

9/27/2022

By Email to:

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Re: Input on 3GPP SA2#153E , AI#9.5 3GPP TR 23.700-58
3GPP RAN2#119-bis-e, AI#8.8.4

Dear Colleagues:

Background

MITRE Engenuity Open Generation 5G Consortium understands that 3GPP SA2 has been studying how PC5 / side link could be used to support Detect and Avoid (DAA) and broadcast Remote ID, with key issues and solutions being documented in 3GPP TR23.700-58. Open Generation would like to inform 3GPP SA2 that it has performed some initial experiments in the field of DAA for UAs using 3GPP technology. As part of these experiments Open Generation has taken off-the-shelf C-V2X commercial implementations and performed a test to see how C-V2X could be used as a DAA solution. The experiments were designed to be “proof of concept” to see how PC5 / side link functionally perform for UA DAA operations. Initial tests consisted of flying 2 UASs and gathering KPIs to see if C-V2X should be investigated further in more complex scenarios / use cases and performing actions based on UA flight characteristics.

Recommendation

Open Generation would like to report that the PC5 / side link using a pseudo implementation of J3161 dictionary set (i.e., messages) provides information to allow UASs to discover other UAS's in a way that would satisfy existing DAA requirements. Open Generation will continue to investigate PC5 / side link to further understand how PC5/ side link can assist the UAS ecosystem.

3GPP SA2 will inform Open Generation when a decision in 3GPP SA2 has been made regarding what solutions have been recommended to 3GPP SA plenary to continue into the normative phase and if there are any experiments or KPIs that 3GPP would find beneficial in scoping 3GPPs work.

Sincerely,

Ajit Kahaduwe

General Manager MITRE Engenuity Open Generation 5G Consortium

Responses should be sent to:

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 Principal, 5G standards

Appendix

Background

MITRE Engenuity Open Generation 5G consortium performed an experiment in the following geographical (see Figure 1& Table 1).

County	Lat / log of Operational Center Point	Operational Area Description	Altitude
Middlesex	42- 30- 10.74 N 71- 14- 4.86 W	MITRE Bedford Ballfield covers an area of 0.034 Square Miles as seen in the figure below.	113' MSL

Table 1 – Experimental area location



Figure 1 – Map of experimental area

The aim of the experiment was:

- a) Determine if a Ground Control Station (GCS) could accurately track a drone (UAS).
- b) Determine the maximum distance operating that the GCS could receive messages from the UAS.

For the experiments a ground control station (GCS) was on the ground (Figure 2), and two drone (UA) (Figure 3) were flown.



Figure 2 GCS housing



Figure 3 – One of 2 UASs with C-V2X modem

Both UA and GCS were equipped with commercial C-V2X products working in the 5.87 to 5.95 GHz band under an experimental license. Before performing the experiments, a spectrum analyzer was used to determine if anyone else was operating in that band (Figure 4).



Figure 4 – Spectrum analyzer before experiments

The band was found to be clear, and the spectrum analyzer was also used to check the band again when the experiment was being performed (Figure 5).

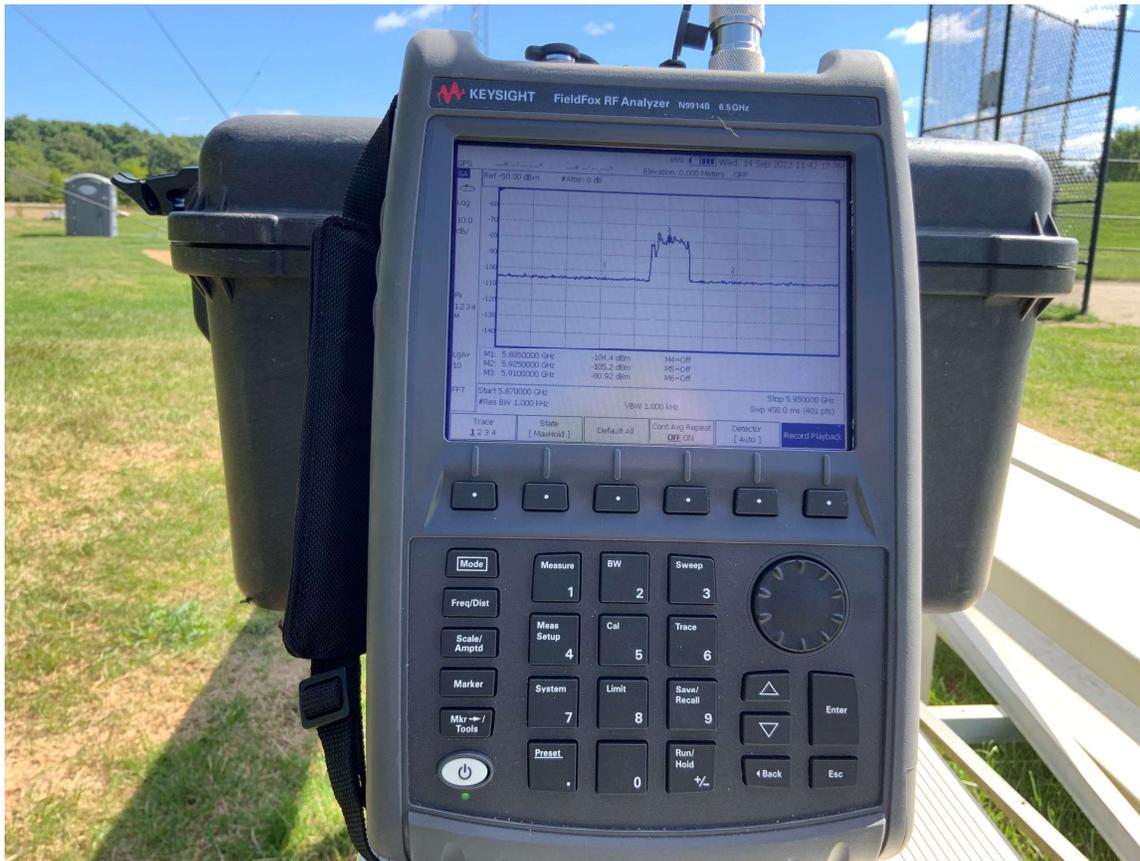


Figure 5 – Spectrum analyzer during experiments

Pseudo SAE J3161 Basic Safety Messages were broadcast from both the GCS and UA's and logs (transmit and receive) were collected on all devices.

c) Results

UA 1

The following Figure 6 shows the flight path and altitude of UA 1 broadcast.

GCS

The following Figure 8 shows the data received by the GCS.



Figure 8 - Flight path and altitude UA1 & UA 2 received at GCS

It can be clearly seen that the GCS receives accurate data as broadcast from UA 1 and UA 2 every 100 msec. The following 2 figures, 9, 10 show the distance from each UA to the GCS over time. The distance has been calculated by the GCS by comparing the latitude and longitude data received from the UA with the GCSs own the latitude and longitude.

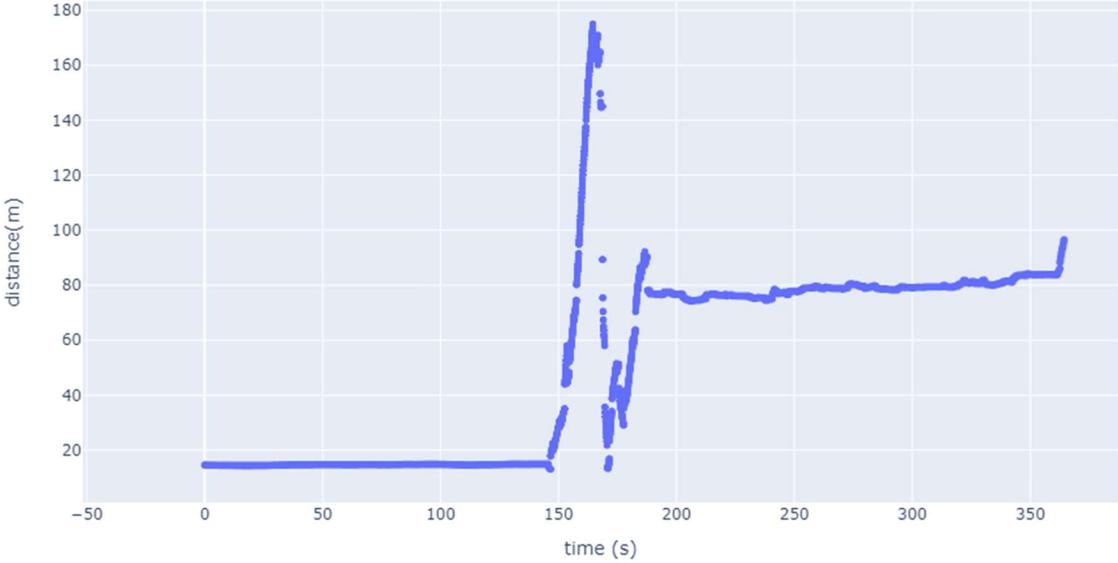


Figure 9 – Distance UA 1 from GCS over time

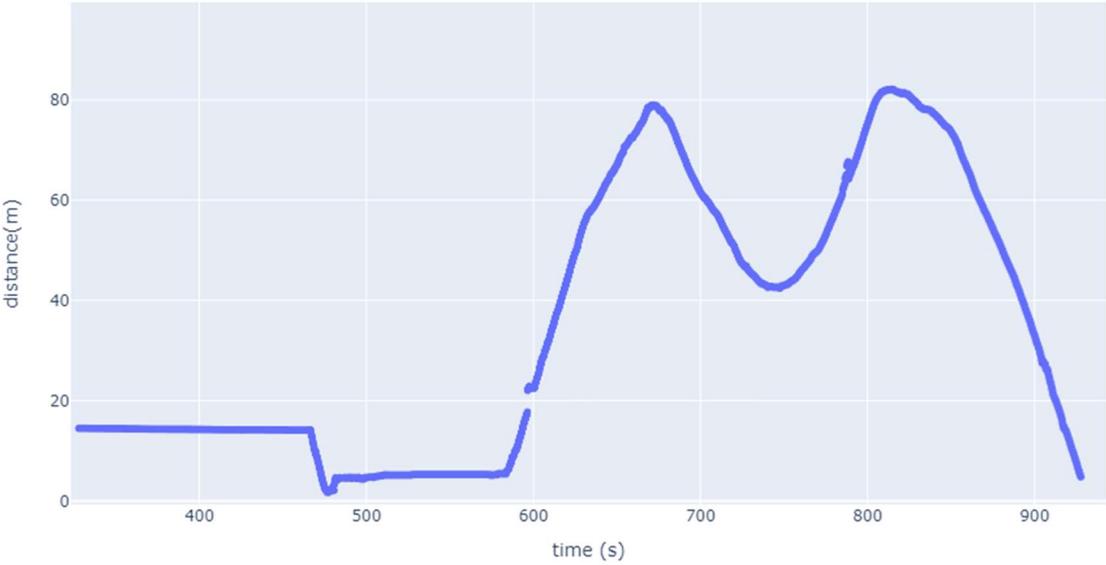


Figure 10 – Distance of UA 2 from GCS over time