Search for r-process nuclear gamma-rays from binary neutron-star merger remnants with the gamma-ray satellite INTEGRAL/SPI P4

Hayato Ohsumi[1](osumi.h.281@ms.saitama-u.ac.jp),

Yugo Motogami[1],Yukikatsu Terada[1][2],Satoru katsuda[1],

Shin-ichiro Fujimoto[3],Aya Bamba[4],Ryo Yamazaki[5]

Introduction

The origin of heavy elements is important science topic.

Neutron-Star Mergers(NSMs) are the most promising site for r-process.

Gamma-rays of r-process elements from NSMs have unique spectra.

→ New method to identify of NSMs using color-color diagram both Hard X-ray and Gamma-ray bands. [Terada et al.2023] (Fig.1)

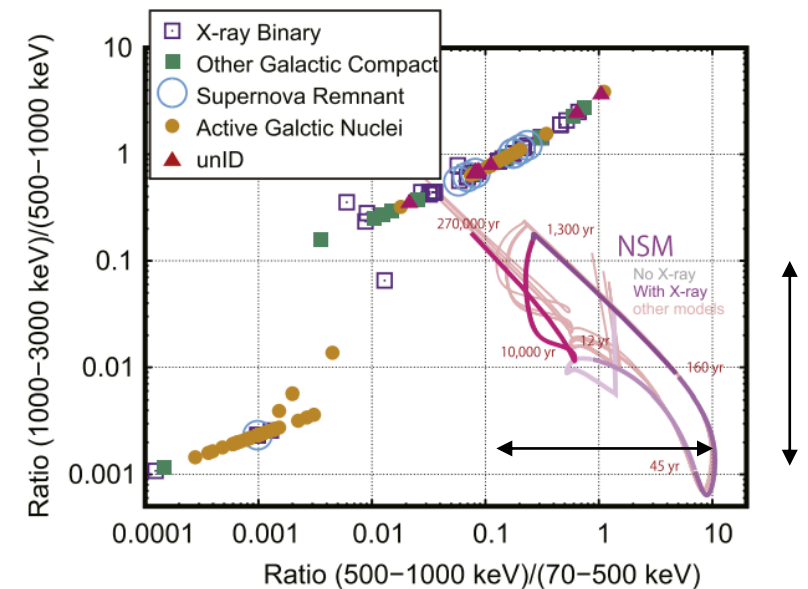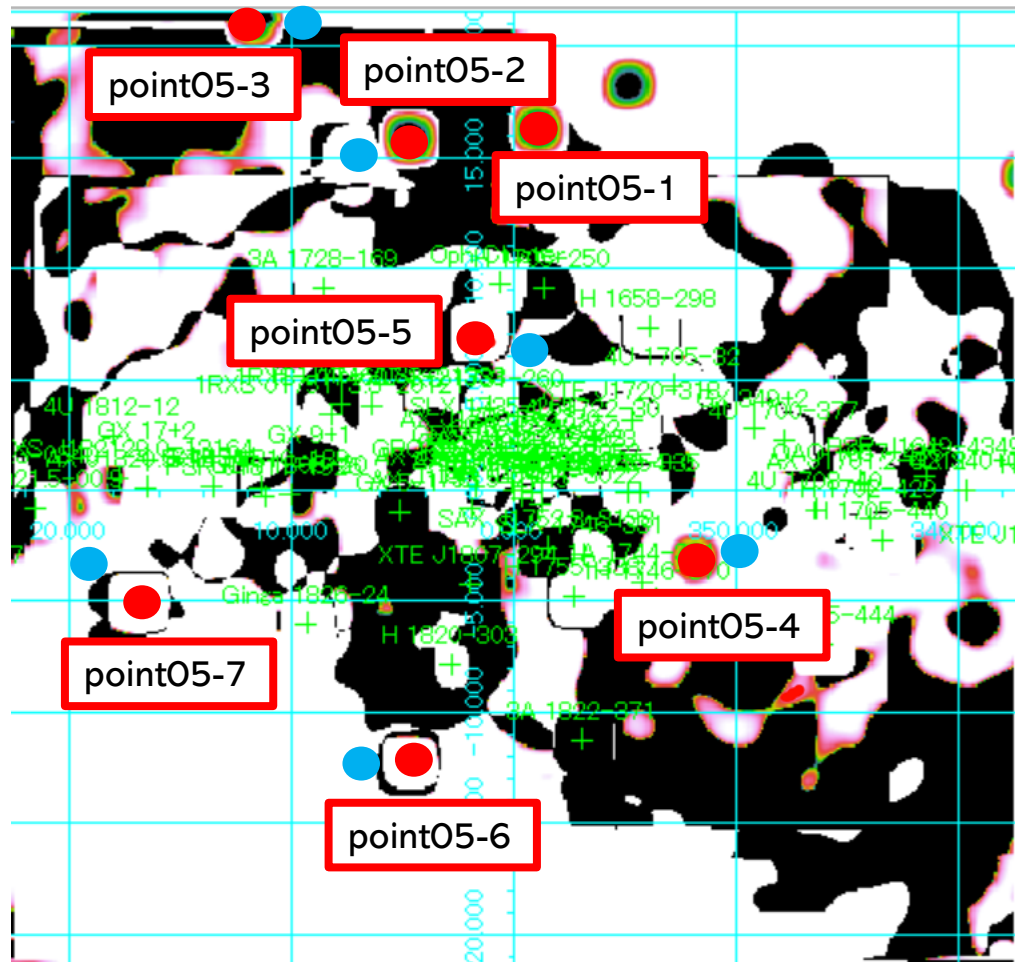**Our Study**: Search for NSM candidates in the galactic center region with INTEGRAL/SPI data.

Fig.1
color-color diagram
of Gamma-ray band.

Result : Image Analysis

band5/band4

Definition of energy band according to color-color diagram

Band	Energy (keV)
band1	10-25
band2	25-70
band3	70-500
band4	500-1000
band5	1000-3000

We extract bright point at band2/band1 and band3/band2, band4/band3 and band5/band4.

As a result,seven points were listed as NSMs candidates.
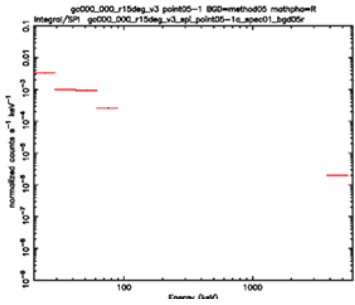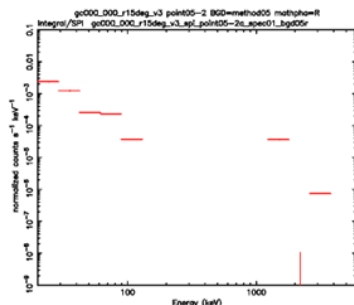
Result : Spectral Analysis
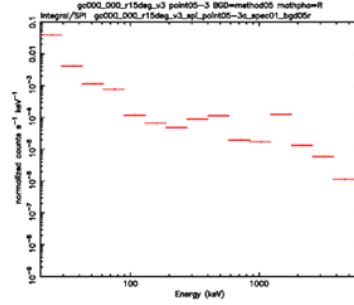

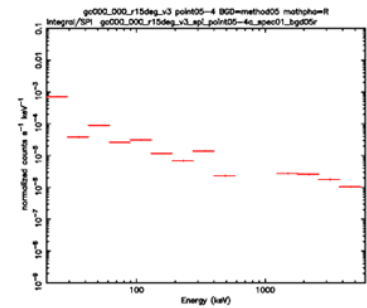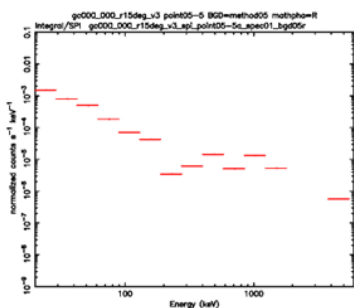Fig 3.1 point05-1   Fig 3.2 point05-2   Fig 3.3 point05-3
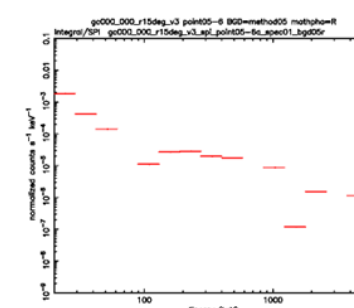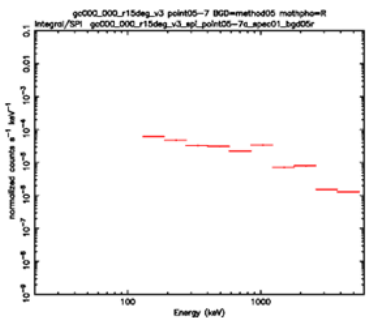
Fig 3.4 point05-4   Fig 3.5 point05-5   Fig 3.6 point05-6

Fig 3.7 point05-7

Spectral extraction resulted in
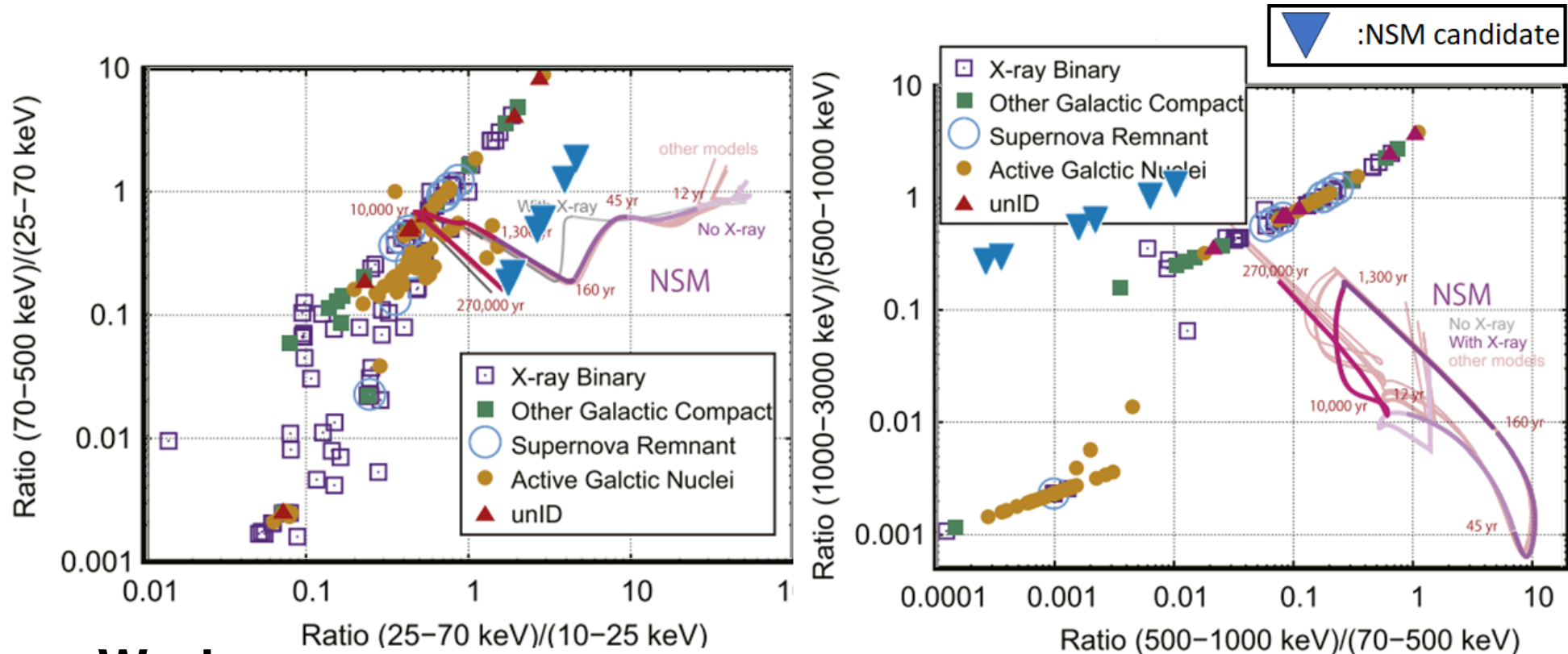
$$\sigma_{stat\ err} << \sigma_{sys\ err}.$$

Estimation of photon flux was performed

by spectral fittings with **powerlaw** model.

! This fitting is performed so **simply** and **roughly** !

→plotted on the color-color diagram

Result : discussion validity as NSM remnant candidates.

Seven candidates cannot be identified as NSMs, statistically.

Future Work
It is necessary to analyze the entire region within the galaxy.
we need more precise background estimation.

Thank you for listening!
Please come to our poster and discuss!