IUPAP SUNAMCO Commission

L. Pendrill

Chair of SUNAMCO

Proposed actions IUPAP and nanostandardisation

Identify interest in IUPAP to work actively in nanostandardisation work:

- IUPAP Commissions and affiliated Commissions
- IUPAP Working Groups
- IUPAP SUNAMCO itself

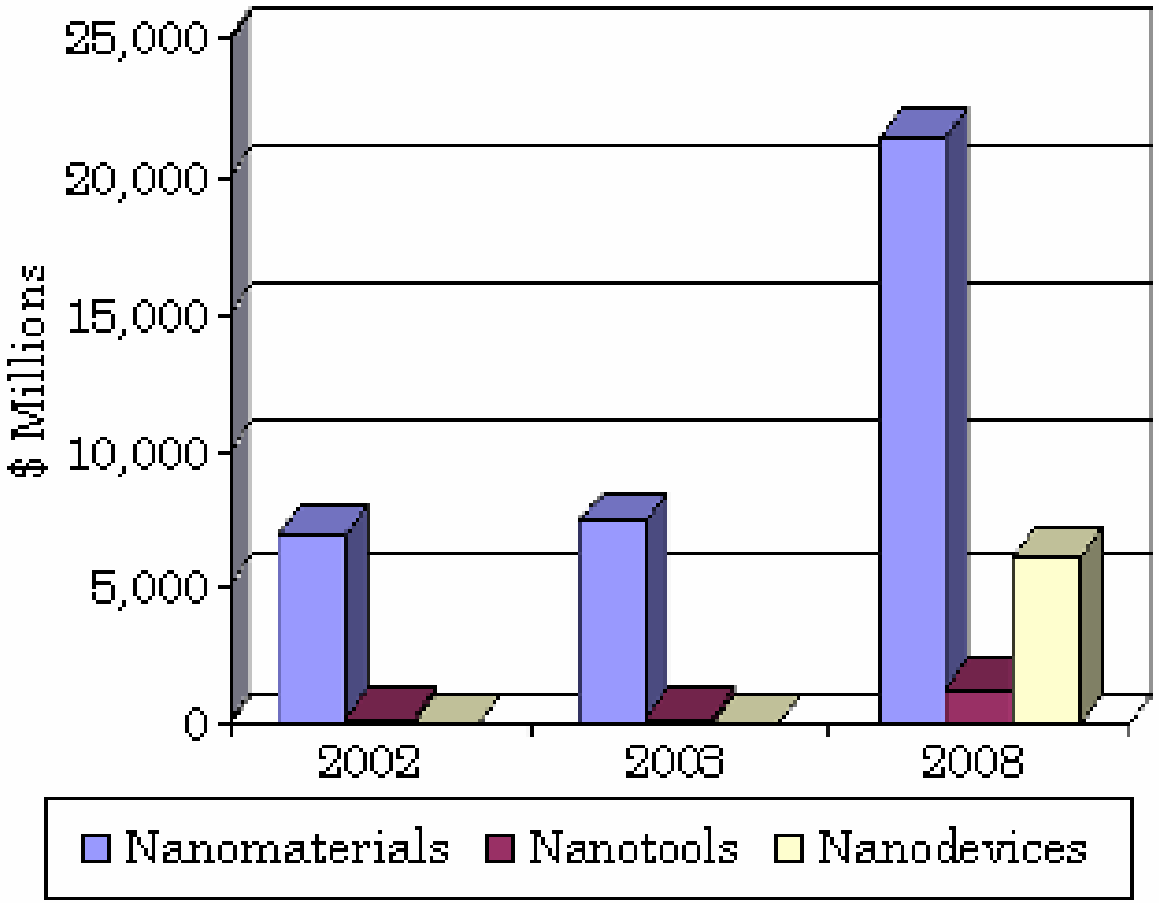
From Minutes of latest IUPAP Council & Commission Chairs meeting (London 24 – 25 February 2006):

” nanostandardization, where IUPAC was involved, but where there was no IUPAP link to the ISO working groups. Council endorsed the need for IUPAP representation on this.”

http://isotc.iso.org/livelink/livelink?func=ll&objId=4192161&objAction=browse&sort=name

Global Nanotechnology Market, 2002-2008

($ Millions)



Source: BCC, Inc.

http://www.bccresearch.com/advmat/GB290.html

TOXIC SUBSTANCES

NANOTECHNOLOGY

Manipulating matter at the nanoscale is now a commercial reality. Nanoscale zinc oxides are used in sunscreen lotions and scratch-resistant glass. Digital camera displays, high resolution printer inks, and high-capacity computer hard drives are among the available products of nanoscience and nanoengineering. In this article, the authors offer general observations regarding the environmental implications of nanotechnology and whether and how existing regulatory controls are suitable to address them. When it does come, according to the authors, environmental regulation almost certainly will look first to the existing statutory framework. Unless nanotechnology confronts lawmakers with urgent and troublesome surprises, the basic set of tools will be what is available now.

DAILY ENVIRONMENT REPORT ISSN 1060-2976 BNA 4-14-04

"A number of new products were launched on the market following a relatively short phase of research and development. To effectively determine both the long-term properties and the general reliability of these products and their effects on consumers and the environment, all the involved parties must endeavour now to gather experience and analyse data. Clearly, this must be done since –as in any other new technological development – specialist circles and society at large have neither solid knowledge derived from the past nor a suitable method for definitively assessing the consequences of any changes that may arise in the future"

Nanotechnology,
Small matters, many unknowns

Swiss Re

A scoping study to identify hazard data needs for addressing the risks presented by nanoparticles and nanotubes

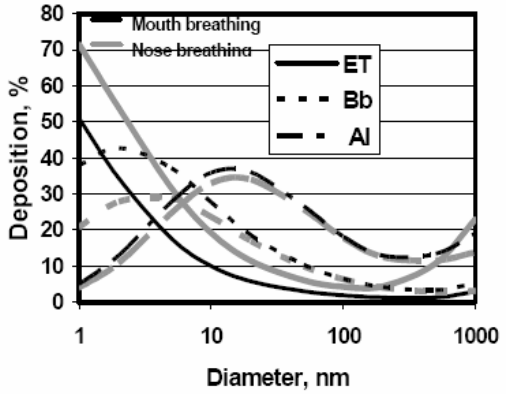


Figure 2.1 Regional deposition of inhaled particles with diameters between 1nm and 1000nm for nose and mouth breathing in the extrathoracic airways (ET) bronchial airways (Bb) and alveolar region (Al) during breathing at rest as predicted by ICRP (Yeh *et al*, 1996).

http://www.defra.gov.uk/environment/nanotech/nrcg/pdf/hazarddata-scoping.pdf

Nordic NanoTrade

Pre-normative R&D in nanotechnology

Nordic NanoTrade

• Much has been said about the predicted **spectacular growth** in nanotechnological production in the coming years.

• In order to sustain such growth, a considerable investment in technological and manufacturing/business **infrastructure** is needed.

• Potentially large **risk to industry** of unnecessary costs and duplicate work if one does not follow the international standardisation development

Standardisation is essential

It is essential to have an internationally valid standardisation of nanotechnological substances and materials as well as a uniform nomenclature. Only if the various classes of substance are precisely defined and everyone is "talking about the same thing" can the results of the risk assessments of different institutions of countries be compared, thus facilitating progress in the clarification of potential risks. Without a uniform "language", neither regulative measures nor underwriting formulations ("wordings") are possible. Without standardisation, even the labelling of products becomes an extremely difficult undertaking. If there were standardisation one might even consider the value of disclosure obligations for companies dealing with products that contain nanomaterials. These would enable insurers to recognise the presence of such products in their portfolios.

Nanotechnology,

Small matters, many unknowns

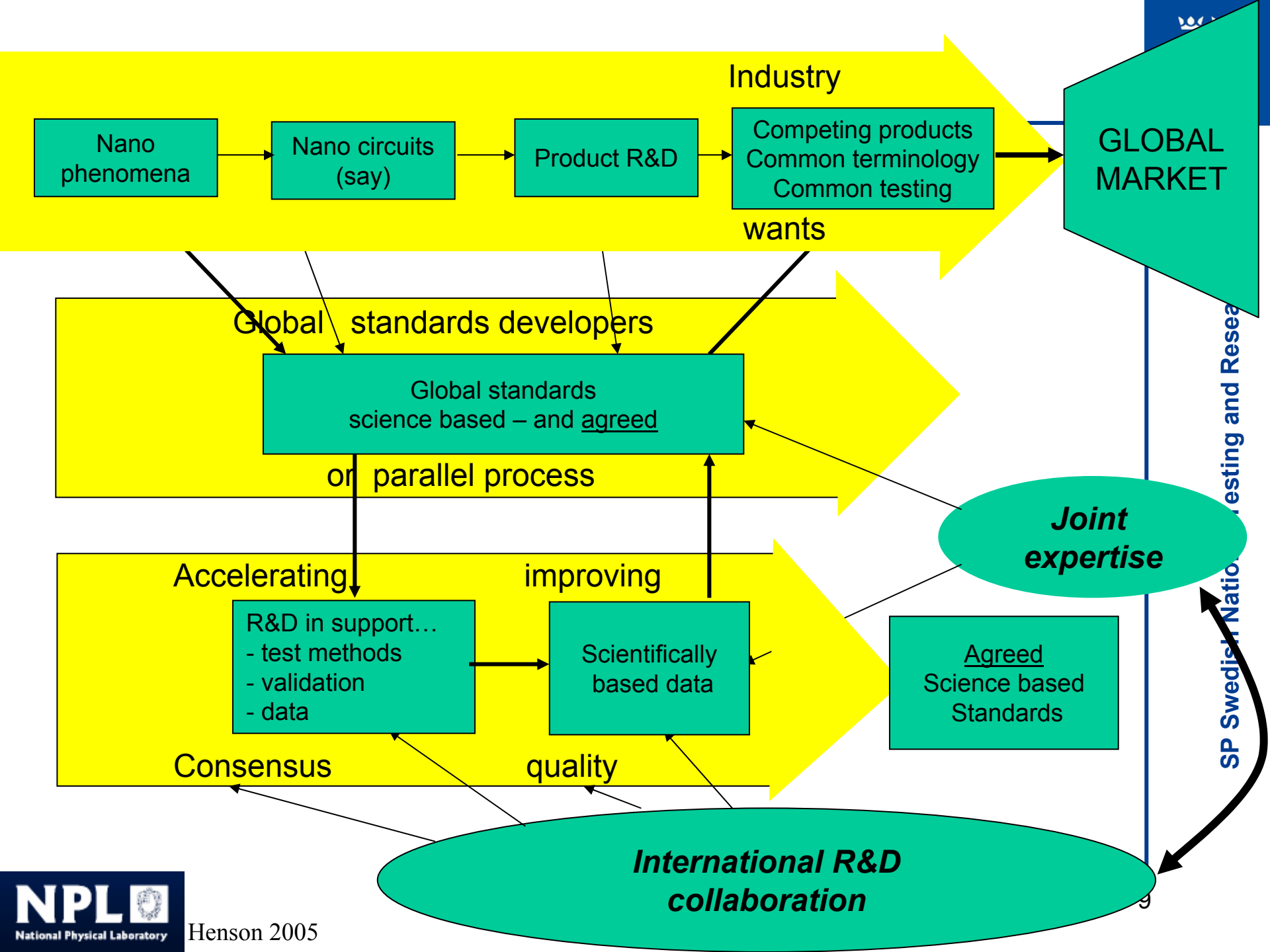
Swiss Re

Unique opportunity

Proactive:

- standardisation development
- developing and introducing standardised characterisation methods in nanotechnology
- before national and regional positions become fixed.

Pre-normative R&D in nanotechnology


Industry
Nano phenomena
Nano circuits (say)
Product R&D
Competing products
Common terminology
Common testing
GLOBAL MARKET
wants
Global standards developers
Global standards
science based – and agreed
or parallel process
Joint expertise
Accelerating
improving
R&D in support…
- test methods
- validation
- data
Scientifically based data
Agreed
Science based
Standards
Consensus
quality
International R&D collaboration
SP Swedish National Testing and Research
NPL National Physical Laboratory
Henson 2005

Key recommendations and actions deemed essential:

- Establish a **collaborative platform** to promote proactively international cooperation in pre-normative R&D in nanotechnology

- Participate in core groups active in projects proposed to **EU Commission** for nanotechnology standardisation and related research

- Contribute actively to on-going national, regional, European and **international standardisation and research** in nanotechnology

Nordic NanoTrade

CEN/BT/WG166 ”Nanotechnologies”

- Terminology & nomenclature
- Measurement & characterisation of nanosystems
- Health, safety and environmental impact
- Product and process standards

International Organization for Standardization

TC 229 Nanotechnologies

ISO/TC229 WG 1

Title: **Terminology and Nomenclature**

Scope: To define and develop uniform terminology and nomenclature in the field of nanotechnologies. It is intended to facilitate communications to ensure common understanding among interested parties.

ISO/TC229 WG 2

Title: ***Measurement and Characterization***

Scope:
Standardization of metrology and test methods (including reference materials) which is used to characterize nano-materials and nano-structures from the aspect of physical properties.

ISO/TC229 WG 3

Title: Health, Safety, and Environmental Aspects of Nanotechnologies

Scope: To develop standards in the areas of health, safety, and environmental aspects of nanotechnologies including: occupational, environmental, and public exposure and monitoring; engineering controls, personal protective equipment, and others measures to assure safety of workers, researchers, and the public; epidemiological and environmental surveillance protocols; human and ecological biokinetics and toxicity; disposal, dispersion, and waste treatment of nanoengineered materials; as well as methodologies, data quality, and data analysis for risk assessment.

Nanostandardisation

Formed Autumn 2005

SP Swedish National Testing and Research Institute

Nano Terminology & Nomenclature

PUBLICLY AVAILABLE SPECIFICATION

PAS 71:2005

Vocabulary — Nanoparticles

3.17
nanofibre
nanoparticle with two dimensions at the **nanoscale** and an **aspect ratio** of greater than 3:1

NOTE Types of nanofibres include nanowhiskers, nanorods and nanowire.

[PAS 71 Steering Group]

3.18
nanohorn
nanoscale cone with a curved axis

[PAS 71 Steering Group]

3.19
nano-onion
nanoparticle composed of concentric molecular shell structures

NOTE Also referred to as a nested **nanoparticle**.

[PAS 71 Steering Group]

10.3
Auger Electron Spectroscopy (AES)
technique in which an electron spectrometer is used to measure the energy distribution of Auger electrons emitted from a surface

NOTE AES instruments can achieve lateral resolutions as low as 5 nm.

[BS ISO 18115, *Surface chemical analysis — Vocabulary*]

10.4
BET analysis
characterization technique based on the model developed by Brunauer, Emmet and Teller that allows the surface area of powders to be determined by gas adsorption

NOTE Typically nitrogen or carbon dioxide is used but gases such as krypton or argon may be used for low surface area materials because of their greater sensitivity (mass gain per unit area).

[PAS 71 Steering Group]

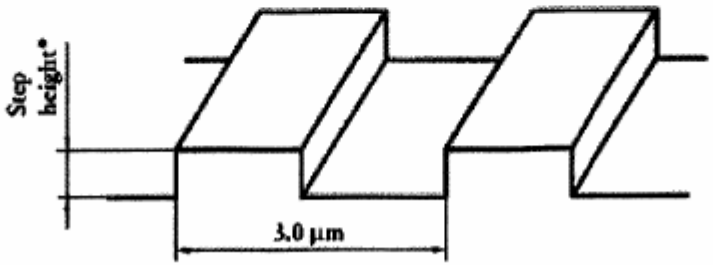
SP Swedish National Testing and Research Institute

DME

Set of Calibration Gratings

Product specification **DME 2356**

TGZ01, TGZ02, TGZ03



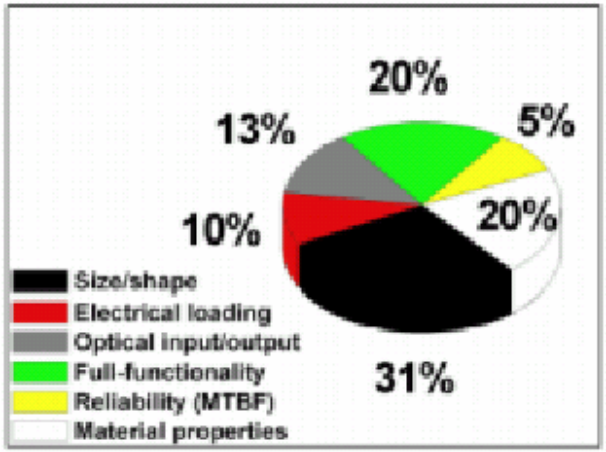
Step height:
TGZ01: 20 ± 0.5 nm
TGZ02: 100 ± 1,5 nm
TGZ03: 500 ± 1,5 nm

Pitch: 3.0 µm

Active area: 3×3 mm

Nordic NanoTrade

Nanocharacterisation



http://www.memstand.org

Nanometrology

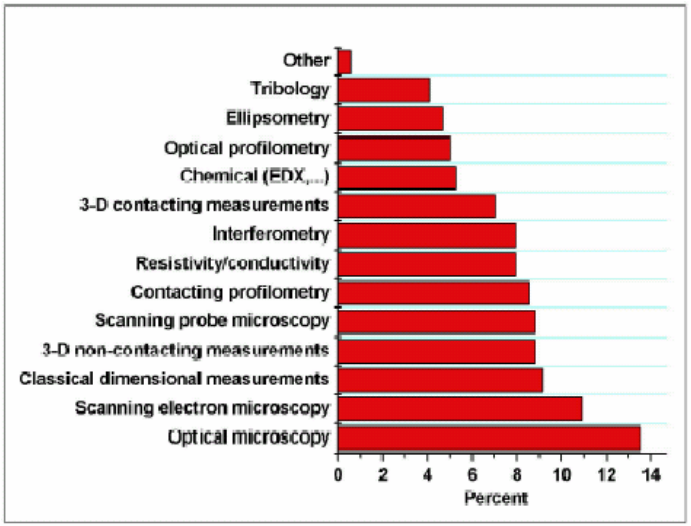
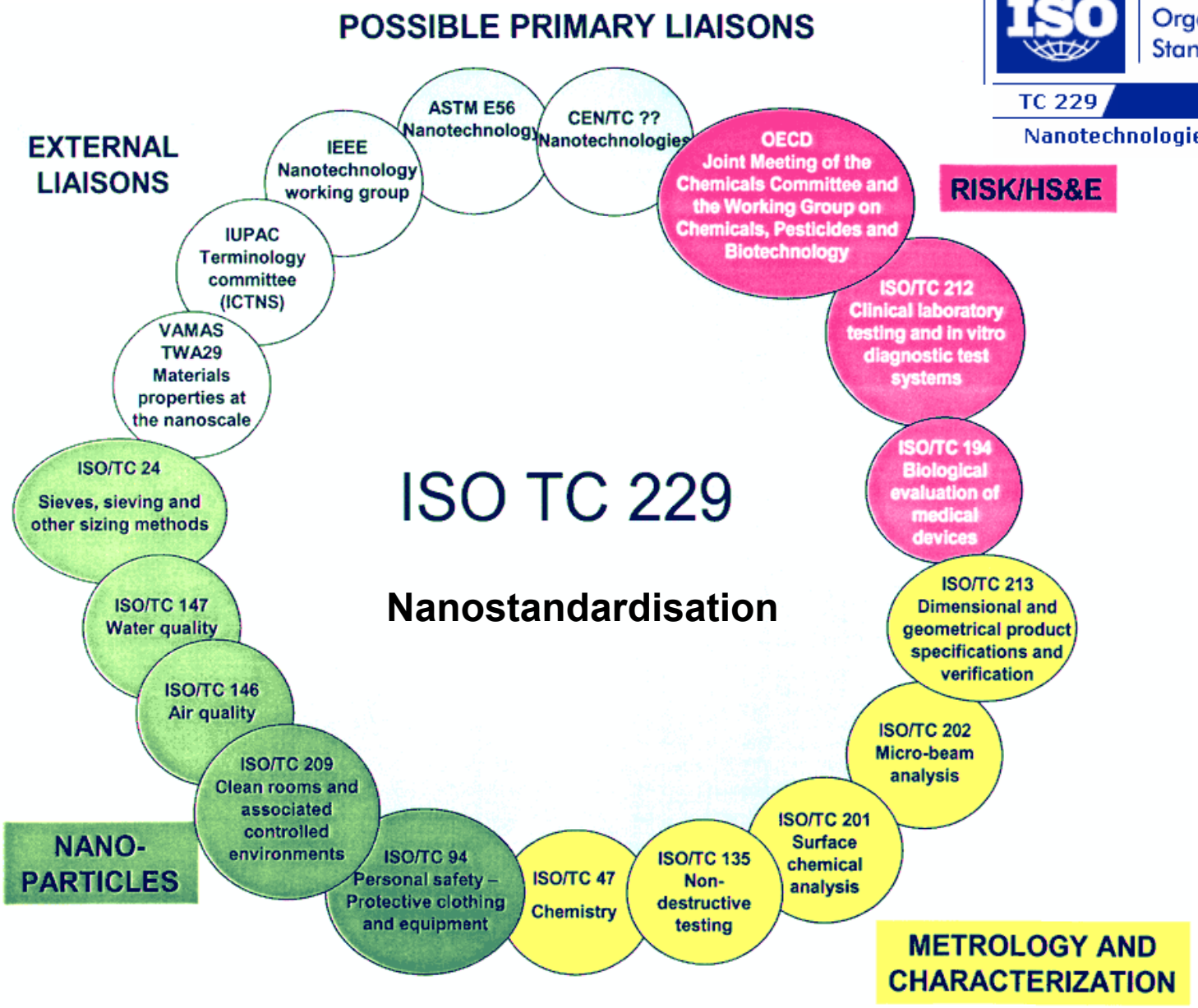


Table 1 Matrix of nanotechnological objects and metrological methods

Metrology / *Object*	mass	optics	electricity	pH
Np/Nt/Nf-physical properties	x	X	x	x
Nscoatsfilm for sensors/actuators/electronics	x	x	X	X
etc				



International Organization for Standardization

TC 229 Nanotechnologies

SP Swedish National Testing and Research Institute