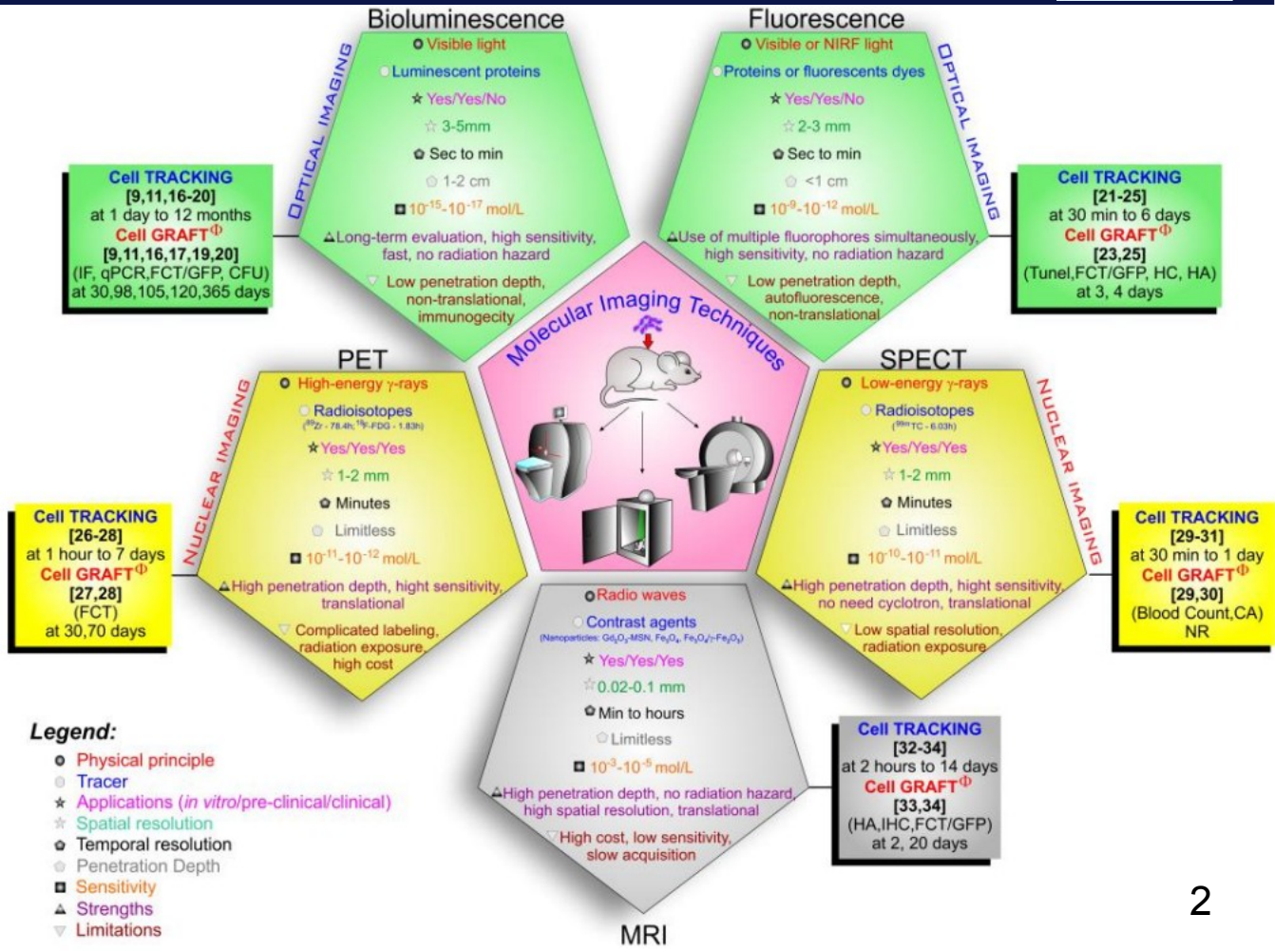
Multienergy tomoghraphy methods for small animals research

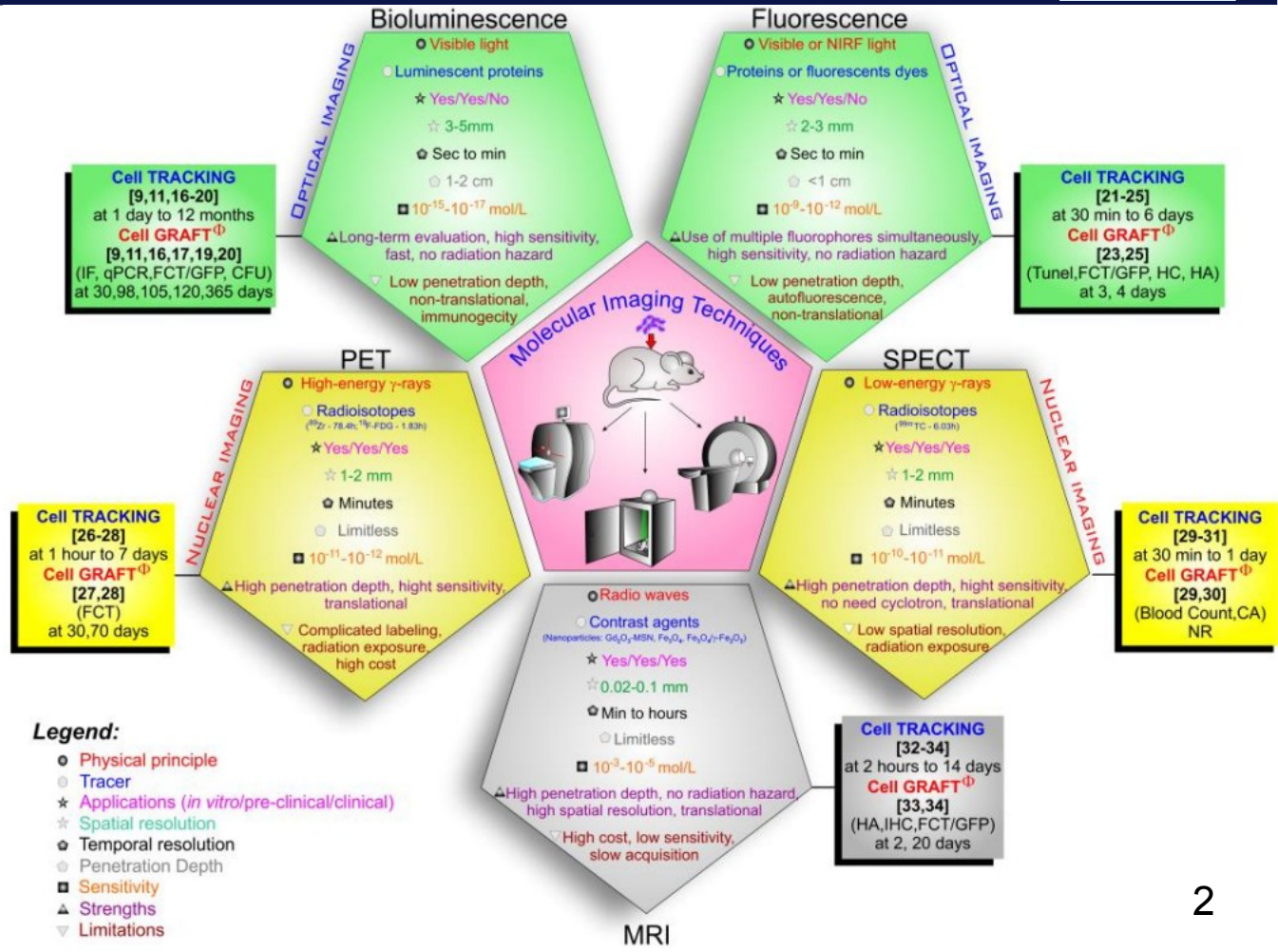
V. Rozhkov, G. Shelkov, R. Sotenckyi, D. Shashurin, E. Suslova, A. Kozlov, O. Medvedev

Molecular Imaging



doi: 10.3390/cells9040939

Molecular Imaging



doi: 10.2174/1389201014051311111105023

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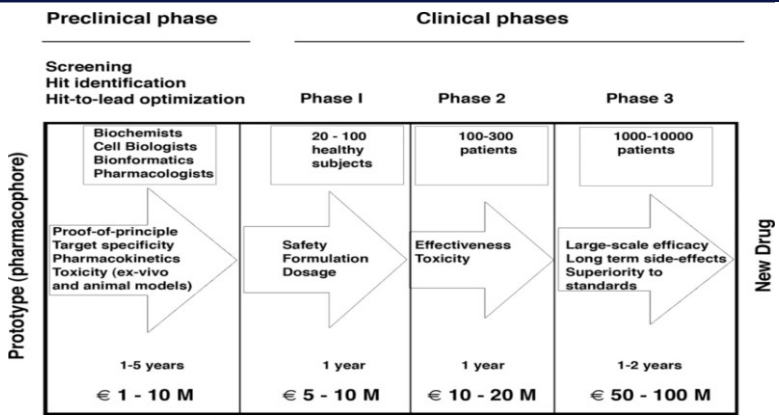
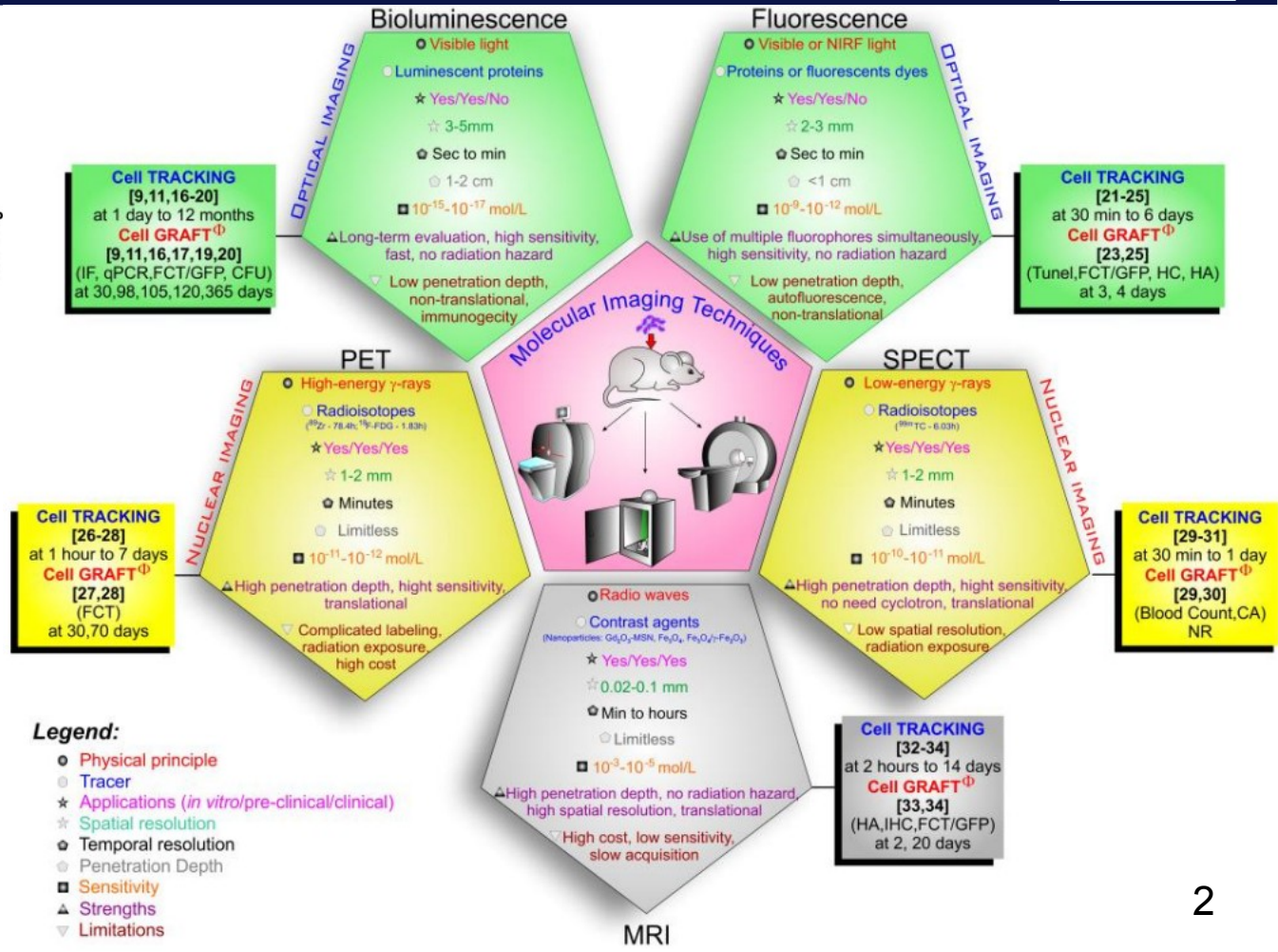
Molecular Imaging





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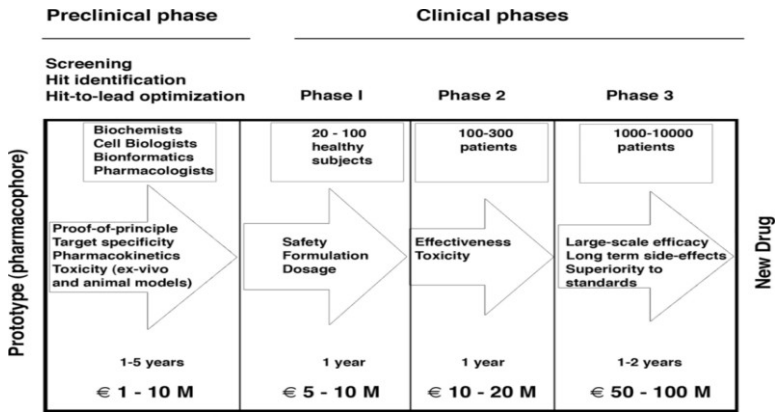
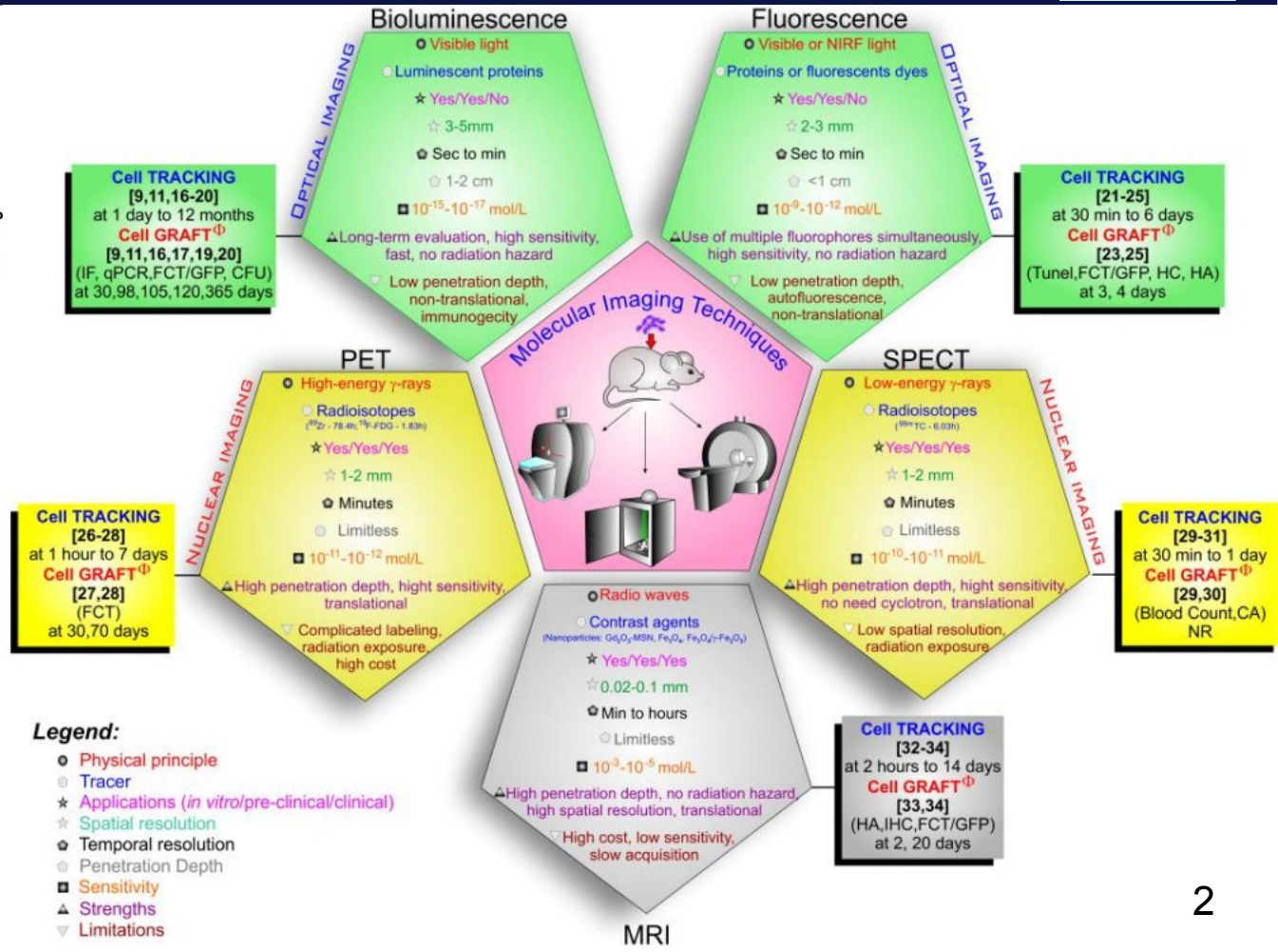
Molecular Imaging



SPECT system:

- High resolution
- High SNR
- High contrast
- High sensitivity



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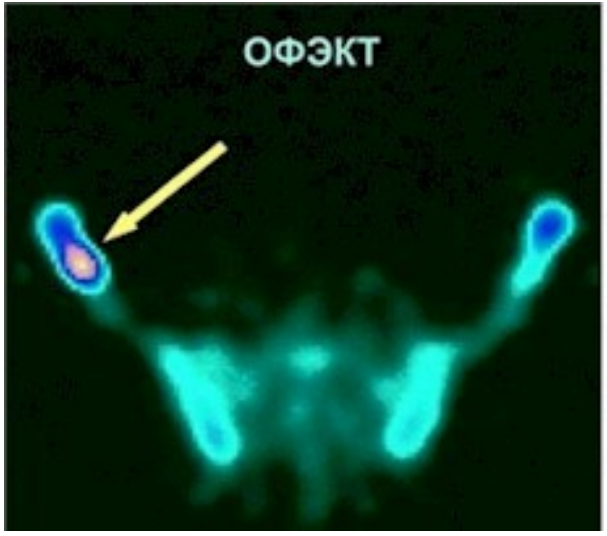
MultyEnergy Computer Tomography



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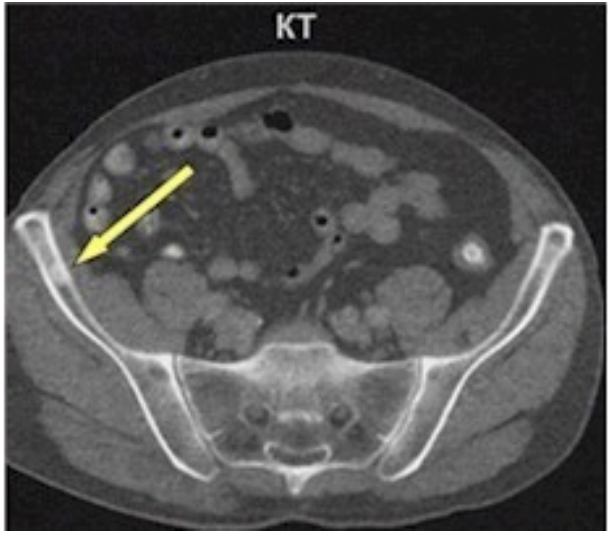

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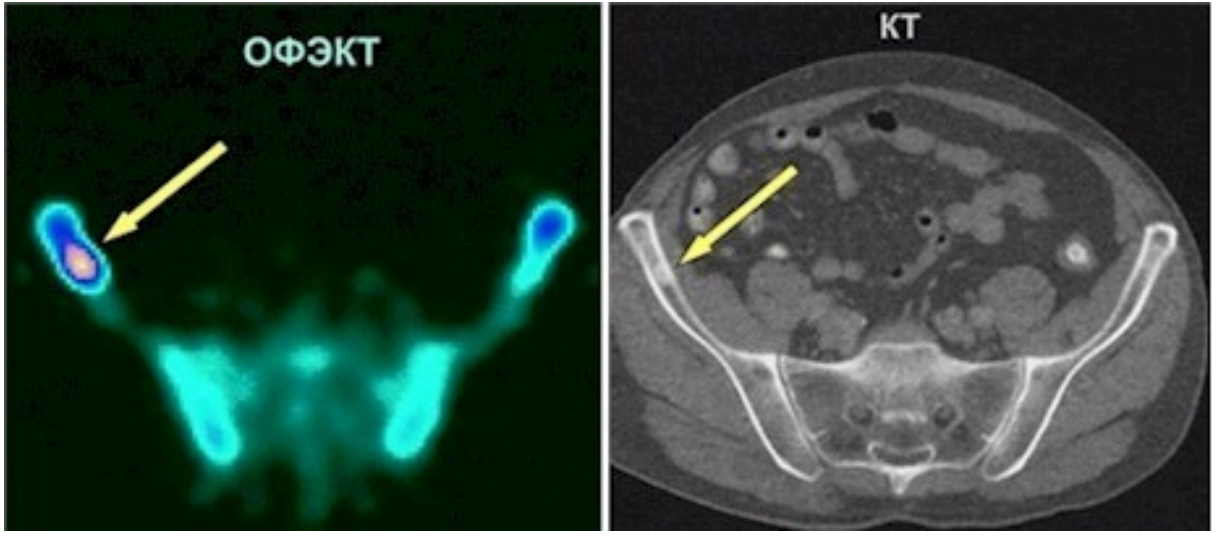

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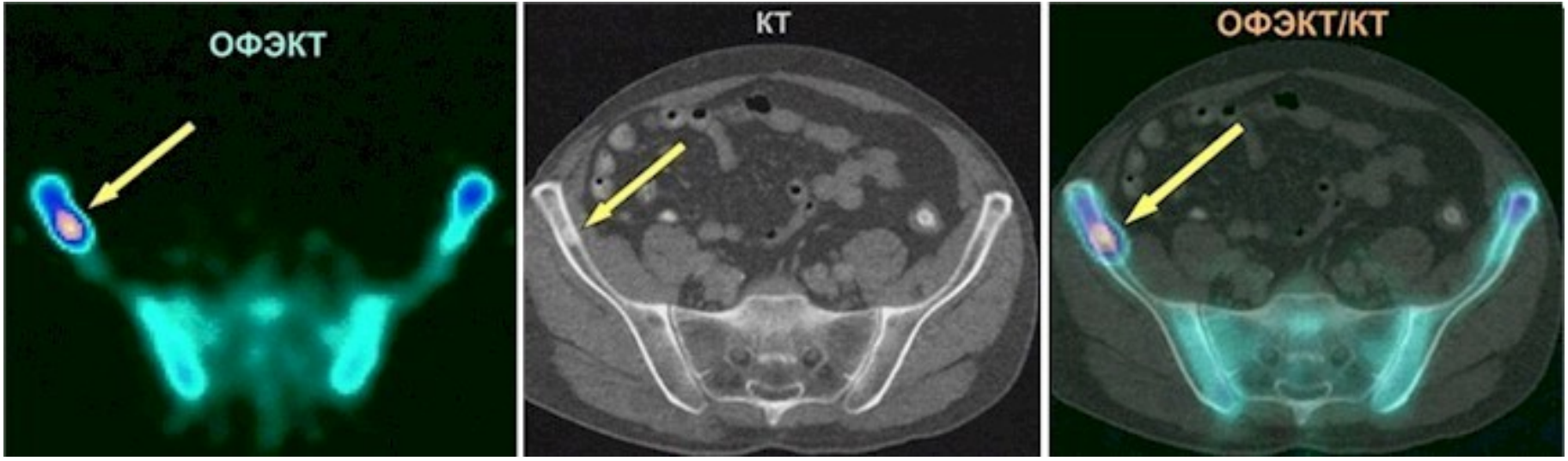

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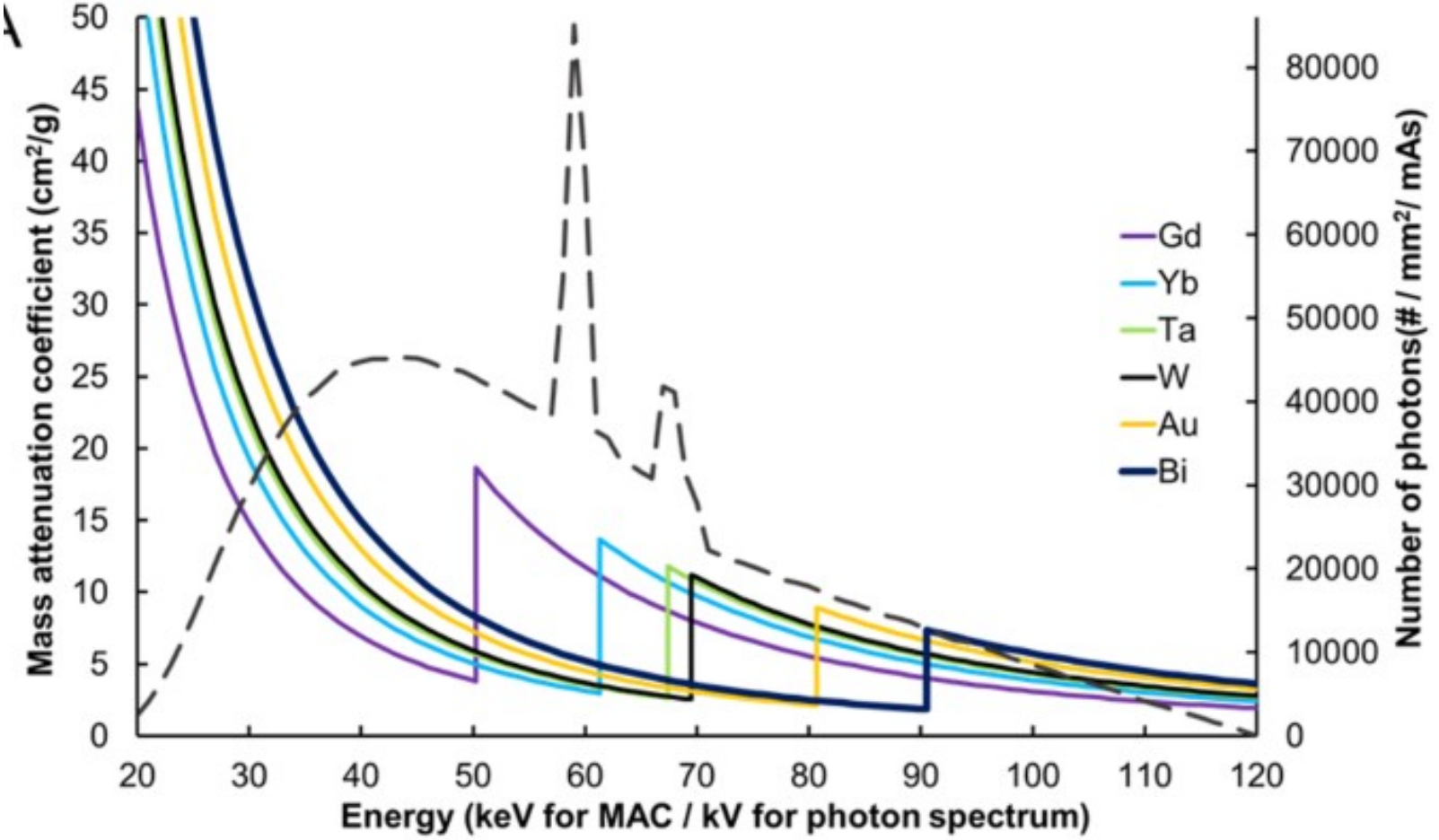
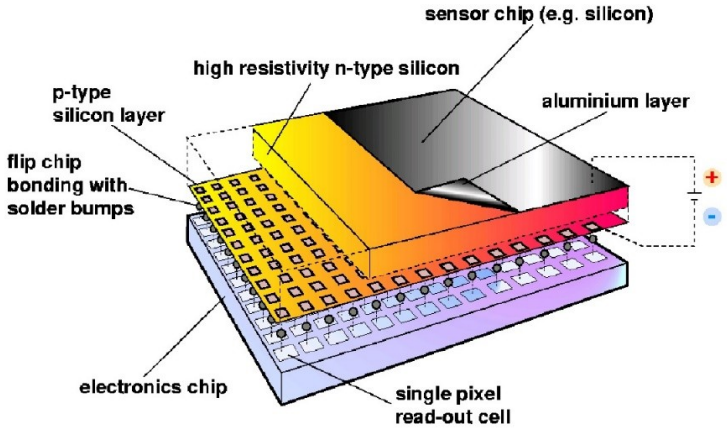
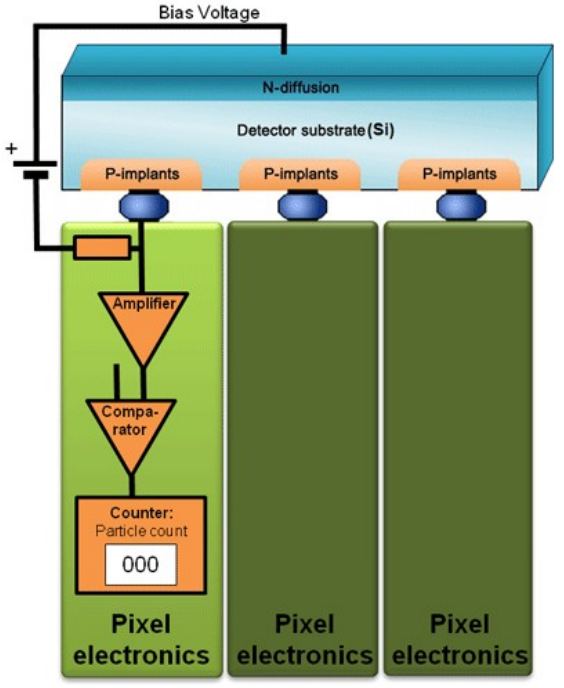


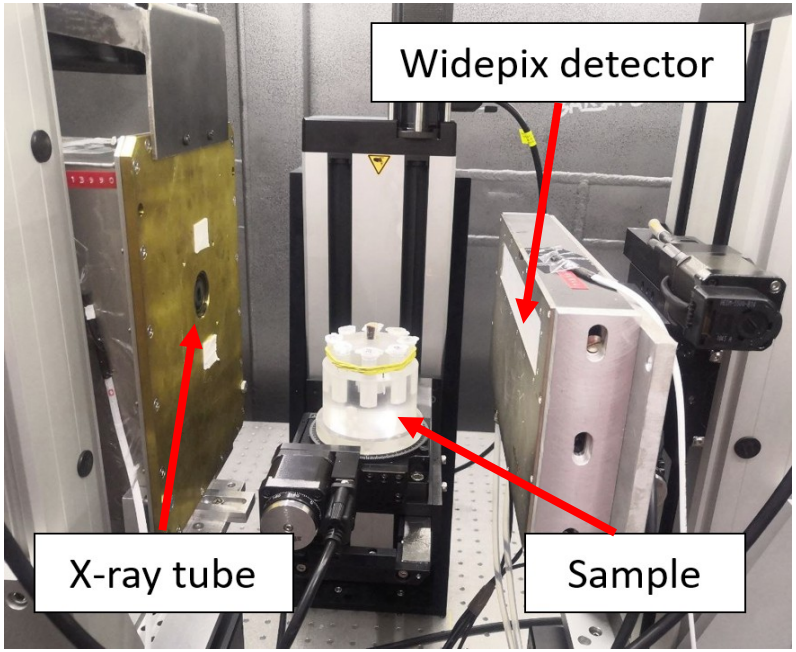
Medipix detector





- Medipix detectors are hybrid semiconductor pixel detectors;
- Developed by Medipix collaboration (https://medipix.web.cern.ch/);
- Semiconductor sensor and a readout integrated circuit;
- The signal is digitized and compared with the threshold in a pixel. Pixels operate independent.

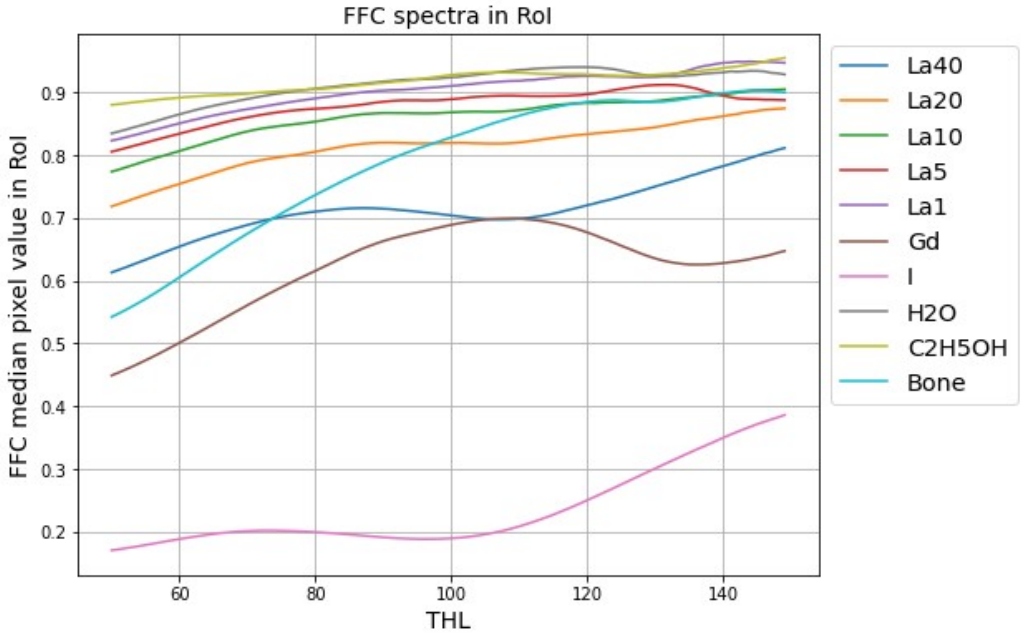
Medipix detector

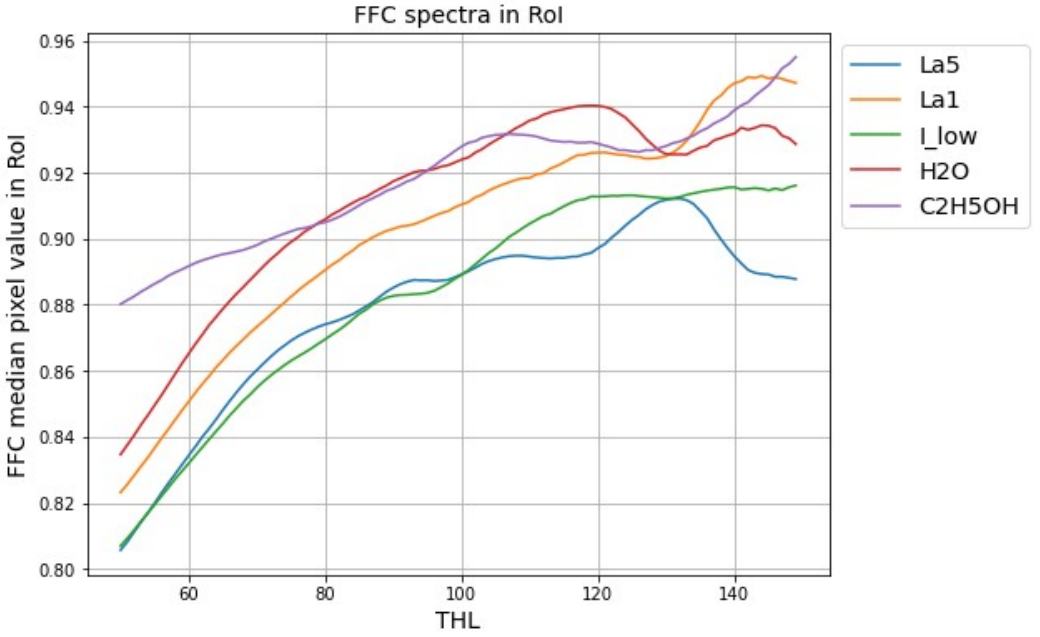


Widepix detector:

- 15 Medipix3RX in one row
- 256x3840 pixels
- Size of pixel - 55x55 um
- Si sensor

Medipix spectra





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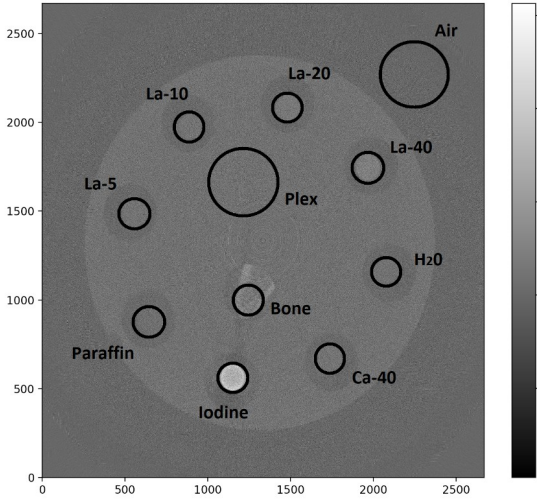

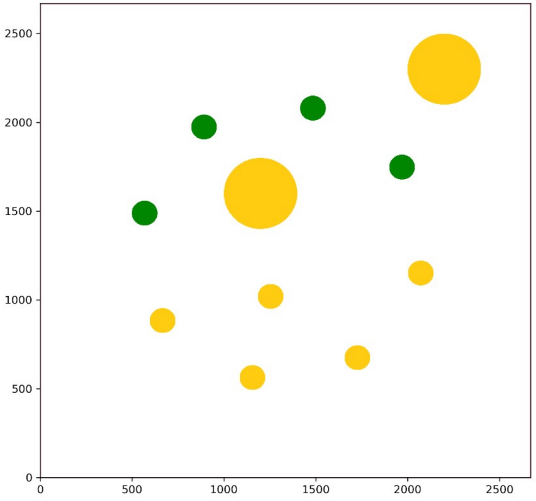

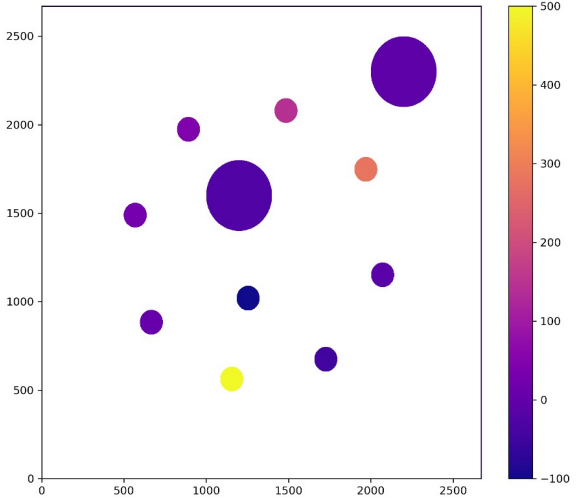

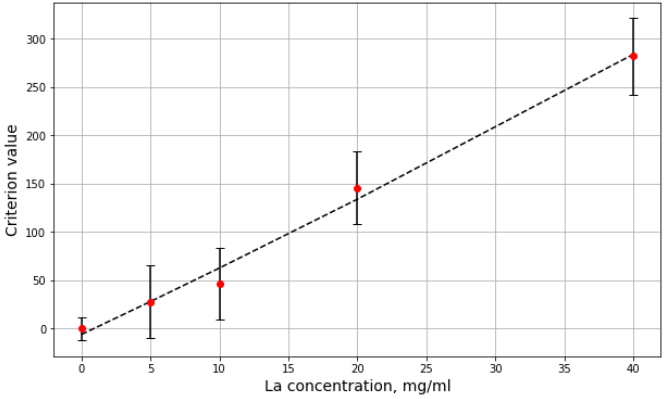

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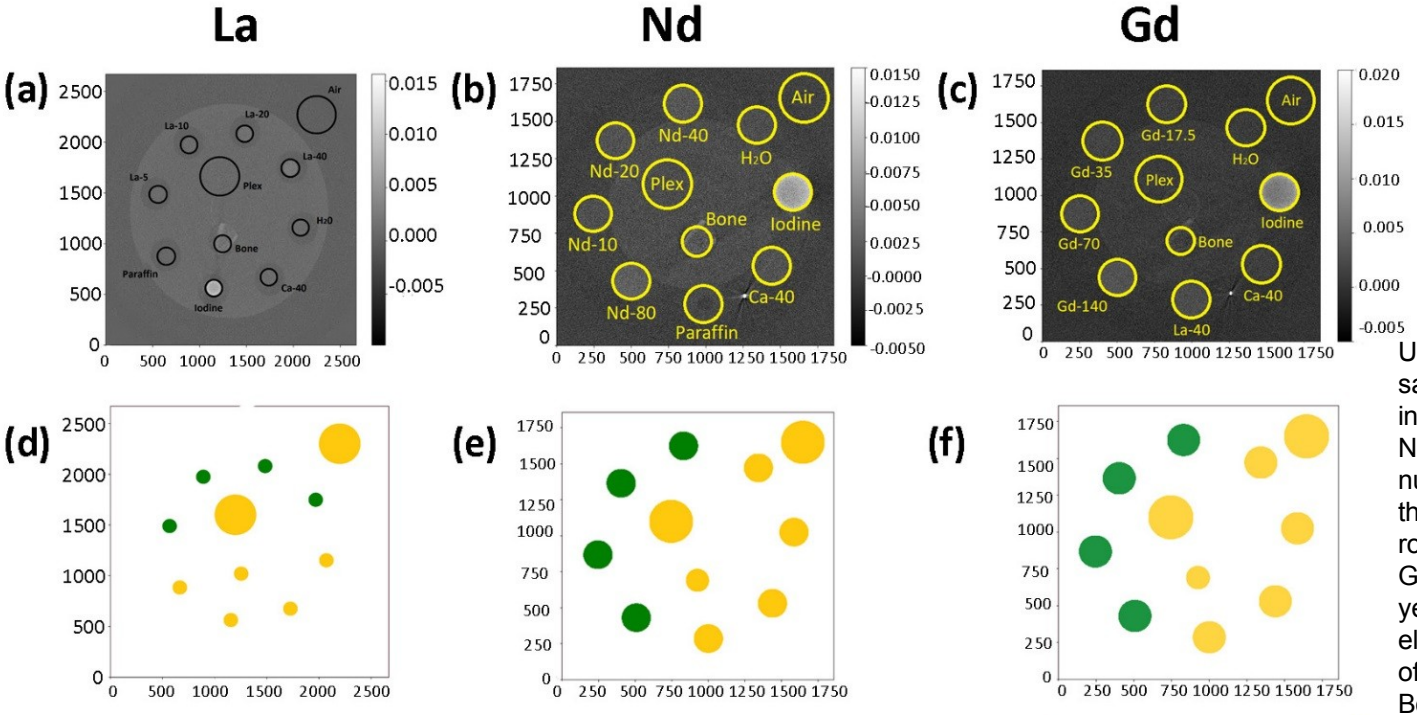

Upper row: CT images of phantom with the standard samples (water, iodine, paraffin, bone, and plex) and the investigated water solutions of La(NO3)3Â·6H2O (a), Nd(NO3)3Â·6H2O (b), and Gd(NO3)3Â·6H2O (c). The numbers shown in the images reflect the concentration of the contrasting element in the study solution. Second row: results of application of the photon energy criteria. Green corresponds to La (d), Nd (e), and Gd (f), while yellow corresponds to samples with no contrasting elements detected by criteria. Third row: the estimation of molar concentrations of La (g), Nd (h), and Gd (i). Bottom row: dependence of simulated concentration criteria from experimental concentrations of water solutions of La(NO3)3Â·6H2O (j), Nd(NO3)3Â·6H2O (k), and Gd(NO3)3Â·6H2O (l).

https://doi.org/10.3390/nano12234110

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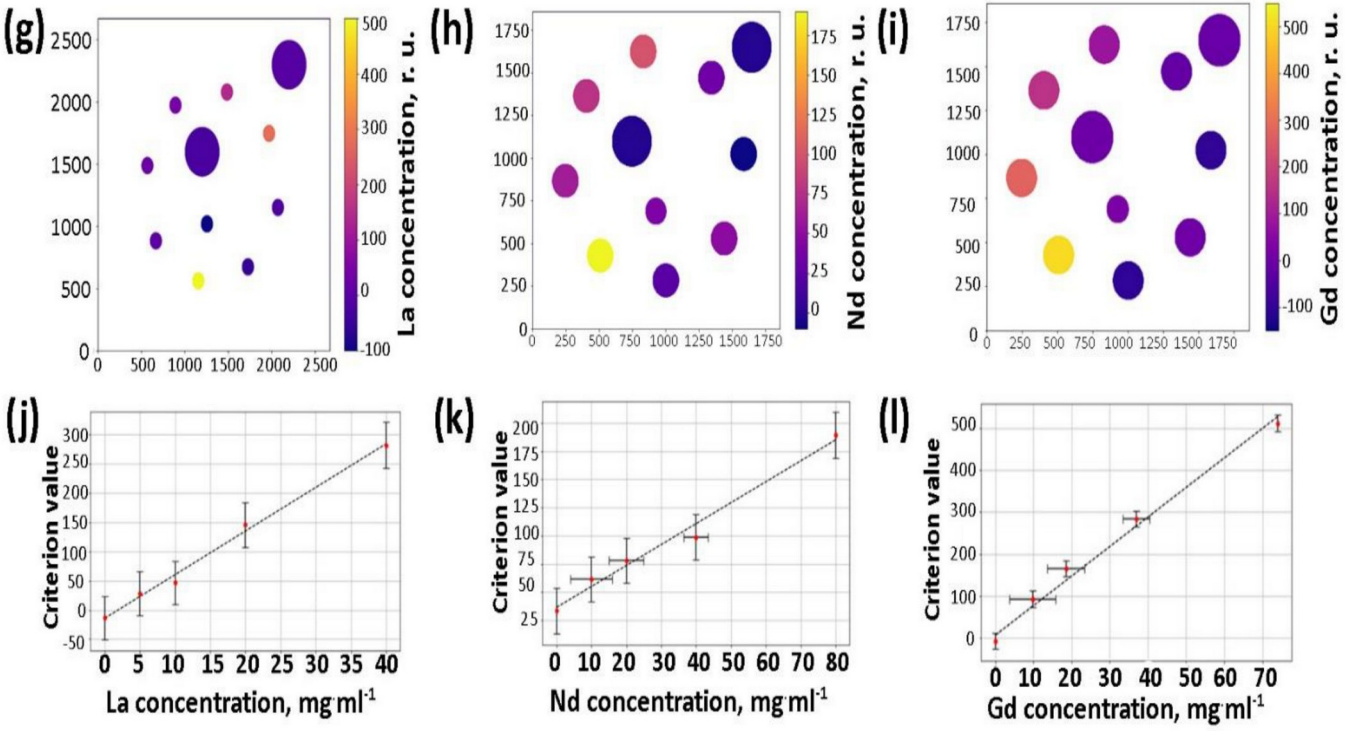

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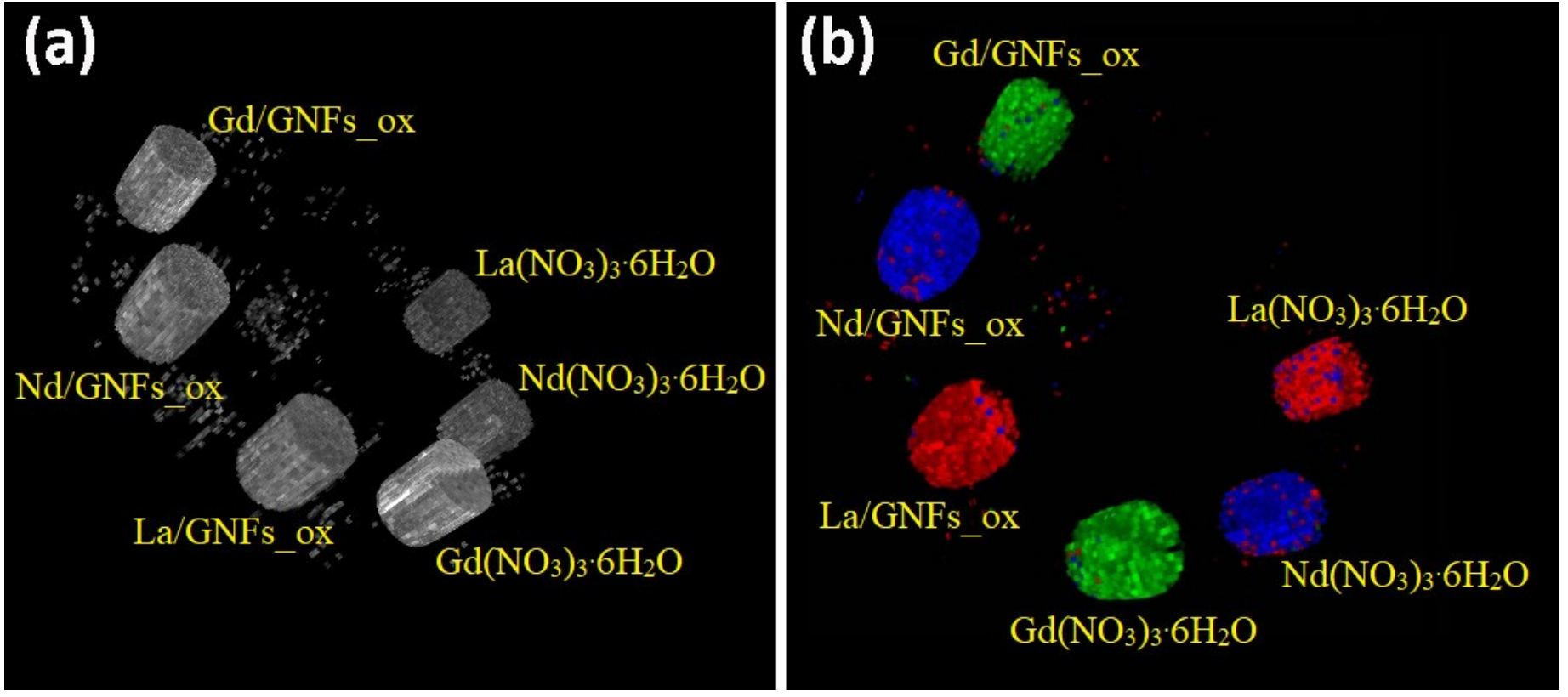

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MultyEnergy Computer Tomography

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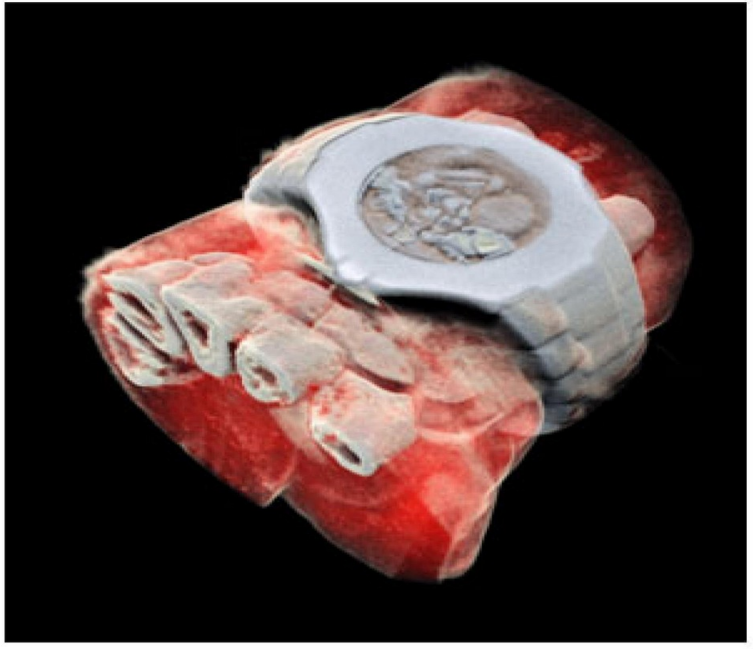

Summary

An algorithm for the material decomposition and their concentrations has been developed

Spectrum equalization technique developed for each MPX3RX chip

The minimum concentrations of contrast agents were determined

Composites based on lanthanides have been developed, which can act as contrast agents.

The research was supported by RSF (project No. 22-15-00072)

Thank you for your attention!