

FROM RESEARCH TO INDUSTRY



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# RADIOACTIVITY MEASUREMENT STANDARDS OF THE INTERNATIONAL STANDARDIZATION ORGANIZATION DRAFTED BY TC85/SC2/WG17 AND TC147SC3

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**Rolf Michel**

**on behalf of Dominique Calmet/CEA**

IRPA14 Congress 2016 May 9<sup>th</sup>

Cape Town International Convention Centre, South Africa

## Main section with normative clauses

- *Scope*
- *Normative references*
- *Terms, definitions and symbols*
- *Principle*
- *Equipment*
- *Sampling (characteristics, duration, ...)*
- *Test method procedure, influence quantities, calibration*
- *Expression of results : uncertainty, decision threshold, detection limit, ...*
- *Test Report*

## Annexe(s) usually informative

- Example of test methods applying the requirements of the standard

## Participating Countries (40)

- [Australia \(SA\)](#)
- [Austria \(ASI\)](#)
- [Belgium \(NBN\)](#)
- [Canada \(SCC\)](#)
- [Chile \(INN\)](#)
- [China \(SAC\)](#)
- [Czech Republic \(UNMZ\)](#)
- [Côte d'Ivoire \(CODINORM\)](#)
- [Denmark \(DS\)](#)
- [Egypt \(EOS\)](#)
- [Finland \(SFS\)](#)
- [France \(AFNOR\)](#)
- [Georgia \(GEOSTM\)](#)
- [Germany \(DIN\)](#)
- [India \(BIS\)](#)
- [Iran, Islamic Republic of \(ISIRI\)](#)
- [Ireland \(NSAI\)](#)
- [Israel \(SII\)](#)
- [Italy \(UNI\)](#)
- [Jamaica \(BSJ\)](#)
- [Japan \(JISC\)](#)
- [Jordan \(JSMO\)](#)
- [Kenya \(KEBS\)](#)
- [Korea, Republic of \(KATS\)](#)
- [Mexico \(DGN\)](#)
- [Myanmar \(MSTRD\)](#)
- [Netherlands \(NEN\)](#)
- [Norway \(SN\)](#)
- [Philippines \(BPS\)](#)

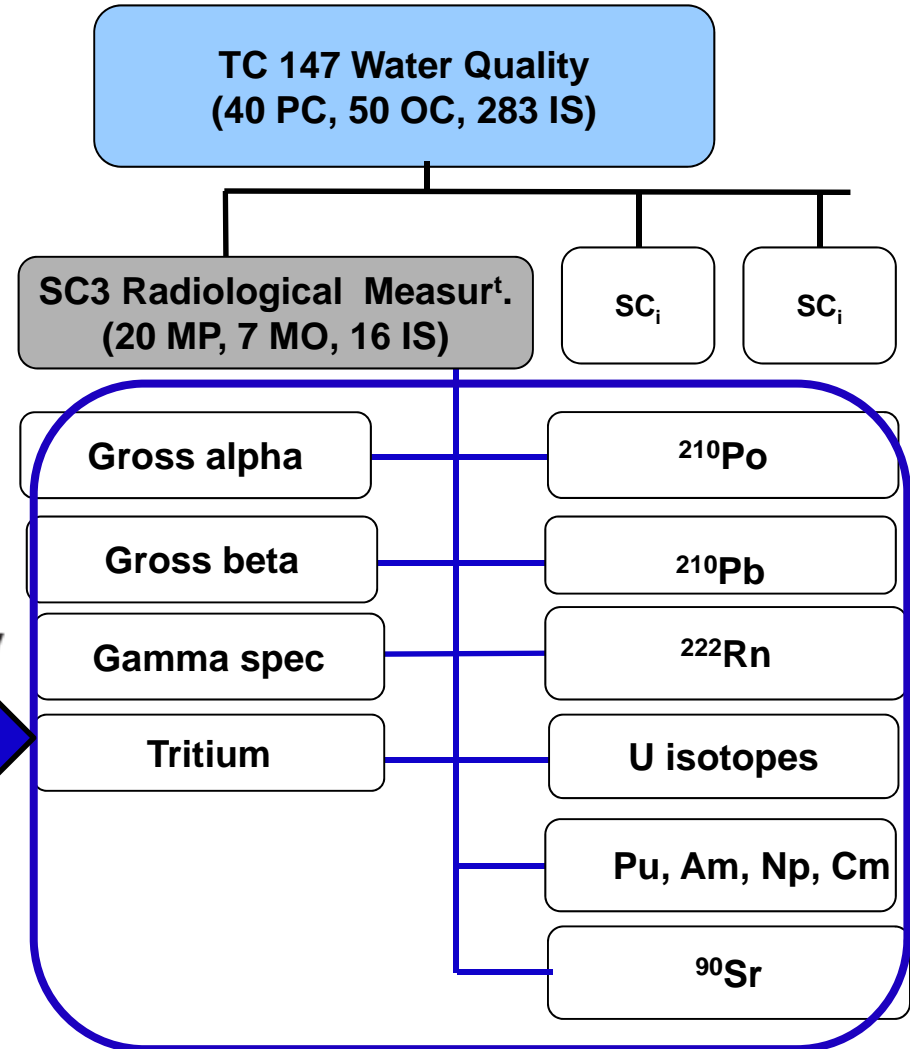
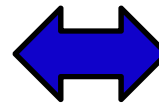
- [Portugal \(IPQ\)](#)
- [Russian Federation \(GOST R\)](#)
- [Slovakia \(SOSMT\)](#)
- [South Africa \(SABS\)](#)
- [Spain \(AENOR\)](#)
- [Sri Lanka \(SLSI\)](#)
- [Sweden \(SIS\)](#)
- [Turkey \(TSE\)](#)
- [Ukraine \(DTR\)](#)
- [United Kingdom \(BSI\)](#)
- [United States \(ANSI\)](#)

## Guidelines for Drinking-water Quality



FOURTH EDITION

**July 2011**



## Sampling methods

- ISO5667 Water quality — Sampling (21 Parts)  
- Part 3 (2012) Preservation and handling of water samples

## Screening methods

- ISO9696 (2016) Measurement of **gross alpha activity** in non-saline water — Thick source method
- ISO9697 (2015) Measurement of **gross beta activity** in non-saline water -  
- Thick source method
- ISO10704 (2009) Measurement of **gross alpha and gross beta activity** in non-saline water — Thin source deposit method
- ISO11704 (2010) Measurement of **gross alpha and beta activity** concentration in non-saline water — Liquid scintillation counting method.
- ISO10703 (2007) Determination of the activity concentration of radionuclides — Method by high resolution **gamma-ray spectrometry**

## Test methods for individual radionuclides

- ISO9698 (2010) Determination of **tritium** activity concentration — LSC method
- ISO13160 (2012) Measurement of **strontium 90 and strontium 89**
- ISO13161 (2011) Measurement of **polonium 210** activity concentration in water by alpha spectrometry
- ISO13162 (2011) Determination of **carbon 14** activity — LSC method
- ISO13163 (2013) Measurement of **lead 210** activity concentration — LSC method
- ISO13164 Measurement of the activity concentration of **radon-222**
  - Part 1 (2013): General principles
  - Part 2 (2013): Test method using gamma-ray spectrometry
  - Part 3 (2013): Test method using emanometry
  - Part 4 (2015): Test method using two-phase liquid scintillation counting.
- ISO13168 (2015) Simultaneous determination of **tritium** and **carbon 14** activities — Test method using LSC

## Test methods for individual radionuclides

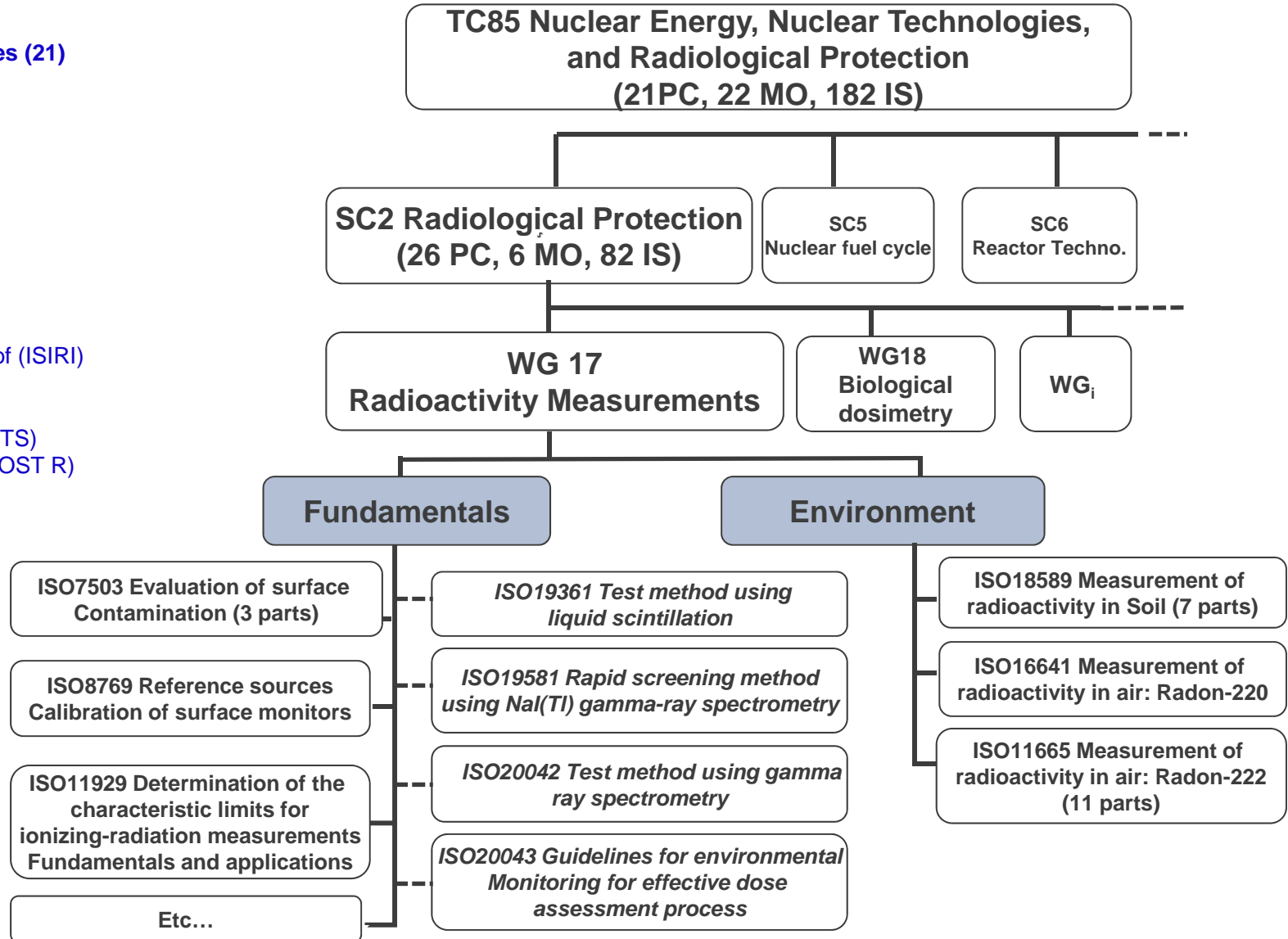
- ISO13165 Measurement of radium 226 activity concentration and its short-lived decay products
  - Part 1 (2013) : Test method using liquid scintillation counting
  - Part 2 (2014) : Test method using emanometry
  - **Part 3 (2016)**: Test method using coprecipitation and gamma-spectrometry
- ISO13166 (2014) Measurement of **uranium** activity concentration by alpha spect.
- ISO13167 (**2015-12-15**) **Plutonium, americium, neptunium and curium** — Test method using alpha spectrometry

## Standards under preparation

- ISO/WD XXXXX :  $^{63}\text{Ni}$  and  $^{55}\text{Fe}$  — Test method using beta liquid scintillation counting“
- ISO/WD XXXXX : Plutonium-238, -239, -240, -241 isotopes and neptunium-237 -  
- Test method using inductively coupled plasma mass spectrometry (ICP-MS)

## Participating Countries (21)

- Argentina (IRAM)
- Austria (ASI)
- Belgium (NBN)
- Bulgaria (BDS)
- Canada (SCC)
- China (SAC)
- France (AFNOR)
- Germany (DIN)
- India (BIS)
- Iran, Islamic Republic of (ISIRI)
- Italy (UNI)
- Japan (JISC)**
- Korea, Republic of (KATS)
- Russian Federation (GOST R)
- Saudi Arabia (SASO)
- Spain (AENOR)
- Sweden (SIS)
- Switzerland (SNV)
- Ukraine (DTR)
- United Kingdom (BSI)
- United States (ANSI)



- ISO 11929 (2010) Determination of the characteristic limits (decision threshold, detection limit and limits of the confidence interval) for measurements of ionizing radiation — Fundamentals and application

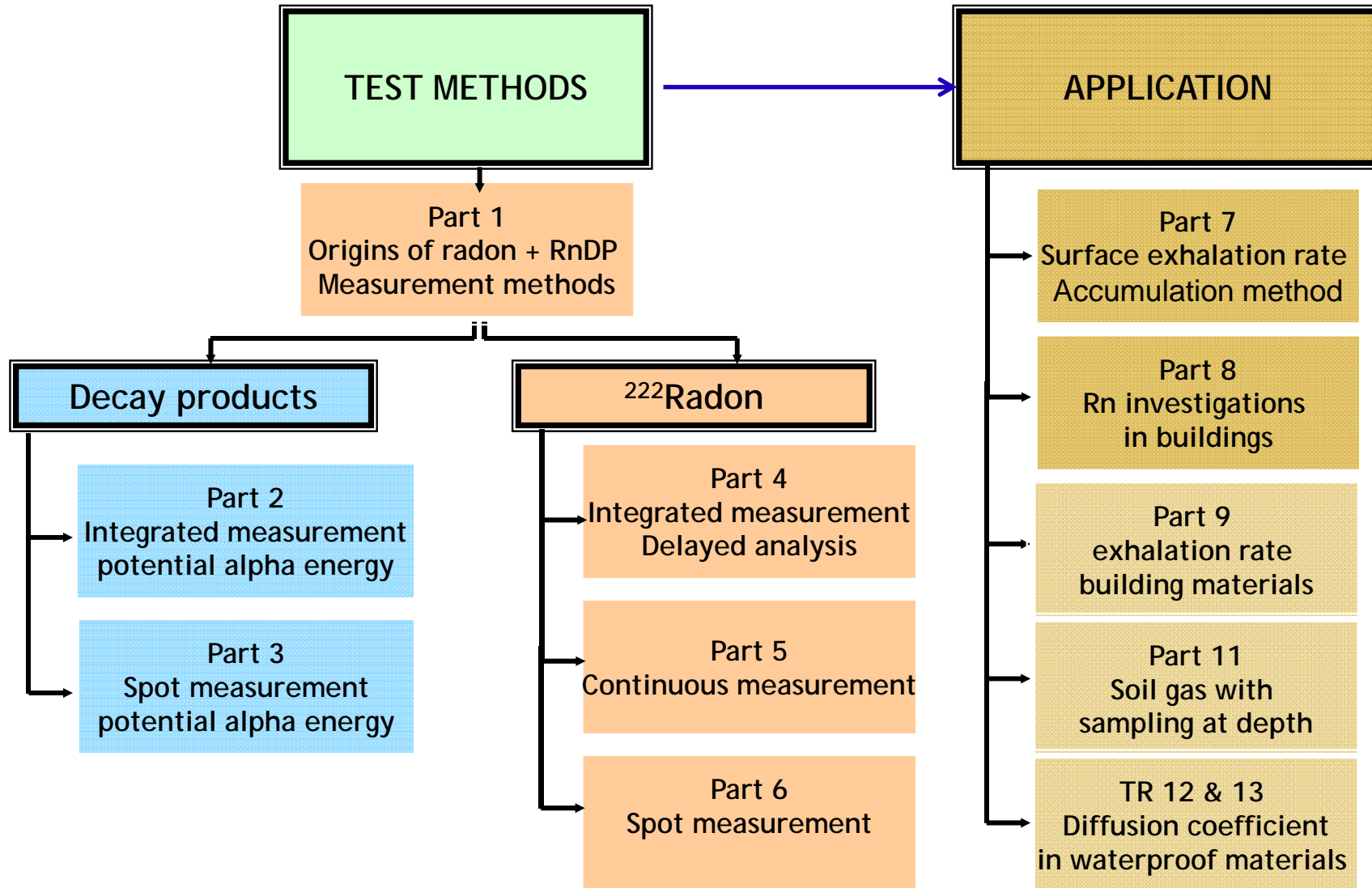
This standard is to be used by testing and calibration laboratories for detailed evaluations of uncertainty and calculations for compliance with specifications (reference levels). Currently under revision because of new developments in metrology.

- **ISO 7503 (2016)** Measurement of radioactivity — Measurement and evaluation of surface contamination : *3 new completely revised parts published in 2016*
  - *Part 1: General principles*
  - *Part 2: Test method using wipe-test samples*
  - *Part 3: Apparatus calibration*
- ISO 8690 (1988) Decontamination of radioactively contaminated surfaces — Method for testing and assessing the ease of decontamination
- **ISO 8769 (2016)** Reference sources — Calibration of surface contamination monitors — Alpha-, beta- and photon emitters.



- ISO18589 Measurement of radioactivity in the environment - Soil
  - Part 1 (2005): General guidelines and definitions
  - Part 2 (2015): Guidance for the selection of the sampling strategy, sampling and pre-treatment of samples
  - Part 3 (2015): Measurement of gamma-emitting radionuclides
  - Part 4 (2009): Measurement of plutonium isotopes (plutonium 238 and plutonium 239 + 240) by alpha spectrometry
  - Part 5 (2009): Measurement of strontium 90
  - Part 6 (2009): Measurement of gross alpha and gross beta activities
  - Part 7 (2013): Portable in situ gamma spectrometry measurement

- ISO 11665 Measurement of radioactivity in the environment — Air : radon-222
  - Part 1 (2012): Origins of radon and its short-lived decay products and associated measurement methods ;
  - Part 2 (2012): Integrated measurement method for determining average potential alpha energy concentration of its short-lived decay products ;
  - Part 3 (2012): Spot measurement method of the potential alpha energy concentration of its short-lived decay products ;
  - Part 4 (2012): Integrated measurement method for determining average activity concentration using passive sampling and delayed analysis ;
  - Part 5 (2012): Continuous measurement method of the activity concentration ;
  - Part 6 (2012): Spot measurement method of the activity concentration ;
  - Part 7 (2012): Accumulation method for estimating surface exhalation rate ;
  - Part 8 (2013): Methodologies for initial and additional investigations in buildings;
  - **Part 9 (2016):** Method for determining exhalation rate of dense building materials;
  - **Part 11 (2016):** Test method for soil gas with sampling at depth;
  - **TR 12 and 13 (2016):** Technical report Determination of diffusion coefficient in waterproof materials using activity concentration measurement.



- ISO 16641 (2014) Measurement of radioactivity in the environment — Air : radon-220 — Integrated measurement methods for the determination of the average activity concentration using passive solid-state nuclear track detectors.

## Standards under preparation

- **ISO19581 (DIS voting)** Measurement of radioactivity — Gamma emitting radionuclides — Rapid screening method using NaI(Tl) gamma-ray spectrometry (TL Dr. Takahiro Yamada - Japan) *under DIS voting and complementary of IEC 61563* (2001) Radiation protection instrumentation – Equipment for measuring specific activity of gamma-emitting radionuclides in foodstuffs *that is under revision*

- **ISO19361 (DIS Drafting Stage)** Measurement of radioactivity — Determination of beta emitters activities — Test method using liquid scintillation counting  
*Scope : This document describes the conditions for measuring the activity of beta emitter radionuclides by liquid scintillation counting. The test sample can be liquid (aqueous or organic), or solid (particles or filter or planchet)...(PL Mr Marc Fournier)*
- **ISO 20042 (CD Drafting Stage)** Measurement of radioactivity — Test method using Gamma Spectrometry  
*Scope : This international standard describes methods to determine the activity (Bq) of gamma-emitting radionuclides by gamma spectrometry in test samples in a laboratory... (PL Steven Judge, Thomas Haug, Jean-Marie Duda, François Byrde)*
- **ISO 20043 (WD Drafting Stage)** Guidelines for environmental monitoring for effective dose assessment process  
*Scope : This Standard provides guidance on food and the environmental characterization needed for the prospective and/or retrospective dose assessment methods of public exposure...(PL Mr Shinji Tokonami and Mr Tetsuya Sanada)*

**THANK YOU FOR YOUR  
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ISO Standards | IRPA14 Congress 2016 May 9th,  
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