

Sept  
2020

# समाचार पत्रों से चयित अंश Newspapers Clippings

A Daily service to keep DRDO Fraternity abreast with DRDO Technologies, Defence Technologies, Defence Policies, International Relations and Science & Technology

Volume: 45 Issue: 224 24 September 2020



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# DRDO Technology News



Press Information Bureau  
Government of India

Ministry of Defence

*Wed, 23 Sept 2020 2:32PM*

## Laser Guided ATGM Successfully Test-fired

Laser Guided Anti Tank Guided Missile (ATGM) was successfully test fired from MBT Arjun Tank at KK Ranges, Armoured Corps Centre and School (ACC&S) Ahmednagar on 22nd Sep 2020. In these tests, the ATGM successfully defeated a target located at 3 km. Laser guided ATGMs lock and track the targets with the help of laser designation to ensure precision hit accuracy.

The missile employs a tandem HEAT warhead to defeat Explosive Reactive Armour (ERA) protected armoured vehicles. It has been developed with multiple-platform launch capability and is currently undergoing technical evaluation trials from gun of MBT Arjun.

Armament Research & Development Establishment (ARDE) Pune in association with High Energy Materials Research Laboratory (HEMRL) Pune, and Instruments Research & Development Establishment (IRDE) Dehradun have developed the missile.

Raksha Mantri Shri Rajnath Singh congratulated DRDO for the successfully test firing of the Laser Guided Anti Tank Guided Missile from MBT Arjun at KK Ranges.

Secretary DDR&D & Chairman DRDO congratulated DRDO personnel and industry on the successful test firing.



<https://www.pib.gov.in/PressReleasePage.aspx?PRID=1658134>



## लेजर गाइडेड एंटी टैंक गाइडेड मिसाइल का सफल परीक्षण किया

लेजर गाइडेड एंटी टैंक गाइडेड मिसाइल (एटीजीएम) का सफलतापूर्वक परीक्षण 22 सितंबर 2020 को अहमदनगर में केके रेंज, आर्मर्ड कॉर्प्स सेंटर एंड स्कूल (एसीसीएंडएस) में एमबीटी अर्जुन टैंक से किया गया। इन परीक्षणों में, एटीजीएम ने 3 किलोमीटर की दूरी पर स्थित लक्ष्य को सफलतापूर्वक अपना निशाना बनाया। लेजर गाइडेड एटीजीएम डेजिगनेशन की सहायता से अपने निर्धारित लक्ष्य पर जाकर सटीकता से हमला करना सुनिश्चित करती है।

इसके अलावा इसमें हीट (हाई स्पीड एक्सपेंडेबल एरियल टारगेट) वारहेड के जरिए एक्सप्लोसिव रिपेक्टिव आर्मर (ईआरए) प्रोटेक्टेड वेहिकल्स (बख्तरबंद वाहनों) को भी उड़ाने की क्षमता है। एटीजीएम को कई-प्लेटफॉर्म लॉन्च क्षमता के साथ विकसित किया गया है और वर्तमान में एमबीटी अर्जुन में लगी बंदूक से फायर कर इसका तकनीकी मूल्यांकन किया जा रहा है।

आर्मामेंट रिसर्च एंड डेवलपमेंट एस्टेब्लिशमेंट (एआरडीई) पुणे ने हाई एनर्जी मेटेरियल रिसर्च लेबोरेटरी (एचईएमआरएल) पुणे और इंस्ट्रूमेंट्स रिसर्च एंड डेवलपमेंट एस्टेब्लिशमेंट (आईआरडीई) देहरादून के सहयोग से यह मिसाइल विकसित की है।

रक्षामंत्री राजनाथ सिंह ने रक्षा अनुसंधान और विकास संगठन-डीआरडीओ को केके रेंज में एमबीटी अर्जुन से लेजर गाइडेड टैंक रोधी मिसाइल के सफलतापूर्वक परीक्षण के लिए बधाई दी है।

रक्षा अनुसंधान और विकास निदेशालय के सचिव तथा रक्षा अनुसंधान और विकास संगठन के अध्यक्ष ने डीआरडीओ कर्मियों के कठिन परिश्रम और इस सफलतापूर्वक परीक्षण के लिए बधाई दी है।



<https://pib.gov.in/PressReleasePage.aspx?PRID=1658342>



Wed, 23 Sept 2020 2:32PM

## లేజర్ గైడెడ్ ఎటిజిఎం విజయవంతంగా పరీక్ష

లేజర్ గైడెడ్ యాంటీ ట్యాంక్ గైడెడ్ క్షిపణి (ఎటిజిఎం) ను 2020 సెప్టెంబర్ 22 న అహ్మద్ నగర్ లోని ఆర్మర్డ్ కార్ప్స్ సెంటర్ మరియు స్కూల్ (ఎసిసి & ఎస్) కెకె రేంజి వద్ద నుండి ఎంబిటి అర్బుస్ ట్యాంక్ ద్వారా విజయవంతంగా పరీక్షించారు. ఈ పరీక్షలలో, 3 కిలోమీటర్ల దూరంలో ఉన్న లక్ష్యాన్ని ఎటిజిఎం విజయవంతంగా చేదించింది. లేజర్ గైడెడ్ ఎటిజిఎం లు లేజర్ సూచించిన దిశగా ఖచ్చితమైన గురిని నిర్ధారించుకుని లక్ష్యాలను లాక్ చేసి ట్రాక్ చేస్తాయి. ఎక్స్ప్లోజివ్ రియాక్టివ్ ఆర్మర్ (ERA) రక్షిత సాయుధ వాహనాలను ధ్వంసం చేయడానికి క్షిపణి ఒక హీట్ వాఠ్ హెడ్ ను ఉపయోగిస్తుంది. ఇది బహుళ-ఫ్లాట్ ఫాం ప్రయోగ సామర్థ్యంతో అభివృద్ధి చేయబడింది, అలాగే ప్రస్తుతం ఎంబిటి అర్బుస్ యొక్క తుపాకీతో అనుసంధానమై సాంకేతిక పరీక్షల్లో ఉంది.

పూణేలోని హై ఎనర్జీ మెటీరియల్స్ రీసెర్చ్ లాబోరేటరీ (హెచ్ఐఎంఆర్ఎల్), ఇన్స్ట్రుమెంట్స్ రీసెర్చ్ & డెవలప్ మెంట్ ఎస్టాబ్లిష్ మెంట్ (ఐఆర్డిఐ) డెవ్రూడూస్ ఈ క్షిపణిని అభివృద్ధి చేశాయి.

కెకె రేంజ్ లలో ఎంబిటి అర్బుస్ నుంచి లేజర్ గైడెడ్ యాంటీ ట్యాంక్ గైడెడ్ క్షిపణిని విజయవంతంగా పరీక్షించినందుకు రక్షణ మంత్రి శ్రీ రాజ్ నాథ్ సింగ్ డిఆర్ డిఓను అభినందించారు. కార్యదర్శి డిడిఆర్ & డి, చైర్మన్ డిఆర్ డిఓ విజయవంతంగా పరీక్షా కాల్పులు జరిపినందుకు డిఆర్ డిఓ సెబ్బందిని, పరిశ్రమను అభినందించారు.



<https://pib.gov.in/PressReleasePage.aspx?PRID=1658201>



## DRDO successfully test-fires Laser-Guided Anti Tank Missile

*The missile was fired at a range of around three kilometers in the test and successfully took out a target. While the missile is currently being tested from the MBT Arjun, it has been designed so that it can be fired from other platforms too*

Pune: In a step towards enhancing India's armoured warfare capabilities, the Defence Research and Development Organisation (DRDO) on Tuesday successfully test-fired the indigenously-developed Laser-Guided Anti Tank Guided Missile (ATGM) from the Main Battle Tank (MBT) Arjun at KK Ranges in Ahmednagar in Maharashtra.

Announcing the test, Defence Minister Rajnath Singh tweeted on Wednesday, "Congratulations to DRDO for successfully conducting test-firing of Laser Guided Anti Tank Guided Missile from MBT Arjun at KK Ranges (ACC&S) in Ahmednagar. India is proud of Team DRDO, which is assiduously working towards reducing import dependency in the near future."

Dr G Satheesh Reddy, secretary of the Department of Defence Research and Development and Chairman of DRDO, also congratulated DRDO personnel and industry on the successful test firing.

KK Ranges is the firing range of the Armoured Corps Centre and School of the Indian Army (ACC&S) located on the outskirts of Ahmednagar. While some parameters of the Laser Guided ATGM have been tested in prior tests, on Tuesday, all parameters were successfully tested and the missile engaged with the target with 'more than desired accuracy', sources said. More tests of the weapon system are expected to take place over a period of time.

The missile uses a warhead that has the capability to neutralise armoured vehicles which have reactive armours, which are specially-designed protective armours used in military vehicles.

The missile was fired at a range of around 3 km in the test and successfully took out a target. While the missile is currently being tested from the MBT Arjun, it has been designed so that it can be fired from other platforms too. DRDO scientists said the operability of the missile from a tank is a key feature in armoured warfare. The missile has the capability of engaging with the target even if it is not in the line of sight.

In a press statement, the DRDO said, "Laser-guided ATGMs lock and track the targets with the help of laser designation to ensure precision-hit accuracy. The missile employs a tandem HEAT warhead to defeat Explosive Reactive Armour (ERA) protected armoured vehicles. It has been developed with multiple-platform launch capability and is currently undergoing technical evaluation trials from the gun of MBT Arjun."

Pune-based DRDO facilities – Armament Research & Development Establishment (ARDE) and the High Energy Materials Research Laboratory (HEMRL) — have developed the missile in collaboration with another DRDO laboratory, Instruments Research and Development Establishment (IRDE) in Dehradun.

Over the last three years, the DRDO has successfully conducted tests of Man Portable ATGM and also an ATGM system named NAG. The indigenously developed low-weight, 'fire and forget' Man Portable Anti Tank Guided Missile (MPATGM) in September last year. In February 2018, ATGM NAG was successfully tested in desert conditions.



DRDO scientists said that the missile uses a warhead that has the capability to neutralise armoured vehicles which have Reactive Armours, which are specially designed protective armours used in military vehicles. (Twitter/@rajnathsingh)

All these systems are in various stages of development. In another related development, the government said in December 2019 that it has procured Anti Tank Spike missiles from Israel along with the allied systems to meet operational requirements of the Indian Army.

<https://indianexpress.com/article/india/drdo-successfully-test-fires-laser-guided-anti-tank-missile-from-mbt-arjun-6607575/>



Thu, 24 Sept 2020

## ‘Proud of you’: Rajnath Singh congratulates DRDO for successfully test firing anti-tank missile

*DRDO successfully tested its Laser-Guided Anti Tank Guided Missile (ATGM) at the Armoured Corps Centre and School (ACC&S) in Ahmednagar, Maharashtra*

*Edited By Karan Manral*

New Delhi: Defence Minister Rajnath Singh on Wednesday congratulated the Defence Research and Development Organisation (DRDO) for successfully test firing its Laser-Guided Anti Tank Guided Missile (ATGM).

“Congratulations to @DRDO\_India for successfully conducting test firing of Laser-Guided Anti Tank Guided Missile from MBT Arjun at KK Ranges (ACC&S) in Ahmednagar. India is proud of team DRDO which is assiduously working towards reducing import dependency in the near future,” Singh tweeted.

Earlier, DRDO announced it had successfully test fired the missile at the Armoured Corps Centre and School (ACC&S) in Ahmednagar on Tuesday. The agency further said in these tests, the missiles--fired from MBT Arjun Tank--successfully defeated a target at three kilometres.

On various features of the missile, DRDO said ATGM employs a tandem HEAT warhead to defeat Explosive Rear Armour (ERA) protected vehicles. “The missile has been developed with multi-platform launch capability and is currently undergoing technical evaluation trials from a gun of MBT Arjun,” the agency further explained.

ATGM has been developed by the Armament Research and Development Establishment (ARDE), Pune, in association with High Energy Materials Research Laboratory (HEMRL), Pune, and Instruments Research & Development Establishment (IRDE), Dehradun.

Also on Tuesday, DRDO had carried out a successful flight test of ABHYAS High Speed Expandable Aerial Target (HEAT) vehicles from a test range in Balasore, Odisha.

<https://www.hindustantimes.com/india-news/proud-of-you-rajnath-singh-congratulates-drdo-for-successfully-test-firing-anti-tank-missile/story-J5e1GR71882TMQsHe90yBN.html>



ATGM being test fired (Image courtesy: [twitter.com/rajnathsingh](https://twitter.com/rajnathsingh))

## DRDO successfully test fires laser-guided anti-tank guided missile

*An indigenously developed laser-guided anti-tank guided missile has been successfully test fired by the DRDO at a firing range in Maharashtra's Ahmednagar, officials said on Wednesday*

New Delhi: An indigenously developed laser-guided anti-tank guided missile has been successfully test fired by the DRDO at a firing range in Maharashtra's Ahmednagar, officials said on Wednesday.

The weapon, having a range of up to four km, was test fired from an MBT Arjun Tank at KK Ranges in Armoured Corps Centre and School (ACC&S) in Ahmednagar on Tuesday, they said.

The laser-guided anti-tank guided missile (ATGM) is likely to significantly enhance the fire-power capability of the Indian Army particularly along the frontiers with Pakistan and China, the officials said.

Defence Minister Rajnath Singh congratulated the Defence Research and Development Organisation (DRDO) on successful test firing of the ATGM.

"Congratulations to @DRDO\_India for successfully conducting test firing of Laser Guided Anti Tank Guided Missile from MBT Arjun at KK Ranges (ACC&S) in Ahmednagar. India is proud of Team DRDO which is assiduously working towards reducing import dependency in the near future," he tweeted.

The officials said the ATGM hit the targets with total accuracy and precision.

"The missile employs a tandem heat warhead to defeat explosive reactive armour protected armoured vehicles. It has been developed with multiple-platform launch capability and is currently undergoing technical evaluation trials from gun of MBT Arjun," said an official.

The Arjun is a third generation main battle tank developed by the DRDO.

Pune-based Armament Research and Development Establishment (ARDE) developed the ATGM in association with High Energy Materials Research Laboratory and Instruments Research and Development Establishment (IRDE).

*(Only the headline and picture of this report may have been reworked by the Business Standard staff; the rest of the content is auto-generated from a syndicated feed.)*

[https://www.business-standard.com/article/defence/drdo-successfully-test-fires-laser-guided-anti-tank-guided-missile-120092300785\\_1.html](https://www.business-standard.com/article/defence/drdo-successfully-test-fires-laser-guided-anti-tank-guided-missile-120092300785_1.html)



Laser Guided Anti Tank Guided Missile | Photo: Twitter: Rajnath Singh



## दुश्मन की तोपों का काल: डीआरडीओ ने किया लेजर गाइडेड एंटी टैंक मिसाइल का सफल परीक्षण

By Manish Pandey

नई दिल्ली: रक्षा अनुसंधान और विकास संगठन (डीआरडीओ) को एक बड़ी उपलब्धि हाथ लगी है। संगठन ने लेजर गाइडेड एंटी टैंक गाइडेड मिसाइल का सफल परीक्षण कर लिया है। डीआरडीओ ने अहमदनगर में केके रेंज (एसीसी एंड एस) में एमबीटी अर्जुन टैंक से लेजर गाइडेड एंटी टैंक गाइडेड मिसाइल का सफल परीक्षण किया है।

### एंटी टैंक गाइडेड मिसाइल की खासियत

डीआरडीओ ने बताया कि यह मिसाइल तीन किलोमीटर तक बैठे टारगेट को अपना निशाना बना सकती है। ये कई सारे प्लेटफॉर्म लॉन्च क्षमता के साथ विकसित किया गया है। मौजूदा समय में एमबीटी अर्जुन की एक बंदूक से तकनीकी मूल्यांकन के परीक्षणों से गुजर रहा है।

इसके अलावा इसमें हीट (हाई स्पीड एक्सपेंडेबल एरियल टारगेट) वारहेड के जरिए एक्सप्लोसिव रिपेक्टिव आर्मर (ERA) प्रोटेक्टेड वेहिकल्स को उड़ाती है। यह मिसाइल मॉडर्न टैंक्स से लेकर भविष्य के टैंक्स को भी नेस्तनाबूद करने में सक्षम होगी। वहीं एटीजीएम के जरिए कम ऊंचाई पर उड़ने वाले हेलिकॉप्टर्स को भी ढेर किया जा सकता है।

देश के रक्षा मंत्री राजनाथ सिंह ने डीआरडीओ को इस सफल परीक्षण के लिए बधाई दी है। राजनाथ सिंह ने ट्वीट करते हुए लिखा कि एमबीटी अर्जुन से लेजर गाइडेड एंटी टैंक गाइडेड मिसाइल का सफलतापूर्वक परीक्षण के लिए डीआरडीओ को बधाई। भारत को डीआरडीओ पर गर्व है, जो निकट भविष्य में आयात निर्भरता को कम करने की दिशा में काम कर रहा है।

इसके अलावा डीआरडीओ ने अभ्यास मिसाइल का भी सफल परीक्षण किया है। संगठन ने मंगलवार को ओडिशा के एक परीक्षण केंद्र से एबीएचवाईएस- हाई-स्पीड एक्सपेंडेबल एरियल टारगेट (एचईएटी) का सफल उड़ान परीक्षण किया। संगठन ने एक बयान में कहा कि परीक्षण के दौरान यान ने पांच किलोमीटर की ऊंचाई तक उड़ सकता है।

इस यान की रफ्तार आवाज की रफ्तार से आधी है। इसमें 2जी क्षमता है और 30 मिनट तक ऑपरेट करने की क्षमता है। यह पूरी तरह से ऑटोनॉमस फ्लाइट लेने में सक्षम है।

<https://www.amarujala.com/india-news/drdo-successfully-launched-lazer-guided-anti-tank-guided-missile-rajnath-singh-congratulate-drdo?src=election-top>



मिसाइल - फोटो: ANI

## DRDO को मिली बड़ी कामयाबी, अर्जुन टैंक से लेजर गाइडेड एंटी टैंक मिसाइल का सफल परीक्षण

By Manish Pandey

नई दिल्ली: रक्षा अनुसंधान और विकास संगठन (डीआरडीओ) ने लेजर गाइडेड एंटी टैंक मिसाइल (Laser-Guided Anti Tank Guided Missile) का किया सफल परीक्षण। इसे महाराष्ट्र के अहमदनगर में एमबीटी अर्जुन टैंक से फायर किया गया। इस टेस्ट के दौरान एंटी टैंक मिसाइल ने तीन किलोमीटर दूरी पर मौजूद लक्ष्य को सफलतापूर्वक नष्ट किया।

डीआरडीओ की सफलता पर रक्षा मंत्री राजनाथ सिंह ने बधाई दी है। राजनाथ सिंह ने ट्वीट कर कहा, अहमदनगर में केके रेंज (एसीसी एंड एस) में एमबीटी अर्जुन से लेजर गाइडेड एंटी टैंक गाइडेड मिसाइल का सफलतापूर्वक परीक्षण किया गया है। भारत को डीआरडीओ पर गर्व है जो निकट भविष्य में आयात निर्भरता को कम करने की दिशा में काम कर रहा है।



डीआरडीओ के मुताबिक कई-प्लेटफॉर्म लॉन्च क्षमता के साथ इसे विकसित किया गया है और वर्तमान में एमबीटी अर्जुन में लगी बंदूक से फायर कर इसका तकनीकी मूल्यांकन किया जा रहा है।

### अभ्यास लड़ाकू ड्रोन का सफल परीक्षण

इससे पहले मंगलवार को ओडिशा के बालासोर में डीआरडीओ ने अभ्यास लड़ाकू ड्रोन का सफल परीक्षण किया था। अभ्यास एक हाई-स्पीड एक्सपेंडेबल एरियल टारगेट (HEAT) है, जिसे एडीई में विकसित किया गया है। डीआरडीओ के मुताबिक, यह हथियार प्रणालियों को परीक्षण के लिए एक रियलिस्टिक खतरा सीनेरियो देता है, जिसकी मदद से विभिन्न मिसाइलों या हवा में मार करने वाले हथियारों का परीक्षण किया जा सकता है। अभ्यास लड़ाकू ड्रोन को ऑटोपायलट की मदद से स्वायत्त उड़ान के लिए तैयार किया गया है।

<https://www.jagran.com/news/national-drdo-successfully-testfired-laser-guided-anti-tank-guided-missile-from-arjun-tank-20785873.html>

## DESIDOC, Kalam's favourite scientific info wing, completes 50 years of silent service

The Defence Scientific Information & Documentation Centre (DESIDOC) of DRDO has completed 50 years of serving the nation silently.

DESIDOC, situated in Delhi's famous Metcalfe House, was a favourite place for Dr APJ Abdul Kalam, during his stint with DRDO and also when he was the President.

"Information is a vital resource for R&D scientists. We provide contemporary information in the field of science and technology along with developments of past to researchers and scientists.

DESIDOC has been serving the scientific community to meet information needs in real time," says an official.



Soon after its inception in 1958, DRDO established Scientific Information Bureau (SIB) to cater to the information requirements of scientists. As the needs and requirements of information increased, SIB was made an independent establishment on July 29, 1970, with much wider scope and responsibilities.

Today, DESIDOC is a central resource centre for scientific information, documentation, IT-based services, multimedia services, e-pub services, publishing services rendered on anticipation and other establishments of the Ministry of Defence.

It being among the best and most advanced libraries in India, many universities send their students on study tours to DESIDOC. The 100-plus team at DESIDOC is currently headed by Dr Alka Suri.

"The core competence of DESIDOC is design and development of databases, application software for information retrieval in a multicentre environment and development of multimedia content. It also provides the scientific community a platform to present their research output ideas through peer-reviewed journals, bulletins, monographs, etc," says an official.

Dr Kalam, while serving as the DRDO chief, frequently visited DESIDOC, and in his lectures often referred to the might of the institution.

“For 20 years Metcalfe House was my great attraction. The main reason was the library and DESIDOC. Even now, I use DESIDOC and whatever book you want, you get here,” Dr Kalam said while delivering a lecture at DRDO as the President.

<https://www.onmanorama.com/news/columns/straight-talk/2020/09/23/desidoc-kalams-scientific-infowing-completes-50-years.html>

**TIMESNOWNEWS.COM**

Thu, 24 Sept 2020

## **DRDO successfully tests Abhyas: What is it and why is it important for India’s air defence mechanism?**

*Capable of fully-autonomous flight, Abhyas runs on a gas turbine engine.  
Its inertial navigation uses micro-electromechanical systems, and  
guidance and control are managed by a flight control computer*

### **Key Highlights**

- **Abhyas is a High-speed Expendable Aerial Target which provides a realistic threat scenario for practising weapon systems**
- **Though technically classified as a drone used as an aerial target, it can be used for other purposes**
- **Abhyas has been developed and designed by the DRDO’s Bengaluru-based Aeronautical Development Establishment wing**

India has successfully conducted the flight test of Abhyas, the High-speed Expendable Aerial Target (or HEAT) vehicles.

The trial, on Tuesday, was carried out from the Integrated Test Range near Chandipur in Odisha by the Defence Research and Development Organisation (DRDO), and tracked by radars and electro-optic equipment.

Congratulating the DRDO, Defence Minister Rajnath Singh tweeted: “The DRDO achieved a milestone today with the successful flight test of ABHYAS - High Speed Expendable Aerial Target from ITR Balasore. This can be used as a target for evaluation of various Missile systems.”

As part of Tuesday’s trial, two demonstrator vehicles were test-flown successfully.

Abhyas has been developed and designed by the DRDO’s Bengaluru-based Aeronautical Development Establishment (ADE) wing. It has been under development for nine years, and this was the second successful test flight.

### **Abhyas – not just an aerial target**

Abhyas is a High-speed Expendable Aerial Target that provides a realistic threat scenario for practising weapon systems.

It has been designed to fly with the aid of an autopilot, and comes with state-of-the-art RCS, Visual and IR augmentation systems needed for weapon practice.

It was first successfully flight tested in May last year.

But with Tuesday’s tests, it has cleared all parameters of evaluation.

The DRDO said the test vehicle had met the user requirement of “5 km flying altitude, vehicle speed of 0.5 mach [half the speed of sound], endurance of 30 minutes and 2G turn capability”.



Photo courtesy drdo.gov.in



Capable of fully-autonomous flight, Abhyas has a gas turbine engine. Its inertial navigation tech uses micro-electromechanical systems, while guidance and control are managed by a flight control computer.

Its fuselage includes the nose cone, fuel tank bay, equipment section, air intake compartment and tail cone. The nose and tail are believed to be made up of glass fibre-reinforced polymer.

Its main purpose is to bolster the country's air-defence mechanism by imitating enemy fighter aircraft. Abhyas is believed to have a range of 400km.

Though technically it may be classified as a drone used as an aerial target, it can in fact be used for other purposes.

Military scientists believe that with modifications, Abhyas can actually be converted into an offensive weapon, something akin to a missile. It also has potential uses as a decoy to mislead the enemy during a conflict situation.

Because it is fully indigenously developed, the Indian military will not have to spend money on imported aerial target platforms in future that end up being more than double the cost of Abhyas.

Also, the augmentation in technical know-how for the Indian defence establishment thanks to the R&D involved in making this system will have a spin-off effect on other military drone technologies, which is a huge plus.

It is being seen as a major step in high-tech, multi-use drone technology that is being perfected by Indian scientists.

Given the two-front challenge India faces from Pakistan and China, Tuesday's test flight could not have been more timely.

<https://www.timesnownews.com/india/article/drdo-successful-tests-abhyas-what-is-it-and-why-is-it-important-for-india-s-air-defence-mechanism/656888>



Thu, 24 Sept 2020

## **Military offset part of Rafale deal still pending, flags CAG**

*According to the CAG report, the defence ministry stated as recently as October 2019 (the first Rafale was handed over in France on October 8, 2019) that the vendors had not yet been able to confirm their capability for technology transfer*  
*By Rahul Singh*

New Delhi: Two weeks after the Indian Air Force (IAF) formally inducted five of the 36 Rafale jets ordered from France under a Rs 59,000-crore deal, the country's top auditor on Wednesday said that the plane's maker Dassault Aviation and weapons-supplier MBDA have not confirmed the transfer of technology (ToT) to the Defence Research and Development Organisation (DRDO), which was part of the contract.

The Comptroller and Auditor General (CAG), in a detailed report tabled in Parliament, doubted if the ToT for a key engine would even take place, and pointed out that several offset contracts built into multiple defence deals have "not yielded the desired results".

The critical observations were part of CAG's scrutiny of the status of a raft of offset contracts — including the September 2016 Rafale deal — between 2005 and 2018.

India's offset policy stipulates that in all capital purchases above Rs 300 crore, the foreign vendor has to invest at least 30% of the value of the purchase in the country to boost indigenous capabilities. In the case of the Rafale deal this was 50%.

According to the CAG report, the defence ministry stated as recently as October 2019 (the first Rafale was handed over in France on October 8, 2019) that the vendors had not yet been able to confirm their capability for technology transfer.

“In the offset contract relating to 36 Medium Multi Role Combat Aircraft (MMRCA), the vendors M/s Dassault Aviation and M/s MBDA initially proposed (September 2015) to discharge 30% of their offset obligation by offering high technology to DRDO.

The DRDO wanted to obtain Technical Assistance for the indigenous development of engine (Kaveri) for the Light Combat Aircraft. Till date the Vendor has not confirmed the transfer of this technology,” said the report.

HT has reviewed parts of report and a press release issued by CAG.

CAG also said that DRDO should identify the right technologies for transfer, while sharply criticising foreign vendors who made several offset commitments to qualify for a contract but were later not earnest about fulfilling their commitments.

Foreign vendors have to select Indian firms as their offset partners to fulfil their obligations.

To be sure, in case of the Rafale deal, the DRDO’s offset share worked out to 30%, while 20% has been allocated to the private sector, including Dassault Reliance Aerospace Ltd (DRAL) -- Dassault’s joint venture (JV) with Anil Ambani’s Reliance Group. CAG did not pick any loopholes as far as the 20% allocation to the private sector, and asked the defence ministry to get more details about its progress.

The report said the defence ministry stated in October 2019 that the vendors had not been able to “confirm their capability to carry out the requisite upgradation”.

“Thus, it is not clear if even this technology transfer (for engine) will take place, and there is need for the MoD/DRDO to identify and acquire the right technologies in order to comply with the directions of Defence Acquisition Council (DAC) given in September 2016,” the report said.

The defence ministry and DRDO declined to comment on the matter. The response to an e-mail sent to Dassault Aviation was awaited when this report was filed.

However, French industry officials said they had given a detailed list of 10 to 15 technologies that could be transferred to the DRDO and the “ball was in the latter’s court”.

The officials said that the offset obligations as part of the 36 jet deal were progressing as per the timeline in the case of the private sector JV (with Anil Ambani’s Reliance Group) despite the challenges posed by Covid-19.

“The DRDO has to figure out what technologies it wants to take and can absorb,” the officials said, speaking on the condition of anonymity.

In the case of private offset partners, CAG said since the discharge period had started — September 23, 2019, to September 23, 2020 — the defence ministry “needs to get the details of the specific products/services being offered for discharge of offset, to monitor and ensure that the objectives of the offset are achieved”.

The Comptroller and Auditor General of India said that the aim of the offset policy was to develop the Indian defence sector to achieve self-reliance and cut dependence on imports.

However, the audit found that the several vendors were not discharging their obligations as per their commitments.

“From 2005 till March 2018, 46 offset contracts had been signed with foreign vendors, valued at ₹66,427 crore. Under these contracts, by December 2018, ₹19,223 crore worth of offsets should have been discharged by the vendors. However, the offsets claimed to have been discharged by them was only ₹11,396 crore, which was only 59% of the commitment. Further, only 48% (₹5,457 crore) of these offset claims submitted by the vendors were accepted by the ministry. The rest were largely rejected as they were not compliant to the contractual conditions and the Defence Procurement Procedure,” CAG noted.

The auditor said the remaining offset commitments of about ₹55,000 crore would be due to be completed by 2024.

“The rate at which the foreign vendors have been fulfilling their offset commitments was about ₹1,300 crore per year. Given this situation, fulfilling the commitment of ₹55,000 crore by the vendors in the next six years (CAG observation is of 2018) remains a major challenge,” the report said.

CAG said there were no effective means of penalising the vendors on account of failure to meet the offset commitments.

Experts said discharge of offsets by vendors was unsatisfactory and some changes were necessary.

Inter-government agreements and foreign military sales have to be brought under the purview of offsets, said Lieutenant General Subrata Saha (retd), a member of the National Security Advisory Board and a former army deputy chief.

“In 2016 with some deft application of policy, offset was associated with the ultra-light howitzer (ULH) procurement from the US. The number of industries that have successfully discharged offsets are very limited. The major issue here is the fact that we have not mapped industries working in defence sector and their capabilities. The number of MSME’s engaged in defence quoted by different agencies widely vary. Proper mapping of defence industries will help in utilising the offset facility much better,” said Saha, who was closely associated with defence procurement as the deputy chief.

He said ToT must be given the highest priority with due incentives.

“In addition to tightening the avenues for discharging offset, with the aim of improving India’s defence industrial capability, there has to be simplification of process as the multiplicity of agencies involved and sequential process takes too long,” Saha added.

The National Democratic Alliance (NDA) government’s decision to enter a \$8.7 billion government-to-government deal with France to buy 36 Rafale warplanes made by Dassault was announced in April 2015, with an agreement signed a little over a year later.

This replaced a previous United Progressive Alliance regime decision to buy 126 Rafale aircraft, 108 of which were to be made in India by the state-owned Hindustan Aeronautics Ltd.

Congress alleged that the new deal entailed buying the fighter jets at a higher price. The government denied this, and the Supreme Court said in a judgment that the deal did not require scrutiny.

The deal also became controversial on account of the fact that one of the offset deals signed by Dassault was with the Reliance Group of Anil Ambani.

The Congress claimed that the earlier deal was scrapped and a new one signed to provide Ambani this opportunity for an offset deal. Both the government and Reliance have repeatedly denied this.

As mentioned above, the problems flagged by CAG are not this part of the offset deal. A February 2019 CAG report said the deal to buy the jets was kosher and cheaper than that was being negotiated by the UPA government.

<https://www.hindustantimes.com/india-news/international-flights-countries-where-indians-can-t-travel/story-PJ5QMZALZDIw97GxmDj7VK.html>

## Rafale vendors yet to confirm technology transfer under offsets: CAG

*DRDO was to receive assistance for developing LCA engine*

New Delhi: French aerospace major Dassault Aviation and European missile maker MBDA have till date “not confirmed” the transfer of technology for the indigenous development of engine for the Light Combat Aircraft (LCA) by the Defence Research and Development Organisation (DRDO), under the offset contract relating to the ₹60,000 crore deal for 36 Rafale fighter jets, the Comptroller and Auditor General (CAG) said in a report tabled in Parliament on September 23.

The report on offset clauses in defence deals observed that in October 2019, the Ministry of Defence (MoD) informed that the vendor had not yet been able to confirm their capability for doing the requisite upgradation. “Thus, it is not clear if this technology transfer will take place, and there is need for MoD/DRDO to identify and acquire the right technologies in order to comply with the directions of Defence Acquisition Council (DAC) given in September 2016,” the report said on the offsets in the Rafale deal.



An Indian Air Force Rafale fighter jet flies over Leh on September 23, 2020. | Photo Credit: ANI

In September 2015, Dassault Aviation and MBDA initially proposed to discharge 30% of their offset obligation in the Rafale deal by offering high technology to the DRDO, and as per the contract, acquisition of technology by the DRDO is envisaged, subject to discussions between the vendor and the DRDO, the report said.

### Six new technologies

In April 2016, the DRDO identified six new technologies to be obtained from the firms under the offset obligations, but the vendors “did not agree on transfer of five technologies as most of them were not within the vendor’s core competence”. The sixth proposal of the DRDO was to obtain technical assistance for the indigenous development of an engine (Kaveri) for the LCA, which also has not been confirmed so far.

“In many cases, it was found that the foreign vendors made various offset commitments to qualify for the main supply contract but later, were not earnest about fulfilling these commitments,” the CAG observed, giving the Rafale deal as example.

To develop the Indian defence industry and bring in high technologies, the offset policy for defence deals was adopted in 2005 for all defence capital imports above ₹300 crore under which the foreign vendor is required to invest at least 30% of the value of the contract in India.

The Rafale deal signed in September 2016 has a 50% offset clause to be discharged by the four French partners — Dassault Aviation, MBDA, Safran and Thales. Dassault Aviation has set up a joint venture with Anil Ambani’s Reliance Defence — Dassault Reliance Aerospace Limited — in Nagpur to manufacture components for the former’s civil jets. The MoD informed the CAG that the offset obligations of the vendor are to start from September 23, 2019 and the first annual commitment would have to be completed by September 23, 2020.

Auditing the offset policy in defence deals, the CAG said that from 2005 till March 2018, 46 offset contracts were signed with foreign vendors, valued at ₹66,427 crore, of which, by December 2018, ₹19,223 crore worth of offsets should have been discharged by the vendors. “However, the offsets claimed to have been discharged by them was only ₹11,396 crore, which was only 59% of the commitment,” the report said.



Further, only 48%, or ₹5,457 crore, of these offset claims submitted by the vendors were accepted by the Ministry. “The rest were largely rejected as they were not compliant to the contractual conditions and the Defence Procurement Procedure,” the CAG said.

The remaining offset commitments of about ₹55,000 crore would be due to be completed by 2024 but the rate at which the foreign vendors have been fulfilling their offset commitments was about ₹1,300 crore per year. “Given this situation, fulfilling the commitment of ₹55,000 crore by the vendors in the next six years remains a major challenge,” the federal auditor stated.

<https://www.thehindu.com/news/national/rafale-vendors-yet-to-meet-offset-clause-cag/article32680091.ece>

## Defence News

## Defence Strategic: National/International

INDIA  
TODAY

Thu, 24 Sept 2020

# Eye on China: A \$3 billion US drone acquisition heads for MoD approval | India Today Insight

*A case for the purchase of 30 MQ-9B Guardians will shortly be put up before the Defence Acquisition Council, headed by defence minister Rajnath Singh. Six drones will be delivered soon after contract signing*

*By Sandeep Unnithan*

Delhi: The Ministry of Defence (MoD) is preparing to acquire 30 General Atomics MQ-9B Guardian drones from the United States, in a deal valued at approximately \$3 billion (Rs 22,000 crore). A recent series of meetings within the MoD have cleared the way for the procurement of an initial lot of six Reaper Medium Altitude Long Endurance drones. These six drones—two each for the army, navy and air force—are to be procured immediately from the US, indicating the urgency of the acquisition.

Sources tell INDIA TODAY that an ‘acceptance of necessity’ (AON) for 30 drones will be put before an upcoming meeting of the Defence Acquisition Council (DAC), headed by defence minister Rajnath Singh. The contract is being broken up into two parts—six MQ-9s worth approximately \$600 million (Rs 4,400 crore) are to be purchased outright and delivered in the next few months. The remaining 24—eight drones for each service—will be acquired over the next three years under an ‘option clause’ in the contract. The deal has been in the pipeline for the past three years, first as the sale of 22 Sea Guardians (an unarmed maritime variant of the MQ-9) for the Indian Navy in 2017. This was then converted into a tri-services acquisition by the government in 2018 when the armed version of the MQ-9 was cleared for sale to India by the US.



A General Atomics MQ-9A Reaper drone.

An AON is formally the first step in hardware procurement by the MoD. It usually takes several years for AON cases to turn into contracts. The MQ-9 acquisition, it is understood, will be

concluded in a far shorter timeframe. It is being processed as a fast-track, government-to-government deal with the United States and will be swiftly concluded by the MoD. The six drones are to be delivered immediately by the US, and could possibly be units already produced for the US armed forces or its allies. It is not clear if the initial batch of drones will be armed with Hellfire missiles and other air-to-ground munitions.

MoD meetings to decide the deal are being steered by Chief of Defence Staff General Bipin Rawat, who, as permanent Chairman Chiefs of Staff Committee, decides inter-service defence acquisitions. The MoD might even convene a special meeting of the DAC to sanction this deal. This is the last major contract signed between the governments of Prime Minister Modi and US President Donald Trump, who is seeking re-election this November.

The Indian Navy has been made the lead service for this significant acquisition. One naval officer calls the deal a 'game changer' because of the platform's ability to mount continuous and persistent surveillance. The MQ-9 can carry electro-optical / infra-red multi-mode radar and multi-mode maritime surveillance radar, laser designators, electronic support measures and various weapons packages. It can form a deadly combination with two other US-supplied platforms—the P8-I Poseidon long range maritime patrol aircraft and the (under delivery) MH-60R multi-role helicopters—to track and hunt surface ships and submarines in the Indian Ocean region.

“The MQ-9 is satellite-steered, can float above the target at 45,000 feet and stay on task for 35 hours, using radar and electronic support measures to locate the enemy—it could be anywhere, the Gulf of Aden or the Malacca Straits or in Eastern Ladakh,” a senior defence official says.

The United States has emerged as India's largest supplier of defence hardware after Russia, selling India a total of \$18 billion worth of military hardware since 2008. In February this year, the two countries concluded a \$2.1 billion deal for India to buy 24 MH-60R Seahawk helicopters for the Indian Navy.

<https://www.indiatoday.in/india-today-insight/story/eye-on-china-a-3-billion-us-drone-acquisition-heads-for-mod-approval-1724393-2020-09-23>



Thu, 24 Sept 2020

## भारतीय सेना को लद्दाख में फौरन चाहिए ये हथियार, चीन के साथ सीमा विवाद के बीच बहुत जरूरी

**भारतीय सेना को अर्जेंट बेसिस पर बड़ी संख्या में कार्बाइन (Carbine) बंदूक चाहिए।**

**यह बंदूक पास की लड़ाइयों में काम आती है। लद्दाख (India China Ladakh Issue)**

**जहां भारत-चीन सैनिकों के बीच हिंसक झड़प हो चुकी है वहां अब यह बेहद जरूरी है।**

लद्दाख में चीन से चल रहे गतिरोध (India China Ladakh Issue) के बीच एक बड़ी खबर सामने आई है। पता चला है कि भारतीय सेना को अर्जेंट बेसिस पर बड़ी संख्या में कार्बाइन (Carbine) बंदूक चाहिए। यह बंदूक पास की लड़ाइयों में काम आती है और लद्दाख जहां भारत-चीन सैनिकों के बीच हिंसक झड़प हो चुकी है वहां अब यह बेहद जरूरी है।

इकोनॉमिक टाइम्स की खबर के मुताबिक, सरकार ने 350,000 कार्बाइन का ऑर्डर भारतीय कंपनियों के लिए रिजर्व रखा है। जिन्हें फिलहाल बनने में दो से तीन साल लगनेवाले हैं। फिलहाल सेना को उन 93,895 कार्बाइन की पहले जरूरत है जिनके संबंध में साल 2018 में फैसला लिया गया था।

## जल्द से जल्द चाहिए 93,895 कार्बाइन बंदूकें

बता दें कि साल 2018 में 93,895 कार्बाइन बंदूकों के लिए फास्ट ट्रैक प्रोसेस शुरू किया गया था। लेकिन उसका बेहद छोटा हिस्सा अबतक मिला है। खबर के मुताबिक, एक अधिकारी ने नाम ना देने की शर्त पर बताया कि जितने हथियारों की तत्काल जरूरत है उसका पांचवा हिस्सा ही फास्ट ट्रैक तरीके से खरीदी हो पाया है। अधिकारी के मुताबिक, आर्मी की इस जरूरत से समझौता नहीं होना चाहिए।

पता चला है कि आर्मी के जवानों के पास पिछले कुछ सालों से पास की लड़ाई वाले हथियार नहीं हैं। इस रोल के लिए फिलहाल सामान्य असॉल्ट राइफल का इस्तेमाल होता आया है। वैसे ये हथियार आतंक-रोधी अभियान के लिए होते हैं लेकिन बॉर्डर ऑपरेशन पर भी इनका इस्तेमाल काफी उपयोगी हैं।

मसले पर पिछले हफ्ते रक्षा सचिव ने बैठक ली थी, इसमें इसपर बात हुई कि क्या मौजूदा जरूरत को पूरा करने के लिए कार्बाइन इंपोर्ट की जाए? फिलहाल इसपर अंतिम फैसला होना बाकी है।

<https://www.tv9bharatvarsh.com/india/india-china-ladakh-issue-indian-army-faces-a-carbine-shortage-seeks-urgent-supply-294666.html>



Thu, 24 Sept 2020

## China minutes away from reach of Indian fighter planes after this project takes off

*The Indian Army soldiers are performing their duty at the border to protect the country. At the same time Government of India is making efforts to create a more conducive operational environment to the Indian Air Force during the war like situations. So that fighter planes can land on any national highway in times of crisis. The central government has started arranging this in the entire country*

*Edited By Ravi Dubey*

The Indian Army soldiers are performing their duty at the border to protect the country. At the same time, the Government of India is making efforts to create a more conducive operational environment to the Indian Air Force during the war like situations. So that fighter planes can land on any national highway in times of crisis. The central government has started arranging this in the entire country.

National Highways in Gujarat, Uttar Pradesh, West Bengal, and some other border states are being made in a way such that the Indian Air Force can use it in emergencies. This arrangement has already been done in Uttar Pradesh and Gujarat. Now this work has started in West Bengal.

### **National highways to be developed at more than 10 locations**

National highways will be developed at more than 10 locations in the state. The system is going to be on all national roads near the Air Force base. Under the project, fighter plane landings are being arranged on National Highway No. 60 in a five-km stretch from Bakhrabad to Potkapul of Belda Police Station. The road measurement process is underway before expansion. Sources said that this work is important at a time when tensions are increasing in the Indo-China border areas almost every day. Kalikunda Air Base is close to here which is a very significant airport. Due to its geographical location, it will take 20 minutes for the Air Force to fly from this place next to the state of Sikkim to the Chinese border. For the construction of this runway, about 30 meters of land is being taken on either side of National Highway No. 60.

The concrete divider between the two lanes of the National Highway is being removed. This emergency runway will be constructed parallel to that place. This runway is going to be 5 km long. Some state-of-the-art technology will be used for this purpose. The project will be started on all national highways where airbases are present. Kalaikunda Air Base Camp is located near Kharagpur, a short distance from Belkuda. Now the National Road Authority wants to complete the road extension work very fast. The target is to complete the remaining work in about seven months.

<https://www.dnaindia.com/india/report-china-minutes-away-from-reach-of-indian-fighter-planes-after-this-project-takes-off-national-highway-to-be-used-as-alternative-emergency-air-strips-for-fighter-planes-of-indian-air-force-2844800>



Thu, 24 Sept 2020

## Not just the borders, China 'Attacked' India in Space. But ISRO Scientists believe it was a trial that failed

*A 2019 report says that China has capabilities to mount sophisticated cyber-attacks directed at ground stations with the intent of either corrupting or hijacking the systems used to control spacecraft/satellite*

Not just on land and sea, China's expansionist plans have reportedly reached the space with Beijing carrying out 'multiple cyber-attacks' against Indian satellite communications between 2012 and 2018. The Indian Space Research Organisation (ISRO), however, has maintained that its systems has not been compromised so far.

*Times of India* quoted a 142-page report by US-based China Aerospace Studies Institute (CASI) that elaborates on the results of one of the attack of 2012. The report stated that a Chinese network based computer attack on the Jet Propulsion Laboratory (JPL) "allowed 'full functional control' over JPL networks." The report quotes multiple sources while listing out some of these attacks.

*TOI* in its report further said that India, as part of its counter-space capabilities, demonstrated Anti-Satellite (A-Sat) missile technology on March 27, 2019, which equipped India with a 'kinetic kill' option to destroy enemy satellites. But the CASI report points to how China has multiple other counter-space technologies that are intended to threaten adversary space systems from ground to geosynchronous orbit (GEO). These include direct-ascent kinetic-kill vehicles (anti-satellite missiles), co-orbital satellites, directed-energy weapons, jammers, and cyber capabilities.

CASI, a think-tank, supports the secretary, chief of staff of the US Air Force, the US chief of space operations, and other senior air and space leaders. It provides expert research and analysis supporting decisions and policymakers in the US Department of Defense and across the US government.

A 2019 report released by the Carnegie Endowment for International Peace said while India demonstrated its A-Sat interceptors, China — which had done the same in 2007 — has capabilities to mount sophisticated cyber-attacks directed at ground stations with the intent of either corrupting or hijacking the systems used to control spacecraft/satellite. "China has investments in developing



Representative image.



ground, air, and space-based radio frequency jammers that target uplinks, downlinks, and crosslinks involved in either control of space systems or data transmission," the report reads.

*Times of India* quoted multiple insiders as saying that ISRO hasn't been able to pinpoint sources of cyber-attacks over the years. "Cyber threats are a given but it cannot be ascertained who are behind such attacks. We've systems in place to alert us and I don't think we've ever been compromised," a senior scientist was quoted, adding that "the Chinese may have tried and failed".

China's expansionist plans have recently picked up pace with Chinese Army engaging in a stand off with India in eastern Ladakh. Satellite images recently showed that China is building heliports close to its borders with India. This includes one heliport near Doklam, which lies on the tri-junction of India, China and Bhutan — the site of the 73-day stand-off that took place between the two Asian powers in 2017.

Over the past decade, China has also steadily hardened its claims to most of the South China Sea from where a third of the world's shipping passes through.

In recent months, with much of the world preoccupied with the Covid-19 pandemic, China has sharply escalated its coercive activities. In early April, a Chinese Coast Guard vessel sank a Vietnamese fishing boat close to islands claimed by both China and Vietnam. A Chinese marine survey vessel harassed a Malaysian oil exploration vessel off Borneo. This month, the Department of Defense voiced concern about the Chinese Navy's decision to seal off an area around the Paracel Islands to conduct naval exercises. In response, the United States increased its own naval activities, including joint exercises by two aircraft carrier groups.

These confrontations have contributed to a sharp deterioration in US-China relations on other fronts.

<https://www.news18.com/news/india/not-just-the-borders-china-attacked-india-in-space-but-isro-scientists-believe-it-was-a-trial-that-failed-2901095.html>



Thu, 24 Sept 2020

## How will China's offensive play out in Ladakh? IAF war games has a answer

*In tensions that began in early May, Indian and Chinese troops have come face-to-face at multiple points along the LAC*

*By Shishir Gupta*

New Delhi: The deployment of at least 50,000 People's Liberation Army (PLA) troops along the Line of Actual Control (LAC) in eastern Ladakh and in the occupied Aksai Chin region, apart from heavy weaponry and missiles, is indicative of the Russian influence not only on Chinese military equipment, but also in war planning and execution, according to a top Indian Air Force (IAF) officer.

The officer, who dissected the Chinese positioning and war plan in a worst-case scenario for HT on condition of anonymity, said that a Chinese offensive, if and when it comes, is likely to involve troops moving forward under a barrage of artillery and rocket fire, with surface-to-air missile batteries giving protection to their weapon systems from IAF attacks. "This is the old Soviet way of fighting a war, with troops based in depth areas (in this case, Hotan airbase 320km from the Line of Actual Control) providing the air-defence cover," the officer added.

While several strategic experts believe that any future war will be fought with stand-off weapons used to force Indian fighters to remain on ground, the IAF's "disperse, absorb, recoup and retaliate" strategy has been war-gamed enough times (including in the Gagan Shakti 2018 exercise) to repel China's plans, the officer said. He explained that the reaction of the IAF to any offensive is faster than that of the PLA Air Force due to the distance of the LAC from air bases such as Hotan,

Lhasa or Kashgar, and that PLA's surface-to-air missile sites become vulnerable to the stand-off air-to-ground missiles of Indian fighters. "Once air-defence missile systems are knocked out, the amassed artillery, rockets and troop concentrations become exposed on the Tibetan desert, where there is no natural camouflage cover for these systems," the officer said.

The officer cited above further said that while the PLA has packed depth areas with troops, any aggression on mountainous terrain will not be easy against a dug-in adversary like the Indian Army in Ladakh. The 1999 Kargil war taught the Indian army that when the aggressor is concentrated and exposed, it becomes vulnerable to air interdiction. This makes the effort to hit Indian troops, who are dominating strategic heights both in the north and south of Pangong Tso, harder in the winter months. Even a Chinese stand-off weapon, given its circular error of probability (a measure of precision) may find it hard to target dug-in troops sitting on mountaintops in sub-polar temperatures, and in the absence of cover from attacking forces in the cold Ladakh desert and the Soda Plains, he added.

The officer was confident that Indian forces could sustain a Chinese strike in a worst-case scenario. The military is prepared for a 10-day intensive war, with the Narendra Modi government allowing emergency purchases of critical ammunition and missiles after the 2016 Uri surgical strikes and 2019 Balakot strikes against Pakistan. "Any India-China hostility is unlikely to continue at an intense level without global intervention beyond 10 days," the officer explained, adding that the indigenous ammunition is available for 40 days and conventional bombs for 60 days.

With four or five additional Rafale fighters, on which IAF pilots are training in France, ready to join the Ambala squadron next month, and a new Ladakh Corps Commander, Lt Gen PGK Menon, taking over, both the armies appear quite evenly matched, he said.

In tensions that began in early May, Indian and Chinese troops have come face-to-face at multiple points along the LAC. In some of these areas, particularly the Finger Area and Depsang, Indian forces have been cut off from points they could previously patrol. But the Indian Army now controls ridgeline positions on the lake's southern bank that allow it to completely dominate the sector and keep an eye on Chinese military activity, with the positions scattered across Rezing La, Reqing pass, Gurung Hill and Magar heights.

The Indian Army has also taken control of key heights overlooking the PLA's deployments on the Finger 4 ridgeline on the northern bank of Pangong Tso where rival soldiers are deployed barely a few hundred metres from each other.

Last week, defence minister Rajnath Singh told lawmakers in Parliament that no force in the world can stop the Indian Army from patrolling the country's borders in the Ladakh sector, signalling a strong resolve to regain access to several areas that are now difficult to reach due to actions by the Chinese army along the LAC, even as the focus of multiple diplomatic and military talks between the two sides has been to "disengage and de-escalate".

Lieutenant General AS Lamba (retd), former Vice Chief of Army Staff, said: "The situation on the LAC is escalating despite intense diplomatic efforts by India and talks between military commanders (of both the nations). It requires full operational readiness all along the LAC to pre-empt any reckless action by China."

<https://www.hindustantimes.com/india-news/china-war-plan-takes-leaf-out-of-russian-playbook/story-LovlIFVsyTTK2ChWHybUMK.html>

Thu, 24 Sept 2020

# India expands Maritime Security footprint in IOR! Joins Djibouti Code of Conduct, Jeddah Amendment as an Observer

*This comes amidst the growing tensions between India and China along the Line of Actual Control (LAC) in eastern Ladakh*

*By Huma Siddiqui*

India has joined the Djibouti Code of Conduct/ Jeddah Amendment (DCOC/JA), as an Observer. This was following the high-level virtual meeting of the Grouping in last week of August.

This comes amidst the growing tensions between India and China along the Line of Actual Control (LAC) in eastern Ladakh. The Indian Navy has picked up the increased presence of the Chinese navy in the Indian Ocean Region (IOR).



The Indian Navy has picked up the increased presence of the Chinese navy in the Indian Ocean Region (IOR). (Representative image)

Highly placed sources have told Financial Express Online “There is no term or duration laid out for being an Observer, and India will work with the DCOC Member States for enhancing maritime security in the Western Indian Ocean Region.”

Though India has been undertaking measures to enhance maritime security and safety in the IOR, joining the DCOC/JA will further enable India’s participation on a coordinated multilateral track, and efforts to enhance maritime security would include assistance through training, capacity building, and information exchange. Also, this will help in providing greater transparency in the maritime domain by assisting in upgrading existing information sharing mechanisms and by connecting them to present a transparent and seamless maritime picture.

“This is not is not related to India’s bilateral relations with Djibouti or access to ports in Djibouti or any other country in the region,” the source clarified.

The very fact that India request for Observer status to the DCOC/JA was accepted by consensus is indicative of her bilateral relations with the DCOC/JA member States along with the work done in enhancing maritime security in the region.”

## **What is DCOC/JA?**

It is a grouping of 18 member states which are adjoining the Red Sea, Gulf of Aden, the East coast of Africa and Island countries in the Indian Ocean Region (IOR).

Aimed at repression of piracy and armed robbery against ships in the Western Indian Ocean Region, the Gulf of Aden and the Red Sea, the DCOC was established in January 2009.

The Jeddah Amendment to DCOC came into effect during its meeting in January 2017.

This amendment has helped in enhancing the scope of the DCOC and will include repression of illicit maritime activity, including maritime terrorism and illegal, unreported and unregulated (IUU) fishing.

India has now joined Japan, Norway, the UK and the US as Observer to the DCOC/JA.

The Secretariat of the DCOC/JA of this organization is supported by the International Maritime Organisation. And the UN Office on Drugs and Crime (UNODC), the EU, INTERPOL and Eastern Africa Standby Force (EASF) are represented at the meetings.

India has been engaged in bilateral as well as multilateral cooperation with countries of the Indian Ocean region including through the Indian Ocean Rim Association (IORA), Indian Ocean Tuna Commission (IOTC) and the Indian Ocean Naval Symposium (IONS).

In support of the spirit of collective solutions for maritime challenges, India announced, in November 2019, at East Asia Summit the 'Indo-Pacific Oceans' Initiative' — with its seven pillars including maritime ecology; maritime security; marine resources; capacity building and resource sharing; disaster risk reduction and management; science, technology and academic cooperation; and, trade, connectivity and maritime transport.

India has signed white shipping agreements under IFC-IOR with many countries in the IOR and shares maritime information with all the partner countries.

### **Expert View**

Sharing his views with Financial Express Online, former spokesperson of the Indian Navy, Capt DK Sharma says, "As we are all aware that the menace of Piracy had shown its ugly head in the 'Gulf of Aden' a decade or so back, (precisely in 2008) and since then Indian Navy has been patrolling those piracy infested waters 24X7. India has a big stake in curbing the menace as a big chunk of world's economy flows through that area viz. The Red Sea and onward into the Mediterranean Sea and beyond."

"Keeping the Sea Lanes of Communications (SLOCs) which traverse through the Indian Ocean Region is the responsibility of the nation-state closer to those lanes and has been entrusted to Indian Navy.," the former Navy Captain adds.

"In spite of all the efforts by India and various other Navies, the threat has been reduced to a large extent and the cases of Piracy have also reduced to almost negligible. However, the threat remains alive and thus the efforts by the world's Navies are an ongoing process."

According to Capt Sharma "On India joining the DCOC/JA as an Observer, I think it's a logical step as the charter is now beyond Piracy and has included illegal fishing/trawling, human trafficking, Contraband trafficking etc. And, it would facilitate us to keep a check and coordinate/contribute towards the maritime security of IOR."

"This construct under the aegis of IMO would also cater to environmental issues. Also, the fora would be able to counter the illegal and unregulated fishing, maritime terrorism and other illegal activities at sea and we know who are the countries who are active in this," he concludes.

<https://www.financialexpress.com/defence/india-expands-maritime-security-footprint-in-ior-joins-djibouti-code-of-conduct-jeddah-amendment-as-an-observer/2090032/>

## Australian Space Agency working with ISRO on Gaganyaan

*Partnerships can be either between our space agencies or through private sector collaboration between our burgeoning space industries, she told TNIE*

*By Pearl Maria D'Souza*

Bengaluru: The Australian Space Agency is working closely with the Indian Space Research Organisation (ISRO) on India's first manned mission into space, Gaganyaan, sprucing up its temporary ground station tracking facilities in Australia for the mission. This is following a request by ISRO, as per a top official from the agency. Australian Space Agency (ASA), established in 2018, has a long history of collaborating with other countries' space missions. This includes NASA's expedition to the moon, where Australia received the first pictures of Armstrong's first steps on the moon, facilitated communication with deep space probes, and rovers on Mars.

Australia has had a partnership with India since 1987 -- "to support data calibration and laser ranging for Indian satellites, launching Australian satellites, and conducting joint research," said Caitlin Caruana, Assistant Manager, International Engagement, Australian Space Agency, at a conference hosted by both agencies on Wednesday.

Australia, she said, is keen on collaborating with ISRO and Indian Space companies on its seven National Civil Space Priority Areas — Position, navigation and timing; Earth observation, communications technologies and services, space situational awareness and debris monitoring among others. Partnerships can be either between our space agencies or through private sector collaboration between our burgeoning space industries, she told TNIE.

Among other collaborations, Adam Gilmour, CEO/Co-Founder, Gilmour Space Technologies, told TNIE that he was looking at a joint mission to the moon or a near earth asteroid with companies in India or ISRO. While Indian companies and startups are waiting to be able to travel to Australia to pursue collaborations, Barry O'Farrell AO, Australian High Commissioner to India, said Australian government recently announced a process for non-citizens in critical sectors or with critical skills to apply for travel exemptions.

While Australian companies sought clarity on whether they can directly apply to ISRO contract or would require Indian partners, G Narayanan, Chairman and Managing Director, NewSpace India Limited (NSIL), said he was not in a position to comment at present on Australian companies getting using Indian Infrastructure.

<https://www.newindianexpress.com/nation/2020/sep/24/oz-agency-working-with-isro-on-gaganyaan-2201087.html>



The wind tunnel facility at IISc, where experiments for the Gaganyaan mission are being conducted.



## New approach to exotic quantum matter

In a three-dimensional world, all particles must be either fermions or bosons, but in fewer dimensions, the existence of particles known as anyons, which have intermediate quantum statistics, is possible. Such fascinating objects are strongly believed to exist as emerging quasiparticles in fractional quantum Hall systems, but despite great efforts, experimental evidence of anyons has remained very limited. Since quantum statistics is defined through the behavior of the phase of the wave function, when two identical particles are exchanged, early attempts at anyon detection have been based on interferometric measurements using Fabry-Perot interferometry or beamsplitter experiments.

So far, there have been many efforts to improve the experimental evidence of anyons by searching for ways to study the FQH effect and understand its underlying physics in highly controllable quantum systems such as cold atoms or photonic quantum simulators. There are studies that have shown that light-matter interactions can create and trap fractional quasiparticles in atomic gasses or electronic systems, and via time-of-flight imaging, measure signatures of fractional statistics carried by the total angular momentum of a fractional quantum Hall system.

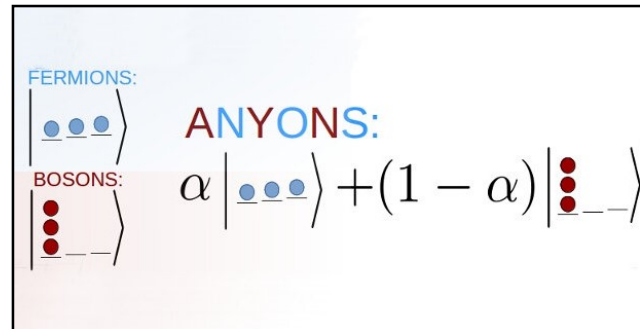
In a recent study published in *Physical Review Letters*, ICFO researchers Tobias Grass, Niccolo Baldelli, and Utso Bhattacharya, led by ICREA Prof. at ICFO Maciej Lewenstein, and in collaboration with Bruno Julia-Díaz from the University of Barcelona, describe a new approach to anyon detection, which is a crucial element for increasing the knowledge of exotic quantum matter.

Contrary to earlier detection schemes, the study authored by the researchers opens up a new possibility that requires neither particle exchange nor interferometry. Instead, the authors propose to trace the behavior of the anyons by binding impurity particles to them. Specifically, the average angular momentum of a single impurity is shown to take characteristic values that are possibly fractional. For a system of multiple impurities, the total angular momentum should then depend on how these effective single-impurity levels are filled. Strikingly, the value obtained by the authors corresponds neither to the filling of a Fermi sea nor to the condensation of a bosonic mode. Instead, the impurity angular momentum interpolates between these limiting cases, and the fractional statistical parameter of the anyons can be straightaway inferred from this interpolation.

Their detection scheme only requires density measurements and might be applicable to Abelian quantum Hall phases in electronic materials as well as in photonic or atomic quantum simulators. The authors discuss also possible generalizations toward non-Abelian anyons. Since the impurities realize a non-interacting gas of anyons, their work also poses the possibility of studying the intricate thermodynamics of anyonic systems.

**More information:** Tobias Graß et al, Fractional Angular Momentum and Anyon Statistics of Impurities in Laughlin Liquids, *Physical Review Letters* (2020). DOI: [10.1103/PhysRevLett.125.136801](https://doi.org/10.1103/PhysRevLett.125.136801)

**Journal information:** [Physical Review Letters](https://phys.org/news/2020-09-approach-exotic-quantum.html)  
<https://phys.org/news/2020-09-approach-exotic-quantum.html>



When the energy levels of a quantum system are filled, fermionic particles exclude each other, whereas bosonic matter can accumulate in the lowest level. In contrast, anyons behave in an intermediate fashion. The paper shows how the anyons' statistical parameter alpha can be detected from the angular momentum of impurity particles attached to the anyons. Credit: ICFO

# Controlling ultra-strong light-matter coupling at room temperature

By Mia Halleröd Palmgren

Physicists at Chalmers University of Technology in Sweden, together with colleagues in Russia and Poland, have managed to achieve ultra-strong coupling between light and matter at room temperature. The discovery is of importance for fundamental research and might pave the way for advances in light sources, nanomachinery and quantum technology.

A set of two coupled oscillators is one of the most fundamental and widely used systems in physics. It is a very general toy model that describes a plethora of systems including guitar strings, acoustic resonators, the physics of children's swings, molecules and chemical reactions, gravitationally bound systems, and quantum cavity electrodynamics.

The degree of coupling between the two oscillators is an important parameter that mostly determines the behavior of the coupled system. However, not much is known about the upper limit by which two pendula can couple to each other—and what consequences such coupling can have.

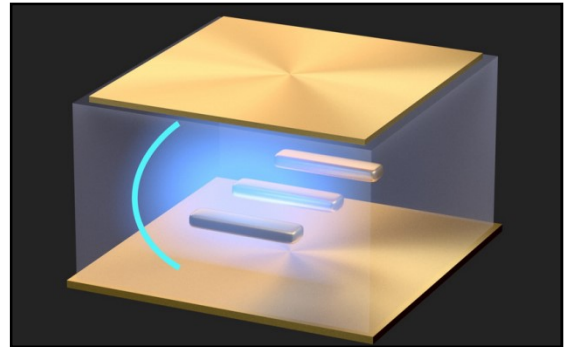
The newly presented results, published in *Nature Communications*, offer a glimpse into the domain of the so called ultra-strong coupling, wherein the coupling strength becomes comparable to the resonant frequency of the oscillators. The coupling in this work is realized through interaction between light and electrons in a tiny system consisting of two gold mirrors separated by a small distance and plasmonic gold nanorods. On a surface that is a hundred times smaller than the end of a human hair, the researchers have shown that it is possible to create controllable ultra-strong interaction between light and matter at ambient conditions—that is, at room temperature and atmospheric pressure.

"We are not the first ones to realize ultra-strong coupling. But generally, strong magnetic fields, high vacuum and extremely low temperatures are required to achieve such a degree of coupling. When you can perform it in an ordinary lab, it enables more researchers to work in this field and it provides valuable knowledge in the borderland between nanotechnology and quantum optics," says Denis Baranov, a researcher at Chalmers University of Technology and the first author of the scientific paper.

## A unique duet where light and matter intermix into a common object

To understand the system the authors have realized, one can imagine a resonator, in this case represented by two gold mirrors separated by a few hundred nanometers, as a single tone in music. The nanorods fabricated between the mirrors affect how light moves between the mirrors and change their resonance frequency. Instead of just sounding like a single tone, in the coupled system, the tone splits into two: a lower pitch and a higher pitch.

The energy separation between the two new pitches represents the strength of interaction. Specifically, in the ultra-strong coupling case, the strength of interaction is so large that it becomes comparable to the frequency of the original resonator. This leads to a unique duet in which light



Researchers have shown that it is possible to create a controllable ultrastrong light-matter coupling at room temperature. The interaction is realised within a tiny system consisting of two gold mirrors separated by a small distance and plasmonic gold nanorods. The discovery is of importance for fundamental research and might pave the way for advances within, for example, light sources, nanomachinery, and quantum technology. Credit: Denis Baranov, Chalmers University of Technology

and matter intermix into a common object, forming quasi-particles called polaritons. The hybrid character of polaritons provides a set of intriguing optical and electronic properties.

The number of gold nanorods sandwiched between the mirrors controls how strong the interaction is. But at the same time, it controls the so-called zero-point energy of the system. By increasing or decreasing the number of rods, it is possible to supply or remove energy from the ground state of the system and thereby increase or decrease the energy stored in the resonator box.

### **The discovery allows researchers to play with the laws of nature**

Notably, the authors indirectly measured how the number of nanorods changes the vacuum energy by "listening" to the tones of the coupled system—that is, looking at the light transmission spectra through the mirrors with the nanorods—and performing simple mathematics. The resulting values turned out to be comparable to the thermal energy, which may lead to observable phenomena in the future.

"A concept for creating controllable ultra-strong coupling at room temperature in relatively simple systems can offer a testbed for fundamental physics. The fact that this ultra-strong coupling 'costs' energy could lead to observable effects, for example it could modify the reactivity of chemicals or tailor van der Waals interactions. Ultra-strong coupling enables a variety of intriguing physical phenomena," says Timur Shegai, Associate Professor at Chalmers and the last author of the scientific article.

In other words, this discovery allows researchers to play with the laws of nature and to test the limits of coupling.

"As the topic is quite fundamental, potential applications may range. Our system allows for reaching even stronger levels of coupling, something known as deep strong coupling. We are still not entirely sure what the limit of coupling in our system is, but it is clearly much higher than we see now. Importantly, the platform that allows studying ultra-strong coupling is now accessible at room temperature," says Timur Shegai.

**More information:** Denis G. Baranov et al, Ultrastrong coupling between nanoparticle plasmons and cavity photons at ambient conditions, *Nature Communications* (2020). [DOI: 10.1038/s41467-020-16524-x](https://doi.org/10.1038/s41467-020-16524-x)

**Journal information:** [Nature Communications](https://phys.org/news/2020-09-ultra-strong-light-matter-coupling-room-temperature.html)  
<https://phys.org/news/2020-09-ultra-strong-light-matter-coupling-room-temperature.html>



*Thu, 24 Sept 2020*

## **Scientists create world's smallest 'refrigerator'**

*By Lisa Garibay*

How do you keep the world's tiniest soda cold? UCLA scientists may have the answer.

A team led by UCLA physics professor Chris Regan has succeeded in creating thermoelectric coolers that are only 100 nanometers thick—roughly one ten-millionth of a meter—and have developed an innovative new technique for measuring their cooling performance.

"We have made the world's smallest refrigerator," said Regan, the lead author of a paper on the research published recently in the journal *ACS Nano*.

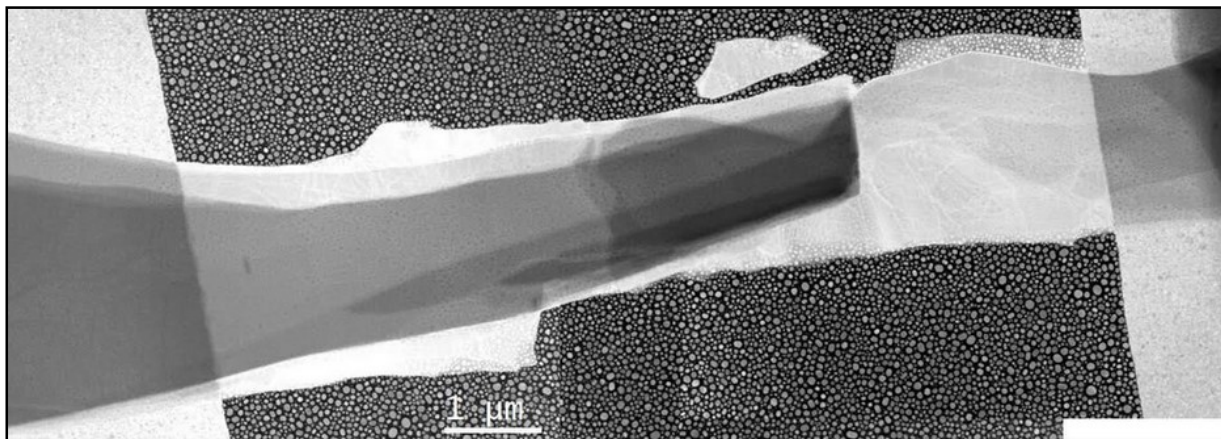
To be clear, these miniscule devices aren't refrigerators in the everyday sense—there are no doors or crisper drawers. But at larger scales, the same technology is used to cool computers and other electronic devices, to regulate temperature in fiber-optic networks, and to reduce image "noise" in high-end telescopes and digital cameras.

### **What are thermoelectric devices and how do they work?**

Made by sandwiching two different semiconductors between metalized plates, these devices work in two ways. When heat is applied, one side becomes hot and the other remains cool; that temperature difference can be used to generate electricity. The scientific instruments on NASA's

Voyager spacecraft, for instance, have been powered for 40 years by electricity from thermoelectric devices wrapped around heat-producing plutonium. In the future, similar devices might be used to help capture heat from your car's exhaust to power its air conditioner.

But that process can also be run in reverse. When an electrical current is applied to the device, one side becomes hot and the other cold, enabling it to serve as a cooler or refrigerator. This technology scaled up might one day replace the vapor-compression system in your fridge and keep your real-life soda frosty.



This electron microscope image shows the cooler's two semiconductors — one flake of bismuth telluride and one of antimony-bismuth telluride — overlapping at the dark area in the middle, which is where most of the cooling occurs. The small “dots” are indium nanoparticles, which the team used as thermometers. Credit: UCLA/Regan Group

### What the UCLA team did

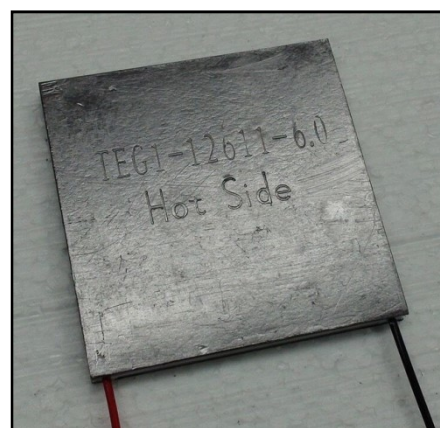
To create their thermoelectric coolers, Regan's team, which included six UCLA undergraduates, used two standard semiconductor materials: bismuth telluride and antimony-bismuth telluride. They attached regular Scotch tape to hunks of the conventional bulk materials, peeled it off and then harvested thin, single-crystal flakes from the material still stuck to the tape. From these flakes, they made functional devices that are only 100 nanometers thick and have a total active volume of about 1 cubic micrometer, invisible to the naked eye.

To put this tiny volume in perspective: Your fingernails grow by thousands of cubic micrometers every second. If your cuticles were manufacturing these tiny coolers instead of fingernails, each finger would be churning out more than 5,000 devices per second.

"We beat the record for the world's smallest thermoelectric cooler by a factor of more than ten thousand," said Xin Yi Ling, one of the paper's authors and a former undergraduate student in Regan's research group.

While thermoelectric devices have been used in niche applications due to advantages such as their small size, their lack of moving parts and their reliability, their low efficiency compared with conventional compression-based systems has prevented widespread adoption of the technology. Simply put, at larger scales, thermoelectric devices don't generate enough electricity, or stay cold enough—yet.

But by focusing on nanostructures—devices with at least one dimension in the range of 1 to 100 nanometers—Regan and his team hope to discover new ways of synthesizing better-performing bulk materials. The sought-after properties for materials in high-performance thermoelectric coolers are good electrical conductivity and poor thermal conductivity, but these properties are almost always mutually exclusive. However, a winning combination might be found in nearly two-dimensional structures like those Regan's team has created.



A standard thermoelectric device, which is made of two semiconductor materials sandwiched between metalized plates. Credit: Wikimedia Commons



An additional distinguishing feature of the team's nanoscale "refrigerator" is that it can respond almost instantly.

"Its small size makes it millions of times faster than a fridge that has a volume of a millimeter cubed, and that would be already be millions of times faster than the fridge you have in your kitchen," Regan said.

"Once we understand how thermoelectric coolers work at the atomic and near-atomic level," he said, "we can scale up to the macroscale, where the big payoff is."

#### **Measuring how cold the devices become**

Measuring temperature in such tiny devices is a challenge. Optical thermometers have poor resolution at such small scales, while scanning probe techniques require specialized, expensive equipment. Both approaches require painstaking calibrations.

In 2015, Regan's research group developed a thermometry technique called PEET, or plasmon energy expansion thermometry, which uses a transmission electron microscope to determine temperatures at the nanoscale by measuring changes in density.

To measure the temperature of their thermoelectric coolers, the researchers deposited nanoparticles made of the element indium on each one and selected one specific particle to be their thermometer. As the team varied the amount of power applied to the coolers, the devices heated and cooled, and the indium correspondingly expanded and contracted. By measuring the indium's density, the researchers were able to determine the precise temperature of the nanoparticle and thus the cooler.

"PEET has the spatial resolution to map thermal gradients at the few-nanometer scale—an almost unexplored regime for nanostructured thermoelectric materials," said Regan, who is a member of the California NanoSystems Institute at UCLA.

To supplement the PEET measurements, the researchers invented a technique called condensation thermometry. The basic idea is simple: When normal air cools to a certain temperature—the dew point—water vapor in the air condenses into liquid droplets, either dew or rain. The team exploited this effect by powering their device while watching it with an optical microscope. When the device reached the dew point, tiny dewdrops instantly formed on its surface.

Regan praised the work of his student researchers in helping to develop and measure the performance the nanoscale devices.

"Connecting advanced materials science and electron microscopy to physics in everyday areas, like refrigeration and dew formation, helps students get traction on the problems very quickly," Regan said. "Watching them learn and innovate gives me a lot of hope for the future of thermoelectrics."

**More information:** William A. Hubbard et al. Electron-Transparent Thermoelectric Coolers Demonstrated with Nanoparticle and Condensation Thermometry, *ACS Nano* (2020). DOI: [10.1021/acsnano.0c03958](https://doi.org/10.1021/acsnano.0c03958)

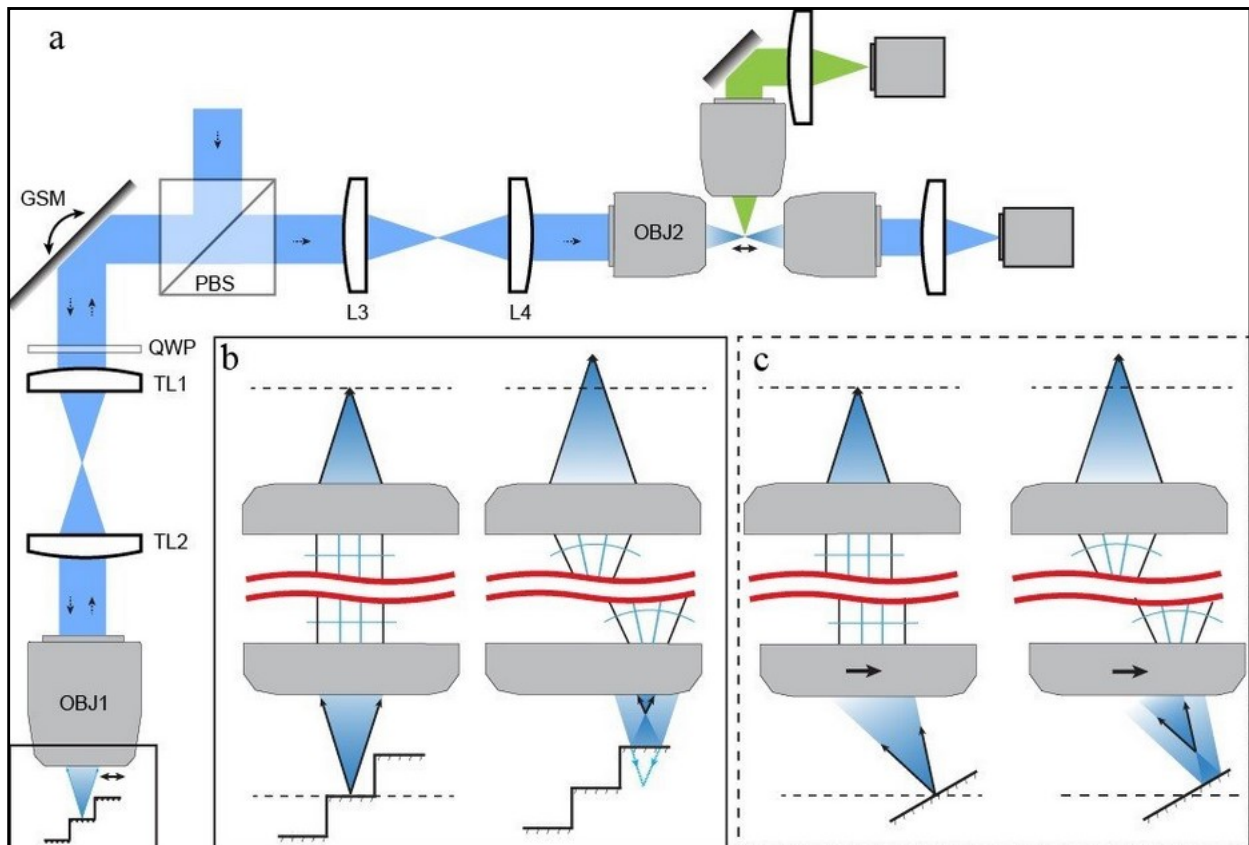
**Journal information:** *ACS Nano*  
<https://phys.org/news/2020-09-scientists-world-smallest-refrigerator.html>



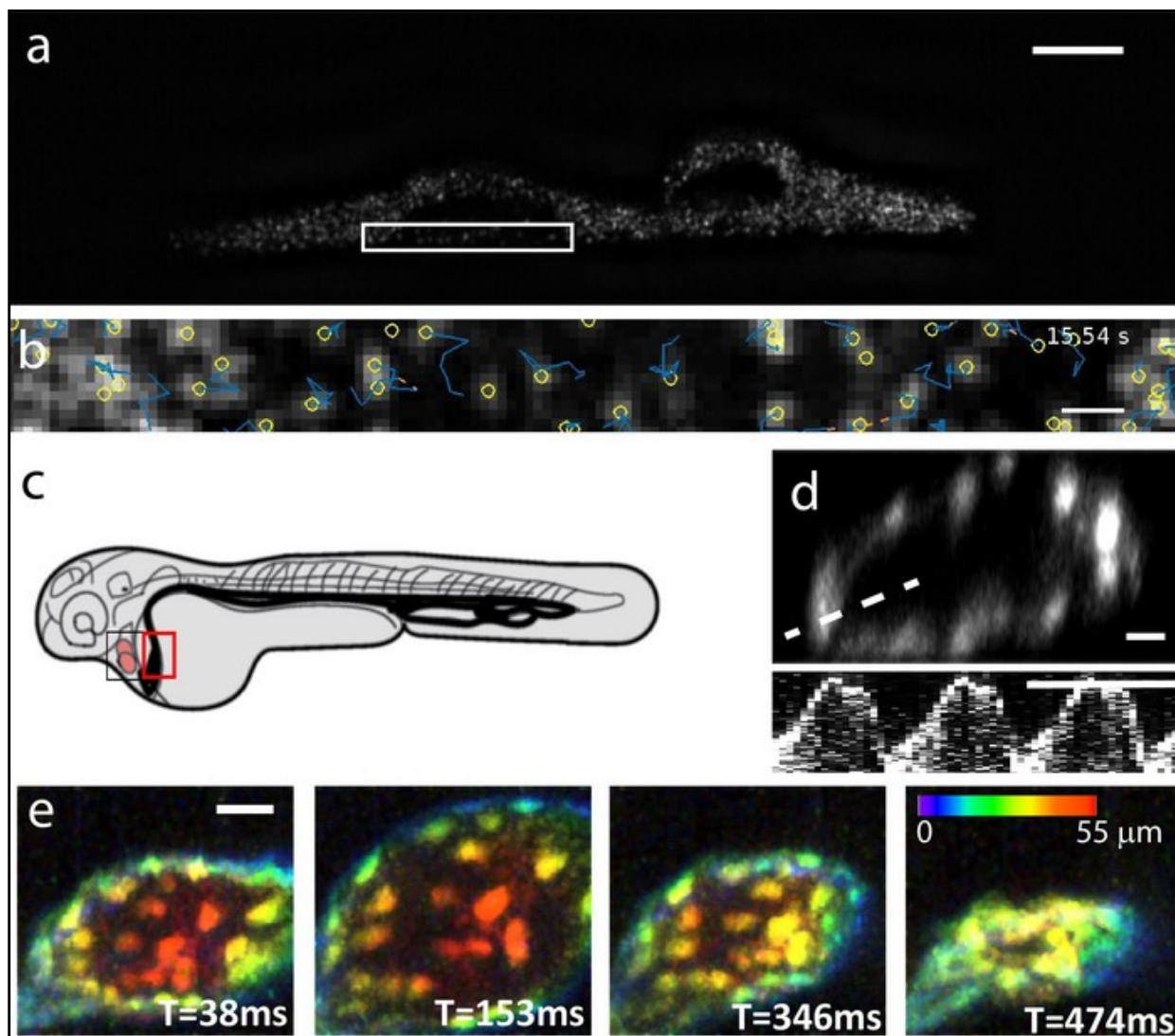
## Converting lateral scanning into axial focusing to speed up 3-D microscopy

In optical microscopy, high-speed volumetric imaging is limited by either the slow axial scanning rate or aberrations introduced by the z-scanning mechanism. To overcome these limitations, scientists at UT Southwestern have introduced a novel optical design that transforms a lateral-scan motion into a scan in the third dimension. Their microscope realized laser focusing at a rate of 12 kHz and allowed observation of fast dynamics inside cells and the beating heart in Zebrafish embryos.

Fast imaging is of great interest in microscopy, computer vision, and laser machining. For example, in neuroscience, high-speed volumetric imaging is essential to monitor dynamic biological processes, including membrane voltage activity (with dynamics on the time scale of 1 ms or less) or cerebral blood flow. How fast one can image is tightly connected to how fast one can change the position of the focus of the imaging system, particularly in the third dimension.



**a**, A collimated laser beam is delivered into the setup by a beam-splitter (BS) and onto a galvanometric scanning mirror (GSM), which is imaged into the back focal plane of an air objective (OBJ1). Scanning the GSM rasters the focus in one dimension as shown by the double-headed arrow in the boxed front focal space of OBJ1. A step mirror reflects the light with different amounts of defocus back into the objective, which then travels through the lenses onto the GSM, where it is de-scanned by, which removes the lateral scan motion and only the axial component remains. The GSM is then again imaged onto the back focal plane of a water dipping objective (OBJ2). OBJ2 forms an aberration free image of the focus (as formed by OBJ1) in the sample space. **b**, Zoomed in view of the boxed region from **a**. Panel on the left shows the focus of the light at its nominal focus. Black arrows show returning marginal rays after reflection. Each step on the mirror results in a focus spot in the sample plane with a displaced axial position. **c**, Alternative configuration with a tilted mirror that allows continuous axial scanning. Here, the remote objective OBJ1 is slightly shifted off the optical axis to create a tilted focus that is incident normal to the mirror surface. Scanning this focus laterally results in a change of focus, as illustrated by the black arrows. Credit: Tonmoy Chakraborty, Bingying Chen, Stephan Daetwyler, Bo-Jui Chang, Oliver Vanderpoorten, Etai Sapoznik, Clemens Kaminski, Tuomas P.J. Knowles, Kevin M. Dean, and Reto Fiolka



a, Genetically encoded multimeric nanoparticles inside two MV3 cells, as imaged by ASLM at 20 ms image integration time, and 3.57 volumes per second. b, YZ view of the perinuclear region. Yellow circles indicate detected vesicles and blue lines illustrate cumulative tracks. c, Schematic drawing of zebrafish embryo. d, Averaged (over 30 cycles) XZ cross section of zebrafish heart, acquired with a framerate of 45 Hz. e, Kymograph of beating heart, measured along line shown in d. Kymograph uses raw data and no averaging was applied. f, Volumetric imaging of a zebrafish heart at a volume rate of 7.4Hz, XY view with depth encoded in color. Scale bar, a, 10 microns; b, 1 microns; d,e 20 microns Credit: Tomoy Chakraborty, Bingying Chen, Stephan Daetwyler, Bo-Jui Chang, Oliver Vanderpoorten, Etai Sapoznik, Clemens Kaminski, Tuomas P.J. Knowles, Kevin M. Dean, and Reto Fiolka

Traditional ways to refocus do so by either mechanically moving the microscope objective or the sample, which both leads to low scanning speed in the third dimension as the speed of moving physical objects is limited by inertia. A potential way to alleviate this problem is through remote focusing, which realizes refocusing by changing the wavefront of the optical system. However, most of the existing technologies face the tradeoff between resolution and speed. As such, there remains a need for a 3-D scan technology capable of reaching multi-kHz rates while avoiding aberrations that would lower its resolution.

In a manuscript published in *Light Science & Applications*, a team of scientists, led by Professor Reto Fiolka from the Department of Cell Biology and Lyda Hill Department of Bioinformatics, at UT Southwestern Medical Center, Dallas, TX, USA., and co-workers have developed a novel optical design to overcome these challenges. They employed well-established lateral scan technologies and transformed the lateral scan motion into refocusing in the third dimension to realize high-speed volumetric imaging. They took the concept of aberration-free remote focusing, and instead of moving a corresponding remote mirror in the third dimension, they scanned a laser spot laterally with a high-speed galvanometer over a stationary mirror. If the distance between the stationary mirror and the objective lens is not constant along the scan direction, a defocus will be

introduced as is necessary for remote refocusing. Furthermore, on the return path, the lateral scan component is perfectly compensated, such that a pure scan motion in the third dimension is obtained. Thereby, the researchers were able to harness high-speed lateral scan technologies to rapidly move a high-resolution laser focus in the third dimension.

Two implementations using a step mirror and a tilted planar mirror, were adopted to realize this concept. The former allows arbitrarily large axial step sizes over a finite number of steps, and the latter allows for an arbitrary number and size of axial steps and is capable of continuous scanning in the third dimension, albeit over a more limited scan range. With the two implementations, the scientists introduce applications of this technology:

"Our first practical demonstration on microscopic imaging was accelerating axially swept light-sheet microscopy (ASLM), which has been criticized for its slow acquisition speed (around 10 Hz framerate in high-resolution implementations, previously). Our new scan technology allows one order of magnitude acceleration while keeping the high spatial resolving power of this emerging imaging technology. In a second application, we implemented our scanning technology in a 2-photon raster scanning microscope and performed high-resolution volumetric imaging with a scan rate in the third dimension of 12 kHz. Indeed, at this spatial resolution, our approach is 6-fold faster than previously reported aberration-free focusing technologies. We then demonstrated the potential of our technology for intravital microscopy by imaging the beating heart of a zebrafish embryo. We believe that this opens up major applications for intravital imaging, especially in the neurosciences."

"Both the discrete and continuous scan technologies may find many applications to image different layers of the brain nearly simultaneously or to rapidly acquire whole volumes to measure neuronal firing patterns or cerebral blood flow. Importantly and unlike previous technologies, our approach is fully compatible with acousto-optical deflectors and thus theoretically capable of scanning on the sub-microsecond timescale (e.g., > 1 MHz) in the third dimension. Thus, using resonant Lissajous scanning patterns, we foresee the possibility for volumetric imaging at kHz rates." the scientists forecast.

**More information:** Tonmoy Chakraborty et al, Converting lateral scanning into axial focusing to speed up three-dimensional microscopy, *Light: Science & Applications* (2020). [DOI: 10.1038/s41377-020-00401-9](https://doi.org/10.1038/s41377-020-00401-9)

**Journal information:** [Light: Science & Applications](https://phys.org/news/2020-09-lateral-scanning-axial-focusing-d.html)  
<https://phys.org/news/2020-09-lateral-scanning-axial-focusing-d.html>



## Nanostructures with a unique property

Nanoscale vortices known as skyrmions can be created in many magnetic materials. For the first time, researchers at PSI have managed to create and identify antiferromagnetic skyrmions with a unique property: critical elements inside them are arranged in opposing directions. Scientists have succeeded in visualizing this phenomenon using neutron scattering. Their discovery is a major step towards developing potential new applications, such as more efficient computers. The results of the research are published today in the journal *Nature*.

Whether a material is magnetic depends on the spins of its atoms. The best way to think of spins is as minute bar magnets. In a crystal structure where the atoms have fixed positions in a lattice, these spins can be arranged in criss-cross fashion or aligned all in parallel like the spears of a Roman legion, depending on the individual material and its state.

Under certain conditions it is possible to generate tiny vortices within the corps of spins. These are known as skyrmions. Scientists are particularly interested in skyrmions as a key component in future technologies, such as more efficient data storage and transfer. For example, they could be used as memory bits: a skyrmion could represent the digital one, and its absence a digital zero. As skyrmions are significantly smaller than the bits used in conventional storage media, data density is much higher and potentially also more energy efficient, while read and write operations would be faster as well. Skyrmions could therefore be useful both in classical data processing and in cutting-edge quantum computing.

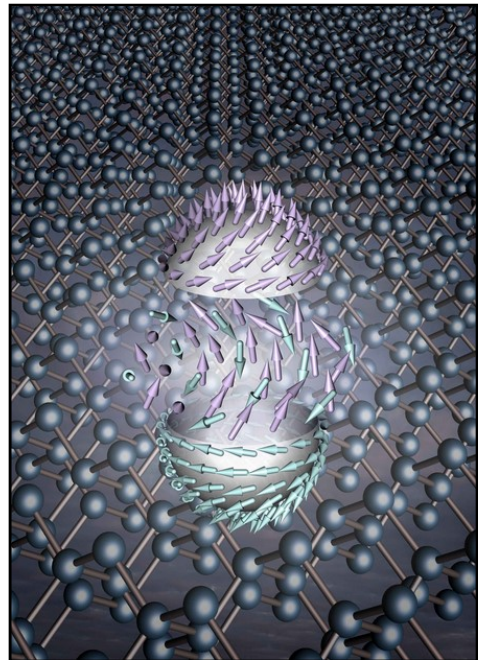
Another interesting aspect for the application is that skyrmions can be created and controlled in many materials by applying an electrical current. "With existing skyrmions, however, it is tricky to move them systematically from A to B, as they tend to deviate from a straight path due to their inherent properties," explains Oksana Zaharko, research group leader at PSI.

Working with researchers from other institutions, Dr. Zaharko and her team have now created a new type of skyrmion and demonstrated a unique characteristic: in their interior, critical spins are arranged in opposite directions to one another. The researchers therefore describe their skyrmions as antiferromagnetic.

### In a straight line from A to B

"One of the key advantages of antiferromagnetic skyrmions is that they are much simpler to control: if an electrical current is applied, they move in a simple straight line," Zaharko comments. This is a major advantage: for skyrmions to be suitable for practical applications, it must be possible to selectively manipulate and position them.

The scientists created their new type of skyrmion by fabricating them in a customized antiferromagnetic crystal. Zaharko explains: "Antiferromagnetic means that adjacent spins are in an antiparallel arrangement, in other words one pointing upwards and the next pointing downwards. So what was initially observed as a property of the material we subsequently identified within the individual skyrmions as well."



Skyrmions are nanoscale vortices in the magnetic alignment of atoms. For the first time, PSI researchers have now created antiferromagnetic skyrmions in which critical spins are arranged in opposing directions. This state is shown in the artist's impression above. Credit: Paul Scherrer Institute/Diego Rosales

Several steps are still needed before antiferromagnetic skyrmions are mature enough for a technological application: PSI researchers had to cool the crystal down to around minus 272 degrees Celsius and apply an extremely strong magnetic field of three tesla—roughly 100,000 times the strength of the Earth's magnetic field.

### Neutron scattering to visualize the skyrmions

And the researchers have yet to create individual antiferromagnetic skyrmions. To verify the tiny vortices, the scientists are using the Swiss Spallation Neutron Source SINQ at PSI. "Here we can visualize skyrmions using neutron scattering if we have a lot of them in a regular pattern in a particular material," Zaharko explains.

But the scientist is optimistic: "In my experience, if we manage to create skyrmions in a regular alignment, someone will soon manage to create such skyrmions individually."

The general consensus in the research community is that once individual antiferromagnetic skyrmions can be created at room temperature, a practical application will not be far off.

**More information:** Fractional antiferromagnetic skyrmion lattice induced by anisotropic couplings, *Nature* (2020). DOI: [10.1038/s41586-020-2716-8](https://doi.org/10.1038/s41586-020-2716-8) , [www.nature.com/articles/s41586-020-2716-8](http://www.nature.com/articles/s41586-020-2716-8)

**Journal information:** *Nature*  
<https://phys.org/news/2020-09-nanostructures-unique-property.html>



Thu, 24 Sept 2020

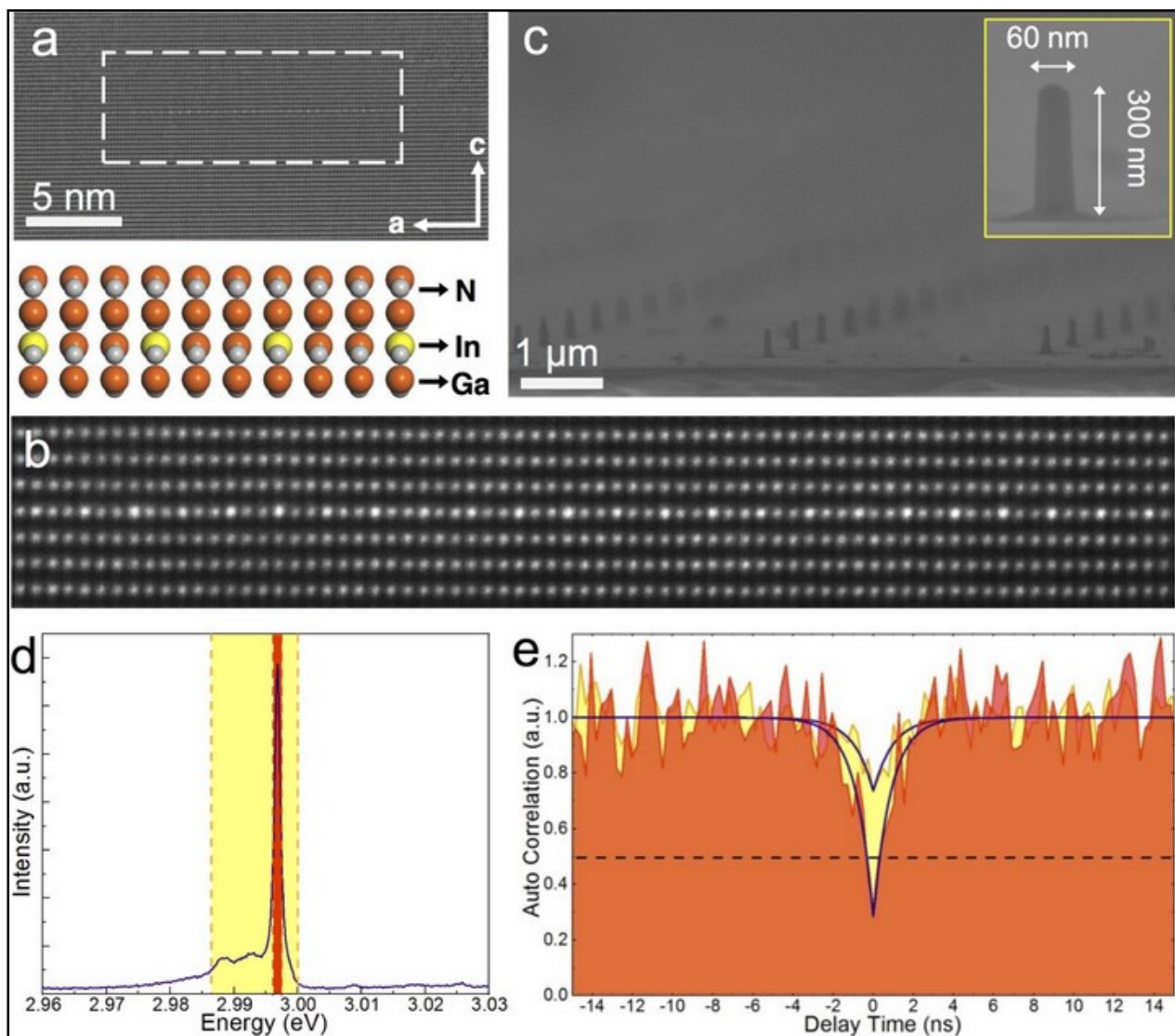
## Single photon emission from isolated monolayer islands of InGaN

Single photon emitters are essential devices for the realization of future optical quantum technologies including optical quantum computing and quantum key distribution. Towards this goal, Scientists in China and Japan identified and characterized a novel type of quantum emitter formed from spatially separated monolayer islands of InGaN sandwiched in a GaN matrix. This new structure could open new opportunities for further quantum devices.

Non-classical light sources such as single photon emitters are essential devices for the realization of future optical quantum technologies including optical quantum computing and quantum key distribution. To date several strategies, including single atoms, quantum dots (QDs), single molecules, and point defects, have been used to explore the development of single photon emitters. Although great strides have been made in the development of solid-state single photon emitters, including high purity and indistinguishability from QDs, and high emission rates from both defects and QDs, each technology has its own drawbacks. Therefore, basic research into the development of single photon emitters using new materials and techniques is crucial.

In a new paper published in *Light Science & Applications*, a team of scientists from State Key Laboratory for Mesoscopic Physics and Frontiers Science Center for Nano-optoelectronics, School of Physics, Peking University, China, and Institute of Industrial Science, The University of Tokyo, Japan have developed a novel type of quantum emitter formed from spatially separated monolayer islands of InGaN sandwiched in a GaN matrix. They first grew a planar structure of InGaN monolayer islands using molecular beam epitaxy, and then patterned the sample into pillars using nanoimprint lithography and inductively-coupled plasma reactive-ion etching. Detailed optical analysis of the emission properties of the isolated monolayer islands showed that the main emission line could be spectrally filtered to act as a bright, and fast single photon emitter at a wavelength of  $\sim 400$  nm, with a high degree of photostability.





a, TEM cross-section image of an In(Ga)N/GaN single monolayer island. b, A high magnification HAADF-STEM image of the In(Ga)N single atomic monolayer, while the top panel shows the corresponding atomic schematic. c, Tilted-view SEM image of arrays of after wet-etched and regrown nanoimprinted In(Ga)N/GaN pillars, inset of the figure represents a typical pillar. d, Photoluminescence spectrum of the emitter from the chosen measurement regions at 8 K under 355 nm excitation. e, Autocorrelation of the main peak as the orange shaded rectangle and together with the lower energy peaks as the yellow shaded rectangle in figure d. Credit: Xiaoxiao Sun, Ping Wang, Tao Wang, Ling Chen, Zhaoying Chen, Kang Gao, Tomoyuki Aoki, Li Mo, Jian Zhang, Tobias Schulz, Martin Albrecht, Weikun Ge, Yasuhiko Arakawa, Bo Shen, Mark Holmes, and Xinqiang Wang

"III-nitride materials were chosen for this study because they are expected to offer several advantages for the development of future devices, including a wide tunability in emission wavelength, compatibility with silicon substrates for growth, and support from a worldwide industrial infrastructure for device fabrication due to their extended use in modern day optoelectronics and power device applications," say the researchers.

The team also suggests that the next step in the research is to work towards higher emission purity, and that future developments (possibly using other materials) could lead to the realization of emitters operating at wavelengths compatible with conventional fiberoptic systems.

**More information:** Xiaoxiao Sun et al, Single-photon emission from isolated monolayer islands of InGa<sub>N</sub>, *Light: Science & Applications* (2020). DOI: [10.1038/s41377-020-00393-6](https://doi.org/10.1038/s41377-020-00393-6)

**Journal information:** *Light: Science & Applications*  
<https://phys.org/news/2020-09-photon-emission-isolated-monolayer-islands.html>

# NATIONAL HERALD

Thu, 24 Sept 2020

## COVID-19 patients may have higher risk of kidney damage: Study

*Researchers found that many hospitalised patients with COVID-19 may face an increased risk for kidney damage or acute kidney injury (AKI), a complication for those suffering from infection*

Researchers have found that many hospitalised patients with COVID-19 may face an increased risk for kidney damage or acute kidney injury (AKI), a dreaded complication for those suffering from infection.

The study, published in the Journal of the American Society of Nephrology, revealed that COVID-19 patients experience elevated levels of soluble urokinase receptor (suPAR), an immune-derived pathogenic protein that is strongly predictive of kidney injury.

"SuPAR is a circulating factor we've seen contribute to kidney injury in thousands of patients," said study author Jochen Reiser from the University of Michigan in the US.

"RNA viruses such as HIV and SARS-CoV-2 (the virus that causes COVID-19) elicit a suPAR response of the innate immune system, leading to a rise in blood suPAR levels," Reiser added.

"If there is a hyperinflammatory suPAR response, kidney cells may be damaged," he explained.

The study results show that more than a third patients with COVID-19 end up in need of dialysis and are also at much higher risk of death.

The research team tested suPAR levels of 352 study participants when they were admitted to the hospital for Covid-19 infection.

A quarter of the participants developed acute kidney injury while hospitalized, and their median suPAR levels were more than 60 percent higher than those of the rest of the participants.

The risk of needing dialysis was increased 20-fold in patients with the highest suPAR levels.

Overall, median suPAR levels for these study participants hospitalised with severe COVID-19 were almost three times higher than levels of healthy people.

"Certainly, a suPAR level at time of hospitalization of COVID-19 patients will provide an important risk stratification tool with respect to patient outcomes such as intubation or kidney failure," the researchers said.

"This will help hospitals by providing proper surveillance of patients at higher risk of a severe COVID-19 course," they noted.

<https://www.nationalheraldindia.com/international/covid-19-patients-may-have-higher-risk-of-kidney-damage-study>

## Johnson & Johnson begins giant trial to test one-dose Covid vaccine

*The J&J vaccine is made from a cold virus that's modified to make copies of the coronavirus's spike protein, which the pathogen uses to enter cells*

*By Robert Langreth and Riley Griffin*

Bloomberg: Johnson & Johnson has begun dosing up to 60,000 volunteers in a study of its Covid-19 vaccine, marking the first big U.S. trial of an inoculation that may work after just one shot.

J&J is the fourth vaccine maker to move its candidate into late-stage human studies in the U.S. If enrollment goes as expected, the trial could yield results as soon as year-end, allowing the company to seek emergency authorization early next year, should it prove effective, Johnson & Johnson Chief Scientific Officer Paul Stoffels said Tuesday.

“We are convinced that the single dose could be very efficacious,” he said on a call with the press, citing promising results from earlier research.

The study will compare the vaccine with a placebo injection, with a goal of showing whether it reduces cases of moderate to severe Covid-19. J&J will publish detailed trial plans Wednesday, Stoffels said. Frontrunners Pfizer Inc., Moderna Inc. and AstraZeneca Plc have already done the same.

“It is likely that multiple Covid-19 vaccine regimens will be required to meet the global need,” said Anthony Fauci, director of the National Institute of Allergy and Infectious Diseases, in a statement. J&J’s vaccine “may be especially useful in controlling the pandemic if shown to be protective after a single dose.”

The J&J study is nearly two months behind those of Moderna, working with NIAID, and Pfizer, partnered with BioNTech SE, whose final-stage trials started in late July. Pfizer has said it could get efficacy results by the end of October. Those vaccines use two-dose regimens.

J&J’s vaccine could offer an advantage in distribution over two-shot inoculations that will require vaccination sites to ensure recipients return for their second dose. The company said its vaccine can be stored at refrigerator temperatures for three months, far longer than the Pfizer vaccine that requires deep freezing for long-term storage.

The product is made from a cold virus, called an adenovirus, that’s modified to make copies of the coronavirus’s spike protein, which the pathogen uses to enter cells. The altered virus can’t replicate in humans, but it induces an immune response that prepares the body for an actual Covid-19 infection. The vaccine was developed with researchers at Harvard University who have spent years working on the adenovirus vaccine platform, which is also used in J&J’s Ebola vaccine.

The health-care behemoth is running the study in conjunction with NIAID and the Biomedical Advanced Research and Development Authority at sites in the U.S., Brazil, Mexico, South Africa and other countries. It will include significant representation among those over the age of 60, as well as minorities at disproportionate risk of becoming infected, including Black, Hispanic, American Indian and Alaskan Native peoples, according to a statement.



Johnson and Johnson Inc. | Flickr

J&J has also agreed to collaborate with the U.K. on a separate phase 3 clinical trial that will test a two-dose regimen of the vaccine in multiple countries, according to Stoffels.

The decision to begin the final-stage trial was based on data from an earlier human study that showed a single shot was safe and stimulated a strong immune response, Stoffels said. Animal studies showed that a single shot protected five out of six macaque monkeys from infection after exposure, according to a study published in *Nature* in July.

Like other final-stage vaccine trials, J&J's study is monitored by an independent board of doctors and statisticians who wait for a certain number of coronavirus cases to accumulate before looking at the data.

The trial aims to accumulate 154 Covid-19 cases for a final efficacy analysis. If the vaccine turns out to be more than 90% effective, the trial could produce results after just 20 cases, Stoffels said. He said that scenario is unlikely, though.

The single-shot trial may also take less time to complete than it would with two doses. Scientists will start counting cases just 15 days after patients get their inoculations or placebo shots.

Despite accelerated timelines, Operation Warp Speed won't cut corners in confirming vaccine safety or efficacy, National Institutes of Health director Francis Collins said on the call. "That absolutely will not be allowed to happen," he said.- *Bloomberg*

<https://theprint.in/health/johnson-johnson-begins-giant-trial-to-test-one-dose-covid-vaccine/509130/>

