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3GPP TSG RAN

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3GPP Summit

Standards Timeline for 5G

GIS MOTC Convention Center
Taipei, Taiwan, 24 November 2015



OUTLINE

- Role of TSG-RAN and related activities outside 3GPP
- Achievement of RAN
- On going activities: Rel-13 stories
- Future plan: Rel-14 and beyond ('5G' related activities)

Role of TSG-RAN and related activities outside 3GPP

RAN ToR

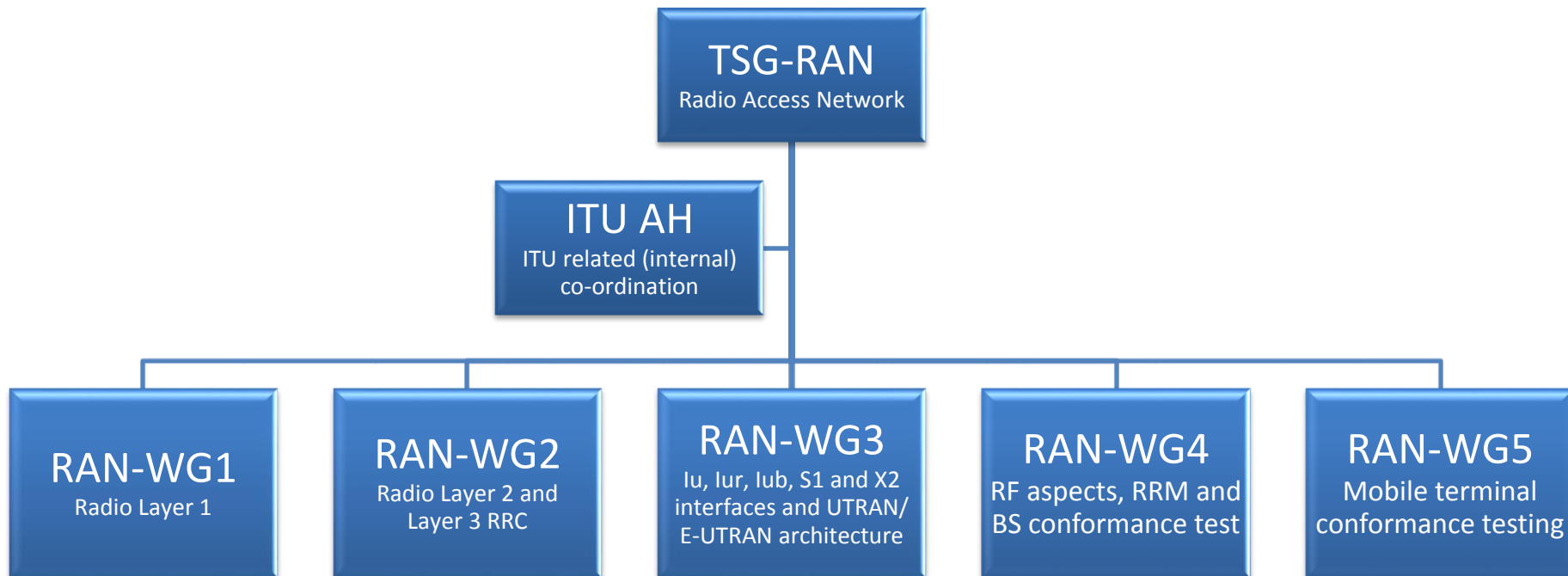
The TSG Radio Access Network (TSG-RAN) is responsible for the UTRAN and evolved UTRAN, including their internal structures and functions, of systems for evolved 3G and beyond.

Specifically it has a responsibility for:

Radio aspects, functions, requirements and interfaces of UTRAN and evolved UTRAN(FDD & TDD)

Management of work items placed under its responsibility.

RAN Working Groups Structure



Achievement of RAN

Releases of 3GPP standards

'99	'00	'01	'02	'03	'04	'05	'06	'07	'08	'09	'10	'11	'12	'13	'14	'15	'16
▼ Release 99: W-CDMA (UMTS)																	
		▼ Release 4: 1.28Mcps TDD															
			▼ Release 5: HSDPA (& IMS)														
						▼ Release 6: HSUPA , MBMS											
										▼ Release 7: HSPA+ (MIMO, Higher order modulation)							
												▼ Release 8: LTE (OFDMA)					
														▼ Release 9 LTE improvement, SON			
Release 10: LTE-Advanced (Carrier Aggregation, eMIMO, eICIC) →												▼					
										Release 11: CoMP, E-PDCCH →				▼			
														Release 12: FDD/TDD CA, D2D, eMTC →			
														Release 13 (Planned)→			

LTE-Advanced: Technical topics (up to Rel-12) [1/2]

- Carrier Aggregation:
 - Intra-band contiguous/Non-contiguous, Inter-band (2 to 3 carriers) [Rel-10 and beyond]
 - FDD/TDD aggregation [Rel-12]
 - Inter-band 4 carrier aggregation (80MHz BW max) [Rel-13].
- Enhanced MIMO [Rel-10]:
 - Single-User MIMO with 8x8 (DL) or 4x4 (UL)
 - Multi-User MIMO with 4x4 (DL) using CSI-RS

LTE-Advanced: Technical topics (up to Rel-12) [2/2]

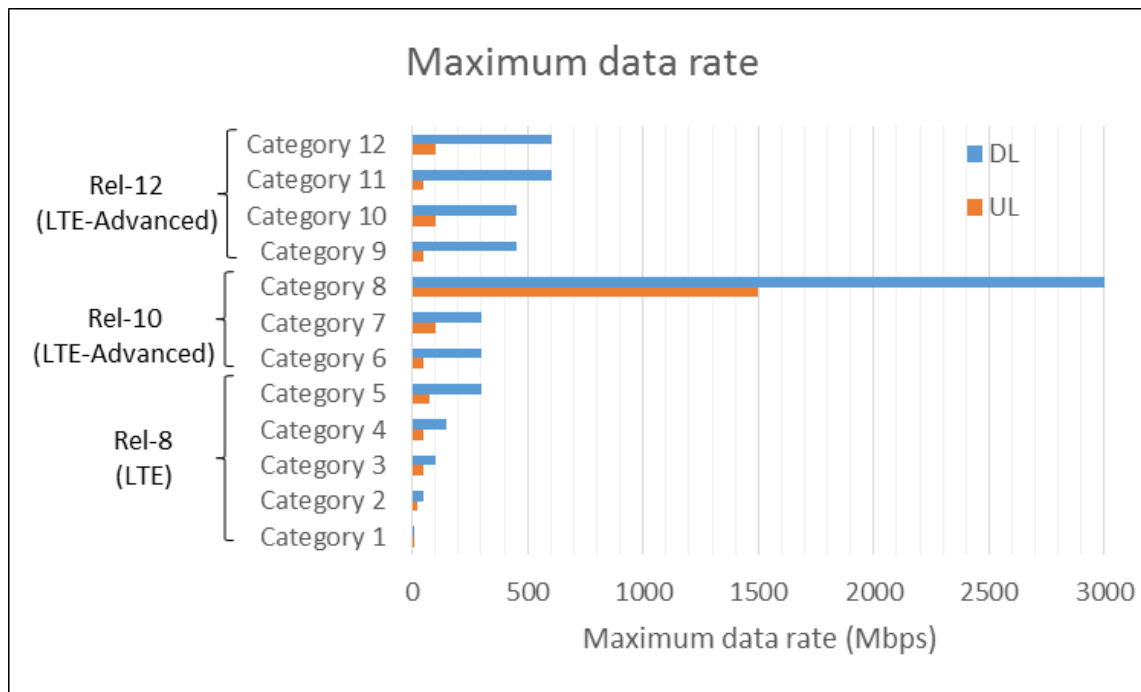
- Enhanced Inter-Cell Interference Coordination (eICIC) [Rel-10]:
 - Time domain coordination between (Macro and Small cell) eNBs using ABS, where only CRS is transmitted.
- Coordinated Multi-Point transmission (CoMP) [Rel-11]:
 - Minimizing co-channel interference by adopting Joint Processing (JP), Joint Transmission (JT) in DL and Joint Reception (JR) in UL.
- Small cell related enhancement: Dual connectivity [Rel-12]
 - Control plane linked to a macro cell together with offloading of user plane to small cells overlaid to the macro cell. Improving mobility under small cell deployment.

ABS: Almost Blank Subframe
CRS: Common Reference Signal

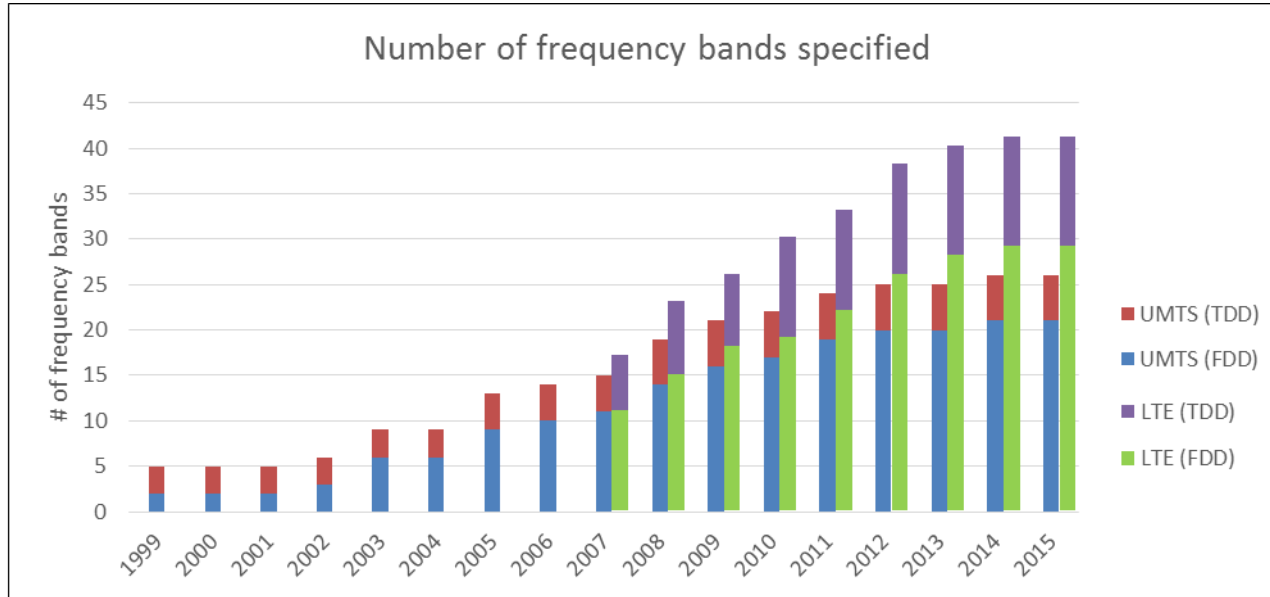
Maximum data rates specified

3GPP Release	Maximum data rate		Remarks
Rel-8 (LTE)	Downlink	300Mbps	Cat. 5 UE (with 20MHz BW, 64QAM with 4 layer MIMO)
	Uplink	75Mbps	Cat. 5 UE (with 20MHz BW, 64QAM)
Rel-10 (LTE-Advanced)	Downlink	3Gbps	Cat. 8 UE (with 100MHz BW, 64QAM with 8 layer MIMO)
	Uplink	1.5Gbps	Cat. 8 UE (with 100MHz BW, 64QAM with 4 layer MIMO)

Maximum data rates specified (per 3GPP release)

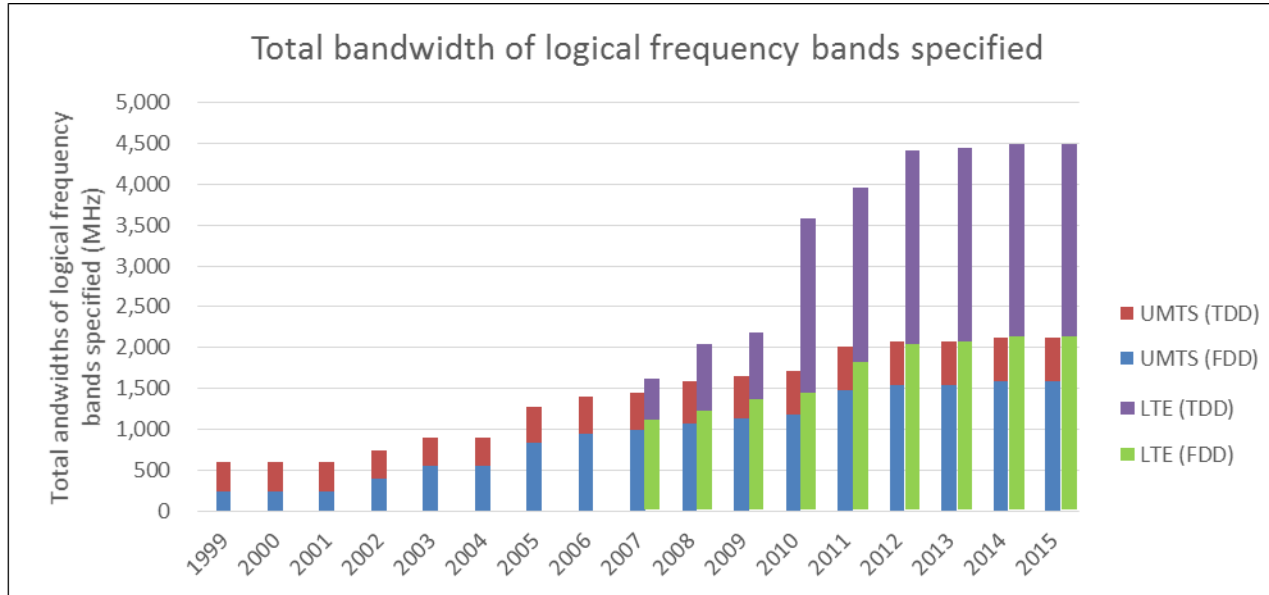


Number of frequency bands specified



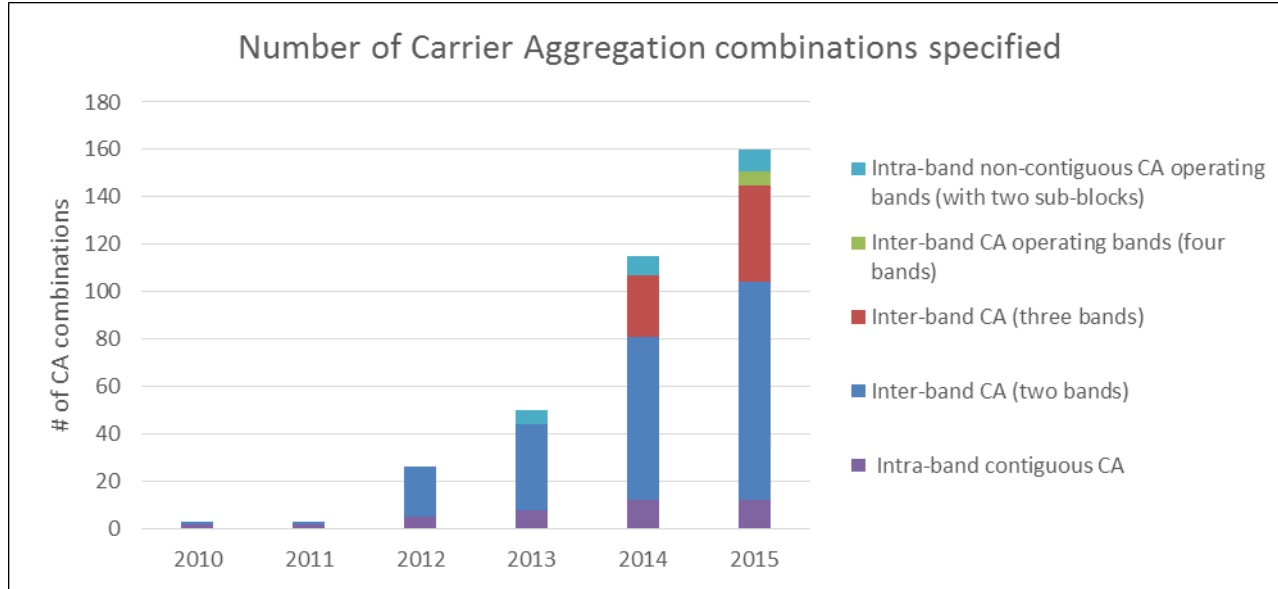
N.B.: 3GPP frequency bands can be implement Release independent manner. as per TS25.307 or TS36.307.

Total bandwidth of frequency bands specified



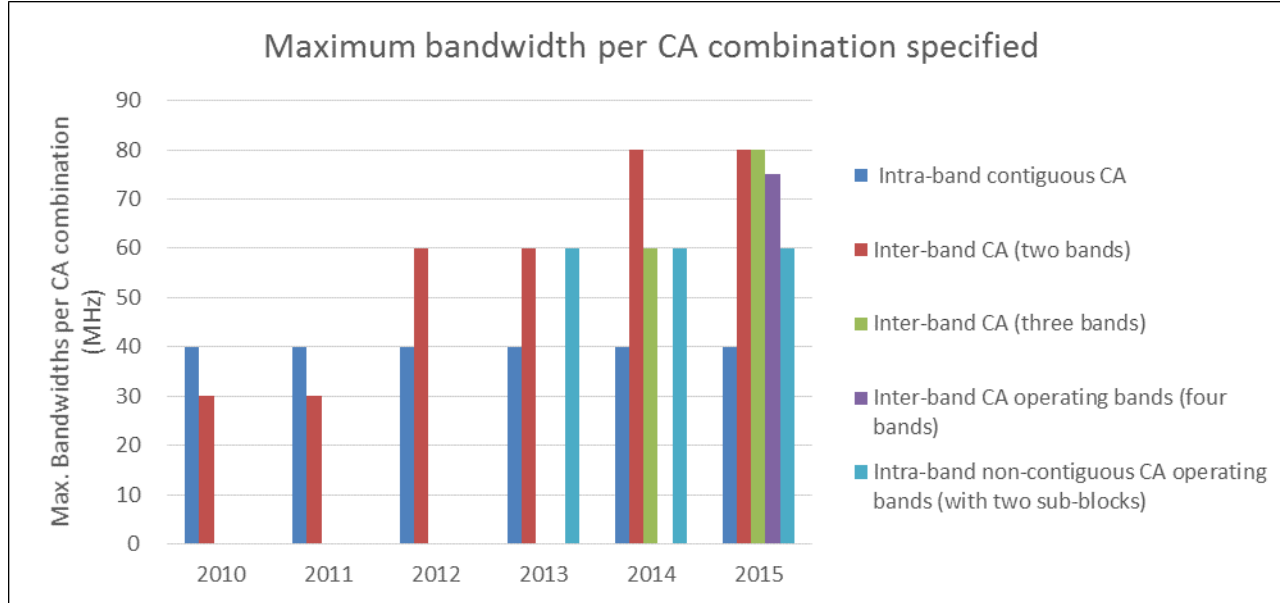
N.B.: Duplicated frequency spectrum in different frequency bands are summed up.
3GPP frequency bands can be implement Release independent manner as per
TS25.307 or TS36.307.

Number of Carrier Aggregation combinations specified



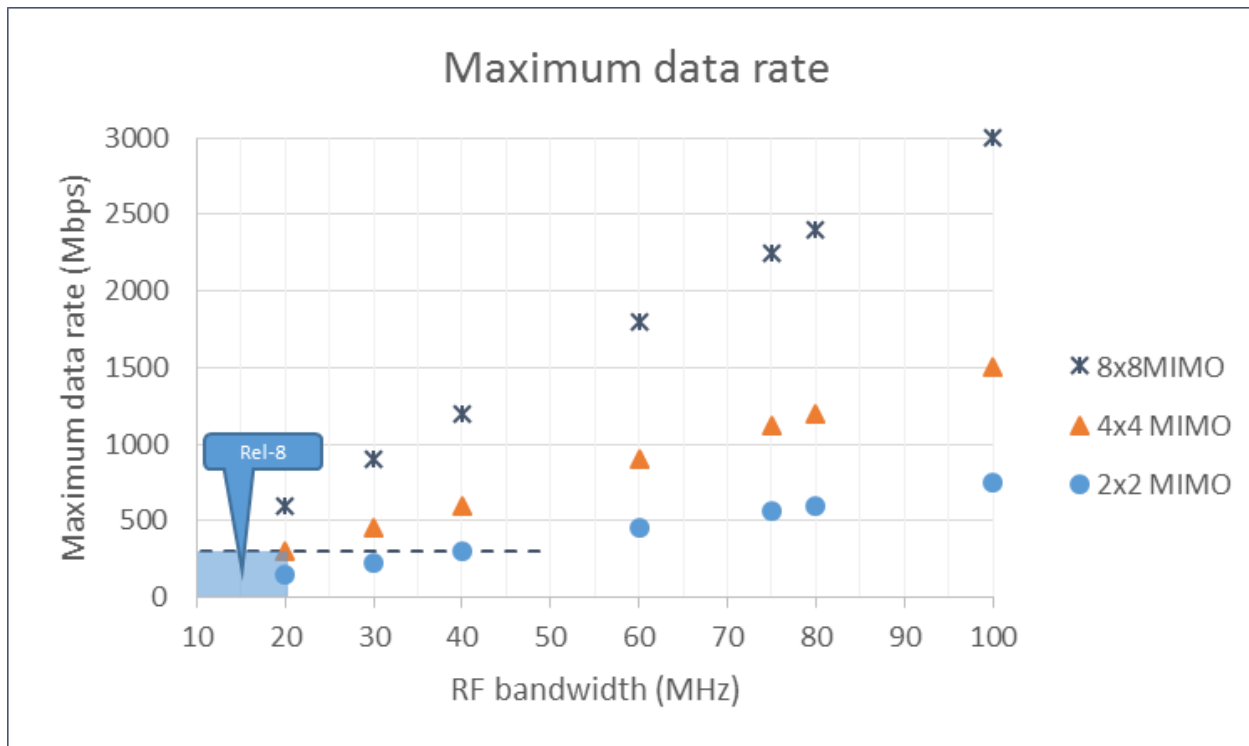
N.B.: Carrier Aggregations can be implement Release independent manner as per TS36.307.

Maximum bandwidth per CA combination specified



N.B.: Carrier Aggregations can be implement Release independent manner as per TS36.307.

Peak data rates in FDD (DL)



On going activities: Rel-13 works

Milestones

Release	Stage 1 (Service description)	Stage 2 (Architecture of functional elements)	Stage 3 (Functions and protocols in physical elements)	Release freeze (incl. ASN.1)
Rel-12	Mar. 2013	Dec. 2013	Sep. 2014	Mar. 2015
Rel-13	Sep. 2014	June 2015	Dec. 2015	Mar. 2016
Rel-14	[Mar. 2016]	t.b.d.	t.b.d.	t.b.d.

Rel-13 works

- Expanding Carrier Aggregation:
 - Four component carrier aggregation (80MHz BW max) has already been available (as of Nov. 2015).
 - Aggregating up to 32 component carriers (640MHz BW max).
- Narrowband IoT (Internet of Things)
 - Low cost devices (Cat. 0 UEs) for massive usage.
- Elevation Beamforming/Full-Dimension (FD) MIMO for LTE
 - Introducing 3-Dimension beamforming

Licensed Assisted Access

- Workshop on LAA was held in Aug. 2015. Contributions from neighboring industries, stake holders.
- Carrier Aggregation scheme aggregating unlicensed band for user plane high speed data and licensed band for primary cell controlling the link.
- Fair LTE and Wi-Fi coexistence using LBT (Listen Before Talk).
- Start with DL-only LAA operation, focusing on 5GHz spectrum.
- Targeting Rel-13 time frame (freezing in Mar. 2016).

Public Safety LTE

- Secure and robust and efficient/nationwide communications with flexible/excellent group communication, floor control/priority control, supporting direct communication amongst terminals.
- Set of features for Critical communications:
 - High power UE for PS-LTE (31dBm for Band 14 in US) [Rel-11]
 - Device to Device (D2D) communication (under eNB control) [Rel-12]
 - D2D enhancement for out-of-coverage terminals [Rel-13]
 - Proximity Services (ProSe) , FDD Half duplex operation [Rel-12] and its enhancement [Rel-13]
 - Group Communications (GCSE) [Rel-12] and its enhancement [Rel-13]
 - Isolated E-UTRAN Operation for Public Safety (IOPS) [Rel-13]
 - Mission Critical Push to Talk (MCPTT) [Rel-13] <SA-WG6 leads>

Future plan:
Rel-14 and beyond
(‘5G’ related activities)

RAN 5G Workshop [1/2]

Phoenix, AZ, USA, September 19, 2015

- Consensus on three high level use cases (in line with ITU-R IMT-2020 discussions) for ‘5G’, in order to support wide range of services foreseen. 3GPP SA-WG1 is working for some of these new services under ‘SMARTER’ WI.
 - Enhance Mobile Broadband
 - Massive Machine Type Communications
 - Ultra-reliable and Low Latency (mission critical) communications
- Necessity of a new and non-backward compatible radio access technology was recognized widely.

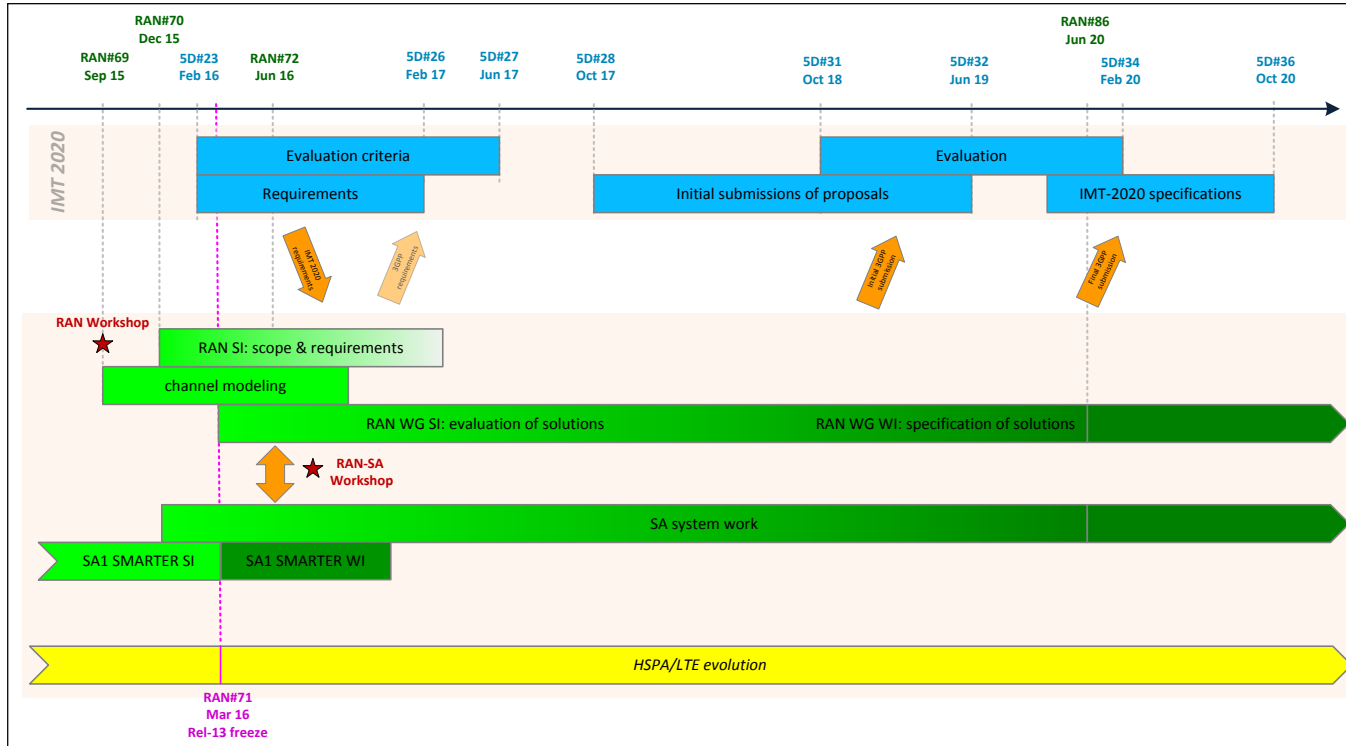
RAN 5G Workshop [2/2]

Phoenix, AZ, USA, September 19, 2015

- Work plan:
 - Phased approach (to be discussed further):
 - Phase 1: To be completed by H2 of 2018 (as a Rel-15 work) , Forward compatible to Phase 2.
 - Phase 2: To be completed by Dec. 2019 for IMT-2020 submission to ITU-R.
 - A study item to identify the requirements and scope to be started in Dec. Targeting completion in Mar. 2016. Succeeding WIs to be started afterwards.
 - RAN has started a Study Item on propagation channel modeling above 6GHz. To be completed by the end of 2015 and then RAN-WG1 to start a work to develop actual channel models (up to 100GHz).

Tentative 3GPP timeline for 5G

As of March, 2015



Ref: SP-150149

Thanks for your attention.