



R/C UAV Testing on Government Contract

RE: Form 442 Q4: Government Project Description, Exhibit

File Number: EL23400295

Confirmation Number: 1215-EX-ST-2020

Date: August 2020

This application is an amendment to 0796-EX-ST-2020, Call Sign WQ9XNZ to add Camp Edwards (R-4101).

Systems & Technology Research (STR) is leading an effort on the DARPA Mercury program. The program involves a series of technology maturation tests to be performed by the STR team throughout CY2020 and early CY2021 at Fort Devens MA and Camp Edwards, Mashpee, MA culminating in a system test not addressed within this request.

The contract number is FA8650-19-C-7927. The contracting agency is USAF, AFMC, Air Force Research Laboratory, 2130 Eighth Street, Building 45, Wright-Patterson AFB, OH 4543307541

This test is being conducted as part of the Mercury Program. Mercury is a classified DoD mission which includes the use of several UAVs carrying classified payloads. The UAVs must autonomously fly to predetermined waypoints, hover at those waypoints, and return to base.

The frequency request is specific to the requirement to test the RF Payload functionality onboard the aircraft. The RF Payload test is designed as a bent pipe test, with a ground transmitter illuminating the aircraft payload, and the payload re-transmitting the signal back to the ground receiver. A series of tests between August and December are planned. Up to 4 sequential day tests will be held in August, September, October, November, and December. Tests will be held at Fort Devens Restricted Operation Zone for UAV operations and Army National Guard Base Camp Edwards. The test areas will remain confined to R-4101 and R-4102 A&B.

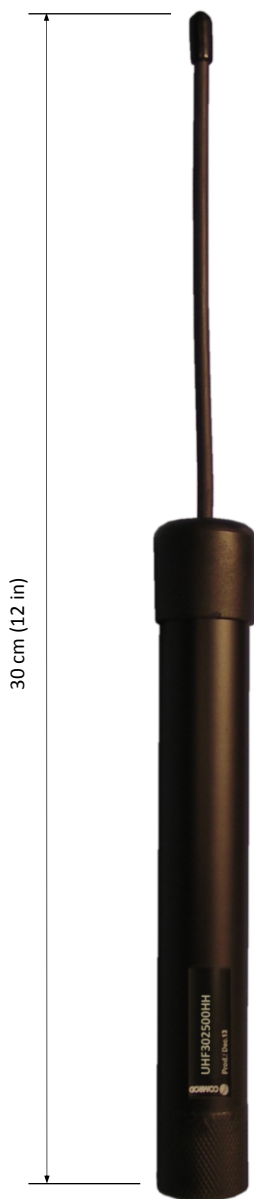
The test includes a ground transmitter composed of a signal generator, power amplifier, and a horn antenna. The aircraft will receive the signal, add a delay, and re-transmit to the ground receiver over an omni-directional antenna on board the aircraft.

This test will confirm the fundamental functionality of the RF payload during flight, providing significant risk mitigation prior to the system demonstration at a government facility.

Tests will be conducted by Systems & Technology Research, LLC (STR) and the Charles Stark Draper Laboratory, Inc. (Draper). The Air Force Research Laboratory



(AFRL) will serve as the Lead Test Organization (LTO). The test team is comprised of members from AFRL/RYZ, STR, Draper, GeoScout, L3Harris, and Centauri.



Description

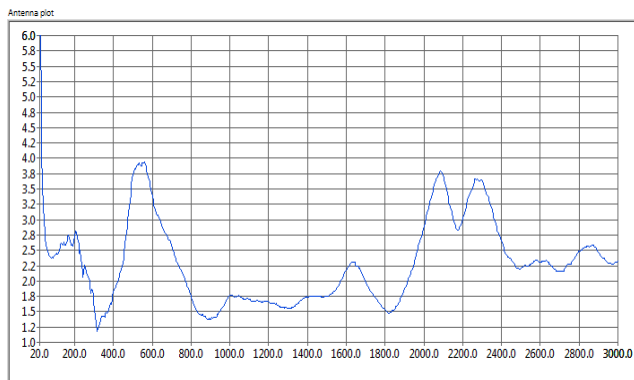
- Wideband antenna for hand-held radios
- Covering VHF, UHF & L-Band
- Small form factor only 30 cm (12 in) long
- Power rating 10 Watts
- Designed to meet MIL-STD-810-G

Electrical Specification

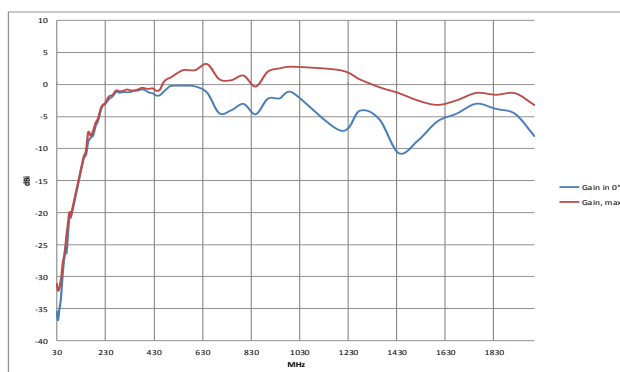
Frequency	30-2500 MHz
VSWR	See Curve
Gain	See Curve
Polarization	Vertical
Impedance	50 Ω
Power Rating	10 W

Mechanical Specification

Length	30 cm (12 in)
Diameter	22 mm (0.87 in)
Weight	137 g (5 oz)
Connector	TNC Male
Color	Black



VSWR



Gain (dBi)

Coaxial

High Power Amplifier

ZHL-100W-272+

50Ω 100W 700 to 2700 MHz

The Big Deal

- High output power, 100W typ.
- High gain, 48 dB typ.
- Excellent reverse isolation, 89 dB typ.
- Built-in over-temperature protection with temperature alarm



CASE STYLE: BT2247

Product Overview

The ZHL-100W-272+ is a high power amplifier module supply which can be used for a wide variety of laboratory testing applications. This rugged amplifier is capable of amplifying signals up to 100W output power over its entire operating frequency range of 700 – 2700 MHz. Built-in safety features include over-temperature protection. The amplifier's output stage is further protected in the event of a fault condition, allowing high power operation for up to 5 minutes into an OPEN or SHORT load (refer to the maximum input power specifications), preventing amplifier damage and providing excellent reliability.

Key Features

Feature	Advantages
Wide frequency range	700 – 2700 MHz frequency range covers popular wireless communications, SATCOM and radar bands in a single instrument, useful for many test applications.
100W output power	Supports high power test applications such as EMI, max power handling, and reliability testing
High Gain	48 dB typical gain allows the ZHL-100W-272+ to be driven to full output power with nearly all commercially available signal generators
High Reverse Isolation	Isolates load reflections to protect sensitive signal sources from potential damage and performance variation due to load pulling
Built-in protection	The unit shuts OFF when the internal amplifier reaches a set temperature of 85±5°C, preventing damage to the amplifier and providing added reliability.

Coaxial High Power Amplifier

50Ω 100W 700 to 2700 MHz

ZHL-100W-272+

Features

- High output power, 100W typ.
- High gain, 48 dB typ.
- Excellent reverse isolation, 89 dB typ.
- Built-in over-temperature protection

Applications

- Laboratory test instrument
- RF Power stress test
- EMI and antenna testing
- Reliability testing



CASE STYLE: BT2247

Connectors	Model
IN SMA-F	ZHL-100W-272+
OUT N-TYPE-F	
D-SUB MALE	

+RoHS Compliant

The +Suffix identifies RoHS Compliance. See our web site for RoHS Compliance methodologies and qualifications

Electrical Specifications at 25°C

Parameter	Condition (MHz)	Min.	Typ.	Max.	Units
Frequency Range		700	—	2700	MHz
Gain	700 - 2700	45	48	—	dB
Gain Flatness	700 - 2700	—	±1.7	±2.1	dB
Output Power at 1dB compression	700 - 2700	—	+49	—	dBm
Output Power at 3dB compression	700 - 2700	+48	+50.6	—	dBm
Noise Figure	700 - 2700	—	8.2	10	dB
Output third order intercept point	700 - 2700	—	+50	—	dBm
Input VSWR	700 - 2700	—	1.5	—	:1
Output VSWR	700 - 2700	—	1.5	—	:1
DC Supply Voltage	DC	28	30	32	V
Supply Current	DC	—	12	16	A

Maximum Ratings¹

Parameter	Ratings
Operating Ambient Temperature	0°C to +40°C
Storage Temperature	-20°C to +70°C
DC Voltage	32V
Input RF Power (no damage)	+7 dBm ² -3 dBm ³

1. Specifications apply to CW signals only permanent damage may occur if any of these limits are exceeded.

2. Into 50 ohm load

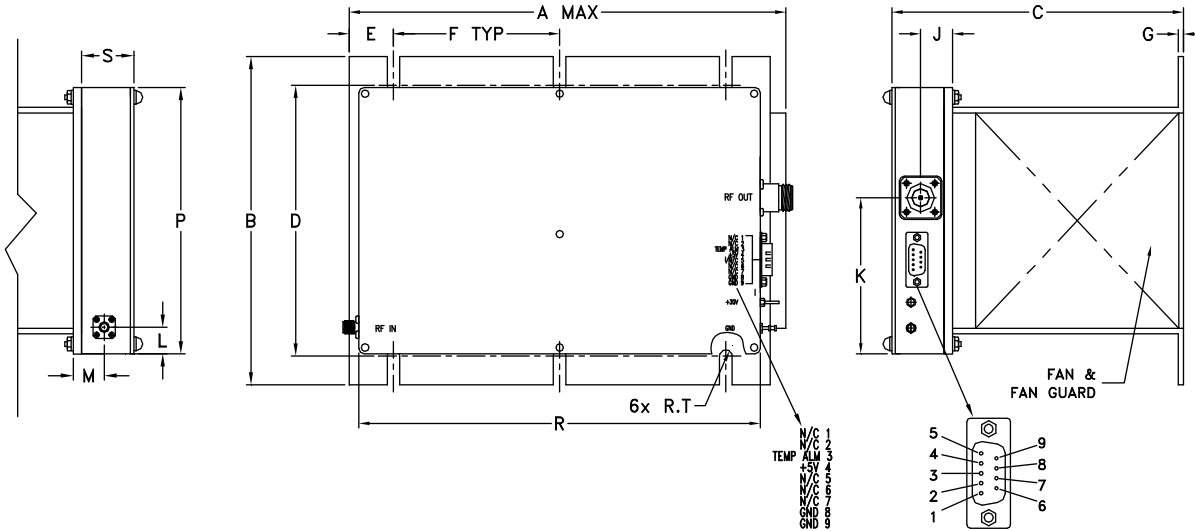
3. Into open or short load, for up to 5 minutes.

D-Sub Male Connector Pin connections*

Pin #	Description
1,2,5,6,7	No Connection
3	TEMP. Alarm (TTL High)
4	+5V (max. 100mA)
8,9	Ground

*Each amplifier will come with additional D-sub female connector for mating with amplifier.

Outline Drawing

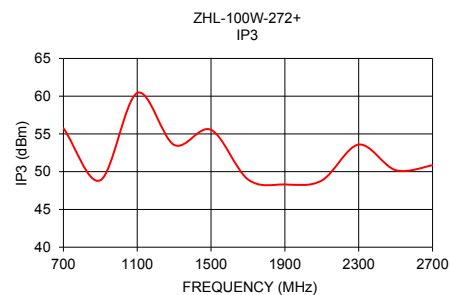
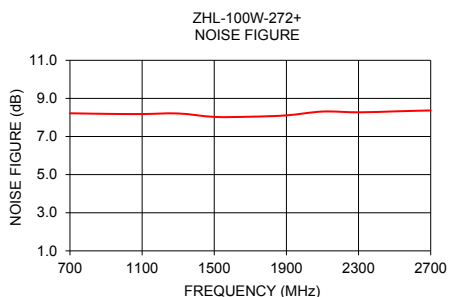
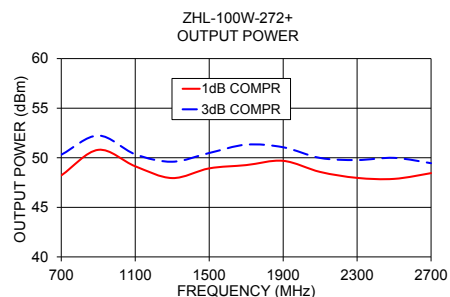
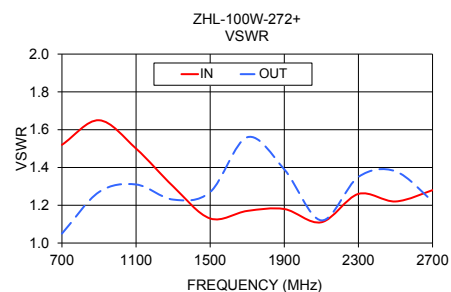
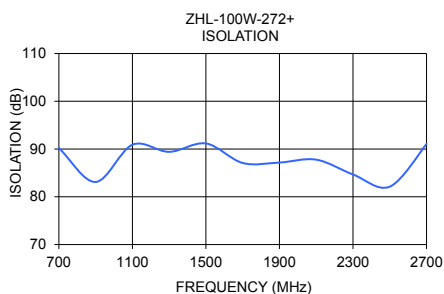
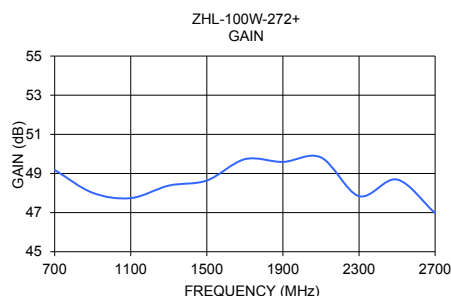


Outline Dimensions (inch mm)

A	B	C	D	E	F	G	J	K	L	M	P	R	S	T	wt
9.85	7.3	6.6	6.00	.98	3.75	.13	.72	3.46	.59	.70	5.91	9.06	1.18	.135	grams
250.19	185.42	167.64	152.40	24.89	95.25	3.30	18.29	87.88	14.99	17.78	150.11	230.12	29.97	3.43	5350

Typical Performance Data

FREQUENCY (MHz)	GAIN (dB)	ISOLATION (dB)	VSWR (:1)		POUT at 1 dB COMPR. (dBm)	POUT at 3 dB COMPR. (dBm)	NOISE FIGURE (dB)	IP3 (dBm)
			IN	OUT				
700	49.2	90.2	1.5	1.1	48.2	50.3	8.2	55.8
900	48.0	83.1	1.7	1.3	50.8	52.2	8.2	48.9
1100	47.7	90.9	1.5	1.3	49.1	50.4	8.2	60.4
1300	48.4	89.4	1.3	1.2	48.0	49.6	8.2	53.6
1500	48.6	91.2	1.1	1.3	48.9	50.5	8.0	55.5
1700	49.7	87.1	1.2	1.6	49.3	51.3	8.0	49.0
1900	49.6	87.2	1.2	1.4	49.7	51.1	8.1	48.3
2100	49.8	87.8	1.1	1.1	48.6	50.0	8.3	48.8
2300	47.8	84.7	1.3	1.4	48.0	49.8	8.3	53.6
2500	48.7	82.1	1.2	1.4	47.9	50.0	8.3	50.2
2700	47.0	91.1	1.3	1.2	48.5	49.5	8.4	50.9



Additional Notes

- Performance and quality attributes and conditions not expressly stated in this specification document are intended to be excluded and do not form a part of this specification document.
- Electrical specifications and performance data contained in this specification document are based on Mini-Circuit's applicable established test performance criteria and measurement instructions.
- The parts covered by this specification document are subject to Mini-Circuits standard limited warranty and terms and conditions (collectively, "Standard Terms"); Purchasers of this part are entitled to the rights and benefits contained therein. For a full statement of the Standard Terms and the exclusive rights and remedies thereunder, please visit Mini-Circuits' website at www.minicircuits.com/MCLStore/terms.jsp