

Plant Name: ****
Coordinator:****
File name: C:\AREVA\IKKP TEST\PUNP-B01
Date: 08/29/2008 15:56:30

Analyst : ****
Equipment : ****

Empath 2000 5.0 Analysis Results

PERFORMANCE SUMMARY

Bottom Line

- This induction motor is operating normally, no action is required.
 This induction motor exhibits suspicious operation, trending of the induction motor is warranted.
 This induction motor exhibits abnormal indications, action is warranted, NOW.

Power Factor Commentary

- Power factor exceeds 0.85.
 Power factor is below 0.85, see detailed report.

Current Commentary

- Current variation is within normal limits.
 Current variation is beyond normal limits, see detailed report.

Voltage Commentary

- Voltage variation is within normal limits.
 Voltage variation is beyond normal limits, see detailed report.
 RMS voltage differs from nameplate by more than 5%.

Load Commentary

- Load on the induction motor is consistent with nameplate values.
 Load on the induction motor exceeds nameplate values, see detailed report.
 Load on the induction motor is less than 25%.

Phase Connection Commentary

- Connections are normal.
 Voltage ground reference is NOT neutral.
 Loose connection.

Rotor Commentary

- Rotor bar health is normal.
 Rotor bar health is questionable, see detailed report.
 Load is insufficient to determine rotor bar health, at this time.

Stator Commentary

- Stator health is normal.
 Stator electrical health is questionable.
 Stator mechanical health is questionable (Matching RB and SS peaks in high freq.spectrum).
 Turn to turn short.

Rotor/Stator Air-gap Characteristics

- Dynamic or static eccentricity indications do not exist.
 Indications of static eccentricity exist (Matching RB and SS peaks in high freq.spectrum).
 Indications of dynamic eccentricity exist.

Harmonic Distortion Commentary

- There is no evidence of harmonic distortion.
 There is evidence of harmonic distortion, see detailed report.

Misalignment Indications

- There are no indications of mechanical problems like misalignment or unbalance.
 There are indications of mechanical problems like misalignment or unbalance. Perform vibration survey to identify and correct the cause.

Bearing Commentary

- There is no evidence of bearing problem.
 Indications of potential bearing problems, perform vibration survey to verify.

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INPUT SUMMARY

NAMEPLATE INFORMATION

		Units
Manufacturer	****	
Serial Number	****	
Model Number	****	
Tested Equipment	Induction	
Power	45.0	KW
RPM	1475	Rpm
Poles	4	
Phases:	3	
Voltage	380.0	Volt
Full Load Current	86.00	Amp
Number of rotor bars	36	
Number of stator slots	48	
Torque	291	N.m
CT Ratio	1.000	
PT Ratio	1.000	
Duty Cycle	****	
Service Factor	115	
Frame Size	****	
Insulation Type	****	
Ambient Temperature	70.0	F°
Motor efficiency	-1.000	
Power factor	-1.000	

Detailed Calculations

LEGENDS:

Impedance = Complex Impedance = v_i/c_i
CF = Crest Factor = (waveform peak)/(waveform rms)
CFC = Carrier Frequency Content = $10^{(x/20)}/frms, \%$
THDF = Transformer Harmonic De-rating Factor = $\sqrt{2}/CF, \%$
VDF = Voltage De-rating Factor = $100 - (\text{voltage unbalance, } \%)^2, \%$
Se, fund = Location of pole pass frequency fundamental, Hz
Se, harm = Number of pole pass frequency harmonics
Level = Sum of spectral amplitudes of pole pass frequency fundamentals and harmonics
Slip % = SRSS sum of slip and harmonic "levels" divided by RMS level of RMS DEMOD spectra between 0 and 65 Hz.
Upper sb = dB level of upper slip sideband of power line peak
Lower sb = dB level of lower slip sideband of power line peak
Rotor bar health = Estimate of the percent of broken or cracked rotor bars
Thd = Total harmonic distortion
+Ve = Positive sequence harmonic
-Ve = Negative sequence harmonic
Zero = Zero sequence harmonic

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Running Speed = 24.667 Hz
 Pole pass frequency = 0.550 Hz
 Load = 37.0 %

Time	RMS	Peak	CF
Current 1	40.863	63.619	1.557
Current 2	40.277	61.811	1.535
Current 3	39.604	61.484	1.552
Average	40.248	62.304	1.548
% dev	1.6	2.1	0.9

THDF = 91.4

Time	RMS	Peak	CF
Voltage 1	390.150	563.940	1.445
Voltage 2	388.880	558.950	1.437
Voltage 3	391.040	564.170	1.443
Average	390.030	562.350	1.442
% dev	0.3	0.6	0.3

VDF = 99.9

	Power factor	Impedance	App. Power kVA	Real Power kW	Reac. Power kVARS
Phase 1	0.676	9.548	9.224	6.238	6.794
Phase 2	0.666	9.655	9.087	6.049	6.781
Phase 3	0.664	9.874	8.880	5.898	6.638
Avg/Total	0.669	9.692	27.191	18.186	20.213
% dev	1.1	1.9			

Demand Pwr = 18.2 KW

Summary of Rotor Bar Health				Power line dB diff.		Rotor bar Health index
	Se, fund	Se, harm	Level %	Upper SB	Lower SB	
Measured	0.550	3	0.5	-47.8	-45.4	1.6391
Severity level	Rotor Condition Assessment			Recommended Corrective Action		
6	Multiple cracked or broken rotor bars and end rings indicated. Also joint and ring problems			Overhaul ASAP		

Harmonic Distortion Results:

Voltage input, from 49.609 Hz harmonics

	THD Odd %	THD Even %	+ve%	-ve %	Zero %	THD All %
Current 1	0.946	0.163	0.840	0.449	0.121	0.960
Current 2	1.273	0.106	1.130	0.592	0.060	1.277
Current 3	1.355	0.117	1.171	0.544	0.425	1.360
Voltage 1	0.652	0.044	0.487	0.412	0.140	0.654
Voltage 2	0.713	0.048	0.532	0.469	0.089	0.715
Voltage 3	0.652	0.057	0.460	0.442	0.144	0.654

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Figure- 1: Current Harmonic distortion graph

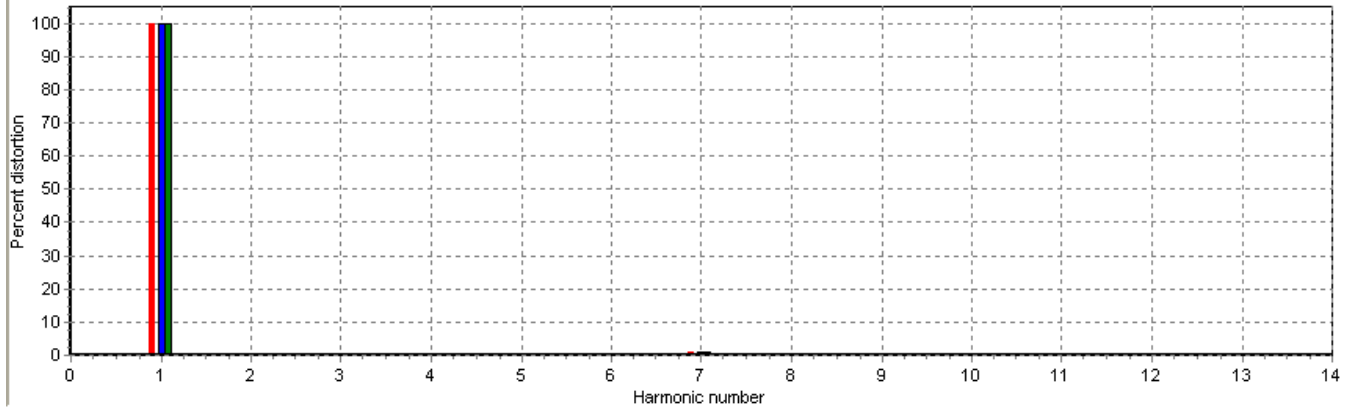
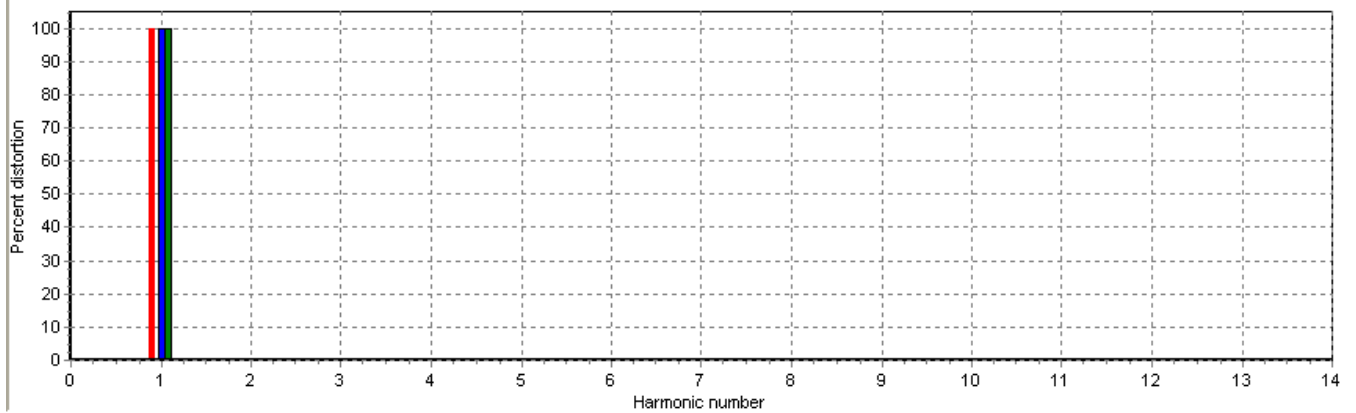


Figure- 2: Voltage Harmonic distortion graph



Harmonic distortion table						
Hz	Cur1	Vlt1	Cur2	Vlt2	Cur3	Vlt3
50	40.5	391	39.9	390	39.2	390
100	0.1	0	0.0	0	0.0	0
150	0.0	0	0.1	0	0.1	0
200	0.0	0	0.0	0	0.0	0
250	0.1	1	0.1	0	0.1	1
300	0.0	0	0.0	0	0.0	0
350	0.3	2	0.3	2	0.3	2
400	0.0	0	0.0	0	0.0	0
450	0.0	0	0.0	0	0.0	0
500	0.0	0	0.0	0	0.0	0
550	0.0	0	0.0	0	0.0	0
600	0.0	0	0.0	0	0.0	0

Bearing condition					
Location	Bearing No.	IR	OR	T/C	BS
Drive end	SKF 6315	OK	OK	OK	OK
Opposite end	SKF 6315	OK	OK	OK	OK

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Description:

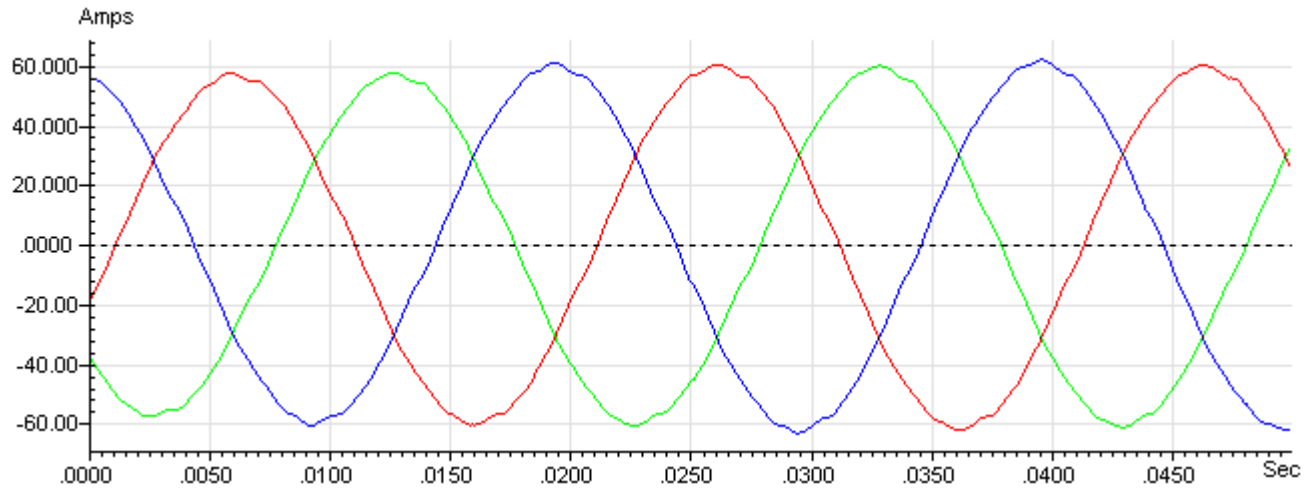


Figure-3 Ch-1 Current-1{ 3, 5}

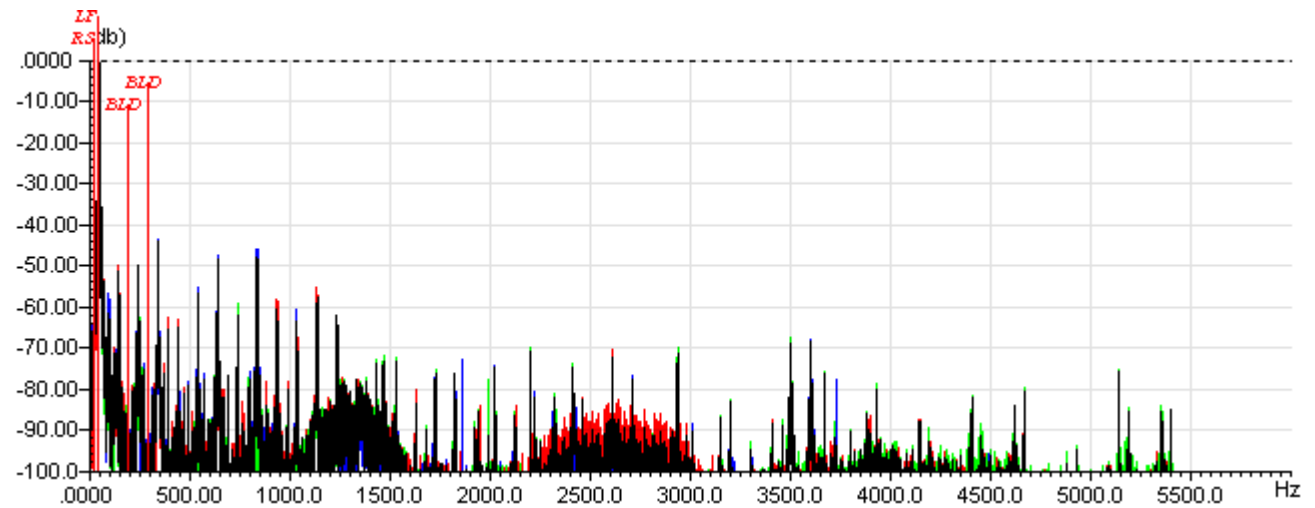


Figure-4 Ch-1 Current-1{ 3, 5}

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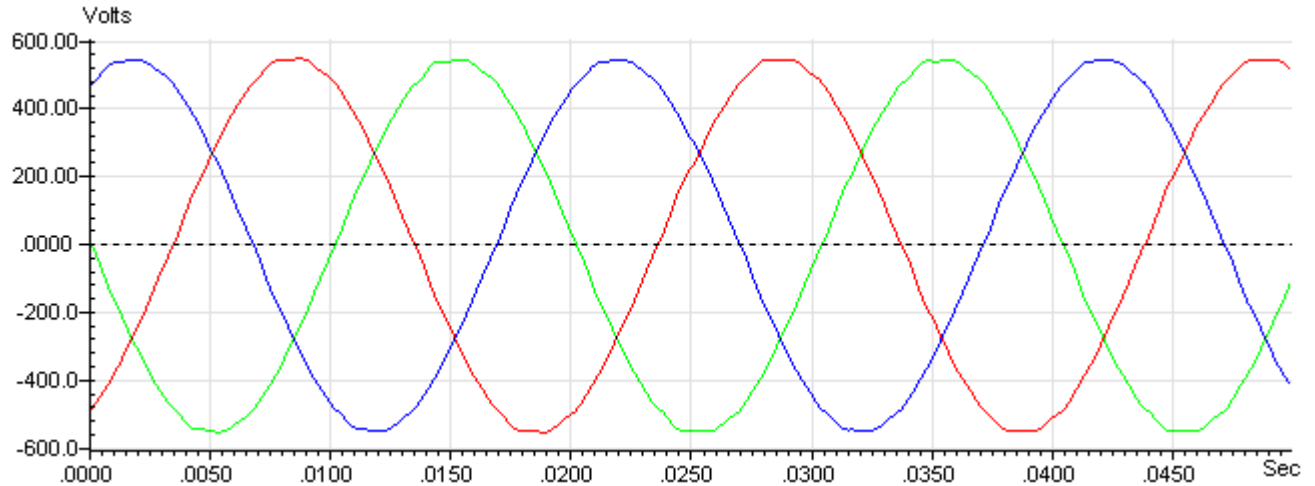


Figure-5 Ch-2 Voltage-1{ 4, 6}

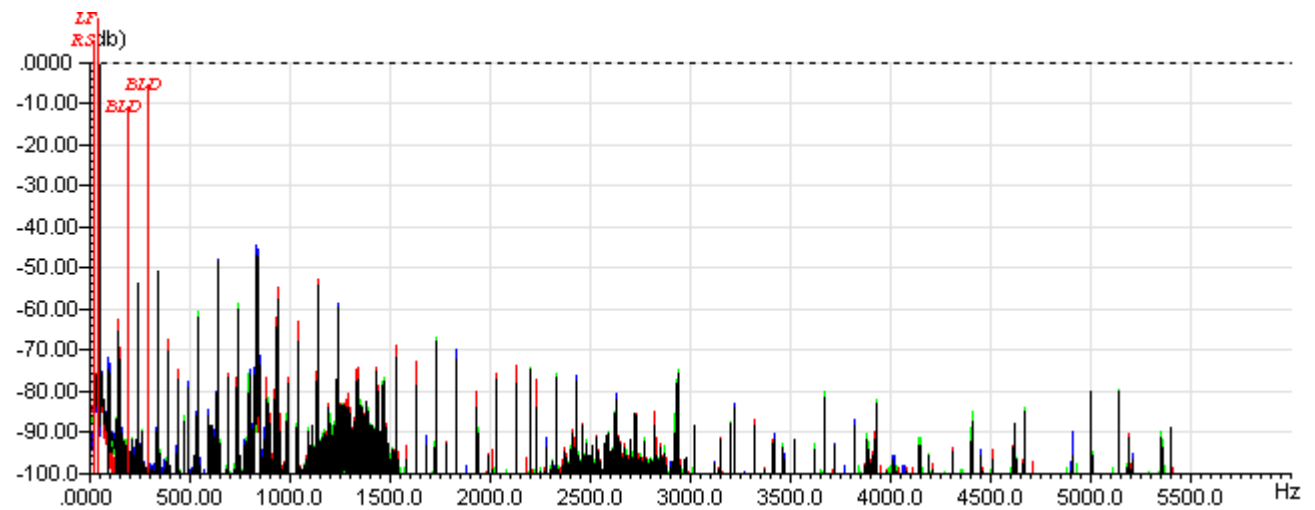


Figure-6 Ch-2 Voltage-1{ 4, 6}

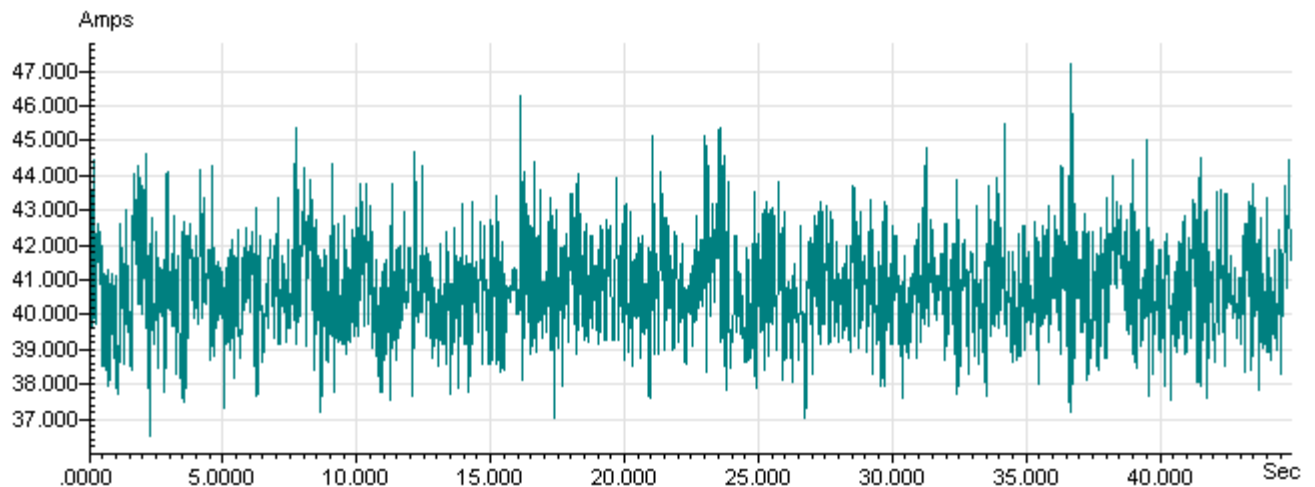


Figure-7 Ch-9 Current-1 { RMS }

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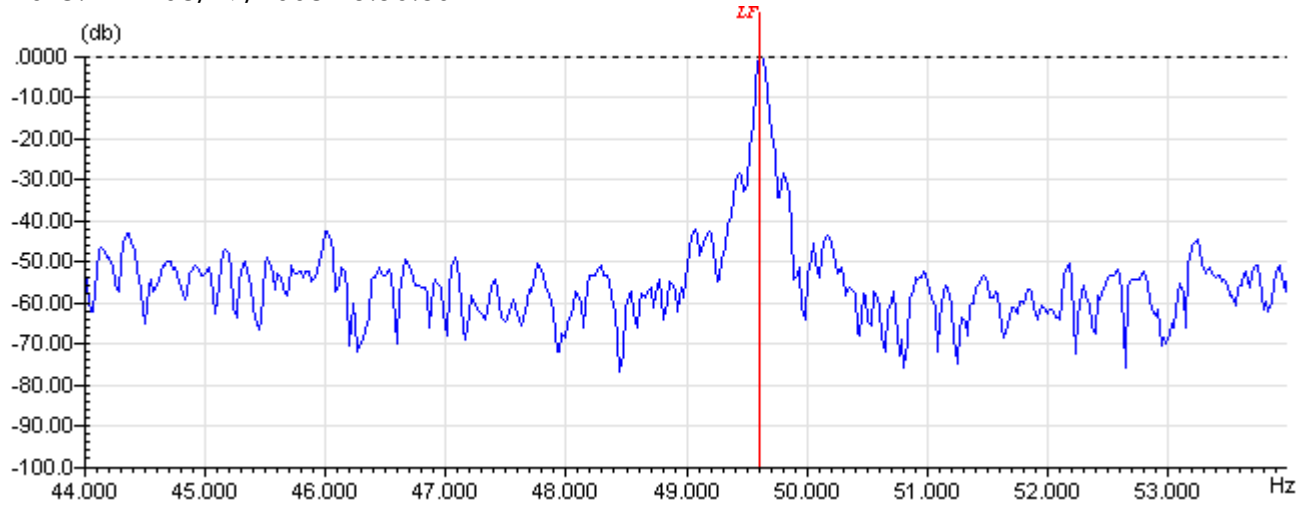


Figure-8 Ch-9 Current-1 { RMS }

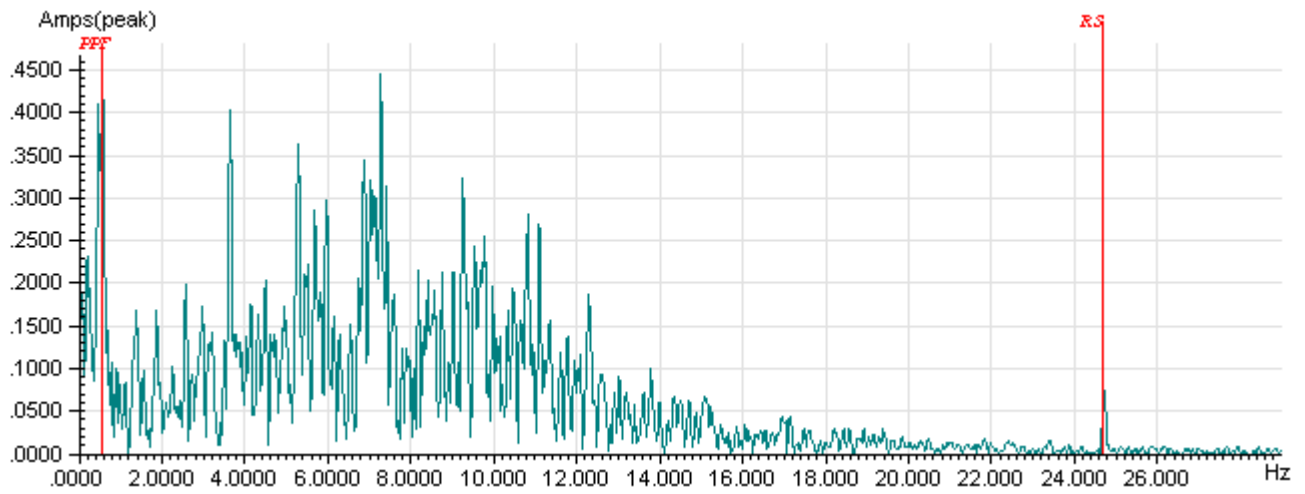
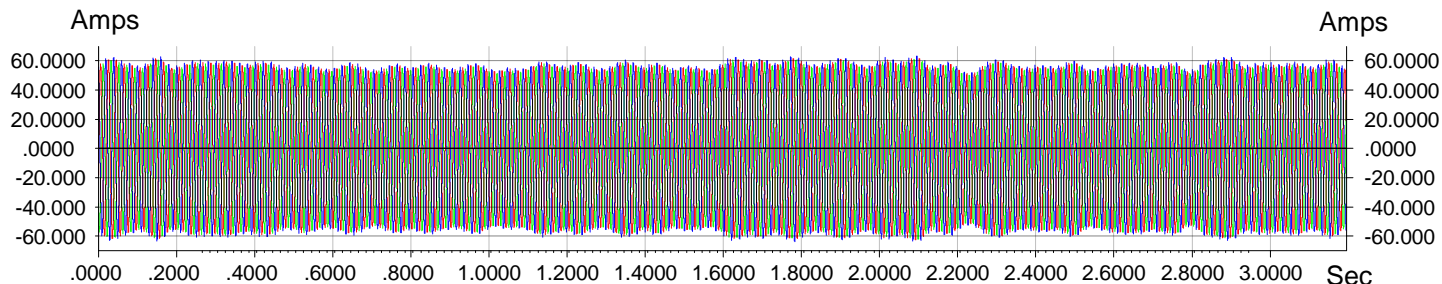
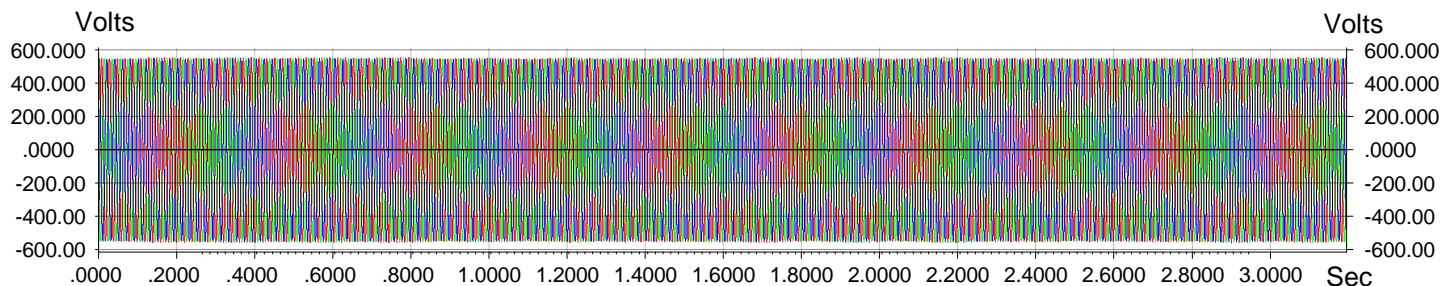


Figure-9 Ch-9 Current-1 { RMS } spectra-Demod

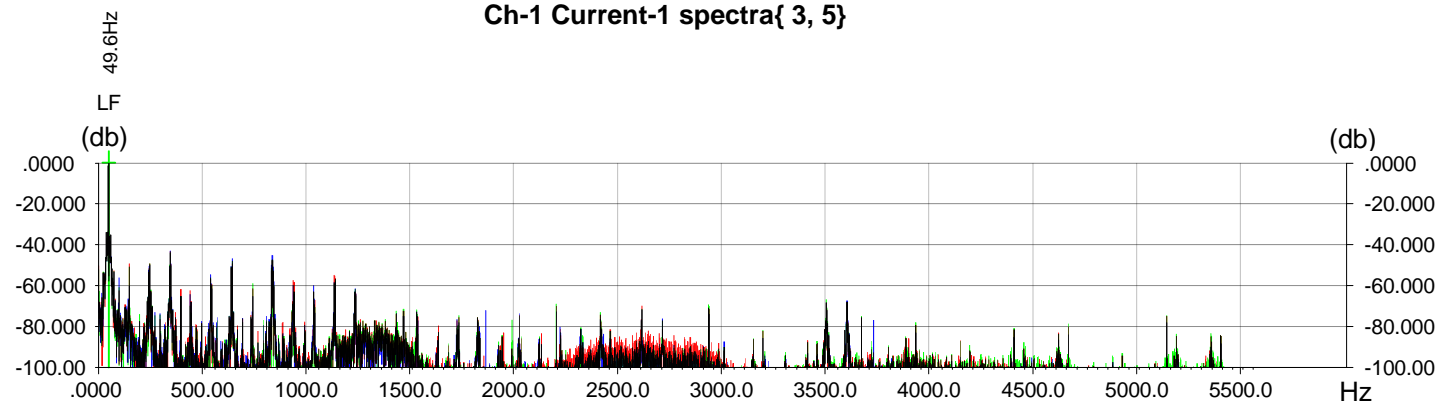
Ch-1 Current-1{ 3, 5}



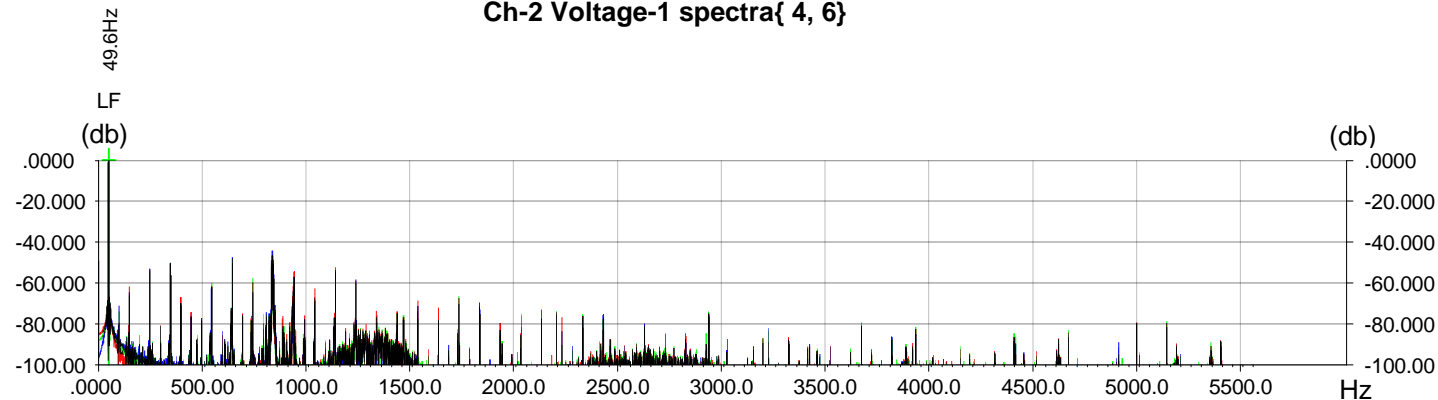
Ch-2 Voltage-1{ 4, 6}



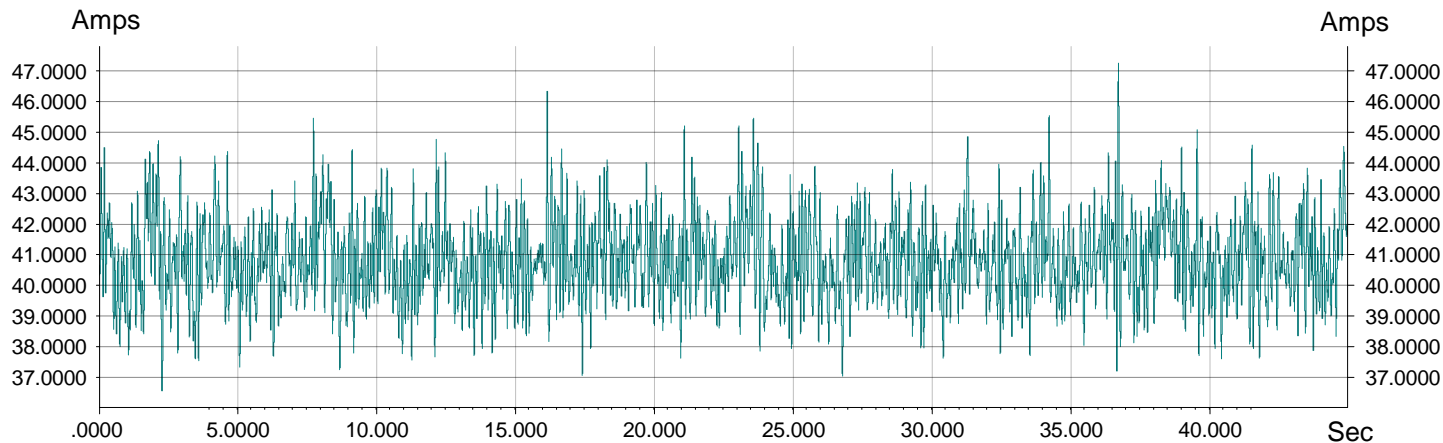
Ch-1 Current-1 spectra{ 3, 5}



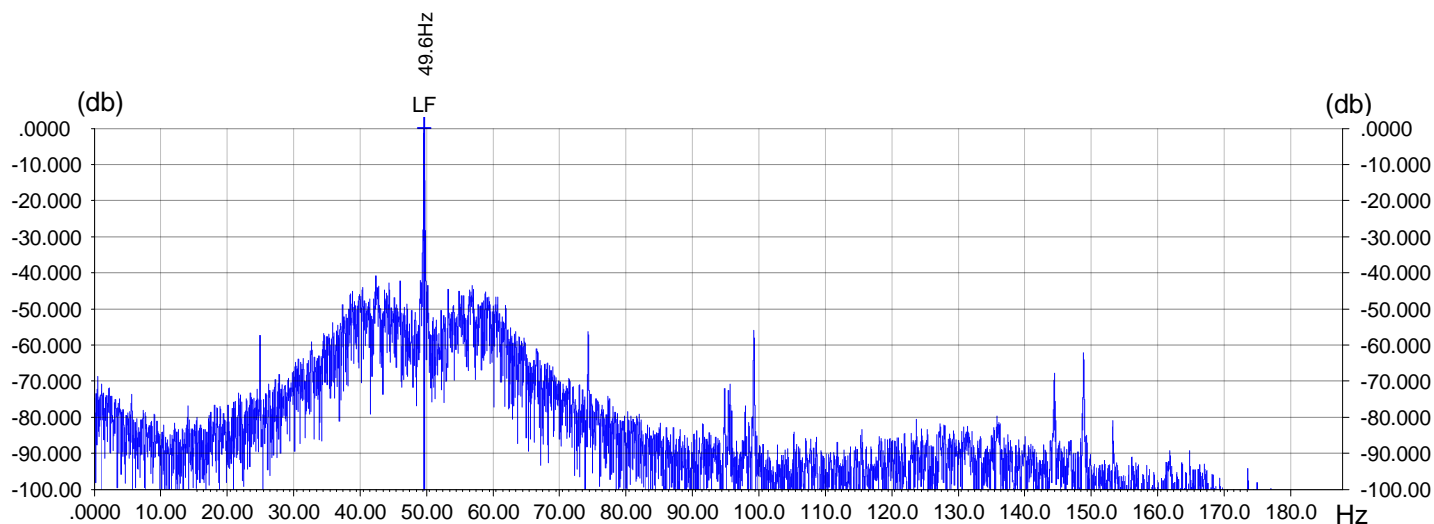
Ch-2 Voltage-1 spectra{ 4, 6}



Ch-9 Current-1 { RMS }



Ch-1 Current-1 spectra



Ch-9 Current-1 { RMS } spectra-Demod

