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समाचार पत्रों से चयनित अंश
Newspapers Clippings

डीआरडीओ समुदाय को डीआरडीओ प्रौद्योगिकियों, रक्षा प्रौद्योगिकियों, रक्षा नीतियों, अंतर्राष्ट्रीय संबंधों और विज्ञान एवं प्रौद्योगिकी की नूतन जानकारी से अवगत कराने हेतु दैनिक सेवा

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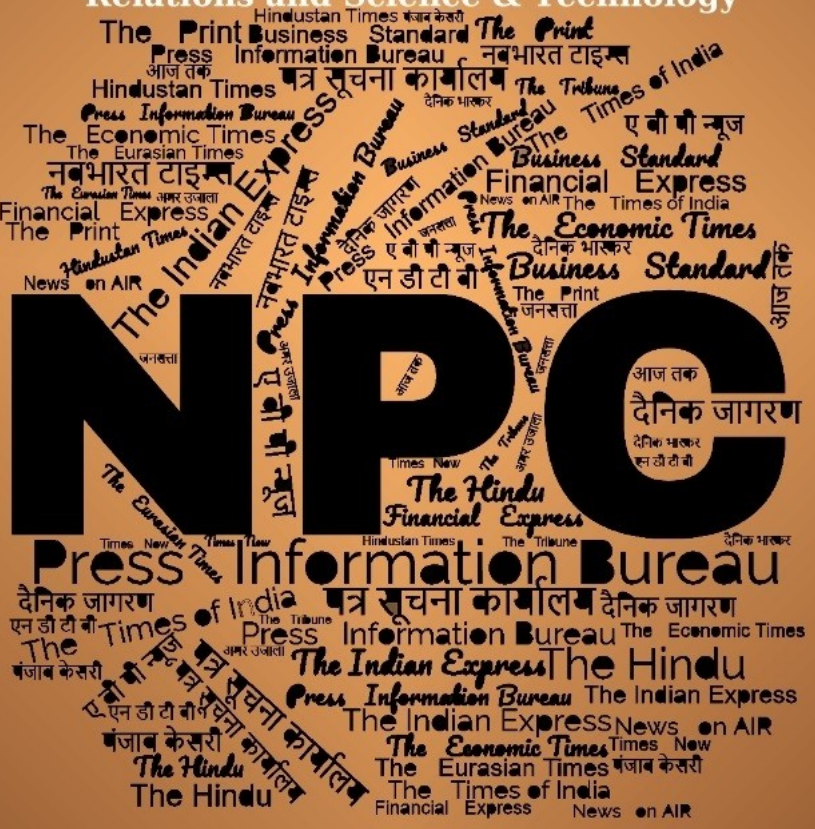

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Defence News

Defence Strategic: National/International

India and Africa: Partnership for the next decade

Source: The Economic Times, Dt. 25 Mar 2025,
URL: https://economictimes.indiatimes.com/news/defence/india-and-africa-partnership-for-the-next-decade/articleshow/119483686.cms

The Manohar Parrikar Institute for Defence Studies and Analyses is organising the fifth India-Africa Strategic Dialogue (IASD) on 'India and Africa: Partnership in the Next Decade' on 25-26 March. Amb Anil Sooklal, High Commissioner of Republic of South Africa to India, delivered the Special Remarks and Shri Dammu Ravi, Secretary (ER), Ministry of External Affairs, Government of India, delivered the Keynote Address on the opening day of the conference

In his Welcome Address, Director General, Manohar Parrikar IDSA, Amb Sujan R. Chinoy noted that amidst growing trade protectionism and self-centered policies, India and Africa can work together to build a values-based future for humankind and build a better global consensus to achieve the UN's Sustainable Development Goals (SDGs).

Chinoy emphasised that India is looking to work with the African countries, as an equal partner, on issues of mutual interests. Beyond IT and educational centers and e-learning, there is potential for deepening our engagement in non-traditional security areas including counter-terrorism, peacekeeping and military training and food and energy security. Piracy and the disruption in the Red Sea are matters of common concern, he added.

India's rich contributions to UN Peace Keeping Operations in Africa, Indian Navy's initiatives for strengthening cooperation with African countries in the maritime domain, and the 'Mutual and Holistic Advancement for Security Across The Regions' (MAHASAGAR) initiative reflect how India-Africa partnership remains anchored in the principles of equality, mutual respect and mutual benefit with direction provided by African priorities. India is invested in Africa's prosperity as envisaged in the African Union's 'Agenda 2063', said Amb Chinoy.

Sooklal, in his Special Remarks, spoke of the historical ties between India and Africa and the need to consolidate on the strong foundation between the two regions by expanding this relationship on all fronts of cooperation. India and Africa need to be more cohesive and reclaim their rightful places on the global stage and amongst the global community of nations, he noted.

Hailing Prime Minister's Modi's landmark speech in Uganda in 2018, outlining India's vision of engagement with Africa, as a concrete step towards enhancing stronger India-Africa ties, Sooklal said that Prime Minister's Modi's vision of Africa are in line with the 'African Union's 'Agenda 2063'.

Describing Africa as the most marginalised continent, Amb Sooklal said that the continent needs to deal with its fault lines and become more cohesive. In India, Africa has a trusted friend and leaders of both the regions should come together to chart a path for the future. He emphasised upon the need to look at the India-Africa partnership in an inclusive manner where the private sector could drive the momentum.

Delivering the Keynote Address, Dammu Ravi, Secretary (ER), Ministry of External Affairs, echoed similar sentiments. He said that India and Africa should work together to build more robust, diverse, and resilient business relations and redefine the parameters of engagement and explore newer sectors for cooperation. India is committed to deepening trade and investments with Africa and increasing knowledge and technology transfer, he added.

Ravi encouraged the use of local currencies, barter system and technology financing as alternatives to boost trade with the African Continent.

Describing security as one of the dimensions of development, Shri Ravi noted that countries forging partnerships with Africa should widen the scope of security by promoting education, capacity building, technology transfer, skill development and food security. India's approach to Africa has always been guided by a deep-rooted commitment to building long-term, mutually beneficial partnerships, he concluded.

The objective of the India Africa Strategic Dialogue is to build on existing partnerships between African countries and India, and to explore new areas of convergence for mutual engagement. The Dialogue brings together more than 20 distinguished experts and policymakers from India and Africa to deliberate on trade, investment, defence and maritime security, multilateral partnerships and energy security.

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Japan backs close security ties with India, South Korea in Indo-Pacific

Source: The Economic Times, Dt. 25 Mar 2025,
URL: https://economictimes.indiatimes.com/news/defence/japan-backs-close-security-ties-with-india-south-korea-in-indo-pacific/articleshow/119478735.cms

Japan has said that it backed close security cooperation with South Korea and India in the Indo-Pacific, days after the Philippines' military chief said a U.S.-backed security group wanted both nations to join to counter China in the region.

Japan's Ministry of Defense said in a statement to Reuters on Monday that it supported building a multi-layered network of alliances in general, and but declined to say whether it has given its consent or made any specific considerations on the expansion of the Squad group.

The Squad is an informal multilateral grouping made up of Australia, Japan, the Philippines, and the United States, focused on defence cooperation, intelligence sharing, and joint military exercises and operations.

"It is important to build networks among allies and like-minded countries organically and in a multi-layered manner, as well as to expand such networks and strengthen deterrence, as Japan faces the most severe and complex security environment since the end of World War II," Japan's Ministry of Defense said.

It added that the ministry "believes that close cooperation among regional partners, including Australia, the Philippines, as well as the Republic of Korea and India is extremely important from the perspective of realizing a 'Free and Open Indo-Pacific', while the Japan-U.S. Alliance remains at its core."

General Romeo S. Brawner, military chief of the Philippines, said at a security forum in New Delhi last week that Squad nations were trying to include India and South Korea in the grouping to counter China. His remarks followed a series of escalating confrontations between Manila and Beijing over the past couple of years in the disputed waters of the South China Sea.

India's defence ministry and South Korea's embassy in India did not respond to a request for comment.

Christopher Elms, the spokesperson of the U.S. Embassy in India, told Reuters last week that, "The United States will continue to work with all of our partners to continue to advance a more secure and prosperous Indo-Pacific region".

Australia's defence ministry did not respond to a request for comment.

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India's 65 pc of defence equipment made domestically; 'Made in Bihar' boots used by Russian army

Source: The Economic Times, Dt. 25 Mar 2025,
URL: https://economictimes.indiatimes.com/news/defence/indias-65-pc-of-defence-equipment-made-domestically-made-in-bihar-boots-used-by-russian-army/articleshow/119493272.cms

India's diverse export portfolio includes bulletproof jackets, Dornier (Do-228) aircraft, Chetak helicopters, fast interceptor boats, and lightweight torpedoes.

New Delhi: Sixty-five per cent of defence equipment is now manufactured domestically, a "significant shift" from the earlier 65-70 per cent import dependency showcasing India's self-reliance in the sector, the government has said. India's defence production has grown at an "extraordinary pace" since the launch of 'Make in India' initiative, reaching a record Rs 1.27 lakh crore in 2023-24, according to a fact sheet shared by the Ministry of Defence on Tuesday.

India's diverse export portfolio includes bulletproof jackets, Dornier (Do-228) aircraft, Chetak helicopters, fast interceptor boats, and lightweight torpedoes. "Notably, 'Made in Bihar' boots are now part of the Russian Army's gear, highlighting India's high manufacturing standards," the ministry said.

"Once dependent on foreign suppliers, the country now stands as a rising force in indigenous manufacturing, shaping its military strength through homegrown capabilities. This shift reflects a strong commitment to self-reliance, ensuring that India not only meets its security needs but also builds a robust defence industry that contributes to economic growth," it said.

According to the fact sheet dated March 24, "India targets Rs 3 lakh crore in defence production by 2029", reinforcing its position as a global defence manufacturing hub.

This growth has been bolstered by the 'Make in India' initiative, which has enabled the development of advanced military platforms including the Dhanush Artillery Gun System, Advanced Towed Artillery Gun System, Main Battle Tank Arjun, Light Combat Aircraft Tejas, Advanced Light Helicopter, Akash Missile System, Weapon Locating Radar, as well as naval assets like destroyers, indigenous aircraft carriers, submarines and offshore patrol vessels, officials said.

Foreign direct investment (FDI) in the defence sector was liberalised in September 2020 to attract foreign investment, allowing up to 74 per cent FDI through the automatic route and above 74 per cent through the government route.

Since April 2000, the total FDI in defence industries stands at Rs 5,516.16 crore, the officials said.

On the 'Make in India' initiative, the ministry said strategic policies have fuelled this momentum, encouraging private participation, technological innovation, and the development of advanced military platforms.

The surge in the defence budget, from Rs 2.53 lakh crore in 2013-14 to Rs 6.81 lakh crore in 2025-26, underlines the nation's determination to strengthen its military infrastructure, it said.

This commitment to self-reliance and modernisation is reflected in the recent approval by the Cabinet Committee on Security for the procurement of the Advanced Towed Artillery Gun System (ATAGS), a significant step in enhancing the Army's firepower, the ministry said.

"The deal includes 307 units of 155mm/52 caliber guns along with 327 High Mobility 6x6 Gun Towing Vehicles, equipping 15 Artillery Regiments under the Buy Indian-Indigenously Designed, Developed, and Manufactured (IDDM) category, at an estimated cost of Rs 7,000 crore," it said.

Developed by the DRDO with Bharat Forge and Tata Advanced Systems, ATAGS is a cutting-edge artillery system with an over 40-km range, advanced fire control, precision targeting, automated loading, and recoil management, thoroughly tested by the Indian Army in all terrains.

"With modern warships, fighter jets, artillery systems, and cutting-edge weaponry being built within the country, India is now a key player in the global defence manufacturing landscape," the ministry said.

Also, "65 per cent of defence equipment is now manufactured domestically, a significant shift from the earlier 65-70 per cent import dependency, showcasing India's self-reliance in defence," it said.

India's robust defence industrial base includes 16 Defence PSUs, over 430 licensed companies, and approximately 16,000 MSMEs, strengthening indigenous production capabilities, according to the fact sheet.

The private sector plays a crucial role, contributing 21 per cent to total defence production, fostering innovation and efficiency, it said.

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Why $500 Kamikaze drones are India's secret weapon against $10 million war machines

Source: The Economic Times, Dt. 25 Mar 2025,
URL: https://economictimes.indiatimes.com/news/defence/kamikaze-drones-vs-tanks-why-500-kamikaze-drones-are-indias-secret-weapon-against-10-million-war-machines/articleshow/119477896.cms

Loitering munitions—often called "kamikaze drones"—are fundamentally changing modern combat. These weapons, which hover over targets before striking with pinpoint accuracy, have combined the surveillance capabilities of UAVs with the lethal precision of guided missiles. Unlike traditional missiles, they do not simply follow a predetermined trajectory; they loiter, track, and strike at the opportune moment. The result is a weapon that delivers intelligence and destruction in one seamless operation.

Autonomous UAVs take this a step further. Equipped with artificial intelligence, these drones can execute complex missions with minimal human intervention, making them faster and more effective than traditional attack systems. The impact of these technologies is already visible across global conflicts, where they are proving to be game-changers.

Kamikaze Drones vs. Tanks: A Testbed for Drone Warfare

The battlefield reality is clear—loitering munitions are now indispensable. In Ukraine, Russia's Lancet-3 drones, with a range of 40 km and a 40-minute endurance, have been systematically targeting Ukrainian artillery. Ukraine, in response, has used U.S.-supplied Switchblade drones and its own RAM II systems to counter Russian advances.

In the Middle East, Israel has relied on Harop loitering munitions, capable of carrying a 23 kg payload, to conduct precision strikes. Meanwhile, Iran's Shahed-136 drones, used extensively by Russia, have proven that cheap, mass-produced drones can overwhelm even sophisticated air defence systems.

Lt Gen Dhiraj Seth, Southern Army Commander, highlighted these lessons in a recent seminar on air defence operations, stating, "Low-cost drones and loitering munitions have emerged as critical force multipliers in modern conflicts, as evident in the ongoing Russia-Ukraine war." He pointed out how Russia's use of Iranian-made Shahed drones to target Ukraine's infrastructure and Ukraine's successful deployment of Turkish Bayraktar TB2 drones have demonstrated the effectiveness of these technologies.

"The war has demonstrated how inexpensive drones and loitering munitions have become crucial assets. A single $500 drone can destroy a $10 million tank—an astounding cost ratio of 20,000:1," Seth said. "This reinforces the urgent need for robust counter-drone systems, including electronic warfare tools, kinetic interceptors, and directed-energy weapons."

He further stressed the urgent need for robust counter-drone systems, including electronic warfare tools and directed-energy weapons, to mitigate these threats.

India's Growing Drone Arsenal

India is taking these battlefield lessons seriously. The Indian Army has been actively building its own fleet of loitering munitions and autonomous drones, emphasising indigenous development.

The SkyStriker drone, already in service, has a range of 500 km and is designed for Suppression of Enemy Air Defences (SEAD). More recently, India inducted the Nagastra-1 in 2024, a tactical drone with a 15 km range and a 1 kg warhead, specifically designed for high-altitude warfare, particularly along the India-China border.

Private companies and research institutions are also stepping up. In March 2022, ZMotion Autonomous Systems successfully tested three loitering munitions in Ladakh, demonstrating their effectiveness at 40% lower costs than imported alternatives. Tata Advanced Systems' ALS-50, a vertical takeoff and landing (VTOL) drone that transitions to fixed-wing mode, has also completed successful trials at Pokhran.

Swarm Warfare and AI-Powered Combat

The future of drone warfare isn't just about individual units—it's about swarms. In 2021, India's Army demonstrated its capability with a 75-drone swarm, executing coordinated attacks over a 50 km range. By 2023, NewSpace Research & Technologies delivered an even more advanced system: a swarm of 100 drones designed for battlefield deployment.

Research is now focusing on AI-driven drones capable of detecting enemy assets through acoustic sensors, mimicking similar advancements seen in Ukraine. The National Aerospace Laboratories is also working on a stealthy, long-range loitering munition weighing 150 kg, designed to strike targets 900 km away with an endurance of 6–9 hours.

The Economics of Drone Warfare

Despite significant progress, India still faces a cost challenge. Indigenous drones are cheaper than Israeli models but remain costlier than Russian and Iranian equivalents. The pressure is now on Indian defence firms to drive innovation and affordability.

Meanwhile, Western manufacturers are also advancing their capabilities. In the U.S., Cummings Aerospace recently tested the Hellhound S3, a turbojet-powered loitering munition designed for long-range strikes. The drone, which reached speeds of 384 mph in trials, combines 3D printing with commercial components to reduce costs. Sheila Cummings, CEO of Cummings Aerospace, stated, "Hellhound's performance at AEWE 2025 highlighted a fundamental reality—speed matters. While quadcopters and propeller-driven drones will still be puttering along behind friendly lines, Hellhound will already be over the target area."

India's Defence Industry: Aiming for Self-Reliance

The broader picture for India's military modernisation is promising. The Ministry of Defence recently announced that 65% of India's defence equipment is now manufactured domestically—a significant shift from an earlier 70% import dependence.

Defence production hit a record Rs 1.27 lakh crore in 2023-24, marking a 174% increase from a decade ago. With defence exports also surging to Rs 21,083 crore, India aims to reach Rs 50,000 crore in exports by 2029. The government's focus is clear: indigenous development, private sector participation, and rapid technological advancement. Initiatives like iDEX and SAMARTHYA are driving AI innovations in defence technology. Over 14,000 items have been indigenised under the SRIJAN scheme, with startups and MSMEs playing a key role in boosting India's self-reliance.

This shift is evident in major procurement decisions. The Cabinet Committee on Security recently approved the purchase of 307 Advanced Towed Artillery Gun Systems (ATAGS), developed by DRDO in collaboration with Bharat Forge and Tata Advanced Systems. These next-generation artillery systems, with a range of over 40 km and advanced automation, will significantly boost India's firepower.

The focus on innovation is further reinforced by the government's iDEX initiative, which has engaged over 600 startups and MSMEs to develop cutting-edge military technologies. The SRIJAN scheme has indigenised over 14,000 defence components, reducing dependency on foreign suppliers.

Challenges and the Road Ahead

Despite these advancements, India faces challenges in competing with ultra-low-cost drone production in Russia and Iran. While domestic drones are cheaper than their Israeli counterparts, they remain costlier than Russian and Iranian models, prompting private firms to innovate further.

Looking ahead, India is exploring AI-driven autonomy for UAVs, with drones equipped with acoustic sensors to detect enemy assets—an approach already seen in Ukraine's battlefield innovations. The National Aerospace Laboratories has also proposed a 150 kg stealthy loitering munition with a 900 km range and endurance of up to nine hours, aiming to rival global systems.

As tensions simmer along India's borders, its investment in drone warfare is more than just a technological leap—it is a strategic imperative. With an unwavering focus on indigenous capability and operational superiority, India is not just preparing for future conflicts. It is actively shaping the future of warfare.

The Future of Indian Aerial Warfare

As geopolitical tensions rise, India's investments in drone warfare are not just strategic—they are essential. The integration of AI, swarm technology, and long-range loitering munitions will ensure that India remains at the cutting edge of modern warfare.

Lt Gen Seth summed it up best: "We have transitioned from conventional airstrikes by manned aircraft to an era dominated by unmanned systems, precision-guided munitions, loitering drones, and hypersonic missiles. The wars of the future will be defined not just by air superiority but also by air denial."

In this rapidly evolving landscape, one thing is certain: India is not just preparing for the future—it is already in flight.

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Mega Rs 45,000 crore desi 156 combat helicopter deal likely to get Cabinet nod soon

Source: ANI News, Dt. 25 Mar 2025,
URL: https://www.aninews.in/news/national/politics/mega-rs-45000-crore-desi-156-combat-helicopter-deal-likely-to-get-cabinet-nod-soon20250325200839/

The Union Cabinet is likely to soon give its nod for a deal to acquire 145 Light Combat Helicopters for the Indian Army and Air Force from Hindustan Aeronautics Limited.

The Defence Ministry is strong pushing the case for buying these choppers for operations along the China and Pakistan borders and would be a major step towards creating jobs and expanding aerospace ecosystem within the country," defence sources told ANI.

Prachand LCH of Indian Air Force

Hindustan Aeronautics Limited (HAL) had received the tender for 156 Light Combat Helicopters (LCH) in June last year and the project is ready for final clearance after negotiations, they said.

Of the 156 Light Combat Helicopter 90 would be for the Indian Army while 66 would be for the Indian Air Force. The IAF is the lead agency for this joint procurement, they said.

The LCH, which is also known as the Prachand, is the world's only attack helicopter that can land and take off at an altitude of 5,000 meters (16,400 ft), which makes it ideal to operate in the high-altitude areas of the Siachen glacier and Eastern Ladakh.

The Prachand is also capable of firing a range of air-to-ground and air-to-air missiles and can destroy air defence operations of the enemy.

The government has been emphasising the intention to go for self-reliance in defence manufacturing through Make in India as part of Atmanirbhar Bharat initiatives. The government

has placed the biggest order for indigenous defence systems including the 83 Light Combat Aircraft and is in the process of ordering 97 more for which the negotiations have been concluded.

The Cabinet Committee on Security recently cleared the deal for 307 ATAGS howitzers and the deal for it is scheduled to be signed on Wednesday this week. The Rs 7,000 crore deal is divided between two companies including Bharat Forge and Tata group.

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India, China hold diplomatic talks in Beijing on border row, bilateral ties

Source: Business Standard, Dt. 25 Mar 2025,
URL: https://www.business-standard.com/external-affairs-defence-security/news/ndia-china-hold-diplomatic-talks-in-beijing-on-border-row-bilateral-ties-125032501150_1.html

India and China on Tuesday agreed to work together to make "substantial preparation" for the next meeting of their Special Representatives (SR) on the boundary question that is set to be held in the national capital later this year.

The decision was taken at a fresh edition of talks held in Beijing under the framework of Working Mechanism for Consultation and Coordination on India-China Border Affairs (WMCC).

The Ministry of External Affairs (MEA) said the WMCC meeting was held in a "positive and constructive atmosphere" and both sides "comprehensively" reviewed the situation along the Line of Actual Control.

"The two sides agreed to work together to make substantial preparation for the next meeting of the Special Representatives (SR), which will be held in India later this year," it said in a statement.

The MEA said peace and tranquillity on the border are critical for the smooth development of overall bilateral relations.

"The two sides explored various measures and proposals to give effect to the decisions taken during the 23rd meeting of the Special Representatives on the India-China boundary question in Beijing in December 2024 and to advance effective border management," it said.

The Indian readout said the two sides agreed to maintain and strengthen relevant diplomatic and military mechanisms towards this end.

"They also exchanged views on early resumption of cross-border cooperation and exchanges, including on trans-border rivers and Kailash-Mansarovar Yatra," the MEA said.

The Indian delegation at the talks was led by Gourangalal Das, Joint Secretary (East Asia) in the MEA.

The Chinese delegation was led by Hong Liang, Director General of the Boundary and Oceanic Affairs Department of the Chinese Ministry of Foreign Affairs.

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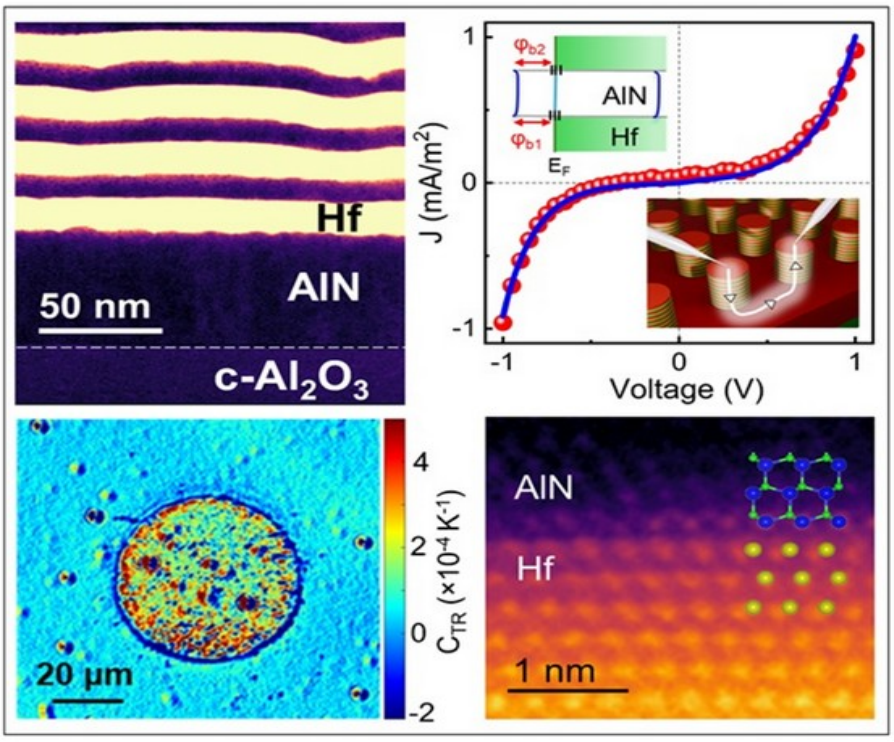
Science & Technology News

Breakthrough in Thermionic Emission with Metal/Semiconductor Superlattices

Source: Press Information Bureau, Dt. 25 Mar 2025,
URL: https://pib.gov.in/PressReleasePage.aspx?PRID=2114875

A groundbreaking advancement in thermionic emission, the process in which electrons escape from a material's surface due to thermal energy, could revolutionize next-generation electronic and energy conversion technologies.

Thermionic emission, the process where electrons are emitted from a heated metal surface, called a cathode, when the metal's thermal energy overcomes the attractive forces holding electrons to the surface, is a fundamental principle behind vacuum electronics, thermoelectric devices, and energy harvesting systems. However, practical applications of thermionic emission in several energy conversion devices have been hindered by the unavailability of materials, high operational temperatures, and inefficient charge transport.



Electron microscope image of newly developed Hf/AlN superlattice and electrical measurement data are presented

To address these challenges, Prof. Bivas Saha and his team at the Jawaharlal Nehru Centre for Advanced Scientific Research (JNCASR), Bangalore, an autonomous institute under the Department of Science & Technology (DST), Government of India have engineered artificially structured defect-free single-crystalline elemental metal/compound semiconductor superlattices

that harness interfacial engineering and leads to thermionic emission. Such engineered metamaterials lead to efficient electron transport and also utilize quantum properties of electrons.

Their pioneering research, published recently in the journal Advanced Materials, introduces a novel approach to enhancing electron emission using artificially structured single-crystalline elemental metal/ compound semiconductor superlattices.

This first-of-its-kind demonstration of controlled thermionic emission using engineered superlattices holds immense promise for thermoelectric energy converters, high-power vacuum electronics, and next-generation semiconductor applications.

"Our research redefines thermionic emission physics by leveraging quantum-engineered materials. These superlattices offer unprecedented control over electron transport, unlocking new possibilities for high-efficiency energy and electronic technologies," emphasised Prof. Saha.

Supported by the Department of Science & Technology (DST), Government of India, this research aligns with the national mission to advance high-tech materials, semiconductor research, and self-reliance (Atmanirbhar Bharat) in cutting-edge technology. The research places India at the forefront of next-generation nanotechnology and material science innovations.

Building on these findings, the research team is focused on refining superlattice architectures for industrial-scale applications, particularly in solid-state energy harvesting and high-temperature electronics. With global demand for energy-efficient and high-performance electronic systems rising, this innovation could serve as a cornerstone for future technological advancements.

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Quantum Startup: QNu Labs working to build and deploy world's first end-to-end quantum- safe heterogeneous network

Source: Press Information Bureau, Dt. 25 Mar 2025,
URL: https://pib.gov.in/PressReleasePage.aspx?PRID=2114874

Incubated at IIT Madras Research Park in 2016, QNu Labs is revolutionizing cybersecurity with quantum-safe solutions, positioning India as a global leader in quantum cryptography. In 2018, QNu launched QKD (Quantum Key Distribution), placing India on the global quantum map.

The journey of the deeptech startup has been an eventful one. In 2022, it won the iDEX Open Challenge 2.0, successfully developing a 150-km QKD system with trusted nodes, completing trials with the Army. Under the NSCS grant, it built a Hub-and-Spoke QKD network and received first large order from Indian Armed Forces for building quantum secure wireline networks using already laid optical fibres. In 2023, QNu solved the problem of security over wi-fi links by bringing in Quantum secure VPN solution using its QRNG product and NIST shortlisted PQC algorithm. This paved way for securing wireless networks using QVPN solution at MCEME and MCTE in 2023-24. In 2024, QNu delivered 25 QKD systems to the Indian Navy, marking a significant milestone in quantum secure communication in India.

The startup offers cutting-edge quantum-safe products --Tropos (QRNG), a Quantum Random Number Generator positioned as the new 'Root of Trust' for all the solutions and has been commercialized with delivery to DRDO and WESEE for critical applications and to Indian Army for quantum safe wireless solutions; Armos, a Quantum Key Distribution (QKD) solution, delivered to a Middle Eastern client, Defence PSU BEL, the Indian Navy, and recently secured a significant order from the Indian Army; QShield, the quantum-secure SaaS platform, with fours services which are already being used by several clients.

Selected as one of the startups under the National Quantum Mission (NQM), QNu Labs aims to build and deploy a Quantum Communication Network that is Made in India, Made for the World with the world's first end-to-end quantum- safe heterogeneous network. This network will integrate free-space QKD, indigenous components like SPD and encryptors, QHSM, and a software-defined QKD controller, showcasing India's leadership in cutting-edge quantum communication technologies.

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Union minister Jitendra Singh says Rs 1,000-crore funding scheme to support space sector startups

Source: The Economic times, Dt. 25 Mar 2025,
URL: https://economictimes.indiatimes.com/news/science/union-minister-jitendra-singh-says-rs-1000-crore-funding-scheme-to-support-space-sector-startups/articleshow/119491056.cms

The Rs 1,000 crore funding scheme for space startups with help the sector grow in India in coming years, a senior minister in the Prime Minister Narendra Modi government Monday said.

"The biggest testimony testimony of the government has been its work. Even in the first 100 days of the Prime Minister Narendra Modi 3.0 government, we had Rs 1,000 crore allocated for the space startups," Jitendra Singh, Minister of State (independent charge) for Science & Technology, Department of Atomic Energy, Department of Space, and Minister of State in the Prime Minister Office, said at the eighth edition of the ETTelecom 5G Congress 2025.

ET Telecom, a telecom and technology focused vertical of The Economic Times organised day-long conference with support from the Department of Telecommunications and London-based GSMA in the national capital. The Rs 10,000 crore corpus will be managed by SIDBI Venture Capital Limited, which aims to support space technology startups in scaling up and becoming globally competitive, while addressing the challenge of risk capital.

The fund will deploy the amount over a period of five years, with Rs 150 crore deployment earmarked for 2025-26 financial year, followed by Rs 250 crore each in the next three financial years, and Rs 100 crore in 2029-30. Singh said despite India being a late entrant into the space sector, the country today has taken a lead today.

"For the Department of Space, the budgetary allocation has increased from Rs 5,615 crore to Rs 13,416 crore, which is 138% more. This is only the contribution of the government. The pool is

much larger because we have opened up the space sector," he said. The Indian Space Policy, approved in April 2023, aims to boost the Indian space economy by encouraging private sector participation, focusing on research and development activities and providing access to public sector infrastructure and expertise.

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Quantum Computing Breakthrough Achieved With Diamond Qubits

Source: SciTech Daily, Dt. 25 Mar 2025,
URL: https://scitechdaily.com/quantum-computing-breakthrough-achieved-with-diamond-qubits/

Scientists at QuTech have achieved a major milestone in quantum computing by creating highly precise quantum gates on a diamond chip, hitting error rates as low as 0.001%. By using ultra-pure diamonds and advanced gate designs, the team overcame key challenges that have limited previous approaches. These precise gates passed rigorous testing with long sequences of operations, marking a significant step toward building scalable quantum computers.

Why Quantum Computers Need Ultra-Precise Gates

Quantum computers are expected to tackle complex problems that are beyond the reach of classical computers. To perform calculations, they rely on sequences of basic operations known as quantum gates. For a quantum computer to work reliably, these gates must be extremely precise. The chance of an error occurring during each gate operation needs to be very low, typically below 0.1 to 1 percent. Only at these low error rates can quantum error correction techniques function effectively, allowing accurate computation even when using imperfect hardware.

Spins in Diamond: A Promising Qubit Platform

One promising type of qubit is based on spins in diamond. These qubits use the electron and nuclear spins associated with atomic defects in the diamond lattice, for example, when a nitrogen atom takes the place of a carbon atom. These defects offer several advantages: they can operate at relatively high temperatures (up to 10 Kelvin), are well-shielded from environmental noise, and naturally interact with photons, making them ideal for building quantum networks. However, until recently, achieving a full set of quantum gates with sufficiently low error rates using diamond spins has remained a significant challenge.

Precise Universal Gates on Diamond Chips

Researchers at QuTech, the interfaculty quantum technology research institute of Delft University of Technology, have now demonstrated a highly precise universal set of quantum gates using a diamond quantum chip. The researchers used a system of two qubits, one formed by the electron spin of the defect center, the other by its nuclear spin. Each type of gate in this two-qubit system operates at an error below 0.1%, and the best gates even reach errors as low as 0.001%.

"To realize such highly precise gates we had to systematically remove sources of errors. The first step was to use ultrapure diamonds that have a lower concentration of carbon-13 isotopes as these

cause noise," says Hans Bartling, lead author. The second key step was to design gates that carefully decouple the spin qubits from each other and from interactions with the remaining noise in the environment.

Characterizing, Optimizing, and Testing the Quantum Gates

A final challenge was to find tools to reliably characterize the gates and optimize their parameters. For this, the team turned to a method called 'gate set tomography', which provides the full quantum description of the gates. "It was essential that our characterization provided complete and precise information about the gate errors, as this enabled us to systematically find imperfections and optimize all the gate parameters," says co-author Jiwon Yun.

Ultimately, the researchers put the quantum gates and their characterization to the test by performing an artificial algorithm with a large sequence of gates. After 800 gate operations the result could be accurately predicted from the team's knowledge of the individual gates, indicating that the gate operations were now both precise and well understood.

Scaling Up: Challenges on the Road to Full Quantum Power

While high-precision universal gates are a key prerequisite towards quantum computation, there is still a long way to go to large scale computation. "Our demonstration was on a two-qubit system and using a particular type of defect," says Tim Taminiau who supervised the research. "A key challenge is to maintain and further improve the gate quality when moving to chip-scale integrated optics and electronics and scaling to many more qubits."

Realizing such larger processors is the focus of the research effort at QuTech and of its collaboration with Fujitsu. The team takes a full stack approach, in which not only improved quantum bits are studied, but also the required control electronics, scalable fabrication methods, and new types of quantum computer architectures. "Making the next big step will require bringing together scientists, engineers, and industry," says Taminiau.

Reference: "Universal high-fidelity quantum gates for spin qubits in diamond" by H.P. Bartling, J. Yun, K.N. Schymik, M. van Riggelen, L.A. Enthoven, H.B. van Ommen, M. Babaie, F. Sebastiano, M. Markham, D.J. Twitchen and T.H. Taminiau, 21 March 2025, Physical Review Applied.

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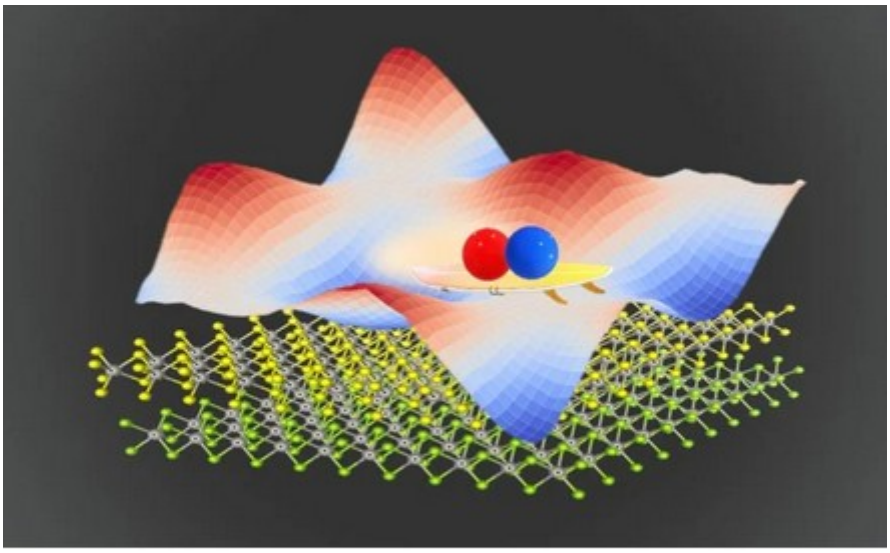
Scientists Discover Motion Where Physics Said There Should Be None

Source: SciTech Daily, Dt. 25 Mar 2025,
URL: https://scitechdaily.com/scientists-discover-motion-where-physics-said-there-should-be-none/

A hidden quantum wave may keep particles moving, even when everything else freezes.

- Researchers discovered that phasons, a type of low-temperature quasiparticle found in crystal lattices, allow interlayer excitons to move, even at temperatures where motion is expected to stop.

- This finding advances fundamental understanding in materials science and could improve the stability of quantum technologies, including the potential use of excitons as qubits.
- The work was made possible by tools and expertise at the Imaging and Manipulation of Nanostructures facility at the Molecular Foundry, Lawrence Berkeley National Laboratory.



Schematic of an exciton surfing the moiré potential arising from a semiconductor material known as a transition metal dichalcogenide.

Moiré Patterns Meet Quantum Materials

When you stack and slightly rotate two images with repeating shapes, like squares or triangles, you get a moiré pattern: a larger, wavelike design that seems to ripple across the surface. It's a striking optical effect created from simple repetition and alignment.

A similar phenomenon happens at the nanoscale when scientists stack ultra-thin layers of materials called transition metal dichalcogenides (TMDs), which are just atoms thick. This stacking creates what's known as a moiré potential, a repeating energy landscape with peaks and valleys between the layers. These moiré patterns can give rise to unusual electronic and optical behaviors.

Surprising Movement in Moiré Potentials

Until recently, moiré potentials were thought to be fixed in place. But researchers at the Molecular Foundry at Lawrence Berkeley National Laboratory discovered something surprising: in stacked TMDs, the moiré potential isn't static – it moves, even at extremely low temperatures.

Their discovery contributes to foundational knowledge in materials science. It also holds promise for advancing the stability of quantum technologies, as controlling moiré potentials could help mitigate decoherence in qubits and sensors. Decoherence occurs when interference causes the quantum state and its information to be lost. The researchers published their findings in ACS Nano. The research is part of broader efforts at Berkeley Lab to advance quantum information systems by working across the quantum research ecosystem, from theory to application, to fabricate and test quantum-based devices and develop software and algorithms.

Research was led by Antonio Rossi, a former postdoctoral scholar under Molecular Foundry staff scientist Alex Weber-Bargioni. Rossi came back to Berkeley Lab to collaborate with Molecular Foundry staff scientist Archana Raja and make use of the tools in the Foundry's Imaging and Manipulation of Nanostructures facility.

Probing Interlayer Excitons at Ultra-Low Temperatures

Raja's lab focuses on characterizing 2D materials using ultrafast lasers and optical spectroscopy at temperatures below -150°C. Exciting the layered TMD samples with a green pulsed laser energizes electrons and causes them to jump from their ground state to an excited one. Excited electrons leave behind a 'hole' with a positive charge, resulting in an electron-hole pair or exciton.

Excitons are known to form within single-layered materials. However, excitons in the stacked two-layer system separate; electrons move into the tungsten disulfide layer, and positively charged holes get left behind in the tungsten diselenide layer. In the materials community, these special layer-jumping excitons are known as "interlayer excitons" or IXs.

"You would expect the moiré valleys to act as traps," Rossi said. "So once the exciton is in there, it's basically trapped. It's like sitting (in a valley), and all you can see is the mountains around you. You're not moving."

The Moiré Landscape: Dynamic, Not Static

However, the team noticed that IXs explored the moiré's seascape despite being trapped within it. "It takes very little energy to make this moiré potential move, so the moiré is moving around exactly like a stormy sea," explained Rossi.

"We showed that even at very cold temperatures, energy, and information are not as localized as you might expect. This happens because of a special 'mechanical property' of the Moiré pattern," said Raja. "There are different ways to transport energy and information at different temperatures. This is a new way to do that."

Tracking Excitons with Advanced Imaging

Collaborator Jonas Zipfel, a postdoctoral researcher in Raja's group, worked with Rossi to automate their measurements to better understand the excitons' motion. "Jonas' work made it so we could seamlessly collect luminescence spectra, image, and lifetime (data), all of which enabled us to extract the diffusivity (movement) of the excitons," said Raja.

To enable the observation of excitons in motion, Johannes Lischner and Indrajit Maity from Imperial College London used simulations to obtain snapshots of the moiré potential "seascape." They wanted to see how it behaved at different times. By working with theorists Lischner and Maity, the research team arrived at the only logical explanation for their observations: the moiré potential itself must be moving.

Quantum Surfing with Phasons

The researchers have proposed that a low-temperature quasiparticle called a phason enables the IX to move even while it's trapped. A quasiparticle is a quantum of energy within a crystal lattice; it

has momentum and position and generally behaves like a particle. Phasons are quasiparticles thought to be naturally present in the moiré potential.

“You have the (interlayer) exciton surfing the moiré and moving around,” Rossi stated. He believes the phason mediates the movement in the same way a surfboard allows a surfer to catch waves. “It’s kind of carrying the exciton, in a way.”

The Surprising Persistence of Motion at Near-Zero Temperatures

Rossi and team found the motion of the interlayer excitons within the moiré potential to be angle and temperature-dependent. Their movement is at a maximum when TMD layers are parallel (when the molecules of the stacked layers align in the same direction).

Unexpectedly, as the system temperature approaches zero, the motion of the interlayer excitons tapers gradually to a number that is slightly higher than zero, rather than coming to a complete halt. And while the number is small, it’s significant. Rossi explained, “It was a surprise to find that this movement happens even at really low temperatures when everything is supposed to be frozen.”

Next Frontiers: Superconductivity and Phason Imaging

His next steps include investigating the superconductivity in twisted bilayer graphene that may arise from phason quasiparticles. Rossi is currently doing research for the Center of Nanotechnology Innovation at NEST, Institute of Technology Italy.

Raja is interested in exploring different semiconductor and moiré systems. She’s also intrigued by the possibility of imaging phasons directly. She said, “Our evidence here is through the diffusion of the (interlayer) exciton, but we haven’t necessarily caught the phason red-handed, yet.”

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