Comparison Among Frequency Bands for Future Mobile Communications

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Abstract

This paper highlights the pivotal role of allocating the upper-mid band (7GHz-24GHz) in the spectrum. The study delves into the technical advantages and challenges associated with 28GHz and 3.5GHz, emphasizing that using upper-mid band can increase network capacity, reduce latency, enhance overall user experience, extend coverage, and reduce network equipment. By shedding light on the importance of strategic frequency allocation, this paper contributes to the ongoing discourse on optimizing telecommunications infrastructure.

Ⅰ. Introduction

3.5GHz and 28GHz bands were proposed for 5G in various countries including Korea. Recently, there is a growing interest in the upper-mid band (7GHz~24GHz) for future mobile communications as a practical solution. In this paper, we analyze the three frequency bands.

Ⅱ. Method

28GHz has significant market potential, but there are also considerations to be taken. 28GHz is a high frequency band that is suitable for high-speed, low latency, and multiple connections communications. It is especially beneficial for delivering multimedia content (e.g., video call, youtube streaming, or movie) which should be transmitted in real time. Table 1 and Figure 1 show that multimedia content can be delivered much faster using 28GHz than 3.5GHz due to immediate transmission and infrequent retransmission.

Table 1. Comparison between 3.5 GHz, 28 GHz, and upper-mid band [1]

Frequency Band	Features
3.5GHz	- Time unit: 0.5ms - Low penetration loss - Huge coverage - Vulnerable to radio errors
28GHz	- Time unit: 0.125ms - Immediate, ultra-high reliable transmission - Reliable against radio errors
7GHz-24GHz (Upper-mid Band)	- Faster, reliable than 3.5GHz - Lower penetration loss, greater coverage than 28 GHz

However, the penetration loss is high when using 28GHz, and it covers less area than 3.5GHz. Therefore, lots of small cells or relays are needed when transmitting from a long distance. For 6G, the upper-mid band (7GHz-24GHz) is being proposed for practical, easier and affordable deployment. This provides faster speed, less latency, better network capacity than 3.5GHz and less penetration loss, greater coverage, less network equipment cost than 28GHz.

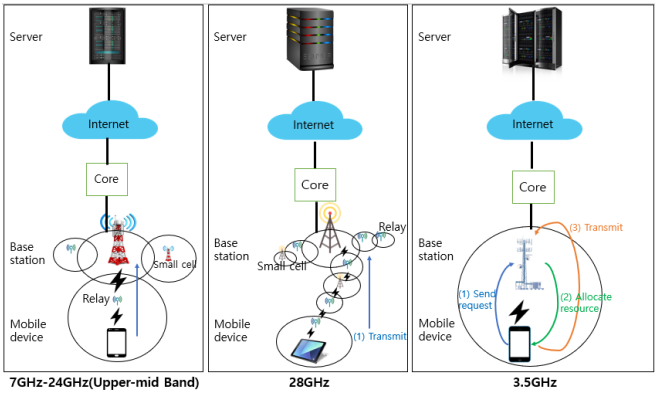

Figure 1. Network architecture using upper-mid band, 28 GHz, and 3.5 GHz [1]

Ⅲ. Conclusion

Even though 28GHz provides high quality services for multimedia content, the cost of investing into equipment cannot be overlooked. This is why upper-mid band is desired for 6G, which combines the advantages of 3.5GHz and 28GHz.

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