Neutral Wireless

spectrum. unleashed.

FPGA • SDR • RFSOC Consultancy

Real Time RF Data Processing

High Speed RF Acquisition

ADC & DAC Integration

Quantum Control Systems

Dynamic & AI Enabled Radio Systems

Custom Radio Prototyping

Neutral Wireless

About Us

- **Radio focused DSP experience** – years of academic research, collaborative industry projects and engineering consultancy
- **Full stack FPGA expertise** – algorithm modelling, HDL implementation and on-board validation
- **Mixed signal integration** – experts at handelling analogue / digital domain crossings
- **Flexible scope** – targeted tasks or full end-to-end delivery, matching your project needs

Typical Engagements

Clients turn to us for feasibility studies, proof of concepts, rapid prototyping, production grade designs, custom toolflow automation and focused PYNQ/RFSoC training. Each engagement is scoped to fit your timelines, internal capabilities and risk profile

Why Choose Neutral Wireless?

Bridging Research Grade Insight with Production Ready Engineering.

Neutral Wireless has a specialist engineering consultancy division that is focused on high performance FPGA, SDR and RFSoC system development.

Operating within Neutral Wireless Ltd., we deliver bespoke embedded systems leveraging advanced signal processing for organistions building complex hardware platforms. We combine research grade algorithm expertise with production focused engineering, enabling clients to move confidenly from concept through to validated hardware development.

We have delivered dozens of FPGA solutions using toolchains such as Vivado, Vitis and MATLAB/Simulink. Our work typically targets off-the-shelf development boards based on Zynq-7000, MPSoC, and RFSoC devices, often incorporating Analog Devices data converters. We also support designs targeting custom hardware platforms provided by our clients, though we do not undertake PCB or hardware board design ourselves.

Flexible Deployment Workflow

Engage for a single phase, multiple stages, or a full cycle delivery.

Research & Feasibility
Requirements capture, technical risk analysis and high level metrics

Algorithm & Behavioural Modelling
MATLAB/Simulink or Python models for feasibility and validation

Hardware Oriented Refinement
Device selection, PS/PL partitioning and resource/latency budgeting

HDL Implementation
VHDL or higher level HLS source code, IP core generation and system integration

Verification & System Validation
Bit accurate testing, hardware-in-the-loop and full performance reporting

Deployment & Handover
Bitstreams, build scripts, technical handover pack, knowledge transfer session

Areas of Expertise

Hardware Specialities

- AMD RFSoC and other SDRs
- AMD FPGAs and SoCs
- Analog Devices radio front-ends
- High speed data transfer

Algorithms and Architectures

- Fixed point DSP design
- Multirate signal processing
- Wireless transmitter & receiver design
- Spectrum analysis and monitoring
- Adaptive DSP (e.g. LMS, QR, Kalman)
- Cognitive radio design

Software Expertise

- MATLAB/Simulink
- HDL Coder
- Embedded Coder
- Model Composer
- C / C++
- Custom toolbox development
- AMD Vivado Suite
- Embedded Linux and Petalinux
- GNU Radio
- SoapySDR
- PYNQ
- ADI No-OS
- Baremetal

Real Time RF Data Processing

We design and implement deterministic FPGA processing pipelines for high throughput RF signal environments. Our architectures are built for sustained performance, low latency, and reliable operation on live over-the-air signals.

Typical implementations include:

- Multi-channel streaming DSP pipelines
- Fixed-point optimisation for hardware efficiency
- Deterministic latency budgeting
- Beamforming, filtering and channelisation architectures
- High throughput data flow design for sustained real time operation

Built for purpose, these systems are engineered to perform in real world RF conditions.

ADC and DAC Integration

We design and implement real time processing pipelines that connect custom algorithms directly to high speed ADC and DAC radio hardware. Our expertise ensures reliable data-flow between the analogue RF front-end and digital signal processing blocks, enabling reliable operation on live radio systems.

We support:

- Integration of DSP and FPGA algorithms with high-speed converters
- High throughput streaming architectures
- Digital up and down conversion chains
- End-to-end validation using live RF inputs and outputs.

We ensure reliable, determinsitic data flow across the analogue / digital boundary.

High Speed RF Acquisition

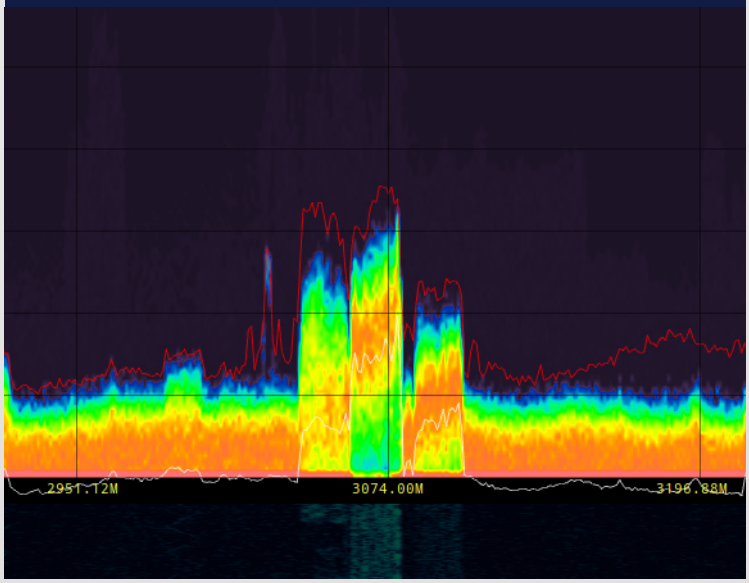
Modern RF systems demand sustained wideband data capture with precise timing and deterministic behaviour. We architect FPGA-based acquisition pipelines that reliably move multi-gigabit data streams from high-speed converters into real time processing environments.

Beyond converter integration, we design complete high throughput data paths. including deterministic buffering, formatting and optical offload via QSFP interfaces, enabling sustained transport of captured RF data to external processing or storage systems.

Typical applications:

- Wideband spectrum monitoring platforms
- Multi-channel RF capture and recording systems
- Distributed processing architectures
- Real time modem and beamforming testbeds
- High speed instrumentation and data logging systems

From converter interface to optical transport, we take care of the high speed acquisition chain for you.



Quantum Control Systems

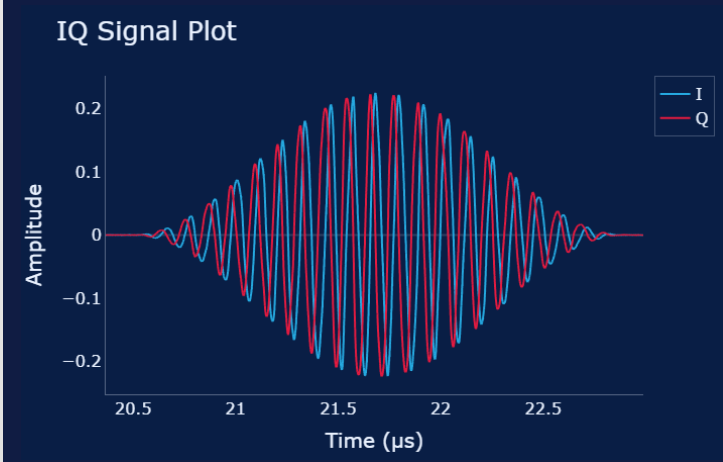
Quantum hardware platforms demand extreme timing precision, phase stability and deterministic control. Even small variations in latency or signal alignment can directly impact system fidelity and repeatability.

For these quantum based solutions, we design real time FPGA based control architectures that translate experimental control strategies into stable, hardware executable systems. Our solutions support qubit control and readout processing, signal generation and synchronisation.

Core capabilities:

- Precision signal generation with deterministic timing control
- Carrier frequency control
- Multi-channel phase coherent signal generation
- Deterministic signalling and low latency control paths
- Real time qubit readout acquisition and processing

These systems are engineered to preserve timing fidelity and phase stability in demanding quantum environments.



Dynamic & AI Enabled Radio Systems

We specialise in physical layer signal processing and real world RF environments. Our expertise bridges the gap between AI models trained on synthetic datasets and the challenges of live signals.

We support organisations through:

- PHY layer signal analysis and spectrum characteristics
- Real world dataset capture
- Over-the-air data collection platforms
- Quantisation of Deep Learning models for embedded hardware
- Integration of AI models with Software Defined Radio systems

Our focus is practical deployment of AI models that perform reliably with real signals.

Custom Radio Prototyping

Our in house expertise can design and build prototype radio systems for organisations developing solutions in emerging or specialised markets. Combining software defined radio platforms with custom signal processing algorithms, we deliver functional, real time radio prototypes ready for testing and validation.

Our capabilities include:

- SDR based rapid prototyping
- Custom PHY layer algorithm development
- RF front-end integration
- Real time signal processing implementation
- Transition from proof-of-concept

We turn your concepts into functioning radio systems and show you how to use them.