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India, Philippines to sign deal on BrahMos missile during summit next year

The deal for BrahMos was to be signed on Nov 6 but was held up by a formality. It will now be signed during Modi-Duterte summit next year. HT had first reported in December last year that the Philippines was set to be the first customer for the BrahMos

By Rezaul H Laskar

New Delhi: India and the Philippines are looking to sign an agreement on the BrahMos cruise missile during a planned summit between Prime Minister Narendra Modi and President Rodrigo Duterte next year, making the Southeast Asian country the first customer for the weapons system developed jointly by New Delhi and Moscow.

A team from BrahMos Aerospace, the New Delhi-based India-Russia joint venture that produces the weapons system, is expected to visit Manila by December to sort out a few remaining issues for the deal to supply the missiles to the Philippines Army's first Land Based Missile System Battery, people familiar with developments said on condition of anonymity on Thursday.

"The BrahMos team is expected to iron out a few kinks and address some small issues so that the deal can be signed during the upcoming summit. Everything else has been worked out," one of the people cited above said.

Though dates for the summit between Modi and Duterte are yet to be finalised, the meeting is expected to be held in February. Several other agreements, including on cooperation between India's Central Drugs Standard Control Organisation (CDSCO) and its Philippines counterpart, ICT, and air rights, are also expected to be signed during the meeting, the people said.

India and the Philippines were initially expected to sign a defence cooperation and procurement agreement, which would have covered the BrahMos deal, during the virtual meeting of the joint commission on bilateral cooperation co-chaired by external affairs minister S Jaishankar and his counterpart Teodoro Locsin Jr on November 6.

However, the signing couldn't go ahead as planned because of a formality, the people said. "One of the signing authorities wasn't available and it was only a formality," said the person cited above.

Hindustan Times had first reported in December last year that the Philippines was set to become the first country to buy the BrahMos cruise missile system. Though both sides were keen on finalising a deal earlier this year, the matter was hit by developments related to the Covid-19 pandemic.



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

Russia's deputy chief of mission Roman Babushkin also said on Thursday that India and Russia plan to gradually increase the range of the BrahMos and begin exporting the missile to "third countries, starting with the Philippines".

The Philippines Army zeroed in on the BrahMos after extensive trials and much of the negotiations had revolved around the cost of the system and financing for the deal. The supersonic cruise missile with a range of about 500 km will equip the Philippines Army's first Land Based Missile System Battery, which was raised and activated in October last year.

The Philippines Army expects this battery to be fully ready and for all the equipment to be acquired by 2024. According to the plans, the battery will be fully capable of defending the Philippines against external threats by 2028.

However, some of the recent discussions have focused on the \$100-million line of credit offered by India to the Philippines for defence purchases, particularly because of Manila's perception that the amount should be increased, the people said. The Philippines side has also noted that India has offered larger lines of credit for defence equipment to other Southeast Asian countries, the people added.

India has been in talks with several countries, including Thailand, Indonesia and Vietnam, over the past few years to sell them land and sea-based versions of the BrahMos. A BrahMos team visited a state-run shipyard in Surabaya in 2018 to assess the fitting of the missile on Indonesian warships.

In recent years, the Philippines has concluded several deals with India for personal protective items or bulletproof gear and armour plating for military vehicles. During Modi's visit to the Philippines in 2017, the two sides signed an MoU on defence industry and logistics cooperation to provide a framework for the development, production and procurement of defence hardware.

https://m.hindustantimes.com/india-news/india-philippines-to-sign-deal-on-brahmos-missile-during-summit-next-year/story-4a2liARMr9EFEU2d8FKqDK_amp.html



Fri, 13 Nov 2020

India, Russia plan to export BrahMos to Philippines: Russian DCM

It is learnt that India has held preliminary rounds of talks with the Philippines for supply of the missile

New Delhi: India and Russia are planning to export the BrahMos supersonic cruise missile to the Philippines and several other countries, Russian Deputy Chief of Mission Roman Babushkin said on Thursday.

The BrahMos missile is produced by an Indo-Russian joint venture and it can be launched from submarines, ships, aircrafts or from land platforms. People familiar with the talks on export of the missile said India is likely to ink an agreement with the Philippines early next year to supply a batch of BrahMos to the Southeast Asian country.

In the last few weeks, several tests of the new version of missile were carried out in multiple locations. The range of the new version of the missile has been extended to 400km from the original 290km.

However, its speed has been maintained at Mach 2.8 which is nearly three times that of sound. "All tests of contemporary versions are successful. They were carried out mainly to increase the range of this exclusive missile. We are exporting it to third countries beginning with the Philippines," Mr. Babushkin said at an online media briefing.

It is learnt that India has held preliminary rounds of talks with the Philippines for supply of the missile.

On October 18, a naval version of the BrahMos missile was successfully test fired from an indigenously-built stealth destroyer of the Indian Navy in the Arabian sea.

Days later, the Indian Air Force test-fired an air launched version of the BrahMos missile from a Sukhoi fighter aircraft in the Bay of Bengal.

A number of countries including in the Gulf region showed interests in procuring the missile. India has already deployed a sizeable number of the original BrahMos missiles and other key assets in several strategic locations along the de-facto border with China in Ladakh and Arunachal Pradesh.

The IAF is also integrating the Brahmos supersonic cruise missile on over 40 Sukhoi fighter jets which is aimed at bolstering overall combat capability of the force.

<https://www.thehindu.com/news/national/india-russia-plan-to-export-brahmos-to-philippines-russian-dcm/article33083807.ece>



The Brahmos missile system.
File | Photo Credit:
Sandeep Saxena

PledgeTimes

Fri, 13 Nov 2020

Brahmos missile agreement to be signed in a few months

By Bhavi Mandalia

India has so far been buying most of the missiles and defense weapons from other countries. But, India's strength is going to increase more in the coming time. In fact, next year India and the Philippines are about to sign the agreement under which the Philippines will buy BrahMos missiles from India. Next year's summit will be attended by Prime Minister Narendra Modi and Philippines President Rodrigo Duterte. BrahMos missiles are jointly produced by India-Russia.

Sources familiar with the matter told the associate newspaper Hindustan Times on Thursday that the deal for the supply of missiles to the Philippines army for the first time by a team from BrahMos Aerospace, a New Delhi-based Indo-Russian joint venture that produces weapons systems K is expected to visit Manila in the month of December to resolve some remaining issues.

"The BrahMos Aerospace team going on a Manila tour will sort out the minor issues to finalize the deal at the upcoming summit," said a person. Everything else has been finalized. "He further added," Although the date for the summit between PM Modi and Rodrigo Duterte has not been fixed yet, it is expected that the summit will be held in February next year. is. Several other agreements including cooperation between ICT and air rights are also expected to be signed between India's Central Drugs Standard Control Organization (CDSCO) and its Philippines counterpart during the meeting.

At the same time, the defense cooperation and procurement agreement was expected to be signed in a virtual meeting between External Affairs Minister S Jaishankar and his counterpart Tayodoro Locksin on November 6 between India and the Philippines. This would have included the agreement of BrahMos missiles, but this could not happen. However, the said sources said that the signature could not be done due to formality. Signing officers were not available and this was a formality.

The associate newspaper Hindustan Times had informed in December last year that the Philippines was going to be the country to buy BrahMos missiles. Both sides had been engaged in finalizing the agreement since the beginning of the year, but the agreement was affected by the Corona virus epidemic. Russia's Deputy Chief Mission Roman Babuskin said on Thursday that India and Russia are gradually starting to increase BrahMos and export missiles to third countries. It starts with the Philippines.

<https://pledgetimes.com/brahmos-missile-agreement-to-be-signed-in-a-few-months/>

Defence News

Defence Strategic: National/International

THE ECONOMIC TIMES

Fri, 13 Nov 2020

Hindustan Aeronautics Limited to begin light chopper production soon

By Manu Pubby

Synopsis

The indigenous light utility helicopter (LUH), which has performed well in recent trials in Ladakh as well, will initially be produced in limited numbers before a larger order is placed for the Army and Air Force. With both satisfied with trial performances, the defence ministry is now processing the first order for 12 choppers.

New Delhi: India has decided to manufacture light choppers designed for operations in high altitudes, vital for maintaining troops through the year, following spike in border deployments.

The indigenous light utility helicopter (LUH), which has performed well in recent trials in Ladakh as well, will initially be produced in limited numbers before a larger order is placed for the Army and Air Force. With both satisfied with trial performances, the defence ministry is now processing the first order for 12 choppers, which will be followed by a larger batches to achieve a total of 187 LUHs in service.

“The acceptance of necessity for the first 12 helicopters is being approved. Once the order is placed, we will be in the position to deliver all of them within 28 months as the production facilities are already in place,” R Madhavan, the chairman of Hindustan Aeronautics Limited, which has designed and developed the chopper, told ET.

These choppers are likely to be cheaper than foreign ones and is also likely to beat the Indo-Russian venture for Ka 226 helicopters on pricing as well. While the commercial bids for the Ka 226 are yet to be opened and issues around indigenisation levels are being discussed, the plan to manufacture at least 200 of the choppers in India is expected to cost under \$2 billion.

While the Indo-Russian joint venture is also progressing, the indigenous LUH could end up in active service earlier if approvals are given for manufacturing. The Indian chopper is also expected



These choppers are likely to be cheaper than foreign ones and is also likely to beat the Indo-Russian venture for Ka 226 helicopters on pricing as well.

to cost less as no transfer of technology costs are involved and it would have a very high indigenous content as most parts will be sourced from domestic companies. HAL has also been scaling up its production infrastructure with a new plant in Tumkur that has significantly enhanced capacity.

“With the Tumkur plant, we can now manufacture up to 60 helicopters per year. Including current capacity, we can do up to 90 chopper per year if the requirement is there and orders are placed,” Madhavan said. There is a huge demand for helicopters in the armed forces, given that the existing Cheetah/Chetak fleet has been in service for over four decades and is getting increasingly difficult to maintain as global manufacturers have stopped manufacturing spare parts, he said. Light choppers are used extensively by the Army and Air Force to supply and maintain troops in high altitude locations including the Siachen glacier where they are a lifeline for soldiers deployed at posts in excess of 18,000 feet. They carry out a variety of missions including casualty evacuation, dropping medical supplies, transporting essential equipment and facilitating quick movement at the frontier.

<https://economictimes.indiatimes.com/news/defence/hindustan-aeronautics-limited-to-begin-light-chopper-production-soon/articleshow/79197258.cms>



Fri, 13 Nov 2020

Cochin Shipyard launches five vessels, lays keel for two

The shipyard achieved this milestone amidst the COVID-19 pandemic by working with available resources taking all necessary precautions

Kochi: The public sector Cochin Shipyard sought to put paid to the pandemic blues by launching five vessels from its building dock in Kochi on Thursday. The day also saw keel being laid for two vessels.

The vessels launched are two mini general cargo ships, each with a dead weight tonnage of 8000 tonnes, for JSW Shipping and Logistics Pvt Ltd, and three Floating Border Outpost Vessels (FBOP) for the Border Security Force (BSF). Meanwhile, keel laying was carried out for two more mini general cargo ships for JSW Shipping and Logistics.



Five vessels being launched at the Cochin Shipyard, in Kochi on November 12, 2020. | Photo Credit: Special Arrangement

The shipyard achieved this milestone amidst the COVID-19 pandemic by working with available resources taking all necessary precautions, said a communication.

The five vessels were launched by Rameetha K — Scientist ‘G’ at the Naval Physical and Oceanographic Laboratory, a DRDO lab — who is spouse of the shipyard CMD, Madhu S. Nair. Mr Nair and Pranab K Jha, VP of JSW Shipping, conducted keel-laying of the two vessels. Senior shipyard officials were present on the occasion.

The mini general cargo ships launched on Thursday are part of a series of four similar ships being built for the JSW group. These vessels are built and classed under the standards of Indian Register of Shipping and will be used for transportation of dry bulk cargo such as coal, iron ore, dolomite, and limestone. The vessels, with a length of 122 metre and height of 7.20 metre and speed of 10 knots, will have a compliment of 16 crew. These ships are expected to ply on the coastal route between Jaigarh Port and Dolvi Steel Plant in the river Amba near Dharamtar Port.

The three FBOPs, with a length of 46 metre each, are part of a series of nine vessels being built for the Water Wing of the Border Security Force. These vessels are designed in-house by Cochin Shipyard and classed by Indian Register of Shipping. Each FBOP is designed with stowage arrangements for four fast patrol boats, which can be launched and hoisted using its own davit system. The vessels will act as a floating base for the flotilla of fast patrol boats and will supply petrol, fresh water and provisions to smaller boats and are meant for deployment on India's eastern and western borders.

<https://www.thehindu.com/news/national/kerala/cochin-shipyard-launches-five-vessels-lays-keel-for-two/article33083294.ece>



Fri, 13 Nov 2020

Indian Navy's fifth Scorpene class submarine Vagir launched at Mazagon Dock

Minister of State for Defence Shripad Naik launched the submarine through video conferencing

Mumbai: Indian Navy's fifth Scorpene class submarine Vagir, having superior stealth features like the advanced acoustic absorption technique, was launched on Thursday at the Mazagon Dock in south Mumbai.

Vijaya, wife of Minister of State for Defence Shripad Naik, launched the submarine through video conferencing.

The minister was the chief guest at the event and attended it via video link from Goa.

Vagir is part of the six Kalvari-class submarines being built in India.

The submarines, designed by French naval defence and energy company DCNS, are being built as part of Indian Navy's Project-75.

These submarines can undertake missions like anti- surface warfare, anti-submarine warfare, intelligence gathering, mine laying, and area surveillance, an official said.

Vagir is named after the Sand Fish, a deadly deep sea predator of the Indian Ocean.

The first Vagir, a submarine from Russia, was commissioned into the Indian Navy on December 3, 1973, and was decommissioned on June 7, 2001 after almost three decades of service to the nation.

"Building the Scorpene was indeed a challenge for MDL, as the complexity of the simplest of tasks increased exponentially due to all work having to be done in the most congested of spaces," MDL said in a release.

"The state-of-art technology used in the submarine has ensured superior stealth features such as advanced acoustic absorption techniques, low radiated noise levels, and hydro- dynamically optimised shape and also the ability to attack the enemy using precision guided weapons," the release said.

The attack can be launched with both torpedoes and tube launched anti-ship missiles, whilst underwater or on surface, MDL said.



The fifth scorpene class submarine 'Vagir' of Project 75 during its launch in Arabian Sea waters by Minister of State for Defence Shrinad Naik. (Photo | PTT)

"The stealth of this potent platform is enhanced by the special attention to her characteristic underwater signatures. These stealth features give it an invulnerability, unmatched by most submarines," it said.

The submarine is designed to operate in all theatres of operation, showcasing interoperability with other components of a Naval Task Force, MDL said.

"With the launching of Vagir, India further cements its position as a submarine building nation. This is in sync with the current impetus of the government towards Make in India and Atma Nirbhar Bharat," MDL said.

Two submarines of the ongoing Project-75 Scorpene programme at MDL, Kalvari and Khanderi, have been commissioned into the Indian Navy.

The third submarine, Karanj, is in the last phase of rigorous sea trials.

The fourth Scorpene, Vela, has commenced her sea trials, whilst the sixth and last submarine, Vagsheer, is being readied for boot together.

"Two SSK submarines built by MDL during 1992-94 are in active service, which is a testimony to the professionalism and capability of Mazagon Dock personnel," it said.

<https://www.newindianexpress.com/nation/2020/nov/12/indian-navys-fifth-scorpene-class-submarine-vagir-launchedatmazagon-dock-2222790.html#:~:text=MUMBAI%3A%20Indian%20Navy's%20fifth%20Scorpene,the%20submarine%20th%20rough%20video%20conferencing.>



Fri, 13 Nov 2020

दुश्मन के दांत खट्टे करेगा 'वजीर', स्कॉर्पीन श्रेणी की पांचवीं पनडुब्बी लॉन्च

दुश्मन के दांत खट्टे करने के लिए लिए भारतीय नौसेना (Indian Navy) ने स्कॉर्पीन श्रेणी की पांचवीं पनडुब्बी 'वजीर' (Scorpene Class Submarine Vagir) का जलावतरण कर दिया है
खास बातें

1. भारतीय नौसेना के बेड़े में शामिल 'वजीर'
2. लॉन्च हुई स्कॉर्पीन श्रेणी की पांचवीं पनडुब्बी
3. हर तरह की अत्याधुनिक तकनीक से है लैस

मुंबई: भारतीय नौसेना (Indian Navy) ने स्कॉर्पीन (Scorpene) श्रेणी की पांचवीं पनडुब्बी 'वजीर' (Submarine Vagir) का दक्षिण मुंबई स्थित मझगांव गोदी (Mazgaon Dock) में जलावतरण किया गया। स्कॉर्पीन दुश्मन के रडार से बचने और आधुनिक प्रौद्योगिकी से लैस है। रक्षा राज्यमंत्री श्रीपद नाइक (Shripad Naik) की पत्नी विजया ने वीडियो कॉन्फ्रेंस के जरिये पनडुब्बी का जलावतरण किया। इस कार्यक्रम में बतौर मुख्य अतिथि नाइक गोवा से वीडियो कॉन्फ्रेंस के जरिये शामिल हुए।

डीसीएनएस ने की है डिजाइन

'वजीर' पनडुब्बी (Submarine Vagir) भारत (India) में बन रही छह कालवेरी श्रेणी की पनडुब्बियों (Kalvari Class Submarin) का हिस्सा है। इस पनडुब्बी को फ्रांसीसी समुद्री रक्षा और ऊर्जा कंपनी डीसीएनएस (DCNS) ने डिजाइन किया है और भारतीय नौसेना (India Navy) की परियोजना-75 के तहत इनका निर्माण हुआ है। नौसेना के एक अधिकारी ने बताया कि ये पनडुब्बियां सतह पर, पनडुब्बी रोधी युद्ध में कारगर होने के साथ खुफिया जानकारी जुटाने, समुद्र में बारूदी सुरंग बिछाने और इलाके में निगरानी करने में भी सक्षम हैं।



फाइल फोटो.

अब नहीं बच सकता दुश्मन

मझगांव डॉक शिपबिल्डिंग लिमिटेड (MDL) ने बताया, स्कॉर्पिन पनडुब्बियों का निर्माण एमडीएल के लिए चुनौतीपूर्ण था क्योंकि यह आसान काम भी कम स्थान में पूरा करने की वजह से चुनौतीपूर्ण बन गया था। रडार से बचने का गुण सुनिश्चित करने के लिए पनडुब्बी में आधुनिकतम तकनीक का इस्तेमाल किया गया है। जैसे आधुनिक ध्वनि को सोखने वाली तकनीक, कम आवाज और पानी में तेज गति से चलने में सक्षम आकार आदि। इसमें दुश्मन पर सटीक निर्देशित हथियारों से हमले की भी क्षमता है।

पानी के अंदर से छोड़ेगी मिसाइल

यह पनडुब्बी टॉरपीडो से हमला करने के साथ और ट्यूब से लांच की जाने वाली पोत रोधी मिसाइलों को पानी के अंदर और सतह से छोड़ सकती है। एमडीएल के मुताबिक पानी के भीतर दुश्मन से छिपने की क्षमता इसकी विशेषता है जो पूरी तरह से सुरक्षित है और अन्य पनडुब्बियों के मुकाबले इनका कोई तोड़ नहीं है। इस पनडुब्बी को नौसेना की सभी तरह की जरूरतों और अभियानों को ध्यान में रखकर बनाया गया है।

वेला और वागशीर भी तैयार

वजीर के जलावतरण से भारत की पनडुब्बी निर्माण करने वाले देशों में पैठ और मजबूत हुई है। साथ ही यह सरकार की मेक इन इंडिया और आत्मनिर्भर भारत के अभियान को प्रोत्साहित करता है। एमडीएल ने बताया कि परियोजना-75 के तहत निर्मित दो पनडुब्बियों कालवेरी और खंडेरी को भी भारतीय नौसेना में शामिल कर लिया गया है। तीसरी पनडुब्बी करंज समुद्री परीक्षण के आखिरी दौर में है जबकि चौथी स्कॉर्पिन पनडुब्बी 'वेला' ने समुद्री परीक्षण की शुरुआत कर दी है। वहीं छठी पनडुब्बी 'वागशीर' जलावतरण के लिए तैयार की जा रही है।

पहली 'वजीर' 1973 में की गई शामिल

बता दें, इस पनडुब्बी का नाम हिंद महासागर (Indian ocean) की शिकारी मछली 'वजीर' के नाम पर रखा गया है। पहली 'वजीर' पनडुब्बी रूस से प्राप्त की गई थी जिसे भारतीय नौसेना में तीन दिसंबर 1973 को शामिल किया गया था और सात जून 2001 को तीन दशक की सेवा के बाद सेवामुक्त किया गया था।

<https://zeenews.india.com/hindi/india/indian-navy-fift-scorpene-class-submarine-vagir-launched-in-mazgaon-dock/785000>



Fri, 13 Nov 2020

Explained: A look at Kalvari class of submarines and its strategic significance

The Kalvari-class submarines have capability of operating in a wide range of Naval combat including anti-warship and anti-submarine operations, intelligence gathering and surveillance and naval mine laying

By Sushant Kulkarni

Indian Navy's fifth Kalvari-class Diesel Electric attack submarine INS Vagir was launched at Mazgaon Dock in Mumbai on Thursday. A look at this modern and stealthy class of submarines having been built under Project 75 and whose design is based on the Scorpene class of the submarines.

Kalvari-class background

Indian Naval Ship (INS) Vagir, launched on Thursday, is the fifth among the six Kalvari-class submarines being constructed by the public sector shipbuilder Mazagon Dock Ltd (MDL) in Mumbai.

The other vessels in the class are INS Kalvari, INS Khanderi, INS Karanj, INS Vela and INS Vagsheer. Of these Kalvari and Khanderi have been commissioned in 2017 and 2019, Vela and Karanj and undergoing sea trials, Vagir has now been launched and Vagsheer is under construction. After its launch today, Vagir will commence with the setting to work of various equipment and the Harbour Acceptance Trials. The crew will subsequently sail the submarine for the Sea Acceptance Trials after which the submarine would be delivered to the Navy.

The submarines in the current Kalvari-class take their names from erstwhile decommissioned classes of submarines named Kalvari which included Kalvari, Khanderi, Karanj and Vela class — which included Vela, Vagir, Vagshir. The now-decommissioned Kalvari and Vela classes were one of the earliest of the submarines in post independence Indian Navy, which belonged to Soviet origin Foxtrot class of vessels.

Launch of a vessel is the process of transferring the ship from dockyard to water and is different from the commissioning of the ship, when it actually enters the active service.

In maritime parlance a class of ships is a group of vessels which have the same make, purpose and displacement. In the Navy and Coast Guard in India, the ships belonging to a particular class are named in a specific manner. Many times the names have the same first letters, prefixes, similar meanings or the names belong to a particular type of words for example names of cities, persons, mythological concepts, animals, rivers, mountains, weapons, etc. The class is generally named after the first vessel in the category. In some cases, a particular class of vessels take their names from an earlier class of vessels which are now decommissioned.

Like Kalvari – which means Tiger Shark, Vagir has been named after a Sand Fish, a predatory marine species. Khanderi has been named after an Island Fort built by Chhatrapati Shivaji, which played a key role in his Navy. Karanj has also been named after an Island located South of Mumbai.

Technical details

The design of Kalvari class of submarines is based on Scorpene class of submarines designed and developed by French defence major Naval Group formerly DCNS and Spanish state owned entity Navantia. This class of submarines have Diesel Electric transmission systems and these are primarily attack submarines or ‘hunter-killer’ type which means they are designed to target and sink adversary naval vessels.

The Kalvari-class submarines have capability of operating in a wide range of Naval combat including anti-warship and anti-submarine operations, intelligence gathering and surveillance and naval mine laying. These submarines are around 220 feet long and have a height of 40 feet. It can reach the highest speeds of 11 knots when surfaced and 20 knots when submerged.

The modern variants of the Scorpene class of submarines have what is called the Air Independent Propulsion (AIP) which enables non-nuclear submarines to operate for a long time without access to surface oxygen. Two of six submarines in Kalvari class are equipped with AIP. It also needs to be noted that the Defence Research and Development Organisation (DRDO) has an ongoing programme to build a fuel cell-based AIP system for Indian Naval Submarines.

The Kalvari class of submarines are capable of launching various types of torpedoes and missiles and are equipped with a range of surveillance and intelligence gathering mechanisms.

Strategic importance

India currently operates one submarine each in nuclear powered Classes of Chakra and Arihant and in addition to 14 submarines belonging to three classes of Diesel Electric category — Kalvari, Shishumar and Sindhughosh, some of which are ageing.

The nuclear powered and diesel electric submarines have their designated roles in the Carrier Battle Groups, which are formations of ships and submarines with Aircraft Carriers at the lead role. As per the basic principles of submarine deployment and minimum requirement for India to create



Indian Naval Ship (INS) Vagir, launched on Thursday, is the fifth among the six Kalvari-class submarines being constructed by the public sector shipbuilder Mazagon Dock Ltd (MDL) in Mumbai. (PTI Photo)

a strategic deterrence, there is a specific number of submarines of both types that India needs to have in active service. Currently India has less number of submarines than what is required with some more of those from both types being at various stages of construction.

In the late 1990's, around the time of Kargil war, a three decade plan took shape for indigenous construction of submarines which is known to have two separate series of submarine building lines – codenamed Project 75 and Project 75I — in collaboration with foreign entities. The Ministry of Defence is also known to have put place a roadmap for indigenous design and subsequent construction submarines which will further add numbers to the Navy's arsenal.

Launch on Thursday

The submarine which was till now identified as 'Yard 11879' was launched on Thursday at Kanhoji Angre Wet Basin of Mazagon Dock Limited (MDL). Minister of State for Defence Shripad Yesso Naik presided over the ceremony via videoconferencing from Goa and the submarine was formally named Vagir in accordance with the Naval traditions by his wife Vijaya Naik.

The ceremony was also attended by senior naval officers and dignitaries both from Integrated Headquarters Ministry of Defence (Navy), Headquarters Western Naval Command and officials from Naval Group, France.

<https://indianexpress.com/article/explained/explained-a-look-at-kalvari-class-of-submarines-and-its-strategic-significance-7049172/>



Fri, 13 Nov 2020

Indian Army selects local firm to upgrade its T-90 & T-72 Main battle tanks under 'make in India' scheme

The Indian Army is looking to upgrade its T-90 and T-72 Main Battle Tanks (MBTs) and recently selected an Indian firm OshoCorp Global for the development and supply of Auxiliary Power Unit under Make II guidelines of the Ministry of Defence.

The project will give a boost to achieve the country's self-reliance aim of APU (Auxiliary Power Unit) manufacturing technology for tanks under the 'Make in India' mission.

Khate said: "Initially we are required to develop quantity 4 Nos APU's (2 each for T-90 and T-72 Tanks) for trial & approval and subsequently produce Quantity 3257 Nos APU's".



In comparison to the 45-ton Russian origin T-90 tanks, Beijing has deployed Type 15 tanks which are way lighter giving them an added advantage of navigating through the challenging terrain of the Himalayan region.

The project costing more than INR 1325 Crore (USD 190 Million) has huge potential to generate future domestic and export business which can be many times more than the current procurement of APU's as it is a continuous requirement keeping in mind the present inventory of T-72, T-90, Arjun Tank and BMPs, as per Col PK Juneja, Head Special Projects at OshoCorp.

Auxiliary Power Unit

An auxiliary power unit is a small engine or powered device on a vehicle that provides energy for functions other than propulsion. These unit help not only to conserve the life of the main engine but also reduce thermal and acoustic signatures when deployed in specific situations.

The army's requirement is for 3,275 APUs, including 1,657 units for the T-90 and 1600 units for the older T-72.

Experts say the APU should be able to concurrently operate the gunner, commander, driver sights, fire control system, radio sets, internal communication systems, navigation aids and charge batteries when the main engines are switched-off.

The "Acceptance of Necessity" for having APUs fitted on tanks was accorded by the Ministry of Defence in October 2019 after undertaking feasibility studies, as per the army sources. As the APU would be mounted on the exterior, it would also be required to be waterproof up to a depth of five metres to enable deep-fording by the tank.

The Russian designed T-72 and heavyweight T-90 tanks have been deployed in Ladakh amid the stand-off with China. India's T-90 tanks are considered one of the deadliest tanks in the world with the capability to deal with biological and chemical weapons.

The APU would enable the tanks to function for a stretch of six hours at a time in temperatures ranging from minus 50 °Celsius and at altitudes ranging up to 16,000 feet.

Earlier in the year, the Indian defense ministry had created a budget of \$7 billion for domestic capital procurement in the current financial year, under the self-reliant India scheme announced by Prime Minister Narendra Modi.

The move had banned the import of 101 defence equipment including simple parts and high technology weapons systems like artillery guns, assault rifles, corvettes, sonar systems, transport aircraft, light combat helicopters, and radar arrays.

<https://eurasianimes.com/indian-army-selects-local-firm-to-upgrade-its-t-90-t-72-main-battle-tanks-under-make-in-india-scheme/>

ThePrint

Fri, 13 Nov 2020

If India loses grip on Kailash Range, PLA will make sure we never get it back

In 1962, the actual objective of the Chinese was Kailash Range and that is where they halted
By Lt Gen H S Panag (Retd)

The eighth round of Corps Commander-level talks between India and China were held on 6 November at Chushul. After the talks, both sides gave per-functionary diplomatic statements of having had candid discussions on disengagement and to carry the process forward as per the consensus reached between the leaders of the two countries. Prior to this development, it was presumed that status quo would continue indefinitely.

Since India secured the dominating heights on the Kailash Range on the night of 29/30 August, during the sixth and seventh round of military talks, the People's Liberation Army (PLA) had been persistent that disengagement must begin with our withdrawal from the Kailash Range because India has 'altered the status quo'. Beijing remained ambiguous with respect to disengagement in the Depsang Plains and north of Pangong Tso, claiming that it has merely secured its own territory up to the 1959 Claim Line.

But India rightly said that it has never recognised the 1959 Claim Line and that it is China that has unilaterally altered the status of the Line of Actual Control (LAC) and violated the 1993 agreement. On the Kailash Range, India has only moved up to the LAC to preempt the People's

Liberation Army's (PLA) planning to alter the status quo. India further insisted on an all-encompassing status quo ante agreement.

In new 'agreement', China eyeing Kailash Range

In a surprise development on 11 November, the media was agog with speculative reports citing “reliable sources”— read government/military unofficial briefings — that an ‘agreement’ had been reached for disengagement along the Kailash range and north of Pangong Tso during the eighth round of talks.



Indian Army vehicles driving through the snow in Ladakh (representational image) | Photo: AFP via Getty Images via Bloomberg

It seems that it is a quid pro quo agreement for the PLA to withdraw east of Finger 8 (north of Pangong Tso) and us withdrawing from the Kailash Range. North of Pangong Tso, we would withdraw to Dhan Singh Thapa post, west of Finger 3. Between Finger 3 and Finger 8, there would be a buffer zone where no deployment or patrolling would take place. Along the Kailash Range, the PLA would vacate Black Top and other positions on the Kailash range with us doing the same. It is presumed that the entire Kailash Range would be a buffer zone. The disengagement would be carried out in three phases and could begin as early as Diwali.

However, there is no mention of any disengagement in the Depsang Plains. The sources hinted that it was a pre-Modi era problem. While this is not the case, in my view, we seem to have agreed to a huge buffer zone on our side of the LAC where we will not deploy (we never did) or patrol.

It is pertinent to mention that all buffer zones which are likely to be created are on our side of the LAC, denying us the right to patrol, deploy or develop infrastructure, which we had up to April 2020. Given the yawning differential between the military capabilities in China's favour, this kind of an agreement was inevitable. In fact, I have been advocating the same up to end August. Once we seized the Kailash Range, the situation had changed and we should have insisted on status quo ante April 2020.



Annotated Google Earth image showing approximate location of landmarks

Kialash Range and 1959 Claim Line

Kailash Range is one area where the alignment of the 1959 Claim Line offers a major strategic advantage to India, and for the first time since 1962, we are holding it in strength. This, negates the strategic advantage the PLA had gained due to its preemptive operations in the Depsang Plains, Hot Springs-Gogra and north of Pangong Tso.

Even in 1962, both sides fought for the control of the Kailash Range. By 27 October, China had reached its 1959 Claim Line in all sectors. However, it did not want to give us the advantage of holding on to the Kailash Range. The 1959 Claim Line passes over the crest of the Kailash Range, except in the area of Black Top that is to its east. China could still claim that it had not violated its Claim Line. On 24 October 1962, Radio Peking announced that in eastern Ladakh, Chushul was the next objective.

In 1962, the Army psychologically collapsed and abandoned the Kailash Range and Chushul Sector when, militarily, there was no need to do so. I analyse the circumstances of our withdrawal from the Kailash Range and Chushul in 1962 and why we must not withdraw from it now.

Indian Army shows resolve

Until 24 October 1962, 114 Infantry Brigade was responsible for the defence of Ladakh. Beginning 20 October 1962, in 48 hours, DBO, Galwan, Hot Springs and Sirijap Sectors had collapsed and troops had been withdrawn. Chushul Sector was held by the 1/8 Gorkha Rifles; 5 Jat was holding Lukung and Phobrang at the northern end of Pangong Tso. By 28 October, 7 J&K Militia in the Indus River Sector had also withdrawn to Dungti. There was a lull in the battle from 28 October to 17 November.

The Indian Army showed great resolve in rushing troops by air and road to Ladakh. HQ 3 Infantry Division was raised on 26 October at Leh.

114 Infantry Brigade with two additional battalions — 13 Kumaon and 1 Jat — was ordered to defend Chushul and Lukung-Phobrang Sector. 70 Infantry Brigade was deployed for the defence of Indus Valley Sector and 163 Infantry Brigade for Leh itself. An ad hoc formation was across the Khardung La to defend the Saser La approach.

However, there was a strategic flaw in planning. The focus was on defence of Leh, 280 km behind the frontline (by existing road), resulting in paucity of resources for defence of Chushul. Until now, our appreciation was that in Eastern Ladakh, the PLA will not cross the 1959 Claim Line, which, in hindsight, was correct. However, when Radio Peking, on 24 October, 1962, gave the next objective as Chushul, it was assumed that the 1959 Claim Line would be crossed and Leh would be the logical strategic objective. The actual objective of the Chinese was the Kailash Range and that is where they halted.

The PLA did not have the resources or logistics to conduct any further operations. It had committed only one division in Ladakh which was stretched from Karakoram to Demchok. In fact, the PLA had to regroup to attack the Demchok area on 27 October 1962. For Phase 2, it had to regroup again to barely muster one regiment for operations in the Chushul Sector. Hence, the PLA was capable of only limited operations along the frontline. Moreover, the winter was setting in and after November, operations were severely restricted. No attempt was made for detailed air or ground reconnaissance to ascertain the strength of the PLA.

The flawed planning of HQ Western Command/15 Corps/3 Infantry Division was to a great extent responsible for the subsequent events. The focus became to defend Leh and led to a 200 km withdrawal to the rear without the Chinese firing a shot after 20 November.

Defence of Chushul

The reinforced 114 Brigade with four battalions was deployed for defence of Chushul and Lukung as follows:

- 13 Kumaon was holding Maggar Hill and Paw Hill with a company each, and one company with an additional section was at Rezag La. Battalion HQ and one company was located in the area of Track Junction, South of the airfield. One company minus one platoon of 5 Jat was holding Tsaka La, the pass between Chushul Valley and Indus Valley.

- 1/8 Gorkha Rifles had one reinforced company at Gurung Hill, one company to the north of Point 5167, one company was defending the Spanggur Gap and the Battalion HQ with one company was located on the airfield.
- 1 Jat had one company minus one platoon in area Jetty to cater to an amphibious attack, two companies with one additional platoon at Thakung Heights and Battalion HQ with one company at Gompa Hill near Chushul village.
- 5 Jat was deployed at Lukung with one company less a platoon at Tsaka La under 13 Kumaon.
- One battery of 13 Field Regiment within 25 Pounder guns was supporting the brigade. The battery had to be split due to limited range and one troop each was deployed south of Gurung Hill and Maggar Hill.
- Two troops of AMX-13 tanks had been flown in on 26 October and were located at the base of Gurung Hill to deny the Spanggur Gap approach to enemy tanks and support Gurung Hill.
- The brigade was supported by one company of engineers and approaches from Spanggur Gap had been mined.

The PLA attacked the Kailash Range in the early hours of 18 November. Gurung Hill and Rezag La were attacked simultaneously with a reinforced battalion each. Rezag La fell by 2200 hours on 18 November. Fighting at Gurung Hill continued up to 19 November afternoon and only the higher heights were captured by the Chinese. The lower heights close to Spanggur Gap were still in our hands.

Inexplicably, after the loss of Rezag La and partial loss of Gurung Hill, held by only two companies, withdrawal was ordered. All other posts on the Kailash Range and in the valley held by 10 infantry companies were withdrawn to the heights west of Chushul Bowl on the night of 19-20 November, even before they were contacted by the enemy. If that was not enough, the entire brigade withdrew from Chushul on 21 November.

Analysis of the debacle

114 Infantry Brigade had sufficient troops for the defence of Chushul. However, its tactical deployment was flawed. The brigade made no attempt to capture Black Top, which was the most dominating feature on the Kailash Range, north of Spanggur Gap. In the initial stages, it was not held in strength by the PLA and could have easily been captured. As a result, the Chinese were able to dominate Gurung Hill and attacked it from higher ground. Similarly, south of the Spanggur Gap, Mukhpari, the most dominating feature located between Rezag La and Muggar Hill, was not held. There was a 10-km gap between the two posts. Rezag La was, thus, completely isolated. The PLA was able to outflank it from the north and south to attack from the rear. To compound the problem, it was out of the radio communication range and telephone lines were cut at the onset of the battle.

There was limited fire support — only one artillery battery was available. Due to limited range, Rezag La had no artillery support. Higher commanders are to blame for this situation. Our aircraft were landing at Chushul till 15 November. On 26 October, six tanks had been landed. If there was will, a minimum of two artillery regiments could have been made available by road or air.

The brigade did not have any idea about the strength of the PLA. No patrols were sent beyond Kailash Range and no air photo reconnaissance was carried out. Had this been done, the commanders would have known that the PLA had only two battalions available for the attack. After the attack on Gurung Hill and Muggar Hill, the PLA had run out of steam. With winter setting in, it was not capable of progressing the attack further.

The brigade was passive in defence and did not launch any spoiling attacks or counter-attacks. There were sufficient troops available. Three companies deployed in the valley were available as reserves. 1 Jat had not even come under artillery fire, and leaving one company behind at Thakung Heights, could have been used for counter-attack.

The Brigade Commander is squarely to be blamed for withdrawal from the Kailash Range. The Army Commander, Corps Commander and the Divisional Commander are responsible for

abandoning Chushul. The PLA did not even have the capacity for progressing operations at Chushul let alone advancing 200 km to Leh.

We must not withdraw from Kailash Range

The Kailash Range gives us the same strategic advantage in Spanggur Tso-Rudok area as the PLA has in the DBO Sector. We must develop the required infrastructure to man it permanently. In event of an escalation, we must capture Black Top and the lower heights of the Kailash Range to the east. In case we have not already done so, we must also secure it in the Indus Valley.

We shamefully abandoned the Kailash Range in 1962. Today we must not pull back from it merely to declare a political victory. More so, when we gain very little in return. What more can the Chinese want? All likely buffer zones will be on our side of the LAC where we cannot patrol, deploy or develop infrastructure. China will achieve its political aim – to secure the 1959 Claim Line and prevent development of border infrastructure. And, above all, it would make us vacate the strategic Kailash Range. Mark my words, the PLA knew of the importance of the Kailash Range in 1962 and it does so now. We must not repeat the folly to give up the Kailash Range because the PLA will make sure that we never get it back.

(Lt Gen H S Panag PVSM, AVSM (R) served in the Indian Army for 40 years. He was GOC in C Northern Command and Central Command. Post retirement, he was Member of Armed Forces Tribunal. Views are personal.)

<https://theprint.in/opinion/if-india-loses-grip-on-kailash-range-pla-will-make-sure-we-never-get-it-back/542327/>



Fri, 13 Nov 2020

India-China standoff: How Indian Air Force's Apache, Chinook will take on China's attack helicopters along LAC

India's air chief Air chief Marshal RKS Bhadauria had said recently that the forces are "fully prepared" for a "two-front war"

IAF fully prepared for any type of conventional conflict

The Indian Air Force (IAF) has deployed its Apache and Chinook helicopters along the Line of Actual Control (LAC) as the Indian and Chinese armies face down a bitter winter in the high Himalayas this year.

India's air chief Air chief Marshal R.K.S. Bhadauria had said recently that the forces are "fully prepared" for a "two-front war".

"Our immediate offensive deployment of combat-ready units in response to the standoff at the LAC (Line of Actual control) in the north is indicative of our operational state today. We are determined to handle any contingency, undoubtedly, our capability and intent would deter," Bhadauria had said.



"The Indian Air Force (IAF) is fully prepared for any type of conventional conflict or any other conflict, including two-front war. We always focus on building up and preparing our (IAF)

operational capability against the current threat scenario, and we are completely ready for a two-front war as well," the air chief said.

The Indian Air Force proudly displayed the Apache, Mi-35 attack helicopters during Air Force Day celebrations on October 8 as the forces prepare for a tough winter ahead.

AH-64E Apache attack helicopters

According to Boeing, the IAF has a fleet of 22 AH-64E Apache attack helicopters. This year the company signed an agreement with the Indian government for the acquisition of six AH-64E Apache helicopters for the Indian Army.

The AH-64E greater thrust and lift, joint digital operability, improved survivability and cognitive decision aiding makes it an elite fighting force capable of undertaking any mission under varied conditions.

Apache's vertical rate of climb

The Apache's vertical rate of climb is at over 2,000 feet per minute with a speed of 279 kilometres per hour. The company had handed the final five of the 22 Apache attack helicopters to the IAF in July.

The helicopter is equipped with Modernized Target Acquisition Designation System which provides day, night and all-weather target information including night-vision navigation capability. It also has Fire Control Radar to operate in the maritime conditions.

India and US had signed a contract for the acquisition of six Apaches for the Indian Army during President Trump's visit to India earlier this year.

Heavy-lift Chinook helicopter

Boeing had also handed the over the last five of 15 CH-47F(I) Chinook heavy-lift helicopters to the IAF in March. According to the company, India is one of 17 nations to select the Apache and has the most advanced variant, the AH-64E Apache that is also flown by the US and many other countries.

The company says twenty defence forces around the world either have Chinooks in service, or are on contract to receive them.

The iconic tandem-rotor helicopter has been the world's most reliable and efficient heavy-lift helicopter for more than 50 years, allowing customers to operate in climatic (hot), altitude (high), and crosswind conditions that typically keep other helicopters from flying.

China's Harbin WZ-19 light reconnaissance helicopter

According to reports, China has around 280 attack helicopters which are mainly reconnaissance and armed versions, not the premier Apaches which India has acquired from the United States. The PLA depends on Harbin WZ-19 light reconnaissance helicopter and the Changhe Z-11 light utility helicopter.

The biggest weakness of the Chinese helicopters is that it hasn't been tested in battle conditions, that too in high altitude. China also has the Russian-built Mi-17 helicopters, which India also possesses.

China also has the Z-20 helicopter which has been operating along the LAC. India with its fleet of Mi-17 V5 copters can easily take on the Dragon in the high Himalayas.

Chinese Army depends on Z-8G large transport helicopter

In order to do the heavy lifting, the Chinese Army depends on Z-8G large transport helicopter which reports say is a copy of French SA 321 Super Frelon that France had sold to China in the 1970s.

The Z-8G is no match for India's Chinook which transports men, material and heavy artillery guns along the LAC and has been doing that few months already in tough battle conditions.

Although India has around 70-80 attack helicopters (AH), its precision-guided Apaches and HAL's Rudra(ALH-WSI) with rockets and turret guns makes India's Air Force and Army a potent force in high altitude.

Rudra is a variant of Dhruv, however, it has been stuck in production delays over the years. India has been vying for faster production and rollout especially in the light of developments along the LAC in the last few months.

[https://www.wionews.com/photos/india-china-standoff-how-indian-air-forces-apache-chinook-will-take-on-chinas-attack-helicopters-along-lac-342634#hals-rudra-\(alh-wsi\)-342631](https://www.wionews.com/photos/india-china-standoff-how-indian-air-forces-apache-chinook-will-take-on-chinas-attack-helicopters-along-lac-342634#hals-rudra-(alh-wsi)-342631)



Fri, 13 Nov 2020

LAC पर चीन को सबक सिखाने की तैयारी, ये हैं इंडियन एयरफोर्स की ताकत

भारतीय वायु सेना प्रमुख एयर चीफ मार्शल आरके भदौरिया (RKS Bhadauria) ने हाल ही में कहा था कि सेनाएं 'दो-फ्रंट युद्ध' के लिए पूरी तरह से तैयार हैं।

चीन के साथ लद्दाख में एलएसी (LAC) पर जारी विवाद के बीच भारतीय वायु सेना (Indian Air Force) ने हर तरह की स्थिति से निपटने के लिए तैयारी शुरू कर दी है। एयरफोर्स ने एलएसी पर कड़ाके की सर्द का सामना कर रही भारतीय सेना की मदद के लिए अपनी अपाचे और चिनूक हेलीकॉप्टरों की तैनाती की है। भारतीय वायु सेना प्रमुख एयर चीफ मार्शल आरके भदौरिया (RKS Bhadauria) ने हाल ही में कहा था कि सेनाएं 'दो-फ्रंट युद्ध' के लिए पूरी तरह से तैयार हैं। तो चलिए बताते हैं अपाचे और चिनूक हेलीकॉप्टरों की खासियत हैं, जो वायु सेना को मजबूत बनाती हैं।

एएच -64 ई अपाचे हमला हेलीकॉप्टर

अमेरिकी एविएशन कंपनी बोइंग के अनुसार भारत के पास 22 AH-64E अपाचे हेलीकॉप्टरों का एक बेड़ा है। यह नवीनतम संचार, नेविगेशन, सेंसर और हथियार प्रणालियों सहित एक ओपन सिस्टम आर्किटेक्चर से लैस है।

अपाचे की क्षमता

अपाचे हेलीकॉप्टर 279 किलोमीटर प्रति घंटे की स्पीड की 2000 फीट की ऊंचाई पर उड़ान भर सकता है। यह हेलीकॉप्टर नाइट विजन है और दिन-रात और किसी भी मौसम में लक्ष्य की जानकारी प्रदान कर सकता है। साथ ही इसके अग्नि नियंत्रण रडार को समुद्री वातावरण में संचालित करने के लिए अपडेट किया गया है। रक्षा मंत्रालय ने 22 अपाचे हेलीकॉप्टरों के उत्पादन, प्रशिक्षण और समर्थन के लिए बोइंग के साथ सितंबर 2015 में डील किया था।

भारी-भरकम चिनूक हेलीकॉप्टर

बोइंग ने इस साल मार्च में भारतीय वायुसेना को अंतिम 5 चिनूक हेवी-लिफ्ट हेलिकॉप्टर सौंप दिए थे। दुनिया के 24 देशों के पास या तो चिनूक हेलीकॉप्टर हैं या फिर उनके लिए डील किया गया है। चिनूक को किसी भी जटिल परिस्थितियों में फिर चाहे वह गर्म हो या अधिक ऊंचाई पर हो, संचालित किया जा सकता है। CH-47F (I) चिनूक में एक आधुनिक मशीनी एयरफ्रेम है, एक एवियोनिक्स आर्किटेक्चर प्रणाली (सीएएएस) वाला कॉकपिट और एक डिजिटल ऑटोमैटिक फ्लाइट कंट्रोल सिस्टम (डीएफसीएस) है।

चीन का हार्बिन डब्ल्यूजेड-19

रिपोर्टों के अनुसार, चीन के पास लगभग 280 हमले करने वाले हेलीकॉप्टर हैं, जो भारत के पास मौजूद अपाचे से काफी कमजोर हैं। चीनी सेना हार्बिन WZ-19 और चांग जेड -11 हेलीकॉप्टर पर निर्भर है। चीनी हेलीकॉप्टरों की सबसे बड़ी कमजोरी यह है कि इसका युद्ध की परिस्थितियों में परीक्षण नहीं किया गया है और वह भी उच्च ऊंचाई पर। चीन के पास रूसी निर्मित एमआई -17 हेलीकॉप्टर भी हैं, जो भारत के पास भी हैं। चीन के पास Z-20 हेलीकॉप्टर भी हैं, जो एलएसी पर तैनात हैं।



चीनी सेना का Z-8G

भारी सामान उठाने के लिए चीनी सेना Z-8G बड़े हेलीकॉप्टर पर निर्भर करती है और रिपोर्ट के अनुसार यहाँ फ्रांसीसी SA 321 सुपर फ्रीलान की कॉपी है, जिसे फ्रांस ने 1970 के दशक में चीन को बेचा था। Z-8G का भारत के चिनूक से कोई मुकाबला नहीं है।

<https://zeenews.india.com/hindi/india/photo-gallery-indian-air-force-apache-and-chinook-will-take-on-china-attack-helicopters-along-lac/785046/z-8g-large-transport-helicopter-785047>

Business Standard

Fri, 13 Nov 2020

Working hard to ensure early supply of S-400 missiles to India: Russia

In October 2018, India had signed a \$5 billion deal with Russia to buy five units of the S-400 air defence missile systems

Russia on Thursday said it was working "very hard" to advance the supply of the S-400 surface-to-air missiles to India even though the delivery of the first batch of the weapons system is scheduled by the end of next year.

At an online media briefing, Russian Deputy Chief of Mission Roman Babushkin also said that both sides are working on a mutual logistics support agreement and close to seal a multi-billion dollar deal under which an Indo-Russian joint venture will produce 200 Kamov Ka-226T attack helicopters for the Indian armed forces.

Asked whether the Basic Exchange and Cooperation Agreement (BECA) signed between India and the US will have security implications in operation of Russian-origin platforms by the Indian armed forces, Babushkin did not give a direct reply, but said Moscow's defence ties with India are immune to any "restrictions and foreign interference".

"We are watching quite closely the relations in strategic areas between India and other nations including the US, of course. But at the same time we are absolutely sure that whatever ties India is developing with other nations, they would not be at the expense of Russia's interests," he said.

Last month, India and the US inked the landmark BECA agreement that will provide for sharing of high-end military technology, geospatial maps and classified satellite data between their militaries.

"As far as our defence cooperation with India is concerned, it is immune to any restrictions and foreign interference, because it reflects national interests of both countries and we are proceeding with a great sense of confidence to the future progress in our ties," Babushkin said.

On the S-400 deal, he said: "The deadlines remained unchanged at the moment. The first batch is expected to be supplied by end of 2021 but we are working very hard for an earlier supply."

In October 2018, India had signed a USD 5 billion deal with Russia to buy five units of the S-400 air defence missile systems, notwithstanding warning from the Trump administration that going ahead with the contract may invite US sanction.



FILE PIC: Russian S-400 air defence mobile missile launching systems | Photo: Reuters

In view of the evolving security scenario in its neighbourhood, India recently requested Russia to explore the possibility of advancing the supply of the interceptor-based missile systems which can destroy incoming hostile aircraft, missiles and even drones at ranges of up to 400 km.

Last year, India made the first tranche of payment of around USD 800 million to Russia for the missile systems. The S-400 is known as Russia's most advanced long-range surface-to-air missile defence system.

Babushkin said the Kamov helicopter deal and another one to manufacture 700,000 AK-47 203 rifles in India under a Indo-Russian joint venture were in the final stages of conclusion.

In October 2016, India and Russia had finalised a broad agreement to set up joint venture between Hindustan Aeronautics Ltd (HAL) and two Russian defence majors for procuring 200 Kamov Ka-226T choppers for Indian armed forces.

According to the understanding, 60 Kamov-226T helicopters will be supplied to India in fly-away condition, while 140 will be manufactured in India. Russia had agreed to ensure transfer of technologies to India as part of the pact.

India and Russia finalised the deal for manufacturing AK-203 rifles during Defence Minister Rajnath Singh's visit to Moscow two months back.

On the Mutual Logistics Support Agreement (MLSA), Babushkin said it will help in deepening maritime security cooperation between the two countries, particularly in the Indian Ocean Region.

The MLSA will allow militaries of the two countries to use each other's bases for repair and replenishment of supplies besides facilitating scaling up of overall defence cooperation.

India has already signed similar agreements with the US, Australia, Japan, France and Singapore.

The Russian Deputy Chief of Mission also said that both countries were also working on a number of other military acquisition programmes including supply of another batch Su-30 MKI aircraft to India. The other major programmes mentioned by him are relating to main battle tanks, frigates, submarines and missiles.

The Kamov helicopters will be supplied to the Indian Air Force and the Army. Both these forces have been pressing for early conclusion of the deal so that they could replace their ageing fleet of existing choppers within next three to four years.

Babushkin said Russia is also aiming to ensure its largest participation in the upcoming Aero-India, considered Asia's largest aerospace exhibition. The exhibition will take place in Bengaluru in February.

"It will also see new developments in our defence partnerships," he said.

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

https://www.business-standard.com/article/current-affairs/working-hard-to-ensure-early-supply-of-s-400-missiles-to-india-russia-120111201083_1.html



Thu, 12 Nov 2020

Russia is an ideal partner to boost India's civil nuclear energy programs

By Ashok Sajjanhar

The work being done by the Russian nuclear industry in the past 75 years makes it an ideal partner for India for accelerating civil nuclear energy programs

Russia has featured extensively in the news over the last several weeks, all for the right reasons. Raksha Mantri Rajnath Singh visited Moscow twice within the last three months. External Affairs Minister went to Moscow once in the second week of September 2020. All these visits underscore the special and privileged strategic partnership between India and Russia. Russia supplies more than 60% of India's total defence imports.

In addition to defence and strategic partnership, nuclear power is another critical sector in which cooperation between the two countries continues to grow rapidly.

The year 2020 marks the 75th anniversary of the Russian nuclear industry. Russia has often been a pioneer in the peaceful use of atomic energy. In 1954, Russian scientists launched the first nuclear power station, and today there are three units with the latest 3+ generation reactors in Russia. Many more are being built in other countries. Over the last three-quarters of a century, thanks to the Russian nuclear industry, nuclear units have appeared in many foreign countries, including India.

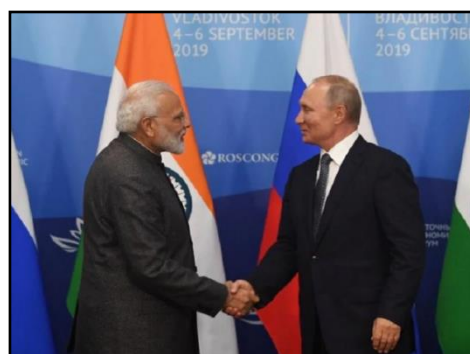
The Russian nuclear industry is an undisputed leader in advanced nuclear technologies, providing innovative engineering and construction solutions for nuclear reactors and the production of nuclear fuel. Over its 75-year history, Russia has amassed a wealth of experience and acquired extensive competencies in large-scale nuclear projects. Rosatom has the world's only nuclear icebreaker fleet, the most powerful fast neutron reactor, the first in its kind floating Nuclear Power Plant (NPP); it contributes to digitalization as well as nuclear medicine.

The development of the nuclear industry is seen as a top national priority in Russia. It is perceived to be a key sector of the Russian economy, essential for national energy security. The nuclear industry drives demand for other products and services and therefore stimulates engineering, steel making, geology, construction, and other sectors of the national economy.

By 2030, India plans to increase the share of renewables in its energy basket to 40%. In this regard, the country is paying significant attention to the development of nuclear energy and expects to increase energy production to 14.6

GW by 2024 and to 63 GW by 2032. It is time to assess how cooperation between the two countries can be further strengthened for nuclear power. The cutting-edge work being done by the Russian nuclear industry in the past 75 years makes it a viable partner for India for accelerating civil nuclear energy programs. For 60 years out of its 75-year nuclear history, Russia has been working with India on peaceful nuclear energy generation with the construction of the Kudankulam NPP being the largest joint Russian Indian project in the energy sector so far.

Currently, the implementation of the Kudankulam NPP project involves the construction of six power units equipped with VVER-1000 reactors. In addition, in October 2018, Russia and India signed an "Action Plan for Setting Priorities and Implementing Areas of Cooperation in the Field of nuclear power". According to the document, the parties intend, in particular, to develop a project



File Photo: MEA

for the construction in India of additional Russian-designed NPP power units on a new site, to expand cooperation in third countries and interaction in new promising areas in nuclear energy in addition to the construction of nuclear power plants. During the visit of Prime Minister Narendra Modi to Russia in September 2019, it was announced that at least 12 Russian-designed power units could be built in India within 20 years.

Nuclear cooperation between the two countries is also promoting the government's 'Make in India' initiative as some vital components are being increasingly manufactured in India.

It needs to be underscored that Russia is the only country that has successfully entered the nuclear power generation field in India with the latest technology. In addition, India and Russia are carrying their cooperation in this vital sector to other countries, the Rooppur nuclear power plant in Bangladesh being the first example.

The road ahead sees far more collaboration as the two countries roll out the plans agreed upon. In October this year, the two countries will celebrate the 20th Anniversary of the Declaration of Strategic Partnership between India and Russia which enshrines the commitment to cooperate in the peaceful use of nuclear energy. As the highest levels of the two governments toast the success of the relationship so far, it will be time to set sights on new horizons in nuclear cooperation.

(Ambassador Ashok Sajjanhar is the President of the Institute of Global Studies, Former Ambassador to Kazakhstan, Sweden, and Latvia (Retd.) and had also served in Indian Embassy in USSR and Russian Federation)

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<https://news.abplive.com/blog/russia-is-an-ideal-partner-to-boost-india-civil-nuclear-energy-programs>

THE TIMES OF INDIA

Fri, 13 Nov 2020

LAC: India, China to dismantle new structures built after April-May timeframe under disengagement plans

New Delhi: As part of the disengagement proposals being discussed between India and China, the two sides would dismantle any new structures that have come up during the ongoing standoff since April-May this year in the Pangong lake area.

There would also be no patrolling activity by either side between the Finger 4 and Finger 8 as China has given up on its old stand to maintain an observation post in the area, sources told ANI here.

The issue of Depsang plains would be discussed between the two countries separately where the Chinese have blocked some patrolling points of the Indian Army and a couple of other patrolling points of the Indian Army where Chinese have not yet disengaged entirely during the first phase of disengagement are also to be resolved soon.



The proposals are being discussed as the armies of the two countries have reached an agreement to discuss stepwise disengagement from parts of the Eastern Ladakh sector under which they would be moving back to their respective positions before April-May timeframe earlier this year.

The disengagement plan was discussed between the two sides during the 8th Corps Commander-level talks which were held on November 6 in Chushul.

As per the disengagement plan which is to be carried out in three steps in one week from the talks in the Pangong lake area, the armoured vehicles including tanks and armoured personnel carriers were to be moved back from their frontline deployment to a significant distance from the Line of Actual Control (LAC) by both sides.

As per the discussions, the disengagement of tanks and armoured personnel carriers was to be carried out within one day. The talks were held on November 6 in which External Affairs Ministry's Joint Secretary Naveen Shrivastava and Brigadier Ghai of Directorate General of Military Operations had taken part.

In the second step to be carried out near the northern bank on the Pangong lake, both sides were supposed to withdraw around 30 per cent of troops every day for three days. The Indian side agreed to come close to its administrative Dhan Singh Thapa post while the Chinese had consented to go back to their position east of Finger 8.

In the third and last step, the two sides were to withdraw from their respective positions from the frontline along the southern bank of Pangong lake area which includes the heights and territories around Chushul and Rezag La area.

The two sides had also agreed for a joint mechanism to verify the progress in the disengagement process through delegation meetings as well as using Unmanned Aerial Vehicles (UAVs).

The Indian side is moving very carefully on the issue as there is a lot of trust deficit with China after the Galwan valley clash in June this year in which 20 Indian soldiers had lost their lives and many Chinese army soldiers, including their Commanding Officer, were killed by the Indian troops.

Prime Minister Narendra Modi's trusted security team, including National Security Advisor Ajit Doval, Chief of Defence Staff General Bipin Rawat, Army chief General Manoj Mukund Naravane and Air Force chief RKS Bhadauria, had taken strong military measures like occupying the dominating heights along the southern and northern bank of Pangong lake on the LAC including the Ane La and Que La features.

China had mobilised its troops in a massive deployment along the LAC and transgressed into multiple Indian locations including patrolling points 14, 15, 15 A, 17 and 17A and the Finger area in April-May timeframe in the 14 Corps area of responsibility with Lt Gen Harinder Singh as Corps Commander and Maj Gen Abhijit Bapat as the 3 Infantry Division Commander based out of Karu.

India gave a huge response as it moved close to 60,000 troops for forward deployments apart from bringing in reserve divisions from the nearby Himachal Pradesh sector and plains. The Indian Air Force made rapid deployments to the frontline where its fighter jets and attack choppers were in 'ready to fire' mode while its Garud Special Forces were deployed in the approach areas with Igla air defence systems to take out any approaching enemy aircraft.

<https://timesofindia.indiatimes.com/india/india-china-to-dismantle-new-structures-built-after-april-may-timeframe-under-disengagement-plans/articleshow/79191684.cms>

Fri, 13 Nov 2020

The first demonstration of phase-matching between an electron wave and a light wave

By Ingrid Fadelli

While researchers have conducted countless studies exploring the interaction between light waves and bound electron systems, the quantum interactions between free electrons and light have only recently become a topic of interest within the physics community. The observation of free electron-light interactions was facilitated by the discovery of a technique known as photon-induced near-field electron microscopy (PINEM).

Although some experiments using PINEM methods have yielded interesting results, the free-electron light interactions observed so far are fairly weak. This is mainly because PINEM methods gather localized and near-field measurements without addressing the velocity mismatch between free electrons and light, which is known to limit the strength of their interaction.

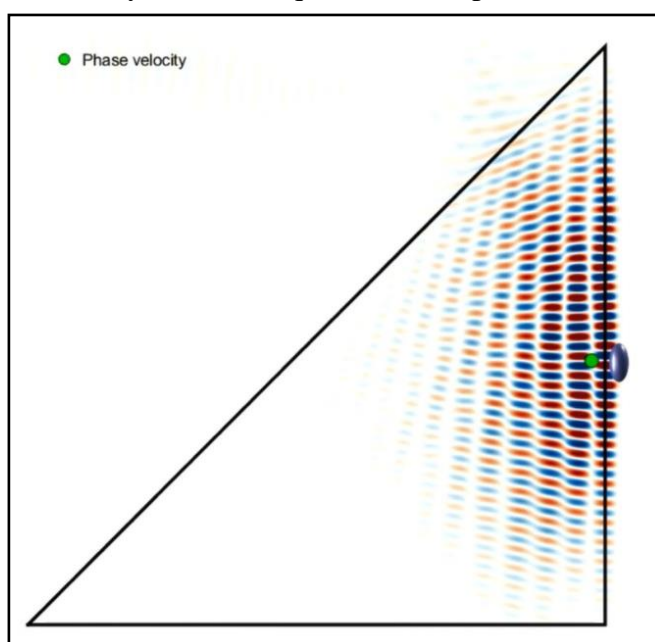
Researchers at Technion–Israel Institute of Technology have recently observed a strong interaction between free electron waves and light waves, using a hybrid electron microscope they developed. Their observation of coherent electron phase matching, which is also a type of inverse-Cherenkov interaction, demonstrates how the nature of electron wavefunctions can alter electron-light interactions.

"This has been a long journey for me personally, as one could say that I've been pursuing this experiment for 7 years now,"

Ido Kaminer, one of the researchers who carried out the study, told Phys.org. "I started working on the Cherenkov effect 7 years ago, around the time that I moved to MIT for a postdoc. Already at that time, the Cherenkov effect had 80 years of history since its first observation in 1934 (and a Nobel prize in 1958)."

The Cherenkov effect, named after Pavel Alekseevic Cherenkov, the physicist who first observed it, is a phenomenon that occurs when a particle that carries an electric charge travels through a transparent medium (e.g., water or air), which can lead to the emission of electromagnetic radiation. If the particle is traveling faster than the speed of light in a medium, its passage through the transparent medium causes a brief flash of light, dubbed Cherenkov light.

When Kaminer started studying the Cherenkov effect, back in 2013, it was considered a classical effect; the work of other physicists, including that of Vitaly Ginzburg and Lev Landau, had suggested that quantum mechanics was of no consequence to this phenomenon. The theoretical



Computer simulation of the electron-light interaction. The laser light (red-blue wave pattern) interacts with the electron wavefunction (elongated sphere) that passes nearby. This unique experimental setup assures that the electron exchanges energy with the laser in a resonant manner – achieving the precise conditions of the Cherenkov effect. Credit: Dahan et al.

findings that Kaminer collected over the next few years were therefore intriguing and surprising, as they suggested that the Cherenkov effect actually contains phenomena arising from the quantum nature of charged particles.

"My results were quite controversial at the beginning, but over a couple of years, other scientists began to find similar theoretical features in related effects, such as the Smith-Purcell effect," Kaminer said. "These findings increased the general interest in building an experiment to test these theoretical predictions."

Over the past few years, physicists have delineated three types of quantum phenomena that can theoretically be observed in Cherenkov effect-related experiments. The recent study led by two students who are part Kaminer's lab at Technion, Raphael Dahan and Saar Nehemia, experimentally demonstrates one of these effects for the first time. The other two effects are yet to be confirmed in experiments and remain theoretical predictions.

"I think that it is quite amazing to see the progress that we've made as a community from a historical perspective," Kaminer said. "The experimental setup that we built at Technion for this experiment, which is based on an ultrafast transmission electron microscope, was impossible to imagine in the days of Ginzburg and Landau."

Kaminer and his students conducted their experiments using a hybrid electron microscope that incorporates laser pulses custom-made at Technion. This type of microscope, which is ideal for performing Cherenkov-type experiments, has become increasingly advanced over the past 10 years, especially through the work of Ahmed Zewail and other renowned scientists worldwide.

When an electron is illuminated, its interaction with light waves is typically very weak. The main reason for this is that electrons and light waves move at entirely different velocities (i.e., the electron always moves slower than the speed of light). This velocity mismatch ultimately prevents the interaction between electrons and light from becoming stronger.

In their experiments, Kaminer and his students used a prism (i.e., a transparent object) to slow down the light waves in the proximity of an electron. By precisely matching the angle at which the electron was illuminated, they were able to slow down the velocity of light waves to the point where it matched that of the electron. This match in their velocity produced an effect known as phase matching.

"Our approach enabled the observation of a very strong interaction and other coherent quantum behaviors of free electrons that were never seen before," Kaminer explained. "The idea of matching the light velocity and the particle velocity is exactly the Cherenkov effect. In other words, the condition for the strong interaction is the same as the condition necessary for the Cherenkov effect and is also what scientists in other fields call phase matching. The fact that these different concepts can be combined in this way is really beautiful, in my opinion."

The researchers' demonstration of phase matching between an electron wave and a light wave reveals a new type of optical nonlinearity, where relativistic free electrons take on the role of crystalline solids as they interact with light. In addition, the team's experiments led to the creation of a free-electron energy comb; a system that is of great interest for attosecond science research.

Attosecond science is an area of optics that specifically examines processes that occur within a few attoseconds (i.e., 10^{-18} seconds), such as the ionization of electrons from an atom or molecule. So far, most experiments in this field have been conducted using attosecond laser pulses, but the findings gathered by Dahan and Nehemia and other students in Kaminer's lab confirm the viability of also using attosecond electron pulses.

"From a fundamental perspective, our experiment proves that the quantum wave nature of a free electron alters its stimulated radiation," Kaminer said. "This is something that has been debated for many years and is still under intense investigation."

The recent study opens up fascinating new possibilities for the study of the Cherenkov effect from a quantum perspective. In their next studies, the researchers will further investigate the effect they observed, while also examining other fundamental questions that remain unanswered.

For instance, while all previous experiments investigating the Cherenkov effect gathered observations of light waves in three dimensions, theorists have also hypothesized the existence of a two-dimensional Cherenkov effect. In their future research, Kaminer and his colleagues will attempt to observe this unique phenomenon experimentally.

"The quantum nature of light is usually neglected for interactions with free electrons, but the strong interaction we achieved here can hopefully change that," Kaminer said. "Such quantum effects enable important technology too. We started to investigate chip-scale electron accelerators in our setup (called ACHIP, i.e. accelerators on chip). The quantum nature of the electrons raises super interesting questions about such devices and will hopefully help to improve them."

More information: Raphael Dahan et al. Resonant phase-matching between a light wave and a free-electron wavefunction, *Nature Physics* (2020). DOI: [10.1038/s41567-020-01042-w](https://doi.org/10.1038/s41567-020-01042-w)

Ido Kaminer et al. Quantum Čerenkov Radiation: Spectral Cutoffs and the Role of Spin and Orbital Angular Momentum, *Physical Review X* (2016). DOI: [10.1103/PhysRevX.6.011006](https://doi.org/10.1103/PhysRevX.6.011006)

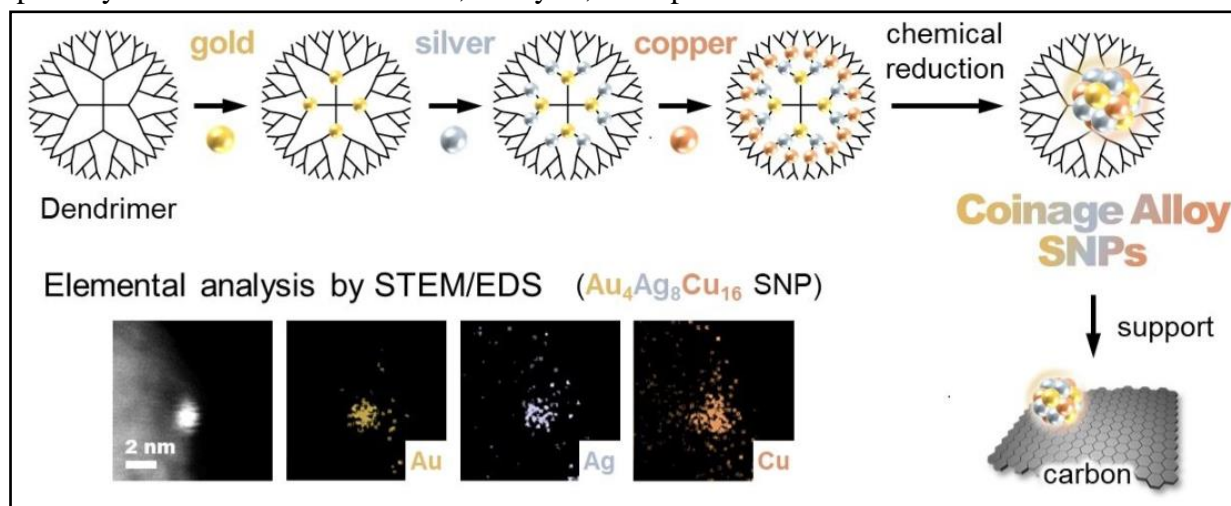
Journal information: [Nature Physics](https://www.nature.com) , [Physical Review X](https://www.physrevx.org/)
<https://phys.org/news/2020-11-phase-matching-electron.html>



Fri, 13 Nov 2020

Smaller than ever—exploring the unusual properties of quantum-sized materials

The development of functional nanomaterials has been a major landmark in the history of materials science. Nanoparticles with diameters ranging from 5 to 500 nm have unprecedented properties, such as high catalytic activity, compared to their bulk material counterparts. Moreover, as particles become smaller, exotic quantum phenomena become more prominent. This has enabled scientists to produce materials and devices with characteristics that had been only dreamed of, especially in the fields of electronics, catalysis, and optics.



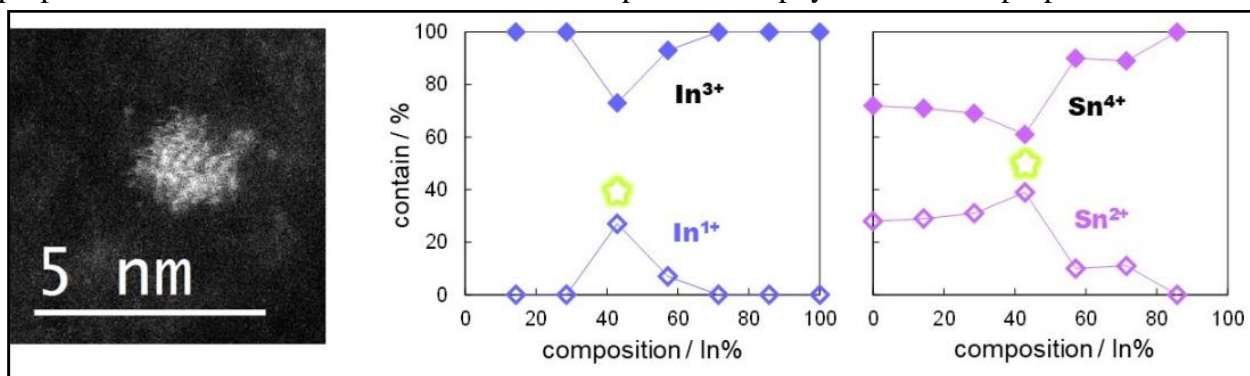
Using dendrimers as molecular templates to produce diverse arrangements of metal ions, SNPs of about 1 nm in diameter with precise indium-to-tin ratios can be readily obtained. Credit: Tokyo Tech

But what if we go smaller? Sub-nanoparticles (SNPs) with particle sizes of around 1 nm are now considered a new class of materials with distinct properties due to the predominance of quantum effects. The untapped potential of SNPs caught the attention of scientists from Tokyo Tech, who are currently undertaking the challenges arising in this mostly unexplored field. In a recent study published in the *Journal of the American Chemical Society*, a team of scientists from the

Laboratory of Chemistry and Life Sciences, led by Dr. Takamasa Tsukamoto, demonstrated a novel molecular screening approach to find promising SNPs.

As one would expect, the synthesis of SNPs is plagued by technical difficulties, even more so for those containing multiple elements. Dr. Tsukamoto explains: "Even SNPs containing just two different elements have barely been investigated because producing a system of subnanometer scale requires fine control of the composition ratio and particle size with atomic precision." However, this team of scientists had already developed a novel method by which SNPs could be made from different metal salts with extreme control over the total number of atoms and the proportion of each element.

Their approach relies on dendrimers (see Figure 1), a type of symmetric molecule that branches radially outwards like trees sprouting from a common center. Dendrimers serve as a template on which metal salts can be accurately accumulated at the base of the desired branches. Subsequently, through chemical reduction and oxidation, SNPs are precisely synthesized on the dendrimer scaffold. The scientists used this method in their most recent study to produce SNPs with various proportions of indium and tin oxides and then explored their physicochemical properties.



(Left) Scanning transmission electron microscopy image of an $\text{In}_{12}\text{Sn}_{16}$ oxide SNP. (Right) Unusual electronic states appear when the indium-to-tin ratio is 3:4 (that is, an SNP with 12 indium atoms and 16 tin atoms). This ratio is marked with a green star

One peculiar finding was that unusual electronic states and oxygen content occurred at an indium-to-tin ratio of 3:4 (see Figure 2). These results were unprecedented even in studies of nanoparticles with controlled size and composition, and the scientists ascribed them to physical phenomena exclusive to the sub-nanometer scale. Moreover, they found that the optical properties of SNPs with this elemental proportion were different not only from those of SNPs with other ratios, but also of nanoparticles with the same ratio. As shown in Figure 3, the SNPs with this ratio were yellow instead of white and exhibited green photoluminescence under ultraviolet irradiation.

Exploring material properties at the sub-nanometer scale will most likely lead to their practical application in next-generation electronics and catalysts. This study, however, is just the beginning in the field of sub-nanometer materials, as Dr. Tsukamoto concludes: "Our study marks the first-ever discovery of unique functions in SNPs and their underlying principles through a sequential screening search. We believe our findings will serve as the initial step toward the development of as-yet-unknown quantum sized materials." The sub-nanometric world awaits!

More information: Takamasa Tsukamoto et al, Quantum Materials Exploration by Sequential Screening Technique of Heteroatomicity, *Journal of the American Chemical Society* (2020). DOI: [10.1021/jacs.0c06653](https://doi.org/10.1021/jacs.0c06653)

Journal information: [Journal of the American Chemical Society](https://phys.org/news/2020-11-smaller-everexploring-unusual-properties-quantum-sized.html)
<https://phys.org/news/2020-11-smaller-everexploring-unusual-properties-quantum-sized.html>

Time for a new state of matter in high-temperature superconductors

When you cool down liquid water, it crystallizes into ice. Consider a bucket filled with water, for example. When the water is liquid, the water molecules can be anywhere inside the bucket. In this sense, every point inside the bucket is equivalent. Once the water freezes, however, the water molecules occupy well-defined positions in space. Thus, not every point inside the bucket is equivalent anymore. Physicists refer to this phenomenon as spontaneous symmetry breaking. Here the translation symmetry in space is broken by the formation of the crystal.

Is it possible for crystals to form in time instead of space? While it appears an outlandish notion, it turns out that a time crystal may emerge when a physical system of many interacting particles is periodically driven. The defining feature of a time crystal is that a macroscopic observable, such as the electric current in a solid, oscillates at a frequency that is smaller than the driving frequency.

So far, time crystals have been realized in artificial model systems. But now, what about real systems? A piece of a high-temperature superconductor is such a real system—you can buy it online. It is not much to look at, with its brownish, rusty color. Yet its frictionless electron flow at temperatures up to 100 K (173 °C) constitutes one of the most spectacular phenomena of material science.

"We propose to turn a high-temperature superconductor into a time crystal by shining a laser on it," explains first author Guido Homann from the Department of Physics at Universität Hamburg. The frequency of the laser needs to be tuned to the sum resonance of two fundamental excitations of the material. One of these excitations is the elusive Higgs mode, which is conceptually related to the Higgs boson in particle physics. The other excitation is the plasma mode, corresponding to an oscillatory motion of electron pairs, which are responsible for superconductivity.

Co-author Dr. Jayson Cosme from Universität Hamburg, now University of the Philippines, adds that "the creation of a time crystal in a high-temperature superconductor is an important step because it establishes this genuine dynamical phase of matter in the domain of solid-state physics." Controlling solids by light is not only fascinating from a scientific perspective but also technologically relevant, as emphasized by group leader Prof. Dr. Ludwig Mathey. "The ultimate goal of our research is to design quantum materials on demand." With their novel proposal, this fascinating endeavor is now advanced towards dynamical states of matter, rather than the usual static states of matter, by laying out a strategy to design time crystals instead of regular crystals, which opens up a new and surprising direction of material design.

More information: Guido Homann et al, Higgs time crystal in a high- T_c superconductor, *Physical Review Research* (2020). DOI: [10.1103/PhysRevResearch.2.043214](https://doi.org/10.1103/PhysRevResearch.2.043214)
<https://phys.org/news/2020-11-state-high-temperature-superconductors.html>

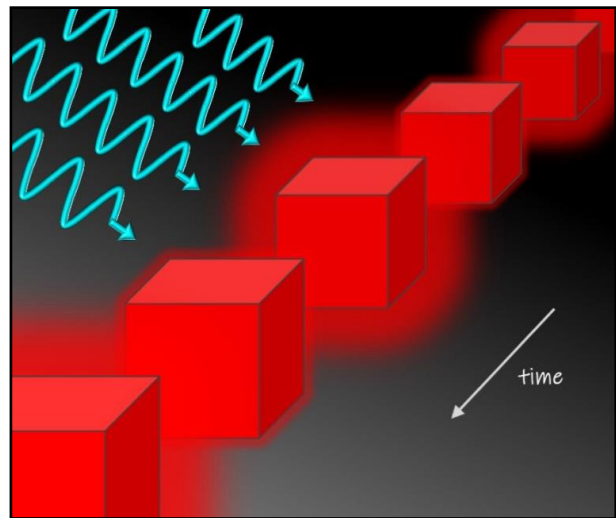


Figure caption: Scientists from Universität Hamburg propose to create a time crystal out of a high-temperature superconductor by shining light on it. This creates macroscopic oscillations of the Higgs field. Credit: UHH/Mathey

Researchers make most precise measurements of deuterium fusing with a proton to form helium-3

By Bob Yirka

A large team of researchers affiliated with a host of institutions in Italy, the U.K and Hungary has carried out the most precise measurements yet of deuterium fusing with a proton to form helium-3. In their paper published in the journal *Nature*, the group describes their effort and how they believe it will contribute to better understanding the events that transpired during the first few minutes after the Big Bang.

Astrophysics theory suggests that the creation of deuterium was one of the first things that happened after the Big Bang. Therefore, it plays an important role in Big Bang

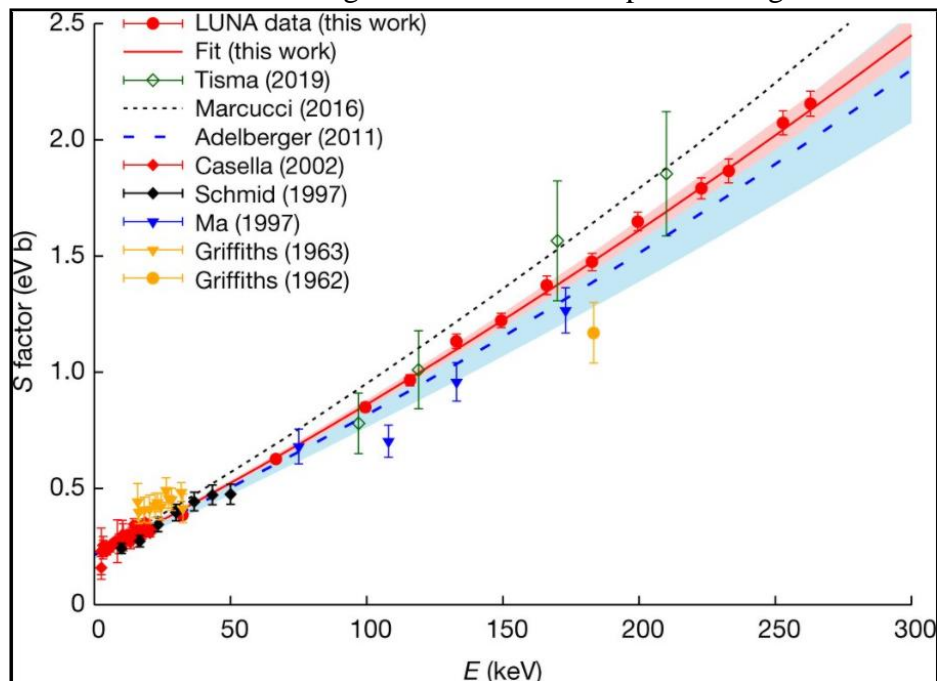
nucleosynthesis—the reactions that happened afterward that led to the production of several of the light elements. Theorists have developed equations that show the likely series of events that occurred, but to date, it

has been difficult to prove them correct without physical evidence. In this new effort, the researchers working at the Laboratory for Underground Nuclear Astrophysics in Italy have carried out experiments to simulate those first few minutes, hoping to confirm the theories.

The work was conducted deep under the thick rock cover of the Gran Sasso mountain to prevent interference from cosmic rays—it involved firing a beam of protons at a deuterium target—deuterium being a form of hydrogen with just one proton and one neutron—and then measuring the rate of fusion. But because the rate of fusion is so low, the bombardment had to be carried out many times—the team carried out their work nearly every weekend for three years.

The hope was that the measured rate would match the amount of cosmic microwave background radiation detected by scientists who have been studying it for many years. Researchers believe such radiation came into existence as the cosmos cooled approximately 380,000 years after the Big Bang.

The researchers found that the measured rate of deuterium fusing across a range of temperatures fell between the rate predicted by the latest theories and tentative measurements taken back in 1997, the last time scientists tried to measure the rate of deuterium fusing with a proton to form helium-3. But most importantly, when they plugged the rate they measured into models that projected Big Bang nucleosynthesis density estimates, it closely matched estimated measurements of the CMB 380,000 years later.



The S factor of the $D(p,\gamma)^3\text{He}$ reaction. Credit: *Nature* (2020). DOI: [10.1038/s41586-020-2878-4](https://doi.org/10.1038/s41586-020-2878-4)

More information: V. Mossa et al. The baryon density of the Universe from an improved rate of deuterium burning, *Nature* (2020). [DOI: 10.1038/s41586-020-2878-4](https://doi.org/10.1038/s41586-020-2878-4)

Journal information: [Nature](https://www.nature.com)
<https://phys.org/news/2020-11-precise-deuterium-fusing-proton-helium-.html>

COVID-19 Research News



Fri, 13 Nov 2020

Chemists discover the structure of a key coronavirus protein

By Anne Trafton

MIT chemists have determined the molecular structure of a protein found in the SARS-CoV-2 virus. This protein, called the envelope protein E, forms a cation-selective channel and plays a key role in the virus's ability to replicate itself and stimulate the host cell's inflammation response.

If researchers could devise ways to block this channel, they may be able to reduce the pathogenicity of the virus and interfere with viral replication, says Mei Hong, an MIT professor of chemistry. In this study, the researchers investigated the binding sites of two drugs that block the channel, but these drugs bind only weakly, so they would not be effective inhibitors of the E protein.

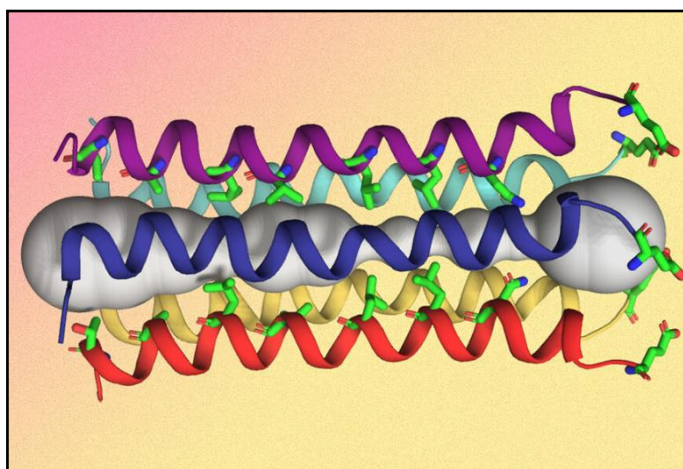
"Our findings could be useful for medicinal chemists to design alternative small molecules that target this channel with high affinity," says Hong, who is the senior author of the new study.

MIT graduate student Venkata Mandala is the lead author of the paper, which appears in *Nature Structural and Molecular Biology*. Other authors include MIT postdoc Matthew McKay, MIT graduate students Alexander Shcherbakov and Aurelio Dregni, and Antonios Kolocouris, a professor of pharmaceutical chemistry at the University of Athens.

Structural challenges

Hong's lab specializes in studying the structures of proteins that are embedded in cell membranes, which are often challenging to analyze because of the disorder of the lipid membrane. Using nuclear magnetic resonance (NMR) spectroscopy, she has previously developed several techniques that allow her to obtain accurate atomic-level structural information about these membrane-embedded proteins.

When the SARS-CoV-2 outbreak began earlier this year, Hong and her students decided to focus their efforts on one of the novel coronavirus proteins. She narrowed in on the E protein partly because it is similar to an influenza protein called the M2 proton channel, which she has previously studied. Both viral proteins are made of bundles of several helical proteins.



This illustration shows the five-helix bundle of the SARS-CoV-2 envelope protein E with a gray water column inside. Credit: Massachusetts Institute of Technology

"We determined the influenza B M2 structure after about 1.5 years of hard work, which taught us how to clone, express, and purify a virus membrane protein from scratch, and what NMR experimental strategies to take to solve the structure of a homo-oligomeric helical bundle," Hong says. "That experience turned out to be the perfect training ground for studying SARS-CoV-2 E."

The researchers were able to clone and purify the E protein in two and half months. To determine its structure, the researchers embedded it into a lipid bilayer, similar to a cell membrane, and then analyzed it with NMR, which uses the magnetic properties of atomic nuclei to reveal the structures of the molecules containing those nuclei. They measured the NMR spectra for two months, nonstop, on the highest-field NMR instrument at MIT, a 900-megahertz spectrometer, as well as on 800- and 600-megahertz spectrometers.

Hong and her colleagues found that the part of the E protein that is embedded in the lipid bilayer, known as the transmembrane domain, assembles into a bundle of five helices. The helices remain largely immobile within this bundle, creating a tight channel that is much more constricted than the influenza M2 channel.

The researchers also identified several amino acids at one end of the channel that may attract positively charged ions such as calcium into the channel. They believe that the structure they report in this paper is the closed state of the channel, and they now hope to determine the structure of the open state, which should shed light on how the channel opens and closes.

Fundamental research

The researchers also found that two drugs—amantadine, used to treat influenza, and hexamethylene amiloride, used to treat high blood pressure—can block the entrance of the E channel. However, these drugs only bind weakly to the E protein. If stronger inhibitors could be developed, they could be potential drug candidates to treat COVID-19, Hong says.

The study demonstrates that basic scientific research can make important contributions toward solving medical problems, she adds.

"Even when the pandemic is over, it is important that our society recognizes and remembers that fundamental scientific research into virus proteins or bacterial proteins must continue vigorously, so we can preempt pandemics," Hong says. "The human cost and economic cost of not doing so are just too high."

More information: Venkata S. Mandala et al. Structure and drug binding of the SARS-CoV-2 envelope protein transmembrane domain in lipid bilayers, *Nature Structural & Molecular Biology* (2020). DOI: [10.1038/s41594-020-00536-8](https://doi.org/10.1038/s41594-020-00536-8)

Journal information: [Nature Structural and Molecular Biology](#) , [Nature Structural & Molecular Biology](#)
<https://phys.org/news/2020-11-chemists-key-coronavirus-protein.html>

