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Techno-Economic Intelligence on China

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DATENNA INTELLIGENCE BRIEFING

New Breakthroughs Empower the Hurricane-3000

China drives forward to develop viable high-powered microwave weapons for counter-UAV warfare

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KEY FINDINGS

- China's high-power microwave (HPM) capability continues to advance with recent breakthroughs. These capabilities will likely contribute to China's burgeoning counter-UAV field.
- Currently, China's most advanced HPM systems include the Hurricane series, a vehicle-mounted 3000-metre microwave pulse system that disrupts electronics and control connections in drone swarms.
- The Chinese government has poured resources into developing this technology since at least 2010, with clear capabilities coming on-line around 2020 and the Hurricane series being released in 2024.
- Patent and procurement activity suggests remaining problems. Nearly 30% of recent patents reference breakdowns from stress at the X and Ku bands, while procurements highlight strong demand for testing and diagnostic systems for faulty equipment.

WHAT HAPPENED

China continues to improve its high-powered microwave capabilities

In July of 2026 the South China Morning Post reported that China's National University of Defense Technology (NUDT) made a breakthrough on high-powered microwave (HPM) technology, allowing newer systems to deliver up to 100 gigawatts of output for counter-UAV weaponry. The team at NUDT responsible for the breakthrough credited China's "sustained and significant national strategic demands" and emphasised the capability's evolution from prototype to functional systems.

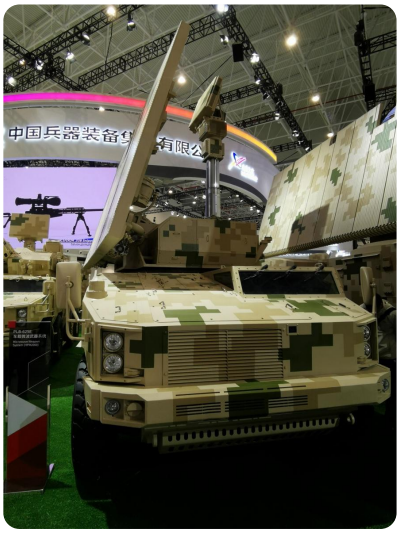
This breakthrough comes amidst fervent Chinese activity in the HPM field. In 2024, the massive Chinese state-owned defence conglomerate NORINCO unveiled the Hurricane-3000 (颶风3000) and 2000. The Hurricane-3000 variant is a large vehicle-mounted system capable of firing microwave pulses that damage electronics within a 3000-metre range, while the Hurricane-2000 is a smaller, modular variant capable of being mounted on a light vehicle chassis. As these systems gain more operational implementation, NUDT's improvements on China's already considerable HPM technology may make these models even more dangerous towards allied UAVs.

WHY IT MATTERS

HPM systems may be the best counter to emerging drone swarm techniques

HPM systems are specialised weaponry designed to degrade and destroy UAVs either directly through damaging their electronics or through disrupting the connection to the UAV's operator. For example, the Hurricane series operates a flat-panel antenna array mounted on the roof that can fire a pulse of intense electro-magnetic radiation up to 10GHz. This causes serious harm to the delicate electronic components in small UAVs like those found in drone swarms or FPV drones. Because of this, HPM weaponry represents a potent defensive military tool capable of effectively countering the evolving battlefield techniques that have gained prominence in Ukraine. These systems may see even broader application if NUDT's newest breakthrough of up to 100 gigawatts can be realised in the field as well.

China has been keenly watching recent conflicts and has taken the importance of counter-drone technology to heart. According to a report by RAND, Chinese entities now constitute up to 90 percent of current worldwide patent filing activity in the HPM field, with the overwhelming majority of these patents being military-related. In this regard, China has also deployed HPM weaponry on surface vessels since at least 2017, and is likely implementing HPM systems attached to hypersonic glide vehicles, allowing missiles to thwart interceptors and other defences. The Hurricane-2000's relatively light weight would allow the PLA to deploy the technology extensively on land as well. Reportedly, the Hurricane-2000 is expected to accompany field units and provide mobile counter-drone capabilities, while the Hurricane-3000 is expected to remain relatively stationary and protect key strategic assets.



NORINCO's PLB-625E (Hurricane-2000) vehicle-mounted microwave weapon system on display in Zhuhai.

WHAT WE FOUND

The Hurricane series relies on key enabling technology

To better understand China's Hurricane systems, Datenna investigated the components that empower HPM technology.

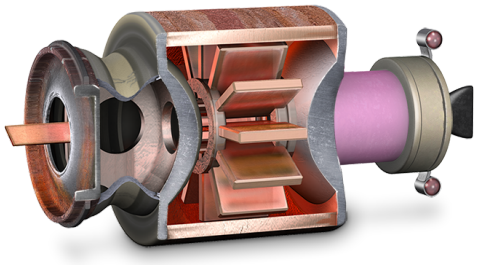
HPM applications in radar, electronic warfare, and directed energy weapons like HPM systems require advanced vacuum electronic devices (VEDs) to enable their operation. VEDs are electron-beam-based microwave and millimetre-wave sources capable of delivering power levels that solid-state electronics cannot sustain, particularly in the L–Ku bands (0.5–18 GHz) and at megawatt-class peak power. They underpin critical applications ranging from particle accelerators, radar, satellite communications, and fusion plasma heating to emerging HPM systems, where devices are often embedded in pulsed architectures without explicit tube disclosure.

These VEDs are found through systems like the Hurricane series and need to be both durable and able to function under the extreme operating conditions of high microwave power. Key classes of VEDs most suited to operate in HPM include klystrons, magnetrons, TWTs, and gyrotrons. These systems are critical in high-power and high-frequency environments where other solid-state technologies are constrained by limits on megawatt-class power density, thermal management, and material breakdown.

Based on limited technical information on the Hurricane series, VED use is strongly suggested by its combination of megawatt-level power, pulsed operation, and an assessed frequency range of 5–18 GHz, as solid-state sources cannot achieve the multi-megawatt levels necessary for thermal damage effects. Furthermore, NORINCO's Zhuhai 2024 technical description of the system's 'beam-wave instability interaction' architecture is strongly consistent with this assessment. For Hurricane-2000, a traveling wave tube (TWT) array is specifically named. Meanwhile, for Hurricane-3000, the reported 2 GW peak pulse power points to a relativistic magnetron or similar relativistic VED as the primary generation source.

A klystron — one class of vacuum electronic device (VED).

The publicly reported operational range of 5–18 GHz is well suited to counter-drone applications. Microwave energy at these wavelengths effectively penetrates the plastic and carbon fibre materials commonly used in drone construction, directly coupling into and disrupting internal electronics. In this regard, the Hurricane series employs tunable frequency selection, allowing operators to optimise transmission characteristics based on atmospheric conditions and target type.



Cutaway of a magnetron, a compact VED capable of high peak-power pulses.

HOW WE GOT HERE

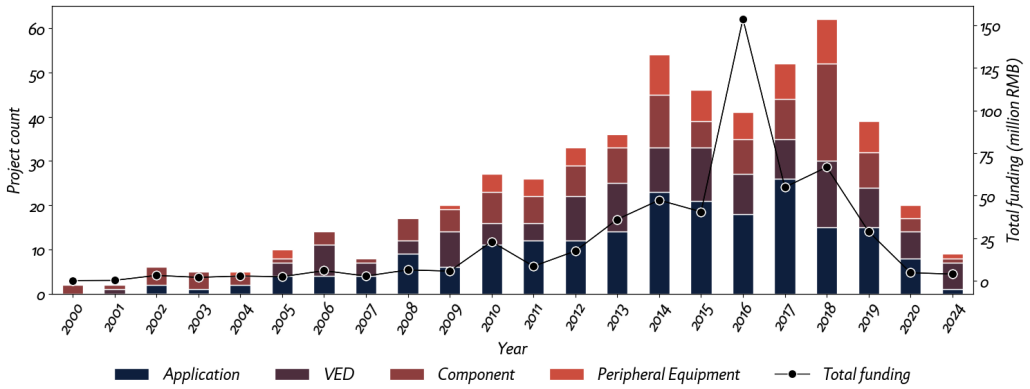
China's HPM prowess is the culmination of a long technical drive

These advanced systems are the culmination of years of intense R&D focus and state-directed support. Tracing the evolution of HPMs from initial research projects, to patent filings, to full procurement activities reveals a history of clearly directed government focus on the technology's development.

From 1987 to 2024 Datenna's datasets record at least 567 HPM-related research and development projects, with activity peaking between 2014 and 2018. Funding came mostly from the National Natural Science Foundation of China, the Ministry of Science and Technology, and individual provincial government R&D funds.

During this time, research projects moved from foundational component development toward application-driven radar and broadband systems. In 2018 defence-related terms increased substantially to 35% of annual projects while research related to peripheral equipment and components also increased notably. Chinese VED research priorities shifted decisively toward defence-relevant applications, with explicit electronic warfare research rising 84% between 2010 and 2019. In total, application-related research constituted the largest share at 38%, while VED technology accounted for 26% and related components accounted for 24%.

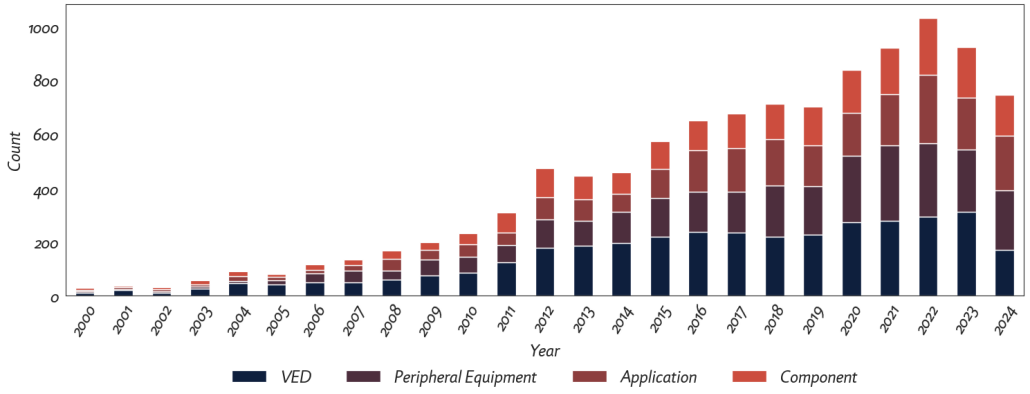
HPM Research & Development Projects by Category, 2000–2024



Project count by category (bars) against total funding in million RMB (line). Source: Datenna.

Following this initial period of pronounced R&D acceleration, HPM-related patent filings also saw a dramatic uptick in activity. Since 2010, patent activity increased sharply, with X-band and Ku-band technologies accounting for 53% of filings explicitly mentioning a frequency band, driven by radar and high-power transmitter requirements. Between 2010 and 2015, traveling-wave tubes and klystron variants focused on efficiency and gain represented around a third of all VED-related patents. Patents explicitly referencing HPM or pulsed-power operation rose from 6% of the total in 2015 to 17% in 2024, signalling a transition toward system-level HPM architectures.

HPM-Related Patent Filings by Category, 2000–2024



Patent filing count by category. Source: Datenna.

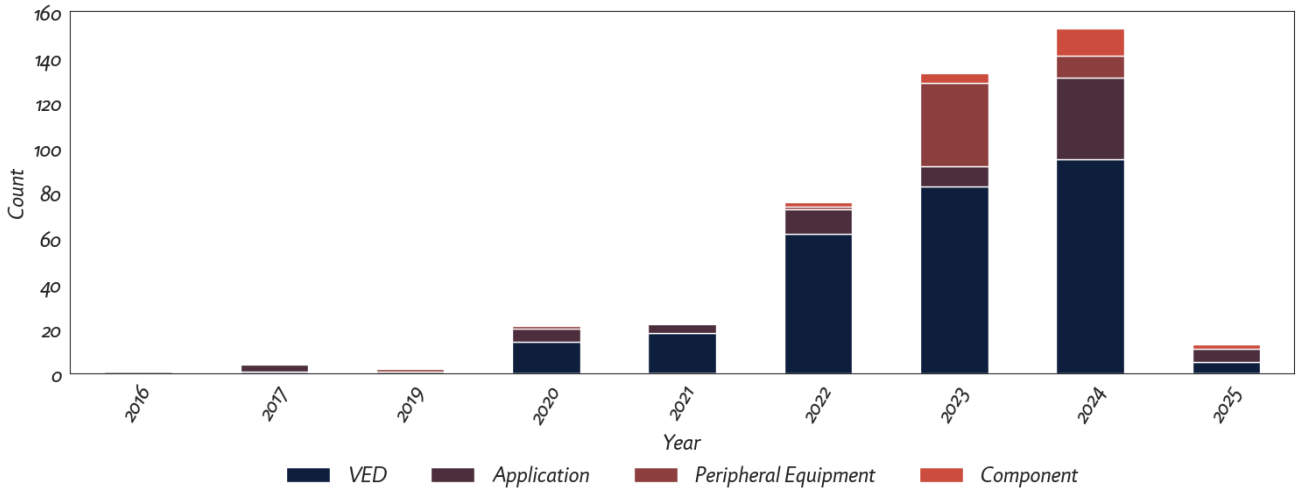
Patents originating from military-affiliated organisations account for the most technically significant contributions to HPM systems, pointing to a clear defence focus for China's advanced HPM capabilities. By far the most prolific research institute by patent count is the University of Electronic Science and Technology of China. Notably, explicitly defence-linked institutions such as CETC, CAEP, and NUDT are also featured prominently in the patent corpus. More precisely, military applications are highlighted by the overall predominance of X-band related patents (137 patents) in comparison to other mentioned radio frequencies.

Most prolific organisations by HPM-related patent count

Organisation	Document count
University of Electronic Science and Technology of China	753
Anhui East China Photoelectric Technology Research Institute Co., Ltd.	332
CAEP's Institute of Applied Electronics	207
Southeast University	201
Institute of Electronics, Chinese Academy of Sciences	171
CETC 12th Research Institute	160
Nanjing Sanle Group Co., Ltd.	150
National University of Defense Technology	133

After this initial period of research, development, and application, the technology appears to have matured enough to begin entering the production phase. Procurement activity from the Chinese government towards these entities for HPM-related products began in earnest in 2020, two years after the peak amount of research projects. Likewise, as patent activity began to decline in 2023, procurements saw a massive increase in activity and remain high. In total, procurement contracts increased eight-fold from 21 in 2020 to 153 in 2024.

HPM-Related Procurement Contracts by Category, 2016–2025



Procurement contract count by category. Source: Datenna.

While VEDs remain the dominant category, their share declined from 81.6% in 2022 to 62% in 2023–2024, reflecting a relative expansion of application-level systems and peripheral equipment. The surge in peripheral equipment procurements in 2023 (28% of notices) suggests that bottlenecks are no longer limited to tube design but increasingly lie in system robustness and power handling.

Unsurprisingly, defence-industrial actors feature most prominently. The CETC 12th Research Institute emerges as the most active buyer, reflecting sustained demand for vacuum electron tubes, microwave/RF subsystems, pulsed-power-adjacent electronics, and associated test equipment. Other defence-linked buyers, including NUDT and the China State Shipbuilding Corporation, reinforce the linkage to military and naval systems.

WHAT THIS MEANS GOING FORWARD

Despite impressive advancements, problems remain

China's HPM capability is the product of a sustained, state-directed drive that unfolded across three sequential phases. Initial research projects outlined the capability and showed a clear shift away from basic components toward defence uses such as radar and electronic warfare. Patent activity quickly picked up in the following period, with filings concentrated on X-band and Ku-band designs and moving toward full system-level HPM architectures. Explicit military linkages became much more prominent during this phase, with many significant filings coming from military-affiliated entities like CETC, CAEP, and NUDT. Finally, as patents plateaued around 2023, procurement surged, rising eight-fold from 21 in 2020 to 153 in 2024. This movement signalled clearly that the technology was ready for production, with the Hurricane series unveiled shortly afterwards in 2024.

Yet this does not mean that China's HPM technology is flawless. Patent filings strongly imply that Chinese entities still face important challenges in managing the physical consequences of high-power systems on components and peripheral equipment. Fully 28% of recent patents (2018–2024) still reference breakdown, flashover, or thermal stress, particularly at X- and Ku-band. This underscores that system survivability, rather than source power alone, remains the principal constraint. Likewise, procurement evidence points the same way, showing persistent gaps in reliability, materials qualification, and full-parameter testing, while continued purchases of dedicated test and diagnostic systems confirm that these challenges remain unresolved at the operational level even as patented solutions mature.

ABOUT DATENNA

Datenna maps over 50 million Chinese organisations, tracking procurement contracts, patent filings, funding streams, and ownership structures. Our platform provides allied governments, defence institutions, and industry with provable, auditable intelligence on China's technology and defence ecosystem.

To book a platform demonstration or speak with our analyst team: datenna.com

DATENNA IN NUMBERS

51M+ Chinese entities	**1B+** Data points	**65.7M** Shareholders
13.1M+ Procurement records	**45M+** Patent filings	**208M+** Staff and people