# **Create XYZ Using File with Tilt Meter Corrections**

There are two new items in GPS Positioning menu labeled GPS Positioning with Tilt Meter Corrections and Grid Positioning with Tilt Meter Corrections (Figure A.1). New procedures are designed to apply roll and pitch parameters to correct positions of reading when data file is collected with the Geonics EM61-MK2 equipped with the Geonics installed tilt meter sensor.

File Data Transfer Convert El (El (et) (el (16) 🗄 111 🗄 🔳 🔳 💷 GPS Positioning Correct Time Delay in XYZ Files GPS Positioning with Tit Meter GPS Positioning with Tit Meter 🖕 ponios Geonios Geonios Geonios Geonios Geonios Geonios Geonios Avenics (Avenics (Av Avecnics Reonics Aleonias Ale Ayeonics Ayeonics Ayeonics Ayeonics Ayeonics Ayeonics Ayeonics Ayeonics Ayeonics Avenies (Avenies Cyeonics Cyeonics Cyeonics Cyeonics Cyeonics Cyeonics Cyeonics Cyeonics Cyeonics

Figure A.1 DAT61MK2 GPS Positioning menu

## A1. GPS Positioning with Tilt Meter Corrections

The **GPS Positioning with Tilt Meter Corrections** option can be used only when EM61-MK2 data is collected with GPS positioning data, GPS antenna is rigidly fixed on the EM61-MK2 sensor, the Geonics installed Tilt Meter was available and Roll and Pitch values were recorded during data collection. In this method the GPS receiver is connected to the logging field computer serial port and GPS data, as well as Tilt Meter data are collected in the EM61-MK2 data file. This method can be used with virtually any GPS receiver that can stream a **GGA** message (standard NMEA-0183 data string). The program is using GPS positions as received from employed GPS receiver, therefore differentially corrected positions (DGSP or any RTK system) provide better accuracy.

After you select the **GPS Positioning**|**GPS Positioning with Tilt Meter Corrections** from the DAT61MK2 menu (as shown in Figure A.1) the Create XYZ File Based on GPS Positions dialog is displayed (Figure A.2).

Before creating the XYZ file several parameters must be specified. These are the Input file name (M61 format), XYZ file name, the format of coordinates in the output file, and several parameters associated with GPS signal.

Data is always placed in the created XYZ file in the following order: X coordinate, Y coordinate, Channel 1, Channel 2, Channel 3, Channel 4 (or T if EM61-MK2 was used), Channel D (if EM61MK2 in mode D was used), following by parameters selected in the Options section.

Create XYZ File Base	d on GPS Positions			×
Select Input Date	a File (M61)			
File No	t Selected			
Select Output Fi	le Name			
File	ot Selected			
Tilt Meter State	and GPS Antenna Heigh	t	Coordinates (Datum WGS84)	
Tilt Meter Sta GPS Antenna	<mark>te Unknown Untill Data F</mark> Height in Data File: N	ile is Selected /A	Geodetic ddd.dddddc $ \sim $	
GPS Antenna	GPS Antenna Height to be used: N/A m GPS Time Gap			
EM61-MK2 Mod	e and Channels		5 seconds (3 to 5 times GPS rate)	
Standard-D (	Mode D): Ch1, Ch2, Ch3	3, ChT, ChD 🗸	GPS Corrections	
XYZ Format	Column Delimiter	Options	AGPS (Raw)	
Geosoft	Exed Comma	✓ Header Info ✓ Roll/Pitch		
◯ Surfer	O Space	🖵 GPS Quality		
◯ Generic	⊖ Tab	🗹 Time Stamp		
Set Parameters, th Version 1.00	ien Select Output File	Cancel	Exit Proceed	

Figure A.2 Create XYZ File Based on GPS Positions dialog before Input Data File is specified

When input data file is not specified the label Tilt Meter State Uknown is displayed. After input data file is specified the program detects presence of Tilt Meter readings and if it is present then the label changes and GPS Antenna Height parameters are enabled.

## Select Input Data File (M61) (Input File)

Click on the **File** button below the Select Input Data File label. The Open File dialog is displayed (Figure A.3).

$\leftarrow$ $\rightarrow$ $\checkmark$ $\Uparrow$ $\blacksquare$ $\Rightarrow$ This PC	> Windows (C:) > ProgramsGeonics > DatTiltX	yz >	ٽ ×	. ○ Search DatTiltXyz	
Organize 🔻 New folder					
- Owick accord	Name	Date modified	Туре	Size	
Culck access	BackupDat318	2023-03-13 3:03 PM	File folder		
💻 This PC	092012B_1.M61	2021-09-22 4:37 PM	M61 File	161 KB	
🧊 3D Objects	092012B_1_NoTilt.M61	2023-02-22 10:57 PM	M61 File	161 KB	
Desktop	AB_092012.M61	2021-09-22 4:37 PM	M61 File	161 KB	
Documents	Ord12N.M61	2021-11-02 4:44 PM	M61 File	33 KB	
L Downloads	Ord092012B.M61	2021-10-28 11:41 AM	M61 File	71 KB	
Music	Ord092012B_org.M61	2021-10-29 1:40 PM	M61 File	71 KB	
Ji Music					
Pictures					
Videos					
L Windows (C:)					
igen Network					
File name:	092012B_1.M61		~	DAT61MK2 M61 Files	~
				Open C	Cancel

Figure A.3 Open DAT61MK2 (M61) Data File dalog

Select a file name and click the **Open** button. The Open File dialog will, the program will check presence of Tilt Meter data in the file while reading EM61MK2 and GPS readings and when done, the selected file name will be displayed beside the **File** button. At the same time if Tilt Meter data is detected in the input file parameters in section labeled Tilt Meter State and GPS Antenna Height will be enabled (Figure A.4), otherwise information

File C:\	ProgramsGeonics\DatTi	illXyz\092012B_1.M61			
Select Output Fil	e Name				
File No	t Selected				
ہ – Tilt Meter State a	and GPS Antenna Heigh	t	Coordinates (Datum WGS84)		
Tilt Meter Readings are Available in Data File			Geodetic ddd.dddddd 🗸		
GPS Antenna	Height in Data File: 1	1.65			
GPS Antenna	Height to be used: 1.	GPS Time Gap			
EM61-MK2 Mode	e and Channels		5 seconds		
Standard-D (I	Mode D) : Ch1 Ch2 Ch	зсытсыр 🗸	(3 to 5 times GPS rate)		
oranada o (i	1000 D). Citt, Cit2, Cit.	s, chr, chb	GPS Corrections		
XYZ Format	Column Delimiter	Options	AGPS (Baw)		
Geosoft	Fixed	Header Info	riar o (riari)		
O Surfer	Comma	Roll/Pitch	HDOP Mask		
OC	O Space	GPS Quality	3 HDOP		
		✓ Time Stamp			
Set Parameters, th	en Select Output File				
(i-n 1 00		Cancel	Exit Proceed		

Figure A.4 The Create XYZ... dialog with confirmation that Tilt Meter data is present in the selected file, and displaying GPS Antenna Height as it was entered during data collection

about lack of Tilt Meter readings will be shown and parameters in this section will remain disabled as shown in Figure A.5. In case selected data file does not contain Tilt Meter read-

Select Input Data	on GPS Positions File (M61) ProgramsGeonics\DatT	iltXyz\092012B_1_NoTilt	.M61	×
Select Output File	Name Selected			
Tilt Meter State a Tilt Meter Rea GPS Antenna GPS Antenna EM61-MK2 Mode Standard-D (N	nd GPS Antenna Heigh dings are not Available i Height in Data File: N Height to be used: N, and Channels 1ode D): Ch1, Ch2, Ch2	t I/A Deta File I/A De A m 3, ChT , ChD ~	Coordinates (Datum WGS84) Geodetic ddd.dddddc v GPS Time Gap 5 seconds (3 to 5 times GPS rate)	
XYZ Format Geosoft Surfer Generic	Column Delimiter Fixed Comma Space Tab	Options Header Info Roll/Pitch GPS Quality Time Stamp	AGPS Corrections AGPS (Raw) ~ HDOP Mask 3 HDOP	
Set Parameters, the Version 1.00	en Select Output File	Cancel	Exit Proceed	

Figure A.5 The Create XYZ... dialog with information that Tilt Meter data is not available the selected file

ings it still can be processed, as any other data file with no Roll and Pitch corrections as long as GPS positions are available.

## Select Output File Name (Output XYZ File)

Click on the **File** button located under the Select Output File Name . The Save As dialog is displayed (Figure A.6).

🥂 Save As						
	This PC > Windows (C:) > Program:	Geonics > Dat61LX2 > DataFiles		✓ Ö Search Data	Files	٩
Organize 👻 New f	older					0
	Name	Date modified	Туре	Size		
Y QUICK access	02A-371.xyz	8/16/2017 1:38 PM	XYZ File	276 KB		
OneDrive	2003A.xyz	8/16/2017 1:44 PM	XYZ File	454 KB		
This PC	2004-5.xyz	8/16/2017 1:48 PM	XYZ File	89 KB		
Dealers	ali 02371.xyz	8/16/2017 1:37 PM	XYZ File	454 KB		
	089217A.xyz	8/16/2017 1:38 PM	XYZ File	276 KB		
Documents	Astat01.xyz	8/16/2017 1:37 PM	XYZ File	454 KB		
Downloads	W07213C.xyz	8/16/2017 1:38 PM	XYZ File	276 KB		
👌 Music	a x.xyz	6/12/2017 12:15 PM	XYZ File	1 KB		
Pictures	a x_L.xyz	6/12/2017 12:15 PM	XYZ File	1 KB		
😸 Videos	x_R.xyz	6/12/2017 12:15 PM	XYZ File	1 KB		
Windows (C:)	yy-xyz	5/9/2017 2:19 PM	XYZ File	1 KB		
🔿 Network						
DESKTOP-QKUN	IGL					
•4 Homegroup						
_						
File name: 33	320-a.xyz					`
Save as type: G	eosoft Format XYZ File					`
∧ Hide Folders				Save	Cancel	

Figure A.6 Select XYZ File Name window

The XYZ file name extension default will be determined by the selected output file format (xyz or dat) in XYZ File Format section. The XYZ File Format option must be selected before clicking on the **File** button.

Specify a file name and click the **Save** button and the Save As dialog will close. When Output Files is specified the **Proceed** button in the Create XYZ File Based on GPS Positions becomes active and name of selected file is displayed in the window associated with the Select Output File Name section (Figure A.7).

Select input Data	a File (M61)			
File C:V	\ProgramsGeonics\DatT	iltXyz\092012B_1.M61		
Select Output Fi	le Name			
File C:	\ProgramsGeonics\DatT	⊺iltXyz\West_B.xyz		
Tilt Meter State a	and GPS Antenna Heigh	nt	Coordinates (Datum WGS84)	
Tilt Meter Rea	adings are Available in D	ata File	Geodetic ddd dddda yw	
GPS Antenna	Height in Data File:	1.65	Geodetic ddd.dddddc 🗸	
GPS Antenna	Height to be used: 1	.65 m	GPS Time Gap	
			5 seconds	
	e and Channels		(3 to 5 times GPS rate)	
Standard-D (	e and Channels Mode D) : Ch1, Ch2, Ch	3, ChT, ChD 🗸 🗸	(3 to 5 times GPS rate)	
Standard-D (	e and Channels Mode D) : Ch1, Ch2, Ch Column Delimiter	3, ChT, ChD 🗸	(3 to 5 times GPS rate) GPS Corrections	
Standard-D ( XYZ Format	e and Channels Mode D) : Ch1, Ch2, Ch Column Delimiter	3, ChT , ChD V Options Header Info	(3 to 5 times GPS rate) GPS Corrections AGPS (Raw)	
Standard-D ( XYZ Format Geosoft	e and Channels Mode D) : Ch1, Ch2, Ch Column Delimiter	3, ChT, ChD Options Header Info Roll/Pitch	(3 to 5 times GPS rate) GPS Corrections AGPS (Raw)	
Standard-D ( XYZ Format Geosoft Surfer	e and Channels Mode D) : Ch1, Ch2, Ch Column Delimiter	3, ChT, ChD Options Header Info Roll/Pitch GPS Quality	(3 to 5 times GPS rate) GPS Corrections AGPS (Raw)	
Standard-D ( XYZ Format © Geosoft ) Surfer ) Generic	e and Channels Mode D) : Ch1, Ch2, Ch Olumn Delimiter Fixed Comma Space Tab	3, ChT, ChD Options Header Info Roll/Pitch GPS Quality Time Stamp	(3 to 5 times GPS rate) GPS Corrections AGPS (Raw) HDOP Mask 3 HDOP	
Standard-D ( Standard-D ( XYZ Format © Geosoft ) Surfer ) Generic	e and Channels Mode D) : Ch1, Ch2, Ch Olumn Delimiter Fixed Comma Space Tab	3, ChT, ChD Options Header Info Roll/Pitch GPS Quality Time Stamp	(3 to 5 times GPS rate) GPS Corrections AGPS (Raw) HDOP Mask 3 HDOP	

Figure A.7 Create XYZ File Based on GPS Positions dialog after both Input and Output Files are specified

#### GPS Antenna Height to be used

The GPS Antenna Height is always displayed as entered during data collection and the same value is displayed by default in the field labeled GPS Antenna Height to be used (Figure A.7). If for any reason the antenna height must be changed it can be entered in the edit box displayed at this label (Figure A.8 where GPS Antenna Height differs from default value). This value will be used by the program while calculating Roll and Pitch corrections, it must be specified in metres.

File	U:\ProgramsGeonics\Dat1	iltXyz\092012B_1.M61			
Select Outpu	t File Name				
File	C:\ProgramsGeonics\DatTiltXyz\West_B.xyz				
Tilt Meter Sta	te and GPS Antenna Heigh	ıt	– Coordinates (Datum WGS84)		
Tilt Meter I	Readings are Available in D	ata File	Geodetic ddd ddddd $\sim$		
GPS Anter	nna Height in Data File:	1.65			
GPS Antenna Height to be used: 1.23 m			GPS Time Gap		
EM61-MK2 M	lode and Channels		5 seconds (3 to 5 times GPS rate)		
Stanuaru	D (Mode D), chi, chi, chi, ch	s, cm, cho 🔹	GPS Corrections		
XYZ Format-	Column Delimiter	Options			
Geosoft	Fixed	🗹 Header Info	Auro (naw)		
O Surfer	🔿 Comma	Roll/Pitch	HDOP Mask		
0	O Space	🗹 GPS Quality	3 HDDP		
🔘 Generic	: O Tab I Time Stamp				

Figure A.8 Create XYZ File Based on GPS Positions dialog with adjusted GPS Antenna Height

## EM61-MK2 Mode and Channels

Select EM61-MK2 and Channels to be placed in the XYZ file. To select this parameter click one of items listed in the combo box labeled EM61-MK2 Mode and Channels, see Figure A.9.

#### **XYZ File Format**

Indicate the appropriate option for the contouring software to be used. The Generic option will create a multi column file without any text strings. This file can be used as an input file for many contouring packages (including Geosoft and Surfer). This parameter will also determine a default file extension name during specifying XYZ file name. The program will prompt extension file names XYZ, DAT, ASC for formats Geosoft, Surfer, and Generic.

#### **Column Delimiter**

Select column delimiter that is required by your application. The option Fixed corresponds to fixed field for each column with space or spaces between columns. This format is suitable for most applications and a file created with this selection provides the easiest option if file is to be viewed using any standard text editor. Remaining column delimiters are Comma, Space (single), and Tab.

Select input Data File (Mb I)					
File C:M	C:\ProgramsGeonics\DatTiltXyz\092012B_1.M61				
Select Output File	e Name				
File         C:\ProgramsGeonics\DatTiltXyz\West_B.xyz					
Tilt Meter State a	Coordinates (Datum WGS84)				
Tilt Meter Rea	dings are Available in D	ata File	Geodetic ddd dddddo 🖂		
GPS Antenna	Height in Data File:	1.65			
GPS Antenna	Height to be used: 1.	23 m	GPS Time Gap		
EM61-MK2 Mode	e and Channels		5 seconds		
Standard-D (N	(ode D) · Ch1, Ch2, Ch	з сыт сыр 🗸	(3 to 5 times GPS rate)		
Standard-D (N Standard-D (N	4ode D) : Ch1, Ch2, Ch 4ode D) : Ch1, Ch2, Ch	3, ChT, ChD 🗸	(3 to 5 times GPS rate)		
Standard-D (N Standard-D (N Standard-4 (M Hand Held-D (Hand Held-4	4ode D): Ch1, Ch2, Ch 4ode D): Ch1, Ch2, Ch 1ode 4): Ch1, Ch2, Ch3 (Mode D): Ch1, Ch2, Ch Mode 4): Ch1, Ch2, Ch	3, ChT, ChD 3, ChT, ChD 3, Ch4 h3, Ch4 h3, Ch7, ChD 3, Ch4	GPS Corrections		
Standard-D (N Standard-D (N Standard-4 (M Hand Held-D Hand Held-4	Aode D): Ch1, Ch2, Ch Aode D): Ch1, Ch2, Ch ode 4): Ch1, Ch2, Ch (Mode D): Ch1, Ch2, Ch Mode 4): Ch1, Ch2, Ch O Comma	3, ChT, ChD 3, ChT, ChD , Ch4 A3, ChT, ChD 3, Ch4 Roll/Pitch	(3 to 5 times GPS rate) GPS Corrections AGPS (Raw) ~		
Standard-D (N Standard-D (N Standard-4 (M Hand Held-D Hand Held-4 Surfer	Aode D): Ch1, Ch2, Ch fode D): Ch1, Ch2, Ch ode 4): Ch1, Ch2, Ch (Mode D): Ch1, Ch2, Ch Mode 4): Ch1, Ch2, Ch O Comma O Space	3, ChT, ChD 3, ChT, ChD 3, Ch4 13, Ch4 3, Ch4	(3 to 5 times GPS rate) GPS Corrections AGPS (Raw) ~ HDOP Mask		
Standard-D (N Standard-D (N Standard-4 (M Hand Held-D Hand Held-4 Surfer Generic	Aode D): Ch1, Ch2, Ch Aode D): Ch1, Ch2, Ch Aode <u>4): Ch1, Ch2, Ch3</u> (Mode <u>4): Ch1, Ch3</u> (	3, ChT, ChD 3, ChT, ChD Ch4 h3, ChT, ChD 3, Ch4 Roll/Pitch GPS Quality Time Stamp	(3 to 5 times GPS rate) GPS Corrections AGPS (Raw) ~ HDOP Mask 3 HDOP		

Figure A.9 Selecting EM61-MK2 Mode and Channels

#### Options

There are four items listed: Header Info, Roll/Pitch, GPS Quality, and Time Stamp. File Header occupies two lines at the beginning of file, the first line contains Datum description and the second line contains labels with description of each column included in the file. Roll/Pitch (2 columns), GPS Quality (3 columns), and Time Stamp will be written in columns (in the order as listed in this dialog) that follow instrument readings. The Roll/Pitch option contains two columns (Roll and Pitch in degrees), while the GPS Quality contains parameters located in three columns: Quality (degree of differential corrections), number of satellites, and HDOP parameter. Time Stamp (if selected) is placed always in the last column of XYZ file.

## Coordinates

Positions can be written in the output file as geodetic (geographical) coordinates (Latitude/ Longitude) or they can be converted to UTM coordinates. The program uses the WGS1984 datum.

Geodetic coordinates are given in degrees. They can be written in format ddd.ddddd. UTM coordinates can be generated in metres, feet or US Survey feet. To select Geodetic or UTM (and units) coordinates click one of the item listed in the combo box labeled Coordinates (Datum WGS 1984), see Figure A.10.

## **GPS Time Gap**

The **GPS Time Gap** parameter specifies the maximum time during which the EM61-MK2 data will be linearly interpolated between two GPS positions. Enter this parameter (in seconds) in the edit box labelled GPS Time Gap. In most cases a value 2 to 3 times larger than the GPS acquisition frequency is adequate

File C:	C:\ProgramsGeonics\DatTiltXyz\092012B_1.M61					
Select Output Fi	le Name					
File C:\ProgramsGeonics\DatTiltXyz\West_B.xyz						
Tilt Meter State	and GPS Antenna Heigh	t	Coordinates (Datum WGS84)			
Tilt Meter Readings are Available in Data File GPS Antenna Height in Data File: 1.65 GPS Antenna Height to be used: 1.23 m		ata File 1.65 23 m	Geodetic ddd.dddddc ~ Geodetic ddd.ddddddd GUTM meters			
EM61-MK2 Mod	le and Channels (Mode D) : Ch1, Ch2, Ch3	3, ChT, ChD 🗸	(3 to 5 times GPS rate)			
			GPS Corrections			
XYZ Format Geosoft	Column Delimiter	Options 🗹 Header Info	AGPS (Raw) $\sim$			
◯ Surfer	○ Comma ○ Space	☑ Roll/Pitch ☑ GPS Quality	HDOP Mask			
⊖ Generic	⊖ Tab	🗹 Time Stamp	3 HDOP			

Figure A.10 Selecting Coordinates in Create XYZ File Based on GPS Positions dialog

#### **GPS Corrections**

Select item in combo box placed in a section labeled **GPS Corrections** to write selected or higher degree of GPS differential corrections. Selection includes: AGPS (Raw), DGPS, RTK-3, RTK-4, RTK-5, Higher (>5), see Figure A11. The latter option covers future RTK

Create XYZ File I	Based on GPS Positions			×			
Select Input File	iput Data File (M61) C:\ProgramsGeonics\DatTiltXyz\092012B_1.M61						
Select Outp	ut File Name C:\ProgramsGeopics\Dat1	iltXuz\West B xuz					
Tilt Meter S	Tilt Meter State and GPS Antenna Height Coordinates (Datum WGS84)						
Tilt Mete GPS Ant	Tilt Meter Readings are Available in Data File GPS Antenna Height in Data File: 1.65						
GPS Ant	GPS Antenna Height to be used: 1.23 m GPS Time Gap						
EM61-MK2	EM61-MK2 Mode and Channels Standard-D (Mode D) : Ch1, Ch2, Ch3, ChT, ChD ~ (3 to 5 times GPS rate)						
XYZ Formal Geosof	t Column Delimiter t	Options	GPS Corrections AGPS (Raw)				
⊖ Surfer	◯ Comma ◯ Space	☑ Roll/Pitch ☑ GPS Quality	H <mark>DGPS RTK 3 RTK 4</mark>				
⊖ Generic	c O Tab	O Tab ☑ Time Stamp RTK 5 Higher(>5)					
Click on the F Version 1.00	Proceed button to Start	Cancel	Exit Proceed				

Figure A.11 Selecting GPS Corrections

options as well as WAAS option that is indicated by Quality Indicator 9. The specified parameter indicates the lowest acceptable degree of corrections. For example, if Raw is selected then all GPS positions will be accepted by the program (obviously with the exception of NO FIX that has Quality Indicator = 0), and if DGPS is selected than all positions with Quality Indicator = 1 (Raw) will be ignored by the program filter and DGPS and higher degree of corrections will be accepted.

## HDOP Mask

Specify value of HDOP parameter the section labeled **HDOP Mask**. Readings associated with GPS positions that have HDOP values higher than specified will not be written to the file.

After all parameters are specified and you click on the **Proceed** button a progress bar, will appear above command buttons and it will indicate the percentage of the created file that has been completed, see Figure A.12 below.

Create XYZ File B	ased on GPS Positions			×		
Select Input File	Select Input Data File (M61) File C:\ProgramsGeonics\DatTiltXyz\092012B_BB.M61					
Select Outpu	ut File Name					
File	File C:\ProgramsGeonics\DatTiltXyz\West_A.dat					
Tilt Meter St. Tilt Meter GPS Ante	Tilt Meter State and GPS Antenna Height Tilt Meter Readings are Available in Data File GPS Antenna Height in Data File: 1.65 UTM meters					
GPS Ante	GPS Antenna Height to be used: 1.65 m GPS Time Gap EM61-MK2 Mode and Channels 5 seconds					
Standard	I-D (Mode D) : Ch1, Ch2, Ch	3, ChT, ChD 🛛 🗸	(3 to 5 times GPS rate)			
XYZ Format	Column Delimiter	Options Theader Info	GPS Corrections AGPS (Raw) ~			
<ul> <li>Surfer</li> <li>Generic</li> </ul>	O Comma O Space O Tab	GPS Quality	HDOP Mask 3 HDOP			
Processing Lin Version 1.00	ie: 1	Cancel	Exit			

Figure A.12 Create XYZ File Based on GPS Positions dialog during creating output file

## A2. Grid Positioning with Tilt Meter Corrections

The **Grid Positioning with Tilt Meter Corrections** option can be used only when EM61-MK2 data file geometry is fully adjusted in DAT61-MK2 (it means survey lines are named as one of coordinates, stations represent another coordinate, and stations are adjusted) and the Geonics installed tilt meter readings (roll and pitch) were recorded.

After you select the **GPS Positioning**|**Grid Positioning with Tilt Meter Corrections** from the DAT61MK2 menu (Figure A.13) the Create XYZ File Based on Grid Positions with Tilt Meter Corrections dialog will be displayed (Figure A.14).

💏 DAT61MK2									• ×
File Data Transfer Convert G	PS Positioning View Help	RI FEA (MAILE) TEL S							
(Sinoe)	GPS Positioning Correct Time Delay in XVZ Files GPS Positioning with Tilt Meter Correc Grid Positioning with Tilt Meter Corre	tions	estaos	( Jeonice	( Jeonics	( Jeonics	Leonics	( Jeonics	
	e Heenics		Since	Steenics	( Jeonics	Deonics	Since		
	e Meonice	Decision	Since	Decision	Deonics	Dechice	( Since (	Deonics	
	e Steenics	Since	Since		coince (	Deonics	Deonics	Deonics	
	e Meenice	Decentes	( Sinoe je		2 puice	Deonics	( Jeonics	Decuies	
	e Steenics	Since	Dechoes	Copyright © 2000-2018 by C	Geonics Limited	Deonics	Deonics	Secures	
	e Gieonice		( Sinoey	( Sysonics	Leonics	Leonics	( Jeonics		
	ectioex	Decinos	Decision	( Sinoe je	Deonics	( Jeonics	Deonics	Deonics	
	e Received	conce	estroey	coinoey	( Staonics	( Staonics	estroe	Since	
~	~	~	6	~	~	~	~	6	-

Figure A.13 DAT61MK2 GPS Positioning menu

Select Outp	ut File Name				
File	Not Selected				
Filt Meter St	ate and Main (Bottom) Anten	na Height	Survey Lines Layout		
Tilt Meter State Unknown Untill Data File is Selected					
Main Anti	enna Height in Data File: 	N/A	lines along S M		
Main Anti	enna Height to be used:	I/A m	Ciries along 544		
<rp></rp>	Column Delimiter	Options	EM61-MK2 Mode		
Geosoft	Fixed	🗹 Header Info	and Channels		
O Surfer	🔘 Comma	Roll/Pitch	Std (Mode D):1,2,3,T,D ~		
0	O Space				
⊂ Comorio	O Tab	Time Stamp			

Figure A.14 Create XYZ File Based on Grid Positions... dialog before Input Data File is specified

Before creating the XYZ file several parameters must be specified. These are the Input file name (M61 format), Output XYZ file name, Survey Lines Layout, format of coordinates in the output file, and EM61-MK2 mode used.

Data is always placed in the created XYZ file in the following order: X coordinate, Y coordinate, Channel 1, Channel 2, Channel 3, Channel 4 (or T if EM61-MK2 was used), Channel D (if EM61MK2 in mode D was used), following by parameters selected in the Options section.

When input data file is not specified the label Titl Meter State Uknown is displayed. After input data file is specified the program detects presence of Tilt Meter readings and if its parameters are present in the data file then Main Antenna Height parameters are enabled.

## Select Input Data File (M61) (Input File)

Click on the **File** button below the Select Input Data File label. The Open File dialog is displayed (Figure A.15).

$\rightarrow$ $\checkmark$ $\uparrow$ $\square$ $\rightarrow$ This PC $\rightarrow$	Windows (C:) > ProgramsGeonics > Dat	GridTilt > ~ ඊ		lt
rganize 🔻 New folder			8== <b>•</b>	
	Name	Date modified	Туре	Size
📌 Quick access	BackupDat318	2023-04-14 1:28 PM	File folder	
💻 This PC	BackupDatGridTilt	2023-04-30 10:33 PM	File folder	
3D Objects	092012B_1.M61	2021-09-22 4:37 PM	M61 File	161
Desktop	092012B_1_NoTilt.M61	2023-02-22 10:57 PM	M61 File	161
Documents	092012B_BB.M61	2023-03-14 9:59 PM	M61 File	1,120
Downloads	AB_092012.M61	2023-04-22 11:08 PM	M61 File	161
Downloads	AB_092012_T40.M61	2023-04-27 1:05 PM	M61 File	18
D Music	AB_092012_T50.M61	2023-04-27 1:25 PM	M61 File	18
Pictures	AB_092012_T50feet.M61	2023-04-27 11:02 PM	M61 File	18
Videos	Ord12N.M61	2021-11-02 4:44 PM	M61 File	33
L Windows (C:)	Ord092012B.M61	2021-10-28 11:41 AM	M61 File	71
🎐 Network	Ord092012B_org.M61	2021-10-29 1:40 PM	M61 File	71
File name: Or	d092012B.M61	~	DAT61MK2 M61 Files	
			Open,	Cancel

Figure A.15 Open DAT61MK2 (M61) Data File dalog

Select a file name and click the **Open** button. The Open File dialog will, the program will check presence of Tilt Meter data in the file while reading EM61MK2 and GPS readings and when done, the selected file name will be displayed beside the **File** button. At the same time if Tilt Meter records are detected in the input file parameters in section labeled Tilt Meter State and Main Antenna Height will be enabled (Figure A.16), otherwise information about lack of Tilt Meter readings will be shown and parameters in this section will remain disabled as shown in Figure A.17. In case selected data file does not contain Tilt Meter readings it still can be processed, as any other data file with no Roll and Pitch corrections as long as GPS positions are available.

Create XYZ File Based on Grid Positions with Tilt Meter Corrections						
Select Input Data File (M61) File C:\ProgramsGeonics\DatGridTilt\Ord092012B.M61						
Select Output File	Name					
File Not Selected						
Tilt Meter State ar Tilt Meter Read Main Antenna H Main Antenna H	id Main (Bottom) Anteni ings are Available in Da Height in Data File: Height to be used:	na Height ata File .45 m	Survey Lines Layout O Lines along W-E Lines along S-N			
XYZ Format	Column Delimiter Fixed Comma Space Tab	Uptions Header Info Roll/Pitch	EM61-MK2 Mode and Chann Std (Mode D):1,2,3,T	els ,D ~		
Set Parameters, the Version 1.00	n Select Output File	Cancel	Exit Pro	ceed		

Figure A.16 The Create XYZ... dialog with confirmation that Tilt Meter data is present in the selected file, and displaying Main Antenna Height as it was entered during data collection

Select Output F	ïle Name					
File	Not Selected					
filt Meter State	and Main (Bottom) Anten	na Height	Survey Lines Layout			
Tilt Meter Re	adings are not Available i	n Data File	◯ Lines along W-E			
Main Antenn	a Height in Data File:		Lines along S-N			
Main Antenn	a Height to be used:	I/A m				
⟨YZ Format —	Column Delimiter	Options	EM61-MK2 Mode			
🔵 Geosoft	Fixed	🗹 Header Info	and Channels			
Surfer	O Comma	Roll/Pitch	Std (Mode D):1,2,3,T,D $\sim$			
	O Space					
<u> </u>	2 3 T I	March Lime Stamp				

Figure A.17 The Create XYZ... dialog with information that Tilt Meter data is not available the selected file

## Select Output File Name (Output XYZ File)

Click on the **File** button located under the Select Output File Name . The Save As dialog is displayed (Figure A.18).

-	-			
Organize 🔻 New folder				💷 👻 🕜
1.0.1	^ Name	Date modified	Туре	Size
R Quick access	BackupDat318	2023-04-14 1:28 PM	File folder	
💻 This PC	BackupDatGridTilt	2023-04-30 10:33 PM	File folder	
🧊 3D Objects	a.xyz	2023-04-27 11:22 PM	XYZ File	29 KB
📃 Desktop	aOrgSn.xyz	2023-04-25 10:28 PM	XYZ File	22 KB
Documents	aOrgWe.xyz	2023-04-25 10:27 PM	XYZ File	13 KB
Downloads	asn.xyz	2023-04-27 11:57 AM	XYZ File	29 KB
Music	asn0.xyz	2023-04-26 4:10 PM	XYZ File	22 KB
J Music	asnf.xyz	2023-04-27 11:12 PM	XYZ File	29 KB
Pictures	awe.xyz	2023-04-27 1:26 PM	XYZ File	29 KB
Videos	awe0.xyz	2023-04-26 4:10 PM	XYZ File	22 KB
L Windows (C:)	v <		10.000 (01)	>
File name: Site01 xy	z			
Save as type: Geosoft I	Format XYZ File			

Figure A.18 Select XYZ File Name window

The XYZ file name extension default will be determined by the selected output file format (xyz or dat) in XYZ File Format section. The XYZ File Format option must be selected before clicking on the **File** button.

Specify a file name and click the **Save** button and the Save As dialog will close. When Output Files is specified the **Proceed** button in the Create XYZ File Based on GPS Positions becomes active and name of selected file is displayed in the window associated with the Select Output File Name section (Figure A.19).



Figure A.19 Create XYZ File Based on Grid Positions dialog after both Input and Output Files are specified

## GPS Antenna Height to be used

The GPS Antenna Height is always displayed as entered during data collection and the same value is displayed by default in the field labeled GPS Antenna Height to be used (Figure A.19). If for any reason the antenna height must be changed it can be entered in the edit box displayed at this label (Figure A.20 where GPS Antenna Height differs from default value). This value will be used by the program while calculating Roll and Pitch corrections, it must be specified in metres.

Create XYZ File Based on Grid Positions with Tilt Meter Corrections						
Select Input Data File C:\F Select Output File	File (M61) frogramsGeonics\DatGi Name	ridTill\Ord092012B.M61				
File C:M	File C:\ProgramsGeonics\DatGridTilt\Site23.dat					
Tilt Meter State and Main (Bottom) Antenna Height       Survey Lines Layout         Tilt Meter Readings are Available in Data File       Item Survey Lines Layout         Main Antenna Height in Data File:       .45         Main Antenna Height to be used:       0.52			iyout 1 W-E ] S-N			
XYZ Format O Geosoft O Surfer O Generic	Column Delimiter Fixed Comma Space Tab	Options Header Info Roll/Pitch Time Stamp	EM61-MK2 Mod and I Std (Mode D):1	te Channels ,2,3,T,D ~		
Click on the Procee Version 1.00	d button to Start	Cancel	Exit	Proceed		

Figure A.20 Create XYZ File Based on Grid Positions dialog with adjusted Main Antenna (Bottom sensor) Height

#### Survey Lines Layout

Indicate if survey lines are oriented in W-E direction (option: Lines along W-E) or survey lines were oriented in the S-N direction (option: Lines along S-N).

#### EM61-MK2 Mode and Channels

Select EM61-MK2 and Channels to be placed in the XYZ file. To select this parameter click one of items listed in the combo box labeled EM61-MK2 Mode and Channels, see Figure A.21.

File C:\ProgramsGeonics\DatGridTilt\Ord092012B.M61					
Select Output File	e Name				
File C:\ProgramsGeonics\DatGridTilt\Site01.xyz					
Tilt Meter State a	und Main (Bottom) Anten	na Height	Survey Lines Layout		
Tilt Meter Readings are Available in Data File		◯ Lines along W-E			
Main Antenna Height in Data File: .45		Lines along S.N.			
Main Antenna	Height to be used:	45 m	Lines along 5-N		
XYZ Format	Column Delimiter	Options	EM61-MK2 Mode		
🔾 Geosoft	Fixed	🗹 Header Info	and Channels		
Curfor	🔾 Comma	Roll/Pitch	Std (Mode D):1,2,3,T,D 😒		
Surfer	O Space		Std (Mode D):1,2,3,T,D		
Surfer	O space				
<ul> <li>Surfer</li> <li>Generic</li> </ul>	O Tab	🗹 Time Stamp	H-H (Mode D):1,2,3,7,0		

Figure A.21 Selecting EM61-MK2 Mode and Channels

## **XYZ File Format**

Indicate the appropriate option for the contouring software to be used. The Generic option will create a multi column file without any text strings. This file can be used as an input file for many contouring packages (including Geosoft and Surfer). This parameter will also determine a default file extension name during specifying XYZ file name. The program will prompt extension file names XYZ, DAT, ASC for formats Geosoft, Surfer, and Generic.

## **Column Delimiter**

Select column delimiter that is required by your application. The option Fixed corresponds to fixed field for each column with space or spaces between columns. This format is suitable for most applications and a file created with this selection provides the easiest option if file is to be viewed using any standard text editor. Remaining column delimiters are Comma, Space (single), and Tab.

#### Options

There are three items listed: Header Info, Roll/Pitch, and Time Stamp. File Header occupies two lines at the beginning of file, the first line contains coordinates units (as entered during data collection) following by labels with description of each column included in the file Roll/Pitch (2 columns), and Time Stamp will be written in columns (in the order as listed in this dialog) that follow instrument readings. The Roll/Pitch option contains two columns (Roll and Pitch in degrees). Time Stamp (if selected) is placed always in the last column of XYZ file.

After all parameters are specified and you click on the **Proceed** button a progress bar, will appear above command buttons and it will indicate the percentage of the created file that has been completed, see Figure A.22 below.

Create XYZ File Based on Grid Positions with Tilt Meter Corrections					
Select Input Data File (M61) File C:\ProgramsGeonics\DatGridTilt\092012B_BB.M61					
Select Output File Name					
File C:\ProgramsGeonics\DatGridTilt\Site02.dat					
Tilt Meter State and Main (Bottom) Antenna Height Tilt Meter Readings are Available in Data File Main Antenna Height in Data File: 1.65 Main Antenna Height to be used: 0.45 m		Survey Lines Layout O Lines along W-E			
XYZ Format Column Delimite O Geosoft I Fixed	r Options	EM61-MK2 Mode and Channels			
Surfer	Roll/Pitch	5(d (Mode D):1,2,3,1,D V			
◯ Generic ◯ Tab	🗹 Time Stamp				
Click on the Proceed button to Start Version 1.00	Cancel	Exit			

Figure A.22 Create XYZ File Based on Grid Positions dialog during creating output file