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AquaLife 2014

Drinking Water – analysis of bacterial contamination

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content

- Goals
- concept
  - 2-phase filtration module
  - Lysation of biological contaminants
  - Detector based on ATP-Assay
  - First test run in RWW water works
  - Additional sensor for PCR-Test

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General purpose

Technological platform for anlysis of drinking water samples and detection of pathogen contaminants in real time.

- Water analysis
  - Module for concentrating the sample
  - Integration of sensitive tests for pathogen detection
  - Development of a device concept for Online Analysis

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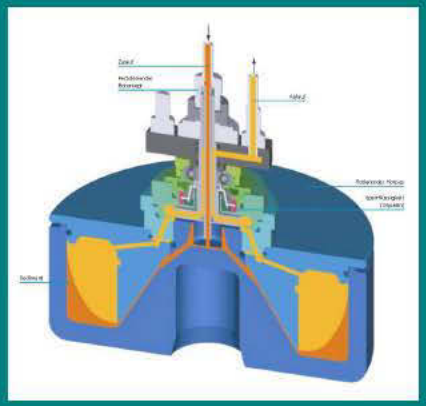
Possible concepts

The first conciderations included different solution for concetrating germs from water samples.

- Common concepts
  - Throughput centrifugation
  - Centrifugal filtration
  - Dead-End-Filtration
  - Cross-Flow-Filtration



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Finding the right solution

The choice fell to filtration methods. Two concepts were built.

- Crossflow-Filtration

Good relation between sample and concentrate volume – very undefined yield rate.

- Dead-End-Filtration

Very defined and well controllable process – concentrate factor can be easily calculated – not continuous.

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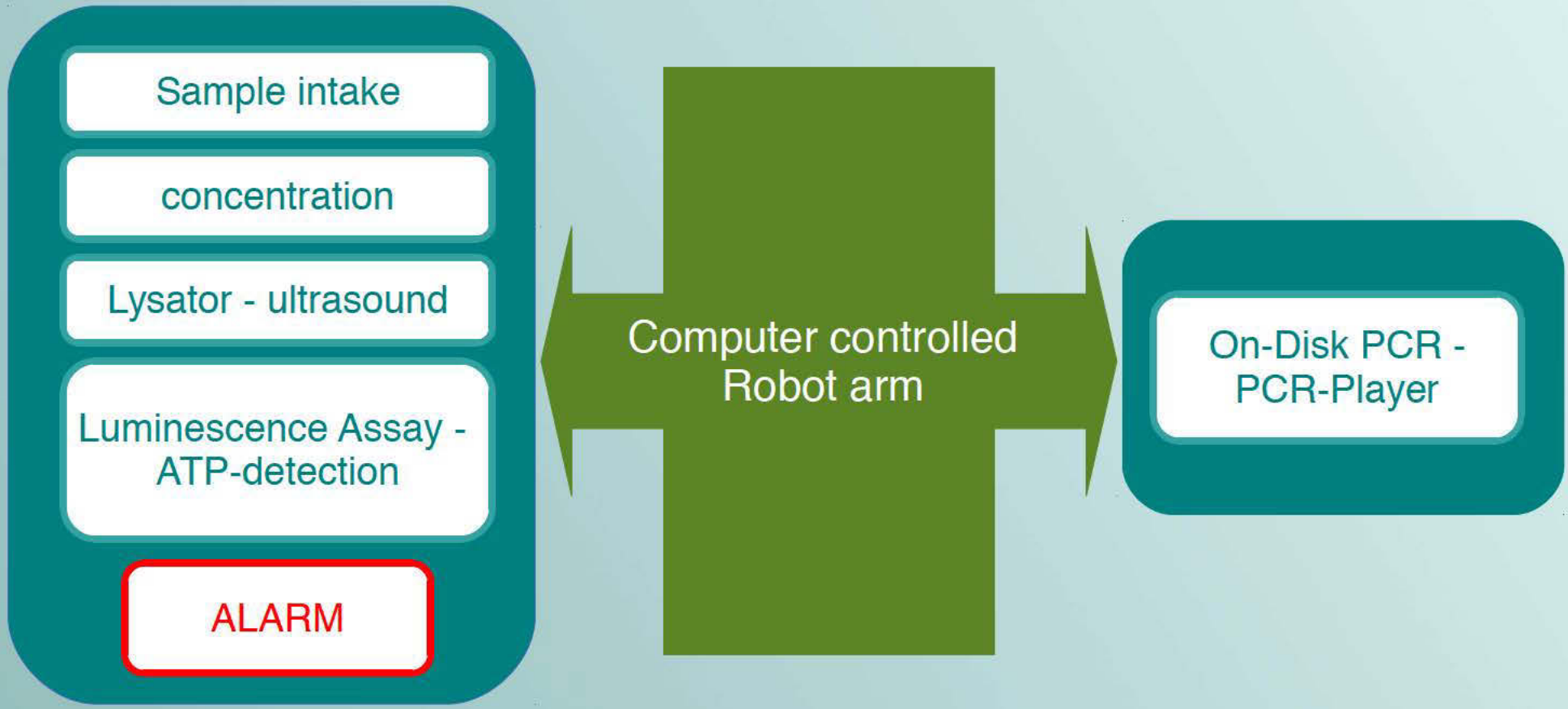
Technical concept



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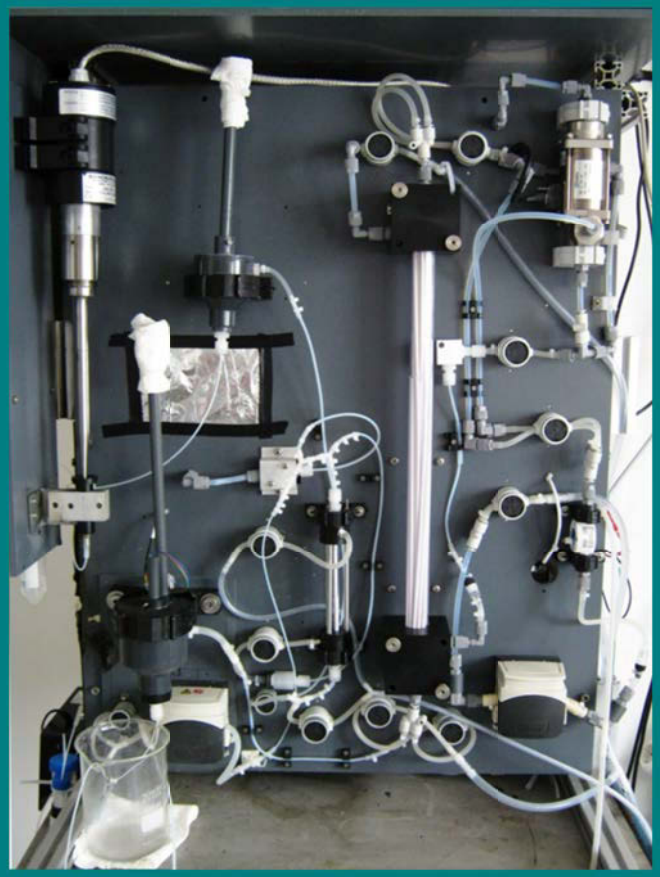
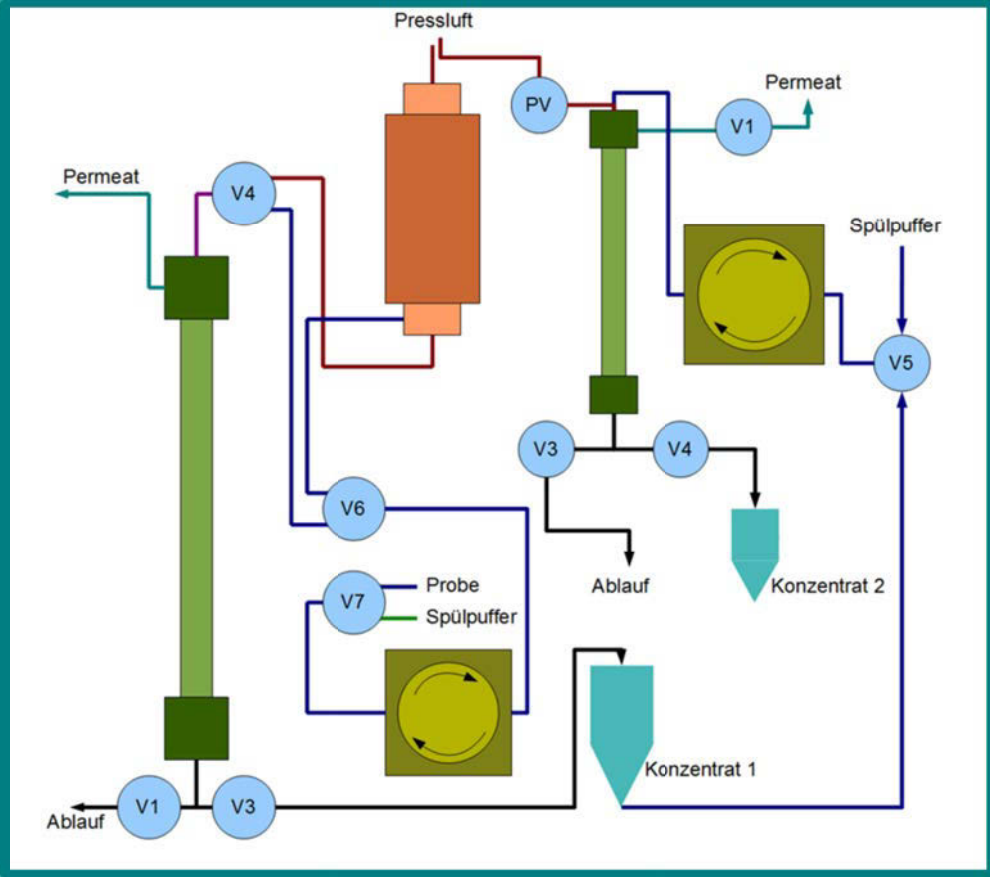
Filtration module – 1. and 2. stage





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Parameter – 1. and 2. stage

Input volume	10 – 100L sample volume
Output volume	5 – 7ml concentrate
concentration	Around factor 2000
durance	30min for 10L
Retrieval rate	>68% for *E.coli*

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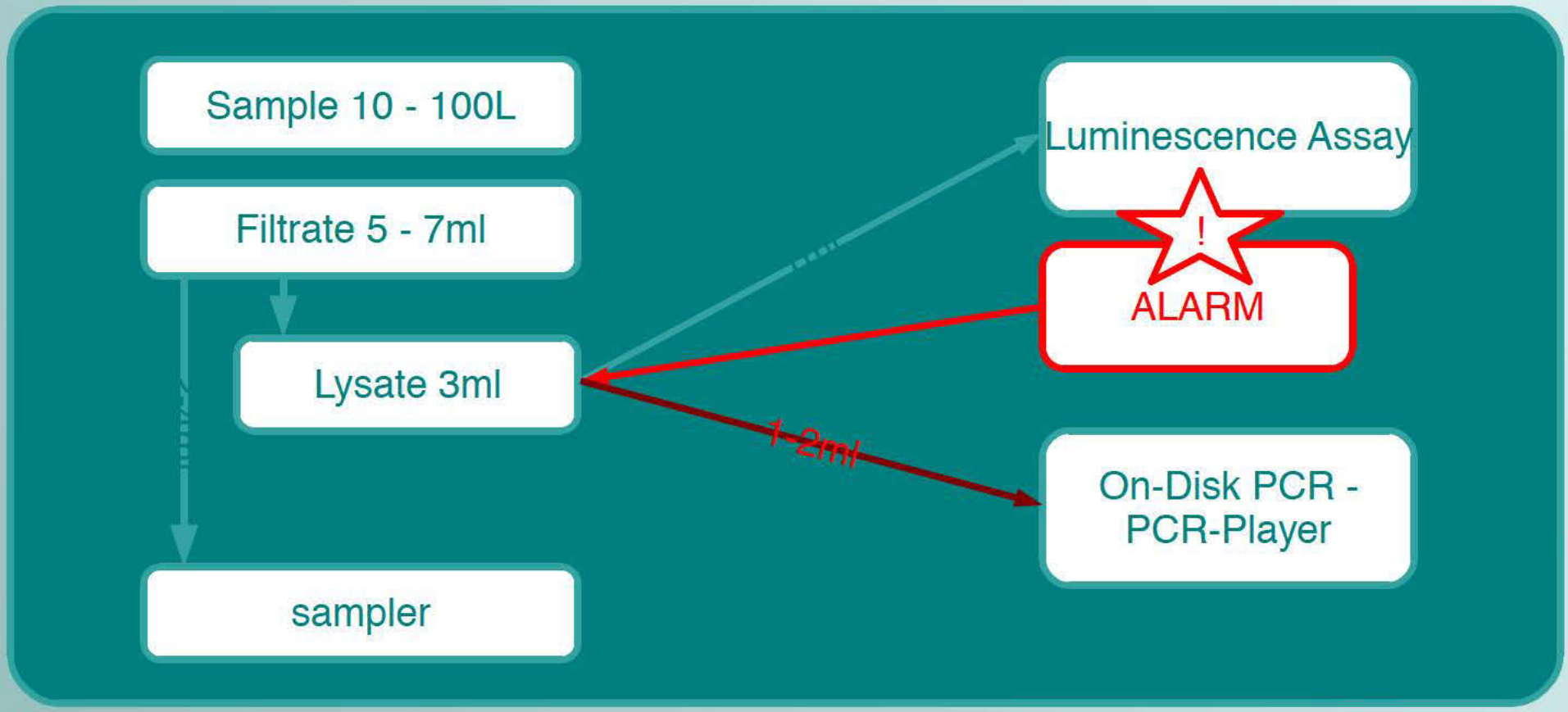
Ablauf



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Lysation - ultrasound

3ml concentrate

10min time of sonification

50% power

50% interval

Heated lysator (70°C)

Bacteria and algae are completely sonified

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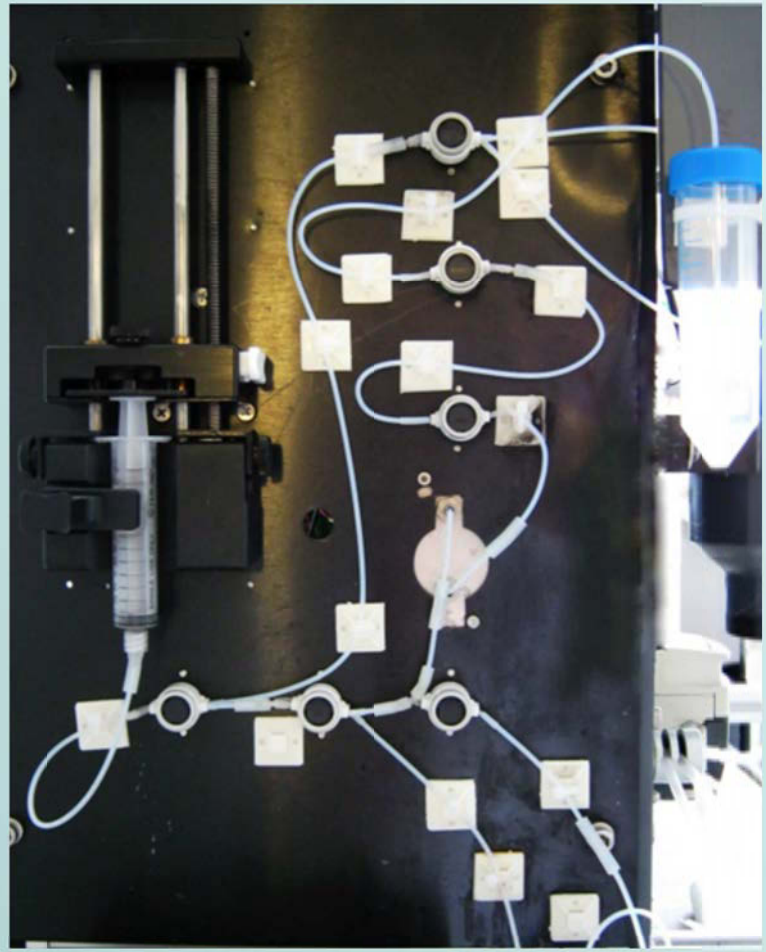
Detection of bacterial ATP

- Test runs online
- Assay lasts >2 weeks and stays stable
- Detection of very low concentrations of bacterial ATP
- Software for alarm and data collection



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Test run of the device at RWW

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Comparison to other methods

RWW-Laboratory

50ml sample from sample site

1ml of sample on agar plate

incubation at 20°C and 36°C

Incubation tome 36h

Pathogen-detection

Connection to same sample site

Concentration of 50L of sample within 60min

Lysis of the sample with ultrasound

Analysis for ATP in Luminescence Assay

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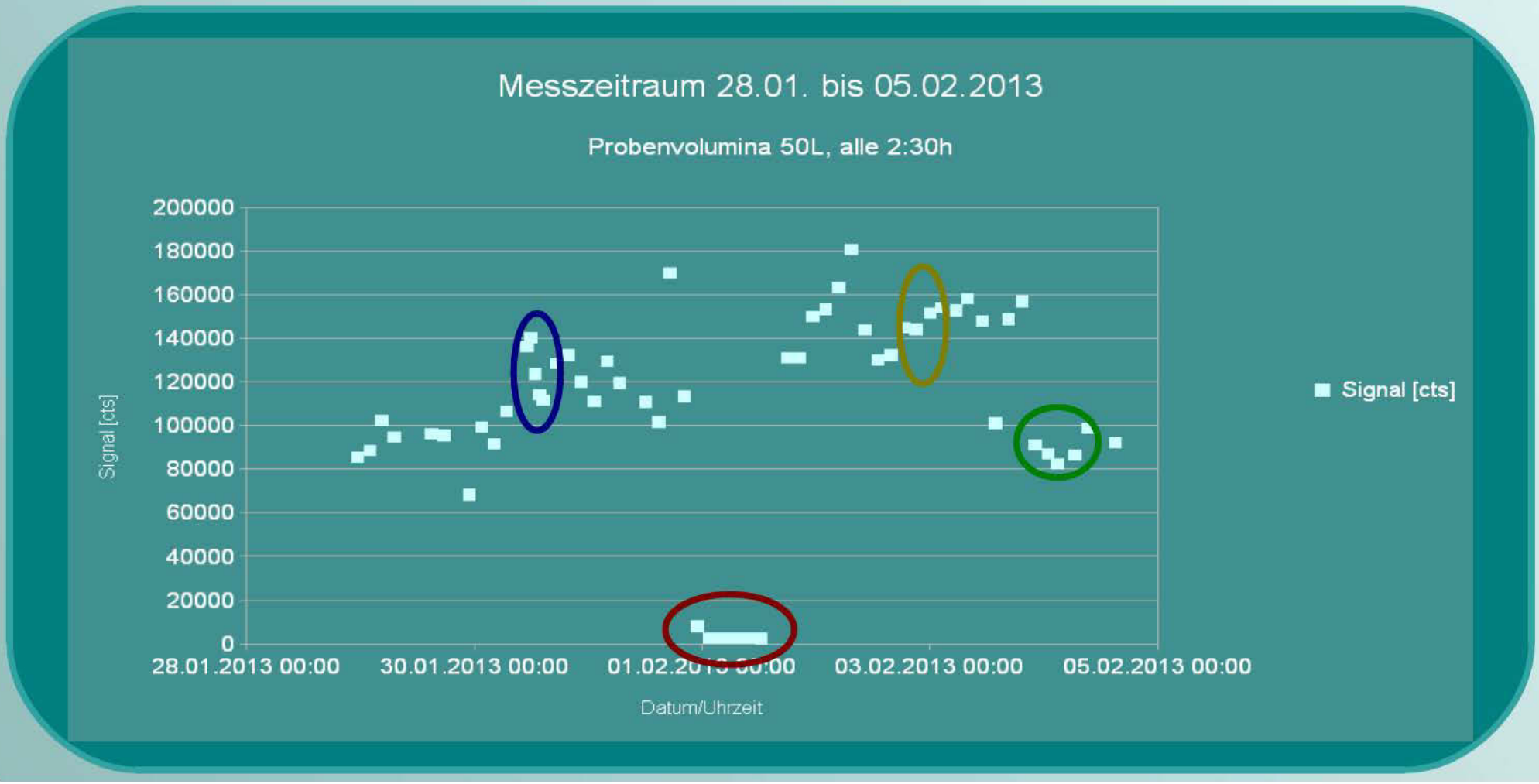
Long-term measurement



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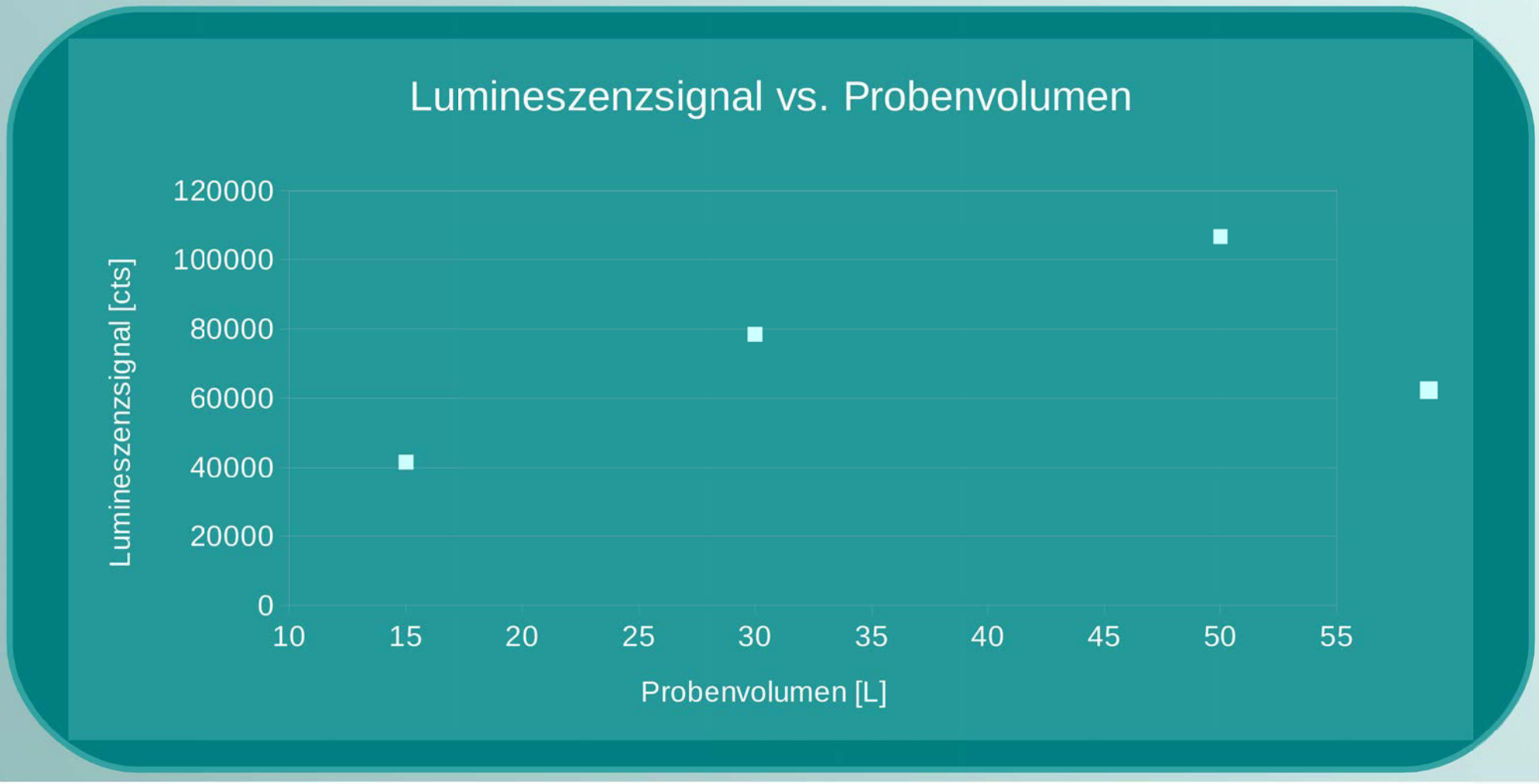
Dilution series



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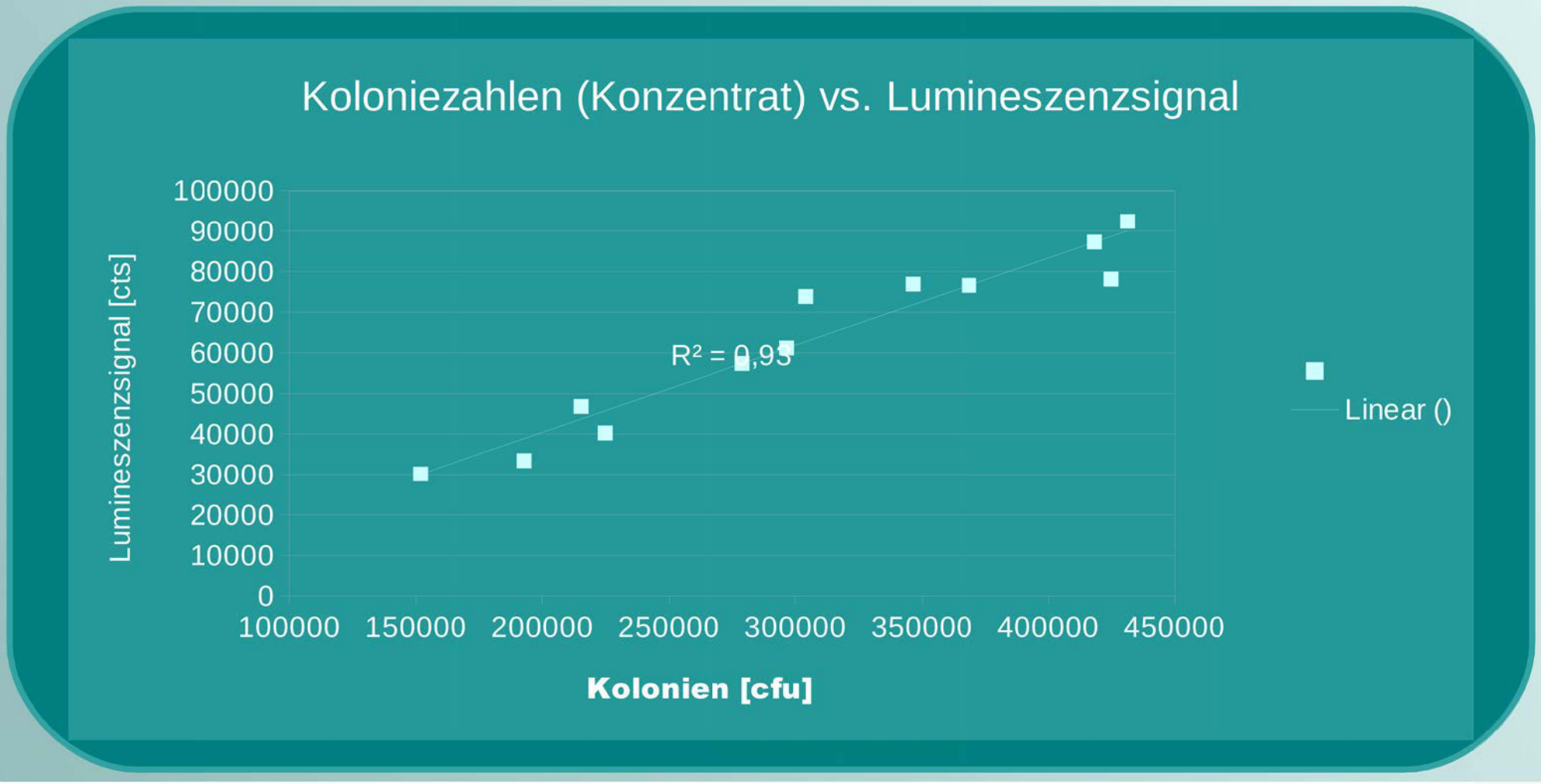
Comparison ATP-Assay vs. colonies



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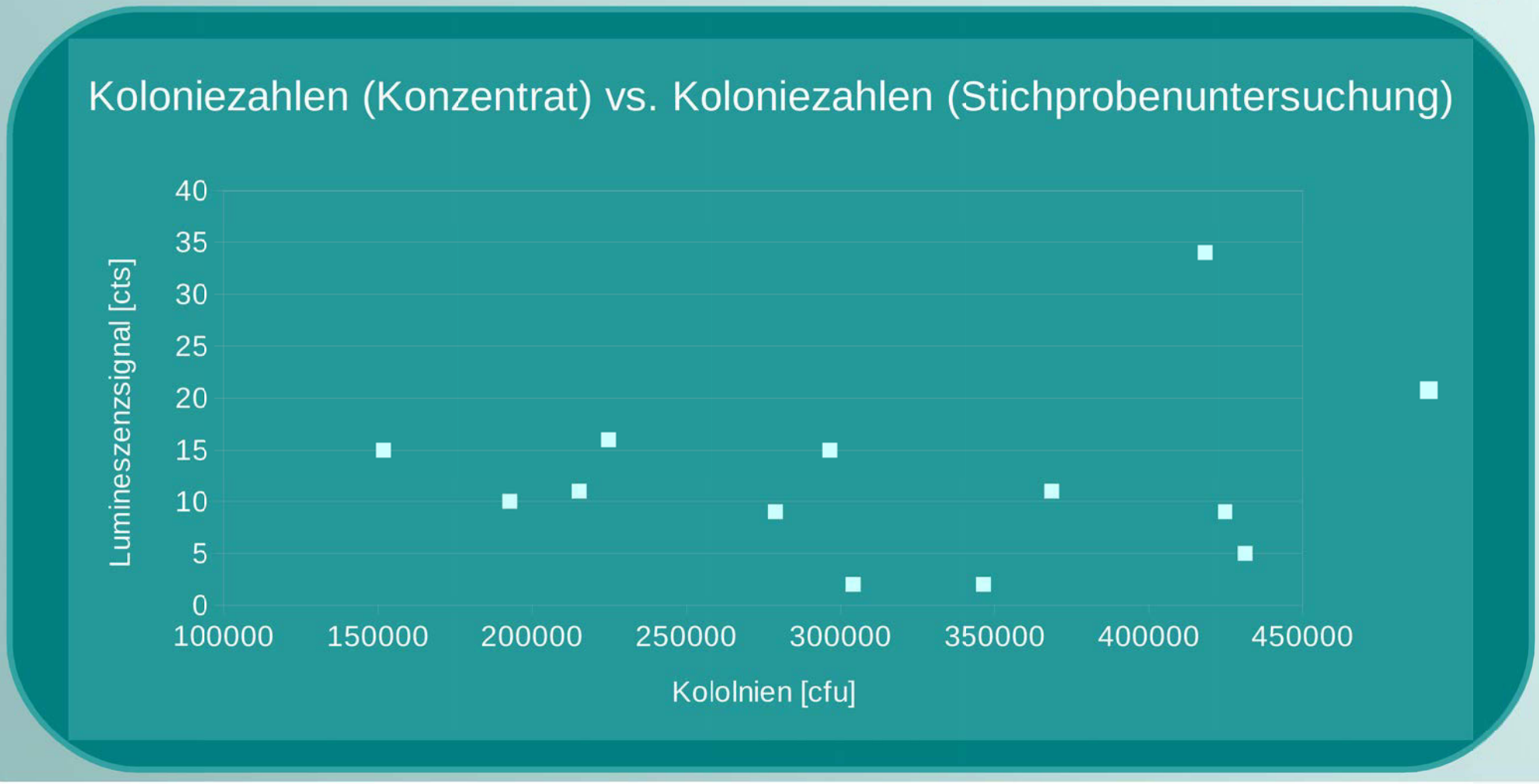
Filtration vs. standard sampling



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Adaptation of the PCR-Disk

Teachable robot

Control via PC through serial interface

Position of the dosing hole
Is freely adjustable

Dosing when luminescence
Signal tests positive

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Something is moving...

Demonstration of the robot and the PCR-Player

Movie...

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Software

Evaluation of the luminscence signal

Controlling the filtration

Control of the robot and the PCR-Player

Generates alarm when detecting pathogens

Nothing to see here ;)

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prospect

- The tests with the demonstrator showed that it is possible to build such a device
- There is a goup of potential apliers who would acquire such device if it meets their criteria
- If there is an interest in an online device for that application bbe is able to deliver a solution

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