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Ageing Characterization on Large Area Photomultipliers

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An accurate study and measurement on the ageing effects on two large area photomultipliers has been performed for over three years. The photomultipliers were 10", 10 stages Hamamatsu R7081one with standard bialkali and the other one with super-bialkali photocathode. Gain, dark count rate, charge and timing properties have been measured, as well as the fraction of the spurious pulses.
During the ageing cycles, the anode current of the two photomultipliers has been monitored and recorded in order to measure the total output anode charge and determining the ageing grade. The ageing conditions have been set by the use of a 400nm led regulated to about 3 photo-electrons at 1 MHz. The ageing process was stopped when the total charge arrived up toabout 2200-2550 C for both the PMTs. Measurements of the parameters of the two PMTs have been performed using a 410 nm pulsed LASER in single photoelectron condition . Considering the main results, only the gain showed a variation while all the other parameters remain quite stable. A first phase of up-drift shows an increase of the gain of about 10% and is followed by a final phase of down drift which shows a faster diminution of the gain of about 30%. The mechanism of the gain drift has been modelled and compared with the results.

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