

# **Assessing the Effect of Five Gasoline Properties on Exhaust Emissions from Light-Duty Vehicles certified to Tier-2 Standards**

## **Analysis of Data from EPA Phase 3**

**(EPAct/V2/E-89)**

### **Appendix N.4**

#### **Model Fitting Information for**

#### **Ethanol (Bag 2)**

This appendix summarizes model fitting for Bag-2 Ethanol. Model-fitting techniques and approaches summarized in Section 8.7. Features of the data and modeling for this compound are listed below.

Fuel-parameter matrix: REDUCED

Media contamination: NO

No. measurements: 63

No. censored values: 24

Modeling approach: TOBIT REGRESSION

Estimated Dependent Variable model: YES

### Models fit for Ethanol, Bag 2 (all models include an intercept term)

Model term	Notation	Model			
		Full (Main Effects)	MM1	MM3	Null model
etOH	$Z_e$	•	•	•	
Arom	$Z_a$	•	•	×	
RVP	$Z_r$				
T50	$Z_5$	•	×		
T90	$Z_9$	•	•	×	

### Model Fitting History for Ethanol, Bag 2 (MM3) selected as best-fit model).

Fit Parameters				Test with respect to Full			Test with respect to Previous Model		
Model	$p$	-2lnL	BIC <sup>1</sup>	Dev. <sup>1</sup>	$d$	Pr> $\chi^2$	Dev.	$d$	Pr> $\chi^2$
Full	4	79.744							
MM1	3	79.749		0.00610	1	0.94			
MM3	1	83.475		3.731	3	0.29	3.725	2	0.16
Null model	0	92.339		12.595	4	0.01	8.864	1	0.0029
<sup>1</sup> A lower value indicates a better fit.				<sup>1</sup> The deviation is the difference in the -2loglik statistics for the nested and reference models, respectively, per Equation 14.					

### Coefficients and Tests of Effect for the Full and Best-Fit Models – Ethanol (Bag 2).

Effect	Full Model					Best-Fit Model (MM3)				
	Estimate	Std.Err.	d.f.	$t$ -value	Pr> $t$	Estimate	Std.Err.	d.f.	$t$ -value	Pr> $t$
Intercept <sup>1</sup>	-9.3072	0.6333	5	-15.45	0.000021	-9.5634	0.6703	5	-14.64	0.00002
$Z_e$	0.9233	0.2824	5	3.27	0.022	0.8163	0.2805	5	2.91	0.033
$Z_a$	-0.3772	0.28499	5	-1.32	0.24					
$Z_5$	-.01910	0.2091	5	-0.091	0.93					
$Z_9$	-0.3017	0.2416	5	-1.25	0.27					
$\sigma_{veh}^2$ <sup>1</sup>	0.3707					0.4634				
$\sigma_\varepsilon^2$	1.0889					1.1682				

<sup>1</sup> Not fit by the model, but manually recalculated from intercepts for individual vehicles.