RPG FMCW Cloud Radar Triggered MBF's

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1 Introduction

1.1 Purpose

The manual describes how to define the MDF's and MBF's required to achieve triggered measurements using the RPG HOst computer software.

1.2 Audience

This manual is intended for users of the RPG FMCW Cloud radar systems.

1.3 Function of the MBF described

The function of the MBF described in this document is to alternate between taking zenith measurements and PPI measurements at 85°elevation. The zenith measurements will be triggered at 22 mins and 30 secs and 52 mins and 30 secs past the hour, every hour. The PPI measurements will be triggered at 07 mins and 30 secs and 37 mins and 30 secs past the hour, every hour. This allows for the zenith measurements to be active and centered on the half hour mark and at the hour mark.

2 Defining the MDF for triggered zenith measurements

- Begin by opening the 'Create MDF's/MBF's' creation window tool in the RPG software.
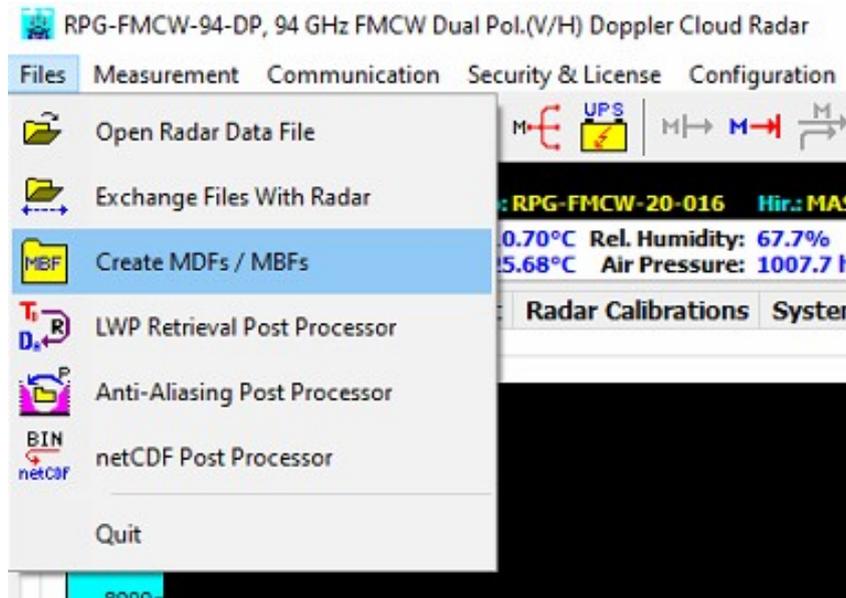
Figure 1: MDF creation tool

- In the 'General' tab select the required chirp program, noise filter level and data files required.
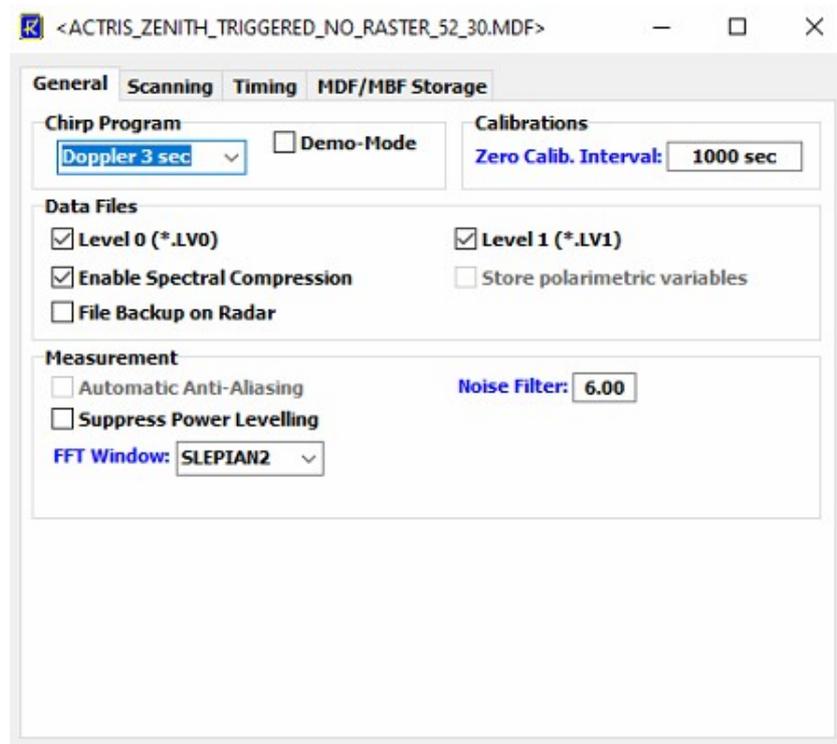
Figure 2: General tab on the MDF creation tool

- In the 'Scanning' tab, select the scan type 'Constant angles' and set the 'Constant angle' variable to 90 °elevation and an azimuth value of 0 °. The 'General Scan' section will be greyed out when constant angle is selected.
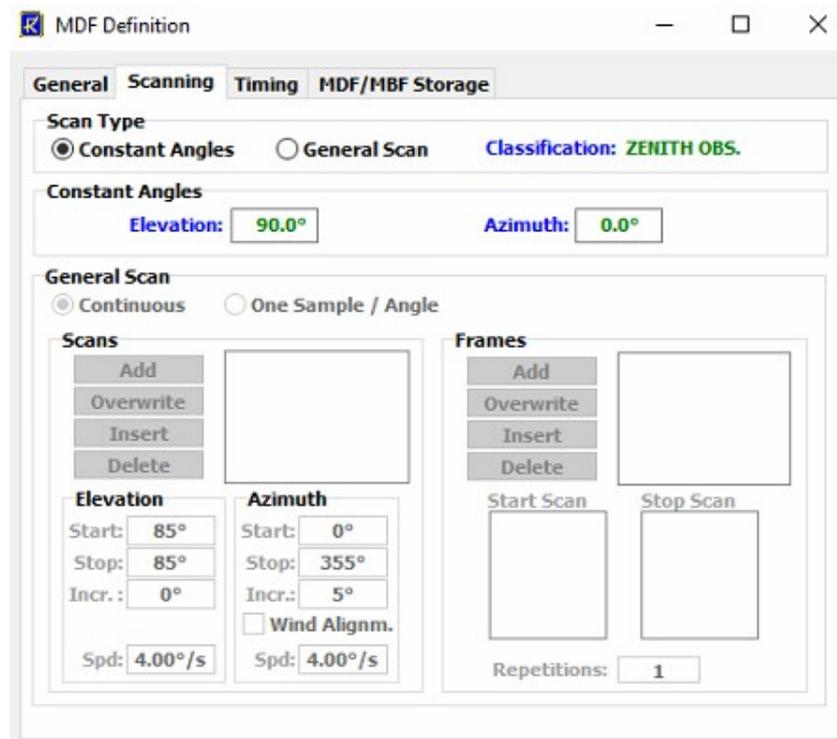
Figure 3: Scanning tab on the MDF creation tool

- In the 'Timing' tab, select 'Limited' mode. The prefix name given to the files can be added. Here we

have chosen the prefix 'TRIGGERED'. We would like a 15min measurement period which would equate to 900 secs. Allowing for time for the radar to move, this has been reduced to 875 secs.

- In the "Measurement start time' section, select the 'Triggered' radio button and select the 'Ignore Date' and 'Ignore Hour' radio buttons.

- Note: Once the MDF has been saved the 'Ignore Date' selection will be lost.

- Leave the 'Raster' radio button unchecked.

- In the 'Start Time' section, enter the minutes and seconds that you would like the measurement to begin each hour. In figure 4, we would like the measurement to begin at 22 mins and 30 secs past the hour.
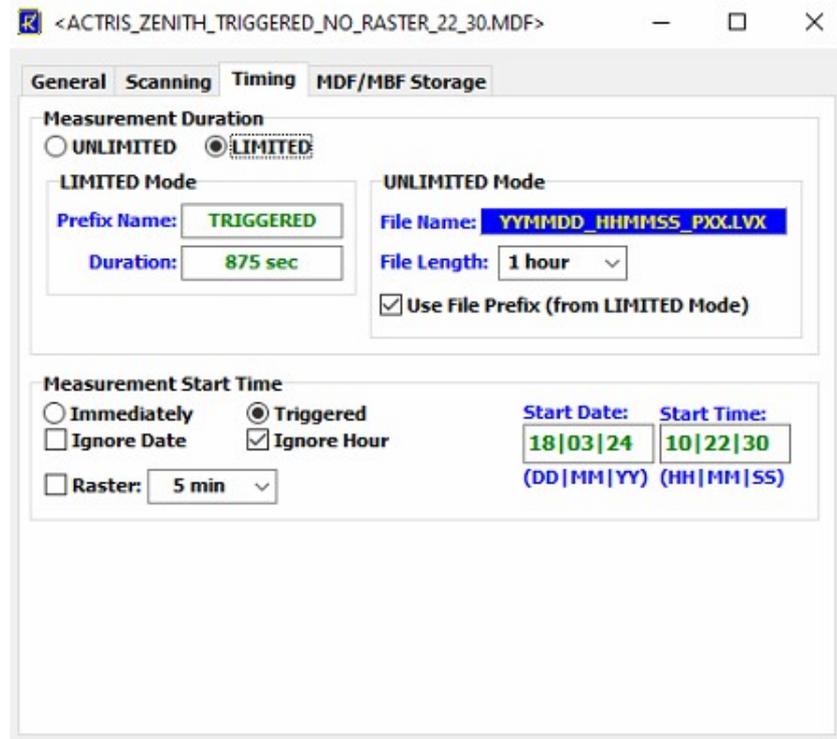
Figure 4: Timing tab on the MDF creation tool

- Finally store the MDF under a name that would make it easily identifiable when creating the MBF.

- In our example we have called this file ACTRIS_TRIGGERED_NO_RASTER_22_30.MDF

- Click the 'Store MDF' button
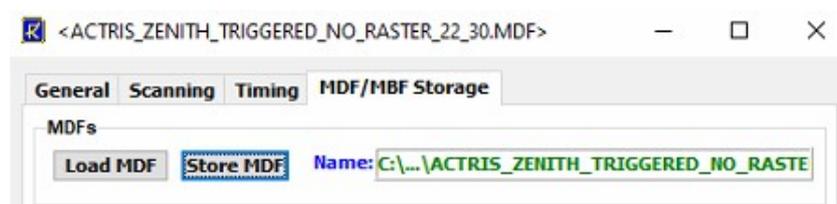
Figure 5: Storage tab on the MDF creation tool

- Repeat these steps to create a second MDF where all the settings are the same but the start time is adjusted to 52 min and 30 secs.
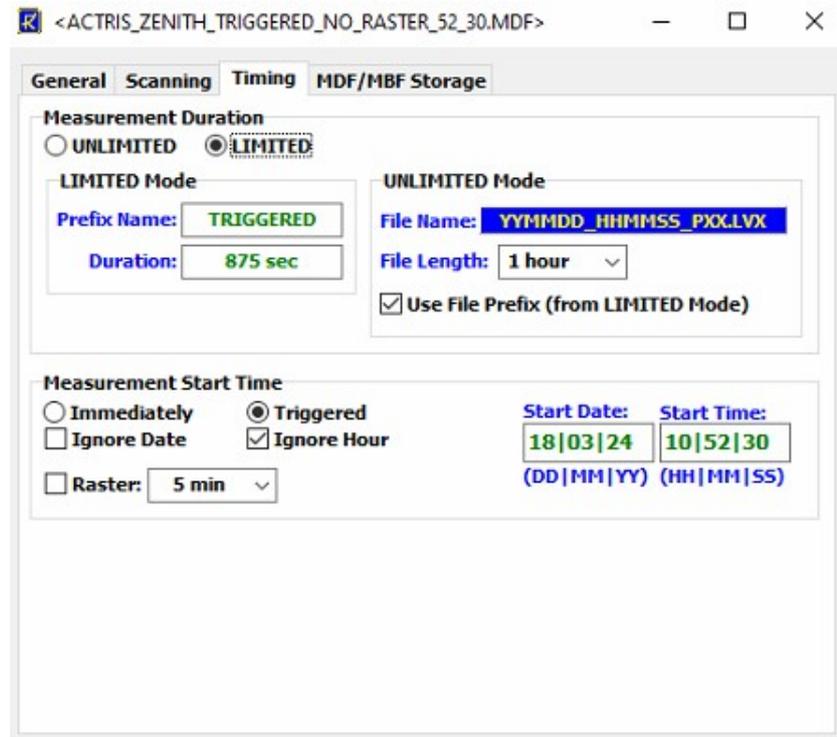
Figure 6: Timing tab with the start time set t0 52:30

3 Defining the MDF for triggered PPI Clockwise measurements

- Similar to the zenith measurements, begin by opening the 'Create MDF's/MBF's' creation window tool in the RPG software.

- In the 'General' tab select the required chirp program, noise filter level and data files required.

- In the 'Scanning' tab, select the scan type 'General Scan

- Enter the start and scan angles for the elevation and the azimuth. in Fig. 7 we are defining a PPI scan with a constant elevation of 85 °and we are defining a rotation in azimuth from 0 °to 359.9 °. For the elevation the Speed does not matter because there is no rotation. For the azimuth rotation we have defined a speed of 5°/sec. This would lead to a rotation period of approximately 72s. The Increment is ignored in both cases.

- Once the values have been entered in to the form, click on the 'Add' button. This will add 'Scan #1' to the list. Any changes to the elevation, azimuth or speed after this point will require the 'Overwrite' button to be clicked to overwrite the 'Scan #1' data that was previously stored.

Figure 7: Scanning tab on the MDF creation tool

- After defining the scan, move to the 'Frames' section. Here click on the starting and the ending frames. As there is only one scan that has been created, the start and end scan are both 'Scan #1'

- Once both are selected, click on the 'Add' button to add 'Frame #1' to the list.
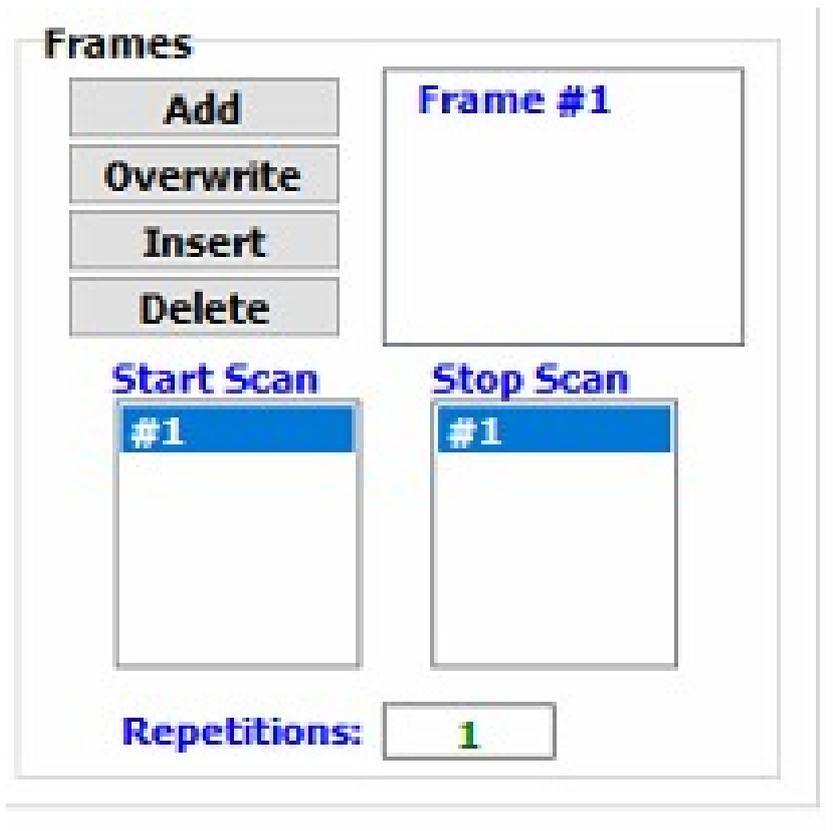
Figure 8: Scanning tab on the MDF creation tool for frame definition

- In the 'Timing' tab, select 'Limited' mode. The prefix name given to the files can be added. Here we have chosen the prefix 'TRIGGERED_PPI'.

- In the "Measurement start time' section, select the 'Triggered' radio button and select the 'Ignore Date' and 'Ignore Hour' radio buttons.

- Note: Once the MDF has been saved the 'Ignore Date' selection will be lost.

- Leave the 'Raster' radio button unchecked.

- In the 'Start Time' section, enter the minutes and seconds that you would like the measurement to begin each hour. In figure , we would like the measurement to begin at 07 mins and 30 secs past the hour.
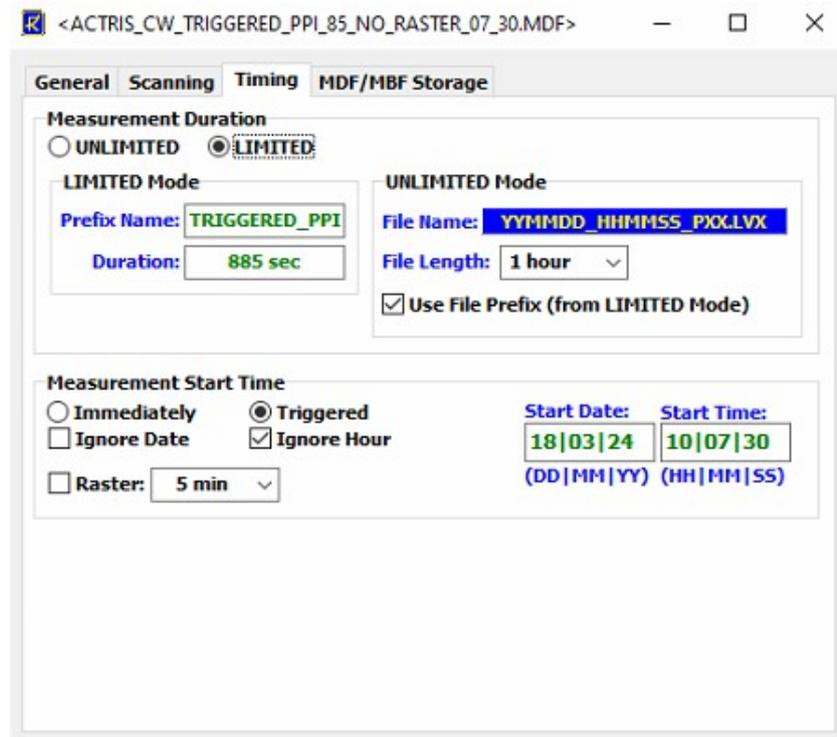
Figure 9: Timing tab on the MDF creation tool

- Finally store the MDF under a name that would make it easily identifiable when creating the MBF.

- In our example we have called this file
  ACTRIS_TRIGGERED_PPI_CW_85_NO_RASTER_07_30.MDF

- Click the 'Store MDF' button

Figure 10: Storage tab on the MDF creation tool

- Repeat these steps to create a second MDF where all the settings are the same but the start time is adjusted to 37 min and 30 secs.

4 Defining the MDF for non- triggered PPI Clockwise measurements and CCW measurements

- Similar to the triggered PPI measurements, begin by opening the 'Create MDF's/MBF's' creation window tool in the RPG software. Follow the same steps for the triggered clockwise PPI until the timing tab.

- In the 'Timing' tab, select 'Limited' mode. The prefix name given to the files can be added. Here we have chosen the prefix 'CW_PPI'.

- In the "Measurement start time' section, select the 'Immediately' radio button. All other radio buttons can be left unchecked.

- This MDF will start immediately after the previous MDF has been run.

- The 'Duration' has been left at 885secs however this duration is not used but it is higher than the time of the measurement. Therefore the rotation speed and angle of rotation is a better definition of the duration. This value would be used if the value was lower than the rotation duration.
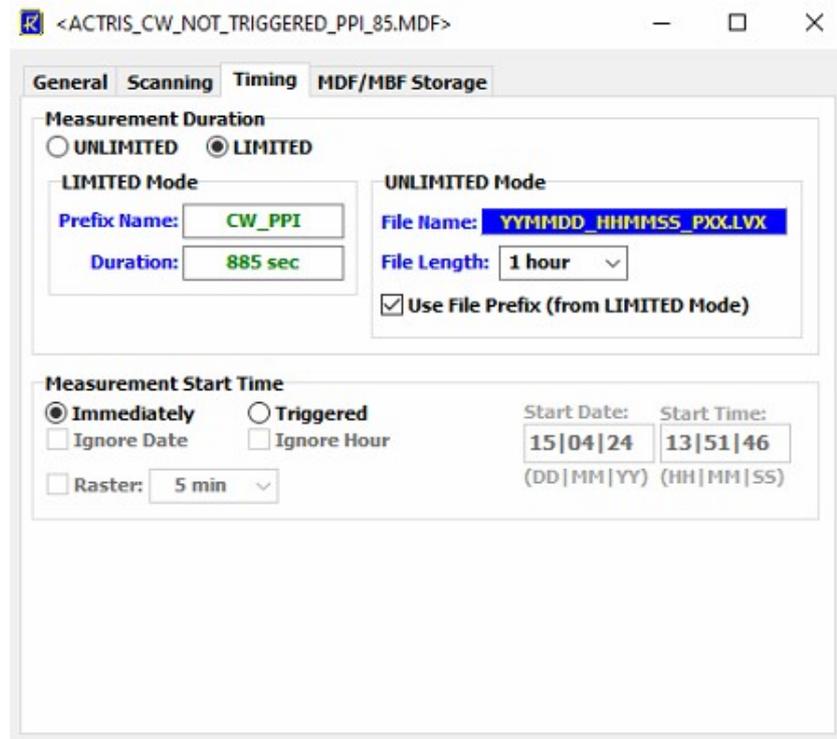
Figure 11: Timing tab on the MDF creation tool with immediate start

- Finally store the MDF under a name that would make it easily identifiable when creating the MBF.

- In our example we have called this file
  ACTRIS_CW_NOT_TRIGGERED_PPI_85.MDF

- Click the 'Store MDF' button

Figure 12: Storage tab on the MDF creation tool

- Repeat these steps to create a CCW PPI MDF. In the 'Scanning' reverse the azimuth angles so that the radar scans from 359.9°to 0°. 'Override' the existing scan of 'Add' new scan. In the 'Frame' window, click the newly created scan as the Start and Stop of the Frame.

- Edit the prefix 'CCW_PPI'.

- Save the new MDF.

5 Defining the MBF

- Once all of the MDF have been defined, an MBF needs to be created.
- To create the MBF click on the 'MDF/MBF Storage' tab.

- In the 'MBF Batch Files' window, find the newly created MDF in the file list on the right. These are located where they were saved. If the files are not listed, navigate to the parent folder and then back into the MDF_MBF folder to refresh the list.

- To start creating the MBF list, drag the MDF over to the window on the left.

- For our example we wanted to have a triggered zenith measurement at 22mins 30secs after the hour for 15mins and then a triggered CW PPI at 37mins 30secs ater the hour. Following the triggered CW PPI, we wanted to make 5 PPI rotations because going back the zenith measurement at 52mins 30 secs after the hour.
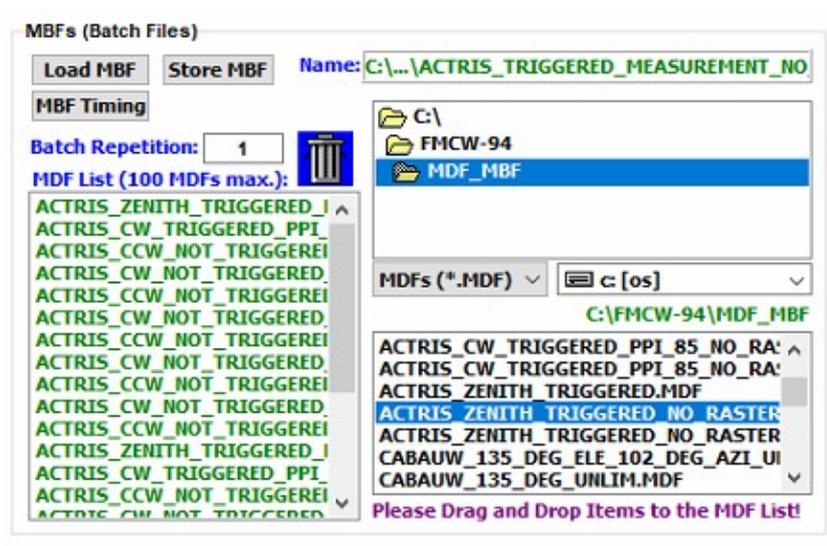
Figure 13: Storage tab on the MBF creation tool

- First we drag the triggered zenith 22:30 MDF in the left window, followed by the triggered PPI 37:30 MDF. After this the non triggered CW and CCW MDF are added as pairs so that the radar rotates in one direction followed immediately by rotating in the opposite direction.

- Once this process has been completed we add the triggered zenith measurement at 52:30 and then the triggered PPI at 07:30.

- The last part of the MBF will again be 5 pairs of non triggered PPI rotations.

- After all of the MDF's have been dragged in to the correct position, the MBF can be saved by clicking the 'Store MBF' button.

- Clicking the 'Load MBF' button and loading the saved MBF, will allow access to the 'MBF Timing' function. Here you can see whether the order and timing of the individual MDF's are correct in the MBF file.
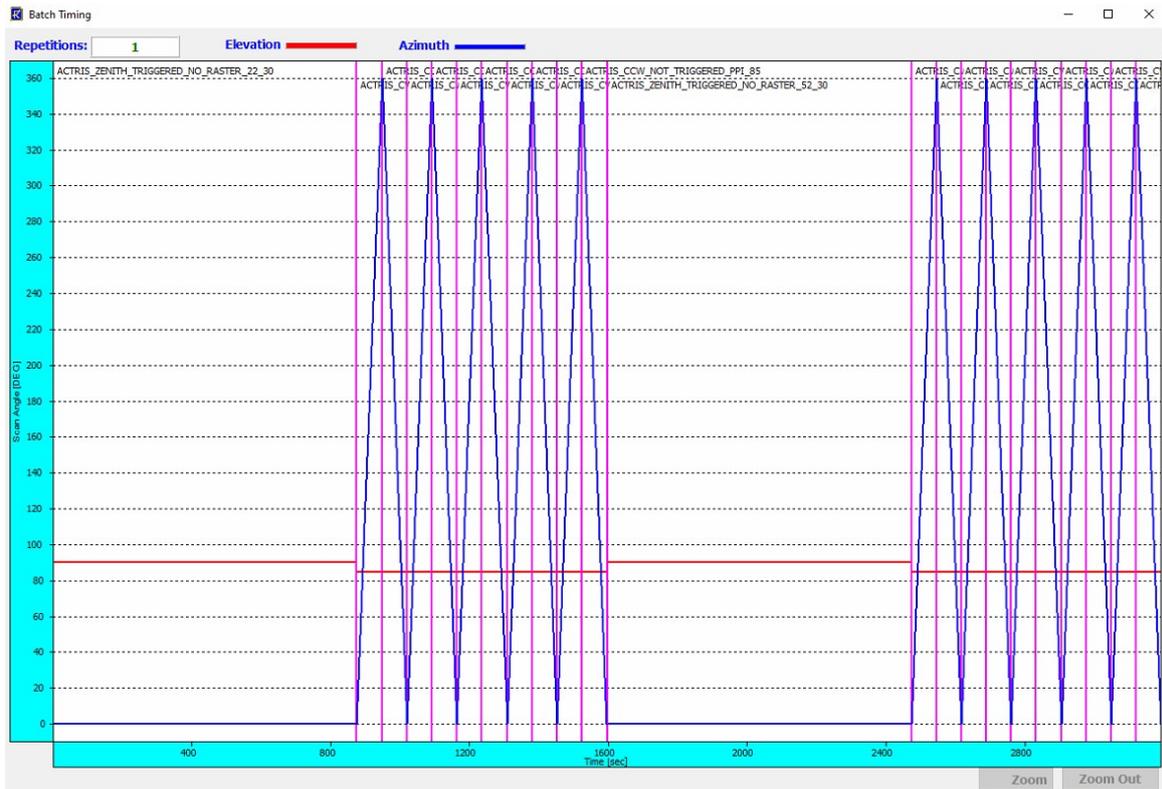
Figure 14: Timings of the MBF

6 Using the Raster function

- The Raster function on the 'Timing' window allows for triggered measurements at certain time intervals. These are between 1 min and 30 mins.

- The raster function ignores the start time and the start date and will trigger the MDF at intervals defined by the raster interval.

- For example, if the raster interval is set to 30 minutes. The MDF will be triggered at 30 minutes past the hour and on the hour. If it is set to 10 minutes it will trigger six times during the hour at 10, 20, 30, 40, 50, 60.

- It is not possible with the raster function to trigger at a set time if that set time is not a multiple of the raster interval. Therefore it is not possible to achieve a trigger time of 07:30, without having a raster interval of 7:30.

7 Limitations

- The radar takes time to switch between the different MDF's listed in the MBF. Therefore the timing of the MBF can be slightly longer than anticipated. Leave a gap of at least 30 sec to compensate for this.

- The radar is designed to only rotate in azimuth once. The MDF's have to be defined to rotate one way (clockwise) and then a second MDF to rotate the other way (counterclockwise) to bring the radar back to 0 °

- The radar struggles with making the distinction between 0 °and 360 °azimuth. RPG have recommended to resolve this to only rotate to 359.9 °azimuth.