

# Electrical Safety Audit Report

**Bank Ltd.**

XXXXXXX

By

**SAS Powertech Pvt Ltd.**

101, Gera's Regent Manor, Survey No. 33, Area No. 39/570,  
Behind Opulent Car Care Center Baner, Pune 411045

Tel: 020 20253015

[Email: solutions@saspowertech.com](mailto:solutions@saspowertech.com)

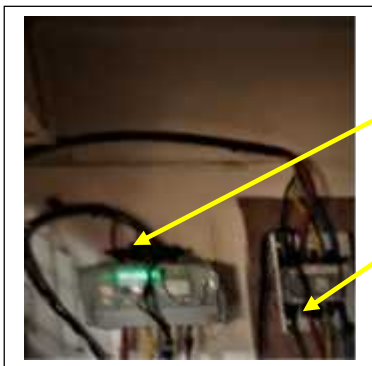
**Audit Period: 2018**

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## Executive summary of audit report

- 1) This Branch uses LT connection from MSEDCL. which comes with **Neutral** from pole. Breaking of Neutral results into very high single phase voltages and the same is dangerous for data centre loads. It is observed that this happens occasionally as the same is under maintenance of MSEDCL. We recommend, a **DELTA - STAR** isolation transformer of required capacity with STAR point of secondary to be properly earthed at bank premises and the same to be used as NEUTRAL inside the bank.
  
- 2) Main MSEDCL INPUT is received, metered and distributed on wall mounted switchgear. We recommend a well-designed metal cabinet in place of present wooden box. Cables laid on wall do not have proper supports and strain relievers.



Incoming cable coming to meter not supported



3)



- 4) As per CEA 2010 guidelines, earth pit resistance test report must be maintained as record at branch. These tests should be carried out at least once in a year. This is also important from data security point of view as UPS output needs proper earthing.



Earth pits for MSEDCL earthing and DG set earthing do not have identifiers, It is not possible to disconnect electrode from Grid so individual pit cannot be checked.

- 5) UPS installation and cabling are done as per standard industrial practice. UPS systems should be used in parallel redundant mode for better redundancy and availability.
- 6) Switchgear redundancy is not provided in data center input electrical distribution. If any of MCCBs fail from Input side, the input supply will be shut off till such MCCBs are replaced.
- 7) The cabling and other electrical arrangements inside the data center follow standard Industry practices, where as main electrical input is received in a wooden box. Old switchgears are still left in this box. External and internal cabling is improper. Electrical documentation is not available for ease of tracing under emergency.
- 8) During Physical inspection of the facility it is observed that Rubber/Insulating mats are not provided in front of distribution panels. As per provisions in CEA 2010, it is recommended to provide the rubber mats of suitable size & rating as per IS: 15652-2006 as amended.
- 9) Earthing measurement by loop test method and physical inspection of earth pits were carried out. All panels, DG set and other equipment are provided with proper earthing. All loop testing results are well within limit. However, earth pit resistances must be checked at least once a year and record must be maintained.
- 10) All cables were validated against measured load current and effect of harmonic distortion and found adequate in size.
- 11) Bank may think about maintaining power factor close to unity to get Power factor Incentive from MSEDCL which is normally 7% of energy charges, which should be around Rs. 8000 to Rs.9000 (At present it is around Rs. 2300/-). **Proper APFC panel must be installed to achieve this PF incentive.**
- 12) Switchgear validation was carried out and respective MCB's & MCCB's are found to be adequate for present load current. However most of them are rated for much larger current than required, and as such may or may not trip under fault conditions.
- 13) Infrared thermography inspection was conducted for electrical installation, one major loose connection was observed at ground floor DB. A tag for the same has already been pasted on this DB. It is recommended that such inspection should be carried out once in six months.

## Audit Objectives & Details of the equipment

Audit objective:

- 1) To check health of electrical infrastructure.
- 2) Statutory compliance of various issues related to electrical safety.
- 3) Physical inspection of electrical installation to identify potential electrical hazards.
- 4) To check quality of power available to the facility.
- 5) Study of reactive power compensation and harmonics.

**Details of Equipment Used:**

| No | Name of the equipment | SR. No Model     | Make           | Use                              |
|----|-----------------------|------------------|----------------|----------------------------------|
| 1  | Power Analyzer        | 1645 (CA 8335)   | Chauvin Arnoux | Electrical Parameter Measurement |
| 2  | Power Analyzer        | 211885 (CA 8335) | Chauvin Arnoux | Electrical Parameter Measurement |
| 3  | IR Imager             | 1910041-875-2    | testo          | IR thermography                  |
| 4  | Earth tester          | Dect-3-Z08118L10 | Motwane        | Earthing resistance measurement  |

### Audit team

**SAS Powertech Pvt Ltd.-:** (Certified energy auditor)

**XXXXXX XXXX Bank Ltd.: -** Mr. ....

**Certification:**

**Report Certified by:**

XXXXXXXXXX XXXXXXXX

**B.E. Electrical and Certified Energy Auditor Reg No: XX XXXX**

**Chartered engineer**

## A note on Electrical safety

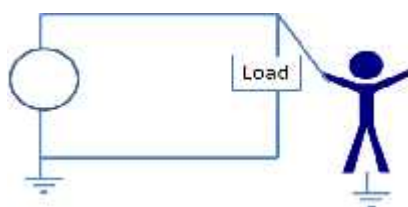
Electricity is most convenient secondary energy source which offers benefits like it is clean, easy to transport from one place to another etc. One can use it to generate heat, light or mechanical energy in the form of flow, pressure etc very efficiently.

**The major drawback of electrical energy is – it cannot be seen or felt by human, whenever it is under normal use.** Heat can be felt without touching; light can be seen without receiving any damage. Presence of electricity in a live conductor can be felt only after touching the same. The major effects are

- a) Sever damage to human being due to electrical shock which is mostly irreversible and can lead to death.
- b) Electrical sparking due to lose contacts and flashover can lead to fire.
- c) As a result of shock or fire or both there is always possibility of secondary damages to human like burns, deafness, blindness, falling from height etc.

### What is electrical shock?

All human functions controlled by brain are actually the result of electro chemical signals carried from brain to a particular limb by nerves in human body. So human heart pumps as per signals received from brain, we can move our hand whenever required due to an electrical signal received by a particular muscle. As shown in the picture, most of the external electrical sources have one terminal earthed or grounded and humans normally sit or stand on ground. Under normal condition the current passes through load. But if a person inadvertently or as a result of overconfidence or as an accident touches live part of the conductor before the load, he forms a parallel path to electrical current.



Human body in dry state offers a resistance of about 1600 ohms. So, depending on the applied voltage and source capacity, current starts flowing through human body. Such current being much more compared to electrical signals sent by brain, various organs within human body get confused. Further such current produces heat inside the body which can burn the tissues. All such unwanted effects are termed as “Electric Shock”. The extent of damage to human body is governed by severity of shock i.e. amount of current flowing through human body during the shock. 30 milliamps current if flows through human body for 5 seconds, then the shock can become fatal and can cause death. This indicates that even 50V are enough ( $50/1500 = 31\text{ma}$ ) to get a fatal shock.

**Electrical safety gets affected mainly due to:**

- Wrong design
- Wrong selection of system parts
- Bad workmanship
- Poor maintenance
- Uneducated persons handling electrical work.
- Using electrical installations beyond its life expectancy
- Over confidence in handling electrical equipment during operation / maintenance
- Using improper tools and tackles

At present electrical safety in India is governed by following notifications issued by Central electricity Authority – CEA – working under Central government energy ministry under electricity act 2003 as amended.

- a) CEA regulations “Measures relating to safety and electric supply” dated 20th Sept 2010
- b) CEA amendment regulations “Measures relating to safety and electric supply” dated 13th April 2015.

In a public place like factories, commercial buildings, bus stations, railway stations, airports, hotels, schools, colleges etc. the electrical safety becomes at most important as any negligence can affect common man. As per above notifications, organizations with connected load more than 250KW, are expected to designate a qualified person as electrical safety officer who would take responsibility of self certification regarding electrical safety. He is allowed to take help of third party experienced external auditors to identify problem areas and work on them to ensure safety.

----- END OF NOTE -----

## Description of Electrical Infrastructure

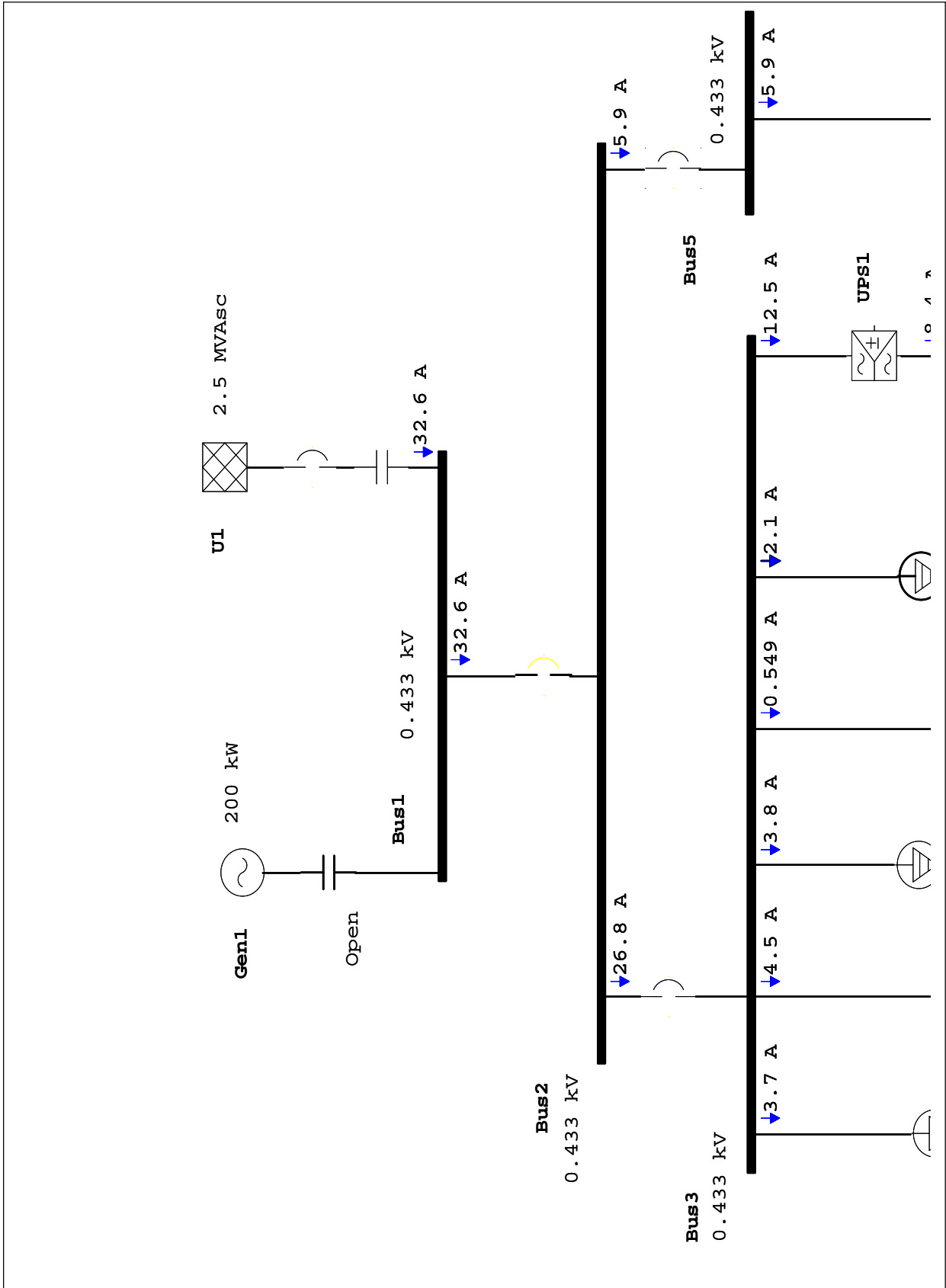
- XXXX XXXX bank Ltd, XXXX receives LT supply from MSEDCL at 440 Volt. The contract demand of bank is 29 KVA and average monthly energy consumption is 11500 KWH. Maximum KW recorded during audit period was 22 KW.

| Month  | Kwh   | Comment on Power factor incentive and Demand charges  |
|--------|-------|---|
| Jul-17 | 11760 | In Jan 2017 bill and (in the bills before that also) the maximum possible PF incentive is Rs. 9100, whereas availed is Rs. 2293 |
| Aug-17 | 11744 |   |
| Sep-17 | 11783 |   |
| Oct-17 | 11170 |   |
| Nov-17 | 11423 |   |
| Dec-17 | 11236 |   |
| Jan-18 | 10397 |   |

- Bank has occupied two floors out of which ground is a branch & ATM whereas first floor is a Data centre.
- Data centre has one DG set of 200KVA & 2 UPS systems of 20 KVA each (Three phase Input & single Phase Output), working in Hot standby mode.
- The electrical distribution has not ensured switchgear redundancy and as a result there are multiple possibilities of single point failure. This being data centre for a banking operation, this situation should be avoided. We can explain this point further during presentation.

## Audit Methodology:

- 1) Undertake survey of existing electrical infrastructure.
- 2) Undertake electrical load measurement using recording type power analyzers to know important electrical parameters like voltage, current, current harmonic distortion etc relevant to electrical safety.
- 3) Use above data to validate cable sizes & validate switchgear ratings for effective protection offered by utilizing above data.
- 4) Measure earth resistance at each panel by loop earth testing method.
- 5) Undertake ONLOAD Thermography on electrical distribution to know loose contacts/ over temperatures if any.
- 6) Undertake physical inspection of electrical panels, panel rooms to check statutory compliance as per CEA2010.
- 7) Present report based on above Analysis.

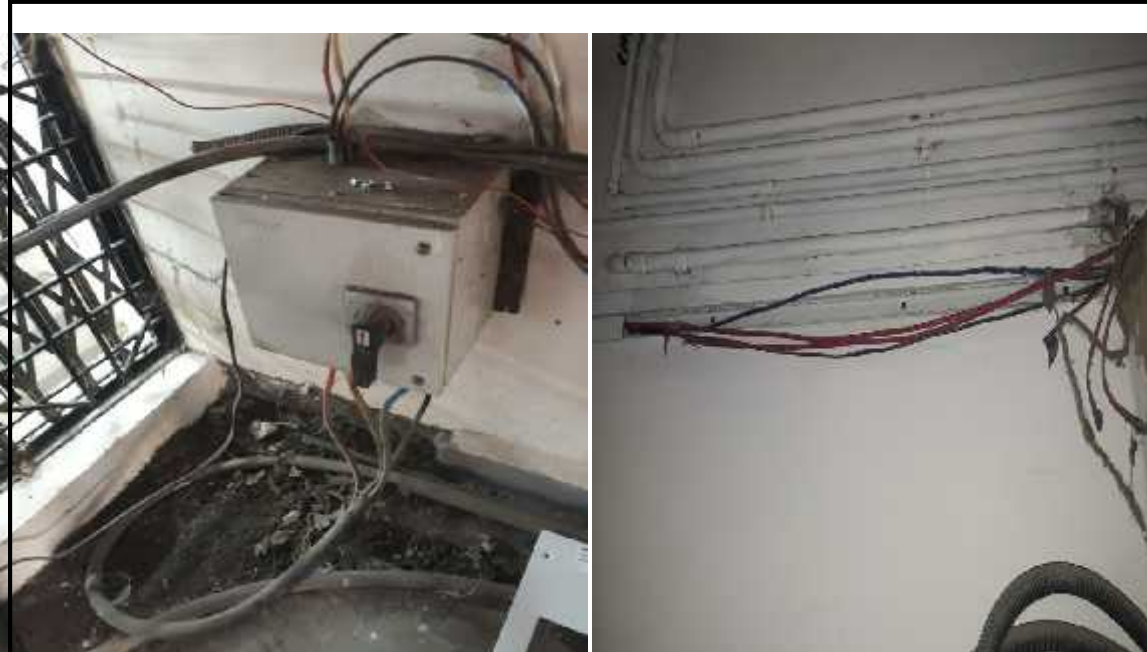


## Few sample photographs showing Audit Findings:-

### Site Photographs:



Rubber Mats are not provided in front of LT panels. Main electrical input cables are not terminated and secured properly.



DG change over switch is mounted on wall and cabling is improper. There is possibility of damage due to rodents. Inside some cables are brought out of casing capping are joined improperly.



UPS installed for Branch & ATM are well protected & are not accessible for layman. Provision should be made for hydrogen exhaust using exhaust fans.



Distribution Boards & Fuse units are installed on wooden board which may catch fire during fault. It is recommended to use metal DB in place of existing wooden board.



Main DB and changeover switch at ground floor are installed above underground water storage tank. This tank frequently overflows. This is a potentially dangerous situation. Corrective actions should be taken to keep this place dry to lower a risk of electric shock or electrical incident.



This is the pole from which bank LT electric supply is tapped. The joints at present are in good condition. This overhead line is property of MSEDCL and may get tapped for other consumers and there is possibility of neutral failure.

## Safety requirements as per CEA 2010

| Sr. No | Regulation No. | Requirements  | Report   |
|--------|----------------|---|--|
| 1      | Regulation 12  | Is there any visible sign of Overloading in respect of equipment wiring   | Overloading in respect of equipment wiring was not observed.   |
|        |                | Whether any unauthorized Temporary Installation Exist   | No unauthorized temporary installations found during physical inspection of electrical infrastructure. Input site cabling is not terminated and secured properly   |
|        |                | Are the electric Supply lines and equipment so installed and protected and maintained to prevent danger                     | YES, but lot of modifications are recommended  |
|        |                | Any other General remark  | Main DB and changeover switch at ground floor are installed above underground water storage tank. This tank frequently overflows. Care should be taken so that this water does not cause trouble. Other wooden boxes and wall mounted switchgears and meters should be housed in sheet metal box with proper earthing. |
| 3      | Regulation 14  | Whether Suitable cut-outs provided by the supplier at the consumer premises are within enclosed fire proof receptacle       | YES. These may be replaced with MCCBs.   |
| 4      | Regulation 15  | Whether switches are provided on live conductor   | YES  |
|        |                | whether indication of a permanent nature is provided as per regulation to distinguish neutral conductor from live conductor | Proper color code/ Indication for bus bar/ Cables are provided so as to distinguish the phase and neutral bus bar/cables   |
| 5      | Regulation 16  | Whether earthed terminal provided by supplier   | YES  |
|        |                | General Visible condition of Earthings arrangement  | Concrete Earth pit chambers are partially covered. Earth electrode should be accessible for testing and maintenance.   |
| 6      | Regulation 17  | Are bare conductor in building inaccessible   | YES  |
|        |                | Whether readily accessible switches have been provided for rendering them dead  |  |
| 7      | Regulation 18  | Whether Danger Notice in Hindi and Local language of the district and of design as per relevant IS are affixed permanently  | YES  |

| STATUTORY SAFETY REQUIREMENT AS PER CEA 2010 |                |  |  |
|--|----------------|--|--|
| Sr. No                                       | Regulation No. | Requirements   | Report   |
| 8  | Regulation 21  | Whether flexible cables used for portable or transportable equipment covered under the regulation, are heavily insulated & adequately protected from mechanical injury   | This being a bank, portable equipment are not in use.  |
| 9  | Regulation 28  | Whether instructions in Hindi or Hindi and local language for the resuscitation of a person suffering from shock have been affixed   | Resuscitation instructions are not affixed. These instructions should be provided in English & local language. |
| 10   | Regulation 35  | Whether a suitable link switch or circuit breaker is placed near the point of commencement of supply so as to be readily accessible and operated to completely isolate the supply  | YES, circuit breakers are grossly over sized; they may not trip under fault condition.                         |
|  |                | Whether every circuit is protected against excess electricity by means of suitable circuit breaker.  |  |
|  |                | Whether suitable linked switch or circuit breaker is provided near each motor or apparatus for controlling supply to the motor or apparatus  |  |
|  |                | Whether adequate precautions are taken to ensure that no live parts are so exposed as to cause danger  |  |
| 11   | Regulation 37  | Whether clear space of 100 Cm is provided in front of main switchboard   | YES  |
| 12   | Regulation 41  | Have the frame of every generator stationary motor and so far as practicable portable motor and the metallic parts of all transformer and any other apparatus used for regulating and controlling electricity at voltage exceeding 250 Volts but not exceeding 650 Volts been earthed by two separate and distinct connection with earth | YES  |
|  |                | Is the earth wire free from any mechanical damage.   | YES  |

## Analysis of Recorded Power Quality Parameters: -

| Power quality parameters |   |             |       |             |       |        |     |              |      |        |      |       |       |        |        |       |       |
|--------------------------|---|-------------|-------|-------------|-------|--------|-----|--------------|------|--------|------|-------|-------|--------|--------|-------|-------|
| Sr.No                    | Feeder Name                             | L-N Voltage |       | L-L Voltage |       | V THD% |     | Line Current |      | I THD% |      | KW    |       | KVAR   |        | PF    |       |
|                          |   | Avg.        | Max   | Avg.        | Max   | Avg.   | Max | Avg.         | Max  | Avg.   | Max  | Avg.  | Max   | Avg.   | Max    | Avg.  | Max   |
| 1                        | data center Panel (Branch Main Incomer) | 231.6       | 241.7 | 402.4       | 414.2 | 1.2    | 2.2 | 20.7         | 40.2 | 5.8    | 11.2 | 16.8  | 22.7  | 4.7    | 5.3    | 0.56  | 0.53  |
| Data center Panel        |   |             |       |             |       |        |     |              |      |        |      |       |       |        |        |       |       |
| 2                        | Main Incomer                            | 230.8       | 236.9 | 399         | 404.7 | 1      | 1.4 | 29.8         | 37.5 | 7.4    | 12.9 | 14.2  | 19.3  | 3.2    | 7.5    | 0.57  | 0.59  |
| 3                        | Data Center-AC-1(A)                     | 231.2       | 235   | 378.2       | 375.9 | 1      | 1.2 | 6.0          | 11.4 | 6.2    | 8.4  | 1.5   | 2.5   | 0.45   | 0.51   | 0.75  | 0.77  |
| 4                        | Data Center-AC-2(A)                     | 233         | 236.7 | 402.4       | 405.1 | 1.1    | 1.3 | 5.2          | 5.7  | 2.7    | 3.5  | 2.7   | 2.9   | 2      | 2.2    | 0.8   | 0.81  |
| 5                        | Data Center-AC-3(A)                     | 231.6       | 236.5 | 400.7       | 404.1 | 1      | 1.3 | 4.1          | 15.8 | 5.8    | 10   | 0.89  | 3.4   | 0.73   | 3.4    | 0.56  | 0.58  |
| 6                        | Help Desk AC                            | 231.4       | 235   | 379.3       | 401.1 | 1      | 1.1 | 6.3          | 7.1  | 13.5   | 17.1 | 1.4   | 1.5   | -0.158 | 0.273  | 0.76  | 0.77  |
| 7                        | Lighting-1                              | 234.1       | 234.4 | 358.8       | 356.2 | 0.95   | 1   | 0.13         | 0.13 | 1.1    | 12.9 | 0.027 | 0.027 | -0.01  | -0.01  | 0.58  | 0.54  |
| 8                        | Lighting-2                              | 235.1       | 235.2 | 359.5       | 401.8 | 1      | 1.2 | 0.75         | 0.77 | 7.8    | 7.3  | 0.165 | 0.166 | -0.024 | -0.034 | 0.59  | 0.59  |
| 9                        | Lighting-3                              | 231.5       | 235   | 402.3       | 404.6 | 1      | 1.1 | 0.42         | 0.42 | 6.4    | 6.5  | 0.092 | 0.093 | -0.013 | -0.013 | 0.75  | 0.75  |
| 10                       | Lighting-4                              | 235.9       | 236.1 | 404         | 404.5 | 1.1    | 1.2 | 0.29         | 0.29 | 1.5    | 12.7 | 0.084 | 0.084 | 0.021  | 0.021  | 0.55  | 0.55  |
| 11                       | UPS-1 Input                             | 230.4       | 236.4 | 358.2       | 401.2 | 1      | 1.3 | 2            | 2.5  | 28.5   | 40.9 | 1.1   | 1.2   | 0.115  | 0.342  | 0.55  | 0.57  |
| 12                       | UPS-2 Input                             | 235.8       | 235.6 | 355.3       | 395.4 | 0.97   | 1.2 | 11           | 11.7 | 5      | 11.7 | 7.4   | 7.5   | 0.556  | 1      | 0.59  | 0.59  |
| 13                       | UPS Room AC-2                           | 235.5       | 234.1 | 397.4       | 400.1 | 1.1    | 1.3 | 4.5          | 4.7  | 21.5   | 49.6 | 1.6   | 1.6   | 0.572  | 0.722  | 0.51  | 0.54  |
| UPS-2 output             |   |             |       |             |       |        |     |              |      |        |      |       |       |        |        |       |       |
| 1                        | UPS-2 output                            | 229         | 225.1 |             |       | 0.7    | 0.8 | 29.2         | 25.6 | 25     | 25.9 | 5.6   | 5.9   | -3.0   | -3.0   | 0.570 | 0.670 |
| Branch Main incomer      |   |             |       |             |       |        |     |              |      |        |      |       |       |        |        |       |       |
| 1                        | Branch Main Incomer                     | 231         | 235.1 | 399.3       | 405.9 | 1.3    | 2.2 | 5.9          | 11.4 | 8.6    | 20.1 | 3.6   | 4.2   | 1.4    | 5      | 0.55  | 0.910 |

Single phase voltage is maintained between 230 – 239 Volts.

Current Distortion at main incomer is well within the limit.

## Earthing resistance measurement using Loop Test Method

| SR NO. | PANEL NAME                              | Resistance (Ohm) | REMARK |
|--------|---|------------------|--------|
| 1      | Main Incomer DB ( Data Centre + Branch) | 0.63             | OK     |
| 2      | Data Center Panel                       | 0.76             | OK     |
| 3      | UPS-1 I/P                               | 1.2              | OK     |
| 4      | UPS-1 O/P                               | 1.3              | OK     |
| 5      | UPS-2 I/P                               | 1.2              | OK     |
| 6      | UPS-2 O/P                               | 1.1              | OK     |

Earth resistance was measured using loop test method, the table above shows that earth resistance measured at all panels and DB's are within acceptable limits.

## Switchgear Validation

| Sr.No.             | Feeder Name                          | MODEL/Make           | Rating (Amp) | Circuit breaker parameter | KA Rating | Measured Current (AMP) | Remark |
|--------------------|--------------------------------------|----------------------|--------------|---------------------------|-----------|------------------------|--------|
| 1                  | Main Incomer ( Data centre + Branch) | Havells MCCB- 160A   | 150          | Icu<br>Ics                | 16 KA     | 40.2                   | OK     |
| <b>Data Center</b> |                                      |                      |              |                           |           |                        |        |
| 2                  | Main Incomer                         | Legrand-MCCB- DPX125 | 125          | Ics                       | 30 KA     | 37.5                   | OK     |
| 3                  | UPS-1 I/P                            | Legrand-MCCB- DPX125 | 63A          | Ics                       | 6 KA      | 2.3                    | OK     |
| 4                  | UPS-2 I/P                            | Legrand-MCCB- DPX125 | 63A          | Ics                       | 6 KA      | 11.7                   | OK     |
| 5                  | AC 3 (A)                             | MCB -Legrand         | 20A          | Ics                       | 10 KA     | 15.8                   | OK     |
| 6                  | AC-3 (B)                             | MCB -Legrand         | 20A          | Ics                       | 10 KA     | 15.8                   | OK     |
| 7                  | AC-2 (A)                             | MCB -Legrand         | 20A          | Ics                       | 10 KA     | 5.7                    | OK     |
| 8                  | AC-2 (B)                             | MCB -Legrand         | 20A          | Ics                       | 10 KA     | 5.7                    | OK     |
| 9                  | AC-1 (A)                             | MCB -Legrand         | 20A          | Ics                       | 10 KA     | 11.4                   | OK     |
| 10                 | AC 2 (B)                             | MCB -Legrand         | 20A          | Ics                       | 10 KA     | 11.4                   | OK     |
| 11                 | AC- H/H/ Desk                        | MCB-MG               | 63A          | Ics                       | 10 KA     | 7.1                    | OK     |
| 12                 | UPS Room AC                          | MCB -Legrand         | 20A          | Ics                       | 10 KA     | 7.7                    | OK     |
| 13                 | Lighting-1                           | MCB -Legrand         | 6A           | Ics                       | 10 KA     | 0.13                   | OK     |
| 14                 | Lighting-2                           | MCB -Legrand         | 6A           | Ics                       | 10 KA     | 0.77                   | OK     |
| 15                 | Lighting-3                           | MCB -Legrand         | 6A           | Ics                       | 10 KA     | 0.42                   | OK     |
| 16                 | Lighting-4                           | MCB -Legrand         | 6A           | Ics                       | 10 KA     | 0.29                   | OK     |
| <b>Branch</b>      |                                      |                      |              |                           |           |                        |        |
| 9                  | Main Incomer                         | Klt-Kat Fuse         | 100 A        | Ics                       | 80KA      | 11.4                   | OK     |

Above table shows nominal current rating of circuit breakers and maximum current measured during audit period. All breakers are validated against load current and found adequate.

## Cable validation

| Cable Validation |                                      |              |      |                        |                               |          |
|------------------|--------------------------------------|--------------|------|------------------------|-------------------------------|----------|
| Sr.No            | Feeder Name                          | Line Current |      | Cable                  | Cable current capacity (amps) | REMARK   |
|                  |                                      | Avg          | Max  |                        |                               |          |
| 1                | Main Incomer ( Data Centre + Branch) | 28.7         | 40.2 | 70 sqmm/3.5/AL/1       | 130                           | Adequate |
| Data Centre      |                                      |              |      |                        |                               |          |
| 2                | Main Incomer                         | 23.8         | 37.5 | 45 sqmm/3.5/Al/1       | 155                           | Adequate |
| 3                | UPS-1 I/F                            | 2            | 2.3  | 16 sqmm/4 Core/CU/Flex | 57                            | Adequate |
| 4                | UPS-2 I/F                            | 11           | 11.7 | 16 sqmm/4 Core/CU/Flex | 57                            | Adequate |
| 5                | AC 3 (A)                             | 4.1          | 15.8 | 4 sqmm/4 Core/CU/Flex  | 25                            | Adequate |
| 6                | AC-2 (A)                             | 5.2          | 5.7  | 4 sqmm/4 Core/CU/Flex  | 25                            | Adequate |
| 7                | AC 1 (A)                             | 6.8          | 11.4 | 4 sqmm/4 Core/CU/Flex  | 25                            | Adequate |
| 8                | AC- Help Desk                        | 6.3          | 7.1  | 4 sqmm/4 Core/CU/Flex  | 25                            | Adequate |
| 9                | UPS Room AC                          | 7.5          | 7.7  | 4 sqmm/2 Core/CU/Flex  | 25                            | Adequate |
| 10               | Lighting -1                          | 0.13         | 0.13 | 4 sqmm/2 Core/CU/Flex  | 25                            | Adequate |
| 11               | Lighting-2                           | 0.76         | 0.77 | 4 sqmm/2 Core/CU/Flex  | 25                            | Adequate |
| 12               | Lighting-3                           | 0.42         | 0.42 | 4 sqmm/2 Core/CU/Flex  | 25                            | Adequate |
| 13               | Lighting-4                           | 0.29         | 0.29 | 4 sqmm/2 Core/CU/Flex  | 25                            | Adequate |
| Branch           |                                      |              |      |                        |                               |          |
| Sr.No            | Feeder Name                          | Line Current |      | Cable                  | Cable current capacity (amps) | REMARK   |
|                  |                                      | Avg          | Max  |                        |                               |          |
| 1                | Main Incomer                         | 5.9          | 11.4 | 50 sqmm/3.5/AL/1       | 105                           | Adequate |

Above table shows cable sizes and their current carrying capacity. The data collected during the audit is used for validating these cables. While validating the cables Load current & effect of harmonic distortion is taken into consideration. All the cables are found adequate.

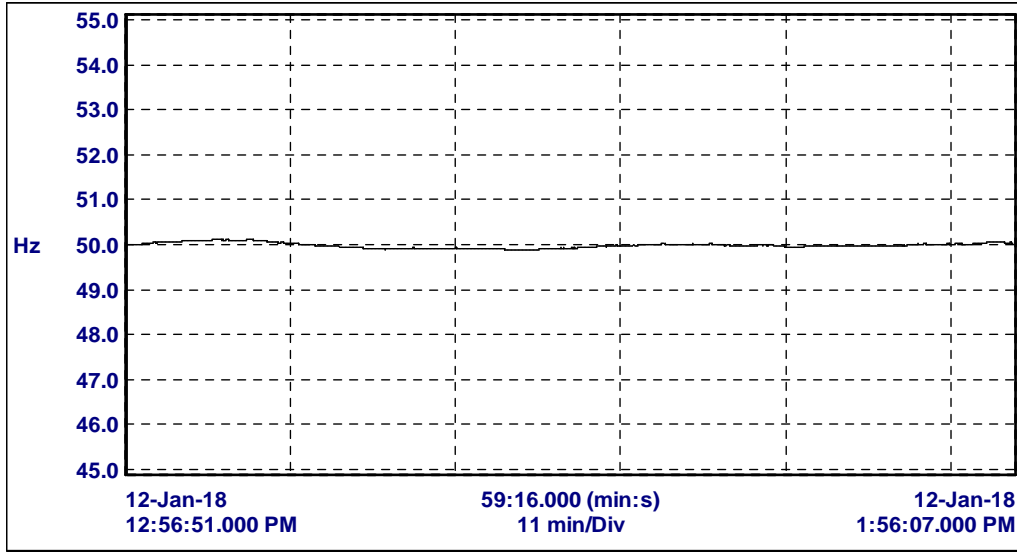
**Recorded data**

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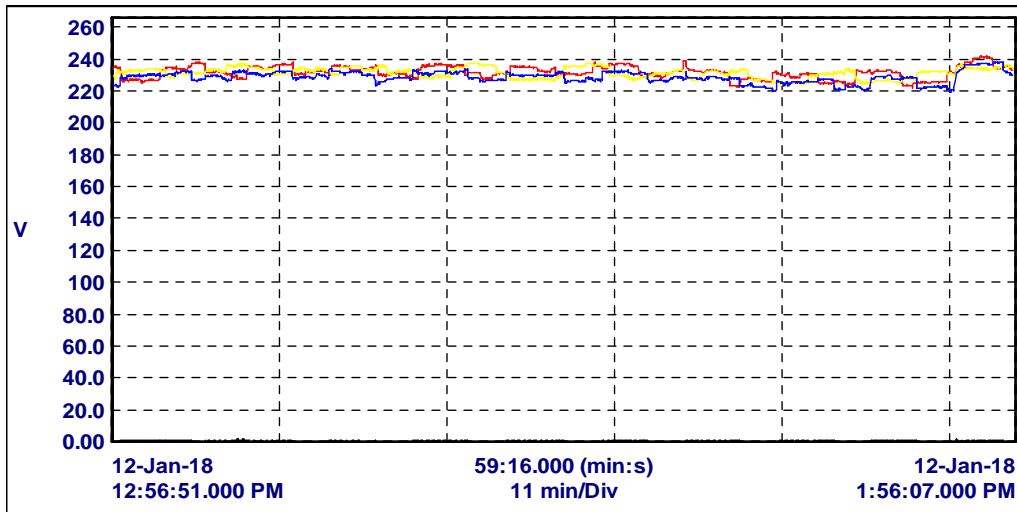
| Sr.No             | Description                             | Page No. |
|-------------------|---|----------|
| 1                 | Data center Panel + Branch Main Incomer | 19       |
| Data center Panel |   |          |
| 2                 | Main incomer                            | 23       |
| 3                 | Data Center -AC-1(A)                    | 25       |
| 4                 | Data Center -AC-2(A)                    | 25       |
| 5                 | Data Center -AC-3(A)                    | 25       |
| 6                 | Help Desk AC                            | 26       |
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| 15                | Main incomer                            | 37       |

### Data center Panel + Branch Main Incomer

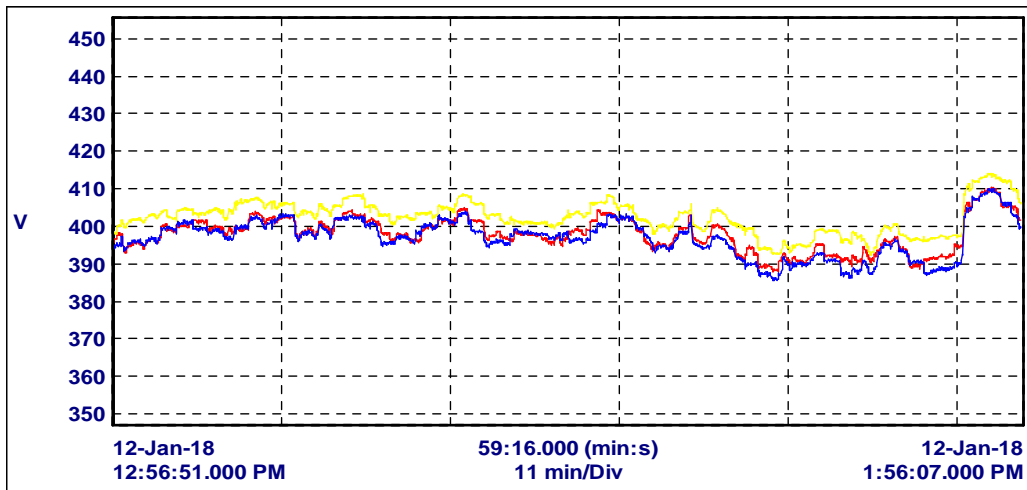
#### Frequency



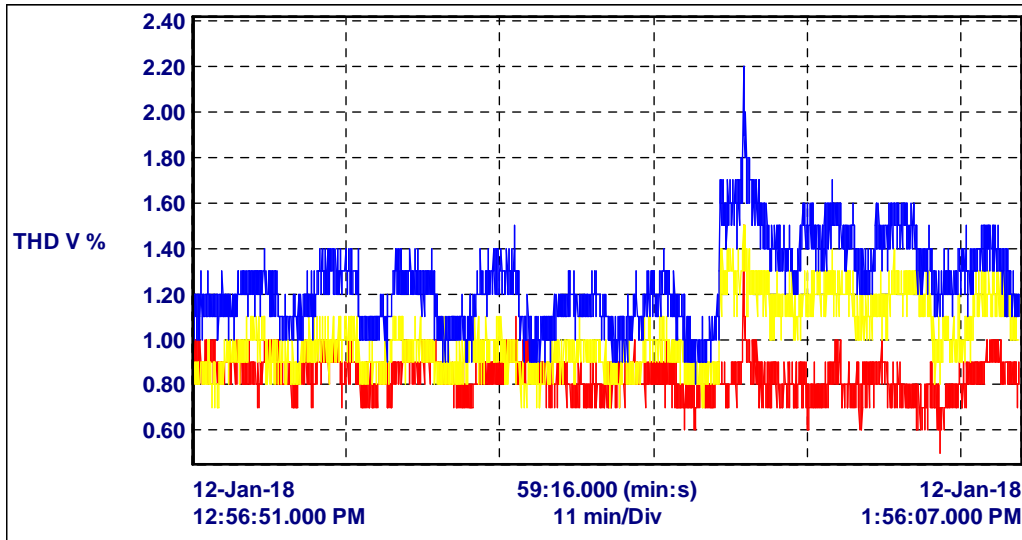
#### Voltage L-N



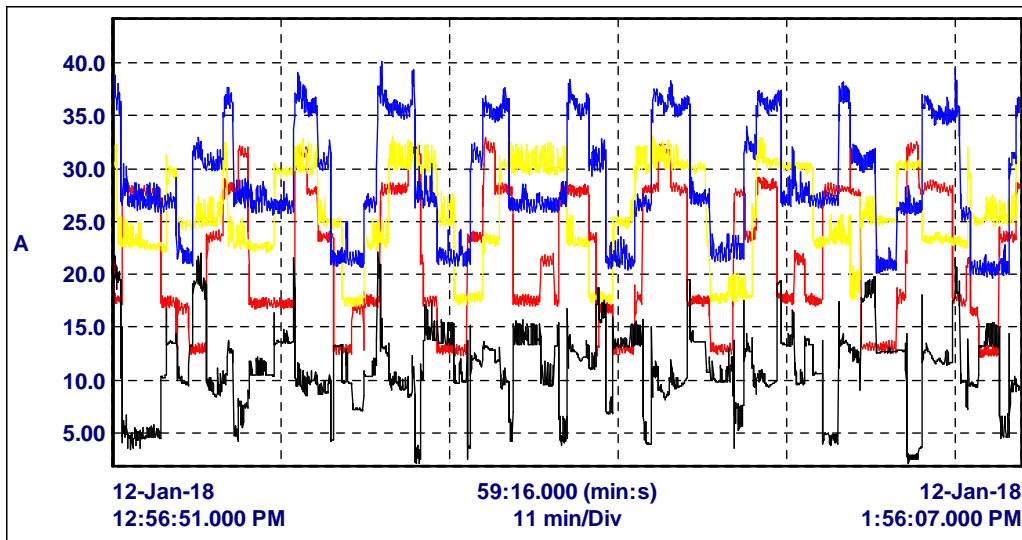
#### Voltage L-L



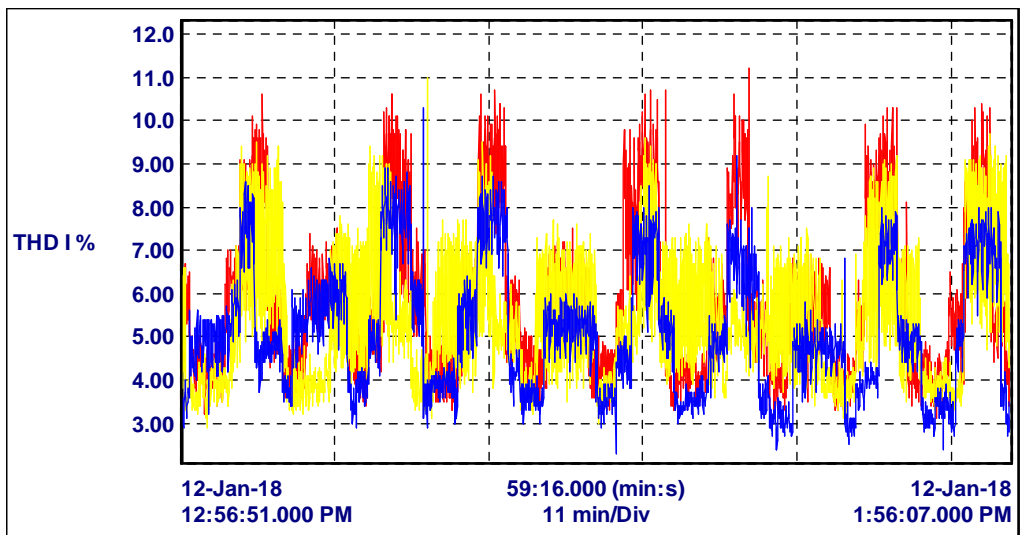
### Voltage harmonic distortion



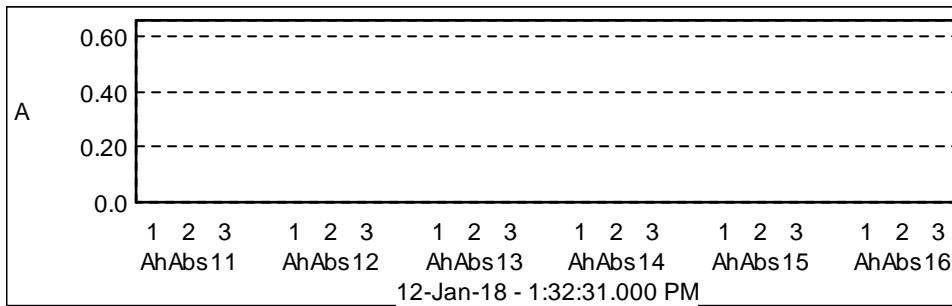
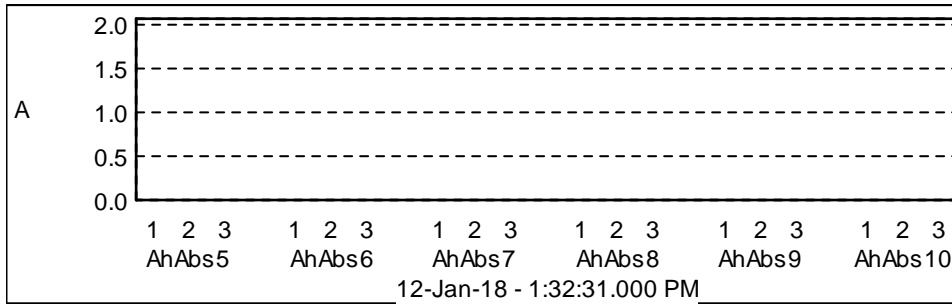
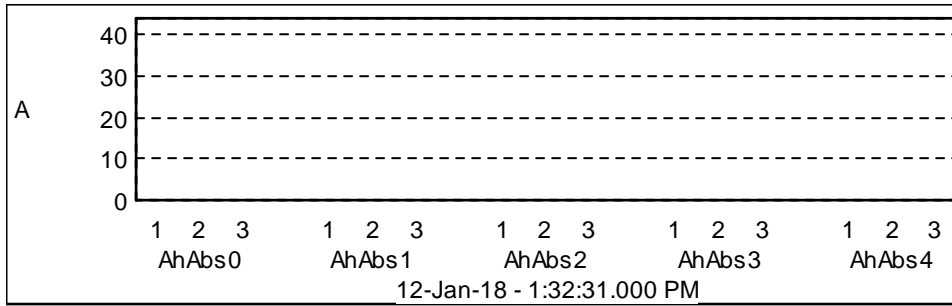
### Current



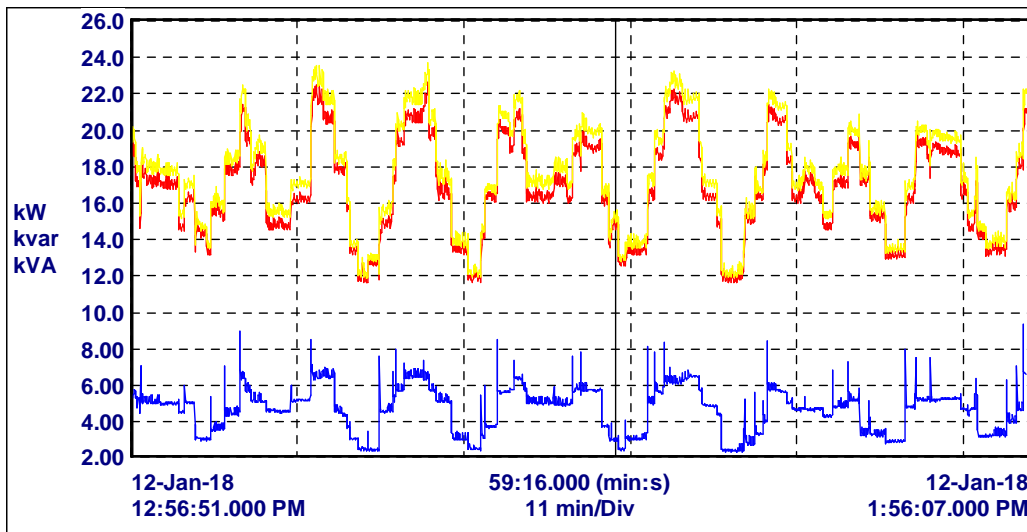
### Current harmonic distortion



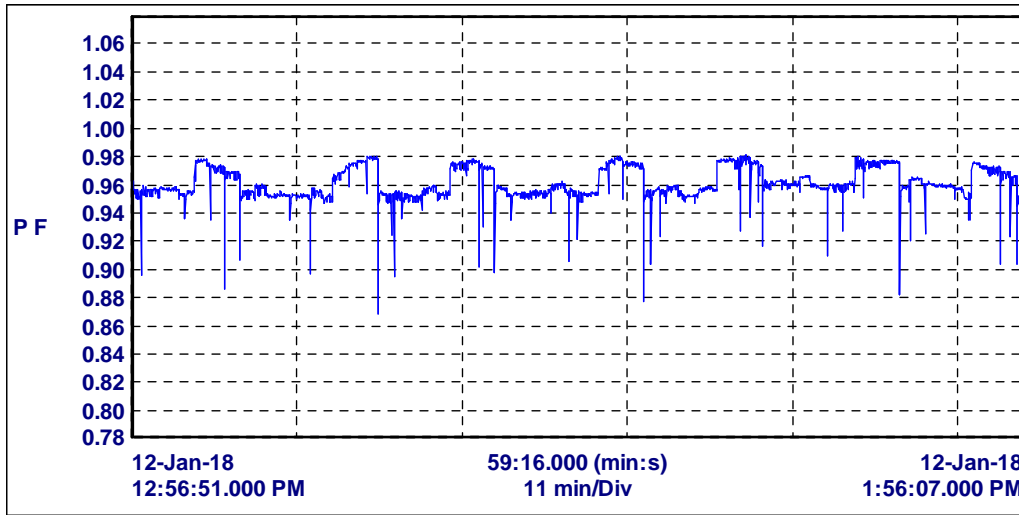
**Individual Current Harmonic**



**KW-KVAR-KVA**



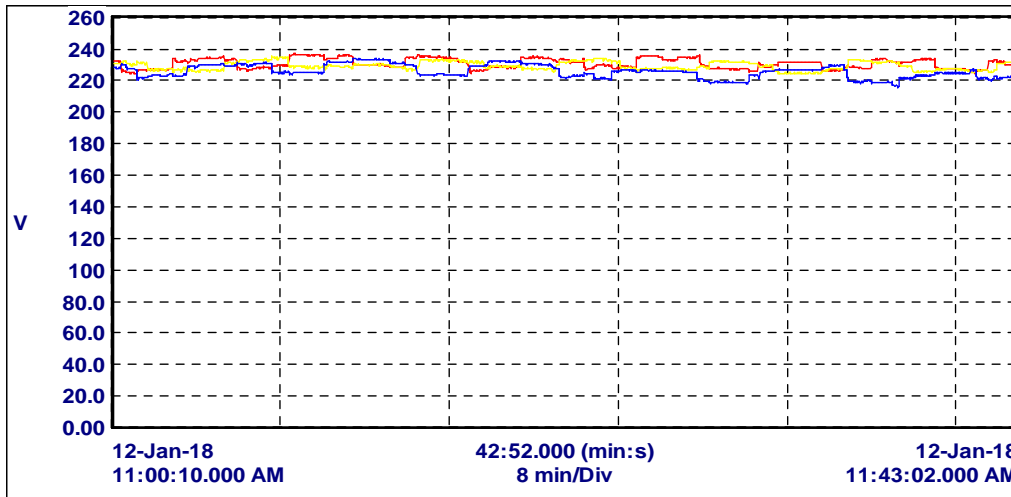
PF



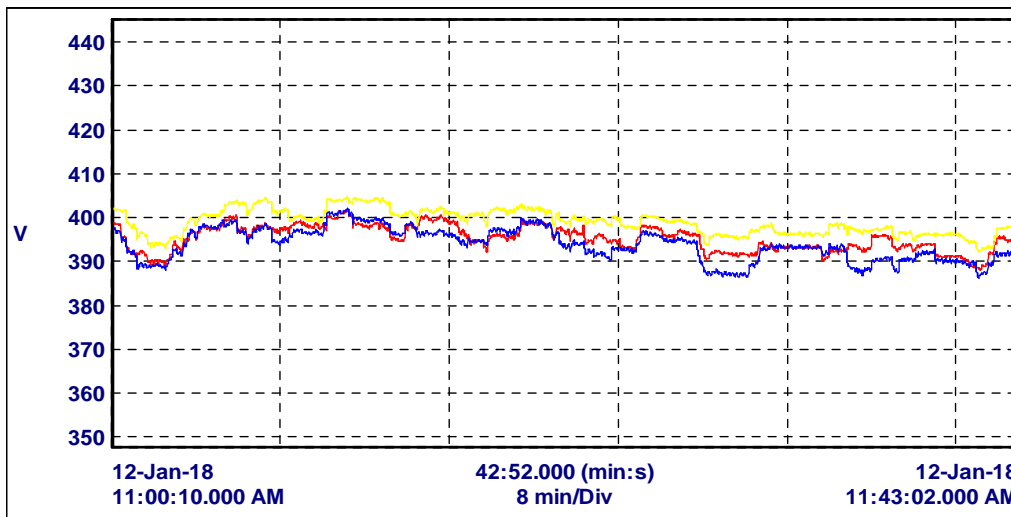
Data center Panel

Main incomer

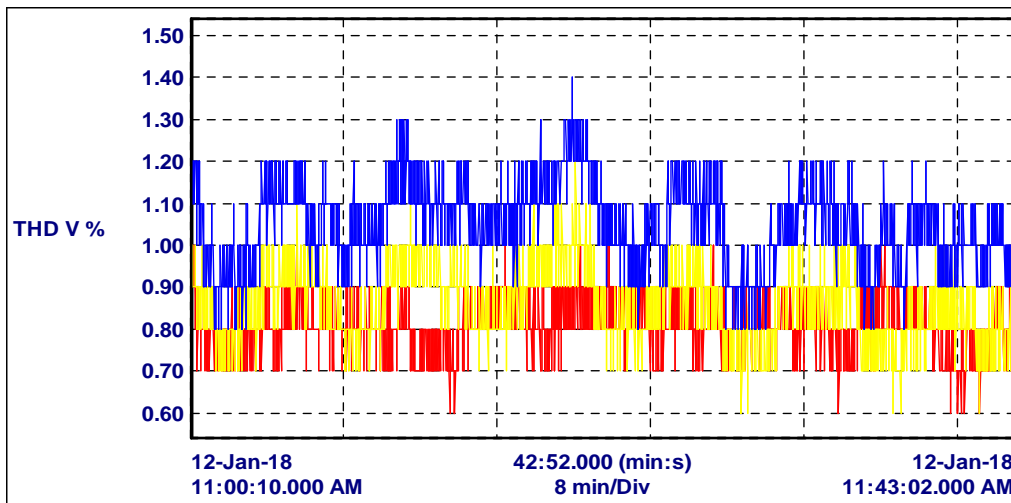
Voltage L-N



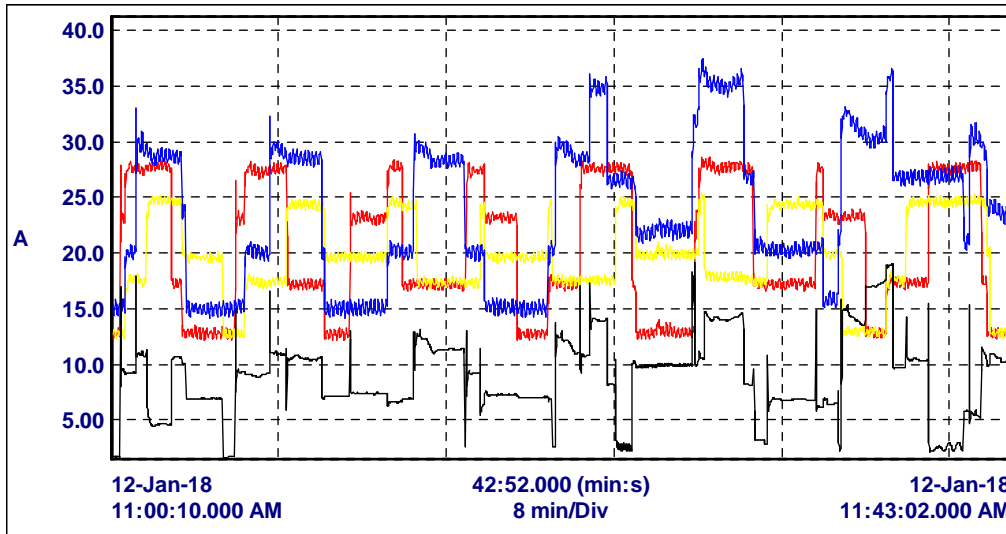
Voltage L-L



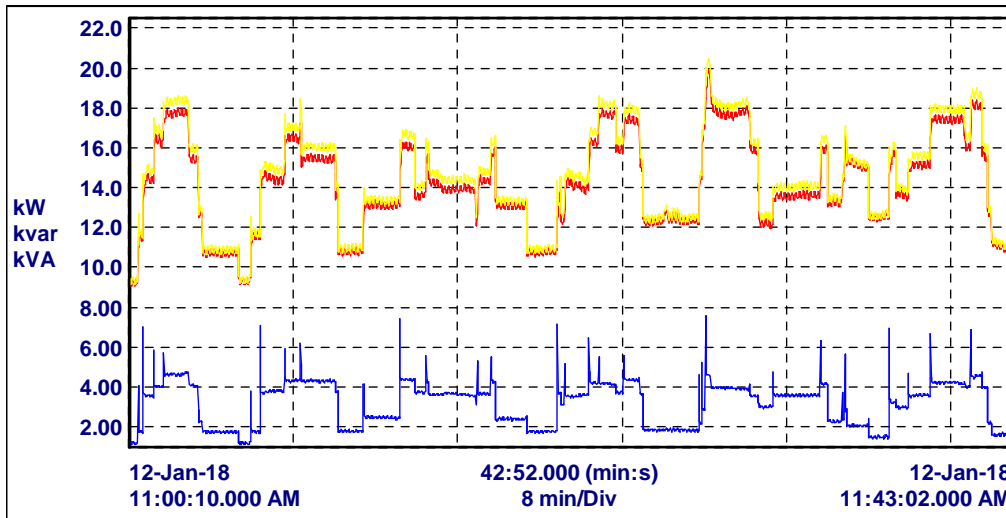
Voltage harmonic distortion



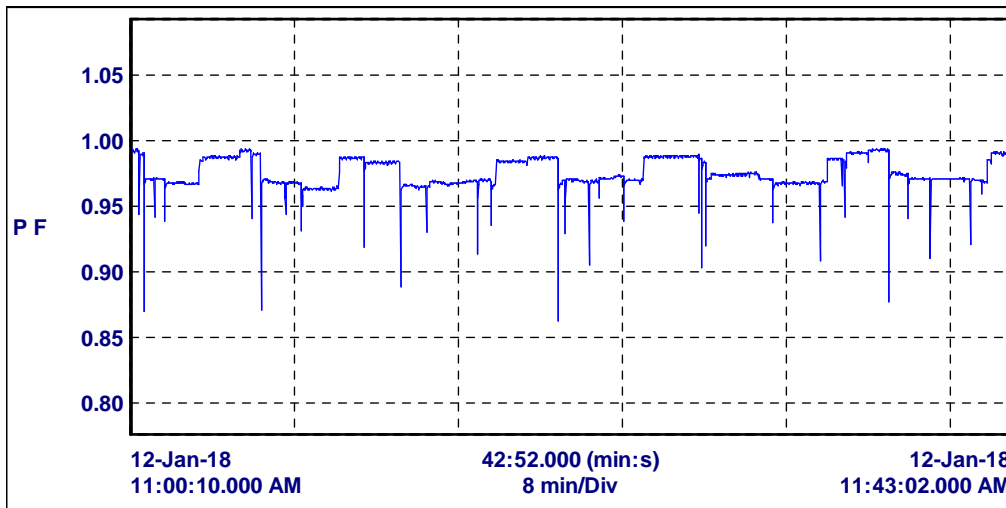
**Current**



**KW-KVAR-KVA**

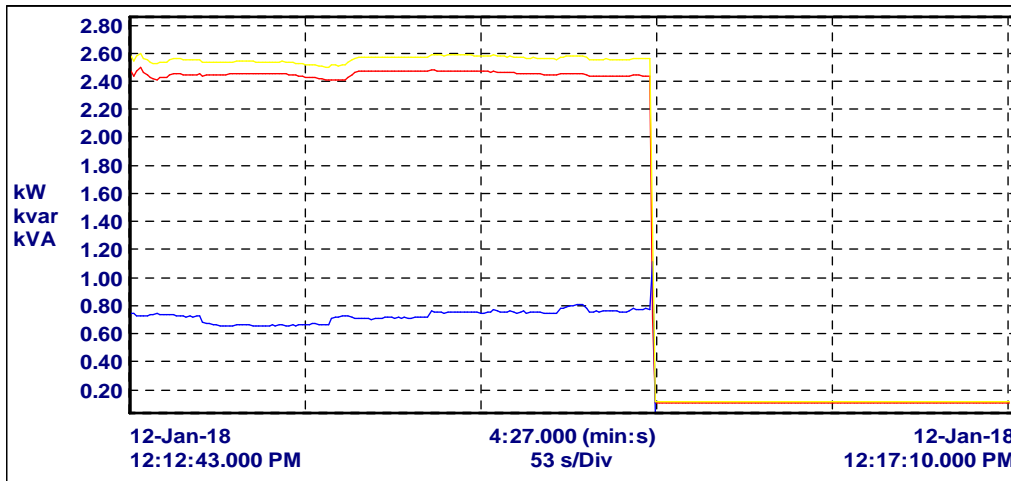


**PF**



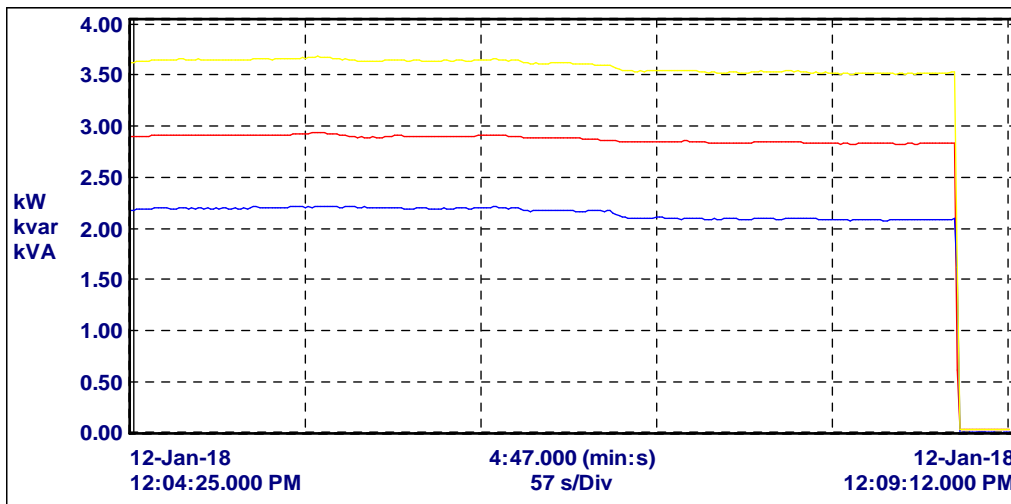
**Data Center -AC-1(A)**

**KW-KVAR-KVA**



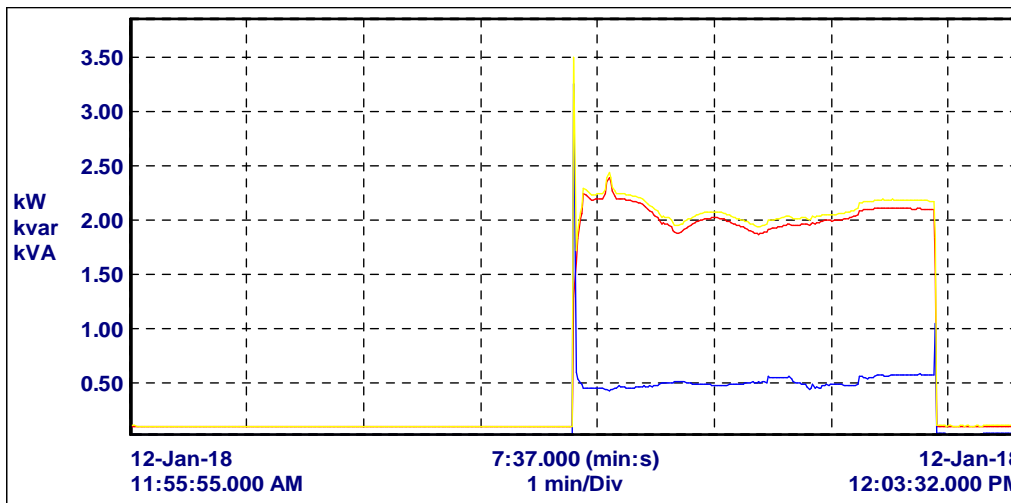
**Data Center -AC-2(A)**

**KW-KVAR-KVA**

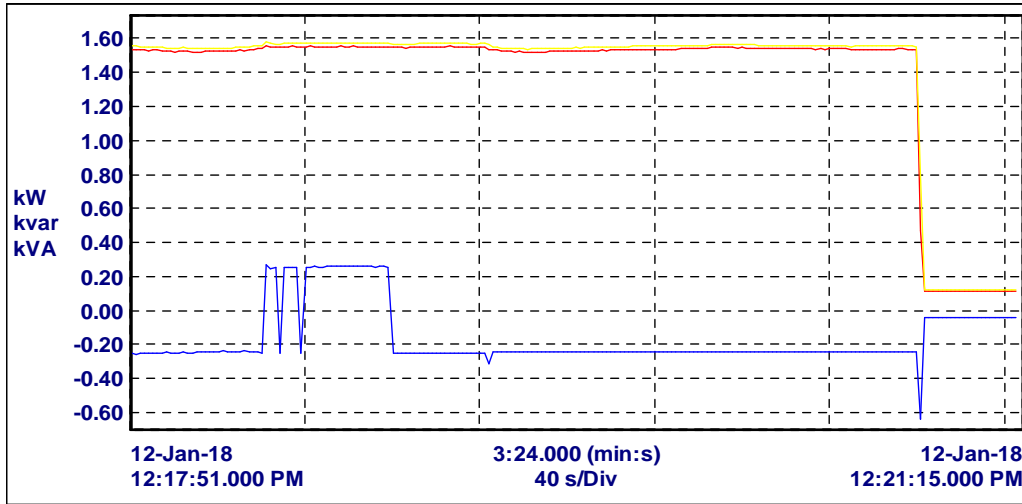


**Data Center -AC-3(A)**

**KW-KVAR-KVA**

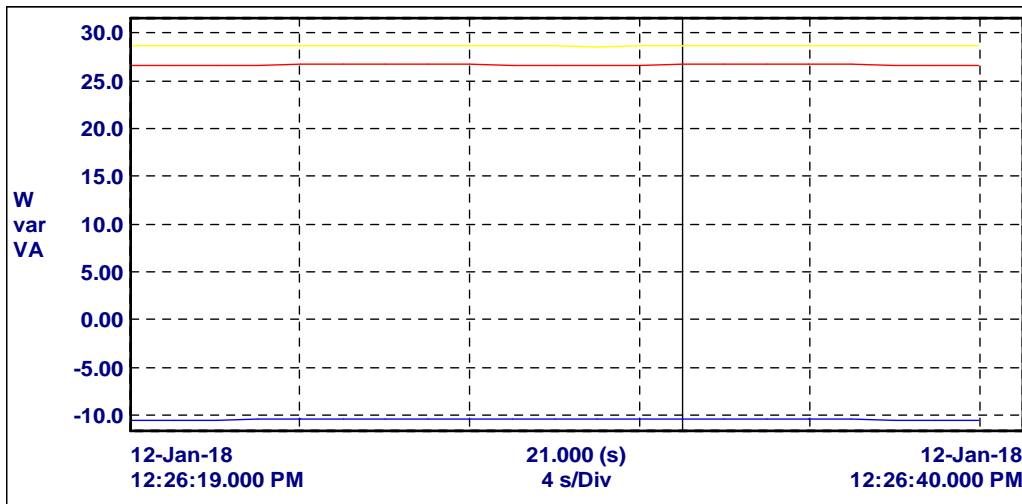


**Help Desk AC**  
**KW-KVAR-KVA**



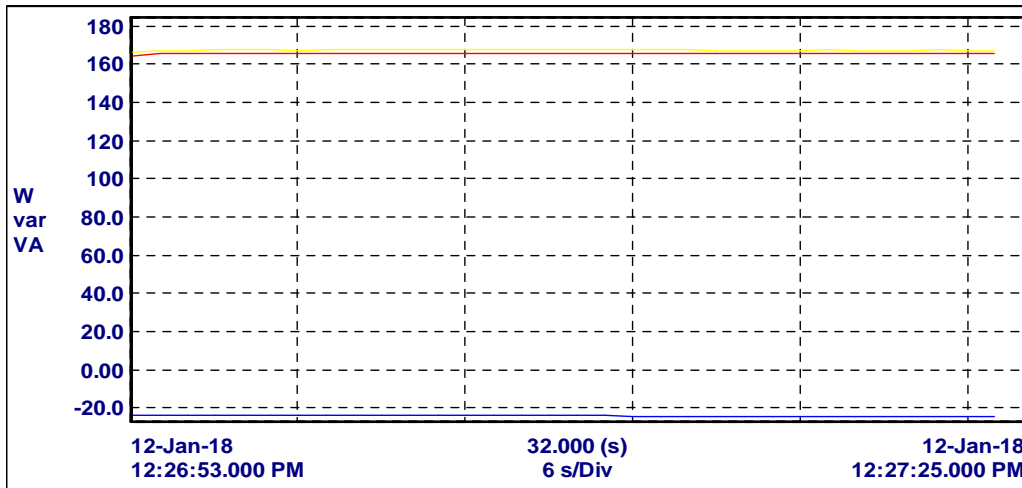
**Lighting -1**

**W-VAR-VA**



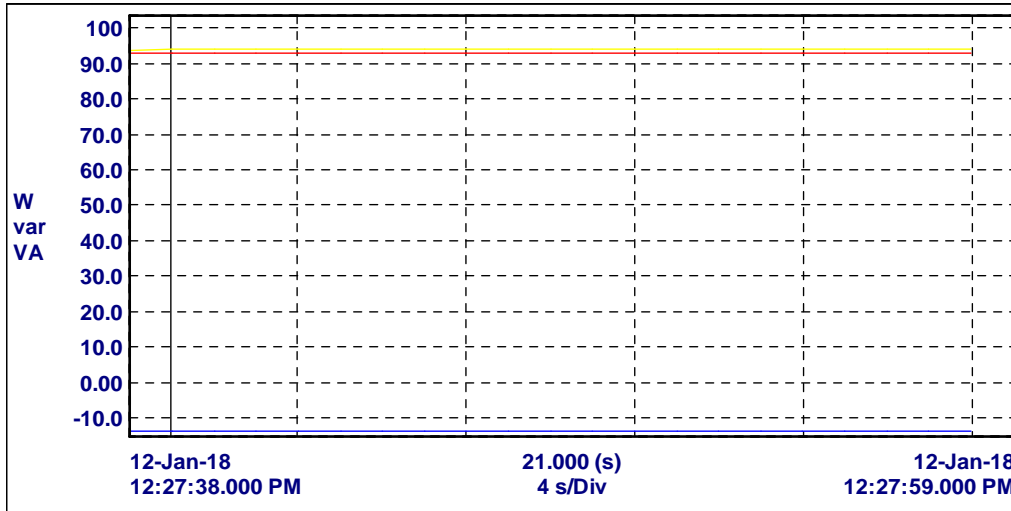
**Lighting -2**

**W-VAR-VA**



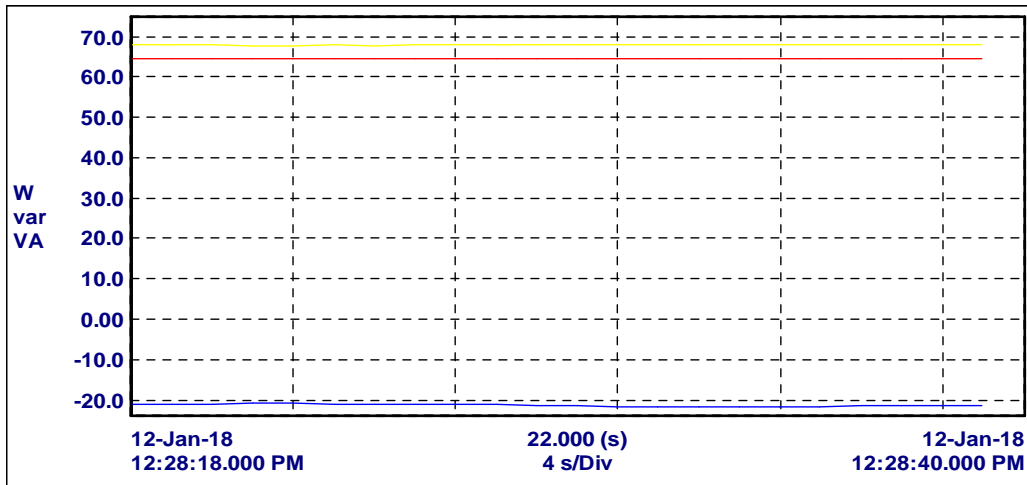
**Lighting -3**

**W-VAR-VA**



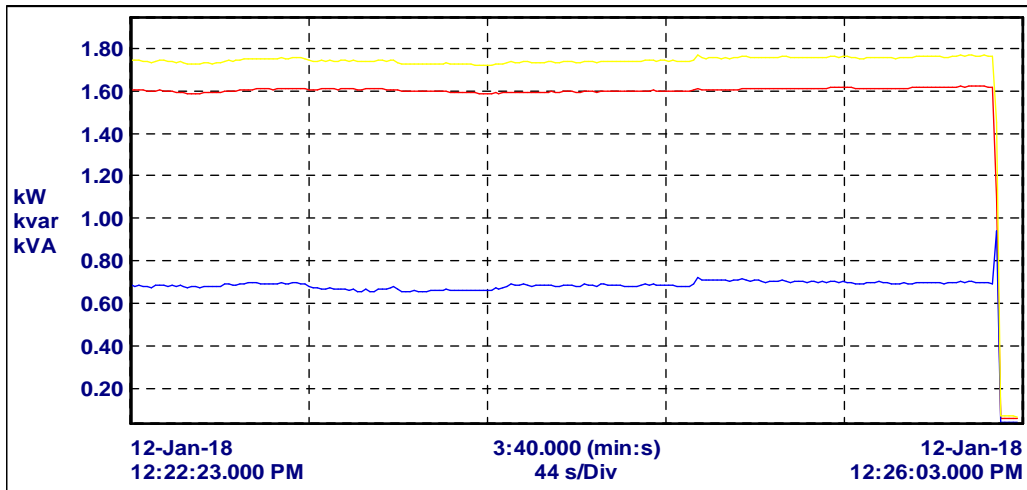
**Lighting -4**

**W-VAR-VA**

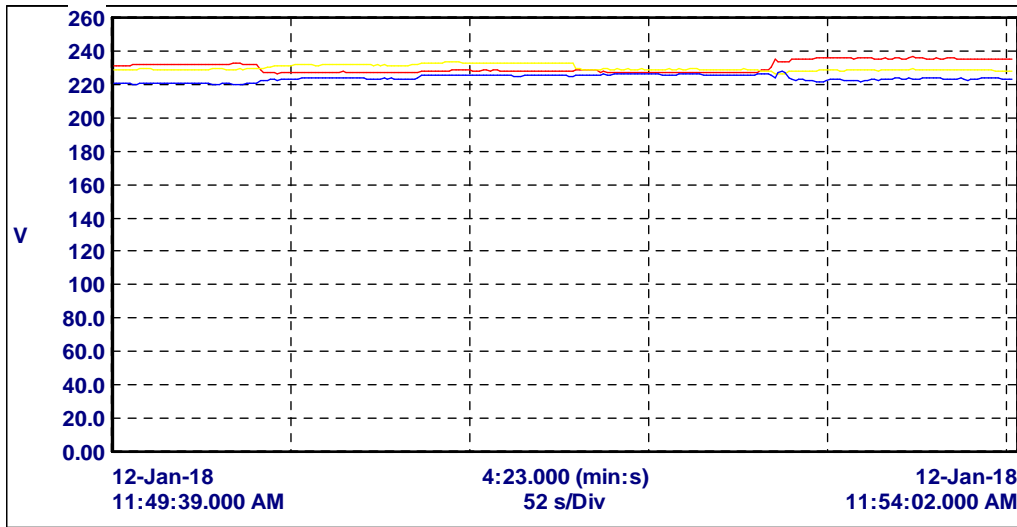


**UPS Room AC- 2**

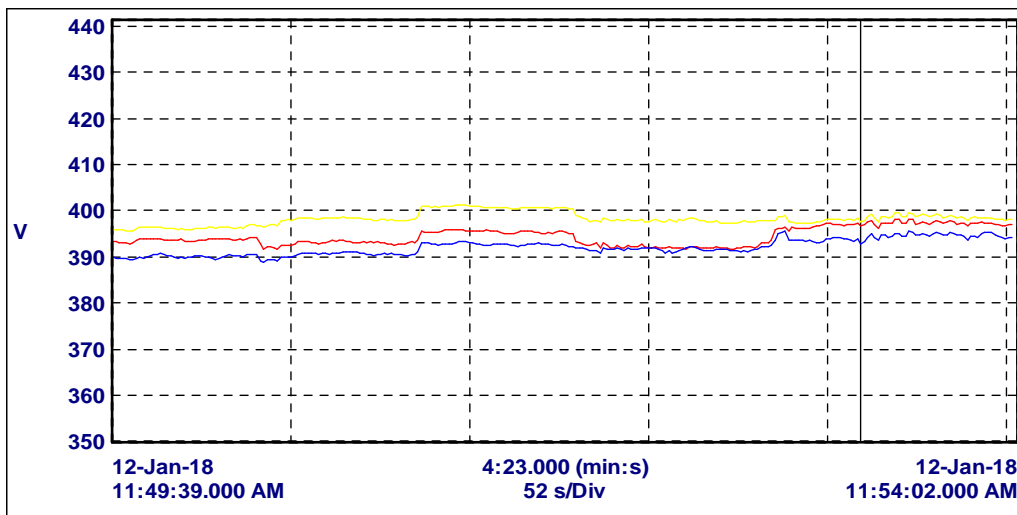
**KW-KVAR-KVA**



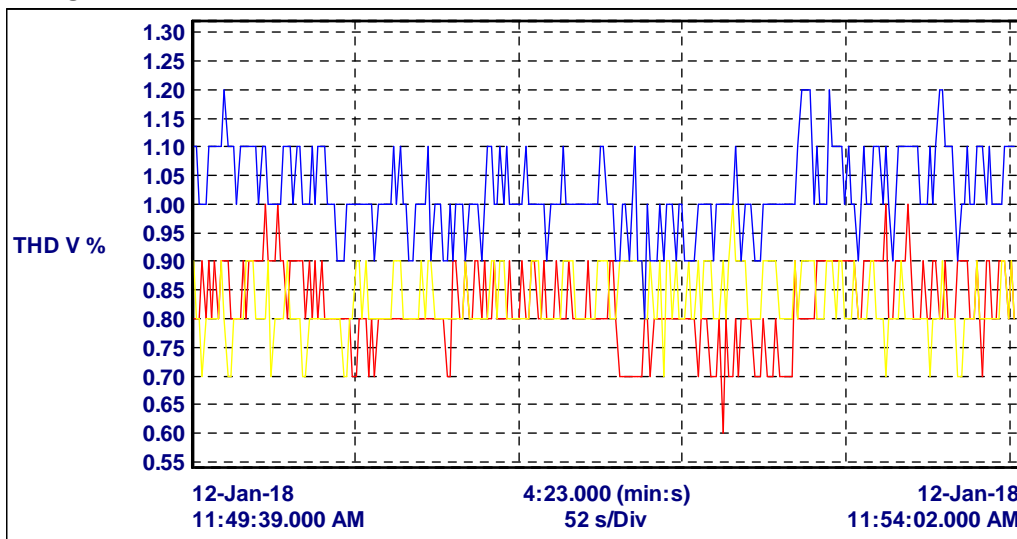
**UPS -1 Input  
Voltage L-N**



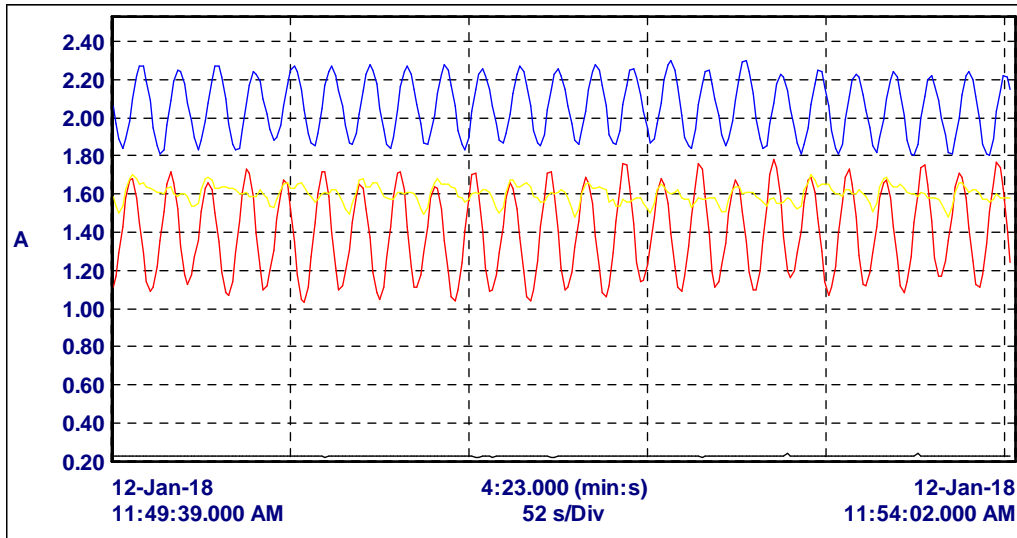
**Voltage L-L**



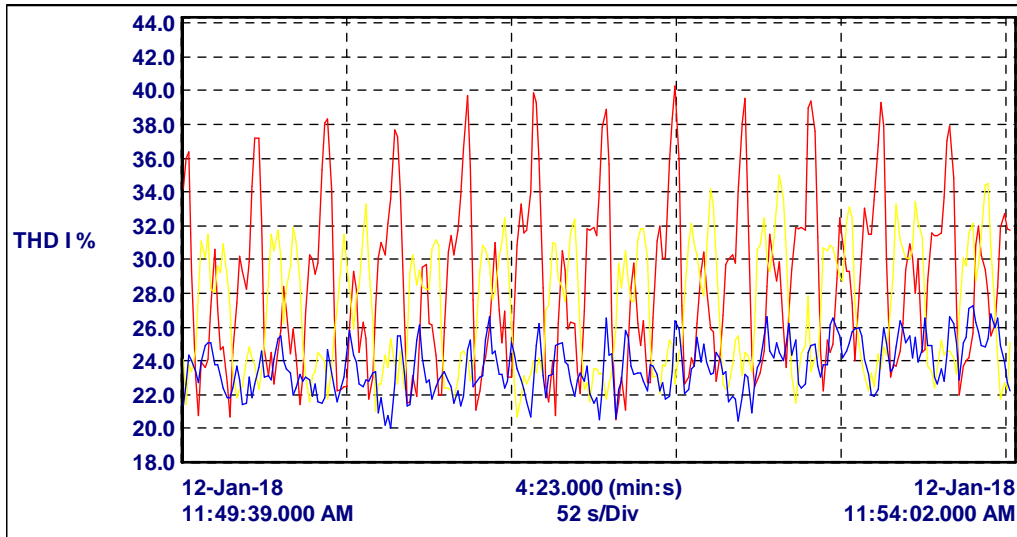
**Voltage harmonic distortion**



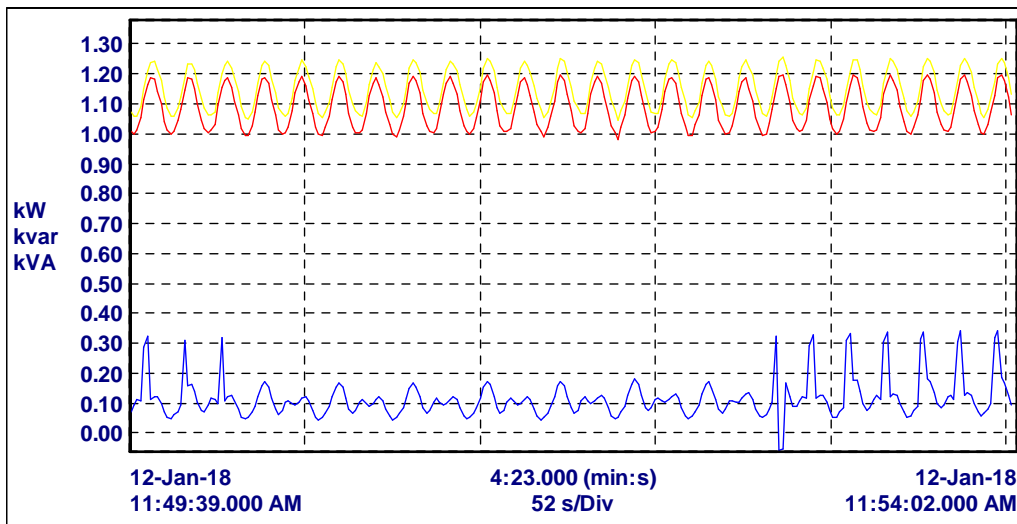
**Current**



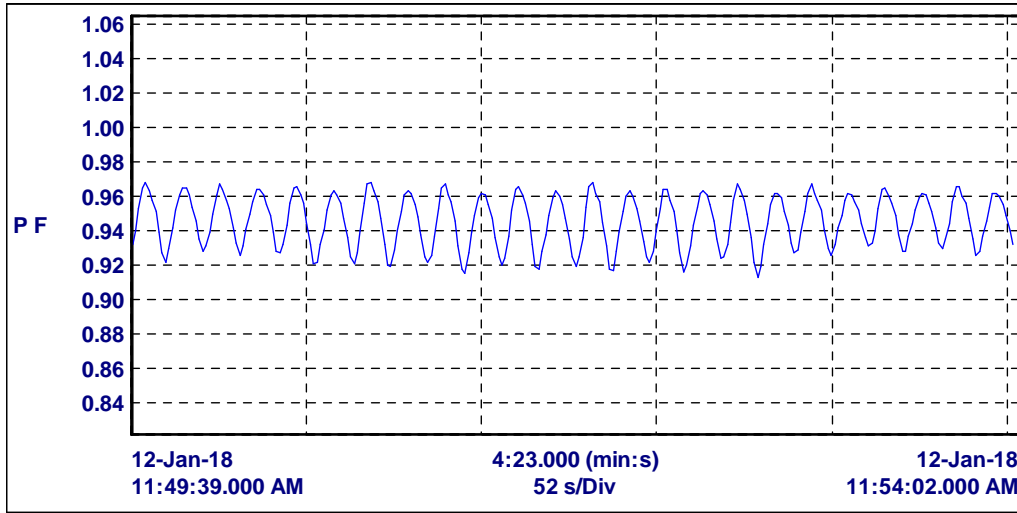
**Current harmonic distortion**



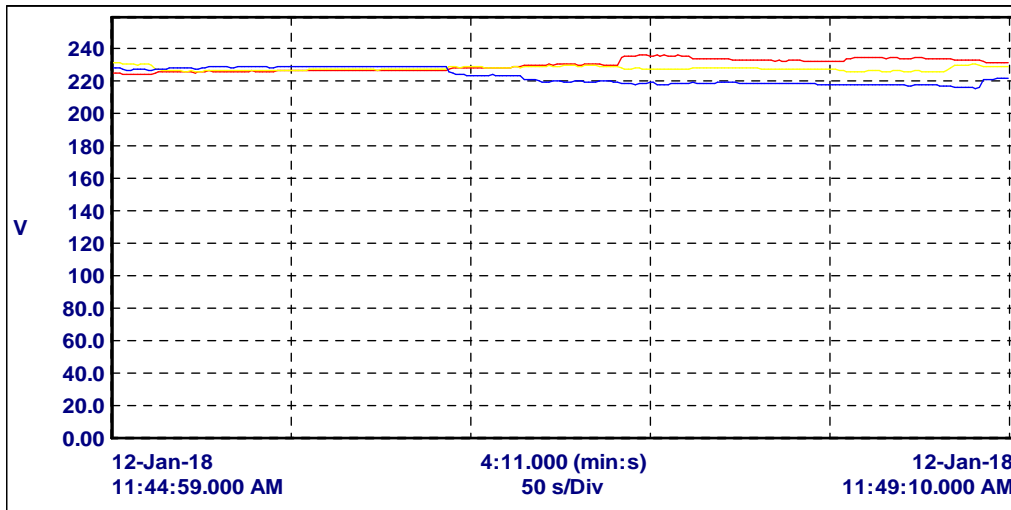
**KW-KVAR-KVA**



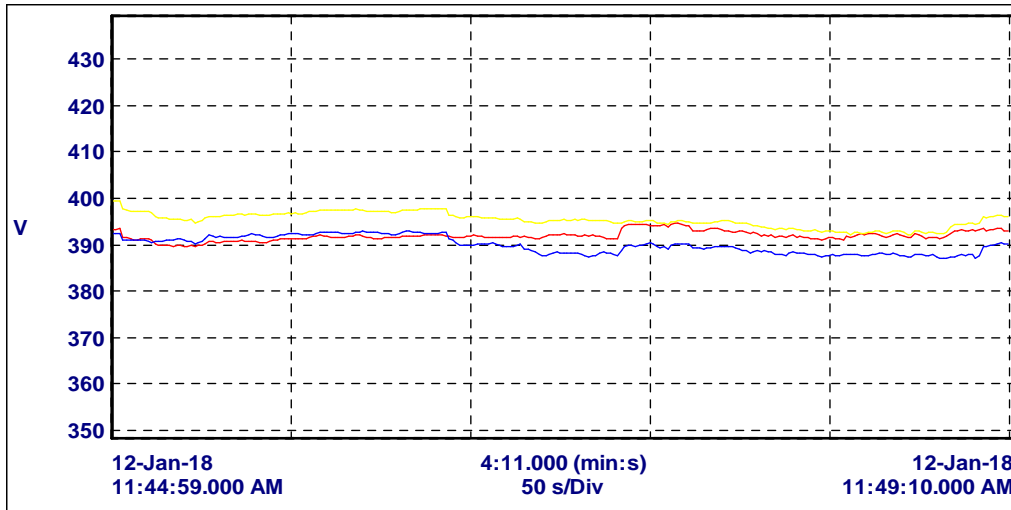
PF



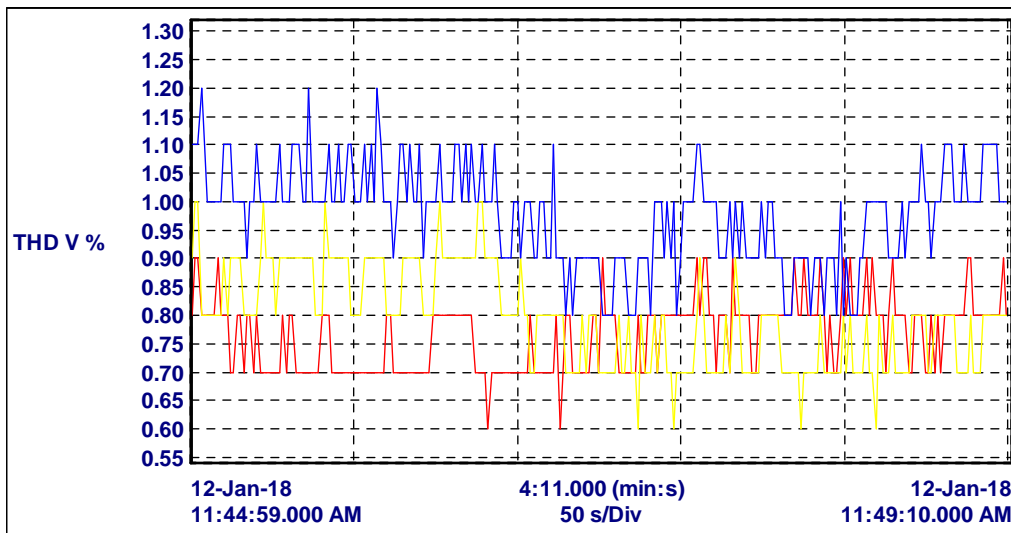
**UPS -2 Input  
Voltage L-N**



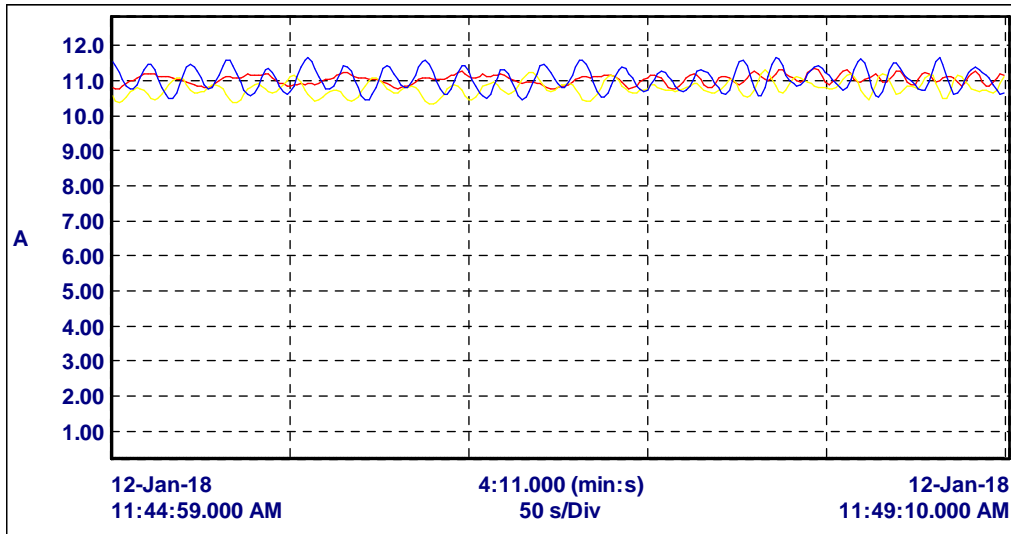
**Voltage L-L**



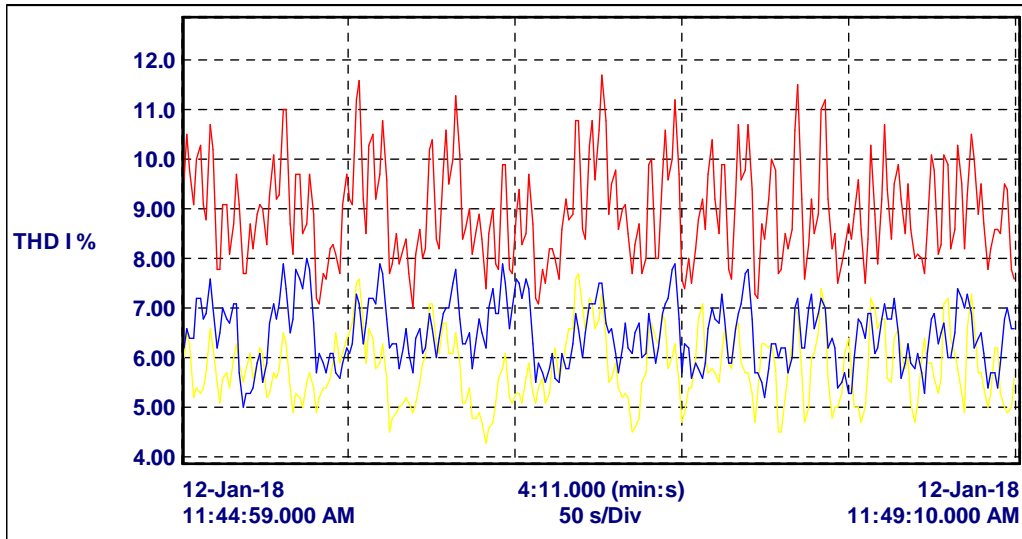
**Voltage harmonic distortion**



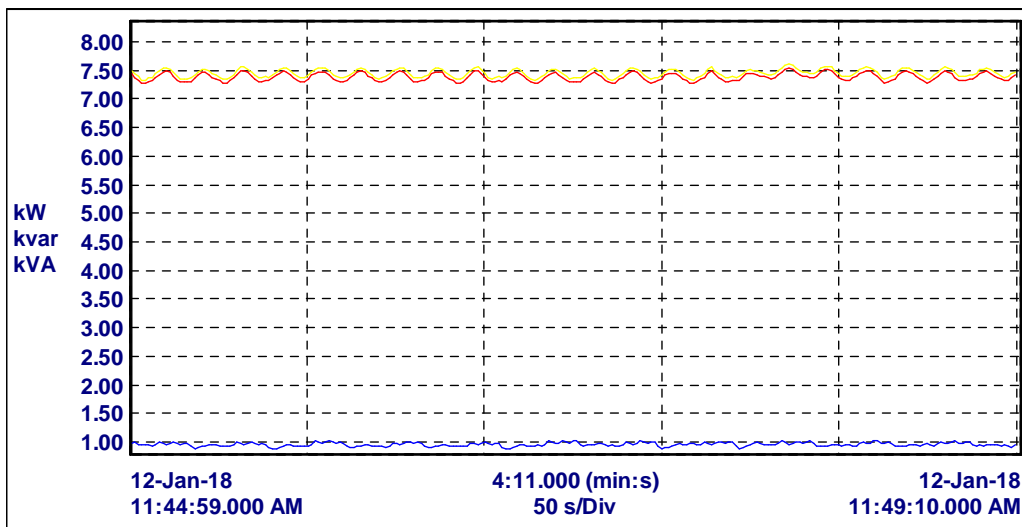
**Current**



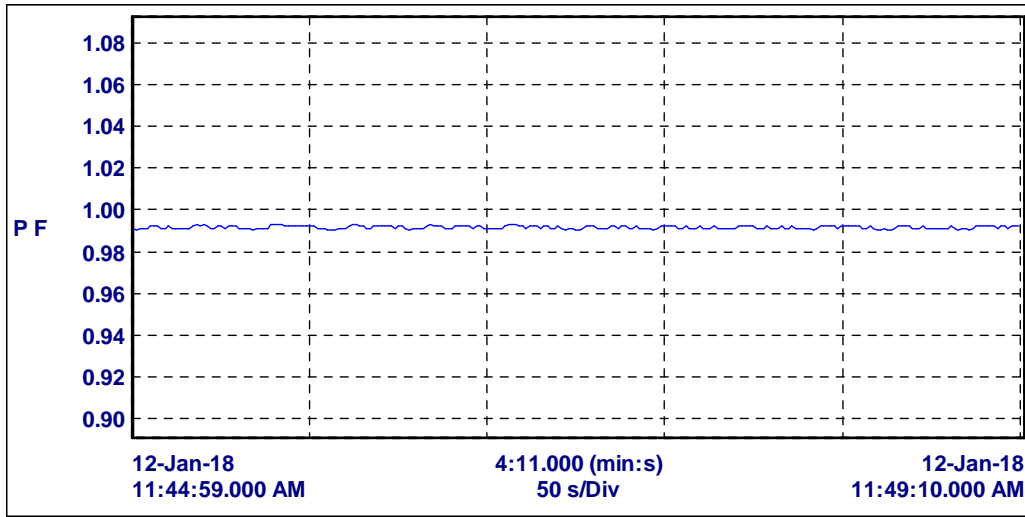
**Current harmonic distortion**



**KW-KVAR-KVA**

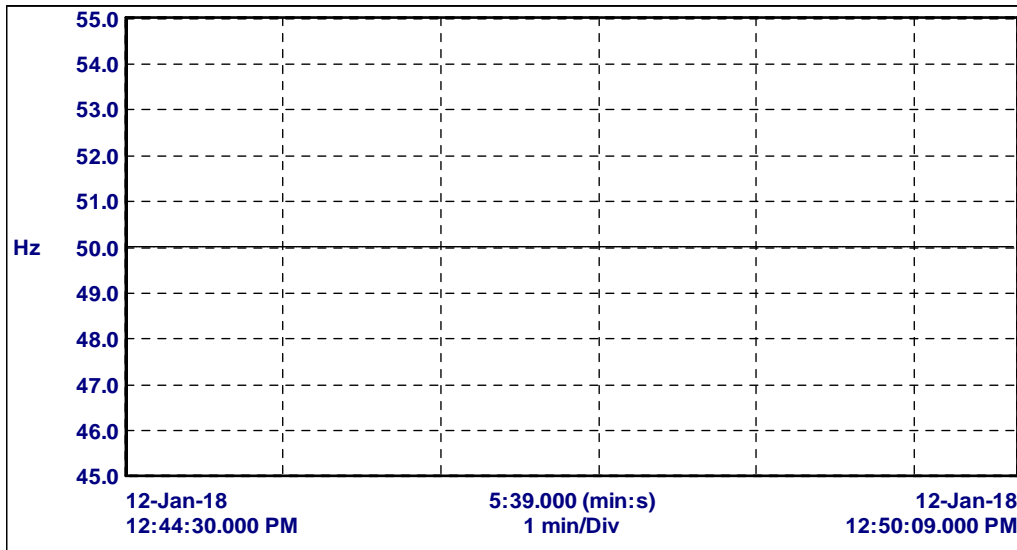


PF

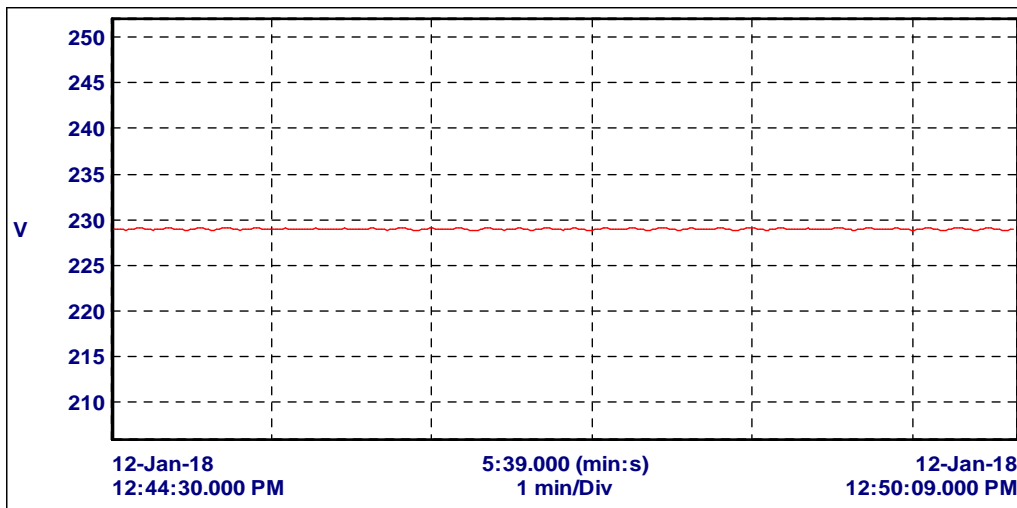


**UPS-2 output**

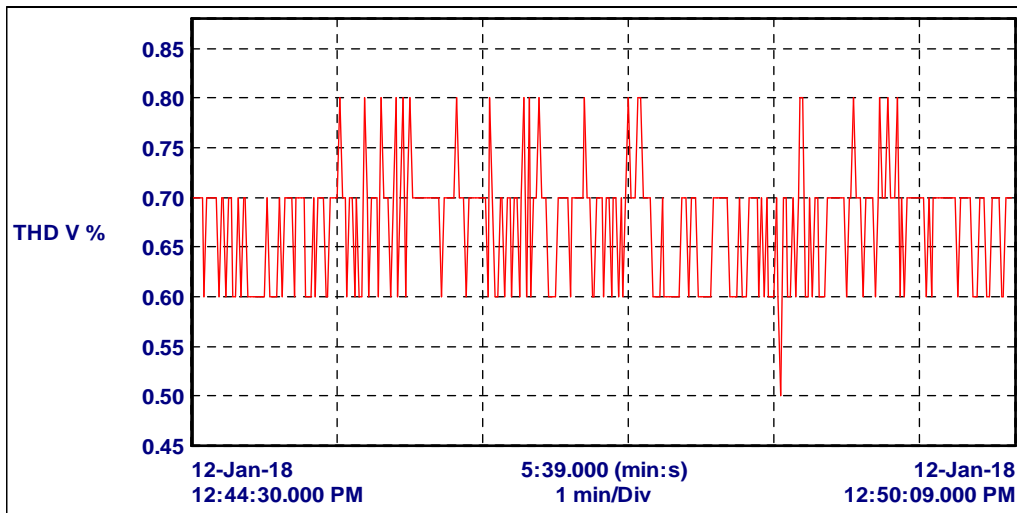
**Frequency**



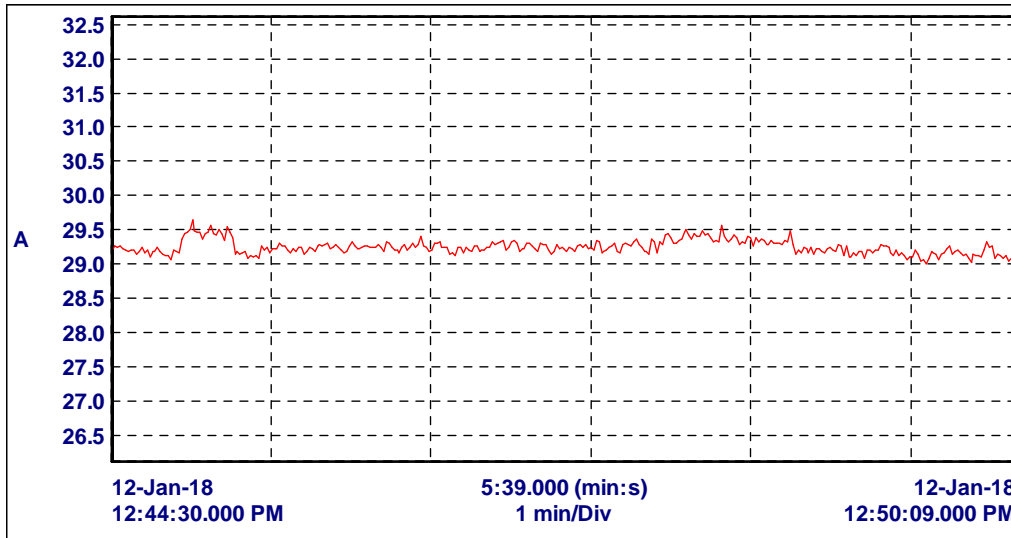
**Voltage L-N**



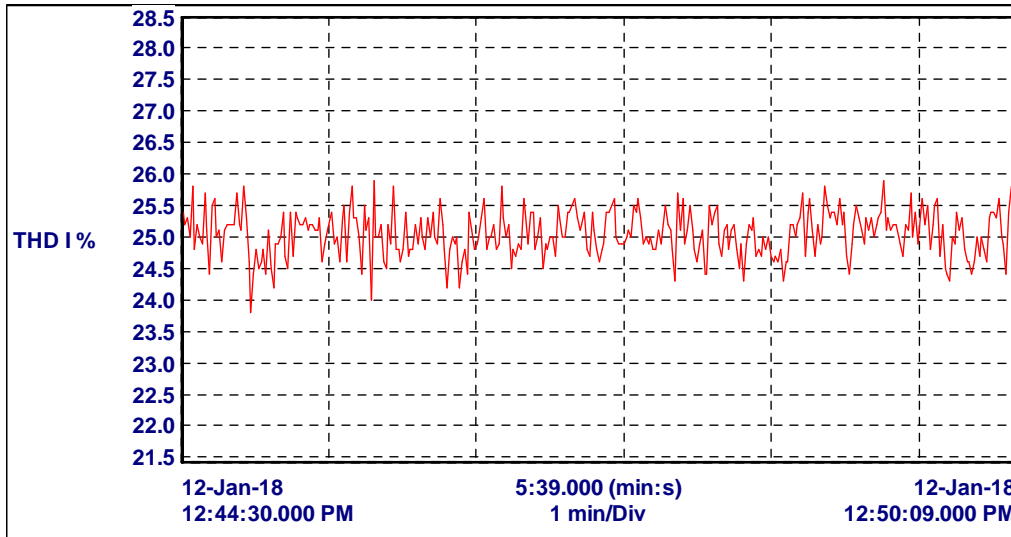
**Voltage harmonic distortion**



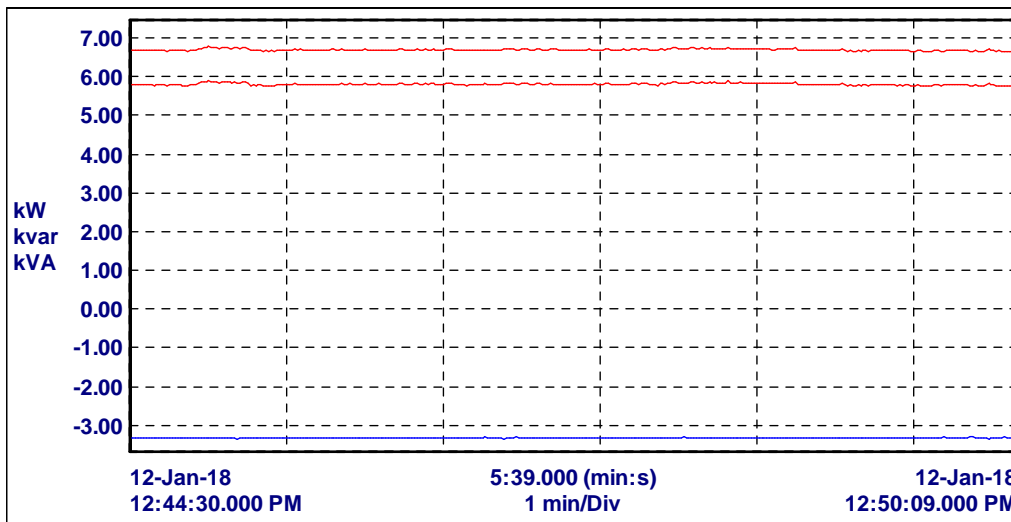
**Current**



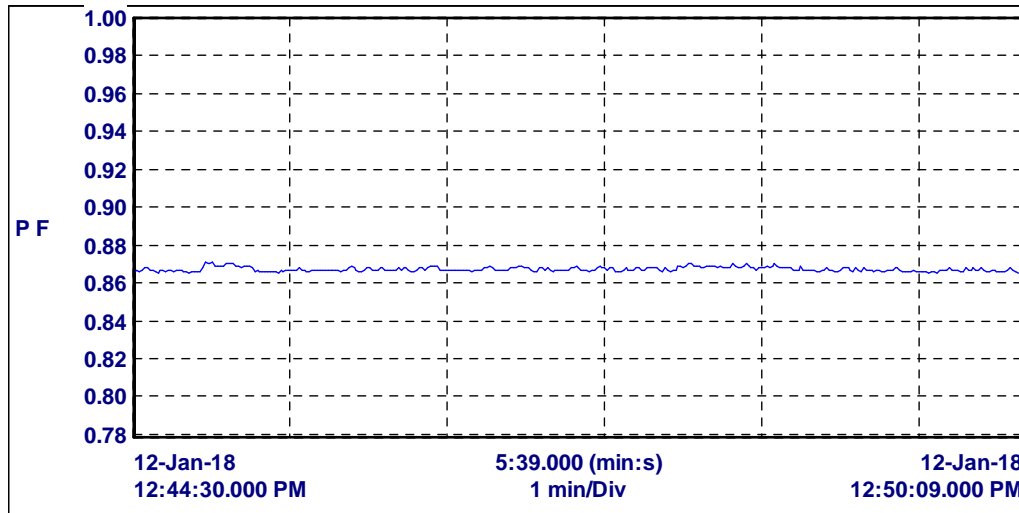
**Current harmonic distortion**



**KW-KVAR-KVA**

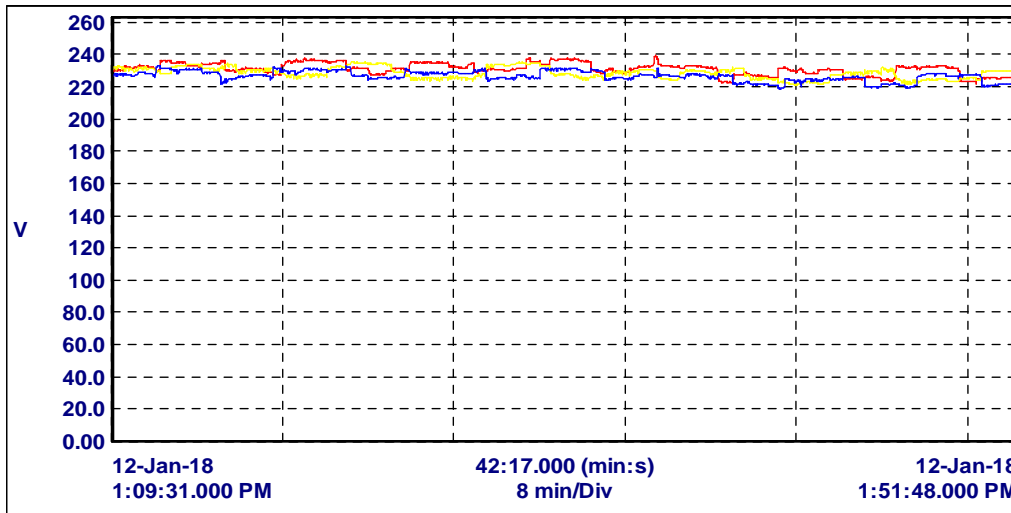


PF

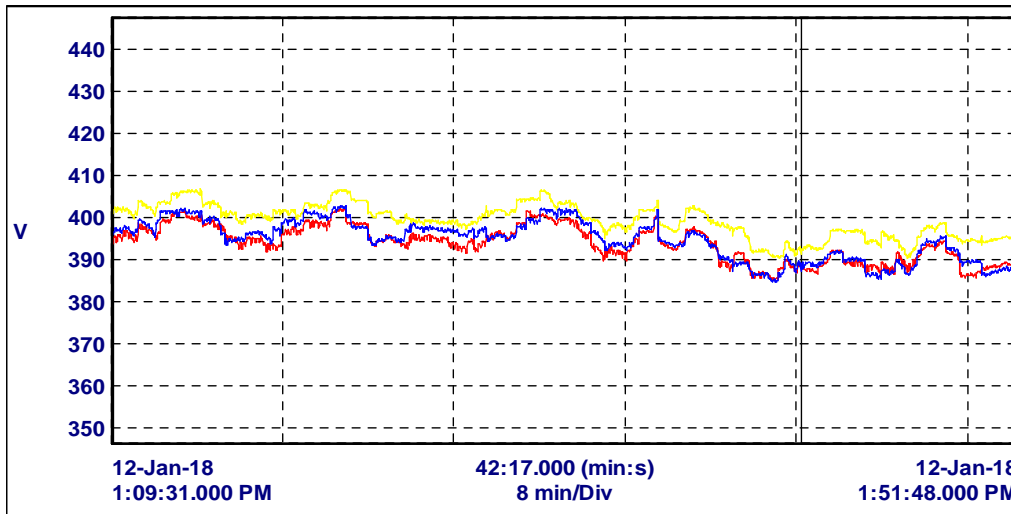


**Branch Main incomer**

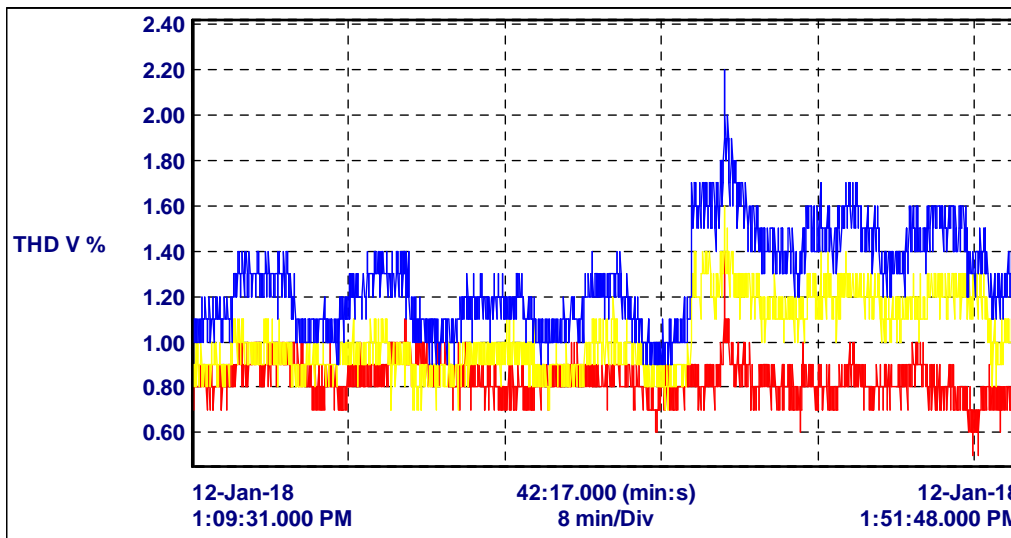
**Voltage L-N**



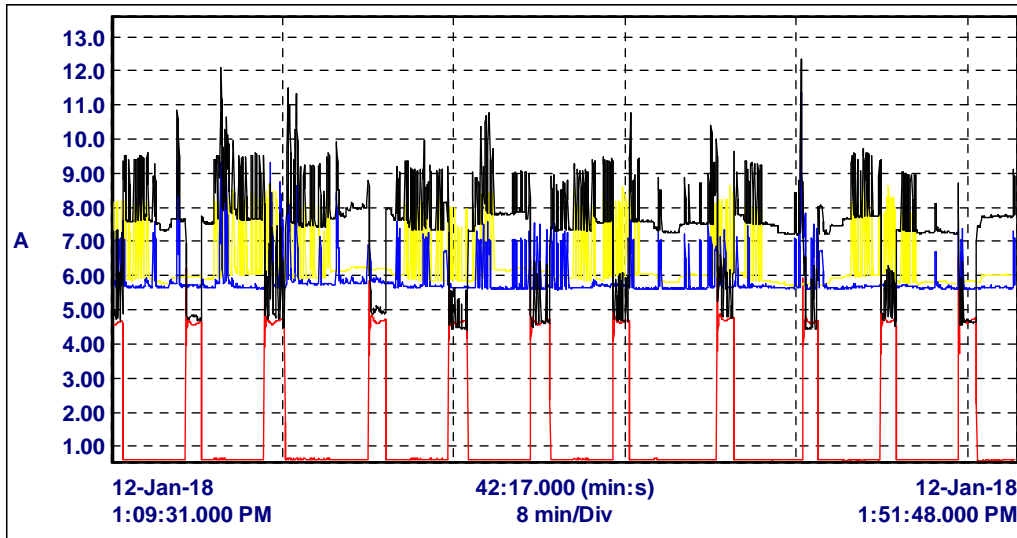
**Voltage L-L**



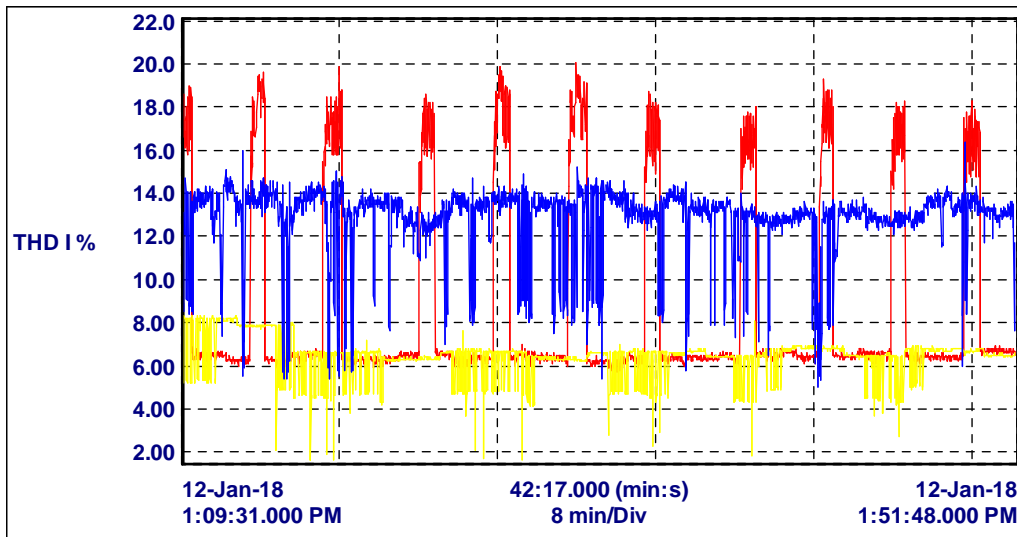
**Voltage harmonic distortion**



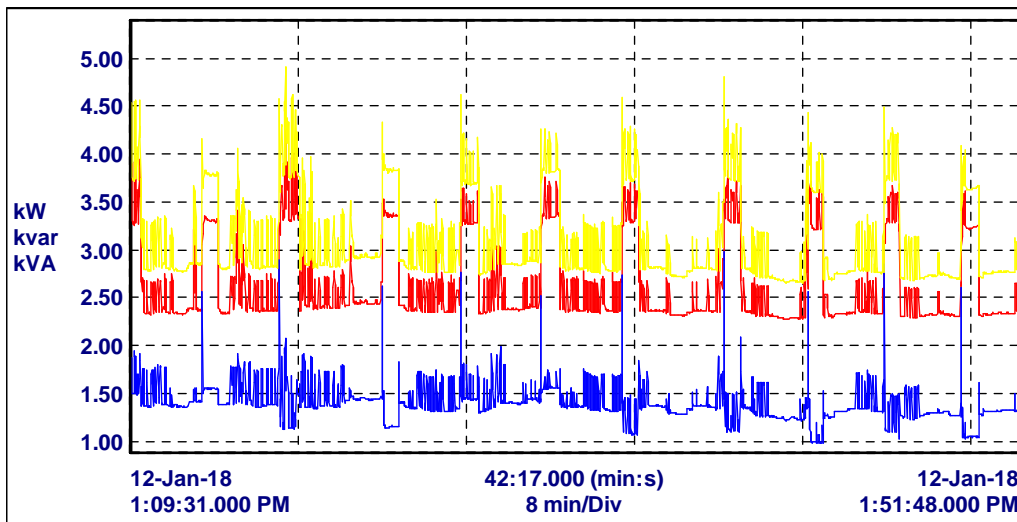
**Current**



**Current harmonic distortion**



**KW-KVAR-KVA**



PF

