



GEOSTATIONARY ATMOSPHERIC NETWORK

New telecommunication technology

GYRONAUTICA – Welcome to the Future

Sergey Kuzikov
CEO Gyronautica LLC

Where is the Internet?

2/3 of the Earth ‘out of reach’

1/2 of Humanity is offline

United Nations «Global Broadband Progress» Report for 2017

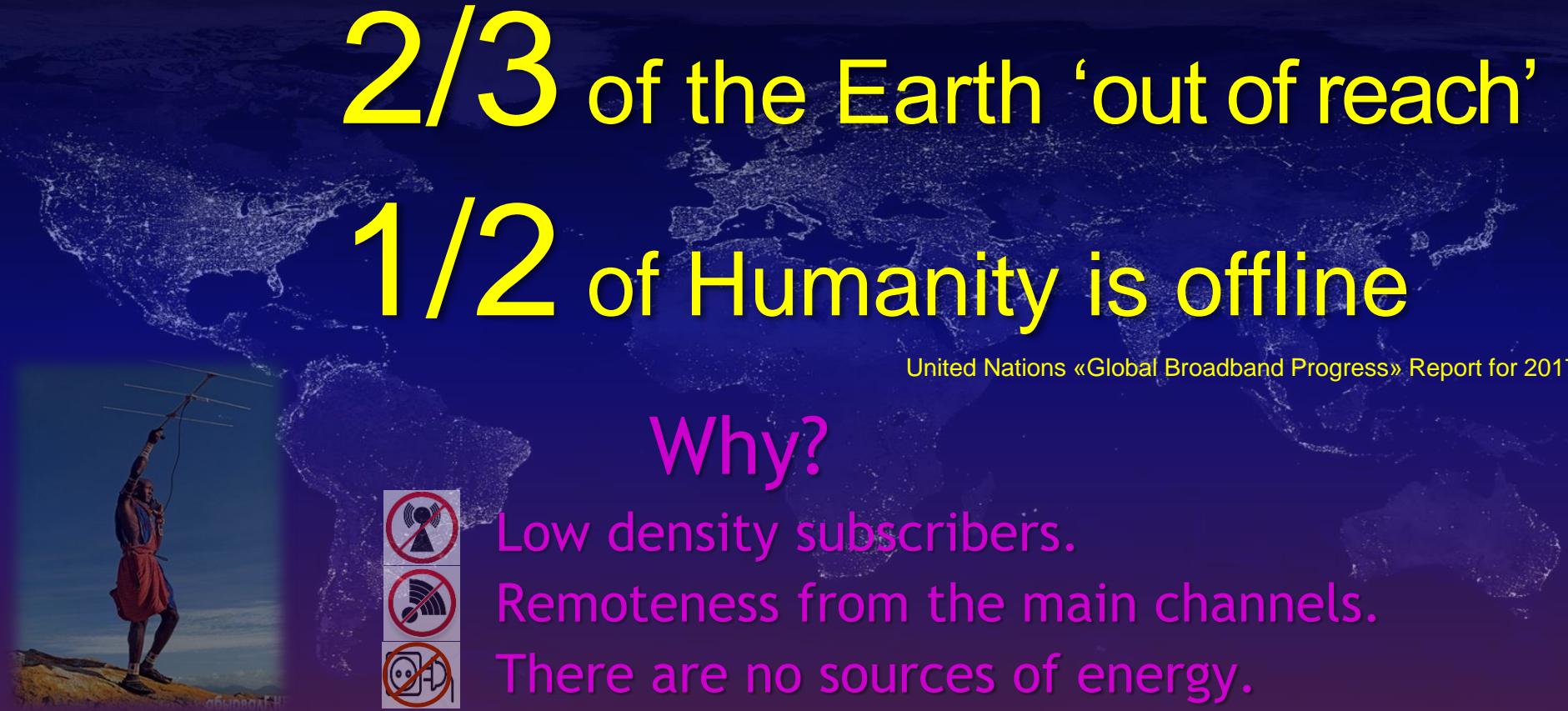
Why?



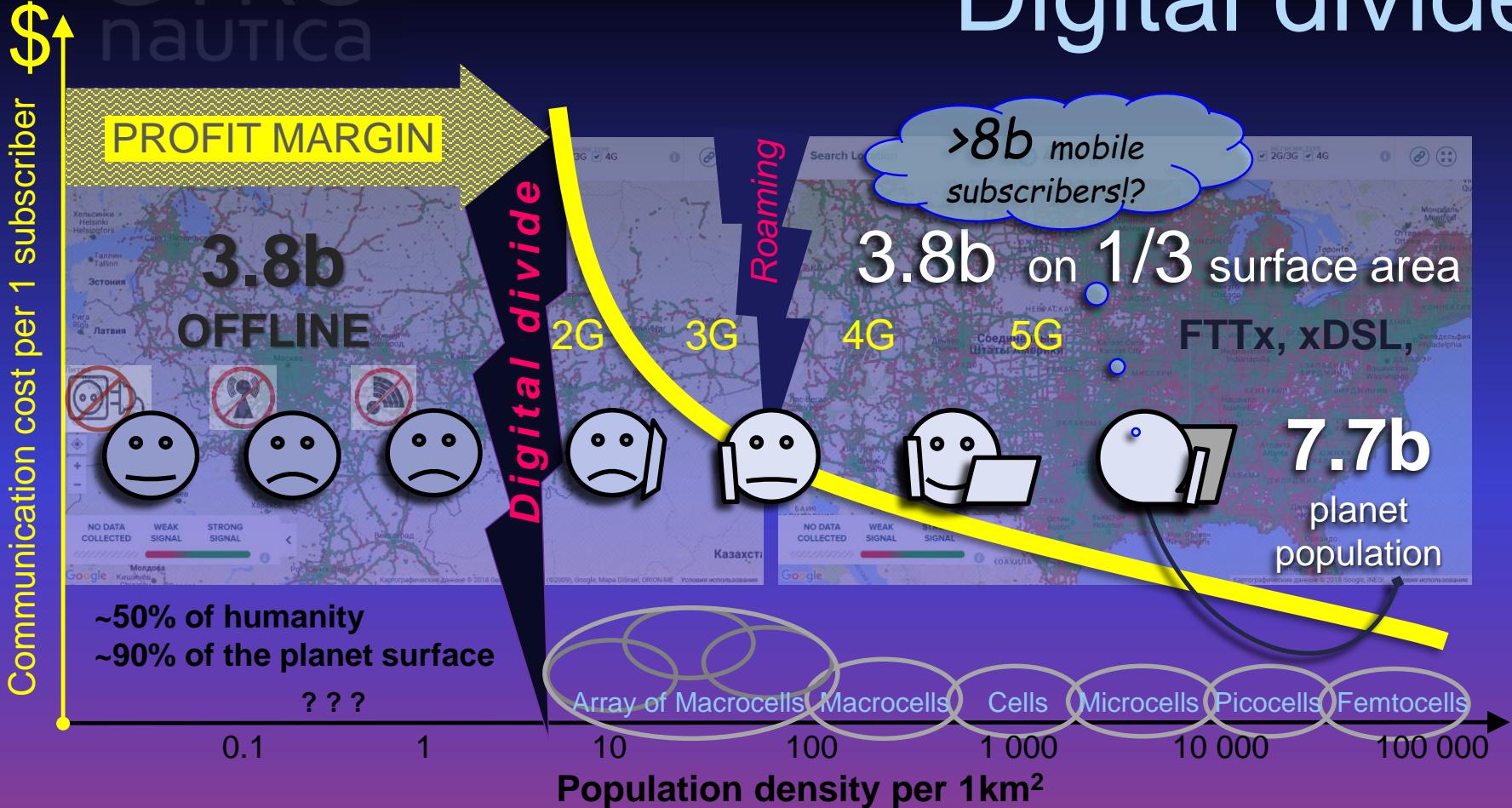
Low density subscribers.

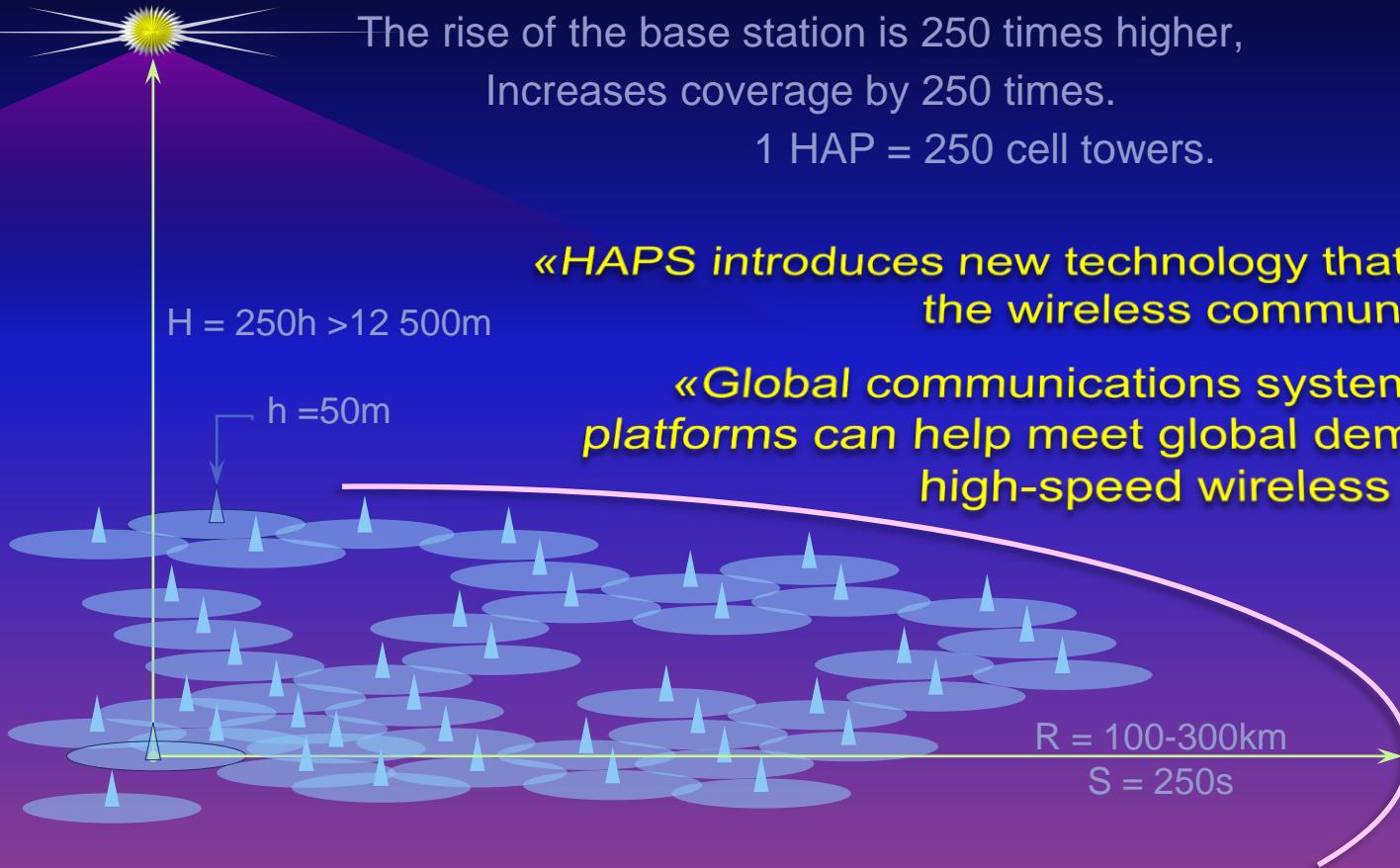
Remoteness from the main channels.

There are no sources of energy.



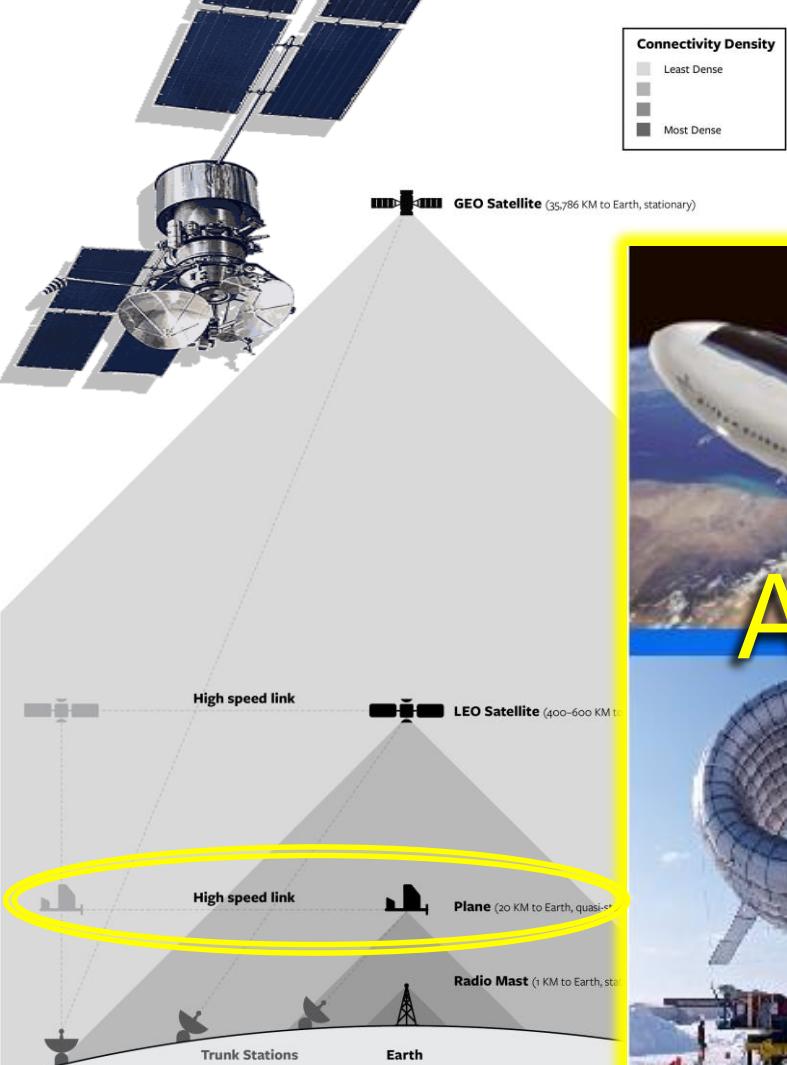
Digital divide





High Altitude Platforms
Atmospheric satellites

International
Telecommunication
Union, ITU



HAPs technology



Atmospheric satellites

Communications energy

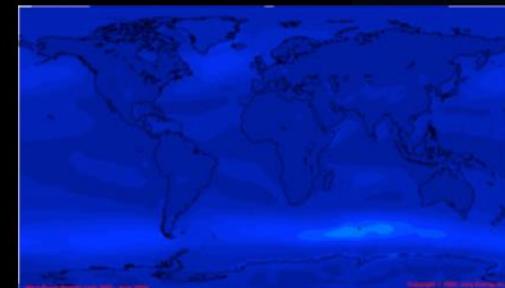
SOLAR CELLS

- < 1 kW/m² - low Power Density
- < 20% - low efficiency of the cells
- 90% to fight with the WIND
- => Heavy batteries
- => Giant sizes
- => High cost

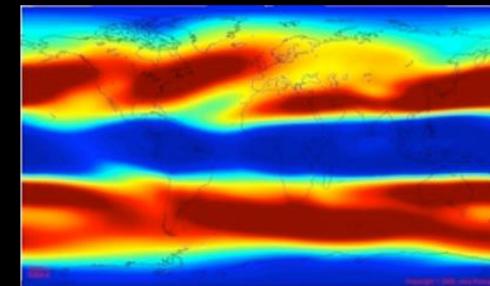
Comparison of Mean Power Density (kW/m²)



Surface Solar



Surface Wind @ 50m



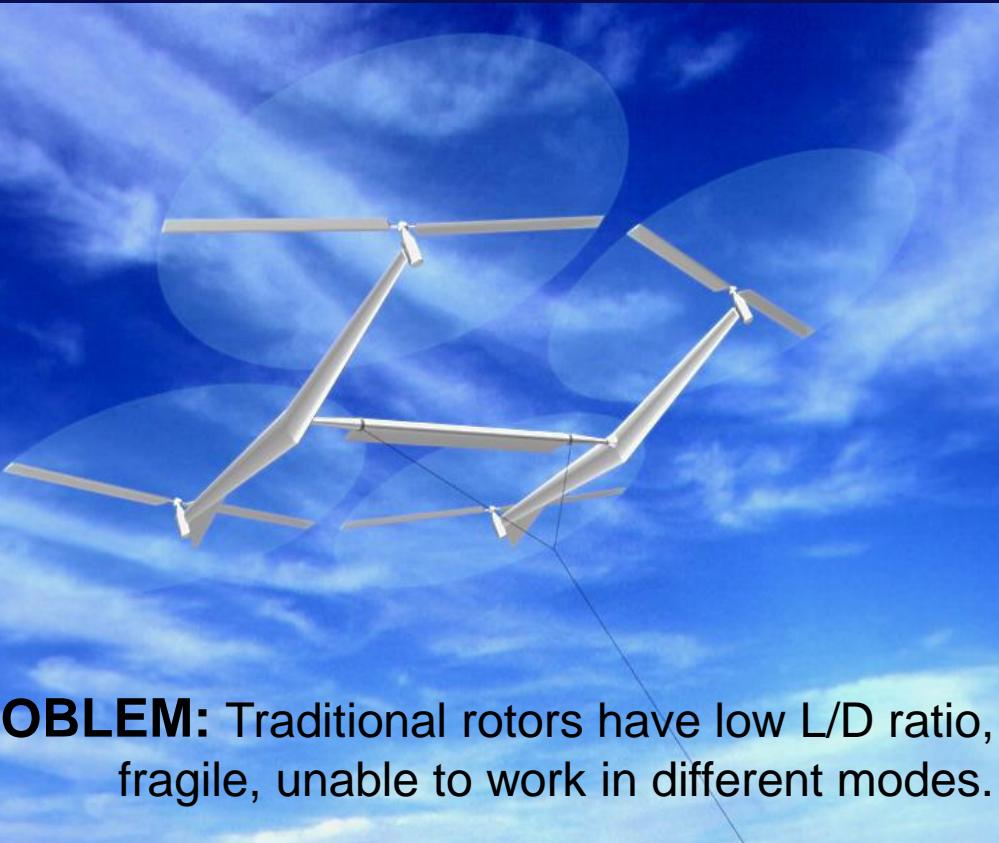
Wind @ 10,000m

HIGH-ALTITUDE WIND

- global, powerful, reliable.
- Stable energy 5-10 kW/m²,
- Efficiency up to 59%.

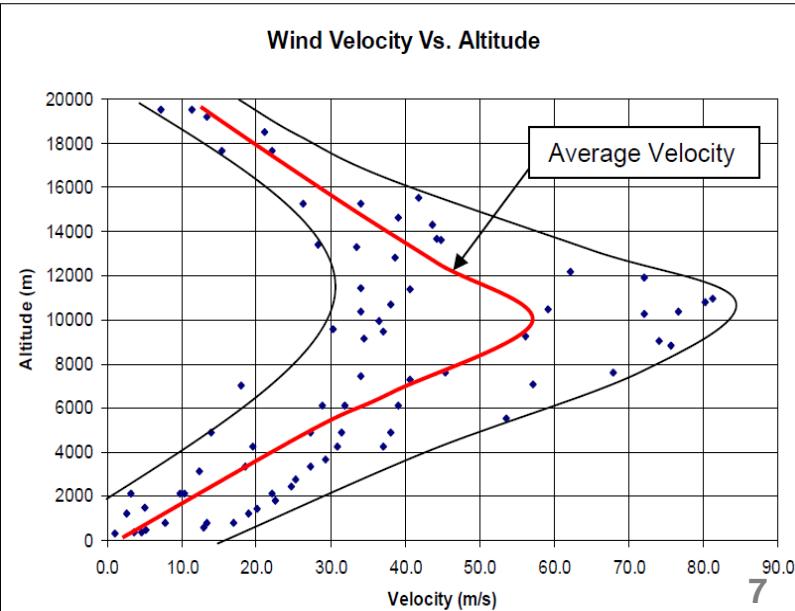
Minimum dimensions, weight
and platform cost.

High-altitude wind power



PROBLEM: Traditional rotors have low L/D ratio, fragile, unable to work in different modes.

*High Wind –
powerful reliable source.
The only one in the Arctic!
How to get it?*



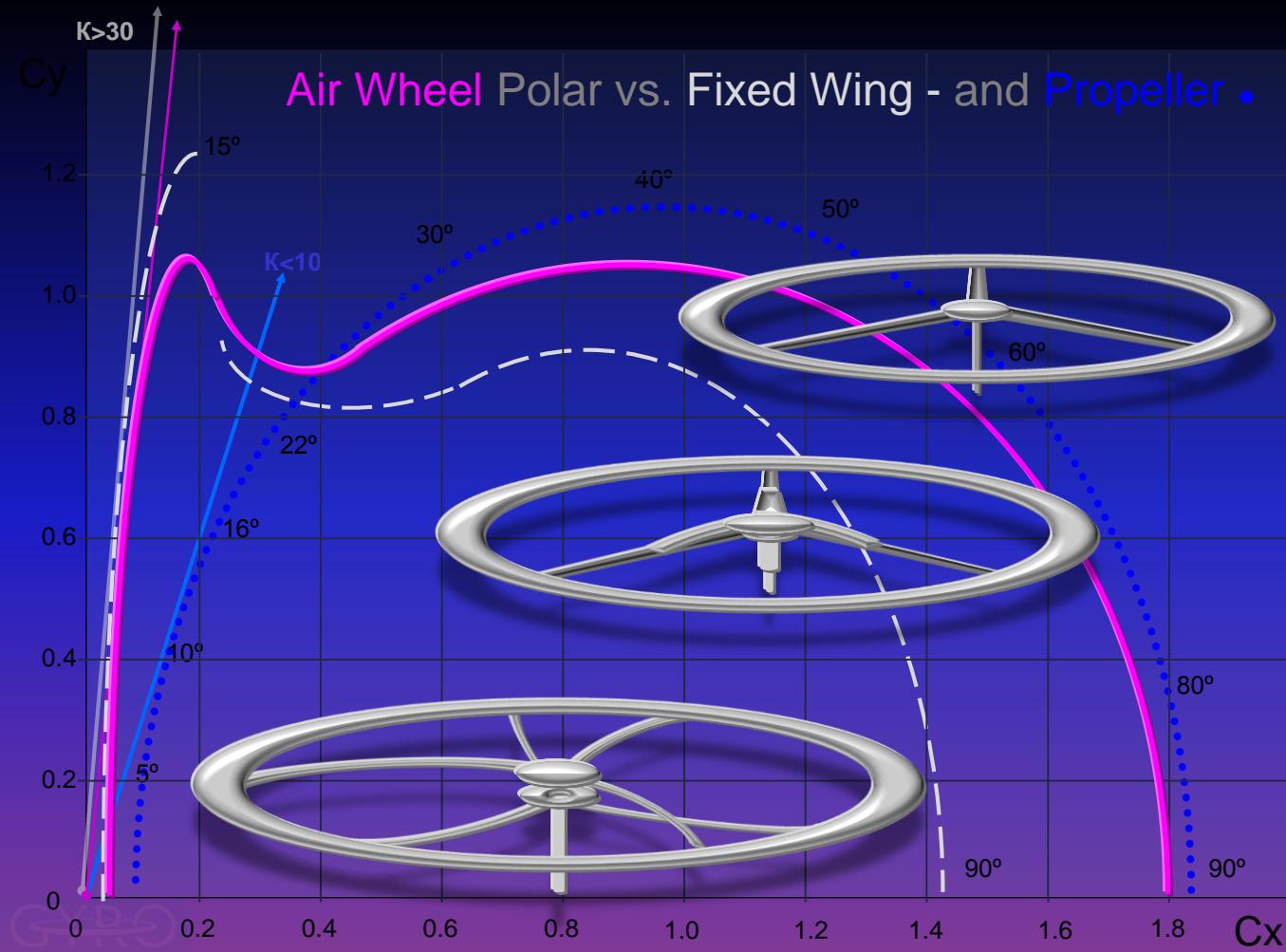
Solution

A key element
of the technology is
the Air Wheel rotor.

Work in 3 modes:

- ✓ helicopter,
- ✓ autorotations,
- ✓ wind turbines

Maximum:
strength, resource,
l/d ratio, efficiency,
elevation angle, ...



Solution

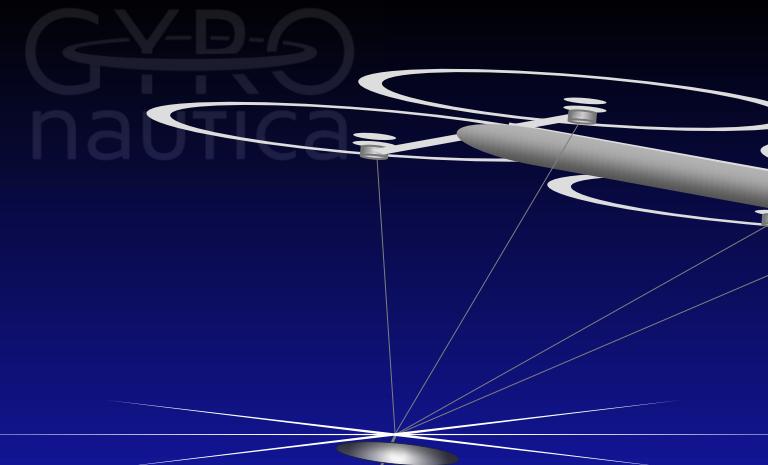
GAS

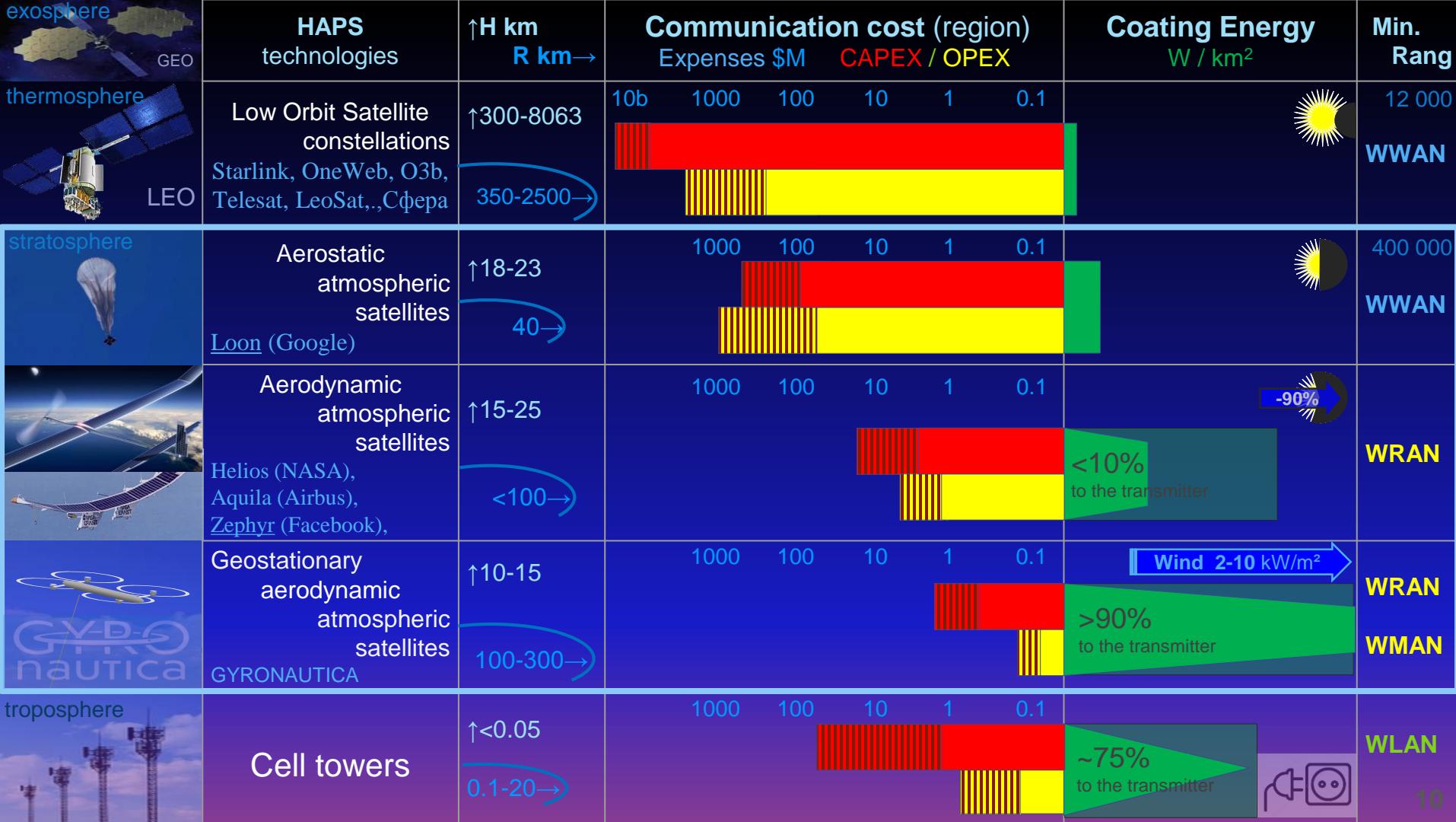
Geostationary Atmospheric Satellite

- high-altitude aerodynamic tethered platform on bearing Air wheel rotors.
- ✓ Absolute Green Energy Autonomy.
- ✓ Maximum reliability and power for transmitter.
- ✓ Minimum mass and dimensions.
- ✓ Minimum cost of the platform and its flight year.
- ✓ Reliable fiber optic channel to Base Station.
- ✓ Work area from the tropics to high latitudes.

Altitude up to 14 km ,
Horizon up to 400 km ,
Coverage area
from 30 000 km²,
up to 300 000 km².

Ultra High Molecular Polyethylene
UHMPE (Dyneema®, Spectra®)
specific strength = 378km!





Competition

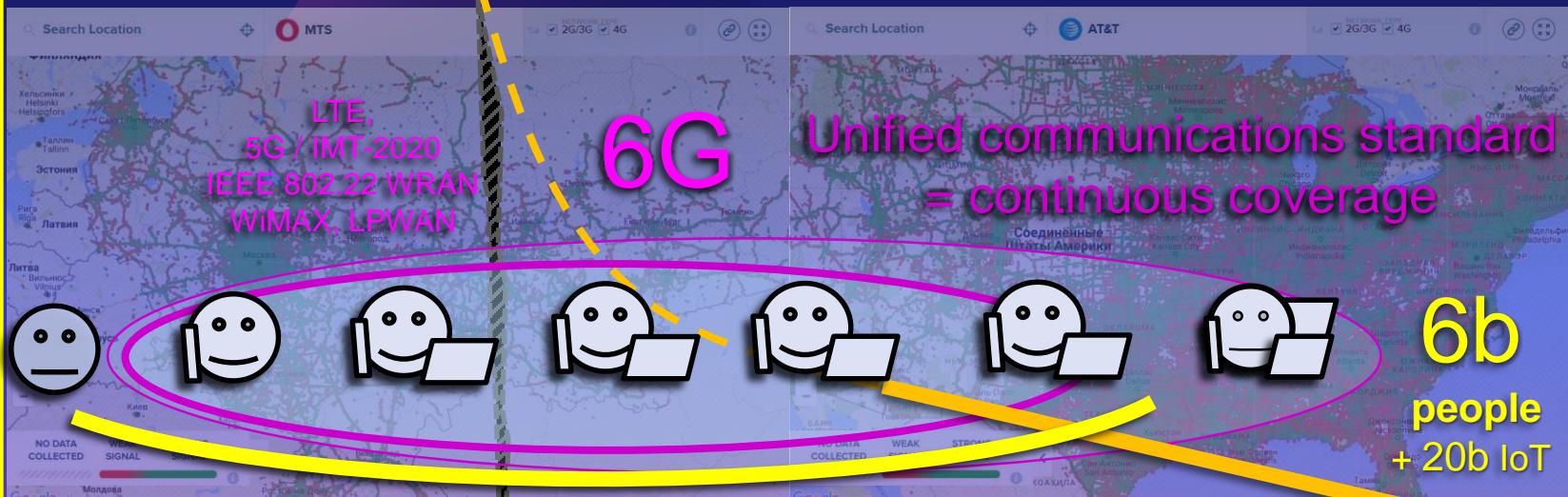


The technology of
Geostationary Atmospheric Satellites
is protected by patent and applications until 2033.

- The maximum signal power in the direct line of sight of the Base Station.
- Compatibility and addition of cellular technologies.
- Organic combination with cable optic lines.
- The cost of coverage is lower than competitors by orders of magnitude.
- Internet backbone stratospheric Free Space Optic.
- A comprehensive solution to communication, navigation, remote sensing, digital broadcasting DTV, ...

Technology 6G

Communication cost per 1 subscriber \$



+2 billion people

GAScels

Mobile Internet over land, in air and coastal waters

0.1

1

10

100

1 000

10 000

100 000

Population density per 1km²

Macrocells

Cells

Microcells

Picocells

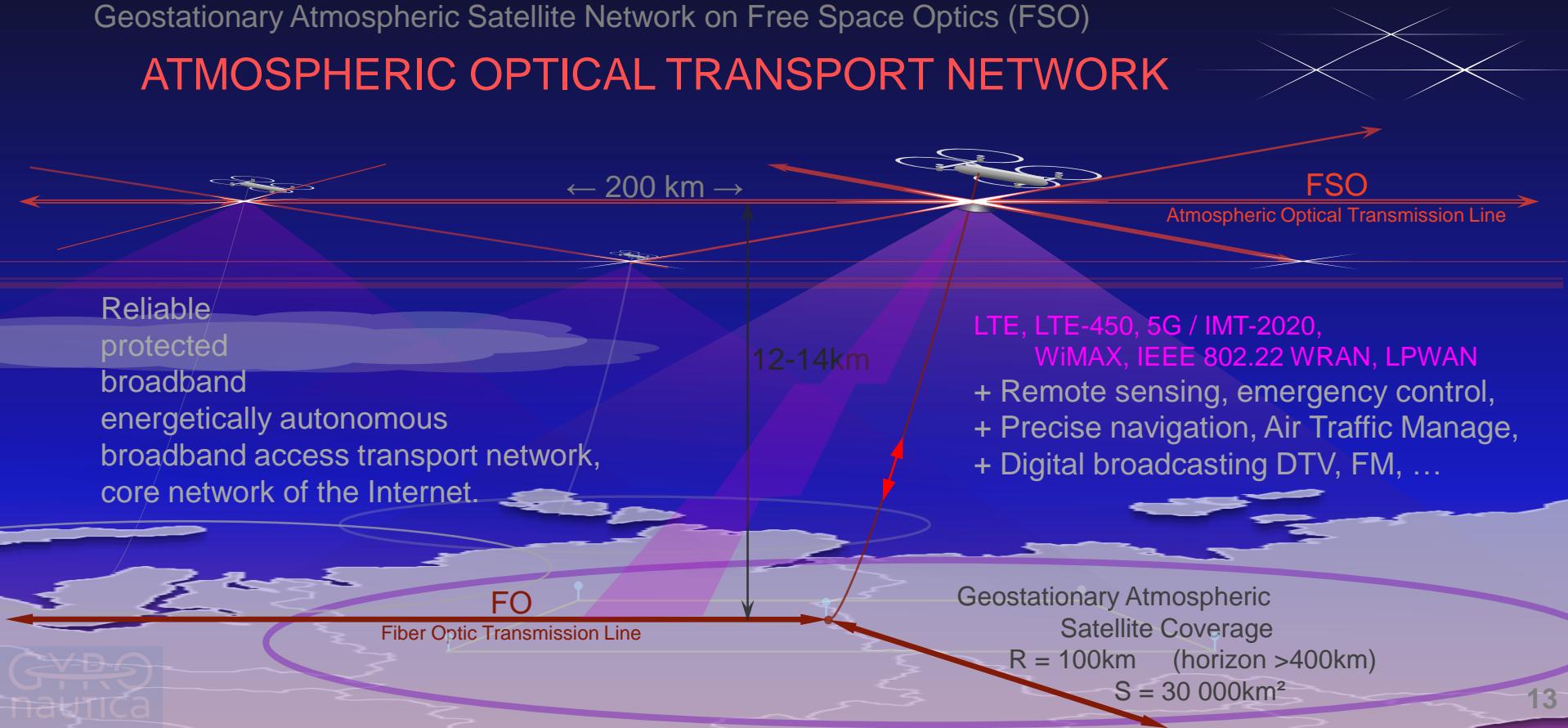
Femtocells

LightNet

Light network

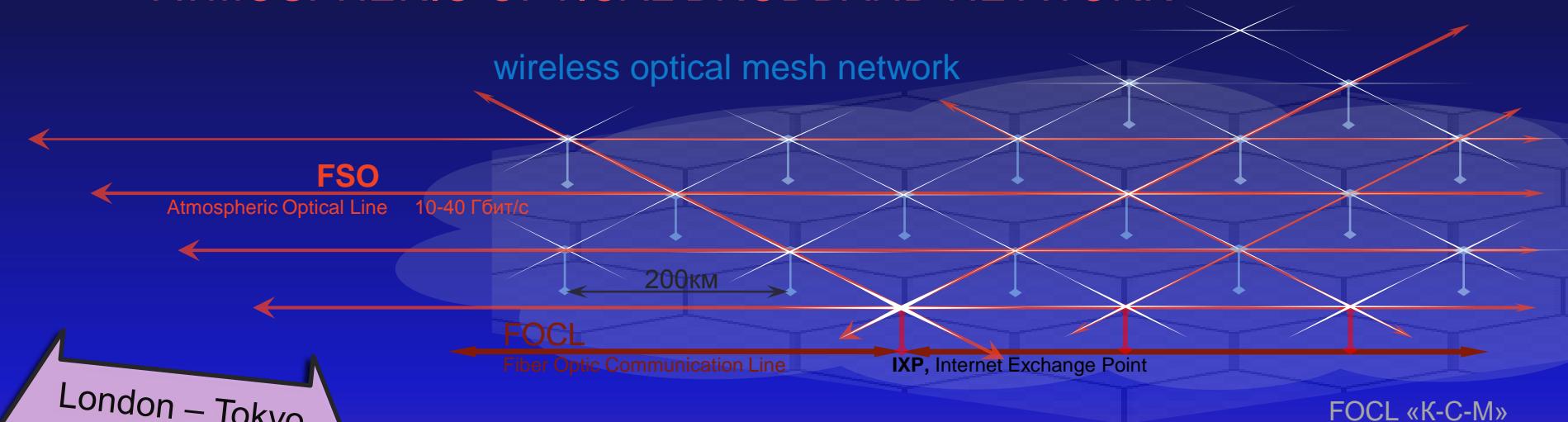
Geostationary Atmospheric Satellite Network on Free Space Optics (FSO)

ATMOSPHERIC OPTICAL TRANSPORT NETWORK



Geostationary Atmospheric Satellite Network on Free Space Optics (FSO)

ATMOSPHERIC OPTICAL BROADBAND NETWORK

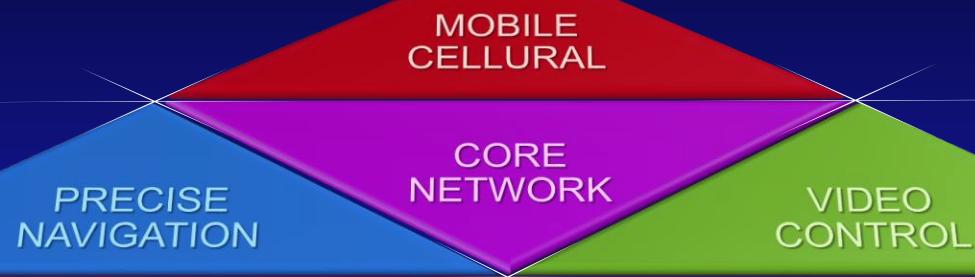


- The stratosphere is more transparent and cheaper than fiber.
- There are no nonlinear signal distortions.
- The signal speed in FSO is **50% higher** than FOCL.
- Each GAS adds ~ 3 FSO channel at ~ 200km.

200км FOCL ~ 555МР
3x200км FSO < 50 МР

Geostationary Atmospheric Satellite Network on Free Space Optics (FSO)

SERVICES OF THE GEOSTATIONARY ATMOSPHERIC NETWORK



- Service Combinations*
- Car navigation
- Social networks
- Objects security
- Surveillance
- Building
- Telecontrol





Russian market

National Project DIGITAL ECONOMY	Σ budget	1 635 mlrd ₽ (\$25 b)
- Federal Program Information Infrastructure		7724 mlrd ₽ (\$12 b)
- FP Elimination of the digital divide in Russia		168 mlrd ₽ (\$2.6b)

600 GAS (100+500) will cover Russia (17 mln km² + 61 t.km border):

- ✓ Mobile broadband (LTE, 5G / IMT-2020, IEEE802.22 WRAN, LPWAN).
- ✓ Atmospheric Optical Network - 360 000 km trunk optical lines.
- ✓ Control of territories, ways, forests, ..., state borders, emergency zone.
- ✓ National Navigation System (centimeter accuracy).
- ✓ Digital Broadcasting FM, DTV, HDTV, UHDTV.
- ✓ Air navigation (ADS-B), airtraffic management, meteorology, ...



Solution

State co-investment ~5% of the budget NP

R&D & CAPEX Project for 4 years - 80 mlrd ₽ (M\$1250)

SOM (50 million subscribers * tariff 134 ₽/mon) = 80 mlrd ₽ / year

World market

- 
- + **2 billion** new subscribers will receive mobile communications and Internet access.
 - + **2 billion** cellular subscribers (~50%):
 - will reduce cost of mobile tariffs;
 - will increase the stability and speed;
 - will expand the Internet access area on land, in the air, in coastal waters.
 - 10 billion** devices and sensors IoT (LPWAN).

Geostationary Atmospheric Satellites (GAS)
able to expand and cover the mobile market
SOM > US\$30 billion / year

Satellite Market Assessment Starlink 2025 Elon Musk

Gyronautica LLC

Team



CEO, CTO

Sergey Kuzikov

co-founder of the company,
author and owner of patents,
aerodynamic calculation,
aircraft design



CFO, Business Development

Daniel Kuzikov

co-founder of the company,
design and product experience
management in international
startups



Advisor

Vladimir Vishnevskiy

Doctor of Technical Sciences,
Professor, Academician of the
International Academy of
Communications and the New York
Academy of Sciences, Full Member
IEEE Communication Societ, ...

The team has qualified young engineers.

GYRO nautICA

Project Current Status



- ✓ The current patent for the group of inventions RU2538737 opens up the possibility of selling technology licenses.
- ✓ The final stages of patenting in USA, Europe, China, Canada.
- ✓ The R&D cycle of the Air Wheel rotors is completed.
- ✓ Aerodynamically stable schemes worked out on the prototypes.
- ✓ Development of production technologies and components.
- ✓ LOMO started designing FSO modules for the project.

To continue the GAS project, we need to make a responsible choice:

- Whose base stations will rise above the surface and cover the planet with 6G.
- Whose global atmospheric optical network will be the backbone of the Internet.



www.gyronautica.ru

gyronautica@mail.ru

gyronautica@gmail.com

Contacts

Gyronautica LLC

CEO Kuzikov Sergey

+7 911 227 1215

PROJECT

GEOSTATIONARY ATMOSPHERIC NETWORK

Welcome to the Future