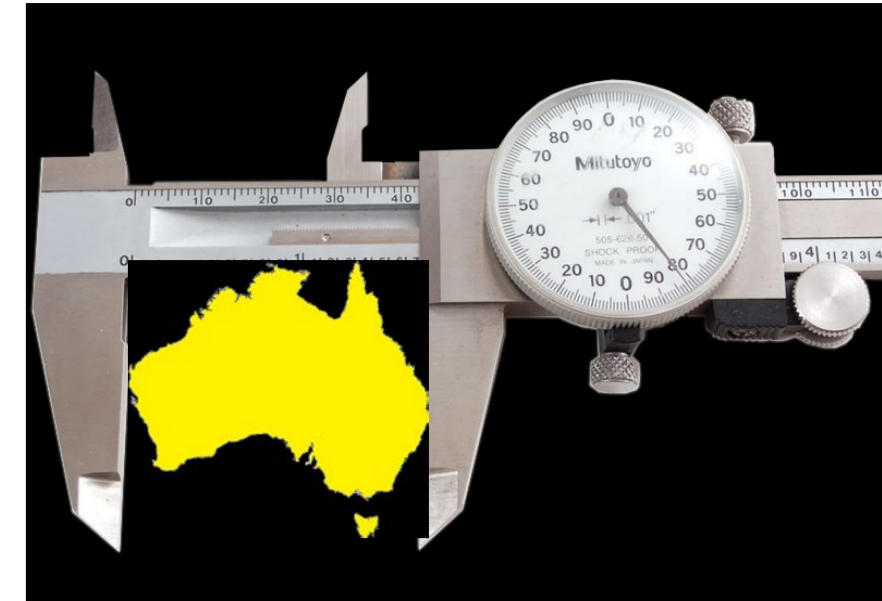


The Australian Clinical Dosimetry Service: a *bespoke* national solution



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Introduction/Purpose

Independent dosimetric audits for radiotherapy centers are internationally recommended to improve the treatment quality and safety for radiotherapy patients. The Australian Clinical Dosimetry Service, (ACDS), is a federally funded pilot dosimetry audit designed so that the Australian Government could determine whether the bespoke design was suitable for an on-going Australian service. The service requirements were defined by a memorandum of understanding (MoU) between the Australian Radiation Protection and Nuclear Safety Agency, (ARPANSA) and the Department of Health.

Aim

The ACDS audits are used to determine whether the dose being delivered to patients is the dose intended to be delivered to patients.

Method

Three main audits, Level I, II and III, each with increasing complexity are offered by the ACDS. In addition, a more precise on-site audit, which uses an ionisation chamber with the facility's water tank, is also offered. This Level Ib audit is used to resolve uncertainties arising from the higher level audits, and is favoured for newly installed linacs prior to clinical release. A clinical advisory group, CAG, was recruited from the Australian professionals to advise and assist the ACDS audit designs, audit interpretations and clinical consequences from audit outcomes.

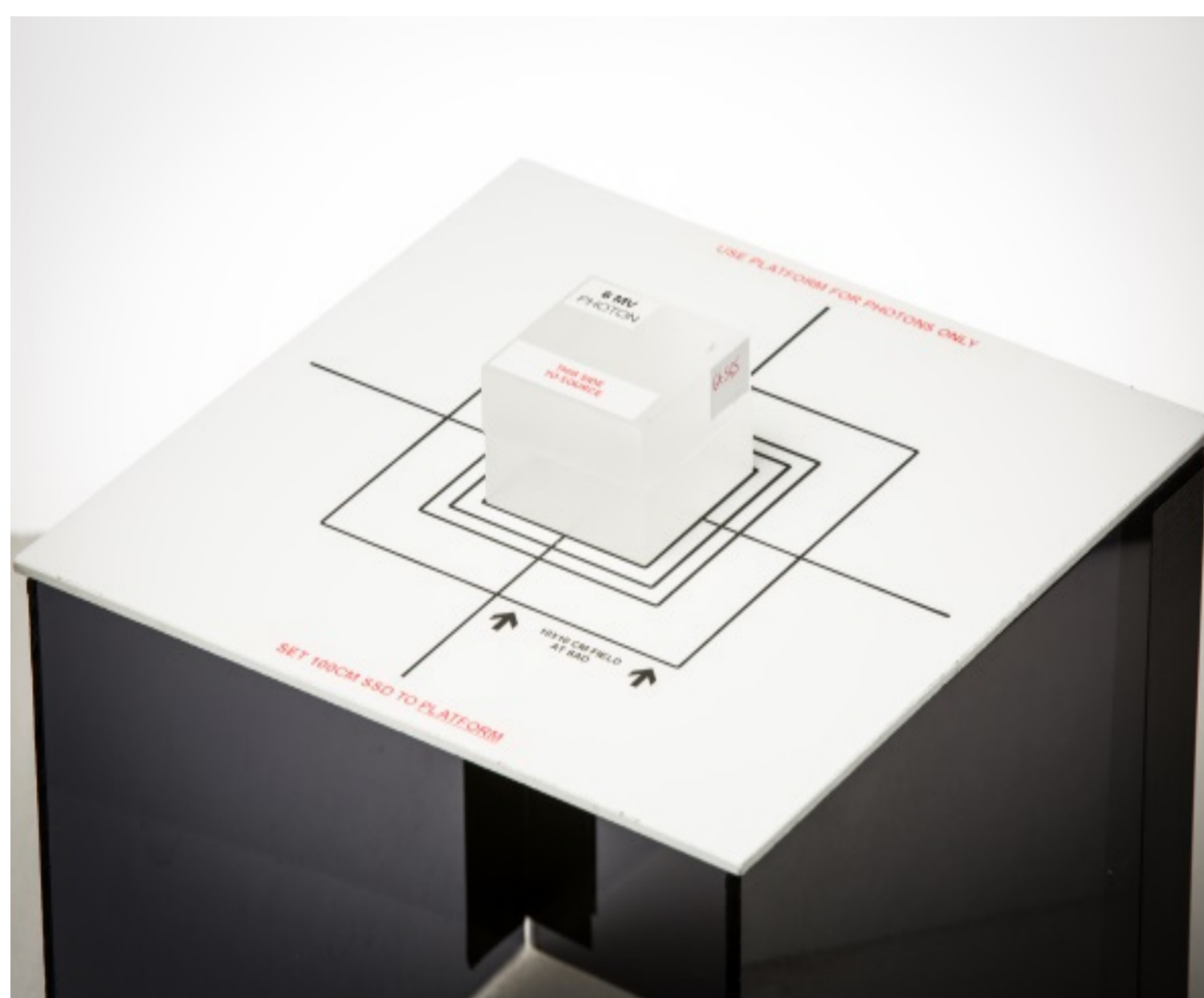


Figure 1a: The Level I audit, a remote reference audit. The ACDS employs optically stimulated luminescent detectors for this audit.

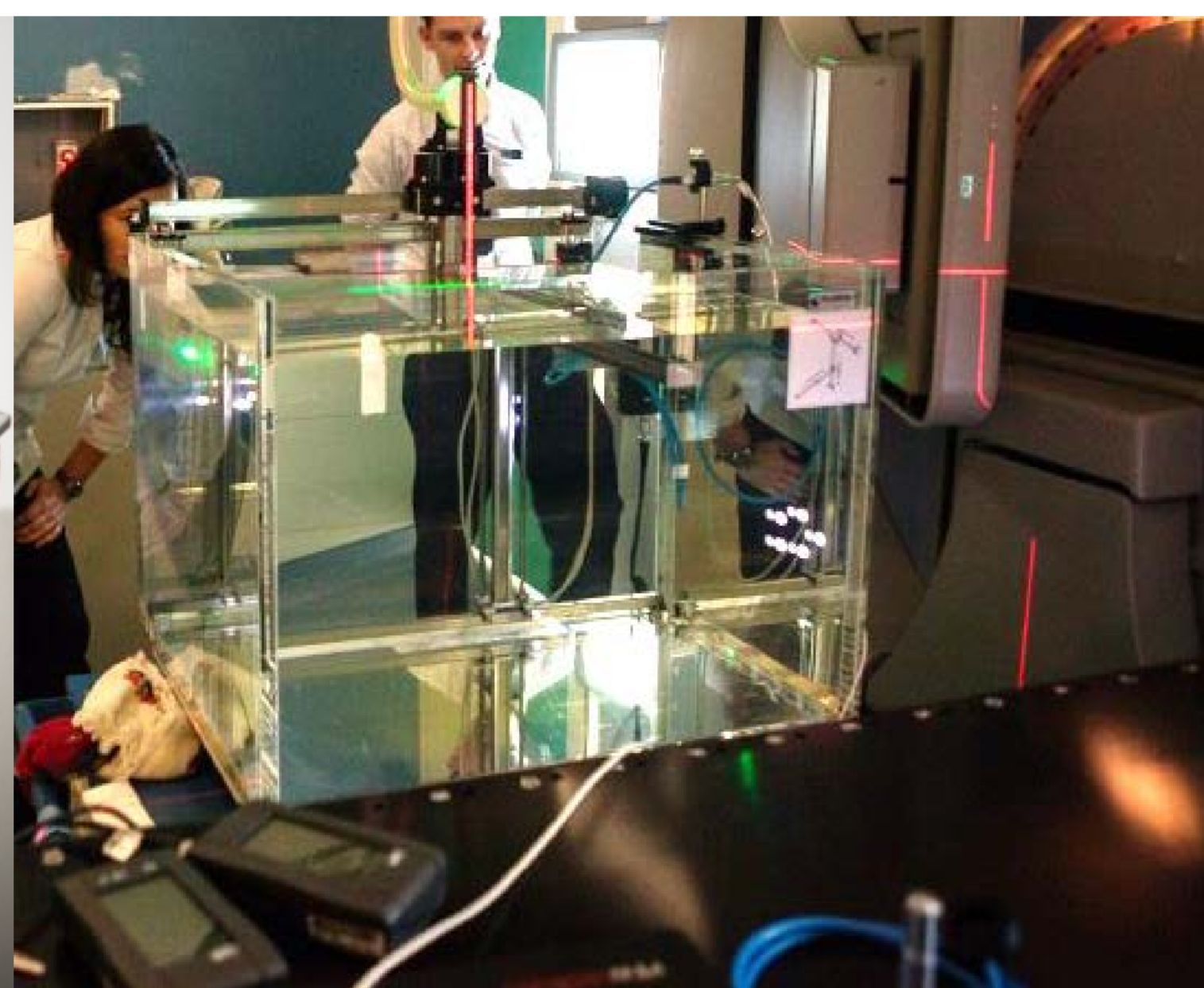


Figure 1b: The Level Ib audit, conducted on-site by the ACDS with the local water tank. Flattening filter free beams, FFF, and small field audits are being developed.



Figure 1c: The Level II audit uses a PTW 729 array with Computerized Imaging Reference Systems, CIRS, plastic water and synthetic lung.

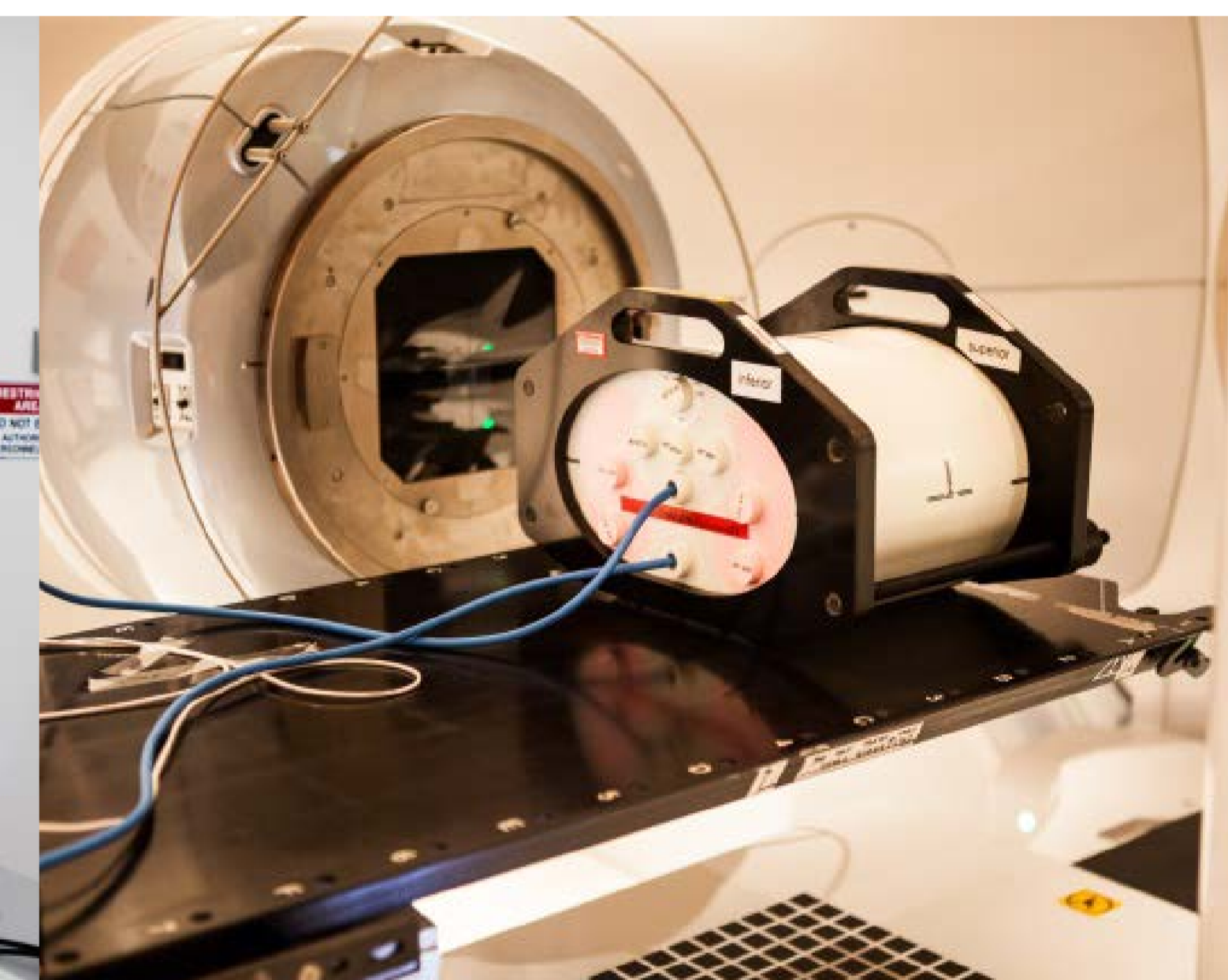


Figure 1d: The Level III audit is an imaging-to-treatment audit, IAEA TECDOC 1583 [2]. A CIRS 002LFC IMRT Thorax Phantom is used

Results

The ACDS scores the audit outcome from the %Variation between the dose predicted by the facility and that measured by the audit. The magnitude of the %Variation is based on the standard deviation of either the uncertainty budget, Level I & II, or a clinically acceptable upper limit of 5%. The table summarises all the audits performed by the ACDS, their outcomes and the recommendations made by the ACDS to correct their dosimetric discrepancies

Audit Type		% Variation: (Facility – ACDS) / ACDS			No. of linacs (OSLD/TLD)			# of linacs	# of recommendations
		Pass: Optimal (≤ 2 σ)	Pass: Action > (2 σ to ≤ 3 σ)	Out of Tolerance (> 3 σ)	Pass: Optimal	Pass: Action	Out of Tolerance		
Level I	Photons	≤ 2.6	> 2.6 to ≤ 3.9	> 3.9	111/51	35	2	147 (+7)/51	20
	Electrons	≤ 3.4	> 3.4 to ≤ 5.1	> 5.1	70	24	7		
Level II		≤ 3.3	3.3 > to ≤ 5.0	> 5.0	52	9	35	99	32
Level III		≤ 3.3	3.3 > to ≤ 5.0	> 5.0	46	34	8	88	24
Level Ib		≤ 1.4	1.4 > to ≤ 2.1	> 2.1	39	3	1	43	15

Conclusions

- The ACDS has successfully engaged with all providers in Australia for the voluntary and free national audit service.
- A great strength of a large scale audit program is the statistical power of the data it collects.
- The ACDS has used its data set to investigate a series of audit issues which related to issues with the AAA algorithm– fully described in Dunn L *et al* [3]. The most recent data set is shown in Figure 2.
- The next challenge for the ACDS is to maintain the existing level or rigour as it moves into the IMRT, FFF, small field and Dynamic Arc audits.

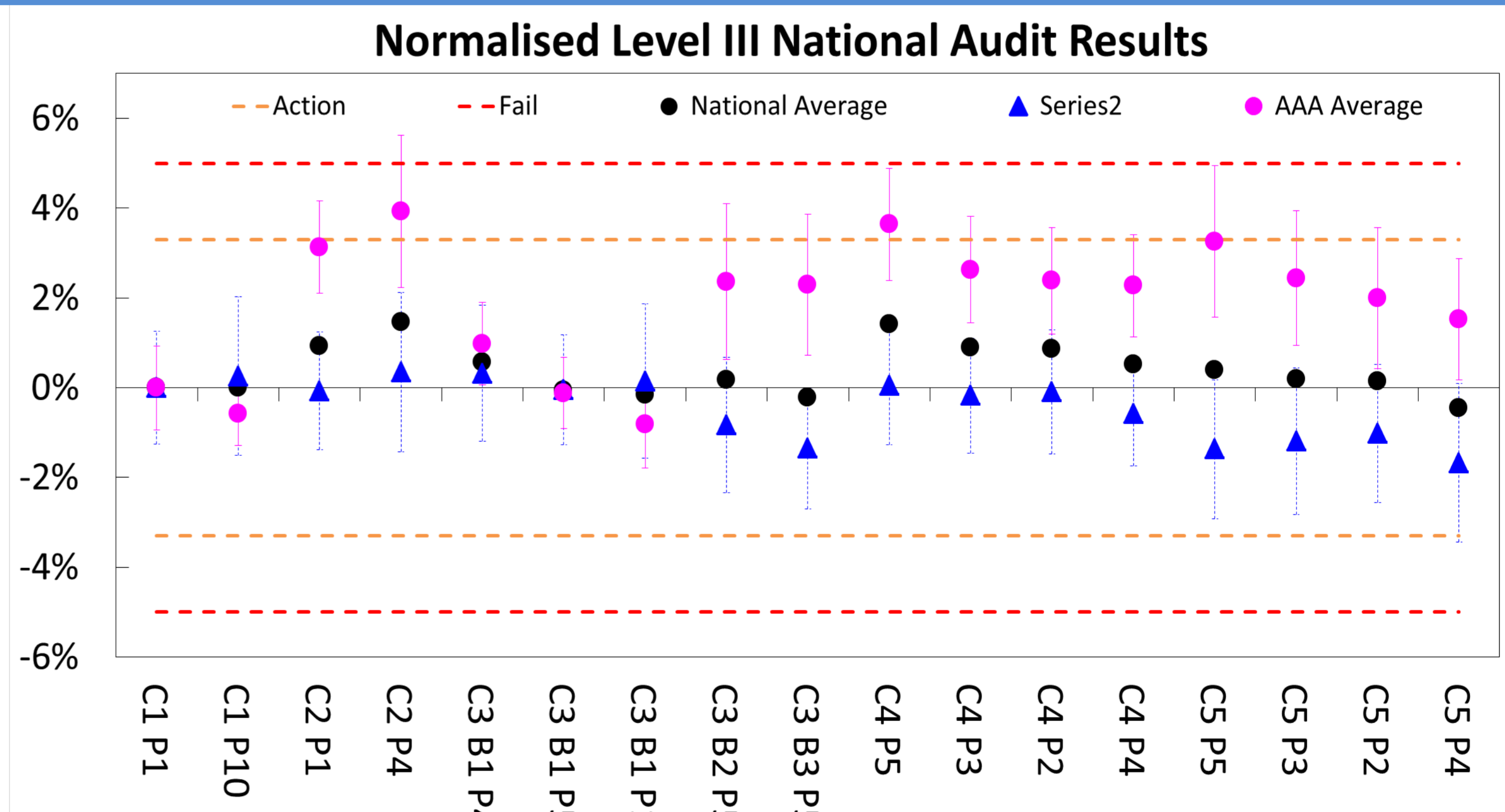


Figure 2: Data to-date for Case# Beamx Pointn of the ACDS Level III audit

References

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 [3] Leon Dunn, Joerg Lehmann, Jessica Lye, John Kenny, Tomas Kron, Andrew Alves, Andrew Cole, Jackson Zifodya, Ivan Williams, "National dosimetric audit network finds discrepancies in AAA lung inhomogeneity corrections" Physica Medica 2015;doi:10.1016/j.ejmp.2015.04.002. (Epub 2015 Apr 23)

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The Australian Clinical Dosimetry Service is a joint initiative between the Department of Health and Ageing and the Australian Radiation Protection and Nuclear Safety Agency.



Australian Government

Australian Radiation Protection and Nuclear Safety Agency