Fig. 2. – The prototype (left) and the working sample (right) of the preamplifier

The created working sample (a prototype) of a preamplifier of a current detector with filters amplifies the noise components of the signal that occurs when electron beams pass through the working area of the current detector.

A circuit with filters has such a significant advantage as a higher sensitivity and a higher gain of the registered signal (Fig. 3) compared to a working sample using stabilizers (yellow signal).
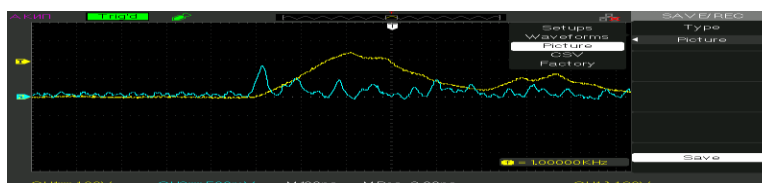

Fig. 3. – Blue signal

This advantage is due not to the use of filters when creating a preamplifier, but to the spread in the parameters of the used transistors.

The use of filters in the preamplifier circuit is inefficient due to the low signal-to-noise ratio. Span-type current detectors with preamplifiers can be used to calibrate charged particle accelerators in medicine.

APPLICATION OF METHODS OF RADIONUCLIDE DIAGNOSTICS USING «DECLIPSESPECT» NAVIGATION DISTRIBUTION SYSTEM FOR SURGICAL PURPOSES

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The study examined the use of the intraoperative navigation distribution system declipseSPECT in operations to remove breast cancer. The accuracy, sensitivity and specificity of the method were identified in the treatment of malignant tumors of given localization.

Keywords: sentinel lymph node, «DeclipseSPECT», breast cancer.

The application of declipseSPECT technology in radiosurgery provides three-dimensional imaging and navigation in the removal of tumors such as metastases and sentinel lymph nodes, which allows to resections with minimal intervention and in full. Due to three-dimensional imaging and information on the depth of the tumor, direct and most convenient access to it, high accuracy and completeness of removal, minimal surgical intervention are possible. The main advantages of declipseSPECT technology are that its use leads to an acceleration of the surgical process, gives a low relapse rate and guarantees faster rehabilitation..

All patients included in the research were examined according to the algorithms for diagnosing and treating malignant neoplasms (order of the Ministry of Health of the Republic of Belarus No. 258 of March 11, 2012). The imaging of malignant neoplasms is based on the difference between the accumulation of the drug in the tumor and the tissue surrounding it. The diagnosis of the primary tumor was in all cases verified cytologically. In this study, lyophysical powder was used to prepare a solution of 99mTc-CTI-SCINT, the active substance of which is human albumin 100-600 nm.

Scintigraphy was performed using SPECT / CT, since SPEC / CT are two different types of diagnostic tests (images): radionuclide – single-photon emission computed tomography (SPECT) and x-ray – low-dose computed tomography (CT), performed sequentially and combined together in one device, which allows you to

get additional diagnostic information. With SPECT, the functions of the organ or system of the human body are evaluated, while CT allows you to get accurate anatomical information (Fig. 1).
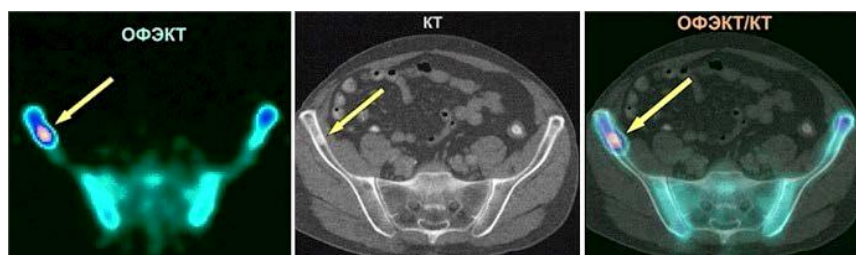

Fig. 1. – Comparative characteristics of SPECT and SPECT/CT for the detection of metastasis in breast cancer

Detection of signal lymph nodes in 3D format and their subsequent excisional biopsy were performed using the declipseSPECT system.

It was possible to visualize the signal lymph node in 100 % of cases, which was confirmed by scanning the removed lymph node in vitro, as well as by scanning the bed of the removed node with a gamma probe. Signal lymph nodes were subjected to an urgent histological and cytological examination. Regardless of its results, for patients with breast cancer, further intervention on the lymphatic apparatus was performed in the volumes established by the diagnostic algorithms for the treatment of malignant neoplasms.

The results of the research of the declipseSPECT navigation system for intraoperative visualization of signal lymph nodes in 9 patients with breast cancer were analyzed (stage 0 – one patient, stage 1 – three patients, stage 2 – three patients, stage 3 – two patients) .

In patients with breast cancer in 3 cases, an urgent histological examination of the signal lymph node showed no signs of tumor growth. According to the results of the final histological examination, in 2 out of three cases, micrometastases were detected in the signal lymph node, and in one case macrometastases in the signal and other lymph nodes of the remote collector were detected. In four patients, metastases were not detected either in the signal or in the remaining removed lymph collector. In two patients, metastases were detected in signal lymph nodes, while in 2 cases these metastases were the only ones.

It was found that the accuracy of radionuclide diagnostic methods using the declipseSPECT navigation system for breast cancer is 83 %, its specificity is 100 %, and its sensitivity is 57 %.

STATISTICAL ANALYSIS OF QUALITY OF TREATMENT OF CERVICAL CANCER BY METHOD OF COMBINED RADIATION THERAPY IN STATE INSTITUTION "N. N. ALEXANDROV NATIONAL CANCER CENTER OF BELARUS"

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Using a statistical analysis method, the databases of 2 years of cervical cancer treatment in patients of the State institution "N. N. Alexandrov National cancer center of Belarus" were investigated. It was found out that in patients with late radiation complications in the rectum and sigmoid colon, the delivered dose to these organs does not exceed 75 Gy. The number of complications to critical organs is 5 % of the total number of patients.

Keywords: radiation therapy, brachytherapy, cervical cancer, radiation injuries.

To analyze the quality of treatment for cervical cancer using contact radiation therapy, a database of patients was created at the State institution "N. N. Alexandrov National cancer center of Belarus" for 2017–2018. The total number of patients was 183 people. All of them underwent combined radiation therapy. The patients are classified by age, diagnosed stage of the disease, treatment results, the presence of complications at the end of treatment and their type.

During the course of brachytherapy, an individual plan of fractional dose distribution is created for each patient. The value of EQD_2 D90 CTV HR (abbreviated D90) was chosen as the studied parameter when analyzing the results of treatment.