JBL

Information on

UV-B Light,

JBL ReptilJungle L-U-W 35 W and **70 W**,

JBL ReptilDesert L-U-W 35 W and **70 W**

and on **JBL TempSet Units L-U-W 35** and 70.

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Speaker:
Dr. Ralf Rombach

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Why L U W lamps ?

Halogen-metal halide lamps are light sources with high light efficiency, high colour reproduction (98 CRI), low los of heat and comparatively low power consumption.

Why do metal halide lamps need an electronic control gear/ballast ?

Metal halide lamps need enormously high starting voltages of up to 5,000 V for ignition. This can only be supplied by corresponding electronic control gears. In this context, the ignition cable must be a special cable with appropriate insulation. Unsafe plug-in connections are unsuitable.

Why does JBL only use electronic control gears (ECG) ?

Safety first: The starting voltage is maintained for a maximum of 20 minutes. If the lamp has not started by then, the electronic control gear turns off. Conventional electronic control gears do not turn off, and they have higher power consumption.

Intelligent electronic control gears (ECG) ?

Safety first: When spotlights reach their end of life, ignition failures occur with increasing frequency. The spot lamp wants to start and draws power. The ECG notices the repeated ignition attempts after a short time and turns off.

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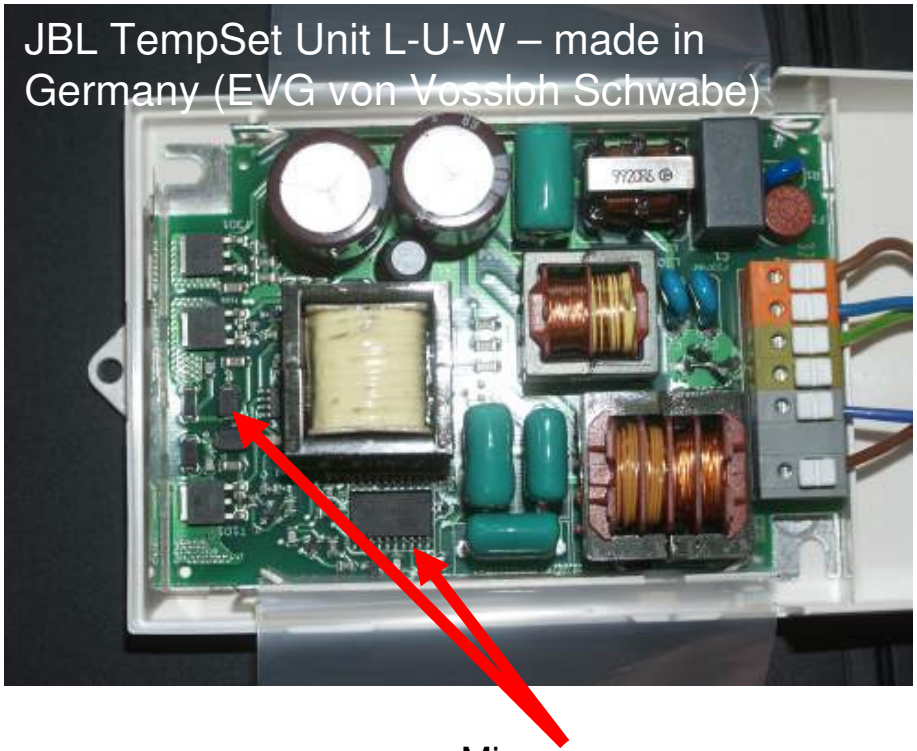

An overview of the benefits offered by the JBL TempSet Unit L-U-W

- Microprocessor-controlled safety shut off in the event of a defective lamp.
- End of Life (EOL) automatic shut off technology. The lamp voltage changes towards the end of life. The control gear registers this change and switches the lamp off.
- Overheating shut off. The control gear switches off if the temperature exceeds pre-set limits. After the unit has cooled down, the ECG restarts automatically.

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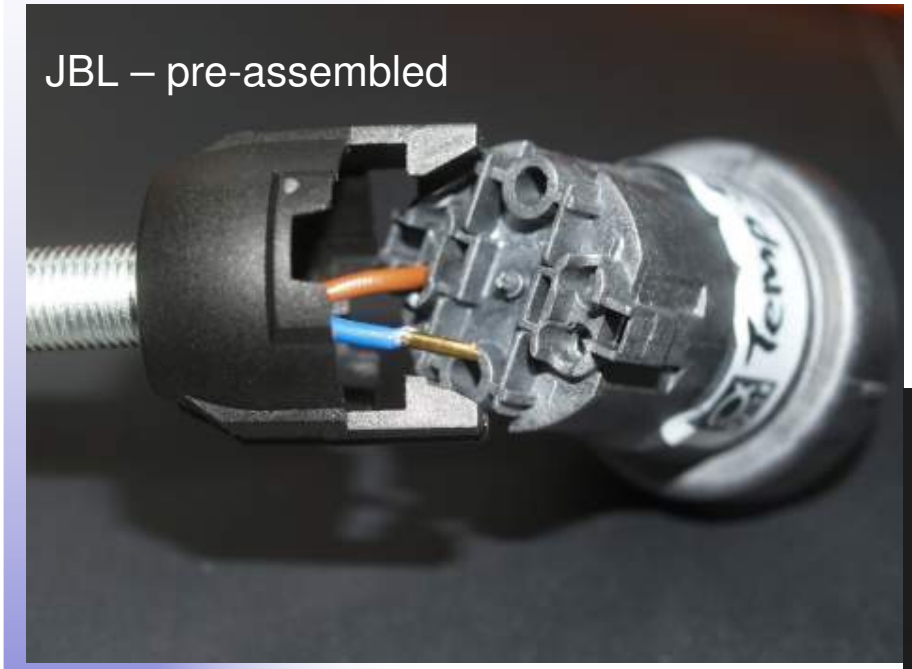
Quality goods from Germany, manufactured and assembled in Germany !

Plastic tested in outer space (Space Shuttle) with temperature tolerances of up to 270 °C in the socket of the **JBL TempSet Unit L-U-W**.

Safe plug-in connection in the socket versus a screw connection

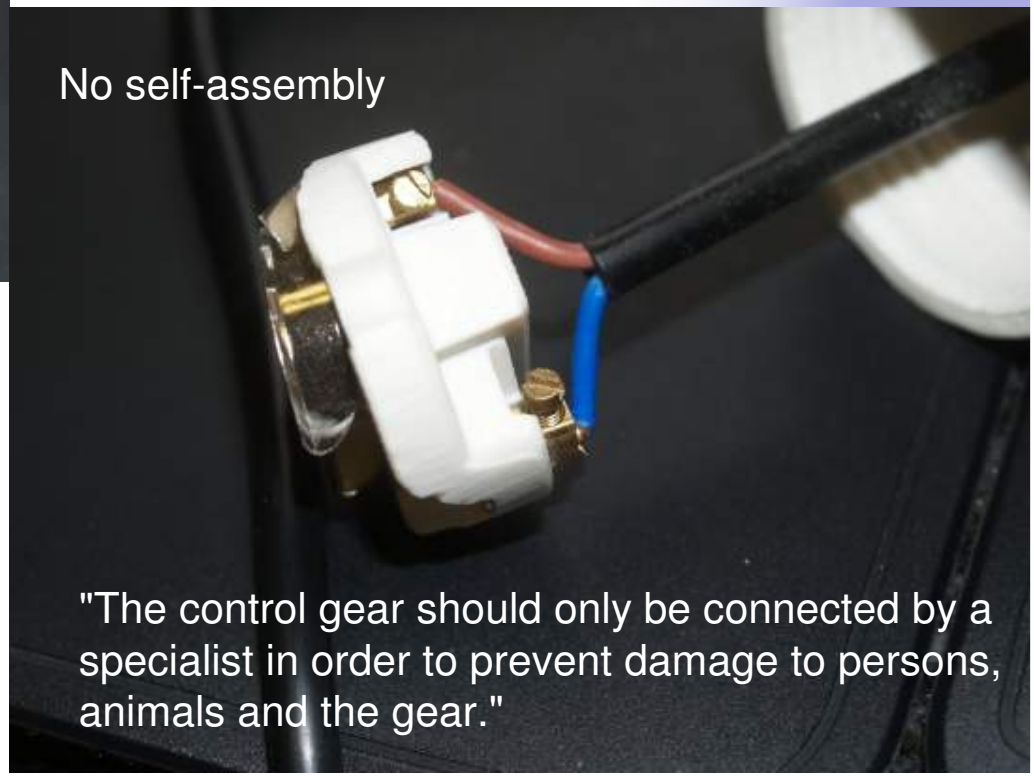


"Assembly can be carried out by anyone if the instructions are followed accurately. This does not require an electrical specialist."

From the instructions of JBL TempSet Unit L-U-W.

5,000 V starting voltage

Requires silicon-coated ignition cables
No unsafe plug-in connection in the ignition cable in the JBL TempSet Unit L-U-W W.



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UV Spot plus 100 W – ReptilDesert 70 W

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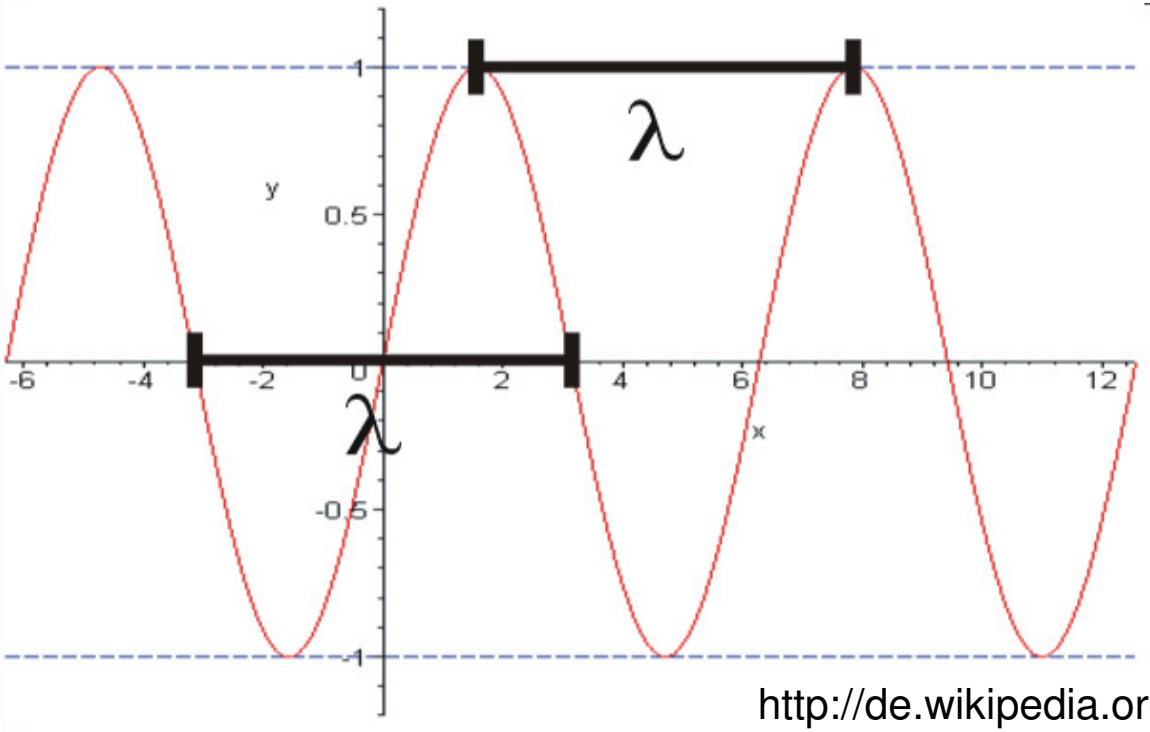
Light is a wave and a particle !

This is due to the wave-particle dualism.
The property as an **electromagnetic wave** is of paramount importance for us.

A wave consisting of coupled electric fields and magnetic fields is known as an **electromagnetic wave**.

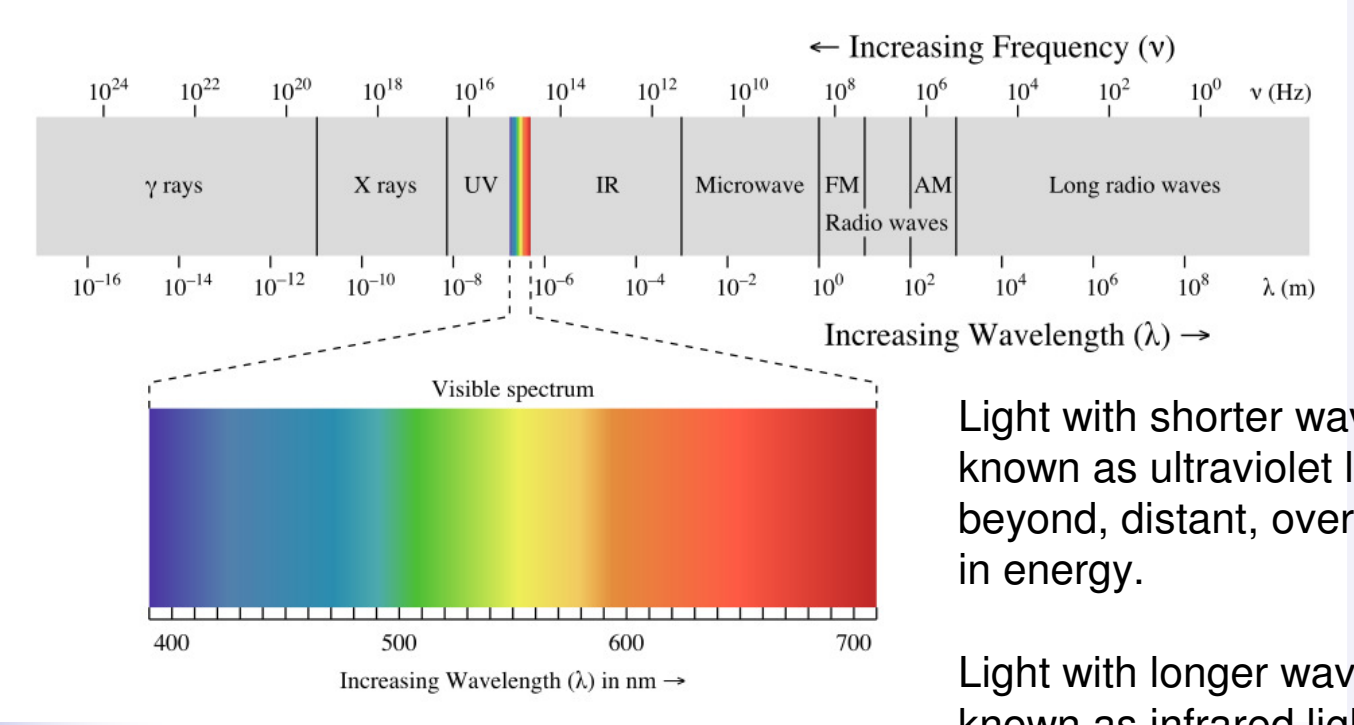
Its **Wavelength (λ)** is an important feature of a wave. It is expressed in metres or a fraction thereof, e.g. **nanometres (1 nm = 0,000000001 m).**



http://de.wikipedia.org/wiki/Wellenlänge

Light has a wavelength !

Light that is visible to humans has wavelengths between 380 nm (violet) and 780 nm (red), while this is different in animals, so that many insects, for example, cannot see red and instead can see ultraviolet light up to 300 nm !



Light with shorter wavelengths is known as ultraviolet light (ultra = beyond, distant, over) and is higher in energy.

Light with longer wavelengths is known as infrared light (infra = under, far below) and is lower in energy.

Philip Ronan
http://en.wikipedia.org/wiki/File:EM_spectrum.svg

UV light has shorter wavelengths than visible light

Below 380 nm, light is termed ultraviolet light, with the following distinctions:

Name	Abbreviation	Wavelength range in nm	Photon energy
Near UV ("black light")	UV-A	315-380 nm	3.26–3.94 eV
Middle UV (Dorno radiation)	**UV-B**	**280-315 nm**	**3.94–4.43 eV**
Remote UV	UV-C-VUV	200 - 280 nm	4.43–6.2 eV
Vacuum UV	UV-C-VUV	100 - 200 nm	6.20–12.4 eV
Extreme UV (no DIN 5031)	EUV, XUV	1 - 100 nm	12.4–1240 eV

http://de.wikipedia.org/wiki/Ultraviolettstrahlung

1 eV = 1.6022 *10^{-19} J (or W*s)

1 kWh = 2.25 * 10^{25} eV

Biological Effects of UV Light

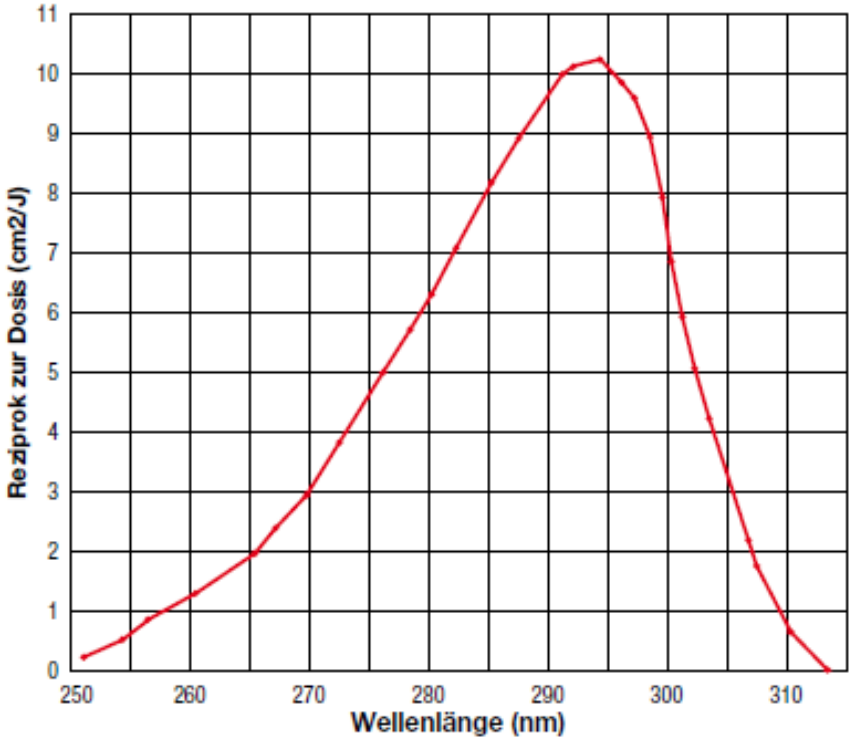
Below 380 nm, light is termed ultraviolet light, with the following distinctions:

Range	Wavelength	Biological effect
UV-A	320–400 nm	Long waves reach the dermis and cause *direct pigmentation* (conformational change of the melanin) – *short-term* tanning, *barely any* light protection, lasts only a number of hours*;* Collagen damage – the skin loses elasticity and ages prematurely; **high risk of melanoma as a result of formation of free radicals;** however, *slightly* erythemic (leading to sunburn)**.**
UV-B	280–320 nm	In the epidermis, short waves cause the formation of melanin – "*indirect* pigmentation", "delayed", *long-term* tanning (compare skin colour) with genuine *light protection* with approx. 72 hours delay. However, they also penetrate deeper, with a *strong erythemic* effect (sunburn); **cause the formation of antirachitic cholecalciferol (Vitamin D_3) in the skin.**
UV-C	100–280 nm	Very short waves, do not reach the earth's surface, absorption by the uppermost air layers of the earth's atmosphere, generate ozone by photolysis of atmospheric oxygen below approx. 200 nm. UV-C radiation (especially at low vapour pressures, with a high yield (30–40 %) of the electrical power applied, excitable emission line of the mercury vapour (at 253,652 nm), used in the field of physical disinfection technology (see also mercury vapour lamps).

Original from:
http://de.wikipedia.org/wiki/Ultraviolettstrahlung

Is every UV-B light suited for the synthesis of vitamin D3 ?

The answer is a loud and clear "NO" !



Aktivitätsspektrum von 7-DHC zur Vor-D3-Umwandlung

Source of the figure: www.exoterra.com (date: August 2011)

Literature:

M.F. Holick: Phylogenetic and Evolutionary Aspects of Vitamin D from Phytoplankton to Humans. In: Pang, PKT, Schreibman (eds.): Vertebrate endocrinology: fundamentals and biomedical implications. Vol. 3. Orlando: Academic Press, 1989

The effectivity of the production of vitamin D3 (more precisely, provitamin D_3) is dependent on wavelength within the UV-B spectrum and has its highest efficacy at 294 – 295 nm.

UV-B meters – suitable or not ?

In the instructions for the HQI spot lamp over the Solarmeter 6.2 (product purchased in July 2011), LuckyReptile writes:

"Accordingly, many manufacturers now advertise with microwatts / cm² (µW/cm²), where the radiated surface is then also taken into account. However, these values are misleading, because they are distance-dependent and ***relate to the entire UVB area****.* ***Therefore, when using this value, it is impossible to make a statement as to whether the lamp is safe or also suited for Vitamin D3 synthesis****.*

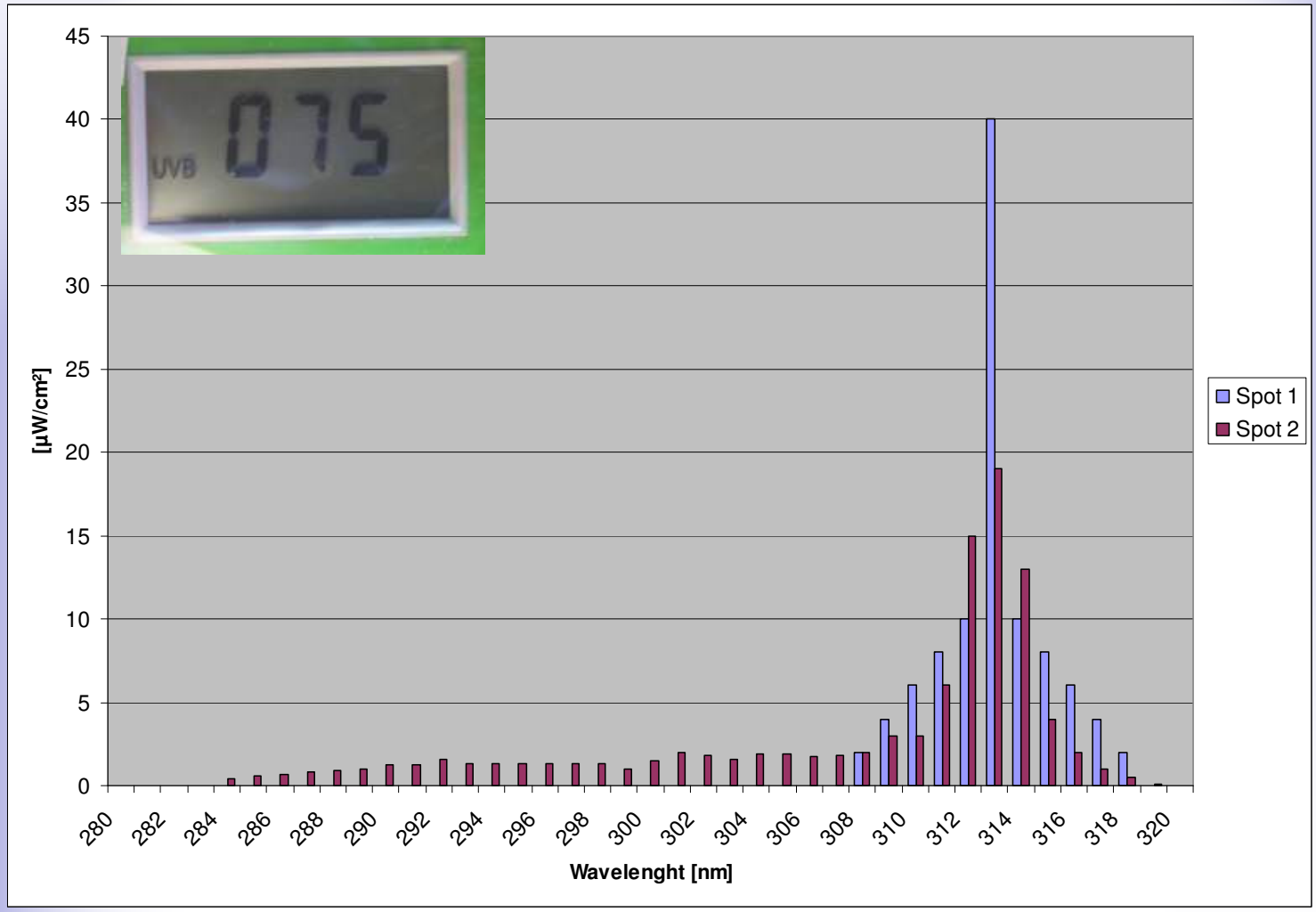
The same applies to measurements with ***broadband UV meters (e.g. solar meter 6.2)****. The instruments indicate the amount of energy emitted by a lamp in the UVB range, i.e. between 280 and 315 nm per surface unit (µW/cm²). In this way, the entire spectral range of UVB is taken into account in the computation. This kind of instrument cannot provide information as to which wavelength precisely is responsible for the energy that is measured with the meter. For example, it may be that the lamp only emits a large amount of UVB radiation in a very narrow spectral range. It is just as conceivable that the value is comprised of the sum of small radiation values which cover a broad spectral range. Many UV lamps exhibit a high radiation intensity in the range of 313 nm, which is characteristic of mercury emission. This wavelength is irrelevant for vitamin synthesis, but the meter will display clear values.*

Accordingly, it may very well be that a lamp with no UVB in the range of 290-305 nm shows higher values with a broadband meter than a good lamp with a balanced spectrum that is much more effective in supplying animals with UV.“

Is that correct ?

UV-B meters – suitable or not?

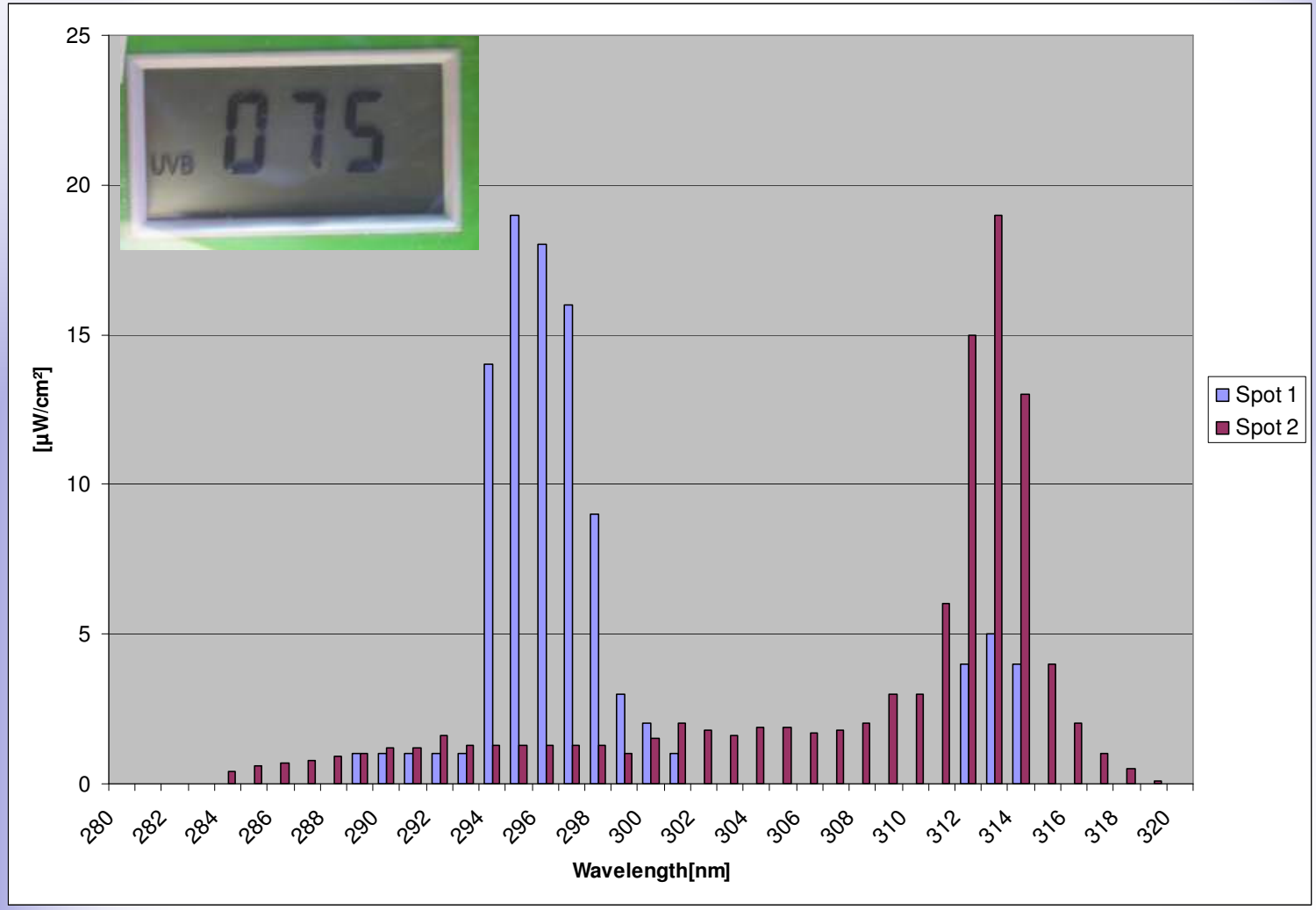
Do these two theoretical lamps show the same result as the Solarmeter 6.2?



Example 1

UV-B meters – suitable or not ?

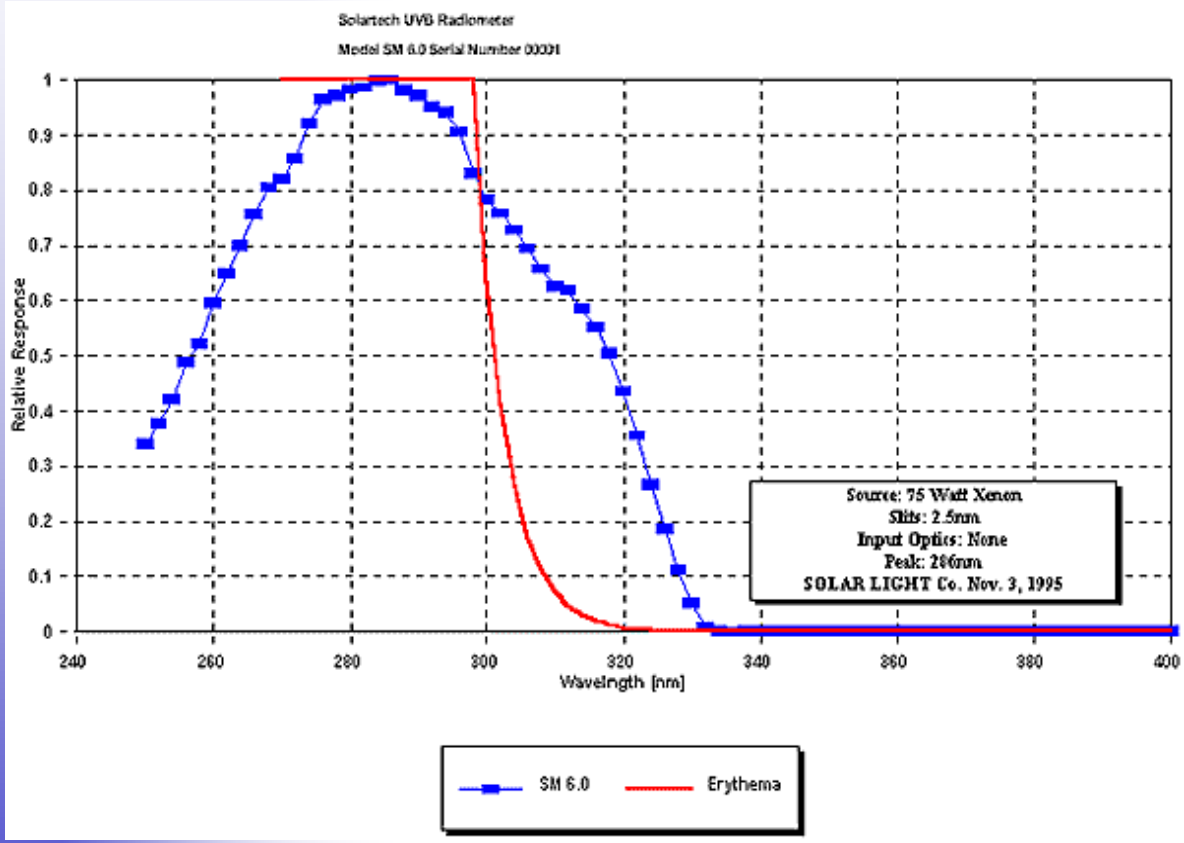
Do these two theoretical lamps indicate the same result as the Solarmeter 6.2 ?



Example 2

Solarmeter 6.2 UVB

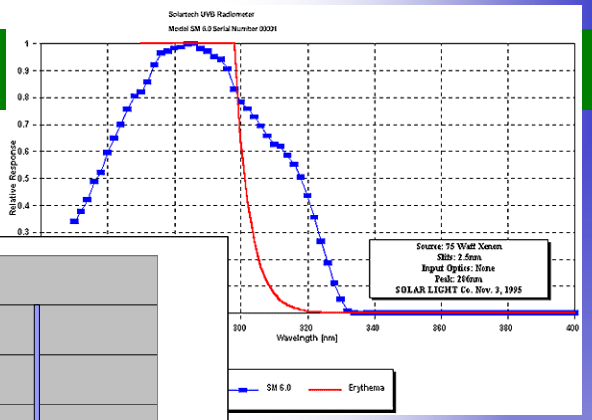
The answer is: No !



Precisely in the range that is important for Vitamin D_3 synthesis, the sensor of the Solarmeter 6.2 shows a high relative response to UV-B light at wavelengths between 275 nm and 295 nm.

http://www.solarmeter.com

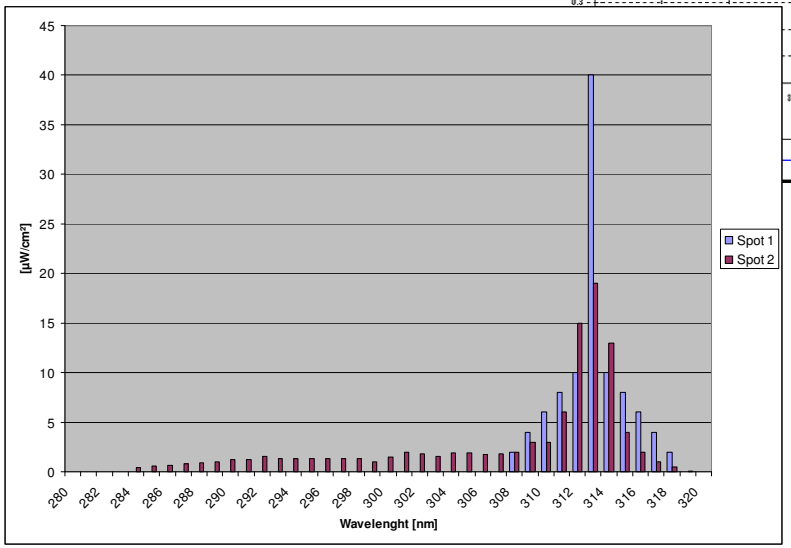
Solarmeter 6.2

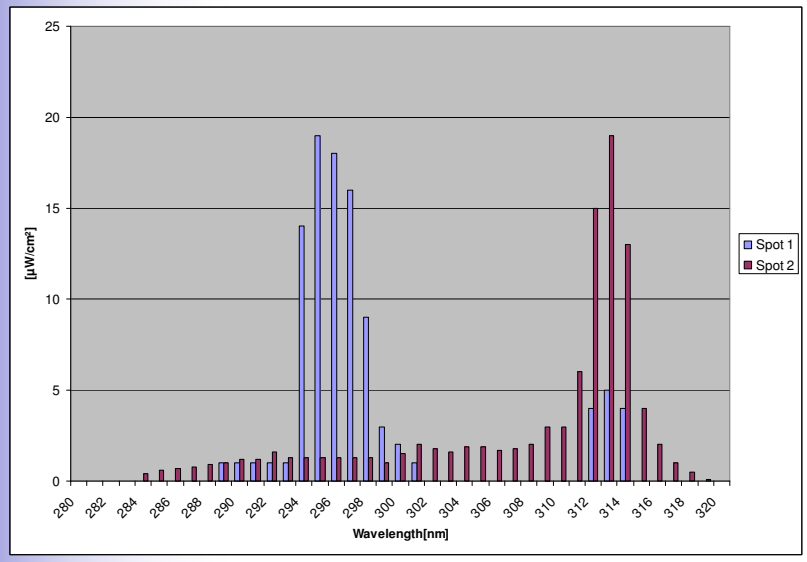


The response of the sensor is wavelength dependent, so that it is weighted !

In **Example 1**, the **meter** would show **59 µW/cm²** for Lamp 1,

By contrast, the value for Lamp 2 would be **69 µW/cm²**.





In Example 2, the meter would show 86 µW/cm² for Lamp 1,

By contrast, the value for Lamp 2 would be **69 µW/cm²**.

Solarmeter 6.2

http://www.licht-im-terrarium.de/uv/breitband_messgeraete

- **Solarmeter 6.2 (UVB)**
  - Einheit UVB µW/cm²
  - Übereinstimmung mit $W(\lambda)$=Vitamin D

$$1 - \frac{1}{2} \int_{280nm}^{400nm} d\lambda \left| \overline{A}(\lambda) - \overline{W}(\lambda) \right| = 75\%$$

According to this computation, 75 % of the measured UV-B values are available for vitamin D_3 synthesis.

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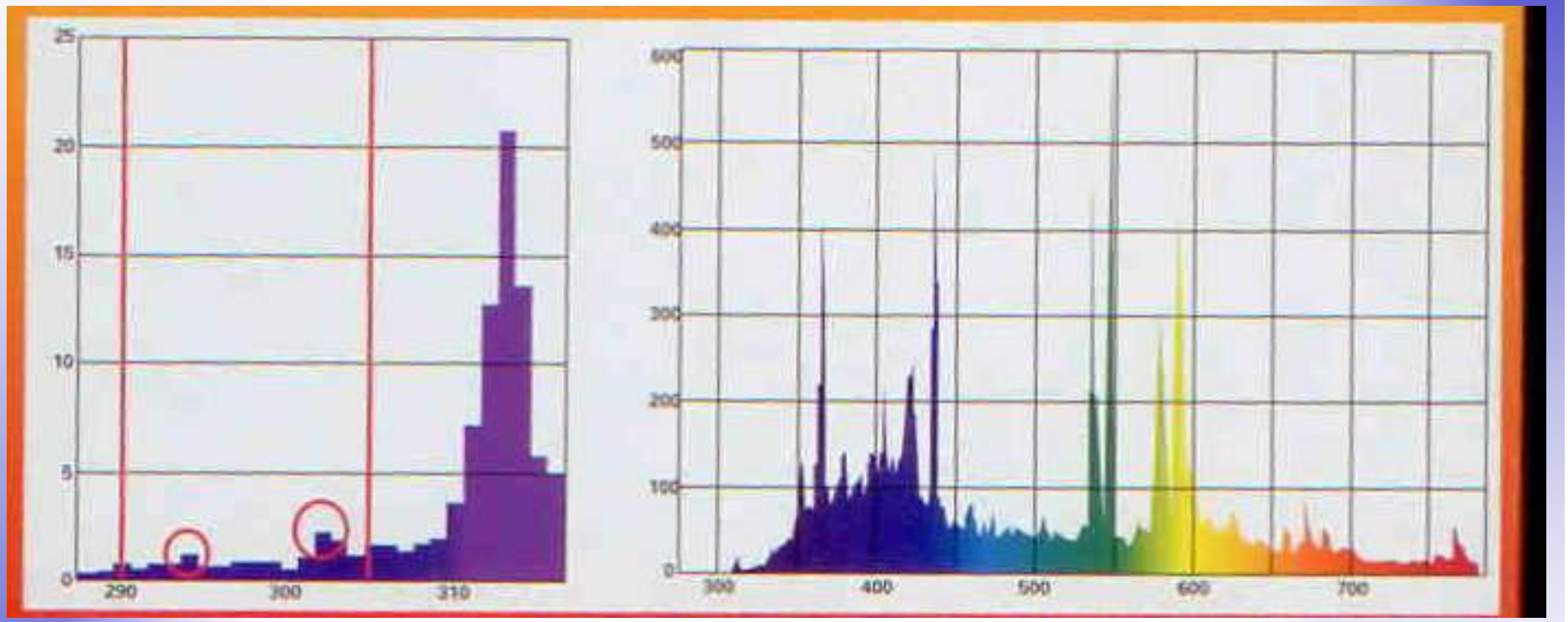
Optimale 10 µW/cm² bei 290-305 nm garantiert*!

Figures, figures, figures ?



Quote from the instructions: "Many UV lamps exhibit a high radiation intensity in the range of 313 nm, which is characteristic of mercury emission. This wavelength is irrelevant for vitamin synthesis, but the meter will display clear values." (Purchase of the product: July 2011)

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Scan of the spectrum of the packaging of the
LuckyReptile Bright Sun UV Desert 70 W HID lamp.
Date: July 2011

JBL

Optimale 10 µW/cm² bei 290-305 nm garantiert*!

Figures, figures, figures ?

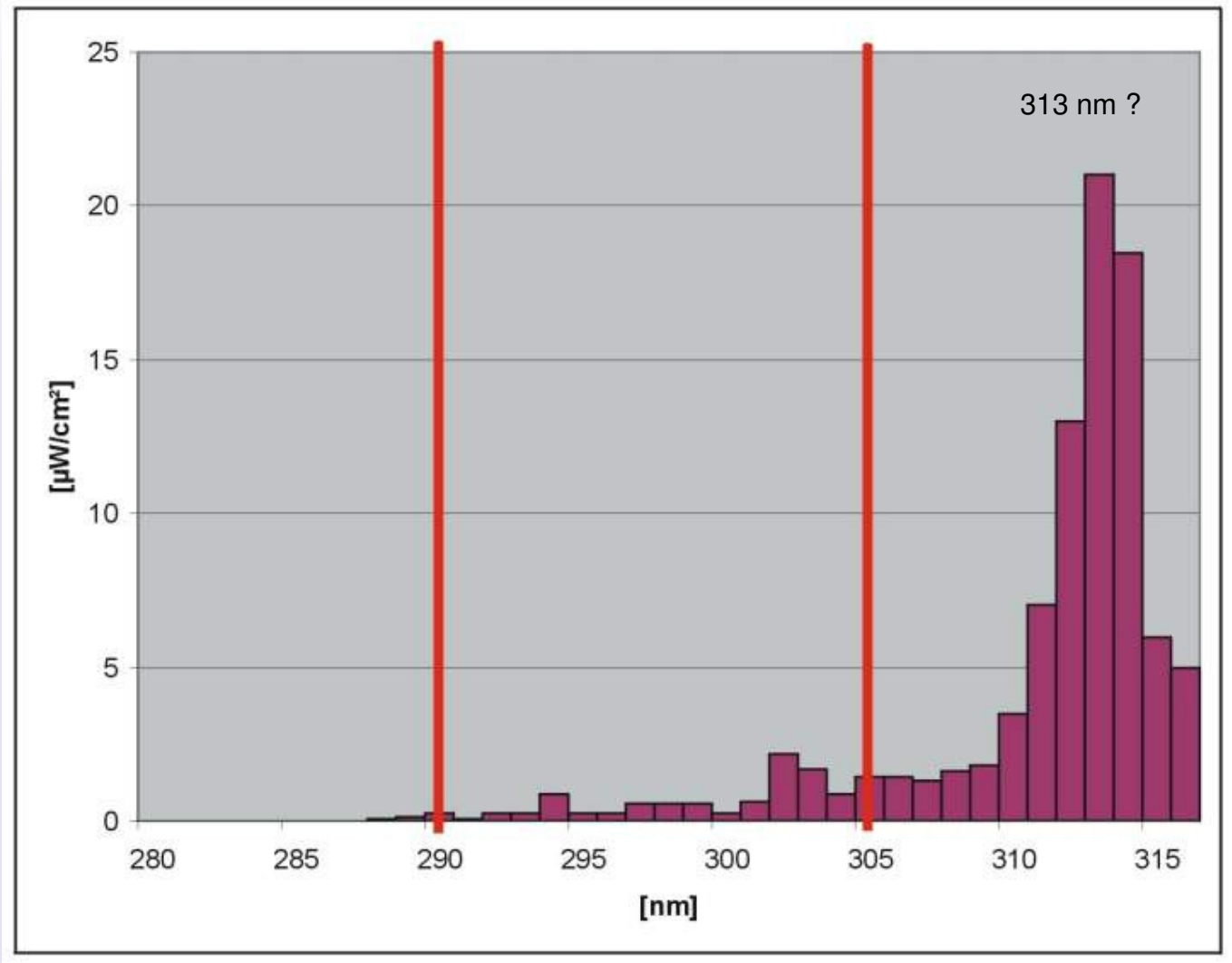
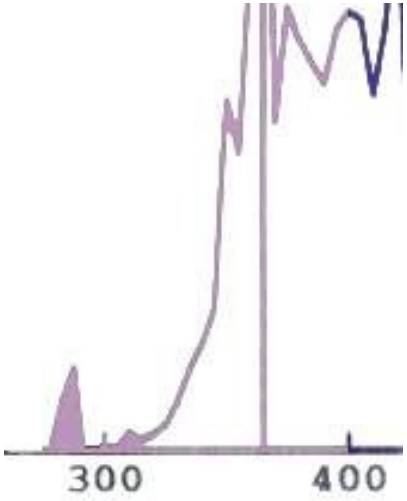
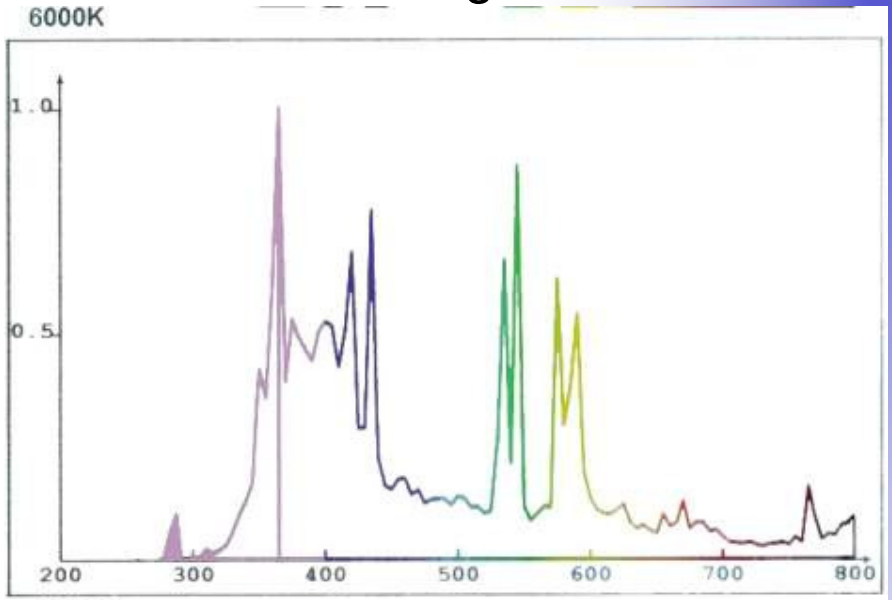


Figure revised according to the packaging of the LuckyReptile Bright Sun UV Desert 70 W HID lamp.
Date: July 2011

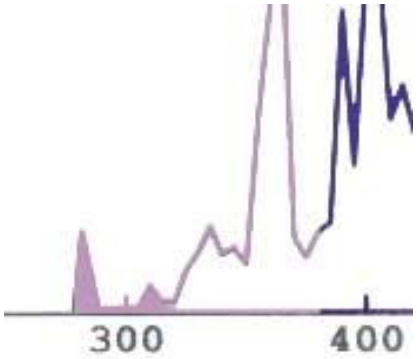
Spectrum of JBL Light L-U-W Desert and Jungle

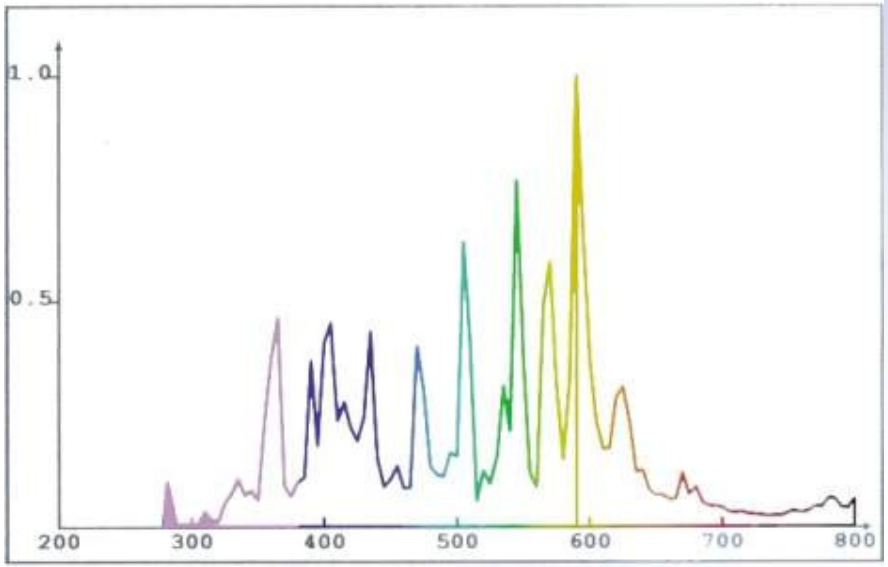
JBL ReptilDesert L-U-W





JBL ReptilJungle L-U-W





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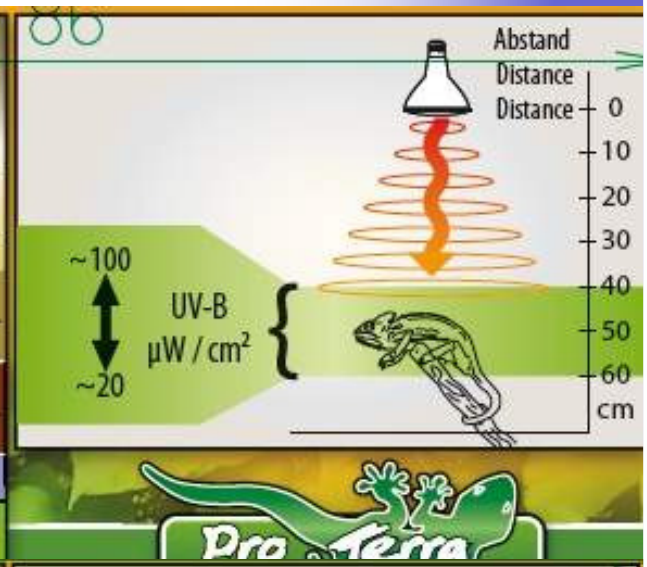
What actually makes sense?

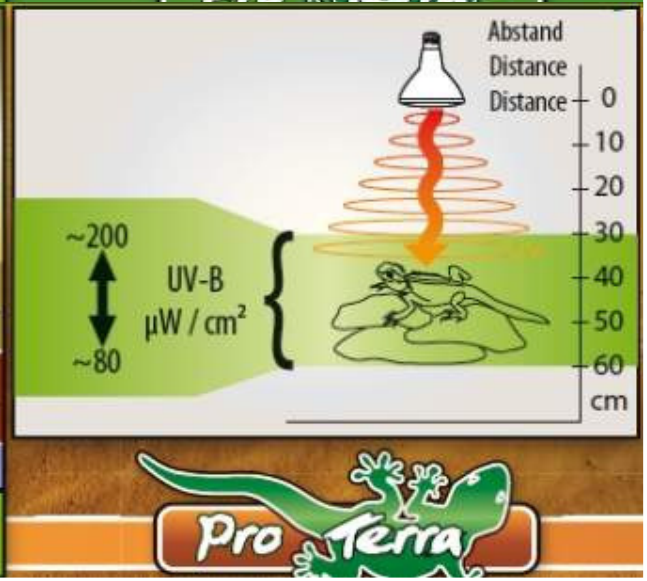
JBL SOLAR / Reptil	Jungle / Desert Daylight	Jungle UV 190 / 310	Desert UV 300 / 480	UV -Spot plus	Jungle / Desert HQI	Reptil Spot	Reptil Day
Licht/Light/ Lumière	++	+	+	+	++	++	++
Wärme/Heat/ Chaleur	-	-	-	++	++	++	++
UV-B	-	++	++	++	++	-	-

++ hoch / ++ high + mittel / + medium - gering / - zero



JBL SOLAR / Reptil	Jungle / Desert Daylight	Jungle UV 190 / 310	Desert UV 300 / 480	UV -Spot plus	Jungle / Desert HQI	Reptil Spot	Reptil Day
Licht/Light/ Lumière	++	+	+	+	++	++	++
Wärme/Heat/ Chaleur	-	-	-	++	++	++	++
UV-B	-	++	++	++	++	-	-

++ hoch / ++ high / ++ beaucoup + mittel / + medium / + moyen - gering / - zero / - zéro



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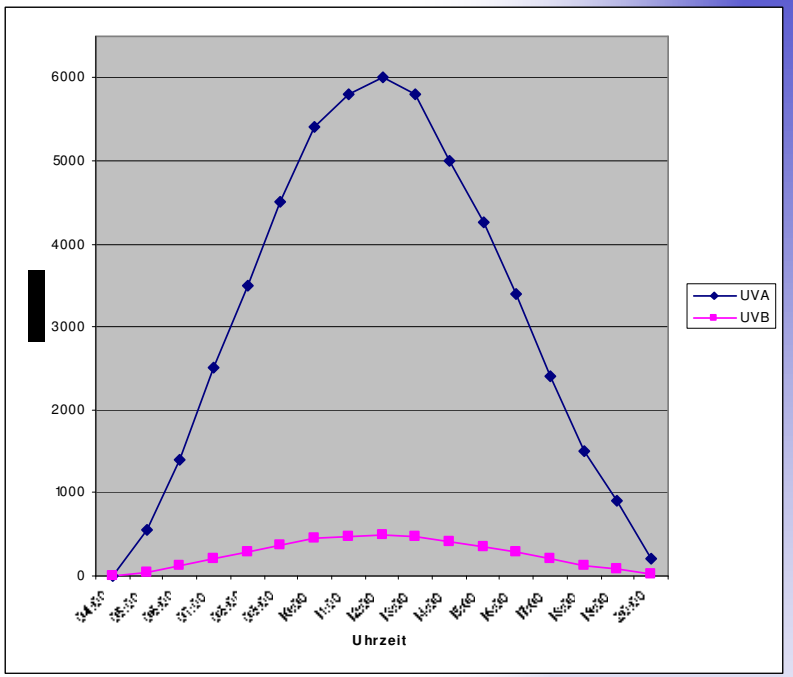
What actually makes sense?

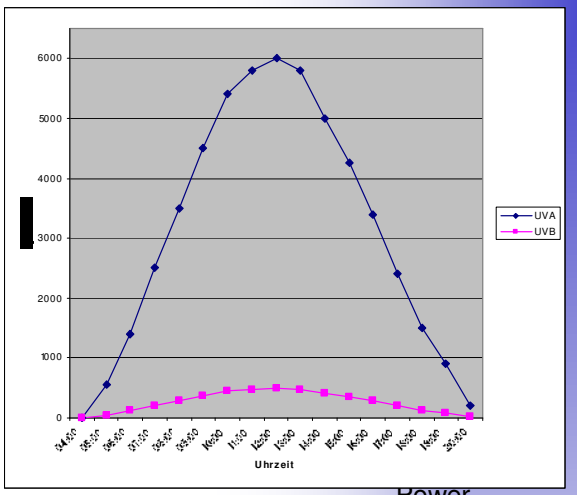
In the course of the day, the UV values fluctuate with the course of the sun. They reach their peak at noon. The course of the wave is the same for UV-A and UV-B, but, of course, different radiation intensities are reached. In desert regions, UV-A radiation can reach values of up to 6,000 µW/cm² and UV-B radiation up to approx. 500 µW/cm². Reptiles generally do not like to bask in the sun during periods of maximum radiation, and instead prefer mornings and afternoons before the times when they are most active.



UV-A light is important for the social behaviour (territorial defence, courtship display) of reptiles, which can see the radiation visually (many lizards and turtles). UV-A radiation is reflected by colour patterns on the head and trunk, making the animals appear more colourful to other members of their species (see literature on this subject by H.D. Lehmann: UV-Bestrahlung im Terrarium – der Status quo. Elaphe 15: 20 – 30 (Issue 4), 2007).

Therefore, many lizards can actively control the production of Vitamin D_3 by exposing themselves to radiation intensities of a correspondingly defined long duration.

Figures, figures, figures



	Colour temperature	Amount of light	Temperature	UV-B	UV-A	Power consumption incl. JBL TempSet L-U-W
	[°K]	[lux]1,2	30 cm [°C]3	[µW/cm²]1,2	[µW/cm²]1,2	[W]
JBL ReptilDesert L-U-W 35 W	6000	30390	36	125	4.1	42
JBL ReptilJungle L-U-W 35 W	4000	42860	38	83	3.8	42
JBL ReptilDesert L-U-W 70 W	6000	148820	55	237	14.4	77
JBL ReptilJungle L-U-W 70 W	4000	175570	61	141	8.5	77

1 - At a distance of 30 cm
2 - Average values
3 - Surface temperature of a dark basalt rock

The world is more colourful than we think !

UV Vision:

Many fish and reptiles, as well as a few primitive mammals, can see UV light. They have a fourth type of cone in their retina which responds to UV light (tetrachromatic vision). Parakeets/budgies (Melopsittacus undulatus) can see UV light, and they can also perceive more shades of blue (e.g. blue with ultraviolet in different portions) in colour combinations than humans can.

The presence of a fourth type of cone in the retina, though, means that the animal actually perceives UV light as well. This requires additional interconnections in the visual centres of the brain. The ability to perceive UV can be tested by behavioural studies and animal training experiments.

For information on tetrachromacy, see also http://www.bio.uni-mainz.de/zoo/abt3/107.php

JBL ReptilDesert L-U-W and **ReptileJungle L-U-W** spotlights undergo a functional test and a quality check that measures UV output.

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JBL UV Spot plus 100 W – JBL ReptilJungle L-U-W 70 W

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For the good of your animals !

Thank you very much for your interest