Nov
2021

समाचार पत्रों से चयित अंश
Newspapers Clippings

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

खंड : 46 अंक : 223 09 नवम्बर 2021

Vol. : 46 Issue : 223 09 November 2021

रक्षा विज्ञान पुस्तकालय
Defence Science Library
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SPUTNIK

Tue, 09 Nov 2021

India offers weapons, software to neighbours to tackle rising threats in Indian Ocean

The Indian Navy has been trying to maintain its dominant role in the Indian Ocean as China's economic and diplomatic influence increases. Aside from enhanced diplomatic attentiveness, Narendra Modi's government has also been reaching out to nearby countries to increase defence and security arrangements in the region

By Rishikesh Kumar

Promising to do more than its fair share, India has emphasised the need for countries in the region to cooperate in tackling the newer and rapidly evolving threats in the Indian Ocean.

Harsh Vardhan Shringla, India's Foreign Secretary, urged the navies of 12 of the Western Indian Ocean's 17 other littoral states to promote inter-operability to confront the challenges. The littoral states are those with a coastline on the Western Indian Ocean and comprise (other than India), the Comoros, Djibouti, Iran, Kenya, Madagascar, the Maldives, Mauritius, Mozambique, Oman, Pakistan, the Seychelles, Somalia, South Africa, Sri Lanka, Tanzania, the United Arab Emirates, and Yemen.

"Non-traditional threats and new technologies have combined to form a whole new spectrum of sub-conventional security threats and problems... Another set of challenges arises from geo-political volatilities. A lack of commitment to settled international law has led to increased militarisation of the region," Shringla said at a Goa Maritime meeting on Monday.

Shringla has underlined that the region will face an increasingly complicated, rapidly evolving, and more demanding security situation, with an ever-increasing number of threats and uncertainties.

"We are willing to work with partners in upgrading maritime hardware and software. We have supplied equipment, vessels, and aircraft to friends such as Vietnam, Mozambique, Maldives, Mauritius, Seychelles, Comoros, Bangladesh, and Myanmar," Shringla said.

India has increased its defence collaboration with these countries by providing credit lines to supply weapons and vessels.

In February this year, India's Prime Minister Narendra Modi urged the country's defence manufacturers to focus on countries that are worried about their security in the present geo-political world.

To achieve the ambitious $5 billion export target by 2024, India has listed 156 defence items for sale, including BrahMos supersonic cruise missiles, the Advanced Towed Artillery Gun System, Pinaka multi-barrel rocket launchers, and the Combat Management System.

India supplied HMS-X2 sonars to Myanmar, offshore patrol vessels to Mauritius, and spare parts for Jaguar aircraft to Oman.

Most recently, New Delhi signed a deal to supply Armenia with SWATHI Weapon Locating Radar. India's credit lines to Mauritius, Bangladesh, Myanmar, the Maldives, and Sri Lanka to buy Indian defence equipment are also progressing well.

https://sputniknews.com/20211108/india-offers-weapons-software-to-neighbours-to-tackle-rising-threats-in-indian-ocean-1090559912.html

Hindustan Times

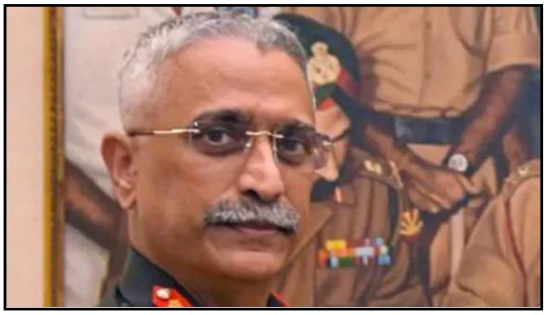
Tue, 09 Nov 2021

Army wants new radar for threat detection along China border

The radar figures on a new list of Make in India projects that the army plans to pursue in partnership with the industry

By Rahul Singh

The Indian Army has sought to equip itself with a modern low-level light-weight radar (LLLWR) for threat detection and response along the China border where surveillance is restricted due to mountainous terrain, officials said on Monday. The terrain provides easy ingress to enemy aircraft, helicopters and unmanned aerial vehicles (UAVs) flying at low altitudes, they said.



Army Chief General Manoj Mukund Naravane. (File photo)

The radar figures on a new list of Make in India projects that the army plans to pursue in partnership with the industry. The list, released by army chief General Manoj Mukund Naravane on Monday, includes surveillance and armed drone swarm, counter-drone systems, infantry weapon training simulator, robotic surveillance platforms, portable helipads and a variety of ammunition.

The army wants a 3D active electronically scanned array radar that has a range of 50 km with tactical control of air defence weapons. To boost self-reliance, the government has notified two lists of 209 defence items that cannot be imported in bans that will be progressively enforced from 2021 to 2025. The LLLWR is among the weapons and systems that cannot be imported.

The radar is required for the northern and eastern borders with China whose army has ramped up military activities in both sectors. India and China have been locked in a border row in Ladakh for more than 18 months, and ongoing military talks to resolve tensions have not resulted in a major breakthrough.

The Defence Research and Development Organisation (DRDO) has also developed an LLLWR named Aslesha Mk I for ground-based surveillance in high altitudes, plains and mountains to detect and track airborne targets.

The Indian Air Force has inducted the Aslesha radar but the army chose not to order it as its requirements were different, the officials said.

There is an urgent need for LLLWR to plug a critical vulnerability along the China border, the officials said.

The army has just inducted the upgraded L-70 anti-aircraft gun, a legacy weapon manufactured by Swedish arms firm Bofors AB, into the eastern sector to tackle aerial threats. This is the first

time the upgraded L-70 gun has been positioned at a high altitude. The upgraded L-70 guns, with a range of 3.5 km, are capable of shooting down aircraft, armed helicopters and UAVs.

India and China have hardened their positions on the Line of Actual Control (LAC) in Ladakh, going by increased military activities on both sides of the boundary, infrastructure development, surveillance and combat manoeuvres by their armies in the midst of the ongoing border standoff, as reported by Hindustan Times on Monday.

Despite two rounds of disengagement at friction points on the LAC this year, the two armies still have 50,000 to 60,000 troops each and advanced weaponry deployed in the Ladakh theatre. In a report released last week, the US defence department said Beijing was taking "incremental and tactical actions to press its claims" at the LAC, despite participating in talks to resolve the crisis.

https://www.hindustantimes.com/india-news/army-wants-new-radar-for-threat-detection-along-china-border-101636385460869.html

Tue, 09 Nov 2021

L&T Construction secures orders from NMDC, DRDO

The construction arm of L&T has secured orders for its businesses in India.

The Metallurgical & Material Handling (MMH) business has been awarded an Engineering, Procurement & Construction (EPC) order for 12 MTPA Dry Circuit Systems on a turnkey basis for a Screening Plant (SP-III) from NMDC Limited at their Kirandul Complex, Chhattisgarh.

The scope of work includes Tertiary Crushing, 2-stage Screening, Stacking, Reclaiming and Dispatch of Iron ore along with the associated Civil, Structural, E&I and other auxiliary facilities.

This plant will be one of the largest Iron Ore Handling plants and aims to ensure uninterrupted Iron Ore supply for different customers of NMDC.

The MMH business has also secured new orders for its Products Business in the mining sector and add on orders from its existing customers.

These orders signify MMH's leadership position and its continued efforts to build customer confidence in this sector.

The Buildings & Factories (B&F) business has secured a prestigious order from DRDO to construct their Flight Control System Facility at ADE, Bengaluru.

The project involves construction of a 1.2 Lakh sq. ft facility consisting of Ground + 6 Floors in an extremely fast track timeline of 4 months.

The project will demonstrate L&T's technological expertise in Modular Offsite Construction with Composite Truss Beam technology that will be used for the Structure. 90% of the building components will be manufactured offsite except for the foundations. The structure will have Composite Structural Steel and the building enveloped with a facade. The interiors comprise 100 mm false flooring and modular wall partitions with false ceilings. The toilets will also be constructed offsite as Fully Finished Toilet PODS (Portable on Demand Storage).

Shares of Larsen & Toubro Limited was last trading in BSE at Rs. 1908.70 as compared to the previous close of Rs. 1888.65. The total number of shares traded during the day was 36399 in over 3536 trades.

The stock hit an intraday high of Rs. 1920.35 and intraday low of 1899.00. The net turnover during the day was Rs. 69479811.00.

https://www.equitybulls.com/admin/news2006/news_det.asp?id=301495

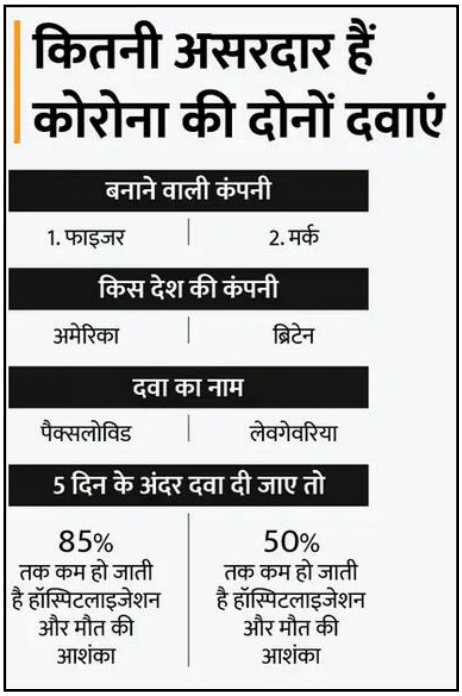
COVID 19: DRDO's Contribution

दैनिक भास्कर

Tue, 09 Nov 2021

भास्कर एक्सप्लेनर: कोरोना मरीजों के लिए अमेरिका-ब्रिटेन में आई दो नई दवाएं, दोनों कैसे काम करती हैं और कितनी इफेक्टिव? जानें सब कुछ

दो नई एंटीवायरल दवाइयां कोरोना के गंभीर मरीजों पर ट्रायल के दौरान काफी इफेक्टिव रही हैं। इनमें से एक को अमेरिकी कंपनी फाइजर और दूसरी को मर्क एंड कंपनी ने बनाया है। दोनों दवाओं पर स्टडी की जा रही है कि क्या ये कोरोना का संक्रमण फैलने से भी रोकती हैं?



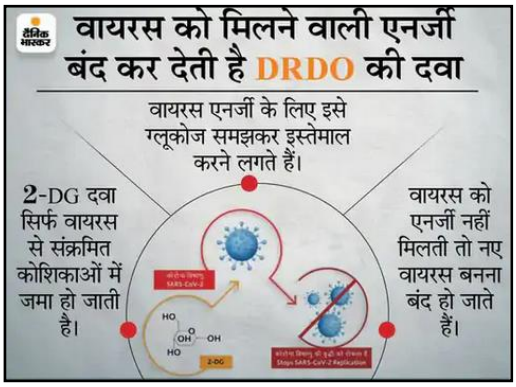
दोनों दवाओं में क्या अंतर है? दोनों में से कौन ज्यादा इफेक्टिव है? ये दवाएं क्यों कोरोना के खिलाफ लड़ाई में अहम हैं? दोनों काम कैसे करती हैं? दोनों की सप्लाई और रेट में क्या अंतर है? आइये जानते हैं ...

दोनों दवाओं में से कौन ज्यादा बेहतर काम करती है?

दोनों दावाओं ने ट्रायल के नतीजे जारी किए हैं। इसके मुताबिक फाइजर की दवा ज्यादा इफेक्टिव है। हालांकि, दोनों कंपनियों की ओर से अभी पूरा डेटा जारी किया जाना बाकी है।

फाइजर ने कहा है कि इस दवा के इस्तेमाल के बाद कोरोना मरीज के हॉस्पिटलाइजेशन या मौत की आशंका बहुत कम होती है। तीन दिन के अंदर अगर दवा का इस्तेमाल होता है तो मौत या हॉस्पिटलाइजेशन की आशंका 89% तक कम हो जाती है। वहीं, अगर लक्षण आने के 5 दिन के अंदर मरीज को दवा दी जाए तो मौत या हॉस्पिटलाइजेशन की आशंका 85% तक कम हो जाती है।

मर्क एंड कंपनी ने अक्टूबर की शुरुआत में अपने ट्रायल के नतीजे जारी किए थे। कंपनी के मुताबिक अगर लक्षण आने के 5 दिन के भीतर उनकी दवा दी जाए तो हॉस्पिटलाइजेशन और मौत की आशंका 50% तक कम हो जाती है। वहीं, तीन दिन के भीतर दवा देने पर कितनी इफेक्टिव है, इसका डेटा कंपनी ने नहीं दिया था।



इन दवाओं को कोई नाम भी दिया गया है क्या?

फाइजर की दवा का ब्रांड नेम पैक्सलोविड दिया गया है। वहीं, मर्क की एंटीवायरल दवा को ब्रिटेन में अप्रूवल मिल चुका है। वहां इस दवा को लेवगेवरियो ब्रांड नेम मिला है।

ये दोनों दवाएं इतनी अहम क्यों हैं?

दुनिया के कई देशों में कोरोना की वैक्सीन लगाई जा रही है। जो कोरोना से बचाव करती हैं। वहीं, जिन लोगों को कोरोना हो जाता है, उनके इलाज के लिए बहुत कम दवाएं हैं। इस वक्त जिन कोरोना मरीजों को अस्पताल में भर्ती करने की जरूरत पड़ रही है, उन्हें एंटीबॉडी ड्रग दिए जा रहे हैं। ऐसे में इन दवाओं की बड़ी उम्मीद पैदा करती है।

दोनों दवाएं कैसे काम करती हैं?

दोनों दवाओं के लिए 5 दिन का कोर्स है। फाइजर की पैक्सलोविड पांच दिन तक तीन टैबलेट सुबह और तीन टैबलेट रात को खानी होती है। वहीं, मर्क की लेवगेवरियो पांच दिन तक 4 टैबलेट सुबह और 4 टैबलेट रात को खानी होती हैं।

फाइजर की दवा प्रोटीन इंहैबिटर डिजाइन पर काम करती है। ये इंहैबिटर उन एंजाइम्स को ब्लॉक कर देते हैं जिनकी मदद से कोरोना का वायरस मल्टिप्लाई होता है। फाइजर की ये दवा रेटोनवीर के साथ दी जाती है। जो पुराना एंटीवायरल है और प्रोटीन इंहैबिटर के लिए उत्प्रेरक का काम करता है। हालांकि, इससे गैस्ट्रोइंटेस्टाइनल साइड इफेक्ट भी हो सकता है।

मर्क की दवा को रिजबैक बायोथेरेप्यूटिक्स के साथ डेवलप की गई है। ये दवा वायरस में रैंडम म्यूटेशन करती है। इसकी वजह से कोरोना के वायरस के लिए खुद को विकसित करना मुश्किल हो जाता है।

कितनी सेफ हैं ये दोनों दवाएं?

अब तक दोनों कंपनियों ने ट्रायल का पूरा डेटा रिलीज नहीं किया है। ऐसे में कोई निश्चित नतीजा नहीं बताया जा सकता है। हालांकि, दोनों ही कंपनियों ने अपनी दवा को सेफ बताया है।

फाइजर ने कहा है कि ट्रायल में शामिल केवल 20% लोगों पर दवा का एडवर्स इफेक्ट हुआ। इनमें से अधिकांश को माइल्ड साइड इफेक्ट हुए। दवा लेने वाले केवल 1.7% लोगों को ही इसके गंभीर साइड इफेक्ट हुए।

वहीं, मर्क ने कहा है कि उसकी दवा लेने वाले 12% मरीजों में इसके एडवर्स इफेक्ट दिखाई दिए। मर्क की इस क्लास की दवा की जानवरों पर हुई स्टडी में जन्म से जुड़ी परेशानियां देखी गई थीं। हालांकि, कंपनी ने कहा है कि इंसानों पर हुई स्टडी में इस तरह की कोई परेशानी नहीं दिखाई दी है। ना ही कैंसर जैसी बीमारी का साइड इफेक्ट हुआ है।

दोनों की सप्लाई की क्या स्थिति है?

फाइजर और मर्क दोनों ने कहा है कि वो सभी देशों को दवा उपलब्ध कराने की कोशिश कर रहे हैं। फाइजर इस साल के अंत तक अपनी थेरेपी के 1 लाख 80 हजार कोर्स का प्रोडक्शन करने की कोशिश में हैं। वहीं, अगले साल कुल 5 करोड़ से ज्यादा कोर्स का प्रोडक्शन करने का टारगेट है।

मर्क ने कहा कि उसे उम्मीद है कि वो साल के अंत तक एक करोड़ कोर्स का प्रोडक्शन कर लेगी। वहीं, अगले साल 2 करोड़ से ज्यादा कोर्स का प्रोडक्शन करने का टारगेट है।

दोनों दवाओं का दाम कितना है?

अमेरिकी सरकार कोरोना की वैक्सीन के साथ ही कोरोना पीड़ितों का इलाज भी मुफ्त कर रही है। ऐसे में अमेरिका में फाइजर की दवा मुफ्त दी जा रही है। अमेरिकी राष्ट्रपति जो बाइडेन ने भी कहा है कि उनकी सरकार फाइजर की इस दवा के दसियों लाख डोज अपने पास सिक्योर किए हैं। वहीं, दूसरे देशों के साथ दाम को लेकर फाइजर और मर्क दोनों का नेगोशिएशन चल रहा है।

मर्क को कोरोना की दवा सप्लाई करने के लिए अमेरिका ने 1.2 बिलियन डॉलर का कॉन्ट्रैक्ट दिया है। इस रकम से अमेरिका को दवा के 17 लाख कोर्स की दवा मिलेगी। यानी, एक कोर्स का दाम करीब 700 डॉलर (करीब 52 हजार रुपए) आएगा।

वहीं, ब्रिटेन ने भी फाइजर की दवा के 2.5 लाख डोज खरीदे हैं। हालांकि, ब्रिटेन ने इसके दाम पब्लिक नहीं किए हैं।

भारत में भी तो DRDO ने कोरोना की दवा बनाई थी उसका क्या हुआ?

छह महीने पहले DRDO ने एंटी कोरोना ड्रग 2-DG लॉन्च की थी। ये दवा फार्मा कंपनी डॉ. रेड्डीज लैबोरेटरीज के साथ तैयार की गई। DRDO के इंस्टीट्यूट ऑफ न्यूक्लियर मेडिसिन एंड एलाइड साइंसेज (INMAS) की लैबोरेटरी में तैयार यह दवा ग्लूकोज का ही एक सब्स्टिट्यूट है। यह संरचनात्मक रूप से ग्लूकोज की तरह है, लेकिन असल में उससे अलग है। यह पाउडर के रूप में है और पानी में मिलाकर मरीजों को दी जाती है।

कोरोना वायरस अपनी एनर्जी के लिए मरीज के शरीर से ग्लूकोज लेते हैं। यह दवा केवल संक्रमित कोशिकाओं में जमा होती है। कोरोना वायरस ग्लूकोज के धोखे में इस दवा का इस्तेमाल करने लगते हैं। इस तरह वायरस को एनर्जी मिलना बंद हो जाती है और उनका वायरल सिंथेसिस रुक जाता है। यानी नए वायरस बनना बंद जाते हैं और बाकी वायरस भी मर जाते हैं।

तो क्या 2-DG सभी मरीजों को दी जा रही है?

इस दवा को केवल इमरजेंसी यूज के लिए अप्रूवल मिला है। फिलहाल इसका इस्तेमाल अस्पताल में भर्ती मरीजों पर ही हो रहा है। 2-DG को बनाने वाली कंपनी डॉक्टर रेड्डीज को दवा का एक्पांडेड ट्रायल करने का अप्रूवल मिल गया है। ट्रायल के नतीजों के बाद ही तय होगा कि क्या ये दवा ऐसे मरीजों को भी दी जा सकती है जो अस्पतालों में भर्ती नहीं हैं।

https://www.bhaskar.com/db-original/explainer/news/coronavirus-new-vaccine-price-know-everything-about-pfizer-paxlovid-and-mercks-antiviral-pill-molnupiravir-129098354.html

Defence News

Defence Strategic: National/International

Press Information Bureau
Government of India

Ministry of Defence

Mon, 08 Nov 2021 7:24PM

Goa Maritime Conclave – 2021

The third edition of Goa Maritime Conclave (GMC) – 2021 is being hosted by the Indian Navy from 07 to 09 November 2021 under the aegis of Naval War College, Goa. The theme for this year's edition of GMC is "Maritime Security and Emerging Non-Traditional Threats: A Case for Proactive Role for IOR Navies", which has been derived keeping in mind the necessity of 'winning everyday peace' in the maritime domain. At the GMC 2021, Indian Navy is hosting Chiefs of Navies/ Heads of Maritime Forces from 12 Indian Ocean Region countries comprising Bangladesh, Comoros, Indonesia, Madagascar, Malaysia, Maldives, Mauritius, Myanmar, Seychelles, Singapore, Sri Lanka and Thailand.

Vice Admiral AK Chawla, Flag Officer Commanding-in-Chief, Southern Naval Command delivered the welcome address by highlighting the importance of the maritime domain and Indian Navy's commitment towards ensuring safety, security, and inclusive growth in the IOR. He reminded all present of the maritime vision of 'SAGAR' (Security and Growth for All in the Region) articulated by Shri Narendra Modi, Hon'ble Prime Minister of India. The Admiral expressed confidence that the discussions during the Goa Maritime Conclave would help foster a shared understanding of the emerging non-traditional threats in the maritime domain and would also help in developing a 'common perspective'.

Delivering the Conclave Address, Shri Ajay Kumar, Defence Secretary brought out that the Goa Maritime Conclave (GMC) was symbolic of India's constructive engagement in the Indian Ocean Region (IOR). Defence Secretary noted that Maritime Security and Economic prosperity were inter-related and inter-dependent from times immemorial. Defence Secretary also highlighted India's engagement and continued efforts towards reaching out to the nations in the region bilaterally and under the framework of IONS, IORA, BIMSTEC, Colombo Security Conclave and other structures. He highlighted the Indian initiative of setting up the Information Fusion Centre for Indian Ocean Region (IFC-IOR) towards fostering better understanding of the maritime domain and sought further support and participation from maritime countries of the IOR.

Dr Ajay Kumar also lauded the Indian Navy for their contribution in fighting the COVID-19 pandemic, adding that it only remained on high vigilance duty safeguarding marine borders but went an extra mile to provide assistance to a large number of IOR littoral nations. Commending the Indian Navy for saving precious lives at sea during cyclones and other natural calamities, he said, Armed Forces, particularly the Navy in the context of seas, has a cardinal role in not only ensuring safe and peaceful sea lanes, but also responding to humanitarian crises in man-made or natural disaster situations. "Indian Navy has and will continue to work for HADR in the region as a first responder and net security provider," he said. He emphasised that India will work with all willing nations for peace in the region. Standing for a rules-bound world, he said that India will continue to oppose attempts of aggression and to deter them on land and the sea. "Maritime domain is so vast and challenges are so diverse that going alone is not an option for practically any country. We welcome all nations which respect rules and shun aggression, to collaborate in our region," he said.

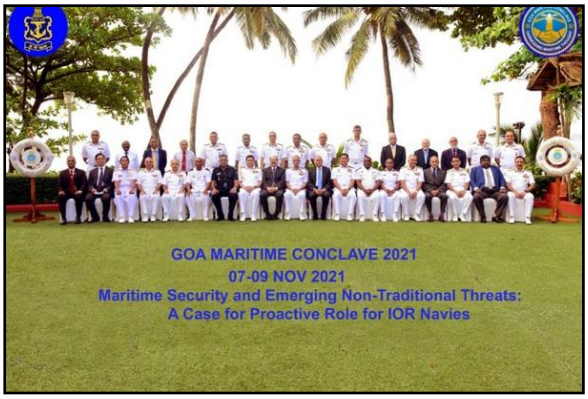
The Keynote Address was delivered by Shri Harsh Vardhan Shringla, Foreign Secretary, who highlighted India's vision of SAGAR and approach to maritime security. He reiterated that maritime transport and logistics are a major component of the Blue Economy and are particularly important for IOR countries. The Foreign Secretary mentioned that half of the world's container ships, one-third of the world's bulk cargo traffic and two-thirds of the world's oil shipments traverse through the IOR. The Secretary brought out that Institutional dialogues between maritime security agencies in partner countries help build relationships and processes that contribute to improvement of security related outcomes. He said that India believes that alleviating suffering is central to reducing insecurity and building trust and confidence in keeping with our philosophy of Vasudhaiva Kutumbakam, or the world is one family.

During day 1 of GMC-21, the following sessions were undertaken with active interaction and constructive deliberations by the delegates.

1. Imperatives for Mitigating Emerging Non-Traditional Threats in Areas Beyond National Jurisdiction in IOR

2. Strengthening Regional Cooperation for Maritime Law Enforcement

3. Leveraging Collective Maritime Competencies to Counter Emerging Non-Traditional Threats.



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Press Information Bureau
Government of India

Ministry of Defence

Mon, 08 Nov 2021 5:22PM

Indian Army organises a webinar on ‘Indian Army Make Projects 2021’

The Indian Army in conjunction with FICCI organised a webinar on ‘Indian Army Make Projects’ on 08 November 2021. This was the sixth such webinar since the inception of the Make process in 2016.

Speaking on the occasion, the Chief of Army Staff, General MM Naravane, emphasised the Government’s initiative of ‘Atmanirbhar Bharat’ and the resultant reforms initiated towards promoting self-reliance in the defence sector. He expressed confidence in the capability of Indian industry to meet the Army’s modernisation requirements indigenously and this was evident from the 36 Make-II projects that the Army was now progressing with the industry.

The Army Chief also highlighted that in the last one year despite the challenges of COVID, the Indian Army had made extraordinary progress. This had resulted in issue of 12 Project Sanction Orders and accordance of an equal number of AoNs. Very niche technologies were now under development within the country. The Make Projects have also been instrumental in enhancing the role of MSMEs in the defence sector with over 40% of the Project Sanction Orders issued to MSMEs and projects amounting to over 1,000 crores reserved for MSMEs.

Delivering the opening remarks, the Deputy Chief of Army Staff (Capability Development and Sustenance), Lt Gen Shantanu Dayal reiterated the Indian Army’s commitment towards ‘Make in India’ with design and development projects with the industry being undoubtedly the preferred mode of acquisition. Be it development of niche technologies or indigenisation of key equipment, the Make process afforded multiple advantages to both the Armed Forces as well as the industry.

Shri SP Shukla, Chairman, FICCI Defence and Aerospace Committee welcomed all the participants and appreciated the stellar role being played by Indian Army in partnering with the private industry in realizing indigenous solutions. Shri Sanjay Jaju, Additional Secretary, Department of Defence Production in his special address, highlighted the indigenisation priorities of the MoD.

During the webinar, the Indian Army unveiled six new ‘Make-II Projects’. The new projects spanned technologies across unmanned systems, technologies to counter such systems as well as emerging solutions for augmenting air defence capabilities. Details of these projects were shared with the Indian Industry by the nodal officers and all queries of the industry on these new projects were deliberated in an interactive session. The Army would now work with the industry to evolve the development dimensions of each project.

A booklet on ‘Army Make Projects 2021’was released on the occasion giving out the current progress of ongoing projects, the new projects being launched along with allied information on the Make Process.

https://pib.gov.in/PressReleasePage.aspx?PRID=1770045

पत्र सूचना कार्यालय
भारत सरकार

रक्षा मंत्रालय

Mon, 08 Nov 2021 5:22PM

भारतीय सेना ने 'भारतीय सेना की परियोजना 2021' पर वेबिनार का आयोजन किया

भारतीय सेना ने फिक्की के साथ मिलकर 08 नवंबर 2021 को 'भारतीय सेना की परियोजनाओं' पर एक वेबिनार का आयोजन किया। 2016 में भारत में निर्माण प्रक्रिया की शुरुआत के बाद से यह ऐसा छठा वेबिनार था।

इस अवसर पर अपने संबोधन में थल सेनाध्यक्ष जनरल एम एम नरवणे ने सरकार की 'आत्मनिर्भर भारत' पहल और रक्षा क्षेत्र में आत्मनिर्भरता को बढ़ावा देने की दिशा में शुरू किए गए सुधारों पर जोर दिया। उन्होंने स्वदेशी रूप से सेना की आधुनिकीकरण की जरूरतों को पूरा करने के लिए भारतीय उद्योग की क्षमता पर भरोसा जताया और यह 36 मेक-II परियोजनाओं से स्पष्ट है कि सेना अब उद्योग के साथ प्रगति कर रही है।

सेना प्रमुख ने इस बात पर भी प्रकाश डाला कि पिछले एक साल में कोविड की चुनौतियों के बावजूद भारतीय सेना ने असाधारण प्रगति की है। इसके परिणामस्वरूप 12 परियोजनाओं के लिए स्वीकृति आदेश जारी किए गए और समान संख्या में एओएन का अनुपालन किया गया। देश के भीतर अब बहुत विशिष्ट प्रौद्योगिकियां विकसित हो रही हैं। देश में निर्माण परियोजनाओं ने रक्षा क्षेत्र में एमएसएमई की भूमिका को बढ़ाने में भी महत्वपूर्ण भूमिका निभाई है। 40% से अधिक परियोजनाओं के लिए स्वीकृति आदेश एमएसएमई को जारी किए गए और एमएसएमई के लिए 1,000 करोड़ से अधिक की परियोजनाएं आरक्षित हैं।

वेबिनार में उद्घाटन भाषण देते हुए डिप्टी चीफ ऑफ आर्मी स्टाफ (क्षमता विकास और पोषण) लेफ्टिनेंट जनरल शांतनु दयाल ने डिजाइन और विकास परियोजनाओं के साथ 'मेक इन इंडिया' के प्रति भारतीय सेना की प्रतिबद्धता को दोहराया, जिसमें उद्योग निस्संदेह अधिग्रहण का पसंदीदा तरीका है। यह विशिष्ट प्रौद्योगिकियों का विकास हो या प्रमुख उपकरणों का स्वदेशीकरण, भारत में निर्माण प्रक्रिया (मेक इन इंडिया) ने सशस्त्र बलों के साथ-साथ उद्योग, दोनों को कई फायदे पहुंचाए।

फिक्की रक्षा और एयरोस्पेस समिति के अध्यक्ष श्री एस पी शुक्ला ने सभी प्रतिभागियों का स्वागत किया और स्वदेशी समाधानों को साकार करने में निजी उद्योग के साथ भागीदारी में भारतीय सेना द्वारा निभाई जा रही शानदार भूमिका की सराहना की। रक्षा उत्पादन विभाग के अतिरिक्त सचिव श्री संजय जाजू ने अपने विशेष संबोधन में रक्षा मंत्रालय की स्वदेशीकरण प्राथमिकताओं पर प्रकाश डाला।

वेबिनार के दौरान, भारतीय सेना ने छह नई 'मेक-2 परियोजनाओं' का अनावरण किया। नई परियोजनाओं में मानव रहित प्रणालियों में प्रौद्योगिकियों, वायु रक्षा क्षमताओं को बढ़ाने के लिए ऐसी प्रणालियों का मुकाबला करने वाले प्रौद्योगिकियों के साथ-साथ उभरते समाधान भी शामिल हैं। इन परियोजनाओं का विवरण नोडल अधिकारियों द्वारा भारतीय उद्योग के साथ साझा किया गया और इन नई परियोजनाओं पर उद्योग के सभी सवालों पर एक संवाद सत्र में विचार-विमर्श किया गया। सेना अब प्रत्येक परियोजना के विकास आयामों को विकसित करने के लिए उद्योग के साथ काम करेगी।

इस अवसर पर 'आर्मी मेक प्रोजेक्ट्स 2021' पर एक पुस्तिका का विमोचन किया गया, जिसमें जारी परियोजनाओं की वर्तमान प्रगति, भारत में निर्माण प्रक्रिया से जुड़ी जानकारी के साथ शुरू की जा रही नई परियोजनाओं की जानकारी दी गई।

https://pib.gov.in/PressReleasePage.aspx?PRID=1770115

THE TIMES OF INDIA

Tue, 09 Nov 2021

Expansionist behaviour in Asia Pacific can spark new arms race, warns defence secretary

By Newton Sequeira

Panaji: Aggressive and expansionist behaviour in the Asia Pacific region can spark a crisis and trigger a fresh arms race, said defence secretary Ajay Kumar here on Monday. In a subtle hint at China, Kumar said that India will oppose attempts of aggression and to deter expansionist moves both on land and the sea.

Kumar, who was speaking at the Goa Maritime Conclave on 'Maritime Security & Emerging Non-Traditional Threats', said that free, open and inclusive oceans are important for all nations to achieve high growth.

"While we talk of non-traditional threats, we cannot ignore the impact of expansion at an unprecedented speed of conventional navy in the Pacific," said Kumar in his address to the naval chiefs and heads of maritime forces from 12 Indian Ocean countries.

"We are also witnessing enhancement of certain maritime presence and passages in our region, which may not be always be innocent. The negative effects of such rapid expansion are felt far beyond the Pacific. Though it is early to conclude, such expansion has potential to trigger others to acquire additional capabilities and thus start a new genre of arms race," said Kumar.

Naval officials and policy makers from Bangladesh, Comoros, Indonesia, Madagascar, Malaysia, Maldives, Mauritius, Myanmar, Seychelles, Singapore, Sri Lanka and Thailand are participating in the Goa Maritime Conclave.

Chief of the Indian Navy, Admiral Karambir Singh echoed the concerns and said it is time to challenge hostile nations that hinder passage or undertake aggressive posturing that threaten overall regional security.

"If there is any action by any country, which is inimical to the free, open and inclusive Indian Pacific or Indian Ocean region, then we have to act. That country has to be called out and said, okay, this is not correct," said Singh while speaking to reporters on the sidelines of the conclave.

He said that the Indian Navy continues to keep a close watch on suspicious vessels operating close to Indian shores in the garb of fishing or scientific research.

China is spying on Indian Naval bases in the Indian Ocean Region (IOR) by deploying surveillance vessels in the Andaman and Nicobar Islands while its fishing vessels have also been fishing in protected waters of other nations, he added.

https://timesofindia.indiatimes.com/india/expansionist-behaviour-in-asia-pacific-can-spark-new-arms-race-warns-defence-secretary/articleshow/87591577.cms

Hindustan Times

Tue, 09 Nov 2021

Army Chief says local technology is a must to win future wars

He said the army was undergoing rapid modernisation and increasingly looking at indigenous solutions for its operational needs

By Rahul Singh

Rooting for increased self-reliance in the defence sector, Army chief General Manoj Mukund Naravane on Monday said only indigenous technologies will be available to the military for full exploitation during conflicts and war-like situations.

File photo: Indian Army Chief General MM Naravane. (ANI)

"Developing indigenous capabilities to confront emerging security challenges and reducing our dependence on borrowed technologies is imperative," Naravane said at a seminar organised jointly by the defence ministry and the Federation of Indian Chambers of Commerce and Industry (FICCI).

He said the industry's enthusiastic participation in the government's Atmanirbhar Bharat (self-reliant India) campaign reaffirmed the country's collective resolve to fight and win future wars with indigenous weapons and equipment.

He said the army was undergoing rapid modernisation and increasingly looking at indigenous solutions for its operational needs. "India has an expanding industrial base and we are confident that most of our core requirements can be realised in-house."

Naravane's comments come at a time when the government is encouraging self-reliance in the defence manufacturing sector through a slew of policy decisions. India has signed contracts and cleared projects worth almost ₹62,000 crore in less than two months to boost military capability with locally produced weapons and systems including transport planes, tanks, helicopters, airborne early warning systems and counter-drone weapons.

The army chief enumerated steps taken by the government for promoting self-reliance, including increasing foreign direct investment (FDI) from 49% to 74%, notifying two lists of 209 weapons/equipment that cannot be imported and creating a separate budget for buying locally-made military hardware.

"These reforms will have a significant impact in times to come. We are privileged to be the agents of this change that has the potential to redefine India as a global hub for manufacturing defence equipment," Naravane said.

Enabling policy measures, swift decision making and accelerating process timelines have induced new confidence in the success of 'Make' projects, he said.

'Make' is a category of capital acquisition in the Defence Procurement Procedure (DPP) and the cornerstone of the Make in India initiative that seeks to build indigenous capabilities through the involvement of both the public and private sectors.

Make-I' refers to government-funded projects while 'Make-II' covers industry-funded programmes.

Another sub-category is 'Make-III' that covers military hardware that may not be designed and developed indigenously, but can be manufactured in the country for import substitution, and Indian firms may manufacture these in collaboration with foreign partners.

"Make-II is undoubtedly going to remain the preferred mode of acquisition for us. The Indian Army is participating in 36 'Make' projects, including 15 projects which are suo moto proposals from the industry," Naravane said.

He released a list of ‘Make’ projects that the industry can participate in. These projects include surveillance and armed drone swarm, counter-drone systems, low-level light radar for surveillance along eastern and northern borders with China, infantry weapon training simulator, robotic surveillance platforms, portable helipads and a variety of ammunition.

“We have to cut down our weapons import bill and eventually tap the export market. The Make in India campaign seeks to take us in that direction,” said former Northern Army commander Lieutenant General BS Jaswal (retd).

On October 15, Prime Minister Narendra Modi said one of the country’s key goals under the Atmanirbhar Bharat campaign was to emerge as one of the most powerful militaries and develop a modern defence industry in the country.

https://www.hindustantimes.com/india-news/army-chief-says-local-technology-is-a-must-to-win-future-wars-101636379640316.html

THE TIMES OF INDIA

Tue, 09 Nov 2021

Top IAF brass to discuss security situation along China border

New Delhi: Amid the ongoing military stand-off with China along the Line of Actual Control, the top brass of the Indian Air Force will review the security situation along the northern borders from Wednesday.

Air Chief Marshal V.R. Chaudhari.

The top brass of the Indian Air Force will sit together from November 10 for three days to discuss the situation on the borders with China and Pakistan during the commanders' conference, IAF officials said.

This would also be the first commanders' conference to be presided over by Air Chief Marshal V.R. Chaudhari who took over as chief on October 1 last month.

The meeting of the top commanders is also taking place soon after the Indian Army and Air Force carried out a major airborne exercise carrying out drills of inserting special forces and airborne troops in high altitude areas in Ladakh.

The Indian forces carried out the drills soon after the Chinese military carried out drills on their side of the LAC.

The conference would be addressed by the Defence Minister and other senior officials of the military and security apparatus.

The Indian Air Force has actively been involved in the stand-off with China as its forward deployments right after the conflict started last year deterred the Chinese from carrying out any type of misadventure there.

The IAF chief had himself also flown sorties in the MiG-29 fighter jets which have been in Forward Area deployment since May-June last year.

https://timesofindia.indiatimes.com/india/top-iaf-brass-to-discuss-security-situation-along-china-border/articleshow/87589859.cms

INDIA TODAY

Tue, 09 Nov 2021

Nepal Army Chief to be conferred with honoury 'General' rank of Indian Army, meet PM Modi during 4-day visit

Nepal Army chief General Prabhuram Sharma will be on a four-day visit to India during which he will be conferred the honorary rank of General in the Indian Army. He is also likely to meet Prime Minister Narendra Modi during his visit to India.

By Abhishek Bhalla

New Delhi: Nepal Army chief General Prabhuram Sharma will be on a four-day visit to New Delhi from November 9 to November 12 during which he will meet Prime Minister Narendra Modi, his Indian counterpart General M M Naravane and other service chiefs to boost bilateral defence ties.

During the visit, Nepal Army chief General Prabhuram Sharma will be conferred the honorary rank of General in the Indian Army in reciprocation of the honour given to Indian Army Chief General MM Naravane during his visit to Nepal in November last year.

The Nepal Army chief will also meet National Security Advisor Ajit Doval, Defence Minister Rajnath Singh, External Affairs Minister S Jaishankar and the three service chiefs and defence secretary Ajay Kumar.

He will also attend an event at the National Defence College where he has attended a course earlier.

Nepal Army chief Prabhuram Sharma will meet National Security Advisor Ajit Doval during his visit to India. (Photo: ANI)

The Nepalese Army Chief's visit takes forward the revival of India-Nepal relations that was achieved when Indian Army Chief Gen Naravane visited the country last year in November.

The diplomatic relations between the two nations had become strained over the construction of a new strategic 80 km road in Uttarakhand to the Lipulekh pass at 17,000 feet on the India-Nepal-China trijunction last year.

There were reports suggesting that China, while taking advantage of the strained relations, made attempts to exert influence in Nepal including land grab in many places at the borders.

Amid all this, China also revived the rail project worth $300 million in Nepal connecting Lhasa to Kathmandu. This came amid the tensions between India and China coupled with a diplomatic row between India and Nepal.

The railway line that is proposed to come till Lumbini, the birthplace of a Lord Buddha, on the India border has, however, not gained much pace since it was first planned in 2008. The next deadline for the ambitious project is 2025.

https://www.indiatoday.in/india/story/nepal-army-chief-india-visit-pm-modi-general-rank-indian-army-1874436-2021-11-08

U.S. Department of Defense

Tue, 09 Nov 2021

Readout of U.S. - India Defense Industry Collaboration Forum Virtual Expo

Department of Defense Spokesperson Jessica Maxwell provided the following readout:

Jesse Salazar, Deputy Assistant Secretary of Defense for Industrial Policy, co-chaired the second Defense Technology and Trade Initiative Industry Collaboration Forum (DICF) Virtual Expo Nov. 8, 2021 8 with his Indian counterpart, Mr. Anurag Bajpai, Joint Secretary (Defence Industries). The virtual expo was held in partnership with the U.S.-India Strategic Partnership Forum (USISPF) and the Society of Indian Defence Manufactures (SIDM).

The DICF, a cornerstone of the U.S.-India Defense Technology and Trade Initiative (DTTI), aims to deepen industrial cooperation between the U.S. and India by identifying opportunities to jointly research, develop, and produce warfighting capabilities. The November 8 DICF virtual expo focused on securing supply chains in critical sectors such as semiconductors and partnering for innovation in emerging domains, such as artificial intelligence and space.

Gregory Kausner, performing the duties of Under Secretary of Defense for Acquisition and Sustainment, delivered recorded opening remarks, and DASD Salazar was joined in the discussion by Mr. Michael Vaccaro, acting Executive Director, International Cooperation, and senior executives from U.S. and Indian companies.

DASD Salazar looks forward to continuing this robust discussion at tomorrow's DTTI group and to hosting a future forum with startups and other industry leaders to deepen the discussions on supply chains and innovation.

https://www.defense.gov/News/Releases/Release/Article/2837908/readout-of-us-india-defense-industry-collaboration-forum-virtual-expo/

i24 NEWS

Tue, 09 Nov 2021

Explainer: Hypersonic weapons, what are they and why does it matter

Ultra fast missiles are upending decades old military calculus, threatening instability and an arms race

By Ash Kline

Several countries are engaged in development of hypersonic missiles, resulting in rising alarm around the world about a potential arms race on a new, ultra fast frontier.

The risk of a traditional nuclear strike has long been deterred by the concept of mutually assured destruction: the idea that both an attacker and a target nation would be demolished following a retaliatory second strike.

However, this assumption is destabilized by the new capabilities of hypersonic projectiles.

These missiles are incredibly fast, versatile, and far harder to detect - limiting the potential for a country to respond to an initial attack.

They travel at over five times the speed of sound, known as Mach five.

When these weapons move at hypersonic speeds, molecules around the missile are altered, either by breaking down, ionizing, or a combination of the two, according to *Popular Mechanics*.

This creates a cloud of plasma, which absorbs radio waves and renders the missile undetectable by radar warning systems, *Military.com* reported.

When paired with this "invisibility cloak" of plasma, the greatest dangers presented by hypersonic weapons lie with their higher speed and maneuverability, features not seen in standard ballistic missiles.

Oscar Sosa/US Navy/AFP, In this handout image released by the US Navy, a hypersonic missile launches from the Pacific Missile Range Facility in Kauai, Hawaii, on March 19, 2020.

While conventional ballistic missiles can also travel beyond the speed of sound, they are generally on a set path once launched, with only a limited range to deviate from their projected flight path. This makes these legacy weapons predictable, a flaw not shared by hypersonic missiles.

There are currently two variations of maneuverable hypersonic weapons driving global concerns - hypersonic boost glide missiles and hypersonic cruise missiles.

Hypersonic boost glide missiles

Hypersonic boost glide missiles are first rocket-propelled on a long, high trajectory similar to ballistic missiles, but when they reenter the atmosphere, after reaching the arc's peak, they are capable of coasting through the sky.

Upon reentry, they use aerodynamic lift to travel vast distances and "boost-glide" without the use of an engine, similar to a hang glider. This grants them additional range, making them far less predictable than traditional ballistic missiles.

Hypersonic cruise missiles

Hypersonic cruise missiles, on the other hand, are powered throughout their entire journey rather than using a gravity assist. They are propelled by a supersonic-combustion ramjet engine, known as a scramjet, to reach speeds of Mach five and beyond.

Rather than arching onto their target in the manner of a ballistic missile, cruise missiles hug low to the ground. Unlike conventional cruise missiles however, the additional thrust of hypersonic engines grants these emerging weapons the speed to take vast zigzagging routes, snaking between a target nation's defense systems.

The technology's incredible capabilities drew attention from the United States, who is keeping an eye on the progress of military rivals.

"Hypersonic weapons are strategic game-changers with the dangerous potential to fundamentally undermine strategic stability as we know it," Maine's US Senator Angus King said, according to *Reuters*.

"The US cannot lag in this development or allow for blind spots as we monitor the progress of our competitors."

https://www.i24news.tv/en/news/technology/1636378377-explainer-hypersonic-weapons-what-are-they-and-why-does-it-matter

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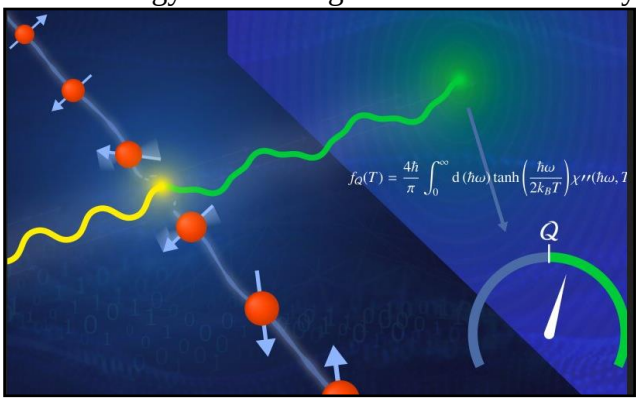
Key witness helps scientists detect 'spooky' quantum entanglement in solid materials

Quantum entanglement occurs when two particles appear to communicate without a physical connection, a phenomenon Albert Einstein famously called "spooky action at a distance." Nearly 90 years later, a team led by the U.S. Department of Energy's Oak Ridge National Laboratory demonstrated the viability of a "quantum entanglement witness" capable of proving the presence of entanglement between magnetic particles, or spins, in a quantum material.



A material's spins, depicted as red spheres, are probed by scattered neutrons. Applying an entanglement witness, such as the QFI calculation pictured, causes the neutrons to form a kind of quantum gage. This gage allows the researchers to distinguish between classical and quantum spin fluctuations. Credit: Nathan Armistead/ORNL, U.S. Dept. of Energy

The team—including researchers from ORNL, Helmholtz-Zentrum Berlin, the Technical University of Berlin, Institut Laue-Langevin, Oxford University and Adam Mickiewicz University—tested three entanglement witnesses using a combination of neutron scattering experiments and computational simulations. Entanglement witnesses are techniques that act as data analysis tools to determine which spins cross the threshold between the classical and quantum realms.

First introduced by John Stewart Bell in the 1960s, entanglement witnesses confirmed that the quantum theory questioned by other scientists had been correct. Bell's technique relied on detecting one pair of particles at a time, but this approach is not useful for studying solid materials composed of trillions and trillions of particles. By targeting and detecting large collections of entangled spins using new entanglement witnesses, the team extended this concept to characterize solid materials and study exotic behavior in superconductors and quantum magnets.

To ensure that the witnesses could be trusted, the team applied all three of them to a material they knew to be entangled because of a previous spin dynamics study. Two of the witnesses, which are based on Bell's approach, adequately indicated the presence of entanglement in this one-dimensional spin chain—a straight line of adjacent spins that communicate with their neighbors while disregarding other particles—but the third, which is based on quantum information theory, fared exceptionally well at the same task.

"The quantum Fisher information, or QFI, witness showed a close overlap between theory and experiment, which makes it a robust and reliable way to quantify entanglement," said Allen Scheie, a postdoctoral research associate at ORNL and a lead author of the team's proof-of-concept paper published in *Physical Review B*.

Because fluctuations in a material that appear to be quantum in nature can be caused by random thermal motion, which only vanishes at absolute zero on the temperature scale, most modern methods cannot distinguish between these false alarms and actual quantum activity. The team not only confirmed the theoretical prediction that entanglement increases as temperature decreases but

also successfully differentiated between classical and quantum activity as part of the most comprehensive QFI demonstration since the technique was proposed in 2016.

"The most interesting materials are full of quantum entanglement, but those are precisely the ones that are the most difficult to calculate," said ORNL neutron scattering scientist Alan Tennant, who leads a project focused on quantum magnets for the Quantum Science Center, or QSC, a DOE National Quantum Information Science Research Center headquartered at ORNL.

Previously, the challenge of quickly identifying quantum materials presented a significant roadblock to the center's mission, which involves exploiting entanglement to develop novel devices and sensors while advancing the field of quantum information science. Streamlining this process with QFI allows QSC researchers to focus on harnessing the power of substances such as rare phases of matter called quantum spin liquids and materials that do not resist electricity called superconductors for data storage and computing applications.

"The power of QFI comes from its connection to quantum metrology, in which scientists entangle multiple quasiparticles to shrink uncertainty and obtain extremely precise measurements," Scheie said. "The QFI witness reverses this approach by using the precision of an existing measurement to determine the minimum number of particles each spin is entangled with. This is a powerful way to reveal quantum interactions, which means that QFI is really applicable to any quantum magnetic material."

Having established that QFI could correctly categorize materials, the team tested a second one-dimensional spin chain, a more complex material featuring anisotropy, which is a property that causes spins to lie in a plane rather than rotating at random. The researchers applied a magnetic field to the spin chain and observed an entanglement transition, in which the amount of entanglement fell to zero before reappearing. They published this finding in *Physical Review Letters*.

To achieve these results, the researchers studied both spin chains using neutron scattering and then analyzed legacy data from experiments conducted decades ago at the ISIS Neutron Source in England and the Institut Laue-Langevin in France along with new data from the Wide Angular-Range Chopper Spectrometer located at the Spallation Neutron Source, a DOE Office of Science user facility operated by ORNL. They also ran complementary simulations to validate the results against idealized theoretical data.

Neutrons, which Tennant describes as "beautifully simple," are an ideal tool for probing the properties of a material because of their neutral charge and nondestructive nature.

"By studying the distribution of neutrons that scatter off of a sample, which transfers energy, we were able to use neutrons as a gauge to measure quantum entanglement without relying on theories and without the need for massive quantum computers that don't exist yet," Tennant said.

According to the team, this combination of advanced computational and experimental resources provided answers about the nature of quantum entanglement originally asked by the founders of quantum mechanics. Scheie expects that QFI calculations are likely to become part of the standard procedure for neutron scattering experiments that could eventually characterize even the most mysterious quantum materials.

More information: A. Scheie et al, Witnessing entanglement in quantum magnets using neutron scattering, *Physical Review B* (2021). DOI: 10.1103/PhysRevB.103.224434

Pontus Laurell et al, Quantifying and Controlling Entanglement in the Quantum Magnet Cs2CoCl4, *Physical Review Letters* (2021). DOI: 10.1103/PhysRevLett.127.037201

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

https://phys.org/news/2021-11-key-witness-scientists-spooky-quantum.html

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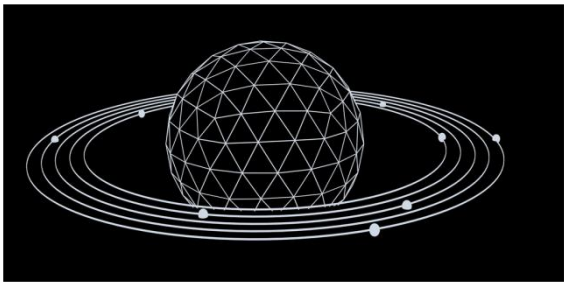
Tue, 09 Nov 2021

Weak coupling shows flaw in strange metal model

By David Nutt

Planckian metals have the potential to power high-temperature superconductors, quantum computers and a host of other next-generation technologies. However, these "strange" metals—in which electrical resistance increases linearly with temperature—are notoriously difficult to study, let alone comprehend.



Credit: CC0 Public Domain

In the last decade, physicists have attempted to explore the inner workings of these quantum materials with cold atom experiments, whereby the behavior of electrons is simulated with neutral atoms, light beams and ultra-cold temperatures. These 2D models provide an analog system that allows experimentalists to see the interactions at more scrutable length and time scales—microns and milliseconds, rather than angstroms and femtoseconds—bringing them ever closer to understanding the materials' unusual electrical functions.

Now, Cornell researchers led by Erich Mueller, professor of physics in the College of Arts and Sciences, have found this experimental model doesn't capture what's really happening inside strange metals at all.

Their paper, "Transport in the Two-Dimensional Fermi-Hubbard Model: Lessons from Weak Coupling," published Oct. 25 in *Physical Review B*. The lead author is doctoral student Thomas Kiely.

"These cold atom experiments are a really awesome way to try and learn about this strange metal behavior, this crazy unusual resistivity, which we believe is the key to understanding how to make higher-temperature superconductors and all sorts of other things," Mueller said. "We found there's actually a simple explanation for what happens in this experiment."

Kiely and Mueller spent two years trying a variety of approaches to model the cold atom experiment. To visualize the experiment, imagine a Go board. The atoms are the black and white stones that can be moved, via quantum tunneling, from square to square, dissipating energy based on the strength of their interactions—or couplings—with other atoms.

The researchers found the most illuminating approach was to change the strength of the interactions between the atoms.

"This gives us a very clear picture of how to describe that system," Kiely said. "When the atoms interact with each other very weakly, we can kind of build in the effective interactions based on the fact that we know what's going on when they're not interacting."

By locating the limit at which these interactions were the weakest, the researchers were able to observe the exotic behavior of strange metals, but, surprisingly, in a context that wasn't strange enough to warrant it. And the behavior still could be quantitatively explained.

"The interpretation of the cold atom experiment was that the same physics that was responsible for these high-temperature superconductors was occurring in these analog experiments, that they had found a strange metal," Mueller said. "What Thomas showed was that although they saw the same thing as in the materials, it's quite likely from a different source. This weakly attracting limit that we modeled is certainly not what's going on in the material."

While the Cornell researchers were able to explain with confidence what is happening in cold atom experiments, they are still not certain what is occurring inside strange metals themselves.

"It's a hard problem," Mueller said. "We're hoping to have a more controlled setting to investigate the same physics, because the models that are being explored with these cold atom experiments probably aren't sophisticated enough to explain what's going on. But I think you can build a lot of great stuff off this, actually looking at this weak coupling limit and how things cross over into strong coupling."

More information: Thomas G. Kiely et al, Transport in the two-dimensional Fermi-Hubbard model: Lessons from weak coupling, *Physical Review B* (2021). DOI: 10.1103/PhysRevB.104.165143

Journal information: *Physical Review B*

https://phys.org/news/2021-11-weak-coupling-flaw-strange-metal.html

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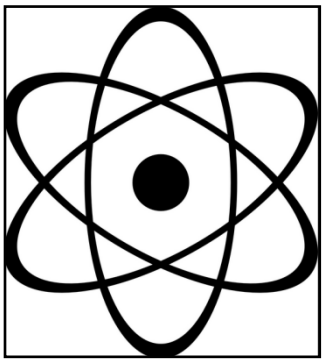
Tue, 09 Nov 2021

New insights into the structure of the neutron

All known atomic nuclei and therefore almost all visible matter consists of protons and neutrons, yet many of the properties of these omnipresent natural building blocks remain unknown. As an uncharged particle, the neutron in particular resists many types of measurement and 90 years after its discovery there are still many unanswered questions regarding its size and lifetime, among other things. The neutron consists of three quarks which whirl around inside it, held together by gluons. Physicists use electromagnetic form factors to describe this dynamic inner structure of the neutron. These form factors represent an average distribution of electric charge and magnetization within the neutron and can be determined by means of experimentation.



Credit: CC0 Public Domain

Blank space on the form factor map filled with precise data

"A single form factor, measured at a certain energy level, does not say much at first," explained Professor Frank Maas, a researcher at the PRISMA+ Cluster of Excellence in Mainz, the Helmholtz Institute Mainz (HIM), and GSI Helmholtzzentrum für Schwerionenforschung Darmstadt. "Measurements of the form factors at various energies are needed in order to draw conclusions on the structure of the neutron." In certain energy ranges, which are accessible using standard electron-proton scattering experiments, form factors can be determined fairly accurately. However, so far this has not been the case with other ranges for which so-called annihilation techniques are needed that involve matter and antimatter mutually destroying each other.

In the BESIII Experiment being undertaken in China, it has recently proved possible to precisely determine the corresponding data in the energy range of 2 to 3.8 gigaelectronvolts. As pointed out in an article published by the partnership in the current issue of *Nature Physics*, this is over 60 times more accurate compared to previous measurements. "With this new data, we have, so to speak, filled a blank space on the neutron form factor 'map', which until now was unknown territory," Professor Frank Maas pointed out. "This data is now as precise as that obtained in corresponding scattering experiments. As a result, our knowledge of the form factors of the neutron will change dramatically and as such we will get a far more comprehensive picture of this important building block of nature."

Truly pioneering work in a difficult field of research

To make inroads into completing the required fields of the form factor 'map', the physicists needed antiparticles. The international partnership therefore used the Beijing Electron-Positron Collider II for its measurements. Here, electrons and their positive antiparticles, i.e., positrons, are allowed to collide in an accelerator and destroy each other, creating other new particle pairs—a process known as 'annihilation' in physics. Using the BESIII detector, the researchers observed and

analyzed the outcome, in which the electrons and positrons form neutrons and anti-neutrons. "Annihilation experiments like these are nowhere near as well-established as the standard scattering experiments," added Maas. "Substantial development work was needed to carry out the current experiment—the intensity of the accelerator had to be improved and the detection method for the elusive neutron had to be practically reinvented in the analysis of the experimental data. This was by no means straightforward. Our partnership has done truly pioneering work here."

Other interesting phenomena

As if this was not enough, the measurements showed the physicists that the results for the form factor do not produce a consistent slope relative to the energy level, but rather an oscillating pattern in which fluctuations become smaller as the energy level increases. They observed similar surprising behavior in the case of the proton—here, however, the fluctuations were mirrored, i.e., phase-shifted. "This new finding indicates first and foremost that nucleons do not have a simple structure," Professor Frank Maas explained. "Now our colleagues on the theoretical side have been asked to develop models to account for this extraordinary behavior."

Finally, on the basis of their measurements, the BESIII partnership has modified how the relative ratio of the neutron to proton form factors needs to be viewed. Many years ago, the result produced in the FENICE experiment was a ratio greater than one, which means that the neutron must have a consistently larger form factor than the proton. "But as the proton is charged, you would expect it to be completely the other way round," Maas asserted. "And that's just what we see when we compare our neutron data with the proton data we've recently acquired through BESIII. So here we've rectified how we need to perceive the very smallest particles."

From the micro- to the macrocosm

According to Maas, the new findings are especially important because they are so fundamental. "They provide new perspectives on the basic properties of the neutron. What's more, by looking at the smallest building blocks of matter we can also understand phenomena that occur in the largest dimensions—such as the fusion of two neutron stars. This physics of extremes is already very fascinating."

More information: Oscillating features in the electromagnetic structure of the neutron, *Nature Physics* (2021). DOI: 10.1038/s41567-021-01345-6

Journal information: *Nature Physics*

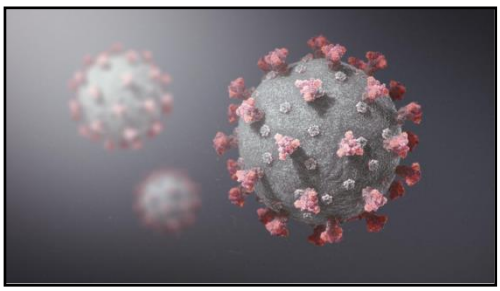
https://phys.org/news/2021-11-insights-neutron.html

Tue, 09 Nov 2021

Study offers insights on why the elderly are more susceptible to COVID-19

New research reveals the cellular mechanism behind why the elderly, as well as those with certain overlapping diseases, are at risk of infection and death from the virus — and how this mechanism can potentially be used to protect them.

PROVIDENCE, R.I. [Brown University] — Among the populations most significantly affected by COVID-19 are the elderly and patients with preexisting medical conditions including diabetes, hypertension, obesity, metabolic syndrome, cardiovascular disease and chronic lung diseases like COPD and asthma.



In a new study published in the journal JCI Insight, Brown University researchers describe the cellular and molecular events that explain why these groups have a higher risk of infection as well as of severe side effects and death.

"This paper details a major discovery in COVID-19," said corresponding author Dr. Jack A. Elias, an immunologist and dean of medicine and biological sciences at Brown. "It shows that levels of a protein called chitinase 3-like-1 increase with age as well as co-morbid diseases and infection. What's more, chitinase 3-like-1 augments SARS CoV-2 infection."

The findings not only answer important questions about key mechanisms of the complex SARS-CoV-2 virus, Elias said, but also have direct implications for the development of therapeutics to control the viral infection.

Elias is part of a National Institutes of Health-funded laboratory that focuses on the cell and molecular biology of lung injury and repair. Researchers in the lab, including lead study author Suchitra Kamle and co-author Chun Geun Lee, have recently focused on the biology of enzymes and enzyme-like molecules, called chitinases and chitinase-like proteins, respectively. Of particular interest is a chitinase-like protein referred to as chitinase 3-like-1, a molecule naturally found in blood.

"We've been studying this gene family here at Brown for a while and we know that it has a large number of biologic effects, as well as tremendously important roles in both health and diseases," said Lee, a professor (research) of molecular microbiology and immunology.

Chitinase 3-like-1 is the cornerstone of a critical pathway that is activated during injury and inflammation. These researchers and others have shown that circulating levels of chitinase 3-like-1 increase during infection, especially in diseases characterized by inflammation and tissue alterations — like emphysema, asthma and COPD, some the same co-morbid diseases that are risk factors for COVID-19.

Interestingly, Lee said, levels of chitinase 3-like-1 have also been shown to increase during normal aging. In fact, they have been reported to be the best predictor of all-cause mortality in people in their 80s.

The researchers thought they might be able to take some of the work they've already done with this gene family and apply it to COVID-19, Elias said. They decided to examine the relationship

between chitinase 3-like-1 and the receptor ACE2, the spike protein to which the SARS-CoV-2 binds to enter human cells.

In a series of studies, the researchers compared the effects of chitinase 3-like-1 on ACE2 as well as on other protease enzymes that metabolize the spike protein and contribute to infection. They examined these interactions in the lungs of mice that were genetically modified to have exaggerated levels of chitinase 3-like-1 as well as mice deficient in chitinase 3-like-1. In the lab, Kamle led experiments that examined the effects of chitinase 3-like-1 on human lung epithelial cells.

The researchers found that levels of chitinase 3-like-1 increased with age, co-morbid diseases and infection. In addition, they noted that chitinase 3-like-1 was a potent stimulator of the receptor that SARS-CoV-2 uses to infect cells.

Spurred by this discovery, the researchers developed a humanized monoclonal antibody called FRG that attacks a particular region of chitinase 3-like-1 — a step that turned out to be critical. They found that this "therapeutic" antibody, as well as another small molecule, powerfully blocked the induction of the ACE2 receptor.

"So in that way, the virus cannot enter into the host system," said Kamle, a Brown investigator in molecular microbiology and immunology as well as antibody engineering. "This means there will be less infection in the presence of this therapeutic FRG antibody."

These findings could pave the way for the development of therapeutics to protect people from infection, Elias said.

"You can imagine a scenario in which someone who has been exposed to a person who has the virus is given the antibody, which then acts like a prophylactic to prevent infection or make the symptoms that the infection induces milder," he said.

Elias described another potential scenario in which the person who has the virus is given the antibody or the small molecule, which halts the infection and effectively "cures" the illness.

"We show in this paper that if we make antibodies or other small molecules that can inhibit chitinase 3-like-1, they can be therapeutics to control viral infection," Elias said.

The team is currently looking at how these antibodies and small molecules react with different variants of the SARS CoV-2 virus, including the infectious delta variant that has recently changed the course of the pandemic.

In addition to Elias, Kamle and Lee, other Brown faculty who contributed to this research included Bing Ma, Chuan Hua He, Bedia Akosman, Yang Zhou, Chang Min Lee, Wafik S. El-Deiry, Kelsey Huntington and Olin Liang.

This work was supported by COVID-19 Research Seed Grant from Brown University, as well as by National Institute of Health grants U01 HL108638, PO1 HL114501,R01 HL115813 and RO1 AG053495, as well as grant USAMRMCW81XWH-17-1-0196 from the U.S. Department of Defense.

https://www.brown.edu/news/2021-11-08/covid-mechanism