1. Title

2. Research Term
FY 2002–2003

3. Research Fields
Space Science

4. Research Categories
Emphasis Research

5. Research Theme
Development of the position resolution of the X-ray CCD and its assembly technique that will be applied in a wide field high sensitivity scanning camera for cosmic X-ray sources

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8. Summary of Research
<table>
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<th>Objective/Significance</th>
<th>Methods</th>
<th>Results</th>
<th>Potential for space experiment</th>
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<td>Measurement of the charge cloud shape inside the CCD</td>
<td>We have measured the shape of the charge cloud generated inside the CCD by using the mesh technique. In the past measurement, we found that it is about 2um when it generated by the front-illuminated (FI) CCD. This size means that most of the X-ray events form single-pixel event. We performed the measurement of the charge cloud shape that is generated by a back-illumination (BI) CCD. We found that it becomes much bigger than those generated in the FI CCD. This is due to the fact that the drift length inside the BI CCD is much longer than that in the FI CCD. Furthermore, we also found that the charge cloud size is inversely proportional to the input X-ray energy.</td>
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<td>Installation of the CCD into the camera body</td>
<td>We actually perform the installation of the CCD chips into the MAXI CCD camera after the screening of the chips. The CCD chips developed so far are not so tough against the electro-static charge. Furthermore, the bonding wire and the wafer are not protected well. The installation is one of the most subtle operations during the production of the camera. We introduced a special print circuit board so that the...</td>
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The open circuit time of the CCD chip is shortened from 30 seconds to 1 second. We confirmed that this process would not actually incur a problem.

**Screening CCD chips**

We performed a chip screening inside a clean booth where the humidity is actively controlled. Using a clocking system and a read-out system, we tested two chips at a time. In order to minimize the possible problem due to the thermal cycle, all the screening process has been done in one cycle down to -100°C.

Which part of the CCD is sensitive to the particle bombardment? The mesh experiment is valid both for X-ray beam and for particle beam. Using a proton beam, we performed the mesh experiment. After the bombardment of proton, the CCD chip degraded its performance. We have measured the charge transfer inefficiency (CTI). We obtained for the first time the CTI distribution within a pixel as a function of the landing position of the proton beam. It clearly shows that there is a region within a pixel showing a heavier degradation of the CTI. It corresponds to a notch structure inside the pixel. The notch structure is a special channel where a small amount of charge is confined when it is transferred so that the charge loss becomes the minimum.

### 9. Publication List


### 10. URL