PhD position: development of a metrological nanoparticle flow cytometer

Apply physics to realize reliable nanoparticles measurements in clinical blood samples

Project description

Analysis of components in body fluids, such as blood, provide detailed insight in the health or disease status of an individual. A key component of body fluids are extracellular vesicles (EVs), which can be seen as biological nanoparticles. Figure 1 shows the size distribution of EVs from urine based on transmission electron microscopy images. Because the concentration, composition and function of EVs chance in disease, accurate EV measurements together with sophisticated data analyses will likely provide new clinical information. However, reliable detection of EVs is a technical challenge!

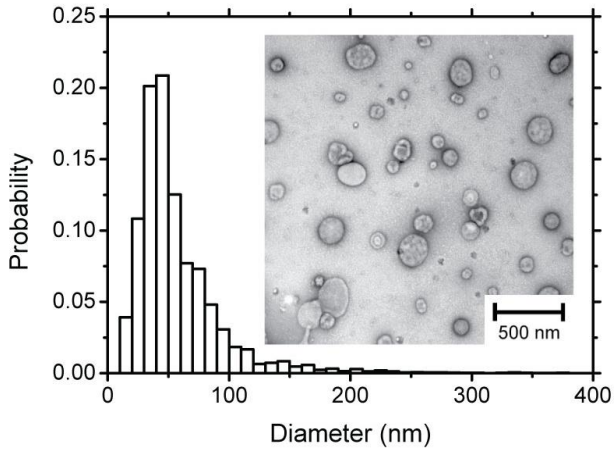

Figure 1: *Size distribution and transmission electron microscopy image of extracellular vesicles (EVs) from human urine*

The goal of this project is to develop a metrological flow cytometer for detection of EVs in human body fluids. Together with a multidisciplinary team from Amsterdam UMC and the Dutch metrology institute VSL, you will (1) develop methods and procedures to determine the mean diameter, size distribution, number concentration, fluorescence, Raman, and refractive index of reference materials including measurement uncertainties, (2) develop methods and procedures to determine the refractive index of body fluids, and (3) apply the developed technology to characterize biological test samples containing EVs.

What we require

A MSc degree in (applied) physics, biomedical engineering or a related field. Affinity with both optics and metrology is required. Interest in performing simulations to optimize the measurement setup. Knowledge of MATLAB, Python and/or flow cytometry is a clear advantage. Combine practical skills with analytical insight is essential.

Our team

This project is a collaboration between VSL (Dr. Arthur van de Nes, Dr. Omar El Gawhary), the Amsterdam UMC Departments of Biomedical Engineering & Physics (Prof. dr. Ton van Leeuwen, Dr. Ir. Edwin van der Pol) and Experimental Clinical Chemistry (Dr. Rienk Nieuwland). The team is considered world leading in the detection of EVs. The dimensional metrology group at VSL has a focus on nanometrology using optical and scanning probe techniques and has experience in measuring extracellular vesicles in liquid and air. The Department of Biomedical Engineering & Physics in the Amsterdam UMC has ample experience with customizing flow cytometers for detection and signal analysis of extracellular vesicles. The Laboratory of Experimental Clinical Chemistry in the Amsterdam UMC focuses on clinical applications of EVs and has specialized equipment available to isolate, store and characterize such particles.

What we offer you

A full-time employment for four years, with a gross monthly salary of €2,336,- (first year) to € 2,992,- (fourth year); a holiday allowance of 8% and 8.3% end of year allowance of the gross annual salary. The opportunity to attend international progress meetings, scientific conferences and summer schools. A PhD degree at the University of Amsterdam, after successful completion of your research. An opportunity to build your own network in metrology and biomedical research. You contribute directly to next generation biomarker research. Importantly, during the first 2 years you will work 3-4 days per week in Delft, at the dimensional metrology group of VSL. We expect that you will travel to the AMC on a weekly basis. The candidate is expected to actively participate in both groups.

Contact

To apply, please send your CV and motivation letter to one of the e-mail addresses below. If you have additional questions, please do not hesitate to contact us.

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