Ka Multi-LO (Preset) Switchable LNB

Ka Multi-LO LNB

Orbital Research Ltd
14239 Marine Drive,
White Rock, BC. Canada V4B 1A9

Input bandwidth range

2 GHz from 19.2 to 21.2 GHz

Multiple Input and Output ranges switchable within this range.

Range of Gain

Prior to shipping, gain is set anywhere in the range of 30 to 60 dB, per band.

Developed for the **WGS/Global Xpress** market, but with the new novel platform architecture we are able to offer a uniquely agile block downconverter that can be configured with multiple Frequency conversion and Gain options.

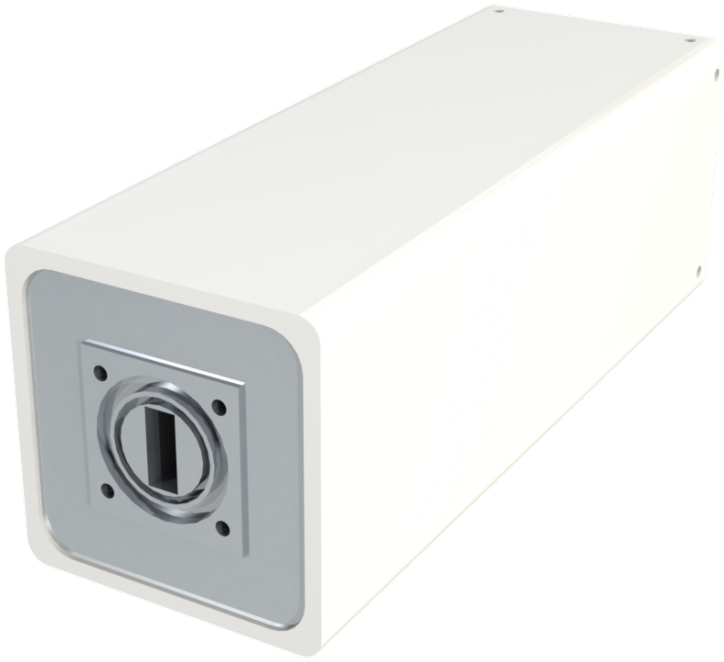
- Switching power supply for less power consumption, less heat
- Low group delay
- Noise Figure of 1.5 dB max
- Integrated waveguide isolator for the best match possible

Options for Frequency Switching:

- DC Voltage Level
- Manual Push Button (back panel)
- Remote data connection (RS232, RS485, Ethernet)
- Open collector input
- Other options for control by request

Our latest product is a high performance Ka LNB switchable between multiple preset input frequencies.

- With ultra low Phase Noise this unit is ideal for receiving HTS Satellites (or any GEO Ka Satellites) plus high order modulations such as Multi-PSK, QAM, & APSK.
- Airborne option available with extended temperature range, hi-vibe and 50,000 ft Altitude
- Frequency ranges (and gains) are configured prior to shipping.
- Meets Mil Standard 188-164B specifications.



Technical Sales contacts:

Doug Macdonald
1-647-992-1210
doug.macdonald@orbitalresearch.net

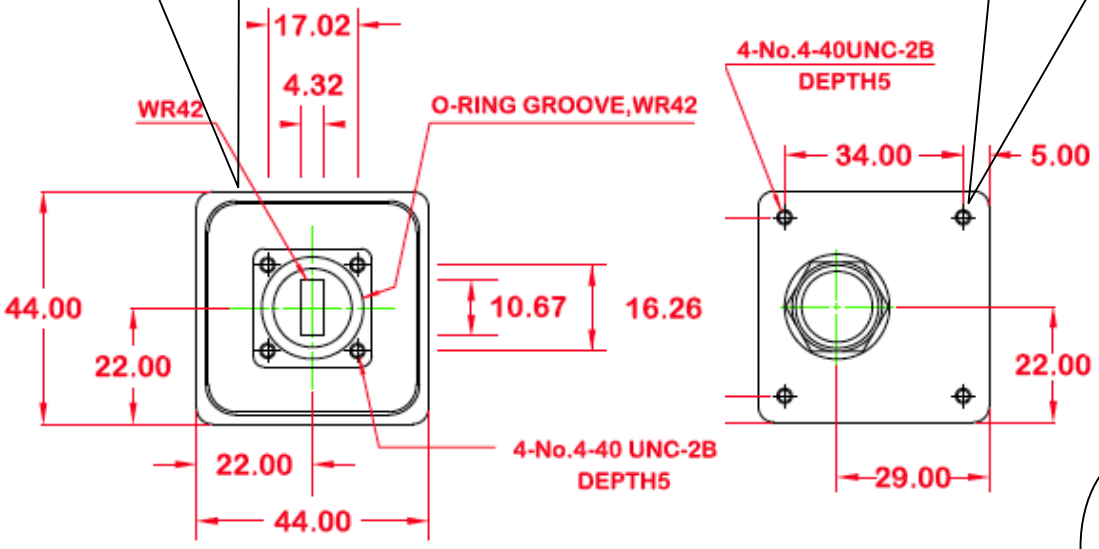
David Zuvic
1-604-856-0305
dzuvic@orbitalresearch.net

Mechanical and Description

Mechanical Diagram

Mil-Std white paint
But also available in Mil-Std 595 coatings as option.

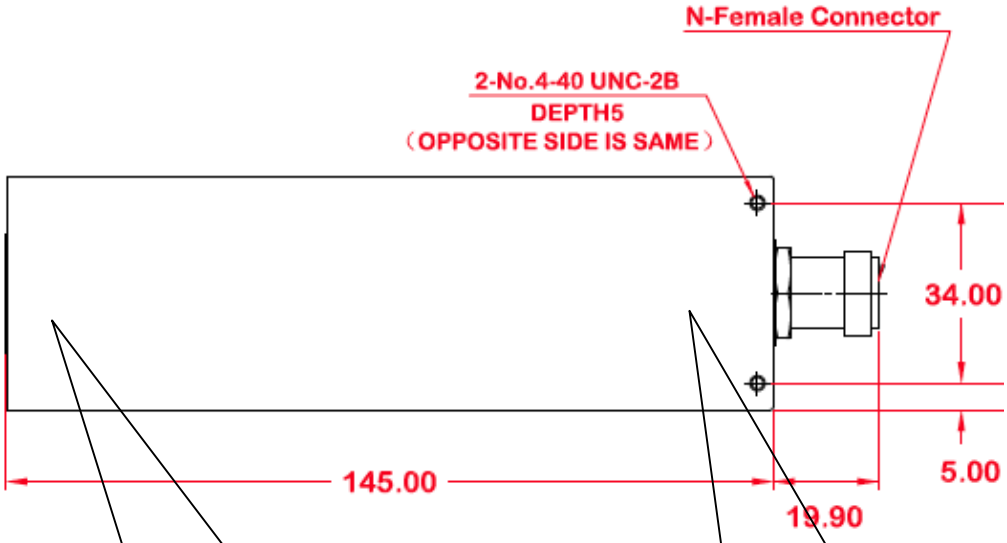
Anchor Holes on Back
of LNB in 3 axes, for mounting support, preserving same form factor as 694X models (drop in replacement) – only the length is slightly different.



Optional Switches
and LED indicators can be included on the back panel for basic user interface functionality: Band and Operational Mode.

Band switching options include:

- DC Level
- Push button (back panel)
- Open collector input
- Remote data connection (RS232, RS485, Ethernet)



Integrated Input Isolator
provides an excellent match between the antenna and LNB, which ensures better G/T and better gain frequency response.

Switching Power Supply
gives an input range of 15 to 26 VDC. Runs cooler and uses a maximum of 5 Watts power.

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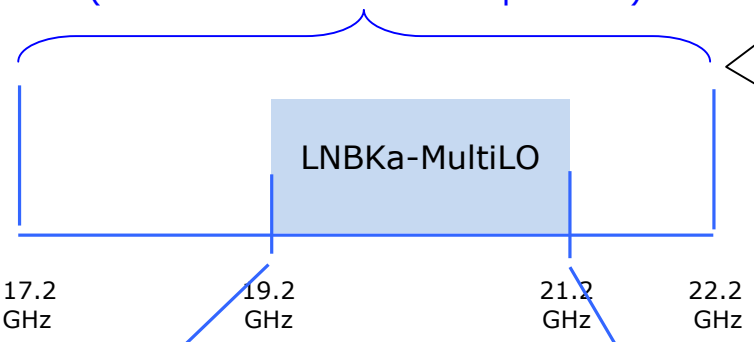
LNB694XA series LNB frequency range
(max 1.0 GHz bandwidth per LNB)



Receive Frequency Band

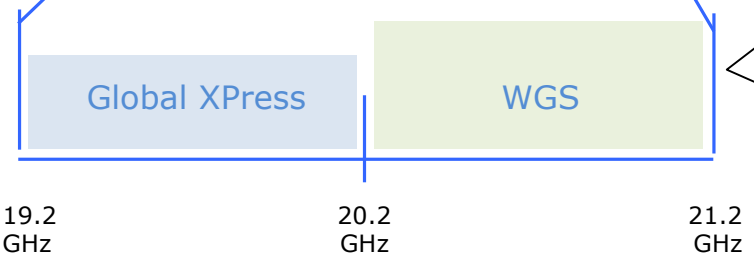
17.2 to 22.2 GHz.

The Ka-Multi LNB covers the most common range of:

19.2 to 21.2 GHz.

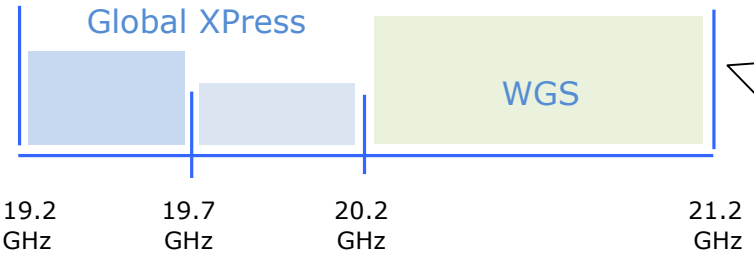
We still produce our 694XA Ka band LNB which covers all of the Ka frequencies (17.2 ~ 22.2 GHz).

Ka-Multi LO LNB Frequency Band



Standard & Non-Standard

A standard structure is to receive Global Xpress and WGS: Input Frequency:
19.2 - 20.2 and 20.2 - 21.2 GHz
with LO frequencies:
18.25 and 19.2 (or 19.25) GHz

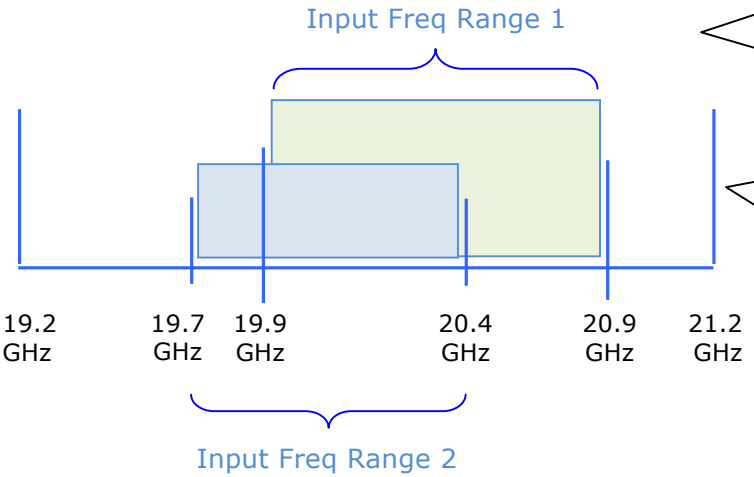


Multiple LOs

Because you can switch between multiple LOs, the Global Xpress band can be broken down into two sections: 19.2~19.7 GHz and 19.7~20.2 GHz.

Bandwidth

You can have the standard 1 GHz of Bandwidth or any size below 2 GHz (19.2~21.2 GHz). But make sure your modem can handle it!



Overlapping Freq Range

You can even overlap the input Frequency ranges. For example:
19.7-20.4 & 19.9-20.9 GHz.

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Sample Test Data Sheets for one LNB

Client	Sample	Part No	LNBKa MultiLO		41 WGS	SCD	Sample	Rev	G
PO	Sample	Serial	Sample	Tested By	MS	Product	Ka LNB Multiple LOs		
Date	30-Jun-14	Unit	41 WGS	Checked By	LT	Orb ID	LNBKa MultiLO		

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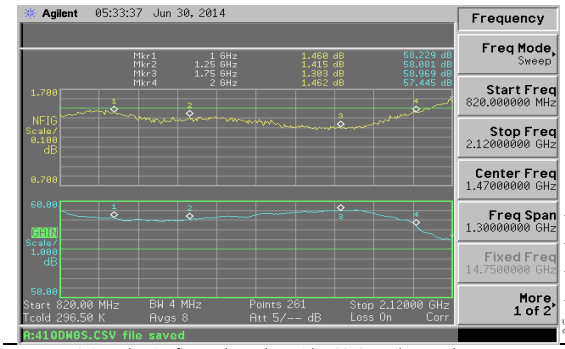
SCD	Compliance Parameters	Specification	Unit	Status	SCD
3.1.1	RF Input Frequency	20.20-21.20	GHz	confirmed	3.1.5
3.2.1	IF Output Frequency	1000-2000	MHz	confirmed	3.5.1
3.3.1	10 Mhz -8 to +8 dBm	tested to +8	dB	confirmed	3.5.3
3.4.1	Local Osc Frequency	19.20	GHz	confirmed	3.5.4
3.6.1	DC Input 18 ± 1 VDC	18	VDC	confirmed	3.5.5
4.0	Length x Width x Height	44x44x145	mm	confirmed	3.4.3
4.2	Input Connector	WR-42	std	confirmed	3.2.3
4.3	Output Connector	Type N (f)	std	confirmed	
4.4	Weight, 360-370gms	480	gms	confirmed	3.6.1
4.5	Mil Sped 595	TBD	White	confirmed	3.1.4

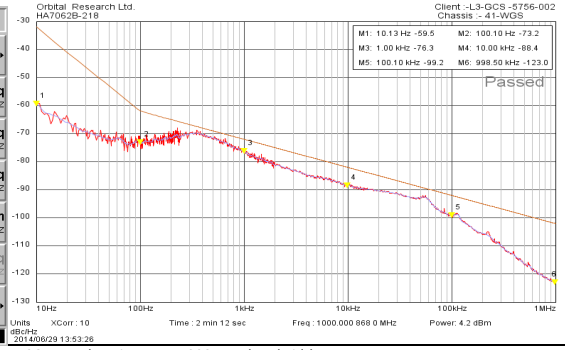
SCD	Measured Parameters	Spec	Data	Unit	SCD
	Noise Figure	< 1.5	1.37	dB	3.4.4
	Gain	56	58.42	dB	3.4.4
	Max Ripple 10 MHz	± 0.15	0.07	dB	3.4.4
	In Band Spurs signal	> 60	<-90	dBc	3.4.4
	Image Rejection	> 45	-51	dBc	3.4.4
	LO Leakage Output	-45	-95	dBm	3.4.4
	1dB Comp @ 1ghz	+7	13	dBm	
	Third Order Intercept	+17	23	dBm	
	DC Current, 18 VDC	400	140	mA	
	Input VSWR	1.5:1	1.11		

Measured Phase Noise, as per plot				
10 Hz	-90	-32	-59.5	dBc/Hz
100 Hz	-151	-62	-73.2	dBc/Hz
1 KHz	-155	-72	-76.3	dBc/Hz
10 KHz	-158	-82	-88.4	dBc/Hz
100 KHz	-158	-92	-99	dBc/Hz
1 MHz	-160	-102	-123	dBc/Hz
Offset	Ref	Spec	Data	Unit

Gain and Noise Figure at 23C with Isolator and Quick Disconnect



Phase Noise at 23C



Note 1 - Gain and Noise figure plots taken with N8973A Agilent Analyzer every 5 MHz, 261 sample points over 1200 MHz bandwidth.
Note 2 - Phase Noise measured with Holzworth 7062A phase noise analyzer and Agilent E8257D 40 GHz source with ultra low phase noise option
Note 3 - Noise and Gain Data plus ripple computations in columns AC through AH, client can create custom formulas for specific data analysis
Note 4 - For 1 dB compression point, the reference output level is +22 dBm

Included are references to customer's order info such as PO & SCD (if provided).

Gain & NF data is average over output frequency range.

Measured performance of all relevant parameters against specifications or SCD.

Phase noise plotted using Orbital's POP OCXO Oscillator as reference.

Test Data panel of compliance parameters.

POP phase noise also provided.

Phase Noise plot provided.

Included is a list of test equipment used.

Raw Data (not shown) of Gain & NF is also supplied.

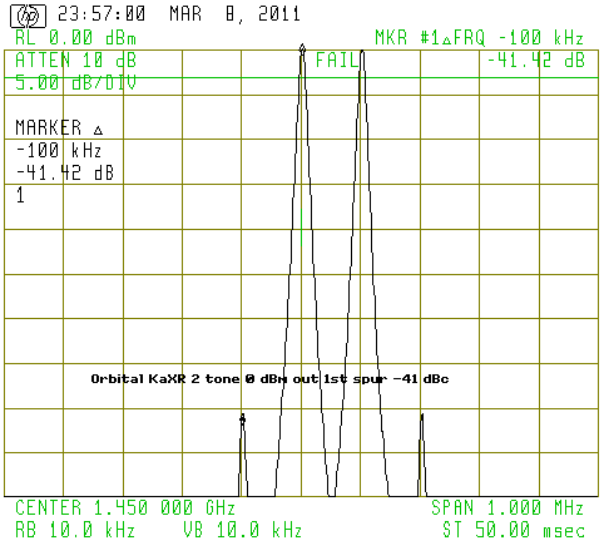
The above 2 test data examples are for WGS and Global Xpress frequencies.

Individual plots of Gain & NF are provided.

One sheet per frequency range is supplied with each LNB shipped.

Two Tone Test

What it means - The two plots below compare gain linearity for the new Orbital design with competitor designs. Two tones at 20.200000 GHz and 20.200100 GHz are injected into the LNBs to provide 0 dBm out. The first spur in the Orbital design is over -40 dBc down compared to the multiple spurs on the competitive LNB starting at only -10 dB down. Intermodulation (IM) distortion for a given output is reduced in the Orbital LNB while providing higher overall gain (60 dB minimum for the Orbital LNB, versus 55 dB for the competitor LNB).



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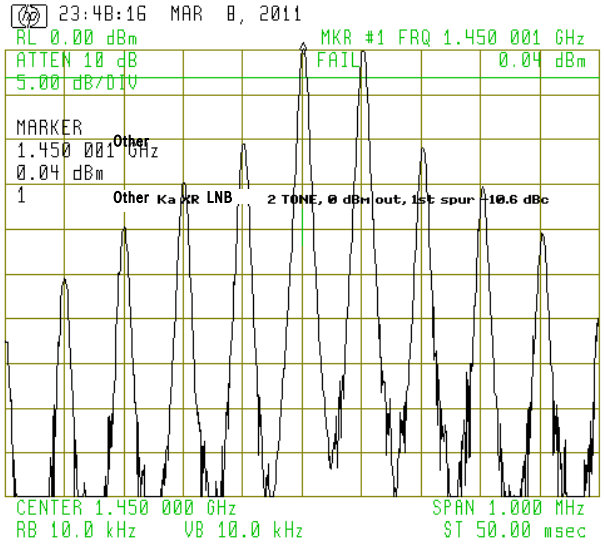

Competitor LNB

How it works - The LNB has to amplify the multiple signals from the satellite by a factor of a million (60 dB) without adding significant noise (noise figure), but also to perform this conversion without adding distortion. The above graphs represent the comparative levels of distortion between the Orbital design and competitive designs. Basically, if you put two signals into the LNB, you should get two signals, and only two signals, out. You can imagine the mess using a poor quality LNB when you amplify and convert the dozens or even hundreds of signals from the satellite.

What it shows - While an LNB would never be operated at 0 dBm output level, the test and design represent the linear conversion quality of each LNB and the P1 dB compression point. The Two Tone tests are proxies for the quality of conversion that is absolutely necessary for low bit error rate satellite transmissions. LNB non-linearity starts at much lower levels than 0 dBm output, and the 2 tone test is the best method of comparing the quality of design and manufacture of LNBs. The ultimate benefit to the end user is lower noise figure, higher conversion gain, and most importantly, lower bit error rate for their digital transmissions.

Orbital Ka Isolator

Until recently, Orbital has been adding an input isolator to the LNB when required by the customer. Because of recent proprietary improvements in isolator design, Orbital has been able to reduce the width of the isolator so that it can fit inside the case of a standard LNB (without the load sticking out sideways). This gives the added benefit of sealing the isolator into the case with the LNB.

Specifications

Frequency Range:

Input RF Frequency:	Multiple options between 19.2 and 21.2 GHz
Output IF Freq:	From 950 up to a limit of 2100 MHz
Local Frequencies:	Dependent upon Input & Output Frequencies.
LO Stability:	Phase locked to external 10 MHz reference

10 MHz Reference:

Insertion:	Multiplexed onto the IF coaxial connector
Input Level:	-10 to 0 dBm
Phase Noise:	-125 dBc/Hz max. @ 10 Hz -150 dBc/Hz max. @ 100 Hz -160 dBc/Hz max. @ 1 kHz -165 dBc/Hz max. @ 10 kHz

VSWR:

Input:	1.3:1 max (integrated input isolator)
Output:	2.0:1

LNB 10 MHz Phase Noise:

-32 dBc/Hz max. @ 10 Hz
-62 dBc/Hz max. @ 100 Hz
-72 dBc/Hz max. @ 1 kHz
-82 dBc/Hz max. @ 10 kHz
-92 dBc/Hz max. @ 100 kHz
-102 dBc/Hz max. @ 1 MHz
-112 dBc/Hz max. @ 10 MHz

Noise Figure:
1.5 dB max. @ +23˚C

Mechanical:

Dimensions:	44 x 44 x 145 mm
Color:	White (standard)
Weight:	485 grams
Anchor holes:	#4 threaded (4-40) x 12

Power:

DC in:	+15 to +26 VDC
Power:	5 Watts max.
Interface:	DC power is multiplexed with the IF & 10 MHz reference signals on the output connector

Gain:

Gain:	30 to 60 dB ±4dB max. over temp & freq. Set at time of order.
Flatness:	±1.5 dB max over freq
Ripple:	±0.15 dB per 10 MHz
Stability:	±0.25dB max over 24hr @ +25˚C

Band Switching Options:

- DC level
  (for dual band, 15-22V: WGS, 22-24V: GX)
- Push button (optional back panel)
- Open collector input
- Remote data connection (RS232, RS485, Ethernet)

Amplitude Response:

10 MHz Band:	±0.3dB max
120 MHz Band:	±1.0dB max
Receive Band:	±1.5dB max

Interfaces:

Input:	WR-42 waveguide flange with O-ring groove & threaded screw holes (#4-40 UNC x .38 deep thread)
Output:	N, 50Ω female coax connector. Optional: SMA (50Ω)

Other Specs:

LO Leakage:	Output: -45 dBm min Input: -45 dBm max at waveguide flange
Image Rejection:	-45 dB min
P1 dB comp pt:	+10 dBm min
OIP3:	+20 dBm min
Overdrive:	-20 dBm, non-damaging
Spurious:	Input Spurious level of -85 dBm equates to <-140 dBm
Desense level:	-50dBm transmit signal level results in no more than 0.1dB of NF degradation

Environmental:

Operating Temp:	-40˚C to +60˚C
Operating Altitude:	10,000 ft ASL
(Airborne option):	50,000 ft ASL
Operating Rel Humidity:	100% condensing
Standards Compliant to:	RoHS & REACH

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