HERON Acceleration Program WGB

Brief overview

INTRODUCTION

In the early 1990 a car acceleration program was developed to investigate the influence of torque & power characteristics in in combination with different gear ratios. Additionally, in the first release, also the fuel consumption was predicted.

Later, during the time at Mercedes-ILMOR, the WGB program was altered to the demands of F1 cars:
- Implementation of car velocity depending aero data (front and rear side)
- Dynamic tyre radius and surface friction coefficient ($f_{VELOCITY}$)
- Tyre slip values, wheel and engine inertia, shift speeds, centre of gravity, …

The program was verified on so-called “straight-ahead acceleration events” where no braking or cornering was applied. The main purpose of the program was to analyse the potential of different power curve characteristics, shift strategies as well as gear ratio settings.

The program code is FORTRAN based.
The input data can be defined in a BASIC program or simple by editing the input data file.
The post-processing is done in a standard EXCEL xlsm sheet/program.

If requested, HERON can improve/modify/alter the program(s) for specific costumer demands (e.g. US units).

This acceleration program can also be applied for simple automotive applications!

The following pages should give an overview about the program and its application.

For more information please contact

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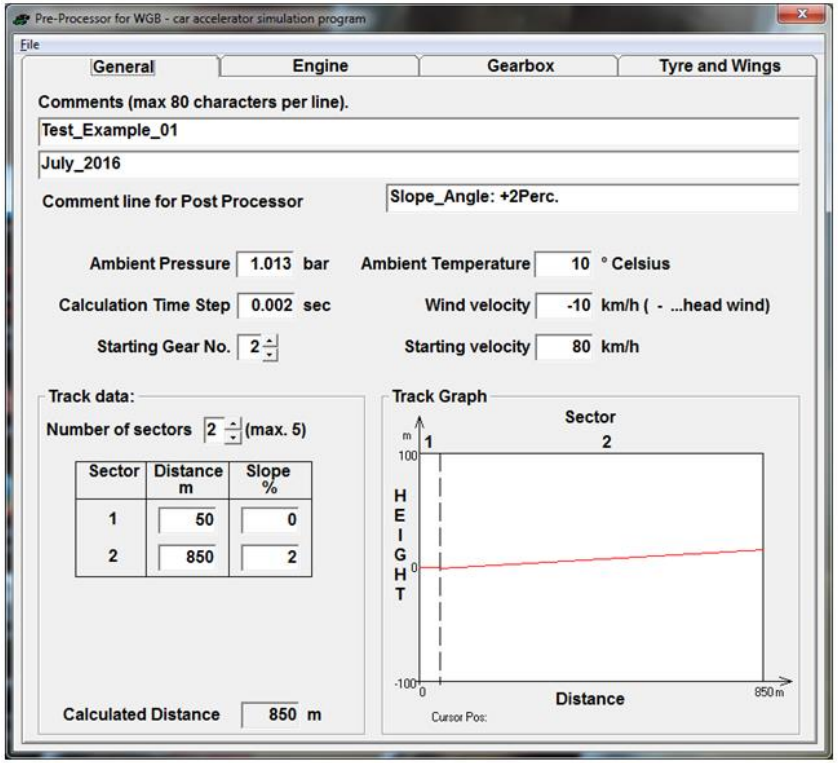
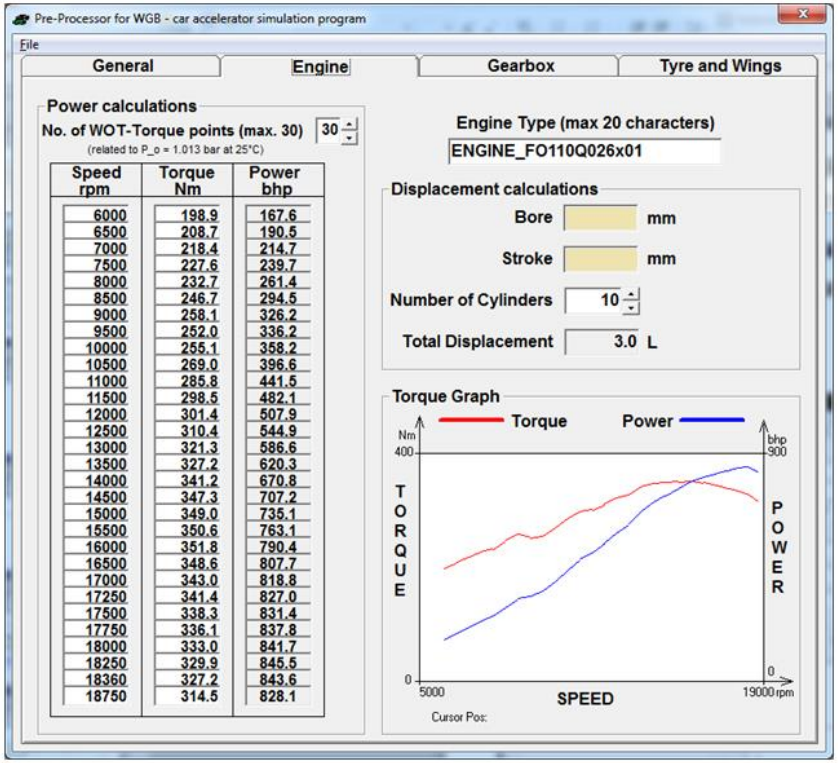
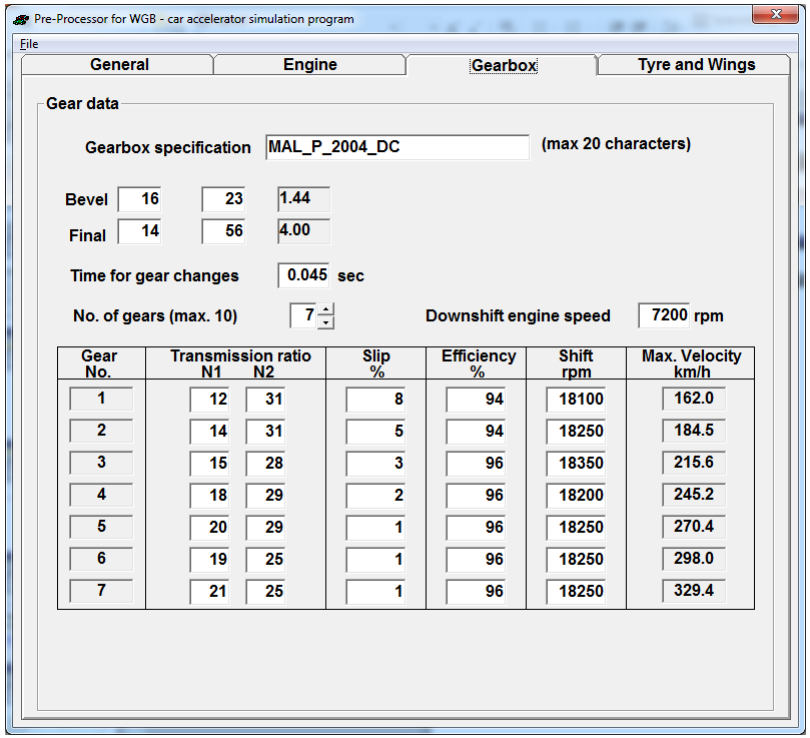
Graz, July 2016

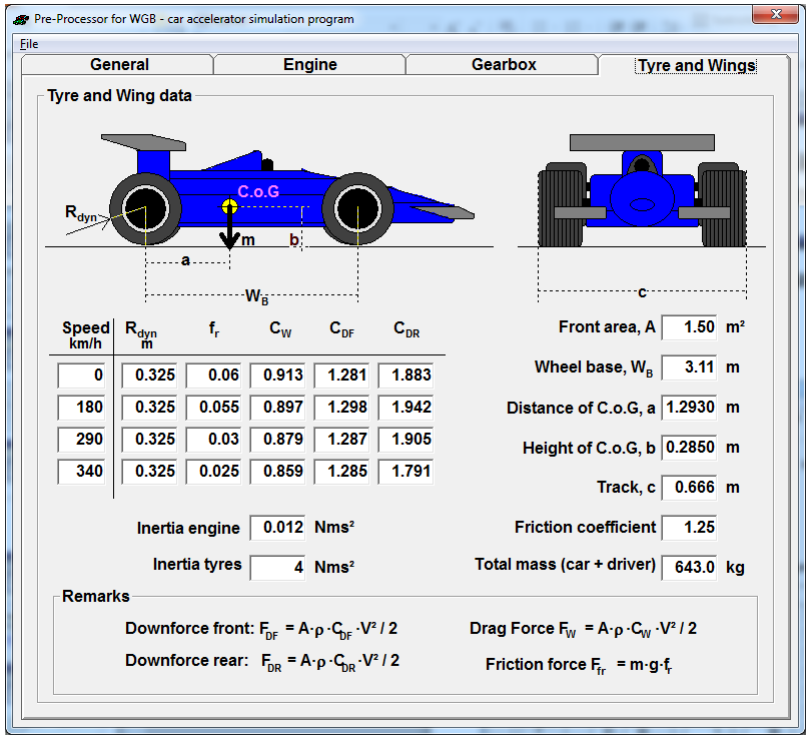
INPUT DATA (Pre-Processing 1/3)





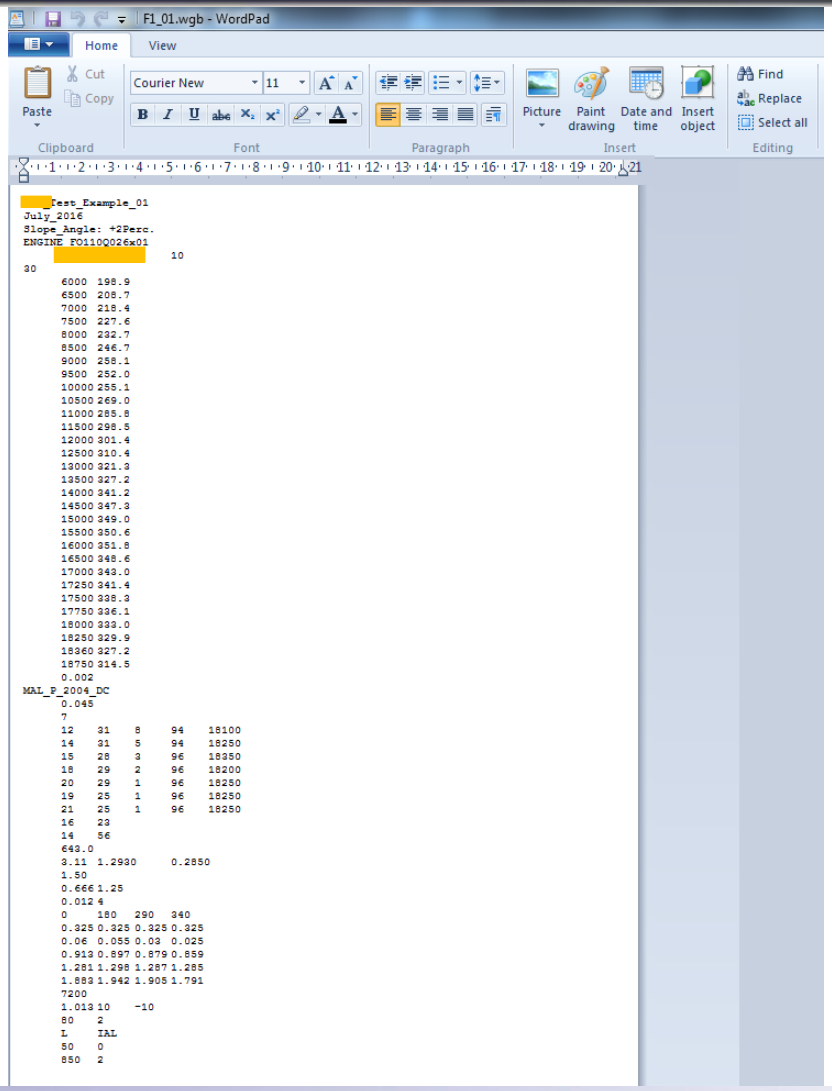
INPUT DATA (Pre-Processing 2/3)





INPUT DATA (Pre-Processing 3/3)

Data modification by simple file editing




```
      Test_Example_01
July_2016
Slope_Angle: +2Perc.
ENGINE_F0110Q026x01
                                10
30
      6000  198.9
      6500  208.7
      7000  218.4
      7500  227.6
      8000  232.7
      8500  246.7
      9000  258.1
      9500  252.0
      10000 255.1
      10500 269.0
      11000 285.8
      11500 298.5
      12000 301.4
      12500 310.4
      13000 321.3
      13500 327.2
      14000 341.2
      14500 347.3
      15000 349.0
      15500 350.6
      16000 351.8
      16500 348.6
      17000 343.0
      17250 341.4
      17500 338.3
      17750 336.1
      18000 333.0
      18250 329.9
      18360 327.2
      18750 314.5
      0.002
MAL_P_2004_DC
      0.045
      7
      12    31    8     94    18100
      14    31    5     94    18250
      15    28    3     96    18350
      18    29    2     96    18200
      20    29    1     96    18250
      19    25    1     96    18250
      21    25    1     96    18250
      16    23
      14    56
      643.0
      3.11  1.2930      0.2850
      1.50
      0.666 1.25
      0.012 4
      0     180   290   340
      0.325 0.325 0.325 0.325
      0.06  0.055 0.03  0.025
      0.913 0.897 0.879 0.859
      1.281 1.298 1.287 1.285
      1.883 1.942 1.905 1.791
      7200
      1.013 10    -10
      80    2
      L     IAL
      50    0
      850   2
```

POST - Processing: Individual in EXCEL

WGB_post_F1.xlsm

Run W G B

	No.	Name		TIME [s]	Distance [m]	VELO [km/h]
Select 1	File 1	F1_01.ERG	Slope_Angle: +2Perc.	12.763	850	302.9
Select 2	File 2	F1_02.ERG	Slope_Angle: 0_Perc.	12.707	850	305.1
Select 3	File 3	F1_03.ERG	Slope_Angle: +2Perc.	12.653	850	307.3
Select 4	File 4					
Select 5	File 5					
Input File	INPUT	F1_01.wgb	July_2016 Slope_Angle: +2Perc. ENGINE_FO110Q026x01			

Starting directory : C:\HERON-Technik\WGB

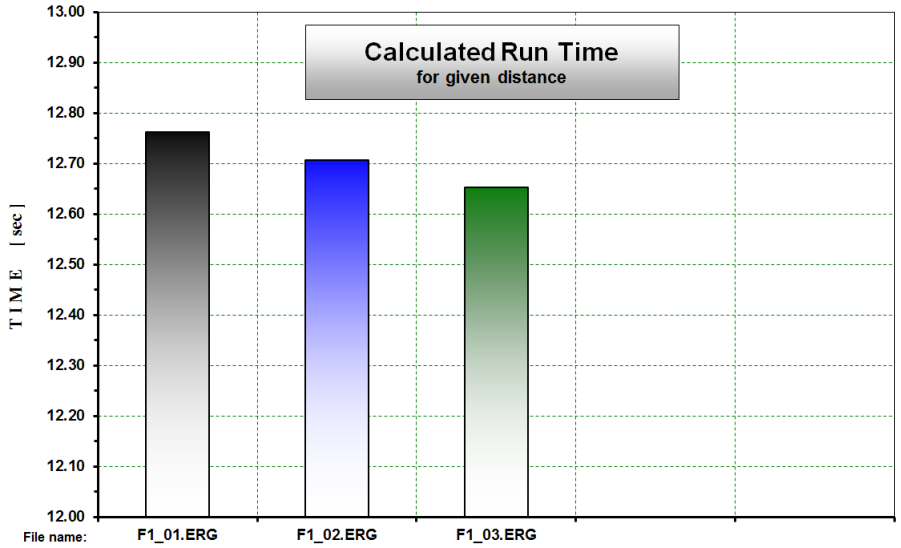
Main Sheet to load and compare results file (.erg)*

RESULTS
========

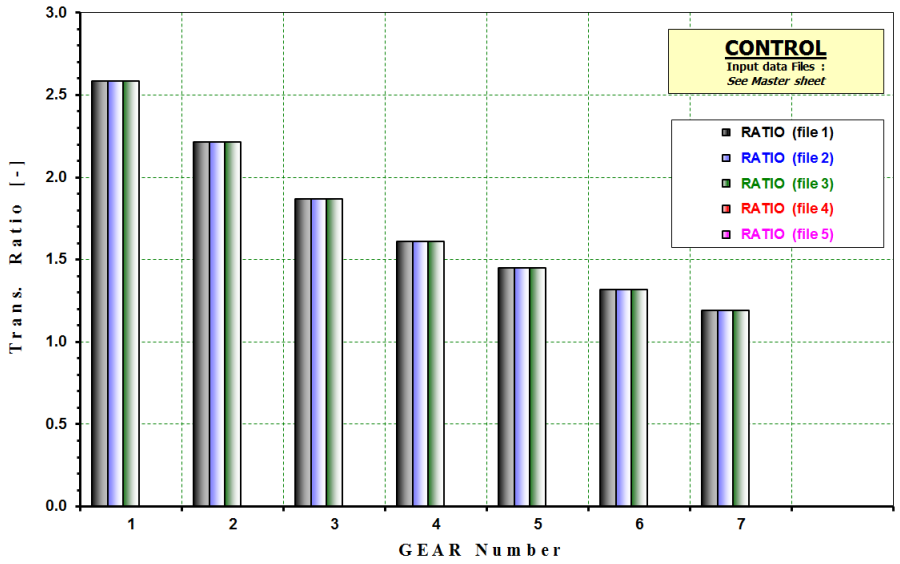
Nr [-]	TIME [sec]	X [m]	V [m/s]	v [km/h]	A [m/s2]	GEAR [-]	SPEED [rpm]	LOAD [%]	Torque [Nm]	FA [N]	ROLL [N]	WIND [N]	STEIG [N]	AV [N]	AH [N]	Power [PS]	ACC-E [rpm/s]
1	0	0	22.22	80	8.49	2	8729.0	71	185.7	6362.4	486.8	418.5	0	2682.4	5110.0	230.9	
2	0.002	0.04	22.24	80.06	8.71	2	8735.9	74	193.7	6643.3	511.6	530.4	0	2818.9	5370.4	241.0	3420.9
3	0.004	0.09	22.26	80.13	8.72	2	8742.7	74	193.8	6647.5	511.8	531.2	0	2819.6	5372.4	241.4	3422.9
4	0.006	0.13	22.27	80.19	8.72	2	8749.6	74	194.0	6651.6	511.9	531.9	0	2820.3	5374.3	241.7	3424.8
5	0.008	0.18	22.29	80.25	8.73	2	8756.4	74	194.1	6655.8	512.1	532.7	0	2821.0	5376.3	242.0	3426.8
6	0.010	0.22	22.31	80.31	8.73	2	8763.3	74	194.2	6660.0	512.3	533.4	0	2821.7	5378.2	242.4	3428.7
7	0.012	0.27	22.33	80.38	8.74	2	8770.1	74	194.3	6664.1	512.4	534.1	0	2822.4	5380.2	242.7	3430.7
8	0.014	0.31	22.34	80.44	8.74	2	8777.0	74	194.4	6668.3	512.6	534.9	0	2823.1	5382.1	243.1	3433.1
9	0.016	0.36	22.36	80.50	8.75	2	8783.9	74	194.6	6672.5	512.8	535.6	0	2823.8	5384.1	243.4	3434.6
10	0.018	0.40	22.38	80.57	8.75	2	8790.8	74	194.7	6676.7	512.9	536.4	0	2824.5	5386.0	243.7	3437.0

List of output values in the results file (.erg)*

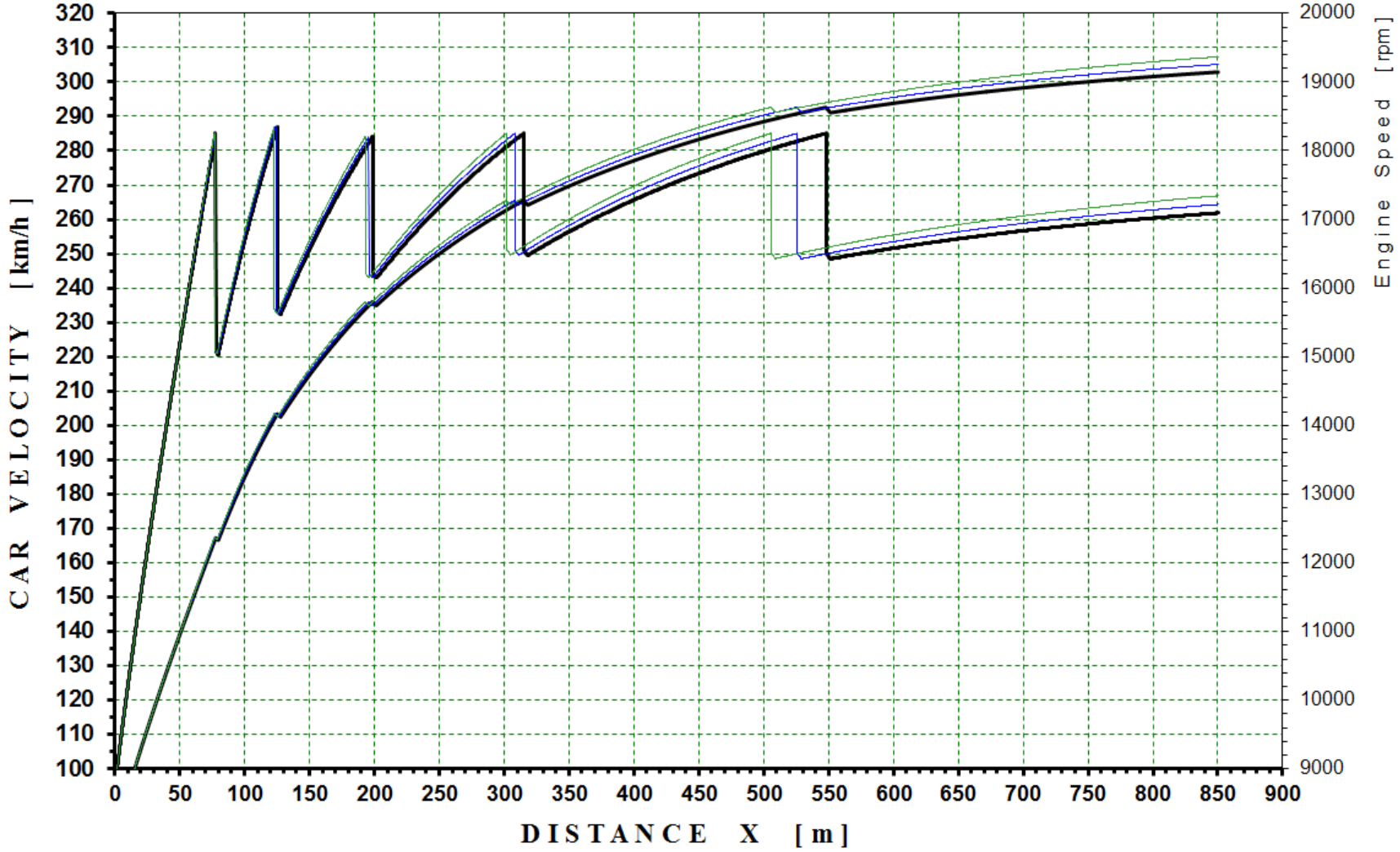
POST - Processing: Individual in EXCEL

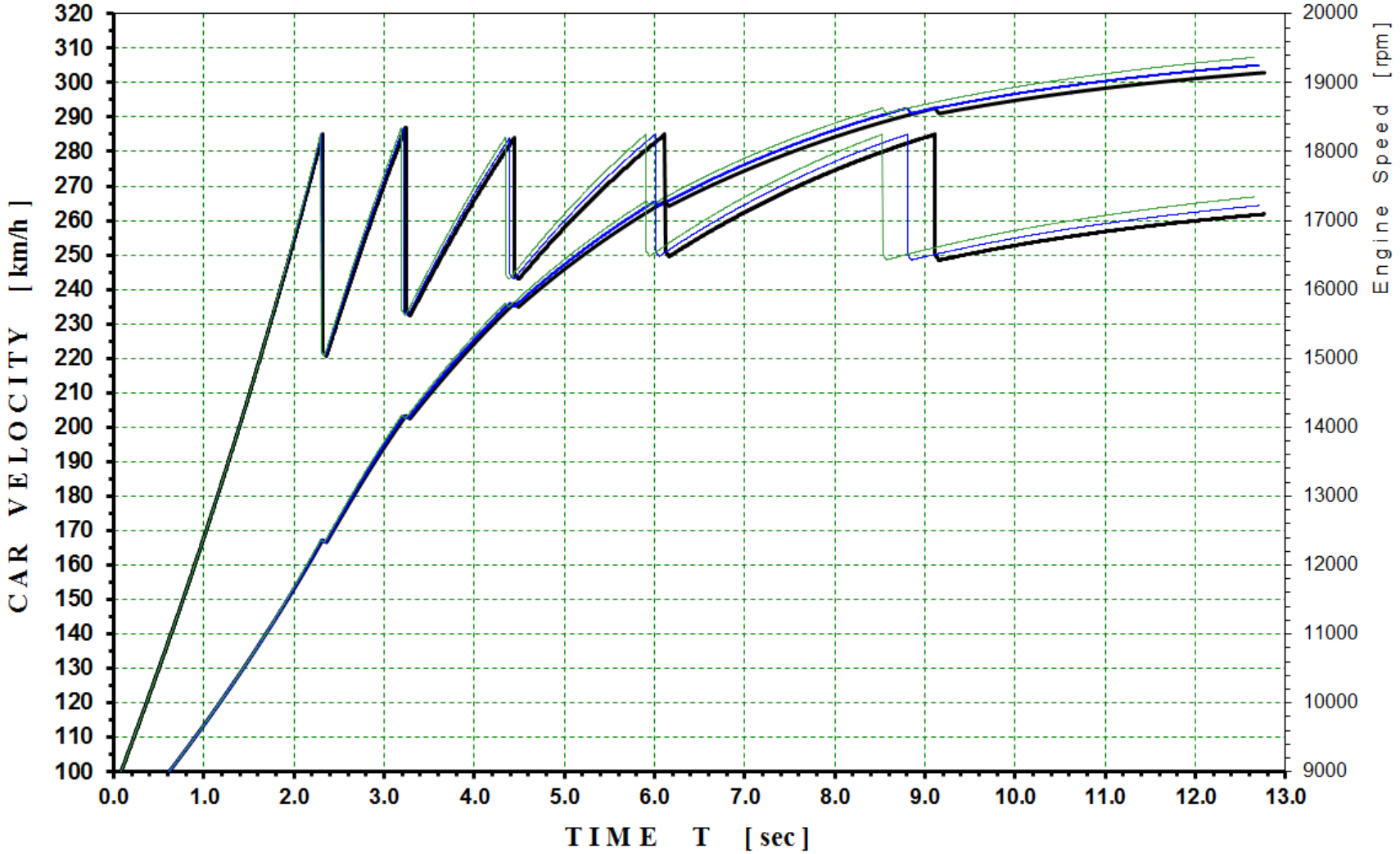


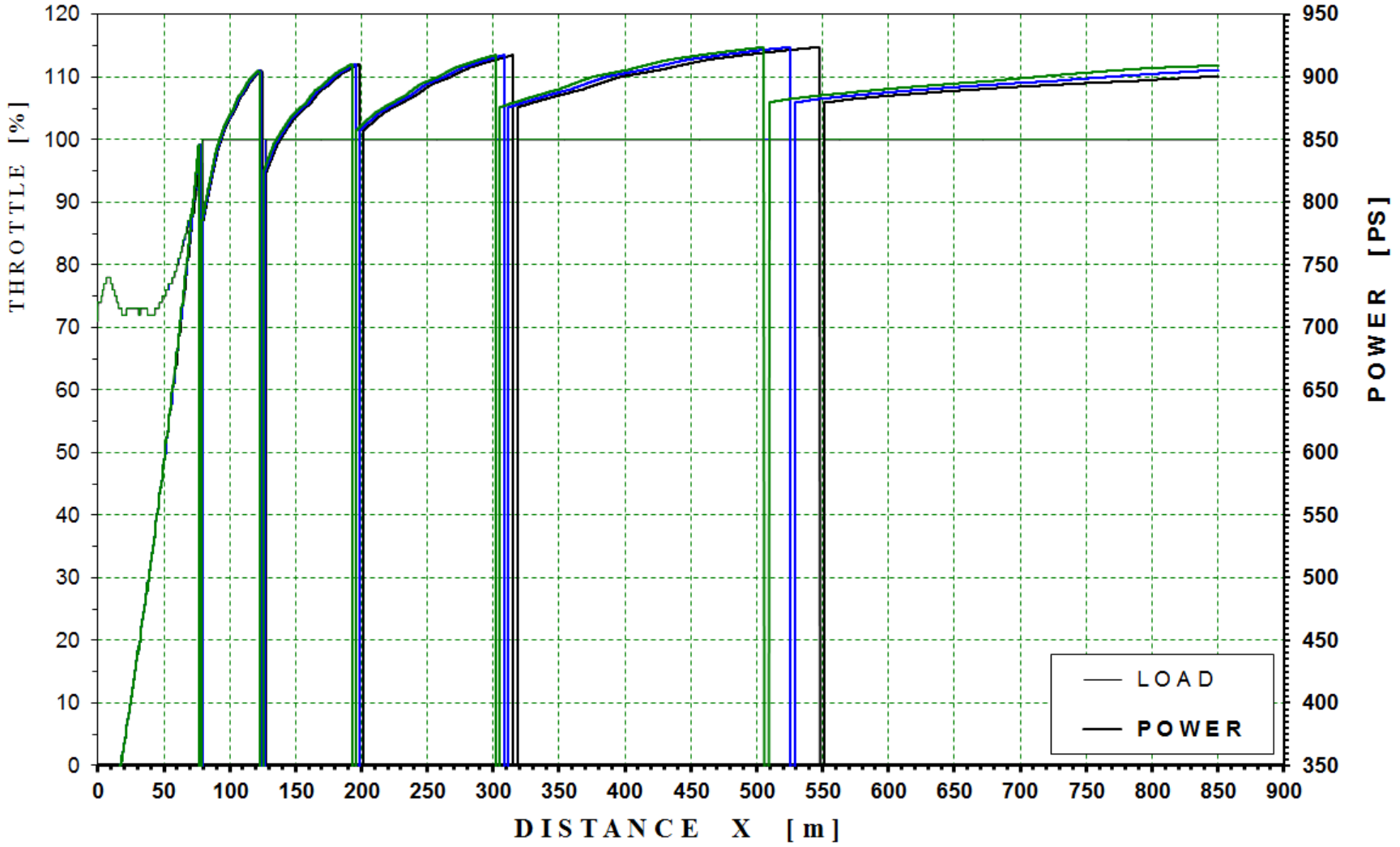
Result Sheet: calculated time



Control Sheet: assumed gear ratios


CAR VELOCITY [km/h]
320
310
300
290
280
270
260
250
240
230
220
210
200
190
180
170
160
150
140
130
120
110
100
Engine Speed [rpm]
20000
19000
18000
17000
16000
15000
14000
13000
12000
11000
10000
9000
0
50
100
150
200
250
300
350
400
450
500
550
600
650
700
750
800
850
900
DISTANCE X [m]


CAR VELOCITY [km/h]
320
310
300
290
280
270
260
250
240
230
220
210
200
190
180
170
160
150
140
130
120
110
100
Engine Speed [rpm]
20000
19000
18000
17000
16000
15000
14000
13000
12000
11000
10000
9000
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
9.0
10.0
11.0
12.0
13.0
TIME T [sec]


THROTTLE [%]
POWER [PS]
DISTANCE X [m]
LOAD
POWER
0
10
20
30
40
50
60
70
80
90
100
110
120
350
400
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