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Anti-Tank Guided Missile Helina will soon add to the Indian defence arsenal

The Defence Research and Development Laboratory (DRDL) Hyderabad, a laboratory of the Defence Research and Development Organisation (DRDO) has completed all trials of the indigenously made Nag Anti-Tank Guided Missile (ATGM), Helina. According to the available data, the Army had started the process for issuing of Acceptance of Necessity (AoN). After the AON, the Request for Proposal (RFP) will be issued regarding the Anti-Tank Guided Missile (ATGM).



The cost estimation of the missiles is yet to be finalized but the expected cost of one missile will be under ₹1 crore. Around 500 missiles and 40 launchers will be required in the initial stage.

Nag Anti-Tank Guided Missile (ATGM), Helina

HELINA is a Helicopter based NAG which is a third-generation fire and forget class anti-tank guided missile (ATGM) system mounted on the Advanced Light Helicopter (ALH). The system can hit a target with a minimum range of 500 m and a maximum range of 7 km. The missile is guided by an Infrared Imaging Seeker (IIR), which makes it one of the most advanced Anti-Tank Weapons in the world.

The missile system has all-weather day and night capability. It can penetrate through the conventional armor and can also destroy the explosive reactive armor. The missile can engage targets both in direct hit mode as well as top attack mode. The Indian Air Force has asked for the feasibility of integrating the Helina on the soon-to-be inducted Light Combat Helicopter (LCH) which will add to the current weapon arsenal of the Indian Air Force.

User trials of Anti-Tank Guided Missile Systems 'Helina' & 'Dhruvastra' were carried in February 2021

In February 2021, the joint user trials for Helina (Army Version) and Dhruvastra (Air Force Version) Missile Systems were carried out from the Advanced Light Helicopter (ALH) platform in desert ranges.

Live firing of five missions was carried out to evaluate the missile capabilities in their minimum and maximum range. The missiles were fired in hover and max forward flight against realistic static and moving targets. Some missions were carried out with warheads against derelict tanks. A mission was also carried out against a moving target from a forward flying helicopter.

<https://newsonair.com/2021/09/20/anti-tank-guided-missile-helina-will-soon-add-to-the-indian-defence-arsenal/>

NIA lodges case regarding Chinese Vessel that arrived in Gujarat, had items that could aid missile launch

In January 2020, a vessel started its journey from a Chinese port and had a Pressure Chamber used to launch missiles, reports had claimed

By Ankur Sharma

The National Investigation Agency (NIA) has registered a case linked to a Chinese vessel that had arrived at Kandla port in Gujarat last year in February and had ‘dual purpose’ use items.

The vessel ‘Da Cui Yun’ was on its way to Pakistan and had items that could be used to launch missiles. The Home Ministry has issued an order to register a case and on the basis of MHA’s order, the investigating agency has registered a case under the relevant sections.

According to the sources, initially, Directorate of Revenue Intelligence (DRI) was probing the case. During the initial probe, DRDO was also roped in after sensing the gravity of the case.

“DRDO and other agencies found that the material which was destined to Pakistan through this Chinese Vessel was of dual-purpose use and can be used to make destructive items or missiles. A case has been registered based on MHA’s order of probing the case last week,” sources told News18.

“A case has been registered under relevant sections of Weapons of Mass Destruction and their Delivery Systems (Prohibition of Unlawful Activities) Act, 2005 along with sections of other acts,” a senior NIA official confirmed News18.

An internal report was also submitted by DRDO giving details about the material and its usage.

In January 2020, a vessel identified as ‘Da Cui Yun’ started its journey from a Chinese port. The vessel which was destined to Karachi, Pakistan, had a Pressure Chamber used to launch missiles, reports had claimed.

“It had mis-declared the item that it was carrying. Our examination has revealed that the item is an autoclave, that is controlled under a dual-use export controls list. Therefore the item has been seized by our authorities, as per legal procedure,” the Ministry of External Affairs spokesperson had said last year.

“It has also been ascertained by our examination, that this item has military applications. We have conveyed our concerns on this issue to the Chinese side. The Chinese government will take appropriate measures to ensure that the Chinese entities do not engage in activities that can contribute to proliferation,” MEA spokesperson had said while briefing media in March last year.

<https://www.news18.com/news/india/nia-lodges-case-regarding-chinese-vessel-that-arrived-in-gujarat-had-items-that-could-aid-missile-launch-4222745.html>



The NIA has registered the case on the basis of MHA's order. (PTI File photo)

NIA takes over probe on Chinese vessel with ‘suspicious’ equipment that arrived in Gujarat last year

Sources said that the NIA has already registered an FIR in relation to the matter

The Ministry of Home Affairs has handed over probe into the case of a Chinese vessel, which authorities suspect may have been transporting missile-related equipment to Pakistan, to the National Investigation Agency (NIA). Sources said that the NIA has already registered an FIR in relation to the matter.

In February last year, intelligence inputs from the Directorate of Revenue Intelligence (DRI) stated they had intercepted a Chinese vessel en route to Karachi at Gujarat’s Kandla port.

The inspection of the vessel had led to discovery of an industrial autoclave that experts at the Defence Research and Development Organisation (DRDO) opined could be used to manufacture long-range missiles. The vessel, sources said, had “misdeclared” the goods as industrial dryers.

Indian security establishment had at that time expressed fears that China was surreptitiously building Pakistan’s military capabilities. China had denied the allegations at that time.

“The orders to register a case in the matter came on Friday, and an FIR has been registered accordingly,” an NIA official said.

According to sources, on February 3, DRI and customs officials detained Chinese ship Dai Cui Yun at Kandla port. Upon inspection, the authorities found an autoclave, which was 18×4 m in size, and was said to be a dual-use civil and military equipment. The item was seized as it was “misdeclared” and the ship was subsequently released to sail to Port Qasim in Karachi.

Later, after being tested by the DRDO, it was said that the equipment could be used in the manufacture of long-range missiles.

The development was taken seriously by the Indian authorities, with the Ministry of External Affairs issuing a statement saying that the equipment had been seized as it was “misdeclared” and controlled under a dual-use export controls list.

Chinese Foreign Ministry spokesman Zhao Lijian had in media interviews then denied that the equipment was meant for military use. “After seeking the information, we know that this item is actually a heat treatment furnace shell system, produced by a private company in China. This is not for military use and it is not a dual-use item under the non-proliferation and export control,” he had been quoted as saying by news agency PTI.

<https://indianexpress.com/article/india/nia-probe-chinese-vessel-equipment-missile-7521843/>



The Ministry of Home Affairs has handed over the probe to the NIA. (Representational image)

मिसाइल उपकरण ले जा रहे चीनी पोत मामले की एनआइए करेगी जांच, पिछले साल का है मामला

केंद्रीय गृह मंत्रालय के आदेश पर एनआइए ने 17 सितंबर को मामला दर्ज किया है। आटोकलेव उपकरण लेकर जाने और उसके बारे में जानकारी छिपाने के लिए दीनदयाल बंदरगाह पर भारतीय सीमा शुल्क अधिकारियों ने चीनी व्यापारिक पोत 'दा कुई युन' को अपने कब्जे में ले लिया था।

By Dhyanendra Singh Chauhan

नई दिल्ली: गुजरात में कांडला बंदरगाह पर पिछले साल पहुंचे चीनी पोत से जुड़े मामले में राष्ट्रीय जांच एजेंसी (NIA) ने मामला दर्ज करके जांच शुरू कर दी है। इस पोत से 'आटोकलेव' उपकरण को पाकिस्तान में कराची ले जाया जा रहा था। इस उपकरण का इस्तेमाल औद्योगिक कार्यों के अलावा बैलिस्टिक मिसाइलों के निर्माण में भी होता है।

एक आधिकारिक सूत्र ने बताया कि केंद्रीय गृह मंत्रालय के आदेश पर एनआइए ने 17 सितंबर को मामला दर्ज किया है। 'आटोकलेव' उपकरण लेकर जाने और उसके बारे में जानकारी छिपाने के लिए दीनदयाल (पूर्व में कांडला) बंदरगाह पर भारतीय सीमा शुल्क अधिकारियों ने चीनी व्यापारिक पोत 'दा कुई युन' को अपने कब्जे में ले लिया था।

यह पोत पिछले साल तीन फरवरी को कांडला बंदरगाह पर पहुंचा था और चार-पांच फरवरी की मध्यरात्रि में पाकिस्तान में कराची के कासिम बंदरगाह के लिए रवाना होने में सफल रहा था। लेकिन बाद में हांगकांग के ध्वज वाले इस पोत को कब्जे में ले लिया गया था और सीमा शुल्क अधिकारियों ने इस पर लदे 'आटोकलेव' उपकरण को जब्त कर लिया था। उस समय खुफिया एजेंसियों के साथ-साथ सीमा शुल्क, रक्षा अनुसंधान एवं विकास संगठन (डीआरडीओ) और राजस्व खुफिया निदेशालय (डीआरआइ) की टीमों ने उपकरण की जांच की थी।

यह पोत 17 जनवरी, 2020 को चीन के जियांगयिन बंदरगाह से रवाना हुआ था। पिछले साल तीन फरवरी को इस पोत से कांडला बंदरगाह पर करीब 2,480 टन वजन की मशीनरी उतारी गई थी। अधिकारियों का कहना है कि पहली नजर में इस पोत ने स्पेशल कैमिकल्स, आर्गनिज्म, मैटीरियल्स, इन्क्विपमेंट एंड टेक्नोलाजीस (स्कोमेट) रेगुलेशंस का उल्लंघन किया है।

<https://www.jagran.com/news/national-nia-will-investigate-the-case-of-chinese-ship-carrying-missile-equipment-22038398.html>

अमरउजाला

Tue, 21 Sept 2021

मोतीपुर सीएचसी में ऑक्सीजन प्लांट बनकर तैयार, ट्रायल पूरा

बहराइच: सामुदायिक स्वास्थ्य केंद्र मोतीपुर में डीआरडीओ की ओर से ऑक्सीजन प्लांट का निर्माण कराया गया है। प्लांट बनकर तैयार हो गया है। सोमवार शाम को इंजीनियरों की टीम ने ट्रायल भी कर दिया। प्लांट से प्रति मिनट 250 लीटर ऑक्सीजन उत्पन्न होगी। जिससे प्रदेश की सबसे बड़ी सीएचसी में ही ऑक्सीजन के द्वारा गंभीर बीमारियों के मरीजों का बेहतर इलाज हो जाएगा।

कोरोना की दूसरी लहर में ऑक्सीजन के अभाव में लोगों की मौत हो रही थी। इसको देखते हुए सरकार ने सीएचसी में ऑक्सीजन प्लांट की स्थापना को हरी झंडी दी थी। आबादी की दृष्टि से प्रदेश की सबसे बड़ी सीएचसी मोतीपुर में प्रधानमंत्री केयर फंड से ऑक्सीजन प्लांट को हरी झंडी मिली थी। डीआरडीओ द्वारा सामुदायिक स्वास्थ्य केंद्र में प्लांट की स्थापना शुरू की गई। सीएचसी अधीक्षक डॉ. अनुराग वर्मा ने बताया कि ऑक्सीजन प्लांट का निर्माण डीआरडीओ की ओर से पूरा कर दिया गया है। प्लांट का फाउंडेशन निर्माण एनएचएआई की ओर से किया गया है।

अधीक्षक ने बताया कि सभी निर्माण कार्य पूरा हो गया है। प्लांट निर्माण पर 50 लाख रुपये का खर्च आया है। इंजीनियर की टीम ने सोमवार को प्लांट का ट्रायल कर दिया है। अब किसी जनप्रतिनिधि द्वारा प्लांट का उद्घाटन किया जाएगा। सीएचसी में प्लांट स्थापित होने से मिर्हीपुरवा और बलहा विकास खंड की आबादी को ऑक्सीजन के अभाव में जिला मुख्यालय का चक्कर नहीं लगाना पड़ेगा। सभी का सीएचसी में ही बेहतर इलाज हो जाएगा।

मोतीपुर सीएचसी में ऑक्सीजन प्लांट का निर्माण डीआरडीओ की ओर से पूरा कर दिया गया है। प्लांट का ट्रायल भी इंजीनियरों की ओर से किया गया है। प्लांट से प्रति मिनट 250 लीटर प्रति मिनट ऑक्सीजन का उत्सर्जन होगा। जिससे क्षेत्र के लोगों को सीएचसी में ही बेहतर इलाज मिल सकेगा।

-डॉ. एसके सिंह, सीएमओ

<https://www.amarujala.com/uttar-pradesh/bahraich/bahraich-bahraich-news-lko5964475101>

सदर अस्पताल में हुई आक्सीजन प्लांट की टेस्टिंग

बोकारो: पीएम केयर्स फंड से स्थापित होने वाले आक्सीजन प्लांट ने सोमवार से बोकारो सदर अस्पताल में काम करना प्रारंभ कर दिया है। 1000 लीटर प्रति मिनट आक्सीजन उत्पादन करने वाले इस आक्सीजन प्लांट को निजी क्षेत्र की कंपनी लार्सन एंड टर्बो ने स्थापित किया है, जबकि आक्सीजन प्लांट का डिजाइन रक्षा शोध एवं विकास संस्थान (डीआरडीओ) ने डेवलप किया है। राज्य के 24 जिलों में से 9 जिलों में पीएसए आक्सीजन प्लांट को स्थापित करने का काम लार्सन एंड टर्बो को दिया गया है। कंपनी के अभियंता राजेश सिन्हा ने अपनी उपस्थिति में सोमवार को प्लांट को चालू कर पूरी प्रक्रिया की जांच की। इस दौरान सदर अस्पताल के चिकित्सक और तकनीशियन उपलब्ध थे। संभावना है कि इसका विधिवत उद्घाटन आने वाले एक दो दिनों में हो जा। उसके बाद मरीजों को इस प्लांट की सुविधा मिलने लगेगी।



स्वचालित है ऑक्सीजन प्लांट: अब तक इस बात को लेकर भ्रम था कि यदि 1000 लीटर क्षमता का यह आक्सीजन प्लांट चलता है तो बिजली की काफी खपत होगी और बन रहा आक्सीजन बेकार होगा, पर डीआरडीओ के डिजाइन में सबसे बड़ी खास बात यह है कि यह ऑक्सीजन प्लांट उतना ही आक्सीजन का उत्पादन करेगा, जितने की जरूरत होगी। उदाहरण के तौर पर, यदि सदर अस्पताल में 10 मरीज आक्सीजन सपोर्टेड बेड के सहारे भर्ती हैं तो उनकी खपत के अनुसार ही आक्सीजन का उत्पादन होगा। यदि किसी भी बेड पर आक्सीजन की जरूरत नहीं हो रही है तो मशीन स्वतः एनर्जी सेवर मोड में चली जाएगी। इससे जहां एक ओर ऊर्जा की बचत होगी तो वहीं प्लांट को चलाने में किसी भी प्रकार की परेशानी नहीं होगी। अगले डेढ़ वर्षों तक लार्सन एंड टर्बो के तकनीशियन इस आक्सीजन प्लांट का देखरेख करेंगे। संचालन का प्रशिक्षण सदर अस्पताल के तकनीशियन को दिया जाएगा। डेढ़ वर्ष के बाद यदि जिला प्रशासन चाहे तो मशीन के अनुरक्षण का काम लार्सन एंड टर्बो या अन्य किसी कंपनी को दे सकता है।

राज्य सरकार की मदद से बन रहा है 500 लीटर का अलग आक्सीजन प्लांट: खास बात यह है कि सदर अस्पताल में दो आक्सीजन प्लांट स्थापित होना है। एक 1000 लीटर का जो कि पीएम केयर्स फंड से बन गया है, जबकि दूसरा 500 लीटर का प्लांट राज्य सरकार के निर्देश पर स्थापित हो रहा है। मतलब कि सदर अस्पताल में आक्सीजन का भी बैकअप उपलब्ध होगा, ताकि किसी भी हालत में किसी भी मरीज की जान आक्सीजन के अभाव में नहीं जाए।

<https://www.jagran.com/jharkhand/bokaro-oxygen-plant-in-sadar-hospital-22039285.html>



Press Information Bureau
Government of India
Ministry of Defence

Mon, 20 Sept 2021 6:18PM

Telecall between Raksha Mantri and US Secretary of Defence

US Secretary of Defence Mr Lloyd Austin made a telephone call to Raksha Mantri Shri Rajnath Singh today evening. Both the leaders discussed bilateral and regional matters, including developments in Afghanistan. They discussed defence cooperation and looked forward to working closely.

The Raksha Mantri and Secretary Austin also exchanged views about combating terrorism in the region. Both sides appreciated the mutual cooperation in the recent evacuation operations in Afghanistan and agreed to remain in regular contact in view of the evolving situation.

<https://pib.gov.in/PressReleasePage.aspx?PRID=1756466>



पत्र सूचना कार्यालय
भारत सरकार
रक्षा मंत्रालय

Mon, 20 Sept 2021 6:18PM

रक्षा मंत्री और उनके अमेरिकी समकक्ष के बीच टेलीकॉल

अमेरिकी रक्षा मंत्री श्री लॉयड ऑस्टिन ने आज शाम रक्षामंत्री श्री राजनाथ सिंह को टेलीफोन किया। दोनों नेताओं ने अफगानिस्तानके घटनाक्रम सहित द्विपक्षीय और क्षेत्रीय मामलों पर चर्चा की। उन्होंनेरक्षा सहयोग पर चर्चा की और बारीकी से काम करने की आशा जताई।

रक्षा मंत्री और अमेरिकी रक्षा मंत्री ऑस्टिन ने क्षेत्र में आतंकवाद कामुकाबला करने के बारे में विचारों का आदान-प्रदान किया। दोनों पक्षों नेअफगानिस्तान में हालिया निकासी अभियानों में आपसी सहयोग की सराहना की औरपैदा हुई स्थिति को देखते हुए नियमित संपर्क में रहने पर सहमत हुए।

<https://pib.gov.in/PressReleasePage.aspx?PRID=1756547>



Raksha Mantri Shri Rajnath Singh flags-in expedition to Mt Kun by NIMAS team

16-member team summits 7,077 mt high mountain in Zaskar ranges near Kargil

Key Highlights:

- **Record 16 mountaineers - nine Army personnel & seven local youth of Arunachal Pradesh - scale the mountain**
- **Complete the expedition without help from sherpas & mountain guides**
- **Such expeditions promote spirit of adventure & patriotism among youth, says Raksha Mantri**
- **Stresses that they can play an important role in strengthening defence & security**

Raksha Mantri Shri Rajnath Singh flagged-in, in New Delhi on September 20, 2021, a team of National Institute of Mountaineering & Allied Sports (NIMAS) Dirang, Arunachal Pradesh, which completed a mountaineering expedition to Mount Kun (7,077 metres). The team, led by Institute Director Colonel Sarfraz Singh, conducted the expedition to the Nun-Kun Mountain Massif which is the highest feature of Zaskar ranges located in Kargil.

Congratulating NIMAS for successfully completing the task in tough weather conditions amid the COVID-19 restrictions, the Raksha Mantri pointed out such expeditions would promote the spirit of adventure and patriotism among the youth. He emphasised that such events can play an important role in strengthening the defence and security of the country. "Through such events, we can learn more about border security and its challenges. Our Army has given a lot of encouragement to such activities," he said.

The Raksha Mantri stressed on the need to encourage such activities and suggested increased involvement of general public as it can play a major role in promoting tourism, employment, knowledge gathering and bolstering economy. He assured all possible support of the Government in these efforts.

Shri Rajnath Singh also lauded NIMAS for providing training in adventure courses in all three fields *i.e.*, land, air and water. The institute is a shining example of unity and integrity, he said. He also commended NIMAS for recently conducting a Mountain Terrain Biking Expedition in Myanmar, Thailand, Malaysia & Singapore. He said such events not only promote sportsmanship, but also strengthen India's ties with friendly countries.

On the occasion, the Raksha Mantri also handed over certificates of participation to the members of the team and extended his best wishes.

The expedition was conducted between July 15, 2021 and August 10, 2021. The peak is technically difficult and involves a challenging climb. The team opened the entire route on its own without taking the help of sherpas and mountain guides.

During the expedition, a record number of 16 mountaineers - nine Army personnel and seven local youth of Arunachal Pradesh - scaled the mountain. The summiting, which coincided with 'Kargil Vijay Diwas' (26th July) was part of 'Azadi Ka Amrit Mahotsav' being celebrated across the country to commemorate 75th year of Independence. The expedition was aimed at inculcating the spirit of patriotism, courage & adventure and promoting 'Fit India Movement'.

NIMAS is a premier mountaineering institute functioning under the aegis of Ministry of Defence. Raksha Mantri is its President and Chief Minister of Arunachal Pradesh is the Vice President.

<https://pib.gov.in/PressReleasePage.aspx?PRID=1756406>



रक्षा मंत्री श्री राजनाथ सिंह ने निमास टीम के माउंट कुन अभियान को झंडी दिखाकर रवाना किया

16 सदस्यीय टीम ने करगिल के पास ज़ांस्कर पर्वतमाला में 7,077 मीटर ऊंचे पर्वत पर चढ़ाई की मुख्य विशेषताएं:

- कुल 16 पर्वतारोही - सेना के नौ जवानों और अरुणाचल प्रदेश के सात स्थानीय युवाओं ने पर्वत पर चढ़ाई की
- शेरपा और माउंटेन गाइड की मदद के बिना ही अभियान को पूरा किया
- इस तरह के अभियान युवाओं में रोमांच और देशभक्ति की भावना को बढ़ावा देते हैं: रक्षा मंत्री
- इस बात पर जोर दिया गया है कि रक्षा और सुरक्षा को मजबूत करने में वे महत्वपूर्ण भूमिका निभा सकते हैं

रक्षा मंत्री श्री राजनाथ सिंह ने 20 सितंबर, 2021 को नई दिल्ली में राष्ट्रीय पर्वतारोहण और संबद्ध खेल संस्थान (निमास) दिरांग, अरुणाचल प्रदेश की एक टीम को हरी झंडी दिखाकर रवाना किया। इस टीम ने माउंट कुन (7,077 मीटर) पर एक पर्वतारोहण अभियान पूरा किया है। संस्थान के निदेशक कर्नल सरफराज सिंह के नेतृत्व में टीम ने नून-कुन माउंटेन मासिफ तक अभियान चलाया, जो करगिल में स्थित ज़ांस्कर पर्वतमाला का सबसे ऊंचा पर्वत है।

कोविड-19 प्रतिबंधों के बीच प्रतिकूल मौसम की स्थिति में इस कार्य को सफलतापूर्वक पूरा करने के लिए निमास की टीम को बधाई देते हुए, रक्षा मंत्री ने कहा कि इस तरह के अभियान युवाओं में साहस और देशभक्ति की भावना को बढ़ावा देंगे। उन्होंने जोर देकर कहा कि इस तरह के अभियान देश की रक्षा और सुरक्षा को मजबूत करने में भी महत्वपूर्ण भूमिका निभा सकते हैं। इस तरह के आयोजनों के माध्यम से, हम सीमा सुरक्षा और इसकी चुनौतियों के बारे में अधिक जानकारी प्राप्त कर सकते हैं। हमारी सेना ने इस तरह की गतिविधियों को बहुत प्रोत्साहन दिया है।

रक्षा मंत्री ने इस तरह की गतिविधियों को प्रोत्साहन दिये जाने की आवश्यकता पर जोर दिया और इनमें आम जनता की भागीदारी बढ़ाने का भी सुझाव दिया, क्योंकि यह पर्यटन, रोजगार, जानकारी प्राप्त करने और अर्थव्यवस्था को मजबूत बनाने में प्रमुख भूमिका निभा सकता है। उन्होंने इस तरह के प्रयासों में सरकार द्वारा हर संभव सहयोग दिये जाने का भी आश्वासन दिया।

श्री राजनाथ सिंह ने तीनों क्षेत्रों अर्थात् भूमि, वायु और जल में साहसिक पाठ्यक्रमों में प्रशिक्षण देने के लिए निमास की सराहना भी की। उन्होंने कहा कि यह संस्थान एकता और अखंडता का जीता जागता उदाहरण है। उन्होंने अभी हाल में म्यांमार, थाईलैंड, मलेशिया और सिंगापुर में माउंटेन टेरेन बाइकिंग अभियान आयोजित करने के लिए निमास की प्रशंसा की। उन्होंने कहा कि इस तरह के आयोजन न केवल खेल भावना को बढ़ावा देते हैं, बल्कि मित्र देशों के साथ भारत के संबंधों को भी मजबूत करते हैं। इस अवसर पर रक्षा मंत्री ने टीम के सदस्यों को भागीदारी के प्रमाण-पत्र दिये और शुभकामनाएं भी दीं।

यह अभियान 15 जुलाई, 2021 से 10 अगस्त, 2021 तक आयोजित किया गया था। यह पर्वत चोटी तकनीकी रूप से बहुत कठिन है और इसपर चढ़ाई में अनेक चुनौतियां शामिल रही। टीम ने शेरपाओं और पर्वतारोहियों की मदद लिए बिना अपने आप ही पूरा रास्ता खोल दिया था।

इस अभियान में 16 पर्वतारोही शामिल रहें, जिनमें सेना के नौ कर्मी और अरुणाचल प्रदेश के सात स्थानीय युवा इस पर्वतारोहण में शामिल थे। यह पर्वतारोहण करगिल विजय दिवस (26 जुलाई) के अवसर पर हुआ जो आजादी के 75वें वर्ष के उपलक्ष्य में देशभर में मनाए जा रहे 'आजादी का अमृत महोत्सव' का हिस्सा था। इस अभियान का उद्देश्य देशभक्ति, साहस और रोमांच की भावना को पैदा करना और 'फिट इंडिया मूवमेंट' को बढ़ावा देना था।

निमास रक्षा मंत्रालय के तत्वावधान में कार्यरत एक प्रमुख पर्वतारोहण संस्थान है। रक्षा मंत्री इसके अध्यक्ष और अरुणाचल प्रदेश के मुख्यमंत्री उपाध्यक्ष हैं।

<https://pib.gov.in/PressReleasePage.aspx?PRID=1756446>



Press Information Bureau
Government of India

Ministry of Defence

Mon, 20 Sept 2021 6:36PM

Indian Navy and Indonesian Navy participate in exercise 'Samudra Shakti'

Indian Naval Ships Shivalik and Kadmatt arrived at Jakarta, Indonesia on 18 Sep 21 to participate in the 3rd edition of Bilateral Exercise 'Samudra Shakti' with the Indonesian Navy scheduled off the approaches to Sunda Strait from 20 Sep to 22 Sep 21. The exercise aims to strengthen the bilateral relationship, enhance mutual understanding and interoperability in maritime operations between the two navies. The exercise will also provide an appropriate platform to share best practices and develop a common understanding of Maritime Security Operations.

The participating Indian Navy ships Shivalik and Kadmatt are amongst the latest indigenously designed and built multi-role Guided Missile Stealth Frigate and Anti-Submarine Corvette respectively, and form part of the Indian Navy's Eastern Fleet, based at Visakhapatnam, under the Eastern Naval Command. Indian Navy's Anti-Submarine Warfare capable Long Range Maritime Reconnaissance Aircraft P8I is also participating in the exercise. KRI Bung Tomo, KRI Malahayati and Maritime Patrol and Reconnaissance Aircraft CN-235 are representing Indonesian Navy.



In pursuance of India's Act East Policy, Exercise 'Samudra Shakti' was conceived in 2018 as a bilateral IN-IDN exercise. The exercise has matured in complexity over the last two editions and will involve conduct of complex maritime operations including Military Interdiction Operations (MIO), Cross Deck Landings, Air Defence serials, Practice Weapon Firings, Replenishment Approaches and Tactical Manoeuvres.

Under the extant policies, the 3rd edition of Exercise Samudra Shakti exercise is being conducted in a COVID safe environment and seeks to bolster the maritime cooperation between the two navies and forge strong bonds of friendship across the Indo Pacific.

<https://pib.gov.in/PressReleasePage.aspx?PRID=1756478>



Mon, 20 Sept 2021 5:17PM

6th edition of SCO exercise “Peaceful Mission - 2021” commences at Orenburg, Russia

The 6th Edition of SCO Exercise Peaceful Mission : 2021 hosted by Russia started at Orenburg Region of South West Russia today. The aim of the exercise is to foster close relations between SCO Member States and to enhance abilities of the military leaders to command multinational military contingents. An Indian military contingent comprising of an all arms combined force of 200 personnel from Indian Army and Indian Air force is participating in the exercise.

The opening ceremony commenced with an impressive parade by all participating contingents. The contingents were addressed by Col Gen Alexander Pavlovich Lapin, Commander Central Military District, Russian Armed Forces. The Exercise Peaceful Mission: 2021 is based on joint counter terrorism operations at operational and tactical level in an urban environment in which Armies and Air Forces of all SCO member states are participating. Over the next few days, troops will train, share and rehearse tactical drills which will culminate in a final validation exercise, where-in troops from all Armies and Air Forces will jointly undertake operations in a controlled and simulated environment.



<https://pib.gov.in/PressReleasePage.aspx?PRID=1756433>



Press Information Bureau
Government of India

Ministry of Defence

Mon, 20 Sept 2021 3:18PM

Indo-Nepal joint military training exercise Surya Kiran begins at Pithoragarh (UK)

The 15th India-Nepal combined battalion level military training exercise 'SURYA KIRAN' commenced at Pithoragarh (UK) today and will continue till 03 October 2021. During the exercise, an Infantry Battalion each from the Indian Army and the Nepali Army will be training together to develop inter-operability and share their experience of counter terrorism operations and disaster relief operations.

A traditional opening ceremony was organised to mark the commencement of the exercise in which both contingents marched in harmony to the Indian and Nepali military tunes. Lt Gen SS Mahal, GOC Uttar Bharat Area addressed the gathering and exhorted the contingents to train and strengthen mutual confidence, inter-operability and also to share best practices.

Earlier on Saturday, the Nepali Army contingent arrived at Pithoragarh and was accorded a traditional military reception. Around 650 defence personnel from both the Armies are participating in the event.



<https://pib.gov.in/PressReleasePage.aspx?PRID=1756405>



पत्र सूचना कार्यालय
भारत सरकार

रक्षा मंत्रालय

Mon, 20 Sept 2021 3:18PM

भारत-नेपाल संयुक्त सैन्य प्रशिक्षण अभ्यास 'सूर्य किरण' पिथौरागढ़ (उत्तराखंड) में शुरू

15वां भारत-नेपाल संयुक्त बटालियन स्तर का सैन्य प्रशिक्षण अभ्यास 'सूर्य किरण' आज पिथौरागढ़ (उत्तराखंड) में शुरू हुआ और यह अभ्यास दिनांक 03 अक्टूबर 2021 तक चलेगा। अभ्यास के दौरान भारतीय सेना और नेपाली सेनाकी एक-एक इन्फैंट्री बटालियन अंतर-संचालन विकसित करने और आतंकवाद विरोधी अभियानों और आपदा राहत कार्यों के अपने अनुभव को साझा करने के लिए एक साथ प्रशिक्षण लेगी।

अभ्यास की शुरुआत करने के लिए एक पारंपरिक उद्घाटन समारोह का आयोजन किया गया जिसमें दोनों टुकड़ियों ने भारतीय और नेपाली सैन्य धुनों का तालमेल बिठाया। उत्तर भारत एरिया के जीओसी लेफ्टिनेंट जनरल एस एस महल ने सभा को संबोधित किया और टुकड़ियों को प्रशिक्षित करने और आपसी विश्वास, अंतर-संचालन को मजबूत करने तथा सर्वश्रेष्ठ प्रथाओं को साझा करने का भी आह्वान किया।

इससे पहले शनिवार को नेपाली सेना की टुकड़ी पिथौरागढ़ पहुंची और उनका पारंपरिक सैन्य स्वागत किया गया। इस आयोजन में दोनों सेनाओं के लगभग 650 रक्षा कर्मी भाग ले रहे हैं।



<https://pib.gov.in/PressReleasePage.aspx?PRID=1756533>

Why the US won't give India nuclear submarines

The US has cited its stringent domestic laws to consistently refuse to discuss the issue over the past 15 years

By Sandeep Unnithan

New Delhi: On September 16, Indian Navy officials read the text of AUKUS, a US-UK-Australian military alliance, with a sense of dismay. The high point of AUKUS is that both the US and the UK will equip Australia to design and build up to eight nuclear-powered attack submarines (SSNs) to counter the rising threat of China in the Indo-Pacific. China's belligerence is a common concern for several countries in the region, especially the 'Quad' countries of US, Australia, Japan and India, who revived their grouping last year.

Indian Navy chiefs and naval veterans have raised the prospect of Indo-US collaboration on nuclear reactor propulsion technology only to have been politely rebuffed by their US counterparts. During a Track 2 dialogue held in Australia two years ago, the US side was emphatic in its refusal, recalls an Indian representative who was part of the event. The US Congress would never contemplate discussing anything to do with the transfer of nuclear propulsion, they were told.



USS Los Angeles (SSN-688), lead ship of the class submarine

This request might have sounded out of place considering that India already operates nuclear submarines—becoming the world's sixth country to do so when it commissioned the *INS Arihant* in 2016. The *Arihant*, however, is an SSBN (nuclear-powered ballistic missile submarine)—a slow-moving 'bomber' and a stealthy launch platform for nuclear weapons. The *Arihant* and three more SSBNs under construction are part of the Strategic Forces Command. What the navy wants are SSNs, which can perform a series of tactical missions, from escorting SSBNs to accompanying its carrier battle groups and hunting enemy warships.

Since the mid-1980s, the Indian Navy has relied upon the Soviet Union, and later Russia, to the lease of SSNs—an arrangement without precedent anywhere else in the world. It needs SSNs to prowl the maritime chokepoints into the Indian Ocean through which the Chinese PLA Navy will send warships towards India and also project power near Chinese waters.

With its growing proximity to the US over the past two decades and dismayed by what was on offer—second-hand US warships, helicopters and aircraft carriers—Indian officials began discussing the possibility of buying or leasing US SSNs. "Let the US show its commitment to a stable defence relationship by leasing a few Los Angeles-class SSNs," an admiral told INDIA TODAY.

The US, with over 70 operational nuclear submarines, has more nuclear submarines than Russia, France and UK put together. US N-sub subs use the most sophisticated nuclear reactors. The newest Virginia class SSNs for instance have reactors that use bomb-grade uranium (U-235 enriched to over 90 %). They are designed to operate for 33 years without refuelling. The US has consistently refused to discuss any possibility of parting with knowhow on naval nuclear reactors. This stance held through even during and after the passage of the Indo-US civil nuclear cooperation agreement of 2008 that tacitly recognised India's nuclear weapon status.

SSNs are regarded as the most technologically complex military platforms ever built. They are capable of tremendous underwater speed and, unlike conventional diesel-electric submarines, don't need to surface to recharge their batteries. Their submerged endurance is limited only by the crew's

endurance or food supplies. They can carry twice the weapon load of conventional submarines and move twice as fast.

The key in an SSN is its high-performance nuclear reactor, reason they are regarded as the crown jewels of nuclear technology. Only the five permanent members of the UN Security Council possess this technology. India is looking to design and build a fleet of six Project-76 indigenous SSNs fitted with a new nuclear reactor. (The proposal was put before the Cabinet Committee on Security for approval this year but even if it is approved, the first unit is not expected to enter service before 2032.) Naval officials believe foreign assistance for this project might be needed, either from traditional partner Russia or from France. In 2017, Indian Navy chief Admiral Sunil Lanba visited a French shipyard for a closer look at its newest Barracuda class SSNs. Meanwhile, it continued sending out feelers to the US for nuclear reactor propulsion technology for submarines and surface ships.

“You (India) are asking us for the kind of technology we don’t give to even our closest allies, the British,” a US defence attache told INDIA TODAY some years ago. One US admiral told his Indian counterpart that the issue of naval reactor propulsion would have to be discussed at the political level. (It is not known if the issue has ever been broached there.)

Their stance reminds naval veterans of the mid-1960s when snubbed by the US and the UK, India turned to the former Soviet Union for acquiring submarines. The Soviets provided India eight ‘Foxtrot’-class conventional submarines, and top officials spoke of eventually providing a fleet of nuclear-powered submarines. In 1987, the Soviet Union provided the K-43, the world’s first true SSGN (cruise missile firing submarine), on lease. The submarine, which had entered Soviet service in 1967, could fire its anti-ship missiles from under water.

The Chakra was returned in 1989 just before the break-up of the Soviet Union. A decade-long gap in India’s nuclear capabilities continued until the mid-1990s when then navy chief Admiral Vishnu Bhagwat revived the lease of Akula-class SSNs from the Russian Federation. The arrangement has continued till date. The Chakra-2 was returned to Russia this year and will be replaced by the Chakra-3, currently being refitted at a Russian shipyard for induction by 2026. (Both sides are discussing the possibility of leasing a second SSN.)

India’s quest for modern naval nuclear reactors, meanwhile, continues. When India approached France for nuclear submarine technology in 2017, it found Paris reluctant. In 2021, furious at being cut out of the submarine deal with Australia, Paris has recalled its ambassadors from Canberra and Washington. It is now entirely possible that India might find in France another partner willing to share nuclear submarine technology.

<https://www.indiatoday.in/india-today-insight/story/why-the-us-won-t-give-india-nuclear-submarines-1854818-2021-09-20>

AUKUS won't impact Quad, US tells India

By Rajat Pandit

New Delhi: The US on Monday briefed India on its new trilateral AUKUS military pact with the UK and Australia to take on the challenges posed by China in the Indo-Pacific, stressing it will not detract from either the bilateral cooperation with New Delhi or multilateral ones like the 'Quad'. US secretary of defence Lloyd J Austin told defence minister Rajnath Singh, while briefing him on AUKUS in a telephonic conversation on Monday evening, that Washington will continue to cooperate closely with New Delhi in multilateral fora as before. "Singh, in turn, said India was studying the AUKUS agreement," said a source.

Austin's call comes just ahead of PM Narendra Modi's visit to Washington for the first in-person Quad summit of the leaders of the US, India, Australia and Japan on September 24.

Singh also conveyed India's deep concerns over the huge amounts of latest US weapons, ranging from Humvees and helicopters to drones, night-vision equipment and assault rifles, left behind in Taliban-controlled Afghanistan.

"Both the leaders discussed bilateral and regional matters including developments in Afghanistan. They discussed defence cooperation and looked forward to working closely," said a defence ministry statement.

"Singh and Austin also exchanged views about combating terrorism in the region. Both sides appreciated the mutual cooperation in the recent evacuation operations in Afghanistan and agreed to remain in regular contact in view of the evolving situation," it added.

On the Indo-Pacific, there are some concerns that AUKUS could dilute the strategic cooperation envisaged under the Quad, relegating the quadrilateral grouping to just issues like climate change, Covid-19 vaccines and the like.

Under the AUKUS, Australia will get the wherewithal to build at least eight nuclear-powered attack submarines or SSNs (different from SSBNs, which are nuclear-propelled as well as armed with nuclear-tipped ballistic missiles) to counter China's expanding naval footprint in the Indo-Pacific.

Compared to India's solitary SSBN INS Arihant as of now, China has at least six SSNs and an equal number of SSBNs, including the latest Jin-class submarines armed with 7,400-km range JL-2 ballistic missiles.

The US, incidentally, has over the years has refused to discuss nuclear reactor propulsion technology for submarines or aircraft carriers with India. The much-touted Indo-US Defence Technology and Trade Initiative (DTTI) for collaboration on cutting-edge military technologies has also largely failed to deliver the goods since being launched in 2012.

<https://timesofindia.indiatimes.com/india/aucus-wont-impact-quad-us-tells-india/articleshow/86379086.cms>



Royal Australian Navy submarine HMAS Rankin is seen during AUSINDEX 21, a biennial maritime exercise between the Royal Australian Navy and the Indian Navy on September 5, 2021 in Darwin, Australia (Getty)

China conducting night drills in high-altitude areas near Ladakh: report

The report noted that several forces in the region “have been carrying out night battle drills at altitudes of around 5,000 metres (16,400 feet), according to the military newspaper PLA Daily.”

New Delhi: The People’s Liberation Army (PLA) of China has been ramping up military exercises including night drills in the high-altitude areas in the Xinjiang Military District, which faces India, according to a report.

The South China Morning Post newspaper reported on Sunday that PLA’s Western Theatre Command, which is responsible for the entire border with India, has “introduced more night drills for units stationed near the Himalayan border as it seeks to familiarise its troops with new-generation weapons and equipment”.

The report noted that several forces in the region “have been carrying out night battle drills at altitudes of around 5,000 metres (16,400 feet), according to the military newspaper PLA Daily.”

It quoted Yang Yang, a company commander saying, “We have revised our schedules and demanded soldiers meet higher standards for high-altitude training as we need to deal with a harsher battlefield environment amid increasing challenges in the peripheral areas.” Yang also said, the report mentioned, that mechanised force had been crossing the snowy highlands without lights and practising nighttime live-fire machine gun drills.

Also, it said that PLA’s new Type PHL-11 truck-mounted self-propelled 122mm multiple system rocket launchers had been deployed in the area and were being used for precision strike drills.

<https://indianexpress.com/article/india/china-conducting-night-drills-in-high-altitude-areas-near-ladakh-report-7523525/>



It said that PLA’s new Type PHL-11 truck-mounted self-propelled 122mm multiple system rocket launchers had been deployed in the area and were being used for precision strike drills.



Tue, 21 Sept 2021

All-nitride superconducting qubit made on a silicon substrate

Researchers at the National Institute of Information and Communications Technology (NICT, President: Tokuda Hideyuki, Ph.D.), in collaboration with researchers at the National Institute of Advanced Industrial Science and Technology (AIST, President: Dr. Ishimura Kazuhiko) and the Tokai National Higher Education and Research System Nagoya University (President: Dr. Matsuo Seiichi) have succeeded in developing an all-nitride superconducting qubit using epitaxial growth on a silicon substrate that does not use aluminum as the conductive material.

This qubit uses niobium nitride (NbN) with a superconducting transition temperature of 16 K (-257 °C) as the electrode material, and aluminum nitride (AlN) for the insulating layer of the Josephson junction. It is a new type of qubit made of all-nitride materials grown epitaxially on a silicon substrate and free of any amorphous oxides, which are a major noise source. By realizing this new material qubit on a silicon substrate, long coherence times have been obtained: an energy relaxation time (T_1) of 16 microseconds and a phase relaxation time (T_2) of 22 microseconds as the mean values. This is about 32 times T_1 and about 44 times T_2 of nitride superconducting qubits grown on a conventional magnesium oxide substrate.

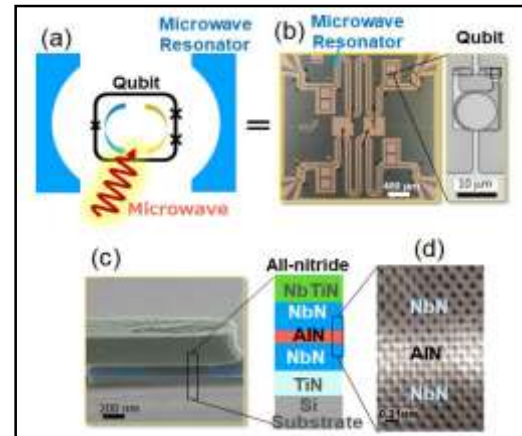
By using niobium nitride as a superconductor, it is possible to construct a superconducting quantum circuit that operates more stably, and it is expected to contribute to the development of quantum computers and quantum nodes as basic elements of quantum computation. We will continue to work on optimizing the circuit structure and fabrication process, and we will proceed with research and development to further extend the coherence time and realize large-scale integration.

These results were published in the British scientific journal *Communications Materials* on September 20 2021 at 18:00 (Japan standard time).

Background and challenges

Toward the coming future Society 5.0, there are limits to the performance improvement of semiconductor circuits that have supported the information society so far, and expectations for quantum computers are rising as a new information processing paradigm that breaks through such limits. However, the quantum superposition state, which is indispensable for the operation of a quantum computer, is easily destroyed by various disturbances (noise), and it is necessary to properly eliminate these effects.

Since superconducting qubits are solid-state elements, they have excellent design flexibility, integration, and scalability, but they are easily affected by various disturbances in their surrounding



(a) Conceptual diagram of microwave cavity and qubit (b) Optical micrograph of nitride superconducting qubit circuit (c) Electron micrograph of nitride superconducting qubit (part) and cross-sectional view of the device (d) Transmission electron micrograph of epitaxially grown nitride Josephson junction. Credit: National Institute of Information and Communications Technology, National Institute of Advanced Industrial Science and Technology, and Nagoya University

environment. The challenge is how to extend the coherence time, which is the lifetime of quantum superposition states. Various efforts are being made by research institutes around the world to overcome this problem, and most of them use aluminum (Al) and aluminum oxide film (AlO_x) as superconducting qubit materials. However, amorphous aluminum oxide, which is often used as an insulating layer, is a concern as a noise source, and it was essential to study materials that could solve this problem.

As an alternative to aluminum and amorphous aluminum oxide with a superconducting transition temperature T_C of 1 K (-272 °C), epitaxially grown niobium nitride (NbN) with a T_C of 16 K (-257 °C), NICT has been developing superconducting qubits using NbN / AlN / NbN all-nitride junctions, focusing on aluminum nitride (AlN) as an insulating layer.

In order to realize a NbN / AlN / NbN Josephson junction (epitaxial junction) in which the crystal orientation is aligned up to the upper electrode, it was necessary to use a magnesium oxide (MgO) substrate whose crystal lattice constants are relatively close to those of NbN. However, MgO has a large dielectric loss, and the coherence time of the superconducting quantum bit using the NbN / AlN / NbN junction on

Achievements

NICT has succeeded in realizing NbN / AlN / NbN epitaxial Josephson junctions using titanium nitride (TiN) as a buffer layer on a silicon (Si) substrate with a smaller dielectric loss. This time, using this junction fabrication technology, we designed, fabricated, and evaluated a superconducting qubit (see Figure 1) that uses NbN as the electrode material and AlN as the insulating layer of the Josephson junction.

As schematically shown in Figure 1(a), the quantum circuit is fabricated on a silicon substrate so that the microwave cavity and the qubit can be coupled and interact with each other as shown in Figure 1(b). From the transmission measurement of the microwave characteristics of the resonator weakly coupled to the qubit under small thermal fluctuation at the extremely low temperature of 10 mK, we achieved an energy relaxation time (T_1) of 18 microseconds and a phase relaxation time (T_2) of 23 microseconds. The mean values for 100 measurements are $T_1=16$ microseconds and $T_2=22$ microseconds. This is an improvement of about 32 times for T_1 and about 44 times for T_2 compared to the case of superconducting qubits on MgO substrates.

For this result, we did not use conventional aluminum and aluminum oxide for the Josephson junction, which is the heart of superconducting qubits. We have succeeded in developing a nitride superconducting qubit that has a high superconducting critical temperature T_C and excellent crystallinity due to epitaxial growth. These two points have great significance. In particular, it is the first time that anyone in the world has succeeded in observing coherence times in the tens of microseconds from nitride superconducting qubits by reducing dielectric loss by epitaxially growing them on a Si substrate. The superconducting qubit of this nitride is still in the early stages of development, and we believe that it is possible to further improve the coherence time by optimizing the design and fabrication process of the qubit.

Using this new material platform that may replace conventional aluminum, we will accelerate research and development of quantum information processing, which will contribute to the realization of more power-saving information processing and the realization of quantum nodes necessary for the construction of safe and secure quantum networks.

Prospects

We plan to work on optimizing the circuit structure and fabrication process with the aim of further extending the coherence time and improving the uniformity of device characteristics in anticipation of future large-scale integration. In this way, we aim to build a new platform for quantum hardware that surpasses the performance of conventional aluminum-based qubits.

More information: Sunmi Kim et al, Enhanced coherence of all-nitride superconducting qubits epitaxially grown on silicon substrate, *Communications Materials* (2021). DOI: [10.1038/s43246-021-00204-4](https://doi.org/10.1038/s43246-021-00204-4)

<https://phys.org/news/2021-09-all-nitride-superconducting-qubit-silicon-substrate.html>

Molecule-mediated surface reconstruction enables giant upconversion luminescence enhancement

By Liu Xiaogang

National University of Singapore researchers have developed a synthetic method to enhance upconversion luminescence in protein-sized lanthanide-doped nanocrystals by surface reconstruction through molecule coordination. This innovation prevents surface-associated energy loss and marks a significant breakthrough in the field of lanthanide luminescence.

Nonlinear frequency upconversion is a subject of fundamental and technological importance in a plethora of research fields, ranging from materials science, chemistry to photophysics and biology. This interest is driven by versatile applications, including three-dimensional displays, solid-state lasers, optoelectronics, and super-resolution bioimaging, as well as optogenetics. There is a high demand for preparing highly luminescent, protein-sized upconversion nanocrystals, which offers great opportunities for advancing imaging techniques with sub-diffraction-limit resolution. However, for small-sized nanocrystals, a large portion of lanthanide dopants resides on the surface or sub-surface layers, forming a non-luminescent dark layer. Previous studies have reached a consensus that excitation energy loss is dominantly attributed to surface quenching. Despite considerable efforts, the mechanism underlying surface quenching remains elusive, largely due to complex energy diffusion in lanthanide-doped upconversion systems and limited techniques for surface defects characterisation.

A research team led by Prof Liu Xiaogang from Department of Chemistry, National University of Singapore and Prof Xu Hui from Heilongjiang University has developed a simple approach to enhance multiphoton upconversion in sub-10 nm crystals by reconstructing orbital hybridization and crystal field splitting in surface lanthanides via ligand coordination. The ligand coordination can activate the sensitizer-containing dark layer and facilitate the energy migration between surface and inner lanthanide sensitizers, enhancing the utility of excitation energy and upconversion efficiency (see Figure). By coordinating with bidentate picolinic acid molecules, NaGdF₄:Yb/Tm nanoparticles with diameters of 5 nm have been shown to feature up to 11,000-fold upconversion enhancement in the ultraviolet spectral region. Moreover, ligand coordination can exert energy-level reconstruction with a ligand–sensitizer separation distance of beyond 2 nm. These findings offer new and fundamental insights into interfacial energy transfer in ultra-small systems and provide a platform for constructing optical interrogation systems at single-particle levels.

Prof Liu said, "Our approach has demonstrated a simple and effective strategy for upconversion luminescence enhancement. Molecule coordination neither changes the size and morphology of nanocrystals nor requires complex instrumentation. These bright, ultra-small upconversion nanoparticles hold potential in achieving super-resolution imaging, intraneuronal axon transport tracking, and imaging-guided precision diagnosis at the single-particle level."

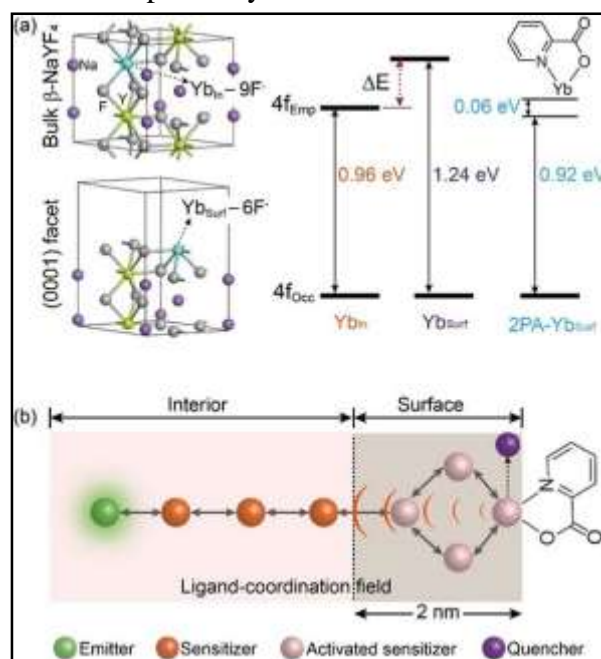


Figure: (a) Schematic illustration of coordination and 4f energy levels of trivalent ytterbium ions residing in the interior (Ybin, top) and surface (Ybsurf, bottom) of a NaYF₄ nanoparticle. (b) Diagram showing upconversion luminescence enhancement by ligand coordination. Credit: Nature Photonics

More information: Hui Xu et al, Anomalous upconversion amplification induced by surface reconstruction in lanthanide sublattices, *Nature Photonics* (2021). DOI: [10.1038/s41566-021-00862-3](https://doi.org/10.1038/s41566-021-00862-3)

Journal information: *Nature Photonics*
<https://phys.org/news/2021-09-molecule-mediated-surface-reconstruction-enables-giant.html>



Tue, 21 Sept 2021

The nanophotonics orchestra presents: Twisting to the light of nanoparticles

By *Vittoria D'alessio*

Physics researchers at the University of Bath in the UK discover a new physical effect relating to the interactions between light and twisted materials—an effect that is likely to have implications for emerging new nanotechnologies in communications, nanorobotics and ultra-thin optical components.

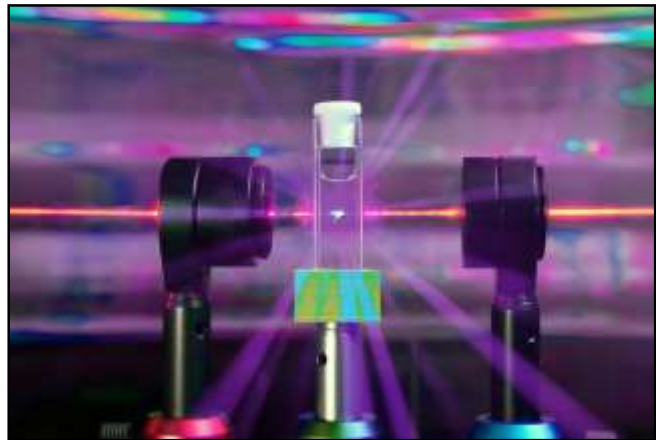
In the 17th and 18th centuries, the Italian master craftsman Antonio Stradivari produced musical instruments of legendary quality, and most famous are his (so-called) Stradivarius violins. What makes the musical output of these musical instruments both beautiful and unique is their particular timbre, also known as tone color or tone quality. All instruments have a timbre—when a musical note (sound with frequency f_s) is played, the instrument creates harmonics (frequencies that are an integer multiple of the initial frequency, i.e. $2f_s$, $3f_s$, $4f_s$, $5f_s$, $6f_s$, etc.).

Similarly, when light of a certain color (with frequency f_c) shines on materials, these materials can produce harmonics (light frequencies $2f_c$, $3f_c$, $4f_c$, $5f_c$, $6f_c$, etc.). The harmonics of light reveal intricate material properties that find applications in medical imaging, communications and laser technology.

For instance, virtually every green laser pointer is in fact an infrared laser pointer whose light is invisible to human eyes. The green light that we see is actually the second harmonic ($2f_c$) of the infrared laser pointer and it is produced by a special crystal inside the pointer.

In both musical instruments and shiny materials, some frequencies are 'forbidden' – that is, they cannot be heard or seen because the instrument or material actively cancels them. Because the clarinet has a straight, cylindrical shape, it suppresses all of the even harmonics ($2f_s$, $4f_s$, $6f_s$, etc.) and produces only odd harmonics ($3f_s$, $5f_s$, $7f_s$, etc.). By contrast, a saxophone has a conical and curved shape which allows all harmonics and results in a richer, smoother sound. Somewhat similarly, when a specific type of light (circularly polarized) shines on metal nanoparticles dispersed in a liquid, the odd harmonics of light cannot propagate along the direction of light travel and the corresponding colors are forbidden.

Now, an international team of scientists led by researchers from the Department of Physics at the University of Bath have found a way to reveal the forbidden colors, amounting to the discovery of a new physical effect. To achieve this result, they 'curved' their experimental equipment.



Upon illumination with red light, third harmonic scattered light (in violet) reveals the twist of metal nanoparticles. Credit: Ventsislav Valev and Lukas Ohnoutek

Professor Ventsislav Valev, who led the research, said: "The idea that the twist of nanoparticles or molecules could be revealed through even harmonics of light was first formulated over 42 years ago, by a young Ph.D. student—David Andrews. David thought his theory was too elusive to ever be validated experimentally but, two years ago, we demonstrated this phenomenon. Now, we discovered that the twist of nanoparticles can be observed in the odd harmonics of light as well. It's especially gratifying that the relevant theory was provided by none other than our co-author and nowadays well-established professor—David Andrews!

"To take a musical analogy, until now, scientists who study twisted molecules (DNA, amino acids, proteins, sugars, etc) and nanoparticles in water—the element of life—have illuminated them at a given frequency and have either observed that same frequency or its noise (inharmonic partial overtones). Our study opens up the study of the harmonic signatures of these twisted molecules. So, we can appreciate their 'timbre' for the first time.

"From a practical point of view, our results offer a straightforward, user-friendly experimental method to achieve an unprecedented understanding of the interactions between light and twisted materials. Such interactions are at the heart of emerging new nanotechnologies in communications, nanorobotics and ultra-thin optical components. For instance, the 'twist' of nanoparticles can determine the value of information bits (for left-handed or right-handed twist). It is also present in the propellers for nanorobots and can affect the direction of propagation for a laser beam. Moreover, our method is applicable in tiny volumes of illumination, suitable for the analysis of natural chemical products that are promising for new pharmaceuticals but where the available material is often scarce.

Ph.D. student Lukas Ohnoutek, also involved in the research, said: "We came very close to missing this discovery. Our initial equipment was not 'tuned' well and so we kept seeing nothing at the third-harmonic. I was starting to lose hope but we had a meeting, identified potential issues and investigated them systematically until we discovered the problem. It is wonderful to experience the scientific method at work, especially when it leads to a scientific discovery!"

Professor Andrews added: "Professor Valev has led an international team to a real first in the applied photonics. When he invited my participation, it led me back to theory work from my doctoral studies. It has been amazing to see it come to fruition so many years later."

The research is published in the journal *Laser & Photonic Reviews*.

More information: Lukas Ohnoutek et al, Optical Activity in Third-Harmonic Rayleigh Scattering: A New Route for Measuring Chirality, *Laser & Photonics Reviews* (2021). DOI: [10.1002/lpor.202100235](https://doi.org/10.1002/lpor.202100235)
<https://phys.org/news/2021-09-nanophotonics-orchestra-nanoparticles.html>



Tue, 21 Sept 2021

Study spots people at high risk of severe breakthrough COVID

By Steven Reinberg

Monday, Sept. 20, 2021 (HealthDay News) -- A study of millions of people vaccinated against COVID-19 has identified those at greatest risk of hospitalization and death after breakthrough infection.

The most vulnerable are those who are immunosuppressed from chemotherapy, a recent bone marrow or solid organ transplant, or HIV/AIDS. Also at risk are people with neurological disorders (such as dementia and Parkinson's disease), nursing home residents, and those with chronic disorders (including Down syndrome).

For the report, British researchers updated a tool called QCovid, using datasets from general practice, national COVID-19 vaccination and testing, death registry and hospital data in the United Kingdom. In all, a sample of nearly 7 million vaccinated adults was included, of whom more than 5 million had received both vaccine doses.

The report was published Sept. 17 in the journal *BMJ*.

"This enormous national study of over 5 million people vaccinated with two doses across the U.K. has found that a small minority of people remain at risk of COVID-19 hospitalization and death. Our risk calculator helps to identify those who remain most at risk post-vaccination," according to researcher Aziz Sheikh. He is a professor of primary care research and development at the University of Edinburgh.

Within the vaccinated group, there were more than 2,000 COVID-19 deaths and nearly 2,000 COVID-19-related hospital admissions, the investigators found. Eighty-one of the deaths and 71 admissions occurred 14 or more days after the second vaccine dose, when substantial immunity is expected.

The researchers also took into account factors such as age, sex, ethnicity and the rate of COVID-19 infections, they noted in a news release from the University of Oxford.

Relatively few COVID-19-related hospitalizations or deaths occurred among those who received a second dose of the vaccine. This means the study lacked the statistical power to determine if the at-risk groups are more, or less, vulnerable after a second vaccine dose, compared with post-first dose.

According to study co-author Julia Hippisley-Cox, a professor of clinical epidemiology and general practice at the University of Oxford, "Individual risk will always depend on individual choices as well as the current prevalence of the disease, however we hope that this new tool will help shared decision making and more personalized risk assessment."

More information

For more on COVID-19, head to the U.S. Centers for Disease Control and Prevention.

SOURCE: University of Oxford, news release, Sept. 17, 2021

<https://www.usnews.com/news/health-news/articles/2021-09-20/study-spots-people-at-high-risk-of-severe-breakthrough-covid>

