

Assignment 3

Future Tech Imaginarium

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6G and Terahertz Communications

Intro

As the global demand for faster, more reliable, and immersive communication continues to accelerate, the convergence of 6G networks and terahertz communications presents a transformative opportunity. From a consulting and advisory standpoint, integrating these two cutting-edge technologies is not only about increasing data speed or reducing latency but also about creating the foundation for communication systems that support real-time holographic interactions, autonomous infrastructure, and seamless global connectivity. By aligning research, policy, and investment strategies to support this integration, we can help drive innovations that enhance everything from remote healthcare and education to environmental monitoring and smart cities. This advancement has the potential to significantly improve human quality of life by enabling more intelligent, inclusive, and resilient communication systems.

6G Network

6G refers to the sixth generation of wireless technology, intended to provide faster speeds and improved network latency. It is the next generation of wireless telecommunications, currently in development and expected to launch around 2030. This advancement is made possible by improvements in radio frequencies, coding techniques, and updated physical infrastructure. Many companies, including Apple, Samsung, and Nokia, as well as others that are less well known, are actively working to develop this infrastructure. Nearly all major countries have expressed interest in 6G and have contributed to its development. However, China has made the most significant strides and holds the highest number of 6G patents.

How will it work

One goal of the upgraded network is to reduce latency from one millisecond to one microsecond. This means that when you hit send on a message from your phone, it currently takes about a microsecond to reach the recipient. With 6G, messages will be sent and received almost instantly. Smart devices will experience dramatic improvements in streaming, downloading, and uploading speeds.

Gigahertz (GHz) and terahertz (THz) are units of frequency. The higher the frequency, the faster information can be processed. One terahertz equals 1,000 gigahertz. Future communication systems will rely on these higher frequencies to transmit large amounts of data almost instantly. However, terahertz waves cannot travel as far as traditional radio

waves and have difficulty passing through buildings and other structures. To support this, a dense network of small, closely placed antennas would be required to keep our devices constantly connected.

Currently, 5G operates in the range of 600 megahertz (MHz) to 2.5 gigahertz on the low end, and up to about 40 gigahertz on the high end. In comparison, 6G is expected to operate at frequencies starting at 100 GHz and reaching up to 10 THz. Doing the math 10THz should be 10THz a 249000% increase (according to ChatGPT, I am no math major. It could be wrong don't come for me.) Our devices will also need to be faster and smarter, possibly incorporating (AI) to handle the speed and data volume of 6G.

AI's role goes beyond managing the massive flow of data at high speeds. With faster processing, physicians could monitor patients in real time. For example, if someone wears a heart monitor and abnormal readings are detected, AI could quickly recognize signs of danger and alert both the patient and physician before a critical event occurs. This proactive use of data and AI could potentially save lives.

With the rollout of 6G networks, we could start seeing a wave of new smart devices that just weren't possible before. Since 6G will be incredibly fast and allow devices to respond almost instantly, things like brain-controlled headsets could become more common. These could help people with physical disabilities to control phones, computers, or even smart homes using just their thoughts. We might also get smart contact lenses that show helpful info right in front of your eyes, like directions, health stats, or translations. I like to think this would be something way, way into the future. Even home robots could get way smarter, learning how to help out more naturally around the house, especially for older adults or anyone needing a bit of extra support. Or people like me that are just terrible housekeepers! I hate laundry! These kinds of tech would rely on 6G's speed and low lag to work smoothly and safely in real time.

So far, we have had the middle age, the industrial age, modern age, and information Age. Could we be looking at the 'smart device age'?

Dangers

Do you remember when 5G launched in 2018 and all kinds of conspiracy theories started floating around? People said it would harm our health, cause cancer, weaken our immune systems, and even blamed it for the COVID-19 pandemic. Others claimed it would harm the environment by killing insects and birds.

In a consultant role for the development and implementation of the new network, we should start at the foundation. Now, 6G is projected to launch around 2030, which is only

about five years away. From a public communication standpoint, that's not enough time to prepare. If people panicked over 5G, imagine the reaction to 6G, which is expected to be exponentially faster and more complex. It's likely to trigger even more fear and misinformation. In today's world, what is misinformation to some is gospel to others.

To prevent this, developers and industry leaders should start releasing public studies and clear information now. Using layman terms, free of jargon that everyday people wouldn't understand. Lot of pictures and visuals so that interpretation isn't up to the readers imaginations. There should be educational campaigns, transparent research, and widespread public relations efforts well before the launch. Mass communication ahead of time can help ease public concerns and avoid a repeat of the backlash seen with 5G.

Currently, the infrastructure needed to support terahertz (THz) frequencies is not in place. The small cell antennas required to transmit these high-frequency signals simply don't exist on the necessary scale yet. Building it will cost billions of dollars. And because THz waves can't travel far or pass through structures easily, far more antennas will be needed than the number of traditional radio towers we see today.

As these small cell antennas start appearing in public spaces, it could cause public concern or alarm. That's why educating people about what these devices are, what they do, and why they're essential will be critical to a smooth and successful transition to 6G.