3GPP RAN work towards '5G'

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*RAN: Radio Access Network
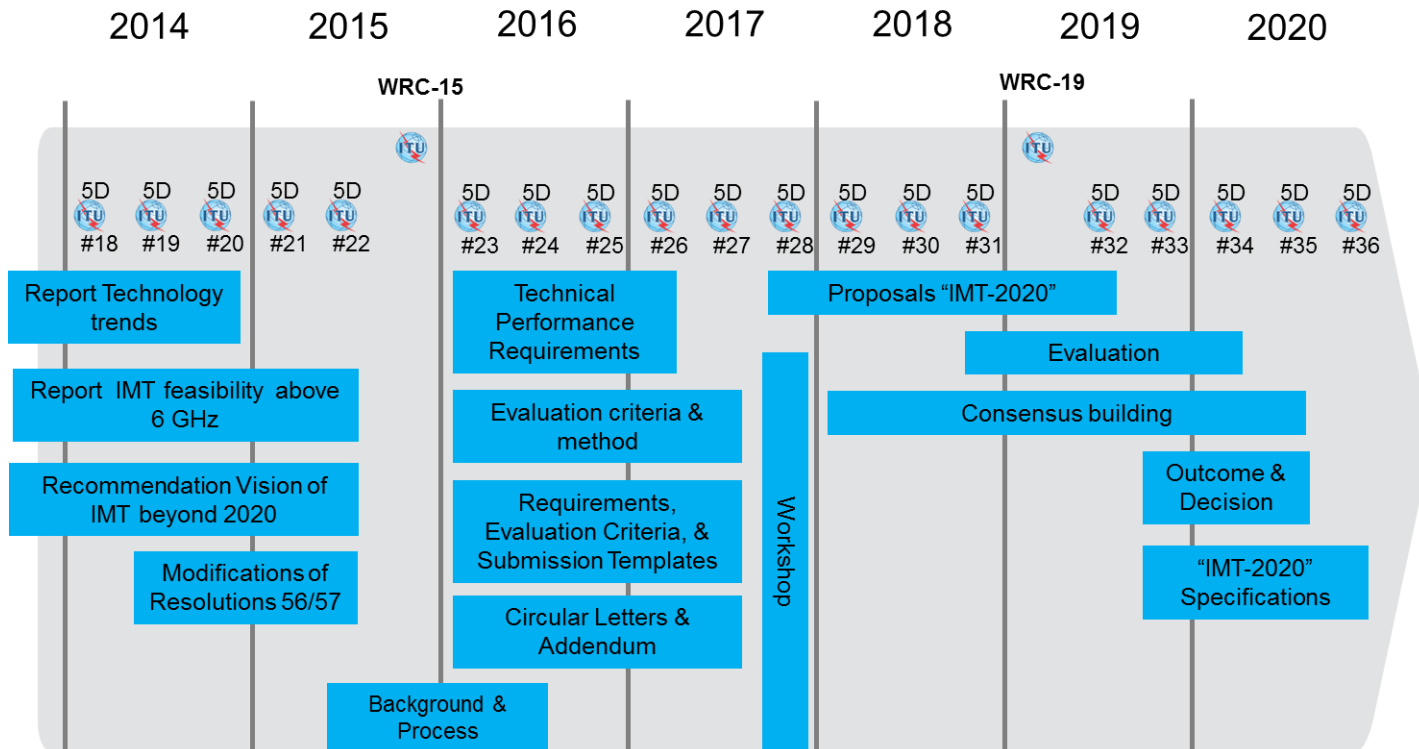
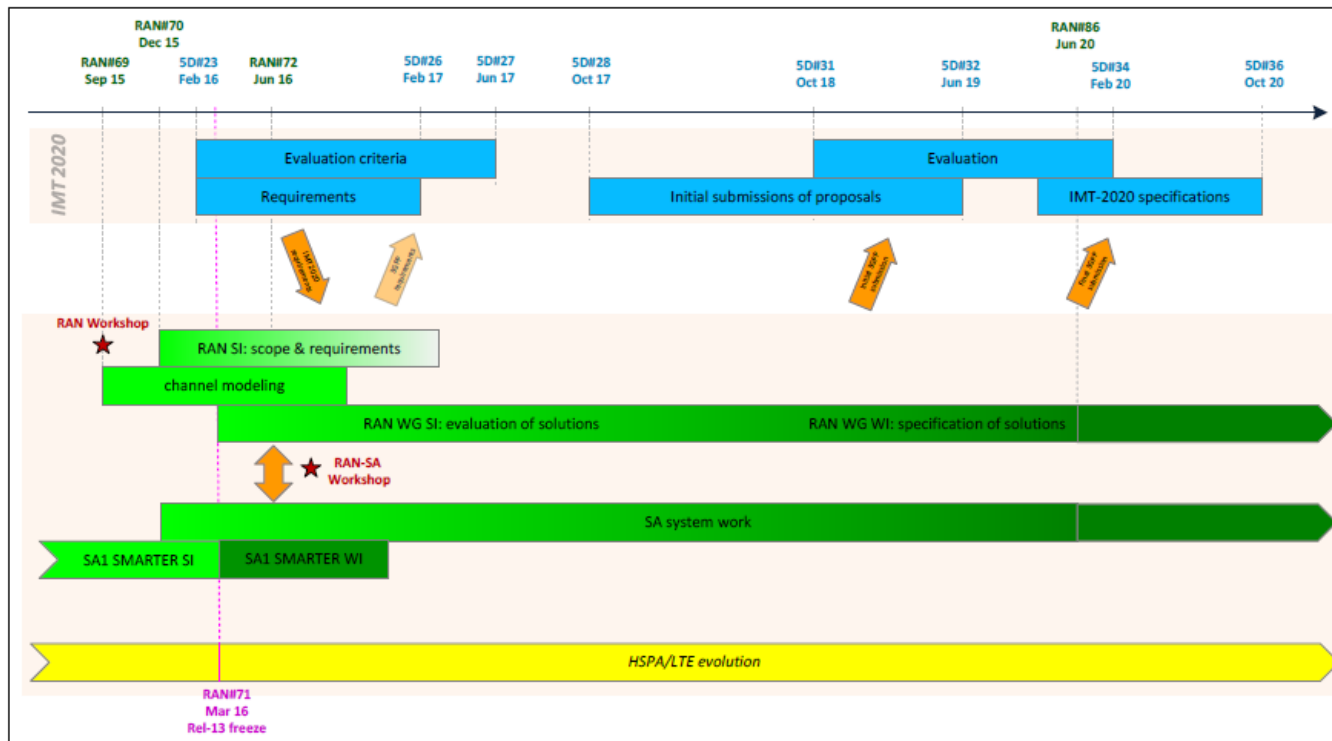# Contents

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Time plan of IMT 2020 or so called '5G'

Workplan for IMT-2020 (ITU-R)

3GPP timeline for 5G

Ref: 3GPP SP-150149 (Mar.2015)

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Timeline (Phasing approach)

- There will be **two phases** for the normative work
  - Phase 1 to be completed by Sep 2018/Rel-15 to address a more urgent subset of the commercial needs (to be agreed)
  - Phase 2 to be completed by Mar 2020/Rel-16 for the IMT 2020 submission and to address all identified usecases & requirements

- With the following, tentative, release timing

Jun-17   *Sep-18*   *Mar-20*

Rel-14	Rel-15	Rel-16

Note: dates above refer to official 3GPP release freeze (ANS.1 freeze)

- Key requirement: 'NR' ('New Radio of 5G') design should be **forward compatible** at its core so that features can be added in later releases in an optimal way

Outline of 'New Radio of 5G'

Outline of 5G/IMT-2020

- 🛜 3GPP submission to IMT 2020 (aka 5G) will include
  - "New Radio of 5G", aka NR
  - LTE / LTE-Advanced

- 🛜 Whether '5G' consists of a single or two RITs (for formal submissions), and how the evaluation process will be organized, are to be discussed in the future.
  - In case of two RITs, it may not be necessary that both RITs fulfill all IMT-2020 requirements.
  - The discussion will also depend on the criteria that will be defined by ITU-R WP5D.

- 🛜 NR shall eventually address all requirements and usecases identified in the RAN SI
  - NR forward compatibility will be key to phase-in the different features in different releases in an optimal way. The Technology SI shall study the best way to achieve that.

Note: NR is a temp term for the "New Radio of 5G"

Study on NR (New Radio of '5G')

- Study item on New Radio: (approved in RP-160671 at Mar. 2016)
  RAN WGs have started evaluations of technology solutions. To be completed by June 2017.
  - The study aims to develop an NR access technology to meet a broad range of use cases including
    a. Enhanced mobile broadband,
    b. Massive MTC,
    c. Critical MTC (Ultra reliable and low latency communications),
    d. Additional requirements defined during the RAN requirements study.
  - The new RAT will consider frequency ranges up to 100 GHz.
  - The new RAT shall be inherently forward compatible.
  - Initial work of the study item should allocate high priority on gaining a common understanding on what is required in terms of radio protocol structure and architecture.

On going studies on 'New Radio of 5G'

3GPP Technical Reports for 'New Radio (aka 5G, including LTE)'

Spec No.	Title	E.C.D
TR 38.913 (V.0.3.0)	Study on Scenarios and Requirements for Next Generation Access Technologies	June 2016
TR 38.900 (0.1.0)	Study on channel model for frequency spectrum above 6 GHz	June 2016
TR38.912	TR for Study on New Radio (NR) Access Technology	June 2017
TR38.802	TR for Study on New Radio Access Technology Physical Layer Aspects	June 2017
TR38.8xx	TR for Study on New Radio Access Technology Radio Interface Protocol Aspects	June 2017
TR 38.801	TR for Study on New Radio Access Technology: Radio Access Architecture and Interface	June 2017
TR38.8xx	TR for Study on New Radio Access Technology: RF and co-existence aspects	June 2017

As of Mar. 2016
TR: Technical Report, E.C.D.: Expected Completion Date
- 3GPP 38 series: Radio technology beyond LTE
- TR38.800 series are 3GPP internal Technical Reports

Requirements & scenarios

- Study on requirements and deployment scenarios for Next Generation Radio Access Technologies, RP-152257 (ECD: June 2016)
    - Identified the initial bulk of scenarios & KPIs, providing a good basis for the technical work to start in the WGs in Q2-16.
    - Few additional scenarios & KPIs will be discussed at next plenary
- Identify the typical deployment scenarios associated with attributes such as carrier frequency, inter-site distance, user density, maximum mobility speed, etc.
- Develop specific requirements for next generation access technologies for the identified deployment scenarios.

Key Performance Indicators in TR38.913 [V.0.3.0]

Sec.	Title	Sec.	Title
7.1	Peak data rate	7.11	UE battery life
7.2	Peak Spectral efficiency	7.12	UE energy efficiency
7.3	Bandwidth	7.13	Cell/Transmission Point/TRP spectral efficiency
7.4	Control plane latency	7.14	Area traffic capacity
7.5	User plane latency	7.15	User experienced data rate
7.6	Latency for infrequent small packets	7.16	5th percentile user spectrum efficiency
7.7	Mobility interruption time	7.17	Connection density
7.8	Inter-system mobility	7.18	Mobility
7.9	Reliability	7.19	Network energy efficiency
7.10	Coverage (Extreme Coverage)	-	-

As of Mar. 2016

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Channel modelling above 6 GHz

- Study on channel model for frequency spectrum above 6 GHz, RP-151606 (ECD: June 2016)

  RAN1 develops a channel model(s) for frequencies up to 100 GHz

  - Skeleton TR, R1-160587 (Skeleton report for the study)
  - Channel modeling scenarios, R1-161145
    - ✓ UMi (Urban micro cell of street canyon, open square)
    - ✓ UMa (Urban macro cell)
    - ✓ Indoor (office, shopping mall)

Channel modelling above 6 GHz (cont'd)

- Channel modelling requirements, R1-161142
  - Support frequency range up to 100 GHz. (the critical path of the study is 6 – 100 GHz)
  - Take care of mmW propagation aspects such as blocking and atmosphere attenuation.
  - The model should be consistent in space, time and frequency
  - Support large channel bandwidths (up to 10% of carrier frequency)
  - Mobile speed up to [500] km/h.
  - Support large antenna arrays
- Methodology, R1-161150 (working assumption)

  Based on the 3D channel model of TR36.873, additional aspect such as foliage, atmosphere and rain attenuations as a function of frequency etc. are being studied.

Inter TSG coordination

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RAN-SA coordination

- Close coordination between RAN and SA (System Architecture group) on Next Generation Architecture is needed.
    1. Radio requirements established by RAN
    2. Service/System requirements established by SA1/SA2 as study item called 'SMARTER'*

    (*Study on New Services and Markets Technology Enablers)

- By December 2016, RAN and SA to converge on:
    1) What are the goals / objectives of the Next Generation Architecture work?
    2) Timing for work: e.g. what scenarios and/or architecture(s) (if there are options) need to be developed when (by which release?)

- For instance one key decision that will have to be made by December is whether we need to support NR standalone operation in Rel-15 and, if so, for what scenarios

Thanks