

Package 2

INSTRUCTION SHEET, DATA SHEET AND RESULTS REPORTING FORM FOR THE STEP 1 AUDIT

This package contains the following forms:

Instruction sheet for TLD postal dose quality audit for co-60 and megavoltage X ray beams;

Data Sheet for TLD postal dose quality audit for Co-60 beams;

Data Sheet for TLD postal dose quality audit for megavoltage X ray beams;

Certificate for TLD audits for photon beams in reference conditions.

TLD POSTAL DOSE QUALITY AUDIT FOR Co-60 AND MEGAVOLTAGE X RAY BEAMS

INSTRUCTION SHEET

Step 1: Reference conditions

Please irradiate the TLDs during the period:

and return them to the address given in the covering letter. Timely response will improve the accuracy of your results. Should the TLDs arrive late, please irradiate them as soon as possible but no later than one month after their receipt. If you are unable to carry out the irradiation, please **RETURN** the TLD set, marking it 'UNEXPOSED'.

GENERAL INSTRUCTIONS

1. Irradiate the TLDs as instructed in the Technical Instruction (part B and C). Ensure that the treatment unit is functioning properly and is one that is being used clinically or is ready for clinical use.

NOTE: If more than one beam is being checked on a linac, it is recommended to complete all measurements of the audit for one energy before going on to the next energy, in order to decrease manipulation errors.

2. After the TLD irradiation, if possible, measure the dose delivered to the reference TLDs (part D) using local ionization chamber dosimetry procedures.
3. Fill in the Data Sheet.
4. Return the TLDs and the Data Sheet within **one week** after the irradiation.

SPECIAL NOTE

After each irradiation, carefully replace the TLD in its original position in its storage box. Please protect the TLD capsules from accidental irradiation, heat (e.g. sunshine) and excessive humidity during storage.

CONFIDENTIALITY

The results of this TLD audit will be kept confidential by [DAN] and will not be disseminated without the written permission of the participating radiotherapy centre.

The TLD equipment sent to you represents a significant investment in cost, time and effort to the [DAN]. Failure to return the TLDs may be reported to your local authorities.

TECHNICAL INSTRUCTIONS FOR HOSPITAL STAFF (physicists, oncologists, technicians)

A. Aim of the TLD audit

The purpose of this TLD audit is to check the dose delivered by your radiotherapy unit. The audit is performed under the following conditions for both Co-60 and megavoltage X rays: 10 cm depth in water, 10 cm × 10 cm field size and your nominal source-to-surface (SSD) or source-to-axis (SAD) distance used clinically.

B. Preparation of the holder, water phantom and therapy unit

1. Assemble the TLD holder, with the lead weight, as in Fig.1.
2. Place the holder in a water tank on the treatment table (Fig. 2). If needed, cut the holder legs (Fig. 1) to fit the holder into the tank. (*Note that if you have no access to a dosimetry water phantom you can use a large plastic container*).
3. Set your therapy unit for a vertical beam, with a 10 cm × 10 cm field size (Fig. 2).
4. Adjust the water level by filling the water tank **exactly** to the level of the top of the holder (Fig. 2).
5. Adjust the table height so that the water surface is at the standard distance to the source, according to the set-up selected (SSD or isocentric, see Fig. 2).

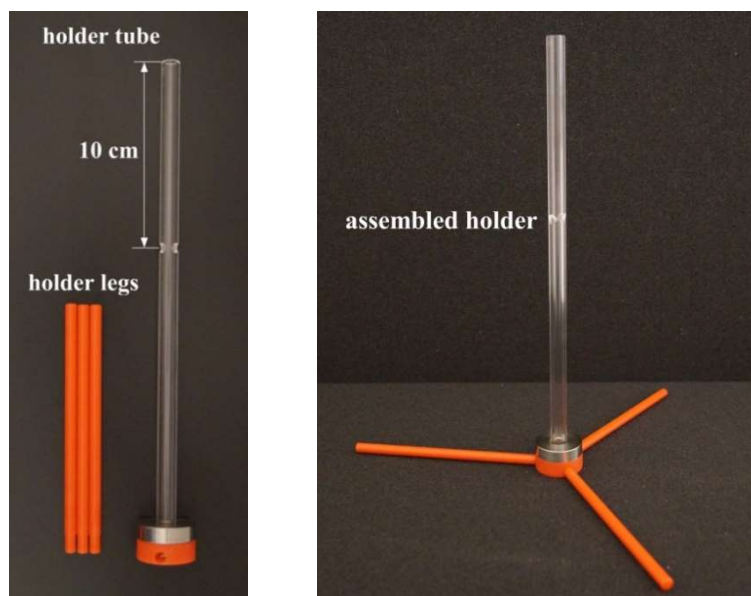


FIG. 1. Assembling the IAEA standard holder for the TLD irradiations.

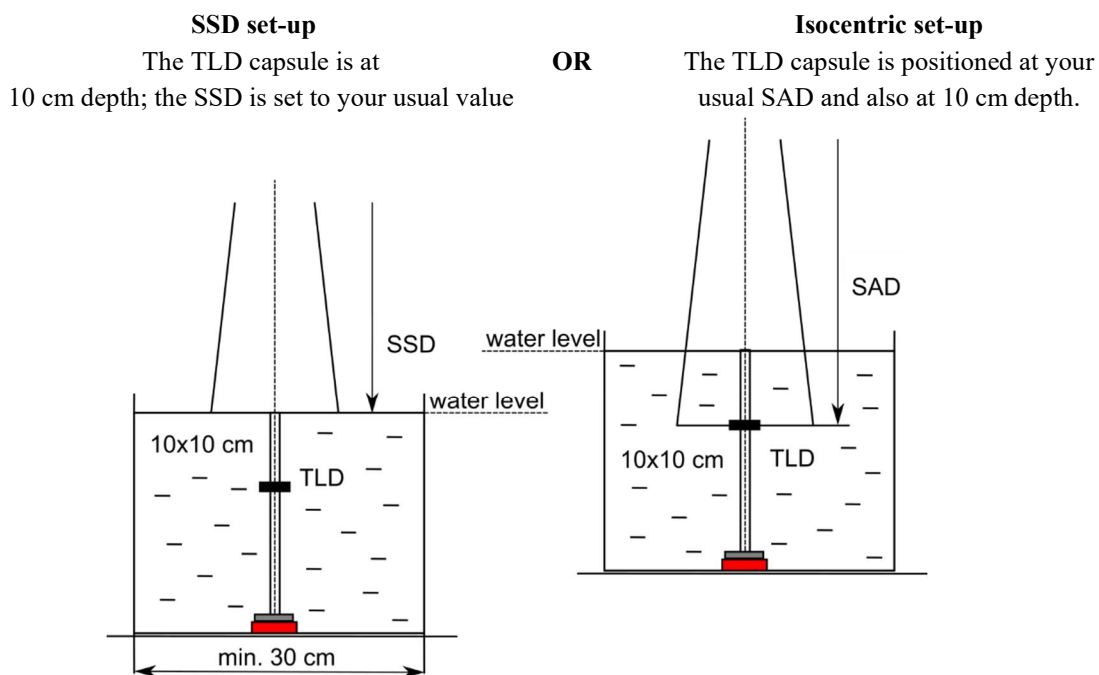


FIG. 2. Two alternative geometry set-ups for the TLD irradiation.

C. Irradiation of the TLD capsules

NOTE: The capsule with white mark **must not** be irradiated; it is used for monitoring environmental influences during transport and storage.

1. Calculate the irradiation time or monitor units to deliver 2 Gy (200 cGy) to the TLD capsule as you would do for a 'tumour' whose centre would be at 10 cm depth, for a 10 cm x 10 cm field. The delivered dose is not a 'given dose' at the depth of maximum dose, but a dose at 10 cm depth (Fig. 3).
2. Choose the first TLD capsule.
3. Insert the capsule into the hole of the holder (Fig. 4).
4. Position the holder, with the TLD inserted, in water, making sure that the tube of the holder is completely filled with water (no air bubbles).
5. Align the holder tube with the central (collimator) axis (Fig. 2).
6. Before irradiation recheck whether the alignment, field size, water level and distance are correct (Fig. 2).

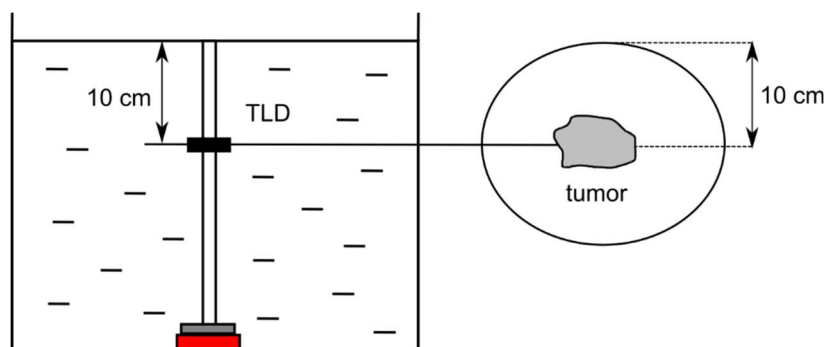


FIG. 3. Irradiation geometry for the TLD (see text in point 1).

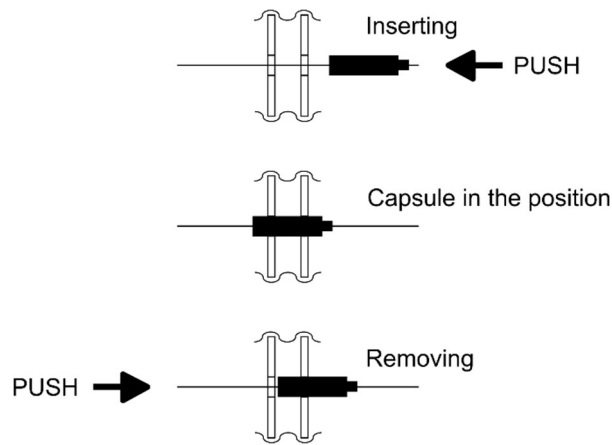


FIG.4. Inserting, positioning and removing the TLD capsule

7. Irradiate the first capsule with the time or the number of monitor units as calculated above.
8. Remove the capsule from the holder (Fig. 4.), wipe it dry.
9. Replace in its position in the box.
10. Choose the second TLD capsule.
11. Repeat the procedure, steps 3 to 9, for the second capsule (2 TLD capsules per beam for reference measurements).

D. Absorbed dose measurements with an ionization chamber (additional request for medical physicists)

Determine experimentally the absorbed dose to water at the position of the TLD according to your usual dosimetry protocol. Complete the data sheet for the appropriate beam.

TLD POSTAL DOSE QUALITY AUDIT FOR Co-60 BEAMS

DATA SHEET

Step 1: Reference conditions

It is of great importance for the TLD evaluation that the information requested below be completed. Please complete Part II if additional absorbed dose to water determination was made by ionization chamber measurements.

Individuals responsible

Radiation oncologist
name *position*

Medical physicist:
name *position*

Name of institution

Address

Telephone number

Fax number

E-mail

Form completed by

Name

Position Medical physicist Radiation oncologist Technician
Other:

On the day
 day month year

TLD irradiation performed by

Name

Position Medical physicist Radiation oncologist Technician
Other:

Previous participation in an external audit or inter-institution comparison for this beam

Has Step 1, TLD audit for photon beams in reference conditions been successfully completed before?

No
Yes Date

Please also give information on participation in any other audit

Please give a detailed explanation of your procedure to determine the dose at the position of the centre of the TLD capsule based on the measurement described above. Please provide all factors you have used:

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and, if any, the shutter correction (timer error) applied was

TLD POSTAL DOSE QUALITY AUDIT FOR MEGAVOLTAGE X RAY BEAMS

DATA SHEET

Step 1: Reference conditions

It is of great importance for the TLD evaluation that the information requested below be completed. Please complete Part II if additional absorbed dose to water determination was made by ionization chamber measurements.

Individuals responsible

Radiation oncologist
name *position*

Medical physicist
name *position*

Name of institution

Address

Telephone number

Fax number

E-mail

Form completed by

Name

Position Medical physicist Radiation oncologist Technician

Other:

On the day

<i>day</i>	<i>month</i>	<i>year</i>		

TLD irradiation performed by

Name

Position Medical physicist Radiation oncologist Technician

Other:

Previous participation in an external audit or inter-institution comparison for this beam

Has Step 1, TLD audit for photon beams in reference conditions been successfully completed before?

No

Yes Date

Please also give information on participation in any other audit

ADDITIONAL REQUEST FOR MEDICAL PHYSICISTS

A. Determination of the absorbed dose to water by ionization chamber in reference conditions

Measurements were performed by

.....
Name *position*

on the following date: |_|_| |_|_| |_|_|_|_|
day *month* *year*

The absorbed dose rate to water in this beam was determined by using a dosimeter system composed of an ionization chamber.....

manufacturer *model*

and an electrometer.....

manufacturer *model*

The Co-60 calibration factor of the dosimeter system (**ionization chamber TOGETHER with electrometer**) was:

- R/scale unit (exposure calibration factor N_X)
- or Gy/scale unit (air kerma calibration factor N_K)
- or Gy/scale unit (absorbed dose to water calibration factor $N_{D,w}$).

If any other calibration factor is used please specify:

The above stated calibration factor was determined by the following laboratory/manufacturer on the following date and refers to a temperature of °C and a pressure [*units*] of[.....].

The absorbed dose to water in this beam was measured under the following conditions:

- water plastic – *please specify material*
- field size: cm × cm
- distance:
SSD = **OR** SAD =
SSD set-up *Isocentric set-up*

The depth of the geometrical centre **or** the P_{eff} of the ionization chamber in phantom was cm.

Please give your reading results:

- Average reading [*scale units*]
- Measurement performed during MU
- Temperature °C
- Pressure [*units*]..... [.....]
- Electrometer scale.....
- Electrometer voltage.....

The absorbed dose to water per MU in this beam was determined by the following code of practice (dosimetry protocol):

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Please give a detailed explanation of your procedure to determine the dose at the position of the centre of the TLD capsule based on the measurement described above. Please provide all factors you have used:

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STEP 1 AUDIT CERTIFICATE

RESTRICTED

[DAN letterhead]

[DAN] TLD POSTAL DOSE QUALITY AUDIT

Institution	<i>Institution name</i>	TLD batch No	<i>xxx</i>
Address	<i>Institution address</i>	TLDs irradiated by	<i>[Ms/Mr] Family name & given name</i>
		Date of irradiation	<i>yyyy-mm-dd</i>
Country	<i>Country name</i>	Evaluation	<i>yyyy-mm-dd</i>

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

Beam	Radiation unit	TLD set #	User stated dose [Gy]	DAN (measured) dose [Gy]*	DAN mean dose [Gy]	% deviation relative** to DAN mean dose	$\frac{\text{DAN mean dose}}{\text{User stated dose}}$

* The uncertainty in the TLD measurement of the dose is $x.x\%$ (1 standard deviation); this does not include the uncertainty intrinsic to the dosimetry protocol (see IAEA TRS-398).
 ** % deviation relative to DAN measured dose = $100 \times (\text{User stated dose} - \text{DAN mean measured dose}) / \text{DAN mean measured dose}$. A relative deviation with negative (positive) sign indicates that the user estimates lower (higher) dose than what is measured; a patient would therefore receive higher (lower) dose than what is intended by the factor given in the last column.

Agreement within $\pm x\%$ between the user stated dose and the DAN measured dose is considered satisfactory.

Signature

Date:

Signature

.....

.....

[TLD Officer] – [DAN]

Head – [DAN]

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. **IT DOES NOT CONSTITUTE A STATEMENT WITH REGARD TO THE QUALITY OF RADIOTHERAPY TREATMENTS.**