

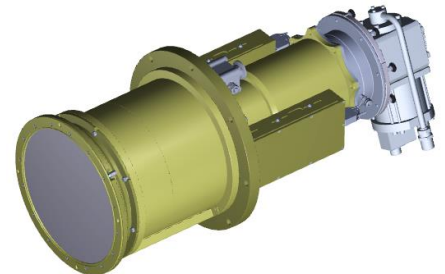
Data Sheet

Prototype QRFH Ultra Wideband Cryogenic Receiver

Ultra Cryo-LNA including QRFH feed

- **Very Low Noise Temperature**
- **Wideband**
 - From 2.3 to 14GHz⁽¹⁾ in one single receiver
 - 2 RF Polarizations/Channels
 - Feed included (CalTech's QRFH design)
- **Simplified Cold Head Service**
 - Sleeve System
 - No need for receiver realignment to antenna optics

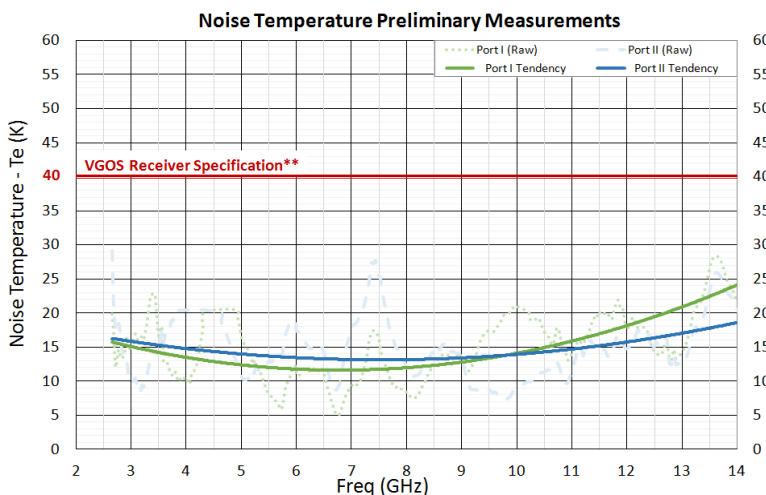
Ultra QRFH Cryogenic Receiver



Main Specifications

Parameter	Specifications
Frequency Bands	S, C, X & Ku (2.3—14GHz) ⁽¹⁾
Noise Temperature	<20K
Gain	>55dB
Cryo Operation	Continuous, (service every 10,000h)

Full specification available on next page



** from B.Corey, MIT Haystack Observatory, VLBI2010 antenna and site recommendations, p.4, VLBI2010 TecSpec Workshop 2012

Laboratory measurements shown above - the commercialized product will have both lower physical temperature and Noise Temperature.

Simplified cold head service

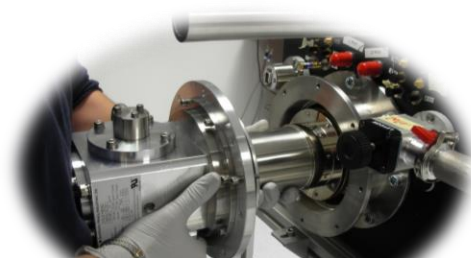
Callisto uses a patented cold head sleeve system allowing the removal of the cold head without dismounting the receiver from the antenna. Once at room temperature, the cold head is simply slipped-off of the receiver by a single operator and, with a spare cold head available, the receiver is ready for cooldown within 30 minutes after the beginning of the cold head removal. As the receiver is not dismounted from the antenna, it does not require realignment to the telescope optics!

Main Benefits

- **Wideband and Ultra Low Noise**
 - One receiver covering 12GHz of bandwidth
 - Noise temperature <20K over full band
 - The frequency band can be adapted to customer's needs
- **Simplified Cold Head Service**
 - No need for receiver dismounting from the antenna
 - No need for receiver opening for cold head service
 - No need for receiver realignment after cold head service
 - Very fast cold head replacement by spare (single operator, <30 minutes with receiver at room temperature)
- **Antenna compatibility**
 - Receiver can be equipped with QRFH feed model 45 or 60, making it compatible with most VLBI telescopes such as Intertronic Solutions, MT Mechatronics and Vertex Antennentechnik.

Sleeve System

Cold head removal from a cryogenic receiver

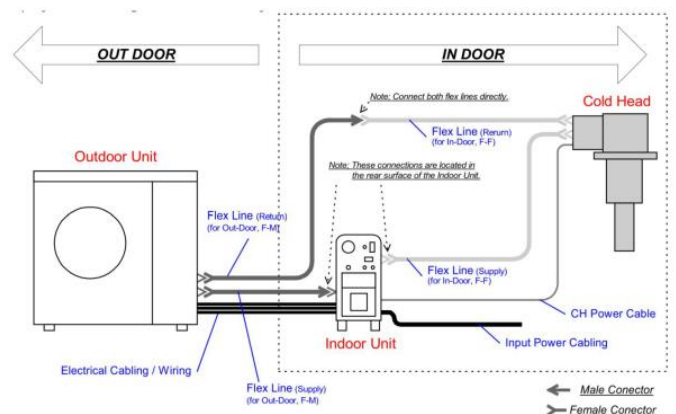


Detailed Specifications

Parameter	Specifications	Comments
Frequency Band	2 – 14GHz ⁽¹⁾	⁽¹⁾ The frequency band can be adapted to customer's needs
Noise Temperature	< 20K	At Dewar window excluding external noise contributions (Tsky, Tground, Tant)
Gain	>55dB	
Gain flatness	4dBpp	Typical value
Output Return loss	14dB typical	12dB minimum
Pout 1dB	>+14dBm	
Cooldown Time to reach RF Specification	3hrs	TBC after prototype manufacture
Input	Free space radiation	QRFH Feed Model 45° or 60° available
RF output connectors	SMA	Localized opposite to input. One output for each polarisation.
10MHz Phase Cal input	SMA	+10dBm minimum Power level. (Phase Cal. unit is optional)
Dimension	L-885 x Ø-380mm	Ø at base plate. RF input window is smaller at Ø336mm. Included: receiver, sleeve and cryocooler. Excluded: Gas lines, Helium compressor, Heat exchanger
Weight	<60Kg	
Mounting	Any orientation on movable antenna structure.	
Operating temperature	-10°C to +40°C	
Storage temperature	-40°C to +60°C	
Relative Humidity	To 90% non condensing	Condensation on vacuum window can occur on high humidity unless embedded radome is used with dry air.
Max Power Consumption	8000W	
Input Voltage	3 Phases (3W+PE) 380VAC/50Hz and 90--264VAC / 47--63Hz	3P/2P depending on compressor option selected Receiver M&C PSU
Distance between receiver and PSU Drawer	< 20m	PSU Drawer contains the M&C functions
Local M&C function	Panel PC (touchscreen)	All functions available locally via touchscreen. Limited M&C functions available via remote monitoring (TCP/IP)
MTBM	10,000 hours	Typical Mean Time Between Maintenance (cold head service)

Important Note: The “Ultra” receiver must be connected to a Helium gas compressor and a heat exchanger. These units can be provided on demand.

Options available: Air cooled/Split system (see figures on the right) or Water cooled system. The compressor and heat exchanger must not be tilted by more than ±5°. The compressor and heat exchanger are large units (~150kg).



The specifications provided in this data sheet are intended as a guide only. Callisto reserves the right to modify specifications without notice.
QRFH Ultra Wideband Cryogenic Receiver Data Sheet v1.5