

# The History of Radon Calibration in the Czech Republic

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# What we measure?



You measure radon! (RnDP are not in soil air)

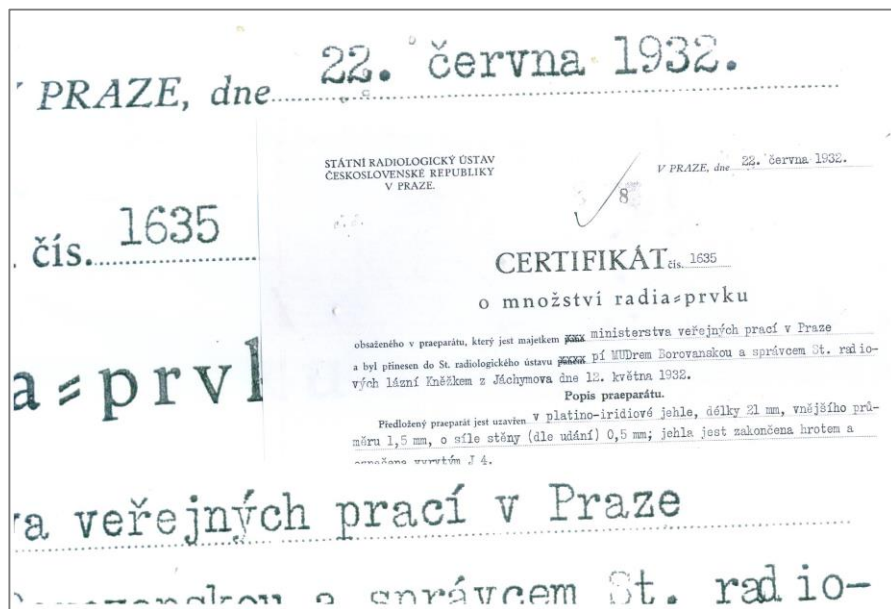


# Purpose of measuring and calibration

- Geological structure in CR → high indoor  $^{222}\text{Rn}$  concentration
- Czech law requires measuring of  $^{222}\text{Rn}$  „in soil“ → many measuring companies in CR
- Supervision of whole process – State Office for Nuclear Safety (SONS) provides the permission for measuring only in the case that devices have been verified
- Following parts of this paper are mostly relevant for radon-in-soil measurement; the other types are omitted



# „Prehistory“ of radon metrology



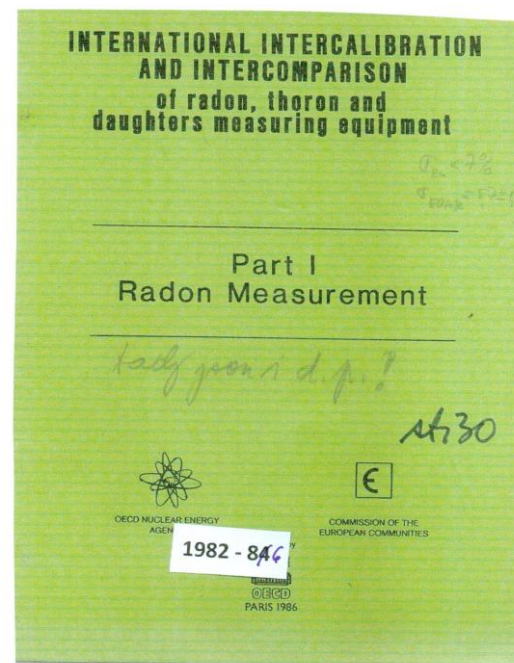
- Radon metrology is known at least for one century
- First certificate about amount of radium
- The decades of radon measuring devices calibration has started







# Radon metrology after 1970



And before  
1989

- Many measurements in mines
- Cooperation between socialist countries
- Intercomparison measurement



# State after 1989

- Our institute build second RAC (duplicate the chambre in Razés, FR) → radon metrology was settled in the CR
- Traceability of our Lucas chambers:
  - NRPB Chilton (UK)
  - VNIIFTRI Mendeleyevo (Rus)
  - Universiteit Gent (BG)
  - EML (NY)
- Era of mutual comparisons – some methods have been extended:
  - 40 ml glas bulbs with defined amount of Rn-222 (NPL Teddington, UK)
  - International intercomparisons (Badgastein, Pribram, US mines and labs)
  - PTB Braunschweig – sending of AlphaGuard
  - PAMI 96





# Current state - circumstances



- Authorized Metrologic Center for radon-222 (AMC) and accredited Calibration Laboratory (CL)
- Organizations have to verify their devices every two years (difference from AMC less than 20 % = OK)
- AMC issued about 5000 verification sheets
- Assistance for the CMI (Czech Metrological Institute) in the process of type approval of new radon or radon decay monitors
- Traceability to eminent laboratories abroad



# Current state - traceability



„transfer standard“





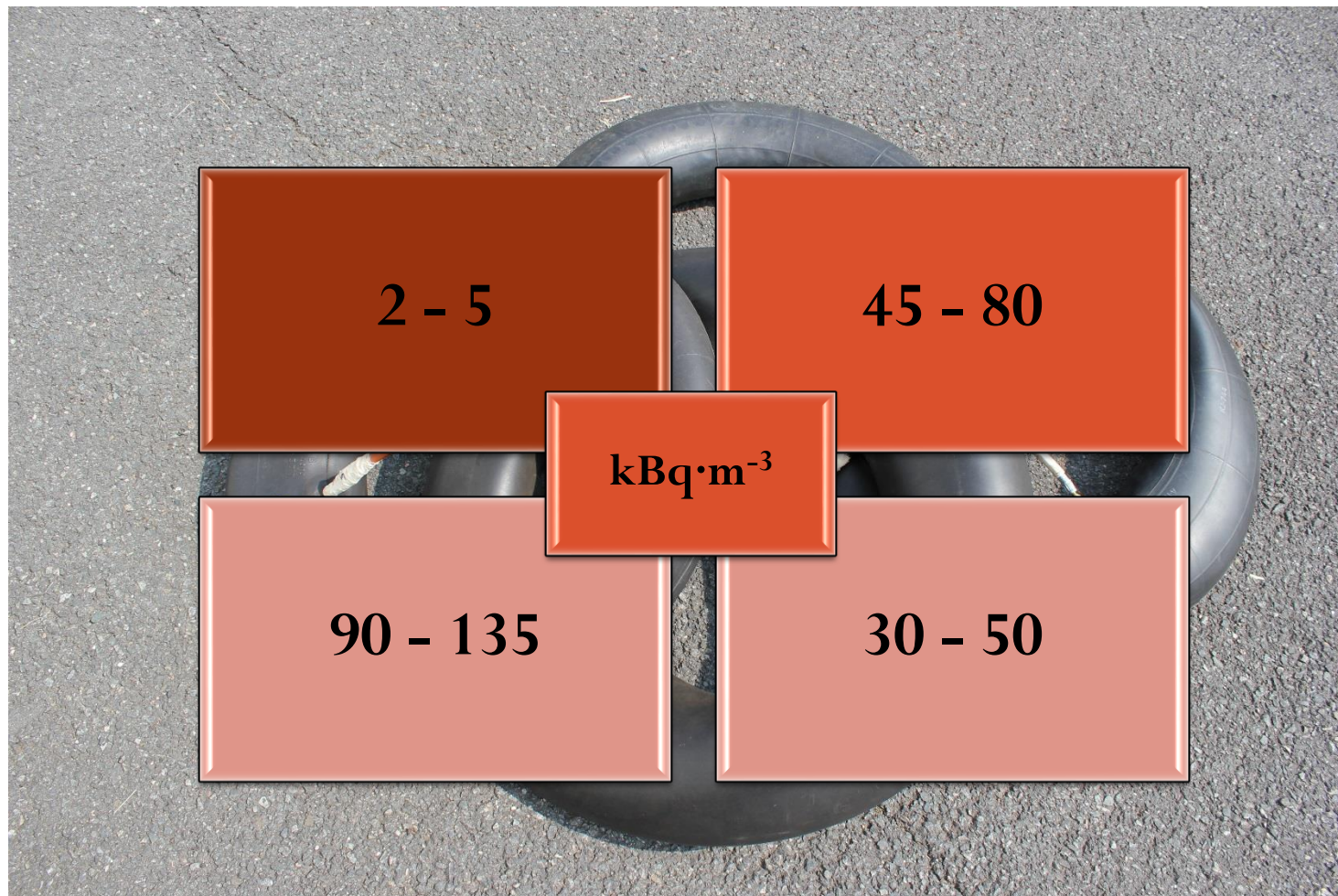
# Quality Assurance

- Authorized by the Czech Office for Standards, Metrology and Testing
- Accredited by the Czech Accreditation Institute
- Certified by Lloyd's Register Quality Assurance



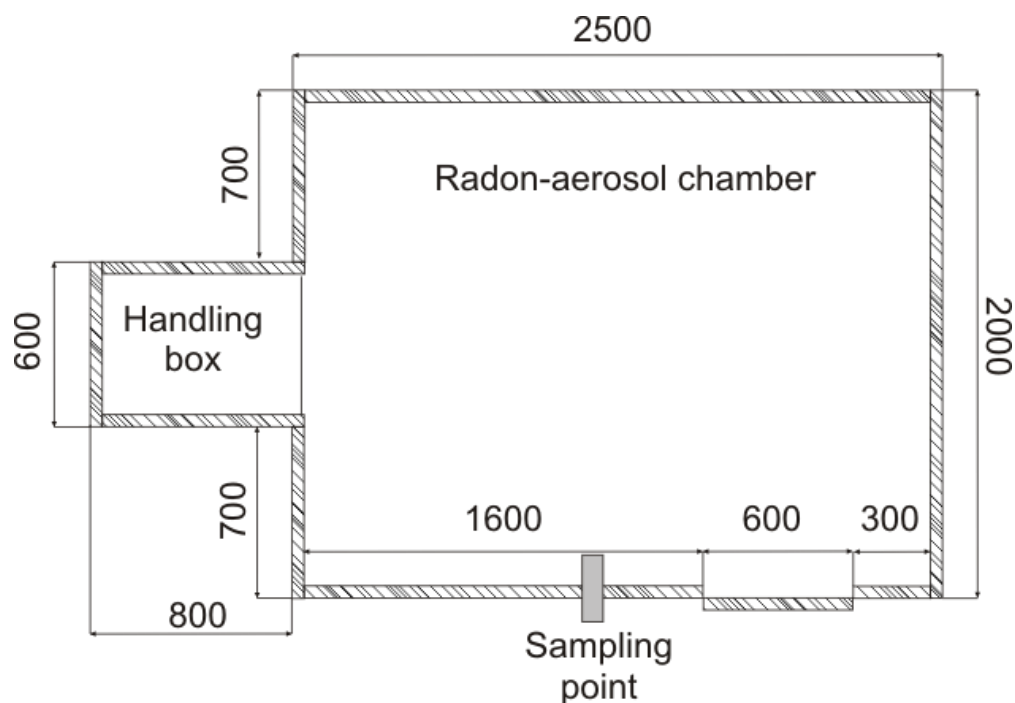


# The calibration process of radon-in-soil devices





# Radon-Aerosol Chamber (RAC)



Walk-in RAC (Volume: 10 m<sup>3</sup>)



# Radon-222 measurements (highest metrological level)



→ Grab sampling



→ Continual monitoring



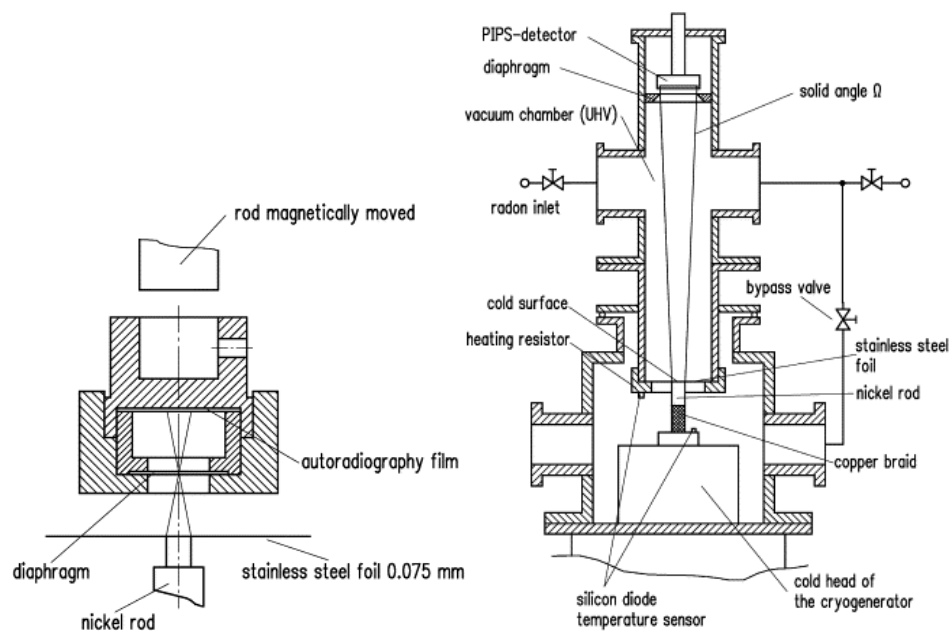


# The best word primary radon measurement (PTB)?

- Picolo L.J. (Nuclear Instrument Methods A. 369, 1996, 452-457)
- R.Derch: Primary and Secondary measurements of  $^{222}\text{Rn}$ , Applied Radiation and Isotopes 60 (2004) 387-390

Radon is deposited to „point“ circle at 25 K, and its activity is measured at precisely defined detection geometry. Radon is transported to the bulb after measurement, and then a secondary system could be applied – gamma measurement of this 40 ml bulb.

Together, both systems provide a reliable tool for the production of gaseous  $^{222}\text{Rn}$  activity standards with relative uncertainties of less than 1%.





Thanks for your attention!



<http://www.metroradon.eu>

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