



AKOS

# Coverage obligation supervision

**INFOFEST 2015**

- ④ Coverage obligations imposed in licence
- ④ Methodology for verifying the fulfilment of obligation
- ④ Practical results of calculations and comparison with measurements

One of the goals was:

Bridge the digital divide and contribute to the objectives of the Digital Agenda for Europe (30 Mb/s to all inhabitants till 2020)

Mechanisms :

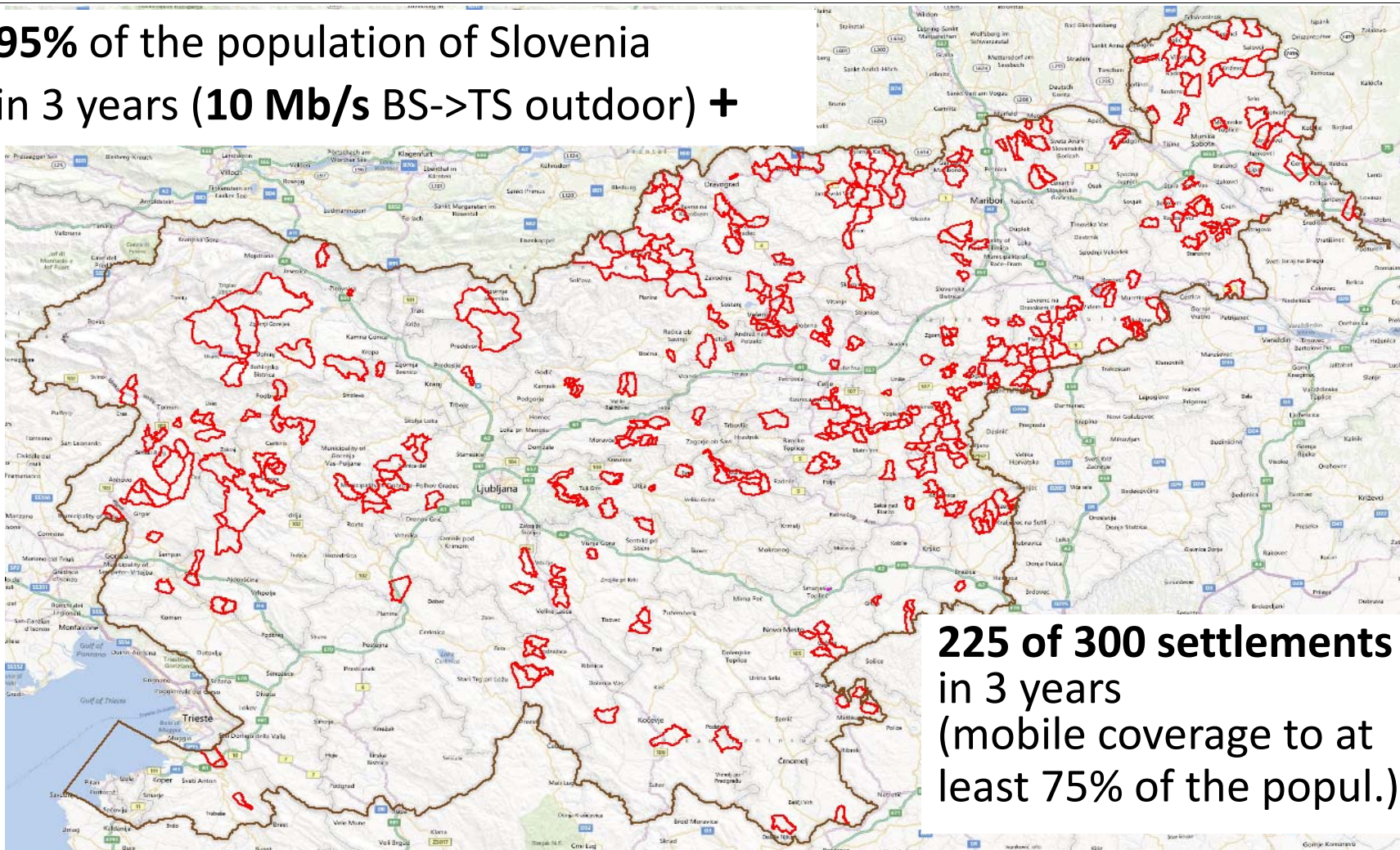
- ④ Licence obligations:
  - ④ General coverage
  - ④ Special coverage and
  - ④ FWBA obligation
- ④ Monitoring

Operators must provide commercial wireless electronic communications services:

- ④ In each assigned frequency band < 1 GHz:
  - ④ 25% of the population of the Republic of Slovenia after 1 year,
  - ④ 50% of the population of the Republic of Slovenia after 2 years,
  - ④ 75% of the population of the Republic of Slovenia after 3 years.
  
- ④ By using any of assigned bands above > 1 GHz
  - ④ 25% of the population of the Republic of Slovenia after 3 years,
  - ④ 40% of the population of the Republic of Slovenia after 5 years

- ④ means providing **broadband wireless service** with bit rate of the user experience of at least 10 Mb/s from the base station to the mobile user terminal (outside of buildings / outdoor)
- ④ **user experience of at least 10 Mb/s** means that the result of the bit rate speed measurements done by user on the terminal by the Agency approved application on the measuring server of the Agency, within 90% of measurements reaches at least 10 Mb/s. (measurements made outside the peak hour time – up to 2 hours notified by operator)

**95% of the population of Slovenia  
in 3 years (10 Mb/s BS->TS outdoor) +**



**225 of 300 settlements  
in 3 years  
(mobile coverage to at  
least 75% of the popul.) +**

These obligations may be fulfilled using any frequencies at disposal.

## On user request provide substitutes for fixed broadband access (Fixed Wireless Broadband Access - FWBA)


- ④ installing appropriate internal or external customer-premises equipment (CPE) with a suitable antenna,
- ④ > 10 Mbps DL
- ④ minimum data transfer > 2 Mbps (99,9 % availability within 2 hours)
- ④ > 1 Mbps UL
- ④ obligatory for permanent residences and businesses
  - ④ which do not have the option of receiving a suitable alternative broadband connection with a bitrate of at least 10 Mbps, and
  - ④ which are within the area of coverage for individual settled locations, even if they are not a part of a settlement or a contiguous group of settlements from the list of 300.

- ④ Same principle of monitoring general and special coverage obligations :
  - ④ based on the calculation of coverage using the information about base stations submitted to the Agency by the licence holder; and
  - ④ based on random measurements of service quality at user locations, which the Agency conducts at its own discretion to verify the accuracy of information submitted by the licence holder.



- ④ the locations of the BS in accordance with a specified geographical projection;
- ④ heights above ground level in meters;
- ④ For each sector:
  - ④ azimuth – direction (degrees);
  - ④ horizontal 3 dB beamwidth (degrees);
  - ④ combined mechanical and electrical downtilt (degrees);
  - ④ vertical 3 dB beamwidth (degrees);
  - ④ the effective isotropic radiated power EIRP;
  - ④ an indication of the frequency used in each cell (sector);
  - ④ cell identifications (Cell ID, PCI, TAC, eNB, ...)
- ④ a map of Slovenia with base stations and covered areas (GIS format, vector graphics, defined by the Agency in cooperation with each operator);
- ④ a list of raster cells covered with the technical specifications for coverage level calculated on that basis;

- ④ Same principle of monitoring general coverage
- ④ Monitoring of selected settlements from the list of settlements at the operator's discretion
  - ④ Every 3 Months operator sends a plan of settlements to be covered
  - ④ After every deadline operator sends a report on covered settlements

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- ④ a list of covered populated addresses in certain settlements from the list of 300;
  - ④ the population coverage in percent for each selected settlement in accordance with the data base on populated addresses (available on the Agency's website);
  - ④ and a list of addresses (HS\_MID) and the number of FWBA connections at these addresses.
- 

- ④ Checking :
  - ④ operator offering FWBA ?
  - ④ report on existing installation of FWBA
- ④ Monitoring of capacity to ensure minimum data transfer rate of at least 2 Mbit/s down link
- ④ In case of non fulfilment of obligation to provide FWBA service at the requested addresses monitoring if those addresses :
  - ④ are within the area of coverage
  - ④ in reality do not have the option of receiving a suitable alternative broadband connection with at least 10 Mbit/s down link

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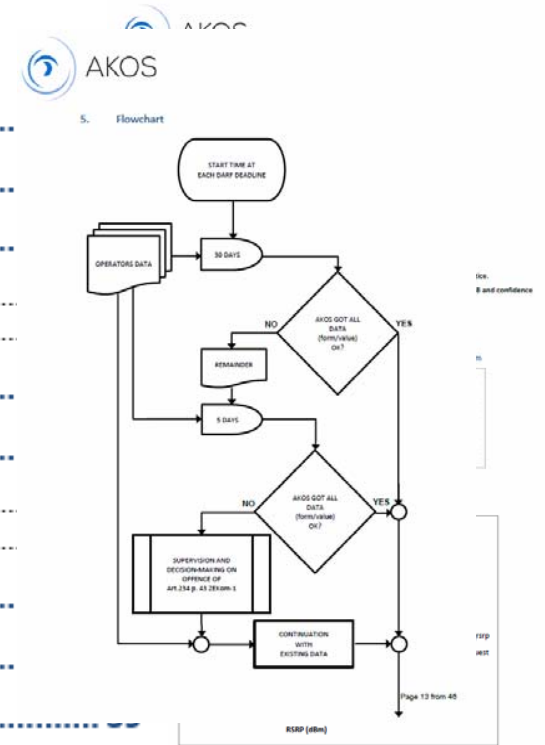
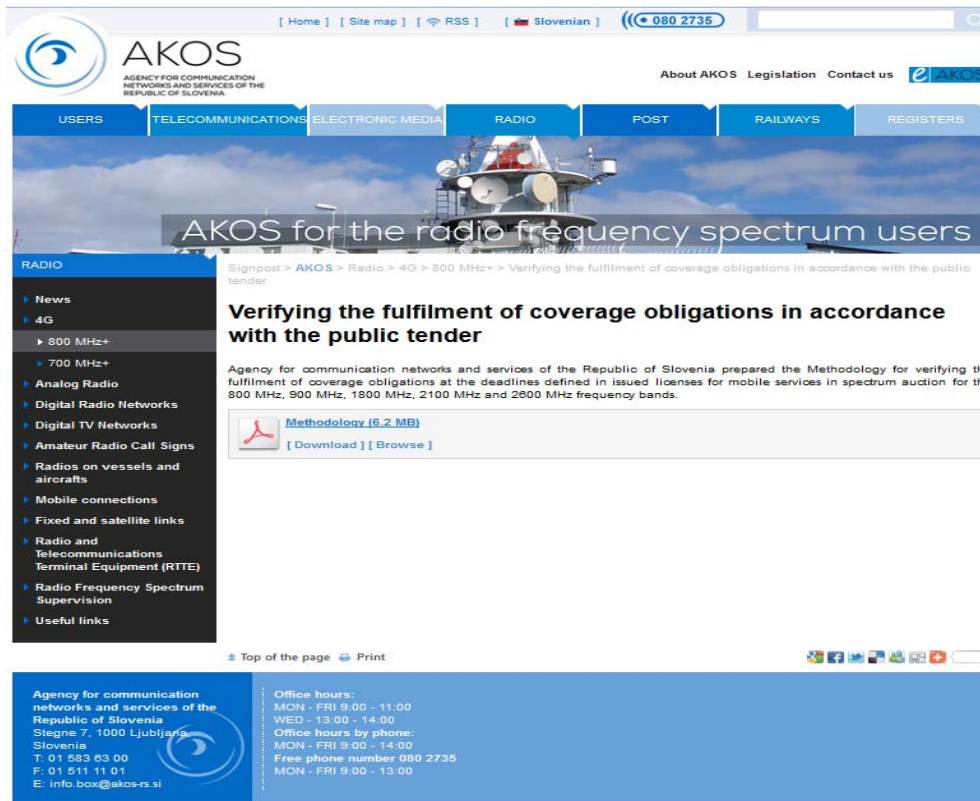


Figure 1. 433 measurements performed with AKOS UE in helmet



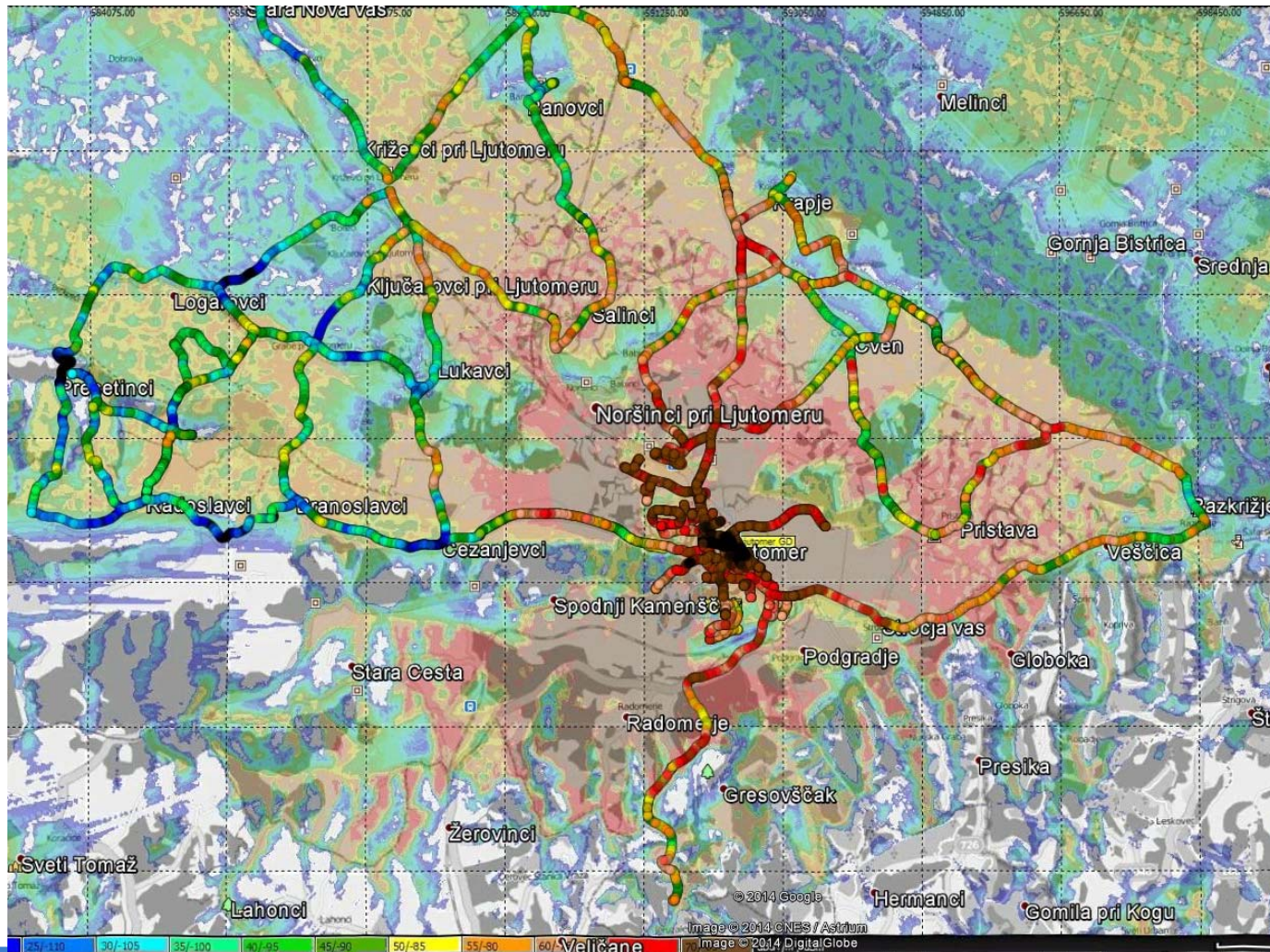
The screenshot shows the AKOS website interface. At the top, there is a navigation bar with links for [ Home ], [ Site map ], [ RSS ], [ Slovenian ], and a phone number 080 2735. Below this is a search bar. The main header features the AKOS logo and the text "AGENCY FOR COMMUNICATION NETWORKS AND SERVICES OF THE REPUBLIC OF SLOVENIA". A secondary navigation bar includes links for USERS, TELECOMMUNICATIONS, ELECTRONIC MEDIA, RADIO, POST, RAILWAYS, and REGISTERS. A large banner image shows a radio tower with the text "AKOS for the radio frequency spectrum users". A sidebar on the left lists various radio-related topics under the heading "RADIO". The main content area displays a signpost: "Signpost > AKOS > Radio > 4G > 800 MHz+ > Verifying the fulfilment of coverage obligations in accordance with the public tender". Below this is the title "Verifying the fulfilment of coverage obligations in accordance with the public tender" and a paragraph of text. A download link for "Methodology (6,2 MB)" is provided with "Download" and "Browse" buttons. At the bottom of the page, there is contact information for the Agency for communication networks and services of the Republic of Slovenia, including address, phone numbers, and office hours.

- <http://www.akos-rs.si/verifying-the-fulfilment-of-coverage-obligations-in-accordance-with-the-public-tender>



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# Measurement – MIMO antenna + simulation





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## Measurements – LTE800

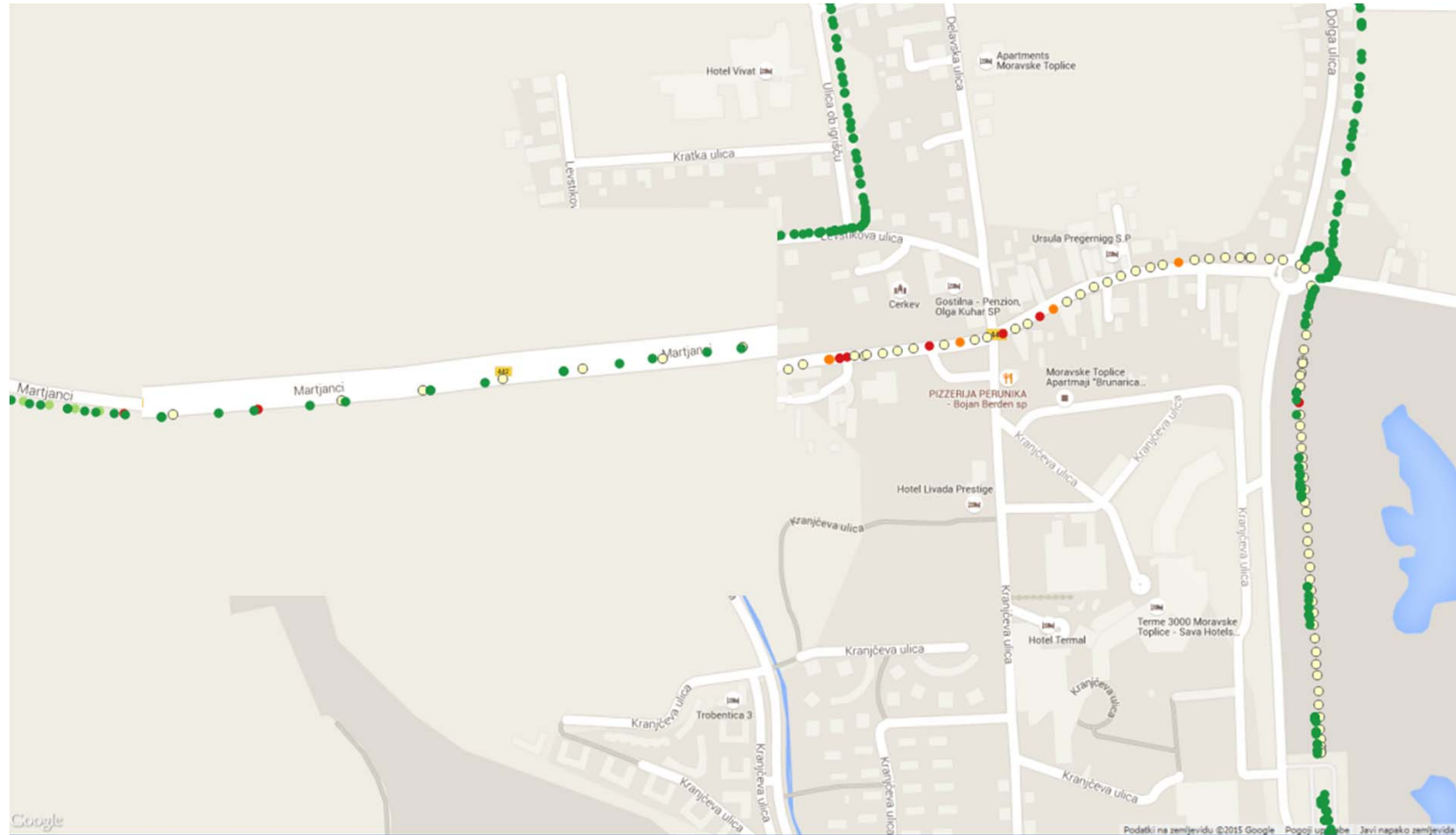
### Drivetest:

- UE – Samsung Galaxy S3
- Scanner R&S TSMW
  - 1x PcTel LTE antenna (700-2700MHz)
  - 2x PcTel LTE antennas (700-2700MHz)
  - MIMO EAD LMO7270 antenna (690-2700 MHz)



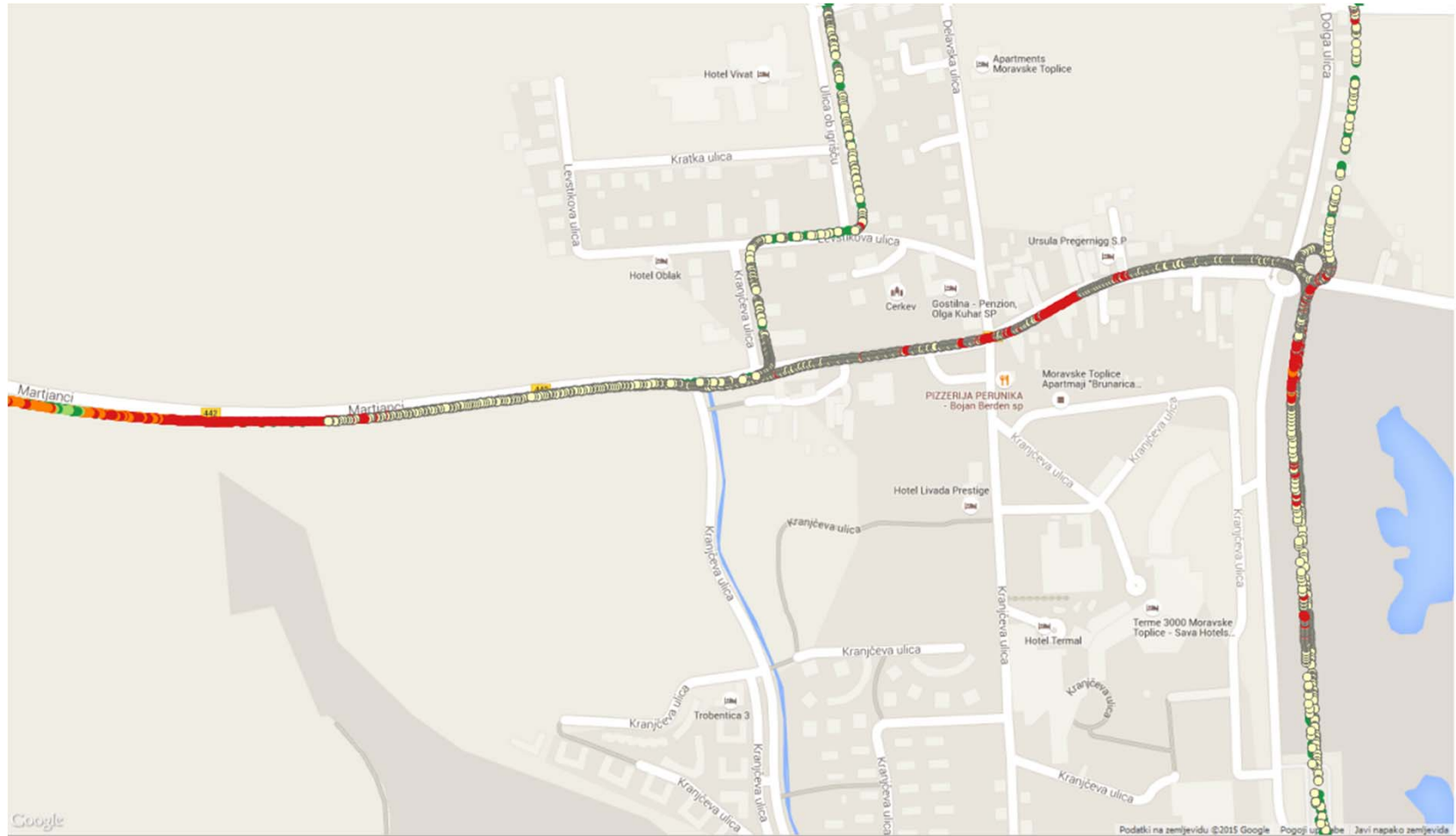


## UE - Samsung

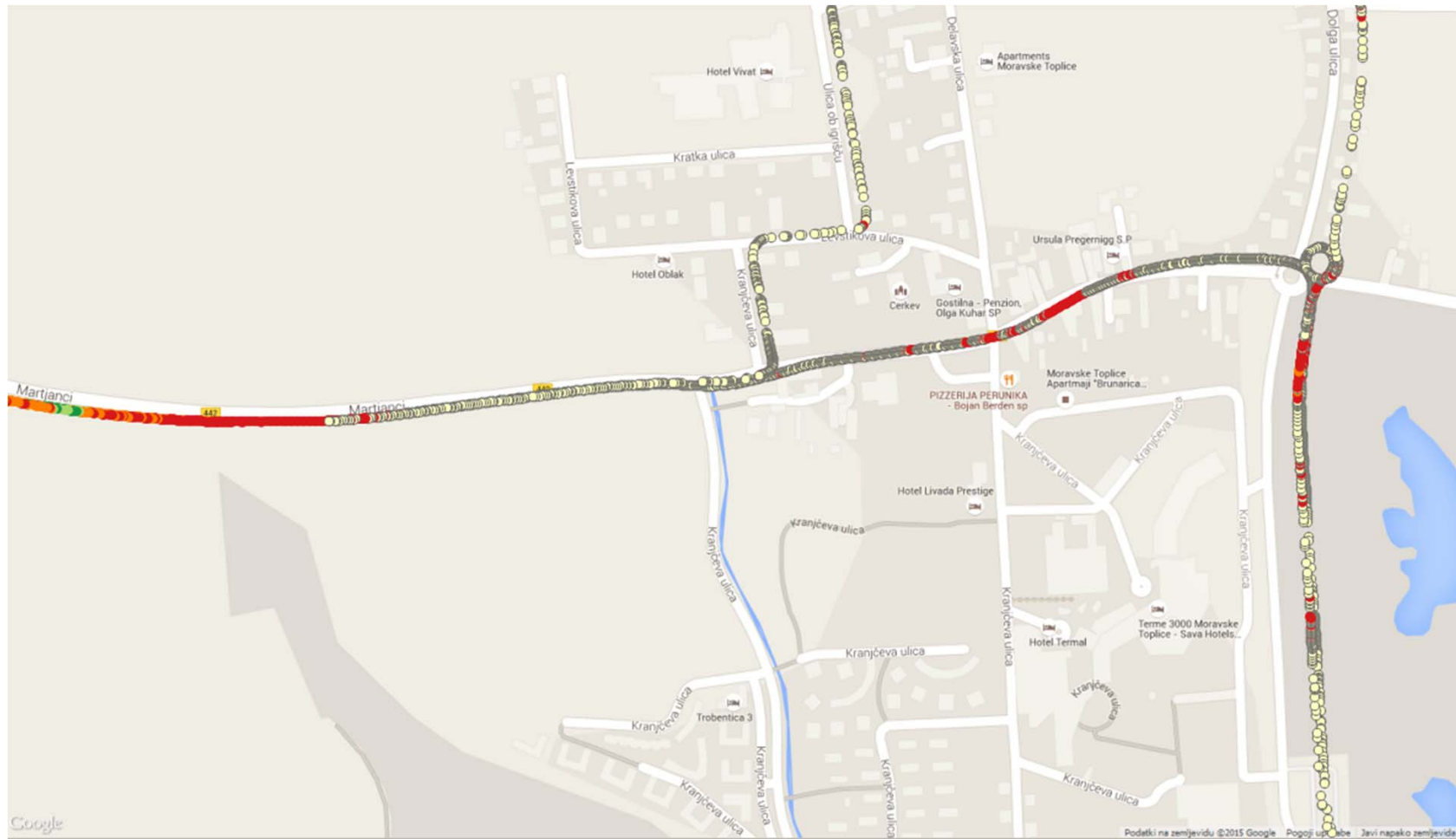




UE – Samsung & Scanner



## Scanner

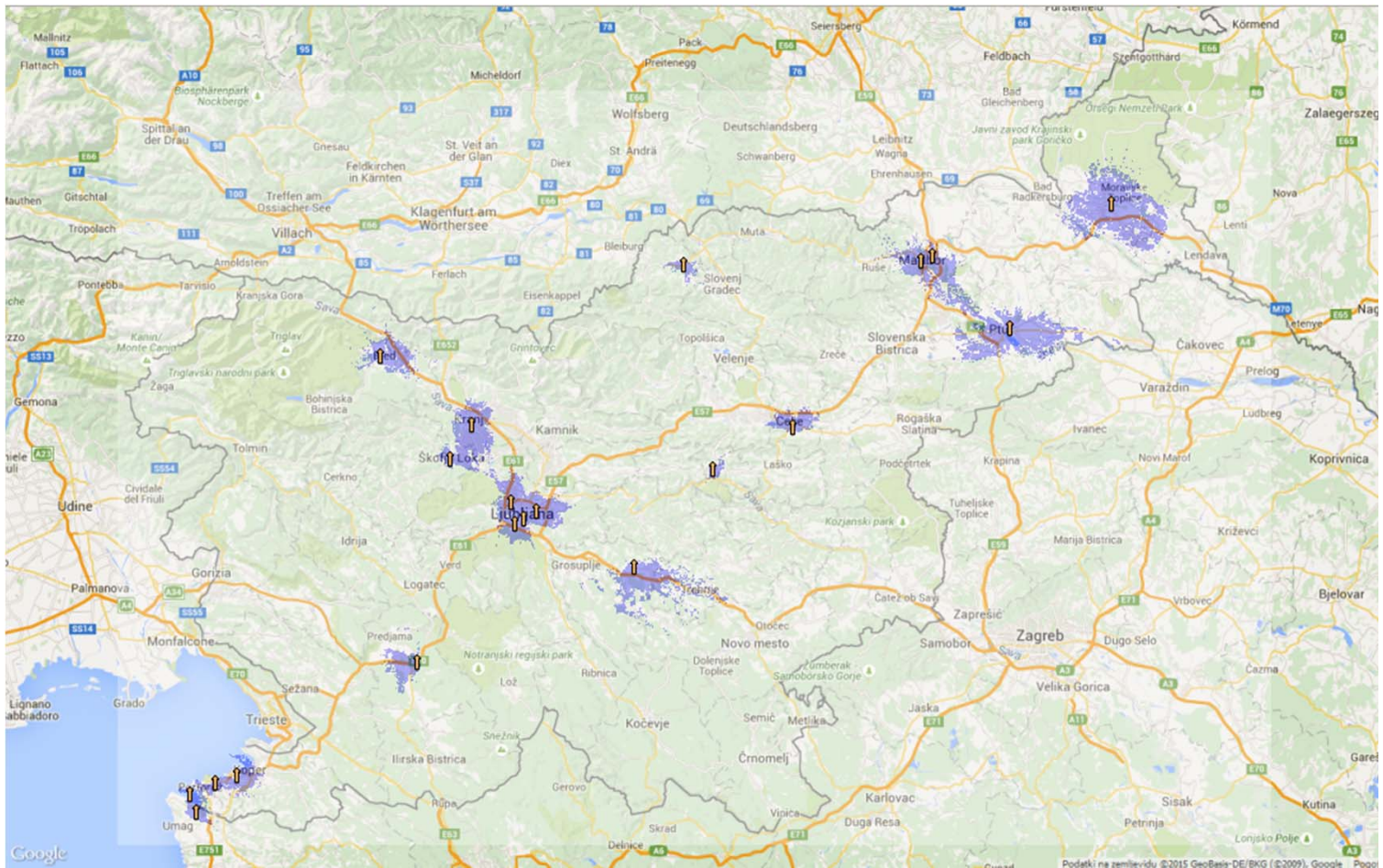




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## Realization of general coverage obligation

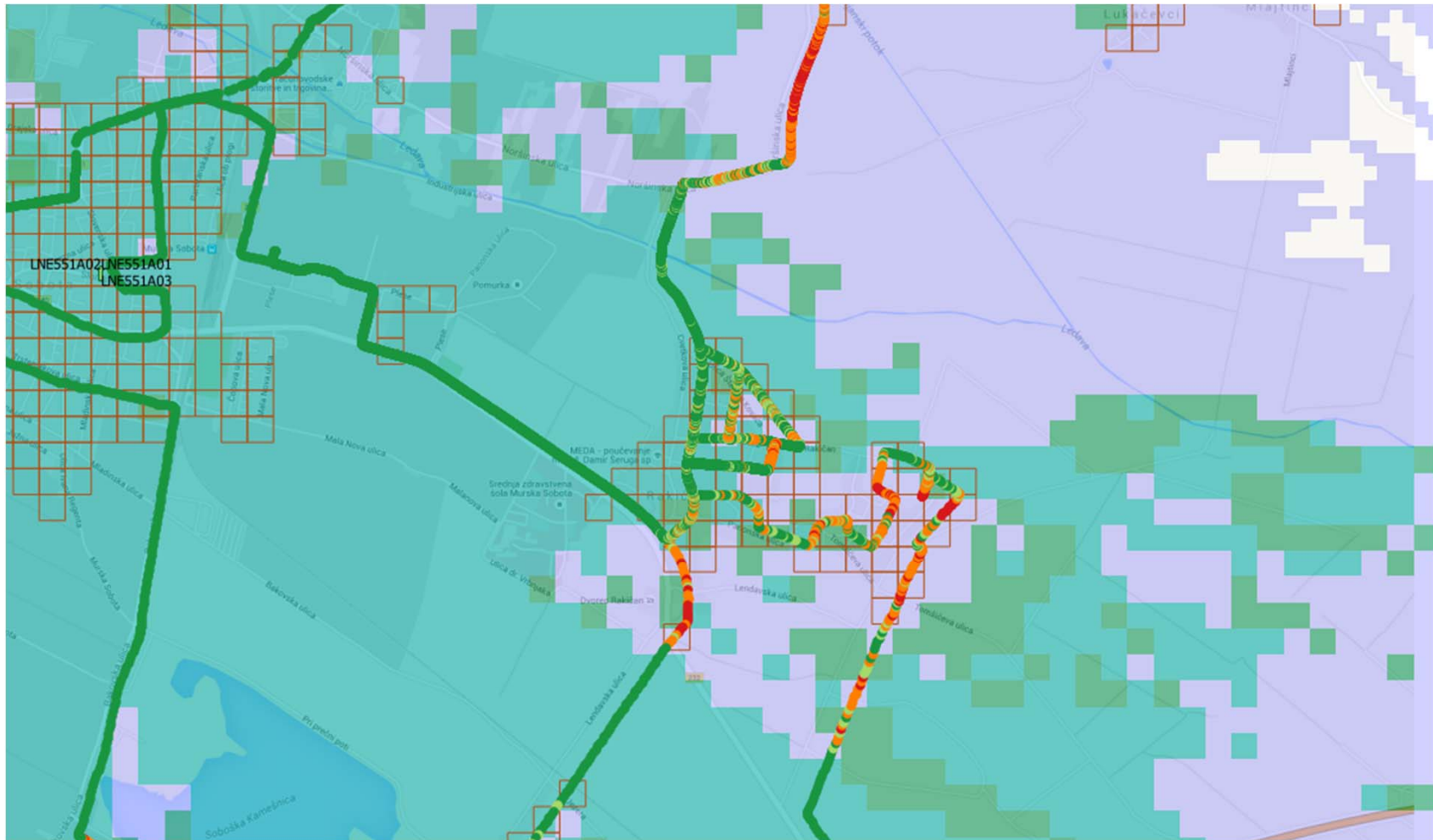
56 cells on 20 locations, is coverage really >25% ?





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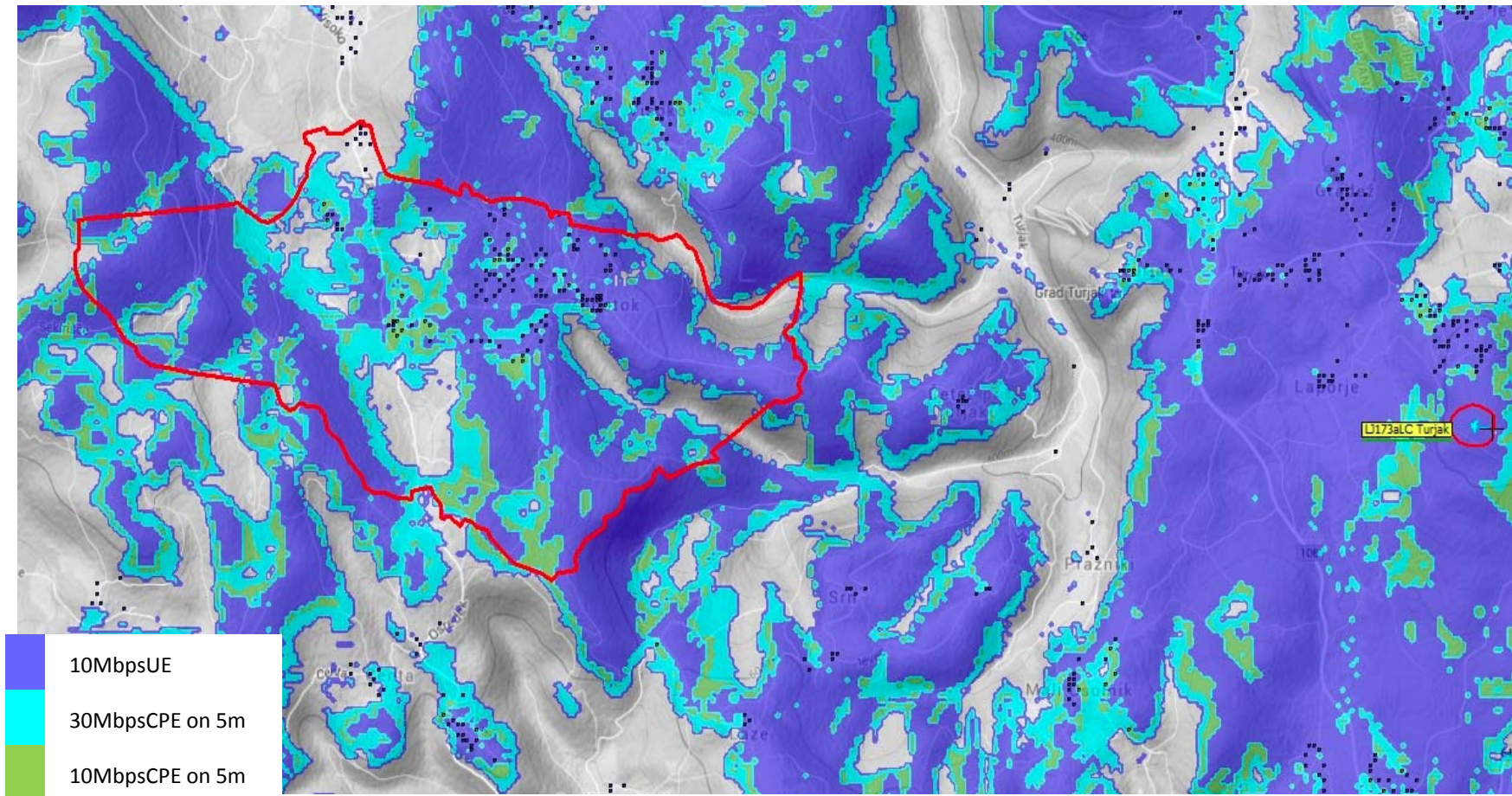
# Realization of general coverage obligation



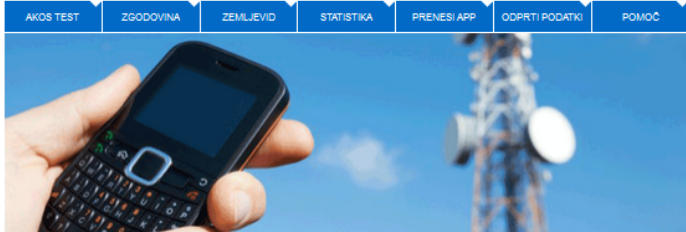


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## Special coverage obligations - realization

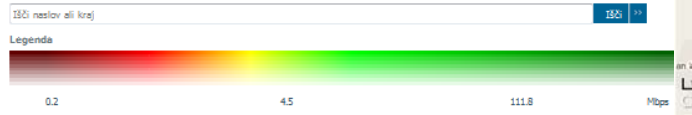
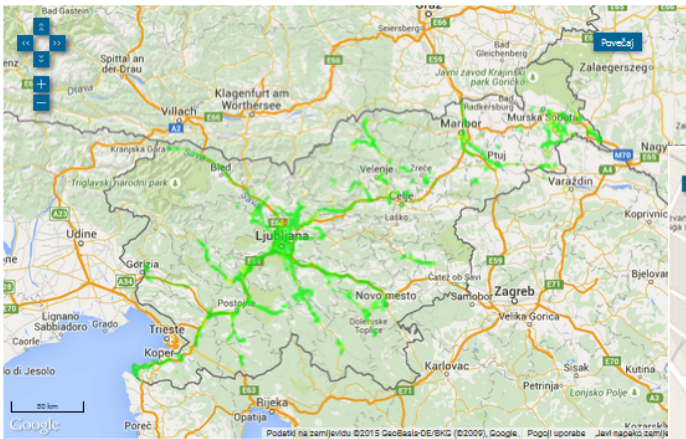


Actual realization in rural area of Zapotok (eNB Turjak)



Zemljevid prikazuje rezultate opravljenih AKOS Testov vseeno pa iz njega ni vedno mogoče pridobiti dokončnih informacij o pokritosti s širokopasovnimi povezavami.

Mobilno - Priložna hitrost:  Semočno:   
 Mediana:  Vse omrežja:  6 mesecev:  4G:



Vir: AKOS Test

Meni

Si.mobil (293-40) 4G/LTE

CPU 7.8% IPv4 ✓  
 RAM 95,6% IPv6 ✗

Promet Lokacija

**START**

AKOS TEST NET

Inicializacija ✓  
 Zakasnitev 20 ms  
 Priložna hitrost 50 Mbps  
 Odočna hitrost -

31%

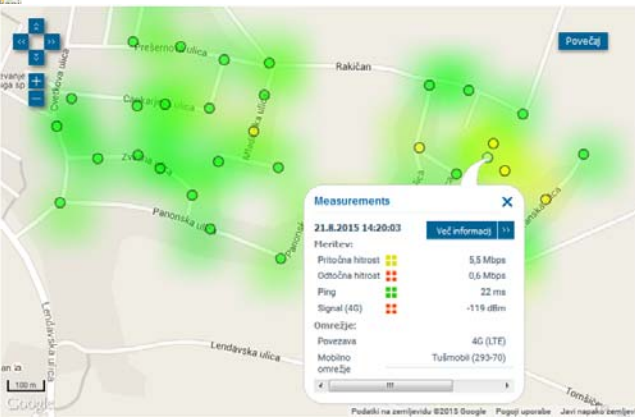
Mbps -91 dBm

Si.mobil (293-40) LTE

IP: 46.122.45.124  
 Strežnik: AKOS-SERVER 1 (Ljubljana)

Rezultat testa

REZULTAT	PODROBNOŠTI	NST
<b>MERITEV</b>		
Priložna hitrost	50 Mbps	
Odočna hitrost	37 Mbps	
Ping	20 ms	
Signal (RSRP)	-91 dBm	
Testi kakovosti	100% (74/74)	
<b>OMREŽJE</b>		
Povezava	4G (LTE)	
Operator	Si.mobil	



800 MHz (31.5.2015)				
		% coverage of RS ( 800 MHz)		
Operater	No of cells / FB	report	AKOS calculation	(-103 dBm)
Tušmobil	57/20	31	39,5 (-119 dBm)	22,3
Telekom Slovenije	207/76	40,3	43,3 (-110 dBm)	31,4
Si.mobil	1157/418	68,9	67,1 (-100 dBm)	72,64
	Number of covered areas (white spots)	108		
	Number of FWBA on white spots	61		



Thank you!