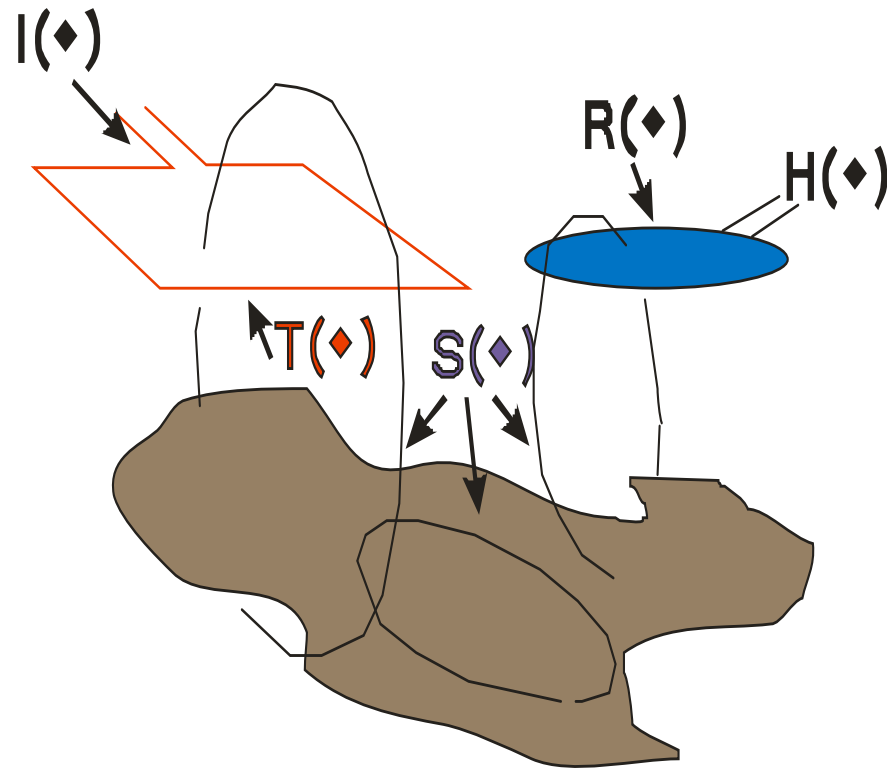


# Frequency to Time Domain Transformation

## 频域到时域的转换



转换为时域软件  
用于频域电磁建模程序

**Transformation to Time Domain Software  
for Frequency Domain Electromagnetic Modelling Programs**

## Overview: 概述: FSEMTRS<sup>®</sup> ( $\omega \rightarrow T$ )

The transform is designed to take the frequency domain response determined by a modelling or simulation program and transform it to the representation of a physical response in time domain. It can represent a measured physical response from either a commercial, experimental or theoretical measuring system. Our cover figure represents the basic components involved.

该变换的目的是将建模或仿真程序确定的频域响应转换为时域物理响应的表示形式。它可以表示从商业、实验或理论测量系统中测量到的物理响应。我们的封面图代表了所涉及的基本组件。

This process consists of representing mathematically 3 systems and the interaction between these three systems. These three systems are the transmitter, **TX**, the **Earth** and the receiver, **RX**. The input into the entire system can usually be considered as the current input into the transmitter. The manufacturer of the specific equipment attempts to know exactly the characteristics of the input current,  $I(\omega)$ , and to measure an output response,  $H(\omega)$ . The modelling program attempts to simulate the response of the Earth,  $S(\omega)$ . In general the transmitter has a system response,  $T(\omega)$ , due to the input current and the receiver has a system response,  $R(\omega)$ , to the input of an electromagnetic wave. For example, if the transmitter is a large loop and it lies on top of a relatively conducting Earth then the waveform inside the loop will tend to distort the input current and this can be somewhat uncontrollable. Similarly, the receiver, especially a coil type receiver, is often bandwidth limited. This limit results in some degree of phase and magnitude distortion, especially at high frequencies. Thus, in the frequency domain the overall system can be represented as:

这个过程包括用数学方法表示三个系统以及这三个系统之间的相互作用。这三个系统是发射器 **TX**、地球和接收器 **RX**。整个系统的输入通常可以认为是输入发射器的电流。特定设备的制造商试图确切地知道输入电流  $I(\omega)$  的特性，并测量输出响应  $H(\omega)$ 。建模程序试图模拟地球响应  $S(\omega)$ 。一般来说，发射器对输入电流有一个系统响应  $T(\omega)$ ，而接收器对输入的电磁波有一个系统响应  $R(\omega)$ 。例如，如果发射器是一个大环路并且它位于相对导电的地球上，则环路内的波形将倾向于使输入电流失真，这在某种程度上是无法控制的。类似地，接收器，尤其是线圈型接收器，常常带宽有限。此限制会导致一定程度的相位和幅度失真，尤其是在高频时。因此，在频域中，整个系统可以表示为：

$$H(\omega) = I(\omega)T(\omega)S(\omega)R(\omega)$$

## ***Our definitions: 我们的定义***

### **spectrum: 光谱:**

the frequencies present in an electromagnetic signal and their strengths  
电磁信号中出现的频率及其强度

### **waveform: 波形:**

A representation of the shape of a wave that indicates the wave's characteristics, such as frequency and amplitude.  
波的形状表示表明了波的特征，例如频率和振幅。

### **periodic: 周期性的:**

A quantity,  $f(t)$ , is periodic when it behaves according to the relation  
一个量  $f(t)$ ，当它按照这个关系表现时，它是周期性的

$$f(t) = f(t+kT), \quad \text{for all } t, \quad k = 0, 1, 2, \dots$$

where  $T$  is the smallest number such that this holds then  $T$  is called the period.  
其中  $T$  是满足此条件的最小数，则  $T$  称为周期。

### **basefrequency: 基频:**

The inverse of  $T$  the period. 周期  $T$  的倒数。

### **interpolation: 插值:**

the action of estimating values from known ones in the same range  
从同一范围内的已知值来估计值的算法

$$H(\omega) = I(\omega)T(\omega)S(\omega)R(\omega)$$

**$I(\omega)$**  – *仪器确定的电流脉冲响应*

impulse response of current as defined by the instrument

**$T(\omega)$**  – *受仪器限制的发射器脉冲响应*

impulse response of transmitter as limited by the instrument

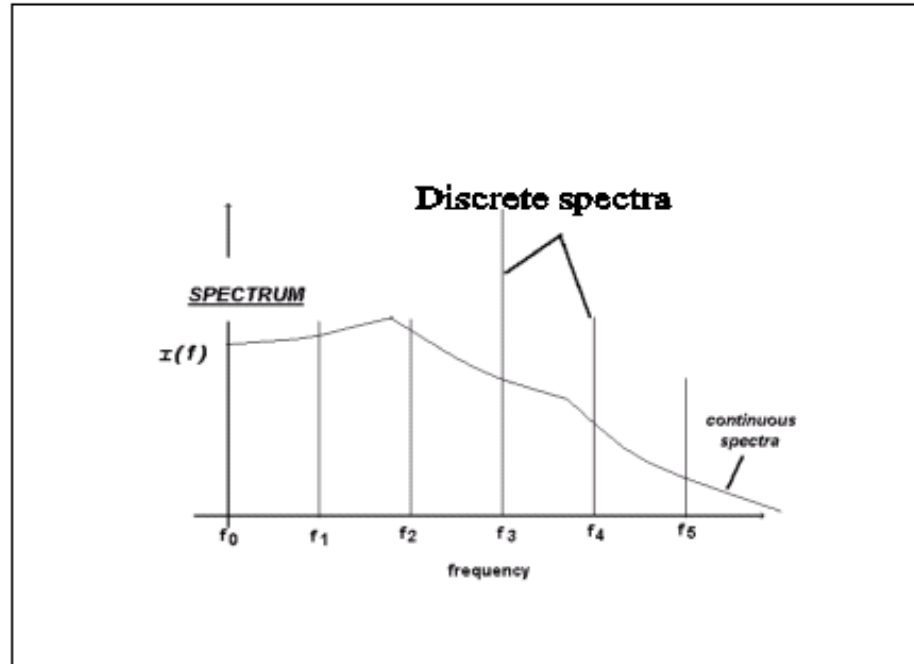
**$R(\omega)$**  – *由传感器特性在物理上确定的接收器脉冲响应*

impulse response of receiver as physically defined by the sensor characteristics

**$S(\omega)$**  – *由模型模拟的地面脉冲响应*

impulse response of the ground which is what is simulated with the model

## 2. The spectrum 频谱

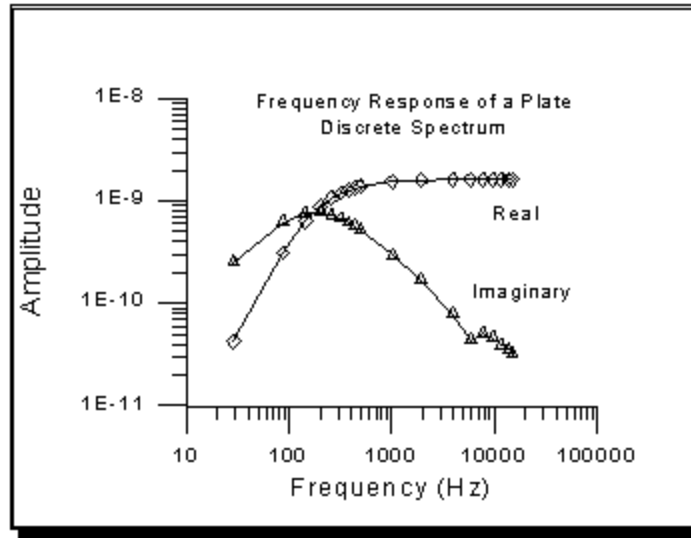


虽然人们通常认为电磁仪器具有从直流到无穷大的连续光谱(功率),但实际上并非如此。仪器测量周期信号时,测量过程中响应会重复和叠加多次。因此,基本频率或最低频率是数据收集期间设置的重复频率。这就是基频。由于仅测量实部或同相分量,因此测量信号中仅包含基频的奇次谐波。这称为离散谱或功率。

While often it is thought that the EM instrument has a continuous spectra (power) from DC to infinity, in practice this cannot be so. The instrument measures a periodic signal with the response repeated and stacked many times during the measurement. Because of this, the fundamental or lowest frequency is that of the repetitive frequency set during data collection. This is the basefrequency. As the measurement measures only a real or inphase component, then only odd harmonics of the basefrequency are contained in the measured signal. This is termed discrete spectra or power.

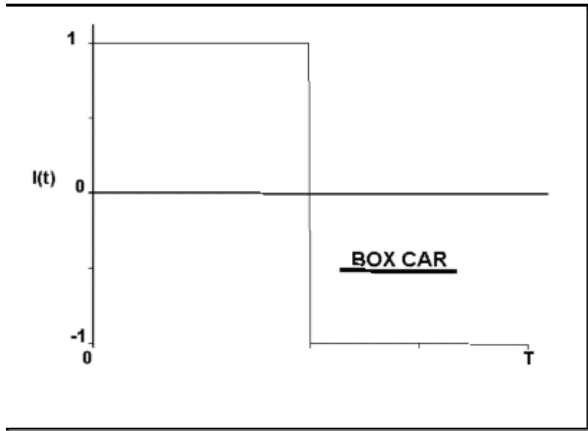
### 3. Interpolation

### 插值



- 功率谱由基频的离散奇次谐波组成
  - power spectrum consists of discrete odd harmonics of basefrequency
- 模拟所有谐波非常耗时
  - simulating all harmonics is time consuming
- 响应是频率的平滑函数
  - response is a smooth function of frequency
- 因此谐波可以插值
  - therefore harmonics may be interpolated
- 必须模拟频率的特定采样以进行精确插值
  - specific sampling of frequencies must be simulated for accurate interpolation
- 插值谐波组合以产生时域响应
  - interpolated harmonics are combined to produce time domain responses

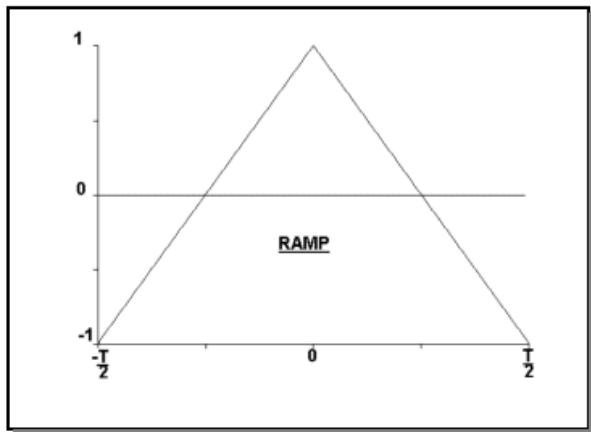
#### 4. Current Waveforms: 电流波形



**Box Car – theoretical step off**

箱车—理论关闭  
时域IP设备的近似

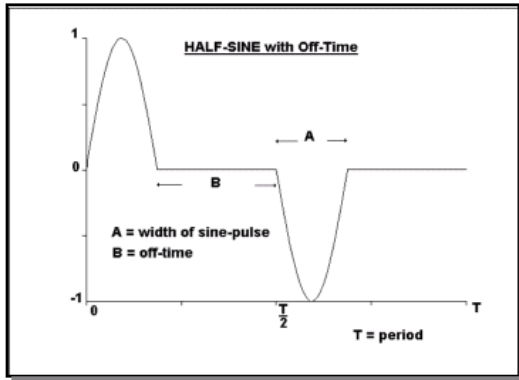
**close approximation to time domain IP equipment**



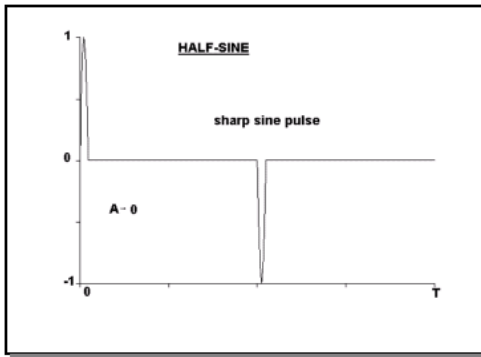
**Ramp – UTEM, Spectrem, AeroQuest**

斜坡 – UTEM、Spectrem、AeroQuest

## 4. Current Waveforms 电流波形



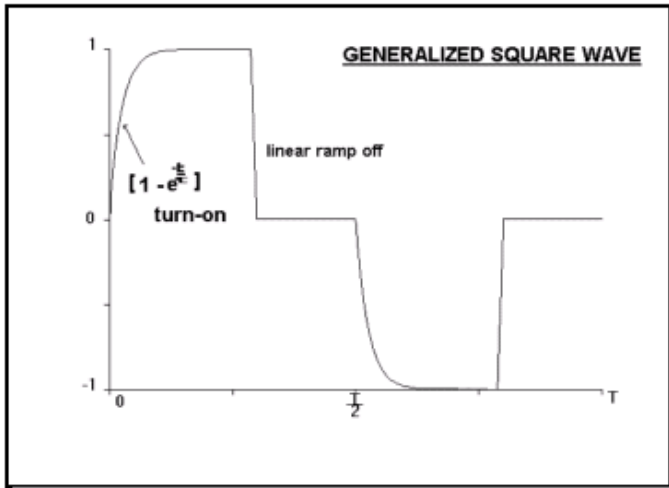
**Half Sine – INPUT, GeoTEM, MegaTEM, HeliTEM**  
**半正弦 - INPUT、GeoTEM、MegaTEM、HeliTEM**



**Half Sine – short pulse**  
**半正弦波——短脉冲**



## 4. Current Waveforms 电流波形



### Generalized Square Wave 广义方波

- 逆指数开启
- 线性非零关闭
- 大多数系统规定波形
  
- inverse exponential turn on
- linear non-zero turn off
- stated waveform for most systems

**Geonics system** – 非常精确的线性关闭，边缘处有振荡

**very accurate linear turn off with ringing just at edges**

**Zonge system** – 仅为近似线性关断 **only approximate linear turn-off**

**TerraTEM** – 指数关闭 **exponential turn off**

**FASTTEM** – 关闭可能不受控制，但未验证

**assumed but not verified but turn off is probably uncontrolled**

**Phoenix** - 仅近似线性 **only approximately linear,**

**Crone system** – 具有良好线性关闭的已经过验证的波形

**verified waveform with good linear turn off**

#### **4.5 Fourier series representations of the waveforms: 波形的傅里叶级数表示:**

在物理上, 请记住没有实际系统是无限带宽的。

*Physically it is always useful to remember that no physical system is band unlimited.*

##### **4.5.1 Generation of Fourier coefficients: 傅里叶系数的生成:**

在波形的基础上, 一旦波形与各种设置一起被选中, **FSEMTRS**为用户生成傅里叶系数。

Based on the waveform, **FSEMTRS** generates the Fourier coefficients for the user once the waveform has been selected along with the various settings.

##### **4.5.2 Basefrequency: 基频:**

EM/IP系统的基频或基频谐波由用户自行选择或通过数据导入设置。建模程序的频域响应必须由基本谐波的响应加上频谱中没有间隙的单调顺序的附加谐波组成。用户可以在所需的任何频率上结束频域系列。在**EMIGMA**中, 谐波之间进行插值, 因此在仿真或建模算法中不需要计算所有谐波。

The basefrequency or fundamental harmonic of the EM/IP system is set by the user by his/her selection or via the data import. The frequency domain response from the modelling program must consist of the responses for the fundamental harmonic plus additional harmonics in monotonic order with no gaps in the spectrum. The user may end the frequency domain series at any frequency desired. In **EMIGMA**, interpolation between harmonics is performed and thus not all harmonics need be calculated in the simulation or modelling algorithms.

##### **4.5.3. The Representation of the Time Series: 时间序列的表示:**

通过变换函数  $f(t)$  的光谱响应  $F(\omega)$  来生成函数的近似值或表示。这种表示对真实函数的准确程度取决于函数的形式  $f(t)$  以及用于表示函数的谐波或频率的数量。

Transforming the spectral responses  $F(\omega)$  of a function  $f(t)$  generates an approximation or representation of the function. How accurate this representation is to the true function depends on the form of the function,  $f(t)$  and the number of harmonics or frequencies used to represent the function.

## 5. Interpolation – 插值 - 用户选择起始和结束带以及 nskip 的值

User selects the beginning and end band and the value of nskip

set#-1 0.017Hz,.0.019. - 0.17Hz	以 x 为增量, 其中 $x= 0.002*(nskip+1)$
set#0 0.17Hz,.19Hz.. - 1.7Hz	以 x 为增量, 其中 $x= 0.02*(nskip+1)$
set#1: 1.7Hz, 1.9Hz.. - 17.1Hz	以 x 为增量, 其中 $x= 0.2*(nskip+1)$
set#2 17Hz,19Hz .. -171Hz	以 x 为增量, 其中 $x= 2*(nskip+1)$
set#3 170Hz,190Hz .. - 1710Hz	以 x 为增量, 其中 $x= 20*(nskip+1)$
set#4 1700Hz,1900Hz. - 17,100Hz	以 x 为增量, 其中 $x= 200*(nskip+1)$
set#5 17KHz,19KHz.. - 171KHz	以 x 为增量, 其中 $x= 2000*(nskip+1)$
set#6 170KHz,190KHz - 1.71MHz	以 x 为增量, 其中 $x= 20000*(nskip+1)$
set#7 1700KHz,1900KHz - 17.1MHz	以 x 为增量, 其中 $x= 200000*(nskip+1)$

nskip ranges from 0 to 7 and thus the number of frequencies generated per set depends on the value of nskip  
 nskip 的范围从 0 到 7, 因此每组生成的频率数取决于 nskip 的值。 .

nskip	# of frequencies per set # 每组频率	# total number of frequencies # 频率总数
0	80	80 x 选择的套数 number of sets selected
1	42	42 x 选择的套数 number of sets selected
2	29	29 x 选择的套数 number of sets selected
3	23	23 x 选择的套数 number of sets selected
4	19	19 x 选择的套数 number of sets selected
5	16	16 x 选择的套数 number of sets selected
15	8	8 x 选择的套数 number of sets selected

(注意: 所需的频率数量显示在波形页面上)

*(Note: The number of frequencies required is shown on the Waveform page)*

## 5. The Errors (bandwidth) 错误 (带宽)

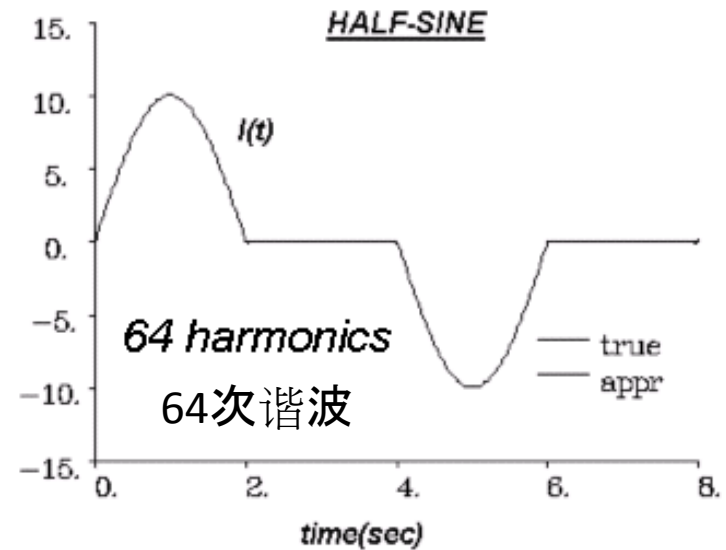
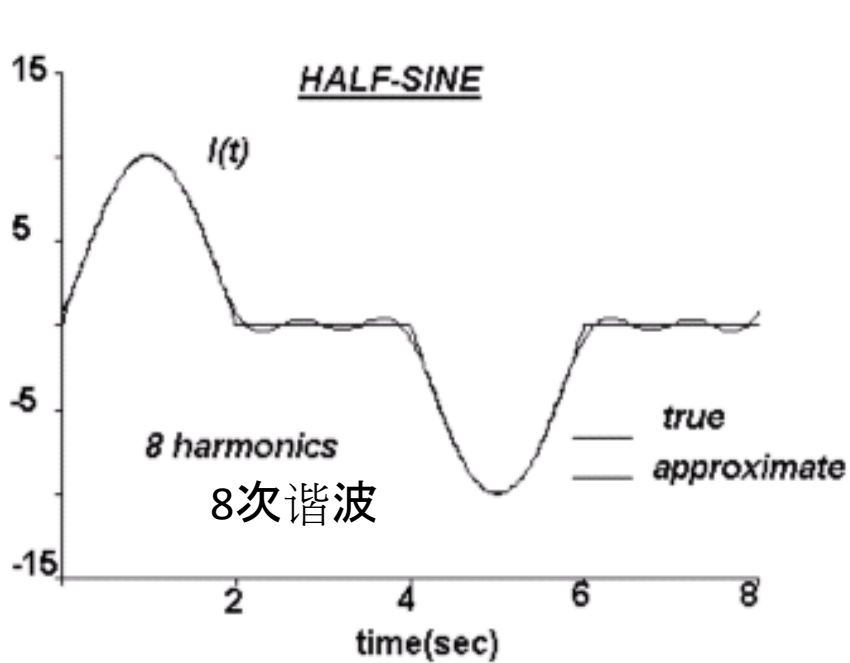


Figure 6.2 Fourier approximation of a half sine wave with 64 harmonics.

例子，测量磁场 (B) 或电压，一个周期、半正弦波形

Example, full waveform, half-sine waveform measuring the magnetic field (B) or a Voltage

## 5. The Errors (bandwidth) 错误（带宽）

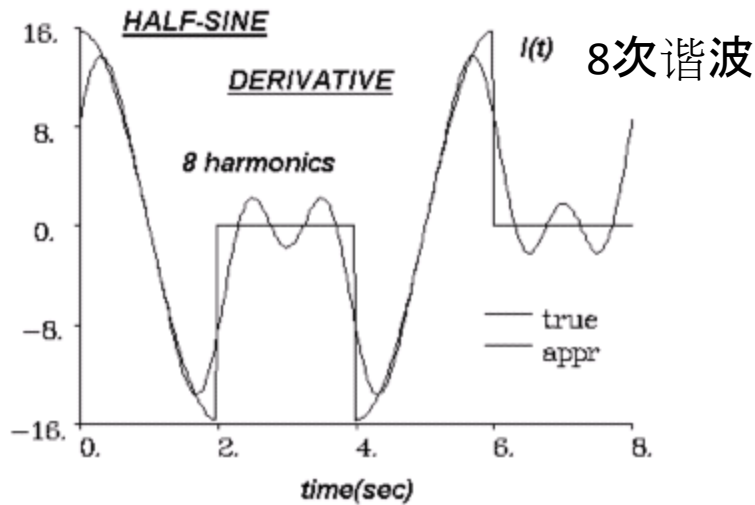


Figure 6.3 Fourier approximation of the time derivative of a half sine with 8 harmonics.

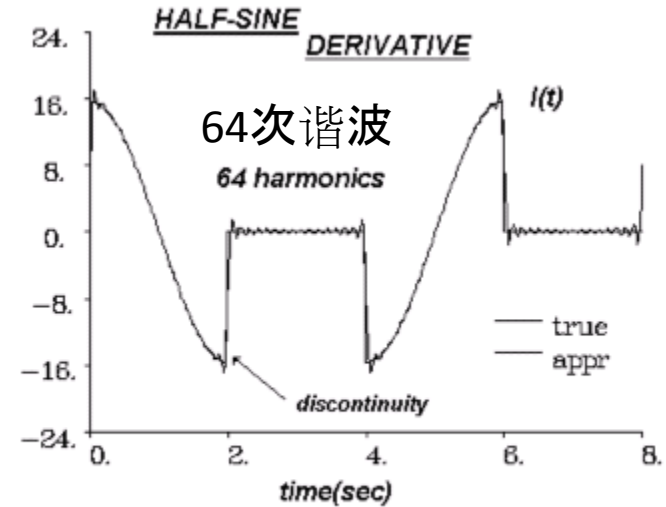


Figure 6.4 Fourier approximation of half sine derivative using 64 harmonics.

例如，全波形、半正弦波形测量磁场的时间导数。现在，该场具有不连续性和梯度的不连续性，以少量谐波的表示变得更加困难。

**Example, full waveform, half-sine waveform measuring the time derivative of the magnetic field. Now, the field has discontinuities and discontinuities of its gradient and representation with a few harmonics gets more difficult.**

## 5. The Errors (bandwidth) 错误 (带宽)

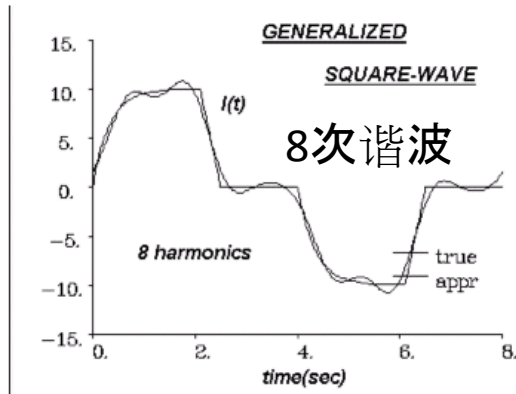


Figure 6.5 Fourier approximation of the Generalized Square Wave using 8 harmonics.

B-field

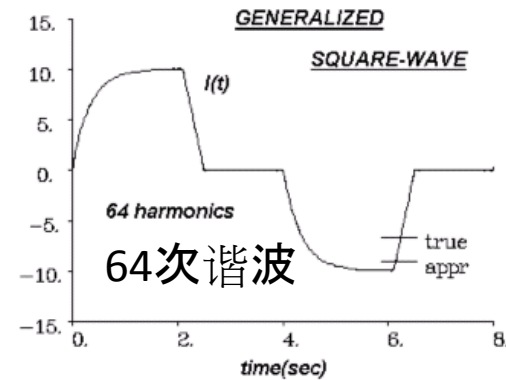


Figure 6.6 Fourier approximation of the waveform of Figure 6.5 with 64 harmonics.

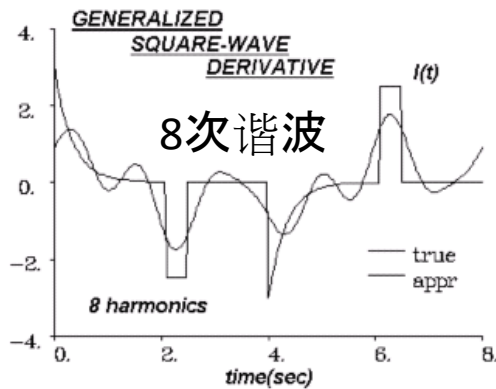


Figure 6.7 Fourier representation of the time derivative of the Generalized Square Wave of Figure 5 and 6 with 8 harmonics.

dB/dt

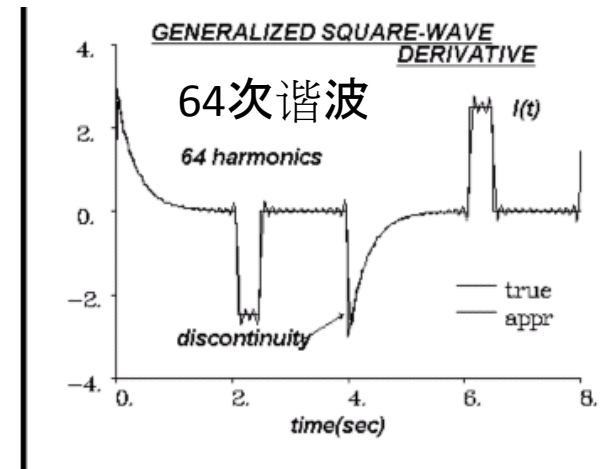


Figure 6.8 Fourier representation of derivative of the Generalized Square Wave using 64 harmonics.

Generalized square wave examples. 广义方波示实例

# The Software 软件 : FSEMTRS

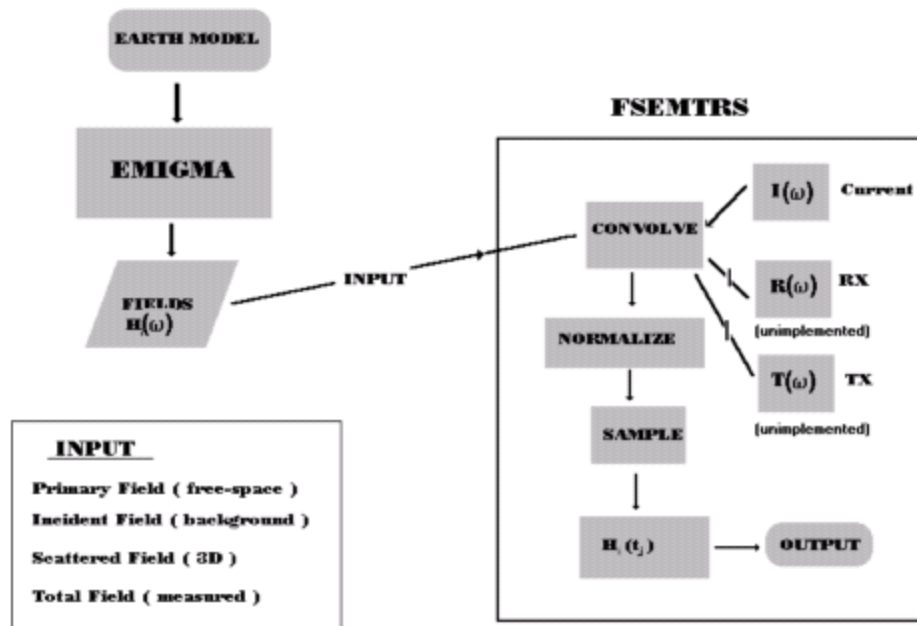


Figure 7.1

**输入**  
 一次场（自由空间场）  
 入射场（背景）  
 散射场（二次场）  
 总场（观测量）

## Current Transform Instructions: 当前转换指令

请注意，以下说明适用于 EMIGMA V10.x 的 FSEMTRS 的用户控制版本。快速转换现在直接在正演模拟中执行。快速转换选项是默认设置并自动执行。用户控制其执行方式。如果是自动的，则软件将执行模拟，然后进行转换并仅保存最终的时域输出。在高级选项中，可以保存中间频域谱数据。因此，如果模型是根据导入的时域数据构建的，或者用户之前转换过数据，则频域到时域的转换将自动运行。

请注意，以下说明适用于所使用的逐步控制版本和快速转换。

*Note that the following instructions are for the user controlled version of EMIGMA V10.0xs FSEMTRS. A fast transform is now performed directly in Forward Simulations. The fast transform option is default and performed automatically. The user controls how this performed. If automatic, then the software will perform the simulation and then the transform and save only the final TEM output. In the advanced options, the intermediate Spectral data can be saved. Thus, the frequency to time domain transform will be run automatically if either the model was built from imported time domain data or the user previously transformed a data set.*

*Note that the following instructions apply to both the used controlled step by step version and the fast transform.*

General Input

Input data from database  Analytic fields (Bode fields)

Base Frequency (Hz) 25

Base Period (msec) 40

Number of Odd Harmonics 701

Maximum Harmonic (Hz) 35025

Low Frequency in Dataset (Hz) 17

High Frequency in Dataset (Hz) 197000

Time Derivative

Use amplifier Amplifier

< Back Next > Cancel Help

1) 选择从正演模拟输出的频域谱文件包含一组频域谱模拟数据，即您已经选择了开始频率和结束频率以及跳跃次数。

1) **Select spectral file** which is output from Forward Simulations consists of simulated data for a Spectral suite of frequencies i.e. you have chosen a start and an end frequency and the number of skips.

2) 选择数据的基频或周期。如果软件发现了时域勘测，这可能会自动找到。

2) **Select the base frequency or period of your data.** This may automatically be found if a time domain survey is found by the software.

3) 奇次谐波数-> 我们已将合理的默认值设置为 2048，但这不是最大值。当您调整此数字时，当您单击该窗口时，最大谐波窗口会更新

3) **Number of Odd Harmonics**-> We have set a reasonable default of 2048 but this is not a maximum. When you adjust this number the Maximum Harmonic window is updated when you Click on that window

4) 场的时间导数被选中但可能被取消

如果读取电场数据，则自动取消时间导数。注意：如果用户希望模拟时域系统的 B 场，必须取消导数。

4) **The time derivative of the field is selected but may be turned off**

If electric fields are read then time derivative is automatically de-selected. Note: If the user wishes to simulate B-fields for a time domain system then they must turn-off the derivative.

5) Next> 自动读取数据，修正设置并继续下一页

5) Next> automatically reads data, makes corrections to settings and continues to next page.



## >>> Page 2 - FSEMTRS - Set Numerical Filters

Filter

Apply Frequency Filters ?

Low Pass Filters

Apply Low Pass Filters

Cosine Bell Low Pass Filter

Minimum Frequency for Filtering

Band-width to filter

Lancos Damping

Notch Filters

Apply Notch Filter

Filter #

Notch Frequency

Notch-Width for Filtering

< Back   Next >   Cancel   Help

- 1) 选择低通和陷波滤波器
- 2) 没有 EM/IP 或电阻率系统具有无限带宽。由于电气和硬件限制所有系统都明确或隐含地应用某种低通滤波器。
- 3) 低通滤波器——每个系统都有自己特定的低通滤波器，但这里我们允许设置 2 种类型的低通滤波器。默认过滤器是 Lancos 滤波器，它是一个简单的平滑低通。第二个过滤器是余弦钟形，您可以选择它。
- 4) Cosine bell - 设置低通开始的初始频率并设置其宽度。在初始+宽度频率之外，没有功率会传递到数值变换中。
- 5) 陷波滤波器 - 这些是标准的陷波滤波器，中心点和宽度。目前，只允许一个缺口，但如果您需要更多，请联系我们，我们将构建一个新的应用程序，允许您可能需要的数量。
- 6) 如果您需要专门的低通滤波器，我们很乐意提供。请联系我们提供详细信息。

### 1) Select Low Pass and Notch Filters

2) No EM/IP or Resistivity system has an infinite bandwidth. Due to electrical and hardware limitations all systems either explicitly or implicitly apply some sort of Low Pass filters.

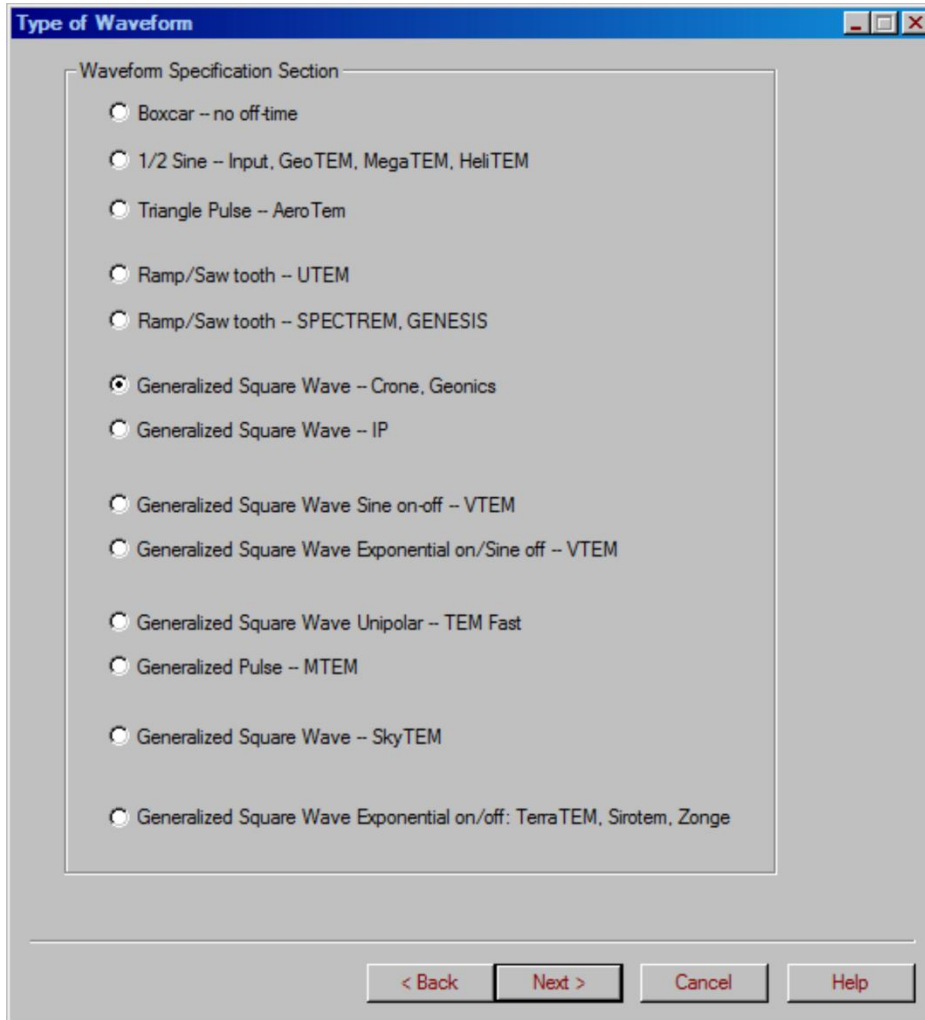
3) Low Pass Filters - each system has its own specific low pass filters but here we allow the setting of 2 types of low pass filters. The default filter is a Lancos filter which is a simple smooth low pass. The 2nd filter is a Cosine bell which may be selected by you.

4) Cosine bell - Set the initial frequency at which the low-pass begins and set its width. Beyond the initial+width frequency, no power will pass into the numerical transform.

5) Notch filters - These are standard notch filters with a centre point and a width. At the present time, only one notch is allowed but should you require more, please contact us and we will build a new application allowing the number that you may require.

6) Should you require a specialized low-pass filter, we would be happy to oblige. Please contact us with the details.

## >>> Page 3 - FSEMTRS - Set Current Waveform: 设置电流波形



选择您当前的波形

- 1) Boxcar 只需打开，没有关闭时间
- 2) 1/2 正弦波仅适合INPUT数据、新旧 GEOTEM 数据或 Questem 数据或仅适合 1/2 正弦波类型的任何波形。请记住，如果您使用线圈进行测量，您将测量磁场的导数，并且 B 的自由空间波形为半余弦。
- 3) AeroTem 系统在关闭前有一个小的三角脉冲，而 VTEM 以半正弦波打开并类似地关闭。通常，占比约为 40%。
- 4) 斜坡/锯齿
- 5) 斜坡/锯齿 – SPRECTREM,GENESIS
- 6) 广义方波是一种非常通用的波形，许多系统都符合这种波形。系统将要求您在下一页设置特征。包括精确的电流波形- Crone、Geonics
- 7) IP——虽然 IP 使用广义方波，但我们已经制作了一些默认设置，以确保开启和关闭特性，用户通常可以忽略。
- 8) 两种VTEM波形
- 9) 广义方波但单极
- 10) 广义脉冲 - MTEM
- 11) SkyTEM——另一个广义方波
- 12) 广义方波——但具有指数关闭  
- TerraTEM、Zonge、SiroteM

### Select Your current waveform

- 1) The Boxcar is simply ON then -On with no off-time
- 2) 1/2 Sine can be tailored to suit only INPUT data, new and old GEOTEM data or Questem data or merely any waveform of the 1/2 sine type. Remember that if you are measuring with a coil you are sensing the derivative of the magnetic field and the free-space waveform of B is a half-cosine.
- 3) The AeroTem system has a small triangular pulse prior to turning off while the VTEM is turned on with a half sinewave and off similarly. Generally, it is about a 40% duty cycle.
- 4) Ramp/Saw tooth
- 5) Ramp/Saw tooth – SPRECTREM,GENESIS
- 6) The Generalized Square Wave is a very generic waveform and many systems conform to this waveform. You will be asked to set characteristics on the next page. Includes a precise current ramp - Crone, Geonics
- 7) IP - although IP utilizes the Generalized Square wave, we have made some default settings to ensure that the turn-on and turn-off characteristics can generally be ignored by the user.
- 8) Two types of VTEM waveforms
- 9) Generalized Square Wave but unipolar
- 10) Generalized Pulse – MTEM
- 11) SkyTEM – another Generalized Square Wave
- 12) Generalized Square Wave – BUT with an exponential turn-off  
- TerraTEM, Zonge, SiroteM

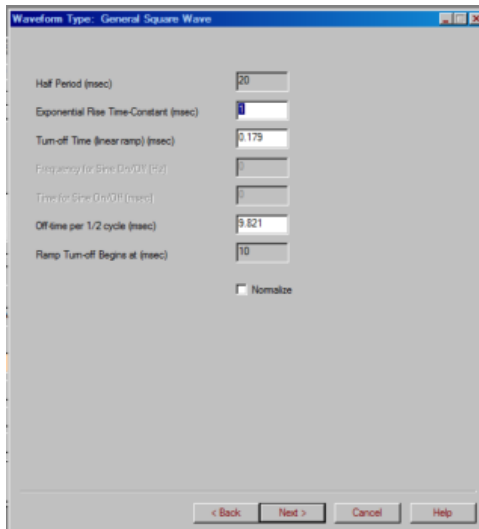
## >Page 4 - FSEMTRS - Set Waveform characteristics: 设置波形特征：

在此页面上，您将选择所选波形的细节。此页面的详细信息取决于波形。

注意：请记住，所有这些系统每半个周期切换一次极性。这是为了允许通过堆叠消除所有 DC 偏移。因此，每个半周期在每个周期重复但极性相反。

On this page, you will select specifics of your chosen waveform. The details of this page are waveform dependent.

NOTE: Remember that all these systems switch polarity every half-cycle. This is to allow with stacking, the removal of all DC offsets. Thus, every half-cycle is repeated in every period but with opposite polarity.



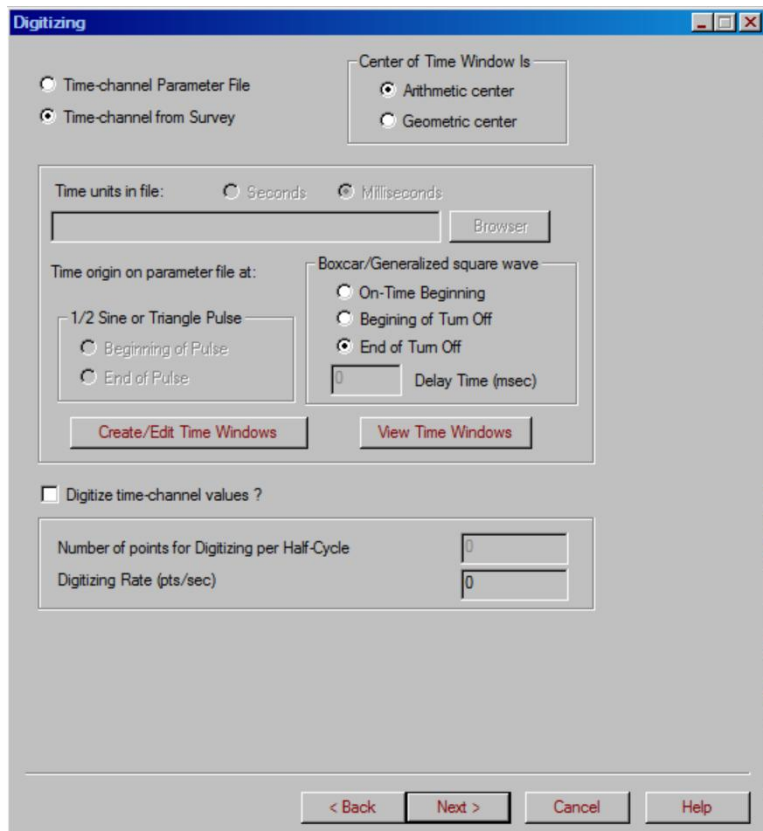
- 1) INPUT波形 - 显示半周期的长度。你可以选择正弦脉冲的宽度，同时自动更新关闭时间，作为半周期的宽度减去正弦脉冲的宽度。
- 2) UTEM - 此波形不显示任何页面
- 3) SPECTRUM - 没有页面显示此波形。
- 4) 广义方波 -
  - 开启时间常数。
  - 斜坡时间 - 从 ON 到 OFF 的线性斜坡的长度
  - OFF-Time - 电流关闭的时间长度
  - 斜坡开始时间 = 半周期 - 关闭时间 - 斜坡时间
- 5) IP - 只能为电场数据选择 - 如果你有问题请联系我们
- 6) 标准化 - 如果您希望对输出进行标准化，请选中此框

- 1) INPUT waveform - The length of a half-cycle is displayed. You may select the width of the sine pulse while the amount of off-time is automatically updated as the width of half-cycle minus the width of the sine pulse.
- 2) UTEM - no page appears for this waveform
- 3) SPECTRUM - no page appears for this waveform.
- 4) Generalized Square Wave -
  - time constant for turn ON.
  - Ramp Time - length of the linear ramp from ON to OFF
  - OFF-Time - length of time the current is off
  - Beginning of Ramp - Half-Period - Off-time - Ramp-time
- 5) IP - can only be selected for Electric field data - please contact us if you have questions
- 6) Normalize - if you wish to Normalize your Output please check this Box

## >>> Page 5 - FSEMTRS - Set Measurement Windows: 设置测量窗口

注意：如果您的 EMIGMA 勘测文件夹包含测量的数据或以前的时域模拟，则此页面已被选中，因为在时域勘测中检测到时间窗口。否则请按照以下说明进行操作。

Note: If your EMIGMA survey folder contains measured field data or a previous time-domain simulation, this page is already selected as the time windows are detected in the time domain survey. Otherwise follow the instructions below.



1) Time-Channel Parameter File: 该文件是一个简单的ASCII文件，包含时间窗口的数量、每个时间窗口的起始门及其结束门。您会在 /EXAMPLES 子目录中找到它们的几个示例。

2) 特定波形设置：时间门相对于波形中的某个时间原点。您可以从几个合适的时间原点中选择 1/2 正弦波或广义方波。例如，如果您希望在 GEOTEM 测量中生成开启时间测量值，只需选择“正弦脉冲开始”作为原点并将所有窗口时间设置为相对于正弦脉冲开始

3) 编辑参数文件：选择时间通道文件后，选择“创建/编辑”按钮，将进入编辑此时间窗口信息的界面。允许修改时间、添加新窗口或删除窗口，最后保存所产生的更改。您也可以在此界面中生成自己的窗口

4) 数字化时间通道值：如果你想计算几个给定时间窗口中的测量值，稍后进行合并和平均（所谓的集成测量值），您可以在此处执行此操作。

**1) Time-Channel Parameter File:** This file is a simple ASCII file containing the number of time window gates, the beginning gate of each time window and its ending gate. You will find several examples of them in your /EXAMPLES sub-directory.

**2) Specific waveform settings:** The time gates are relative to some time origin in the waveform. You may select from several suitable time origins for either the 1/2 sine or the generalized square wave. As an example, if you wish to generate ON-time measurements in a GEOTEM survey, simply select "Beginning of Sine Pulse" as the origin and set all of your window times relative to the beginning of the sine-pulse

**3) Editing the parameter file:** After selecting a time-channel file, select the Create/Edit button and you will be taken to an interface allowing you to edit this time-window information. Allowing to modify times, add new windows or delete windows and finally to save the resulting changes. You may also generate your own windows in this interface

**4) Digitize Time-Channel Values:** If you desire to calculate several measurements in a given time window which are later binned and average (so-called integrated measurements), you may do so here.

## >>> Page 6 - FSEMTRS - Normalization Procedures: 规范化程序

如果您的数据已标准化, 则您必须在此页面上设置标准化设定。

注意 1 : 如果您的勘测包含测量数据或以前的时域模拟, 则此页面会根据您以前的数据或模拟自动设置

注 2 : 此页因波形而异

If your data is normalized, then you must set the normalization criteria on this page.

NOTE 1: If your survey contains measured data or a previous time-domain simulation, then this page is automatically set from you previous data or simulation

NOTE 2: This page varies with waveform

Normalization for Boxcar/General Square Wave

Normalization

Divisor

Freospace  Total  Host

At Channel Time (msec)  
(To Given Time-origin) -0.0895

Use Absolute Values

Normalization Component

Same Receiver  Multiple Components

X  Y  Z

Norm. Convention

PPM  Percent  Ratio

< Back Next > Cancel Help

1) 1/2 正弦:

a) 除数:

- 这可能是自由空间或总场 (即在测量高度测得)

b) 标准化约定: 输出单位

c) 标准化组件:

- 您的数据可能被标准化为测量的同一分量或多个分量(即X,Y,Z)

2) UTEM数据: 请联系我们

3) 广义方波:

a) 除数 - 除以 Ch1、自由空间、总场或主场 (背景场)

利用除数的绝对值的实际值。您必须在此处设置您希望用于标准化的时间。

此时间的默认值是位于相对于您选择的时间起点的开启时间段

b) 归一化组件 - 同上

c) 标准化约定 - 输出单位

4) IP 波形: - 与上述 (3) 相同

1) 1/2 sine:

a) Divisor :

- This may be either Free-Space or Total Field (i.e. measured at survey height)

b) Norm convention : output units

c) Normalization component:

- your data may be normalized either to same component as measured or to Multiple components ( i.e. X,Y,Z)

2) UTEM data: please contact us

3) Generalized Square Wave:

a) Divisor - divide by Ch1, Free-space, Total Field or just Host (Background)

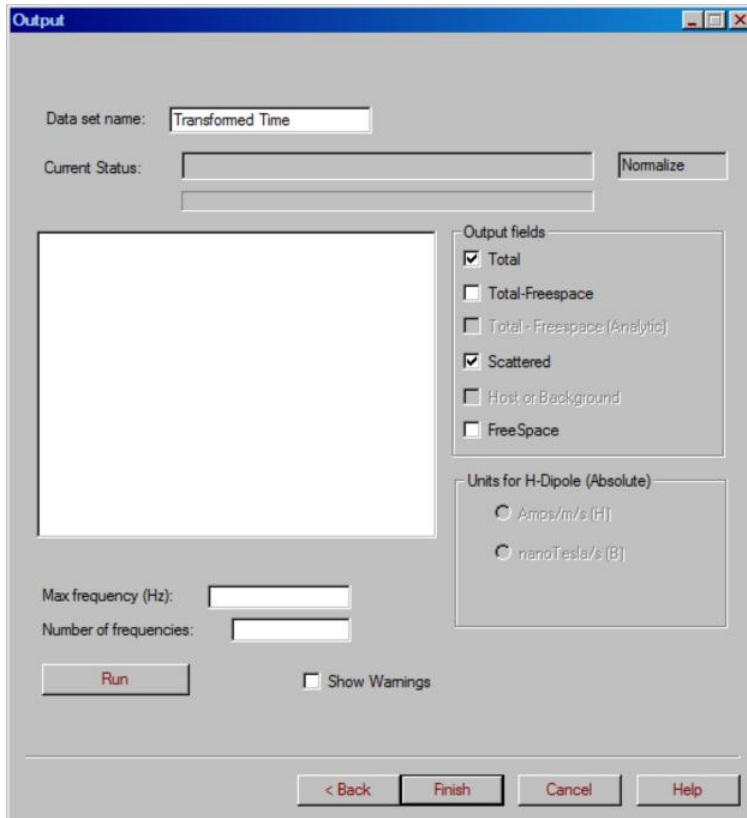
utilize the actual value of the absolute value of the divisor. Here you must set the time which you wish to use for normalization. The Default for this time is during the On-time relative to your selected time-origin

b) Normalization component - same as above

c) Normalization convention - output units

4) IP waveform: - same as (3) above

## >>> Page 7 - FSEMTRS - Output settings: - 输出设置



- 1) 输出数据集名称—我们选择了一个默认值，但您可以对其进行编辑
  - 2) 单位——这取决于被转换的数据类型
    - a) 磁场数据
      - 对于线圈数据，选择是 Amp/m/sec 或 nanoTesla/sec
      - 如果需要磁场数据（无时间导数），则单位为 Amp/m 或 nanoTesla/sec
    - b) 电场数据
      - 伏特或毫伏或时间导数 伏特/秒或毫伏/秒
- 注意：如果数据已标准化，则无法选择这些单位

- 3) 输出字段
  - Total指的是模拟的总场 = 主场 + 二次场
  - 主场或背景 - 是在没有任何 3D 异常的情况下测量的场
  - Total-FreeSpace = 总场 - 自由空间场
  - Total - FreeSpace (analytic) ) - 在转换前的频域中计算，相当于除去自由空间场。

注意：选择完成后，正确的顺序是选择 RUN 按钮。界面将指示输出文件的成功完成和写入。然后您可以返回到第一页以选择另一个文件或选择完成以关闭应用程序。

- 1) **Output dataset name** - we have selected a default but you may edit this
  - 2) **Units** - this depends on the type of data being transformed
    - a) Magnetic Field Data
      - for coil data the selections are Amp/m/sec or nanoTesla/sec
      - if magnetic field data is required (no time derivative) then the units are Amp/m or nanoTesla/sec
    - b) Electric Field Data
      - Volts or mV or if time derivative Volts/sec or mV/sec
- NOTE: If the data is normalized then these units cannot be selected*

- 3) **Output fields**
  - Total refers to the simulated Total field = Host + Scattered
  - Host or Background - is the field measured in the absence of any 3D anomalies
  - Total - FreeSpace = Calculated Total - Calculated FreeSpace
  - Total - FreeSpace (analytic) - Calculated in the frequency domain prior to transformation which is equivalent to freespace bucking.

*NOTE: When selections are complete, the proper sequence is to select the RUN button. Messages will indicate successful completion and writing of the output file. You may then return to the first page to select another file or select FINISH to close the application.*