TATA	**FIR** **VEHICLE TESTING**	**29/05/2023**

FIR No :FIR/Testing-Outdoor/518100/2023/6035

Part No/ Group :51790251R

Subject :Performance evaluation of Signa 2823.T Cx RDE in comparison with Ashok Leyland 2820.T BSVI and Signa 2818.T BSVI base vehicle.

Test Vehicle	Project Name :Signa 2823.T Cx BSVI RDE Model Name : Signa 2823.T Cx BSVI RDE	Enclosures : Annexure 1 to Annexure 7
	Chasis Number : PC03505022RJ00755 Engine Number : 12L63889392	
FIR Status :	Completed	

Role	Name	Signature
Prepared By	Debabrata Das	 29-May-2023
Checked By	Swapnil Jadhav	 30-May-2023
Approved By	Ajaykumar Jadhav	 30-May-2023

Cc: Head CVBU Engg, Chief Engineer, Head COC, Project Team [Design]; Project Team [Testing]

PA 20 - F 222 / May19

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Documents : Please click here

FIR_Testing_Outdoor_51810..

Subject: -	Performance evaluation of Signa 2823.T Cx RDE in comparison with Ashok Leyland 2820.T BSVI and Signa 2818.T BSVI base vehicle.	
➢ **Conclusion:**		
➢ **Signa 2823.T Cx RDE in comparison with Ashok Leyland 2820.T BSVI**		
• Overall performance of Signa 2823.T Cx BSVI RDE is better as compared to Ashok Leyland 2820.T BSVI. PALS position achieved "AL" against "AL"	--	--
➢ **Signa 2823.T Cx RDE in comparison with Signa 2818.T BSVI**	--	--
• Overall performance of Signa 2823.T Cx BSVI RDE is better as compared to Signa 2818.T BSVI base vehicle.		
1.1 Acceleration:		
➢ **Signa 2823.T Cx RDE in comparison with Ashok Leyland 2820.T BSVI**	--	--
• Acceleration (0-60 kmph) of Signa 2823.T Cx BSVI RDE was found to be **49.47** Sec. Signa 2823.T BSVI RDE is **1.90%** better as compared to Ashok Leyland 2820.T BSVI vehicle and meets PALS target.		
• Acceleration (0-1000m) of Signa 2823.T Cx BSVI RDE was found to be **75.22** Sec. Signa 2823.T Cx BSVI RDE is **0.82%** better as compared to Ashok Leyland 2820.T BSVI vehicle and meets PALS target.	--	--
➢ **Signa 2823.T Cx RDE in comparison with Signa 2818.T BSVI**		
• Acceleration (0-60 kmph) of Signa 2823.T Cx BSVI RDE is **negative at par** as compared to Signa 2818.T BSVI vehicle.	VI/ENG	C
• Acceleration (0-1000m) of Signa 2823.T Cx BSVI RDE is **negative at par** as compared to Signa 2818.T BSVI vehicle.	VI/ENG	C
1.2 Wide open throttle drivability:		
➢ **Signa 2823.T Cx RDE in comparison with Ashok Leyland 2818.T BSVI**		
• In gear drivability of Signa 2823.T Cx BSVI RDE vehicle was found to be **2.25** kmph/s, **2.04** kmph/s, **1.72** kmph/s, **1.10** kmph/s, **0.80** kmph/s, and **0.57** kmph/s in 1st , 2nd , 3rd , 4th , 5th and 6th gear respectively.	--	--

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• Rate of acceleration of Signa 2823.T Cx BSVI RDE vehicle is superior to AL 2820.T BSVI in 1st, 2nd & 3rd gears and inferior to AL 2820.T in 4th, 5th & 6th Gear.		
1.3 <u>Bathtub drivability:</u>		
➢ **<u>Signa 2823.T RDE in comparison with Ashok Leyland 2820.T</u>**		
• Bathtub drivability of Signa 2823.T Cx BSVI RDE vehicle was found **better** as compared to Ashok Leyland 2820.T BSVI vehicle in 4th, 5th & 6th gear and meets PALS revised target.	--	--
➢ **<u>Signa 2823.T BSVI RDE in comparison with Signa 2818.T BSVI</u>**		
• Bathtub drivability of Signa 2823.T Cx BSVI RDE vehicle was found **superior** to Signa 2818.T BSVI vehicle in all gears.	--	--
1.4 <u>Sustain and Restart Gradability:</u>		
➢ **<u>Signa 2823.T Cx BSVI RDE in comparison with Ashok Leyland 2820.T BSVI</u>**		
• Sustain gradeability of Signa 2823.T Cx BSVI RDE was found to be **30.25 %.** Signa 2823.T Cx BSVI RDE is **17.25%** superior as compared to Ashok Leyland 2820.T BSVI vehicle.	--	--
• Restart gradeability of Signa 2823.T Cx BSVI RDE was found to be **24.93%.** Signa 2823.T Cx BSVI RDE is **16.93%** superior as compared to Ashok Leyland 2820.T BSVI vehicle.	--	--
➢ **<u>Signa 2823.T Cx BSVI RDE in comparison with Signa 2818.T BSVI</u>**		
➢ Sustain gradeability of Signa 2823.T Cx BSVI RDE is **8.93%** superior as compared to Signa 2818.T BSVI base vehicle.	--	--
➢ Restart gradeability of Signa 2823.T Cx BSVI RDE is **8.20%** superior as compared to Signa 2818.T BSVI base vehicle.		
FIR Status	Page 2 of 5	
2.0 <u>Result:</u> Wide observation.		

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FAILURES CLASS:

A: Failure that happen without warning. Detrimental to vehicle / personnel, road users and safety. Can cause death / hospitalization. Noncompliance of regulatory requirement.

B: Vehicle gets crippled with sufficient warning. Minor injury to occupant & road users (First aid only). Premature failures / repeated failures. Leads to consequential catastrophic damages. Need immediate attention.

C: Customer irritants. Capable of damaging aesthetics. Failure can be attended at next servicing Schedule.

D: Customer perception issues and minor irritants.

3.0 Test Vehicle:

1. Signa 2823.T Cx BSVI RDE (ERC – 1219)
   Chassis No. – PC03505022RJ00755
   Engine No. – 12L63889392

Input Doc Ref. : Testing-Outdoor/15076

DID No : NA

DDP No : NA

Enclosures:

Annexure 1: Panel chart
Annexure 2: PAT Sheet
Annexure 3: PAT Summary
Annexure 4: Test request
Annexure 5: Test plan
Annexure 6: EOL

Work Order No. :- P.21.EA.501	**Make :-** Tata Motors Ltd	**T I No. –** 42070

Earlier Ref: -

- FIR/Testing-Outdoor/ 508500/2021/3980 Report on performance evaluation of Ashok Leyland 2820 HG BSVI vehicle in Comparison with Signa 2818.T Ashwamedh and Signa 2821.T 5L BSVI vehicle.

4.0 Project Status: DR3

5.0 Introduction:

- As a part of RDE program, Signa 2823.T Cx BSVI RDE vehicle was offered for performance evaluation, Ashok Leyland 2820.T BSVI was taken as core benchmark and Signa 2818.T BSVI vehicle was taken as Base for performance comparison. This report will reveal detail of this trial with the status.

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6.0 Testing

➢ Following test was conducted during trials.

Sr. No.	Test Description	Standard Referred	Instrument used
1	Acceleration	TST_VT_WG_0002	VBOX SX with GPS, Weighbridge (CRS Gate)
2	WOT Drivability	TST_VT_WG_0002	
3	Bath -Tub Drivability	TST_VT_WG_0261	
4	Gradability	TST_VT_WG_11	
5	Restart Gradability	TST_VT_WG_127	
6	Coastdown	TST_VT_WG_36	

7.0 Vehicle details:

Sr. No.	Parameters			Base Vehicle : OBD-1	Core Benchmark	Test Vehicle : OBD-2
				SIGNA 2818.T BSVI	AL 2820.T BSVI	SIGNA 2823.T RDE BSVI
1	Vehicle Identification No. (ERC No. /EJ No./Reg. No.)			ERC-1183	--	ERC-1219
2	Vehicle GVW/GCW		kg	28000	28000	28000
3	Engine Details (Make/cc/Norms/no. of Cyl.)			Cummins BS-VI Ashwamedh 5.6lit	H-Series CRS BSVI	Cummins BS-VI Ashwamedh 5.6lit
	Engine Max Power			180 HP @ 2300 rpm	200 hp @ 2400 rpm	220 HP
	Engine Max Torque			850Nm @ 1000-1600 rpm	700 Nm @ 1200-1900 rpm	925Nm @ 1000-1300rpm
	Engine Calibration Maturity Level			As per production released	As per production released	95% Cal Maturity(XWTPA19850)
4	Regeneration Strategy (Time ase/Soot base)			Time Based (100 Hrs)	--	Time Based (100 Hrs)
5	Gear Box (make/drive/FGR)			G950-FGR - 9.36,DD	ZF 6S-850 Gearbox	G950-FGR - 9.36,DD
	Gear Ratios			1-9.36, 2- 5.20, 3- 3.05, 4- 1.84, 5- 1.33, 6- 1.00	1st: 8.51, 2nd: 4.66, 3rd: 2.73, 4th: 1.78, 5th: 1.27, 6th: 1, Rev:7.64	1-9.36 , 2-5.20 , 3-3.04 , 4-1.83 , 5-1.32 , 6-1.0
6	RAR			4.88	5.57	4.88
7	Tyre Details			All 295/90R 20 (Apollo Make)	F1 - Apollo 295/90R 20 16PR R1, R2 - Apollo 295/90R 20 16PR	All 295/90R 20 (Bridgestone Make)
8	LBSC	High & Low Engine Speed Breakpoint	RPM	1900 rpm,1900 rpm	--	1900, 1900
		Vehicle Mass Threshold	kg	28000.00	--	28000
	VAM	Variable Acceleration 1, 2	kmph/sec	2.5,2.5	--	2.5,2.5
		Variable Acceleration Speed 1, 2	kmph	10, 40	--	10,40
	GDP	GD Max. Veh. Speed (Heavy & Light Engine Load)	kmph	50, 50	--	50,50
	RSG	Maximum Accelerator Vehicle Speed	kmph	80.00	80	80
	Torque Factor	Torque Limit Medium Adjustment Factor	Balance	100%	--	105%
		Torque Limit Maximum Adjustment Factor	Economy	100%	--	115%
	PTP	Powertrain Protection (Enable / Disable)		Disable	Disable	Disable
		Torque Limit	Nm	NA	NA	NA
	USFE / Torque Table Revision (1/2/3/n)			USFE-1	--	USFE-1
9	Fan Details (type/make/blades)			24'' E-Viscous, Make - Behr , 11 no's blade	--	24'' E- Viscous fan
10	Base Cal Improvement (Cal Maturity %)			As per production released	As per production released	95% Cal Maturity

Vehicle Photographs		NA	

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8.0 Torque table:-

Signa 2823.T – Test vehicle

- **Balance mode (TF – 115 %)**

	600	800	1000	1200	1400	1600	1800	2000	2200	2400	2600	2800
1	500	500	850	753	400	400	400	400	400	400	80	0
1.33	500	500	850	800	753	543	400	400	400	400	80	0
1.84	500	500	850	800	753	543	400	400	400	400	80	0
3.05	500	500	850	800	800	753	543	400	400	400	80	0
5.2	450	500	850	850	850	850	772	694	616	412	80	0
9.36	450	500	850	850	850	850	772	694	616	412	80	0

- **Economy mode (TF – 105 %)**

	600	800	1000	1200	1400	1600	1800	2000	2200	2400	2600	2800
1	500	500	850	753	400	400	400	400	400	400	80	0
1.33	500	500	850	800	753	543	400	400	400	400	80	0
1.84	500	500	850	800	753	543	400	400	400	400	80	0
3.05	500	500	850	800	800	753	543	400	400	400	80	0
5.2	450	500	850	850	850	850	772	694	616	412	80	0
9.36	450	500	850	850	850	850	772	694	616	412	80	0

Signa 2818.T – Base vehicle

- **Balance mode (TF – 100 %)**

	600	800	1000	1200	1400	1600	1800	2000	2200	2400	2600	2650
1	570	650	600	600	600	600	550	550	550	486	100	5
1.33	570	650	600	600	600	600	550	550	550	486	100	5
1.84	570	650	650	650	600	600	550	550	500	486	100	5
3.05	570	650	650	650	600	600	550	550	500	486	100	5
5.2	570	650	925	925	915	850	790	732	692	486	100	5
9.36	570	650	925	925	915	850	790	732	692	486	100	5

- **Economy mode (TF – 100 %)**

	600	800	1000	1200	1400	1600	1800	2000	2200	2400	2600	2650
1	570	650	450	450	450	450	400	400	400	400	100	5
1.33	570	650	450	450	450	450	400	400	400	400	100	5
1.84	570	650	600	550	550	500	450	450	450	400	100	5
3.05	570	650	600	550	550	500	450	450	450	400	100	5
5.2	570	650	925	925	915	850	790	732	692	486	100	5
9.36	570	650	925	925	915	850	790	732	692	486	100	5

- **9.0 Observation:-**

Overall performance Signa 2823.T Cx BSVI RDE is better as compared to Ashok Leyland 2820.T BSVI and PALS position achieved "AL" against "AL".

10. Future testing:- As per further development.

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Annexure 1

Level 1 Attribute:

PAT- Performance and Drivability

PANEL chart

VE CVBU/ PD/00

Specification:
Max Power-220 hp @ 2300 rpm
Max Torque - 925 Nm 1000-1300 rpm
Driveline : G-950 DD | 4.88 RAR | 295/90R 20 Tyres | 3 Mode FE Switch | Torque Factor: E-115% ; B-105%
EOL Parameters : LBSC: 1800,1800 RPM | VAM: 2.5,2.5 kmph/s @ 10,40 kmph | GDP: 45,45 kmph | RSG: 80 kmph | PTP: Disable

Panel Chart No.: VE CVBU/ M&HCV/ Signa 2823.T Cx BSVI RDE Ashwamedh/ PD/00

Programme / MY : SIGNA 2823.T Cx 5.6L BSVI RDE | **Gateway :** DR3 | **Owner: Ajaykumar Jadhav** | **Project Name:** SIGNA 2823.T 5.6L BSVI RDE(Cx Version) | **Date:** 29/05/2023

Level 1 Summary:

		PALS	Status: Current/ Gateway	Status: Job#1 Predicted
PALS	**Level 1:**	**AL**	**AL**	

Statement Of Intent (SOI) or DNA Description:

Performance: Haulage application

Fuel Economy: Haulage application

Attribute Target Summary:

Level 2	Level 3	Level 4	Level 5	Level 6	PALS	Metric	Current Target: w.r.t Ashok Leyland 3520.T BSVI	Status: Current/Gateway SIGNA 2823.T Cx BSVI RDE	Base Vehicle: Signa 2818.T BSVI	Competitor Data BS VI: Core Benchmark Ashok Leyland 2820.T	Competitor Data BS VI: Adjecent Benchmark	Remarks
								Heavy mode	Heavy mode	--	--	
Specification								**LBSC - 1900,1900,28000 Kg VAM- 2.5 Kmph/s, 2.5Kmph/s, 10 kmph, 40kmph GDP- 50 kmph, 50 kmph RSG - 80kmph**	**LBSC - 1900,1900,28000 Kg VAM- 2.5 Kmph/s, 2.5Kmph/s, 10 kmph, 40kmph GDP- 50 kmph, 50 kmph RSG - 80kmph**	--	--	--
Vehicle GVW (Payload)						kg		28000	28000	28000	--	--
Power (Max) @ rpm						HP		220 hp @ 2300 rpm	180 hp @ 2300 rpm	200 hp @ 2400 RPM	--	
Power to Weight ratio						HP / Ton		7.86	6.43	7.14	--	
Torque (Max) @ rpm						Nm		925 Nm @ 1000-1300 rpm	850 Nm @ 1000-1600 rpm	700 Nm at 1200-2000 rpm	--	
Torque to Weight ratio						Nm / Ton		33.04	30.36	25.00	--	
Tyres size						~		Bridgestone 295/90R20	Apollo 295/90 R20	Apollo JK Tyres 295/90 R20	--	
Gear Box Ratios						~		G950 DD, FGR -9.36	G950 DD, FGR -9.36	Eaton DD 6S Gearbox	--	
Final Drive Ratio						~		4.88	4.88	5.57	--	
Acceleration at rated load					**AL**			**AL**				
0-60 kmph						Sec	**≤ 53.23**	**49.47**	49.38	50.43	--	
0-1000 m						Sec	**≤ 80.04**	**75.22**	74.89	75.84	--	
Bathtub Drivability (Time) at Rated load					**AL**			**AL**				
3rd Gear												
15 - 20 Kmph						sec	**≤ 4.3**	**4.27**	3.05	3.24	--	
20 - 25 Kmph						sec	**≤ 3.0**	**3.00**	--	2.48	--	
25 - 30 Kmph						sec	**≤ 3.0**	**2.93**	--	2.62	--	
4th Gear												
20 - 25 Kmph						sec	**≤ 5.66**	5.00	5.66	4.55	--	
25 - 30 Kmph						sec	**≤ 4.33**	3.85	3.97	4.33	--	
30 - 35 Kmph						sec	**≤ 3.89**	3.11	3.42	3.89	--	
5th Gear												
30-40 kmph						sec	**≤ 12.83**	**11.46**	11.53	12.83	--	
40-50 kmph						sec	**≤ 12.74**	**9.76**	10.67	12.74	--	
50-60 kmph						sec	**≤ 14.14**	**--**	--	14.14	--	
6th Gear												
30-40 kmph						sec	**≤ 27.76**	**26.35**	27.76	17.44	--	
40-50 kmph						sec	**≤ 17.68**	**15.49**	15.79	17.68	--	
50-60 kmph						sec	**≤ 17.77**	**12.45**	14.89	17.77	--	
60-70 kmph						sec	**≤ 20.12**	**15.66**	--	20.12	--	
Gradeability at rated load					**AL**			**AL**				
Sustain Gradeability						%	**≥25.8**	**30.25**	27.77	25.80	--	--
Restart Gradeability						%	**≥21.32**	**24.93**	23.04	21.32	--	

Executive Summary:

1. Ashok Leyland 2820.T BSVI have been taken for target setting.
2.2nd Gear(15-20 Kmph, 20-25 kmph, 25 - 30 Kmph), 4th Gear (20 - 25 kmph) and 6th (30 - 40 Kmph) Gear Bath-tub driveability target is balanced as per target balancing sign off report
3. Signa 2823.T Cx BSVI RDE was having 95% engine calibration maturation.
4.Target has been taken at-par as per Cx variant approach

Tested by:	Verified and Approved by:
Debabrata Das / Swapnil Jadhav PAT Engineer	Ajaykumar Jadhav / Sanjeev Kumar PAT Lead / Project Lead

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Enclosed with FIR/Testing-Outdoor/518100/2023/6035

TATA MOTORS LTD.
ERC,PUNE

PAT ATTRIBUTES SHEET
Performance and Drivability | Vehicle-level Engine Calibration
Features / End of Line | OBDII and Diagnostics

Document Version: VE CVBU/PD/00

Document Revision No.: VE CVBU/ M&HCV/ Signa 2823T Cx RDE Ashwamedh/ 00

Department Name: Vehicle Engineering

Project Name: Signa 2823.T Atulya Cx BSVI RDE

Date: 29/05/2023

Sr.No.	Aggregate and test parameter: Level 2	Level 3	Level 4	Level 5	Level 6	Level 7	Unit	Test Type	Classification @DR3	Ref.Standard / Work Guideline	Simulation	Base Vehicle: Signa 2818.T 5.6L Aswamedh BSVI G950 DD 6S RAR 4.88	Core Benchmark: Ashok Leyland 2820.T Eaton 6 Speed DD RAR 5.57	Target	Test Vehicle: Signa 2823.T Cx RDE BSVI G950 DD RAR 4.88	Status (RYG)	Remarks	CoC Remark
A	**Performance Evaluation**								Heading			LBSC - 1900,1900,28000 Kg VAM- 2.5 Kmph/s, 2.5Kmph/s, 10 kmph, 40kmph GDP- 50 kmph, 50 kmph RSG - 80kmph	--	--	LBSC - 1900,1900,28000 Kg VAM- 2.5 Kmph/s, 2.5Kmph/s, 10 kmph, 40kmph GDP- 50 kmph, 50 kmph RSG - 80kmph	--	1. Ashok Leyland 2820.T BSVI have been taken for target setting. 2.2nd Gear(15-20 Kmph, 20-25 kmph, 25 - 30 Kmph), 4th Gear (20 - 25 kmph) and 6th (30 - 40 Kmph) Gear Bath-tub driveability target is balanced as per target balancing sign off report 3. Signa 2823.T Cx BSVI RDE was having 95% engine calibration maturation. 4.Target has been taken at-par as per Cx variant approach	
1.1	Minimum speed								Heading			Heavy Mode			Heavy Mode	--		
1.1.1			1st gear				Kmph	Standard	Specification	TST/VT/WG/02		3.2	2.7	--	2.8	--	--	
1.1.2			2nd gear				Kmph		Specification			5.8	5.3		4.9	--	--	
1.1.3			3rd gear				Kmph		Specification			10.1	8.6		8.6	--	--	
1.1.4			4th gear				Kmph		Specification			16.4	12.8		14.2	--	--	
1.1.5			5th gear				Kmph		Specification			21.9	18.9		19.3	--	--	
1.1.6			6th gear				Kmph		Specification			29.4	23.8		26.3	--	--	
1.1.7			7th gear				Kmph		Specification			NA	NA		NA	--	--	
1.1.8			8th gear				Kmph		Specification			NA	NA		NA	--	--	
1.2	Maximum speed								Heading							--		
1.2.1			1st gear				Kmph	Standard	Specification	TST/VT/WG/02		10.9	12.4	--	7.9	--	--	
1.2.2			2nd gear				Kmph		Specification			19.8	21.1		14.1	--	--	
1.2.3			3rd gear				Kmph		Specification			33.7	34.7		26.1	--	--	
1.2.4			4th gear				Kmph		Specification			48.3	51.7		48.4	--	--	
1.2.5			5th gear				Kmph		Specification			49.6	71.4		51.2	--	--	
1.2.6			6th gear				Kmph		Specification			76.6(1900 RPM)	74.96(1700 RPM)		79.7	--	--	
1.2.7			7th gear				Kmph		Specification			NA	NA		NA	--	--	
1.2.8			8th gear				Kmph		Specification			NA	NA		NA	--	--	
1.2.9			Vehicle maximum speed				Kmph		Specification				80.0	**80**	80	G	--	
1.4	Acceleration								Heading							--		
1.4.2			**AC Off**					Standard	Heading	TST/VT/WG/02						--		
1.4.2.1			0-60 kmph (0-37 mph)				Sec		Target			49.38	50.43	**≤ 50.43**	49.47	G		
1.4.2.4			0-1000 m				Sec		Target			74.89	75.84	**≤ 75.84**	75.72	G		
1.5	Grad ability								Heading							--		
1.5.2			**AC Off**						Heading							--		
1.5.2.1			Maximum (sustained) Gradeability (forward)				%	Standard	Target	TST/VT/WG/011		27.77	25.8	**≥25.8**	30.25	G	--	
1.5.2.2			Max Restart Gradeability (forward)				%	Standard	Target	TST/VT/WG/127		23.04	21.32	**≥21.32**	24.93	G		
1.6	Coast down ($a+bV^2$)								Heading							--		
1.6.2			**Laden condition**						Heading	TST/VT/WG/36						--	--	
1.6.2.1			Power consumed at 40 kmph				kW	Standard	Data Generation			--	--	--	--	NA		
1.6.2.2			a				N		Data Generation			--	--	--	--	NA		
1.6.2.3			b				N/kmph^2		Data Generation			--	--	--	--	NA		
1.6.2.4			Coeff of rolling resistance				--		Data Generation			--	--	--	--	NA		
B	**Drivability Evaluation**								Heading							--		
1.3	WOT Drivability (AC Off)								Heading							--		
1.3.1			1st gear 4-6 Kmph				Sec	Standard	Data Generation	TST/VT/WG/02		1.02	0.84	--	0.89	--	--	
1.3.2			2nd gear 8-12 Kmph				Sec		Data Generation			1.92	2.32	--	1.96	--		
1.3.3			3rd gear 12- 20 Kmph				Sec		Data Generation			4.86	6.04	--	4.64	--		
1.3.4			4th gear 19- 31 Kmph				Sec		Data Generation			10.18	9.95	--	10.90	--		
1.3.5			5th gear 25 - 42 Kmph				Sec		Data Generation			20.32	21.22	--	21.14	--		
1.3.6			6th gear 36 - 50 kmph				Sec		Data Generation			22.67	23.40	--	24.36	--		
1.3.10			**AC Off (Rate of acceleration)**						Heading							--		
1.3.11			1st gear 4-6 Kmph				Kmph/sec		Data Generation			1.96	2.38	--	2.25	--		
1.3.12			2nd gear 8-12 Kmph				Kmph/sec		Data Generation			2.08	1.72	--	2.04	--		
1.3.13			3rd gear 12- 20 Kmph				Kmph/sec		Data Generation			1.65	1.32	--	1.72	--		
1.3.14			4th gear 19- 31 Kmph				Kmph/sec		Data Generation			1.18	1.21	--	1.10	--		
1.3.15			5th gear 25 - 42 Kmph				Kmph/sec		Data Generation			0.84	0.80	--	0.80	--		
1.3.16			6th gear 36 - 50 kmph				Kmph/sec		Data Generation			0.62	0.60	--	0.57	--		
1.4	Bathtub Curve - Part Throttle Drivability (AC Off)								Heading							--		
1.4.7			**2nd gear**					Standard	Heading	TST/VT/WG/261							1. Ashok Leyland 2820.T BSVI have been taken for target setting. 2.2nd Gear(15-20 Kmph, 20-25 kmph, 25 - 30 Kmph), 4th Gear (20 - 25 kmph) and 6th (30 - 40 Kmph) Gear Bath-tub driveability target is balanced as per target balancing sign off report 3. Signa 2823.T Cx BSVI RDE was having 95% engine calibration maturation. 4.Target has been taken at-par as per Cx variant approach	
1.4.13			**3rd gear**						Heading									
1.4.14			15 - 20 Kmph				sec		Target			3.05	3.24	**≤ 4.3**	4.27	G		
1.4.15			20 - 25 Kmph				sec		Target			--	2.48	**≤ 3.0**	3.00	G		
1.4.16			25 - 30 Kmph				sec		Target			--	2.62	**≤ 3.0**	2.93	G		
1.4.1			**4th gear**						Heading									
1.4.4			20 - 25 Kmph				sec		Target			5.66	4.55	**≤ 5.66**	5.00	G		
1.4.5			25 - 30 Kmph				sec		Target			3.97	4.33	**≤ 4.33**	3.85	G		
1.4.6			30 - 35 Kmph				sec		Target			3.42	3.89	**≤ 3.89**	3.11	G		
1.4.8			**5th gear**						Heading									
1.4.9			30-40 kmph				sec		Target			11.53	12.83	**≤ 12.83**	11.46	G		
1.4.10			40-50 kmph				sec		Target			10.67	12.74	**≤ 12.74**	9.76	G		
1.4.11			50-60 kmph				sec		Target			--	14.14	**≤ 14.14**	--	--		
1.4.13			**6th gear**						Heading									
1.4.14			30-40 kmph				sec		Target			27.76	17.44	**≤ 27.76**	26.35	G		
1.4.9			40-50 kmph				sec		Target			15.79	17.68	**≤ 17.68**	15.49	G		
1.4.15			50-60 kmph				sec		Target			14.89	17.77	**≤ 17.77**	12.45	G		
1.4.16			60-70 kmph				sec		Target			--	20.12	**≤ 20.12**	15.66	G		
1.5	Cold Drivability (In cold state- after the vehicle is soaked for 1 night and trial done in first shift)								Heading							--		
1.5.1			1st gear				sec	Standard	Data Generation				--	As Per Simulation / 5 % better than competitor	--	--	--	
1.5.2			2nd gear				sec		Data Generation				--		--	--	--	
1.5.3			3rd gear				sec		Data Generation				--		--	--	--	
1.5.4			4th gear				sec		Data Generation				--		--	--	--	
1.5.5			5th gear				sec		Data Generation				--		--	--	--	
1.5.6			6th gear				sec		Data Generation				--		--	--	--	
1.5.7			7th gear				sec		Data Generation				--		--	--	--	
1.5.8			8th gear				sec		Data Generation				--		--	--	--	
1.5.9			9th gear				sec		Data Generation				--		--	--	--	
1.5.9			**Rate of acceleration in cold Drivability**						Heading							--		
1.5.10			1st gear				Kmph/sec	Standard	Target				--		--	NA	--	
1.5.11			2nd gear				Kmph/sec		Target				--		--	NA	--	
1.5.12			3rd gear				Kmph/sec		Target				--		--	NA	--	
1.5.13			4th gear				Kmph/sec		Target				--		--	NA	--	
1.5.14			5th gear				Kmph/sec		Target				--		--	NA	--	
1.5.15			6th gear				Kmph/sec		Target				--		--	NA	--	
1.5.16			7th gear				Kmph/sec		Target				--		--	NA	--	
1.5.17			8th gear				Kmph/sec		Target				--		--	NA	--	
1.5.18			9th gear				Kmph/sec		Target				--		--	NA	--	
C	**Engine Calibration Activities**								Heading							--		
1.0	System Verification Trials								Heading							--		
1.1			**Powertrain Characteristics (AC ON)**						Target				--	--	--	NA	--	
1.2.1			**Powertrain Characteristics (AC OFF)**						Target				--	Pass	Pass	G	--	
2.0	Vehicle Perfomance Trials								Heading							--		

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Annexure 2

Sr.No.	Aggregate and test parameter						Unit	Test Type	Classification @DR3	Ref.Standard / Work Guideline	Simulation	Base Vehicle	Core Benchmark	Target	Test Vehicle	Status (RYG)	Remarks	CoC Remark
	Level 2	Level 3	Level 4	Level 5	Level 6	Level 7						Signa 2818.T 5.6L Aswamedh BSVI G950 DD 6S RAR 4.88	Ashok Leyland 2820.T Eaton 6 Speed DD RAR 5.57		Signa 2823.T Cx RDE BSVI G950 DD RAR 4.88			
2.1			Vehicle Speed detection						Target				--	Pass	Pass	G	--	
2.2			Engine Speed detection						Target				--	Pass	Pass	G	--	
2.3			Gear Detection						Target				--	Pass	Pass	G	--	
2.4			Driven Idle						Target				--	Pass	Pass	G	--	
3.0		Engine derate verification							Heading							--		
3.2			Limp home validation						Heading				--	Pass	Pass	G	--	
3.3			Reduced torque fault validation						Heading				--	Pass	Pass	G	--	
4.0		Evaluation of Take-off ability, Acceleration and Deceleration							Target					Pass		G		
D	Vehicle feature validation and Fuel Economy features / End of Line (EOL) parameters segreggation and verification								Heading							--		
1.0		Vehicle Mass Estimation							Target				--	Pass	Pass	G	--	
2.0		Road Slope Estimation							Target				--	Pass	Pass	G	--	
3.0		Vehicle acceleration management (VAM tuning)							Target				--	Pass	Pass	G	--	
4.0		Electronic vehicle speed Limiter (EVSL) / Load based speed control (LBSC)							Target				--	Pass	Pass	G	--	
5.0		Vehicle speed limiter (Top and one-gear down)							Target				--	Pass	Pass	G	--	
6.0		EVSL+ VAM / LBSC+VAM							Target				--	Pass	Pass	G	--	
7.0		Gear Down Protection (GDP)							Target				--	Pass	Pass	G	--	
8.0		Idle shutdown							Target				--	Pass	Pass	G	--	
9.0		Average fuel economy (AFE)							Target				--	Pass	Pass	G	--	
10.0		IFE							Target				--	Pass	Pass	G	--	
11.0		Engine Brake control							Target				--	Pass	Pass	G	--	
12.0		Cruise control (CC)							Target				--	Pass	Pass	G	--	
13.0		Power Take off (PTO)							Target				--	Pass	Pass	G	--	
14.0		Remote PTO							Target				--	Pass	Pass	G	--	
15.0		Road Speed governor							Target				--	Pass	Pass	G	--	
16.0		Engine Protection shutdown							Target				--	Pass	Pass	G	--	
17.0		Powertrain protection							Target				--	Pass	Pass	G	--	
18.0		Trip-Info							Target				--	Pass	Pass	G	--	
E	Environmental Trials Verification								Heading							--		
1.0		Summer trials							Heading							--		
1.4			Hot start						Target				--	Pass	Pass	G	Carry over from OBD I validation	
1.5			Low idle governor calibration						Target				--	Pass	Pass	G		
1.6			Driven Idle						Target				--	Pass	Pass	G		
1.7			Subjective Driveability Assessment						Target				--	Pass	Pass	G		
2.0		Winter trials							Heading							--		
2.2			Cold Start (at Ambient as per Application requirement)						Target				--	Pass	Pass	G	Carry over from OBD I validation	
2.3			Smoke level (visually) during free acceleration after start						Target				--	Pass	Pass	G		
2.4			Subjective Driveability Assessment						Target				--	Pass	Pass	G		
6.0		High altitude trials/ calibration							Heading							--		
6.2			Low idle governor calibration				rpm	New Devlopment	Target				--	Pass	Pass	G	Carry over from OBD I validation	
6.9.1			% Deterioration in Drivability with base calibration				%		Target				--	Pass	Pass	G		
6.10.1			Turbocharger duty cycle mapping						Target				--	Pass	Pass	G		
6.10.1.1			Smoke during driving present or not					New Devlopment	Target				--	Pass	Pass	G		
6.10.1.2			Assessment of turbocharger Whistling noise						Target				--	Pass	Pass	G		
6.11.1			Power calculation				%		Target				--	Pass	Pass	G		
F	Onboard Diagnostics								Heading							--		
5.0		OBD Diagnostic - TML tool verification							Heading				--	Pass	Pass	G		
7.0		Derate Strategies for Critical Faults							Heading				--	Pass	Pass	G	Carry over from OBD I validation	
8.0		Verification of OBD interface for Comprehensive Component Monitors							Heading				--	Pass	Pass	G		

Sign Off

Responsibility	Name	Signature
Prepared by: PAT Engineer	Debabrata Das/Swapnil	
Checked & Approved by: PAT Lead / Project Lead	Ajaykumar Jadhav / Sanjeev kumar	

Index for Status

Off target, no resolution
Marginally off target, resolution planned/low risk
Met target, no concern

Enclosed with FIR/Testing-Outdoor/518100/2023/6035

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PED evaluation of Signa 2823.T RDE BSVI in comparison with Ashok Leyland 2820 BSVI and Signa 2818.T Ashwamedh BSVI

PED| 29.04.23

OUR CULTURE CREDO

AT TATA MOTORS

We are connecting aspirations by being bold in thought and action, owning every opportunity and challenge, Solving together as one team and engaging all our stakeholders with empathy.

We are **MORE WHEN ONE!**

Content

TATA MOTORS
Connecting Aspirations

- ✓ Vehicle specification comparison
- ✓ Performance Data Summary
- ✓ Minimum and Maximum Gear Speed
- ✓ Wide open throttle performance
- ✓ Tractive effort comparison
- ✓ Acceleration
- ✓ WOT drivability
- ✓ Bathtub drivability
- ✓ Sustain and restart Gradeability

Vehicle Specification Comparison

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Sr. No.	Parameters			Base Vehicle : OBD-1	Core Benchmark	Test Vehicle : OBD-2
				SIGNA 2818.T BSVI	AL 2820.T BSVI	SIGNA 2823.T RDE BSVI
1	Vehicle Identification No. (ERC No. /EJ No./Reg. No.)			ERC-1183	--	ERC-1219
2	Vehicle GVW/GCW		kg	28000	28000	28000
3	Engine Details (Make/cc/Norms/no. of Cyl.)			Cummins BS-VI Ashwamedh 5.6lit	H-Series CRS BSVI	Cummins BS-VI Ashwamedh 5.6lit
	Engine Max Power			180 HP @ 2300 rpm	200 hp @ 2400 rpm	220 HP
	Engine Max Torque			850Nm @ 1000-1600 rpm	700 Nm @ 1200-1900 rpm	925Nm @ 1000-1300rpm
	Engine Calibration Maturity Level			As per production released	As per production released	95% Cal Maturity(XWTPA19850)
4	Regeneration Strategy (Time ase/Soot base)			Time Based (100 Hrs)	--	Time Based (100 Hrs)
5	Gear Box (make/drive/FGR)			G950-FGR - 9.36,DD	ZF 6S-850 Gearbox	G950-FGR - 9.36,DD
	Gear Ratios			1-9.36, 2- 5.20, 3- 3.05, 4- 1.84, 5- 1.33, 6- 1.00	1st: 8.51, 2nd: 4.66, 3rd: 2.73, 4th: 1.78, 5th: 1.27, 6th: 1, Rev:7.64	1-9.36 , 2-5.20 , 3-3.04 , 4-1.83 , 5-1.32 , 6-1.0
6	RAR			4.88	5.57	4.88
7	Tyre Details			All 295/90R 20 (Apollo Make)	F1 - Apollo 295/90R 20 16PR R1, R2 - Apollo 295/90R 20 16PR	All 295/90R 20 (Bridgestone Make)
8	LBSC	High & Low Engine Speed Breakpoint	RPM	1900 rpm,1900 rpm	--	1900, 1900
		Vehicle Mass Threshold	kg	28000.00	--	28000
	VAM	Variable Acceleration 1, 2	kmph/sec	2.5,2.5	--	2.5,2.5
		Variable Acceleration Speed 1, 2	kmph	10, 40	--	10,40
	GDP	GD Max. Veh. Speed (Heavy & Light Engine Load)	kmph	50, 50	--	50,50
	RSG	Maximum Accelerator Vehicle Speed	kmph	80.00	80	80
	Torque Factor	Torque Limit Medium Adjustment Factor	Balance	100%	--	105%
		Torque Limit Maximum Adjustment Factor	Economy	100%	--	115%
	PTP	Powertrain Protection (Enable / Disable)		Disable	Disable	Disable
		Torque Limit	Nm	NA	NA	NA
	USFE / Torque Table Revision (1/2/3/n)			USFE-1	--	USFE-1
9	Fan Details (type/make/blades)			24'' E-Viscous, Make - Behr , 11 no's blade	--	24'' E- Viscous fan
10	Base Cal Improvement (Cal Maturity %)			As per production released	As per production released	95% Cal Maturity

Performance Data Summary

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Parameter	Unit	Target	PALS	Benchmark	Base Vehicle	Test Vehicle			RDE Status (%) w.r.t Benchmark	RDE Status (%) w.r.t Base	RDE Status w.r.t Target	PALS status
				Ashok Leyland 2820.T BSVI	Signa 2818.T BSVI HM	Signa 2823.T BSVI RDE HM	Signa 2823.T BSVI RDE BM	Signa 2823.T BSVI RDE LM				
Accleration at Rated Load												
0 - 60 kmph	sec	≤ 50.43	AL	50.43	49.38	49.47	78.10	79.68	1.90%	-0.18%	1.90%	
0 - 1000 m	sec	≤ 75.84	AL	75.84	74.89	75.22	85.44	87.34	0.82%	-0.44%	0.82%	
Driveability(Rate of acceleration) at Rated Load												
1st Gear(4-6)	sec	Not Applicable/ Data Generation	Not Applicable/ Data Generation	0.84	1.02	0.89	0.96	1.05	Not Applicable/Data Generation	Not Applicable/Data Generation	Not Applicable/Data Generation	--
2nd Gear(8-12)	sec			2.32	1.92	1.96	2.05	1.92				
3rd Gear(12-20)	sec			6.04	4.86	4.64	5.36	5.50				
4th Gear(19-31)	sec			9.95	10.18	10.90	12.14	12.38				
5th Gear(25-42)	sec			21.22	20.32	21.14	25.48	26.46				
6th Gear(36-50)	sec			23.40	22.67	24.36	30.39	30.22				
1st Gear(4-6)	kmph/sec	Not Applicable/ Data Generation	Not Applicable/ Data Generation	2.38	1.96	2.25	2.08	1.90	Not Applicable/Data Generation	Not Applicable/Data Generation	Not Applicable/Data Generation	--
2nd Gear(8-12)	kmph/sec			1.72	2.08	2.04	1.95	2.08				
3rd Gear(12-20)	kmph/sec			1.32	1.65	1.72	1.49	1.45				
4th Gear(19-33)	kmph/sec			1.21	1.18	1.10	0.99	0.97				
5th Gear(25-42)	kmph/sec			0.80	0.84	0.80	0.67	0.64				
6th Gear(36-50)	kmph/sec			0.60	0.62	0.57	0.46	0.46				
Bath-Tub Driveability at Rated Load												
3rd Gear												
15 - 20 Kmph	Sec	≤ 4.3	AL	3.24	3.05	4.27	4.18	4.42	-31.79%	-40.00%	0.70%	
20 - 25 Kmph	Sec	≤ 3.0	AL	2.48	--	3.00	2.97	3.06	-21.05%	--	0.00%	
25 - 30 Kmph	Sec	≤ 3.0	AL	2.62	--	2.93	3.40	3.47	-11.83%	--	2.33%	
4th Gear												
20 - 25 Kmph	Sec	≤ 5.66	AL	4.55	5.66	5.00	5.55	5.65	-9.93%	11.63%	11.66%	
25 - 30 Kmph	Sec	≤ 4.33	AL	4.33	3.97	3.85	4.30	4.62	11.13%	3.07%	11.13%	
30 - 35 Kmph	Sec	≤ 3.89	AL	3.89	3.42	3.11	4.71	5.20	20.10%	9.12%	20.10%	
35 - 40	Sec	--	--									
5th Gear												
30-40 kmph	Sec	≤ 12.83	AL	12.83	11.53	11.46	14.31	14.74	10.71%	0.64%	10.71%	
40-50 kmph	Sec	≤ 12.74	AL	12.74	10.67	9.76	--	--	23.41%	8.55%	23.41%	
50-60 kmph	Sec	≤ 14.14	AL	14.14	--	--	--	--	--	--	--	
6th Gear												
30-40 kmph	Sec	≤ 27.76	AL	17.44	27.76	26.35	26.38	26.42	-51.08%	5.09%	5.08%	
40-50 kmph	Sec	≤ 17.68	AL	17.68	15.79	15.49	19.14	19.98	12.39%	1.90%	12.39%	
50-60 kmph	Sec	≤ 17.77	AL	17.77	14.89	12.45	--	--	29.96%	16.41%	29.96%	
60-70 kmph	Sec	≤ 20.12	AL	20.12		15.66	--	--			22.17%	
Sustain and Restart Gradeability												
Sustained Gradeability	%	≥25.8	AL	25.8	27.77	30.25	--	--	17.25%	8.93%	17.25%	
Restart Gradeability	%	≥21.32	AL	21.32	23.04	24.93	--	--	16.93%	8.20%	16.93%	

Signa 2823.T Cx BSVI RDE Performance. PALS position achieved "AL" against "AL"

Acceleration

- Acceleration of Signa 2823.T Cx BSVI RDE was found to be **better as compared to target** in 0-60 kmph speed and 0-1000 meters band

Bath tub Drivability

- Drivability of Signa 2823.T Cx BSVI RDE was found to be **better as compared** to target in all the speed bands

Sustain & Restart Gradeability

- Restart Gradability of 2823.T Cx RDE BSVI was **found better** than target.
- Sustain Gradability of 2823.T Cx RDE BSVI was **found better** that target

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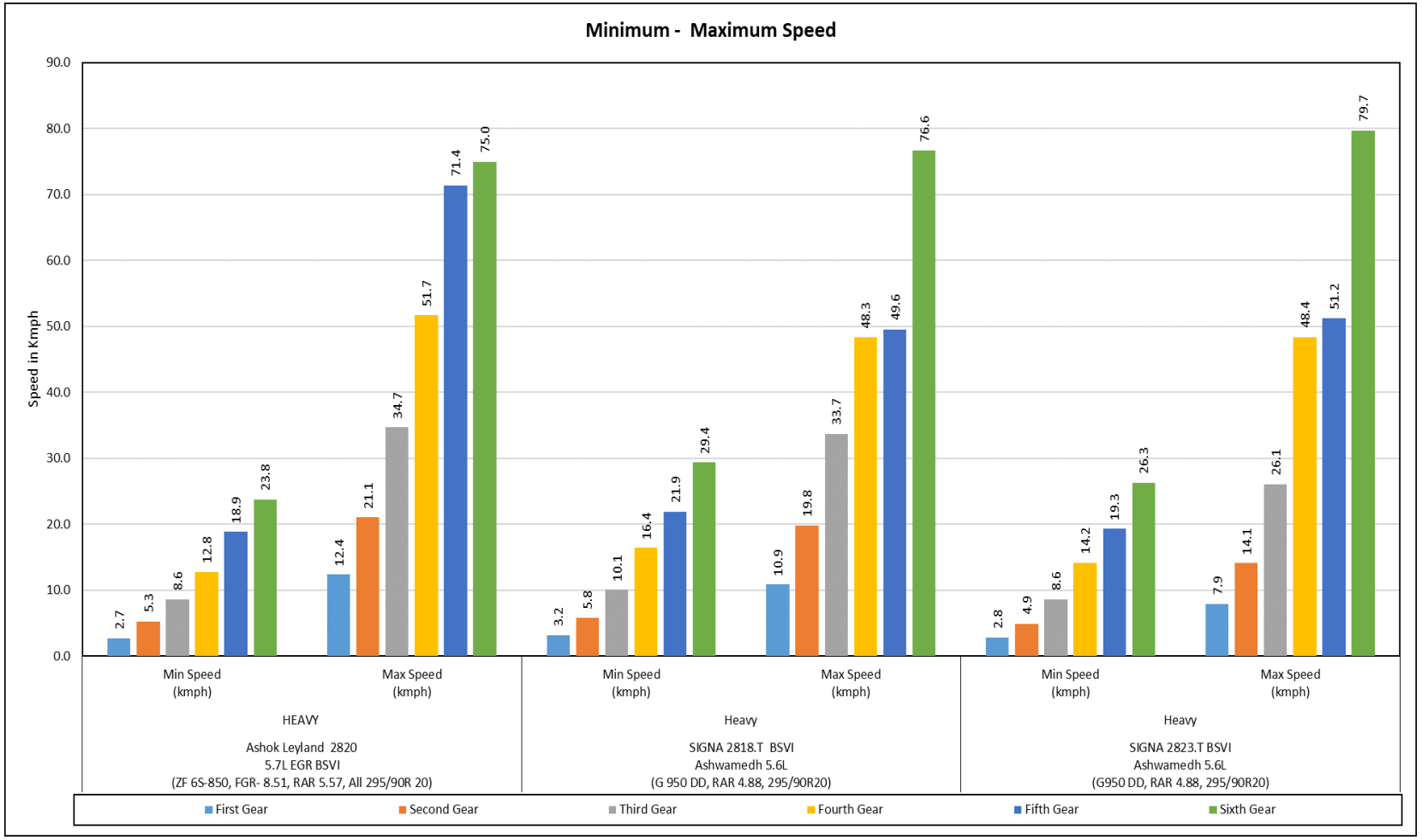
Minimum & Maximum Gear Wise speed Comparison

GEAR	Ashok Leyland 2820 5.7L EGR BSVI (ZF 6S-850, FGR- 8.51, RAR 5.57, All 295/90R 20)		SIGNA 2818.T BSVI Ashwamedh 5.6L (G 950 DD, RAR 4.88, 295/90R20)		SIGNA 2823.T BSVI Ashwamedh 5.6L (G950 DD, RAR 4.88, 295/90R20)	
	HEAVY		Heavy		Heavy	
	Min Speed (kmph)	Max Speed (kmph)	Min Speed (kmph)	Max Speed (kmph)	Min Speed (kmph)	Max Speed (kmph)
1	2.7	12.4	3.2	10.9	2.8	7.9
2	5.3	21.1	5.8	19.8	4.9	14.1
3	8.6	34.7	10.1	33.7	8.6	26.1
4	12.8	51.7	16.4	48.3	14.2	48.4
5	18.9	71.4	21.9	49.6	19.3	51.2
6	23.8	75.0	29.4	76.6	26.3	79.7



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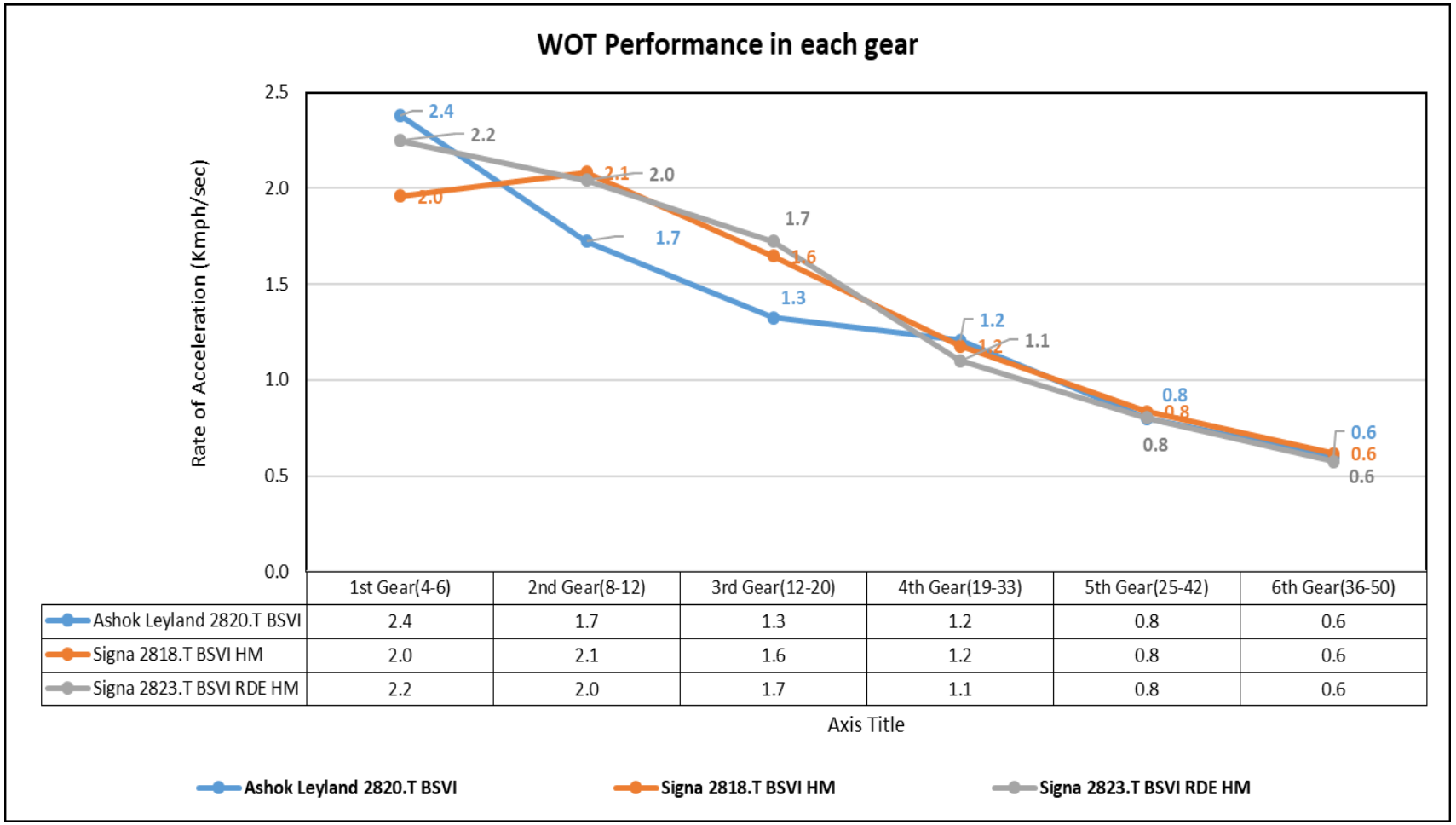
Wide open throttle Performance

Gear	Ashok Leyland 2820.T BSVI	Signa 2818.T BSVI HM	Signa 2823.T BSVI RDE HM
	Kmph/sec	Kmph/sec	Kmph/sec
1st Gear(4-6)	2.4	2.0	2.2
2nd Gear(8-12)	1.7	2.1	2.0
3rd Gear(12-20)	1.3	1.6	1.7
4th Gear(19-33)	1.2	1.2	1.1
5th Gear(25-42)	0.8	0.8	0.8
6th Gear(36-50)	0.6	0.6	0.6



Tractive effort

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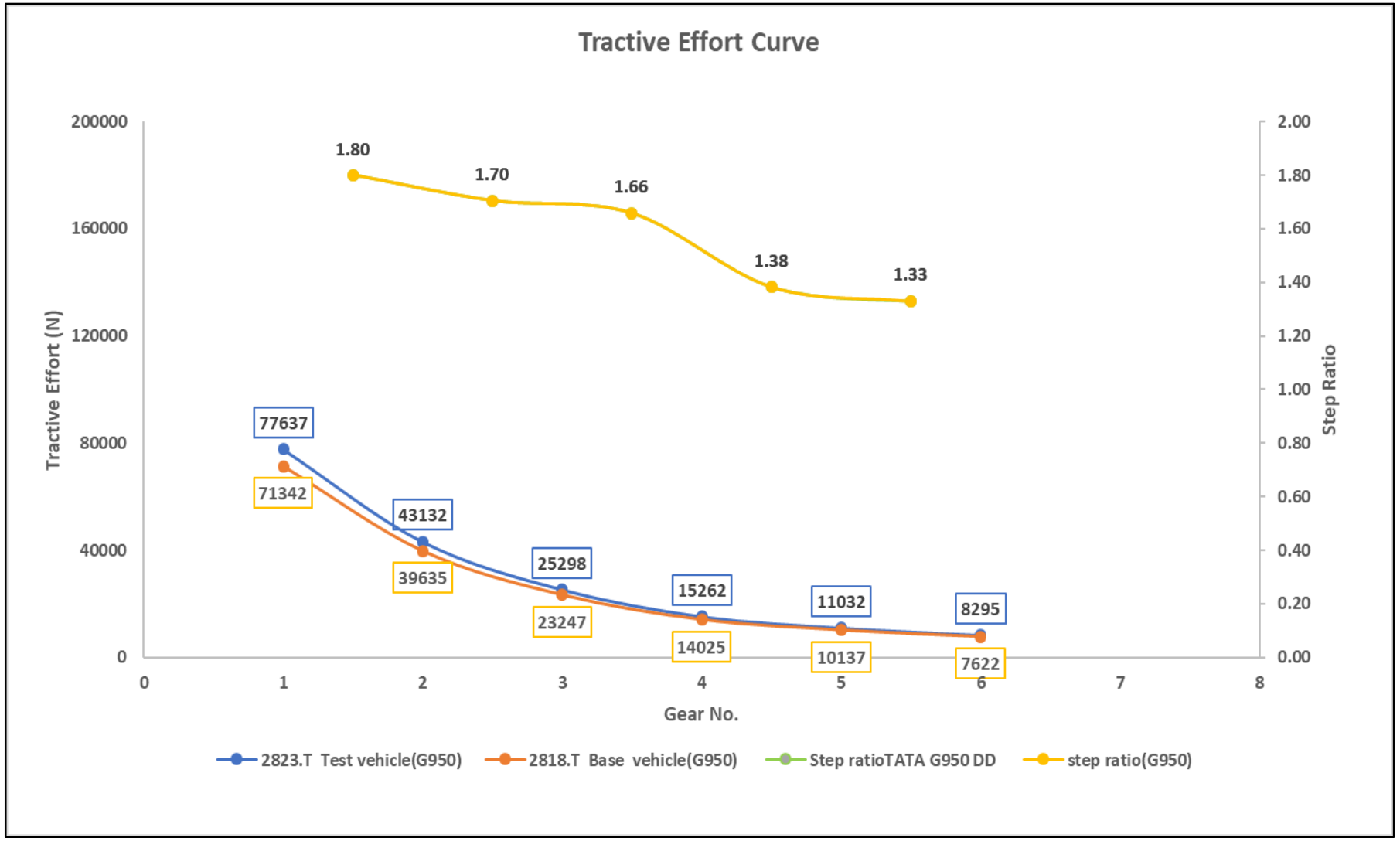

Remarks:

- Tractive effort of Signa 2823.T RDE BSVI is Superior than Base Vehicle vehicle in all gear.

Acceleration Performance – Through Gear

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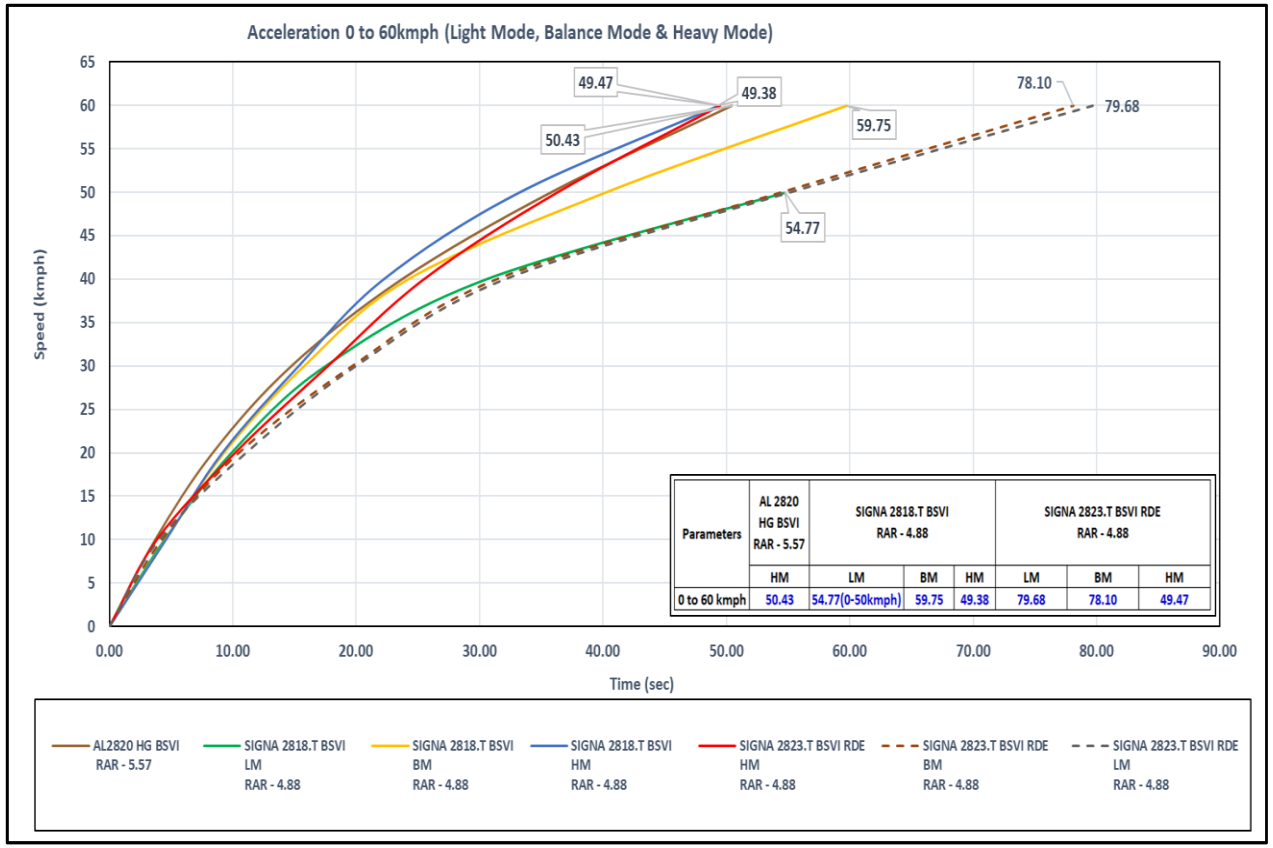
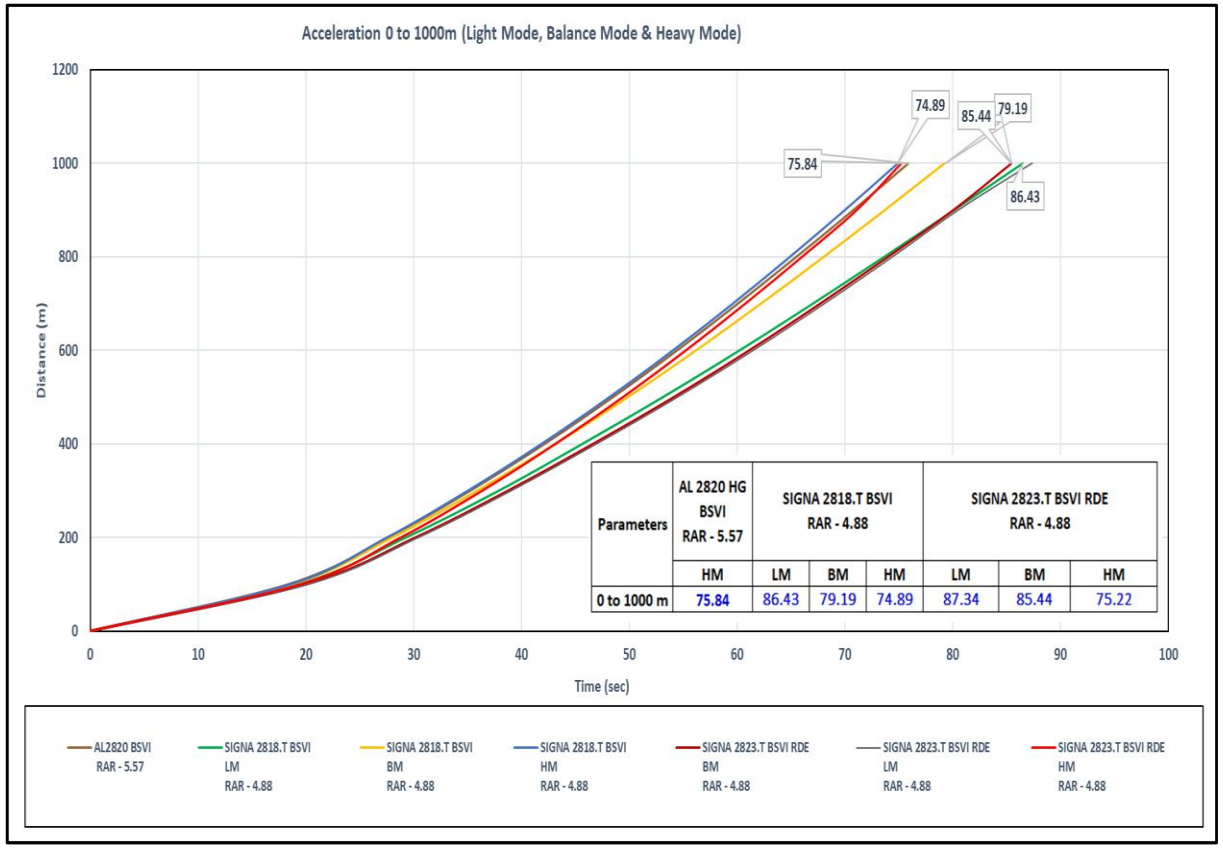


Parameters	AL 2820 HG BSVI RAR - 5.57	SIGNA 2818.T BSVI RAR - 4.88			SIGNA 2823.T BSVI RDE RAR - 4.88		
	HM	LM	BM	HM	LM	BM	HM
0 to 60 kmph	50.43	54.77(0-50kmph)	59.75	49.38	79.68	78.10	49.47



Parameters	AL 2820 HG BSVI RAR - 5.57	SIGNA 2818.T BSVI RAR - 4.88			SIGNA 2823.T BSVI RDE RAR - 4.88		
	HM	LM	BM	HM	LM	BM	HM
0 to 1000 m	75.84	86.43	79.19	74.89	87.34	85.44	75.22

- In 0 – 60 Kmph, Through gear acceleration performance of Signa 2823.T Cx RDE vehicle **is better as compared** with AL 2820.T BSVI
- In 0 – 1000 mts, Through gear acceleration performance of Signa 2823.T Cx RDE vehicle **is better as compared** AL 2820.T BSVI
- In 0 – 60 Kmph, WOT acceleration performance of Signa 2823.T Cx RDE vehicle **is inferior as compared** with Signa 2818.T BSVI
- In 0 – 1000 mts, WOT acceleration performance of Signa 2823.T Cx RDE vehicle **is inferior as compared** Signa 2818.T BSVI

WOT Drivability @ 1st & 2nd Gear

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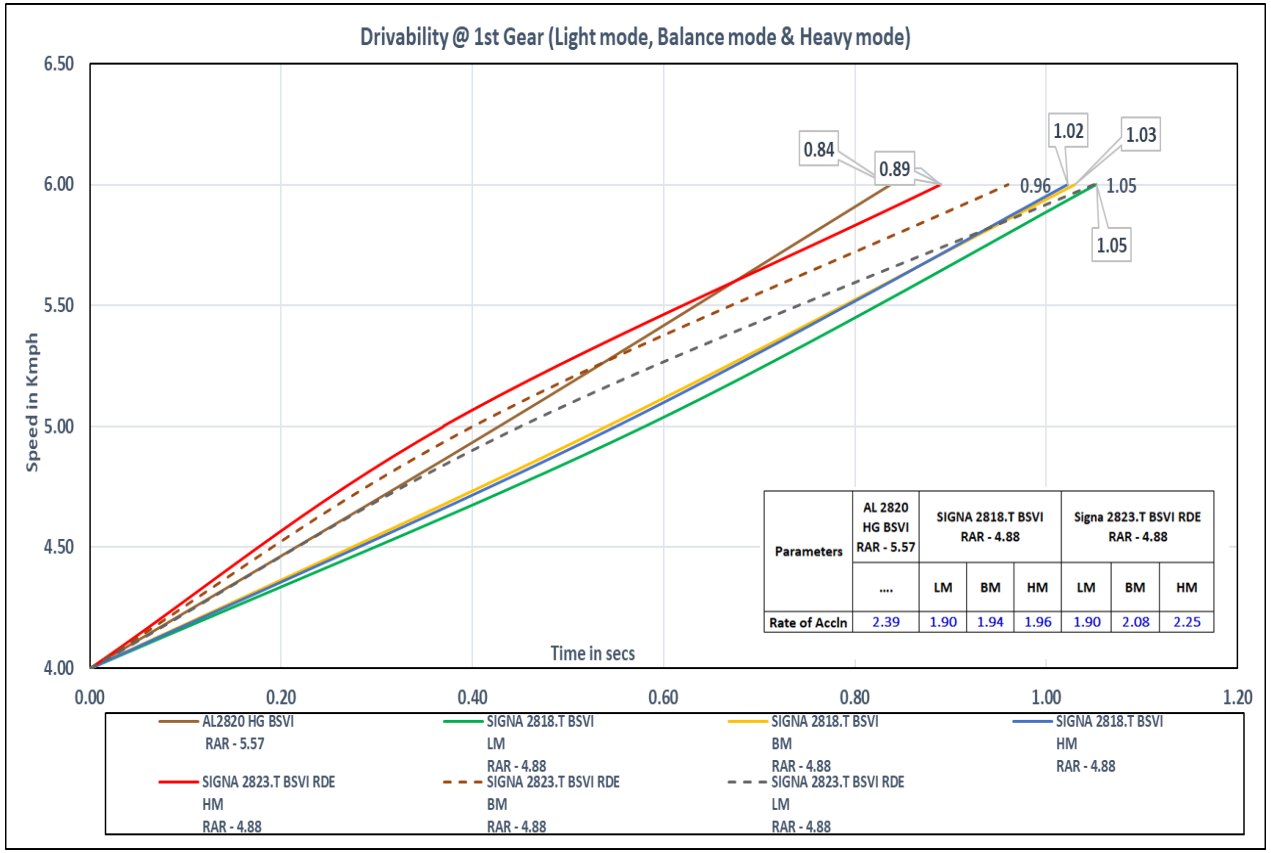
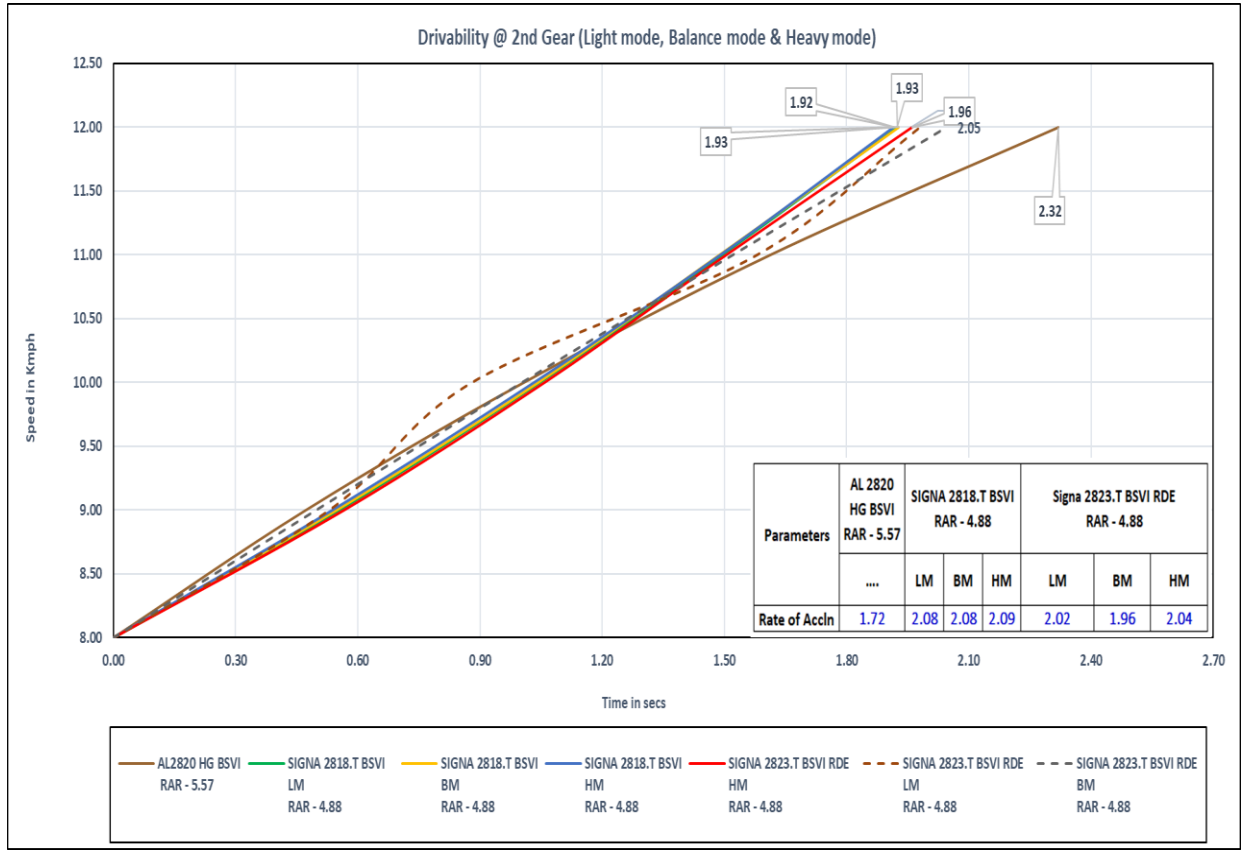


Parameters	AL 2820 HG BSVI RAR - 5.57	SIGNA 2818.T BSVI RAR - 4.88			Signa 2823.T BSVI RDE RAR - 4.88		
	....	LM	BM	HM	LM	BM	HM
Rate of Accln	2.39	1.90	1.94	1.96	1.90	2.08	2.25



Parameters	AL 2820 HG BSVI RAR - 5.57	SIGNA 2818.T BSVI RAR - 4.88			Signa 2823.T BSVI RDE RAR - 4.88		
	....	LM	BM	HM	LM	BM	HM
Rate of Accln	1.72	2.08	2.08	2.09	2.02	1.96	2.04

- In First gear, WOT acceleration performance of Signa 2823.T Cx RDE vehicle **is better as compared** with AL 2820.T BSVI
- In Second gear, WOT acceleration performance of Signa 2823.T Cx RDE vehicle **is better as compared** with AL 2820.T BSVI
- In First gear, WOT acceleration performance of Signa 2823.T Cx RDE vehicle **is better as compared** with Signa 2818.T BSVI
- In Second gear, WOT acceleration performance of Signa 2823.T Cx RDE vehicle **is better as compared** with Signa 2818.T BSVI

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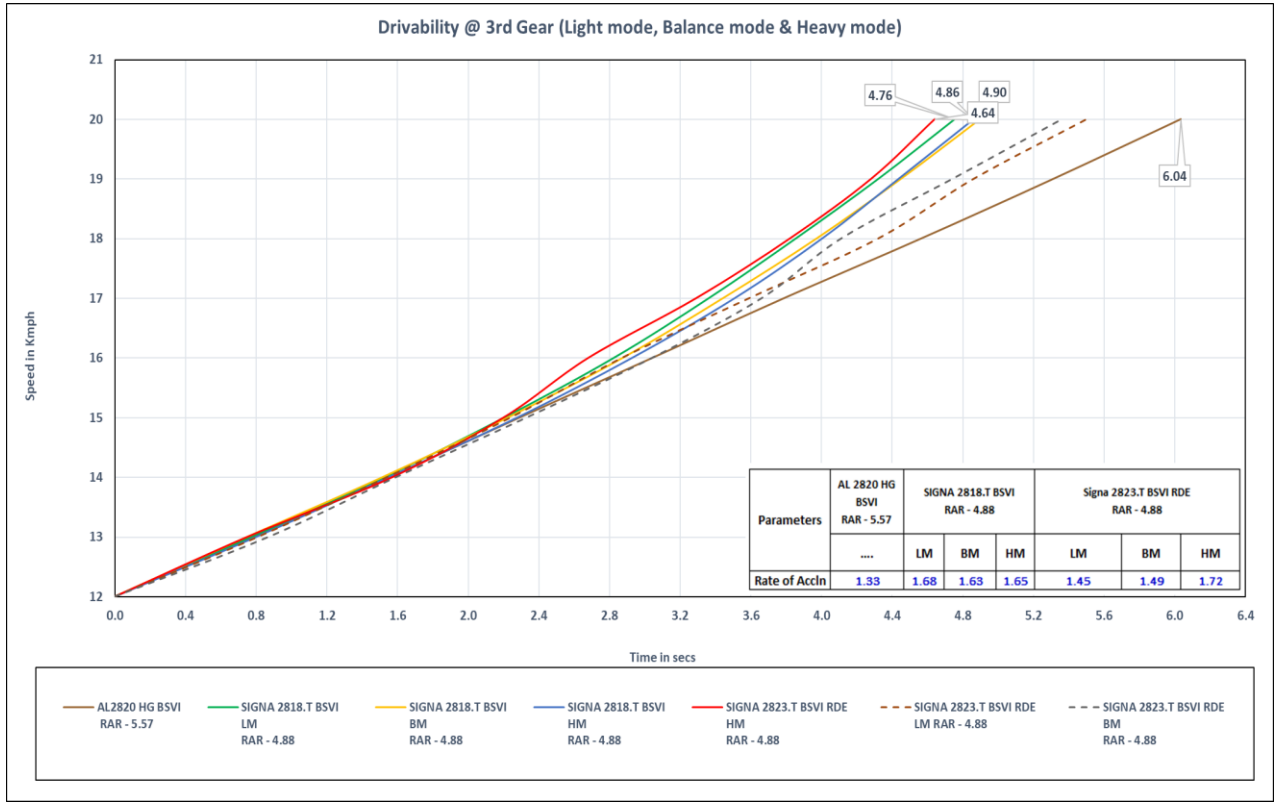
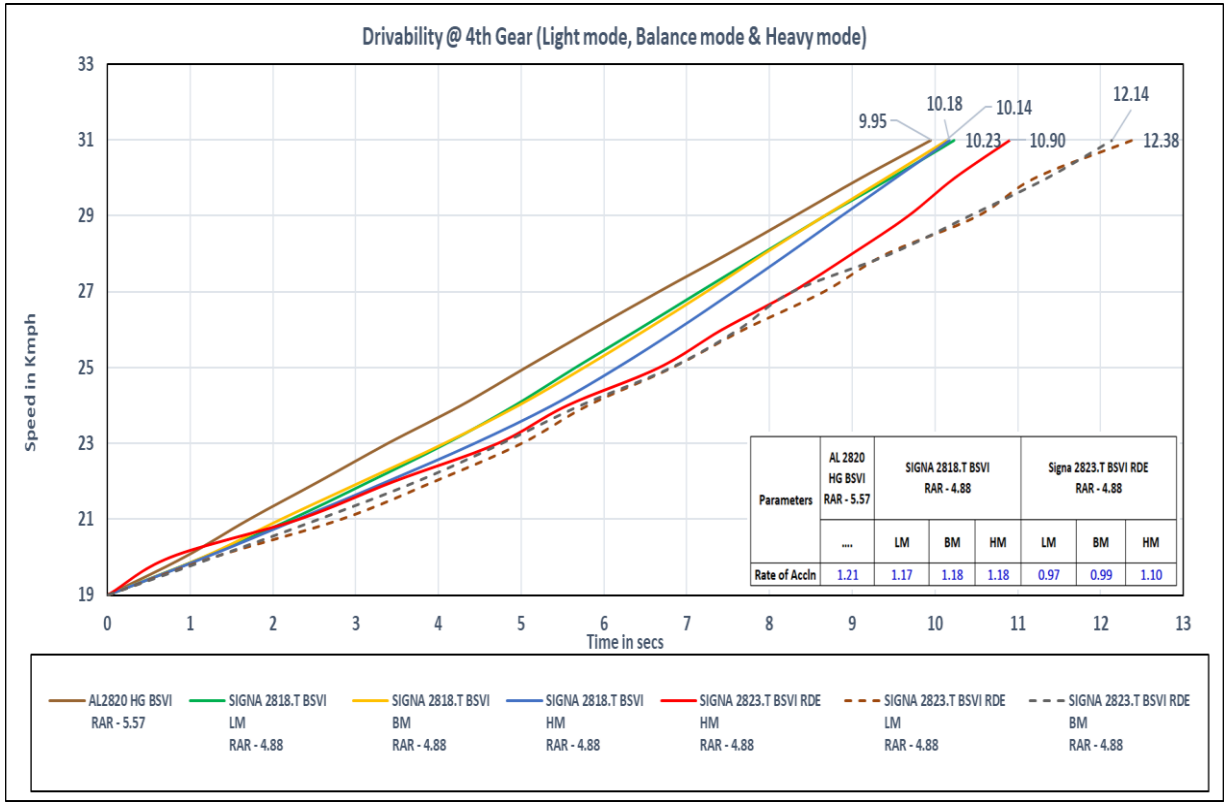
WOT Drivability @ 3rd & 4th Gear





- In third gear, WOT acceleration performance of Signa 2823.T Cx RDE vehicle **is better as compared** with AL 2820.T BSVI
- In fourth gear, WOT acceleration performance of Signa 2823.T Cx RDE vehicle **is inferior as compared** with AL 2820.T BSVI
- In third gear, WOT acceleration performance of Signa 2823.T Cx RDE vehicle **is better as compared** with Signa 2818.T BSVI
- In fourth gear, WOT acceleration performance of Signa 2823.T Cx RDE vehicle **is inferior as compared** with Signa 2818.T BSVI

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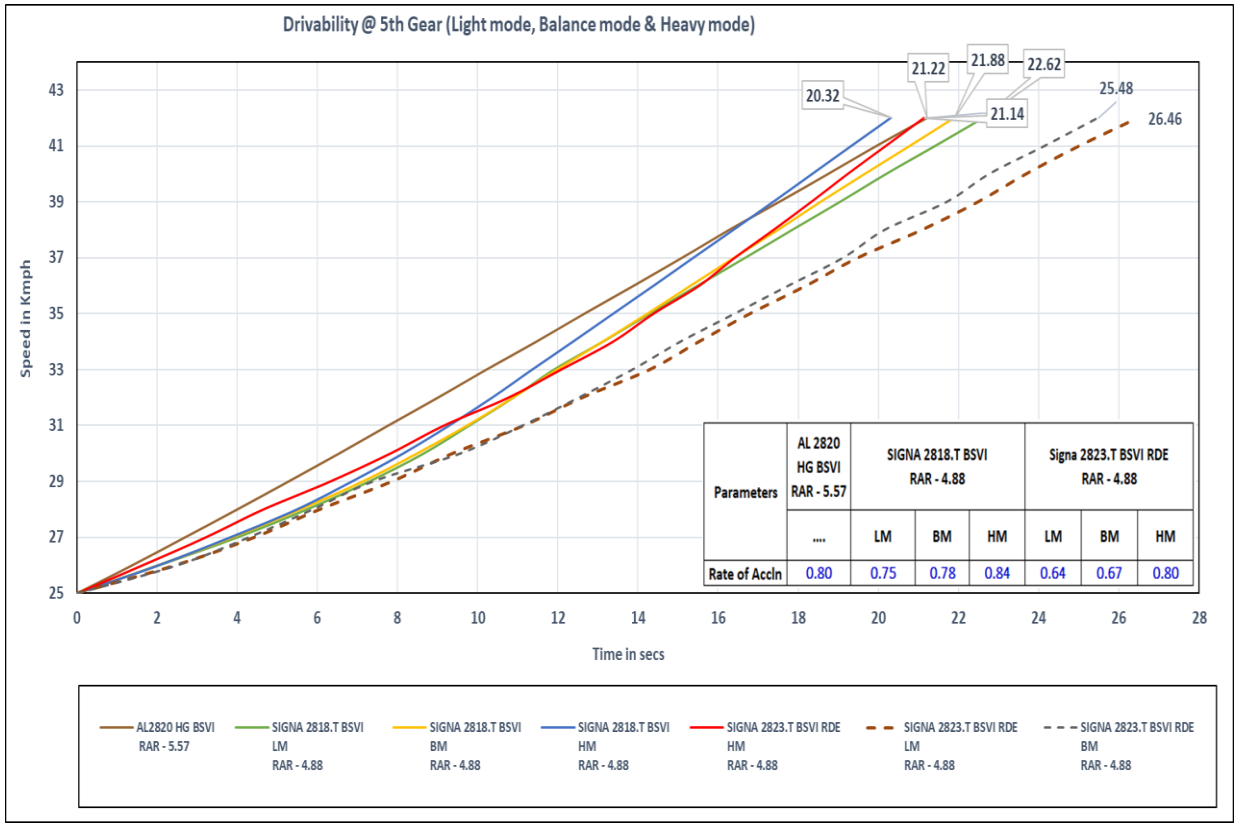
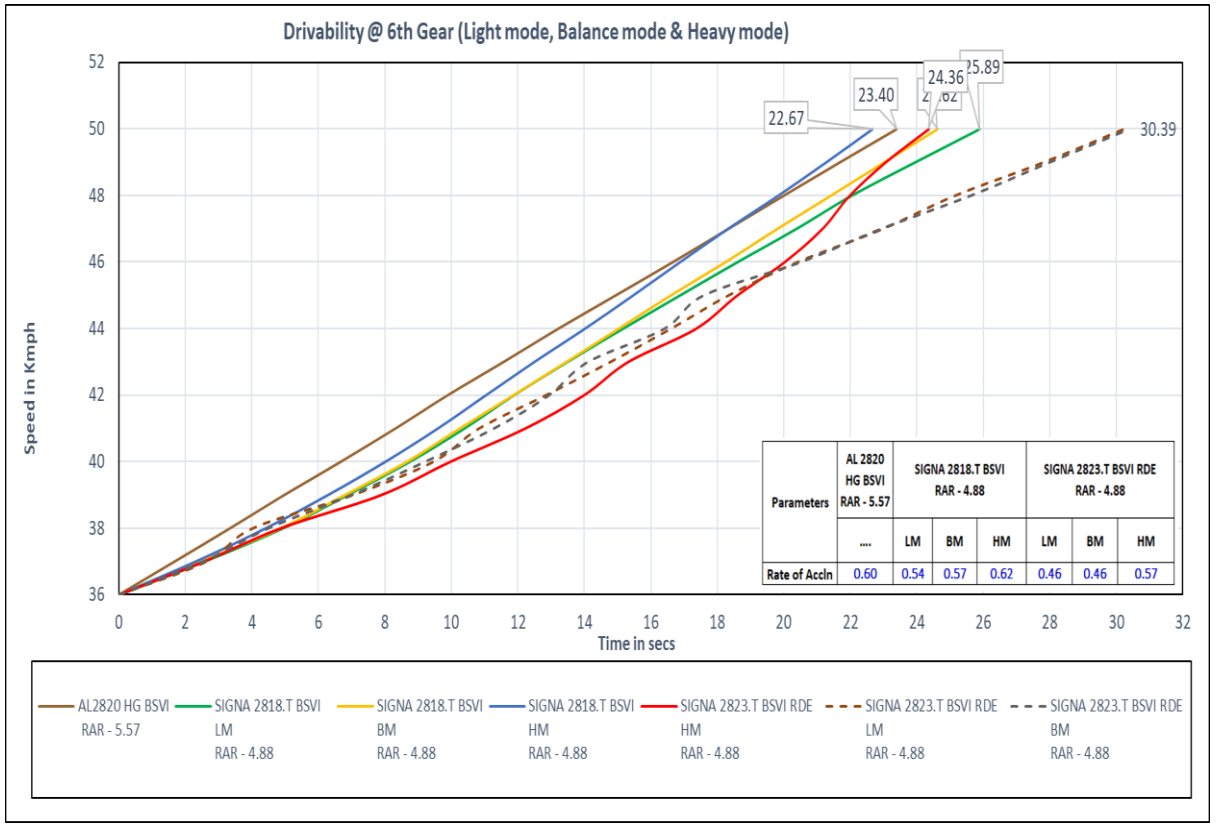
WOT Drivability @ 5th & 6th Gear



Parameters	AL 2820 HG BSVI RAR - 5.57	SIGNA 2818.T BSVI RAR - 4.88			Signa 2823.T BSVI RDE RAR - 4.88		
	....	LM	BM	HM	LM	BM	HM
Rate of Accln	0.80	0.75	0.78	0.84	0.64	0.67	0.80



Parameters	AL 2820 HG BSVI RAR - 5.57	SIGNA 2818.T BSVI RAR - 4.88			SIGNA 2823.T BSVI RDE RAR - 4.88		
	....	LM	BM	HM	LM	BM	HM
Rate of Accln	0.60	0.54	0.57	0.62	0.46	0.46	0.57

- In Fifth gear, WOT acceleration performance of Signa 2823.T Cx RDE vehicle **is at par** with AL 2820.T BSVI
- In Sixth gear, WOT acceleration performance of Signa 2823.T Cx RDE vehicle **is inferior as compared** with AL 2820.T BSVI
- In Fifth gear, WOT acceleration performance of Signa 2823.T Cx RDE vehicle **is better as compared** with Signa 2818.T BSVI
- In Sixth gear, WOT acceleration performance of Signa 2823.T Cx RDE vehicle **is inferior as compared** with Signa 2818.T BSVI

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Bathtub Drivability Report

Gear	Speed Band	Target	Ashok Leyland 2820 BSVI	SIGNA 2818.T BS-VI HM G 950 DD_4.88	SIGNA 2823.T BSVI RDE HM	SIGNA 2823.T BSVI RDE BM	SIGNA 2823.T BSVI RDE LM
3rd Gear	15 - 20 Kmph	≤ 4.3	3.24	3.05	4.3	4.2	4.4
	20 - 25 Kmph	≤ 3.0	2.48		3.0	3.0	3.1
	25 - 30 Kmph	≤ 3.0	2.62		2.9	3.4	3.5
4th Gear	20 - 25 Kmph	≤ 5.66	4.55	5.66	5.0	5.6	5.7
	25 - 30 Kmph	≤ 4.33	4.33	3.97	3.8	4.3	4.6
	30 - 35 Kmph	≤ 3.89	3.89	3.42	3.1	4.7	5.2
5th Gear	30-40 kmph	≤ 12.83	12.83	11.53	11.46	14.31	14.74
	40-50 kmph	≤ 12.74	12.74	10.67	9.76		
	50-60 kmph	≤ 14.14	14.14				
6th Gear	30-40 kmph	≤ 27.76	17.44	27.76	26.35	26.38	26.4
	40-50 kmph	≤ 17.68	17.68	15.79	15.49	19.1	20.0
	50-60 kmph	≤ 17.77	17.77	14.89	12.45		
	60-70 kmph	≤ 20.12	20.12		15.66		

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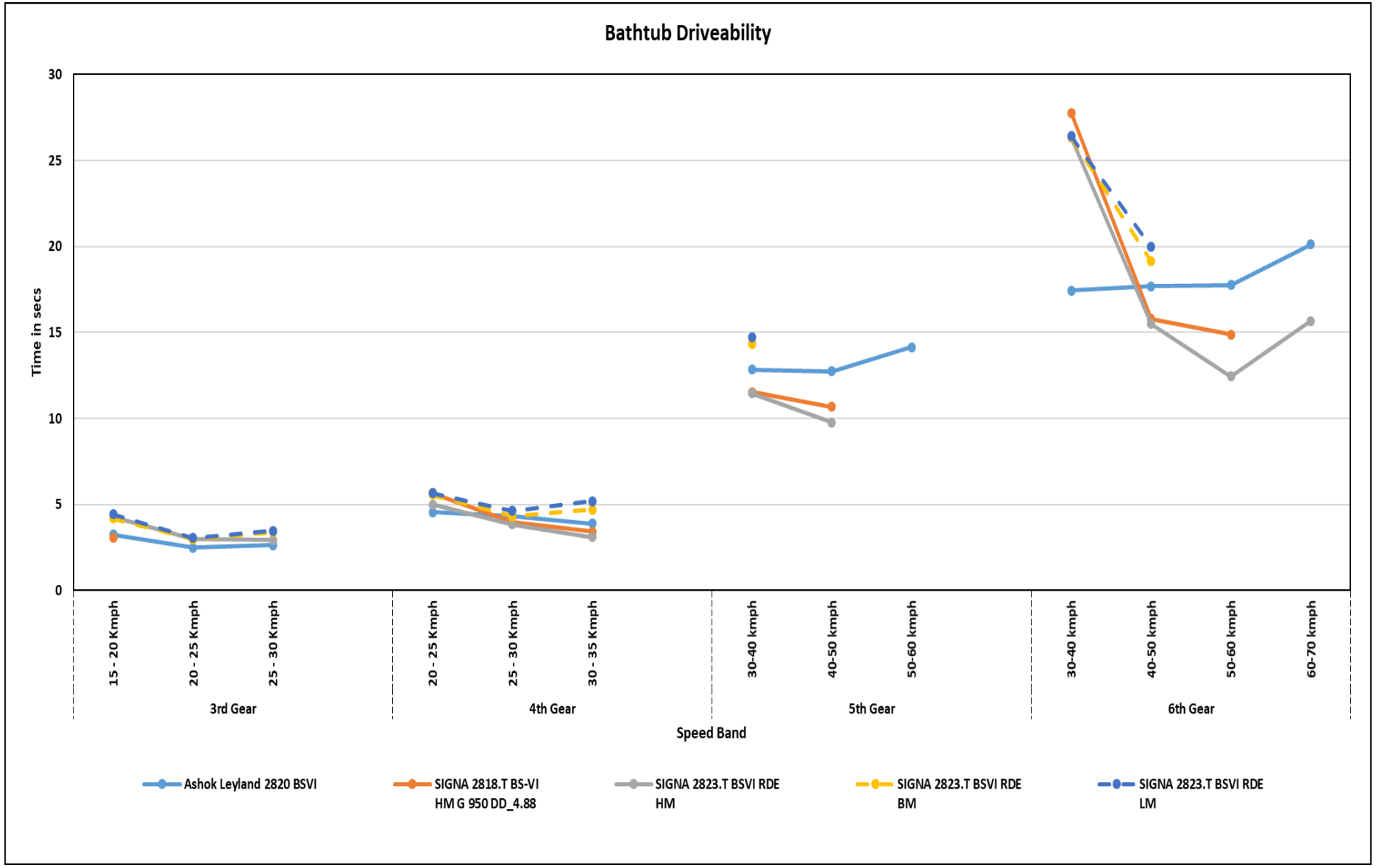
Bathtub Drivability Comparison with Benchmark & Base Vehicles



Remarks:

Vehicle is meeting PALS target in all gears

Sustained and Restart Gradeability

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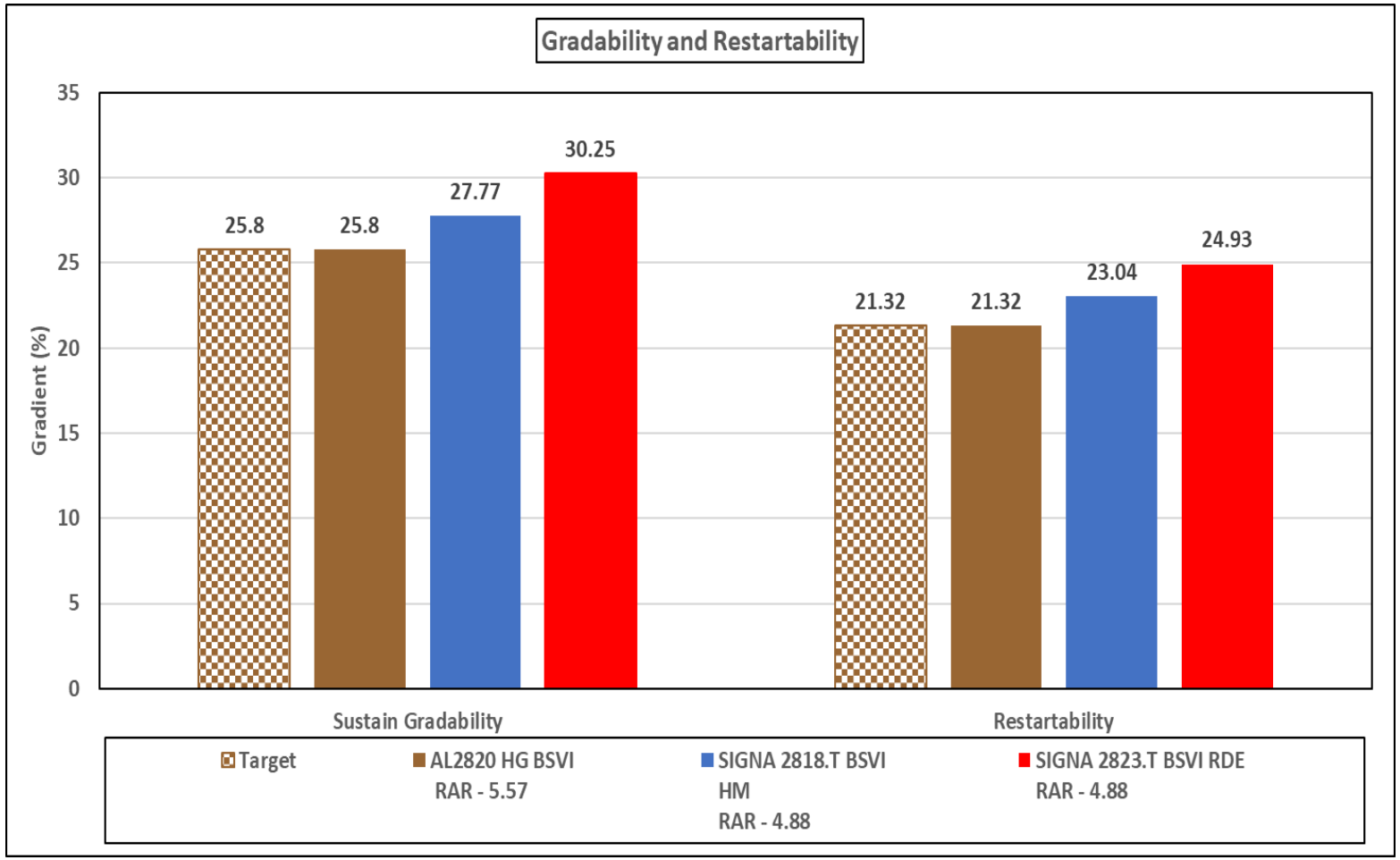
Test	Sustained & Restart Gradeability			
	Target	AL2820 HG BSVI RAR - 5.57	SIGNA 2818.T BSVI HM RAR - 4.88	SIGNA 2823.T BSVI RDE RAR - 4.88
Sustain Gradability	25.8	25.8	27.77	30.25
Restartability	21.32	21.32	23.04	24.93



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Thank You!

TEST REQUISITION

Ref.		Date:	30/03/2023

To,
ERC Testing
Kindly arrange to take up for testing of the following component.

1	Part Description	TATA SIGNA 2823.T BSVI				
2	Part Number	51815248R,				
3	Drawing number	518100000005,	Mod status	C,2,	Mod Date	07/05/2023
4	Vehicle Model / Project	SIGNA 2825.T RDe BSVI				
5	WBS Number	P.22.EA.501 -RDE Truck 5.6 Ltr 3123.T / 3523.T				
6	Supplier	NA				
7	Number of samples					
8	Inspection report	Enclosed	☑ Yes	☐ No	If No commitment date:	
9	Material report	Enclosed	☐ Yes	☑ No	If No commitment date:	
10	Suppliers test report	Enclosed	☑ Yes	☐ No	If No commitment date:	
11	Reason for testing	First Source Development		☐	Weight Reduction	☐
		Alternate source development		☐	Cost Reduction	☐
		Data generation Test		☐	Regulatory test	☐
		Any other (pl. specify)		☐	New Development	☐
12	What testing required?	RIDE AND HANDLING				
13	Remarks					
14	Peripheral Parts Availability	YES				

Authorized Signature:	
Name:	
Dept:	

Contact Person:	
Phone Number	

For Testing Dept Use only	Test Item Number and Date(stamp)	Test Engineer

PA20-F071 /Apr 06

TATA MOTORS LIMITED ERC PUNE	TEST PLAN VEHICLE TESTING DEPARTMENT	DATE: 29/05/2023			
Description: TATA SIGNA 2823.T BSVI 48WB; G950 GB; 4.88RAR; 295/90R20 TYRES		**Test Item No:** 42070			
		New	✔	**Moderate**	✘
		Major	✘	**Minor**	✘

Part No: 51815248R, **Drawing No:** 518100000005,	**Modification No:** C,2,	**Enclosures:**
Make: NA	**WBS Number:** P.22.EA.501 -RDE Truck 5.6 Ltr 3123.T / 3523.T	**Copies to** :
Vehicle Type: SIGNA 2825.T RDe BSVI	**No. of Samples:** 1	
Test Requested by:	VEHICLE-I	**Equipments:**
Test Requisition Reference:	Testing-Outdoor/15033	
Reason for Test/s:	Component & System Level Performance Tests	
Regulatory Requirement:	a) Component:	
	b) Vehicle:	

Sr. No.	Test description	Test specification	Acceptance criteria	No. of Samples	Test Responsibility	Proto Phase (Mule/ Alpha/ Beta/PP)	Remarks
1	Signa 2823.T PD trials	As per PED work guideline	As per PALS	1	Debabrata Das	Beta	Nil

REMARKS: Test plan for DVP execution	**INTERNAL REF:**	
TEST TO FAILURE: No		
MEOST: No		
RELIABILITY TESTING: No		
BENCHMARKING TESTING: Yes		
DFMEA/FMEA DONE: Yes		
PREPARED BY	**CHECKED BY**	**APPROVED BY**

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VC No.					VC : 51815156R	VC : 51815256R
Vehicle Model					Signa 2823.T_AC	Signa 2823.T_Blower
Parameter	VEPS Name	DEFAULT VALUE *	MIN/MAX *	UNITS	Signa 2823.T Ashwamedh (G-950 DD |4.88RAR |295/90R20)	Signa 2823.T Ashwamedh (G-950 DD |4.88RAR |295/90R20)
Fuel Economy						
Gear Down Protection (GDP)						
Gear Down Protection Enable	20061	N		Y = Enable N = Disable	Y	Y
Gear Down Protection Heavy Load Vehicle Speed	11440	28	Min: 16 Max: (10000)	mph	45 kmph (27.96 mph)	50 kmph (31.25 mph)
Gear Down Protection Light Load Vehicle Speed	11430	28	Min: 19 Max: 56	mph	45 kmph (27.96 mph)	50 kmph (31.25 mph)
Idle Speed Control						
Adjustable Low Idle Speed Enable (Read Only)	50512	Y		49	Y	Y
Low Idle Speed	10030	750	Min: 600 Max: 800	rpm	650	650
Idle Shutdown						
Idle Shutdown Enable	20051	N		Y = Enable N = Disable	Y	Y
Idle Shutdown Timer	10170	60.0	Min: 0.5 Max: 1440.0	Minutes	5	5
Idle Shutdown in PTO Enable	20071	N		Y = Enable N = Disable	N	N
Idle Shutdown Manual Override Enable	20081	N		Y = Enable N = Disable	Y	Y
Idle Shutdown service brake switch interaction	50057	N		Y = Enable N = Disable	Y	Y
Load-Based Speed Control						
Load Based Speed Control Enable	50016	N		Y = Enable N = Disable	Y	Y
Load Based Speed Control Low Engine Speed Breakpoint	50027	1800	Min: 1200 Max: 2100	rpm	1800	1900
Load Based Speed Control High Engine Speed Breakpoint	50028	1800	Min: 1500 Max: 2500	rpm	1800	1900
Load Based Speed Control Vehicle Mass Threshold Enable (Read Only)	50446	Y		Y = Enable N = Disable	Y	Y
Load Based Speed Control Vehicle Mass Threshold	50447	68343	Min: 22046 Max: 220460	lb	28000 kg (61729.43 lbs)	28000 kg (61729.43 lbs)
Road Speed Governor						
Road Speed Governor Enable (Read Only)	99001	Y		Y = Enable N = Disable	Y	Y
Maximum Accelerator Vehicle Speed	10000	56	Min: 12 Max: (13590)	mph	80 kmph (49.709 mph)	80 kmph (49.709 mph)
User Adjustable Fuel Economy						
User Adjustable Fuel Economy Enable	50437	N		Y = Enable N = Disable	Y	Y
UAFE Max Road Speed Enable	50475	Y		Y = Enable N = Disable	Y	Y
UAFE Max Road Speed Limit	50476	36	Min: 12 Max: 56	mph	79.9 kmph (49.647 mph)	79.9 kmph (49.647 mph)
UAFE Torque Limit Enable	50486	N		Y = Enable N = Disable	Y	Y
UAFE Mid Torque Limit Adjust Factor	50487	100	Min: 80 Max: 200	%	125	125
UAFE Max Torque Limit Adjust factor	50488	100	Min: 80 Max: 200	%	115	115
Accelerator Control						
Variable Rate Vehicle Acceleration Management	50040	N		Y = Enable N = Disable	Y	Y
Variable Acceleration 1	50041	0.6	Min: 0.0 Max: 8.1	mph/sec	1.5 kph/sec (0.93 mph/s)	1.5 kph/sec (0.93 mph/s)
Variable Acceleration 2	50042	0.6	Min: 0.0 Max: 8.1	mph/sec	1.5 kph/sec (0.93 mph/s)	1.5 kph/sec (0.93 mph/s)
Variable Acceleration Speed 1	50043	6	Min: 0 Max: 124	mph	20 kmph (12.43 mph)	20 kmph (12.43 mph)
Variable Acceleration Speed 2	50044	37	Min: 0 Max: 124	mph	60 kmph (37.28 mph)	60 kmph (37.28 mph)
Engine Brakes						
Engine Brake Control Enable	23021	N		Y = Enable N = Disable	Y	Y
Engine Brake Type	12790	0		0 = Exhaust Brake 2 = Engine Brake	2	2
Engine Brake Minimum Vehicle Speed	11540	0	Min: 0 Max: 35	mph	0	0
Engine Brake Delay Time	11542	0.0	Min: 0.0 Max: 4095.9	Seconds	0	0
Engine Brake Service Brake Activation Enable	21251	N		Y = Enable N = Disable	N	N
Engine Brake Clutch Pedal Activation Enable	21253	N		Y = Enable N = Disable	Y	Y
Cruise Control and Engine Brake Interaction Enable	20601	N		Y = Enable N = Disable	N	N
Start Maximum Engine Braking in Cruise Control	12410	3.1	Min: 0.0 Max: 6.2	mph	--	--
Start Minimum Engine Braking in Cruise Control	12420	2.0	Min: 0.0 Max: 6.2	mph	--	--
Accelerator Base						
Clutch Switch	10790	0		0 = Not Installed 1 = Installed	1	1
Starter Lockout Enable	24000	N		Y = Enable N = Disable	Y	Y
Starter Lockout Relay Type	22161	0		0 = Normally Closed 1 = Normally Open	1	1
Transmission Setup						
Transmission Top Gear Ratio	10300	1.000	Min: 0.000 Max: 64.000	Ratio	1	1
Gear Down Transmission Ratio	11340	1.330	Min: 0.000 Max: 64.000	Ratio	1.33	1.33
Transmission Type	11410	0		0 = Manual ; 1 = Automatic ; 2 = Fully Automated with Clutch ; 3 = Partially Automated 4 = Fully Automated without Clutch	0	0
Vehicle Speed Input						
Rear Axle Ratio	10050	5.120	Min: 1.000 Max: 15.996		4.88	4.88
Tire Size	10060	500	Min: 301 Max: 1287	Rev/Mile	295 rev/km (475 rev/mile)	295 rev/km (475 rev/mile)
Number of Transmission Tailshaft Gear Teeth	10070	4	Min: 1 Max: 64		4	4
Vehicle Speed Sensor Type	10080	0		(0 = None) ; 1 = Magnetic 3 = Data Link - Tailshaft	1	1

Maintenance Monitor						
Maintenance Monitor Enable	20131	N		Y = Enable N = Disable	Y	Y
Maintenance Monitor Alert Percentage	10860	90	Min: 0 Max: 100	%	90	90
Maintenance Monitor Operating Mode	10230	0	0=Automatic ; 1=Time 2=Fuel ; 3=Distance	0 = Automatic ; 1 = Time 2 = Fuel ; 3 = Distance	3	3
Maintenance Monitor Time	10290				1000 sec	1000 sec
Maintenance Monitor Distance	10280	25000	Min: 0 Max: 1000000	Miles	40000 km (24854.848 miles)	40000 km (24854.848 miles)
Maintenance Monitor Fuel	10250				2404	2404
Alternator Failure Warning	22571	N		Y = Enable N = Disable	Y	Y
Anti-Tampering Measures						
Maximum Engine Speed Without Vehicle Speed Source	10020	2850	Min: 900 Max: 3000	rpm	1800	1800
Vehicle Speed Sensor Anti-Tampering Enable	20761	N		Y = Enable N = Disable	Y	Y
Engine Protection						
Engine Protection Shutdown Enable	20091	Y		Y = Enable N = Disable	Y	Y
Service Brake						
Service Brake Switch Enable	50070	N		Y = Enable N = Disable	Y	Y
Fan Control						
Air Conditioning Pressure Switch Input	21712	Disable		Y = Enable N = Disable	Y	N
Min Fan ON Time for Air Conditioning Pressure Switch	11350			Seconds	5	--
Fan Type	12490				7	7
Fan drive ratio	50670			ratio	1.2	1.2
Air Condition Control (Applicable ony for SIGNA cabin)						
Air Conditioner Control	51260				Y	N
Air Conditioner On Idle Speed Adjust	51262				Y	--
Low Speed Idle Setpoint with Air Conditioning	51264				900	--
Powertrain Protection (PTP)						
Powertrain Protection	21781	Disable		Y = Enable N = Disable	N	N

DEBABRATA DAS [TMCV, Engineering, Jamshedpur]

From: AJAYKUMAR JADHAV [TMCV, Engineering, Pune]
Sent: 08 March 2023 12:58
To: SWAPNIL JADHAV [TMCV, Engineering, Pune]; GURMEET SINGH [TMCV, Engineering, Pune]; ANIRUDDHA TIRUKHE [TMCV, Engineering, Pune]; SANDIP PHAPALE [TMCV, Engineering, Pune]; DEBABRATA DAS [TMCV, Engineering, Jamshedpur]
Subject: M&HCV Summer Trials

Dear Team,
PFA trailing mail for summer trials are not required for 5.6 and 6.7L engine.

Regards,
Ajay

From: AJAYKUMAR JADHAV [TMCV, Engineering, Pune]
Sent: 08 June 2022 17:18
To: 'Raj Mohanty' <raj.mohanty@cummins.com>; UDAY HADAP [ERC, Engineering, Pune] <uday.hadap@tatamotors.com>; SUBHAYU DAS [TMCV, Engineering, Jamshedpur] <subhayu.das@tatamotors.com>; SANJEEV KUMAR [TMCV, Engineering, Jamshedpur] <sanjeev1.kumar@tatamotors.com>
Cc: Abhijit M Chittewan <abhijit.chittewan@cummins.com>; G. Karthikeyan <karthikeyan.ganesan@cummins.com>; Madhurima Biswas <madhurima.biswas@cummins.com>; PRAHLADA ANAND [ERC, Engineering, Pune] <anand.p@tatamotors.com>; SANJEEV KUMAR [TMCV, Engineering, Jamshedpur] <sanjeev1.kumar@tatamotors.com>; Abhijit M Chittewan <abhijit.chittewan@cummins.com>; G. Karthikeyan <karthikeyan.ganesan@cummins.com>; Sachin Solanki <sachin.solanki@cummins.com>; Gupta Deepak <gupta.deepak@cummins.com>; VISHNU DIXIT [TMCV, Engineering, Jamshedpur] <vishnud@tatamotors.com>; SANDIP GAIDHANE [TMCV, Engineering, Pune] <sandip.gaidhane@tatamotors.com>; MAHESH PISE [TMCV, Engineering, Pune] <mahesh.pise@tatamotors.com>; VINODKUMAR S M [TMCV, Engineering, Pune] <vinodkumar.sm@tatamotors.com>; Rahul Singh (TTL) <rahuls4.ttl@tatamotors.com>
Subject: RE: M&HCV Summer Trials

Dear All,
As per trailing mail confirmation from Cummins team. Only LPC trials is planned on 4830.TK as worst case at JSR and summer trials are not required for 5.6 and 6.7L engine.

Subhayu/ Sanjeev Sir: Kindly confirm 48T vehicle availability for LPC trials at JSR . Cummins team will join trials along with instrument setup.

Thanks for confirmation.

Regards,

Ajay

From: Raj Mohanty <raj.mohanty@cummins.com>
Sent: 02 June 2022 15:58
To: UDAY HADAP [ERC, Engineering, Pune] <uday.hadap@tatamotors.com>
Cc: Abhijit M Chittewan <abhijit.chittewan@cummins.com>; G. Karthikeyan <karthikeyan.ganesan@cummins.com>; Madhurima Biswas <madhurima.biswas@cummins.com>; PRAHLADA ANAND [ERC, Engineering, Pune] <anand.p@tatamotors.com>; SANJEEV KUMAR [TMCV, Engineering, Jamshedpur] <sanjeev1.kumar@tatamotors.com>; AJAYKUMAR JADHAV [TMCV, Engineering, Pune] <ajaykumar_jadhav@tatamotors.com>; Abhijit M Chittewan <abhijit.chittewan@cummins.com>; G. Karthikeyan <karthikeyan.ganesan@cummins.com>; Sachin Solanki <sachin.solanki@cummins.com>; Gupta Deepak <gupta.deepak@cummins.com>
Subject: RE: M&HCV Summer Trials

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Dear Uday,
LPC trial is planned in Signa 4830.TK vehicle at JSR as a worst case based on higher fuel layout.

Regards,
Raj Mohanty
Application Engineering
+91 90310 56223

From: uday.hadap@tatamotors.com <uday.hadap@tatamotors.com>
Sent: 30 May 2022 15:07
To: Gupta Deepak <gupta.deepak@cummins.com>
Cc: anand.p@tatamotors.com; sanjeev1.kumar@tatamotors.com; ajaykumar_jadhav@tatamotors.com; Abhijit M Chittewan <abhijit.chittewan@cummins.com>; G. Karthikeyan <karthikeyan.ganesan@cummins.com>; Sachin Solanki <sachin.solanki@cummins.com>
Subject: M&HCV Summer Trials
Importance: High

EXTERNAL SENDER: This email originated outside of Cummins. Do not click links or open attachments unless you verify the sender and know the content is safe.

Dear Deepak,

Reference discussion last week. Kindly confirm Cummins team availability for summer trials (Jaisalmer) with instrument & include the tests to be conducted.

Engine	Model	Responsible person	Location	Remark	Cummins team remark if any
5.6L	Signa 3023.T	Uday Hadap	Jaisalmer	Discussion under progress (Details will be shared shortly by Engine) Note: LPC trials not required for summer trials . final confirmation required from engine if any additional tests with supplier	
6.7L	Signa 5530.S	Uday Hadap	Jaisalmer		

Regards,

Uday

****
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****
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