Purpose:
The purpose of this study was to determine the X-ray imaging properties of two spectroscopic pixel detectors of the Medipix2 kind operated with 1 mm thick cadmium telluride (CdTe) sensors. With pixel pitches of 110 and 165 um and sizes of 2.8 x 2.8 cm^2 and 4.2 x 2.8 cm^2, these devices seem well suited for small animal imaging. Particular emphasis was placed on determining energy response functions (ERFs), modulation transfer functions (MTFs), and detective quantum efficiencies (DQEs).

Methods:
ERFs were measured for both pixel pitches using 60 keV monochromatic photons. The full widths at half maximum (FWHMs) of the corresponding photopeaks were calculated. The sensors' presampling MTFs were determined using a tilted wedge technique for three different values of the detectors' low energy threshold (10, 25 and 50 keV). Zero frequency DQEs were measured for photon energies of 60 and 122 keV by determining the average number of pixels responding to a single incident photon.

Results:
For the 110 and 165 um pixel pitches, FWHMs of 2.2 and 2.3 keV were found for a bias voltage of 500 V. However, the corresponding ERFs are heavily biased especially for the smaller pixel size due to charge sharing and characteristic X-rays. The 5% levels of the MTF were measured to be 5.7, 7.2 and 9.0 / mm for the three energy thresholds chosen. The DQEs found were 0.77 (110 um, 60 keV), 0.84 (165 um, 60 keV), 0.37 (110 um, 122 keV) and 0.38 (165 um, 122 keV).

Conclusions:
The generation of characteristic X-rays in the sensor by the incident beam leads to a distortion of the detector's response to radiation, because a significant amount of these fluorescence photons are detected in neighbor pixels. Another consequence is that the spatial resolution can be effectively increased by discarding low energy events.