

# 6G – Closer Than You Think

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## 6G

All over the world, scientists, governments, corporations and consumers are collaborating to turn the Earth into a giant computer, fulfilling the warning predictions of the great Swedish physicist and Nobel laureate Hannes Alfvén. Written under the pen name Olof Johannesson, his 1966 science fiction novel *Sagan om den stora datamaskinen* (The Tale of the Great Computer) predicted smart phones, the internet, fitbits, artificial intelligence, chip implants enabling direct human-to-computer communication, the colonization of Mars, and ultimately the replacement of humankind entirely by computers, which regarded human beings as just one step on the evolutionary path to themselves.

Some of the national and international groups already working toward 6G are:

- [6G Flagship](#), a Finnish research and development program funded by the University of Oulu and the Academy of Finland.
- [URLLC](#) (Ultra Reliable Low Latency Communications) is a collaboration between the University of Oulu and South Korea's Electronics and Telecommunications Research Institute (ETRI).
- [TEMA](#) (Telecom Equipment Manufacturers Association of

India), in association with [CMAI](#) (Cellular Mobile Association of India), have formed the [6G Council](#).

- [CEA-LETI](#). This is the Laboratoire d'électronique des technologies de l'information (LETI), a subsidiary of the Commissariat à l'Energie Atomique et aux Energies Alternatives ([CEA](#)), France's nuclear and renewable energy commission. LETI employs 1,900 people and is headquartered in Grenoble. Its 6G program is called [New-6G](#).
- [6GIC](#) (6G Innovation Centre), a project of the University of Surrey, in the UK.
- [InterDigital](#), a technology research and development company with offices in the US, Canada, Belgium, England and France.
- [6GWorld](#), a subsidiary of InterDigital.
- [ATIS](#), the Alliance for Telecommunications Industry Solutions, which has 150 member companies. ATIS issued a press release on October 13, 2020 proclaiming, "ATIS Launches [Next G Alliance](#) to Advance North American Leadership in 6G."
- [5G-ACIA](#), the 5G Alliance for Connected Industries and Automation. This is a working group of Zentralverband Elektrotechnik- und Elektronikindustrie e.V. (ZVEI), the German Electrical and Electronic Manufacturers Association.,
- [5G IA](#) (5G Infrastructure Association), the "Voice of European Industry for the development and evolution of 5G." In the 5G PPP (5G public private partnership), 5G IA represents the private side and the European Commission the public side. 5G IA is Headquartered in Brussels, Belgium.
- [6G@UT](#), a new research center launched on July 7, 2021 by the University of Texas at Austin and funded by

InterDigital, AT&T, Qualcomm, Samsung, and NVIDIA.

6G will use frequencies from 40 GHz to 330 GHz, called “sub-terahertz” frequencies, in order to support “extreme data rates up to 1 Tbps.” The signal bandwidth will be in tens of GHz to “over 100 GHz.” Among other things, 6G will enable autonomous drones, cars, forklifts, trains, excavators and harvesters.

The first European [6G Symposium](#), a virtual event with 72 speakers, took place May 4-6, 2021. It was organized jointly by 6GWorld, 6GIC, Interdigital, and 6G Flagship. It featured Andreas Mueller, chairman of ACIA; Colin Willcock, chairman of 5G-IA; BK

Syngal, chairman of the 6G Council of TEMA/CMAI; Emilio Calvanese Strinati, program director of New-6G, CEA-LETI; DongKu Kim, professor at Yonsei University, Seoul, South Korea and co-chair of the 6G R&D Strategy Committee of the university.

The [2021 Joint EuCNC & 6G Summit](#) took place June 8-11, 2021. EuCNC is the European Conference on Networks and Communications. This event was a joint program of 6G Flagship and the European Commission. It was a virtual conference based in Porto, Portugal.

On July 13, 2021, at an event called [Asia Tech x Singapore](#), 6G Flagship announced a partnership with the country of Singapore. The Singapore part of the collaboration will be housed at the Singapore University of Technology and Design.

Another [6G Summit](#) will take place on August 31, 2021 at the Colorado Convention Center in Denver, Colorado. There will be speakers from Verizon, AT&T, US Cellular, Rogers Communications, T-Mobile, Northeastern University, the Next G Alliance, the National Science Foundation, Virginia Tech and others. The physical event will be followed by a virtual event on September 2, 2021. This 6G Summit is sponsored by the [Big](#)

[5G Event](#) in collaboration with the Next G Alliance and ATIS.

The [IEEE International Symposium on Personal, Indoor and Mobile Radio Communications \(PIMRC\)](#), a virtual conference sponsored by 6G Flagship, will take place September 13-16, 2021.

A [6G Symposium](#) will take place Sept. 21-22, 2021 in Washington DC at Halcyon House. There will be 50 speakers from industry, universities and governments. It is sponsored by 6GWorld in partnership with InterDigital; the Institute for the Wireless Internet of Things at Northeastern University; and the Next G Alliance.

On September 23, 2021, also at Halcyon House in Washington, the U.S. Department of Defense will hold a symposium called [5G to XG US Defense Symposium](#). It will feature former FCC Commissioner Robert McDowell as well as speakers from InterDigital, Lockheed Martin, Space Economy Rising, the IEEE, the National Institute of Standards and Technology, the National Spectrum Consortium, DARPA (Defense Advanced Research Projects Agency), and the Department of Defense.

And the [Brooklyn 6G Summit](#), titled “Dawn of 6G” and hosted by the Tandon School of Engineering in Brooklyn, New York, will be held virtually on October 18-19, 2021. It will feature speakers from the U.S., Japan, Europe and China.

The third issue of [6G Waves magazine](#) was published in Spring 2021. In it, we read that “the role of 5G/6G is to cognitively connect every feasible device, process, and human to a global information grid.” Its articles paint a picture of a nightmare world into which scientists and engineers are leading us:

- The [Hexa-X project](#) promises “seamless unification of the physical, digital and human worlds... Whereas 5G is significantly enhancing our ability to consume digital media anywhere, anytime, 6G should enable us to embed ourselves in entire virtual or digital worlds.” This

article talks about “massive twinning,” “telepresence,” “cobots,” “the internet-of-senses,” and “ubiquitous autonomous systems closely interleaved in every aspect of our lives.”

“Massive twinning” is “the creation of a digital twin from humans, physical objects, and processes.”

“Telepresence” will allow people to “interact with, or experience the physical world remotely with lifelike fidelity.”

“Cobots” will be “collaborative robots” in homes and public spaces.

- Another article discusses a “tactile internet” enabling “humans wearing wearables and interacting with virtual spaces implemented in the network, where the users feel as if they were present in a real place of interest directly interacting with its surroundings.” It envisions “face-to-face (F2F) conferences where remote attendees feel as if they were in a conference room where they can look at any direction. The ongoing COVID-19 pandemic has highlighted the demand for such applications.”
- Another article reviews the development of “extremely fine smart dust” – wireless devices that are so small they are the size of tiny particles.
- Dr. Ian Oppermann, a government scientist and professor at the University of Technology in Sydney, Australia, thinks 6G is necessary, and that there is “no alternative path for us, if we are to survive as a species.” His only concerns are that we protect people’s data and privacy. He imagines “a smart home, where the lights turn on and off as you move from room to room, where the heating is controlled intelligently by the number of people at home.” He envisions “a smart toilet

that analyzes your urine chemistry and gives you recommendations for what to eat, based on your phosphate levels. Maybe that information gets shared with your fridge and it suggests you should eat more bananas.” “Another convenient piece of technology might be a drone hovering above your home, providing you with an ad hoc mobile network (great), but in addition the drone can record your location (dubious, but OK) and perhaps measure your body temperature (definitely not OK). The obvious question is, do you consent to all of this?”

And [on August 5, 2021](#), the Federal Communications Commission created new “[Innovation Zones](#)” in Raleigh, North Carolina and Boston, Massachusetts and expanded its existing Innovation Zone in New York City. These are programs of the [Platforms for Advanced Wireless Research](#) (PAWR), which is funded by the National Science Foundation and a consortium of over 30 technology and telecommunications companies.

The Northeastern Innovation Zone will be operated jointly by Northeastern University and DARPA. It will cover 0.8 square miles at Northeastern’s main campus in Boston, bordering Carter Playground to the east, Columbus Avenue to the south, and Huntington Avenue to the north; and 0.9 square miles at its satellite campus in Burlington, bordering Mary Cummings Park. These facilities will expose everyone in these test areas to frequencies ranging from 746 MHz all the way up to 1.05 THz (1,050 GHz).

The expanded New York City Innovation Zone, known as COSMOS, will be run jointly by Columbia University, Rutgers University, New York University, and City College of New York, and will cover portions of Columbia University, City College, nearby streets, and parts of Riverside and Morningside Parks. Other partners include Silicon Harlem, the University of Arizona and IBM. The New York City testbed will focus on developing ultra-high bandwidth, low latency wireless communications. It will use frequencies from 2500 MHz to 40

GHz.

The Raleigh Innovation Zone will be split into two areas. One will cover 10.5 square miles, including the North Carolina State University campus, a suburban residential area, and the Lake Wheeler Agricultural Research Station. This zone will house the [Aerial Experimentation and Research Platform for Advanced Wireless](#) (AERPAW), which will focus on developing wireless communications from unmanned drones. An additional 3 square miles, covering a different portion of the university campus and extending into the Town of Cary, will host four fixed towers with wireless transceivers. The Raleigh testbed will be operated by North Carolina State University

in partnership with Wireless Research Center of North Carolina, Mississippi State University, the University of North Carolina at Chapel Hill, the Town of Cary, the City of Raleigh, the North Carolina Department of Transportation, Purdue University, and the University of South Carolina. This testbed will use frequencies from 617 MHz to 40 GHz.

Another Innovation Zone, which [was established by the FCC in September 2019](#), is located in Salt Lake City, Utah. It covers 4 square miles consisting of a portion of the University of Utah campus, a downtown area and a corridor connecting the two. This testbed is a joint project of the University of Utah, Rice University and Salt Lake City. The frequencies used in this testbed range from 698 MHz to 7125 MHz. All of the Innovation Zones are managed by the National Science Foundation's Platforms for Advanced Wireless Research (PAWR) program.

And on June 22, 2021, PAWR [announced](#) the establishment of yet another large testbed, based at Iowa State University in central Iowa. This testbed will be spread across Iowa State University, the City of Ames, and surrounding farms and rural communities. Funded by the National Science Foundation and the U.S. Department of Agriculture, it "will create a multi-modal,

high-capacity wireless mesh network including low Earth orbit (LEO) satellite links, a free-space optical (FSOC) platform, and long-distance millimeter wave (mmWave) and microwave point-to-point communications.”

In 1862 Henry Brooks Adams, grandson of the sixth American president, wrote, “I firmly believe that before many centuries more, science will be the master of man. The engines he will have invented will be beyond his strength to control. Some day science may have the existence of mankind in its power, and the human race commit suicide by blowing up the world.”

The nightmares of sages past are coming true at a dizzying pace. Do we have the ability to face them, and the courage to plot a different course? To stop blaming one another, and realize that no one is in charge. To stop fighting fire with fire, to let the flames of technology die out so that the dormant seeds of nature may reemerge through its cinders to rebeautify the world, before it is too late.

*The last 23 newsletters, including this one, are available for downloading and sharing on the [Newsletters page](#) of the Cellular Phone Task Force. Some of the newsletters are also available there in German, Spanish, Italian and French.*

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