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DRDO News

DRDO Technology News

Press Information Bureau
Government of India

Ministry of Defence

Tue, 31 Aug 2021 7:00PM

Boost to 'Atmanirbhar Bharat' in defence

Indian Navy signs contract with BEL for supply of Naval Anti drone system

Key Highlights:

- ***First indigenously developedanti-drone system, NADS to be inducted by Indian Navy***
- ***It can instantly detect, jam micro drones and use a laser-based kill mechanism to terminate targets***
- ***BEL to sign similar contacts with Army and Air Force***

Indian Navy has signed contract with Navratna Defence PSU Bharat Limited (BEL) for supply of the first indigenous comprehensive Naval Anti Drone System (NADS) with both hard kill and soft kill capabilities in New Delhi on August 31, 2021.

The contract was signed in the presence of senior Naval Officers and DRDO representatives. Indian Navy has provided consistent support and has led in the joint development of the anti-drone system with Defence Research and Development Organisation (DRDO) and BEL.

The NADS, developed by DRDO and manufactured by BEL, is the first indigenously developed anti-drone system to be inducted into the Indian Armed Forces. Multiple Units of BEL, namely Bangaluru, Hyderabad, Pune and Machilipatanam; and DRDO Labs, namely Electronics & Radar Development Establishment (LRDE), Bangaluru; Defence Electronics Research Laboratory (DLRL) and Centre for High Energy Systems and Sciences (CHESS), Hyderabadand Instruments Research & Development Establishment (IRDE) Dehradun; in close collaboration with the Indian Navy, were involved in the making of this fully indigenous system, as part of the Atmanirbar Bharat initiative to counter drone threats of adversaries.

The NADS can instantly detect and jam micro drones and use a laser-based kill mechanism to terminate targets. It will be an effective all-encompassing counter to the increased drone threat to strategic naval installations.

The anti-drone system was first deployed to provide security cover for the Republic Day Parade this year and later during the Prime Minister's Independence Day Address to the Nation from the ramparts of the Red Fort. The system, which offers 360-degree coverage, was also deployed in Ahmedabad for the Modi-Trump roadshow.

The NADS uses the help of Radar, Electro-optical/infrared (EO/IR) sensors and Radio Frequency (RF) detectors to detect and jam the micro drones. The DRDO's RF/Global Navigation

Satellite System (GNSS) detects the frequency which is being used by the controller and the signals are then jammed. The anti-drone technology system of DRDO provides for both 'soft kill' and 'hard kill' options to the Indian Armed Forces to tackle fast-emerging aerial threats. Both the static and mobile versions of NADS will be supplied to the Indian Navy within a short time from the signing of contract.

Senior civil and military officials of Ministry of Defence and BEL were present on the occasion. The BEL is to sign similar contracts with Army and Air Force also.

https://pib.gov.in/PressReleasePage.aspx?PRID=1750830

पत्र सूचना कार्यालय
भारत सरकार

रक्षा मंत्रालय

Tue, 31 Aug 2021 7:00PM

रक्षा क्षेत्र में 'आत्मनिर्भर भारत' को बढ़ावा भारतीय नौसेना ने एन्टी ड्रोन प्रणाली की आपूर्ति हेतु बीईएल के साथ अनुबंध पर हस्ताक्षर किए

प्रमुख बातें:

- ***पहली बार स्वदेश में विकसित एंटी ड्रोन सिस्टम, एनएडीएस को भारतीय नौसेना शामिल किया जाएगा।***
- ***यह तुरंत पता लगा कर माइक्रो ड्रोन जाम कर सकता है और लक्ष्य गिराने के लिए एक लेजर आधारित मारण प्रणाली का उपयोग करता है।***
- ***बीईएल सेना और वायुसेना के साथ इसी तरह के अनुबंधों पर हस्ताक्षर करेगा।***

भारतीय नौसेना ने दिनांक 31 अगस्त, 2021 को नई दिल्ली मेंहार्ड किल और सॉफ्ट किल दोनों क्षमताओं के साथ पहले स्वदेशी व्यापक नौसेनाएंटी ड्रोन सिस्टम (एनएडीएस) की आपूर्ति के लिए नवरत्न रक्षा पीएसयू भारतलिमिटेड (बीईएल) के साथ अनुबंध पर हस्ताक्षर किए हैं ।

नौसेना के वरिष्ठ अधिकारियों और डीआरडीओ के प्रतिनिधियों कीउपस्थिति में इस अनुबंध पर हस्ताक्षर किए गए। भारतीय नौसेना ने इस बारेमें निरंतर समर्थन प्रदान किया है और रक्षा अनुसंधान और विकास संगठन (डीआरडीओ) और बीईएल के साथ ड्रोन विरोधी प्रणाली के संयुक्त विकास कीअगुवाई की है।

भारतीय सशस्त्र बलों में शामिल होने वाला नौसेना एंटी ड्रोनसिस्टम (एनएडीएस) डीआरडीओ द्वारा विकसित और बीईएल द्वारा निर्मित पहलास्वदेश विकसित एंटी-ड्रोन सिस्टम है। बीईएल की कई इकाइयाँ अर्थात्बैंगलोर, हैदराबाद, पुणे और मछलीपट्टनम; और डीआरडीओ लैब, अर्थात्इलेक्ट्रॉनिक्स और रडार विकास प्रतिष्ठान (एलआरडीई), बैंगलोर; रक्षाइलेक्ट्रॉनिक्स अनुसंधान प्रयोगशाला (डीएलआरएल) और उच्च

ऊर्जा प्रणाली एवंविज्ञान केंद्र (सीएचईएसएस), हैदराबाद और उपकरण अनुसंधान एवं विकासप्रतिष्ठान (आईआरडीई) देहरादून; ने भारतीय नौसेना के साथ करीबी सहयोग सेदेश विरोधियों के ड्रोन खतरों का मुकाबला करने के लिए आत्मनिर्भर भारत पहलके अंतर्गत इस पूरी तरह से स्वदेशी प्रणाली को बनाया है।

एनएडीएस माइक्रो ड्रोन का तुरंत पता लगा सकता है और जाम करसकता है और लक्ष्यों को समाप्त करने के लिए लेजर आधारित मारण प्रणाली काउपयोग करता है। यह सामरिक नौसैनिक प्रतिष्ठानों के लिए बढ़ते ड्रोन खतरोंके लिए एक प्रभावी सर्वव्यापी काउंटर होगा।

ड्रोन रोधी प्रणाली को इस वर्ष पहले गणतंत्र दिवस परेड के लिएसुरक्षा कवच प्रदान करने के लिए तैनात किया गया था और बाद में लाल किले कीप्राचीर से प्रधानमंत्री के स्वतंत्रता दिवस के संबोधन के दौरान इसकीतैनाती हुई थ । यह सिस्टम, जो 360-डिग्री कवरेज प्रदान करता है, इसेमोदी-ट्रम्प रोड शो के लिए अहमदाबाद में भी तैनात किया गया था।

एनएडीएस माइक्रो ड्रोन का पता लगाने और जाम करने के लिए रडार, इलेक्ट्रो-ऑप्टिकल/ इन्फ्रारेड (ईओ/आईआर) सेंसर और रेडियो फ्रीक्वेंसी (आरएफ) डिटेक्टरों की मदद का उपयोग करता है । डीआरडीओ का आरएफ/ग्लोबलनेविगेशन सैटेलाइट सिस्टम उस आवृत्ति का पता लगाता है जिसका उपयोग नियंत्रकद्वारा किया जा रहा है और फिर सिग्नल जाम हो जाते हैं । डीआरडीओ कीएंटी-ड्रोन प्रौद्योगिकी प्रणाली भारतीय सशस्त्र बलों को तेजी से सामने आतेहवाई खतरों से निपटने के लिए 'सॉफ्ट किल' और 'हार्ड किल' दोनों का विकल्पप्रदान करती है। अनुबंध पर हस्ताक्षर करने के थोड़े समय के भीतर एनएडीएसके स्थिर और मोबाइल दोनों संस्करणों की भारतीय नौसेना को आपूर्ति की जाएगी।

इस अवसर पर रक्षा मंत्रालय और बीईएल के वरिष्ठ नागरिक औरसैन्य अधिकारी उपस्थित थ । बीईएल को सेना और वायु सेना के साथ भी इसी तरहके अनुबंध पर हस्ताक्षर करने हैं ।

https://pib.gov.in/PressReleasePage.aspx?PRID=1751003

Wed, 01 Sept 2021

Navy signs deal with for DRDO-developed anti-drone system

Developed by the Defence Research and Development Organisation and built by the Bharat Electronics Limited, the NADS is the first indigenously developed anti-drone system to be inducted into the Indian Armed Forces

By Anish Kumar

Indian Navy on Tuesday signed a deal with the defence public sector undertaking Bharat Electronics Limited for the supply of the first indigenous Naval Anti Drone System with both hard-kill and soft-kill capabilities.

Developed by the Defence Research and Development Organisation and built by the Bharat Electronics Limited, the NADS is the first indigenously developed anti-drone system to be inducted into the Indian Armed Forces.

The naval anti-drone system, which can instantly detect and jam micro-drones and use a laser-based kill mechanism to eliminate targets, would be an effective counter-measure to the increased drone threat to strategic naval installations.

The anti-drone system, which offers 360-degree coverage, was first deployed in New Delhi this year for the Republic Day parade. It was used as recently as August to protect the skies over the national capital during the Prime Minister's Independence Day address to the nation from the ramparts of the Red Fort.

DRDO's NADS can detect and jam micro drones using radar, electro-optical/infrared (EO/IR) sensors and radio frequency (RF) detectors.

The technology uses a Global Navigation Satellite System to detect the controller frequency and then jams the signals. It then provides soft-kill and hard-kill options to tackle fast-emerging aerial threats.

The Navy will be provided with both mobile and static versions of the NADS soon after the contract signing. The Indian Army and Indian Air Force too will sign similar contracts with the BEL soon.

https://newsable.asianetnews.com/india-defence/navy-signs-deal-with-for-drdo-developed-anti-drone-system-vpn-qypmaq

Hindustan Times

Wed, 01 Sept 2021

Navy, BEL ink contract for first indigenous anti-drone system

The anti-drone system will give the military both 'soft kill' and 'hard kill' options to deal with the fast-emerging threat

By Rahul Singh

The Indian Navy on Tuesday signed a contract with Bharat Electronics Limited (BEL) for India's first locally made naval anti-drone system (NADS) with both "hard kill" and "soft kill capabilities", the ministry of defence said in a statement. The deal comes two months after small drones were used to target the Jammu air force station on June 27, the first-ever offensive use of drones to target an Indian military facility.

Both the static and mobile versions of NADS will be supplied to the navy shortly.

BEL will sign similar contracts with the army and the Indian Air Force, the statement said.

The anti-drone system will give the military both "soft kill" and "hard kill" options to tackle the new and fast-emerging aerial threat. The first refers to jamming the hostile drone, while the second involves a laser-based kill system. The indigenous anti-drone system has been developed by the Defence Research and Development Organisation (DRDO) and manufactured by BEL. The DRDO said its counter-drone technology could provide the armed forces with the capability to swiftly detect, intercept and destroy small drones that pose a security threat.

"The NADS can instantly detect and jam micro drones and use a laser-based kill mechanism to terminate targets. It will be an effective, all-encompassing counter to the increased drone threat to strategic naval installations," the statement said.

The Jammu drone attack was a watershed in asymmetric warfare and underlined the need for the armed forces to build capabilities to counter the aerial threat, experts previously said.

The system was deployed for VVIP protection duties during Republic Day 2020, the visit of US President Donald Trump to Motera stadium in Ahmedabad, Independence Day 2020, Republic Day 2021 and Independence Day 2021. DRDO demonstrated its counter-drone technology to different security agencies at the Hindon air force station in January 2020 and at the National Security Guard (NSG) campus in Manesar in August 2020 and January 2021.

Both the static and mobile versions of NADS will be supplied to the navy shortly.

DRDO is also ready to transfer technology to private companies to produce the anti-drone system.

https://www.hindustantimes.com/india-news/navy-signs-contract-with-bel-for-anti-drone-system-army-iaf-to-follow-suit-101630421993258.html

mint

Wed, 01 Sept 2021

Indian Navy signs pact with BEL for country's first locally made naval anti-drone system

By Elizabeth Roche

- ***The pact comes after several drones were used to target the Indian Air Force station in Jammu in recent months***

New Delhi: The Indian Navy on Tuesday signed a contract with state run Bharat Electronics Limited (BEL) for India's first locally made naval anti-drone system (NADS) with both "hard kill" and "soft kill capabilities," the defence ministry said in a statement.

The pact comes after several drones were used to target the Indian Air Force Station in Jammu in recent months. The attacks were the first ever of suspected terrorists using drones to target Indian military facilities.

According to the defence ministry statement, BEL will sign similar contracts with the Indian Army and the Indian Air Force.

The BEL manufactured anti-drone system will give the military both "soft kill" ie jamming of the drone and "hard kill" ie using a laser to knock out the drone.

The homegrown anti-drone system has been developed by the Defence Research and Development Organisation (DRDO).

The DRDO is of the view that its anti-drone technology can provide Indian armed forces with the capability to swiftly detect, intercept and destroy small drones that pose a security threat.

"The NADS can instantly detect and jam micro drones and use a laser-based kill mechanism to terminate targets. It will be an effective, all-encompassing counter to the increased drone threat to strategic naval installations," the statement said.

The DRDO-BEL system was deployed for VVIP protection duties during Republic Day 2020, the visit of US President Donald Trump to Motera stadium in Ahmedabad, Independence Day 2020, Republic Day 2021 and Independence Day 2021, the Defence Ministry said.

DRDO demonstrated its counter-drone technology to different security agencies at the Hindon air force station in January 2020 and the National Security Guard (NSG) campus in Manesar in August 2020 and January 2021.

The counter-drone technology uses a variety of methods to neutralise the danger from aerial attacks.

"The NADS uses the help of Radar, Electro-optical/infrared (EO/IR) sensors and Radio Frequency (RF) detectors to detect and jam the micro drones," the statement said.

"The DRDO's RF/Global Navigation Satellite System (GNSS) detects the frequency which is being used by the controller and the signals are then jammed…. Both the static and mobile versions of NADS will be supplied to the Indian Navy within a short time from the signing of contract," the statement added.

https://www.livemint.com/news/india/indian-navy-signs-pact-with-bel-for-country-s-first-locally-made-naval-anti-drone-system-11630426296805.html

अमर उजाला

Wed, 01 Sept 2021

देश के दुश्मनों की खैर नहीं: स्वदेशी तकनीक से सीमाओं पर नजर, डीआरडीओ ने तैयार किया एंटी ड्रोन सिस्टम

सार

देश की सीमा पर आंख उठाने वालों की अब खैर नहीं है। देश की सीमा को सुरक्षित करने के लिए भारत ने स्वदेशी एंटी ड्रोन तकनीक विकसित कर लिया है। इसके जरिए अब दुश्मनों पर पैनी नजर रखी जाएगी। नेवल एंटी ड्रोन सिस्टम (एनएडीएस) को डीआरडीओ ने तैयार किया है ।

विस्तार

नई दिल्ली: देश की तरफ नजर उठाकर देखने वाले दुश्मनों पर पैनी नजर रखने के लिए भारत ने स्वदेशी एंटी ड्रोन तकनीक विकसित कर लिया है। इस तकनीक से अब देश की सीमा और सुरक्षित हो जाएगी। भारत ने स्वदेशी एंटी ड्रोन तकनीक विकसित किया है। भारतीय नौसेना ने हार्ड और सॉफ्ट किलर क्षमताओं के साथ पहले स्वदेशी एंटी ड्रोन सिस्टम की आपूर्ति के लिए भारत इलेक्ट्रॉनिक्स लिमिटेड के साथ करार किया है।नेवल एंटी ड्रोन सिस्टम (एनएडीएस) को रक्षा अनुसंधान और विकास संगठन (डीआरडीओ) ने विकसित किया है और भारत इलेक्ट्रॉनिक्स लिमिटेड ने बनाया है।

स्वदेशी व्यापक नेवल एंटी ड्रोन सिस्टम - फोटो : ANI

ये एंटी-ड्रोन सिस्टम प्रधानमंत्री नरेंद्र मोदी की सुरक्षा का भी हिस्सा होंगे। दरअसल, पाकिस्तान के आतंकी लाइन ऑफ कंट्रोल और अंतरराष्ट्रीय सीमा के पार जम्मू-कश्मीर में हथियार भेजने के लिए चाइनीज निर्मित कॉमर्शियल ड्रोन्स का इस्तेमाल कर रहे हैं, इसे देखते हुए डीआरडीओ ने एंट्री ड्रोन टेक्नोलॉजी विकसित की है,जिससे दुश्मन के ड्रोन्स को कुछ ही पलों में निष्क्रिय कर गिरा दिया जाएगा।

https://www.amarujala.com/india-news/anti-drone-system-developed-by-drdo-manufactured-by-bharat-electronics-limited

नवभारत टाइम्स

Wed, 01 Sept 2021

भारतीय नौसना ने ड्रोन रोधी प्रणाली के लिए बीईएल से करार किया

नयी दिल्ली: भारतीय नौसेना ने मंगलवार को रक्षा क्षेत्र के सार्वजनिक उपक्रम भारत इलेक्ट्रॉनिक लिमिटेड (बीईएल) के साथ स्वदेश में ही विकसित नौसेना ड्रोन रोधी प्रणाली (एनएडीएस) की आपूर्ति के लिए करार किया। रक्षा मंत्रालय ने यह जानकारी दी।

मंत्रालय ने बताया कि एनएडीएस का विकास रक्षा अनुसंधान और विकास संगठन (डीआरडीओ) ने किया है और इसका उत्पादन बीईएल कर रही है। यह देश में ही विकसित पहली ड्रोन रोधी प्रणाली है जिसे भारतीय सशस्त्र सेनाओं में शामिल किया जाना है।

रक्षा मंत्रालय द्वारा जारी बयान के मुताबिक, ''भारतीय नौसेना ने नवरत्न में शामिल रक्षा क्षेत्र के सार्वजिक उपक्रम बीईएल से पहली व्यापक नौसेना ड्रोन रोधी प्रणाली की आपूर्ति के लिए करार किया है जो दुश्मन के हमलों को रोकने और उसके इरादों को निष्क्रिय करने में सक्षम है।''

बयान में कहा गया कि एनएडीएस प्रणाली तत्काल छोटे आकार के ड्रोन का पता लगा सकती है और लेजर आधारित 'हथियार' से लक्ष्य को नष्ट कर सकती है।

गौरतलब है कि इस साल जून में जम्मू स्थित वायुसेना के ठिकाने पर पाकिस्तान से संचालित आतंकवादियों ने दो ड्रोन से पहली बार हमला किया था, जिससे ड्रोन से गंभीर खतरा सामने आया था।

मंत्रालय ने बताया कि एनएडीएस को सबसे पहले इस साल गणतंत्र दिवस परेड के दौरान सुरक्षा के लिए तैनात किया था और उसके बाद स्वतंत्रता दिवस के दिन लाल किले की प्राचीर से प्रधानमंत्री के भाषण के दौरान इस प्रणाली की तैनाती की गई। उसने कहा, ''360 डिग्री सुरक्षा मुहैया कराने वाली इस प्रणाली की तैनाती मोदी-ट्रंप के अहमदाबाद में हुए रोड़ शो के दौरान भी की गई थी।''

मंत्रालय ने बताया कि एनएडीएस छोटे ड्रोन का पता लगाने और उन्हें जाम करने के लिए रडार, इलेक्ट्रो ऑप्टिकल/इंफ्रा सेंसर और रेडियो फ्रीक्वेंसी डिटेक्टर का इस्तेमाल करती है।

मंत्रालय ने बताया कि करार के बाद बहुत कम समय में भारतीय नौसेना को एनएडीएस के स्थायी और सचल संस्करण की आपूर्ति कर दी जाएगी।

https://navbharattimes.indiatimes.com/india/indian-navy-inks-agreement-with-bel-for-anti-drone-system/articleshow/85808746.cms

#SWARAJYA

Wed, 01 Sept 2021

A very brief history of drones in India

AuthorBy Ritu Bhandari

Snapshot

- ***After the introduction of the new Drone Rules 2021, here's a quick look back at the history of drones in India.***

The Ministry notified the drone rules on 26 August, after feedback from academia, startups, and other stakeholders supposedly indicated the earlier drone rules to be "restrictive in nature".

Representative image of a drone

According to a statement by the Ministry of Civil Aviation, India has the potential to be a global drone hub by 2030. The new drone policy is expected to help in fulfilling this potential.

As we move into a new drone regime for India, here's a brief look back at the history of drones in India.

Looking Back: Drones In India

The Indian Army was the first to acquire unmanned aerial vehicles or UAVs in the late 1990s from Israel, and the Indian Air Force and Navy followed suit.

India first used military drones during the 1999 Kargil war with Pakistan. At first, the Indian Air Force deployed manned English Canberra PR57 aircraft for photo reconnaissance along the Line of Control, but this system proved highly inefficient and strategically weak over the mountainous Kargil terrain.

After India lost a Canberra PR57 to Pakistani infrared homing missiles, Israel discreetly supplied the Indian Air Force with the IAI Heron and Searcher drones, which were useful for acquiring target information along the Line of Control.

Since Kargil, India has procured numerous Israeli military unmanned aircraft. In 2009, the Indian Air Force purchased 10 Harops in a $100 million contract with Israel Aerospace Industries.

In 2013, the Indian Air Force made a $280 million deal with Israel Aerospace Industries for a new series of Heron medium-altitude, long-endurance drones.

In June of 2013, India began deploying Heron surveillance drones in a limited capacity over Maoist rebel strongholds in the east. Such activity has been limited to Andhra Pradesh-Odisha and Andhra Pradesh-Chhattisgarh. These states are densely forested, so the UAVs have been of little use in reconnaissance and surveillance.

Back in the 1990s, the Indian Army bought Israeli drones for recce and surveillance, but in 2019, India procured 54 Harop attack drones from Israel. The Air Force already had an inventory of around 110 of these drones.

These drones are equipped with electro-optical sensors to loiter over military targets such as surveillance bases and radar stations before exploding them. They have been designed to have a minimal radar signature, allowing them to perform stealth operations.

Meanwhile, state-run Defence Research and Development Organisation (DRDO) and a clutch of private Indian companies are making drones and developing UAV technologies.

DRDO has developed its own domestic UAV/UAS programme. The project aims to develop a domestic arsenal to replace and augment the existing fleet of unmanned vehicles. Examples include:

DRDO Lakshya

This is a target drone used for discreet aerial reconnaissance and target acquisition. It is launched by a solid propellant rocket motor and sustained by a turbojet engine in flight.

DRDO Nishant

It has been primarily designed for intelligence-gathering over enemy territory. It is also used for reconnaissance, training, surveillance, target designation, artillery fire correction, and damage assessment.

DRDO Aura

Similar to the Lockheed Martin RQ-170 Sentinel, this is a stealth drone capable of releasing missiles, bombs, and precision-guided munitions.

DRDO Rustom

Modelled after the American Predator UAV, the Rustom is a Medium-Altitude Long-Endurance (MALE) system. Like the Predator, the Rustom is designed to be used for both reconnaissance and combat missions. It is expected to replace and supplement the Israeli Heron model UAVs in the Indian Air Force.

These drones can travel at 200 kilometres per hour (km/hr) and fly at altitudes of 6,000-10,000 feet. A higher version of MALE can fly up to an altitude of 30,000 feet and travel over 200 km/hr. HALE or High Altitude Long Endurance drone can go beyond 30,000 feet.

In India, the use of all aerial vehicles, manned or unmanned, are governed by the Directorate General of Civil Aviation (DGCA), and foreigners are currently not allowed to fly drones in India.

Notably in 2018, Harshwardhansingh Zala, an Indian teen, invented a drone to detect and defuse landmines. He watched a YouTube video where soldiers were trying to defuse a mine, and the mine exploded suddenly, injuring several of them. He, thus, designed a drone that could detect the mines without seeing them off, and then drop a marker to allow mine clearers to detonate them safely.

There are more than 100 million active landmines across the globe and such drones would be useful to save thousands of lives across the world.

Evolution of Drone Use

The development and use of drones occurred predominantly in the context of warfare by the military until the end of the twentieth century when flying remote-controlled aircraft grew significantly as a hobby.

Drones are, however, evolving into mainstream civilian purposes, akin to the internet and the global positioning system (GPS), which were initially used in the military.

The use of drones is rapidly expanding to commercial and civil government applications like scientific, recreational, agricultural, product delivery, aerial photography, infrastructure inspections, drone racing, policing and surveillance, firefighting, and more.

Drones are a common sight even in weddings across India. Civilian UAVs now vastly outnumber their military counterparts. One would attribute this to the lowering costs of production and the increasing usability of maturing technology.

With the new Drone Rules 2021, individuals as well as organisations in India are set to find it easier to own and operate drones, setting the stage for the wider use of drones in the country.

https://swarajyamag.com/technology/a-very-brief-history-of-drones-in-india

Hindustan Times

Wed, 01 Sept 2021

Lucknow to build next-gen BrahMos missiles, confirms Rajnath Singh

Union defence minister Rajnath Singh said the manufacturing unit of BrahMos unit in Lucknow would facilitate employment for around 5,000 people

New Delhi: Union defence minister Rajnath Singh said on Tuesday that the state-of-the-art next-generation range of BrahMos missiles will be manufactured in Lucknow.

While inaugurating a slew of developmental projects, Rajnath Singh said Uttar Pradesh chief minister Yogi Adityanath has informed him that the proposed manufacturing unit of BrahMos missiles in the state would generate employment for an estimated 5,000 people.

BrahMos missiles on display during the Republic Day parade.(File photo)

"Nobody ever imagined that missiles would be manufactured in Uttar Pradesh. BrahMos missiles will be manufactured near Lucknow," the defence minister was quoted as saying by news agency PTI.

Adityanath gave his consent to the project last week. According to media reports, director general of BrahMos Aerospace Sudhir Kumar Mishra had last week written to Uttar Pradesh's additional chief secretary (home) Awanish Awasthi, seeking 200 acres of land for the project at the UP Defence Industrial Corridor.

Speaking on the occasion, Singh said that each household in Lucknow would get piped natural gas (PNG) connections soon. "I have been informed by Green gas Limited that a target has been set to provide PNG gas to each household in Lucknow which will reduce the consumption of LPG gas," he added.

https://www.hindustantimes.com/india-news/lucknow-to-build-next-gen-brahmos-missiles-confirms-rajnath-singh-101630401660168-amp.html

पत्रिका

Wed, 01 Sept 2021

अच्छी खबर: ग्वालियर और श्योपुर में बनेंगे आयुध उपकरण

पुणे डीआरडीओ की लगेंगी यूनिट, रक्षा उपकरणों का निर्माण शुरू होगा

By Hitendra Sharma

ग्वालियर. देश की सीमा पर रक्षा के लिए आयुध बनाने केलिए डीआरडीओ पुणे की एक यूनिट ग्वालियर और श्योपुर जिले में स्थापित होगी। सीमा की रक्षा और आम जन के स्वास्थ्य की रक्षा संबंधी उपकरण बनाने के लिए स्थापित होने वाली लैब आदि के लिए जमीन आवंटन की प्रक्रिया बीते वर्ष शुरूहुई थी।

ग्वालियर जिले के मोहना में जगह आवंटन के बदले में प्रदेश सरकार रक्षा अनुसंधान एवं विकास संगठन पुणे से 98.88 लाख भूभाटक लेगी। आवंटन केबाद यहां बाउंड्री बनाने वाली यूनिट में महत्वपूर्ण आयुधों के लिए हिस्से बनाए जाएंगे। जबकि श्योपुर में आवंटित हुई जगह में महत्वपूर्ण आयुधों की टेस्टिंग होगी। सूत्र बताते हैं कि आयुध उपकरण बनाने के लिए देश की किसी प्रतिष्ठित कंपनी को यहां अलॉटमेंट किया जाएगा। इसके बाद यहां रक्षा उपकरणों का निर्माण शुरू होगा।

ग्वालियर कलेक्टर कौशलेन्द्र विक्रम सिंह ने बताया कि डीआरडीओ को मोहलना क्षेत्र में करीब100 एकड़ जगह आवंटित की गई है। इसको हैंडओवर भी कर दिया गया है। इन्होंने पजेशन भी ले लिया है। वही कलेक्टर श्योपुर शिवम वर्मा ने कहा कि डीआरडीओ के लिए जिले बड़ौदा ब्लॉक में 1206 हैक्टेयर जगह फाइनल हुई है। इस जगह डीआरडीओ द्वारा अपने हिसाब से निर्माण आदि किए जाएंगे। रक्षा से संबंधित उपकरण आदि बनाए जाने की संभावना है।

इतनी जमीन हुई आवंटित

ग्वालियर जिले की मोहना नगर पंचायत की सीमा से लगे क्षेत्र में डीआरडीओ के लिए तीन जगह चिन्हित की गई थीं। एसडीएम डॉ. संजीव खेमरिया ने बताया कि उम्मेदगढ़ रोड पर नौ सर्वे नंबरों की 131.8520 हैक्टेयर भूमि आवंटित की गई है। राजस्व विभाग द्वारा आवंटित भूमि पर बाउंड्री बनाने का काम शुरू कियाजा चुका है।

श्योपुर जिले के बड़ौदा ब्लॉक में जगह चिन्हित हुई है। 1206 हैक्टेयर जगह पर काम शुरू होगा। राजस्व विभाग ने जमीन आवंटन की प्रक्रिया पूरी कर ली है। यह जगह जल्द ही डीआरडीओ को हस्तांतरित की जाएगी। हर आवंटित हुई जमीन पर प्रयोग और टैस्टिंग की जाएगी।

https://www.patrika.com/gwalior-news/good-news-ordnance-equipment-will-be-made-in-gwalior-and-sheopur-7039963/

dailyhunt

Fri, 27 Aug 2021

'Lightning speed', Tejas makes thunderous appearance in capital

Thiruvananthapuram: Indigenously developed Tejas fighter jets, the Air Force's lethal weapon, flew down for training and made a thunderous appearance the capital city. This is the first time that the Tejas, which flies at the speed of sound, reached Kerala and flew so low in populated areas. At around 9 am yesterday, two fighter jets from the Sulur Air Force Base in Coimbatore circled over the capital for more than half an hour before returning. The roar of warplanes made the people of the capital anxious.

The Tejas fighter jets are part of the Southern Air Command, based in Thiruvananthapuram, but cannot land near the Thiruvananthapuram airport due to the threat of birds. Tejas' powerful engines can pull birds and collide with them. The warplanes are kept at Thanjavur and Sulur. The Tejas flew the No. 18 Squadron (Flying Bullets) from Sulur to Thiruvananthapuram. Designed by DRDO, the Tejas is manufactured by Hindustan Aeronauticals.

In addition, the growing Chinese and Pakistani presence in Sri Lanka and the Maldives is a matter of concern. Sri Lanka is located at a distance of 380.19 km from Thiruvananthapuram. National Security Adviser Ajith Doval arrived in Thiruvananthapuram and Kanyakumari after discovering that the ISI was supplying large quantities of arms with Chinese aid through the Kodiyakkarai port between Tamil Nadu and Sri Lanka. The Southern Air Force has set up an integrated air command-and-control system for air defense control of the Indian subcontinent to counter the threat of air strikes.

Air fighter

The lightest supersonic fighter. Land, air and sea can be attacked with missiles, rockets and laser bombs

Has the ability to turn around quickly. Can carry up to three tons of weapons. Can be refueled during flight. Radar with greater visibility and accuracy

The new Tejas has long-range and short-range missiles. Possible review with digital 2D and 3D maps of the area traveled

Tejas can land on an aircraft carrier. Can do arrested landing

Speed-2205 km (per hour)

Weight-8.5 tons

Height-4.4.m

Price-Rs 309 crore

https://m.dailyhunt.in/news/bangladesh/english/kaumudiglobal-epaper-kglobal/lightning+speed+tejas+makes+thunderous+appearance+in+capital-newsid-n310489554

Wed, 01 Sept 2021

Apollo Micro Systems bags supply order worth Rs5.30cr; Stock up 1%

The company had bagged an order for supplying security & surveillance systems worth Rs59.62cr, last week

Apollo Micro Systems Limited has bagged an order for the supply of Electronic Control System for a strategic programme from DRDO worth Rs5.30cr.

Last week, the company had bagged an order for supplying of security & surveillance systems worth Rs59.62cr.

Meanwhile, the company's 24th Annual General Meeting is scheduled for September 24, 2021, and the record date for the same is September 17, 2021

At around 9.35 am, Apollo Micro Systems Ltd was trading at Rs113.70 per piece up by Rs1.3 or 1.16% from its previous closing of Rs112.40 per piece on the BSE.

The scrip opened at Rs113.50 and has touched a high and low of Rs115.10 and Rs113.05 respectively.

https://www.indiainfoline.com/article/news-top-story/apollo-micro-systems-bags-supply-order-worth-rs5-30cr-stock-up-1-121090100372_1.html

DRDO on Twitter

ANI @ANI · 15h

NADS has been developed by DRDO & manufactured by Bharat Electronics Limited. First indigenously developed anti-drone system to be inducted into Indian Armed Forces.

NADS can instantly detect& jam micro drones &use laser-based kill mechanism to terminate targets:Defence Ministry

ANI @ANI · 16h

Indian Navy today signed a contract with Bharat Electronics Limiter for the supply of the first indigenous comprehensive Naval Anti Drone System (NADS) with both hard-kill and soft kill capabilities.

Defence News

Defence Strategic: National/International

Press Information Bureau
Government of India

Ministry of Defence

Tue, 31 Aug 2021 10:44AM

Indian Navy's Maiden Exercise with Algerian Navy

As part of her ongoing goodwill visit to Europe and Africa, INS Tabar took part in a Maritime Partnership Exercise with Algerian Navy ship 'Ezzadjer' on 29 Aug 21.

The landmark exercise, held off the Algerian coast, saw participation of a frontline Algerian warship, 'Ezzadjer'.

As part of the exercise, diverse activities includingco-ordinatedmanoeuvring, communication procedures and steam past were undertaken between the Indian and Algerian warships. The exercise enabled the two navies to understand the concept of operations followed by each other, enhanced interoperability and opened the possibility of increasing interaction and collaboration between them in future.

https://pib.gov.in/PressReleasePage.aspx?PRID=1750639

पत्र सूचना कार्यालय
भारत सरकार

रक्षा मंत्रालय

Tue, 31 Aug 2021 10:44AM

अल्जीरिया की नौसेना के साथ भारतीय नौसेना का पहला नौसैन्य अभ्यास

यूरोप और अफ्रीका के लिए वर्तमान में जारी अपनी सद्भावना यात्रा के हिस्से के रूप में आईएनएस ताबर ने 29 अगस्त 2021 को अल्जीरियाई नौसेना के पोत 'एज़्ज़ादजेर' के साथ एक समुद्री साझेदारी अभ्यास में हिस्सा लिया।

अल्जीरियाई तट पर हुए इस ऐतिहासिक नौसैन्य अभ्यास में फ्रंटलाइन अल्जीरियाई युद्धपोत 'एज़्ज़ादजेर की भागीदारी देखी गई।

अभ्यास के दौरान भारतीय और अल्जीरियाई युद्धपोतों के बीच समन्वित युद्धाभ्यास, संचार प्रक्रियाओं और स्टीम पास्ट सहित अनेक गतिविधियां आयोजित की गईं। इस नौसैन्य अभ्यास से दोनों नौसेनाओं को एक-दूसरे के द्वारा अपनाए जाने वाले संचालन की अवधारणा को समझने में मदद मिली, इसने पारस्परिकता को बढ़ाया और भविष्य के लिए दोनों नौसेनाओं के बीच बातचीत तथा सहयोग बढ़ाने की संभावनाओं के द्वार को भी खोल दिया।

https://pib.gov.in/PressReleasePage.aspx?PRID=1750697

Wed, 01 Sept 2021

Indian Army reaches Taraz for joint military exercise with Kazakhstan

This is the fifth joint maneuver between India and Kazakhstan. The armies of both the countries have also participated in Shanghai Cooperation Organization i.e. SCO Multination Exercise.

Military Exercise: With the Taliban once again taking over Afghanistan and US forces returning to the country, India has begun to consolidate its hold in Central Asia. In this episode, a contingent of the Indian Army on Tuesday reached the Central-Asian country Kazakhstan for a joint military exercise.

India and Kazakhstan will participate in counter-insurgency and counter-terrorism drills.

According to the reports, this joint exercise between the armies of India and Kazakhstan - KAZIND-21 - will be held in the Taraz Military area of Kazakhstan between August 31 and September 13.

A contingent of the Bihar Regiment of the Indian Army reached the Taraz airport for this exercise on August 20. Taraj is an area adjacent to Kyrgyzstan. The Indian Air Force's C-17 Globemaster aircraft had arrived with this troop. On reaching Taraz, India's Defense Attache in Kazakhstan and senior military officers of the Kazakhstan Army welcomed the Indian soldiers.

Air Force's C-17 aircraft has reached India through the air routes of Uzbekistan, Turkmenistan and Iran after leaving the soldiers. The plane did not use Afghanistan's airspace.

This is the fifth joint maneuver between India and Kazakhstan. The armies of both the countries have also participated in Shanghai Cooperation Organization i.e. SCO Multination Exercise.

During the KAZIND-21 exercise, the armies of India and Kazakhstan will participate in counter-insurgency and counter-terrorism drills. The purpose of this exercise is to promote military diplomacy, mutual reconciliation and military cooperation between the two countries.

Over the last few years, India has significantly increased its defense cooperation with Central Asian countries, which were formerly part of the Soviet Union. In the month of March this year, the armies of India and Uzbekistan also participated in the 'Dustlik' exercise at Chaubatia (Ranikhet) in Uttarakhand.

https://news.abplive.com/news/india/indian-army-reaches-taraz-for-joint-military-exercise-with-kazakhstan-1479515

Wed, 01 Sept 2021

Exclusive: ISRO to emphasize on Mfg process, make minor tweaks on GSLV for Gaganyaan

Indian Space Research Organization (ISRO) will be making only minor tweaks to its heavy-lifter rocket GSLV Mk3

By Sidharth MP, Edited By Rahul Jaywant Bhise

Highlights

1. ***ISRO makes changes to GSLV Mk3 as the agency gears up for Human Spaceflight missions***
2. ***ISRO is working towards performing two unmanned flights of Gaganyaan***
3. ***Mandatory testing and qualifications apart, ISRO would also be launching two satellites that are meant to provide communications support for its human-carrying spacecraft.***

Chennai: According to top officials, the Indian Space Research Organization (ISRO) will be making only minor tweaks to its heavy-lifter rocket GSLV Mk3, as the agency gears up for Human Spaceflight missions. These changes on its most advanced rocket are meant to improve its reliability for undertaking the daunting task of lifting a human-carrying spacecraft to orbit. Additional emphasis would also be paid to the manufacturing process of the rocket and its components.

ISRO is working towards performing two unmanned flights of Gaganyaan, in order to test and certify its systems, before the actual Human Spaceflight. Mandatory testing and qualifications apart, ISRO would also be launching two satellites that are meant to provide communications support for its human-carrying spacecraft. Known as IDRSS (Indian Data Relay System Satellites), they would be placed nearly 36,000km above the equator(where it would remain in sync with the earth's rotation or at a constant position when seen from earth) and will offer near-total tracking and communication with India's space assets. It must be noted that a constellation of 3 satellites positioned in the 36,000km orbit can offer real-time, 24/7 monitoring of almost the entire earth.

ISRO intends to launch two such IDRSS satellites prior to the Gaganyaan Human Spaceflight. Dr. K.Sivan, Chairman, ISRO told Zee Media that the Gaganyaan spacecraft would be placed in a low earth orbit, 400kms above the earth. He added that ISRO was looking at launching the IDRSS satellites in 2022. For context, when Gaganyaan is orbiting earth, but not visible to the ground stations, Gaganyaan can send its signals and communicate to the IDRSS satellites up above, which in turn would relay it down to the ground stations and vice versa. This would ensure constant communication between the astronauts and their mission control on earth.

Referring to the orbital placement of Gaganyaan, he said "The rocket will put the 7.5ton Gaganyaan module into 170x400kms orbit (170kms from earth and 400kms from earth at its nearest and farthest points in orbit respectively). Thereafter, the on-board propulsion will raise the Gaganyaan module to a uniform 400kms orbit (Low earth orbit). He also added that, the same propulsion system would be used to lower the orbit and bring the spacecraft closer to earth for aiding re-entry.

When queried about the astronauts' mission duration in space and the splash-landing site(Bay of Bengal or the Arabian Sea), he said that it would be decided in due course.

On the testing of rocket engines, Dr. S. Somanath, Director of Vikram Sarabhai Space Center told Zee Media that minor tweaks would be made to the GSLV Mk3 rocket, in terms of few materials being used. However, he added that these would be very minor changes that are aimed at

improving reliability and not fundamental, technological ones. Also, the space agency would be laying additional emphasis on the manufacturing process of the rocket and its components. It is pertinent to recall that the GSLV Mk3, which is to be used for Gaganyaan has had complete success in all its four flights thus far.

Regarding the engines being used to propel the Gaganyaan spacecraft, he said that it was a cluster of five engines. Here too, the engines being used are the tried and tested 440N thrust engines that are in use in the GSAT series of satellites. A system demonstration model comprising a cluster of five engines were recently test-fired successfully by ISRO, for a duration of 450 seconds. In the coming months, ISRO would be performing long-duration test-fire of its engines, in order to accumulate more data for human-rating of the entire rocket. It essentially means that a rocket that is used for hauling Cargo (satellites) to space is being modified, certified for carrying humans while ensuring higher safety and reliability.

https://zeenews.india.com/india/exclusive-isro-to-emphasize-on-mfg-process-make-minor-tweaks-on-gslv-for-gaganyaan-2390110.html

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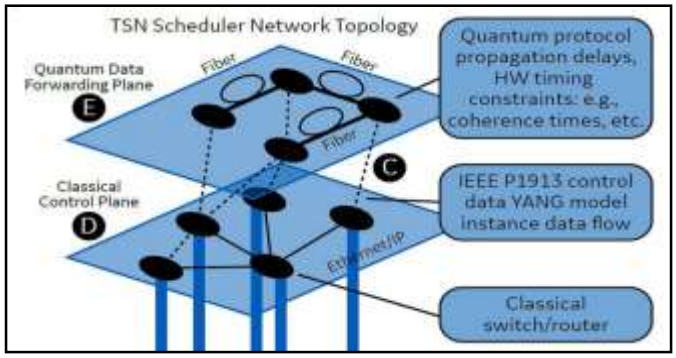
Wed, 01 Sept 2021

To develop quantum networks, the unique needs of industry must be considered and may provide a solution

Large-scale quantum networks have been proposed, but so far, they do not exist. Some components of what would make up such networks are being studied, but the control mechanism for such a large-scale network has not been developed. In *AVS Quantum Science*, investigators outline how a time-sensitive network control plane could be a key component of a workable quantum network.



Control mechanism for proposed quantum network. Credit: Stephen F. Bush

Quantum networks are similar to classical networks. Information travels through them, providing a means of communication between devices and over distances. Quantum networks move quantum bits of information, called qubits, through the network.

These qubits are usually photons. Through the quantum phenomena of superposition and entanglement, they can transmit much more information than classical bits, which are limited to logical states of 0 and 1, are able to. Successful long-distance transmission of a qubit requires precise control and timing.

In addition to the well-understood requirements of transmission distance and data rate, for quantum networks to be useful in a real-world setting there are at least two other requirements of industry that need to be considered.

One is real-time network control, specifically time-sensitive networking. This control method, which takes network traffic into account, has been used successfully in other types of networks, such as Ethernet, to ensure messages are transmitted and received at precise times. This is precisely what is required to control quantum networks.

The second requirement is cost. Large-scale adoption of an industrial quantum network will only happen if costs can be significantly reduced. One way to accomplish cost reduction is with photonic integrated circuits.

"The value of quantum technologies in industry must be favorable before it will be adopted," said author Stephen Bush. "In particular, a 'quantum advantage' must exist in which a quantum technology has the ability to outperform a classical technology (computing, communication, or sensing)."

So far, no quantum technology has demonstrated such an advantage, but scientists are working to develop benchmarks as they work toward this goal.

"The ability to scale the number of quantum network interconnections is an important requirement that must be addressed," said Bush.

One application area of interest for quantum networks is cybersecurity. These applications can involve a method known as quantum key distribution, or QKD, in which two parties share a random secret key known only to them that can be used to encrypt and decrypt a message.

Use of QKD will, however, require standardization and certification, which is in the early stages.

"Government regulations enforcing the use of QKD cannot be enacted until consensus has been reached for how security is tested and certified by a trusted organization," said Bush.

Despite the challenges that must be overcome, the authors believe the industry has the technological ability to build functioning quantum networks.

More information: "A perspective on industrial quantum networks" *AVS Quantum Science*, aip.scitation.org/doi/10.1116/5.0051881

https://phys.org/news/2021-08-quantum-networks-unique-industry-solution.html

Wed, 01 Sept 2021

Exploring quantum correlations of classical light source for image transmission

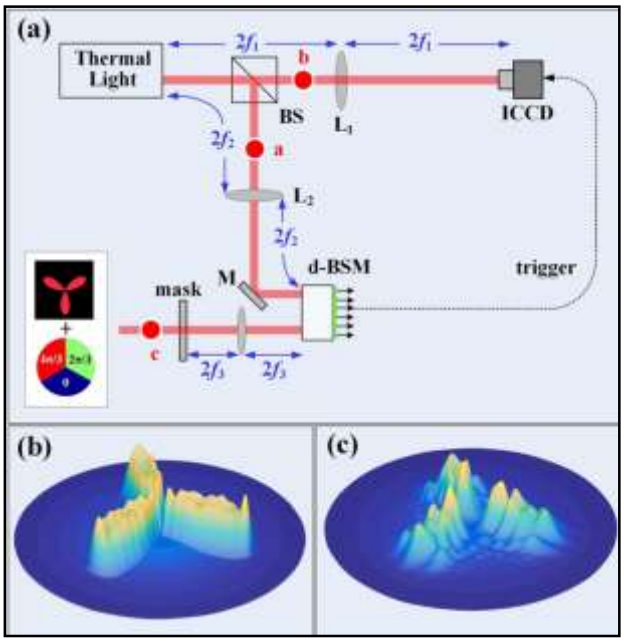
There has been an interesting debate on the quantum versus classical origin of ghost imaging in thermal light. To clarify this quantum-classical dilemma, Lixiang Chen at Xiamen University of China formulated a density matrix to fully describe thermal two-photon orbital angular momentum state, which revealed the hidden quantumness with non-zero discord. Then, a scheme of mimicking teleportation was devised to demonstrate the possibility of teleporting an optical image, with an accompanying featureless background.

In science fiction, "teleportation" is commonly portrayed as a means to transfer physical objects from one location to another one some distance away. But in physics, quantum teleportation only transfers quantum information, i.e., the quantum state of a particle, without any physical transmission of the particle itself. The quantum protocol of teleportation was theoretically developed by Bennett and coworkers in 1993 and its first experimental demonstration was realized by Bouwmeester and his colleagues in 1997. Recent progress has been made to realize the teleportation from a transmitter on Earth to a receiver on a satellite, towards a global scale. In the original scheme, quantum entanglement is an essential prerequisite for implementing the teleportation.

On the other hand, ghost imaging represents an intriguing image acquisition technique in which an image can be reconstructed by using a light beam that never interacts with the object. However, it was demonstrated that, besides quantum entangled biphoton source, classical thermal light source can also be exploited for realizing the task of ghost imaging, thus raising a question whether

entanglement was truly necessary for ghost imaging. A lot of distinguished work has contributed, both theoretically and experimentally, however the quantum-classical dilemma still persists.

In a new paper published in *Light Science & Application*, Lixiang Chen from the College of Physical Science and Technology, Xiamen University, China, has investigated this on-going quantum-classical dilemma. In a photon orbital angular momentum (OAM) Hilbert space, he formulated a density matrix to fully describe two-photon state within a thermal light source, which appears as a sum of a high-dimensional OAM entangled state and a diagonal fully separable state. Interestingly, the density matrix is proven to be separable, i.e., zero entanglement per se. Still, this formulation offers a physically intuitive picture to reveal the quantumness hidden in thermal two-photon OAM state, as was characterized by non-zero geometric discord that discerns quantum correlations beyond entanglement.



a) the proposed scheme. (b) the correct transmission of a Clover image. (c) an incorrect transmission. Credit: Lixiang Chen

A following question arises naturally as to whether such non-entangled yet non-classical thermal two-photon state could be explored for any useful quantum applications. The author answered this question positively by revisiting the quantum teleportation protocol. The numerical simulations showed that, at the single-photon level, the thermal two-photon OAM state could be exploited for teleporting a high-dimensional OAM state, in which the retrieved state is just a mixture of an exact replica of the original state and a background maximally mixed one.

Unlike two-dimensional polarization state, the OAM eigenstates form an infinite-dimensional, orthogonal, and complete basis. Therefore, a complex-amplitude optical image can be equivalently represented by a high-dimensional OAM state vector. Thus, the possibility of teleporting a Clover image of both amplitude and phase modulation was also theoretically demonstrated, with multiple repetitions of the protocol.

Professor Chen summarize the operational principle of the protocol like this: "The light field, emitted from a thermal light source, is divided into two paths by a non-polarizing beam splitter, which generates the thermal two-photon OAM state. The photon in one path is directed to interact with another third photon (encoded with the complex-amplitude Clover image) in the high-dimensional Bell state measurement (BSM) stage. Conditional on the BSM results and after being performed with a proper unitary operation, the photon in the other path are sent to hit an ICCD camera working at the trigger mode. Then, the original image can be retrieved correctly by the ICCD camera, with multiple repetition of our protocol."

"In present proposal, the correct transmission of an image is ensured by the pure high-dimensional OAM entanglement component, while the diagonal completely mixed component merely brings about a featureless background." He added.

"In the future, my theoretical framework can also call for further studies of using thermal multi-photon state to demonstrate some new quantum information tasks, such as remote state preparation and novel imaging with undetected photons." Professor Chen forecasts.

More information: Lixiang Chen, Quantum discord of thermal two-photon orbital angular momentum state: mimicking teleportation to transmit an image, *Light: Science & Applications* (2021). DOI: 10.1038/s41377-021-00585-8

Journal information: *Light: Science & Applications*

https://phys.org/news/2021-08-exploring-quantum-classical-source-image.html

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Wed, 01 Sept 2021

Measurement beyond standard quantum limit realized with nitrogen-vacancy centers in diamond

By Liu Jia

Many measurements are limited by standard quantum limit (SQL). SQL is defined as the measured noise levels set by quantum mechanics. Quantum entanglement can be used to beat SQL and approach an ultimate limit called Heisenberg limit (HL). Sub-SQL measurements have been realized in many systems under extreme conditions and sensors in these systems are not suitable for realistic measurements under ambient conditions.

Nitrogen-vacancy (NV) centers in diamond can be utilized as sensors for electron and nuclear magnetic resonance. They can work well in environmental conditions due to the protection of solid crystal lattice. An entire sub-SQL measurement process based on a single NV center includes initialization of NVs spins, entanglement under ambient conditions, detection of physical quantities, and readout of results. Difficulties now emerged on initialization and entanglement of NV.

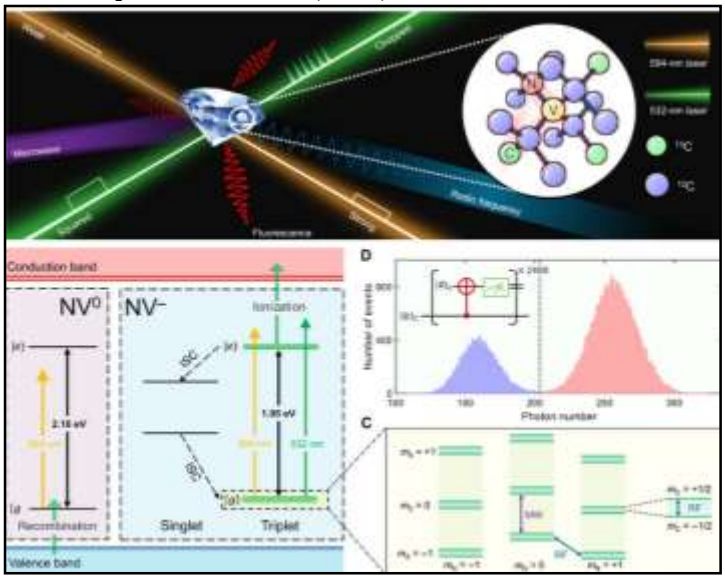

Fig. 1 Dynamics and control of a single NV center. (A) Diagram of a single NV center in diamond. It is driven by various laser beams and coherently controlled by MW and RF pulses. Squared: squared 532-nm green laser for readout of the NV electron spin and mixing charge states; chopped: chopped laser sequence for a better polarization of the electron spin without destroying charge state; strong: strong (4 μW) 594-nm orange laser for readout of charge state in real-time feedback; weak: weak (0.18 μW) orange laser for single-shot readout of charge state. The NV electron spin (S = 1), the attendant 14N nuclear spin (I = 1), and one of randomly distributed 13C nuclear spins (I = 1/2) constitute the interferometer. (B) Level diagrams of NV negative and neutral states denoted by NV− and NV0 and the corresponding dynamics driven by the 532-nm green laser and the 594-nm orange laser. (C) Spin level structure of the ground state of NV− triplet. MW and RF pulses are used to coherently manipulate the NV electron spin and two nuclear spins (14N and 13C). (D) Projective measurement of the 13C nuclear spin. The dashed line denotes the threshold to determine which state it stays in. Credit: DOI: 10.1126/sciadv.abg9204

A research team led by Prof. Du Jiangfeng from University of Science and Technology of China (USTC) of the Chinese Academy of Sciences realized a sub-SQL measurement under ambient condition with NV centers in diamond, and found that the use of entangled sensors can beat SQL and realize more accurate measurements. This study was published in *Science Advances*.

The researchers applied a real-time feedback technique to initialize spins to a highly pure state, and achieved the joint initialization of NV charge state, electron spin, and two nuclear spins with high fidelity.

They replaced squared pulse laser with chopped laser sequence for polarization of electron spin, improving the corresponding laser fidelity from 90% to 97.7%.

Additionally, the researchers optimized experiment setups to better control experimental conditions. Through sophisticated configuration for heat isolation and apropos proportion-integration-differentiation (PID) parameters for feedback, they realized a relatively low temperature fluctuation of 0.5mK during experiments and a highly stable magnetic field with the volatility of 1ppm.

This work opens up new perspectives for the investigation of solid-state spin systems, and lays the foundations for quantum sensing and computing.

More information: Tianyu Xie et al, Beating the standard quantum limit under ambient conditions with solid-state spins, *Science Advances* (2021). DOI: 10.1126/sciadv.abg9204

Journal information: *Science Advances*

https://phys.org/news/2021-08-standard-quantum-limit-nitrogen-vacancy-centers.html

COVID-19 Research News

NYU Langone Health

Wed, 01 Sept 2021

High virus count in the lungs drives covid-19 deaths

Findings Contrast Previous Suspicions That Simultaneous Infections Played a Major Role in Heightened Risk of Death

A buildup of coronavirus in the lungs is likely behind the steep mortality rates seen in the pandemic, a new study finds. The results contrast with previous suspicions that simultaneous infections, such as bacterial pneumonia or overreaction of the body's immune defense system, played major roles in heightened risk of death, the investigators say.

Photo: Yelizaveta Tomashevska/Getty

Led by researchers at NYU Grossman School of Medicine, the new study shows that people who died of COVID-19 had on average 10 times the amount of virus, or viral load, in their lower airways as did severely ill patients who survived their illness. Meanwhile, the investigators found no evidence implicating a secondary bacterial infection as the cause of the deaths, although they cautioned that this may be due to the frequent course of antibiotics given to critically ill patients.

"Our findings suggest that the body's failure to cope with the large numbers of virus infecting the lungs is largely responsible for COVID-19 deaths in the pandemic," says study lead author Imran Sulaiman, MD, PhD, an adjunct professor in the Department of Medicine at NYU Langone Health.

Current guidelines from the Centers for Disease Control and Prevention (CDC), he notes, do not encourage use of antivirals such as remdesivir for severely ill patients on mechanical ventilation. But Dr. Sulaiman says the NYU Langone study results suggest that these medications may still remain a valuable tool in treating these patients.

Despite previous concerns that the virus may prompt the immune system to attack the body's own lung tissue and lead to dangerous levels of inflammation, the investigators found no evidence that this was a major contributor to COVID-19 deaths in the group studied. In fact, Dr. Sulaiman notes that the strength of the immune response appeared proportionate to the amount of virus in the lungs.

The coronavirus has so far killed more than 4 million people worldwide, researchers say. Those placed on mechanical ventilators in order to breathe fare particularly poorly, with 70 percent nationwide succumbing to the illness. Notably, experts attribute the high mortality seen in other

viral pandemics such as the Spanish flu in 1918 and swine flu in 2009 to a secondary bacterial infection. However, it remained unclear whether a similar issue affected people with COVID-19.

The new study, published online August 31 in the journal *Nature Microbiology*, was designed to clarify the role of secondary infections, viral load, and immune cell populations in COVID-19 mortality, according to Dr. Sulaiman. He says the investigation provides the most detailed survey of the lower airway environment in patients with coronavirus.

For the investigation, the researchers collected bacterial and fungal samples from the lungs of 589 men and women who were hospitalized in NYU Langone facilities in Manhattan and on Long Island. All required mechanical ventilation. For a subset of 142 patients who also received a bronchoscopy procedure to clear their air passages, the investigators analyzed the amount of virus within their lower airways and identified the microbes present by studying small pieces of the germs' genetic code. The study authors also surveyed the type of immune cells and compounds located in the lower airways.

Among the findings, the study revealed that those who died had on average 50 percent lower production of a type of immune chemical that targets the coronavirus compared with the patients with COVID-19 who survived the illness. These customized proteins are part of the body's adaptive immune system, a subset of cells and chemicals that "remember" invading newly encountered microbes, leaving the body better prepared for future exposure.

"These results suggest that a problem with the adaptive immune system is preventing it from effectively combating the coronavirus," says study senior author Leopoldo N. Segal, MD. "If we can identify the source of this issue, we may be able to find an effective treatment that works by bolstering the body's own defenses," says Dr. Segal, an associate professor in the Department of Medicine at NYU Langone.

He cautions that the investigators only studied patients with coronavirus who survived their first two weeks of hospitalization. It is possible, he says, that bacterial infections or autoimmune reactions may play a greater role in COVID-19 mortality that occurs earlier.

Dr. Segal says the research team next plans to observe how the microbe community and immune response in the lungs of patients with coronavirus change over time.

Funding for the study was provided by National Institutes of Health grants R37 CA244775, R01 HL125816, R21 AI158997, R01 AI143861, R01 AI143861-02S, R01 DK110014, P20 CA252728, and P30 CA016087; and CDC Foundation grant UWSC1085.1. Further funding was provided by Ingelheim Pharma GmbH & Co., Bristol-Myers Squibb, Celgene Corporation, Genentech Inc., Gilead, GlaxoSmithKline plc, Janssen Pharmaceutical Companies of Johnson & Johnson, Novartis Institutes for Biomedical Research, Pfizer Inc., and Sanofi.

In addition to Dr. Sulaiman and Dr. Segal, other NYU Langone researchers were Luis F. Angel, MD; Jun-Chieh J. Tsay, MD; Benjamin G. Wu, MD; Kelsey Krolikowski, BA; Yonghua Li, MD, PhD; Rosemary Schluger, RN; Stephen Yeung, PhD; Ralf Duerr, MD, PhD; Sara Thannickal; Chang Wang, MS; George Jour, MD; Guomiao Shen, PhD; Joseph Carpenito, BS; Xiuxiu Liu, MD; Kun Ji, MD; Destiny Collazo, BA; Anthony Labarbiera, BA; Nancy E. Amoroso, MD; Shari B. Brosnahan, MD; Vikramjit Mukherjee, MD; David A. Kaufman, MD; Jan Bakker, MD, PhD; Anthony S. Lubinsky, MD; Deepak R. Pradhan, MD; Daniel H. Sterman, MD; Michael D. Weiden, MD; Adriana Heguy; PhD; Ludovic P. Desvignes, PhD; Shohei Koide, PhD; Kenneth A. Stapleford, PhD; Kamal M. Khanna, PhD; Ann Marie Schmidt, MD; Bo Shopsin, MD, PhD; Peter Meyn; Chan Wang, PhD; and Huilin Li, PhD. Other study co-investigators were Matthew Chung, PhD; Stephanie Banakis, MS; and Elodie Ghedin, PhD, at the National Institute of Allergy and Infectious Diseases in Bethesda, Maryland.; Lizzette Perez-Perez, MSc; and Emmie De Wit, PhD, at the National Institute of Allergy and Infectious Diseases in Hamilton, Montana; Laura Evans, MD, MSc, at the University of Washington in Seattle; Timothy Uyeki, MD, at the CDC in Atlanta; and Jose Clememte, PhD; Bin Zhang, PhD; and Christian Forst, PhD, at Icahn School of Medicine at Mount Sinai in New York City.

https://nyulangone.org/news/high-virus-count-lungs-drives-covid-19-deaths