



# Australian Clinical Dosimetry Service

## Directly measured $k_Q$ ACDS Fact

### Introduction

The ACDS has moved from using the tabulated  $k_Q$  values published in TRS-398 to the directly measured  $k_Q$  factors provided by ARPANSA. From 1<sup>st</sup> July 2016, all photon doses measured by the ACDS in audits will be derived from the directly measured calibration service.

### Summary

The primary standards laboratory at ARPANSA now offers MV photon beam measured  $k_Q$  factors. Up until recently, the only option in Australia has been to use the tabulated  $k_Q$  values published in TRS-398. However, the TRS-398 protocol recommends the use of chamber specific, measured  $k_Q$  values where available in preference to the generic values (Andreo *et al* 2000). The ACDS chambers have been directly calibrated in MV photon beams and on average the difference is up to 1.2 % (see Table 1). The ARPANSA measured  $k_Q$  values are within the uncertainty of the TRS-398 published  $k_Q$  values (Wright *et al* 2015).

Table 1 Shift in  $N_{D,w}$  with directly measured  $k_Q$  factors compared to TRS-398 tabulated  $k_Q$  factors.

Chamber	6MV	10MV	18MV
NE 2571	-0.4	-1.0	-1.1
NE 2561	-0.2	-0.8	-1.2
PTW 30013	-0.7	-1.1	-1.1
IBA FC65-G	-0.9	-1.3	-1.4

Directly measured chamber specific  $k_Q$  values are now used to determine the dose in ACDS audits. The ACDS OSLDs and ion chamber arrays are cross calibrated against calibrated Farmer chambers with measured  $k_Q$  values. This means all ACDS audits will utilize the new  $k_Q$  values.

For national uniformity and global harmonization, the dose will be determined in a consistent manner in all ACDS audits. This means that facilities using the TRS-398 tabulated values for  $k_Q$  to perform dosimetry will be audited against ACDS dose as determined using directly measured  $k_Q$  values. Where this difference contributes to an action or out of tolerance audit result the ACDS audit report will contain a comment explaining the origin of the difference.

### References

Andreo P, Burns DT, Hohlfield K, Huq MS, Kanai T, Laitano F, Smyth V, Vynckier S, Absorbed dose determination in external beam radiotherapy: an international code of practice for dosimetry based on standards of absorbed dose to water. IAEA TRS-398 (2000)

Wright T, Lye JE, Ramanathan G, Harty PD, Oliver C, Webb DV, Butler DJ, Direct calibration in megavoltage photon beams using Monte Carlo conversion factor: validation and clinical implications. *Physics in medicine and biology*, 60(2):883 (2015)

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