受験番号：26IPE014

問１.

1. An energy-distributed type X-ray detection apparatus that irradiates a sample with electronic beams, X-rays, or the like, that detects characteristic X-rays generated from the surface of the sample, and that performs elemental analysis of the sample, the energy-distributed type X-ray detection apparatus comprising:

an element holder that accommodates a semiconductor X-ray detection element and that is provided with a cylindrical female thread; and

a finger body that accommodates a substrate having a first-stage FET for amplifying a signal from the semiconductor X-ray detection element, that has a cooling mechanism, and that is provided with a male thread;

wherein the energy-distributed type X-ray detection apparatus is configured to fasten the element holder and the finger body by using the female thread and the male thread so as to fix the semiconductor X-ray detection element.

2. An energy-distributed type X-ray detection apparatus according to claim 1, wherein the element holder that accommodates the semiconductor X-ray detection element is manufactured from a metal material having a large thermal expansion coefficient, and the finger body that accommodates the substrate having the first-stage FET is manufactured from a metal material having a smaller thermal expansion coefficient than that of the element holder.

3. An energy-distributed type X-ray detection apparatus according to claim 1, wherein the element holder is provided with a slit-shaped opening such that high-voltage wiring for supplying a voltage to an electrode of the semiconductor X-ray detection element can be drawn through the element holder.

問２.

A JPEG system, standardized by ISO, is one of existing well-known systems for image compression. This system uses discrete cosine transformation and is known to provide a good encoded and decoded image when a relatively large number of encoded bits are assigned. However, when the number of encoded bits is reduced below a certain degree, remarkable block distortion occurs and degradation becomes prominent in a subjective view.

Meanwhile, many researches has been done recently on systems that divide an image into a plurality of bands by using a filter called a filter bank in which a highpass filter and a lowpass filter are combined, and that perform encoding for each band.

Among these systems, wavelet transformation encoding is considered as a new promising technology that will replace DCT because wavelet transformation encoding does not have a disadvantage, like DCT, that remarkable block distortion occurs in high compression.

For example, JPEG 2000, which was internationally standardized in January 2001, employs a system in which this wavelet transformation is combined with highly efficient entropy encoding, and significantly improves encoding efficiency compared with that of JPEG.

問３.

Specifically, the electronic paper apparatus 26 is of a well-known self-writing type that can display prescribed information on an image display unit as an image in a voltage-applying state, and that can retain the displayed information in a no-power state. In a state in which no voltage is applied by a microprocessor 23, via a driver, to respective pixel electrodes that configure a matrix in the image display unit, particles charged negatively (-) accumulate on a bottom surface side of the image display unit, while black particles charged positively (+) remain on a top surface side. Thus, when viewing the image display unit from the top surface side, the image display unit appears to be colored in black. When the driver operates on the basis of electronic data output from the microprocessor 23 and the polarity of pixel electrodes of required parts of the matrix is reversed in accordance with the information to be displayed as an image, the positional relationship between the while particles and the black particles is switched, as appropriate, and the information represented by the contrast of the while particles and the black particles is displayed on the image display unit as an image. In addition, in the electronic paper apparatus 26, the image display state can be retained even in the no-power state in which no voltage is applied, via the driver, to the respective pixel electrodes that configure a matrix in the image display unit.