DEPERTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

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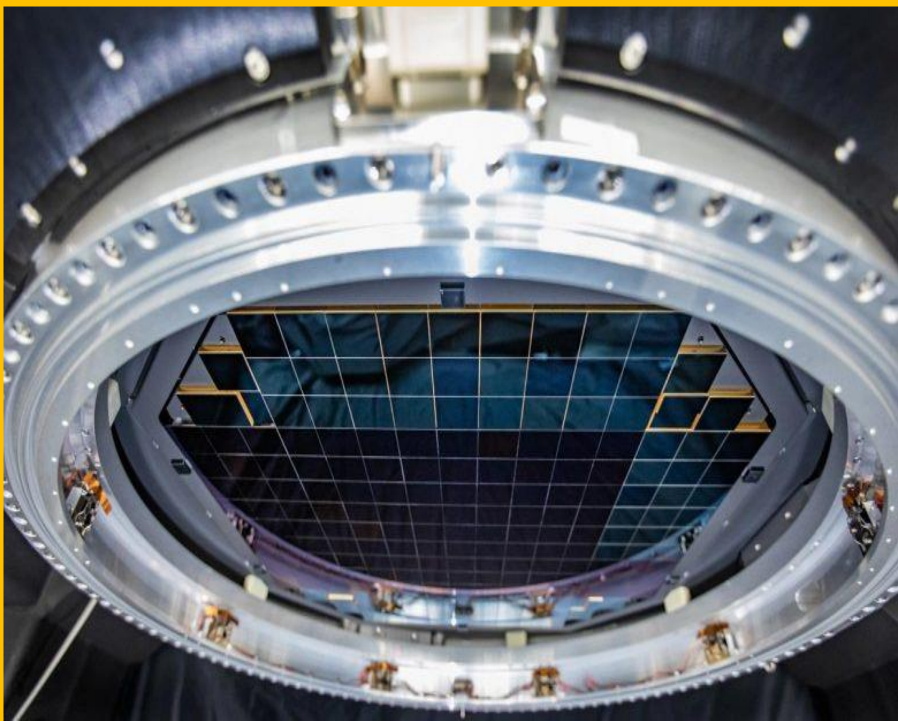
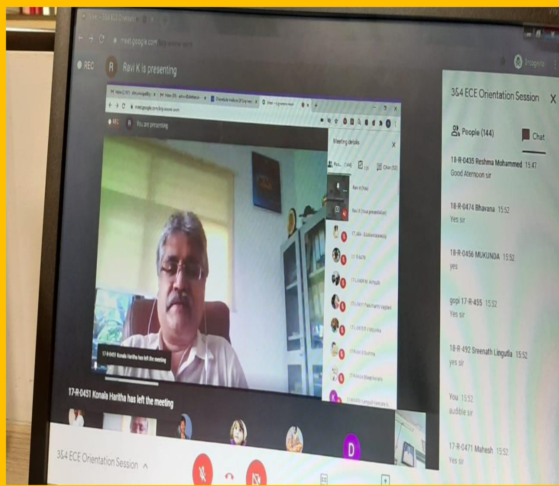


NEWSLETTER

Volume 7 -Issue 2(Aug-Sep)

2020-21



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DHANEKULA INSTITUTE OF ENGINEERING & TECHNOLOGY::GANGURU

Institute Vision

Pioneering Professional Education through Quality.

Institute Mission

1. Quality Education through state-of-art infrastructure, laboratories and committed staff.
2. Moulding Students as proficient, competent, and socially responsible engineering personnel with ingenious intellect.
3. Involving faculty members and students in research and development works for betterment of society.

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Vision

- Pioneering Electronics and Communication Engineering Education & Research to Elevate Rural Community

Mission

- Imparting professional education endowed with ethics and human values to transform students to be competent and committed electronics engineers.
- Adopting best pedagogical methods to maximize knowledge transfer.
- Having adequate mechanisms to enhance understanding of theoretical concepts through practice.
- Establishing an environment conducive for lifelong learning and entrepreneurship development.
- To train as effective innovators and deploy new technologies for service of society.

Principal's Message

Dear Parents and Students,

It is with great pleasure that I welcome you to our College (DIET) Newsletter.

As Principal I am hugely impressed by the commitment of the college and the staff in providing an excellent all-round education for our students with our state of the art facilities. We as a team working together, strongly promote the zeal towards academic achievement among our students. The cultural, sports and other successes of all our students and staff are also proudly celebrated together. I congratulate the staff and students who brought latest technologies and concepts onto the day to day teaching learning platform. As long as our ideas are expressed and thoughts kindled, we can be sure of learning, as everything begins with an idea.

I appreciate every student who shared the joy of participation in co-curricular and extracurricular activities along with their commitment to curriculum. That little extra we do, is the icing on the cake. 'Do more than belong – participate. Do more than care – help. Do more than believe – practice. Do more than be fair – be kind. Do more than forgive – forget. Do more than dream – work.'

With a long and rewarding history of achievement in education behind us, our DIET community continues to move forward together with confidence, pride and enthusiasm.

I hope you enjoy your visit to the website, and should you wish to contact us, please find details at the www.diet.ac.in

Yours in Education,

Dr. Ravi Kadiyala
Principal

HOD's Message

The Department of Electronics & Communication Engineering (ECE) has consistently maintained an exemplary academic record. The greatest asset of the department is its highly motivated and learned faculty. The available diversity of expertise of the faculty with the support of the other staff prepares the students to work in global multicultural environment. The graduates of the Electronics & Communication Stream have been selected by some of the world's leading corporations & as well as by most of the leading Indian counter parts. We hope that we will continue to deliver our best to serve the society and mankind. It is also expected that our students will continue to pass-on the skills which they have developed during their stay at this department to whole of the world for a better society.

Dr.G.L.Madhumati

Professor & HOD

Dept. of ECE

Dhanekula Institute of Engineering & Technology

Editor's Note

Dear Readers,

It gives us great pleasure to bring you the second issue of **Tele-Electro** for the academic year 2020-21, the Department newsletter of Dhanekula Institute of Engineering & Technology, Ganguru.

The name and fame of an institute depends on the caliber and achievements of the students and teachers. The role of a teacher is to be a facilitator in nurturing the skills and talents of students.

This Newsletter is a platform to exhibit the literary skills and innovative ideas of teachers and students. **Tele-Electro** presents the achievements of students and con-tributions of teachers.

We profusely thank the management for giving support and encouragement and a free hand in this endeavour. Last but not the least we are thankful to all the authors who have sent their articles. We truly hope that the pages that follow will make an interesting read.

Mr. N Nagaraju
Faculty Member

G.U.Maheswara Reddy
Student Coordinator

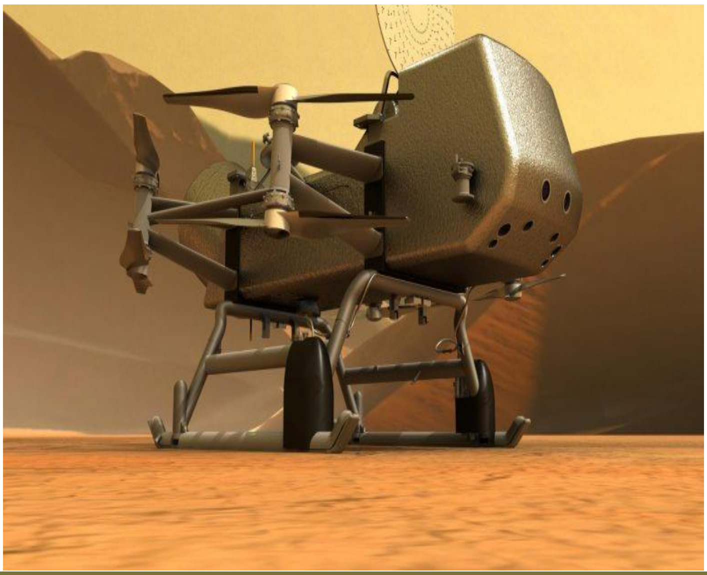
G.Nagaraju
Student Coordinator

STUDENT ARTICLES

NASA Dragonfly Launch Delayed – Revolutionary Mission to Saturn's Moon Titan

Dragonfly is a NASA mission that delivers a rotorcraft to Saturn's moon Titan to advance our search for the building blocks of life. While Dragonfly was originally scheduled to launch in 2026, NASA has requested the Dragonfly team pursue their alternative launch readiness date in 2027. No changes will be needed to the mission architecture to accommodate this new date, and launching at a later date will not affect Dragonfly's science return or capabilities once at Titan.

The decision to pursue the alternative launch date is based on factors external to the Dragonfly project team, including COVID-19's impact on the Planetary Science Division's budget.

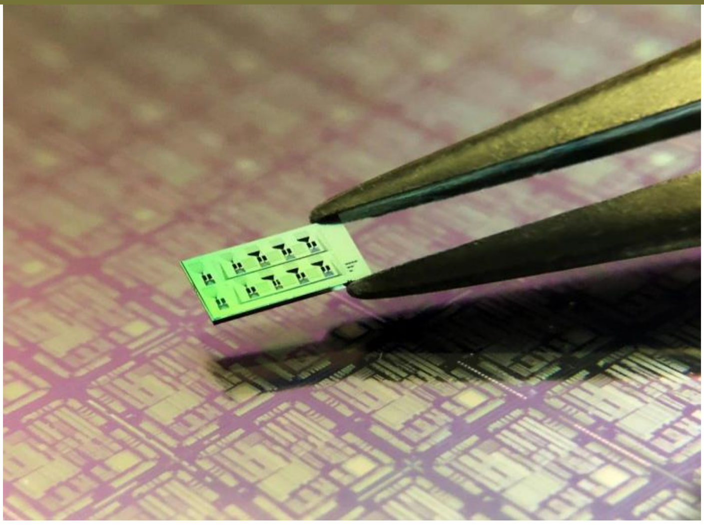


"NASA has the utmost confidence in the Dragonfly team to deliver a successful mission that conducts compelling science," said Lori Glaze, Director for the Planetary Science Division at NASA Headquarters in Washington. "Dragonfly will significantly increase our understanding of this richly organic world and help answer key astrobiology questions in our search to understand the processes that supported the development of life on Earth."

Dragonfly marks the first time NASA will fly a multi-rotor vehicle for science on another planet. Taking advantage of Titan's dense atmosphere – four times denser than Earth's – it will also become the first vehicle ever to fly its entire science payload to multiple locations for repeatable and targeted access to surface materials. By surveying dozens of locations across the icy world, Dragonfly will characterize the habitability of Titan's environment and investigate the progression of its prebiotic chemistry.

Article by
188T1A0402
III-ECE Student

Super-Resolution Imaging: World's Smallest Ultrasound Detector Developed – Smaller Than a Blood Cell



Researchers at Helmholtz Zentrum München and the Technical University of Munich (TUM) have developed the world's smallest ultrasound detector. It is based on miniaturized photonic circuits on top of a silicon chip. With a size 100 times smaller than an average human hair, the new detector can visualize features that are much smaller than previously possible, leading to what is known as super-resolution imaging.

Since the development of medical ultrasound imaging in the 1950s, the core detection technology of ultrasound waves has primarily focused on using piezoelectric detectors, which convert the pressure from ultrasound waves into electric voltage. The imaging resolution achieved with ultrasound depends on the size of the piezoelectric detector employed. Reducing this size leads to higher resolution and can offer smaller, densely packed one or two dimensional ultrasound arrays with improved ability to discriminate features in the imaged tissue or material. However, further reducing the size of piezoelectric detectors impairs their sensitivity dramatically, making them unusable for practical application.

Using computer chip technology to create an optical ultrasound detector

Silicon photonics technology is widely used to miniaturize optical components and densely pack them on the small surface of a silicon chip. While silicon does not exhibit any piezoelectricity, its ability to confine light in dimensions smaller than the optical wavelength has already been widely exploited for the development of miniaturized photonic circuits.

Researchers at Helmholtz Zentrum München and TUM capitalized on the advantages of those miniaturized photonic circuits and built the world's smallest ultrasound detector: the silicon waveguide-etalon detector, or SWED. Instead of recording voltage from piezoelectric crystals, SWED monitors changes in light intensity propagating through the miniaturized photonic circuits.

"This is the first time that a detector smaller than the size of a blood cell is used to detect ultrasound using the silicon photonics technology," says Rami Shnaiderman, developer of SWED. "If a piezoelectric detector was miniaturized to the scale of SWED, it would be 100 million times less sensitive."

Super-resolution imaging

"The degree to which we were we able to miniaturize the new detector while retaining high sensitivity due to the use of silicon photonics was breathtaking," says Prof. Vasilis Ntziachristos, lead of the research team. The SWED size is about half a micron (=0,0005 millimeters). This size corresponds to an area that is at least 10,000 times smaller than the smallest piezoelectric detectors employed in clinical imaging applications. The SWED is also up to 200 times smaller than the ultrasound wavelength employed, which means that it can be used to visualize features that are smaller than one micrometer, leading to what is called super-resolution imaging.

Inexpensive and powerful

As the technology capitalizes on the robustness and easy manufacturability of the silicon platform, large numbers of detectors can be produced at a small fraction of the cost of piezoelectric detectors, making mass production feasible. This is important for developing a number of different detection applications based on ultrasound waves. "We will continue to optimize every parameter of this technology — the sensitivity, the integration of SWED in large arrays, and its implementation in hand-held devices and endoscopes," adds Shnaiderman.

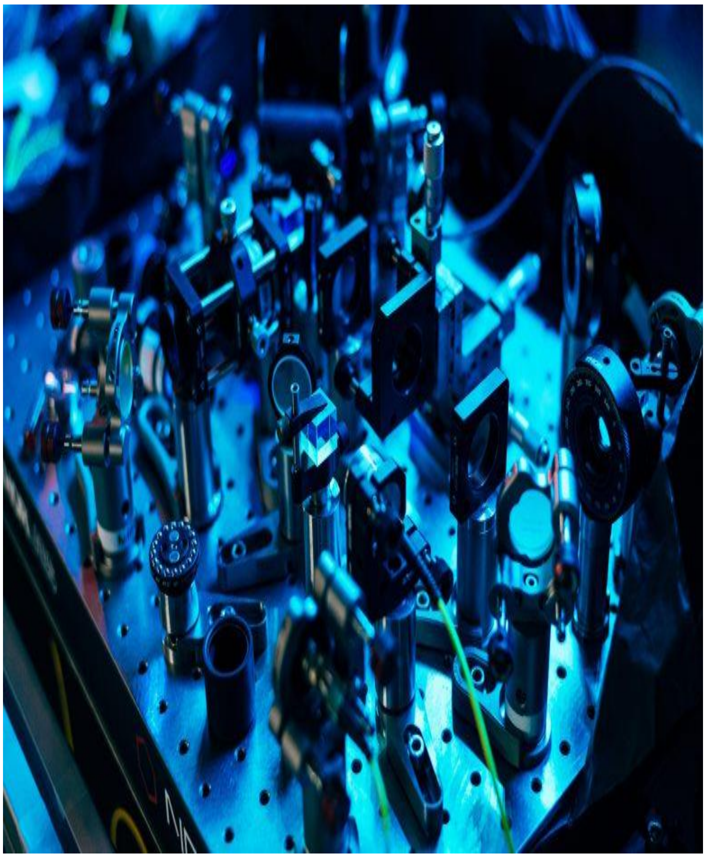
Future development and applications

"The detector was originally developed to propel the performance of optoacoustic imaging, which is a major focus of our research at Helmholtz Zentrum München and TUM. However, we now foresee applications in a broader field of sensing and imaging," says Ntziachristos.

While the researchers are primarily aiming for applications in clinical diagnostics and basic biomedical research, industrial applications may also benefit from the new technology. The increased imaging resolution may lead to studying ultra-fine details in tissues and materials. A first line of investigation involves super-resolution optoacoustic (photoacoustic) imaging of cells and micro-vasculature in tissues, but the SWED could be also used to study fundamental properties of ultrasonic waves and their interactions with matter on a scale that was not possible before.

Article by
188T1A0401
III-ECE Student

Revolutionary Quantum Cryptography Breakthrough Paves Way for Safer Online Communication



The world is one step closer to having a totally secure internet and an answer to the growing threat of cyber-attacks, thanks to a team of international scientists who have created a unique prototype that could transform how we communicate online.

The invention led by the University of Bristol, revealed today in the journal *Science Advances*, has the potential to serve millions of users, is understood to be the largest-ever quantum network of its kind, and could be used to secure people's online communication, particularly in these internet-led times accelerated by the COVID-19 pandemic.

By deploying a new technique, harnessing the simple laws of physics, it can make messages completely safe from interception while also overcoming major challenges that have previously limited advances in this little used but much-hyped technology.

Lead author Dr. Siddarth Joshi, who headed the project at the university's Quantum Engineering Technology (QET) Labs, said: "This represents a massive breakthrough and makes the quantum internet a much more realistic proposition. Until now, building a quantum network has entailed huge cost, time, and resource, as well as often compromising on its security which defeats the whole purpose."

"Our solution is scalable, relatively cheap and, most important of all, impregnable. That means it's an exciting game changer and paves the way for much more rapid development and widespread rollout of this technology."

The current internet relies on complex codes to protect information, but hackers are increasingly adept at outsmarting such systems leading to cyber-attacks across the world which cause major privacy breaches and fraud running into trillions of pounds annually. With such costs projected to rise dramatically, the case for finding an alternative is even more compelling and quantum has for decades been hailed as the revolutionary replacement to standard encryption techniques.

So far physicists have developed a form of secure encryption, known as quantum key distribution, in which particles of light, called photons, are transmitted. The process allows two parties to share, without risk of interception, a secret key used to encrypt and decrypt information. But to date this technique has only been effective between two users.

"Until now efforts to expand the network have involved vast infrastructure and a system which requires the creation of another transmitter and receiver for every additional user. Sharing messages in this way, known as trusted nodes, is just not good enough because it uses so much extra hardware that could leak and would no longer be totally secure," Dr. Joshi said.

The team's quantum technique applies a seemingly magical principle, called entanglement, which Albert Einstein described as 'spooky action at a distance.' It exploits the power of two different particles placed in separate locations, potentially thousands of miles apart, to simultaneously mimic each other. This process presents far greater opportunities for quantum computers, sensors, and information processing.

"Instead of having to replicate the whole communication system, this latest methodology, called multiplexing, splits the light particles, emitted by a single system, so they can be received by multiple users efficiently," Dr. Joshi said.

The team created a network for eight users using just eight receiver boxes, whereas the former method would need the number of users multiplied many times – in this case, amounting to 56 boxes. As the user numbers grow, the logistics become increasingly unviable – for instance 100 users would take 9,900 receiver boxes.

To demonstrate its functionality across distance, the receiver boxes were connected to optical fibers via different locations across Bristol and the ability to transmit messages via quantum communication was tested using the city's existing optical fiber network.

"Besides being completely secure, the beauty of this new technique is its streamline agility, which requires minimal hardware because it integrates with existing technology," Dr. Joshi said.

The team's unique system also features traffic management, delivering better network control which allows, for instance, certain users to be prioritized with a faster connection.

Whereas previous quantum systems have taken years to build, at a cost of millions or even billions of pounds, this network was created within months for less than £300,000. The financial advantages grow as the network expands, so while 100 users on previous quantum systems might cost in the region of £5 billion, Dr. Joshi believes multiplexing technology could slash that to around £4.5 million, less than 1 percent.

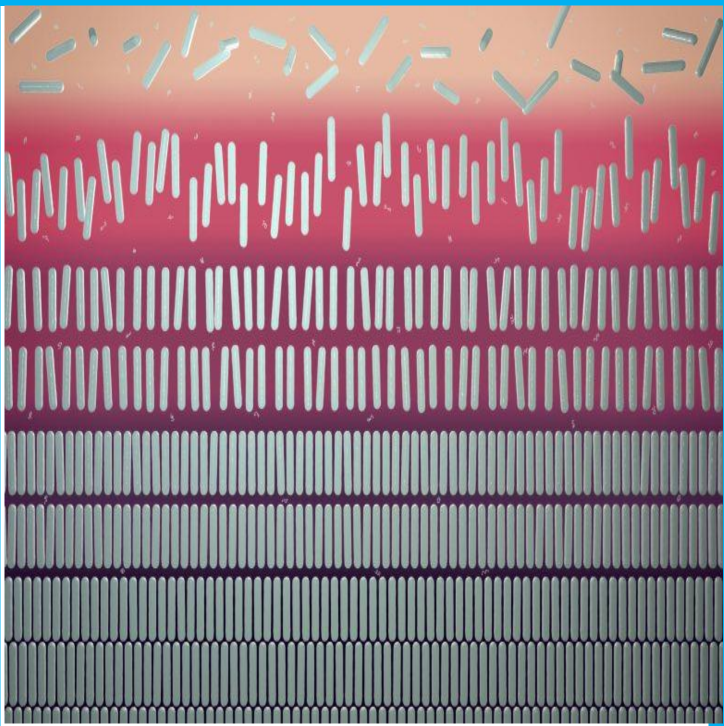
In recent years quantum cryptography has been successfully used to protect transactions between banking centers in China and secure votes at a Swiss election. Yet its wider application has been held back by the sheer scale of resources and costs involved.

"With these economies of scale, the prospect of a quantum internet for universal usage is much less far-fetched. We have proved the concept and by further refining our multiplexing methods to optimize and share resources in the network, we could be looking at serving not just hundreds or thousands, but potentially millions of users in the not too distant future," Dr. Joshi said.

"The ramifications of the COVID-19 pandemic have not only shown importance and potential of the internet, and our growing dependence on it, but also how its absolute security is paramount. Multiplexing entanglement could hold the vital key to making this security a much-needed reality."

Article by
198T5A0414
III-ECE Student

Physicists Break 150-Year-Old Rule for Phase Behaviour



Eindhoven University of Technology researchers found five different phases in mixtures of two substances.

Frozen water can take on up to three forms at the same time when it melts: liquid, ice, and gas. This principle, which states that many substances can occur in up to three phases simultaneously, was explained 150 years ago by the Gibbs phase rule. Today, researchers from Eindhoven University of Technology and University Paris-Saclay are defying this classical theory, with proof of a five-phase equilibrium, something that many scholars considered impossible. This new knowledge yields useful insights for industries that work with complex mixtures, such as in the production of mayonnaise, paint, or LCD's. The researchers have published their results in the journal Physical Review Letters.

The founder of contemporary thermodynamics and physical chemistry is the American physicist Josiah Willard Gibbs. In the 1870s he derived the phase rule, which describes the maximum number of different phases a substance or mixture of substances can assume simultaneously. For pure substances, the Gibbs Phase Rule predicts a maximum of 3 phases.

Professor Remco Tuinier, of the Institute for Complex Molecular Systems: "At the time, Einstein called Gibbs' thermodynamics the only theory he really trusted. If we take water as an example, there is one point, with a specific temperature and pressure, where water occurs as gas, liquid, and ice at the same time. The so-called triple point." Assistant professor Mark Vis, from the same research group as Tuinier, adds: "This classic Gibbs phase rule is as solid as a rock and has never been defied."

Shape matters

According to this phase rule, the mixture studied by the researchers would also exhibit a maximum of three phases at one specific point at the same time. But Tuinier and his colleagues now show that in this mixture there is a whole series of circumstances in which four phases exist at the same time. There is even one point at which there are five coexisting phases. Two too many, according to Gibbs. At that specific one point, also called a five-phase equilibrium, a gas phase, two liquid crystal phases, and two solid phases with 'ordinary' crystals exist simultaneously. And that has never been seen before. "This is the first time that the famous Gibbs rule has been broken," Vis says enthusiastically.

The crux lies in the *shape* of the particles in the mixture. Gibbs did not take this into consideration, but the Eindhoven scientists now show that it is precisely the specific length and diameter of the particles that play a major role. Tuinier: "In addition to the known variables of temperature and pressure, you get two additional variables: the length of the particle in relation to its diameter, and the diameter of the particle in relation to the diameter of other particles in the solution."

Ranked rods

In their theoretical models, the researchers worked with a mixture of two substances in a background solvent: rods and polymers. This is also called a colloidal system, in which the particles are solid and the medium is liquid. Because the particles cannot occupy exactly the same space, they interact with each other. "This is also called the excluded volume effect; it causes the rods to want to sit together. They are, as it were, pushed towards each other by the polymer chains. In this way, you get a region in the mixture that mainly contains rods, and an area that is rich in polymers," explains Tuinier.

He continues: "The rods then sink to the bottom, because they're usually heavier. That's the beginning of segregation, creating phases." The lower part, which mainly contains rods, will eventually become so crowded that the rods will interfere with each other. They then take up a preferential position, so that they are less in each other's way.

With the rods it looks like a neat arrangement next to each other. Eventually you get five different phases, a gas phase with unaligned rods at the top (an isotropic phase), a liquid phase with rods pointing in about the same direction (nematic liquid crystal), a liquid phase with rods lying in different layers (smectic liquid crystal), and two solid phases at the bottom.

Mayonnaise and monitors

Vis: "Our research contributes to the fundamental knowledge about this kind of phase transition and helps to understand and predict more precisely when these kinds of transition occur." And that is useful in many areas. Think of pumping complex mixtures around in industrial reactors, making complex products like colloidal mixtures such as mayonnaise and paint, or ice that forms on car windows and black ice on roads.

Even in liquid crystals in monitors, these processes play a role. "Most industries choose to work with a single-phase system, where there is no segregation. But if the exact transitions are clearly described, then the industry can actually use those different phases instead of avoiding them," says Vis.

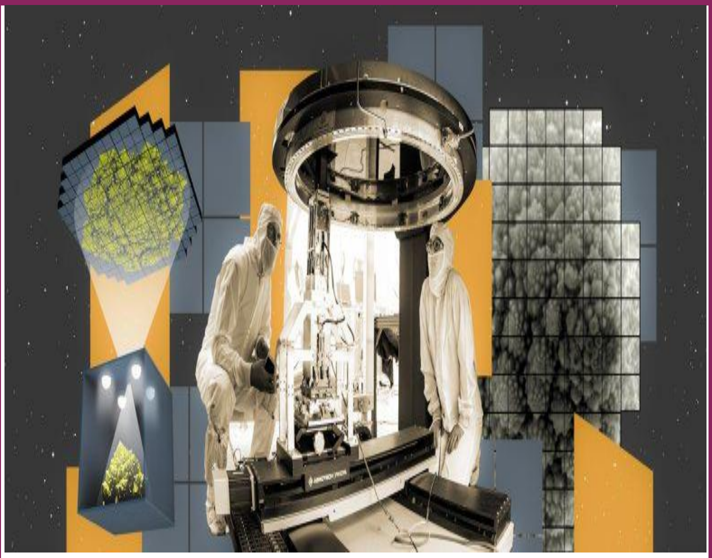
Chance

It was more or less chance that the researchers arrived at an equilibrium of more than three phases. When simulating and programming plate-shaped particles and polymers, PhD students Álvaro González García and Vincent Peters from Tuinier's group saw a four-phase equilibrium. Tuinier: "Álvaro came to me one day and asked me what had gone wrong. Because four phases just couldn't be right."

Then the researchers tried out multiple shapes, such as cubes and also rods. Tuinier: "With the rods, most phases turned out to be possible, we even found a five-phase equilibrium. That could also mean that even more complicated equilibria are possible, as long as you search long enough for complex different particle shapes."

Article by
188T1A04B2
III-ECE Student

World's Largest Digital Camera Snaps First 3,200-Megapixel Images



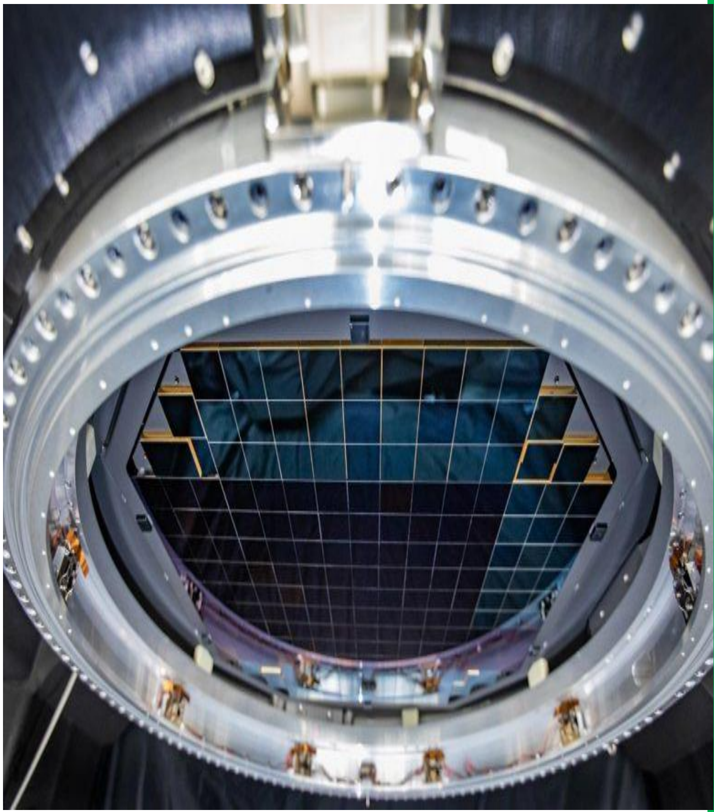
The camera will explore cosmic mysteries as part of the Rubin Observatory's Legacy Survey of Space and Time.

Crews at the Department of Energy's SLAC National Accelerator Laboratory have taken the first 3,200-megapixel digital photos – the largest ever taken in a single shot – with an extraordinary array of imaging sensors that will become the heart and soul of the future camera of Vera C. Rubin Observatory.

The images are so large that it would take 378 4K ultra-high-definition TV screens to display one of them in full size, and their resolution is so high that you could see a golf ball from about 15 miles away. These and other properties will soon drive unprecedented astrophysical research.

Next, the sensor array will be integrated into the world's largest digital camera, currently under construction at SLAC. Once installed at Rubin Observatory in Chile, the camera will produce panoramic images of the complete Southern sky – one panorama every few nights for 10 years.

Its data will feed into the Rubin Observatory Legacy Survey of Space and Time (LSST) – a catalog of more galaxies than there are living people on Earth and of the motions of countless astrophysical objects. Using the LSST Camera, the observatory will create the largest astronomical movie of all time and shed light on some of the biggest mysteries of the universe, including dark matter and dark energy.



The first images taken with the sensors were a test for the camera's focal plane, whose assembly was completed at SLAC in January.

"This is a huge milestone for us," said Vincent Riot, LSST Camera project manager from DOE's Lawrence Livermore National Laboratory. "The focal plane will produce the images for the LSST, so it's the capable and sensitive eye of the Rubin Observatory."

SLAC's Steven Kahn, director of the observatory, said, "This achievement is among the most significant of the entire Rubin Observatory Project. The completion of the LSST Camera focal plane and its successful tests is a huge victory by the camera team that will enable Rubin Observatory to deliver next-generation astronomical science."

A technological marvel for the best science

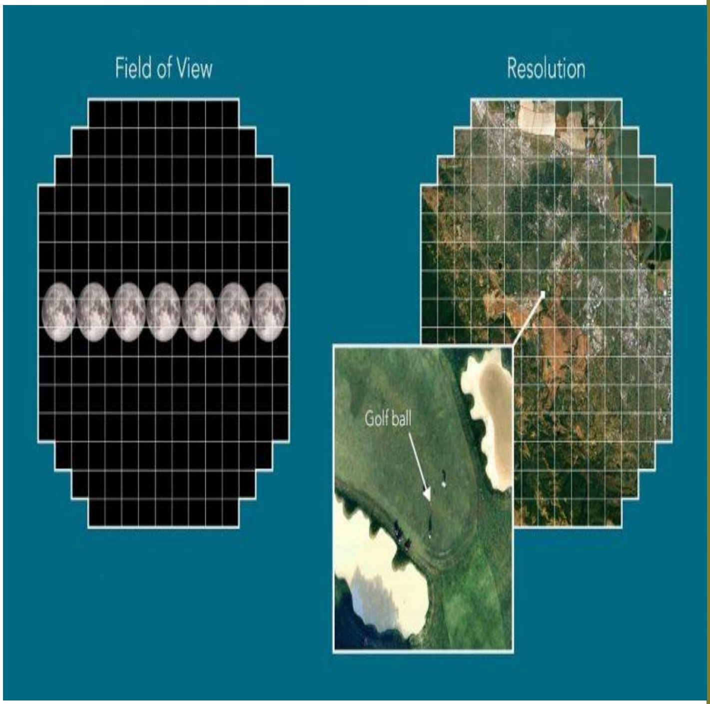
In a way, the focal plane is similar to the imaging sensor of a digital consumer camera or the camera in a cell phone: It captures light emitted from or reflected by an object and converts it into electrical signals that are used to produce a digital image. But the LSST Camera focal plane is much more sophisticated. In fact, it contains 189 individual sensors, or charge-coupled devices (CCDs), that each bring 16 megapixels to the table – about the same number as the imaging sensors of most modern digital cameras.

Sets of nine CCDs and their supporting electronics were assembled into square units, called "science rafts," at DOE's Brookhaven National Laboratory and shipped to SLAC. There, the camera team inserted 21 of them, plus an additional four specialty rafts not used for imaging, into a grid that holds them in place.

The focal plane has some truly extraordinary properties. Not only does it contain a whopping 3.2 billion pixels, but its pixels are also very small – about 10 microns wide – and the focal plane itself is extremely flat, varying by no more than a tenth of the width of a human hair. This allows the camera to produce sharp images in very high resolution. At more than 2 feet wide, the focal plane is enormous compared to the 1.4-inch-wide imaging sensor of a full-frame consumer camera and large enough to capture a portion of the sky about the size of 40 full moons. Finally, the whole telescope is designed in such a way that the imaging sensors will be able to spot objects 100 million times dimmer than those visible to the naked eye – a sensitivity that would let you see a candle from thousands of miles away.

"These specifications are just astounding," said Steven Ritz, project scientist for the LSST Camera at the University of California, Santa Cruz. "These unique features will enable the Rubin Observatory's ambitious science program."

Over 10 years, the camera will collect images of about 20 billion galaxies. "These data will improve our knowledge of how galaxies have evolved over time and will let us test our models of dark matter and dark energy more deeply and precisely than ever," Ritz said. "The observatory will be a wonderful facility for a broad range of science – from detailed studies of our solar system to studies of faraway objects toward the edge of the visible universe.”



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A high-stakes assembly process

The completion of the focal plane earlier this year concluded six nerve-wracking months for the SLAC crew that inserted the 25 rafts into their narrow slots in the grid. To maximize the imaging area, the gaps between sensors on neighboring rafts are less than five human hairs wide. Since the imaging sensors easily crack if they touch each other, this made the whole operation very tricky.

The rafts are also costly – up to $3 million apiece.

SLAC mechanical engineer Hannah Pollek, who worked at the front line of sensor integration, said, “The combination of high stakes and tight tolerances made this project very challenging. But with a versatile team we pretty much nailed it.”

Inserting rafts into the focal plane of the LSST Camera was a high-stakes operation that took about six months. Credit: Olivier Bonin/SLAC National Accelerator Laboratory

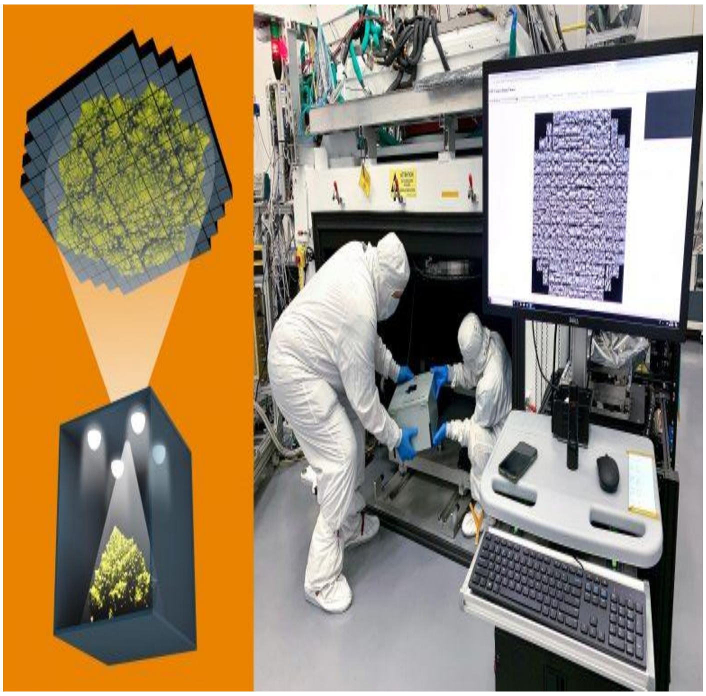
The team members spent a year preparing for the raft installation by installing numerous “practice” rafts that did not go into the final focal plane. That allowed them to perfect the procedure of pulling each of the 2-foot-tall, 20-pound rafts into the grid using a specialized gantry developed by SLAC’s Travis Lange, lead mechanical engineer on the raft installation.

Tim Bond, head of the LSST Camera Integration and Test team at SLAC, said, “The sheer size of the individual camera components is impressive, and so are the sizes of the teams working on them. It took a well-choreographed team to complete the focal plane assembly, and absolutely everyone working on it rose to the challenge.”

Taking the first 3,200-megapixel images

The focal plane has been placed inside a cryostat, where the sensors are cooled down to negative 150 degrees Fahrenheit, their required operating temperature. After several months without lab access due to the coronavirus pandemic, the camera team resumed its work in May with limited capacity and following strict social distancing requirements.

Extensive tests are now underway to make sure the focal plane meets the technical requirements needed to support Rubin Observatory's science program.



Taking the first 3,200-megapixel images of a variety of objects, including a head of Romanesco – a type of broccoli – that was chosen for its very detailed surface structure, was one of these tests. To do so without a fully assembled camera, the SLAC team used a 150-micron pinhole to project images onto the focal plane. These photos, which can be explored in full resolution online (links at the bottom of the release), show the extraordinary detail captured by the imaging sensors.

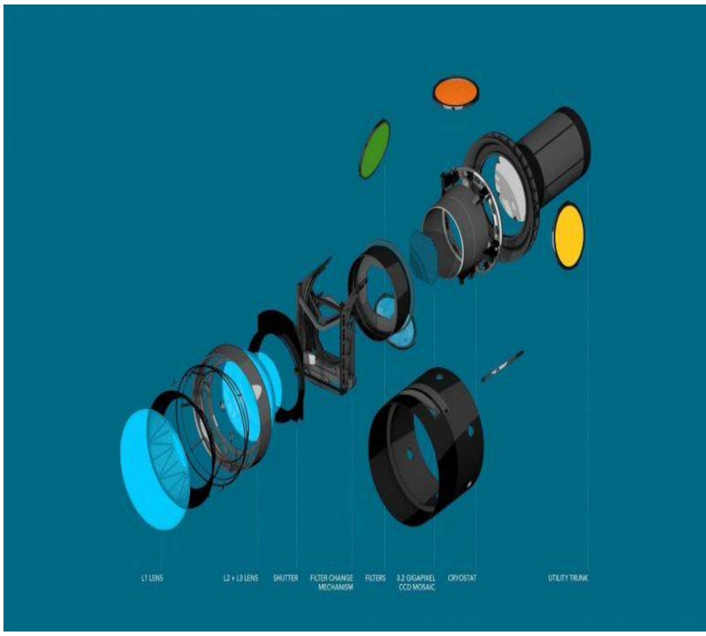
"Taking these images is a major accomplishment," said SLAC's Aaron Roodman, the scientist responsible for the assembly and testing of the LSST Camera. "With the tight specifications we really pushed the limits of what's possible to take advantage of every square millimeter of the focal plane and maximize the science we can do with it."

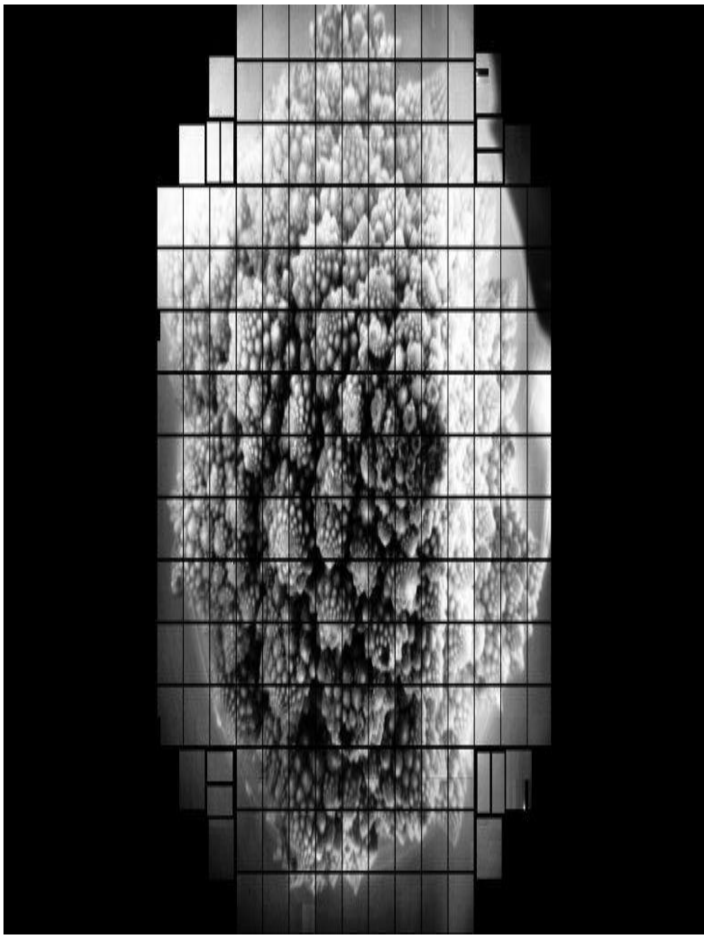
Camera team on the home stretch

More challenging work lies ahead as the team completes the camera assembly.

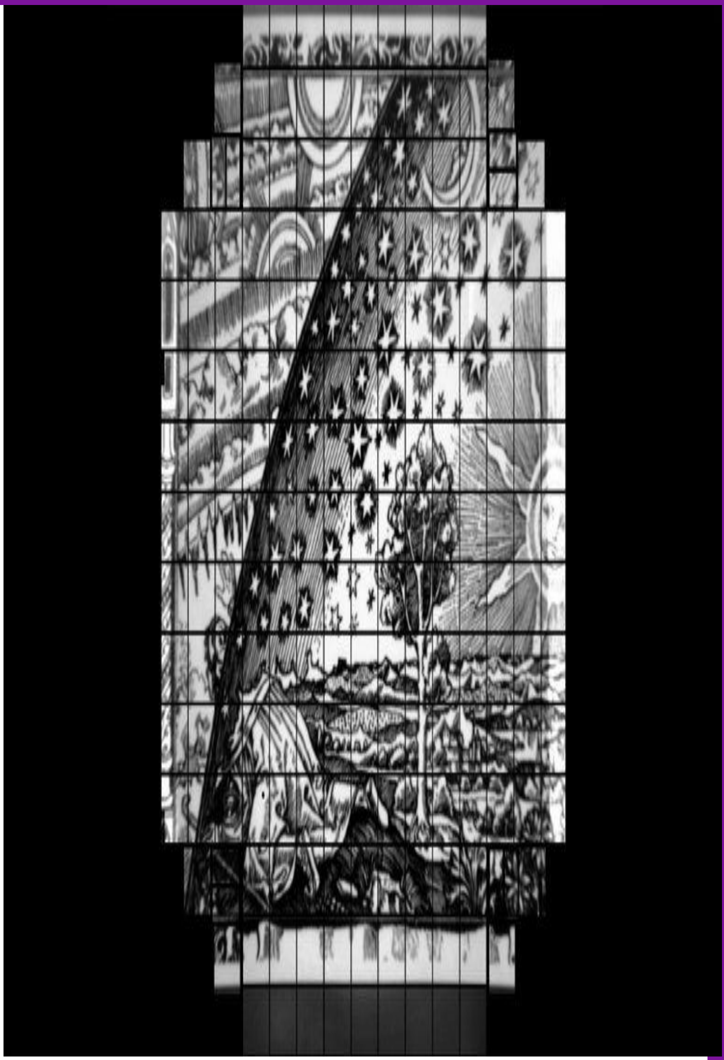
In the next few months, they will insert the cryostat with the focal plane into the camera body and add the camera's lenses, including the world's largest optical lens, a shutter and a filter exchange system for studies of the night sky in different colors. By mid-2021, the SUV-sized camera will be ready for final testing before it begins its journey to Chile.

"Nearing completion of the camera is very exciting, and we're proud of playing such a central role in building this key component of Rubin Observatory," said JoAnne Hewett, SLAC's chief research officer and associate lab director for fundamental physics. "It's a milestone that brings us a big step closer to exploring fundamental questions about the universe in ways we haven't been able to before."

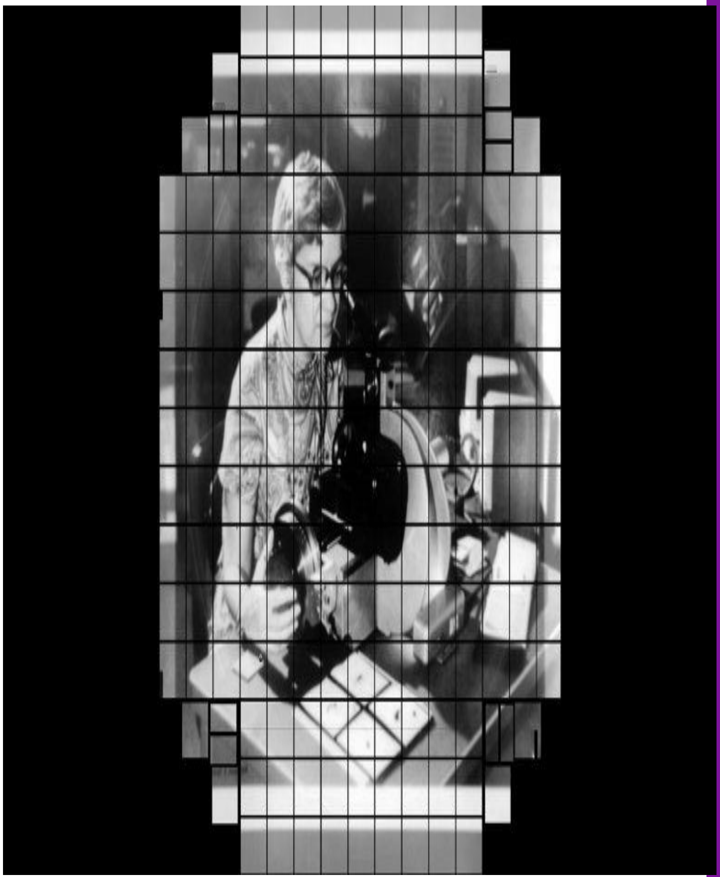




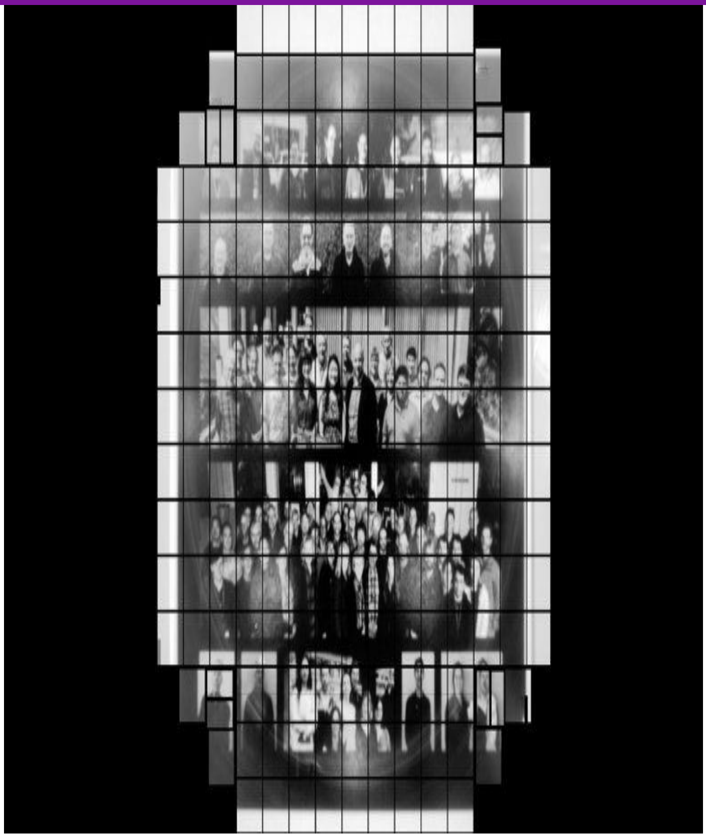
Head of Romanesco



Flammarion Engraving

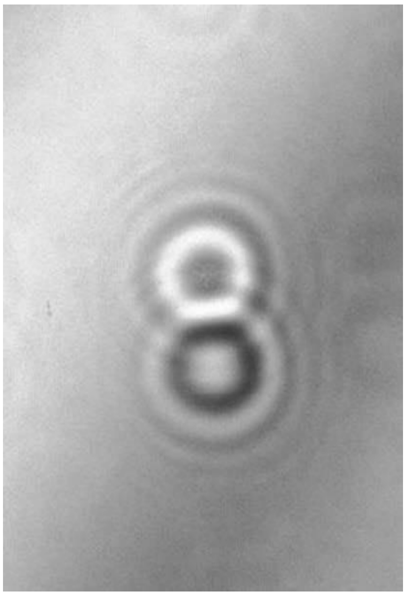


Vera Rubin



Collage of LSST Camera team photos

Detailed Features of the Pinhole Projector Images



Diffraction rings:

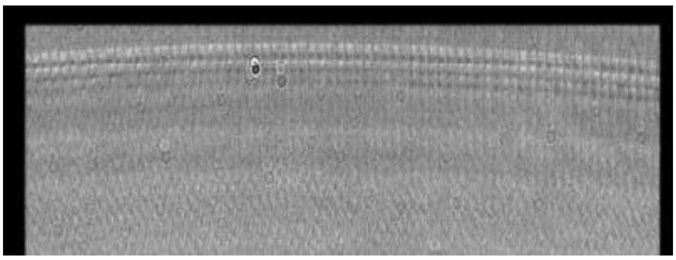
These are caused by small dust particles or tiny defects on the vacuum window. They show up as diffraction rings because the pin hole projector produces a very collimated optical beam, much different than the F#1.23 beam we have in the Rubin Observatory. Rubin Observatory images will not have such diffraction rings. Also the current vacuum window is a test window. The final cryostat window is the third Camera lens and has been made to a higher optical standard than the test window. It will be installed later this year.

These diffraction rings come in pairs because we have applied a simple illumination correction, made from a calibration image taken of a blank piece of paper. For each image we had to remove and replace the pin hole projector, so these rings do not line up perfectly between the two images.

Cosmic rays:

You can also see many cosmic rays in the images; these are small bright spots or short streaks in the images from secondary electrons or muons. These occur in all astronomical images, and in Rubin Observatory images will be detected and masked.

These images were taken with long 600 second exposures, compared to the 15 second exposures planed for our survey, and the longer the exposure the more cosmic rays.



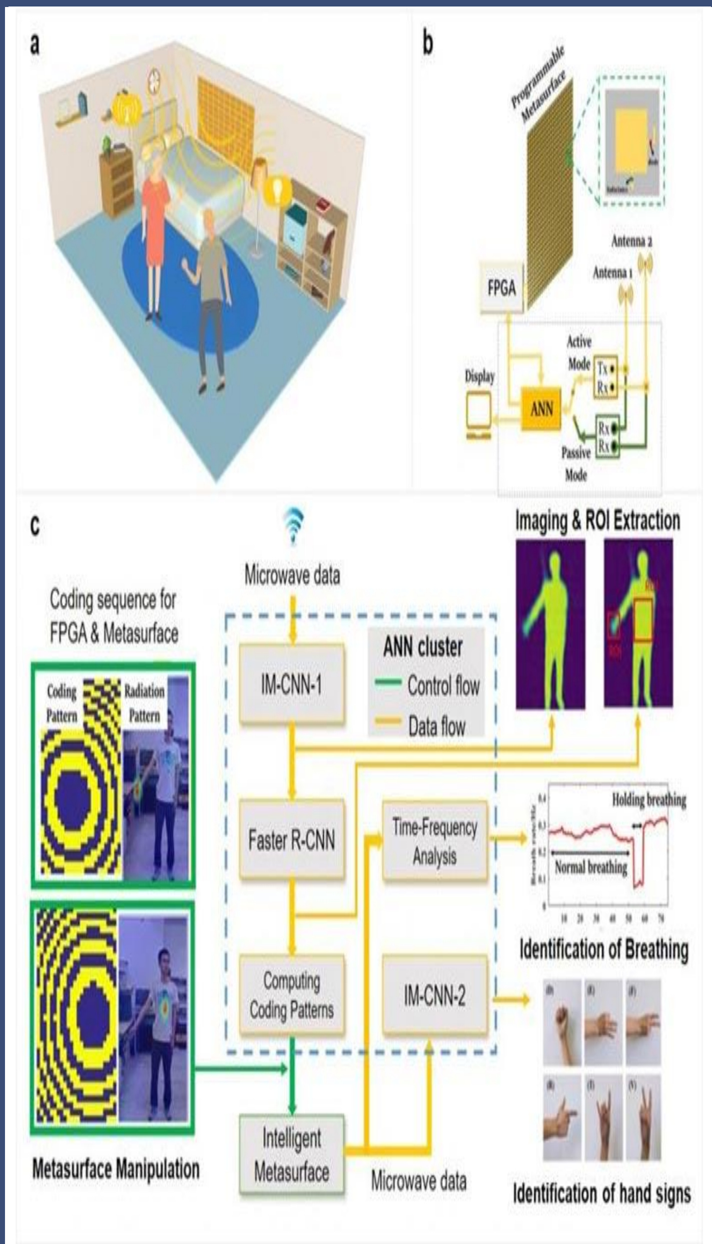
Reflection:

Lastly, there is a circular reflection in these images, coming from the inside of the cryostat. Light from the telescope will be shielded, or baffled, by the full LSST Camera, and should not reach this part of the cryostat.

Article by
178T1A0411
IV-ECE Student

FACULTY ARTICLES

Intelligent Metasurface Imager Can Remotely Monitor People Using Radio-Frequency Probe Signals



The Internet of Things (IoT) and cyber physical systems have opened up possibilities for smart cities and smart homes, and are changing the way for people to live. In this smart era, it is increasingly demanded to remotely monitor people in daily life using radio-frequency probe signals. However, the conventional sensing systems can hardly be deployed in real-world settings since they typically require objects to either deliberately cooperate or carry an active wireless device or identification tag. Additionally, the existing sensing systems are not adaptive or programmable to specific tasks. Hence, they are far from efficient in many points of view, from time to energy consumptions.

In a **paper** published in *Light Science & Application*, scientists from the State Key Laboratory of Advanced Optical Communication Systems and Networks, Department of Electronics, Peking University, China, the State Key Laboratory of Millimeter Waves, Southeast University, China, and co-workers developed an AI-driven smart metasurface for jointly controlling the EM waves on the physical level and the EM data flux on the digital pipeline. Based on the metasurface, they designed an inexpensive intelligent EM "camera," which has robust performance in realizing instantaneous in-situ imaging of full scene and adaptive recognition of the hand signs and vital signs of multiple non-cooperative people. More interestingly, the EM camera works very well even when it is passively excited by stray 2.4GHz Wi-Fi signals that ubiquitously exist in the daily lives. As such, their intelligent camera allows us to remotely "see" what people are doing, monitor how their physiological states change, and "hear" what people are talking without deploying any acoustic sensors, even when these people are non-cooperative and are behind obstacles. The reported method and technique will open new avenues for future smart cities, smart homes, human-device interactive interfaces, health monitoring, and safety screening, without causing the visual privacy problems.

The intelligent EM camera is centered around a smart metasurface, i.e., a programmable metasurface empowered with a cluster of artificial neural networks (ANNs). The metasurface can be manipulated to generate the desired radiation patterns corresponding to different sensing tasks, from data acquisition to imaging, and to automatic recognition. It can support various kinds of successive sensing tasks with a single device in real-time. These scientists summarize the operational principle of their camera:

"We design a large-aperture programmable coding metasurface for three purposes in one: (1) to perform in-situ high-resolution imaging of multiple people in a full-view scene; (2) to rapidly focus EM fields (including ambient stray Wi-Fi signals) to selected local spots and avoid undesired interferences from the body trunk and ambient environment; and (3) to monitor the local body signs and vital signs of multiple non-cooperative people in real-world settings by instantly scanning the local body parts of interest."

"Since the switching rate of metasurface is remarkably faster than that of body changing (vital sign and hand sign) by a factor of ~ , the number of people monitored in principle can be very large" they added.

"The presented technique can be used to monitor the notable or non-notable movements of non-cooperative people in the real world but also help people with profound disabilities remotely send commands to devices using body languages. This breakthrough could open a new venue for future smart cities, smart homes, human-device interactive interface, health monitoring, and safety screening without causing privacy issues," the scientists forecast.

Article by
Md. Abdul Aziz
ECE Faculty

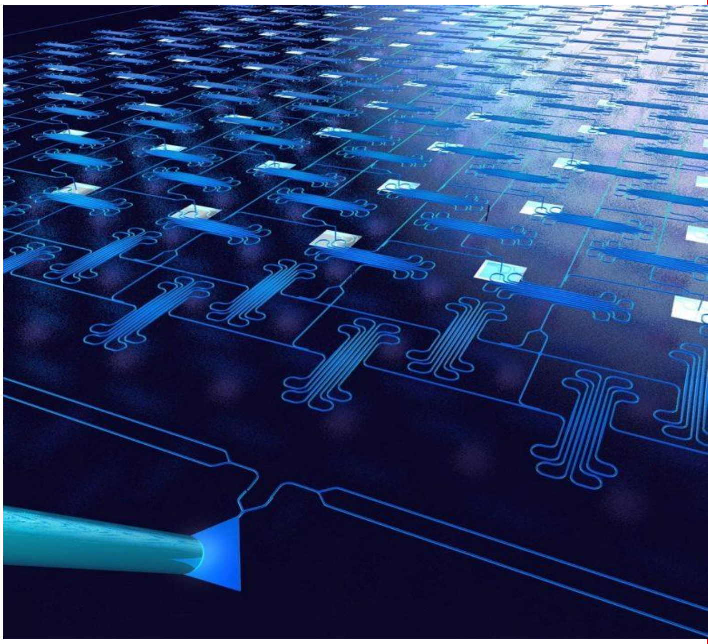
Hand-Held Microwave Imaging – To See Through Walls or Detect Tumors

Washington — Researchers have developed a new microwave imager chip that could one day enable low-cost handheld microwave imagers, or cameras. Because microwaves can travel through certain opaque objects, the new imagers could be useful for imaging through walls or detecting tumors through tissue in the body.

In *Optica*, The Optical Society's (OSA) journal for high-impact research, the researchers describe how they used a standard semiconductor fabrication process to make a microwave imager chip containing more than 1,000 photonic components. The square chip measures just over 2 millimeters on each side, making it about half the width of a pencil eraser.

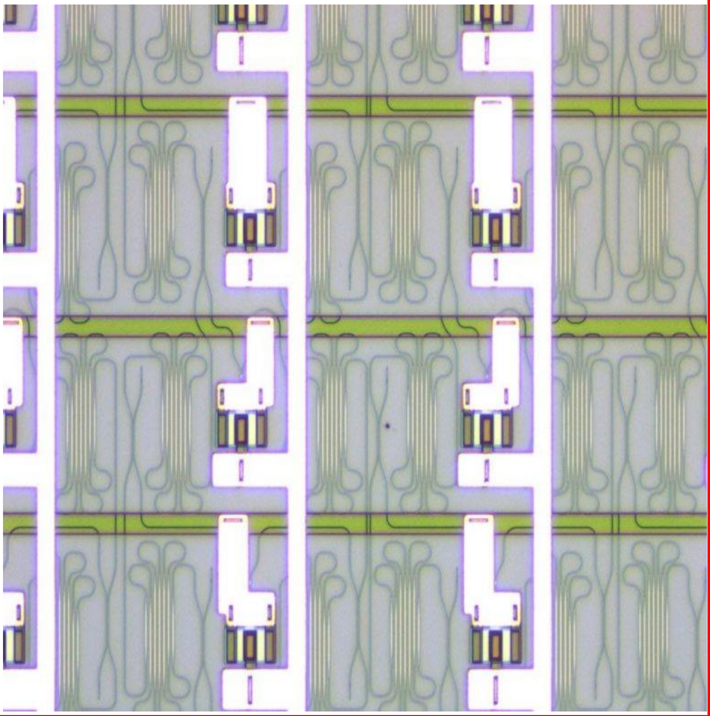
"Today's practical microwave imagers are bench-top systems that are bulky and expensive," said research team leader Firooz Aflatouni from the University of Pennsylvania, USA. "Our new near-field imager uses optical, rather than electronic, devices to process the microwave signal. This enabled us to make a chip-based imager similar to the optical camera chips in many smartphones."

Hand-held near-field microwave imagers would be useful for many applications including high-resolution brain imaging and monitoring heart motion and breathing. Miniaturization of microwave imagers would also benefit applications such as tracking objects in radar systems and low-power, high-speed communication links.



Optical processing used to create microwave images

Optical cameras like the ones in smartphones use a lens to form an image on the camera's image sensor. The new near-field imager uses four antennas to receive microwave signals reflected from an object. These microwave signals are then encoded into an optical signal and are optically processed — emulating a microwave lens — to form an image.



The chip-based imager includes more than 1,000 photonic components such as waveguides, directional couplers, photodiodes and ring modulators. One of the essential components is the optical delay element network used for signal processing, which consists of more than 280 delay cells.

"This system is significantly smaller and more efficient than its electronic equivalent because the delay cells are more than 10 times smaller and more than 10 times more efficient," said Farshid Ashtiani, a graduate student in Aflatouni's group and coauthor on the paper. "They can also operate with significantly shorter microwave pulses, which produces higher imaging resolution."

Demonstrating the microwave imager

To demonstrate the new chip, the researchers used it to image objects with metallic surfaces, including metallic squares measuring 24 centimeters on each side and the UPenn logo. After short microwave pulses illuminated each object placed in front of the imager, the four antennas received the reflected signals, which were used to form the image of each target object.

"Our work shows that standard semiconductor fabrication techniques can be used to create robust photonic systems containing many devices," said Aflatouni. "The tiny imager chip we demonstrated can be scaled up, enabling realization of low-cost handheld high-resolution microwave imagers."

Now that they've demonstrated a chip-based microwave imager, the researchers plan to increase the number of pixels by upping the number of on-chip delay lines, using more advanced fabrication technologies and stitching together smaller images. They also want to use shorter microwave pulses to achieve higher resolution.

Article by
M.Venkateswara Rao
ECE Faculty

Orientation Program

The Electronics and Communication Engineering department had conducted orientation program on "online classes" for 1st Semester II, III, IV year students during the AY: 2020-2021. Our College Principal Dr. Ravi Kadiyala addressing the students and parents.

Seminars

One of the ECE department faculty "K.Radha" has given a seminar on "Online Pedagogy" in the month of september-2020.

Faculty Achievements

One of the ECE department faculty "M.Venkatesara Rao" awarded Ph.D in Metamaterial Microwave Antennas form KL University, Vijayawada.

NSS EVENTS

DHANEKULA INSTITUTE OF ENGINEERING & TECHNOLOGY

NSS CELL

EVENT REPORT

Date	**22-09-2020**
Event Name	**Webinar on “Creating Awareness on NEP 2020”**
Venue	**Online (Google Meet)**
Participants	**1014**

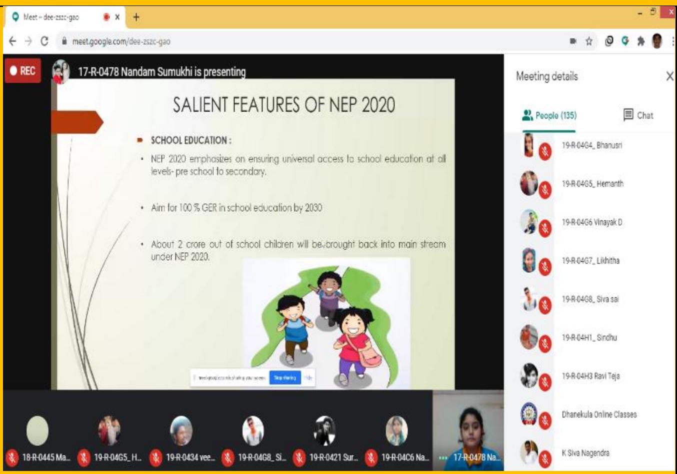
DESCRIPTION

As the Ministry of Education, Government of India has recently announced a New Education Policy (NEP) 2020, the college NSS Unit by instructions from the government of India has organized a Webinar on “Creating Awareness on NEP 2020” within the Institution.

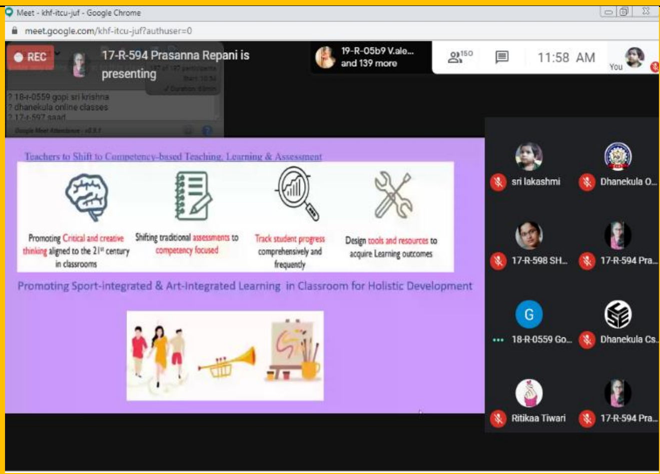
The webinar has been organized individually by the various departments with the help of student NSS volunteers. The volunteers have prepared presentations and have explained the various salient features of NEP 2020 in detail to the students and staff of the department. The volunteers have emphasized on the various drawbacks of the previous education policy and how the new education policy is able to overcome them and providing all round holistic personality development of each individual in the learning process.

Approximately 1014 total number of students and staff have participated in and around 07 Webinars conducted within the institution and learned about the positive outcomes of the NEP 2020. All the students and staff expressed their strong belief on NEP 2020 in building a better future for the further generations.

Event PICS with Description



Student Volunteer explaining the Salient Features of NEP 2020 in primary and higher education.



Student Volunteer explaining about Competency based teaching, learning and assessment.

DHANEKULA INSTITUTE OF ENGINEERING & TECHNOLOGY

GANGURU, VIJAYAWADA – 521139

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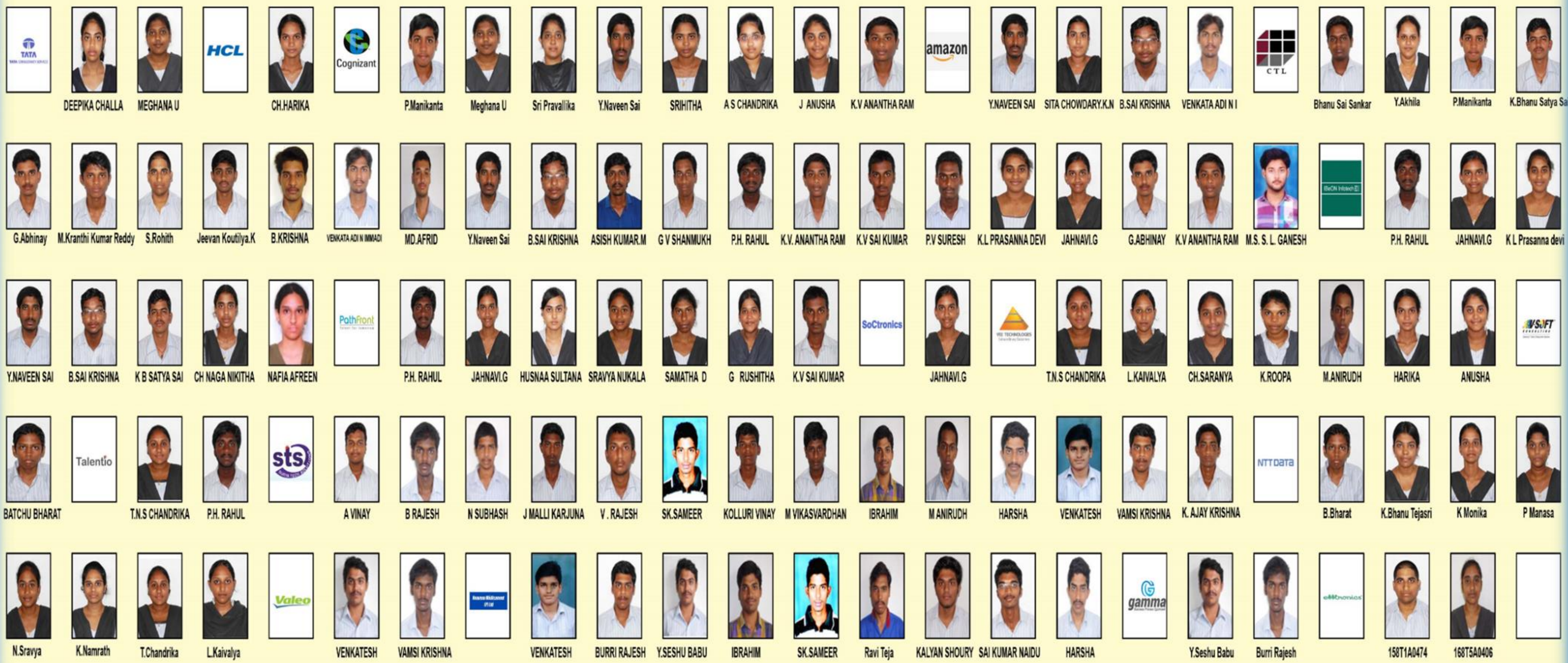
DEPARTMENT OF ECE

TRAINING, PLACEMENT & CAREER GUIDANCE CELL

WORDS REALLY FAIL TO EXPRESS OUR JOY AT THE NEWS OF YOUR SELECTION FOR THE REPUTED ORGANISATIONS RANGING FROM NATIONAL REPUTATION AND INTERNATIONAL RECOGNITION. YOUR SELECTION WAS HOWEVER, NO SURPRISE BECAUSE YOUNG AND TALENTED TECHNOCRATS OF YOUR CALIBER AND SUPERIOR INTELLIGENCE WERE BOUND TO FARE EXCELLENTLY.



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