

# Energy Quality Analyzer

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**Abstract:** This work is about implementing an energy quality analyzer based on digital signal processors from Analog Devices for the estimation of the total harmonic distortion and power factor

**Key words:** THD, PF, harmonic analysis

The goal of this project is to analyze the theory and practice within the resolution of the harmonic measurement problem in energy quality systems, for the use in the industry for normative purposes and to maximize the energy savings, using real time digital signal processing techniques.

Taking voltage and current measures at the input of the device under analysis, we take samples and quantify those values using analog to digital converters (ADC). Then we apply the Fast Fourier Transform on these values to obtain the spectral representation of the signal.

There are many considerations to keep in mind: As every real system doesn't have an infinite amount of memory, we need to analyze the influence of this limitation in the data size (windowing). In our case, we choose the Flattop window, though its performance is optimum for amplitude estimations. Another constrain is the sampling

frequency. We must take in consideration the IEEE recommendation, which stands for the use up to the 60<sup>th</sup> harmonic component. According to the Nyquist theorem, the minimum sampling frequency will be 6000Hz (if we measure 50Hz signals)

Next, we find the values for the parameters that are significant when it comes to the evaluation of the energy quality: the Total Harmonic Distortion (THD) and Power Factor (FP)

Finally, we've built a prototype based on the evaluation board for the Blackfin DSP BF537 from Analog Devices. This prototype returns the

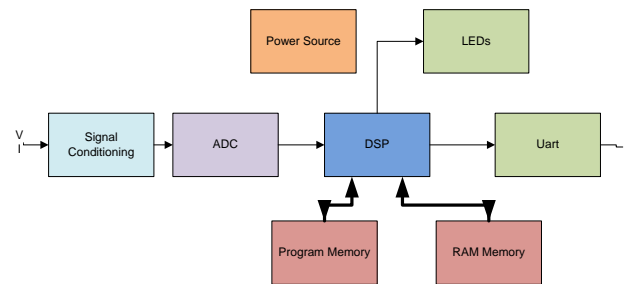
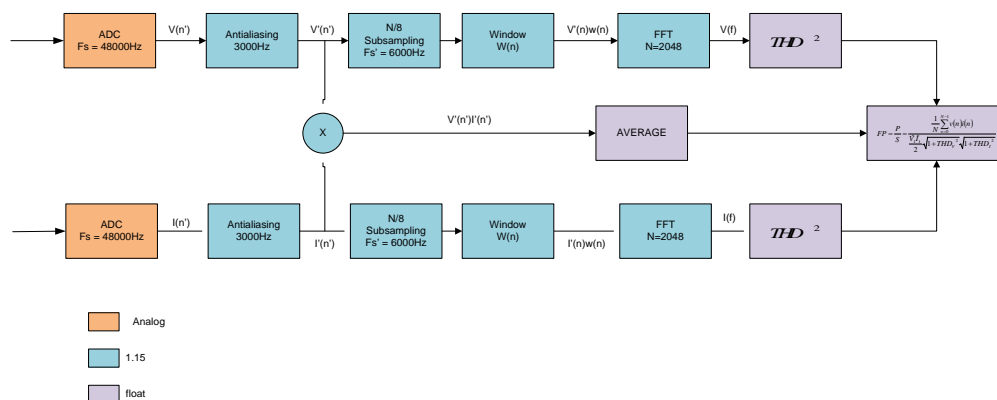


Fig 1. Hardware Block Diagram

parameters measured using a serial port interface, in text mode. The results gave a resolution near 2% for THD and FP measurements.



Analog  
 1.15  
 float

Fig 2 Software Block Diagram