

**Document for: Discussion**  
**Agenda Item: 13.2**

# **Discussion Paper on Unlicensed Spectrum Integration to IMT systems**

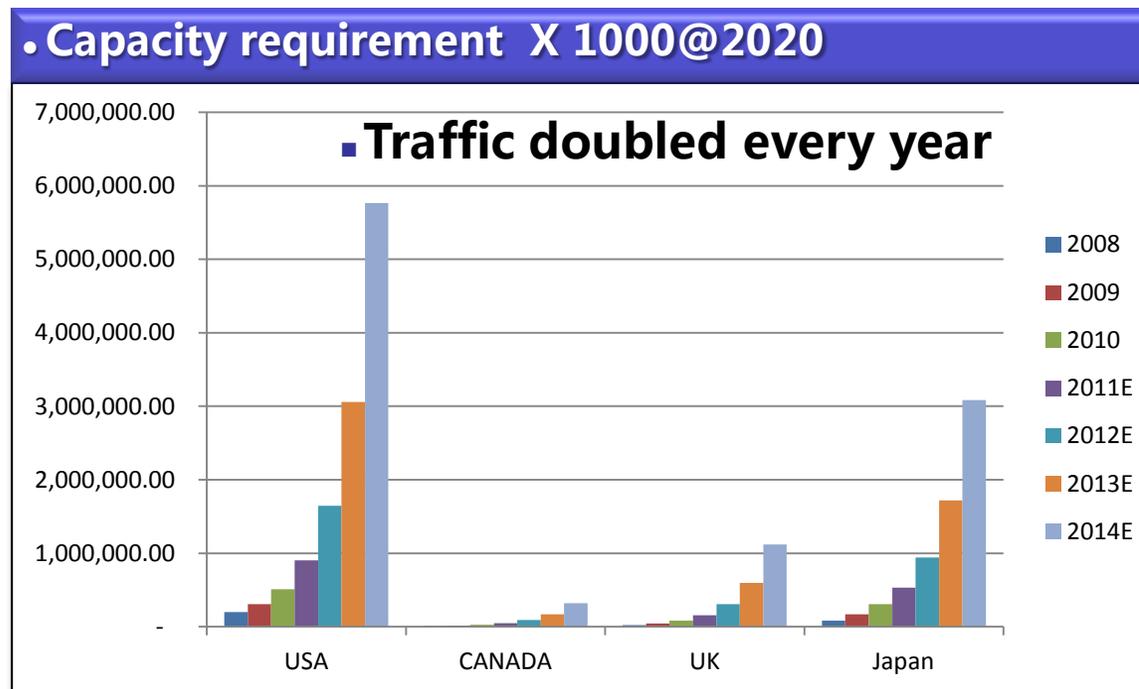
**Huawei, CMCC, CATR, CATT, HiSilicon**

[www.huawei.com](http://www.huawei.com)

# Outline



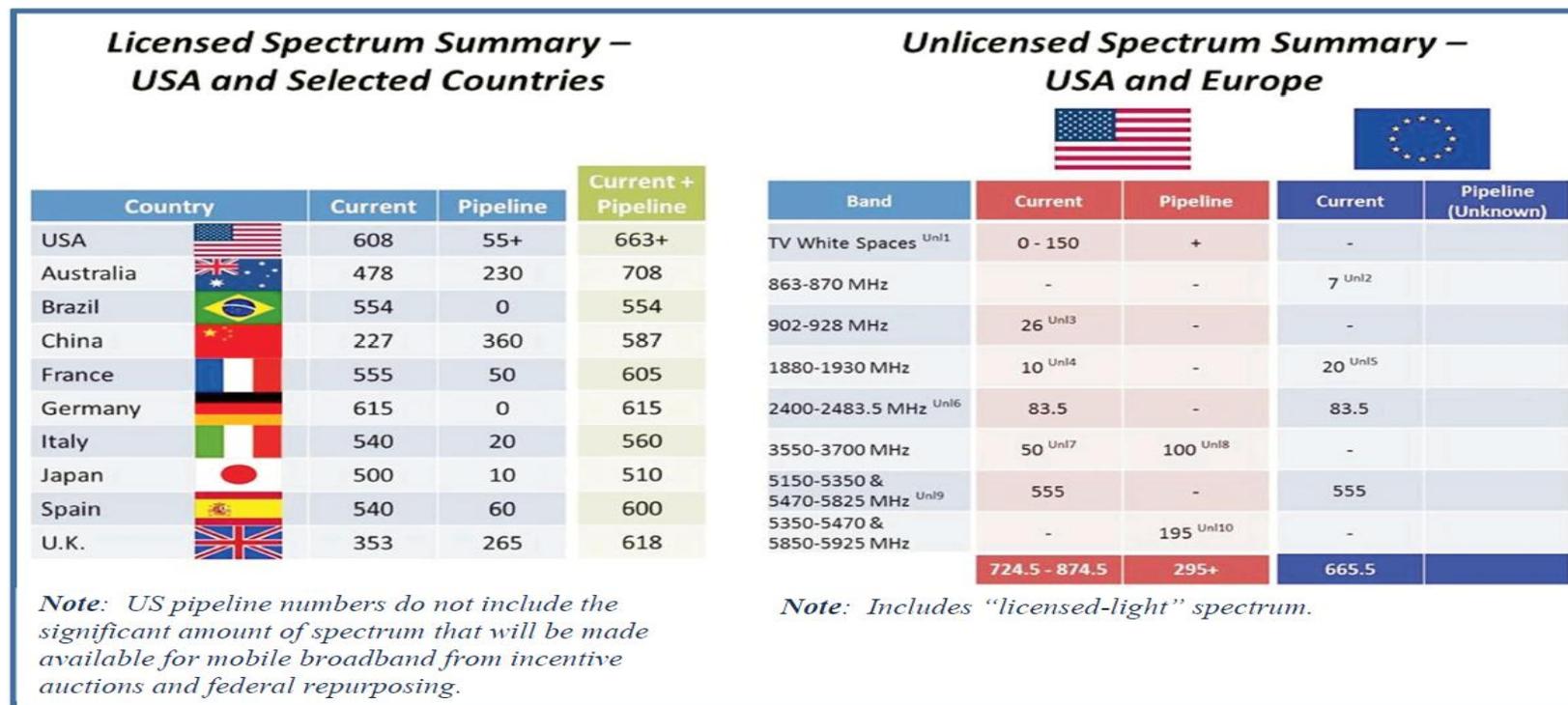
# IMT System Desires Additional Spectrum to meet MBB Traffic Increase



■ Source: Huawei Wireless 2011 Q1 ( Based on Informa 2010Q3)

- **Dramatic increase of traffic (@1000 per 10 years), resulting in:**
  - Increase of the required network resources
  - Increase of the cost due to the expensive licensed spectrum and saturation of spectrum efficiency per Hz.

# Plentiful Unlicensed Spectrum



Band	Frequency Range (GHz)
ISM	2.4-2.425
ISM	61-61.5
Unlicensed PCS	2.39-2.40

\* FCC White Paper The Mobile Broadband Spectrum Challenge: International Comparisons

- Currently, the amount unlicensed spectrum assigned is comparable to the amount of licensed spectrum
- **Naturally, mobile operators will look into the efficient utilization of all the spectrum resources including unlicensed spectrum to offer diverse accesses to users, with maintaining the carrier user experience on quality, security, mobility, etc.**

# Apply Unlicensed Spectrum to Operator Networks

- **A straightforward way to apply unlicensed spectrum to operator network:**
  - Extending the mechanism in well-operated IMT network to unlicensed spectrum with minimal modification
  - Unlicensed carrier is integrated to IMT systems, with authentication, service quality guarantee, RRM and scheduling controlled in the primary licensed carriers
- **An unified technology, LTE with efficient air-interface design, running over both of licensed and unlicensed spectrum would be attractive to mobile operators, e.g. from operational and cost point of view**

Unlicensed spectrum can be part of the spectrum resource pool for the IMT systems operation, With integration to and controlled by the existing operator licensed carriers to offer the carrier-level seamless mobile user experience on service quality and reliable security maintenance

# Outline

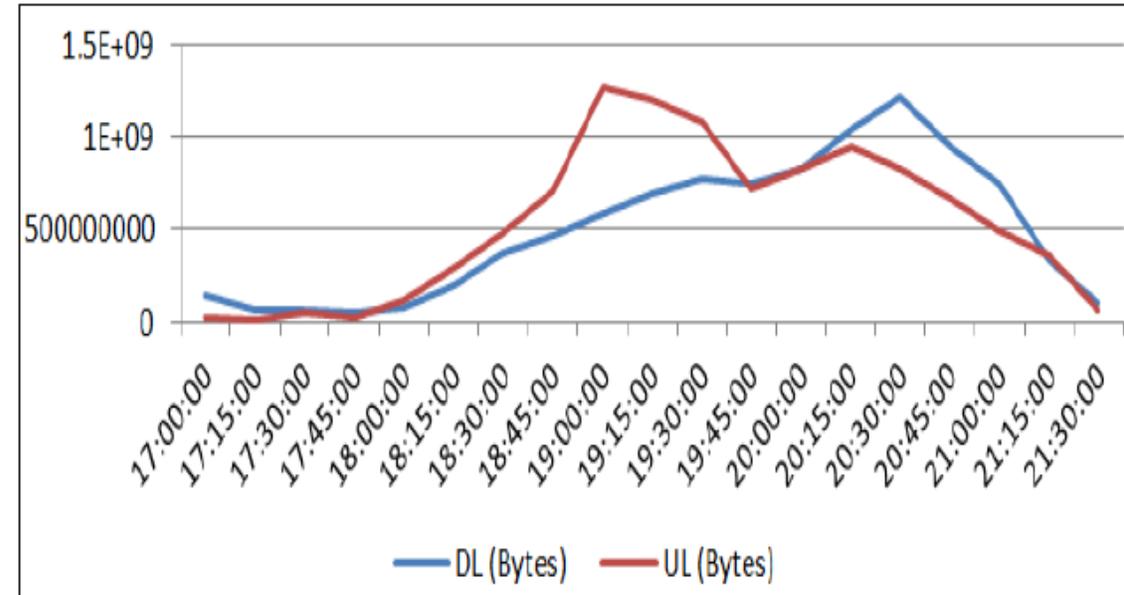


# Scope : Unlicensed Spectrum Integration to IMT systems

- **Recommended Scenarios:** Only focus on deployment scenarios that are tightly controlled by operators
- **Potential Requirements:**
  - **High efficiency:** Reuse LTE physical-layer design and numerology as much as possible, to ensure high-efficient use of unlicensed spectrum
  - **Operational:** Integrate the unlicensed carrier to IMT RAN architecture, with better joint operation, service quality guarantee, security and resource management
  - **Co-existence:**
    - Coexistence of the U-IMT devices among different operators that are sharing the same unlicensed band
    - Investigate the coexistence with other technologies in unlicensed spectrum, i.e. Carrier WiFi
- **Highlights**
  - **NOT** a New “Wi-Fi” . U-LTE is to develop an unlicensed spectrum branch under LTE framework;
  - **NOT** to deploy at all unlicensed bands. Mainly considering the bands and potential bands which are not very crowded by existing unlicensed systems, e.g. 5.8GHz;
  - **NOT** to cover all scenarios. Mainly consider to serve mobile operator networks, i.e. integrated with licensed carriers;
  - **NOT** to seek for a private or closed standards. Open to any interested company to develop it together in 3GPP

# U-LTE for Hotspot Offloading in both DL and UL

- **Hotspot traffic loads may be heavy in both DL and UL, and DL/UL ratio varies**
  - The traditional data services have dominating downlink.
  - With social networking and information sharing becoming more popular, more uploading activities are expected than before, esp. at Stadium, gathering area, CBD mobile office, etc. and when big events occur.



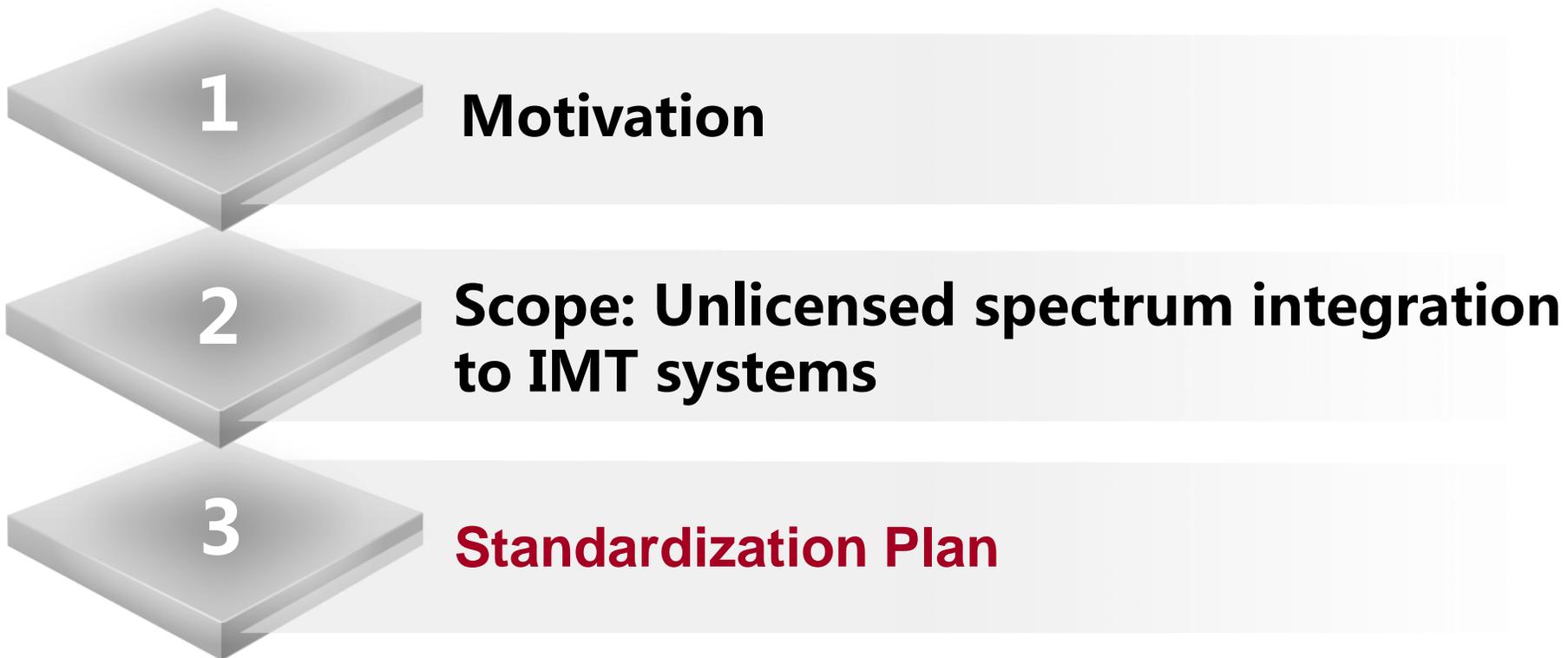
The real volume statistic at a football game on one Sunday at some city in Europe, June, 2012.

- **TDD mode on the spectrum with wide bandwidth is more flexible to adapt to the fluctuation of traffic DL/UL ratio.**

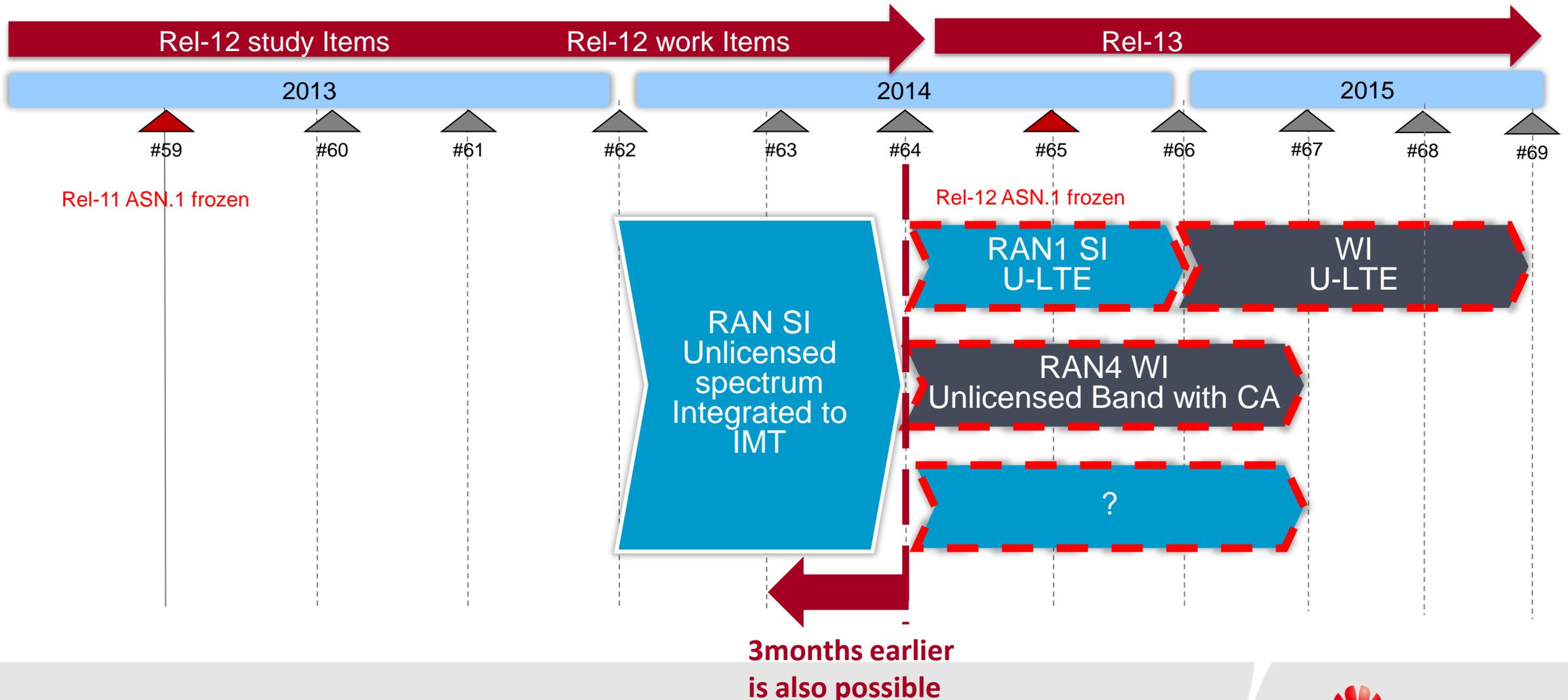
# Selection of Unlicensed Spectrum for Integration to IMT systems

- **Diverse unlicensed spectrum, with different regulation restrictions in different regions**
  - 2.4GHz is widely used by residential WLAN, with high interference
  - 5GHz and other unlicensed spectrum: regulation restriction differs for different bands and in different regions
  - A summary of regulation restriction of unlicensed spectrum will be a good starting point to move forward
- **Potential principle of selecting proper unlicensed spectrum for integration to IMT systems:**
  - Existing interference level due to existing deployment of other systems
  - Regulation restriction
  - Available bandwidth
  - Inter-modulation interference with existing IMT bands
  - ...

# Outline



# Standard Plan: 3GPP U-LTE SI/WI schedule



# R12 RAN SI: Unlicensed spectrum Integrated to IMT

- **Identify the deployment scenarios and requirements of IMT systems with the integration of unlicensed carriers**
  - Identify the targeted deployed scenarios with the need of data offloading to the integrated unlicensed carriers, e.g. traffic distribution and characteristics and deployment.
  - Identify the requirements of the network deployment with integrated unlicensed carrier, from the aspects of system performance and user experience, operation and deployment, coexistence, etc..
- **Summarize regional regulation status and restrictions of unlicensed spectrum**
  - Identify the status of unlicensed spectrum in different regions
  - Identify the potential requirements on air-interface modifications due to the regulation restrictions
- **Identify the target unlicensed spectrum for LTE integration deployments, and recommend the priority of unlicensed bands for the integration of IMT systems, based on the availability, commonality and feasibility analyses.**

Thank you !

