that is a concern; it also can avoid putting the additional stress on the body's blood clearance mechanisms that can accompany administration of multiple doses of agents.

The idea of combining imaging technologies moved to the mainstream with the advent of the first successful commercial fused instruments. The first fused PET/CT instrument, developed in 1998 by Townsend and colleagues in collaboration with Siemens Medical, was available commercially in 2001 (Louie A., 2010).

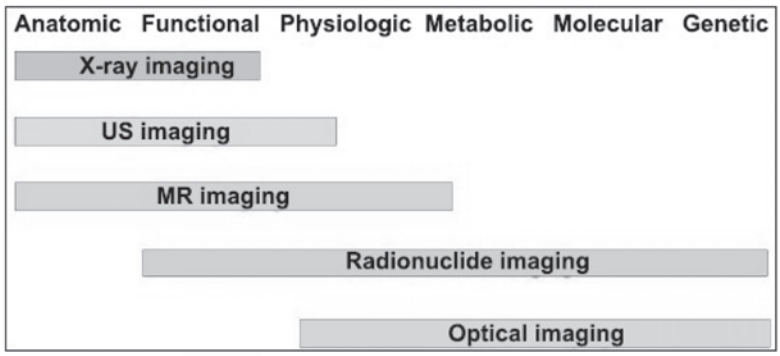


Fig.Molecular imaging technique

The size and multicomponent nature of many nanomaterials offer a forgiving platform to combine probe materials for various imaging modalities. Since the first applications of quantum dots (QD) to biological systems, these versatile nanoparticles have been hotly pursued as a potentially superior alternative to organic fluorophores. As such, they have also been the topic of many efforts to develop probes that are detectable by both optical imaging and other modalities such as PET or MRI. Multimodality imaging probes could be created by integrating QDs with paramagnetic or superparamagentic agents (examples: $^{64}$Cu-DOTA to CdTe/ZnS – PET/optical (Cai W.B., 2007); Gd-DOTA to CdSeTe/CdS/ glutathione - MRI/ optical (Jin T., 2008); Co/CdSe - magnetic/ optical (Kim H., 2005)) .

Medical imaging modalities such as MRI and PET can identify diseases noninvasively, but they do not provide a visual guide during surgery. The development of magnetic or radioactive QD probes could solve this problem.

**Galushko K.S.**

## CHARACTERISTICS OF «POLYCHROMATIC SPECKLE FIELDS» AND TEMPORAL COHERENCE

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The connection between contrast changes of intensity distribution of speckle pattern, obtained for polychromatic illumination of scattering object and coherence characteristics of wave is considered. It is shown, that Changes of mean contrast of a speckle field (from center of pattern toward the periphery), obtained for quasimonochromatic illuminating wave, are found to be connected with spectral range of the wave. The experimental results are presented.

Beam from white light source (xenon lamp), passes through the pinhole (pinhole diameter is ~ 20μ*m*), which provides a spatial coherence of the analyzing radiation. After that the wave passes through the polarizer and interference filters placed, directly before the scattering object.

It has been noted that for confirmation of our assumptions two "red" filters were used. The spectral characteristics of these filters are approximately differed by three times.

After the scattered object, the scattered radiation puts into observation plane, where CCD-camera is placed. Speckle-patterns, formed by polychromatic illuminating radiation. The changes of contrast of these patterns are different.

The normalized to unit mean contrasts of speckle patterns for first and second filters, depending on the space between center of pattern and observation point.

As it follows from the figure the mean contrast of the speckle pattern for the second filter decreases essentially quickly. It has been noted, that in the first approximation the relationship of contrast from coordinate may be presented as linear one. Thus, derivation from the mean contrast changes may be considered as some parameter, which characterizes a spectral range of illuminating radiation.

Thus, one can state, that space distribution of mean contrast of the speckle-field, its changes in dependence on the space from the center of speckle-pattern to the observation point gives us complete information about spectral range of radiation, illuminating the scattering object. Obviously this statement is true, at least, when quasimonochromatic approximation is satisfied.

**Ivanchuk M.A.**

## STATISTICAL ANALYSIS OF THE CONTINGENCY TABLES IN MEDICAL RESEARCHES

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Sometimes in medical research there are situations when the result of research cannot be described numerically, they can only be said whether symptoms are present or not. In this case, the results are presented in the form of contingency tables. It is a special type of frequency distribution table, where two variables are shown simultaneously. Contingency tableindicates the number of persons in each experimental group who have or do not have the symptom. In this case, for statistical analysis of medical research results the use of Pearson $\chi 2$ test,Fisher's exact test, odds ratio, relative risk or McNemar testare recommended. Each test has its advantages and disadvantages, and the choice of test depends on the task.

The Pearson criterion $\chi^2$can be used for both 2×2 and larger tables. When analyzing 2x2 tables, the value in each cell should not be less than 10. If at least one cell has a value less than 5, use Fisher exact test.Fisher's exact test is used to compare small samples. It can be used in cases where the cells in table 2x2 contain zero values, that is, if the test characteristic did not occur in one of the groups or, conversely, was present in all patients in one of the groups.The odds ratio is an estimation ofarelative risk in case-control studies. Odds ratio is one of the main ways to numerically describe how the absence or presence of a particular trait is related to the presence of the factor under study in the statistical group. It is used only for case-control comparisons.Relative risk is used to determine the risk of some sign in patients who are exposed to the risk factor relative to the control group. McNemar test is used to compare dependent samples (for example before-after treatment).

**Kulchynsky V.V.**

## CdTe-BASED X / γ-RADIATION DETECTORS OF SPECTROMETRIC TYPE

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Increasing the number of areas of practical use of high-energy radiation in medicine and other areas, strengthening the requirements for the safety of such radiation for both patients and medical staff – all this raises the question of improving the spectrometric and dosimetric characteristics of X- and γ-radiation detectors. Modern radiology requires X-ray and gamma-ray detectors that can detect not only the presence of radiation, but also determine the energy of its quantum andintensity. The efficiency of converting the absorbed energy into a useful electrical signal for semiconductor detectors of high-energy radiation depends on such factors as dark current through the structure, lifetime of charge carriers, carrier mobility, and the time of charge carrier collection.

Dark current is influenced by both the mechanism of charge transfer through the structure and, in fact, by the resistivity of the bulk part of the single crystal. To ensure the energy resolution of a semiconductor detector of high-energy quanta of electromagnetic energy, it is necessary to achieve the highest possible signal-to-noise ratio. The number of generated electron-hole pairs