

# Detection Principle

## Optomagnetic Cluster Assay

Our biosensor makes use of an optomagnetic cluster assay to detect NT-proBNP in picomolar ranges. Superparamagnetic beads of 500 nm are coated with antibodies, and can, in presence of NT-proBNP, form a cluster. These clusters can be measured using a rotating magnetic field.

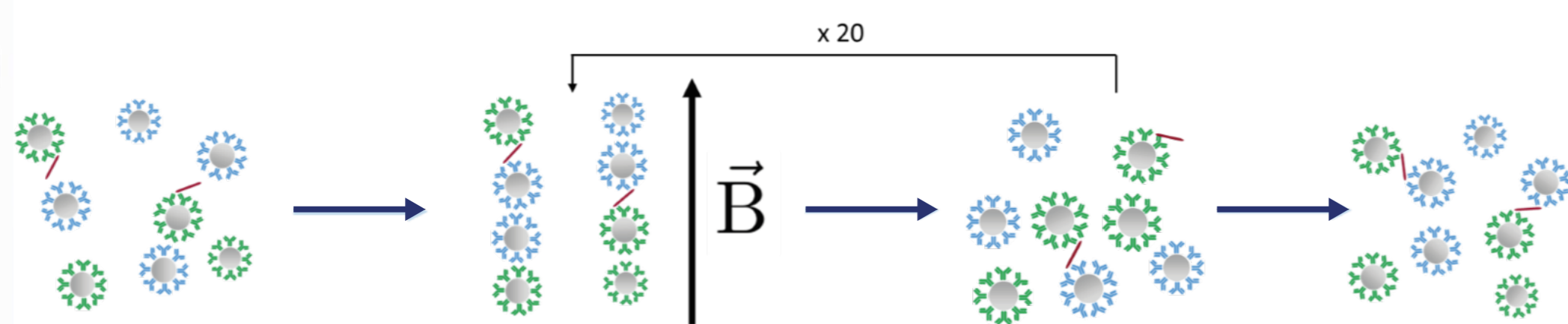
### The Concept

#### Phase I: Incubation

The first phase of the assay is the incubation, in which the NT-proBNP is captured by the particles using antibodies. This is based on diffusion, so cluster forming takes time. The incubation step in our assay takes ten minutes.

#### Phase II: Accelerating the assay

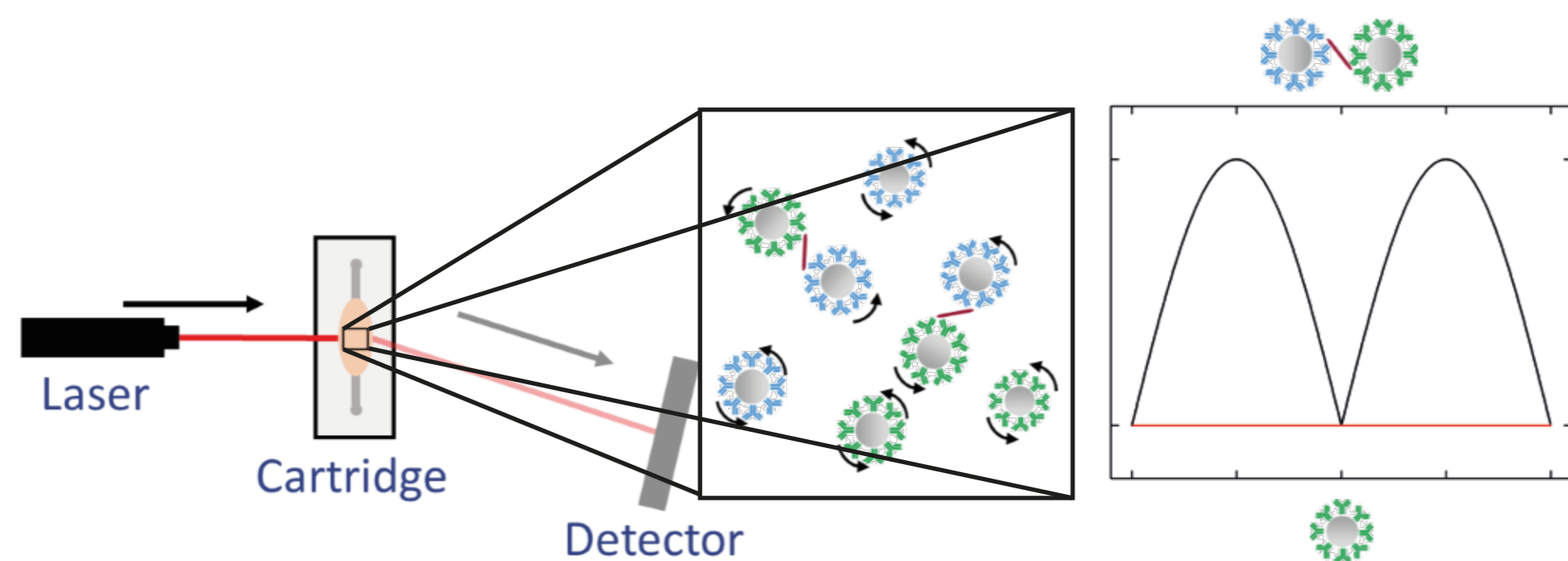
- Superparamagnetic beads can improve cluster formation when exposed to a linear, external magnetic field.



- The magnetic actuation will be repeated twenty times. In between the pulses, the beads will re-orientate in order to get another chance to form a cluster.

#### Phase III: Optomagnetic detection

- A rotating magnetic field allows for distinguishing between clusters and single beads, when measuring the scattering intensity of the sample.

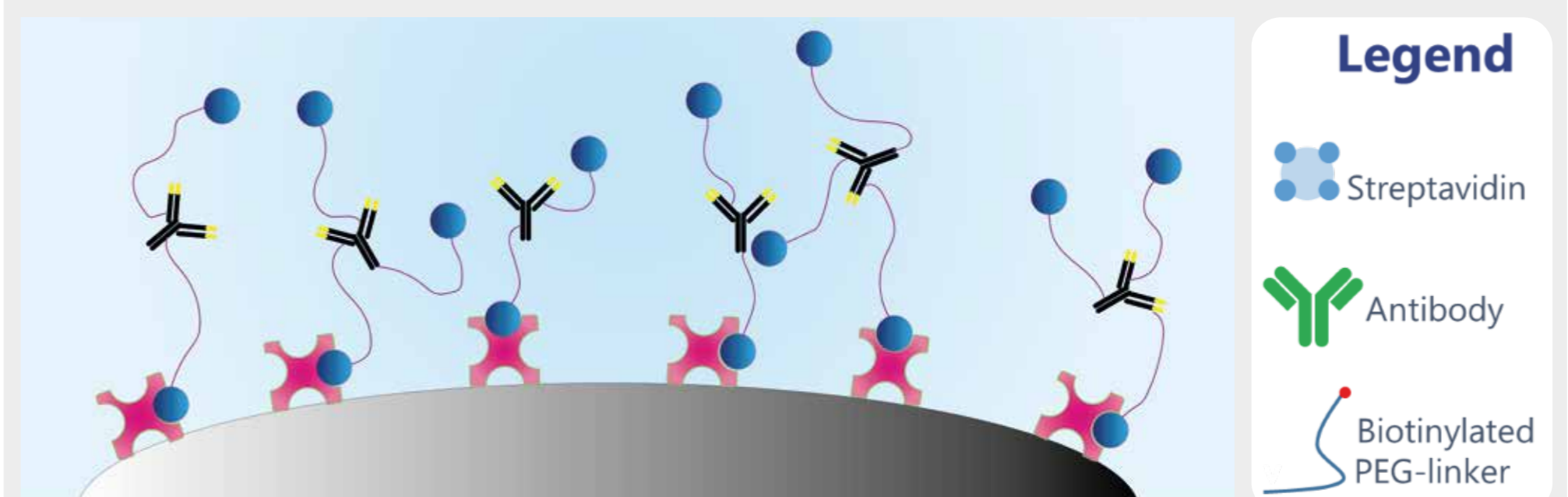


### Properties Of Our Biosensor

- Sample volume: 15 microliters
- Incubation time: 5 minutes
- Total assay time: 10 minutes
- Detection range:
  - In buffer: 10-100 pM
  - In plasma: 10-100 pM
- Range adaptable with different bead concentration

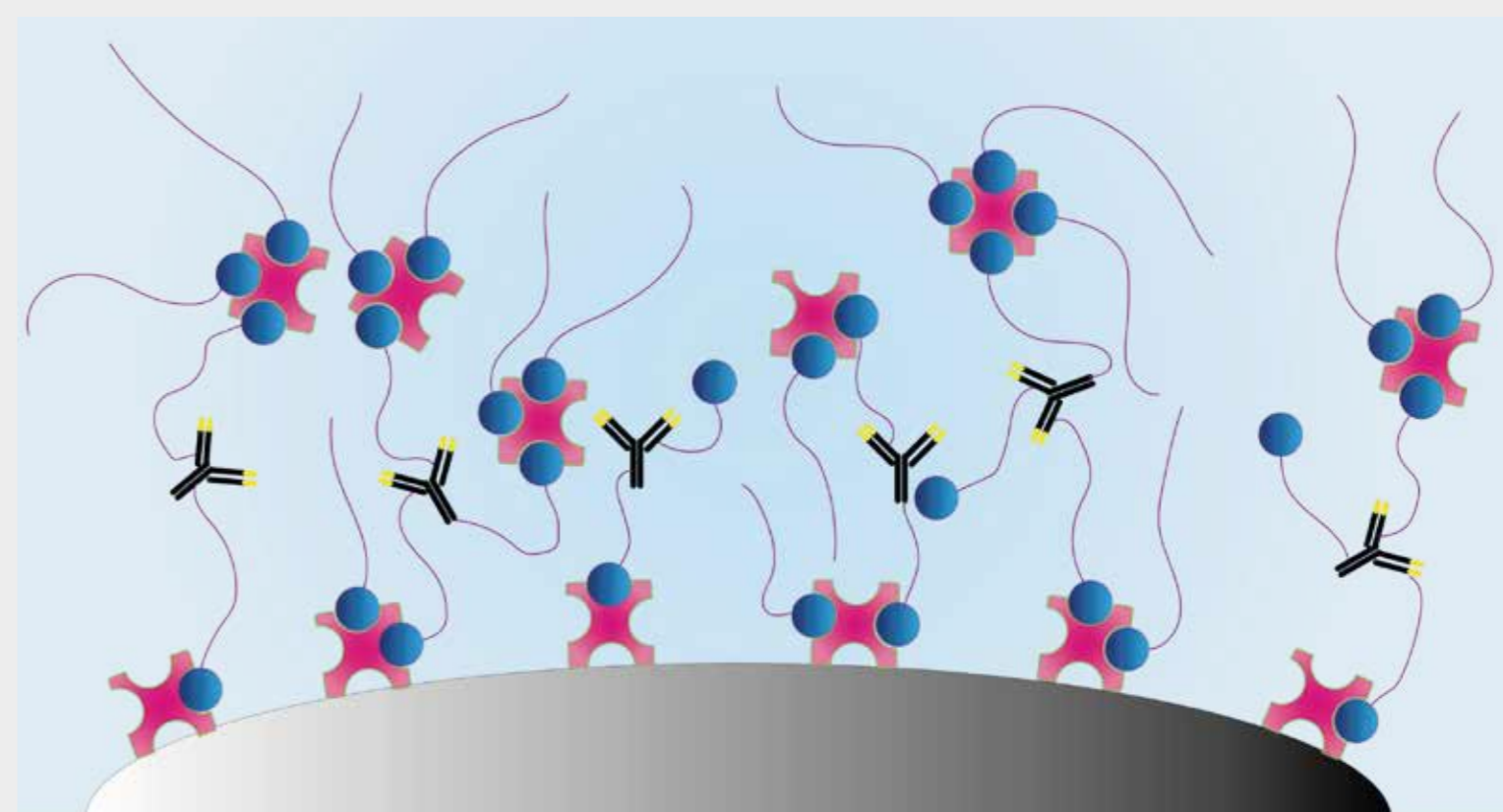
### Bead Functionalization

- PEG-linkers are coupled to antibodies using NHS
- Biotinylated PEG binds to beads via streptavidin



### Anti-Fouling Network

- PEG-linkers are coupled to antibodies using NHS
- Biotinylated PEG binds to beads via streptavidin



### Dose-Response Curves

- Measured in buffer (left) and 5% plasma (right)
- Small errorbars, clear distinction between concentrations
- Increase in signal at higher concentrations

