IRSN
INSTITUT
DE RADIOPROTECTION
ET DE SÛRETÉ NUCLÉAIRE

Enhancing nuclear safety

The eye lens dosimeter by IRSN

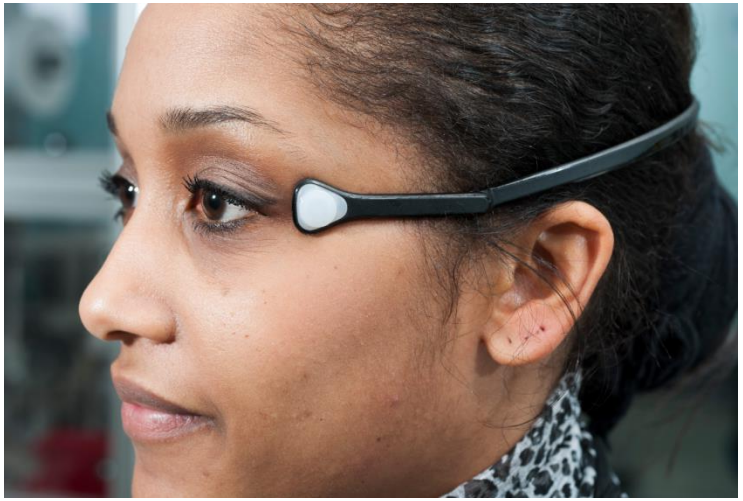
IRSN Dosimetry lab

DOSIRIS

MEMBER OF
ETSON
EUROPEAN
TECHNICAL SAFETY
ORGANISATIONS
NETWORK

Summary

- Generality
- Components and wearing of DOSIRIS
- Metrological aspects
- Intercomparison results
- Key figures



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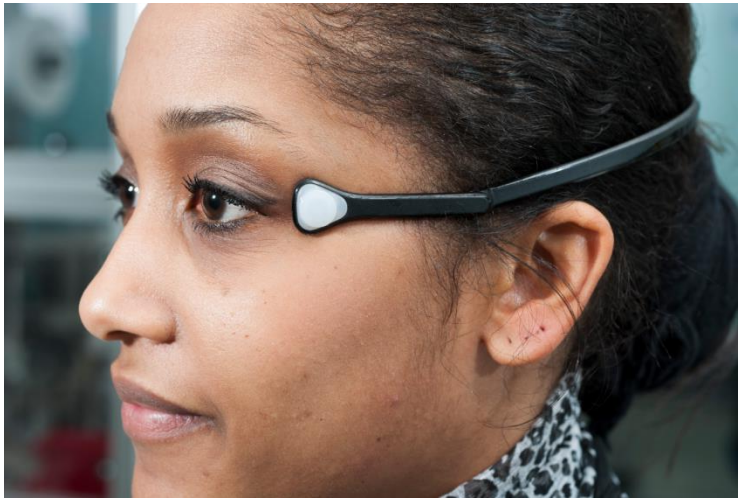


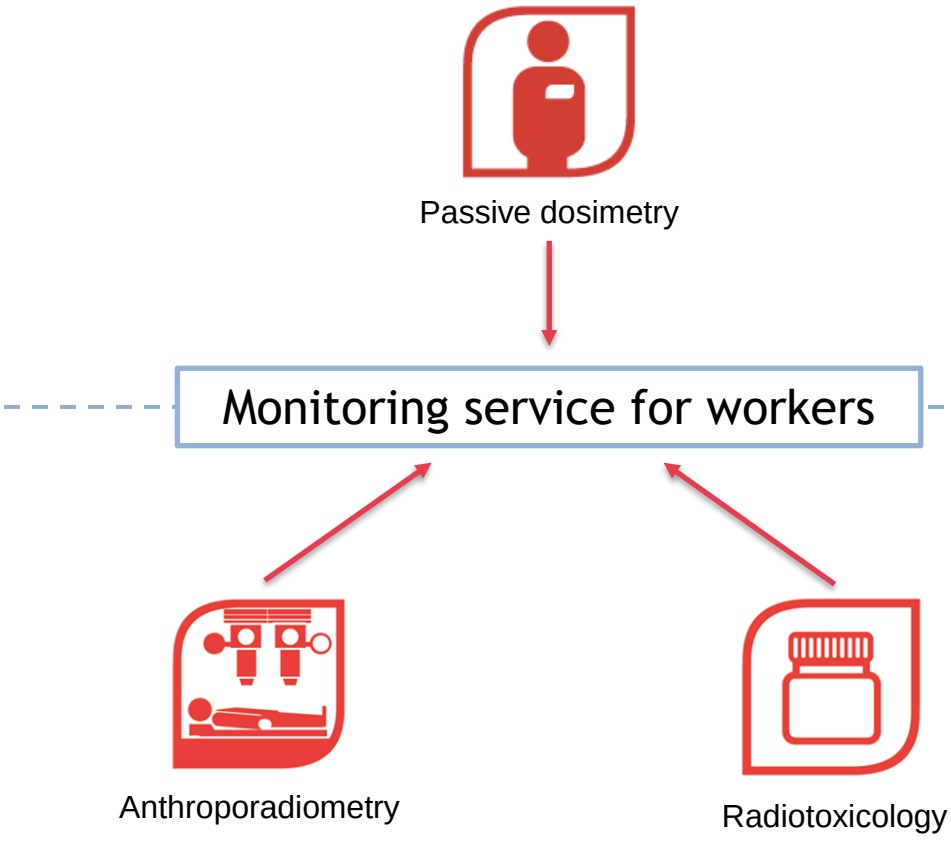
Identity of IRSN

- **A public body with industrial and commercial activities**, is placed under the joint authority of the Ministries of Defense, Environment, Energy, Research, and Health
- National public expert for research and technical support on radiation protection and nuclear safety risks
- 1800 employees, including more than 1000 specialists: researchers, Ph.D. students, post-docs and engineers
- A budget of €280 million, with 40% devoted to research
- 8 establishments in France, including 3 major sites: Fontenay-aux-Roses, Cadarache and Le Vésinet
- Our values : Knowledge, independence, proximity

Three main missions

- Research and services of public interest, including public transparency
- Support and technical assistance to the public authorities for civil or defense-related activities
- Contractual assessment, study and measurement services for public and private organizations, both French and foreign

Presentation of the Department : SMERI



External exposures

- 4 types of passive dosimetry (RPL, TLD, SSNTD and ESR)
- 1 250 000 dosimeters analyzed per year
- 168 000 workers monitored

Internal exposures

- 14 500 radiotoxicological exams per year
- 740 anthroporadiometric exams per year (500 on site with mobile means)

Development of DOSIRIS

- It was developed in 2013 with the main idea that it should be suitable for all wearing situation

- The specifications were :
  - Should be worn as close as possible to the eye
  - Should be confortable for the person wearing the dosimeter
  - Must be able to fit under individual protection devices (glasses or visor)
  - The result of the measure should be in $H_p(3)$

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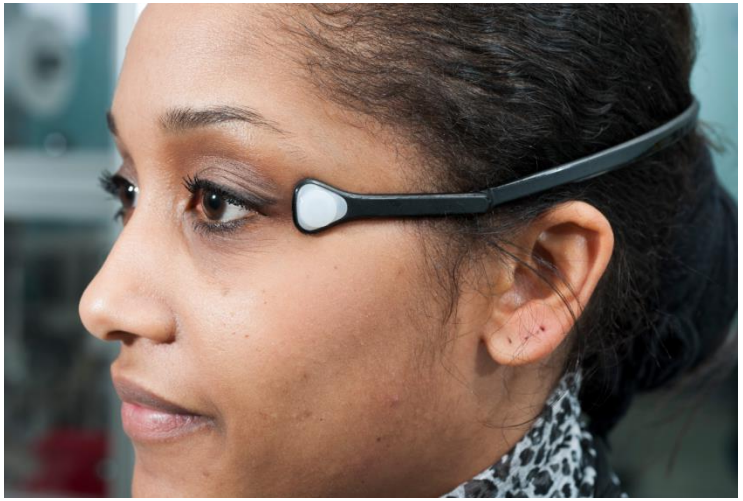

Composition of the DOSIRIS

TLD chip with single identification

Detector (FLi)

Support (POM)

How to wear DOSIRIS

- The headband and its articulated arm allow to **ideally place DOSIRIS** to obtain **the best possible dosimetry** with **an unrivaled wearing comfort.**
- **The optimum position** is obtained when **the detection part** (white cap) **is placed as close to the eye corner,** against the temple and under the glasses, visors or protective mask.
- **DOSIRIS** can be worn **either left or right.** You place it on the side of the most exposed eye to radiations.
- Possibility to use just the arm.

Identification

Different colors for each use period

- Detector number
- Wearing period and periodicity
- Identification of the customer
- Identification of the wearer

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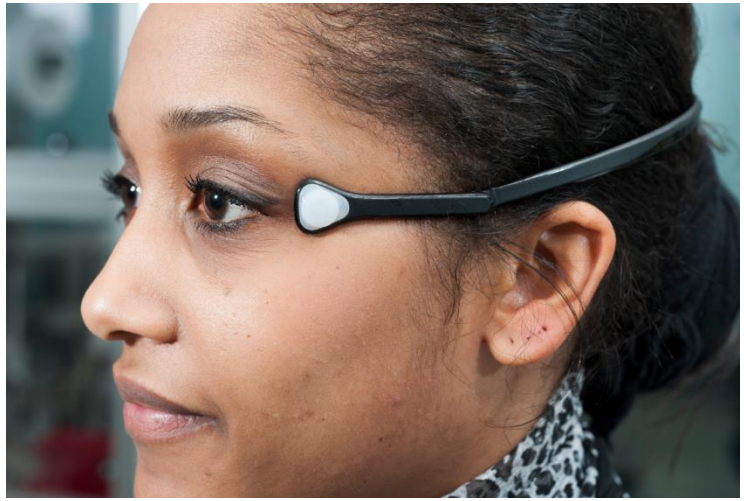
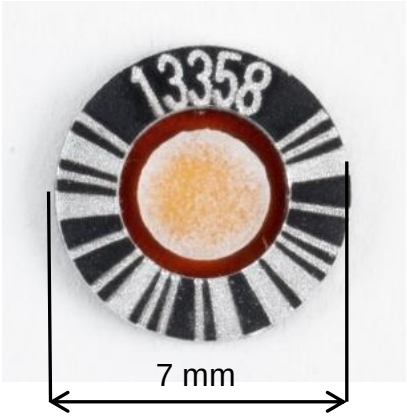
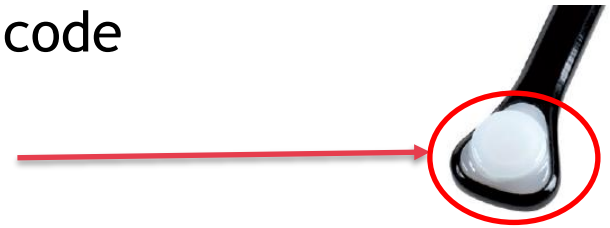


Detector description

- Material :
  - ^{7}FLi : Mg,Ti
  - Type TLD 700



- Geometry : chip less 1 mm thick
- Single identification with a bar code
- The chip is behind a 3 mm cap

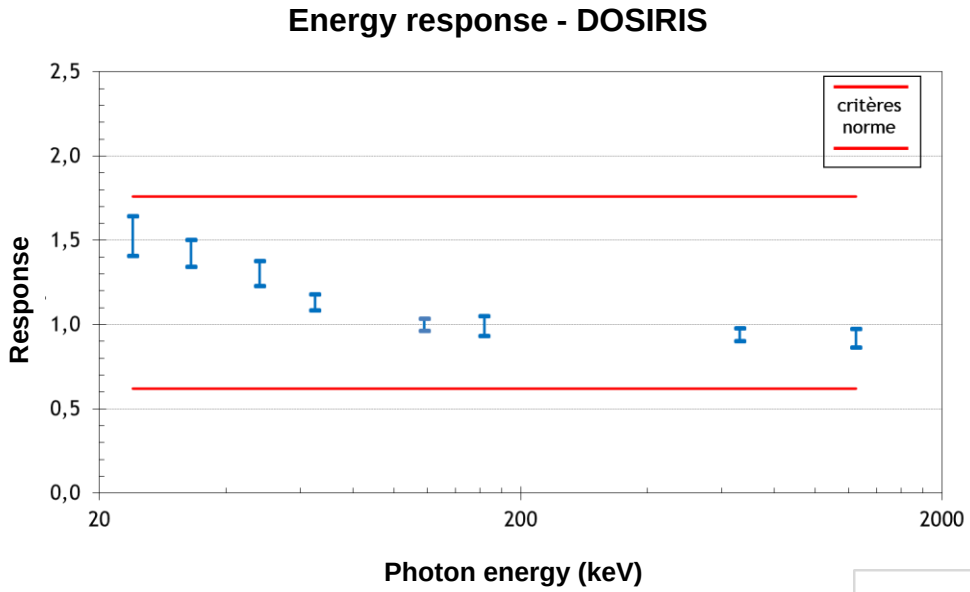


- Measure principle : TLD technology is based on the principle of reading a light emission caused by heating

Metrological informations

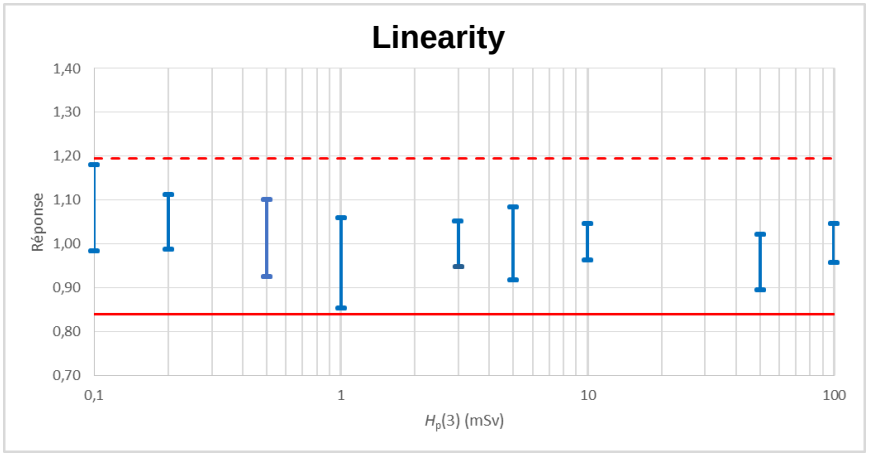
- Range of energy :
  - Photons : 24 keV to 1,3 MeV
  - Bêtas : > 800 keV (^{90}Sr-^{90}Y)
- Range of $H_p(3)$:
  - 100 µSv to 1 Sv

Energy and linearity response for photons



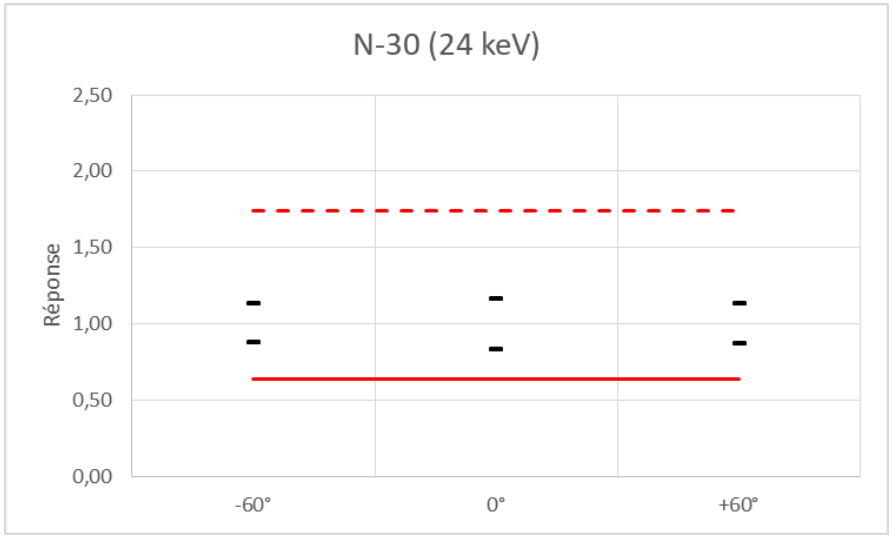
Response between 0,86 and 1,64

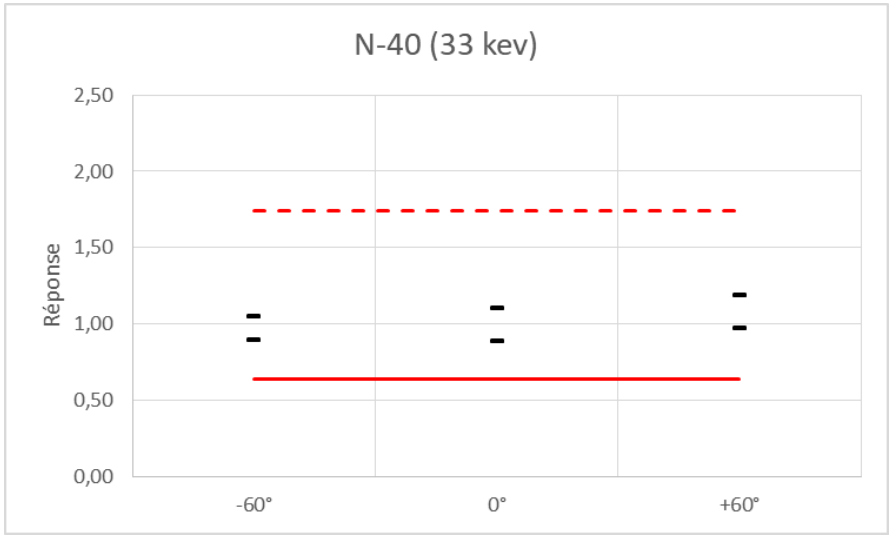
Linearity response between 0,85 and 1,18



Nota : the reference standard is the ISO 62387 : 2012

Angular response for photons



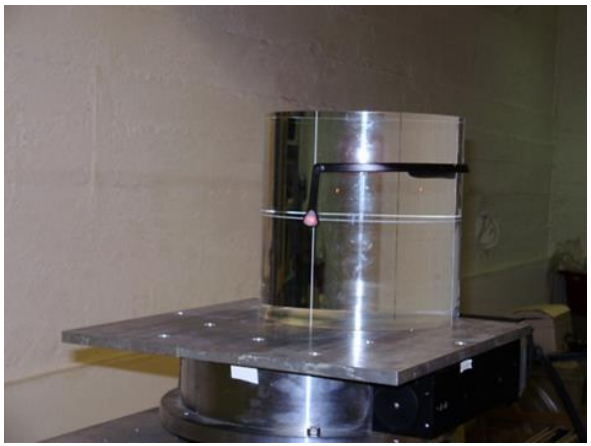


Between +/- 60°, the angular dependence is low

Calibration and quality assurance

- For calibration :
  - To perform a good metrological traceability, a cylindar phantom and the appropriate conversion coefficients $h_{pK}(3;R,a)_{cyl}$ are used
  - Some samples are irradiated in IRSN accreditated (COFRAC) facilities
  - The reference field for calibration is a radiation quality of the standard ISO 4037

- For QA (quality assurance) :
  - Daily quality control
  - Monthly calibration



DOSIRIS on a cylindar phantom

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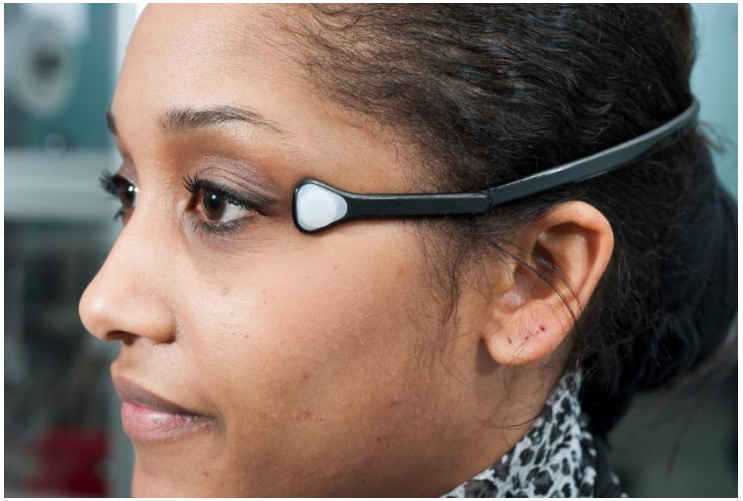
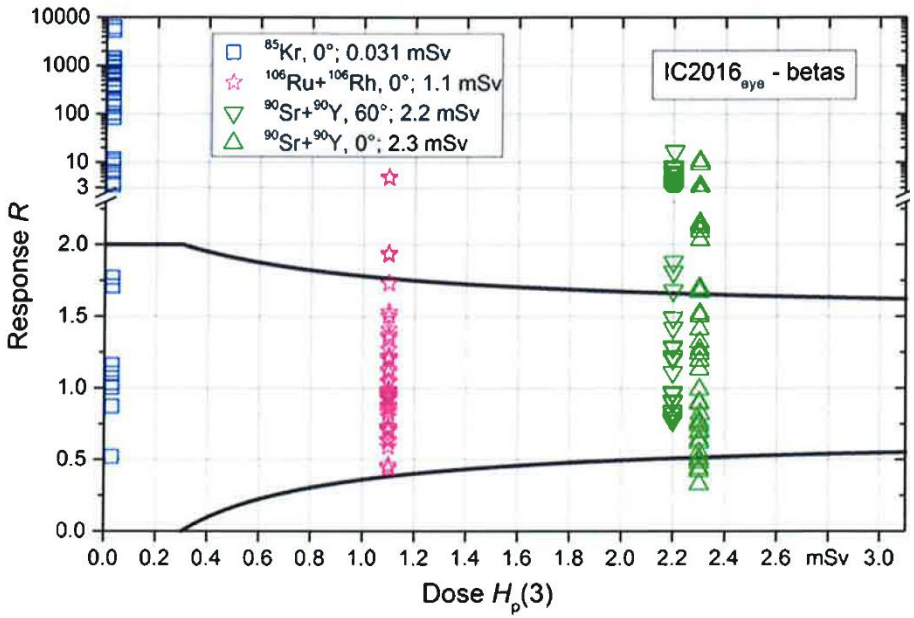


EURADOS 2016 : results for all the participants

22 participants

Summary of all reported response values as a function of reference dose for all the participants – beta qualities



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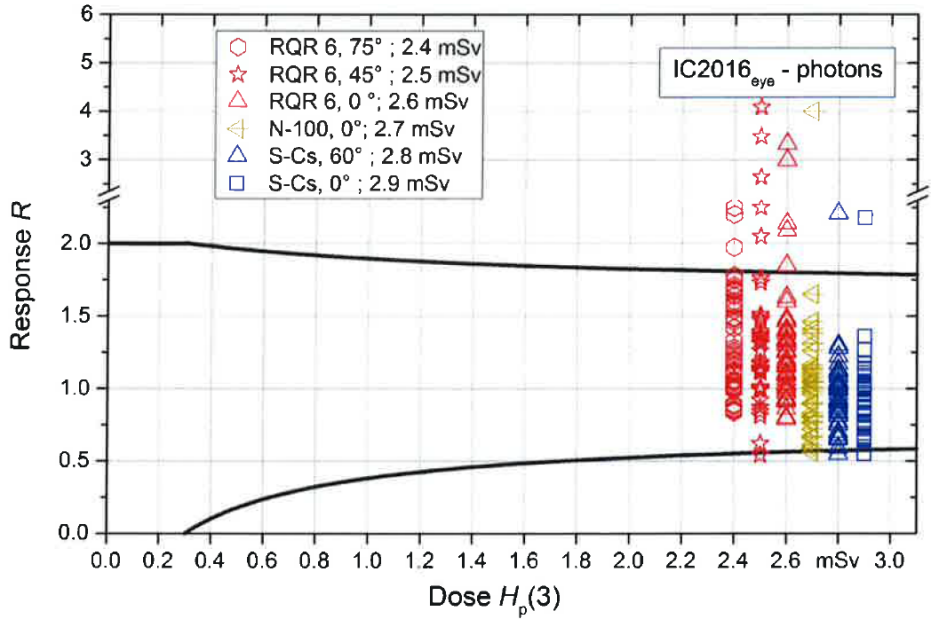
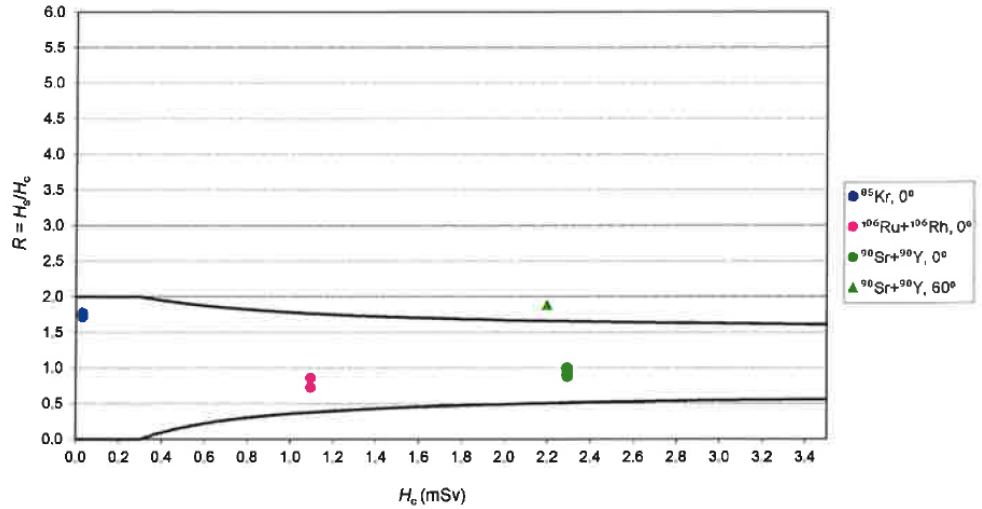
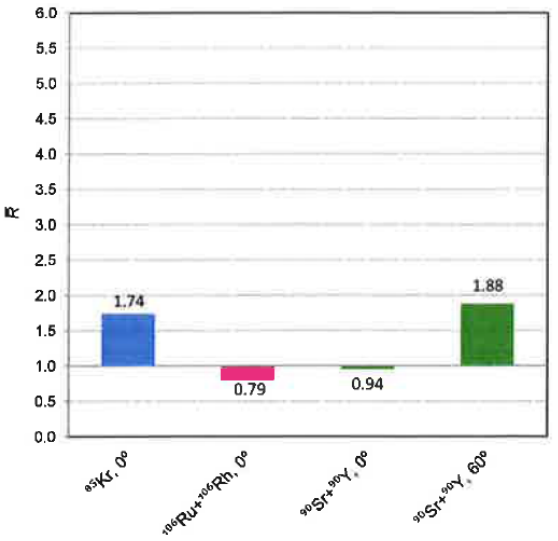
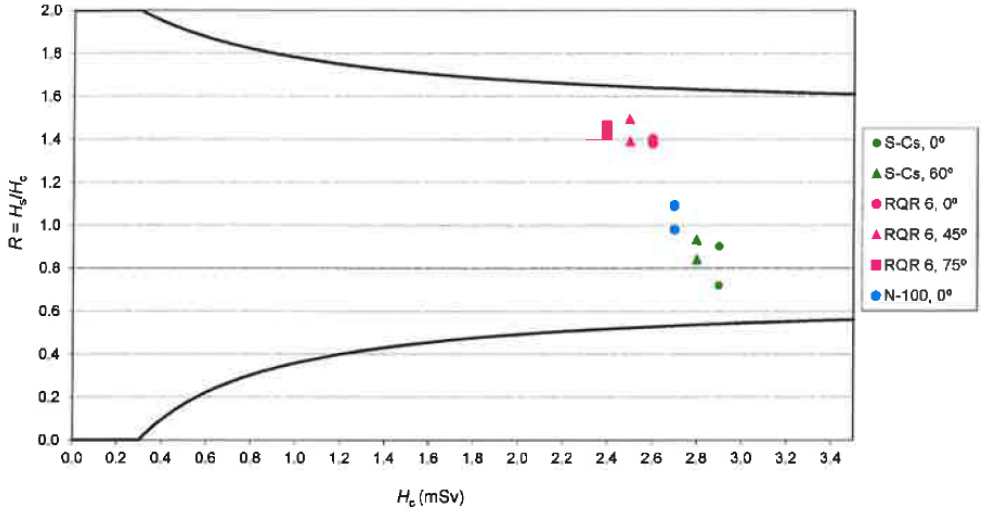
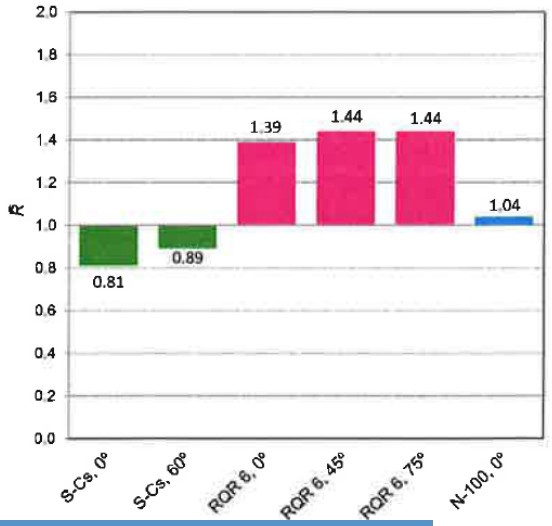


EURADOS 2016 – IRSN Results – $H_p(3)$









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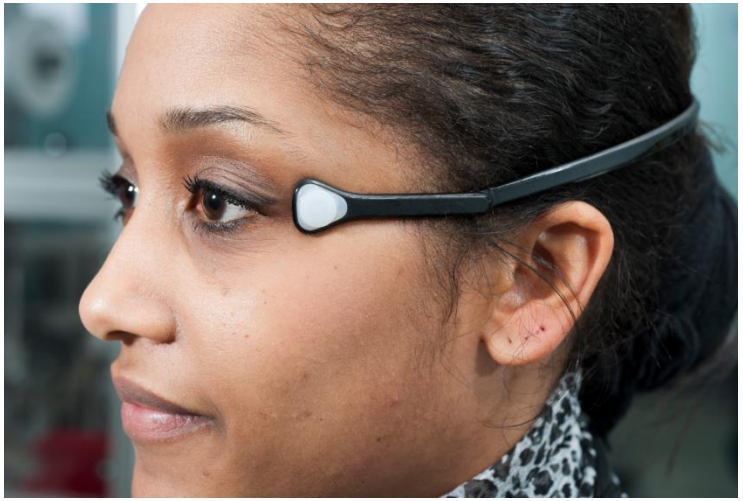
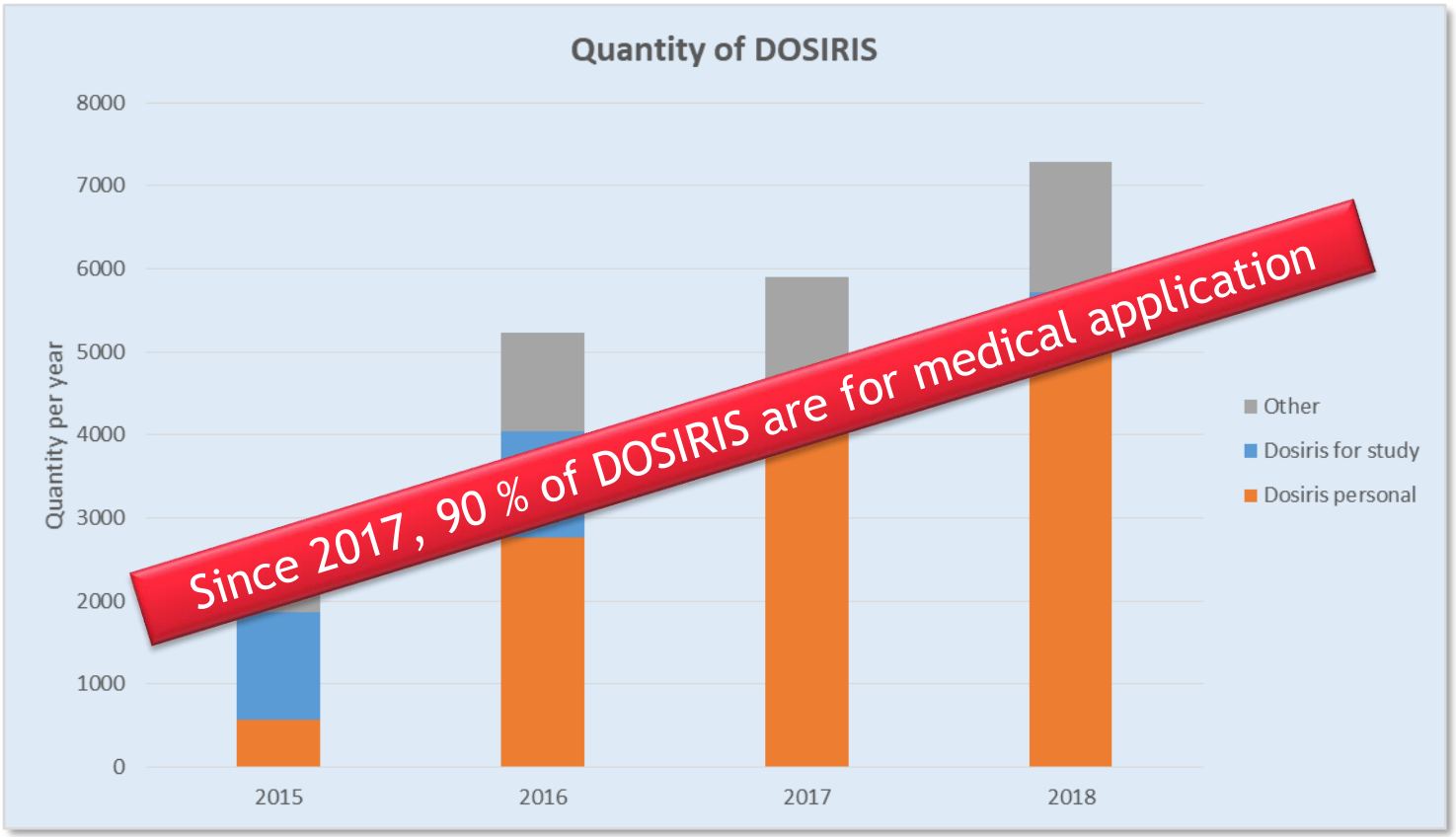


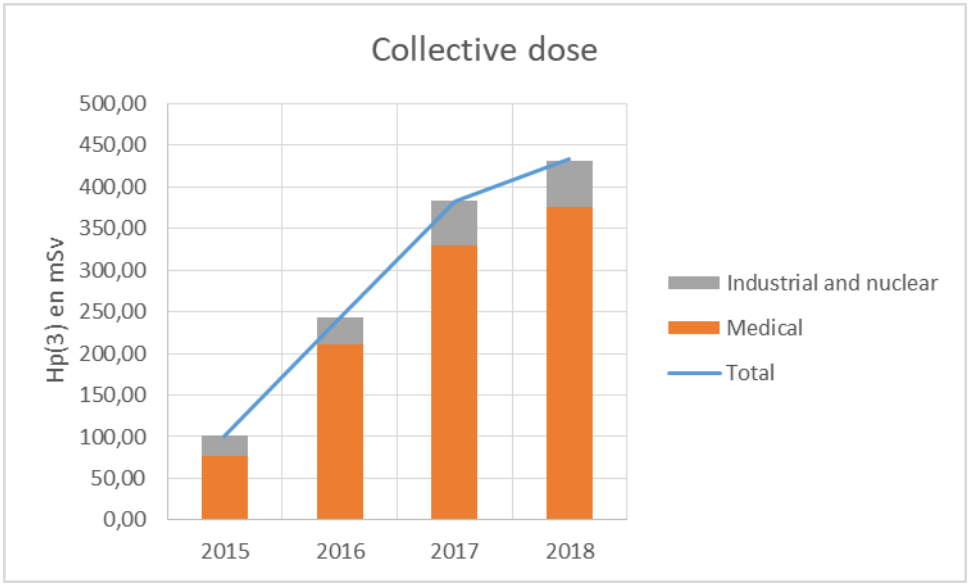
Quantity of production



DOSIRIS personal → + 400 % → + 50 % → + 23 %

Key figures about dose

Year	Dosimeter > SE	Dosemeter rate > SE	Monthly dosimeter rate	$H_p(3)$ max for 1 dosimeter	Total $H_p(3)$ max for a worker	Total $H_p(3)$ > 15 mSv for a worker
2015	246	46%	62%	4,1	7	0
2016	455	17%	64%	6,8	21,8	1
2017	615	16%	59%	11,45	26,1	2
2018	685	14%	47%	8,25	18,4	2



SE = Threshold registration

Thank you for your attention

DOSIRIS

http://dosimetrie.irsn.fr