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Role and Capabilities of the Federal Office for Radiation Protection in the response to the Po-210 incident in Hamburg in 2006

4th EURADOS Winter School
Radiological emergencies – Internal exposures
Rome, 3 February 2010

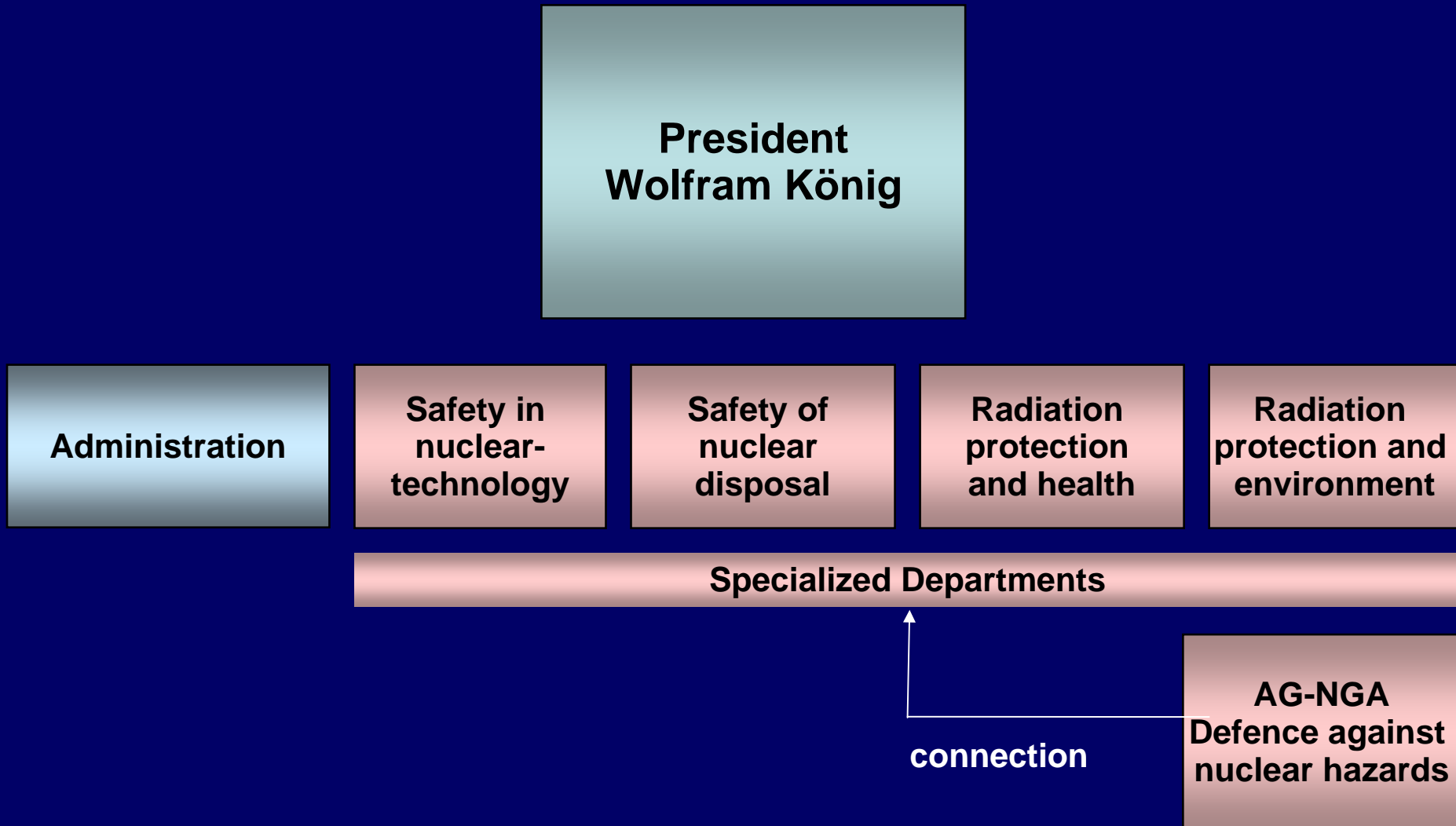
- Overview of the German Federal Office for Radiation Protection (BfS) and its capabilities.
- General information about Po-210.
- Detailed information about the case and the tasks of the BfS including...
- Communication challenges
- Summary

is a scientific and technical Federal Office

belongs to the Federal Ministry for the Environment, Nature Conservation and Reactor Safety (BMU).

works together with the Federal Criminal Police Office and the Federal Police for the defence against nuclear hazards.





- Detection of radioactive materials, radionuclide determination, the estimation of activity levels and contamination measurements.
- Evaluation of radioactive materials and criticality risks.
- Estimation of radiological consequences following a detonation/dispersion and radioactivity predictions.
- Advising policy-makers in all aspects of radioactivity (medical, protective measures, transport, public, etc.)



Physical properties

Po-210

Physical half-life:	138 Days
Biological half-life:	30 – 50 Days
α -particle mfp (body):	42 μm

Uses

Together with Be as a neutron source
(eg., as a trigger for a fission bomb)

Static eliminator (photocopiers, textiles)

RTG cell for spaceflight
(1g Po-210 produces 140 Watt)

Uptake in the body

Inhalation (eg., smoking)

Ingestion with food

Open cuts



Production of Po-210

Manufactured production

A Po-210 > 0 Bq/kg

A Pb-210 = 0 Bq/kg

Manufacturing methods for POLONIUM-210

- Most of the world's Po-210 is produced in Russia in Chernobyl-type RBMK reactors;
- As far as we know, gram amounts are produced by Russia annually.
- According to a claim by Sergei Kiriyyenko, the head of Russia's state atomic energy agency, RosAtom, all of it goes to U.S. companies through a single authorized supplier.

Po-210 INCORPORATION

Consequences

(estimation of the magnitudes involved)

The smallest amounts of ingested Po-210 that lead to an acute lethal dose (assumed to be 10 Sv) are between 10 and 200 MBq (0.06 to 1.2 μg), depending on the time in which the lethal dose is reached.

0.06 μg give a dose of 10 Sv after around 100 Days

1.20 μg give a dose of 10 Sv after around 3 Days

The picture shows 0.01 g

0.0000012 g is the lethal dose within 3 days



Due to the death of the ex-KGB agent Litvinienko in November 2006 in London.



1st Nov 2006: Litvinenko met **two Russians** in the **Millenium Hotel** in London. At 3 pm he met the Italian security expert **Scaramella** at the **Itsu Sushi Bar**.

23rd Nov 2006: Litvinenko died at 9.21 pm

Deployment 08-22.12.2006

28th Oct 2006:

Kovtun flew with Areoflot from Moscow to Hamburg and was picked up from the airport with a BMW. He sat on the passenger-seat. He spent the night at a flat belonging to his ex-wife in the Erzbergerstraße.

29th Oct 2006:

Kovtun stayed over in Haselau in the parish of Pinneberg.

30th Oct 2006:

Kovtun had an appointment at the Immigration Office in Hamburg-Altona and signed some papers. He stayed over at a friend's flat in the Kieler Straße in Altona.

31st Oct 2006:

Kovtun travelled around Hamburg and then stayed over in the Erzbergerstraße.

1st Nov 2006:

Kovtun travelled by taxi to Hamburg Airport and flew with Germanwings to London.



- Is Po-210 present at the sites visited by Kovtun?
- If so, how much?
- What measures have to be taken?

- The ZUB was called on by the City of Hamburg to carry out the deployment

- I. Measurements at different scenes in Hamburg, Schleswig-Holstein and Cologne
(detective work; clues) Erzberger Straße, Kieler Straße, Haselau, airport, shops, restaurants
- II. Laboratory analysis in Munich Air filter samples, Every-day objects
- III. Laboratory analysis in Munich / Berlin / Rossendorf Urine samples
- IV. Evaluation of the measurement results
- V. Advice for the public and deployed forces

Confirming that Po-210 was present



Testing the α detector before driving to the site

Measuring for air contamination



Air filter samples were taken
on the 9th December:

In the stairway of Erzberger Str

150 m³ and 50 m³

In the ex-wife's house

150 m³ and 50 m³

Measuring for air contamination



The air filter samples with a sampled air volume of 150 m³ were flown to the BfS laboratory in Munich.

The measurements were ready on the 10th December and showed no elevated α -activity in the air in the buildings.

Measuring for alpha contamination



German legal limit Po-210 $1 \text{ Bq} / \text{cm}^2$

Efficiency 10 %

Detector area 100 cm^2

⇒ **10 counts/second**

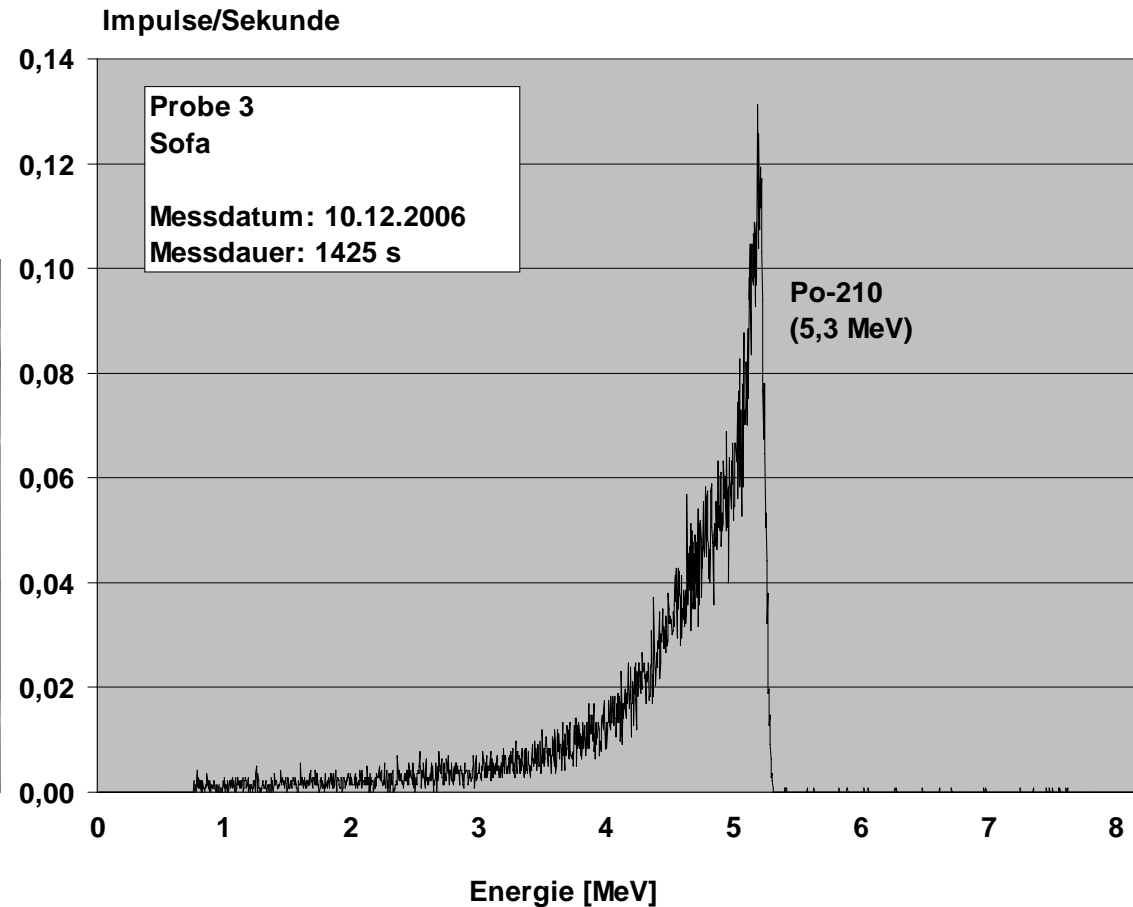
Fabric Samples

Seat of the leather sofa
10.0 – 15.0 counts/second



Po-210 : 0.23 ± 0.060 Bq/cm²

Pb-210 < 0.0073 Bq/cm² (γ -spectroscopy)



Fabric Samples

Head-rest from the family car
9.0 counts/second



**Po-210: 3.1 ± 0.7 Bq/cm²
(Grid ionisation chamber)**

**4.4 ± 1.1 Bq/cm²
(Radiochemistry)**

Pb-210: < 0.0024 Bq/cm² (γ -spectroscopy)

INCORPORATION – Urine samples

59 urine samples were collected from 53 people.

The median activity in uncontaminated urine was 3.5 mBq/d.

<u>Group tested</u>	<u>24h-activity (mBq/d)</u>	<u>Dose (mSv)</u>
Toddler (urine from nappy)	106.0 / 156.0	0.84 / 1.25
Family of ex-wife	20.0 ± 4.8	0.03 ± 0.02
Special unit forces	4.4 ± 3.8	0.005 ± 0.004

- **Internal (different organisations working together)**
- **External (press conferences)**
- **Discrepancies between internal and external sources**

Inappropriate protective clothing for picking up the family from the hotel



Inappropriate choice of vehicle for the transport of the family to a routine check-up



➤ **The family involved lost trust in the emergency workers**

Hamburg, 07.12.2006

Hamburg, 08.12.2006



Two press conferences were held. These were meant to reassure the public that there was no danger to them or any member of the emergency services at the scenes...

External Communication



...however, the press encouraged their readership to believe that the counter measures were not simply precautionary.

➤ **Anxiety among the public and the emergency workers**

- Some police officers were contacted from home with additional and/or misleading information taken from media sources before the deployment.
- **Heightened anxiety within the police force during the operation.**
- Several “worried well” from the police service and their families demanded health checks after the deployment, even though none had been inside the scenes involved.
- **Strain on health physics resources.**

- **The deployment in Hamburg was successful in general.**
- **A new internal and external communication strategy was developed with the aim to deliver a customised, homogeneous and appropriate response in future.**
- **Communication is vital for the success of a deployment and should be prepared for in advance and also made part of regular deployment exercises.**

Thanks

Thank you for your attention

Questions?

**E. A. Kroeger, Federal Office for Radiation Protection,
EURADOS Winter School, February 2010**