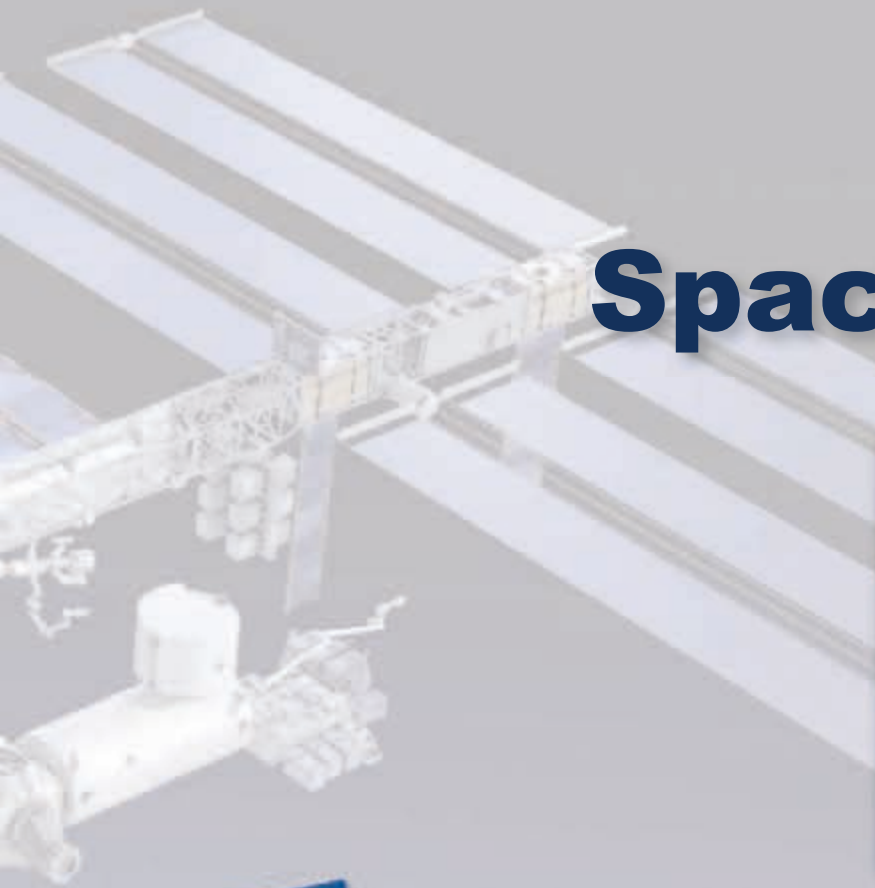
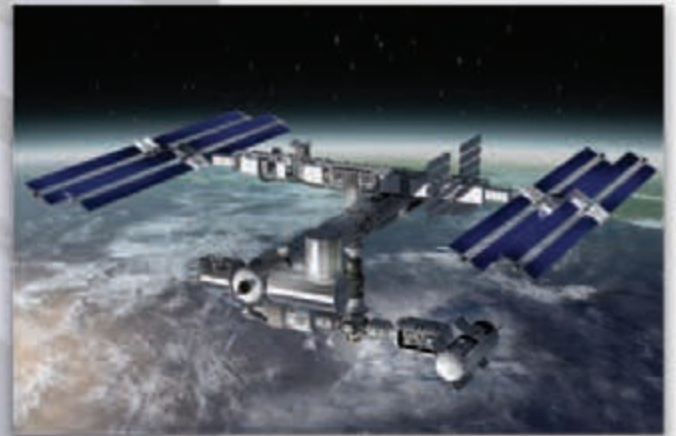


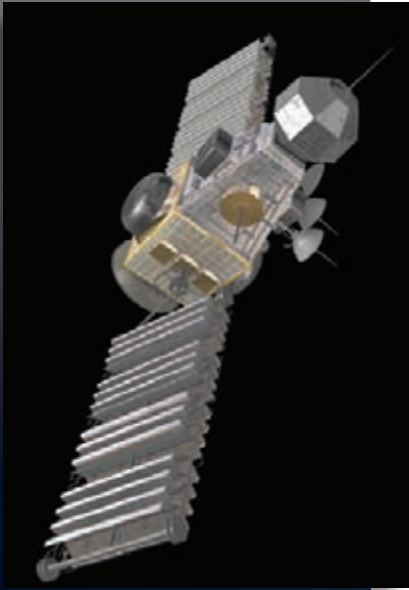
# Space Heritage





## OVER FORTY YEARS

EMC Technology / Florida RF Labs has been supplying RF Passive Components for space flight missions for over 40 years. We have participated in over 200 military, commercial and scientific satellite programs such as the Mars Exploration Rover. Our capabilities to assist you from design concept through launch include design reviews, qualification testing, special process documentation, serialized data, weight measurements and custom packaging. We have long-standing relationships with many of the world's major space companies and have supplied components to leading organizations such as Jet Propulsion Labs and NASA Goddard Space Center. Our mission has always been to design and manufacture high performance products using the best core technologies of the company while maintaining the extremely high reliability levels required for long life military, commercial and civil satellites.



EMC Technology / Florida RF Labs is certified to the following international standards:

AS9100  
Nadcap  
ISO9001  
ISO14001  
OHSAS18001



# SPACE APPROVED PRODUCTS



The following product groups have flown or are scheduled to fly on space programs listed on the pages that follow:

- High Reliability Fixed Attenuators
- Thermopad® High Reliability Temperature Variable Attenuators
- Coaxial Fixed & Thermopad® Temperature Variable Attenuators
- High Power Chip Attenuators
- CVD Diamond Rf Resistives®
- Coaxial Terminations
- Stripline Flange Terminations
- Stripline Pill Terminations
- High Power Flange Terminations
- High Power Chip Resistors
- Semi-Rigid Cable Assemblies –
  - Copper & Aluminum Jackets
  - Solid Teflon® & Low-Loss Dielectrics
- Mini-Flex 105 Flexible Cable Assemblies
- HybriX® 3dB Hybrid Couplers
- HybriX® Directional Couplers



# SUPPORTED SPACE PROGRAMS

PROGRAM NAME	CUSTOMER(S)	ACTIVITY/APPLICATION(S)
ACES	EADS	Hi-Rel Attenuators
ACSS	Lockheed Martin	Semi-Rigid Cables for Aircraft Surveillance Satellite
Advanced EHF (MILSTAR II)	Lockheed Martin, Northrop Grumman	Semi-Rigid Cables & Temperature Variable Attenuators (TVAs)
Aireon/Birdtracker	Harris	Semi-Rigid Cables, TVAs, Fixed Attenuators
Aireon/Roadrunner	Harris	Hi-Rel Attenuators & TVAs
Alphasat	Astrium	Hi-Rel Attenuators & TVAs
Amazonas	Astrium	Hi-Rel Attenuators & TVAs for Commercial Communications Satellite (Brazil)
AMC-21	Thales Alenia Space	Hi-Rel Attenuators & TVAs
Amos 1, 2, 3, 4	Thales Alenia Space	Hi-Rel Attenuators & TVAs
Anik F1 & F2	Boeing Space	Hi-Rel Attenuators & TVAs. Prime: Telesat Canada
Applications Technology Satellite (ATS)	Hughes Space, Boeing Space for NASA	Hi-Rel Attenuators & TVAs
Asiasat 5, 9	Space Systems/Loral	Semi-Rigid Cables
ASTRA	ND SATCOM, Astrium	Hi-Rel Attenuators
Bepi Columbo	Thales Alenia Space	Hi-Rel Attenuators & TVAs for Planet Mercury Exploration
Bock III	Lockheed Martin	Hi-Rel TVAs
BRASILSAT	Jet Propulsion Labs	Hi-Rel Attenuators
Chandrayaan-1, 2	SAC, ISRO, Astra Microwave, GAETEC	Hi-Rel Attenuators, TVAs, CVD Diamond Rf Resistives® for Govt of India Moon Landing
CHINA STAR	Lockheed Martin, Tesat	Hi-Rel Attenuators
COMSTAR	Boeing Space	Hi-Rel Attenuators
COSMO, SG	Hughes Space, Thales Alenia Space	Hi-Rel TVAs & Hi-Rel Diamond Rf Resistives®
Deep Space Probe	Boeing Space	Hi-Rel TVAs
DirectV 5, 6, 7S, 10, 11, 12	Space Systems/Loral, Boeing Space	Semi-Rigid Cables
DISCUS 1-5	Alcatel Space	Hi-Rel Attenuators
DMSP	Hughes Space, Boeing Space	Hi-Rel TVAs
DSCS-SLEP	Lockheed Martin	Semi-Rigid Cables for Military Satellite
Earth Observation	Astrium	Hi-Rel Attenuators & TVAs
EchoStar VII	Lockheed Martin	Semi-Rigid Cables
EchoStar V, VI, VIII, IX, XI, XIV, XV	Space Systems/Loral	Semi-Rigid Cables, End Customer Dish Network
Edusat	Astra Microwave	Hi-Rel Thermopads for Educational Satellite
Eutel Sat	Thales Alenia Space, Space Systems/Loral	Hi-Rel Attenuators & TVAs for Broadcast & VSAT, Semi-Rigid Cables
Firestone	Harris Government Systems	Hi-Rel Attenuators & TVAs for Classified Satellite (WRF-5) Prime: Lockheed
GALAXY III C, XI	Boeing Space	Customer: Pan Am Sat Corp.
GALILEO PROBE	Jet Propulsion Labs	Hi-Rel Attenuators
GEO	Space Systems/Loral	Semi-Rigid Cables
GOES D-H, I-M, N-P	Boeing Space, Northrop Grumman, Harris Govt. Systems	Hi-Rel Attenuators & TVAs for Geostationary Operational Environmental Satellite Weather Tracking Satellites
Galaxy III C, XI	Boeing Space	Customer: Pan Am Sat Corp.
Globalstar	Space Systems/Loral	Hi-Rel Attenuators
GlobalStar2	Thales Alenia Space, Com Dev	Hi-Rel Attenuators & TVAs for Mobile Satellite Voice & Data
GPM	General Dynamics	Global Precipitation Measurement Satellite for NASA Goddard
GMS-1	Hughes Space	Hi-Rel Attenuators
GPS I & II, IIF, III	Lockheed Martin, Boeing Space, General Dynamics	Hi-Rel Attenuators, TVAs, & Semi-Rigid Cables
GRAIL	Jet Propulsion Labs	Hi Rel Attenuators for Gravity Recovery and Interior Laboratory
GSAT-5	ISRO (SAC & ISAC)	Hi-Rel Attenuators, TVAs & Cable Assemblies for Geo-Stationary Satellite
G-STAR SATELLITE	Lockheed Martin	Hi-Rel Attenuators

PROGRAM NAME	CUSTOMER(S)	ACTIVITY/APPLICATION(S)
Hispasat	Thales Alenia Space	Hi-Rel Attenuators & TVAs for Global Communication Satellite
Hylas	Astrium	Hi-Rel Attenuators & TVAs
Immarsat	Thales Alenia Space	Hi-Rel Attenuators & TVAs for Satellite Telephone System
INMARSAT 1 & 2	Astrium	Hi-Rel Attenuators
Insat	SAC, ISRO, Astra Microwave, Tesat	Hi-Rel Attenuators & TVAs
Intelsat 1-4	Lockheed, Boeing Space	Semi-Rigid Cables
Intelsat 5, 7, 9, 15, 16,19, 20, 34	Space Systems/Loral	Semi-Rigid Cables
Iridium	Boeing Space, Argon ST, Thales Alenia Space	Hi-Rel Attenuators, TVAs & Hi-Rel Diamond Rf Resistives®
Iridium-Next	Lockheed Martin, Thales Alenia Space	Semi-Rigid Cables, TVAs
Jaquar	General Dynamics	Cable Assemblies and Thermopads
JCSAT, 14	Lockheed Martin	Hi-Rel Attenuators & Semi-Rigid Cables
JUNO	Thales Alenia Space, Jet Propulsion Labs	Leaded Hi-Rel Attenuators
Jupiter, 2	Space Systems/Loral	Semi-Rigid Cables for Hughes Network - Broadband Communications
JWST, SMAP	Jet Propulsion Labs	Hi-Rel Attenuators, TVAs, Terminations, Multipaction Tested Couplers
Ka-band Transceiver	Gaetech	Communications for ISRO
KA-SAT	Thales Alenia Space	Ka Band
Kitty Hawk	Harris	Hi-Rel Attenuators & TVAs
Kizuna	NT Space	Communications
Kompsat	Thales Alenia Space	Hi-Rel Attenuators & TVAs for Korean Multi-Purpose Earth Observation
Ku-IMUX	Thales Alenia Space	Hi-Rel Attenuators
LDCM	General Dynamics	Hi-Rel Attenuators & TVAs for Landsat Data Continuity Mission
LEASAT	Hughes Space	US Navy
LEO L/S	Orbital Space	Hi-Rel Attenuators
Little Bear	General Dynamics	Hi-Rel Attenuators & TVAs for AKA P06. Secret Program. Prime: Lockheed
Luxembourg Satellite	Astrium	Astrium
Mars Lander & Rover	Jet Propulsion Labs	Hi-Rel Attenuators & TVAs for Mars Exploration Vehicle
MEASAT 1,2,3	Boeing Space	Hi-Rel Attenuators & TVAs for Malaysia East Asia Satellite
MER	Jet Propulsion Labs	Mars Exploration Rover
MEXSAT	Boeing Space	Hi-Rel Attenuators
MSAT	Boeing Space	Hi-Rel Attenuators
MUOS (Mobile User Objective System)	Lockheed Martin	Semi-Rigid Cables, Hi-Rel Attenuators & TVAs for a Tactical Satellite Communications System to Improve Ground Communications for U.S. forces
New Skies XIV	Space Systems/Loral	Semi-Rigid Cables
NPOESS	Northrop Grumman	Custom & Standard Hi-Rel Attenuators & TVAs for National Polar-Orbiting Operational Environmental Satellite System
NSS-12	Space Systems/Loral	Semi-Rigid Cables for New Skies Satellite
OCEANSAT-2	SAC, ISRO	Hi-Rel Attenuators & TVAs for Microwave Remote Sensing
OCO	Orbital Sciences	High Power Coax Termination for Orbiting Carbon Observatory Monitors Greenhouse Gas Co2 Emissions
ORION Crew Exploration Vehicle	General Dynamics	Hi-Rel Attenuators for CEV Transponder
OSO-8	Lockheed Martin	Orbiting Solar Observatory
P01 - P10	General Dynamics	Hi-Rel Attenuators & TVAs for Classified Spy Satellite Systems
P072, P461, P617, P982, P1196	Northrop Grumman	Hi-Rel Attenuators & TVAs for Secret Programs
PALAPA-A, B	Boeing Space	Hi-Rel Attenuators
Payload W	General Dynamics	Hi-Rel Attenuators & TVAs for Secret Program
Phoenix	Lockheed Martin	Classified Spy Satellite System
Pioneer Venus Multprobe & Orbiter	Boeing Space	Hi-Rel Attenuators

# SUPPORTED SPACE PROGRAMS

PROGRAM NAME	CUSTOMER(S)	ACTIVITY/APPLICATION(S)
Polar Platform-ESA	Marta Marconi Space	For European Space Agency
QuetzSat 1	Space Systems/Loral	Semi-Rigid Cables
RCM (RADARSAT)	MDA, COM DEV	Attenuators, MTVAs, and Semi-Rigid Cable Assemblies
RISAT-2	ISRO	Earth Observation Satellite
SARSAT	Com Dev	TVAs, Flg Termination for Search & Rescue Satellite - Aided Tracking
Satellite Navigation and Remote Sensing	Electronics Institute of CAST	Cable Assemblies
SATMEX-6	Space Systems/Loral	Semi-Rigid Cables
SBIRS	Lockheed Martin	Semi-Rigid Cables, Hi-Rel Attenuators & TVAs
Sentinal-1	Astrium, Thales Alenia Space	Hi-Rel Attenuators & TVAs for Earth Observation for Europe's GMES Global Monitoring for Environment & Security
SES Sirius-5, 9	Space Systems/Loral	Semi-Rigid Cables & Hi-Rel Attenuators
SHARAD SkyNet V	Astrium, Tesat	Hi-Rel Attenuators
Shen Zhou	503 Institute of CAST	TVA for Satellite and Manned Space Craft
Sicral 1A, 1B, 2	Thales Alenia Space	Hi-Rel Attenuators & TVAs for Strategic Military Communications
SIRIUS 1,2,3,4,6	Space Systems/Loral	Semi-Rigid Cables
SKYNET V	Astrium, Tesat	Hi-Rel Attenuators
SMAP	Jet Propulsion Labs	Directional Coupler
Spaceway	Space Systems/Loral	Semi-Rigid Cables for Hughes Network Systems (Augment to Spaceway for High-Speed Internet Access)
Spaceway 1,2, 3	Boeing Space	DirecTV, Hughes Network Systems
SSPA Glonass	Astrium	Hi-Rel Attenuators & TVAs
STAR One C2, D1	Thales Alenia Space, Space Systems/Loral	Hi-Rel Attenuators, TVAs & Semi-Rigid Cables for Brazilian Communications
Superbird C-2	Mitsubishi Space	Communications
SURVEYOR	Hughes Space	Hi-Rel Attenuators
SYNCOM	Hughes Space	Hi-Rel Attenuators
TACSAT	Hughes Space	Hi-Rel Attenuators
TDRSS	Boeing Space	Tracking & Data Relay Satellite System
TELSTAR, 3	Boeing Space	Hi-Rel Attenuators
TELSTAR 14	Space Systems/Loral	Semi-Rigid Cables
TerreStar	Space Systems/Loral	Semi-Rigid Cables
THURAYA 1, 2, 3	Boeing Space	Hi-Rel Attenuators
TIROS	Lockheed Martin	Hi-Rel TVAs
TSAT	Boeing Space	Transformational Satellite System
Turksat 1C, 2A, 3A	Thales Alenia Space	Hi-Rel Attenuators & TVAs for Communications Satellite
Tuscany	Harris	Hi-Rel Attenuators
Tx	Astra Microwave	Educational Satellite Payload
VIASAT-1, -2	Space Systems/Loral	Semi-Rigid Cables & Hi-Rel Attenuators
WESTAR I, II, III, IV, V, VI	Hughes Space	Hi-Rel Attenuators
WGS	Boeing Space	Hi-Rel Attenuators for Wideband Global Satcom
WISE	Lockheed Martin	NASA's Wide-Field Infrared Survey Explorer
WORLD STAR	EADS Astrium	Commercial Communications
WRF-5	Lockheed Martin, Harris Govt. Systems, Assurance Technology	Hi-Rel Attenuators & TVAs for Secret Satellite Program
XM-1,2,3 & 4	Boeing Space	Hi-Rel Attenuators
XM-5 Radio	Space Systems/Loral	Semi-Rigid Cables

## STANDARD HIGH RELIABILITY TEST FLOW FOR RF COMPONENTS

### GROUP A TESTING AND INSPECTION (100% of the lot)

Pre-cap Visual Inspection  
 Conductor Metallization Defects  
 Resistor Defects  
 Substrate Defects  
 Foreign Material  
 Visual Mechanical Inspection  
 Electrical Inspections  
 Electrical Performance  
 Thermal Shock  
 Electrical Performance  
 Burn-In [100% 168 hours at input power]  
 Final RF Test  
 Percent Defective Allowable (PDA)  
 Temperature Coefficient of Attenuation

### GROUP B TESTING AND INSPECTION (Sample)

Subgroup 1 (sample)  
 Low Temperature Operation  
 Electrical Performance  
 High Temperature Bake  
 Visual Mechanical Inspection  
 Electrical Performance  
 Termination Adhesion (Planar, W1, W3 only)  
 Bondability (WB1 and G only)  
 Termination Solderability (Planar, W1, W3, T3 and T3S only)  
 Terminal Lead Strength (T3 and T3S only)  
 Subgroup 2 (sample)  
 Electrical Performance  
 Life Test. Sample units for 1000 hours at the maximum input power specified  
 Electrical Performance

### GROUP C TESTING AND INSPECTION (Sample)

Electrical Performance  
 Load Life. Burn-in units at 125°C for duration of 1000 hours at maximum input power specified.  
 Electrical Performance  
 Data Review and Data Pack

### ADDITIONAL RF COMPONENT TESTING AVAILABLE:

Stability of Attenuation After:	Barometric Pressure
Temperature Change	Outgassing
Thermal Shock	Endurance
Vibration	Resistance to Bonding Exposure
Shock	Low Temperature Operation
Moisture Resistance	Short Term Overload
Peak Power	High Temperature Exposure
Salt Spray	Solderable Mounting Integrity
Sensitivity of Attenuation After:	Bondable Mounting Integrity
Change in Input Power	Resistance to Solvents
Change in Frequency	Gross and Fine Leak Detection
Change in Temperature	Radiographic Inspection
Vibration and Shock Testing	First Article Inspection
Moisture Resistance	Pre-Cap Inspection
Peak Power	Source Inspection
Salt Spray	Other testing services are available upon request.



## STANDARD HIGH RELIABILITY TEST FLOW FOR CABLE PRODUCTS

### TESTING AND INSPECTION (100% of the lot)

Visual Mechanical Inspection	Electrical Inspections
Materials	Pre-Conditioning
Finish	DWV (Dielectric Withstanding Voltage)
Configuration and Features	Electrical Performance
Mechanical Definition Verification	VSWR & Insertion Loss
(Fit Fixtures), as required	Thermal Shock
Mechanical Master, as required	Electrical Performance
First Article Inspection	Serialized Data (as required)
Marking	Insertion Loss (read & record)
Mating	VSWR (read & record)
Workmanship	X-Ray Inspection (as required)
	Data Review and Data Pack Supplied

### ADDITIONAL TESTING AND SERVICES AVAILABLE:

Phase Matching  
 Vibration and Shock  
 Moisture Resistance  
 Peak Power  
 Salt Spray  
 Corrosion  
 Barometric Pressure  
 Resistance to Solvents  
 Force to Engage/Disengage  
 Cable Forming  
 Custom Painting  
 Custom Marking  
 Custom Packaging & Packing  
 Source Inspection  
 Other testing services are available upon request.



- We are a best-in-class, international leader in RF/MW cable assemblies led by our Lab-Flex® low-loss line of flexible cables for high-reliability, aerospace, test and specialty applications.
- We are the world leader in passive temperature variable and fixed attenuators from DC through Q band, featuring our patented Thermopad® line of products.
- We are one of the top two suppliers of RF/MW terminations and resistors, including our proprietary Diamond Rf Resistives®.
- We are a recognized leader in signal distribution components featuring our HybriX® line of 3 dB hybrid and directional couplers, power dividers & RF cross-overs.

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EMC CAGE Code: 24602

FRFL CAGE Code: 2Y194

AS 9100, Nadcap, ISO 9001 & 14001 and OSHAS 18001 Certified

EMC Technology & Florida RF Labs, a Smiths Microwave business, is an internationally recognized leader in the development and manufacturing of thin and thick film RF and Microwave resistive components, signal distribution products, and cable assemblies.

Smiths Microwave is a leading provider of components, sub-assemblies, antennas and systems solutions, primarily for defense and aerospace applications, and solutions that test, filter and process high-frequency signals for wireless telecommunication networks. As a family of brands, Kaelus, Radio Waves, TECOM, TRAK, LORCH, TRAK Limited, Millitech, EMC Technology and Florida RF Labs provide exacting solutions for antenna systems for the military and commercial aerospace, transceivers, frequency sources, timing systems, component applications, and a wide range of innovative RF and Microwave solutions for the wireless telecommunications sector.

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millitech

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RADIO WAVES

TECOM

TRAK