Microwave Device

Microwave Component

Microwave Equipment

Microwave Device

Microwave circuits are composed of various microwave devices. According to their functions, microwave devices can be divided into filters, circulators, isolators, switches, limiters, phase shifters, amplifiers, attenuators, detectors, mixers, frequency multipliers, frequency dividers, oscillators, frequency synthesizers, power amplifiers, couplers, etc. These devices can be used to easily build various microwave components and systems.

In today's pursuit of equipment miniaturization, most microwave devices have been made into MMIC. MMIIC has the advantages of small size, light weight, and stable performance, but it is difficult to integrate high-power and high-Q value circuits. Therefore, in the pursuit of high power or optimal performance of microwave front-end circuits, the use of discrete devices such as resistors, capacitors, inductors, diodes, triodes, and microwave transmission lines, connectors, and shielded shells to build microwave device modules still has a wide range of applications.

Our company has the ability to develop various microwave devices, especially in the development of the following types of devices, and has rich engineering experience.

(1) Power Amplifier
(2) Low Noise Amplifier
(3) Microwave Switch
(4) Limiter
(5) Phase Shifter
(6) Frequency Synthesizer
(7) Filter

Power Amplifier

Features:

(1) Using solid-state power devices such as LDMOS, GaAs, and GaN, the company can customize and develop pulse or continuous wave power amplifiers with a frequency coverage of 0.2MHz~40GHz and a power of 1W~1000W for users.

(2) The power amplifier can add power-on timing protection, output mismatch protection, over-temperature/over-voltage/over-current protection, over-excitation protection and other functions as needed, which can cope with various accidents and has strong anti-burning ability.

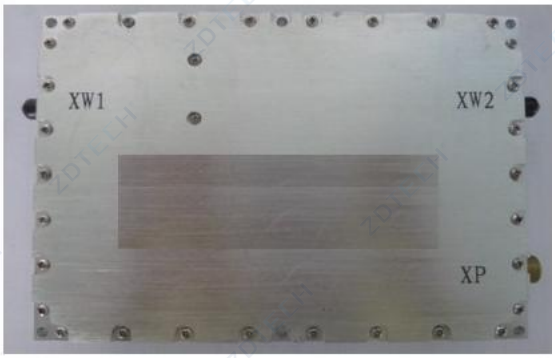
(3) It has excellent and mature pulse modulation technology, and can use RF signal modulation, gate or drain power supply modulation technology to realize amplifier pulse operation. The pulse rise and fall edges are less than 100nS, and the pulse top drop is <0.5dB.

(4) It has excellent external matching circuit design capabilities, which can give full play to the performance of the power amplifier tube and obtain the best power output capability or the best power conversion efficiency. The efficiency of the external matching GaN narrowband power amplifier module can reach more than 60%. The broadband matching of the amplifier can be achieved through transformers, transmission line impedance converters and other technologies, and it can be competent for the development of ultra-wideband amplifiers with operating frequencies spanning multiple octaves.

(5) Master excellent linearization technology, use power back-off, doherty, and analog pre-distortion technologies, and be competent for most communication power amplifier development.

(6) Master good thermal simulation skills, familiar with various heat dissipation designs such as natural heat dissipation, air cooling, and liquid cooling, master microstrip, stripline, and waveguide power synthesis technology, and be competent for high-power amplifier development.

C-Band Pulse Power Amplifier



GaN external matching amplifier

High-speed power supply pulse debugging

Power-on and power-off timing protection

Working Frequency	3.8~4.3GHz
Port Standing Wave	≤1.5
Small Signal Power Gain	≥40dB
Gain Fluctuation	≤1dB
P-1dB	≥38dBm
Working Power Supply	±12V
Input/Output Connector	SMA-50K
Appearance Size	≤150×110×35mm

Ka-Band Pulse Power Amplifier

GaN power tube amplifier

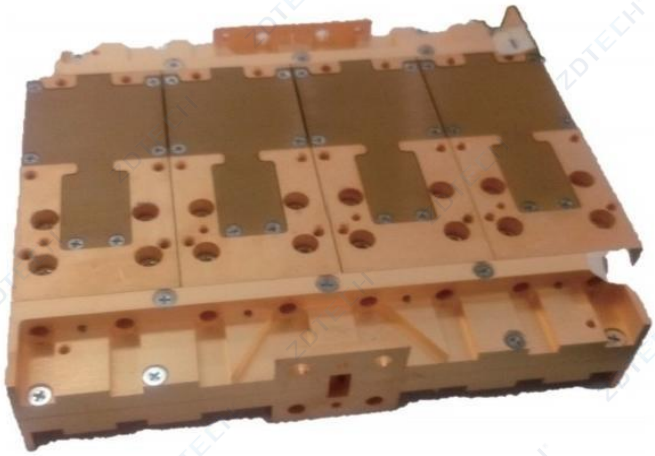
Rectangular waveguide power synthesis

High-speed pulse power supply drain modulation

Power-on/off timing protection

Working Frequency	30-40GHz
Rising Edge	≤50ns
Falling Edge	50ns
Top Drop	≤0.5dB
Inter-Pulse Spurious Suppression	≥60dBc
Saturated Output Power	≥46.0dBm (duty cycle ≤20%, pulse width ≤20us);
Power Supply	DC (+28V, -5V)
Efficiency	about 30% (typical value)
Power Interface	J30J-9-ZKP
RF Input and Output Interface	BJ320
Size	60X30X20mm
Weight	≤200g

Ka Band-Pulse 100W Power Amplifier



Gan power tube internal matching amplifier

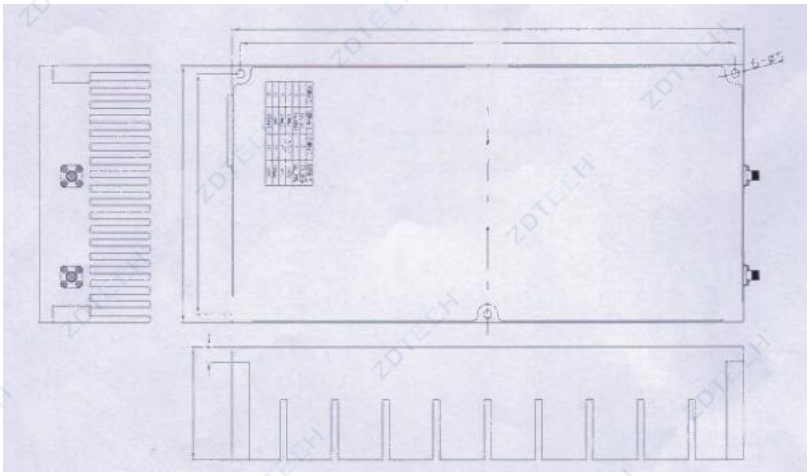
Rectangular waveguide power synthesis

High-speed pulse power supply drain modulation

Power-on/power-off timing protection function

Working Frequency	34-36GHz
Rising Edge	≤100ns
Falling Edge	≤100ns
Top Drop	≤0.5dB
Inter-Pulse Spurious Suppression	≥60dBc
Saturated Output Power	≥52.0dBm (duty cycle ≤20%, pulse width ≤20us);
Power Supply	DC (+28V, -5V)
Efficiency	About 30% (typical value)
Power Interface	J30J-31-ZKP
RF Input and Output Interface	BJ320
Size	110X90X20mm
Weight	≤1000g

S-Band 100W Power Amplifier



Continuous wave GaN power tube external matching amplifier

3dB bridge power synthesis

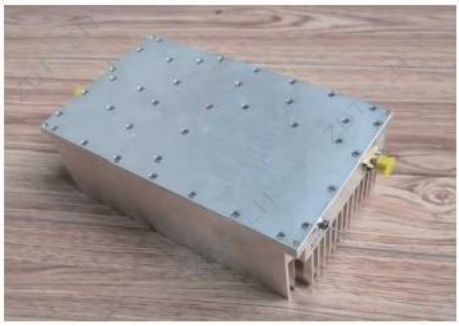
Power-on/power-off timing protection function

Over-temperature, mismatch, over-excitation protection function

Working Frequency	1350MHz~2690MHz
1dB Compression Point Output Power	≥50dBm
Falling Edge	≤100ns
Output Flatness	≤2dB
Small Signal Gain	≥40dB
Power Supply	DC +28V

6-18GHz Power Amplifier

6-18GHz Power Amplifier



Supports pulse and continuous wave working systems

Single power supply, convenient system integration

Power amplifier temperature detection, over-temperature protection

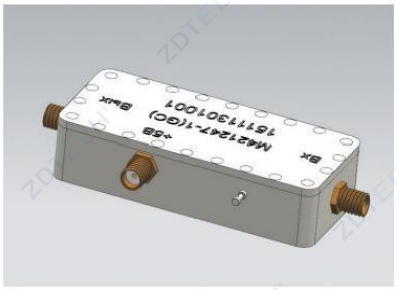
Output power detection, mismatch protection

Working Frequency	6-18GHz
Output Saturation Power	≥44dBm
Power Gain	≥40dB
Power Supply	DC +28V

Narrowband Low Noise Amplifier

Low noise amplifiers with operating frequency relative bandwidth less than or equal to 20% are defined as narrowband low noise amplifiers. With the best noise matching technology, the product noise factor can reach the domestic advanced level. Products with higher performance and medium power can be customized.

C-Band Low Noise Amplifier



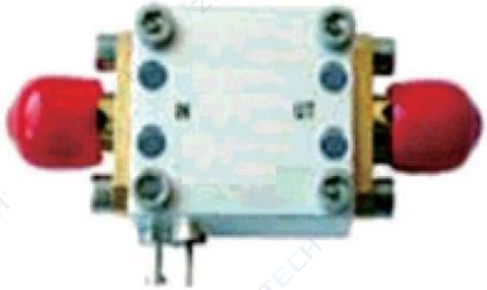
Working Frequency	3.8~4.3GHz
Noise Figure	≤1.2dB
Port Standing Wave	≤1.5
Small Signal Power Gain	≥25±1.5dB
P-1dB	≥10dBm
Working Power Supply	+5V
Input/Output Connector	SMA-50K
Appearance Size	≤87×40×16mm

Waveband	Relative Bandwidth	Noise Figure (dB)	Power Gain (dB)	P-1dB (dBm)	Gain Flatness (±dB)	VSWR (max)
VHF	≤20%	0.7~2	≥20	10~20	0.5	≤1.5
P	≤20%	0.5~2	≥20	10~20	0.5	≤1.5
L	≤20%	0.6~2	≥15	10~20	0.5	≤1.5
S	≤20%	0.7~2	≥15	10~20	0.5	≤1.8
C	≤20%	1.2~2.5	≥10	5~15	0.5	≤1.8
X	≤20%	1.8~3	≥10	5~15	0.5	≤1.8
Ku	≤20%	2~4	≥10	5~15	0.5	≤2.0

Broadband Low Noise Amplifier

A low noise amplifier with an operating frequency relative to the bandwidth greater than or equal to 20% is defined as a broadband low noise amplifier. The amplifier adopts the best noise matching and takes into account the gain fluctuation index within the band. It has the characteristics of low noise figure and small gain fluctuation. Products with higher performance and medium power can be customized.

X-Band Low Noise Amplifier



Working Frequency	5~10GHz
Noise Figure	≤2.2dB
Port Standing Wave	≤2
Small Signal Power Gain	≥15dB
Gain Fluctuation	≤2dB
P-1dB	≥10dBm
Working Power Supply	+ 5V
Input/Output Connector	SMA-50K
Appearance Size	≤25×25×8mm

Waveband	Relative Bandwidth	Noise Figure (dB)	Power Gain (dB)	P-1dB (dBm)	Gain Flatness (±dB)	VSWR (max)
VHF	≥20%	<2	≥20	10~17	≤1.5	≤2.5
P	≥20%	<2	≥20	10~17	≤1.5	≤2.5
L	≥20%	<2	≥15	10~17	≤1.5	≤2.5
S	≥20%	<2	≥15	10~13	≤1.5	≤2.5
C	≥20%	<3	≥10	5~13	≤1.5	≤2.5
X	≥20%	<4	≥10	5~13	≤1.5	≤2.5
Ku	≤20%	2~4	≥10	5~15	0.5	≤2.0

Microwave PIN Switch

Features:

(1) Bandwidth: The frequency can cover 0.01～18GHz;

(2) High power: The pulse power can reach several kilowatts, and the continuous wave power can reach hundreds of watts;

(3) Fast switching speed: The typical value of the switching speed is tens of nanoseconds;

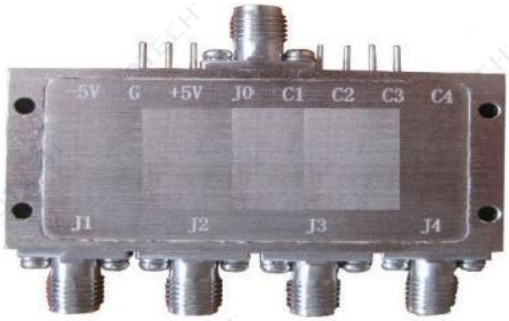
(4) High isolation: The isolation of the switch using special technology can reach more than 100dB.

(5) Good performance: It has excellent performance such as low insertion loss and low standing wave ratio.

(6) Small size: The glass bead interface is used to achieve surface mount installation.

(7) High reliability: It adopts advanced processes such as chip eutectic, metal sealing structure, exquisite appearance and reliable quality.

2~8GHz Microwave Switch



Working Frequency	2GHz~8GHz
Insertion Loss	≤1.5dB
Switching Time	≤50ns
Port Standing Wave	≤1.5
Power Handling	≥27dBm
Drive Voltage	+5V, -12V (Negative pressure, current ≤500mA)
Isolation	≥30dBc
In-Band Flatness	±0.5dB
Operating Temperature	40℃~+70℃
Dimension	75×52×10mm

Limiter

Features:

(1) Bandwidth: frequency can cover 0.02～18GHz;

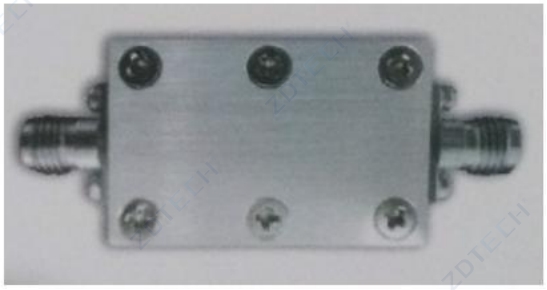
(2) High power: pulse power can reach several kilowatts, continuous wave power can reach hundreds of watts;

(3) Good performance: has excellent performance such as low insertion loss and low standing wave ratio.

(4) Small size: glass bead interface is adopted, which can realize surface mount installation.

(5) High reliability: advanced processes such as chip eutectic are adopted, metal sealing structure, exquisite appearance and reliable quality.

S-Band High-Power Limiter



Working Frequency	2GHz~4GHz
Insertion Loss	≤0.8dB
Port Standing Wave	≤1.5
Withstand Power	continuous wave ≥50dBm 10% duty cycle pulse≥60dBm
Leakage Power	≤20dBm
Operating Temperature	-40℃~+70℃
Dimension	20×12×18mm

Phase Shifter

Features:

(1) Bandwidth: The frequency can cover 0.02~18GHz;

(2) High power: The pulse power can reach hundreds of watts, and the continuous wave power can reach tens of watts;

(3) High speed: The typical value of phase switching time is tens of nanoseconds;

(4) High precision: The phase shift accuracy is high, which can reach ±1° within the working frequency band;

(5) High stability: The phase stability is good and is not affected by factors such as stability and signal level.

(6) Good performance: It has excellent performance such as low insertion loss and low standing wave ratio.

(7) Small size: It can be packaged in a small size with a glass bead interface;

(8) High reliability: It adopts advanced processes such as chip eutectic, metal sealing structure, exquisite appearance and reliable quality.

Six-Bit Non-Dispersive Phase Shifter

Working Frequency	5.2GHz~5.8GHz
Phase Shift Step	5.625°
Insertion Loss	≤6dB
Amplitude Fluctuation	≤1dB
Input/Output VSWR	≤1.5
Phase Shift Accuracy	≤2.5°
Power Handling	≥1W
Phase Switching Time	≤150ns
Power Supply and Control	±5V, TTL level
Operating Temperature	-40℃~+70℃
Dimension	96×38×12mm

Integer-Division Basic Loop Frequency Synthesizer

Use an integer-division PLL frequency synthesis chip with a low phase noise floor to achieve frequency synthesis with a single loop. The product circuit is simple and small in size, but still has high comprehensive indicators. The circuit can be designed according to user requirements to meet special requirements. When the requirements for spurious suppression are relaxed and special circuit measures are taken, the frequency hopping time can be made shorter.

Wave band	Relative Bandwidth	Phase Noise(Mid Frequency)dBc/ Hz@1kHz	Power Output (dBm)	Spur Suppression (dBc)	Step Size (Hz)	Harmonic Suppression (dBc)
P	≤100%	100	(0~20)±1	>70	10k~50M	20~50
L	≤100%	90	(0~15)±1	>70	10k~50M	20~50
S	≤80%	85	(0~15)±1	>70	10k~50M	20~50
C	≤40%	80	(0~10)±1	>65	10k~50M	20~50
X	≤12%	75	(0~10)±1	>60	10k~50M	20~50
Ku	≤7%	70	(0~10)±1	>60	10k~50M	20~50

Fractional Frequency Basic Ring Synthesizer

The biggest advantage of FN-PLL technology is that it can still obtain a very fine step length when using a higher phase detection frequency fp, thereby improving the phase noise index. However, the existence of its inherent fractional spurious makes the spurious suppression index poor. With the continuous development of fractional spurious suppression technology, especially the maturity of Z-△ modulation technology, this problem has been solved to a large extent. The company uses advanced FN-PLL chips with low phase noise floor and 12bit/22bit modulus to design this type of product, and its step length can reach the Hz level.

Wave band	Relative Bandwidth	Phase Noise(dBc/Hz@1kHz)	Spur Suppression (dBc)	Step Size (Hz)	Settling Time (μs)	Harmonic Suppression (dBc)	Output Power (dBm)
P	≤100%	115	60~75	10~50M	20~200	20~50	0~20
L	≤100%	105	60~75	10~50M	20~200	20~50	0~15
S	≤80%	100	60~75	10~50M	20~200	20~50	0~15
C	≤40%	95	60~75	10~50M	20~200	20~50	0~10
X	≤12%	90	60~75	10~50M	20~200	20~50	0~10
Ku	≤7%	85	60~75	10~50M	20~200	20~50	0~10

Fractional-Number Mixing Loop Phase-Locked Frequency Synthesizer

On the basis of using M/N loop to reduce PLL phase noise, when the step size is fine, the FN-PLL chip is used to increase the phase detection frequency, which can further reduce the frequency deterioration of loop phase noise, thereby improving the phase noise index.

Wave band	Relative Bandwidth	Phase Noise (dBc/ Hz@1kHz)	Spur suppression (dBc)	Step Size (Hz)	Settling Time(μs)	Harmonic Suppression (dBc)	Power Output (dBm)
L	≤25%	-115	50~75	10Hz~30MHz	50~200	20~50	0~10
S	≤25%	-115	50~75	10Hz~30MHz	50~200	20~50	0~10
C	≤25%	-110	50~75	10Hz~30MHz	50~200	20~50	0~10
X	≤25%	-105	50~75	10Hz~30MHz	50~200	20~50	0~10
Ku	≤25%	-100	50~75	10Hz~30MHz	50~200	20~50	0~10
Ku	≤7%	85	60~75	10~50M	20~200	20~50	0~10

Direct Digital Frequency Synthesizer

DDS realizes frequency synthesis based on the new digital waveform synthesis technology. With the development of semiconductor technology, the clock of DDS can reach 12GHz, which can generate 40% of the clock frequency output and the frequency reaches 3GHz.

The phase noise floor of DDS chip is also continuously reduced, and the spurious-free dynamic range index (SFDR) is getting higher and higher, which greatly improves its practicality. The biggest advantages of DDS are fine step length, agile frequency change and low phase noise.

Frequency Output	Relative Bandwidth	Phase Noise (dBc/ Hz@1kHz)	Spur Suppression			Step Size (Hz)	Settling Time (μs)	Harmonic Suppression (dBc)
			±50 (KHz)	±1 (MHz)	±5 (MHz)			
DC~3000 MHz	100%	<-115	85	80	78	<1	<1	<50

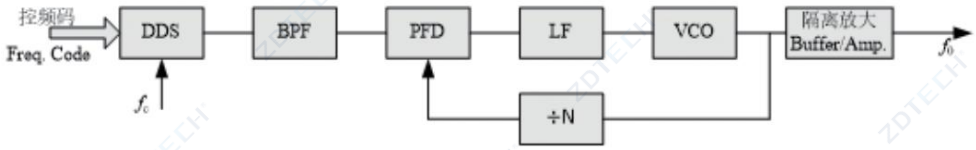
① Spurious suppression is related to the output frequency. The above spurious indicators are the values when using a 1GHz clock and 100MHz output;

② DDS frequency hopping time is mainly determined by the external frequency code processing circuit. When there are few frequency hopping points, using the inherent frequency register of DDS, the frequency hopping time can be less than 50ns;

③ When the DDS used has a high noise floor, it will affect the phase noise indicator of the output frequency.

DDS Plus PLL Frequency Synthesizer

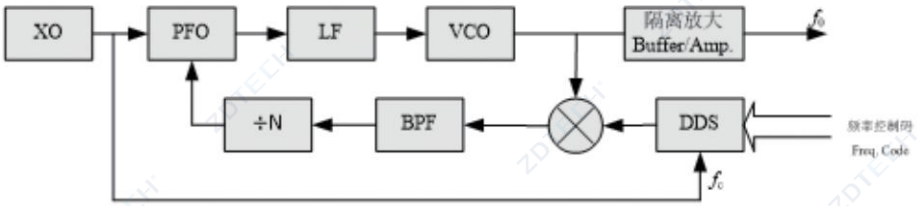
Technical Solution 1



When using DDS as the reference source of PLL, the maximum output frequency of DDS is limited by the allowed clock frequency. Combining DDS with PLL can overcome this shortcoming and generate a fine-step frequency source that can cover the entire microwave frequency band. It has excellent performance of high resolution and wide bandwidth, but in the high microwave band, due to the large N value, the spurious in-band deterioration of DDS is large.

Waveband	Relative Bandwidth	Phase Noise (dBc/ Hz@1kHz)	Step Size(Hz)	Settling Time(μs)	Spur Suppression (dBc)
					±10kHz
L	DC~fout	-105	1	50~200	75
S	DC~fout	-95	1	50~200	70
C	DC~fout	-90	1	50~200	65
X	DC~fout	-85	1	50~200	60
Ku	DC~fout	-80	1	50~200	55

Technical Solution 2



The PLL interpolation DDS form is adopted, which has the excellent performance of high resolution and no deterioration of DDS spurious. When N is a fixed value, only DDS frequency hopping can achieve faster frequency hopping. The change of N value can achieve broadband output.

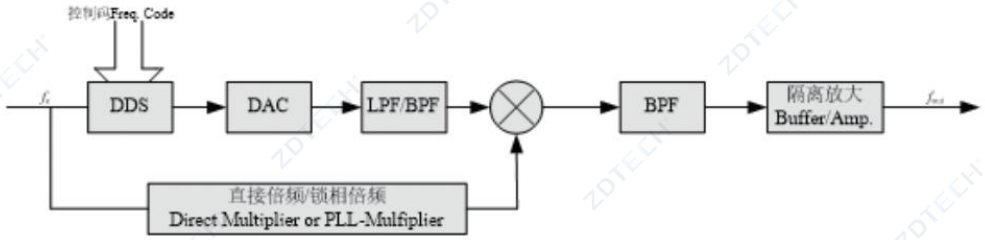
Waveband	Relative Bandwidth	Phase Noise (dBc/Hz@10kHz)	Step Size (Hz)	Settling Time (μs)	Spur Suppression (dBc)
					±10kHz
L	40%	-110	1	50~200	75
S	15%	-100	1	50~200	75
C	8%	-98	1	50~200	75
X	5%	-95	1	50~200	70
Ku	3%	-85	1	50~200	70

① Output power, power supply and power consumption, and operating temperature can be produced according to user requirements;

② If the DDS+frequency multiplication scheme is adopted, its indicators are similar to the DDS Plus PLL frequency synthesizer technical scheme 1;

③ When the user provides an external reference source (or clock), the requirements for phase noise indicators must be guaranteed to achieve the listed frequency synthesis phase noise indicators.

Technical Solution 3



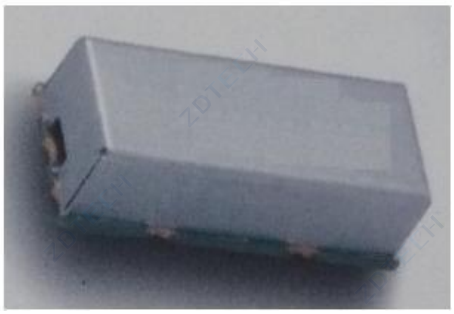
This solution uses out-of-loop mixing to achieve the output of Technical Solution 2. In addition to the characteristics of high resolution and low phase noise, as long as the frequency-multiplied output is a single-point frequency, the frequency hopping time is determined only by DDS, thus achieving agile frequency switching.

Waveband	Relative Bandwidth	Phase Noise(dBc/Hz@10kHz)	Step Size(Hz)	Settling Time(μs)	Spur Suppression (dBc)
L	40%	-120	1	<1	50
S	15%	-110	1	<1	50
C	8%	-105	1	<1	50
X	4.6%	-100	1	<1	50
Ku	2.8%	-95	1	<1	50
When the output frequency range is reduced, the spurious suppression index can be higher than the parameters in the above table.					

LC Filter

The circuit simulation and parameter optimization are performed by dedicated CAD software. The operating frequency can cover 2~5000MHz, with low insertion loss, good passband standing wave characteristics and high out-of-band attenuation.

70MHz Bandpass Filter



Center Frequency	70MHz
1dB Bandwidth	10MHz
Insertion Loss	≤2.5dB
f0±20MHz Out-of-Band Suppression	≥60dB
Input/Output Impedance	50Ω
Dimension	30×12×8mm

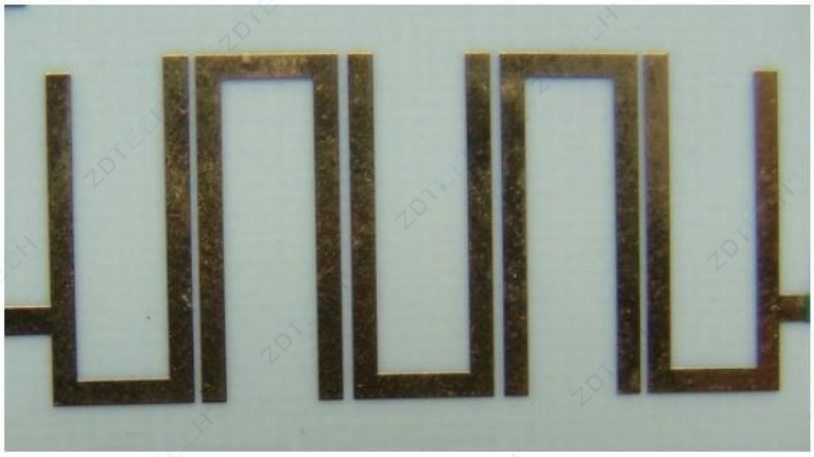
2500MHz Bandpass Filter

Center Frequency	2500MHz
1dB Bandwidth	300MHz
Insertion Loss	≤2dB
f0±20MHz Out-of-Band Suppression	≥50dB
Input/Output Impedance	50Ω
Input/Output VSWR	≤1.5
Dimension	30×12×8mm

Microstrip Filter

Microstrip filters are classified into low-pass, high-pass, band-pass and band-stop filters according to frequency selection functions. For LPF, the technical solutions of high and low impedance lines and suspended microstrips are adopted; for BPF, the technical solutions of parallel coupling lines, branch lines, tapped comb lines, tapped interdigital lines, suspended microstrips, SIR and cross-coupling by SIR are adopted; for HPF, the technical solutions of branch lines and suspended microstrips are adopted. It has many advantages such as small size, light weight and wide frequency band.

C-Band Microband Filter



Center Frequency	5000MHz
1dB bandwidth	600MHz
Insertion Loss	≤2.5dB
f0±800MHz Out-of-Band suppression	≥40dB
Input/Output impedance	50Ω
Input/Output VSWR	≤1.8
Dimension	100×50mm

Cavity Filter

Frequency covers 500MHz~18GHz, with low insertion loss, good passband standing wave characteristics and high out-of-band attenuation. The cavity filters provided by our company are in three forms: comb filter, interdigital filter and coaxial resonant cavity filter. The input and output methods are standard SMA connectors or detachable connectors, and a variety of flexible lead pin forms can also be used as needed.

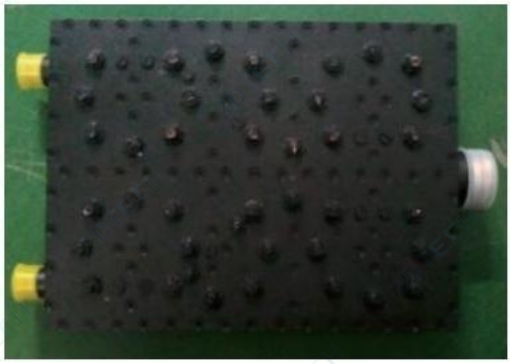
C-Band Bandpass Filter

Center Frequency	4000MHz
3dB Bandwidth	15MHz
f0±3MHz In-Band Fluctuation	≤0.5dB
Insertion Loss	≤4dB
f0±60MHz Out-of-Band Suppression	≥75dB
Input/Output Impedance	50Ω
Input/Output VSWR	≤1.3
Dimension	140×32X33mm

Multiplex /Duplex Filter

A duplex/multiplex filter (also known as a frequency divider) is another common filter besides a switch filter. It consists of two or more filters that share a common input port and can separate signals into different frequency bands.

S-Band Duplex Filter



Filter 1 Operating Frequency f1	2100MHz±50MHz
Filter 2 Center Frequency f2	2400MHz±50MHz
Inband Insertion Loss	≤1.5dB
Input/Output VSWR	≤1.3
Isolation between F1 and F2	≥80dB

Microwave Component

Microwave components are products assembled from various microwave components and other parts. They also include RF circuits, power circuits, control circuits, and embedded software. According to their main functions, they can be divided into frequency synthesis components, frequency conversion components, switch filtering components, and receiving and transmitting components.

1. Frequency synthesis components are used to generate various frequencies and provide clock signals, local oscillator signals, calibration signals, etc. for the entire system. Phase noise, frequency hopping time, clutter suppression, frequency and power stability are key indicators of frequency synthesis components. We can customize and develop various high-stability frequency synthesis components with low phase noise, low clutter, and agile frequency conversion.

2. The core of the frequency conversion component is the mixer, amplification, and filtering, which are used to realize the frequency conversion from RF to IF or IF to RF of the entire machine, and can integrate clock and local oscillator signals. How to plan the frequency, filter out the mixing clutter, and improve the anti-interference ability is the difficulty of the frequency converter design. We can customize and develop various wide-band, large dynamic, and low-spurious frequency conversion components.

3. The switch filter component consists of a filter and a multi-way switch. It can select a certain frequency band signal and block other frequency signals according to work requirements. It has a wide range of applications in broadband microwave systems. We can develop various switch filter components for customization, which have the advantages of small size and high out-of-band suppression.

4. The receiving and transmitting components are usually composed of RF filters, duplexers, limiters, low noise amplifiers, attenuators, phase shifters, power amplifiers and other front-end circuits for receiving and transmitting. With the antenna, the RF signal can be received or transmitted. At the same time, switches, intermediate frequency filters, frequency converters, frequency synthesizers, etc. can be integrated to form a complete receiving and transmitting link.

Frequency Synthesizer Component

Features:

(1) With the function of converting intermediate frequency signal to X band; including reference clock source; Can output the 1GHz reference clock signal;

(2) It has the X-band correction signal generation function, and the correction signal output can be closed;

(3) It has the frequency point control and status query function

XL Frequency Source Component

Medium Freq. Input	**Frequency**	170MHz±15MHz
	Level	5±2dBm
RF Output	**Frequency**	10.52GHz±150MHz
	Frequency Hopping Step	5MHz
	Amplitude	5dBm±2dBm
	Phase Noise	≤-107dBc/Hz@1kHz
	Spurious Suppression	≤-65dBc
Correction Signal Output	**Frequency**	10.52GHz±150MHz
	Frequency Hopping Step	100kHz
	Amplitude	-30dBm±3dBm
	Output Phase Noise	≤-95dBc/Hz@1kHz
	Output Spurious	≤-50dBc
1GHz Ref. Clock Output	**Level**	5±2dBm
	Phase Noise	≤-135dBc/Hz@1kHz
	Spurious	≤-65dBc(Out-of-band)
100MHz Sampling Clock	**Level**	5±2dBm
	Spurious	≤-80dBc
	Frequency Stability	≤1ppm/year
	Frequency Accuracy	≤1ppm
	Phase Noise	≤-155dBc/Hz@1kHz
	Power Supply	+12V, 2A
	Control	RS485

Frequency Conversion Component

Features:

(1) VPX plate structure, broadband super heterodyne secondary frequency conversion;

(2) With the hopping frequency local vibration and clock, can be automatically synchronized with the external clock

VPX Architecture RF Component

Input Frequency	0.95~3.8GHz
Output Frequency	140MHz
Gain	30±2dB
Gain Step	1dB
Gain Flatness	1.5dB
Third-order Cutoff Point	≥30dBm
Signal Bandwidth	72MHz
Signal 1dB Bandwidth	±20/±40MHz
Noise Figure	≤12dB(full-gain test)
Frequency Step Interval	10kHz
Phase Noise	≤-70dBc/Hz@100Hz ≤-80dBc/Hz@1kHz ≤-90dBc/Hz@10kHz ≤-100dBc/Hz@100kHz
Image Rejection	≥70dBc
Clutter Signal	≥60dBc
Input/Output VSWR	<1.5
LO Leakage	Input end is less than -70dBm
Output P-1	≥±15dBm
Operating Temperature	-25~+70℃
Storage Temperature	-40~+80℃
Input/Output Interface	SMA-K
Supply Voltage	±5.5V, +12V
Control Mode	VPX Interface
Dimension	Standard 6 UVPX Card
Weight	≤1kg
Dimension	Standard 1U case
External Ref.	10MHz, internal and external clock switching

Switch Filter Component

Feature:

(1) The switch filter is mainly composed of the filter set, the multi-channel selection switch and the control circuit.

(2) It has the advantages of small size, fast frequency switching speed, and high out-of-band inhibition.

C-band 5-in Switch Filter

Center Frequency	F1、F2、F3、F4、F5
1dB Bandwidth	20MHz
Insertion Loss	≤5dB
±100MHz Out-of-band Suppression	≥60dB
Port VSWR	≤1.5
Third-order Cutoff Point	≥30dBm
Frequency Switching Speed	≤200nS
Appearance Size	160*100*30 (mm)

Transmitter

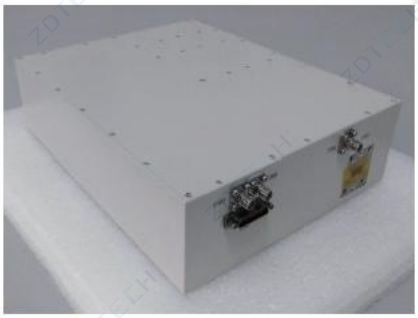
Features:

(1) All-solid-state transmitter, with up-conversion function, built-in local oscillator; High-speed pulse power supply drain modulation;

(2) Power management function, convenient for users to adjust output power; Power amplifier unit temperature detection, providing early warning and alarm indication;

(3) Single power supply is convenient to use, power supply with slow start protection function; Output mismatch protection function; Output power real-time detection function.

Ku-band Transmitter



IF-FRE	720MHz
RF	15-17GHz
Spurious Suppression	≥70dBc
LO Suppression	≥50dBc
Sideband Suppression	≥70dBc
Rising Edge	≤100ns
Falling Edge	≤100ns
Top Drop	≤0.8dB
Saturation Output Power	≥55.0dBm (Duty cycle ≤30%, pulse width ≤300us)
Power Supply	DC(+24V~+30V)
Efficiency	About 20%
Power Interface	J30J-31-ZKP
RF Interface	BJ180
LO/IF Interface	SMA-K
Weight	≤4.4Kg
Dimension	240*200*60 (mm)

Transceiver Component

Feature:

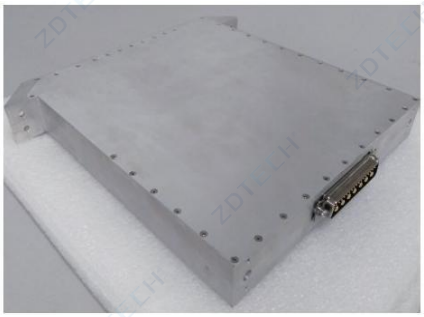
(1) The component contains 2 receiving channels, 1 receiving and transmitting channel, and 1 self-test channel;

(2) It has transmission power detection; transmission channel temperature detection;

(3) It has transmission port mismatch protection function; transmission power management; the receiving port has a limiting function;

(4) It has a built-in power supply component, single power supply, and is easy to use.

Ku-Band Transceiver Component



Transmitting Channel	**IF-FRE**	720MHz
	RF	14-18GHz
	Spurious Suppression	≥70dBc
	LO Suppression	≥50dBc
	Sideband Suppression	≥70dBc
	Rising Edge	≤100ns
	Falling Edge	≤100ns
	Top Drop	≤0.8dB
	Saturation Output Power	≥55.0dBm (Duty cycle ≤30%, pulse width ≤300us)
ReceivingChannel	**Noise Figure**	4dB (Channel), 3dB (Receiving channel)
	Overall Gain	≥30dB
	Gain Flatness	±0.5 dB/50MHz
	Spurious Suppression	≥40dBc
	Image Rejection	≥45dBc
	Channel Isolation	≥50dBc
	Channel Amplitude Imbalance	≤±0.5dB
	Channel Relative Phase	≤±10°
	Channel Phase Variation with Temperature	≤±10°

	Isolation Between Transmitting Channel and Receiving Channel	≥60dBc
	Power Supply	DC(+10V)
	Efficiency	About 20%
	Power Interface	J30J-31-ZKP
	RF/IF Interface	SMA-K
	Weight	≤2Kg
	Dimension	248*230*30 (mm)

Features:

(1) Adopt high-speed gate pulse modulation technology;

(2) Have output power detection function;

(3) Have power amplifier temperature detection function;

(4) Have power supply timing protection function;

(5) Have self-check function for transmitting branch and receiving branch;

(6) Can carry out wave control communication through RS485 serial port to complete the phase shift of transmitting and receiving branch.

L-band Transceiver Component

Transmitting Channel	**Working Frequency**	0.96-1.25GHz
	Input Excitation Level	+10dBm~+15dBm
	Saturation Output Power	≥55.0dBm (Duty cycle ≤12%, pulse width ≤30us)
	Rising Edge	≤100ns
	Falling Edge	≤100ns
	Top Drop	≤0.8dB
	Spurious Suppression	≥70dBc
	Phase Shift No.	6
	Phase Shift Accuracy	≤±5°
	Power Supply	DC(+50V,+28V,+12V,+5V,-5V)
	Efficiency	About 60%
Receiving Channel	**Noise Figure**	4dB (Channel), 3dB (Receiving channel)
	Gain	≥20dB
	In-band fluctuation	≤1dB
	CNC Attenuation	5 bits, step in 0.5dB
	Anti-burning power	≥500W
	Port VSW	≤1.5
	Transmit/receive Switching Time	≤500ns
	Transmit and Receive Isolation	≥20dB
	Power Interface	J35H29-01
	RF/IF Interface	BMA-K
	Weight	≤1.5Kg
	Dimension	300×147×30 (mm)

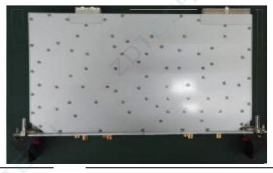
Receiver Component

Feature:

(1) CPCI board structure, ultra-wideband double-conversion superheterodyne receiving components;

(2) It has the advantages of low noise, high sensitivity, and large dynamic range;

CPCI Architecture Ultra-Wideband Receiver Component



Input Frequency	30~3000MHz
Output Frequency	76.8/70MHz
Gain	30±2dB
Gain Step	1dB
Gain Flatness	≤2dB
Output Third-Order Intercept Point	≥40dBm
Input Second-Order Intercept Point	≥45dBm
Output Third-Order Intercept Point	≥10dBm
Signal Bandwidth	20 MHz (narrow band 500 kHz)
Noise Figure	≤10dB
Phase Noise	≤-100dBc/Hz@10kHz ≤-120dBc/Hz@100kHz
Medium Freq. Suppression	≥90dBc
Image Rejection	≥90dBc
Spurious Signal	≤-110dBm
Input/Output VSWR	≤2.0
LO Leakage	≤-90dBm
Frequency Synthesis Step Interval	10kHz
Operating Temperature	-25~+70℃
Storage Temperature	-40~+80℃
Output P-1	≥±15dBm
Input Interface	SMA-K
Output Interface	SMA-K
Control Mode	CPCI Interface
Dimension	Standard 6 UCP CI Card
Power Supply Voltage	±5.5V,+12V
External Ref.	10MHz, internal and external clock switching

Microwave Equipment

Microwave equipment is a product assembled from various microwave components, microwave functional components and other parts. It has a good human-computer interaction interface, comes with a battery or can work directly with AC power, meets certain specific functions, and can be used independently. We can develop various microwave equipment according to user requirements and have rich engineering experience in the development of portable signal sources, switch matrices and devices.

1. Portable signal sources are small in size, light in weight, low in power consumption, come with batteries, have most of the functions of general signal sources, and have excellent performance indicators. They are very suitable for carrying and can meet the needs of field use.

2. The switch matrix has multiple inputs and multi-channel interfaces, and can connect any input to any output. According to the connection requirements of input and output, it can be divided into one-input and one-output, multiple-input and one-output, one-input and multiple-output, and multiple-input and multiple-output. The switch matrix has the advantages of wide working frequency band, flat gain in the band, large power capacity, high isolation, and fast switching speed. It is widely used in multi-channel radar and communication systems or multi-channel test systems.

3. The frequency converter equipment is usually made into a standard chassis, powered by 220V mains electricity; it has a keyboard and display screen, and can manually configure the working parameters; it uses network port and serial port communication, can configure the working parameters, and has the function of indicating the working status. The inverter equipment we developed has the advantages of wide working frequency band, flat gain in the band, small output noise, strong anti-interference ability, high linearity, and large dynamic range. It has a wide range of applications in measurement and control systems.

Portable Signal Source(customized)

Features:

(1) Built-in rechargeable battery, convenient for field testing and maintenance;

(2) Built-in control keyboard and display screen, supports manual control;

(3) Output signal has wide frequency band, low phase noise, large dynamic range, and high clutter suppression.

100MHz~3GHz Portable Signal Source

Working Frequency	100MHz~3GHz
Frequency Resolution	0.1MHz
Frequency Stability	≤1×10-6/24h
Frequency Conversion	≤50ms
Full-frequency Output Power Range	-60dBm~+12dBm
Power Percision	≤±1.0dB
Harmonic Suppression	≥20dBc
Clutter Suppression	≥50dBc
Built-in battery for continuous working hours	≥8h

Switch Matrix

Features:

(1) The equipment adopts modular design, can be disassembled and assembled repeatedly and ensure technical indicators.

(2) It uses Gigabit network to communicate with the host computer to realize remote control of the switch matrix.

(3) It has the advantages of wide working frequency bandwidth, high isolation, good channel consistency and long service life.

1~2.5GHz 5x13 Switch Matrix

Working Frequency	1GHz~2.5GHz
Input Power	≥20dBm
Channel Switch Isolation (Off) Degree	≥90dBc (when input=0dBm)
Interpass Isolation	≥90dBc (when input=0dBm)
Insertion Loss	≤10dB
Channel Delay Repeatability	≤ 1ns
Channel-Phase Repeatability	≤3°
Channel Consistency	≤1dB
Switching Response Speed	≤0.1s
VSWR	≤2.0
Impedance	50Ω
Working Life	500 Thousand times

L Band Downconversion Equipment

L-Band 950-2150MHz Downconversion Equipment

Input Frequency	950-2150MHz
Output Frequency	70/140MHz
Gain	30dB
Gain Step	0.1dB step controllable
Gain Flatness	≤1dBp-p
Third-Order Intermodulation	≤-60dBc
Output P-1	≥10dBm
Signal 1dB Bandwidth	±20/±40MHz
Noise Figure	≤12dB
Frequency Step Interval	10kHz
Frequency Stability	±5x10-8/day
Input Signal Level	-80~-20dBm
Phase Noise	≤-85dBc/Hz@100Hz ≤-100dBc/Hz@1kHz ≤-105dBc/Hz@10kHz ≤-110dBc/Hz@100kHz
Harmonic Suppression	≥45dBc
Spurious Suppression (max. gain)	≥45dBc
Medium Freq. Suppression	≥60dBc
Image Rejection	≥70dBc
Input/Output VSWR	<1.5
Group Delay	<1ns
LO Leakage	Input end is less than -70dBm
Operating Temperature	-10~+55℃
Storage Temperature	-40~+85℃
Input Interface	SMA-50K
Output Interface	SMA-50K
Local Control	VFD+Keypad
Remote Control	RS422/LAN port
Dimension	Standard 1U case
External Ref.	10MHz, internal and external clock switching

S Band Downconversion Equipment

S-Band 2-2.8GHz Downconversion Equipment

Input Frequency	2-2.8GHz
Output Frequency	70/140/720MHz
Gain	30~50dB
Gain Step	0.1dB step controllable
Gain Flatness	≤1dBp-p
Third-Order Intermodulation	≤-60dBc
Output P-1	≥10dBm
Signal 1dB Bandwidth	±20/±40±250MHz
Noise Figure	≤12dB
Frequency Step Interval	10kHz
Frequency Stability	±5x10-8/day
Input Signal Level	-80~-20dBm
Phase Noise	≤-85dBc/Hz@100Hz ≤-100dBc/Hz@1kHz ≤-105dBc/Hz@10kHz ≤-110dBc/Hz@100kHz
Harmonic Suppression	≥45dBc
Spurious Suppression (max. gain)	≥60dBc
Medium Freq. Suppression	≥60dBc
Image Rejection	≥70dBc
Input/Output VSWR	<1.5
Group Delay	<2ns
LO Leakage	Input end is less than -70dBm
Operating Temperature	-40~+55℃
Storage Temperature	-40~+85℃
Input Interface	SMA-50K
Output Interface	BNC-50K
Local Control	VFD+Keypad
Remote Control	RS422/LAN port
Dimension	Standard 1U case
External Ref.	10MHz, internal and external clock switching

S-Band 3.2-4.2GHz Downconversion Equipment

Input Frequency	3.2-4.2GHz
Output Frequency	70/140/720MHz
Gain	30dB
Gain Step	0.1dB step controllable
Gain Flatness	≤1dBp-p
Third-Order Intermodulation	≤-60dBc
Output P-1	≥10dBm
Signal 1dB Bandwidth	±20/±40±250MHz
Noise Figure	≤12dB
Frequency Step Interval	10kHz
Frequency Stability	±5x10-8/day
Input Signal Level	-80~-20dBm
Phase Noise	≤-85dBc/Hz@100Hz ≤-95dBc/Hz@1kHz ≤-100dBc/Hz@10kHz ≤-105dBc/Hz@100kHz
Harmonic Suppression	≥45dBc
Spurious Suppression (max. gain)	≥60dBc
Medium Freq. Suppression	≥60dBc
Image Rejection	≥70dBc
Input/Output VSWR	<1.5
Group Delay	<2ns
LO Leakage	Input end is less than -70dBm
Operating Temperature	-10~+55℃
Storage Temperature	-40~+85℃
Input Interface	SMA-50K
Output Interface	SMA-50K
Local Control	VFD+Keypad
Remote Control	RS422/LAN port
Dimension	Standard 1U case
External Ref.	10MHz, internal and external clock switching

X-Band Downconversion Equipment

X-Band 7-9GHz Downconversion Equipment

Input Frequency	7-9GHz
Output Frequency	70/140/720/1500MHz
Gain	30~50dB
Gain Step	0.1dB step controllable
Gain Flatness	≤1.5dBp-p
Third-Order Intermodulation	≤-60dBc
Output P-1	≥10dBm
Signal 1dB Bandwidth	±20/±40/±250/±300/±450MHz
Noise Figure	≤13dB
Frequency Step Interval	10kHz
Frequency Stability	±5x10-8/day
Input Signal Level	-80~-20dBm
Phase Noise	≤-75dBc/Hz@100Hz ≤-90dBc/Hz@1kHz ≤-95dBc/Hz@10kHz ≤-97dBc/Hz@100kHz
Harmonic Suppression	≥45dBc
Spurious Suppression (max. gain)	≥60dBc
Medium Freq. Suppression	≥60dBc
Image Rejection	≥70dBc
Input/Output VSWR	<1.5
Group Delay	<2ns
LO Leakage	Input end is less than -70dBm
Operating Temperature	-10~+55℃
Storage Temperature	-40~+85℃
Input Interface	SMA-50K
Output Interface	SMA-50K
Local Control	VFD+Keypad
Remote Control	RS422/LAN port
Dimension	Standard 1U case
External Ref.	10MHz, internal and external clock switching

Ku Band Downconversion Equipment

Ku-Band 10.75-12.75GHz Downconversion Equipment

Input Frequency	10.75-12.75GHz
Output Frequency	70/140/720/1200/1500MHz
Gain	30~50dB
Gain Step	0.1dB step controllable
Gain Flatness	≤1.5dBp-p
Third-Order Intermodulation	≤-60dBc
Output P-1	≥10dBm
Signal 1dB Bandwidth	±20/±40/±250/±300/±450MHz
Noise Figure	≤13dB
Frequency Step Interval	10kHz
Frequency Stability	±5x10-8/day
Input Signal Level	-80~-20dBm
Phase Noise	≤-75dBc/Hz@100Hz ≤-90dBc/Hz@1kHz ≤-95dBc/Hz@10kHz ≤-97dBc/Hz@100kHz
Harmonic Suppression	≥45dBc
Spurious Suppression (max. gain)	≥55dBc
Medium Freq. Suppression	≥60dBc
Image Rejection	≥70dBc
Input/Output VSWR	<1.5
Group Delay	<2ns
LO Leakage	Input end is less than -70dBm
Operating Temperature	-10~+55℃
Storage Temperature	-40~+85℃
Input Interface	SMA-50K
Output Interface	SMA-50K
Local Control	VFD+Keypad
Remote Control	RS422/LAN port
Dimension	Standard 1U case
External Ref.	10MHz, internal and external clock switching

Ka Band Downconversion Equipment

Ka-Band 25.5-27.5GHz Downconversion Equipment

Input Frequency	25.5-27.5GHz
Output Frequency	70/140/720/1200/1500MHz
Gain	30~50dB
Gain Step	0.1dB step controllable
Gain Flatness	≤1.5dBp-p
Third-Order Intermodulation	≤-60dBc
Output P-1	≥10dBm
Signal 1dB Bandwidth	±20/±40/±250/±300/±450MHz
Noise Figure	≤13dB
Frequency Step Interval	10kHz
Frequency Stability	±5x10-8/day
Input Signal Level	-80~-20dBm
Phase Noise	≤-75dBc/Hz@100Hz ≤-80dBc/Hz@1kHz ≤-85dBc/Hz@10kHz ≤-95dBc/Hz@100kHz
Harmonic Suppression	≥45dBc
Spurious Suppression (max. gain)	≥55dBc
Medium Freq. Suppression	≥60dBc
Image Rejection	≥70dBc
Input/Output VSWR	<1.5
Group Delay	<2ns
LO Leakage	Input end is less than -70dBm
Operating Temperature	-10~+55℃
Storage Temperature	-40~+85℃
Input Interface	SMA-2.92K
Output Interface	SMA-50K
Local Control	VFD+Keypad
Remote Control	RS422/LAN port
Dimension	Standard 1U case
External Ref.	10MHz, internal and external clock switching

1-18GHz Broadband Downconversion Equipment

1-18GHz Broadband Downconversion Equipment

Input Frequency	1-18GHz
Output Frequency	70/140/720/1200/1500MHz
Gain	30~50dB
Gain Step	0.1dB step controllable
Gain Flatness	≤1.5dBp-p
Third-Order Intermodulation	≤-60dBc
Output P-1	≥10dBm
Signal 1dB Bandwidth	±20/±40/±250/±300/±450MHz
Noise Figure	≤13dB
Frequency Step Interval	10kHz
Frequency Stability	±5x10-8/day
Input Signal Level	-70~-35dBm
Phase Noise	≤-75dBc/Hz@100Hz ≤-80dBc/Hz@1kHz ≤-85dBc/Hz@10kHz ≤-95dBc/Hz@100kHz
Spurious Suppression (max. gain)	≥60dBc
Medium Freq. Suppression	≥60dBc
Image Rejection	≥60dBc
Input VSWR	≤2.5
Output VSWR	≤1.5
Group Delay	<5ns
Harmonic Suppression	≥50dBc
LO Leakage	Input end is less than -80dBm
Operating Temperature	-10~+55℃
Storage Temperature	-40~+85℃
Input Interface	SMA-2.92K
Output Interface	SMA-50K
Local Control	VFD+Keypad
Remote Control	RS422/LAN port
Dimension	Standard 1U case
External Ref.	10MHz, internal and external clock switching

18-31GHz Broadband Downconversion Equipment

18-31GHz Broadband Downconversion Equipment(Gain=30dB)

Input Frequency	18-31GHz
Output Frequency	70/720/1200MHz
Gain	30dB
Gain Step	0.5dB step controllable
Gain Flatness	≤2dBp-p
Third-Order Intermodulation	≤15dBc
Output P-1	≥10dBm
Signal 1dB Bandwidth	±20/±250/±450MHz
Noise Figure	≤12dB
Frequency Step Interval	10kHz
Frequency Stability	±5x10-8/day
Input Signal Level	-70~-35dBm
Phase Noise	≤-70dBc/Hz@100Hz ≤-80dBc/Hz@1kHz ≤-83dBc/Hz@10kHz
Spurious Suppression (max. gain)	≥60dBc
Medium Freq. Suppression	≥60dBc
Image Rejection	≥50dBc
Input VSWR	≤2.5
Output VSWR	≤1.5
Group Delay	<3ns
LO Leakage	Input end is less than -70dBm
Operating Temperature	-10~+60℃
Storage Temperature	-40~+85℃
Input Interface	SMA-50K
Output Interface	SMA-2.92K
Local Control	VFD+Keypad
Remote Control	RS422/LAN port
Dimension	Standard 2U case
External Ref.	10MHz, internal and external clock switching

18-31GHz Broadband Downconversion Equipment(Gain=50dB)

Input Frequency	18-31GHz
Output Frequency	70/720/1200MHz
Gain	50dB
Gain Step	0.1dB step controllable
Gain Flatness	≤3dBp-p
Third-Order Intermodulation	≤20dBc
Output P-1	≥10dBm
Signal 1dB Bandwidth	±20/±250/±450MHz
Noise Figure	≤12dB
Frequency Step Interval	10kHz
Frequency Stability	±5x10-8/day
Input Signal Level	-70~-35dBm
Phase Noise	≤-75dBc/Hz@100Hz ≤-80dBc/Hz@1kHz ≤-83dBc/Hz@10kHz ≤-90dBc/Hz@100kHz
Spurious Suppression (max. gain)	≥60dBc
Medium Freq. Suppression	≥60dBc
Image Rejection	≥70dBc
Input VSWR	≤2.5
Output VSWR	≤1.5
Group Delay	<3ns
Harmonic Suppression	≥50dBc
LO Leakage	Input end is less than -80dBm
Operating Temperature	-10~+60℃
Storage Temperature	-40~+85℃
Input Interface	SMA-2.92K
Output Interface	SMA-50K
Local Control	VFD+Keypad
Remote Control	RS422/LAN port
Dimension	Standard 2U case
External Ref	10MHz, internal and external clock switching