



# 5G Initiative – “5G Roadmap” Working Group

## 5G Hardware Challenge

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# “5G Hardware Challenge”

- **Topic Field** (eg device, wireless, core, application)
  - Mm-wave Transceiver Design
  - Massive MIMO Beamforming Transceiver
  - Circuits – Antenna – Packaging – Integration Challenge
  - Green Technology and 5G waveforms
- **Relation to SDOs and other**
  - P1765: Recommended Practice for Estimating the Uncertainty In Measurements of Modulated Signals for Wireless Communications with Application to Error Vector Magnitude and Other System-Level Distortion Metrics
- **Impact Horizon** (short, medium, long)
  - Short: below 6 GHz domain
  - Medium: Above 6 GHz domain – Ka-band, Q-band
  - Long: V-band, W-band

# New Frontier for RF Hardware Design

- New demanding requirements that stretch the limits of physics for opposite objectives
  - High linearity for  $> 1024$  QAM
  - Increase propagation losses at millimeter-waves
  - Phased Array technology for beamforming
  - Green Communications
  - Affordability for high volume deployments
- Unsettled regulatory and spectrum landscape
  - Multiple new potential frequency bands for global coverage
  - Lack of standards
- Competition between silicon versus III-V technologies
- Evolution versus Revolution? Both!

# Conference Activities

- **Specific Contribution/Thought/Idea**
  - IMS 2017 – 5G Focus
    - 5G Summit and Executive Forum
    - Hardware Demos

# Future Directions: Internet of Space

- **Specific Contribution/Thought/Idea**
  - Hardware-focused IEEE FDC seedling
    - Space-based delivery of Internet access
    - Global connectivity for 5G ecosystem backbone