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WIRELESS SOLUTIONS

FUTURE WIRELESS TECHNOLOGY FORUM

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Objectives

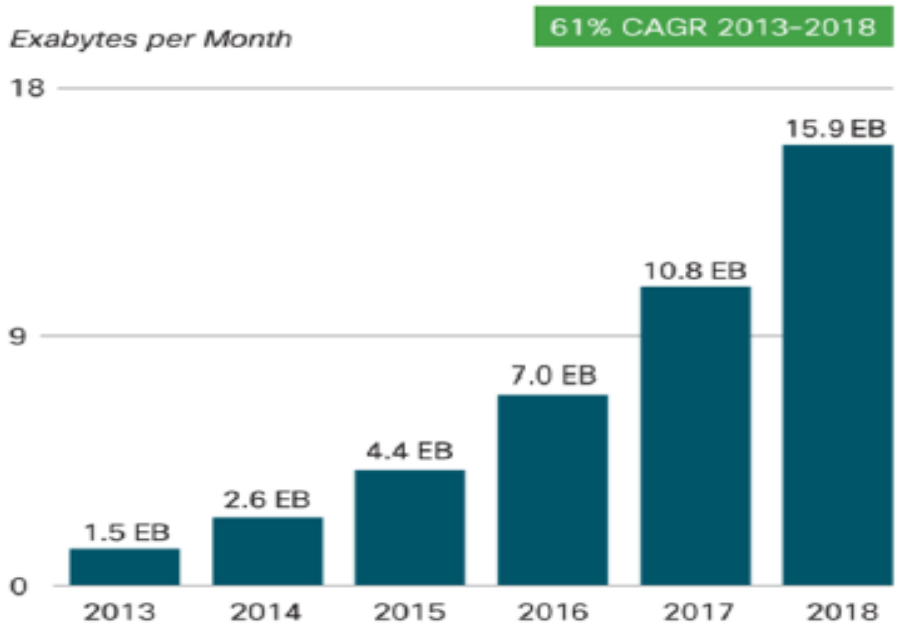
This session has the following objectives:

- To provide E-Band frequency spectrum world norms
- Recommendations on spectrum fees for South Africa

Background and forecasts

- The diversity of communications is driving tremendous increase in data consumption (mobile as well as fixed)
  - Forecasted growth – Smartphone to generate 2.7GB traffic / month by 2018 (average).

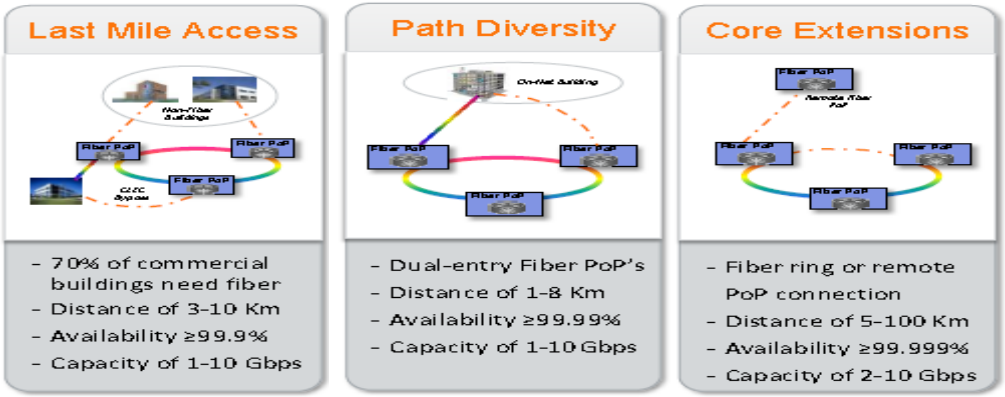
Forecasted growth – mobile data traffic



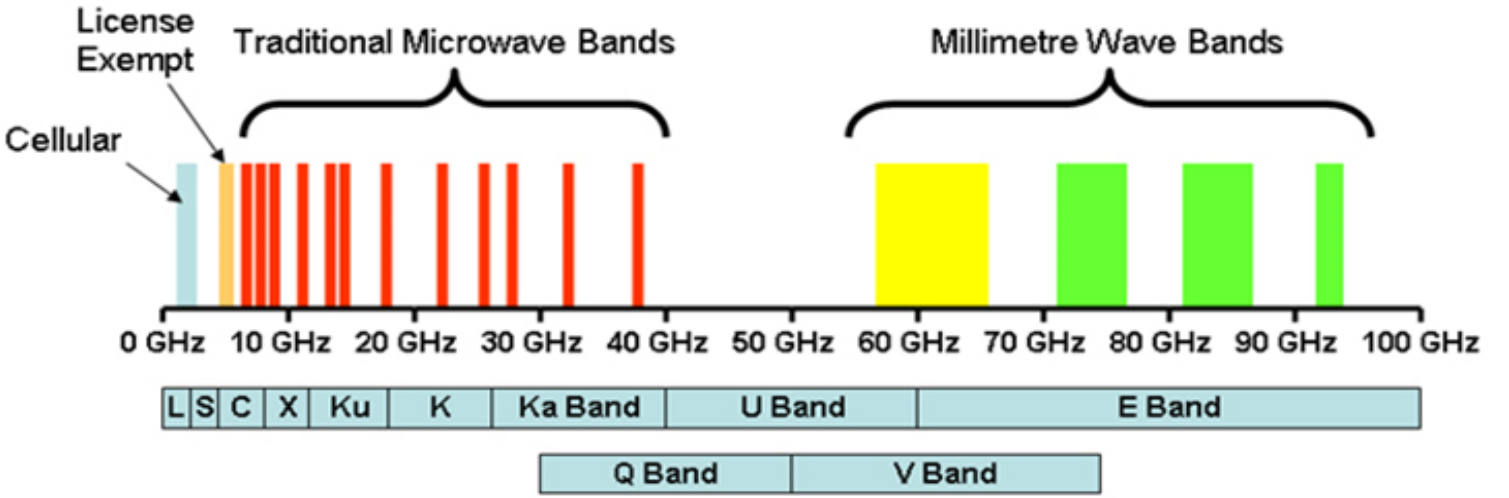
Wireless Transport Requirement Driven by Application Demands

- Mobile backhaul applications
  - Small cells – to provide improved coverage & capacity
    - Distance: < 1km
    - Capacity: 1Gbps or less (Typical 150Mbps)

- Long distance networks: Path lengths greater than 1km
  - Distance: > 1km
  - Capacity: 1 – 10Gbps



Technology Overview and Deployment



- Traditional: 2-40GHz = congested & throughput limited (Typical 360Mbps)
- mmWave (E-band): 71-76GHz & 81-86GHz = High data rates (1Gbps +)

Assessment of Modulation Techniques

- Example-1

Requirement: 3.5km, 1Gbps

Fixed Distance = 3.52 KM; Data Rate = 1 Gbps; Average Rainfall = 22 mm/hr		
Modulation	**Channel Size**	**Availability**
QPSK	1 Ghz	99.99 % (52 mins/year outage) **(~3 times more)**
64 QAM	250 Mhz	99.97 % (157 mins/year outage)

- Example-2

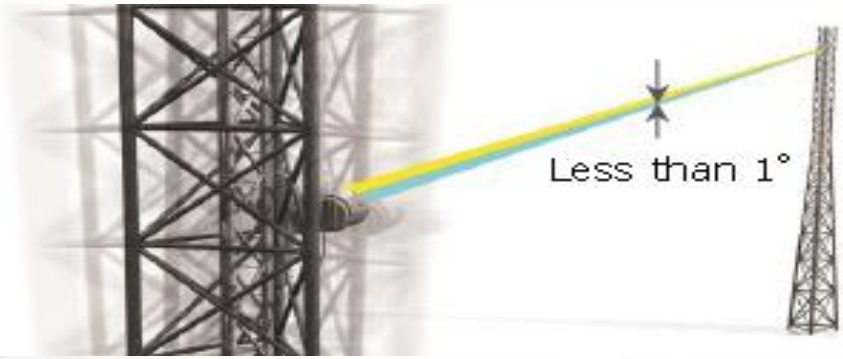
Requirement: 1Gbps, 99.99% availability

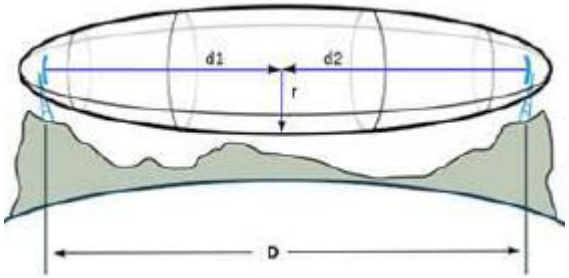
Fixed Availability= 99.99% ; Data Rate = 1 Gbps; Average Rainfall = 22 mm/hr		
Modulation	**Channel Size**	**Distance**
QPSK	1 Ghz	3.52 KM (~**32% more**)
64 QAM	250 Mhz	2.65 KM

- Conclusion: Wider channels with simpler modulations enable multi-gigabit capacities over longer distance and higher availability

Assessment of Interference

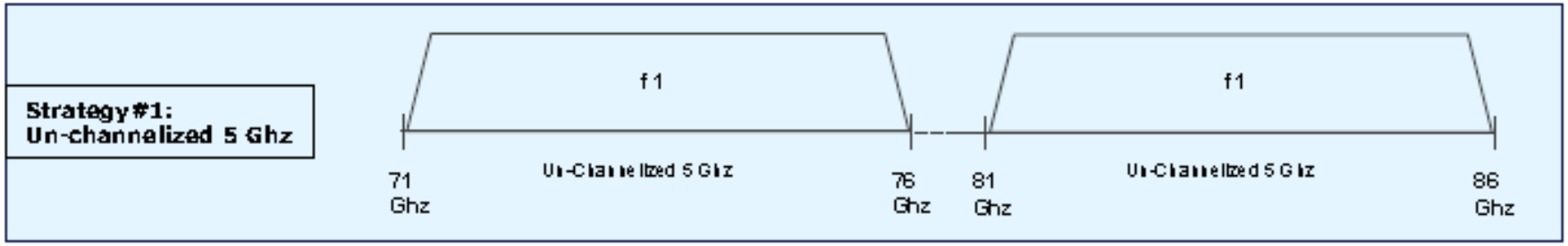
- E-band frequencies produce a typical 3dB beam width of:
  - 0.9º (12” antenna)
  - 0.4º (24” antenna)
- Freshnel Zone:
  - 5km – 2.2m
  - 10km – 3.1m
- E-band systems with extremely narrow beams and very short Fresnel distance mitigate interference risks, thus enabling high spatial reuse of the frequencies.





Worldwide Spectrum Allocation Strategies & Trends

- Strategy #1 – “Un-channelized Open”
  - Spectrum is open without any channelization – User applies for national license. Self coordinated, first-come, first-served.
  - USA – 2 x 5GHz, FDD
  - Australia – 2 x 4.75GHz, FDD

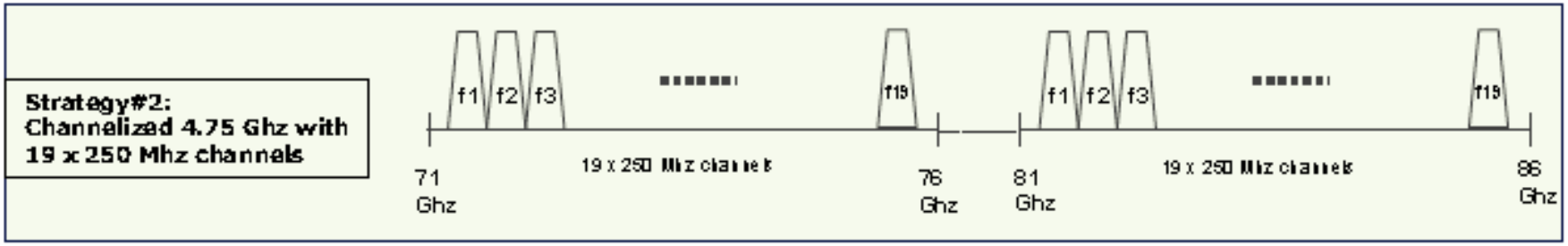


Worldwide Spectrum Allocation Strategies & Trends

- Strategy #2 – “Channelized Open”

  Europe (42 CEPT administrations) as described by ECC/REC(05)07

  - Full bands open (Self coordinated, first-come, first-served)
  - 2 x 4.75GHz, FDD
  - Allowing 19 x 250Mhz channels
  - Adopted by: Belgium, Croatia, Denmark, Estonia, France, Germany, Greece, Iceland, Ireland, Luxembourg, Montenegro, Netherlands, Portugal, Romania and Spain

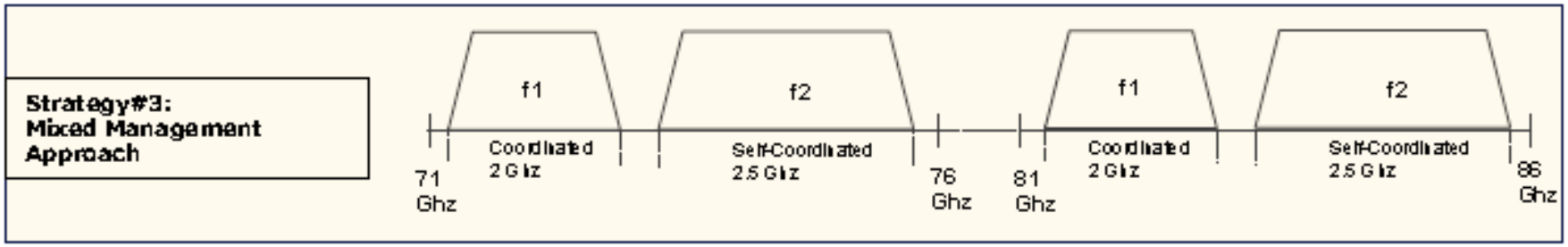


Worldwide Spectrum Allocation Strategies & Trends

- Strategy #3 – “Un-channelized - Regulated & Open”

  United Kingdom (42 CEPT administrations) as described CC/REC(05)07

  - Mix management approach
    - 2 x 2.5GHz self-coordinated
    - 2 x 2GHz coordinated



Cost considerations

- Unlicensed
  - No spectrum fees

Unlicensed	Czech Republic	74-76 and 84-86 Ghz	Free
	Russia	71-76 and 81-86 Ghz	Free
	Hong Kong	71-76 and 81-86 Ghz	Free
	Mexico	71-76 and 81-86 Ghz	Free

- Light License (Self Coordination)
  - Small annual or one-time fee
  - National license is required

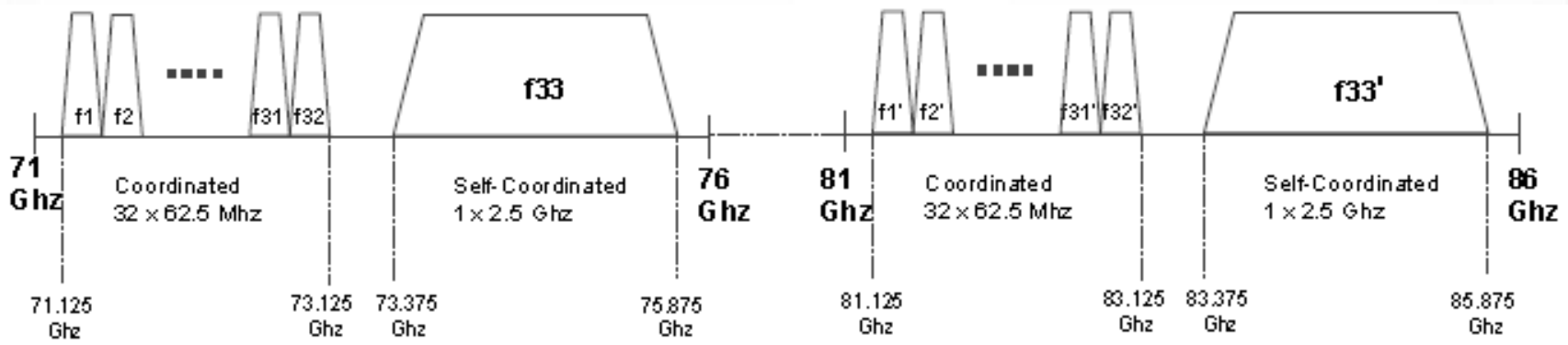
Light License (self-coordinated)	USA	71-76 and 81-86 Ghz	$75 for ten years
	UK	71.125-75.875GHz & 81.125-85.875GHz	$100 per year
	Australia	71.125-75.875GHz & 81.125-85.875GHz	$175 per year

- Traditional Point-to-Point
  - Higher frequency factor is applied – cost kept low

Licensed (Traditional Point-to-Point Microwave model)	Japan	Traditional PTP	$10 per year
	New Zealand	71.125-75.875GHz and 81.125-85.875GHz	$170 per year
	Jordan	Traditional PTP	$300 per year
	UAE	Traditional PTP	$1200 per year
	Ireland	Traditional PTP	$1500 per year

Recommendations

- Comply to ITU-R F.2006
- Channelized & Un-channelized
- Regulated – 32 x 62.5MHz channels, FDD – Low cost
- Open – 1 x 2.5GHz, FDD - Free



LATEST “STATE OF THE ART” EQUIPMENT

The first true hybrid wireless transport solution, combining advanced optical and millimeter wave technologies. It is a breakthrough product offering ultra-high capacity over long distances with carrier-grade availability, delivering the performance of fibre with the flexibility and economics of wireless.

Key Features

- Layer 1 transport with in-band or out-of band management
- Full duplex, 2 Gbps constant data rate in all weather conditions
- Up to 10 km point-to-point LOS with 99.999% availability*
- Compensates for tower twist & sway up to ± 3˚
- Unlimited distance in daisy chain configuration
- 3R regeneration at every node without degradation over long distances
- Minimal linear space on towers
- Automated precision link alignment usually in 5 min
- All-outdoor design
- Lowest cost/bit/km
- Rapid ROI compared to fibre

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