RD Instruments
Acoustic Doppler Solutions

ChannelMaster H-ADCP Application Note:

Measurements of Flow Pattern Using ChannelMaster H-ADCP

(Bridge at Irish Bayou, New Orleans, LA)

SUMMARY: *Flow patterns were measured using RD Instruments new 600 kHz ChannelMaster H-ADCP downstream a five-pier bridge at Irish Bayou, New Orleans, Louisiana on June 4, 2003. Horizontal velocity profile data revealed that the flow pattern downstream of the bridge exhibited four distinct peaks. The results indicate that the 600 kHz ChannelMaster H-ADCP is able to accurately measure the complex flow pattern resulted in by the bridge piers at a high spatial resolution of 0.5 meter and temporal resolution of 33 seconds.*

The test site on the Irish Bayou was approximately 20 meters wide, and its maximum depth was 3 meters. The 600 kHz H-ADCP ChannelMaster H-ADCP was mounted about 20 meters downstream of a bridge (Figures 1, 2 and 3).

The bridge has five piers with water flowing through four openings. The piers generated wake flows and resulted in significant changes to flow pattern. Therefore, the flow pattern downstream of the bridge was complex, and no longer the same as that upstream of the bridge.

Figure 1: 600 kHz ChannelMaster H-ADCP at the test site.

The H-ADCP was installed on a pipe that was mounted on the bottom with a steel bar. The water depth at the H-ADCP mounting place was about 1.1 meters. The water level over the H-ADCP was 0.68 meters during the test.

Figure 2: The bridge about 20 meters upstream of the H-ADCP mounting location.

WinH-ADCP, RDI's Windows based real-time data acquisition program, was used to set up the H-ADCP and to collect the data.

In order to measure flow pattern resulting from the bridge piers, both high spatial and temporal resolution were required, in addition to high accuracy. Therefore, the H-ADCP was configured at a cell size of 0.5 meters and an averaging interval of 4.7 seconds. The sampling interval was chosen to be the same as the averaging interval so that, if needed, further time averaging in post processing could be made to average out more random noise.

The following is the summary of the system settings:

- Cell size: 0.5 meter
- Number of cells: 50
- Blank distance: 2 meter
- Averaging Interval: 4.7 seconds
- Sampling Interval: 4.7 seconds

The stream flow was steady during the test period. About two hours of data were collected. Figure 4 shows a screenshot of WinH-ADCP when playing back a data file. The left bottom plot shows time series of velocity magnitude profiles. The right top plot shows the velocity profile at time 16:44:53. The right bottom plot shows the velocity magnitude profile. The averaging interval for the plots is 33 seconds (done in post processing using WinH-ADCP).

Figure 3: System configuration and data review.

It can be seen from the plots that the structure of the mean flow downstream the bridge exhibits four distinct peaks, which correspond to the four openings of the bridge. The profile data, which are "clean", indicate that the 600kHz ChannelMaster H-ADCP is able to accurately measure the complex flow pattern at the high spatial resolution of 0.5 meter and temporal resolution of 33 seconds.

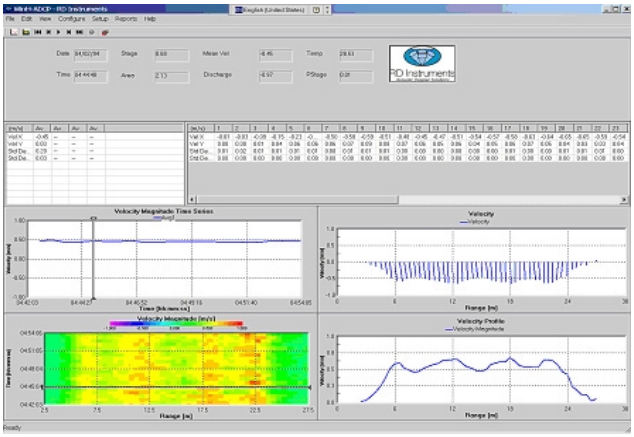

Figure 4: Screenshot of WinH-ADCP. Velocity profile plots (right plots) are at time 16:44:53 with averaging interval of 33 seconds (data averaged in post processing). Four velocity peaks are seen, consistent with the four openings of the bridge.

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