



## In vitro SPF Testing



### 1. PRODUCT SAMPLE APPLICATION



### 2. SPECTROPHOTOMETRIC MEASUREMENT

#### Utilisation

The SPF *in vitro* is useful for comparative purposes, particularly R & D. However, it is formulation type and substrate interaction dependent, and, as such, should not be relied upon as a substitute for *In vivo* SPF testing.

#### Principle

A film of sunscreen sample is applied to a supporting substrate. The absorbance is measured in the range 290nm to 400nm. Using the SPF contribution values published by C.I.E., the *in-vitro* SPF is calculated.

#### Materials and Equipment

Labsphere 2000 Spectrophotometer fitted with integrating sphere and customised software .  
Helioscreen HD 6 5cm x 5 cm  
Moulded PMMA Plates.

#### Experimental Design

The absorbance of a sunscreen product applied on a PMMA Moulded Slide at 1.3 mg.cm<sup>2</sup> are measured between 400nm and 290nm and compared to the absorbance of the substrate or blank cell. Using these values in a calculation the *in vitro* SPF is determined. Determine the *in-vitro* SPF using the values provided in the CIE Table. These values are derived from the reference action spectrum adopted by the Commission on Illumination "CIE".

#### Calculation

The *in vitro* SPF is determined by the calculation as indicated below, according to Diffey and Robinson 1989 (3.1).

The absorbance is compared to the absorbance of the substrate or blank cell. Using these values in a calculation, the *in vitro* SPF is determined by utilising the individual SPF contribution values provided in the CIE Table. These values are derived from the reference action spectrum adopted by the Commission on Illumination (CIE).

#### References

1. Journal of the Society of Cosmetic Chemists, Vol.40, pp127-133 (1989).
2. CIE Journal 6, 17-22 (1987) International Commission on Illumination "A reference action Spectrum for ultraviolet induced erythema in human skin".
3. DESOP - 036 Procedure for *in vitro* SPF Determination.

The *in vitro* SPF is determined by the following calculation according to Diffey and Robinson 1989 (3.1).

$$SPF = \frac{\sum_{290}^{400} E(\lambda)\epsilon(\lambda)}{\sum_{290}^{400} E(\lambda)\epsilon(\lambda)} / PF(\lambda)$$

where  $E(\lambda)$  = spectral irradiance of terrestrial sunlight under defined conditions.  
 $\epsilon(\lambda)$  = erythral effectiveness of UVR at wavelength  $\lambda$ nm in producing delayed erythema in human skin.  
 $PF(\lambda)$  = protection factor

### 3 DIFFEY CALCULATION

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