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TREATMENT TANK OFF-GAS TESTING FOR THE ENHANCED CHEMICAL CLEANING PROCESS

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ACRONYMS

ASTM - American Society of Testing and Materials
ECC – Enhanced Chemical Cleaning
GC – Gas Chromatograph
LPR – Linear Polarization Resistance
M&TE – Materials and Testing Equipment
UNS – Unified Numbering System

Treatment Tank Off-Gas Testing for the Enhanced Chemical Cleaning Process

1.0 Executive Summary

The purpose of this activity was to provide a bounding estimate of the volume of hydrogen gas generated during Enhanced Chemical Cleaning (ECC) of residual sludge remaining in a Type I or Type II treatment tank as well as to provide results independent of the sludge volume in the waste tank to be cleaned. Previous testing to support Chemical Cleaning was based on a 20:1 oxalic acid to sludge ratio [1]. Hydrogen gas evolution is the primary safety concern.

Sealed vessel coupon tests were performed to estimate the hydrogen generation rate due to corrosion of carbon steel by 2.5 wt.% oxalic acid. These tests determined the maximum instantaneous hydrogen generation rate, the rate at which the generation rate decays, and the total hydrogen generated. These values were quantified based on a small scale methodology similar to the one described in WSRC-STI-2007-00209, Rev. 0 [1]. The measured rates support identified Safety Class functions [2].

The tests were performed with ASTM A285 Grade C carbon steel coupons. Bounding conditions were determined for the solution environment. The oxalic acid concentration was 2.5 wt.% and the test temperature was 75 °C. The test solution was agitated and contained no sludge simulant. Duplicate tests were performed and showed excellent reproducibility for the hydrogen generation rate and total hydrogen generated. The results showed that the hydrogen generation rate was initially high, but decayed rapidly within a couple of days.

A statistical model was developed to predict the instantaneous hydrogen generation rate as a function of exposure time by combining both sets of data. An upper bound on the maximum hydrogen generation rate was determined from the upper 95% confidence limit. The upper bound confidence limit for the hydrogen generation rate is represented by the following equation.

$$\ln (G_v) = -8.22 - 0.0584\, t + 0.0002\, t^2$$

This equation should be utilized to estimate the instantaneous hydrogen generation rate per unit surface area, G_v, at a given time, t. The units for G_v and t are $ft^3/ft^2/min$ and hours, respectively.

The total volume of hydrogen gas generated during the test was calculated from the model equation. An upper bound on the total gas generated was determined from the upper 95% confidence limit. The upper bound limit on the total hydrogen generated during the 163 hour test was 0.332 ft^3/ft^2.

The maximum instantaneous hydrogen generation rate for this scenario is greater than that previously measured in the 8 wt.% oxalic acid tests [1] due to both the absence of sludge in the test (i.e., greater than 20:1 ratio of acid to sludge) and the use of polished coupons (vs. mill scale coupons). However, due to passivation of the carbon steel surface, the corrosion rate decays by an order of magnitude within the first three days of exposure such that the instantaneous hydrogen generation rates are less than that previously measure in the 8 wt.% oxalic acid tests. While the results of these tests are bounding, the conditions used in this study may not be representative of the ECC flowsheet, and the applicability of these results to the flowsheet should be evaluated for the following reasons:

- The absence of sludge results in higher instantaneous hydrogen generation rates than when the sludge is present.
- Polished coupons do not represent the condition of the carbon steel interior of the tank, which are covered with mill scale. Based on lower instantaneous corrosion rates measured on mill scale coupons exposed to oxalic acid, lower instantaneous hydrogen generation rates are expected for the tank interior than measured on the polished coupons.

Corrosion rates were determined from the coupon tests and also calculated from the measured hydrogen generation rates. Excellent agreement was achieved between the time averaged corrosion rate calculated from the hydrogen generation rates and the corrosion rates determined from the coupon tests. The corrosion rates were on the order of 18 to 28 mpy. Good agreement was also observed between the maximum instantaneous corrosion rate as calculated from the hydrogen generation rate and the corrosion rate determined by previous electrochemical tests [3].

2.0 Background

As a part of chemical cleaning, oxalic acid is added to the treatment tank to dissolve and break up the residual sludge heel that remains after bulk sludge removal is complete [1]. However, the acid also corrodes the carbon steel tank wall and cooling coils. If sludge has dissolved into the oxalic acid, little or no hydrogen evolution is anticipated due to corrosion of the carbon steel or other chemical reactions. Various corrosion tests, including those at 1 wt%, 2.5 wt.% and 8 wt% [3, 4], show that when the sludge simulant is present, the electrochemical potential shifts toward more oxidizing values and therefore reduces the likelihood of hydrogen generation.

On the other hand, if the oxalic acid has little interaction with the sludge, hydrogen gas, could conceivably evolve at cathodic areas due to the corrosion of the carbon steel. Scenarios where hydrogen evolution could occur during ECC include the initial filling of the tank prior to agitation and near the end of the process when there is little or no sludge present. The purpose of this activity was to provide an estimate of the volume of gas generated during ECC of the residual sludge remaining in a Type I or Type II treatment tank.

A test condition that was expected to result in the highest instantaneous corrosion rate was selected. An upper bound oxalic acid concentration of 2.5 wt.% was utilized for the tests. The oxalic acid concentration of the ECC process will nominally be 2 wt.%. No sludge was present in the test to address the scenarios where the tank is essentially empty and oxalic acid is added back either inadvertently or for a final rinse. Hydrogen evolution may occur at these acidic, reducing conditions.

Previous electrochemical tests indicated that the highest corrosion rates in 2.5 wt.% oxalic acid were observed at 75 °C in an agitated solution (i.e., approximately 300 mpy) [3]. However, corrosion rates measured on 30 day coupon tests at the same test conditions indicated that the corrosion rate is on the order of 20 mpy [3]. This result indicates that after an initially high corrosion rate, the surface is passivated and the corrosion rates decrease dramatically. Based on this observation, the hydrogen generation rates measured initially will be quite high, and will decay significantly as the corrosion rate decreased.

The tests reported in this document determined the maximum instantaneous hydrogen generation rate, the rate at which the generation rate decays, and the total hydrogen generated. The generation rates for hydrogen and total gas were quantified based on a small scale methodology similar to the one described in WSRC-STI-2007-00209, Rev. 0 [1]. The measured rates support identified Safety Class functions [2]. Quality assurance measures for this testing were identified in the task technical and quality assurance plan [5].

3.0 Experimental

3.1 Test Material

The material tested was ASTM A285, Grade C carbon steel (UNS K02200). This material has similar chemical and physical properties as the Type I and II waste storage tanks that will be the focus of the initial chemical cleaning operations. The chemical composition and the mechanical properties (see Tables 1 and 2) of the as-received coupons were vendor certified. The dimensions of each coupon were measured with digital calipers to the nearest 0.025 mm (or 0.001 inches). The coupons were weighed on an analytical balance to the nearest 0.0001 grams. Table 3 shows the dimensions, surface area, and weight of the two coupons that were tested.

The initial surface condition of the coupons was a 600 grit polished finish. The polished coupons provide a uniform, reproducible surface finish ideal for studying reactions between the steel and the environment.

Table 1. Chemical Composition (Wt %) of A285 Grade C, Carbon Steel

C	Mn	P	S	Cu	Ni	Cr	Si	Fe
0.18	0.75	0.011	0.008	0.03	0.03	0.06	-	balance

Table 2. Mechanical Properties of A285 Grade C, Carbon Steel

Yield Strength (ksi)	Tensile Strength (ksi)	% Elongation
48	67	31 (2 inch)

Table 3. Initial Dimensions, Surface Areas and Weights of Corrosion Coupons

Sample ID	Length (cm)	Width (cm)	Thickness (cm)	Surface Area (cm2)[a]	Initial Weight (g)
7	2.534	2.178	0.587	16.212	23.7783
9	2.224	2.227	0.614	15.019	22.4889

a – Surface area includes correction for the hole in coupon which was 0.476 cm in diameter.

3.2 Test Solution

The 2.5 wt.% oxalic acid solution was prepared with reagent grade $C_2H_2O_4$-$2H_2O$. The solution was prepared by adding 35 g of the reagent to 1 liter of distilled water. The solution temperature during the test was 75 ± 5 ºC.

3.3 Test Set-up

The tests were performed in the stainless steel container shown in Figure 1. Two of these vessels were used for the tests. A copper gasket was utilized to seal the test vessel. Nominally the vessel had a three inch interior diameter and a two inch internal height. Each vessel was equipped with a 100 psig rupture disk as shown in Figure 1a.

The set up of the coupon test is shown in Figure 1c. A glass insert was utilized to contain the oxalic acid and the coupon. The insert was equipped with a glass hanger for the coupon. A small sheet of Teflon™ was also hung to shield the stirring bar from the carbon steel coupon. Agitation was achieved with the magnetic stirring bar on a stirring hot plate. The volume of oxalic acid and the vapor space volume is shown in Table 4. The vapor space volume was determined from the vapor space in the vessel, the volume of the tubing, and the volume within the pressure transducer that was utilized for the test.

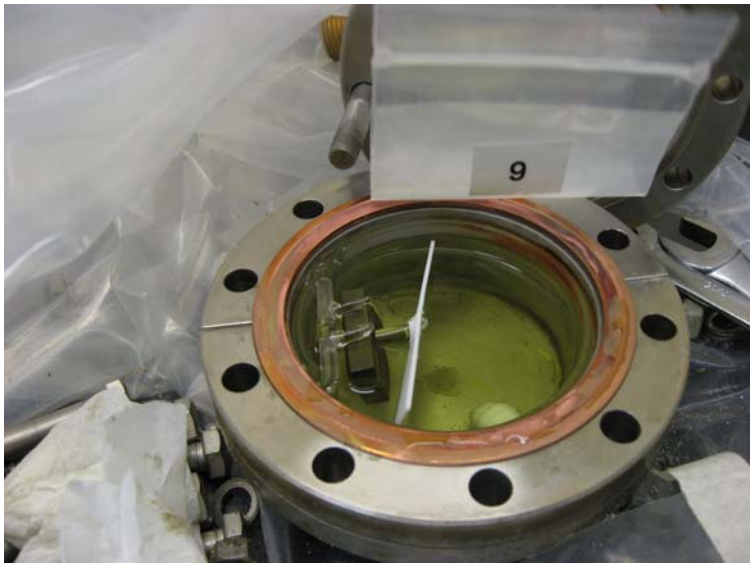
Table 4. Liquid and Vapor Space Volumes that Were Utilized for the Tests.

Sample ID	Liquid Volume (ml)	Vapor Volume
7	93	143
9	93	137

The complete system is shown in Figure 2. The test vessels were placed in a bed of sand on a hot plate with stirring capability. The sand was utilized to moderate the temperature of the vessel during the test. Type E thermocouples were used to monitor the container temperature. The pressure in each container was measured with a Rosemount™ Model 1151DP pressure transducer (see Figure 3). The transducers were calibrated with a range of 0 to 150 inches of water (0 to 5.4 psig). The temperature and pressure were monitored with LabVIEW™ 7.1 (National Instruments) software.

(a)

(b)



(c)

Figure 1. Sealed vessel utilized for off-gas tests (a) vessel with rupture disk assembly, (b) interior of vessel, and (c) vessel with coupon and solution.

Figure 2. System utilized to perform off-gas tests.

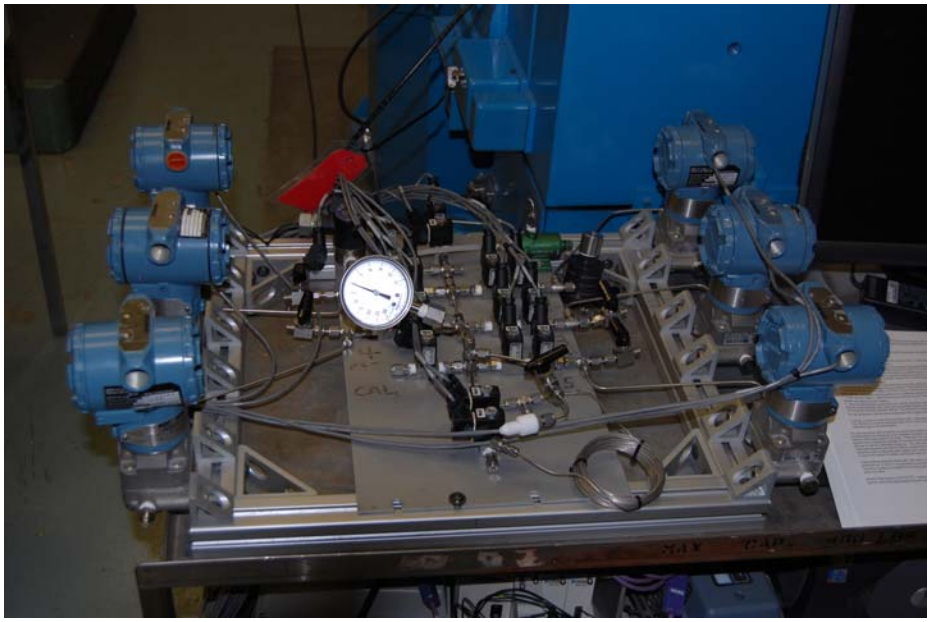


Figure 3. Transducers used to monitor pressure.

Samples were obtained manually during the test. The stainless steel tubing included a port whereby samples could be withdrawn from the closed system periodically via a syringe. Sufficient sample was withdrawn to perform duplicate analyses with a gas chromatograph (GC). A MTI Model M200 Micro GC™ gas chromatograph was used to analyze for hydrogen. EZChrom™ version 4.5 software, developed by Agilent, operated and provided output from the GC. Prior to testing, the GC system was checked with prepared calibration gases.

3.4 Test Procedure

This procedure was developed to obtain an "instantaneous" hydrogen generation rate. A volume of gas was captured in the system over a given time interval. The system was then sampled to determine the concentration of hydrogen present. The system was then purged and the process was initiated again to determine another instantaneous hydrogen generation rate. The following steps outline this process and were taken once the system had achieved equilibrium at 75 ºC.

1) Isolate the system by closing all valves, except those between the test vessel and the pressure transducer.
2) Monitor the pressure and temperature for time intervals between 2 to 20 hours (see Figure 4). If the pressure exceeded 150 inches of water, a sample would be obtained and the system purged.
3) Use a syringe to obtain a gas sample from the port. Analyze the sample in the GC for hydrogen.
4) Vent the system to the atmosphere by opening a valve on the manifold.
5) Isolate test vessel from the system. Evacuate the stainless steel tubing to remove residual hydrogen from the system.
6) Vent the test vessel and the system to the atmosphere by opening a valve on the manifold.
7) Repeat steps 5 and 6 twice.
8) Return to step 1 to gather the next data point.

3.5 Post-Test Characterization of Coupons

At the completion of the test, the coupons were removed from the test vessel for visual examination. During this examination, the form of corrosion on each coupon was identified (e.g., general) and differences in the corrosion products were noted. Photographs were taken to document these results. ASTM standard practices were followed to determine the general corrosion rate [6]. The corrosion products were removed from the sample by a two step process. First, loose corrosion products were removed using a wire brush. The coupons were then immersed in Clarke's solution (i.e., an inhibited HCl acid solution) to remove the final corrosion products. After removal of the corrosion products, the coupons were weighed on an M&TE calibrated balance to determine the resultant weight loss.

The corrosion rate, in mils per year (mpy), is related to the weight loss of the coupon by the following equation:

$$\text{Corrosion Rate} = \frac{3.45x10^6}{AxTx\rho}w \qquad \text{Equation 1}$$

where w is the weight loss in grams, A is the area in cm^2, T is the exposure time in hours, and ρ is the density in g/cm^3.

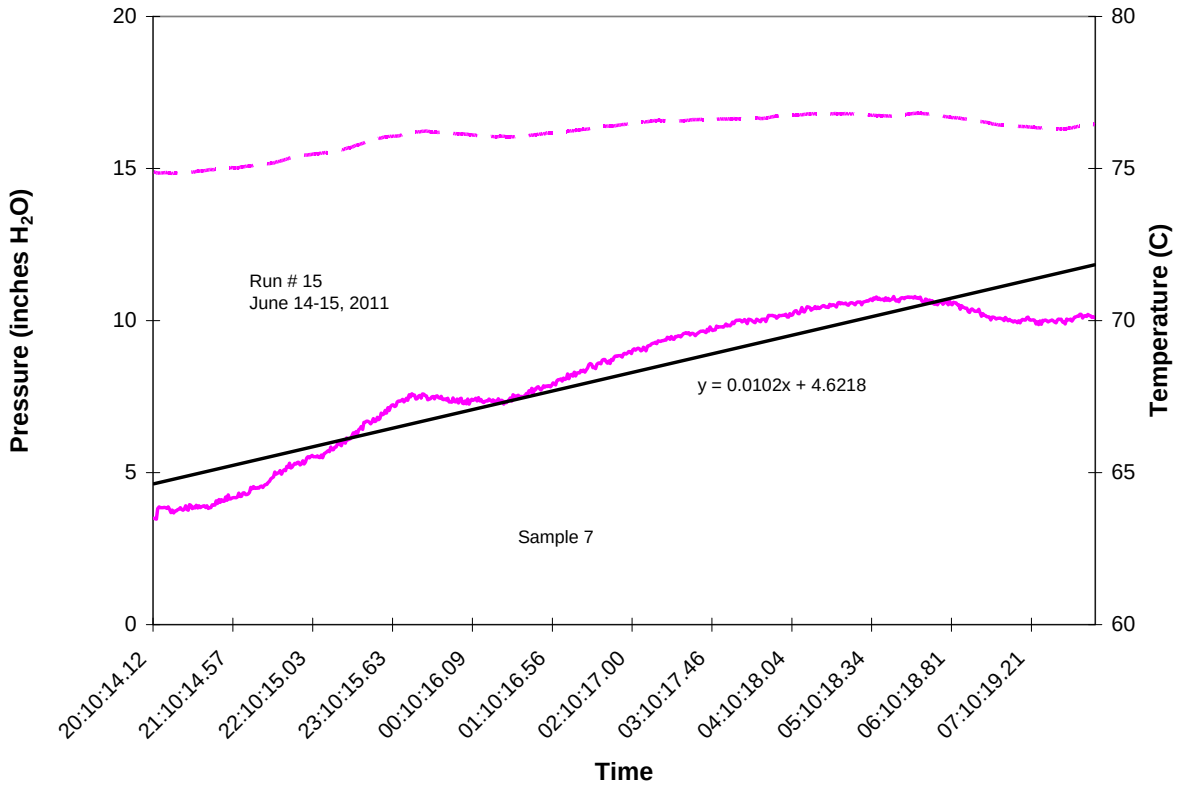


Figure 4. Example of pressure and temperature transient measured during the test. The dashed line is the temperature and is shown on the y-axis on the right. The solid line with the trend line is the pressure transient and is shown on the y-axis on the left. Data was obtained between approximately 8:00 pm on June 14, 2011 through 8:00 am on June 15, 2011.

3.6 Data Analysis

Direct and indirect methods were utilized to measure the hydrogen generation rate. The direct method involved obtaining a measurement of the hydrogen concentration via the GC. Two gas samples were obtained from each test and the results for each time interval are reported in the Appendix. The hydrogen generation rate may be calculated given the

concentration, the volume of the system, and the time interval over which the hydrogen had accumulated in the system.

The indirect method involved the pressure measurements that were made during the test. The primary purpose of the pressure measurements was to ensure that the system did not over-pressurize. Secondarily, the pressure is related to the volume of gas generated via the ideal gas law. The pressure, P, in the vessel is expressed as:

$$P = n\ R\ T/V \qquad \text{Equation 2}$$

where n is the number of moles, R is the gas constant (of 0.0821 mole-l/atm-K), T is the temperature in degrees K, and V is the volume in liters of the vessel, tubing and pressure transducer. For this test, T and V are constant and therefore the first derivative of Equation 2 with respect to time is:

$$\frac{dP}{dt} = \frac{RT}{V} * \frac{d\Delta n}{dt} \qquad \text{Equation 3}$$

In these tests, the only assumed change in the number of moles is due to the generation of hydrogen gas. Re-arranging Equation 3 gives the following equation for the molar hydrogen generation rate.

$$\frac{d\Delta n}{dt} = \frac{V}{RT}\ \frac{dP}{dt} \qquad \text{equation 4}$$

The pressure as a function of time was recorded in an EXCEL™ spreadsheet by the LabView software. The response was linear as a function of time in each vessel for nearly all the tests. The EXCEL™ program was used to determine the slope of the line, or dP/dt.

4.0 Results and Discussion

Figure 5 shows the instantaneous hydrogen generation rate per unit area measured for the duplicate tests. The maximum generation rate occurred between 2.5 to 5 hours after the beginning of the test for both samples. The maximum generation rate ranged between 7.1 x 10^{-5} to 8.6 x 10^{-5} $ft^3/ft^2/min$ for samples 9 and 7, respectively. Within 48 hours after the test began, the hydrogen generation rate had decayed by an order of magnitude from the maximum value. At the end of the week the rate had decreased even further to approximately one to two orders of magnitude less than the initial maximum rate.

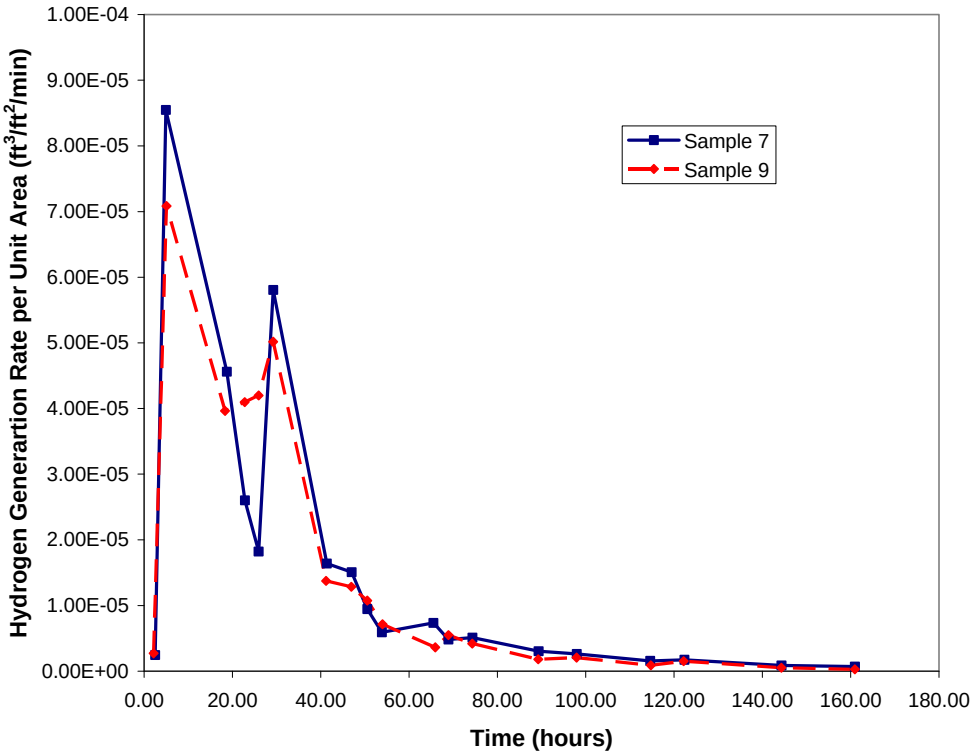


Figure 5. Instantaneous hydrogen generation rates for duplicate tests.

As mentioned above, two methods were utilized to measure the volume of hydrogen generated during the tests. Figure 6 shows a comparison of the direct, by volume change, and the indirect, by pressure change, methods utilizing the data from the test with sample 9. The first observation is that fewer data points were gathered with the indirect method. The changes in pressure measured were very small, typically less than 10 inches of water (i.e., approximately 0.3 psig). As a result, changes in the ambient conditions are believed to have influenced the pressure gauge readings at these low values. Thus, the pressure gauge was not sensitive enough in these tests to provide sufficient resolution at these low pressures. In previous tests, when other gases such as carbon dioxide were evolved, these gauges performed well [2]. Nevertheless, the hydrogen generation rate calculated from this method does indicate the same decaying trend with time as the rates measured by the direct method.

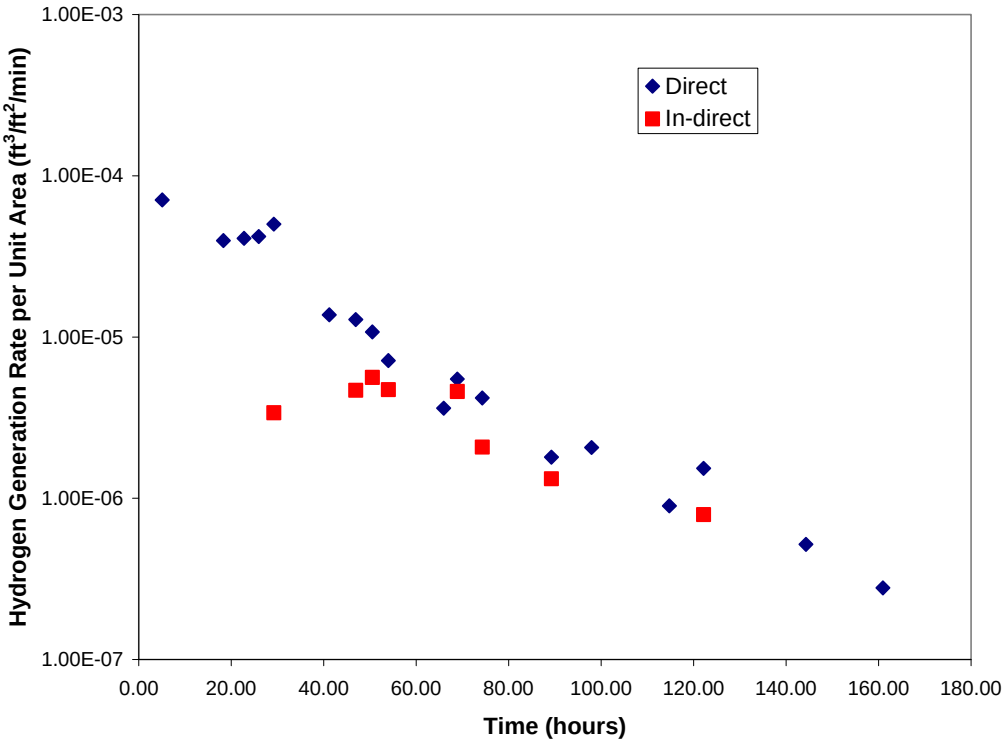


Figure 6. Comparison of the direct and indirect measurement methods for the hydrogen generation rate for the test with Sample 9.

These results indicate that the hydrogen generation rates from samples 7 and 9 were virtually identical (see Figure 5). A statistical analysis was performed to evaluate the two data sets and determine an equation that would predict the maximum generation rate and the rate at which the generation rate decays. Confidence intervals (95% level) were also determined to assess the uncertainty in the hydrogen generation rates.

To perform the analysis a log transformation of the hydrogen generation rates was performed. (Note: For this analysis the first data point obtained after 2.5 hours of testing was neglected. The generation rate was low during this time due to a number of factors such as a transient temperature and the time necessary to establish an equilibrium between the sample and the solution.) The data were then input into the JMP™ statistical package to determine the best fit regression model and the confidence interval (see Figure 7). The best fit model as shown by the middle curve was a quadratic expression.

$$\ln (G_v) = -9.65 - 0.0361\ t + 0.00011\ (t - 68.5)^2 \qquad \text{Equation 5}$$

where G_v is the volumetric hydrogen generation rate per unit area in ft^3/ft^2/minute and t is the time in hours. The R^2 for this model was 0.96. The model predicts a high initial hydrogen generation rate followed by a rapid decay to a low constant generation rate that is one to two orders of magnitude less than the initial generation rate. Given that the maximum generation rate was observed five hours after the initiation of the test, the equation would predict a hydrogen generation rate of 8.38×10^{-5} ft^3/ft^2/minute. After two

and five days the hydrogen generation rate decreased to 1.2×10^{-5} and 1.1×10^{-6} ft^3/ft^2/minute, respectively.

The upper and lower 95% confidence intervals are shown around the polynomial fit. An upper bound on the maximum hydrogen generation rate was determined from the upper 95% confidence limit. The curve that represents the 95% upper confidences limit may be fit with a spline technique. The equation for this line is:

$$\ln (G_v) = -8.22 - 0.0584\, t + 0.0002\, t^2 \qquad \text{Equation 6}$$

The upper bound limit on the maximum instantaneous generation rate at 5 hours was 2.03×10^{-4} ft^3/ft^2/minute. After two and five days the upper bound limit decayed to 2.6×10^{-5} and 4.4×10^{-6} ft^3/ft^2/minute, respectively.

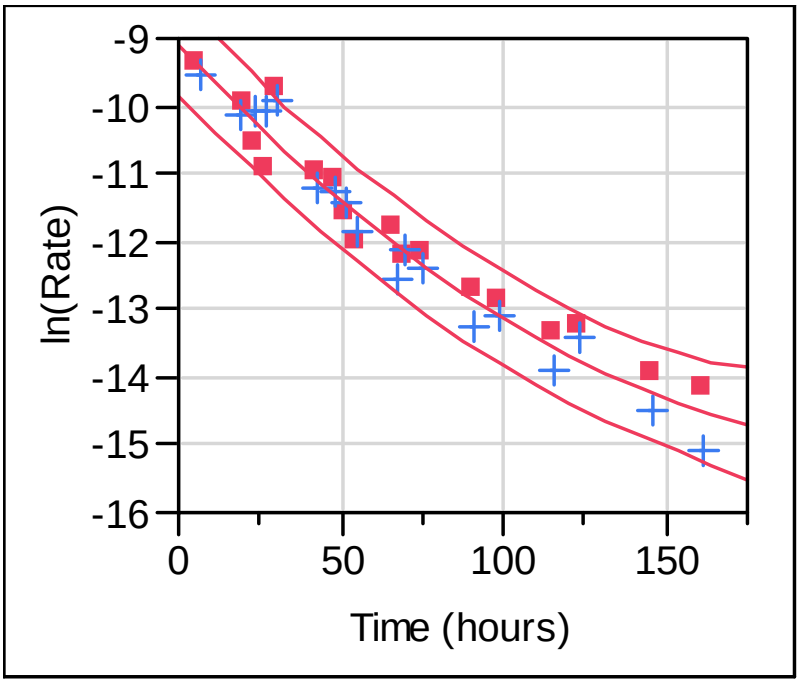


Figure 7. Model for prediction of the volumetric hydrogen generation rate as a function of time. Red squares represent the test data from sample 7 and blue crosses represent the test data from sample 9.

The total volume of hydrogen gas generated during the test may be calculated by integrating the model equation with respect to time. The total hydrogen generated as a function of time is shown in Table 5. Approximately 86% of the total gas that was generated during the 1 week interval was generated during the first two days of the test. The upper bound for the total gas generated was determined by integrating beneath the curve for the upper 95% confidence interval. As shown in Table 5, the upper bound limit is approximately 2.4 times greater than that predicted by the model.

Table 5. Total Volume of Hydrogen Gas Per Unit Area Generated During the Test

Time (hours)	Total Volume of Hydrogen from Model Equation (ft^3/ft^2)	Total Volume of Hydrogen Upper 95% Confidence Interval (ft^3/ft^2)
5	0.029	0.071
48	0.121	0.279
120	0.139	0.323
160	0.140	0.332

The moles of hydrogen generated are related to the volume of hydrogen generated by the ideal gas law. Furthermore, in the case of iron in an acidic reducing environment, the number of moles of hydrogen generated is equal to the number of moles of iron corroded [7]. A relationship between the hydrogen generation rate and the corrosion rate was previously derived [8]:

$$\text{Corrosion Rate} = G_r/S_A/(3.8\text{x } 10^{-5}) \qquad \text{Equation 7}$$

where G_r is the hydrogen generation rate in moles/hr, S_A is the surface area in ft^2, and the corrosion rate is in mpy. The instantaneous corrosion rate as a function of time was calculated based on the instantaneous hydrogen generation rates and the surface area of each sample. Figure 8 shows that the maximum corrosion rate also occurred between 2.5 and 5 hours after the initiation of the test and ranged between 135 and 162 mpy for samples 9 and 7, respectively. The corrosion rates also decay by an order of magnitude after 48 hours. This decay in the corrosion rate clearly indicates that passivation occurs at this relatively high temperature.

These corrosion rates were approximately a factor of 2 less than the corrosion rates measured previously by the linear polarization resistance (LPR) technique [3]. Duplicate LPR tests on carbon steel samples resulted in corrosion rates of 264 and 312 mpy. However, the LPR test was conducted approximately 2 hours after the sample was exposed and lasted approximately 10 minutes. On the other hand, these corrosion rates were calculated based on measurements that were taken over a 2.5 hour time period. Thus, given the decay of the corrosion rate with time the lower corrosion rate obtained for the longer test time interval is not surprising that the initial instantaneous corrosion rate is lower for the hydrogen generation tests than the LPR tests.

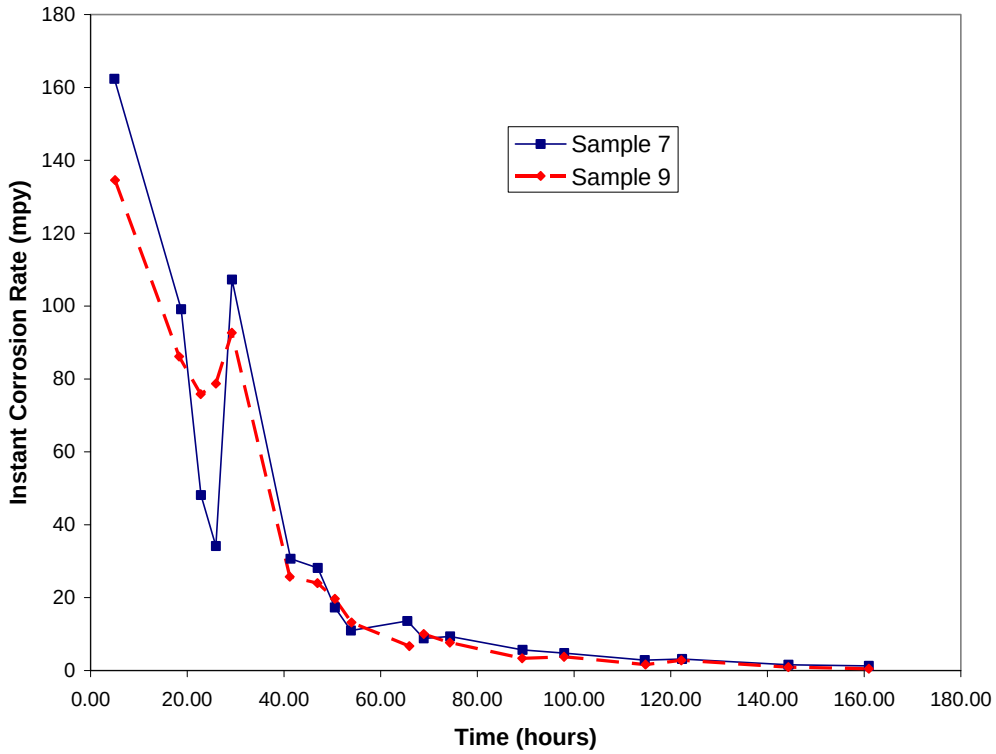


Figure 8. Instantaneous corrosion rates for duplicate tests.

Similar to the hydrogen generation rate, both sets of corrosion rate data may be combined again. The JMP™ statistical analysis package was utilized to determine the best fit line through the corrosion rate data. Figure 9 shows that a quadratic equation fits both sets of data quite well. The equation for the corrosion rate is:

$$\ln(\text{Corrosion Rate}) = 4.82 - 0.0367\,t + 0.00012\,(t-68.5)^2 \qquad \text{Equation 8}$$

where the corrosion rate is in mpy and t is the time in hours. The R^2 for this model was 0.96. The model predicts a high initial corrosion rate followed by a rapid decay to a low constant generation rate that is one to two orders of magnitude less than the initial generation rate. Given that the highest corrosion rate was observed five hours after the initiation of the test, the equation would predict a maximum corrosion rate of 167 mpy. After two and five days the corrosion rate decreased to 22.4 and 2 mpy, respectively.

The upper and lower 95% confidence intervals are shown around the polynomial fit. An upper bound on the maximum hydrogen generation rate was determined from the upper 95% confidence limit. The upper bound limit on the maximum instantaneous corrosion rate at 5 hours was 353 mpy. Thus, the corrosion rate estimated by the LPR test was within this confidence interval. After two and five days the upper bound limit has decayed to 45 and 3 mpy, respectively.

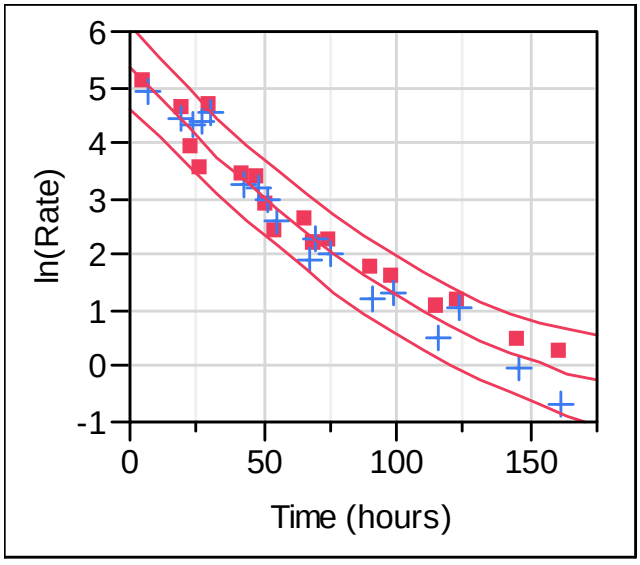


Figure 9. Model for prediction of the instantaneous corrosion rate as a function of time. Red squares represent the test data from sample 7 and blue crosses represent the test data from sample 9.

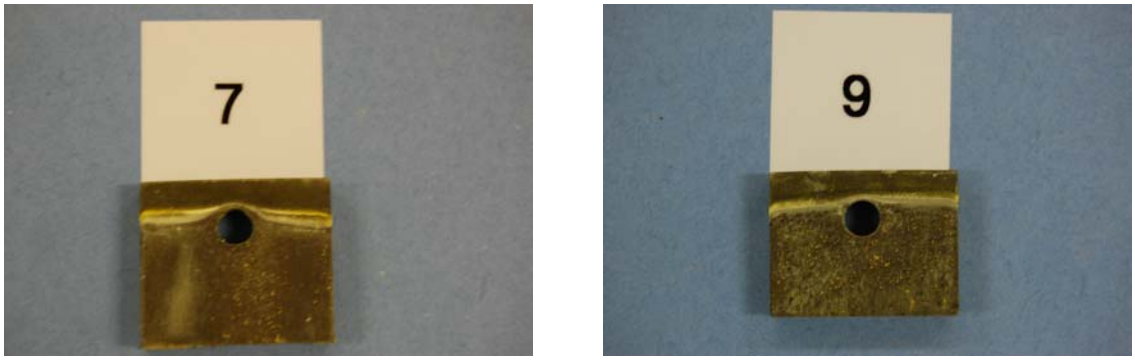
The time averaged corrosion rate was calculated by integrating Equation 8 over the time interval of the test, approximately 160 hours, and then dividing by the time interval. The time averaged corrosion rate as a function of time is shown in Table 4. In addition, the 95% upper and lower confidence interval on the corrosion rate is shown. The time averaged corrosion rate after 160 hours may be compared to the corrosion rates measured from weight loss measurements on the samples used for these studies.

Table 6. Time averaged corrosion rate at various times during the test. Upper and lower 95% confidence intervals are also shown.

Time (hours)	Time Averaged Corrosion Rate from Model Equation (mpy)	Time Averaged Corrosion Rate Upper 95% Confidence Interval (mpy)	Time Averaged Corrosion Rate Lower 95% Confidence Interval (mpy)
5	191	404	104
48	82.3	172	43.8
120	37.6	77.4	19.6
160	28.5	58.5	14.9

The coupons that were tested during these off-gas studies are shown in Figure 10. Both coupons had a dark ferrous oxalate film on the surface similar to that observed in previous coupon tests [3]. The yellow line of ferrous oxalate precipitate on the coupon

could be indicative of a stagnant liquid level. However, the dark ferrous oxalate film was also apparent above this line suggesting that during the test that the whole sample had been exposed. The yellow line may have formed after the test, when the solution was no longer being agitated and while the solution cooled down prior to opening the vessel.



(a) **(b)**

Figure 10. Photographs of post-test coupons (a) sample 7 and (b) sample 9.

The general corrosion rate was calculated based on the weight loss of the sample as shown by Equation 1. The weight loss, exposure time, and general corrosion rates for each sample are shown in Table 7. The general corrosion rates were 17 and 18.5 mpy for samples 9 and 7, respectively. These rates are in good agreement with the 30 day coupon tests that were performed previously [3] and are within the 95% confidence interval for the corrosion rates calculated from the hydrogen generation rates (see Table 6). The slight differences observed are likely due to the error in the assumed model fit for the corrosion rates that were calculated from the hydrogen generation rates.

Table 7. Weight Loss, Exposure Time and General Corrosion Rates for each Sample.

Sample ID	Weight Loss (g)	Exposure Time (hours)	Corrosion Rate (mils/yr)
7	0.1116	163.25	18.5
9	0.0947	163.25	17

5.0 Conclusions

Sealed vessel coupon tests were performed to estimate the hydrogen generation rate due to corrosion of carbon steel by 2.5 wt.% oxalic acid. These tests determined the maximum instantaneous hydrogen generation rate, the rate at which the generation rate decays, and the total hydrogen generated. These values were quantified based on a small scale methodology similar to the one described in WSRC-STI-2007-00209, Rev. 0 [1]. The measured rates support identified Safety Class functions [2].

The tests were performed with ASTM A285 Grade C carbon steel coupons. Bounding conditions were determined for the solution environment. The oxalic acid concentration was 2.5 wt.% and the test temperature was 75 °C. The test solution was agitated and contained no sludge simulant. Duplicate tests were performed and showed excellent reproducibility for the hydrogen generation rate and total hydrogen generated. The results showed that the hydrogen generation rate was initially high, but decayed rapidly within a couple of days.

A statistical model was developed to predict the instantaneous hydrogen generation rate as a function of exposure time by combining both sets of data. An upper bound on the maximum hydrogen generation rate was determined from the upper 95% confidence limit. The upper bound confidence limit for the hydrogen generation rate is represented by the following equation.

$$\ln (G_v) = -8.22 - 0.0584\, t + 0.0002\, t^2$$

This equation should be utilized to estimate the instantaneous hydrogen generation rate per unit surface area, G_v, at a given time, t. The units for G_v and t are ft^3/ft^2/min and hours, respectively.

The total volume of hydrogen gas generated during the test was calculated from the model equation. An upper bound on the total gas generated was determined from the upper 95% confidence limit. The upper bound limit on the total hydrogen generated during the 163 hour test was 0.332 ft^3/ft^2.

The maximum instantaneous hydrogen generation rate for this scenario is greater than that previously measured in the 8 wt.% oxalic acid tests [1] due to both the absence of sludge in the test (i.e., greater than 20:1 ratio of acid to sludge) and the use of polished coupons (vs. mill scale coupons). However, due to passivation of the carbon steel surface, the corrosion rate decays by more than two orders of magnitude within the first three days of exposure such that the instantaneous hydrogen generation rates are less than that previously measure in the 8 wt.% oxalic acid tests. While the results of these tests are bounding, the conditions used in this study may not be representative of the ECC flowsheet, and the applicability of these results to the flowsheet should be evaluated for the following reasons:

- The absence of sludge results in higher instantaneous hydrogen generation rates than when the sludge is present.
- Polished coupons do not represent the condition of the carbon steel interior of the tank, which are covered with mill scale. Based on lower instantaneous corrosion rates measured on mill scale coupons exposed to oxalic acid, lower instantaneous hydrogen generation rates are expected for the tank interior than measured on the polished coupons.

Corrosion rates were determined from the coupon tests and also calculated from the measured hydrogen generation rates. Excellent agreement was achieved between the

time averaged corrosion rate calculated from the hydrogen generation rates and the corrosion rates determined from the coupon tests. The corrosion rates were on the order of 18 to 28 mpy. Good agreement was also observed between the maximum instantaneous corrosion rate as calculated from the hydrogen generation rate and the corrosion rate determined by previous electrochemical tests [3].

6.0 Records and Quality Assurance

All records for the tests were maintained in laboratory notebook SRNL-NB-2011-00054. M&TE equipment that were utilized are recorded in the notebook. The equipment includes: thermocouples, pressure transducers, balance, and digital caliper. The mill certificate for the carbon steel samples is also shown here. Copies of the results of the GC analysis for samples 7 and 9 are shown in the appendix of this report.

7.0 Acknowledgements

The author recognizes the invaluable assistance provided by G.D. Creech in the set-up and performance of these tests. Special thanks also to H. T. Sessions for providing technical assistance with the gas chromatograph and the laboratory facility in the Center for Hydrogen Research. T. K. Williamson and L. T. Smith also provided necessary assistance by preparing the test vessel and solutions. K. R. Hicks and K. J. Kalbaugh were responsible for preparation and cleaning of the carbon steel coupons. The author also recognizes the contributions of Dr. J. I. Mickalonis, who provided insights into the test results, and Dr. S. P. Harris, who provided the statistical analysis of the data.

8.0 References

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8. B. J. Wiersma and H. B. Peacock, “Flammable Gas in Tank 43-H Leak Detection Boxes”, WSRC-TR-2002-00142, March 2002.

APPENDIX

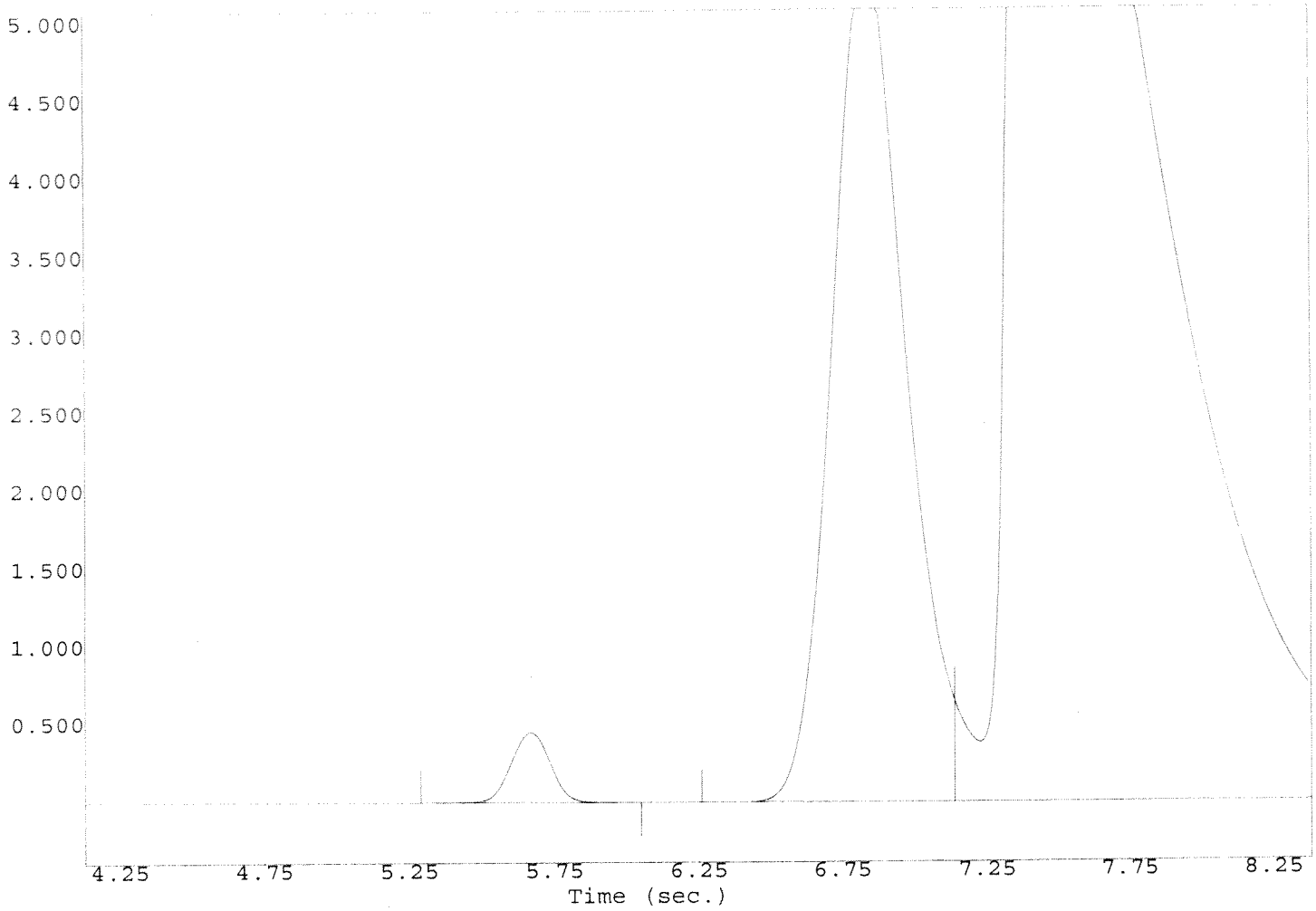
GC Data for Sample 7

External Standard Report

Name	Amount	Units	RT	Min	Max	Mean	%SD
Hydrogen	0.097	%	5.670	-1.000	10.203	0.671	165.800

Channel: A
Current Time: Jun 13, 2011 17:04:40
Method: c:\mti\ezchrom\200\methods\bh51.
File : c:\mti\ezchrom\200\chrom\01090815.1
Data file creation time: Jun 13, 2011 17:03:38
Instrument ID: 180122
Column Type: MS-5A 4m
Carrier Gas: He
Column Head Pressure: 23.8 psi
Column Temperature: 65 C
Instrument Gain: MED
Sample Time: 2 seconds
Inject Time: 10 milliseconds
Run Time: 45 seconds

Sample 7-1



Channel: A
Current Time: Jun 13, 2011 17:04:44
Method: c:\mti\ezchrom\200\methods\bh51.
File : c:\mti\ezchrom\200\chrom\01090815.1
Data file creation time: Jun 13, 2011 17:03:38
Instrument ID: 180122
Column Type: MS-5A 4m
Carrier Gas: He
Column Head Pressure: 23.8 psi
Column Temperature: 65 C
Instrument Gain: MED
Sample Time: 2 seconds
Inject Time: 10 milliseconds
Run Time: 45 seconds

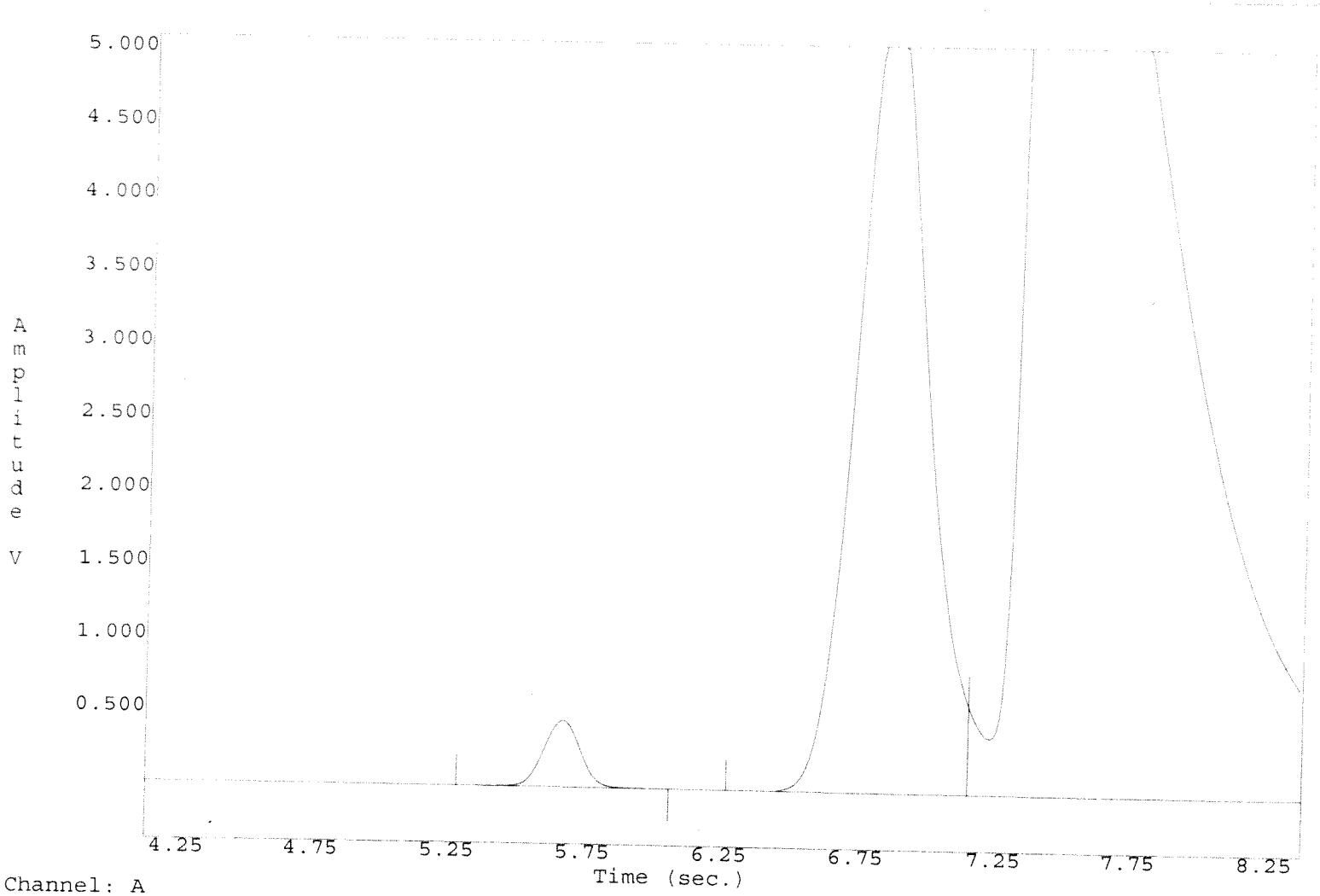
7-1

External Standard Report

Name	Amount	Units	RT	Min	Max	Mean	%SD
Hydrogen	0.098	%	5.670	-1.000	10.203	0.663	167.072

Channel: A
Current Time: Jun 13, 2011 17:07:54
Method: c:\mti\ezchrom\200\methods\bh51.
File : c:\mti\ezchrom\200\chrom\01090815.1
Data file creation time: Jun 13, 2011 17:06:33
Instrument ID: 180122
Column Type: MS-5A 4m
Carrier Gas: He
Column Head Pressure: 23.8 psi
Column Temperature: 65 C
Instrument Gain: MED
Sample Time: 2 seconds
Inject Time: 10 milliseconds
Run Time: 45 seconds

Sample 7-1a



Channel: A
Current Time: Jun 13, 2011 17:07:57
Method: c:\mti\ezchrom\200\methods\bh51.
File : c:\mti\ezchrom\200\chrom\01090815.1
Data file creation time: Jun 13, 2011 17:06:33
Instrument ID: 180122
Column Type: MS-5A 4m
Carrier Gas: He
Column Head Pressure: 23.8 psi
Column Temperature: 65 C
Instrument Gain: MED
Sample Time: 2 seconds
Inject Time: 10 milliseconds
Run Time: 45 seconds

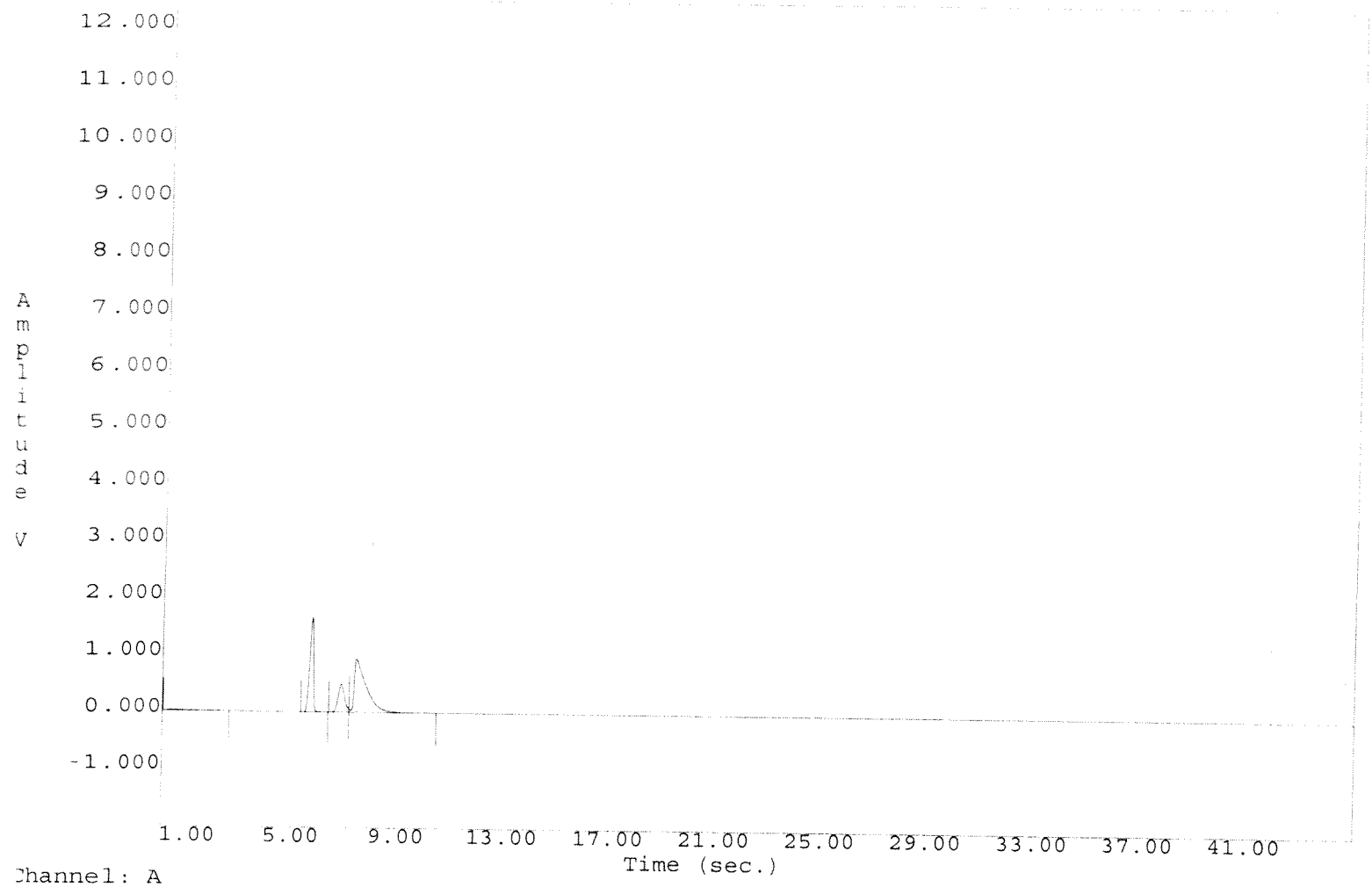
7-1a

External Standard Report

Name	Amount	Units	RT	Min	Max	Mean	%SD
Hydrogen	0.411	%	5.740	-1.000	10.203	0.631	171.971

Channel: A
Current Time: Jun 13, 2011 19:48:00
Method: c:\mti\ezchrom\200\methods\bh51.
File : c:\mti\ezchrom\200\chrom\01090815.1
Data file creation time: Jun 13, 2011 19:46:58
Instrument ID: 180122
Column Type: MS-5A 4m
Carrier Gas: He
Column Head Pressure: 23.8 psi
Column Temperature: 65 C
Instrument Gain: LOW
Sample Time: 2 seconds
Inject Time: 10 milliseconds
Run Time: 45 seconds

Sample 7-2b
Low



Channel: A
Current Time: Jun 13, 2011 19:48:03
Method: c:\mti\ezchrom\200\methods\bh51.
File : c:\mti\ezchrom\200\chrom\01090815.1
Data file creation time: Jun 13, 2011 19:46:58
Instrument ID: 180122
Column Type: MS-5A 4m
Carrier Gas: He
Column Head Pressure: 23.8 psi
Column Temperature: 65 C
Instrument Gain: LOW
Sample Time: 2 seconds
Inject Time: 10 milliseconds
Run Time: 45 seconds

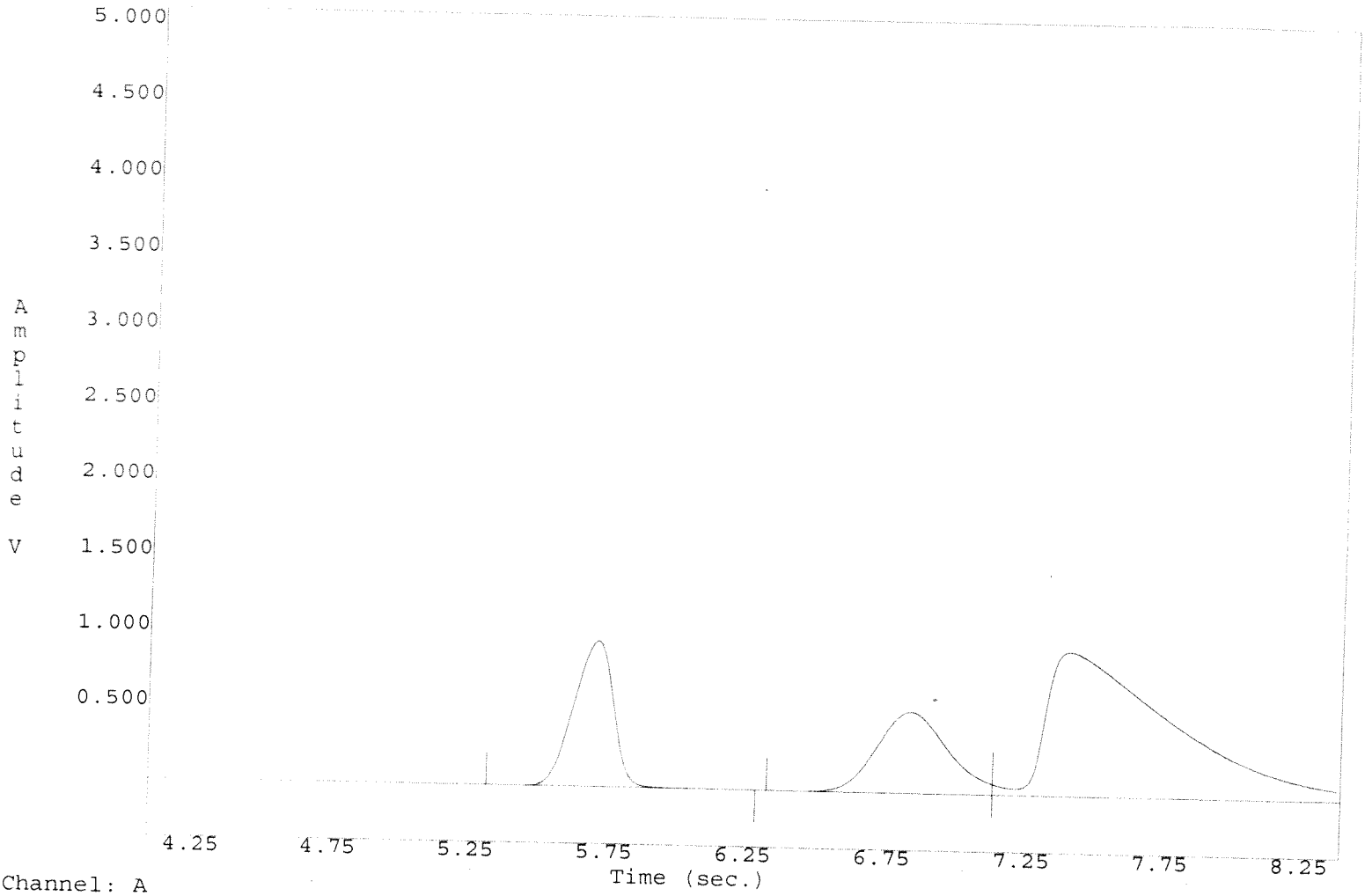
7-2b

External Standard Report

Name	Amount	Units	RT	Min	Max	Mean	%SD
Hydrogen	0.224	%	5.720	-1.000	10.203	0.612	174.070

Channel: A
Current Time: Jun 14, 2011 09:21:56
Method: c:\mti\ezchrom\200\methods\bh51.
File : c:\mti\ezchrom\200\chrom\01090815.1
Data file creation time: Jun 14, 2011 09:21:00
Instrument ID: 180122
Column Type: MS-5A 4m
Carrier Gas: He
Column Head Pressure: 23.8 psi
Column Temperature: 65 C
Instrument Gain: LOW
Sample Time: 2 seconds
Inject Time: 10 milliseconds
Run Time: 45 seconds

7-3



Channel: A
Current Time: Jun 14, 2011 09:22:00
Method: c:\mti\ezchrom\200\methods\bh51.
File : c:\mti\ezchrom\200\chrom\01090815.1
Data file creation time: Jun 14, 2011 09:21:00
Instrument ID: 180122
Column Type: MS-5A 4m
Carrier Gas: He
Column Head Pressure: 23.8 psi
Column Temperature: 65 C
Instrument Gain: LOW
Sample Time: 2 seconds
Inject Time: 10 milliseconds
Run Time: 45 seconds

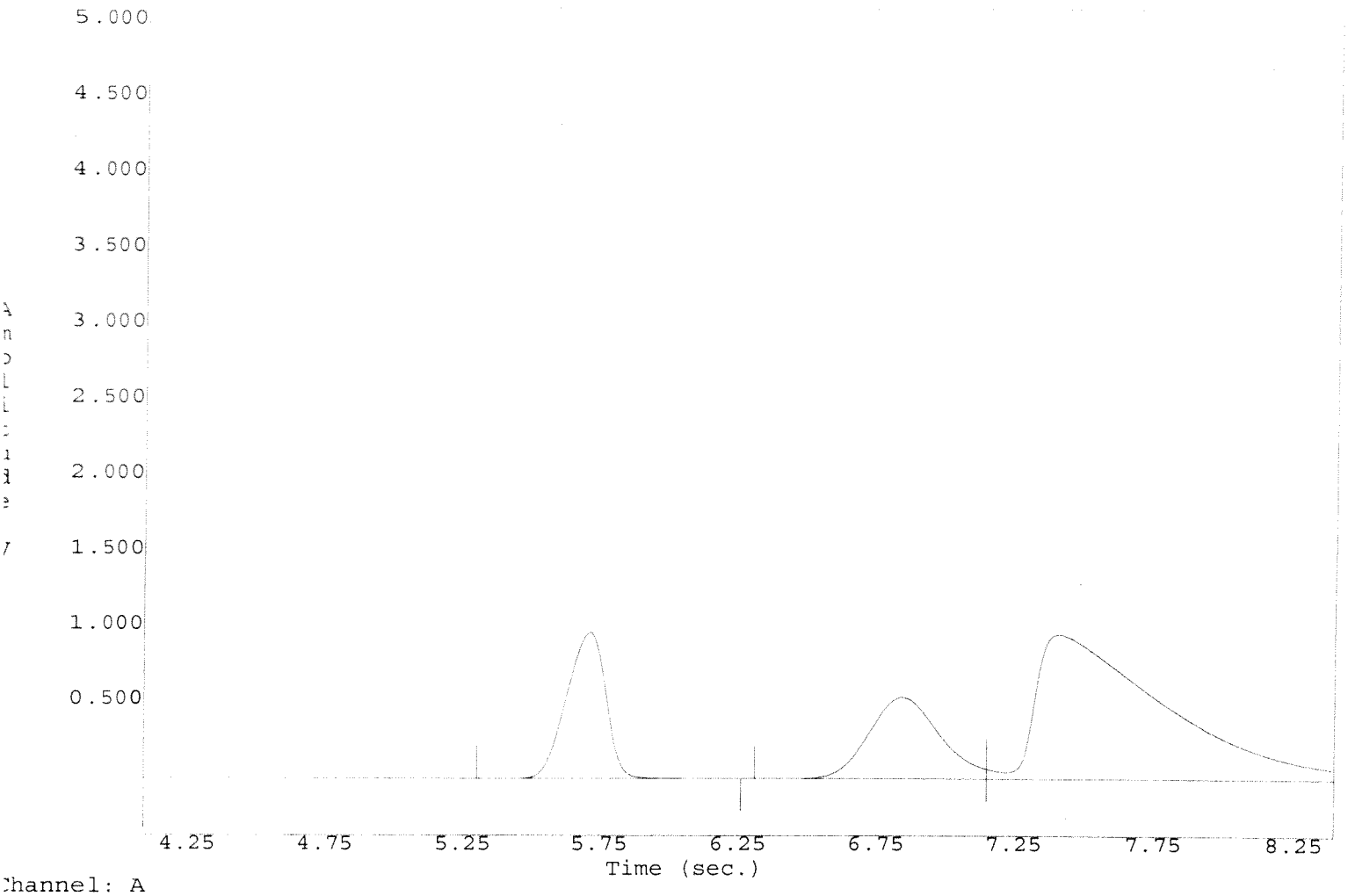
7-3

External Standard Report

Name	Amount	Units	RT	Min	Max	Mean	%SD
Hydrogen	0.225	%	5.720	-1.000	10.203	0.607	174.948

Channel: A
Current Time: Jun 14, 2011 09:24:56
Method: c:\mti\ezchrom\200\methods\bh51.
File : c:\mti\ezchrom\200\chrom\01090815.1
Data file creation time: Jun 14, 2011 09:23:52
Instrument ID: 180122
Column Type: MS-5A 4m
Carrier Gas: He
Column Head Pressure: 23.8 psi
Column Temperature: 65 C
Instrument Gain: LOW
Sample Time: 2 seconds
Inject Time: 10 milliseconds
Run Time: 45 seconds

Sample 7-3a



Channel: A
Current Time: Jun 14, 2011 09:25:00
Method: c:\mti\ezchrom\200\methods\bh51.
File : c:\mti\ezchrom\200\chrom\01090815.1
Data file creation time: Jun 14, 2011 09:23:52
Instrument ID: 180122
Column Type: MS-5A 4m
Carrier Gas: He
Column Head Pressure: 23.8 psi
Column Temperature: 65 C
Instrument Gain: LOW
Sample Time: 2 seconds
Inject Time: 10 milliseconds
Run Time: 45 seconds

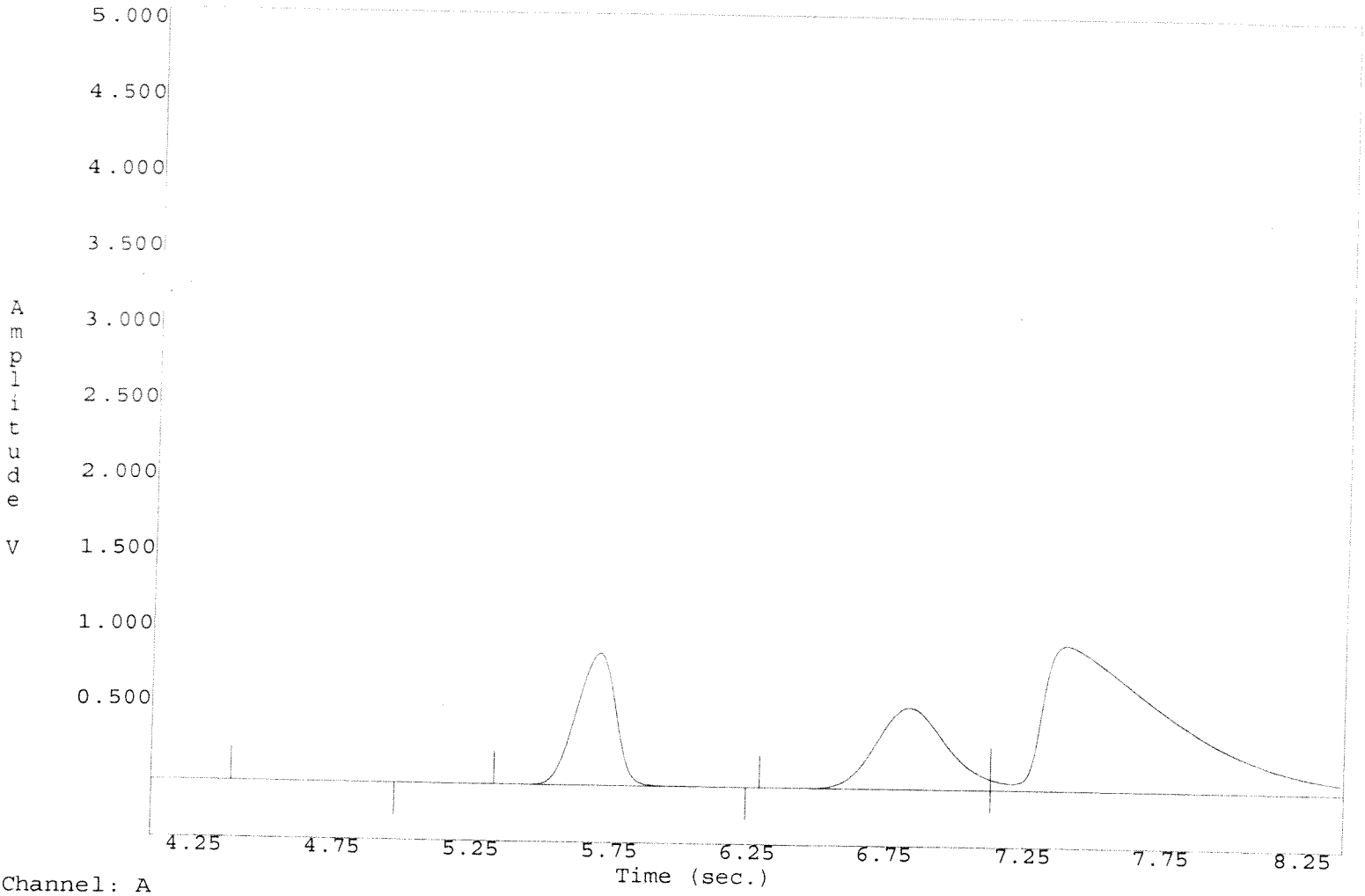
7-3a

External Standard Report

Name	Amount	Units	RT	Min	Max	Mean	%SD
Hydrogen	0.201	%	5.710	-1.000	10.203	0.589	177.679

Channel: A
Current Time: Jun 14, 2011 13:28:26
Method: c:\mti\ezchrom\200\methods\bh51.
File : c:\mti\ezchrom\200\chrom\01090815.1
Data file creation time: Jun 14, 2011 13:27:07
Instrument ID: 180122
Column Type: MS-5A 4m
Carrier Gas: He
Column Head Pressure: 23.8 psi
Column Temperature: 65 C
Instrument Gain: LOW
Sample Time: 2 seconds
Inject Time: 10 milliseconds
Run Time: 45 seconds

Sample 9-4



Channel: A
Current Time: Jun 14, 2011 13:28:29
Method: c:\mti\ezchrom\200\methods\bh51.
File : c:\mti\ezchrom\200\chrom\01090815.1
Data file creation time: Jun 14, 2011 13:27:07
Instrument ID: 180122
Column Type: MS-5A 4m
Carrier Gas: He
Column Head Pressure: 23.8 psi
Column Temperature: 65 C
Instrument Gain: LOW
Sample Time: 2 seconds
Inject Time: 10 milliseconds
Run Time: 45 seconds

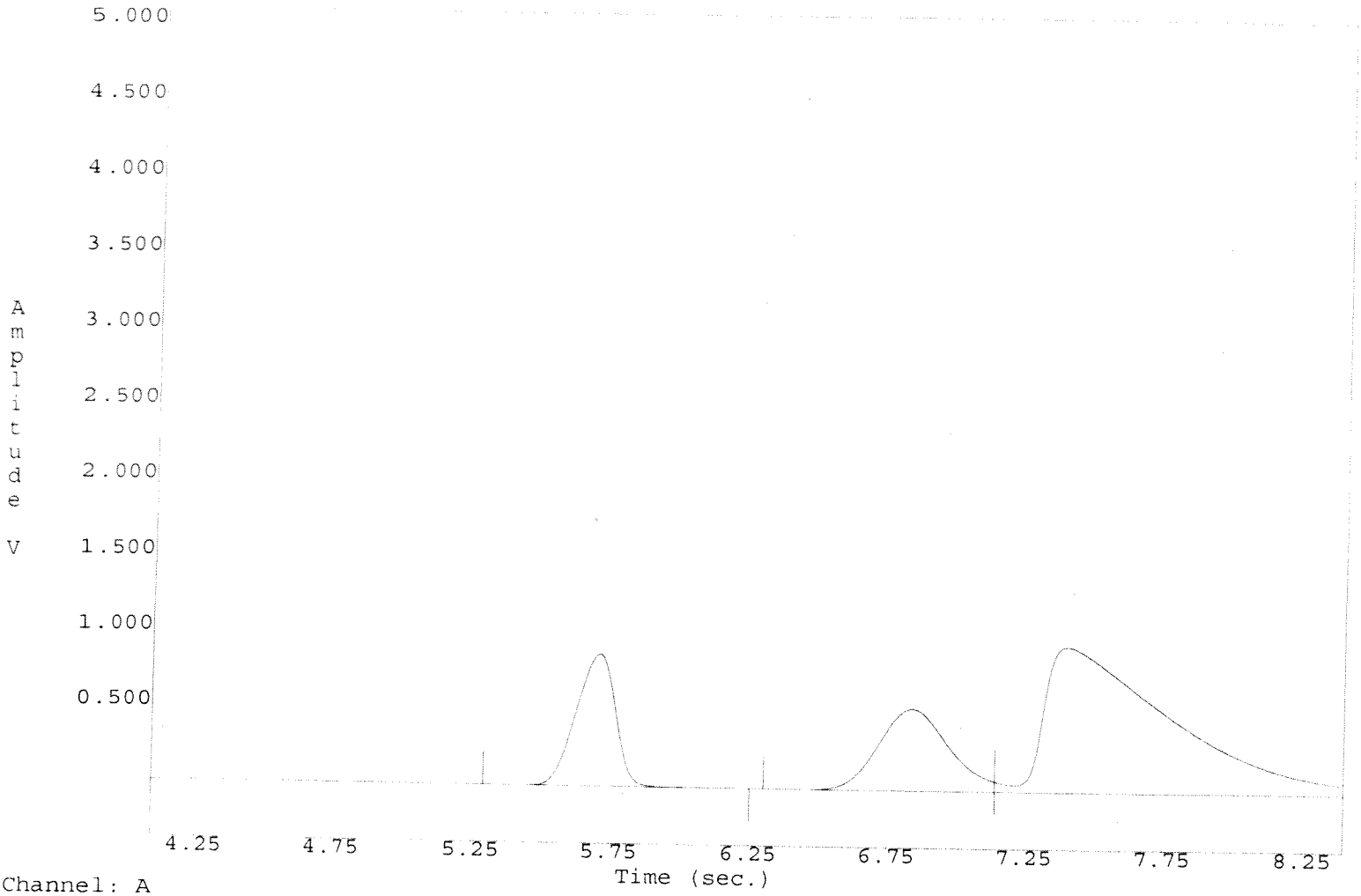
7.4

External Standard Report

Name	Amount	Units	RT	Min	Max	Mean	%SD
Hydrogen	0.201	%	5.710	-1.000	10.203	0.584	178.557

Channel: A
Current Time: Jun 14, 2011 13:32:08
Method: c:\mti\ezchrom\200\methods\bh51.
File : c:\mti\ezchrom\200\chrom\01090815.1
Data file creation time: Jun 14, 2011 13:30:36
Instrument ID: 180122
Column Type: MS-5A 4m
Carrier Gas: He
Column Head Pressure: 23.8 psi
Column Temperature: 65 C
Instrument Gain: LOW
Sample Time: 2 seconds
Inject Time: 10 milliseconds
Run Time: 45 seconds

Sample 7-4a



Channel: A
Current Time: Jun 14, 2011 13:32:12
Method: c:\mti\ezchrom\200\methods\bh51.
File : c:\mti\ezchrom\200\chrom\01090815.1
Data file creation time: Jun 14, 2011 13:30:36
Instrument ID: 180122
Column Type: MS-5A 4m
Carrier Gas: He
Column Head Pressure: 23.8 psi
Column Temperature: 65 C
Instrument Gain: LOW
Sample Time: 2 seconds
Inject Time: 10 milliseconds
Run Time: 45 seconds

7-4a

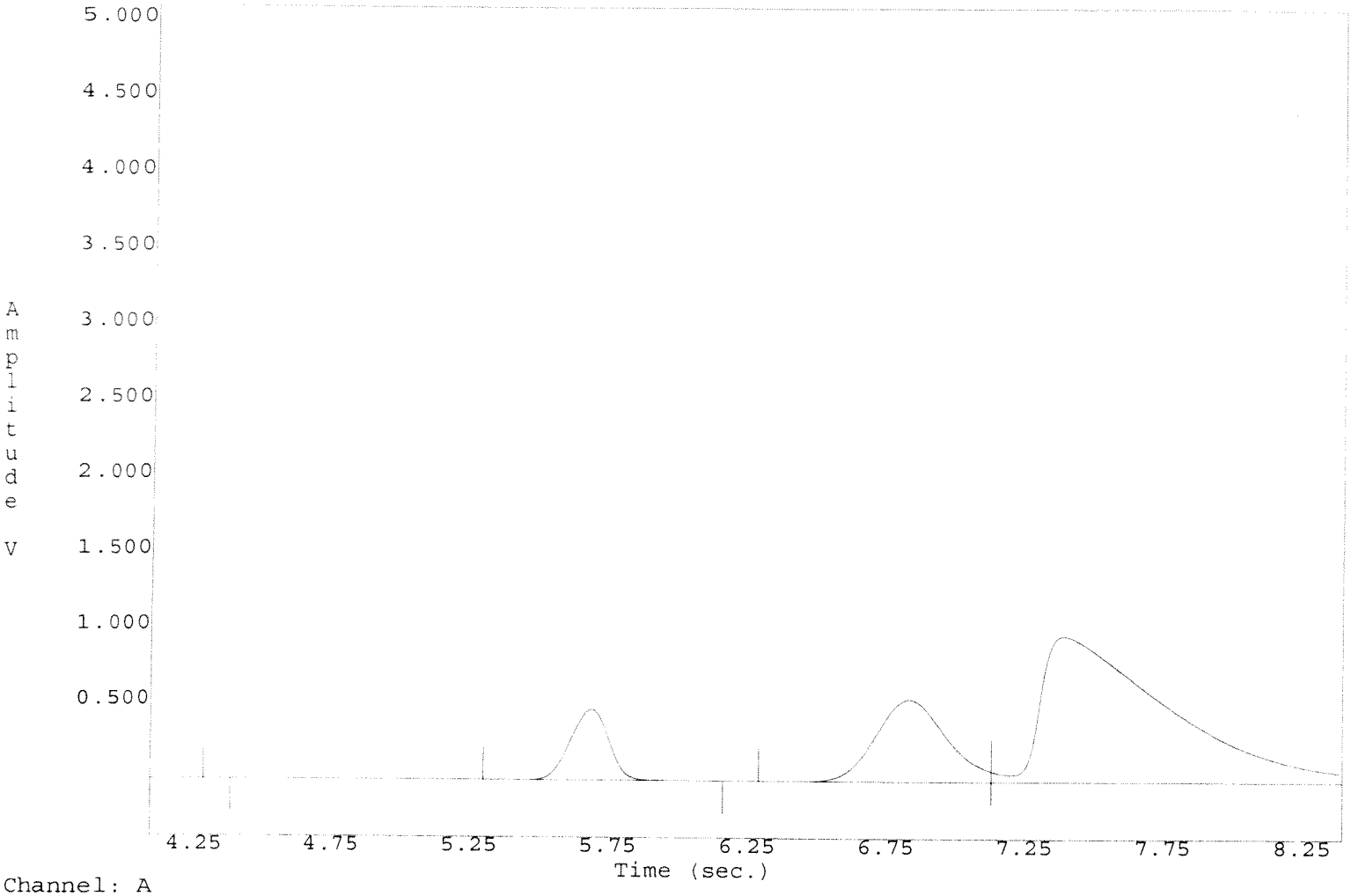
External Standard Report

Name	Amount	Units	RT	Min	Max	Mean	%SD
Hydrogen	0.102	%	5.690	-1.000	10.203	0.563	182.155

Channel: A
Current Time: Jun 14, 2011 16:33:54
Method: c:\mti\ezchrom\200\methods\bh51.
File : c:\mti\ezchrom\200\chrom\01090815.1
Data file creation time: Jun 14, 2011 16:32:42
Instrument ID: 180122
Column Type: MS-5A 4m
Carrier Gas: He
Column Head Pressure: 23.8 psi
Column Temperature: 65 C
Instrument Gain: LOW
Sample Time: 2 seconds
Inject Time: 10 milliseconds
Run Time: 45 seconds

Sample ~~9-5~~ 7-5

6/14/11



Channel: A
Current Time: Jun 14, 2011 16:33:55
Method: c:\mti\ezchrom\200\methods\bh51.
File : c:\mti\ezchrom\200\chrom\01090815.1
Data file creation time: Jun 14, 2011 16:32:42
Instrument ID: 180122
Column Type: MS-5A 4m
Carrier Gas: He
Column Head Pressure: 23.8 psi
Column Temperature: 65 C
Instrument Gain: LOW
Sample Time: 2 seconds
Inject Time: 10 milliseconds
Run Time: 45 seconds

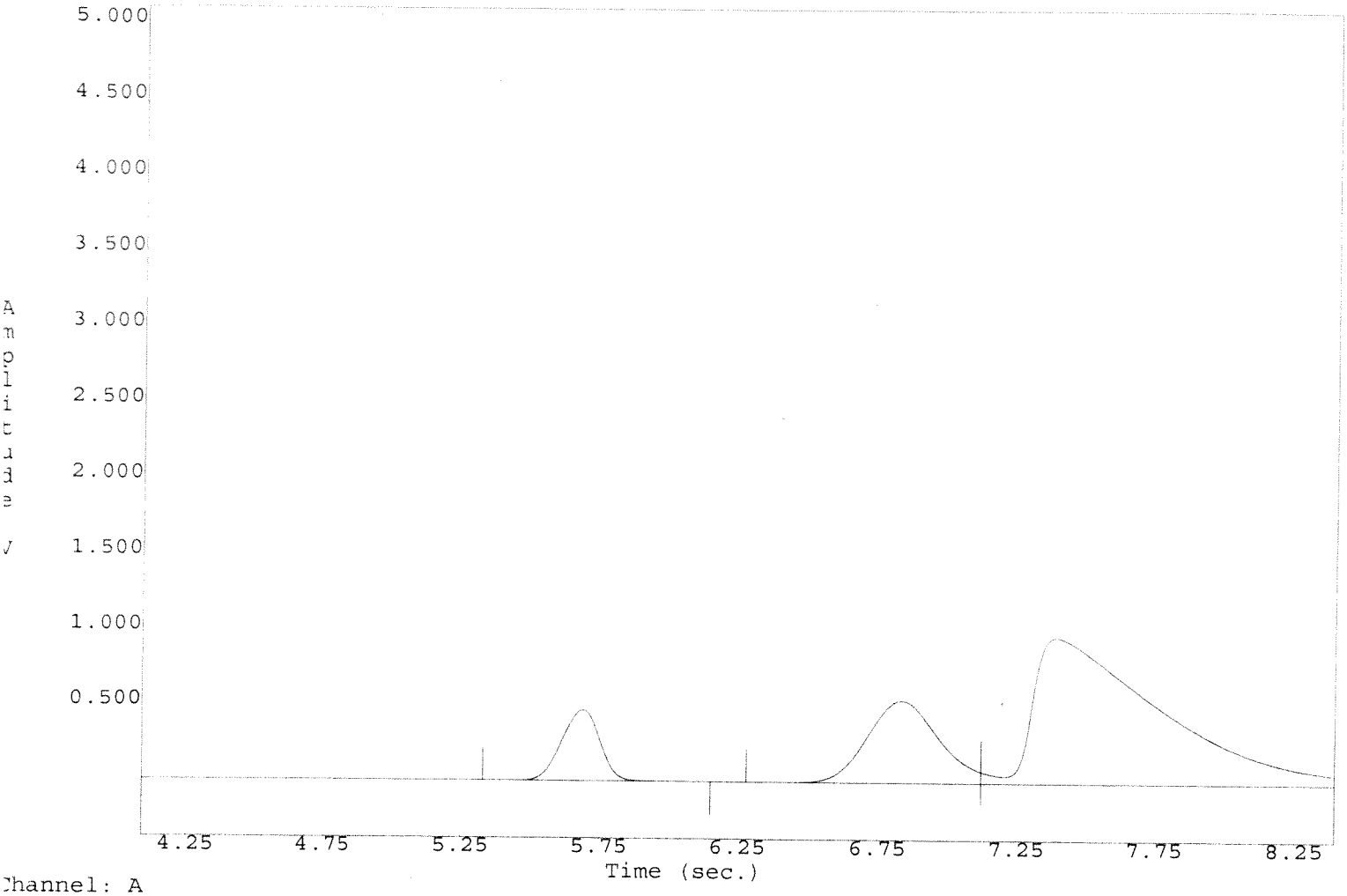
7-5

External Standard Report

Name	Amount	Units	RT	Min	Max	Mean	%SD
Hydrogen	0.102	%	5.690	-1.000	10.203	0.557	183.188

Channel: A
Current Time: Jun 14, 2011 16:36:59
Method: c:\mti\ezchrom\200\methods\bh51.
File : c:\mti\ezchrom\200\chrom\01090815.1
Data file creation time: Jun 14, 2011 16:35:54
Instrument ID: 180122
Column Type: MS-5A 4m
Carrier Gas: He
Column Head Pressure: 23.8 psi
Column Temperature: 65 C
Instrument Gain: LOW
Sample Time: 2 seconds
Inject Time: 10 milliseconds
Run Time: 45 seconds

Sample ~~9-5a~~
7-5a
6/14/11



Channel: A
Current Time: Jun 14, 2011 16:37:01
Method: c:\mti\ezchrom\200\methods\bh51.
File : c:\mti\ezchrom\200\chrom\01090815.1
Data file creation time: Jun 14, 2011 16:35:54
Instrument ID: 180122
Column Type: MS-5A 4m
Carrier Gas: He
Column Head Pressure: 23.8 psi
Column Temperature: 65 C
Instrument Gain: LOW
Sample Time: 2 seconds
Inject Time: 10 milliseconds
Run Time: 45 seconds

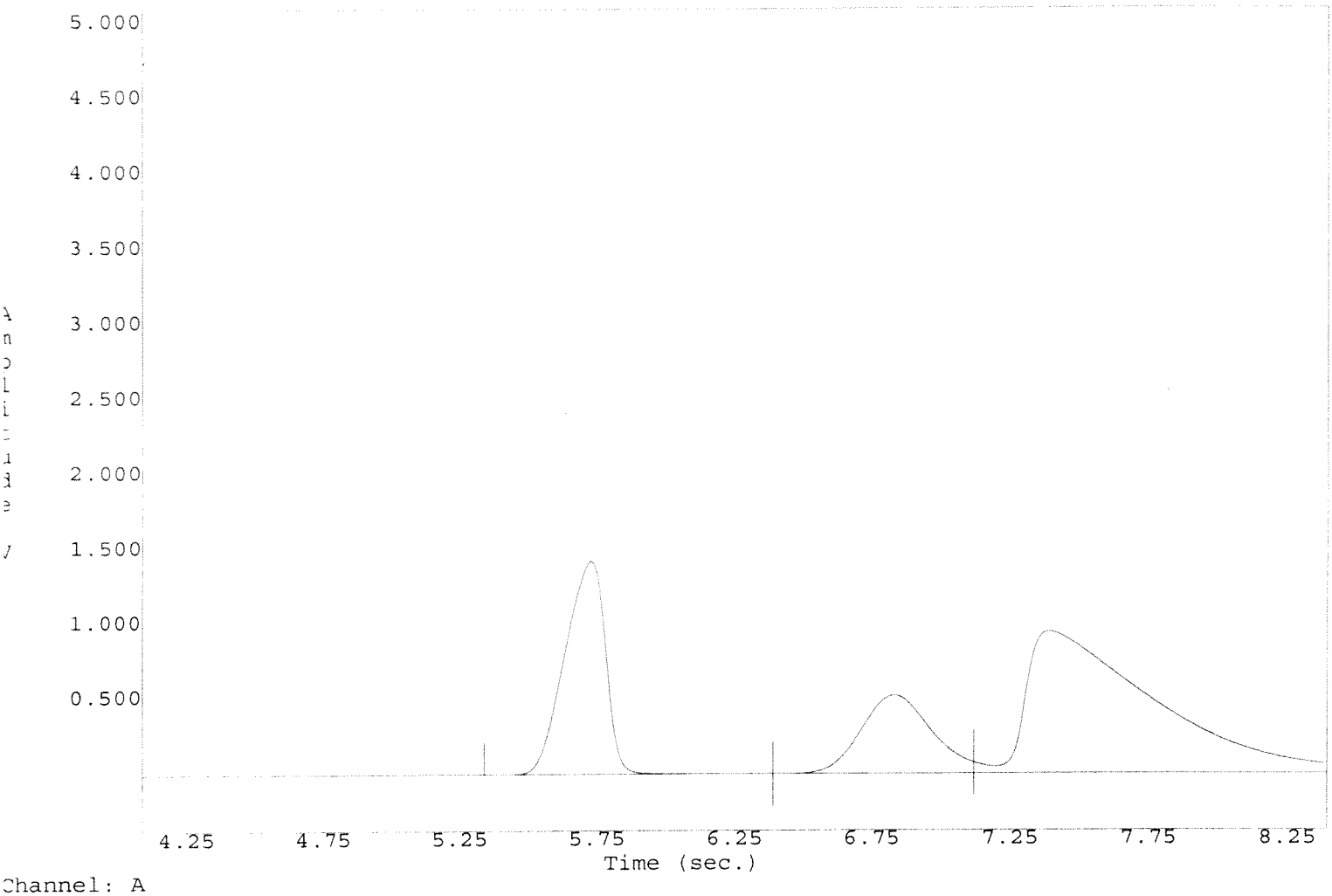
7-5a

External Standard Report

Name	Amount	Units	RT	Min	Max	Mean	%SD
Hydrogen	0.344	%	5.730	-1.000	10.203	0.539	186.383

Channel: A
Current Time: Jun 14, 2011 19:52:49
Method: c:\mti\ezchrom\200\methods\bh51.
File : c:\mti\ezchrom\200\chrom\01090815.1
Data file creation time: Jun 14, 2011 19:51:42
Instrument ID: 180122
Column Type: MS-5A 4m
Carrier Gas: He
Column Head Pressure: 23.8 psi
Column Temperature: 65 C
Instrument Gain: LOW
Sample Time: 2 seconds
Inject Time: 10 milliseconds
Run Time: 45 seconds

Sample 7-6



Channel: A
Current Time: Jun 14, 2011 19:52:52
Method: c:\mti\ezchrom\200\methods\bh51.
File : c:\mti\ezchrom\200\chrom\01090815.1
Data file creation time: Jun 14, 2011 19:51:42
Instrument ID: 180122
Column Type: MS-5A 4m
Carrier Gas: He
Column Head Pressure: 23.8 psi
Column Temperature: 65 C
Instrument Gain: LOW
Sample Time: 2 seconds
Inject Time: 10 milliseconds
Run Time: 45 seconds

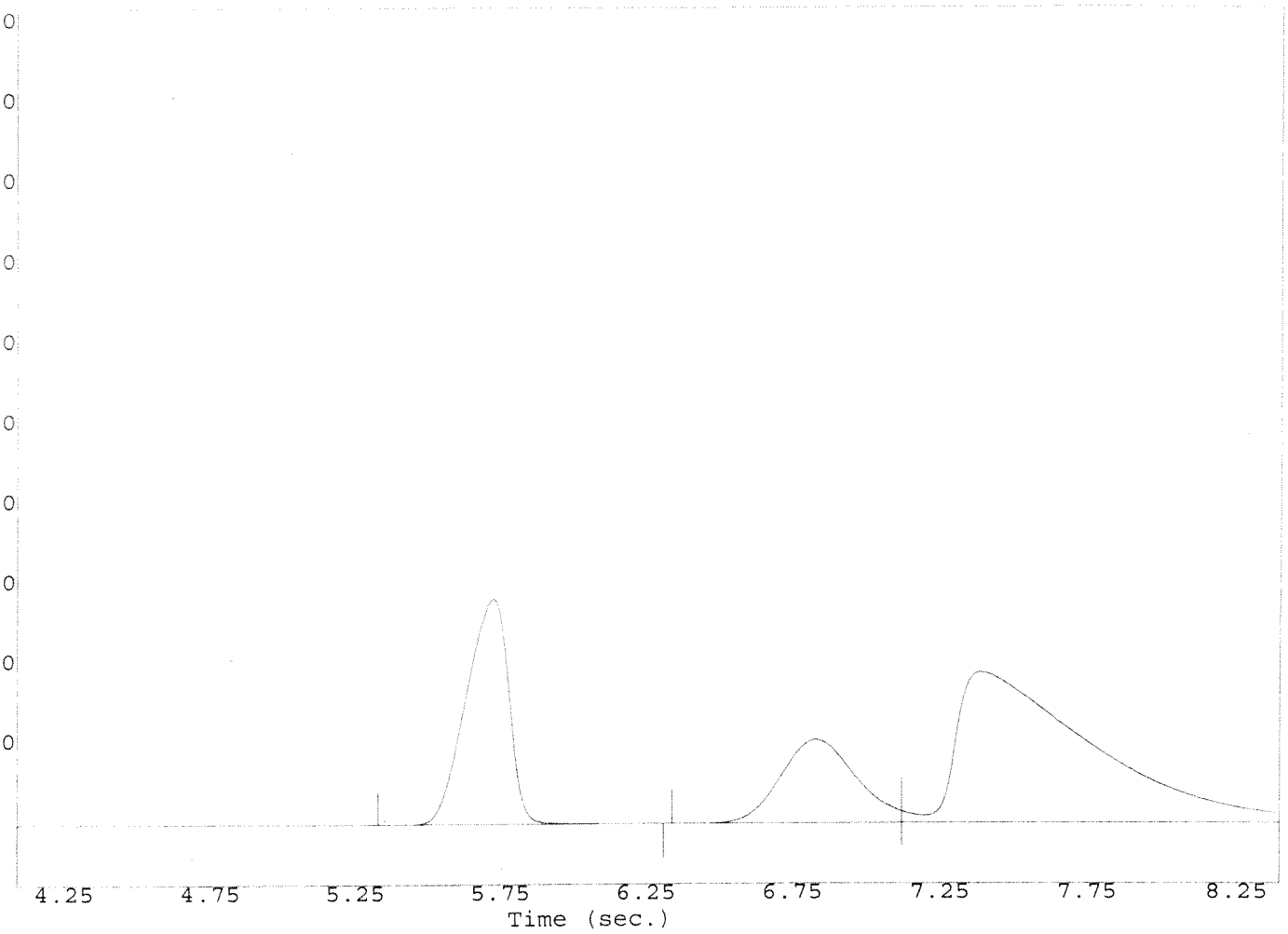
7-6

xternal Standard Report

Name	Amount	Units	RT	Min	Max	Mean	%SD
Hydrogen	0.341	%	5.730	-1.000	10.203	0.535	186.876

'hannel: A
'urrent Time: Jun 14, 2011 19:57:10
lethod: c:\mti\ezchrom\200\methods\bh51.
'ile : c:\mti\ezchrom\200\chrom\01090815.1
)ata file creation time: Jun 14, 2011 19:55:15
nstrument ID: 180122
olumn Type: MS-5A 4m
arrier Gas: He
olumn Head Pressure: 23.8 psi
olumn Temperature: 65 C
nstrument Gain: LOW
ample Time: 2 seconds
nject Time: 10 milliseconds
Run Time: 45 seconds

7-6a



Channel: A
Current Time: Jun 14, 2011 19:57:13
Method: c:\mti\ezchrom\200\methods\bh51.
File : c:\mti\ezchrom\200\chrom\01090815.1
Data file creation time: Jun 14, 2011 19:55:15
Instrument ID: 180122
Column Type: MS-5A 4m
Carrier Gas: He
Column Head Pressure: 23.8 psi
Column Temperature: 65 C
Instrument Gain: LOW
Sample Time: 2 seconds
Inject Time: 10 milliseconds
Run Time: 45 seconds

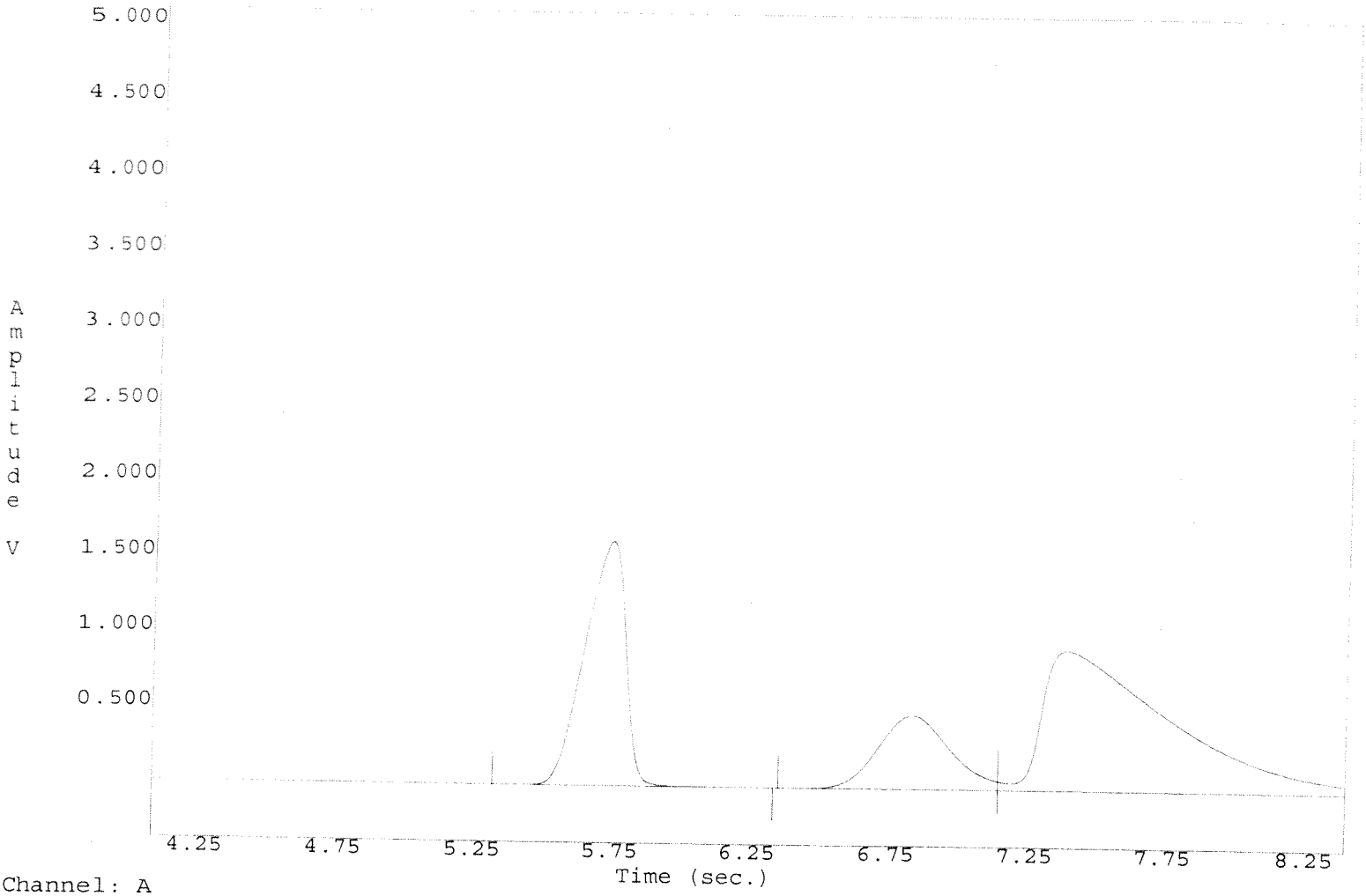
7-6a

External Standard Report

Name	Amount	Units	RT	Min	Max	Mean	%SD
Hydrogen	0.397	%	5.750	-1.000	10.203	0.521	188.795

Channel: A
Current Time: Jun 15, 2011 07:59:40
Method: c:\mti\ezchrom\200\methods\bh51.
File : c:\mti\ezchrom\200\chrom\01090815.1
Data file creation time: Jun 15, 2011 07:58:29
Instrument ID: 180122
Column Type: MS-5A 4m
Carrier Gas: He
Column Head Pressure: 23.8 psi
Column Temperature: 65 C
Instrument Gain: LOW
Sample Time: 2 seconds
Inject Time: 10 milliseconds
Run Time: 45 seconds

Sample 7-7



Channel: A
Current Time: Jun 15, 2011 07:59:41
Method: c:\mti\ezchrom\200\methods\bh51.
File : c:\mti\ezchrom\200\chrom\01090815.1
Data file creation time: Jun 15, 2011 07:58:29
Instrument ID: 180122
Column Type: MS-5A 4m
Carrier Gas: He
Column Head Pressure: 23.8 psi
Column Temperature: 65 C
Instrument Gain: LOW
Sample Time: 2 seconds
Inject Time: 10 milliseconds
Run Time: 45 seconds

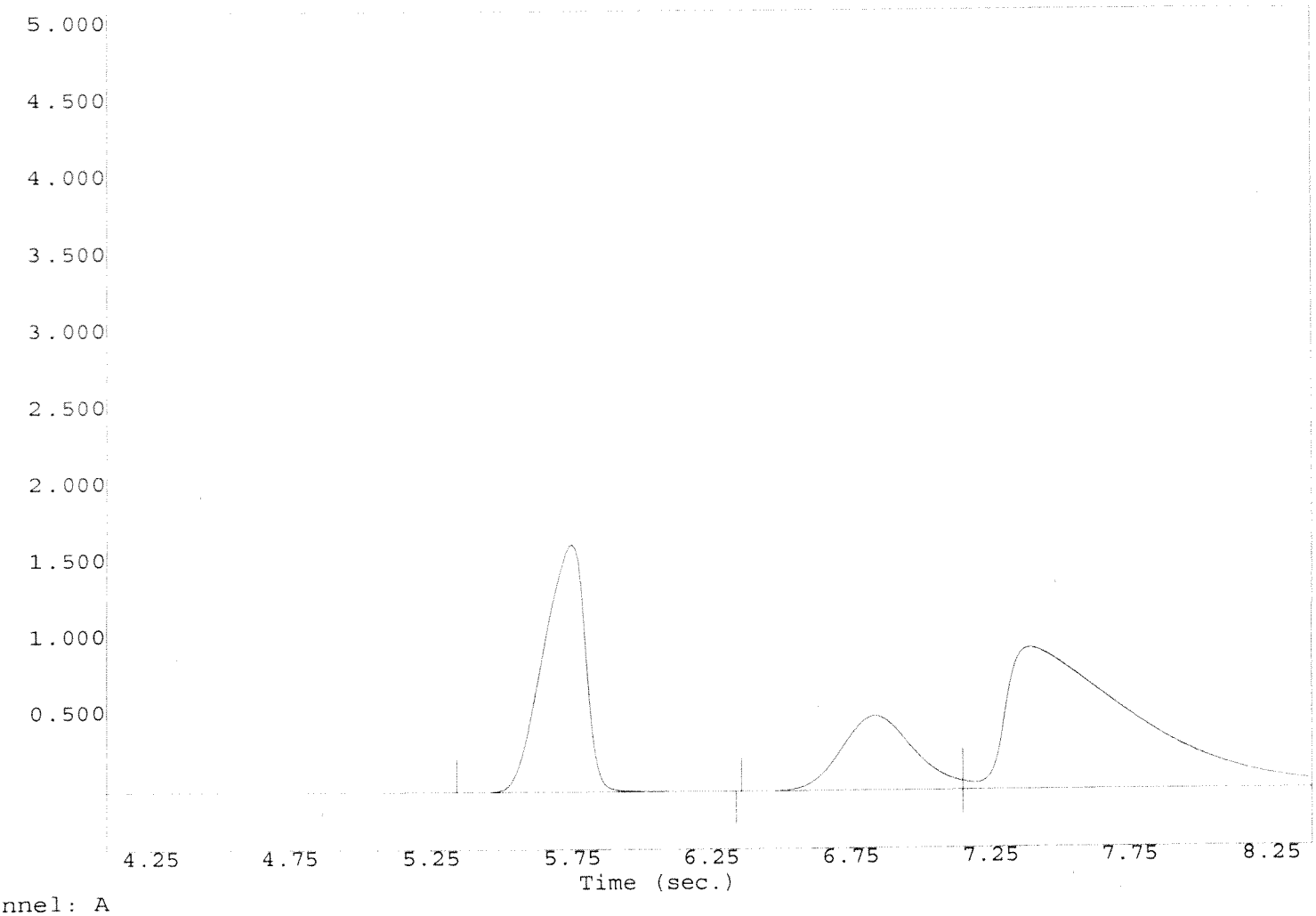
7-7

External Standard Report

Name	Amount	Units	RT	Min	Max	Mean	%SD
Hydrogen	0.398	%	5.750	-1.000	10.203	0.518	189.138

Channel: A
Current Time: Jun 15, 2011 08:02:41
Method: c:\mti\ezchrom\200\methods\bh51.
File : c:\mti\ezchrom\200\chrom\01090815.1
Data file creation time: Jun 15, 2011 08:01:41
Instrument ID: 180122
Column Type: MS-5A 4m
Carrier Gas: He
Column Head Pressure: 23.8 psi
Column Temperature: 65 C
Instrument Gain: LOW
Sample Time: 2 seconds
Inject Time: 10 milliseconds
Run Time: 45 seconds

Sample 7-7a



Channel: A
Current Time: Jun 15, 2011 08:02:42
Method: c:\mti\ezchrom\200\methods\bh51.
File : c:\mti\ezchrom\200\chrom\01090815.1
Data file creation time: Jun 15, 2011 08:01:41
Instrument ID: 180122
Column Type: MS-5A 4m
Carrier Gas: He
Column Head Pressure: 23.8 psi
Column Temperature: 65 C
Instrument Gain: LOW
Sample Time: 2 seconds
Inject Time: 10 milliseconds
Run Time: 45 seconds

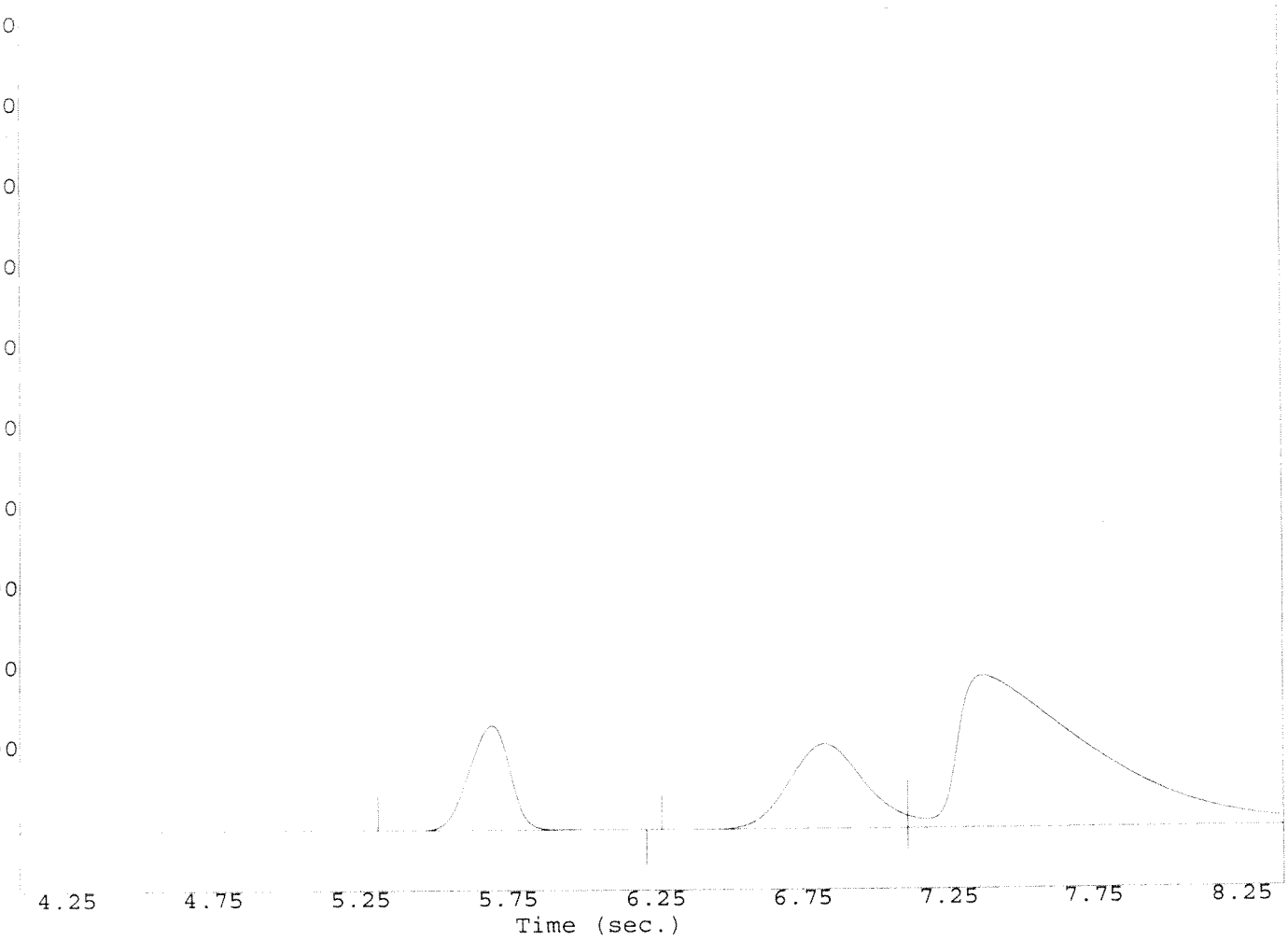
7-7a

External Standard Report

Name	Amount	Units	RT	Min	Max	Mean	%SD
Hydrogen	0.147	%	5.700	-1.000	10.203	0.514	189.971

Channel: A
Current Time: Jun 15, 2011 13:36:57
Method: c:\mti\ezchrom\200\methods\bh51.
File : c:\mti\ezchrom\200\chrom\01090815.1
Data file creation time: Jun 15, 2011 13:35:55
Instrument ID: 180122
Column Type: MS-5A 4m
Carrier Gas: He
Column Head Pressure: 23.8 psi
Column Temperature: 65 C
Instrument Gain: LOW
Sample Time: 2 seconds
Inject Time: 10 milliseconds
Run Time: 45 seconds

Sample 7-8



Channel: A
Current Time: Jun 15, 2011 13:36:58
Method: c:\mti\ezchrom\200\methods\bh51.
File : c:\mti\ezchrom\200\chrom\01090815.1
Data file creation time: Jun 15, 2011 13:35:55
Instrument ID: 180122
Column Type: MS-5A 4m
Carrier Gas: He
Column Head Pressure: 23.8 psi
Column Temperature: 65 C
Instrument Gain: LOW
Sample Time: 2 seconds
Inject Time: 10 milliseconds
Run Time: 45 seconds

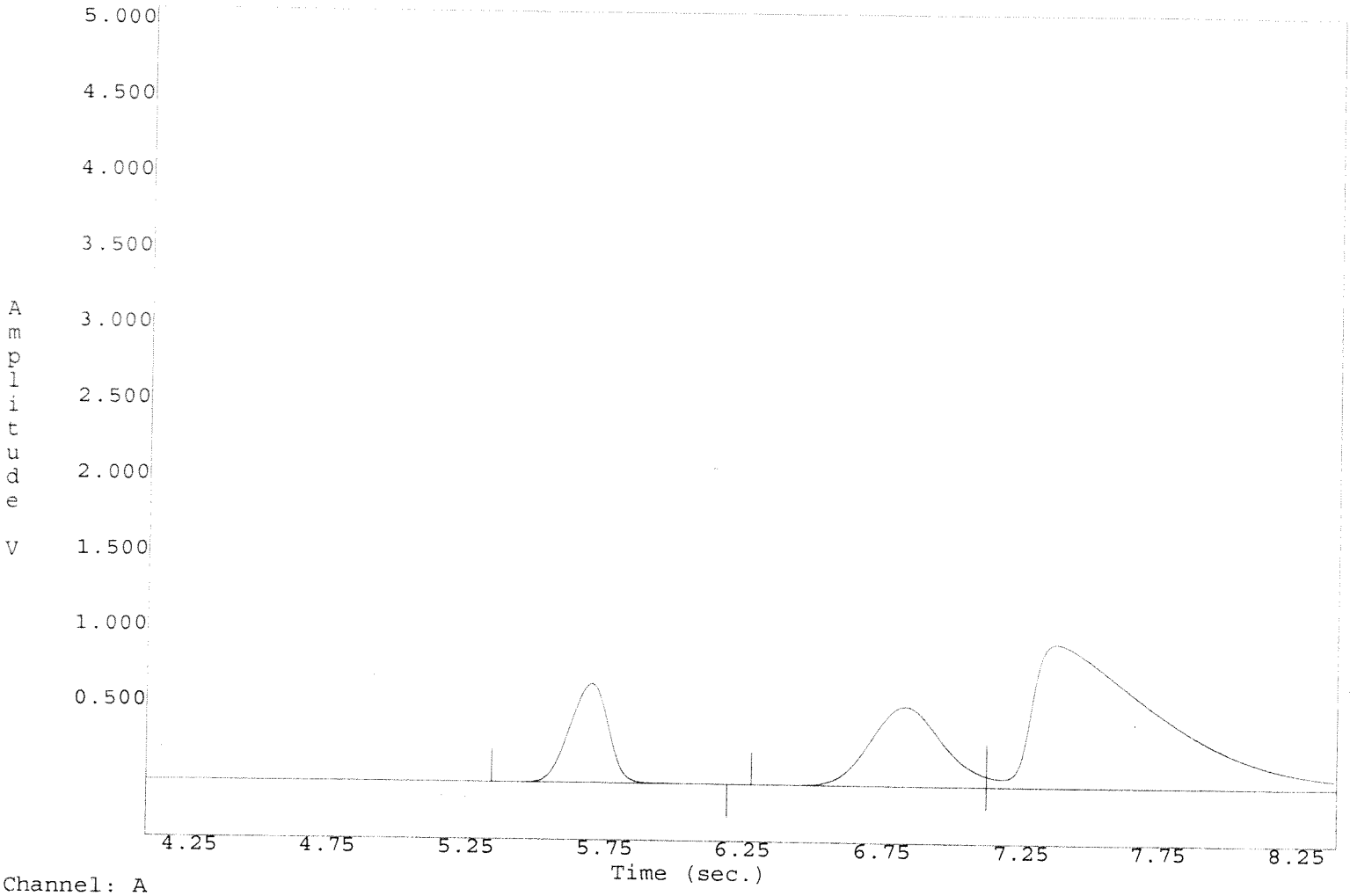
Sample 7-8

External Standard Report

Name	Amount	Units	RT	Min	Max	Mean	%SD
Hydrogen	0.147	%	5.700	-1.000	10.203	0.510	190.793

Channel: A
Current Time: Jun 15, 2011 13:39:52
Method: c:\mti\ezchrom\200\methods\bh51.
File : c:\mti\ezchrom\200\chrom\01090815.1
Data file creation time: Jun 15, 2011 13:38:43
Instrument ID: 180122
Column Type: MS-5A 4m
Carrier Gas: He
Column Head Pressure: 23.8 psi
Column Temperature: 65 C
Instrument Gain: LOW
Sample Time: 2 seconds
Inject Time: 10 milliseconds
Run Time: 45 seconds

Sample #
7-89



Channel: A
Current Time: Jun 15, 2011 13:39:53
Method: c:\mti\ezchrom\200\methods\bh51.
File : c:\mti\ezchrom\200\chrom\01090815.1
Data file creation time: Jun 15, 2011 13:38:43
Instrument ID: 180122
Column Type: MS-5A 4m
Carrier Gas: He
Column Head Pressure: 23.8 psi
Column Temperature: 65 C
Instrument Gain: LOW
Sample Time: 2 seconds
Inject Time: 10 milliseconds
Run Time: 45 seconds

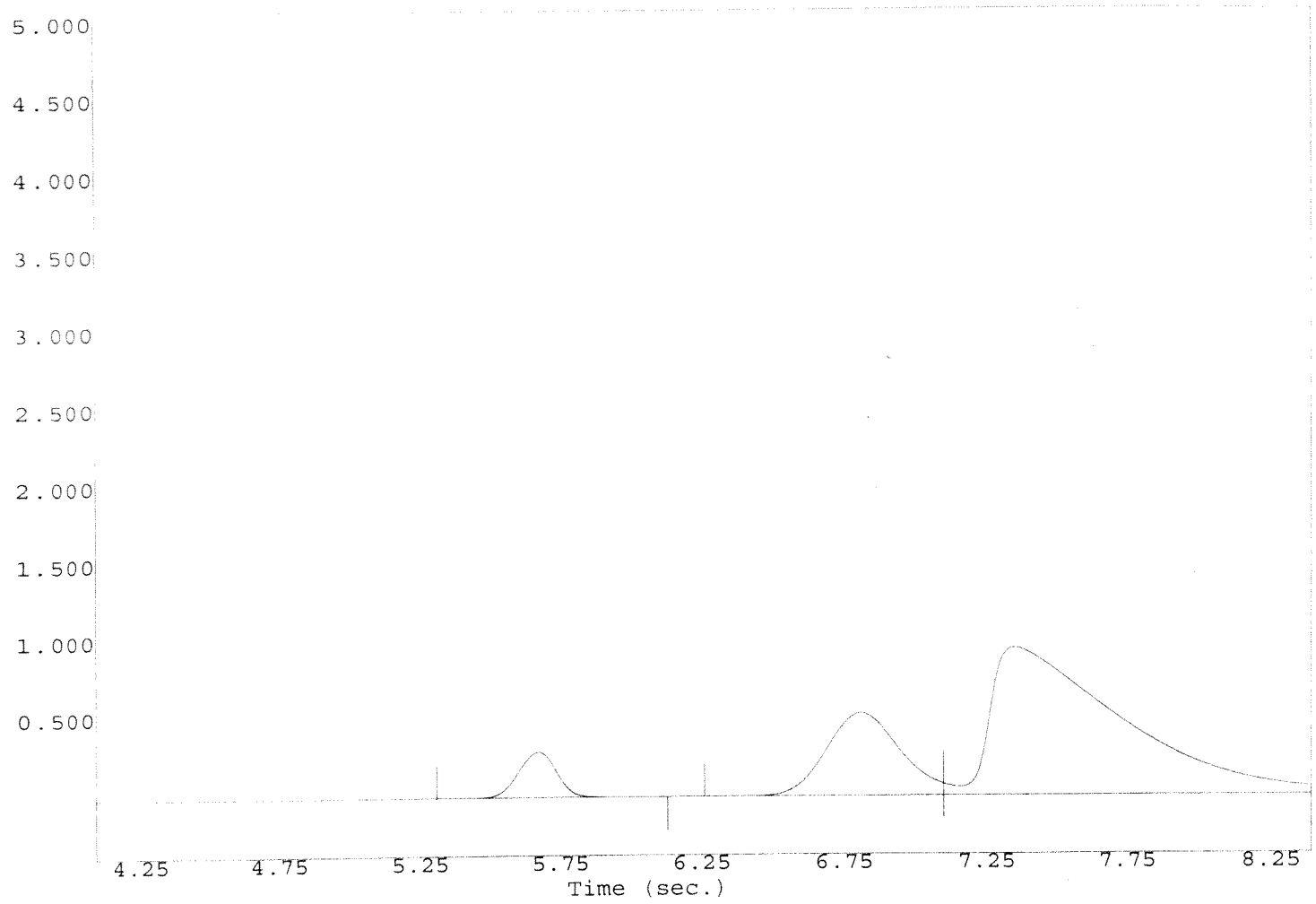
Sample 7-8a

External Standard Report

Name	Amount	Units	RT	Min	Max	Mean	%SD
Hydrogen	0.063	%	5.680	-1.000	10.203	0.495	194.045

Channel: A
Current Time: Jun 15, 2011 17:09:52
Method: c:\mti\ezchrom\200\methods\bh51.
File : c:\mti\ezchrom\200\chrom\01090815.1
Data file creation time: Jun 15, 2011 17:08:47
Instrument ID: 180122
Column Type: MS-5A 4m
Carrier Gas: He
Column Head Pressure: 23.8 psi
Column Temperature: 65 C
Instrument Gain: LOW
Sample Time: 2 seconds
Inject Time: 10 milliseconds
Run Time: 45 seconds

Sample 7-9



Channel: A
Current Time: Jun 15, 2011 17:09:54
Method: c:\mti\ezchrom\200\methods\bh51.
File : c:\mti\ezchrom\200\chrom\01090815.1
Data file creation time: Jun 15, 2011 17:08:47
Instrument ID: 180122
Column Type: MS-5A 4m
Carrier Gas: He
Column Head Pressure: 23.8 psi
Column Temperature: 65 C
Instrument Gain: LOW
Sample Time: 2 seconds
Inject Time: 10 milliseconds
Run Time: 45 seconds

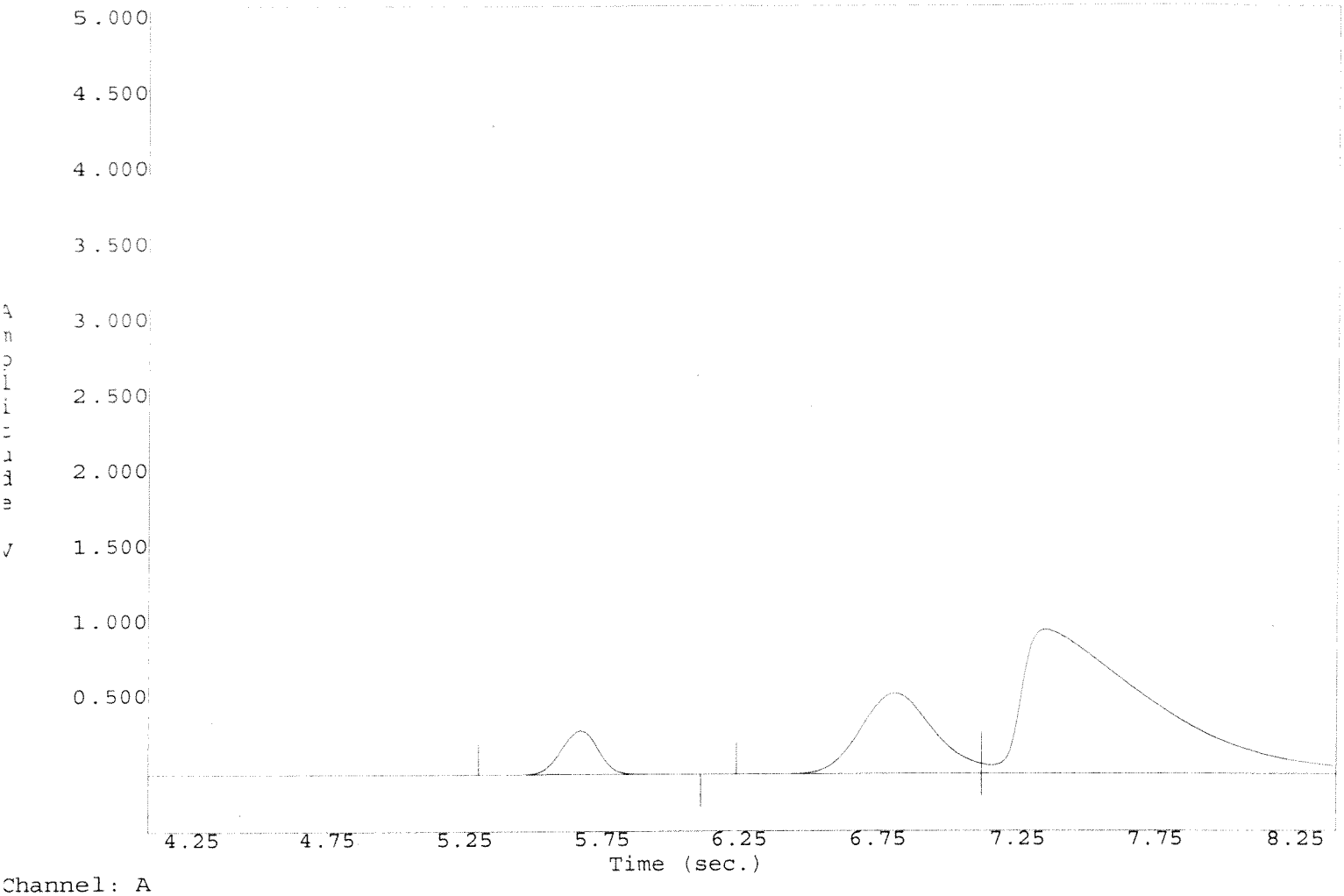
7-9

xternal Standard Report

Name	Amount	Units	RT	Min	Max	Mean	%SD
Hydrogen	0.062	%	5.680	-1.000	10.203	0.491	195.016

'hannel: A
'urrent Time: Jun 15, 2011 17:13:14
lethod: c:\mti\ezchrom\200\methods\bh51.
'ile : c:\mti\ezchrom\200\chrom\01090815.1
)ata file creation time: Jun 15, 2011 17:12:07
nstrument ID: 180122
:olumn Type: MS-5A 4m
:arrier Gas: He
:olumn Head Pressure: 23.8 psi
:olumn Temperature: 65 C
:nstrument Gain: LOW
)ample Time: 2 seconds
:nject Time: 10 milliseconds
Run Time: 45 seconds

Sample 7-9a



Channel: A
Current Time: Jun 15, 2011 17:13:17
Method: c:\mti\ezchrom\200\methods\bh51.
File : c:\mti\ezchrom\200\chrom\01090815.1
Data file creation time: Jun 15, 2011 17:12:07
Instrument ID: 180122
Column Type: MS-5A 4m
Carrier Gas: He
Column Head Pressure: 23.8 psi
Column Temperature: 65 C
Instrument Gain: LOW
Sample Time: 2 seconds
Inject Time: 10 milliseconds
Run Time: 45 seconds

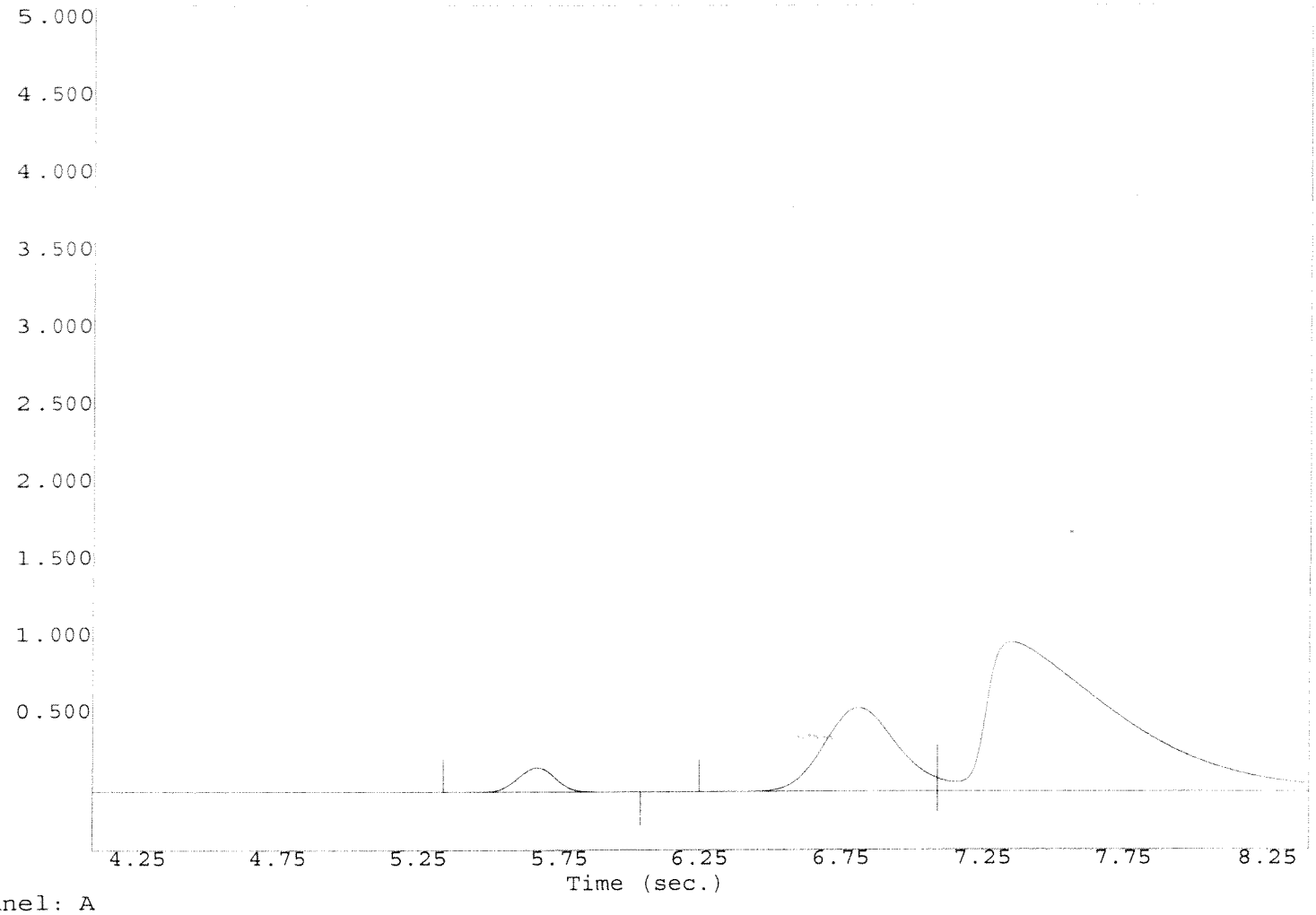
7-9a

External Standard Report

Name	Amount	Units	RT	Min	Max	Mean	%SD
Hydrogen	0.033	%	5.680	-1.000	10.203	0.479	197.907

Channel: A
Current Time: Jun 15, 2011 20:29:45
Method: c:\mti\ezchrom\200\methods\bh51.
File : c:\mti\ezchrom\200\chrom\01090815.1
Data file creation time: Jun 15, 2011 20:27:40
Instrument ID: 180122
Column Type: MS-5A 4m
Carrier Gas: He
Column Head Pressure: 23.8 psi
Column Temperature: 65 C
Instrument Gain: LOW
Sample Time: 2 seconds
Inject Time: 10 milliseconds
Run Time: 45 seconds

Sample 7-10



Channel: A
Current Time: Jun 15, 2011 20:29:52
Method: c:\mti\ezchrom\200\methods\bh51.
File : c:\mti\ezchrom\200\chrom\01090815.1
Data file creation time: Jun 15, 2011 20:27:40
Instrument ID: 180122
Column Type: MS-5A 4m
Carrier Gas: He
Column Head Pressure: 23.8 psi
Column Temperature: 65 C
Instrument Gain: LOW
Sample Time: 2 seconds
Inject Time: 10 milliseconds
Run Time: 45 seconds

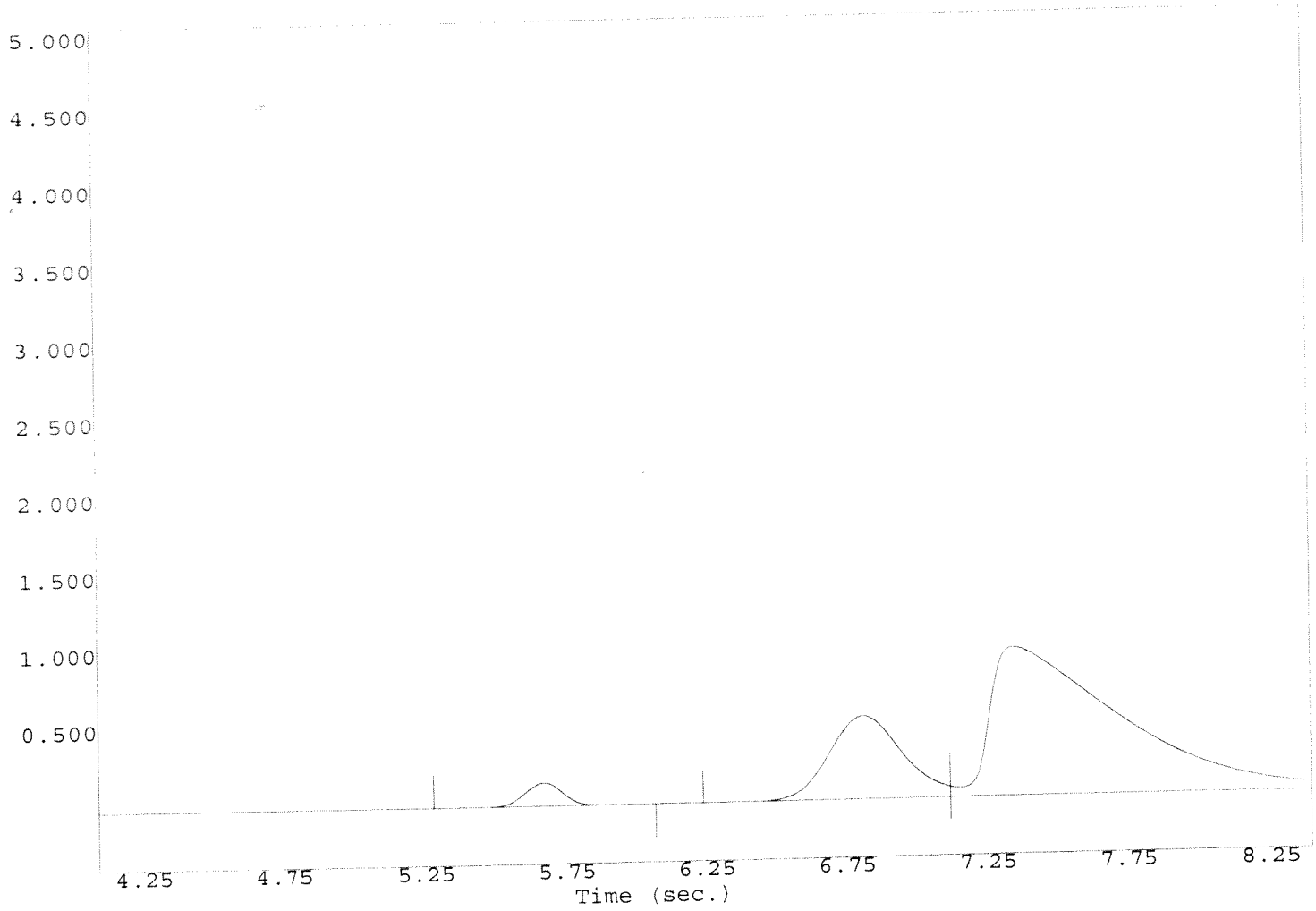
7-10

External Standard Report

Name	Amount	Units	RT	Min	Max	Mean	%SD
Hydrogen	0.032	%	5.680	-1.000	10.203	0.475	198.918

Channel: A
Current Time: Jun 15, 2011 20:43:28
Method: c:\mti\ezchrom\200\methods\bh51.
File : c:\mti\ezchrom\200\chrom\01090815.1
Data file creation time: Jun 15, 2011 20:42:25
Instrument ID: 180122
Column Type: MS-5A 4m
Carrier Gas: He
Column Head Pressure: 23.8 psi
Column Temperature: 65 C
Instrument Gain: LOW
Sample Time: 2 seconds
Inject Time: 10 milliseconds
Run Time: 45 seconds

Sample 7-10a



Channel: A
Current Time: Jun 15, 2011 20:43:31
Method: c:\mti\ezchrom\200\methods\bh51.
File : c:\mti\ezchrom\200\chrom\01090815.1
Data file creation time: Jun 15, 2011 20:42:25
Instrument ID: 180122
Column Type: MS-5A 4m
Carrier Gas: He
Column Head Pressure: 23.8 psi
Column Temperature: 65 C
Instrument Gain: LOW
Sample Time: 2 seconds
Inject Time: 10 milliseconds
Run Time: 45 seconds

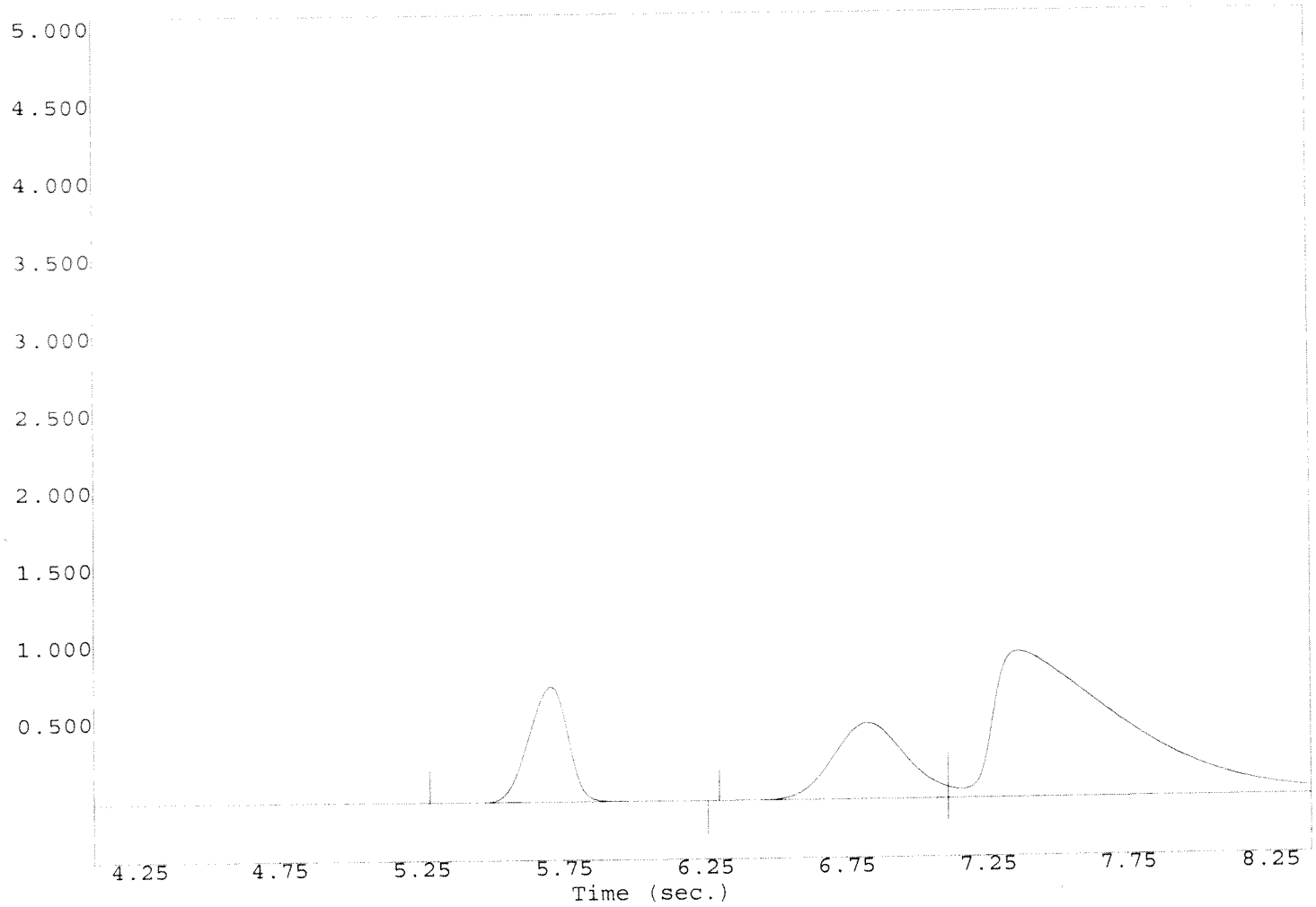
7-109

xternal Standard Report

Name	Amount	Units	RT	Min	Max	Mean	%SD
Hydrogen	0.168	%	5.710	-1.000	10.203	0.464	201.565

hannel: A
urrent Time: Jun 16, 2011 08:08:23
ethod: c:\mti\ezchrom\200\methods\bh51.
ile : c:\mti\ezchrom\200\chrom\01090815.1
ata file creation time: Jun 16, 2011 08:07:02
nstrument ID: 180122
'olumn Type: MS-5A 4m
'arrier Gas: He
'olumn Head Pressure: 23.8 psi
'olumn Temperature: 65 C
nstrument Gain: LOW
ample Time: 2 seconds
njject Time: 10 milliseconds
un Time: 45 seconds

Sample T-11



Channel: A
Current Time: Jun 16, 2011 08:08:26
Method: c:\mti\ezchrom\200\methods\bh51.
File : c:\mti\ezchrom\200\chrom\01090815.1
Data file creation time: Jun 16, 2011 08:07:02
Instrument ID: 180122
Column Type: MS-5A 4m
Carrier Gas: He
Column Head Pressure: 23.8 psi
Column Temperature: 65 C
Instrument Gain: LOW
Sample Time: 2 seconds
Inject Time: 10 milliseconds
Run Time: 45 seconds

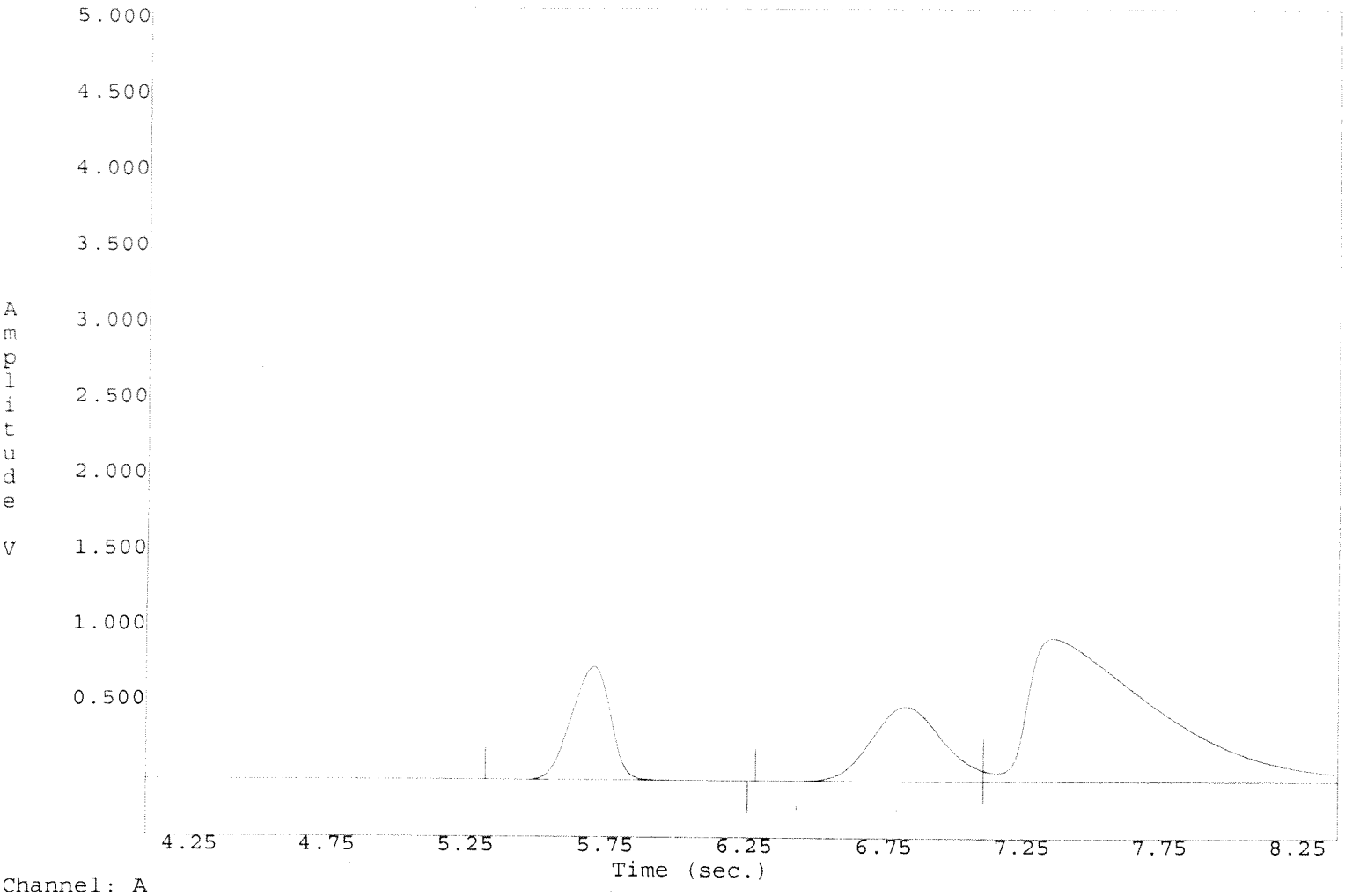
7-11

External Standard Report

Name	Amount	Units	RT	Min	Max	Mean	%SD
Hydrogen	0.169	%	5.710	-1.000	10.203	0.460	202.249

Channel: A
Current Time: Jun 16, 2011 08:11:11
Method: c:\mti\ezchrom\200\methods\bh51.
File : c:\mti\ezchrom\200\chrom\01090815.1
Data file creation time: Jun 16, 2011 08:10:11
Instrument ID: 180122
Column Type: MS-5A 4m
Carrier Gas: He
Column Head Pressure: 23.8 psi
Column Temperature: 65 C
Instrument Gain: LOW
Sample Time: 2 seconds
Inject Time: 10 milliseconds
Run Time: 45 seconds

Sample 7-11a



Channel: A
Current Time: Jun 16, 2011 08:11:12
Method: c:\mti\ezchrom\200\methods\bh51.
File : c:\mti\ezchrom\200\chrom\01090815.1
Data file creation time: Jun 16, 2011 08:10:11
Instrument ID: 180122
Column Type: MS-5A 4m
Carrier Gas: He
Column Head Pressure: 23.8 psi
Column Temperature: 65 C
Instrument Gain: LOW
Sample Time: 2 seconds
Inject Time: 10 milliseconds
Run Time: 45 seconds

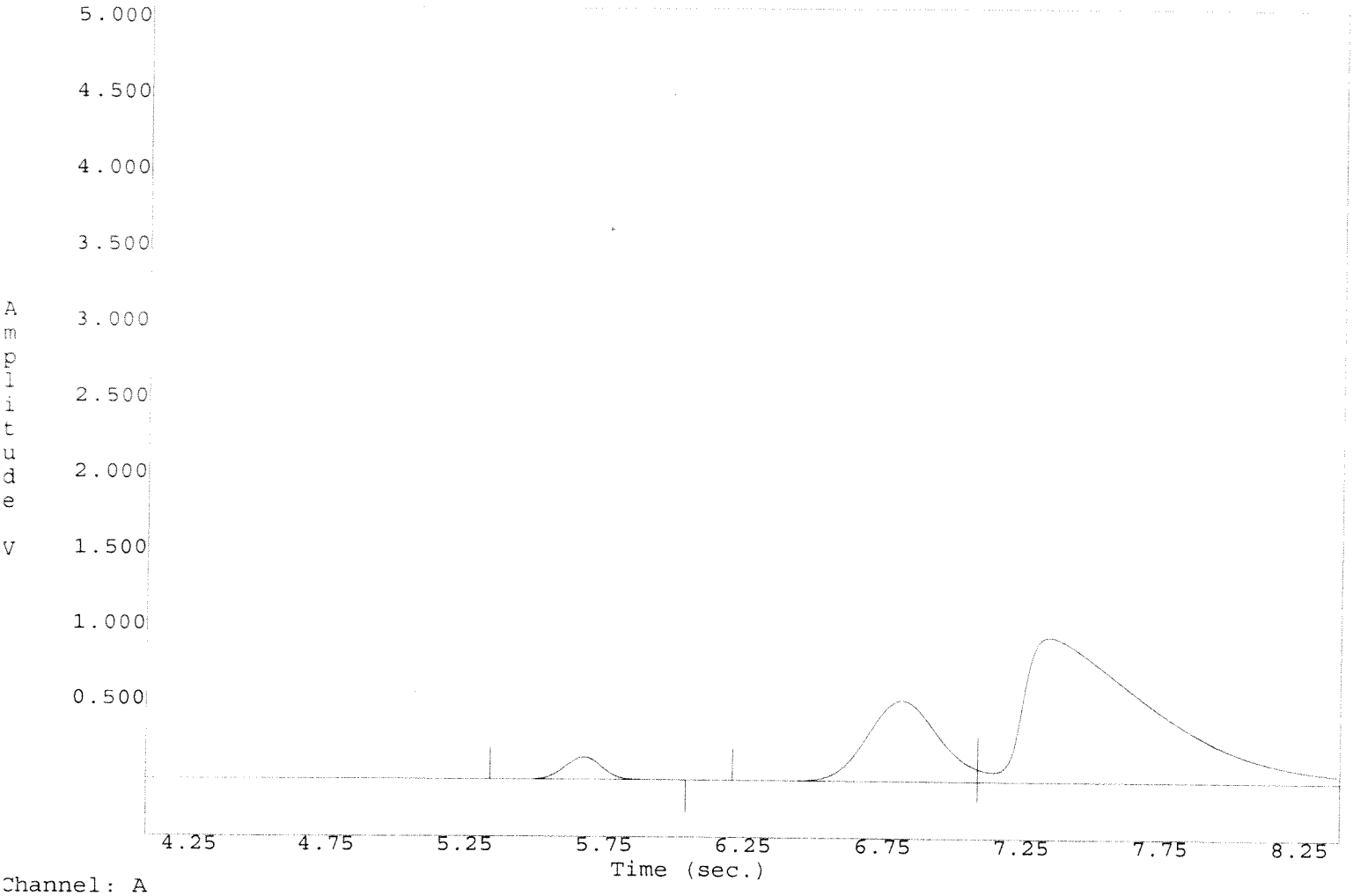
7-11a

xternal Standard Report

Name	Amount	Units	RT	Min	Max	Mean	%SD
Hydrogen	0.031	%	5.680	-1.000	10.203	0.450	204.947

hannel: A
urrent Time: Jun 16, 2011 11:35:49
ethod: c:\mti\ezchrom\200\methods\bh51.
ile : c:\mti\ezchrom\200\chrom\01090815.1
ata file creation time: Jun 16, 2011 11:34:21
nstrument ID: 180122
olumn Type: MS-5A 4m
arrier Gas: He
olumn Head Pressure: 23.8 psi
olumn Temperature: 65 C
nstrument Gain: LOW
ample Time: 2 seconds
nject Time: 10 milliseconds
un Time: 45 seconds

Sample 7-12



Channel: A
Current Time: Jun 16, 2011 11:35:53
Method: c:\mti\ezchrom\200\methods\bh51.
File : c:\mti\ezchrom\200\chrom\01090815.1
Data file creation time: Jun 16, 2011 11:34:21
Instrument ID: 180122
Column Type: MS-5A 4m
Carrier Gas: He
Column Head Pressure: 23.8 psi
Column Temperature: 65 C
Instrument Gain: LOW
Sample Time: 2 seconds
Inject Time: 10 milliseconds
Run Time: 45 seconds

7-12

ternal Standard Report

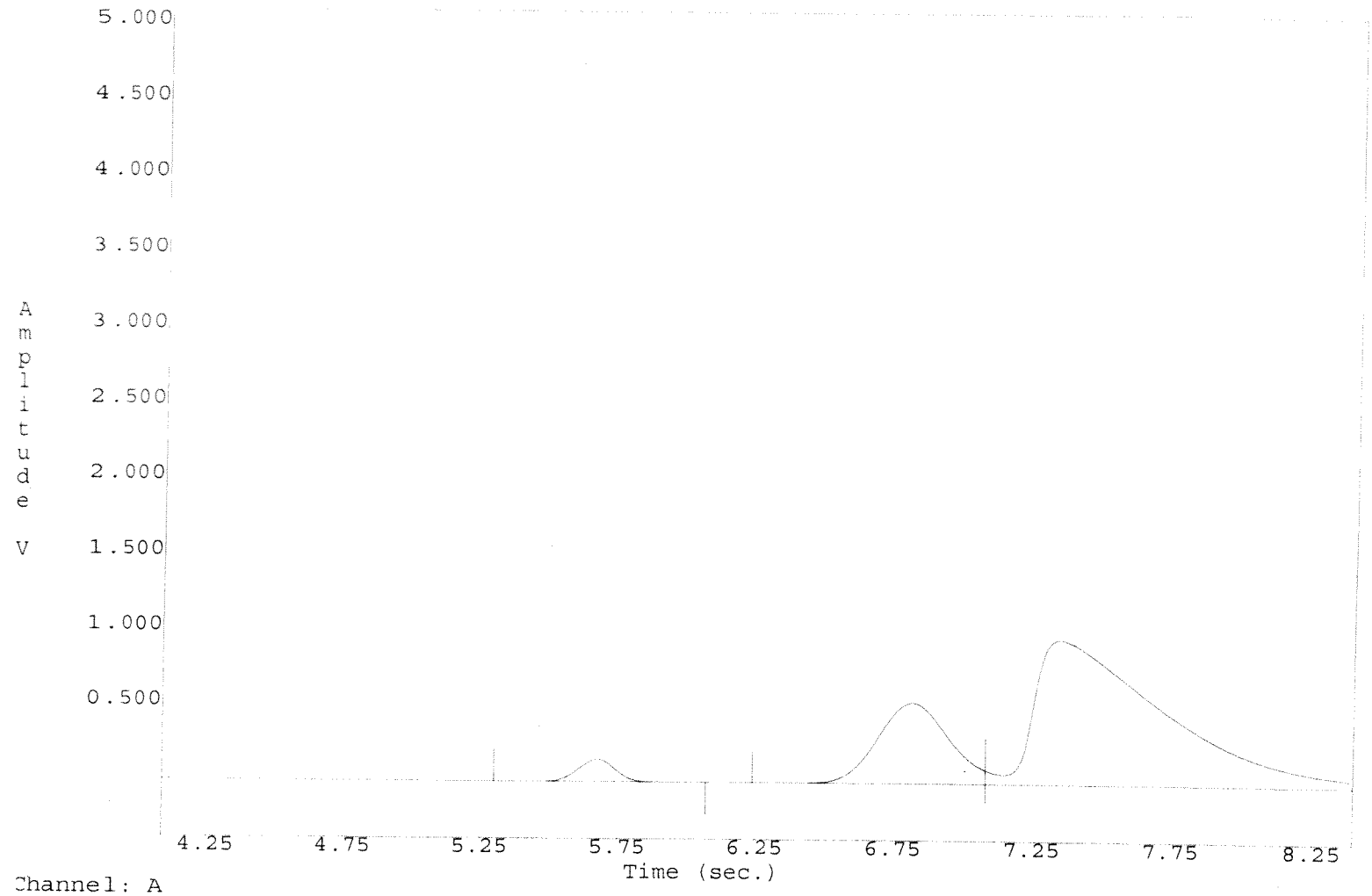
ame	Amount	Units	RT	Min	Max	Mean	%SD
ydrogen	0.031	%	5.680	-1.000	10.203	0.446	205.910

annel: A
rrent Time: Jun 16, 2011 11:38:35
thod: c:\mti\ezchrom\200\methods\bh51.
le : c:\mti\ezchrom\200\chrom\01090815.1
ta file creation time: Jun 16, 2011 11:37:37
strument ID: 180122
lumn Type: MS-5A 4m
rrier Gas: He
lumn Head Pressure: 23.8 psi
lumn Temperature: 65 C
strument Gain: LOW
mple Time: 2 seconds
ject Time: 10 milliseconds
n Time: 45 seconds

Sample 7-12a

Detector Sensitivity

Medium



Channel: A
Current Time: Jun 16, 2011 11:38:36
Method: c:\mti\ezchrom\200\methods\bh51.
File : c:\mti\ezchrom\200\chrom\01090815.1
Data file creation time: Jun 16, 2011 11:37:37
Instrument ID: 180122
Column Type: MS-5A 4m
Carrier Gas: He
Column Head Pressure: 23.8 psi
Column Temperature: 65 C
Instrument Gain: LOW
Sample Time: 2 seconds
Inject Time: 10 milliseconds
Run Time: 45 seconds

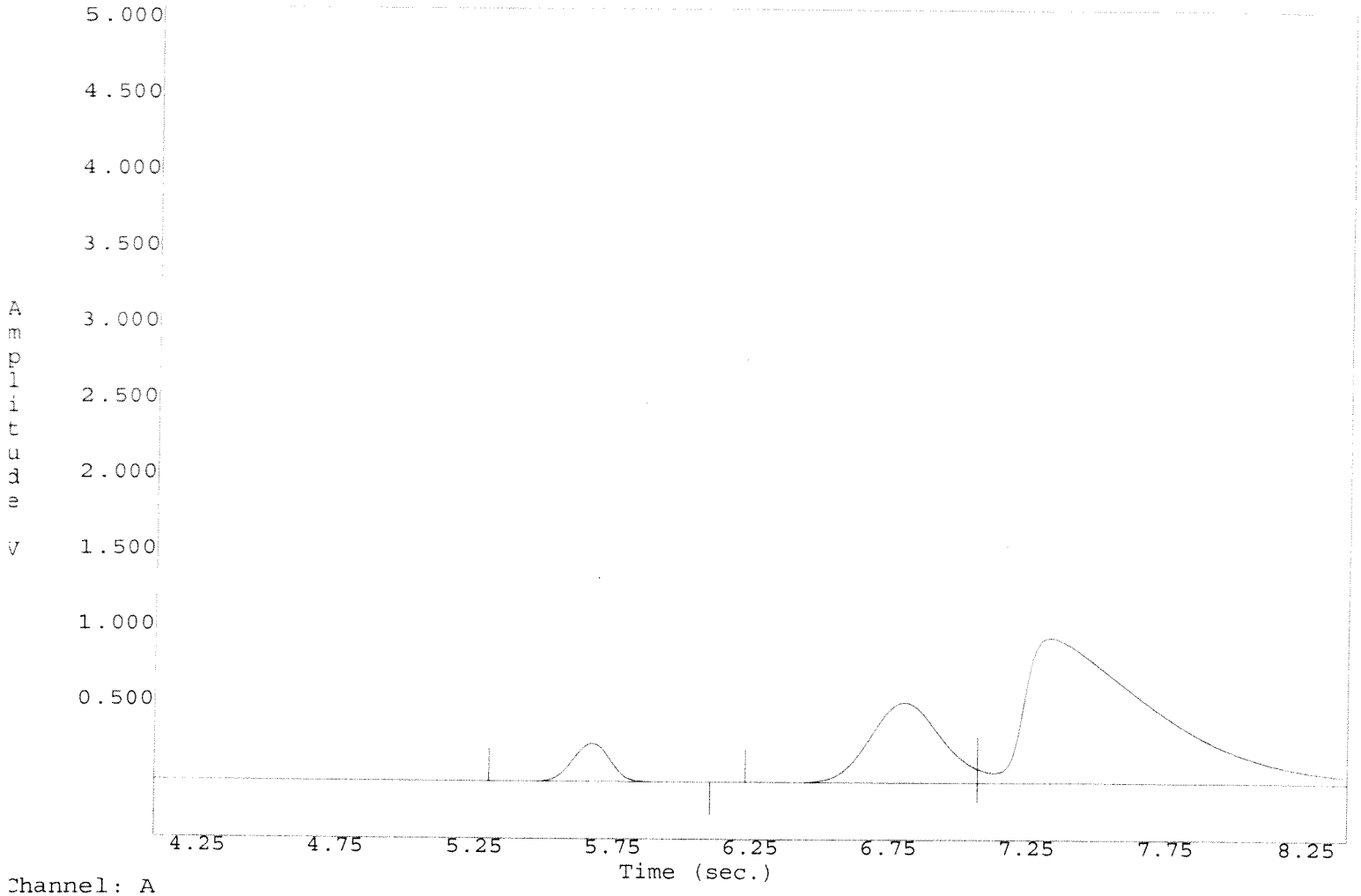
7-12a

External Standard Report

Name	Amount	Units	RT	Min	Max	Mean	%SD
Hydrogen	0.054	%	5.680	-1.000	10.203	0.436	208.693

Channel: A
Current Time: Jun 16, 2011 16:59:50
Method: c:\mti\ezchrom\200\methods\bh51.
File : c:\mti\ezchrom\200\chrom\01090815.1
Data file creation time: Jun 16, 2011 16:58:30
Instrument ID: 180122
Column Type: MS-5A 4m
Carrier Gas: He
Column Head Pressure: 23.8 psi
Column Temperature: 65 C
Instrument Gain: LOW
Sample Time: 2 seconds
Inject Time: 10 milliseconds
Run Time: 45 seconds

Sample 7-13



Channel: A
Current Time: Jun 16, 2011 16:59:52
Method: c:\mti\ezchrom\200\methods\bh51.
File : c:\mti\ezchrom\200\chrom\01090815.1
Data file creation time: Jun 16, 2011 16:58:30
Instrument ID: 180122
Column Type: MS-5A 4m
Carrier Gas: He
Column Head Pressure: 23.8 psi
Column Temperature: 65 C
Instrument Gain: LOW
Sample Time: 2 seconds
Inject Time: 10 milliseconds
Run Time: 45 seconds

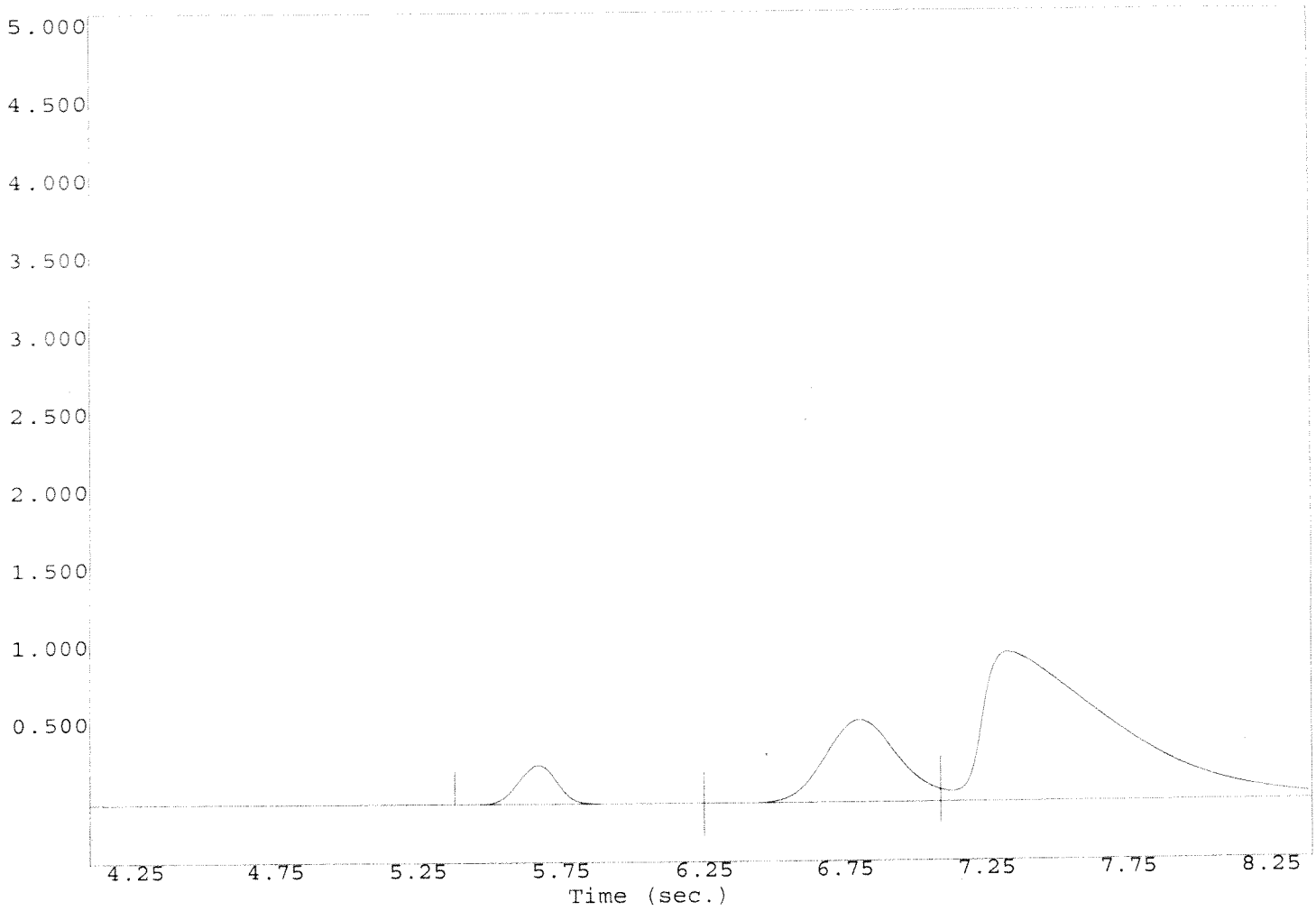
7-13

External Standard Report

Name	Amount	Units	RT	Min	Max	Mean	%SD
Hydrogen	0.054	%	5.690	-1.000	10.203	0.433	209.582

Channel: A
Current Time: Jun 16, 2011 17:02:46
Method: c:\mti\ezchrom\200\methods\bh51.
File : c:\mti\ezchrom\200\chrom\01090815.1
Data file creation time: Jun 16, 2011 17:01:44
Instrument ID: 180122
Column Type: MS-5A 4m
Carrier Gas: He
Column Head Pressure: 23.8 psi
Column Temperature: 65 C
Instrument Gain: LOW
Sample Time: 2 seconds
Inject Time: 10 milliseconds
Run Time: 45 seconds

Sample 7-13a



Channel: A
Current Time: Jun 16, 2011 17:02:49
Method: c:\mti\ezchrom\200\methods\bh51.
File : c:\mti\ezchrom\200\chrom\01090815.1
Data file creation time: Jun 16, 2011 17:01:44
Instrument ID: 180122
Column Type: MS-5A 4m
Carrier Gas: He
Column Head Pressure: 23.8 psi
Column Temperature: 65 C
Instrument Gain: LOW
Sample Time: 2 seconds
Inject Time: 10 milliseconds
Run Time: 45 seconds

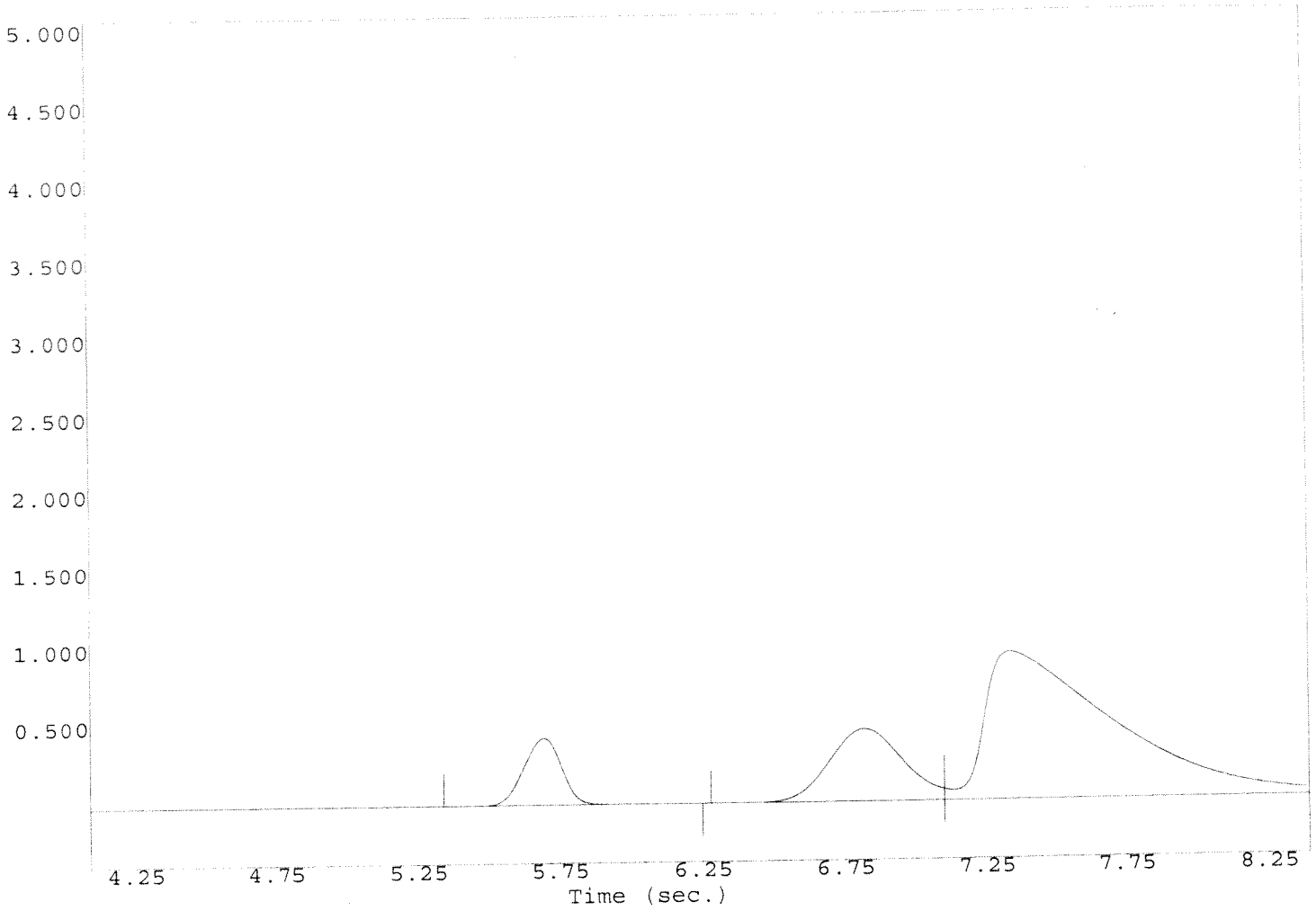
7-134

External Standard Report

Name	Amount	Units	RT	Min	Max	Mean	%SD
Hydrogen	0.093	%	5.700	-1.000	10.203	0.424	212.172

Channel: A
Current Time: Jun 17, 2011 07:57:35
Method: c:\mti\ezchrom\200\methods\bh51.
File : c:\mti\ezchrom\200\chrom\01090815.1
Data file creation time: Jun 17, 2011 07:56:29
Instrument ID: 180122
Column Type: MS-5A 4m
Carrier Gas: He
Column Head Pressure: 23.8 psi
Column Temperature: 65 C
Instrument Gain: LOW
Sample Time: 2 seconds
Inject Time: 10 milliseconds
Run Time: 45 seconds

Sample 7-14



Channel: A
Current Time: Jun 17, 2011 07:57:30
Method: c:\mti\ezchrom\200\methods\bh51.
File : c:\mti\ezchrom\200\chrom\01090815.1
Data file creation time: Jun 17, 2011 07:56:29
Instrument ID: 180122
Column Type: MS-5A 4m
Carrier Gas: He
Column Head Pressure: 23.8 psi
Column Temperature: 65 C
Instrument Gain: LOW
Sample Time: 2 seconds
Inject Time: 10 milliseconds
Run Time: 45 seconds

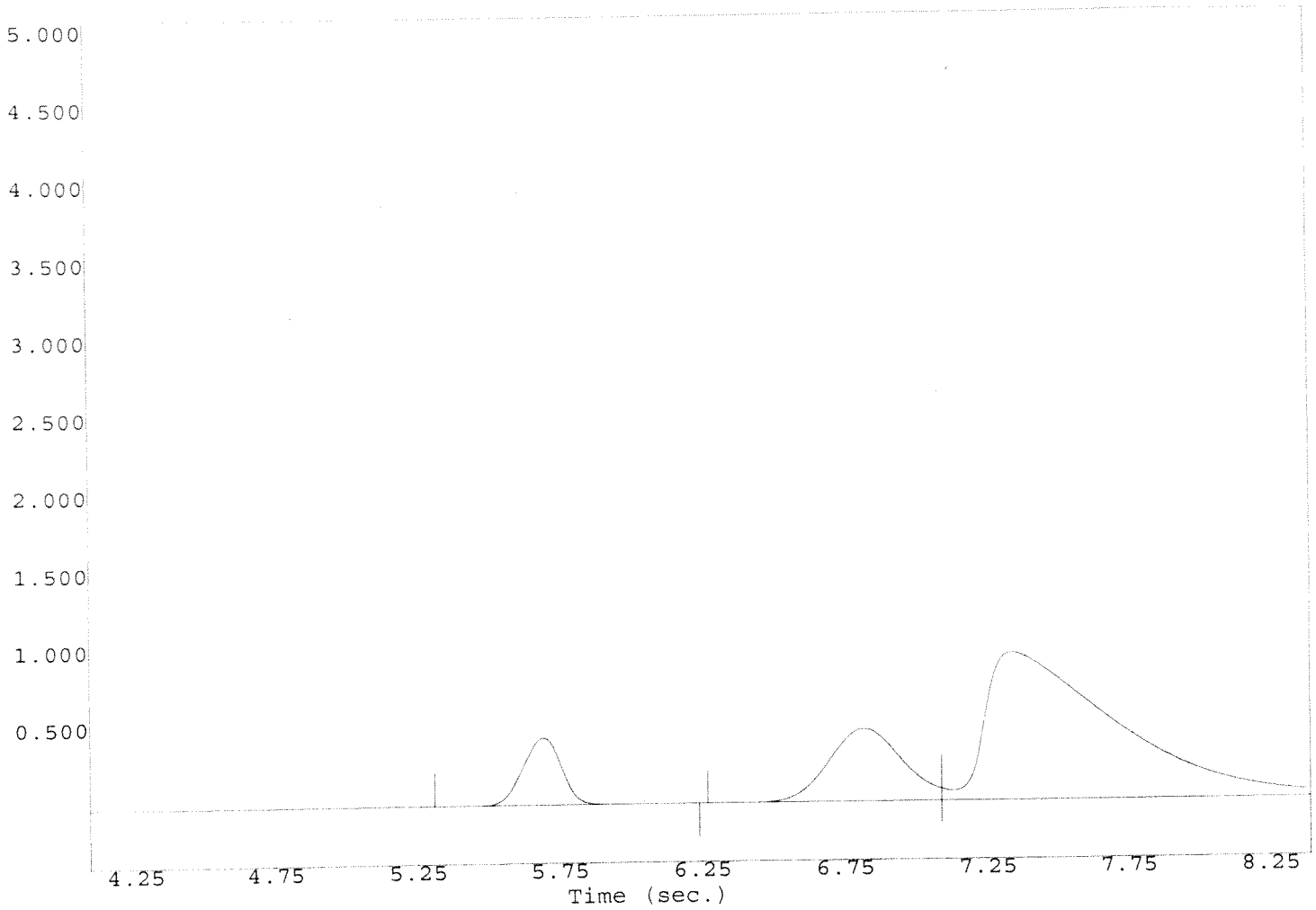
Sample 1-14

External Standard Report

Name	Amount	Units	RT	Min	Max	Mean	%SD
Hydrogen	0.093	%	5.700	-1.000	10.203	0.421	212.949

Channel: A
Current Time: Jun 17, 2011 08:01:44
Method: c:\mti\ezchrom\200\methods\bh51.
File : c:\mti\ezchrom\200\chrom\01090815.1
Data file creation time: Jun 17, 2011 08:00:21
Instrument ID: 180122
Column Type: MS-5A 4m
Carrier Gas: He
Column Head Pressure: 23.8 psi
Column Temperature: 65 C
Instrument Gain: LOW
Sample Time: 2 seconds
Inject Time: 10 milliseconds
Run Time: 45 seconds

Sample 7-14a



Channel: A
Current Time: Jun 17, 2011 08:01:42
Method: c:\mti\ezchrom\200\methods\bh51.
File : c:\mti\ezchrom\200\chrom\01090815.1
Data file creation time: Jun 17, 2011 08:00:21
Instrument ID: 180122
Column Type: MS-5A 4m
Carrier Gas: He
Column Head Pressure: 23.8 psi
Column Temperature: 65 C
Instrument Gain: LOW
Sample Time: 2 seconds
Inject Time: 10 milliseconds
Run Time: 45 seconds

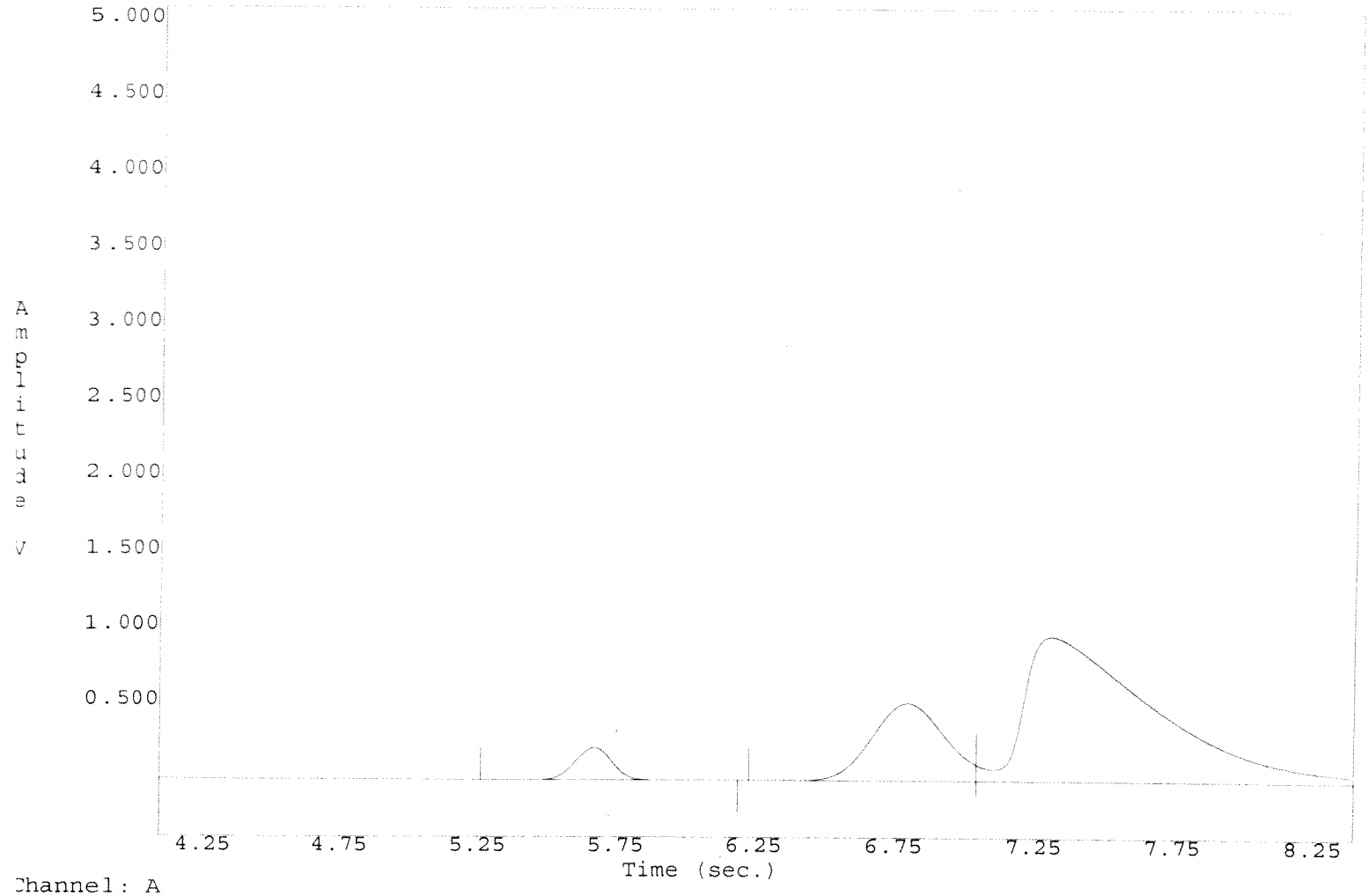
Sample 7-14a

External Standard Report

Name	Amount	Units	RT	Min	Max	Mean	%SD
Hydrogen	0.045	%	5.680	-1.000	10.203	0.412	215.536

Channel: A
Current Time: Jun 17, 2011 16:36:05
Method: c:\mti\ezchrom\200\methods\bh51.
File : c:\mti\ezchrom\200\chrom\01090815.1
Data file creation time: Jun 17, 2011 16:34:52
Instrument ID: 180122
Column Type: MS-5A 4m
Carrier Gas: He
Column Head Pressure: 23.8 psi
Column Temperature: 65 C
Instrument Gain: LOW
Sample Time: 2 seconds
Inject Time: 10 milliseconds
Run Time: 45 seconds

Sample 7-15



Channel: A
Current Time: Jun 17, 2011 16:36:08
Method: c:\mti\ezchrom\200\methods\bh51.
File : c:\mti\ezchrom\200\chrom\01090815.1
Data file creation time: Jun 17, 2011 16:34:52
Instrument ID: 180122
Column Type: MS-5A 4m
Carrier Gas: He
Column Head Pressure: 23.8 psi
Column Temperature: 65 C
Instrument Gain: LOW
Sample Time: 2 seconds
Inject Time: 10 milliseconds
Run Time: 45 seconds

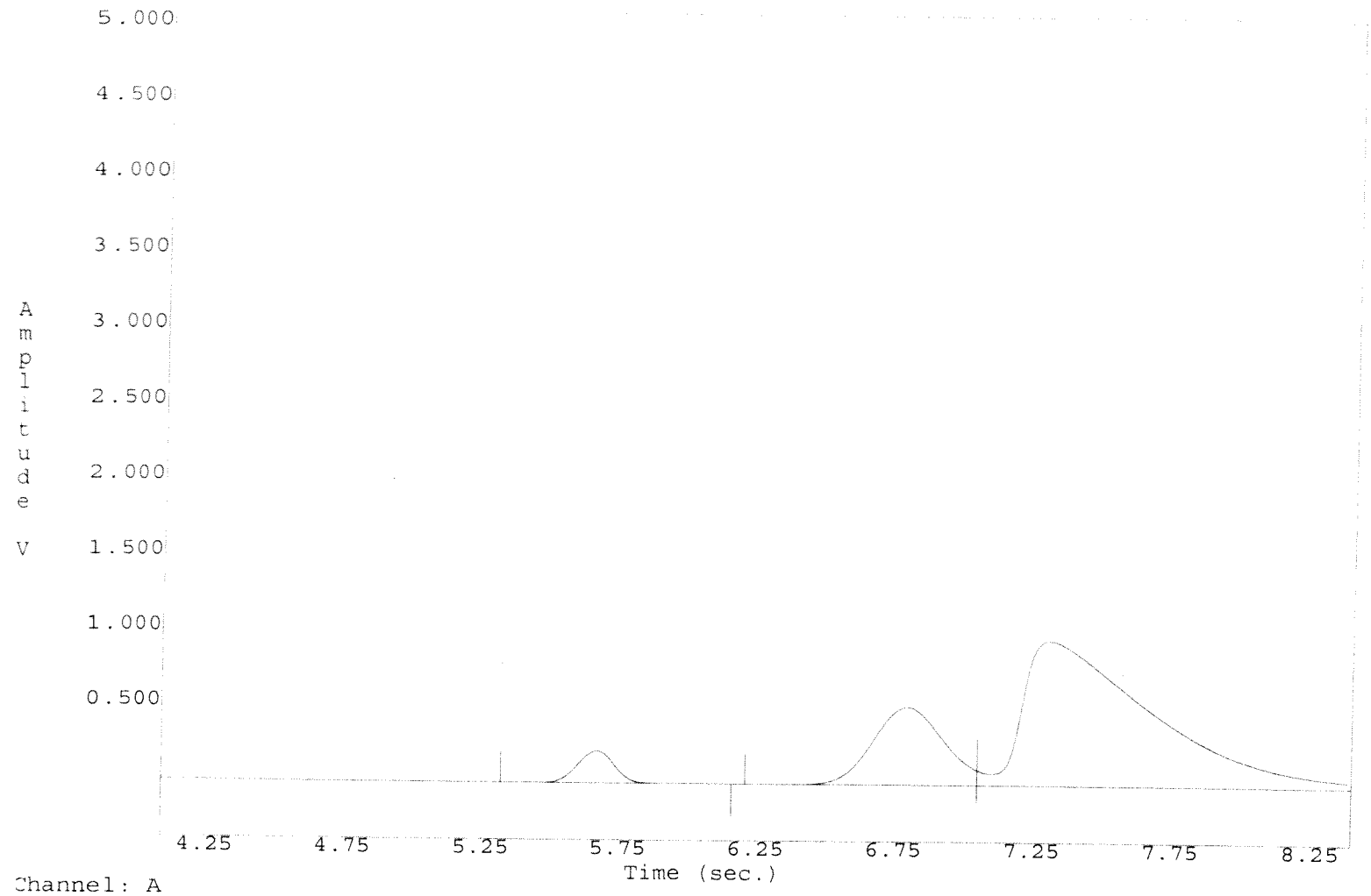
9-15

External Standard Report

Name	Amount	Units	RT	Min	Max	Mean	%SD
Hydrogen	0.045	%	5.670	-1.000	10.203	0.409	216.403

Channel: A
Current Time: Jun 17, 2011 16:39:51
Method: c:\mti\ezchrom\200\methods\bh51.
File : c:\mti\ezchrom\200\chrom\01090815.1
Data file creation time: Jun 17, 2011 16:38:18
Instrument ID: 180122
Column Type: MS-5A 4m
Carrier Gas: He
Column Head Pressure: 23.8 psi
Column Temperature: 65 C
Instrument Gain: LOW
Sample Time: 2 seconds
Inject Time: 10 milliseconds
Run Time: 45 seconds

7-15a



Channel: A
Current Time: Jun 17, 2011 16:39:54
Method: c:\mti\ezchrom\200\methods\bh51.
File : c:\mti\ezchrom\200\chrom\01090815.1
Data file creation time: Jun 17, 2011 16:38:18
Instrument ID: 180122
Column Type: MS-5A 4m
Carrier Gas: He
Column Head Pressure: 23.8 psi
Column Temperature: 65 C
Instrument Gain: LOW
Sample Time: 2 seconds
Inject Time: 10 milliseconds
Run Time: 45 seconds

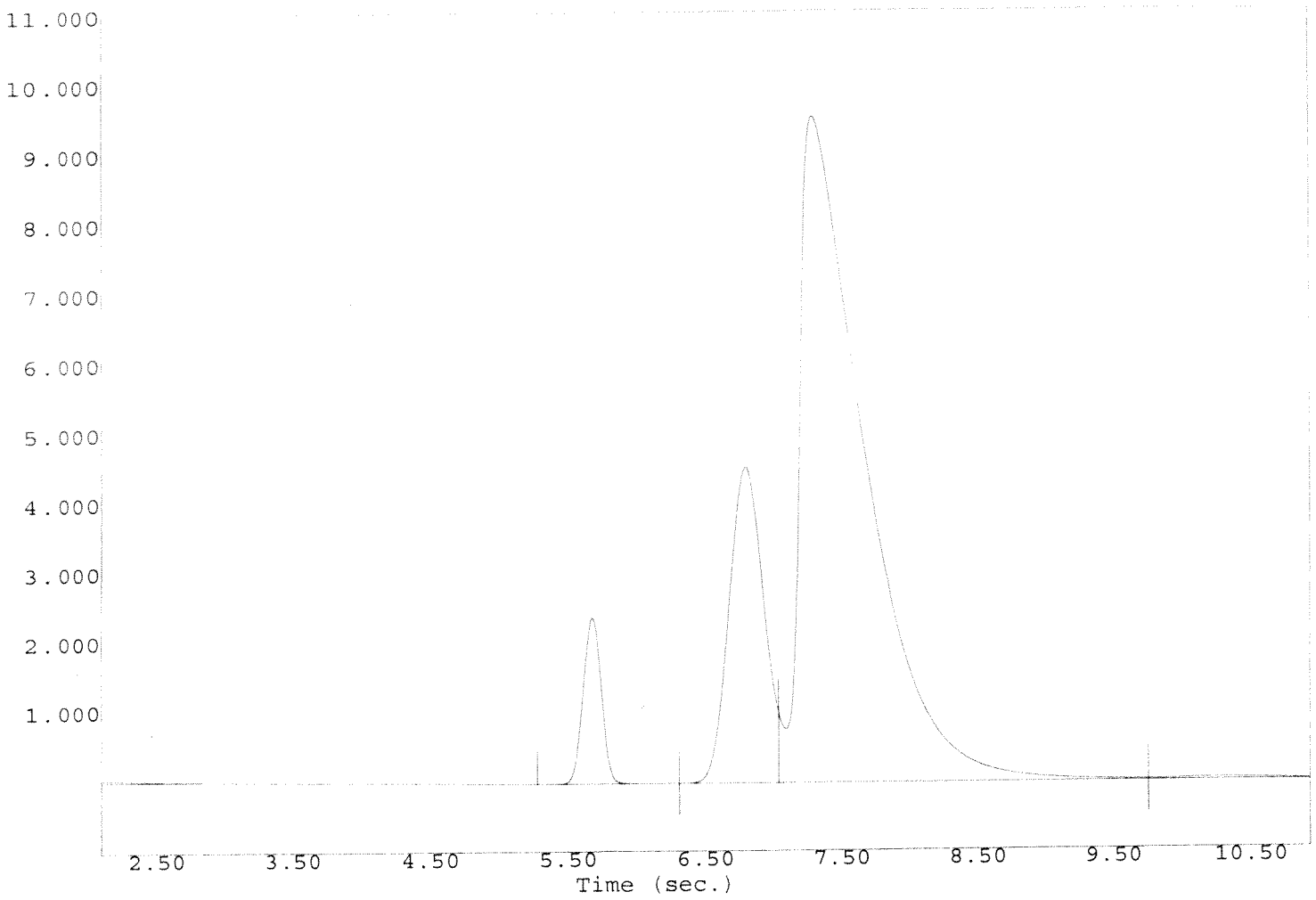
7-15a

External Standard Report

Name	Amount	Units	RT	Min	Max	Mean	%SD
Hydrogen	0.528	%	5.690	-1.000	10.203	0.401	218.489

Channel: A
Current Time: Jun 18, 2011 09:17:06
Method: c:\mti\ezchrom\200\methods\bh51.
File : c:\mti\ezchrom\200\chrom\01090815.1
Data file creation time: Jun 18, 2011 09:15:04
Instrument ID: 180122
Column Type: MS-5A 4m
Carrier Gas: He
Column Head Pressure: 23.8 psi
Column Temperature: 65 C
Instrument Gain: MED
Sample Time: 2 seconds
Inject Time: 10 milliseconds
Run Time: 45 seconds

Sample T-16



Channel: A
Current Time: Jun 18, 2011 09:17:10
Method: c:\mti\ezchrom\200\methods\bh51.
File : c:\mti\ezchrom\200\chrom\01090815.1
Data file creation time: Jun 18, 2011 09:15:04
Instrument ID: 180122
Column Type: MS-5A 4m
Carrier Gas: He
Column Head Pressure: 23.8 psi
Column Temperature: 65 C
Instrument Gain: MED
Sample Time: 2 seconds
Inject Time: 10 milliseconds
Run Time: 45 seconds

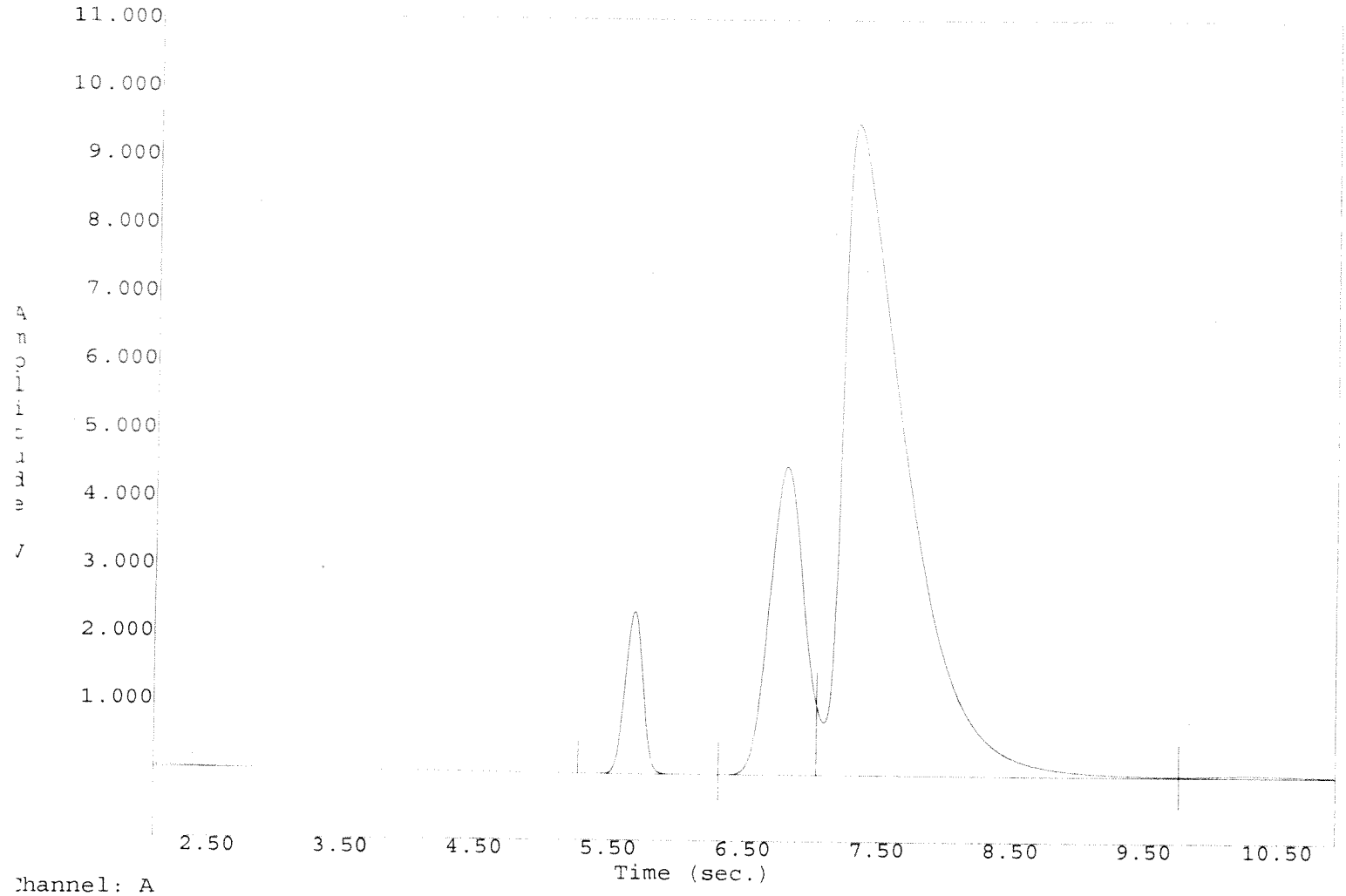
7-16

External Standard Report

Name	Amount	Units	RT	Min	Max	Mean	%SD
Hydrogen	0.527	%	5.690	-1.000	10.203	0.400	218.328

Channel: A
Current Time: Jun 18, 2011 09:20:33
Method: c:\mti\ezchrom\200\methods\bh51.
File : c:\mti\ezchrom\200\chrom\01090815.1
Data file creation time: Jun 18, 2011 09:19:19
Instrument ID: 180122
Column Type: MS-5A 4m
Carrier Gas: He
Column Head Pressure: 23.8 psi
Column Temperature: 65 C
Instrument Gain: MED
Sample Time: 2 seconds
Inject Time: 10 milliseconds
Run Time: 45 seconds

Sample 7-16a



Channel: A
Current Time: Jun 18, 2011 09:20:30
Method: c:\mti\ezchrom\200\methods\bh51.
File : c:\mti\ezchrom\200\chrom\01090815.1
Data file creation time: Jun 18, 2011 09:19:19
Instrument ID: 180122
Column Type: MS-5A 4m
Carrier Gas: He
Column Head Pressure: 23.8 psi
Column Temperature: 65 C
Instrument Gain: MED
Sample Time: 2 seconds
Inject Time: 10 milliseconds
Run Time: 45 seconds

7-16a

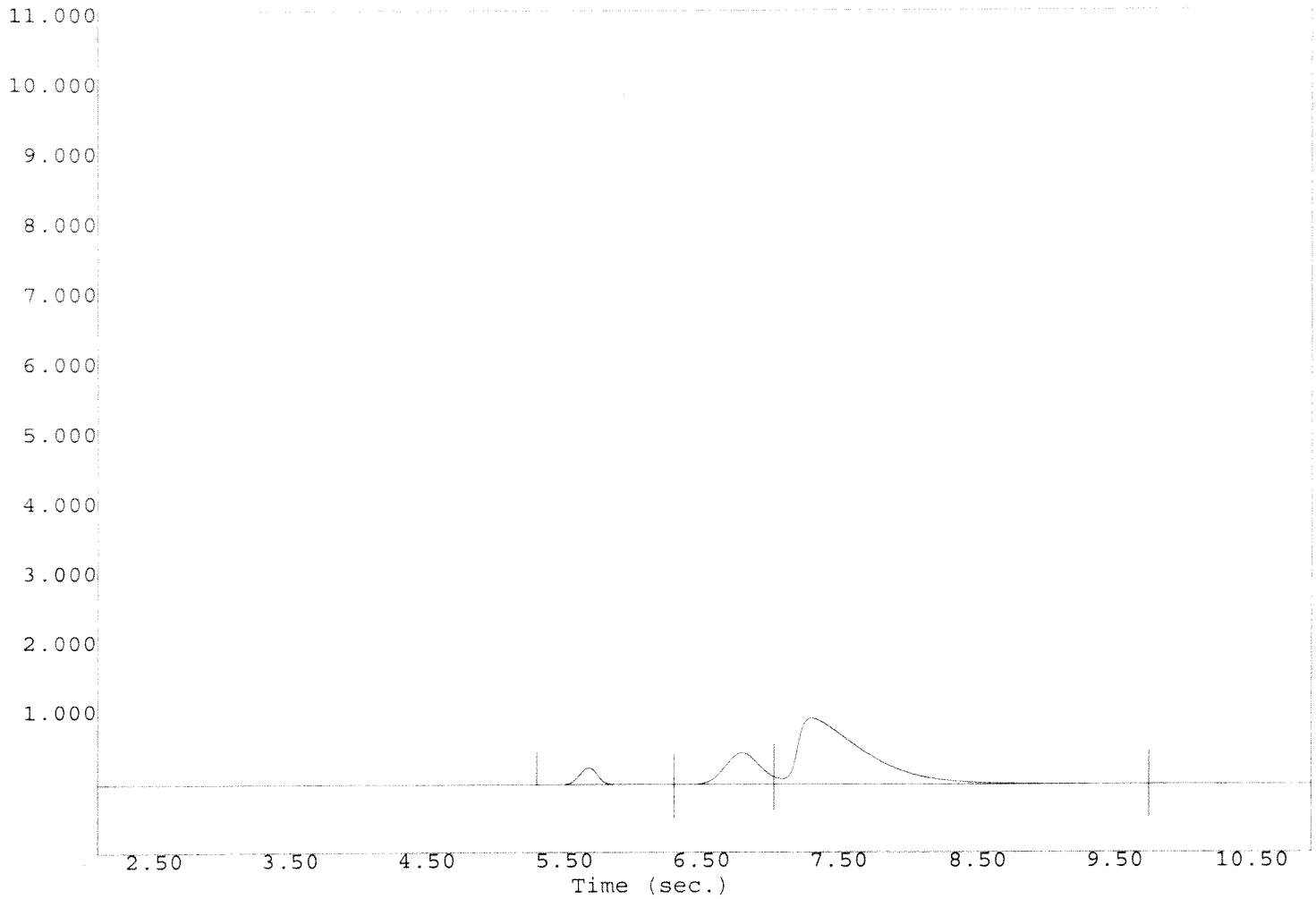
External Standard Report

Name	Amount	Units	RT	Min	Max	Mean	%SD
Hydrogen	0.050	%	5.680	-1.000	10.203	0.397	219.152

Channel: A
Current Time: Jun 18, 2011 09:25:45
Method: c:\mti\ezchrom\200\methods\bh51.
File : c:\mti\ezchrom\200\chrom\01090815.1
Data file creation time: Jun 18, 2011 09:23:39
Instrument ID: 180122
Column Type: MS-5A 4m
Carrier Gas: He
Column Head Pressure: 23.8 psi
Column Temperature: 65 C
Instrument Gain: LOW
Sample Time: 2 seconds
Inject Time: 10 milliseconds
Run Time: 45 seconds

Sample 7-16 b

Shows the effect of gain.



Channel: A
Current Time: Jun 18, 2011 09:25:50
Method: c:\mti\ezchrom\200\methods\bh51.
File : c:\mti\ezchrom\200\chrom\01090815.1
Data file creation time: Jun 18, 2011 09:23:39
Instrument ID: 180122
Column Type: MS-5A 4m
Carrier Gas: He
Column Head Pressure: 23.8 psi
Column Temperature: 65 C
Instrument Gain: LOW
Sample Time: 2 seconds
Inject Time: 10 milliseconds
Run Time: 45 seconds

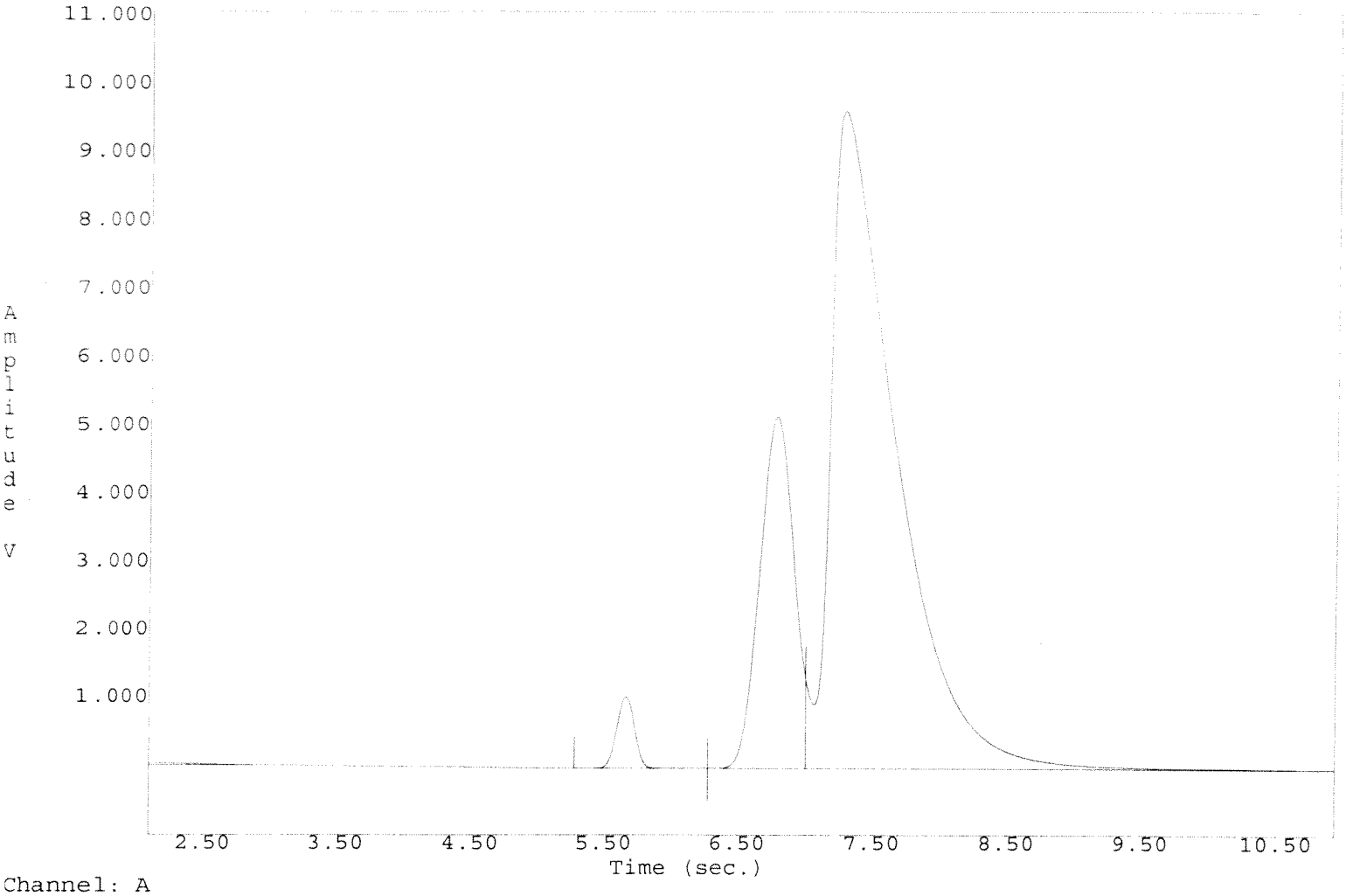
7-16b

External Standard Report

Name	Amount	Units	RT	Min	Max	Mean	%SD
Hydrogen	0.232	%	5.670	-1.000	10.203	0.389	221.020

Channel: A
Current Time: Jun 18, 2011 17:02:08
Method: c:\mti\ezchrom\200\methods\bh51.
File : c:\mti\ezchrom\200\chrom\01090815.1
Data file creation time: Jun 18, 2011 17:00:58
Instrument ID: 180122
Column Type: MS-5A 4m
Carrier Gas: He
Column Head Pressure: 23.8 psi
Column Temperature: 65 C
Instrument Gain: MED
Sample Time: 2 seconds
Inject Time: 10 milliseconds
Run Time: 45 seconds

Sample 7-17



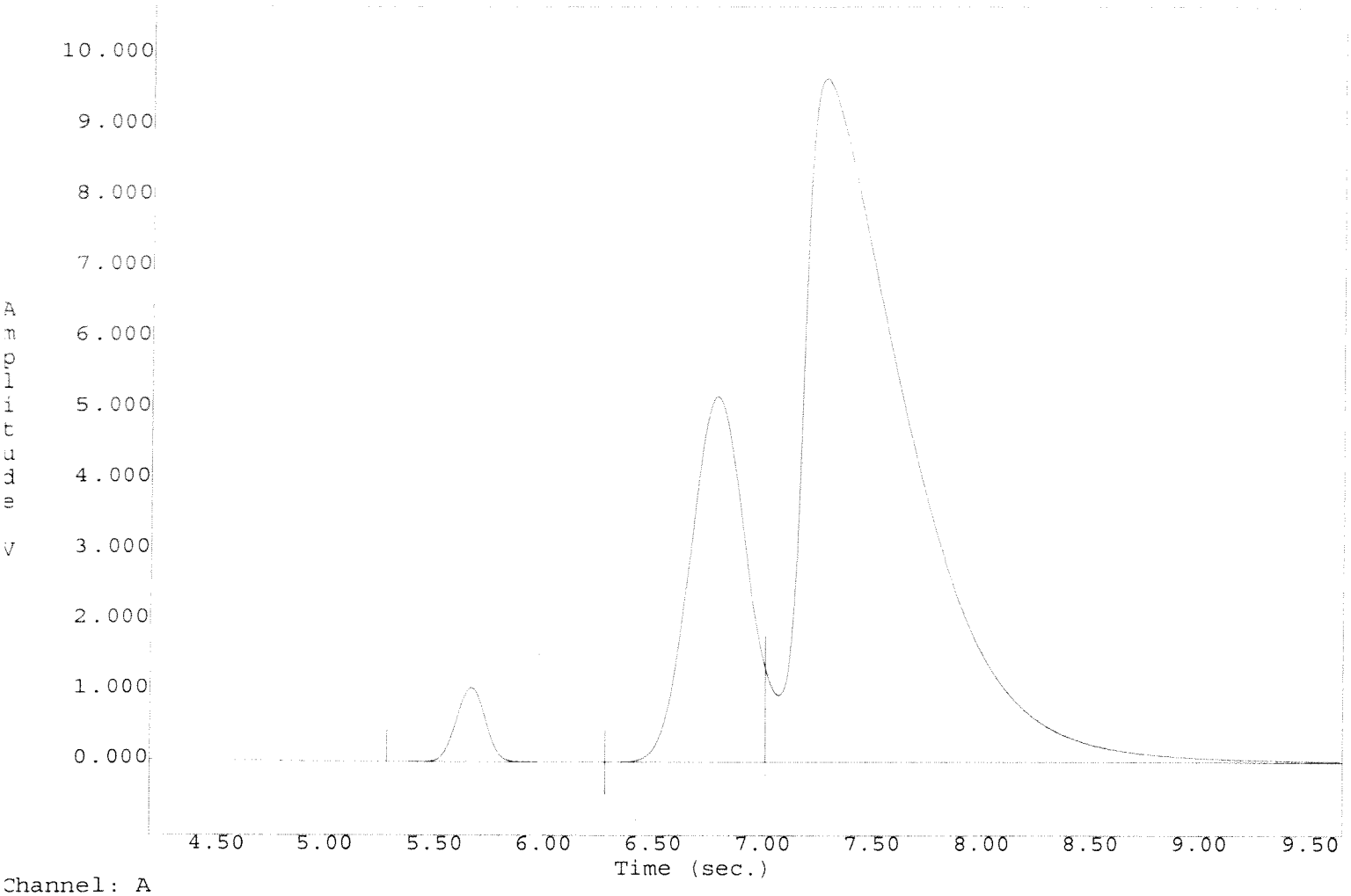
Channel: A
Current Time: Jun 18, 2011 17:02:11
Method: c:\mti\ezchrom\200\methods\bh51.
File : c:\mti\ezchrom\200\chrom\01090815.1
Data file creation time: Jun 18, 2011 17:00:58
Instrument ID: 180122
Column Type: MS-5A 4m
Carrier Gas: He
Column Head Pressure: 23.8 psi
Column Temperature: 65 C
Instrument Gain: MED
Sample Time: 2 seconds
Inject Time: 10 milliseconds
Run Time: 45 seconds

External Standard Report

Name	Amount	Units	RT	Min	Max	Mean	%SD
Hydrogen	0.231	%	5.670	-1.000	10.203	0.387	221.416

Channel: A
Current Time: Jun 18, 2011 17:06:02
Method: c:\mti\ezchrom\200\methods\bh51.
File : c:\mti\ezchrom\200\chrom\01090815.1
Data file creation time: Jun 18, 2011 17:04:56
Instrument ID: 180122
Column Type: MS-5A 4m
Carrier Gas: He
Column Head Pressure: 23.8 psi
Column Temperature: 65 C
Instrument Gain: MED
Sample Time: 2 seconds
Inject Time: 10 milliseconds
Run Time: 45 seconds

Sample 7-17a



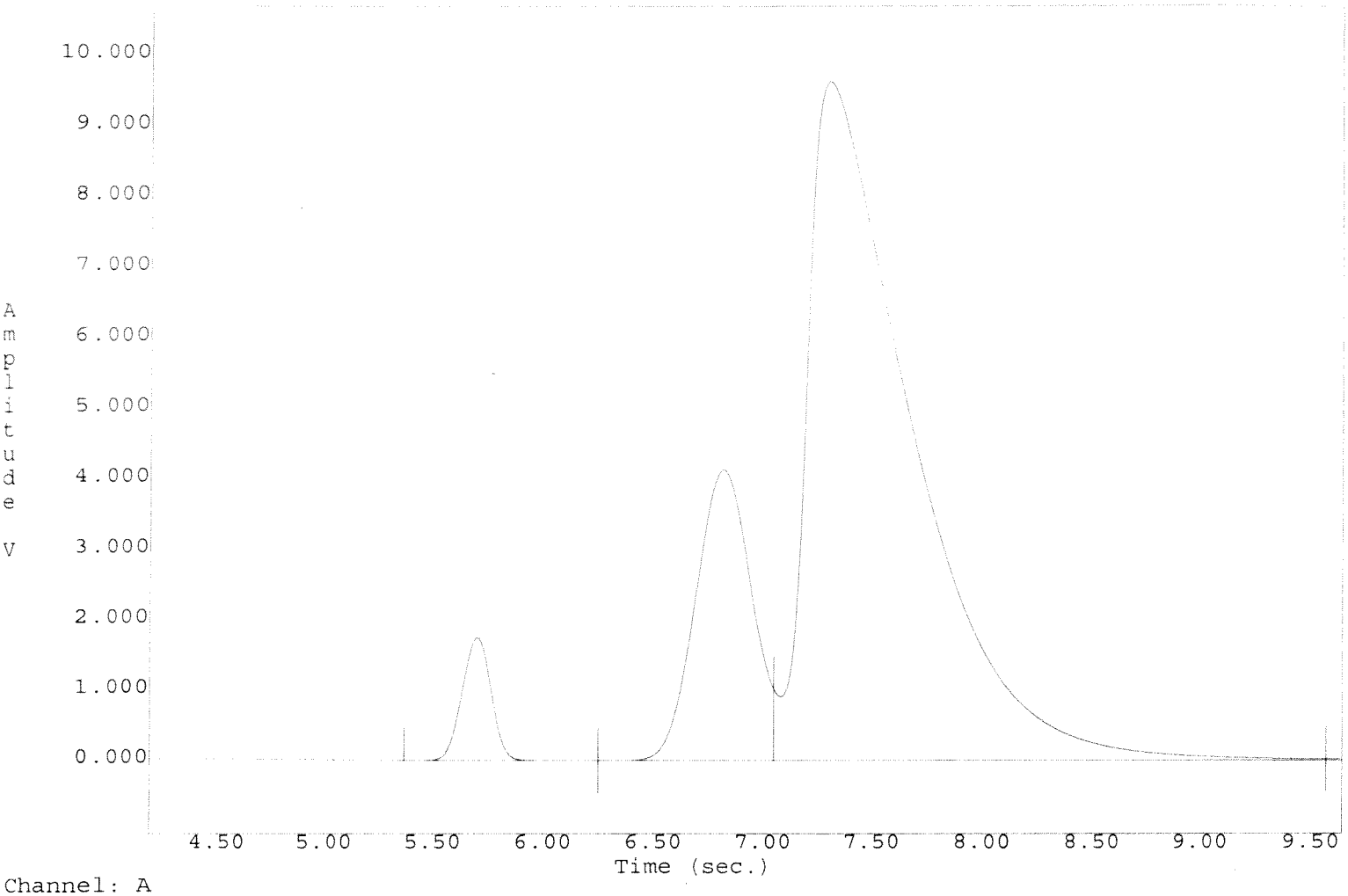
Channel: A
Current Time: Jun 18, 2011 17:06:07
Method: c:\mti\ezchrom\200\methods\bh51.
File : c:\mti\ezchrom\200\chrom\01090815.1
Data file creation time: Jun 18, 2011 17:04:56
Instrument ID: 180122
Column Type: MS-5A 4m
Carrier Gas: He
Column Head Pressure: 23.8 psi
Column Temperature: 65 C
Instrument Gain: MED
Sample Time: 2 seconds
Inject Time: 10 milliseconds
Run Time: 45 seconds

External Standard Report

Name	Amount	Units	RT	Min	Max	Mean	%SD
Hydrogen	0.380	%	5.690	-1.000	10.203	0.382	222.394

Channel: A
Current Time: Jun 19, 2011 14:59:19
Method: c:\mti\ezchrom\200\methods\bh51.
File : c:\mti\ezchrom\200\chrom\01090815.1
Data file creation time: Jun 19, 2011 14:58:11
Instrument ID: 180122
Column Type: MS-5A 4m
Carrier Gas: He
Column Head Pressure: 23.8 psi
Column Temperature: 65 C
Instrument Gain: MED
Sample Time: 2 seconds
Inject Time: 10 milliseconds
Run Time: 45 seconds

Sample 7-18



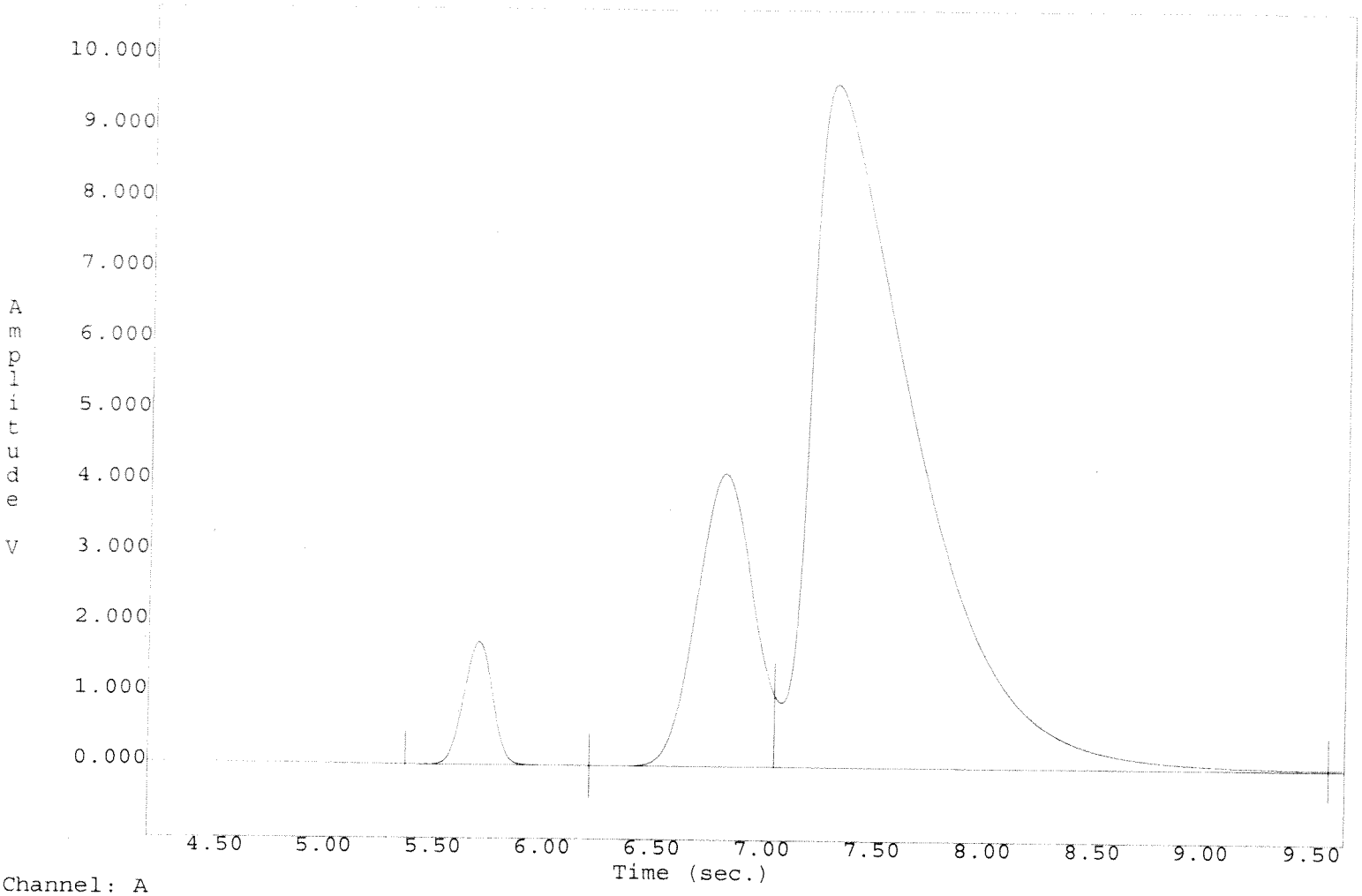
Channel: A
Current Time: Jun 19, 2011 14:59:25
Method: c:\mti\ezchrom\200\methods\bh51.
File : c:\mti\ezchrom\200\chrom\01090815.1
Data file creation time: Jun 19, 2011 14:58:11
Instrument ID: 180122
Column Type: MS-5A 4m
Carrier Gas: He
Column Head Pressure: 23.8 psi
Column Temperature: 65 C
Instrument Gain: MED
Sample Time: 2 seconds
Inject Time: 10 milliseconds
Run Time: 45 seconds

External Standard Report

Name	Amount	Units	RT	Min	Max	Mean	%SD
Hydrogen	0.379	%	5.690	-1.000	10.203	0.381	222.471

Channel: A
Current Time: Jun 19, 2011 15:02:35
Method: c:\mti\ezchrom\200\methods\bh51.
File : c:\mti\ezchrom\200\chrom\01090815.1
Data file creation time: Jun 19, 2011 15:01:30
Instrument ID: 180122
Column Type: MS-5A 4m
Carrier Gas: He
Column Head Pressure: 23.8 psi
Column Temperature: 65 C
Instrument Gain: MED
Sample Time: 2 seconds
Inject Time: 10 milliseconds
Run Time: 45 seconds

Sample 7-18a



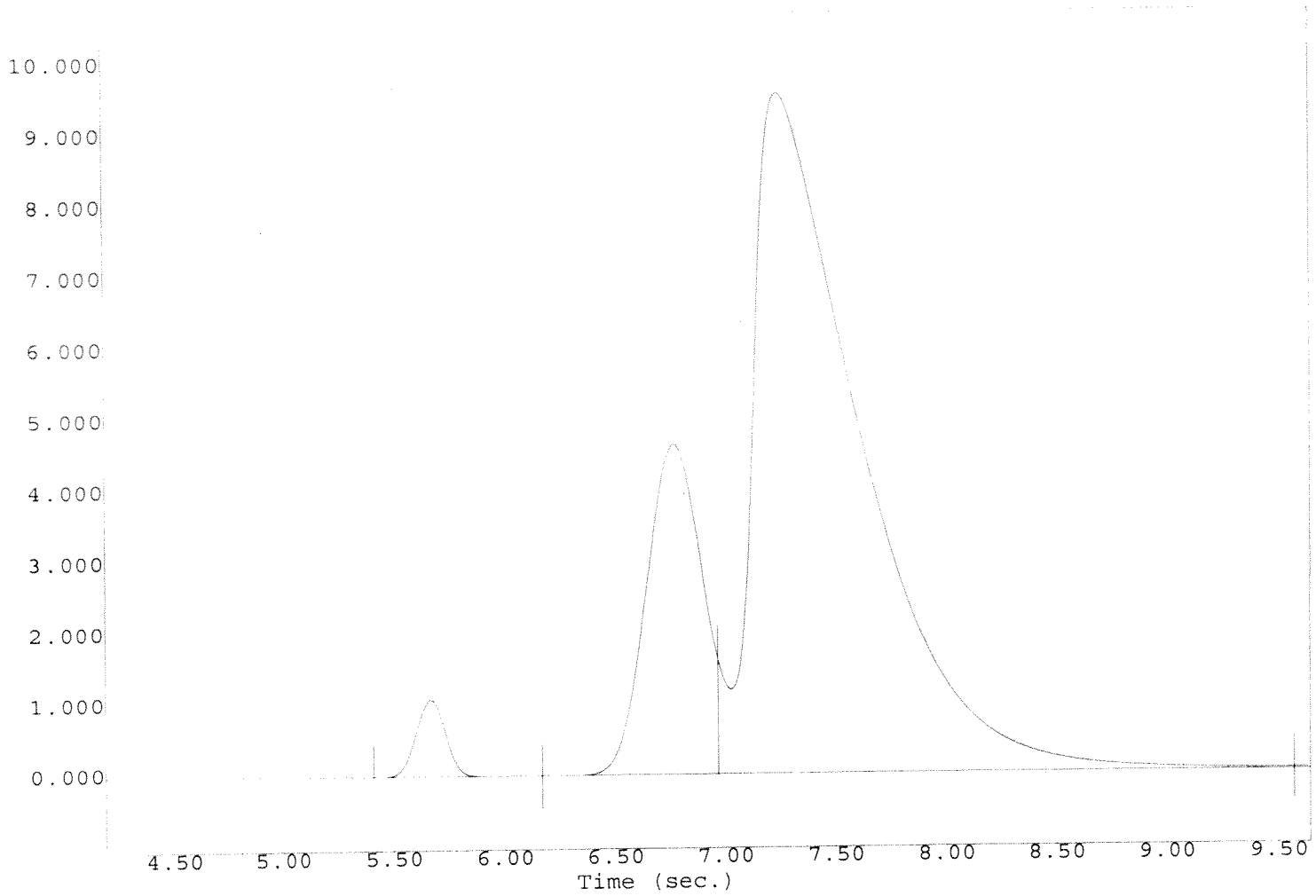
Channel: A
Current Time: Jun 19, 2011 15:02:38
Method: c:\mti\ezchrom\200\methods\bh51.
File : c:\mti\ezchrom\200\chrom\01090815.1
Data file creation time: Jun 19, 2011 15:01:30
Instrument ID: 180122
Column Type: MS-5A 4m
Carrier Gas: He
Column Head Pressure: 23.8 psi
Column Temperature: 65 C
Instrument Gain: MED
Sample Time: 2 seconds
Inject Time: 10 milliseconds
Run Time: 45 seconds

External Standard Report

Name	Amount	Units	RT	Min	Max	Mean	%SD
Hydrogen	0.233	%	5.690	-1.000	10.203	0.375	223.614

Channel: A
Current Time: Jun 20, 2011 07:35:59
Method: c:\mti\ezchrom\200\methods\bh51.
File : c:\mti\ezchrom\200\chrom\01090815.1
Data file creation time: Jun 20, 2011 07:34:51
Instrument ID: 180122
Column Type: MS-5A 4m
Carrier Gas: He
Column Head Pressure: 23.8 psi
Column Temperature: 65 C
Instrument Gain: MED
Sample Time: 2 seconds
Inject Time: 10 milliseconds
Run Time: 45 seconds

Sample 7-19



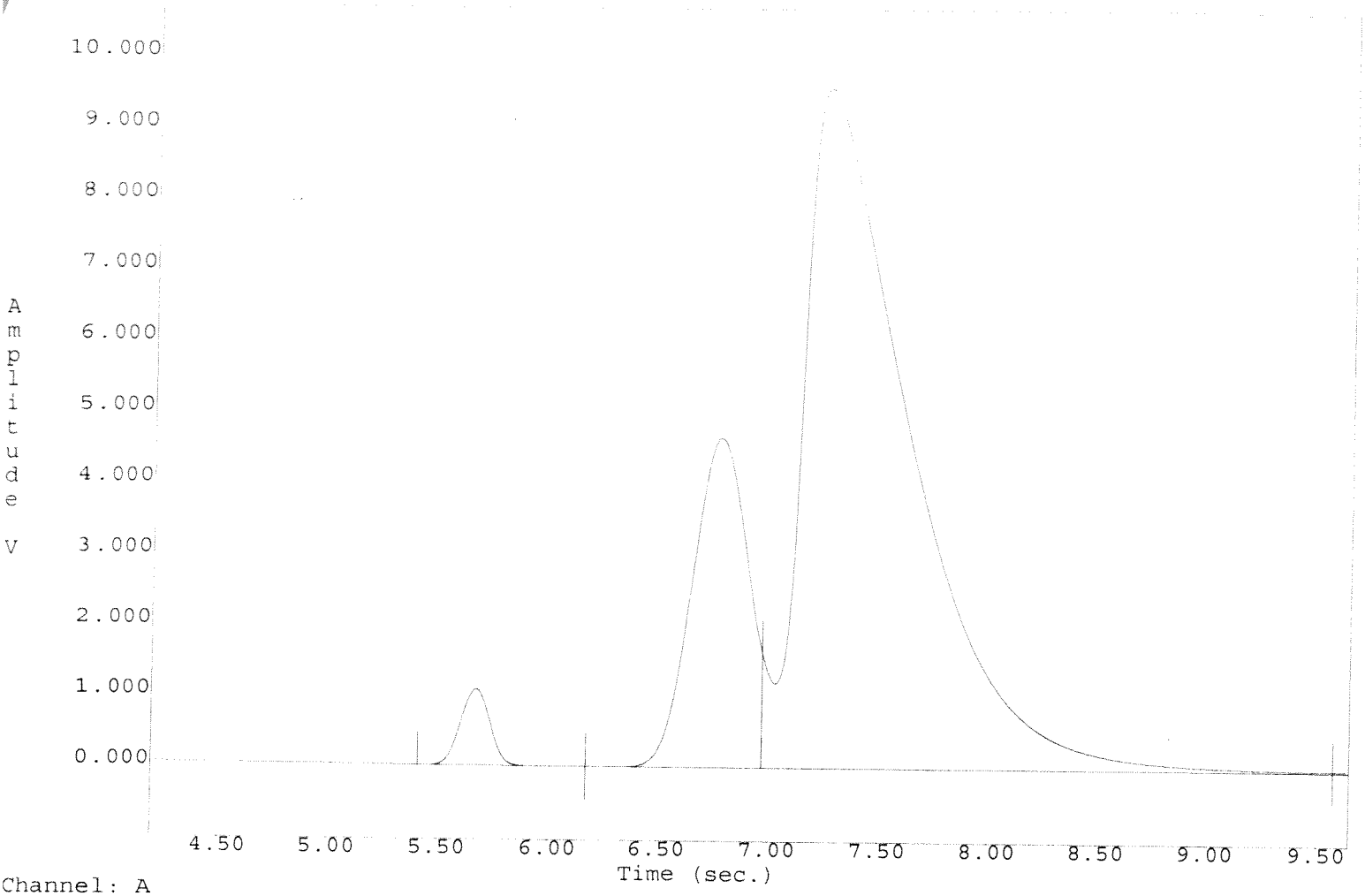
Channel: A
Current Time: Jun 20, 2011 07:36:02
Method: c:\mti\ezchrom\200\methods\bh51.
File : c:\mti\ezchrom\200\chrom\01090815.1
Data file creation time: Jun 20, 2011 07:34:51
Instrument ID: 180122
Column Type: MS-5A 4m
Carrier Gas: He
Column Head Pressure: 23.8 psi
Column Temperature: 65 C
Instrument Gain: MED
Sample Time: 2 seconds
Inject Time: 10 milliseconds
Run Time: 45 seconds

External Standard Report

Name	Amount	Units	RT	Min	Max	Mean	%SD
Hydrogen	0.233	%	5.690	-1.000	10.203	0.374	223.972

Channel: A
Current Time: Jun 20, 2011 07:39:27
Method: c:\mti\ezchrom\200\methods\bh51.
File : c:\mti\ezchrom\200\chrom\01090815.1
Data file creation time: Jun 20, 2011 07:37:59
Instrument ID: 180122
Column Type: MS-5A 4m
Carrier Gas: He
Column Head Pressure: 23.8 psi
Column Temperature: 65 C
Instrument Gain: MED
Sample Time: 2 seconds
Inject Time: 10 milliseconds
Run Time: 45 seconds

Sample 7-19a



Channel: A
Current Time: Jun 20, 2011 07:39:29
Method: c:\mti\ezchrom\200\methods\bh51.
File : c:\mti\ezchrom\200\chrom\01090815.1
Data file creation time: Jun 20, 2011 07:37:59
Instrument ID: 180122
Column Type: MS-5A 4m
Carrier Gas: He
Column Head Pressure: 23.8 psi
Column Temperature: 65 C
Instrument Gain: MED
Sample Time: 2 seconds
Inject Time: 10 milliseconds
Run Time: 45 seconds

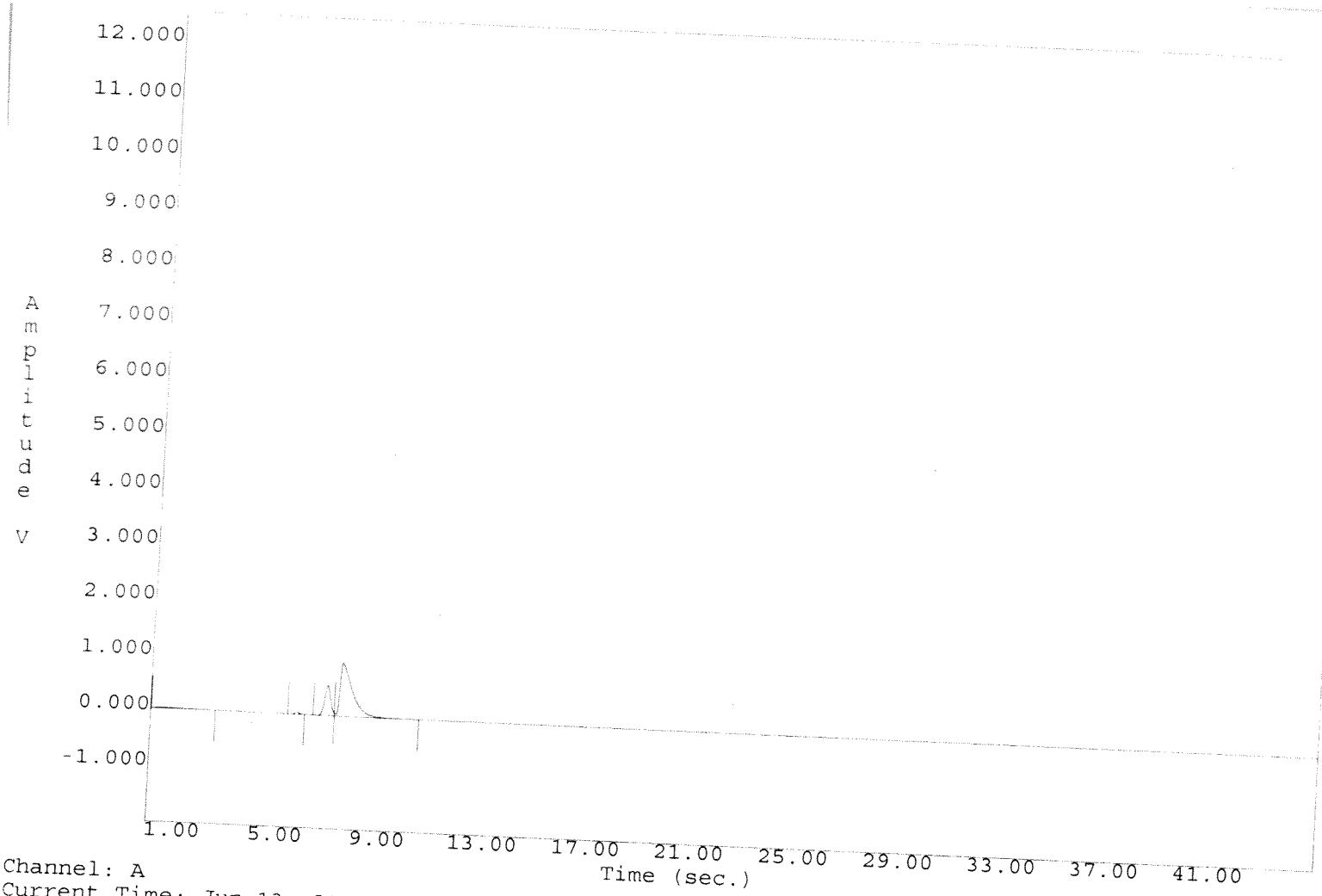
GC Data for Sample 9

External Standard Report

Name	Amount	Units	RT	Min	Max	Mean	%SD
Hydrogen	0.009	%	5.670	-1.000	10.203	0.688	163.207

Channel: A
Current Time: Jun 13, 2011 16:55:55
Method: c:\mti\ezchrom\200\methods\bh51.
File : c:\mti\ezchrom\200\chrom\01090815.1
Data file creation time: Jun 13, 2011 16:54:53
Instrument ID: 180122
Column Type: MS-5A 4m
Carrier Gas: He
Column Head Pressure: 23.8 psi
Column Temperature: 65 C
Instrument Gain: LOW
Sample Time: 2 seconds
Inject Time: 10 milliseconds
Run Time: 45 seconds

Sample 9-1



Channel: A
Current Time: Jun 13, 2011 16:56:39
Method: c:\mti\ezchrom\200\methods\bh51.
File : c:\mti\ezchrom\200\chrom\01090815.1
Data file creation time: Jun 13, 2011 16:54:53
Instrument ID: 180122
Column Type: MS-5A 4m
Carrier Gas: He
Column Head Pressure: 23.8 psi
Column Temperature: 65 C
Instrument Gain: LOW
Sample Time: 2 seconds
Inject Time: 10 milliseconds
Run Time: 45 seconds

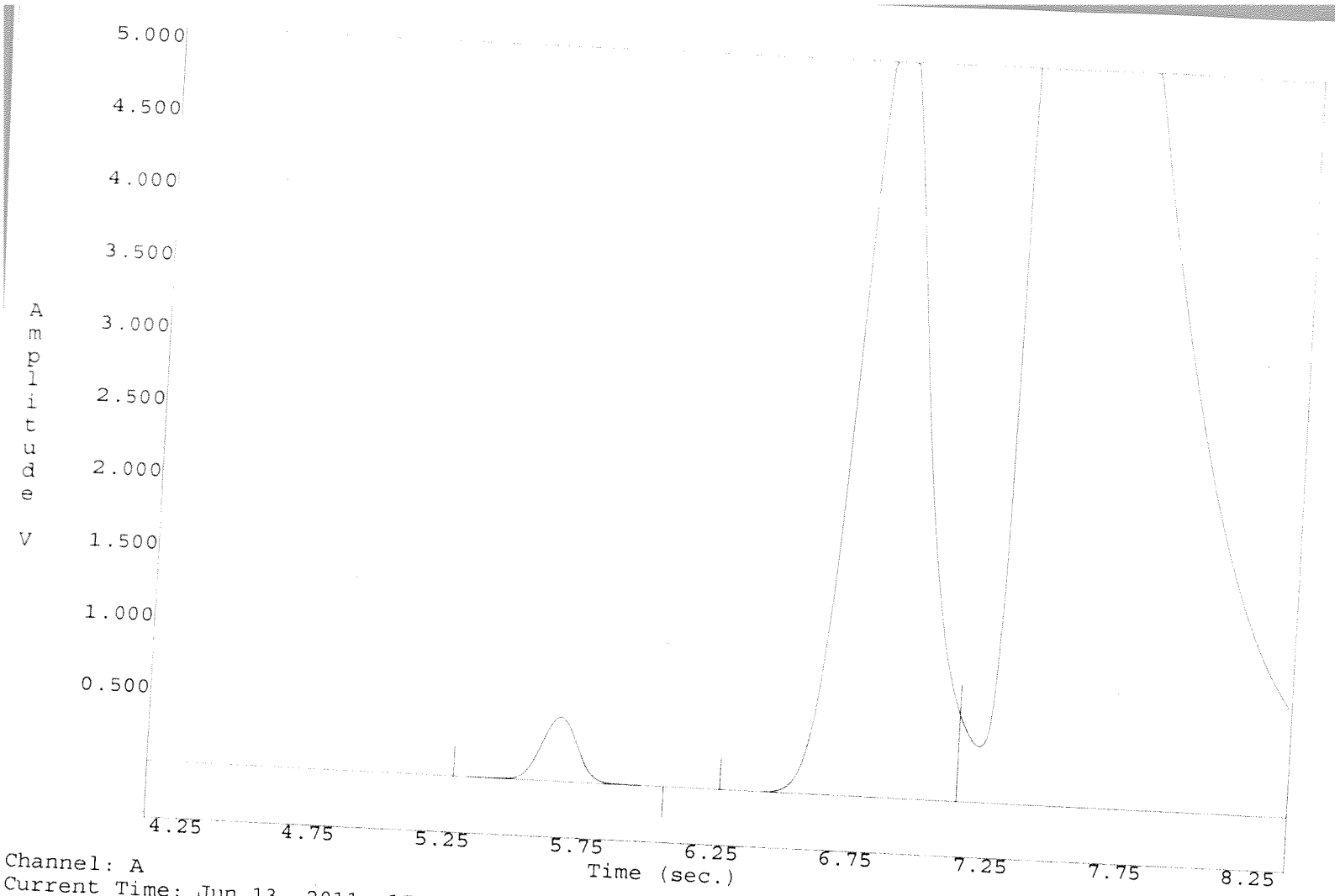
9-1

External Standard Report

Name	Amount	Units	RT	Min	Max	Mean	%SD
Hydrogen	0.096	%	5.670	-1.000	10.203	0.679	164.513

Channel: A
Current Time: Jun 13, 2011 17:00:51
Method: c:\mti\ezchrom\200\methods\bh51.
File : c:\mti\ezchrom\200\chrom\01090815.1
Data file creation time: Jun 13, 2011 16:59:49
Instrument ID: 180122
Column Type: MS-5A 4m
Carrier Gas: He
Column Head Pressure: 23.8 psi
Column Temperature: 65 C
Instrument Gain: MED
Sample Time: 2 seconds
Inject Time: 10 milliseconds
Run Time: 45 seconds

Sample 9-1a



Channel: A
Current Time: Jun 13, 2011 17:00:54
Method: c:\mti\ezchrom\200\methods\bh51.
File : c:\mti\ezchrom\200\chrom\01090815.1
Data file creation time: Jun 13, 2011 16:59:49
Instrument ID: 180122
Column Type: MS-5A 4m
Carrier Gas: He
Column Head Pressure: 23.8 psi
Column Temperature: 65 C
Instrument Gain: MED
Sample Time: 2 seconds
Inject Time: 10 milliseconds
Run Time: 45 seconds

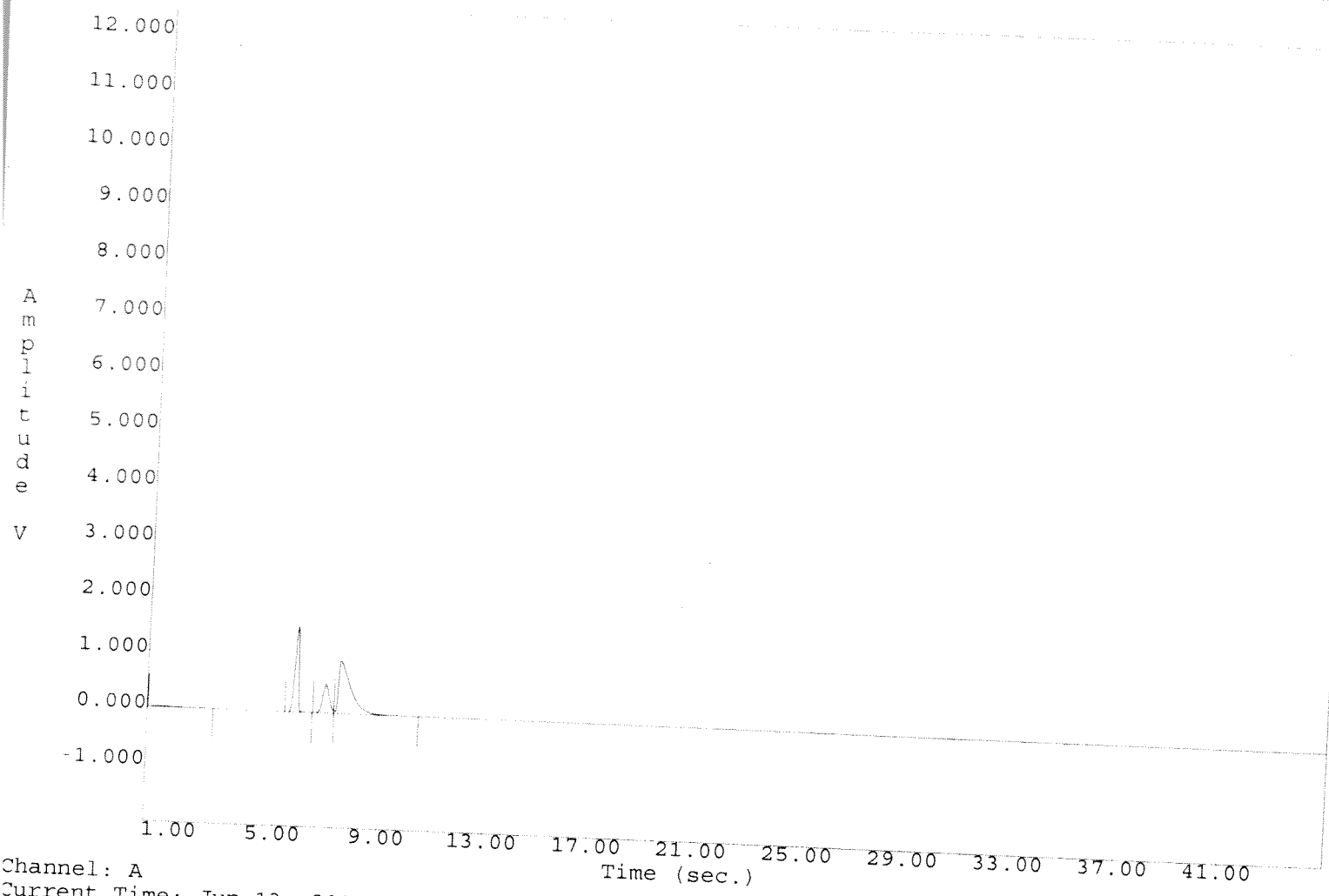
9-1a

External Standard Report

Name	Amount	Units	RT	Min	Max	Mean	%SD
Hydrogen	0.369	%	5.730	-1.000	10.203	0.624	172.557

Channel: A
Current Time: Jun 13, 2011 19:53:20
Method: c:\mti\ezchrom\200\methods\bh51.
File : c:\mti\ezchrom\200\chrom\01090815.1
Data file creation time: Jun 13, 2011 19:52:21
Instrument ID: 180122
Column Type: MS-5A 4m
Carrier Gas: He
Column Head Pressure: 23.8 psi
Column Temperature: 65 C
Instrument Gain: LOW
Sample Time: 2 seconds
Inject Time: 10 milliseconds
Run Time: 45 seconds

Sample 9-2



Channel: A
Current Time: Jun 13, 2011 19:53:22
Method: c:\mti\ezchrom\200\methods\bh51.
File : c:\mti\ezchrom\200\chrom\01090815.1
Data file creation time: Jun 13, 2011 19:52:21
Instrument ID: 180122
Column Type: MS-5A 4m
Carrier Gas: He
Column Head Pressure: 23.8 psi
Column Temperature: 65 C
Instrument Gain: LOW
Sample Time: 2 seconds
Inject Time: 10 milliseconds
Run Time: 45 seconds

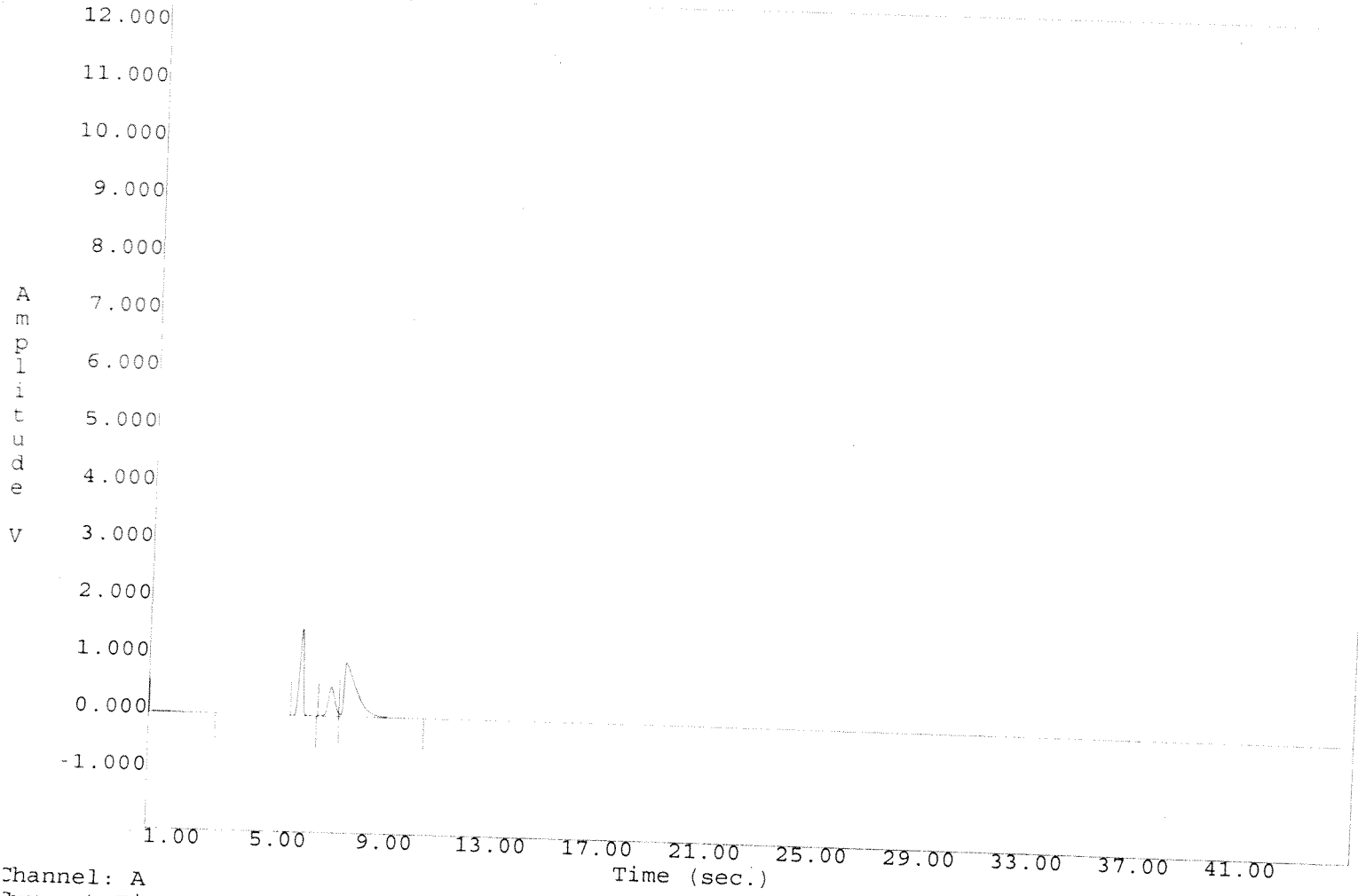
9-2

External Standard Report

Name	Amount	Units	RT	Min	Max	Mean	%SD
Hydrogen	0.369	%	5.730	-1.000	10.203	0.618	173.176

Channel: A
Current Time: Jun 13, 2011 19:56:06
Method: c:\mti\ezchrom\200\methods\bh51.
File : c:\mti\ezchrom\200\chrom\01090815.1
Data file creation time: Jun 13, 2011 19:55:09
Instrument ID: 180122
Column Type: MS-5A 4m
Carrier Gas: He
Column Head Pressure: 23.8 psi
Column Temperature: 65 C
Instrument Gain: LOW
Sample Time: 2 seconds
Inject Time: 10 milliseconds
Run Time: 45 seconds

Sample 9-29



Channel: A
Current Time: Jun 13, 2011 19:56:08
Method: c:\mti\ezchrom\200\methods\bh51.
File : c:\mti\ezchrom\200\chrom\01090815.1
Data file creation time: Jun 13, 2011 19:55:09
Instrument ID: 180122
Column Type: MS-5A 4m
Carrier Gas: He
Column Head Pressure: 23.8 psi
Column Temperature: 65 C
Instrument Gain: LOW
Sample Time: 2 seconds
Inject Time: 10 milliseconds
Run Time: 45 seconds

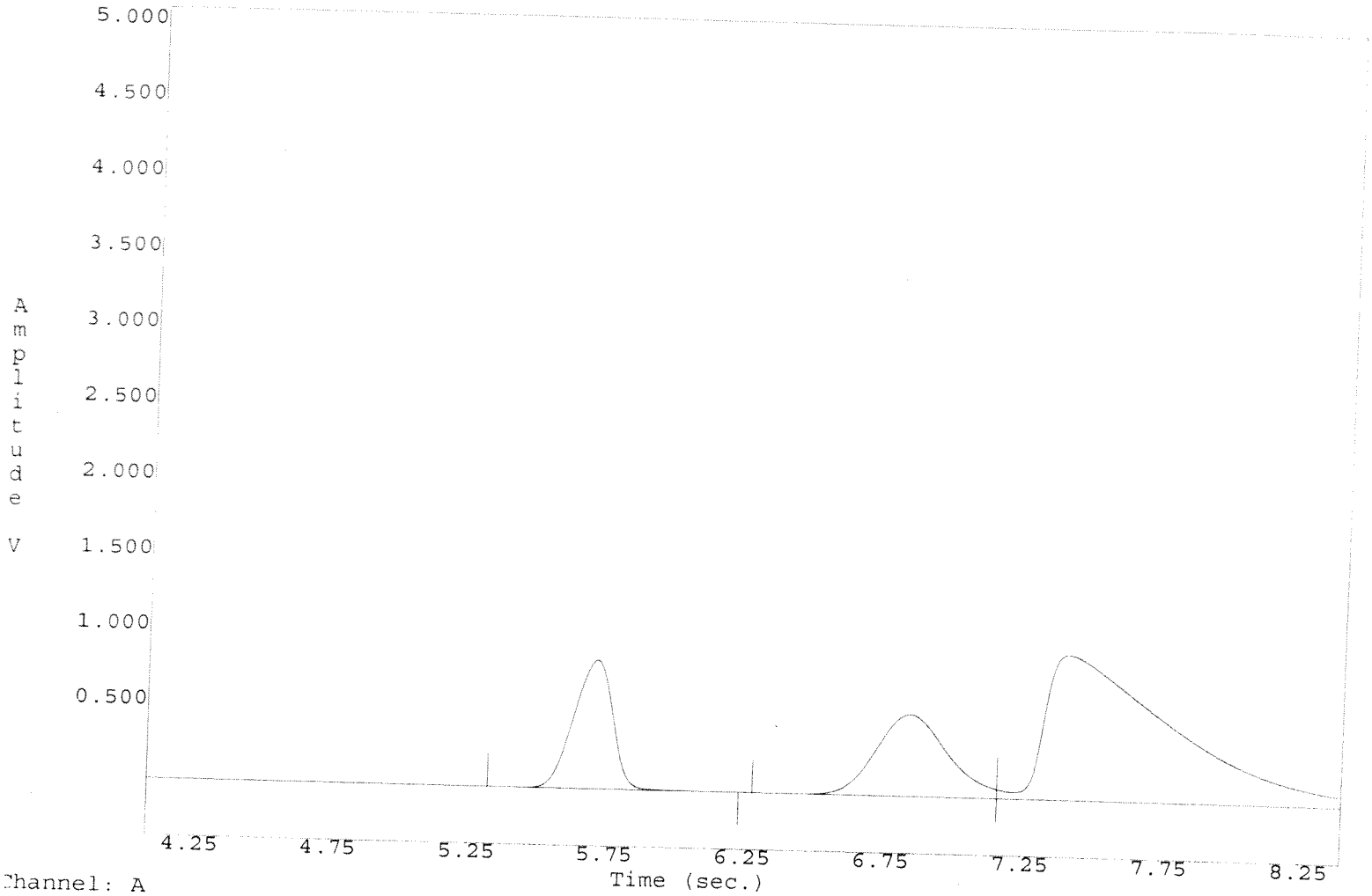
9-2a

External Standard Report

Name	Amount	Units	RT	Min	Max	Mean	%SD
Hydrogen	0.196	%	5.710	-1.000	10.203	0.601	175.874

Channel: A
Current Time: Jun 14, 2011 09:29:22
Method: c:\mti\ezchrom\200\methods\bh51.
File : c:\mti\ezchrom\200\chrom\01090815.1
Data file creation time: Jun 14, 2011 09:28:26
Instrument ID: 180122
Column Type: MS-5A 4m
Carrier Gas: He
Column Head Pressure: 23.8 psi
Column Temperature: 65 C
Instrument Gain: LOW
Sample Time: 2 seconds
Inject Time: 10 milliseconds
Run Time: 45 seconds

Sample 9-3



Channel: A
Current Time: Jun 14, 2011 09:29:25
Method: c:\mti\ezchrom\200\methods\bh51.
File : c:\mti\ezchrom\200\chrom\01090815.1
Data file creation time: Jun 14, 2011 09:28:26
Instrument ID: 180122
Column Type: MS-5A 4m
Carrier Gas: He
Column Head Pressure: 23.8 psi
Column Temperature: 65 C
Instrument Gain: LOW
Sample Time: 2 seconds
Inject Time: 10 milliseconds
Run Time: 45 seconds

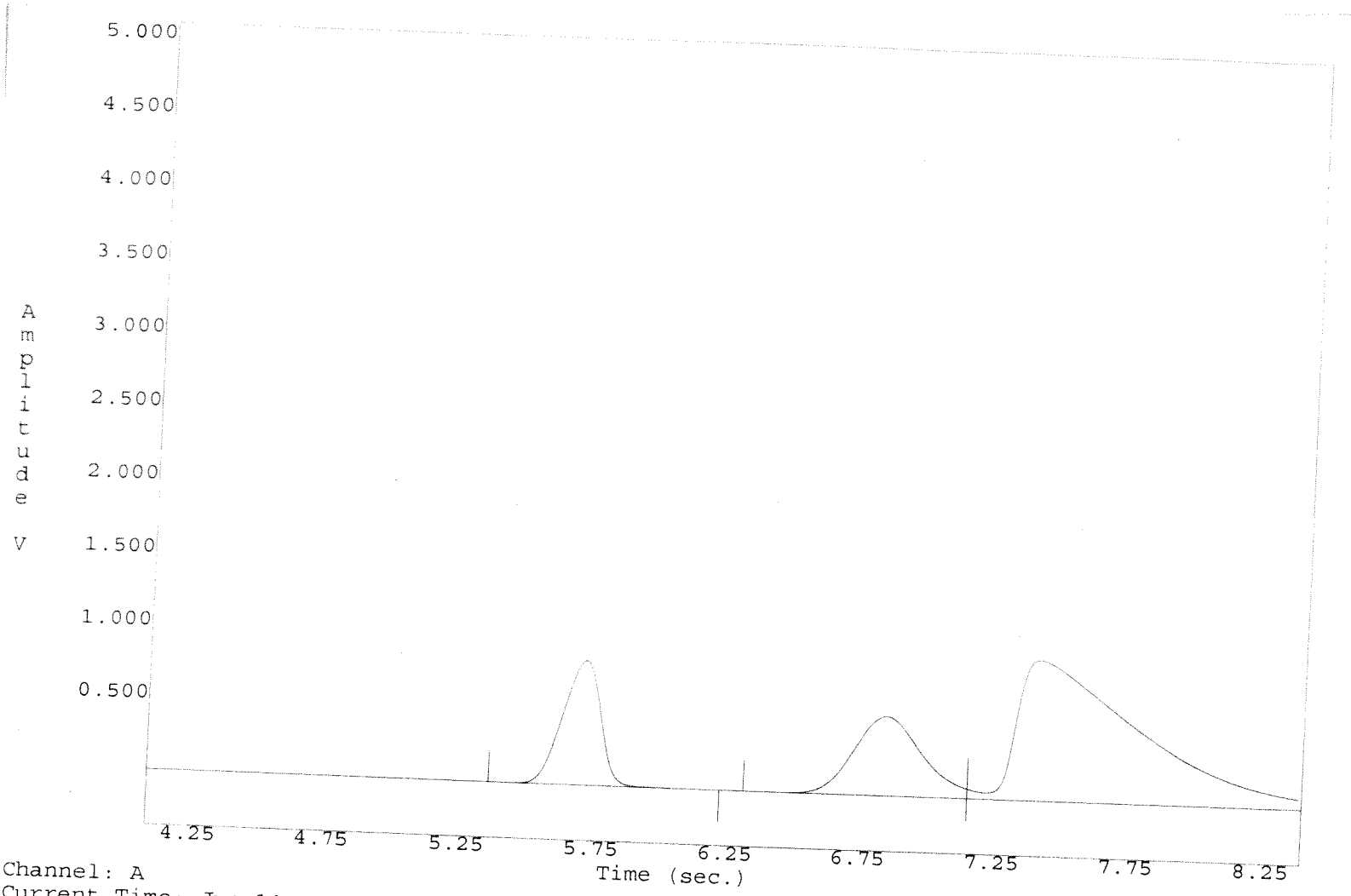
9-3

External Standard Report

Name	Amount	Units	RT	Min	Max	Mean	%SD
Hydrogen	0.196	%	5.710	-1.000	10.203	0.595	176.788

Channel: A
Current Time: Jun 14, 2011 09:32:31
Method: c:\mti\ezchrom\200\methods\bh51.
File : c:\mti\ezchrom\200\chrom\01090815.1
Data file creation time: Jun 14, 2011 09:31:29
Instrument ID: 180122
Column Type: MS-5A 4m
Carrier Gas: He
Column Head Pressure: 23.8 psi
Column Temperature: 65 C
Instrument Gain: LOW
Sample Time: 2 seconds
Inject Time: 10 milliseconds
Run Time: 45 seconds

Sample 9-3a



Channel: A
Current Time: Jun 14, 2011 09:32:34
Method: c:\mti\ezchrom\200\methods\bh51.
File : c:\mti\ezchrom\200\chrom\01090815.1
Data file creation time: Jun 14, 2011 09:31:29
Instrument ID: 180122
Column Type: MS-5A 4m
Carrier Gas: He
Column Head Pressure: 23.8 psi
Column Temperature: 65 C
Instrument Gain: LOW
Sample Time: 2 seconds
Inject Time: 10 milliseconds
Run Time: 45 seconds

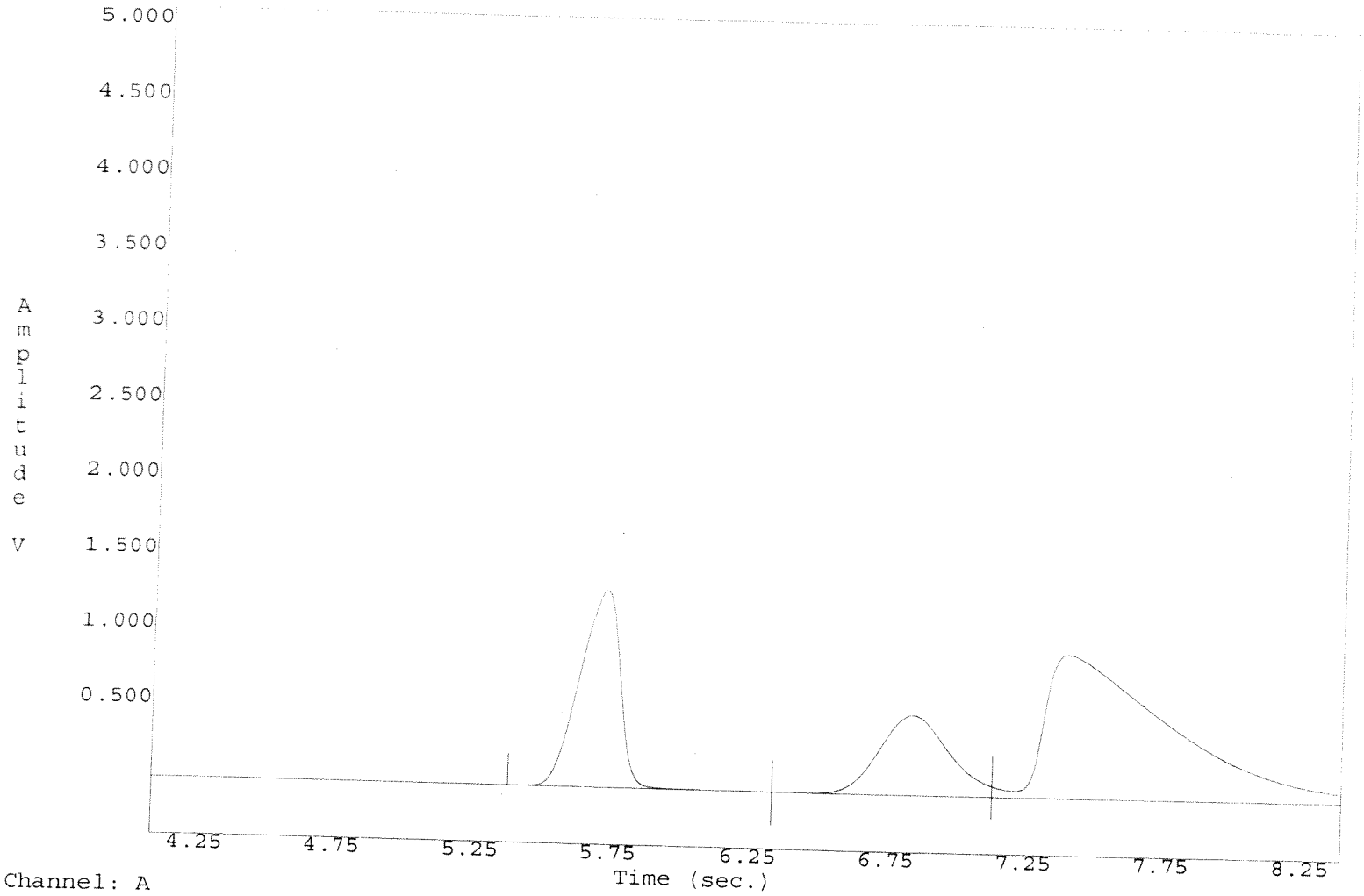
9-3 a1

External Standard Report

Name	Amount	Units	RT	Min	Max	Mean	%SD
Hydrogen	0.313	%	5.690	-1.000	10.203	0.579	179.200

Channel: A
Current Time: Jun 14, 2011 13:35:50
Method: c:\mti\ezchrom\200\methods\bh51.
File : c:\mti\ezchrom\200\chrom\01090815.1
Data file creation time: Jun 14, 2011 13:34:33
Instrument ID: 180122
Column Type: MS-5A 4m
Carrier Gas: He
Column Head Pressure: 23.8 psi
Column Temperature: 65 C
Instrument Gain: LOW
Sample Time: 2 seconds
Inject Time: 10 milliseconds
Run Time: 45 seconds

Sample 9-4



Channel: A
Current Time: Jun 14, 2011 13:35:54
Method: c:\mti\ezchrom\200\methods\bh51.
File : c:\mti\ezchrom\200\chrom\01090815.1
Data file creation time: Jun 14, 2011 13:34:33
Instrument ID: 180122
Column Type: MS-5A 4m
Carrier Gas: He
Column Head Pressure: 23.8 psi
Column Temperature: 65 C
Instrument Gain: LOW
Sample Time: 2 seconds
Inject Time: 10 milliseconds
Run Time: 45 seconds

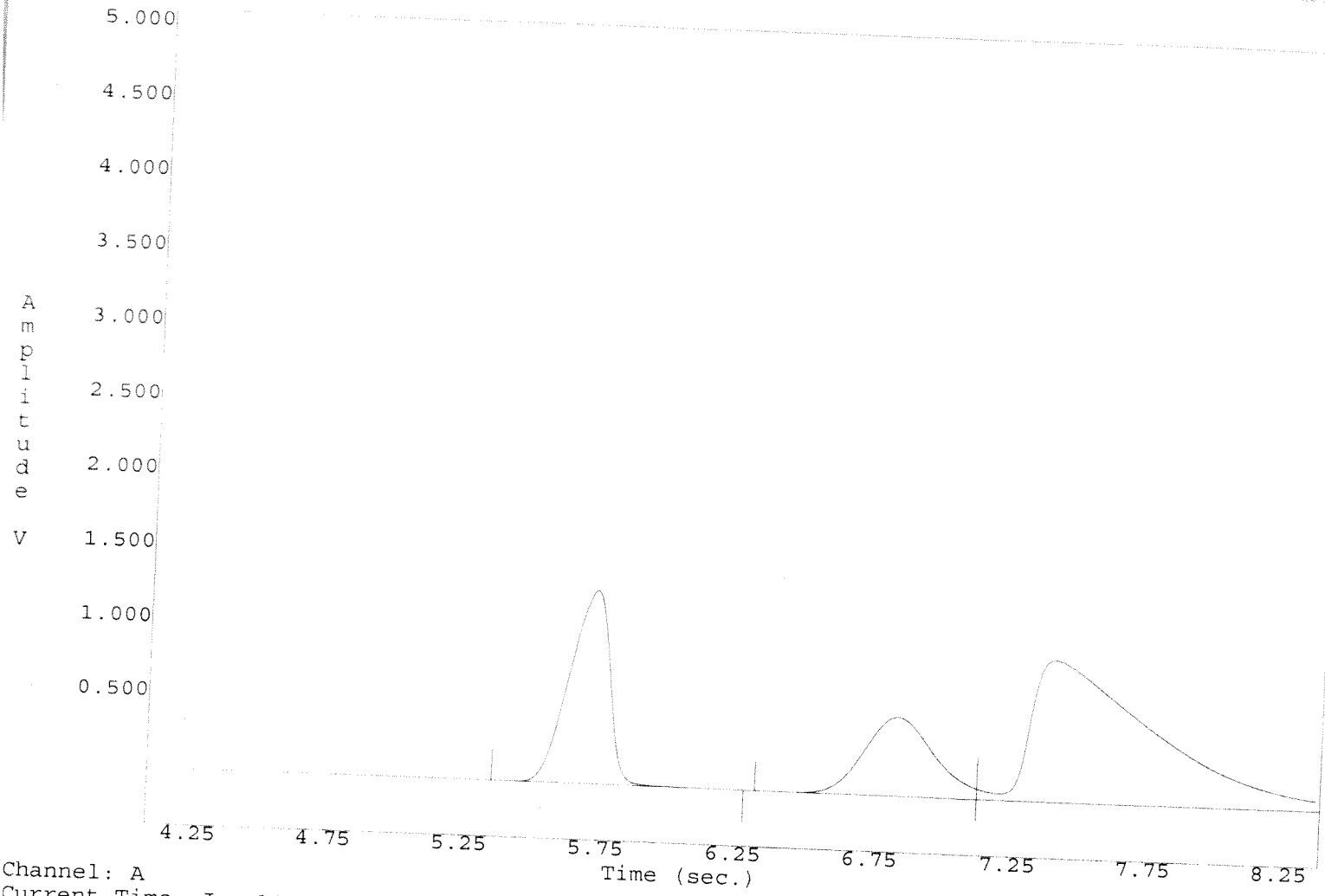
9-4

External Standard Report

Name	Amount	Units	RT	Min	Max	Mean	%SD
Hydrogen	0.311	%	5.720	-1.000	10.203	0.575	179.835

Channel: A
Current Time: Jun 14, 2011 13:40:05
Method: c:\mti\ezchrom\200\methods\bh51.
File : c:\mti\ezchrom\200\chrom\01090815.1
Data file creation time: Jun 14, 2011 13:38:56
Instrument ID: 180122
Column Type: MS-5A 4m
Carrier Gas: He
Column Head Pressure: 23.8 psi
Column Temperature: 65 C
Instrument Gain: LOW
Sample Time: 2 seconds
Inject Time: 10 milliseconds
Run Time: 45 seconds

Sample 9-4a



Channel: A
Current Time: Jun 14, 2011 13:40:06
Method: c:\mti\ezchrom\200\methods\bh51.
File : c:\mti\ezchrom\200\chrom\01090815.1
Data file creation time: Jun 14, 2011 13:38:56
Instrument ID: 180122
Column Type: MS-5A 4m
Carrier Gas: He
Column Head Pressure: 23.8 psi
Column Temperature: 65 C
Instrument Gain: LOW
Sample Time: 2 seconds
Inject Time: 10 milliseconds
Run Time: 45 seconds

9-4a

External Standard Report

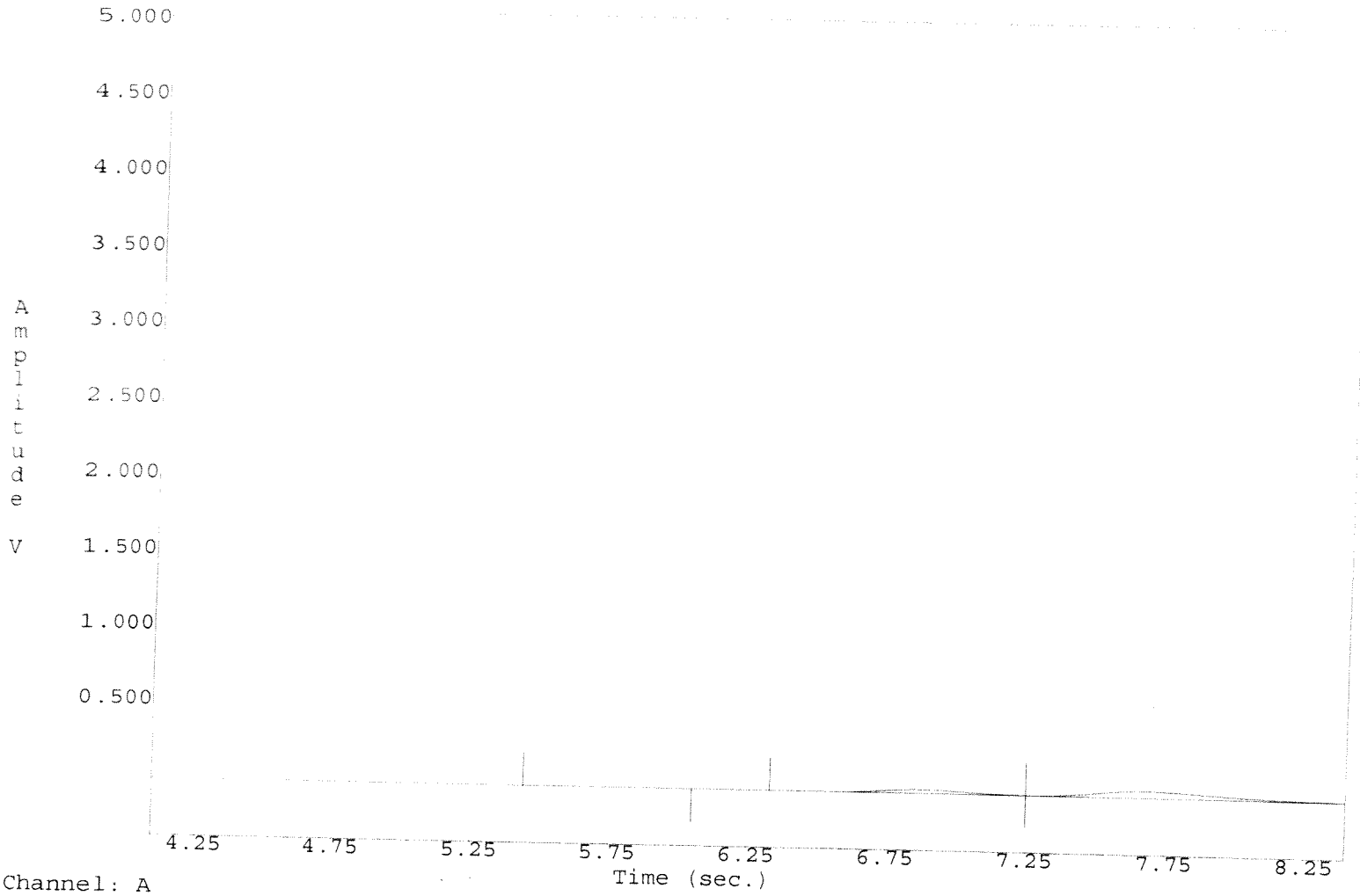
Name	Amount	Units	RT	Min	Max	Mean	%SD
Hydrogen	0.000	%	5.650	-1.000	10.203	0.552	184.438

Channel: A
Current Time: Jun 14, 2011 16:43:08
Method: c:\mti\ezchrom\200\methods\bh51.
File : c:\mti\ezchrom\200\chrom\01090815.1
Data file creation time: Jun 14, 2011 16:41:50
Instrument ID: 180122
Column Type: MS-5A 4m
Carrier Gas: He
Column Head Pressure: 23.8 psi
Column Temperature: 65 C
Instrument Gain: LOW
Sample Time: 2 seconds
Inject Time: 10 milliseconds
Run Time: 45 seconds

Sample ~~9-5~~

9-5

Bad sample



Channel: A
Current Time: Jun 14, 2011 16:43:10
Method: c:\mti\ezchrom\200\methods\bh51.
File : c:\mti\ezchrom\200\chrom\01090815.1
Data file creation time: Jun 14, 2011 16:41:50
Instrument ID: 180122
Column Type: MS-5A 4m
Carrier Gas: He
Column Head Pressure: 23.8 psi
Column Temperature: 65 C
Instrument Gain: LOW
Sample Time: 2 seconds
Inject Time: 10 milliseconds
Run Time: 45 seconds

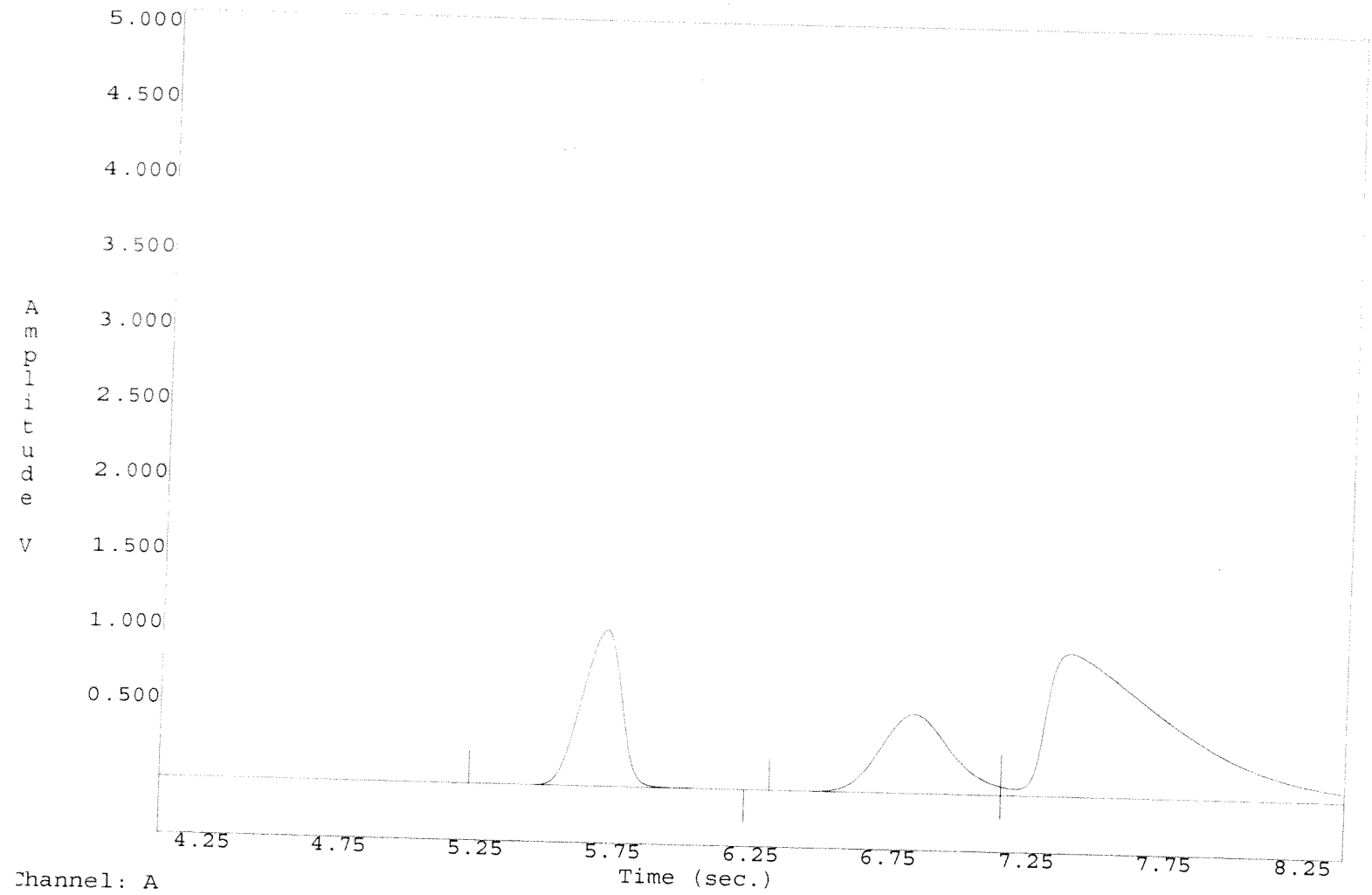
9-5
Bad Sample

External Standard Report

Name	Amount	Units	RT	Min	Max	Mean	%SD
Hydrogen	0.243	%	5.710	-1.000	10.203	0.547	185.155

Channel: A
Current Time: Jun 14, 2011 16:47:15
Method: c:\mti\ezchrom\200\methods\bh51.
File : c:\mti\ezchrom\200\chrom\01090815.1
Data file creation time: Jun 14, 2011 16:45:27
Instrument ID: 180122
Column Type: MS-5A 4m
Carrier Gas: He
Column Head Pressure: 23.8 psi
Column Temperature: 65 C
Instrument Gain: LOW
Sample Time: 2 seconds
Inject Time: 10 milliseconds
Run Time: 45 seconds

Sample ~~9-5a~~ 9-5a 6/14/11 BTW



Channel: A
Current Time: Jun 14, 2011 16:47:18
Method: c:\mti\ezchrom\200\methods\bh51.
File : c:\mti\ezchrom\200\chrom\01090815.1
Data file creation time: Jun 14, 2011 16:45:27
Instrument ID: 180122
Column Type: MS-5A 4m
Carrier Gas: He
Column Head Pressure: 23.8 psi
Column Temperature: 65 C
Instrument Gain: LOW
Sample Time: 2 seconds
Inject Time: 10 milliseconds
Run Time: 45 seconds

External Standard Report

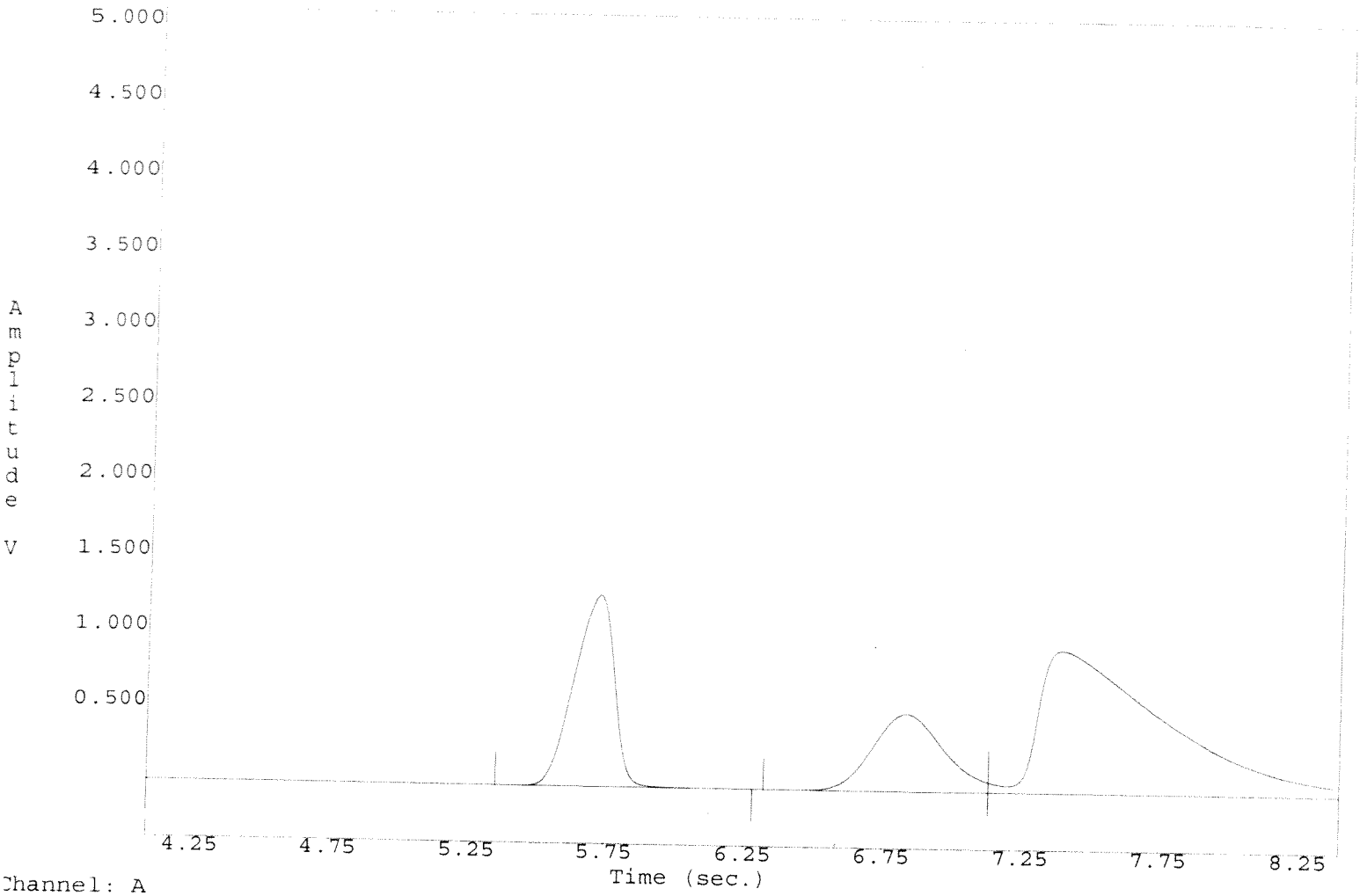
Name	Amount	Units	RT	Min	Max	Mean	%SD
Hydrogen	0.302	%	5.720	-1.000	10.203	0.531	187.437

Channel: A
Current Time: Jun 14, 2011 20:00:56
Method: c:\mti\ezchrom\200\methods\bh51.
File : c:\mti\ezchrom\200\chrom\01090815.1
Data file creation time: Jun 14, 2011 19:59:51
Instrument ID: 180122
Column Type: MS-5A 4m
Carrier Gas: He
Column Head Pressure: 23.8 psi
Column Temperature: 65 C
Instrument Gain: LOW
Sample Time: 2 seconds
Inject Time: 10 milliseconds
Run Time: 45 seconds

Sample 9-6

Only one

Sample



Channel: A
Current Time: Jun 14, 2011 20:00:58
Method: c:\mti\ezchrom\200\methods\bh51.
File : c:\mti\ezchrom\200\chrom\01090815.1
Data file creation time: Jun 14, 2011 19:59:51
Instrument ID: 180122
Column Type: MS-5A 4m
Carrier Gas: He
Column Head Pressure: 23.8 psi
Column Temperature: 65 C
Instrument Gain: LOW
Sample Time: 2 seconds
Inject Time: 10 milliseconds
Run Time: 45 seconds

9-6

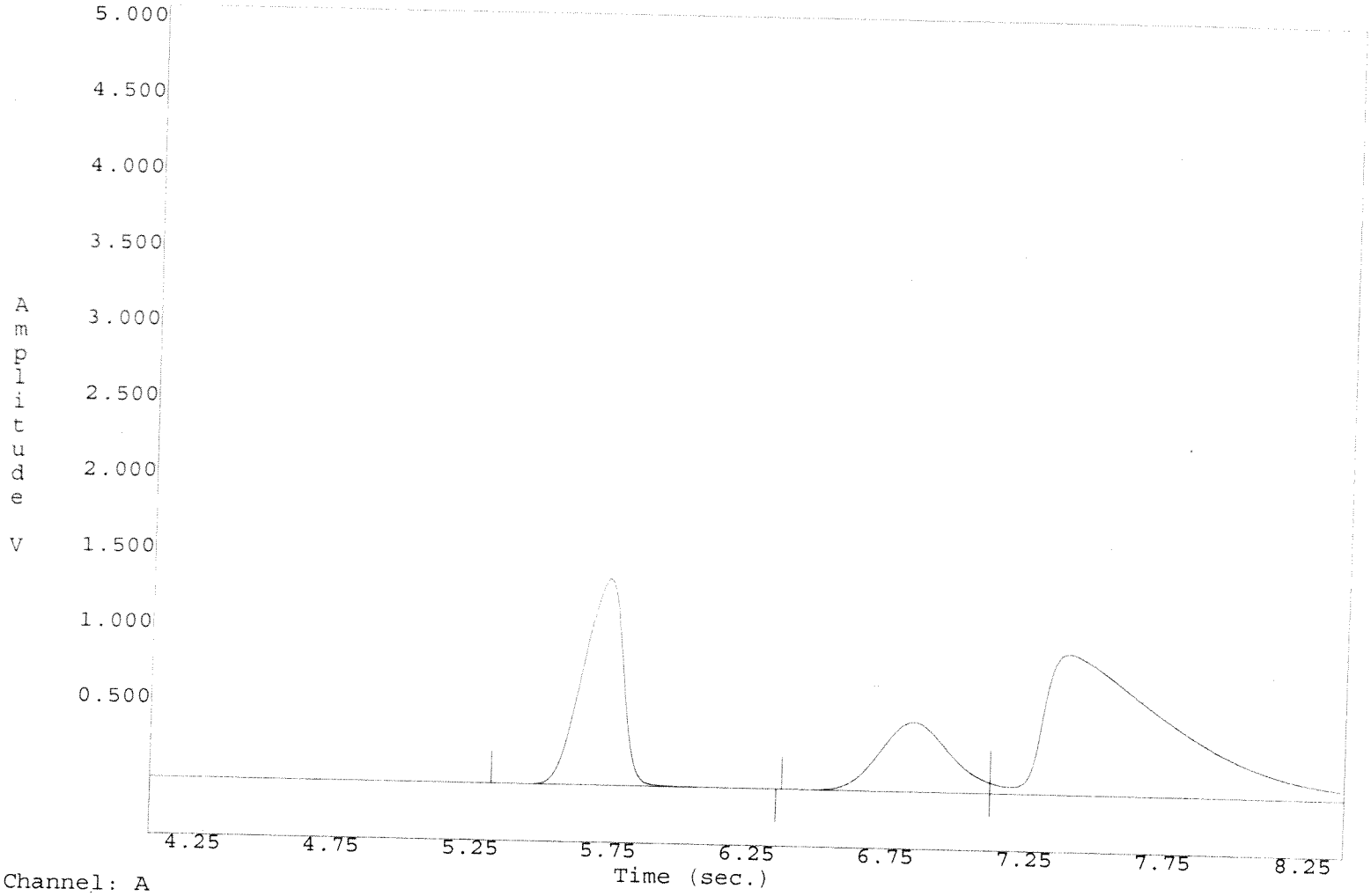
only one sample

External Standard Report

Name	Amount	Units	RT	Min	Max	Mean	%SD
Hydrogen	0.325	%	5.740	-1.000	10.203	0.528	187.943

Channel: A
Current Time: Jun 15, 2011 07:51:57
Method: c:\mti\ezchrom\200\methods\bh51.
File : c:\mti\ezchrom\200\chrom\01090815.1
Data file creation time: Jun 15, 2011 07:50:53
Instrument ID: 180122
Column Type: MS-5A 4m
Carrier Gas: He
Column Head Pressure: 23.8 psi
Column Temperature: 65 C
Instrument Gain: LOW
Sample Time: 2 seconds
Inject Time: 10 milliseconds
Run Time: 45 seconds

Sample 9-7



Channel: A
Current Time: Jun 15, 2011 07:51:59
Method: c:\mti\ezchrom\200\methods\bh51.
File : c:\mti\ezchrom\200\chrom\01090815.1
Data file creation time: Jun 15, 2011 07:50:53
Instrument ID: 180122
Column Type: MS-5A 4m
Carrier Gas: He
Column Head Pressure: 23.8 psi
Column Temperature: 65 C
Instrument Gain: LOW
Sample Time: 2 seconds
Inject Time: 10 milliseconds
Run Time: 45 seconds

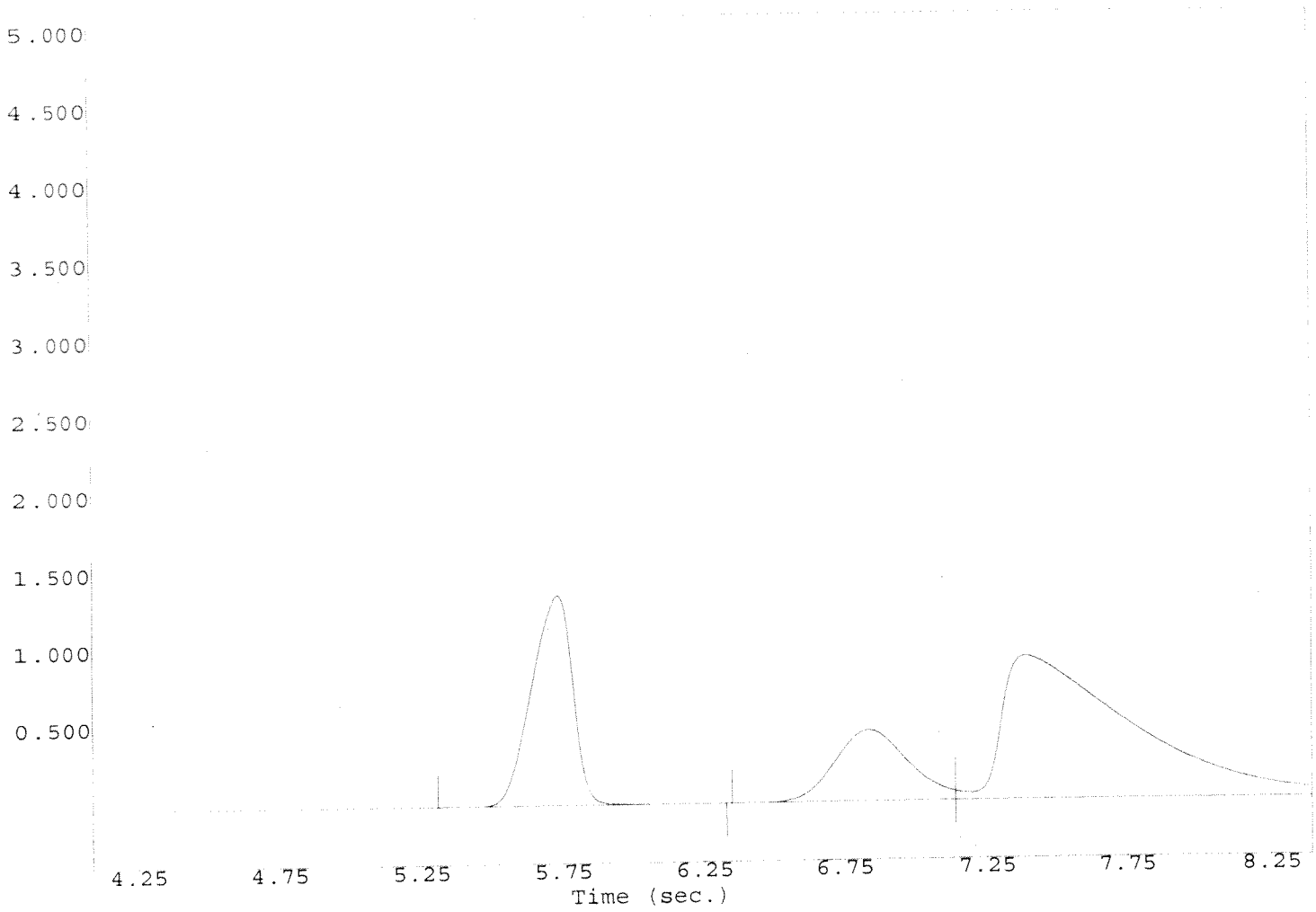
9-7

External Standard Report

Name	Amount	Units	RT	Min	Max	Mean	%SD
Hydrogen	0.324	%	5.740	-1.000	10.203	0.524	188.443

Channel: A
Current Time: Jun 15, 2011 07:55:35
Method: c:\mti\ezchrom\200\methods\bh51.
File : c:\mti\ezchrom\200\chrom\01090815.1
Data file creation time: Jun 15, 2011 07:54:33
Instrument ID: 180122
Column Type: MS-5A 4m
Carrier Gas: He
Column Head Pressure: 23.8 psi
Column Temperature: 65 C
Instrument Gain: LOW
Sample Time: 2 seconds
Inject Time: 10 milliseconds
Run Time: 45 seconds

Sample 9-7a



Channel: A
Current Time: Jun 15, 2011 07:55:36
Method: c:\mti\ezchrom\200\methods\bh51.
File : c:\mti\ezchrom\200\chrom\01090815.1
Data file creation time: Jun 15, 2011 07:54:33
Instrument ID: 180122
Column Type: MS-5A 4m
Carrier Gas: He
Column Head Pressure: 23.8 psi
Column Temperature: 65 C
Instrument Gain: LOW
Sample Time: 2 seconds
Inject Time: 10 milliseconds
Run Time: 45 seconds

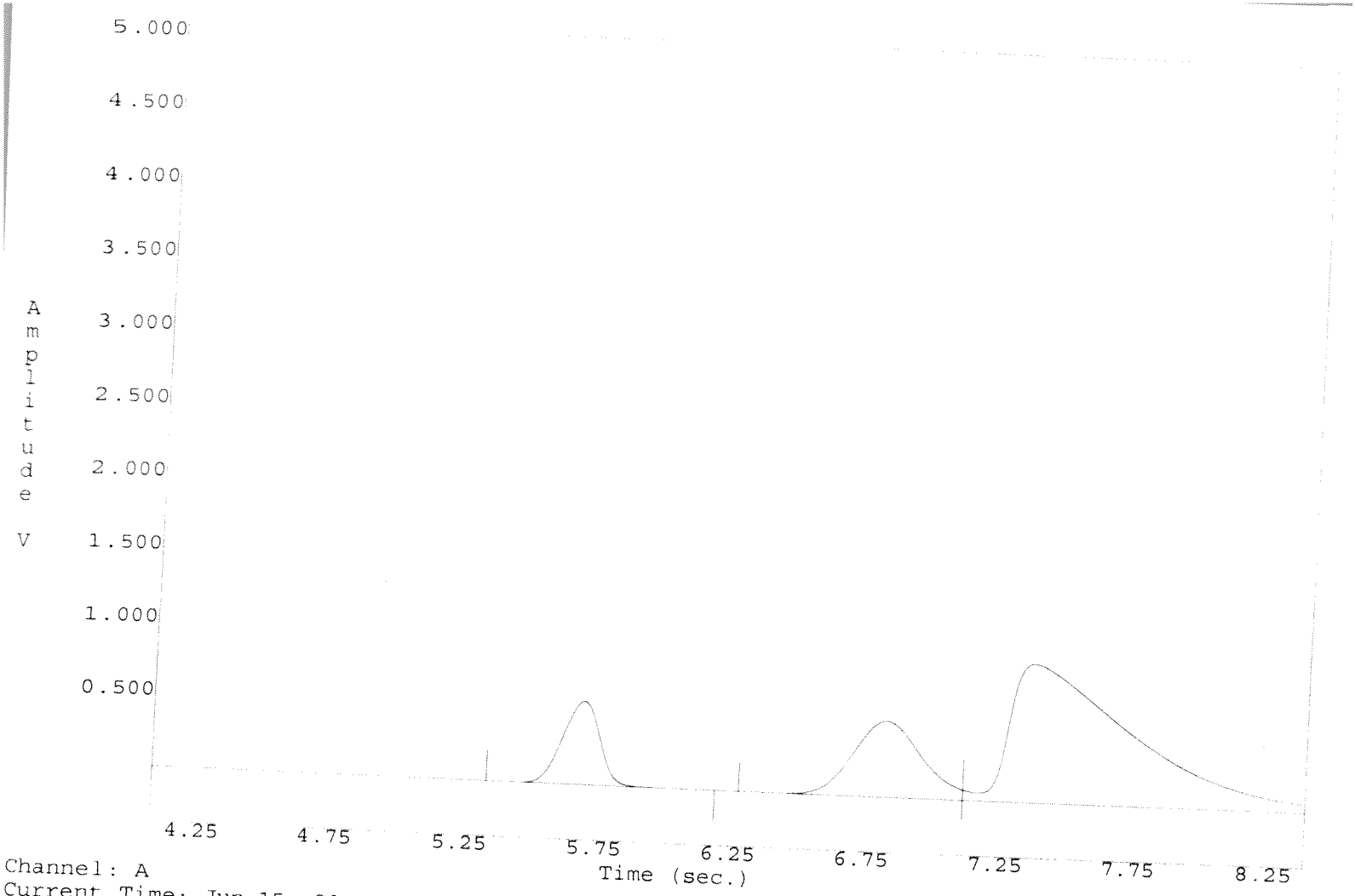
9-7a

External Standard Report

Name	Amount	Units	RT	Min	Max	Mean	%SD
Hydrogen	0.127	%	5.700	-1.000	10.203	0.505	191.652

Channel: A
Current Time: Jun 15, 2011 13:43:30
Method: c:\mti\ezchrom\200\methods\bh51.
File : c:\mti\ezchrom\200\chrom\01090815.1
Data file creation time: Jun 15, 2011 13:42:23
Instrument ID: 180122
Column Type: MS-5A 4m
Carrier Gas: He
Column Head Pressure: 23.8 psi
Column Temperature: 65 C
Instrument Gain: LOW
Sample Time: 2 seconds
Inject Time: 10 milliseconds
Run Time: 45 seconds

Sample 9-8



Channel: A
Current Time: Jun 15, 2011 13:43:31
Method: c:\mti\ezchrom\200\methods\bh51.
File : c:\mti\ezchrom\200\chrom\01090815.1
Data file creation time: Jun 15, 2011 13:42:23
Instrument ID: 180122
Column Type: MS-5A 4m
Carrier Gas: He
Column Head Pressure: 23.8 psi
Column Temperature: 65 C
Instrument Gain: LOW
Sample Time: 2 seconds
Inject Time: 10 milliseconds
Run Time: 45 seconds

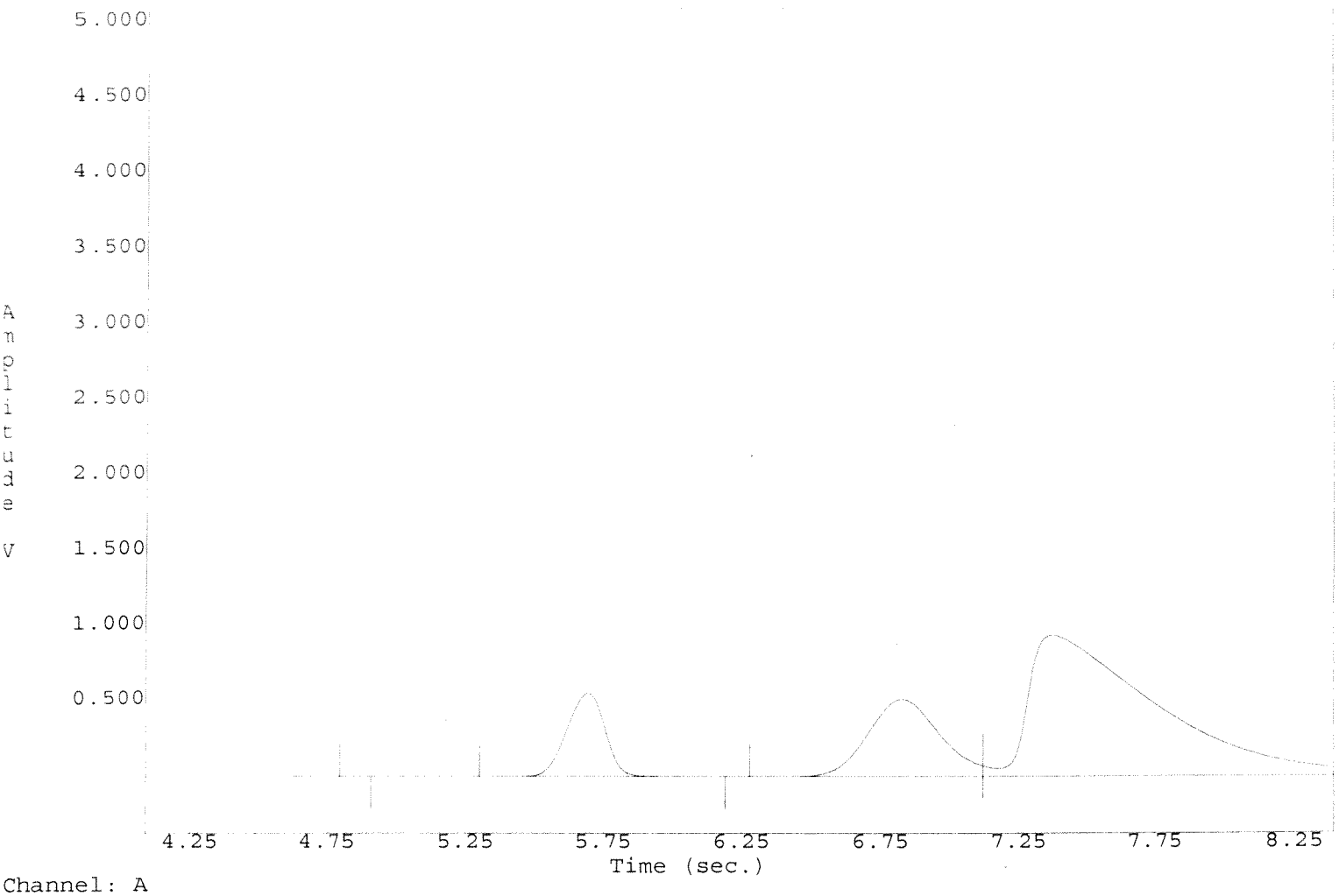
Sample 9-8

External Standard Report

Name	Amount	Units	RT	Min	Max	Mean	%SD
Hydrogen	0.123	%	5.700	-1.000	10.203	0.499	193.070

Channel: A
Current Time: Jun 15, 2011 13:47:24
Method: c:\mti\ezchrom\200\methods\bh51.
File : c:\mti\ezchrom\200\chrom\01090815.1
Data file creation time: Jun 15, 2011 13:46:25
Instrument ID: 180122
Column Type: MS-5A 4m
Carrier Gas: He
Column Head Pressure: 23.8 psi
Column Temperature: 65 C
Instrument Gain: LOW
Sample Time: 2 seconds
Inject Time: 10 milliseconds
Run Time: 45 seconds

Sample 9-8a
Note: Not much sample



Channel: A
Current Time: Jun 15, 2011 13:47:25
Method: c:\mti\ezchrom\200\methods\bh51.
File : c:\mti\ezchrom\200\chrom\01090815.1
Data file creation time: Jun 15, 2011 13:46:25
Instrument ID: 180122
Column Type: MS-5A 4m
Carrier Gas: He
Column Head Pressure: 23.8 psi
Column Temperature: 65 C
Instrument Gain: LOW
Sample Time: 2 seconds
Inject Time: 10 milliseconds
Run Time: 45 seconds

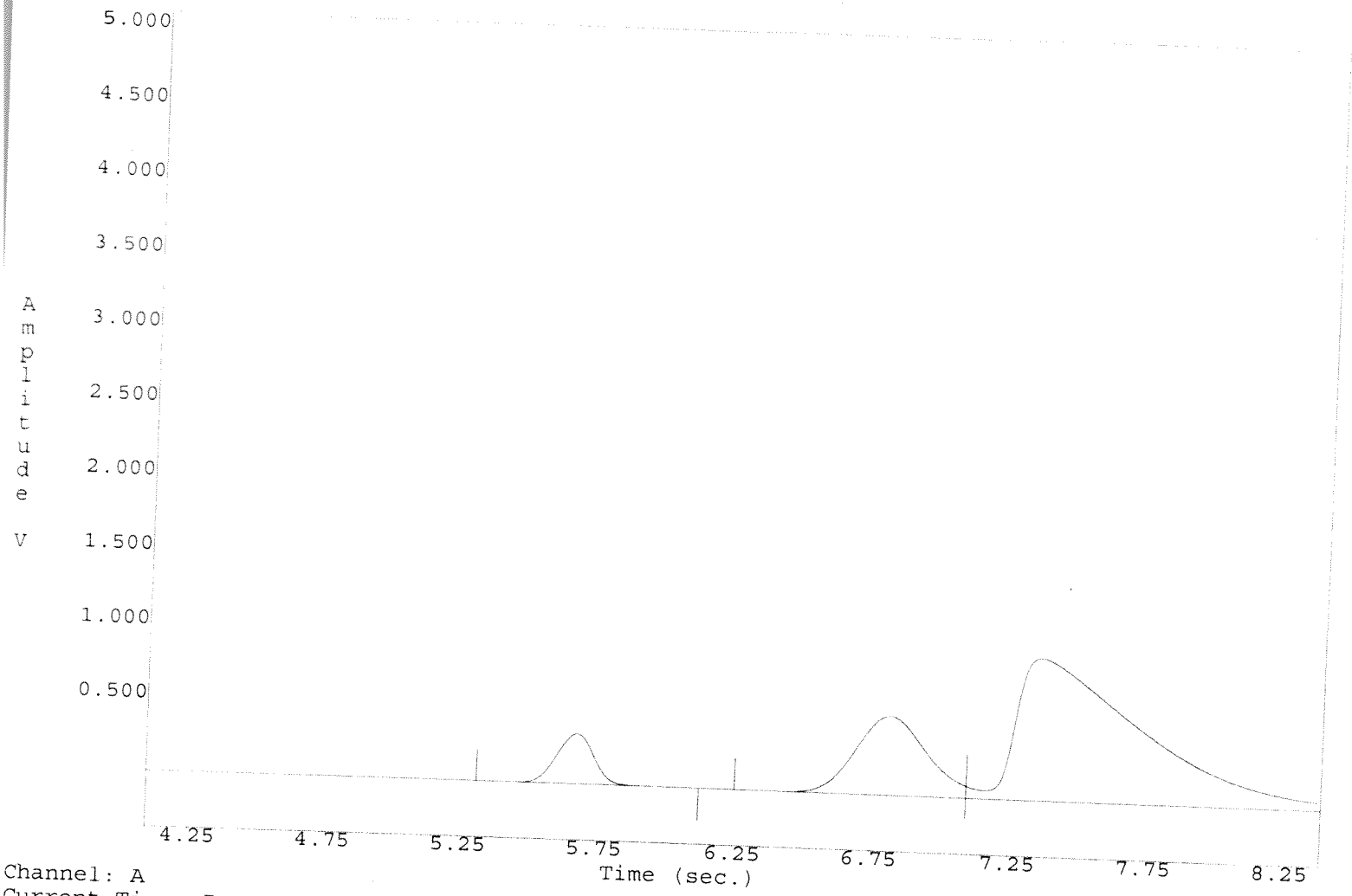
Sample 9-8a

External Standard Report

Name	Amount	Units	RT	Min	Max	Mean	%SD
Hydrogen	0.073	%	5.680	-1.000	10.203	0.487	195.958

Channel: A
Current Time: Jun 15, 2011 17:18:22
Method: c:\mti\ezchrom\200\methods\bh51.
File : c:\mti\ezchrom\200\chrom\01090815.1
Data file creation time: Jun 15, 2011 17:17:21
Instrument ID: 180122
Column Type: MS-5A 4m
Carrier Gas: He
Column Head Pressure: 23.8 psi
Column Temperature: 65 C
Instrument Gain: LOW
Sample Time: 2 seconds
Inject Time: 10 milliseconds
Run Time: 45 seconds

Sample 9-9



Channel: A
Current Time: Jun 15, 2011 17:18:23
Method: c:\mti\ezchrom\200\methods\bh51.
File : c:\mti\ezchrom\200\chrom\01090815.1
Data file creation time: Jun 15, 2011 17:17:21
Instrument ID: 180122
Column Type: MS-5A 4m
Carrier Gas: He
Column Head Pressure: 23.8 psi
Column Temperature: 65 C
Instrument Gain: LOW
Sample Time: 2 seconds
Inject Time: 10 milliseconds
Run Time: 45 seconds

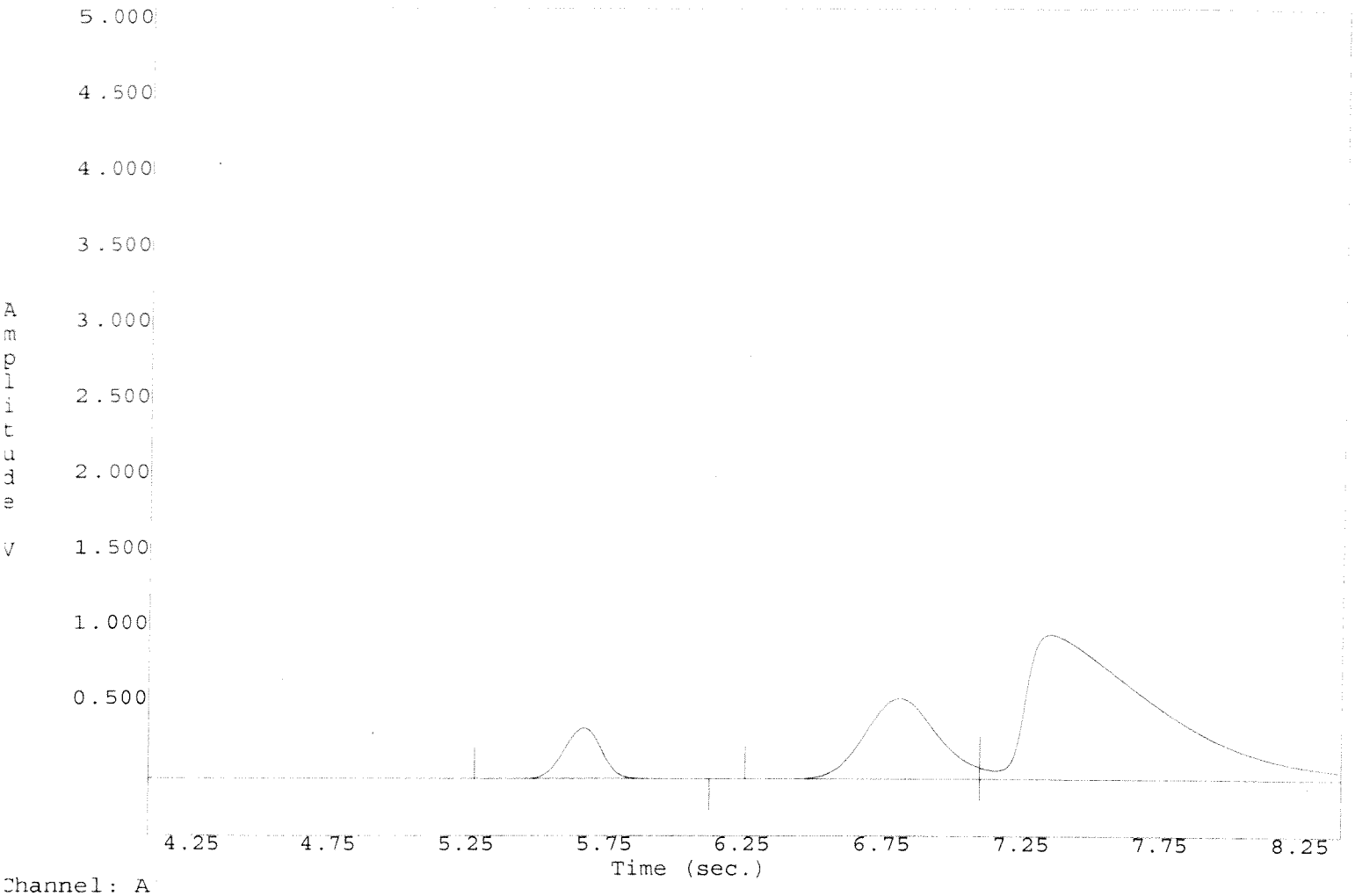
9-9

External Standard Report

Name	Amount	Units	RT	Min	Max	Mean	%SD
Hydrogen	0.072	%	5.680	-1.000	10.203	0.483	196.892

Channel: A
Current Time: Jun 15, 2011 17:20:57
Method: c:\mti\ezchrom\200\methods\bh51.
File : c:\mti\ezchrom\200\chrom\01090815.1
Data file creation time: Jun 15, 2011 17:19:56
Instrument ID: 180122
Column Type: MS-5A 4m
Carrier Gas: He
Column Head Pressure: 23.8 psi
Column Temperature: 65 C
Instrument Gain: LOW
Sample Time: 2 seconds
Inject Time: 10 milliseconds
Run Time: 45 seconds

Sample 9-9a



Channel: A
Current Time: Jun 15, 2011 17:20:59
Method: c:\mti\ezchrom\200\methods\bh51.
File : c:\mti\ezchrom\200\chrom\01090815.1
Data file creation time: Jun 15, 2011 17:19:56
Instrument ID: 180122
Column Type: MS-5A 4m
Carrier Gas: He
Column Head Pressure: 23.8 psi
Column Temperature: 65 C
Instrument Gain: LOW
Sample Time: 2 seconds
Inject Time: 10 milliseconds
Run Time: 45 seconds

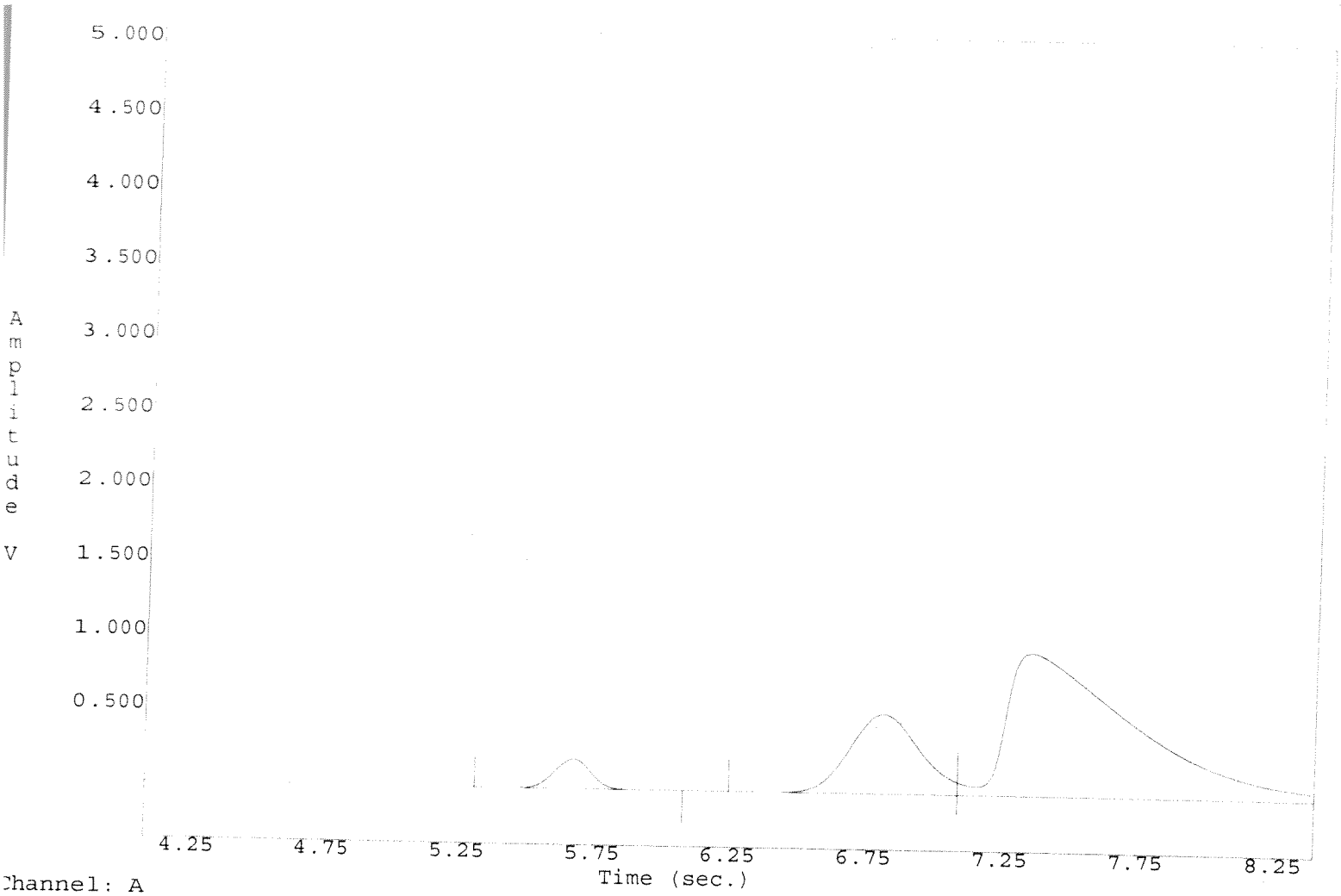
9-9a

External Standard Report

Name	Amount	Units	RT	Min	Max	Mean	%SD
Hydrogen	0.043	%	5.680	-1.000	10.203	0.471	199.899

Channel: A
Current Time: Jun 15, 2011 20:46:53
Method: c:\mti\ezchrom\200\methods\bh51.
File : c:\mti\ezchrom\200\chrom\01090815.1
Data file creation time: Jun 15, 2011 20:45:43
Instrument ID: 180122
Column Type: MS-5A 4m
Carrier Gas: He
Column Head Pressure: 23.8 psi
Column Temperature: 65 C
Instrument Gain: LOW
Sample Time: 2 seconds
Inject Time: 10 milliseconds
Run Time: 45 seconds

Sample 9-10



Channel: A
Current Time: Jun 15, 2011 20:46:56
Method: c:\mti\ezchrom\200\methods\bh51.
File : c:\mti\ezchrom\200\chrom\01090815.1
Data file creation time: Jun 15, 2011 20:45:43
Instrument ID: 180122
Column Type: MS-5A 4m
Carrier Gas: He
Column Head Pressure: 23.8 psi
Column Temperature: 65 C
Instrument Gain: LOW
Sample Time: 2 seconds
Inject Time: 10 milliseconds
Run Time: 45 seconds

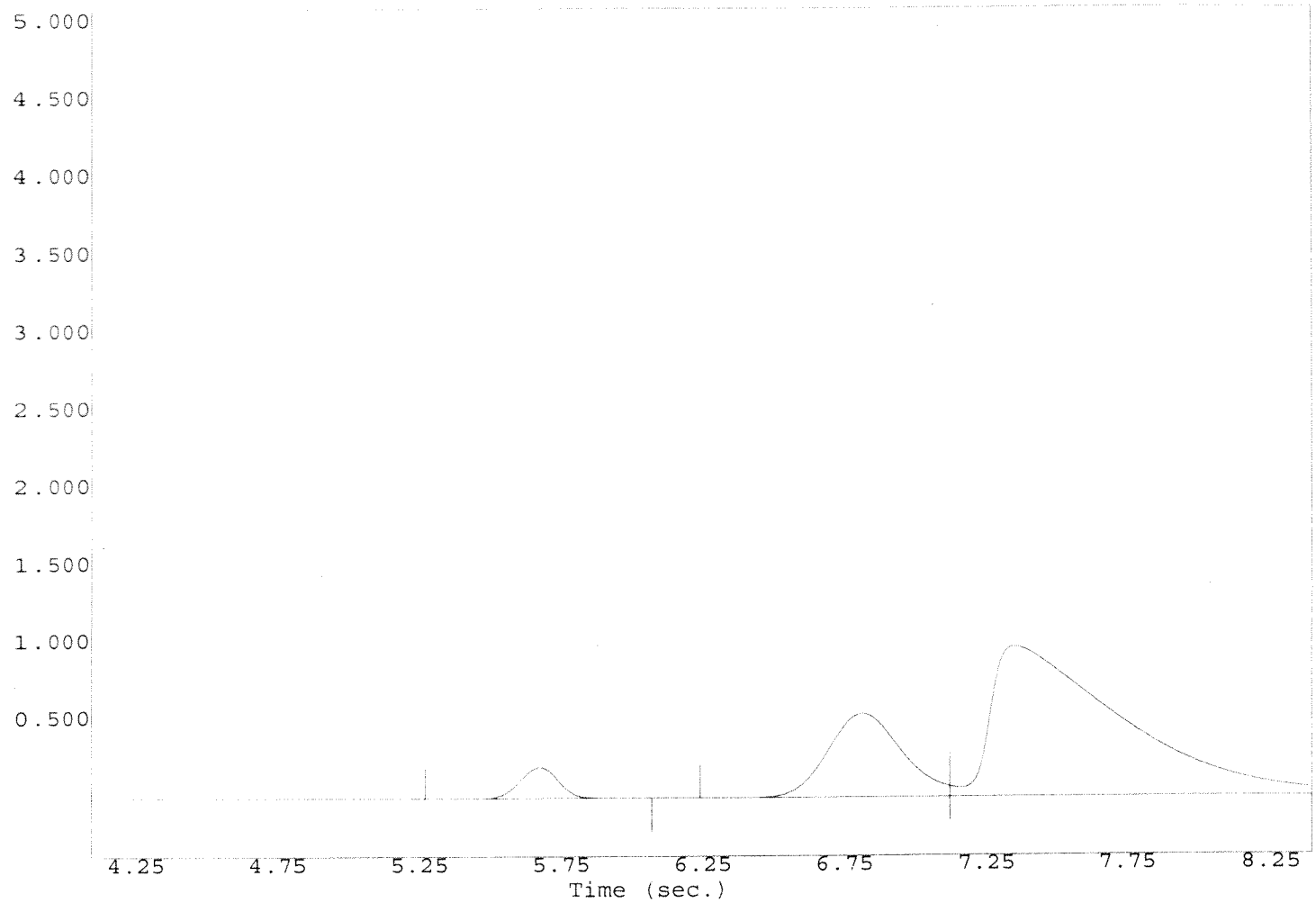
9-10

External Standard Report

Name	Amount	Units	RT	Min	Max	Mean	%SD
Hydrogen	0.043	%	5.680	-1.000	10.203	0.467	200.874

Channel: A
Current Time: Jun 15, 2011 20:50:32
Method: c:\mti\ezchrom\200\methods\bh51.
File : c:\mti\ezchrom\200\chrom\01090815.1
Data file creation time: Jun 15, 2011 20:49:20
Instrument ID: 180122
Column Type: MS-5A 4m
Carrier Gas: He
Column Head Pressure: 23.8 psi
Column Temperature: 65 C
Instrument Gain: LOW
Sample Time: 2 seconds
Inject Time: 10 milliseconds
Run Time: 45 seconds

Sample 9-10a



Channel: A
Current Time: Jun 15, 2011 20:50:35
Method: c:\mti\ezchrom\200\methods\bh51.
File : c:\mti\ezchrom\200\chrom\01090815.1
Data file creation time: Jun 15, 2011 20:49:20
Instrument ID: 180122
Column Type: MS-5A 4m
Carrier Gas: He
Column Head Pressure: 23.8 psi
Column Temperature: 65 C
Instrument Gain: LOW
Sample Time: 2 seconds
Inject Time: 10 milliseconds
Run Time: 45 seconds

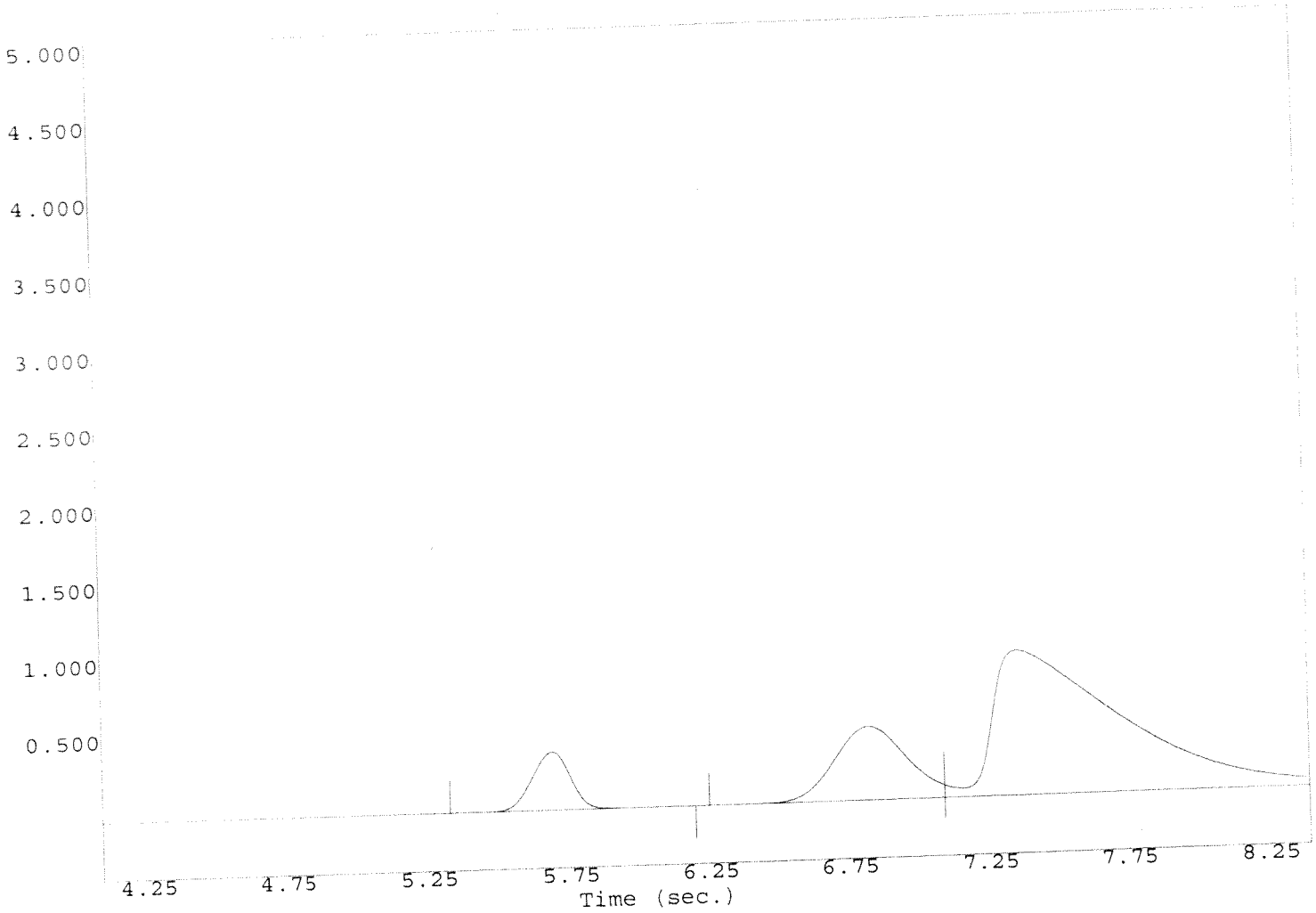
9-10a

External Standard Report

Name	Amount	Units	RT	Min	Max	Mean	%SD
Hydrogen	0.082	%	5.700	-1.000	10.203	0.457	203.117

Channel: A
Current Time: Jun 16, 2011 08:15:17
Method: c:\mti\ezchrom\200\methods\bh51.
File : c:\mti\ezchrom\200\chrom\01090815.1
Data file creation time: Jun 16, 2011 08:14:15
Instrument ID: 180122
Column Type: MS-5A 4m
Carrier Gas: He
Column Head Pressure: 23.8 psi
Column Temperature: 65 C
Instrument Gain: LOW
Sample Time: 2 seconds
Inject Time: 10 milliseconds
Run Time: 45 seconds

Sample 9-11



Channel: A
Current Time: Jun 16, 2011 08:15:18
Method: c:\mti\ezchrom\200\methods\bh51.
File : c:\mti\ezchrom\200\chrom\01090815.1
Data file creation time: Jun 16, 2011 08:14:15
Instrument ID: 180122
Column Type: MS-5A 4m
Carrier Gas: He
Column Head Pressure: 23.8 psi
Column Temperature: 65 C
Instrument Gain: LOW
Sample Time: 2 seconds
Inject Time: 10 milliseconds
Run Time: 45 seconds

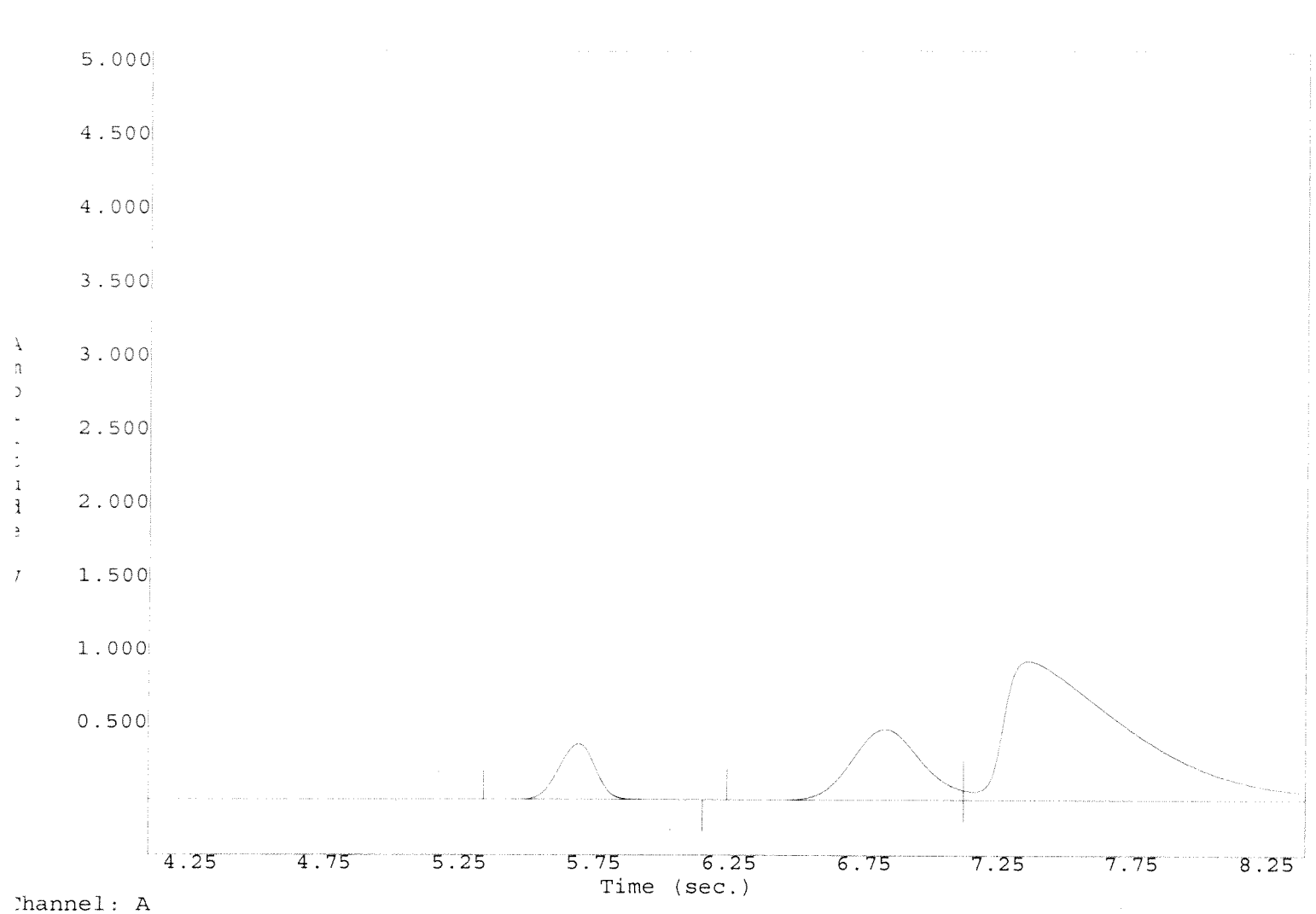
9-11

External Standard Report

Name	Amount	Units	RT	Min	Max	Mean	%SD
Hydrogen	0.081	%	5.700	-1.000	10.203	0.453	203.979

Channel: A
Current Time: Jun 16, 2011 08:17:56
Method: c:\mti\ezchrom\200\methods\bh51.
File : c:\mti\ezchrom\200\chrom\01090815.1
Data file creation time: Jun 16, 2011 08:16:56
Instrument ID: 180122
Column Type: MS-5A 4m
Carrier Gas: He
Column Head Pressure: 23.8 psi
Column Temperature: 65 C
Instrument Gain: LOW
Sample Time: 2 seconds
Inject Time: 10 milliseconds
Run Time: 45 seconds

Sample 9-11a



Channel: A
Current Time: Jun 16, 2011 08:17:58
Method: c:\mti\ezchrom\200\methods\bh51.
File : c:\mti\ezchrom\200\chrom\01090815.1
Data file creation time: Jun 16, 2011 08:16:56
Instrument ID: 180122
Column Type: MS-5A 4m
Carrier Gas: He
Column Head Pressure: 23.8 psi
Column Temperature: 65 C
Instrument Gain: LOW
Sample Time: 2 seconds
Inject Time: 10 milliseconds
Run Time: 45 seconds

9-11a

External Standard Report

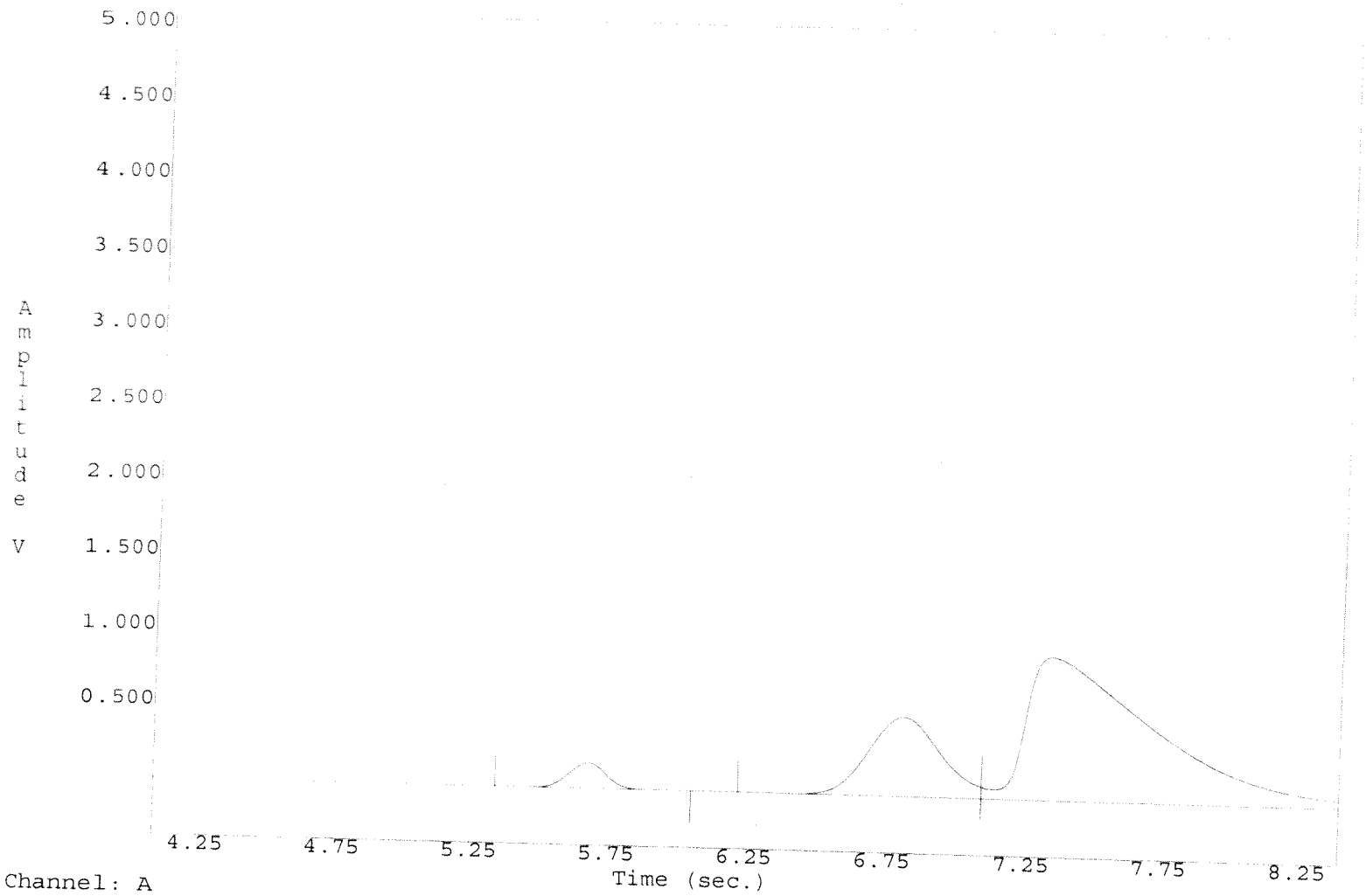
Name	Amount	Units	RT	Min	Max	Mean	%SD
Hydrogen	0.036	%	5.680	-1.000	10.203	0.443	206.857

Channel: A
Current Time: Jun 16, 2011 11:42:06
Method: c:\mti\ezchrom\200\methods\bh51.
File : c:\mti\ezchrom\200\chrom\01090815.1
Data file creation time: Jun 16, 2011 11:40:58
Instrument ID: 180122
Column Type: MS-5A 4m
Carrier Gas: He
Column Head Pressure: 23.8 psi
Column Temperature: 65 C
Instrument Gain: LOW
Sample Time: 2 seconds
Inject Time: 10 milliseconds
Run Time: 45 seconds

Sample 9-12

Detector Sensitivity

9-12



Channel: A
Current Time: Jun 16, 2011 11:42:07
Method: c:\mti\ezchrom\200\methods\bh51.
File : c:\mti\ezchrom\200\chrom\01090815.1
Data file creation time: Jun 16, 2011 11:40:58
Instrument ID: 180122
Column Type: MS-5A 4m
Carrier Gas: He
Column Head Pressure: 23.8 psi
Column Temperature: 65 C
Instrument Gain: LOW
Sample Time: 2 seconds
Inject Time: 10 milliseconds
Run Time: 45 seconds

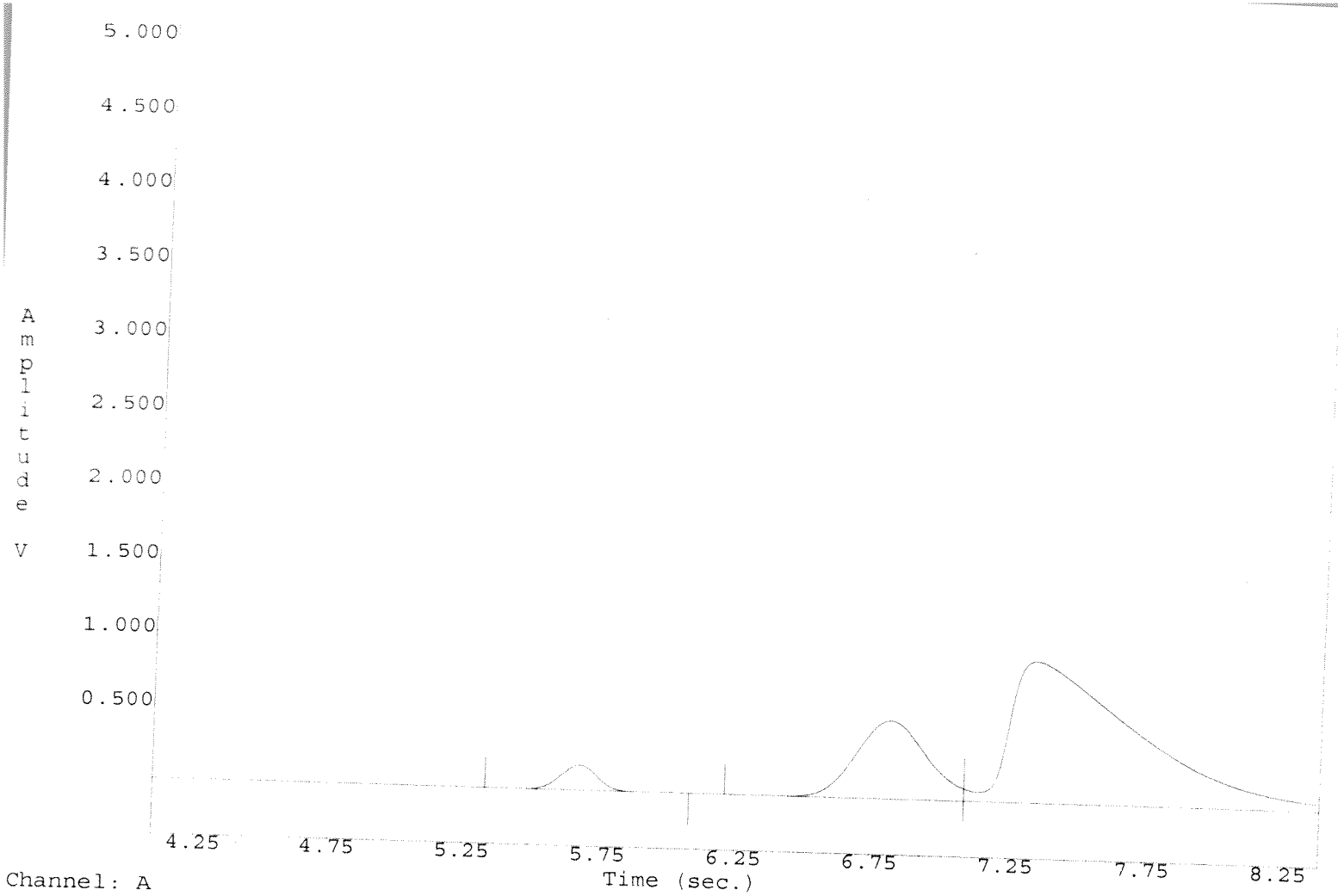
9-12

External Standard Report

Name	Amount	Units	RT	Min	Max	Mean	%SD
Hydrogen	0.036	%	5.680	-1.000	10.203	0.439	207.798

Channel: A
Current Time: Jun 16, 2011 11:44:33
Method: c:\mti\ezchrom\200\methods\bh51.
File : c:\mti\ezchrom\200\chrom\01090815.1
Data file creation time: Jun 16, 2011 11:43:32
Instrument ID: 180122
Column Type: MS-5A 4m
Carrier Gas: He
Column Head Pressure: 23.8 psi
Column Temperature: 65 C
Instrument Gain: LOW
Sample Time: 2 seconds
Inject Time: 10 milliseconds
Run Time: 45 seconds

Sample 9-12a



Channel: A
Current Time: Jun 16, 2011 11:44:34
Method: c:\mti\ezchrom\200\methods\bh51.
File : c:\mti\ezchrom\200\chrom\01090815.1
Data file creation time: Jun 16, 2011 11:43:32
Instrument ID: 180122
Column Type: MS-5A 4m
Carrier Gas: He
Column Head Pressure: 23.8 psi
Column Temperature: 65 C
Instrument Gain: LOW
Sample Time: 2 seconds
Inject Time: 10 milliseconds
Run Time: 45 seconds

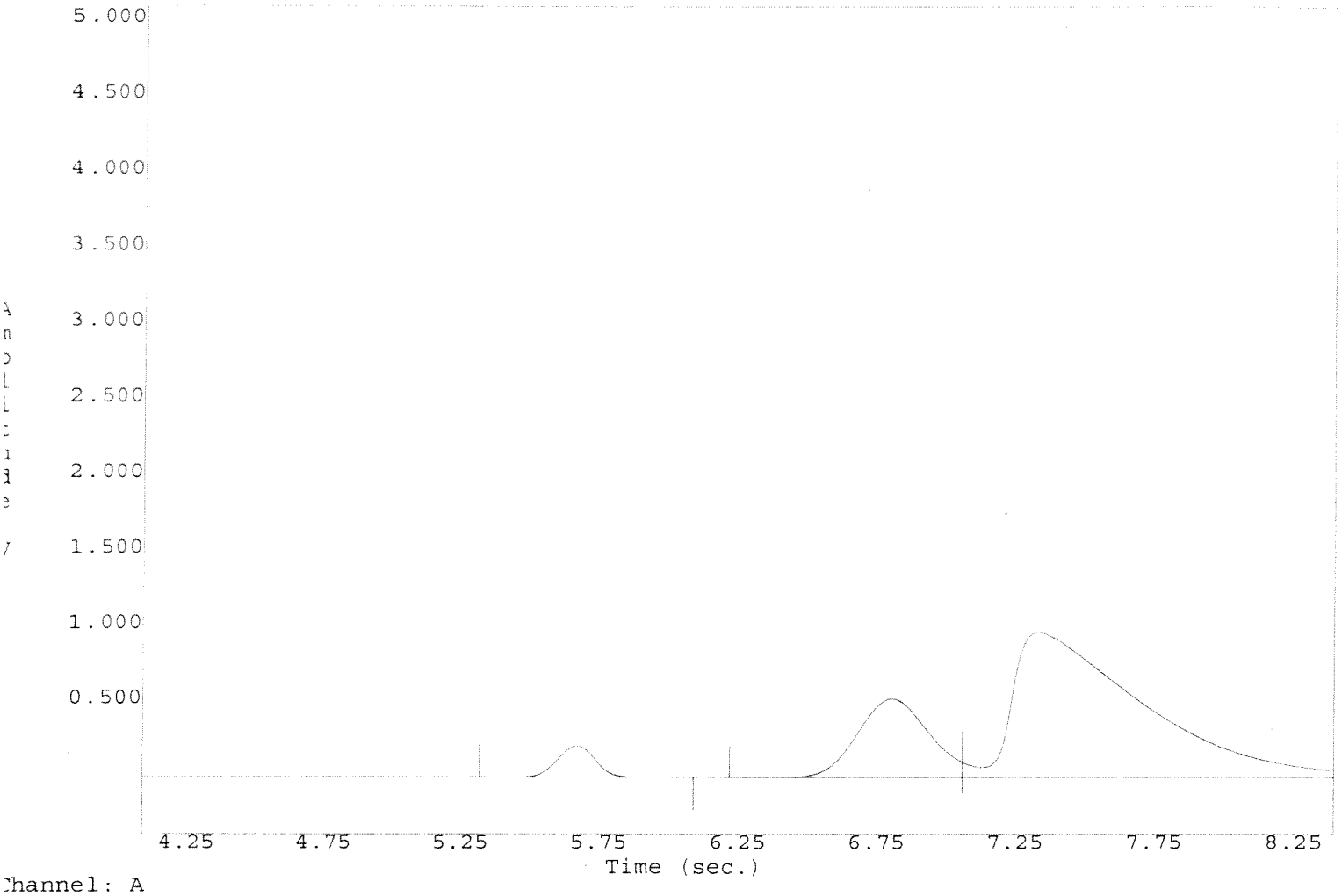
9-12a

External Standard Report

Name	Amount	Units	RT	Min	Max	Mean	%SD
Hydrogen	0.044	%	5.680	-1.000	10.203	0.430	210.488

Channel: A
Current Time: Jun 16, 2011 17:06:31
Method: c:\mti\ezchrom\200\methods\bh51.
File : c:\mti\ezchrom\200\chrom\01090815.1
Data file creation time: Jun 16, 2011 17:04:47
Instrument ID: 180122
Column Type: MS-5A 4m
Carrier Gas: He
Column Head Pressure: 23.8 psi
Column Temperature: 65 C
Instrument Gain: LOW
Sample Time: 2 seconds
Inject Time: 10 milliseconds
Run Time: 45 seconds

Sample 9-13



Channel: A
Current Time: Jun 16, 2011 17:06:34
Method: c:\mti\ezchrom\200\methods\bh51.
File : c:\mti\ezchrom\200\chrom\01090815.1
Data file creation time: Jun 16, 2011 17:04:47
Instrument ID: 180122
Column Type: MS-5A 4m
Carrier Gas: He
Column Head Pressure: 23.8 psi
Column Temperature: 65 C
Instrument Gain: LOW
Sample Time: 2 seconds
Inject Time: 10 milliseconds
Run Time: 45 seconds

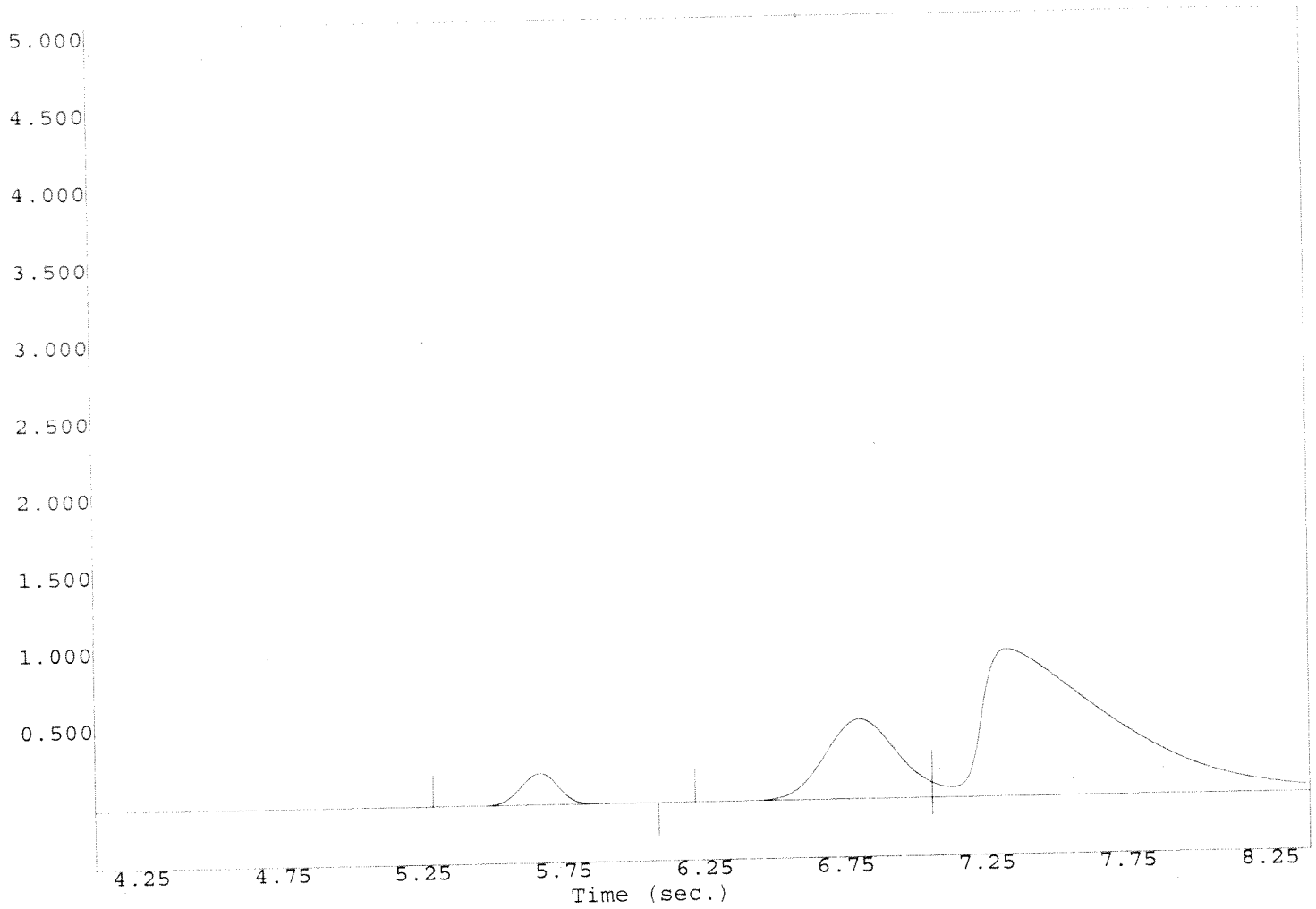
9-13

ternal Standard Report

ame	Amount	Units	RT	Min	Max	Mean	%SD
ydrogen	0.044	%	5.680	-1.000	10.203	0.427	211.389

annel: A
rrent Time: Jun 16, 2011 17:09:46
thod: c:\mti\ezchrom\200\methods\bh51.
le : c:\mti\ezchrom\200\chrom\01090815.1
ta file creation time: Jun 16, 2011 17:08:34
strument ID: 180122
olumn Type: MS-5A 4m
rrier Gas: He
olumn Head Pressure: 23.8 psi
olumn Temperature: 65 C
strument Gain: LOW
mple Time: 2 seconds
ject Time: 10 milliseconds
n Time: 45 seconds

Sample 9-13a



Channel: A
Current Time: Jun 16, 2011 17:09:49
Method: c:\mti\ezchrom\200\methods\bh51.
File : c:\mti\ezchrom\200\chrom\01090815.1
Data file creation time: Jun 16, 2011 17:08:34
Instrument ID: 180122
Column Type: MS-5A 4m
Carrier Gas: He
Column Head Pressure: 23.8 psi
Column Temperature: 65 C
Instrument Gain: LOW
Sample Time: 2 seconds
Inject Time: 10 milliseconds
Run Time: 45 seconds

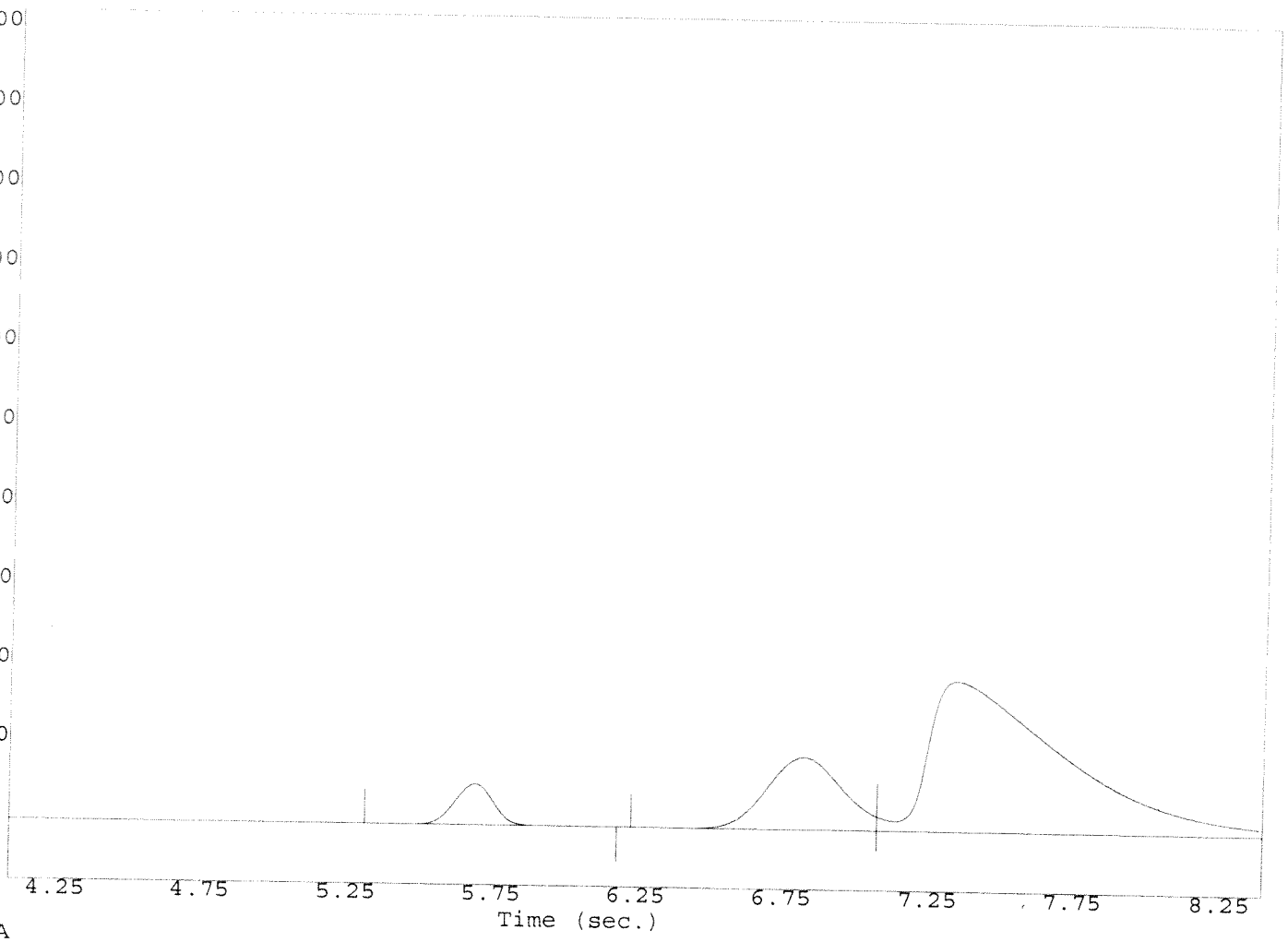
9-13a

xternal Standard Report

Name	Amount	Units	RT	Min	Max	Mean	%SD
Hydrogen	0.054	%	5.690	-1.000	10.203	0.418	213.809

hannel: A
urrent Time: Jun 17, 2011 08:06:33
ethod: c:\mti\ezchrom\200\methods\bh51.
ile : c:\mti\ezchrom\200\chrom\01090815.1
ata file creation time: Jun 17, 2011 08:04:16
nstrument ID: 180122
olumn Type: MS-5A 4m
arrier Gas: He
olumn Head Pressure: 23.8 psi
olumn Temperature: 65 C
nstrument Gain: LOW
ample Time: 2 seconds
nject Time: 10 milliseconds
un Time: 45 seconds

Sample 9-14



hannel: A
urrent Time: Jun 17, 2011 08:05:20
ethod: c:\mti\ezchrom\200\methods\bh51.
ile : c:\mti\ezchrom\200\chrom\01090815.1
ata file creation time: Jun 17, 2011 08:04:16
nstrument ID: 180122
olumn Type: MS-5A 4m
arrier Gas: He
olumn Head Pressure: 23.8 psi
olumn Temperature: 65 C
nstrument Gain: LOW
mple Time: 2 seconds
ject Time: 10 milliseconds
n Time: 45 seconds

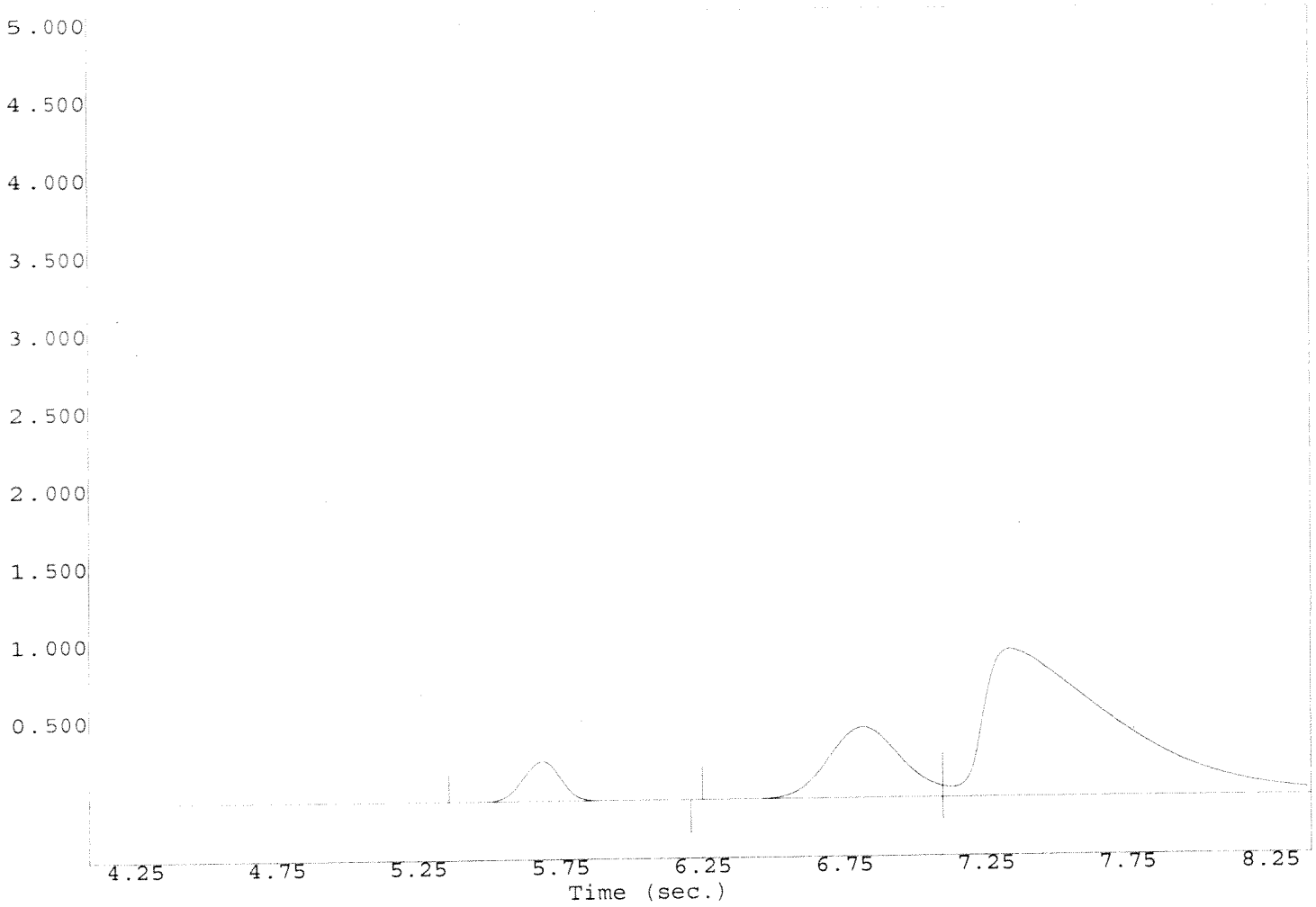
Sample 9-14

External Standard Report

Name	Amount	Units	RT	Min	Max	Mean	%SD
Hydrogen	0.054	%	5.690	-1.000	10.203	0.415	214.665

Channel: A
Current Time: Jun 17, 2011 08:09:48
Method: c:\mti\ezchrom\200\methods\bh51.
File : c:\mti\ezchrom\200\chrom\01090815.1
Data file creation time: Jun 17, 2011 08:08:52
Instrument ID: 180122
Column Type: MS-5A 4m
Carrier Gas: He
Column Head Pressure: 23.8 psi
Column Temperature: 65 C
Instrument Gain: LOW
Sample Time: 2 seconds
Inject Time: 10 milliseconds
Run Time: 45 seconds

Sample 9-14a



ıannel: A
ırrent Time: Jun 17, 2011 08:09:46
:thod: c:\mti\ezchrom\200\methods\bh51.
.le : c:\mti\ezchrom\200\chrom\01090815.1
ıta file creation time: Jun 17, 2011 08:08:52
ıstrument ID: 180122
)lumn Type: MS-5A 4m
ırrier Gas: He
)lumn Head Pressure: 23.8 psi
)lumn Temperature: 65 C
ıstrument Gain: LOW
ımple Time: 2 seconds
ıject Time: 10 milliseconds
ın Time: 45 seconds

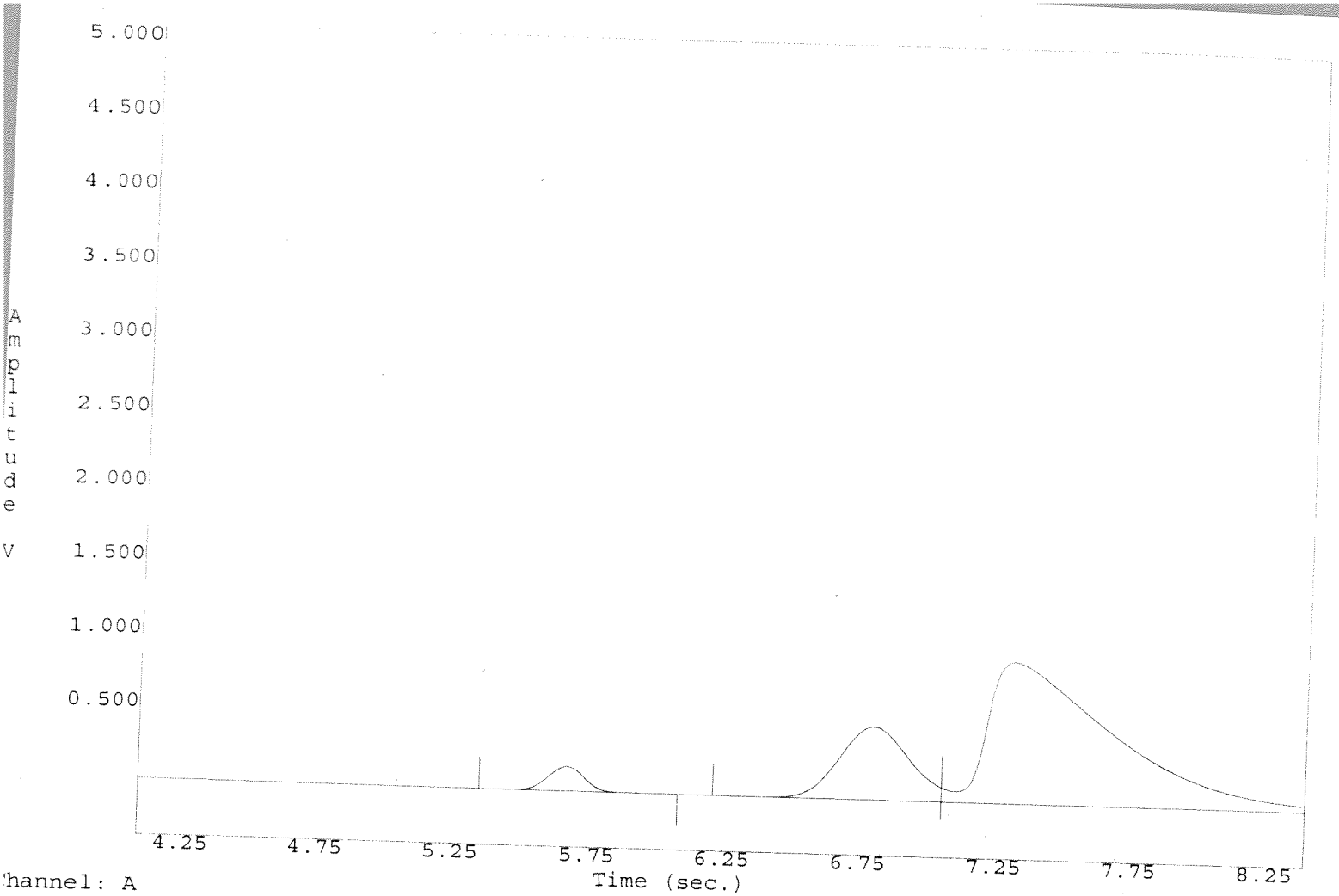
Sample 9-14a

:ternal Standard Report

Name	Amount	Units	RT	Min	Max	Mean	%SD
Hydrogen	0.035	%	5.670	-1.000	10.203	0.406	217.289

Sample 9-15

```
lannel: A
urrent Time: Jun 17, 2011  16:43:23
ethod: c:\mti\ezchrom\200\methods\bh51.
ile  : c:\mti\ezchrom\200\chrom\01090815.1
ata file creation time: Jun 17, 2011  16:42:20
nstrument ID: 180122
olumn Type: MS-5A 4m
arrier Gas: He
olumn Head Pressure: 23.8 psi
olumn Temperature: 65 C
nstrument Gain: LOW
ample Time:   2 seconds
nject Time: 10 milliseconds
un Time: 45 seconds
```



hannel: A
urrent Time: Jun 17, 2011 16:43:27
ethod: c:\mti\ezchrom\200\methods\bh51.
ile : c:\mti\ezchrom\200\chrom\01090815.1
ata file creation time: Jun 17, 2011 16:42:20
nstrument ID: 180122
olumn Type: MS-5A 4m
arrier Gas: He
olumn Head Pressure: 23.8 psi
olumn Temperature: 65 C
nstrument Gain: LOW
ample Time: 2 seconds
nject Time: 10 milliseconds
un Time: 45 seconds

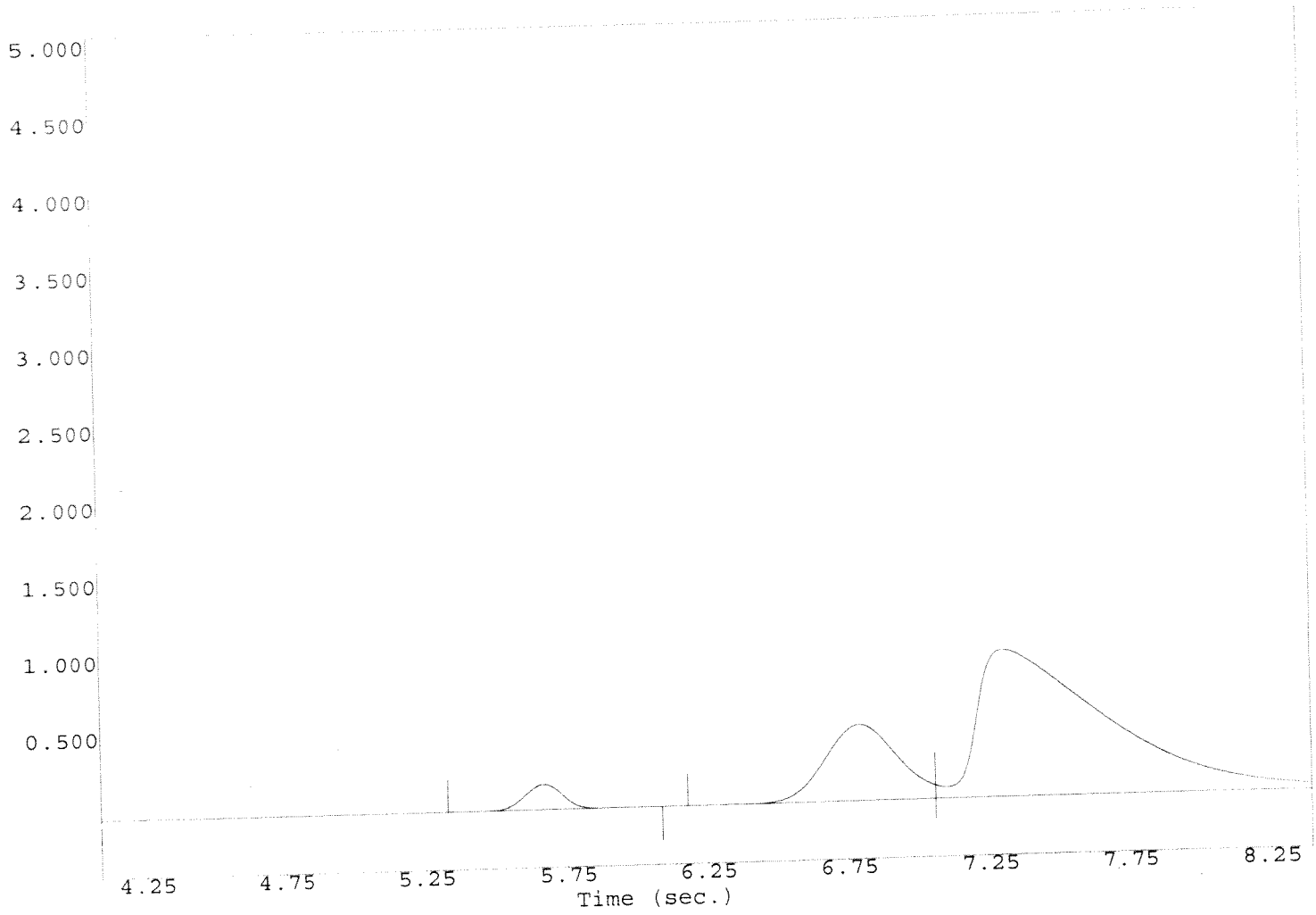
9-15

:ternal Standard Report

lame	Amount	Units	RT	Min	Max	Mean	%SD
lydrogen	0.035	%	5.670	-1.000	10.203	0.403	218.170

lannel: A
urrent Time: Jun 17, 2011 16:46:45
ethod: c:\mti\ezchrom\200\methods\bh51.
ile : c:\mti\ezchrom\200\chrom\01090815.1
ata file creation time: Jun 17, 2011 16:45:36
nstrument ID: 180122
olumn Type: MS-5A 4m
arrier Gas: He
olumn Head Pressure: 23.8 psi
olumn Temperature: 65 C
nstrument Gain: LOW
ample Time: 2 seconds
nject Time: 10 milliseconds
un Time: 45 seconds

Sample 9-15a



hannel: A
urrent Time: Jun 17, 2011 16:46:47
ethod: c:\mti\ezchrom\200\methods\bh51.
ile : c:\mti\ezchrom\200\chrom\01090815.1
ata file creation time: Jun 17, 2011 16:45:36
nstrument ID: 180122
olumn Type: MS-5A 4m
arrier Gas: He
olumn Head Pressure: 23.8 psi
olumn Temperature: 65 C
nstrument Gain: LOW
ample Time: 2 seconds
nject Time: 10 milliseconds
un Time: 45 seconds

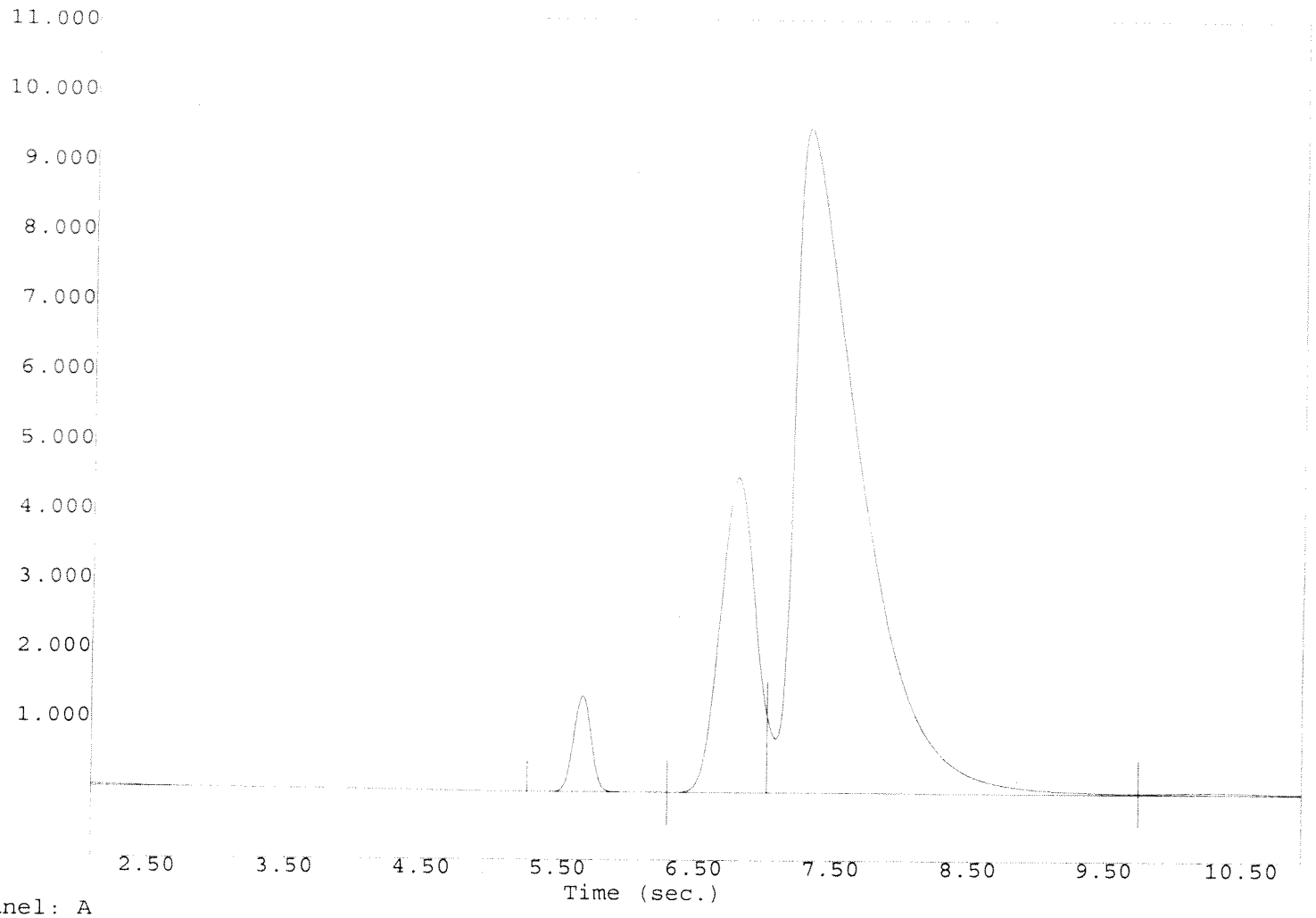
9-15a

xternal Standard Report

Name	Amount	Units	RT	Min	Max	Mean	%SD
Hydrogen	0.300	%	5.680	-1.000	10.203	0.393	220.357

hannel: A
urrent Time: Jun 18, 2011 09:33:24
ethod: c:\mti\ezchrom\200\methods\bh51.
ile : c:\mti\ezchrom\200\chrom\01090815.1
ata file creation time: Jun 18, 2011 09:32:12
nstrument ID: 180122
olumn Type: MS-5A 4m
arrier Gas: He
olumn Head Pressure: 23.8 psi
olumn Temperature: 65 C
nstrument Gain: MED
ample Time: 2 seconds
nject Time: 10 milliseconds
un Time: 45 seconds

Sample 9-16



hannel: A
urrent Time: Jun 18, 2011 09:33:26
ethod: c:\mti\ezchrom\200\methods\bh51.
ile : c:\mti\ezchrom\200\chrom\01090815.1
ata file creation time: Jun 18, 2011 09:32:12
nstrument ID: 180122
olumn Type: MS-5A 4m
arrier Gas: He
olumn Head Pressure: 23.8 psi
olumn Temperature: 65 C
nstrument Gain: MED
ample Time: 2 seconds
nject Time: 10 milliseconds
un Time: 45 seconds

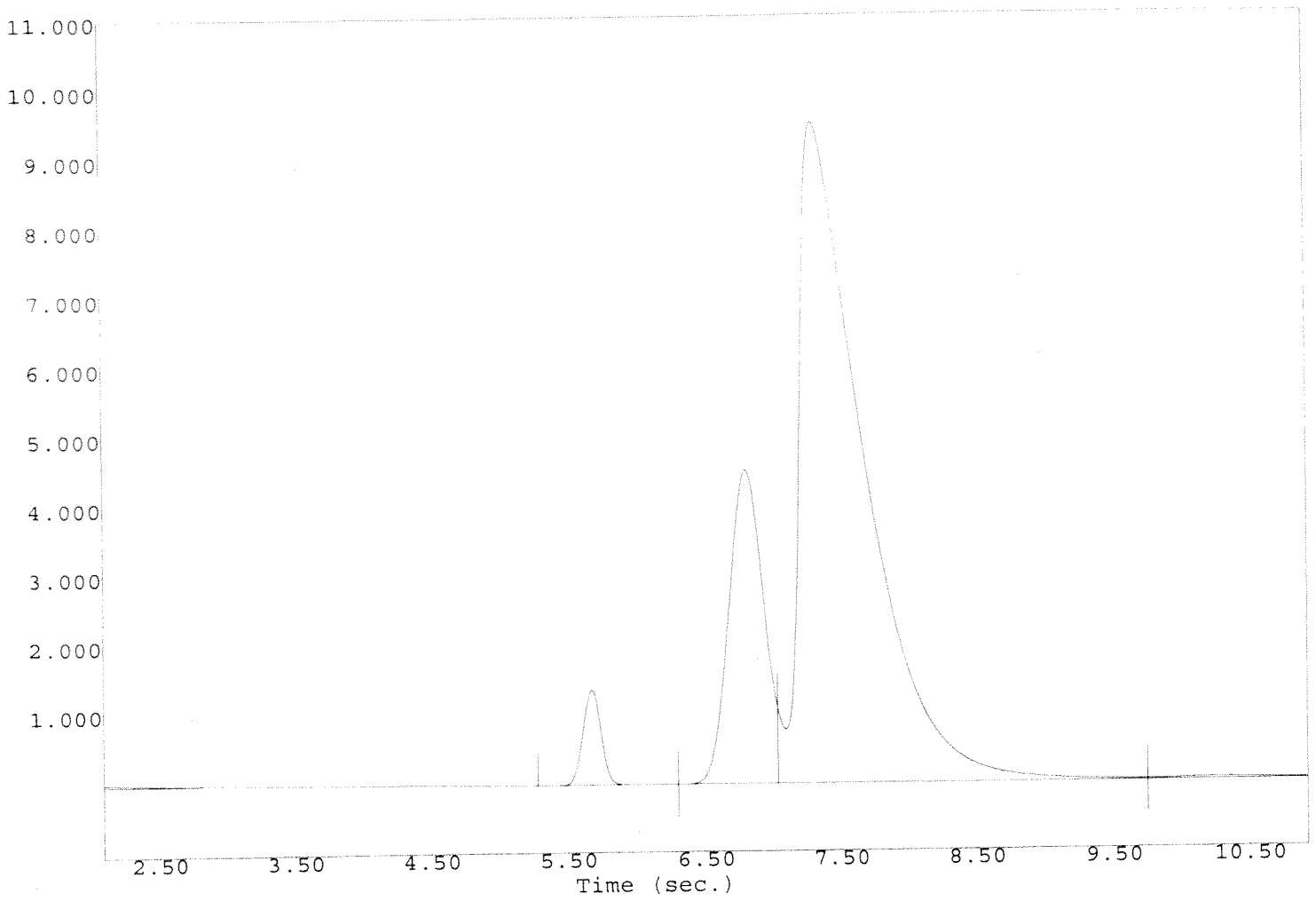
4-16

External Standard Report

Name	Amount	Units	RT	Min	Max	Mean	%SD
Hydrogen	0.299	%	5.680	-1.000	10.203	0.391	220.620

Channel: A
Current Time: Jun 18, 2011 09:36:31
Method: c:\mti\ezchrom\200\methods\bh51.
File : c:\mti\ezchrom\200\chrom\01090815.1
Data file creation time: Jun 18, 2011 09:35:16
Instrument ID: 180122
Column Type: MS-5A 4m
Carrier Gas: He
Column Head Pressure: 23.8 psi
Column Temperature: 65 C
Instrument Gain: MED
Sample Time: 2 seconds
Inject Time: 10 milliseconds
Run Time: 45 seconds

Sample 9-16c



Channel: A
Current Time: Jun 18, 2011 09:36:33
Method: c:\mti\ezchrom\200\methods\bh51.
File : c:\mti\ezchrom\200\chrom\01090815.1
Data file creation time: Jun 18, 2011 09:35:16
Instrument ID: 180122
Column Type: MS-5A 4m
Carrier Gas: He
Column Head Pressure: 23.8 psi
Column Temperature: 65 C
Instrument Gain: MED
Sample Time: 2 seconds
Inject Time: 10 milliseconds
Run Time: 45 seconds

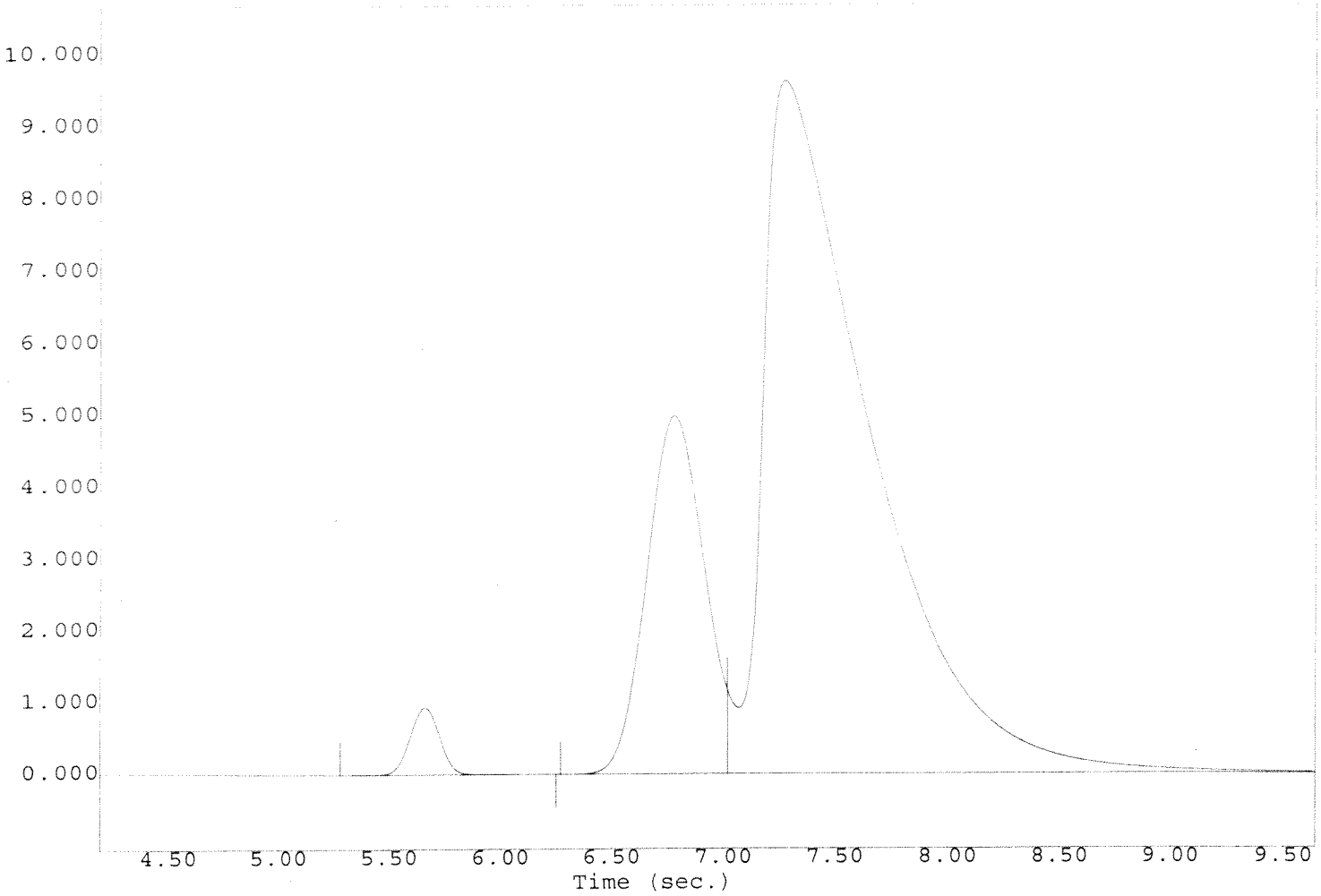
9-1bc

xternal Standard Report

Name	Amount	Units	RT	Min	Max	Mean	%SD
Hydrogen	0.203	%	5.670	-1.000	10.203	0.385	221.868

hannel: A
urrent Time: Jun 18, 2011 17:09:17
ethod: c:\mti\ezchrom\200\methods\bh51.
ile : c:\mti\ezchrom\200\chrom\01090815.1
ata file creation time: Jun 18, 2011 17:07:56
nstrument ID: 180122
olumn Type: MS-5A 4m
arrier Gas: He
olumn Head Pressure: 23.8 psi
olumn Temperature: 65 C
nstrument Gain: MED
ample Time: 2 seconds
nject Time: 10 milliseconds
un Time: 45 seconds

Sample 9-17



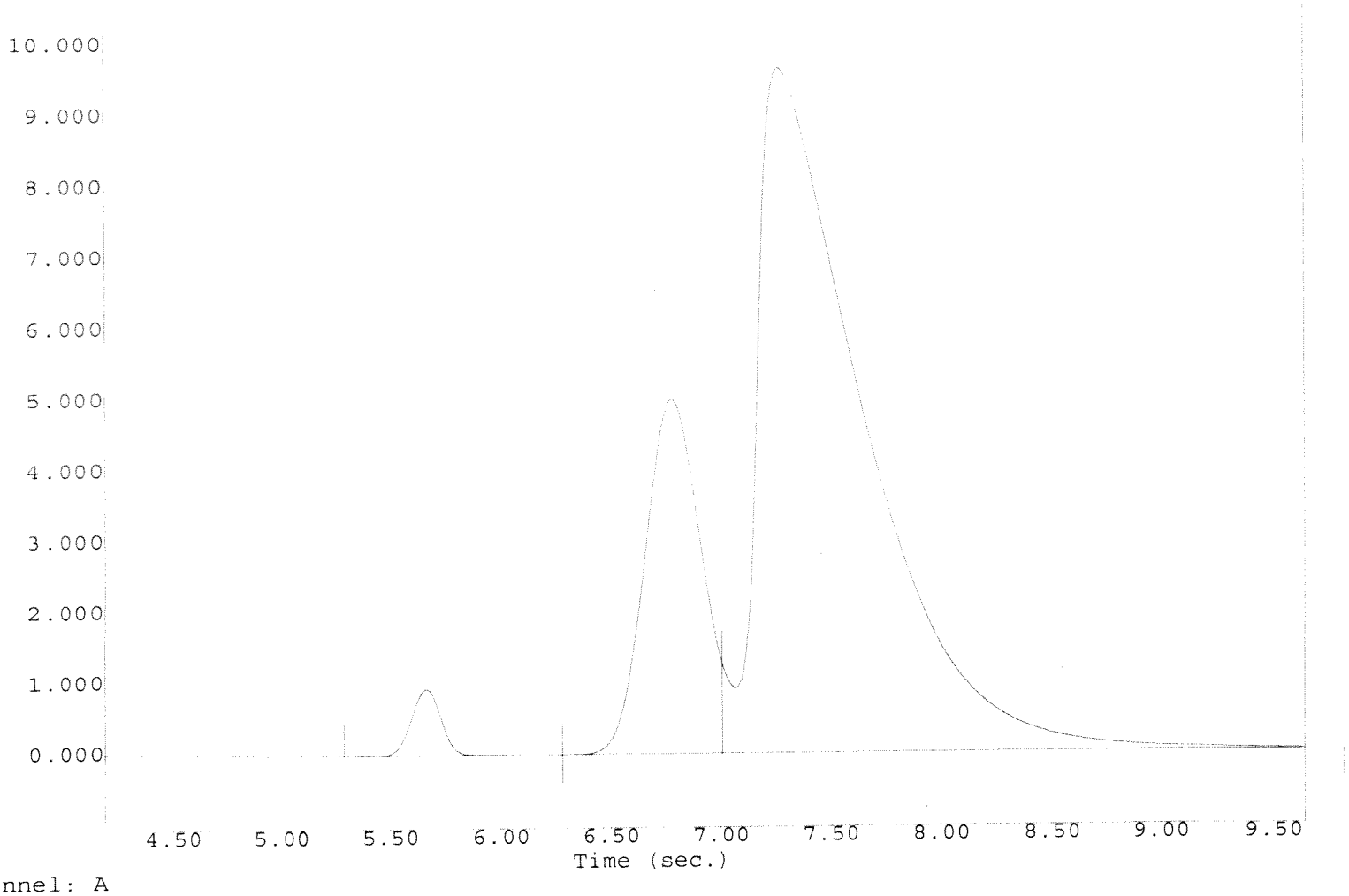
Channel: A
Current Time: Jun 18, 2011 17:09:19
Method: c:\mti\ezchrom\200\methods\bh51.
File : c:\mti\ezchrom\200\chrom\01090815.1
Data file creation time: Jun 18, 2011 17:07:56
Instrument ID: 180122
Column Type: MS-5A 4m
Carrier Gas: He
Column Head Pressure: 23.8 psi
Column Temperature: 65 C
Instrument Gain: MED
Sample Time: 2 seconds
Inject Time: 10 milliseconds
Run Time: 45 seconds

External Standard Report

Name	Amount	Units	RT	Min	Max	Mean	%SD
Hydrogen	0.204	%	5.670	-1.000	10.203	0.383	222.315

Channel: A
Current Time: Jun 18, 2011 17:12:10
Method: c:\mti\ezchrom\200\methods\bh51.
File : c:\mti\ezchrom\200\chrom\01090815.1
Data file creation time: Jun 18, 2011 17:11:07
Instrument ID: 180122
Column Type: MS-5A 4m
Carrier Gas: He
Column Head Pressure: 23.8 psi
Column Temperature: 65 C
Instrument Gain: MED
Sample Time: 2 seconds
Inject Time: 10 milliseconds
Run Time: 45 seconds

Sample 9-17a



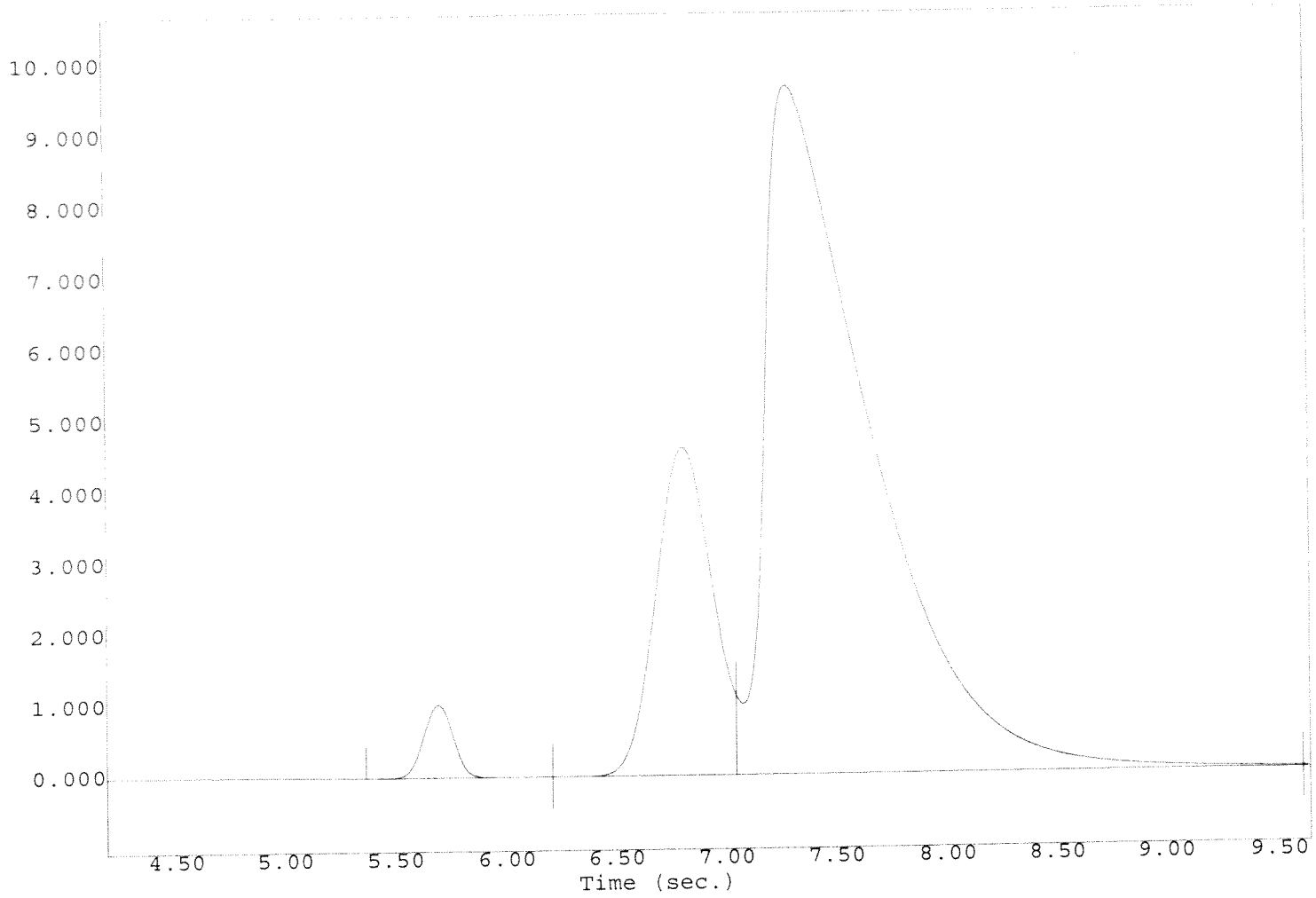
'hannel: A
'urrent Time: Jun 18, 2011 17:12:13
lethod: c:\mti\ezchrom\200\methods\bh51.
'ile : c:\mti\ezchrom\200\chrom\01090815.1
)ata file creation time: Jun 18, 2011 17:11:07
:nstrument ID: 180122
:olumn Type: MS-5A 4m
:arrier Gas: He
:olumn Head Pressure: 23.8 psi
:olumn Temperature: 65 C
:nstrument Gain: MED
:ample Time: 2 seconds
:nject Time: 10 milliseconds
:un Time: 45 seconds

External Standard Report

Name	Amount	Units	RT	Min	Max	Mean	%SD
Hydrogen	0.223	%	5.690	-1.000	10.203	0.379	222.863

Channel: A
Current Time: Jun 19, 2011 15:06:29
Method: c:\mti\ezchrom\200\methods\bh51.
File : c:\mti\ezchrom\200\chrom\01090815.1
Data file creation time: Jun 19, 2011 15:05:05
Instrument ID: 180122
Column Type: MS-5A 4m
Carrier Gas: He
Column Head Pressure: 23.8 psi
Column Temperature: 65 C
Instrument Gain: MED
Sample Time: 2 seconds
Inject Time: 10 milliseconds
Run Time: 45 seconds

Sample 9-18



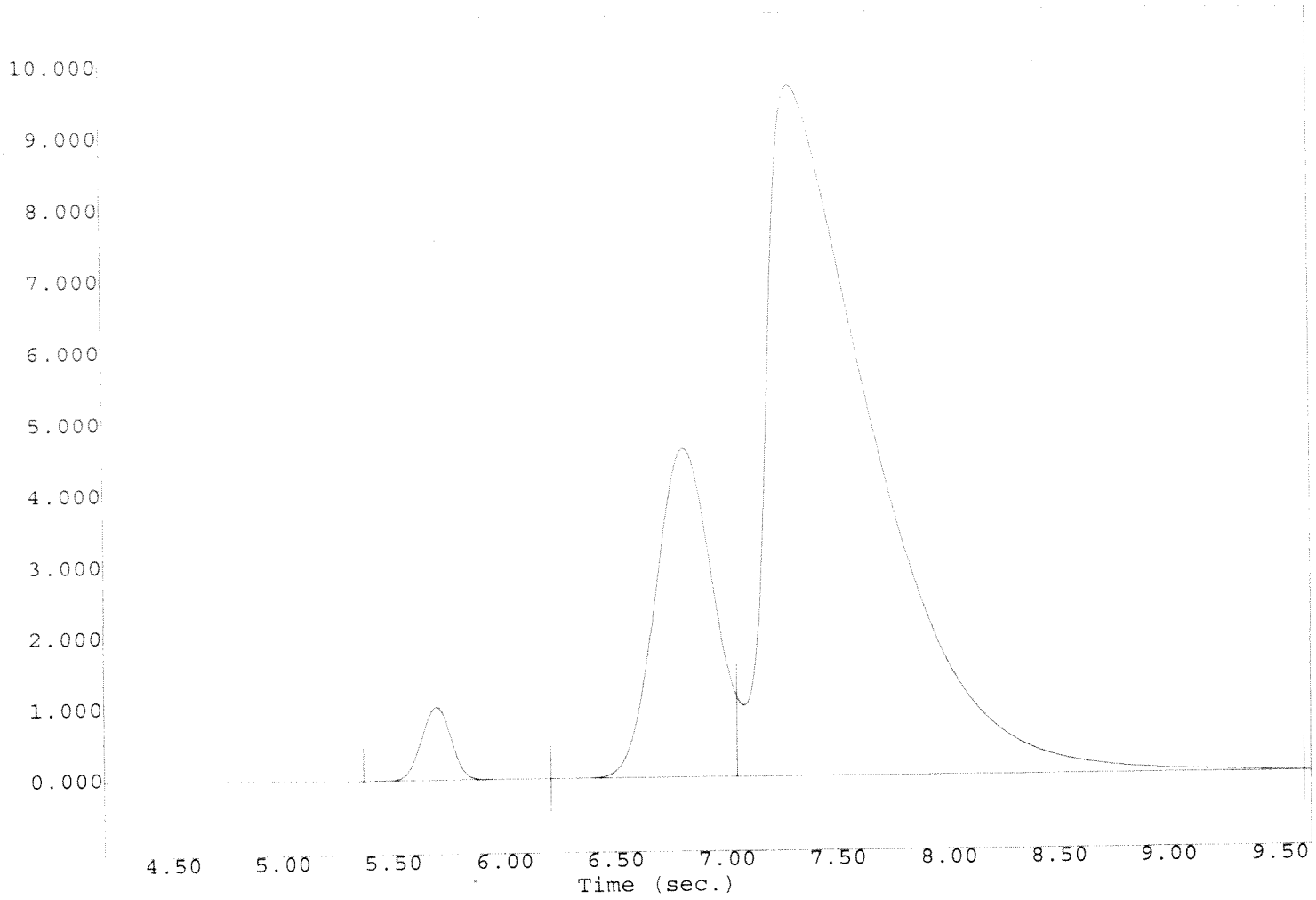
Channel: A
Current Time: Jun 19, 2011 15:06:31
Method: c:\mti\ezchrom\200\methods\bh51.
File : c:\mti\ezchrom\200\chrom\01090815.1
Data file creation time: Jun 19, 2011 15:05:05
Instrument ID: 180122
Column Type: MS-5A 4m
Carrier Gas: He
Column Head Pressure: 23.8 psi
Column Temperature: 65 C
Instrument Gain: MED
Sample Time: 2 seconds
Inject Time: 10 milliseconds
Run Time: 45 seconds

xternal Standard Report

Name	Amount	Units	RT	Min	Max	Mean	%SD
Hydrogen	0.223	%	5.690	-1.000	10.203	0.377	223.251

hannel: A
urrent Time: Jun 19, 2011 15:10:26
ethod: c:\mti\ezchrom\200\methods\bh51.
ile : c:\mti\ezchrom\200\chrom\01090815.1
ata file creation time: Jun 19, 2011 15:08:50
nstrument ID: 180122
olumn Type: MS-5A 4m
arrier Gas: He
olumn Head Pressure: 23.8 psi
olumn Temperature: 65 C
nstrument Gain: MED
ample Time: 2 seconds
nject Time: 10 milliseconds
un Time: 45 seconds

Sample 9-18a



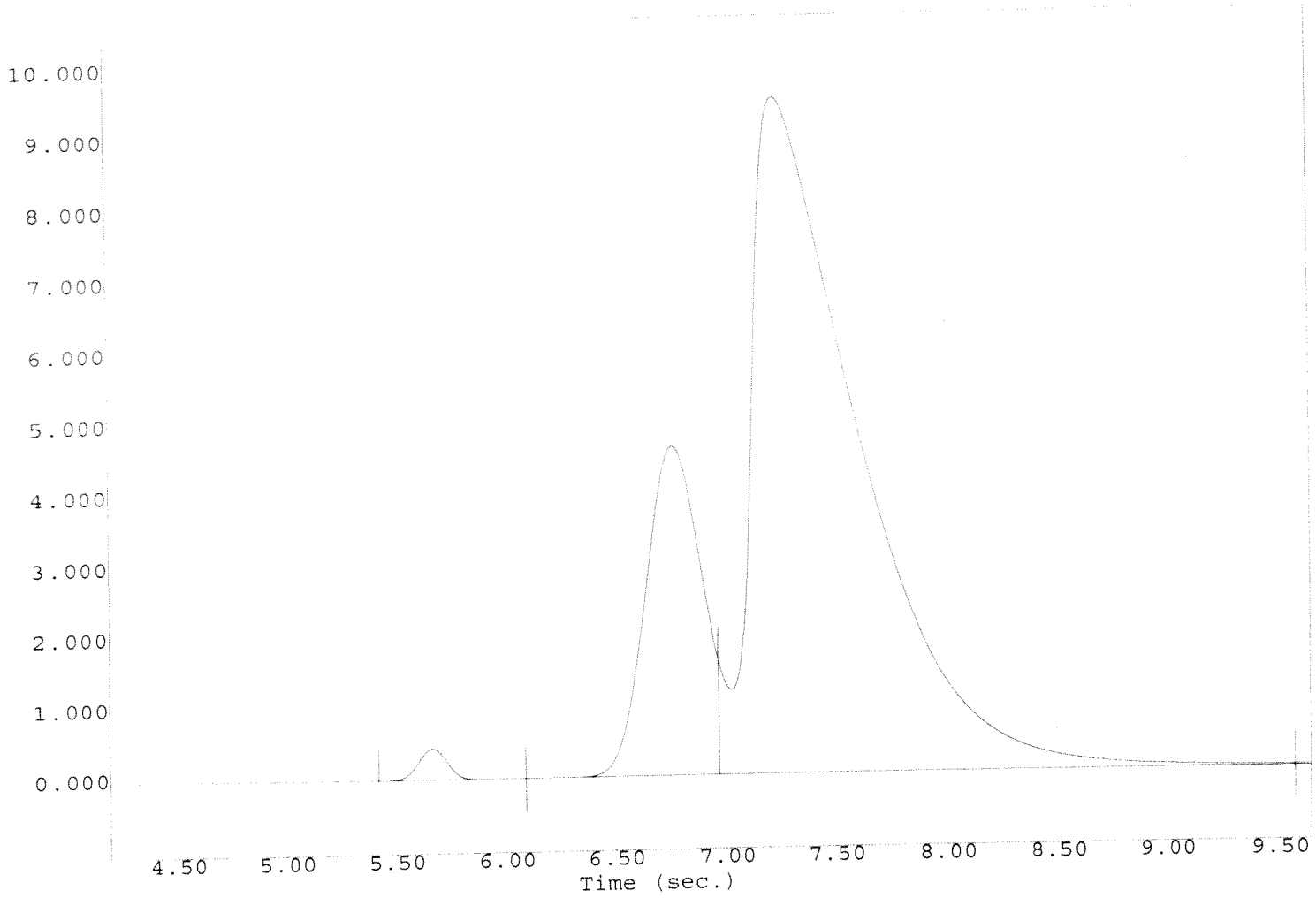
Channel: A
Current Time: Jun 19, 2011 15:10:28
Method: c:\mti\ezchrom\200\methods\bh51.
File : c:\mti\ezchrom\200\chrom\01090815.1
Data file creation time: Jun 19, 2011 15:08:50
Instrument ID: 180122
Column Type: MS-5A 4m
Carrier Gas: He
Column Head Pressure: 23.8 psi
Column Temperature: 65 C
Instrument Gain: MED
Sample Time: 2 seconds
Inject Time: 10 milliseconds
Run Time: 45 seconds

xternal Standard Report

Name	Amount	Units	RT	Min	Max	Mean	%SD
Hydrogen	0.092	%	5.690	-1.000	10.203	0.372	224.633

hannel: A
urrent Time: Jun 20, 2011 07:43:59
ethod: c:\mti\ezchrom\200\methods\bh51.
ile : c:\mti\ezchrom\200\chrom\01090815.1
ata file creation time: Jun 20, 2011 07:42:50
nstrument ID: 180122
olumn Type: MS-5A 4m
arrier Gas: He
olumn Head Pressure: 23.8 psi
olumn Temperature: 65 C
nstrument Gain: MED
ample Time: 2 seconds
nject Time: 10 milliseconds
un Time: 45 seconds

Sample 9-19



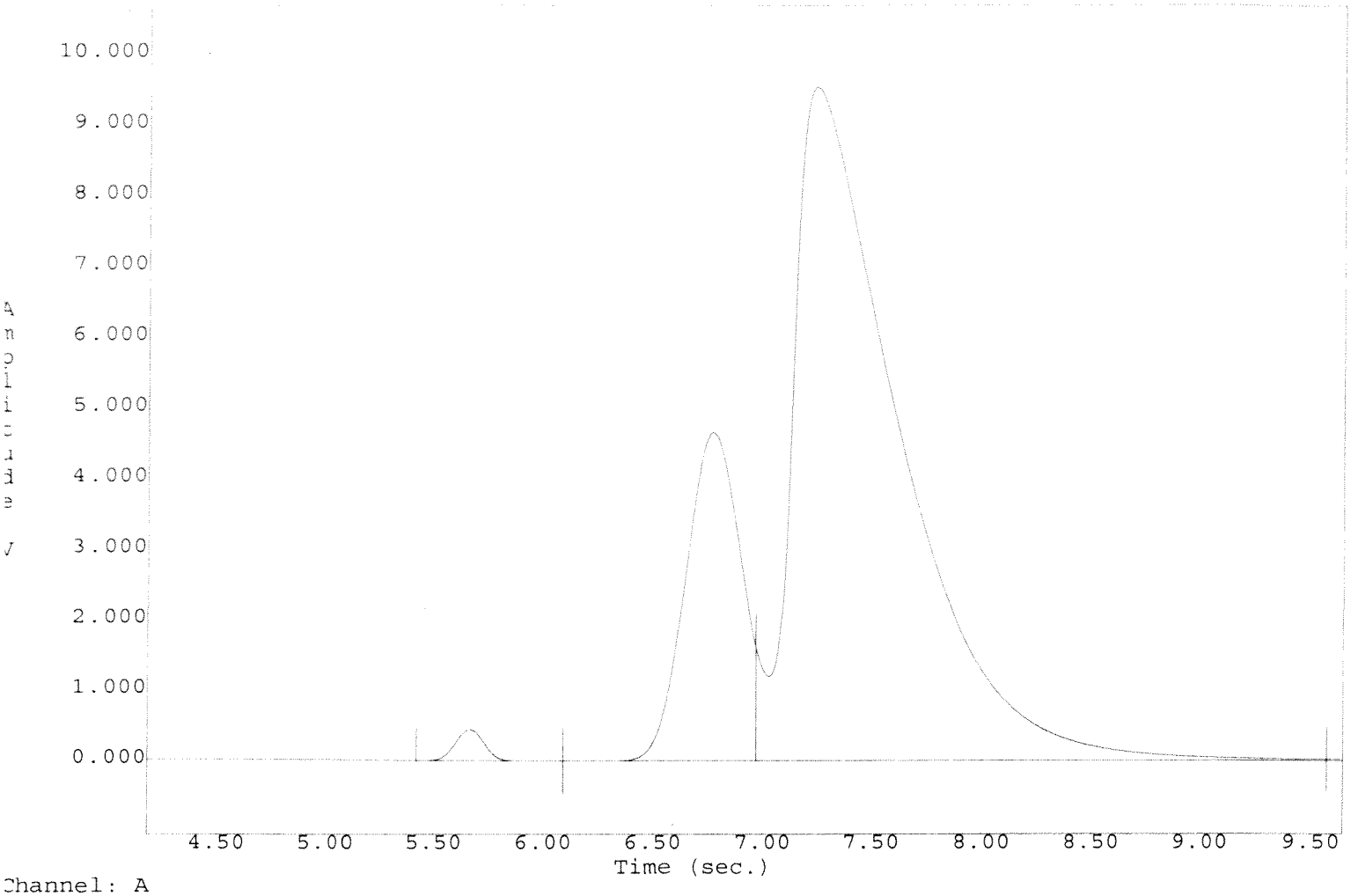
Channel: A
Current Time: Jun 20, 2011 07:44:02
Method: c:\mti\ezchrom\200\methods\bh51.
File : c:\mti\ezchrom\200\chrom\01090815.1
Data file creation time: Jun 20, 2011 07:42:50
Instrument ID: 180122
Column Type: MS-5A 4m
Carrier Gas: He
Column Head Pressure: 23.8 psi
Column Temperature: 65 C
Instrument Gain: MED
Sample Time: 2 seconds
Inject Time: 10 milliseconds
Run Time: 45 seconds

External Standard Report

Name	Amount	Units	RT	Min	Max	Mean	%SD
Hydrogen	0.091	%	5.690	-1.000	10.203	0.370	225.290

Channel: A
Current Time: Jun 20, 2011 07:46:57
Method: c:\mti\ezchrom\200\methods\bh51.
File : c:\mti\ezchrom\200\chrom\01090815.1
Data file creation time: Jun 20, 2011 07:45:50
Instrument ID: 180122
Column Type: MS-5A 4m
Carrier Gas: He
Column Head Pressure: 23.8 psi
Column Temperature: 65 C
Instrument Gain: MED
Sample Time: 2 seconds
Inject Time: 10 milliseconds
Run Time: 45 seconds

Test 9-19a



Channel: A
Current Time: Jun 20, 2011 07:47:00
Method: c:\mti\ezchrom\200\methods\bh51.
File : c:\mti\ezchrom\200\chrom\01090815.1
Data file creation time: Jun 20, 2011 07:45:50
Instrument ID: 180122
Column Type: MS-5A 4m
Carrier Gas: He
Column Head Pressure: 23.8 psi
Column Temperature: 65 C
Instrument Gain: MED
Sample Time: 2 seconds
Inject Time: 10 milliseconds
Run Time: 45 seconds