

## TSP HIGH VOLUME AIR SAMPLER CALIBRATION REPORT

Sampler Location				Date	December 9, 2022
Project Site				Start Time	10:30 AM
Sampler Number	TSP No.2	Transfer Standard Type	Orifice	Stop Time	10:45 AM
Motor Serial Number	TSP No.2	Calibrator Model	25A	Person	Mr.Pasagorn Samol
Recorder Serial Number	-	Calibrator Serial Number	307N		

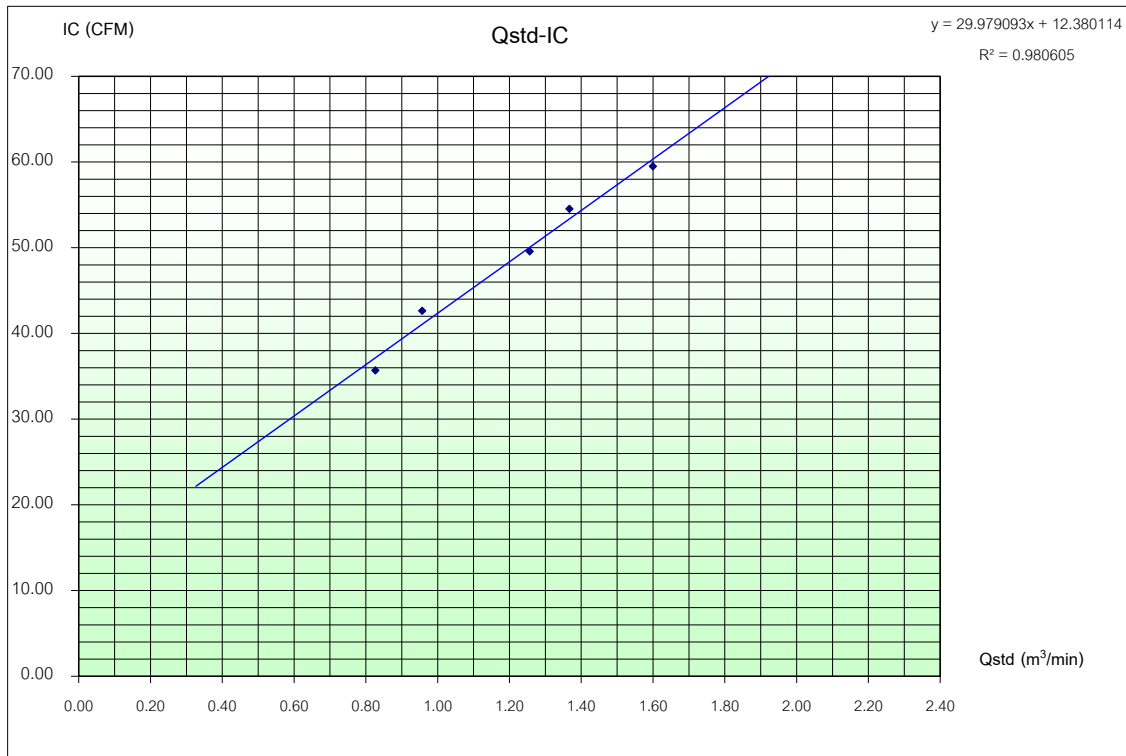
Plate No.	(Delta H)			(A)	(X)	(I)	(Y)	Temperature	Barometric Pressure	Start Meter	Stop Meter
	Positive	Negative	$\Delta H_{H_2O}$	$[\Delta H_{H_2O} (Pa/P_{std}) (T_{std}/T_a)]^{1/2}$	$Q_{std} = (1/m) [(A-b)]$ (m <sup>3</sup> /min)	Sample Flow Rate Indicator (ft <sup>3</sup> /min)	$[C = I [(Pa/P_{std}) (T_{std}/T_a)]^{1/2}]$	(°K = °C+273)	(mmHg)		
5	1.5	1.4	2.9	1.67421	0.82660	36.0	35.70	303.0	760.0		
7	2.0	1.8	3.8	1.94336	0.95703	43.0	42.64	303.0	760.0		
10	3.4	3.3	6.7	2.56124	1.25646	50.0	49.59	303.0	760.0		
13	4.0	3.9	7.9	2.78917	1.36692	55.0	54.54	303.0	760.0		
18	5.5	5.4	10.9	3.26965	1.59976	60.0	59.50	303.0	760.0		

Linear Regression Y ON X : Y= mX + b

1	Slope ( m )	2.06353	Linear Equation		Average	303.0	760.0		
2	Intercept ( b )	-0.03151	Set Point Flow Rate ( X ) (m <sup>3</sup> /min)	1.133	r <sup>2</sup>	0.999555	Pstd(mmHg)	760.0	
3	Correlation Coefficient ( r )	0.99993	Final Set Flow Rate = ( I )	0	r	0.9997775	T <sub>NTP</sub>	298.0	
Result								C=(Pa/Pstd)*(Tstd/Ta)^0.5	0.991714853

COMMENT

Andersen Instruments, Inc.



Calibrated By

  
Mr. Pasagorn Samol

## PM10 HIGH VOLUME AIR SAMPLER CALIBRATION REPORT

Sampler Location				Date	December 9, 2022
Project Site				Start Time	10:20 AM
Sampler Number	PM10 No.2	Transfer Standard Type	Orifice	Stop Time	10:35 AM
Motor Serial Number	PM10 No.2	Calibrator Model	25A	Person	Mr.Pasagorn Samol
Recorder Serial Number	-	Calibrator Serial Number	307N		

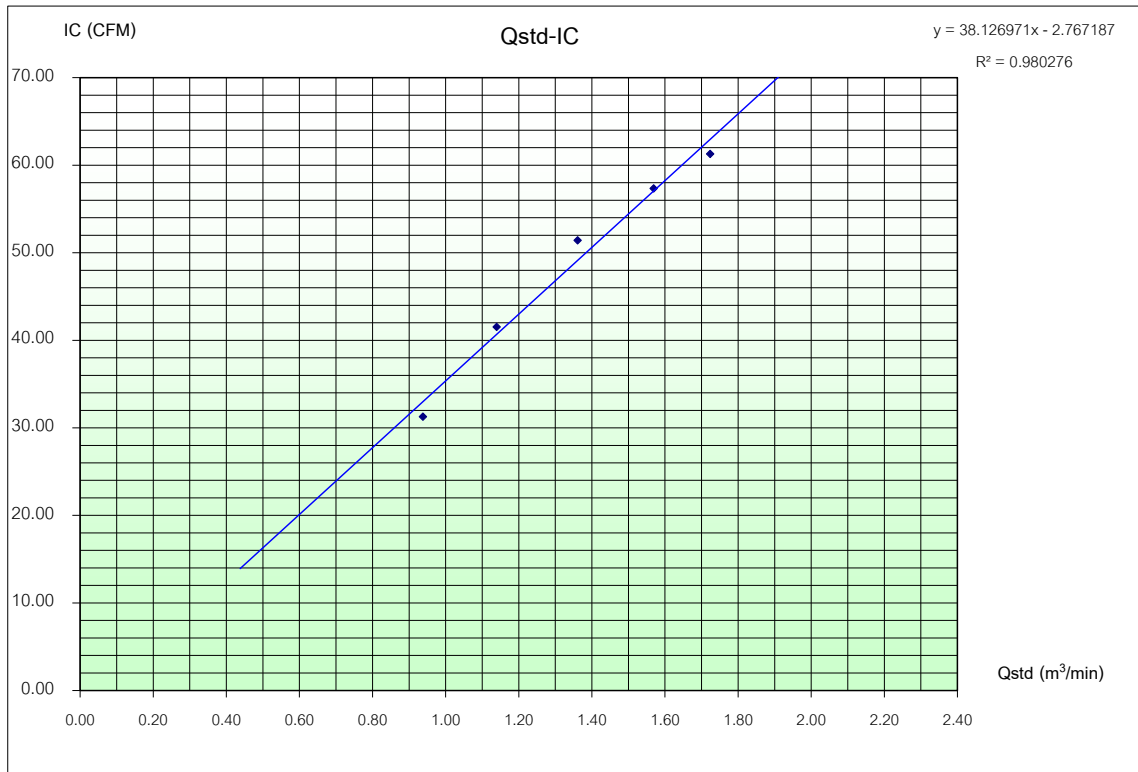
Plate No.	(Delta H)			(A)	(X)	(I)	(Y)	Temperature	Barometric Pressure	Start Meter	Stop Meter
	Pressure Drop Across Orifice (inH <sub>2</sub> O)			$[\Delta H_2O(Pa/P_{std})(T_{std}/Ta)]^{1/2}$	$Q_{std} = (1/m)[(A-b)]$	Sample Flow Rate Indication	$IC = I[(Pa/P_{std})(T_{std}/Ta)]^{1/2}$	(°K = °C+273)	(mmHg)		
	Positive	Negative	$\Delta H_2O$		(m <sup>3</sup> /min)	(ft <sup>3</sup> /min)					
5	1.9	1.8	3.7	1.90390	0.93791	32.0	31.27	305.0	760.0		
7	2.8	2.7	5.5	2.32025	1.13968	42.0	41.52	305.0	760.0		
10	4.0	3.9	7.9	2.77649	1.36078	52.0	51.40	305.0	760.0		
13	5.3	5.2	10.5	3.20602	1.56893	58.0	57.33	305.0	760.0		
18	6.4	6.3	12.7	3.52535	1.72368	62.0	61.28	305.0	760.0		

Linear Regression Y ON X : Y= mX + b


1	Slope ( m )	2.0635	Linear Equation		Average	305.0	760.0		
2	Intercept( b )	-0.03151	Set Point Flow Rate ( X ) (m <sup>3</sup> /min)	1.133	r <sup>2</sup>	0.982631	Pstd(mmHg)	760.0	
3	Correlation Coefficient ( r )	0.99993	Final Set Flow Rate = ( I )	0	r	0.99127746	T <sub>NTP</sub>	298.0	
Result							(Pa/Pstd)*(Tstd/Ta)	0.97704918	
							C=(Pa/Pstd)*(Tstd/Ta)^0.5	0.988457981	

COMMENT

Andersen Instruments, Inc.



Calibrated By

  
Mr.Pasagorn Samol  
Technician



บริษัท เอ็นไวร์ เซอร์วิส จำกัด  
ENVIR SERVICE CO., LTD.

## บริษัท เอ็นไวร์ เซอร์วิส จำกัด

42 รามอินทรา 14 แยก 9 แขวงท่าแร้ง เขตบางเขน กรุงเทพฯ 10230 โทรศัพท์ 02-9435814-5 โทรสาร 02-9438201

42 Raminthra 14 yeak 9, Tha Rang, Bangkhen, Bankok 10230 Tel : 02-9435814-5 Fax : 02-9438201

### Analyzer Performance Test

Calibrated Date: 22 April 2022

#### Instruments Information

Analyzer Type: CO Analyzer Model: 48C	Manufacturer Thermo Environmental S/N: 0401304259
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#### Calibration System

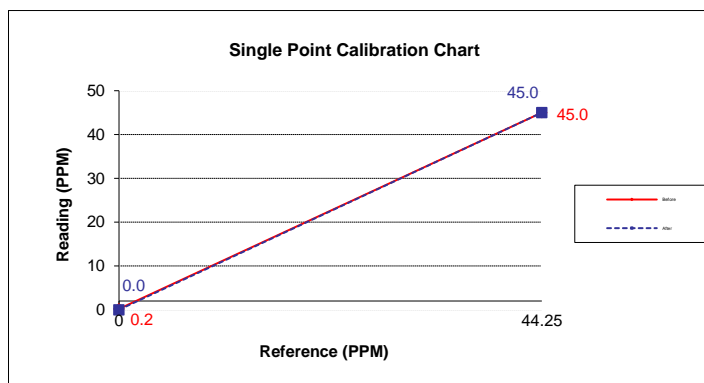
Calibrator Unit	Standard Gas
Dilutor Model Dasibi Model 5008 S/N: 705 ZERO AIR Generator API MODEL 701 S/N: 1924	NO Conc 55.47 PPM SO2 Conc 55.11 PPM CO Conc 4,535 PPM Cylinder number EB0129027 Expire Date: 29 Oct. 2027

Environment: Temperature 25.5 °C

Humidity: 51 %RH

#### Calibration Report

Status	Zero			Span		
	Reference (PPM)	Reading (PPM)	Drift (PPM)	Reference (PPM)	Reading (PPM)	Drift%
Before	0.0	0.2	0.2	44.3	45.0	1.7
After	0.0	0.0	0.0	45.0	45.0	0.0



Calibrate By :

Mr. PASAGORN SAMOL



บริษัท เอ็นไวร์ เซอร์วิส จำกัด  
ENVIR SERVICE CO., LTD.

## บริษัท เอ็นไวร์ เซอร์วิส จำกัด

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42 Raminthra 14 yeak 9, Tha Rang, Bangkhen, Bangkok 10230 Tel : 02-9435814-5 Fax : 02-9438201

### Analyzer Performance Test

Calibrated Date: 22 April 2022

#### Instruments Information

Analyzer Type: CO Analyzer Model: 48C	Manufacturer Thermo Environmental S/N: 0604815182
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#### Calibration System

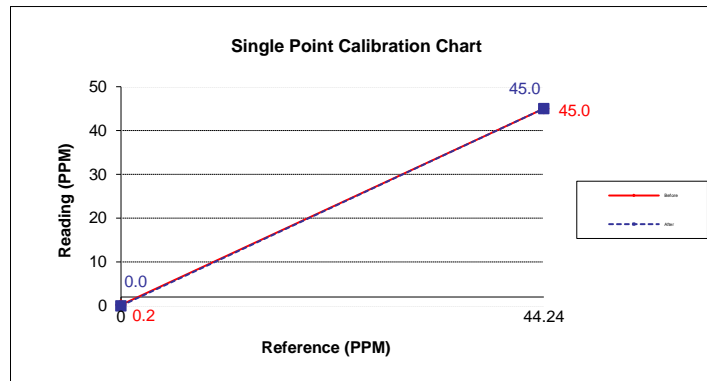
Calibrator Unit	Standard Gas
Dilutor Model Dasibi Model 5008 S/N: 705 ZERO AIR Generator API MODEL 701 S/N: 1924	NO Conc 55.47 PPM SO2 Conc 55.11 PPM CO Conc 4,535 PPM Cylinder number EB0129027 Expire Date: 29 Oct. 2027

Environment: Temperature 25.5 °C

Humidity: 51 %RH

#### Calibration Report

Status	Zero			Span		
	Reference (PPM)	Reading (PPM)	Drift (PPM)	Reference (PPM)	Reading (PPM)	Drift%
Before	0.0	0.2	0.2	44.2	45.0	1.7
After	0.0	0.0	0.0	45.0	45.0	0.0



Calibrate By :

Mr. PASAGORN SAMOL





บริษัท เอ็นไวร์ เซอร์วิส จำกัด  
ENVIR SERVICE CO., LTD.

## บริษัท เอ็นไวร์ เซอร์วิส จำกัด

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42 Raminthra 14 yeak 9, Tha Rang, Bangkhen, Bankok 10230 Tel : 02-9435814-5 Fax : 02-9438201

### Analyzer Performance Test

Calibrated Date: 22 April 2022

#### Instruments Information

Analyzer Type: CO Analyzer Model: 300E	Manufacturer TELEDAY S/N: 1799
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#### Calibration System

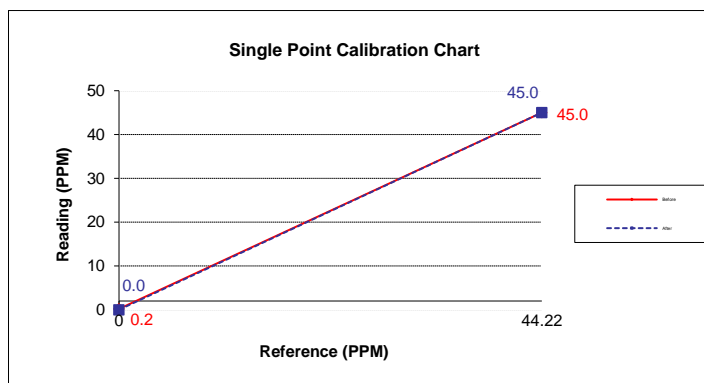
Calibrator Unit	Standard Gas
Dilutor Model Dasibi Model 5008 S/N: 705 ZERO AIR Generator API MODEL 701 S/N: 1924	NO Conc 55.47 PPM SO2 Conc 55.11 PPM CO Conc 4,535 PPM Cylinder number EB0129027 Expire Date: 29 Oct. 2027

Environment: Temperature 25.5 °C

Humidity: 51 %RH

#### Calibration Report

Status	Zero			Span		
	Reference (PPM)	Reading (PPM)	Drift (PPM)	Reference (PPM)	Reading (PPM)	Drift%
Before	0.0	0.2	0.2	44.2	45.0	1.8
After	0.0	0.0	0.0	45.0	45.0	0.0



Calibrate By :

Mr. PASAGORN SAMOL



THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-65/0480

MTC No. EEL. BP. 30/0565

## CALIBRATION CERTIFICATE

Submitted by : Green Envi Engineering Co.,Ltd.

Address : 80/179 Moo 5, Bophut, Koh Samui, Surat Thani 84320 Thailand.

Calibrated at : Electrical and Electronic Standards Laboratory, Industrial Metrology and Testing Service Centre.  
: Soi 1C, Bangpoo Industrial Estate, Sukhumvit Rd., Muang, Samutprakan 10280.

### Instrument Calibrated :

Description : Sound Calibrator

Manufacturer : ACO

Model : 2127

Serial No. : 200002

### Ambient Environment

Temperature :  $(23 \pm 3) ^\circ\text{C}$

Relative Humidity :  $(50 \pm 15) \%$

Ambient Pressure :  $(101.325 \pm 1.500) \text{ kPa}$

Standards used : 1. Digital Function Synthesizer NF Electronic DF-193A S/N 122037.

2. Measuring Amplifier Bruel&Kjaer 2636 S/N 1537484.

3. Programmable Attenuator Tamagawa TPA-303A S/N OF 2214.

4. Digital Multimeter Agilent 34401A S/N MY44005560.

5. Pressure Transmitter Vaisala PTB202AD S/N T0650001.

6. Audio Analyzer Keithley 2015-P S/N 4106495.

7. Condenser Microphone Bruel&Kjaer 4180 S/N 2889871.

**Calibration Procedure:** CP-102-04 based on IEC 60942-2003. The sound pressure level of instrument was measured by standard microphone using an insert voltage technique.

This instrument has been calibrated against standards maintained at Electrical and Electronic Standards Laboratory (EEL), which are traceable to the International System of Units through the National Institute of Metrology (Thailand).

The information on actual reading is attached herewith and the uncertainty limits quoted refer to the measured values only.

Date of Receipt : 9 May 2022

Date of Calibration : 11 May 2022

The results relate only to the items tested/calibrated or value assigned.

Advertising the Report/Certificate and publicity of the results except in full are prohibited unless written permission is obtained from the governor of TISTR.

FM.BL.MTC.002 Rev.4

#### Head Office

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Changwat Pathumthani 12120, Thailand

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Fax. (66) 0 2577 9009

E-mail : rumpai@tistr.or.th Website:www.tistr.or.th

#### Office/Laboratory

Soi 1C, Bangpoo Industrial Estate, Sukhumvit Road,  
Amphoe Muang, Changwat Samutprakan 10280, Thailand

Tel. (66) 0 2323 1672-80 ext. 115, 116

Fax. (66) 0 2323 9165

E-mail : mtc@tistr.or.th

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196 Phahonyothin Road, Chatuchak, Bangkok 10900,  
Thailand

Tel. (66) 0 2579 1121-30 ext. 5219, 5225, 5217

Fax. (66) 0 2579 8592

E-mail : sumalee@tistr.or.th

THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-65/0480

MTC No. EEL. BP. 30/0565

The reported expanded uncertainty is based upon a standard uncertainty multiplied by a coverage factor  $k = 2$ , providing a level of confidence of approximately 95%.

Nominal Output of Unit Under Test = 94 dB re 20 $\mu$ Pa at 1000 Hz

Acoustic Output in dB re 20 $\mu$ Pa, Corrected to Reference Conditions: 101.325 kPa, 23.0 °C and 50 %RH.

1. Sound Pressure Level

Standard Microphone Type	Measured Sound Pressure Level (dB)	Deviated value (dB)	Uncertainty (dB)	Tolerance limit IEC60942:2003 Class 1
1/2 inch Bruel&Kjaer 4180	93.95	-0.05	$\pm 0.10$	$\pm 0.40$ dB

2. Frequency

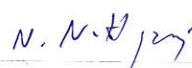
Standard Microphone Type	Measured Frequency (Hz)	Deviated value (Hz)	Uncertainty (Hz)	Tolerance limit IEC60942:2003 Class 1
1/2 inch Bruel&Kjaer 4180	999.1	-0.9	$\pm 1.5$	$\pm 1.0\%$


3. Total Distortion

Standard Microphone Type	Measured Total Distortion (%)	Uncertainty (%)	Tolerance limit IEC60942:2003 Class 1
1/2 inch Bruel&Kjaer 4180	2.25	$\pm 0.54$	$\pm 3.0\%$

- Note :
1. No adjustment.
  2. The calibrator pressure correction was not included.
  3. The microphone volume correction was not included.

Calibrated by :

  
(Mr. Nuttapong Niljrusvanit)

  
(Mr. Tawikiat Iamsamran)

Approved by :

  
(Mr. Prawate Kluaypa)  
Director

Electrical and Electronic Standards Laboratory  
Industrial Metrology and Testing Service Centre

Date of Calibration : 11 May 2022

Date of Issue : 12 May 2022

Ref : 2011265050902017001

2 / 2

End of Certificate

The results relate only to the items tested/calibrated or value assigned.

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Tel. (66) 0 2579 1121-30 ext. 5219, 5225, 5217  
Fax. (66) 0 2579 8592  
E-mail : sumalee@tistr.or.th



# Calibration Certificate

Part Number: 721A2601

Description: Micromate with DIN Geophone

Serial Number: UM16052

Calibration Date: NOV 30 2021

Calibration Reference Equipment: SRV-AFR 714J7401

*Instantel certifies that the above product was calibrated in accordance with the applicable Instantel procedures. These procedures are part of a quality system that is designed to assure that the product listed above meets or exceeds Instantel specifications.*

*Instantel further certifies that the measurement instruments used during the calibration of this product are traceable to the National Institute of Standards and Technology; or National Research Council of Canada. Evidence of traceability is on file at Instantel and is available upon request.*

*The environment in which this product was calibrated is maintained within the operating specifications of the instrument.*

*Please note that the sensor check function is intended to check that the sensors are connected to the unit, installed in the proper orientation and sufficiently level to operate properly. This function should not be confused with a formal calibration, which requires the sensors be checked against a reference that is traceable to a known standard. Instantel recommends that products be returned to Instantel or an authorized service and calibration facility for annual calibration.*

Calibrated By: \_\_\_\_\_

Xiaoming Yang

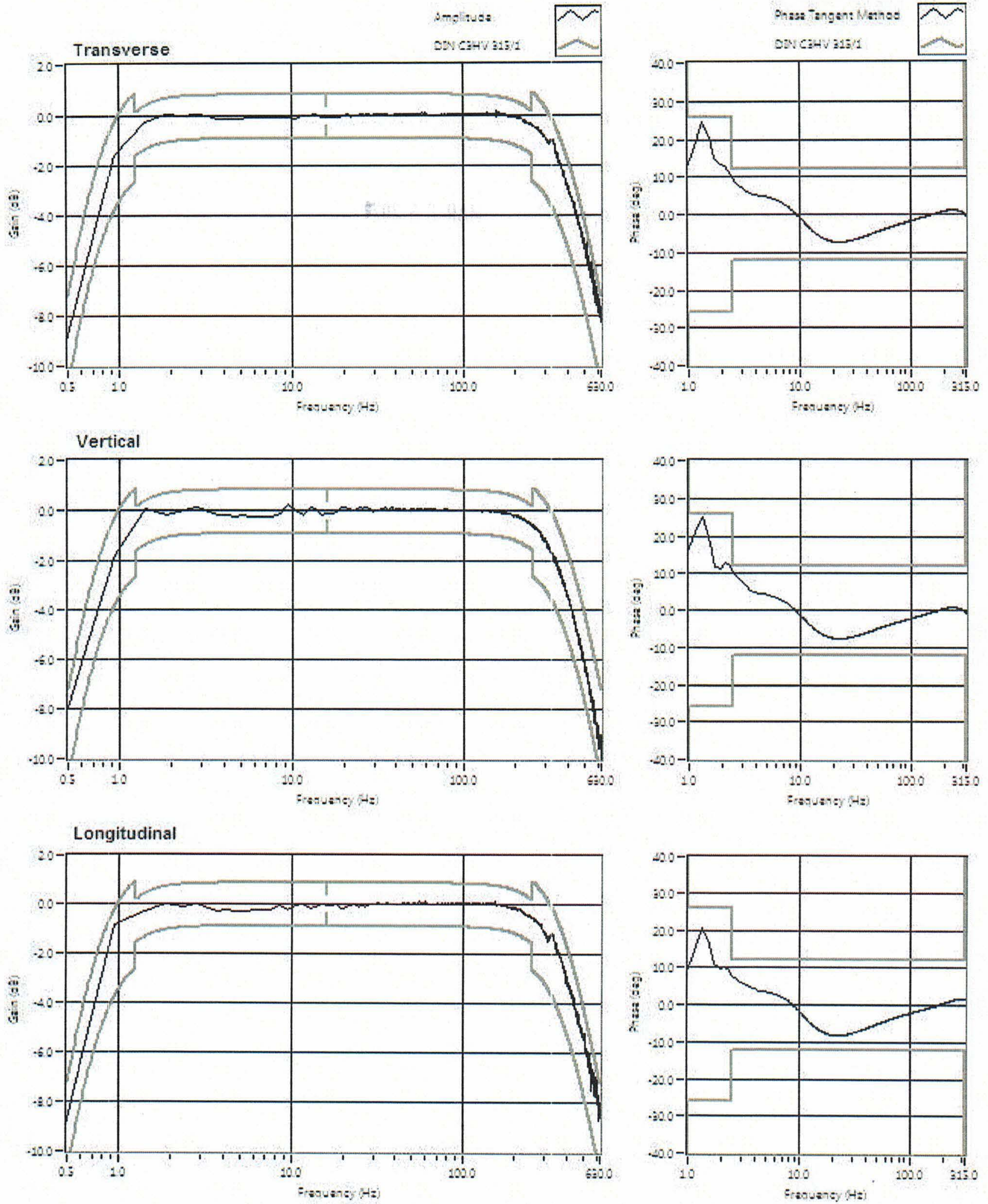


**Instantel®**

309 Legget Drive, Ottawa, Ontario, K2K 3A3, (613) 592-4642



## Frequency Response of UM16052





# Calibration Certificate

Part Number: 721A2601

Description: Micromate with DIN Geophone

Serial Number: UM16256

Calibration Date: NOV 30 2021

Calibration Reference Equipment: 714J7402

*Instantel certifies that the above product was calibrated in accordance with the applicable Instantel procedures. These procedures are part of a quality system that is designed to assure that the product listed above meets or exceeds Instantel specifications.*

*Instantel further certifies that the measurement instruments used during the calibration of this product are traceable to the National Institute of Standards and Technology; or National Research Council of Canada. Evidence of traceability is on file at Instantel and is available upon request.*

*The environment in which this product was calibrated is maintained within the operating specifications of the instrument.*

*Please note that the sensor check function is intended to check that the sensors are connected to the unit, installed in the proper orientation and sufficiently level to operate properly. This function should not be confused with a formal calibration, which requires the sensors be checked against a reference that is traceable to a known standard. Instantel recommends that products be returned to Instantel or an authorized service and calibration facility for annual calibration.*

Calibrated By: \_\_\_\_\_



Xiaoming Yang

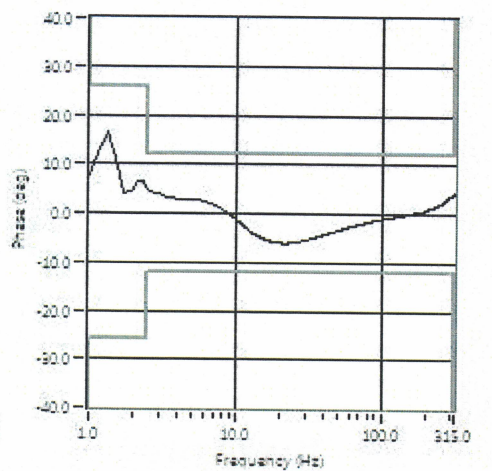
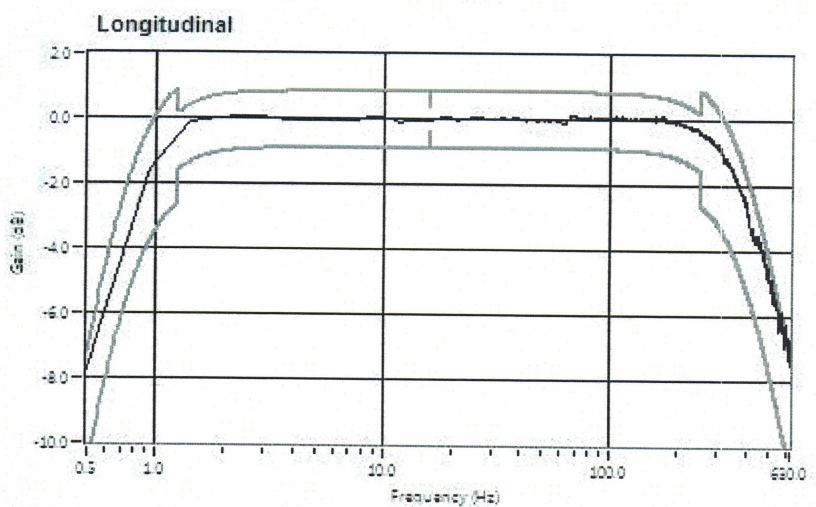
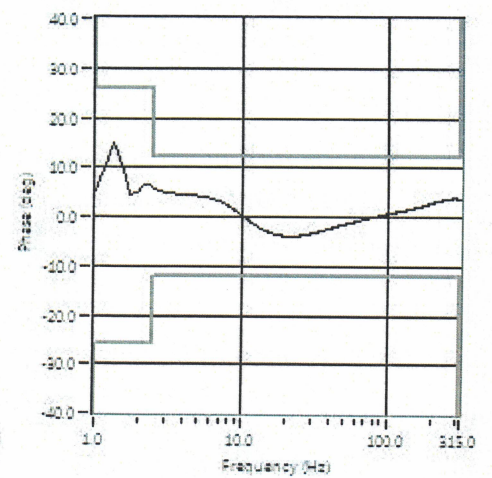
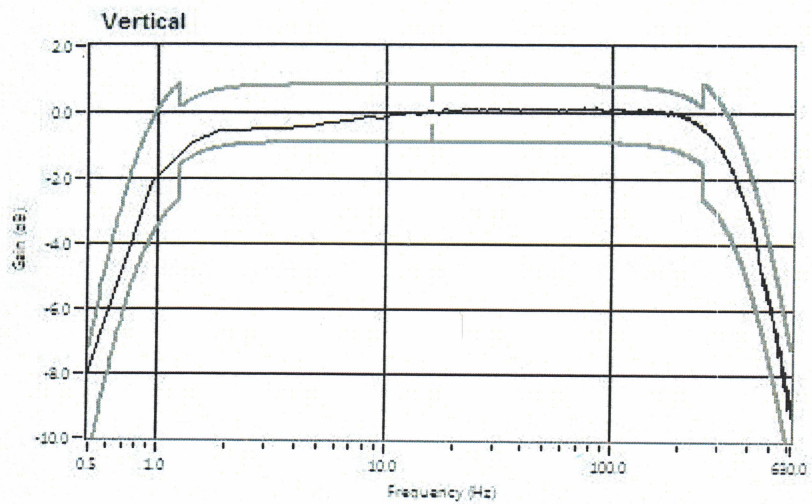
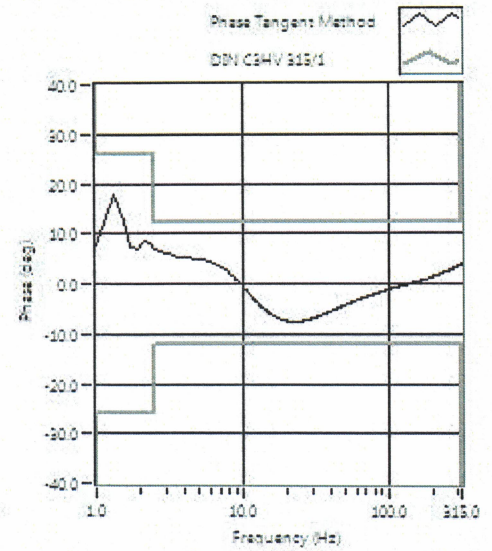
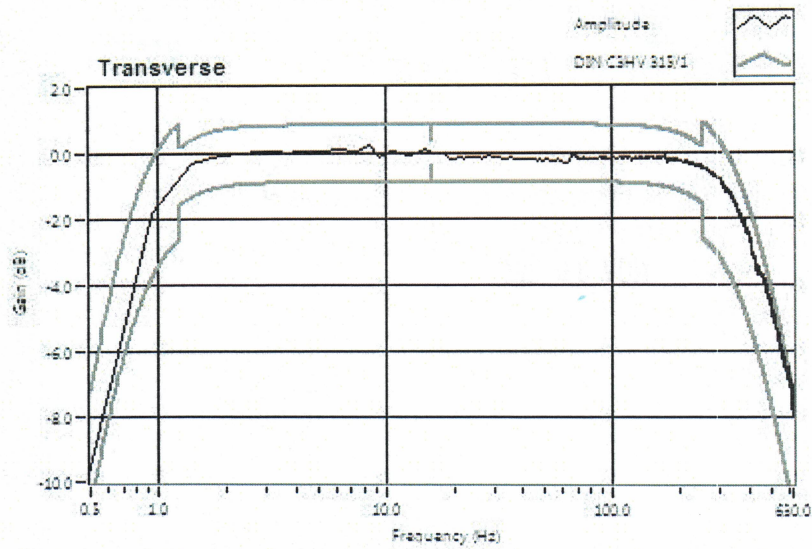


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# Frequency Response of UM16256





# Calibration Certificate

Part Number: 721A2601

Description: Micromate with DIN Geophone

Serial Number: UM16257

Calibration Date: NOV 30 2021

Calibration Reference Equipment: 714J7402

*Instantel certifies that the above product was calibrated in accordance with the applicable Instantel procedures. These procedures are part of a quality system that is designed to assure that the product listed above meets or exceeds Instantel specifications.*

*Instantel further certifies that the measurement instruments used during the calibration of this product are traceable to the National Institute of Standards and Technology; or National Research Council of Canada. Evidence of traceability is on file at Instantel and is available upon request.*

*The environment in which this product was calibrated is maintained within the operating specifications of the instrument.*

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Calibrated By: \_\_\_\_\_



Xiaoming Yang

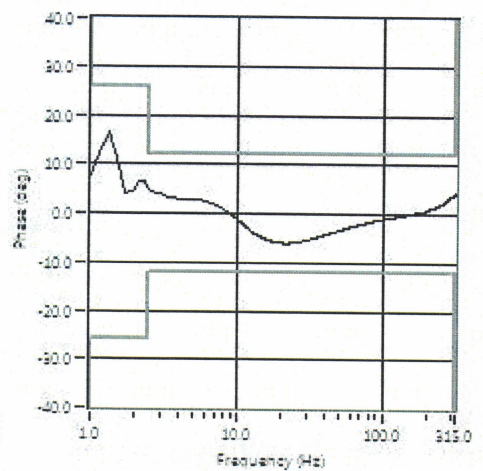
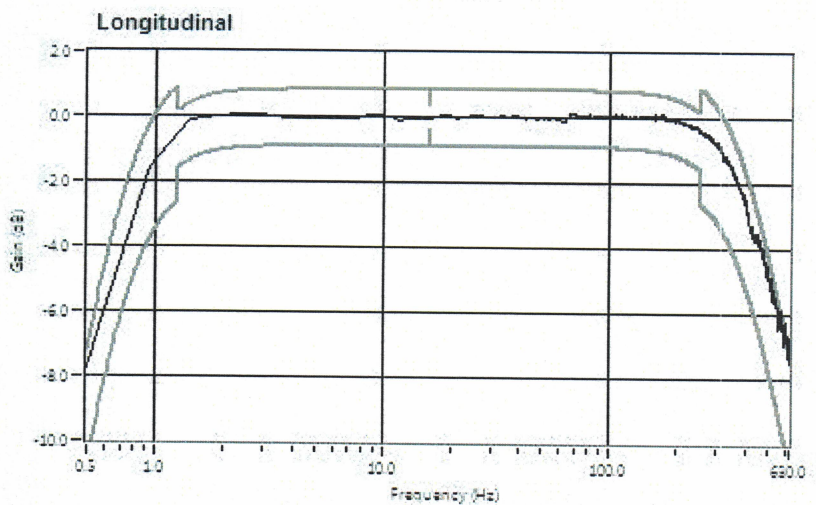
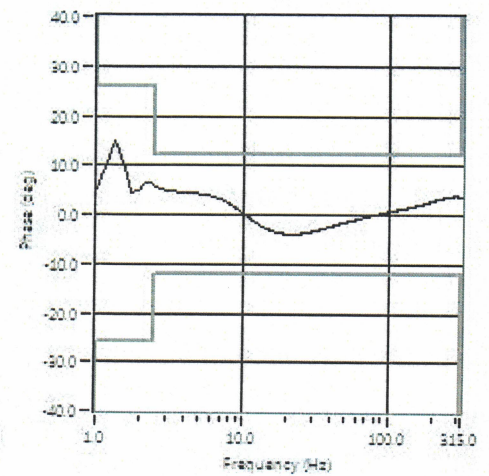
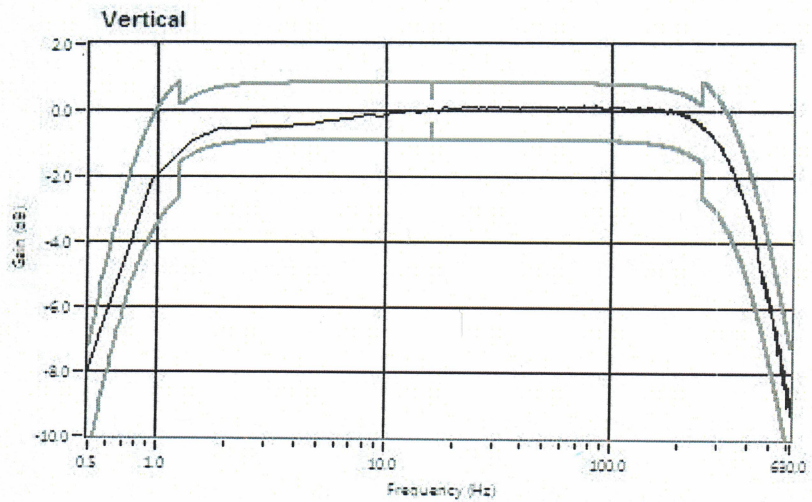
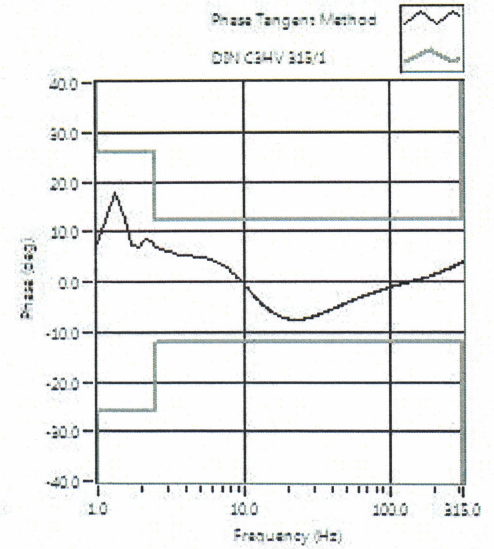
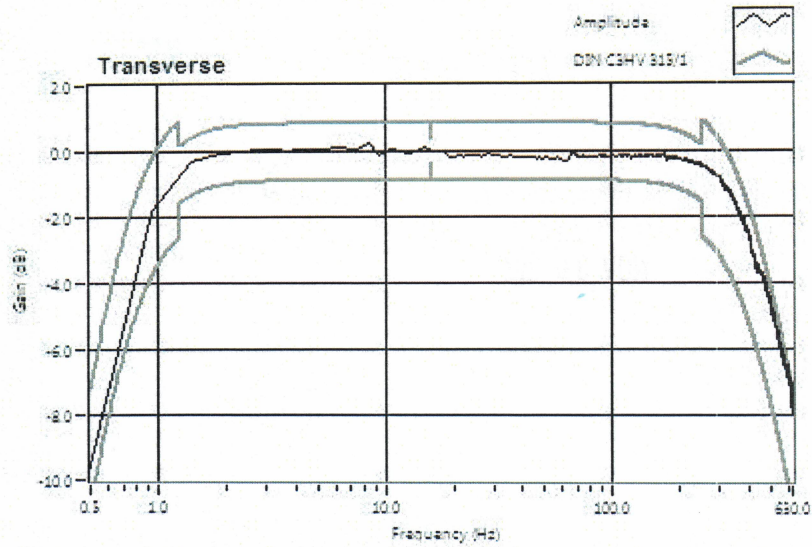


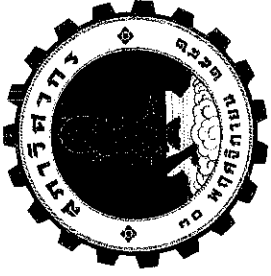
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# Frequency Response of UM16257





## สภากวีศวก

ตามพระราชบัญญัติศวก พ.ศ. ๒๕๕๒  
ออกโดยอนุบัญญัติให้ไว้เพื่อแสดงว่า

บริษัท กรีน เอ็นไว เอ็นจิเนียริง จำกัด

ได้รับอนุญาตประกอบวิชาชีพวิศวกรรมควบคุม

เลขทะเบียน ๑๕๖๕/๖๒

ตั้งแต่วันที่ ๑๖ สิงหาคม ๒๕๖๗ ถึงวันที่ ๑๕ สิงหาคม ๒๕๗๐

ศาสตราจารย์ ดร. นพ.

(นายชเนต วิระศิริ)

นายกสภากวีศวก