

*Amended*

*Exhibit 12*

# Exhibit 12

## Claim 15 of U.S. Patent No. 10,900,000

"15. An orthogonal frequency division multiple access (OFDMA)-compatible mobile station that uses subcarriers in a frequency domain and time slots in a time domain, the OFDMA-compatible mobile station comprising:"

<p>15. An orthogonal frequency division multiple access (OFDMA)-compatible mobile station that uses subcarriers in a frequency domain and time slots in a time domain, the OFDMA-compatible mobile station comprising:</p>	<p>GM's Accused Products include vehicles equipped with components and/or services to 4G/LTE networks and services, including services sold and provided by GM.</p> <p>To the extent the preamble is considered a limitation, GM's Accused Products do not infringe the patent. <i>E.g.</i>,</p> <p>For clarity, release 8 of the 36 series 3GPP specifications was frozen in December 2009 and was used as the basis for the first wave of LTE equipment. The LTE market includes releases from Release 8 through Release 17. Though for ease of review releases 8 through 17 are cited below, the same or functionally identical content exists in each corresponding release.</p> <p>The LTE specification (starting at Series 36, Release 8) supports user equipment and eNodeBs.</p>
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"15. An orthogonal frequency division multiple access (OFDMA)-compatible mobile station that uses subcarriers in a frequency domain and a time domain, the OFDMA-compatible mobile station comprising:"

## 4 Overall architecture

The E-UTRAN consists of eNBs, providing the E-UTRA user plane (PDCP/RLC/MAC/PHY) protocol terminations towards the UE. The eNBs are interconnected with each other by means of the X2 interface. eNBs are also connected by means of the S1 interface to the EPC (Evolved Packet Core), (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.

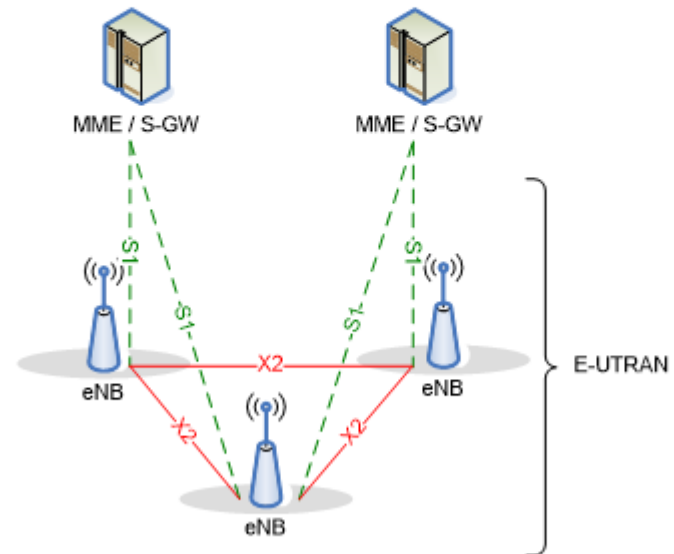


Figure 4-1: Overall Architecture

See e.g., 3GPP TS 36.300 V8.12.0 at pg. 15.

LTE uses OFDMA in the downlink transmission.

"15. An orthogonal frequency division multiple access (OFDMA)-compatible mobile station that uses subcarriers in a frequency domain, the OFDMA-compatible mobile station comprising:

	<p><b>5.1 Downlink Transmission Scheme</b></p> <p><b>5.1.1 Basic transmission scheme based on OFDM</b></p> <p>The downlink transmission scheme is based on conventional OFDM using a cyclic prefix. The sub-carrier spacing is <math>\Delta f = 15</math> kHz. 12 consecutive sub-carriers during one slot correspond to one downlink OFDM symbol in the frequency domain, the number of resource blocks, <math>N_{RB}</math>, can range from <math>N_{RB-min} = 6</math> to <math>N_{RB-max}</math>.</p> <p>In addition there is also a reduced sub-carrier spacing <math>\Delta f_{low} = 7.5</math> kHz, only for MBMS-dedicated channels.</p> <p>In the case of 15 kHz sub-carrier spacing there are two cyclic-prefix lengths, corresponding to two OFDM symbols per slot respectively.</p> <ul style="list-style-type: none"><li>- Normal cyclic prefix: <math>T_{CP} = 160 \times T_s</math> (OFDM symbol #0), <math>T_{CP} = 144 \times T_s</math> (OFDM symbol #1 to #11)</li><li>- Extended cyclic prefix: <math>T_{CP-e} = 512 \times T_s</math> (OFDM symbol #0 to OFDM symbol #5)</li></ul> <p>where <math>T_s = 1 / (2048 \times \Delta f)</math></p> <p>In case of 7.5 kHz sub-carrier spacing, there is only a single cyclic prefix length <math>T_{CP-low} = 160 \times T_s</math> for 12 OFDM symbols per slot.</p> <p>See e.g., 3GPP TS 36.300 V8.12.0 at pg. 25.</p> <p>Each frame structure has time slots. For example, Frame structure type 1 for FDD.</p> <p><b>4.1 Frame structure type 1</b></p> <p>Frame structure type 1 is applicable to both full duplex and half duplex FDD. Each radio frame has a length <math>T_f = 307200 \cdot T_s = 10</math> ms and consists of 20 slots of length <math>T_{slot} = 15360 \cdot T_s = 0.5</math> ms, where <math>T_s</math> is the sampling period. A subframe is defined as two consecutive slots where subframe <math>i</math> consists of slots <math>2i</math> and <math>2i+1</math>.</p>
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