Solaria in Australia and the Standards Making Process.

Peter Gies[1], John Javorniczky[1], Stuart Henderson[1], Alan McLennan[1], Colin Roy[1], Jordan Lock[1], Claire Lynga[1], Alan Melbourne[1] and Louisa Gordon[2]

Abstract. As a result of a compromise between the solarium industry and health agencies , the 2002 standard on solaria for Australia and New Zealand (AS/NZS 2635:2002) left the upper limit of allowed emissions at UV Index 60. To aid in the deliberations of the standards committee preparing the new standard, ARPANSA researchers made measurements of a number of solaria to assess the range of intensities emitted. In total, 20 solaria were examined in detail. Of these, only one solarium had emissions of less intensity than UV Index 12, typical of mid latitude summer sunlight and the maximum allowed for solaria in the European Community, while three solaria emitted at intensities above UV Index 36. As a result, the upper limit on solaria emissions was reduced to UV Index 36 in the 2008 standard (AS/NZS 2635:2008).

Introduction

Media attention following the death in Australia of a young solarium user due to melanoma in 2007 put the solarium industry and the solarium standard (AS/NZS 2635: 2002) in the spotlight and as result the standard on solaria was reopened in 2008. Numerous research studies had shown that many of the recommendations for solaria were not being complied with and concluded that self regulation of the solarium industry was clearly not working (Paul *et al.*, 2005; Team *et al.*, 2006; Dobbinson *et al.*, 2006). The International Agency on Research on Cancer (IARC, 2006) also reported the first evidence that long-term use of sunbeds was positively associated with melanoma and that first exposure to sunbeds before age 35 significantly increased risk of melanoma.

In the light of this new evidence, it became obvious that the 2002 solarium Standard had a number of elements that required updating, eg skin types, age limits, operator training etc, but particularly the allowed upper limit of UVR emissions of UV Index 60, ie 5 times as strong as typical mid latitude summer sunshine. Standards Australia and New Zealand require the various parties on the committee, such as the solarium industry, health agencies and consumer organisations to reach consensus. If one of the parties does not vote for the standard, then there can be no new standard. The solarium industry was prepared to consider reducing the allowed upper limit of UVR emissions for solaria from UV index 60, as long as this did not entail major reconfiguration of sunbeds at substantial cost to the industry. The solarium industry would not consider revising down to the current EC limit for the maximum intensity of UV Index 12. The question was, what were current solaria emitting? ARPANSA agreed to survey as many solaria as possible and report back to the committee.

In 2007, ARPANSA contracted QIMR to do a report on health impacts of regulation of solaria, (Gordon *et al.*, 2007) and also organised a National Forum on Solaria in November 2007 which brought together state regulators, along with other stakeholders such as the Cancer Council Australia, the Solarium Industry and public health representatives. The ARPANSA forum came up with a set of basic requirements for solaria regulations eg; prohibition on persons under 18 years of age using sun-tanning units; all exposures to sun-tanning units to be subject to supervision by an operator; all persons supervising the operation of sun-tanning units to be trained; only such trained persons to determine and control exposures; skin type to be assessed by operators and persons with skin type 1 to be prohibited from using sun-tanning units; clients to provide written consent before using a sun-tanning unit; and specified limit on exposure in an individual session and on minimum times (48 hrs) between successive sessions. The outcomes of the forum were used by the Radiation Health Committee to develop uniform regulatory proposals for inclusion in the National Directory for Radiation Protection and adoption by all states and territories. The full details are available at http://www.arpansa.gov.au /pubs /comment/dr_ndrp4.pdf

Selection of Solaria

ARPANSA undertook to survey the outputs of as many commercial solaria as possible before the Standards committee was required to finalise the standard. Solaria were selected in consultation with the various solarium industry representatives on the Standards committee to include as many different types of sunbeds and lamps as possible. Solarium establishments in both Sydney and Melbourne were selected, as ARPANSA has offices in both cities and there were large numbers of operating solaria within 10-20 kms. A typical visit involved 3 to 4 ARPANSA staff along with at least two spectrometers and a number of handheld UV meters.

Measurement Equipment

Measurements of the spectral emissions from solaria were made with two systems, the first was a Bentham TM300 double monochromator system, which can cover the UVR and part of the visible spectral wavelength range from 200 to 600 nm at 1nm intervals with a bandwidth of 1nm. The input optics consisted of a cosine-corrected Teflon diffuser with 2 metre fibre optic cable and a bi-alkali end-window photomultiplier. Scans of the solarium output were done from 250 to 400 nm at 1 nm steps. The second measurement system was an Ocean Optics USB 4000 3648 element Toshiba linear CCD array. Spectral wavelength range was across the UVR and visible from 250 to 850 nm and the input optics were a cosine corrected Spectralon diffusing fibre optic irradiance probe. Both instruments were calibrated against deuterium and quartz tungsten halogen standard lamps traceable to the CSIRO Australian National Measurement Institute at

[1] Australian Radiation Protection and Nuclear Safety Agency, 619 Lower Plenty Road, Yallambie VIC, Australia 3085
[2] Queensland Institute of Medical Research, Post Office Royal Brisbane Hospital Queensland, Australia 4029

Lindfield, New South Wales. Wavelength drift was checked with a Hg pencil lamp.

Results

The intensities of UVR being emitted by the 20 solaria examined ranged from a minimum of UV Index 10.1 up to a maximum of UV Index 48, with only 3 solaria emitting more than UV Index 36. The distribution of maximum intensities is shown in Table 1. Although a limit of UV Index 30 was briefly considered, the solarium industry was not prepared to reduce the limit this far, even though only five of the twenty solaria had measured outputs of greater than UV Index 30. The standards committee then managed to agree on a compromise upper limit of UV Index 36.

Table 1. The distribution of UVR emissions from solaria in terms of UV Index.

UV Index	<12	12 – 24	24 – 36	> 36
No.	1	10	6	3

Solarium operators generally do not know what the intensity of their solaria are in real terms, either UV index or $W.m^{-2}$. The solarium industry classes sunbeds by time eg beds are 6 min, 8 min, 10 min etc. However at one establishment, the three 8 min sunbeds differed in intensity by 55%, with UV Index values of 31.3, 40.7 and 48.6, which meant 8 min UV doses ranged from 3.8, 4.9 and 5.8 SEDs, a very substantial variation and one that could easily result in overexposure of clients. This raises the question of whether there is a pathway for reporting overexposures built into the regulation process?

While the % UVB emissions from the solaria were less than found in sunlight (5.8%), the actual UVB emissions in $W.m^{-2}$ were higher than those found in sunlight for 14 of the 20 solaria. These solaria therefore had more UVA and more intense UVB than sunlight (CIE 172, 2006).

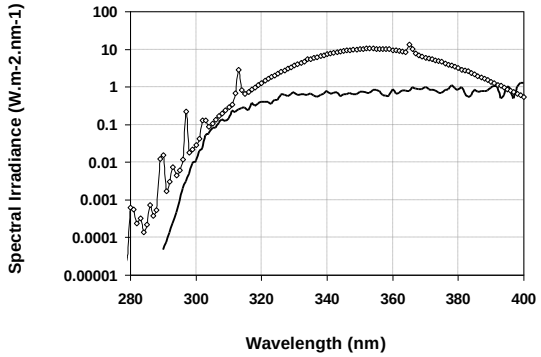

Figure 1. A comparison of the emission from a solarium (○) against the solar spectrum (--) on a log scale, with the solarium clearly a factor of 10 higher in parts of the UVA region, while also being higher across most of the UVB.

Gordon et al carried out a study on the impact of solaria in terms of the numbers of new melanoma cases and melanoma-related deaths attributable to solarium use by younger people in the five most populous Australian states, taking into account the local state levels of solar UVR (Gordon *et al.*, 2008). The study concluded that by successfully enforcing solarium regulations that ban use by people younger than 18 years or with fair skin, favourable health and cost benefits could be expected. State regulations governing solaria have been enacted in Victoria, South Australia, Queensland and Western Australia in 2008, followed by New South Wales and Tasmania in 2009. ARPANSA's National Directory for Radiation Protection will help to ensure future national uniformity of regulations.

Conclusions

1. Solaria emissions ranged from UV Index 10 to 48, achieved with high UVA outputs but low % UVB
2. Despite low % UVB, most solaria emitted more UVB than found in mid-latitude summer sunlight
3. UVR emissions from solaria in Australia are the highest so far reported in the world.
4. Compliance with the recommendations of IARC would minimize adverse health effects.
5. Regulation of solaria by states should help to ensure these recommendations are complied with.
6. Improved public education is also required and should be continued into the future.

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