One of the ways to increase the detection efficiency of CZT detectors is to combine several detectors in an assembly. Using the summation of each CZT detector spectrum from its respective multi-channel-analyzer, creates a sum spectrum with an increased detection efficiency. Combining in this way, the capacity and noise of the detectors will not be added, as it would be in the case with just paralleling the detector crystals. Furthermore, the maximum total count rate increases with the number of detectors. The difference in charge collection efficiencies of the used detectors can be compensated by the gain adjustment of the MCA.

The energy resolution of the total spectrum is in the interval between the best and worst energy resolution of the component detectors. The equipment and a special software that allows combining up to 16 micro-spectrometers in a high efficiency clustered spectrometer were designed, manufactured and tested.

Serial micro-spectrometers CUBE527 [1] or µSPEC [2] based on the MCA527 micro(E) [3] and detector modules with CZT quasi-hemispherical detectors [4] were used. For spectra collection, gain adjustment and spectra stabilization, the special software WinSPECx16 was developed. Clustered spectrometers consisting of 4 elements with CZT detectors of 0.5 cm³ and 1.6 cm³ and clustered spectrometer consisting of 16 elements with quasi-hemispherical CZT detectors of 1.6 cm³ were tested. 4-element clustered spectrometer can be powered via USB port. When using more spectrometers in the cluster, an external power supply must be used.

MAIN RESULTS:

1. Clustered spectrometers with different numbers of elements and different volumes of CZT quasi-hemispherical detectors were designed, manufactured and tested.
2. Software WinSPECx16 that forms the clustered spectrometer has been developed. It allows the gain and spectrum stabilization of up to 16 spectrometers.
3. Possibility of a significant increase in the registration efficiency by combining several serial micro-spectrometers into a clustered spectrometer was demonstrated.
4. Clustered spectrometers were tested for weak and high-flux with a dose rate up to 25 mSv/h gamma-radiation measurements.

REFERENCES:

1. CUBE527, Digital Multi Channel Analyzer, GBS-Elektronik GmbH, Dresden, Germany http://www.gbs-elektronik.de
3. MCA527 micro(E), GBS-Elektronik GmbH, Dresden, Germany