A REMOTE AND REAL-TIME OPTICAL DETECTION OF ALPHA EMITTING RADIONUCLIDS IN THE ENVIRONMENT

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Remote Alpha project

Need

Alpha emitting radionuclides represent the greatest radiological threat for human beings if they enter the human body. Currently, detection systems to measure large-scale contamination are not available.

Receiving optical system: based on lens objectives, and a modular mirror system developed at PTB

For tripod: For UAV:

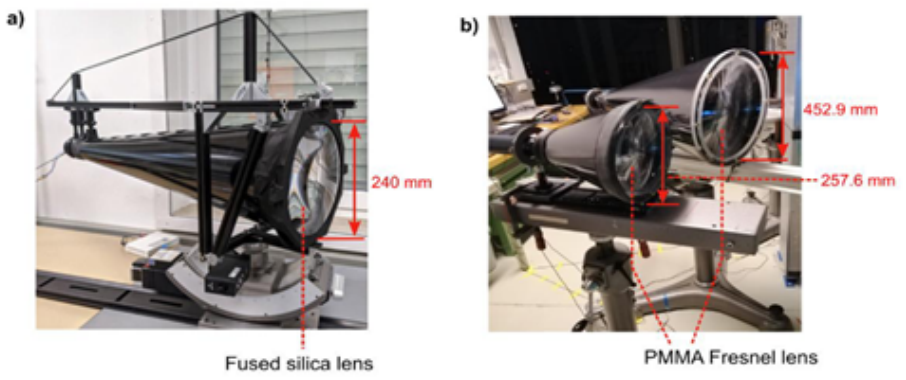
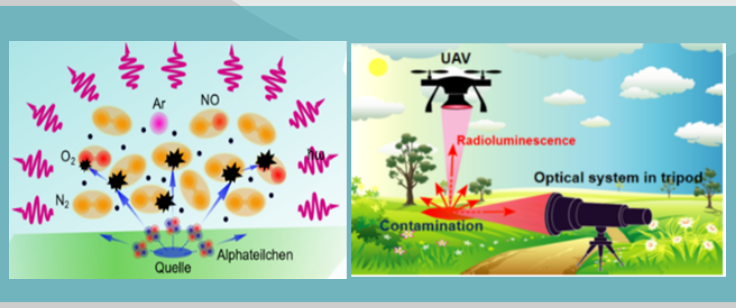


Figure 1: Lens-based radioluminescence detection setups developed at the PTB (M. Luchkov, V. Dagendorf, F. Krasniqi). (a) Fused-silica lens (Abet Technologies) system mounted on a goniometer and rotation stage (Newport M-BGM160PE and RVS80CC). (b) PMMA Fresnel lens (Orafol Fresnel Optics) systems. All lens systems can be coupled to selected PMTs and UV-C or UV-A interference filters.

https://tinyurl.com/2pskbnxm



Laboratory results: for solar blind region (UV-C: below280 nm): N2–NO mixture to enhance the detection limit. (about 0.4 m)

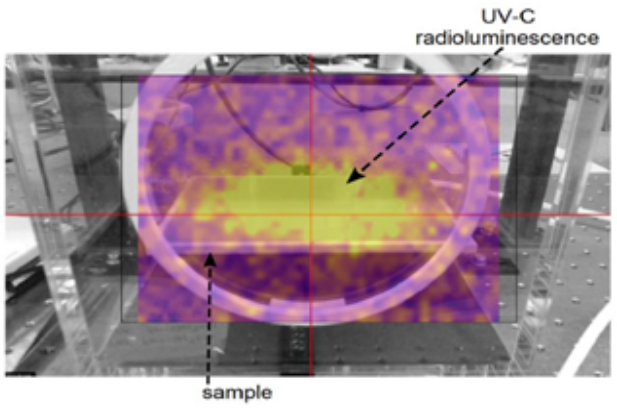


Fig. 6. (color online) Image of a wide area reference alpha-emitting source composed of the uranium isotopes U-234, U-235 and U-238, with a total activity of 330 Bq over an active area of 19.1 × 11.9 cm^2. The concentration of NO at the N_2 atmosphere was about 3 ppm. The scene was scanned using scanning PMT system at about 0.4 m distance with a resolution of 1 deg and 30 s integration per point.

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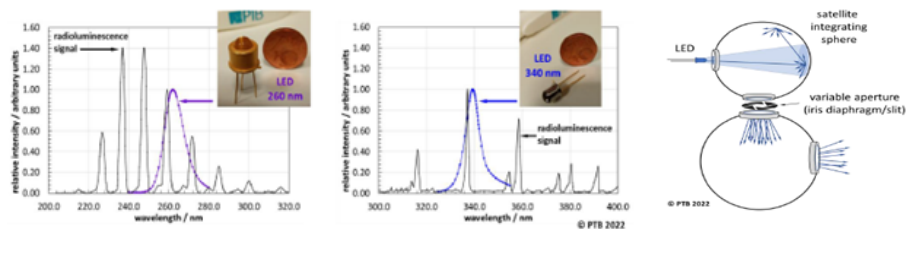
Developing and establishing a calibration system for the novel-type radioluminescence detector systems (PTB, D.Taubert 2022, Blog)

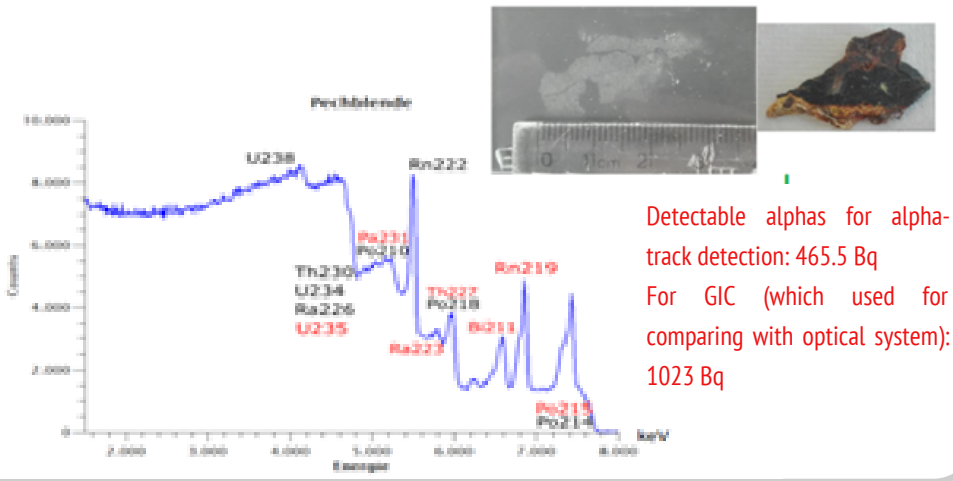
by quasi monochromatic isotropic and large area optical source with variable output namely: UV LEDs transforming into large area uniform and diffuse optical emitter using double integrating sphere with variable with variable aperture



https://tinyurl.com/45z3fze9

Characterization and measuring contaminated common environmental surfaces under well-known conditions in the lab (LUH- Annika Klose)

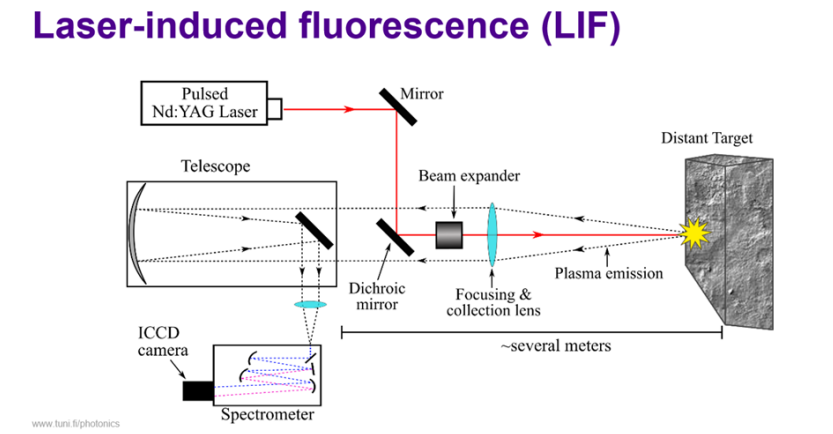
Before measuring the pitchblende samples with the optical system in UAV and UVC, they were analysed via alpha-track - detection regarding homogeneity. The surface count rate was



Detectable alphas for alpha-track detection: 465.5 Bq
For GIC (which used for comparing with optical system): 1023 Bq

Feasibility study for a laser-induced fluorescence spectroscopic method for the detection of alpha emitters (TAU): re-excitation of excited nitrogen states triggering by alpha-particles by laser

Tampere University



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https://remotealpha.drmr.nipne.ro/

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