



Color and Spectrum Control Application for Ecological Lighting

Heliodor Macko, CEO SEAK
Tel Aviv, 7.7.2026



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Technology Fast 50
2025 CE LAUREATE
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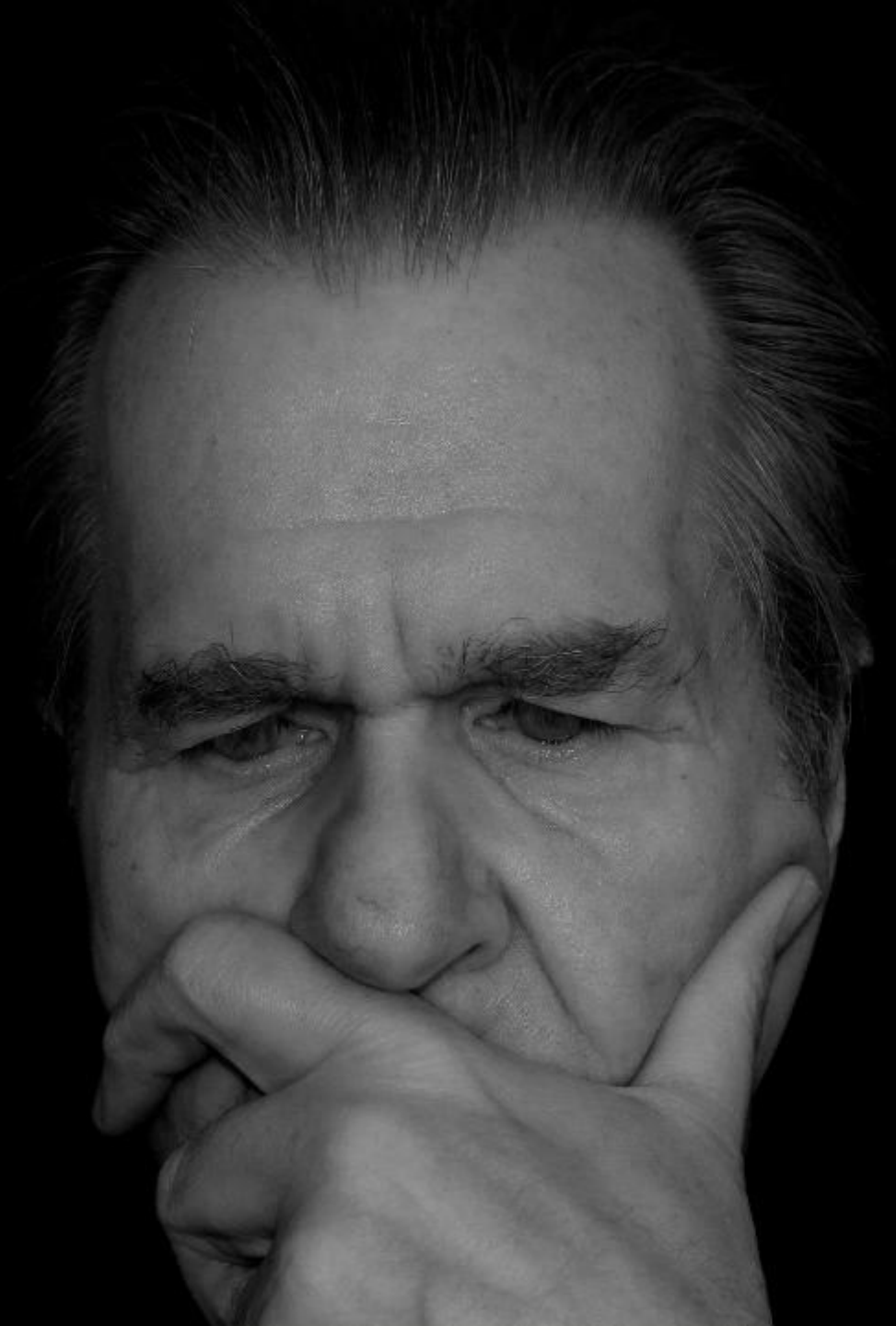
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**In the last 10 years we
have changed a lot of
lighting to LED
to cut the energy bills**

**But was it
always good?**



The LED Paradox

Efficiency vs. Ecology

While we solved the energy efficiency problem, we accidentally triggered an ecological crisis.

⚠ Too much lighting ruins the night sky

⚡ Standard white LEDs have the “blue pump” in color spectrum



The Blue Light Problem

Wavelengths between 450nm and 480nm do:

1. The suppression of melatonin in vertebrates causes:



disrupted sleep cycles



weakened immune response



long-term cognitive fatigue

2. Act as an absolute magnet for phototactic insects (decimating local food chains)

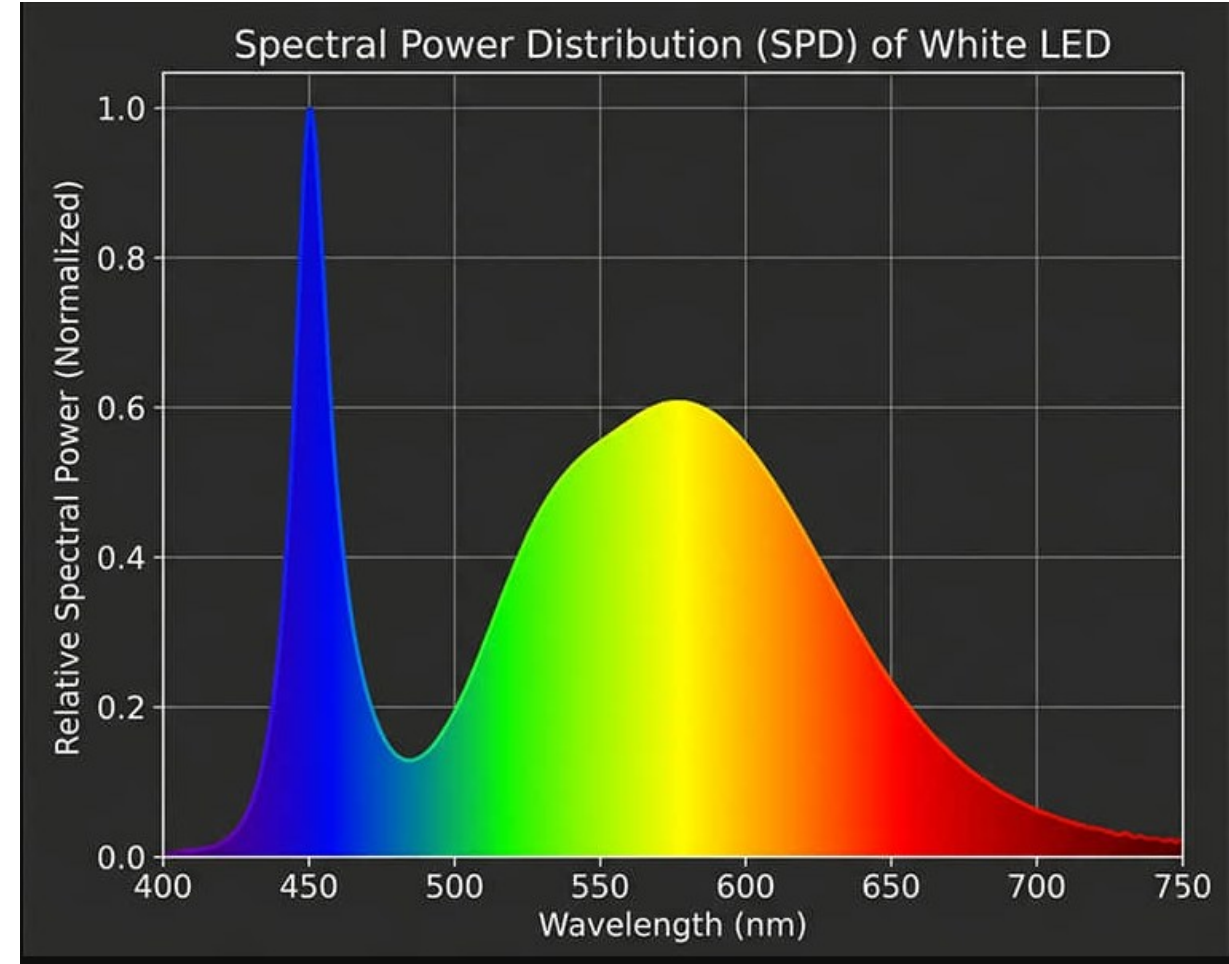


The Blue Light Problem

Debunking a Myth

Correlated Color Temperature
is not everything

A fixture labelled with
CCT 3000 K can still emit
a massive spike
of blue light at 450 nm



Technical Solution

You can use...

Special color lighting

Using "Warm White" (2700K) is often not enough. The blue peak remains present, just reduced in intensity.

or

Amber LEDs

Amber LEDs emit light entirely above 550nm and take the intensity DOWN (if needed, use sensors to detect humans and bring the light up temporarily)

Different light sources have different % of blue spectrum



White LED 4000K
27-32% Blue



PC Amber LED
1% Blue



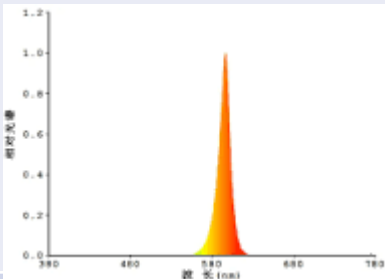
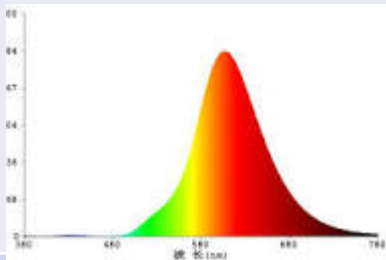
HPS lamp
10% Blue



MH lamp
33% Blue

Technical Solution

True Amber vs PC Amber LEDs

	TRUE Amber (Monochromatic)	Phosphor-Converted Amber
Technology	True Amber uses an Aluminum Indium Gallium Phosphide (AlInGaP) semiconductor chip. Natively emits light at exact wavelength.	PC Amber uses standard LED chip (blue pump), coated with thick layer of amber-emitting phosphor
Spectral power distribution	590 nm (+-5 nm) 	Broader range 
Blue light	Zero blue light	A small fraction of blue light gets through
Efficacy	30–50 lm/W	85-110 lm/W
Color rendering index	Terrible CRI 0-20	Somewhat better CRI 40 – 60
Cost	\$\$\$\$	\$\$
Usage	Coastal zones Nature reserves	Inland roads Buffer zones around nature parks

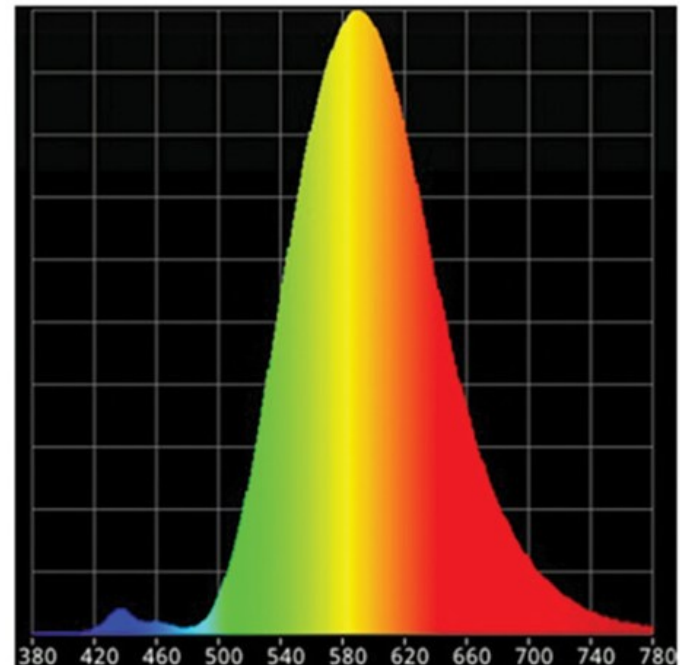
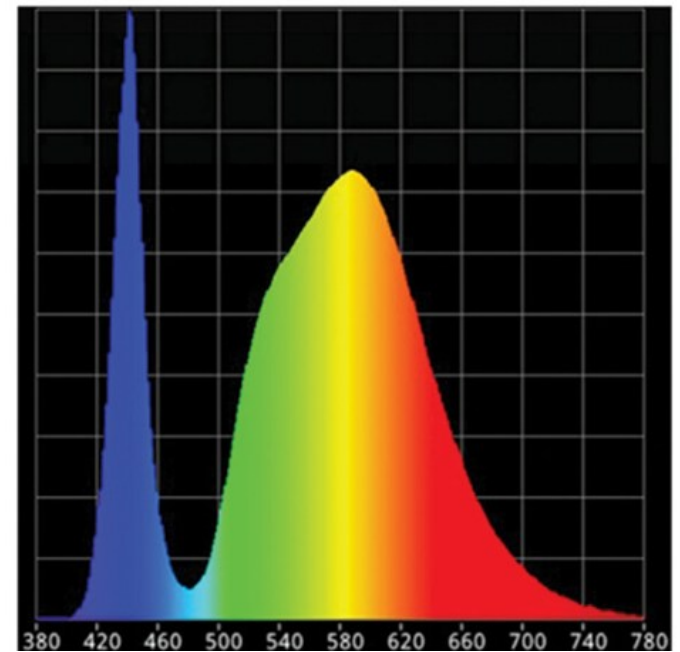
The Technical Solution

So why not use PC Amber LED everywhere?

Because the Colour Rendering Index (CRI) for PC Amber is < 60

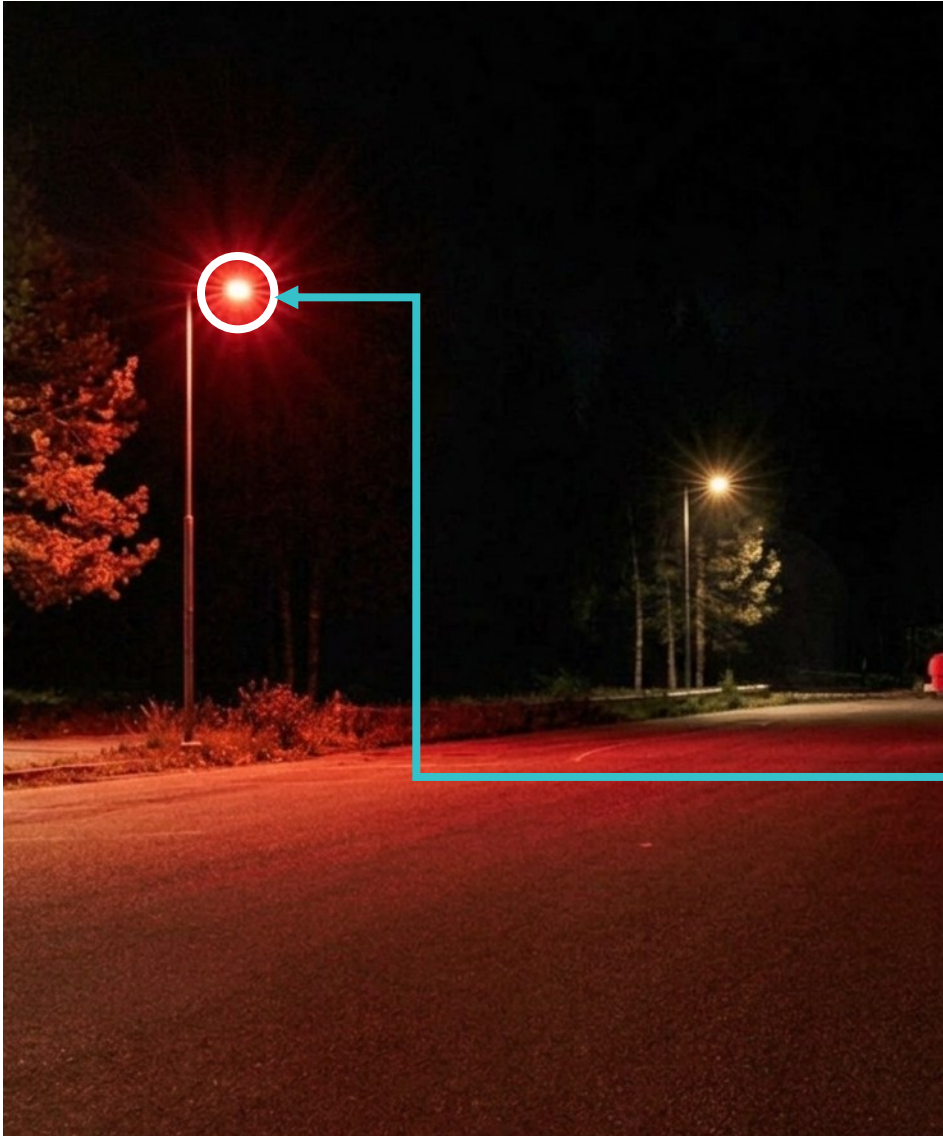
Whereas the requirement for public spaces is $\text{CRI} > 70$ in EU and Israel

For natural reserves (turtles) zero blue light is tolerated



Dynamic Spectral Tuning

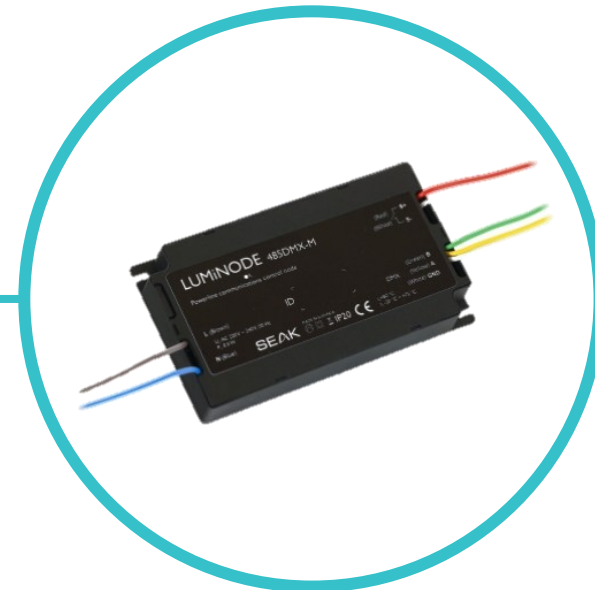
Bridge the gap between human safety and ecological preservation



Dual Channel Tuning

a combination of 2700K White LED
and PC Amber LEDs

DALI2 DT8 driver or DMX driver



Dynamic Spectral Tuning

Control is Everything

We can use powerline controls

to control
lighting
intensity



to remotely
diagnose
the luminaires



to dynamically
change the weight
of White LED and
PC Amber channels



Economics

Dynamic Spectral Control has its Price Tag

Dual Channel streetlight costs approx. 2x – 3x as much as standard streetlight

With powerline lighting controls we can save a lot of energy on dimming the intensity of lighting.

City with 1000 street lamps	SEAK Smart Spectral Control	Standard LED
CAPEX (Initial Investement)	500 000 €	250 000 €
OPEX (Annual Operating Expenses)	39 000 € (*dimming, remote management)	66 000 €
Annual Savings vs. Legacy HID Lamps	131 000 €/per year	104 000 €/per year
ROI	3.8 yrs	2.4 yrs

Dynamic Spectral Tuning

Israel Reference: Animal pass / Netanya

Map

Schedule

Alarms

Config

Users

Reports

About

ENELTEC Ltd.

Show labels

Map

Satellite

Netanya

IBN SHADIR

David's Harp Hotel &

GRINTAL

Nishi

Argaman Beach

AGAMIM

GIV'AT HAIRUSIM

Iris Reserve

Ir Yamim Mall

IR YAMIM

Sironit Beach

Ofer Hasharon Mall

Netanya Interchange

BP

Alabama

MAX Stock

BEN TSIYON

RAMAT HEN

SHIKUN DORA NORTH

Osher Ad

Miriam Stadium

Decathlon Netanya-

Yochananof Netanya - Tzoran

PARK SI'IM

Fratelli

NEVE ITAMAR

David Pinkas St

Zorba

NE'OT GANIM

KIRYAT RABIN

MISHKENOT ZEVULUN HAMMER

KIRYAT HA-SHARON

Netanya Shikun Vatikim Cemetery

WIZO CANADA CHILDREN'S VILLAGE

Ganot Hadar

NE'OT NORDIYA

Nordia

Pardes

Tsur M

Ilanot Arboretum Visitor Center

Tuvik- Spa water garden

KADIMA

Herzl St

GROUPS | SCENES

יום - קבוצה 3 (20)

יום - קבוצה 2 (20)

יום - קבוצה 1 (21)

ערב - קבוצה 3 (4)

לילה - קבוצה 3 (3)

לילה - קבוצה 2 (4)

ערב - קבוצה 2 (3)

ערב - קבוצה 1 (4)

לילה - קבוצה 1 (3)

Dynamic Spectral Tuning

Israel Reference: Animal pass / Netanya



Dynamic Spectral Tuning

Israel Reference: Animal pass

Requirements...

Night

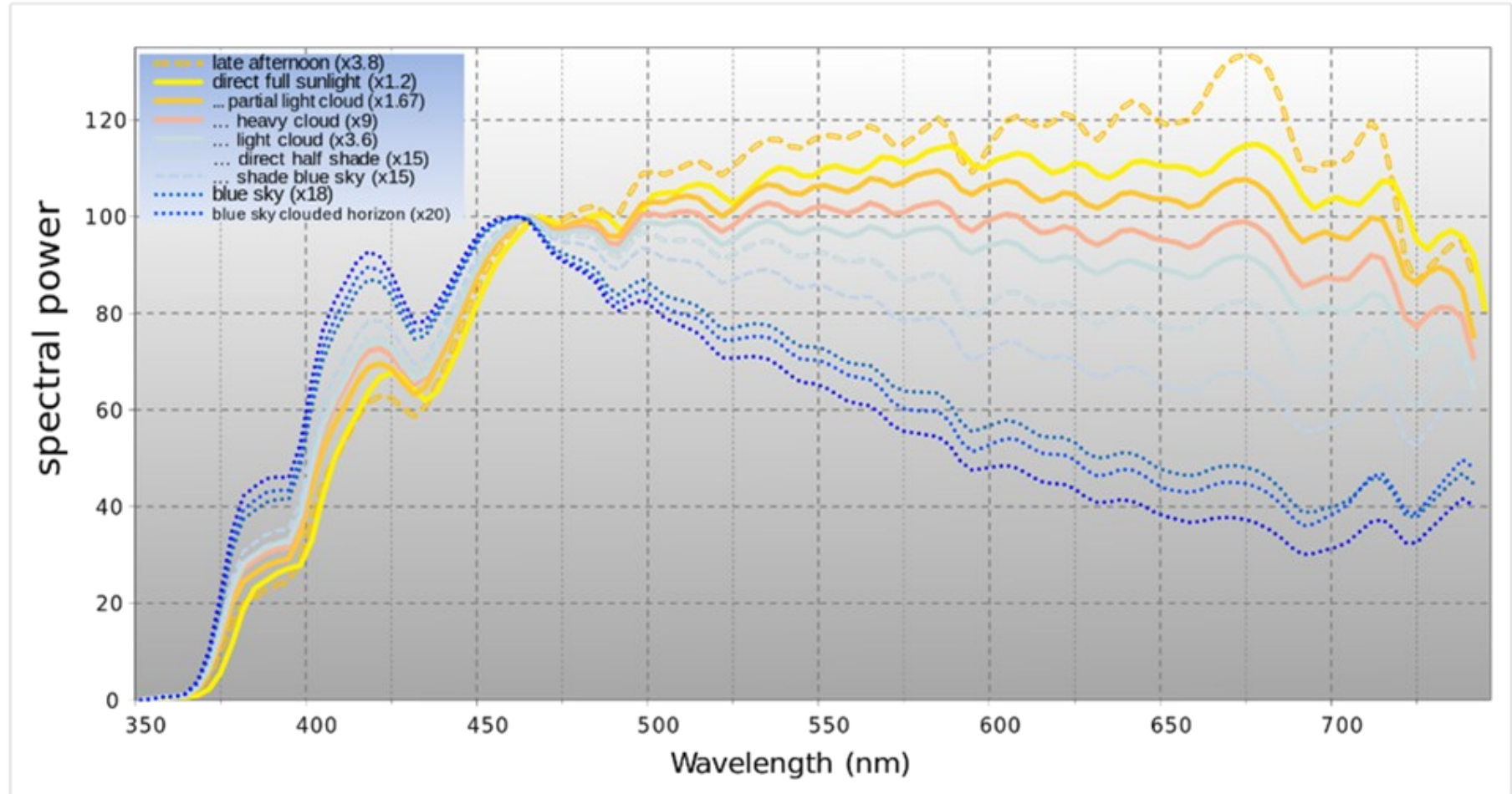
0.2 lux
460 – 570 nm

Day

2000 lux
full spectrum

Sunrise/Sunset

40 lux
520 – 570 nm



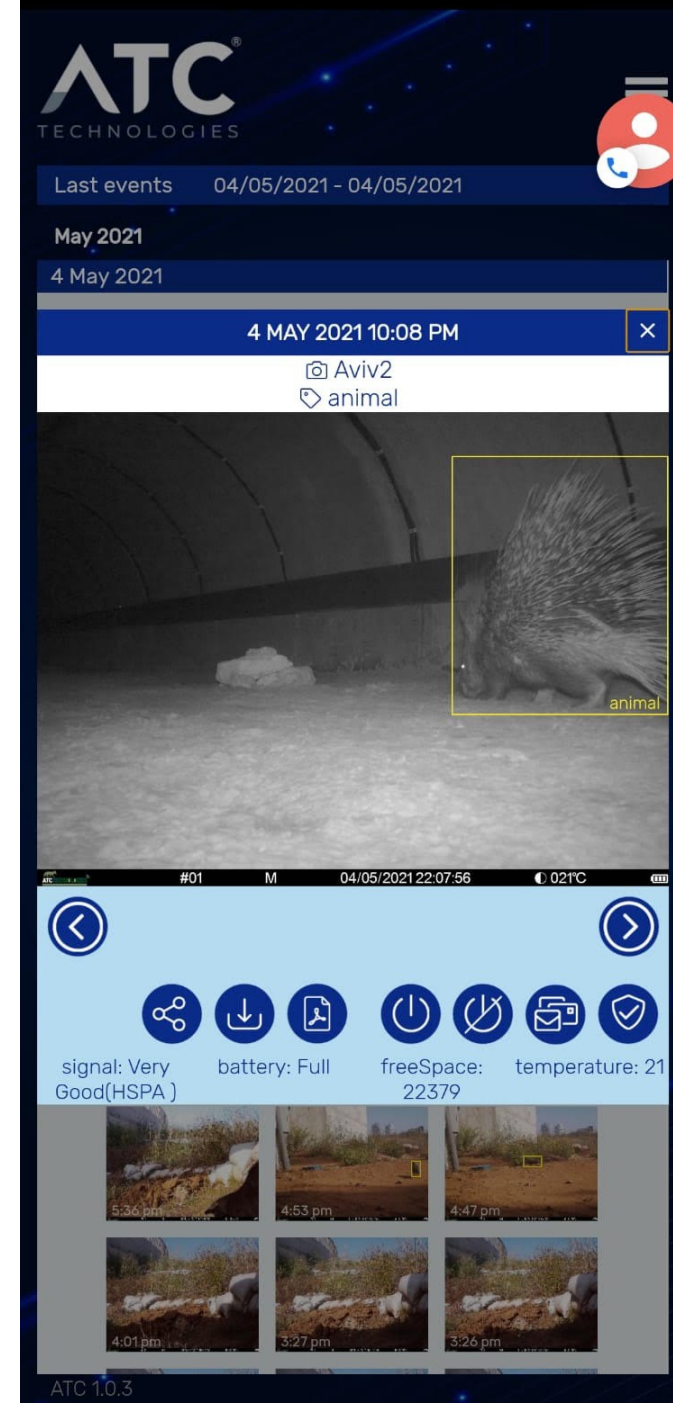
Dynamic Spectral Tuning

Israel Reference: Animal pass



Dynamic Spectral Tuning

Israel Reference: Animal pass





Thank you.
Questions?

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