

BASF Sunscreen Simulator

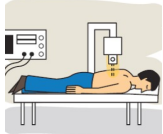
SPF, UVA-Metrics, Protection Profile, Real-Life Calculations



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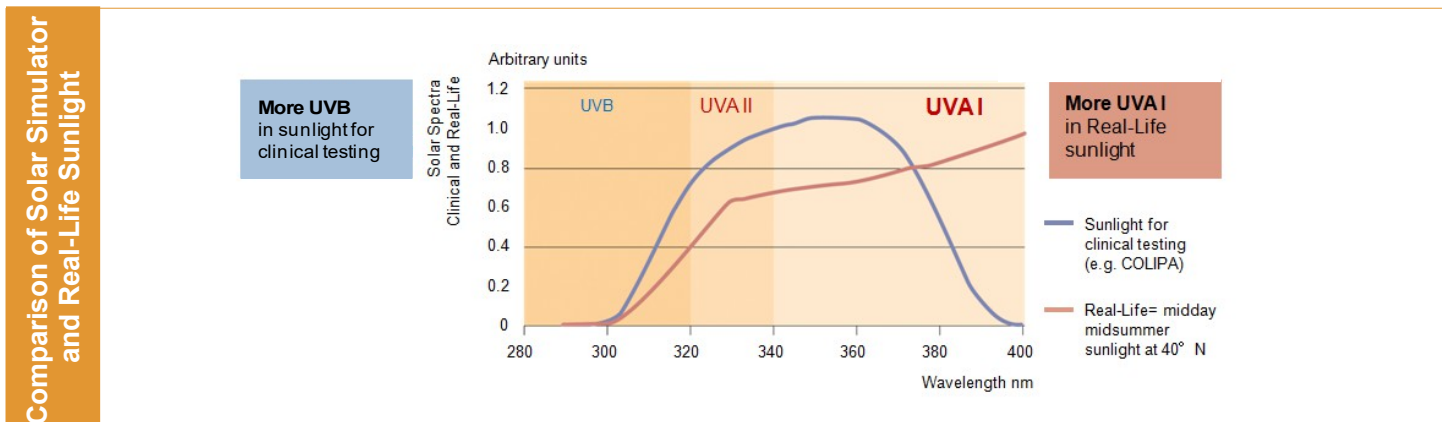
Input	Region:	Date:		
	Application amount:			
	UV Filter composition	USAN name	Abbreviation	Amount
	INCI name			

SPF




Simulation of the sun protection factor in vivo (SPF, ISO 24444) is performed. A description of the calculations is given in: "In silico Determination of Topical Sun Protection", Bernd Herzog and Uli Osterwalder, Cosmetic Science Technology 2011, 62 - 70

The UV Filter efficiency is the ratio of SPF and total UV Filter concentration (in %). The higher this value, the less Filter is required to achieve a certain SPF. This means a higher degree of freedom in the choice of other ingredients in a sunscreen formulation.



Real-Life Calculations



Real-Life Sunburn Protection Factor
(calculated with midday midsummer sunlight at 40°N)

The SPF in vivo method (ISO 24444) uses as irradiation source a solar simulator with a cut-off of radiation >400 nm, thus emitting also far less UVA radiation than the sun. In contrast, the real-life SPF is calculated using a standard solar spectrum with full UVA content. Since sunscreens are commonly UVB biased, the Real-Life SPF is smaller than the SPF obtained with the solar simulator. The two SPF's are only the same in the case of the "ideal sunscreen" with spectral homeostasis.

The irradiance of the sun is stronger in the UVA range than in the UVB range. Therefore, the total Transmitted UV Dose (from 290 to 400 nm) after having received 1 MED depends strongly on the spectral properties of the applied sunscreen. The Transmitted UV Dose after 1 MED is calculated in J/cm² using the same standard solar spectrum as for the Real-Life SPF.

An "ideal sunscreen" would perform like a neutral density filter with the same protection at any wavelength. In such a case the Transmitted UV Dose at 1 MED has a value of 7.9 J/cm². This value is used to normalize the Transmitted UV Dose @ 1 MED. The closer the normalized value comes to 1, the more ideal is the spectral profile of the respective sunscreen.

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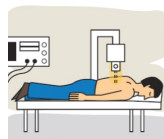
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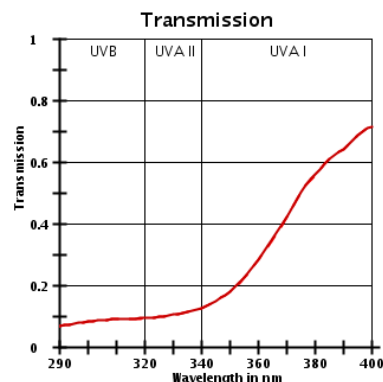
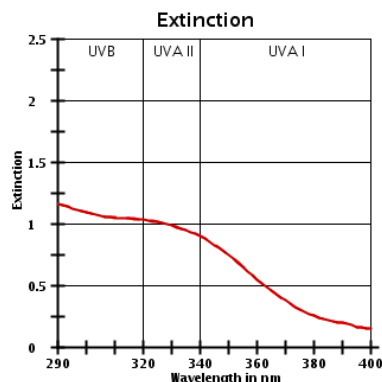


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UVA-Metrics

Country	in vivo	in vitro	Rating
EU	Simulated PPD	EC Recommendation (UVA-PF/SPF > 0.33)	
CH			
AUS			
MERCOSUR			
GB	UVA-PF and ratio calculation with labeled SPF	(Method: Cosmetics Europe)	
JP		Boots Star-Rating UVA/UVB ratio	none
USA	JCIA Rating		
USA		FDA Final Rule	
Global	No global standard has been defined		

UV Protection Profile



--- Initial ⁽¹⁾ — Final ⁽¹⁾

--- Initial ⁽¹⁾ — Final ⁽¹⁾

1) Profiles before (Initial) and after (Final) irradiation dose of SPF x MED (1 Minimal Erythema Dose passes through sunscreen onto skin)

Normalized Transmitted UV Dose at 1MED



An "ideal sunscreen" would perform like a neutral density filter with the same protection at any wavelength. In such a case the Transmitted UV Dose at 1 MED has a value of 7.9 J/cm². This value is used to normalize the Transmitted UV Dose @ 1 MED. The closer the normalized value comes to 1, the more ideal is the spectral profile of the respective sunscreen.

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