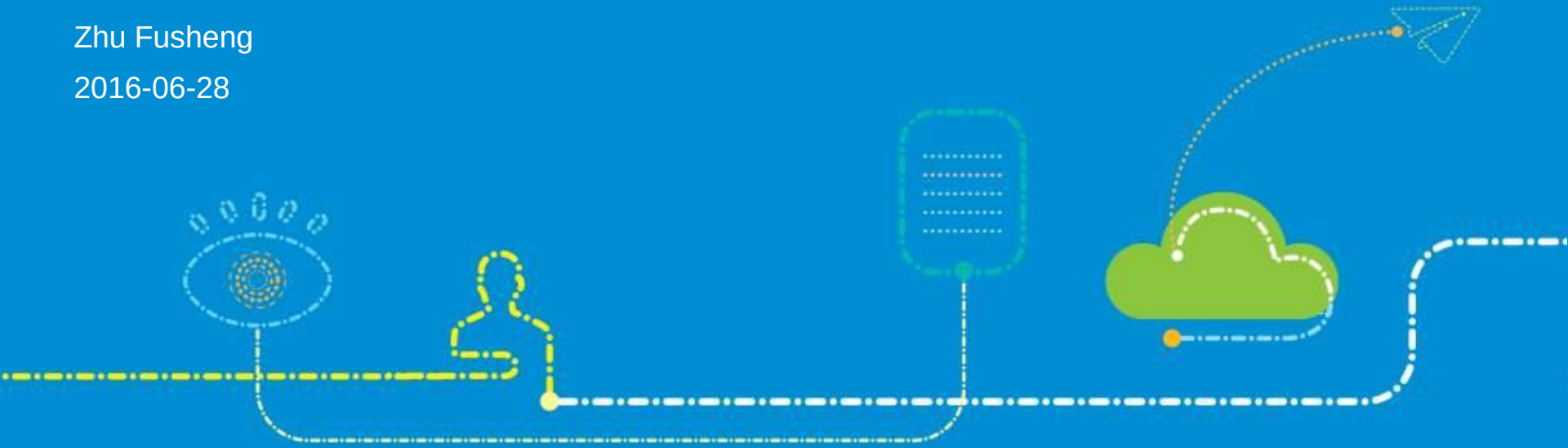
Usage Scenario and Progress on Spectrum for 5G

ZTE
Tomorrow never waits

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5G Required Large bandwidth

For eMBB	Macro Coverage	Outdoor Hotspot	Indoor Hotspot
Total Spectrum Req.	611-916MHz	4.9-7.3GHz	13.3-20GHz
Req. below 6GHz	611-916MHz	——	——
Req. for 6~45GHz	——	4.9-7.3GHz	4.9-7.3GHz
Req. above 45GHz	——	——	11-12.7GHz

- For eMBB, estimated based on 5G KPIs
- The requirement in the LF bands is about 600-900MHz
- The requirement in the HF bands is about 5-7GHz for outdoor hotspots
- The requirement in the HF bands is about 13-20GHz for indoor hotspots

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Property of the spectrum above 6GHz

- Large spectrum resource
- Reflection is rich
- Larger path-loss at high frequency bands
- Outdoor-to-indoor penetration loss increases with higher frequency
  - No penetration through concrete walls
  - Indoor cells needed at high frequency
- RF challenge and device cost
  - PA efficiency, power consumption
  - Semiconductor readiness

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Deployment scenarios of spectrum above 6GHz

Scenarios	Indoor Hotspot	Dense urban	Urban macro	High Speed
Carrier Frequency	Around 30 GHz Around 70 GHz	Around 4GHz + Around 30GHz	Around 30 GHz	1) BS to relay: 4 GHz Relay to UE: 4/30/70 GHz 2) BS to relay: 30 GHz Relay to UE: 4/30/70 GHz
Bandwidth	Up to 1GHz	4GHz: Up to 200MHz Around 30GHz: Up to1GHz	Around 30GHz: Up to 1GHz	4GHz: Up to 200MHz Around30 / 70GHz: Up to1GHz
Layout	Single layer	Macro + Micro	Single layer	Macro only Macro + relay
ISD	20m	Macro 200m 3micro per macro	500m	Macro 1732m Micro 25m

Note: 30 GHz is chosen as proxy for 24-40GHz;70GHz is chosen as proxy for 66-86GHz

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Candidate HF Bands for WRC-19 A.I. 1.13



Group 30

24.25 - 27.5 GHz
31.8 - 33.4 GHz



Group 40 / 50

37.0-40.5 GHz
40.5-42.5 GHz
42.5-43.5 GHz
45.5-47.0 GHz
47.0-47.2 GHz
47.2-50.2 GHz



Group 70/80

66 - 76 GHz
81 - 86 GHz

8/11 bands have been allocated to mobile on primary basis

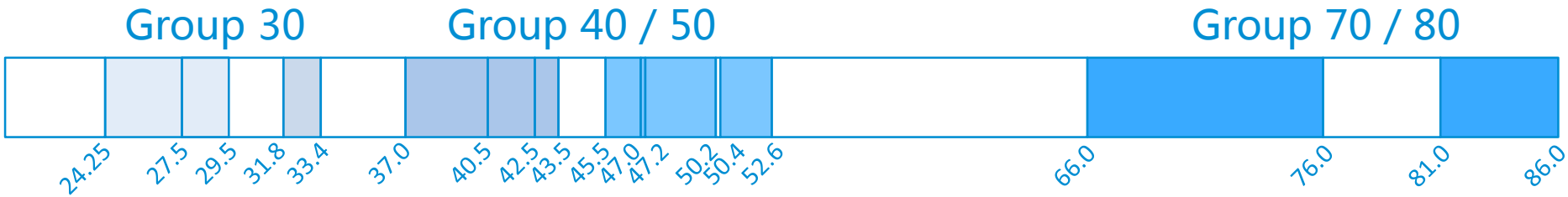
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Principles of High Frequency selection

- Spectrum efficiency
  - propagation characteristic, coverage, deployment scenarios
- Continuity of spectrum
  - Large continuous bandwidth(>500MHz) is desired for 5G systems
- Primary services allocated on the band
  - The band should be allocated to mobile on the primary basis
- Electromagnetic compatibility
  - Be friendly to other systems, avoid the interference between systems
- The industrial manufacturing level for different bands

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Overview of High Frequency



	Group 30	Group 40 / 50	Group 70 / 80
Propagation Characteristic	Lowest band w/ better propagation	Middle band w/ Moderate propagation	Highest band w/ Poor propagation
Capacity	High	Higher	Highest
Deployment	Outdoor hotspot	Outdoor hotspot	Indoor hotspot
Continuous BW	1.5~3 GHz ←	→	3~5 GHz
Coverage	several 100m ←	→	several 10m
Industry chain	Mature	Less mature	Immature

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HF Usage Suggestion



01

First priority: group 30

- Relatively better propagation, better industry
- Valuable lowest bands, R&D on microwave

02

Second priority: group 40/50

- Moderate propagation, less mature industry
- Consider the bands planed but not used

03

Third priority: group 70/80

- worst propagation, immature industry
- a lot of bands not planed and used

04

Additional bands needed for mobile

- 31.8 - 33.4 / 40.5-42.5 / 47.0-47.2 GHz
- 27.5~29.5GHz should be considered

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HF Usage Suggestion

05

Electromagnetic compatibility

- careful spectrum planning
- optimized 5G design to be friendly

06

Unified global spectrum planning

- for the compliance of the IMT industry
- convenient for regulation and operation

07

spectrum planning ASAP

- 3~5 years for the industry to be prepared
- spectrum planning in advance to release clear sign
- early planning, early focus, big support needed for the weak high frequency industry

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Thanks for attention!

