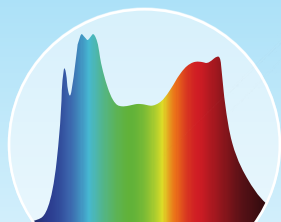


SPECTRASOL
PROCOGNITIVE LIGHTING



SILENT **LAB**



Developed and validated in
collaboration with

NIMH NATIONAL INSTITUTE
OF MENTAL HEALTH



PHOTOTHERAPY PAVILION



Patented
full-spectrum LED technology
with unique circadian effect

The development and application methodology of this device were created in cooperation with CTU UCEEB (Czech Technical University - University Centre for Energy Efficient Buildings) and NIMH in project No. FW02020025 funded with the support of the Czech Technology Agency and the Ministry of Industry and Trade of the Czech Republic within the TREND Programme.



Light as a biological signal

Light is a highly significant signal from the external environment that influences many physiological processes. Besides enabling image vision through rods and cones in the retina, it is the most important synchronizer of the biological clock and also directly influences areas of the brain regulating mood, cognitive functions and sleep. This so-called non-image “vision” is mediated by a third type of photoreceptor in the retina, the intrinsically photosensitive retinal ganglion cells (ipRGCs).

Mechanism of phototherapy effect

The mechanism of the phototherapy effect is mediated by the ipRGC pathway. These cells form part of the optic nerve and their axons affect many areas of the brain. The dominant part leads to the hypothalamic region that controls circadian rhythms (suprachiasmatic nuclei, SCN). The human circadian clock runs with a genetically determined period typically slightly longer than the 24h length of the solar cycle, according to which social, conventional time is set. In healthy individuals, exposure to daylight during the day is sufficient to synchronize this internal time through phase shifts with the solar cycle, thus adjusting the length of its endogenous period. Disrupted synchronization between the master pacemaker in the SCN and peripheral clocks in other brain structures and peripheral organs, or inefficient light synchronization, tend to be concomitant phenomena of many psychiatric and other illnesses, and may be the primary cause of some disorders. In these cases, phototherapy acts as an amplified synchronization signal that modifies the phase, period and amplitude of circadian rhythms and, as a result, ameliorates symptoms and accelerates the treatment of psychiatric disorders in particular. For people with disrupted circadian systems, the phase-response curve is a useful tool to help find the optimal time for phototherapy to achieve the maximum expected effect. Since morning light is essential for humans to adjust the internal long period, morning hours also tend to be the first choice for the application of light intervention.

In addition to the synchronizing effect of phototherapy on the circadian system, light also has a direct effect on brain structures that regulate cognitive function and mood. In particular, ipRGCs affect the perihabellar nucleus, connected to the lateral habenula, whose neuronal activity is significantly altered in patients with depression and other forms of psychiatric illness. Light also directly influences serotonergic, dopaminergic, and noradrenergic neurotransmission via ipRGCs and their indirect impact on relevant neurons in the brainstem (via the lateral habenula and the dorsomedial nucleus of the hypothalamus).



Spectrasol phototherapy pavilion

The pavilion is a large phototherapy device for promoting psychological well-being and stabilizing circadian rhythms. It is a self-contained cubic structure with a side of 2.5 meters that can be placed in a lobby area, waiting room in a mental health centre or similar institution providing inpatient and outpatient care. Inside it there is comfortable seating for up to 6 people.

The entire structure has a pleasant modern design with a combination of soft upholstered surfaces in light colours and natural wooden surfaces. The entire ceiling and half of one side wall are fitted with LED light sources with diffusers so that the whole area is lit and creates a feeling of open space, of sky, with its low, balanced brightness. The two side walls of the pavilion are open, fitted with curtains that allow creation of a private space and at the same time promote the even distribution of light.

The effectiveness of the pavilion is ensured by the combination of high illuminance, efficient spectrum and multi-directional, even light distribution in the space. To ensure good patient acceptance of the therapy, the visual comfort of phototherapy is based on the size of the illuminated area, its position in the field of view and the brightness conditions it produces.

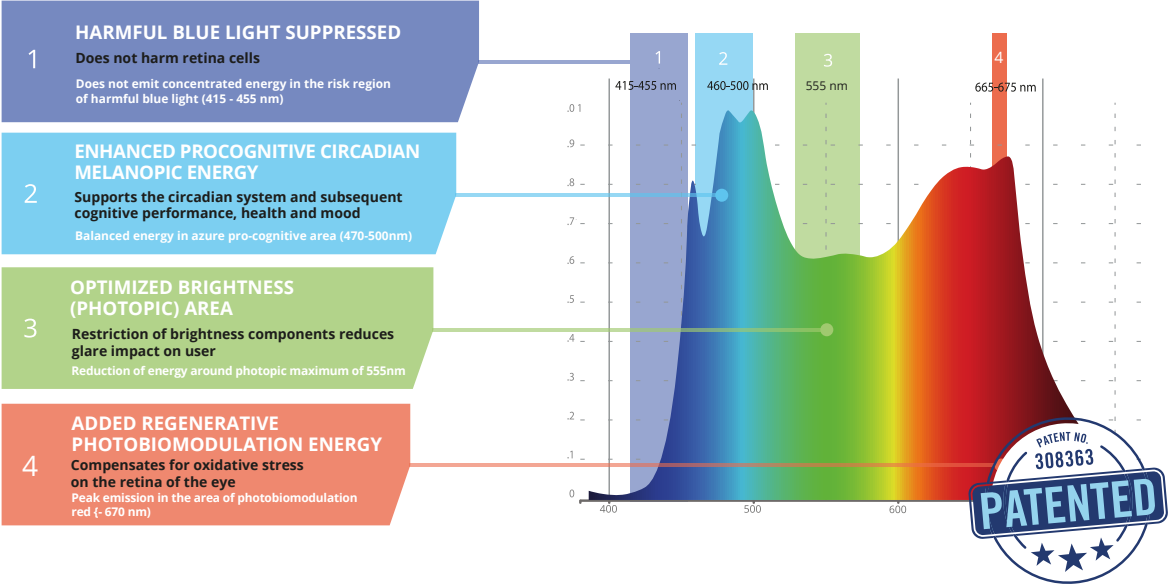
- ▶ A high therapeutic impact is made possible by the use of Spectrasol Therapeutic's unique light spectrum technology (protected by patent no. 308363) with a high representation of wavelengths in the sensitivity range of ipRGC cells, which act on the circadian system. At the same time, the composition of the spectrum is beneficial for the eyes of the user due to the limitation of harmful blue wavelengths below 450 nm and the content of red wavelengths around 670 nm.
- ▶ Compared to commonly available phototherapy devices, the pavilion offers a spatial solution with a large-area light source that covers more than 40% of the field of view. The dominant light flux is directed from above. The large emitting area makes it possible to achieve a pleasant diffuse character of light in the space without the presence of glare from high brightness on the surface.
- ▶ The power of the light source can be infinitely adjusted according to the therapy needs. The basic setting offers two levels. At higher power, the so-called therapeutic mode, the illuminated area reaches the average surface brightness of a summer sky. In the lower power, so-called civil mode, the brightness of the area corresponds to an overcast sky. Achieved illuminance converted to the melanopic sensitivity of ipRGC cells (melanopic EDI) corresponds to the values required in Czech and international standards for phototherapy.

Use of chronobiological phototherapy

Bright light has been used in the treatment of the mentally ill since ancient times. Phototherapy (chronobiological phototherapy, bright light therapy, BLT) as a scientific and therapeutic method began to be used in the 1980s in the scientific and therapeutic treatment of seasonal affective disorder (SAD). Today, it is considered the go-to treatment for this diagnosis, and meta-analyses confirm its effectiveness even in non-seasonal depression, with an effectiveness comparable to that of antidepressants. Light therapy can also be combined with other psychological or pharmacological treatments. Unlike conventionally used pharmacotherapy, phototherapy produces significant improvement within days and can therefore help to bridge the long latency of onset of action of antidepressants. In addition to the treatment of depression, phototherapy is also considered an effective method of treating circadian rhythm sleep disorders and has been successfully applied to a number of other diagnoses - bipolar depression, premenstrual dysphoric disorder, perinatal depression, borderline personality disorder with comorbid depression, Parkinson's disease, Alzheimer's disease, etc.



Unique spectral composition and key areas of emitted therapeutic light Spectrasol



Basic technical data

Pavilion dimensions	2500x2400x2550 mm	
Light area	3100x2200 mm	
Relative melanopic device efficiency (melanopic DER)	0,934	
Photopic luminance *	Routine mode 2300 lx	Therapeutic mode 8000 lx
Equivalent melanopic daylight illuminance *	2100 lx	7500lx
Input power	800 W	2500 W
Correlated colour temperature (CCT)	5000 K	
Colour rendering index (Ra)	>80	

* on the pupil of a seated person

Verified efficacy

The National Institute of Mental Health of the Czech Republic conducted a validation of the efficacy of phototherapy in the Spectrasol phototherapy pavilion on healthy subjects and the clinical population. The aim was to verify whether the technology affects subjective experience, cognitive function and physiological variables, both immediately after a single exposure and after regular repeated exposure. Validation was conducted in the following six areas:

- › **Visual comfort**
- › **Affective experience and mood**
- › **Cognitive function**
- › **Sleep**
- › **Circadian rhythms**
- › **Brain electrical activity**



NIMH NATIONAL INSTITUTE
OF MENTAL HEALTH



The detailed NIMH certified methodology, available as part of the delivery, can be used in the application see. QR link on the reverse side.



Therapy can only be carried out on the recommendation and as instructed by a specialist doctor or therapist. Violation of these instructions may cause adverse effects on the body.

SPECTRASOL
PROCOGNITIVE LIGHTING



Spectrasol.eu - phototherapy



Product information



**Certified application methodology -
National Institute of Mental Health**

The development and application methodology of this device were created in cooperation with the CTU UCEEB and the NIMH in the project No. FW02020025 funded with state support from the Technology Agency of the Czech Republic and the Ministry of Industry and Trade of the Czech Republic within the TREND Programme.



NIMH NATIONAL INSTITUTE
OF MENTAL HEALTH

Spectrasol s.r.o.
www.spectrasol.eu
info@spectrasol.cz

