

# Upcon<sup>®</sup> upconverting nanoparticle (UCNP) technology

Unique labeling technology with exceptional sensitivity





## Exceptional solution for research laboratories and point-of-care applications

The Upcon® upconverting nanoparticle (UCNP) system is a unique labeling technology based on photon upconversion. This system offers a complete solution that combines luminescent upconverting nanoparticles, user-friendly instruments, software, and technical support. One major advantage of the Upcon system is its ability to eliminate autofluorescence and scattered excitation light, ensuring high sensitivity and performance for life science, research, and diagnostic purposes. Its sensitivity surpasses traditional lateral flow assay formats by several hundred times.

### Technology meets the needs of high-sensitive applications

- **Diagnostics and bioanalytics:** Bioaffinity assays, lateral flow tests and sensors
  - A 10-fold higher sensitivity for cardiac troponin I (Raiko et al., 2021)
- **Imaging and microscopy:** In vitro, In vivo & In situ
  - High-contrast images without interference produced with Lumito's SCIZYS kit

In the Upcon system, labels are excited using near-infrared wavelengths (NIR;  $\lambda = 980 \text{ nm}$ ) and the emitted light is detected at shorter, visible wavelengths. This ensures the emitted signal is free from disturbances like autofluorescence and is exceptionally clear.

## Key facts

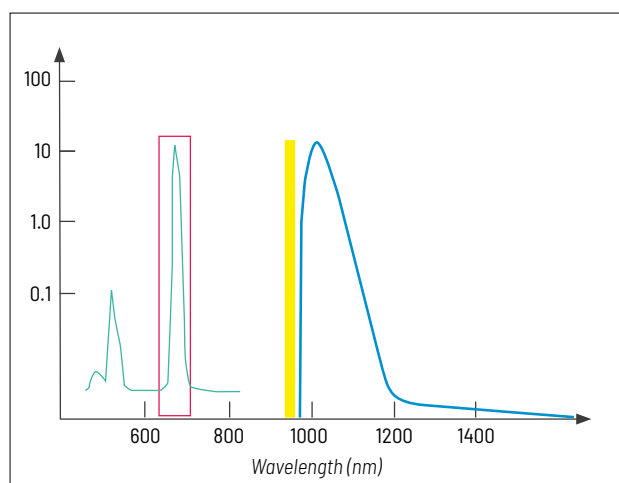
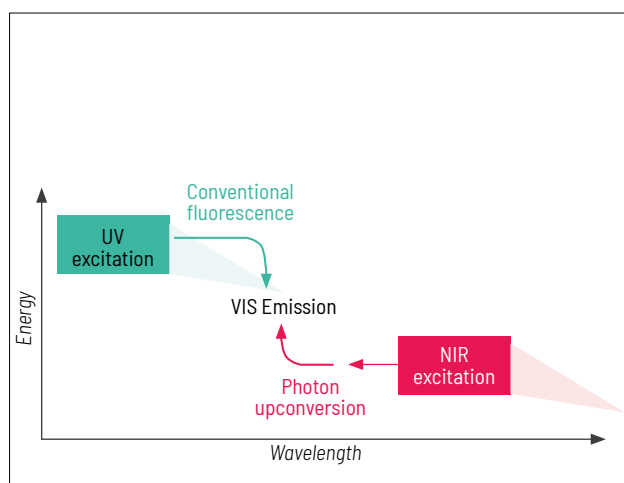
- Exceptional labeling technology utilizing brightly luminescent Upcon® upconverting nanoparticles (UCNPs)
- Sensitive detection even through tissue and in whole blood (< pM detection limit)
- Measurement without photobleaching, self-quenching, or autofluorescence
- Bright luminescence with discrete emission bands and unprecedented assay sensitivity

## Upcon® plate readers

### Versatile and portable modular readers for biochemical assays utilizing Upcon® technology

Upcon® plate readers are modular instruments designed for biochemical assays using the Upcon® technology. They are compact and lightweight, suitable for research labs. For point-of-care settings, development of small hand held reader is possible. These readers can adapt to 6–1536 well-plate formats. They operate within a temperature range of 3°C to 65°C and and three shaking modes.

The automation interface can be tailored to fit most open system stackers and automation lines. On demand, custom plate maps and sample holders are provided. The optional Strip Scanning Software allows scanning over lateral flow strip lines. Uniogen's LF Strip Holder lets users process up to 10 LF strips per experiment. The accessory list also includes an 800 nm High Sensitivity PMT Module and an Upcon Test Plate.



In Upcon, the label is excited at long wavelengths (NIR) and emission is detected at shorter wavelengths (VIS). Auto-fluorescence occurs always with longer wavelengths than excitation, so autofluorescence will not disturb the detection with visible wavelengths.

In the picture above the laser excitation is presented as yellow line and autofluorescence as blue curve. The emission signal presented as green curve can be measured free of autofluorescence.

## Upcon® upconverting nanoparticles (UCNPs)

### Photostable and brightly fluorescent upconverting nanoparticles for biomolecule detection

Upcon® upconverting nanoparticles (UCNP) offer superior benefits over traditional fluorescent labels, such as high sensitivity and the absence of autofluorescence. These nanoparticles surpass conventional fluorophores or quantum dots in performance. These UCNPs come in different forms, either functionalized or attached to biomolecules like streptavidin or a chosen antibody. There are multiple choices concerning their size and coating. The incorporation of lanthanide ions in UCNPs results in bright and stable emission, distinct emission bands, and a long emission lifetime. These features make Upcon UCNPs perfect for applications like lateral flow assays, bioaffinity assays, microscopy, and imaging.



## Ordering information

Uniogen offers you ISO13485/9001 certified Upcon particles and instruments. Additionally we offer both conjugation and functionality testing services.

**Contact us for more information!**

### References:

1. Raiko K *et al.*, Supersensitive photon upconversion based immunoassay for detection of cardiac troponin I in human plasma. *Clin Chim Acta*. 2021;523:380-385. doi:10.1016/j.cca.2021.10.023.
2. Bayoumy S. & Martiskainen I. *et al.* (2021) Sensitive and quantitative detection of cardiac troponin I with upconverting nanoparticle lateral flow test with minimized interference. *Sci Rep*. 11:18698 doi: 10.1038/s41598-021-98199-y.
3. Martiskainen I. *et al.* (2021) Upconverting nanoparticle reporter-based highly sensitive rapid lateral flow immunoassay for hepatitis B virus surface antigen. *Anal Bioanal Chem*. 413:967-978. doi: 10.1007/s00216-020-03055-z.
4. Martiskainen I. *et al.* (2021) Double-Antigen Lateral Flow Immunoassay for the Detection of Anti-HIV-1 and -2 Antibodies Using Upconverting Nanoparticle Reporters. *Sensors* 21:330. doi: 10.3390/s21020330.
5. Salminen T. *et al.* (2020) Ultrasensitive and Robust Point-of-Care Immunoassay for the Detection of Plasmodium falciparum Malaria. *Anal Chem*. 92:15766-15772 doi: 10.1021/acs.analchem.0c02748.
6. Bayoumy S. *et al.* (2020) Glycovariant-based lateral flow immunoassay to detect ovarian cancer-associated serum CA125. *Commun Biol*. 2020 3:460. doi: 10.1038/s42003-020-01191-x.
7. Juntunen E. *et al.* (2017) Lateral flow immunoassay with upconverting nanoparticle-based detection for indirect measurement of interferon response by the level of MxA. *J Med Virol*. 89:598-605. doi: 10.1002/jmv.24689.

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