RADIO FREQUENCY SYSTEMS
The Clear Choice®

Innovative Infrastructure Solutions

RFS is a global designer and manufacturer of cable and antenna systems plus active and passive RF conditioning modules, providing total-package solutions for wireless infrastructure

WIRELESS | MOBILE RADIO | MICROWAVE | IN-TUNNEL | IN-BUILDING | TV & RADIO | HF & DEFENSE

microkit 8 edition

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- **RFS The Clear Choice®**

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Company Profile

RFS is a global designer of cable, antenna and tower systems plus active and passive RF conditioning modules, providing total-package solutions for wireless infrastructure

RFS serves OEMs, distributors, system integrators, operators and installers in the broadcast, wireless communications, land-mobile and microwave market sectors.

As an ISO 9001 & 14001 compliant organization with manufacturing and customer service facilities that span the globe, RFS offers cutting-edge engineering capabilities, superior field support and innovative product design.

RFS is committed to fulfilling the most demanding worldwide environmental protection directives and to integrating green initiatives in all aspects of its business.

- **RFS** is a leading **innovator** in outdoor and indoor wireless infrastructure **solutions**

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Key Customers

The following companies are examples of our key customers

- Alcatel-Lucent
- America Móvil
- AT&T
- Broadcast Australia
- China Mobile
- China Unicom
- CMC
- Ceragon
- E-Plus
- Ericsson
- Harris Stratex
- Huawei
- Idea
- Intracom
- KPN
- Megafon
- Motorola
- MTC
- NEC
- Nokia Siemens Networks
- Orange
- Orascom
- Reliance
- SingTel
- Maxis
- Oi
- QTEL
- Sprint
- Telefonica Moviles
- TeliaSonera
- Telstra
- TIM
- T-Mobile
- Toshiba
- TV Globo
- Verizon Wireless
- Vimpelcom
- Vivo
- Vodafone

RFS - Global presence with **global customers** who are **major players**

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RFS Global Solutions

RFS provides scalable, flexible, future proof and lightweight end-to-end solutions that are optimized across the entire RF chain

WIRELESS | MOBILE RADIO | MICROWAVE | IN-TUNNEL | IN-BUILDING | TV & RADIO | HF & DEFENSE

Worldwide presence

- **9 manufacturing centers of excellence (Germany, France, USA, Brazil, China, Mexico, India and Australia)**
- **Represented on 6 continents and 23 countries**
- **35 technical support and sales offices**

Innovative solutions

- **At the forefront of RF technology**
- **Proven quality & reliability**
- **Renowned technical leader for more than half a century**

Evolutive solutions

- **Scalable and flexible**
- **Future-proof**
- **Reliable**
- **Optimized end-to-end**

True value throughout the complete life cycle, guaranteeing **maximum return on investment**

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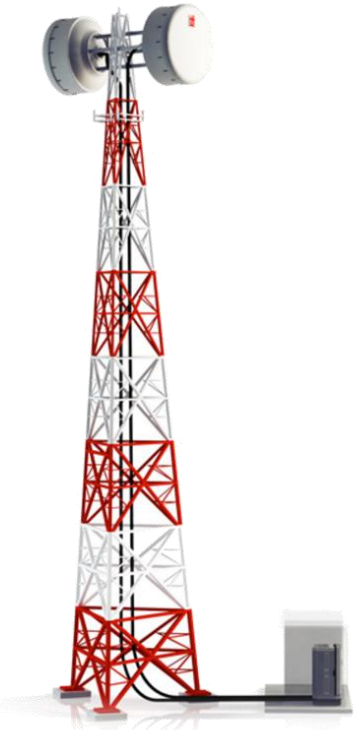
The RFS Application Domains

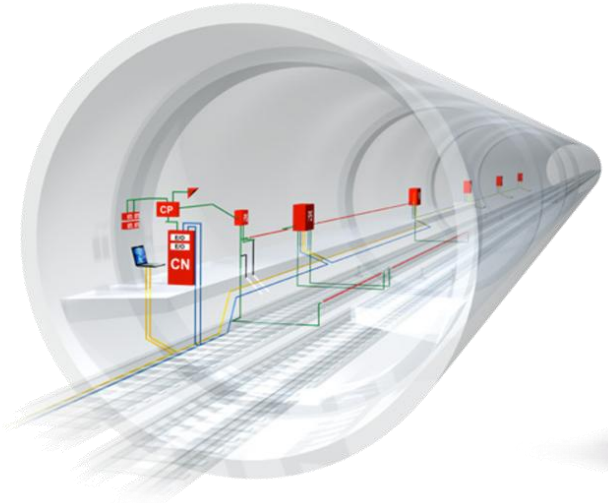
Solutions for the entire RF chain

Cellular sites

Microwave links



Indoor coverage



TV & Radio

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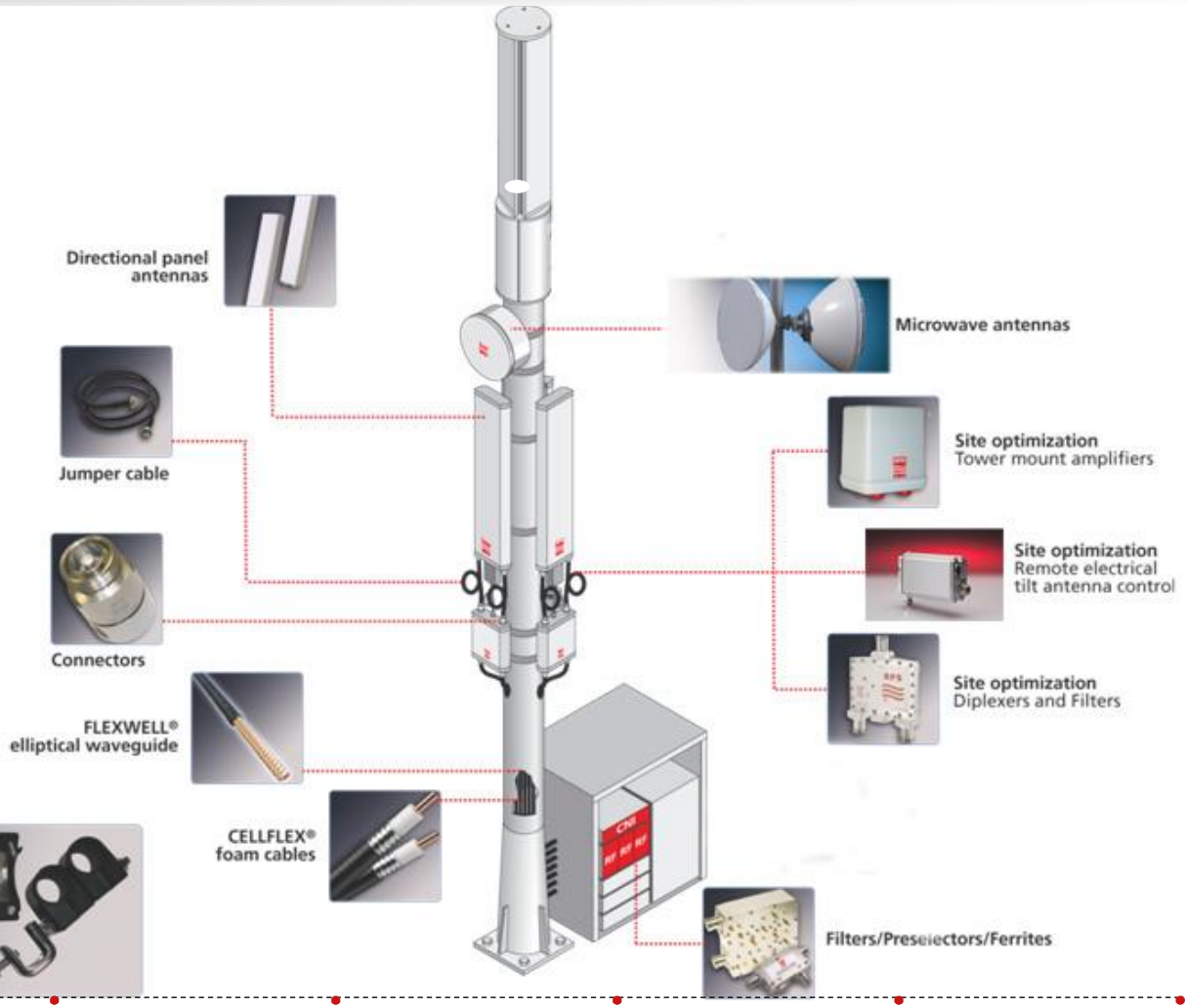
Cellular Sites

- Unique suite of leading RF solutions ready to support next-generation voice and data-rich wireless services



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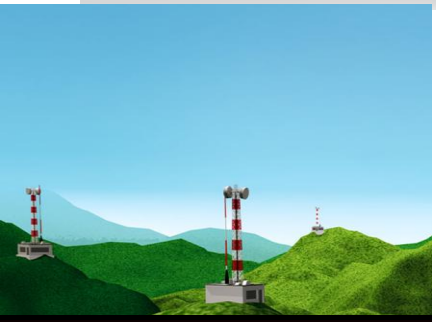
Microwave Links



- **Ultra-high performance, rugged antennas manufactured in every region of the globe for faster deployment**

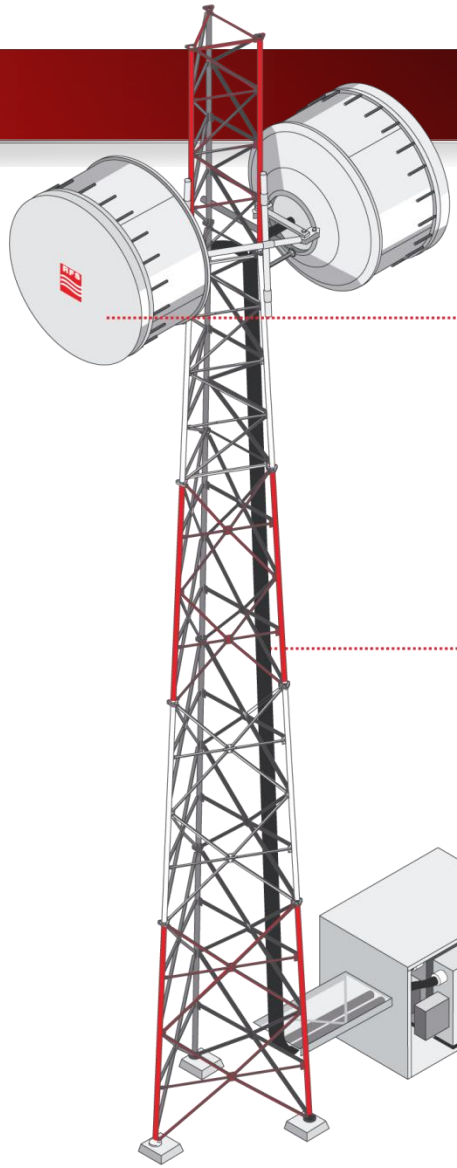
Accessories

Connectors

Twist flex cable

Jumper cable

Coupler



Microwave solid antennas

FLEXWELL® elliptical waveguides

Pressurization equipment

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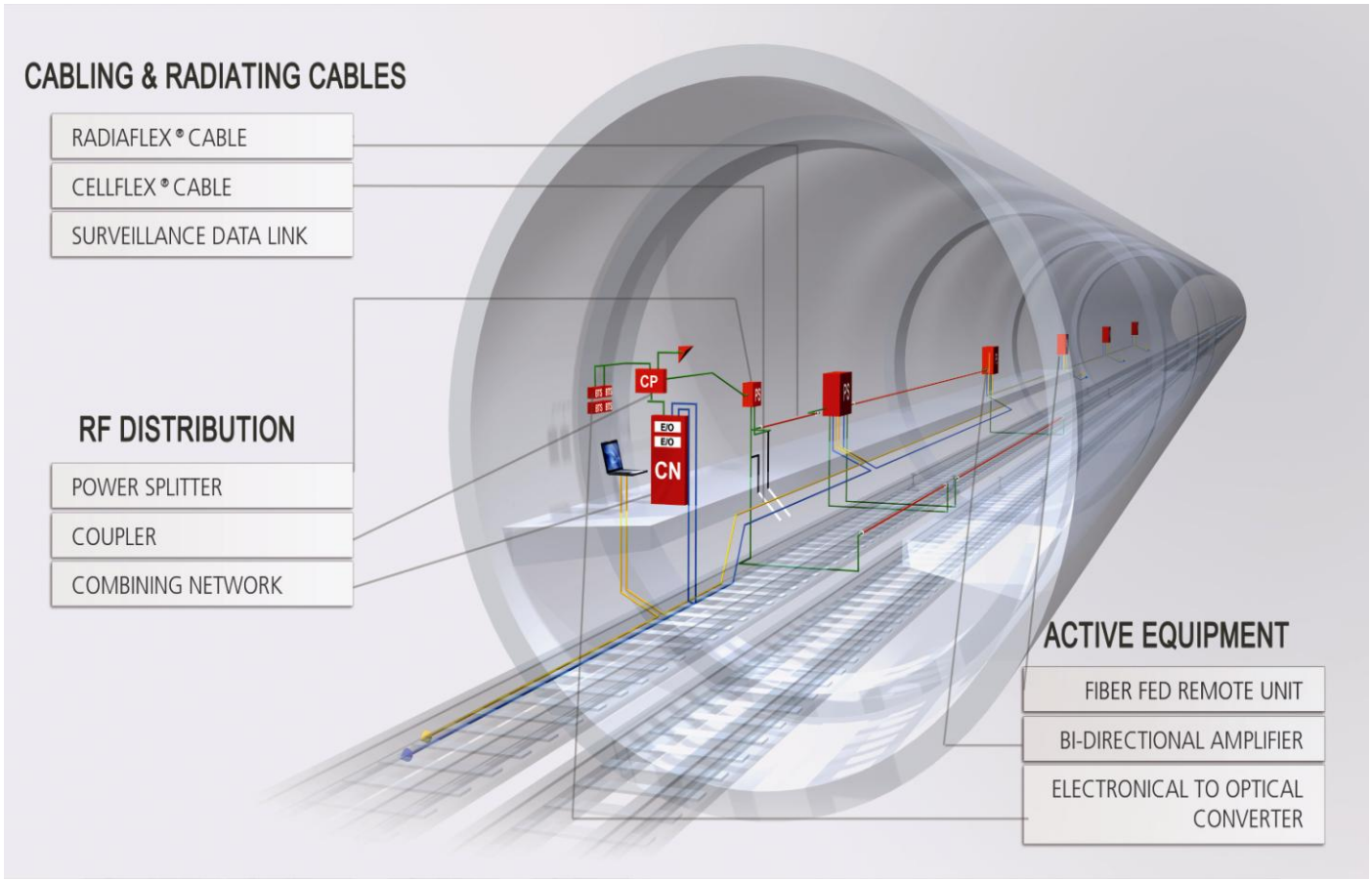
Indoor Coverage

- **Best-in-class coverage systems for mission-critical and commercial radio services**
- **Support for multi-carrier, multi-service applications in road and rail tunnels**
- **Unique patented radiating cable for multi-technology applications**



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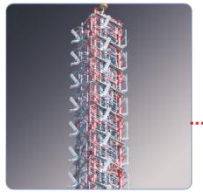
TV & Radio

- Offering superior RF solutions for broadcasters worldwide, from analog radio and TV to DAB, mobile TV and Digital TV switchover



Band III panel array

Antennas, TV
Band IV/V panel array

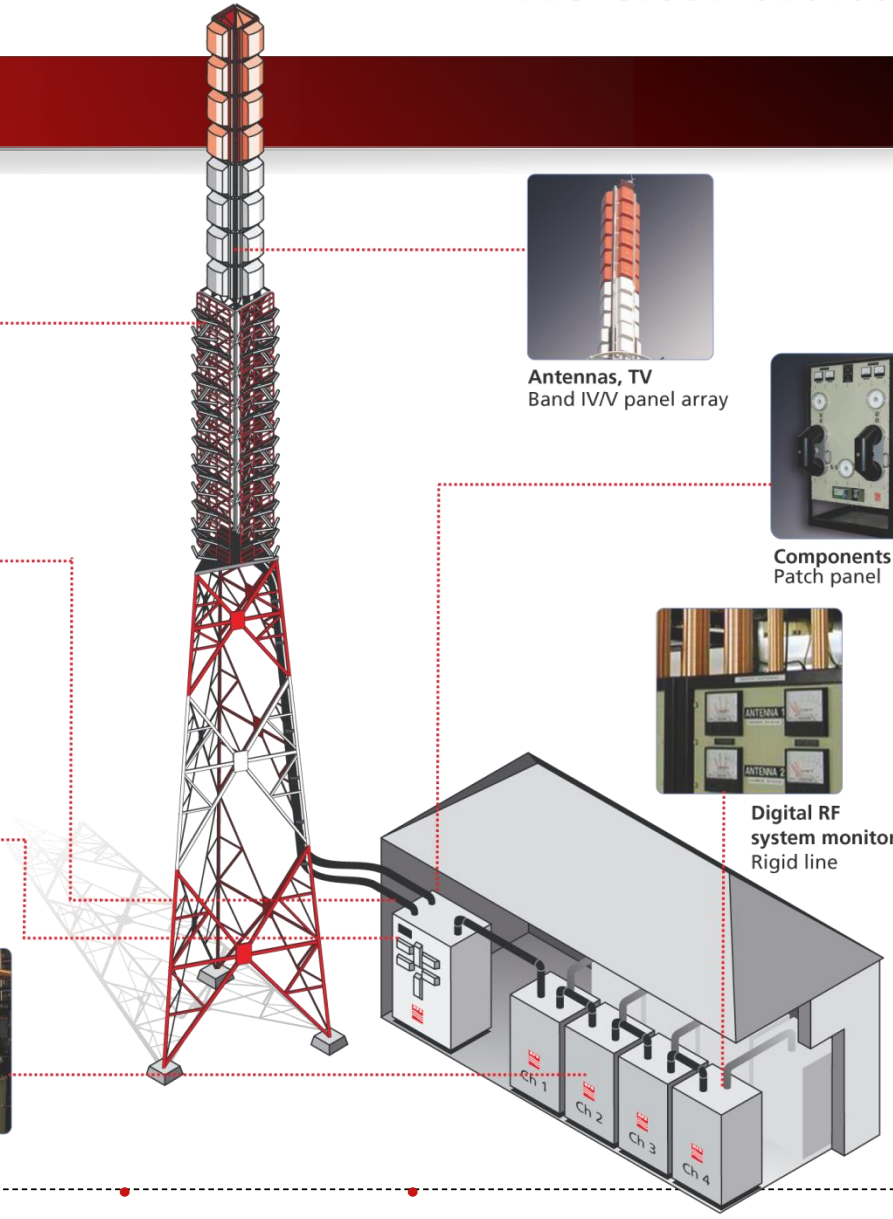
HELIFLEX® Air cable
Connectors, Accessories

Components
Patch panel

Dehydrators

Digital RF
system monitor
Rigid line

Combiners



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Major Production Facilities and Sales Offices

MERIDEN, USA

HANNOVER, GERMANY

MELBOURNE, AUSTRALIA

SÃO PAULO, BRAZIL

TRIGNAC, FRANCE

SHANGHAI, CHINA

Technical support & sales offices in 23 countries

NORTH AMERICA	LATIN AMERICA	EUROPE	MIDDLE EAST, AFRICA & INDIA	ASIA PACIFIC
Meriden	Bogota	Copenhagen	Dubai	Bangkok
San Jose	Buenos Aires	Haddenham	Johannesburg	Beijing
Wallingford	Mexico City	Hannover	Kolkata	Guangzhou
	São Paulo	Madrid	New Delhi	Hong Kong
	Santiago	Moscow	Mumbaï	Melbourne
		Paris (HQ)		Shanghai
		Trignac/Lannion		Singapore
		Vimercate		Taipei
				Tokyo

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Production Facilities by Product Line

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General Missions

Radio Frequency Systems carries off coveted Emmy Award

General missions

- Leader in new technologies
- Innovative product concepts (Windmaster ™, Hybriflex™, RFS Xtreme..)
- Dedication to lightweight designs
- End-to-end solutions covering the entire RF Chain
- Global presence and manufacturing excellence
- Fast delivery time and superior service
- Environmental protection and energy efficiency

Proven longevity thanks to **premium performance** and unrivalled **quality**

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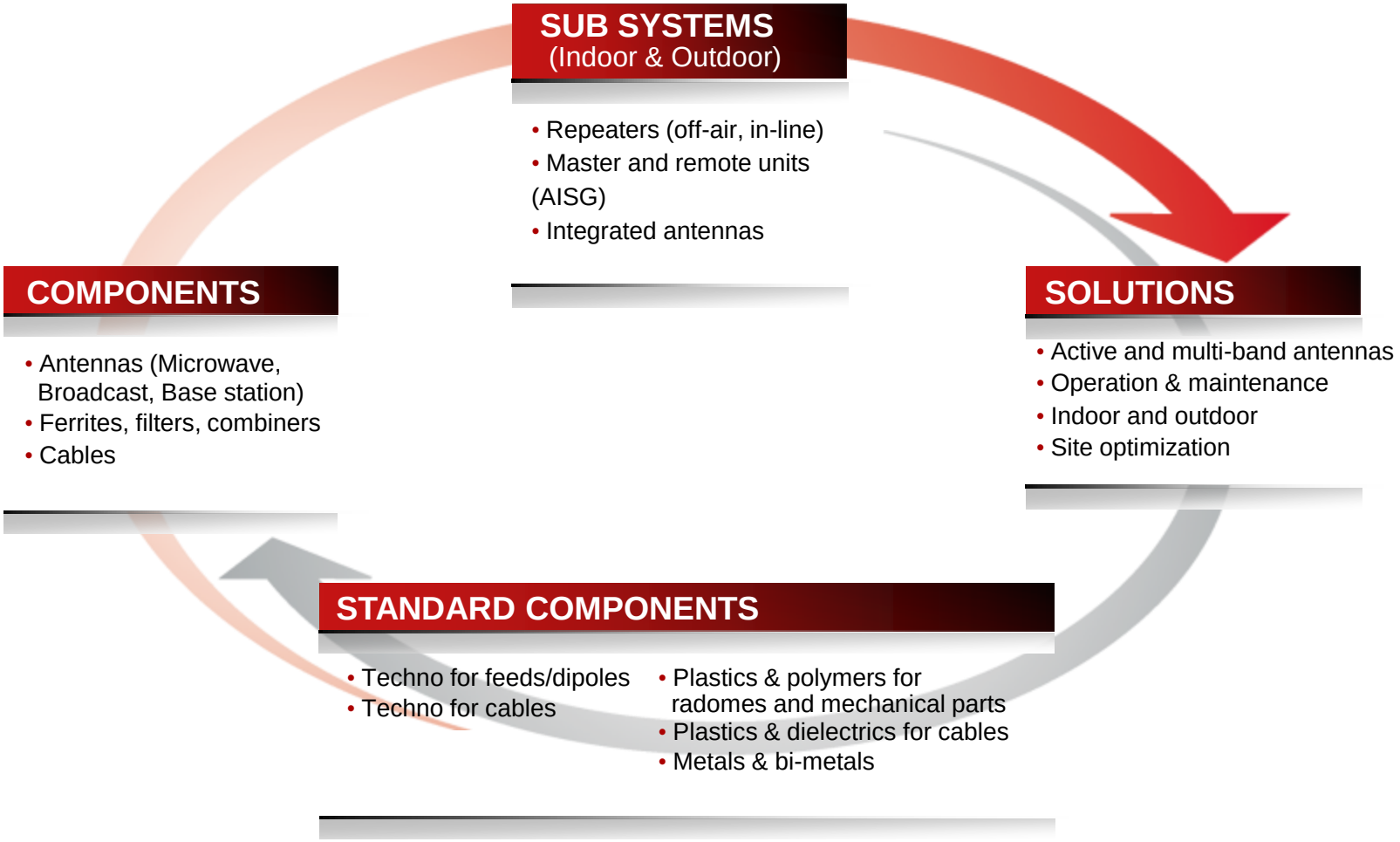
RFS Technology Roadmap



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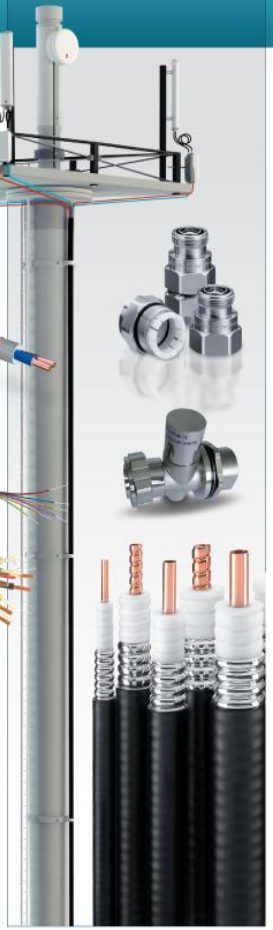
RFS Product Profile

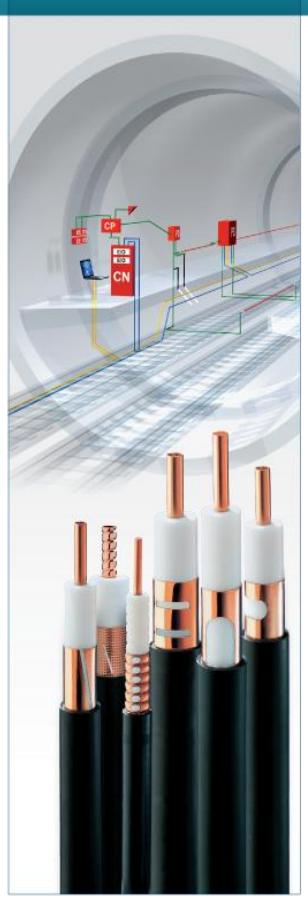
Base Station Antennas and Site Optimization

Infrastructure Solutions for RRU Deployments products

Transmission Lines



Wireless Indoor Solutions



Microwave Antennas

Broadcast Systems

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Base Station Antennas
Position and Future Directions

Position today

- Wide suite of 2G, 3G and 4G antennas for the global market
- Full Coverage of diplexing needs for feeder sharing among technologies
- **Optimizer® RT**: True end-to-end AISG 2.0 and 3G PP compliance
- **WindMaster™ :** Multiband antennas with industry's lowest tower loading (RF X-TREME)
- 2 highly efficient and flexible production sites

Future directions

- Evolution towards 700 MHz and 2.6 GHz LTE
- Advanced research on smart and active antennas
- Continuous development in radiating technology and energy efficiency
- Increased coverage for multi band antennas
- Improved coverage for global LTE antennas
- Reduced footprint in terms of size and tower loading
- Cluster and canister antenna assemblies – visual impact solutions

RFS **BSA portfolio** covers frequencies from **25 MHz** to **2.7 GHz** with a **wide choice** of tilt and band combinations

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Base Station Antennas
Production Sites

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Infrastructure Solutions for RRH Deployments
Position and Future Directions

Position today

- Founded in 2010 to support customers in their technology migration to Remote Radio Units (RRU) with best-in-the-market infrastructure solutions
- Under the brand HYBRIFLEX™ , RFS offers a complete portfolio of hybrid cable to meet the requirements from MNOs and all major RRU manufacturers
- HYBRIFLEX™ cables are engineered to make RRU deployments easier, faster and more reliable
- HYBRIFLEX™ cables are ready for LTE
- The product families DC-FIT™ and F/O-FIT™ allow easy and cost-effective swapping from a conventional BTS to a distributed BTS with RRU

Future directions

- Continuous extension of HYBRIFLEX™ cable family to meet the customer needs in a single RAN applications with multiple services and RRUs per sector
- Customized infrastructure solutions for large RRU rollouts
- Innovative logistic concepts to enable fast, on-demand delivery to RRU deployment projects

RFS serves its customers with innovative infrastructure solutions that support the introduction of RRU technology in the networks.

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Infrastructure Solutions for RRH Deployments
Production Sites

MERIDEN

HANNOVER

SHANGHAI

SAO PALO

MELBOURNE

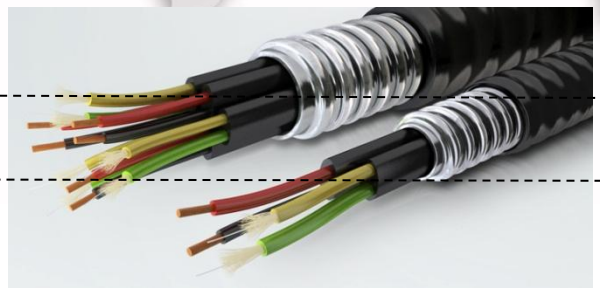
MERIDEN
USA

HANNOVER
GERMANY

SAO PAULO
BRAZIL

SHANGHAI
CHINA

MELBOURNE
AUSTRALIA



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Transmission Lines
Position and Future Directions

Position today

- Technology leader and inventor with many product firsts including the corrugated coaxial cable
- Most complete corrugated copper and aluminum cable portfolio **CELLFLEX®**
- 100% common accessories for **CELLFLEX®** copper and **CELLFLEX®** Lite aluminum cables
- Two tailored accessory families satisfying all application needs
  - **OMNI-FIT premium** for PIM-critical applications
  - **OMNI-FIT standard** for typical requirements and optimized rollout costs
- **LTE ready** product portfolio
- Full recyclability for **CELLFLEX®** copper and aluminum cables
- Reduced **TCO** due to **PIM aware** connector and jumper technology
- Improved installation due to **space-efficient** designs

Future directions

- Continuous **material optimization** research to ensure **optimum cost-performance ratio**
- Performance and quality enhancements to extend **technology leadership**
- Continued cooperation with measurement equipment manufacturers to establish **installation quality standards** and **monitoring procedures**

RFS focuses on excellence in the overall RF path – and offers durable performance exactly where it matters most!

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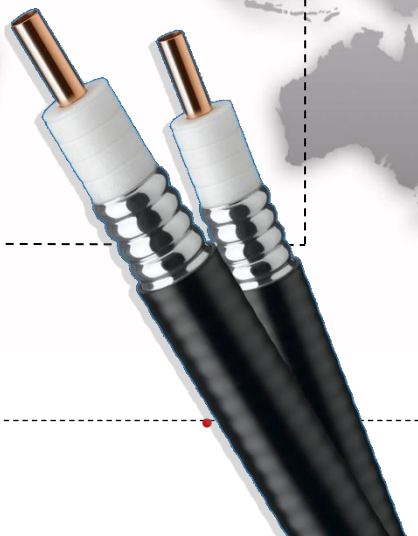
Transmission Lines
Production Sites

MERIDEN
USA

HANNOVER
GERMANY

SAO PAULO
BRAZIL

SHANGHAI
CHINA



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Radio Link Networks
Position and Future Directions

Position today

- RFS is a premium supplier of microwave antennas for OEMs
- All common frequency bands and sizes are available
- No compromise on performances with the most stringent qualification procedures including wind tunnel tests
- Low profile design **CompactLine ® Easy** antenas to reduce transportation costs, wind load and antenna weight
- The best 3ft /1m antenna in the market : SC3
- Manufacturing in all regions for shorter lead times and better service

Future directions

- A unique 2 ports OMT upgradable to 4 ports (pay-as-you-grow plan)
- E-Band antennas for ultra-high capacity links
- Small form antennas for low visual impact and evolution to small cells and HetNets

The most complete microwave antenna portfolio, **manufactured in all regions** to support **rapid deployments** and help operators meet ever-increasing traffic requirements

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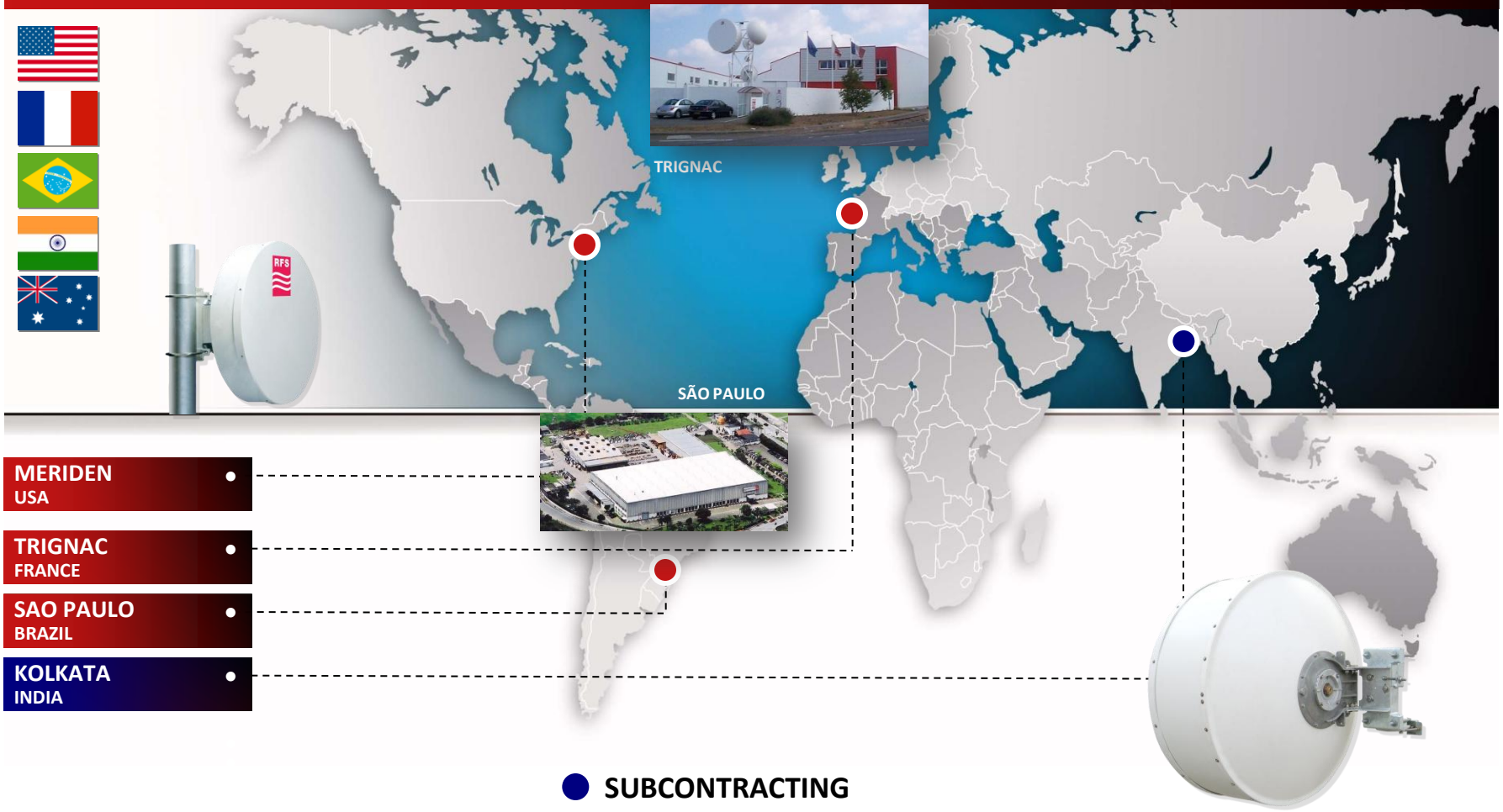
Radio Link Networks
Production Sites



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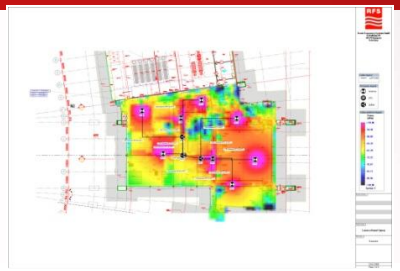
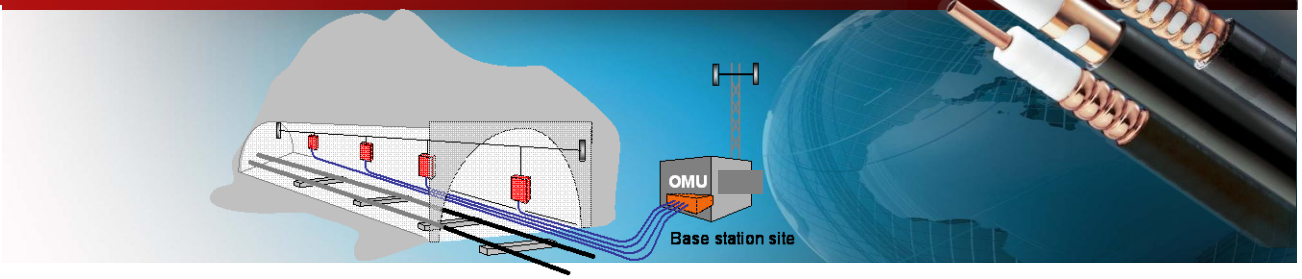
Wireless Indoor Solutions
Position and Future Directions





Position today

- Comprehensive in-building and in-tunnel solutions suite
- The expert blend of active and passive ClearFill® solutions, suit any building size or tunnel length
- Provide coverage of commercial & mission critical services for 2G, 3G, 4G/LTE, DAB, DVB; GSM-Rail & TETRA…
- Support single and multiple operators, single and multiple wireless services
- End-to-end indoor solutions offer including consultancy and product-attached services such as solution design and on-site acceptance for lowest-cost solutions
- Broadest RF bandwidth (380 MHz to 3.5+ GHz) passive indoor DAS
- CELLFLEX® and CELLFLEX® Lite lowest loss feeder cables
- RADIAFLEX® best-in-class radiating cables from 70 MHz to 6 GHz

Future directions

- Strengthen global leadership in radiating cable technology through continuous portfolio evolution and introduction of innovative, future proof (full frequency spectrum) products aligned with changing market needs
- Distributed antenna concepts for 6 GHz — for example, radiating waveguides enabling real-time signaling and track-to-train applications with the highest data throughput demands

We optimize and expand our comprehensive set of **solutions** to support the widest range of indoor coverage projects, from purely passive designs to **intelligent** active and **turnkey networks**

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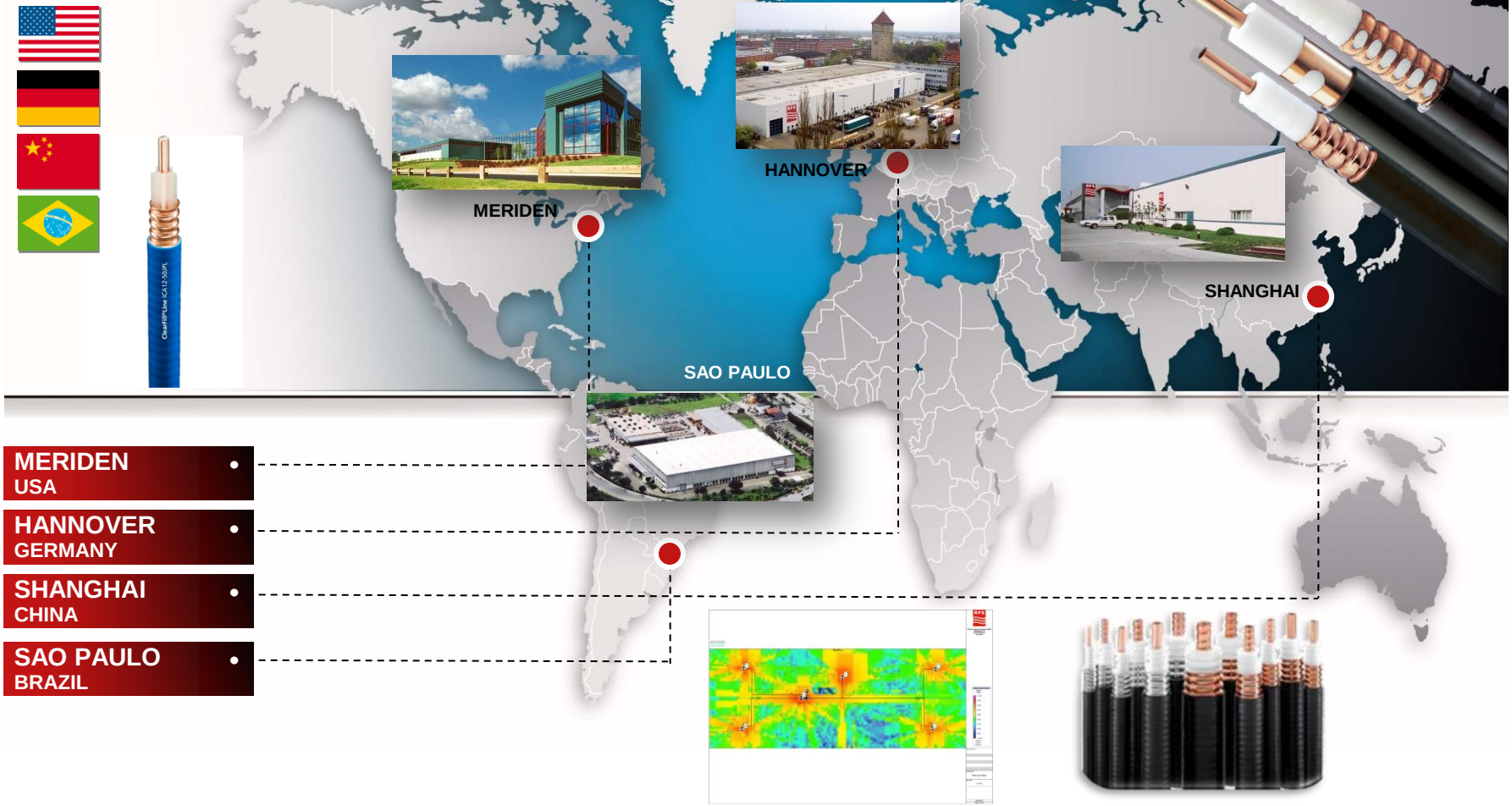
Wireless Indoor Solutions
Production Sites



- **MERIDEN** – USA
- **HANNOVER** – GERMANY
- **SHANGHAI** – CHINA
- **SAO PAULO** – BRAZIL

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Broadcast Systems
Position and Future Directions

Position today

- Suite of antennas, combiners, filters, transmission lines, and switch frames
- From analog radio & TV to DAB, mobile TV and DTV
- Unrivalled Digital Switch Over (DSO) project expertise
- FM, UHF/VHF panel array and slot antennas
- **HELIFLEX®** air-dielectric transmission lines from 3/8” to 9”
- Numerous broadband HF antenna designs

Future directions

- New post-DSO broadcast applications
- Best-in-class digital mask filters
- Variable polarization antenna technology
- Low windload panel array solutions

RFS’ “adjacent channel combiners” win an Emmy Award for TV Broadcasting

Every RFS radio and TV solution is **fully custom designed** and optimized to meet the most **stringent requirements**

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Broadcast Systems
Production Sites

MERIDEN

HADDENHAM

HANNOVER

SHANGHAI

- ✓ Our strong global presence enables rapid mobilization of experienced RFS engineers

SAO PAULO

MELBOURNE

- **MERIDEN** USA
- **HANNOVER** GERMANY
- **SAO PAULO** BRAZIL
- **SHANGHAI** CHINA
- **MELBOURNE** AUSTRALIA
- **HADDENHAM** G.B

The World Technology Competence Centre for Broadcast is located in Melbourne, Australia

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RF Conditioning
Position and Future Directions

Position today

- Leading-edge combiners, co-location filters, diplexers, duplexers and Tower Mount Amplifiers (TMAs)
- From LTE700 to UMTS, WiMAX and LTE2600
- **UltraAmp™**: Ultra-low-noise-figure TMAs
- **ShareLite™** : High performance combiner family
- Long-standing expertise in integrated BTS filters for leading OEM vendors
- Rapid development of custom filter and combiner solutions
- Highly efficient and flexible production of RF assemblies

Future directions

- Lightweight, lower cost filter materials
- High-performance ceramic resonator technology for same-band combiners
- TD-LTE interference mitigation solutions
- Wide range of 700 MHz to 2600 MHz combiners, LNAs, diplexers, etc.

RFS is committed to being the **leading** supplier of high performance **site optimization** equipment across all standards and frequencies

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RF Conditioning
Production Sites

MERIDEN

MERIDEN
USA

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Ferrocom
Position and Future Directions

Position today

- Ferrite isolators and circulators from 80 MHz to 40 GHz
- Drop-in, coaxial and waveguide isolators
- 4-port Coaxial isolators and circulators for public safety applications
- Excellent electrical performance
- Ferrites for :
  - Microwave radio and LMDS
  - Microwave sub-systems
  - Mobile cellular telecommunications (GSM, PCS, UMTS)
  - Public Safety
  - Emerging Technology (LTE, MMDS)

Future directions

- Product development for GSM/3G wireless base stations
- Low-IMD devices for wireless data applications
- Expanding Asian manufacturing capacity
- Leveraging technical leadership in ferrites to capture more of the high volume OEM market

RFS Ferrocom excels at customizing **high quality ferrite devices** to precise customer specifications – including **unique electrical** requirements or **enhanced performance** specifications

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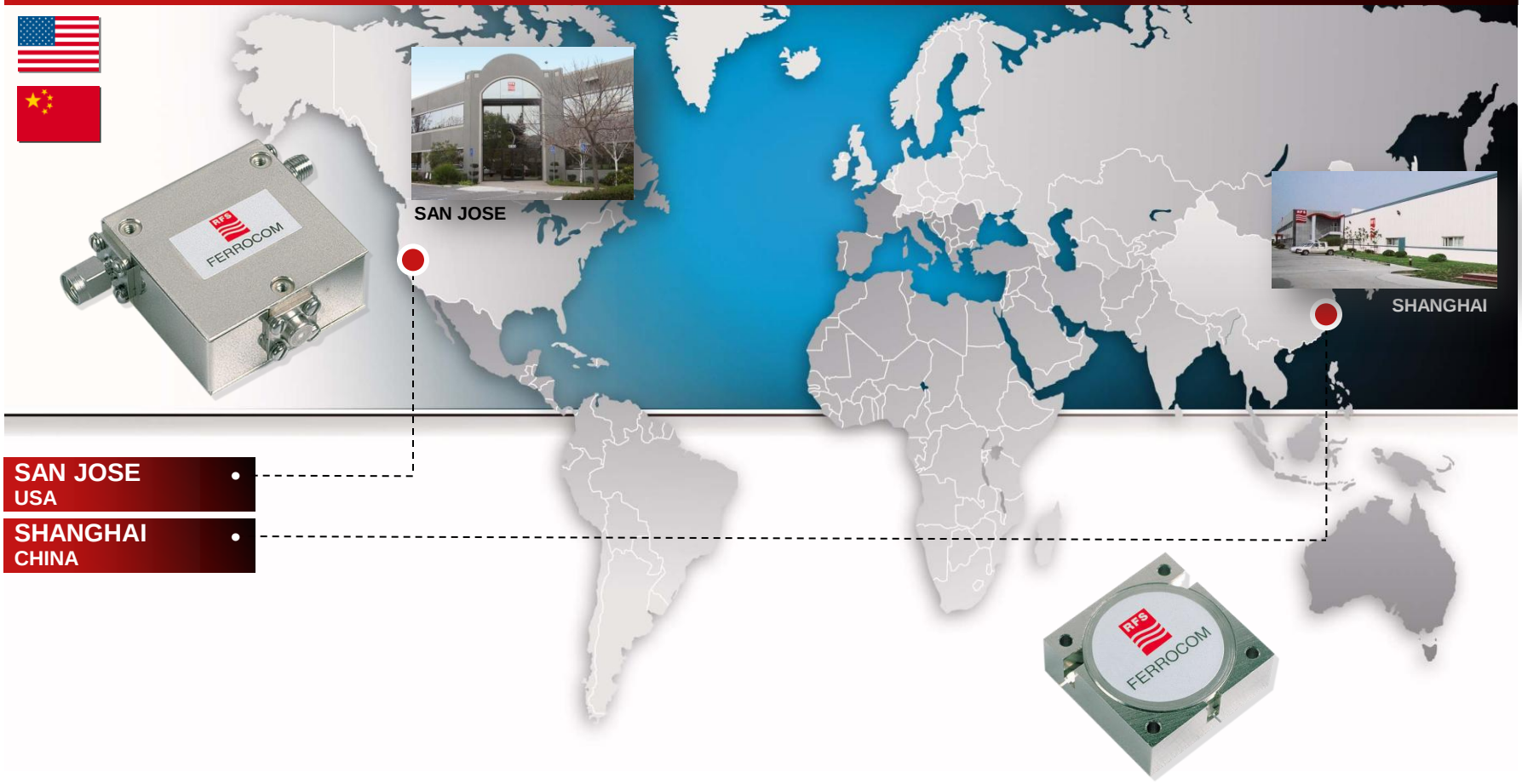
Ferrocom
Production Sites



SAN JOSE
USA

SHANGHAI
CHINA

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The Clear Choice®

In every corner of the world RFS works closely with its business partners, anticipating their evolving technology needs and offering powerful and cost-efficient products and solutions.

Dedicated customer service, expert technical advice and support, and a total product package – RFS' promise, every time it does business.

Across the globe, wireless communications operators rely on Radio Frequency Systems as their global supplier of cutting edge technology in telecommunications, broadcast and defense communications. RFS offers advanced engineering capabilities, superior field support, and dedicated technical assistance and training.

- These value-added services, plus the convenience of a single source, make **RFS the clear choice…** time after time

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