Spectrum Matters

Spectrum Policy Forum

Consideration of Potential for C-band exploitation

Satellite Applications Catapult

Context:
Competing Pressures of Demand and Supply

- Competing pressures of customer demand (volume & price) vs (capital & operational) cost constraints
  - The realisation that Generative AI will transform autonomous systems and drive commercial and economic imperative is amplifying the clamour for ubiquitous digital connectivity;
  - The consequential demand for increased spectrum availability to support densification of terrestrial mobile networks is inevitable, but it cannot address the sparser extra-urban population and device densities
  - Network (and device) energy consumption is becoming a limiting factor to increased deployment and coverage, due to both the embodied carbon and operational energy cost of the networks
- Convergence requirements across technology boundaries are more than “commercial bundling” – architecture and design for integration needed.
  - Data growth is booming , but this needs to be cost effective as it is not already reflected in revenue growth
  - Security is growing in importance as we do ever more over telecoms / satellite networks
  - Investments in SNO and MNO networks need longer term planning to assure reasonable returns – this means protecting some legacy systems through their investment journey

OPPORTUNITY: Technical and commercial barrier erosion

- Technical and commercial barriers for heterogenous networks (NTN integration) eroding
  - Convergence in wireless radio technologies, advances in manufacturing and flexibility of software radio techniques allow for efficient exploitation of multiple RAT in each devices
  - Simple transition between wireless infrastructure (PANs; (LiFi &) WiFi LANs; IoT; LTE/5G+ WAN; Satellite)
  - Architectures to allow new business models to exploit the prevalence of such capabilities are emerging (neutral hosting/ wifi roaming/ hierarchical models)
- Innovative services will stimulate demand
  - We need to prepare for the growth in demand / revenue far beyond that witnessed today
  - Coverage infill is a key demand generator – whether remote and rural , tourist destinations , marine and transport , connected energy systems and net zero – this is about the Digital economy and not just smartphones for Consumers!
- Standards and Regulation
  - Driving, supporting and adopting International /ETSI standards imperative for growth.
  - Assuring spectrum compatibility with Europe key to achieving economies of scale
  - Regulation and IPR polices need to support R&D – achieving value for public money through impact

SPECTRUM MATTERS: 1
Specific Spectrum Bands

- L-band and S-band spectrum
  - Historically Considered ideal (from a device perspective) for interoperability
  - Available spectrum is extremely limited
  - ITU regulations on allowable PFD have meant that benefits for direct-handset cannot be realised
  - Scale has never been achieved.
- Lower C-band (3.4-4.2GHz)
  - since WRC 2019 is now licensable for terrestrial use, with devices and radio access network infrastructure now available
  - very high performance services achievable using massive-MIMO
  - However, our experience in MK and Dorset has illustrated limitations with regard to range and power consumption of the network
  - exploitation for direct to device via NTN may rejuvenate the value of this spectrum at scale to provide high data rate service coverage extension to existing licence holders
- Upper C-band (6.4-7.4GHz)
  - Likely to be a massive challenge to existing operators if utilised at scale for terrestrial urban macrocells
  - It will be almost impossible to coexist due to the massive interference environment that will be created
  - (experience with exploitation of L-band for ATC while at Inmarsat was illustrative of this challenge).
  - Instead we should consider it to be potentially exploitable as part of a future FDD configuration for NTN to facilitate high performance device exploitation of satellite bands.

SPECTRUM MATTERS 2: Regulatory stance influences investment

- Costs of spectrum and the balance of spectrum in use need to be watched both nationally and regionally.
- Compatibility with European spectrum policy imperative to stimulate innovation and investment.
- We need to keep the door open to NTN and not bifurcate by accident from Europe through spectrum policy.

Conclusion

- There are increasingly compelling commercial and economic reasons for co-existence and indeed integration of satellite NTN and terrestrial systems, but new technologies, regulation, and business models need to be advanced to realise the benefits to citizens…

Recommendations

- Integrate UK Spectrum Policy within both UK Industrial Strategy as well as Economic Growth perspective
- We need a UK NTN Working group which brings together
  a) Standards
  b) Spectrum
  c) Knowledge exchange
  d) Innovation Policy
- Incorporate WRC 2023 feedback from December 2023 and build a DSIT/ UK Space Agency NTN action plan for 2024