

# Industrial XRD using Medipix 2/3

Roelof de Vries



# Agenda



- Who is Malvern Panalytical?
  - <https://www.malvernpanalytical.com/>
- How we got involved in the Medipix collaboration.
- What we have made as a product.
- The collaboration
- The future

## Our Owners – Spectris plc

[www.spectris.com](http://www.spectris.com)

### OUR BUSINESS

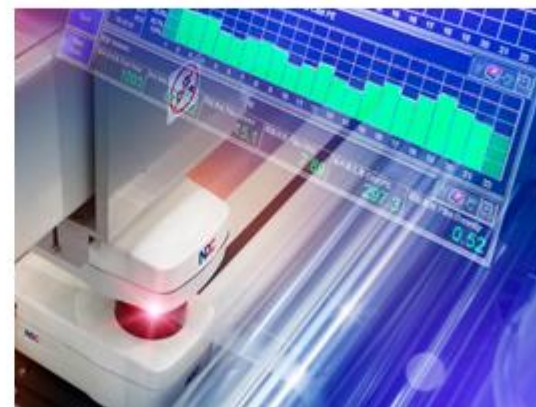
#### Materials Analysis



#### Test and Measurement



#### In-line Instrumentation

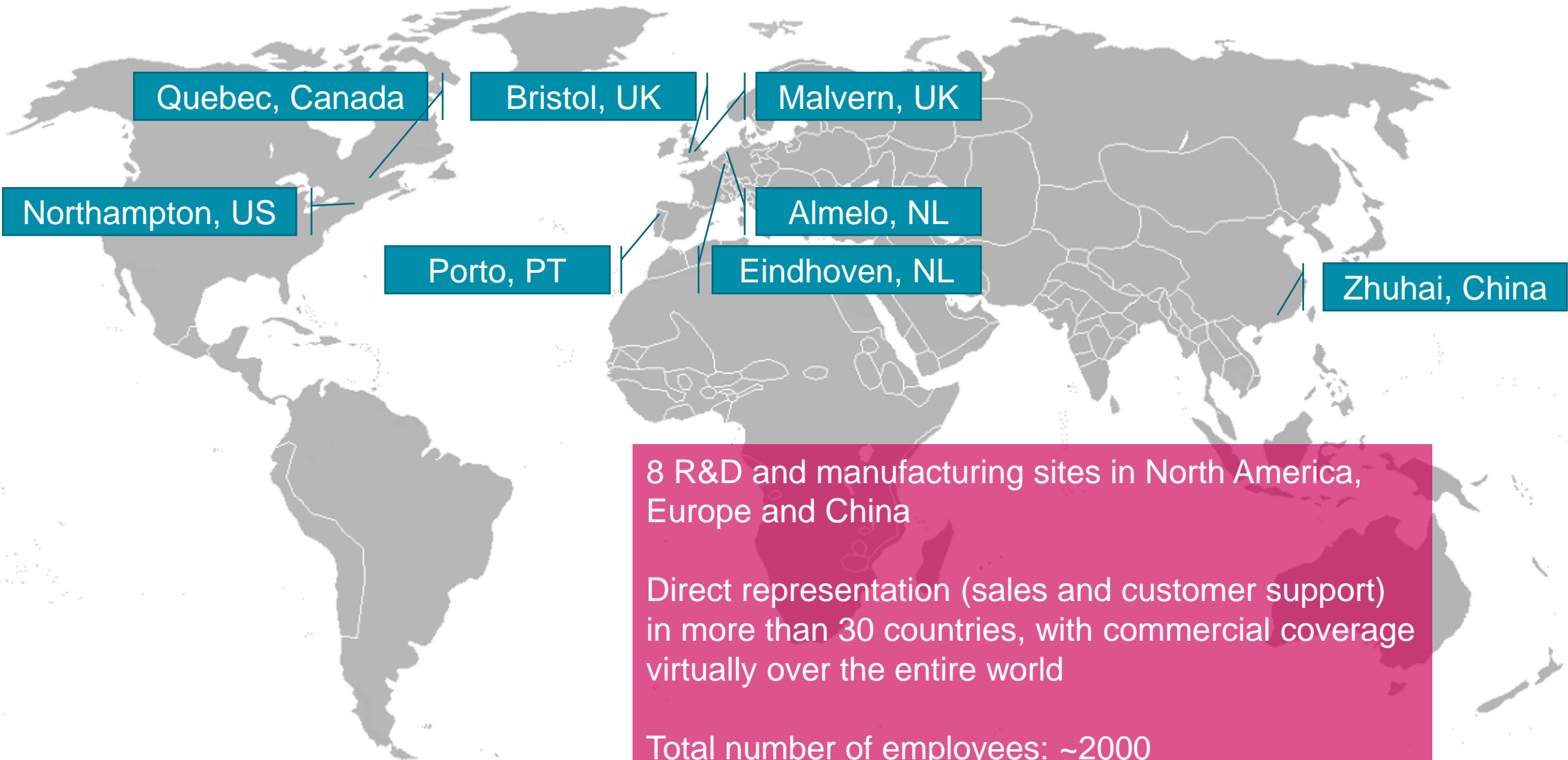


#### Industrial Controls



- Listed and headquartered in London, UK. In 2017 Spectris had sales of £1,525 million and employed around 8,900 people worldwide.

# Malvern Panalytical

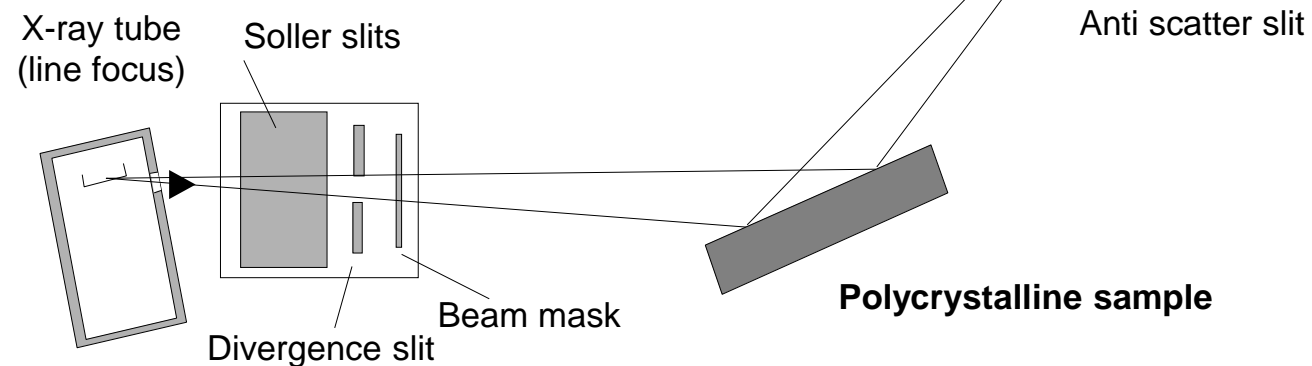
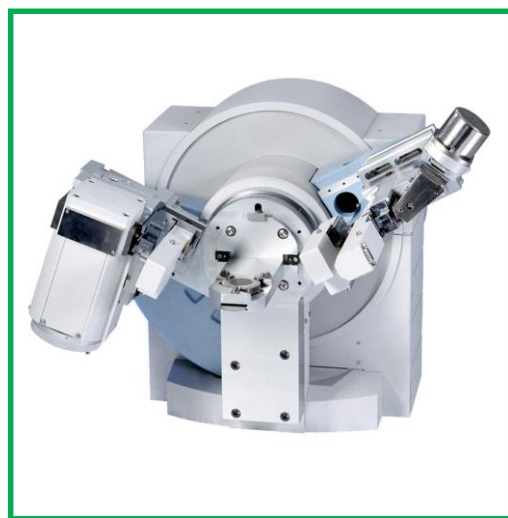


## Malvern Panalytical Almelo

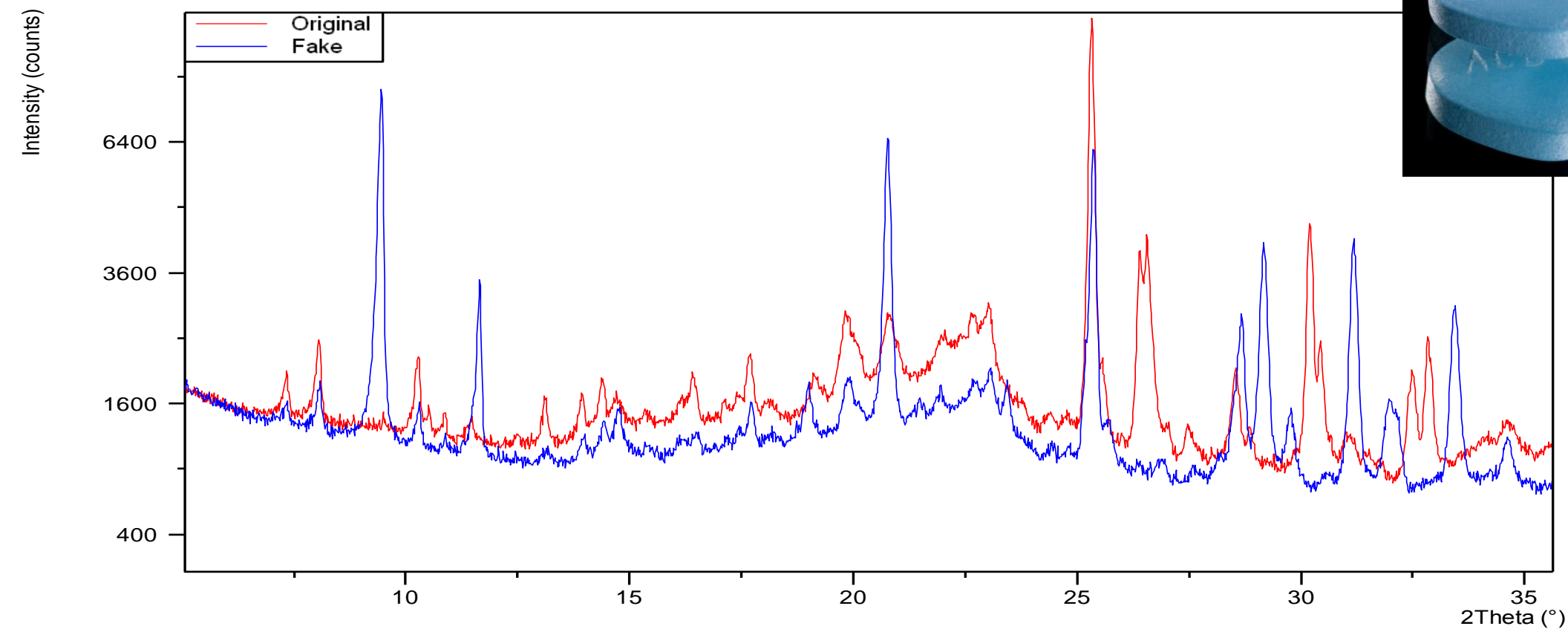


- Formerly known as Philips Analytical and PANalytical
- Focusing on **X-ray Fluorescence** and **X-ray Diffraction**
- Located in Almelo since the mid seventies
- Sold to Spectris in 2002
- Merged with Malvern Instruments on 1 January 2017
- Employing about 400 people in Almelo (~2000 worldwide)
- Large portion with a university degree, about 10% have a PhD
- About 100 people working in development

# Powder diffraction

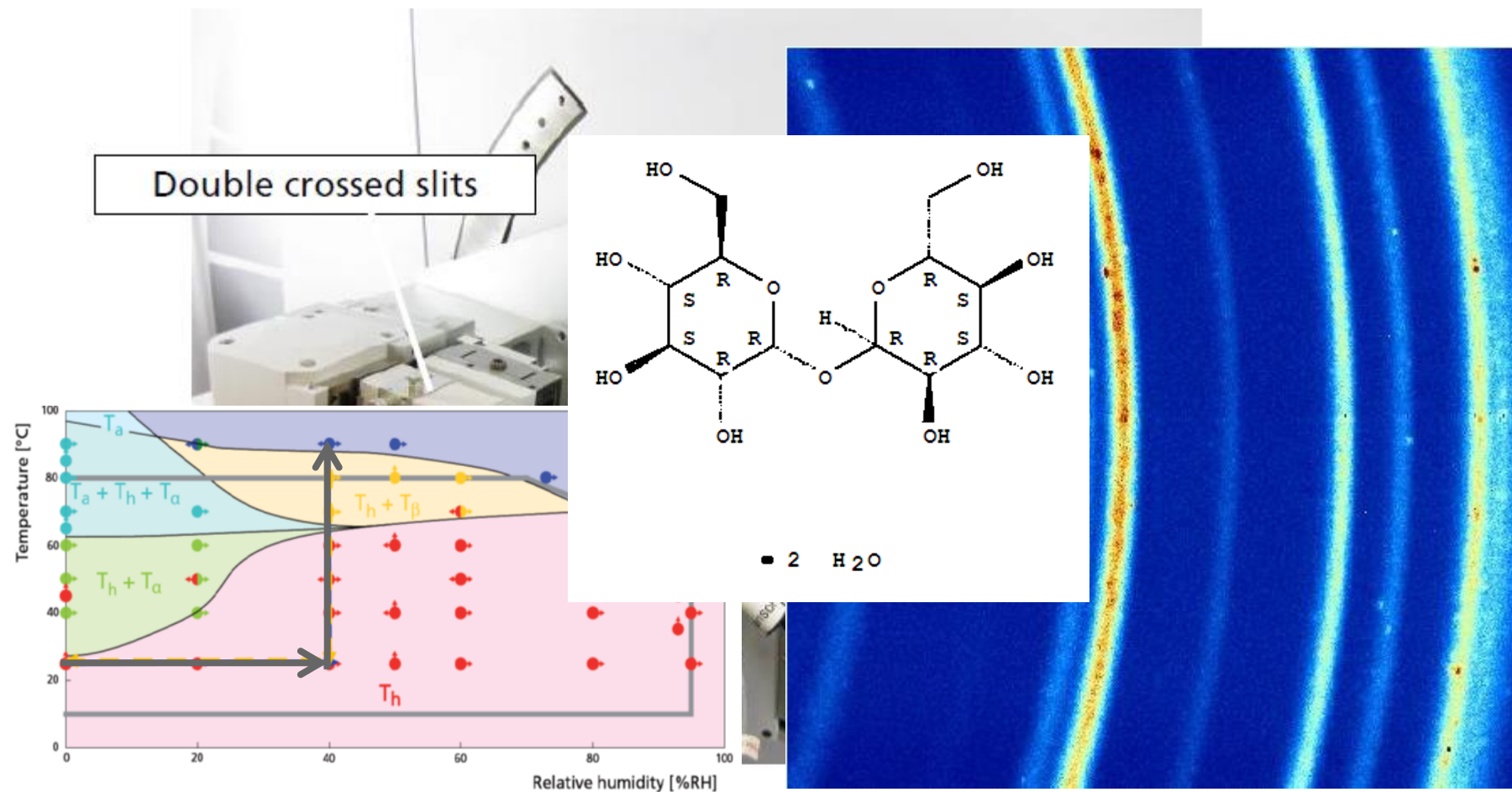


## A typical example



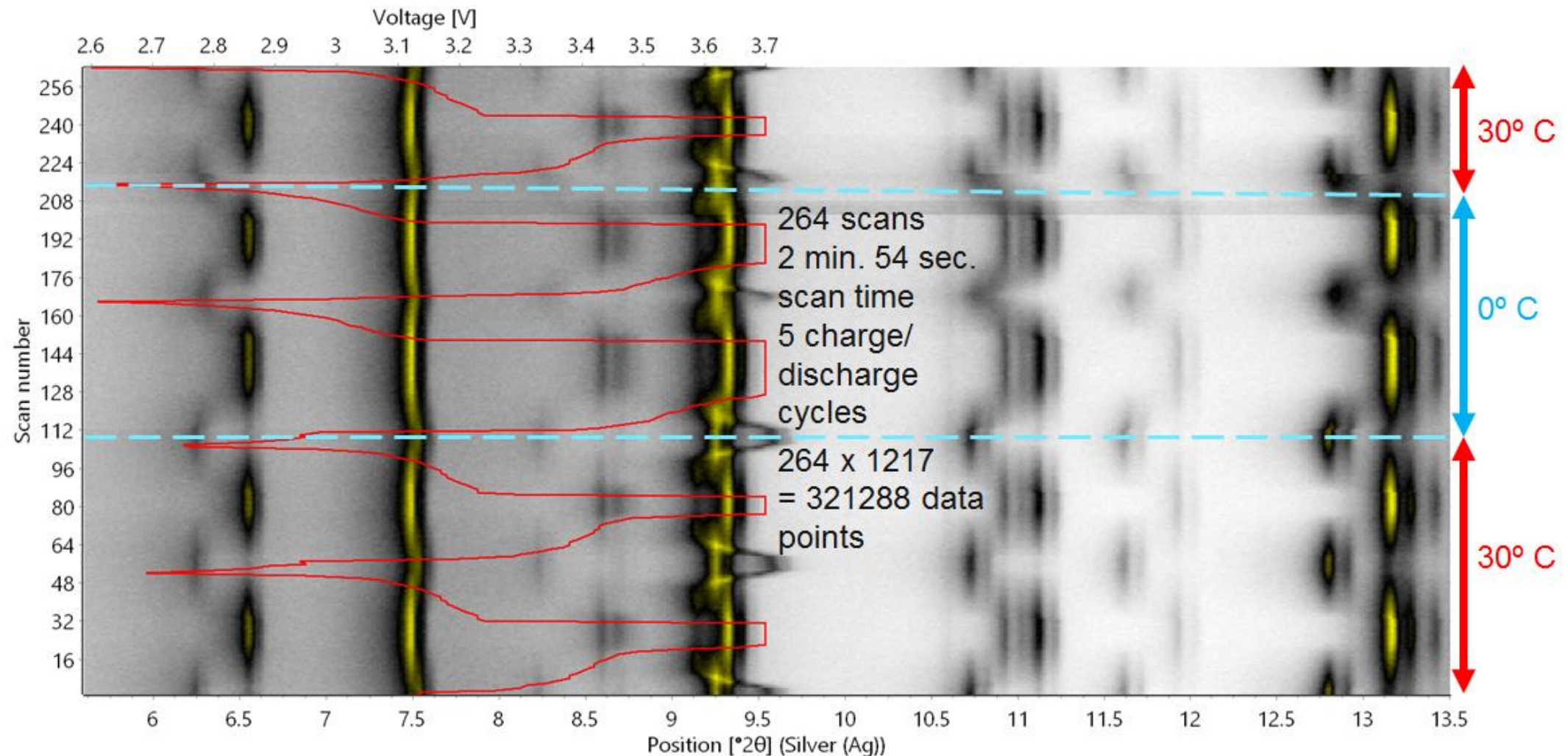


## Another example: XRD powder trehalose dihydrate





## Hot topic at the moment: Battery research



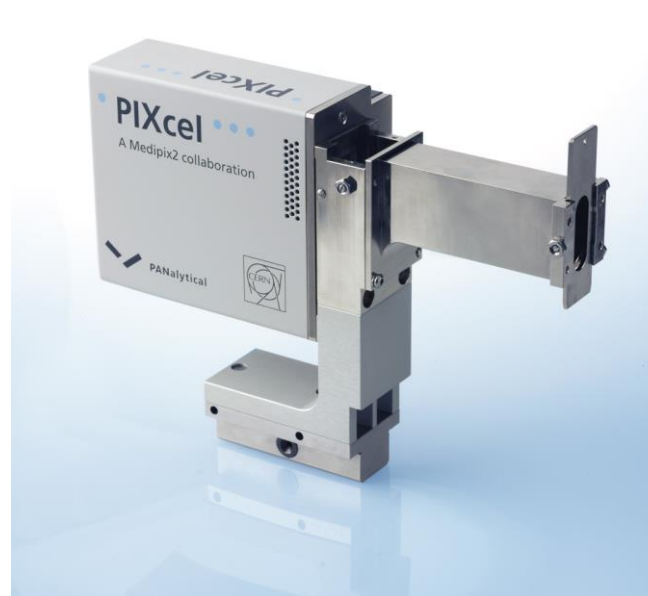
## How it al started



## Evolution of the product



August 2007: 1D version,  
Medipix 2



August 2010: 2D version, read  
out electronics integrated,  
Medipix 2



August 2014: 2D version,  
Medipix 3, improved design.

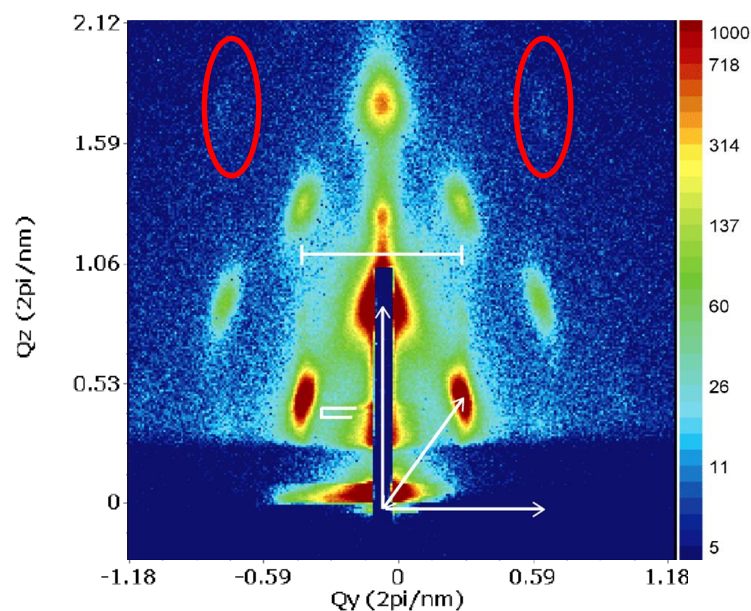
## Medipix 3's unique properties for XRD.



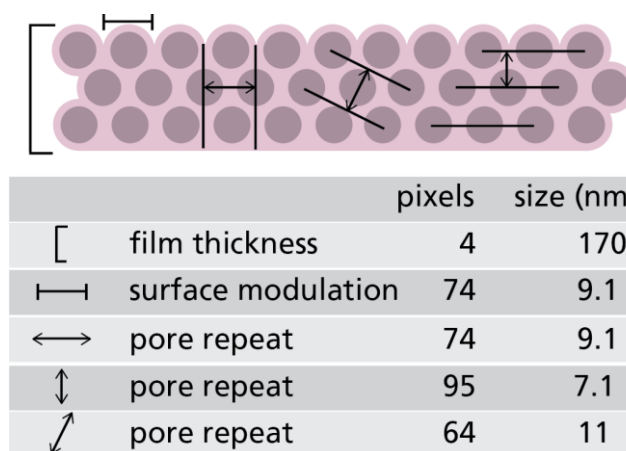
- Extremely stable.
- Extremely reliable
- High count rate linearity per  $\text{mm}^2 \Rightarrow$  Extreme count rate linearity per strip.
- Small pixel size.
- With silicon sensor optimal for use with 8 keV radiation.
- No maintenance needed.
- Very low noise



## Application example: GI-SAXS mesoporous $\text{SiO}_2$



Measurement time : 15h



Alternative: synchrotron

- Pro: Fast data collection (seconds)
- Con: Not always available  
Usually not next door

What we have made as a product

## Systems where Medipix 3 is used



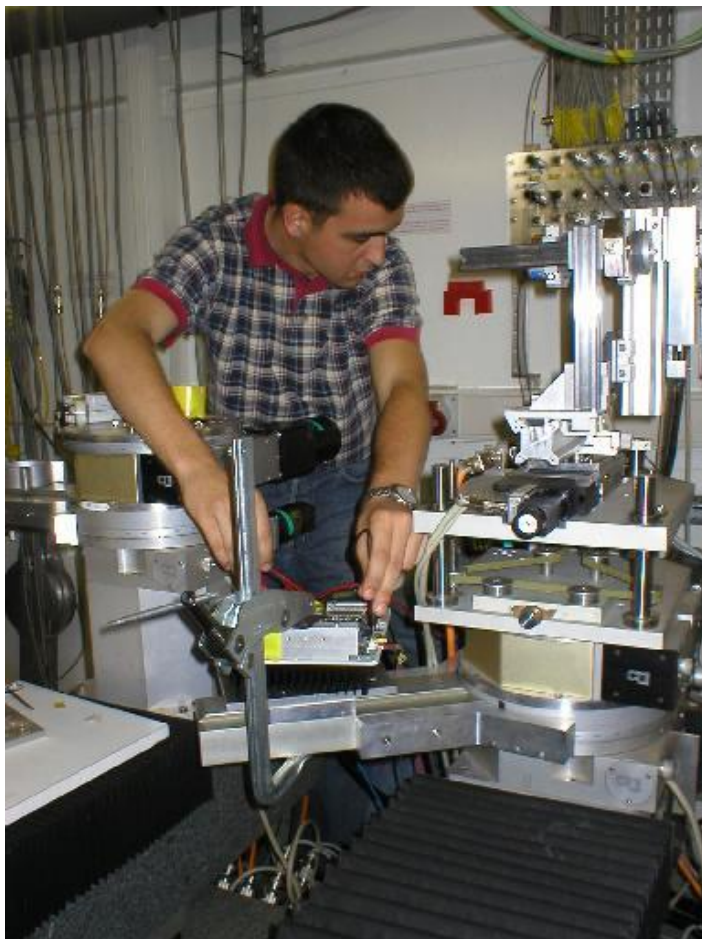


## Some observations



- Collaboration with the Medipix consortium has always been open, pleasant and constructive.
- We learned a lot from the Medipix collaboration and have very much appreciated that we have been involved in the development and testing of devices.
- On site (in Almelo) support by the CERN team has speeded up the development at Panalytical.
- The collaboration with Nikhef has been and still is very strong: several production steps are still performed at Nikhef.
- We like to believe that our involvement has made the Medipix 3 a very successful chip in terms of performance and stability

## Some observations



Thank you all for the exciting  
journey



[www.malvernpanalytical.com](http://www.malvernpanalytical.com)