**3GPP TSG-WG SA2 Meeting #153E e-meeting *S2-220XXXX***

**Elbonia, October 10 – 14, 2022 (revision of S2-220xxxx)**

**Source: Huawei, HiSilicon**

**Title: KI#3: Evaluation update**

**Document for: Approval**

**Agenda Item: 9.5**

**Work Item / Release: FS\_UAS\_Ph2 / Rel-18**

*Abstract: Update of KI#3 evaluation based on the update of solution#2.*

# 1. Introduction/Discussion

This paper proposes the update of KI#3 evaluation based on the update of Sol#2 (S2-2206753) in last meeting, and also update the evaluation of Sol#5.

The Sol#2 includes two Options for network-assisted DAA: network-assisted DAA with calculation functionality, and network-assisted DAA without calculation functionality.

The Sol#5 is only applicable to the UAVs with ProSe capability.

# 2. Text Proposal

It is proposed to capture the following changes vs. TR 23.700-58.

\* \* \* \* First change \* \* \* \*

## 7.2 Evaluation of solutions for Key Issue #3

The description of KI#3 assumes that direct UAV to UAV communication via PC5 based on the enhancements of the existing PC5 direct communication is the baseline mechanism for DAA solution. It also allows exploring network-assisted or ground-based solutions.

There are three solutions: Solution #2, Solution #5 and Solution #7, that address Key Issue #3.

Solution #2 focuses on the network-assisted DAA approach. Two Options are proposed, including network-assisted DAA with calculation functionality (Option A) and network-assisted DAA without calculation functionality (Option B). In Option A, the collision detection is performed at the USS based on the “relative location” or clearance calculation reported by the GMLC. The solution applies to UAV UEs that register to the network and are in coverage. The solution applies to USS-driven DAA scenarios where the USS triggers DAA deconfliction between pairs of UAVs based on knowledge of flight paths. A significant limitation of Option A is that it is only applicable to the UAVs controlled by the same USS and served by the same PLMN. It also requires new functionalities in the GMLC to support “relative location” calculation and report. In Option B, USS as AF/LCS client obtains UAV location using the legacy LCS procedure, and calculates the relative positioning result by itself. Option B applies to the UAV UEs belonging to the same PLMN or different PLMNs.

Solution #7 doesn’t address how collision is detected or deconflicted and focuses more on how to enable UAV controllers to follow the “local DAA policies” to avoid collisions. It introduces a new ground entity AAM which scans and establishes communication with the UAVs within a local area and passes the local DAA policies through the UAVs to its controllers. The solution only applies to specific scenarios where local DAA policies and ground AAMs are available. It is not clear how local DAA policies can effectively enable the UAVs/UAV-Cs to avoid collisions. The solution assumes local DAA policies are implemented by the UAV-C, and not the UAV. In scenarios of high automation where a UAV-C may control a large number of UAVs, it is FFS whether it is feasible to implement such policies in the UAV-C and not the UAV. The AAM requires a level of thrust and authorization to be able to retrieve NRID information from the UTM.

Solution #5 covers the baseline mechanism of using direct UAV to UAV communication for DAA. It reuses the existing V2X framework with some adaptations for DAA. The detection and deconflicting of collisions are fully based on direct communication between UAVs over PC5. The solution does not require the involvement of any UTM/USS functionality or knowledge of UAV flight plans. The USS is optionally informed of the collision situation and otherwise doesn’t play a role in DAA. The solution re-uses the PC5-based security mechanisms defined in 3GPP, and can use an application-layer security solution to be defined outside of 3GPP (as in the case of C-V2X). The solution applies to both in-coverage UAV UEs and out-of-coverage UAV UEs, and whether the solution applies to UAV UEs served by different PLMNs and with subscriptions to different PLMNs depends on the 5G ProSe specification. It applies to most common DAA scenarios and doesn’t have the limitations listed for the other solutions. This solution is only applicable to the UAVs with ProSe capability.

Editor’s Note: Solution #5 may have the risk of a high potential amount of data that may need to be transferred, since in case of large number of UAVs in an area the solution needs to broadcast of a big amount of data.

Editor’s Note: the impact on RAN of the potential large amount of data transfer needs to be evaluated.

\* \* \* \* End of changes \* \* \* \*