



LTE-Advanced Enhancements and IMT-Advanced Evaluation

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Centre of Excellence in Wireless Technology (CEWiT)

CEWiT: A Brief Introduction

- **Centre of Excellence in Wireless Technology (CEWiT)** is a public-private partnership between the Govt of India and telecom industry
- Focus on 4G technologies with strong mandate to participate in relevant standard forums
- CEWiT's activities span across several areas including
 - Research and standardisation
 - Providing inputs to telecom regulator and government depts
 - Creating awareness among key stakeholders on 4G standards
 - Working with the industry to build 4G prototypes and trial platforms
- CEWiT also drives the **Broadband Wireless Consortium of India**
 - BWCI is a strategic initiative to bring together all the stakeholders in the telecom sector
 - Members include Ericsson, Nokia, Samsung, Qualcomm, Intel, Alcatel-Lucent, COAI, Airtel, TTSL, Tech Mahindra, Wipro etc.

India Specific Requirements & Challenges

- More than 85% of the calls originate from fixed or nomadic users
- Small urban cells (~ 0.5 Km ISD) to large rural cells (~ 20 Km ISD)
- DSL penetration very low, broadband wireless needed for last-mile
- Very fast growing mobile user market
- Low ARPU v. volume of users

- Optimization needed on multiple fronts
 - From network specific challenges to operation models
 - Radio layer should be flexible for supporting different use cases
 - Radio should be capable of
 - Effective interference management in small cells
 - Support enough link budget for larger cells



CEWIT @ 3GPP

- Associate member of ETSI since 2007
- Introduced support for SMS in Indian languages by working with 3GPP CT1 and SA1 working groups (with COAI support)
- Regular participation at 3GPP RAN1 meetings since 2007
- Submitted Indian BWA requirements to RAN plenary in 2008
- Active in LTE-Advanced specification with technical contributions, particularly focussing on India-relevant solutions
 - MIMO
 - CoMP
 - Relays
 - Het-Nets
 - ...
- Plans underway for hosting a CT1 meeting in India (October 2011)



3GPP LTE Rel-8 to Rel-10

- LTE Rel-8 had some basic, but essential functionalities
 - Support of robust link adaptation
 - Efficient control channel performance
 - Efficient MIMO modes
 - 3GPP family of specifications inherently supported, 3GPP2 is one step away
- In Rel-9 time frame, some deployment scenarios and enhancements were (are continued to be) done
 - Enhanced MIMO modes for hotspot type deployments
 - Relays for coverage extension
 - Network positioning support
- Some of the relevant (India specific) enhancements which we desire happening in the Rel-10 and further timeframe
 - Cooperative precoding for efficient spectrum reuse



Vision for Rel-10 and beyond

- India specific challenges to be addressed by the specification
 - Relays for coverage extension and capacity enhancement
 - Cost effective means of relay implementation
 - Cooperative precoding / beamforming for effective spectrum utilization
 - Performance improvement of simple configurations
 - Performance characterization in severe interference limited and nomadic applications
 - Solutions for use cases identified for mass deployments

IMT-Advanced Evaluation

- CEWiT assisted TCoE-India consortium to evaluate the candidate technologies for IMT-Advanced
 - Joint exercise involving participants from the IITs and Industry
 - CEWiT's in-house LTE simulator used in the evaluation
 - Components evaluated involved spectral efficiency calculation, latency computation, spectrum aspects, etc.
 - The specification was tested under some strict evaluation conditions
 - Rel-8 was seen satisfying most of the ITU-Requirements
 - Good learning's from the evaluation, manpower trained and expertise
- As part of this exercise two new aspects were tested with the RIT
 - Open Area Rural model for testing a fixed wireless solution in large cells
 - A modified scheduler for testing a wireless DSL like use-case
- The expertise gained can be used during the roll-out of broadband wireless services in the country



CEWiT – Road Ahead

- CEWiT drives the technology demonstration under the umbrella of Broadband Wireless Technology of India
 - LTE Radio Access Test Bed
 - Collaboration between industry, R&D and Academic institutes – Sasken, L&T Infotech, Tata Elxsi, CEWiT, IIT Madras
 - eNodeB and UE developed including PHY and higher layers
 - The Test Bed will be useful to Vendors, Operators and Tech companies to demonstrate, pilot and conduct R&D
 - Converged network test bed
 - Objective to create a converged core network covering EPC and WiMAX Core and interoperation with existing access like 2G/3G, WiFi
 - Collaborative efforts from Industry, CEWiT and IITs
 - Test bed will be available for various stakeholders for R&D, demo & training, pre-IOT, and to workout solutions for Indian needs

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Thank You