Chapter 38 of the Society of Broadcast Engineers
SBE
EL PASO - LAS CRUCES - JUAREZ

OCTOBER 2018

PO Box 3561 El Paso, TX 79923-3561 www.kint98.com

NEWS

Get ready for ATOMIC radio

Using a laser to detect the effect of radio waves on certain atoms is the basis for a new kind of antenna that resists interference and can receive a wider range of signals.

The basic design of the radio antenna hasn't changed in a century. The antenna is usually a set of metal rods roughly half the size of the wavelength they are designed to receive.

The electric field in a passing radio wave accelerates electrons inside these rods, converting energy from the wave into a tiny electrical current that can be amplified.

But physicists would dearly love to make antennas more capable and more secure. It would be good, for example, if simple antennas could receive a wider range of wavelengths and be more resilient to electromagnetic interference.

Enter David Anderson at Rydberg Technologies in Ann Arbor, Michigan, and a couple of colleagues, who have reinvented the antenna from scratch. Their new device works in an entirely different way from conventional antennas, using a laser to measure the way radio signals interact with certain types of atoms.

The secret sauce in the new device is Rydberg atoms. These are cesium atoms in which the outer electrons are so excited that they orbit the nucleus at great distance. At these distances, the electrons' potential energy levels are extremely closely spaced, and this gives them special properties. Indeed, any small electric field can nudge them from one level to another.

Radio waves consist of alternating electric fields that readily interact with any Rydberg atoms they come across. This makes them potential sensors.

But how to detect this interaction? A gas made of Rydberg atoms has another property that turns out to be useful—it can be made transparent by a laser tuned to a specific frequency. This laser essentially saturates the gas's ability to absorb light, allowing another laser beam to pass through it.

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However, the critical frequency at which this happens depends crucially on the properties of the Rydberg atoms in the gas. When these atoms interact with radio waves, the critical frequency changes in response.

That's the basis of the radio detection. Anderson and co create a gas of cesium atoms excited into Rydberg states. They then use a laser tuned to a specific frequency to make the gas transparent. Finally, they shine a second laser through the gas and measure how much light is absorbed, to see how the transparency varies with ambient radio waves.

The signal from a simple light-sensitive photodiode then reveals the way the radio signals are frequency modulated or amplitude modulated.

And that's it: an antenna consisting of a cloud of excited cesium atoms, zapped by laser light that flickers in time to any ambient radio waves. They call it **atomic radio.**

Anderson and co have put their device through its paces using microwaves and say it works well. "We demonstrate an atom-based receiver for AM and FM micro-wave communication," they say.

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EL PASO, TX SBE CHAPTER 38 MEETING MINUTE

DATE 9/11/2018 LOCATION: COMO'S ITALIAN RESTAURANT

MEETING CALLED TO ORDER: 12:41 PM, BY ANTONIO CASTRO. THERE WERE 5 ATTENDANTS.

REPORT OF THE SECRETARY: MINUTES IN THE SEPTEMBER NEWSLETTER. ACCEPTED BY OWEN SMITH, SECONDED BY DAVID GRICE.

REPORT OF THE TREASURER: $ 3,840.73 IN THE BANK. AFTER PAYING ELIAS VENTANILLA FOR FINANCING THE CATERING AT THE SOUTHWEST UNIVERSITY PARK. ACCEPTED BY NORBERT MILES, SECONDED BY WARREN REEVES.

REPORT OF THE CERTIFICATION COMMITTEE: NO REPORT.

REPORT OF THE MEMBERSHIP COMMITTEE: NO REPORT.

REPORT OF THE FREQUENCY COORDINATOR COMMITTEE: NO REPORT.

REPORT OF THE SCHOLARSHIP COMMITTEE: WAITING FOR RICK VILARDELL TO PROVIDE CANDIDATES, .

REPORT OF THE WEBSITE COMMITTEE: 2382 HITS LAST TIME, NOW 2402 (20).

REPORT OF THE EAS CHAIRMAN: MONTHLY TEST NM WAS FINE, FOR TEXAS, WAS NOT RECEIVED AT KLAQ. NATIONAL TEST TO BE 9/20/19

REPORT OF THE PROGRAM COMMITTEE. THE PRESENTER FOR THE MONTH OF SEPTEMBER IS MEGAN STOCKTON FROM LUMENSERVE.

UNFINISHED BUSINESS: NONE.

NEW BUSINESS OR ANY ITEMS FOR THE CHAPTER INTEREST: PEOPLE AT KTSM VERY BUSSY RELOCATING TO A NEW BUILDING.

NEXT MEETING DATE AND LOCATION: OCTOBER 9, 2018. TIME 11:30 AM AT THE RIO CHINA BUFFET RESTAURANT.

MEETING ADJOURNED: AT 13:05 PM.

THE WILER TRAM IS DOWN !!
WE NEED TO ADDRESS THIS VERY IMPORTANT ISSUE AT OUR NEXT MEETING.
PLEASE ATTEND AND BRING YOUR INPUT !!!!

OCTOBER PROGRAM

IN SEPTEMBER WE HAD OUR REGULAR CHAPTER MEETING AT THE "COMO'S" ITALIAN RESTAURANT.
IT WAS ONE OF THE LOWEST ATTEN-DANCE, BUT, IF WE HAD A PRE-SENTER, I BET IT WILL BE ANOTHER STORY
NOW LET'S SEE THE DIFERENCE IN OUR OCTOBER MEETING.

WHEN:
TUESDAY OCTOBER 9th, 2018

PLACE:
THE ANOTHER WELL KNOWN "RIO CHINA BUFFET, SUNLAND PARK, EL PASO, TX.

TIME:
NOON OR MORE PRECISELY 11:30 PM

SO WE HAVE ENOUGH TIME FOR THE PRESENTATION OF:
LumenServe, Inc.
Bear Poth, founder president and CEO to be present at the meeting.

Thanks for offering the presentation and lunch

Among its advantages over conventional antennas is the huge range of signals it can detect—over four octaves from the C band to the Q band, or wavelengths from 2.5 to 15 centimeters. The antenna itself is a small vapor cell that can create and hold cesium gas excited into Rydberg atoms.

But perhaps most revolutionary is that the detection does not involve conventional radio circuitry. "The atomic radio wave receiver operates by direct real-time optical detection of the atomic response to AM and FM baseband signals, precluding the need for traditional de-modulation and signal-conditioning electronics," say Anderson and co.

That means the device should be more or less insensitive to the kind of electromagnetic interference that can render conventional antennas useless.

To test the device, the team have used it to receive AM and FM microwave signals of a recording of a human voice singing "Mary Had a Little Lamb." "The demonstrated atomic radio exhibits good performance over the entire human audio band," they say.

The new antenna is not perfect. For example, its dynamic range is a little less than usually expected over radio. But the team is optimistic that it can be significantly improved.

Atomic radios are on their way.
Ref: arxiv.org/abs/1808.08589 : An Atomic Receiver for AM and FM Radio Communication