

# Integration Guide

BlueTex.GPS

## **Product principle**

The main aim of the BlueTex.GPS is to provide personal navigation and a back office positioning solution combined in one unit. This is achieved by integrating a GPS receiver, a Bluetooth chip and a Mobitex radio modem in the BlueTex.GPS.

## **Personal navigation – the Bluetooth link**

The BlueTex.GPS is connectable over Bluetooth via the serial port profile. The raw NMEA v0183 data is directly forwarded from the GPS-receiver to the Bluetooth serial port.

The GPS data is sent once every second at 115.200 bits/second.

## **Positioning via mobitex – POSPAC18 message format**

The back office positioning solution is achieved by the BlueTex.GPS by generating and sending the current position over the mobitex network as a HPID15 message. The message interval is configurable. The message data format is POSPAC18, i.e. the position, time, date and optional 3 byte payload is compressed to only 18 bytes. This has the benefit of minimizing the radio traffic and saving precious battery power. The 3 byte payload can be set to any user defined value. In the BlueTex.GPS, the payload is used for indicating the status of the unit for the back office system. This status could say “normal operation”, “parked car” or “other obstacle” for instance.

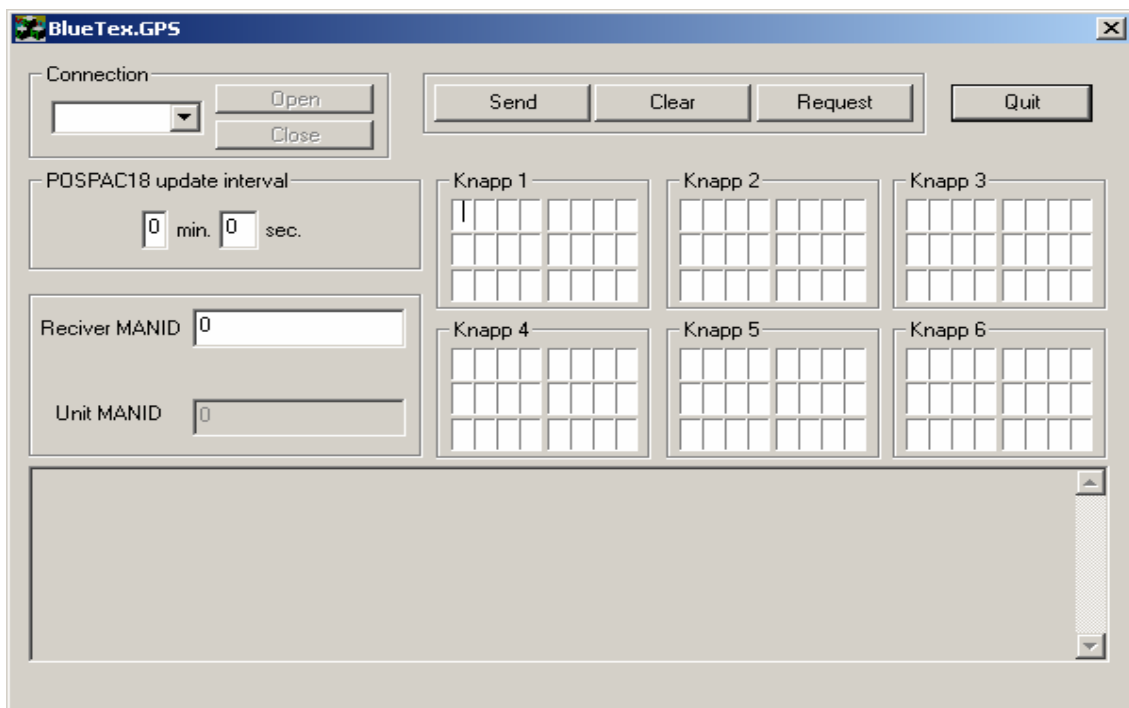
Byte nr	Name	Size (bits)	Comment
1-2	date	16	7 bits for year, 4 bits for month, 5 bits for day 0000010 1001 10011 for 02-09-19
3-4	time	1+16	Number of seconds since midnight. MSB is put in the field "extra bits".
5	lat deg	8	Latitude degrees. 0=90° south, 90=equator, 180=90° north
6-7	lat frac	1+16	5 decimals for latitude (accuracy < 0,8m). MSB is put in the field "extra bits".
8	long deg	1+8	Longitude degrees. 0=180° west, 180=0°, 360=180° east. MSB is put in the field "extra bits".
9-10	long frac	1+16	5 decimals for longitude (accuracy < 0,8m). MSB is put in the field "extra bits".
11	speed	1+8	Speed in km/h. Max 512 km/h. MSB is put in the field "extra bits".
12	direction	8	Circle split in 256 parts
13	Temp	8	0 = -128°C, 128 = 0°C, 255 = 127°C
14	RSSI	8	0-255
15-17	Payload	24	
18	GPS-q	2	0 = no gps, 1 = gps position, 2 = differential gps position
18	Extra bits	5	The 5 extra bits from the fields with +1 above is collected in the order the appear in the package. (time, lat frac, long deg, long frac, speed).
18	Not used	1	Always zero
	Summary	144	18 bytes

## **Configuration possibilities**

The sending and generation of the POSPAC18 messages are configurable through a software control panel. The control panel is executed on a MS Windows PC and connects to the BlueTex.GPS via Bluetooth. The configurable parameters are:

- Receiver MANID for the POSPAC18 messages.
- POSPAC18 generation and sending time interval
- Individual payload associated with the F1 to F6 function buttons on the BlueTex.GPS keyboard.

Below is a screendump of the BlueTex.GPS control panel.



## **GPS data – NMEA v0183**

The GPS data have the standard format of NMEA v0183. The supported NMEA sentences are:

- ZDA
- GGA
- GLL
- VTG
- GSA
- GSV
- RMC

### **Specification of NMEA v0183 sentences**

ZDA – Time and date.

\$DPZDA,hhmmss.ss,xx,xx,xxxx,\*,\*hh<CR><LF>

Field data:

- 1: UTC
- 2: Day (01 to 31)
- 3: Month (01 to 12)
- 4: Year
- 5: unused
- 6: unused
- hh: checksum

GGA – GPS fix data.

\$GPGGA,hhmmss.ss,llll.lll,a,nnnnn.nnn,b,t,uu,v.v,w.w,M,x.x,M,y.y,zzzz\*hh <CR><LF>

Field data:

- 1: UTC of Position
- 2,3: Latitude, N (North) or S (South)
- 4,5: Longitude, E (East) or W (West)
- 6: GPS Quality Indicator: 0 = No GPS, 1 = GPS, 2 = DGPS
- 7: Number of Satellites in Use
- 8: Horizontal Dilution of Precision (HDOP)
- 9,10: Antenna Altitude in Meters, M = Meters
- 11,12: Geoidal Separation in Meters, M=Meters. Geoidal separation is the difference between the WGS-84 earth ellipsoid and mean sealevel
- 13: Age of Differential GPS Data. Time in seconds since the last Type 1 or 9 Update
- 14: Differential Reference Station ID (0000 to 1023)
- hh: Checksum

#### GLL - Geographic Position - Latitude/Longitude.

\$GPGLL,llll.lll,a,yyyyy.yyy,a,hhmmss.ss,A,i\*hh<CR><LF>

- 1,2: Latitude, N (North) or S (South)
- 3,4: Longitude, E (East) or W (West)
- 5: UTC of position
- 6: Status: A = Valid, V= Invalid
- 7: Mode Indicator
  - A=Autonomous Mode
  - D=Differential Mode
  - E=Estimated (dead reckoning) Mode
  - M=Manual Input Mode
  - S=Simulated Mode
  - N-Data Not Valid
- hh: Checksum

#### VTG - Track Made Good and Ground Speed.

\$GPVTG,x.x,T,x.x,M,x.x,N,x.x,K,i\*hh<CR><LF>

- 1: Track made good in degrees true.
- 2: Track made good in degrees magnetic.
- 3,4: Speed over the ground (SOG) in knots.
- 5,6: Speed over the ground (SOG) in kilometer per hour.
- 7: Mode Indicator: A=Autonomous Mode, D=Differential Mode, E=Estimated (dead reckoning) Mode, M=Manual Input Mode, S=Simulated Mode, N-Data Not Valid
- hh: Checksum

#### GSA - GPS DOP and Active Satellites

\$GPGSA,a,x,xx,xx,xx,xx,xx,xx,xx,xx,xx,xx,xx,x.x,x.x,x.x\*hh<CR><LF>

- 1: Mode: M = Manual, A = Automatic. In manual mode, the receiver is forced to operate in either 2D or 3D mode. In automatic mode, the receiver is allowed to switch between 2D and 3D modes subject to the PDOP and satellite masks.
- 2: Current Mode: 1 = fix not available, 2 = 2D, 3 = 3D
- 3-14: PRN numbers of the satellites used in the position solution. When less than 12 satellites are used, the unused fields are null
- 15: Position dilution of precision (PDOP)
- 16: Horizontal dilution of precision (HDOP)
- 17: Vertical dilution of precision (VDOP)
- hh: Checksum

#### GSV - GPS Satellites in View

\$GPGSV,x,x,xx,xx,xx,xxx,xx,xx,xxx,xx,xx,xxx,xx,xx,xxx,xx\*hh<CR><LF>

- 1: Total number of GSV messages
- 2: Message number: 1 to 3
- 3: Total number of satellites in view
- 4: Satellite PRN number
- 5: Satellite elevation in degrees (90° Maximum)
- 6: Satellite azimuth in degrees true (000 to 359)
- 7: Satellite SNR (C/No), null when not tracking
- 8-11: PRN, elevation, azimuth and SNR for second satellite

- 12-15: PRN, elevation, azimuth and SNR for third satellite
- 16-19: PRN, elevation, azimuth and SNR for fourth satellite
- hh: Checksum

RMC - Recommended Minimum Specific GPS/Transit Data

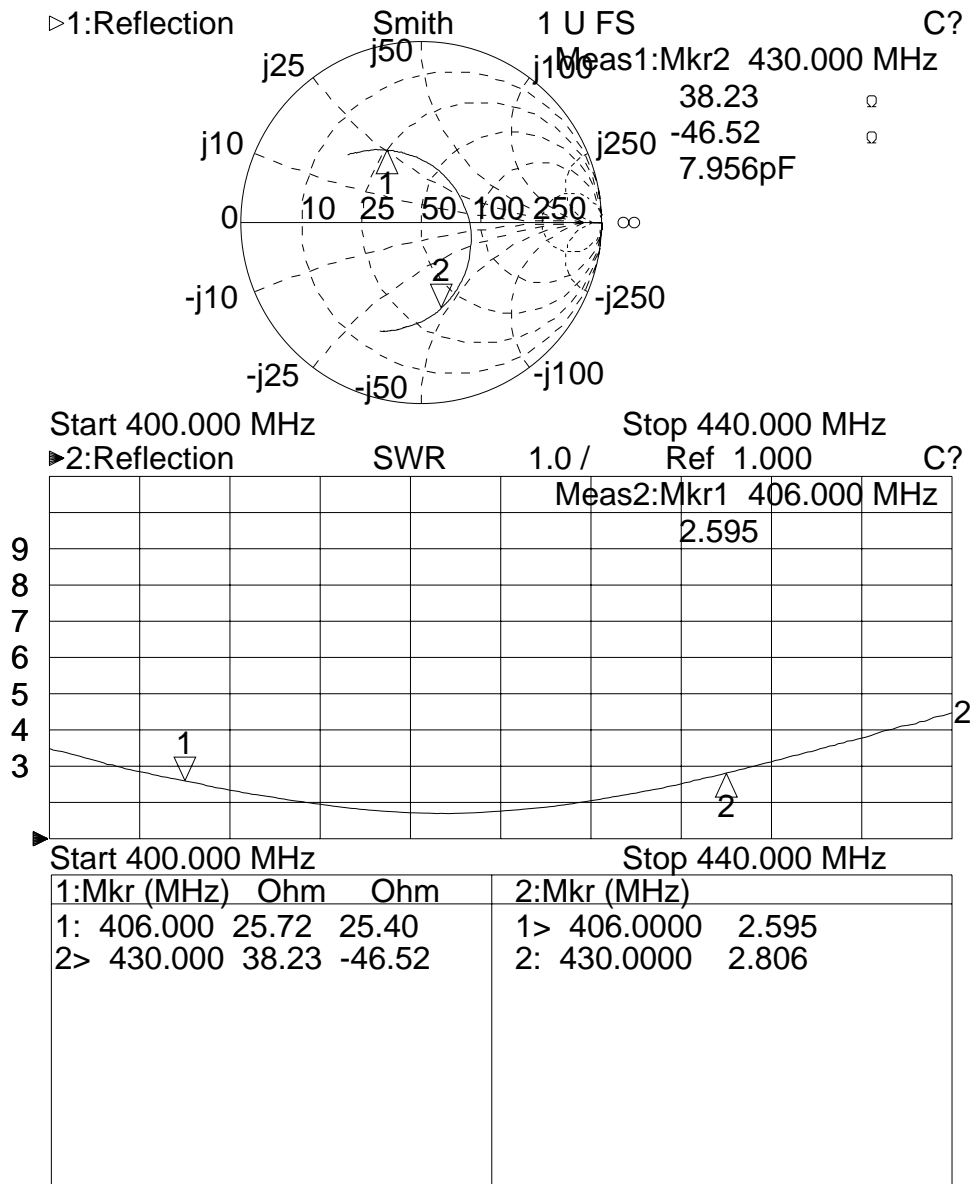
\$GPRMC,hhmmss.ss,A,llll.ll,a,yyyy.yy,a,x.x,x.x,xxxxxx,x.x,a,i\*hh<CR><LF>

- 1: UTC of Position Fix.
- 2: Status: A = Valid, V = navigation receiver warning
- 3,4: Latitude, N (North) or S (South).
- 5,6: Longitude, E (East) or W (West).
- 7: Speed over the ground (SOG) in knots
- 8: Track made good in degrees true.
- 9: Date: dd/mm/yy
- 10,11: Magnetic variation in degrees, E = East / W= West
- 12: Position System Mode Indicator; A=Autonomous, D=Differential, E=Estimated (Dead Reckoning), M=Manual Input, S=Simulation Mode, N=Data Not Valid
- hh: Checksum

## Antenna performance

The internal antennas are pcb integrated monopoles and made in 1.0 mm thick FR4.

### Input Impedance



**Fig:** Smith chart and VSWR, BlueTex GPS EU.

# Magnitude (dB ) vs.A

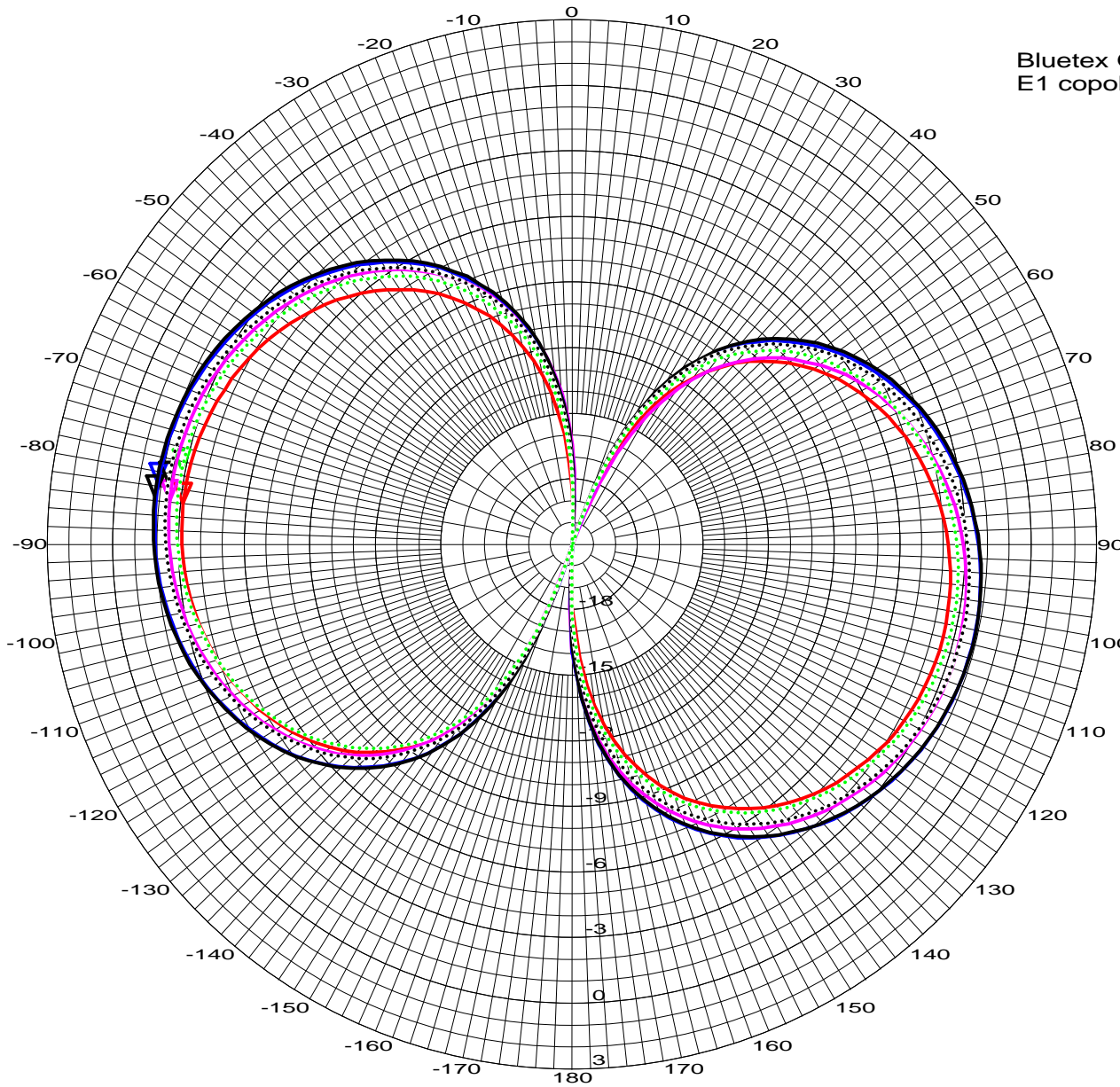
(Deg)

Bluetex GPS  
E1 copol

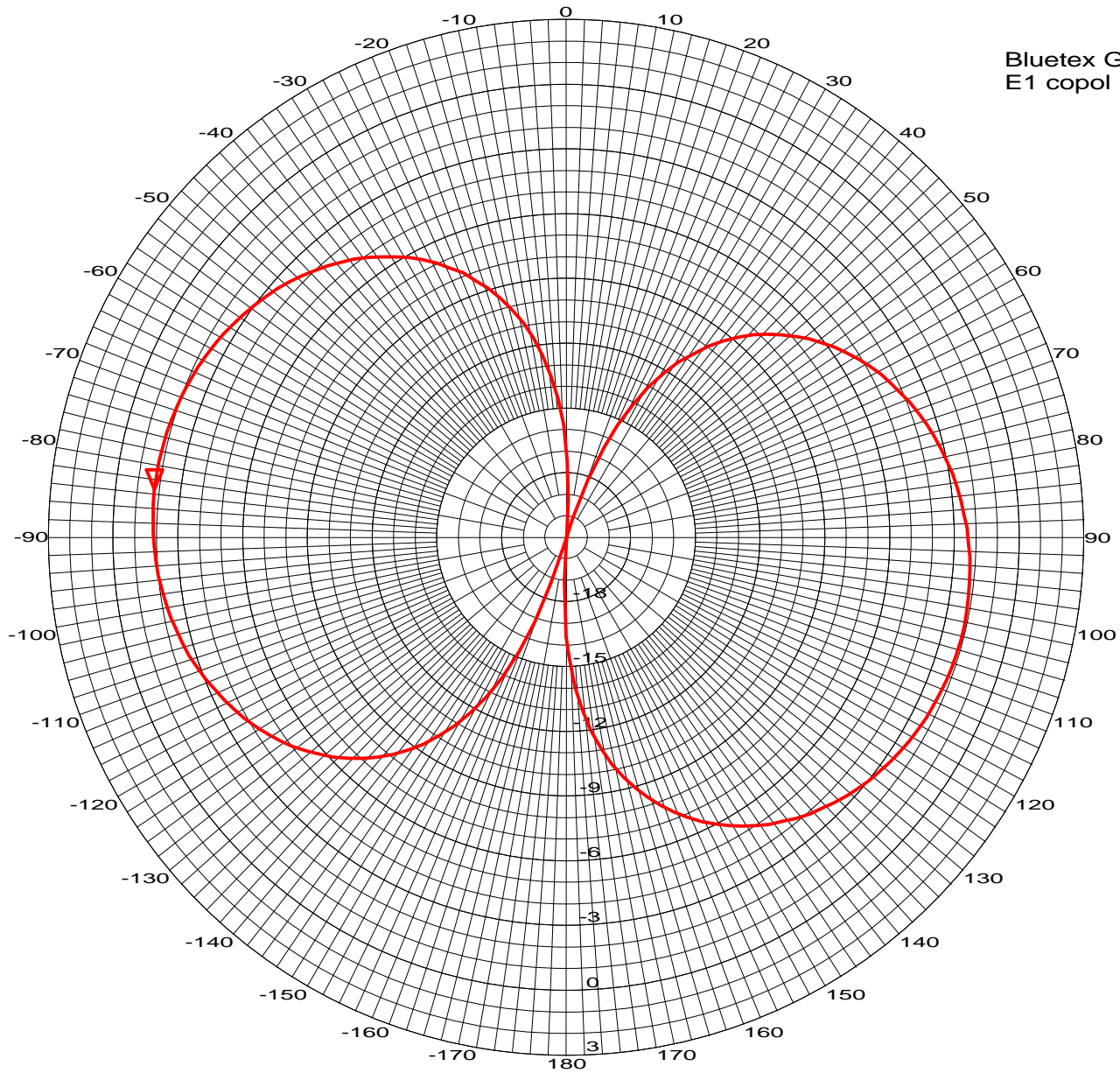
File: E1C.DAT  
Date: 11-May-04  
Time: 18:21  
Operator: pabe  
Ser. no.:  
Channel: chA Tx pol: Horiz. Rx: Horiz.  
Frequency : See Legend

Calibration status:  
File: E1C.DAT  
Table: per1  
Chan.: chA  
Units: dBi

Overlays			
Freq:	0.406 GHz	-3.11 dB	-83.9°
Freq:	0.410 GHz	-2.49 dB	-83.7°
Freq:	0.415 GHz	-1.87 dB	-81.6°
Freq:	0.420 GHz	-1.79 dB	-83.3°
Freq:	0.426 GHz	-2.31 dB	-81.2°
Freq:	0.430 GHz	-2.82 dB	-79.1°



# Magnitude (dB ) vs.A (Deg)



Bluetex GPS  
E1 copol

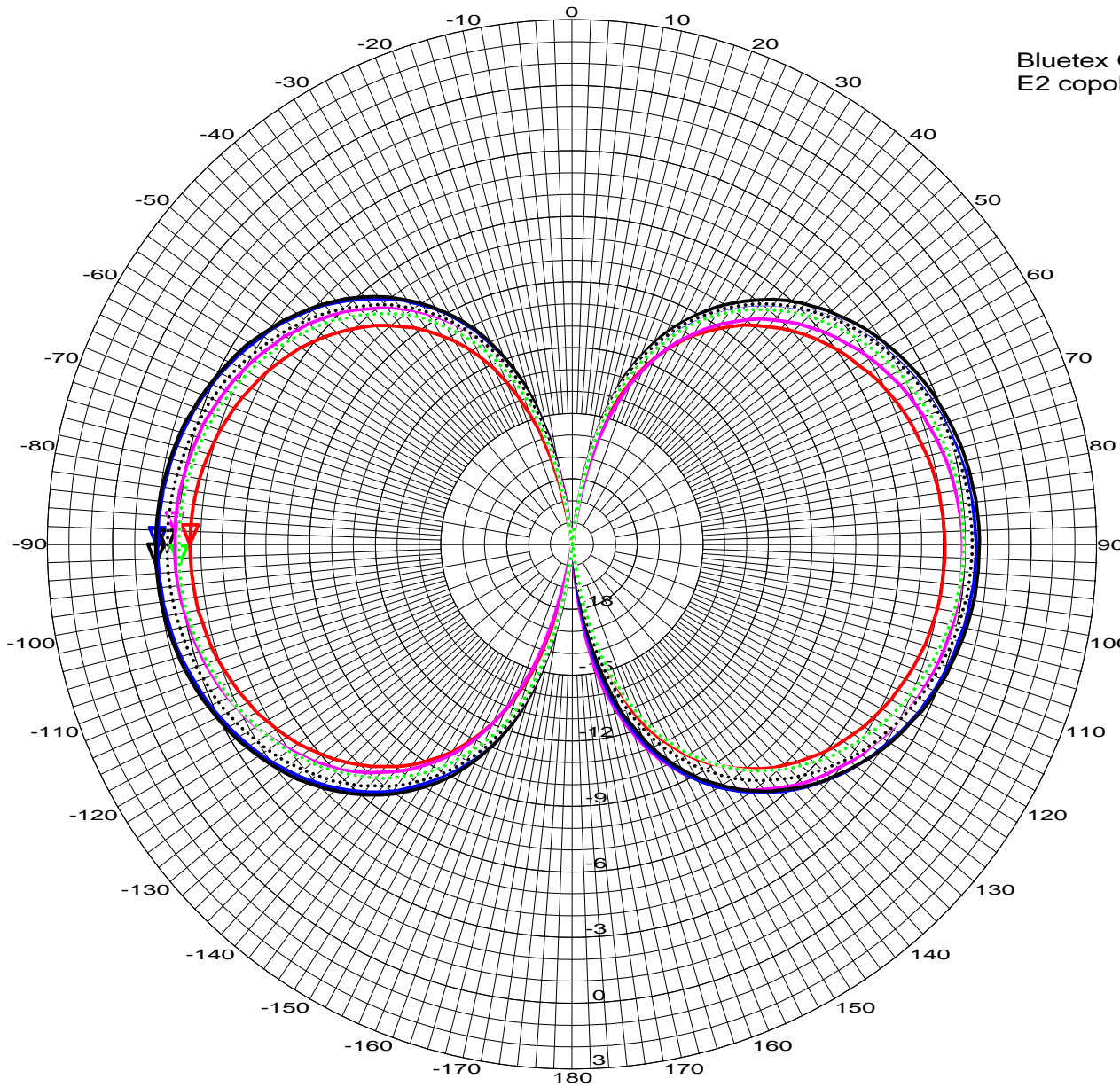
File: E1C.DAT  
Date: 11-May-04  
Time: 18:21  
Operator: pabe  
Ser. no.:  
Channel: chA Tx pol: Horiz. Rx: Horiz.  
Frequency : 0.420 GHz

Calibration status:  
File: E1C.DAT  
Table: per1  
Chan.: chA  
Units: dBi

-1.79 dB -83.3°

# Magnitude (dB ) vs.A

(Deg)



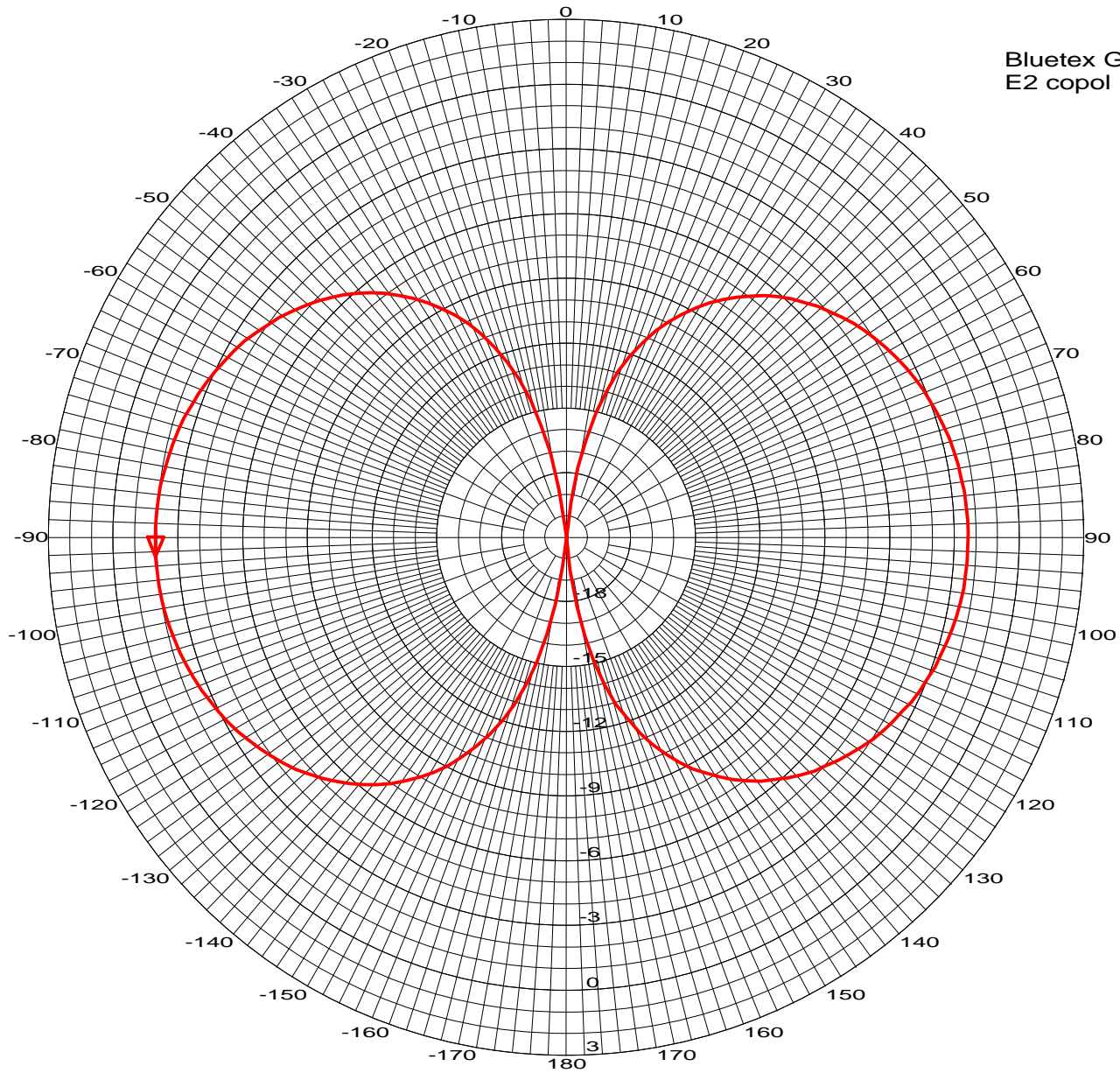
Bluetex GPS  
E2 copol

File: E2C.DAT  
Date: 11-May-04  
Time: 18:23  
Operator: pabe  
Ser. no.:  
Channel: chA Tx pol: Horiz. Rx: Horiz.  
Frequency : See Legend

Calibration status:  
File: E2C.DAT  
Table: per1  
Chan.: chA  
Units: dBd

Overlays			
Freq:	0.406 GHz	-3.53 dB	-90.0°
Freq:	0.410 GHz	-2.83 dB	-88.3°
Freq:	0.415 GHz	-2.04 dB	-90.4°
Freq:	0.420 GHz	-1.94 dB	-92.7°
Freq:	0.426 GHz	-2.48 dB	-90.8°
Freq:	0.430 GHz	-3.00 dB	-93.1°

# Magnitude (dB ) vs.A (Deg)



Bluetex GPS  
E2 copol

File: E2C.DAT  
Date: 11-May-04  
Time: 18:23  
Operator: pabe  
Ser. no.:  
Channel: chA Tx pol: Horiz. Rx: Horiz.  
Frequency : 0.420 GHz

Calibration status:  
File: E2C.DAT  
Table: per1  
Chan.: chA  
Units: dBi

-1.94 dB -92.7°