PROJECT

Free-surface turbulence

Technical Report

Waves generated by wind

Experiments carried out in wind tunnel II

CEAMA, Granada, Spain, July 2010

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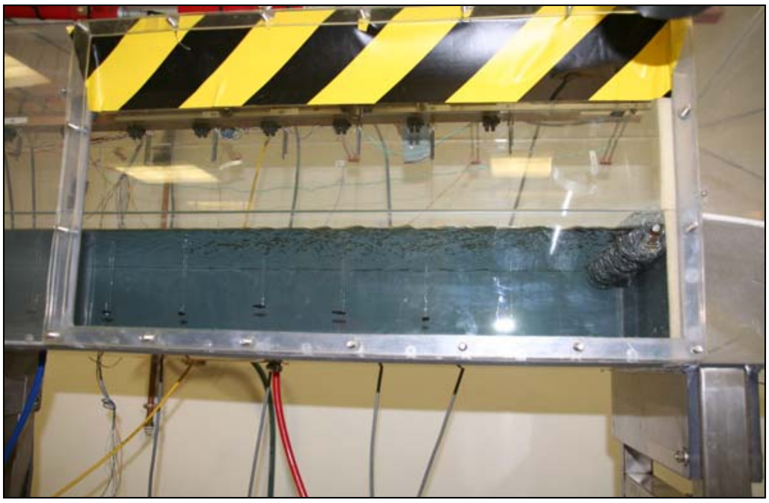

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Preface

This report is on the experimental activity carried out in Granada from March to July 2010. Sandro Longo was on sabbatic leave while the other participants were visitors, like Luca Chiapponi, or part of the permanent staff of CEAMA.

The aim of the report is to give a clear description of the activity and of the data collected. It is well known that after a short time, most information about the experiments and the details are lost if it is not properly recorded. For this reason, a description of the activity, general set-up, procedure and software is given. Generally only successful activities are described; in this project we had only a failure in measurements while using multiplexing for the Ultrasound Doppler Velocimeter Profiler; it is itself a success, considering the huge amount of data collected and the variety of instruments used. The adopted technology was quite helpful in avoiding malfunctioning and only a single flooding of the lab occurred, due to the detachment between the glass and PVC (glue is never reliable in sticking these two materials); it would have been better no flooding at all, but we dealt with air and water which was not part of the wind tunnels original design: having dealt only with air, surely no flood would have occurred!

Many thanks to the persons in charge for the lab, Maria Clavero and Antonio Monino, for their support to the activity and a special thanks to Christian Mans who introduced the Italian group to the wind tunnel technology.

Parma, Granada, March 2011 *The Authors*

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1. Introduction

The interface between water and air in the sea separates the atmospheric boundary layer and the sea boundary layer and is an essential intermediary for gas, chemical and mass exchange with a wide variety of length and time scales. Spray, bubbles, water drops, gravity waves, vortical structure coexist and interactively participate in the overall dynamics. The huge extension of the sea surface transforms minor local exchange phenomena into large quantities of exchanged matter or gas. For this reason all the details of the transfer mechanisms are important in order to have a correct balance at large scales. Wave climate itself is strongly influenced by the exchange mechanisms and some spectacular events like hurricanes and waterspouts requires accurate knowledge of the drag coefficients, enthalpy balance and mixing in the air-sea boundary layers in order to be forecasted. Sea wave growth is crucially controlled by drag coefficients as well as by possible resonance phenomena between pulsating pressure in air and water body dynamics.

These are some of the motivations of the present experimental work. Literature on the topic is huge and covers several aspects from different point of views. The approach herein used is the analysis of both water and wind stream kinematic characteristics. Many different instruments have been used, (1) 2-D Laser Doppler Velocimetry (LDV) in air and in water, (2) Ultrasound Doppler Velocimetry in water (UDVP), (3) free surface position measurements through resistive probes and (4) Ultrasound devices (US). The aim of the report is a detailed description of the experimental activity with a post-processing of the data in order to validate them, and some data elaboration in order to present the results in synthesis. The detailed interpretation of the results is left for future analysis.

2. Experimental facilities and experiments

The experimental apparatus is a small tank mounted inside a boundary layer wind tunnel with a PMMA structure having a testing section 36 cmx43 cm and 3.00 m long. It is a replica 1:5 of a larger wind tunnel available in CEAMA. Wind velocity, up to 20 m/s, is controlled by a variable frequency converter acting on the electric fan of maximum power equal to 2.2 kW. The water tank is constructed of PVC, having dimensions 395x970 mm and still water depth equal to 105 mm. The air flow section in the measuring area is connected to the wind tunnel through an upstream and a downstream contraction/expansion element (Figure 2). The upstream contraction avoids air flow separation and guarantees a stable thin boundary layer in the area of contact between air and water. The downstream expansion is required in order to reduce dissipations and to avoid large vortices which, in turn, can induce pulsating dissipation effects and consequent pulsating velocity in the air stream and to also maintain relatively smooth airflow at the downstream fan. In the downstream end of the tank, the PVC side is higher than the upstream side wall, in order to limit overtopping of the generated waves, and an absorbing system is realized in stainless steel wool in order to minimize wave reflection.

Figure 1. Overview of the replica wind tunnel

One side of the tank is constructed of glass (thickness 5 mm) to allow clear access for LDV measurements. Measurements were carried in several sections as shown in Figure 3.

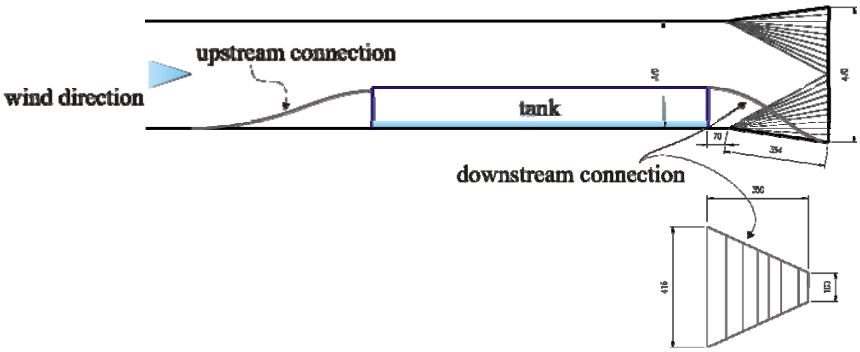

Figure 2. Side view of the water tank in the wind tunnel

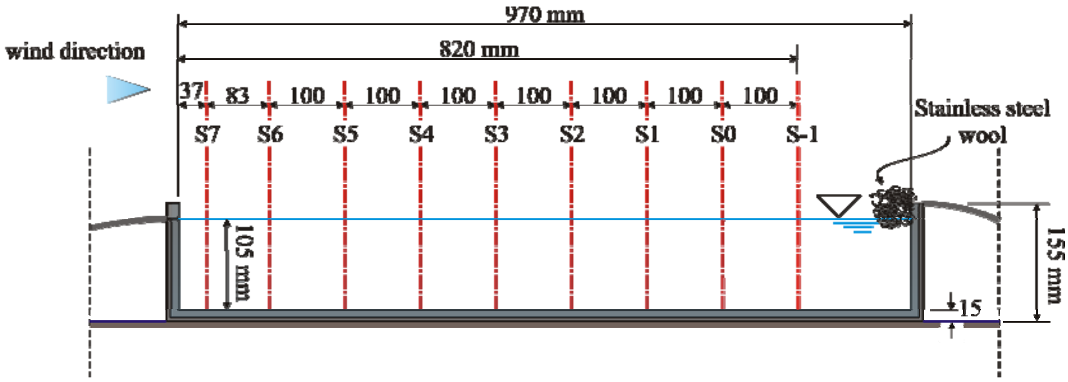

Figure 3. Tank geometry and position of the measurement sections. Side view

During tests it is expected a mean water level reduction due to evaporation and overtopping of the generated waves. In order to control the mean water level, the tank is connected to a circular sharp crest weir through a plastic pipe of limited diameter, in order to filter the water level fluctuations. The first attempt was to guarantee an automatic refilling of the water with a drop dispenser and a continuous overflowing of the weir. The weir was supported by a vertical brass bar controlled by a screw thread with movement recorded on a vernier scale (Figure 4). Modifying the vertical position of the crest (moving the crest by moving the entire weir) the stage control in the water tank could be achieved.

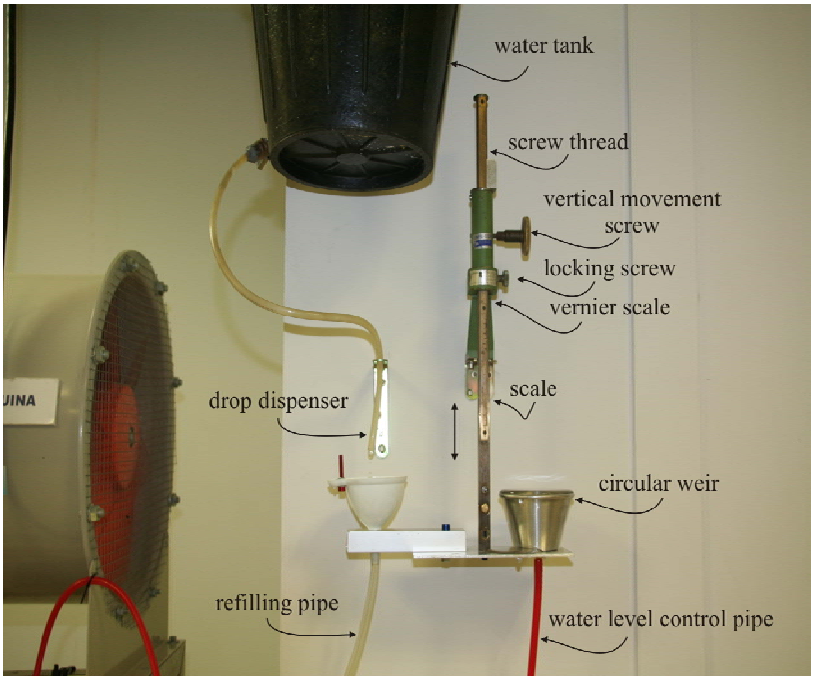

Figure 4. Automatic refilling circuit to control the mean water level in the tank at a fixed stage

Unfortunately the surface tension effects were responsible for a strong hysteresis and the long pipes induced a strong inertia. The feedback system was hysteretic and with time-delay, inherently unstable. The system was substituted with a manual system: an Ultrasound distance meter measured the water level in a piezometer (Figure 5) and a manual refilling through a second pipe was operated whenever necessary. The control could have been automatic but a manual control was preferred, with the operator reading periodically the water level in the piezometer as detected by the Ultrasound distance meter and ready to fill up the wave tank, through a second pipe, if the variation was of say ±0.2 mm. The accuracy of the measurements was equal to 0.3 mm and a similar value is expected for the accuracy in the mean water level control.

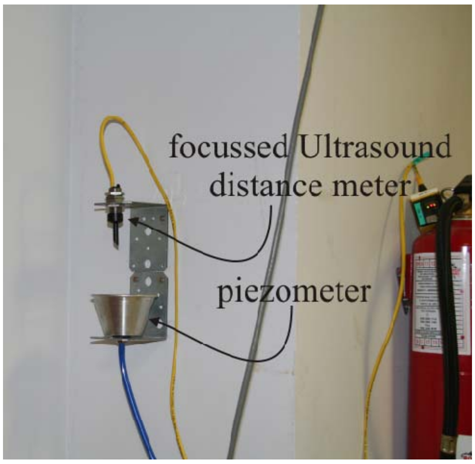

Figure 5. Stage measurements system

After switching on the fan of the wind tunnel, it was necessary to wait long enough to reach a stationary state. In fact, immediately after starting the fan, a pressure reduction on the free surface of the wave tank was responsible for a reduction of the water level in the piezometer. This variation was always less than 10 mm, equivalent to ≅ 1 mbar, and accordingly a mass flux from the piezometer tank towards the wave tank was generated. The effect was simply due to the gradient pressure (respect to the atmospheric pressure) generated by the fan screw; the water level variation in the wave tank can be easily computed and is negligible.

A two-component (2D) Laser Doppler Velocimetry system produced by TSI Inc. was used to measure the fluid velocity locally along two orthogonal directions. For this purpose, the system works with two pairs of laser beams having different wavelengths (λ_g and λ_b); each couple of beams defines a plane and the two planes are mutually normal.

The laser is an Innova 70 Series water cooled Ar-Ion laser, which can reach a maximum power of 5 Watts. The TSI optical modular system consists of a multicolour beam separator to divide the laser beam in two color components (green, λ_g = 514.5 nm and blue, λ_b = 488.0 nm) and then each component into two beams; a Bragg cell to introduce a frequency shift to one beam for each color; four fiberoptics couplers to convey the beams towards the transmitting lens and a two-component fiberoptics transmitting/receiving probe. The probe provides the convergence of the laser beams into the measurement volume and, since the system works in backward scatter mode, it also collects the scattered light sending it to the elaboration system. The focus length of the probe lens is 363 mm, the beam spacing is 50 mm and the half-angle between the incident beams is 3.96°.

The measurement volume defined by the intersection of the four laser beams has the shape of a prolate ellipsoid whose dimensions are of the order 0.08×0.08×1.25 mm; the cross sections of the measurement volume on the two planes defined by each beam pair are ellipses and present an interference fringe pattern with a fringe spacing which depends on the wavelength of the light and the angle between the two incident light beams of the couple, the order of magnitude of the fringe distance is 3.5 μm.

The collected scattered light, carrying the Doppler frequency information, is sent by a transmitting fibre to the Photo Detector Module (PDM) which includes a series of photomultiplier tubes to identify and amplify the optical signal, a beam splitter and a high-pass filter. Inside the PDM, the signal is detected, amplified and it has the pedestal removed; the elaborated signal is then sent to the signal processor Flow Size Analyzer (FSA) which processes the analogue burst signals and sends the results (Doppler frequency, velocity, time stamp, transit time, channel number) to a computer.

Uncertainties in LDV systems are due to velocity bias, inhomogeneous distribution of tracer particles, errors in the individual velocity measurements, occurrence of velocity gradients in the measurement volume, the presence of errors in the optical system, the resolution of the detector and the signal processing. These may be viewed as noise adding up to the wide bandwidth electric noise from stray light (reflections or scattering of laser light from walls, windows or optical components), the photomultiplier and the associated electronics.

A weighting function based on the transit time is applied to correct the velocity bias due to the dependence of the sampling on the velocity magnitude.

The hardware set-up of the probe is:

- Probe model: TLN06-363
- focal length: 363.00 mm
- beam separation: 50 mm
- beam diameter: 2.80 mm

It should be noted that, since the LDV system performs single-point velocity measurements, it is important to accurately separate turbulence from background large scale motions.

3. Laser set-up

This section outlines the procedures performed to increase the data rate – the number of particles crossing the measurement volume in a given time interval – and to improve the quality of the data.

First of all, the convergence of the laser beams was checked. A good convergence of the beams is, in fact, the main requirement for the achievement of high-quality measurements and it implies three conditions:

- the two beams of each pair must intersect by at least the 80% of their diameter;
- the crossings of the two pairs must overlap by at least the 80% of their diameters;
- the crossing of the four beams must be aligned with the receiving fibre.

The first condition aims at achieving a minimum size of the measurement volume and, hence, a minimum number of fringes, which is important to obtain reliable velocity measurements. The second condition requires that the two measurement volumes defined by the two pairs of beams coincide. The third condition assures that the measurement volume and the viewing volume, namely the zone from which light is most efficiently collected by the receiving fibre, are aligned, so that the maximum of the light scattered by particles crossing the measurement volume is acquired by the system.

Since the initial configuration of the laser system did not fulfil the crossing and alignment requirements, a delicate procedure of beam steering was performed.

A second requirement, which should be satisfied to obtain good velocity measurements, is the balance of the beam power: the four beams should come out from the transmitting lens with sensibly equal intensity. In order to achieve this condition, attention must be paid in the procedure of aligning the heads of the transmitting fibres with the light beams emitted by the multi-beam separator. This procedure was performed daily, before starting to run the tests.

The power of the laser can be easily controlled, with a feedback based on current or on light intensity. In general a low power would be preferable if it can guarantee an acceptable S/N ratio and a good data rate. In some conditions, relatively high values of the laser power were set, up to 2.20 W in order to achieve good results, with a current equal to 23.9 A, more or less equal to half the maximum current of 40 A. The high values of the power can be set if, and only if, a proper alignment of the fibres has been set, otherwise the strong impedance between couplings of the optics can burn the dirt on the head of the fibres and on the related optics, requiring a cleaning by the factory. Note that during calibration a current control is advisable, in order to avoid shock pulses triggered by the feedback light-controlled, whereas in running mode a light control is requested, in order to guarantee stability in the beam intensity. The minimum current to activate laser emission is equal to 10.0 A, but 10.1 A or 10.2 A is a proper value for set-up activity.

Figure 6. Current flowing and overall power of the laser during running tests. LT means that a light intensity feedback control has been selected

Finally, it turned out to be extremely important to run the tests in clear water, seeded only by suitably selected particles: the quality of the water and of the seeding particles strongly affects the quality of the measurements. At the beginning of each day of testing, the water in the tank was changed and replaced with fresh, clean water; upon which, particles were gradually added until the correct concentration of the tracer in water was reached. After several trials, TiO_2 particles were selected as an appropriate tracer. For measurements in air, water drops generated by a spray gun were used for seeding. The spray gun was outside the wind tunnel, with the nozzle pointed toward the honeycomb section at the entrance to the wind tunnel This ensured the large water droplets were captured by the honeycomb section and only fine droplets reached the test section.

It is well known that the system measures the velocity of the particles and not of the fluid; however for small light particles the motion of the particles is almost coincident with the fluid motion and a large volume of literature is available regarding the origin of uncertainties for this approximation.

4. Probe set-up

The transmitting/receiving probe of the LDV is mounted on an ISEL traverse system and placed adjacent to the wind tunnel. The traverse system allows horizontal (parallel to the wind tunnel) and vertical displacements of the probe, which are prompted and controlled by means of a MatLab program which transfer data to a Controller ISEL C142 4.1. The stepper has a resolution of 0.0125 mm (1 step = 0.0125 mm), a maximum length of 81239 steps equivalent to 1015 mm and a velocity ranging from 30 to 10 000 step/s, equivalent to 0.375-125mm/s.

The reference system for the transverse displacements and, hence, for the velocity measurements, has its horizontal origin (x = 0) on the axis of the grid and its vertical origin (z = 0) at the still water level. The position of the still water level is defined at the beginning of each series of measurements and the crossing of the LDV beams is aligned to the free surface.

In addition to the position of the probe, its inclination (Figure 8 and Figure 9) with respect to the horizontal plane can also be changed. An angle of β = 0° favours a high data rate, as scattered light is intercepted more easily by the receiving optics and refraction effects on the beams overlap are negligible, but positive angles enable velocity measurements closer to the free surface in the air side, whereas negative angles enable velocity measurements closer to the free surface in the water side. The adopted tilting angles are β = –6.5° in water and β = +4.2° in air. Larger values dramatically dropped the data rate, especially for the blue component (axis 2 in the LDV reference system).

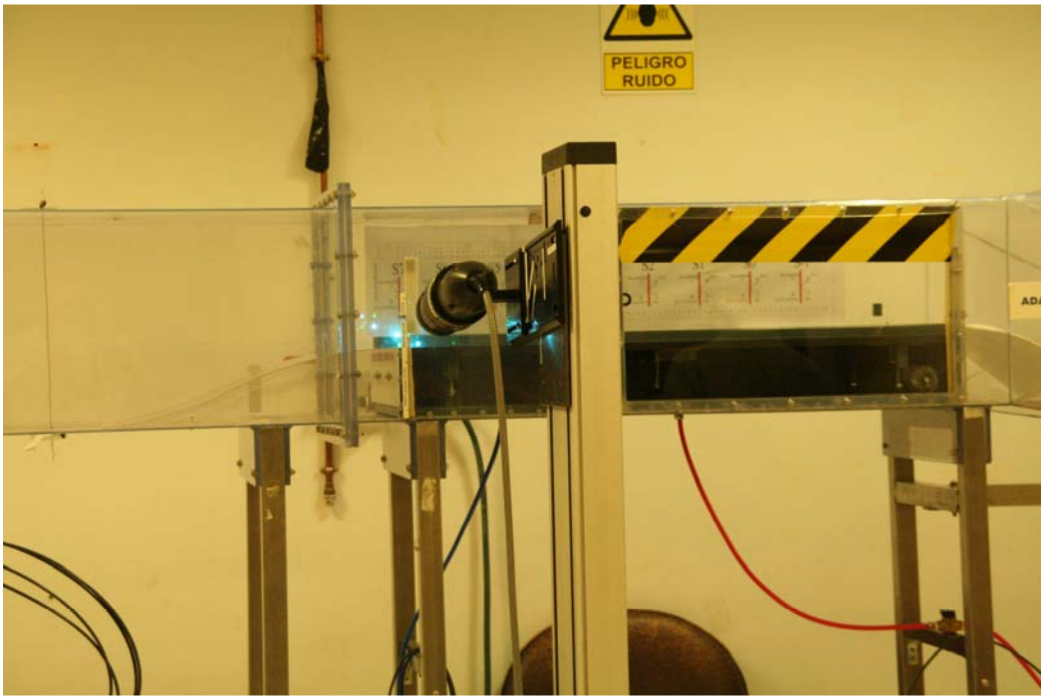

Figure 7. Probe on the traverse system

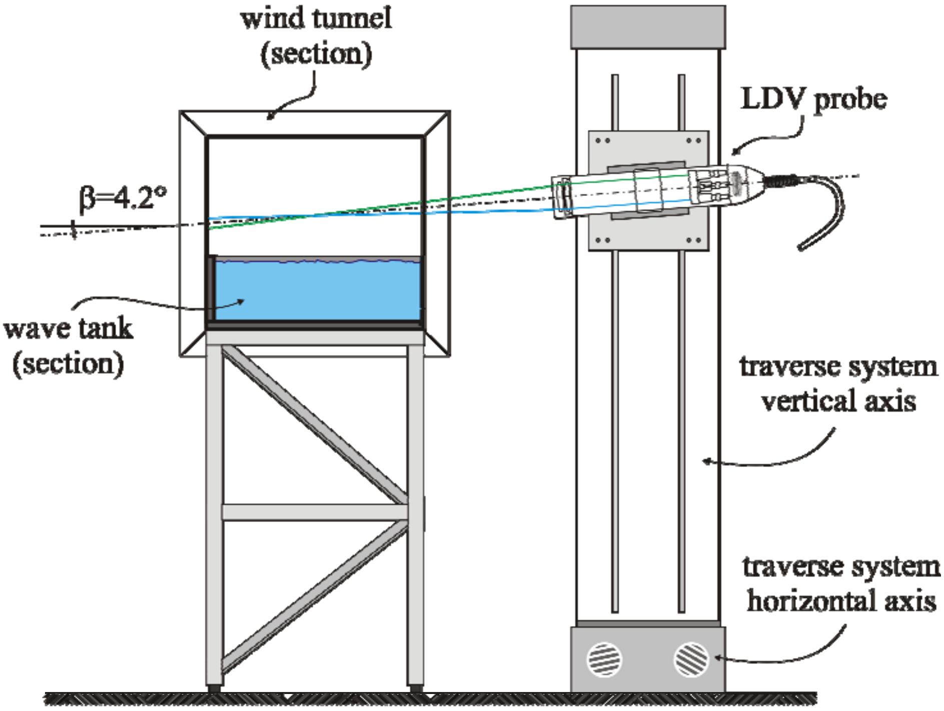

Figure 8. Set-up of the LDV probe for measurements in air

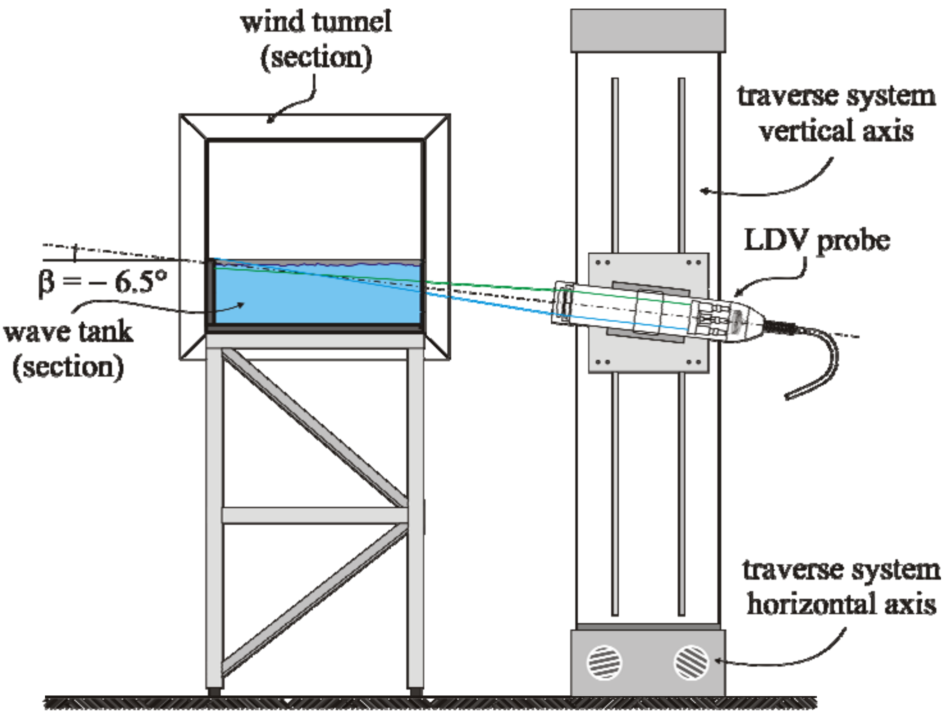

Figure 9. Set-up of the LDV probe for measurements in water

The last parameter set for the LDV velocity measurements is the orientation of the laser beams. The laser reference system can be rotated by an angle θ with respect to the external reference system made of the horizontal and vertical axes *x* and *z* (see Figure 10). For the purposes of the present experiments, it is useful to introduce a rotation θ = 45° in order to reach points closer to the free surface. It should be noted that the LDV reference system is the system by which the velocity components are actually measured.

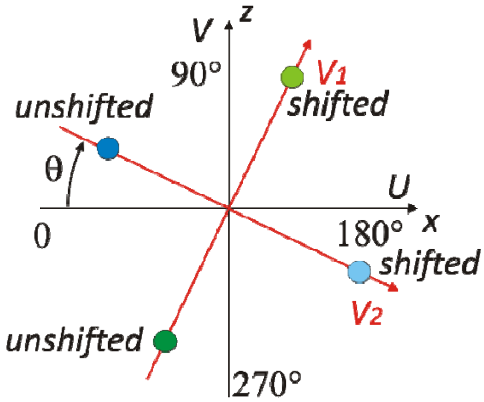

Figure 10. External (*x*-*z*) and LDV reference systems (θ is the probe angle)

In most measurements the 4 laser beams cross only the glass window, but for measurements in sections 5-6-7 the laser beams cross both the PMMA walls of the wind tunnel and the glass window. For these last measurements the data rate and the overall quality of the signal is still acceptable.

4.1. Transformation matrix

In order to transform the measured velocity into a velocity expressed in a fixed external coordinate system, it is necessary to evaluate the transformation matrix. Let us consider the intrinsic LDV coordinate system 1-2-3 and the external coordinate system *x*-*z*-*y* and assume their relative position as shown in Figure 11.

The plane 1-2 is parallel to the plane of the lens of the probe and the axis 3 is the axis of the lens, passing through the measurement volume. The transformation matrix reads:

$$\begin{Bmatrix} V_1 \\ V_2 \\ V_3 \end{Bmatrix} = \begin{bmatrix} \cos\theta & \sin\theta\cos\beta & -\sin\theta\sin\beta \\ \sin\theta & -\cos\theta\cos\beta & \cos\theta\sin\beta \\ 0 & \sin\beta & \cos\beta \end{bmatrix} \begin{Bmatrix} U \\ V \\ W \end{Bmatrix} \quad (1)$$

and

$$\begin{Bmatrix} U \\ V \\ W \end{Bmatrix} = \begin{bmatrix} \cos\theta & \sin\theta & 0 \\ \sin\theta\cos\beta & -\cos\theta\cos\beta & \sin\beta \\ -\sin\theta\sin\beta & \cos\theta\sin\beta & \cos\beta \end{bmatrix} \begin{Bmatrix} V_1 \\ V_2 \\ V_3 \end{Bmatrix} \quad (2)$$

where V_1, V_2 and V_3 are the velocity as measured by the LDV, *U*, *V* and *W* are the velocity in the *x*-*z*-*y* reference system.

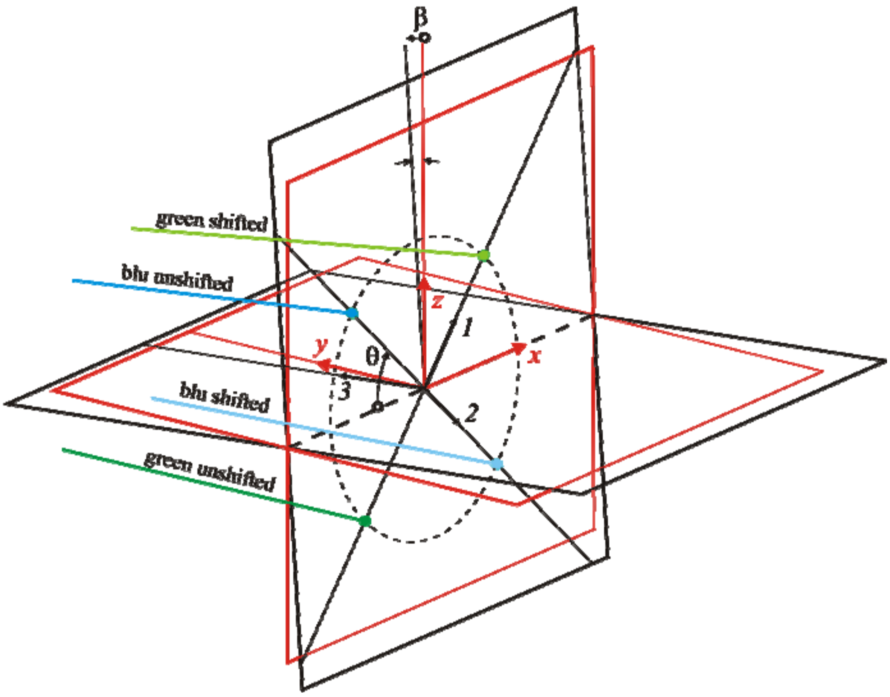

Figure 11. Sketch for the coordinate transformation

If the system is a 2D measuring only V_1 and V_2, some hypothesis on the structure of the flow field is necessary for a correct transformation. Assuming that the flow field has only components *U* and *V*, results that V_3 is equal to $V_3 = V \sin\beta$ and, hence, the second equation in (2) reads:

$$V = V_1 \sin\theta \cos\beta - V_2 \cos\theta \cos\beta + V \sin^2\beta \rightarrow V = V_1 \frac{\sin\theta}{\cos\beta} - V_2 \frac{\cos\theta}{\cos\beta} \quad (3)$$

The two-dimensional transformation matrix becomes:

$$\begin{Bmatrix} U \\ V \end{Bmatrix} = \begin{bmatrix} \cos\theta & \sin\theta \\ \dfrac{\sin\theta}{\cos\beta} & -\dfrac{\cos\theta}{\cos\beta} \end{bmatrix} \begin{Bmatrix} V_1 \\ V_2 \end{Bmatrix} \quad (4)$$

Note that the coordinate transformation is applied by software Flowsizer only if **coincidence mode** is set-up (software or hardware). Also, turbulent kinetic energy and velocity cross-correlation is computed by Flowsizer software only in **coincidence mode** (see next paragraph).

5. Data elaboration

After acquisition, the measured data are post-processed in order to evaluate the two velocity components. Two different modes are available: **coincidence mode** and **non-coincidence mode**.

In coincidence mode only velocity signals from particles crossing both fringe patterns (1 and 2 axes) are retained. Virtually the signals are emitted by the same particle crossing the volume of measurements and intersecting the green generated and the blue generated fringes. These data are quite good for cross-correlation evaluations, but their rate is usually very low.

In non-coincidence mode all signals are processed and the timestamp and the data rate for the two channels are different. In order to use these data, characterized by a high data rate, it is necessary an interpolation in order to reduce them to two values (*U* and *V*) virtually captured at the same timestamp. The best way was to interpolate *U* on *V* timestamp, to interpolate *V* on the original *U* timestamp and then to combine the original and the interpolated values. In this way, at each time stamp at least one of the two components is measured and the other one is merely estimated and the apparent mean data rate becomes equal to the sum of the two separate channels data rate.

Note that if seeding is effective, the timestamp of two or more sequent data can be equal (i.e. the time difference amongst the acquired data is below the resolution). Considering that most interpolating functions (e.g. the Matlab interpolating functions) require a monotonic sequence, it is necessary to force timestamp adding a very small value (10^{-6} s was used) to the subsequent timestamp.

5.1. Measurements in water

The matrix transformation to be inserted in the TSI post-processing software is the transpose of the original matrix transformation (also coincident with the transpose, being orthogonal), i.e.

$$\begin{Bmatrix} V_1 \\ V_2 \end{Bmatrix} = \begin{bmatrix} \cos\theta & \dfrac{\sin\theta}{\cos\beta} \\ \sin\theta & -\dfrac{\cos\theta}{\cos\beta} \end{bmatrix} \begin{Bmatrix} U \\ V \end{Bmatrix} \qquad (5)$$

and, for the LDV probe geometry adopted for measurements in water ($\theta = 45°$, $\beta = -6.5°$) it reads

$$\begin{Bmatrix} V_1 \\ V_2 \end{Bmatrix} = \begin{bmatrix} 0.70711 & 0.71168 \\ 0.70711 & -0.71168 \end{bmatrix} \begin{Bmatrix} U \\ V \end{Bmatrix} \qquad (6)$$

The horizontal (parallel to the wind direction) and the vertical velocities in water were measured in several points in the vertical and in sections S0, S3, S5 and S6. The Reynolds tangential stresses and the diagonal stresses (turbulent kinetic energy) were computed. The numerous tables in Appendix contains the main features of the tests.

The data are processed with two Matlab files, the programs counting_laser_*.m and counting_laser_*_bis.m which perform almost identical operations on files named test_*.txt and test_*_bis.txt; these files are the output of the TSI Flowsizer software, are in ASCII format and contain the data respectively for the NON coincidence mode and for the coincidence mode. After reading the files, the programs clean the data time series, removing the data acquired before triggering occurs (triggering signal is often sent to start data acquisition from LDV and other devices with the same initial timestamp); correct if timestamp has the same value for two different data, adding 0.000001 s to the second value; calculate the effective data rate, dividing the number of data by the interval time as recorded by timestamps, separately for the two channels. After adding two columns, i.e. datarate1 (Hz) and datarate2 (Hz), they write the results in ASCII format, in files with the same root of the source files and with the *.txt extension. They also open a new output file where the synthetic results for all files specified in input are given.

If the data are in NON coincidence mode, data interpolation is forced, linearly interpolating the data from Channel 1 to the timestamps from Channel 2, and vice versa. The new velocities (mixed from acquisition and interpolation) are stored in the variables VelocityInterpCh1_msec and VelocityInterpCh2_msec, whereas the variable TimeInterp contains the mixed progressive timestamps. A new check if timestamp has the same value for two different data is performed and eventually corrected. The output data are stored in Matlab files with the _elab.mat extension.

Some synthetic output are computed through Matlab *.m files, as elabora_S0_acqua.m, elabora_S3_acqua.m, elabora_S5_acqua.m, elabora_S6_acqua.m. They evaluate the turbulent kinetic energy as $k = \frac{1}{2}\left(U'^2_{\text{rms}} + V'^2_{\text{rms}}\right)$ and the principal axis angle as:

$\phi = \frac{1}{2}\tan^{-1}\left(\frac{-(U'V')_{\text{rms}}}{U'^2_{\text{rms}} + V'^2_{\text{rms}}}\right)$, but only for the COINCIDENCE MODE files. The output data are in files like Test_22_07_02_S0_acqua_CM.txt. For the NON COINCIDENCE MODE files, the output is in files like Test_22_07_02_S0_acqua_NCM.txt and only the measured data are transferred. The data for plotting the profiles are contained in files with the extension .txt.

Table 1. Measurements set in water

Section #	LDV operation mode	Figure	File name (.txt)
S0	Coincidence Mode	Yes	Test_22_07_02_S0_acqua_CM
S0	Non Coincidence Mode	No	Test_22_07_02_S0_acqua_NCM
S3	Coincidence Mode	Yes	Test_23_07_02_S3_acqua_CM
S3	Non Coincidence Mode	No	Test_23_07_02_S3_acqua_NCM
S5	Coincidence Mode	Yes	Test_23_07_02_S5_acqua_CM
S5	Non Coincidence Mode	No	Test_23_07_02_S5_acqua_NCM
S6	Coincidence Mode	Yes	Test_24_07_02_S6_acqua_CM
S6	Non Coincidence Mode	No	Test_24_07_02_S6_acqua_NCM

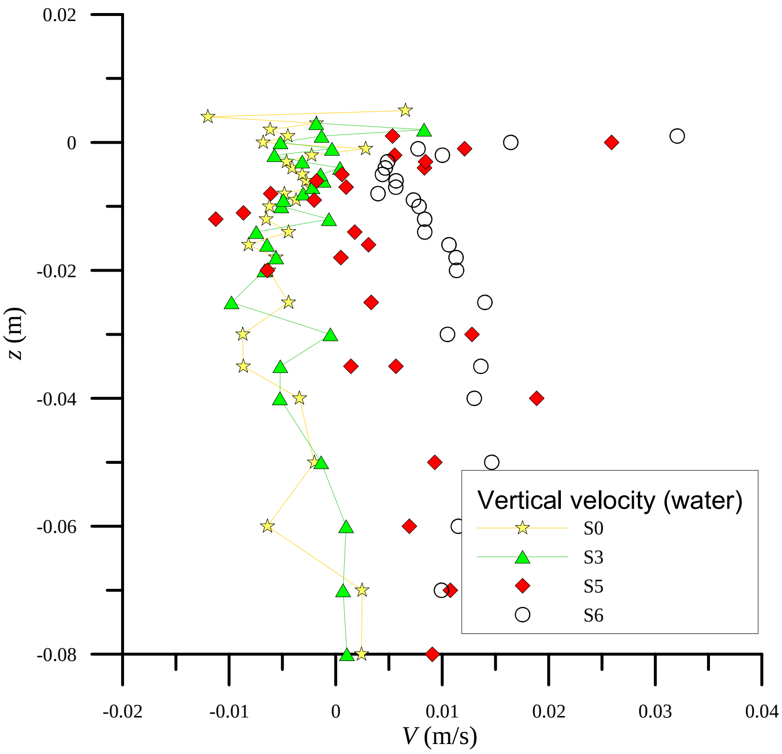

Figure 12. Vertical velocity profiles in water for all tests

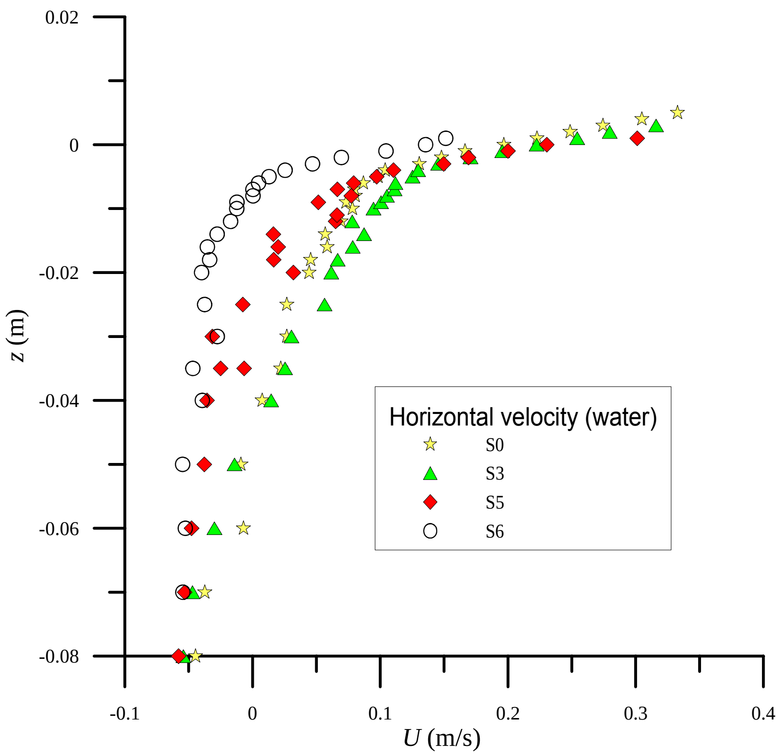

Figure 13. Horizontal velocity profiles in water for all tests

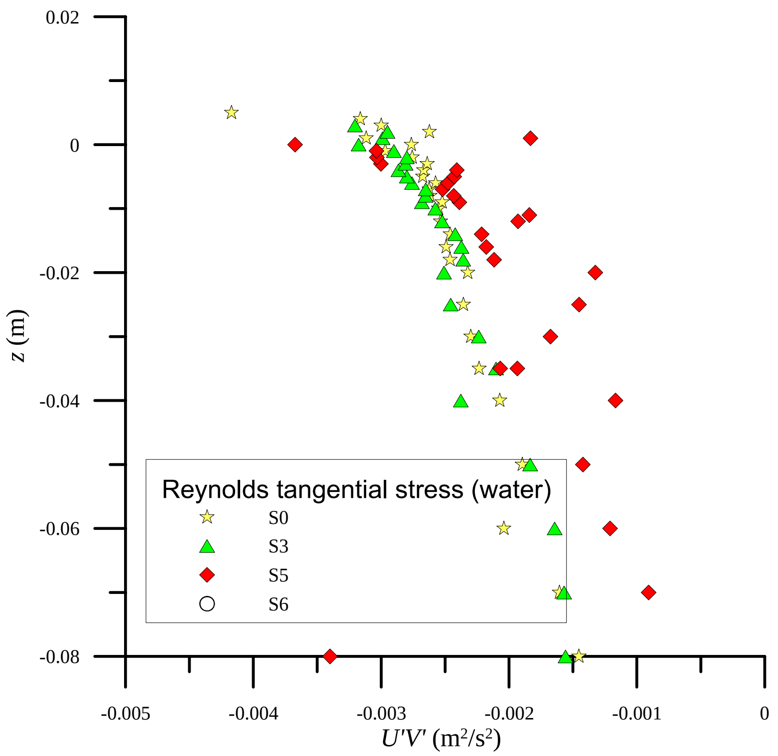

Figure 14. Reynolds tangential stresses in water for all tests

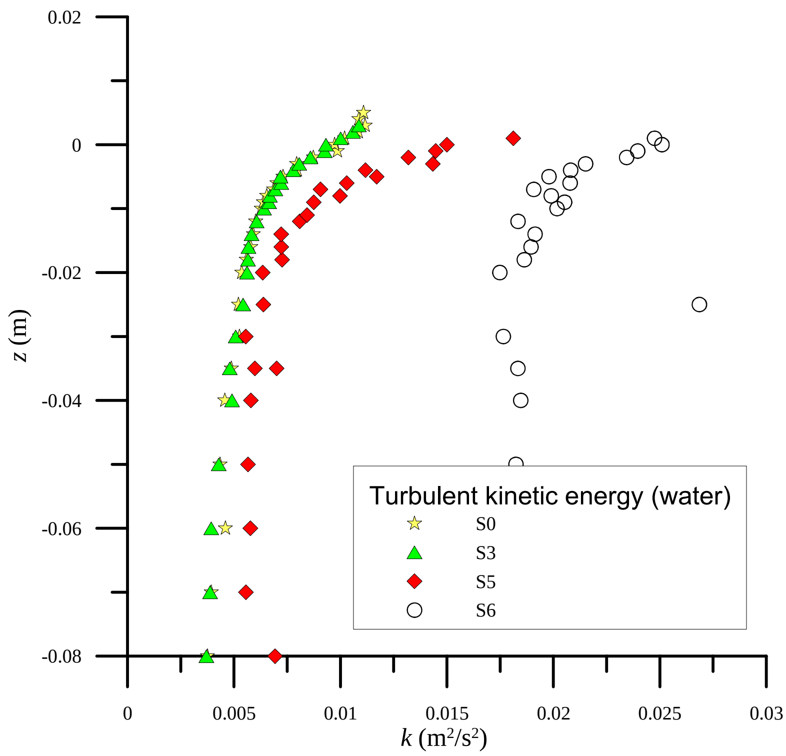

Figure 15. Turbulent kinetic energy in water for all tests

5.2. Measurements in air

The matrix transformation to be inserted in the TSI post-processing software is the inverse of the original matrix transformation (also coincident with the transpose, being orthogonal), i.e.

$$\begin{Bmatrix} V_1 \\ V_2 \end{Bmatrix} = \begin{bmatrix} \cos\theta & \dfrac{\sin\theta}{\cos\beta} \\ \sin\theta & -\dfrac{\cos\theta}{\cos\beta} \end{bmatrix} \begin{Bmatrix} U \\ V \end{Bmatrix} \tag{7}$$

and, for the LDV probe geometry adopted for measurements in air (θ = 45°, β = 4.2°) it reads:

$$\begin{Bmatrix} V_1 \\ V_2 \end{Bmatrix} = \begin{bmatrix} 0.70711 & 0.7090 \\ 0.70711 & -0.7090 \end{bmatrix} \begin{Bmatrix} U \\ V \end{Bmatrix} \tag{8}$$

The horizontal (parallel to the wind direction) and vertical velocity components in air were measured in section S0, S1, S2, S3, S4, S5, S6 and S7. The measurements were performed with two different ground surfaces:

a) tank full of water with wind stress acting on the free surface;

b) empty tank with rigid surface to replace the water.

The Reynolds tangential stresses and the turbulent kinetic energy were computed. All the tests were performed with a fixed fan velocity. The data for plotting the profiles are contained in files with the extension **.txt**

Table 2. Measurements set in air on water

Section #	LDV operation mode	Figure	Boundary type	File name (.txt)
S0	Coincidence Mode	Yes	water	Test_18_07_02_S0_aria_CM
S0	Non Coincidence Mode	No	water	Test_18_07_02_S0_aria_NCM
S1	Coincidence Mode	Yes	water	Test_10_07_02_S1_aria_CM
S1	Non Coincidence Mode	No	water	Test_10_07_02_S1_aria_NCM
S2	Coincidence Mode	Yes	water	Test_12_07_02_S2_aria_CM
S2	Non Coincidence Mode	No	water	Test_12_07_02_S2_aria_NCM
S3	Coincidence Mode	Yes	water	Test_13_07_02_S3_aria_CM
S3	Non Coincidence Mode	No	water	Test_13_07_02_S3_aria_NCM
S4	Coincidence Mode	Yes	water	Test_18_07_02_S4_aria_CM
S4	Non Coincidence Mode	No	water	Test_18_07_02_S4_aria_NCM
S5	Coincidence Mode	Yes	water	Test_19_07_02_S5_aria_CM
S5	Non Coincidence Mode	No	water	Test_19_07_02_S5_aria_NCM
S6	Coincidence Mode	Yes	water	Test_20_07_02_S6_aria_CM
S6	Non Coincidence Mode	No	water	Test_20_07_02_S6_aria_NCM
S7	Coincidence Mode	Yes	water	Test_21_07_02_S7_aria_CM
S7	Non Coincidence Mode	No	water	Test_21_07_02_S7_aria_NCM

Table 3. Measurements set in air on rigid bottom

Section #	LDV operation mode	Figure	Boundary type	File name (.txt)
S0	Coincidence Mode	Yes	rigid plane	Test_29_07_02_S0_aria_piano_CM
S0	Non Coincidence Mode	No	rigid plane	Test_29_07_02_S0_aria_piano_NCM
S1	Coincidence Mode	Yes	rigid plane	Test_30_07_02_S1_aria_piano_CM
S1	Non Coincidence Mode	No	rigid plane	Test_30_07_02_S1_aria_piano_NCM
S2	Coincidence Mode	Yes	rigid plane	Test_30_07_02_S2_aria_piano_CM
S2	Non Coincidence Mode	No	rigid plane	Test_30_07_02_S2_aria_piano_NCM
S3	Coincidence Mode	Yes	rigid plane	Test_30_07_02_S3_aria_piano_CM
S3	Non Coincidence Mode	No	rigid plane	Test_30_07_02_S3_aria_piano_NCM
S4	Coincidence Mode	Yes	rigid plane	Test_30_07_02_S4_aria_piano_CM
S4	Non Coincidence Mode	No	rigid plane	Test_30_07_02_S4_aria_piano_NCM
S5	Coincidence Mode	Yes	rigid plane	Test_30_07_02_S5_aria_piano_CM
S5	Non Coincidence Mode	No	rigid plane	Test_30_07_02_S5_aria_piano_NCM
S6	Coincidence Mode	Yes	rigid plane	Test_30_07_02_S6_aria_piano_CM

S6	Non Coincidence Mode	No	rigid plane	Test_30_07_02_S6_aria_piano_NCM
S7	Coincidence Mode	Yes	rigid plane	Test_30_07_02_S7_aria_piano_CM
S7	Non Coincidence Mode	No	rigid plane	Test_30_07_02_S7_aria_piano_NCM

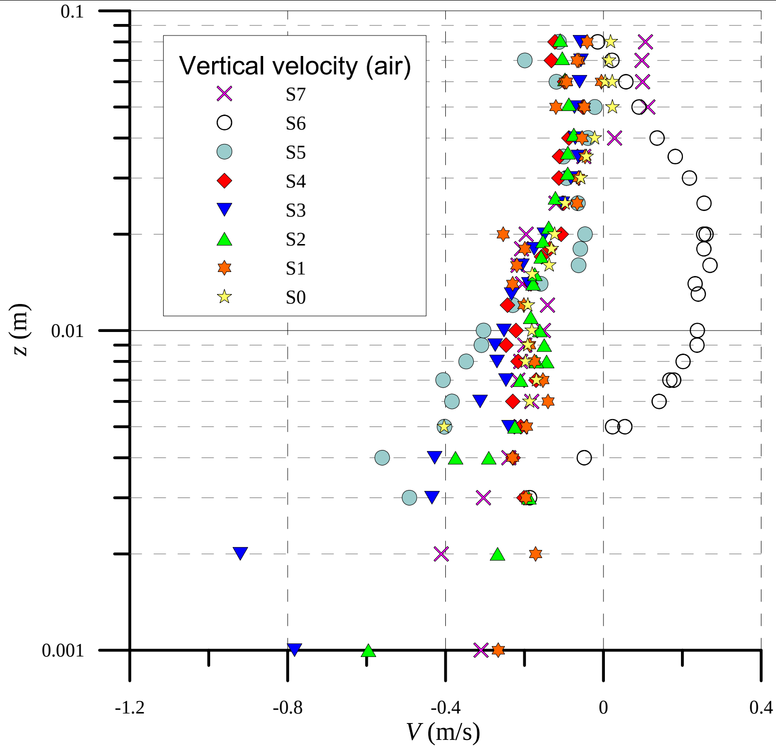

Figure 16. Vertical velocity profiles in air on water for all tests

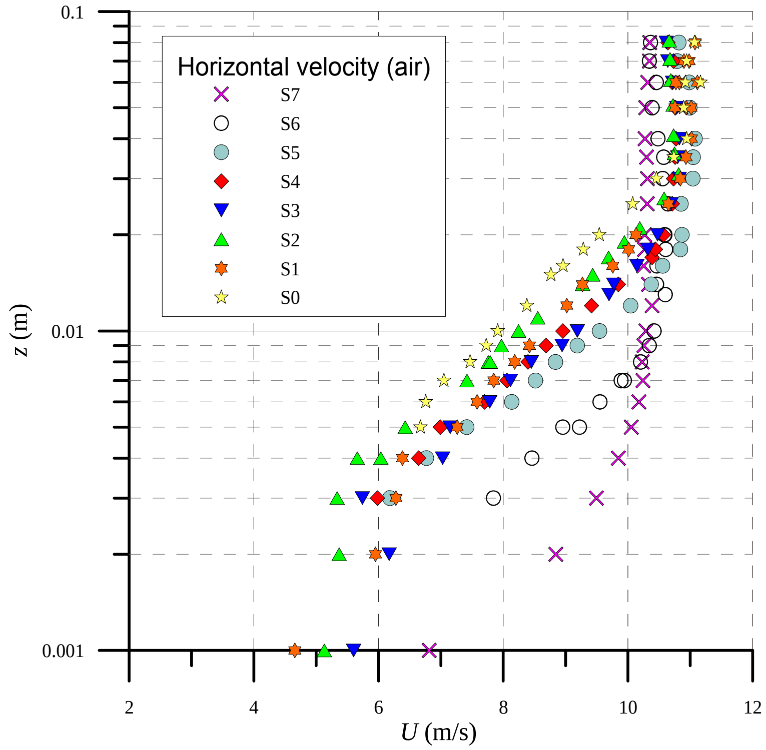

Figure 17. Horizontal velocity profiles in air on water for all tests

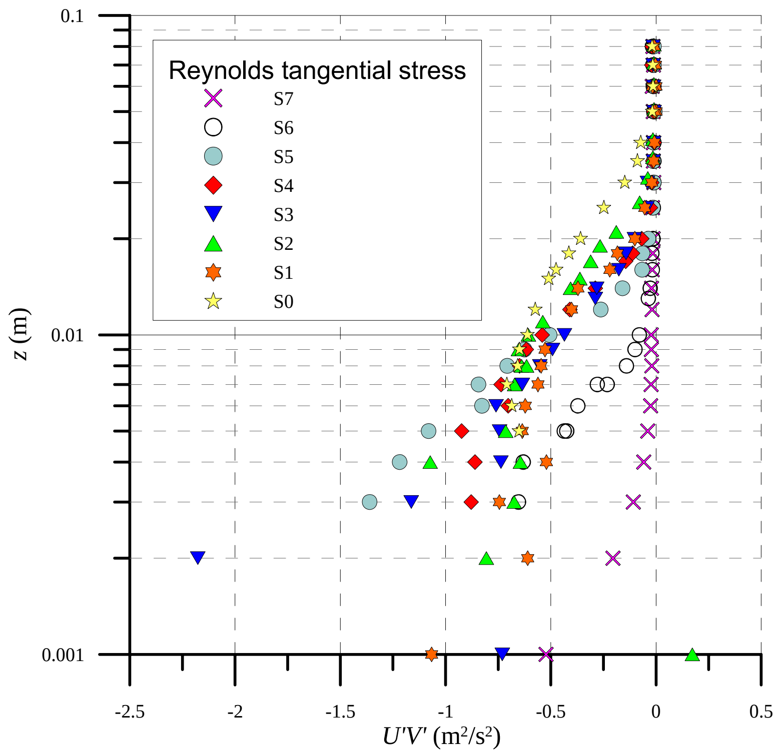

Figure 18. Reynolds tangential stresses in air on water for all tests

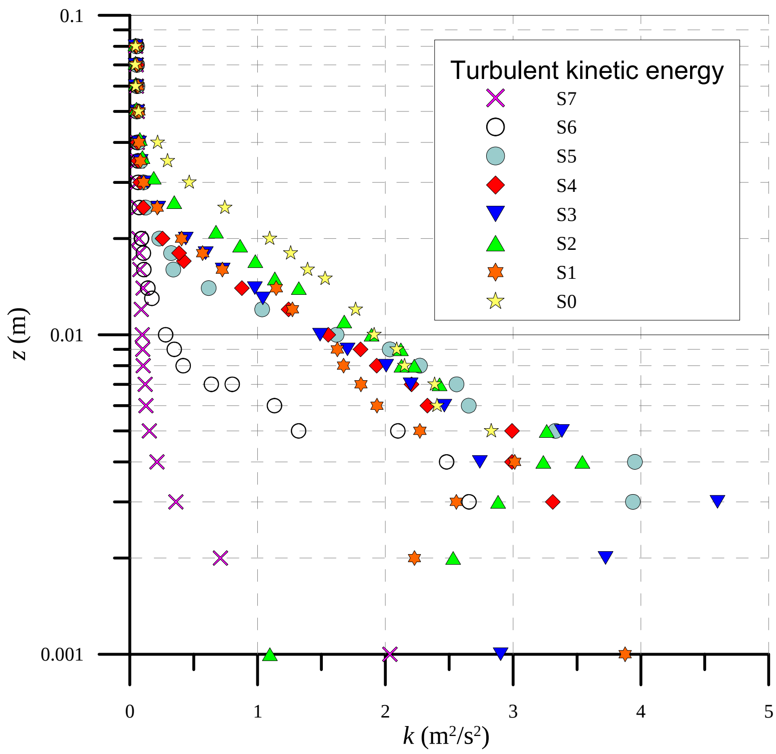

Figure 19. Turbulent kinetic energy in air on water for all tests

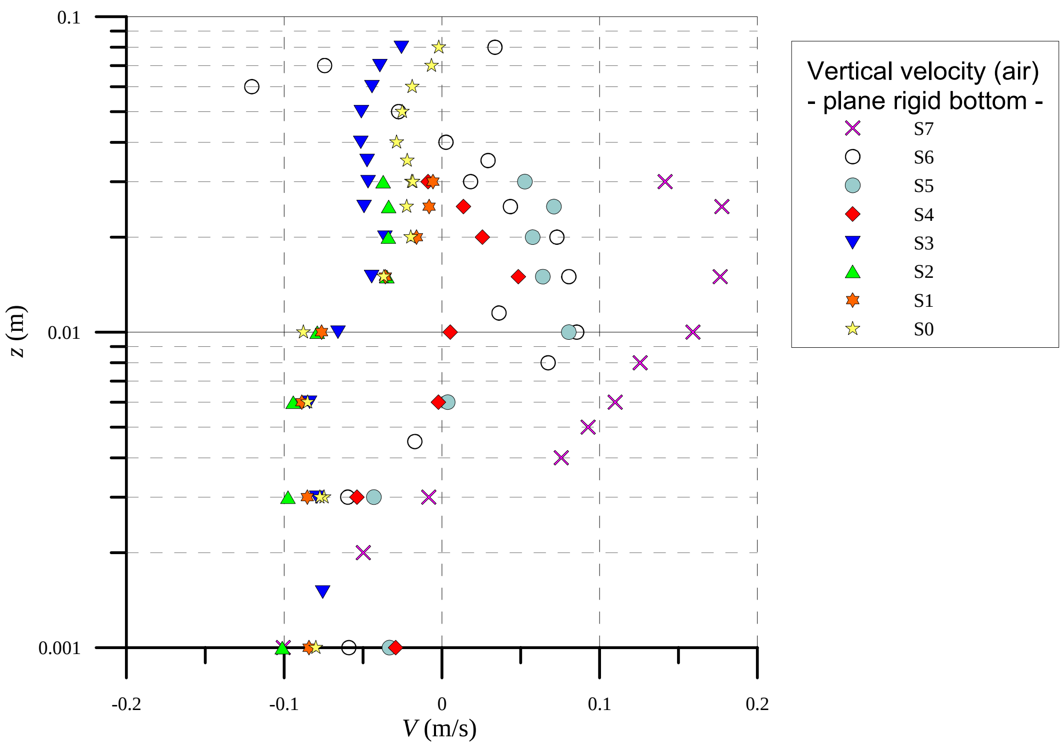

Figure 20. Vertical velocity profiles in air on rigid bottom for all tests

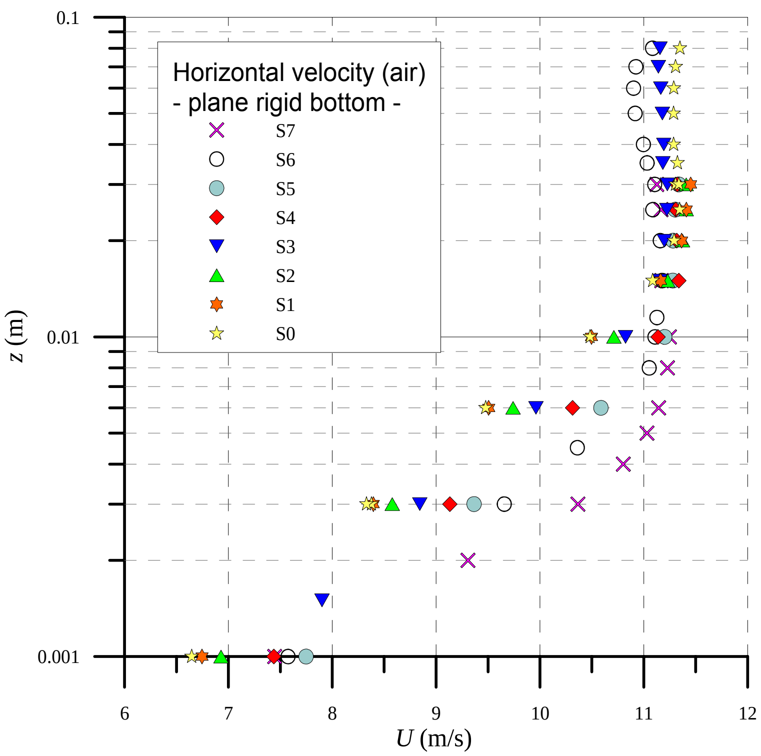

Figure 21. Horizontal velocity profiles in air on rigid bottom for all tests

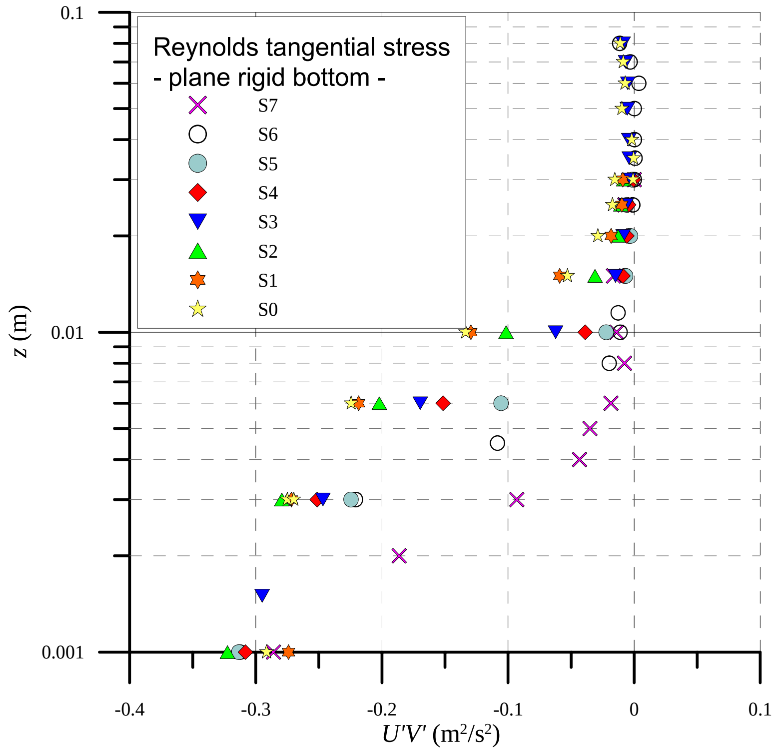

Figure 22. Reynolds tangential stresses in air on rigid bottom for all tests

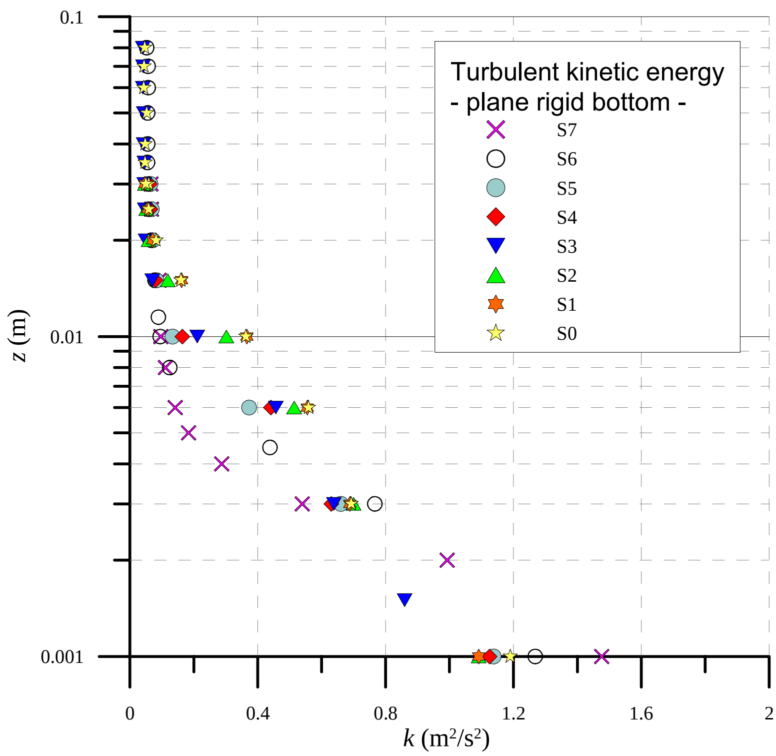

Figure 23. Turbulent kinetic energy in air on rigid bottom for all tests

5.3. Measurements in air in section S-1 as reference velocities

In order to have a reference velocity for the fluid level measurements (see paragraph on instantaneous water level measurements), several measurements in air have been carried out in section S-1 at z = 70 mm. For this set of measurements, the same geometry usually adopted for measurements in water has been used (there was no need to reach close to the interface). For the LDV probe geometry adopted (θ = 45°, β = –6.5°) the transformation matrix reads

$$\begin{Bmatrix} V_1 \\ V_2 \end{Bmatrix} = \begin{bmatrix} 0.70711 & 0.71168 \\ 0.70711 & -0.71168 \end{bmatrix} \begin{Bmatrix} U \\ V \end{Bmatrix} \quad (9)$$

The set of experiment are reported in Table 4.

Table 4. Measurements set in air on water in Section -1

Section #	Tension control for the fan (V)	*z* (mm)		File name (.txt)
S-1	6.5	70	air	Test_aria_205
S-1	7.0	70	air	Test_aria_206
S-1	7.5	70	air	Test_aria_207
S-1	8.0	70	air	Test_aria_208
S-1	8.5	70	air	Test_aria_209
S-1	9.0	70	air	Test_aria_210
S-1	9.5	70	air	Test_aria_211

6. Water level measurement

Water Level measurements were performed simultaneously at all sections (S0 to S7) using 8 inductive probes. The hardware is produced by DHI (water level modules, filter, DAQ) but the 8 wave gauges were realized in the lab with twin parallel wire (Φ = 0.3 mm) at a spacing of 20 mm.

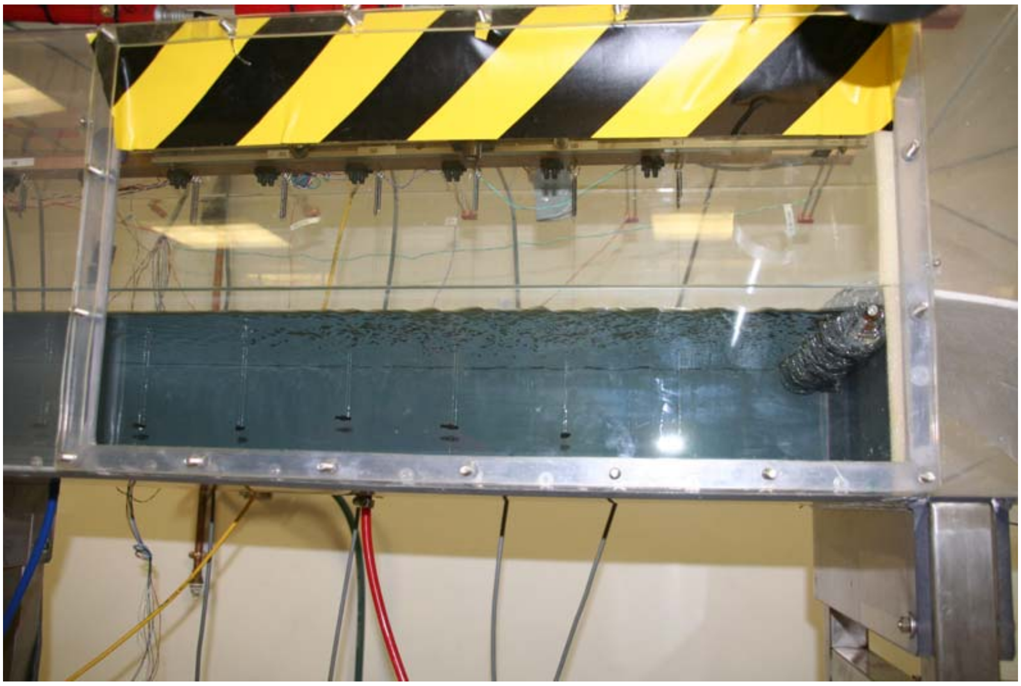

Figure 24. Water level probe setup

The calibration was carried out modifying the water level in the expected range, measuring the input value through an Ultrasound distance meter installed in the wind tunnel over the tank (long-range calibration). The hardware modules were set with the maximum gain and the zero offset corresponding to an empty tank. The calibration was realized forcing 11 different water levels in the tank, acquiring the output of the Ultrasound distance meter and of the wave gauges for 10 s, data rate equal to 40 Hz, analogic filter cut-off frequency equal to 20 Hz. The output files have the extension ***.daf** and are in ASCII format, with the first column containing timestamp and the other columns containing the output of the DHI software in internal units.

Table 5. Files for calibration of the wave gauges

File name	distance measured by the US distance meter (mm)	Data rate (Hz)	Measurement type
0001log1.daf	224.9	40	Level
0002log1.daf	221.6	40	Level
0003log1.daf	na	na	na
0004log1.daf	215.7	40	Level
0005log1.daf	210.0	40	Level
0006log1.daf	205.4	40	Level
0007log1.daf	200.6	40	level
0008log1.daf	196.6	40	Level
0009log1.daf	192.1	40	Level
0010log1.daf	188.9	40	Level
0011log1.daf	185.7	40	Level
zero_fin_log1.daf	184.2	40	Level
0012log1.daf	183.9	40	Level

The reference level is the still water level for a filled tank. The distance measured by the US distance meter at the reference level is equal to 184.2 mm, while the recorded signals from the wave gauges are stored in the file zero_fin_log1.daf. Table 6 contains the mean values of the recorded data, expressed in internal units of the DHI software. The files have been converted in Excel format with a further process in order to evaluate the standard deviation σ, listed in Table 7.

Table 6. Mean value of the output signal. The unit of measurement named iu means internal unit

file	US distance (mm)	*z* (mm)	S0 (iu)	S1 (iu)	S2 (iu)	S3 (iu)	S4 (iu)	S5 (iu)	S6 (iu)	S7 (iu)
0001log1.daf	224.9	-40.7	5.325	5.307	5.443	5.399	5.330	5.539	5.385	5.328
0002log1.daf	221.6	-37.4	5.619	5.780	5.745	5.693	5.609	5.842	5.691	5.601
0004log1.daf	215.7	-31.5	6.155	8.044	6.315	6.240	6.151	6.400	6.249	6.135
0005log1.daf	210.0	-25.8	6.697	9.207	6.871	6.777	6.665	6.948	6.800	6.643
0006log1.daf	205.4	-21.2	7.139	13.989	7.320	7.213	7.077	7.397	7.233	7.056
0007log1.daf	200.6	-16.4	7.576	14.869	7.794	7.669	7.514	7.862	7.704	7.490
0008log1.daf	196.6	-12.4	7.945	15.621	8.191	8.052	7.859	8.241	8.089	7.846
0009log1.daf	192.1	-7.9	8.341	16.426	8.612	8.445	8.249	8.662	8.519	8.265
0010log1.daf	188.9	-4.7	8.631	16.958	8.904	8.727	8.521	8.956	8.816	8.535
0011log1.daf	185.7	-1.5	8.918	17.614	9.224	9.041	8.815	9.276	9.146	8.832
0012log1.daf	183.9	0.3	9.086	17.943	9.395	9.204	8.969	9.451	9.331	8.982

Table 7. Standard deviation value of the signal. The unit of measurement named iu means internal unit

file	US distance (mm)	σ_z (mm)	S0 (iu)	S1 (iu)	S2 (iu)	S3 (iu)	S4 (iu)	S5 (iu)	S6 (iu)	S7 (iu)
0001log1.daf	224.9	0.3	0.105	0.162	0.081	0.074	0.068	0.076	0.073	0.076
0002log1.daf	221.6	0.3	0.071	0.204	0.091	0.067	0.068	0.071	0.070	0.060
0004log1.daf	215.7	0.3	0.113	0.230	0.080	0.067	0.076	0.066	0.074	0.074
0005log1.daf	210.0	0.3	0.084	0.180	0.084	0.078	0.091	0.073	0.072	0.071
0006log1.daf	205.4	0.3	0.095	0.171	0.066	0.077	0.082	0.076	0.084	0.080
0007log1.daf	200.6	0.3	0.100	0.135	0.106	0.070	0.090	0.062	0.075	0.085
0008log1.daf	196.6	0.3	0.096	0.200	0.073	0.083	0.073	0.071	0.074	0.100
0009log1.daf	192.1	0.3	0.093	0.171	0.093	0.085	0.082	0.069	0.092	0.075
0010log1.daf	188.9	0.3	0.079	0.213	0.088	0.077	0.078	0.066	0.064	0.085
0011log1.daf	185.7	0.3	0.096	0.191	0.089	0.072	0.074	0.079	0.083	0.084
0012log1.daf	183.9	0.3	0.091	0.180	0.072	0.075	0.084	0.083	0.086	0.076

The calibration curves (see the Appendix) are strongly linear and have similar gain and offset for all the probes except for probe in Section S1. For this probe, only the second branch of the data has been considered for computing the best fitting line.

Table 8. Calibration equations. *x* is in DHI software internal units

probe	z (mm)	gain		offset
S0	*z=*	10.873	**x*	–98.597
S1	*z=*	5.46	**x*	–97.592
S2	*z=*	10.338	**x*	–96.881
S3	*z=*	10.743	**x*	–98.649
S4	*z=*	11.245	**x*	–100.674
S5	*z=*	10.469	**x*	–98.604
S6	*z=*	10.405	**x*	–96.593
S7	*z=*	11.159	**x*	–99.994

The raw data have been processed applying the calibration equation to each wave gauge output. Then a de-spiking toolbox has been used (using phase-space method by Goring and Nikora, 2002 as modified by Mori, 2005) in order to remove spikes. The data have been reduced to a mean zero value and stored in binary files in Matlab format. The files, named with the same root of the files containing the raw data and with the extension .mat, store a matrix named datac containing in the first column the time stamps and in the other columns the converted data for the probe S0, S1,...,S7. They also contain a vector named medio with the mean value of the signal for each probe.

In a first set of 6 tests several files have been recorded with fixed velocity of the fan (the maximum allowed) in order to check the data repeatability and the effects of the data rate (see Table 9). A continuous shift of the mean water level is recorded over time, presumably due to dirty deposit on the wires, equal to ~1.5 mm in 30 minutes of testing but the major variation occurred during the first minutes of testing. The drift of the signal during a single test is very small and can be neglected. Then the fan velocity was set up at different values modifying the control voltage, obtaining 12 sets

(2 for each control voltage, see Table 9). The wind velocity was measured by LDV in section S-1 at z = 70 mm.

Table 9. Water level data set

File name (raw data)	date	File name (converted data)	Measurement type	Fan control voltage	Data rate (Hz)	duration (s)
1001log1.daf	26/07/2011	1001log1.mat	Level	9.5	40	600
1002log1.daf	26/07/2011	1002log1.mat	Level	9.5	40	600
1003log1.daf	26/07/2011	1003log1.mat	Level	9.5	40	600
1004log1.daf	26/07/2011	1004log1.mat	Level	9.5	40	600
1005log1.daf	26/07/2011	1005log1.mat	Level	9.5	100	600
1006log1.daf	26/07/2011	1006log1.mat	Level	9.5	200	600
1007log1.daf	26/07/2011	1007log1.mat	level	6.5	200	600
1008log1.daf	26/07/2011	1008log1.mat	Level	6.5	200	600
1009log1.daf	26/07/2011	1009log1.mat	Level	7.0	200	600
1010log1.daf	26/07/2011	1010log1.mat	Level	7.0	200	600
1011log1.daf	26/07/2011	1011log1.mat	Level	7.5	200	600
1012log1.daf	26/07/2011	1012log1.mat	Level	7.5	200	600
1013log1.daf	26/07/2011	1013log1.mat	Level	8.0	200	600
1014log1.daf	26/07/2011	1014log1.mat	Level	8.0	200	600
1015log1.daf	26/07/2011	1015log1.mat	Level	8.5	200	600
1016log1.daf	26/07/2011	1016log1.mat	Level	8.5	200	600
1017log1.daf	26/07/2011	1017log1.mat	Level	9.0	200	600
1018log1.daf	26/07/2011	1018log1.mat	Level	9.0	200	600

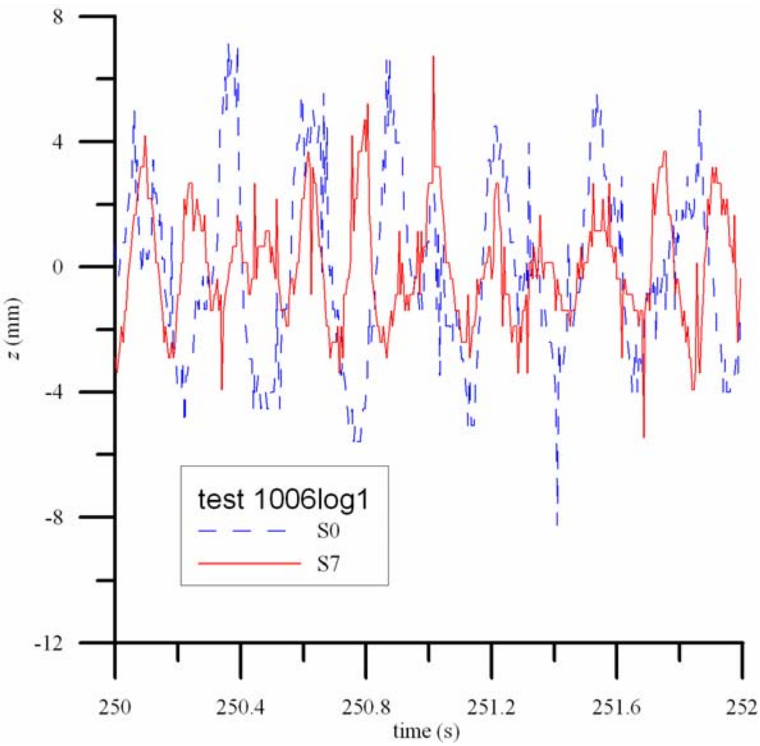

Figure 25. Water level measurements in section S0 and S7. Data from test 1006log1

The data have been analyzed in the time domain with a zero-up-crossing technique, in order to extract some statistical parameter. The value of the H_{rms}, of the crests and of the troughs are sketched in Figure 26 for the maximum wind velocity test (1006log1) and for the minimum wind velocity test (1007log1).

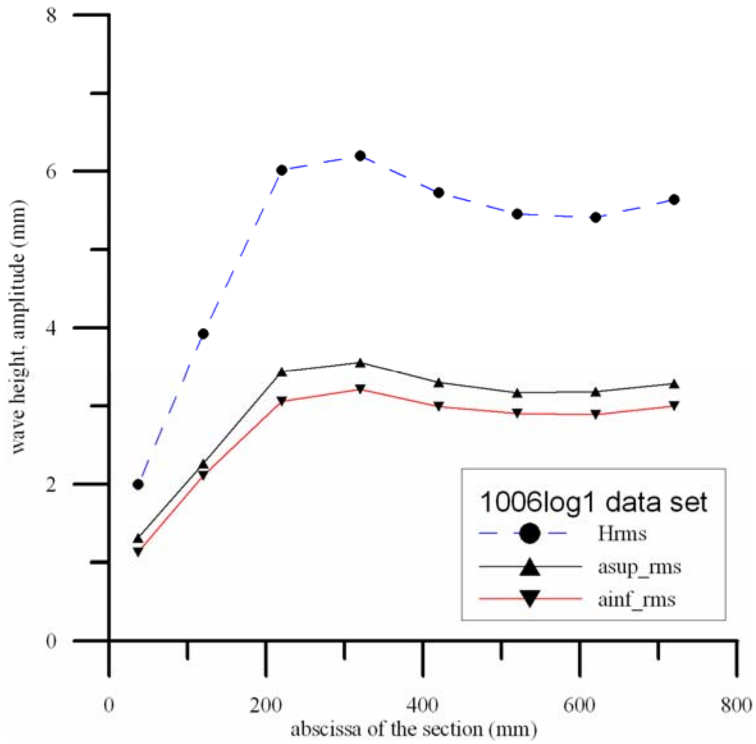

Figure 26. Wave height (H_{rms}), wave crest (asup) and wave trough (ainf), root mean square values. Fan control voltage 9.5 V

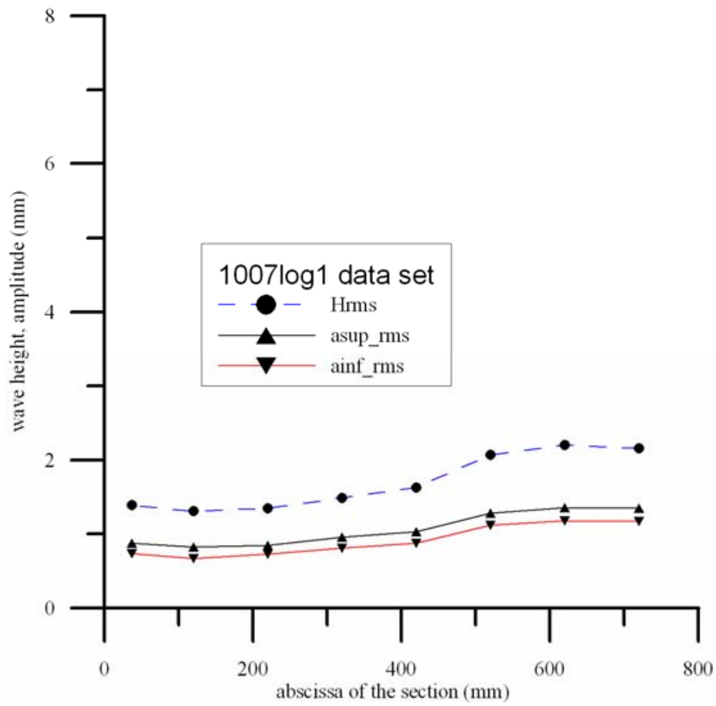

Figure 27. Wave height (H_{rms}), wave crest (asup) and wave trough (ainf), root mean square values. Fan control voltage 6.5 V

7. Measurements with Ultrasound Doppler velocimeter

Measurements of the fluid velocity below the free surface were taken using a single vertical probe connected to an Ultrasonic Doppler Velocity Profiler (UDVP by Signal Processing, Switzerland, model DOP2000, 2005), and the carrier frequency of the probe was 8 MHz (TR0805LS). The arrangement of the probe is shown in Figure 28.

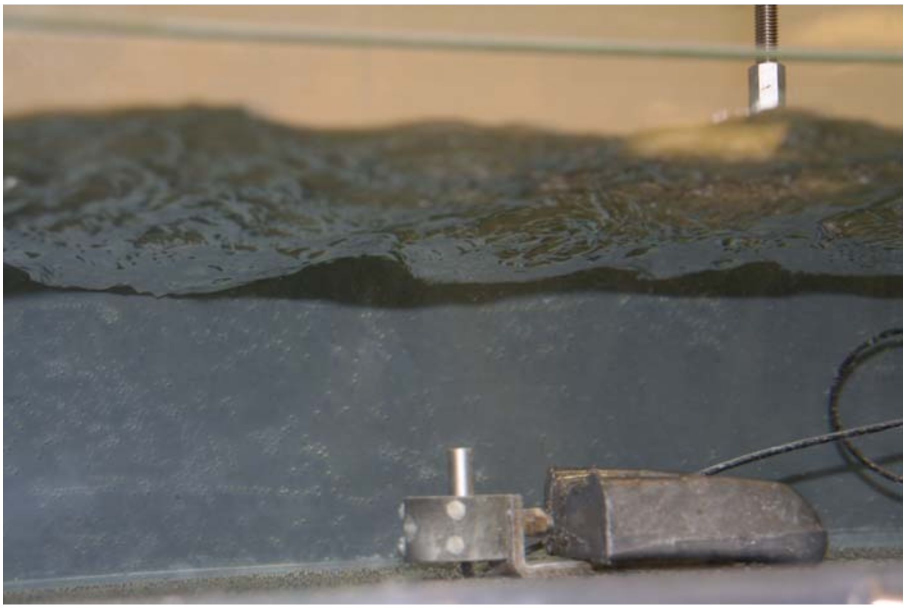

Figure 28. Ultrasound Doppler Velocimeter probe set-up

The transducer had active element diameters of 5 mm in an 8 mm (diameter) cylindrical plastic housing. The origin of the measurements is at 38 mm above the bottom of the tank, i.e. 67 mm below the still water level. The arrangement of the probe was chosen to have the minimum possible number of gates, with the aim of mapping out the near-surface flow field. To increase the S/N ratio, the water was seeded with TiO_2 particles.

The transducer measured the axial velocity component as a function of the axial position. The velocity profile was measured in 100 spatial positions (gates), starting from 3 mm in front of the probe head. The measuring volume of a single gate was approximately disk-shaped, with a thickness related to the operating condition and a diameter that was almost invariant (nominally equal to 5 mm in the near field zone, ~33 mm long for the probe used in water). The measuring volume increased in the far field progressively due to lateral spreading of the US energy, with a half diverging angle of 1.2° for the probe used in water.

The actual diameter of the measuring volume is smaller than the nominal volume if the correct sensitivity level and beam power are selected. In fact, a reduced sensitivity during the echo reception (i.e., a high level of energy of the echoes requested to process the signal) and a high power of the US beam favour the backscatter of the particles near the axis of the beam (the US power decreases in the radial direction as well as the axial direction) and thus focus the volume of measurements in the near-axis region. Balancing this, multiple particles or micro-eddies present in the volume of measurement scatter the echoes and broaden the spectral peak, whereas diffraction tends to enlarge the measurement volume. The thickness of the sampling volumes is assumed to be equal to half the wavelengths contained in a burst, unless the electronic bandwidth of the instrument is limiting. In our experimental setup, this last variable is the limiting factor that determines the minimum thickness of the sampling volume (0.68 mm in water). The overall size of the measurement volumes allows only the detection and analysis of macroturbulence, but this limitation is outweighed by some advantages, such as the large number of measurement points that are almost simultaneously available. In addition, the larger dimension of the measurement volumes is in the horizontal plane, and, in the flow field of the present experiments, the fluid velocity has a moderate spatial gradient in the horizontal direction. The most important spatial gradient is expected in the vertical dimension, and the resolution in the vertical axis is comparable to the resolution obtained using Laser Doppler Velocimetry, Particle Image Velocimetry or Thermal Anemometry. The distance between two gates is equal to 0.75 mm, as measured along the beam axis using non-overlapping measurement volumes. Each profile was obtained as an average of 32 emissions of a four-wave burst. The time lag of the pulse from one gate to another was $k\delta z/c$, where k is a coefficient (~2), δz is the distance between two gates and c is the ultrasound celerity in water. The velocity resolution was 1/128 (1 Least Significant Bit) of the velocity range (~0.8% FS). For all tests, this was better than 4 mm/s (the velocity measured along the probe axis).

There are some effects to be considered in evaluating the reliability of the measurements made using UDVP. The presence of the moving interface generates a Doppler shift that is highly energetic and can persist in the flow field as a stationary signal. The elimination of these stationary components by high-pass filtering implies an increase in the dynamic of the analysed echoes and a reduction in the sensitivity of low velocity measurements. Unfortunately, the Doppler frequency shift induced by these mobile interfaces cannot be removed if its value is the same as that of the flowing particles. To balance all these effects, the presence of some artifacts is tolerated.

The main sources of uncertainty for the UDVP are Doppler noise, the presence of air bubbles or highly reflective interfaces, and the gradient of temperature in the liquid medium.

Doppler noise is essentially a Gaussian white noise and depends on the seeding particles and on the presence of gas bubbles. The effects of gas bubbles are quite dramatic: even though the celerity of the Ultrasound carrier is essentially not affected if the bubble void fraction is < 0.1, the UDVP system measures the bubbles' velocities, and these can be much different from the fluid velocity if the bubbles are large. In the presence of bubbles or highly reflective interfaces, several velocity spikes are recorded that are not due to turbulence. For this reason, we limited the experiments to non-aerated flows.

The uncertainty in the position of the gates and in the fluid velocity evaluation is due to the mean celerity of the Ultrasounds, which is affected by the temperature and density of the fluid. Considering pure water and assuming that the temperature varies linearly between the emitter and the gate, the relative uncertainty in the position of the gate is equal to:

$$\frac{\Delta L}{L_0} = \frac{c_1^2 - c_0^2}{4c_0^2} \tag{10}$$

Here, L_0 is the distance of the gate from the emitter/receiver as measured at the nominal uniform celerity c_0 (the celerity near the emitter/receiver with a fluid temperature Θ_0) and c_1 is the celerity near the gate with a local fluid temperature equal to Θ_1. The uncertainty in travel time measurements has been neglected because the electronics allow for very accurate estimations of the interval time. Assuming Θ_0 = 288 K and $\Theta_1 = \Theta_0 \pm 1$ K, then c_0 = 1462.8 m/s, c_1 = 1462.8±2.7 m/s, the relative uncertainty $\Delta L/L_0$ = 0.1% and the absolute uncertainty = ± 0.1 mm at a distance of 100 mm.

The evaluation of the uncertainty in fluid velocity evaluation requires a short description of the principle of the Ultrasonic Doppler Velocity Profiler that we used. In the UDVP adopted, the emitter periodically sends a short ultrasonic burst (four waves per burst in the setup used), and a receiver (coincident with the emitter) collects echo issues from targets that may be present in the path of the ultrasonic beam. By sampling the incoming echoes at the same time relative to the emission of the bursts, the displacements of scatters along the beam axis are detected, and from these, the fluid velocity along the beam axis (assumed equal to the velocity of the scatters) is computed as:

$$u = \frac{c(t_2 - t_1)}{2t_{prf}} \tag{11}$$

where t_{prf} is the time between two subsequent pulses, t_1 is the travel time of the first pulse and t_2 is the travel time of the second pulse. Assuming that the two events, "travel of the first pulse" and "travel of the second pulse", are not correlated, the absolute uncertainty in the velocity estimation can be computed as:

$$\Delta u = \frac{L_0}{2t_{prf}} \frac{\Delta(L_2 - L_1)}{L_0} = \frac{L_0}{t_{prf}} \frac{\Delta L}{L_0} \tag{12}$$

This is very large for most of the operating conditions (e.g., setting t_{prf} = 3×10-4 s for measurements in a gate at L_0 = 100 mm and assuming $\Delta L/L_0$ = 0.1% results in Δu = 0.33 m/s). In practical situations, if turbulence in the flow field has a time scale larger than t_{prf}, the fluctuations of celerity along the path have a similar pattern for the two subsequent pulses and this results in $\Delta(L_2 - L_1) << 2\,\Delta L$. In addition, the velocity is estimated as the average of several bursts (32 in the present experimental setup), with a consequent reduction in the uncertainty.

A last source of uncertainty arises from the finite size of the measurement volumes, which affects the velocity measurements and the Reynolds stress estimates. Here, this uncertainty is negligible with respect to the other sources of uncertainty.

The overall accuracy in the velocity measurements under carefully controlled conditions can be assessed as 3% of the instantaneous value, with a minimum equal to 0.8% of the Full Scale (less than 4 mm/s for most tests).

The signal can also be used to detect the instantaneous free surface. The echo shows a large increment (most of the time it is in saturation) due to the reflection of the moving surface (Figure 29) and a detecting algorithm can be used to evaluate the instantaneous free surface. The detecting algorithm performs two different operations: the first is the evaluation of the first gate towards the free surface where saturation occurs (it is necessary to start far from the near probe region where saturation occurs before ultrasonic field spreading); if nowhere saturation occurs, the algorithm evaluates the gate where the maximum echo is recorded.

The last gate of measurements is at 75 mm from the probe and the typical mean water level is at ~ 65 mm. On the base of the wave statistics as elaborated using the water level probe, it is expected that the crests of the highest waves are missing, but their number is quite limited (less than 30 points for the highest fan velocity in section S-1) and can be neglected. A total of 60 000 profiles were recorded in each test for further analysis, with a data rate equal to ~ 100 profiles per second.

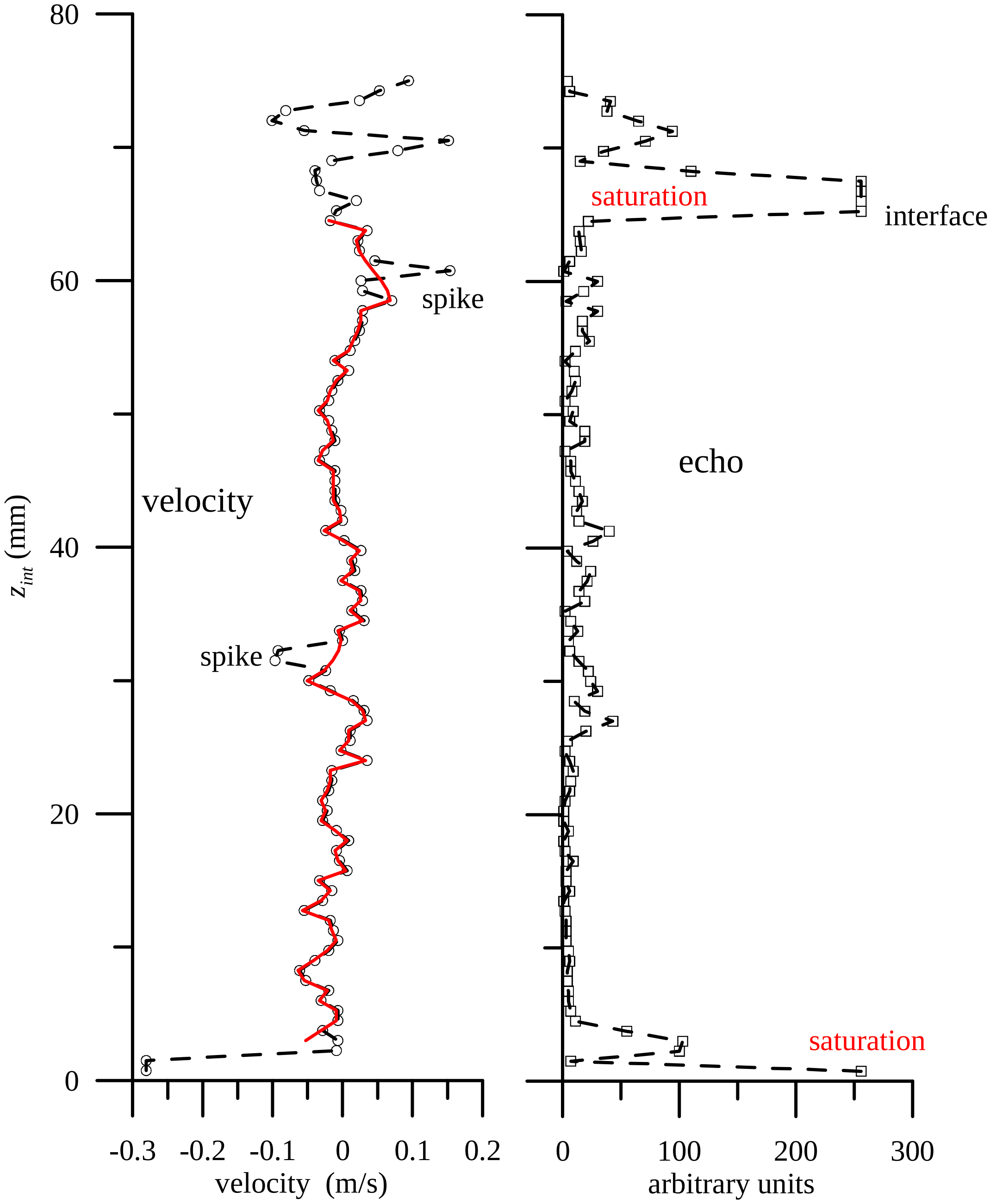

Figure 29. Instantaneous vertical velocity (circles are the raw data, solid line refers to the despiked velocity) and echo profile. At the interface, echo saturation occurs

The probe was positioned in Section S-1, S0 and S1. The tests where carried out with different fan velocities, controlled with voltage tension from 6.5 V to 9.5 V in steps of 0.5 V. The data have been despiked on using the 3D phase spaced methods proposed by Goring and Nikora (2002) and implemented, with modifications, by Mori et al. (2007). A snapshot of a typical free surface as detected on using the echo is shown in Figure 30. The filled symbols indicate the accepted values after despiking.

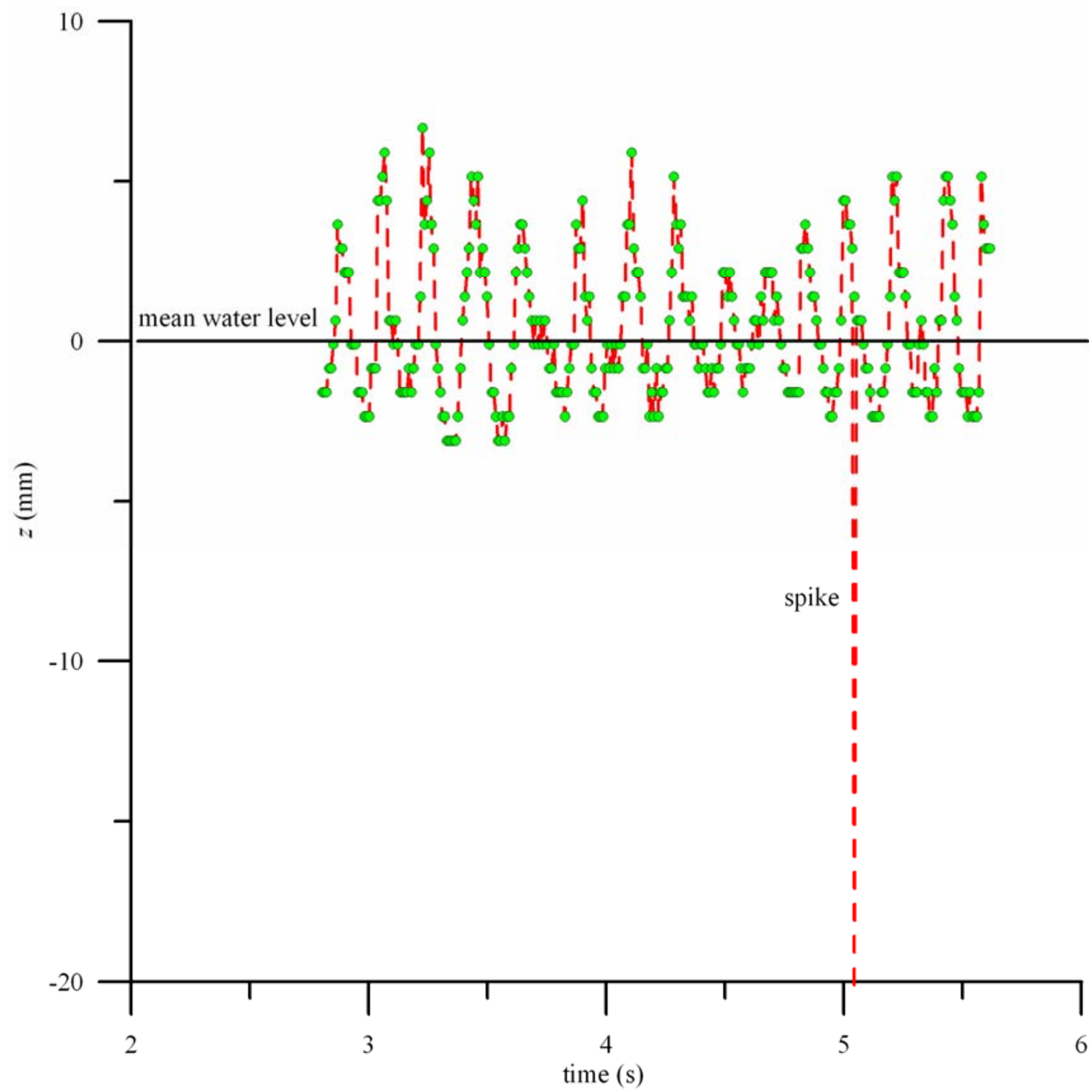

Figure 30. Instantaneous water level as detected by the UDVP (dashed line). Filled symbols indicate the retained values after despiking

The raw data files, listed for all tests in Table 10, are in binary format recoded by the DOP2000 unit and have been extracted and transferred in binary Matlab format files, saving the matrix vel containing the instantaneous velocity in m/s, 100 rows (the number of gates) and 60 000 columns (the number of profiles); the matrix echo containing the echo signal expressed in internal units ranging from −256 to 256, 100 rows (the number of gates) and 60 000 columns (the number of profiles); the vector t containing the timestamp in ms; the vector z containing the gate position in mm in a reference with the origin at the probe head, named z_{int}; the vector ppp containing the number of the gate at the interface, i.e. z(ppp) is the position of the interface; the vector ppp_despik containing the number of the gate at the interface after despiking algorithm application; the vector jjj containing the pointers of the profiles in which the interface has been detected finding the maximum value of the echo, because no saturation occurred. In order to transform the US probe internal coordinate into the assumed coordinate system (*z* vertical axis with the origin at the still water level, positive upward; *x* horizontal axis positive in the wind stream positive velocity), it is necessary to subtract the depth of the UDVP probe internal coordinate, i.e. $z = z_{int} - 67$ (mm).

The average and the phase-average velocity in section S0, maximum fan velocity, is shown in Figure 31.

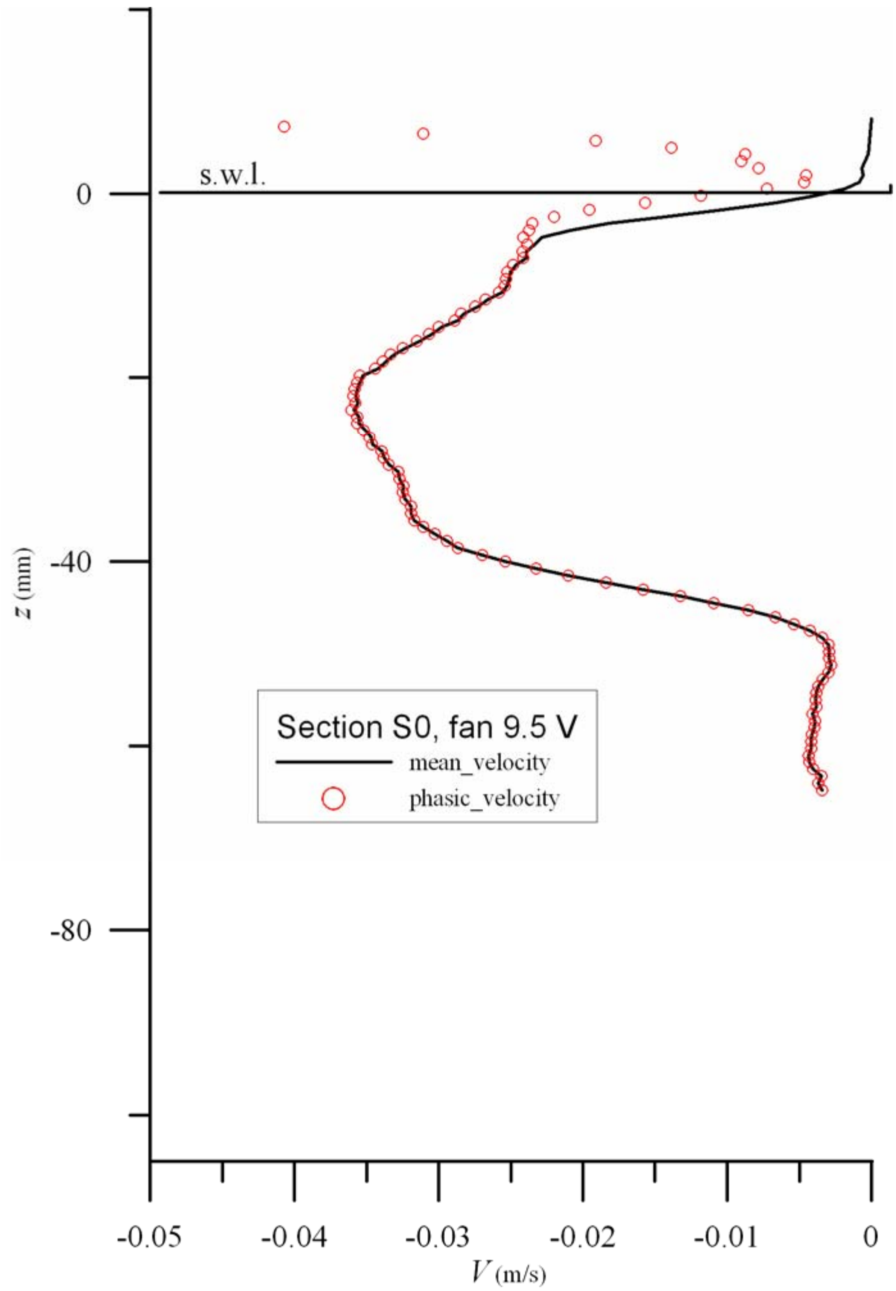

Figure 31. Average and phasic average vertical velocity measured by UDVP in section S0, maximum fan speed

Table 10. Measurements with UDVP and with US water level gauge, data files

raw data file binary format	Matlab file binary format	US water level file ASCII format	section	profiles No	duration	fan voltage
dop_6_5_S_1_sing_p.BDD	dop_6_5_S_1_sing_p.mat	dop_6_5_S_1_sing_p.txt	S-1	60 000	562 s	6.5 V
dop_7_0_S_1_sing_p.BDD	dop_7_0_S_1_sing_p.mat	dop_7_0_S_1_sing_p.txt	S-1	60 000	562 s	7.0 v
dop_7_5_S_1_sing_p.BDD	dop_7_5_S_1_sing_p. mat	dop_7_5_S_1_sing_p.txt	S-1	60 000	562 s	7.5 V
dop_8_0_S_1_sing_p.BDD	dop_8_0_S_1_sing_p. mat	dop_8_0_S_1_sing_p. txt	S-1	60 000	562 s	8.0 V
dop_8_5_S_1_sing_p.BDD	dop_8_5_S_1_sing_p. mat	dop_8_5_S_1_sing_p. txt	S-1	60 000	562 s	8.5 V
dop_9_0_S_1_sing_p.BDD	dop_9_0_S_1_sing_p. mat	dop_9_0_S_1_sing_p. txt	S-1	60 000	562 s	9.0 V
dop_9_5_S_1_sing_p.BDD	dop_9_5_S_1_sing_p. mat	dop_9_5_S_1_sing_p. txt	S-1	60 000	562 s	9.5 V
dop_6_5_S0_sing_p.BDD	dop_6_5_S0_sing_p. mat	dop_6_5_S0_sing_p. txt	S0	60 000	562 s	6.5 V
dop_7_0_S0_sing_p.BDD	dop_7_0_S0_sing_p. mat	dop_7_0_S0_sing_p. txt	S0	60 000	562 s	7.0 v
dop_7_5_S0_sing_p.BDD	dop_7_5_S0_sing_p. mat	dop_7_5_S0_sing_p. txt	S0	60 000	562 s	7.5 V
dop_8_0_S0_sing_p.BDD	dop_8_0_S0_sing_p. mat	dop_8_0_S0_sing_p. txt	S0	60 000	562 s	8.0 V
dop_8_5_S0_sing_p.BDD	dop_8_5_S0_sing_p. mat	dop_8_5_S0_sing_p. txt	S0	60 000	562 s	8.5 V
dop_9_0_S0_sing_p.BDD	dop_9_0_S0_sing_p. mat	dop_9_0_S0_sing_p. txt	S0	60 000	562 s	9.0 V
dop_9_5_S0_sing_p.BDD	dop_9_5_S0_sing_p. mat	dop_9_5_S0_sing_p. txt	S0	60 000	562 s	9.5 V
dop_6_5_S1_sing_p.BDD	dop_6_5_S1_sing_p. mat	dop_6_5_S1_sing_p. txt	S1	60 000	562 s	6.5 V
dop_7_0_S1_sing_p.BDD	dop_7_0_S1_sing_p. mat	dop_7_0_S1_sing_p. txt	S1	60 000	562 s	7.0 v
dop_7_5_S1_sing_p.BDD	dop_7_5_S1_sing_p. mat	dop_7_5_S1_sing_p. txt	S1	60 000	562 s	7.5 V
dop_8_0_S1_sing_p.BDD	dop_8_0_S1_sing_p. mat	dop_8_0_S1_sing_p. txt	S1	60 000	562 s	8.0 V
dop_8_5_S1_sing_p.BDD	dop_8_5_S1_sing_p. mat	dop_8_5_S1_sing_p. txt	S1	60 000	562 s	8.5 V
dop_9_0_S1_sing_p.BDD	dop_9_0_S1_sing_p. mat	dop_9_0_S1_sing_p. txt	S1	60 000	562 s	9.0 V
dop_9_5_S1_sing_p.BDD	dop_9_5_S1_sing_p. mat	dop_9_5_S1_sing_p. txt	S1	60 000	562 s	9.5 V

8. Water level oscillation measurements

Water level oscillations are measured by an ultrasonic water level sensor (US), model Q45UR, produced by the company Turck-Banner (Figure 32).

Figure 32. Ultrasonic water level gauge

The sensor consists of a piezoelectric transducer immersed in an alternate electrical field, whose voltage oscillates at a certain frequency; the transducer responds to the electric excitation, vibrating at a high frequency and emitting an ultrasonic pressure wave burst. The ultrasonic wave packet propagates in air towards the water free surface, where it is reflected. This reflected wave packet travels back to the sensor, where it is collected by the same membrane that emits the wave. The sensor measures the time elapsed between the emission of the ultrasonic pulse and the reception of the reflected pulse and hence determines the distance (*d*) from the membrane to the target through the relation:

$$d = \frac{1}{2} c t_f \tag{13}$$

where t_f is the flight time of the ultrasonic wave and *c* is the celerity of the ultrasonic wave in air. Since *c* is a function of temperature, the sensor is equipped with a temperature gauge to compensate for the effects of temperature variations.

Some of the instrumental characteristics of the gauge are reported in Table 11. The emitted ultrasonic wave has a conical shape, with a diverging angle of 3.5°; therefore, the measurement is not precisely local and the averaging area, corresponding to the print of the ultrasonic cone on the water surface, varies with the distance between the emitting membrane and the target.

In this study, the instrument is set to give a voltage output signal, with a full range scale of 10 V. Two gauges are calibrated to measure two possible ranges of distance: the whole nominal sensing range of the instrument, which corresponds to the distance window 50-250 mm, and a shorter range of distances (70-120 mm); the short range calibration provides an increased sensibility of the measurement when the free surface is close to the gauge. The gauge with the long-range calibration was installed in the wind tunnel in section S0, S1 and S-1, to measure the oscillating free surface (the mean distance is 180 mm); the gauge with the short-range calibration was installed for measuring the water level in the external piezometer used to control the water level in the tank. The response time is 10 ms.

Table 11. Ultrasonic water level characteristics

Feature	*Range*
supply voltage	15-24 V
no-load current	≤100 mA
current analogue output	4-20 mA
voltage analogue output	0-10 V
load resistance	<500 Ω
sensing range	50-250 mm
resolution (nominal)	0.1 mm
switching frequency (selectable)	3-100 Hz

8.1. Calibration of the ultrasonic sensor

The voltage output of the ultrasonic sensor must be related to a metric water level signal. The input – output relation (mm – V) is determined by measuring a number of known distances; to do so, the water level is kept still and the gauge is moved to known locations by means of a traverse system. For each location, the output signal is acquired for a time interval of 120 s, the mean voltage value is then computed and associated with the known distance from the water surface. The long-range calibration curve is plotted in Figure 33; the calibration output is linear.

The short-range calibration curve is plotted in Figure 34; the calibration output is linear for the most part of the measuring range but it shows a distinct knee between 6.75 and 7 V. The data conversion from tension to distance values is therefore performed interpolating linearly between each couple of points mapped during the calibration procedure, or using a table lookup.

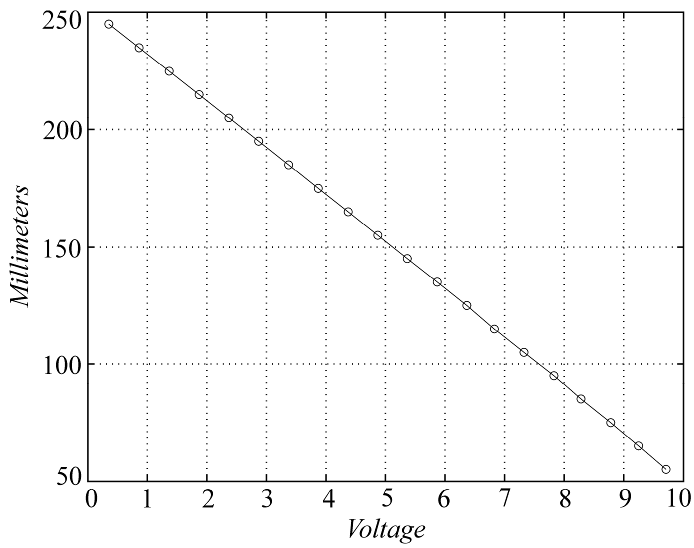

Figure 33. Ultrasonic water level gauge – long-range calibration curve

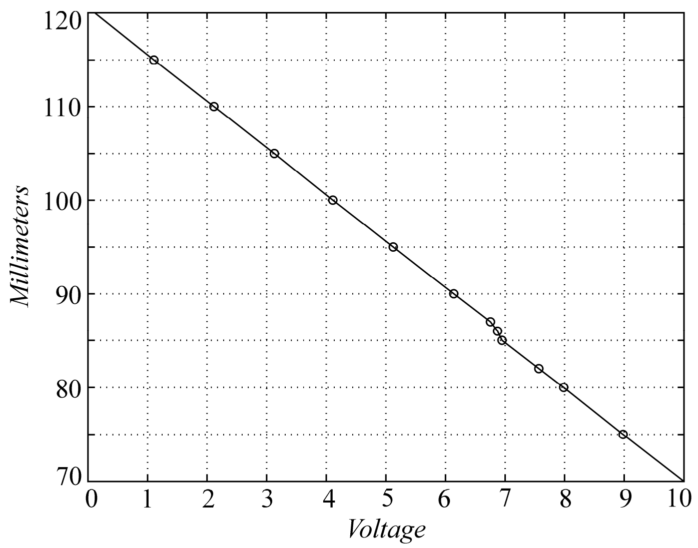

Figure 34. Ultrasonic water level gauge – short-range calibration curve

The nominal resolution of the ultrasonic level sensor is 0.10 mm but due to several other sources of error it can be assumed equal to 0.3 mm. The long-range sensor was positioned in the wind tunnel at roughly 180 mm from the still water level. The vertical alignment with the UDVP probe was obtained through the laser beam moved vertically with the traverse system. The data files have been acquired and stored in ASCII format already converted in distance of the reflective target from the sensor, and in binary DAQ format; in this last format, the timestamp in second and the tension in voltage can be retrieved by using the daqread command in Matlab. Water level acquisition through the US sensor and fluid velocity through the DOP2000 are triggered and have identical origin of the timestamp. It has been obtained using an output channel of the NIDAQ which send a TTL signal to the DOP2000; DOP2000 has an external BNC to receive this triggering signal and a proper selectable option to start data acquisition on triggering.

A snapshot of the raw data and of the despiked data is shown in Figure 35. There are numerous spikes due to several reasons. The first one is the non horizontal reflective surface shape for the US packets; it tends to diffuse the energy and to reflect the wave packets out of the receiver path, with consequent loss of signal. A second reason is due to the presence of the wind. The path of the US packets is not vertical but is shifted due to the relatively high air velocity. The horizontal shift after reflection is equal to

$$\Delta x = 2\frac{U_{wind} L}{c} \qquad (14)$$

where U_{wind} is the wind velocity, L is the distance between the emitter-receiver and the reflective surface, c is the US velocity. Assuming U_{wind} = 10 m/s, L = 200 mm, c = 320 m/s results Δx = 12.5 mm, large enough to loose the emitter.

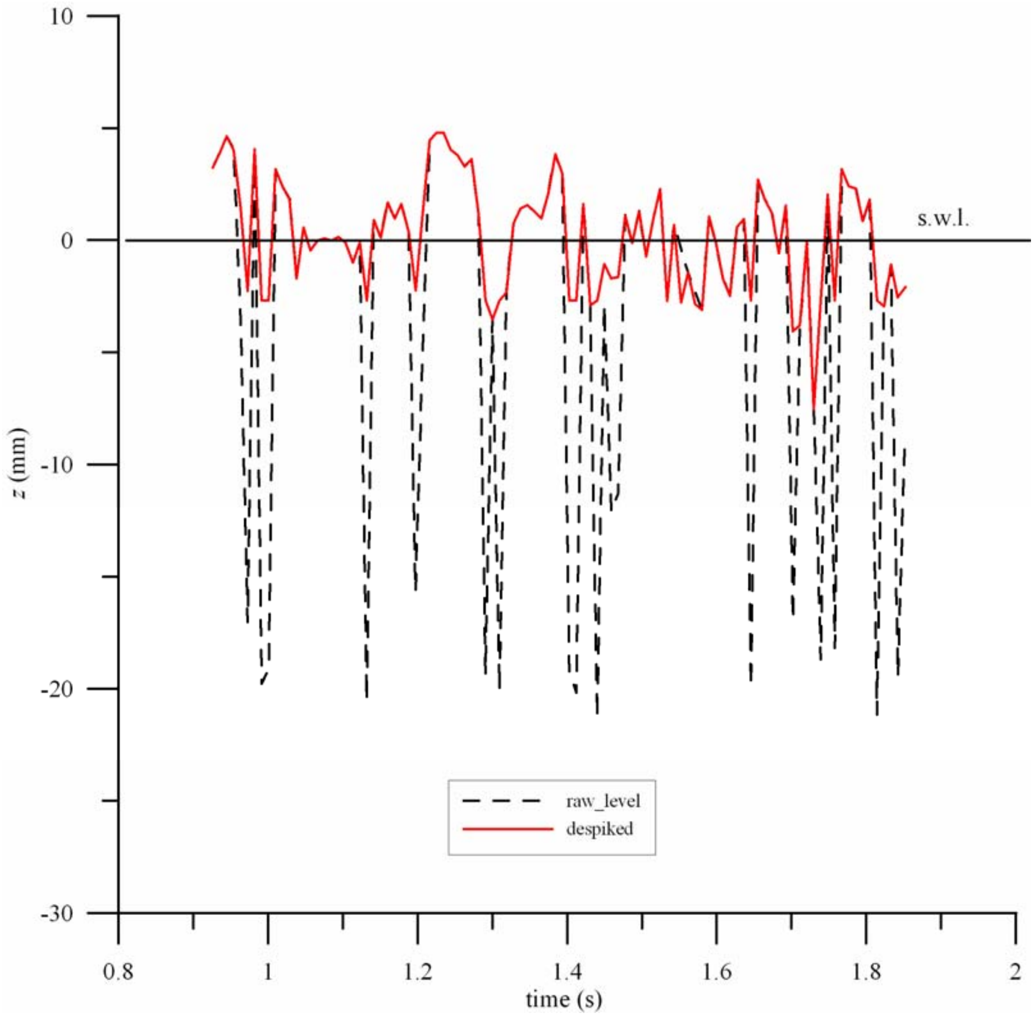

Figure 35. Instantaneous water level measured by the US level sensor. Dashed line: raw data; solid line: despiked data

The comparison between the interface position evaluated using the UDVP data and the US data is shown in Figure 36. There is an acceptable agreement of the data but there are too many spikes in the US signal, which are assumed to be less accurate due to the previously described interference which induce the loss of the signal. In addition, the data retrieved by using the UDVP signal have a higher spatial resolution than the data retrieved by the US distance meter, because the angle of spread of the US field in water (8 MHz carrier frequency) is much smaller than the angle of the US in air (1 MHz carrier frequency) and also the mean distance is smaller in water than in air (less than 75 mm in water, nearly 180 mm in air) and the initial diameter of the US is smaller in water than in air (5 mm in water, 10 mm in air).

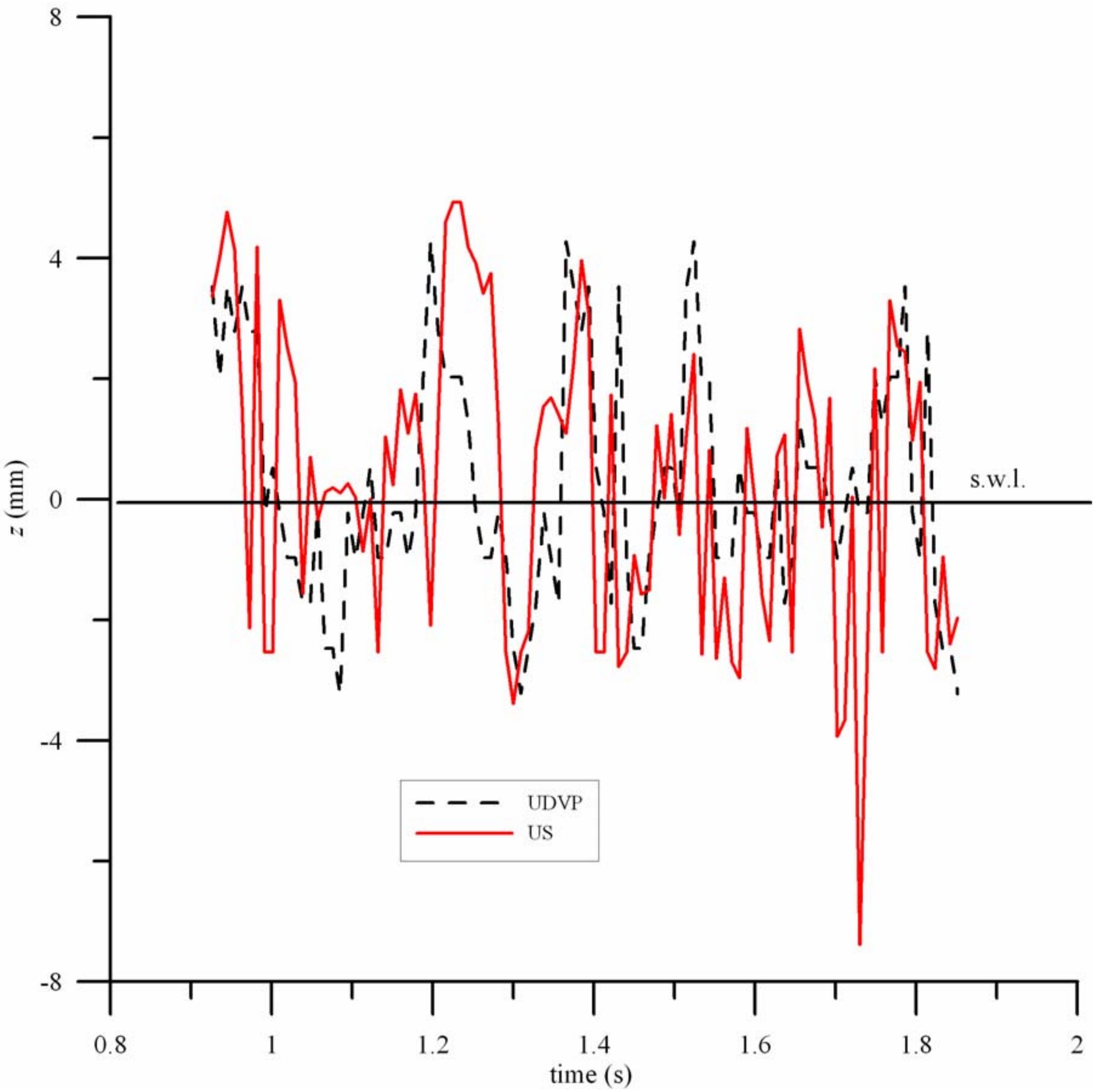

Figure 36. Instantaneous water level computed using the UDVP data (dashed line) and the US water level data (solid line)

9. Comparison between LDV and UDVP velocity measurements

The last comparison is between the vertical velocity at level z = –10 mm in section S0, maximum fan velocity as measured by the LDV in coincidence mode (data contained in the file test_acqua_16_bis_elab.mat) and by the UDVP (data contained in the file dop_9_5_S0_sing_p.mat, gate pointer 76). The measurements are not simultaneous and refer to two different tests. The results are shown in Figure 37. The mean velocity measured by LDV is equal to V_{LDV} =–0.0062 m/s and by UDVP is V_{UDVP} = –0.0260 m/s; the standard deviation is STD_{LDV} = 0.0752 m/s and STD_{UDVP} = 0.0895 m/s. A shift occurs of the order of the UDVP accuracy, but the STD values show a good agreement.

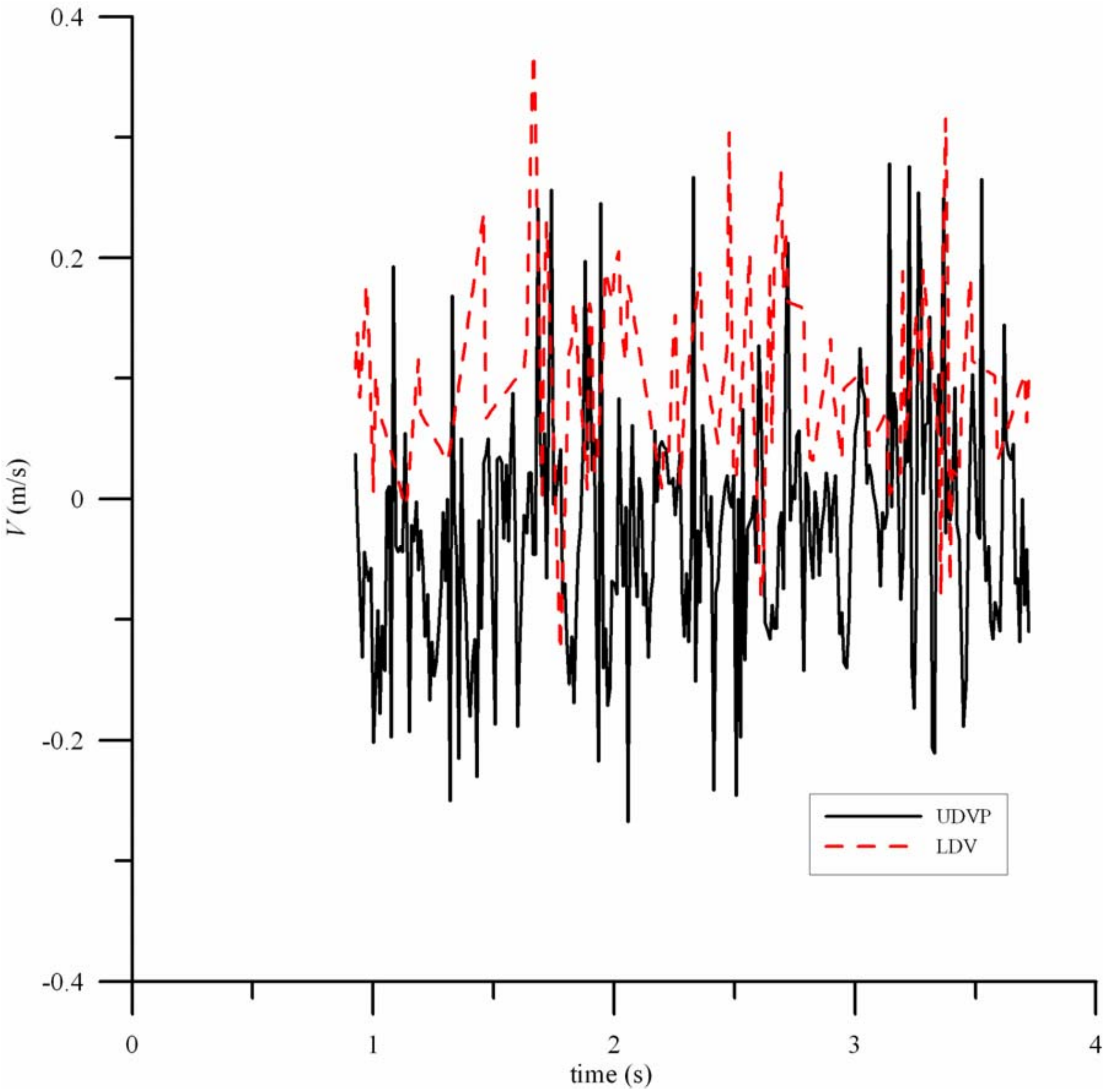

Figure 37 Comparison between the vertical fluid velocity at z = –10 mm measured by LDV and by UDVP

10. References

Goring D. G., Nikora V. I, (2002), Despiking Acoustic Doppler Velocimeter Data, Journal of Hydraulic Engineering, Vol. 128, No. 1, 117-126.

Mori N., Suzuki T., Kakuno S. (2007), Noise of Acoustic Doppler Velocimeter Data in Bubbly Flows. *Journal of Engineering Mechanics*, Vol. 133, No. 1, 122-125.

APPENDIX

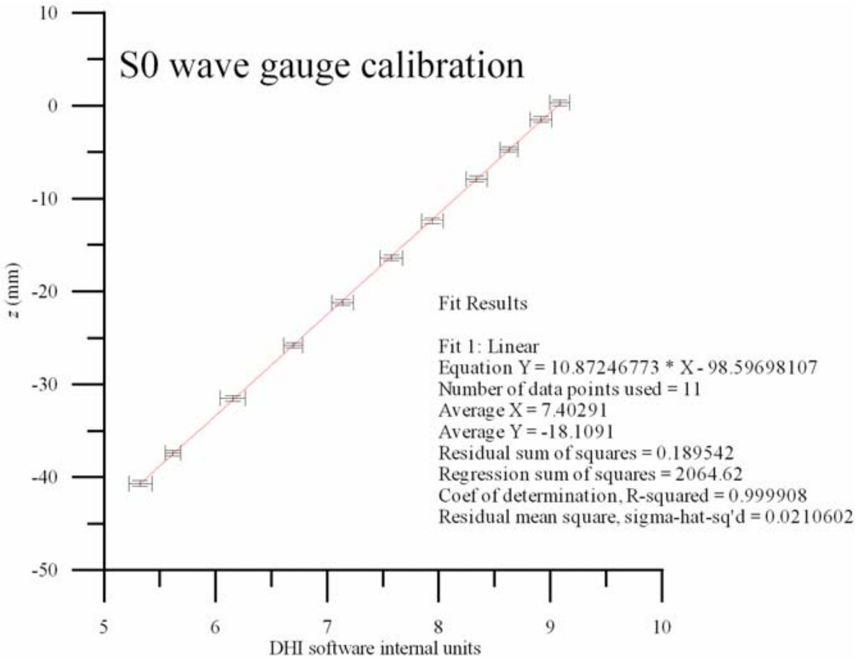

Figure 38. Calibration of the wave gauge in section S0

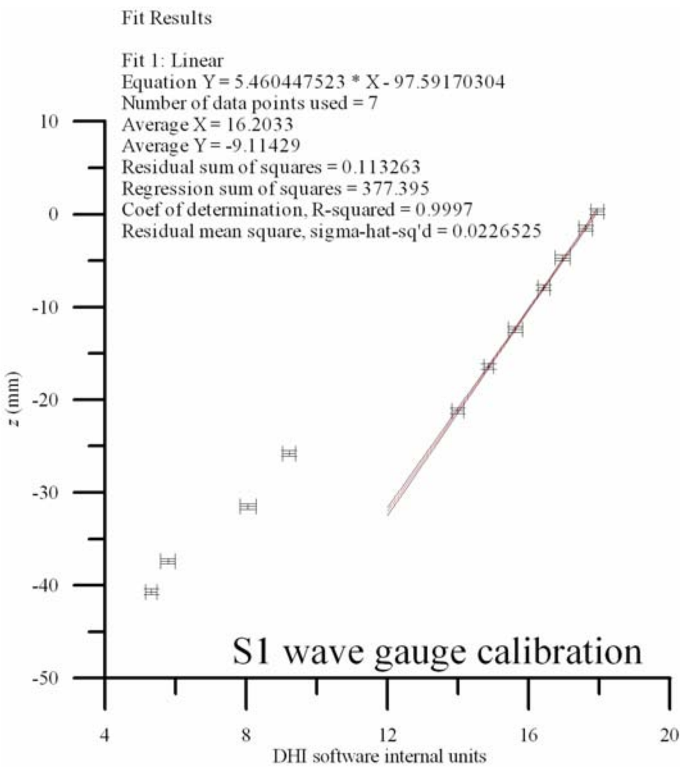

Figure 39. Calibration of the wave gauge in section S1

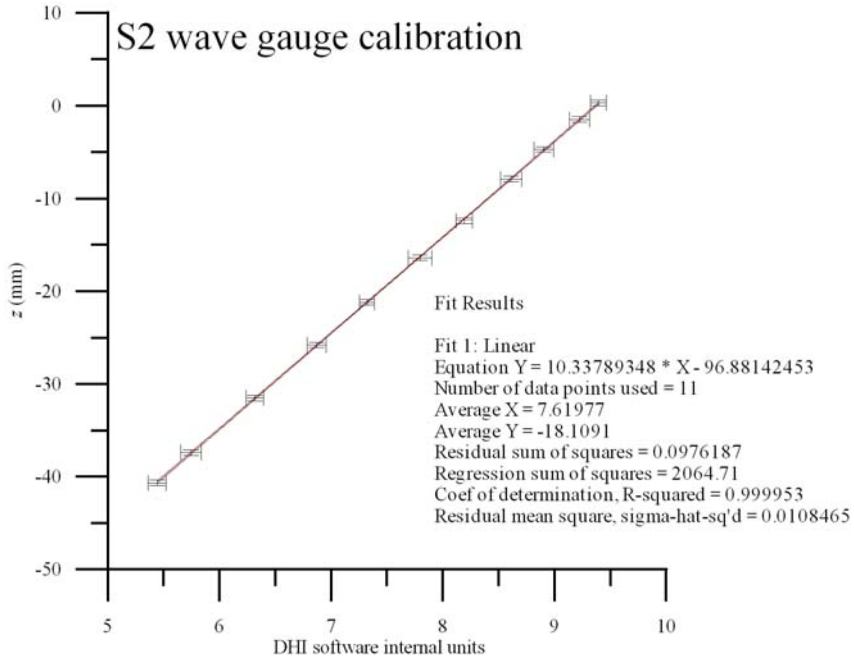

Figure 40. Calibration of the wave gauge in section S2

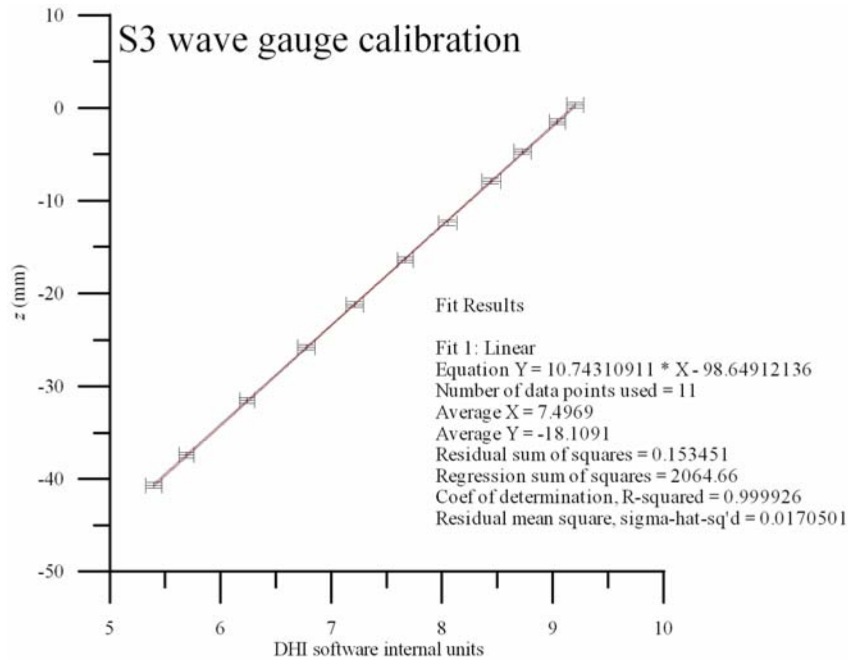

Figure 41. Calibration of the wave gauge in section S3

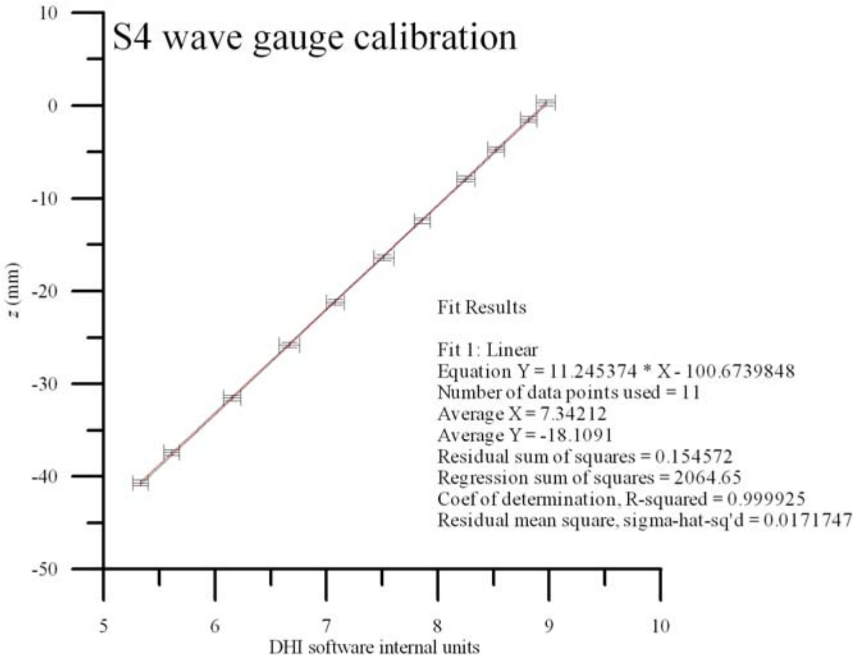

Figure 42. Calibration of the wave gauge in section S4

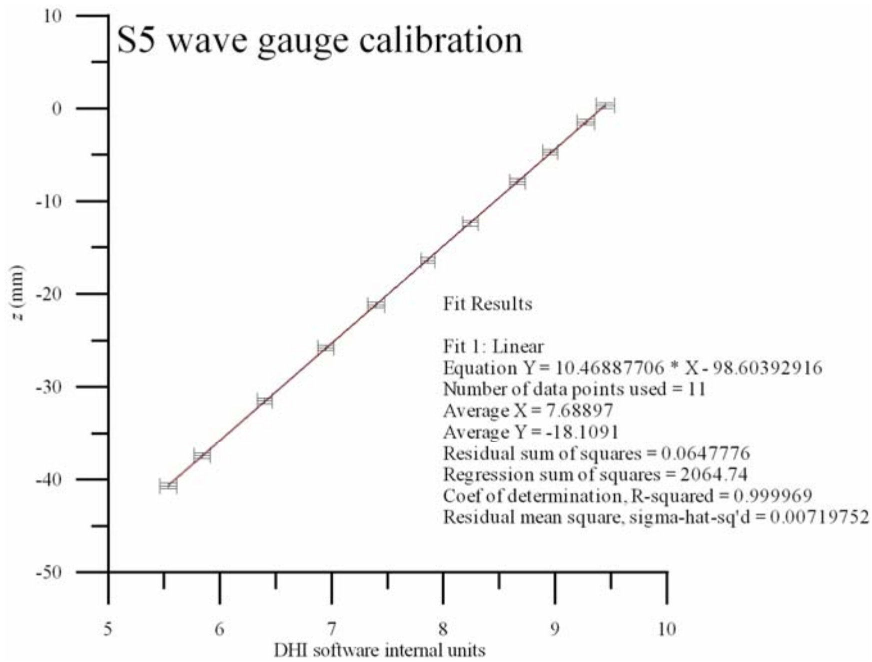

Figure 43. Calibration of the wave gauge in section S5

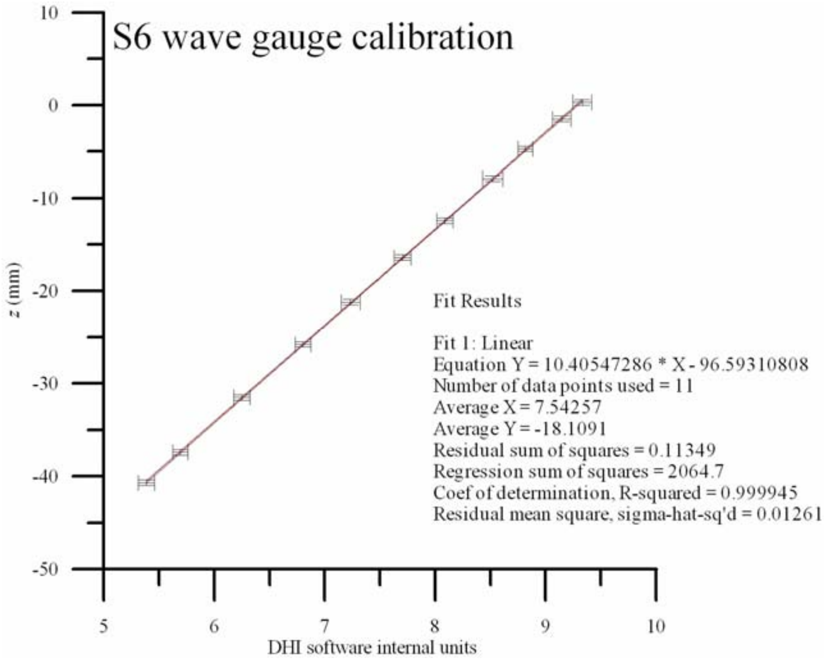

Figure 44. Calibration of the wave gauge in section S6

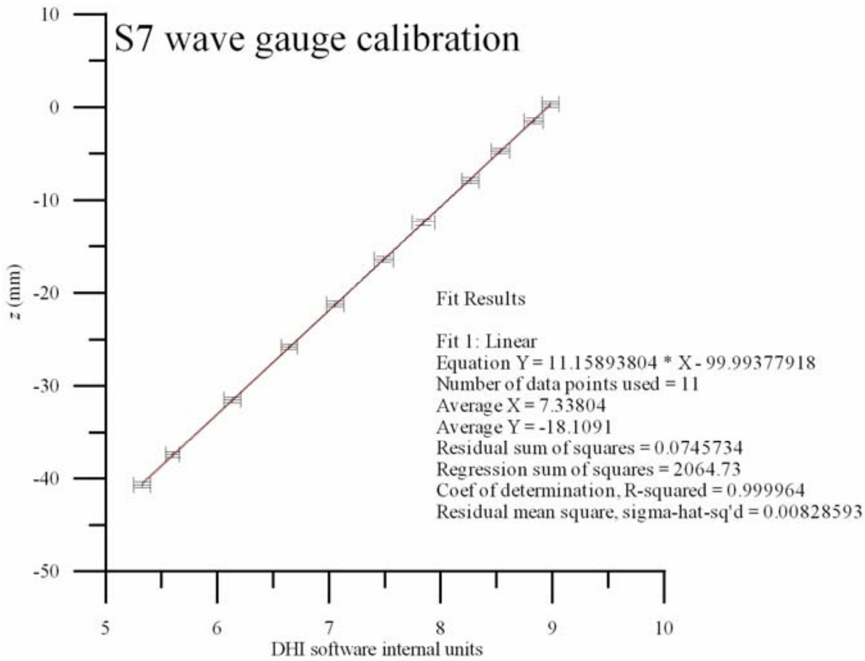

Figure 45. Calibration of the wave gauge in section S7

Table 12. Section S0 in coincidence mode. Measurements in water. File Test_22_07_02_S0_acqua_CM.txt

measured data					*transformed data*						
z (m)	V_1 (m/s)	V_2 (m/s)	V_{1rms} (m/s)	V_{2rms} (m/s)	U (m/s)	V (m/s)	U'_{rms} (m/s)	V'_{rms} (m/s)	$(U'V')_{rms}$ (m^2/s^2)	k (m^2/s^2)	ϕ (°)
-0.080	-0.030	-0.034	0.034	0.046	-0.045	0.002	0.064	0.059	-0.0015	0.0038	34.014
-0.070	-0.026	-0.030	0.035	0.050	-0.037	0.002	0.065	0.060	-0.0016	0.0039	34.332
-0.060	-0.009	0.001	0.040	0.060	-0.007	-0.006	0.071	0.064	-0.0020	0.0046	32.033
-0.050	-0.008	-0.005	0.039	0.055	-0.009	-0.002	0.069	0.062	-0.0019	0.0043	32.545
-0.040	0.003	0.005	0.041	0.059	0.008	-0.003	0.072	0.063	-0.0021	0.0046	30.315
-0.035	0.013	0.025	0.041	0.062	0.022	-0.009	0.075	0.065	-0.0022	0.0049	29.170
-0.030	0.016	0.025	0.045	0.066	0.027	-0.009	0.078	0.067	-0.0023	0.0053	27.048
-0.025	0.020	0.025	0.044	0.066	0.027	-0.004	0.077	0.067	-0.0024	0.0052	28.672
-0.020	0.030	0.039	0.046	0.065	0.044	-0.006	0.078	0.069	-0.0023	0.0054	30.528
-0.018	0.030	0.038	0.047	0.067	0.046	-0.006	0.080	0.069	-0.0025	0.0056	28.868
-0.016	0.040	0.048	0.048	0.068	0.058	-0.008	0.081	0.071	-0.0025	0.0058	29.332
-0.014	0.041	0.049	0.049	0.068	0.057	-0.004	0.082	0.072	-0.0025	0.0059	29.420
-0.012	0.047	0.054	0.049	0.069	0.069	-0.007	0.081	0.074	-0.0025	0.0060	32.092
-0.010	0.054	0.061	0.052	0.071	0.078	-0.006	0.083	0.075	-0.0026	0.0063	31.989
-0.009	0.052	0.057	0.054	0.071	0.073	-0.004	0.083	0.076	-0.0025	0.0064	33.091
-0.008	0.058	0.063	0.054	0.071	0.080	-0.005	0.084	0.078	-0.0026	0.0065	34.281
-0.007	0.057	0.059	0.057	0.076	0.080	-0.002	0.086	0.080	-0.0026	0.0069	35.302
-0.006	0.062	0.067	0.058	0.077	0.087	-0.003	0.086	0.082	-0.0026	0.0070	37.144
-0.005	0.071	0.072	0.059	0.077	0.098	-0.003	0.087	0.084	-0.0027	0.0073	40.821
-0.004	0.072	0.079	0.063	0.079	0.104	-0.004	0.090	0.089	-0.0027	0.0080	43.260
-0.003	0.091	0.096	0.063	0.080	0.131	-0.005	0.087	0.092	-0.0026	0.0079	-35.592
-0.002	0.102	0.107	0.067	0.085	0.148	-0.002	0.092	0.094	-0.0028	0.0087	-41.175
-0.001	0.118	0.116	0.074	0.093	0.166	0.003	0.099	0.100	-0.0030	0.0099	-43.475
0.000	0.133	0.143	0.072	0.090	0.197	-0.007	0.099	0.098	-0.0028	0.0097	43.599
0.001	0.150	0.159	0.076	0.095	0.223	-0.004	0.103	0.099	-0.0031	0.0102	37.196
0.002	0.170	0.180	0.082	0.094	0.249	-0.006	0.107	0.102	-0.0026	0.0108	34.438
0.003	0.193	0.195	0.081	0.104	0.274	-0.002	0.110	0.101	-0.0030	0.0112	28.864

0.004	0.205	0.214	0.087	0.103	0.305	-0.012	0.110	0.098	-0.0032	0.0109	26.477
0.005	0.231	0.227	0.076	0.093	0.333	0.007	0.111	0.099	-0.0042	0.0111	29.298

Table 13. Section S3 in coincidence mode. Measurements in water. File Test_23_07_02_S3_acqua_CM.txt

measured data					*transformed data*						
z (m)	V_1 (m/s)	V_2 (m/s)	V_{1rms} (m/s)	V_{2rms} (m/s)	*U* (m/s)	*V* (m/s)	U'_{rms} (m/s)	V'_{rms} (m/s)	$(U'V')_{rms}$ (m^2/s^2)	*k* (m^2/s^2)	ϕ (°)
-0.080	-0.039	-0.037	0.033	0.043	-0.054	0.001	0.062	0.060	-0.0016	0.0037	39.672
-0.070	-0.034	-0.033	0.035	0.046	-0.047	0.001	0.064	0.060	-0.0016	0.0039	36.012
-0.060	-0.023	-0.026	0.036	0.047	-0.030	0.001	0.065	0.060	-0.0016	0.0039	35.325
-0.050	-0.010	-0.010	0.039	0.054	-0.014	-0.001	0.069	0.062	-0.0018	0.0043	32.481
-0.040	0.009	0.013	0.042	0.064	0.015	-0.005	0.075	0.065	-0.0024	0.0049	30.503
-0.035	0.014	0.024	0.041	0.057	0.026	-0.005	0.073	0.065	-0.0021	0.0048	30.506
-0.030	0.023	0.024	0.041	0.060	0.031	0.000	0.076	0.066	-0.0022	0.0051	29.630
-0.025	0.037	0.046	0.044	0.064	0.056	-0.010	0.078	0.069	-0.0025	0.0054	31.267
-0.020	0.041	0.048	0.045	0.064	0.062	-0.007	0.080	0.069	-0.0025	0.0056	28.752
-0.018	0.045	0.052	0.046	0.065	0.067	-0.006	0.080	0.071	-0.0024	0.0057	30.068
-0.016	0.053	0.065	0.046	0.064	0.079	-0.006	0.079	0.071	-0.0024	0.0057	31.405
-0.014	0.058	0.068	0.047	0.066	0.087	-0.007	0.080	0.072	-0.0024	0.0058	30.905
-0.012	0.057	0.060	0.048	0.068	0.078	-0.001	0.082	0.074	-0.0025	0.0061	31.213
-0.010	0.065	0.070	0.050	0.072	0.095	-0.005	0.085	0.075	-0.0026	0.0064	29.168
-0.009	0.070	0.076	0.053	0.073	0.101	-0.005	0.086	0.076	-0.0027	0.0067	29.440
-0.008	0.074	0.077	0.052	0.073	0.105	-0.003	0.086	0.077	-0.0027	0.0067	31.158
-0.007	0.078	0.080	0.055	0.075	0.111	-0.002	0.087	0.080	-0.0027	0.0069	32.758
-0.006	0.079	0.082	0.056	0.076	0.112	-0.001	0.088	0.082	-0.0028	0.0072	35.373
-0.005	0.089	0.091	0.057	0.074	0.125	-0.001	0.087	0.082	-0.0028	0.0072	37.009
-0.004	0.093	0.095	0.060	0.079	0.130	0.000	0.089	0.087	-0.0029	0.0078	41.511
-0.003	0.099	0.105	0.062	0.079	0.145	-0.003	0.091	0.089	-0.0028	0.0081	41.500
-0.002	0.117	0.125	0.065	0.084	0.171	-0.006	0.093	0.092	-0.0028	0.0086	42.974
-0.001	0.136	0.138	0.070	0.086	0.196	0.000	0.097	0.096	-0.0029	0.0093	43.962
0.000	0.150	0.159	0.071	0.092	0.223	-0.005	0.098	0.095	-0.0032	0.0093	39.008
0.001	0.175	0.181	0.074	0.093	0.254	-0.001	0.104	0.095	-0.0030	0.0100	29.486
0.002	0.200	0.190	0.080	0.094	0.280	0.008	0.109	0.096	-0.0030	0.0106	24.218
0.003	0.226	0.219	0.083	0.106	0.316	-0.002	0.110	0.098	-0.0032	0.0109	26.924

Table 14. Section S5 in coincidence mode. Measurements in water. File Test_23_07_02_S5_acqua_CM.txt

measured data					*transformed data*						
z (m)	V_1 (m/s)	V_2 (m/s)	V_{1rms} (m/s)	V_{2rms} (m/s)	U (m/s)	V (m/s)	U'_{rms} (m/s)	V'_{rms} (m/s)	$(U'V')_{rms}$ (m^2/s^2)	k (m^2/s^2)	ϕ (°)
-0.080	-0.018	-0.042	0.038	0.089	-0.058	0.009	0.080	0.086	-0.0034	0.0069	-37.126
-0.070	-0.042	-0.035	0.043	0.052	-0.053	0.011	0.074	0.075	-0.0009	0.0056	-44.247
-0.060	-0.026	-0.034	0.043	0.053	-0.048	0.007	0.075	0.076	-0.0012	0.0058	-41.111
-0.050	-0.013	-0.037	0.047	0.050	-0.038	0.009	0.078	0.073	-0.0014	0.0057	31.330
-0.040	-0.018	-0.040	0.049	0.058	-0.036	0.019	0.076	0.076	-0.0012	0.0058	42.866
-0.035	-0.016	-0.030	0.042	0.056	-0.025	0.006	0.079	0.076	-0.0019	0.0060	38.376
-0.035	-0.003	0.004	0.044	0.072	-0.007	0.001	0.087	0.081	-0.0021	0.0070	32.444
-0.030	-0.011	-0.030	0.040	0.065	-0.031	0.013	0.077	0.072	-0.0017	0.0056	33.182
-0.025	-0.014	-0.003	0.043	0.062	-0.008	0.003	0.083	0.077	-0.0015	0.0064	27.378
-0.020	0.031	0.026	0.049	0.067	0.032	-0.006	0.083	0.076	-0.0013	0.0064	25.297
-0.018	0.016	0.016	0.058	0.067	0.017	0.000	0.088	0.083	-0.0021	0.0073	33.817
-0.016	0.012	0.015	0.050	0.078	0.020	0.003	0.088	0.082	-0.0022	0.0072	33.313
-0.014	0.020	0.025	0.058	0.074	0.016	0.002	0.088	0.082	-0.0022	0.0072	32.267
-0.012	0.045	0.056	0.061	0.073	0.065	-0.011	0.092	0.087	-0.0019	0.0081	32.890
-0.011	0.049	0.055	0.065	0.079	0.066	-0.009	0.095	0.088	-0.0018	0.0084	27.627
-0.009	0.045	0.034	0.062	0.077	0.052	-0.002	0.095	0.092	-0.0024	0.0087	37.235
-0.008	0.058	0.062	0.065	0.094	0.077	-0.006	0.104	0.096	-0.0024	0.0100	27.979
-0.007	0.051	0.052	0.069	0.080	0.066	0.001	0.096	0.094	-0.0025	0.0091	41.556
-0.006	0.064	0.056	0.072	0.089	0.079	-0.002	0.101	0.102	-0.0025	0.0103	-42.619
-0.005	0.068	0.064	0.081	0.094	0.097	0.001	0.106	0.111	-0.0024	0.0117	-33.254
-0.004	0.096	0.067	0.078	0.097	0.110	0.008	0.105	0.106	-0.0024	0.0112	-42.704
-0.003	0.124	0.094	0.083	0.114	0.150	0.008	0.118	0.121	-0.0030	0.0143	-39.212
-0.002	0.116	0.102	0.088	0.115	0.169	0.006	0.118	0.112	-0.0030	0.0132	33.665
-0.001	0.152	0.145	0.097	0.112	0.200	0.012	0.122	0.118	-0.0030	0.0145	36.608
0.000	0.178	0.102	0.091	0.106	0.230	0.026	0.120	0.125	-0.0037	0.0150	-35.663
0.001	0.171	0.186	0.108	0.123	0.301	0.005	0.145	0.123	-0.0018	0.0181	8.509

Table 15. Section S6 in coincidence mode. Measurements in water. File Test_24_07_02_S6_acqua_CM.txt

measured data					*transformed data*						
z (m)	V_1 (m/s)	V_2 (m/s)	V_{1rms} (m/s)	V_{2rms} (m/s)	*U* (m/s)	*V* (m/s)	U'_{rms} (m/s)	V'_{rms} (m/s)	$(U'V')_{rms}$ (m^2/s^2)	*k* (m^2/s^2)	ϕ (°)
-0.070	-0.030	-0.043	0.064	0.084	-0.055	0.010	0.135	0.133	-0.0057	0.0179	42.665
-0.060	-0.024	-0.045	0.064	0.085	-0.053	0.012	0.130	0.129	-0.0047	0.0167	42.815
-0.050	-0.028	-0.045	0.063	0.090	-0.055	0.015	0.136	0.134	-0.0067	0.0182	43.004
-0.040	-0.017	-0.034	0.063	0.088	-0.039	0.013	0.137	0.135	-0.0067	0.0185	43.556
-0.035	-0.019	-0.038	0.061	0.089	-0.047	0.014	0.137	0.134	-0.0071	0.0183	42.462
-0.030	-0.010	-0.026	0.061	0.085	-0.028	0.011	0.133	0.133	-0.0064	0.0177	-44.910
-0.025	-0.011	-0.035	0.080	0.106	-0.037	0.014	0.165	0.163	-0.0087	0.0269	42.889
-0.020	-0.019	-0.031	0.065	0.086	-0.040	0.011	0.133	0.131	-0.0053	0.0175	42.389
-0.018	-0.012	-0.028	0.065	0.091	-0.034	0.011	0.137	0.136	-0.0066	0.0186	42.944
-0.016	-0.015	-0.028	0.065	0.093	-0.035	0.011	0.138	0.137	-0.0069	0.0190	43.286
-0.014	-0.010	-0.026	0.070	0.090	-0.028	0.008	0.139	0.137	-0.0062	0.0191	42.732
-0.012	-0.004	-0.015	0.069	0.090	-0.017	0.008	0.136	0.135	-0.0060	0.0183	43.221
-0.010	-0.002	-0.013	0.067	0.097	-0.012	0.008	0.143	0.141	-0.0081	0.0202	43.604
-0.009	-0.002	-0.010	0.068	0.100	-0.012	0.007	0.144	0.142	-0.0084	0.0205	43.033
-0.008	0.005	-0.004	0.070	0.100	0.000	0.004	0.142	0.140	-0.0073	0.0199	43.109
-0.007	0.009	-0.001	0.071	0.096	0.000	0.006	0.139	0.137	-0.0064	0.0191	43.361
-0.006	0.011	0.003	0.076	0.106	0.005	0.006	0.145	0.143	-0.0079	0.0208	42.874
-0.005	0.016	0.007	0.075	0.103	0.013	0.004	0.141	0.141	-0.0066	0.0198	-44.662
-0.004	0.026	0.016	0.079	0.108	0.026	0.005	0.144	0.144	-0.0071	0.0208	-44.664
-0.003	0.041	0.031	0.090	0.111	0.047	0.005	0.144	0.149	-0.0061	0.0215	-38.026
-0.002	0.065	0.046	0.095	0.121	0.070	0.010	0.148	0.158	-0.0066	0.0234	-33.588
-0.001	0.087	0.067	0.099	0.125	0.105	0.008	0.150	0.159	-0.0062	0.0240	-33.004
0.000	0.114	0.076	0.108	0.131	0.136	0.016	0.155	0.161	-0.0061	0.0251	-36.314
0.001	0.149	0.106	0.094	0.130	0.151	0.032	0.152	0.162	-0.0060	0.0248	-30.584

Table 16. Section S0 in NON coincidence mode. Measurements in water. File Test_22_07_02_S0_acqua_NCM.txt

measured data				
z (m)	V_1 (m/s)	V_2 (m/s)	V_{1rms} (m/s)	V_{2rms} (m/s)
-0.080	-0.029	-0.031	0.035	0.053
-0.070	-0.025	-0.027	0.036	0.056
-0.060	-0.009	0.001	0.040	0.062
-0.050	-0.007	-0.005	0.040	0.060
-0.040	0.003	0.007	0.041	0.062
-0.035	0.011	0.021	0.042	0.063
-0.030	0.013	0.023	0.045	0.067
-0.025	0.017	0.023	0.045	0.067
-0.020	0.028	0.034	0.047	0.066
-0.018	0.028	0.034	0.048	0.069
-0.016	0.035	0.045	0.049	0.070
-0.014	0.037	0.042	0.051	0.070
-0.012	0.044	0.051	0.051	0.072
-0.010	0.051	0.057	0.053	0.073
-0.009	0.060	0.065	0.068	0.092
-0.008	0.067	0.073	0.069	0.093
-0.007	0.053	0.055	0.058	0.077
-0.006	0.059	0.062	0.059	0.078
-0.005	0.066	0.070	0.061	0.079
-0.004	0.068	0.074	0.065	0.082
-0.003	0.087	0.091	0.066	0.083
-0.002	0.099	0.102	0.070	0.087
-0.001	0.113	0.110	0.076	0.093
0.000	0.129	0.138	0.076	0.092
0.001	0.147	0.155	0.078	0.097
0.002	0.164	0.172	0.082	0.100
0.003	0.187	0.197	0.084	0.102

0.004	0.202	0.211	0.086	0.106
0.005	0.227	0.223	0.083	0.103

Table 17. Section S3 in NON coincidence mode. Measurements in water. File Test_23_07_02_S3_acqua_NCM.txt

measured data				
z (m)	V_1 (m/s)	V_2 (m/s)	V_{1rms} (m/s)	V_{2rms} (m/s)
-0.080	-0.037	-0.038	0.034	0.052
-0.070	-0.033	-0.031	0.037	0.054
-0.060	-0.022	-0.022	0.037	0.056
-0.050	-0.012	-0.007	0.040	0.060
-0.040	0.008	0.014	0.043	0.066
-0.035	0.013	0.022	0.043	0.063
-0.030	0.020	0.022	0.044	0.064
-0.025	0.032	0.044	0.047	0.069
-0.020	0.039	0.044	0.047	0.068
-0.018	0.042	0.048	0.048	0.068
-0.016	0.050	0.059	0.048	0.069
-0.014	0.068	0.080	0.061	0.087
-0.012	0.054	0.056	0.050	0.071
-0.010	0.061	0.067	0.054	0.076
-0.009	0.067	0.072	0.055	0.076
-0.008	0.072	0.075	0.054	0.076
-0.007	0.076	0.078	0.056	0.078
-0.006	0.078	0.080	0.058	0.079
-0.005	0.085	0.088	0.059	0.079
-0.004	0.089	0.090	0.062	0.083
-0.003	0.098	0.103	0.065	0.085
-0.002	0.114	0.122	0.069	0.087
-0.001	0.133	0.132	0.072	0.092
0.000	0.149	0.157	0.073	0.094
0.001	0.172	0.175	0.076	0.099
0.002	0.196	0.193	0.078	0.098
0.003	0.221	0.217	0.086	0.103

Table 18. Section S5 in NON coincidence mode. Measurements in water. File Test_23_07_02_S5_acqua_NCM.txt

measured data				
z (m)	V_1 (m/s)	V_2 (m/s)	V_{1rms} (m/s)	V_{2rms} (m/s)
-0.080	-0.032	-0.039	0.048	0.074
-0.070	-0.032	-0.040	0.048	0.062
-0.060	-0.025	-0.035	0.049	0.063
-0.050	-0.017	-0.032	0.052	0.063
-0.040	-0.013	-0.026	0.053	0.067
-0.035	-0.012	-0.020	0.049	0.069
-0.035	-0.004	-0.012	0.051	0.076
-0.030	-0.007	-0.024	0.065	0.090
-0.025	0.001	-0.008	0.055	0.073
-0.020	0.020	0.024	0.057	0.076
-0.018	0.014	0.012	0.056	0.076
-0.016	0.017	0.013	0.056	0.077
-0.014	0.018	0.015	0.059	0.080
-0.012	0.040	0.050	0.063	0.083
-0.011	0.040	0.048	0.064	0.085
-0.009	0.034	0.031	0.066	0.085
-0.008	0.054	0.057	0.069	0.090
-0.007	0.049	0.047	0.070	0.091
-0.006	0.054	0.050	0.074	0.095
-0.005	0.068	0.066	0.079	0.099
-0.004	0.084	0.075	0.084	0.101
-0.003	0.103	0.086	0.096	0.108
-0.002	0.122	0.106	0.098	0.111
-0.001	0.150	0.138	0.102	0.122
0.000	0.171	0.147	0.095	0.120
0.001	0.201	0.178	0.124	0.133

Table 19. Section S6 in NON coincidence mode. Measurements in water. File Test_24_07_02_S6_acqua_NCM.txt

measured data				
z (m)	V_1 (m/s)	V_2 (m/s)	V_{1rms} (m/s)	V_{2rms} (m/s)
-0.070	-0.029	-0.043	0.082	0.112
-0.060	-0.025	-0.044	0.082	0.111
-0.050	-0.026	-0.046	0.081	0.115
-0.040	-0.017	-0.035	0.082	0.117
-0.035	-0.020	-0.038	0.083	0.120
-0.030	-0.010	-0.025	0.082	0.118
-0.025	-0.013	-0.034	0.106	0.150
-0.020	-0.018	-0.032	0.085	0.121
-0.018	-0.013	-0.028	0.083	0.119
-0.016	-0.015	-0.030	0.084	0.116
-0.014	-0.011	-0.025	0.087	0.117
-0.012	-0.003	-0.015	0.087	0.120
-0.010	-0.001	-0.012	0.087	0.126
-0.009	-0.002	-0.010	0.087	0.129
-0.008	0.006	-0.002	0.089	0.129
-0.007	0.008	0.000	0.090	0.126
-0.006	0.011	0.003	0.093	0.132
-0.005	0.016	0.007	0.092	0.130
-0.004	0.025	0.017	0.097	0.135
-0.003	0.041	0.030	0.105	0.139
-0.002	0.061	0.043	0.112	0.158
-0.001	0.086	0.062	0.117	0.197
0.000	0.106	0.081	0.121	0.213
0.001	0.126	0.091	0.116	0.323

Table 20. Section S0 in coincidence mode. Measurements in air on water. File Test_18_07_02_S0_aria_CM.txt

measured data					*transformed data*						
z (m)	V_1 (m/s)	V_2 (m/s)	V_{1rms} (m/s)	V_{2rms} (m/s)	U (m/s)	V (m/s)	U'_{rms} (m/s)	V'_{rms} (m/s)	$(U'V')_{rms}$ (m^2/s^2)	k (m^2/s^2)	ϕ (°)
0.005	4.428	4.901	1.473	1.813	6.671	-0.404	2.101	1.115	-0.6505	2.8292	5.795
0.006	4.404	4.564	1.398	1.869	6.758	-0.187	1.883	1.124	-0.6858	2.4046	8.360
0.007	4.652	4.762	1.391	1.884	7.048	-0.170	1.836	1.184	-0.7087	2.3858	9.910
0.008	4.948	5.091	1.301	1.782	7.468	-0.197	1.753	1.108	-0.6574	2.1502	9.809
0.009	5.143	5.260	1.280	1.788	7.727	-0.192	1.731	1.086	-0.6487	2.0887	9.824
0.010	5.314	5.431	1.177	1.685	7.911	-0.181	1.649	1.052	-0.6108	1.9122	10.378
0.012	5.644	5.813	1.146	1.616	8.380	-0.192	1.582	1.015	-0.5740	1.7673	10.644
0.015	6.032	6.138	1.008	1.500	8.765	-0.181	1.501	0.897	-0.5100	1.5284	9.696
0.016	6.137	6.229	0.984	1.451	8.959	-0.137	1.411	0.890	-0.4747	1.3912	10.818
0.018	6.381	6.490	0.944	1.368	9.284	-0.132	1.349	0.835	-0.4144	1.2589	10.117
0.020	6.579	6.689	0.880	1.280	9.540	-0.123	1.257	0.781	-0.3584	1.0945	10.147
0.025	7.008	7.110	0.724	1.051	10.076	-0.097	1.021	0.667	-0.2482	0.7441	11.261
0.030	7.326	7.386	0.576	0.831	10.457	-0.058	0.788	0.555	-0.1486	0.4647	12.672
0.035	7.549	7.598	0.459	0.648	10.737	-0.043	0.605	0.474	-0.0883	0.2949	16.012
0.040	7.711	7.739	0.382	0.533	10.943	-0.022	0.500	0.430	-0.0726	0.2172	23.969
0.050	7.715	7.691	0.210	0.264	10.894	0.023	0.257	0.264	-0.0175	0.0680	-39.276
0.060	7.892	7.895	0.172	0.230	11.163	0.004	0.226	0.225	-0.0165	0.0508	44.222
0.060	7.734	7.713	0.159	0.206	10.921	0.022	0.210	0.214	-0.0143	0.0451	-41.780
0.070	7.743	7.734	0.143	0.197	10.942	0.014	0.206	0.204	-0.0155	0.0421	43.287
0.080	7.835	7.818	0.146	0.213	11.067	0.018	0.223	0.200	-0.0184	0.0449	31.164

Table 21. Section S1 in coincidence mode. Measurements in air on water. File Test_10_07_02_S1_aria_CM.txt

measured data					*transformed data*						
z (m)	V_1 (m/s)	V_2 (m/s)	V_{1rms} (m/s)	V_{2rms} (m/s)	U (m/s)	V (m/s)	U'_{rms} (m/s)	V'_{rms} (m/s)	$(U'V')_{rms}$ (m^2/s^2)	k (m^2/s^2)	ϕ (°)
0.000	2.335	3.010	1.596	2.136	3.741	-0.261	2.543	1.164	-0.9531	3.9099	5.283
0.001	2.366	2.996	1.780	2.186	4.658	-0.266	2.586	1.032	-1.0663	3.8770	5.367
0.002	4.073	3.848	1.190	1.601	5.951	-0.172	1.825	1.060	-0.6099	2.2279	7.720
0.003	4.014	4.201	1.479	1.877	6.279	-0.196	1.977	1.097	-0.7442	2.5555	7.691
0.004	4.395	4.352	1.656	2.286	6.384	-0.230	2.240	1.004	-0.5207	3.0122	3.701
0.005	4.937	5.003	1.189	1.758	7.262	-0.195	1.844	1.068	-0.6356	2.2702	7.863
0.006	5.158	5.221	1.144	1.647	7.581	-0.140	1.665	1.048	-0.6211	1.9342	10.179
0.007	5.317	5.432	1.157	1.607	7.848	-0.153	1.619	0.998	-0.5608	1.8091	9.520
0.008	5.558	5.695	1.120	1.579	8.184	-0.175	1.561	0.953	-0.5460	1.6727	9.835
0.009	5.722	5.888	1.064	1.537	8.420	-0.187	1.532	0.949	-0.5274	1.6243	10.006
0.012	6.179	6.371	0.938	1.372	9.020	-0.201	1.377	0.807	-0.4013	1.2730	8.939
0.014	6.357	6.600	0.880	1.293	9.270	-0.230	1.293	0.787	-0.3707	1.1454	9.695
0.016	6.712	7.004	0.715	1.004	9.756	-0.219	1.022	0.635	-0.2195	0.7241	9.429
0.018	6.914	7.178	0.623	0.885	10.011	-0.199	0.896	0.580	-0.1836	0.5699	10.739
0.020	6.980	7.307	0.532	0.753	10.129	-0.254	0.748	0.500	-0.1009	0.4048	9.049
0.025	7.474	7.575	0.367	0.518	10.649	-0.066	0.504	0.419	-0.0536	0.2146	17.235
0.030	7.613	7.713	0.277	0.339	10.841	-0.063	0.332	0.325	-0.0202	0.1079	38.126
0.035	7.688	7.768	0.248	0.286	10.931	-0.047	0.288	0.288	-0.0112	0.0829	44.208
0.040	7.745	7.841	0.228	0.249	11.018	-0.054	0.264	0.269	-0.0078	0.0712	-35.906
0.050	7.691	7.775	0.216	0.211	10.934	-0.050	0.242	0.243	-0.0012	0.0587	-30.515
0.050	7.509	7.697	0.217	0.197	10.753	-0.120	0.247	0.232	0.0004	0.0574	-1.391
0.050	7.746	7.831	0.232	0.248	11.014	-0.048	0.262	0.274	-0.0074	0.0720	-24.919
0.060	7.583	7.731	0.206	0.192	10.824	-0.097	0.231	0.232	-0.0004	0.0534	-18.594
0.060	7.543	7.690	0.214	0.198	10.771	-0.093	0.239	0.237	0.0002	0.0569	-4.484
0.060	7.848	7.873	0.196	0.249	11.116	-0.005	0.239	0.266	-0.0166	0.0638	-25.087
0.070	7.652	7.758	0.188	0.192	10.899	-0.062	0.225	0.221	-0.0030	0.0499	29.946
0.070	7.710	7.818	0.202	0.200	10.982	-0.067	0.231	0.228	-0.0028	0.0526	30.736

0.080	7.796	7.871	0.184	0.211	11.077	-0.041	0.223	0.232	-0.0088	0.0518	-32.603

Table 22. Section S2 in coincidence mode. Measurements in air on water. File Test_12_07_02_S2_aria_CM.txt

measured data					*transformed data*						
z (m)	V_1 (m/s)	V_2 (m/s)	V_{1rms} (m/s)	V_{2rms} (m/s)	U (m/s)	V (m/s)	U'_{rms} (m/s)	V'_{rms} (m/s)	$(U'V')_{rms}$ (m^2/s^2)	k (m^2/s^2)	ϕ (°)
0.001	2.708	3.463	1.553	1.071	5.131	-0.595	1.465	0.215	0.1724	1.0957	-2.348
0.002	3.595	3.860	1.245	1.720	5.367	-0.268	1.937	1.145	-0.8060	2.5306	9.138
0.003	3.288	3.216	1.585	2.308	5.337	-0.189	2.078	1.203	-0.6743	2.8825	6.607
0.004	3.748	3.953	1.536	1.900	5.658	-0.375	2.404	1.142	-0.6445	3.5421	4.098
0.004	3.914	4.274	1.456	2.080	6.035	-0.290	2.250	1.188	-1.0727	3.2361	8.188
0.005	4.214	4.339	1.691	2.135	6.428	-0.224	2.309	1.093	-0.7141	3.2623	4.899
0.007	4.856	5.115	1.470	1.860	7.418	-0.210	1.891	1.127	-0.6719	2.4234	8.118
0.008	5.245	5.307	1.319	1.812	7.760	-0.144	1.793	1.113	-0.6386	2.2263	8.965
0.008	5.216	5.357	1.288	1.755	7.790	-0.170	1.734	1.117	-0.6149	2.1275	9.625
0.009	5.419	5.525	1.223	1.724	7.971	-0.150	1.745	1.093	-0.6533	2.1204	9.726
0.010	5.606	5.762	1.170	1.642	8.245	-0.161	1.634	1.056	-0.6065	1.8925	10.660
0.011	5.808	5.980	1.107	1.571	8.553	-0.184	1.536	0.998	-0.5376	1.6781	10.762
0.014	6.347	6.526	0.990	1.408	9.275	-0.178	1.368	0.880	-0.4054	1.3232	10.128
0.015	6.489	6.685	0.893	1.290	9.436	-0.174	1.271	0.810	-0.3621	1.1351	10.347
0.017	6.678	6.858	0.836	1.206	9.690	-0.158	1.176	0.762	-0.3104	0.9821	10.565
0.019	6.878	7.070	0.792	1.112	9.942	-0.153	1.100	0.720	-0.2662	0.8634	10.530
0.021	7.077	7.239	0.711	0.992	10.191	-0.139	0.965	0.646	-0.1887	0.6742	10.099
0.026	7.380	7.547	0.514	0.670	10.580	-0.122	0.659	0.510	-0.0774	0.3473	11.939
0.031	7.571	7.702	0.384	0.468	10.815	-0.090	0.467	0.397	-0.0388	0.1880	16.352
0.036	7.528	7.664	0.275	0.317	10.748	-0.090	0.318	0.310	-0.0145	0.0986	35.678
0.041	7.530	7.646	0.229	0.265	10.734	-0.075	0.281	0.281	-0.0149	0.0787	-44.985
0.051	7.518	7.648	0.176	0.211	10.725	-0.088	0.230	0.223	-0.0095	0.0511	35.751
0.061	7.485	7.630	0.162	0.202	10.688	-0.097	0.220	0.212	-0.0099	0.0466	34.990
0.071	7.473	7.626	0.163	0.195	10.676	-0.104	0.217	0.204	-0.0096	0.0443	29.742
0.081	7.462	7.622	0.147	0.189	10.665	-0.109	0.211	0.202	-0.0098	0.0427	34.328

Table 23. Section S3 in coincidence mode. Measurements in air on water. File Test_13_07_02_S3_aria_CM.txt

measured data					*transformed data*						
z (m)	V_1 (m/s)	V_2 (m/s)	V_{1rms} (m/s)	V_{2rms} (m/s)	U (m/s)	V (m/s)	U'_{rms} (m/s)	V'_{rms} (m/s)	$(U'V')_{rms}$ (m^2/s^2)	k (m^2/s^2)	ϕ (°)
0.001	2.561	4.152	1.353	1.731	5.600	-0.783	2.318	0.656	-0.7301	2.9021	4.202
0.002	3.295	4.675	1.360	2.747	6.171	-0.920	2.432	1.239	-2.1769	3.7243	13.219
0.003	4.112	4.568	1.701	2.032	5.740	-0.434	2.877	0.959	-1.1632	4.5998	4.491
0.004	4.648	5.238	1.163	1.762	7.029	-0.428	1.997	1.221	-0.7371	2.7397	8.217
0.005	4.692	5.062	1.661	1.989	7.148	-0.239	2.341	1.133	-0.7430	3.3820	5.019
0.006	5.117	5.385	1.370	1.914	7.784	-0.312	1.891	1.161	-0.7601	2.4616	9.423
0.007	5.423	5.470	1.282	1.969	8.115	-0.247	1.787	1.097	-0.6353	2.1981	8.848
0.008	5.639	5.879	1.253	1.703	8.451	-0.269	1.694	1.069	-0.5521	2.0051	8.866
0.009	6.000	6.258	1.190	1.647	8.945	-0.274	1.550	1.003	-0.4919	1.7038	9.712
0.010	6.232	6.472	1.046	1.518	9.187	-0.252	1.452	0.932	-0.4357	1.4891	9.671
0.013	6.636	6.899	0.872	1.262	9.698	-0.233	1.213	0.780	-0.2880	1.0402	9.217
0.014	6.737	6.917	0.850	1.225	9.774	-0.189	1.176	0.757	-0.2816	0.9777	9.598
0.016	6.993	7.233	0.750	1.022	10.145	-0.206	0.996	0.679	-0.1767	0.7269	9.199
0.018	7.145	7.354	0.677	0.928	10.318	-0.175	0.886	0.634	-0.1425	0.5934	10.191
0.020	7.288	7.475	0.576	0.776	10.476	-0.149	0.746	0.564	-0.1032	0.4378	11.701
0.025	7.478	7.623	0.414	0.531	10.693	-0.104	0.502	0.439	-0.0429	0.2222	17.882
0.030	7.586	7.709	0.293	0.370	10.821	-0.082	0.374	0.369	-0.0408	0.1380	42.194
0.035	7.585	7.682	0.246	0.286	10.798	-0.063	0.293	0.292	-0.0127	0.0855	43.251
0.040	7.600	7.704	0.221	0.268	10.825	-0.071	0.271	0.265	-0.0106	0.0719	37.436
0.050	7.570	7.680	0.194	0.230	10.784	-0.073	0.252	0.231	-0.0090	0.0583	20.563
0.060	7.531	7.622	0.164	0.209	10.715	-0.060	0.221	0.207	-0.0115	0.0458	31.106
0.070	7.481	7.567	0.141	0.205	10.640	-0.057	0.215	0.206	-0.0141	0.0443	36.922
0.080	7.463	7.550	0.132	0.208	10.615	-0.058	0.217	0.206	-0.0144	0.0447	35.792

Table 24. Section S4 in coincidence mode. Measurements in air on water. File Test_18_07_02_S4_aria_CM.txt

measured data					*transformed data*						
z (m)	V_1 (m/s)	V_2 (m/s)	V_{1rms} (m/s)	V_{2rms} (m/s)	U (m/s)	V (m/s)	U'_{rms} (m/s)	V'_{rms} (m/s)	$(U'V')_{rms}$ (m^2/s^2)	k (m^2/s^2)	ϕ (°)
0.003	3.688	4.320	1.748	1.963	5.984	-0.201	2.300	1.153	-0.8781	3.3099	6.248
0.004	4.248	4.679	1.554	1.987	6.643	-0.229	2.143	1.179	-0.8600	2.9913	7.513
0.005	4.626	4.891	1.510	2.071	6.990	-0.209	2.083	1.281	-0.9237	2.9906	9.445
0.006	5.165	5.470	1.345	1.785	7.702	-0.230	1.856	1.102	-0.7023	2.3289	8.747
0.007	5.440	5.672	1.288	1.778	8.059	-0.171	1.804	1.074	-0.7358	2.2047	9.648
0.008	5.683	5.970	1.147	1.646	8.398	-0.216	1.662	1.050	-0.6483	1.9318	10.664
0.009	5.889	6.186	1.122	1.607	8.686	-0.246	1.624	0.987	-0.6165	1.8062	10.167
0.010	6.105	6.356	1.035	1.507	8.957	-0.221	1.509	0.910	-0.5406	1.5521	10.228
0.012	6.423	6.724	0.943	1.335	9.415	-0.243	1.336	0.837	-0.4097	1.2421	10.349
0.014	6.811	7.058	0.772	1.124	9.845	-0.184	1.121	0.706	-0.2880	0.8777	10.406
0.017	7.214	7.426	0.539	0.771	10.387	-0.156	0.739	0.548	-0.1438	0.4233	15.185
0.018	7.286	7.452	0.522	0.731	10.442	-0.136	0.701	0.530	-0.1118	0.3857	13.974
0.020	7.397	7.534	0.432	0.573	10.569	-0.107	0.549	0.458	-0.0675	0.2555	18.144
0.025	7.499	7.643	0.273	0.334	10.712	-0.101	0.325	0.326	-0.0262	0.1061	-44.626
0.030	7.511	7.666	0.237	0.276	10.732	-0.113	0.279	0.290	-0.0194	0.0810	-36.358
0.035	7.531	7.689	0.210	0.235	10.756	-0.111	0.253	0.262	-0.0160	0.0663	-36.598
0.040	7.568	7.688	0.195	0.205	10.770	-0.087	0.246	0.246	-0.0087	0.0605	44.730
0.050	7.603	7.660	0.190	0.186	10.763	-0.052	0.230	0.233	-0.0116	0.0535	-41.185
0.060	7.538	7.659	0.201	0.180	10.711	-0.098	0.228	0.230	-0.0099	0.0525	-43.118
0.070	7.502	7.686	0.168	0.212	10.733	-0.132	0.242	0.234	-0.0204	0.0566	39.299
0.080	7.443	7.621	0.143	0.183	10.643	-0.123	0.217	0.216	-0.0194	0.0470	44.216

Table 25. Section S5 in coincidence mode. Measurements in air on water. File Test_19_07_02_S5_aria_CM.txt

measured data					*transformed data*						
z (m)	V_1 (m/s)	V_2 (m/s)	V_{1rms} (m/s)	V_{2rms} (m/s)	U (m/s)	V (m/s)	U'_{rms} (m/s)	V'_{rms} (m/s)	$(U'V')_{rms}$ (m^2/s^2)	k (m^2/s^2)	ϕ (°)
0.003	3.787	4.245	1.664	2.468	6.181	-0.492	2.488	1.299	-1.3605	3.9376	8.409
0.004	4.113	4.914	1.758	2.355	6.769	-0.561	2.538	1.210	-1.2180	3.9532	6.877
0.005	4.654	5.313	1.651	2.097	7.414	-0.403	2.257	1.252	-1.0804	3.3310	8.518
0.006	5.187	5.742	1.643	2.017	8.137	-0.384	2.020	1.107	-0.8270	2.6524	8.080
0.007	5.628	6.098	1.393	1.962	8.518	-0.406	1.984	1.086	-0.8435	2.5574	8.502
0.008	5.889	6.263	1.351	1.879	8.839	-0.348	1.855	1.048	-0.7069	2.2701	8.397
0.009	6.223	6.563	1.317	1.749	9.187	-0.309	1.744	1.015	-0.6251	2.0351	8.632
0.010	6.538	6.821	1.101	1.638	9.546	-0.304	1.527	0.951	-0.5058	1.6181	9.761
0.012	6.915	7.167	0.954	1.257	10.044	-0.230	1.200	0.794	-0.2624	1.0356	8.986
0.014	7.206	7.428	0.713	0.919	10.375	-0.159	0.883	0.674	-0.1592	0.6171	13.068
0.016	7.446	7.509	0.500	0.640	10.556	-0.063	0.621	0.544	-0.0662	0.3403	18.215
0.018	7.684	7.690	0.498	0.657	10.843	-0.058	0.592	0.544	-0.0647	0.3235	24.935
0.020	7.691	7.707	0.422	0.501	10.867	-0.047	0.482	0.478	-0.0361	0.2303	41.678
0.025	7.649	7.722	0.316	0.343	10.853	-0.065	0.351	0.351	-0.0147	0.1232	44.650
0.030	7.754	7.880	0.302	0.313	11.042	-0.094	0.318	0.336	-0.0107	0.1070	-21.219
0.035	7.756	7.893	0.260	0.276	11.048	-0.101	0.289	0.297	-0.0120	0.0859	-33.465
0.040	7.813	7.872	0.219	0.243	11.077	-0.039	0.253	0.264	-0.0119	0.0668	-31.480
0.050	7.795	7.804	0.213	0.212	10.992	-0.022	0.234	0.244	-0.0060	0.0569	-25.656
0.060	7.688	7.860	0.207	0.222	10.983	-0.119	0.260	0.227	-0.0099	0.0594	15.843
0.070	7.493	7.766	0.186	0.204	10.790	-0.199	0.237	0.224	-0.0104	0.0531	30.151
0.080	7.571	7.735	0.189	0.203	10.817	-0.113	0.230	0.216	-0.0103	0.0499	29.261

Table 26. Section S6 in coincidence mode. Measurements in air on water. File Test_20_07_02_S6_aria_CM.txt

measured data					*transformed data*						
z (m)	V_1 (m/s)	V_2 (m/s)	V_{1rms} (m/s)	V_{2rms} (m/s)	U (m/s)	V (m/s)	U'_{rms} (m/s)	V'_{rms} (m/s)	$(U'V')_{rms}$ (m^2/s^2)	k (m^2/s^2)	ϕ (°)
0.003	5.323	5.556	1.407	1.802	7.843	-0.187	2.099	0.952	-0.6534	2.6552	5.290
0.004	5.628	5.902	1.764	1.930	8.460	-0.049	2.025	0.925	-0.6310	2.4792	5.500
0.005	5.381	6.256	2.615	1.637	8.954	0.054	1.878	0.819	-0.4362	2.0980	4.342
0.005	6.498	6.485	0.980	1.349	9.223	0.023	1.392	0.840	-0.4242	1.3212	9.510
0.006	6.842	6.597	0.859	1.271	9.552	0.141	1.267	0.812	-0.3713	1.1321	10.730
0.007	7.140	6.862	0.721	1.069	9.890	0.168	1.041	0.720	-0.2789	0.8015	13.140
0.007	7.174	6.905	0.616	0.960	9.943	0.178	0.895	0.689	-0.2319	0.6383	17.717
0.008	7.401	7.094	0.527	0.752	10.202	0.202	0.703	0.584	-0.1402	0.4180	21.228
0.009	7.536	7.146	0.482	0.688	10.343	0.237	0.626	0.551	-0.0997	0.3479	24.338
0.010	7.585	7.216	0.431	0.598	10.420	0.238	0.546	0.513	-0.0791	0.2804	33.197
0.013	7.686	7.350	0.358	0.435	10.599	0.240	0.419	0.411	-0.0365	0.1726	39.830
0.014	7.548	7.257	0.318	0.385	10.460	0.232	0.377	0.375	-0.0276	0.1411	43.431
0.016	7.596	7.223	0.279	0.334	10.465	0.270	0.338	0.324	-0.0172	0.1097	30.876
0.018	7.697	7.345	0.271	0.328	10.607	0.255	0.336	0.316	-0.0198	0.1063	28.348
0.020	7.690	7.321	0.256	0.293	10.595	0.254	0.312	0.289	-0.0137	0.0903	22.648
0.020	7.690	7.316	0.259	0.298	10.585	0.260	0.315	0.294	-0.0146	0.0926	24.578
0.025	7.721	7.353	0.227	0.259	10.644	0.255	0.281	0.263	-0.0125	0.0742	25.780
0.030	7.627	7.320	0.215	0.235	10.557	0.218	0.265	0.240	-0.0100	0.0638	19.183
0.035	7.615	7.366	0.217	0.235	10.573	0.182	0.265	0.238	-0.0099	0.0635	17.773
0.040	7.517	7.324	0.202	0.218	10.483	0.136	0.246	0.227	-0.0102	0.0560	24.120
0.050	7.414	7.293	0.189	0.213	10.389	0.090	0.243	0.217	-0.0108	0.0531	20.745
0.060	7.435	7.361	0.186	0.222	10.457	0.057	0.255	0.220	-0.0129	0.0568	18.990
0.070	7.316	7.295	0.188	0.227	10.344	0.022	0.249	0.221	-0.0147	0.0556	24.148
0.080	7.301	7.349	0.180	0.227	10.363	-0.015	0.253	0.214	-0.0168	0.0548	21.172

Table 27. Section S7 in coincidence mode. Measurements in air on water. File Test_21_07_02_S7_aria_CM.txt

measured data					*transformed data*						
z (m)	V_1 (m/s)	V_2 (m/s)	V_{1rms} (m/s)	V_{2rms} (m/s)	U (m/s)	V (m/s)	U'_{rms} (m/s)	V'_{rms} (m/s)	$(U'V')_{rms}$ (m^2/s^2)	k (m^2/s^2)	ϕ (°)
0.000	2.520	3.271	1.673	1.964	4.962	-0.364	2.358	0.595	-0.7113	2.9566	3.891
0.001	4.415	4.568	1.295	1.782	6.812	-0.310	1.793	0.926	-0.5225	2.0356	6.251
0.002	5.918	6.454	0.731	1.046	8.843	-0.411	1.088	0.484	-0.2047	0.7087	6.083
0.003	6.476	6.890	0.514	0.729	9.495	-0.304	0.754	0.391	-0.1078	0.3608	7.278
0.004	6.776	7.126	0.380	0.522	9.847	-0.240	0.554	0.345	-0.0581	0.2129	8.590
0.005	6.947	7.261	0.325	0.426	10.053	-0.210	0.452	0.318	-0.0395	0.1529	10.437
0.006	7.066	7.336	0.303	0.374	10.176	-0.182	0.408	0.293	-0.0255	0.1262	8.800
0.007	7.095	7.404	0.295	0.358	10.240	-0.217	0.392	0.294	-0.0232	0.1200	9.588
0.008	7.101	7.392	0.272	0.330	10.229	-0.210	0.360	0.282	-0.0201	0.1046	10.860
0.009	7.123	7.398	0.264	0.325	10.256	-0.199	0.354	0.277	-0.0223	0.1011	12.377
0.010	7.185	7.391	0.258	0.318	10.289	-0.152	0.348	0.272	-0.0226	0.0975	12.744
0.012	7.261	7.448	0.257	0.302	10.386	-0.142	0.332	0.264	-0.0185	0.0899	12.332
0.014	7.192	7.463	0.272	0.321	10.331	-0.205	0.341	0.302	-0.0215	0.1037	20.444
0.016	7.085	7.423	0.237	0.277	10.252	-0.217	0.299	0.260	-0.0175	0.0784	19.419
0.018	7.093	7.409	0.233	0.264	10.268	-0.207	0.289	0.256	-0.0152	0.0743	20.166
0.020	7.104	7.399	0.227	0.256	10.268	-0.196	0.279	0.250	-0.0137	0.0701	21.268
0.025	7.208	7.383	0.203	0.248	10.309	-0.120	0.262	0.247	-0.0165	0.0649	32.612
0.030	7.242	7.346	0.202	0.224	10.313	-0.077	0.239	0.240	-0.0103	0.0574	-42.994
0.035	7.251	7.313	0.199	0.231	10.299	-0.050	0.244	0.245	-0.0126	0.0598	-43.477
0.040	7.275	7.245	0.197	0.233	10.274	0.028	0.242	0.243	-0.0129	0.0587	-43.543
0.050	7.324	7.193	0.196	0.230	10.286	0.113	0.242	0.241	-0.0134	0.0583	44.321
0.060	7.355	7.231	0.164	0.225	10.317	0.099	0.227	0.227	-0.0177	0.0515	44.648
0.070	7.381	7.251	0.174	0.212	10.344	0.098	0.224	0.223	-0.0119	0.0500	44.149
0.080	7.384	7.237	0.155	0.199	10.350	0.106	0.214	0.215	-0.0147	0.0460	-44.401

Table 28. Section S0 in NON coincidence mode. Measurements in air on water. File Test_18_07_02_S0_aria_NCM.txt

measured data				
z (m)	V_1 (m/s)	V_2 (m/s)	V_{1rms} (m/s)	V_{2rms} (m/s)
0.005	5.300	5.483	1.896	2.547
0.006	4.484	4.478	1.372	1.891
0.007	4.692	4.672	1.363	1.922
0.008	4.970	5.041	1.296	1.806
0.009	5.187	5.239	1.247	1.791
0.010	5.335	5.397	1.170	1.696
0.012	5.674	5.775	1.128	1.636
0.015	6.053	6.158	1.008	1.498
0.016	6.157	6.217	0.980	1.463
0.018	6.397	6.473	0.940	1.382
0.020	6.592	6.674	0.874	1.289
0.025	7.019	7.101	0.718	1.071
0.030	7.324	7.384	0.573	0.838
0.035	7.546	7.600	0.456	0.663
0.040	7.707	7.742	0.383	0.540
0.050	7.707	7.696	0.217	0.286
0.060	7.884	7.902	0.183	0.238
0.060	7.727	7.718	0.170	0.243
0.070	7.734	7.740	0.153	0.221
0.080	7.826	7.823	0.156	0.231

Table 29. Section S1 in NON coincidence mode. Measurements in air on water. File Test_10_07_02_S1_aria_NCM.txt

measured data				
z (m)	V_1 (m/s)	V_2 (m/s)	V_{1rms} (m/s)	V_{2rms} (m/s)
0.000	2.580	2.722	1.651	2.075
0.001	2.912	3.252	1.678	2.085
0.002	3.664	3.854	1.489	2.024
0.003	4.105	4.152	1.471	1.929
0.004	4.560	4.113	1.415	2.133
0.005	4.895	4.824	1.293	1.853
0.006	5.145	5.135	1.165	1.685
0.007	5.331	5.363	1.143	1.615
0.008	5.578	5.613	1.101	1.581
0.009	5.730	5.826	1.064	1.573
0.012	6.173	6.290	0.944	1.390
0.014	6.369	6.479	0.880	1.348
0.016	6.727	6.881	0.715	1.090
0.018	6.931	7.066	0.623	0.957
0.020	6.985	7.227	0.537	0.831
0.025	7.471	7.535	0.389	0.553
0.030	7.612	7.702	0.284	0.361
0.035	7.682	7.767	0.257	0.294
0.040	7.739	7.833	0.239	0.260
0.050	7.684	7.779	0.224	0.219
0.050	7.502	7.700	0.225	0.206
0.050	7.738	7.829	0.242	0.263
0.060	7.576	7.733	0.215	0.201
0.060	7.536	7.693	0.223	0.225
0.060	7.836	7.862	0.209	0.258
0.070	7.645	7.762	0.199	0.223
0.070	7.703	7.822	0.212	0.207

0.080	7.790	7.873	0.199	0.254

Table 30. Section S2 in NON coincidence mode. Measurements in air on water. File Test_12_07_02_S2_aria_NCM.txt

measured data				
z (m)	V_1 (m/s)	V_2 (m/s)	V_{1rms} (m/s)	V_{2rms} (m/s)
0.001	2.380	2.449	1.564	2.184
0.002	3.360	3.502	1.582	2.050
0.003	3.351	3.446	1.634	2.257
0.004	3.587	3.852	1.722	2.180
0.004	3.783	4.010	1.657	2.051
0.005	4.296	4.247	1.518	2.107
0.007	4.869	4.995	1.497	1.959
0.008	5.221	5.219	1.367	1.867
0.008	5.256	5.321	1.278	1.765
0.009	5.421	5.457	1.235	1.749
0.010	5.627	5.682	1.166	1.690
0.011	5.816	5.946	1.108	1.583
0.014	6.356	6.495	0.988	1.427
0.015	6.490	6.653	0.892	1.313
0.017	6.684	6.843	0.841	1.225
0.019	6.893	7.046	0.786	1.143
0.021	7.088	7.236	0.706	0.997
0.026	7.384	7.549	0.517	0.692
0.031	7.570	7.708	0.385	0.476
0.036	7.523	7.667	0.284	0.327
0.041	7.525	7.653	0.244	0.281
0.051	7.514	7.654	0.196	0.237
0.061	7.479	7.636	0.184	0.219
0.071	7.467	7.633	0.180	0.206
0.081	7.456	7.628	0.166	0.206

Table 31. Section S3 in NON coincidence mode. Measurements in air on water. File Test_13_07_02_S3_aria_NCM.txt

measured data				
z (m)	V_1 (m/s)	V_2 (m/s)	V_{1rms} (m/s)	V_{2rms} (m/s)
0.001	2.375	2.376	2.053	2.650
0.002	3.224	2.609	1.871	2.742
0.003	3.886	4.228	1.897	2.199
0.004	4.082	4.434	1.811	2.155
0.005	4.629	4.800	1.706	2.166
0.006	5.112	5.084	1.419	2.106
0.007	5.426	5.331	1.321	1.998
0.008	5.673	5.742	1.266	1.799
0.009	6.023	6.153	1.157	1.684
0.010	6.241	6.399	1.046	1.535
0.013	6.645	6.817	0.863	1.312
0.014	6.747	6.829	0.848	1.288
0.016	6.999	7.158	0.750	1.101
0.018	7.149	7.289	0.673	0.993
0.020	7.285	7.432	0.577	0.843
0.025	7.476	7.611	0.417	0.574
0.030	7.580	7.713	0.307	0.386
0.035	7.578	7.693	0.255	0.299
0.040	7.593	7.715	0.238	0.274
0.050	7.565	7.691	0.211	0.238
0.060	7.524	7.632	0.187	0.218
0.070	7.474	7.576	0.161	0.226
0.080	7.456	7.562	0.159	0.233

Table 32. Section S4 in NON coincidence mode. Measurements in air on water. File Test_18_07_02_S4_aria_NCM.txt

measured data				
z (m)	V_1 (m/s)	V_2 (m/s)	V_{1rms} (m/s)	V_{2rms} (m/s)
0.003	3.974	4.122	1.596	2.078
0.004	4.333	4.419	1.533	2.125
0.005	4.727	4.801	1.468	2.103
0.006	5.184	5.251	1.313	1.949
0.007	5.470	5.520	1.252	1.867
0.008	5.705	5.818	1.143	1.756
0.009	5.914	6.029	1.099	1.736
0.010	6.127	6.260	1.012	1.581
0.012	6.429	6.621	0.928	1.452
0.014	6.811	6.961	0.748	1.221
0.017	7.202	7.412	0.527	0.828
0.018	7.271	7.432	0.521	0.795
0.020	7.381	7.531	0.426	0.632
0.025	7.480	7.648	0.274	0.364
0.030	7.494	7.667	0.242	0.298
0.035	7.523	7.691	0.219	0.265
0.040	7.553	7.688	0.202	0.222
0.050	7.556	7.680	0.185	0.233
0.060	7.511	7.685	0.182	0.233
0.070	7.480	7.691	0.173	0.302
0.080	7.460	7.631	0.160	0.221

Table 33. Section S5 in NON coincidence mode. Measurements in air on water. File Test_19_07_02_S5_aria_NCM.txt

measured data				
z (m)	V_1 (m/s)	V_2 (m/s)	V_{1rms} (m/s)	V_{2rms} (m/s)
0.003	3.831	3.926	1.715	2.463
0.004	4.375	4.423	1.639	2.557
0.005	4.782	4.928	1.605	2.400
0.006	5.345	5.497	1.467	2.194
0.007	5.680	5.848	1.355	2.129
0.008	5.966	6.068	1.282	2.067
0.009	6.220	6.386	1.258	1.937
0.010	6.524	6.698	1.081	1.755
0.012	6.917	7.093	0.898	1.385
0.014	7.207	7.345	0.670	1.144
0.016	7.396	7.502	0.497	0.778
0.018	7.633	7.686	0.495	0.697
0.020	7.632	7.712	0.428	0.528
0.025	7.629	7.721	0.318	0.361
0.030	7.763	7.874	0.300	0.324
0.035	7.753	7.888	0.264	0.343
0.040	7.784	7.868	0.227	0.251
0.050	7.735	7.825	0.214	0.228
0.060	7.651	7.860	0.213	0.234
0.070	7.546	7.768	0.198	0.217
0.080	7.565	7.739	0.197	0.211

Table 34. Section S6 in NON coincidence mode. Measurements in air on water. File Test_20_07_02_S6_aria_NCM.txt

measured data				
z (m)	V_1 (m/s)	V_2 (m/s)	V_{1rms} (m/s)	V_{2rms} (m/s)
0.003	5.362	5.230	1.402	2.128
0.004	5.834	5.639	1.455	2.024
0.005	5.963	6.121	2.011	1.694
0.005	6.502	6.297	0.979	1.545
0.006	6.825	6.531	0.920	1.370
0.007	7.128	6.748	0.722	1.183
0.007	7.174	6.863	0.608	1.044
0.008	7.376	7.053	0.512	0.842
0.009	7.498	7.132	0.477	0.726
0.010	7.551	7.204	0.428	0.630
0.013	7.657	7.347	0.354	0.467
0.014	7.567	7.276	0.320	0.414
0.016	7.569	7.254	0.280	0.352
0.018	7.669	7.346	0.273	0.337
0.020	7.664	7.332	0.257	0.313
0.020	7.662	7.324	0.259	0.310
0.025	7.680	7.355	0.238	0.269
0.030	7.603	7.326	0.225	0.244
0.035	7.581	7.370	0.227	0.254
0.040	7.507	7.325	0.210	0.229
0.050	7.402	7.299	0.198	0.220
0.060	7.429	7.390	0.192	0.233
0.070	7.333	7.301	0.193	0.235
0.080	7.320	7.355	0.187	0.238

Table 35. Section S7 in NON coincidence mode. Measurements in air on water. File Test_21_07_02_S7_aria_NCM.txt

measured data				
z (m)	V_1 (m/s)	V_2 (m/s)	V_{1rms} (m/s)	V_{2rms} (m/s)
0.000	2.521	3.013	1.653	1.981
0.001	4.391	4.640	1.368	1.726
0.002	7.391	7.967	0.917	1.388
0.003	6.478	6.859	0.504	0.772
0.004	6.771	7.113	0.379	0.561
0.005	6.939	7.253	0.325	0.440
0.006	7.037	7.336	0.308	0.384
0.007	7.053	7.407	0.300	0.368
0.008	7.048	7.392	0.280	0.349
0.009	7.084	7.395	0.270	0.332
0.010	7.136	7.390	0.267	0.349
0.012	7.222	7.436	0.258	0.311
0.014	7.181	7.448	0.267	0.326
0.016	7.102	7.421	0.235	0.318
0.018	7.122	7.406	0.238	0.281
0.020	7.131	7.394	0.230	0.290
0.025	7.207	7.379	0.214	0.296
0.030	7.237	7.352	0.211	0.245
0.035	7.248	7.323	0.210	0.240
0.040	7.274	7.256	0.204	0.248
0.050	7.325	7.214	0.190	0.241
0.060	9.179	9.045	0.217	0.293
0.070	7.362	7.272	0.182	0.220
0.080	7.380	7.240	0.164	0.212

Table 36. Section S0 in coincidence mode. Measurements in air on rigid bottom. File Test_29_07_02_S0_aria_piano_CM.txt

measured data					*transformed data*						
z (m)	V_1 (m/s)	V_2 (m/s)	V_{1rms} (m/s)	V_{2rms} (m/s)	*U* (m/s)	*V* (m/s)	U'_{rms} (m/s)	V'_{rms} (m/s)	$(U'V')_{rms}$ (m^2/s^2)	*k* (m^2/s^2)	ϕ (°)
0.001	4.561	4.536	0.943	1.248	6.646	-0.080	1.489	0.404	-0.2915	1.1901	4.039
0.003	5.836	5.885	0.645	0.992	8.377	-0.075	1.030	0.568	-0.2750	0.6918	10.206
0.003	5.785	5.895	0.648	0.974	8.329	-0.077	1.045	0.540	-0.2699	0.6922	9.314
0.006	6.618	6.694	0.569	0.885	9.477	-0.085	0.916	0.528	-0.2244	0.5588	10.922
0.010	7.338	7.444	0.472	0.717	10.483	-0.088	0.736	0.429	-0.1336	0.3626	10.250
0.015	7.810	7.859	0.314	0.451	11.086	-0.037	0.470	0.314	-0.0529	0.1596	11.731
0.020	7.968	8.000	0.211	0.298	11.292	-0.020	0.310	0.260	-0.0288	0.0819	22.763
0.025	8.003	8.039	0.183	0.246	11.345	-0.022	0.257	0.227	-0.0172	0.0588	25.165
0.030	7.978	8.011	0.187	0.239	11.305	-0.019	0.253	0.231	-0.0153	0.0588	27.654
0.030	8.001	8.039	0.198	0.179	11.338	-0.018	0.237	0.209	-0.0009	0.0499	2.047
0.035	7.989	8.030	0.193	0.171	11.324	-0.022	0.228	0.206	-0.0004	0.0474	1.319
0.040	7.960	8.010	0.191	0.174	11.287	-0.029	0.228	0.208	-0.0019	0.0477	6.384
0.050	7.962	8.007	0.185	0.182	11.287	-0.025	0.238	0.220	-0.0097	0.0525	25.436
0.060	7.968	8.003	0.168	0.178	11.289	-0.019	0.218	0.197	-0.0071	0.0433	19.722
0.070	7.990	8.008	0.165	0.185	11.306	-0.007	0.225	0.194	-0.0086	0.0441	16.411
0.080	8.021	8.033	0.165	0.195	11.348	-0.002	0.237	0.191	-0.0110	0.0463	14.660

Table 37. Section S1 in coincidence mode. Measurements in air on rigid bottom. File Test_30_07_02_S1_aria_piano_CM.txt

measured data					*transformed data*						
z (m)	V_1 (m/s)	V_2 (m/s)	V_{1rms} (m/s)	V_{2rms} (m/s)	U (m/s)	V (m/s)	U'_{rms} (m/s)	V'_{rms} (m/s)	$(U'V')_{rms}$ (m^2/s^2)	k (m^2/s^2)	ϕ (°)
0.001	4.556	4.696	0.920	1.186	6.746	-0.084	1.420	0.408	-0.274	1.091	4.215
0.003	5.837	5.955	0.643	0.978	8.395	-0.085	1.032	0.557	-0.272	0.688	9.888
0.006	6.635	6.767	0.580	0.882	9.507	-0.089	0.916	0.520	-0.218	0.555	10.491
0.010	7.352	7.465	0.484	0.703	10.496	-0.076	0.752	0.407	-0.129	0.366	8.964
0.015	7.862	7.918	0.312	0.432	11.162	-0.036	0.474	0.314	-0.059	0.162	12.515
0.020	8.021	8.053	0.215	0.269	11.365	-0.016	0.303	0.224	-0.018	0.071	11.770
0.025	8.060	8.078	0.182	0.221	11.410	-0.008	0.255	0.216	-0.010	0.056	14.157
0.030	8.088	8.107	0.179	0.202	11.452	-0.006	0.230	0.201	-0.009	0.047	17.680

Table 38. Section S2 in coincidence mode. Measurements in air on rigid bottom. File Test_30_07_02_S2_aria_piano_CM.txt

measured data					transformed data						
z (m)	V_1 (m/s)	V_2 (m/s)	V_{1rms} (m/s)	V_{2rms} (m/s)	U (m/s)	V (m/s)	U'_{rms} (m/s)	V'_{rms} (m/s)	$(U'V')_{rms}$ (m^2/s^2)	k (m^2/s^2)	ϕ (°)
0.001	4.696	4.850	0.885	1.194	6.929	-0.101	1.403	0.463	-0.3225	1.0917	5.209
0.003	5.944	6.076	0.643	0.994	8.578	-0.098	1.042	0.560	-0.2793	0.6996	9.947
0.006	6.794	6.926	0.549	0.835	9.742	-0.094	0.881	0.502	-0.2020	0.5138	10.531
0.010	7.505	7.629	0.442	0.629	10.712	-0.079	0.675	0.385	-0.1016	0.3021	9.115
0.015	7.915	7.968	0.283	0.373	11.230	-0.035	0.405	0.271	-0.0310	0.1189	9.426
0.020	8.017	8.073	0.197	0.237	11.372	-0.034	0.268	0.212	-0.0128	0.0584	12.711
0.025	8.040	8.097	0.181	0.210	11.408	-0.034	0.242	0.208	-0.0106	0.0510	17.326
0.030	8.037	8.100	0.177	0.195	11.409	-0.037	0.228	0.205	-0.0083	0.0470	19.469

Table 39. Section S3 in coincidence mode. Measurements in air on rigid bottom. File Test_30_07_02_S3_aria_piano_CM.txt

measured data					*transformed data*						
z (m)	V_1 (m/s)	V_2 (m/s)	V_{1rms} (m/s)	V_{2rms} (m/s)	U (m/s)	V (m/s)	U'_{rms} (m/s)	V'_{rms} (m/s)	$(U'V')_{rms}$ (m^2/s^2)	k (m^2/s^2)	ϕ (°)
0.002	5.451	5.544	0.756	1.103	7.900	-0.076	1.210	0.504	-0.2950	0.8593	6.843
0.003	6.149	6.270	0.625	0.942	8.843	-0.079	0.995	0.535	-0.2468	0.6382	9.669
0.006	6.957	7.078	0.531	0.787	9.962	-0.084	0.835	0.466	-0.1696	0.4567	9.736
0.010	7.593	7.697	0.379	0.516	10.824	-0.066	0.555	0.337	-0.0622	0.2106	8.889
0.015	7.855	7.927	0.215	0.259	11.155	-0.044	0.295	0.232	-0.0148	0.0703	12.128
0.020	7.891	7.953	0.181	0.204	11.198	-0.036	0.237	0.205	-0.0087	0.0492	15.762
0.025	7.899	7.980	0.176	0.185	11.223	-0.049	0.227	0.205	-0.0064	0.0466	17.116
0.030	7.904	7.982	0.176	0.171	11.228	-0.047	0.219	0.203	-0.0042	0.0447	16.203
0.035	7.875	7.953	0.178	0.175	11.184	-0.047	0.216	0.211	-0.0038	0.0455	29.076
0.040	7.876	7.961	0.172	0.168	11.192	-0.051	0.207	0.207	-0.0042	0.0428	43.713
0.050	7.868	7.952	0.172	0.169	11.179	-0.051	0.212	0.205	-0.0054	0.0435	31.426
0.060	7.861	7.935	0.165	0.163	11.163	-0.044	0.206	0.195	-0.0051	0.0403	24.990
0.070	7.848	7.914	0.157	0.166	11.140	-0.039	0.210	0.192	-0.0067	0.0406	21.561
0.080	7.868	7.915	0.152	0.165	11.156	-0.026	0.212	0.189	-0.0088	0.0404	22.350

Table 40. Section S4 in coincidence mode. Measurements in air on rigid bottom. File Test_30_07_02_S4_aria_piano_CM.txt

measured data					*transformed data*						
z (m)	V_1 (m/s)	V_2 (m/s)	V_{1rms} (m/s)	V_{2rms} (m/s)	U (m/s)	V (m/s)	U'_{rms} (m/s)	V'_{rms} (m/s)	$(U'V')_{rms}$ (m^2/s^2)	k (m^2/s^2)	ϕ (°)
0.001	5.114	5.231	0.932	1.205	7.438	-0.029	1.436	0.435	-0.3081	1.1252	4.672
0.003	6.412	6.484	0.610	0.936	9.132	-0.054	0.993	0.525	-0.2514	0.6303	9.751
0.006	7.273	7.295	0.548	0.768	10.313	-0.002	0.826	0.448	-0.1514	0.4413	8.748
0.010	7.885	7.887	0.344	0.439	11.138	0.005	0.482	0.308	-0.0389	0.1637	7.886
0.015	8.063	7.986	0.248	0.269	11.338	0.048	0.317	0.243	-0.0089	0.0797	6.038
0.020	8.024	7.981	0.231	0.239	11.317	0.026	0.281	0.223	-0.0057	0.0642	5.537
0.025	7.987	7.983	0.237	0.224	11.307	0.014	0.274	0.229	-0.0043	0.0638	5.492
0.030	7.983	8.018	0.240	0.219	11.322	-0.009	0.272	0.225	-0.0005	0.0622	0.559

Table 41. Section S5 in coincidence mode. Measurements in air on rigid bottom. File Test_30_07_02_S5_aria_piano_CM.txt

measured data					*transformed data*						
z (m)	V_1 (m/s)	V_2 (m/s)	V_{1rms} (m/s)	V_{2rms} (m/s)	*U* (m/s)	*V* (m/s)	U'_{rms} (m/s)	V'_{rms} (m/s)	$(U'V')_{rms}$ (m^2/s^2)	*k* (m^2/s^2)	ϕ (°)
0.001	5.366	5.427	0.951	1.244	7.748	-0.033	1.439	0.452	-0.3134	1.1378	4.763
0.003	6.619	6.639	0.657	0.941	9.365	-0.043	1.027	0.514	-0.2245	0.6599	7.929
0.006	7.522	7.489	0.511	0.699	10.588	0.004	0.754	0.420	-0.1055	0.3729	7.522
0.010	8.023	7.887	0.321	0.381	11.201	0.080	0.418	0.303	-0.0222	0.1332	7.473
0.015	8.041	7.937	0.259	0.283	11.279	0.064	0.327	0.241	-0.0068	0.0827	3.949
0.020	8.032	7.940	0.248	0.245	11.282	0.058	0.297	0.233	-0.0030	0.0714	2.487
0.025	8.055	7.947	0.240	0.244	11.303	0.071	0.287	0.233	-0.0059	0.0683	5.923
0.030	8.068	7.986	0.243	0.229	11.337	0.053	0.276	0.229	-0.0018	0.0642	2.151

Table 42. Section S6 in coincidence mode. Measurements in air on rigid bottom. File Test_30_07_02_S6_aria_piano_CM.txt

measured data					*transformed data*						
z (m)	V_1 (m/s)	V_2 (m/s)	V_{1rms} (m/s)	V_{2rms} (m/s)	U (m/s)	V (m/s)	U'_{rms} (m/s)	V'_{rms} (m/s)	$(U'V')_{rms}$ (m^2/s^2)	k (m^2/s^2)	ϕ (°)
0.001	5.181	5.298	1.030	1.276	7.574	-0.059	1.529	0.445	-0.3125	1.2681	4.154
0.003	6.775	6.843	0.772	1.019	9.657	-0.060	1.123	0.521	-0.2209	0.7664	6.294
0.005	7.343	7.347	0.575	0.753	10.360	-0.017	0.831	0.430	-0.1084	0.4381	6.044
0.008	7.903	7.792	0.301	0.365	11.052	0.067	0.403	0.295	-0.0198	0.1248	7.298
0.010	7.958	7.817	0.262	0.301	11.108	0.085	0.345	0.265	-0.0111	0.0947	6.426
0.012	7.931	7.877	0.253	0.295	11.127	0.036	0.330	0.263	-0.0127	0.0890	8.953
0.015	8.003	7.866	0.243	0.267	11.177	0.080	0.309	0.248	-0.0070	0.0784	5.916
0.020	7.962	7.850	0.234	0.237	11.158	0.073	0.281	0.233	-0.0039	0.0665	4.449
0.025	7.870	7.809	0.228	0.212	11.087	0.043	0.264	0.220	-0.0010	0.0591	1.386
0.030	7.874	7.859	0.226	0.203	11.105	0.018	0.261	0.217	0.0002	0.0575	-0.309
0.035	7.821	7.789	0.223	0.198	11.032	0.029	0.252	0.216	0.0008	0.0551	-1.295
0.040	7.766	7.777	0.223	0.201	10.996	0.003	0.252	0.219	0.0003	0.0558	-0.517
0.050	7.667	7.738	0.220	0.197	10.917	-0.027	0.247	0.224	0.0002	0.0555	-0.493
0.060	7.584	7.810	0.235	0.196	10.902	-0.121	0.253	0.224	0.0037	0.0573	-7.499
0.070	7.661	7.792	0.221	0.207	10.924	-0.074	0.258	0.217	-0.0032	0.0570	4.622
0.080	7.866	7.847	0.185	0.219	11.084	0.034	0.255	0.200	-0.0115	0.0525	12.388

Table 43. Section S7 in coincidence mode. Measurements in air on rigid bottom. File Test_30_07_02_S7_aria_piano_CM.txt

measured data					*transformed data*						
z (m)	V_1 (m/s)	V_2 (m/s)	V_{1rms} (m/s)	V_{2rms} (m/s)	U (m/s)	V (m/s)	U'_{rms} (m/s)	V'_{rms} (m/s)	$(U'V')_{rms}$ (m^2/s^2)	k (m^2/s^2)	ϕ (°)
0.001	5.114	5.198	1.139	1.356	7.446	-0.101	1.642	0.507	-0.2860	1.4763	3.344
0.002	6.534	6.586	0.942	1.088	9.307	-0.050	1.324	0.482	-0.1863	0.9926	3.492
0.003	7.348	7.338	0.689	0.810	10.366	-0.008	0.960	0.397	-0.0931	0.5393	3.476
0.004	7.758	7.593	0.482	0.562	10.802	0.076	0.676	0.343	-0.0433	0.2872	3.631
0.005	7.918	7.757	0.377	0.464	11.031	0.093	0.515	0.318	-0.0351	0.1834	6.020
0.006	8.018	7.827	0.334	0.394	11.143	0.110	0.438	0.303	-0.0184	0.1417	5.202
0.008	8.086	7.877	0.308	0.320	11.229	0.126	0.372	0.289	-0.0077	0.1111	3.996
0.010	8.121	7.856	0.268	0.308	11.248	0.159	0.346	0.272	-0.0139	0.0968	8.433
0.015	8.036	7.758	0.266	0.306	11.172	0.176	0.339	0.260	-0.0163	0.0914	9.535
0.025	7.995	7.757	0.235	0.246	11.167	0.177	0.273	0.246	-0.0074	0.0675	14.068
0.030	7.937	7.751	0.245	0.228	11.126	0.142	0.269	0.243	0.0001	0.0659	-0.196

Table 44. Section S0 in NON coincidence mode. Measurements in air on rigid bottom. File Test_29_07_02_S0_aria_piano_CM.txt

measured data				
z (m)	V_1 (m/s)	V_2 (m/s)	V_{1rms} (m/s)	V_{2rms} (m/s)
0.001	4.560	4.567	0.945	1.215
0.003	5.847	5.869	0.645	1.001
0.003	5.789	5.875	0.649	0.984
0.006	6.627	6.679	0.575	0.895
0.010	7.339	7.430	0.474	0.813
0.015	7.806	7.859	0.318	0.467
0.020	7.957	8.008	0.226	0.342
0.025	7.995	8.049	0.196	0.277
0.030	7.966	8.023	0.198	0.263
0.030	7.990	8.044	0.208	0.184
0.035	7.977	8.035	0.204	0.177
0.040	7.949	8.015	0.202	0.181
0.050	7.952	8.012	0.196	0.185
0.060	7.959	8.008	0.181	0.184
0.070	7.977	8.013	0.178	0.190
0.080	8.013	8.037	0.178	0.201

Table 45. Section S1 in NON coincidence mode. Measurements in air on rigid bottom. File Test_30_07_02_S1_aria_piano_CM.txt

measured data				
z (m)	V_1 (m/s)	V_2 (m/s)	V_{1rms} (m/s)	V_{2rms} (m/s)
0.001	4.567	4.677	0.968	1.189
0.003	5.829	5.941	0.645	0.976
0.006	6.617	6.758	0.578	0.878
0.010	7.339	7.461	0.490	0.708
0.015	7.850	7.922	0.323	0.430
0.020	8.009	8.057	0.227	0.277
0.025	8.054	8.082	0.193	0.226
0.030	8.082	8.110	0.185	0.206

Table 46. Section S2 in NON coincidence mode. Measurements in air on rigid bottom. File Test_30_07_02_S2_aria_piano_CM.txt

measured data				
z (m)	V_1 (m/s)	V_2 (m/s)	V_{1rms} (m/s)	V_{2rms} (m/s)
0.001	4.711	4.817	0.960	1.211
0.003	5.942	6.062	0.642	1.002
0.006	6.783	6.925	0.555	0.840
0.010	7.499	7.630	0.448	0.633
0.015	7.900	7.969	0.309	0.380
0.020	8.009	8.076	0.209	0.241
0.025	8.033	8.101	0.191	0.215
0.030	8.030	8.106	0.187	0.200

Table 47. Section S3 in NON coincidence mode. Measurements in air on rigid bottom. File Test_30_07_02_S3_aria_piano_CM.txt

measured data				
z (m)	V_1 (m/s)	V_2 (m/s)	V_{1rms} (m/s)	V_{2rms} (m/s)
0.0015	5.451	5.523	0.757	1.113
0.003	6.140	6.256	0.629	0.950
0.006	6.953	7.073	0.536	0.795
0.010	7.583	7.697	0.384	0.521
0.015	7.845	7.930	0.224	0.265
0.020	7.880	7.957	0.194	0.225
0.025	7.890	7.984	0.187	0.191
0.030	7.896	7.986	0.188	0.177
0.035	7.866	7.957	0.190	0.180
0.040	7.869	7.964	0.186	0.174
0.050	7.860	7.955	0.185	0.176
0.060	7.852	7.938	0.177	0.170
0.070	7.838	7.918	0.171	0.176
0.080	7.859	7.919	0.165	0.171

Table 48. Section S4 in NON coincidence mode. Measurements in air on rigid bottom. File Test_30_07_02_S4_aria_piano_CM.txt

measured data				
z (m)	V_1 (m/s)	V_2 (m/s)	V_{1rms} (m/s)	V_{2rms} (m/s)
0.001	5.113	5.169	0.900	1.212
0.003	6.338	6.450	0.615	0.941
0.006	7.201	7.265	0.536	0.779
0.010	7.802	7.878	0.363	0.454
0.015	8.001	7.992	0.258	0.274
0.020	7.983	7.983	0.240	0.241
0.025	7.953	7.985	0.243	0.225
0.030	7.939	8.017	0.248	0.222

Table 49. Section S5 in NON coincidence mode. Measurements in air on rigid bottom. File Test_30_07_02_S5_aria_piano_CM.txt

measured data				
z (m)	V_1 (m/s)	V_2 (m/s)	V_{1rms} (m/s)	V_{2rms} (m/s)
0.001	5.326	5.374	0.926	1.245
0.003	6.568	6.611	0.649	0.965
0.006	7.477	7.475	0.512	0.711
0.010	7.930	7.884	0.328	0.385
0.015	7.975	7.938	0.271	0.283
0.020	7.984	7.943	0.255	0.248
0.025	8.013	7.951	0.245	0.244
0.030	8.009	7.986	0.256	0.229

Table 50. Section S6 in NON coincidence mode. Measurements in air on rigid bottom. File Test_30_07_02_S6_aria_piano_CM.txt

measured data				
z (m)	V_1 (m/s)	V_2 (m/s)	V_{1rms} (m/s)	V_{2rms} (m/s)
0.001	5.179	5.256	0.992	1.288
0.003	6.731	6.817	0.742	1.035
0.005	7.284	7.319	0.583	0.778
0.008	7.855	7.789	0.308	0.368
0.010	7.895	7.818	0.272	0.304
0.012	7.885	7.876	0.260	0.299
0.015	7.928	7.867	0.259	0.268
0.020	7.909	7.851	0.244	0.238
0.025	7.841	7.813	0.235	0.214
0.030	7.838	7.858	0.236	0.211
0.035	7.800	7.792	0.230	0.200
0.040	7.762	7.779	0.228	0.204
0.050	7.670	7.741	0.226	0.201
0.060	7.632	7.810	0.239	0.196
0.070	7.698	7.788	0.225	0.208
0.080	7.839	7.841	0.198	0.222

Table 51. Section S7 in NON coincidence mode. Measurements in air on rigid bottom. File Test_30_07_02_S7_aria_piano_CM.txt

measured data				
z (m)	V_1 (m/s)	V_2 (m/s)	V_{1rms} (m/s)	V_{2rms} (m/s)
0.001	5.085	5.122	1.137	1.385
0.002	6.476	6.551	0.918	1.107
0.003	7.277	7.298	0.691	0.828
0.004	7.662	7.574	0.501	0.603
0.005	7.834	7.748	0.377	0.458
0.006	7.931	7.817	0.337	0.396
0.008	8.008	7.872	0.309	0.325
0.010	8.044	7.852	0.288	0.310
0.015	7.967	7.762	0.276	0.307
0.025	7.948	7.768	0.246	0.247
0.030	7.934	7.760	0.244	0.231

Table 52. Section S0. Measurements in air on water

file name (non coinc. mode)	file name (coinc. mode)	date (gg/mm/aaaa)	section	relative level (mm)	duration (s)	datarate ch1 (Hz)	datarate ch2 (Hz)	datarate coinc. (Hz)	comments
test_aria_116	test_aria_116_bis	18/07/2010	S0	5	606	7	2	0	
test_aria_117	test_aria_117_bis	18/07/2010	S0	6	520	160	87	22	
test_aria_118	test_aria_118_bis	18/07/2010	S0	7	540	221	118	41	coincidence mode only for the first 160 s
test_aria_119	test_aria_119_bis	18/07/2010	S0	8	n.a.	238	158	82	
test_aria_120	test_aria_120_bis	18/07/2010	S0	9	456	244	161	85	
test_aria_121	test_aria_121_bis	18/07/2010	S0	10	645	232	154	84	
test_aria_122	test_aria_122_bis	18/07/2010	S0	12	305	331	218	120	
test_aria_123	test_aria_123_bis	18/07/2010	S0	15	302	113	97	28	glass junction at 14 mm
test_aria_124	test_aria_124_bis	18/07/2010	S0	16	313	383	245	131	
test_aria_125	test_aria_125_bis	18/07/2010	S0	18	301	498	312	172	
test_aria_126	test_aria_126_bis	18/07/2010	S0	20	320	447	286	156	
test_aria_127	test_aria_127_bis	18/07/2010	S0	25	305	621	377	214	
test_aria_128	test_aria_128_bis	18/07/2010	S0	30	301	596	362	203	
test_aria_129	test_aria_129_bis	18/07/2010	S0	35	300	805	455	264	
test_aria_130	test_aria_130_bis	18/07/2010	S0	40	132	859	518	288	data overflow
test_aria_131	test_aria_131_bis	18/07/2010	S0	50	232	915	557	313	data overflow
test_aria_132	test_aria_132_bis	18/07/2010	S0	60	62	887	518	289	data overflow (invalid)

test_aria_133	test_aria_133_bis	18/07/2010	S0	70	301	1064	654	370	
test_aria_134	test_aria_134_bis	18/07/2010	S0	80	143	976	587	327	data overflow
test_aria_135	test_aria_135_bis	18/07/2010	S0	60	169	1602	936	529	data overflow

Table 53. Section S1. Measurements in air on water

file name (non coinc. mode)	file name (coinc. mode)	date (gg/mm/aaaa)	section	relative level (mm)	duration (s)	datarate ch1 (Hz)	datarate ch2 (Hz)	datarate coinc. (Hz)	comments
test_aria_18	test_aria_18_bis	02/07/2010	S1	5	630	11	13	3	double peak spectrum
test_aria_19	test_aria_19_bis	02/07/2010	S1	4	615	2	8	0	
test_aria_20	test_aria_20_bis	02/07/2010	S1	3	608	32	27	9	
test_aria_21	test_aria_21_bis	02/07/2010	S1	2	600	13	8	0	
test_aria_22	test_aria_22_bis	02/07/2010	S1	1	608	11	7	0	
test_aria_23	test_aria_23_bis	02/07/2010	S1	0	602	15	6	0	
test_aria_24	test_aria_24_bis	02/07/2010	S1	6	607	61	55	23	
test_aria_25	test_aria_25_bis	02/07/2010	S1	7	631	68	60	26	
test_aria_26	test_aria_26_bis	02/07/2010	S1	8	613	74	66	28	
test_aria_27	test_aria_27_bis	02/07/2010	S1	9	611	86	63	30	
test_aria_28	test_aria_28_bis	02/07/2010	S1	12	604	58	52	20	glass junction at 10 and 11 mm
test_aria_29	test_aria_29_bis	02/07/2010	S1	14	604	43	44	16	
test_aria_30	test_aria_30_bis	02/07/2010	S1	16	635	59	54	20	
test_aria_31	test_aria_31_bis	02/07/2010	S1	18	622	62	65	21	
test_aria_32	test_aria_32_bis	02/07/2010	S1	20	605	26	59	11	
test_aria_33	test_aria_33_bis	02/07/2010	S1	25	604	23	20	9	
test_aria_34	test_aria_34_bis	02/07/2010	S1	30	605	45	35	17	
test_aria_35	test_aria_35_bis	02/07/2010	S1	35	608	53	40	20	

test_aria_36	test_aria_36_bis	02/07/2010	S1	40	621	28	24	11	
test_aria_37	test_aria_37_bis	02/07/2010	S1	50	266	264	170	95	data overflow
test_aria_38	test_aria_38_bis	02/07/2010	S1	50	617	158	112	61	
test_aria_39	test_aria_39_bis	02/07/2010	S1	60	486	633	399	237	data overflow
test_aria_40	test_aria_40_bis	02/07/2010	S1	60	665	281	185	106	
test_aria_41	test_aria_41_bis	02/07/2010	S1	70	604	153	113	59	
test_aria_42	test_aria_42_bis	02/07/2010	S1	80	614	41	43	17	
test_aria_43	test_aria_43_bis	02/07/2010	S1	60	603	18	20	7	
test_aria_44	test_aria_44_bis	02/07/2010	S1	50	601	95	69	36	
test_aria_45	test_aria_45_bis	02/07/2010	S1	70	603	158	110	60	data overflow

Table 54. Section S2. Measurements in air on water

file name (non coinc. mode)	file name (coinc. mode)	date (gg/mm/aaaa)	section	relative level (mm)	duration (s)	datarate ch1 (Hz)	datarate ch2 (Hz)	datarate coinc. (Hz)	comments
test_aria_46	test_aria_46_bis	12/07/2010	S2	5	602	24	14	1	
test_aria_47	test_aria_47_bis	12/07/2010	S2	4	600	11	4	0	
test_aria_48	test_aria_48_bis	12/07/2010	S2	4	597	10	3	0	presumably the transverse system has lost the step
test_aria_49	test_aria_49_bis	12/07/2010	S2	3	630	8	3	0	
test_aria_50	test_aria_50_bis	12/07/2010	S2	2	n.a.	na	na	0	invalid
test_aria_51	test_aria_51_bis	12/07/2010	S2	1	613	1	0	0	
test_aria_52	test_aria_52_bis	12/07/2010	S2	7	639	71	40	22	
test_aria_53	test_aria_53_bis	12/07/2010	S2	8	n.a.	68	52	24	invalid
test_aria_54	test_aria_54_bis	12/07/2010	S2	9	601	79	60	30	
test_aria_55	test_aria_55_bis	12/07/2010	S2	10	600	97	72	37	
test_aria_56	test_aria_56_bis	12/07/2010	S2	8	n.a.	148	94	25	
test_aria_57	test_aria_57_bis	12/07/2010	S2	11	604	123	84	47	
test_aria_58	test_aria_58_bis	12/07/2010	S2	14	607	190	124	70	
test_aria_59	test_aria_59_bis	12/07/2010	S2	15	605	216	138	78	
test_aria_60	test_aria_60_bis	12/07/2010	S2	2	612	9	3	0	
test_aria_61	test_aria_61_bis	12/07/2010	S2	17	289	292	177	103	
test_aria_62	test_aria_62_bis	12/07/2010	S2	19	338	126	85	46	

test_aria_63	test_aria_63_bis	12/07/2010	S2	21	360	143	98	54	
test_aria_64	test_aria_64_bis	12/07/2010	S2	26	322	205	137	76	
test_aria_65	test_aria_65_bis	12/07/2010	S2	31	128	348	216	122	data overflow
test_aria_66	test_aria_66_bis	12/07/2010	S2	36	160	383	232	132	data overflow
test_aria_67	test_aria_67_bis	12/07/2010	S2	41	582	468	273	166	
test_aria_68	test_aria_68_bis	12/07/2010	S2	51	296	891	526	313	data overflow
test_aria_69	test_aria_69_bis	12/07/2010	S2	61	302	1201	704	422	
test_aria_70	test_aria_70_bis	12/07/2010	S2	71	137	1509	886	519	
test_aria_71	test_aria_71_bis	12/07/2010	S2	81	303	1665	985	581	

Table 55. Section S3. Measurements in air on water

file name (non coinc. mode)	file name (coinc. mode)	date (gg/mm/aaaa)	section	relative level (mm)	duration (s)	datarate ch1 (Hz)	datarate ch2 (Hz)	datarate coinc. (Hz)	comments
test_aria_72	test_aria_72_bis	13/07/2010	S3	5	605	18	9	4	
test_aria_73	test_aria_73_bis	13/07/2010	S3	3	610	2	1	0	
test_aria_74	test_aria_74_bis	13/07/2010	S3	4	613	4	2	0	
test_aria_75	test_aria_75_bis	13/07/2010	S3	2	579	1	0	0	
test_aria_76	test_aria_76_bis	13/07/2010	S3	1	651	0	0	0	
test_aria_77	test_aria_77_bis	13/07/2010	S3	6	603	22	25	9	
test_aria_78	test_aria_78_bis	13/07/2010	S3	7	601	23	26	9	double peak spectrum
test_aria_79	test_aria_79_bis	13/07/2010	S3	8	606	29	29	12	
test_aria_80	test_aria_80_bis	13/07/2010	S3	9	608	33	35	14	
test_aria_81	test_aria_81_bis	13/07/2010	S3	10	609	38	34	16	
test_aria_82	test_aria_82_bis	13/07/2010	S3	13	615	36	35	14	
test_aria_83	test_aria_83_bis	13/07/2010	S3	14	600	51	51	21	
test_aria_84	test_aria_84_bis	13/07/2010	S3	16	601	61	57	26	
test_aria_85	test_aria_85_bis	13/07/2010	S3	18	602	72	71	31	
test_aria_86	test_aria_86_bis	13/07/2010	S3	20	607	85	84	37	
test_aria_87	test_aria_87_bis	13/07/2010	S3	25	607	117	110	51	
test_aria_88	test_aria_88_bis	13/07/2010	S3	30	307	181	153	75	
test_aria_89	test_aria_89_bis	13/07/2010	S3	35	351	265	216	110	
test_aria_90	test_aria_90_bis	13/07/2010	S3	40	309	296	240	121	

test_aria_91	test_aria_91_bis	13/07/2010	S3	50	304	437	353	182	
test_aria_92	test_aria_92_bis	13/07/2010	S3	60	187	592	467	243	data overflow
test_aria_93	test_aria_93_bis	13/07/2010	S3	70	274	642	509	265	data overflow
test_aria_94	test_aria_94_bis	13/07/2010	S3	80	517	486	406	206	

Table 56. Section S4. Measurements in air on water

file name (non coinc. mode)	file name (coinc. mode)	date (gg/mm/aaaa)	section	relative level (mm)	duration (s)	datarate ch1 (Hz)	datarate ch2 (Hz)	datarate coinc. (Hz)	comments
test_aria_95	test_aria_95_bis	18/07/2010	S4	5	n.a.	69	24	8	lost time steps but data are correct
test_aria_96	test_aria_96_bis	18/07/2010	S4	4	650	53	19	8	
test_aria_97	test_aria_97_bis	18/07/2010	S4	3	612	20	6	2	
test_aria_98	test_aria_98_bis	18/07/2010	S4	6	608	57	42	12	
test_aria_99	test_aria_99_bis	18/07/2010	S4	7	610	52	38	11	
test_aria_100	test_aria_100_bis	18/07/2010	S4	8	606	67	55	15	
test_aria_101	test_aria_101_bis	18/07/2010	S4	9	613	80	60	19	
test_aria_102	test_aria_102_bis	18/07/2010	S4	10	609	129	60	21	
test_aria_103	test_aria_103_bis	18/07/2010	S4	12	603	196	92	36	
test_aria_104	test_aria_104_bis	18/07/2010	S4	14	602	103	67	18	
test_aria_105	test_aria_105_bis	18/07/2010	S4	17	641	364	240	96	glass junction at 16 mm

test_aria_106	test_aria_106_bis	18/07/2010	S4	18	607	285	265	96	
test_aria_107	test_aria_107_bis	18/07/2010	S4	20	607	376	385	128	
test_aria_108	test_aria_108_bis	18/07/2010	S4	27	207	801	642	246	data overflow
test_aria_109	test_aria_109_bis	18/07/2010	S4	30	317	774	591	246	
test_aria_110	test_aria_110_bis	18/07/2010	S4	35	360	736	478	218	
test_aria_111	test_aria_111_bis	18/07/2010	S4	40	316	568	514	191	
test_aria_112	test_aria_112_bis	18/07/2010	S4	50	421	342	516	101	
test_aria_113	test_aria_113_bis	18/07/2010	S4	60	329	172	458	50	
test_aria_114	test_aria_114_bis	18/07/2010	S4	70	302	581	277	89	
test_aria_115	test_aria_115_bis	18/07/2010	S4	80	302	737	349	100	

Table 57. Section S5. Measurements in air on water

file name (non coinc. mode)	file name (coinc. mode)	date (gg/mm/aaaa)	section	relative level (mm)	duration (s)	datarate ch1 (Hz)	datarate ch2 (Hz)	datarate coinc. (Hz)	comments
test_aria_136	test_aria_136_bis	19/07/2010	S5	5	600	26	12	3	lost time step but data are correct
test_aria_137	test_aria_137_bis	19/07/2010	S5	4	600	24	11	2	
test_aria_138	test_aria_138_bis	19/07/2010	S5	3	600	20	9	2	
test_aria_139	test_aria_139_bis	19/07/2010	S5	6	662	32	24	5	
test_aria_140	test_aria_140_bis	19/07/2010	S5	7	603	41	34	8	
test_aria_141	test_aria_141_bis	19/07/2010	S5	8	592	32	30	8	
test_aria_142	test_aria_142_bis	19/07/2010	S5	9	604	77	89	19	
test_aria_143	test_aria_143_bis	19/07/2010	S5	10	625	103	110	27	
test_aria_144	test_aria_144_bis	19/07/2010	S5	12	620	89	96	26	
test_aria_145	test_aria_145_bis	19/07/2010	S5	14	616	33	62	7	
test_aria_146	test_aria_146_bis	19/07/2010	S5	16	582	22	121	6	low data rate for ch1 due to glass juntion
test_aria_147	test_aria_147_bis	19/07/2010	S5	18	610	63	69	21	
test_aria_148	test_aria_148_bis	19/07/2010	S5	20	611	96	79	30	
test_aria_149	test_aria_149_bis	19/07/2010	S5	25	475	136	100	44	
test_aria_150	test_aria_150_bis	19/07/2010	S5	30	475	41	28	13	
test_aria_151	test_aria_151_bis	19/07/2010	S5	35	300	67	46	22	
test_aria_152	test_aria_152_bis	19/07/2010	S5	40	337	55	42	19	

test_aria_153	test_aria_153_bis	19/07/2010	S5	50	307	54	61	18
test_aria_154	test_aria_154_bis	19/07/2010	S5	60	307	77	46	19
test_aria_155	test_aria_155_bis	19/07/2010	S5	70	309	83	36	14
test_aria_156	test_aria_156_bis	19/07/2010	S5	80	320	49	28	15

Table 58. Section S6. Measurements in air on water

file name (non coinc. mode)	file name (coinc. mode)	date (gg/mm/aaaa)	section	relative level (mm)	duration (s)	datarate ch1 (Hz)	datarate ch2 (Hz)	datarate coinc. (Hz)	comments
test_aria_157	test_aria_157_bis	20/07/2010	S6	5	631	6	12	1	
test_aria_158	test_aria_158_bis	20/07/2010	S6	4	615	8	10	1	
test_aria_159	test_aria_159_bis	20/07/2010	S6	3	625	5	8	1	
test_aria_160	test_aria_160_bis	20/07/2010	S6	6	602	14	18	3	
test_aria_161	test_aria_161_bis	20/07/2010	S6	7	600	19	38	6	
test_aria_162	test_aria_162_bis	20/07/2010	S6	8	605	30	29	8	
test_aria_163	test_aria_163_bis	20/07/2010	S6	9	600	26	27	8	
test_aria_164	test_aria_164_bis	20/07/2010	S6	10	602	22	24	7	
test_aria_165	test_aria_165_bis	20/07/2010	S6	13	614	32	35	11	glass junction at 12 mm
test_aria_166	test_aria_166_bis	20/07/2010	S6	14	604	12	26	3	
test_aria_167	test_aria_167_bis	20/07/2010	S6	16	602	19	45	6	
test_aria_168	test_aria_168_bis	20/07/2010	S6	18	605	69	75	26	
test_aria_169	test_aria_169_bis	20/07/2010	S6	20	612	87	88	32	
test_aria_170	test_aria_170_bis	20/07/2010	S6	25	304	131	104	42	
test_aria_171	test_aria_171_bis	20/07/2010	S6	30	302	229	175	81	
test_aria_172	test_aria_172_bis	20/07/2010	S6	35	301	224	180	78	
test_aria_173	test_aria_173_bis	20/07/2010	S6	40	243	393	269	125	data overflow
test_aria_174	test_aria_174_bis	20/07/2010	S6	50	302	310	255	118	

test_aria_175	test_aria_175_bis	20/07/2010	S6	60	323	166	163	46
test_aria_176	test_aria_176_bis	20/07/2010	S6	70	305	254	184	74
test_aria_177	test_aria_177_bis	20/07/2010	S6	80	352	159	122	54
test_aria_178	test_aria_178_bis	20/07/2010	S6	5	650	10	12	2
test_aria_179	test_aria_179_bis	20/07/2010	S6	20	621	68	71	26
test_aria_180	test_aria_180_bis	20/07/2010	S6	7	634	18	23	6

Table 59. Section S7. Measurements in air on water

file name (non coinc. mode)	file name (coinc. mode)	date (gg/mm/aaaa)	section	relative level (mm)	duration (s)	datarate ch1 (Hz)	datarate ch2 (Hz)	datarate coinc. (Hz)	comments
test_aria_181	test_aria_181_bis	21/07/2010	S7	5	602	105	90	34	
test_aria_182	test_aria_182_bis	21/07/2010	S7	4	623	99	95	33	
test_aria_183	test_aria_183_bis	21/07/2010	S7	3	628	69	69	24	
test_aria_184	test_aria_184_bis	21/07/2010	S7	2	742	38	43	14	
test_aria_185	test_aria_185_bis	21/07/2010	S7	1	n.a.	11	15	5	lost time step but data are correct
test_aria_186	test_aria_186_bis	21/07/2010	S7	0	605	11	7	2	
test_aria_187	test_aria_187_bis	21/07/2010	S7	6	692	88	83	29	
test_aria_188	test_aria_188_bis	21/07/2010	S7	7	600	87	79	27	
test_aria_189	test_aria_189_bis	21/07/2010	S7	8	604	140	111	40	
test_aria_190	test_aria_190_bis	21/07/2010	S7	9	666	142	98	42	
test_aria_191	test_aria_191_bis	21/07/2010	S7	10	616	157	109	47	
test_aria_192	test_aria_192_bis	21/07/2010	S7	12	642	141	97	42	
test_aria_193	test_aria_193_bis	21/07/2010	S7	14	615	29	26	4	
test_aria_194	test_aria_194_bis	21/07/2010	S7	16	625	109	74	30	
test_aria_195	test_aria_195_bis	21/07/2010	S7	18	601	209	150	69	
test_aria_196	test_aria_196_bis	21/07/2010	S7	20	605	159	124	58	
test_aria_197	test_aria_197_bis	21/07/2010	S7	25	661	115	96	41	
test_aria_198	test_aria_198_bis	21/07/2010	S7	30	338	99	120	38	

test_aria_199	test_aria_199_bis	21/07/2010	S7	35	490	99	84	34
test_aria_200	test_aria_200_bis	21/07/2010	S7	40	403	100	85	35
test_aria_201	test_aria_201_bis	21/07/2010	S7	50	346	82	52	24
test_aria_202	test_aria_202_bis	21/07/2010	S7	60	309	88	62	29
test_aria_203	test_aria_203_bis	21/07/2010	S7	70	300	44	40	15
test_aria_204	test_aria_204_bis	21/07/2010	S7	80	330	42	28	12

Table 60. Section S0. Measurements in water

file name (non coinc. mode)	file name (coinc. mode)	date (gg/mm/aaaa)	section	relative level (mm)	duration (s)	datarate ch1 (Hz)	datarate ch2 (Hz)	datarate coinc. (Hz)	comments
test_acqua_1	test_acqua_1_bis	22/07/2010	S0	-5	385	1370	1022	98	time step lost after 385 s, but data are correct
test_acqua_2	test_acqua_2_bis	22/07/2010	S0	-4	656	1255	959	104	
test_acqua_3	test_acqua_3_bis	22/07/2010	S0	-3	608	1034	797	85	
test_acqua_4	test_acqua_4_bis	22/07/2010	S0	-2	600	861	643	74	
test_acqua_5	test_acqua_5_bis	22/07/2010	S0	-1	646	641	488	57	
test_acqua_6	test_acqua_6_bis	22/07/2010	S0	0	620	411	306	36	
test_acqua_7	test_acqua_7_bis	22/07/2010	S0	1	601	261	196	22	
test_acqua_8	test_acqua_8_bis	22/07/2010	S0	2	635	153	113	13	
test_acqua_9	test_acqua_9_bis	22/07/2010	S0	3	621	91	69	8	
test_acqua_10	test_acqua_10_bis	22/07/2010	S0	4	630	34	26	2	
test_acqua_11	test_acqua_11_bis	22/07/2010	S0	5	610	11	7	0	
test_acqua_12	test_acqua_12_bis	22/07/2010	S0	-6	610	1359	1052	118	
test_acqua_13	test_acqua_13_bis	22/07/2010	S0	-7	607	1363	1057	115	
test_acqua_14	test_acqua_14_bis	22/07/2010	S0	-8	632	1345	1088	120	
test_acqua_15	test_acqua_15_bis	22/07/2010	S0	-9	607	1354	1094	116	
test_acqua_16	test_acqua_16_bis	22/07/2010	S0	-10	602	1350	1074	118	
test_acqua_17	test_acqua_17_bis	22/07/2010	S0	-12	606	1342	1081	116	
test_acqua_18	test_acqua_18_bis	22/07/2010	S0	-14	622	1322	1076	114	

test_acqua_19	test_acqua_19_bis	22/07/2010	S0	-16	789	1299	1074	118
test_acqua_20	test_acqua_20_bis	22/07/2010	S0	-18	635	1305	1065	115
test_acqua_21	test_acqua_21_bis	22/07/2010	S0	-20	602	1276	1091	108
test_acqua_22	test_acqua_22_bis	22/07/2010	S0	-25	607	1198	1047	107
test_acqua_23	test_acqua_23_bis	22/07/2010	S0	-30	602	1200	1018	102
test_acqua_24	test_acqua_24_bis	22/07/2010	S0	-35	606	1166	968	94
test_acqua_25	test_acqua_25_bis	22/07/2010	S0	-40	602	1136	969	92
test_acqua_26	test_acqua_26_bis	22/07/2010	S0	-50	604	1066	877	82
test_acqua_27	test_acqua_27_bis	22/07/2010	S0	-60	606	1002	859	80
test_acqua_28	test_acqua_28_bis	22/07/2010	S0	-70	612	1018	918	86
test_acqua_29	test_acqua_29_bis	22/07/2010	S0	-80	603	1098	997	100

Table 61. Section S3. Measurements in water

file name (non coinc. mode)	file name (coinc. mode)	date (gg/mm/aaaa)	section	relative level (mm)	duration (s)	datarate ch1 (Hz)	datarate ch2 (Hz)	datarate coinc. (Hz)	comments
test_acqua_30	test_acqua_30_bis	23/07/2010	S3	-5	603	1098	997	100	test_acqua_30
test_acqua_31	test_acqua_31_bis	23/07/2010	S3	-6	1046	648	676	74	test_acqua_31
test_acqua_32	test_acqua_32_bis	23/07/2010	S3	-7	634	778	642	86	test_acqua_32
test_acqua_33	test_acqua_33_bis	23/07/2010	S3	-4	608	784	683	85	test_acqua_33
test_acqua_34	test_acqua_34_bis	23/07/2010	S3	-3	612	713	626	77	test_acqua_34
test_acqua_35	test_acqua_35_bis	23/07/2010	S3	-2	603	638	558	71	test_acqua_35
test_acqua_36	test_acqua_36_bis	23/07/2010	S3	-1	602	492	416	52	test_acqua_36
test_acqua_37	test_acqua_37_bis	23/07/2010	S3	0	606	341	287	37	test_acqua_37
test_acqua_38	test_acqua_38_bis	23/07/2010	S3	1	624	211	187	23	test_acqua_38
test_acqua_39	test_acqua_39_bis	23/07/2010	S3	2	603	117	102	12	test_acqua_39
test_acqua_40	test_acqua_40_bis	23/07/2010	S3	3	603	52	49	5	test_acqua_40
test_acqua_41	test_acqua_41_bis	23/07/2010	S3	-8	710	24	21	2	test_acqua_41
test_acqua_42	test_acqua_42_bis	23/07/2010	S3	-9	650	783	676	85	test_acqua_42
test_acqua_43	test_acqua_43_bis	23/07/2010	S3	-10	602	772	693	84	test_acqua_43
test_acqua_44	test_acqua_44_bis	23/07/2010	S3	-12	606	758	688	81	test_acqua_44
test_acqua_45	test_acqua_45_bis	23/07/2010	S3	-14	600	714	682	74	test_acqua_45
test_acqua_46	test_acqua_46_bis	23/07/2010	S3	-16	601	736	673	77	test_acqua_46
test_acqua_47	test_acqua_47_bis	23/07/2010	S3	-18	602	717	658	75	test_acqua_47
test_acqua_48	test_acqua_48_bis	23/07/2010	S3	-20	302	684	635	68	test_acqua_48

test_acqua_49	test_acqua_49_bis	23/07/2010	S3	-25	306	720	652	63	test_acqua_49
test_acqua_50	test_acqua_50_bis	23/07/2010	S3	-30	302	713	595	62	test_acqua_50
test_acqua_51	test_acqua_51_bis	23/07/2010	S3	-35	311	662	602	55	test_acqua_51
test_acqua_52	test_acqua_52_bis	23/07/2010	S3	-40	309	705	621	58	test_acqua_52
test_acqua_53	test_acqua_53_bis	23/07/2010	S3	-50	313	644	615	59	test_acqua_53
test_acqua_54	test_acqua_54_bis	23/07/2010	S3	-60	332	659	654	62	test_acqua_54
test_acqua_55	test_acqua_55_bis	23/07/2010	S3	-70	308	607	591	56	test_acqua_55
test_acqua_56	test_acqua_56_bis	23/07/2010	S3	-80	313	576	523	48	test_acqua_56

Table 62. Section S5. Measurements in water

file name (non coinc. mode)	file name (coinc. mode)	date (gg/mm/aaaa)	section	relative level (mm)	duration (s)	datarate ch1 (Hz)	datarate ch2 (Hz)	datarate coinc. (Hz)	comments
test_acqua_57	test_acqua_57_bis	23/07/2010	S5	-5	619	137	128	8	
test_acqua_58	test_acqua_58_bis	23/07/2010	S5	-6	611	178	137	8	
test_acqua_59	test_acqua_59_bis	23/07/2010	S5	-7	600	180	134	9	
test_acqua_60	test_acqua_60_bis	23/07/2010	S5	-4	603	134	140	8	
test_acqua_61	test_acqua_61_bis	23/07/2010	S5	-3	600	79	97	4	
test_acqua_62	test_acqua_62_bis	23/07/2010	S5	-2	604	87	69	4	
test_acqua_63	test_acqua_63_bis	23/07/2010	S5	-1	600	49	41	2	
test_acqua_64	test_acqua_64_bis	23/07/2010	S5	0	n.a.	20	24	1	
test_acqua_65	test_acqua_65_bis	23/07/2010	S5	1	600	3	10	0	
test_acqua_66	test_acqua_66_bis	23/07/2010	S5	-8	717	100	111	4	
test_acqua_67	test_acqua_67_bis	23/07/2010	S5	-11	707	123	104	4	low data rate on ch2 at -10 mm
test_acqua_68	test_acqua_68_bis	23/07/2010	S5	-12	608	131	115	5	
test_acqua_69	test_acqua_69_bis	23/07/2010	S5	-9	604	105	109	6	
test_acqua_70	test_acqua_70_bis	23/07/2010	S5	-14	613	184	129	6	
test_acqua_71	test_acqua_71_bis	23/07/2010	S5	-16	600	179	136	6	
test_acqua_72	test_acqua_72_bis	23/07/2010	S5	-18	601	123	127	4	
test_acqua_73	test_acqua_73_bis	23/07/2010	S5	-20	301	156	75	4	
test_acqua_74	test_acqua_74_bis	23/07/2010	S5	-25	309	101	55	2	

test_acqua_75	test_acqua_75_bis	23/07/2010	S5	-30	303	145	82	5	
test_acqua_76	test_acqua_76_bis	23/07/2010	S5	-35	304	163	74	4	
test_acqua_77	test_acqua_77_bis	23/07/2010	S5	-35	300	157	82	3	
test_acqua_78	test_acqua_78_bis	23/07/2010	S5	-40	311	127	100	4	
test_acqua_79	test_acqua_79_bis	23/07/2010	S5	-50	317	109	87	2	
test_acqua_80	test_acqua_80_bis	23/07/2010	S5	-60	302	172	105	4	
test_acqua_81	test_acqua_81_bis	23/07/2010	S5	-70	311	142	112	3	
test_acqua_82	test_acqua_82_bis	23/07/2010	S5	-80	303	102	32	1	
test_acqua_114	test_acqua_114	24/07/2010	S5	-20	322	na	na	na	LDV set up as for test_acqua 113 to check the output

Table 63. Section S6. Measurements in water

file name (non coinc. mode)	file name (coinc. mode)	date (gg/mm/aaaa)	section	relative level (mm)	duration (s)	datarate ch1 (Hz)	datarate ch2 (Hz)	datarate coinc. (Hz)	comments
test_acqua_83	test_acqua_83_bis	24/07/2010	S6	-5	583	2042	1386	169	run ended (low number of maximum points)
test_acqua_84	test_acqua_84_bis	24/07/2010	S6	-6	541	2247	1448	182	run ended (low number of maximum points)
test_acqua_85	test_acqua_85_bis	24/07/2010	S6	-4	605	2100	1230	169	
test_acqua_86	test_acqua_86_bis	24/07/2010	S6	-3	681	1340	1068	111	
test_acqua_87	test_acqua_87_bis	24/07/2010	S6	-2	604	698	539	54	
test_acqua_88	test_acqua_88_bis	24/07/2010	S6	-1	601	241	179	18	
test_acqua_89	test_acqua_89_bis	24/07/2010	S6	0	608	63	49	3	
test_acqua_90	test_acqua_90_bis	24/07/2010	S6	1	611	16	9	0	
test_acqua_91	test_acqua_91_bis	24/07/2010	S6	-7	427	1916	1476	147	run ended (low number of maximum points)
test_acqua_92	test_acqua_92_bis	24/07/2010	S6	-8	604	1968	1226	127	
test_acqua_93	test_acqua_93_bis	24/07/2010	S6	-9	619	2412	1353	189	
test_acqua_94	test_acqua_94_bis	24/07/2010	S6	-10	625	2223	1335	166	
test_acqua_95	test_acqua_95_bis	24/07/2010	S6	-12	638	1830	1561	166	

test_acqua_96	test_acqua_96_bis	24/07/2010	S6	-14	627	1824	1968	140	
test_acqua_97	test_acqua_97_bis	24/07/2010	S6	-16	620	2535	2052	208	
test_acqua_98	test_acqua_98_bis	24/07/2010	S6	-18	617	2281	1754	194	
test_acqua_99	test_acqua_99_bis	24/07/2010	S6	-20	326	1977	1512	113	
test_acqua_100	test_acqua_100_bis	24/07/2010	S6	-25	307	1953	1375	117	
test_acqua_101	test_acqua_101_bis	24/07/2010	S6	-30	324	2559	1615	164	
test_acqua_102	test_acqua_102_bis	24/07/2010	S6	-35	307	2559	1571	156	
test_acqua_103	test_acqua_103_bis	24/07/2010	S6	-40	356	2617	2028	197	
test_acqua_104	test_acqua_104_bis	24/07/2010	S6	-50	308	3485	2153	194	
test_acqua_105	test_acqua_105_bis	24/07/2010	S6	-60	301	2669	2521	207	
test_acqua_106	test_acqua_106_bis	24/07/2010	S6	-70	305	2685	2671	204	
test_acqua_107	test_acqua_107_bis	24/07/2010	S6	-80	235	na	na	na	fan and traverse system stopped for electric shock
test_acqua_108	na	24/07/2010	S6	-25	618	na	na	na	invalid due to stop of traverse system
test_acqua_109	na	24/07/2010	S6	-30	620	na	na	na	invalid due to stop of traverse system
test_acqua_110	na	24/07/2010	S6	-20	324	na	na	na	invalid due to stop of traverse system
test_acqua_111	test_acqua_111_bis	24/07/2010	S6	-25	623	na	na	na	to check the time acquisition effect vs test_acqua_100
test_acqua_112	test_acqua_112_bis	24/07/2010	S6	-30	623	na	na	na	to check the time acquisition effect vs test_acqua_101
test_acqua_113	test_acqua_113_bis	24/07/2010	S6	-20	313	na	na	na	LDV setup as for test_acqua_73, to

	check the effect on output

Table 64. Section S0. Measurements in air on rigid bottom

file name (non coinc. mode)	file name (coinc. mode)	date (gg/mm/aaaa)	section	relative level (mm)	duration (s)	datarate ch1 (Hz)	datarate ch2 (Hz)	datarate coinc. (Hz)	comments
test_aria_212	test_aria_212_bis	29/07/2011	S0	1	729	27	76	15	
test_aria_213	test_aria_213_bis	29/07/2011	S0	3	347	74	62	26	
test_aria_214	test_aria_214_bis	29/07/2011	S0	6	357	151	116	55	
test_aria_215	test_aria_215_bis	29/07/2011	S0	10	305	210	123	72	
test_aria_216	test_aria_216_bis	29/07/2011	S0	15	335	301	199	106	
test_aria_217	test_aria_217_bis	29/07/2011	S0	20	303	349	225	121	
test_aria_218	test_aria_218_bis	29/07/2011	S0	25	327	327	213	112	
test_aria_219	test_aria_219_bis	29/07/2011	S0	30	303	411	287	146	
test_aria_220	test_aria_220_bis	29/07/2011	S0	30	345	331	198	128	similar to previous but with modification to BSA
test_aria_221	test_aria_221_bis	29/07/2011	S0	35	312	437	255	168	
test_aria_222	test_aria_222_bis	29/07/2011	S0	40	317	498	285	190	
test_aria_223	test_aria_223_bis	29/07/2011	S0	50	411	451	260	176	
test_aria_224	test_aria_224_bis	29/07/2011	S0	60	305	523	299	198	
test_aria_225	test_aria_225_bis	29/07/2011	S0	70	321	447	256	169	
test_aria_226	test_aria_226_bis	29/07/2011	S0	80	302	329	184	123	

Table 65. Section S1. Measurements in air on rigid bottom

file name (non coinc. mode)	file name (coinc. mode)	date (gg/mm/aaaa)	section	relative level (mm)	duration (s)	datarate ch1 (Hz)	datarate ch2 (Hz)	datarate coinc. (Hz)	comments
test_aria_267	test_aria_267_bis	30/07/2011	S1	1	303	55	43	21	
test_aria_268	test_aria_268_bis	30/07/2011	S1	3	316	65	35	21	
test_aria_269	test_aria_269_bis	30/07/2011	S1	6	301	64	33	20	
test_aria_270	test_aria_270_bis	30/07/2011	S1	10	305	117	65	42	
test_aria_271	test_aria_271_bis	30/07/2011	S1	15	329	106	56	37	
test_aria_272	test_aria_272_bis	30/07/2011	S1	20	300	102	55	35	
test_aria_273	test_aria_273_bis	30/07/2011	S1	25	327	100	52	34	
test_aria_274	test_aria_274_bis	30/07/2011	S1	30	301	75	38	24	
Note: limited set of measurements due to limited available time									

Table 66. Section S2. Measurements in air on rigid bottom

file name (non coinc. mode)	file name (coinc. mode)	date (gg/mm/aaaa)	section	relative level (mm)	duration (s)	datarate ch1 (Hz)	datarate ch2 (Hz)	datarate coinc. (Hz)	comments
test_aria_259	test_aria_259_bis	30/07/2011	S2	1	301	68	44	24	
test_aria_260	test_aria_260_bis	30/07/2011	S2	3	322	84	46	28	
test_aria_261	test_aria_261_bis	30/07/2011	S2	6	308	102	58	36	
test_aria_262	test_aria_262_bis	30/07/2011	S2	10	303	98	55	35	
test_aria_263	test_aria_263_bis	30/07/2011	S2	15	302	117	65	42	
test_aria_264	test_aria_264_bis	30/07/2011	S2	20	300	160	84	56	
test_aria_265	test_aria_265_bis	30/07/2011	S2	25	331	127	68	44	
test_aria_266	test_aria_266_bis	30/07/2011	S2	30	na	214	120	78	
Note: limited set of measurements due to limited available time									

Table 67. Section S3. Measurements in air on rigid bottom

file name (non coinc. mode)	file name (coinc. mode)	date (gg/mm/aaaa)	section	relative level (mm)	duration (s)	datarate ch1 (Hz)	datarate ch2 (Hz)	datarate coinc. (Hz)	comments
test_aria_228	test_aria_228_bis	30/07/2011	S3	1.5	315	134	77	47	
test_aria_229	test_aria_229_bis	30/07/2011	S3	3	303	115	69	42	
test_aria_230	test_aria_230_bis	30/07/2011	S3	6	347	224	139	87	
test_aria_231	test_aria_231_bis	30/07/2011	S3	10	301	335	197	129	
test_aria_232	test_aria_232_bis	30/07/2011	S3	15	302	555	333	213	
test_aria_233	test_aria_233_bis	30/07/2011	S3	20	167	617	364	233	
test_aria_234	test_aria_234_bis	30/07/2011	S3	25	327	579	338	218	
test_aria_235	test_aria_235_bis	30/07/2011	S3	30	414	629	375	245	
test_aria_236	test_aria_236_bis	30/07/2011	S3	35	303	964	553	358	
test_aria_237	test_aria_237_bis	30/07/2011	S3	40	308	1043	601	383	
test_aria_238	test_aria_238_bis	30/07/2011	S3	50	306	1284	721	470	
test_aria_239	test_aria_239_bis	30/07/2011	S3	60	237	1338	770	500	
test_aria_240	test_aria_240_bis	30/07/2011	S3	70	311	1173	647	426	
test_aria_241	test_aria_241_bis	30/07/2011	S3	80	299	1032	573	379	

Table 68. Section S4. Measurements in air on rigid bottom

file name (non coinc. mode)	file name (coinc. mode)	date (gg/mm/aaaa)	section	relative level (mm)	duration (s)	datarate ch1 (Hz)	datarate ch2 (Hz)	datarate coinc. (Hz)	comments
test_aria_275	test_aria_275_bis	30/07/2011	S4	1	308	67	26	13	
test_aria_276	test_aria_276_bis	30/07/2011	S4	3	310	50	20	11	
test_aria_277	test_aria_277_bis	30/07/2011	S4	6	303	50	23	12	
test_aria_278	test_aria_278_bis	30/07/2011	S4	10	315	68	33	20	
test_aria_279	test_aria_279_bis	30/07/2011	S4	15	307	113	52	31	
test_aria_280	test_aria_280_bis	30/07/2011	S4	20	228	115	55	34	
test_aria_281	test_aria_281_bis	30/07/2011	S4	25	317	101	43	28	
test_aria_282	test_aria_282_bis	30/07/2011	S4	30	301	122	51	32	

Table 69. Section S5. Measurements in air on rigid bottom

file name (non coinc. mode)	file name (coinc. mode)	date (gg/mm/aaaa)	section	relative level (mm)	duration (s)	datarate ch1 (Hz)	datarate ch2 (Hz)	datarate coinc. (Hz)	comments
test_aria_283	test_aria_283_bis	30/07/2011	S5	1	305	66	30	15	
test_aria_284	test_aria_284_bis	30/07/2011	S5	3	310	51	28	14	
test_aria_285	test_aria_285_bis	30/07/2011	S5	6	301	54	29	16	
test_aria_286	test_aria_286_bis	30/07/2011	S5	10	300	78	40	23	
test_aria_287	test_aria_287_bis	30/07/2011	S5	15	311	97	47	28	
test_aria_288	test_aria_288_bis	30/07/2011	S5	20	205	129	60	36	
test_aria_289	test_aria_289_bis	30/07/2011	S5	25	304	93	44	28	
test_aria_290	test_aria_290_bis	30/07/2011	S5	30	306	90	40	25	

Table 70. Section S6. Measurements in air on rigid bottom

file name (non coinc. mode)	file name (coinc. mode)	date (gg/mm/aaaa)	section	relative level (mm)	duration (s)	datarate ch1 (Hz)	datarate ch2 (Hz)	datarate coinc. (Hz)	comments
test_aria_242	test_aria_242_bis	30/07/2010	S6	1	302	96	35	18	
test_aria_243	test_aria_243_bis	30/07/2010	S6	3	302	90	36	18	
test_aria_244	test_aria_244_bis	30/07/2010	S6	6	308				invalid file
test_aria_245	test_aria_245_bis	30/07/2010	S6	4.5	331	133	61	31	
test_aria_246	test_aria_246_bis	30/07/2010	S6	8	302	173	89	48	
test_aria_247	test_aria_247_bis	30/07/2010	S6	10	309	220	94	52	
test_aria_248	test_aria_248_bis	30/07/2010	S6	11.5	314	363	146	84	glass junction at 13 mm
test_aria_249	test_aria_249_bis	30/07/2010	S6	15	303	449	208	119	
test_aria_250	test_aria_250_bis	30/07/2010	S6	20	304	702	351	208	
test_aria_251	test_aria_251_bis	30/07/2010	S6	25	302	776	377	231	
test_aria_252	test_aria_252_bis	30/07/2010	S6	30	304	769	360	223	
test_aria_253	test_aria_253_bis	30/07/2010	S6	35	301	742	330	206	
test_aria_254	test_aria_254_bis	30/07/2010	S6	40	304	756	329	206	
test_aria_255	test_aria_255_bis	30/07/2010	S6	50	302	812	355	204	
test_aria_256	test_aria_256_bis	30/07/2010	S6	60	302	915	448	259	
test_aria_257	test_aria_257_bis	30/07/2010	S6	70	344	687	300	174	
test_aria_258	test_aria_258_bis	30/07/2010	S6	80	342	453	181	113	

Table 71. Section S7. Measurements in air on rigid bottom

file name (non coinc. mode)	file name (coinc. mode)	date (gg/mm/aaaa)	section	relative level (mm)	duration (s)	datarate ch1 (Hz)	datarate ch2 (Hz)	datarate coinc. (Hz)	comments
test_aria_291	test_aria_291_bis	30/07/2011	S7	1	301	16	8	3	
test_aria_292	test_aria_292_bis	30/07/2011	S7	3	272	43	21	10	
test_aria_293	test_aria_293_bis	30/07/2011	S7	2	303	27	13	6	
test_aria_294	test_aria_294_bis	30/07/2011	S7	4	310	41	20	10	
test_aria_295	test_aria_295_bis	30/07/2011	S7	5	304	54	30	15	
test_aria_296	test_aria_296_bis	30/07/2011	S7	6	310	44	24	12	
test_aria_297	test_aria_297_bis	30/07/2011	S7	8	307	38	22	11	
test_aria_298	test_aria_298_bis	30/07/2011	S7	10	372	76	43	23	
test_aria_299	test_aria_299_bis	30/07/2011	S7	15	302	109	54	31	
test_aria_300	test_aria_300_bis	30/07/2011	S7	20	302				invalid file
test_aria_301	test_aria_301_bis	30/07/2011	S7	25	306	121	46	27	
test_aria_302	test_aria_302_bis	30/07/2011	S7	30	302	76	28	16	

Table 72. Section S-1. Measurements in air on water as reference

file name (non coinc. mode)	file name (coinc. mode)	date (gg/mm/aaaa)	section	relative level (mm)	duration (s)	datarate ch1 (Hz)	datarate ch2 (Hz)	datarate coinc. (Hz)	comments
test_aria_205	test_aria_205_bis	27/07/2010	S-1	70	319	96	120	40	6.5 V (fan control)
test_aria_206	test_aria_206_bis	27/07/2010	S-1	70	315	129	152	52	7.0 V (fan control)
test_aria_207	test_aria_207_bis	27/07/2010	S-1	70	372	146	175	61	7.5 V (fan control)
test_aria_208	test_aria_208_bis	27/07/2010	S-1	70	321	125	160	53	8.0 V (fan control)
test_aria_209	test_aria_209_bis	27/07/2010	S-1	70	312	128	159	54	8.5 V (fan control)
test_aria_210	test_aria_210_bis	27/07/2010	S-1	70	305	134	166	56	9.0 V (fan control)
test_aria_211	test_aria_211_bis	27/07/2010	S-1	70	308	120	109	47	9.5 V (fan control)