

## Session II: 5G Spectrum Policy



## Deploying 5G using low and mid band spectrum

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Вклад мобильной связи в развитие региона Евразия:  
Долгосрочная политика по выделению спектра

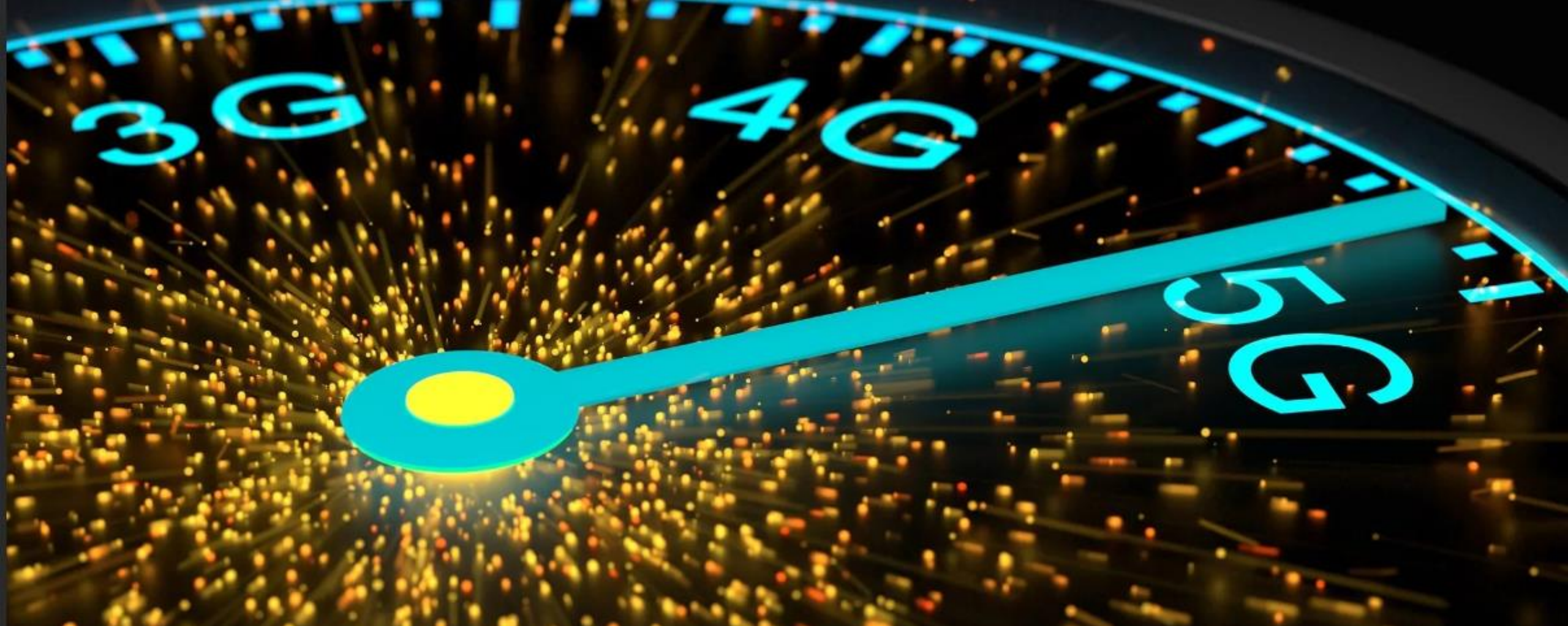
Moscow 8-9 October 2019

## Часть II: Политика по выделению спектра для 5G

### Развертывание 5G с использованием спектра низких и средних частот

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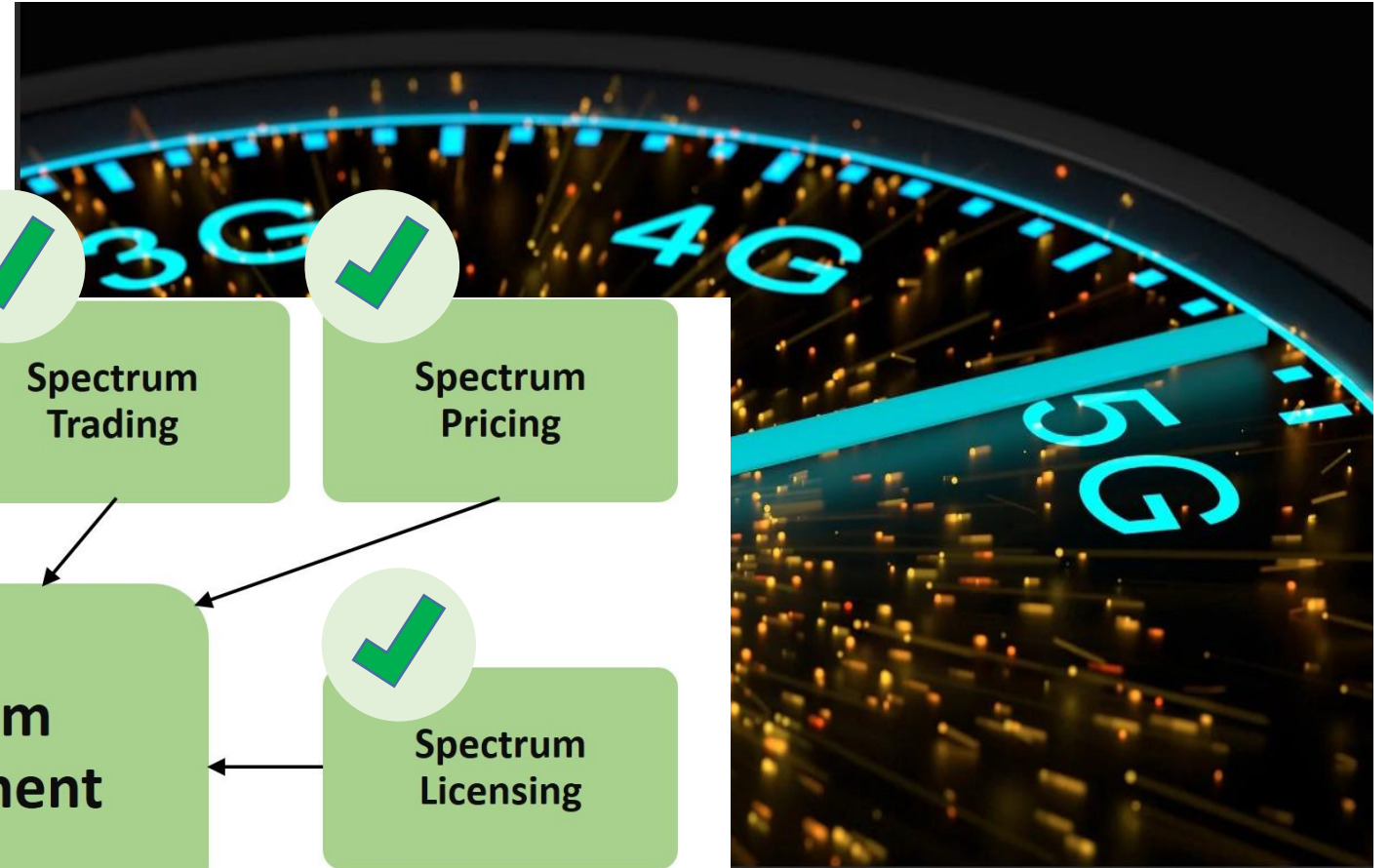
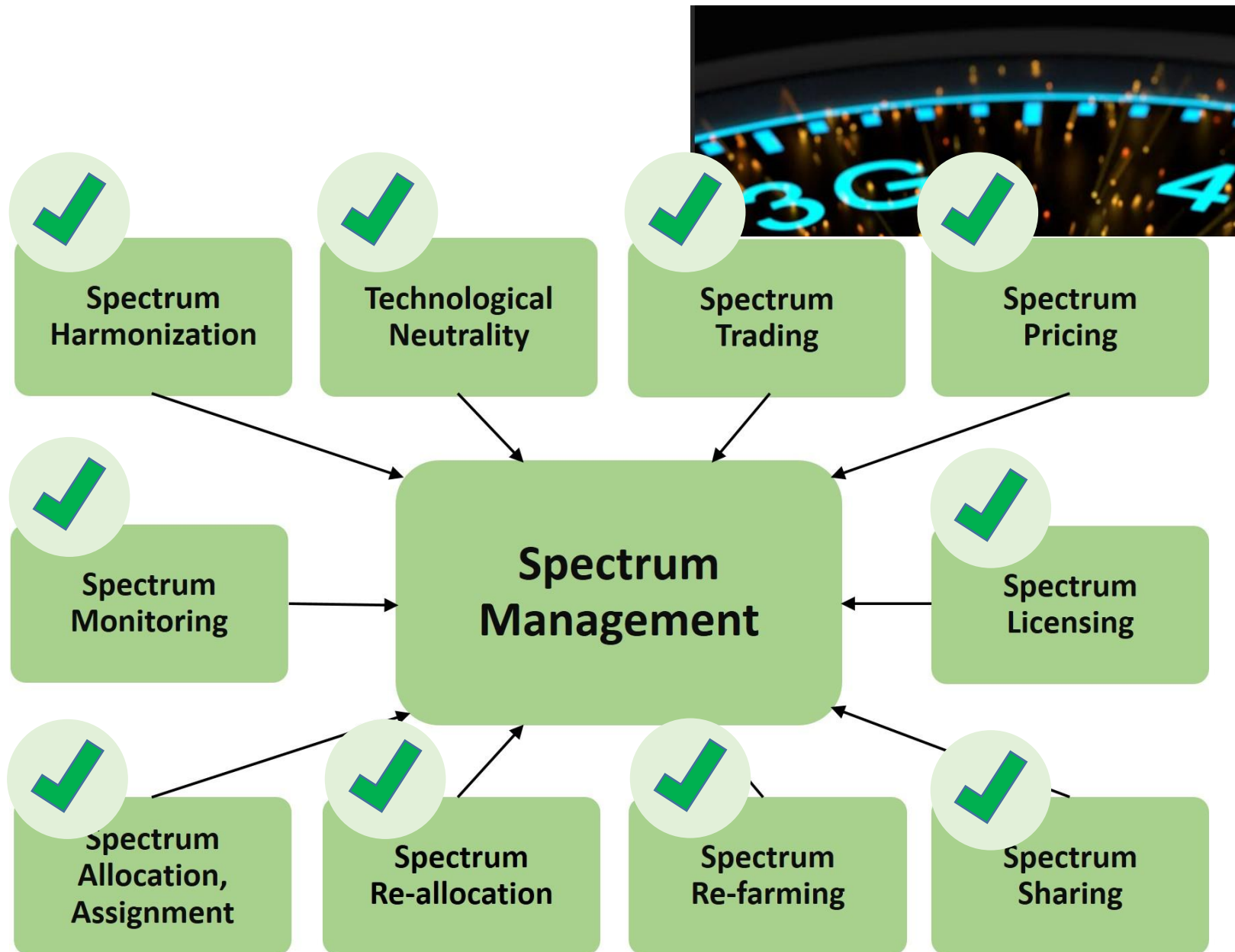




# Specific Features of 5G Spectrum Management: Insight from the Mobile Carriers' Industry

Pavel Mamchenkov, MegaFon

# Constituent Elements of SM and Relevance to 5G



# Spectrum Reallocation. 5G Versus Incumbents. ASEAN

## C-BAND INCUMBENTS

### Fixed Satellite Service



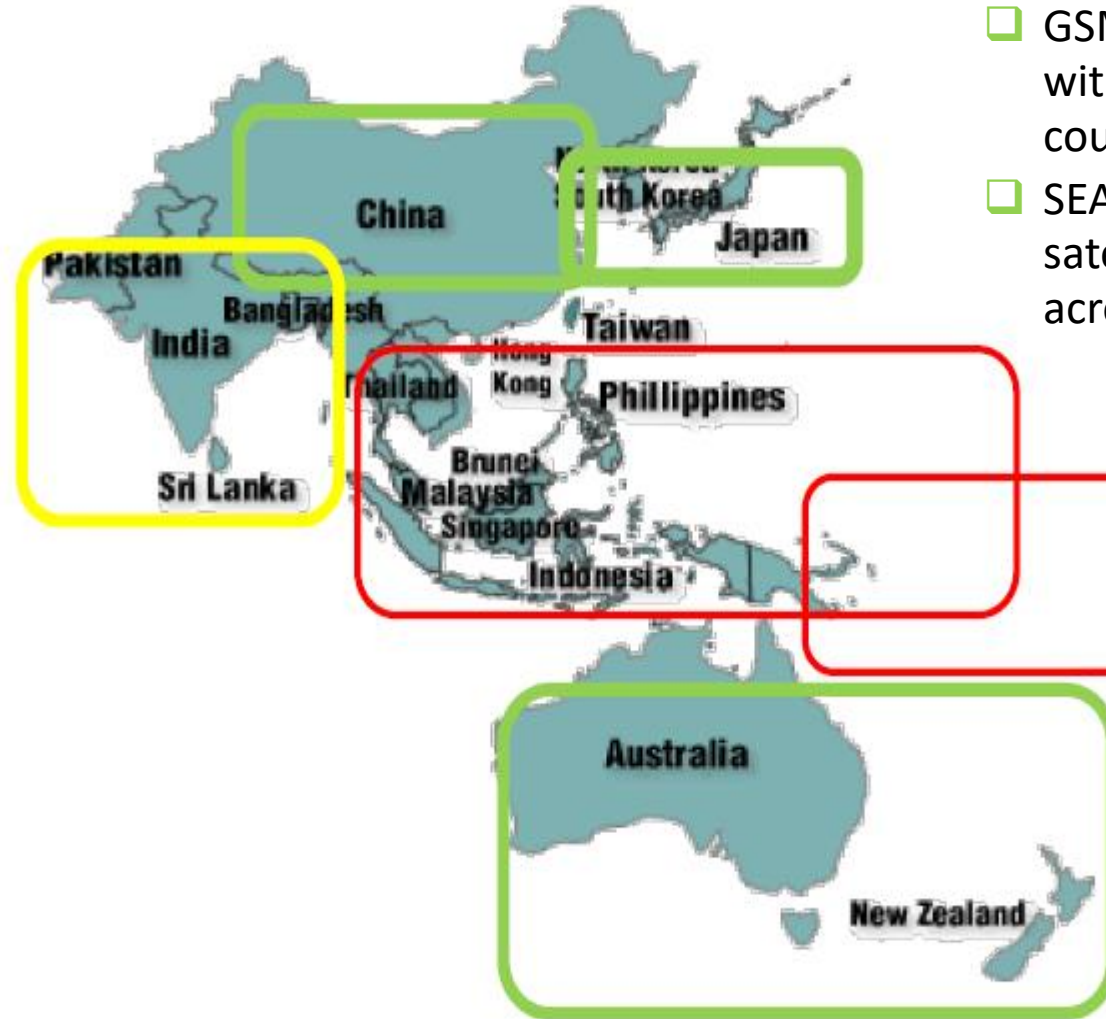
### Fixed Wireless Broadband



### Point-to-Point Links



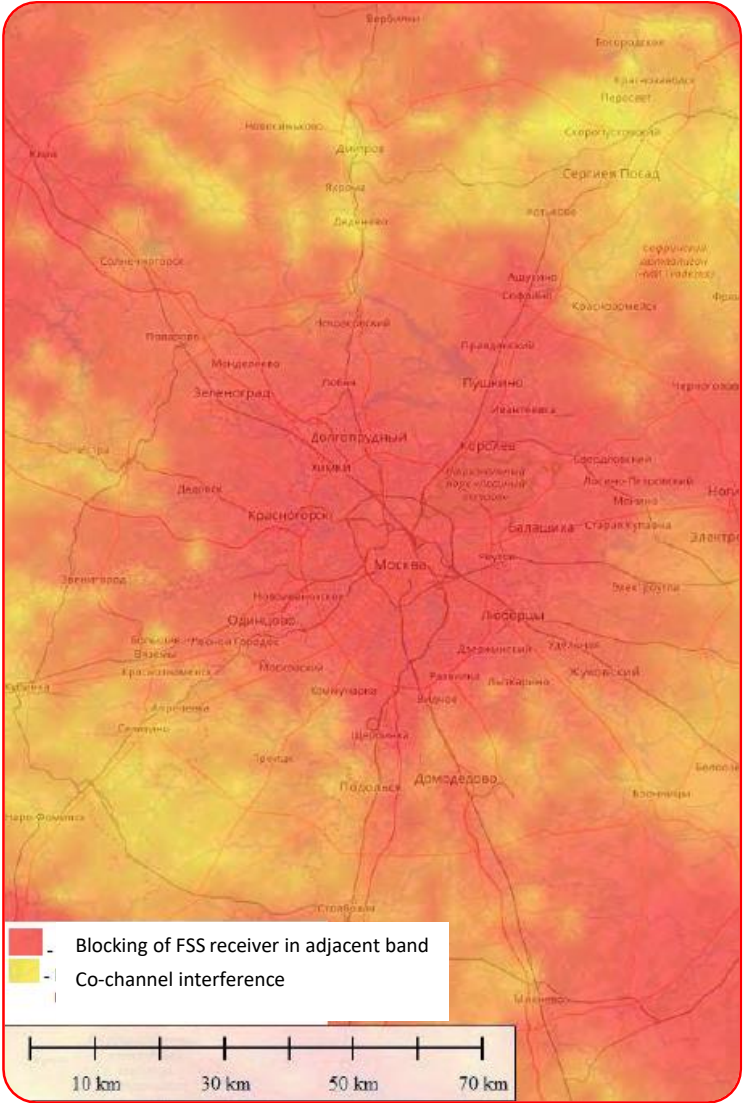
## C-BAND AVAILABILITY FOR 5G DUE TO C-BAND EARTH RECEIVING STATIONS IN ASEAN



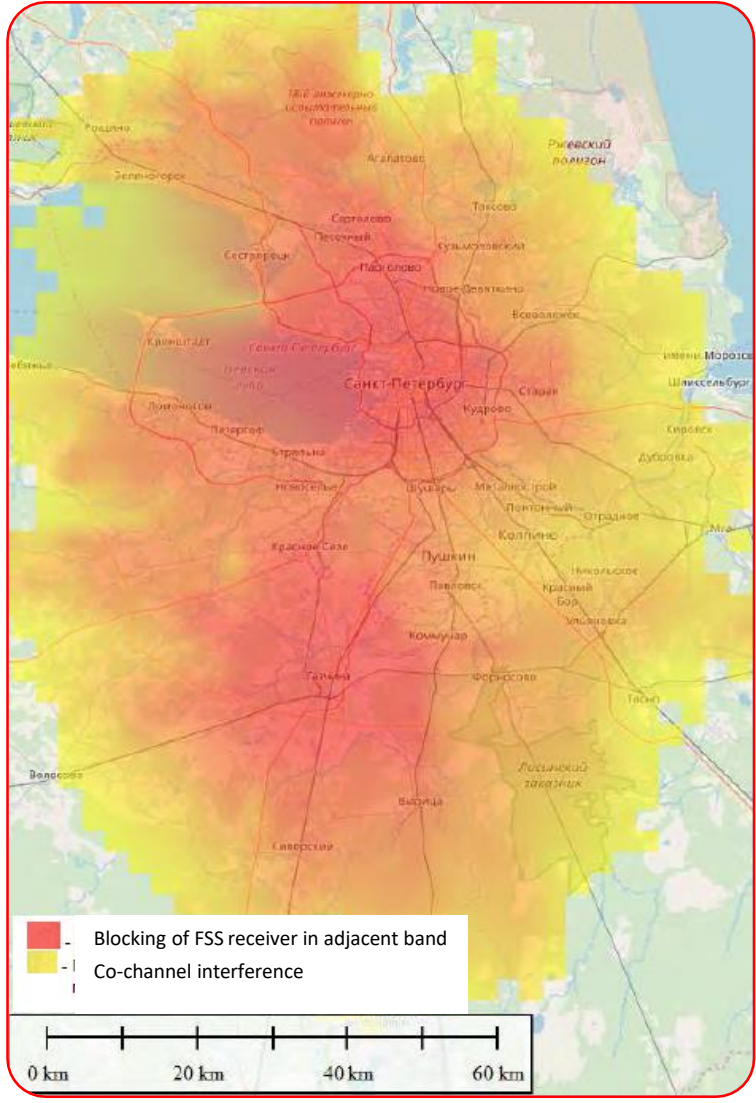
- ❑ GSMA is conducting studies of situation with C-band availability for 5G in ASEAN countries
- ❑ SEA has a high level of incumbency by satellite FSS, modes of deployment vary across ASEAN members
- ❑ C-band provides best characteristics against heavy rain fade
- ❑ General concern from ASEAN members about limited access to C-band spectrum (5G pioneer band)
- ❑ Questions about coexistence IMT/ FSS and interference mitigation mechanisms

Source: GSMA

# Spectrum Reallocation. 5G Versus FSS. Russia



Moscow



Saint-Petersburg

5G Source of Interference	$h_a, \text{ м}$	Carrier Channel Offset, MHz		Side Lobes Emissions
		0 MHz	20 MHz	
Coordination distances for ESSS (type 1), km				
BS	35	100	23	73
UE	1,5	1,2	0,2	0,7
Coordination distances for ESSS (type 2), km				
BS	35	73	40	23
UE	1,5	0,5	0,2	0,2

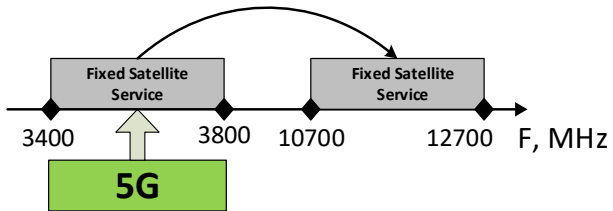
- ❑ Reallocation of incumbent FSS users – feasibility is dependent on nature of use (limited or ubiquitous FSS and location)
- ❑ Sharing with FSS requires mitigation technics and administrative coordination
- ❑ Supply of 3.5 GHz may be different in the amount of spectrum available by regions.
- ❑ Strategic regulatory decisions are essential to facilitate 5G implementation in FSS spectrum bands

# Incremental Cost of Redeployment for Incumbent FSS Earth Stations

The majority of incumbent FSS earth receive stations should become subject to redeployment

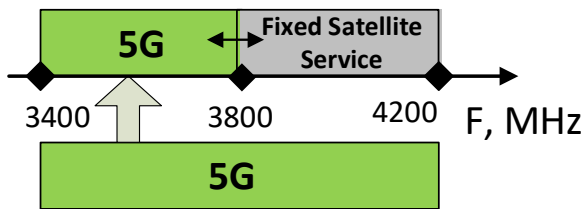
## Frequency Relocation

### Alternative Band



It may be possible for FSS Earth Stations to relocate their services to a different band, including the adjacent 3800–4200 MHz band. It should be noted that it may not be a simple or practical option in many cases.

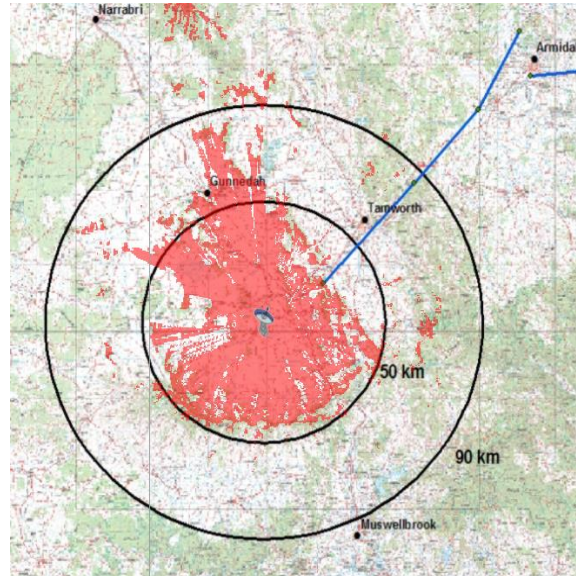
### Sub-band Set Aside



There are different factors defining the carrier frequency of a FSS Earth Station, which are not always easily controlled by the FSS operator.

- ✓ There may be limited opportunity to move FSS Earth Station to other portions of the band.

## Geographic Relocation



There would be numerous costs involved in acquiring and constructing a new Earth Stations located in a regional or remote area. These costs include land acquisition, construction of building facilities, labour accommodation costs, power and fibre interconnection for the new facility.

Costs would be involved in either relocating existing C-band antennas and radio equipment from existing sites or investment in new equipment.

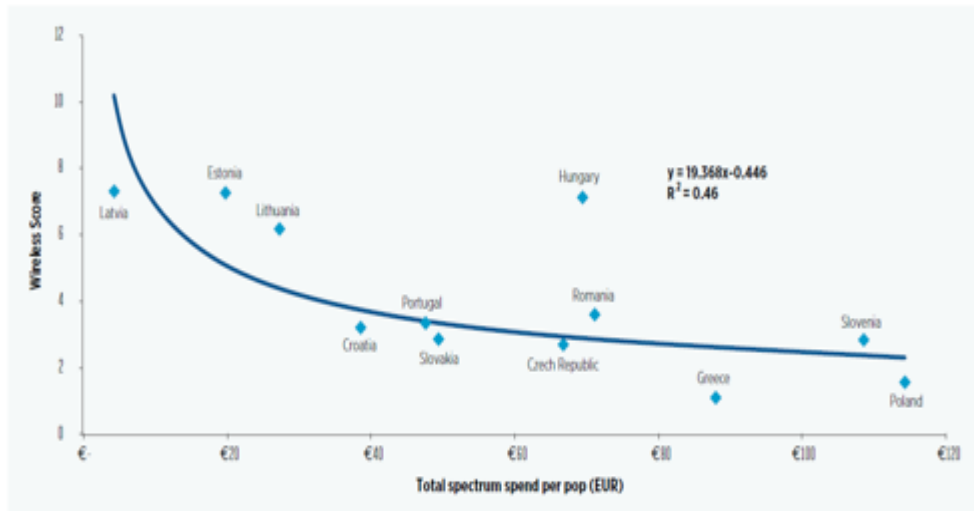
- ✓ There may be additional costs involved in operating a new facility from a regional or remote location that would not be incurred with existing facilities.

**Frequency reallocation and geographic relocation will most likely affect producer surplus of MNOs unless public-private partnership is applied**

# 5G Spectrum Pricing Issues

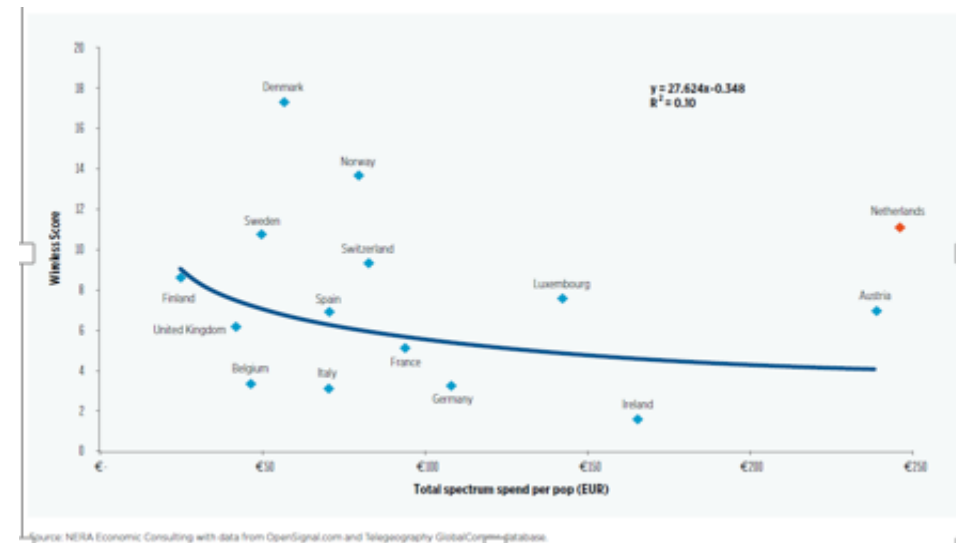
- ❑ Network investments guarantee fast deployment and provision of mobile broadband applications with the high QoS.
- ❑ Governments and regulators should adopt policies that incentivize heavy network investment into 5G networks. The role of spectrum pricing is to deliver incentives in network investment.
- ❑ Recent academic researches assert that high spectrum prices for 5G may reduce incentives for spectrum investments.

“**Wireless Score**” measures service quality in the form of data rates, coverage, QoS and 4G network uptake



Source: NERA Economic Consulting with data from OpenSignal.com and Teleography GlobalComms database.

Relationship between total spectrum spend and wireless score in middle income European countries



Source: NERA Economic Consulting with data from OpenSignal.com and Teleography GlobalComms database.

Relationship between total spectrum spend and wireless score in higher income European countries

High 5G spectrum prices jeopardize the effective 5G uptake. Seeking to maximize state revenues from spectrum has negative socio-economic effect as far as 5G is the backbone of digital economies. 5G markets can be undermined and there is a risk of higher retail prices and lower network investment. Regulators should set spectrum prices conservatively to allow the market to determine a fair price and to reduce the risk of leaving spectrum unassigned.



# 5G Licensing Awarding

**1) AUCTIONS** can deliver strong social benefits as long as they are properly designed

- Clarity and transparency prior and during the award are essential to ensure an efficient process and avoid delays in the release of spectrum.
- Introducing mechanisms of auctions proceeds payment by instalment to avoid overloading of licensees

**2) ADMINISTRATIVE ASSIGNMENT** can offer advantages over auctions in some circumstances, such as where authorities wish to assign licenses with regard to a range of criteria.

**3) EXCLUSIVE LICENSING** is the main 5G licensing mechanism to MNOs so far

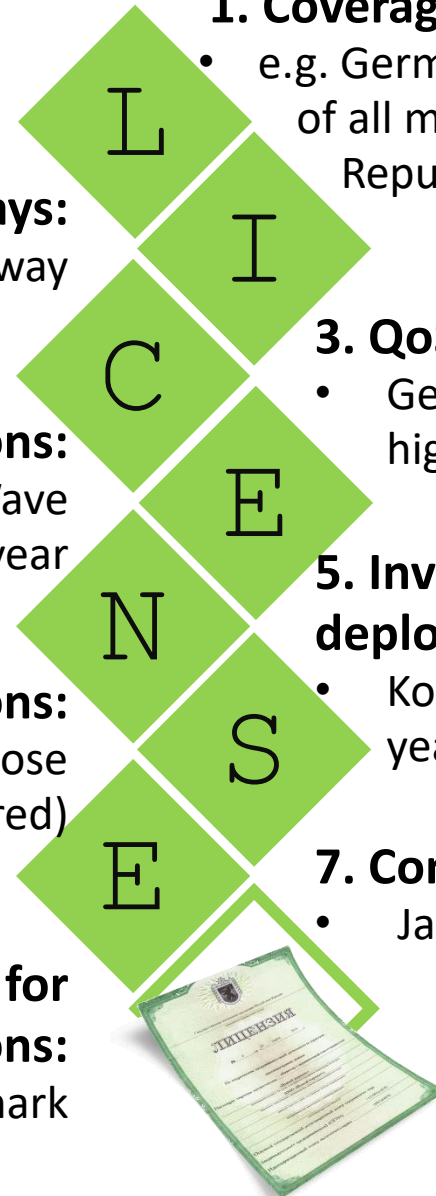
- No significant use of shared spectrum in key 5G bands so far –except in 3.5 GHz in the US

Nationwide licensing predominates but more markets have embraced regional licensing

- US & Australia continue to use regional licensing but others have joined with 3.5 GHz (Ireland, Austria)



# 5G Licensing Obligations



## 1. Coverage obligations (population and/or geographical):

- e.g. Germany 98% of HH, Netherlands 98% of all municipalities, Italy 80% of commutes, Czech Republic 95% of population

## 2. Covering roads and railways:

- Germany, Qatar, Norway

## 3. QoS obligations:

- Germany 100 MB/s for HH covered, 10 ms latency for highways and federal roads

## 4. Network deployment obligations:

- Singapore MNOs have to deploy mmWave spectrum within a year

## 5. Investment (\$) and number of BTS to be deployed:

- Korea (150,000 base stations - 22,500 within first 3 years, 45,000 within next five years)

## 6. Sharing obligations:

- Finland (leasing spectrum for the purpose of providing services in the area not covered)

## 7. Commitments to expand optical fiber networks:

- Japan

## 8. Higher prices in exchange for no coverage obligations:

- Sweden, Norway, Denmark

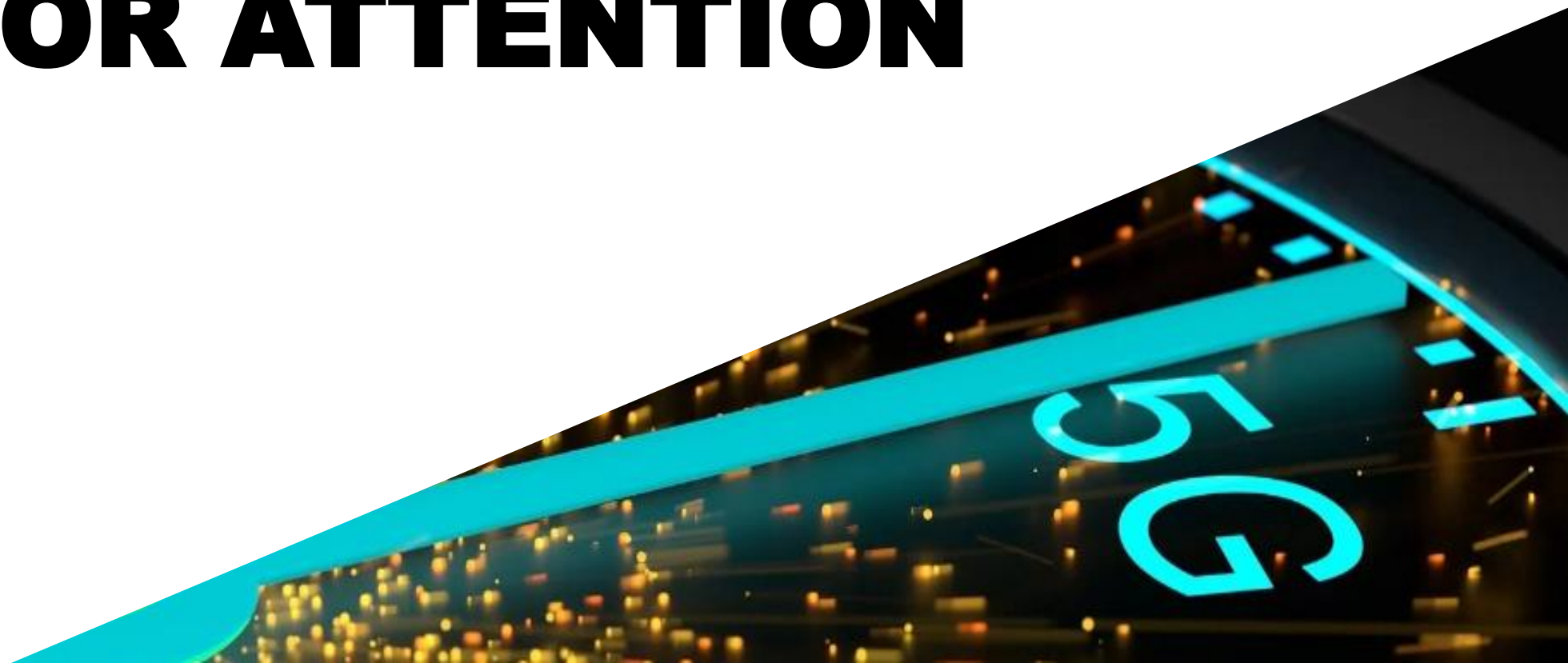
# 5G Technology Neutrality Issues

Spectrum landscape establishes the scope of technology neutrality regulation relevant to 5G

CATEGORY	FREQUENCY RANGE	MNO'S EXISTING USAGE	COMMENT
Low-bands	<1GHz	Mostly existing bands, but depending on the region and timing of spectrum assignment 700 MHz and 600 MHz may go straight to 5G	It is essential that MNOs have the freedom to re-farm existing spectrum holdings to 5G in particularly relevant for 700 and 800 MHz spectrum licenses, some of which have been licensed as 4G technology specific spectrum but will be useful as a 5G coverage layer.
Mid-bands	1 GHz to 2,6 GHz	Mostly existing bands which will be refarmed, but depending on the country some bands e.g. 2300 MHz may go straight to 5G	It is now possible to 'gracefully refarm' bands so they are used simultaneously for several technologies – including 4G and 5G.
Mid-bands	3,3 GHz to 6 GHz	These are predominately new bands for mobile usage so will be used by mobile operators for 5G. Notably there is some legacy fixed-wireless access (e.g. LTE or WiMAX)	Regulators should adopt a service and technology neutral framework to support IoT in these bands or they risk stifling the development of what is also referred to as the 4th industrial revolution.
High bands	> 24 GHz	New bands for 5G	Licensing conditions for MW backhaul spectrum must also keep up with mobile access technology development. MNOs need to be free to deploy the latest technology to ensure spectral efficiency is maximized,. Where they still exist, capacity based microwave spectrum regulatory fee structures need to be replaced so it becomes economically feasible to deploy Gbit backhaul.

Source: GSMA The Benefits of Technology Neutral Spectrum Licences. Report, June 2019.

**THANK YOU  
FOR ATTENTION**



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