COMPANY OVERVIEW

ARQUIMEA DEUTSCHLAND and ARQUIMEA INGENIERÍA are sister companies with complementary capabilities.

Fabless Design Houses specialized in hi-rel technologies mainly for space applications.

Suppliers of electronics, microelectronics, mechanisms and SW.

Strong R&D activity and product-oriented strategy.
INCOMES

INCOMES in Million Euros

Shareholder:
Diego Fernández, PhD.

13M€ revenues
2M€ EBITDA

Employees: 100
Patents: 15

FACILITIES

Headquarters:
> Madrid (ES)

Subsidiaries:
> Frankfurt Oder (DE)
> Hong Kong (CN)

BUSINESS UNITS

HI-REL COMPONENTS AEROSPACE

ON-BOARD SYSTEMS DEFENCE & SECURITY

OUTSOURCING & CONSULTING

BIOTECHNOLOGY

INCOMES

FACILITIES

BUSINESS UNITS
COMPANY OVERVIEW

ITAR FREE  FABLESS  DESIGN HOUSE  SPACE & HI-REL  MULTINATIONAL

MEMBER OF

BUSINESS AREAS
- ELECTRONICS & MICROELECTRONICS
- ACTUATORS & MECHANISMS
- SOFTWARE & ICT
- R&D

MAIN COSTUMERS & PARTNERS
IHP MICROELECTRONICS GmbH

Direct access through ARQUIMEA to ultrafast and rad-hard SiGe CMOS:BiCMOS technology, including IP cores, support to design, digital back-end, manufacturing and test.

- 0.25 & 0.13 µm SiGe CMOS:BiCMOS technologies with HBTs up to 500 GHz.
- Integrated RF-MEMS and LDMOS as well as localized backside etching (LBE) and copper plating are technology extensions.
- 0.25 µm SGB25RH and 0.13 µm SG13RH rad-hard CMOS libraries and design kits under development; HBTs are radiation hardened.
OHB SYSTEM AG

Direct access through ARQUIMEA to space-qualified electronic equipment and instrumentation.

- Development of complex instruments, satellites and space missions. Equipment design for optical and electrical instruments and systems.
- More than 100 systems and sub-systems for manned space stations, satellites and interplanetary missions.
- Optical systems and sub-systems for 15 space telescopes and space cameras.

COMMERCIAL PARTNERS

Radiation Tolerant Analog I/O Module
Radiation Tolerant CPU Module
Radiation Tolerant Digital I/O Module
Online Camera System
Power Distribution Module
Power Supply DC/DC Module
MICROELECTRONICS

RAD-HARD IC DESIGN
ANALOG, DIGITAL, MIXED-SIGNAL
RADIATION CHARACTERIZATION

RH IPs & LIBRARIES
ASICs / FPGAs
SPACE COMPONENTS
## Supply Chain, Capabilities & Alliances

<table>
<thead>
<tr>
<th>DESIGN FLOW</th>
<th>CAPABILITIES</th>
<th>PARTNERS</th>
</tr>
</thead>
</table>
| **DEFINITION & FEASIBILITY ANALYSIS** | Spec review  
Technology selection  
ASIC development plan |                                |
| **DESIGN**                   | Rad-hard IPs and ICs  
Rad-hard smart power  
Test vehicles  
Technology hardening by design and modeling  
Space FPGAs  
FPGA to ASIC conversion  
ESD protections | Support from SOFICS (BE) |
| **DESIGN VERIFICATION**      | Functional  
Reliability  
Radiation simulation |                                |
| **MANUFACTURING**            | MPW  
MLM  
Full mask | IHP (SGB25RH, SG13RH)  
ON SEMI (I3T80)  
UMC 180nm / DARE (IMEC)  
Atmel (ATMX150RHA) | |
| **ASSEMBLY**                 | Package selection  
Package design | HCM                           |
| **VALIDATION**               | Qualification according to ESCC  
Screening  
Mechanical, Electrical and ESD test  
Reliability test  
Radiation test (SEE, SEL, TID) | SERMA  
ALTER |
MICROELECTRONICS
Microelectronics roadmap

R&D PROJECTS
- Space science
- MEIGA MetNet Precursor

ASICs
- REDSAT-ELSA
- ESA Cosmic Vision MF
- ESA Cosmic Vision HF
- DETECTA: 5-bit Flash ADC @ 16GHz
- CA-RTU: 12 ENOB ADC @ 100KHz
- QUANTUM

RAD-HARD IPs
- Converters
- Interface
- Signal conditioning
- Signal processing

CUSTOM SERVICES
- Technology characterization
- Test vehicles design
- Electrical and radiation tests
- RH Digital libraries
- Space FPGA development

RAD-HARD COMPONENTS
(on going)
- LVDS octal repeater
- LVDS driver
- LVDS receiver
- 16-channel analog MUX
- Ethernet PHY transceiver
## Main projects

<table>
<thead>
<tr>
<th>ASICs &amp; FPGAs</th>
<th>Customer</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>REDSAT ASIC set ELSA</strong></td>
<td>Airbus Defence &amp; Space</td>
</tr>
<tr>
<td>Smart Power Chip Set for reconfigurable antenna control. Qualified for Small GEO Satellite.</td>
<td></td>
</tr>
<tr>
<td>1500+ flight units delivered since 2012</td>
<td></td>
</tr>
<tr>
<td><strong>COSMIC VISION reconfigurable mixed-signal ASICs (MF and HF)</strong></td>
<td>European Space Agency – ESA</td>
</tr>
<tr>
<td>Avionics mixed-signal ASIC for low-cost satellites (analog IPs design)</td>
<td>IHP Microelectronics</td>
</tr>
<tr>
<td>SWIPE ASIC for Radiometry</td>
<td>EU (FP7)</td>
</tr>
<tr>
<td>Design and integration of a RH ADC IP for an Scalable Sensor Data Processor ASIC (SSDP)</td>
<td>Thales Alenia Space (ESA project)</td>
</tr>
<tr>
<td>QUANTUM – Fast Beam Hopping Enabled Digital ASIC</td>
<td>Airbus Defence &amp; Space</td>
</tr>
<tr>
<td>TMTC ASIC – Mixed-signal ASIC for telemetry and telecommand</td>
<td>Airbus Defence &amp; Space</td>
</tr>
<tr>
<td>QUANTUM – Space FPGA’s implementation and verification</td>
<td>Airbus Defence &amp; Space</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>STANDARD COMPONENTS</th>
<th>Customer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rad-Hard Octal 500 Mbps Bus LVDS Repeater. LVDS driver. LVDS receiver</td>
<td>ESA – European Components Initiative</td>
</tr>
<tr>
<td>SEPHY – 10/100Mbps Space Ethernet Physical Layer Transceiver</td>
<td>European Commission – H2020</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>RAD-HARD IPs &amp; TECHNOLOGY CHARACTERIZATION</th>
<th>Customer</th>
</tr>
</thead>
<tbody>
<tr>
<td>IHP 250 nm rad-hard mixed-signal library</td>
<td>R&amp;D project (Eurostars)</td>
</tr>
<tr>
<td>ON SEMI 0.35 µm rad-hard mixed-signal library</td>
<td>R&amp;D project (ILB programme)</td>
</tr>
<tr>
<td>UMC 180 nm analog IP cores</td>
<td>Internal R&amp;D project</td>
</tr>
<tr>
<td>Electrical and radiation characterization of IHP SGB25RH and SG13RH technologies</td>
<td>IHP Microelectronics</td>
</tr>
</tbody>
</table>
MICROELECTRONICS

Product Highlights

ARQ-LVR001
RAD-HARD Octal 500 Mbps Bus LVDS Repeater

- 500.0 Mbps low jitter fully differential data path
- 250MHz clock channel
- 3.3V power supply
- 24mA output driver short circuit (OUT+, OUT−)
- Cold sparing on all pins
- Fast propagation delay of 2ns
- Receiver input threshold ≤ ± 100 mV
- Fail Safe included
- Radiation tolerant: 300 Krad(Si)
- Latch-up free up to 60 MeVcm²/mg
- ESD tolerance: 8KV
- Packaging: 48-pin, Ceramic Quad Flat Pack (CQFP)
- Compliant with ANSI TIA/EIA 644a standard (LVDS)
- Extended input common mode in LVDS inputs
- Space level

ASIC REDSAT

- Space-Qualified Quad High Side Switch with Current and Temperature Monitoring Chip set (1 analog + 5 digital ASIC)
- Multichip Control Module of a Reconfigurable Active Array Antenna

ANALOG ASIC (ARQ-RSA02)

- (Current and temperature sensing; Analog part of an ADC; High Voltage switch (8.6V))
- Negative substrate polarization
- Power on reset
- Total Ionizing dose 50 Krad(Si), Latch-up free
- Current digital monitoring
- RDS ON of 200mΩ
- 500+ parts supplied

DIGITAL ASIC (ARQ-RSB01)

- Total Ionizing dose >120 Krad(Si), LU free, SEU free
- Dual Mode ASIC. Mode selection through A/B pin
  - Mode A: Control ASIC mode
  - Mode B: Shift Register 24/48 bits
- 1000+ parts supplied
MICROELECTRONICS

Product Highlights

ARQIP-ADC003A
RAD-HARD 13 Bits 100KSPS ADC
12 bit ENOB
From 1 KSPS to 100 KSPS
Single ended or differential data path
2.5V Input Voltage
3.5 MHz clock channel
3.3V power supply
12mA digital output drivers
30mA Power consumption
 Radiation tolerant: 40 Krad(Si)
Latch-up free up to 60 MeVcm²/mg
Transient free up to 40 MeVcm²/mg
ESD tolerance: 8KV

ARQIP-DAC003A
RAD-HARD 13 Bits 100KSPS DAC
12 bit ENOB
From 1 KSPS to 100 KSPS
Single ended or differential data path
2.5V differential output Voltage
3.5 MHz clock channel
3.3V power supply
12mA digital output drivers
30mA Power consumption
 Radiation tolerant: 40 Krad(Si)
Latch-up free up to 60 MeVcm²/mg
Transient free up to 40 MeVcm²/mg
ESD tolerance: 8KV

ARQ-SEPHY
10/100Mbps Space Ethernet PHY Transceiver
IEEE 802.3 10BASE-T compatible
IEEE 802.3 100BASE-TX compatible
ANSI X3.263-1995 compatible
Integrated high performance 100 Mb/s clock recovery circuitry (no external filters)
Full Duplex support for 10 and 100 Mb/s
Programmable loopback modes for easy system diagnostics
Temperature range from -55°C to 125°C
Inrush current protection
MII/RMII MAC communication interface
MDIO interface for MAC management and diagnostics
Energy Efficiency Ethernet-802.3az support
15 years lifetime
TID greater than 100krad
SEU threshold LET 20MeV/mg/cm²
SEU Error Rate lower than 10⁻¹⁰ errors/bit-day (@ <70 MeV/mg/cm²)
SEL Threshold LET greater than 60 MeV/mg/cm²

OTHER ICs UNDER DEVELOPMENT
• Rad-Hard LVDS Driver
• Rad-Hard LVDS Receiver
• Rad-Hard 16-channel analog MUX
# MICROELECTRONICS

Rad-Hard Libraries (under development)

<table>
<thead>
<tr>
<th>IHP SGB25RH</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ANALOG CELLS</strong></td>
</tr>
<tr>
<td>LVDS Repeater, Driver, Receiver, Transceiver</td>
</tr>
<tr>
<td>ADC, DAC</td>
</tr>
<tr>
<td>Bandgap</td>
</tr>
<tr>
<td>3.3V Voltage Regulator</td>
</tr>
<tr>
<td>3.3V I/O Pads</td>
</tr>
<tr>
<td>5V Voltage Regulator</td>
</tr>
<tr>
<td>5V I/O Pads</td>
</tr>
<tr>
<td>Analog Multiplexer</td>
</tr>
<tr>
<td><strong>DIGITAL CELLS</strong></td>
</tr>
<tr>
<td>Adder; AND; Buffer; Decaps; Delay; Filler</td>
</tr>
<tr>
<td>DICE Flip Flop; HIT Flip Flop</td>
</tr>
<tr>
<td>Inverter; Tristate Inverter; MUX 2:1</td>
</tr>
<tr>
<td>NAND; NOR; ORNAND; Scan Flip Flop</td>
</tr>
<tr>
<td>Tie Up/Down; Voter; XOR; XNOR</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>OnSemi I3T80</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ANALOG CELLS</strong></td>
</tr>
<tr>
<td>Bandgap voltage reference, OpAmps, ADCs, Voltage regulators</td>
</tr>
<tr>
<td><strong>DIGITAL CELLS</strong></td>
</tr>
<tr>
<td>NOR</td>
</tr>
<tr>
<td>NAND</td>
</tr>
<tr>
<td>XNOR</td>
</tr>
<tr>
<td>XOR</td>
</tr>
<tr>
<td>DICE Flip Flop</td>
</tr>
</tbody>
</table>
MICROELECTRONICS
Test Engineering

SERVICES

• Management; specification; test flow; test set-up; PA/QA
• Full test campaigns management and engineering:
  Electrical characterization, mechanical stress, environmental stress, endurance, radiation and construction analysis.
• Test chips and test vehicles design
• Test SW custom development
• Electrical characterization
• Characterization of technologies versus radiation effects
• Assessment and consulting services

MAIN PROJECTS

• Rad-test 250 nm: Heavy Ion testing of IHP SGB25RH test vehicle chips
• Rad-test 130 nm: Radiation testing of IHP SG13S test vehicle chips
• Consulting and support on SEE test campaigns for IHP SGB25V
• Electrical, ESD and radiation characterization of a space SoC
ACTUATORS

NON-EXPLOSIVE LOW-SHOCK
RESETTABLE

HOLD-DOWN & RELEASE

SHAPE MEMORY ALLOYS (SMA)

OFF-THE-SHELF / CUSTOM DESIGN

SMARQ® - ARQUIMEA’S EXCLUSIVE EXTENDED TEMPERATURE SMA
ACTUATORS
SMARQ actuators roadmap

R&D / CUSTOM DEVELOPMENT
- Dust sensor cleaning (for Mars)
- Prototype / BB / EQM
- Petrol cap door opening actuator (automotive)

SMARQ MATERIAL DEVELOPMENT

ITI
Assessment on smart materials (SMARQ) for space mechanisms
- HDRM
- Pin puller
- Rotary actuators

GSTP/ARTES
Pin puller and HDRM family qualification up to TRL6

OFF-THE-SHELF PRODUCTS
In-orbit validation. Flight missions (JUICE, METOP, PROBA 3...)

© 2016 ARQUIMEA Enterprises S.L. – All rights reserved www.arquimea.com
ACTUATORS
Off-the-shelf HDRMs & Pin Pullers

<table>
<thead>
<tr>
<th>PIN PULLER</th>
<th>ARQ.PPLL.S01.250</th>
<th>ARQ.PPLL.S01.051</th>
<th>ARQ.PPLL.S01.012</th>
<th>ARQ.PPLL.S02.052</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pull Force (min) [N]</td>
<td>25</td>
<td>50</td>
<td>100</td>
<td>500</td>
</tr>
</tbody>
</table>

- **Qualified to TRL6** according to ECSS
- **Low-shock**, non-explosive
- Operation temperature up to +120°C
- Redundant **SMA trigger** (two independent initiators)
- Resettable by end user (**manual reset**)
- COTS and custom configurations available
SOFTWARE

ICT CONSULTING
ENTERPRISE INFORMATION SYSTEMS

CLOUD COMPUTING
WEB APPLICATIONS
MOBILITY
IoT
ARTIFICIAL INTELLIGENCE
SOFTWARE
ICT Services

Consulting
Digital Services
R&D

Consulting
Development
Deployment
Maintenance and support

Requirements analysis
Feasibility studies
Technology analysis

Design
Implementation
Test
Continuous integration

Production architecture design
Cloud provisioning
Solution deployment
Test

Corrective maintenance
Evolutive maintenance
Strategic evolution partnership
Support

© 2016 ARQUIMEA Enterprises S.L. – All rights reserved
www.arquimea.com
SOFTWARE
Capabilities & Technologies

Cloud computing
PaaS IaaS SaaS

Web applications
RIAs
Responsive designs
RESTful

Enterprise Information Systems
SOA architectures
REST architectures
Microservices
Enterprise Integration
Security
Managed environments
J2EE ecosystem (JMS, JMX, JNDI, JDBC...)

Mobility
Industry-ready devices
Disconnected environments
Material design
Usability
Non-standard peripherals

Artificial Intelligence
Computer vision
Machine learning
Data analysis
Big data
Cognitive systems

Future Internet and IoT
Embedded software
Low-power protocols
FIWARE
SOFTWARE
Solutions

- E-Government/administration
- Digital transformation
- Business management
SOFTWARE Solutions

HEALTH AND WELLNESS
- Social networks

TRANSPORT
- International trading
- Track & Trace
- Global logistics services

INDUSTRY
- Management solutions
- Apps for industrial environments

ENVIRONMENT
- Fire causes investigation
- Mobile solutions
- Document Management
<table>
<thead>
<tr>
<th>PROJECT</th>
<th>CUSTOMER</th>
</tr>
</thead>
<tbody>
<tr>
<td>QAPP – Quality Applicants</td>
<td>ARQUIMEA GROUP</td>
</tr>
<tr>
<td><em>This social network fills the gap between the University and the Industry for talent recruitment</em></td>
<td></td>
</tr>
<tr>
<td>REMEDISS – Telemedicine Social Network</td>
<td>Spanish Ministry of Economy</td>
</tr>
<tr>
<td><em>A social network, seamlessly integrated with health services, where health practitioners can collaborate, monitor their patients, as well as get in contact with them in real time</em></td>
<td></td>
</tr>
<tr>
<td>EXQUDO – Explosives Quality Documentation</td>
<td>EC, Spanish Civil Guard</td>
</tr>
<tr>
<td><em>An appropriate technology solution to manage explosives traceability and the associated documentation</em></td>
<td></td>
</tr>
<tr>
<td>TRAJECTORY</td>
<td>Expace On Board Systems</td>
</tr>
<tr>
<td><em>Graphical wizard to automate trajectory simulation and parametrization with an optimized presentation of results</em></td>
<td></td>
</tr>
<tr>
<td>MDU TECHFIRE</td>
<td>Expace On Board Systems</td>
</tr>
<tr>
<td><em>Connected device for military operations</em></td>
<td></td>
</tr>
<tr>
<td>FARGO – FIWAR Cargo</td>
<td>EC, SOUL-FI Accelerator</td>
</tr>
<tr>
<td><em>Global end-to-end intermodal logistics platform supported by a network of electronic seal devices. Based on the Future Internet FIWARE platform</em></td>
<td></td>
</tr>
</tbody>
</table>
## Main projects

<table>
<thead>
<tr>
<th>PROJECT</th>
<th>CUSTOMER</th>
</tr>
</thead>
<tbody>
<tr>
<td>SQS / SQSLAB</td>
<td>Zoitech</td>
</tr>
<tr>
<td><em>Electronic microscope for artificial insemination labs</em></td>
<td></td>
</tr>
<tr>
<td>RIOTIMING</td>
<td>Expace, MAXAM</td>
</tr>
<tr>
<td><em>App to manage, configure and analyze blasting plans</em></td>
<td></td>
</tr>
<tr>
<td>WHYFIRE</td>
<td>Zoitech, Eural</td>
</tr>
<tr>
<td><em>App and web tool for fire research</em></td>
<td></td>
</tr>
<tr>
<td>GROW</td>
<td>Arquimea Group</td>
</tr>
<tr>
<td><em>A framework to develop integrated corporate and business</em></td>
<td></td>
</tr>
<tr>
<td><em>management tools on top of an Enterprise Architecture vision</em></td>
<td></td>
</tr>
<tr>
<td>MUSART – Artificial Muscles</td>
<td>Ministrio de Industria, Energía y Turismo de España</td>
</tr>
<tr>
<td><em>Rehabilitation platform</em></td>
<td></td>
</tr>
</tbody>
</table>
SPACE R&D

ENGINEERING FOR SPACE SCIENCE

ROBOTIC PARTS

SENSING SYSTEMS
MetNet Precursor Mission
Active measurement using back scattering to estimate the concentration of particles in the airborne dust.

In-flight calibration system based on a reflector stick inserted in the optical path by means of a novel rotary actuator based on a proprietary Shape Memory Alloy.
- Mass: 41.2 g
- Main dimensions: 85x65x20 mm
- Operational temperature range: -90 to +25°C
- Nominal Power Consumption: 360 mW

FLIGHT MODEL DELIVERED
SPACE R&D

European R&D Projects

Space Wireless sensor networks for Planetary Exploration

Smart technology for artificial muscle applications in Space

10/100Mbps Space Ethernet Physical Layer Transceiver

Resettable Hold-Down and Release Actuator (In-Orbit Validation)

POWER RH  Development of a space-qualified rad-hard library (ON SEMI I3T80)

LIBRA  Development of a space-qualified rad-hard library (IHP SGB25RH)

PISA  Power robust IC design for space applications