**3GPP TSG-SA WG1 Meeting #94e S1-211186r1**

**Electronic Meeting, 10th -20th May** *(revision of S1-20xxxx)*

Title: New Use case: Mobile Vehicular Relays using Non-terrestrial and terrestrial access simultaneously

Agenda Item: 7.14.1

Source: CATT

Contact: Ming Ai, aiming@catt.cn

*Abstract: This document proposes to a new use case to be inludced into the FS\_VMR TR 22.839.*

---All New Text----

## 5.X Mobile Vehicular Relays using Non-terrestrial and terrestrial access simultaneously

### 5.X.1 Description

In section 5.16, use case for Non-terrestrial coverage for Mobile Vehicular Relays has been specified.

In actual 5G deployment, some areas could be covered by both non-terrestrial coverage and terrestrial coverage.

It could be good to support of mobile vehicular relays using non-terrestrial access and terrestrial access simultaneously to connect to 5GC.

### 5.X.2 Pre-conditions

The following are assumed to be available for this use case:

- 5G non-terrestrial access is provided in an area A by a non-terrestrial platform (e.g. a LEO, MEO satellite) of one PLMN named O;

- 5G terrestrial access is provided in an area B by a terrestrial (fixed) base station of same PLMN O;

- Area A and area B are largely overlapped;

- One vehicle named X equipped with 5G mobile BS relays, is able to using access from a non-terrestrial platform and a terrestrial access at same time;

- The vehicle relays provide 5G access to UEs inside the vehicle and UEs nearby the vehicle (e.g. those UEs could be normal smartphones, without satellite capabilities.)

### 5.X.3 Service Flows

The vehicle X equipped with 5G mobile BS relay locates within area A, it detects the access could be used to 5GC. Then it decides to connect via terrestrial access to PLMN O. Once successes, it then provide the 5G access to UEs inside the vehicle.

Due to some reasons, e.g. UE amounts accesses increase, huge demand of bandwidth, the vehicle X find that total bandwidth of current relay link could not meet above demands, and then vehicle X decides to use the non-terrestrial access as relay link.

The vehicle X then detect whether there is non-terrestrial access coverage. If yes, the vehicle X equipped with 5G mobile BS relay connect to the PLMN O. If it is authorised to provide 5G access to UEs, then more UEs and more bandwidths requirements could be meet. That is, more and more UE could access the network via this vehicle X equipped with 5G mobile BS.

The vehicle X equipped with 5G mobile BS monitors the usage of the relay link, and once the service demand decrease, it then decides to dis-connect one relay link, e.g. it dis-connect the terrestrial access link.

The vehicle X also monitors the radio coverage. For example, if there is no terrestrial access available, or the radio conditions of terrestrial access deteriorates, the vehicle X has no choice but to dis-connect the terrestrial access link



Figure 5.x.1: Vehicle Relays using non-terrestrial access and terrestrial access simultaneously

### 5.x.4 Post-conditions

The vehicle X equipped with 5G mobile BS relays using both 5G terrestrial access and non-terrestrial access connect to 5GC, and provide the 5G access to UEs inside the vehicle and UEs nearby the vehicle (e.g. those UEs could be normal smartphones, without satellite capabilities).

### 5.x.5 Existing features partly or fully covering the use case functionality

FFS.

### 5.x.6 Potential New Requirements needed to support the use case

[PR5.x.6-1] The 5G System shall be support mobile base station relays capable of both NR satellite access and NR terrestrial access and able to use either relay link (terrestrial or satellite, not simultaneously) to connect to 5GC.

[PR5.x.6-2] The 5G System shall support mobile base station relays capable of both NR satellite access and NR terrestrial access and able to use both relay links simultaneously to connect to 5GC.

NOTE : such relays, if required, can use both access links to increase backhaul bandwidth and capacity; each access link may be added or removed to adapt to traffic demand.

[PR5.x.6-5] The 5G System shall be able to support mechanisms for a mobile base station relay, capable of both NR satellite access and NR terrestrial access simultaneously, to balance traffic among both access links.

Note 1: The simultaneous satellite and terrestrial access links (from the relay) are assumed to carry traffic pertaining to different UEs.

-----End Of Changes----