The hard X-ray observation of the Compton-thick Seyfert 2 galaxy Mrk 1210
Masanori Ohno¹, Yasushi Fukazawa¹, and Naoko Iyomoto²
1. University of Hiroshima, Japan; 2. NASA/Goddard Space Flight Center, USA

We observed Seyfert 2 galaxy Mrk 1210 with BeppoSAX, and found that the X-ray spectral properties are quite different from the previous observation by ASCA; the flux is significantly higher than that of ASCA and clear absorption cut-off was seen below 5 keV. A bright hard X-ray emission is detected up to 100 keV and we found the reflection component is necessary to describe the BeppoSAX spectrum. The reflection component flux is as high as that of the ASCA observation. This indicates that the dramatic spectral variability is attributed to a large change of the absorption column density by a factor of >5, rather than the variability of the nuclear emission. In this case, the torus is not be homogeneous but like a blob with a size of < 0.1 pc.

II. Mrk 1210 dramatic spectral variability between the ASCA and BeppoSAX observation

We found large spectral variability due to either change their luminosity or absorption. Recently, many Seyfert 2 galaxies reported that they have large spectral variability due to either change their luminosity or absorption. Such a information is useful to investigate circumnuclear structure.

III. Compton reflection component of Mrk 1210

We can see the “bump” structure around 50 keV in the BeppoSAX spectrum. This suggests that it is required Compton reflection component model. Thus, we applied Compton reflection model “PEXRAV”.

Compton reflection model

We tried fit the ASCA data using reflection parameter obtained by BeppoSAX results

Good Agreement !!

The flat hard component of ASCA can be expressed by reflection component of BeppoSAX

The flat component of ASCA is also Compton reflection component of completely obscured nuclear emission?; in this case, we estimate the absorption to be > 1.5 × 10²⁴ cm⁻²

The scenario of change of absorption (scenario 2) is preferable?

But we need wide energy band observation such as Astro-E2 HXD!

IV. Structure of the molecular torus

We estimate the distance from nucleus of torus to be < 1 pc using the maser data assuming simple Keplerian motion of torus around the nucleus with a mass of 10⁷ M☉. According this and the variability of spectral shape, we can impose some constrains on geometry of the torus

Scenario 1
Absorption has not changed in 6 years,
⇒ size of molecular torus more than 2 pc

Scenario 2
Absorption has changed dramatically, and consider the rotation velocity of torus
⇒ the size of torus less than 0.1 pc

Compton-thick blob

Compton-thin Layer?

In the case of scenario 2, we need inhomogeneous structure of torus
⇒ Expand unified model of AGN ?? (Matt. 2000)

V. Summary

- We found dramatic spectral variability of Mrk 1210 between ASCA and BeppoSAX
- To explain such a variability, we suggest two possibilities
  - scenario 1: the nucleus luminosity has changed by the factor > 6
  - scenario 2: the absorption column density have changed in an order of magnitude but we cannot distinguish these clearly
- According to the reflection component of BeppoSAX spectrum, scenario 2 is preferable.
- We can impose some constrains to the geometry of the molecular torus. In the case of scenario 2, we need inhomogeneous structure of torus. (Expand Unified Model of AGN?)