable even for the periods which exceed 20% of the center frequency, while the deviation results of the decameter radio waves show little spreading of less than 0.1%. This results are consistent with the characteristic of rotation of the radiation sources pointed out by Oya(JpGU Meeting in 2010).

Keywords: decimeter radio wave, radio wave pulse, coherent integration analysis, Kerr black hole, Garactic center