GNSS RFI MON
Project Team update

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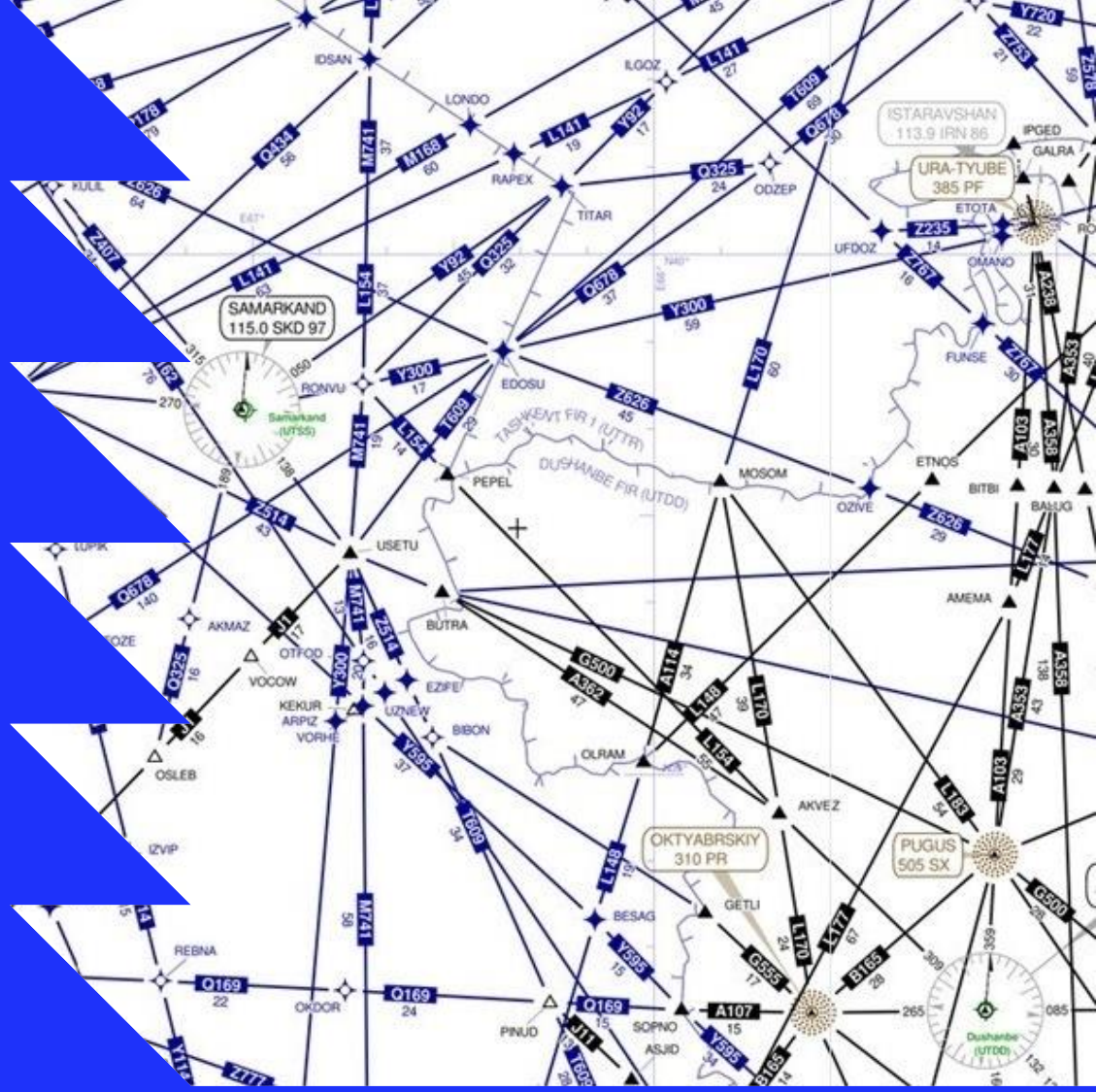
GNSS RFI MON

- GNSS is becoming primary source of navigation for PBN applications in nominal scenario for entire ICAO EUR Region
- Vulnerability of GNSS/GPS to intentional and unintentional signal interference presents a significant safety issue
- In EU Article 6 of PBN IR addresses the safety risks associated with GNSS RFI
- For non-Eurocontrol Sates ANSISG/7 initiated the establishment of GNSS RFI Minimum Operational Network Project Team (MON PT)

GNSS RFI Minimum Operational Network Project Team

(EASPG PCG Decision 6/1)

Objectives: In close coordination with the developments in the EUROCONTROL area, **develop a regional GNSS RFI Minimum Operational Network (MON) for the Eastern part of the ICAO EUR Region**, for the FIRs which are not covered by the EUROCONTROL area



Project High Level Tasks

1. Collect data on the existing ground-based NAV infrastructure (type of NAV system, ranges, coverage, etc.) from all FIRs in the ANSISG area which are not covered by the EUROCONTROL area
2. Consider the proposed recommendations from the Antalya Symposium (Feb 2024)
3. Collect the individual NAV Spec Requirements, as published in the AIP, in the involved FIRs
4. Study and include relevant EUROCONTROL CNS MON developments based on the European MON Concept and Design Criteria
5. Develop a comprehensive and compatible MON proposal for the ANSISG Area
6. Verify the proposal with all involved airspace users, including State aircraft, business aviation and general aviation
7. Actively support the coordination and review of the proposal with the regulatory entities in each ANSISG State

GNSS RFI MON Project Team

ALGERIA
ARMENIA
CZECH REPUBLIC
GEORGIA
KAZAKHSTAN
MOROCCO
REPUBLIC OF MOLDOVA
ROMANIA

Joined at ANSISG 08
AZERBAIJAN
KYRGYZSTAN

TUNISIA
TÜRKIYE
UKRAINE
UNITED KINGDOM
UZBEKISTAN
ACAO
EUROCONTROL
IATA

Generic considerations on MON

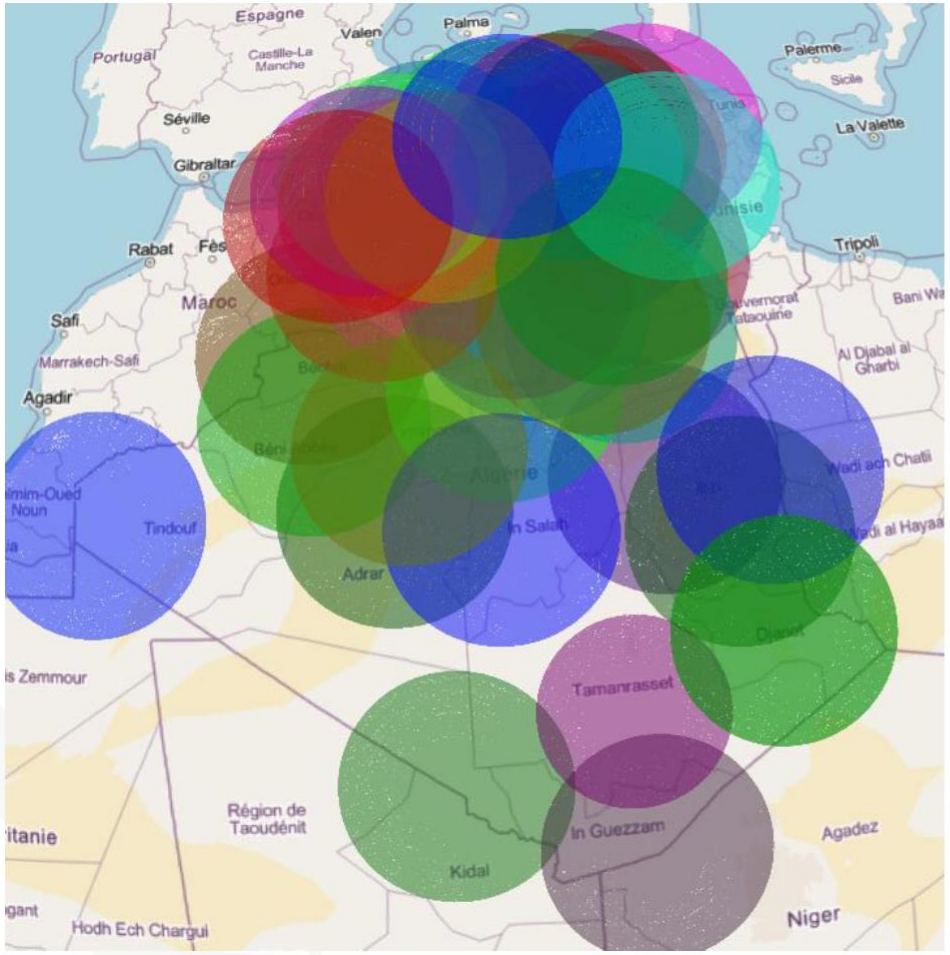
- Top-down vs Bottom-up approach for GNSS contingency planning
- Redundancy avoidance
- Cross-border Navaids applicability should be considered
- Military Navaids may be part of MON
- Use case analysis and airspace user consultation are essential

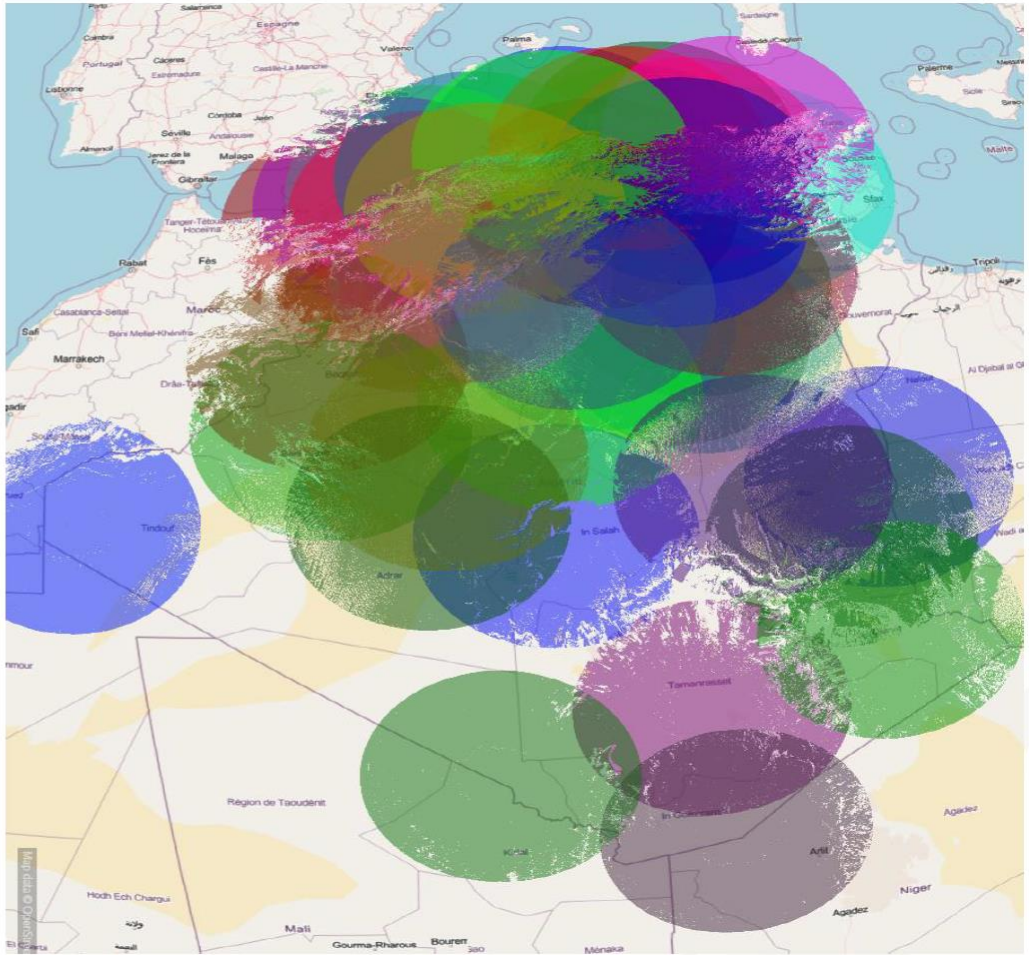
Optimal option – ensure continued PBN operations by support of multiple applications (DME/DME based PBN, etc)

Phase of Flight	Nav Spec	GNSS	DME/DME	VOR/DME	INS/IRS
En Route	RNAV 5[1]	O	O	O	O
SIDs/STARs	RNAV 1[1]	O	O		Note 5
	RNP 1	R	TBD[2]		
Approach	RNP APCH[3]	R			
	RNP AR[4]	R			R
Helicopters only	RNP 0.3	R			

Current status

Algeria. DME coverage FL 180 & FL 250



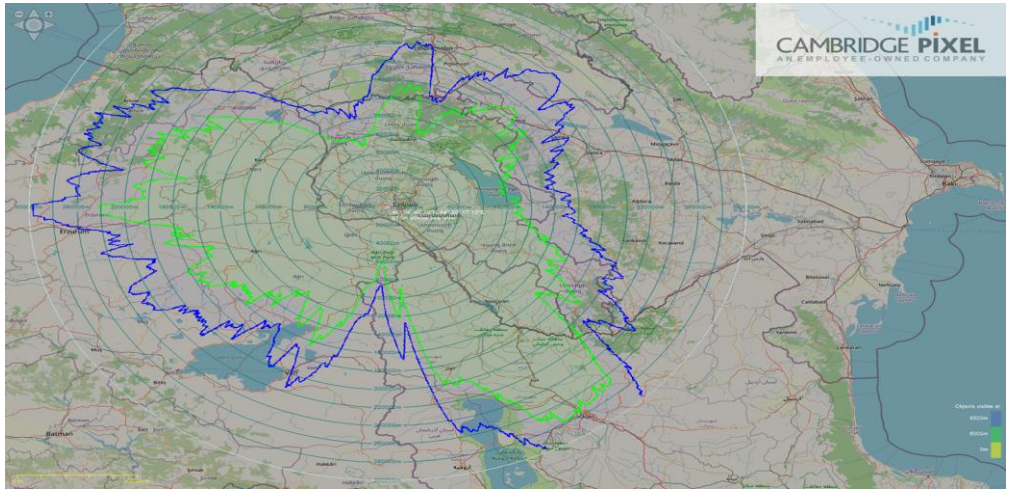


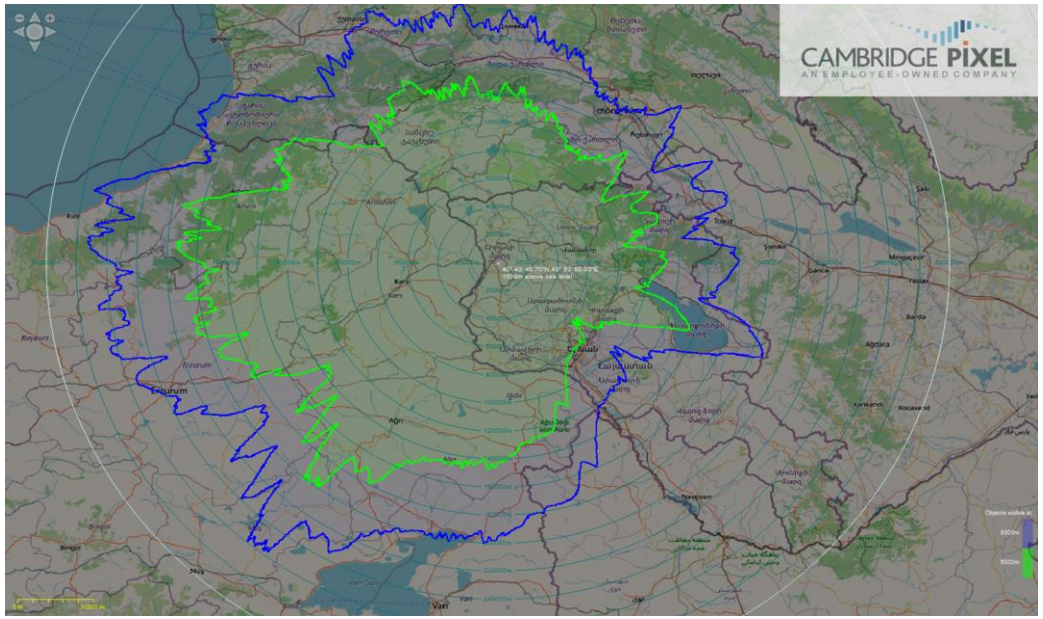
Current status

Armenia

ZVARTNOTS DVOR-DME (ZVR) FL195-FL280

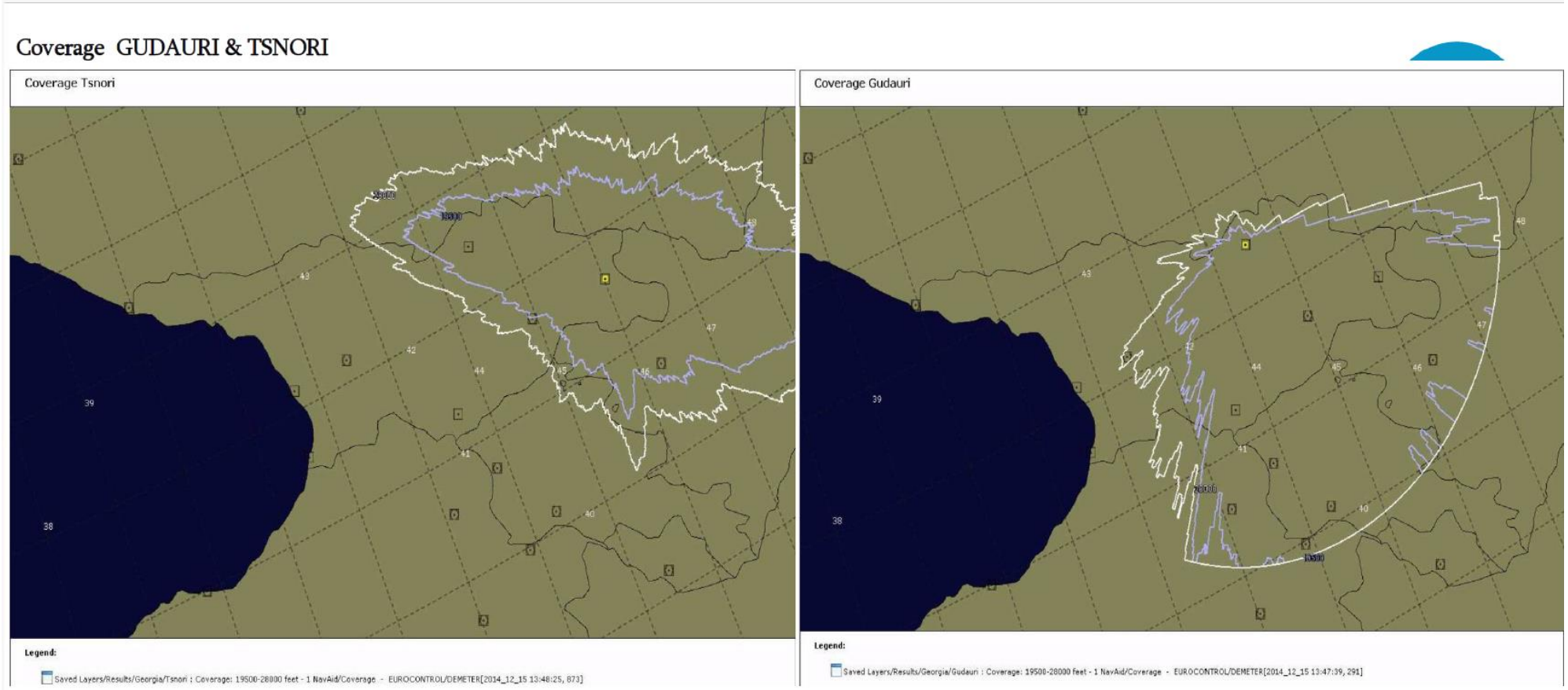
GYUMRI DVOR-DME (GRM) FL195-FL280





Current status

Georgia

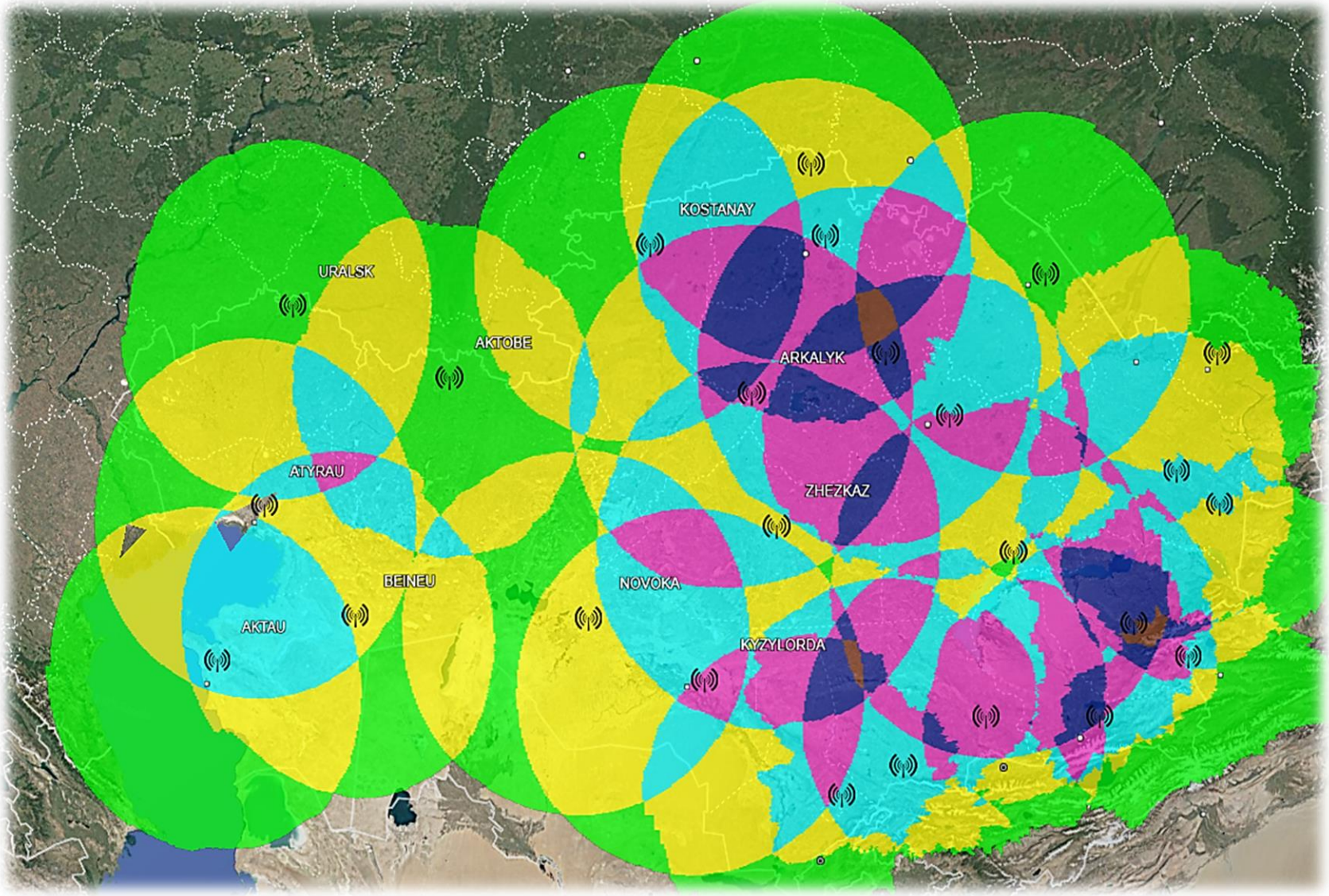


Current status

Kazakhstan

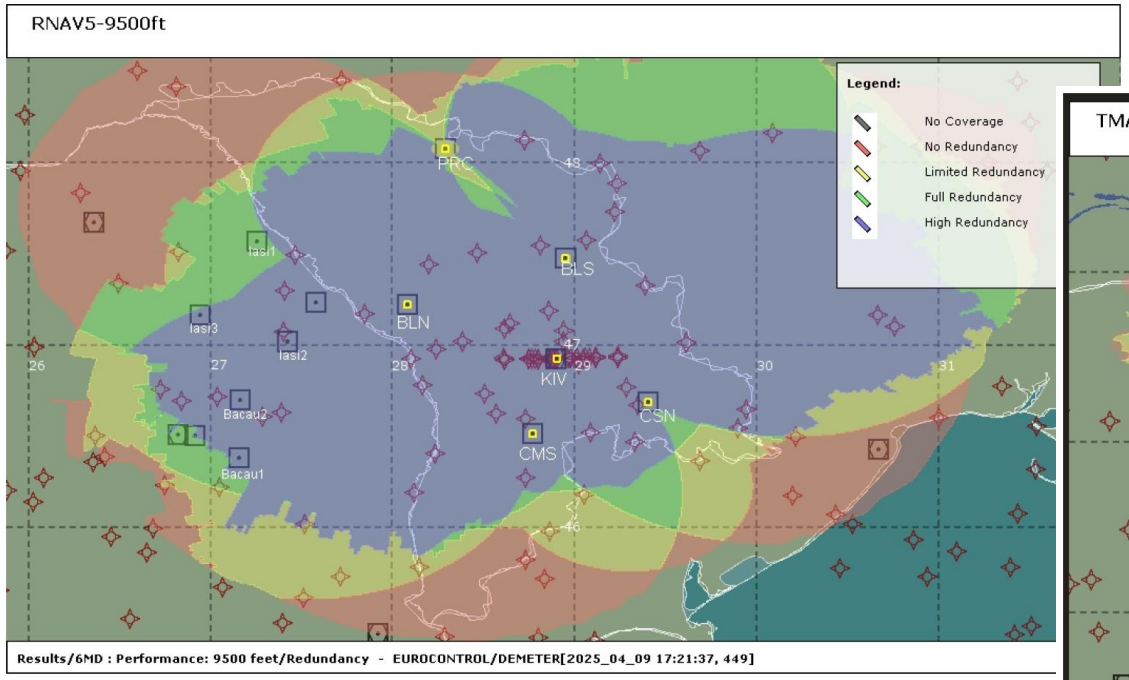
DME Coverage at FL300 without considering DMEs of neighboring States

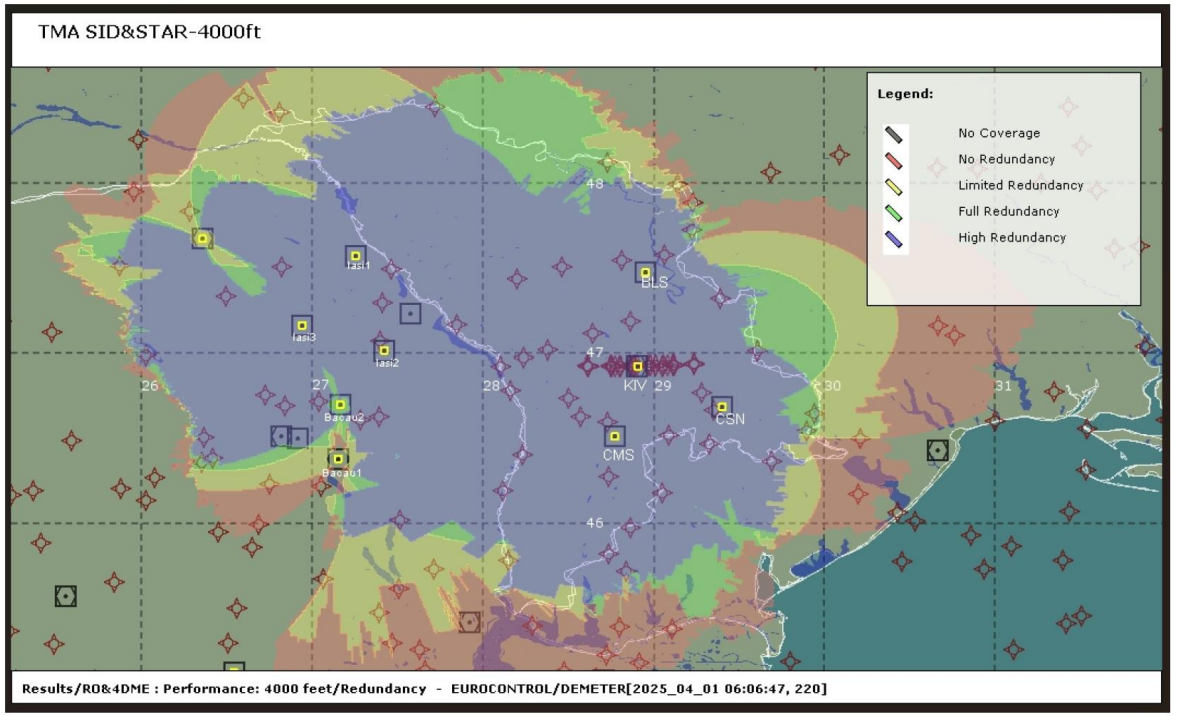
	Single coverage
	Double coverage
	Triple coverage
	Quadruple coverage
	Fivefold coverage



Current status

Moldova





Current status

Türkiye

En-route:

- B-RNAV/RNAV5 specs are being applied since 1998
- Conventional routes functional
- Radar coverage available all-around FIR, when needed/asked for Radar vectors given to the IFR aircraft in case of loss of GNSS signal

1. TMAs with Radar Service:

- Conventional SIDs, STARs and Instrument Approach Procedures are functional.
- P-RNAV/RNAV1 SIDs and STARs are in service.
- In case of loss of GNSS signal, Radar vectors can be provided when needed and conventional procedures are still available.

2. TMAs without Radar Service:

- RNP1 SIDs and STARs are in service.
- Conventional SIDs, STARs and Instrument Approach Procedures are functional as the back- up procedures in case of loss of GNSS signal.
- DME-DME method is being implemented to support RNP1 SIDs and STARs in case of loss of GNSS signal.

Current status

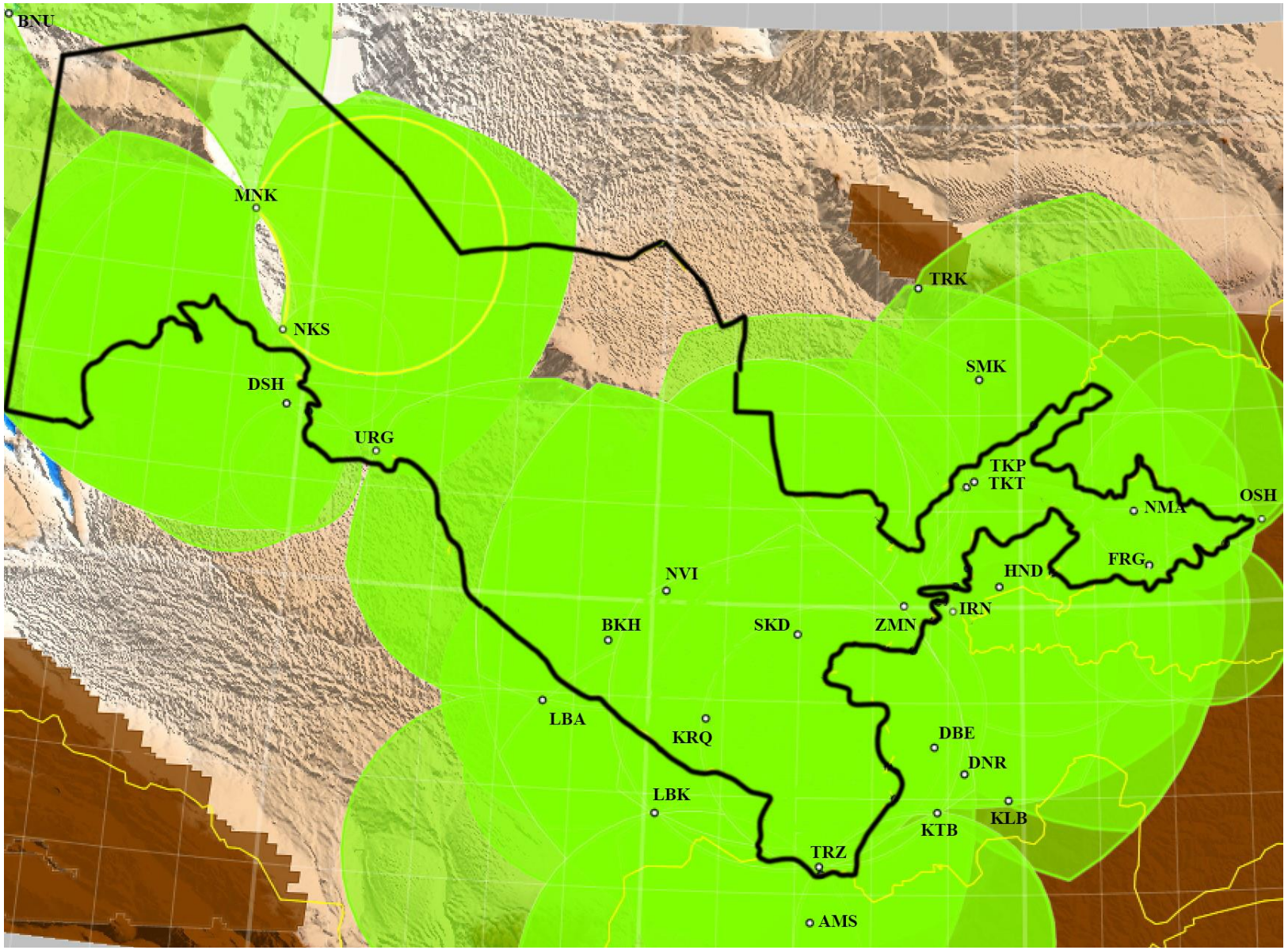
Uzbekistan

DME/DME coverage

Studies considering DMEs of neighboring States

Tajikistan

DME/DME coverage considering DMEs of neighboring States



Preliminary results

GNSS back-up En-route:

- RNAV5 can be ensured by existing VOR/DME and DME network in case of GNSS outage/unavailability considering the FMS resistance to degradation through the airspace of Armenia, Georgia, Kazakhstan, Kyrgyzstan, Moldova, Türkiye (with conventional routes and other functions), Tajikistan and Uzbekistan

Preliminary results

GNSS back-up TMAs:

- RNAV 1 can be fully ensured in Georgia and Tajikistan
- RNAV 1 can be partially ensured in in Algeria, Kazakhstan, Kyrgyzstan and Uzbekistan by DME/DME
- Türkiye provides GNSS back up with DME/DME, conventional SIDs/STARs and radar vectoring
- Armenia, Georgia and Moldova are working over the MON in the framework of Eurocontrol GNSS reversion strategy
- All the States have the VOR/DME, DME deployment plans to improve the coverage

MON PT during ANSISG 08

➢ **MON PT meeting 23 May in Tbilisi, Georgia discussed the following issues:**

- Determine the States to be considered for Regional MON
- Expansion to more Project Team members
- Interface and coordination with Eurocontrol States under CNS programme manager
- Formalization of the Regional GNSS Reversion Strategy and MON Concept (IATA Doc?, EUR eANP Vol III?, MoU?, etc)
- Mechanism of realization
- Technical solutions – VOR/DME, DME/DME, ILS, conventional NAV, Radar Vectoring?
- Roadmap

Next steps

➢ **MON PT outcomes:**

- Azerbaijan and Kyrgyzstan performed NAV infrastructure analysis and presented MON strategy. MON PT strongly supported the cross-border use of NAV Aids in the MON strategy. Only missing States Russian Federation, Belarus and Turkmenistan
- MON PT members will contact their PANS OPS Design colleagues to support the MON developments with maps for RNAV1 approach feasabilities
- The MON strategy will include tables of NAV Aids by State for ensuring RNAV5/RNAV1 with VOR/DME, DME/DME and ILS infrastructure. The NAV Aids that are used by multiple States will be highlighted. The tables will also include information about the NAV infrastructure developments in each State for the next 3 years, as several States indicated that either new installations and replacement plans are underway or planned for the near future.
- The MON tables will be developed for 3 focus areas**, Northern Africa area , South Caucasus area, Mid-Asia area** and should be published as part of the EUR eANP, Vol lll
- EUROCONTROL CNS programme manager will be contacted to discuss how to adress the States in the interface area of ANSISG , eg Moldova, Türkiye or Romania

Thank you!

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