

Mar  
2021

# 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

खंड : 46 अंक : 59 23 मार्च 2021

Vol.: 46 Issue : 59 23 March 2021



रक्षा विज्ञान पुस्तकालय  
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Press Information Bureau  
Government of India

Ministry of Defence

Mon, 22 March 2021 3:20PM

### New inventions by DRDO

During the past 3 years, 79 projects amounting to Rs.8201 Crores directly pertaining to development of new defence equipments i.e. Cruise Missile, Anti-Ship Missile, Surface-to-Air Missile, Air-to-Air Missile, Extended Range Anti-Submarine Rocket, Mounted Gun System, Ammunitions, Electronic Warfare System, Radars, Torpedoes, High Endurance Autonomous Underwater Vehicle etc. have been undertaken. Some of the DRDO developed systems which are likely to be available to our defence personnel during 2021-23 are as follow:

Sl. No.	System	Timelines
1.	ASTRA Missile	2021
2.	Anti Drone System	2021
3.	SATCOM Devices	2021
4.	QRSAM	2022
5.	ADFCR	2022
6.	Helina	2022
7.	ADTCR	2022
8.	Guided Bomb	2022
9.	NAG	2022
10.	NGARM	2023
11.	SAAW	2023

Many DRDO developed technologies such as Battle Field Surveillance Rader (BFSR), Joint Venture Protective Carbine (JVPC) Jammers, 5.56 mm Rifle, 40 mm Under Barrel Grenade Launcher (UBRL), Oleo Resin (OR) Grenade etc are being utilized by the State Police.

Upgrades to some of the systems have been developed by DRDO. Details of the same are as follow:-

- Arjun Mk-1A
- Akash-NG
- Light Combat Aircraft Mk-1A
- Medium Power Radar-Extended Range
- PINAKA- Extended Range, Guided
- Electronics & Communication System: Unified Mission Computer for SU-30 MKI aircraft, Internal EW System for MIG-29 Upgrade Aircraft, EW systems for Naval platforms.

This information was tabled in a written reply by Raksha Rajya Mantri Shri Shripad Naik to a question asked by Shri Harnath Singh Yadav and Shri Vijay Pal Singh Tomar in Rajya Sabha today.

<https://pib.gov.in/PressReleasePage.aspx?PRID=1706596>



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**Ministry of Defence**

*Mon, 22 March 2021 3:22PM*

## **Proposals for indigenous designing and manufacturing of defence system**

Defence Acquisition Procedure (DAP)-2020 envisages the basic tenets of 'Aatmanirbhar Bharat Abhiyan' and encourages indigenous designing and manufacturing of defence items. The proposals for indigenous design and manufacturing are considered under 'Make' Procedure of DAP-2020. The 'Make' Procedure aims to achieve the objective of self-reliance by involving greater participation of Indian industries including private sector through following mechanisms:

- **Make-I (Government Funded):** This involves design and development of equipment, systems, major platforms or upgrades thereof by the industry. Ministry provides financial support upto 70% of prototype development cost or maximum Rs. 250 crores per Development Agency (DA).
- **Make-II (Industry Funded):** This includes design & development and innovative solutions by Indian vendor, for which no Government funding is provided, but it has assurance of procurement on successful prototype development.

As on date, there are 4 ongoing projects under Make-I category. Further, 56 proposals have been accorded 'Approval in Principal' under Make-II category out of which 23 proposals have been accorded Acceptance of Necessity (AoN). In addition, Defence Research and Development Organisation (DRDO) has also undertaken 233 projects during the past three years since 2018. The projects include new defence equipment such as Cruise missile, Hypersonic missile, Anti-Ship missile, Extended Range Anti-Submarine Rocket, Mounted Gun System, Ammunitions, Electronic Warfare system, Radars, Torpedos, High Endurance Autonomous Underwater Vehicles, etc. AoN has been accorded for 45 DRDO developed systems during last 03 years since 2018 for induction into Services.

Further, in order to promote indigenous design and development of defence equipment 'Buy {Indian-IDD (Indigenously Designed, Developed and Manufactured)}' category under DAP is accorded top most priority for procurement of capital equipment.

Ministry of Defence has notified a 'Negative list' of 101 identified items for which there would be an embargo on the import beyond the timeline indicated against them. This is a big step

towards self-reliance in defence. This offers a great opportunity to the Indian defence industry to manufacture these items indigenously and develop capabilities to meet the requirements of the Armed Forces. This list includes some high technology weapon systems like artillery guns, assault rifles, corvettes, sonar systems, transport aircrafts, light combat helicopters (LCHs), radars etc. to fulfil the needs of our Defence Services.

Further, an indigenization portal namely SRIJAN has also been launched in August, 2020 for Defence Public Sector Undertakings (DPSUs)/Ordnance Factory Board (OFB)/Services with an industry interface to provide development support to MSMEs/Startups/Industry for import substitution. As on date, 9370 Defence items, which were earlier imported, have been displayed on the portal. The Indian industry has shown interest for 1864 displayed items so far. The items displayed on the SRIJAN Portal have well structured description including specification, images, business volume etc.

This information was tabled in a written reply by Raksha Rajya Mantri Shri Shripad Naik to a question asked by Shri Sambhaji Chhatrapati in Rajya Sabha today.

<https://pib.gov.in/PressReleasePage.aspx?PRID=1706601>

# The Daily Guardian

*Tue, 23 March 2021*

## **DAP envisages basic tenets of ‘Aatmanirbhar Bharat’, encourages indigenous designing, manufacturing of defence items**

New Delhi: In information tabled in a written reply by Union Minister of State for Defence Shripad Naik to a question asked by Member of Parliament Sambhaji Chhatrapati in Rajya Sabha on Monday, the Ministry of Defence (MoD) stated that Defence Acquisition Procedure (DAP) 2020 envisages the basic tenets of ‘Aatmanirbhar Bharat Abhiyan’ and encourages indigenous designing and manufacturing of defence items.

As per the ministry, the proposals for indigenous design and manufacturing are considered under the ‘Make’ Procedure of DAP-2020.

The ministry stated that the ‘Make’ Procedure aims to achieve the objective of self-reliance by involving greater participation of Indian industries including the private sector through two mechanisms.

Talking about the first mechanism, Make-I (Government Funded), the ministry said that this involves the design and development of equipment, systems, major platforms or upgrades thereof by the industry, adding that it provides financial support up to 70 per cent of prototype development cost or maximum of Rs 250 crores per Development Agency (DA).

It further said that the second mechanism, Make-II (Industry Funded), includes design and development and innovative solutions by Indian vendor, for which no Government funding is provided, but it has the assurance of procurement on successful prototype development. As of date, there are four ongoing projects under the Make-I category. Further, 56 proposals have been accorded ‘Approval in Principal’ under the Make-II category out of which 23 proposals have been accorded Acceptance of Necessity (AoN).

In addition, the Defence Research and Development Organisation (DRDO) has also undertaken 233 projects during the past three years since 2018.

The projects include new defence equipment such as a Cruise missile, Hypersonic missile, Anti-Ship Missile, Extended Range Anti-Submarine Rocket, Mounted Gun System, Ammunitions, Electronic Warfare system, Radars, Torpedos, High Endurance Autonomous Underwater Vehicles,

etc. AoN has been accorded for 45 DRDO developed systems during the last three years since 2018 for induction into Services.

Further, in order to promote indigenous design and development of defence equipment ‘Buy {Indian-IDD (Indigenously Designed, Developed and Manufactured)}’ category under DAP is accorded topmost priority for procurement of capital equipment.

Ministry of Defence has notified a ‘Negative list’ of 101 identified items for which there would be an embargo on the import beyond the timeline indicated against them. This is a big step towards self-reliance in defence.

This offers a great opportunity to the Indian defence industry to manufacture these items indigenously and develop capabilities to meet the requirements of the Armed Forces. This list includes some high technology weapon systems like artillery guns, assault rifles, corvettes, sonar systems, transport aircraft, light combat helicopters (LCHs), radars etc. to fulfil the needs of our Defence Services.

Further, an indigenisation portal namely ‘Srijan’ has also been launched in August 2020 for Defence Public Sector Undertakings (DPSUs)/Ordnance Factory Board (OFB)/Services with an industry interface to provide development support to Micro Small and Medium Enterprises (MSMEs)/startups/industry for import substitution.

As of date, 9370 Defence items, which were earlier imported, have been displayed on the portal. The Indian industry has shown interest in 1864 displayed items so far. The items displayed on the SRIJAN Portal have well-structured description including specification, images, business volume etc. (ANI)

<https://thedailyguardian.com/dap-envisages-basic-tenets-of-aatmanirbhar-bharat-encourages-indigenous-designing-manufacturing-of-defence-items/>

## DATAQUEST

Tue, 23 March 2021

# ISRO, like DRDO, achieves quantum communication: What is Quantum Key Distribution

*ISRO has announced that it has successfully demonstrated of free-space Quantum Key Distribution, which underpins Quantum Communication technology*

The Indian Space Research Organisation (ISRO) has announced that it has been successful in demonstrating free-space Quantum Communication over a distance of 300 metres. The demonstration, which was conducted at Space Applications Centre (SAC) between two line-of-sight buildings within the campus, included a live video conferencing using quantum-key-encrypted signals.

“A number of key technologies were developed indigenously to accomplish this major feat, which included the use of indigenously developed NAVIC receiver for time synchronization between the transmitter and receiver modules, and gimbal mechanism systems instead of bulky large-aperture telescopes for optical alignment,” said a statement from ISRO.



A similar announcement was made by the Defence Research and Development Organisation (DRDO) a few months ago. DRDO developed Quantum Key Distribution (QKD) technology

recently underwent trials in Hyderabad between two DRDO labs, Defence Research and Development Laboratory (DRDL) and Research Centre Imarat (RCI), to show secure communication.

### **What is the Quantum Key Distribution Technology Demonstrated by ISRO and DRDO**

The Quantum Key Distribution underpins Quantum Communication technology that basically ensures unconditional data security. This communication is considered extremely secure as two parties produce a shared random secret key, which only they have knowledge of and can be used to encrypt or decrypt messages. The communication technology is considered to be extremely secure as it is possible for the two communication parties to detect the presence of any intruders trying to gain knowledge of the key.

Furthermore, this technology is also considered future-proof as it is unlikely for any future advancements in computational power to be able to break the quantum-cryptosystem. “The conventional cryptosystems used for data-encryption rely on the complexity of mathematical algorithms, whereas the security offered by quantum communication is based on the laws of Physics,” adds ISRO.

### **What ISRO and DRDO Aim at Doing through Quantum Key Distribution**

DRDO aims at enabling start-ups and SMEs in the domain of Quantum information technologies as well as to serve to define standards and crypto policies that can leverage Quantum Key Distribution system in a unified Cipher Policy Committee (CPC) framework for more secure and pragmatic key management for current and future military cryptographic systems. ISRO, on the other hand, aims at demonstrating Satellite Based Quantum Communication (SBQC) and is also gearing up to demonstrate the technology between two Indian ground stations.

<https://www.dqindia.com/isro-like-drdo-achieves-quantum-communication-quantum-key-distribution/>



Tue, 23 March 2021

## **बर्फीले पहाड़ों पर तैनात सैनिक इलेक्ट्रिक बसों से कर सकेंगे सफर, IIT Patna देगा DRDO को तकनीक**

*बर्फीले पर्वत पर भी बैट्री से चलेंगी बसें सीमा पर आसानी से पहुंचेंगे सेना लिथियम बैट्री से  
चलेंगी बसें आइआइटी-डीआरडीओ में साझा होगी तकनीक डीआरडीओ से मंजूरी के बाद  
आइआइटी पटना के भौतिकी के प्राध्यापकों ने बनाई विशेष तकनीक युक्त लिथियम बैट्री*

*By Nalini Ranjan and Shubh Narayan Pathak*

पटना: अब देश की सीमा के बर्फीले व तराई क्षेत्रों में सेना को पेट्रोल-डीजल की टेंशन से जल्द ही मुक्ति मिलेगी। इलेक्ट्रिक बसें (Electric Bus) पहाड़ी और तराई सीमा क्षेत्रों में भी आसानी से फर्राटा भरेंगी। ऐसी बसें जम्मू-कश्मीर और लेह-लद्दाख के लिए भी उपयोगी होंगी। आइआइटी पटना की टीम इलेक्ट्रिक बस को लिथियम बैट्री से चलाने की कवायद पर काम कर रही है। बहुत जल्द पटना आइआइटी (Patna IIT) द्वारा निर्मित बैट्री से सुदूर क्षेत्रों में देश की सीमा पर सेना इलेक्ट्रिक बसें चलाई जाएंगी। इसके लिए रक्षा अनुसंधान एवं विकास संगठन (डीआरडीओ) के साथ जल्द ही तकनीक साझा की जाएगी। प्राथमिक रूप से डीआरडीओ की ओर से इस प्रोजेक्ट को हरी झंडी दे दी गई है।



## पांच पेटेंट के साथ डीआरडीओ को साझा की जाएगी तकनीक

पांच पेटेंट के साथ लिथियम बैट्री की तकनीक डीआरडीओ को साझा की जाएगी। इस प्रोजेक्ट को इलेक्ट्रिक व्हीकल, डिफेंस आदि के लिए उपयोग किया जा सकेगा। इस प्रोजेक्ट को आइआइटी पटना के वरीय प्राध्यापक प्रो. एके ठाकुर के निर्देशन में तैयार किया गया है। इसकी विशेषता होगी कि बैट्री हल्की होने से वाहन का वजन कम रहेगा। ज्यादा बैकअप होने से अधिक दूरी तय की जा सकेगी। साथ ही प्रदूषण भी कम कर सकेगा।

## इंजन की जगह लगेगी ब्रशलेस डीसी मोटर, टैंक की जगह बैट्री

आइआइटी के प्रो. एके ठाकुर ने बताया कि लिथियम बैट्री के उपयोग से सेना के लिए इलेक्ट्रिक बस चलाने के लिए संभावना तलाशी जा रही है। इसके लिए जून में डीआरडीओ और आइआइटी पटना के बीच एमओयू होगा। इसमें तकनीक साझा की जाएगी। इस इलेक्ट्रिक बस में इंजन की जगह ब्रशलेस डीसी मोटर लगेगी। इसमें इंजन की जगह मोटर ही कार्य करेगी। साथ ही पेट्रोल-डीजल टैंक की जगह बैट्री पैक लगा दिया जाता है।

## माइनस 30 डिग्री पर भी आसानी से चल सकेंगी बसें

इस बैट्री की खूबी रहेगी कि माइनस 30 डिग्री तापमान में भी बिना किसी परेशानी के बसें आसानी से चल सकेंगी। उन्होंने बताया कि डीआरडीओ की ओर से आइआइटी पटना को इस प्रोजेक्ट को अंतिम रूप देने को कहा गया है। जून में विधिवत कार्यक्रम आयोजित कर इसकी घोषणा भी की जा सकती है।

<https://www.jagran.com/bihar/patna-city-iit-patna-is-working-to-develop-a-lithium-battery-in-consultation-with-drdo-which-is-specially-to-use-in-buses-in-hill-and-cold-areas-jagran-special-21487038.html>



Tue, 23 March 2021

# Analysts: Philippines Would Make Leap in Coastal Defenses with Indian Missiles

By J.C. Gotinga

Manila: The Philippines has a deal in the works with India for the potential acquisition of supersonic BrahMos missiles that would represent a leap for Manila's defense of its territorial interests in the contested South China Sea, analysts say.

In early March, the government of the archipelagic Southeast Asian nation inked a general agreement with New Delhi to procure defense assets which would possibly include a battery of the Indo-Russian-made missiles.

Philippine officials, however, have not disclosed a price-tag or other details about the potential deal. But if it goes through, it would mark the country's first acquisition of major military hardware from India, China's regional rival, as part of a multi-billion-dollar program by Manila to modernize its military.

"As of this time, there are no substantial developments regarding the project as it is still in the initial stages of the acquisition process," Arsenio Andolong, a spokesman for the Philippine Department of National Defense, told BenarNews late last week.

The BrahMos PJ-10 missile, the world's fastest cruise missile, flies three times faster than the speed of sound and can be deployed and fired from land as well as from navy ships and submarines, according to reports.



The Indian Army displays BrahMos weapon systems during a full-dress rehearsal for the Republic Day parade in New Delhi, Jan. 23, 2015.



The possible acquisition is being seen as a value-for-money choice for a country that needs to be more judicious about its defense spending, analysts said, adding that acquiring the BrahMos system would help Manila build a credible defense posture.

“It’s a cost-effective solution for the navy to have a sea-denial capability. Right now Chinese vessels are operating with impunity in our EEZ,” said Rommel Jude Ong, a retired Navy admiral now affiliated with the Ateneo School of Government in Manila, referring to the Philippines’ exclusive economic zone in the South China Sea.

“The BrahMos, with a 290-km [180-mile] range, will provide a defensive buffer across a certain extent of the EEZ,” Ong told BenarNews.

The potential acquisition comes amid tensions in the South China Sea and Beijing’s expansionist activities in the maritime region. The Philippine government confirmed it had lodged a new diplomatic protest on Sunday against Beijing over reports that about 220 boats manned by Chinese militia had been spotted within Philippine territorial waters.

Between January and August 2019, the Philippine defense department recorded at least 25 instances in which vessels of China’s People’s Liberation Army Navy had passed through the Philippine EEZ and territorial waters without official notice to Manila.

The BrahMos would be the first weapon in the Philippine arsenal that could substantially hurt an aggressor out on the contested waters, according to Ong.

“It gives the navy a ‘mission-kill’ option in case of conflict. In peacetime it will provide strategic deterrence,” he said.

However, some observers believe that the Philippine military would do better to make it a priority to improving its surveillance capability and integrating a missile system into that.

“A missile system provides a deterrence. A requirement of a deterrent and defense system is the need for eyes and ears,” Edilberto Adan, a retired Philippine military general, told BenarNews.

“It has to be integrated with a surveillance and intelligence capability for the simple reason that what you cannot see or what you cannot detect, you cannot engage.”

### **Modernization program**

The Philippines, meanwhile, is set to spend more than U.S. \$6 billion (291 billion pesos) between 2018 and 2022 through the current stage of its military modernization program.

Last month, the country acquired its second brand-new, Korean-made naval frigate, the BRP Antonio Luna (FF-151), which is capable of being armed with missiles. The Luna and its sister ship, the BRP Jose Rizal (FF-150), together cost the Philippine government roughly \$330 million (16 billion pesos). Before these acquisitions, the Philippine naval fleet consisted mostly of dated hand-me-downs from other countries, including long-time defense ally, the United States.

Despite the spending spree, the country’s defense expenditure falls below the global average ratio to gross domestic product (GDP). In 2019, even with military acquisitions under way, Manila spent slightly under 1 percent of its gross domestic product on defense, compared with Beijing’s 1.9 percent, and Washington’s 3.4 percent, according to data from the World Bank.

Acquiring new aircraft and ships should remain a priority, even if it takes longer to shore up the funds to buy them, analyst Adan said.

While ships and planes can act as eyes and ears for the military, missiles cannot, he said.

“A missile system would require a robust command-and-control [facility] in place, meaning there is detection, there is analysis, then there is a decision process for the government to engage either by sending ships or aircraft, or firing the missiles,” he said.

That is true especially when dealing with a potential adversary of far superior might in China, the retired general warned.

“Knowing our adversary, it has infinitely more capability than us. Expect a robust retaliation once you fire a missile,” Adan said, noting that the cost of acquiring a missile would run into the millions of dollars. “And that is [just] for one shot.”

<https://www.benarnews.org/english/news/philippine/weapons-deal-03222021134326.html>

# Defence Strategic: National/International



**Press Information Bureau**  
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**Ministry of Defence**

*Mon, 22 March 2021 3:20PM*

## **New Defence Production Policy**

A Draft 'Defence Production & Export Promotion Policy (DPEPP)' 2020 was placed in public domain by the Department of Defence Production, Ministry of Defence. This draft policy is positioned as Ministry of Defence's overarching guiding document to provide a focused, structured and significant thrust to defence production capabilities of the country for self-reliance and exports. It envisions to make India amongst the top countries of the world in Defence sector, including Aerospace and Naval Shipbuilding sectors, from design to production, with active participation of public and private sector. This policy, inter alia, aims to create an environment that encourages R&D, rewards innovation, creates Indian Intellectual Property (IP) ownership and promotes a robust and self-reliant defence industry.

The new Defence Acquisition Procedure (DAP)-2020 has been released on 30th September, 2020. DAP-2020 is a product of extensive analysis, deliberations, interactions and focused formulations. It aims to further 'Self Reliance' of the country in the defence sector by promoting indigenization and bring 'Ease of Doing Business' with emphasis on Simplification, Delegation, Reduced Timelines and make the process as Industry friendly.

This information was tabled in a written reply by Raksha Rajya Mantri Shri Shripad Naik to a question asked by Dr Banda Prakash in Rajya Sabha today.

<https://pib.gov.in/PressReleasePage.aspx?PRID=1706595>



**Press Information Bureau**  
**Government of India**

**Ministry of Defence**

*Mon, 22 March 2021 3:20PM*

## **Modernisation of the Naval Fleet**

Indian Navy remains operationally ready and maintains combat ready platforms with additional forces in readiness at various bases/ports. Indian Navy is always ready to address any eventuality posed by the adversaries in its area of operations. It also diligently follows the Maintenance, Training, Operations and Deployment Cycle ensuring a high state of material as well as combat readiness encompassing all spectrums of maritime operations.

Modernisation of Indian Navy is an ongoing process, and is undertaken in accordance with Long Term Integrated Perspective Plan which is reviewed from time to time.

This information was tabled in a written reply by Raksha Rajya Mantri Shri Shripad Naik to a question asked by Dr Sasmit Patra in Rajya Sabha today.

<https://pib.gov.in/PressReleasePage.aspx?PRID=1706598>



*Mon, 22 March 2021 3:58PM*

## **MoD signs contract with MDSL to supply Light Specialist Vehicles to Indian Army**

Providing further boost to 'Make in India', Ministry of Defence (MoD) signed a contract with Mahindra Defence Systems Ltd (MDSL) for supply of 1,300 Light Specialist Vehicles to the Indian Army, at a cost of Rs 1,056 crore, in New Delhi on March 22, 2021. The induction of vehicles is planned to be completed in four years.

The Light Specialist Vehicle is a modern fighting vehicle and will be authorised to various fighting units for carriage of Medium Machine Guns, Automatic Grenade Launchers as well as Anti-tank Guided Missiles.

The Light Specialist Vehicle is indigenously designed and developed by MDSL. These combat vehicles are extremely agile with all round protection against small arms fire and will assist small independent detachments which are required to operate this weapon platform in the operational area.

This is a flagship project showcasing the indigenous manufacturing capabilities of the defence industry and will add another milestone to the 'Atmanirbhar Bharat Abhiyaan' and 'Make in India' initiative of the Government.

<https://pib.gov.in/PressReleasePage.aspx?PRID=1706618>





पत्र सूचना कार्यालय  
भारत सरकार  
रक्षा मंत्रालय

Mon, 22 March 2021 3:58PM

## रक्षा मंत्रालय ने भारतीय सेना को लाइट स्पेशलिस्ट वाहनों की आपूर्ति के लिए एमडीएसएल के साथ अनुबंध पर हस्ताक्षर किए

'मेक इन इंडिया' को और बढ़ावा देते हुए रक्षा मंत्रालय (एमओडी) ने दिनांक 22 मार्च, 2021 को नई दिल्ली में 1,056 करोड़ रुपये की लागत से भारतीय सेना को 1,300 लाइट स्पेशलिस्ट वाहनों की आपूर्ति के लिए महिंद्रा डिफेंस सिस्टम्स लिमिटेड (एमडीएसएल) के साथ एक अनुबंध पर हस्ताक्षर किए। वाहनों को शामिल करने का काम चार साल में पूरा करने की योजना है।

लाइट स्पेशलिस्ट व्हीकल एक आधुनिक फाइटिंग व्हीकल है और इसे मीडियम मशीनगन्स, ऑटोमैटिक ग्रेनेड लॉन्चर्स के साथ-साथ एंटी टैंक गाइडेड मिसाइलों की दुलाई के लिए विभिन्न फाइटिंग यूनिट्स के लिए प्राधिकृत किया जाएगा।



लाइट स्पेशलिस्ट व्हीकल को महिंद्रा डिफेंस सिस्टम्स लिमिटेड (एमडीएसएल) द्वारा स्वदेशी रूप से डिजाइन और विकसित किया गया है। येलडाकू वाहन छोटे हथियारों के खिलाफ चौतरफा सुरक्षा के साथ बेहद फुर्तीले वाहन हैं और सामरिक क्षेत्र में इस हथियार को संचालित करने के लिए आवश्यक छोटे स्वतंत्र सैन्य टुकड़ियों की सहायता करेंगे।

यह रक्षा उद्योग की स्वदेशी विनिर्माण क्षमताओं को प्रदर्शित करने वाली एक प्रमुख परियोजना है और सरकार के 'आत्मनिर्भर भारत अभियान' और 'मेक इन इंडिया' पहल में एक और मील का पत्थर जोड़ेगी।

<https://pib.gov.in/PressReleasePage.aspx?PRID=1706662>

## HAL meets ‘full-production target’ of 140 Sukhoi Su-30MKI Fighter Jets at Nashik facility

By Mansij Asthana

In a big boost to the Indian Air Force (IAF), Hindustan Aeronautics Limited (HAL) has finished the Phase 4 production of 140 Sukhoi Su-30MKI fighter jets in its facility in Maharashtra’s Nashik.

Phase 4 production involves building an aircraft from the raw-material stage.

HAL, which also develops India’s home-grown Tejas fighters, made this announcement in a Twitter post on March 18.

The Sukhoi Su-30MKI fighter jets are jointly developed by Russia’s Sukhoi Design Bureau and HAL for the use of the Indian Air Force (IAF). HAL has obtained the production license from Russia’s United Aircraft Corporation (UAC).

The Su-30MKI, which is equipped with thrust vectoring control and canards, is said to be the backbone of the Indian Air Force. The license production program in India for the Russian-origin fighter jets is carried out in a four-phased manner.

In the earlier phases, the fighter jets’ manufacturing had been progressively indigenized, according to reports. Phase 4 of the production involves the development of the fighter jets from raw materials sourced from the Sukhoi company.

The HAL Nashik division, called the Aircraft Division Nasik, was established in 1964 for the license manufacture of MiG-21FL aircraft & K-13 Missiles. The division is located at Ojhar town, 24 km from the main city and approximately 200 km from India’s financial capital of Mumbai.

Along with the Su-30MKI fighters, the HAL division has manufactured variants of Russia’s Mikoyan (MiG) fighters, including MiG-21M, MiG-21 BIS, MiG-27 M.

Currently, HAL Nashik is manufacturing thousands of components that are required for integration into the Su-30MKI fighter jet.

According to reports, the completion of the project is considered the end of the manufacturing of the Su-30MKI fighters for the Indian Air Force from the raw material stage.

Apart from the Su-30MKI fighters, HAL also manufactures the fighters’ AL31FP engines from raw materials supplied by Sukhoi at its Engine Division in Koraput town of Odisha.

Two AL-31FP turbojet engines are used to power the Su-30MKI fighter, with each engine generating a full afterburn thrust of 12,500kgf, helping it to attain speeds of Mach 1.9.

The latest developments regarding the Russian-origin fighters mark the completion of the production of the 272 Su-30MKI fighters.

India had signed a Memorandum of Understanding (MoU) with Russia in October 2000, to start the license production of Su-30MKIs at HAL’s plant.

The Indian version of the Sukhoi has advanced Israeli avionics and electronic warfare systems, making them different from the standard Su-30s or the Chinese versions. Additionally, the S3-30 MKI has a variety of missiles including the Russian origin R73/77 and the Indian-made Astra and Brahmos.



Su-30MKI fighter

<https://eurasianimes.com/big-boost-to-iaf-as-hal-meets-full-production-target-of-140-sukhoi-su-30mki-fighters/>

*Tue, 23 March 2021*

## **Israel completes test of extended range interceptor**

*Barak' extended range missile can take out aircraft and missiles up to 150 km away*

*By Paul Shindman*

Israel Aerospace Industries announced Monday that it had successfully completed a series of tests of the Barak air defense system showing it can intercept targets, including ballistic missiles, up to 150 km (90 miles) distance.

A derivative of IAI's successful Barak-8 missile that has a range of 100 km (60 miles), the Extended Range interceptor (ER) version is "designed to intercept a variety of systems in different ranges," the company said in a statement.

"The evolution of airborne threats across the globe, combined with geopolitical changes, requires an advanced, agile, and versatile air defense system," said IAI CEO Boaz Levy. "The Barak system was operationally proven against countless threats, including some of the most challenging ones today."

"This series of experiments added another tier to the system's capabilities in the long run and against a wider range of threats and joins many dozens of experiments performed in the Barak system across all its derivatives," Levy said.

IAI co-developed a version of the Barak missile for the Indian Army with India's Defense Research and Development Organization (DRDO).

In 2017, IAI was awarded \$1.6 billion in contracts, at the time the largest defense deal in Israel's Defense Industries' history, with IAI to provide an advanced air and missile defense systems to the Indian army.

A subsequent deal worth \$777 million was reached to supply the maritime version of the Barak-8 surface-to-air missile system on seven Indian Navy vessels at a cost of \$111 million each.

Israel uses the Barak-8 on its own vessels that are capable of intercepting aerial threats such as missiles and jets, including the kinds of anti-ship missiles that the Hezbollah terror group in Lebanon has in its arsenal.

Israel and India enjoy the sharing of technological developments, and India is one of Israel's biggest clients in the defense technology market. Israel's military delegation to India is second in size only to its delegation to America.

<https://worldisraelnews.com/israel-completes-test-of-extended-range-interceptor/>

## China aggressively building new villages in disputed borderlands in Himalayas: Report

New Delhi: With the aim to expand its territory, Beijing is aggressively building many new villages in disputed borderlands in the Himalayas, according to a report published in The Japan Times.

Brahma Chellaney, professor of strategic studies at the New Delhi-based Center for Policy Research, in an article, titled 'China's Himalayan salami tactics' said, "China is aggressively building many new villages in disputed borderlands to extend or consolidate its control over strategically important areas that India, Bhutan, and Nepal maintain fall within their national boundaries."

Chellaney wrote that the strategic implications of China's drive to populate these desolate, uninhabited border areas is its major buildup of new military facilities. The new installations range from electronic warfare stations and air defence sites to underground ammunition depots.

"China's militarised village-building spree has renewed the regional spotlight on Chinese President Xi Jinping's expansionist strategy at a time when, despite a recent disengagement in one area, tens of thousands of its troops remain locked in multiple standoffs with Indian forces. Recurrent skirmishing began last May after India discovered to its alarm that Chinese forces had stealthily occupied mountaintops and other strategic vantage points in its northernmost Ladakh borderlands," he wrote.

He further stated that Xi's regime advanced its South China Sea expansionism through asymmetrical or hybrid warfare, waged below the threshold of overt armed conflict. This approach blends conventional and irregular tactics with small incremental territorial encroachments (or "salami slicing"), psychological manipulation, disinformation, lawfare, and coercive diplomacy.

The Hong Kong-based South China Morning Post, citing a Chinese government document, recently reported that China intends to build 624 border villages in disputed Himalayan areas.

"In the name of "poverty alleviation," the Communist Party of China (CPC) is callously uprooting Tibetan nomads and forcing them to settle in artificial new border villages in isolated, high-altitude areas," Chellaney said while adding that the CPC has also sent ethnic Han Chinese party members to such villages to serve as resident overseers.

By building new border villages and relocating people there, China can now invoke international law in support of its claims. Effective control is the sine qua non of a strong territorial claim in international law. Armed patrols don't prove effective control, but settlements do, wrote Chellaney.

He added that China's construction of villages and military facilities in the borderlands threatens to wreak havoc on the ecologically fragile Himalayas, which are the source of Asia's great rivers. Environmental damage is already apparent on the once-pristine Doklam Plateau, claimed by Bhutan, which China has transformed into a heavily militarized zone since seizing it in 2017.

<https://timesofindia.indiatimes.com/india/china-aggressively-building-new-villages-in-disputed-borderlands-in-himalayas-report/articleshow/81637487.cms>



## What is at stake for India in South China Sea?

### Story Highlights

#### **China claims almost the entirety of the South China Sea, which is extremely rich in resources**

The Indo-Pacific region has become the geopolitical centre of the world for which several leaders are fighting over.

The location is crucial because it is the merging point of two oceans, that is, the Indian Ocean and the Pacific Ocean.

The geographic region has become the biggest maritime flashpoint of the world.

China claims almost the entirety of the South China Sea, which is extremely rich in resources.

The country has been accused by the United States of efforts to "intimidate, coerce and threaten other nations" to control it.

An international tribunal invalidated China's claim to 90 per cent of the South China Sea in 2016, but Beijing does not recognise the ruling. China has built islands in the disputed waters in recent years, putting airstrips on some of them.

Beijing often invokes the so-called nine-dash line to justify its apparent historic rights over most of the South China Sea, parts of which are also claimed by Taiwan, Malaysia, the Philippines and Brunei.

Pentagon chief Lloyd Austin told Prime Minister Narendra Modi that he "commended India's leadership role in the Indo-Pacific and growing engagement with like-minded partners across the region to promote shared goals," Pentagon spokesman John Kirby said.

New Delhi has recently shifted its foreign policy focus eastward. Nearly 200 billion dollars worth of Indian trade passes through the South China Sea.

Free and open navigation is in India's interest, but Chinese dominance would be disastrous.

The Philippines urged China on Sunday to recall more than 200 Chinese boats it said had been spotted at a reef in the South China Sea, saying the presence of the vessels violated its maritime rights as it claims ownership of the area.

From the British empire in the 16th and 17th centuries to the United States since World War I, maritime superpowers have dominated world politics.

China's unilateral actions have had an unintended effect. It has brought all the regional stakeholders including the Quad together.

The leaders of the United States, India, Australia and Japan - countries together known as the Quad - held the first summit last week pledging to work together for a free and open Indo-Pacific and to cooperate on maritime and cybersecurity in the face of challenges from China.

India has been cultivating its ties in the region as a part of the "act east" policy. Its major focus is on the ASEAN grouping.

The ASEAN has 10 member nations. It is among the fastest-growing political unions in the world.

India has opted for mini trade deals. It is mulling a preferential trade arrangement with the Philippines, the third-largest economy in ASEAN.

Despite over 70 years of diplomatic ties -- India and the Philippines do not have close ties. Earlier this month, the two countries signed a major defence deal.



Satellite photo shows Chinese-controlled North Island, part of the Paracel Islands group in the South China Sea, on September 29, 2017. Photograph:( Reuters )



The Philippines will buy the Indian-made Brahmos PJ-10 missiles, the fastest cruise missile in the market. Defence cooperation mostly leads to strategic partnerships.

India and the Philippines are also cooperating on the vaccine front. Manila plans to secure 8 million doses of COVAXIN -- developed by India's Bharat biotech.

India could help the Philippines revive its struggling inoculation campaign.

In December last year - India and Vietnam participated in a two-day military drill

An Indian warship was dispatched to Vietnam to deliver humanitarian aid and the naval drills were organised on its return voyage.

Singapore's Prime Minister Lee Hsien Loong said that the region is "India's sphere of influence."

Indians have sailed these waters for more than 1,500 years.

Economically and politically -- India has a lot at stake in the South China Sea.

In the last 40 years -- the Indo-Pacific prospered as a hub of free navigation...

Deterring China's belligerence in the region is key and India could be the bulwark against Beijing.

New Delhi has the economic power, the political clout and the military strength to tackle China on the high seas.

<https://www.wionews.com/india-news/what-is-at-stake-for-india-in-south-china-sea-372397>

## Science & Technology News

THE TIMES OF INDIA

Tue, 23 March 2021

# ISRO demonstrates quantum comm tech; to extend it to Sats next

By Chethan Kumar

Bengaluru: In the first step towards developing quantum satellite technology, the Indian Space Research Organisation (ISRO) late last week successfully demonstrated a technology enabling secure communication between two buildings that were 300 metres apart using free-space quantum communication technology.

“This is a major breakthrough for SAC (space applications centre) engineers who have demonstrated quantum communication between two buildings on March 19. Today, advanced computers can break encryption and future strategic communication will need quantum communication. Every country will need this and we have demonstrated it,” Sivan said. The technology will be useful for a range of strategic sectors ranging from defence to digital money transactions, among other things and ISRO has plans for extending this to satellites as well.



Just last month, a team led by Prof Urbasi Sinha had demonstrated a similar technology that was developed as part of the Quantum Experiments using Satellite Technology (QuEST) project. In that case, the communication was between two structures that were only 50 metres apart.

As reported by TOI in February, working on quantum cryptography — encrypting a message in a way nobody can read it at the quantum (minimal level of a unit in physics) level — the scientists had demonstrated the ability to share this secret key “safely” to another building.

QuEST, carried out by RRI's Quantum Information and Computing (QuIC) lab, is India's first project on satellite-based long-distance quantum communications. Started in 2017, QuEST is being implemented in collaboration with Isro.

However, Sivan said: "While we are working with others on quantum technology, the demonstration we did last week was a technology developed at SAC. The most important thing is that we will be able to extend this to the satellites given that it is a free space quantum technology. That will be a quantum jump."

He did not immediately elaborate more on the technology stating that the space agency will be making a formal announcement soon. On whether the SAC technology also uses QKD (quantum key distribution), Sivan said: "Yes."

According to Isro, a number of key technologies were developed indigenously to accomplish this major feat, which included the use of indigenously developed NAVIC receiver for time synchronization between the transmitter and receiver modules, and gimbal mechanism systems instead of bulky large-aperture telescopes for optical alignment.

The demonstration has included live videoconferencing using quantum-key-encrypted signals. This is a major milestone achievement for unconditionally secured satellite data communication using quantum technologies, Isro said.

"The Quantum Key Distribution (QKD) technology underpins Quantum Communication technology that ensures unconditional data security by virtue of the principles of quantum mechanics, which is not possible with the conventional encryption systems," an Isro statement read.

Stating that conventional cryptosystems used for data-encryption rely on the complexity of mathematical algorithms, ISRO said the security offered by quantum communication is based on the laws of Physics. "Therefore, quantum cryptography is considered as 'future-proof', since no future advancements in the computational power can break quantum-cryptosystem," the space agency said. The free-space QKD was demonstrated between two line-of-sight buildings within the campus. The experiment was performed at night, in order to ensure that there is no interference from the direct sunlight.

"The experiment is a major breakthrough towards ISRO's goal of demonstrating Satellite-Based Quantum Communication (SBQC), where Isro is gearing up to demonstrate the technology between two Indian ground stations," the space agency added.

<https://timesofindia.indiatimes.com/india/isro-demonstrates-quantum-comm-tech-to-extend-it-to-sats-next/articleshow/81636095.cms>

## ISRO का 'फ्री स्पेस क्वांटम कम्युनिकेशन' परीक्षण सफल हुआ, अब भेजे गए संदेश को नहीं किया जा सकेगा हैक

*भारत में पहली बार भारतीय अंतरिक्ष अनुसंधान संगठन ने ऐसी तकनीक का प्रदर्शन किया है जिससे भेजे गए संदेश को किसी भी कीमत पर चोरी या हैक नहीं किया जा सकता है। वहीं ये परीक्षण 300 मीटर की दूरी तक किया गया है*

भारतीय अंतरिक्ष अनुसंधान संगठन ने पहली बार एक ऐसी तकनीक का प्रदर्शन किया है जिससे भेजा गया संदेश किसी भी कीमत पर चोरी नहीं किया जा सकेगा। इस प्रमुख परीक्षण को पूरा करने के लिए कई प्रमुख तकनीकों को स्वदेशी रूप से विकसित किया गया है, जिसमें ट्रांसमीटर और रिसीवर माँड्यूल के बीच समय को नोट करने के लिए स्वदेशी रूप से विकसित नाविक रिसीवर का उपयोग शामिल है। इसरो के मुताबिक इस प्रदर्शन में क्वांटम-की-एन्क्रिप्टेड सिग्नल का इस्तेमाल करके लाइव वीडियो कॉन्फ्रेंसिंग की जा सकती है। वहीं इसरो की ये तकनीक अगर ताकतवर स्तर पर विकसित हो जाती है तो अंतरिक्ष से भेजे गए संदेशों और अपने सैटेलाइट के संदेशों को बेहद कम समय में अत्यधिक सुरक्षित तरीके से हासिल किया जा सकेगा।

### क्वांटम कुंजी वितरण क्या है?

क्वांटम कुंजी वितरण प्रौद्योगिकी क्वांटम संचार प्रौद्योगिकी को कम करती है जो क्वांटम यांत्रिकी के सिद्धांतों के आधार पर बिना शर्त डेटा की सुरक्षा सुनिश्चित करती है, जो पारंपरिक एन्क्रिप्शन सिस्टम के साथ संभव नहीं है। वहीं इसरो ने बताया कि क्वांटम क्रिप्टोग्राफी को भविष्य प्रूफ माना जाता है। ऐसा इसलिए है क्योंकि कम्प्यूटेशनल पावर में भविष्य की कोई भी प्रगति क्वांटम क्रिप्टोसिस्टम को नहीं तोड़ सकती है।

### रात में किया गया परीक्षण

अहमदाबाद के स्पेस एप्लीकेशन सेंटर में द लाइन ऑफ विज़न इमारतों के बीच खाली जगह द क्वांटम की डिस्ट्रीब्यूशन पाया गया। इस प्रयोग को रात में किया गया था, ताकि ये सुनिश्चित किया जा सके कि इस पर सूरज की किरणों का कोई असर को नहीं पड़ रहा है।

<https://www.abplive.com/news/india/isro-free-space-quantum-communication-test-succeeded-now-sent-message-cannot-be-stolen-1829196>

## इसरो: प्रकाश कणों पर संदेश भेजने में मिली पहली बार कामयाबी

सार

- इसरो ने 300 मीटर के दायरे में फ्री स्पेस क्वांटम कम्युनिकेशन का सफल परीक्षण किया।
- इस तकनीक के जरिये भेजे गए संदेश को हैक करना नामुमकिन होगा।
- सैटेलाइट डाटा कम्युनिकेशन को सुरक्षित करने में बहुत बड़ी कामयाबी।

विस्तार

भारतीय अंतरिक्ष अनुसंधान संगठन (इसरो) ने देश में पहली बार एक ऐसी तकनीक का प्रदर्शन किया है, जिससे संदेश भेजना बेहद सुरक्षित है। इसरो ने 300 मीटर के दायरे में फ्री स्पेस क्वांटम कम्युनिकेशन का सफल परीक्षण किया है।

इसके जरिये इसरो ने प्रकाश कण फोटॉस के जरिये संदेश भेजने में महारत हासिल कर ली है। खास बात यह है कि इस तकनीक के जरिये भेजे गए संदेश को हैक करना नामुमकिन होगा।

इसरो ने स्वदेशी तकनीक से 'एनएवीआईएस' रिसेवीर को विकसित कर इस योग्य बनाया है ताकि फ्री स्पेस क्वांटम कम्युनिकेशन को प्रदर्शित कर सके। इसके परीक्षण के दौरान लाइव वीडियोकांफ्रेंस और क्वांटम की एनक्रिप्शन संकेत का इस्तेमाल किया गया।

क्वांटम की डिस्ट्रीब्यूशन के जरिये संदेश, फोटो या वीडियो प्रकाश कण में डाल कर एक जगह से दूसरी जगह विशेष ट्रांसमीटर के जरिये ही भेजा जाता है, जिसे खास तरह का रिसेवीर ही प्राप्त कर सकता है। बंगलूरू स्थित स्पेस एजेंसी मुख्यालय की ओर से जारी बयान में कहा गया है कि क्वांटम तकनीक के इस्तेमाल से सैटेलाइट डाटा कम्युनिकेशन को नितांत सुरक्षित करने में बहुत बड़ी कामयाबी मिली है।

<https://www.amarujala.com/india-news/isro-success-in-sending-messages-on-light-particles>

## 4 Indian astronaut candidates for Gaganyaan mission complete training in Russia

*The contract for the training of Indian officers was signed between the Indian Space Research Organisation (ISRO) and Russian launch service provider Glavcosmos in June 2019*

Moscow: Four Indian officers, who were selected to become astronauts to crew Gaganyaan into orbit, have completed their one-year training course in Russia's Zvyozdny gorodok city near Moscow.

The Gaganyaan mission is aimed at sending astronauts to space in an orbital spacecraft.

"In the evening we met with Indian gaganauts who had completed their training at Gagarin Cosmonaut Training Center. We also discussed with the (Indian) ambassador the future bilateral space projects," Dmitry Rogozin, the head of the Russian state space corporation, said on his Telegram channel, as quoted by Sputnik.

The contract for the training of Indian officers was signed between the Indian Space Research Organisation (ISRO) and Russian launch service provider Glavcosmos in June 2019. The four pilots of the Indian Air Force (IAF) include a Group Captain and three Wing Commanders, according to the IAF sources.

The training began on February 10, 2020, but it was temporarily interrupted due to the COVID-19 pandemic.

Earlier, the ISRO officials had said that after receiving training in Russia, these astronauts will now receive module-specific training in India. They will be trained in crew and service module designed by ISRO, learn to operate it, work around it and do simulations.

Prime Minister Narendra Modi-led government has sanctioned ₹10,000 crores for the Gaganyaan project.

Earlier this month, Union Minister of Atomic Energy and Space Jitendra Singh had said the ISRO's Gaganyaan programme envisages sending humans in space.

In a statement laid on the table of the Rajya Sabha in reply to a question, the Minister had said that the objective of programme is to demonstrate the capability to send humans to Low earth orbit (LEO) on board an Indian Launch vehicle and bring them back to earth safely.

"ISRO has wide experience in technological areas with respect to the launch vehicle, spacecraft management and ground infrastructure etc and it has taken steps for a human rating of existing systems to ensure crew safety. India is proud of the fact that many Indian scientists are doing significant work in collaboration with international institutions," he had added.

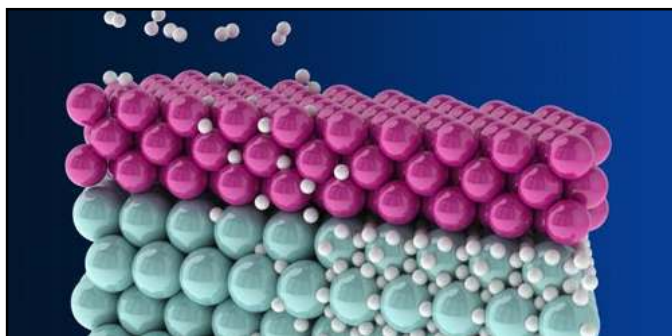
<https://www.hindustantimes.com/science/4-indian-astronaut-candidates-for-gaganyaan-mission-complete-training-in-russia-101616461070269.html>

# A material that is superconductive at room temperature and lower pressure

By Bob Yirka

A team of researchers from the University of Rochester, the State University of New York at Buffalo and the University of Nevada Las Vegas has reduced the amount of pressure required to force a material to become superconductive at room temperature, improving on their own previous results. In their paper published in the journal *Physical Review Letters*, the group outlines their technique and plans for the future.

Scientists have been looking to create materials that are superconductive at room temperature for many years. Such a material would allow for building cooler electronics and would dramatically increase the efficiency of the electricity grid. It was not until late last year that the first such material was created—a hydrogen-rich compound that, when squeezed to 267 GPa, became superconductive. And while the feat was a step in the right direction, the need for



Credit: D. Smith/Argonne National Laboratory; R. Dias/University of Rochester

high pressure made the material impractical for everyday use. In this new effort, the same team has found a way to dramatically reduce the required pressure by making a change to their prior technique—they combined hydrogen with yttrium instead of carbon and sulfur.

Prior research had shown that materials with a high hydrogen content lend themselves well to superconductive materials created under higher temperatures and that was why they had chosen it for their experiments.

The work involved using two diamond anvils to create the pressure. They were placed slightly apart with hydrogen gas and a sample of yttrium in its solid state between them. The materials were separated by a sheet of palladium, which the team added to prevent oxidation of the yttrium—it also served as a catalyst, aiding in moving the hydrogen atoms into the yttrium. Testing of the resulting material showed it to be superconductive at 182 GPa—much lower than they found last year, but still much too high for practical use. They suggest that they are moving in the right direction, however, and plan to continue revising their technique to learn more about its potential—and, of course, to find out if it could be used to create a room temperature superconductive material.

**More information:** Elliot Snider et al. Synthesis of Yttrium Superhydride Superconductor with a Transition Temperature up to 262 K by Catalytic Hydrogenation at High Pressures, *Physical Review Letters* (2021). DOI: [10.1103/PhysRevLett.126.117003](https://doi.org/10.1103/PhysRevLett.126.117003)

On Arxiv: arXiv:2012.13627v1 [cond-mat.supr-con] [arxiv.org/abs/2012.13627](https://arxiv.org/abs/2012.13627)

**Journal information:** *Physical Review Letters*, arXiv

<https://phys.org/news/2021-03-material-superconductive-room-temperature-pressure.html>

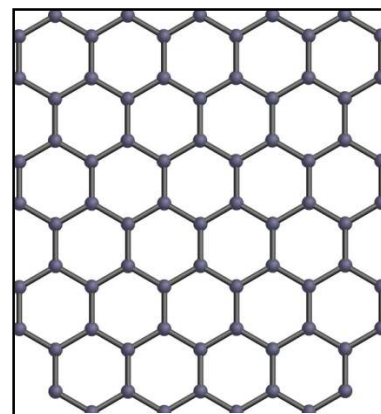
## Modification of graphene using laser light

Graphene is an exciting new material, which has been characterized as a 'wonder material' because of its excellent properties. Graphene gained widespread attention in 2010 when the Nobel Prize in physics was awarded to researchers who discovered it. Graphene is only one atom layer thick making it the world's thinnest material. In his dissertation, Vesa-Matti Hiltunen showed that graphene could be 'forged' using laser light. This creates very stiff three-dimensional structures out of graphene, which can potentially be used to make faster and more accurate mechanical devices.

Graphene has several excellent properties, such as electric conductivity, transparency and mechanical strength. Due to these properties, graphene has been envisioned to be used in various applications, in energy storage, sensors or communication technology.

MSc Vesa-Matti Hiltunen has studied in his Ph.D. how shape and properties of graphene can be modified by exposing it to very short but powerful laser pulses. Due to the laser pulses, normally fully two-dimensional graphene can be molded into three-dimensional structures.

"We call this method optical forging, since it resembles how flat metal sheet can be forged into three-dimensional shapes with a hammer. Structures that are made using optical forging are hundreds of times higher than the thickness of graphene, but still so small that they fit easily, for example, on a hair," says Vesa-Matti Hiltunen.



Credit: CC0 Public Domain

### Laser light stiffens graphene

Devices that can be made from graphene are, for example, different sensors that work by vibrating mechanically. Optical forging was discovered to stiffen graphene so that it does not bend so easily. This is an interesting observations, since the increase of bending stiffness also increases vibrational frequency of graphene. Increased frequency, in turn, can improve speed and precision of the devices made from it.

"Using optical forging we were able to create structures that are up to 10 000 times stiffer than unmodified graphene. This is record breaking for a material as thin as this," says Hiltunen.

### Shape is a result of atomic scale changes

During the study, it was discovered that optical forging causes lattice defects to graphene, i.e. graphene structure breaks up.

Graphene starts to break from random points. If graphene is exposed to the laser light for a long enough time, dot-like defects form into line defects, or cracks. The defects lead to local expansion of graphene, which causes graphene to bulge to three-dimensional shapes.

"The research gave plenty of insight into how shape of graphene and its properties can be altered. A great strength of the method is that in order to modify graphene, no complex processes or chemical treatments are needed. Laser light is all that is needed," Hiltunen sums up.

<https://phys.org/news/2021-03-modification-graphene-laser.html>

## Scientist bridges the gap between quantum simulators and quantum computers

A researcher from Skoltech has filled in the gaps connecting quantum simulators with more traditional quantum computers, discovering a new computationally universal model of quantum computation, the variational model. The paper was published as a Letter in the journal *Physical Review A*. The work made the Editors' Suggestion list.

A quantum simulator is built to share properties with a target quantum system we wish to understand. Early quantum simulators were 'dedicated'—that means they could not be programmed, tuned or adjusted and so could mimic one or very few target systems. Modern quantum simulators enable some control over their settings, offering more possibilities.

In contrast to quantum simulators, the long-promised quantum computer is a fully programmable quantum system. While building a fully programmable quantum processor remains elusive, noisy quantum processors that can execute short quantum programs and offer limited programmability are now available in leading laboratories around the world. These quantum processors are closer to the more established quantum simulators. Despite today's prototype quantum processors suffering from noise and a general lack of controllability, we have seen amazing demonstrations of quantum computational supremacy by Google as well as scientists in China. Quantum computational supremacy shows that quantum processors can perform certain tasks dramatically faster than even the world's leading supercomputers.

Quantum computational supremacy was achieved using only limited programmability: a fixed and short quantum program, or circuit, can be tuned, followed by simplistic quantum measurements. Researchers around the world are questioning how far this simplistic approach might be pushed towards applications that are more practical than quantum supremacy.

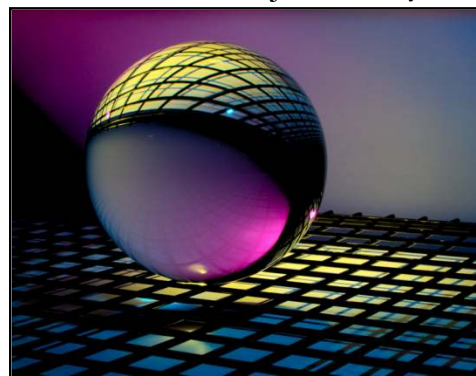
"When does a quantum simulator become a quantum computer? The quantum processors at Google and elsewhere have often been described as being "situated somewhere between a dedicated quantum simulator and a programmable quantum computer." The ad hoc approach used by Google and others was to variationally tune a quantum circuit to minimize a cost function calculated classically. This approach turns out to represent a universal model of quantum computation, meaning that a quantum simulator only needs limited additional control to execute general quantum algorithms," Skoltech's Associate Professor Jacob Biamonte notes.

Biamonte, who heads the Laboratory for Quantum Information Processing, has proved, as the editors of the journal note, "that the contemporary variational approach to quantum-enhanced algorithms enables a universal model of quantum computation." The editors went on to state, "This brings the resources required for universal quantum computation closer to contemporary quantum processors." "The study bridges the gap between a programmable quantum simulator and a universal quantum computer. The analysis provided a new means to implement quantum algorithms using a variational approach," Biamonte says.

**More information:** Jacob Biamonte, Universal variational quantum computation, *Physical Review A* (2021). [DOI: 10.1103/PhysRevA.103.L030401](https://doi.org/10.1103/PhysRevA.103.L030401)

**Journal information:** [Physical Review A](https://phys.org/news/2021-03-scientist-bridges-gap-quantum-simulators.html)

<https://phys.org/news/2021-03-scientist-bridges-gap-quantum-simulators.html>



Credit: Unsplash/CC0 Public Domain





Mon, 22 March 2021

## Research evidence strongly shows COVID-19 link to hearing loss, tinnitus, and vertigo

Hearing loss and other auditory problems are strongly associated with Covid-19 according to a systematic review of research evidence led by University of Manchester and NIHR Manchester Biomedical Research Centre (BRC) scientists.

Professor Kevin Munro and PhD researcher Ibrahim Almufarrij found 56 studies that identified an association between COVID-19 and auditory and vestibular problems.

They pooled data from 24 of the studies to estimate that the prevalence of hearing loss was 7.6%, tinnitus was 14.8% and vertigo was 7.2%.

They publish their findings in the *International Journal of Audiology*.

However, the team – who followed up their review carried out a year ago – described the quality of the studies as fair.

Their data primarily used self-reported questionnaires or medical records to obtain COVID-19-related symptoms, rather than the more scientifically reliable hearing tests.

The study was funded by NIHR Manchester Biomedical Research Centre (BRC)

Kevin Munro, Professor of Audiology at The University of Manchester and Manchester BRC Hearing Health Lead said: “There is an urgent need for a carefully conducted clinical and diagnostic study to understand the long-term effects of COVID-19 on the auditory system.

“It is also well-known that viruses such as measles, mumps, and meningitis can cause hearing loss; little is understood about the auditory effects of the SARS-CoV-2 virus.”

“Though this review provides further evidence for an association, the studies we looked at were of varying quality so more work needs to be done.”

Professor Munro, is currently leading a year-long UK study to investigate the possible long-term impact of COVID-19 on hearing among people who have been previously treated in a hospital for the virus.

His team hope to accurately estimate the number and severity of COVID-19 related hearing disorders in the UK, and discover what parts of the auditory system might be affected

They will also explore the association between these and other factors such as lifestyle, the presence of one or more additional conditions and critical care interventions.

A recent study led by Professor Munro, suggested that more than 13 percent of patients who were discharged from a hospital reported a change in their hearing.

Ibrahim Almufarrij said: “Though the evidence is of varying quality, more and more studies are being carried out so the evidence base is growing. What we really need are studies that compare COVID-19 cases with controls, such as patients admitted to hospital with other health conditions.

“Though caution needs to be taken, we hope this study will add to the weight of scientific evidence that there is a strong association between Covid-19 and hearing problems.”



Professor Munro added: “Over the last few months I have received numerous emails from people who reported a change in their hearing, or tinnitus after having COVID-19.

“While this is alarming, caution is required as it is unclear if changes to hearing are directly attributed to COVID-19 or to other factors, such as treatments to deliver urgent care.”

Reference: “One year on: an updated systematic review of sarscov-2, covid-19 and audio-vestibular symptoms” 22 March 2021, *International Journal of Audiology*. DOI: 10.1080/14992027.2021.1896793

<https://scitechdaily.com/research-evidence-strongly-shows-covid-19-link-to-hearing-loss-tinnitus-and-vertigo/>

