



company  
OVERVIEW



## Introduction

**RF Engines Limited (RFEL) is a provider of digital signal processing hardware designs for high quality signal filtering and conditioning. Utilising patented architectures and high speed Field Programmable Gate Array (FPGA) devices, our off the shelf or specialist system solutions are used in the defence, instrumentation and communications markets.**

**Based on the Isle of Wight in the UK, we provide standard designs sold as Intellectual Property Cores, complete turn-key designs developed against a specific specification, and consultancy services to establish suitable architectures for specific tasks.**

## Products and services

Our product range and services are as follows.

RFEL provide individual IP cores and integrated turn-key designs for front-end digital signal processing in FPGAs and ASICs.

RFEL provide “off the shelf” IP cores that are highly optimised in terms of speed, power and size compared to cores available from the major FPGA vendors. RFEL also provides specialist consultancy and design services for complete front-end solutions using its standard IP blocks, which are configured to meet the customer’s system requirements. RFEL will provide engineering consultancy during the design phase and advise on the best system architecture to meet a particular requirement. RFEL will then provide a guaranteed implemented design, complete with test benches and documentation. After sales design support is also available as required by the project.



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### **rf engines limited**

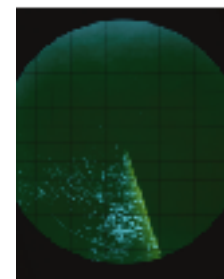
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# view

Additional information  
can be found at  
[www.rfel.com](http://www.rfel.com)

## IP Cores

- **Pipelined Frequency Transform (PFT)** - Proprietary high quality filter bank.
- **Pipelined FFTs**  
8 points to 64K points fully pipelined continuous real-time processing.  
Optional 50% overlap input stage. Mixed Radix solutions.
- **Half Band Filters**  
Highly optimised Distributed Half Band Filter.  
Multi-channel interleaved versions available.
- **Highly Optimised FIR Filters** - Using canonical signed digit multiplier techniques.
- **NCO Down Converters**
- **Polyphase DFTs/WOLA**
- **CORDICS**
- **Interleavers/De-interleavers** - Used to multiplex multiple channels through the high speed cores.
- **Windowing** - used in conjunction with the FFTs.
- **Bit Reversers** - optional item with the FFTs.
- **Fixed point to floating point output converter**



## System Design Solutions

- **Military Signal Processing Designs. (Surveillance/EW/Comms/RADAR)**

DHBF/NCO down converters ▶ FFT/PFT ▶ CORDIC and other post processing.  
Multi-channel interleaved filter banks. DF systems. Wide band frequency hopping  
and sweeping signal detection/measurement.

- **Test Equipment Designs (Spectrum Analysers/Production Test Systems)**

High quality and flexible spectrum analysis. Analogue IF strip replacement. Wide band  
real time analysis. Specialist communication signal testing, Bluetooth, 802.11x etc.

- **Commercial Communications Front End Designs**

High quality communications multi-channel filtering front ends. TI-Graychip/Intersil  
replacement on FPGA. Wireless communications base station front ends.  
Flexible user controlled high quality filter banks.

## Consultancy

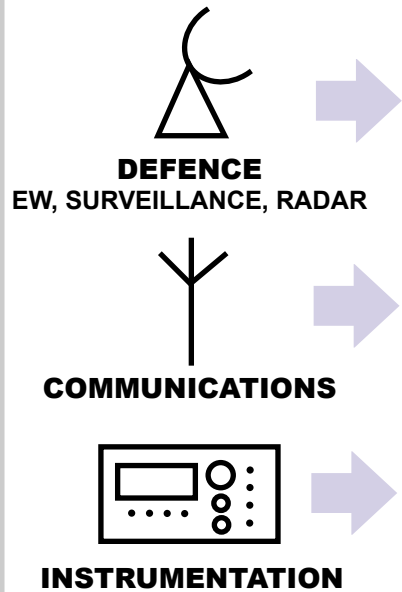
RF Engines provides consultancy at the system and detailed implementation level to establish optimal configuration of the down conversion and filtering requirements in the digital domain. Choice of Intermediate Frequency (IF) selection, analogue to digital converter (A/D) selection and type of process used to perform the signal conditioning, splitting and filtering are complicated issues. Our engineers have extensive experience gained at system level, which enables this complex analysis to be provided.

Optimal FPGA selection and design is also a highly complicated area. Our engineers have years of experience in providing the most compact and efficient designs using the latest design tools available. Support can be provided on device selection and implementation issues.



## Consultancy and design services

### Complete turn-key designs and individual IP cores



### ANALOGUE TO DIGITAL CONVERSION

### CONVERSION TO BASEBAND

- NCO Digital Down Converter
- Half Band Filter
- Distributed Half Band Filter
- Interleaved Distributed Half Band Filter

### CHANNELISATION

- Pipelined Frequency Transform
- Pipelined Fast Fourier Transform
- Polyphase DFTs/WOLA
- Processing blocks
  - Interleavers/De-interleavers
  - Windowing
  - Bit Reversers
  - Fixed point to floating point output converter

### POST PROCESSING FUNCTIONS

- Averaging
- Triggering
- $I^2 + Q^2$  Power
- CORDICS - phase and magnitude
- Carrier Recovery
- LOG(MAG)
- etc

