



Technical Highlights Future Challenges from TC Flow

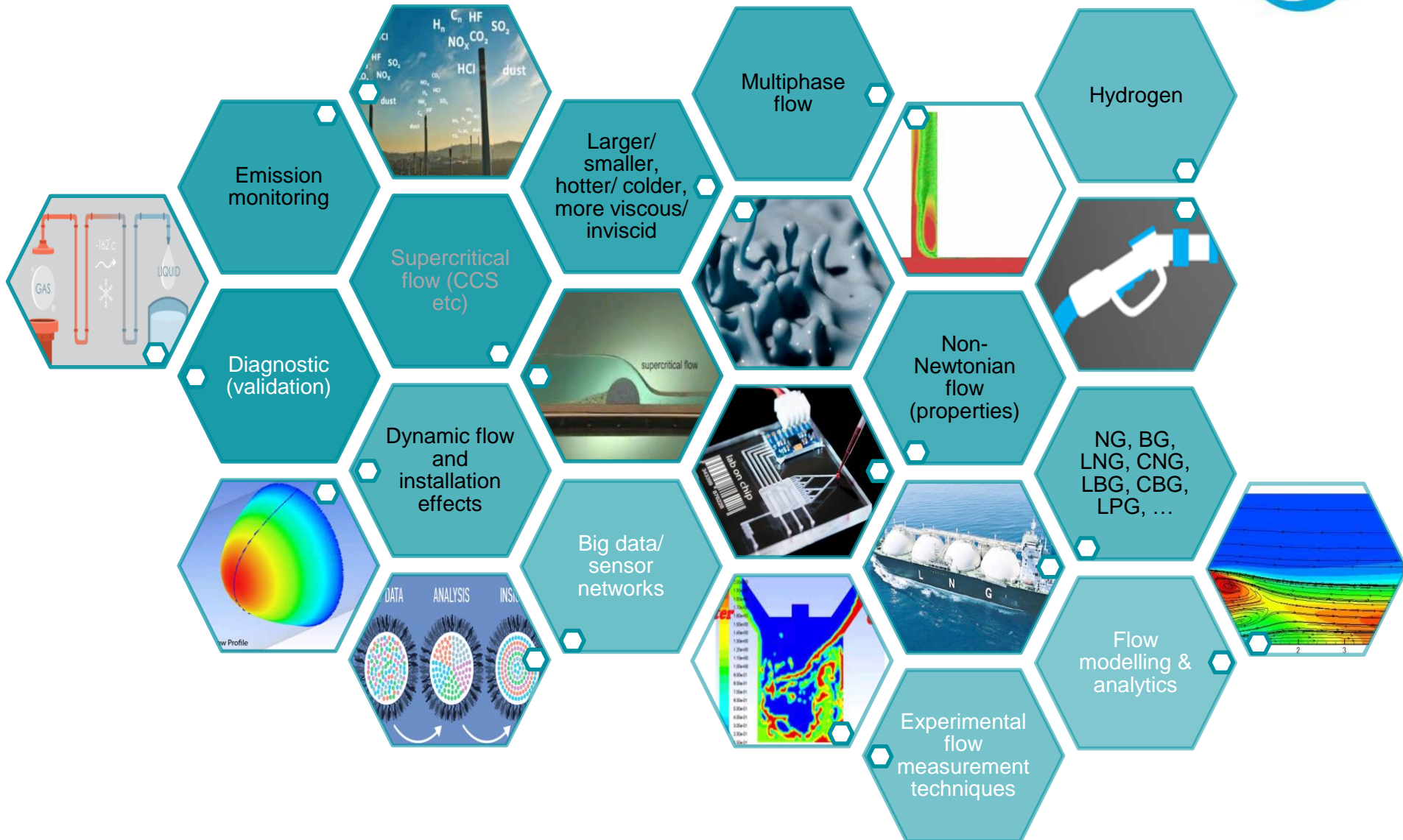
TC - Chair Petra Milota

Bucharest, Romania, 29 – 30 May 2018



Flow

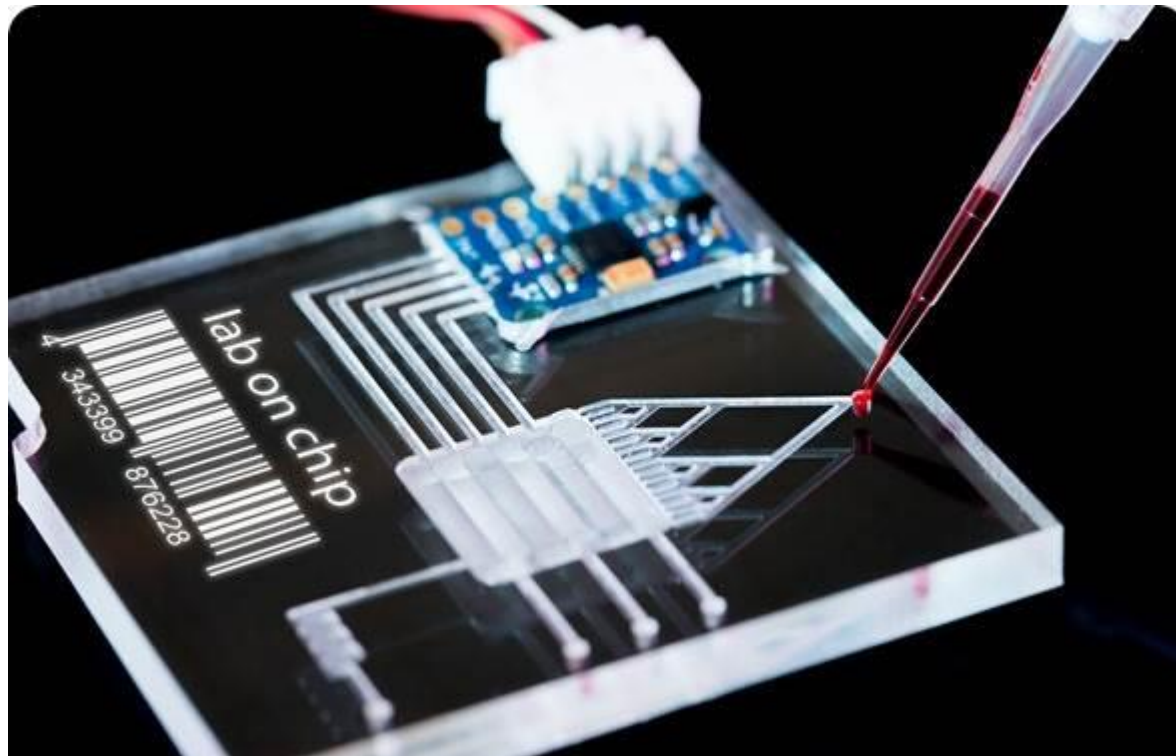
Big Topics



Micro is the new volume



- Microfluidics association since February 2018
 - 3 EURAMET NMIs involved IPQ, CETIAT-LNE and METAS



- Purpose
 - develop guidelines and standards regarding microfluidics technology
- Deals with
 - the behavior, precise control and manipulation of fluids that are geometrically constrained to a small, typically sub-millimeter, scale
- Intersection of
 - engineering, physics, chemistry, biochemistry, nanotechnology, and biotechnology

- Applications in
 - the design of systems in which low volumes of fluids are processed to achieve multiplexing, automation, and high-throughput screening
- Used in
 - the development of inkjet printheads
 - DNA chips
 - lab-on-a-chip technology
 - micro-propulsion
 - micro-thermal technologies
- <http://www.makefluidics.com/en/event>

Not only micro -
also dispensing nl and pl



Why should we do that



- **Save money**



- **Save sample**



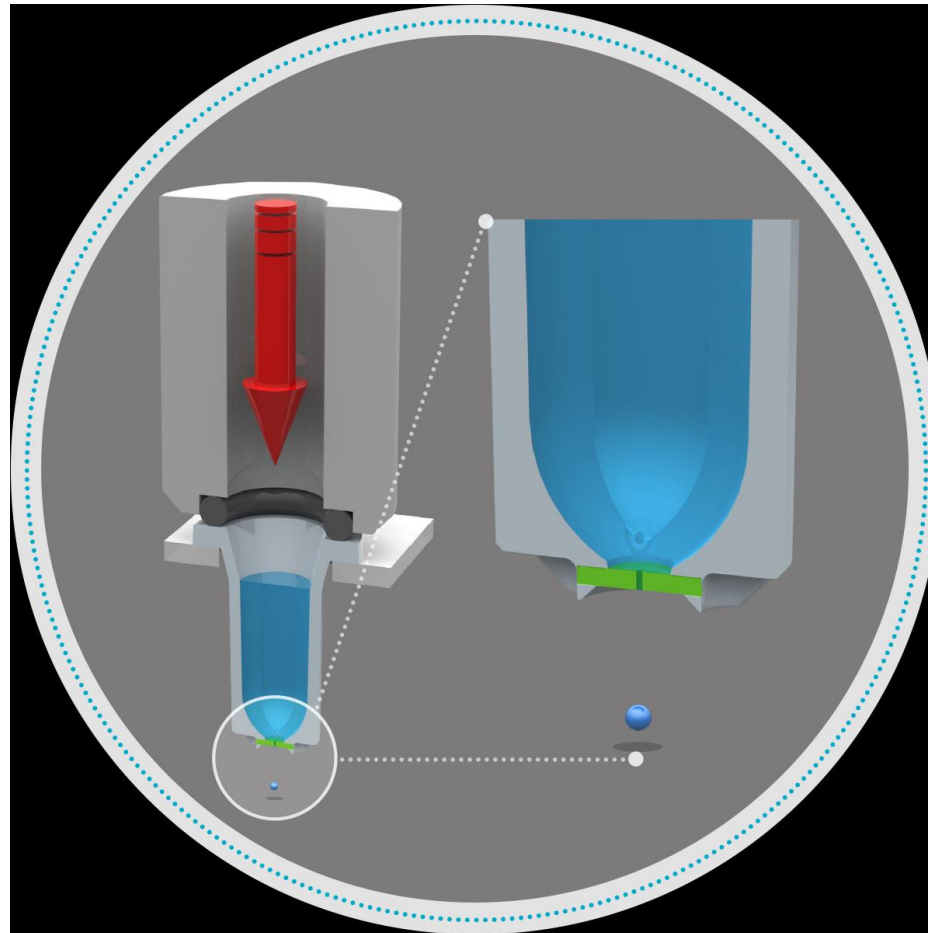
- **Molecular testing**

Tiny samples

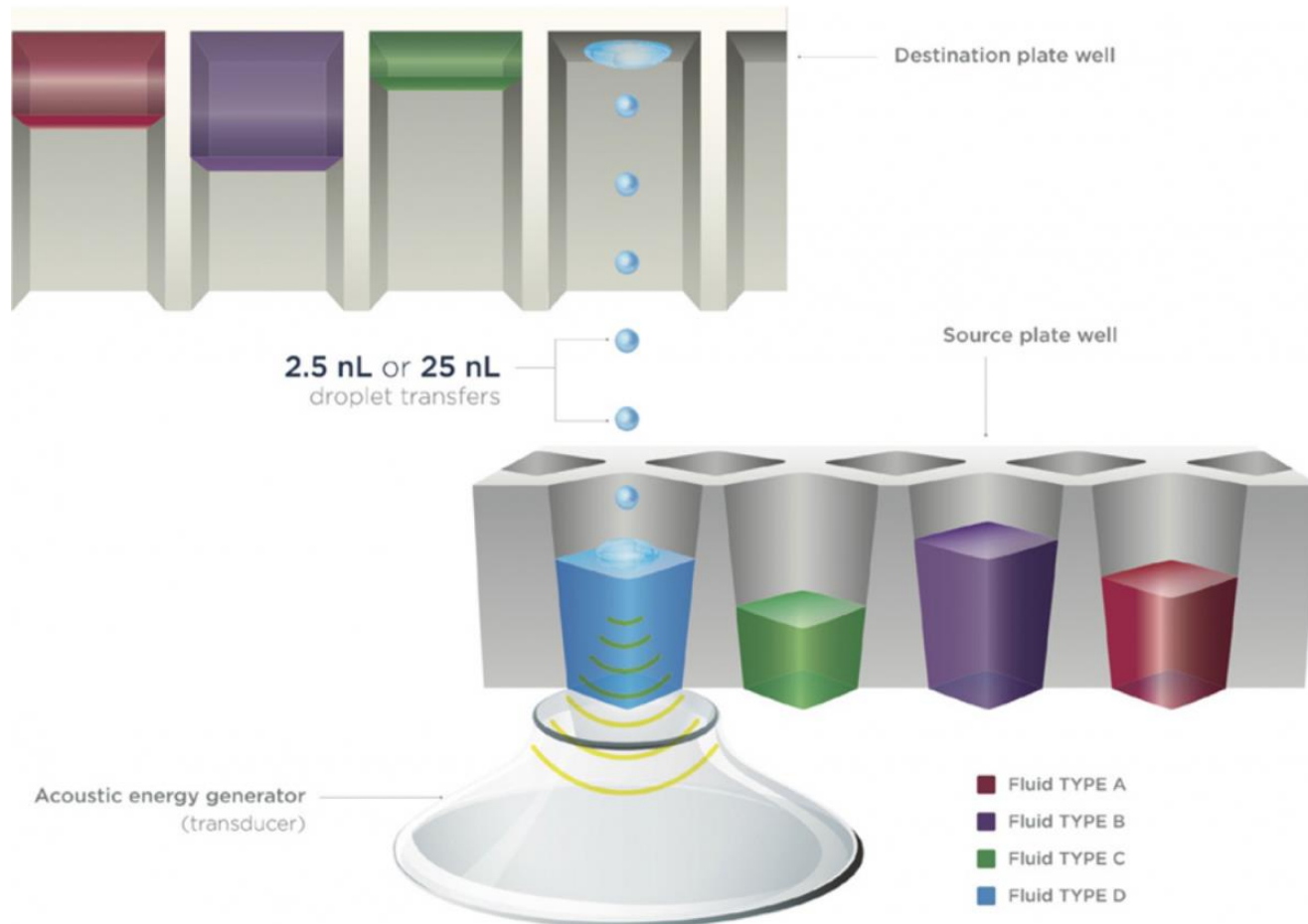
Less pain, less money, more access



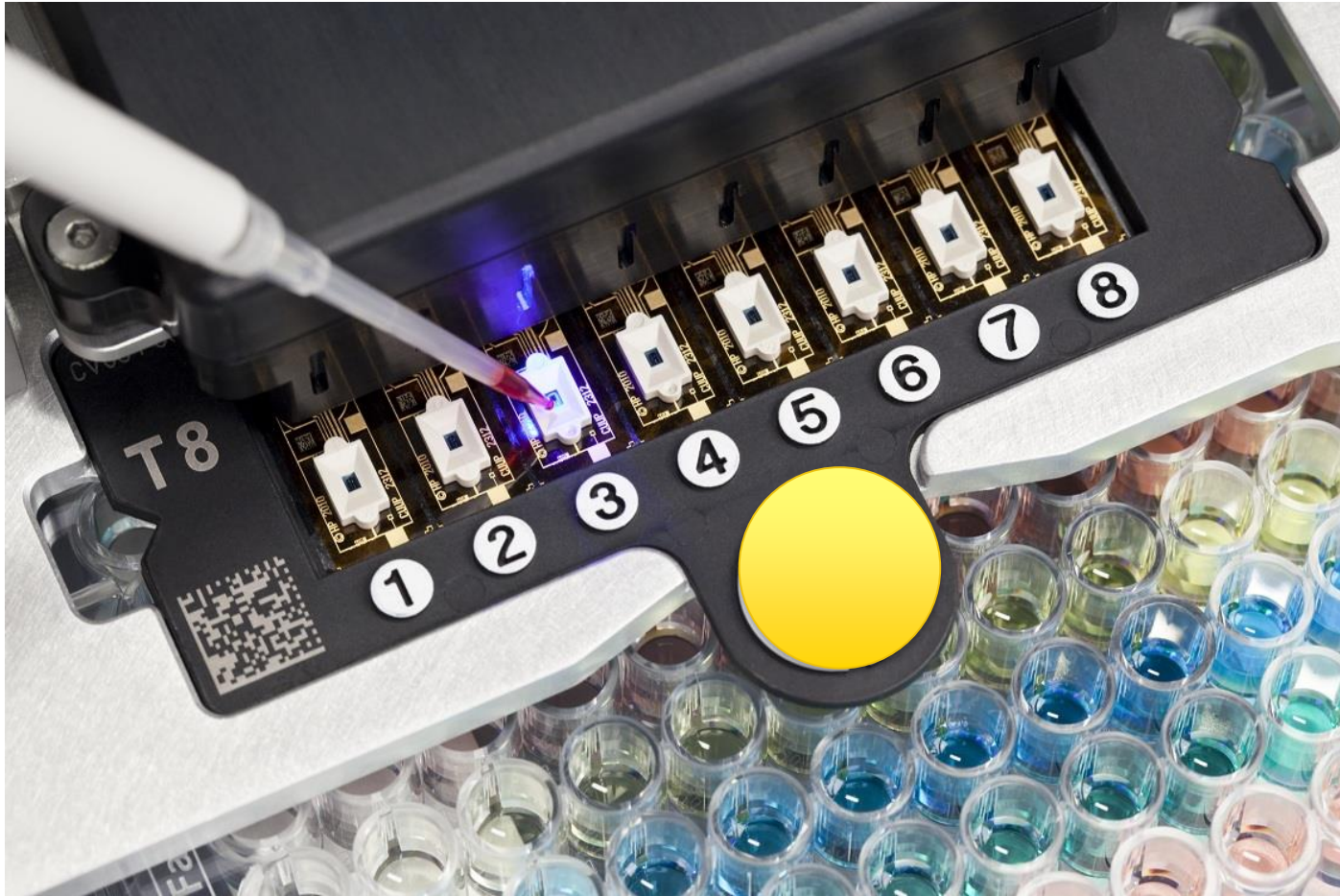
Pressure pulse system, 2 nl



Acoustic transfer: 2,5 nl and 25 nl

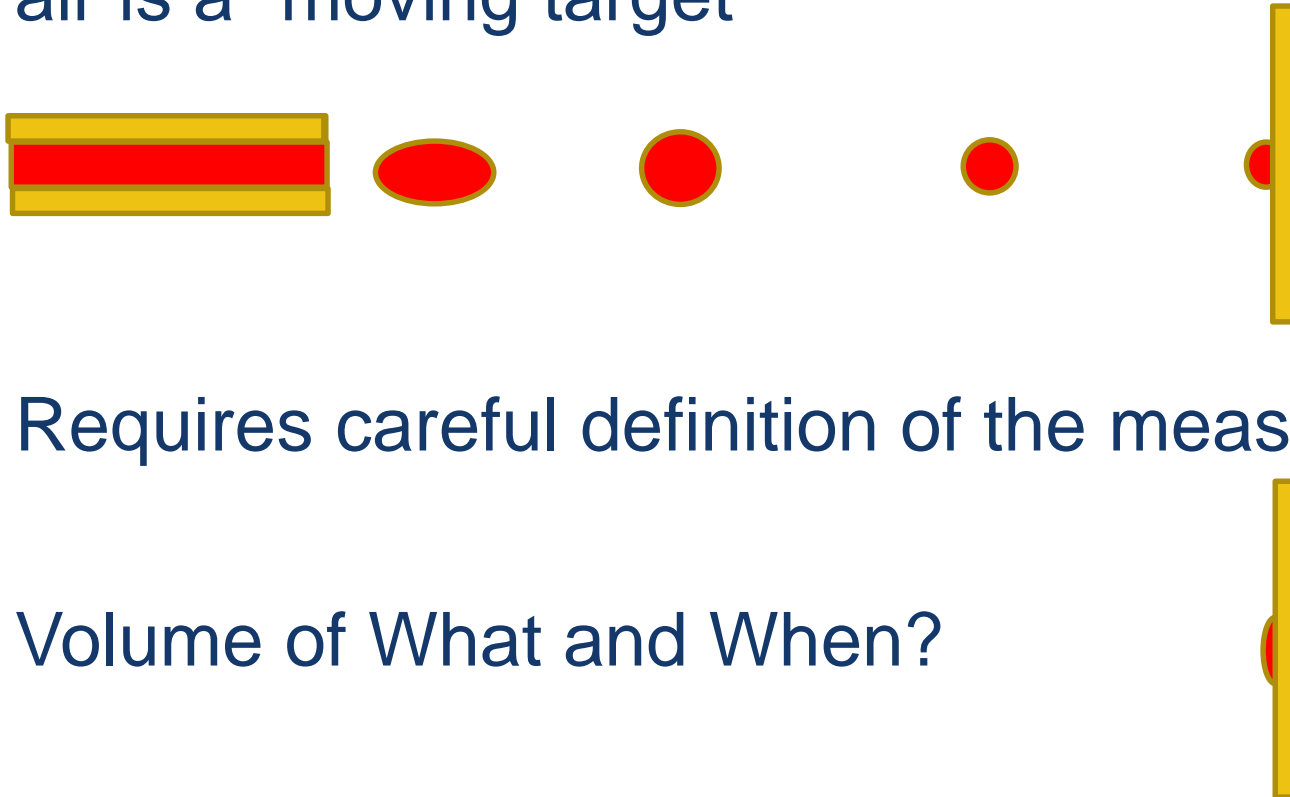


Ink jet technology 13 and 20 picoliters



Small Volume Calibration

- The volume of a nano-droplet traveling through air is a “moving target”



- Requires careful definition of the measurand
- Volume of What and When?

Methods



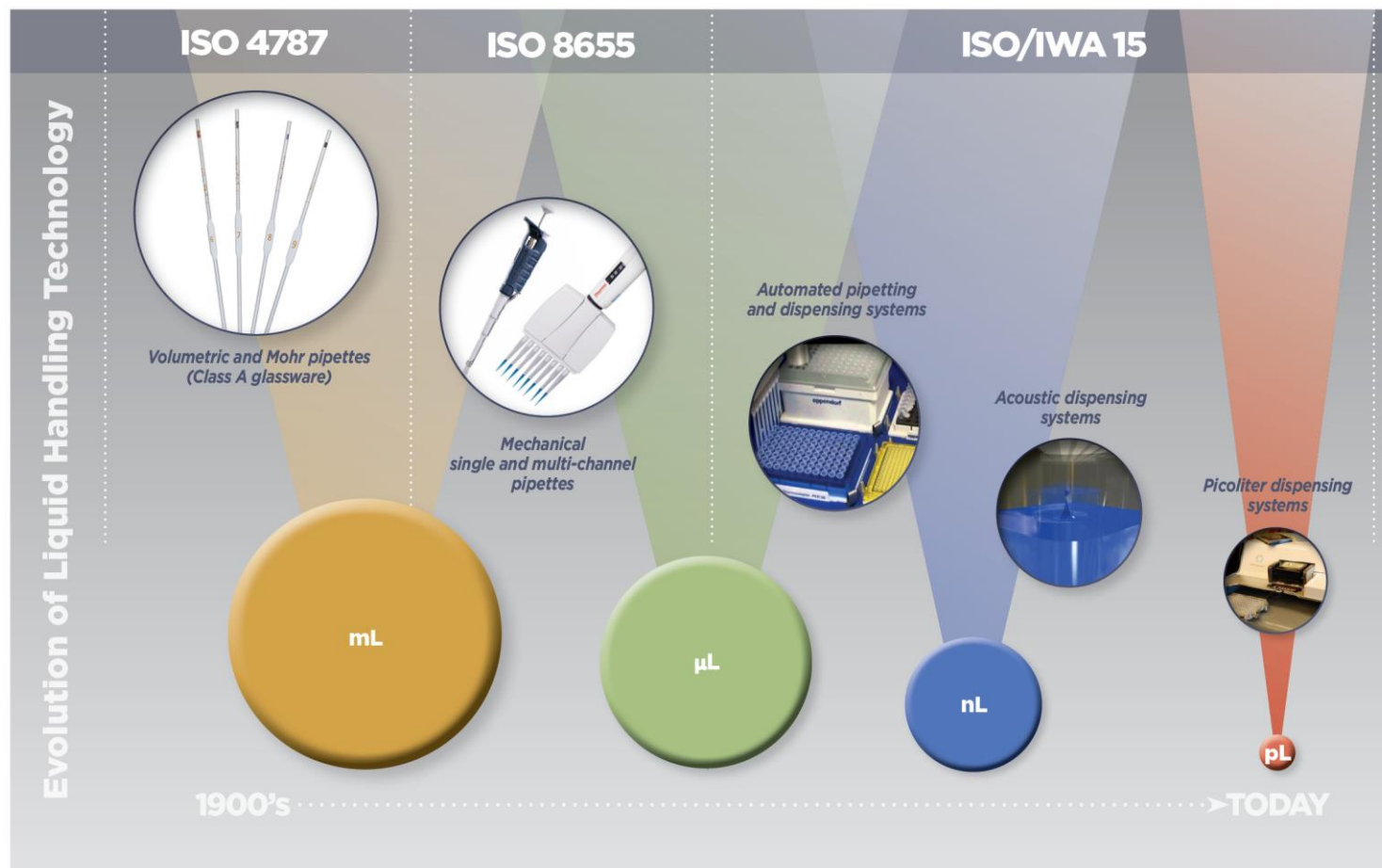
Based on total solution:

- Weighing single channel
- Weighing entire plate
- GRM – gravimetric regression method
- Pressure change
- Thermal capacity
- Optical imaging

Methods based on chemical amount

- Titration
- Single dye absorbance
- Fluorescence
- Ratiometric absorbance

Standards Progression



Guides from/ in cooperation with TC-F



Guideline on the Calibration of
Solid Anemometers



Part 1: Pitot Static Tubes

EURAMET Guide
on Comparisons
EURAMET Guide No. 4
Version 1.1 (12/2016)



**Guidelines on the Calibration of
Standard Capacity Measures using
the Volumetric Method**

EURAMET cg-21
Version 1.0 (04/2013)

Calibration Guide



**Guidelines on the determination
of uncertainty in gravimetric
volume calibration**

EURAMET cg-19
Version 2.1 (03/2012)

Calibration Guide

Proposal for new Guides



- Guide on air speed calibration of solid anemometers
Part 2: Thermal Anemometers
- Guide on the Calibration, Operation and Handling of Micropipettes

Participation in Standard Organisations



- Revision of ISO 8655 from ISO TC 48
- Revision of ISO 8222 from ISO TC 28
- OIML TC8 – Measurement of quantity of fluids

In measurement techniques for enhanced industrial efficiency

- Development for cost-effective complex flow measurements
- Covers multiphase flows, high temperature & pressure flows, higher viscosity, CO₂, LNG flows.
- Modelling & meter diagnostics
- **Developments**
 - EMPIR project on multiphase including modelling, new ISO standard
 - Several LNG projects, new LNG facility soon, new ISO standards
 - New elevated temperature & pressure facility, higher viscosity testing capability, CO₂ testing capability, R&D on meter diagnostics. Info feed into updated ISO standards.

Basic science for reduced uncertainty in traceability chains

- New fundamental standard for absolute molecule counting
- Change from traceability from SI length, mass & time to units of Ampere, Mol & Secs
- Feasibility study under EMPIR?

Optimisation & reduction of energy consumption

- Enhanced metering of energy-carrying fluids, e.g. hot water, LNG, biofuels, multiphase...
- Networks, modelling and facilities for development of techniques
- **Developments**
 - New facilities, advances in CFD modelling
 - Potential EMN on Energy Gases
 - EMPIR project on biofuels

Emissions & waste monitoring techniques

- Traceable measurement techniques for emission/waste reduction, monitoring & trade
- Updated regulations, policy, legislation & underpinning measurement techniques
- **IMPRESS I & II Stack emissions & landfill sites**
- Aligns with new EMPIR call in 2019 on Environment

