OPTOGAN

LED SOLUTIONS

Company Introduction

Three Business Units. Portfolio

Business unit 1 – Chip production
Fab in Landshut, Germany

Number of chips (10x23mil)
600 M per year

MOCVD reactors:
3 for production
1 for R&D

Epitaxial Wafer

InGaN CHIP

Leading patented epitaxial technology – *epimaxx™*

Business unit 2 – LED, COB, LED module production
Fab in Sankt-Petersburg, Russia

LED

Chip-on-board

LED Module

Number of LEDs (PLCC2 form factor)
300 M per year

LED components and light engines with high level of quality at very competitive costs

LED Lamp

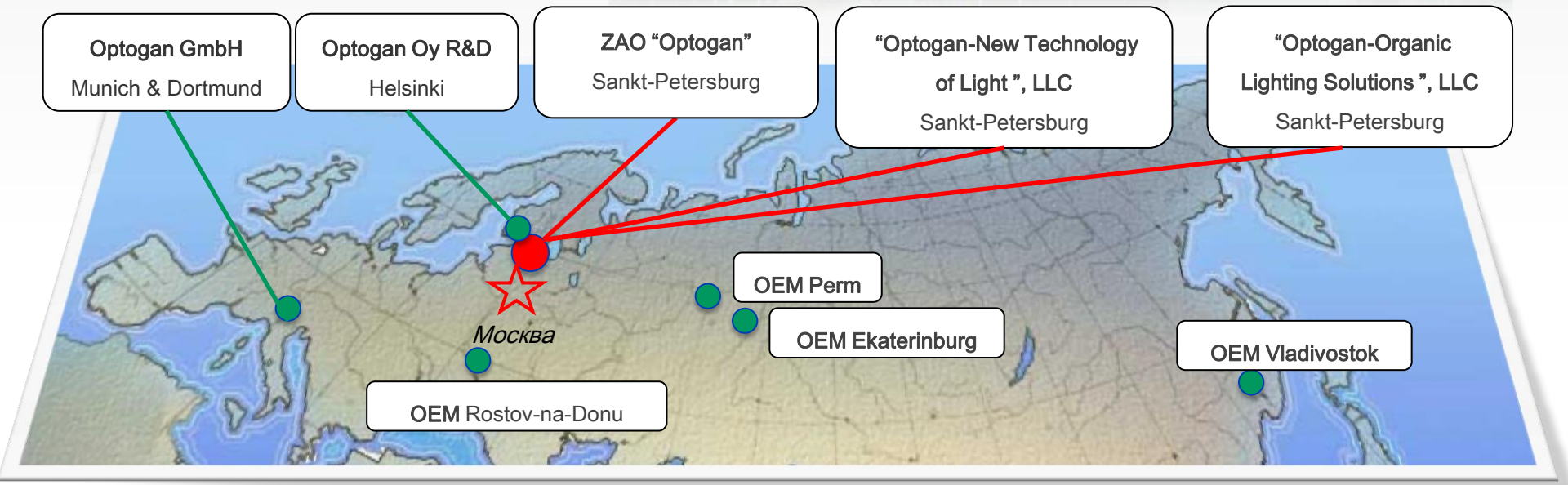
LED Luminaire

Business unit 3- Luminaries production, Sankt-Petersburg, Russia

- Optogan Design Bureau
- Own manufacturing
- 5 OEM manufacturers

Leading luminaries manufacture at Russian market

Optogan's geography



Shareholders

- **Founders of Optogan**, well known scientists in solid state physics (more than 600 publications in international science magazines), pupils of Nobel prize winner Zhores Alferov http://optogan.com/
- **RUSNANO**, state-owned fund with $10B allocated for investments into nanotechnology and SSL projects. RUSNANO was founded in 2007 for implementation of the government policy in the sphere of nanotechnologies. The Corporation acts as co-investor in nanotechnology projects with significant economic or social potential. http://www.rusnano.com

Photo: Nobel Prize winner Zhores Alferov with the Optogan Founders Maxim Odnobludov, Alexey Kovsh and Vladislav Bugrov

- **ONEXIM**, one of Russia's largest private investment funds with more than $10B allocated for investments, founded by Mikhail Prokhorov in May 2007 with a focus on innovative projects within the energy sector, SSL and nanotechnology. http://www.onexim.org/
- **RIC**, fund of Saha Republic, with $1B under its management http://www.ricsakha.ru/

OLED

All existing light sources in nature are point sources

OLED - the only natural source of uniform surface illumination





The essence of innovation is the use printing technology for the production of lighting systems based on organic light-emitting diodes with an optically active conjugated polymers and nanocomposites based on polymer-inorganic nanoparticles as a active layers.

The technology allows:

- Modulate an emission color by electric field
- Improve the parameters of OLED-based multilayer composite structures due to the effective radiative recombination in the polymer as well as in the nanoparticles and in the complexes formed by them.
- Reduce the characteristic relaxation times of charge carriers in composite structures
- Reduce the degradation of the hybrid structure and increase the service life of these OLED structures.

Optogan-OLS

Direction	**Energy efficiency and energy saving**
Aim	**Create a reasonable costs, the most effective and trouble-free light sources based on organic light-emitting diodes**
The essence of Innovation	**The use of optically active conjugated polymers and nanocomposites based on polymer-inorganic nanoparticles in the printing technology of OLEDs. Development of an integrated intellectual control system of emission color.**

Uniqueness of the technology:

- Glowing 3D surface of any reasonable shape and size
- Transparency in turned-odd state
- Color management of emission
- No need in additional optics and lens leads to reduction of radiation losses and to efficiency increase.
- Low (up to 10 times less) the cost of equipment and at the same time more productive
- Material utilization is 5 times better than spraying technology

Key parameters	2012	2013	2014	2015
Efficacy, Lm/W	60	80	100	150
CRI	88	92	95	95
Longevity (hours)	10 000	20 000	50 000	50 000
Device cost per Lumen $/KLm	350	160	40	16

Year	Milestone
2012	Technology developed
2013	IP protected
2014	Technology commercialized

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Thank you!