# **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.

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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				
File No	t Selected			
Select Output Fi	le Name			
File	ot Selected			
Tilt Meter State	and GPS Antenna Heigh	t	Coordinates (Datum WGS84)	
	<mark>te Unknown Untill Data F</mark> Height in Data File: N		Geodetic ddd.dddddc $ \sim $	
GPS Antenna	Height to be used: N/	GPS Time Gap		
EM61-MK2 Mod			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	Fixed	✓ Header Info ✓ Roll/Pitch	HDOP Mask	
◯ Surfer	O Space	🖵 GPS Quality		
◯ Generic	⊖ Tab	🗹 Time Stamp	3 HDOP	
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).

Open				×
$\leftarrow \rightarrow \ \ \land \ \ \uparrow$ This PC	> Windows (C:) > ProgramsGeonics > Dat	TiltXyz >	ٽ ~	,○ Search DatTiltXyz
Organize 🔻 New folder				III 🕶 🔟 😮
<ul> <li>Curick access</li> <li>This PC</li> <li>30 Objects</li> <li>Desktop</li> <li>Documents</li> <li>Downloads</li> <li>Music</li> <li>Pictures</li> <li>Videos</li> <li>Windows (C:)</li> <li>Network</li> </ul>	Name  BackupDat318  0920128_1.M61  0920128_1.V611  AB_092012_M61  Ord12N.M61  Ord12N.M61  Ord12012B_6rg.M61	Date modified 2023-03-13 3:03 PM 2021-09-22 4:37 PM 2020-09-22 4:37 PM 2021-09-22 4:37 PM 2021-11-02 4:44 PM 2021-11-02 4:141 AM 2021-10-28 11:41 AM	Type File folder M61 File M61 File M61 File M61 File M61 File	Size 161 KB 161 K8 161 K8 33 KB 71 K8 71 K8
File name	0920128_1.M61		~	DAT61MK2 M61 Files V Open 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

Select Input Data	ProgramsGeonics\DatTi	illXyz\092012B_1.M61			
Select Output Fil	e Name				
File No	t Selected				
∽ Tilt Meter State a	and GPS Antenna Heigh	t	Coordinates (Datum WGS84)		
Tilt Meter Readings are Available in Data File			Geodetic ddd.dddddc 🗸		
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		
	Mode D): Ch1, Ch2, Ch		(3 to 5 times GPS rate)		
Standard-D (i	mode by: cirr, cirz, cirk	o, chr, cho	GPS Corrections		
XYZ Format	Column Delimiter	Options	AGPS (Raw) 🗸		
Geosoft	Fixed	Header Info			
O Surfer	O Comma	Roll/Pitch	HDOP Mask		
○ Comoria	O Space	GPS Quality	3 HDOP		
◯ Generic	⊖ Tab				
Set Parameters, th	en Select Output File				
Version 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-

Create XYZ File Based Select Input Data File	File (M61)	iltXyz\092012B_1_NoTilt	.M61	×
Select Output File	Name Selected			
Tilt Meter Read GPS Antenna I GPS Antenna I EM61-MK2 Mode	Height to be used: N	n Data File I/A Do MA m	Coordinates (Datum WGS84) Geodetic ddd.dddddc v GPS Time Gap 5 seconds (3 to 5 times GPS rate) GPS Corrections	
XYZ Format	Column Delimiter Fixed Comma Space	Options Header Info Roll/Pitch GPS Quality	AGPS (Raw)	
Generic Set Parameters, the Version 1.00	◯ Tab en Select Output File	Cancel	3 HDOP 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).

						(1 × *	
rganize 🔻 New fold	^					8== -	
Ouick access	Name	Date modified	Туре	Size			
Culck access	ali 02A-371.xyz	8/16/2017 1:38 PM	XYZ File	276 1	(B		
OneDrive	a 2003A.xyz	8/16/2017 1:44 PM	XYZ File	454 H	(B		
This PC	2004-5.xyz	8/16/2017 1:48 PM	XYZ File	89 F	(B		
Desktop	02371.xyz	8/16/2017 1:37 PM	XYZ File	454 (	(B		
	089217A.xyz	8/16/2017 1:38 PM	XYZ File	276 1			
Documents	Astat01.xyz	8/16/2017 1:37 PM	XYZ File	454 H			
Downloads	W07213C.xyz	8/16/2017 1:38 PM	XYZ File	276 H			
Music	x.xyz	6/12/2017 12:15 PM	XYZ File	11			
Pictures	a x_L.xyz	6/12/2017 12:15 PM		11			
🚼 Videos	🛄 x_R.xyz	6/12/2017 12:15 PM		11			
🏪 Windows (C:)	🗐 уу-хуг	5/9/2017 2:19 PM	XYZ File	11	(B		
Network							
DESKTOP-QKUMGU							
Homegroup							
File name: 3320-	a.xyz						
Save as type: Geos	oft Format XYZ File						

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				
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	Tilt Meter Readings are Available in Data File		Geodetic ddd.dddddc 🗸	
GPS Antenna	Height in Data File:	1.65	ueodetic ada.adaddc 🗸	
GPS Antenna	Height to be used: 1	.65 m	GPS Time Gap	
ENCI NV2 H-J			5 seconds	
	e and Channels		(3 to 5 times GPS rate)	
	e and Channels Mode D) : Ch1, Ch2, Ch	3, ChT, ChD 🗸 🗸	(3 to 5 times GPS rate)	
		3, ChT, ChD 🗸	(3 to 5 times GPS rate) GPS Corrections	
Standard-D (	Mode D): Ch1, Ch2, Ch		(3 to 5 times GPS rate)	
Standard-D( XYZ Format ③ Geosoft	Mode D) : Ch1, Ch2, Ch Column Delimiter	Options	(3 to 5 times GPS rate) GPS Corrections	
Standard-D ( XYZ Format	Mode D) : Ch1, Ch2, Ch Column Delimiter	Options	(3 to 5 times GPS rate) GPS Corrections AGPS (Raw) ~ HDOP Mask	
Standard-D ( XYZ Format	Mode D) : Ch1, Ch2, Ch Column Delimiter	Options Header Info Roll/Pitch	(3 to 5 times GPS rate) GPS Corrections AGPS (Raw)	
Standard-D ( XYZ Format	Mode D) : Ch1, Ch2, Ch Column Delimiter	Options Header Info Roll/Pitch GPS Quality	(3 to 5 times GPS rate) GPS Corrections AGPS (Raw) ~ HDOP Mask	

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	C:\ProgramsGeonics\DatTillXyz\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 🗸		
GPS Anter	nna Height in Data File:	1.65			
GPS Antenna Height to be used: 1.23 m			GPS Time Gap		
	lode and Channels D (Mode D) : Ch1, Ch2, Ch		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	AGPS (Raw)		
Geosoft	Fixed	🗹 Header Info	Auro (naw)		
O Surfer	🔿 Comma	Roll/Pitch	HDOP Mask		
0	O Space	🗹 GPS Quality	3 HDOP		
🔘 Generic	🔾 Tab	🗹 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.

	File (M61)				
File C:\	ProgramsGeonics\DatT	`illXyz\092012B_1.M61			
Select Output File	e Name				
File C:\ProgramsGeonics\DatTiltXyz\West_B.xyz					
Tilt Meter State and GPS Antenna Height			Coordinates (Datum WGS84)		
Tilt Meter Rea	idings are Available in D	)ata File	Geodetic ddd.ddddda 🗸		
GPS Antenna	Height in Data File:	1.65			
GPS Antenna	Height to be used: 1.	23 m	GPS Time Gap		
EM61-MK2 Mode and Channels			5 seconds (3 to 5 times GPS rate)		
0. 1.10.0			(3 to 5 times GPS rate)		
	Mode D) : Ch1, Ch2, Ch 4ada D) : Ch1, Ch2, Ch				
Standard-D (N XY Standard-4 (M Hand Held-D	Mode D) : Ch1, Ch2, Ch Mode D) : Ch1, Ch2, Ch (ode 4) : Ch1, Ch2, Ch3 (Mode D): Ch1, Ch2, Ch3 (Mode 4): Ch1, Ch2, Ch	3, ChT, ChD 3, Ch4 h3, Ch7, ChD	(3 to 5 times GPS rate) GPS Corrections AGPS (Raw) ~		
Standard-D (N Standard-4 (M Hand Held-D C Hand Held-4	Mode D) : Ch1, Ch2, Ch 1ode 4) : Ch1, Ch2, Ch3 (Mode D): Ch1, Ch2, Cl	3, ChT, ChD 3, Ch4 h3, Ch7, ChD	GPS Corrections		
Standard-D (N XY Standard-4 (M Hand Held-D	Mode D) : Ch1, Ch2, Ch Iode 4) : Ch1, Ch2, Ch3 (Mode D): Ch1, Ch2, Ch3 (Mode 4): Ch1, Ch2, Ch	3, ChT, ChD 3, Ch4 h3, Ch7, ChD 3, Ch4	GPS Corrections AGPS (Raw)		
Standard-D (N Standard-4 (M Hand Held-D Hand Held-4	Mode D) : Ch1, Ch2, Ch Mode 4) : Ch1, Ch2, Ch3 (Mode 1) : Ch1, Ch2, Ch3 (Mode 4) : Ch1, Ch2, Ch Comma	3, ChT, ChD 3, Ch4 h3, Ch7, ChD 3, Ch4 Ch4 Roll/Pitch	GPS Corrections		

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:	ile 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			Geodetic ddd.dddddc V 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	Data File (M61) C:\ProgramsGeonics\DatTiltXyz\092012B_1.M61						
Select Outp	ut File Name C:\ProgramsGeonics\Dat1	iltXuz\West B vuz					
	Tilt Meter State and GPS Antenna Height Coordinates (Datum WGS84						
	r Readings are Available in D enna Height in Data File:	Geodetic ddd.dddddc $ \sim $					
	GPS Antenna Height to be used: 1.23 m GPS Time Gap						
	EM61-MK2 Mode and Channels Standard-D (Mode D) : Ch1, Ch2, Ch3, ChT, ChD v						
XYZ Formal Geosof		Options Header Info	GPS Corrections AGPS (Raw)				
⊖ Surfer	◯ Comma ◯ Space	☑ Roll/Pitch ☑ GPS Quality	H <mark>DGPS RTK 3 RTK 4</mark>				
⊖ Generic	c 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	lased on GPS Positions			×		
Select Input File	Select Input Data File (M61) File C:\ProgramsGeonics\DatTiltXyz\092012B_BB.M61					
Select Output	ut File Name					
File	File C:\ProgramsGeonics\DatTiltXyz\West_A.dat					
Tilt Meter	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 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 O Geosoft		Options	GPS Corrections           AGPS (Raw)			
<ul> <li>Surfer</li> <li>Generic</li> </ul>	○ Comma ○ Space ○ Tab	☑ Roll/Pitch □ GPS Quality ☑ Time Stamp	HDOP Mask 3 HDOP			
O demone						
Processing Lin	ne: 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 Combine EM61-MK2 and GPS Files								
(Sinoe)	GPS Positioning Correct Time Delay in XYZ Files GPS Positioning with Tilt Meter Corre Grid Positioning with Tilt Meter Corre	etions	estroex	( Jeonice	( Jeonics	( Jeonice	estroef	( Jeonice	
1.00	s Neonics								1997
	n Neonica	( Jeonics	Decision	Decision	Deonics	( Leonics	esinoe		
	e Syeonice	( Jeonics	( Jeonics	(Ayaonica	coince (	( Jeonics		Since	
	s Heenics Heenics	( Jeonics	Dechice		2 puice	( Jeonics	asinoe)		
	s Aeonics	Loonics	Loonics	Copyright © 2000-2018 by C	Geonics Limited	( Jeonics	coince	Deonics	
	s Aeonics	Leonics	( Jeonics	( Jeonics	Deonics	( Leonics	( Sinoe)	Decutes	
Decinica	n Neonjas	Deonics	( Jeonics	( Jeonics	Deonics	( Jeonice	asinoe je	Deonics	
	e Aeonice	( Leonics	( Jeonics	( Jeonics	( Stroey	( Jeonics		Since	
~	~	-	~	~	~	-	-	~	-

Figure A.13 DAT61MK2 GPS Positioning menu

Select Outp	ut File Name			
File	Not Selected			
Tilt Meter State and Main (Bottom) Antenna Height Survey Lines Layout				
Tilt Meter State Unknown Untill Data File is Selected			◯ Lines along W-E	
Main Antenna Height in Data File: N/A			<ul> <li>Lines along S-N</li> </ul>	
Main Anti	enna Height to be used: 🛛 🔊	I/A m	Ciries along 514	
<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	◯ Space			
Generic	○ 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).

open ← → ∽ ↑ 🔒 > This PC	> Windows (C:) > ProgramsGeonics > Date	GridTilt → ~ Č		ntGridTilt
Organize 🔻 New folder				🕮 🕶 🛄 🌔
1.0.1	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 K
Desktop	092012B_1_NoTilt.M61	2023-02-22 10:57 PM	M61 File	161 K
Documents	092012B_BB.M61	2023-03-14 9:59 PM	M61 File	1,120 K
Downloads	AB_092012.M61	2023-04-22 11:08 PM	M61 File	161 K
Music	AB_092012_T40.M61	2023-04-27 1:05 PM	M61 File	18 K
-	AB_092012_T50.M61	2023-04-27 1:25 PM	M61 File	18 K
Pictures	AB_092012_T50feet.M61	2023-04-27 11:02 PM	M61 File	18 K
Videos	Ord12N.M61	2021-11-02 4:44 PM	M61 File	33 K
🏪 Windows (C:)	Ord092012B.M61	2021-10-28 11:41 AM	M61 File	71 K
i Network	Ord092012B_org.M61	2021-10-29 1:40 PM	M61 File	71 K
File name:	Ord092012B.M61	~	DAT61MK2 M6	1 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 wit	th Tilt Meter Correction	ns	×			
Select Input Data File (M61) File C:\ProgramsGeonics\DatGridTilt\Ord092012B.M61 Select Output File Name							
File Not Selected							
Tilt Meter State and Main (Bottom) Antenna Height       Survey Lines Layout         Tilt Meter Readings are Available in Data File       O Lines along W-E         Main Antenna Height in Data File:       .45         Main Antenna Height to be used:       .45				g W-E			
XYZ Format Geosoft  Surfer  Generic	Column Delimiter Fixed Comma Space Tab	Options Header Info Roll/Pitch Time Stamp	EM61-MK2 Mod and I Std (Mode D):1	Channels			
Set Parameters, the Version 1.00	n Select Output File	Cancel	Exit	Proceed			

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	ile Name				
File	Not Selected				
filt Meter State	and Main (Bottom) Anten	na Height	Survey Lines Layout		
Tilt Meter Readings are not Available in Data File			O Lines along W-E		
		N/A 🔓	<ul> <li>Lines along S-N</li> </ul>		
Main Antenn	a Height to be used: N	I/A m	Clines along 544		
⟨YZ Format —	Column Delimiter	Options	EM61-MK2 Mode		
🔵 Geosoft	Fixed	🗹 Header Info	and Channels		
Surfer	◯ Comma	Roll/Pitch	Std (Mode D):1,2,3,T,D 🖂		
	O Space	Time Stamp			
🔿 Generic					

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     Neme     Date modified     Type          • Quick access       • This PC       • BackupDatSint       • Dastap       • Dostrop       • Dostrop       • Dostrop       • Dostrop       • Dostrops       • Dostrops	dTilt
Quick access         Date induited         Date induited         Pile           Image: Description of the security	BE •
Imis PC       BackupDat318       2023-04-14 1/28 PM       File folder         BackupDatGiridTitit       2023-04-13 1/28 PM       File folder         BackupDatGiridTitit       2023-04-27 1/122 PM       XYZ File         Desktop       BorgSnayz       2023-04-27 1/122 PM       XYZ File         Downloads       BorgSnayz       2023-04-27 1/127 File       XYZ File         Downloads       Barñayz       2023-04-27 1/127 PM       XYZ File         Music       Barñayz       2023-04-27 1/12 PM       XYZ File         Windows (C)       Wexyz       2023-04-26 4/10 PM       XYZ File         Imarka (C)       V Z       Barñayz       2023-04-27 1/12 PM       XYZ File         Imarka (C)       Barñayz       2023-04-27 1/12 PM       XYZ File         I	Size
3 D Objects          a accept standing           Desktop           a accept standing           Desktop          D Desktop           a ofrgSn-syz           2023-04-27 11:22 PM         XYZ File           XYZ File          D Documents           a ofrgWexyz           2023-04-27 11:52 PM         XYZ File           XYZ File          D Downloads           a and xyz           2023-04-27 11:52 PM         XYZ File           a and xyZ          Music           a and xyz           2023-04-27 11:12 PM         XYZ File           a and xyZ          Videos           a wee.xyz           2023-04-27 11:12 PM         XYZ File           a wee.xyz           2023-04-27 11:12 PM         XYZ File          Windows (C)           wee.xyz           2023-04-27 11:12 PM         XYZ File           a wee.xyz           2023-04-27 11:12 PM         XYZ File          Windows (C)           wee.xyz           2023-04-27 1:04 PM         XYZ File           a wee.xyz           2023-04-27 1:04 PM           Avz File	
Desktop         a o'rg5n.xyz         2023-04-25 10.28 PM         XYZ File           Downloads         a o'rgWexyz         2023-04-25 10.27 PM         XYZ File           Downloads         a anoyz         2023-04-27 10.27 PM         XYZ File           Music         a anoyz         2023-04-27 11.57 PM         XYZ File           Pictures         a anotyz         2023-04-27 11.57 PM         XYZ File           Windows (C)         a wex.yz         2023-04-27 11.57 PM         XYZ File           The anmec         SiteO'lly/z         <	
Boruments       ■ ofrgWexyz       2023-04-25 10.27 PM       XYZ File         Downloads       ■ ansayz       2023-04-27 11:57 AM       XYZ File         Music       ■ ansayz       2023-04-27 11:57 AM       XYZ File         Pictures       ■ anfatyz       2023-04-27 11:57 PM       XYZ File         Pictures       ■ anfatyz       2023-04-27 11:12 PM       XYZ File         Videos       ■ anfatyz       2023-04-27 11:12 PM       XYZ File         ■ videos       ■ anexyz       2023-04-27 11:12 PM       XYZ File         ■ videos       ■ anexyz       2023-04-27 11:12 PM       XYZ File         ■ anexyz       2023-04-26 4:10 PM       XYZ File       ■ anexyz         ■ videos       ■ anexyz       2023-04-26 4:10 PM       XYZ File         ■ anexyz       2023-04-26 4:10 PM       XYZ File       ■ anexyz         ■ anexyz       2023-04-26 4:10 PM       XYZ File       ■ anexyz         ■ anexyz       2023-04-26 4:10 PM       XYZ File       ■ anexyz         ■ anexyz       2023-04-26 4:10 PM       XYZ File       ■ anexyz         ■ anexyz       2023-04-26 4:10 PM       XYZ File       ■ anexyz         ■ anexyz       ■ anexyz       ■ anexyz       ■ anexyz	29
Windows         asn.xyz         2023-04-27 11:57 AM         XYZ File           Music         asn0.xyz         2023-04-26 4:10 PM         XYZ File           Pictures         asn6.xyz         2023-04-27 11:57 AM         XYZ File           Windows (C)         awe0.xyz         2023-04-27 11:52 PM         XYZ File           File name:         Site01kyz         2023-04-27 1:52 PM         XYZ File	22
▶ Downloads         ■ sn0.xyz         2023-04-26 4:10 PM         XYZ File           ▶ Music         ■ san5.xyz         2023-04-27 11:12 PM         XYZ File           ■ Pictures         ■ avec.xyz         2023-04-27 11:12 PM         XYZ File           ■ Videos         ■ avec.xyz         2023-04-27 11:12 PM         XYZ File           ■ Videos         ■ avec.xyz         2023-04-27 1:15 PM         XYZ File           ■ Videos         ■ avec.xyz         2023-04-27 1:05 PM         XYZ File           ■ Videos         ■ avec.xyz         2023-04-26 4:10 PM         XYZ File           ■ Videos         ■ avec.xyz         2023-04-27 1:05 PM         XYZ File	13
Music         a snfxyz         2023-04-27 11:12 PM         XYZ File           Evictures         a wex.yz         2023-04-27 11:12 PM         XYZ File           Videos         a we0.xyz         2023-04-26 4:10 PM         XYZ File           Windows (C)         v <	29
Pictures         a santayz         2023-04-27 1/s12 PM         XYZ File           Videos         a wee.xyz         2023-04-27 1/s12 PM         XYZ File           Windows (C)         a wee.xyz         2023-04-27 1/s12 PM         XYZ File           File name:         Ste01/xyz         2023-04-27 1/s12 PM         XYZ File	22
Videos         a wedzyz         2023-04-25 + 100 PM         XYZ File           Windows (C)         v         c         2023-04-25 + 100 PM         XYZ File           File name         Ste01/kyz         2023-04-25 + 100 PM         XYZ File	29
Windows (C)  File name Site01kyz	29
Windows (c) V c File name Ste01[xyz	22
Save as type: Geosoft Format XYZ File	
A Hide Folders	Cancel

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	ProgramsGeonics\DatGr	ridTill\Ord092012B.M61			
File C:\ProgramsGeonics\DatGridTilt\Site23.dat					
Tilt Meter Read Main Antenna I		-	Survey Lines Lay	W-E	
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 C Std (Mode D):1,	hannels	
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:A	ProgramsGeonics\DatG	ridTilt\Ord092012B.M61			
Select Output File	e Name				
File C:\ProgramsGeonics\DatGridTilt\Site01.xyz					
Tilt Meter State a	and 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:					
Main Antenna	Height to be used:	45 m	Lines along S-N		
XYZ Format	Column Delimiter	Options	EM61-MK2 Mode		
🔾 Geosoft	Fixed	🗹 Header Info	and Channels		
-	🔾 Comma	Roll/Pitch	Std (Mode D):1,2,3,T,D 😒		
Surfer	O Space	Noivrich	Std (Mode D):1,2,3,T,D		
Surfer	O space				
<ul> <li>Surfer</li> <li>Generic</li> </ul>	O Tab	🗹 Time Stamp	Std (Mode 4):1,2,3,4 H-H (Mode D):1,2,3,T,Dv H-H (Mode 4):1,2,3,4		

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) Ar Tilt Meter Readings are Available i Main Antenna Height in Data File: Main Antenna Height to be used:	Survey Lines Layout O Lines along W-E				
XYZ Format Column Delimite O Geosoft I Fixed O Comma	Header Info	EM61-MK2 Mode and Channels			
Surfer	Roll/Pitch	Std (Mode D):1,2,3,T,D 🗸			
◯ Generic ◯ Tab	🗹 Time Stamp				
Click on the Proceed button to Start Version 1.00	Cancel	Exit Proceed			

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