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Table 2: The first 25 eigenvalues of matrix Y

|     |         |         |         |         |         |         |         |         |         |
|-----|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| No. | 1       | 2       | 3       | 4       | 5       | 6       | 7       | 8       | 9       |
|     | 3.0E+11 | 3.0E+11 | 3.0E+11 | 3.0E+11 | 3.0E+11 | 3.0E+11 | 3.0E+11 | 3.0E+11 | 3.0E+11 |
| No. | 10      | 11      | 12      | 13      | 14      | 15      | 16      | 17      | 18      |
|     | 3.0E+11 | 3.0E+11 | 3.0E+11 | 3.0E+11 | 3.0E+11 | 3.0E+11 | 3.0E+11 | 3.0E+11 | 2.5E+11 |
| No. | 19      | 20      | 21      | 22      | 23      | 24      | 25      |         |         |
|     | 2.0E+11 | 1.5E+11 | 1.0E+11 | 0.5E+11 | 2.05    | 1.03    | 0.89E-2 |         |         |

Table 3: Reactions of the Explicit Model Mechanism

| No. | Reactants | Products          | Rate Constants<br>(ppm <sup>-1</sup> min <sup>-1</sup> ) | Activation<br>Energy(K) |
|-----|-----------|-------------------|----------------------------------------------------------|-------------------------|
| 1   | NO2       | O3P + NO          | 0.46E+0(min <sup>-1</sup> )                              | 0.0                     |
| 2   | O3        | O1D + O2          | 0.10E-2(min <sup>-1</sup> )                              | 0.0                     |
| 3   | O3        | O3P + O2          | 0.25E-1(min <sup>-1</sup> )                              | 0.0                     |
| 4   | HNO2      | OH + NO           | 0.83E-1(min <sup>-1</sup> )                              | 0.0                     |
| 5   | HNO3      | OH + NO2          | 0.17E-4(min <sup>-1</sup> )                              | 0.0                     |
| 6   | NO3       | NO + O2           | 0.12E+1(min <sup>-1</sup> )                              | 0.0                     |
| 7   | NO3       | NO2 + O3P         | 0.98E+1(min <sup>-1</sup> )                              | 0.0                     |
| 8   | H2O2      | OH + OH           | 0.34E-3(min <sup>-1</sup> )                              | 0.0                     |
| 9   | O3P+O2    | O3                | 0.18E+2                                                  | -686.0                  |
| 10  | O3P+NO2   | NO+O2             | 0.14E+5                                                  | -120.0                  |
| 11  | O1D+O2    | O3P+O2            | 0.60E+5                                                  | -70.0                   |
| 12  | O1D+N2    | O3P+N2            | 0.38E+5                                                  | -110.0                  |
| 13  | O1D+H2O   | OH+OH             | 0.32E+6                                                  | 0.0                     |
| 14  | O3+NO     | NO2+O2            | 0.27E+2                                                  | 1400.0                  |
| 15  | O3+OH     | HO2+O2            | 0.10E+3                                                  | 940.0                   |
| 16  | O3+HO2    | OH+O2             | 0.30E+1                                                  | 500.0                   |
| 17  | HO2+NO    | NO2+OH            | 0.12E+5                                                  | -240.0                  |
| 18  | HO2+HO2   | H2O2              | 0.26E+5                                                  | -619.0                  |
| 19  | H2O2+OH   | HO2+H2O           | 0.25E+4                                                  | 200.0                   |
| 20  | NO+OH     | HNO2              | 0.99E+4                                                  | -806.0                  |
| 21  | O3+NO2    | NO3               | 0.47E-1                                                  | 2500.0                  |
| 22  | NO3+NO    | NO2+NO2           | 0.42E+5                                                  | -150.0                  |
| 23  | NO3+NO2   | NO+NO2+O2         | 0.60E+0                                                  | 1230.0                  |
| 24  | NO3+HO2   | HNO3+O2           | 0.26E+5                                                  | -619.0                  |
| 25  | NO3+NO2   | N2O5              | 0.18E+4                                                  | -250.0                  |
| 26  | N2O5      | NO2+NO3           | 0.33E+1                                                  | 10947.0                 |
| 27  | OH+NO2    | HNO3              | 0.16E+5                                                  | -713                    |
| 28  | OH+HNO3   | NO3+H2O           | 0.22E+3                                                  | -1000.0                 |
| 29  | OH+HO2    | H2O+O2            | 0.15E+6                                                  | -230.0                  |
| 30  | CO+OH     | HO2+CO2           | 0.35E+3                                                  | 0.0                     |
| 31  | OH+NC1    | RO2R              | 0.13E+2                                                  | 0.0                     |
| 32  | OH+NC2    | RO2R              | 0.41E+3                                                  | 0.0                     |
| 33  | OH+NC3    | 0.96RO2R+0.04RO2N | 0.18E+4                                                  | 0.0                     |

Table 4: Reactions of the Explicit Model Mechanism

| No. | Reactants | Products                   | Rate Constants<br>(ppm <sup>-1</sup> min <sup>-1</sup> ) | Activation<br>Energy(K) |
|-----|-----------|----------------------------|----------------------------------------------------------|-------------------------|
| 34  | OH+NC4    | 0.92RO2R+0.08RO2N+0.4R2O2  | 0.38E+4                                                  | 0.0                     |
| 35  | OH+ISC4   | 0.97RO2R+0.03RO2N+0.74R2O2 | 0.35E+4                                                  | 0.0                     |
| 36  | OH+NC5    | 0.88RO2R+0.12RO2N+0.54R2O2 | 0.58E+4                                                  | 0.0                     |
| 37  | OH+ISC5   | 0.93RO2R+0.07RO2N+0.73R2O2 | 0.59E+4                                                  | 0.0                     |
| 38  | OH+NEC5   | 0.95RO2R+0.05RO2N+0.02R2O2 | 0.11E+4                                                  | 0.0                     |
| 39  | OH+CLC5   | 0.87RO2R+0.13RO2N+1.75R2O2 | 0.82E+4                                                  | 0.0                     |
| 40  | OH+NC6    | 0.82RO2R+0.18RO2N+0.74R2O2 | 0.79E+4                                                  | 0.0                     |
| 41  | OH+2MC5   | 0.87RO2R+0.13RO2N+0.75R2O2 | 0.79E+4                                                  | 0.0                     |
| 42  | OH+3MC5   | 0.89RO2R+0.11RO2N+0.86R2O2 | 0.84E+4                                                  | 0.0                     |
| 43  | OH+22MB   | 0.85RO2R+0.15RO2N+0.96R2O2 | 0.27E+4                                                  | 0.0                     |
| 44  | OH+23MB   | 0.90RO2R+0.06RO2N+0.94R2O2 | 0.80E+4                                                  | 0.0                     |
| 45  | OH+CLC6   | 0.81RO2R+0.19RO2N+0.35R2O2 | 0.12E+5                                                  | 0.0                     |
| 46  | OH+MCL5   | 0.86RO2R+0.14RO2N+2.06R2O2 | 0.10E+5                                                  | 0.0                     |
| 47  | OH+NC7    | 0.73RO2R+0.27RO2N+0.73R2O2 | 0.99E+4                                                  | 0.0                     |
| 48  | OH+3MC6   | 0.82RO2R+0.18RO2N+0.84R2O2 | 0.10E+5                                                  | 0.0                     |
| 49  | OH+24MP   | 0.87RO2R+0.13RO2N+0.84R2O2 | 0.10E+5                                                  | 0.0                     |
| 50  | OH+23MP   | 0.86RO2R+0.13RO2N+1.10R2O2 | 0.11E+5                                                  | 0.0                     |
| 51  | OH+MCL6   | 0.78RO2R+0.22RO2N+0.98R2O2 | 0.15E+5                                                  | 0.0                     |
| 52  | OH+NC8    | 0.67RO2R+0.33RO2N+0.71R2O2 | 0.12E+5                                                  | 0.0                     |
| 53  | OH+4MC7   | 0.75RO2R+0.25RO2N+0.80R2O2 | 0.13E+5                                                  | 0.0                     |
| 54  | OH+ISC8   | 0.81RO2R+0.19RO2N+0.94R2O2 | 0.69E+4                                                  | 0.0                     |
| 55  | OH+ECL6   | 0.74RO2R+0.26RO2N+1.46R2O2 | 0.18E+5                                                  | 0.0                     |
| 56  | OH+NC9    | 0.63RO2R+0.37RO2N+0.67R2O2 | 0.14E+5                                                  | 0.0                     |
| 57  | OH+4EC7   | 0.73RO2R+0.27RO2N+0.80R2O2 | 0.15E+5                                                  | 0.0                     |
| 58  | OH+NC10   | 0.60RO2R+0.40RO2N+0.66R2O2 | 0.16E+5                                                  | 0.0                     |
| 59  | OH+4PC7   | 0.70RO2R+0.30RO2N+0.78R2O2 | 0.17E+5                                                  | 0.0                     |
| 60  | OH+NC11   | 0.59RO2R+0.41RO2N+0.65R2O2 | 0.18E+5                                                  | 0.0                     |
| 61  | OH+NC12   | 0.58RO2R+0.42RO2N+0.64R2O2 | 0.20E+5                                                  | 0.0                     |
| 62  | NO+RO2R   | NO2+HO2                    | 0.11E+5                                                  | -181.0                  |
| 63  | HO2+RO2R  | HO2                        | 0.74E+4                                                  | -1000.0                 |
| 64  | NO+RO2N   | RNO3                       | 0.11E+5                                                  | -181.0                  |
| 65  | HO2+RO2N  | HO2                        | 0.74E+4                                                  | -1000.0                 |
| 66  | NO+R2O2   | NO2                        | 0.11E+5                                                  | -181.0                  |
| 67  | HO2+R2O2  | SINK                       | 0.74E+4                                                  | -1000.0                 |
| 68  | A         | H2O+A                      | 0.72E-2                                                  | 0.0                     |

Table 5: Reactions of the Alkane Portion of CB4 Mechanism

| No. | Reactants | Products                 | Rate Constants<br>(ppm <sup>-1</sup> min <sup>-1</sup> ) | Activation<br>Energy(K) |
|-----|-----------|--------------------------|----------------------------------------------------------|-------------------------|
| 31  | OH+CH4    | HO2+XO2                  | 1.14E+1                                                  | 1283.0                  |
| 32  | OH+PAR    | 0.82HO2+1.60XO2+0.16XO2N | 1.19E+3                                                  | 0.0                     |
| 33  | NO+XO2    | NO2                      | 1.19E+4                                                  | 0.0                     |
| 34  | NO+XO2N   | SINK                     | 1.00E+3                                                  | 0.0                     |
| 35  | XO2+HO2   | SINK                     | 7.91E+3                                                  | 0.0                     |
| 36  | XO2+XO2   | SINK                     | 9.89E-1                                                  | 0.0                     |
| 37  | A         | H2O+A                    | 0.72E-2                                                  | 0.0                     |

Table 6: Reactions of the Alkane Portion of SAPRC93 Mechanism

| No. | Reactants | Products                   | Rate Constants<br>(ppm <sup>-1</sup> min <sup>-1</sup> ) | Activation<br>Energy(K) |
|-----|-----------|----------------------------|----------------------------------------------------------|-------------------------|
| 31  | OH+CH4    | RO2R                       | 0.13E+2                                                  | 1283.0                  |
| 32  | OH+ALK1   | 0.72RO2R+0.06RO2N+0.41R2O2 | 5.32E+3                                                  | -141.0                  |
| 33  | OH+ALK1   | 0.21HO2+0.03CO             | 5.32E+3                                                  | -141.0                  |
| 34  | OH+ALK2   | 0.71RO2R+0.22RO2N+0.75R2O2 | 1.49E+4                                                  | -216.0                  |
| 35  | OH+ALK2   | 0.07HO2+0.01CO             | 1.49E+4                                                  | -216.0                  |
| 36  | NO+RO2R   | NO2+HO2                    | 0.11E+5                                                  | -181.0                  |
| 37  | HO2+RO2R  | HO2                        | 0.74E+4                                                  | -1000.0                 |
| 38  | NO+RO2N   | RNO3                       | 0.11E+5                                                  | -181.0                  |
| 39  | HO2+RO2N  | HO2                        | 0.74E+4                                                  | -1000.0                 |
| 40  | NO+R2O2   | NO2                        | 0.11E+5                                                  | -181.0                  |
| 41  | HO2+R2O2  | SINK                       | 0.74E+4                                                  | -1000.0                 |
| 42  | A         | H2O+A                      | 0.72E-2                                                  | 0.0                     |