

Straubing, 31 March 2004

Test Report No.: 56502-40188

TEST-REPORT

No. 56502-40188

for

Remotus BC 8518

UHF Handheld Transmitter

Applicant: Akerströms Björbo AB

Test Specification: FCC Code of Federal Regulations,

Part 15 Subpart C, Section 15.231

Note:

The test data of this report relate only to the individual item which has been tested. This report shall not be reproduced except in full extent without the written approval of the testing laboratory.



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1. Administrative Data

-
Remotus BC 8518
92 8677-000-0650
UHF Handheld Transmitter
OG4BC8518
433.050 MHz - 434.790 MHz
434.650 MHz
10K0F1D
N/A
N/A
Integrated
Battery 7.4 V
Akerströms Björbo AB S-780 45 Björbo
Mr. Bernt Eriksson
Akerströms Björbo AB
22.March 2004
22 - 26 March 2004
Thomas Eberl
Thomas Eberl



2. Identification of Test Laboratory

DETAILS OF THE TEST LABORATORY

COMPANY NAME: Senton GmbH EMI/EMC Test Center

ADDRESS: Aeussere Fruehlingsstrasse 45

D-94315 Straubing

Germany

LABORATORY ACCREDITATION: DAR-Registration No. TTI-P-G 062/94-01

FCC TEST SITE LISTING 90926

INDUSTRY CANADA TEST SITE

REGISTRATION

IC 3050

NAME FOR CONTACT PURPOSES: Mr. Johann Roidt

TELEPHONE: (+49) (0)9421 5522-0 FAX: (+49) (0)9421 5522-99

LABORATORY MANAGER: Mr. Johann Roidt RESPONSIBLE FOR TESTING: Mr. Thomas Eberl RESPONSIBLE FOR TEST REPORT: Mr. Thomas Eberl



SUMMARY OF TEST RESULTS

The tested sample complies with the requirements set forth in the FCC Code of Federal Regulations
Part 15, Subpart C, Section 15.231



3. Operation Mode of EUT

While one button is pressed, the transmitter continuously sends the corresponding datagram. When the button is released, the transmitter stops working instantly.



4. Configuration
Configuration of the EUT
Not applicable
Cables connected to the EUT
Not applicable
Peripheral devices connected to the EUT
Not applicable



5.	Measuring	Methods
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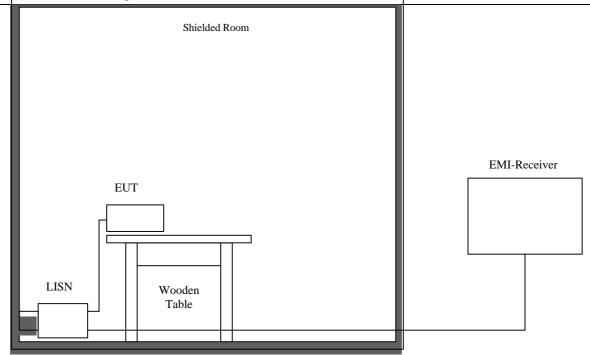


5.1. Conducted powerline emissions

Rules and Specifications:	Sections 15.107 & 15.207
Guide:	CISPR 22

Measurement Procedure:

In general conducted emission tests in the frequency range 0.15 - 30 MHz are required to be performed with quasi-peak and average detector. To simplify testing the following procedure is used: First the whole spectrum of emission caused by equipment under test (EUT) is recorded with detector set to peak. After that all emission levels having less margin than 20 dB to or exceeding the appropriate limit (in general average limit is 10 dB lower than quasi-peak limit) are retested with detector set to quasi-peak. If average limit is kept no additional scan with average detector is necessary. In cases of emission levels between quasi-peak and average limit an additional scan with detector set to average has to be recorded.



No.	Туре	Model	Serial Number	Manufacturer
01	EMI Receiver	ESHS 10	860043/016	Rohde & Schwarz
02	LISN	ESH3-Z5	862770/021	Rohde & Schwarz
03	LISN	ESH-3-Z5	830952/025	Rohde & Schwarz
04	Shielded Room No. 4		3FD-100 544	Euroshield



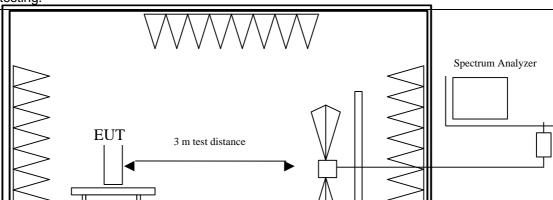
5.2. Field Strength of Emissions, Prescans in a fully-anechoic room (30 MHz – 1 GHz)

Rules and Specifications:	Sections 15.109 & 15.231
Guide:	ANSI C63.4 1997

Measurement Procedure:

Radiated emissions are measured over the frequency range from 30 MHz to 1 GHz.

Measurements were made in both the horizontal and vertical planes of polarization in a fully anechoic room using a spectrum analyzer with the detector function set to peak and resolution bandwidth set to 100 kHz. All tests were performed at a test-distance of 3 meters. Hand-held or body-worn devices are rotated through three orthogonal axes to determine which attitude and configuration produces the highest emission relative to the limit and therefore shall be used for final testing.



Fully anechoic chamber

No.	Туре	Model	Serial Number	Manufacturer
01	Spectrum Analyzer	FSP 30	100063	Rohde & Schwarz
113	Preamplifier	CPA9231A	3393	Schaffner
141	Biconical antenna	HK 116	829708/006	Rohde & Schwarz
143	Log. periodic antenna	3147	9112-1054	EMCO
003	Fully anechoic room	No. 2	1452	Albatross Projects



5.3. Fieldstrength of Emissions, Measurement at Open Area Test Site (30 MHz – 1 GHz)

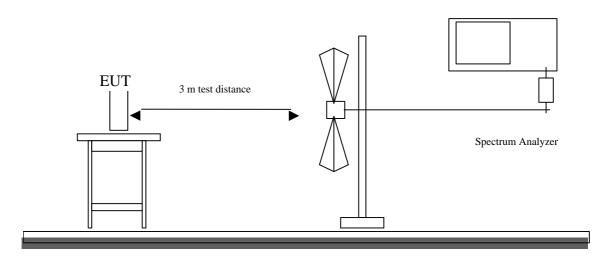
Rules and Specifications:	Sections 15.109 & 15.231
Guide:	ANSI C63.4 1997

Measurement Procedure:

Measurement Procedure:

For final testing an open-area test-side was used. Radiated emissions are measured over the frequency range from 30 MHz to 1 GHz.

Measurements were made in both the horizontal and vertical planes of polarisation at a open area test side using a spectrum analyser with the detector function set to CISPR. All test were performed at a test distance of 3 meters. During the tests the EUT is rotated all around, and the receiving-antenna is rased and lowered from 1m to 4m to find the maximum levels of emissions. The cables and equipment were placed and moved within the range of position likely to find their maximum emissions.



No.	Туре	Model	Serial Number	Manufacturer
01	EMI Receiver	ESVP	881414/009	Rohde & Schwarz
141	Biconical antenna	HK 116	829708/006	Rohde & Schwarz
143	Log. periodic antenna	3147	9112-1054	EMCO
003	Open Field Test Site	No. 1	N/A	Senton



5.4. Fieldstrength of Emissions above 1 GHz

Rules and Specifications:	Sections 15.109 & 15.209
Guide:	ANSI C63.4 1997

Measurement Procedure:

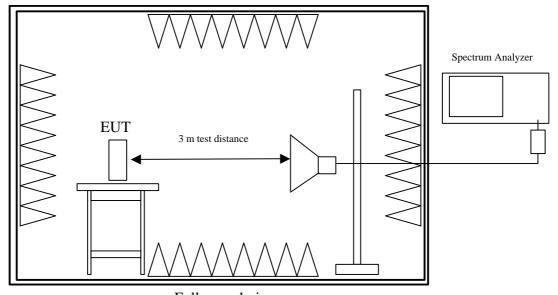
Radiated emissions are measured in the frequency range 1 GHz to the 10th harmoic of the maximum frequency of the EUT.

Resolution and video bandwidth of the spectrum analyzer are set to 1 MHz. Hand-held or body-worn devices are rotated through three orthogonal axes to determine which attitude and configuration produces the highest emission relative to the limit and therefore shall be used for final testing. Additional measurements are performed at critical frequencies with reduced span.

EUT is rotated all around and receiving antenna is raised and lowered to find the maximum levels of emission. The cables and equipment are placed and moved within the range of position likely to find their maximum emissions.

All tests are performed in a fully-anechoic chamber with a test-distance of 3 meters.

If required preamplifiers are used for the whole frequency range. Special care is taken to avoid overload in transmit mode (using appropriate attenuators and filters if necessary).



Fully anechoic

No.	Туре	Model	Serial Number	Manufacturer
01	Spectrum Analyzer	FSP 30	100063	Rohde & Schwarz
143	Log. periodic antenna	3147	9112-1054	EMCO
145	Horn antenna	3115	9508-4553	EMCO
146	Horn antenna set	3160-03/-09	9112-1003	EMCO
114	Preamplifier 1-8 GHz	AFS3-00100800- 32-LN	847743	Miteq
115	Preamplifier 8-18 GHz	ACO/180-3530	32641	CTT
003	Fully anechoic room	No. 2	1452	Albatross Projects



6.	Photographs Taken During Testing



Test setup for radiated emission measurement (fully anechoic room)







Test setup for radiated emission measurement (fully anechoic room)





Test setup for radiated emission measurement (open-area test-side)







Test setup for radiated emission measurement (open-area test-side)







7. List of Measurements

FCC Part 15			
Section(s):	Test	Page(s)	Result
15.205	Restricted Bands		Pass
15.207	AC powerline emissions		Not aplicable
15.231 (a) (1)	Periodic operation		Pass
15.231 (b)	Duty Cycle Correction		Not aplicable
15.231 (b)	Field strength of emissions		Pass
15.231 (c)	Bandwidth of emissions		Pass



Field strength of emissions

Rules and Specifications:	15.231 (b) Radiated Emission Limits			
Guide:	ANSI C63.4			
Limit:	In addition to the provisions of Section 15.205, the field streng emissions from intentional radiators operated under Section 1 shall not exceed the following:			
	Fundamental Frequency (MHz)	Field Strength of Fundamental (microvolts/meter)	Field Strength of Spurious Emissions (microvolts/meter)	
	40.66 - 40.70 70 - 130 130 - 174 174 - 260 260 - 470 above 470	2.250 1.250 1.250 to 3.750** 3.750 3750 to 12.500** 12.500	225 125 125 to 375 ** 375 375 to 1250 ** 1250	

^{**} linear interpolations

Test Site:	Open Area Test Site (< 1 GHz), Fully anechoic chamber (> 1 GHz)
Distance:	3 Meter

I	Frequency	Detector	Antenna	Analyzer	Antenna	Duty Cycle	Field	Limit	Margin (dB)
	(MHz)		Polarization	Reading	Correction	Correction	Strength	(dBµV/m)	
l				(dBµV)	(dB/m)	(dB/m)	(dBµV/m)		
I	434.65	PK	horizontal	61.3	19.50	0	80.80	80.85	0.0
I	869.30	Q	horizontal	10.20	27.30	0	37.50	60.85	-23.4
	1301.00	PK	horizontal	5.83	27.82	0	33.65	60.85	-27.2

*** = All emissions showed more than 20 dB margin to the limit

A negative value for Margin indicates, that the limit is kept.

Sample calculation of erp values:

Field Strength $(dB\mu V/m)$ = Analyzer Reading $(dB\mu V)$ + Antenna Correction (dB/m) + Duty Cycle Correction (dB)

Test Results:	Pass	
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Duty Cycle Correction

Rules and Specifications:	15.231 (b) (2) Limits on the Field Strength of Emissions
Guide:	ANSI C63.4
ANSI C63.4	When average detector function limits are specified for a pulse modulated transmitter, the average level of emissions may be found by measuring the peak levels of the emissions and correcting them with the duty cycle according to ANSI C64.4, section I4 (10)

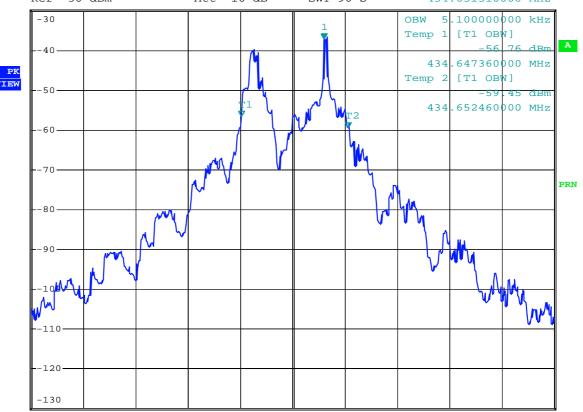
$$Duty \, Cycle \, Correction \big[dB \big] = 20 \cdot \log \left(\frac{Sumofthe Pulse Widths}{100ms} \right) = -dB$$



Bandwidth of Emission

Rules and Specifications:	15.231 c
Guide:	ANSI C63.4
Limit:	The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20 dB from the modulated carrier

Test Results:	Pass	
	*RBW 30 Hz *VBW 30 Hz	Marker 1 [T1] -37.20 dBm
Ref -30 dBm	Att 10 dB *SWT 90 s	434.651310000 MHz
40	1	OBW 5.100000000 kHz Temp 1 [T1 OBW] -56 76 dRm
-40		-56 76 dBm



Comment A: Ak40188 OBW

Date: 1.APR.2004 16:14:33

Center 434.64981 MHz

Span 25 kHz

2.5 kHz/



8. Referenced Regulations

All tests were performed with reference to the following regulations and standards:

\boxtimes	FCC Part 2	Code of Federal Regulations Part 2	October 01, 1999
		Frequency allocationand radio treaty matters;	
		General rules and regulations	
	FCC Part 15	Code of Regulations Part 15 (Radio Frequency	May 30, 2002
	Subpart A	Devices), Subpart A (General) of the Federal	
		Communication Commission (FCC)	
	FCC Part 15	Code of Regulations Part 15 (Radio Frequency	May 30, 2002
	Subpart B	Devices), Subpart B (Unintentional Radiators) of	
		the Federal Communication Commission (FCC)	
\boxtimes	FCC Part 15	Code of Regulations Part 15 (Radio Frequency	May 30, 2002
	Subpart C	Devices), Subpart C (Intentional Radiators) of the	
		Federal Communication Commission (FCC)	
	FCC Part 74	Code of Regulations Part 15 (Radio Frequency	October 20, 1997
	Subpart H	Devices), Subpart H (Low Power Auxiliary	
		Stations) of the Federal Communication	
		Commission (FCC)	
\boxtimes	ANSI C63.4	American National Standard for Methods of	October, 1992
		Measurement of Radio-Noise Emissions from	
		Low-Voltage Electrical and Electronic Equipment	
		in the Range of 9 kHz - 40 GHz	
	RSS-210	Radio Standards Specification RSS-210 Issue 5	November, 2001
		for Low Power Licence-Exempt	
		Radiocommuniction Devices of Industry Canada	



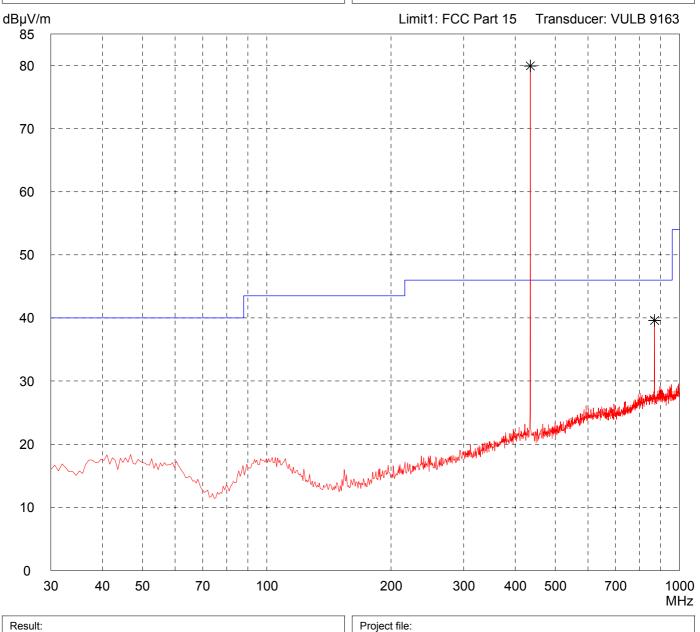
Model:		(
BC85XX		
Serial no.:		-
#1		
Applicant:		-
Akerströms Björbo AE	3	
Test site:		
Fully anechoic room,	cabin no. 2	
Tested on:		
Test distance 3 metre Horizontal Polarization	•	
Date of test:	Operator:	
03/22/2004	T. Eberl	
Test performed:	File name:	
automatically	default.emi	
Detector:		L

Prescan

Comment:

- TX mode
- EUT in horizontal position rear side on table (1)





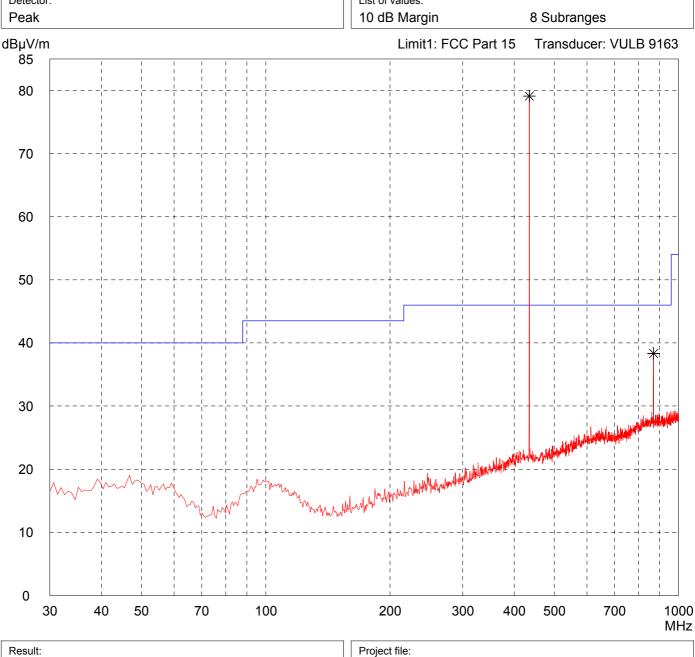
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Model: BC85XX		Comment:
Serial no.:		- TX mode
#1 Applicant:		- EUT in horizon
Akerströms Björbo A	В	
Test site: Fully anechoic room,		
Tested on: Test distance 3 metre Horizontal Polarization		
Date of test: 03/23/2004	Operator: T. Eberl	
Test performed: automatically	File name: default.emi	
Detector:		List of values:

EUT in horizontal position rear side on table (2)



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Prescan

Result: Presca	an								Project 5650	t file: 2-40188			Page	of	Pa	ages
	30 4	10	50	7	0	-	10	00		00	300	400	500	700		1000 MHz
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Detector Peak										values: 3 Margin			8 Subrar			
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Date of t					rator: ber											
	istance 3 intal Pola															
	nechoic	room	, cabin	no. 2												
	röms Bjö	rbo A	AΒ						-		 	(-)				
Serial no	0.:									mode T in vertic	al positi	on (3)				
Model: BC85									Comm	nent: mode						

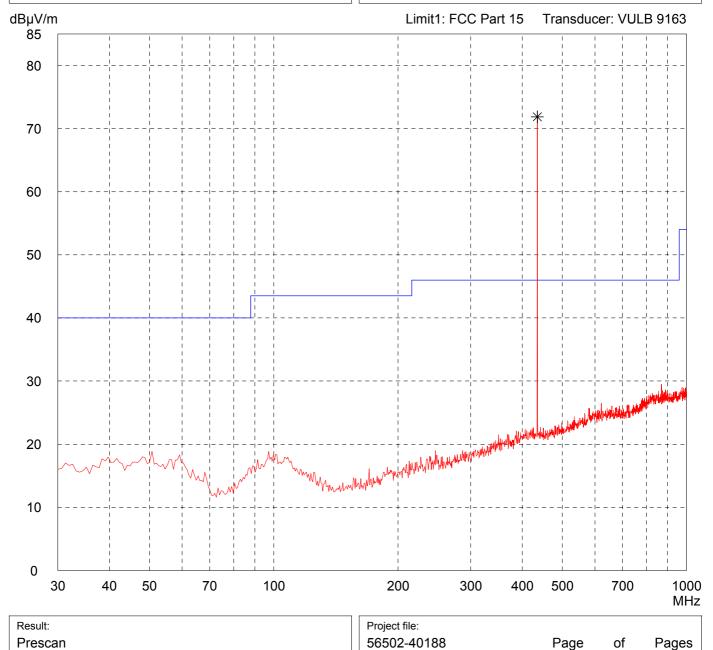
Model:						
BC85XX						
Serial no.:			-			
#1						
Applicant:			-			
Akerströms Björbo AB						
Test site:						
Fully anechoic room, cabin no. 2						
Tested on:						
Test distance 3 metres Vertical Polarization						
Date of test:	Operator:					
03/22/2004	T. Eberl					
Test performed:	File name:					
automatically	default.emi					
Detector:						

Comment:

- TX mode

- EUT in horizontal position rear side on table (1)





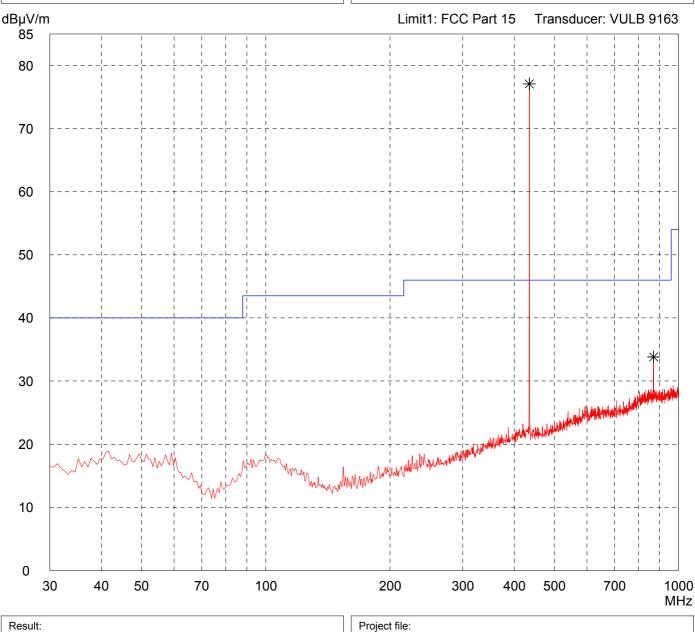
Model: BC85XX					
Serial no.: #1					
Applicant: Akerströms Björbo AB					
Test site: Fully anechoic room, cabin no. 2					
Tested on: Test distance 3 metres Vertical Polarization					
Date of test: 03/23/2004	Operator: T. Eberl				
Test performed: automatically	File name: default.emi				
Datastani					

Prescan

Comment:

- TX mode
- EUT in horizontal position rear side on table (2)





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Pages

Result:								Project 5650	t file: 2-40188	3		Page	of	Paç	ges
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	ströms	Björbo	AB						i iii veit	icai positi	JII (J)				
Serial r	no.:								mode Lip vert	ical position	on (3)				
Model: BC85								Comm							

			11 10 (EMBS 8118)						
Model:	ΚΧ		Comment:						
Serial no			- TX mode						
#1	-4.		- EUT in horizontal position - rear side on table (1)						
Applicar Akerst	röms Björbo AB								
Test site	e :								
	nechoic room, cab	in no. 2							
	on: istance 3 metres ontal Polarization								
Date of t		Operator: T. Eberl							
Test per		File name:							
	atically	default.emi							
Detector Peak	r:		List of values: Selected by hand						
dBµV/m	ı		Limit1: FCC Part 1	5 Transducer: EMCO 3115					
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Project file:

Result:

Model: BC85X	X		Comment:						
Serial no.			- TX mode						
#1 Applicant			- EUT in horizontal position - right side on table (2)						
1	öms Björbo AB								
Test site: Fully ar	nechoic room, cabi	n no. 2							
1	n: stance 3 metres ntal Polarization								
Date of te		Operator: T. Eberl							
Test perfo	ormed:	File name: default.emi							
Detector: Peak			List of values: 10 dB Margin	8 Subranges					
dBμV/m			Limit1: FCC Part 15	Transducer: E	MCO 3115				
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Result: Limit ke	ept		Project file: 56502-40188	Page c	of Pages				

Model: BC85X	X		Comment:		
Serial no.	:		- TX mode		
#1 Applicant	<u> </u>		- EUT in vertical position ((3)	
Akerstr	öms Björbo AB				
Test site: Fully ar	nechoic room, cab	oin no. 2			
Tested or	n:				
	stance 3 metres ntal Polarization				
Date of te		Operator:			
03/23/2 Test perfo		T. Eberl File name:			
automa		default.emi			
Detector: Peak			List of values: 10 dB Margin	8 Subranges	
dBµV/m 80			Limit1: FCC Part 15	Transducer: EM	CO 3115
75			 		-
70					<u>-</u>
65		 	 		<u> </u>
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10			 		† !
5					-
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Result: Limit ke	ept		Project file: 56502-40188	Page of	Pages

Result: Limit kept	Project file: 56502-40188	Page of	Pages
1000 20		000 40	000 4500 MHz
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5		 	
10		; 	
15		 	
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70			+ - - -
75		 	
80		 	
Peak dBμV/m	10 dB Margin Limit1: FCC Part 15	8 Subranges Transducer: EM	CO 3115
Detector:	List of values:	0.0.1	
Test performed: File name: automatically default.emi			
Vertical Polarization Date of test: Operator: 03/23/2004 T. Eberl			
Fully anechoic room, cabin no. 2 Tested on: Test distance 3 metres			
Akerströms Björbo AB Test site: Fully appelping room, palin no. 2	-		
Applicant:	- EUT in horizontal position	on - rear side on tab	le (1)
Serial no.: #1	- TX mode		
Model: BC85XX	Comment:		

Model: BC85X	(X		Co	omment:				
Serial no).:		- '	TX mode				
Applican			-	EUT in horizontal positio	on - right side o	on tabl	e (2)	
Akersti Test site	röms Björbo AB							
Fully a	nechoic room, cabin	no. 2						
Test di	istance 3 metres al Polarization							
Date of t		Operator: T. Eberl						
Test peri	formed:	File name: default.emi						
Detector Peak	-	ad-ladik.com		st of values: 0 dB Margin	8 Subrang	es		
dBµV/m	1	,		Limit1: FCC Part 15	Transduce	r: EMC	O 31	115
80		 		 				
75								
70				 		 		
65						 		
60		 		 				
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Test site	e: inechoic room, cal	bin no. 2					
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	istance 3 metres al Polarization						
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