August 3, 1998

Federal Communications Commission
Authorization and Evaluation Division
7435 Oakland Mills Road Columbia, MD 21046

Attention: Applications Examiner

Applicant: Allgon Enterprises, Inc.
7317 Jack Newell Blvd. North Fort Worth, Texas 76118

Equipment: AMPS Cellular Repeater, Model: AR4200
FCC ID: L6GAR4200

Specification: 47 CFR 22 Type Acceptance

Dear Examiner:

The following application for Grant of Equipment Authorization is presented on behalf of Allgon Enterprises, Inc. for the Type Acceptance of their Model: AR4200, AMPS Cellular Repeater.

Enclosed, please find a complete data and documentation package demonstrating that this device complies with the technical requirements of 47 CFR, Part 22, for a Cellular Repeater.

If you have any questions, please contact the undersigned, who is authorized to act as Agent.

Sincerely,

Chris Harvey
Director, EMC Laboratory

MET Laboratories, Inc. *Safety Certification - EMI - Telecom Environmental Simulation*

914 WEST PATAPSCO AVENUE • BALTIMORE, MARYLAND 21230-3432 • PHONE (410) 354-3300 • FAX (410) 354-3313

ENGINEERING TEST REPORT

in support of the
Application for Grant of Equipment Authorization

EQUIPMENT:	AMPS Cellular Repeater, Model 4200
FCC ID::	L6GAR4200
Specification:	47 CFR 22
On Behalf of the Applicant:	Allgon Enterprises, Inc. 7317 Jack Newell Blvd. North FortWorth, TX 76118
Manufacturer:	Allgon Enterprises, Inc. 7317 Jack Newell Blvd. North FortWorth, TX 76118
Manufacturer's Representative	Mr. Tim Purvis
Test Date(s):	June 24 thru July 9, 1998

ENGINEERING STATEMENT

I ATTEST: the measurements shown in this report were made in accordance with the procedures indicated, and that the emissions from this equipment were found to be within the limits applicable. I assume full responsibility for the accuracy and completeness of these measurements.On the basis of the measurements made, the equipment tested is capable of operation in accordance with the requirements of Part 22 of the FCC Rules under normal use and maintenance.

Kenneth Bass
EMI Engineer, MET Laboratories

Supervised by:
Chris Harvey
Director, EMC Laboratory

1.0 INTRODUCTION

The following data is presented on behalf of the Applicant, Allgon Enterprises, Inc., as verification of the compliance of the Allgon AMPS Cellular Repeater, Model 4200 to the requirements of 47CFR 22.

2.0 TEST SITE

All testing was conducted at MET Laboratories, Inc., 914 West Patapsco Avenue, Baltimore, Maryland 21230-3493. Radiated emissions measurements were performed on a three-meter open area test site (OATS). A complete site description is on file with the FCC Laboratory Division as 31040/SIT/MET.

3.0 TEST EQUIPMENT USED

Manufacturer	Equipment	Calibration Due	Cal. Interval
Hewlett Packard	8591E Spectrum Analyzer	1/29/99	annual
EMCO	Biconical Antenna 3104	2/9/99	annual
EMCO	EMCO Log Periodic Antenna	3/20/99	annual
EMCO	Double Ridge Guided Horn	3/20/99	annual
Hewlett Packard	8594EM Analyzer	11/19/98	annual
Solar	LISN	6/30/99	annual

4.0 EQUIPMENT UNDER TEST CONFIGURATION

The Cellular Repeater was configured with AC power supply modules and a digital signal generator was used to simulate various AMPS cellular RF input signals to the EUT. The EUT with host external computer was configured for maxim signl gain and bandwidth. The EUT was operated in a manner representative of the typical usage of the equipment. During all testing, system components were manipulated within the confines of typical usage to maximize each emission.

5.0 TEST TYPE(S)

5.1 Radiated Emissions: 47CFR2.993, 22.901(d), 22.917(e)

5.2 Occupied Bandwidth: 47CFR2.989

5.3 RF Power Output: 47CFR 2.985, 22.913(a)

5.4 Spurious Emission ar Antenna Terminals:(uplink & downlink) 47CFR 2.991

5.5 Intermodulations Spurious Emissions-3 Tone Somultaneous RF Injection (uplink & downlink): 47CFR2.991

6.0 TEST RESULTS

6.1 TEST TYPE: Radiated Emissions

6.1.1 TECHNICAL SPECIFICATION: 2.993; 22.109(d); 22.917(e)

6.1.2 TEST DATE(S): 06 Jul 1998

6.1.3 MEASUREMENT PROCEDURES:

As required by §2.993, *field strength of spurious radiation measurements* were made in accordance with the general procedures of ANSI C63.4-1992 "Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9kHz to 40 GHz". Preliminary radiated emission measurements were performed inside a shielded chamber with all digital signal generators on and terminated. The frequency list from the preliminary measurements was used as a guide for making final measurements on an 10 meter open area test site. The unit was scanned over the frequency range of 30MHz to 9 GHz.
The Radiated Spurious Emissions *Limit* is obtained by the following:
Based on an input power (as measured at the output of the Amplifier) of 3 watts:

$P_o = 3$ W

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As per 2.993 (a), it is assumed this power is to be fed to a half-wave tuned dipole. Using a conversion formula for distance, the field strength at one meter can be derived:

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Install Equation Editor and double-click here to view equation.

Install Equation Editor and double-click here to view equation.

As per 24.238, the spurious emissions must be attenuated by 43 + log(P) which is:
Therefore, the limit for spurious emissions is:
At 3 meters measurement distance, the limit is;
Again, according to 24.238, all signals must be attenuated by 58 dB;
Therefore, the limit for spurious emissions for a test distance of 3 meters is:

Install Equation Editor and double-click here to view equation.

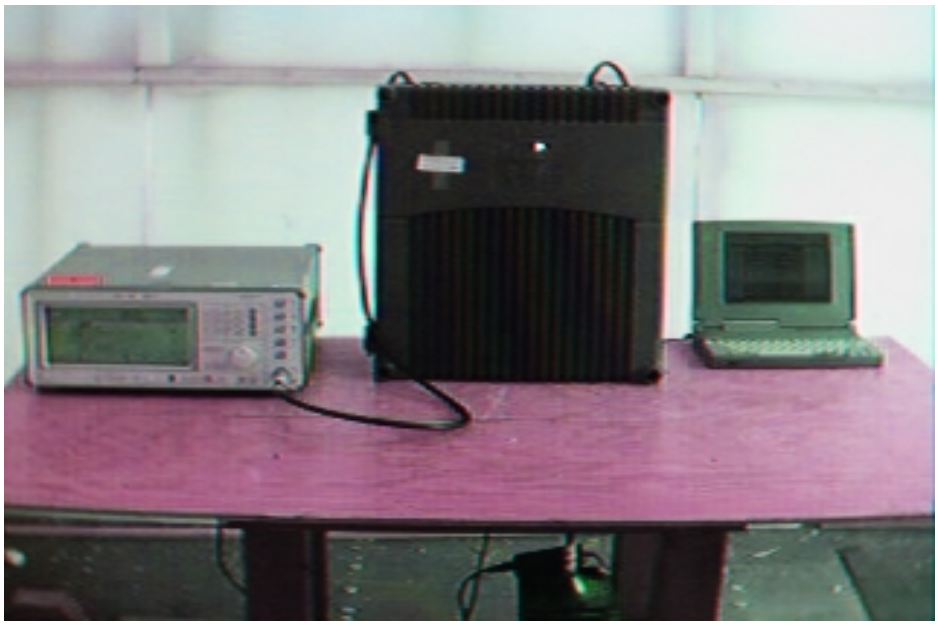
6.1.4 RESULTS:

Carrier Emission: 3 Watts

FREQUENCY (MHz)	EUT AZIMUTH (Degrees)	ANTENNA		EUT RADIATION (dBµV)	ANTENNA FACTOR (dB/m)	TEST DISTANCE (m)	CABLE LOSS (dB)	AMP GAIN MINUS FILTER LOSS (dBµV)	FIELD STRENGTH (dBuV/m)	LIMITS @ 3m (dBuV/m)
		POL (H/V)	HGT (m)							
117.02	0	H	2.0	13.2	14.1	3	1.9	n/a	29.2	84.37
117.02	315	V	1.0	15.6	14.6	3	1.9	n/a	32.1	84.37
172.79	45	H	2.0	18.6	14.8	3	2.4	n/a	35.80	84.37
172.79	45	V	1.0	20.4	16.1	3	2.4	n/a	38.90	84.37
30.77	0	H	2.0	23.3	14.2	3	1.0	n/a	38.5	84.37
30.77	0	V	1.0	25.4	12.0	3	1.0	n/a	38.4	84.37
60.02	225	H	1.5	19.2	10.7	3	1.3	n/a	31.2	84.37
60.02	90	V	1.0	21.2	10.8	3	1.3	n/a	33.3	84.37
459.3	135	H	1.0	12.5	17.3	3	4.1	n/a	33.9	84.37
459.3	180	V	1.5	12.1	17.2	3	4.1	n/a	33.4	84.37
525.8	180	H	1.5	12.0	18.4	3	5.0	n/a	35.4	84.37
525.8	45	V	1.5	11.6	18.4	3	5.0	n/a	35.0	84.37

Equipment meets the specifications of 2.985; 2.993; 24.238(a)

Photograph of Radiated Emissions Test Configuration



6.2 TEST TYPE: Occupied Bandwidth

6.2.1 TECHNICAL SPECIFICATION: 47CFR2.989

6.2.2 TEST DATE(S): 26 Jun 1998

6.2.3 MEASUREMENT PROCEDURES:

As required by §2.989 of CFR 47, *occupied bandwidth measurements* were made on the Cellular Repeater pre- and post- repeater. A digital signal generator was configured to transmit an AMPS FSK FM, TDMA (pi/4 DQPSK), and a CDMA GMSK modulated carrier signal. Using a bandwidth of 300Hz, we determined the occupied bandwidth of the emission at the lowest and highest selectable channel range.

As recommended in §22.917(h)(ii), a 30kHz bandwidth was chosen to measure the peak of any spurious emission at 45 kHz removed from the carrier. The unit was exercised using signal types required by §2.989.

6.2.4 RESULTS:

Equipment complies with Section 2.989. Plots of the occupied bandwidth, as measured at the Repeater/Booster RF input port and at the antenna RF output port (post amplification), are included in this application as file attachment:1stplots.pdf The following plots illustrate that the introduction of the Cellular Repeater, as implemented will not significantly broaden the Cellular signal bandwidth.

6.3 TEST TYPE: RF Power Output

6.3.1 TECHNICAL SPECIFICATION: 47CFR2.985 and 22.913(a)

6.3.2 TEST DATE(S): 25 Jun 1998

6.3.3 MEASUREMENT PROCEDURES:

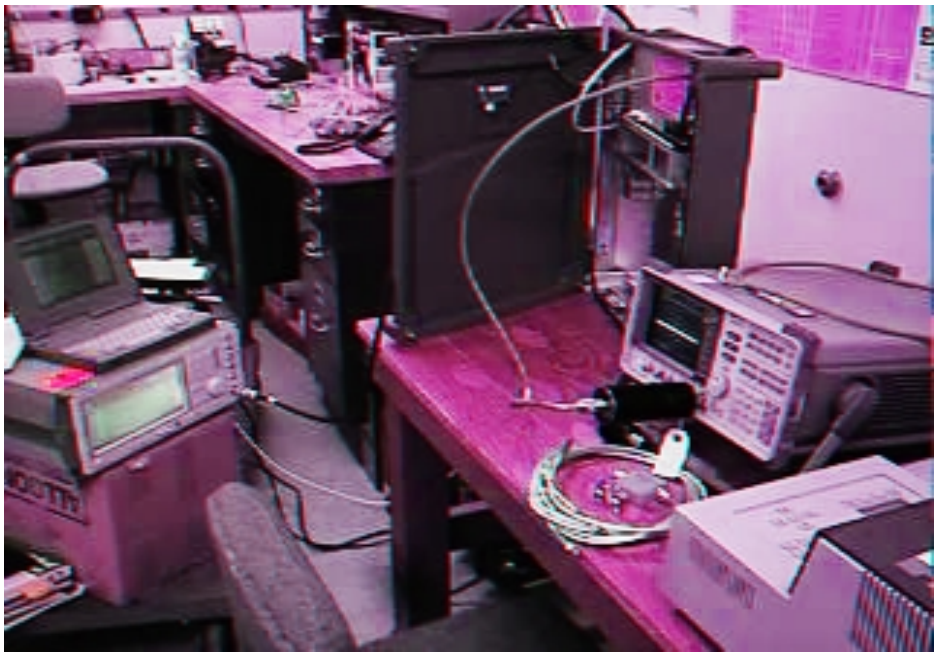
As required by §2.985 of CFR 47, *RF power output measurements* were made at the RF output terminals using an attenuator and spectrum analyzer. This test was performed with carrier modulated by a CDMA (QPSK), TDMA (pi/4 DQPSK), and an AMPS FSK FM modulation signals.

Plots of the RF output Power level of the Digitally modulated carrier, as measured at the RF output of the signal generator and at the RF output terminals of the EUT are included in this application as file attachment **2nd**plots.pdf. The power output was measured for Channels at the low (uplink) and high end (downlink) of the AMPS authorized range. The spectrum analyzer was replaced with an HP RF power meter for comparison.

6.3.4 RESULTS:

Equipment complies with 47CFR 2.985 and 22.913(a). The Cellular repeater/booster power does not exceed 500 W (57 dBm) at the carrier frequency.

Photograph of Antenna Conducted Spurious Emissions and RF Power Output Test Configuration



6.4 TEST TYPE: Spurious Emissions at Antenna Terminals

6.4.1 TECHNICAL SPECIFICATION: 2.991

6.4.2 TEST DATE(S): 29 Jun 1998

6.4.3 MEASUREMENT PROCEDURES:

As required by §2.991 of CFR 47, *spurious emissions at antenna terminal measurements* were made at the RF output terminals using a 50 Ω attenuator and spectrum analyzer set for a 30 kHz bandwidth. This test was performed with Digitally modulated carrier signals. The Digital signal generator was adjusted for continuous transmit on frequencies in both the uplink and down-link frequency bands. The frequency spectrum was investigated from 10.0 KHz to 20.0 GHz. For measuring emissions above 2 GHz, a high-pass filter was used to eliminate the fundamental transmit frequency to prevent possible saturation effects on the front end of the spectrum analyzer.

6.4.4 RESULTS:

Equipment complies with Section 2.991

SUMMARY OF SPURIOUS EMISSIONS AT ANTENNA TERMINALS - UpLink

Frequency Range	Emission Frequency	Emission Level (dBm)	Limit (dBm)
10 kHz - 1.0 MHz	none	n/a	-13.1
1.0 - 1 GHz	none	n/a	-13.1
1 - 2 GHz	1.652	-67.00	-13.1
2 - 2.9 GHz	2.460	-80.67	-13.1
2.9 - 4.0 GHz	3.047	-85.33	-13.1
4.0 - 9.0 Ghz	8.283	-79.33	-13.1

Plots follow are included in this application as file attachment: 3rdplots.pdf

6.5 TEST TYPE: Spurious Emissions at Antenna Terminals

6.5.1 TECHNICAL SPECIFICATION: 2.991

6.5.2 TEST DATE(S): 29 Jun 1998

6.5.3 MEASUREMENT PROCEDURES:

As required by §2.991 of CFR 47, *spurious emissions at antenna terminal measurements* were made at the RF output terminals using a 50 Ω attenuator and spectrum analyzer set for a 30 kHz bandwidth. This test was performed with Digitally modulated carrier signals. The Digital signal generator was adjusted for continuous transmit on frequencies in both the uplink and down-link frequency bands. The frequency spectrum was investigated from 10.0 KHz to 20.0 GHz. For measuring emissions above 2 GHz, a high-pass filter was used to eliminate the fundamental transmit frequency to prevent possible saturation effects on the front end of the spectrum analyzer.

6.5.4 RESULTS:

Equipment complies with Section 2.991

SUMMARY OF SPURIOUS EMISSIONS AT ANTENNA TERMINALS - DownLink

Frequency Range	Emission Frequency (GHz)	Emission Level (dBm)	Limit (dBm)
10 kHz - 1.0 MHz	none	n/a	-13.1
1.0 MHz - 1 Ghz	none	n/a	-13.1
1.0 - 2.0 Ghz	1.747	-63.33	-13.1
2 - 2.9 GHz	2.624	-72.83	-13.1
2.9 - 4.0 GHz	3.754	-85.33	-13.1
4.0 - 9.0 Ghz	8.017	-80.00	-13.1

Plots of the spurious emissions as measured at the antenna port are included in this application as file attachment **4th**plots.pdf

6.6 TEST TYPE: Intermodulations Spurious Emissions Antenna Terminals

6.6.1 TECHNICAL SPECIFICATION: 47CFR2.991

6.6.2 TEST DATE(S): 7-9 Jul 1998

6.6.3 MEASUREMENT PROCEDURES: (UPLINK)

Spurious emissions were measured at the antenna terminal with the Digital signal generator tuned to transmit on a frequency in the uplink of its tuneable range.

6.6.4 RESULTS:

Equipment complies with 47CFR 2.991. Plots of the spurious emissions as measured at the antenna port are included in this application as file attachment: 5thplots.pdf.

Uplink - Input tone Frequencies : F_1 = 825.0 MHz ; F_2 = 826.0 MHz ; F_3 = 840.0 MHz

modulation type	Intermodulation products (MHz)	Emission Level (dBm)	Limit (dBm)
FM, FSK	839.0	-16.9	-13.0
FM, FSK	841.0	-22.1	-13.0
FM, FSK	854.0	-30.8	-13.0
FM, FSK	855.0	-33.5	-13.0
FM, FSK	853.0	-38.2	-13.0
CDMA, GMSK	854.1	-43.5	-13.0
TDMA, Pi/4 DQPSK	839.0	-22.0	-13.0
TDMA, Pi/4 DQPSK	841.0	-22.0	-13.0
TDMA, Pi/4 DQPSK	854.0	-30.0	-13.0
TDMA, Pi/4 DQPSK	855.0	-28.1	-13.0
TDMA, Pi/4 DQPSK	853.0	-37.0	-13.0
TDMA, Pi/4 DQPSK	852.0	-39.0	-13.0

6.7 TEST TYPE: Intermodulations Spurious Emissions Antenna Terminals

6.7.1 TECHNICAL SPECIFICATION: 2.991

6.7.2 TEST DATE(S): 7-9 Jul 1998

6.7.3 MEASUREMENT PROCEDURES: (DOWNLINK)

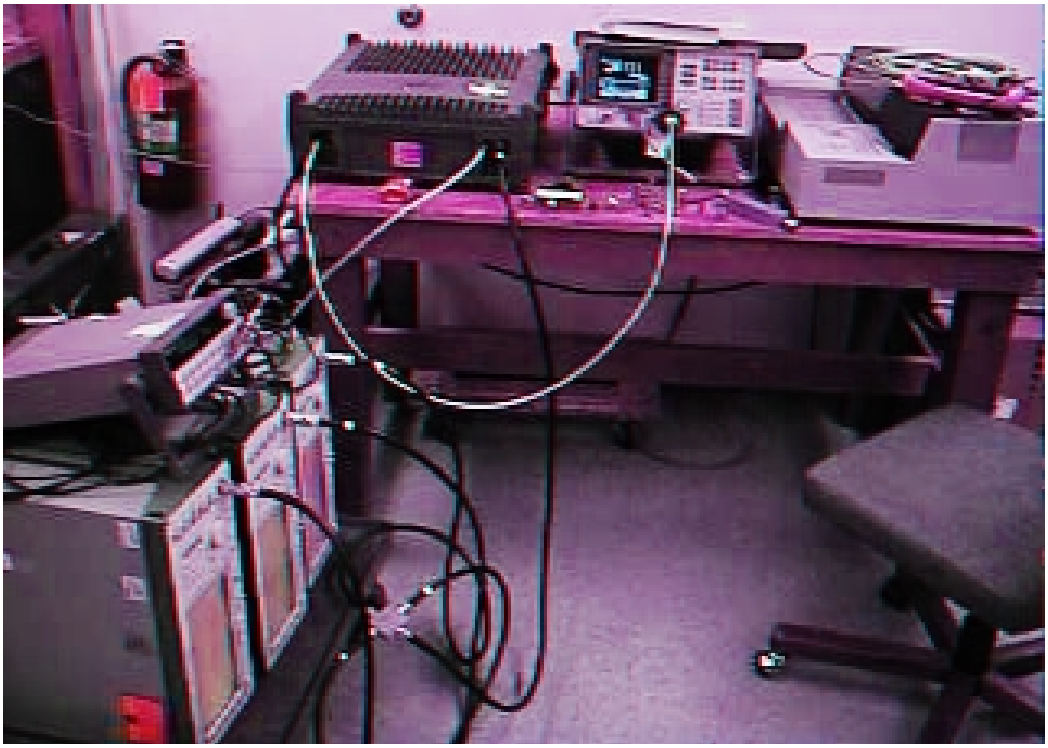
Modulation products outside of the authorized band are attenuated at least 43 + 10 Log (P) below the level of the modulated carrier.

6.7.4 RESULTS:

Equipment complies with 47CFR 2.991. Plots of the spurious emissions as measured at the antenna port are included in this application as file attachment 6thplots.pdf

Intermodulation Spurious Products from 3-tone Simulaneous RF Injection Downlink
Input tone Frequencies : F_1 = 869.0 MHz ; F_2 = 870.0 MHz ; F_3 = 885.0 MHz

modulation type	Intermodulation products (MHz)	Emission Level (dBm)	Limit (dBm)
FM, FSK	886.0	-15.1	-13.0
FM, FSK	884.0	-16.6	-13.0
FM, FSK	900.0	-25.5	-13.0
FM, FSK	901.0	-23.7	-13.0
CDMA, GMSK	898.0	-28.9	-13.0
CDMA, GMSK	855.0	-32.8	-13.0
TDMA, Pi/4 DQPSK	839.0	-22.0	-13.0
TDMA, Pi/4 DQPSK	841.0	-22.0	-13.0
TDMA, Pi/4 DQPSK	854.0	-30.0	-13.0
TDMA, Pi/4 DQPSK	855.0	-28.1	-13.0
TDMA, Pi/4 DQPSK	853.0	-37.0	-13.0
TDMA, Pi/4 DQPSK	852.0	-39.0	-13.0



Photograph of Antenna Conducted Intermodulation Distortion Spurious Emissions Test Configuration