



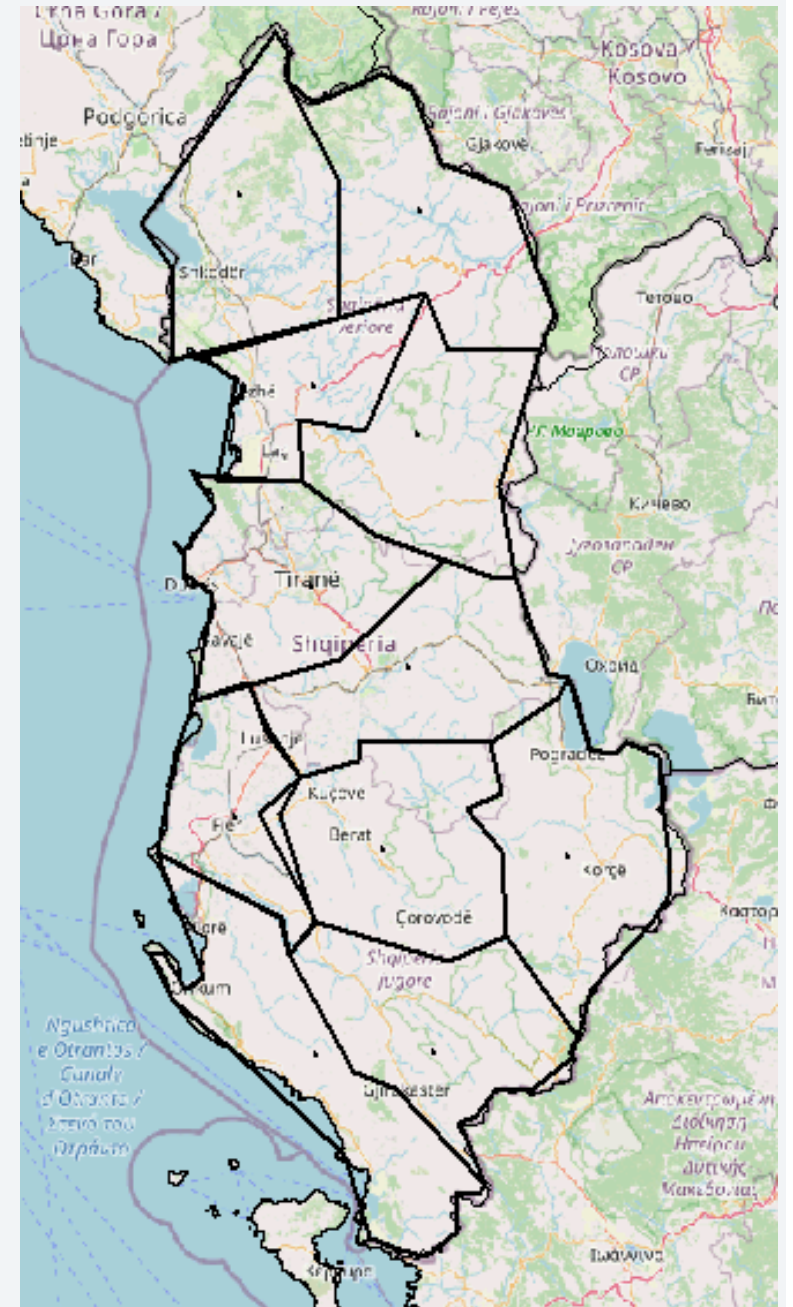
NMHH Nemzeti Média- és  
Hírközlési Hatóság

# DTT Frequency planning for Albania

In the frame of ITU Twinning Program

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# Content

- Basics of the work
- Frequency planning at allotment level
- Frequency planning at assignment level
- Summary

# Basics of the work

# First steps

Kick-off meeting – 7 October 2020

List of requirements by NMHH

Timetable and workplan of the frequency planning process

NMHH team: Marcell Lakatos, András Tóth, Ádám Vörös

Information provided by Albania – 13 November 2020

Main requirements:

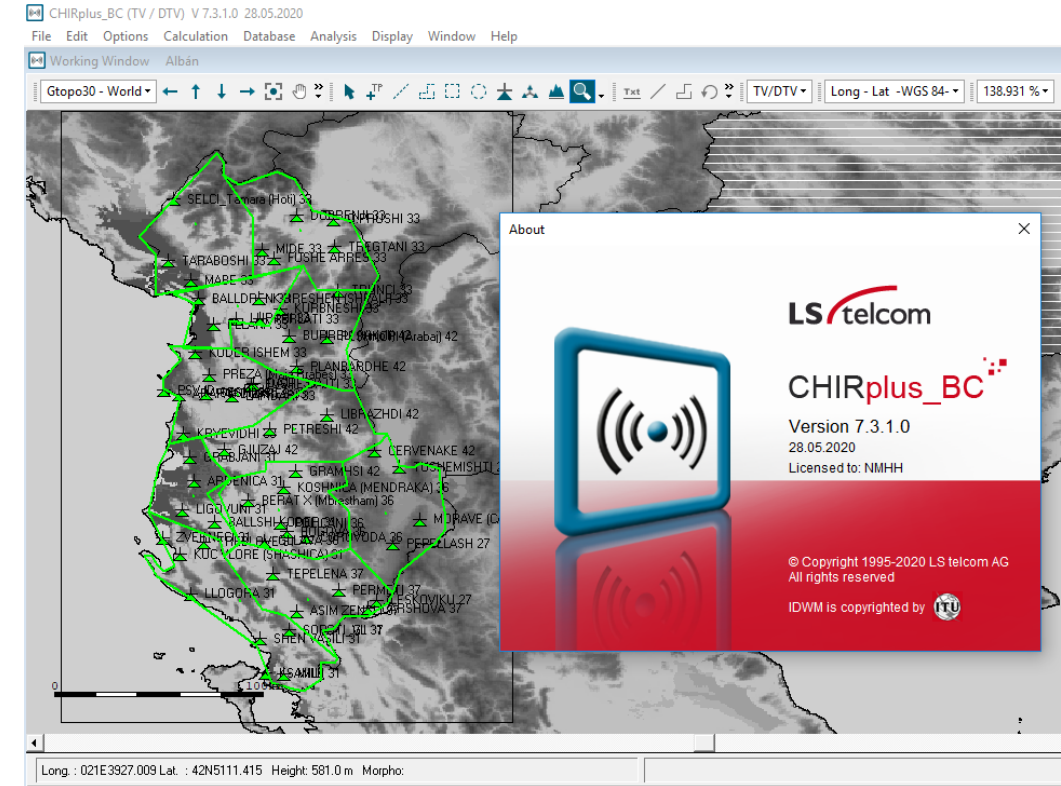
- 7 nationwide layers (plus one local for 3 region)
- the capacity of each networks cannot change

# Planning Tool

CHIRplus\_BC by LS Telcom

Used for network, frequency planning and international coordination

- DTM: Resolution ~700 m
- Illustration: OpenStreetMap
- Propagation models: great variety, including ITU-R 1546 Database and Terrain, IRT\_2D
- Field strength simulations and network calculations



# Frequency planning at allotment level

# Planning process

- 1) Overview of allotment and assignment data and network requirements (system parameters, number of layers) of Albania and neighbouring countries
  - Collect necessary data (allotments, assignments)
  - Analyse the requirements

# Planning process

2) Examine the possibilities of allotment extension in Albania - technical analysis and examinations

- Assess the possibilities of allotment extensions
  - which constellations are in GE06
  - analysis of SEDDIF channel maps
  - technical analysis based on provided assignment information
- Collect the possibilities for each allotments





# Planning process

3) Survey of the possibilities to fulfil Albanian requirements in the given environment (SEDDIF Plan) and channel distribution at allotment/SFN level – do technical analysis and examinations, create a compatibility matrix

	BIH	GRC					ITA	MKD				MNE					SRB	ALB														
	LEO	KERKYRA	THESPROTIA	IONNINA	METAKSAS	FLORINA	CB, FG, BT, BA, TA, BR, LE CS, KR	PELISTER	MALI VJAL	STOGOVO	POPOVA SAPKA	BIELASICA-CENTER	BIELASICA-SOUTH	COAST	LOVCEN-CENTER	PODGORICA	TVRDAS	KOPACNIK	KOSOVO I METOHIJA	AL001D	AL002D	AL003D	AL004D	AL005D	AL006D	AL007D	AL008D	AL009D	AL010D	AL011D	AL012D	
AL001D	1	1	1	1	1	1	2	1	1	1	1	1	2	11	2	2	2	1	1	1	x	2	1	2	2	1	1	1	1	1	1	11
AL002D	1	1	1	1	1	1	1	1	1	1	1	1	11	11	1	1	1	1	1	2	2	x	1	1	1	1	1	1	1	1	1	1
AL003D	1	1	1	1	1	1	1	1	1	2	2	1	1	1	1	1	1	1	1	1	2	1	x	2	2	1	1	1	1	1	1	1
AL004D	1	1	1	1	1	1	2	1	1	1	1	1	1	1	2	11	1	1	1	1	2	1	2	x	2	1	1	1	1	1	1	2
AL005D	1	1	1	1	1	1	2	1	1	1	1	1	1	1	2	2	1	1	1	1	2	1	1	2	x	2	2	2	1	1	1	2
AL006D	1	1	1	1	1	1	1	1	1	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	x	2	2	1	2	1	1
AL007D	1	1	1	1	1	1	2	1	1	1	1	1	1	1	11	11	1	1	1	1	2	1	1	1	2	2	x	2	1	2	2	2
AL008D	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	x	1	2	1	1
AL009D	1	1	1	1	1	2	1	1	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	x	1	1	1
AL010D	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	x	1	1	1
AL011D	1	2	2	2	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	2	x	11	
AL012D	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	2	2	1	1	1	1	1	1	x

# Frequency plan at allotment/SFN level

## Version 1

Allotment/ layer	AL001D	AL002D	AL003D	AL004D	AL005D	AL006D	AL007D	AL008D	AL009D	AL010D	AL011D	AL012D	Legend
1	21*	40	40	21*	21	40	31	25	21	26	31	26	GE06
2	22	36	24	22	22	24	22	24	24	37	39	37	new
3	23	23	23	23	23	23	29	32	43	29	43	44	new, other country needs to change its current plan
4	28	42	38	28	28	42	28	47	28	44	28	39	
5	33**	32	25	33	33	33	35	36	27	35	35	41	
6	34	26+	30	34	34	48	27	48	48	48	27	47	
7	45	45	45	45	45	45	45	45	45	38	23	32	
local	29 (37,46)					46					46?		
<b>Notes</b>													
*	MNE COAST SOUTH 21 and PODGORICA 21 change to ch 41												
**	MNE PODGORICA 33 change to ch 48												
	other, alternative possibilities to PODGORICA: ch 36, ch 46												
+	in order to solve the incompatibility on ch 26 between MNE and ALB, AL002D could be freed up and use ch 30 as extension in this way MNE could use ch 26 without restrictions												

# Planning process

Additional requirements from Albania:

- not to connect more than 4 allotment areas together as an SFN,
- use 6-7 frequencies per layer
- keep the currently operating frequencies in the networks, as much as possible,

New versions were prepared: not possible to fulfil all requirements at the same time: versions 2-5

# Frequency plan at allotment/SFN level

Version 6 prepared by Albania and it was further developed

More released GE06 frequencies

## Version 6.2

MUX	Shkoder	Kukes	Diber	Lezhe	Tirane	Elbasan	Fier	Berat	Korce	Gjirokaster	Vlore	No. of channels	Legend
MUX1	28	28	38	28	28	43	27	25	43	26	27	6	GE06
MUX2	34	34	24	34	34	48	39	32	48	39	39	5	new
MUX3	21**	35	42	21**	21	42	21	30	30	23	23	5	new, other country needs to change its current plan
MUX4	23	23	30	23	29	40	29	36	28	28	28	6	
MUX5	45	45	25	45	45	23	31	31	45	37	31	6	
MUX6	22	22	36	22	22	46	43	24	21	44	43	6	
MUX7	33*	40	32	33	33	33	35	47	27	35	35	6	
Local network						37							
Free of local networks	29		39				-	34	-	42	-		
		26?		43?	26?			38		40			
					37?					46			
					44?					38			
										44	43		
33*	MNE PODGORICA channel 33 change to ch 48												
21**	MNE COAST SOUTH 21 and PODGORICA 21 change to ch 41												

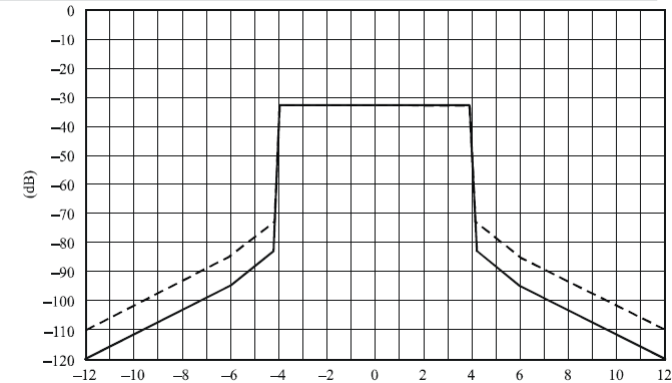
# Planning process

New, detailed information regarding transmitter parameters and network structures

The case of adjacent channels should also be taken into account

- Neighbouring channels could be used in the same area if the same infrastructure (antenna) is used and the requirements of critical spectrum mask are fulfilled (bandpass filter)

The allotment plan was re-formed/replanned and fine-tuned



# Frequency plan at allotment/SFN level

Accepted, final version: 7.4

Allotment/ layer	AL001D	AL002D	AL003D	AL004D	AL005D	AL006D	AL007D	AL008D	AL009D	AL010D	AL011D	Number of frequencies
1	33**	33	42	33	33	42	31	36	27	37	31	6
2	34	34	40	34	34	40	39	41	28	38	39	6
4	21*	36	38	21*	21	48	21	48	48	48	28	5
5	22	22	24	22	22	24	27	47	24	26	27	5
7	23	23	25	23	23	25	35	32	21	35	35	5
3	28	28	30	28	28	30	29	30	45	29	23	5
6	45	45	32	45	45	46	43	43	43	44	43	5
local	29!	26?	27	29!	-	37	-	34	-	42	-	

Legend
GE06
new
new, other country needs to change its current plan
local (in use)

**Notes**

\* MNE COAST SOUTH 21 and PODGORICA 21 change to ch 41

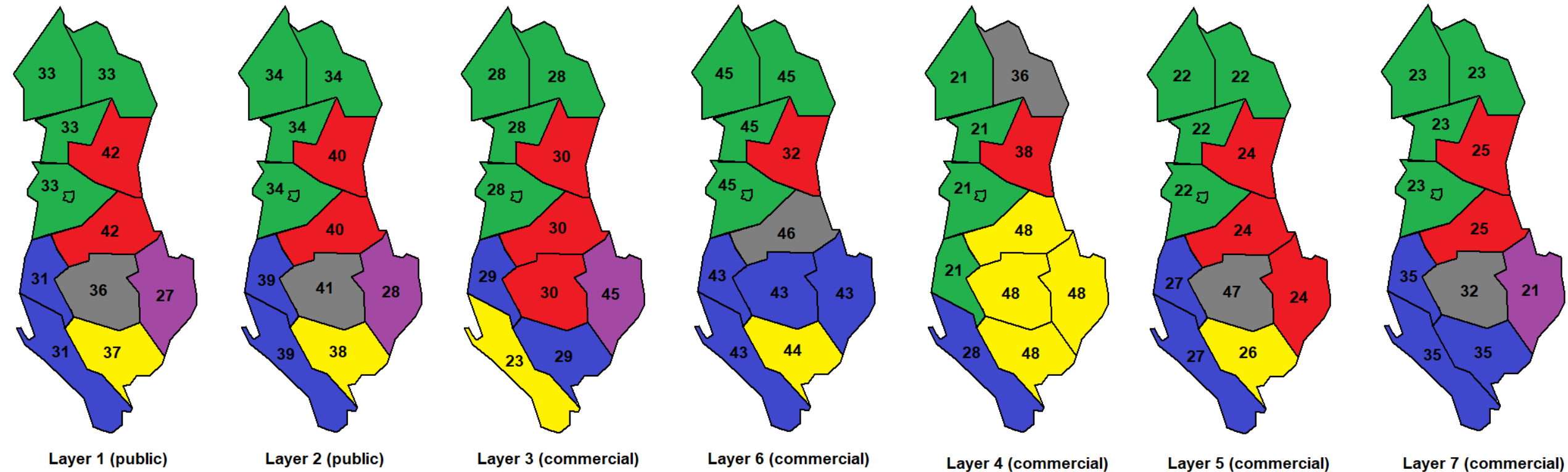
\*\* MNE PODGORICA 33 change to ch 48

other, alternative possibilities to PODGORICA: ch 36, ch 46

! Local multiplexes should use the same infrastructure than the nationwide, adjacent channel

# Frequency plan at allotment/SFN level

Version 7.4 - Layer maps



# Frequency planning assignment level



# Planning process

- 1) Collect information about transmitter parameters in operation
  - Input from Albania: main parameters from tables and antenna patterns (for public MUXs) from images, GE06 assignment for additional MUXs
- 2) Create assignment lists and parameters according to version 7.4
- 3) Technical calculations and analyses
- 4) Summary about the results

# Calculations

Collect the potential interfering transmitters

Fieldstrength calculations

- For wanted and interfering assignments
- With three different propagation models (ITU-R 1546 Database and Terrain, IRT\_2D)

Coverage calculations

- With given DVB-T2 system parameters
- Without examination of possible self-interference

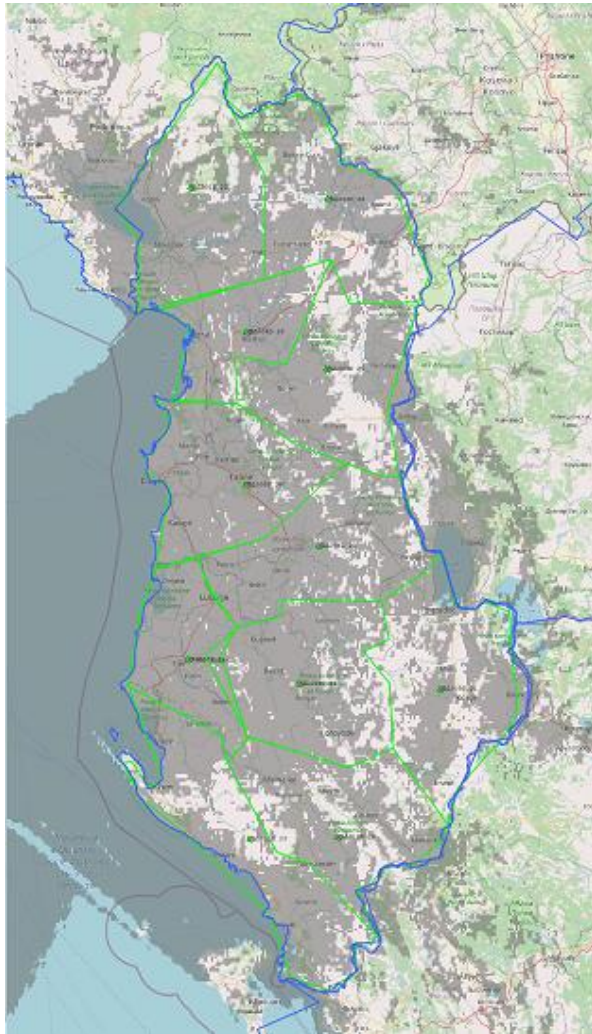
# Calculations

## Steady and Tropo Sum Level calculations

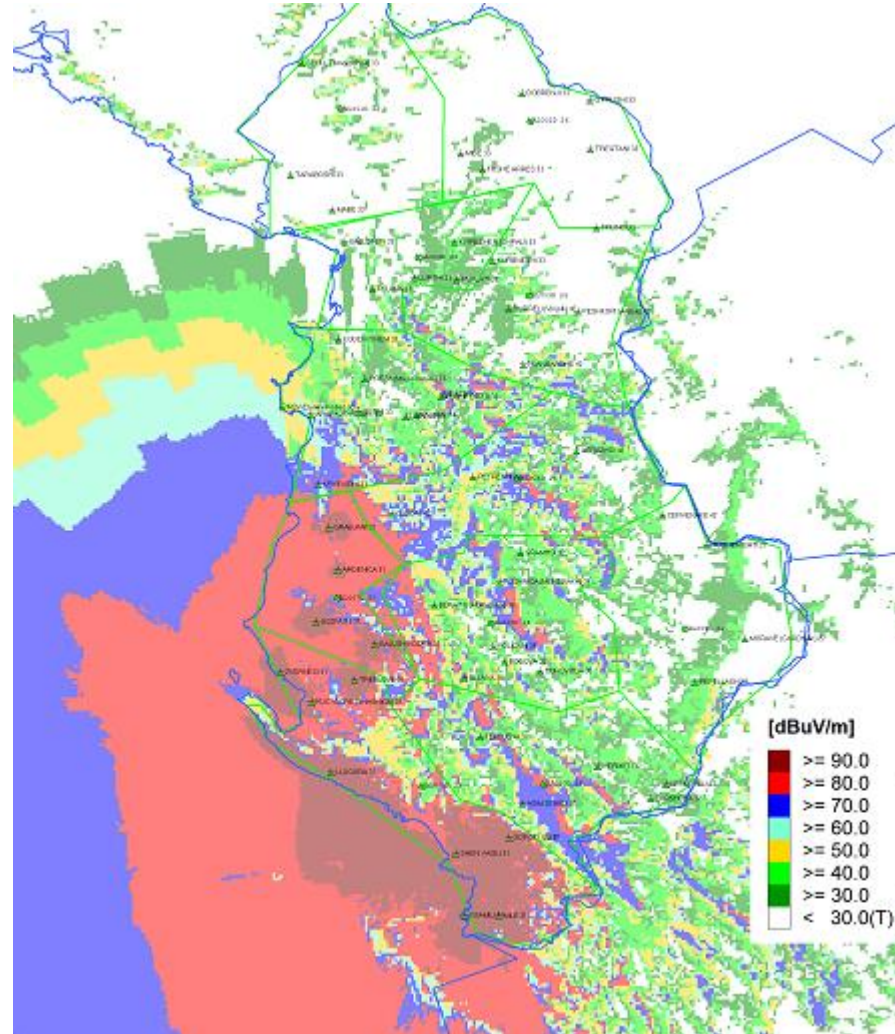
- In case of significant degradation in coverage
- Cumulative fieldstrength level of wanted and interfering transmitters
- To see what could cause degradation in coverage

# Some results

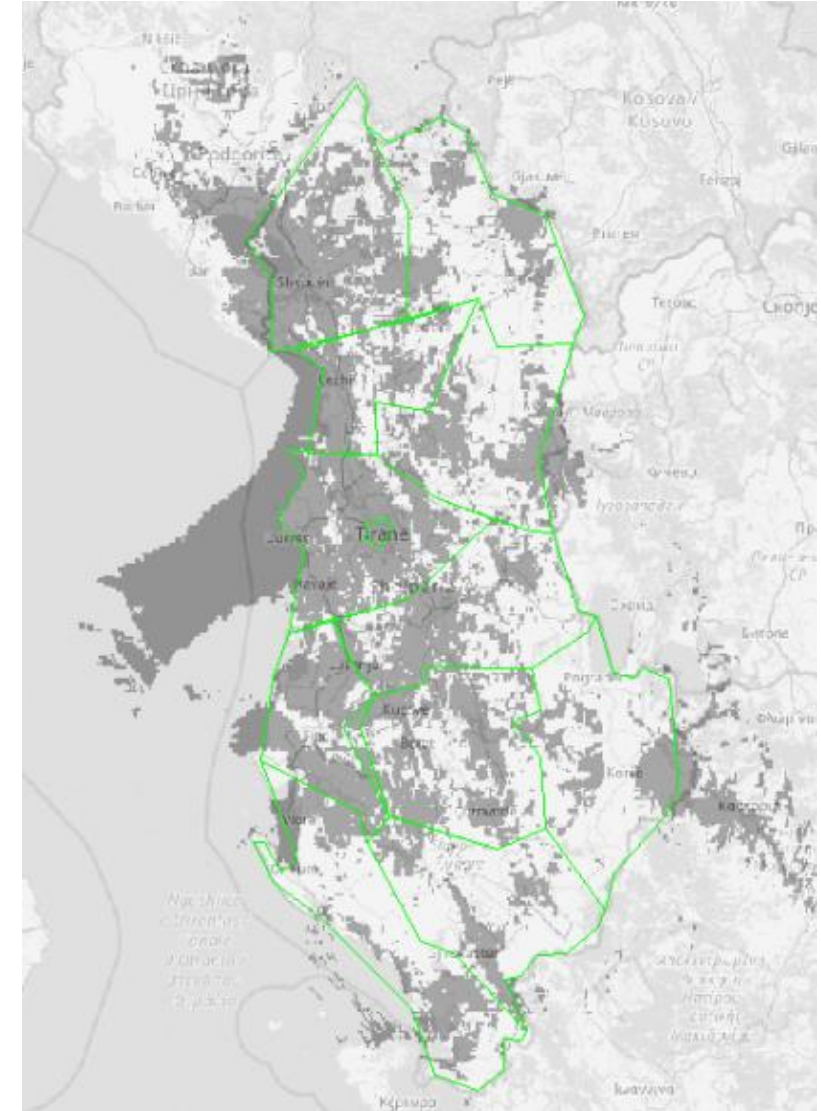
Coverage of MUX2 (IRT\_2D)



Steady Sum Level – ch 31 AL007-11



Coverage of MUX6 (IRT\_2D)



## Evaluation of results

- No seriously critical cases
- Partly interfered cases existing in the GE06 Plan and are in operation as well
- Larger allotment/SFN areas → Guard Interval parameters should be increased → avoid possible self-interference
- Code Rate parameters should be modified to achieve the same bitrates
- Significant difference in coverage between commercial and public multiplexes (less transmitters, lower ERPs)

# Summary

# Summary

- 7 implementable nationwide layers could be achieved
- Local layer is possible in some allotments
- Number of frequencies per layer 5 and 6
- Allotment extension limitation could be achieved
- MUX1 and MUX2 coverage could be satisfactory
- Coverage for other multiplexes could be improved by new transmitters and higher ERPs
- FREQUENCY COORDINATION: important and unavoidable step
- Frequency plans could be finalized after coordination process

# Thank you for your attention!

Ádám Vörös



13 April 2021