

# AVANTEGO

## PRODUCT SPECIFICATION & PERFORMANCE TEST

### 2003-1-0000

## RETRACTABLE SNAP-IN ANTENNA

---

**This AVANTEGO retractable snap-in antenna is developed to be used as a mobile phone antenna. The performance is optimised for the NEXCOM NCP-2000, CDMA handset.**

**Document No: 2003-1-0000 issue 3**

09 February 2000  
Mechanical Development

09 February 2000  
RF Development

---

Joakim Stralje  
Manager Mechanical development

---

Jari Paananen  
Manager RF development & Technical support

Approved 09 February 2000  
AVANTEGO AB

Approved \_\_\_\_\_  
NEXCOM, Inc.

---

Anders Sandgren  
Manager Project & Sales Manager

# AVANTEGO

| <b>1: ELECTRICAL SPECIFICATION</b>     | <b>PAGE</b> |
|--|-------------|
| 1:1 Frequency range                    | 3           |
| 1:2 Handset                            | 3           |
| 1:3 Matching circuit                   | 3           |
| 1:4 VSWR                               | 4           |
| 1:5 Gain                               | 4           |
| 1:6 Power rating                       | 4           |
| <br><b>2: MECHANICAL SPECIFICATION</b> |             |
| 2:1 Appearance                         | 5           |
| 2:2 Helical deformation                | 5           |
| 2:3 Torque                             | 5           |
| 2:4 Force on Contact Spring            | 5           |
| 2:5 Drop                               | 6           |
| 2:6 Tension Load                       | 6           |
| 2:7 Extension and Retraction Forces    | 6           |
| 2:8 Operating temperature              | 6           |
| 2:9 Temperature cycling                | 7           |
| 2:10 Humidity                          | 7           |
| <br><b>3: PERFORMANCE TEST</b>         |             |
| 3:1 VSWR                               | 8           |
| 3:2 Radiation                          | 8           |
| 3:3 Power Rating                       | 9           |
| 3:4 Helix deformation                  | 10          |
| 3:5 Torque                             | 10          |
| 3:6 Force on Contact Spring            | 11          |
| 3:7 Drop                               | 11          |
| 3:8 Tension Load                       | 11          |
| 3:9 Extension and Retraction Forces    | 11          |
| 3:10 Operating temperature             | 11          |
| 3:11 Temperature cycling               | 12          |
| 3:12 Humidity                          | 12          |
| <br><b>4: LOG OF CHANGES</b>           | <b>13</b>   |
| <b>5: SPECIFICATION DRAWING</b>        | <b>14</b>   |

# AVANTEGO

## ELECTRICAL SPECIFICATION

### 1:1 FREQUENCY RANGE

*Frequency range:*  
824-894 MHz

### 1:2 HANDSET

*Handset number:*  
AVANTEGO No: NX102  
Received at AVANTEGO: 5<sup>th</sup> February 2000

*Note: This specification is only valid with the handset above..*

### 1:3 MATCHING CIRCUIT

The matching provided in the chassis provided by Nexcom is used.  
(We believe it is 8.2 or 10 nH in series.)

*Note: This specification is only valid with matching circuit above .*

# AVANTEGO

## 1:4 VSWR

*Maximum values in free space for retracted antenna:*

824-894 MHz      VSWR < 2.5:1

*Typical values in talk position for retracted antenna:*

824-894 MHz      VSWR < 2.5:1

*Maximum values in free space for extended antenna:*

824-894 MHz      VSWR < 2.5:1

*Typical values in talk position for extended antenna:*

824-894 MHz      VSWR < 2.5:1

## 1:5 GAIN

*Typical values in maximum direction for retracted antenna:*

824-894 MHz      -3.0 dB

*Typical values in maximum direction for extended antenna:*

824-894 MHz      -1.5 dB

## 1:6 POWER RATING

*Maximum input power:*

824-894 MHz      2W

*Demands:*

No visual deformation is allowed, and the antenna must meet the electrical specification after the test.

# AVANTEGO

## MECHANICAL SPECIFICATION

### 2:1 APPEARANCE

#### *Demands*

The appearance shall be according to the product specification drawing 2003-1-0001 issue 7 on page 14.

### 2:2 HELICAL DEFORMATION

#### *Demands*

Angle ( $\alpha$ ): 30°  
Bending Force (F) 30N

The antenna must meet the electrical specification and remain mechanically bounded after the test.  
Only minor non reversible deformations is allowed.

### 2:3 TORQUE

#### *Typical value*

T=10 Ncm

The antenna must meet the electrical specification and remain mechanically bounded after the test. Only minor non reversible deformations is allowed.

### 2:4 Force on Contact Spring

#### *Demands*

F=5 N

The antenna must meet the electrical specification and remain mechanically bounded after the test.

# AVANTEGO

## 2:5 DROP

### *Demands*

|                |       |
|----------------|-------|
| Drop Height    | 150cm |
| Handset weight | 100g  |
| Angle          | 45°   |

The antenna must meet the electrical specification and remain mechanically bounded after the test.  
Only minor non reversible deformations is allowed.

## 2:6 TENSION LOAD

### *Demands*

|                         |     |
|-------------------------|-----|
| Between cover and frame | 50N |
| Between whip and helix  | 50N |

The antenna must meet the electrical specification and remain mechanically bounded after the test.  
Only minor non reversible deformations is allowed.

## 2:7 EXTENSION AND RETRACTION FORCES

### *Demands*

|                                   |          |
|-----------------------------------|----------|
| Extension from retracted position | 0,5-5,0N |
| Retraction from extended position | 0,5-5,0N |

The demands is valid up to 10 000 cycles.

## 2:8 OPERATING TEMPERATURE

### *Demands*

-20°C to 70°C

No visual deformation is allowed, and the antenna must operate properly during the test.

# AVANTEGO

## 2:9 TEMPERATURE CYCLING

### *Demands*

Low cycling temperature                      -40°C

High cycling temperature                      70°C

No visual deformation is allowed, and the antenna must meet the specification after the test.

## 2:10 HUMIDITY

### *Demands*

Relative humidity                              95%

Temperature                                      55°C

No visual deformation is allowed, and the antenna must satisfy the electrical specification after the test.

# AVANTEGO

## PERFORMANCE TEST

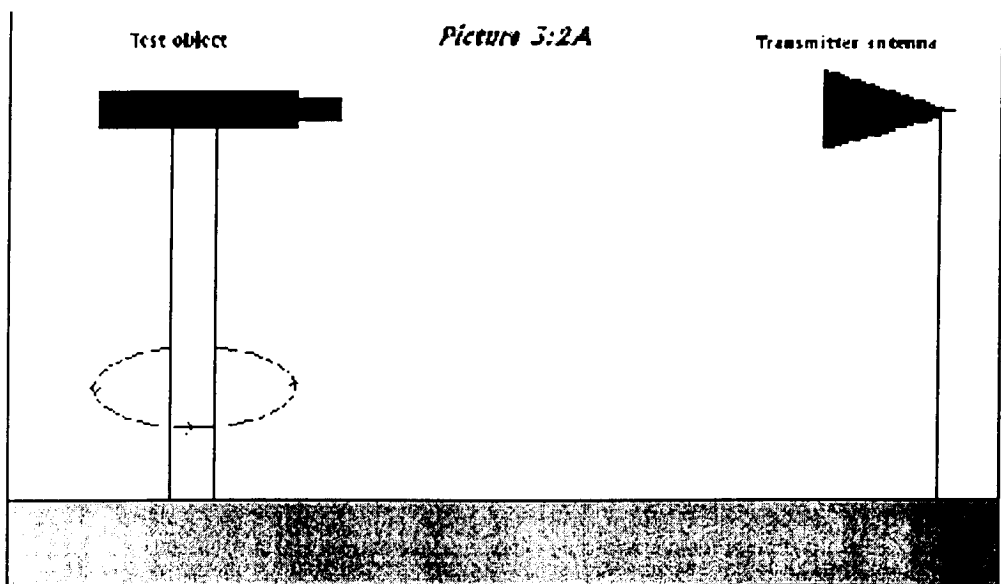
### 3:1 VSWR

The VSWR is measured with a network analyser or other equipment with same or better accuracy as HP 8753D network analysers.

*Free space* means that the antenna and mobile phone is placed on a non absorbing non reflecting material in an environment suitable for measurements on antennas. *Talk position* means that the phone is measured in user position. The talk position VSWR measurements is performed when a person is holding the phone in a typical user position.

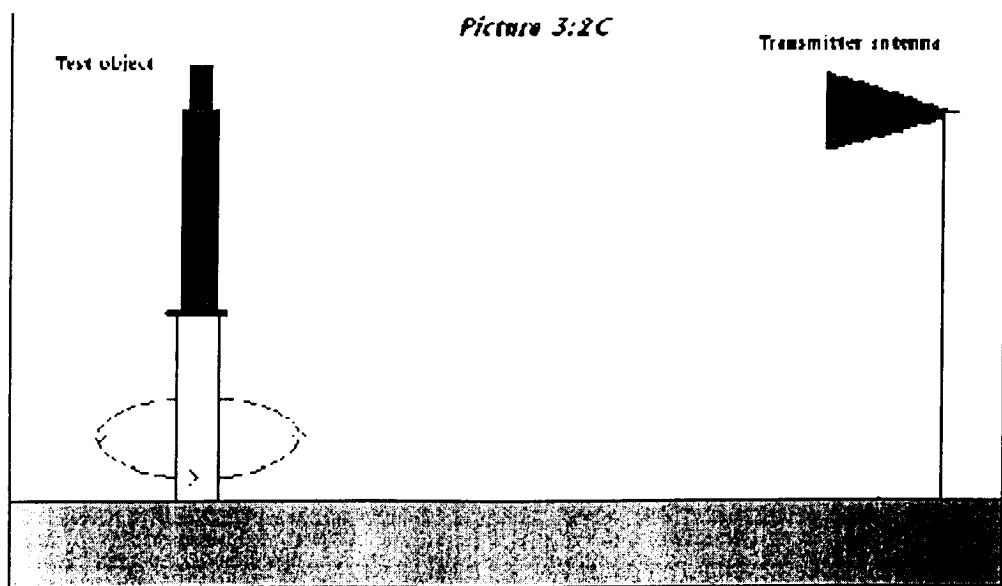
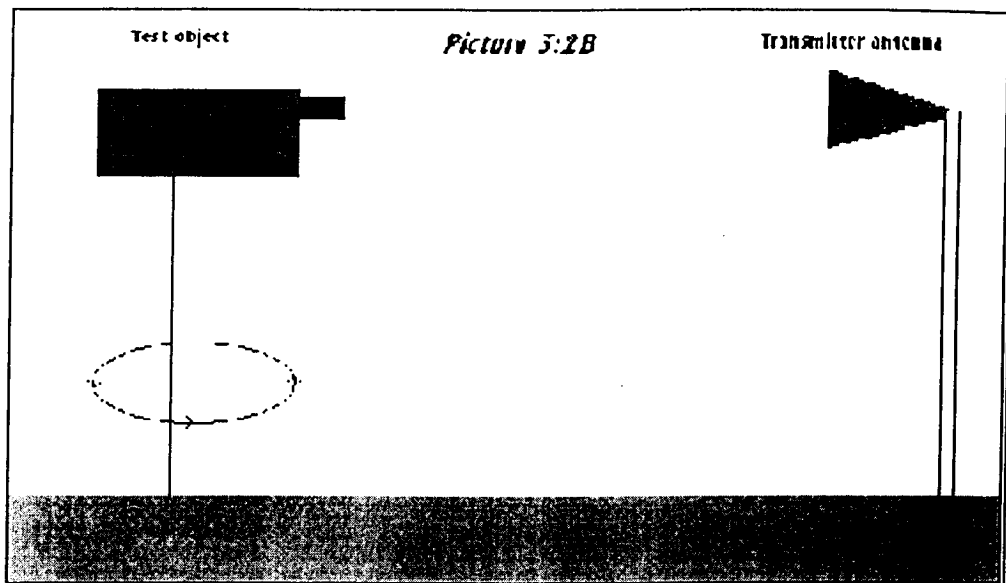
### 3:2 RADIATION

The radiation measurements are performed in an anechoic chamber. Three different planes are measured. E1-plane (*picture 3:2A*), E2-plane (*picture 3:2B*) and H-plane (*picture 3:2C*).





# AVANTEGO



## 3:3 POWER RATING

A 2W cw signal from a signal generator/amplifier is connected, through a power meter to the antenna for 10 minutes at room temperature.

# AVANTEGO

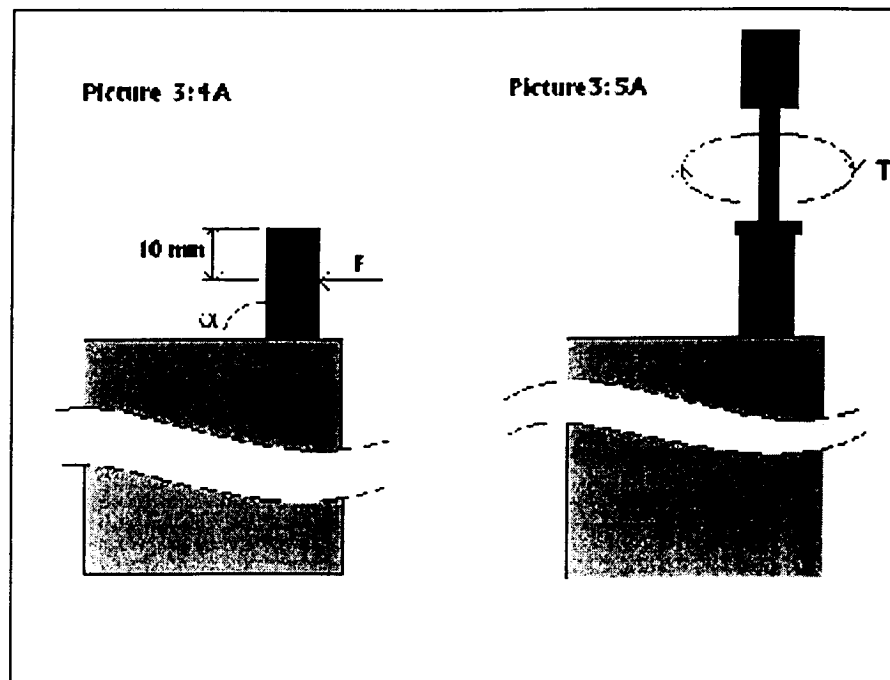
## 3:4 HELIX DEFORMATION

The test object is placed in a test jig.

A force (F) is applied perpendicular to the antenna, 10mm from the top until the specified force (F) or angle ( $\alpha$ ) is reached. (picture 3:4A)

## 3:5 TORQUE

The test object is placed in a test jig. A torque measurement instrument is attached to the test object. The test object is exposed to the specified torque. (picture 3:5A)



# AVANTEGO

## **3:6 FORCE ON CONTACT SPRING**

The test object is placed in a test jig.

A force (F) is applied on the contact spring in axial direction. The force (F) is increased until the contact spring releases from the antenna.

## **3:7 DROP**

The retracted antenna is attached to a test fixture with a specified weight, and is after that dropped from a specified height and with specified angle. This is repeated with the same antenna in extended position.

## **3:8 TENSION LOAD**

The antenna is placed in a test jig. A force measurement instrument is attached to the cover. The cover is exposed to the specified force. Then the whip is exposed to the specified force.

## **3:9 EXTENSION AND RETRACTION FORCES**

The antenna is placed in a test jig. A force measurement instrument is attached to the whip. The antenna is extended from retracted position.

The whip is locked in extended position. The antenna is pushed down from extended position using a force measurement instrument.

## **3:10 OPERATING TEMPERATURE**

The test is performed in a climatic chamber.

VSWR is measured at lowest and highest specified temperature

# AVANTEGO

## 3:11 TEMPERATURE CYCLING

The test is performed in a climatic chamber.

The temperature is cycled between “Low cycling temperature” and “High cycling temperature” 10 times. Between every cycling the temperature is kept constantly at “Low cycling temperature” and “High cycling temperature” for one hour. Start and end temperature is room temperature (approximately 20°C)

*Room temperature  $\Rightarrow$  10 times (Low cycling temperature for one hour  $\Rightarrow$  High cycling temperature for one hour)  $\Rightarrow$  Room temperature*

## 3:12 HUMIDITY

The test object is placed in a climatic chamber with specified humidity for 24 hours. After that it's kept in room temperature for 24 hours.

The antenna must satisfy the electrical demands after the test.

# AVANTEGO

## 4 LOG OF CHANGES

| Issue | Item | From             | To  |
|-------|------|------------------|---|
| 2     | 1:2  | TBD              | Specified Handset                                 |
| 2     | 1:3  | TBD              | Specified Matching                                |
| 2     | 1:4  | TBD              | Specified VSWR                                    |
| 2     | 1:4  | TBD              | Specified Gain                                    |
| 3     | 1:2  | Handset NX101    | Handset NX102                                     |
| 3     | 1:3  | 8,2 nH in series | Matching provided by Nexcom in the chassis NX102. |
| 3     | 1:5  | -1,0dB           | -1,5dB  |
| 3     | 5    | Max 90           | 92,4±1  |

This document and its contents are AVANTEGO AS technical property and must not be copied, reproduced, transmitted or communicated to any other party or used for purposes not explicitly permitted by us.

