

MUPY Dermocosmetic Testing Center

Faculty of Pharmacy, Mahidol University

447 Sri-Ayuthaya Road, Rajathevi, Bangkok 10400 THAILAND

In vitro SPF study without pre-irradiation

Product: NAG Kayman Beauty Suntella UV Milk SPF50+ PA++++

Formulation no.: [REDACTED]

Lot no.: -

Manufacturing date: 08/12/2021

Job no: 1221/012-01

Sponsor: [REDACTED]

Study monitor: [REDACTED]

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1. Aims

To evaluate the Sun Protection Factor (SPF) of cosmetic product using an *in vitro* spectrophotometric method

2. Laboratory

2.1 Laboratory site

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3. Quality assurance

The study is conducted under the quality controlled-standard protocol at each stage of method so as to lead to accurate investigations and guarantee the reliability of analyzed data.

This study is totally performed under the responsibility of MUPY Dermocosmetic Testing Center.

4. Principle

In vitro SPF test is an evaluation of the sun protection factor (SPF) that expresses the sun protection level of cosmetic product to the full UV spectrum (290-400 nm). The product is spreading on an adequate substrate (PMMA) and using spectrophotometric method to analyze the UV protection level.

5. Methodology

5.1 Study materials

5.1.1 Instruments

- Spectrophotometer: UV-2000s (Lab sphere) equipped with a continuous radiation over 290-400 nm used for collecting the transmitted irradiance through the rough substrate (PMMA). The area of reading site is over 0.5 cm² with accuracy wavelength of 1 nm.
- Balance: A 10⁻⁵ g precision laboratory balance
- Product are deposited with positive-displacement pipette

5.1.2 Substrate

PMMA plate size 5x5 cm, Helioplate HD6, a textured upper surface substrate is the material used for applied sun care product.

Table 1 Parameter of Helioplate HD6 PMMA substrate

Parameter	Ra	Rv	Rdq	A1	Ssc	Vwv
Target value	4.188	11.402	11.004	238.252	0.032	8.701E-4
Upper limit	4.443	12.640	11.964	274.243	0.038	9.756E-04
Lower limit	3.934	10.160	10.044	202.261	0.026	7.646E-04

5.2 Studied products

5.2.1 Product description

Sponsor name: [REDACTED]

Product name: NAG Kayman Beauty Suntella UV Milk SPF50+ PA++++

Formulation no.: [REDACTED]

Lot no.: -

Mfg. date: 08/12/2021

Reception date: 23/12/2021

Appearance: White color cream

Original packaging: Plastic bottle

Study date: 24/12/2021

5.2.2 Storage

The product will be stored at 25±5°C or reference condition as soon as received.

5.3 Methods

5.3.1 Product application and measurement

Sample was loaded and spread evenly onto the PMMA plate to let the sample on the plate of 1.3 mg/cm². Then, sample loaded PMMA plate was allowed to be dried for 15 min in dark condition at 25±2 °C before the measurement. The sample loaded PMMA plate was measured for SPF and UVAPF value by UV-2000s. The sample was prepared in triplicate and the obtained results are averaged.

5.3.2 Standard sunscreen

Standard sunscreen (P5 Lot No: 2901D) was used to be a reference standard in the measurement. SPF of P5 reference standard had to be in a range of 23.7-37.4.

5.4 Data analysis

The *in vitro* SPF value was calculated from UV-2000s program according to the following equation:

$$In\ vitro\ SPF = \frac{\int_{290nm}^{400nm} E(\lambda).I(\lambda).d\lambda}{\int_{290\ nm}^{400\ nm} E(\lambda).I(\lambda).T(\lambda).d\lambda}$$

where $I(\lambda)$ = Spectral irradiance of the UV light source

$E(\lambda)$ = Erythral action spectrum

$T(\lambda)$ = Transmittance

Nine different positions on PMMA plate was measured and averaged. Each sample was analyzed in triplicate.

6. Conclusions

6.1 Results

Product: NAG Kayman Beauty Suntella UV Milk SPF50+ PA++++

Formulation no.: -

Lot no.: -

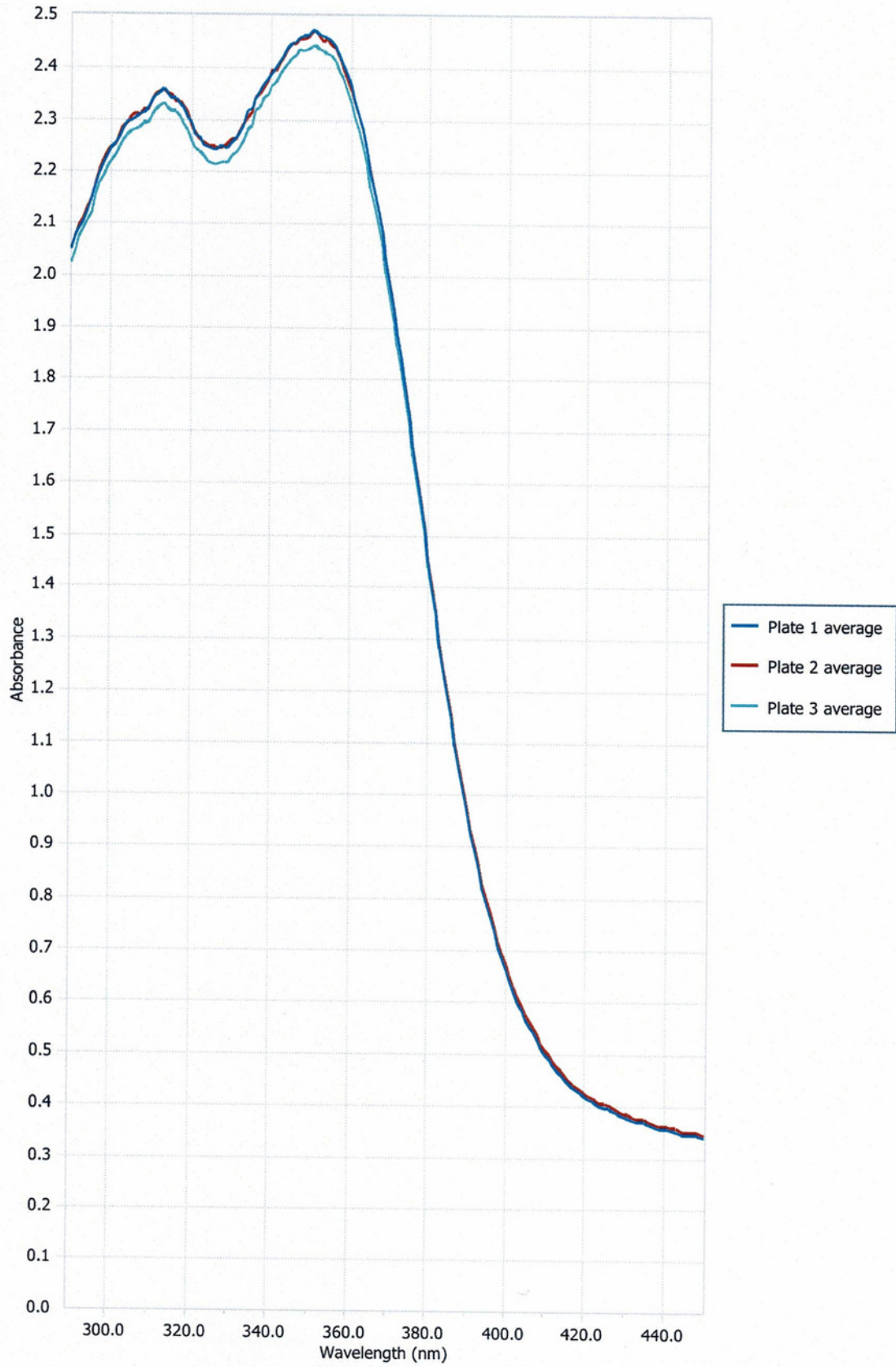
Mfg. date: 08/12/2021

- Mean SPF value of Standard P5 (Lot No: 2901D): 35.67 ± 0.30 (23.7-37.4)
- Mean SPF value of sample : 195.72 ± 6.19
- Mean UVAPF value of sample: 90.77 ± 2.39
- Mean Critical wavelength (nm) : 378.74 ± 0.23

PMMA no.	NAG Kayman Beauty Suntella UV Milk SPF50+ PA++++			Std. P5 (Lot No: 2901D)
	SPF	UVAPF	Critical wavelength (nm)	SPF
Plate 1	198.77	91.57	378.56	35.45
Plate 2	199.78	92.65	378.67	35.55
Plate 3	188.59	88.08	379.00	36.02
Average	195.72	90.77	378.74	35.67
Standard deviation	6.19	2.39	0.23	0.30

NAG Kayman Beauty Suntella UV Milk SPF50+ PA++++

(Manufacturing date: 08/12/2021)



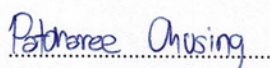
6.2 Report storage

The copy of report will be kept at MUPY Dermocosmetic Testing Center for 5 years. The tested sample will be kept for 3 months after testing and will be disposed in case no return criteria from the sponsor.

6.3 Confidentiality

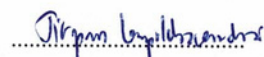
Any information of products such as patents, formula, raw material, and manufacturing procedures provided by the sponsor will be regarded as confidential, and will not be disclosed without consent.

27th December 2021



Analyzer

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Approver

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