Exhibit E

APPENDIX A: LTE STANDARDS

1. Each of the Accused Products complies with LTE. *See* Appx. E: Accused Products, Sections 1 and 2 ("Operation of LTE in Ford's Vehicles" and "Use of LTE Carrier Networks").

I. LTE NETWORK ARCHITECTURE

2. The LTE network architecture comprises two primary components: the core network and the access network. The core network, also referred to as the Evolved Packet Core ("EPC"), serves as the backbone, handling tasks like data routing, mobility management, and connection to external networks. The access network, also referred to as the Evolved – UMTS RAN ("E-UTRAN"), constitutes the interface between user equipment ("UE") and the core network.

3. The evolved Node B ("eNodeB") is an element of the access network, which serves as the base station in LTE, responsible for communicating directly with UEs. There are multiple eNodeBs in an LTE network, each responsible for providing network access for UEs located in a certain geographic region. The eNodeBs are inter-connected with each other by means of the X2 interface, and connected to the core network by means of the S1 interface.

> ### 4 Overall architecture
>
> The E-UTRAN consists of eNBs, providing the E-UTRA user plane (PDCP/RLC/MAC/PHY) and control plane (RRC) protocol terminations towards the UE. The eNBs are interconnected with each other by means of the X2 interface. The eNBs are also connected by means of the S1 interface to the EPC (Evolved Packet Core), more specifically to the MME (Mobility Management Entity) by means of the S1-MME and to the Serving Gateway (S-GW) by means of the S1-U. The S1 interface supports a many-to-many relation between MMEs / Serving Gateways and eNBs.
>
> The E-UTRAN architecture is illustrated in Figure 4 below.

The random access procedure is performed for the following five events:

- Initial access from RRC_IDLE;
- RRC Connection Re-establishment procedure;
- Handover;
- DL data arrival during RRC_CONNECTED requiring random access procedure;
  - E.g. when UL synchronisation status is "non-synchronised";
- UL data arrival during RRC_CONNECTED requiring random access procedure;
  - E.g. when UL synchronisation status is "non-synchronised" or there are no PUCCH resources for SR available.

Furthermore, the random access procedure takes two distinct forms:

- Contention based (applicable to all five events);
- Non-contention based (applicable to only handover and DL data arrival).

Normal DL/UL transmission can take place after the random access procedure.

Source: 3GPP TS 36.300 V8.12.0 at 52.

1. __Random Access Preamble__

20. In both contention based and non-contention based procedures, the UE transmits a random access preamble selected from 64 available preambles that are associated with the eNodeB. Those preambles are generated from Zadoff-Chu sequences, which in turn are generated from a root Zadoff-Chu sequence broadcasted by the eNodeB. The root Zadoff-Chu sequence broadcasted is among one of 838 possible Zadoff-Chu sequences.

5.7.2 Preamble sequence generation

The random access preambles are generated from Zadoff-Chu sequences with zero correlation zone, generated from one or several root Zadoff-Chu sequences. The network configures the set of preamble sequences the UE is allowed to use.

There are 64 preambles available in each cell. The set of 64 preamble sequences in a cell is found by including first, in the order of increasing cyclic shift, all the available cyclic shifts of a root Zadoff-Chu sequence with the logical index RACH_ROOT_SEQUENCE, where RACH_ROOT_SEQUENCE is broadcasted as part of the System Information. Additional preamble sequences, in case 64 preambles cannot be generated from a single root Zadoff-Chu sequence, are obtained from the root sequences with the consecutive logical indexes until all the 64 sequences are found. The logical root sequence order is cyclic: the logical index 0 is consecutive to 837. The relation between a logical root sequence index and physical root sequence index u is given by Tables 5.7.2-4 and 5.7.2-5 for preamble formats 0 – 3 and 4, respectively.

The u^{th} root Zadoff-Chu sequence is defined by

$$x_u(n) = e^{-j\frac{\pi un(n+1)}{N_{\mathrm{ZC}}}}, \quad 0 \le n \le N_{\mathrm{ZC}} - 1$$

where the length N_{ZC} of the Zadoff-Chu sequence is given by Table 5.7.2-1. From the u^{th} root Zadoff-Chu sequence, random access preambles with zero correlation zones of length $N_{\mathrm{CS}} - 1$ are defined by cyclic shifts according to

$$x_{u,v}(n) = x_u((n + C_v) \bmod N_{\mathrm{ZC}})$$

where the cyclic shift is given by

$$C_v = \begin{cases} vN_{\mathrm{CS}} & v = 0,1,\ldots,\lfloor N_{\mathrm{ZC}}/N_{\mathrm{CS}} \rfloor - 1, N_{\mathrm{CS}} \neq 0 & \text{for unrestricted sets} \\ 0 & N_{\mathrm{CS}} = 0 & \text{for unrestricted sets} \\ d_{\mathrm{start}} \lfloor v/n_{\mathrm{shift}}^{\mathrm{RA}} \rfloor + (v \bmod n_{\mathrm{shift}}^{\mathrm{RA}}) N_{\mathrm{CS}} & v = 0,1,\ldots,n_{\mathrm{shift}}^{\mathrm{RA}} n_{\mathrm{group}}^{\mathrm{RA}} + \bar{n}_{\mathrm{shift}}^{\mathrm{RA}} - 1 & \text{for restricted sets} \end{cases}$$

and N_{CS} is given by Tables 5.7.2-2 and 5.7.2-3 for preamble formats 0-3 and 4, respectively. The parameter *High-speed-flag* provided by higher layers determines if unrestricted set or restricted set shall be used.

Source: 3GPP TS 36.211 V8.9.0 at 39.

4. A preamble sequence is selected from the preamble sequence set using the preamble index.

5. A single preamble is transmitted using the selected preamble sequence with transmission power P_{PRACH} on the indicated PRACH resource.

Source: 3GPP TS 36.213 V8.8.0 at 17.

6 Random access procedure

Prior to initiation of the non-synchronized physical random access procedure, Layer 1 shall receive the following information from the higher layers:

1. Random access channel parameters (PRACH configuration and frequency position)

2. Parameters for determining the root sequences and their cyclic shifts in the preamble sequence set for the cell (index to logical root sequence table, cyclic shift (N_{CS}), and set type (unrestricted or restricted set))

Source: 3GPP TS 36.213 V8.8.0 at 16.

21. The root Zadoff-Chu sequence is broadcasted by the eNodeB in SystemInformationBlockType2 ("SIB2") carried by the downlink channels. SIB2 includes the information element "radioResourceConfigCommon," which in turn includes "PRACH-Config,"

which includes the root sequence index “rootSequenceIndex.” The set of available Zadoff-Chu sequences associated with the eNodeB is generated based on the root sequence index.

5.2.1.1 General

System information is divided into the *MasterInformationBlock* (MIB) and a number of *SystemInformationBlocks* (SIBs). The MIB includes a limited number of most essential and most frequently transmitted parameters that are needed to acquire other information from the cell, and is transmitted on BCH. SIBs other than *SystemInformationBlockType1* are carried in *SystemInformation* (SI) messages and mapping of SIBs to SI messages is

flexibly configurable by *schedulingInfoList* included in *SystemInformationBlockType1*, with restrictions that: each SIB is contained only in a single SI message, only SIBs having the same scheduling requirement (periodicity) can be mapped to the same SI message, and *SystemInformationBlockType2* is always mapped to the SI message that corresponds to the first entry in the list of SI messages in *schedulingInfoList*. There may be multiple SI messages transmitted with the same periodicity. *SystemInformationBlockType1* and all SI messages are transmitted on DL-SCH.

Source: 3GPP TS 36.331 V8.9.0 at 20–21.

– *SystemInformationBlockType2*

The IE *SystemInformationBlockType2* contains radio resource configuration information that is common for all UEs.

NOTE: UE timers and constants related to functionality for which parameters are provided in another SIB are included in the corresponding SIB.

***SystemInformationBlockType2* information element**

```
-- ASN1START

SystemInformationBlockType2 ::=     SEQUENCE {
    ac-BarringInfo                      SEQUENCE {
        ac-BarringForEmergency              BOOLEAN,
        ac-BarringForMO-Signalling          AC-BarringConfig                OPTIONAL,   -- Need OP
        ac-BarringForMO-Data                AC-BarringConfig                OPTIONAL    -- Need OP
    }                                                                       OPTIONAL,   -- Need OP
    radioResourceConfigCommon           RadioResourceConfigCommonSIB,
    ue-TimersAndConstants               UE-TimersAndConstants,
    freqInfo                            SEQUENCE {
        ul-CarrierFreq                      ARFCN-ValueEUTRA                OPTIONAL,   -- Need OP
        ul-Bandwidth                        ENUMERATED {n6, n15, n25, n50, n75, n100}
                                                                            OPTIONAL,   -- Need OP
        additionalSpectrumEmission          AdditionalSpectrumEmission
    },
    mbsfn-SubframeConfigList            MBSFN-SubframeConfigList            OPTIONAL,   -- Need OR
    timeAlignmentTimerCommon            TimeAlignmentTimer,
    ...
}
```

Source: 3GPP TS 36.331 V8.9.0 at 103.

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