

Key Considerations for Air-to-Ground-to-Air (AGA) Broadband Solutions

TCCA Critical Update Webinar

23 February 2022

View the webinar recording [here](#).

This document sets out the questions and answers from the webinar.

Q. What about Device-to-Device links between air vehicles or between ground and air vehicles?

D2D isn't possible with 4G as no terminal chipsets have been designed for it (too small ecosystem). In 5G, D2D can be reconsidered as much work is on-going in developing the sidelink channel.

Q. Could beamforming also be used from the aircraft side (UE)?

Yes in theory, but from practical perspective I would say no. Complex antennas outside on the aircraft allowing to freely adjust in any direction.

Q. How many sites are now active in ESN AGA?

Currently a few sites are on air in live environment where the pilot phase is carried out.

Q. In one slide you discussed mm-wave and beamforming, what implications on coverage will mm-wave have? What is the expectation in an AGA-network?

Of course the use of mm-wave will improve the data speeds, but it will also impact the cell size, meaning smaller cells. In details mm-wave has not yet been studied from Ericsson side for the AGA use cases, it's something we need to come back to at a later stage.

Q. Did you use polarization diversity on the antenna panels?

EAN and ESN: antennas characteristics cannot be disclosed.

Q. Have you conducted studies on interference-limited use cases i.e. cases where the distance and/or bandwidth is limited by interference from adjacent cells?

Interference impact is the same as on every terrestrial LTE network. It is taken into account during RF network planning.

Q. Have you considered using HPUE to extend the coverage?

EAN and ESN: UE power cannot be disclosed.

Q. In ESN, is the aircraft height measurement used by the network for handover decision between EE air and EE ground cells (at around 150 m over ground)?

EAN and ESN: cannot be disclosed.

Q. In case a nation has only very limited number of airborne vehicles - say 20 - and no dedicated spectrum, what would be the optimal approach to provide 4G/5G broadband service utilising MNO RAN?

Not an easy question as our webinar explains why you shouldn't reuse the terrestrial frequencies for the AGA network. The very limited number of aircraft means that capacity will not be a key dimensioning factor, however the coverage is still key dimensioning factor. If no frequency from the MNO RAN can be dedicated to AGA means that an overlay network with very large cells isn't possible. Maybe it's worth making a network design simulation by using very high antennas with the lowest frequency from the MNO and make simulations with different vertical antenna patterns. However, it will be difficult to optimise the coverage for both ground and air networks with the same antennas.

Q. Do you foresee to use active antennas on board the aircraft or helicopters for AGA purposes (higher EIRP/narrower beams, reduced interference...)?

Aircrafts do not like to install active elements on it for maintenance purposes, and benefit of active antennas would be very minimal anyway.

Q. Does it have the same power consumption as terrestrial?

EAN and ESN: Yes, as the same base stations are used for both AGA and ground networks

Q. How do we resolve the issue of coverage holes in the air?

Accurate network planning with careful estimation of the cell edge patterns, many "measurements flights" where measurements reports are collected. Processing of all the data and then finetuning of relevant network parameters. This is an iterative process until we reach the targeted KPIs.