

Specifications

Ka-BOOM Rack Mounted RF-Over-Fiber Equipment

2/18/2015

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1.0 Introduction

The Ka-Band Objects Observation and Monitoring (Ka-BOOM) site is located at Kennedy Space Center in Florida. The site consists of three 12-meter parabolic antennas with equipment in each pedestal. The antenna systems are configured for communications operation in X-Band. An upgrade for communications operation in Ka-Band is currently being implemented. The Radio Frequency (RF) signals to and from the antennas, and the Operations Control Center, are routed over RI-Over-Fiber links.

2.0 Scope

This specification establishes the minimum requirements for the procurement of RI-Over-Fiber equipment to support the upgrade of the Ka-BOOM system to Ka-Band operations. The upgrade will require the following equipment:

- Rack Mounted Enclosures
- Power Supplies
- Status and Control Assemblies
- Fiber Optic Transmitters
- Fiber Optic Receivers
- Spares

Wherever possible, commercial off-the-shelf products shall be utilized to satisfy the requirements of this specification.

All like deliverables shall be the same hardware, firmware, and software revision.

3.0 General

The function of the RI-Over-Fiber links shall be to:

- a. Transport uplink Intermediate Frequency (IF) signals from the Operations Control Center equipment rack to each antenna pedestal equipment rack
- b. Transport downlink IF signals from each antenna pedestal equipment rack to the Operations Control Center equipment rack
- c. Transport 10 MHz reference signals from the Operations Control Center equipment rack to each antenna pedestal equipment rack

The uplink IF signals will be up-converted by the Ka-Band Block Up-converter (BUC), the downlink Ka-Band signals will be down-converted to an IF frequency by the Low Noise Block Down-converter (LNB). The 10 MHz reference signal will be the output signal from the Reference Frequency Standard.

The Rack Mounted Enclosures shall house the Power Supplies, Status and Control Assemblies, Fiber Optic Transmitters, and Fiber Optic Receivers.

The Status and Control Assemblies shall provide "health" status and current configuration of the Power Supplies, Fiber Optic Transmitters, and Fiber Optic Receivers installed in each Rack Mounted Enclosure. The Status and Control Assemblies shall also provide the capability to remotely reconfigure each assembly installed in the Rack Mounted Enclosures.

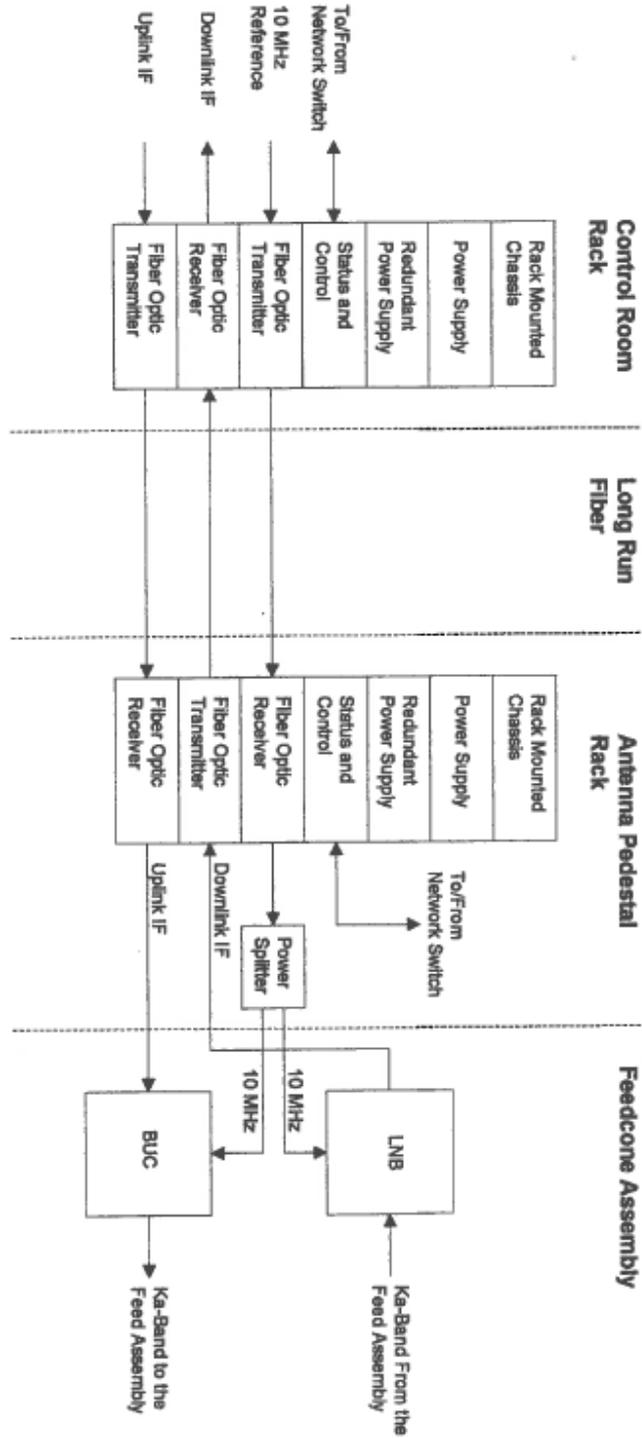


Figure 1 – Single Antenna Block Diagram of Ka-Band RF-over-Fiber Link

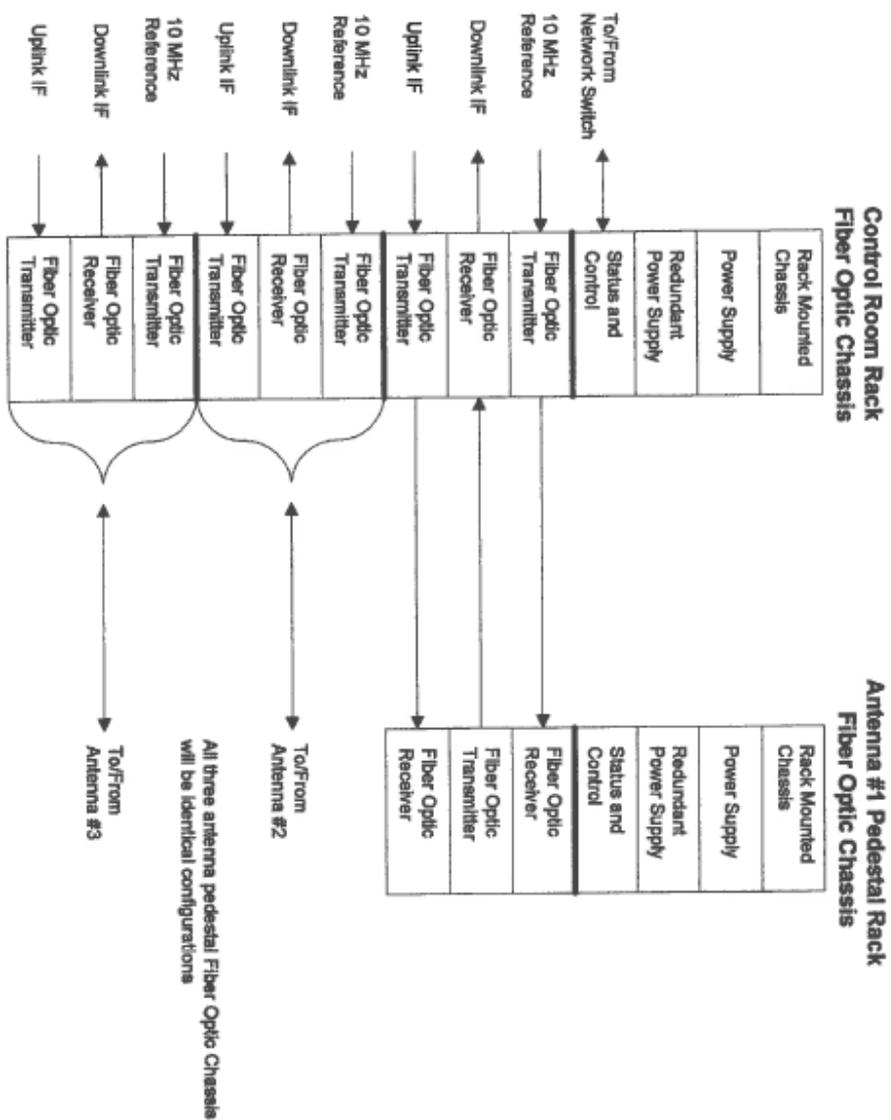


Figure 2 – Fiber Optic Chassis Configurations

4.0 Minimum Equipment Specifications

As a minimum, the required equipment shall perform to the following listed specifications.

4.1 Rack Mounted Enclosure

The Rack Mounted Enclosure shall fit in a standard 19 inch equipment rack. The enclosure shall have a depth no greater than 15 inches and a height no greater than 5.25 inches.

The enclosure shall have on board fan cooling for temperature control of the enclosure. The enclosure shall support redundant power supplies.

In addition to the power supplies, the enclosure shall be capable of housing a minimum of 16 single slot assemblies.

The enclosure shall support hot-swappable assemblies; power supplies or any other type of assembly installed in any of the other slots.

The enclosure shall operate with an Alternating Current (AC) input voltage between 90 and 130 volts, and an input frequency of 50-60 Hertz (Hz).

The enclosure shall operate at temperatures between (-)10 and (-050 degrees Centigrade (C) at 90% non-condensing humidity.

All unused slots within the chassis shall be protected with removable covers. The covers can cover a single slot, or multiple slots with a single protective cover.

4.2 Power Supply for Rack Mounted Enclosure

The enclosure Power Supply Assemblies shall occupy locations within the enclosure other than the 16 *single* slots available for other types of assemblies.

The power supply shall operate with an AC input voltage between 90 and 130 volts, and an input frequency of 50-60 Hz.

The power supply Direct Current (DC) output voltage shall be compatible with the voltage and current requirements of the Status and Control Assembly, Fiber Optic Transmitters, and Fiber Optic Receivers installed in the enclosures.

All available power supply status and control parameters shall be available to the Status and Control Assemblies installed in the Rack Mounted Enclosures. The Power Supply Assemblies shall be SNMP compatible.

4.3 Status and Control Assembly

The Status and Control Assembly shall occupy no more than a single slot within the Rack Mounted Enclosures. The Status and Control Assembly shall provide the remote interface to monitor and control all of the individual assemblies and power supplies within the Rack Mounted Enclosures.

The Status and Control Assembly shall have an Ethernet interface for remote operation. The Ethernet interface connector shall be an RJ45(f) connector.

Software for operation of the Status and Control Assembly shall be supplied with the assembly. In addition to the supplied software, documentation describing the software interface shall *be* supplied to allow the end user to develop mission specific software interfaces to operate the assembly. The Status and Control Assembly shall be SNMP compatible.

4.410 MHz Reference Link

The 10 MHz Reference Link shall include a Fiber Optic Transmitter and a Fiber Optic Receiver. The Fiber Optic Transmitter and Fiber Optic Receiver shall occupy no more than a single slot each within each Rack Mounted Enclosure.

All available Fiber Optic Transmitter and Receiver status and control parameters shall be available to the Status and Control Assembly installed in each Rack Mounted Enclosure.

Fiber Optic Transmitter

- Wavelength: 1310 nm**
- Optic Output Power: 6 to 8 dBm**
- Optic Output Connector: FC/APC, or SC/APC, or E2000**
- RF Input Frequency: 9.9 —10.1 MHz**
- RF Input Power: (+)10 - (+) 15 dBm**
- RF Input Connector: SMA(f), 50 ohm**
- RF Input Monitor Connector: SMA(f)**

Fiber Optic Receiver

- Wavelength: 1310 nm**
- Optic Input Power: 5 to 7 dBm**
- Optic Input Connector: FC/APC, or SC/APC, or E2000**
- RF Output Power: Greater than (+) 10 dBm**
- RF Output Connector: SMA(f), 50 ohm**
- RF Output Monitor Connector: SMA(f)**

45 Ka-Band Uplink and Downlink IF Links

The Ka-Band IF links shall include a Fiber Optic Transmitter and a Fiber Optic Receiver for both the uplink and downlink signals. The Fiber Optic Transmitter and Fiber Optic Receiver shall occupy no more than a single slot each within each Rack Mounted Enclosure.

All available Fiber Optic Transmitter and Receiver status and control parameters shall be available to the Status and Control Assembly installed in each Rack Mounted Enclosure. The Fiber Optic Transmitters and Fiber Optic Receivers shall be SNMP compatible.

Link RF Gain

25 dB minimum

Fiber Optic Transmitter

Wavelength: 1310 nm

Optic Output Power 3 to 6 dBm

Optic Output Connector: FC/APC, or SC/APC, or E2000

RE Input Frequency: 50 MHz 3 GHz

RF Input Power: 0 - (-) 35 dBm

RF Input Connector: SMA(f), 50 ohm

RF Input Monitor Connector: SMA(f)

Fiber Optic Receiver

Wavelength: 1310 nm

Optic Input Power: 2 to 5 dBm

Optic Input Connector: FC/APC, or SC/APC, or E2000

RE Output Frequency: 50 MHz —3 GHz

RF Output Connector: SMA(f), 50 ohm

RF Output Monitor Connector: SMA(f)

4.6 Quantities

Table 1 describes the quantities of each device required to support Ka-Band upgrade of the Ka-BOOM system.

Description	Quantity	Total
Rack Mounted Enclosure		4
Control Room Rack	1	
Antenna Pedestal Rack	3	
Power Supplies		8
Primary	4	
Redundant	4	
10 MHz Reference Links		
Fiber Optic Transmitter	3	3
Fiber Optic Receiver	3	3
Uplink and Downlink IF Links		
Fiber Optic Transmitter	6	6
Fiber Optic Receiver	6	6
Unused Slot Protective Covers		42
Control Room Rack Enclosure	6	
Antenna #1 Pedestal Rack Enclosure	12	
Antenna #2 Pedestal Rack Enclosure	12	
Antenna #3 Pedestal Rack Enclosure	12	

Table 1— Equipment Quantities Required for Ka-Band Upgrade

4.7 Spares

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Table 2 describes the quantity of spare devices required to support the Ka-Band upgrade of the Ka-BOOM system.

Description	Quantity
Power Supplies	1
10 MHz Reference Links	
Fiber Optic Transmitter	1
Fiber Optic Receiver	1
Uplink and Downlink IF Links	
Fiber Optic Transmitter	1
Fiber Optic Receiver	1

Table 2 — Spares Required to Support Ka-Band Upgrade