RF Modulation Classification at the Edge

Communication Reference Platform

July 2026



© 2026 BrainChip Holdings Ltd. All rights reserved.

Placeholder for Bio slide



Dr. Steven D. Harbour

Technical Fellow
BrainChip



Aras Pirbadian

Sr. Machine Learning Engineer
BrainChip

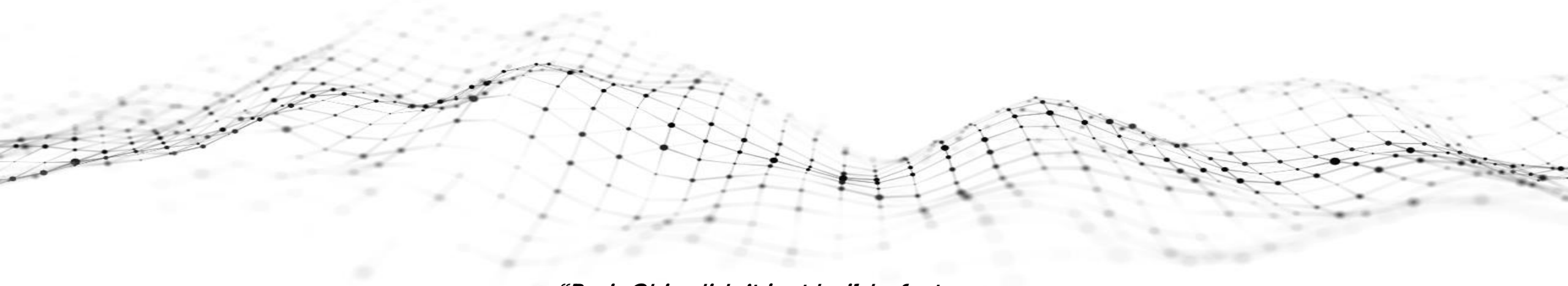
© 2026 BrainChip Holdings Ltd. All rights reserved.

Who We Are

- The world's first commercial producer of **neuromorphic AI processors**
- **Publicly listed** deep-tech company (ASX: BRN) with global reach
- **HQ in the US** with teams across Europe, Australia, and Asia

What is Neuromorphic AI

- "Neuro" = brain. "Morphic" = shaped like. Literally: **AI shaped like a brain**
- **Mimics how neurons fire** only when triggered – not all the time
- **The result:** AI that is ultra-low power, ultra-fast, and runs without the cloud



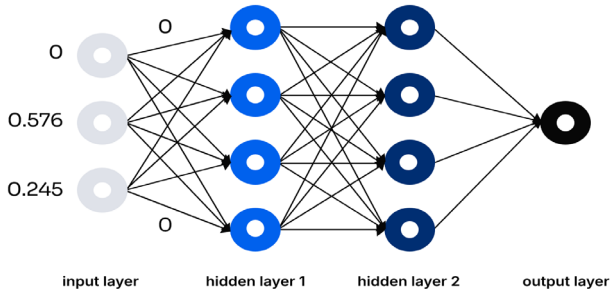
*"BrainChip didn't just build a faster chip. We went back to **nature's blueprint** and asked: what if AI worked the way the **brain actually works**?"*

© 2026 BrainChip Holdings Ltd. All rights reserved.

Traditional AI Chips Brute-Force Every Calculation.
Akida Only Computes What Matters — Just Like Your Brain.

Conventional NPU

Compute all data
"brute force"

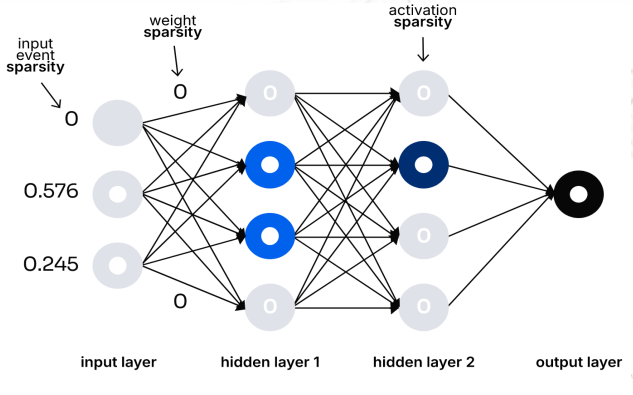


Conventional NPUs running CNNs
fire every element

vs.

Akida NPU

Compute only event data
"elegant, like the brain"



What's the Result?

10X
Computational Efficiency

mW
Ultra-Low Power

<10ms
Real-Time Response

© 2026 BrainChip Holdings Ltd. All rights reserved.

Powering Next-Gen Physical AI

On-Device Physical AI, Near the Sensor

Brain-Inspired Neuromorphic Computing for Ultra-Low Power Event-Based Processing

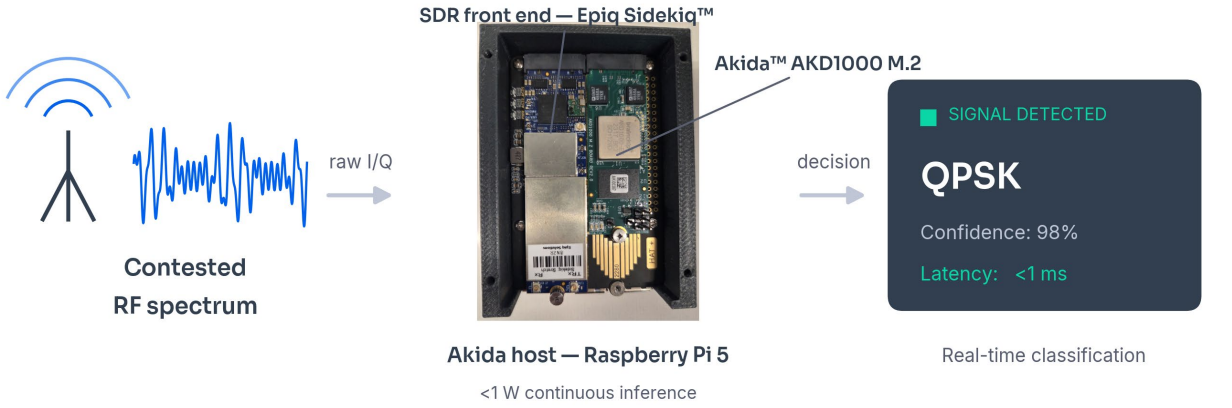
Scalable Platform from IP to Solutions

Reference Platforms	
Dev Kits & Modules	
Akida Models	See Hear Sense
Akida Tools	TensorFlow ONNX PyTorch
Akida Silicon	
License IP	 akida

© 2026 BrainChip Holdings Ltd. All rights reserved.

Akida™ Communication Reference Platform

Identify and classify modulations, in real time, at the tactical edge, on milliwatts of power.





© 2026 BrainChip Holdings Ltd. All rights reserved.

The Edge Signal Intelligence Challenge



Mission-Critical SWaP-C

Defense platforms require minimal size, weight, power, and cost—ruling out high-power AI compute at the tactical edge.



Legacy DSP Limits

Traditional DSP chains cannot adapt to complex, evolving threats without costly and slow hardware upgrade cycles.



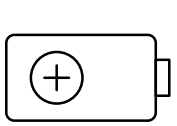
Cloud Dependency Risks

Off-board analysis adds unacceptable latency and exposes transmission signatures to adversaries.

Industry is shifting from fixed DSP chains to adaptive deep learning — and the DoD is actively seeking AI-enabled communications and spectrum management at the edge.

© 2026 BrainChip Holdings Ltd. All rights reserved.

Why Akida for **Signal Intelligence**



Low-SWaP Intelligence

Advanced classification in battery-powered devices with no thermal penalty.



100% Data Sovereignty

All processing stays on-device — a zero-emission profile keeps missions secure.



Ultra-Low Latency

Millisecond-level reaction to jamming and threats, with no transmission delays.



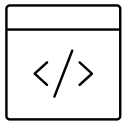
Low Thermal Signature

Minimal heat enables covert deployment and extends hardware lifespan.



Scalable Cost

Compact silicon footprint keeps per-unit cost low at fleet scale.



Ease of Deployment

A simple SDK lets engineers deploy models without deep neural-network expertise.

© 2026 BrainChip Holdings Ltd. All rights reserved.

A Complete RF-to-Decision Pipeline

The reference design pairs a software-defined radio with a Raspberry Pi 5 host and the Akida AKD1000 accelerator on an M.2 module — a full modulation classification pipeline in a palm-sized footprint.

AI Processor
AKD1000 Co-Processor — in M.2 module

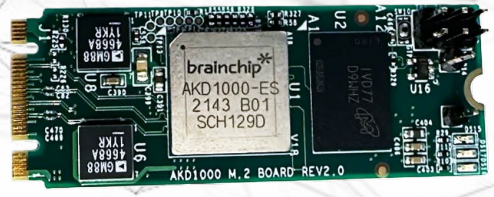
SDR Front End
70 MHz – 6 GHz tunable range (SDR-dependent)

Receiver Host
Raspberry Pi 5 single-board computer

Coverage
20+ modulation schemes — digital and analog



Raspberry Pi 5 with Epiq Sidekiq™ Stretch M.2 SDR



AKD1000 M.2 Key Accelerator Card

© 2026 BrainChip Holdings Ltd. All rights reserved.

Built on the **Epiq Sidekiq™ Stretch**

The reference platform pairs Akida with the Epiq Sidekiq™ Stretch — a compact, low-power M.2 software-defined radio purpose-built for size-, weight-, and power-constrained missions.

Compact M.2 Form Factor
A full RF transceiver in an M.2 card — mounts directly on the host, no external radio box.

Mission-Grade Power Efficiency
Just 2.5 W SDR draw alongside Akida's sub-1 W inference — ideal for battery power.

Wide Frequency Coverage
45 MHz – 6 GHz tuning, 50 MHz instantaneous bandwidth, PPS and GPS timing inputs.

Validated with Akida
>90% classification accuracy demonstrated end-to-end on the reference platform.



Epiq Sidekiq™ Stretch M.2 SDR

© 2026 BrainChip Holdings Ltd. All rights reserved.

Lab-Validated Performance

Model size: 3.7M MACs and 104k parameters

90%+
Classification accuracy

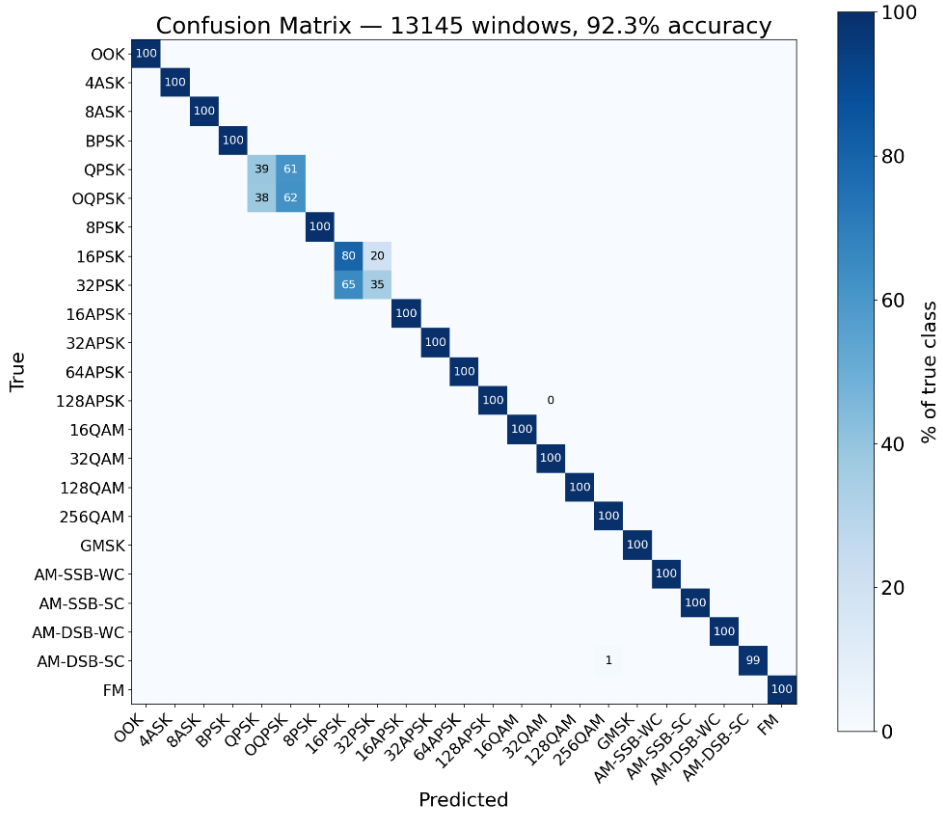
<1 W
Power at continuous inference

0.11 W
Idle power (measured by RTX)

0.26 ms
Inference latency per frame

2,734
Frames per second, continuous

23
Modulation schemes covered



Confusion matrix across 23 digital and analog modulations — 92.3% accuracy over 13,145 windows

© 2026 BrainChip Holdings Ltd. All rights reserved.

Built for the **Missions That Matter**



Electronic Warfare

Real-time threat detection and jammer classification at the point of signal capture — millisecond response with no reach-back.



UAV / Drone SIGINT

Passive signals intelligence on small unmanned platforms, with dramatically reduced data-link bandwidth requirements.

Backed by a Funded U.S. Defense Program

Developed under a U.S. Air Force Research Laboratory effort with Raytheon (RTX) for neuromorphic radar signal processing.
Approved for Public Release; Distribution Unlimited: AFRL-2026-1488.

© 2026 BrainChip Holdings Ltd. All rights reserved.

Live D

We Are....

- **Showcasing RF modulation classification implemented with neuromorphic deep learning**
- **Introducing ultra-low SWaP-C signal intelligence algorithms**
- **Delivering an end-to-end platform to show it is real!**
- **The platform allows:**
  - Recording your own RF dataset, training and validating your own model with Akida MetaTF

Options We Can Provide:

- **Dev Kits**
- **Build with BrainChip support**
- **Modulation Classification model**



© 2026 BrainChip Holdings Ltd. All rights reserved.

Q & A



© 2026 BrainChip Holdings Ltd. All rights reserved.