Guide lines for updating SkyTEM results with the new refined reference model

November 2011

This note explains how to update the geometry file according to the refinement of the national TEM reference model (Lyngby, Aarhus), and how to start a new inversion in Aarhus Workbench with these new settings. The update induces changes in the upper 15 m with normally a higher resistive top layer in the first 5 m. For more details, reader is invited to look at the report entitled “Refinement of the national TEM reference model at Lyngby” written in November 2011.

Step 1/4: Update the time shifts in the geometry file

First you need to add -1.1 µs to both Super Low (SLM) and High (HM) moment time shifts in the geometry file, as well as to the time of the frontgate which is always modeled for HM:

```
Ch. #1 - Super Low Moment - z component ()
                    1    !Channel Number:
  0.0      0.0    0.0    !TxPos, Relative position of Transmitter, negative in the air [m] {float}
 -9.03     0.0   -1.95   !RxPos, Relative position of Receiver [m] {float}
                    3    !Receiver polarization (1->x, 2->y, 3->z)
                    1    !Rx device number {integer}
                  7.5    !Current interval (A) {float}
                   72    !LoopType, 7=Rectangular Loop, 72=Segmented Loop {=7 or = 72, int}
9  132.45                !if Loop=72: NumberOfWires, LoopArea [m2] {>=2 or <=16,int}{>0,float}
   -8.18    -2.06        !if Loop=72:   !1st wire begin and end points (x0,y0) -> (x1,y1))
   -5.90    -4.34
    5.90    -4.34
    8.40    -1.835
    8.40     1.835
    5.90     4.34
   -5.90     4.34
   -8.18     2.06
                    1    !NTurns, Number of turns in loop {>=1, int}
                   26    !NGates, Number of gates for the proton instrument, number of times per channel {>=1, int}
               -0.5e-6   !Shift times by a constant [s] {float}
                    0.0  !Shift fields by a constant [V/m2] {float}
                   0.97  !Factor
```

-0.5e-6 **-1.1e-6** => -1.6e-6

First lines in the geometry file corresponding to the SLM channel

```
Ch. #2 - High Moment - z component ()
                    2
  0.0      0.0    0.0    !TxPos, Relative position of Transmitter, negative in the air [m] {float}
 -9.03     0.0   -1.95   !RxPos, Relative position of Receiver [m] {float}
                    3    !Receiver polarization (1->x, 2->y, 3->z)
                    1    !Rx device number {integer}
                   56    !Current interval (A) {float}
                   72    !LoopType, 7=Rectangular Loop, 72=Segmented Loop {=7 or = 72, int}
9  132.45                !if Loop=72: NumberOfWires, LoopArea [m2] {>=2 or <=16,int}{>0,float}
   -8.18    -2.06        !if Loop=72:   !1st wire begin and end points (x0,y0) -> (x1,y1))
   -5.90    -4.34
    5.90    -4.34
    8.40    -1.835
    8.40     1.835
    5.90     4.34
   -5.90     4.34
   -8.18     2.06
                    1    !if Loop=72: 8th wire begin point. Connects back to 1st wire begin point (x,y) [m]
                    1    !NTurns, Number of turns in loop {>=1, int}
                   26    !NGates, Number of gates for the proton instrument, number of times per channel {>=1, int}
               -1.2e-6   !Shift times by a constant [s] {float}
                    0.0  !Shift fields by a constant [V/m2] {float}
                   0.97  !Factor
                    0    !Default remove gates 1..X and Y..NGate on datasets, if 0 no gates are removed {>=0 and <=NGates-1, int}{>=0, int}
                    0    !Default remove gates 1..X and Y..NGate on noise datasets, if 0 no gates are removed {>=0 and <=NGates-1, int}{>=0, int}
                    0    !Median filter, number of data to remove from Low end {>=0, int}
                    0    !Median filter, number of data to remove from High end {>=0, int}
   1       -1       -1   !SlopFilters before front gate, -1 means no filter (3 numbers) {=-1 or >=1 and <=2 - all values set, int}
 450E+3     1        1   !Filter cut off frequency [Hz] (3 numbers) {>0,>0,>0, float}
   1     21.3e-6  0.01   !Use Frontgate (1=yes, 0=no),FrontGate time [s], Primary field damping factor {=0 or 1, int}{<FirstGateTime, float}{>0, float}
```

21.3e-6 **-1.1e-6** => 20.2e-6

First lines in the geometry file corresponding to the HM channel

Step 2/4: Update the *.bia file for the coil response inversion

If a coil response inversion has been run before, then an update of the *.bia file is necessary. Since the times given in the first column of the *bia file corresponds to the gate center times shifted according to value defined in the geometry file, these times needs also to be shifted by **-1.1µs:**

Coil response of NICA survey - from the HA test of 22/06/2011

0.6900000E-06	2.0869769E-07
2.6900000E-06	-4.8598424E-05
4.6900000E-06	-1.8183371E-05
6.6900000E-06	-2.5425268E-06
8.6900000E-06	-2.9445568E-07
1.0690000E-05	-2.2408661E-08

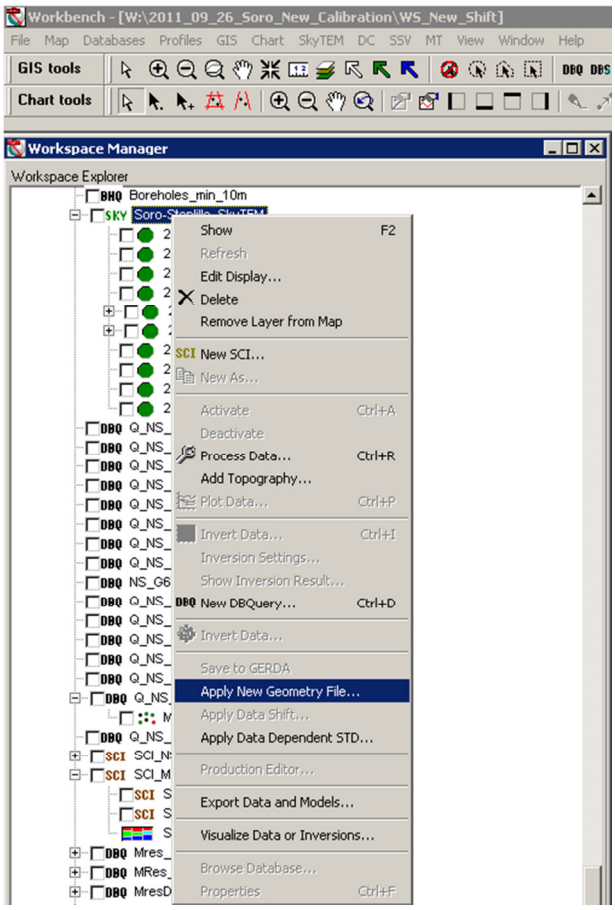
→ **Has to be shifted by -1.1e-6**

*Example of *.bia file for coil response inversion*

Step 3/4: Apply the updated geometry file in Aarhus Workbench

Before applying the updated geometry file, it is highly recommended to make a backup of the workspace before to avoid problems in the case where the update could be interrupted during its process. This could result in a lost workspace where part of the data is updated and the other not.

The application of the new geometry file is done by right clicking on the Sky node containing the data and choose “Apply new geometry file”:



Application of a new geometry file in Aarhus WorkBench

Step 4/4: running a new inversion

For a LCI inversion you just have to run a new inversion from one of the flight of the sky node. For a SCI inversion **you need to create a new SCI node**, since every SCI node builds its own image of the current data set when it is created.

Important check: with the application of a time shift of -1.1 µs, it is possible that the first gate you used before has an opening time before the end of the turn-off time of the ramp. If so, you need to ignore this gate during the new inversion.