

Introducing

Olympus

High-Power

Solid-State Power Amplifier

Systems

Product Description

Olympus Terminals from Advantech Wireless Technologies are Solid State Power Amplifier (SSPA) systems that are factory integrated, tested and shipped on a one-piece, welded mounting-frame (installation-ready). The four terminal types include redundant and phase-combined-redundant system configurations, designed to deliver the highest level of RF output-power in a neatly-packaged assembly. Olympus systems are based on Advantech Wireless Technologies' SapphireBlu Series high-power SSPAs and are designed for high-modulation, single and multi-carrier uplink applications.

Features

- Delivered as factory-integrated and tested systems up to 1.8kW
- C, X and Ku-Band
- With or without integrated L-band converters
- Full M&C capability
- Weatherproof construction
- CE marking
- Available in 4 Standard-Configurations:
 - **Type-1:** One on-line Amplifier with dedicated back-up (Single Pol)
 - **Type-2:** Two on-line amplifiers phase-combined (Single-Pol)
 - **Type-3:** Two on-line amplifiers with dedicated back-up (Dual-Pol)
 - **Type-4:** Two on-line amplifiers phase-combined with dedicated back-up (Single Pol)

Type-1 / Type-2



Type-3 / Type-4



Olympus Line

High-Power Solid-State Power Amplifier Systems

Standard C-band Olympus Terminals

Model No.	Configuration	Band	Device	P-sat		P1dB		Pol	Optional L-band BUC
Type 1-Cs	1:1 Redundant	5.85-6.425 GHz	GaAs	60.0dBm	1000W	59.0dBm	800W	Single	Internal to amplifiers
Type 2-Cs	1:1 Phase Combined	5.85-6.425 GHz	GaAs	62.5dBm	1800W	61.5dBm	1400W	Single	External 1:1 Redundant
Type 3-Cs	1:2 Redundant	5.85-6.425 GHz	GaAs	60.0dBm	1000W	59.0dBm	800W	Dual	Internal to amplifiers
Type 4-Cs	1:2 Phase Combined	5.85-6.425 GHz	GaAs	62.5dBm	1800W	61.5dBm	1400W	Single	External 1:1 Redundant

Extended C-band Olympus Terminals

Model No.	Configuration	Band	Device	P-sat		P1dB		Pol	Optional L-band BUC
Type 1-Cx	1:1 Redundant	5.85-6.725 GHz	GaAs	59.5dBm	900W	58.5dBm	700W	Single	Internal to amplifiers
Type 2-Cx	1:1 Phase Combined	5.85-6.725 GHz	GaAs	62.0dBm	1600W	61.0dBm	1250W	Single	External 1:1 Redundant
Type 3-Cx	1:2 Redundant	5.85-6.725 GHz	GaAs	59.5dBm	900W	58.5dBm	700W	Dual	Internal to amplifiers
Type 4-Cx	1:2 Phase Combined	5.85-6.725 GHz	GaAs	62.0dBm	1600W	61.0dBm	1250W	Single	External 1:1 Redundant

X-band Olympus Terminals

Model No.	Configuration	Band	Device	P-sat		P1dB		Pol	Optional L-band BUC
Type 1-X	1:1 Redundant	7.9-8.4 GHz	GaAs	60.0dBm	1000W	59.0dBm	800W	Single	Internal to amplifiers
Type 2-X	1:1 Phase Combined	7.9-8.4 GHz	GaAs	62.5dBm	1800W	61.5dBm	1400W	Single	External 1:1 Redundant
Type 3-X	1:2 Redundant	7.9-8.4 GHz	GaAs	60.0dBm	1000W	59.0dBm	800W	Dual	Internal to amplifiers
Type 4-X	1:2 Phase Combined	7.9-8.4 GHz	GaAs	62.5dBm	1800W	61.5dBm	1400W	Single	External 1:1 Redundant

Standard Ku-band Olympus Terminals

Model No.	Configuration	Band	Device	P-sat		P-linear		Pol	Optional L-band BUC
Type 1-Ks	1:1 Redundant	14.00-14.5 GHz	GaN	60.0dBm	1000W	56.0dBm	400W	Single	Internal to amplifiers
Type 2-Ks	1:1 Phase Combined	14.00-14.5 GHz	GaN	62.5dBm	1800W	58.5dBm	700W	Single	External 1:1 Redundant
Type 3-Ks	1:2 Redundant	14.00-14.5 GHz	GaN	60.0dBm	1000W	56.0dBm	400W	Dual	Internal to amplifiers
Type 4-Ks	1:2 Phase Combined	14.00-14.5 GHz	GaN	62.5dBm	1800W	58.5dBm	700W	Single	External 1:1 Redundant

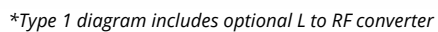
Extended Ku-band Olympus Terminals

Model No.	Configuration	Band	Device	P-sat		P-linear		Pol	Optional L-band BUC
Type 1-Kx	1:1 Redundant	13.75-14.5 GHz	GaN	60.0dBm	1000W	56.0dBm	400W	Single	Internal to amplifiers
Type 2-Kx	1:1 Phase Combined	13.75-14.5 GHz	GaN	62.5dBm	1800W	58.5dBm	700W	Single	External 1:1 Redundant
Type 3-Kx	1:2 Redundant	13.75-14.5 GHz	GaN	60.0dBm	1000W	56.0dBm	400W	Dual	Internal to amplifiers
Type 4-Kx	1:2 Phase Combined	13.75-14.5 GHz	GaN	62.5dBm	1800W	58.5dBm	700W	Single	External 1:1 Redundant

Notes:

1. RF Output Power levels are 'typical' system-level values.
2. Type 2 terminals include a combiner bypass switch to reduce insertion loss upon amp failure.
3. AWT recommends completion of Signal Transmission Questionnaire to drive system selection.

High-Power Solid-State Power Amplifier Systems



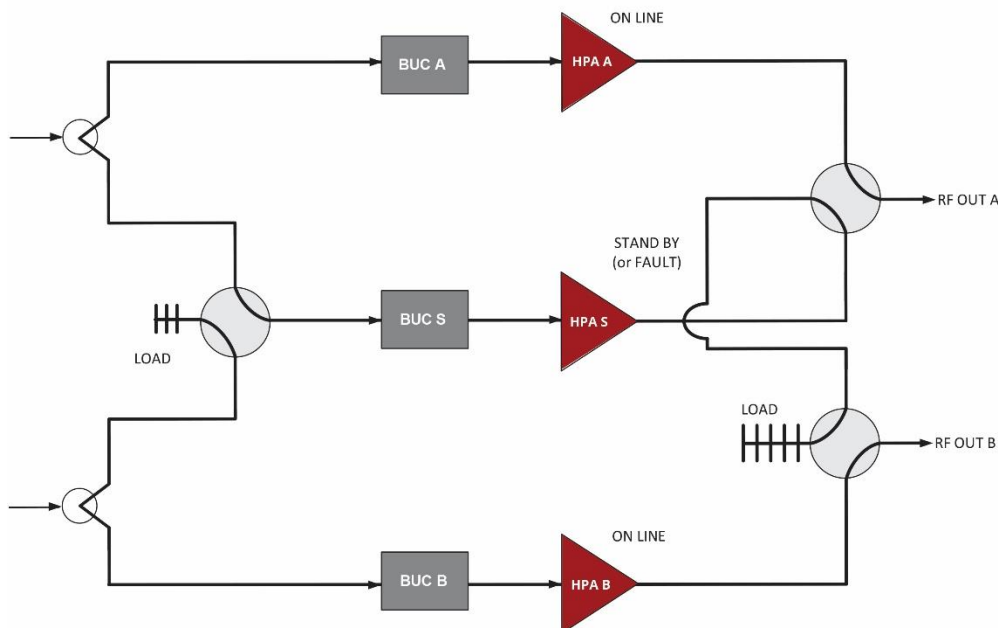
The diagram illustrates a dual-carrier transmitter architecture. An input signal splits into two parallel paths. The upper path contains a Baseband Unit Controller (BUC A), followed by a coupler with a Load port. The lower path contains BUC B, also followed by a coupler with a Load port. The outputs from these couplers are combined at a summing junction. This combined signal then splits again for two parallel High Power Amplifier (HPA) stages, labeled HPA A and HPA B. Each HPA stage is followed by another coupler with a Load port. The outputs from both HPA branches are fed into a central summer block, denoted by the symbol Σ . The output of the summer is connected to a final coupler with a Load port, which produces the RF OUT signal.



Olympus Line

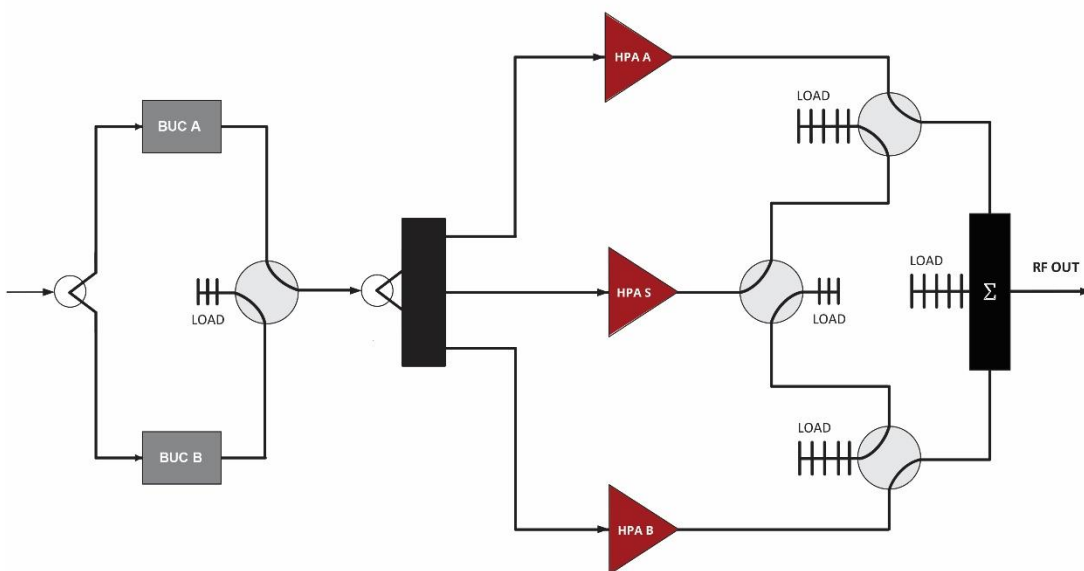
High-Power Solid-State Power Amplifier Systems

Type-3: Two on-line amplifiers with dedicated back-up (Dual-Pol)



*Type 3 diagram includes optional L to RF converter

Type-4: Two on-line amplifiers phase-combined with dedicated back-up (Single Pol)



Redundancy

Type 1 – 1:1 Redundant terminals are configured with a dedicated (online) amplifier for carrying traffic and a second amplifier for backup. The backup amplifier shares a common input with the online amplifier, whose RF output is normally routed into a dummy load. If a failure occurs with the online amplifier, its output is routed into a dummy load while the backup amplifier's output is switched from a load to the antenna transmit port. With a Type 1 terminal, there is no loss in the terminal's RF output power following an amplifier failure. When fitted with SSPBs, the converters are integrated in the amplifiers, so no additional logic is required for the Block Upconverters (BUCs). **Type 1 terminals are intended for single-Pol applications.**

Type 2 – 1:1 Phase-Combined terminals combine the RF outputs of two identical amplifiers through a passive combiner for applications that require more power than a single amplifier can produce. Since there is no dedicated backup, the loss of one amplifier will result in a 3dB reduction in total RF output power. Additional waveguide and switching are included to route the functional amplifier's output around the RF combiner to eliminate the additional loss. Type 2 terminals are not an appropriate solution for applications that require full system redundancy. When BUCs are required, a redundant, outboard assembly is included to provide IF to RF conversion prior to phase combining. **Type 2 terminals are intended for single-Pol applications.**

Type 3 – 1:2 Redundant terminals are configured to provide two dedicated amplifiers for carrying traffic to both antenna transmit feed ports simultaneously and a third amplifier that is designated the 'backup'. The RF output from the backup amplifier is automatically routed to the relevant feed port upon the failure of either online amplifier. In the case of a Type 3 terminal, there is no loss in the terminal's RF output power following an amplifier failure. When fitted with SSPBs, the converters are integrated in the amplifiers, so no additional logic is required for the Block Upconverters (BUCs). **Type 3 terminals are intended for two-Pol applications.**

Type 4 – 1:2 Phase-Combined terminals combine the RF outputs of two identical amplifiers through a passive combiner for applications that require more power than a single amplifier can produce. Unlike the case for Type 2 terminals, Type 4 terminals are provided with a dedicated backup amplifier that will automatically come online to replace either of the two online amplifiers, should a failure occur. Since there is a dedicated backup, the loss of one amplifier will result in no reduction in total RF output power. Type 4 terminals are an excellent solution for applications that require more power than a single amplifier can produce, with full system redundancy. When BUCs are required, a redundant, outboard assembly is included to provide IF to RF conversion prior to phase combining. **Type 4 terminals are intended for single-Pol applications.**

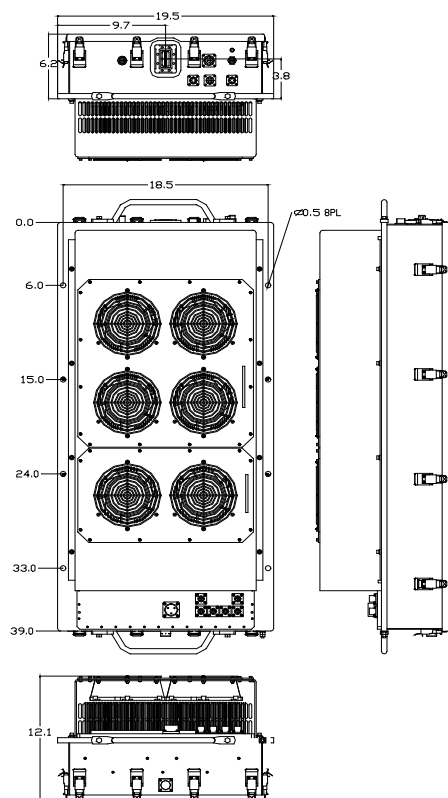
Components

Olympus-Series High-Power Outdoor SSPA Systems				
	Type 1	Type 2	Type 3	Type 4
Switching & Combining (includes WG, switches, terminations, combiner, loads and cabling)	1:1 Redundant	1:1 Phase- Combined	1:2 Redundant	1:2 Phase- Combined
SSPAs	2 x 1 kW	2 x 1 kW	3 x 1 kW	3 x 1 kW
BUC (L-band to RF)	2 ea (Internal)	2 ea (External 1:1)	3 ea (Internal)	2 ea (External 1:1)
Rack Mount Remote Controller	Included	Included	Included	Included
30 meters of controller IFL	Included	Included	Included	Included
Free-standing mounting frame	Included	Included	Included	Included
Factory integration and test	Included	Included	Included	Included
Documentation	Included	Included	Included	Included
Crating for shipment	Included	Included	Included	Included

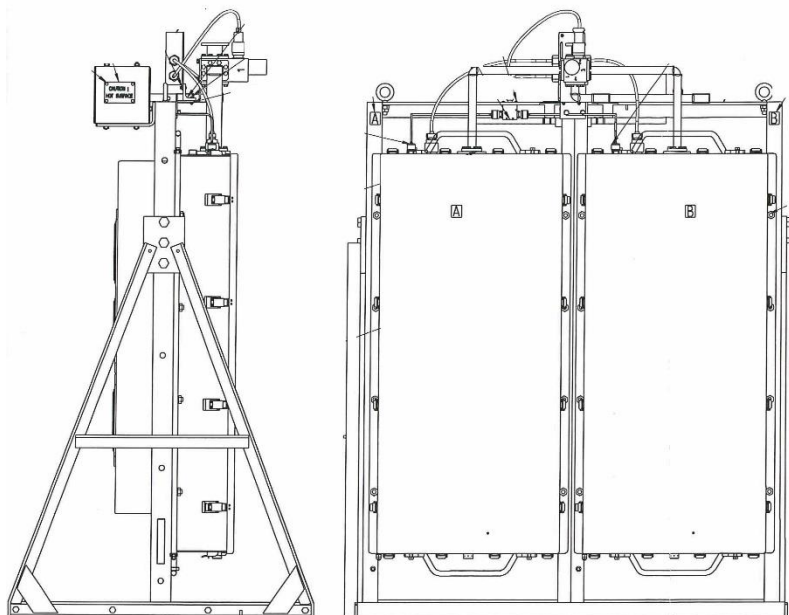
Olympus Line

High-Power Solid-State Power Amplifier Systems

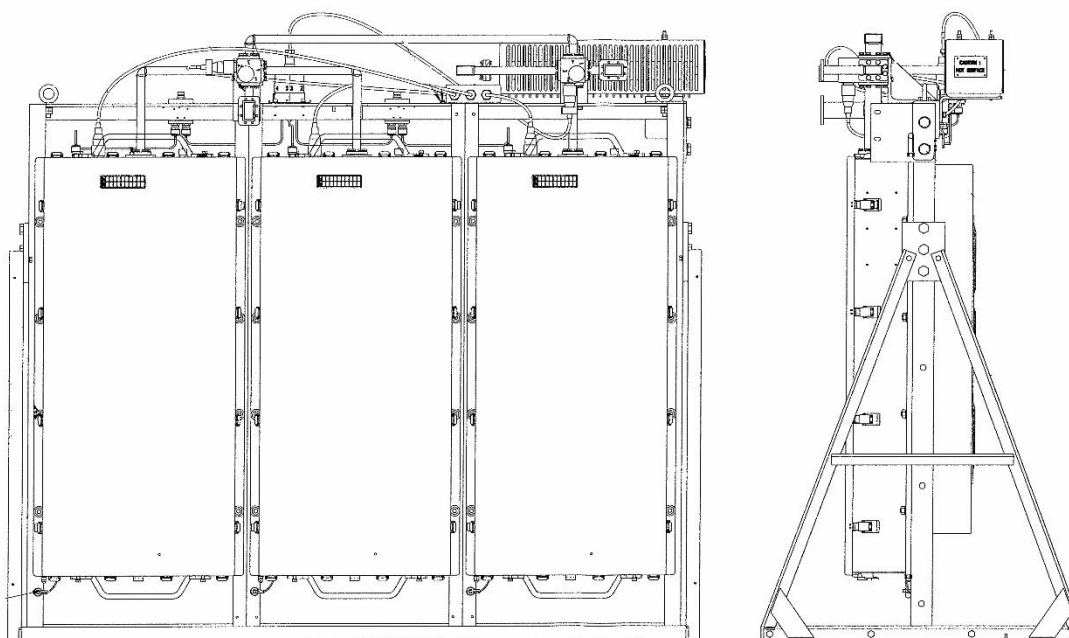
Product Outline



1:1 Redundant System / 1:1 Phase Combined System



1:2 Redundant System / 1:2 Phase Combined System



C-Band High-Power Solid-State Power Amplifier

Product Specifications

1000W C-Band Hub-mount SSPA/SSPB				
General Specifications				
CS / CX				
Operating Frequency	5.850 – 6.425 GHz (CS)		5.850 – 6.725 GHz (CX)	
L-Band input (BUC)	950 – 1525 MHz (CS)		950 – 1825 MHz (CX)	
Output Power	1000W (CS)		800W (CX)	
P _{SAT}	+60 dBm (1000W)		+59 dBm (800W)	
P1dB	+59 dBm		+58 dBm	
Gain	SSPA	+70 dB minimum		
	SSPB (BUC)	+80 dB minimum		
Gain adjustment range	20 dB in 0.1 dB steps			
Gain flatness over full band	± 1dB max for SSPA		± 1.5dB max for SSPB (BUC)	
Gain slope over 40 MHz	± 0.3 dB max for SSPA		± 0.5dB max for SSPB (BUC)	
Gain variation over temperature	± 1.5 dB max			
Input Impedance and VSWR	50 Ω	SSPA 1.3:1 max	SSPB (BUC) 1.4:1 max	
Output VSWR	1.3:1 max			
Noise power density	-70dBm/Hz in Tx-band -155dBm/Hz in Rx band (3.4 - 4.2Ghz)			
Spurious at P1dB	-65 dBc for SSPA		-60 dBc for SSPB (BUC)	
Harmonics	-60 dBc max @ P1dB			
AM/PM conversion	2.5°/dB at P1dB, 1°/dB at 3dB back off			
Third order intermod (two tones)	-26dBc, at 3 dB total back-off from rated P _{1dB} , relative to carrier level			
Group delay	Linear	0.02 nsec/MHz max	Parabolic	0.003 nsec/MHz ² max
	Ripple	1 nsec p-p max		
Residual AM Noise	0 – 10 kHz	-45 dBc	F = Frequency in kHz	
	10 kHz – 500 kHz	-20 (1.25 + log F) dBc		
	500 kHz – 1 MHz	-80 dBc		
SSPB (BUC)				
Local Oscillator frequency	4.900 GHz			
Internal Reference frequency (option)	10 MHz	Stability ±2 × 10 ⁻⁸ over temp range Aging ±5 × 10 ⁻⁸ /year		
Phase Noise	-60 dBc/Hz at 10Hz -65 dBc/Hz at 100Hz -75 dBc/Hz at 1000Hz		-85 dBc/Hz at 10 kHz -95 dBc/Hz at 100 kHz	
External Reference Frequency phase noise (max)	10 MHz	-150 dBc/Hz at 10 kHz -160 dBc/Hz at 100 kHz		
	-115 dBc/Hz at 10Hz			
	-135 dBc/Hz at 100Hz			
	-148 dBc/Hz at 1000Hz			
External reference level	0 dBm ± 5 dB via L-Band interface or separate connector			
Weight & Dimensions				
Dimensions	L x W x H 39.00" x 18.50" x 12.10" (990 x 470 x 307 mm)			
Weight	176 lbs (80kg)			
AC input voltage	190 - 265 VAC (47 - 63 Hz)			
Power consumption	5500W (nominal)			
Interfaces	Input (RF or L-Band)	N type female	AC line	MS3102 type
	Output Sample Port	N type female	RF output	CPR 137 contact
	RS232/RS485	MS3102 type	Ethernet	RJ45 (Weatherized)
Environmental	Temperature	Operating -30°C to +55 °C	Option 1 -40°C to +55 °C Option 2 -50°C to +55 °C with startup @ -40°C	
		Storage -55°C to +85 °C		
	Humidity	100% condensing		
	Altitude	10,000' AMSL, derated by 2 °C/1000' from AMSL		

X-Band High-Power Solid-State Power Amplifier

Product Specifications

1000W X-Band Hub-mount SSPA/SSPB				
General Specifications				
X				
Operating Frequency		7.9 – 8.4 GHz		
L-Band input (BUC)		950 - 1450 MHz		
Output power		1000W		
P _{SAT}		+60 dBm		
P1dB		+59 dBm		
Gain	SSPA	+70 dB minimum		
	SSPB (BUC)	+80 dB minimum		
Gain adjustment range		20 dB in 0.1 dB steps		
Gain flatness over full band		± 1dB max for SSPA	± 1.5dB max for SSPB (BUC)	
Gain slope over 40 MHz		± 0.3 dB max for SSPA	± 0.5dB max for SSPB (BUC)	
Gain variation temperature		± 1.5 dB max -30°C to +55°C		
Input Impedance and VSWR		50 Ω SSPA 1.3:1 max	SSPB (BUC) 1.4:1 max	
Output VSWR		1.3:1 max		
Noise Power Density		-70dBm/Hz in TX band -110 dBm/Hz in (7.25 - 7.75GHz)		
Spurious at P1dB		-65 dBc for SSPA -60 dBc max for SSPB (BUC)		
Harmonics		-60 dBc, max @ P1dB		
AM/PM conversion		2°/dB at P1dB, 1°/dB at 3dB back-off		
Third order intermod (two tones)		-25 dBc, max at 3 dB back-off from P _{1dB} , relative to carrier level		
Group Delay		Linear	0.02 ns /MHz, max	Parabolic 0.003 ns/MHz ² , max
(Over any 40 MHz):		Ripple	1 nsec p-p, max	
Residual AM Noise		0 – 10 kHz	-45 dBc	F = Frequency in kHz
		10 kHz – 500 kHz	-20 (1.25 + log F) dBc	
		500 kHz – 1 MHz	-80 dBc	
SSPB (BUC)				
Local Oscillator frequency (LO)		6.950 GHz		
LO leakage		-20 dBm		
Phase noise*		-60 dBc/Hz at 10Hz	-83 dBc/Hz at 10 kHz	
		-65 dBc/Hz at 100Hz	-93 dBc/Hz at 100 kHz	
		-73 dBc/Hz at 1000Hz	-110 dBc/Hz at 1 MHz	
External Reference frequency level		0 dBm ± 5 dB		
External Reference frequency phase noise (max)		10 MHz		
		-115 dBc/Hz at 10 Hz	-150 dBc/Hz at 10 kHz	
		-135 dBc/Hz at 100 Hz	-160 dBc/Hz at 100 kHz	
		-148 dBc/Hz at 1000 Hz		
Weight & Dimensions				
Dimensions		L x W x H 39.00" x 18.50" x 12.10" (990 x 470 x 307 mm)		
Weight		275 lbs (125 kg)		
AC input voltage		190 – 265 VAC (47 - 63 Hz)		
Power consumption (nominal)		6300W		
Interfaces		Input (RF or L-Band)	N type female	AC line MS3102 type
		Output Sample Port	N type female	RF output CPR-112G
		RS232/RS485	MS3102 type	Ethernet RJ45 (Weatherized)
Environmental		Temperature	Operating -30°C to +55°C	Option 1 -40°C to +55°C
			Storage -55°C to +85°C	Option 2 -50°C to +55 °C with startup @ -40°C
	Humidity	100%, condensing		
	Altitude	10,000' AMSL, de-rated 2°C/1,000' from AMSL		

* Based on internal 10MHz Reference.

Ku-Band High-Power Solid-State Power Amplifier

Product Specifications

1000W Ku-Band BUC/SSPB/SSPA SapphireBlu-Series GaN

General Specifications

KS /KX

Operating Frequency	14.0 – 14.5 GHz (KS)	13.75 – 14.5 GHz (KX)
L-Band input (BUC)	950 – 1450 MHz (KS)	950 – 1700 MHz (KX)
Output Power	1000W	
P _{SAT}	+60 dBm nominal	
P _{LINEAR}	+57.0 dBm minimum	
P _{LINEAR} is the maximum combined transmit power of two equal amplitude continuous wave (CW) carriers 5MHz apart, when the third order intermodulation product power is -25dB relative to each carrier and the spectral regrowth is <-30 dBc @ 1.0 x symbol rate for QPSK/OQPSK/8PSK modulation.		
Gain	SSPA	+70 dB minimum
	SSPB (BUC)	+80 dB minimum
Gain adjustment range	20 dB in 0.1 dB steps	
Gain flatness over full band	SSPA: 2dB p-p max ± 1dB max	SSPB (BUC): 3 dB p-p max ± 1.5dB max
Gain slope over 40 MHz	± 0.3 dB max	SSPB (BUC) ± 0.5 dB max
Gain variation over temperature	± 1.5 dB max	
Input Impedance and VSWR	50 Ω	SSPA 1.3:1 max SSPB (BUC) 1.4:1 max
Output VSWR	1.3:1 max	
Noise power density	-70 dBm/Hz in Transmit Band, -145 dBm/Hz in Receive Band (10.95 GHz – 12.75 GHz)	
Spurious at P _{LINEAR}	SSPA: -65 dBc max	SSPB (BUC): -60 dBc max
Harmonics	-50 dBc max @ P _{LINEAR}	
AM/PM conversion	<1.0°/dB P _{LINEAR}	
Third order intermod (two tones)	-25 dBc two signals 5 MHz apart at total +57 dBm, relative to carrier level	
Group delay	Linear	0.02 nsec/MHz max Parabolic 0.003 nsec/MHz ² max
	Ripple	1 nsec p-p max
Residual AM Noise	0 – 10 kHz	-45 dBc
	10 kHz – 500 kHz	-20 (1.25 + log F) dBc F = Frequency in kHz
	500 kHz – 1 MHz	-80 dBc

SSPB (BUC)

Local Oscillator freq.	13.05 GHz (KS)	12.8 GHz (KX)
Internal Reference frequency (optional)	10 MHz	Aging/day ±2 × 10 ⁻¹⁰ Aging/year ±5 × 10 ⁻⁸ Stability ±2 × 10 ⁻⁸ over temp range
Phase Noise	-53 dBc/Hz at 10Hz -63 dBc/Hz at 100Hz -73 dBc/Hz at 1000Hz	-83 dBc/Hz at 10 kHz -93 dBc/Hz at 100 kHz
External Reference Frequency phase noise (max)	10 MHz -120 dBc/Hz at 10Hz -135 dBc/Hz at 100Hz -150 dBc/Hz at 1000Hz	-155 dBc/Hz at 10 kHz -160 dBc/Hz at 100 kHz

Weight & Dimensions

Dimensions	L x W x H 39.00" x 18.50" x 12.10" (990 x 470 x 307 mm)		
Weight	275 lbs (125 kg)		
AC input voltage	190 – 265 VAC (47-63 Hz)		
Power consumption	3.8kW at 46 dBm	5kW at 56 dBm	6.5kW at P _{SAT}
Interfaces	Input (RF or L-Band) Output Sample Port RS232/RS485	N type female N type female MS3102 type	AC line RF output Ethernet MS3102 type WR75 Cover RJ45 (Weatherized)
Environmental	Temperature Humidity Altitude	Operating -30°C to +55 °C Storage -55°C to +85 °C 100% condensing 10,000' AMSL, derated by 2 °C/1000' from AMSL	Option 1 -40°C to +55 °C Option 2 -50°C to +55 °C with startup @ -40°C

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