

TRM's extensive flight heritage is comprised of high-reliability components designed to optimize size, weight and power. Our components are engineered to meet the most severe environmental requirements as specified by top-tier defense contractors. Since our first space-qualified component was delivered in 1999, we have steadily contributed to the success of many major space programs. Custom orders to meet exact electrical and mechanical specifications are available in all beamformers, power dividers, directional couplers, 90° and 180° hybrids.

Space Level Screening and Qualification

Space qualification, like many other high-reliability qualifications, is specific to the end users environment and mission profile. TRM Microwave will customize component design and screening to meet your specific requirements.

Space qualification begins during the material selection process at the design stage. TRM selects materials that meet the NASA outgassing standards of 1% TML and .1% CVCM. Epoxy cure cycles effect the outgassing of the final material and TRM uses NASA approved cure cycles for these epoxies to ensure compliance to outgassing requirements. CTE is as much a key parameter when selecting a material for severe environments as is its electrical properties; TRM takes the entire environment into consideration when selecting our materials.

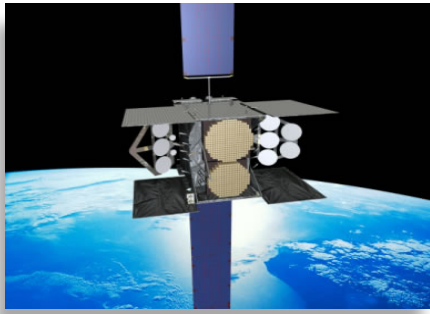
Multipaction Analysis is always conducted during the initial phase of the design cycle, to identify any potential areas of concern early so they can be designed out of the product. The final design will then be reviewed again to verify that it does not have the potential for multipaction to occur.

The component assemblies are subjected to several levels of quality validations and inspections throughout the manufacturing process. The qualification and first article inspection ensures

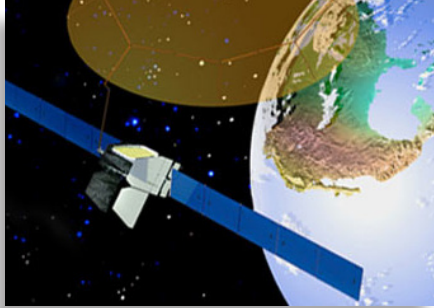
that the design and manufacturing process is capable of producing high quality results that can be relied upon to produce flight hardware. For example this includes micro-cross sectioning and SEM analysis of solder joints. The in-process quality inspection, which includes a combination of visual, X-ray and cleanliness inspections confirms that the flight hardware is built to the same high quality standards as the qualifications units. A Destructive Physical Analysis (DPA) unit, built in the same production lot as the flight units, is typically used to validate the manufacturing process on each space qualified component.

Environmental stress screening and validation are also typical of flight hardware. Vibration, shock, humidity and thermal cycling are all typically conducted screening tests. TRM utilizes automated network analyzers, integrated with thermal chambers to validate and characterize performance at temperature. Units are monitored continually during thermal cycling to validate the design integrity while the unit is undergoing thermal stress.

TRM uses this process to continue to support and release new space-qualified and hi-rel solutions for the military airborne and space applications.



WGS



MSV



TDRS



INMARSAT



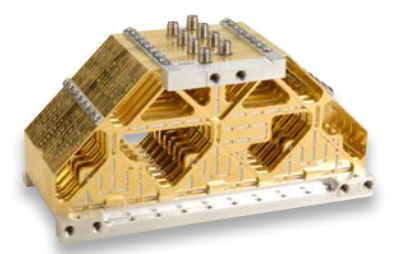
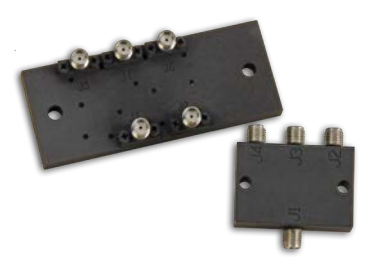
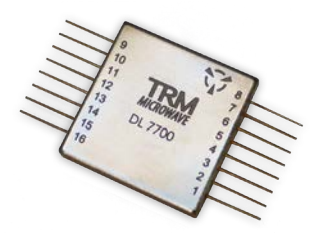
INTELSAT



SPACE QUALIFIED LOW PROFILE POWER DIVIDERS

Split	Band	Input	Output	Technology
1 x 2	VHF/UHF	Surface	Surface	Ferrite / Flatpack
2 x 3	X	SMA	SMA	Stripline
2 x 4	X	SMA	SMP	Stripline
2 x 6	X	SMA	SMP	Stripline
2 x 8	UHF	SMA	SMA	Stripline / Ferrite
2 x 8	L	SMA	SMA	Stripline / Ferrite
2 x 8	X	SMA	SMP	Stripline
2 x 10	X	SMA	SMP	Stripline
2 x 12	X	SMA	SMP	Stripline
2 x 18	UHF	SMA	SMA	Ferrite
2 x 26	S	SMA	SMA	Stripline
2 x 24	S	SMA	SMP	Stripline
2 x 24	L	SMA	SMP	Stripline
2 x 30	L	SMA	SMP	Stripline
2 x 32	S	SMA	SMP	Stripline
2 x 32	VHF	SMA	SMP	Ferrite
2x32 Dual	S/X	SMA	SMP	Stripline
3 x 1	Ku	SMA	SMA	Stripline
3 x 24	HF	Surface	Surface	Ferrite / Flatpack
12 x 8	X	MSSS	MSSS	AirStrip
15 x 8	X	MSSS	MSSS	AirStrip
16 x 8	X	MSSS	MSSS	AirStrip
17 x 8	X	MSSS	MSSS	AirStrip
18 x 8	X	MSSS	MSSS	AirStrip
19 x 8	X	MSSS	MSSS	AirStrip
20 x 8	X	MSSS	MSSS	AirStrip

SPACE QUALIFIED POWER DIVIDERS				
Split	Band	Input	Output	Technology
12 x 8	X-Band	MSSS	MSSS	AirStrip
12 x 8	X-Band	MSSS	MSSS	AirStrip
15 x 8	X-Band	MSSS	MSSS	AirStrip
16 x 8	X-Band	MSSS	MSSS	AirStrip
17 x 8	X-Band	MSSS	MSSS	AirStrip
18 x 8	X-Band	MSSS	MSSS	AirStrip
19 x 8	X-Band	MSSS	MSSS	AirStrip
20 x 8	X-Band	MSSS	MSSS	AirStrip
2x18	UHF	SMA	SMA	Ferrite
1x2	VHF/UHF	Surface	Surface	Ferrite / Flatpack
1x4	VHF	Surface	Surface	Ferrite / Flatpack
1x7	UHF	Surface	Surface	Ferrite / Flatpack
3x24	HF	Surface	Surface	Ferrite / Flatpack
1x2	L-Band	SMA	SMA	Microstrip
1x4	L-S-C-Bands	SMA	SMA	Microstrip
1x4	L-Band	SMA	SMA	Microstrip
1x6	X-Band	SMA	SMA	Microstrip
1x2	Ku-Band	SMK	SMK	Microstrip
1x4	Ku-Band	SMK	SMK	Microstrip
1x6	Ku-Band	SMK	SMK	Microstrip
1x8	Ku-Band	SMK	SMK	Microstrip
1x12	Ku-Band	SMK	SMK	Microstrip
2x8	UHF	SMA	SMA	Stripline / Ferrite
2x8	UHF	SMA	SMA	Stripline / Ferrite
2x8	L-Band	SMA	SMA	Stripline / Ferrite
2x8	L-Band	SMA	SMA	Stripline / Ferrite
1x2	S-Band	SMA	SMA	Stripline
1x4	S-Band	SMA	SMA	Stripline
2x3	S-Band	SMA	SMA	Stripline
1x2	X-Band	SMA	SMA	Stripline
2x3	X-Band	SMA	SMA	Stripline
2x6	X-Band	SMA	SMA	Stripline
3x1	Ku-Band	SMA	SMA	Stripline



SPACE QUALIFIED HYBRIDS					
Description	Split	Band	Input	Output	Technology
Hybrid	2x2	X-Band	SMA	SMA	Stripline
Hybrid	1x2	VHF	Surface	Surface	Ferrite / Flatpack
Hybrid	1x2	VHF	SMA	SMA	Ferrite
90° Hybrid	3 dB	L-Band	SMA	SMA	Stripline
90° Hybrid	2x2	S-Band	SMA	SMA	Stripline
90° Hybrid	2x2	S-Band	SMA	SMA	Stripline
90° Hybrid	2x2	L-Band	SMA	SMA	Stripline
90° Hybrid	2x2	S-Band	SMA	SMA	Stripline
90° Hybrid	2x2	X-Band	SMA	SMA	Stripline
180° Hybrid	2x2	VHF	SMA	SMA	Ferrite
180° Hybrid	2x2	VHF	SMA	SMA	Ferrite
SPACE QUALIFIED COUPLERS					
Description	Band	Coupling	Input	Output	Technology
Directional Coupler	L-S-C-Bands	10 dB	SMA	SMA	Stripline
High Power Dual Directional Coupler	Ku-Band	20 dB	SMA	SMA	Stripline
Coupler	VHF	10 and 30 dB	TNC	SMA	Stripline

About TRM Microwave

TRM is a global leader in the design and manufacture of custom and standard high-reliability RF and microwave components, integrated assemblies and subsystems for space, defense and commercial applications. TRM's robust product line includes power dividers, directional couplers, hybrids, beamformers, baluns, switched combiners, image reject mixers, phase comparators and space qualified components, coverage from DC to 40 GHz and power handling of up to 100 KW.

CONTACT INFORMATION

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TRM is ISO 9001:2008 certified and is an ITAR compliant facility.