Australian Government
Australian Radiation Protection and Nuclear Safety Agency

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Australian Clinical Dosimetry Service

Level II Audit – Fact Sheet

Definition

The ACDS Level II Audit determines absorbed dose to water delivered to selected points and planes within a 'slab' geometry phantom. This is an audit of the beam model within a treatment planning system (TPS), where the phantom CT is supplied to the Facility for treatment planning and delivery. Dosimetry measurements are made in a custom phantom of CIRS solid water, using a 2D ionisation chamber array as a primary detector and supporting measurements with CC13 and/or farmer ionisation chambers. The 2D array is calibrated against a Farmer type ionization chamber, which is traceable to the primary standard at ARPANSA.

Audit Coverage

The Level II Audit is available to all facilities as part of the four year ACDS audit program. For organisations with matched beam models and centralised planning, the Level II audit plans can be completed once and delivered at multiple facilities. The Level II audit is also offered for a new radiotherapy TPS.

Audit Scope

The Level II audit includes several modalities, each with additional options. The facility can choose to complete as many options in the audit as deemed necessary for their clinical practice (see Table 1).

Table 1. Summary of options for the Level II audit

Compulsory	**Optional** Please select as relevant to clinical practice		
3DCRT	**3DCRT**	**IMRT**	**VMAT**
6X (Linac) 6FFF (Halcyon)	10X	6X	6X
	15X	10X	10X
	18X	6FFF	6FFF
	Wedges	10FFF	10FFF
	6FFF		
	10FFF		

Measurements are performed on a single representative Linac of each Linac class type, at each facility. If the facility operates different linac class types (e.g. a Conventional Linac and a Halcyon), the Level II audit will be offered for both systems.

CPD

For Radiation Therapists participating in the audit, ASMIRT CPD hours are claimable at a rate of 8 hours for treatment planning and 3 for treatment delivery. Certificates will be issued with the audit report.

ASMIRT CPD APPROVED

Dose reporting

The ACDS acknowledges that treatment planning systems can report dose as dose-to-water or dose-to-tissue (where the TPS is modelling the phantom as a mixture of muscle and soft tissue by default). The audit is performed in a water equivalent phantom. AAPM TG-329 has identified the mass energy absorption coefficient ratio and the stopping power ratio of muscle/water to be approximately 0.99. The D_{tissue}/D_{water} correction and the audit outcome are tailored according to the algorithm that was used by the facility to report dose.

Audit Outcome

An outcome for an individual case is determined using the measured 2D dose map. An overall Audit Outcome for each modality is determined, which is equal to the worst case outcome, for each modality.

Table 2. Scoring criteria for the Level II audit

	Pass (Optimal Level)	Pass (Action Level)	Out of Tolerance	Reported not scored (RNS)
3DCRT	≤ 3.3%*	> 3.3% and ≤ 5%	> 5%	Any deliveries which are restricted for clinical use, repeated measurements, alternative scoring options and supporting measurements
IMRT, VMAT	γ≤1 at 3%/3mm+ for ≥95% points	γ≤1 at 3%/3mm for ≥90% and <95% points	γ≤1 at 3%/3mm <90% points	

*Dose variation between the *Facility Stated Dose (planned dose)/*the *ACDS Measured Dose*.

+Global Gamma criteria

Outcome Reporting

An individual report is created for each facility audited and is specific to the beam model(s) audited. A formal report will be sent to the Facility within approximately 30 working days of the audit. Data collected is held confidentially by the ACDS and its oversight groups. Publicly reported outcomes are de-identified and randomised.

General Audit Procedures

- Scheduling of the audit is confirmed 3-6 months prior to the audit date.
- The standard procedure is for a two phase audit. In Phase 1, plans are completed on a phantom CT data. The data required for planning is sent ~6 weeks prior to the on-site audit. Planning data should be returned to the ACDS 1-2 weeks prior to the on-site audit, for ACDS to review. In Phase 2, the ACDS attends the facility for treatment delivery and dose measurements.
- At minimum, the Facility should book staff and equipment for 12hrs of treatment planning time and 5 hours of treatment delivery time. Additional planning and Linac time will be required, as the number of beam models is increased. The ACDS suggests an on-site audit start time no later than 1pm.
- The Facility must ensure that (a) A physics representative is available for the duration of the audit to provide supplemental information if required; (b) A radiation therapist is available for the duration of the audit to deliver the planned treatment and provide supplemental information if required.
- Measurements are completed in R&V QA mode to allow multiple deliveries (if required).For the IMRT and VMAT modalities, the facility must confirm the plans are deliverable and pass all QA measures employed by the facility for clinical IMRT plans (e.g. patient specific QA)
- A comparison of ACDS versus Facility temperature and ambient air pressure measurements will be performed.