



**GRANTED**

FOR THE REASONS INDICATED BELOW

*Scott Shaw 4/29/16*

EMS Technologies  
400 Maple Grove Road  
Ottawa, Ontario, Canada, K2V 1B8

21<sup>th</sup> March 2016

**BY CERTIFIED MAIL**

James Shaffer  
Mobility Division  
Wireless Telecommunications Bureau  
Federal Communications Commission  
445 12<sup>th</sup> Street, SW  
Washington, DC 20554

RECEIVED & INSPECTED

**MAR 31 2016**

FCC-GBG MAILROOM

**RE: EMS Technologies Canada, Ltd. Request for waiver of sections 87.131, 87.133 87.137, 87.139(i)(1) and 87.141(i) to Allow Equipment Certification of: Aeronautical Mobile Satellite Service Transmitters: A781-MK4.**

Dear Mr. Shaffer:

On March 12, 2010<sup>(1)</sup>, the Wireless Telecommunications Bureau ("Bureau") granted EMS Technologies Canada Ltd. ("EMS") a waiver of Sections 87.131, 87.133, 87.137, 87.139(i)(1), 87.139(i)(3) and 87.141(j) of the Commission's rules to permit certification of its next generation aeronautical mobile satellite service ("AMSS") transceivers HSD-128, HSD-400, HSD-440, HSD-X, HSD-Xi.

On April 29, 2010<sup>(1)</sup>, the Wireless Telecommunications Bureau ("Bureau") granted EMS Technologies Canada Ltd. ("EMS") a waiver of Sections 87.131, 87.133, 87.137, 87.139(i)(1), 87.139(i)(3) and 87.141(j) of the Commission's rules to permit certification of its next generation aeronautical mobile satellite service ("AMSS") transceivers A781, HSD-MK2, A781-MK2, HSD-MK3 and A781-MK3.

On July 5, 2010<sup>(1)</sup>, the Wireless Telecommunications Bureau ("Bureau") granted EMS Technologies Canada Ltd. ("EMS") a waiver of Sections 87.139(i)(1) of the Commission's rules to permit certification of its next generation aeronautical mobile satellite service ("AMSS") transceivers HSD-MK2.

On June 23, 2011<sup>(2)</sup>, the Wireless Telecommunications Bureau ("Bureau") released an Order, DA 11-1104, WT Docket No. 11-19, permitting EMS Technologies Canada Ltd. ("EMS") a waiver of Sections 87.139(i)(1) of the Commission's rules to permit Certification and use of its next generation aeronautical mobile satellite service ("AMSS") transceivers -HSD-MK2.

As discussed below, EMS Technologies Canada Ltd, pursuant to section 1.925 of the Commission's rules, hereby requests waivers to Part 87 of the Commission's rules as referenced above to permit next generation services available with transceiver A781-MK4.

The A781-MK4 operates in the Aviation Radio Service. This transceiver is based on its predecessor, the A781-MK3. The A781-MK4 has had an HPA change which required a new FCC ID. This system operates at higher transmission speeds associated with the newer AMSS

<sup>(1)</sup>See EMS Waivers, March 12/2010, April 29/2010, July 5/2010 – Exhibit A

<sup>(2)</sup>See FCC ORDER DA 11-1104, Released June 23/2011(Submitted to the WTB June 2/2010) – Exhibit B

systems in the 1626.5-1660.5 MHz, 1525-1559 MHz, transmit and receive band respectively, providing Classic services and SwiftBroadband services using BPSK, QPSK and QAM modulations. The Classic services have an authorized bandwidth of 25kHz<sup>(3)</sup>, while the SwiftBroadband services have an authorized bandwidth of 225kHz<sup>(4)</sup>

The A781-MK4 meets the requirements of the appropriate RTCA, ICAO Minimum Performance Standards (MOP's), in particular with respect to GPS protection requirements criteria. EMS Technologies Canada Ltd. also must certify the A781-MK4 with Inmarsat, the satellite network service provider, for full type approval established by Inmarsat to the following RTCA requirement: RTCA/DO-210D, Minimum Operational Performance Standard for Geosynchronous Orbital Aeronautical Mobile Satellite Service (AMSS) Avionics, Change Number 3, Issued 19<sup>th</sup> Sept. 2006, Section 2.2.4.2.5.2 – Harmonics, Discrete Spurious and Noise Density for Equipment without Intermodulation Frequency Control.

### **Request Waivers – Part 87**

The EMS transceivers will meet the technical requirements of Part 87 AMSS rules with respect to output power, spurious emissions, intermodulation and priority and preemption. Specifically SwiftBroadband Transmissions can be suspended if they would interfere with safety-related messages, or if ordered by the Captain of the aircraft (87.189). The part 87 rules, however, only contemplate the modulation types and transmission characteristics used for the Inmarsat Aero-H, Aero-L and Aero I services. Inmarsat's SwiftBroadband services offer higher data rates by utilizing more efficient modulation techniques. The Part 87 rules have not yet been updated to reflect these emission types and bandwidths.

#### 87.131 Authorized Emissions

Section 87.131 authorizes G1D, G1E and G1W for aircraft earth stations. The SwiftBroadband services, however, use 16 point Quadrature Amplitude Modulation (16 QAM) and QPSK modulation schemes, with emission types G7W and D7W. Therefore EMS requests waiver of the authorized emissions in Section 87.131 of the Commission's rules.

#### 87.133 Frequency Stability

Pursuant to Section 87.133(a), the frequency tolerance of an aircraft earth station operation in the 1626.5-1660.5 MHz band is +/- 320 Hz. For the purposes of bench testing for certification, a tolerance of +/- 160 Hz applies to the reference oscillator of the transmitter. The EMS transceivers contain a HSR oscillator with a guaranteed accuracy (including aging) equivalent to +/- 365 Hz. Therefore, the guaranteed accuracy of any Classic or SwiftBroadband transmissions will be +/- 365 Hz and EMS requests a waiver of Section 87.133(a) of the Commission's rules for this reason.

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<sup>(3)</sup>See 47 C.F.R. 87.137(a)

<sup>(4)</sup>See Exhibit A, March 12/2010 waiver - WTB.

87.137 Types of Emissions

Section 87.137(a) of the Commission's rules authorizes for aircraft earth stations emissions designator 21K0G1D and the authorized bandwidth for aircraft earth station emissions above 50 MHz is 25 kHz. Lower values of necessary and authorized bandwidth are also permitted. As explained above, SwiftBroadband utilizes a 16 QAM and QPSK modulations, with emissions classes D7W and G7W. In addition, due to the increased symbol rates for QPSK and QAM, a larger authorized bandwidth is necessary. An adequate bandwidth for SwiftBroadband is 225 kHz.

Therefore, EMS seeks waiver of Section 87.137(a) of the Commission's rules to authorize the following emission designators and authorized bandwidth for the EMS transceivers:

<b>Emission Designator</b>	<b>Authorized Bandwidth (kHz) Above 50 MHz</b>
25K0G7W	225
50K0G7W	225
100KG7W	225
200KG7W	225
50K0D7W	225
100KD7W	225
200KD7W	225

87.139(i)(1), note 2.

Section 87.139(i)(1) of the Commission's rules provides the required attenuation for a modulated carrier and note 2 provides an absolute offset of +/-35 kHz. Under the required design for the new modulation techniques, in many cases, 99% of the occupied bandwidth exceeds the +/-35 kHz offset. Therefore the newer modulation scheme used for SwiftBroadband make meeting this offset impossible. IAW Inmarsat requirements, EMS requests a waiver Section 87.139(i)(1), note 2 to permit an absolute offset of +/- 504 kHz.

87.139(i)(1) Emissions Limitations

Section 87.139(i)(1) of the Commission's rules provides the required attenuation for a modulated carrier relative to the maximum emission envelope level. This Mask is intended for use in conjunction with the authorized bandwidth in Section 87.137(a) of the Commission's rules for aircraft earth stations. The Bureau, however, granted EMS a waiver of Section 87.137(a) of the rules to operate another transceiver previously, and we are seeking the same waiver as noted above, due to increased symbol rates for 16 QAM.

The larger authorized bandwidth requires a 9.5 dB adjustment to the emission mask set forth in Section 87.139(i)(1). At the larger bandwidth the total power is more widely distributed and the emission envelope is at a lower absolute level for an equivalent total carrier power. Therefore, EMS's request for a waiver to permit a 9.5dB adjustment in the mask reflects the mask that would be

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extrapolated if the attenuation levels specified in Section 87.139(i)(1) were associated with the larger bandwidth that the Commission authorized EMS to use in its April 29, 2010 waiver grant. As a result, an adjustment of 9.5dB in the emission mask specified in Section 87.139(i)(1) would provide the same effective protection levels as specified currently in the Commission rules.

The 9.5 dB adjustment is derived as follows:

$$\begin{aligned}\text{Adjustment (dB)} &= 10 \cdot \log_{10} (\text{larger authorized BW} / \text{Part 87 authorized BW}) \\ &= 10 \cdot \log_{10} (225 \text{ kHz} / 25 \text{ kHz}) \\ &= 9.5 \text{ dB}\end{aligned}$$

#### 87.141(j) Modulation Requirements

Section 87.141(j) of the Commission's rules requires transmitters used as aircraft earth stations to employ BPSK for transmission rates up to and including 2400 bps, and QPSK for higher rates. Due to the requirements of SwiftBroadband services, the EMS transceivers use additional modulation schemes that do not meet this requirement. Specifically SwiftBroadband services require the use of 16-QAM at transmission rates higher than 200 bps. EMS therefore requests waiver of Section 87.141(j) of the Commission's rules to permit these modulations.

#### **Conclusion**

EMS requests that the Commission waive the requirements of part 87 described above to permit certification of this Inmarsat AMSS transceiver – A781-MK4. The Commission has granted similar waivers to EMS, Rockwell Collins, Honeywell and others in the past, specifically the A781-MK3 which is has all emission designators listed for this waiver of the A781-MK4. Such a waiver will not cause harmful interference to other services and is in the best interest to the public such that aircraft passengers and crew can receive high speed voice and data communications.

Please feel free to contact the undersigned with any questions.

Respectfully Submitted.

EMS Technologies Canada Ltd.

Steven Mills  
Director of Engineering



<sup>(3)</sup>See 47 C.F.R. 87.137(a)

<sup>(4)</sup>See Exhibit A, March 12/2010 waiver - WTB.