

# 12<sup>th</sup> International Electronic Communications Regulators Conference. “Technologies Shaping Social Life: Opportunities and Threats”. Regulators and Policy Makers



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Deputy Director General  
Communications Regulatory Authority Republic of Lithuania

Ankara, 9-10 May 2018



- 65 200 sq. km. – area.
- 2,743,500 – population.
- 100 years of the restored Lithuania.
- Official language – Lithuanian.



## Lithuania



LABAS  
MERHABA





# RRT Communications Regulatory Authority

RRT is an independent public institution responsible for the regulation of electronic communications, postal and railway sectors; est. in 2001



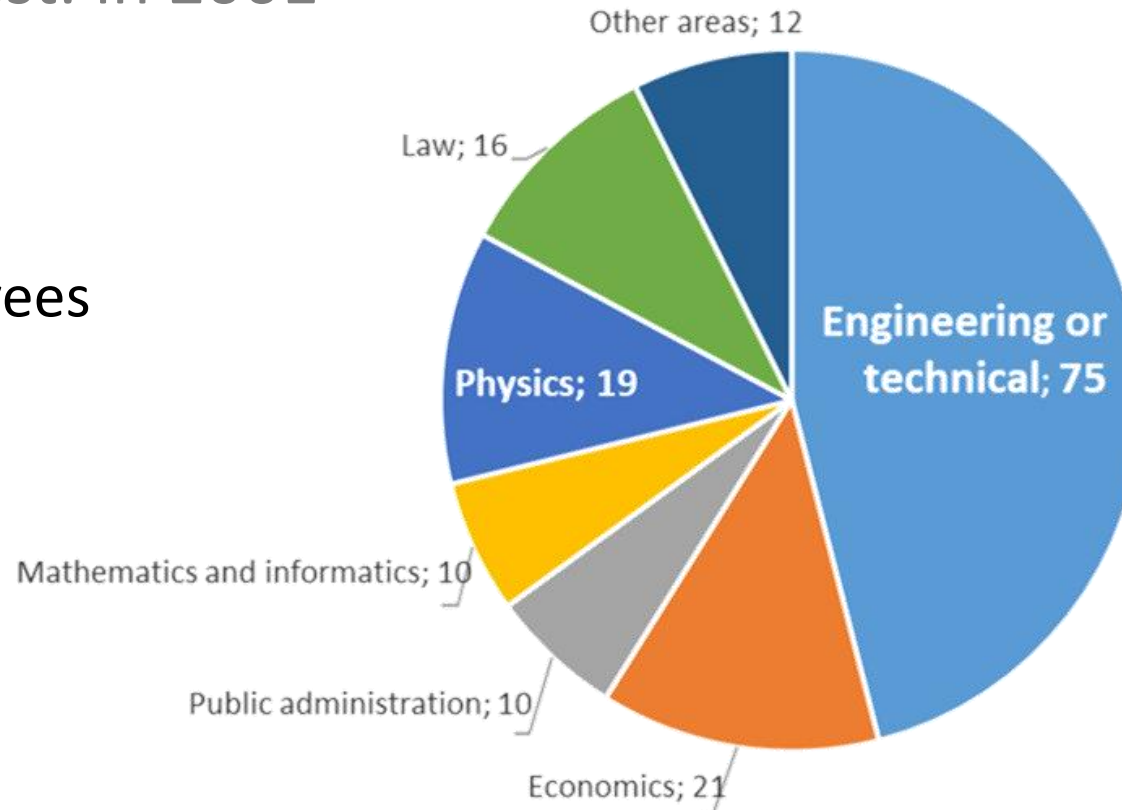
**63** Women



**163** Employees



**100** Men

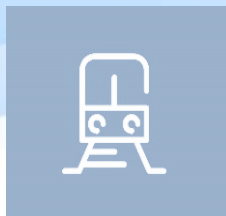


7 employees have a doctoral (Ph.D) degree

# RRT activities



Regulation of the  
electronic  
communication  
sector



Regulation of rail  
transport market



Regulation of the  
postal sector



Radio spectrum  
management  
and supervision



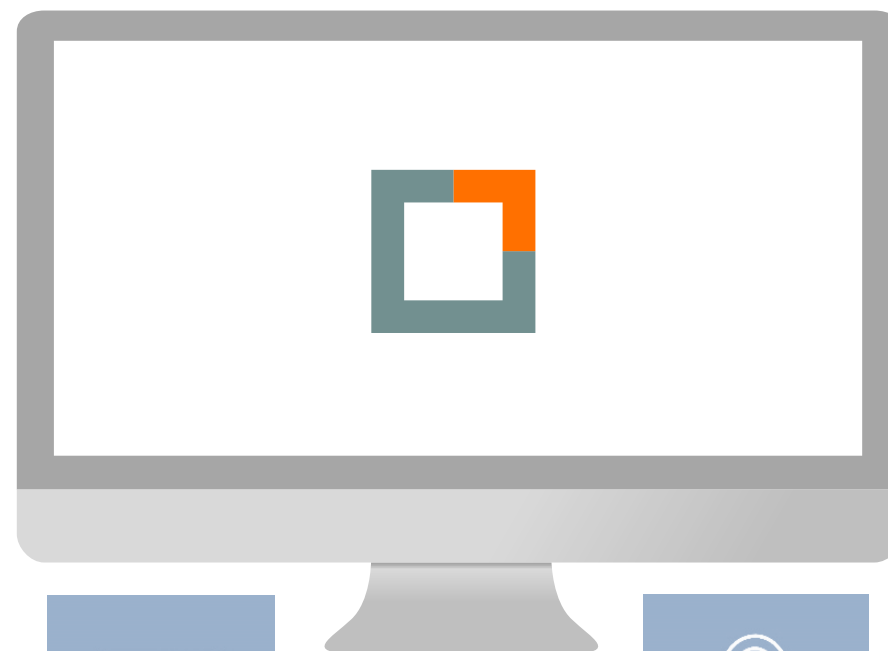
Management and  
supervision  
of electronic  
communications  
resources



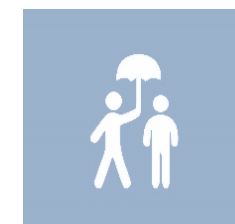
Supervision of  
devices and  
equipment



Supervision of trust  
service providers



Harmful Internet  
content prevention



Protection of  
consumers' rights  
and legitimate  
interests





# Global ICT Regulatory Outlook 2017

## Rationale for generations of regulation.

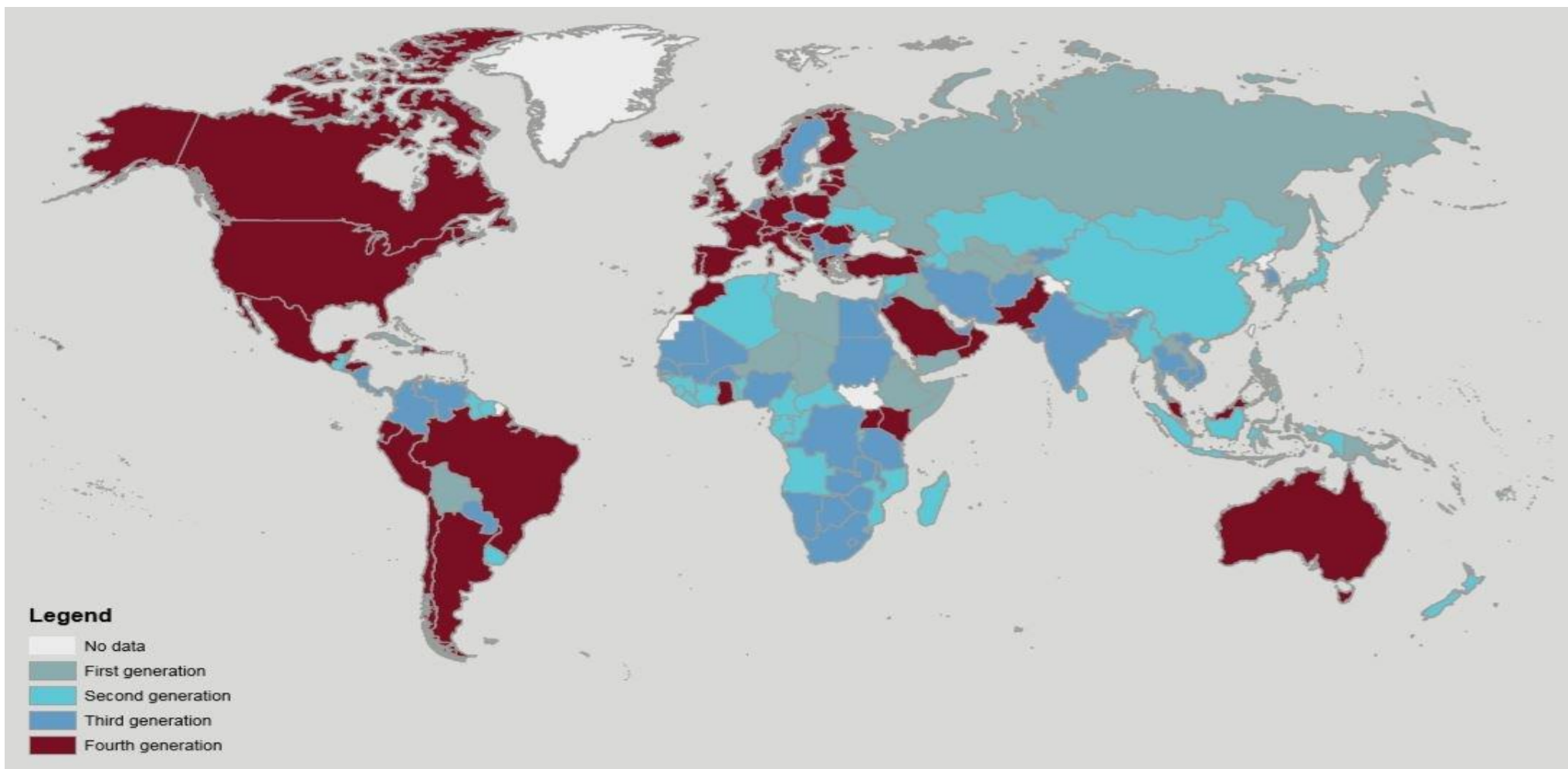
Source: ITU

	<b>1. Regulatory authority</b>	<b>2. Regulatory mandate</b>	<b>3. Regulatory regime</b>	<b>4. Competition framework</b>
<b>G1</b>	<ul style="list-style-type: none"><li>• Consolidated with policy-maker and/or industry</li></ul>	<ul style="list-style-type: none"><li>• Business as usual</li></ul>	<ul style="list-style-type: none"><li>• Doing as we have always done</li></ul>	<ul style="list-style-type: none"><li>• State-owned monopoly</li></ul>
<b>G2</b>	<ul style="list-style-type: none"><li>• Separate agency</li></ul>	<ul style="list-style-type: none"><li>• First wave of regulatory reform</li></ul>	<ul style="list-style-type: none"><li>• Doing more</li></ul>	<ul style="list-style-type: none"><li>• Liberalization</li></ul>
<b>G3</b>	<ul style="list-style-type: none"><li>• Separate agency, autonomous in decision-making</li></ul>	<ul style="list-style-type: none"><li>• Advanced liberalization of ICT sector</li></ul>	<ul style="list-style-type: none"><li>• Doing the right things</li></ul>	<ul style="list-style-type: none"><li>• Partial competition</li></ul>
<b>G4</b>	<ul style="list-style-type: none"><li>• Separate agency with enforcement power</li></ul>	<ul style="list-style-type: none"><li>• Adjacent issues become core mandate</li></ul>	<ul style="list-style-type: none"><li>• Doing the things right</li></ul>	<ul style="list-style-type: none"><li>• Full competition</li></ul>
<b>G5</b>	<ul style="list-style-type: none"><li>• Separate agency as part of a network of partner regulators</li></ul>	<ul style="list-style-type: none"><li>• Separate agency as part of a network of partner regulators</li></ul>	<ul style="list-style-type: none"><li>• Doing things together</li></ul>	<ul style="list-style-type: none"><li>• Intra-modal competition</li></ul>

# Global ICT Regulatory Outlook 2017

Regulatory landscape in the ICT sector (2015).

Source: ITU





	Country	Cluster 1. Regulatory authority	Cluster 2. Regulatory mandate	Cluster 3. Regulatory regime	Cluster 4. Competition framework	Overall Score 2015	Rank 2015	Rank 2007	Change in rank
1	Ireland	20	19	30	28	97.0	1	19	18
2	Slovenia	19	19	30	27	95.0	2	8	6
3	Brazil	19	20.5	27	28	94.5	3	81	78
4	Italy	19	19	28	27.3	93.3	4	36	32
5	Mexico	19	20	26	28	93.0	5	109	104
6	Croatia	19	19	28	27	93.0	5	29	24
7	Poland	19	18	28	28	93.0	5	5	0
8	Portugal	19	19	28	27	93.0	5	3	-2
9	Turkey	19	19.5	30	24.3	92.8	9	25	16
10	Australia	18	19.5	28	27	92.5	10	5	-5
11	Hungary	18	21.5	26	27	92.5	10	2	-8
12	Montenegro	19	20	26	27	92.0	12	32	20
13	Dominican Rep.	19	19	26	28	92.0	12	26	14
14	Norway	18	17	30	27	92.0	12	16	4
15	Lithuania	19	18	28	27	92.0	12	15	3
16	Finland	18	18	28	27	91.0	16	28	12
17	France	18	19.5	30	23	90.5	17	11	-6
18	Greece	20	17	28	25.3	90.3	18	10	-8
19	Iceland	18	18	26	28	90.0	19	36	17
20	Switzerland	17	18	28	27	90.0	19	19	0

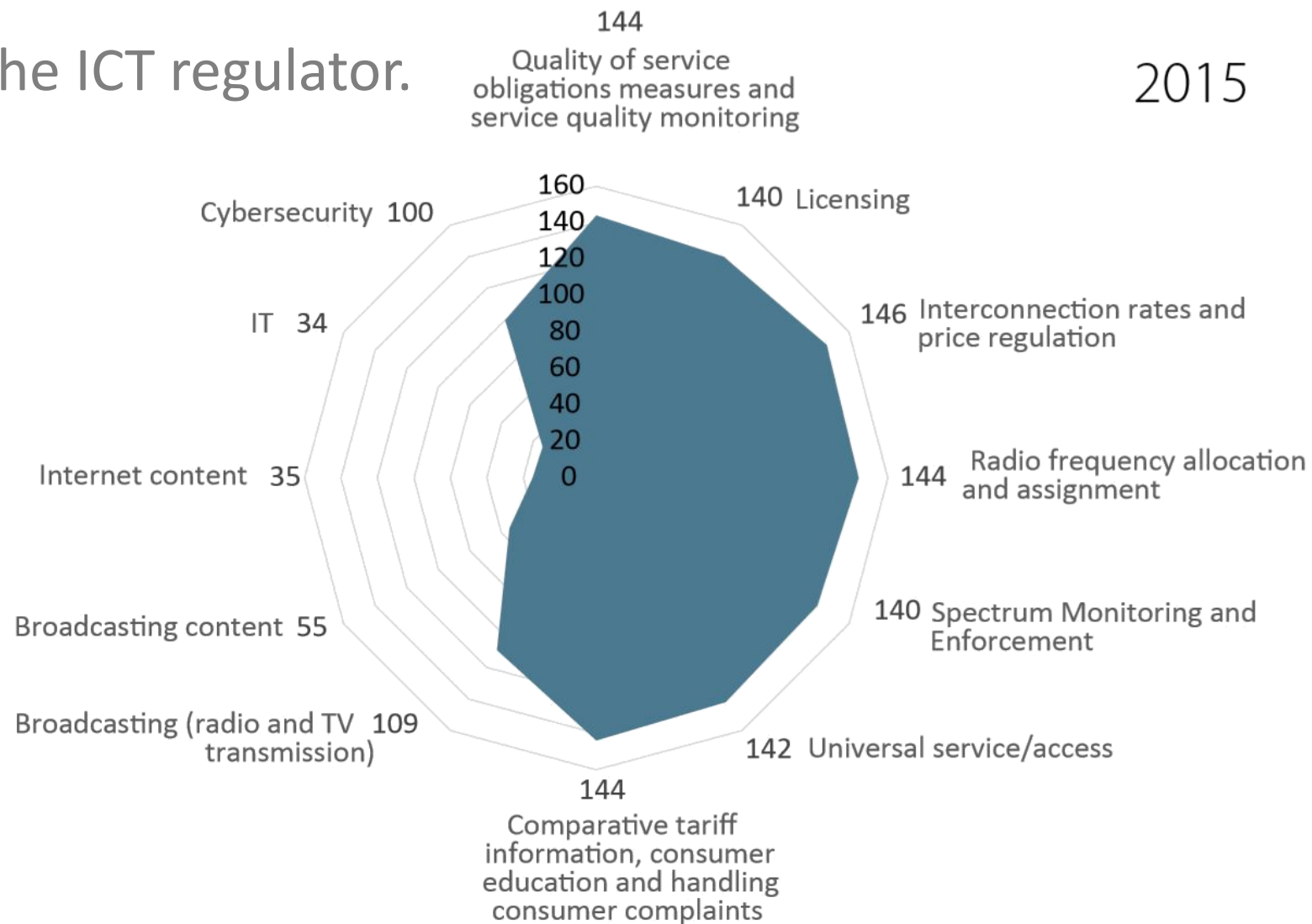




# Global ICT Regulatory Outlook 2017

## Mandate of the ICT regulator.

Source: ITU

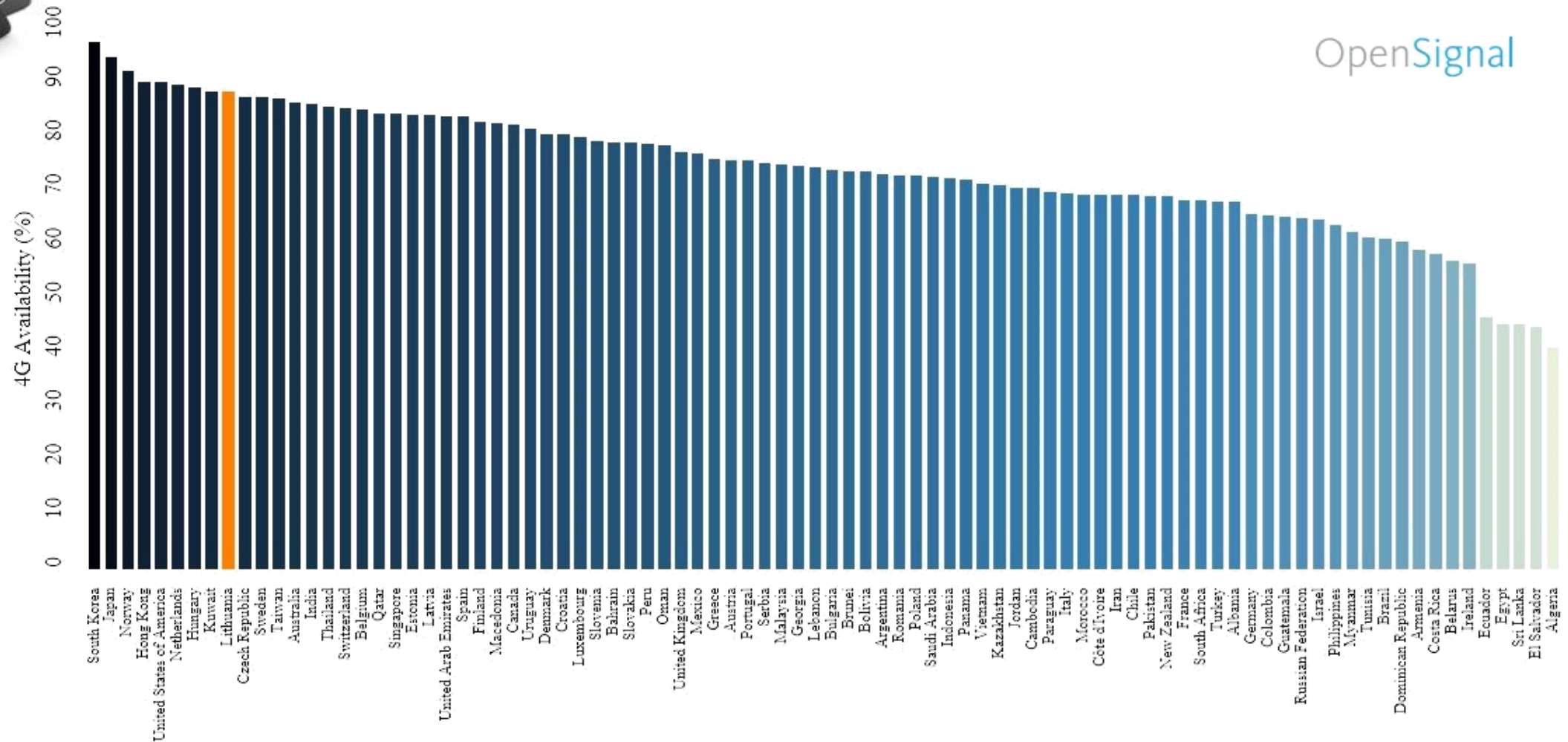


# Mobile communications

“One of the major trends moving ICT markets – Mobile – the engine for expanded local access to the internet.”

LTE coverage (2017).

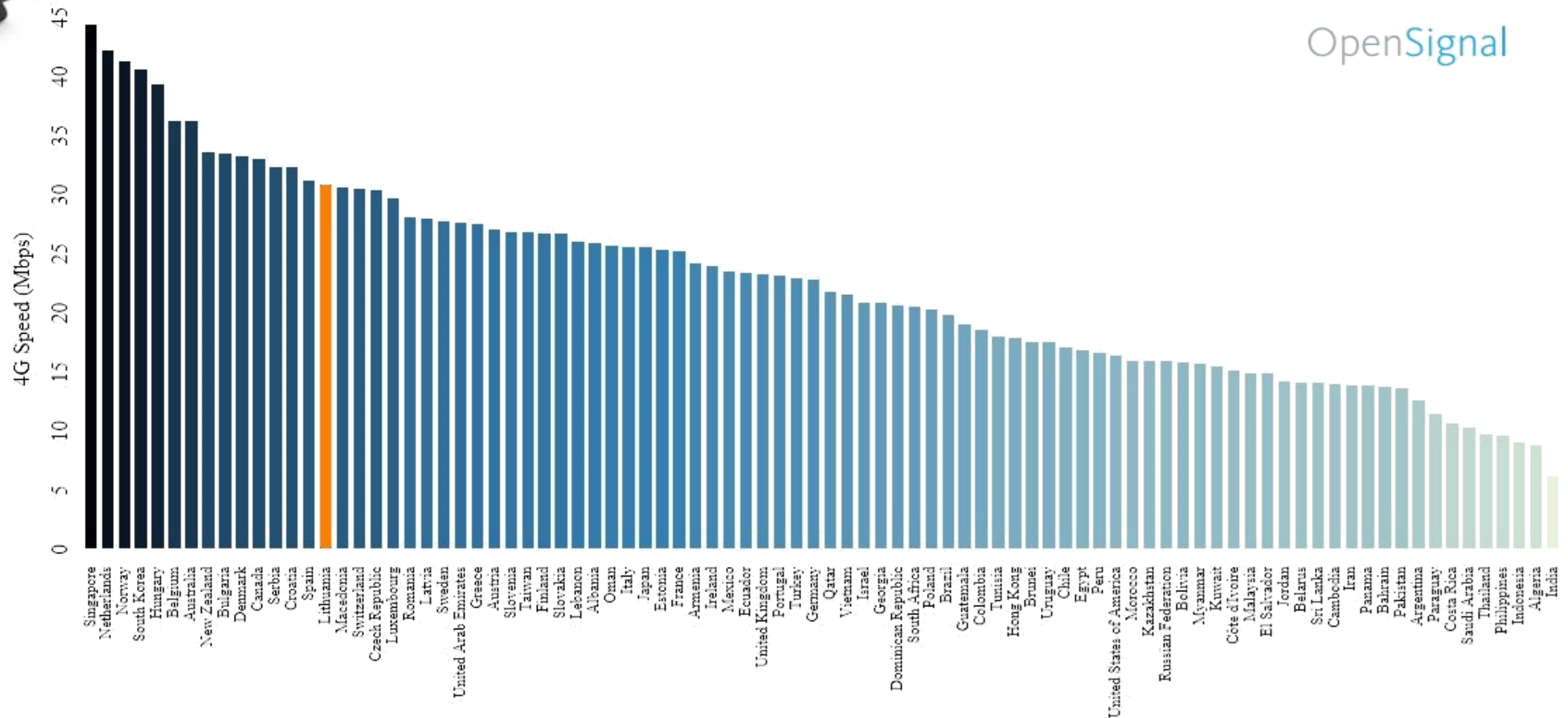
Global ICT Regulatory Outlook 2017



# Mobile communications

“the engine for expanded local access to the internet.”

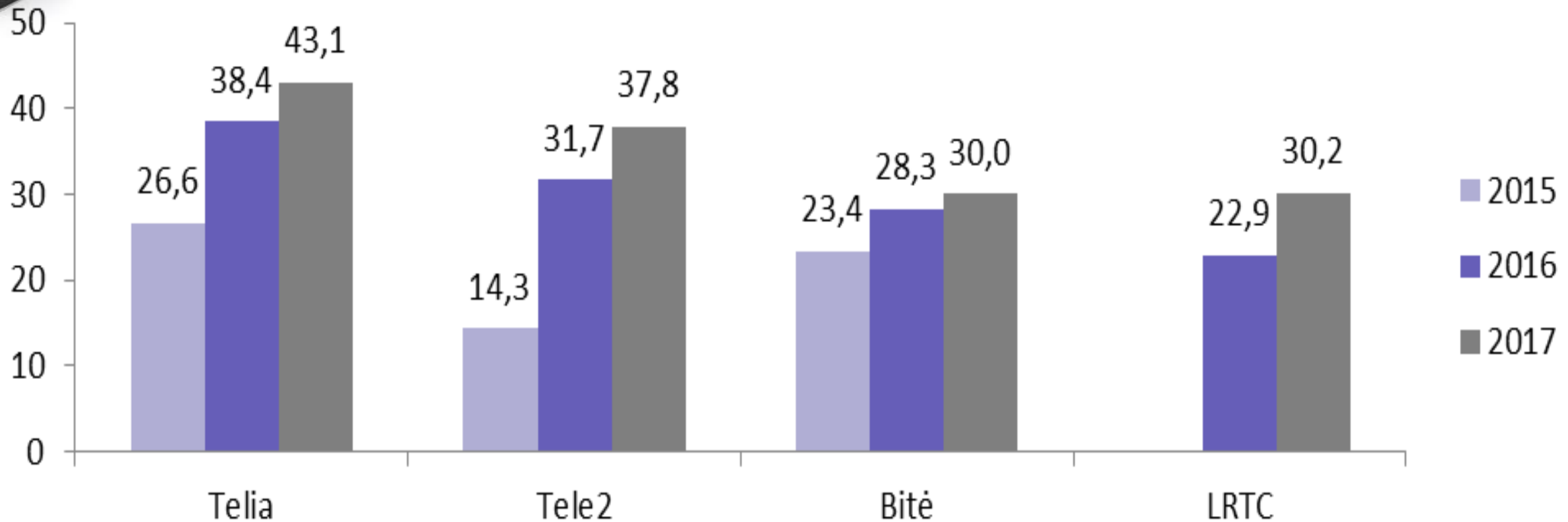
LTE speed (2017).





# Mobile communications

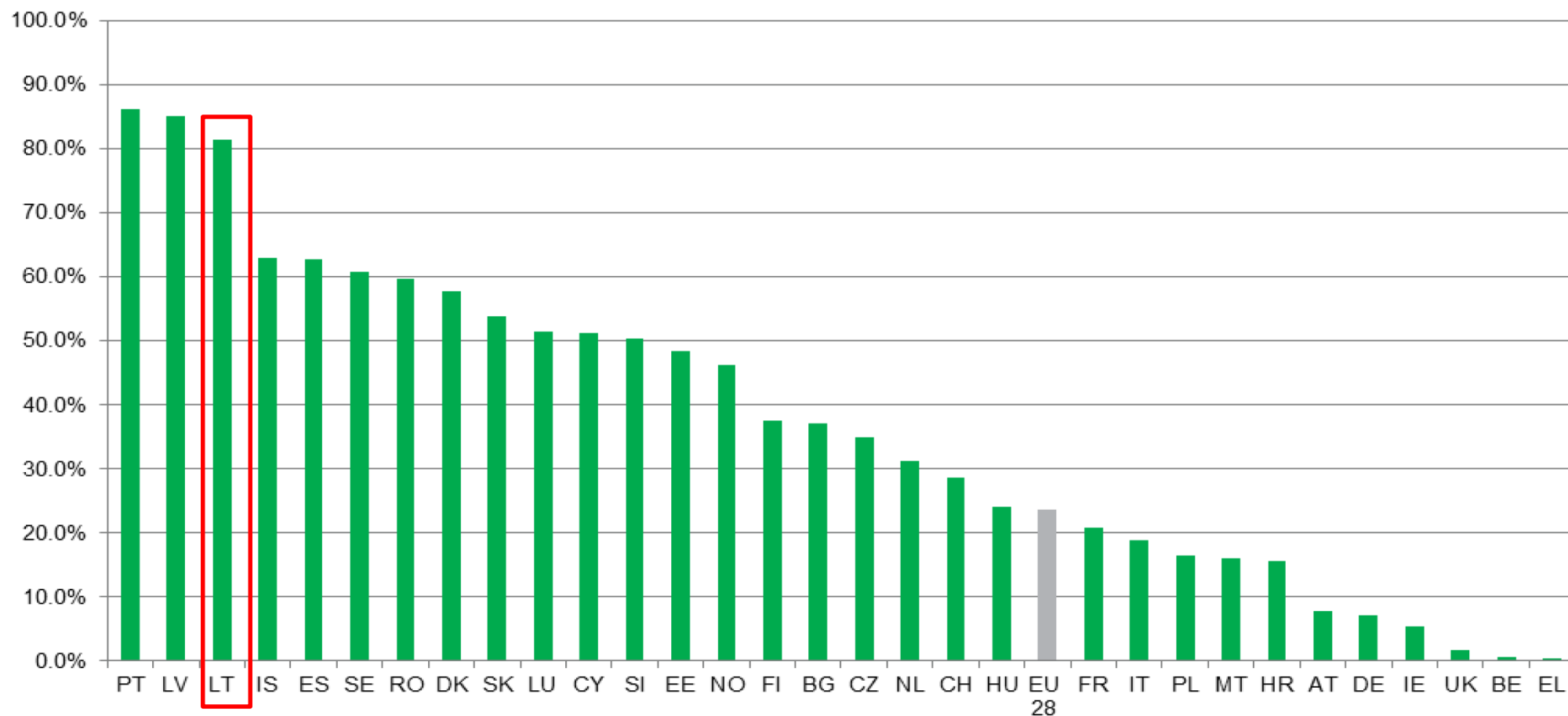
Measured average download speed in LTE networks (in Mbps)





# Electronic communications FTTP coverage

By country, 2016

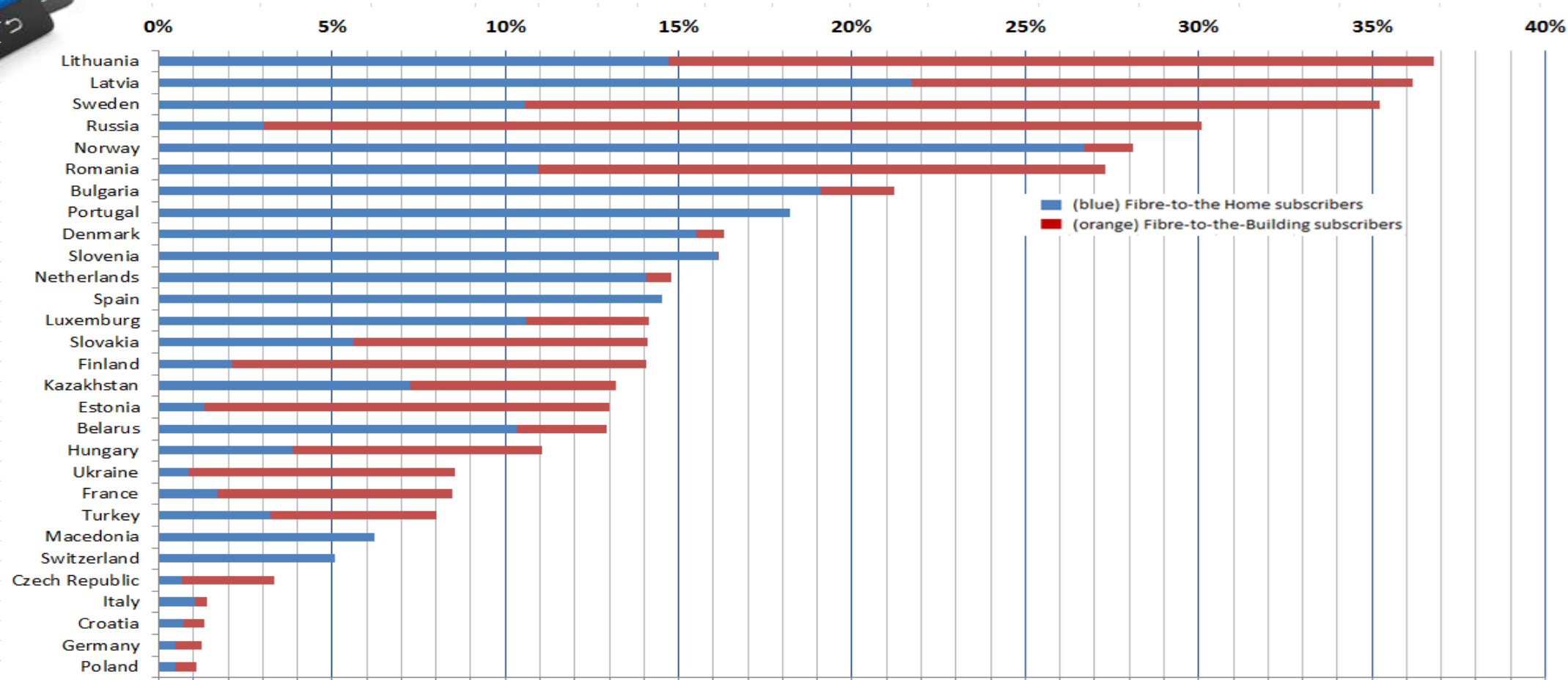




# Electronic communications

## FTTx subscribers per 100 households

Fiber penetration, 2016



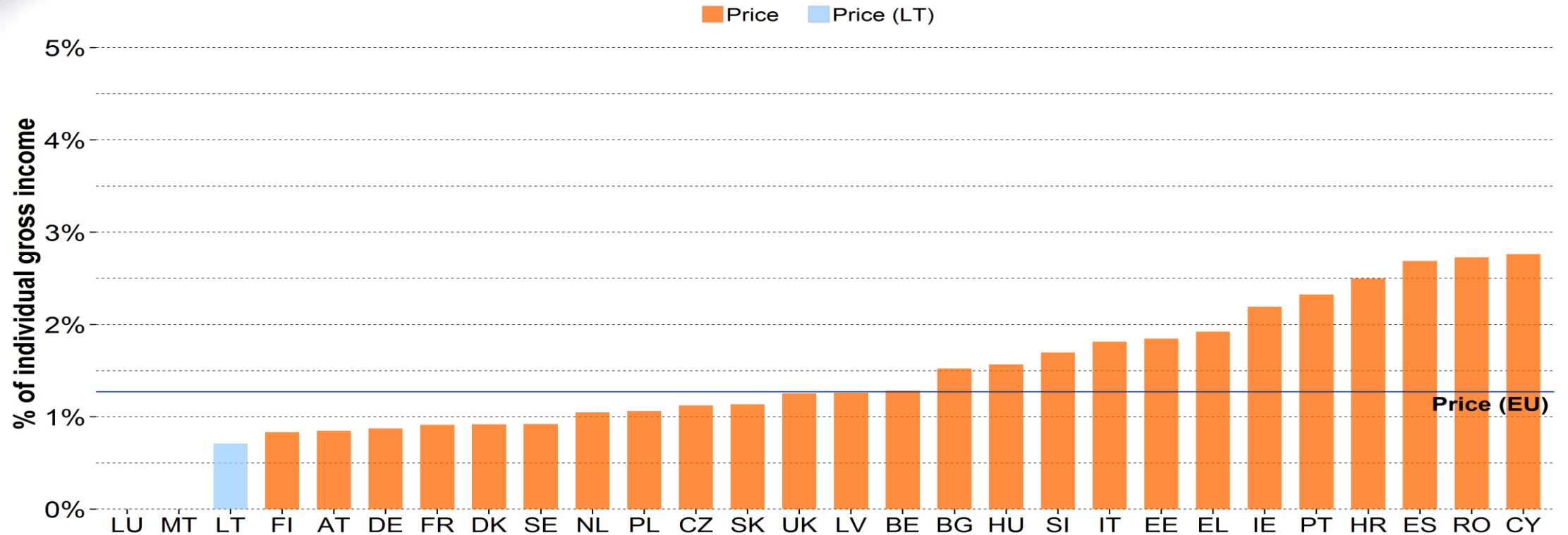
The number of FTTx subscribers per 100 households EU ranking. Source: IDATE for FTTH Council Europe, February 2016



# Electronic communications

## Fixed Broadband Price

### Fixed Broadband Price (2015) (cheapest standalone 12-30 Mbps connection)



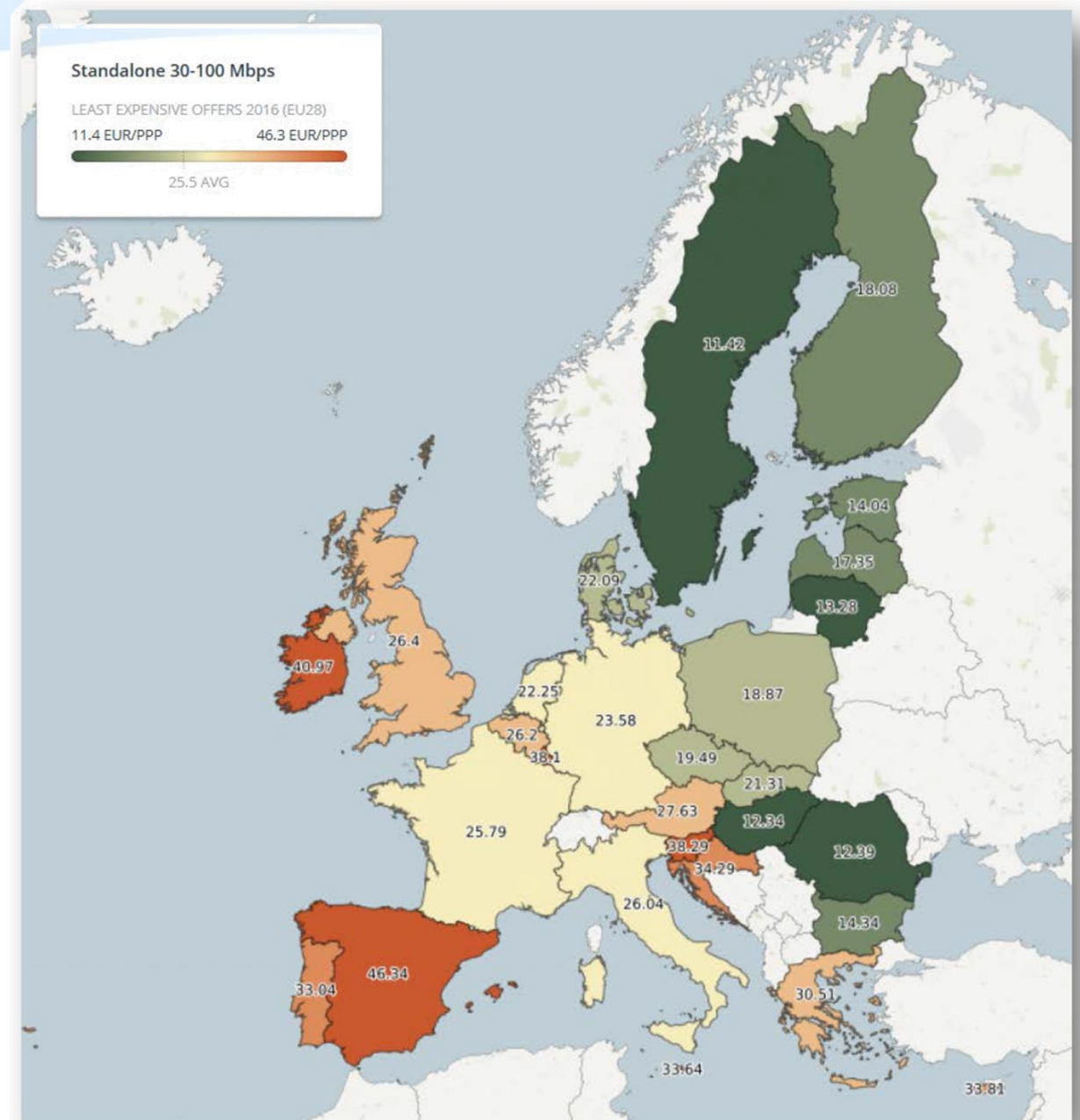
Sources: (access cost) Broadband Internet Access Cost (BIAC), annual studies for the EC realised by Van Dijk; (income) real adjusted gross disposable income of households per capita (Eurostat: tec00113)

# Electronic communications



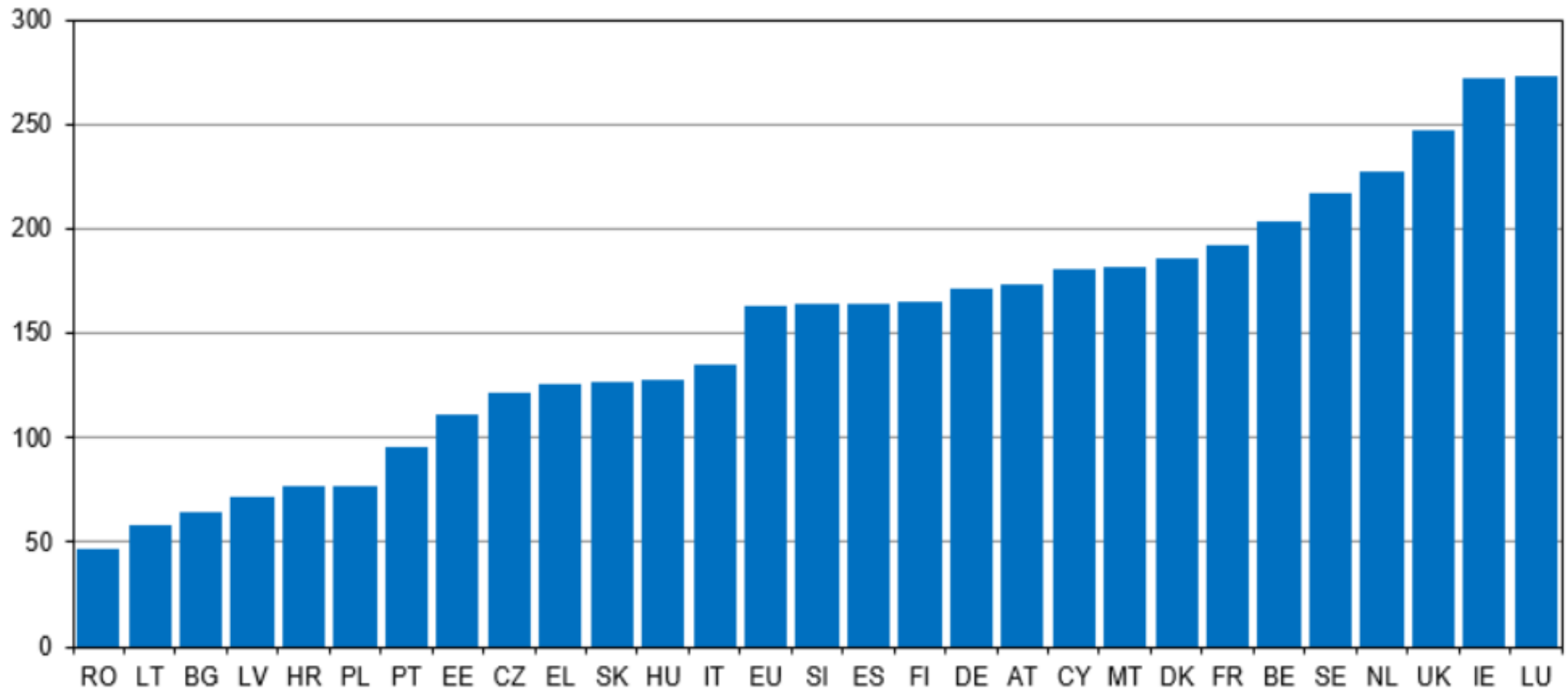
Fixed Broadband prices  
in Europe 2016,

Study prepared for EC 2017  
September 21.  
[doi:10.2759/630850](https://doi.org/10.2759/630850)



# Mobile communications

Average revenue per user (ARPU) in mobile communications, 2015



Source: Eurostat



# Mobile communications

Mobile - the engine for expanded local access to the internet

(Global ICT Regulatory Outlook 2017 ITU)

## How to stimulate the growth of mobile networks ?

- Technologically neutral licenses;
- Infrastructure sharing;
- Secondary trading;
- License exempt access;
- Licensed sharing access (LSA);
- Mobile number portability;
- Light licensing regime for some supplementary services;
- Frequencies fees regulation (just for CRA expenses, lower than FFTx);
- Calculations and publications of their networks coverages.

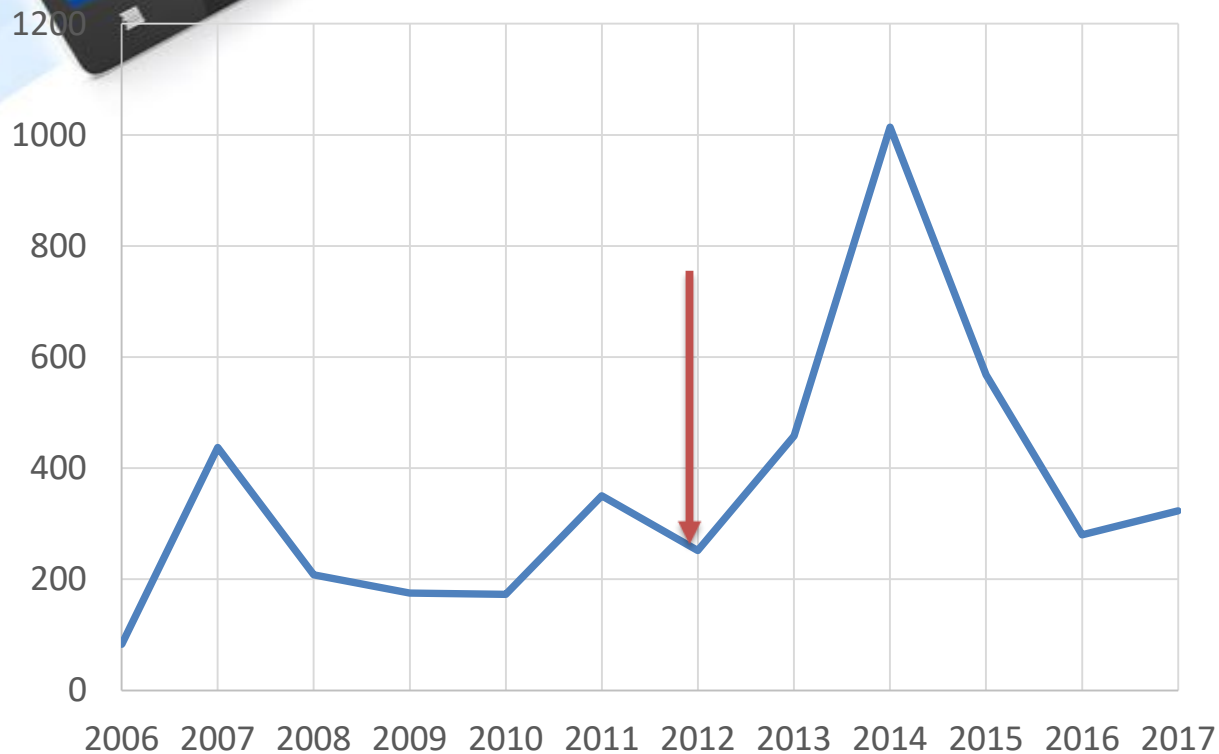


# Mobile communications

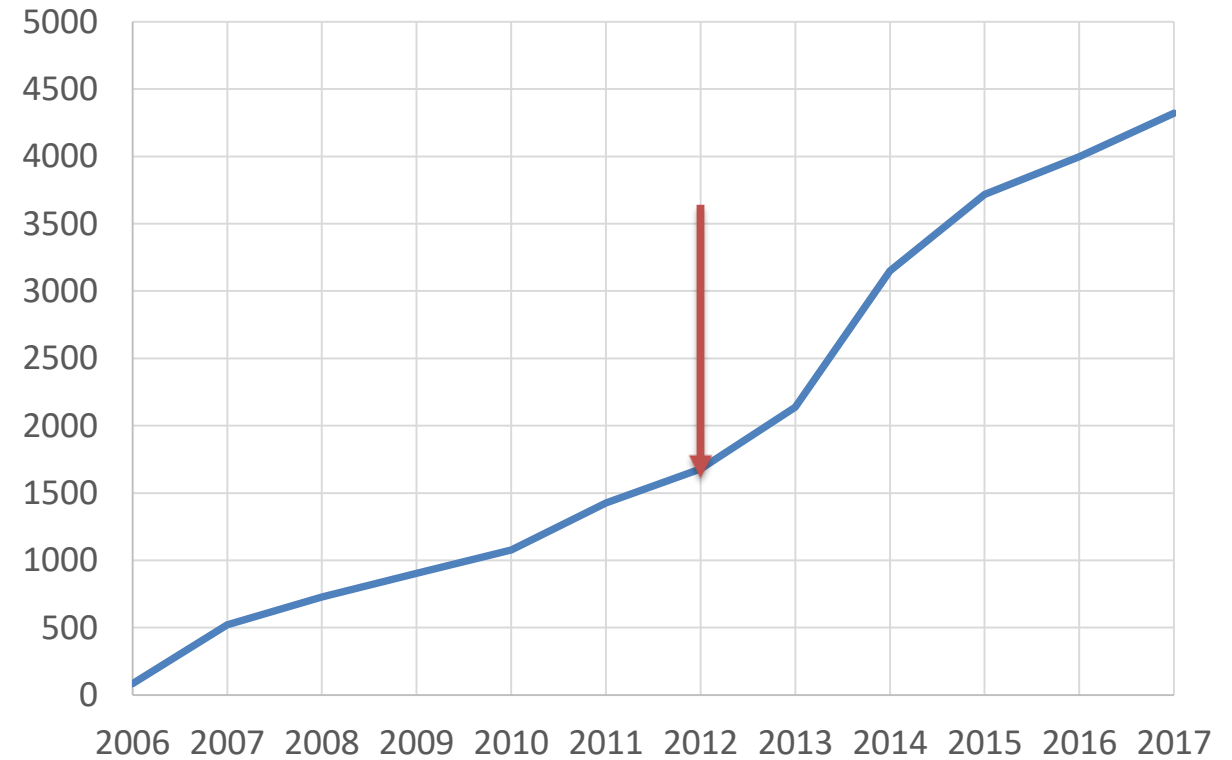
## The growth of UMTS Base stations

Licenses for UMTS networks were issued in February of 2006

Publications started 2012 Q2



Number registered BSs per year

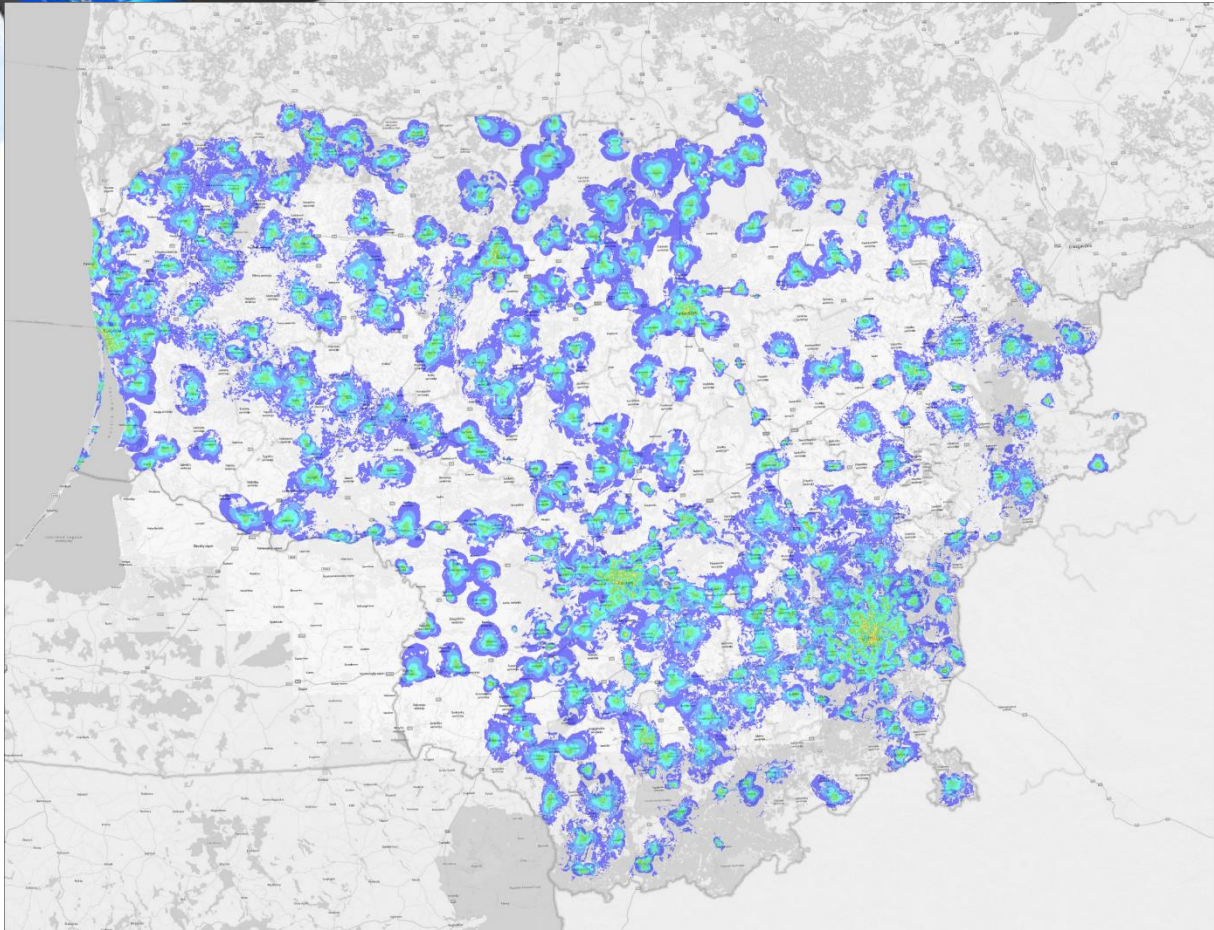


Total number of BSs

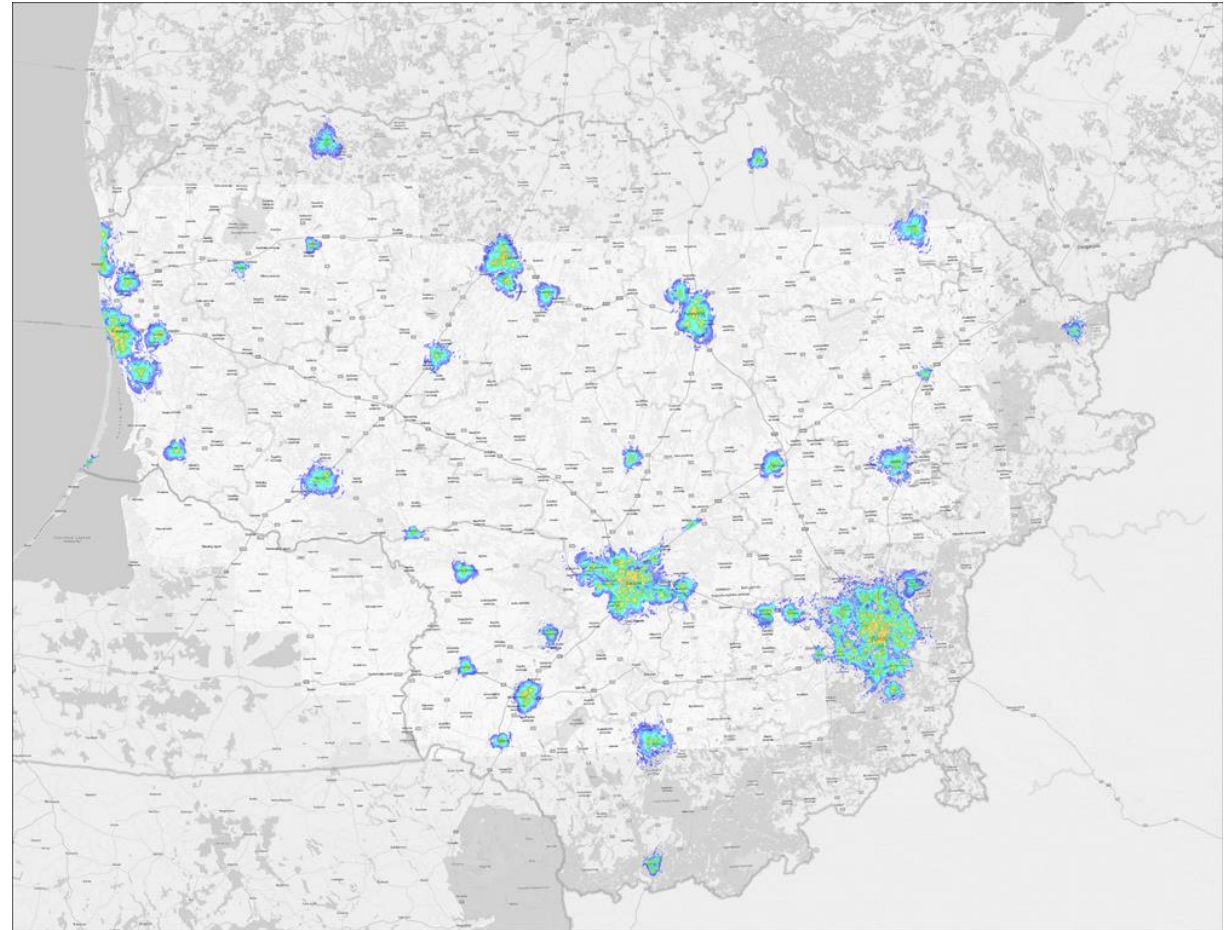
# Mobile communications

UMTS (2012 I half-year)

Operator I



Operator II

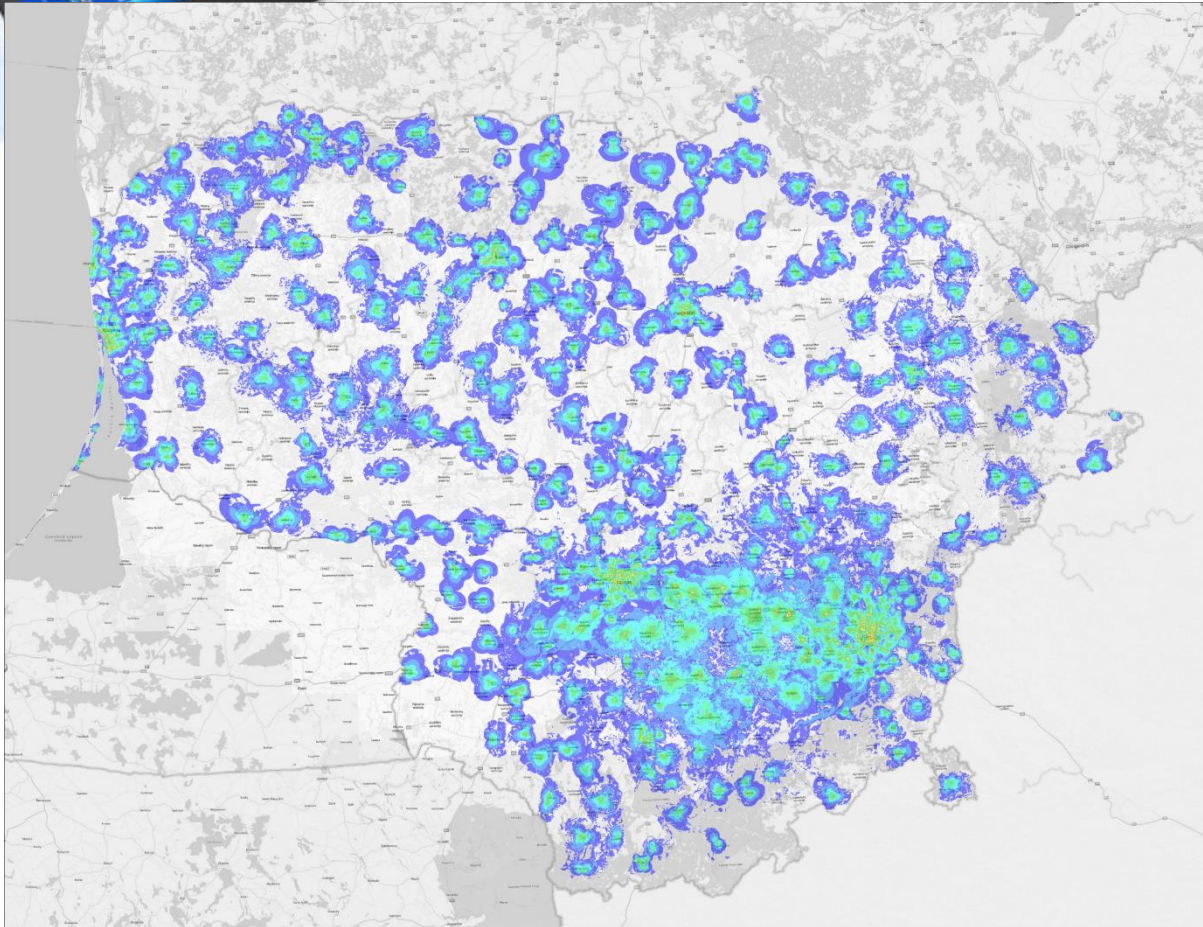




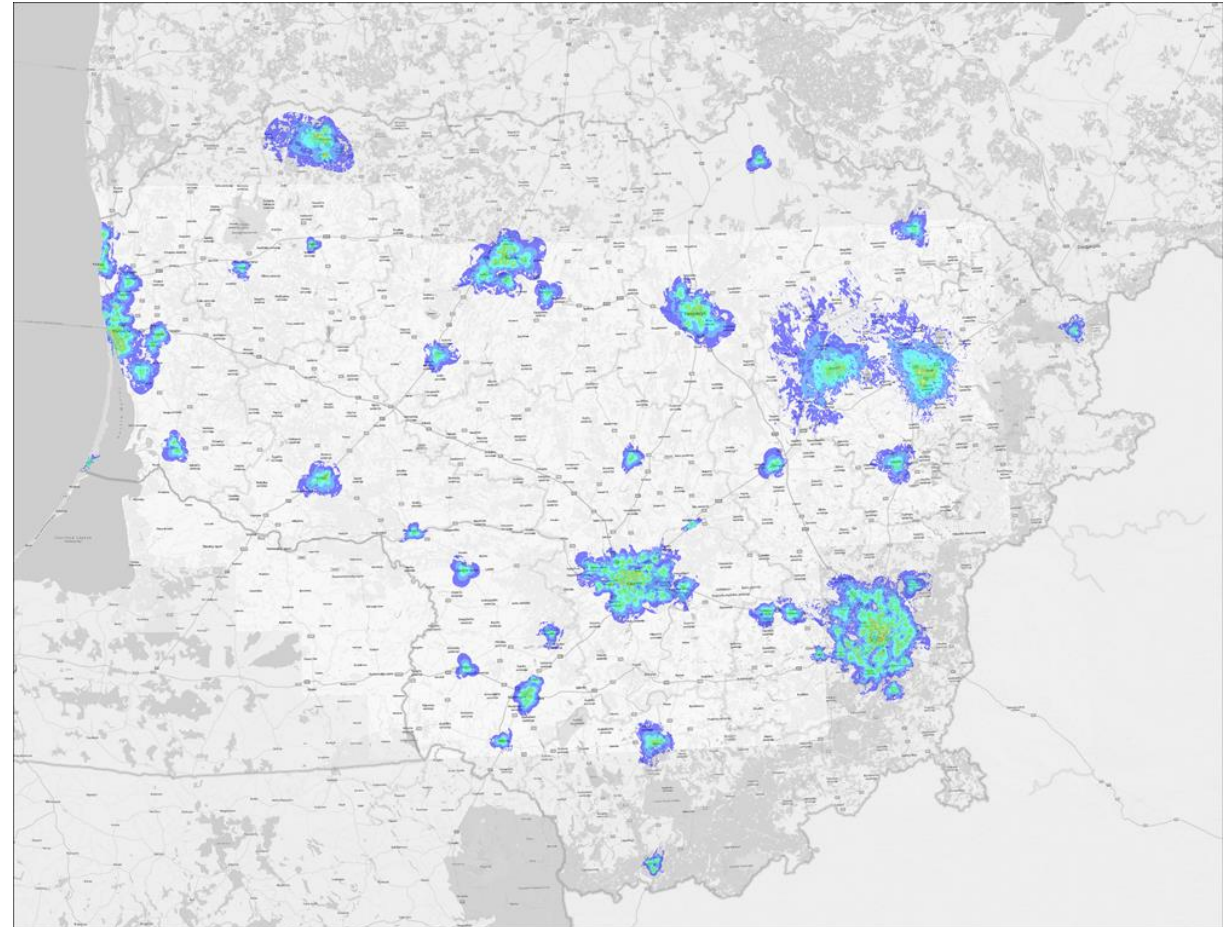
# Mobile communications

UMTS (2013 I half-year)

Operator I



Operator II

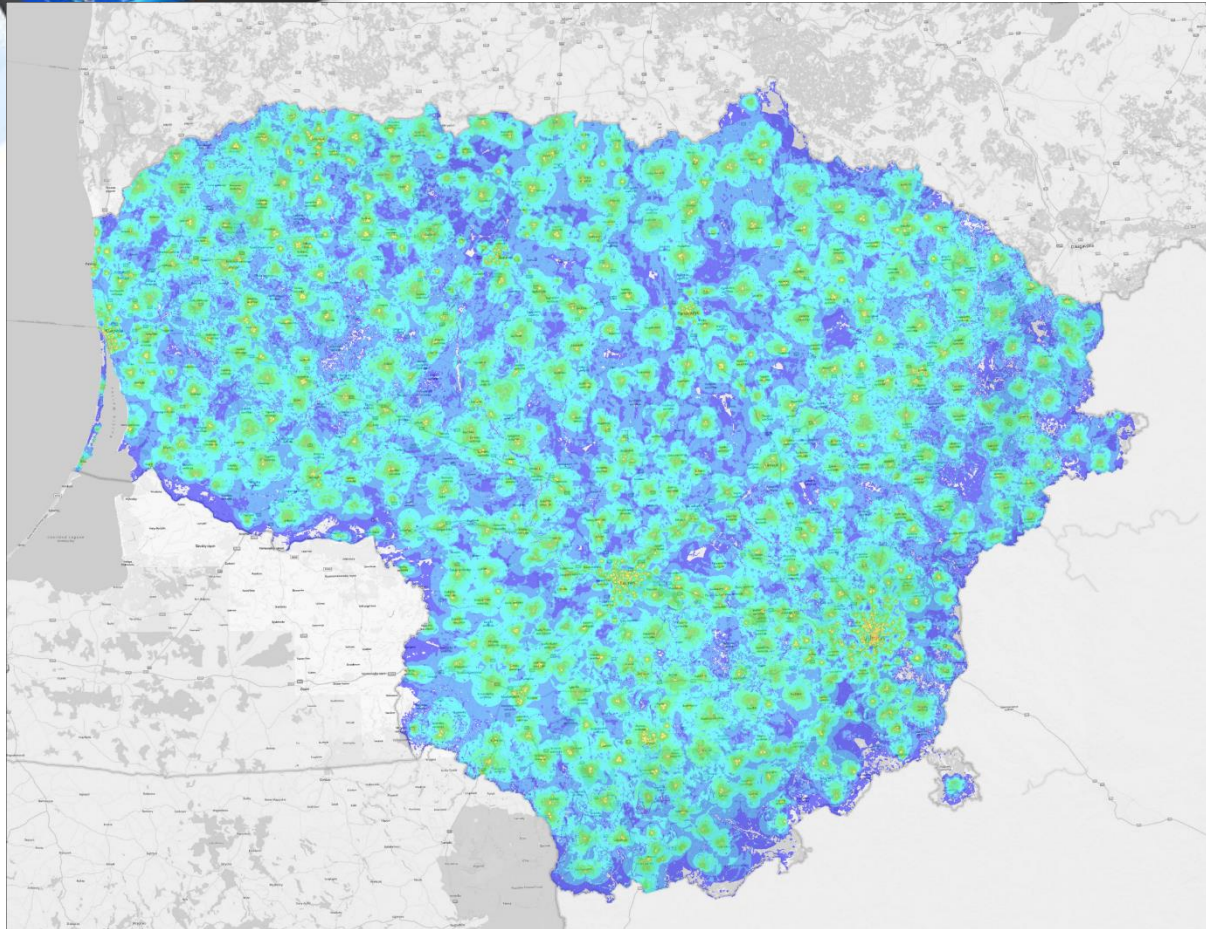




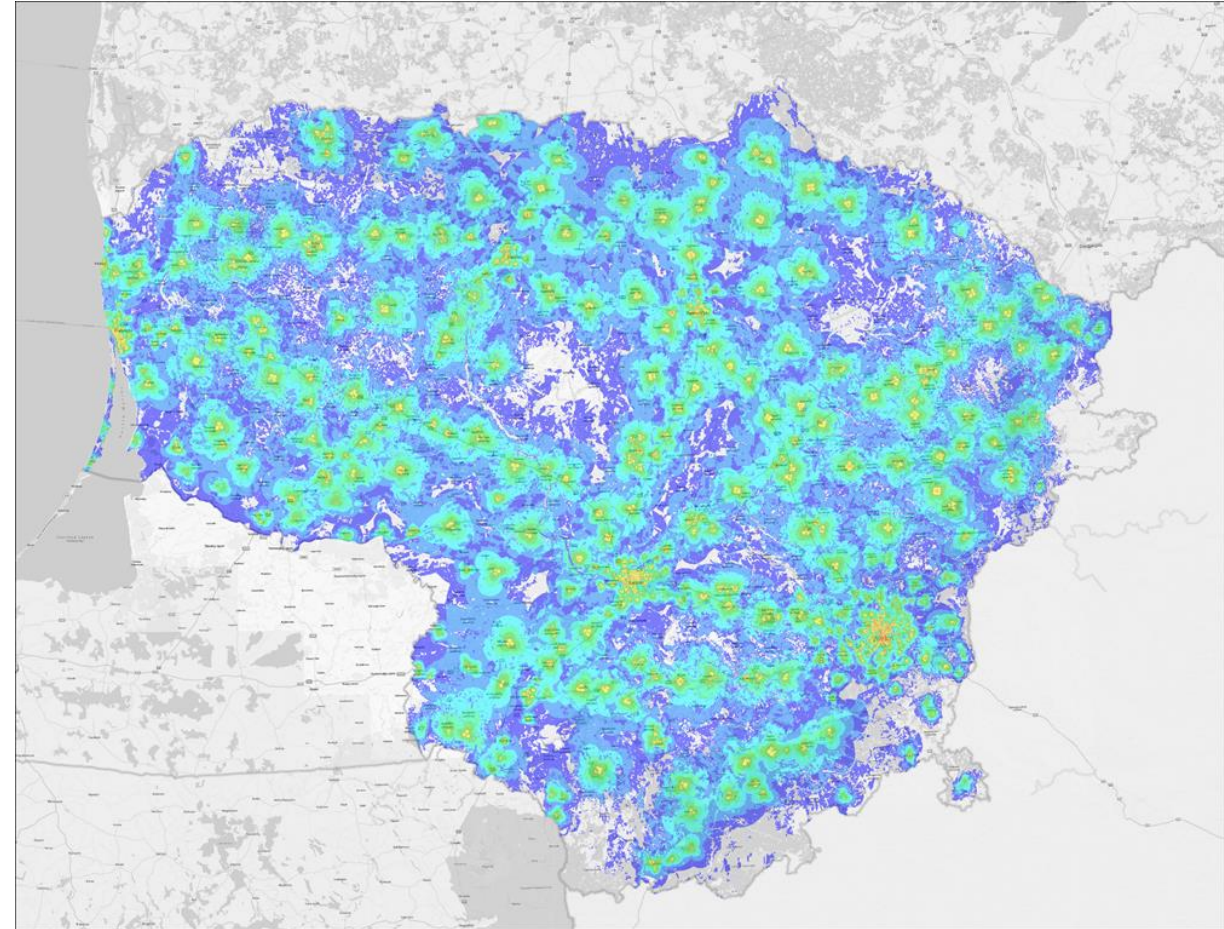
# Mobile communications

UMTS (2014 II half-year)

Operator I



Operator II





# Mobile communications

## The growth of LTE Base stations

LTE, LTE+, LTE++

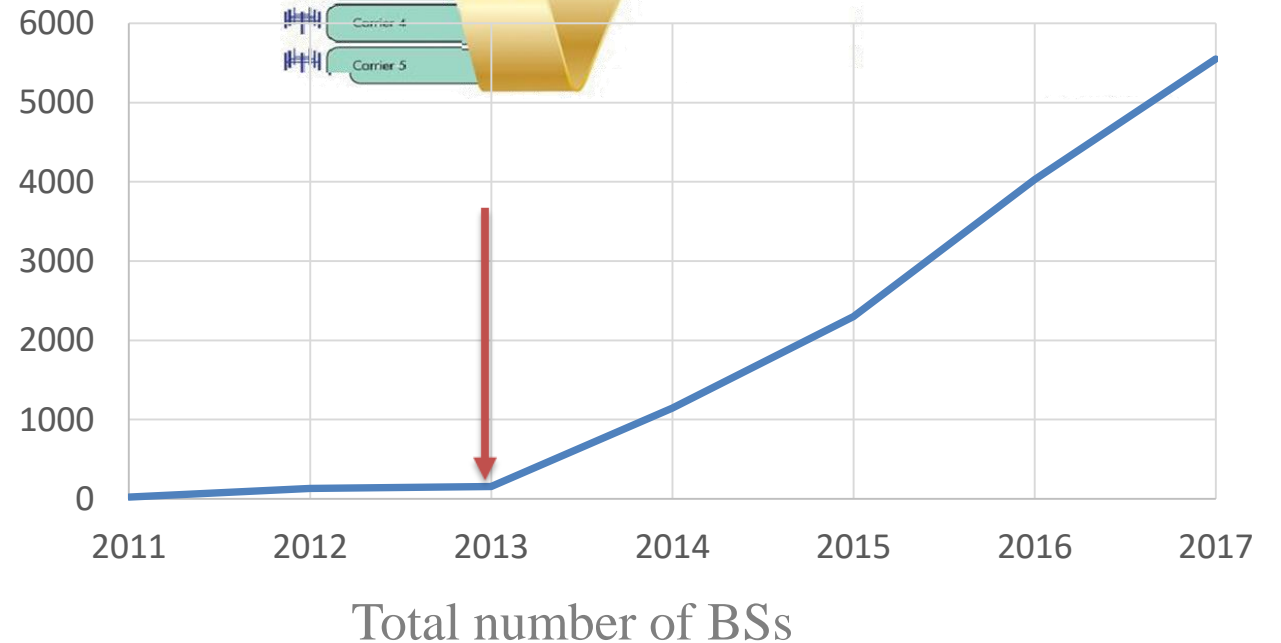
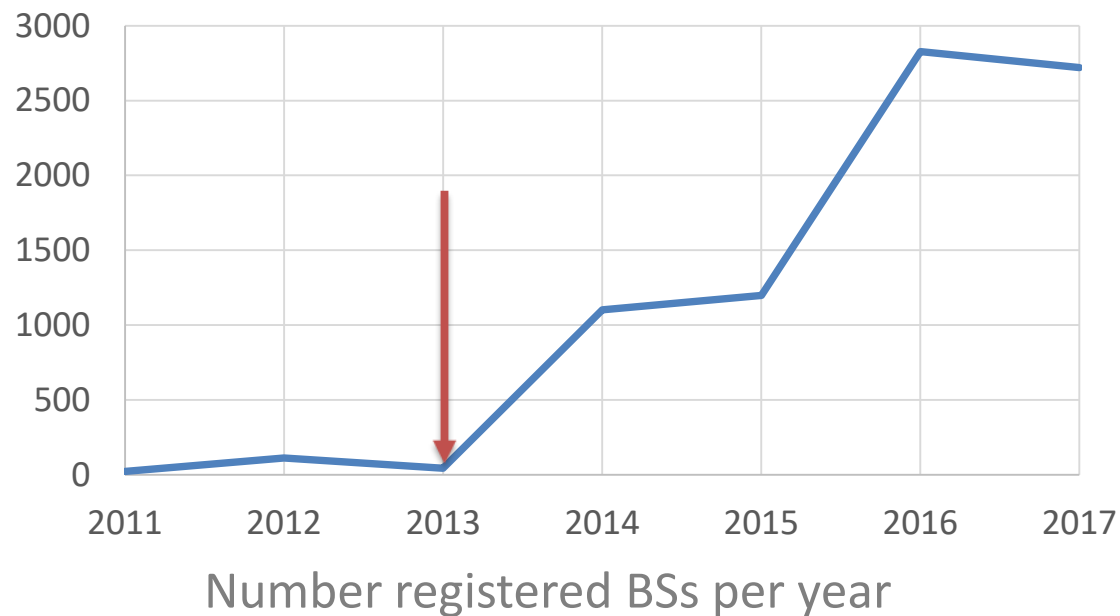
LTE-800:

LTE-900:

LTE-1800:

LTE-2100:

LTE-2600.





# Mobile communications

Coverage (2017 Q4)

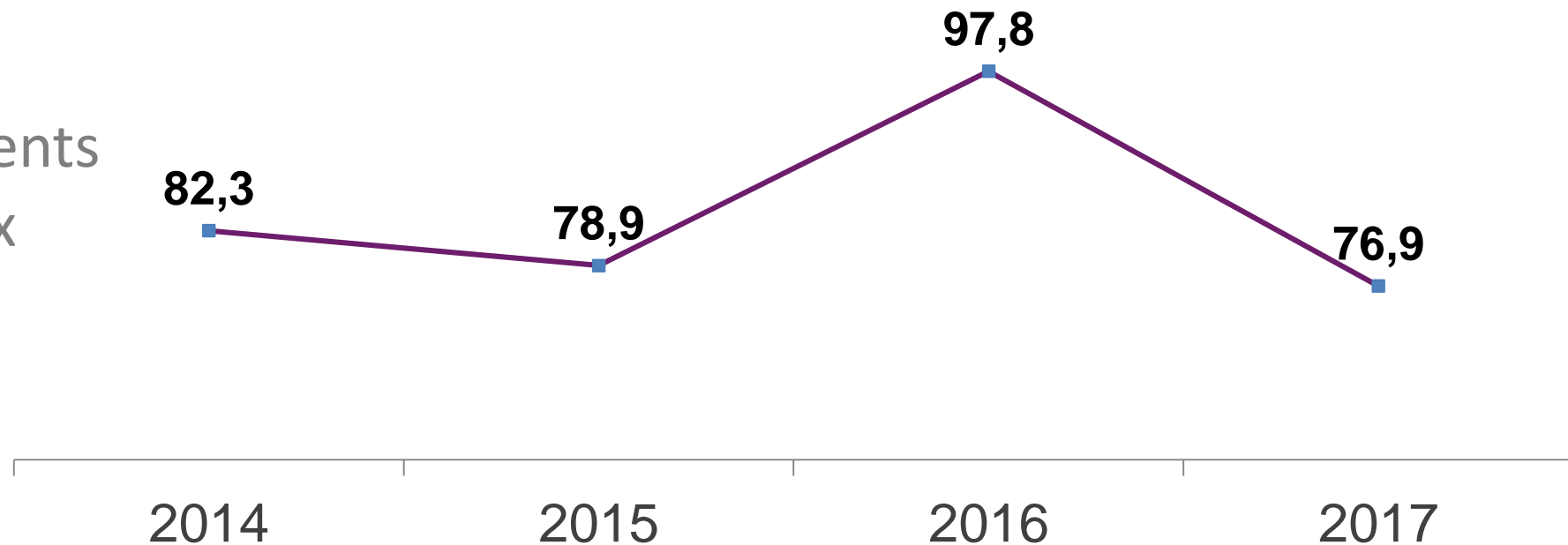
*Next - download speed calculations, in Mbps and publications*

	GSM networks coverage			UMTS networks coverage			LTE networks coverage		
	−95 dBm	−85 dBm	−75 dBm	−105 dBm	−95 dBm	−75 dBm	−115 dBm	−105 dBm	−75 dBm
UAB „Bitė Lietuva“	99,4	90,7	65,4	98,5	91,6	65,5	93,4	61,1	31,5
Telia Lietuva, AB	99,7	95,2	74,1	99,7	97,1	81	98,0	73,0	42,0
UAB „Tele2“	99,8	97,0	78,8	99,8	97,9	80,3	97,0	74,0	43,0

# Electronic communications market

Investment in ICT sector of Lithuania, in millions EUR.

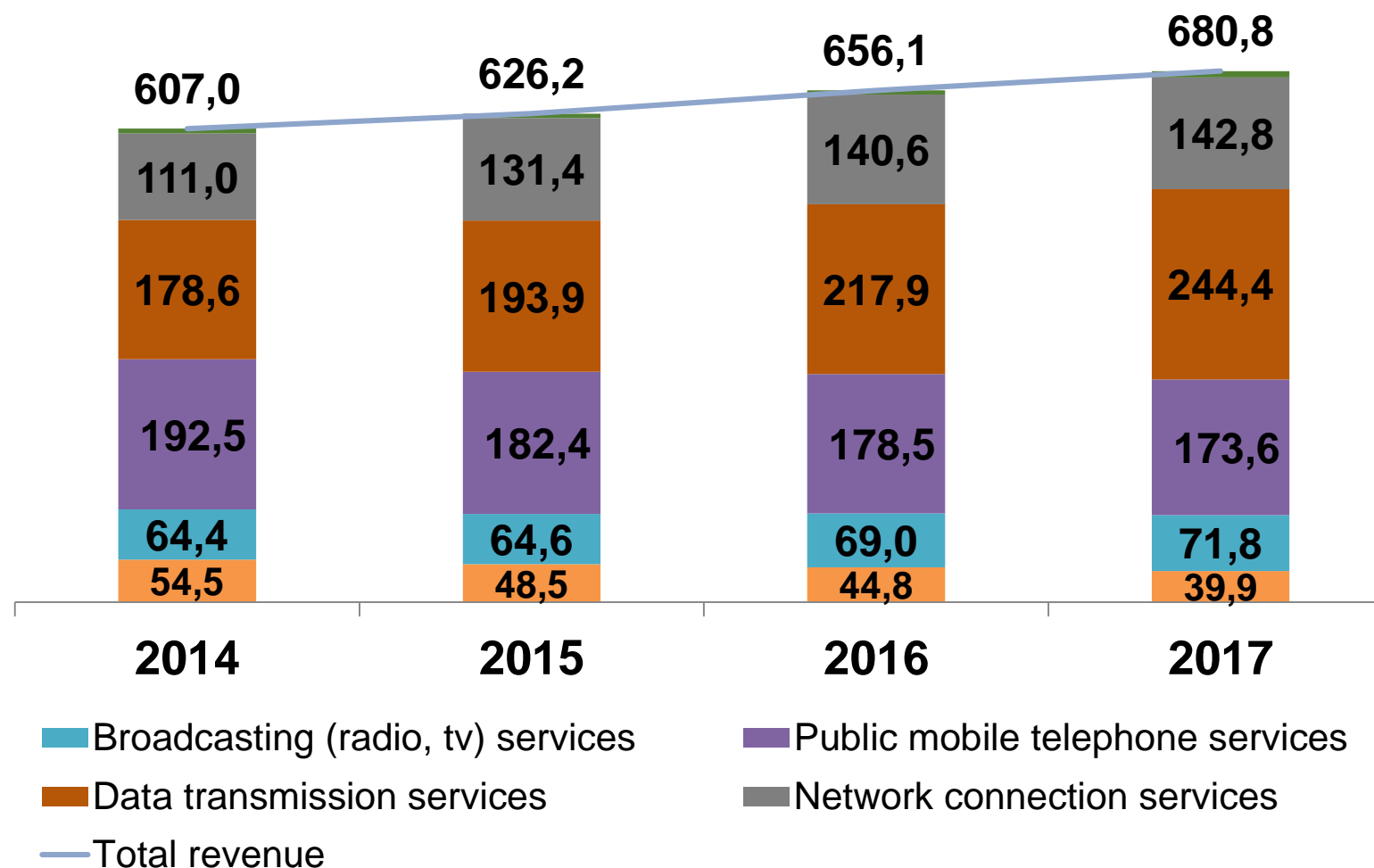
Main investments  
in to: LTE, FTTx





# Electronic communications market

Revenue, in millions EUR.

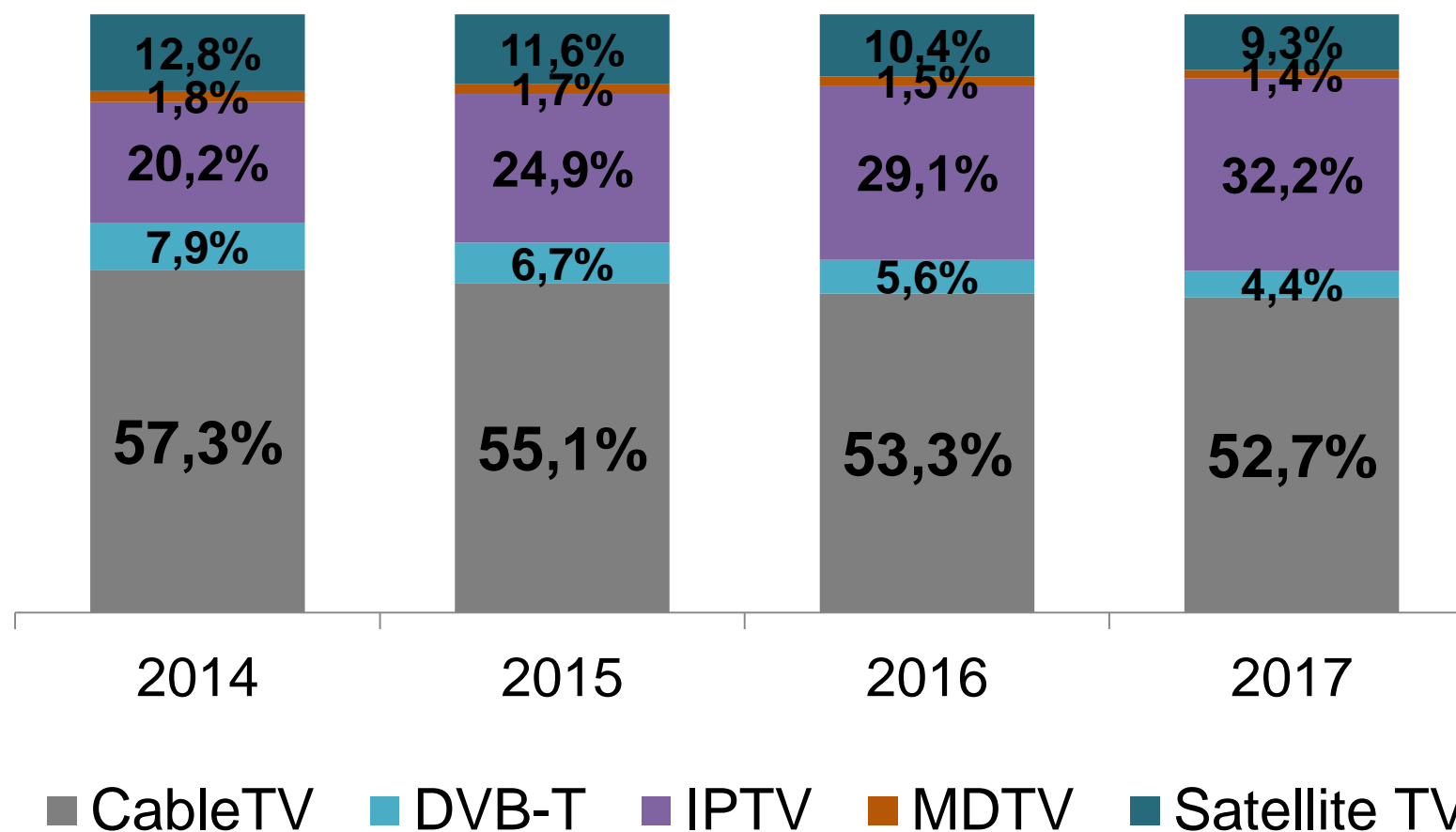






# Electronic communications market. Shaping social life

Pay TV; customers distribution





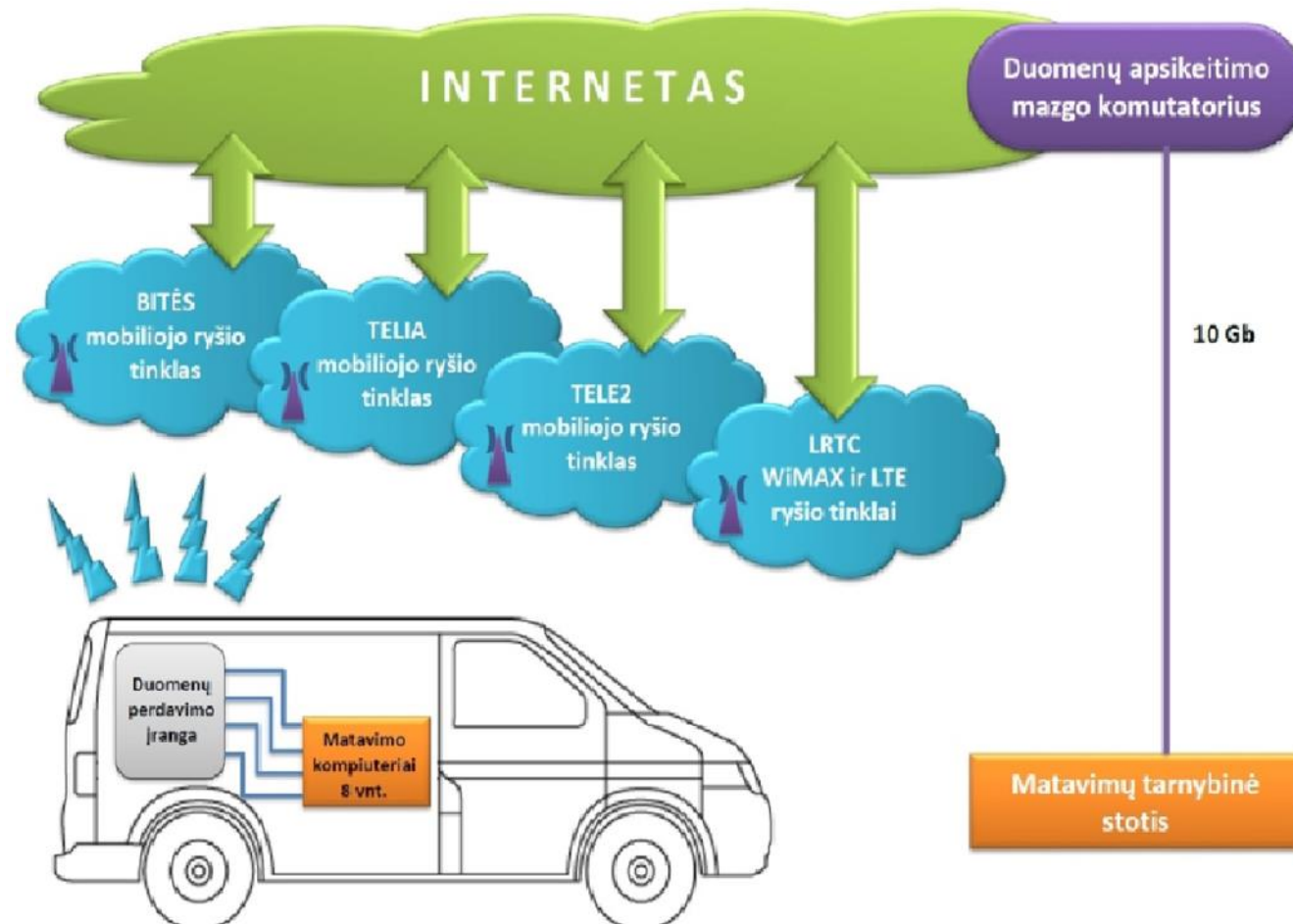
# Electronic communications market

<http://matuok.lt> 119 000 measurements (speed test tool by  
OOKLA [www.speedtest.net](http://www.speedtest.net) )

Interneto prieigos paslaugų teikėjas	Download speed, Mbps	Measurements
UAB „Cgates“	87,1	7860
UAB „Penkių kontinentų komunikacijų centras“	82,9	2223
VĮ „Infostruktūra“	72,9	1005
UAB „Kauno interneto sistemos“	68,0	1040
UAB „KLI LT“	53,6	7353
„Telia Lietuva“, AB	50,6	37574
SPLIUS, UAB	49,5	2937
UAB „INIT“	49,1	3846
UAB „Nacionalinis telekomunikacijų tinklas“	44,6	1052
UAB „Balticum TV“	34,0	2981
UAB „Tele2“	24,6	16831
UAB „NNT“	20,4	1181
UAB „Bitė Lietuva“	19,2	7870
AB Lietuvos radijo ir televizijos centras	11,4	15883

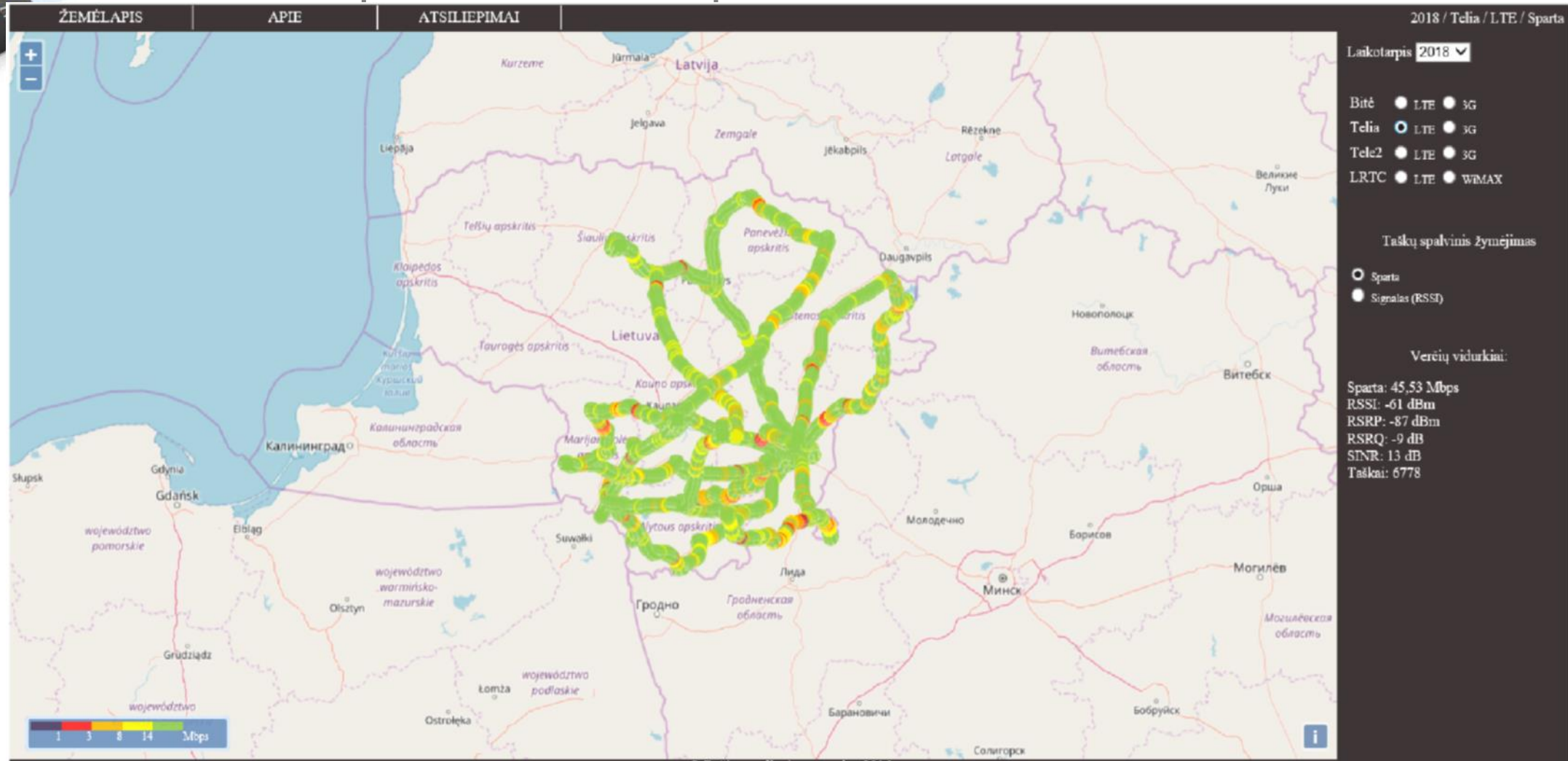
# Electronic communications market

## Measurements of download speed



# Electronic communications market

## Date and map of download speed measurements in Lithuania





# Electronic communications market

BE  
CONNECTED

NEBŪK  
BE RYŠIO

Turite klausimų ar pastebėjimų? [Susisiekite!](#)

?

- **Find Internet** - information of providers on internet services in specific places of Lithuania
- **Internet speed measurement**
- **Wireless Internet speed**
- **Mobile coverage**
- **Safe Internet**
- **Security incidents**

Rask internetą

Interneto spartos matavimas

Belaidžio interneto sparta

Mobiliojo ryšio aprėptis

Saugus internetas

Saugumo incidentai

Rask internetą

Svetainė: [www.raskinterneta.lt](http://www.raskinterneta.lt)

Interneto teikėjų informacija apie konkrečiose Lietuvos vietovėse teikiamas interneto paslaugas.

SUŽINOSITE:

- Kas teikia plačiajuosčio interneto paslaugas jus dominančiu adresu.
- Kokias technologijas naudoja paslaugų teikėjas.
- Kokia deklaruojamą interneto sparta ar aprėptis.

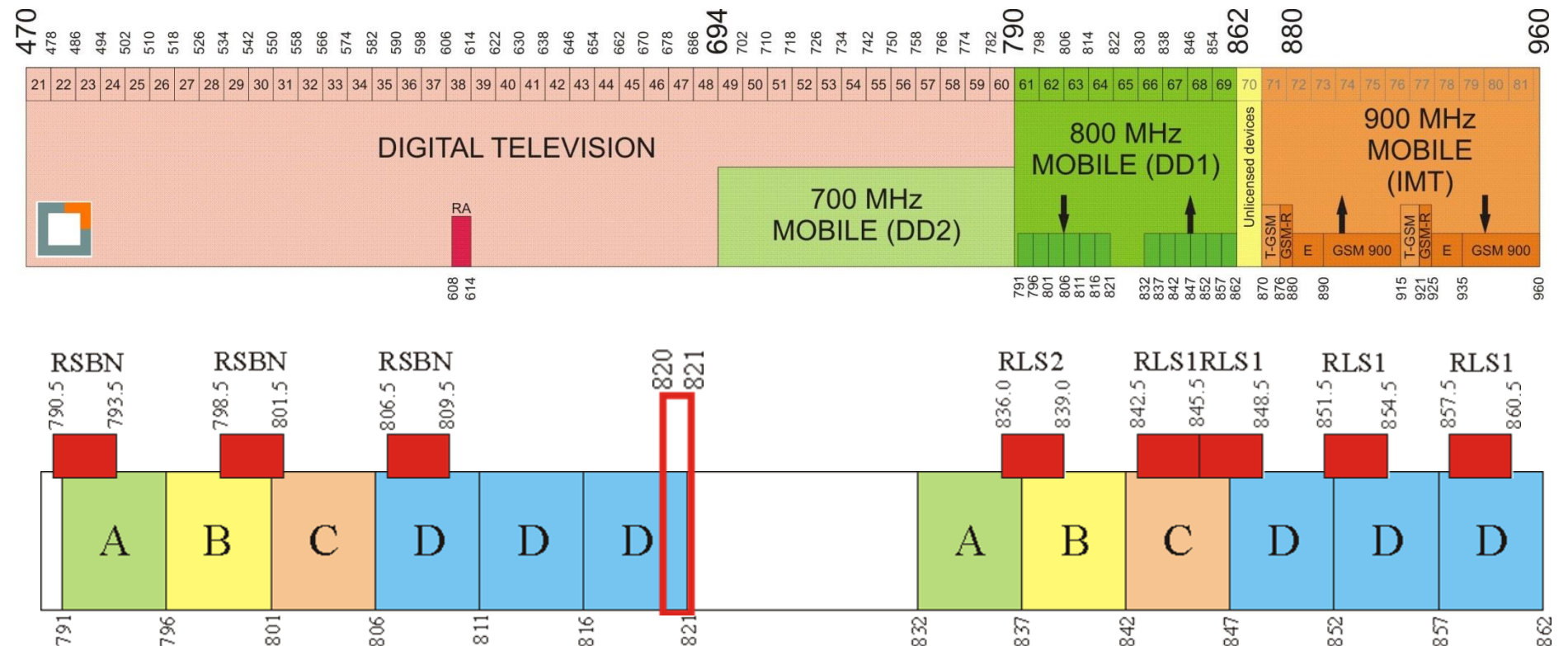
Eiti į svetainę





# “Opportunities and Threats” Harmonization of radio frequencies for IMT Digital dividends and coordination issues

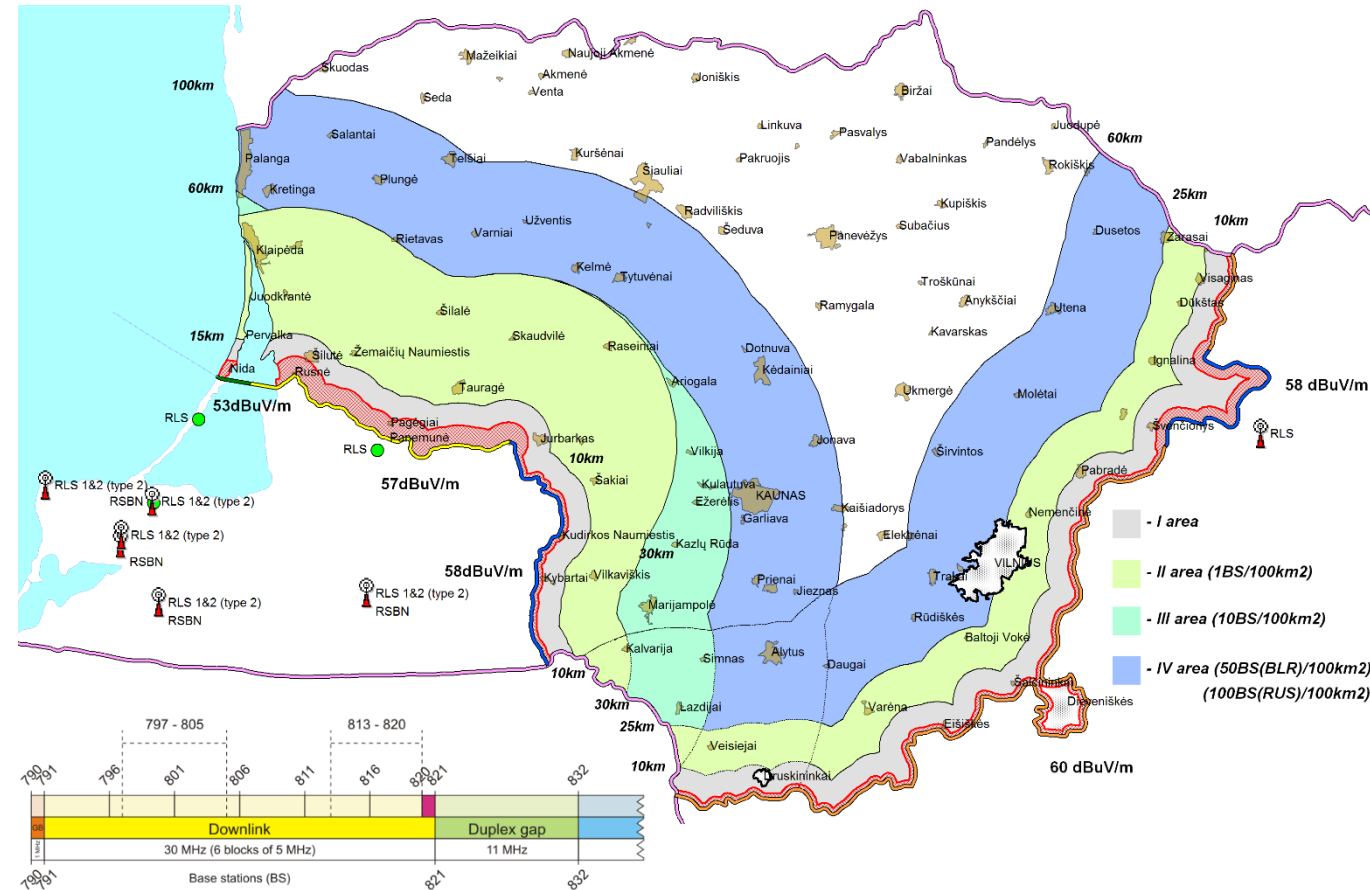
790-862 MHz (61-69 TV channels) 800 MHz band Digital Dividend 1 - WRC12



RR 5.312 and  
RR 9.21

# “Opportunities and Threats”

## Harmonization of radio frequencies for IMT Digital dividends and coordination issues

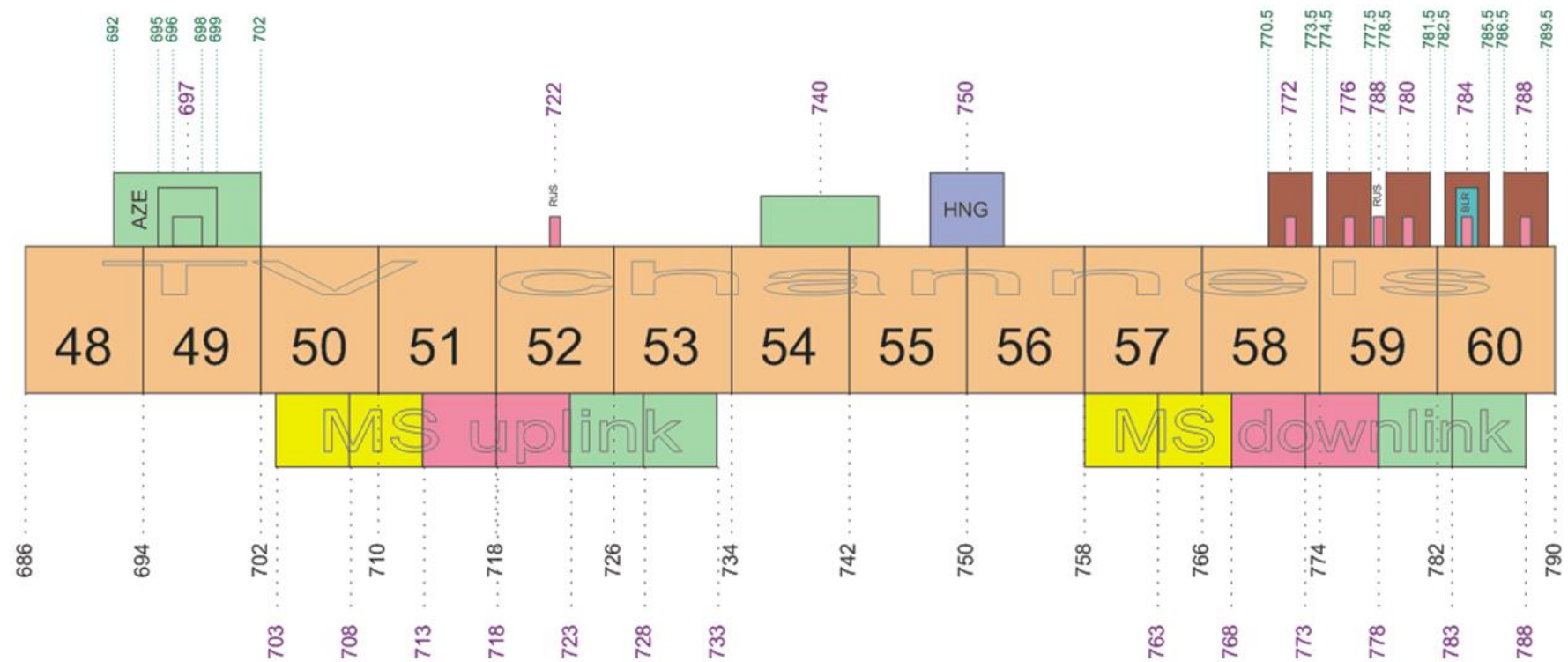






# “Opportunities and Threats” 5G in 2<sup>nd</sup> Digital Dividend

694-790 MHz (49-60 TV channels) 700 MHz band Digital Dividend 2 - WRC15







# “Opportunities and Threats” IMT compatibility with ARNS and DVB-T in neighboring countries

Agenda item: AI 1.2 700 MHz

Coordination agreements on compatibility between IMT and aeronautical radio navigation systems were signed in Geneva on 3 November 2015 with Russian Federation and Belorussia.

- Field strength level at the point of ARNS according to the ITU-R rec. M.1830 and/or certain value on the border line.

Rezoliution COM4/4 (WRC-15): separation distance: 70-432 km





## “Opportunities and Threats”

## 5G in 700 MHz Refarming of DVB-T



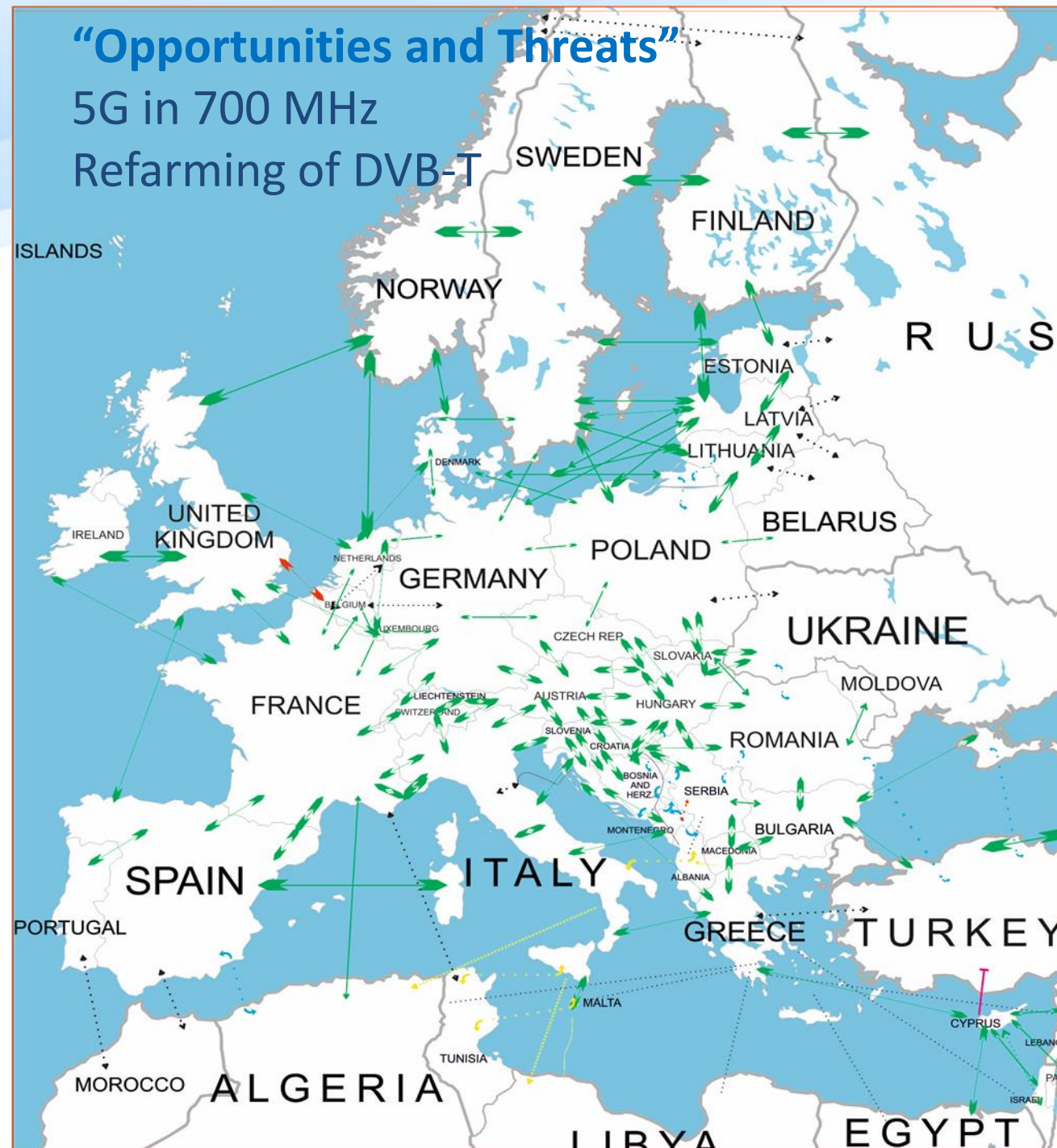




## “Opportunities and Threats”

5G in 700 MHz

Refarming of DVB-T



REV4

Q7status of  
coordination

a .....

b .....→

c ~~~~~

d - - - - ->

e <.....>

f <====>

g <====|====>

objection —|—

red arrows-  
inconsistency between  
administrations

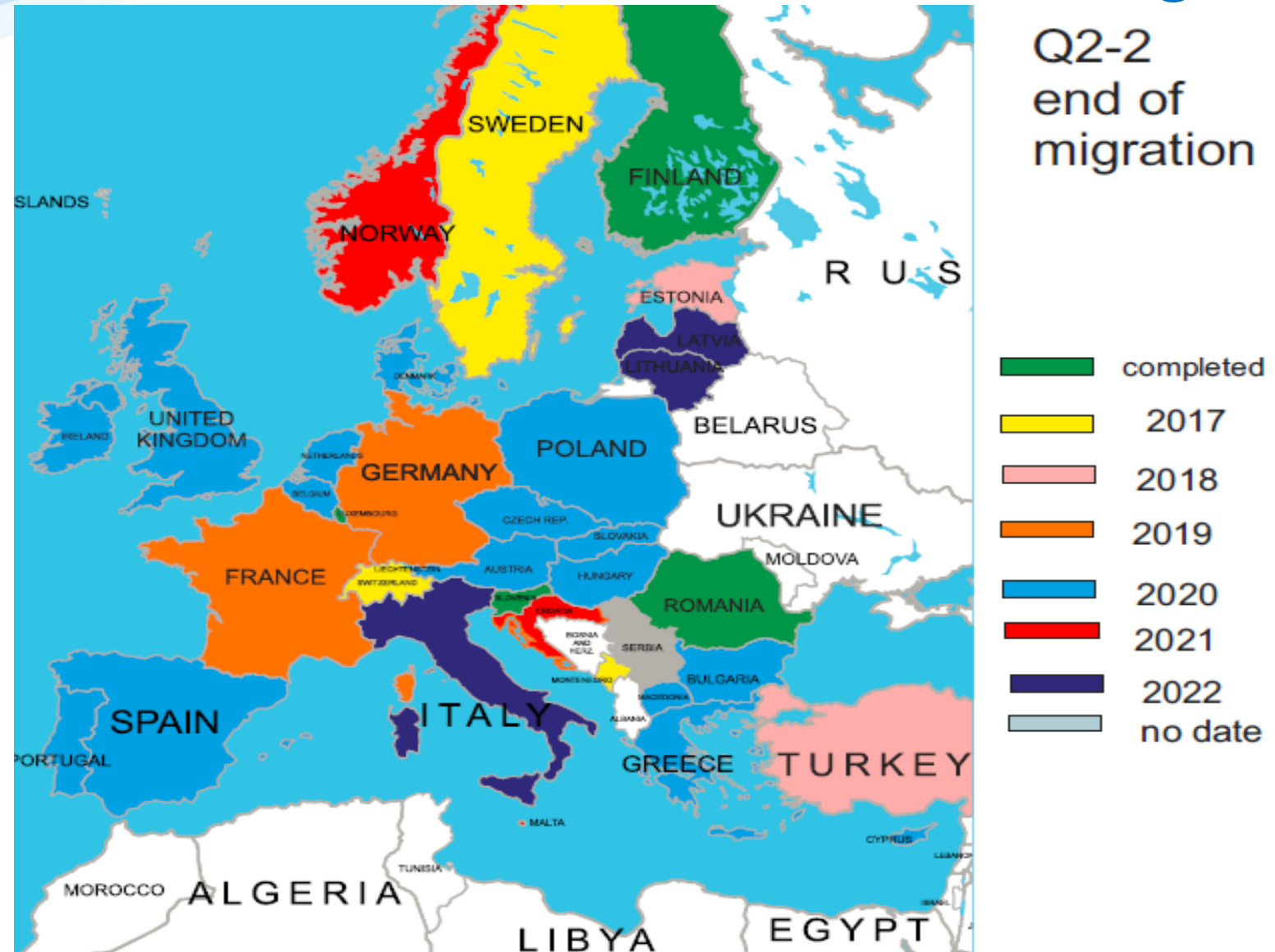
yellow arrows - request for  
assistance

RSPG18-009 Final,  
January 2018.



## “Opportunities and Threats”

## 5G in 700 MHz Refarming of DVB-T



RSPG18-009 Final,  
January 2018.

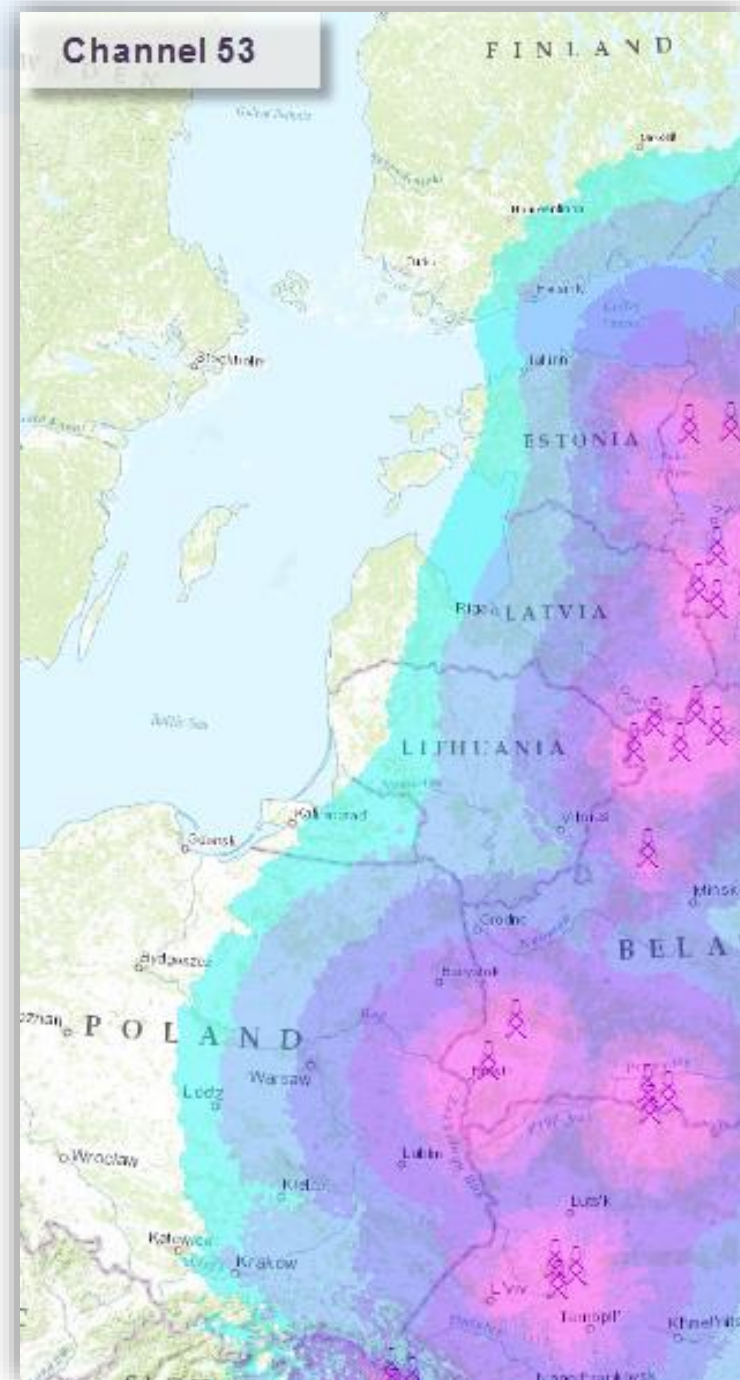
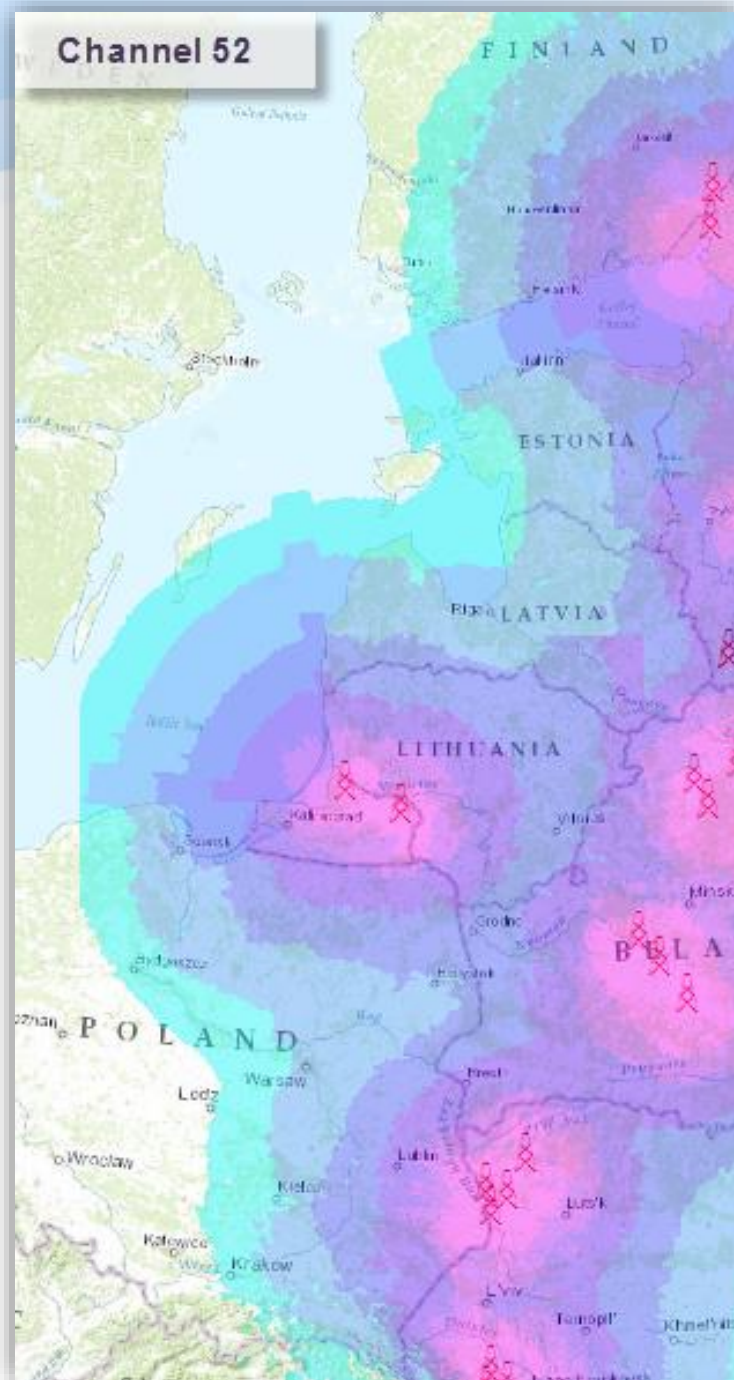
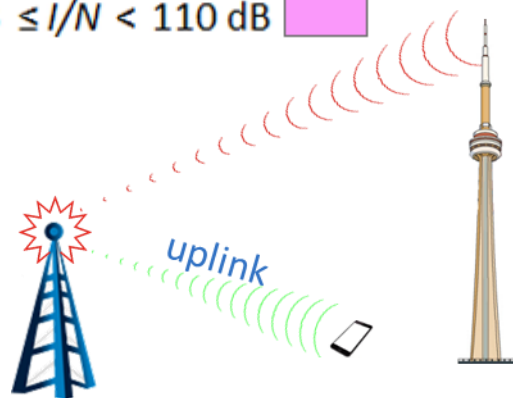




# “Opportunities and Threats” 5G in 700 MHz DVB-T impact

Legend:

$-6 \text{ dB} \leq I/N < 0 \text{ dB}$	
$0 \text{ dB} \leq I/N < 10 \text{ dB}$	
$10 \text{ dB} \leq I/N < 20 \text{ dB}$	
$20 \text{ dB} \leq I/N < 40 \text{ dB}$	
$40 \text{ dB} \leq I/N < 60 \text{ dB}$	
$60 \text{ dB} \leq I/N < 110 \text{ dB}$	

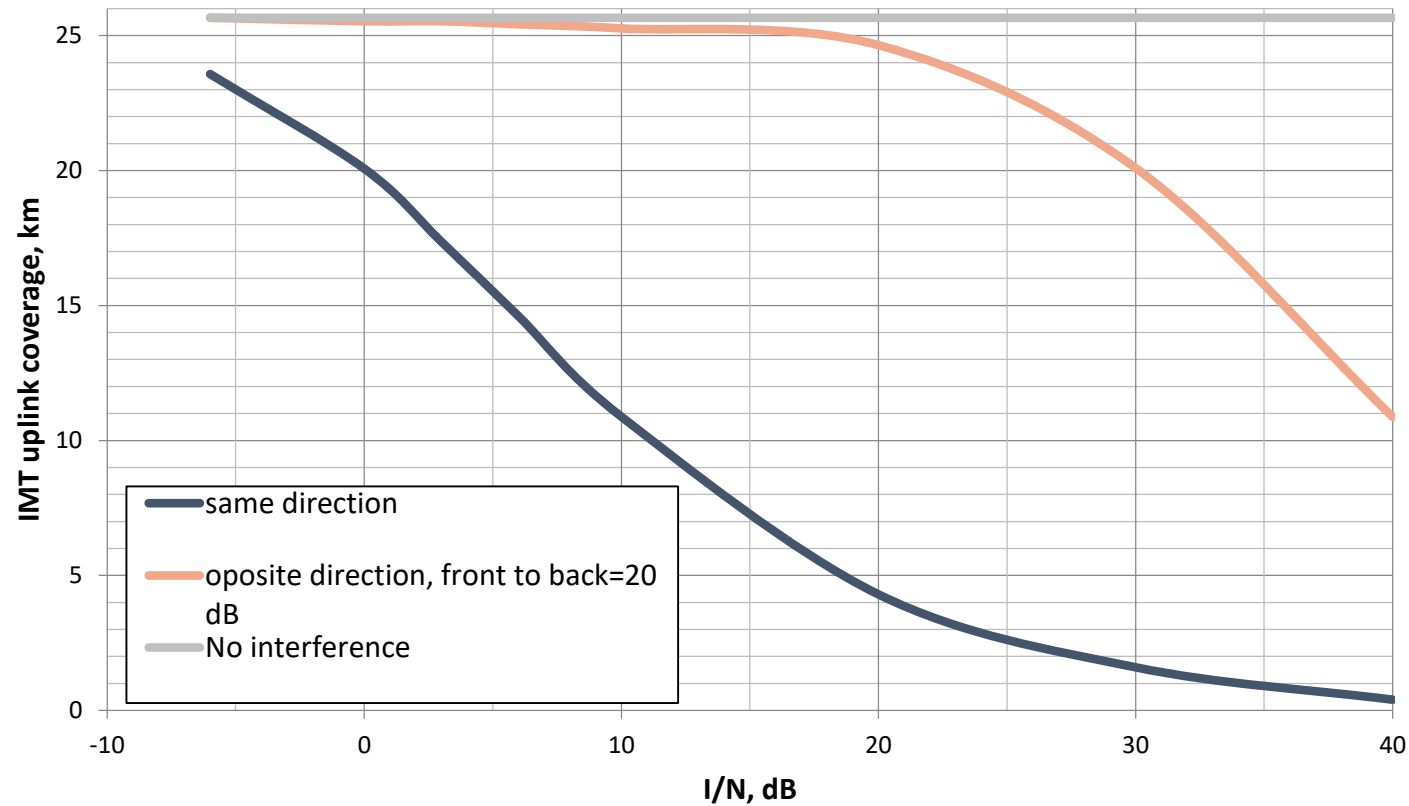




## “Opportunities and Threats”

5G in 700 MHz

Dependence of radius of BS on the level of TV interference (ITU-R P.1546)



(N=-115 dBm)

Radius of BS decrease 5-16 times

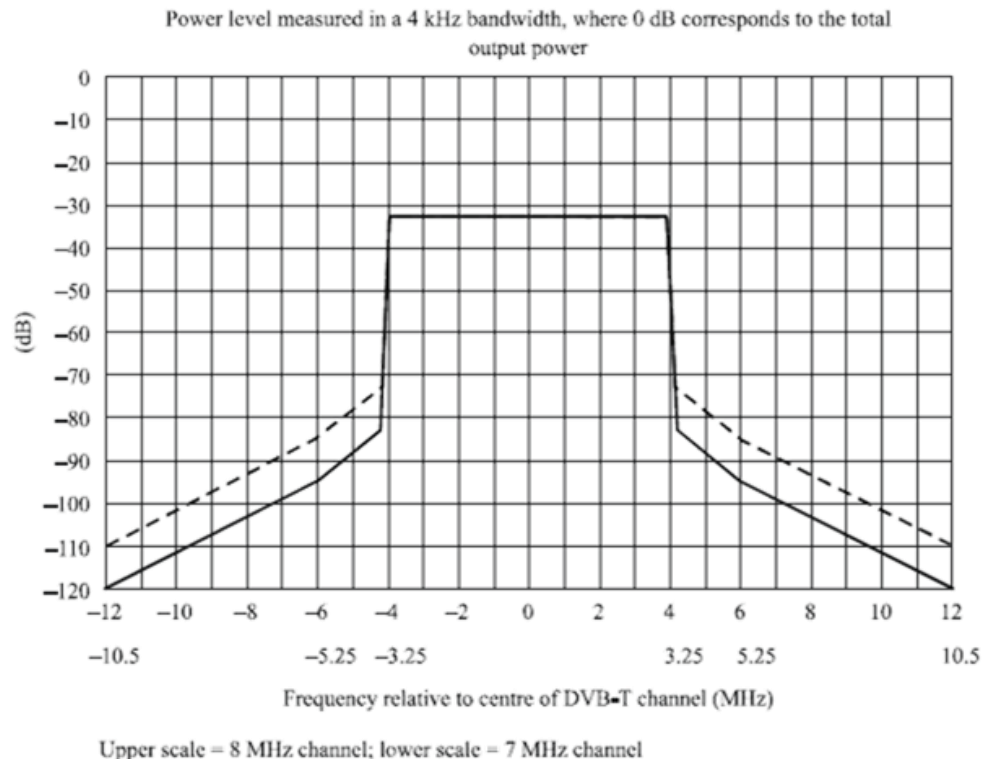


# “Opportunities and Threats” 5G in 700 MHz

## The Final Acts of RCC-06 ( for Ge06 Agreement)

**5.1.3** A digital entry in the Plan may also be notified with characteristics different from those appearing in the Plan, for transmissions in the broadcasting service or in *other primary terrestrial services* operating in conformity with the *Radio Regulations*, provided that the peak power density in any 4 kHz of the above-mentioned notified assignments shall not exceed the spectral power density in the same 4 kHz of the digital entry in the Plan. Such use shall not claim more protection than that afforded to the above-mentioned digital entry.

Symmetrical spectrum masks for non-critical and sensitive cases



Symmetrical spectrum masks for non-critical and sensitive cases

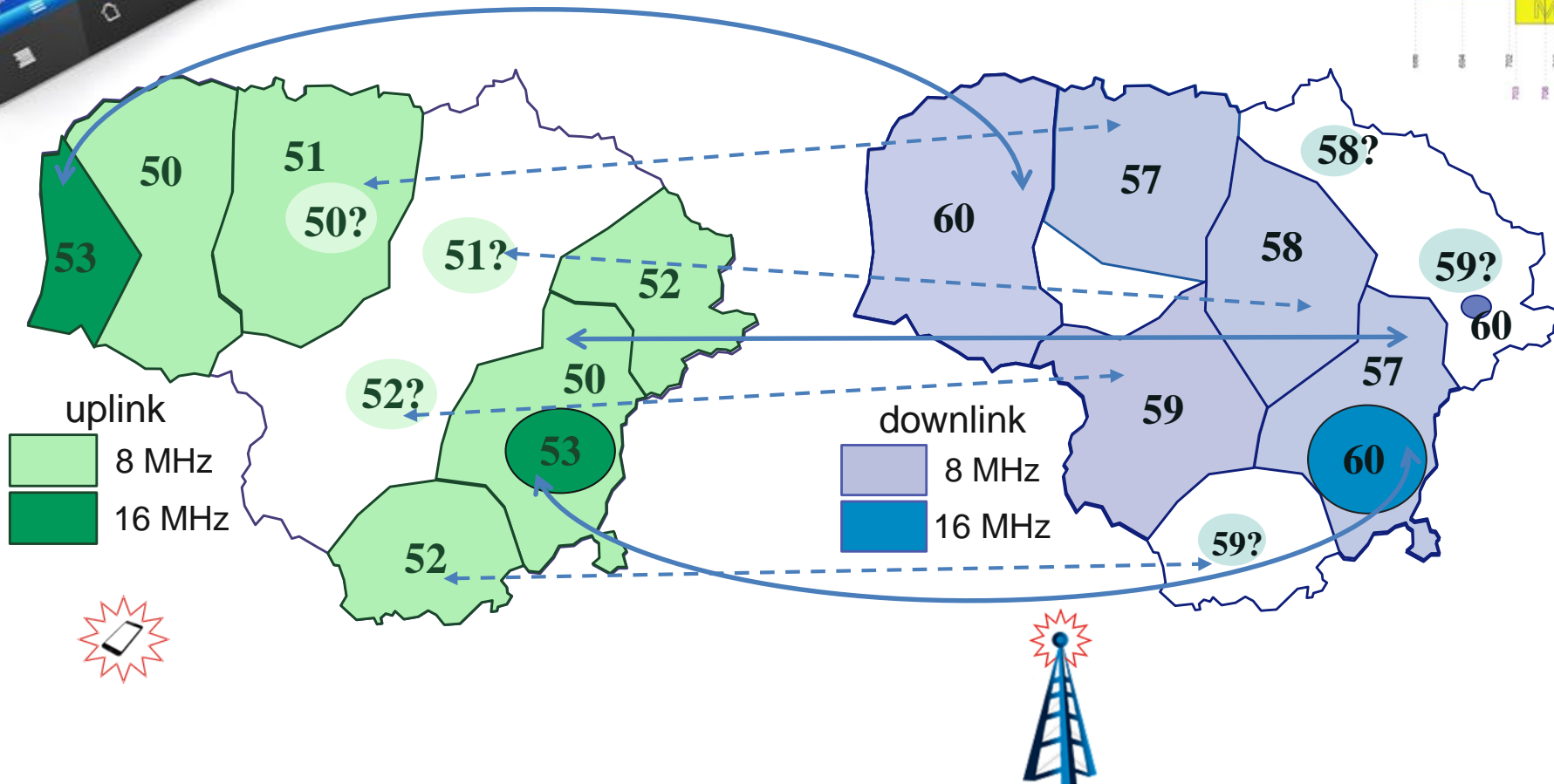
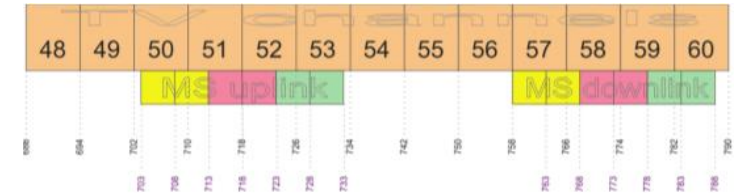
Breakpoints					
	8 MHz channels			7 MHz channels	
	Non-critical cases	Sensitive cases		Non-critical cases	Sensitive cases
Relative frequency (MHz)	Relative level (dB)	Relative level (dB)	Relative frequency (MHz)	Relative level (dB)	Relative level (dB)
-12	-110	-120	-10.5	-110	-120
-6	-85	-95	-5.25	-85	-95
-4.2	-73	-83	-3.7	-73	-83
-3.9	-32.8	-32.8	-3.35	-32.8	-32.8
+3.9	-32.8	-32.8	+3.35	-32.8	-32.8
+4.2	-73	-83	+3.7	-73	-83
+6	-85	-95	+5.25	-85	-95
+12	-110	-120	+10.5	-110	-120



# “Opportunities and Threats”

5G in 700 MHz

Lithuanian case, GE06 provision 5.1.3



50	51	52	53
57	58	59	60

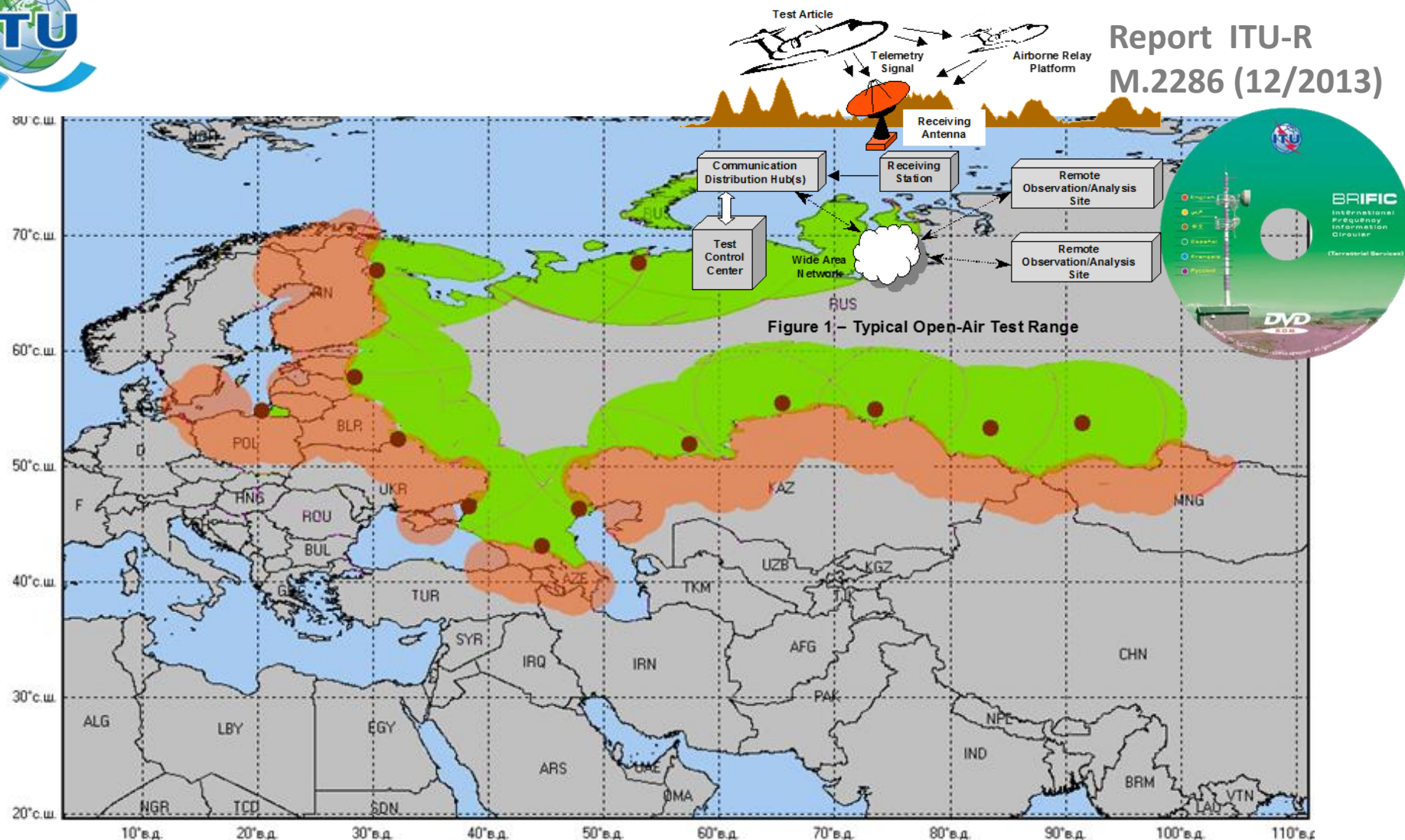


# 5G in L – Band: 1427-1518 MHz and aeronautical telemetry stations



“Opportunities and Threats”

RR 5.342



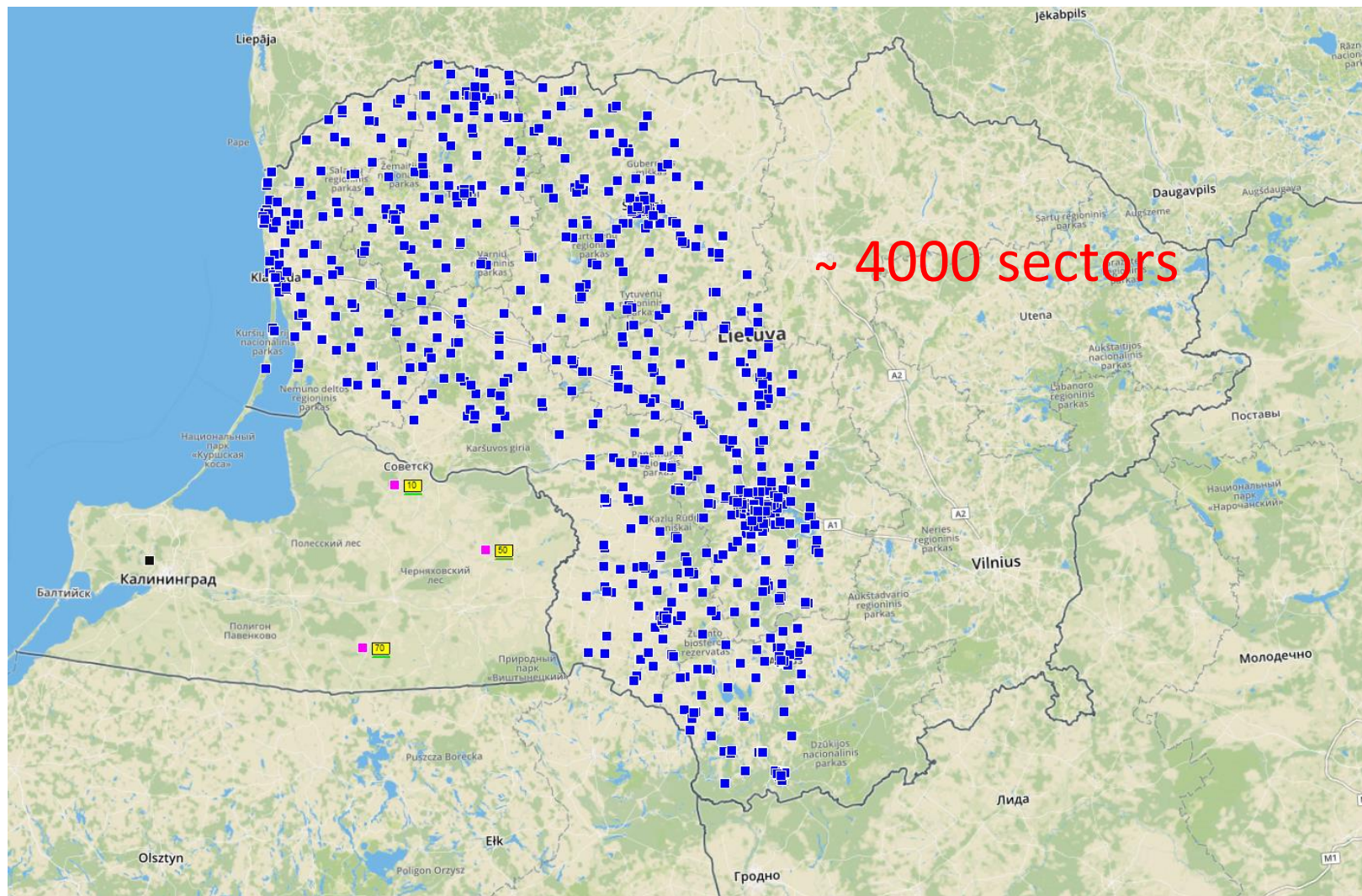




# “Opportunities and Threats”

5G in L- Band

ATS ground station and LTE -1400 MHz stations  
arrangement





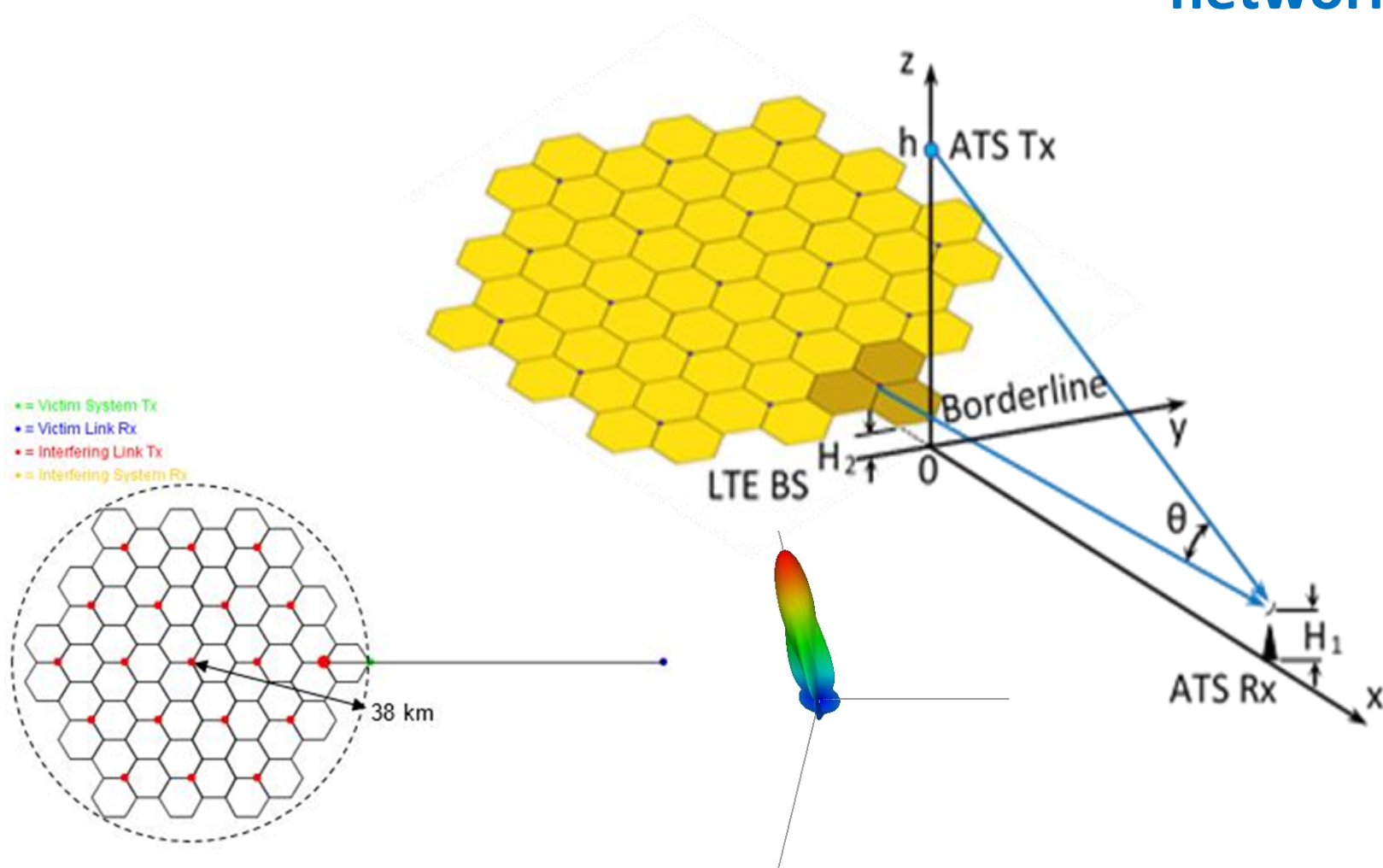


# “Opportunities and Threats”

## 5G in L- Band

### Interference scenario including aggregate effect of a network

ECO software SEAMCAT:  
ITU –Rec. 525;  
ITU Rec. 1546;  
Antenna – ITU –R F.1245





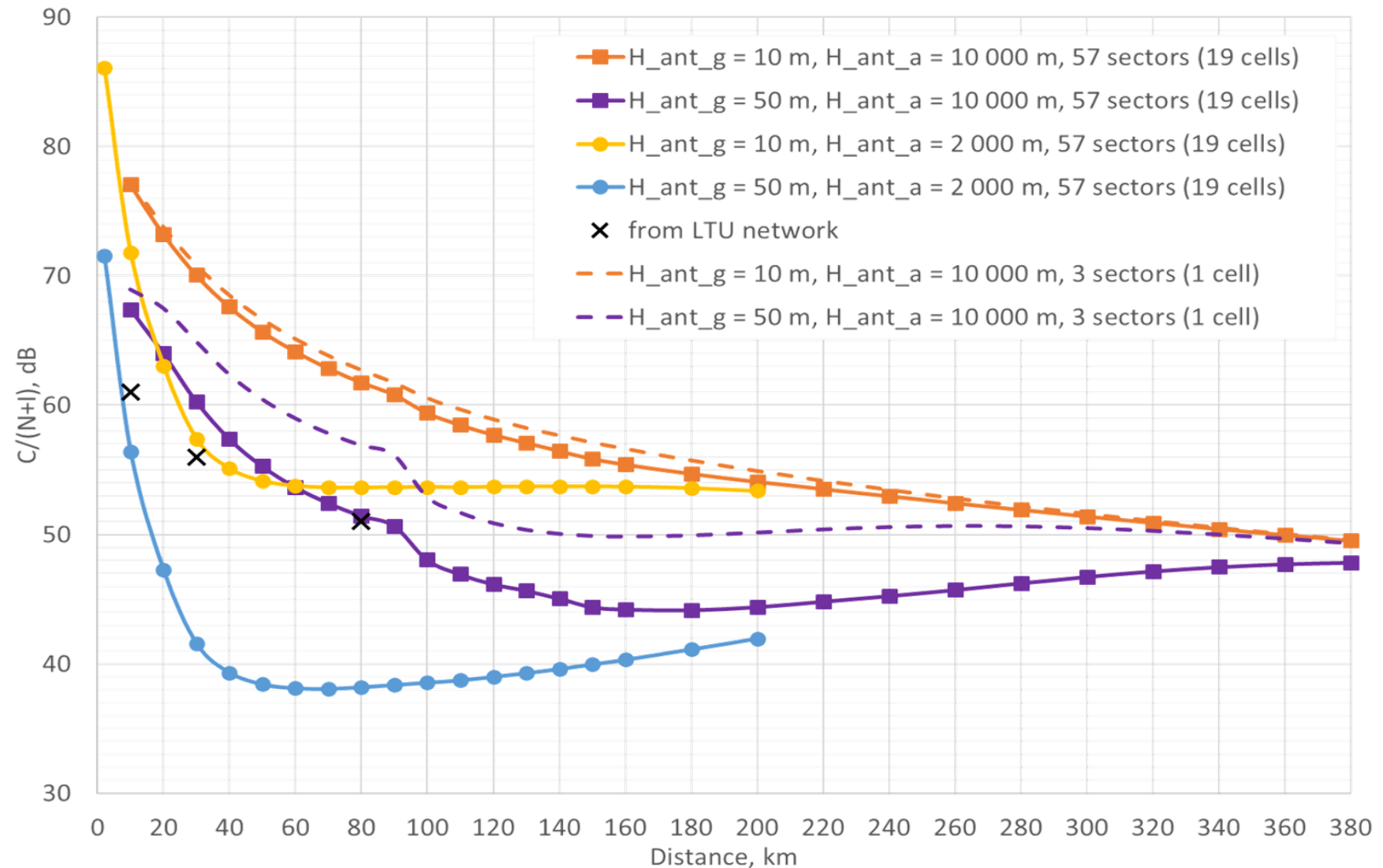
## “Opportunities and Threats”

## 5G in L- Band

Methods :  $I/N$  and  $C/(I+N)$

$I/N = -6$  dB, separation distance up to 360 km, at  $H_{\text{ant}} = 50$  m

$C/(I+N) = 13$ ,  
separation distance 10 km



# Spectrum monitoring and enforcement



during 2017

3941 measurements



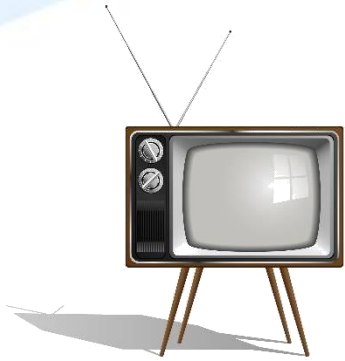
28 infringements

208 – infringements of MS agreements from  
bordering countries;  
144 infringements of MS agreements from LTU  
side

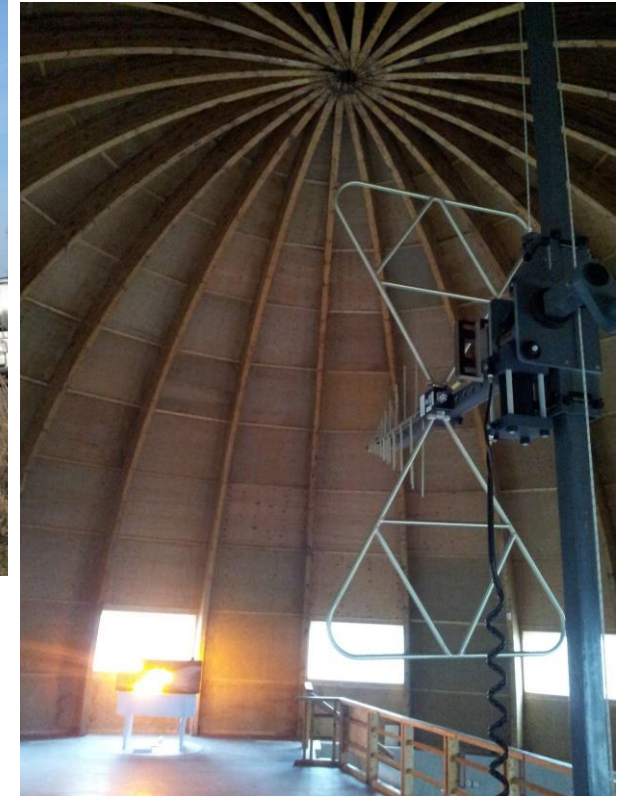




# Market control Assessment of Compliance



# Emissions Testing in Open Area and Anechoing Chamber

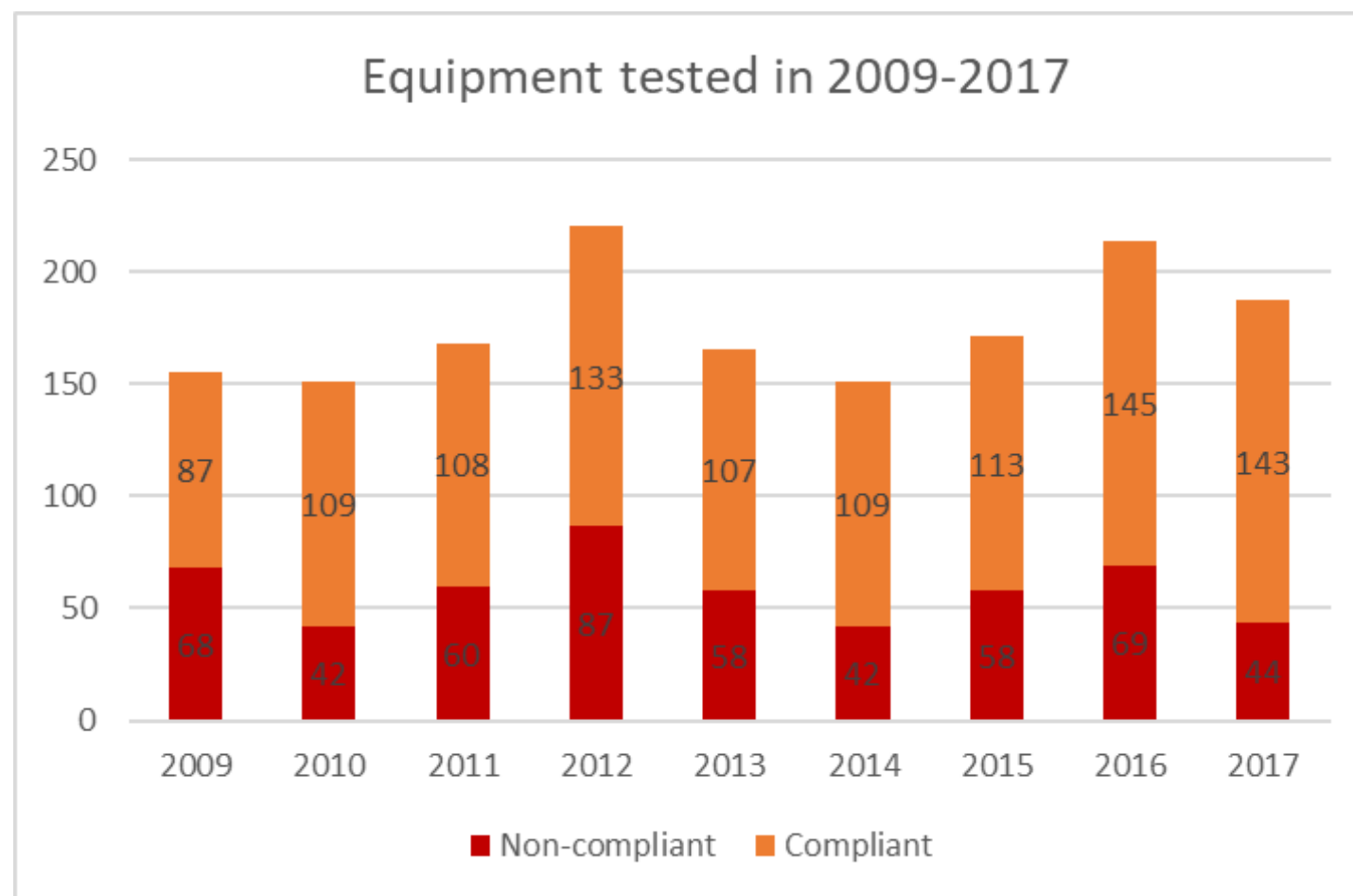






# Total number of equipment tested

Number of equipment tested in the accredited lab  
Including equipment taken from the market in Lithuania







Equipment	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
EMC D	24	16	24	32	17	15	22	21	33	27
R&TTE D *	38	60	29	9	17	20	16	27	26	18
Sum:	62	76	53	41	34	35	38	48	59	45
<i>Non compliance to harmonised standards:</i>										
EMC D	42%	56%	4%	63%	65%	80%	45%	71%	30%	37%
R&TTE D	50%	48%	52%	78%	82%	40%	19%	48%	58%	56%
NOTE * EMC and efficient use of radio spectrum aspects of R&TTED										



# Supervision of business undertakings

- Risk evaluation and management
- Control questionnaires
- Inspections (public schedule, procedures established in the rules)

## *5G features*

- Consulting (by phone with audiorecording)
- Application of „new-in-the-business“ status (1 year without fines)
- Minor violations (elimination term)
- Feedback

Fine up to 3 % of revenue depending on damage to customers



# “Technologies Shaping Social Life”

## Emergency call, positioning „arc“ on the map

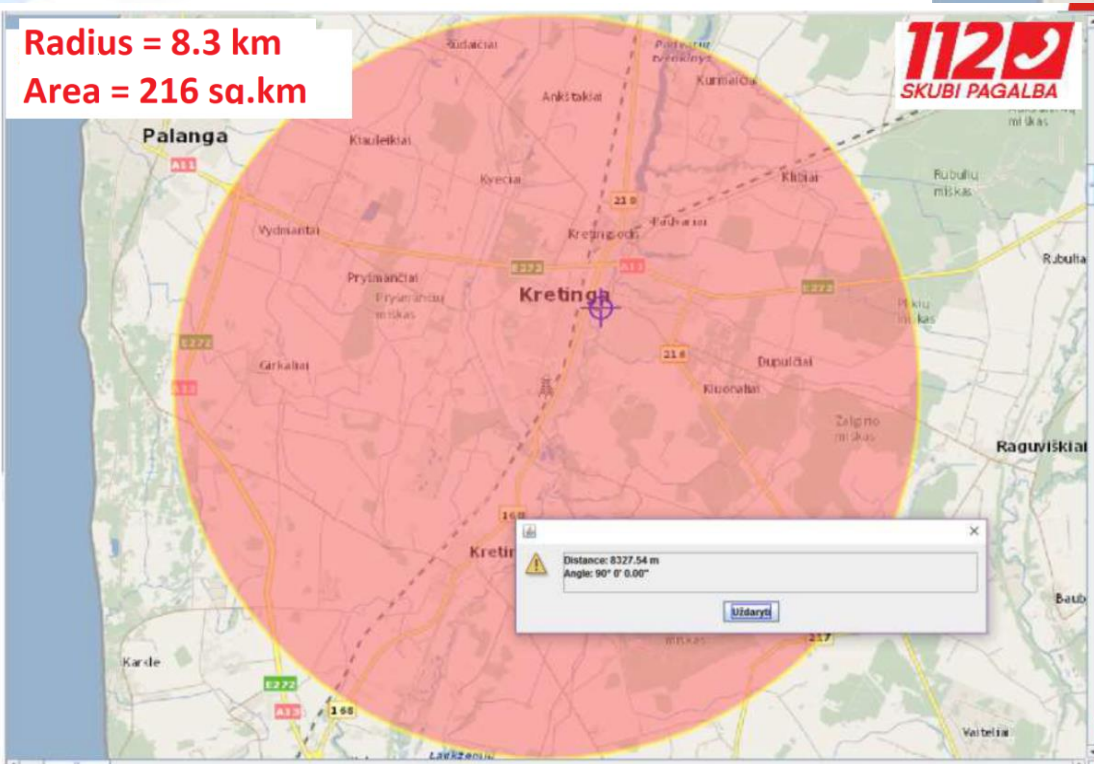
(timing advance 2G, round trip time 3G, first in EU)

width - 2,2 km  
area - 8,1 sq. km

Radius = 8.3 km  
Area = 216 sq.km

112  
SKUBI PAGALBA

112  
SKUBI PAGALBA



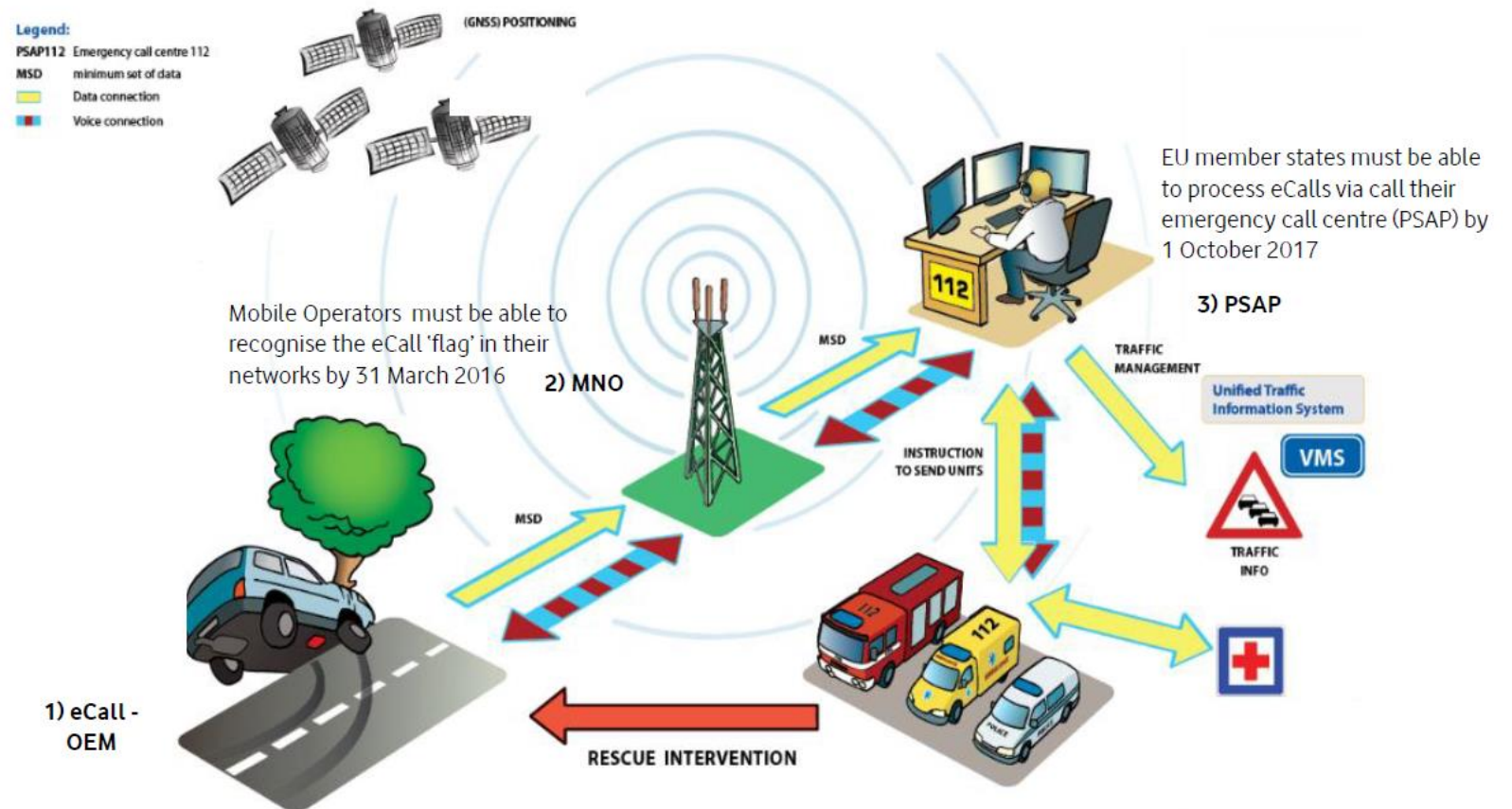




# “Technologies Shaping Social Life”

## 112 E-call service since the 1th of October 2017

### eCall – case study



eCall functionality has to be fitted to all new models of cars and light vans in the EU by 31 March 2018

# “Technologies Shaping Social Life” Internet of Things (IoT)



## Smart Metering

Gas Metering  
Water Metering



## Smart Cities

Streetlights  
Parking  
Waste Management



## Smart Buildings

Alarm Systems  
HVAC  
Access Control

## Consumer

White Goods  
People Tracking

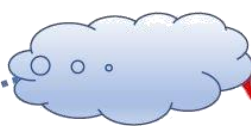


## Agriculture / Environment

Land / Environment Monitoring  
Pollution Monitoring  
Animal Tracking



Narrowband IoT (NB-IoT) specification was frozen at Release 13 of the 3GPP specification (LTE-Advanced Pro), in June 2016.



GSM



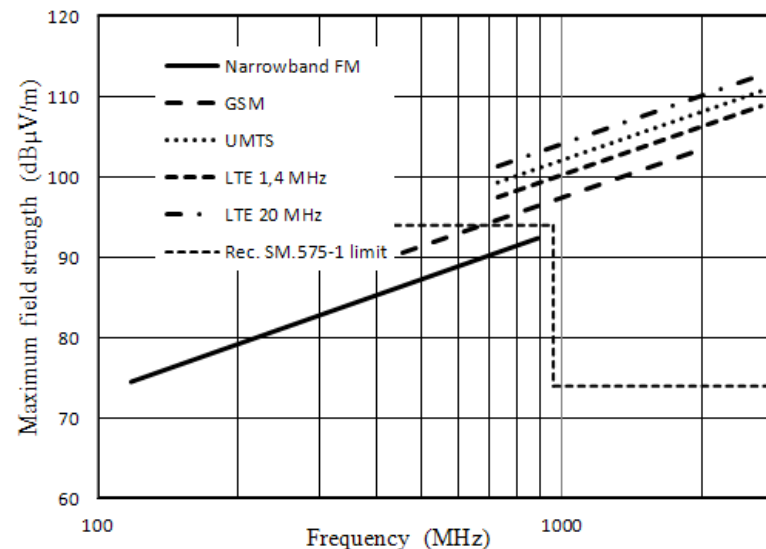


# Protection of fixed monitoring stations against interference from strong electromagnetic fields

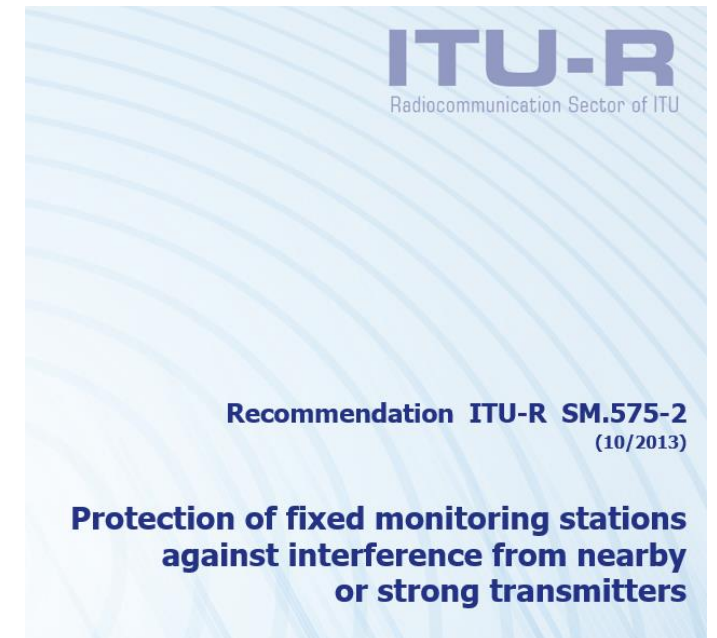
A model for calculating the maximum permissible field strength was proposed, which assumes that:

- the most critical combination is the intermodulation of three signals of the same power;
- interference due to intermodulation products begin to be visible when the level of the 3rd order intermodulation product exceeds the receiver noise floor.

**The new Recommendation ITU-R SM.575-2 has been prepared based on this model.**



Dependence of maximum permissible field strength values of several typical signals on a frequency



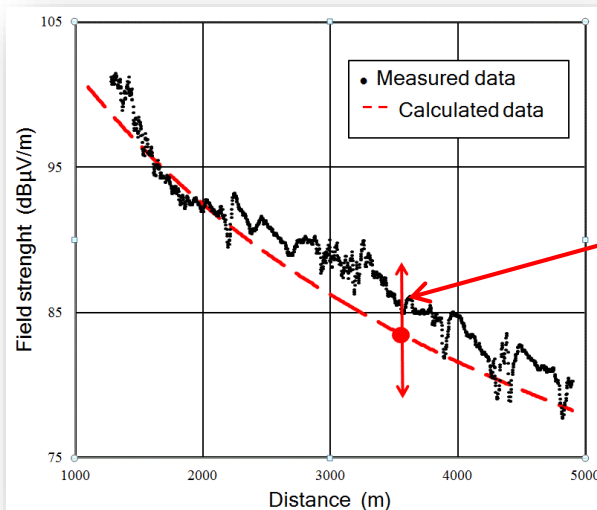




## Determination of the radiated power through field strength measurement along a route

A model for determination of the radiated power was proposed, which assumes that the difference between the measured and the calculated values of the field strength occurs only because of the radiated power  $P_m$  value used in the model.

**This method is included in the new revision of ECC Recommendation (12)03 “Determination of the radiated power through field strength measurements in the frequency range from 87.5 MHz to 6000 MHz”.**



The best-fit value  $P_m$  is the value of radiated power determined from the field strength measurement along the route.

The suggested method allows to determine radiated power of broadcast FM radio stations with error **less than 2 dB**.

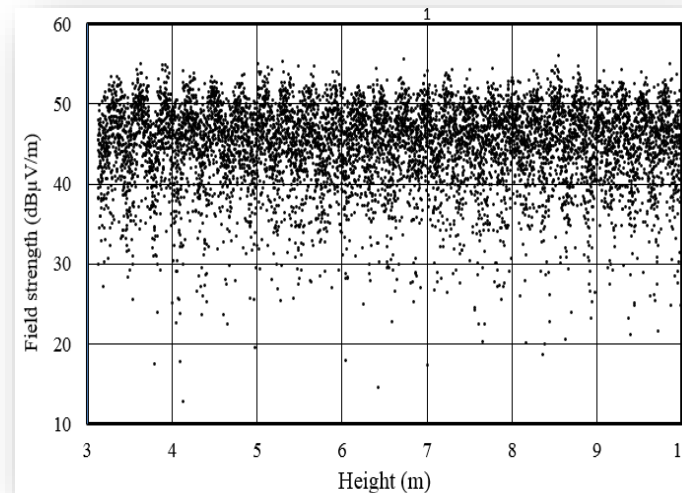
The field strength level as a function of the distance from the transmitting antenna along the route which coincides with antenna's beam axis



# Height scan methods for determining the radiated power at microwaves frequencies

A new method for determination of the field strength of direct wave was proposed, which made it possible to significantly improve the accuracy of the height scan method.

**This method is included in the new revision of ECC Recommendation (12)03 “Determination of the radiated power through field strength measurements in the frequency range from 87.5 MHz to 6000 MHz”.**



It is hard to believe but using this method the acceptable measurement error was obtained even at signal-to-noise ratio of about **3 dB**.

The field strength at low signal level as function on height.



# WiFi in 5925–6425 MHz, Broad band PPDR in 410-430 MHz, L -band

**Public Wifi hotspots globally: in 2015- 50 mil.  
Expected: in 2018 -340 mil.**

Source: Global ICT Regulatory Outlook 2017

## **ECC 44<sup>th</sup> Meeting**

Dublin, 28 February-3 March 2017

Date issued: 10 February 2017

Source: Belarus, Estonia, Lichtenstein,  
Lithuania, Russian Federation, Slovenia,  
Switzerland

Subject: proposed studies on Wireless  
Access Systems including Radio Local  
area networks in 6 GHz band

## **ECC PT1 #58**

Prague, Czech Republic, 16-20 April 2018

Date issued: 11 April 2018

Source: Lithuania, Hungary, Poland

Subject: L-band x-border MFCN vs.  
ATS

Number: ECC PT1(18)065

## **WG SE7**

Hamburg, Germany, 6-8 February 2017.

Source : Lithuania

Subject: Compatibility between RAS and LTE UE  
in 400 MHz frequency band.

Number: WG SE7(17)002.





**Thank You!**

**Dr. Mindaugas Žilinskas**  
Deputy Director General, Lithuania  
Communications Regulatory Authority

