

MEASUREMENT/TECHNICAL REPORT

Company: Krohne, Inc.

FRN: 0006-7986-64

Model: BM 70 A

FCC ID: JH5-70

Description: This is a report to support a request for an original grant of equipment authorization.

Equipment Type: Radiolocation device

Report prepared for:

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Introduction

This report is an application for Certification of a Transmitter operating pursuant to Part 15.209 of the FCC Rules, 47 CFR. The model number covered by this report is BM 70 A. This report is designed to demonstrate the compliance of this device with the requirements outlined in 47 CFR Part 15 using the methods outlined in 47 CFR Part 2.

The BM 70 A, in its most general form, is an FCC Part 90 licensed device. This application is an attempt to gain certification as an unlicensed transmitter under Part 15 using a waiver for operation in the band 9-10GHz issued by the FCC to Krohne on October 26, 2001 (included). As per the conditions of the waiver, this application is only for those installations of the BM 70 A which are inside a steel tank.

The BM 70 A Level-Radar level gauging system can be implemented in various different configurations, each consisting of a combination of certain options. The particular options considered in this application for certification are listed below: (those options used during testing are indicated with an asterisk)

Power Supply: 1) 24V DC *
2) 115/230V AC *

Antenna Type: 1) Wave-Stick *
2) 8" Horn (Type 4)
3) 6" Horn (Type 3) *
4) 4" Horn (Type 2)
5) 3" Horn (Type 1)

Signal Output: 1) Ex-e current output HART® *
2) Ex-i current output HART®
3) Current output
4) RS 485 + current output *
5) PROFIBUS FMS/DP
6) PROFIBUS PA
7) Foundation Fieldbus (FF) *

The following factors and assumptions were considered in producing a test plan which would conservatively cover the entire range of configurations:

- 1) It is unlikely that there would exist differences in emissions characteristics between...
 - a) ...the two power supply options at frequencies above 1GHz.
 - b) ...the seven signal output options at frequencies above 1GHz.
 - c) ...the three antenna types at frequencies below 1GHz.
- 2) It has been determined that three of the seven signal output options would be representative of the entire group regarding emissions characteristics: Ex-e current output HART®, RS 485 + current output, and Foundation Fieldbus. The interface options do not impact the operation of the transmitter and the three samples chosen represent the most fully featured versions of the seven available variants.

- 3) With regards to the voltage variation measurements, (pursuant to 47 CFR 15.31(e)) it has been determined sufficient to test the DC power supply option only. This determination was based on the fact that the AC power option delivers 24VDC power to the same 24V DC module used in the DC only configuration.
- 4) The sample tank used for testing can accommodate only up to a 6" horn antenna. All horn antenna testing was performed using the 6" horn. As the horn size increases, so does the gain of the antenna. Since the output of the transmitter cannot be varied, the worst-case configuration would be with the 8" horn. To compensate for the use of the 6" horn during testing, an out of tank measurement was made with both the 6" and 8" horns. This allowed us to generate a correction factor to determine the compliance of the worst-case 8" horn configuration.

The resultant test plan is shown below:

- 1) Determine a correction factor to be added to the emissions measurements taken at the fundamental operating frequency of the BM 70 A w/ 6" Horn, in order to represent the emissions at the fundamental operating frequency of a properly implemented BM 70 A w/ 8" Horn. Determine the correction factor by taking measurements at the fundamental operating frequency of both antennas operating in "open air" with identical (maximized) positions relative to the receiving antenna.
- 2) Perform radiated emissions scans from 1 to 40GHz of both the 6" Horn, and Wave-Stick antennas using either power option and any communication option.
- 3) Perform radiated emissions scans from 30MHz to 1GHz of the following three configurations:
a) AC supply; Wave-Stick; Ex-e current output HART® b) DC supply; 6" Horn; Foundation Fieldbus c) DC supply; 6" Horn; RS 485 + current output
- 4) Perform six conducted emissions scans from 450kHz to 30MHz consisting of both the DC supply and AC supply each in conjunction with the three representative signal output alternatives.
- 5) Perform the voltage variation measurements with any configuration, which has DC as its power supply option.

Calculation of Duty Cycle Correction Factor

47 CFR 15.35(c) provides for an alternative method of representing a measurement of an emission above 1000MHz. Under normal circumstances, measurements of emissions above 1000MHz are taken with an average detector. In cases where it is not possible to use an average detector, it is acceptable to use a peak detector, provided that a correction factor is determined which correlates a peak measurement and an average measurement by way of a duty cycle calculation. The worst-case duty cycle is given as the maximum percentage of 100ms during which the source of the emission could be operating. This value is then multiplied by the peak reading (in $\mu\text{V/m}$) to give the average reading (in $\mu\text{V/m}$), or $20 \cdot \log(\text{duty cycle})$ may be subtracted from the peak reading (in $\text{dB}\mu\text{V/m}$) to give the average reading (in $\text{dB}\mu\text{V/m}$).

The BM 70 A is a swept frequency device. The frequency sweeps through 1GHz worth of spectrum in 20ms. The minimum time between sweeps is 200ms. There are inter-sweep calibration cycles which occur as well. The worst-case calibration process is a "rectangular" calibration which transmits a fixed frequency for 18ms. Only a single 18ms rectangular

calibration cycle will appear between any two given frequency sweeps. The amount of time that the swept frequency spends within a certain 1MHz bandwidth is $20\text{ms}/(1\text{GHz}/1\text{MHz}) = 20\mu\text{s}$. For this calculation, a more severe value of 1ms was used. Therefore the worst-case duty cycle is $(18\text{ms} + 1\text{ms})/100\text{ms} = 0.19$ or 19%.

The correction factor used was $20 \cdot \log(0.19) = -14.4\text{dB}\mu\text{V/m}$.

Statement of Conformity

The Krohne, Inc. BM 70 A has been found to conform to the following parts of the 47 CFR as detailed below:

Part 2	Part 15	Comments
	15.15(b)	The product contains no user accessible controls that increase transmission power above allowable levels.
2.925	15.19	The label is shown in the label exhibit.
	15.21	Information to the user is shown in the instruction manual exhibit.
	15.27	A section in the installation manual details the use of special accessories that are required for compliance.
	15.31(e)	Measurements were taken of the fundamental operating frequency as the DC voltage was varied 15% below the lowest and above the highest nominal rated voltages.
	15.205	The fundamental operating frequency range includes two restricted bands from 15.205. (9.0-9.2GHz and 9.3-9.5GHz) Krohne has been granted a waiver by the FCC, which is included with this application.
	15.209	All other emissions comply with the general emission limits of 15.209.
	15.207	The unit complies with the conducted limits of 15.207.

Test Methodology

Radiated emission testing was performed according to the procedures in ANSI C63.4 (1992). The testing was performed at an antenna to EUT distance of 3 or 1 meter(s) below 18 GHz, and at a distance of 0.1 meter above 18 GHz. The actual test distance used is noted in the test data sheets. The device's performance was investigated to 40GHz. The emissions were maximized around the vertical axis and the maximum reading was recorded. The antenna cannot be maximized separately.

All other performance tests were made in accordance with the procedures outlined in 47 CFR Part 15. The applicable sections provided under Part 15 are provided in the measurement section of this report.

Test Facility

Curtis-Straus LLC

All radiated emissions testing in the range 30–40,000MHz was performed at Curtis-Straus (A2LA Certificate Number 1627-01). The open area test site used to collect the radiated data is located at 527 Great Road, Littleton, MA 01460. Site “T” was used.

Test Equipment Used

SPECTRUM ANALYZERS					
x	Analyzer	Model No.	Company	Serial No.	Calibration Due
X	BLUE 9kHz-1.8GHz	8591E	HP	3223A00227	14-SEP-2002
X	GREEN 9kHz-26.5GHz	8593E	HP	3829A03618	04-OCT-2002
X	ORANGE 9kHz-26.5GHz	E4407B	HP	US39440975	18-MAY-2002

LISNs					
x	LISN	Model No.	Company	Serial No.	Calibration Due
	YELLOW-BLACK 10kHz-30MHz	8012-50-R-24-BNC	Solar	984735	02-OCT-2002

OPEN AREA TEST SITES (OATS)					
x	Site	FCC Code	IC Code	VCCI Code	Calibration Due
	“T” Texas	93448	IC 2762-T	R-905/ C-480	09-SEP-2002

ANTENNAS					
x	Antenna	Model No.	Company	Serial No.	Calibration Due
X	GREEN-WHITE Bilog: 30MHz-2GHz	CBL6112B	Chase	2574	28-JUN-2002
X	RED Bilog: 30MHz-1GHz	3143	EMCO	1270	28-JUN-2002
X	ORANGE Horn: 1-18GHz	3115	EMCO	0004-6123	27-MAY-2002
X	WHITE Std Gain Horn: 18-26.5GHz	3160-09	EMCO	9610-1068	26-JUN-2002

<i>HARMONIC MIXER</i>					
x	Mixer	Model No.	Company	Serial No.	Calibration Due
X	HARMONIC MIXER 26.5-40 GHz	11970A	HP	2332A00900	07-JUL-2002

<i>PREAMPLIFIERS</i>					
x	Preamplifier	Model No.	Company	Serial No.	Calibration Due
X	BLUE 0.01-2000MHz	ZFL-1000-LN	MiniCircuits/ C-S	n/a	18-MAY-2002
X	ORANGE 0.01-2000MHz	ZFL-1000-LN	MiniCircuits/ C-S	n/a	22-FEB-2003
X	ORANGE-BLACK 1-20GHz	SMC-12A	MITEQ	690639	06-AUG-2002

Unless otherwise noted the calibration interval is one year. All equipment is calibrated using standards traceable to NIST or other nationally recognized calibration standard.

Measurement Results

Operating Frequency

This device operates in the range 8.5-9.5GHz.

Radiated and Conducted Electric Field Strength Measurements

Antenna Comparison Table				Curtis-Straus LLC		
Date: 05-Dec-01		Company: Krohne, Inc.				
Engineer: Evan Gould		EUT Desc: Level Radar BM 70 A				
Work Order: B1249		Measurement Distance: 3 m				
Frequency Range: 10GHz Fundamental						
Notes: AC supply; Standard display; Ex-e current output HART EUT's antenna pointed straight at receiving antenna Maximized approx. 110cm off of ground plane						
Antenna Polarization (H / V)	Frequency (MHz)	Reading (dBμV)	Preamp Factor (dB)	Antenna Factor (dB/m)	Cable Factor (dB)	Adjusted Reading (dBμV/m)
Wave-Stick Antenna			---	---	---	---
H	9288.0	80.4	0.0	39.2	4.4	124.0
6-inch Horn			---	---	---	---
H	9340.0	82.7	0.0	39.0	4.4	126.1
8-inch Horn			---	---	---	---
H	9321.0	84.5	0.0	39.1	4.4	128.0
Test Site: "T"			Pre-Amp: none		Cable: 3m Microflex	
Analyzer: Orange			Antenna: Orange Horn			

Note: The preceding data table shows that the difference in electric field strength amplitude between the 8" Horn antenna and the 6" Horn antenna is 2dB. Since the measurements that follow prove that the 6" Horn antenna passes the limits specified in 47 CFR 15.209(a) by *at least* 2dB, it follows that the 8" Horn antenna passes those limits as well.

Radiated Emissions Table								Curtis-Straus LLC		
Date: 01-Feb-02 Engineer: Evan Gould				Company: Krohne, Inc. EUT Desc: BM 70 A				Table 2 Work Order: B1249		
Frequency Range: 1-18GHz				Measurement Distance: 1 m						
Notes: 6" Horn				EUT Max Freq: 9.5GHz				Analyzer: Orange		
Antenna Polarization (H / V)	Frequency (MHz)	Reading (dBμV)	Preamp Factor (dB)	Antenna Factor (dB/m)	Cable Factor (dB)	Averaging Factor (dBμV)	Adjusted Reading (dBμV/m)	47 CFR 15.209(a)		
								Limit (dBμV/m)	Margin (dB)	Result (Pass/Fail)
V pk	9343.0	49.8	20.8	37.7	4.4	14.4	56.7	63.5	-6.8	Pass
H pk	9388.0	48.0	20.9	37.7	4.4	14.4	54.8	63.5	-8.7	Pass
Table Result: Pass				by -6.8 dB				Worst Freq: 9343.0 MHz		
Test Site: "T"				Pre-Amp: Or-Blk Cable: 3m Microflex				Antenna: Orange Horn		

Radiated Emissions Table								Curtis-Straus LLC		
Date: 07-Feb-02 Engineer: Evan Gould				Company: Krohne, Inc. EUT Desc: BM 70 A				Table 3 Work Order: B1249		
Frequency Range: 1-18GHz				Measurement Distance: 1 m						
Notes: Wave-Stick limit includes averaging factor				EUT Max Freq: 9.5GHz				Analyzer: Orange		
Antenna Polarization (H / V)	Frequency (MHz)	Reading (dBμV)	Preamp Factor (dB)	Antenna Factor (dB/m)	Cable Factor (dB)	Averaging Factor (dBμV)	Adjusted Reading (dBμV/m)	47 CFR 15.209(a)		
								Limit (dBμV/m)	Margin (dB)	Result (Pass/Fail)
H	9358.0	50.2	20.8	37.7	3.3	14.4	56.0	63.5	-7.5	Pass
Table Result: Pass				by -7.5 dB				Worst Freq: 9358.0 MHz		
Test Site: "T"				Pre-Amp: Or-Blk Cable: 3m Microflex				Antenna: Orange Horn		

In order for the WaveStick to pass the 47 CFR 15.209(a) limits as shown above, the following was required:

- 3/4" steel bolts used to join antenna flange to tank flange.
- CAD plated steel washers on both top and bottom flanges; one between the bolt heads and top flange, the other between the nut and bottom flange.
- Shielding strip placed in gap between flanges and secured in place with the strap retainer (both parts detailed in installation manual)

Radiated Emissions Table								Curtis-Straus LLC		
Date: 07-Feb-02 Engineer: Evan Gould				Company: Krohne, Inc. EUT Desc: BM 70 A				Table 3.5 Work Order: B1249		
Frequency Range: 18-40GHz				Measurement Distance: 0.1 m						
Notes: 6" Horn -AND- Wave-Stick				EUT Max Freq: 9.5GHz				Test Site: "T"		
Antenna Polarization (H / V)	Frequency (MHz)	Reading (dBμV)	Preamp Factor (dB)	Antenna Factor (dB/m)	Cable Factor (dB)	Adjusted Reading (dBμV/m)		47 CFR 15.209(a)		
								Limit (dBμV/m)	Margin (dB)	Result (Pass/Fail)
noise floor	26500.0	36.9	0.0	41.3	---	78.2		83.5	-5.3	Pass
noise floor	40000.0	33.1	0.0	44.1	---	77.2		83.5	-6.3	Pass
Table Result: Pass				by -5.3 dB				Worst Freq: 26500.0 MHz		
18-26.5GHz >>				Pre-Amp: HF Cable: 3m Microflex				Analyzer: Orange Antenna: High F Horn		
26.5-40GHz >>				Pre-Amp: none Cable: 40GHz Mixer				Analyzer: Orange Antenna: 40GHz Mixer		

Radiated Emissions Table							Curtis-Straus LLC		
Date: 05-Dec-01			Company: Krohne, Inc.				Table 4		
Engineer: Evan Gould			EUT Desc: BM 70 A				Work Order: B1249		
Frequency Range: 30-1000MHz					Measurement Distance: 1 m				
Notes: AC supply; Ex-e current output HART; Wave-Stick					EUT Max Freq: 9.5GHz				
Antenna Polarization (H / V)	Frequency (MHz)	Reading (dBμV)	Preamp Factor (dB)	Antenna Factor (dB/m)	Cable Factor (dB)	Adjusted Reading (dBμV/m)	47 CFR 15.209(a)		
							Limit (dBμV/m)	Margin (dB)	Result (Pass/Fail)
V	90.0	30.2	22.5	8.6	0.8	17.1	53.0	-35.9	Pass
H	240.0	40.3	22.5	11.5	1.7	31.0	55.5	-24.5	Pass
H	280.0	49.1	22.6	12.7	1.9	41.1	55.5	-14.4	Pass
H	290.0	43.2	22.6	12.9	2.0	35.5	55.5	-20.0	Pass
H	320.0	47.6	22.6	13.6	2.1	40.7	55.5	-14.8	Pass
H	330.0	39.7	22.6	13.9	2.1	33.1	55.5	-22.4	Pass
H	608.0	45.4	22.3	18.7	3.2	45.0	55.5	-10.5	Pass
H	612.5	37.1	22.3	18.8	3.2	36.8	55.5	-18.7	Pass
V	906.0	30.6	22.4	20.6	4.1	32.9	55.5	-22.6	Pass
V	937.3	44.2	22.3	20.9	4.2	47.0	55.5	-8.5	Pass
Table Result:		Pass	by	-8.5 dB			Worst Freq:		937.3 MHz
Test Site: "T"		Pre-Amp: Blue		Cable: 65 ft RG8A/U		Analyzer: Green		Antenna: Grn-Wht	

Radiated Emissions Table							Curtis-Straus LLC		
Date: 25-Jan-02			Company: Krohne, Inc.			Table 5			
Engineer: Evan Gould			EUT Desc: BM 70 A			Work Order: B1249			
Frequency Range: 30-1000MHz					Measurement Distance: 3 m				
Notes: DC supply; Foundation Fieldbus; 6" Horn					EUT Max Freq: 9.5GHz				
Antenna Polarization (H / V)	Frequency (MHz)	Reading (dBµV)	Preamp Factor (dB)	Antenna Factor (dB/m)	Cable Factor (dB)	Adjusted Reading (dBµV/m)	47 CFR 15.209(a)		
							Limit (dBµV/m)	Margin (dB)	Result (Pass/Fail)
V	215.0	34.1	24.7	11.0	1.6	22.0	43.5	-21.5	Pass
V	240.0	52.7	24.7	12.2	1.7	41.9	46.0	-4.1	Pass
V	280.0	39.4	24.6	13.5	1.9	30.2	46.0	-15.8	Pass
V	320.0	34.2	24.5	14.4	2.1	26.2	46.0	-19.8	Pass
V	340.0	31.3	24.5	14.8	2.1	23.7	46.0	-22.3	Pass
V	200.0	42.9	24.8	10.2	1.5	29.8	43.5	-13.7	Pass
Table Result: Pass by -4.1 dB Worst Freq: 240.0 MHz									
Test Site: "T"		Pre-Amp: Orange		Cable: 65 ft RG8A/U		Analyzer: Green		Antenna: Red	

Radiated Emissions Table							Curtis-Straus LLC		
Date: 25-Jan-02			Company: Krohne, Inc.			Table 6			
Engineer: Evan Gould			EUT Desc: BM 70 A			Work Order: B1249			
Frequency Range: 30-1000MHz					Measurement Distance: 3 m				
Notes: DC supply; RS485 + current output; 6" Horn					EUT Max Freq: 9.5GHz				
Antenna Polarization (H / V)	Frequency (MHz)	Reading (dBµV)	Preamp Factor (dB)	Antenna Factor (dB/m)	Cable Factor (dB)	Adjusted Reading (dBµV/m)	47 CFR 15.209(a)		
							Limit (dBµV/m)	Margin (dB)	Result (Pass/Fail)
V	240.0	46.6	24.7	12.2	1.7	35.8	46.0	-10.2	Pass
H	275.6	41.5	24.6	13.4	1.9	32.2	46.0	-13.8	Pass
H	280.0	45.2	24.6	13.5	1.9	36.0	46.0	-10.0	Pass
H	300.7	48.1	24.6	14.0	2.0	39.5	46.0	-6.5	Pass
H	350.8	48.2	24.5	15.1	2.2	41.0	46.0	-5.0	Pass
V	596.8	34.7	24.2	19.0	3.1	32.6	46.0	-13.4	Pass
Table Result: Pass by -5.0 dB Worst Freq: 350.8 MHz									
Test Site: "T"		Pre-Amp: Orange		Cable: 65 ft RG8A/U		Analyzer: Green		Antenna: Red	

AC Mains Conducted Emissions							Curtis-Straus LLC	
Date: 05-Dec-01			Company:Krohne			Table No: 7		
Engineer: Evan Gould			EUT Desc:Level Radar BM 70 A			Work Order: B1249		
Notes: 8-inch horn; AC supply; Ex-e current output HART								
Range: 0.45-30Mhz			LISN(s): Yellow-Black			Spectrum Analyzer: Blue		
Frequency (MHz)	Q.P. Readings		Ave. Readings		Impedance Factor (dB)	47 CFR 15.207(a)		Overall Result (Pass/Fail)
	QP1 (dBµV)	QP2 (dBµV)	AV1 (dBµV)	AV2 (dBµV)		Limit (dBµV)	Margin dB	
0.45	9.3	8.1			20.0	47.9	-18.6	Pass
1.64	6.0	6.8			20.0	47.9	-21.1	Pass
4.40	4.6	3.4			20.0	47.9	-23.3	Pass
9.78	5.5	5.8			20.0	47.9	-22.1	Pass
16.30	3.1	5.7			20.0	47.9	-22.2	Pass
24.90	3.9	3.0			20.0	47.9	-24.0	Pass
Table Result: Pass by -18.6 dB Worst Freq: 0.5 MHz								

AC Mains Conducted Emissions							Curtis-Straus LLC	
Date: 05-Dec-01			Company: Krohne			Table No: 8		
Engineer: Evan Gould			EUT Desc: Level Radar BM 70 A			Work Order: B1249		
Notes: 8-inch horn; AC supply; Foundation Fieldbus								
Range: 0.45-30Mhz			LISN(s): Yellow-Black		Spectrum Analyzer: Blue			
Frequency (MHz)	Q.P. Readings		Ave. Readings		Impedance Factor (dB)	47 CFR 15.207(a)		Overall Result (Pass/Fail)
	QP1 (dBµV)	QP2 (dBµV)	AV1 (dBµV)	AV2 (dBµV)		Limit (dBµV)	Margin dB	
0.45	10.3	9.7			20.0	47.9	-17.6	Pass
2.54	8.1	7.4			20.0	47.9	-19.8	Pass
9.18	7.9	7.9			20.0	47.9	-20.0	Pass
11.87	11.9	5.7			20.0	47.9	-16.0	Pass
16.12	5.5	3.7			20.0	47.9	-22.4	Pass
20.90	6.5	3.4			20.0	47.9	-21.4	Pass
Table Result:		Pass	by		-16.0 dB	Worst Freq:		11.9 MHz

AC Mains Conducted Emissions							Curtis-Straus LLC	
Date: 05-Dec-01			Company: Krohne			Table No: 9		
Engineer: Evan Gould			EUT Desc: Level Radar BM 70 A			Work Order: B1249		
Notes: 8-inch horn; AC supply; RS-485 + current output								
Range: 0.45-30Mhz			LISN(s): Yellow-Black		Spectrum Analyzer: Blue			
Frequency (MHz)	Q.P. Readings		Ave. Readings		Impedance Factor (dB)	47 CFR 15.207(a)		Overall Result (Pass/Fail)
	QP1 (dBµV)	QP2 (dBµV)	AV1 (dBµV)	AV2 (dBµV)		Limit (dBµV)	Margin dB	
0.45	7.9	9.4			20.0	47.9	-18.5	Pass
5.75	5.0	3.8			20.0	47.9	-22.9	Pass
11.49	5.3	3.7			20.0	47.9	-22.6	Pass
17.10	5.7	3.9			20.0	47.9	-22.2	Pass
21.30	5.4	4.7			20.0	47.9	-22.5	Pass
26.60	6.5	3.5			20.0	47.9	-21.4	Pass
Table Result:		Pass	by	-18.5 dB	Worst Freq:		0.5 MHz	

AC Mains Conducted Emissions							Curtis-Straus LLC	
Date: 05-Dec-01			Company:Krohne			Table No: 10		
Engineer: Evan Gould			EUT Desc:Level Radar BM 70 A			Work Order: B1249		
Notes: Wave-Stick; DC supply; Ex-e current output HART								
Range: 0.45-30Mhz			LISN(s): Yellow-Black			Spectrum Analyzer: Blue		
Frequency (MHz)	Q.P. Readings		Ave. Readings		Impedance Factor (dB)	47 CFR 15.207(a)		Overall Result (Pass/Fail)
	QP1 (dBµV)	QP2 (dBµV)	AV1 (dBµV)	AV2 (dBµV)		Limit (dBµV)	Margin dB	
0.45	9.6	6.6			20.0	47.9	-18.3	Pass
3.51	8.1	5.3			20.0	47.9	-19.8	Pass
7.39	8.1	3.1			20.0	47.9	-19.8	Pass
13.81	8.1	2.6			20.0	47.9	-19.8	Pass
19.85	5.7	2.2			20.0	47.9	-22.2	Pass
25.30	7.0	3.2			20.0	47.9	-20.9	Pass
Table Result: Pass by -18.3 dB Worst Freq: 0.5 MHz								

AC Mains Conducted Emissions							Curtis-Straus LLC	
Date: 05-Dec-01			Company:Krohne			Table No: 11		
Engineer: Evan Gould			EUT Desc:Level Radar BM 70 A			Work Order: B1249		
Notes: Wave-Stick; DC supply; Foundation Fieldbus								
Range: 0.45-30Mhz			LISN(s): Yellow-Black			Spectrum Analyzer: Blue		
Frequency (MHz)	Q.P. Readings		Ave. Readings		Impedance Factor (dB)	47 CFR 15.207(a)		Overall Result (Pass/Fail)
	QP1 (dBµV)	QP2 (dBµV)	AV1 (dBµV)	AV2 (dBµV)		Limit (dBµV)	Margin dB	
0.45	9.0	9.7			20.0	47.9	-18.2	Pass
3.58	7.3	6.5			20.0	47.9	-20.6	Pass
10.37	5.9	2.9			20.0	47.9	-22.0	Pass
19.55	5.5	4.3			20.0	47.9	-22.4	Pass
23.10	6.6	6.0			20.0	47.9	-21.3	Pass
28.50	6.3	5.5			20.0	47.9	-21.6	Pass
Table Result: Pass by -18.2 dB Worst Freq: 0.5 MHz								

AC Mains Conducted Emissions							Curtis-Straus LLC	
Date: 05-Dec-01			Company: Krohne			Table No: 12		
Engineer: Evan Gould			EUT Desc: Level Radar BM 70 A			Work Order: B1249		
Notes: Wave-Stick; DC supply; RS-485 + current output								
Range: 0.45-30Mhz			LISN(s): Yellow-Black		Spectrum Analyzer: Blue			
Frequency (MHz)	Q.P. Readings		Ave. Readings		Impedance Factor (dB)	47 CFR 15.207(a)		Overall Result (Pass/Fail)
	QP1 (dBµV)	QP2 (dBµV)	AV1 (dBµV)	AV2 (dBµV)		Limit (dBµV)	Margin dB	
0.45	8.0	8.4			20.0	47.9	-19.5	Pass
5.67	7.3	5.0			20.0	47.9	-20.6	Pass
10.00	5.3	4.7			20.0	47.9	-22.6	Pass
16.40	5.7	3.7			20.0	47.9	-22.2	Pass
22.20	5.9	4.6			20.0	47.9	-22.0	Pass
27.60	5.9	3.3			20.0	47.9	-22.0	Pass
Table Result: Pass by -19.5 dB Worst Freq: 0.5 MHz								

Voltage Variation Table

Date: 01-Feb-02			Company: Krohne America			
Engineer: Evan Gould			EUT Desc: BM70A			
Work Order: B1249						
Frequency Range: 8-11GHz						
Notes: 6-inch horn						
Antenna Polarization (H / V)	Frequency (MHz)	Reading (dBμV)	Preamp Factor (dB)	Antenna Factor (dB/m)	Cable Factor (dB)	Adjusted Reading (dBμV/m)
15.3V	9478.0	89.7	21.0	37.6	4.4	110.7
24V	9478.0	90.0	21.0	37.6	4.4	111.0
35.9V	9478.0	89.6	21.0	37.6	4.4	110.6
Test Site: "T"			Pre-Amp: Or-Blk		Cable: 3m Microflex	
Analyzer: Orange			Antenna: Orange Horn			

There was little or no change as the DC input voltage was changed through the required range.

Emissions Plots









