

**EMISSION MEASUREMENTS IN ACCORDANCE
WITH FCC PART 15 AND ANSI C63.4-1992 ON AN
INDUCTIVE LAPTURING SYSTEM CONSISTING OF
THREE TRANSPONDERS, BRAND AMB PRODUCTS,
TYPES TRANX 120, TRANX 160 AND TRANX 260,
INCLUDING A TRANX DECODER, BRAND
AMB PRODUCTS, TYPE AMB TRANX DECODER,
AND A BATTERY CHARGER, BRAND MNI CELLUAR
LTD, TYPE V834K01.**

FCC report layout endorsed by the FCC by
Public Notice of March 11, 1992.

Accredited by	:STERLAB accreditation number L029 D.A.R., TTI-P-G.127/96-00
Competent body	:Article 10-2 EMC Directive
Notified body nr. 0122	:Article 10-5 EMC Directive Low Voltage Directive TTE Directive
Certification body	:Electrical Products Safety regulation, Hong Kong
Designated laboratory	:TTE Directive
Notified test service	:Automotive Directive
FCC listed	:31040/SIT
VCCI registered	:R-592 C-607

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Subsidiary companies:
NMI Certin B.V. (27233418)
NMI Van Swinden Laboratorium B.V. (27228703)
NMI International B.V. (27239176)

Description of EUT: Inductive laptiming system
Manufacturer: AMB i.t. B.V.
Brand mark: AMB products
Type: TranX 120, 160, 260 and TranX decoder
FCC ID: NXYTRANX

MEASUREMENT/TECHNICAL REPORT

AMB i.t. B.V.

FCC ID: NXYTRANX

Date: May 20, 1999

This report concerns: Verification / Notification / Certification																												
Equipment type: Intentional radiator																												
Deferred grant requested per 47 CFR 0.457(d)(1)(ii) No																												
If yes defer until: not applicable																												
Transition Rules Request per 15.37: No																												
If no, assumed Part 15, Subpart B for unintentional radiators - the new 47 CFR (10-01-93 Edition) provision.																												
Report prepared by:	<table><tr><td>Name</td><td>:</td><td>J.G. Mozes</td></tr><tr><td>Company name</td><td>:</td><td>NMi Certin B.V.</td></tr><tr><td>Address</td><td>:</td><td>Smidshornerweg 18</td></tr><tr><td>Telephone number</td><td>:</td><td>+ 31 594 505005</td></tr><tr><td>Telefax number</td><td>:</td><td>+ 31 594 504804</td></tr><tr><td>Mailing address</td><td>:</td><td>P.O. Box 15</td></tr><tr><td>City/Place/Postal cd.</td><td>:</td><td>9822 ZG NIEKERK</td></tr><tr><td>Country</td><td>:</td><td>The Netherlands</td></tr><tr><td>Email</td><td>:</td><td>et-desk@nmi.nl</td></tr></table>	Name	:	J.G. Mozes	Company name	:	NMi Certin B.V.	Address	:	Smidshornerweg 18	Telephone number	:	+ 31 594 505005	Telefax number	:	+ 31 594 504804	Mailing address	:	P.O. Box 15	City/Place/Postal cd.	:	9822 ZG NIEKERK	Country	:	The Netherlands	Email	:	et-desk@nmi.nl
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The data taken for this test and report herein was done in accordance with FCC Part 15 and ANSI C63.4-1992 measurements. NMi Certin B.V.. location Niekerk, The Netherlands, certifies that the data is accurate and contains a true representation of the emission-profile of the Equipment Under Test (EUT) on the date of the test noted in the test report. I have reviewed the test report and find it to be an accurate description of the test(s) performed and the EUT so tested.

Date: May 26, 1999

Signature:

P.A.J.M. Robben, B.Sc.E.E.
Department EMC and Telecommunication

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1 General Information.

1.1 Product description.

The product tested is an inductive laptiming system consisting of three transponders, brand AMB products, types TranX 120, TranX 160 and TranX 260, including a TranX decoder, brand AMB products, type AMB TranX decoder, and a battery charger, brand MNI Cellular Ltd., type V834K01.

1.2 Related Submittal(s)/grant(s).

Not applicable.

1.3 Test Methodology.

The Test methodology of ANSI C63.4-1992 has been applied to provide adequate measuring data.

Complete data of the tested model has been recorded.

According to FCC Part 15, § 101 the EUT shall be classified as an intentional radiator and is therefore subject to certification.

1.4 Test facility.

The FCC has per Public Notice declared that the measurement facilities located at the NMI Certin B.V. testsite Niekerk, Smidshornerweg 18, The Netherlands, have been reviewed and found to be in compliance with the requirements of section 2.948 (previously section 15.38) of the FCC rules per August 4, 1994.

The description of the measuring facilities have been filed with reference 31040/SIT, 1300B3 at the FCC's Offices.

1.5 List of measurement equipment.

NMI number	Description	Marketing name	Type
14277	Antennamast 4m	Heinrich Deisel	HD100
14278	Controller OATS	Heinrich Deisel	MA240
14340	Biconilog antenna 20MHz - 1100MHz	EMCO	3143
12473	Log-per antenna 200MHz - 1000MHz	Eaton	96005
12471	Biconical antenna 20MHz - 200MHz	Eaton	94455-1
12636	Plastic measurement room	Polyforce	-
13886	Open Area Test Site	Comtest	-
99108	Turntable OATS	Heinrich Deisel	HD050
15667	Measuring receiver 9kHz - 2750MHz	Rohde & Schwarz	ESCS30
12507	Artificial mains network 3-phase	Rohde & Schwarz	ESH2-Z5
13313	Impuls limiter	Rohde & Schwarz	ESH3Z2.357...
99115	Voltage probe	Schwarzbeck	TK9416

1.6 Bandwidth and antenna factors.

The utilized measuring equipment is stated in § 1.5. The bandwidth of the receiver switches automatically to the right bandwidth in accordance with CISPR 16. This is implemented in the receiver. Also the antennafactors are included in the testreceiver. The receiver automatically calculates the appropriate correction factor for the utilized antenna and also the appropriate correction factor for the cable loss. The total correction is automatically added to the measured value.

2 Product labelling.

The following text shall be attached to the EUT, by means of a label, or -in case the enclosure is too small- on a prominent location in the users manual.

**This device complies with part 15 of the FCC Rules.
Operation is subject to the following two conditions: (1)
This device may not cause harmful interference, and (2)
this device must accept any interference received,
including interference that may cause undesired
operation.**

The dimensions of the label, the location of the label and the type of font can be found in the FCC regulation book CFR 47, parts 0 to 19, revised as per October 1, 1993.

3 System test configuration.

3.1 Justification.

During all measurements the transponders were transmitting continuously. The RF signal, generated by the transponder, is a CW signal. The measurements on the TranX decoder were carried out in combination with the TranX 260 transponder since this transponder is generating the most powerful RF signal of the three versions.

The differences between the three transponders can be described as follows:

1. TranX 120

This transponder is a low-cost version without a built-in battery charger

2. TranX 160

This transponder is identical to the TranX 260 transponder. This only difference consists of the internal jumper settings for setting the level of RF output power.

3. Tranx 260

This transponder is identical to the TranX 160 transponder. This only difference consists of the internal jumper settings for setting the level of RF output power.

In accordance with § 11.2.4. of ANSI C63.4-1992 the placing and manipulation of interface cables has been carried out.

3.2 Equipment modifications.

Not applicable.

3.3 Description of tested EUT.

3.3.1 Transponder TranX 120

Unit title	:	Transponder
Model number	:	TranX 120
Part number	:	Not applicable
FCC ID number	:	NXYTRANX
Frequency range	:	3.58 MHz
Description/details	:	see section 3.1 of this report and exhibits to the application
Power supply	:	Internal NiCd battery
Clock Oscillator(s)	:	3.58 MHz
Cabinet & Screening	:	Plastic
Interface Cable(s)	:	Not applicable
Method of screening	:	Not applicable
Method of grounding	:	Not applicable
Operating configuration	:	Transponder is continuously transmitting
Applicant's representative	:	F. Hin
Company	:	AMB i.t. B.V.
Address	:	Herenweg 29A
Postal code and city	:	2105 MB HEEMSTEDE
Country	:	The Netherlands
Telephone number	:	+31 (0)23 5291893
Telefax number	:	+31 (0)23 5290156

3.3.2 Transponder TranX 160

Unit title	:	Transponder
Model number	:	TranX 160
Part number	:	Not applicable
FCC ID number	:	NXYTRANX
Frequency range	:	3.58 MHz
Description/details	:	see section 3.1 of this report and exhibits to the application
Power supply	:	Internal NiCd battery
Clock Oscillator(s)	:	3.58 MHz
Cabinet & Screening	:	Plastic
Interface Cable(s)	:	Not applicable
Method of screening	:	Not applicable
Method of grounding	:	Not applicable
Operating configuration	:	Transponder is continuously transmitting
Applicant's representative	:	F. Hin
Company	:	AMB i.t. B.V.
Address	:	Herenweg 29A
Postal code and city	:	2105 MB HEEMSTEDE
Country	:	The Netherlands
Telephone number	:	+31 (0)23 5291893
Telefax number	:	+31 (0)23 5290156

Description of EUT:	Inductive laptiming system
Manufacturer:	AMB i.t. B.V.
Brand mark:	AMB products
Type:	TranX 120, 160, 260 and TranX decoder
FCC ID:	NXYTRANX

3.3.3 Transponder TranX 260

Unit title	:	Transponder
Model number	:	TranX 260
Part number	:	Not applicable
FCC ID number	:	NXYTRANX
Frequency range	:	3.58 MHz
Description/details	:	see section 3.1 of this report and the exhibits to the application
Power supply	:	Internal NiCd battery
Clock Oscillator(s)	:	3.58 MHz
Cabinet & Screening	:	Plastic
Interface Cable(s)	:	Not applicable
Method of screening	:	Not applicable
Method of grounding	:	Not applicable
Operating configuration	:	Transponder is continuously transmitting
Applicant's representative	:	F. Hin
Company	:	AMB i.t. B.V.
Address	:	Herenweg 29A
Postal code and city	:	2105 MB HEEMSTEDE
Country	:	The Netherlands
Telephone number	:	+31 (0)23 5291893
Telefax number	:	+31 (0)23 5290156

Description of EUT:	Inductive laptiming system
Manufacturer:	AMB i.t. B.V.
Brand mark:	AMB products
Type:	TranX 120, 160, 260 and TranX decoder
FCC ID:	NXHYTRANX

3.3.4 TranX decoder

Unit title	:	AMB TranX Decoder
Model number	:	-
Part number	:	-
FCC ID number	:	NXYTRANX
Frequency range	:	3.58 MHz
Description/details	:	see section 3.1 of this report and the exhibits to the application
Battery charger	:	Brand MNI Celluar, type V834K01
Clock Oscillator(s)	:	28.720 MHz, 20 MHz
Cabinet & Screening	:	Metal enclosure (Decoder), plastic enclosure (Charger)
Interface Cable(s)	:	Shielded antenna cable, headphone, +12 VDC, RS-232 and Auxiliary
Method of screening	:	Not applicable
Method of grounding	:	Not applicable
Operating configuration	:	Decoding received signal from transponder
Applicant's representative	:	F. Hin
Company	:	AMB i.t. B.V.
Address	:	Herenweg 29A
Postal code and city	:	2105 MB HEEMSTEDE
Country	:	The Netherlands
Telephone number	:	+31 (0)23 5291893
Telefax number	:	+31 (0)23 5290156

4 Conducted and radiated measurement photos.

On pages 12 to 16 the conducted and radiated emission measurements photos are given:

Page 12:	TranX 120 (radiated emission, front/back)
Page 13:	TranX 160 (radiated emission, front/back)
Page 14:	TranX 260 (radiated emission, front/back)
Page 15:	TranX decoder (radiated emission, front/back)
Page 16:	TranX decoder (conducted emission, front/back)

Description of EUT: Inductive lap timing system
Manufacturer: AMB i.t. B.V.
Brand mark: AMB products
Type: TranX 120, 160, 260 and TranX decoder
FCC ID: NXYTRANX



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Description of EUT: Inductive lap timing system
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Manufacturer: AMB i.t. B.V.
Brand mark: AMB products
Type: TranX 120, 160, 260 and TranX decoder
FCC ID: NXYTRANX



5 Conducted emission data.

Frequency (MHz)	Measurement results dB(μV) Neutral	Measurement results dB(μV) Line 1	Limits dB(μV) section 207	Result
	QP	QP	QP	
0.45 - 30.0	< 20.0	< 20.0	48.0	PASS

QP = Quasi-peak

Measured levels on frequencies not stated in this report have been measured more than 20 dB below the applicable limit.

Table 1

The results of the disturbance voltage level measurements at the AC mains connection terminal **LINE and NEUTRAL** of the receiver/decoder, brand AMB products, type TranX decoder, carried out in accordance with FCC Part 15, section 207 and ANSI C63.4-1992, are depicted in table 1. Measurement results are quasi-peak results.

Frequency (MHz)	Measurement results dB(μV) Neutral	Measurement results dB(μV) Line 1	Limits dB(μV) section 207	Result
	QP	QP	QP	
0.45 - 30.0	< 20.0	< 20.0	48.0	PASS

QP = Quasi-peak

Measured levels on frequencies not stated in this report have been measured more than 20 dB below the applicable limit.

Table 2

The results of the disturbance voltage level measurements at the AC mains connection terminal **LINE and NEUTRAL** of the battery charger, brand MNI Celluar, type V834K01, carried out in accordance with FCC Part 15, section 207 and ANSI C63.4-1992, are depicted in table 2. Measurement results are quasi-peak results.

Test engineer : J.G. Mozes

Tester signature : Date: May 26, 1999

6 Radiated emission data.

6.1 Radiated field strength measurement (30 MHz - 1000 MHz, E-field)

6.1.1 TranX decoder

Frequency (MHz)	Measurement results dB(μV)/m 3 metres QP		Limits dB(μV)/m @ 3 metres QP section 209
	Vertical	Horizontal	
30.0 - 88.0	< 20.0	< 20.0	40,0
100.0	32.9	< 20.0	43.5
140.0	30.4	29.7	43,5
180.0	24.9	23.4	43,5
216.0 - 425.0	< 20.0	< 20.0	46.0
425.0 - 630.0	< 25.0	< 25.0	46.0
630.0 - 960.0	< 30.0	< 30.0	46.0
960.0 - 1000.0	< 31.0	< 31.0	54.0

QP = Quasi-peak

Measured levels on frequencies not stated in this report have been measured more than 20 dB below the applicable limit.

Table 3

Results of the radiated field strength (E-field) measurements on the receiver/decoder, brand AMB products, type TranX decoder, carried out in accordance with FCC Part 15, section 209 and ANSI C63.4-1992 in the configuration and operation mode(s) as stated in this testreport, are depicted in table 3. Measurement results are quasi-peak results.

Test engineer : J.G. Mozes

Tester signature : Date: May 26, 1999

6.1.2 TranX 120 transponder

Frequency (MHz)	Measurement results dB(μV)/m 3 metres QP		Limits dB(μV)/m @ 3 metres QP section 209
	Vertical	Horizontal	
30.0 - 88.0	< 20.0	< 20.0	40,0
88.0 - 216.0	< 20.0	< 20.0	43.5
216.0 - 425.0	< 20.0	< 20.0	46.0
425.0 - 630.0	< 25.0	< 25.0	46.0
630.0 - 960.0	< 30.0	< 30.0	46.0
960.0 - 1000.0	< 31.0	< 31.0	54.0

QP = Quasi-peak

Measured levels on frequencies not stated in this report have been measured more than 20 dB below the applicable limit.

Table 4

Results of the radiated field strength (E-field) measurements on the transponder, brand AMB products, type TranX 120, carried out in accordance with FCC Part 15, section 209 and ANSI C63.4-1992 in the configuration and operation mode(s) as stated in this testreport, are depicted in table 4. Measurement results are quasi-peak results.

Test engineer : J.G. Mozes

Tester signature : Date: May 26, 1999

6.1.3 TranX 160 transponder

Frequency (MHz)	Measurement results dB(μV)/m 3 metres QP		Limits dB(μV)/m @ 3 metres QP section 209
	Vertical	Horizontal	
30.0 - 88.0	< 20.0	< 20.0	40,0
88.0 - 216.0	< 20.0	< 20.0	43.5
216.0 - 425.0	< 20.0	< 20.0	46.0
425.0 - 630.0	< 25.0	< 25.0	46.0
630.0 - 960.0	< 30.0	< 30.0	46.0
960.0 - 1000.0	< 31.0	< 31.0	54.0

QP = Quasi-peak

Measured levels on frequencies not stated in this report have been measured more than 20 dB below the applicable limit.

Table 5

Results of the radiated field strength (E-field) measurements on the transponder, brand AMB products, type TranX 160, carried out in accordance with FCC Part 15, section 209 and ANSI C63.4-1992 in the configuration and operation mode(s) as stated in this testreport, are depicted in table 5. Measurement results are quasi-peak results.

Test engineer : J.G. Mozes

Tester signature : Date: May 26, 1999

6.1.4 TranX 260 transponder

Frequency (MHz)	Measurement results dB(μV)/m 3 metres QP		Limits dB(μV)/m @ 3 metres QP section 209
	Vertical	Horizontal	
30.0 - 88.0	< 20.0	< 20.0	40,0
88.0 - 216.0	< 20.0	< 20.0	43.5
216.0 - 425.0	< 20.0	< 20.0	46.0
425.0 - 630.0	< 25.0	< 25.0	46.0
630.0 - 960.0	< 30.0	< 30.0	46.0
960.0 - 1000.0	< 31.0	< 31.0	54.0

QP = Quasi-peak

Measured levels on frequencies not stated in this report have been measured more than 20 dB below the applicable limit.

Table 6

Results of the radiated field strength (E-field) measurements on the transponder, brand AMB products, type TranX 260, carried out in accordance with FCC Part 15, section 209 and ANSI C63.4-1992 in the configuration and operation mode(s) as stated in this testreport, are depicted in table 6. Measurement results are quasi-peak results.

Test engineer : J.G. Mozes

Tester signature : Date: May 26, 1999

6.2 Radiated field strength measurement (9 kHz - 30 MHz, H-field)

6.2.1 TranX 120 transponder

Frequency	Measurement results (QP) 3m	Measurement results (QP) 10m	Antenna factor	Cable loss	Measurement results (QP)	Limits FCC Part 15 section 209
(MHz)	dB μ V	dB μ V	dB	dB	(dB μ V/m)	(dB μ V/m)
0.009 - 0.490	<10.0	< 5.0	17	1	<10.0	48.5 - 13.8 (300 m.)
0.490 - 1.705	<10.0	< 5.0	17	1	<10.0	33.8 - 22.9 (30 m.)
1.705 - 30.000	<10.0	< 5.0	17	1	<10.0	29.5 (30 m.)

QP = Quasi-peak

Measured levels on frequencies not stated in this report have been measured more than 20 dB below the applicable limit.

Table 7

Results of the radiated field strength (H-field) measurements, carried out in accordance with FCC Part 15, section 209 (Edition 10-1-93) and ANSI C63.4-1992, on a transponder, brand AMB products, type TranX 120, are depicted in table 7.

Notes:

-Frequency range:	9-90 kHz	Average detector used during measurements
	110-490 kHz	Average detector used during measurements

-The radiated field strengths were measured at a distance of 3 and 10 metres.

-A plot of the carrier bandwidth can be found in appendix A.

Test engineer : J.G. Mozes

Tester signature : Date: May 26, 1999

6.2.2 TranX 160 transponder

Frequency	Measurement results (QP) 3m	Measurement results (QP) 10m	Antenna factor	Cable loss	Measurement results (QP)	Limits FCC Part 15 section 209
(MHz)	dB μ V	dB μ V	dB	dB	(dB μ V/m)	(dB μ V/m)
0.009 - 0.490	<10.0	< 5.0	17	1	<10.0	48.5 - 13.8 (300 m.)
0.490 - 1.705	<10.0	< 5.0	17	1	<10.0	33.8 - 22.9 (30 m.)
1.705 - 30.000	<10.0	< 5.0	17	1	<10.0	29.5 (30 m.)

QP = Quasi-peak

Measured levels on frequencies not stated in this report have been measured more than 20 dB below the applicable limit.

Table 8

Results of the radiated field strength (H-field) measurements, carried out in accordance with FCC Part 15, section 209 (Edition 10-1-93) and ANSI C63.4-1992, on a transponder, brand AMB products, type TranX 160, are depicted in table 8.

- Notes:**
- Frequency range: 9-90 kHz Average detector used during measurements
 - 110-490 kHz Average detector used during measurements
 - The radiated field strengths were measured at a distance of 3 and 10 metres.
 - A plot of the carrier bandwidth can be found in appendix A.

Test engineer : J.G. Mozes

Tester signature : Date: May 26, 1999

6.2.3 TranX 260 transponder

Frequency	Measurement results (QP) 3m	Measurement results (QP) 10m	Antenna factor	Cable loss	Measurement results (QP)	Limits FCC Part 15 section 209
(MHz)	dB μ V	dB μ V	dB	dB	(dB μ V/m)	(dB μ V/m)
0.009 - 0.490	<10.0	< 5.0	17	1	<10.0	48.5 - 13.8 (300 m.)
0.490 - 1.705	<10.0	< 5.0	17	1	<10.0	33.8 - 22.9 (30 m.)
1.705 - 3.580	<10.0	< 5.0	17	1	<10.0	29.5 (30 m.)
3.580	43.9	<10.0	17	1	<10.0	29.5 (30 m.)
3.580 - 30.000	<10.0	<5.0	17	1	<10.0	29.5 (30 m.)

QP = Quasi-peak

Measured levels on frequencies not stated in this report have been measured more than 20 dB below the applicable limit.

Table 9

Results of the radiated field strength (H-field) measurements, carried out in accordance with FCC Part 15, section 209 (Edition 10-1-93) and ANSI C63.4-1992, on a transponder, brand AMB products, type TranX 260, are depicted in table 9.

Notes: -Frequency range: 9-90 kHz Average detector used during measurements
 110-490 kHz Average detector used during measurements

-The radiated field strengths were measured at a distance of 3 and 10 metres.

-A plot of the carrier bandwidth can be found in appendix A.

Test engineer : J.G. Mozes

Tester signature : Date: May 26, 1999

Description of EUT:	Inductive lap timing system
Manufacturer:	AMB i.t. B.V.
Brand mark:	AMB products
Type:	TranX 120, 160, 260 and TranX decoder
FCC ID:	NXYTRANX

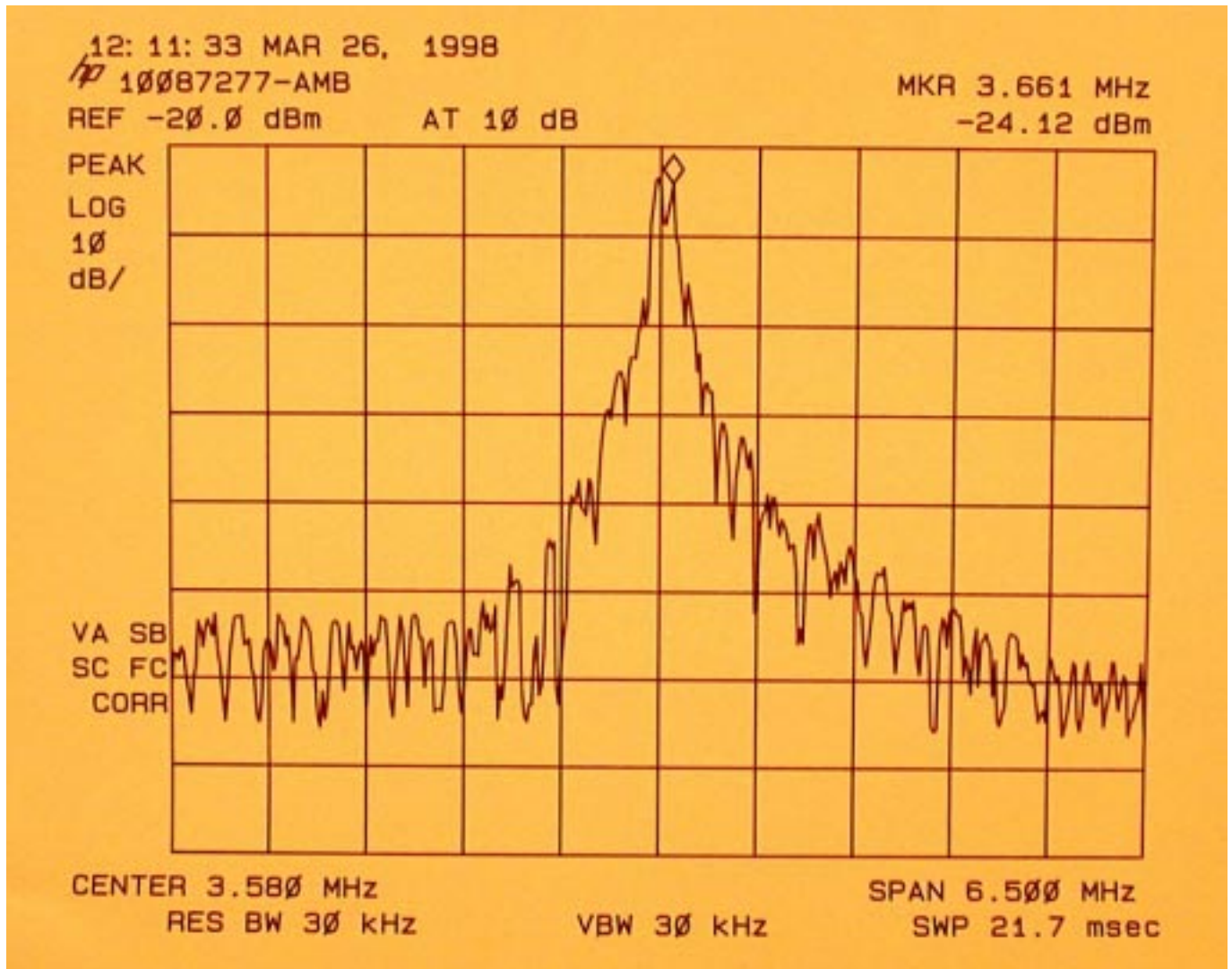
7 Photos of tested EUT.

Not applicable, see § 4 of this report.

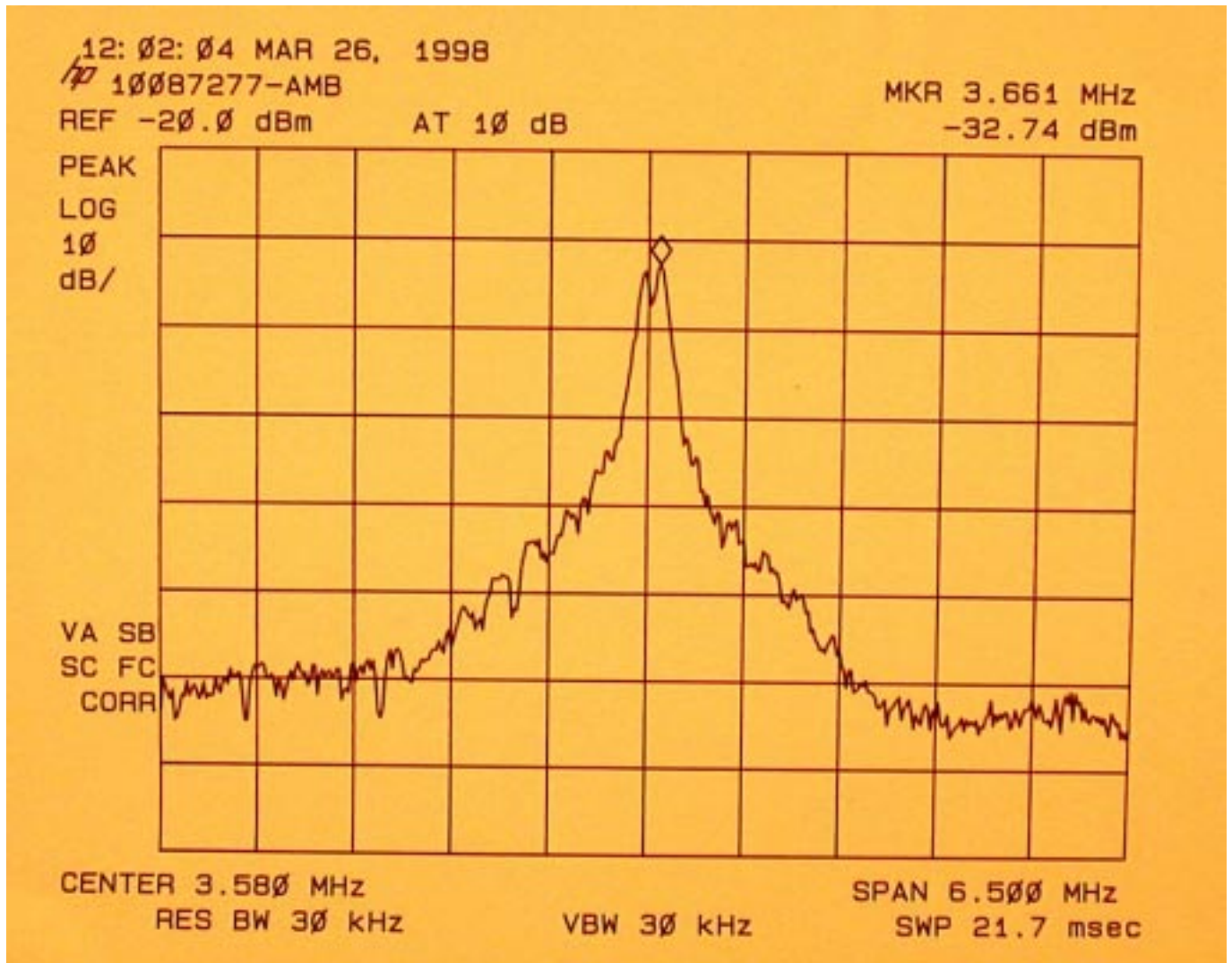
Description of EUT:	Inductive laptiming system
Manufacturer:	AMB i.t. B.V.
Brand mark:	AMB products
Type:	TranX 120, 160, 260 and TranX decoder
FCC ID:	NXYTRANX

APPENDIX A

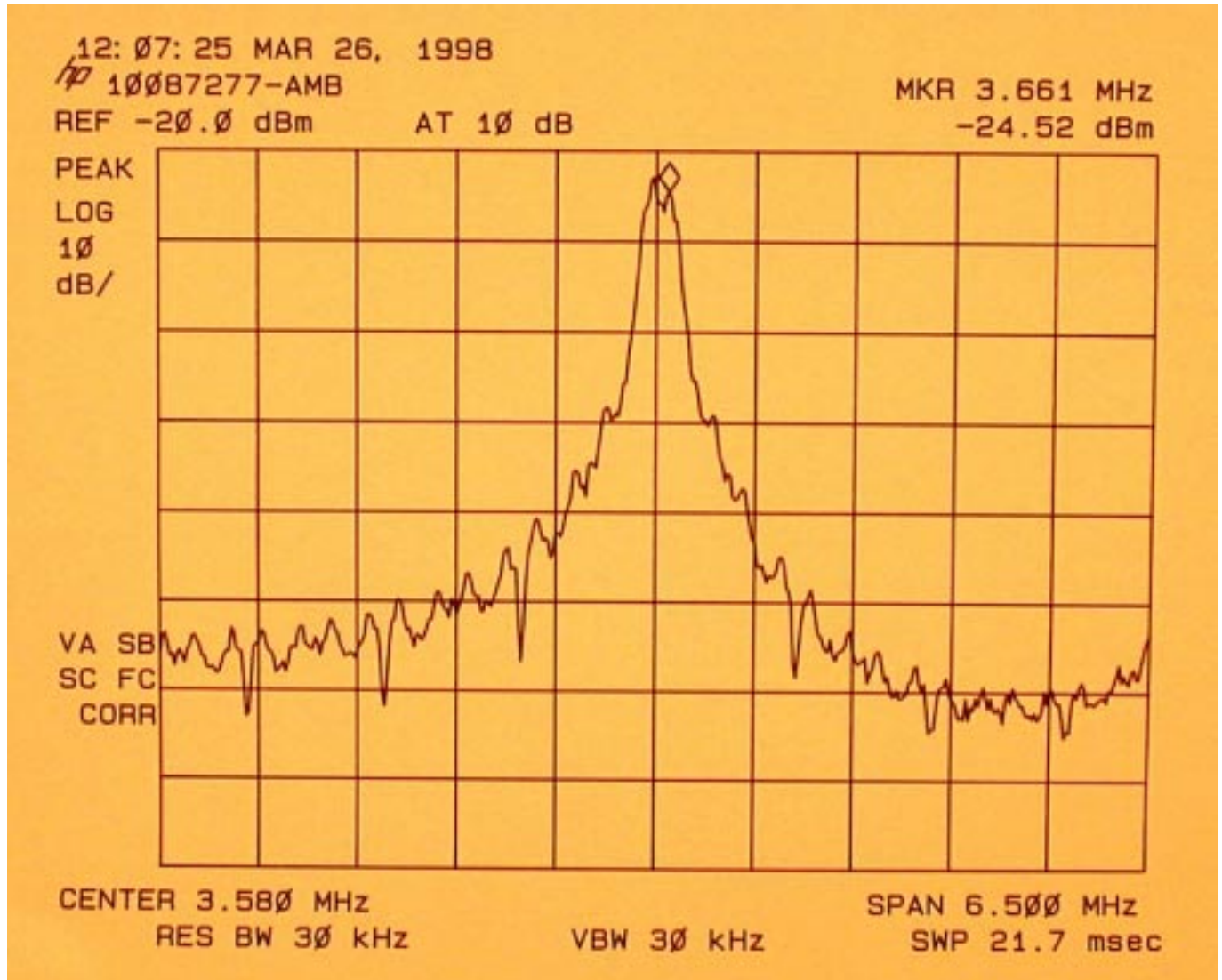
Plots of carrier bandwidth



Plot 1 - Carrier bandwidth TranX 120



Plot 2 - Carrier bandwidth TranX 160



Plot 3 - Carrier bandwidth TranX 260