



**JMA Wireless • Teko Systems Group**  
Teko Telecom S.r.l. a Socio Unico  
Via Meucci, 24/A  
40024 Castel S. Pietro Terme (BO) – Italy  
Tel +39 051 69 46 811 – Fax +39 051 94 84 73

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Nemko Canada Inc  
303 River Road  
Ottawa, Ontario, Canada  
K1V 1H2

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**935210 D02 v02r01 APPENDIX D—Cross-reference Notes to 935210 D05 v01,**  
**935210 D02 v03, C63.26/D15 with deviations highlighted in red**



#	935210 D02 v02r01	935210 D05 v01, 935210 D02 v03 C63.26/D15	Comments
01	<p align="center"><b>BOOSTER, AMPLIFIER, AND REPEATER INTERIM BASIC AUTHORIZATION PROCEDURES</b></p> <p><b>D.1 GENERAL</b></p> <p>The interim guidance in this appendix is intended to support uniform basic procedures for equipment authorizations of amplifier, booster, and repeater devices, other than part 20 Consumer Boosters. This includes typical in-building radiation systems consisting at a minimum of one host unit and one or more remote units, used to improve service reliability inside buildings or other structures located within particular licensed service areas.</p> <p>Manufacturers or test labs should obtain prior FCC review and approval for test procedures used for industrial signal boosters that deviate significantly from those herein.</p> <p>For Consumer Signal Boosters, uniform test procedures consistent with the requirements in the <i>Order</i> are continuing under review and development in the ANSI ASC C63® working group (i.e., see KDB Publication 935210 D03 and KDB Publication 935210 D04).</p> <p>In addition, per the <i>Order</i> for example §§ 90.219(d) and 90.219(e) contain specific provisions for which information and test data must be included in applications;<sup>1</sup> uniform test procedures for the § 90.219 requirements will be amended to KDB Publication 935210 as soon available.</p>	general	20.21 CMRS Industrial Signal Booster
02	<p><b>D.2 BASIC TERMS AND DEFINITIONS</b></p> <p>The following general definitions are applicable for the purposes of this appendix.</p> <p><b>External radio frequency power amplifier (ERFPA)</b> - any device which, (1) when used in conjunction with a radio transmitter signal source, is capable of amplification of that signal, and (2) is not an integral part of a radio transmitter as manufactured. The EAS equipment class AMP is used only for an ERFPA device inserted between a transmitter (TNB/PCB) and an antenna (has only one antenna port).</p> <p>The term “extender” is generally the same as booster, but booster should be used rather than extender.</p> <p><b>Booster</b> is a device that automatically reradiates signals from base transmitters without channel translation, for the purpose of improving the reliability of existing service by increasing the signal strength in dead spots.<sup>2</sup> An “inbuilding radiation system” is a signal booster. These devices are not intended to extend the size of coverage from the originating base station.<sup>3</sup> A booster can be either single or multiple channels.</p> <p><b>Repeater</b> is a device that retransmits the signals of other stations. Repeaters are different from boosters in that they can include frequency translation and can extend coverage beyond the design of the original base station. A repeater is typically single channel but can also be multiple channels. The term “translator” is generally the same as repeater, but repeater should be used rather than translator.</p>	935210 D02 v03 Appdx A	Booster

<sup>1</sup> See also §§ 2.911(b), 2.947(a)(3), 2.947(c), 2.947(d), 2.947(e), 2.962(f)(5)(i).

<sup>2</sup> § 22.99 Dead spots. Small areas within a service area where the field strength is lower than the minimum level for reliable service. Service within dead spots is presumed.

<sup>3</sup> § 90.219(d)(2) Signal boosters must not be used to extend PLMRS stations’ normal operating range.



03	<b>D.3 POLICIES AND PROCEDURES</b> For devices other than consumer signal boosters, tests should be done with each typical signal, e.g., for F3E emissions use 2500 Hz with 2.5 kHz or 5 kHz deviation. Use of CW signal for some tests is acceptable in lieu of actual emission, in cases when CW signal gives worst case results.	935210 D05 v01 3.1), 4.1) C63.26/D15 7.2.2.1, 7.2.3.1	935210 D02 Signal Boosters Certification v02r01) D.3, g), h), i) <b>Tested Radiated spurs (enclosure) CW</b> <b>Tested Conducted spurs – all modulations</b> <b>Tested Intermodulation – all modulations</b>
04	D.3) a) Form 731 entries <sup>4</sup>	935210 D02 v03 C.2)	Noted
05	D.3) a) 1) For ERFPA as defined above D.3) a) 1) i) In one enclosure D.3) a) 1) i) a) Equipment Class – AMP D.3) a) 1) i) b) List AMP in frequency tolerance field of Form 731 D.3) a) 1) i) c) List emission designators without necessary bandwidth (e.g., F3E, F1D) D.3) a) 1) ii) In two enclosures D.3) a) 1) ii) a) Does not exist (if it does, use same entries as for one enclosure)	935210 D02 v03 C.2) a)	N/A
06	D.3) a) 2) For Booster as defined above D.3) a) 2) In one enclosure D.3) a) 2) i) Equipment Class –BOS, B2I, B9A, B9B D.3) a) 2) i) a) List AMP in frequency tolerance field of Form 731 D.3) a) 2) i) b) List emission designators without necessary bandwidth (e.g., F3E, F1D) D.3) a) 2) i) c) List in Form-731 description or comments field the word “booster” D.3) a) 2) ii) In two enclosures (host/remote) D.3) a) 2) ii) a) Two separate FCC IDs/applications D.3) a) 2) ii) b) Equipment Class –BOS, B2I, B9A, B9B D.3) a) 2) ii) c) List AMP in frequency tolerance field of Form 731 D.3) a) 2) ii) d) List emission designators without necessary bandwidth (e.g., F3E, F1D) D.3) a) 2) ii) e) List in comments field the words “Part of booster system used with FCC ID: xxxyyy.” (Where xxxyyy is FCC ID of other device(s) in system).	935210 D02 v03 C.2) b)	Noted
07	D.3) a) 3) For Repeater as defined above D.3) a) 3) i) In one enclosure D.3) a) 3) i) a) Equipment Class – BOS, B2I, B9A, B9B D.3) a) 3) i) b) List AMP in frequency tolerance field of Form 731 if device contains no frequency translation; otherwise, measure frequency tolerance and list. D.3) a) 3) i) c) List in comments field the word “repeater” D.3) a) 3) ii) In two enclosures (host/remote) D.3) a) 3) ii) a) Two separate FCC IDs/applications D.3) a) 3) ii) b) Equipment Class – BOS, B2I, B9A, B9B D.3) a) 3) ii) c) List AMP in frequency tolerance field of Form 731 if device contains no frequency translation; otherwise, measure frequency tolerance and list. D.3) a) 3) ii) d) List in comments field the words “Part of repeater system used with FCC ID: xxxyyy.” (Where xxxyyy is FCC ID of other device(s) in system).	935210 D02 v03 C.2) c)	N/A

<sup>4</sup> Before February 20, 2013, booster and repeater device submissions had used AMP, PCB, or TNB equipment classes; all new grants for nonconsumer booster devices shall use Bxx (BOS, B2I, B9A, or B9B) equipment classes.



08	D.3) b) Applicable rule part(s) D.3) b) 1) Specific rule part(s) the device will be used with. Verify applicable emission masks etc and if booster rules apply. D.3) b) 2) Check to see if frequency and device is licensable in applicable rule part.	935210 D02 v03 Appdx D, etc.; KDB pub 634817	Noted
09	D.3) c) Booster rules – Include exhibit or correspondence showing applicant was informed that boosters must meet all criteria stated in § 90.219 and Part 20 for related booster/in-building operations.	935210 D02 v03 IV), V)	N/A
10	D.3) d) Single or multiple FCC IDs – One FCC ID per transmitter enclosure or rack (not per overall system).	935210 D02 v03 Appdx C, Appdx B, etc.	Single FCC ID for Booster in one enclosure, used in remote unit and service front end
11	D.3) e) Form 731 line items – All transmitters in the device (uplink/downlink) should be listed and tested.	935210 D02 v03 II) n), II) o), Appdx B, etc.	DL only D02 v3 II) o) 3) see grant note D02 v3 II) n) RF Gain and RF output power of the system are set at the maximum level by the factory.
12	D.3) f) System operation – When transmitter requires other devices in a system, select Form 731 “Part of system...” checkbox. List FCC IDs of other components. Test with system components if needed. Usually applies for fiber-optic systems. Control of power level is one implication.	935210 D02 v03 Appdx C, Appdx B, etc.	Booster in one enclosure, does not require another device for control of power, see p10 operational description
13	D.3) g) Radiated spurs (enclosure) – Use of CW signal (low, mid, and high freq.) is acceptable rather than all modulations	935210 D05 v01 3.8), 4.9) C63.26/D15 7.2.2.7, 7.2.3.9	Measured radiated emissions per 935210 D02 Signal Boosters Certification v02r01) D.3, g)
14	D.3) h) Conducted spurs – Test all modulation types [TDMA, CDMA, and FM (covers GSM and F1D)] at low, mid, and high frequency	935210 D05 v01 3.6), 4.7) C63.26/D15 7.2.2.5, 7.2.3.6, 7.2.3.7	Measured conducted emissions per 935210 D02 Signal Boosters Certification v02r01) D.3, h)
15	D.3) i) Intermodulation – Test all modulation types [TDMA, CDMA, and FM (covers GSM and F1D)] D.3) i) 1) For part 90 boosters, apply the requirements of § 90.219(e). D.3) i) 2) For other boosters: D.3) i) 2) i) CW signal rather than typical signal is acceptable (for FM). D.3) i) 2) ii) At maximum drive level, for each modulation: one test with three tones, or two tests (high-band edge, low-band edge) with two tones (KDB Publication 670583 has other guidance). D.3) i) 2) iii) Limit usually is -13 dBm conducted. D.3) i) 2) iv) Not needed for Single Channel systems. D.3) i) 2) v) Combination of modulation types not needed.	935210 D05 v01 3.6), 4.7) C63.26/D15 7.2.2.5, 7.2.3.6, 7.2.3.7	Measured intermodulation using two signal-test of KDB 670583
16	D.3) j) Occupied bandwidth – Use RBW 300 Hz or 1% RBW. The spectral shape of the output should look similar to input for all modulations.	935210 D05 v01 3.4), 4.4) C63.26/D15 7.2.2.3, 7.2.3.3	Measured occupied bandwidth input/output per 935210 D02 Signal Boosters Certification v02r01) D.3, j)



17	<p>D.3) k) Output power</p> <p>D.3) k) 1) Power on Form 731 should be clearly identified as either composite of multi-channels or per carrier. If power is composite include in comments field: "Power output listed is composite for multi-channel operation."</p> <p>D.3) k) 2) Check that the input drive level is at maximum input rating and maximum gain settings for all tests. Check both uplink and downlink input levels. See manual or brochures/technical description for maximum rating.</p> <p>May need to check FCC identifier of transmitter used for tests.</p> <p>D.3) k) 3) Confirm device cannot operate in saturation. Are there means to control maximum power and to assure linear operation (use in system configuration may be necessary)? How is saturation or over-modulation prevented for pulsed signal inputs?</p> <p>D.3) k) 4) Meets power limits of § 90.219 for Part 90 booster operations.</p> <p>D.3) k) 5) Devices using automatic gain control (AGC) for compliance with service rule power limits should provide test results showing maximum output with and without AGC activated.<sup>5</sup></p> <p>Rated power listed on grant should not exceed applicable service rule limit (see also V j 1 of 935210 D02 v03).</p>	<p>935210 D05 v01 3.5), 4.5), etc.;</p> <p>C63.26/D15 7.2.2.4, 7.2.3.4</p> <p>935210 D02 v03 II) p) 1)</p> <p>935210 D02 v03 II) p) 4); 935210 D05 v01 3.2), 4.2), etc.;</p> <p>C63.26/D15 7.2.2.1, 7.2.3.1</p>	<p>Measured output power and PAPR per 971168 D01 Power Meas License Digital Systems v02r02, 5.2.1, 5.7.1 for all modulations</p> <p>RF Gain and RF output power of the system are set at the maximum level by the factory, see p10 operational description</p>
18	<p>D.3) l) Out of Band Rejection – Test for rejection of out of band signals. Filter frequency response plots are acceptable.</p>	<p>935210 D02 v03 II) p) 2); 935210 D05 v01 3.3), 4.3), etc.;</p> <p>C63.26/D15 7.2.2.2, 7.2.3.2</p>	<p>Measured Out of Band Rejection per 935210 D02 Signal Boosters Certification v02r01) D.3, l)</p>
19	<p>D.3) m) Worst case results should be reported for occupied bandwidth comparison and intermodulation tests done with and without any AGC circuitry activated, for devices so equipped.</p>	<p>935210 D02 v03 II) p) 3); 935210 D05 v01 3.2), 4.2), etc.;</p> <p>C63.26/D15 7.2.2.1, 7.2.3.1</p>	<p>RF Gain and RF output power of the system are set at the maximum level by the factory, see p10 operational description</p>

<sup>5</sup> EXAMPLE: For a rule output power limit of 1 W EIRP (30 dBm), and applicant's compliance is based on AGC design/set to 32 dBm and with -2 dB maximum antenna gain with professional-install addressed in the filing, then the grant should not list AGC-off higher maximum measured power that would lead to exceeding the 30 dBm ERP rule limit.

**Dated** 29 July 2015

**By:** Alessandro Brunelli  
**Signature**

**ALESSANDRO BRUNELLI**  
**Printed**

**Title:** CERTIFICATION ENGINEER

**On behalf of :** TEKO TELECOM

**Telephone:** +39 051 6946811

