

1. Technical Report

1.1. Name and Address [2.1033(c)(1)]

The name and address of the manufacturer of the HST-21X0 High Speed Satellite Transceiver and applicant for certification is Rockwell Collins, Inc., 1300 Wilson Boulevard, Suite 200, Arlington, Virginia 22209.

1.2. FCC Identifier [2.1033(c)(2)]

| FCC ID | Description |
|------------|--|
| AJK8222231 | HIGH-SPEED SATCOM TRANSCEIVER (Type Number HST-2110) |
| AJK8222233 | HIGH-SPEED SATCOM TRANSCEIVER (Type Number HST-2120) |

1.3. Type or Types of Emission [2.1033(c)(4)]

The HST utilizes the following types of emissions:

| Data Rate | Symbol Rate | Modulation Type | Emission Designation |
|------------|---------------|-----------------|-------------------------------|
| 3000 bps | 3000 sym/sec | Unfiltered BPSK | 5K60G1D |
| 134400 bps | 33.6k sym/sec | 16-QAM | 40K0D1D 40K0D1E 40K0D1W |

Table 1 – Emission Types

1.4. Frequency Range [2.1033(c)(5)]

The HST transmitter frequency range is 1626.5 MHz to 1660.5 MHz. The receiver frequency range is 1530 MHz to 1559 MHz.

1.5. Range of Operating Power Values [2.1033(c)(6)]

The HST-2110 channel has a maximum transmitter output power of 159 mW (22 dBm) for 134400 bps and 22.4 mW (13.5 dBm) for 3000 bps (measured at the HST output terminals).

Due to an internal 3 dB combiner, the HST-2120 has a maximum transmitter output power of 79 mW (19 dBm) for 134400 bps and 11.2 mW (10.5 dBm) for 3000 bps (measured at the HST output terminals).

The HST-2110 and HST-2120 carrier transmit output power adjustment range is from 0 dB to -28.5 dB.

At a system level, this signal is amplified by the HPA contained within the SRT-2100 and transmitted through the High Gain antenna. The SRT-2100 considers the current antenna gain, and controls the HST output gain in order to maintain the desired EIRP. The 3000 bps registration channel operates at a fixed EIRP of 14 dBW. The 134400 bps data channel is established at an initial EIRP of 22.5 dBW, and may be reduced by 2, 4 or 6 dB, depending on observed link margins.

Therefore, the power output at the antenna terminals (equivalent to the HPA output minus coax loss) varies depending on antenna gain, and may approach an absolute maximum of 45 Watts under conditions of low antenna gain.

1.6. Maximum Power Rating [2.1033(c)(7)]

According to Section 87.131, UHF aircraft earth stations with emission designator G1D, G1E, and G1W are permitted a maximum of 60 Watts per carrier. Although the HST transmits a signal with emission designator of D1D, D1E and D1W, it operates in the same frequency band and should logically be expected to conform to this requirement.

The HST operates as an exciter in the system and does not determine the maximum output power. System gains are controlled by logic in the SRT-2100 to maintain a desired EIRP. The desired EIRP for the 3000 bps control channel is 14 dBW. The initial EIRP for the 134400 bps channel is 22.5 dBW, and may be reduced to lesser levels if link margins warrant.

Under conditions of reduced antenna gain, the HPA contained within the SRT-2100 may be driven to its **maximum rated output power of 45 Watts** (combined output power of all carriers) in order to maintain the desired EIRP. If the antenna gain falls to the extent that the EIRP of all carriers can no longer be maintained without exceeding the rated output power of the HPA, carriers are dropped according to priority to prevent overdriving the HPA.

1.7. DC Voltages and Currents [2.1033(c)(8)]

The DC input voltages and currents to the final RF amplifier of the HST-2110 and HST-2120 are as follows:

| Unit | DC Supply Voltage | Maximum Supply Current | Typical Measured DC Supply Current |
|----------------------|-------------------|------------------------|------------------------------------|
| HST-2110 or HST-2120 | +12 VDC | 0.5 A | 0.35 A |

1.8. Schematics and Circuit Diagrams [2.1033(c)(10)]

All RF circuitry is contained on the channel card and RF Output module. The complete schematics for these modules are contained in "**Exhibits E1 and E2 – Schematics**". The channel card and amplifier are interconnected as shown in Figures 2 and 3 in "**Exhibit E – Product Description**".

1.9. Nameplate Label Drawings [2.1033(c)(11)]

The proposed front panel nameplate content and location is contained in “***Exhibit A – Nameplate Label Drawings***”.

1.10. Equipment Photographs – External [2.1033(c)(12)]

Internal and external photographs of the HST-2110 and HST-2120 are contained in “***Exhibit C – External and Internal Photos***”.

1.11. Digital Modulation System [2.1033(c)(13)]

The HST-2110 and HST-2120 each utilize two different modulation types as described below:

3000 BPS Digital Modulation

Used for registration and call setup / teardown.

Modulation: BPSK

Pulse Shape Filtering: None

The bit sequence from the FEC encoder modulates an intermediate frequency using BPSK. The intermediate frequency is then up-converted to L-band for transmission.

| Bit Rate | Symbol Rate | Modulation Type |
|----------|-------------|-----------------|
| 3000 | 3000 | BPSK |

134400 BPS (64000 BPS User Data Rate)

Used for user data communication.

Modulation: Square 16-QAM.

Pulse Shape Filtering: Square root raised cosine filter with roll-off factor of 0.25.

The 4-bit symbol sequence output from the FEC encoder is mapped into a square 16-QAM intermediate frequency and is then up-converted to L-band for transmission.

| Bit Rate | Symbol Rate | Modulation Type |
|----------|-------------|-----------------|
| 134400 | 33600 | 16-QAM |

Note: This channel is commonly referred to as the 64000 bps (64K) channel, as this is the information data rate available to the user.

1.12. Required Measurements [2.1033(c)(14)]

The data required by 2.1046 through 2.1057, inclusive, measured in accordance with the procedures set out in 2.1041, is provided in “***Exhibit F - Test Report***”.