



# Field test of microLFA modules for on-line measurement of nutrients in Ship of Opportunity application

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## User requirements for an on-line chemical analyzer in a Ferrybox analytical system

- Long term unattended autonomy
- Compactness
- Low reagents and sample consumption
- Low life-cycle cost
- Excellent reliability
- Easy interface with data-logger
- Low maintenance by non expert users



## Micromac-1000 features and limitations in Ferrybox systems

### Features:

- Unattended long term use
- Low reagents consumption
- High sensitivity
- Compactness and portability
- Modularity
- 12 Vdc power supply.

### Limitations:

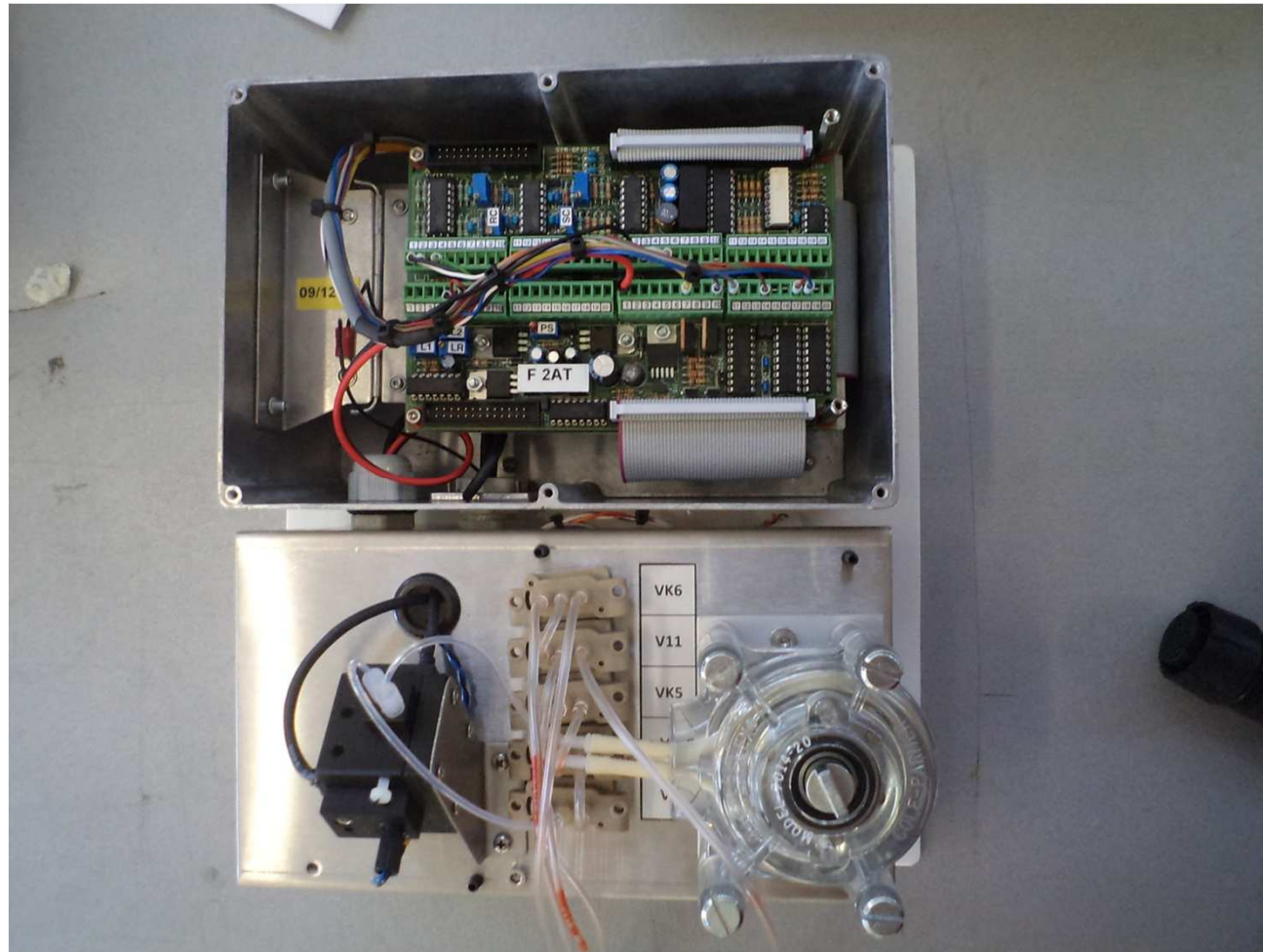
- Silicone based not sealed hydraulics
- Limited internal space for reagents solutions
- Hydraulics not directly visible to the user
- Electronics not sealed.



MUMM (Belgica ship), 2011



## The advance: $\mu$ LFA Smart module



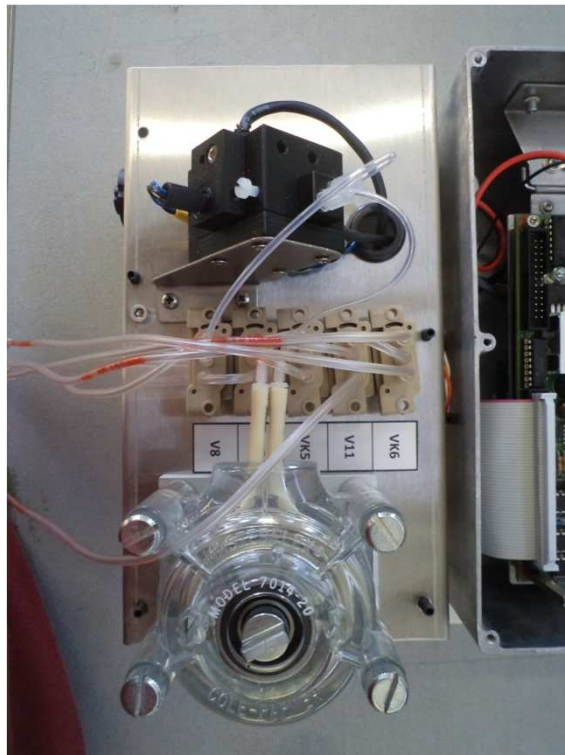


## **μLFA Smart module**

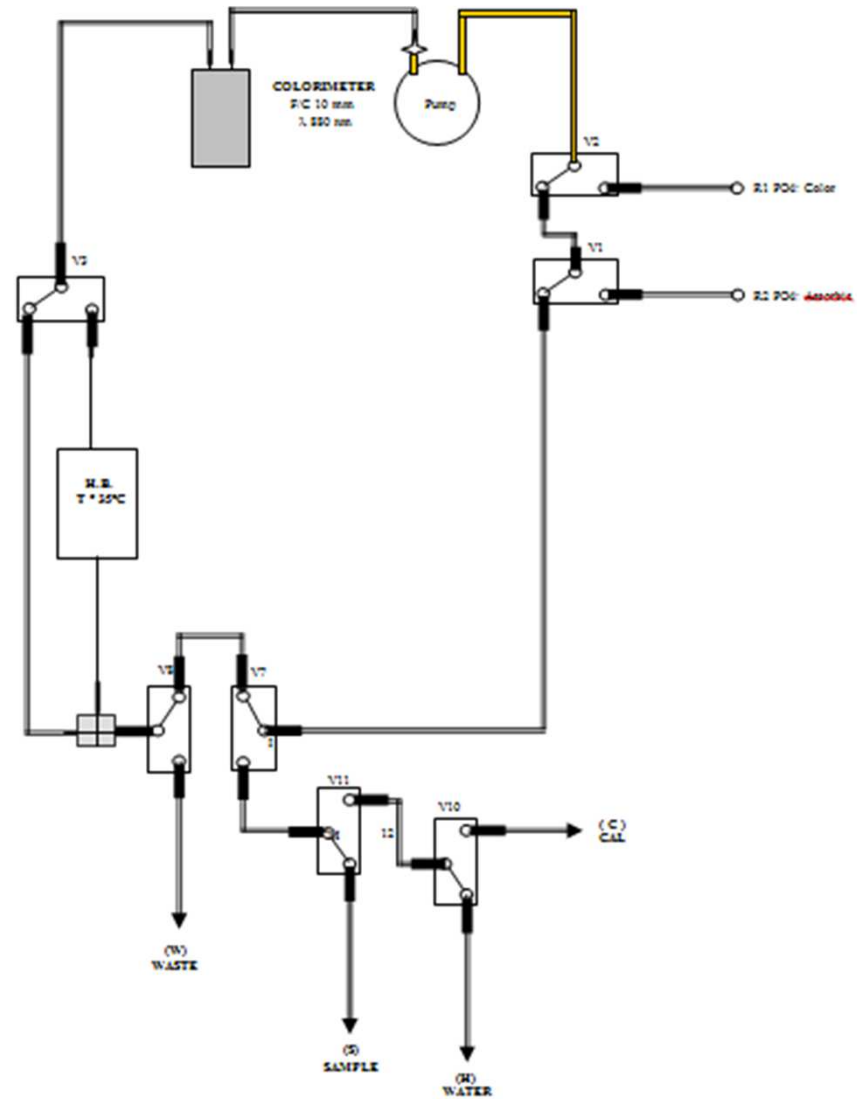
- **Very simple hydraulics directly accessible by operator**
- **Complete separation between hydraulic and sealed electronic**
- **Suitable to run all nutrients methods already developed and tested on field**
- **Lower reagents consumption: 250 μL for most of the reagents used, NH<sub>3</sub> and PO<sub>4</sub> fluorimetric**
- **Fast “plug-in” hydraulic connector allows easy deployment and reagents changeover on board**
- **Power supply: 12 Vdc, 3 W stand-by, 6 W analysis, max. 1 A**
- **Very low maintenance (one pump long life tube)**
- **Suitable for long term deployment.**



# The micro Loop Flow Reactor

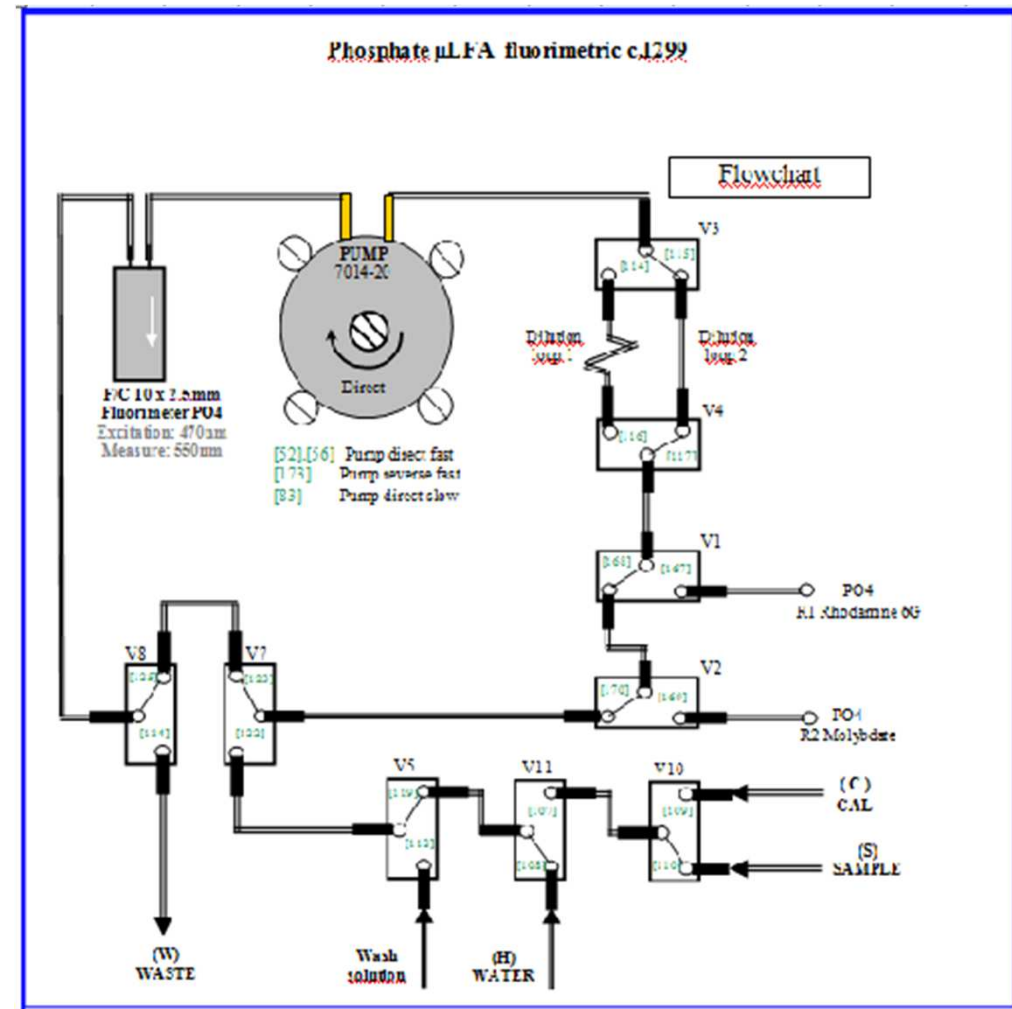
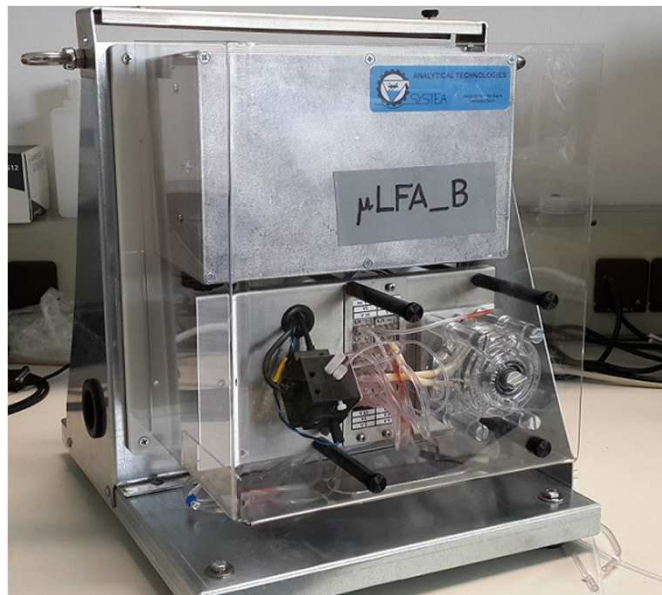


P- PO4 Analyzer – Seawater rev 0





# The micro Loop Flow Reactor PO4 Fluorimetric

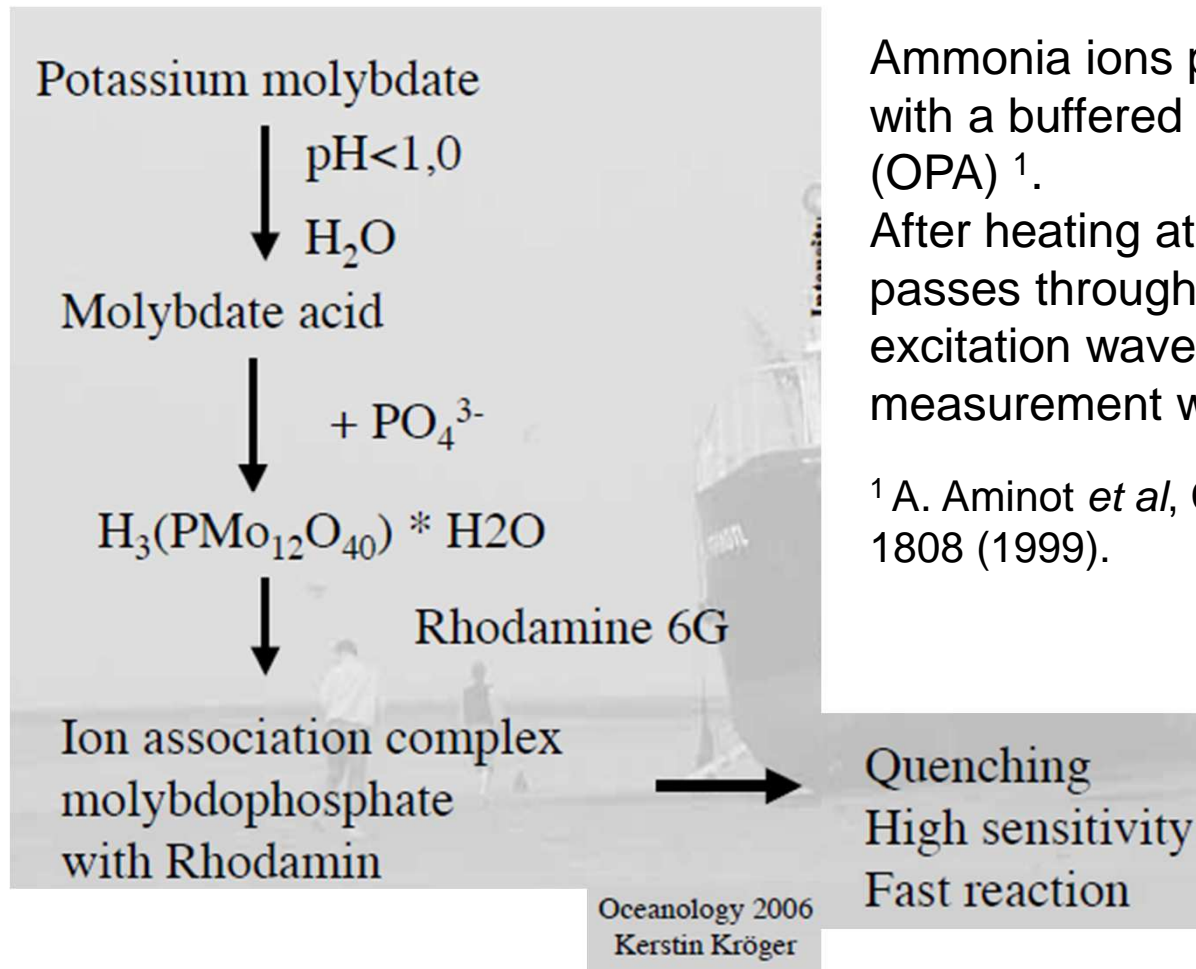




# Applied fluorimetric methods

$\text{PO}_4$

$\text{NH}_3$



Ammonia ions present in the sample reacts with a buffered solution of OrthoPhtalAldeide (OPA) <sup>1</sup>.

After heating at 40° C, the reaction product passes through a fluorimetric cell having the excitation wavelength at 374/390 nm and the measurement wavelength at 460 nm..

<sup>1</sup> A. Aminot *et al*, Can. J. Fish. Aquat. Sci, **56**, 1801-1808 (1999).





## MicroLFA Smart technical features

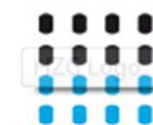
- **automatic sample blank correction**
- **automatic washing**
- **automatic sample dilution allows double scale measurements**
- **plug-in multi-hydraulic connector available for easy reagents changeover**
- **compactness and modularity allow easy integration in Ferrybox**
- **RS-232 protocol compatibility with Micromac-1000 and sondes**
- **compact dimensions: 270 (H) x 150 (L)x 175 (W) mm, hydraulics / electronics.**



## Field test under JERICO TransNational Access program



- Cuxhaven fixed monitoring station at the Elbe river estuarine
- Lysbris Ferrybox system on a weekly route in North Sea.



**Helmholtz-Zentrum  
Geesthacht**

Zentrum für Material- und Küstenforschung

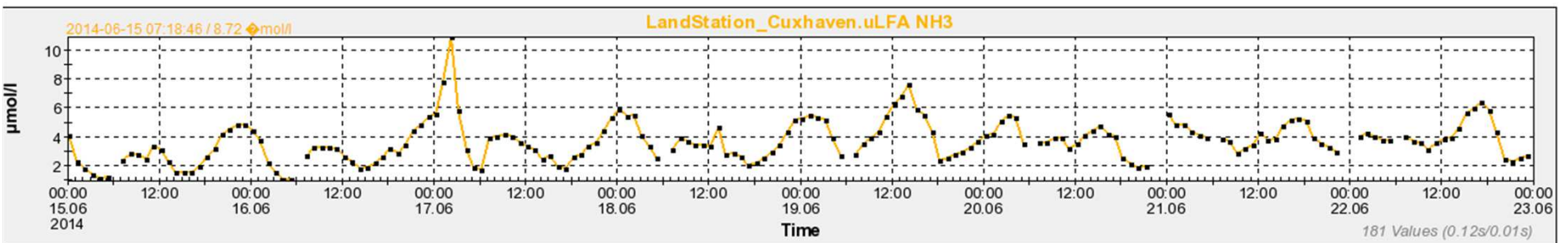
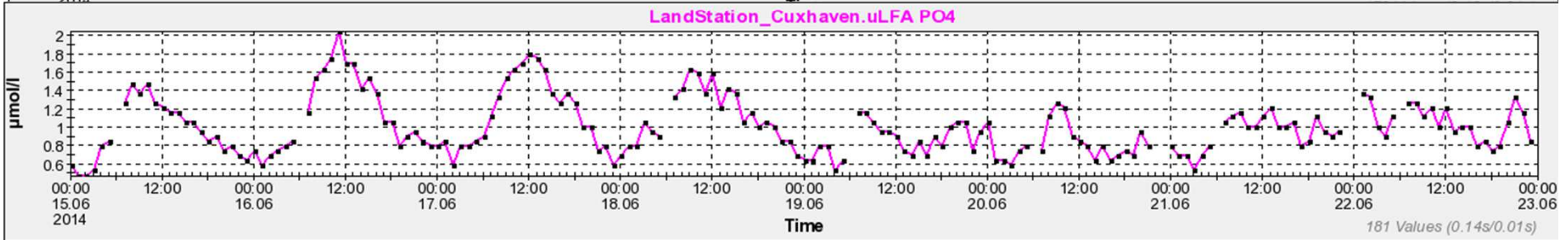
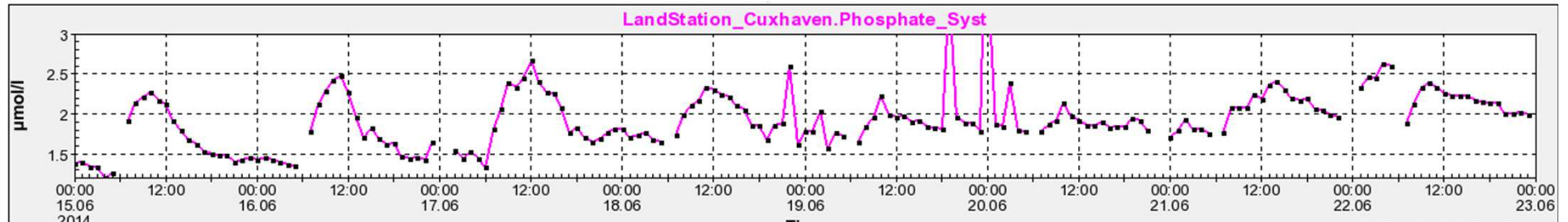


- **μLFA Smart NH<sub>3</sub> data from 20-05 to 06-07-2014**
- **μLFA Smart PO<sub>4</sub> data from 01-06 to 06-07-2014**
- **PO<sub>4</sub> data comparison with Micromac C MP3 on-line analyzer**



# Field test in Cuxhaven

## Data from 15 to 23-06-14





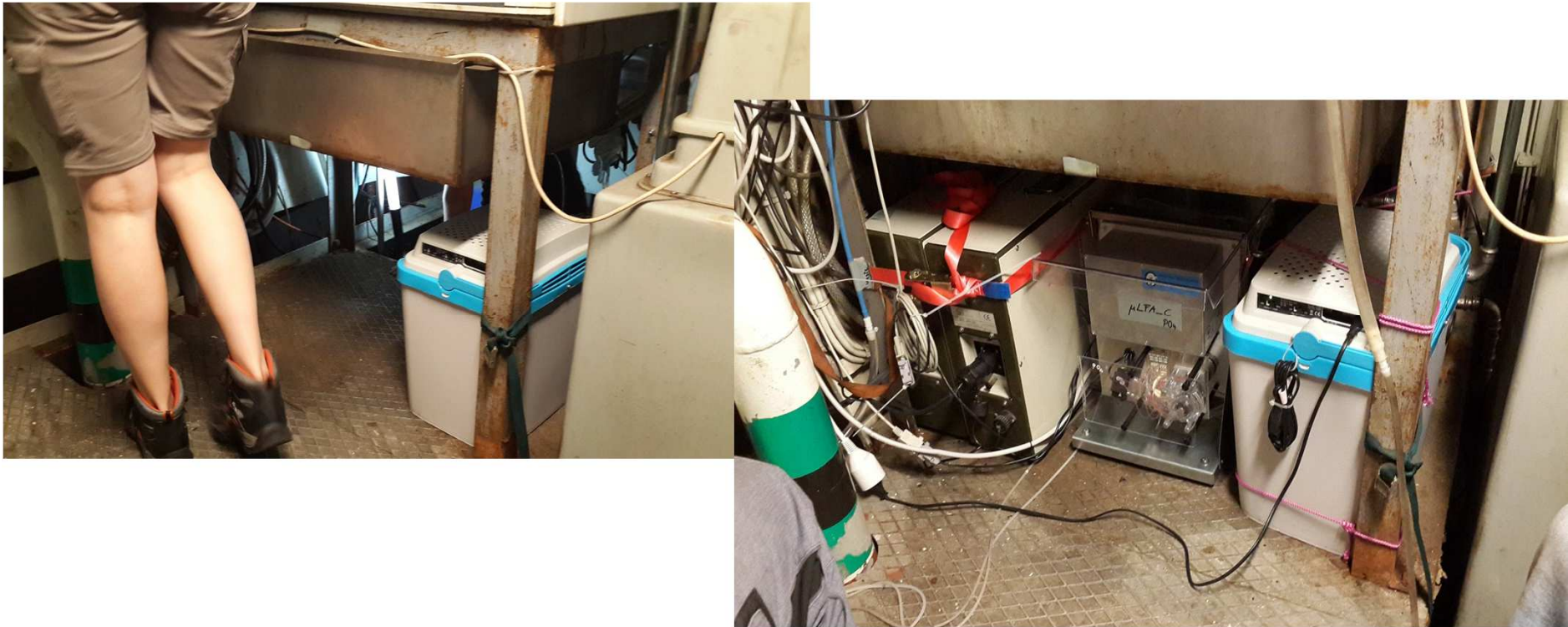
## Field test on Lysbris Ferrybox system



- **Data from 18-07 to now**
- **PO<sub>4</sub> and NH<sub>3</sub> data comparison with on-board Micromac-1000 units**



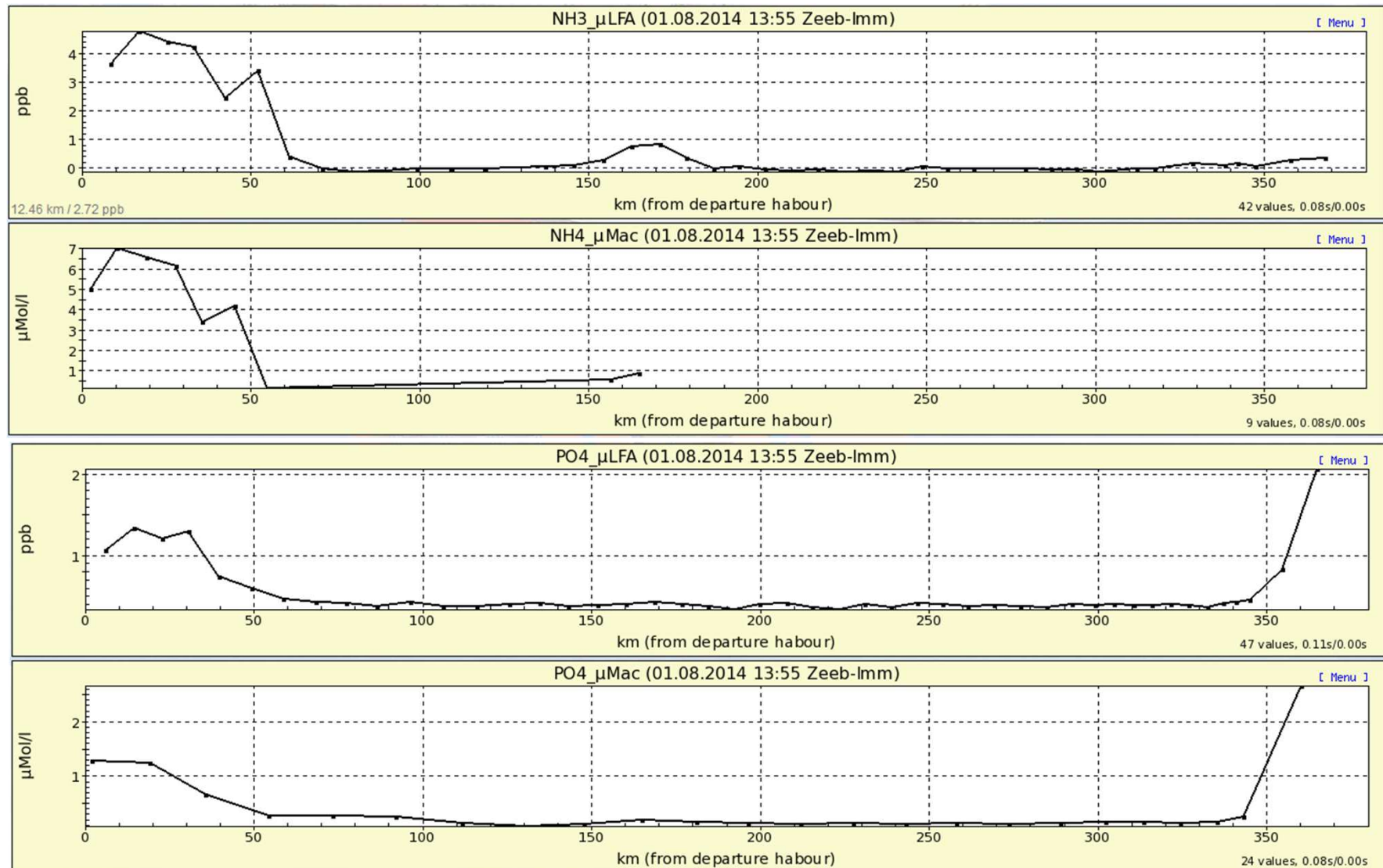
## Field test on Lysbris Ferrybox system



- **Location on Lysbris, under the Ferrybox**
- **PO<sub>4</sub> and NH<sub>3</sub> data comparison with on-board Micromac-1000 units**



# Field test on Lysbris Ferrybox system





## **μLFA Smart module: conclusions**

- **Long term unattended autonomy**
- **Compactness**
- **Low reagents and sample consumption**
- **Low life-cycle cost**
- **Easy interface with data-logger**
- **Low maintenance by non expert users**



**THANK YOU  
FOR YOUR ATTENTION**