ANNEXURE I

SPECIFICATIONS OF FTIR ANALYSER FOR AUTOMOTIVE EXHAUST

The FTIR analyser should be capable of simultaneous measurement of the concentrations of multiple components of automotive engine emissions by utilizing the Fourier Transform Infrared (FTIR) method along with measurement of THC using the FID principle with all the necessary equipment and cabling from the exhaust of engine to the sampling point of the equipment.

The equipment should be capable of measuring at least 28 components (selectable from a total list) simultaneously with a Sampling Rate of 5 Hz. The other specifications that are to be met are given in Table 1 below.

Table 1 specification of FTIR Analyser

Principle	(a)Fourier Transform infrared spectroscopy (FTIR) With minimum spectrum range 650 to 4000 cm^{-1} & spectral Resolution 0.5 per cm. (b) Total hydrocarbons with FID
Response time (T10-90)	Within 5 seconds.
Warm-up time	Approx. Less than 2 hours after turning on the main power (Sleep to Stand-by).
Operating Environment	Ambient Temperature 15°C to 35°C.The FTIR along with FID shall have inbuilt temperature control mechanism
Zero drift / span drift	Within ± 1.0 % of full scale When the ambient temperature is stable, confirmed with 200ppm CO, 500ppm CH4 and 500ppm C2H6
Repeatability	(a) For FTIR: Within ± 1.0 % of full scale (When the ambient temperature is stable, confirmed with 200ppm CO, 500ppm CH_4 and 500ppm C_2H_6) (b) For FID: Within ± 0.5% of full scale
Accuracy	(a) FTIR: within ±1% of full scale. (b) FID: 2% of the reading or 1% of the full scale whichever is smaller
Zero Noise and interference for FID	Zero Noise:0.02 ppm C Interference: O_2 0 vol% to 21 vol%: within ±1.5% THC readings (for C_3H_8 350 ppm C ± 75 ppm C)
Control Unit	Separate PC with touchscreen along with latest OS and Bench software or Rack mounted PC with latest OS and Software Platform.
Heated Sampling line	11m or higher – for transient operation
The system must have the capability to manually perform: 1. Calibration of each of the analysers in the system. 2. Leak Check. 3. Line Response Check 4. Interference check	
Warranty inclusive of consumables and spare parts	For 3 years starting from one month after the date of delivery or date of installation – whichever is earlier

Table-2 Details of component needed and its range (FTIR along with FID)

Sl.No	Types of fuel used	Name of the Component	Chemical formula	Range
1	Methanol,Ethanol, Butanol,Biogas,Bio-diesel,Natural Gas,Hydrogen,Diesel and Gasoline	Methanol	CH_3OH	0-1000 ppm
2		Formaldehyde	HCOOH	0-1000 ppm
3		Acetaldehyde	CH_3COOH	0-1000 ppm
4		Benzene	C6H6	0-500 ppm
5		Toluene	C7H8	0-1000 ppm
6		Xylene	C8H10	0-500 ppm
7		Ethylene	C2H4	0-1000 ppm
8		1,3 Butadiene	C4H6	0-1000 ppm
9		Acetylene	C2H2	0-1000 ppm
10		N-octane	C8H18	0-500 ppm
11		Formic Acid	HCOOH	0-200 ppm
12		Sulphur Dioxide	SO2	0-1000 ppm
13		Non-methane Hydrocarbon	NMHC = FID – CH4 (calculated)	0-10000 ppm
14		Ammonia	NH3	0-1000 ppm
15		Nitrous oxide	N2O	0-1000 ppm
16		Ethanol	C2H5OH	0-1000 ppm
17		Hydro-cyanides	HCN	0-500 ppm
18		Iso-Cyanides	HNCO	0-1000 ppm
19		Nitric oxides	NO	0-500,0-3000 ppm
20		Nitrogen Di-oxide	NO2	0-2000 ppm
21		Oxides of Nitrogen	NOX = NO + NO2 (calculated)	0-500, 0-4000 ppm
22		n-pentane	C5H12	0-200 ppm
23		Propane	C3H8	0-300, 0-2000 ppm
24		Ethane	C2H6	0-1000 ppm
25		Methane	CH4	0-3000 ppm
26		Carbon Monoxide	CO	0-1% , 0-10% Vol.
27		Carbon Dioxide	CO2	0-20% Vol
28		Water	H2O	0-20% Vol
29		Iso-pentane	C5H12	0-1000 ppm
30		THC (FID)	-	0-20000 ppm

Supplier Qualification Requirements

1. The bidder should have supplied at least three FTIR based analysers with BS IV or higher specifications to NATRIP testing centers (National Automotive Testing and R&D Infrastructure Project) and reputed automotive OEMs (Original Equipment Manufacturers) in the last five years. Out of the three at least two should have been supplied to NATRIP testing centers like ARAI (Automotive Research Association of India) or ICAT (International Centre for Automotive Technology) or GARC (Global Automotive Research Centre) or NATRAX (National Automotive Test Tracks) for

automotive applications with BS IV capability or higher. Proof of supply has to be provided along with the technical bid without any financial items being indicated.

2. The supplier should be the sole representative of the manufacturer of the offered item in India.
3. The supplier should be able to offer complete after sales service support in Chennai with office in Chennai. During the warranty period of 3 years the supplier should be able to respond to any service issue within 48 hours.
4. Warranty should be for three years starting from one month after the date of delivery or date of installation – whichever is earlier. The date of supply should be within 6 months of the PO, the rate indicated should be CIP and that the mode of payment should be specified.
5. No financial details should be specified in the technical bid. Violation will lead to disqualification. EMD should be kept in the financial bid only.
6. Any other support systems that are needed for the functioning of the analyser but do Not form a part of the analyser should be specified in the technical bid.