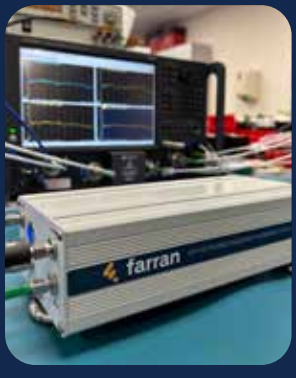
farran

Millimeter wave solutions, made simple

Irish Millimeter Wave Design, Production & Test Enterprise

Providing mm-wave Solutions from 20 - 500 GHz

Systems, sub-systems and components for Test & Measurement, Security & Imaging, Communications and Research Applications.



Frequency Extension Products
(FCE/FEV/AET&AER/FEK/FEC)

5G Communication Extenders (FCE)

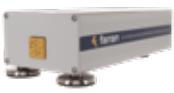
Farran's FCE series up/down converters serve as frequency extenders for communication test equipment. The FCE-06-TR-0001 model covers the 110-150 GHz band, crucial for 6G communications, and acts as a dedicated Transmit/Receive system. It features enhanced IF bandwidth for wideband modulation, is cost-effective to reduce development and testing time, and supports external power, low noise amplifiers, and band-pass filters.

FEATURES
- Broad bandwidth measurements
- Low noise figure & good output power for high system dynamic range
- Compact and lightweight

Frequency Extension Heads for Vector Network Analyzers (FEV)

FEV modules connects to your existing VNA and leverage the inherent microwave VNA's performance and features to conduct industry leading mm-Wave full port S-parameters: measurements between 40-500 GHz. Two measurement architectures are available: 1-path/2-port and fully reversing 2 port. Waveguide calibration kits are also available as separate accessories.

MM-WAVE S-PARAMETERS MEASUREMENTS
- Full 2-port S-parameters millimeter wave measurements up to 500 GHz.
- Error-corrected measurements – full 2-port TRL/SOLT calibration



Antenna Measurement Frequency Extenders (AET/AER)

Farran offers Antenna Measurement Frequency Extension Modules for extending frequency range of customer systems to 500GHz. Farran's AET and AER frequency extenders are a dedicated Test & Measurement solution for antenna performance verification. The system comprises of the transmitter and receiver units that enable antenna radiation pattern, gain and phase polarisation measurement in the near- and far-field up to 500 GHz, using your existing baseband VNA.

MEASUREMENTS
- Lightweight and low complexity make it an ideal solution for omni-directional spherical systems and scanners
- Does not require complex and expensive positioners
- Coherent phase and amplitude measurements
- High phase and amplitude stability

Frequency Extension Calibration Kits (FEK)

Farran's FEK-XX-000X calibration kit provides accurate calibration of the Vector Network Analyzers (VNA). It is compatible with TRL and SOLT calibration techniques and allows for a full 12-term port calibration.

CONTENT
- Fixed termination
- Flush short
- 1/4 lambda offset
- Hex ket 5/64"
- Flange screws
- Precision alignment pins
- USB flash memory

Frequency Extension Controller (FEC)

Farran's Frequency Extension Controllers are part of the mm-wave measurement extension solution which ensure that Farran's mm-Wave products are fully compatible with Keysight PNA-X Vector Network Analyzer's and offers the best S-Parameter accuracy available on the market.

FEATURES
- RF/LO and IF signal routing & amplification
- Fast Switching Speed
- Compatability with PNA-X
- DC bias source for FEV-XX

Signal Generator Frequency Extenders & Spectrum Analyzers Extenders (FES/SAE)

Signal Generator Frequency Extenders (FES)

Farran's FES modules extends microwave signal generators to 40-500 GHz, providing a high-performance source for DUT characterization. FES modules connect easily to customer's signal generator, ensuring superior output power, spurious, and harmonic performance for accurate measurements.

FEATURES
- Stable and lightweight
- Support FM/PM and pulse modulation
- Optional manual variable attenuator

Spectrum and Signal Analyzer Frequency Extension Systems (SAE)

Farran's SAE frequency extenders are a dedicated Test & Measurement solution for extending the range of Signal and Spectrum Analyzers. The SAE modules are designed to interface with your existing micr owave signal or spectrum analyzer and extend its frequency coverage to 170 GHz.

MODES OF OPERATION
- Signal and spectrum Analyzer mode
- Block down-converter mode
- Block up-converter mode

Noise Figure Analyzer Extenders (FBC/WGNS)

Frequency Extension Noise Figure Analyzers (FBC)

Farran offers the FBC series of down converters as frequency extenders for noise figure measurement systems. The FBC-XX-FB, compatible with the Keysight N8975A Noise Figure Analyzer (NFA) or X Series Signal Analyzer with option N9069A, extends the NFA's frequency range for accurate noise figure measurements across Ka, U, V, E, and W bands (26.5-170 GHz) when used with an Agilent E8247C signal generator or equivalent.

FEATURES
- Lightweight and low complexity make it an ideal solution for use with existing systems
- Fully compatible with Y-factor based noise figure analyzers
- Accurate millimeter wave noise figure & gain measurements

Noise Sources (WGNS)

Farran's WGNS noise sources, part of the Noise Figure measurement system (FBC-XX-FB) built on a Keysight N8975A Noise Figure Analyzer (NFA) or X-Series Signal Analyzer with option N9069A, extends the NFA's frequency range to 26.5-170 GHz for accurate noise figure measurements on wafer and benchtop applications. The WGNS series of noise sources works with the FBC-XX-FB down converters as frequency extenders for this noise figure test system.

FEATURES
- Lightweight and low complexity make it an ideal solution for use with existing systems
- Fully compatible with Y-factor based noise figure analyzers
- Accurate millimeter wave noise figure & gain measurements

Custom Band Pass Filters (BPF)

Band Pass Waveguide Filters (BPF) 40 - 220 GHz

Farran's BPF filters, designed with precision rectangular waveguide interfaces for 40-220 GHz, use Farran's proprietary technology to achieve low pass-band insertion loss and exceptional high out-of-band rejection. This unique design technique enables cost-effective manufacturing of custom high-performance filters, ensuring excellent agreement between simulations and measurements.

CUSTOMISATION OPTIONS

- Centre frequency and fractional bandwidth
- Filter's order: 7, 9 or 11

APPLICATIONS

- 5G, 6G & WiGig
- Wireless Communications
- 70/80/90 GHz backhaul radio
- Automotive FMCW analysis

FMCW Radar / Imaging Products (FMCW/PMMW)

Radar Front Ends (FMCW)

Farran's FMCW radar front end, available at 77 GHz, uses a GaAs MMIC chipset for wide bandwidth in a compact package. It employs an externally derived VCO signal, internally multiplied to serve as the LO for the receive mixer. The resulting IF is optimized for gain and filtering, offering an industry-leading noise figure. C**ustom designs are also available, such as D-band FMCW-06-0001 (110-150 GHz), with wider IF bandwidth.**

FEATURES

- Stable and lightweight
- Supports FMCW modulation schemes
- Customised performance available

Passive Imaging & Radiometers (PMMW)

Passive mm-wave (PMMW) imaging creates high-resolution images in low visibility conditions, useful for applications like concealed weapon detection and airplane landing. The 80-110 GHz (W Band) atmospheric window is ideal for PMMW systems, which detect naturally emitted thermal radiation. Products are available up to 345 GHz.

APPLICATIONS

- Airport security screening
- Material composition
- Remote sensing
- Medical
- Metrology
- Metal detection in food

Amplifiers (Low Noise & Power Amplifiers) (FLNA/FPA)

Power Amplifiers (FPA) 50-170 GHz

FPA series driver and power amplifiers, based on discrete and MMIC pHEMT devices, operate from 18 to 110 GHz for high output power applications. Available as standard or custom-built up to 250 GHz, these amplifiers feature various RF interfaces, including waveguide or coaxial connectors, for easy integration. Optional integrated isolators enhance port return loss.

APPLICATIONS

- Communication transmitters
- Radar front ends
- Driver amplifiers
- Test & Measurement
- Point to point communication

Low Noise Amplifiers (FLNA) 18-170 GHz

FLNA series low noise amplifiers are constructed with discrete or MMIC pHEMT devices that operate over the frequency range 18 to 110 GHz. These amplifiers are specifically designed for low noise applications. The amplifiers are offered in two categories: standard and custom-built. The custom-built amplifiers are offered in various RF interfaces, including standard waveguide or coaxial connectors, for convenient system integration.

APPLICATIONS
- Communication receivers
- Radar front ends
- Driver amplifiers
- Point to point communication

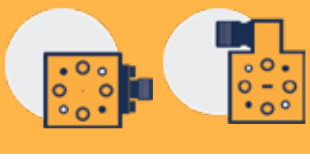
Multipliers (Active & Passive Multipliers)
(FDA/FT)

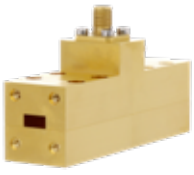
Active Multipliers (FDA) 18 - 110 GHz & Passive Multipliers (FT) 30 -500 GHz

Farran's Frequency Multipliers are a high-performance instrumentation grade component designed to multiply microwave signals to millimeter wave range of 18 – 500 GHz. The multipliers are based on commercially available MMIC and Schottky diode devices and are designed for full waveguide bands coverage with best-inclass spectral purity. These modules use Farran's proprietary multiplier technology to achieve high conversion efficiency and very high output power levels available in extremely wide bandwidths. Farran's multipliers are the most cost-effective way to multiply microwave frequencies to millimeter wave range.

APPLICATIONS
- Communication receivers
- Radar front ends
- Driver amplifiers
- Point to point communication

Mixers (Harmonic & Sub Harmonic Mixers)
(WHMB/SPM)





Harmonic Mixers (WHMB) 26.5 - 500 GHz

Farran offers fundamental (RF - LO), sub-harmonic (RF - 2xLO) and harmonic mixers (RF-NxLO, where N=2, 4, 6) for a wide variety of applications from 26.5 GHz to 500 GHz. All mixers use planar Schottky diodes and provide state of the art performance in a small and lightweight package. Farran's WHMB harmonic mixers are a dedicated Test & Measurement solution for extending the range of Signal and Spectrum Analyzers. The WHMB harmonic mixers are designed to interface with your existing microwave signal or spectrum analyzer and extend its frequency coverage to 500 GHz.

APPLICATIONS
- Spectrum analysis
- mm-Wave instrumentation
- Signal processing
- Phased locked loops

Sub Harmonic Mixers (SPM) 50 - 300 GHz

Farran offers fundamental (RF - LO), sub-harmonic (RF - 2xLO) and harmonic mixers (RF - NxLO, where N=2, 4, 6) for a wide variety of applications from 26.5 GHz to 500 GHz. All mixers use planar Schottky diodes and provide state of the art performance in a small and lightweight package. A high-performance sub harmonically pumped mixers available in frequencies from 50 to 350 GHz and beyond.

APPLICATIONS
- Hetrodyne Receivers
- Instrumentation
- Imaging Front end
- Laboratory Test systems

10-Step Custom Design Process

Farran provides the unique creative service of custom products and solutions that perfectly meet your needs. We employ agile development processes and proof-of-concept prototypes throughout testing, iteration, integration and low- to mid-volume production.

Over the past 10+ years, we have designed and delivered over 120 custom solutions which required our specialized design capabilities to convert the vision into an exceptional solution. This included the following steps: from proof-of-concept prototypes through to testing, iteration, integration and low- to mid-volume production in over 70 projects.

Farran is a trusted innovation partner to billion-dollar companies, system integrators, and research organizations worldwide. We are committed to the highest standards of quality management from initial quotation through to final testing, packaging, and delivery. We thrive on solving complex challenges with leading edge solutions that work the first time, every time. To ensure we meet your standards, we use a 10-Step Custom Design Process.

1 Assessment

2 Planning

3 Quotation

4 Order

5 Design

6 Review

7 Manufacture

8 Test

9 Ship

10 Support

5G Chip Design Project

When developing their 5G chipsets, our customers trust Farran's wealth of mm-wave knowledge and expertise to enable high fidelity prototype testing in their development labs. Farran's know-how enables customers to develop, test, and modify their chipset designs, with full confidence in the accuracy of the results to ensure they bring 'Best in Class' products early to the 5G market.

R&D work with European Space Agency

Over the last two decades, Farran has been involved in several research and development projects sponsored by European Space Agency. The objectives of these initiatives were to develop novel design techniques, manufacturing technologies, and processes for millimeter wave and sub-terahertz receivers along with atmospheric sensing front-ends. Farran has partnered with academic institutions (Tyndall National Institute, Cork) as well as commercial entities (United Monolithic Semiconductors) to develop mixer and multiplier gallium arsenide (GaAs) membrane circuits operating in the 170 – 380 GHz range. This work involved designing demonstrators with optimised and novel diode topologies, and manufacturing devices using hot embossing techniques. It also included various wafer post processing techniques such as beam lead incorporation, wafer thinning and window etching. A variety of doublers and sub-harmonic mixer circuits has been successfully developed and tested.