This project is directly related to the development of the new types of luminescent materials, based on the solid solutions of mixed garnet, orthosilicate and perovskite compounds, prepared in the functional forms of *single crystalline films* and *bulk single crystals*. In our project we focus first of all on the *scintillating materials*, which are the converters transforming the energy of photons of ionising radiation (x or γ-rays) or particles (protons, electrons, neutrons, α-particles, etc.) into a large number of UV/visible photons easily detectable with a conventional photomultipliers or semiconductor diodes. Scintillating materials, usually based on the different alkali halide (in past) and oxide materials (nowadays), are currently widely used for radiation detection in many fields, such as high energy physics, bolometry for rare events search, industrial control, safety and homeland security, medical and industrial imaging, and others.

The aim of project is design of advanced single crystalline film scintillators based on the Ce, Tb and Eu doped mixed $(Lu,Gd,Tb)_3Al_5O_{12}$ garnets, $(Lu,Gd)AlO_3$ perovskites, $(Lu,Gd)_2SiO_5$ orthosilicates and $(Lu,Gd)_2Si_2O_7$ pyrosilicates for application as the scintillation screens in the microimaging detectors *with submicron spatial resolution* using Liquid Phase Epitaxy (LPE) growth method (Fig.1); (ii) study of basic physical phenomena related to the efficiency of energy transfer from excited hosts of mentioned compounds to emission centers as well as charge trapping-detrapping phenomena, which play the substantial role in the light output and timing characteristics of scintillations.

We expect that these *novel film scintillators will possess the higher absorption ability of X-rays, larger light yield and better energy resolution with respect to already developed film analogues* (Fig.2)

The main differences in the structure of the emission centers, *caused by* dopants and defects, at different methods of scintillator preparation in film and crystal forms will be determined as well. We plan to establish also the regularities in the transformation of these centers depending on the growth conditions of the film scintillators from the low-temperature melt-solution (LPE technique) and their crystal counterparts from high-temperature melt using micro-pulling down or Czochralski technique.

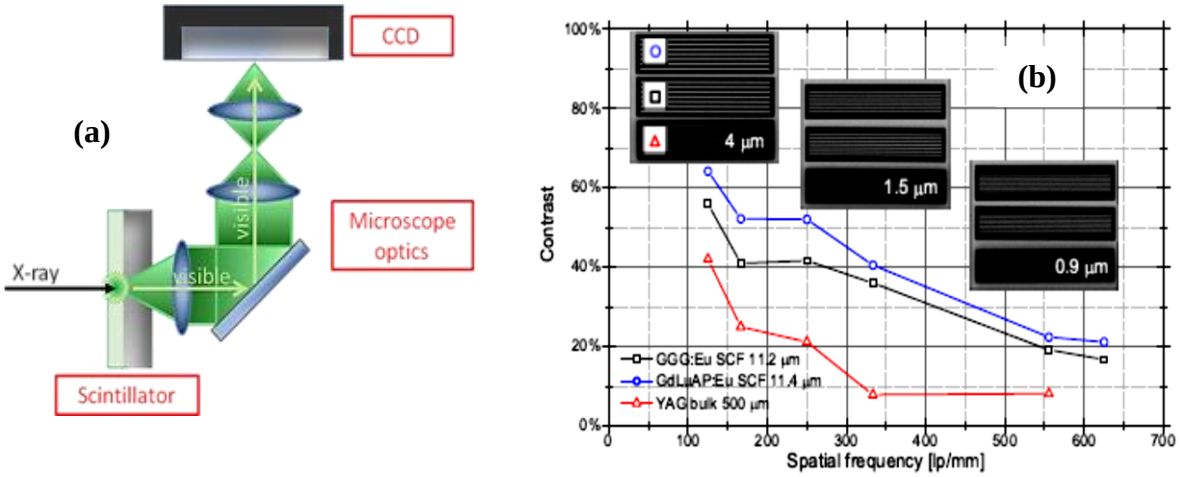

Fig. 1. (a) The functional scheme of detector for microtomography developed in ESFR, Grenoble, France [1]; (b) possibility of improvement of the tungsten pattern images, recorded using a $(Gd_{0.45}Lu_{0.55})AlO_3$:Eu SCF screen with 11.4 μm thickness in comparison with images recorded using a $Gd_3Ga_5O_{12}$:Eu film screens with 11.2 μm thickness and (YAG):Ce crystal screens with 500 μm thickness [2].

Apart from the scintillators detectors, the possible fields of application of the compounds under study can also include the cathodoluminescent screens, thermoluminescent detectors, white LED convectors, laser media and photovoltaic devices.

1. T. Martin, A. Koch, J. Synchrot. Rad. **13**, 180 (2006).
2. F. Riva, P-.A.Douissard, T. Martin, F. Carla, Y.V. Zorenko, C. Dujardin, CrystEngComm. **18**, 608 (2016).