Abstract: We report the simple X-ray polarimeter, using one dimensional position sensitive proportional counter (1DPSPC) with a thin anode wire. One of the methods to detect the X-ray polarization is measuring the distribution size of photo-electrons. To observe the expansion of photo-electron cloud, a gas chamber needs to have an enough position resolution. The position resolution of 1DPSPC depends on the resistance noise of anode wire. To improve the position resolution we used thin carbon fibers for anode. The fiber showed good position resolution. We test this 1DPSPC to detect the X-ray polarization. A simple method to detect the X-ray polarization is to measure the precise size of ejected photoelectron in the perpendicular plane to the electric vector of incoming photon. By using this simple method we could observe the different distribution at two different polarization angles. This difference is caused by X-ray polarization and was confirmed by using carbon-fiber PSPC. The Cu-Kα X-ray beam with 70% polarization was used for HETE-2 WXM[1] and MAXI GSC[2].

1. Improvement of Position Resolution of PSPC with a Thin Carbon Fiber

<table>
<thead>
<tr>
<th>Name</th>
<th>Diameter</th>
<th>Resistance</th>
<th>Strength</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>7μm</td>
<td>4.0 kΩ</td>
<td>10μm</td>
</tr>
<tr>
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<td>10μm</td>
<td>6.5 kΩ</td>
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We selected 2 thin carbon fibers. This table shows the results of our tests. The 10μm fiber was used for HETE-2 WXM[1] and MAXI GSC[2].

**Figure 1.** Configuration of our experiment at RIKEN

**Figure 2.** The marks show our experimental results and lines present calculation by formula (1).

**Figure 3.** The table shows the performance of 2 carbon fibers. The position resolution was measured using a gas gain as shown in Figure2. We try to describe a formula of position resolution for the obtained the data, and the performance of the detector as an X-ray polarimeter.

**Figure 4.** Photoelectron tends to be ejected at the same direction of the electric vector of incoming photon. To confirm this prediction, we irradiated the >70% polarized X-ray beam to the 7μm PSPC at KEK photon factory BL14A. The electric field of polarized photon is rotated in the perpendicular plane to X-ray beam. The irradiated X-ray energy is 30-80keV.

**Figure 5.** Our experimental set up at KEK Photon Factory.

**Figure 6.** Left panel shows observed 1-dimensional photoelectron distribution. When we set it along Y-axis we expect one bump. Thus we can measure X-ray polarization from the position distribution.

**Figure 7.** Comparison of the calculation and our experimental data. The region of extracted area are displayed above right panels.

References

1. Toru Tamagawa (RIKEN), and Kazuo Makishima (Tokyo-U/RIKEN), Mihara Tatehiro (RIKEN), Ikuya Sakurai (RIKEN), Motoki Kohama (RIKEN), Mihara Tatehiro (RIKEN), Mihara Tatehiro (RIKEN), Mihara Tatehiro (RIKEN), Mihara Tatehiro (RIKEN), Mihara Tatehiro (RIKEN), Mihara Tatehiro (RIKEN).

2. Application for an X-ray Polarimeter of 7μm Carbon Fiber

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