



## **SILICON CHIP**

## Silicon chip will drive next generation communications

A new design of ultra-small silicon chip called a multiplexer will effectively manage terahertz waves which are key to the next generation of communications: 6G and beyond.

Researchers from Osaka University, Japan and the University of Adelaide, Australia have worked together to produce the new multiplexer made from pure silicon for terahertz-range communications in the 300-GHz band.

"In order to control the great spectral bandwidth of terahertz waves, a multiplexer, which is used to split and join signals, is critical for dividing the information into manageable chunks that can be more easily processed and so can be transmitted faster from one device to another," said Associate Professor Withawat Withayachumnankul from the University of Adelaide's School of Electrical and Electronic Engineering.

"Up until now compact and practical multiplexers have not been developed for the terahertz range. The new terahertz multiplexers, which are economical to manufacture, will be extremely useful for ultrabroadband wireless communications."Associate Professor Withawat Withayachumnankul

"The shape of the chips we have developed is the key to combining and splitting channels so that more data can be processed more rapidly. Simplicity is its beauty." People around the world are increasingly using mobile devices to access the internet and the number of connected devices is multiplying exponentially. Soon machines will be communicating with each other in the Internet of Things which will require even more powerful wireless networks able to transfer large volumes of data fast.

Terahertz waves are a portion of the electromagnetic spectrum that has a raw spectral bandwidth that is far broader than that of conventional wireless communications, which is based upon microwaves. The team has developed ultra-compact and efficient terahertz multiplexers, thanks to a novel optical tunnelling process.

"A typical four-channel optical multiplexer might span more than 2000 wavelengths. This would be about two meters in length in the 300-GHz band," said Dr Daniel Headland from the University of Osaka who is lead author of the study.

"Our device is merely 25 wavelengths across, which offers dramatic size reduction by a factor of 6000." The new multiplexer covers a spectral bandwidth that is over 30 times the total spectrum that is allocated in Japan for 4G/LTE, the fastest mobile technology currently available and 5G which is the next generation, combined. As bandwidth is related to data rate, ultrahigh-speed digital transmission is possible with the new multiplexer.

"Our four-channel multiplexer can potentially support aggregate data rate of 48 gigabits per second (Gbit/s), equivalent to that of uncompressed 8K ultrahigh definition video being streamed in real time," said Associate Professor Masayuki Fujita, the team's leader from Osaka University.

"To make the entire system portable, we plan to integrate this multiplexer with resonant tunnelling diodes to provide compact, multi-channel terahertz transceivers."

The modulation scheme employed in the teams' study was quite basic; terahertz power was simply switched on-and-off to transmit binary data. More advanced techniques are available that can squeeze even higher data rates towards 1 Terabit/s into a given bandwidth allocation.

"The new multiplexer can be mass-produced, just like computer chips, but much simpler. So large-scale market penetration is possible," said Professor Tadao Nagatsuma from Osaka University.

"This would enable applications in 6G and beyond, as well as the Internet of Things, and low-probability-ofintercept communications between compact aircraft such as autonomous drones."

This study, which is published in the journal Optica and was financed by the Japan Science and Technology Agency (JST) CREST fund and an Australia Research Council (ARC) Discovery grant, builds on the team's work in 2020 when they created substrate-free, metal-free, silicon micro-photonics for efficient integrated terahertz devices. This innovation opened a pathway to convert existing nanophotonic multiplexers into the terahertz realm.

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About Osaka University Osaka University was founded in 1931 as one of the seven imperial universities of Japan and now has expanded to one of Japan's leading comprehensive universities. The University has now embarked on open research revolution from a position as Japan's most innovative university and among the most innovative institutions in the world according to Reuters 2015 Top 100 Innovative Universities and the Nature Index Innovation 2017. The university's ability to innovate from the stage of fundamental research through the creation of useful technology with economic impact stems from its broad disciplinary spectrum. Website: https://resou.osaka-

website: https://resou.osakau.ac.jp/en

About the University of Adelaide Ranked in the top 1% of universities worldwide and located in the heart of the world's 10th most liveable city, the University of Adelaideoffers the rare combination of elite academic performance and an unrivalled quality of life. Home to 25,000 students and 3,600 staff from around the globe, our student body reflects our diverse international community, made up of 30% international students from more than 100 countries.

https://www.miragenews.com/ silicon-chip-will-drive-nextgeneration-552189/

## SBE CHAPTER 38 OFFICERS

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WEB SITE COMMITTEE: Norbert Miles

SUSTAINING MEMBERSHIP: Antonio Castro

PROGRAM CHAIRMAN: Warren Reeves

> NEWSLETTER: Antonio Castro

EAS CHAIRMAN: David Halperin

EXECUTIVE COMMITTEE: Antonio Castro Bruno Cruz Walter Hanthorn



DATE 4/13/2021

LOCATION: ZOOM MEETING

*MEETING CALLED TO ORDER*: 11:05 AM, BY ANTONIO CASTRO. THERE WERE 18 (EIGHTEEN) ATTENDANTS.

**REPORT OF THE SECRETARY**: MINUTES IN THE MARCH NEWSLET-TER. ACCEPTED BY NORBERT MILES, SECONDED BY MARIO TELLEZ.

**REPORT OF THE TREASURER**: \$4,818.92 IN THE BANK, ACCEPTED BY WARREN REEVES, SECONDED BY MARIO TELLEZ.

**REPORT OF THE CERTIFICATION COMMITTEE:** GLENN LEEFLER OBTAINED HIS CPBE.

**REPORT OF THE MEMBERSHIP COMMITTEE:** WARREN REEVES RETIRED AS WELL AS HIS SUSTAINING MEMBERSHIP.

*REPORT OF THE FREQUENCY COORDINATOR COMMITTEE:* NO REPORT.

REPORT OF THE SCHOLARSHIP COMMITTEE: NO REPORT.

*REPORT OF THE WEBSITE COMMITTEE:* NOW 3194 VS. 3171 EQUAL 23 HITS.

**REPORT OF THE EAS CHAIRMAN**: TEXAS AND NEW MEXICO-MONTHLY TEST WERE FINE.

**REPORT OF THE PROGRAM COMMITTEE:** ALONG WITH THIS CHAP-TER MEETING, WE HAD THE PRESENTATION OF JVCKENWOOD. WILL FIND A PRSENTER FOR MAY MEETING.

*NEW BUSINESS OR ANY ITEMS FOR THE CHAPTER INTEREST:* THE GROUP AGREED TO HAVE THE ENNES WORKSHOP IN THE ZOOM MODE. WILL TALK TO CATHY OROZ TO FIND OUT THE POSIBILITIES..

OTHER NONE.

*NEXT MEETING DATE AND LOCATION*: MAY 11, 2021 AT 11 AM. ZOOM MODE !!

MEETING ADJOURNED: AT 11:15 AM.

## WHO WILL BE THE 2021 SBE CH-38 ENGINEER OF THE YEAR?

WE NEED TO HAVE "ELECTIONS" TO DEFINE WHO WILL REPRESENT US IN THE NATIONAL ROBERT FLANDERS AWARD



Advanced Broadcast

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LAST MONTH OF APRIL IT WAS THE REGULAR CHAPTER MEETING PLUS THE PRESENTATION OF JVCKENWOOD. WITH THE VERY INTERESTING SHOW OF THE JVC ENG CAMERAS. EDGAR SHANE MADE IT IN ZOOM WITH THE THEME: "REMOTE PRODUCTION OVER THE INTERNET".

MR.OSTOS WAS AT THE KFOX CONFERENCE ROOM.

THANK YOU GUYS !!

OUR MEETING FOR THIS MONTH IS GOING TO BE IN THE ZOOM WAY

WHEN: TUESDAY MAY 11, 2021.

PLACE: AT YOUR COMPUTER OR MOBIL.

TIME: 11:00 AM

NO PRESENTATION AT THIS TIME, ONLY DISCUSSION OF SEVERAL ISSUES TO BE RESOLVED. PLEASE ATTEND

