



HSE
Occupational Health & Safety
and Environmental Protection unit



The Occupational Health & Safety and Environmental Protection (HSE) Unit

S. Roesler

Head of the Radiation Protection Group and Deputy to the HSE Unit Head

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Outline

The Occupational Health & Safety and Environmental Protection (HSE) Unit

- Mandate
- Stakeholders
- Organizational Structure

The Radiation Protection Group

- Mandate, legal framework
- Instrumentation and equipment

Technology Transfer

Mandate of the HSE Unit

Expert advice and services in matters of
Occupational Health and Safety & Environment

Establishing **Safety Rules** as required for the proper functioning of the Organization

Granting **authorizations** for installations, equipment, activities and projects with major Safety implications

Support

Safety rules

Monitoring the environmental impact of the Organization's activities

Responsible for
Radiation Protection

RP

Environmental monitoring

Responsible for
Occupational Medicine

Occupational Medicine

HSE Mission

Fire & rescue service

Responsible for
Fire and Rescue and Emergency response

The HSE Unit reports directly to the Director General

Our Stakeholders



All CERN Units and Departments, including their partners (e.g., universities and institutes)



Host States Authorities in Matters of Radiation Protection and Radiation Safety

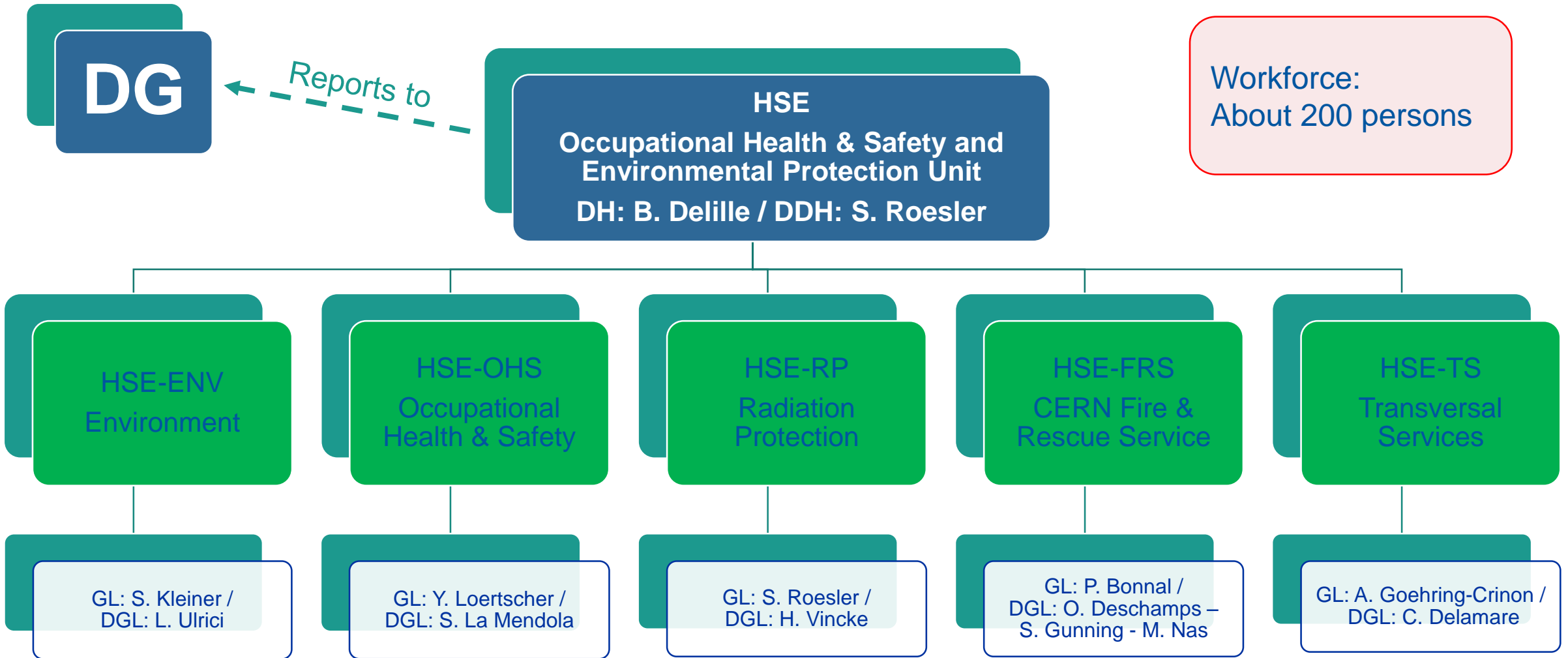
Local Authorities in matters of Environmental Protection

Fire and Rescue Services in France and Switzerland

for the safe operation of CERN's accelerators, experiments and premises



Organizational Structure



Radiation Protection Group

Mandate

“The Radiation Protection Group (HSE-RP) of the HSE Unit ensures that personnel on the CERN sites and the public are protected from potentially harmful effects of ionizing radiation linked to CERN activities. The HSE-RP Group fulfils its mandate in collaboration with the CERN departments owning or operating sources of ionizing radiation and having the responsibility for Radiation Safety of these sources.”

Operational Radiation Protection

- Risk assessments for personnel and public
- Definition of protective measures, authorization of operation
- Lead in implementation of ALARA principle
- Studies for projects and upgrades
- R&D for tools and methods, operation of shielding benchmark facility

Environmental Radiation Protection

- Environmental monitoring program with emission and immission monitoring
- Studies of environmental impact for upgrades and new facilities

Radioactive Waste Management

- Operation of pre-conditioning and interim storage facility
- Waste disposal towards host states
- Support to departments in radioactive waste minimization and treatment

Individual Dosimetry

- Monitoring of external and internal doses and reporting (CERN dosimetry service carries official accreditation in Switzerland)
- Operation of calibration facility



Instrumentation

- Development, Installation and operation of radiation monitoring system

Services

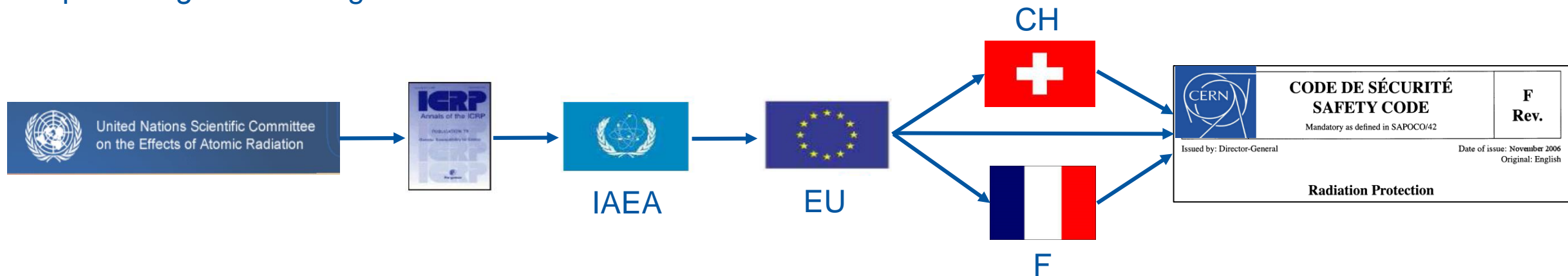
- Inter/intra-site radioactive transport
- Shipping (import/export) of radioactive goods
- Radiological characterization of material and waste, operation of analytical laboratory
- Radioactive sources service

Radiation Protection Legal Framework

CERN is an intergovernmental Organization subject not to national but international law. Its status has been recognized by its host states where it must ensure their safety and security.

CERN has the right to establish rules as necessary for the proper functioning of the Organization, among others, Safety Rules.

CERN agrees to follow **best practices in matters of radiation protection and radiation safety** taking into account the legislation of its host states, as well European and international standards. Their implementation is discussed between the host states authorities, ASN (F) and OFSP (CH), and CERN according to a "Tripartite Agreement" signed in 2010.



Key facts related to Radiation Protection

- About 50 km of accelerator infrastructure and over 160 physics experiments, all areas classified as Radiation Areas
- Radioactive Ion Beam facility (ISOLDE), Spallation Source (n-TOF),
- Several experimental halls for fixed target experiments
- Radioactive laboratories
- Radioactive Waste Treatment Center and radioactive waste interim storage facility

- Over 10000 Radiation Workers
- Low radiological risks (more than 90% of annual individual doses are lower than 100 nSv)
- External exposure mostly due to gamma irradiation (handling of activated equipment during shutdown periods)
- Most of the accelerator infrastructure is located underground (LHC up to 100m), thus very low external exposure during operation

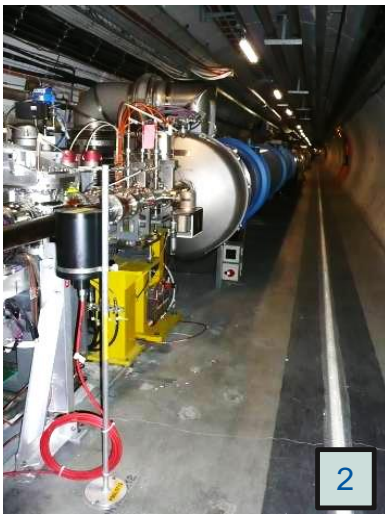
The Radiation Protection Group is mandated to monitor the radiological impact of CERN's accelerators and installations. For this purpose the group operates a large network of radiation monitors (mobile and fixed installed) to assess radiation risks and to control the release of radioactivity.



Radiation Protection Instrumentation – Area Monitoring



Measurement System	Detector Type (example)	Number of devices
Radiation monitor for mixed field and gamma radiation (1)	Centronic IG5-H20	187
	Centronic IG5-A20	73
Neutron Monitor	Thermo Scientific FHT762	15
Radioactivity Monitor (2)	PTW 32006	337
Xray and Gamma Monitor (3)	Berthold LB6360, LB6500	150
Hand-and-foot Monitor (4)	Berthold LB147	55
Material Controller	Saphymo PCM	19
Site Gate Monitor (5)	Novelec MSA-T	29
Truck Gate Monitor (6)	Thermo Scientific FHT1388S	2



Radiation Protection Instrumentation – *Environmental Monitoring*



Measurement System	Detector Type (example)	Number of devices
Stray Radiation Monitor (1)	“Gamma”: Centronic IG5-A20 Neutron: Thermo Scientific FHT752 or 762	41
Ventilation Monitoring Stations (3 & 4) + Environmental Aerosols Samplers (2)	Short-lived radioactive gases monitor: BERTIN / ASGA Sampling filter head: ALGADE / P-535-117/142 Tritium sampler: E2S INNOVATION / PA3 “Maintenance free” pump: ELMO-RIETSCHLE / 2BH7 420	42 + 13
Aerosol Monitor (5)	MIRION iCAM	3
Water Monitoring Station (6)	Released water monitor: BERTIN / LIRA Hydrocarbons detector: ISMA / ODL-1600	13
Ultra Sound Anemometer (7)	Meteorological monitoring: METEK / USA-1 & USA-1/T	5

Radiation Protection Instrumentation – *Laboratories*



Measurement System	Detector Type (example)	Number of devices
Gamma Spectrometers (1)	MIRION-CANBERRA / Type-P: Coax, BEGe & XTRA & Transportable (20%-50% rel. eff.)	16
Automated Sample Exchanger (2)	MEDICAD / S.A.M.E.	1
Liquid Scintillation Counters (3)	PERKINELMER / 2910 & 3180 TR/SL HIDEX / 300 SL-SLL	2 1
Desorption (4)	E2S INNOVATION / BAN3	2
Alpha/Beta Counters (5)	Thermo Scientific / FHT770GR MIRION-CANBERRA / LB4200 BERTHOLD / LB770	2 1 1
Large Object/Waste Monitors (6)	MIRION-RADOS / RTM661/440Inc MIRION-RADOS / RTM644Inc	2 1



Radiation Protection Instrumentation – *Dosimetry*



1

Measurement System	Manufacturer	Number of devices
DIS-1 Dosimeters (1)	Mirion (formerly RADOS)	6000
DBR-1 readers (2)	Mirion (formerly RADOS)	65
DMC 2000 (3)	Mirion	750
DMC 3000 (4)	Mirion	1200
LDM 2000 readers (5)	Mirion	65
LDM 320 readers - USB (6)	Mirion	15



6



2



3



4

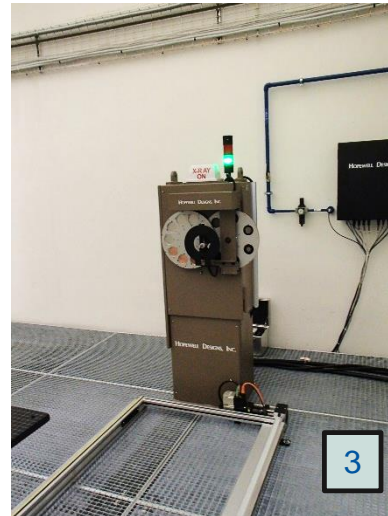
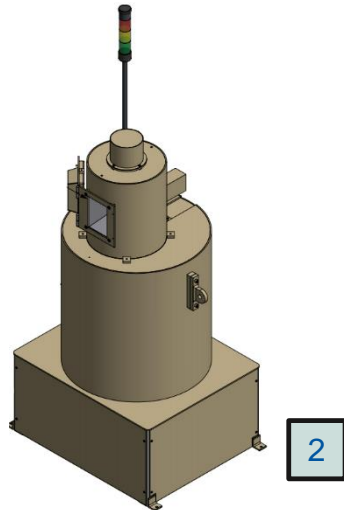


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Radiation Protection Instrumentation – *Calibration Facility*



Measurement System	Manufacturer	Number of devices
GC-60-100 Gamma Irradiator (1)	Hopewell Design	1
GC-60-1000 Gamma Irradiator (2)	Hopewell Design	1
X-80 X-ray Generator (3)	Hopewell Design	1
N-40 Neutron irradiator (4)	Hopewell Design	1
Beta-4 Beta irradiator (5)	Hopewell Design	1



Radioactive Waste Processing – *Industrial Equipment*



Cable shredder (Seltek)



600t Press-shear (Danieli-Henschel)



12t In-drum press (Blik)



Cutting cell (Füchtenkötter-Brandis)



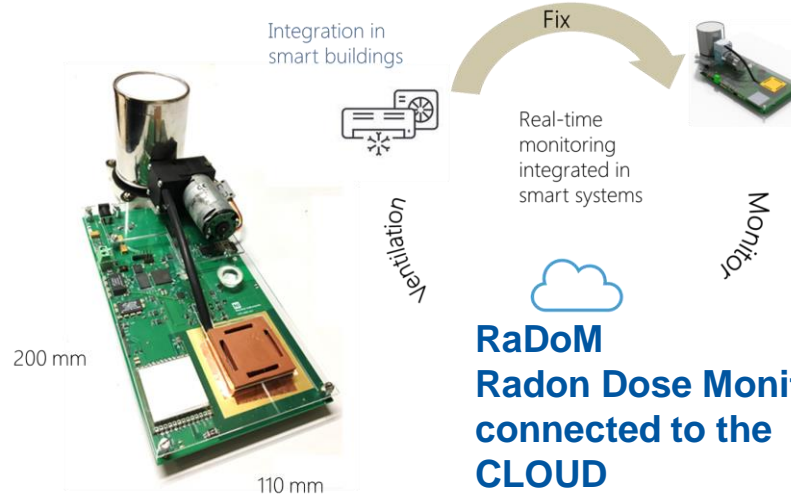
X-ray for tech. waste (Visiom)



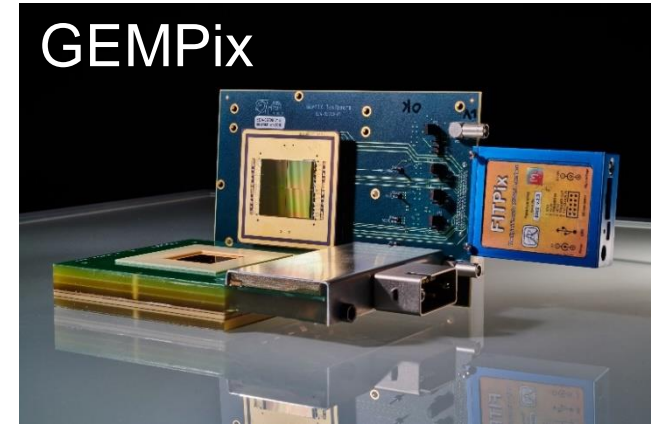
Technology Transfer



Software for fast assessments of material activation and residual dose rates



B-RAD survey meter for use in magnetic fields



Combination of Gas Electron Multiplier and four Timepix readout chips



Reference person: 1.76 cm

Eye lens - 170 cm

Chest - 135 cm

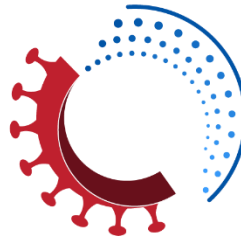
Belt - 96 cm

Knee - 53 cm

Timepix 3 photon fluence measurement in hospitals



Software for sizing pressure relief valves in cryostats



CARA
COVID Airborne
Risk Assessment

App to estimate the probability of infection, via airborne transmission, in enclosed spaces

Conclusion

The HSE Unit is in **close contact with companies in a wide range of fields** through purchase of instruments and equipment as well as service and consultancy contracts.

Such contacts are **beneficial for both sides**, due to the often unique nature of application at CERN as well as through technology transfer.

This presentation gave only a few examples, mainly for Radiation Protection, while there are many more needs, applications and contacts in the **other fields of HSE** and our colleagues would be happy to establish further contacts and are available for discussions.

