EEAE ΕΛΛΗΝΙΚΗ ΕΠΙΤΡΟΠΗ ΑΤΟΜΙΚΗΣ ΕΝΕΡΓΕΙΑΣ
GREEK ATOMIC ENERGY COMMISSION

EEAE IRRADIATIONS

EURADOS IC 2018

Boziari A., Askounis P., Konstantinou P., Carinou E.

Lodz, February 2019

EEAE Regulatory authority

- competent authority for the control, regulation and supervision in the fields of nuclear energy, nuclear technology, radiological, nuclear safety and radiation protection.
- public entity (Legal person of public law)
- supervised by the Ministry of Education, Research and Religious Affairs

Our laboratories

Occupationally exposed workers

- individual monitoring of 12 000 occupationally exposed workers
- distribution and measurements of 150 000 dosemeters/year
- aircrew personnel doses records

Calibrations

- national laboratory of ionizing radiation metrology

Environment

- α- & γ-spectroscopic analysis of various types of samples /// total α and β measurements in water and food samples
- radon measurements

www.eeae.gr

Activities IRCL

- Covers the needs for the calibration of ionizing radiation equipment in the fields of radiotherapy, diagnostic radiology and radiation protection in Greece.
- Secondary standard calibration laboratory which has developed and maintains the national standards of Gy, Sv, for gamma and X radiation in Greece.
- Since 2000 represents Greece in the European Association of National Metrology Institute (EURAMET) in the field of ionizing radiation.
- In 2002 the Calibration and Measurement Capabilities (CMCs) were published in the european database for measurement capabilities and qualifications of the European metrology laboratories.

EEAE-IRCL -EIM

In 2003, the Hellenic Institute of Metrology (EIM) assigned EEAE's laboratory to be the "designated laboratory" for gamma, X and beta ionizing radiation metrology applications.

The Hellenic Institute of Metrology (EIM) is the National Metrology Organization of Greece and the official metrology and measurements advisor of the Greek State.

Integrated Management System

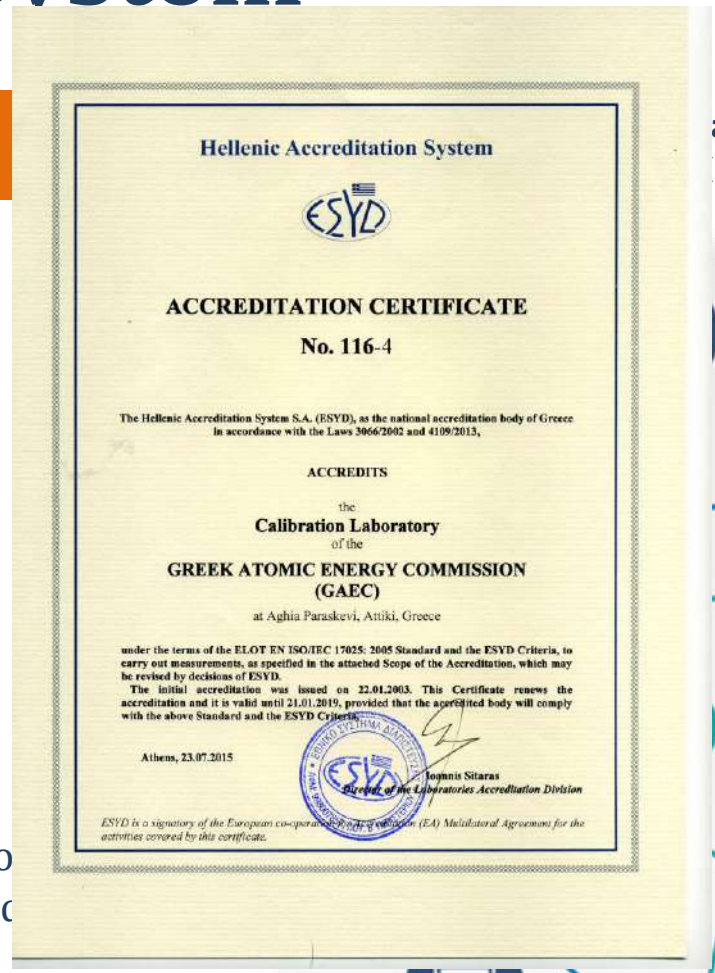
ISO 9001

ISO 17025

- individual monitoring of occupationally exposed workers
- gamma spectrometry measurements
- radon measurements
- calibration of ionizing radiation instruments
- non-ionizing radiation measurements

ISO 17020 // inspections body of type A

ISO 29990 // design, development and provision o
formal education and training in rac
protection and nuclear safety


Hellenic Accreditation System

ESYD

ACCREDITATION CERTIFICATE

No. 116-4

The Hellenic Accreditation System S.A. (ESYD), as the national accreditation body of Greece in accordance with the Laws 3066/2002 and 4109/2013,

ACCREDITS

the

Calibration Laboratory

of the

GREEK ATOMIC ENERGY COMMISSION (GAEC)

at Aghia Paraskevi, Attiki, Greece

under the terms of the ELOT EN ISO/IEC 17025: 2005 Standard and the ESYD Criteria, to carry out measurements, as specified in the attached Scope of the Accreditation, which may be revised by decisions of ESYD.

The initial accreditation was issued on 22.01.2003. This Certificate renews the accreditation and it is valid until 21.01.2019, provided that the accredited body will comply with the above Standard and the ESYD Criteria.

Athens, 23.07.2015

Ioannis Sitaras

Director of the Laboratories Accreditation Division

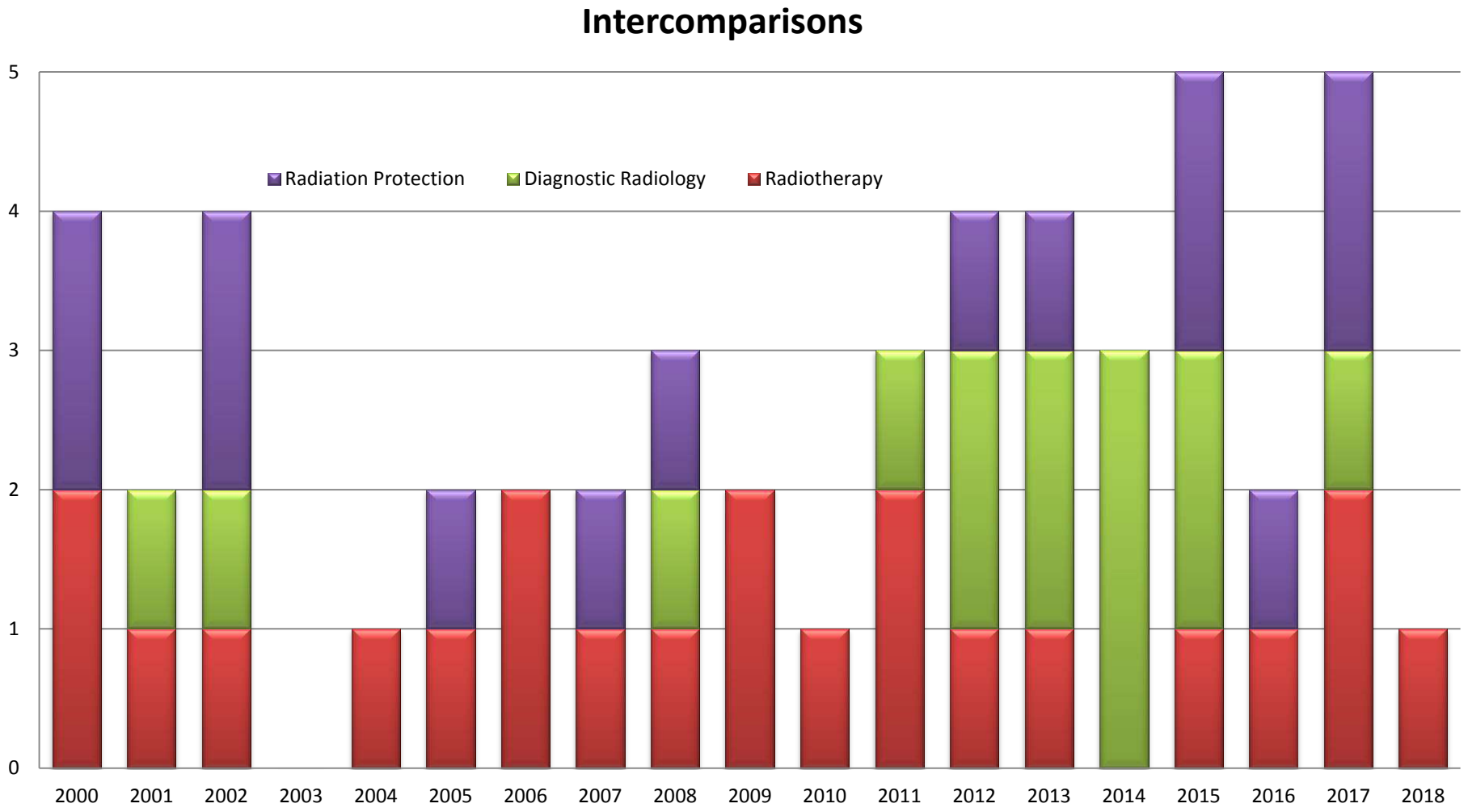
ESYD is a signatory of the European co-operation for Accreditation (EA) Multilateral Agreement for the activities covered by this certificate.

ards

anagement for Safety, GSR Part 2

www.eeae.gr

Intercomparisons



Intercomparisons 2018

IAEA
International Atomic Energy Agency
Atoms for Peace

RESTRICTED

INTERNATIONAL ATOMIC ENERGY AGENCY
Dosimetry and Medical Radiation Physics Section - Division of Human Health
Vienna International Centre, P.O. Box 100, A-1400 VIENNA, AUSTRIA
Fax: +43 1 2600781662, Telephone: +43 1 2600-28207 or 28331, e-mail: DOSIMETRY@IAEA.ORG

IAEA/WHO POSTAL DOSE QUALITY AUDIT

Institution: *Greek Atomic Energy Commission, Ionizing Radiation Calibration Laboratory*
Address: *Patriarhou Grigoriou & Neapoleos St. Agia Paraskevi, Athens, Attiki*
Country: *Greece*

RPLD batch No: *DL18*
RPLDs irradiated by: *Boziari*
Date of irradiation: *2018-05-25*
Evaluation: *2018-07-25*

RESULTS OF RPLD MEASUREMENTS FOR Co-60 AND HIGH-ENERGY PHOTONS

Beam	Radiation unit	Set #	User stated dose [Gy]	IAEA (measured) dose [Gy]*	IAEA mean dose [Gy]	% deviation relative to IAEA mean dose**	IAEA mean dose / User stated dose
Co-60	*Picker C-9 ATC*	*DL1817*	*2.01* *2.01* *2.01*	*2.01* *2.00* *2.01*	*2.00*	*0.3*	*1.00*

Agreement within +/-3.5% between the user stated dose and the IAEA measured dose is considered satisfactory.
** % deviation relative to IAEA measured dose = 100 x (User stated dose - IAEA mean measured dose)/ IAEA mean measured dose. A relative deviation with negative (positive) sign indicates that the user estimates lower (higher) dose than what is measured.
* The uncertainty in the RPLD measurement of the dose is 1.5% (1 standard deviation); this does not include the uncertainty intrinsic to the dosimetry protocol (see IAEA TRS-398).

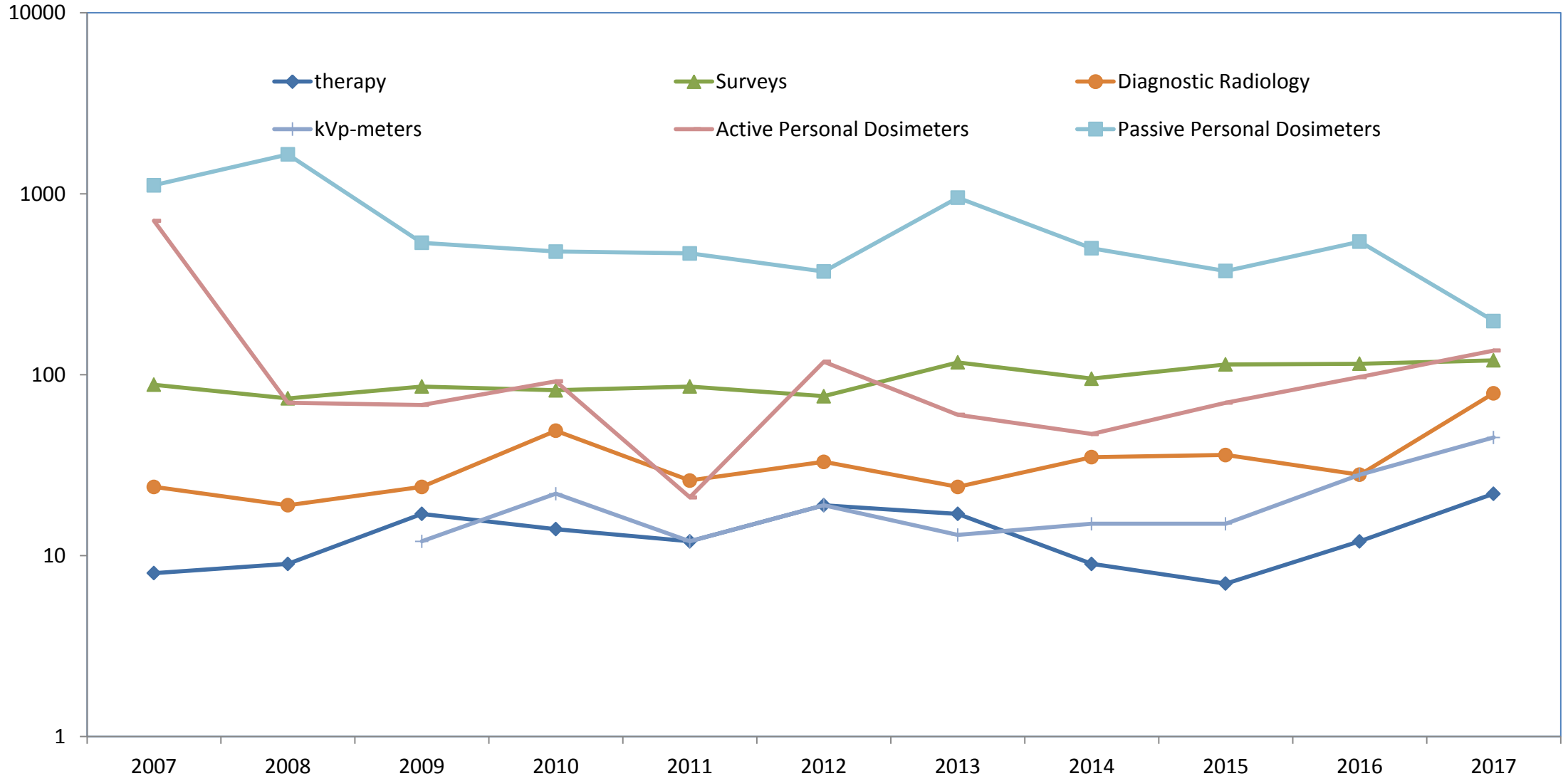
J. Izewska, Ph.D.
Head - Dosimetry Laboratory

Date: 2018-07-26

D. van der Merwe, Ph.D.
Head - DMRP Section

IMPORTANT NOTICE: This information is provided only as an independent verification of beam output and not as a machine calibration, nor as an alternative to frequent calibrations by a qualified physicist.

Calibrations Workload



IRRADIATION ROOMS

1st IRRADIATION ROOM

2nd IRRADIATION ROOM

CONFIDENTIAL

Distribution only to:

- Members of the Organization Group
- selected candidate-irradiation laboratories

Eurados IC2018 – Proposed irradiation plan
Version 18 January 2018

Sample irradiation plan for 1 participant/system (80 - 100 participants/systems expected)				
Quality	$H_p(10)$ Low dose (1 mSv - 10 mSv)	$H_p(10)$ Medium dose (max: 100 mSv)	$H_p(10)$ High dose (max: 500 mSv)	number of irradiations points
S-Cs 0°	2 x 0.5 mSv 4 x 5 mSv 2 x 3 mSv			2 + 4 +2
S-Co 0º	2 x 5 mSv	2 x 50 mSv	2 x 500 mSv	2+ 2 + 2
N-60 0°	2 x 5 mSv			2
N-60 60°	2 x 5 mSv			2
N-150 0°	2 x 3 mSv			2
N-150 60°	2 x 5 mSv			2
W-110 0°	2 x 5 mSv			2
			Total:	24 irradiations (22 dosemeters)

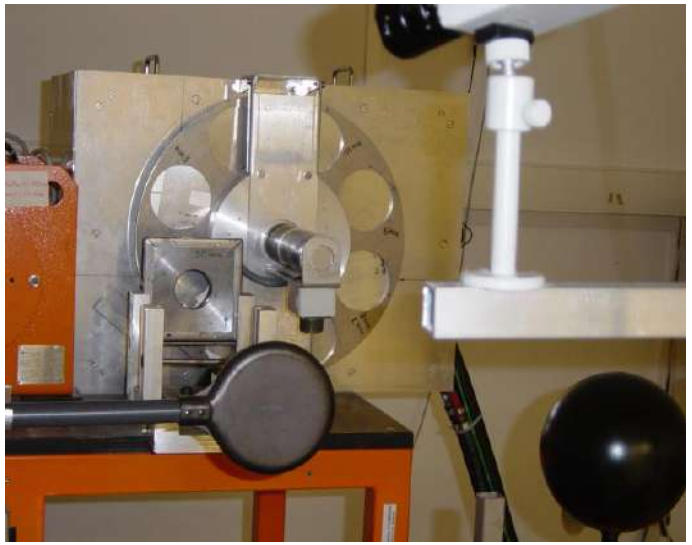
S-Cs 0° (3 mSv) + N-150 0° (3 mSv) will be combined for one dosemeter pair to obtain a mixed field irradiation

14 dosimeters/system
16 irradiations/system

Irradiation Equipment

Beam Qualities

• S-Cs	125.6 μGy/min (200 cm)
• S-Co	26.42mGy/min (300 cm)
• S-Co	26.42mGy/min (300 cm Lead Blocks)
• Narrow Beam Series PANTAK X-ray 225 kVp, W anode, High Frequency	543.1 μGy/min (200 cm)



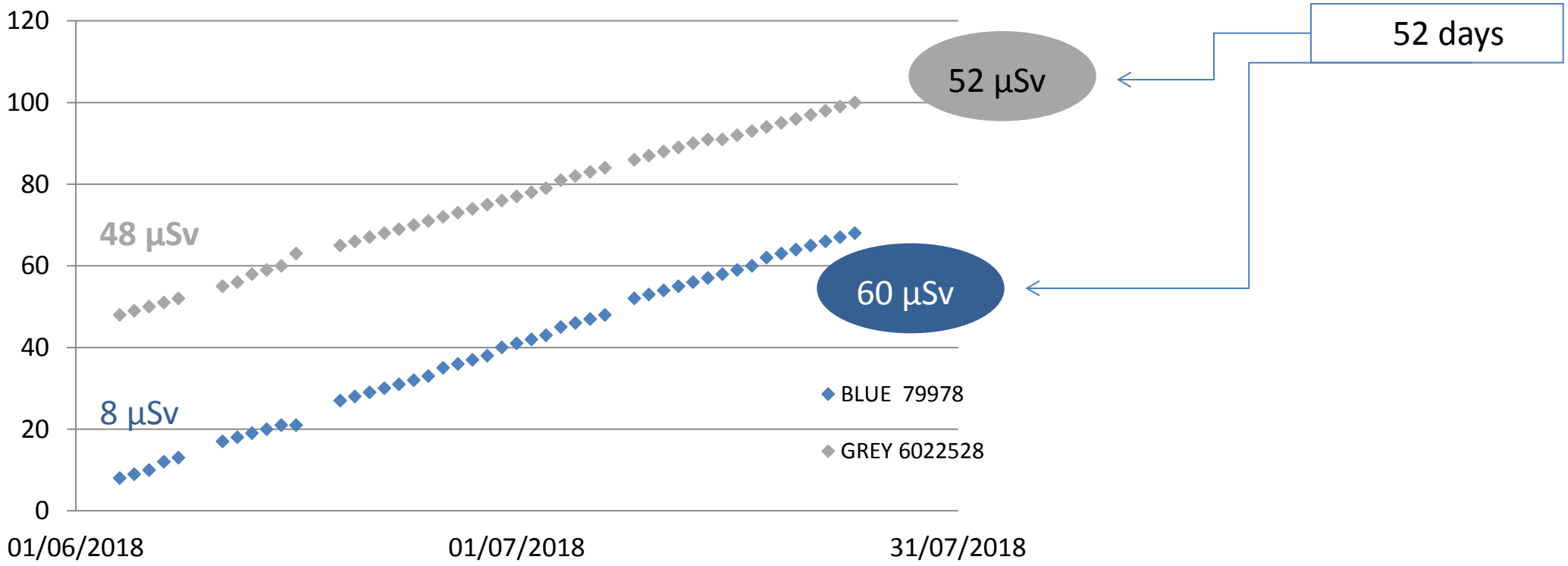
Phantom:	ISO water phantom, (30x30x15) cm^3
Source to PD Distance:	200-300 cm, depending on required Kair rate
Field Size:	S-Cs: Circular, with diameter of 55.6 cm (at 200 cm) S-Co-60: Rectangular (30x30) cm^2 (at 300 cm) x-rays: Circular with diameter 26.8 cm
Build up PMMA:	S-Cs: (0.2 x 30x30) cm^3 S-Co-60: (0.4 x 30x30) cm^3
Reference point of PD:	Frontal surface of phantom.
Rotation axis:	Around the vertical axis of the PD which is parallel to the coronal axis of the person who wears it.

DAY 1


S-41


S106
S104
S105

APDs Indications



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ΕΕΑΕ ΕΛΛΗΝΙΚΗ ΕΠΙΤΡΟΠΗ ΑΤΟΜΙΚΗΣ ΕΝΕΡΓΕΙΑΣ GREEK ATOMIC ENERGY COMMISSION

ESYD Διακριβώσεις Αρ. Πιστ.116(4)

ΕΡΓΑΣΤΗΡΙΟ ΒΑΘΜΟΝΟΜΗΣΗΣ ΟΡΓΑΝΩΝ ΙΟΝΤΙΖΟΥΣΩΝ ΑΚΤΙΝΟΒΟΛΙΩΝ (Ε.Β.Ο.Ι.Α.)
Συνεργαζόμενο Περιφερειακό Εργαστήριο Ελληνικού Ινστιτούτου Μετρολογίας (ΕΙΜ)

ΚΩΔΙΚΟΣ ΕΡΓΑΣΤΗΡΙΟΥ:	S115 ... + Bgr
ΗΜΕΡΟΜΗΝΙΑ ΠΑΡΑΛΑΒΗΣ:	5.6.2018
ΤΥΠΟΣ ΔΟΣΙΜΕΤΡΩΝ:	HARSH Am.
ΑΡΙΘΜΟΣ ΔΟΣΙΜΕΤΡΩΝ ΠΟΥ ΠΑΡΑΛΗΦΘΗΚΑΝ:	21

ΚΩΔΙΚΟΙ ΔΟΣΙΜΕΤΡΩΝ:

S115 - 02 ✓	-11 ✓	-24 ✓	-32 ✓
-03 ✓	-13 ✓	-25 ✓	-33 ✓
-06 ✓	-16 ✓	-26 ✓	-34 ✓
-08 ✓	-17 ✓	-27 ✓	
-09 ✓	-19 ✓	-30 ✓	
-10 ✓	-20 ✓	-31 ✓	

ΑΝΑΦΕΡΕΤΑΙ REFERENCE POINT ΔΟΣΙΜΕΤΡΟΥ: ....ΝΑΙ....... ΟΧΙ

ΣΥΝΟΔΕΥΟΝΤΑΙ ΑΠΟ ΕΙΔΙΚΕΣ ΟΔΗΓΙΕΣ ΑΚΤΙΝΟΒΟΛΗΣΗΣ: ☒ΝΑΙ.... ΟΧΙ

(αν ναι επισυνάπτονται)

ΣΧΟΛΙΑ:

Το μπαλαμι μπροστά!

BGD: S115/2016-33 ✓ -26 ✓ S115/2018-20 ✓ -25 ✓ S115/2018 -06 ✓ -32 ✓ -34 ✓

ΦΩΤΟΓΡΑΦΙΑ ΔΟΣΙΜΕΤΡΟΥ ΚΑΙ ΣΗΜΕΙΩΣΗ ΤΟΥ REFERENCE POINT:

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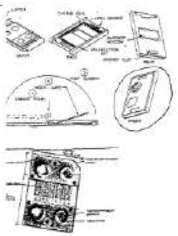
	# Dosimeter	Quality	Angle	SDD	Kair mGy/min	Time / sec	Hp(10)	Hp(0.07)	Date	APD (mSv)
1	S115-13	Cs-137	0°	200	0.12582	1100	5.7		5.6.2018	1225
2	S115-16	Cs-137	0°	200	0.12582	1192	5.7		5.6.2018	1318
3	S115-30	Cs-137	0°	200	0.12582	1100	5.7		5.6.2018	1224
4	S115-31	Cs-137	0°	200	0.12582	1192	5.7		5.6.2018	1354
5	S115-02	Co-60	0°	300	26.560	11.31	340		16.6.2018	82.24
6	S115-03	Co-60	0°	300	26.560	11.31	340		16.6.2018	
7	S115-08	Co-60	0°	300	26.560	1.54	46		16.6.2018	10.18
8	S115-09	Co-60	0°	300	26.560	1.54	46		16.6.2018	
9	S115-11	Cs-137	0°	200	0.12573	342.1	0.85		18.06.2018	342 μSv
10	S115-27	Cs-137	0°	200	0.12573	342.1	0.85		18.06.2018	
11	S115-20	Co-60B	0°	300	1.2347	3.87	5.4		18.07.2018	949 μSv
12	S115-24	Co-60B	0°	300	1.2347	3.87	5.4		18.07.2018	
13										
14										
15										
16										
17										
18										

	# Dosimeter	Q-1	...ate	Q-2	SDD	Kair μGy/min	Time / sec	Hp(10)\ Q2	Date	Hp(10)	Hp(0.07)	APD
19	S115-17	Cs.137	...17	N-150	200	543.16	191.6	3.0	17.07.18	6.3		60
20	S115-19	Cs-137	...17	N-150	200	543.16	191.6	3.0	17.07.18	6.3		56

844
1581

INFOCITEC · DIAGRAM

S115



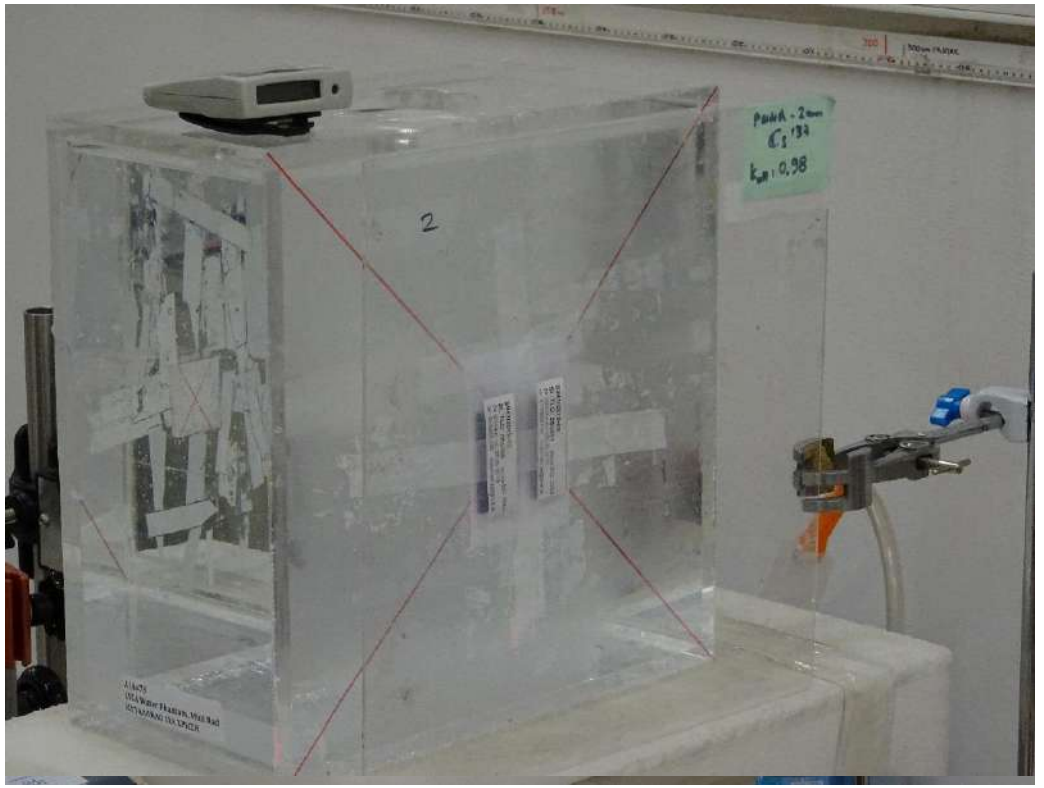
Calculations

	SSD	Rate			Hp-(10)			ΧΡΟΝΟΣ ΠΟΥ
	cm	mGy/min	h	katt	mSv/min	mSv	min	ΒΑΖΩ
BLOCKED								
S-Co60 : 5 mSv	300	1.2329	1.15	0.985	1.40	5.5	3.94	3.95

N-150	145 kV	15 mA	Angle = 0°			
SSD	Rate		Hp-(10)			
cm	μGy/min	h	μSv/min	μSv	min	sec
N-150 : 3 mSv 0 o	200	543.16	1.73	939.67204	3200	3.41	204.3
15mA							102.2

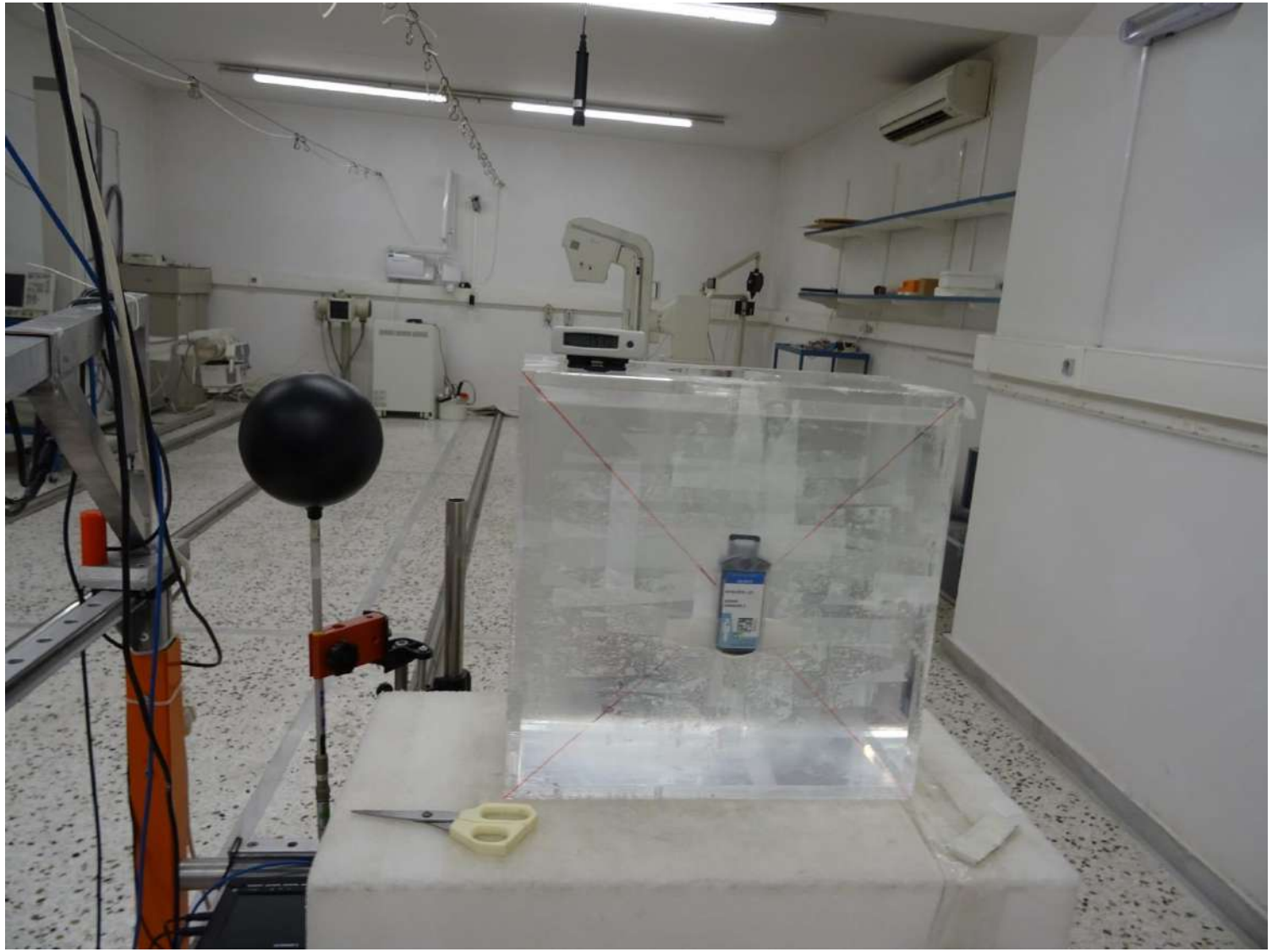
ISO 4037/1-2-3, IEC-62387

Irradiations set-up S-Cs

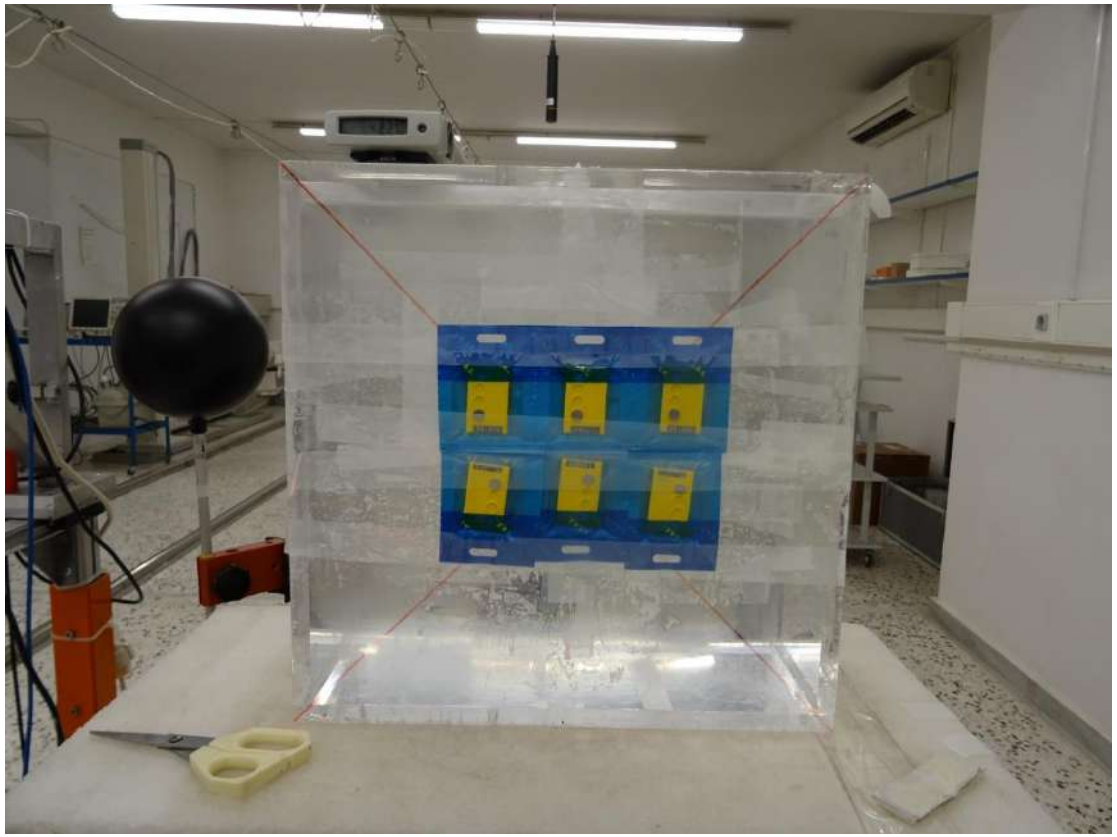


Irradiations set up S-Co

Irradiations set-up: Narrow beams qualities

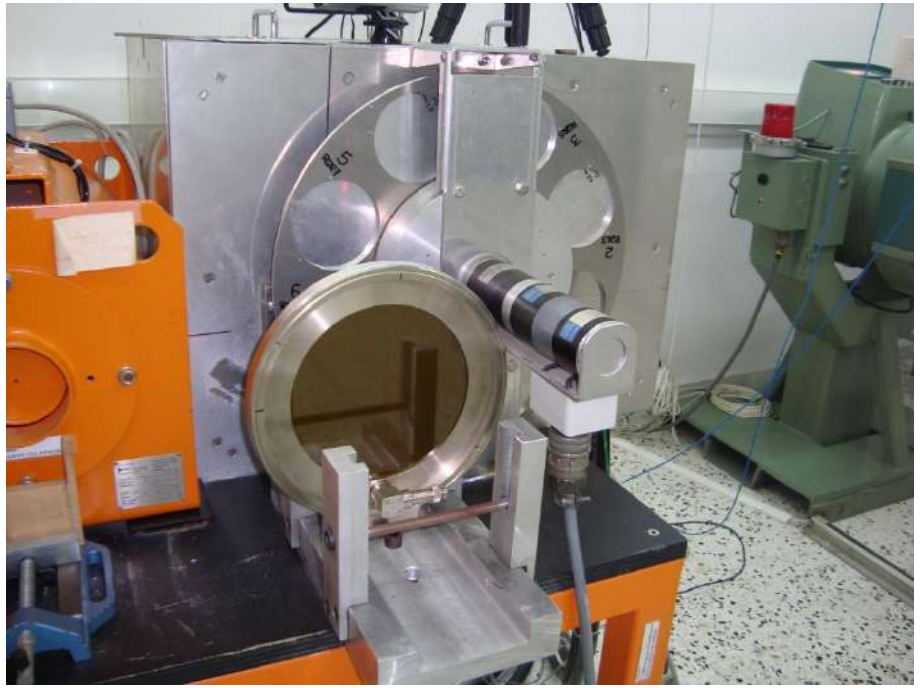


CONTROL CHECKS DURING IRRADIATIONS



- Dose checks with APDs and TLDs

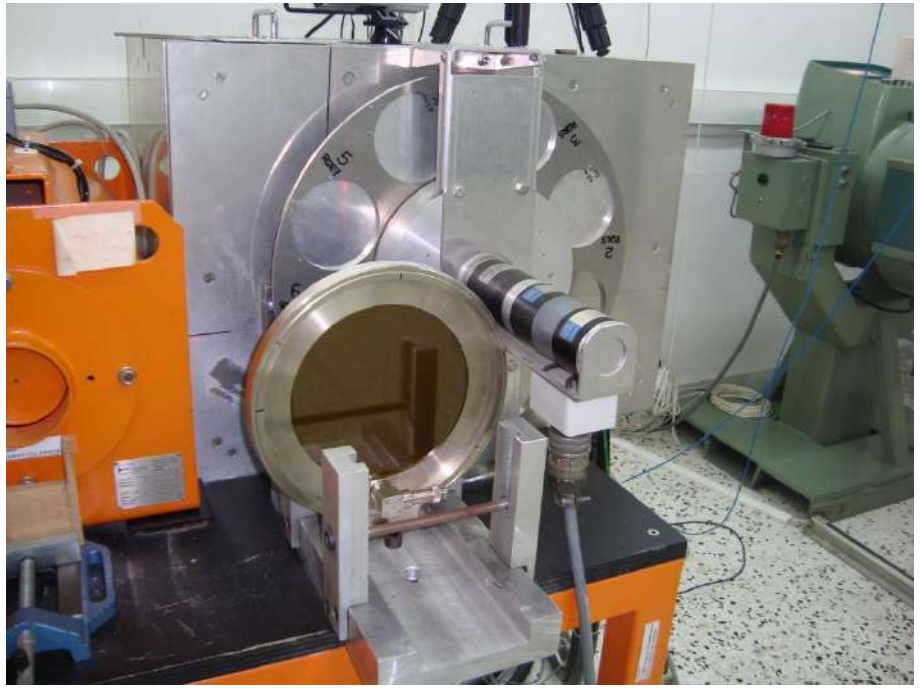
CONTROL CHECKS DURING IRRADIATIONS



Monitor Chamber

Detector on primary beam behind phantom

CONTROL CHECKS DURING IRRADIATIONS



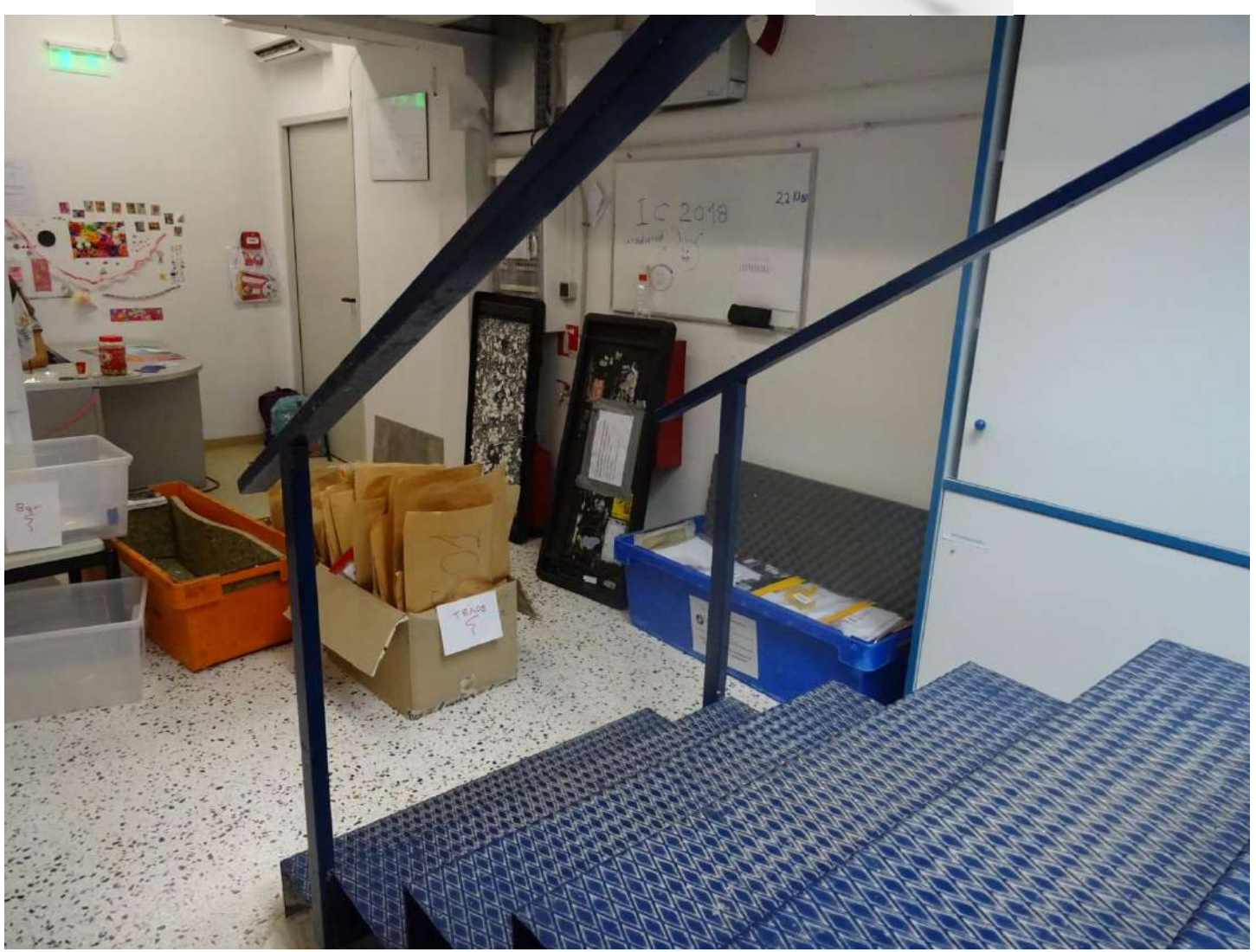
Monitor Chamber

Detector on primary beam behind phantom

Flashing lamps and alarm monitor

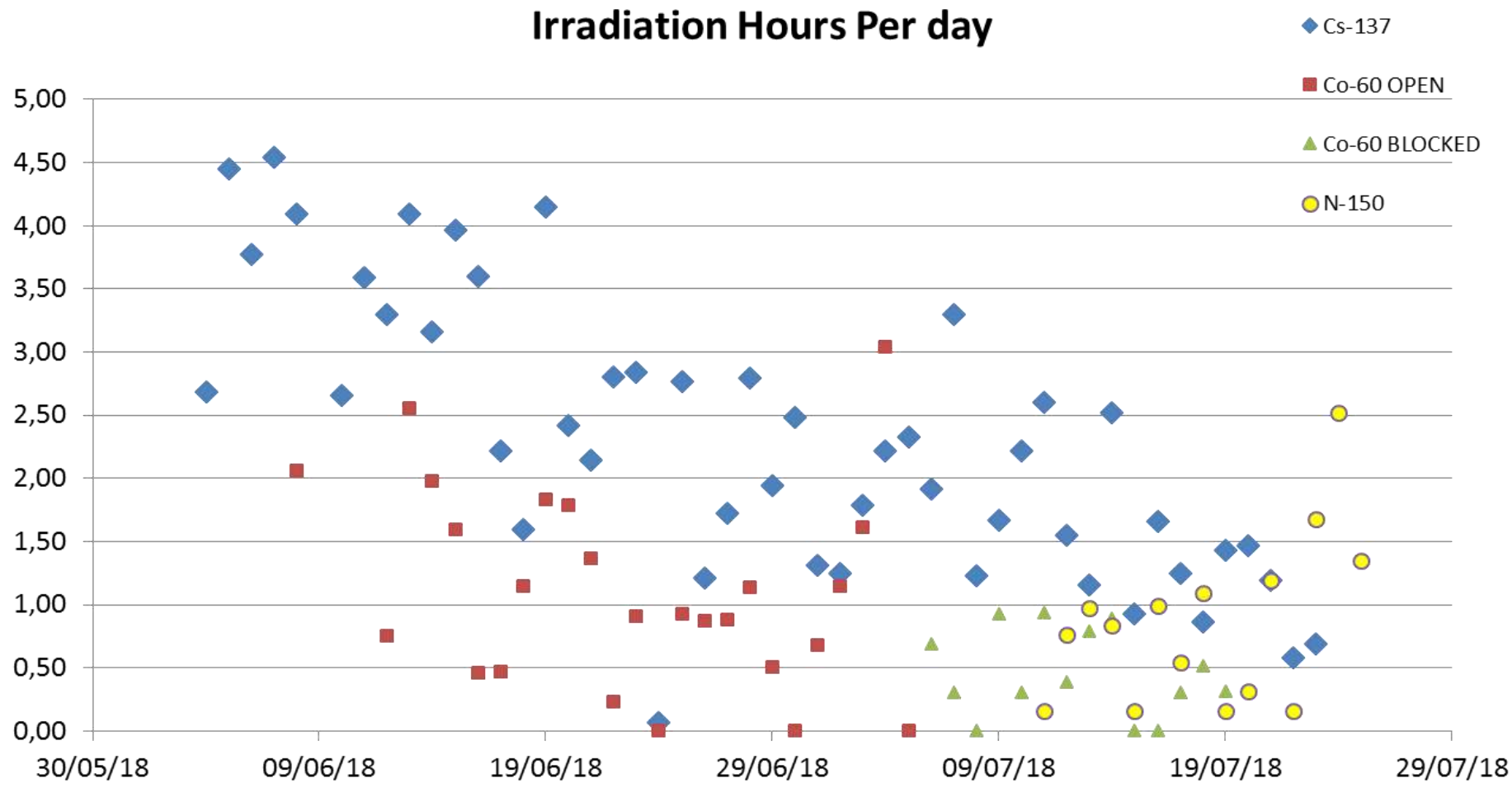
Electrical signals and indications for shutter and x-ray system operation

25/7: DAY 52




EMERGENCY
STOP
EMERGENCY
STOP

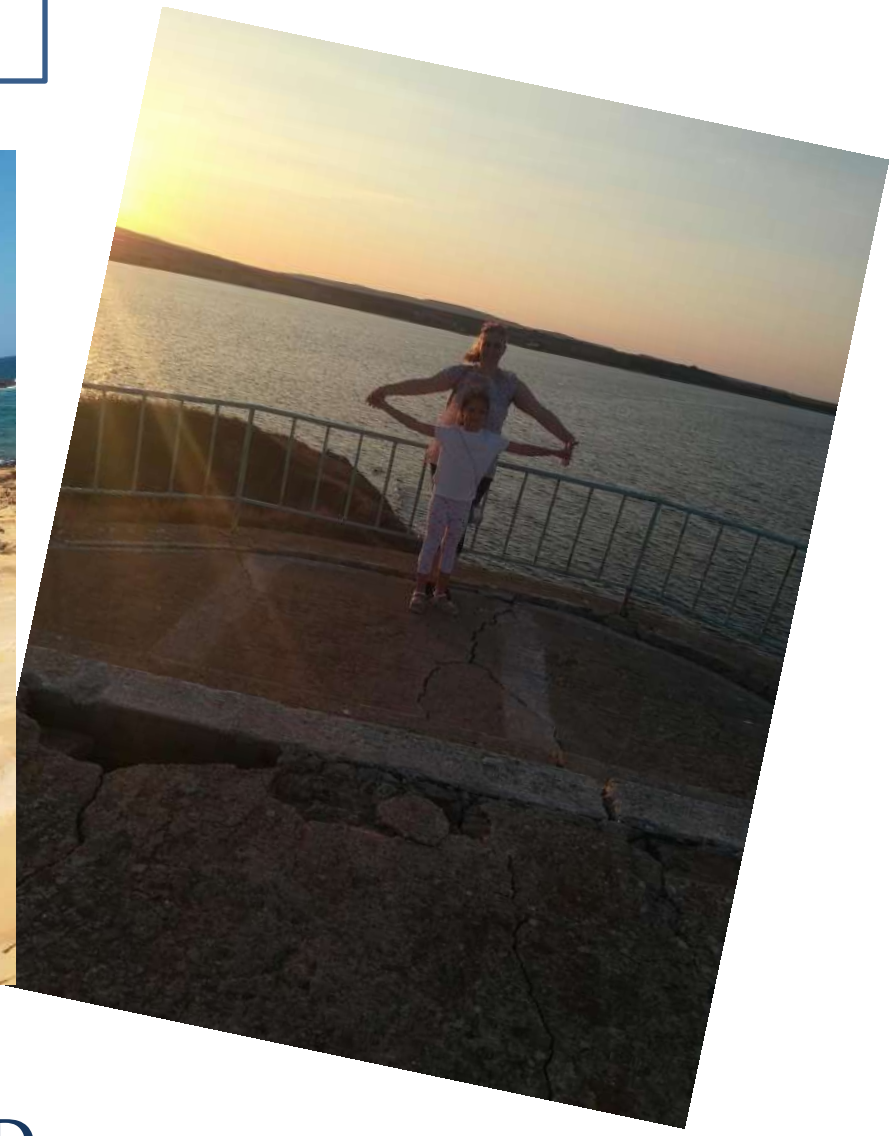
Irradiations hours per day



IRRADIATIONS PERFORMED BY:

- Panagiotis Askounis, Physicist
- Panagiota Konstantinou, Technician
- Boziari A., Medical Physicist

...DAY 61



LIMNOS ISLAND

EEAE in keywords

Safety

Trust

Expertise

Efficiency

THANK YOU FOR YOUR ATTENTION