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Thu, 02 Jun 2022

Eminent Sonar Scientist Dr K Ajith Kumar Appointed as NPOL Director

Eminent sonar scientist Dr. K. Ajith Kumar has been appointed as the Director of the Naval Physical and Oceanographic Laboratory (NPOL), the only DRDO Laboratory in Kerala, on Wednesday. A native of Thiruvananthapuram, Dr. K. Ajith Kumar was serving as the Director (Science & Technology) at NPOL, before assuming charge as the 10th director of this prestigious laboratory. Dr. K. Ajith Kumar joined DRDO at NPOL in 1987. During a productive journey of more than 34 years, he helmed various positions including that of Project Manager, Project Director, and Associate Director, towards the design of Sonar systems/subsystems for surface, subsurface and Airborne ASW applications, a release said. As the Project Director of MAAREECH, the first indigenous towed array-based torpedo defence system, he played a stellar role in developing the system in collaboration with R&D institutes, academia and industrial partners, and was instrumental in getting the first indigenous towed array-based sonar inducted by the Indian Navy in multiple numbers.

He graduated in Mechanical Engineering from College of Engineering, Trivandrum, followed by MTech in Engineering Mechanics from IIT Madras and PhD. in Technology Management. He possesses an International Executive Diploma in Project Management, jointly awarded by the International Institute of Projects & Program Management, India and George Washington University School of Business, USA. Taking charge as Director, he stated, "As a laboratory continually supporting the Indian Navy with the state-of-the-art systems for Anti-Submarine Warfare, NPOL shall continue to strive for excellence in delivering indigenous underwater surveillance systems and solutions at par with global standards, in the true spirit of the Hon'ble PM's mission for 'Aatmanirbhar Bharat'. Currently, he is also serving as a Member of the Board of Directors, KSEDC, Trivandrum & as the Technology Director of Keltron Components, Kerala. Earlier, he served as the Chairman, Program Progress Monitoring Committee, Coastal Research Vessels, Ministry of Earth Sciences, Govt. of India.

He is a Fellow of the Institution of Engineers (India), and member of professional bodies like the American Society of Mechanical Engineers (ASME), Kerala Management Association (KMA), Institute of Smart Structures & Systems (ISSS), and Indian Society of Systems for Science & Engineering (ISSSE). He has published more than 20 Journal / Conference papers in International / national publications and has a product patent to his credit. He received the

DRDO ‘Agni Award for Excellence in Self Reliance’ for the year 2018 as the leader of Team MAAREECH for indigenous design and development of advanced torpedo defence system.

<http://www.uniindia.com/eminent-sonar-scientist-dr-k-ajith-kumar-appointed-as-npol-director/south/news/2747202.html>

ThePrint

Wed, 01 Jun 2022

Deal for Desi Astra MK 1 Sealed, India Set to Test Next-Gen Air-To-Air Missile ‘This Month’

With an aim to end decades of Indian reliance on Russian and French air-to-air missiles (AAM), the Indian defence and security establishment is set for the maiden test of the indigenous Astra Mk 2 missile with a 160-km range, ThePrint has learnt. On Tuesday, the Defence Ministry announced the signing of a deal for the Astra Mk 1 Beyond Visual Range (BVR) AAM and associated equipment, at a cost of Rs 2,971 crore. The Astra Mk 1 missile, for the use of the Indian Air Force and Indian Navy, is being procured from Bharat Dynamics Limited (BDL). This is the first such indigenous missile to enter the service of the Indian armed forces, which has always depended on Russian (mainly R 73 and R 77) and French (Mica and Meteor) air-to-air missiles.

While the defence establishment remained tight-lipped on the exact number of missiles that have been ordered, sources said it is over 200 and will cater to the Sukhoi Su-30 MKI of the IAF and the MiG-29K of the Indian Navy. The plan is to integrate the missile on board the MiG-29 of the IAF and Light Combat Aircraft ‘Tejas’ Mk 1 in a phased manner. While the Astra Mk 1 has a range of about 110 kilometres, sources said the real game-changer will be the next-generation version, which will have a long range of about 160 kilometres. The Astra Mk 1 missile, which cost about Rs 7-8 crore each and has been developed by Defence Research and Development Organisation (DRDO), has a maximum speed of Mach 4.5 (over 5,500 kmph). Sources indicated that the test for Mk 2, which will bring back India’s air-to-air combat superiority over Pakistan, will take place soon, or within this month. For the Astra Mk 2, the DRDO has developed a dual-pulse rocket motor to extend the range.

<https://theprint.in/defence/deal-for-desi-astra-mk-1-sealed-india-set-to-test-next-gen-air-to-air-missile-this-month/979234/>



Wed, 01 Jun 2022

DRDO’s Indigenous Air to Air Missiles Ordered: How Astra Mk1 will Make Indian Air Force Formidable in Aerial Faceoffs

The Ministry of Defence has placed its first order for indigenous air-to-air missiles with the Hyderabad-based public-sector Bharat Dynamics Ltd (BDL). The order is for the supply of the Astra Mark-1 — a beyond visual range (BVR), air-to-air missile (AAM) — at a cost of Rs 2,971 crore, for deployment on fighter jets of the *Indian Air Force* and Indian Navy. The contract for

these Astra Mk1 will be executed in six years. The order has been placed for an undisclosed number of missiles, which will be fitted onboard Su 30 MKI fighter jets of the Indian Air Force as well as the naval MiG 29K/KUB carrier-borne combat aircraft. Developed by Defence Research and Development Organisation (DRDO), Astra MK1 are said to out range the current set of Russian origin air to air missiles. The need for these state-of-art missiles arose when the Russian AAMs used by the air force were found wanting during an aerial faceoff in the aftermath of the Balakot air strikes.

In 2019, when the Indian fighter planes attacked Balakot, Pakistan Air Force F 16s equipped with US supplied AIM 120 missiles could lock on and fire at Indian Sukhoi 30 MKIs from across the border in the counter strike attempt. While the Sukhois were not hit as they performed evasive manoeuvres, the Indian jets could not strike back on the F 16s as they remained out of range. This led to the need of missiles that could strike beyond the visual range, and the development of Astra Mark-1. This is a major boost to the domestic defence manufacturing capacity, which has designed and developed these missiles “based on the staff requirements issued by the Indian Air Force catering for beyond visual range as well as close combat engagement, reducing the dependency on foreign sources.” “Until now, the technology to manufacture missiles of this class indigenously was not available,” the Defence Ministry’s statement on Tuesday said.

The various variants

The missile has been specifically designed for deployment on fighter jets like Sukhoi-30 MKI and Tejas of the IAF and the Mig-29K of the Navy. These BVM missiles can engage beyond the range of 20 nautical miles (37 kilometres). AAMs are fired from an airborne asset to destroy an airborne target. Astra Mk-1’s range is around 110 km, the Mk-2 is under development with a range over 150 km and the Mk-3 version is being envisaged with a longer range. More versions of Astra with a range smaller than Mk-1 are also under development. As per DRDO, the Astra project was officially launched in the early 2000s with defined parameters and proposed future variants. However, the development phase of the Mk-1 version was complete around 2017. Since then, several successful tests have been conducted from Sukhoi-30 MKIs.

Strategic importance

According to the MoD, Astra is superior — technologically and economically — to most such imported missile systems. Capable of travelling at speeds more than four times that of sound, it can reach a maximum altitude of 20 km — making it extremely pliable for air combat. Designed based on the specific requirements of the IAF for BVR and close-combat engagement, the missile reduces the dependency on foreign sources. BVR- AAMs’ capability provides large stand-off ranges — the distance to launch a missile sufficient to allow the attacking side to evade defensive fire from the target — to own fighter aircraft. These can effectively neutralise adversary airborne missiles without exposing themselves to the enemy’s air defence measures. The missiles will add impetus to the lethality of IAF and Navy’s formidable carriers.

<https://www.timesnownews.com/exclusive/drdo-indigenous-air-to-air-missiles-ordered-how-astra-mk1-will-make-indian-air-force-formidable-in-aerial-faceoffs-article-91947966>

RailTel to Execute Two DRDO Projects Worth Over Rs 68 Crore

One order is for supply, installation and commissioning for enhancement of DRDO Data Centre and its networking infrastructure. The second order is for supply, installation and commissioning of DRDO on-premise cloud services. RailTel has bagged two orders worth over Rs 68 crore from Defence Research and Development Organisation (DRDO) pertaining to Data Centre management and cloud services. While one order is for supply, installation and commissioning for enhancement of data centre and its networking infrastructure, the second order is for supply, installation and commissioning of DRDO on-premise cloud services. Both the orders together amount to Rs 54.11 crore, excluding GST which becomes Rs 68.86 crore including GST.

The scope of the first order work entails a turnkey solution for enhancing the data centre and its networking infrastructure to cater to the needs of future and enhanced IT needs. This project is specifically focussed to enhance the IT/Non-IT/Networking Infrastructure to facilitate the deployment of Cloud Services for the entire DRDO community. It will also help in setting up a Security Operation Centre (SOC) to safeguard the huge data, ensure uninterrupted services and future planning of new application and operational requirements. This project is aimed to upgrade the data centre at DRDO headquarters in the Capital to bring up a world class facility. DRDO Data Centre is envisioned as the shared, reliable and secure infrastructure services centre for hosting and managing the IT services of DRDO community.

After upgradation, the data centre would provide many functionalities like Central Repository, Secure Data Storage, Online Delivery of Services, IT Services Portal, Disaster Recovery, Remote Management and Service Integration. It would facilitate secure, reliable and efficient delivery of IT services thereby improving end-user satisfaction. Disaster Recovery (DR) services are required to prevent either man-made or natural disasters from causing expensive service disruptions. This work order is valued at Rs 22.77 crore (excluding GST) which after including GST amounts to Rs 26.87 crore. The scope of work of the second order entails a turnkey solution for deploying a DRDO Cloud over their wide area network to cater to the needs of DRDO community for various needful IT services.

DRDO decided to migrate to a new scalable hardware platform by creating DRDO Cloud to provision storage space, hosting of new applications and distributed computer resources. It will benefit the organisation to perform day-to-day activities smoothly. It will help in the efficient utilisation of resources with centralised management and monitoring. This second work order is valued at Rs 31.34 crore, excluding GST which after including GST amounts to Rs 36.99 crore. RailTel Chairman and Managing Director Aruna Singh said, "RailTel has established itself as a prominent Information and Communication Technology (ICT) provider and as one of the largest neutral telecom infrastructure providers in the country. Securing these prestigious projects from DRDO is an endorsement of RailTel's key position in the domestic IT space based on its strong technology expertise, process excellence and superior execution capabilities."

"With this, RailTel is well- positioned to win other Ministries, Central government and State government, Data Centres and cloud service projects as well," Singh added.

<https://swarajyamag.com/amp/story/news-brief%2Frailtel-to-execute-two-drdo-projects-worth-over-rs-68-crore>

Defence News

Defence Strategic: National/International



Press Information Bureau
Government of India

Ministry of Defence

Wed, 01 Jun 2022 6:08 PM

E-Concurrence Module Launched on Government e-Marketplace (GeM) for Ministry of Defence

As a significant step towards the Digital India vision of the Government, Government e-Marketplace (GeM) has developed an IT module for Ministry of Defence, for integration of competent financial authorities and Internal Financial Advisers (IFA) for online e-concurrence and approval of procurement proposals on GeM portal. The integration module was launched by Shri. Rajnish Kumar, Controller General of Defence Accounts (CGDA), in the presence of Shri Prashant Kumar Singh, Chief Executive Officer of Government e-Marketplace (GeM) at Defence Accounts Department Headquarters in New Delhi on June 01, 2022.

The module has been developed by GeM over the course of last one year, utilising Business Process Re-engineering (BPR)-based procedural inputs provided by the Ministry of Defence, Defence Accounts Department Headquarters and the Headquarters of the various defence services and other MoD organisations. Procurement by Ministry of Defence (MoD) through Government e-Market (GeM) portal had reached an all-time high of Rs 15,047.98 crore for the Financial Year 2021-22, which is more than 250 percent over the last financial year.

<https://www.pib.gov.in/PressReleasePage.aspx?PRID=1830159>

Wed, 01 Jun 2022

India, Italy Hold Military Cooperation Group Meeting in Rome

The 11th edition of the India - Italy Military Cooperation Group (MCG) was held in Rome from May 31 to June 1. The discussion was focused on strengthening ongoing defence engagements between the two countries and implementing new initiatives under the existing bilateral defence cooperation mechanism. The meeting was co-chaired from the Indian side by deputy assistant chief of the integrated staff IDC(A), HQ IDS Brigadier Vivek Narang and Italian defence general staff Brigadier General Alessandro Grassano, from the Italian side.

The India - Italy Military Cooperation Group (MCG) is a forum established to boost defence cooperation between the two countries. It holds regular talks at the strategic and operational levels between the headquarters, integrated defence staff and the joint staff headquarters of the Indian and Italian armed forces. The Headquarters Integrated Defence Staff (HQ IDS) of India reported that both sides expressed satisfaction at the broad scope and depth of the bilateral military cooperation and discussed operationalising new avenues to further enhance bilateral military ties.

<https://www.indiatoday.in/amp/defence/story/india-italy-military-cooperation-group-meeting-rome-1957210-2022-06-01>



Thu, 02 Jun 2022

Israel Ties Sharpen India's Military Edge

By Nishtha Kaushiki

Bilateral relations with Israel are thirty years old, one aspect of which, sources indicate, is that country extending military help to India even during the Cold War period, especially during the 1971 war with Pakistan. Its no-strings-attached help with ammunition and laser-guided missiles during the Kargil conflict years later had transformed the battlespace in India's favour. The contribution of Israel can be assessed just by the Phalcon air radar system and the joint production of the Barak missile defence system. Previous governments could not strike a balance between Israel and Palestine and hence always saw Israel from the prism of the Palestinian issue. On the other hand, Prime Minister Narendra Modi in 2017 and 2018 visited Israel and Palestine, respectively, and this marked the first-ever visit of India's political leadership. In 2018, the then Israeli Prime Minister Benjamin Netanyahu paid an official visit to India. Since then, the relations between the two countries have seen an upward trajectory.

The security and the foreign policy acknowledged that India's pursuit of politico-strategic equilibrium remains incomplete without Israel. Through the multi-alignment policy, India has de-hyphenated its relations with Palestine, and hence has moved much ahead with Israel in terms of cooperation in counter-terrorism measures, including intelligence sharing and missile supplies. The use of precision-guided Spice bombs in the non-military surgical strikes strongly indicates the choice of weapons that Israel can offer to India. As Israeli Defence Minister Benny Gantz is on an upcoming visit, it becomes essential to analyse the possible contours of coordination between the two countries. The Quad Joint Leaders' Statement 2022 condemned the Mumbai and the Pathankot attacks and pledged to "take concerted action against all terrorist groups, including those individuals and entities designated pursuant to the UNSC Resolution 1267(1999)". This is a significant development as the perpetrators of 26/11 continue to be shielded by Pakistan. The statement might indicate a crucial upcoming development. Is it possible that the CIA, Mossad and RAW can actively coordinate to use different coercion tools against the terror groups that harmed the joint interests of the three?

Possible coordination between the three agencies is necessary from another perspective. The recent use of Rocket Propelled Grenade Launchers (RPG) in the Mohali terror attacks and the findings that the US military hardware left in Afghanistan is now landing in Kashmir expands the horizon of Pakistan's proxy war against India. The shrinking foreign exchange reserves and mounting external debt apart from the Baloch and the Tehrik-e-Taliban Pakistan attacks on the military establishment might lead to a full-blown civil war in Pakistan. To divert attention, Rawalpindi might resort to terror attacks against the Indian interests to escalate the tensions that might endanger the South Asian peace and security. The next few months are all the more critical for India's security. In such a scenario, India's operational preparedness should be high.

To defeat terror, India should integrate its available and new technologies with the help of Israel and the US. There can be active cooperation between the two countries for technology transfer or the direct purchase of the Iron Dome Air Defense System to protect military installations prone to attacks by Pakistan-based proxies. Rafael Advanced Defence Systems have developed the Iron dome. Its Active cooperation with ISRO and DRDO can be sought to collaborate on futuristic weapons based on Artificial Intelligence and precise weaponry for external and internal security purposes. If made possible, it can significantly defeat Pakistan's sinister objectives.

Israel has also gained expertise in weaponising intelligence where the adversary's military and proxies' build-up are internationally exposed. The exposure of the covert 2010 military deployment of Hizbollah and the 2018 secret atomic warehouse in Tehran are examples wherein Israel has actively used its intelligence to avoid escalation. Intelligence weaponisation sends strong signals that the covert operations have been exposed and need to be halted immediately; failing which surgical strikes can soon follow. Also, it serves as an essential tool in perception management and psychological warfare, which play an essential role in building up the narratives in the home country and the international community apart from the adversary population. Coordination in intelligence can be helpful for India, wherein it can expose the terror launch pads from across the LOC. Such measures can also have the sword of being blacklisted in FATF hanging over Pakistan. Nevertheless, the use of strategic communication witnessed in the post-Pulwama non-military surgical strikes can be clubbed with intelligence weaponisation to restrict the scope of Pakistan's terror manoeuvring.

Concerning energy security, it has to be recalled that India could not materialise its TAPI and IPI pipeline dream because of the Pakistan factor. However, to overcome the geographical constraint

of Pakistan, apart from the other geopolitical competing interests like the Pak-Turkish alliance, Modi has crafted the 'Act West' policy. Other strategic interests include intelligence sharing, defence, cyber, and maritime security. From a futuristic perspective, the emergence of multilateral Mediterranean "security architectures" has become profound with the discovery of natural gas fields in Israel's Eastern Mediterranean offshore Tamar (2009) and Leviathan (2010), apart from Cyprus's Aphrodite (2011) and Egypt's Zohar (2015).

The rise of the EastMed energy alliance that intends to take natural gas to Europe can be an essential natural gas source for India. If the Abraham accord, which is already in place, can be extended to include Saudi Arabia, the natural gas can be brought to India too via underwater pipelines. The same week Benny Gantz would be in India, Israel's NSA Eyal Hulata is scheduled to meet his US counterpart Jake Sullivan in Washington to normalise relations between Israel and Saudi Arabia. If all goes well, the alliance between Israel, the U.S., Saudi Arabia and U.A.E. would be in place, and India can join the alliance for its energy and security requirements. Last year, the logic of India's strategic alliance axes got a stronghold with the first closed-door virtual meeting between foreign ministers of India, Israel, UAE and the US. India is on its path to be a part of the formulation of a structural framework that could be a win-win situation for the regional and the extra-regional players to push back the terror-sponsoring countries apart from the expansionist forces.

As President Joe Biden has decided to retain the Iranian Revolutionary Guards on the US list of sanctioned terror organisations, it might negatively affect the prospects of a new nuclear deal with Iran. This will lead to the sharpening of the strategic polarisations in India's western neighbourhood, and China's influence over Iran is bound to increase. Simultaneous geopolitical convergences between India, Israel and the US to fight terror will also increase the threat factor. India and Israel have to be cautious concerning the attempts of the various proxy groups to harm the Israeli diplomats in India. For instance, Tal Yehoshua-Koren, wife of the Israeli defence attache to India, was targeted in 2012 while an explosion took place near the Israeli Embassy on the 29th Anniversary of the establishment of the bilateral relations. It is only through joint efforts in human and signal intelligence that such attacks can be averted. Overall, the future is bright for India's overwhelming presence in West Asia.

<https://www.dailypioneer.com/2022/columnists/israel-ties-sharpen-india-s-military-edge.html>



Wed, 01 Jun 2022

Israel Defence Minister Gantz to Visit India, Meet Rajnath Singh, Doval

Benjamin (Benny) Gantz, the defence minister of Israel, will be in New Delhi on Thursday for talks with defence minister Rajnath Singh and national security advisor Ajit Doval. Gantz, who was earlier Alternate Prime Minister of Israel, is a retired Army general and high-profile political leader and on the agenda, are closer defence ties between the two countries. In New Delhi till Friday, Gantz will discuss issues that relate to the new mantras of South Block— co-development and co-production with India. This could be advantageous for Israel as its defence industries have been working together with India in the past.

One major project has been the MRSAM or Medium Range Surface to Air Missile for the Indian Air Force and also, the Indian Navy. This was jointly developed by the Defence Research and Development Organisation and the Israel Aerospace Industries. India and Israel also have a joint working group at the defence secretary level to work together towards the development and other areas. Israel has been, along with Russia, France and more recently, the United States of America, a major supplier of military equipment. It is one of the handful of countries involved in defence co-production with India. The visit by defence minister Gantz comes in the wake of plans for a likely visit by Israel prime minister Naftali Bennett. An earlier visit had to be postponed after a Covid problem.

<https://www.timesnownews.com/india/exclusive-israel-defence-minister-gantz-to-visit-india-meet-rajnath-singh-doal-article-91934662/amp>

Science & Technology News



Wed, 01 Jun 2022

Using Laser Technology to Measure the Rotational Cooling of Molecular Ions Colliding with Electrons

When it is free in cold space, a molecule will spontaneously cool down by slowing its rotation and losing rotational energy in quantum transitions. Physicists have shown that this rotational cooling process can be accelerated, slowed down and even inverted by the molecule's collisions with surrounding particles. Researchers at the Max-Planck Institute for Nuclear Physics in Germany and the Columbia Astrophysics Laboratory have recently carried out an experiment aimed at measuring the rate of quantum transitions caused by collisions between molecules and electrons. Their findings, published in *Physical Review Letters*, offer the first experimental evidence of this rate, which had previously only been theoretically estimated.

"When electrons and molecular ions are present in tenuous, ionized gases, the lowest quantum level populations of the molecules can be changed in a collision process," Ábel Kálosi, one of the researchers who carried out the study, told Phys.org. "One example of this process is in interstellar clouds, where observations reveal molecules predominantly in their lowest quantum states. The attractive force between the negatively charged electrons and the positively charged molecular ions makes the process of electronic collisions particularly efficient." Physicists have been trying for many years to theoretically determine the strength with which a free electron interacts with a molecule during collisions and ultimately change the rotational state of the molecule. So far, however, their theoretical predictions had not been tested in an experimental setting.

"Until now, no measurement could determine the effectiveness of the rotational level changes for a given electron density and temperature," Kálosi explained. To collect this measurement, Kálosi

and his colleagues brought isolated, charged molecules in close contact with electrons, at a temperature of approximately 25 Kelvin. This allowed them to experimentally test the theoretical hypotheses and predictions outlined in previous works. In their experiment, the researchers used a cryogenic storage ring at the Max-Planck Institute for Nuclear Physics in Heidelberg, Germany, designed for species-selected molecular ion beams. In this ring, molecules move on a racetrack-like orbit in a cryogenic volume, which is emptied to a very high degree from any other background gas.

"In a cryogenic ring, the stored ions can radiatively cool towards the temperature of the walls of the ring, generating ions that are populated in their lowest few quantum levels," Kálosi explained. "There are a handful of cryogenic storage rings recently built in a few countries, but our facility is the only one equipped with a specially designed electron beam that can be steered to enter in contact with the molecular ions. The ions are stored for many minutes in this ring, and a laser is used to interrogate the rotational energy of the molecular ions." By selecting a specific optical wavelength for their probing laser, the team could destroy a very small fraction of the stored ions, if their rotational energy level matched this wavelength. They then detected the fragments of the destroyed molecules to attain a so-called spectroscopy signal.

The team collected their measurements both in the presence and absence of electron collisions. This allowed them to detect level population changes under the cryogenic conditions set in their experiment.

"To measure the process of rotational state changing collisions, one must ensure that only the lowest rotational energy levels are populated in the molecular ions," Kálosi said. "Hence, in a laboratory experiment, the molecular ions must be kept in an extremely cold volume, using cryogenic cooling to a temperature considerably lower than the usual near-300 Kelvin room temperature. In this volume, the molecules can be isolated from the omnipresent, infrared heat radiation of our environment." In their experiment, Kálosi and his colleagues were able to realize experimental conditions in which electron collisions dominated over radiative transitions. By using enough electrons, they could then collect a quantitative measurement of electronic collisions with CH^+ molecular ions.

"We found rates for electron-induced rotational transitions compatible with previous theoretical predictions," Kálosi said. "Our measurements provided the first experimental test of the existing theoretical predictions. We expect that future calculations will more strongly focus on the possible influence of electronic collisions on the lowest energy level populations in cold, isolated quantum systems." In addition to confirming theoretical predictions in an experimental setting for the first time, the recent work by this team of researchers could have important research implications. For instance, their findings suggest that measuring electron-induced rates of quantum-level changes could be crucial when analyzing faint signals of molecules in space detected by radio telescopes or the chemical reactivity in dilute and cold plasmas.

In the future, this paper could pave the way for new theoretical studies that consider the influence of electronic collisions on the occupation of rotational quantum levels in cold molecules more closely. This could help to single out cases in which electronic collisions have the strongest effects, potentially leading to more detailed experiments in this area. "At the cryogenic storage ring, we plan to introduce more versatile laser techniques to probe the rotational energy levels for more diatomic and polyatomic molecular species," Kálosi added. "This will pave the way for electronic collision studies with a large range of additional molecular

ions. This type of laboratory measurements will continue to complement, especially observational astronomy, using the powerful observatories like the Atacama Large Millimeter/submillimeter Array in Chile."

<https://phys.org/news/2022-06-laser-technology-rotational-cooling-molecular.html>



Thu, 02 Jun 2022

IIT Mandi Develops New Spectrum Sensor to Improve Wireless Communication

Pointing out the need for research in the area, one of the researchers said, "Given the fixed-spectrum allocation policy of many governments around the world, including ours, it becomes important to use the available spectrum intelligently." Researchers at the Indian Institute of Technology Mandi have developed a state-of-art solution for telecommunication – a cooperative spectrum sensor which enhances the reusability of the radiofrequency spectrum, which will help improve data communication for future wireless communication applications.

The findings of their work have recently been published in the IEEE (Institute of Electrical and Electronics Engineers) Transactions on Consumer Electronics and other IEEE journals. These papers have been authored by Dr Rahul Shrestha, Assistant Professor (School of Computing and Electrical Engineering – IIT Mandi), and his PhD scholar, Mr Rohit B Chaurasiya. Dr Shrestha said that radiofrequency waves, or "spectrum" as they are known in the telecommunication field, are used for wireless communication and the wireless radiofrequency spectrum is a limited resource allocated by the government to telecom companies through a licensing process. The rapid growth in wireless communication technology seen in recent years and the projected exponential increase due to mass adoption of technology such as fifth-generation new-radio (5G-NR) and the Internet of Things (IoT) are expected to result in a massive demand for the spectrum bands, he added.

Pointing out the need for research in the area of spectrum optimization, he said, "Given the fixed-spectrum allocation policy of many governments around the world, including ours, it becomes important to use the available spectrum intelligently. Cognitive Radio Technology is considered one of the best ways to optimise spectrum use." Not all parts of the spectrum band licensed to a telecom company (called primary user or PU) are used all the time by the PU. The idea of Cognitive Radio Technology is that a wireless device such as a cell phone, used by the secondary user (SU) can be fitted with a special sensor that can detect "spectrum holes" (spectrum parts that are not used by the PU) and use them when the main channel is unavailable or crowded, Dr Shrestha said. "This forms the basis of a dynamic-spectrum access policy that can overcome shortages of available spectrum at a given time. The spectrum-hole detecting sensor that is built into the SU's device is called a Stand-Alone Spectrum Sensor (SSSR)," he added.

Discussing the relevance of the team's research, Dr Shrestha said, "The SSSR's detection capability is often less than satisfactory due to various problems such as signal-to-noise ratio

(SNR)-wall problems. This leads to the unreliability of performance when the SSSR is used in real-time.” “The team’s research work seeks to circumvent the above problem. The technology is one where instead of equipping the SU’s wireless device with an SSSR, the received parts are transmitted from the spectrum band to a Data Fusion Centre (DFC). The DFC then digitises these parts and processes them using a single cooperative spectrum sensor (CSR)” he said. Mr Rohit B. Chaurasiya, elucidated on the matter further, “We have proposed implementation-friendly algorithms for cooperative spectrum sensing with lower computational complexity and have also developed multiple new hardware architectures for CSR and their submodules.”

This digital CSR ASIC-chip developed by IIT Mandi delivers excellent detection reliability of the PU under real-world channel scenarios with the best hardware efficiency and fast sensing time. The CSR chip can be used with any handheld mobile wireless communication device for accessing the unused spectrum. Specifically, it can be used in future 5G and 6G wireless communication technologies for enhancing spectral efficiency, he added. He said that in addition, this will enable massive deployment of IoT-based networks where numerous connected devices can use spectrum holes for break-less communication. The specific uses of cooperative spectrum-sensing technology in India cannot be understated and will help in establishing broadband services in remote and rural parts of the country.

<https://indianexpress.com/article/technology/science/iit-mandi-develops-new-spectrum-sensor-to-improve-wireless-communication-5g-7948387/lite/>

