

## 4G LTE Standard Essential Patent Candidates Data 2Q 2013

LTE Standard Essential Patent Candidates Data 2Q 2013 is a product of TechIPm, LLC ([www.techipm.com](http://www.techipm.com)) based on LTE patents research for US market leader among LTE UE (cellular phones, smart phones, PDAs, mobile PCs, etc.) and base station (eNB) product manufactures. LTE Essential Patent Candidates Data provides assignee, patent (publication) number, prosecution status for published applications, related 3GPP TS36 specifications, and the key technology components for an implementation of the products.

### Methodology

#### 1. Search for LTE related patents.

- Search the current USPTO database for published and issued patents as of 2Q 2013
- Search the ETSI database for LTE standard specifications
- 3GPP Release 10 technical specifications (LTE-Advanced) for LTE RAN (Radio Access Network):
- PHY: TS 36.211, 212, 213, 305 (Positioning Technology)
- L2/L3 Protocols: TS 36.321, 322, 323, 331, 304, 300
- \* LTE RAN products: LTE UE (cellular phones, smart phones, PDAs, mobile PCs, etc.) and base station (eNB) baseband modem and radio SW products

#### 2. Review the searched patents for essential patent candidates.

- Review the patents in portfolio
- Categorize the identified patents through the evaluation process by technology in the standard specifications  
Key technology components for an implementation of the LTE baseband modem: OFDM/OFDMA (Frame & Slot Structure, Modulation), SC-FDMA (PUSCH, PUCCH), Channel Estimation (UL RS, DL RS, CQI), Cell Search & Connection (PRACH, DL SS), MIMO (Transmit Diversity, Spatial Multiplexing), Resource Management (Resource Allocation, Scheduling), Coding (Convolution, Turbo), Power Control, HARQ, Carrier Aggregation, and Positioning Technology.  
Key technology components for an implementation of the LTE radio protocol: Random Access, HARQ, Channel Prioritization, Scheduling (Dynamic, SPS), Protocol Format (PDUs, SDUs), Radio Link Control (ARQ), PDCP Process (SRB, DRB, ROHC), Security (Ciphering, Integrity), System Information, Connection Control, Mobility (Handover, Inter-RAT, Measurements), and Carrier Aggregation.
- Evaluate the level of essentiality  
Essentiality Index (EI):  
E1 : Patent disclosure is weakly related to LTE technical specifications  
E2 : Patent disclosure is partially related to LTE technical specifications  
E3 : Patent disclosure is related to LTE technical specifications overall  
E4 : Patent disclosure is strongly related to LTE technical specifications  
\*To be a potential essential patent candidate, EI should be E3 or E4.  
\*E4 Example  
A patent has one or more claims that cover completely some part of the standard specification.

Claim	Specification
<p>1. An apparatus for transmitting <b>a random access signal</b> comprising:</p> <p>a CAZAC root sequence selector coupled to a CAZAC root sequence generator, wherein the CAZAC root sequence generator <b>generates at least one CAZAC root sequences</b>, and wherein the CAZAC root sequence selector selects a preamble root sequence from the at least one CAZAC root sequences.</p> <p>2. The apparatus of claim 1 wherein: the CAZAC root sequence generator is a prime-length <b>Zadoff-Chu sequence</b> generator.</p>	<p>3GPP TS 36.211 V8.9.0 (2009-12)</p> <p>5.7.2 Preamble sequence generation</p> <p><b>The random access preambles</b> are generated from <b>Zadoff-Chu sequences</b> with zero correlation zone, <b>generated from one or several root Zadoff-Chu sequences</b>. The network configures the set of preamble sequences the UE is allowed to use.</p>

## Deliverables

**MS excel file** for essential patent candidates (patent number, standard specification section number, technology category, and prosecution status for essentiality level E3 or E4).

\* The LTE IPR shareholders for essential patent candidates are Alcatel-Lucent, Andrew, Apple, BlackBerry, Ericsson, ETRI, Huawei, III, Innovative Sonic, Intel, InterDigital, ITRI, LG, Motorola, NEC, Nokia, NSN, NTT Docomo, Qualcomm, ROCKSTAR, Samsung, TI, and ZTE. Among 23 IPR shareholders, Samsung is the leader followed by LG, Qualcomm, Motorola, Nokia, InterDigital, ZTE, Innovative Sonic, Ericsson, and ETRI. Among the 283 standard essential patent candidates, 182 candidates are issued as of 2Q 2013: LG is the leader followed by Samsung, Motorola, Nokia, Qualcomm, InterDigital, TI, Innovative Sonic, ZTE, and Ericsson.

Sample:

	A	B	C	D	E	F
1	Assignee	Patent No.	TS36	Section	Tech Class	Prosecution Status
2	Ericsson				Cell Search & Connection	
3				213 5. Power Control	Power Control	
4				331 5.5 Measurement		
5				211 6.11 DL SS		Notice of Allowance Mailed
6				211 5.7 PRACH		Response to Non-Final
7				211 6.11 DL SS		
8				212 5.3 DTrCH & CI		
9	ETRI					Final Rejection Mailed
10	Freescale					
11	Huawei					
12	Innovative Sonic					
13	InterDigital					
14						
15						
16					MIMO	
17						
18					HARQ	
19					PDCP Process	
20					Connection Control	
21					Mobility	
22				331 5.4 Inter-RAT mobility		Non Final Action Mailed
23				331 5.3 Connection Ctl		
24				331		
25				331		

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