

# DEEPWAVE DIGITAL

## Artificial Intelligence Radio Transceiver (AIR-T)

### AIR-T Embedded Series Product Line



#### Overview

Deepwave's AIR-T is the first software defined radio with embedded high performance computing. It contains three unique digital processors for any application:

- FPGA for strict real-time operations
- GPU for highly parallelized processing
- CPU for control, I/O, and software applications

The AIR-T allows users to easily incorporate artificial intelligence into their radio frequency and wireless technologies.

This versatile system can function as a highly parallel SDR, data recorder, or inference engine for deep learning algorithms. The embedded GPU allows for SDR applications to process bandwidths greater than 200 MHz in real-time.

#### Key Specifications

- **Dual Channel MIMO Transceiver**
  - 300 MHz to 6 GHz
  - 100 MHz bandwidth Rx (per channel)
  - 100 MHz bandwidth Tx (per channel)
- **Digital Signal / Deep Learning Processors**
  - Xilinx Artix 7 FPGA
  - NVIDIA Jetson TX2
    - ARM Cortex-A57 CPU (4 core)
    - NVIDIA Denver2 CPU (2 core)
    - NVIDIA Pascal GPU (256 core)
    - 8 GB of memory
- **Connectivity**
  - GPS Sync via 1 PPS and 10 MHz
  - USB 3.0, USB 2.0/3.0, SATA
  - High-speed digital I/O (GPIO/UART)
  - 1 Gbps Ethernet
- **Dual Power Mode:**
  - 22 / 14 Watts

#### Software Support



CUDA

#### GPU Acceleration

HPC with CUDA toolkit using C/C++ or Python interfaces



GNU Radio  
THE FREE & OPEN SOFTWARE RADIO ECOSYSTEM

#### Signal Processing

Support for industry leading SDR development environment



TensorFlow

#### Deep Learning

Train and deploy AI systems using standard frameworks

Operating System  
Ubuntu 18.04



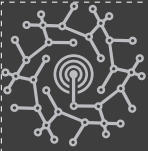
#### Mechanical

- Size - 17.0 x 17.0 x 3.5 cm
- Weight - 0.35 kg

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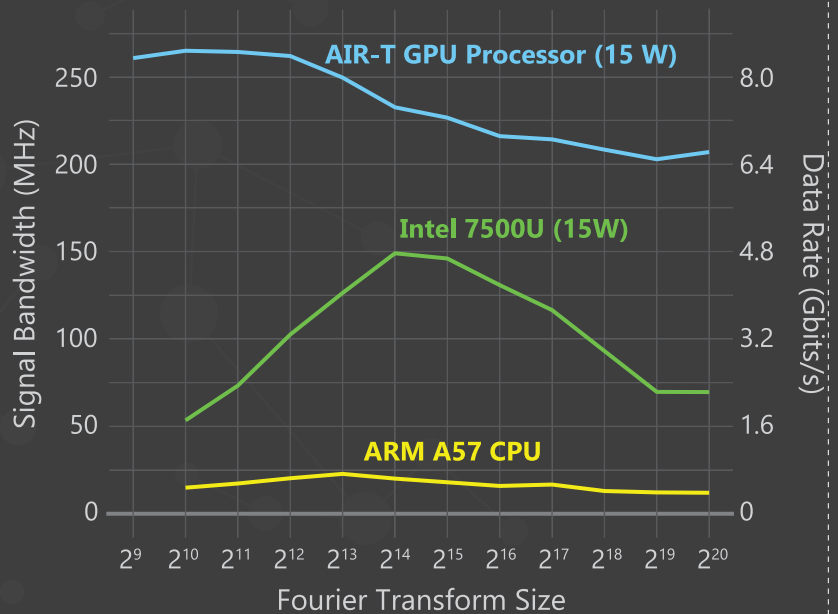
#### Performance

The AIR-T uses **256 GPU cores** to create a highly parallel compute environment making wideband processing for software defined radio (SDR) applications obtainable.

Using the embedded NVIDIA Jetson TX2 the AIR-T provides **250% bandwidth improvement** over a power-comparable CPU and **1,350% bandwidth improvement** over an embedded CPU for real-time SDR applications.

The AIR-T uses **zero copy** memory access to overcome the data transfer overhead typically associated with GPU processing.

#### Real-time DSP Measurements



#### Applications

Pre-trained  
AI Cores

User Developed  
Applications

AI  
Frameworks

DSP  
Frameworks

AIR-T Hardware Abstraction

AIR-T Hardware

#### Embedded Series Models

	AIR7101-A	AIR7101-B	AIR7201-A	AIR7201-B
GPU Cores	256	256	256	256
CPU Cores	6	6	6	6
Shared Memory	8 GB	8 GB	8 GB	8 GB
FGPA Model	XC7A75T	XC7A75T	XC7A200T	XC7A200T
Logic Cells	75,520	75,520	215,360	215,360
DSP Slices	180	180	740	740
Memory	3,780	3,780	12,140	12,140
Enclosure	No	Yes	No	Yes

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