Computer Aided Lab A

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# Introduction

Digital Storage Oscilloscopes are widely used to measure voltage signals. For the correct interpretation of the results, it is important to be aware of their properties and possible errors that can occur when the DSO is not used properly. In this experiment you will verify some important properties of the DSO using digital signal processing techniques.

Phát triển ý này lên, giới thiệu về các thuật ngữ SP cũng như tầm quan trọng của DSP, DSO,

ứng dụng của chúng trong đời thường và

mục tiêu của project/ lab này là gì

# Theoritical part

## Digital Storage Oscilloscope

### Digital Storage Oscilloscope

<https://en.wikipedia.org/wiki/Oscilloscope>

Giới thiệu về oscilloscope

Công dụng của Osciloscope

Tầm quan trọng của oscilloscope

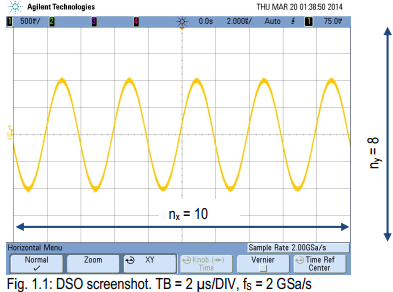
Chapter 1. fourier transform and oscilloscope – oscilloscope book

Resolution of analogue to digital converter

### Depth of storage

Dùng troong file của thầy á, em tìm ko thấy tài liệu

Này chắc định nghỉa + công thức và các thành phần liên quan tới nó.



Cho hình này vào lun nha chị

## Foiurier transform

### Fourier transform – Fast Fourier Transform

#### Fourier transfrom – công thức

<https://en.wikipedia.org/wiki/Fourier_transform>

<https://lpsa.swarthmore.edu/Fourier/Xforms/FXformIntro.html>

Định nghĩa

công thức

công dụng

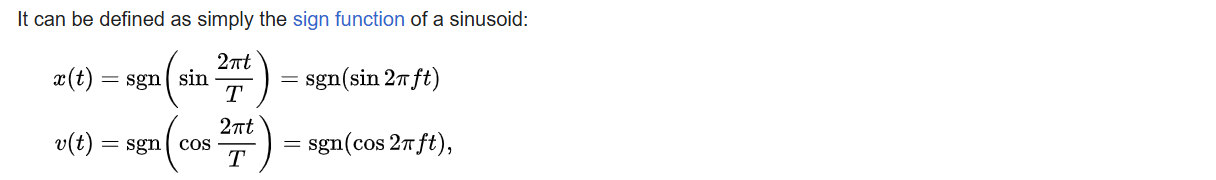
#### Wave form

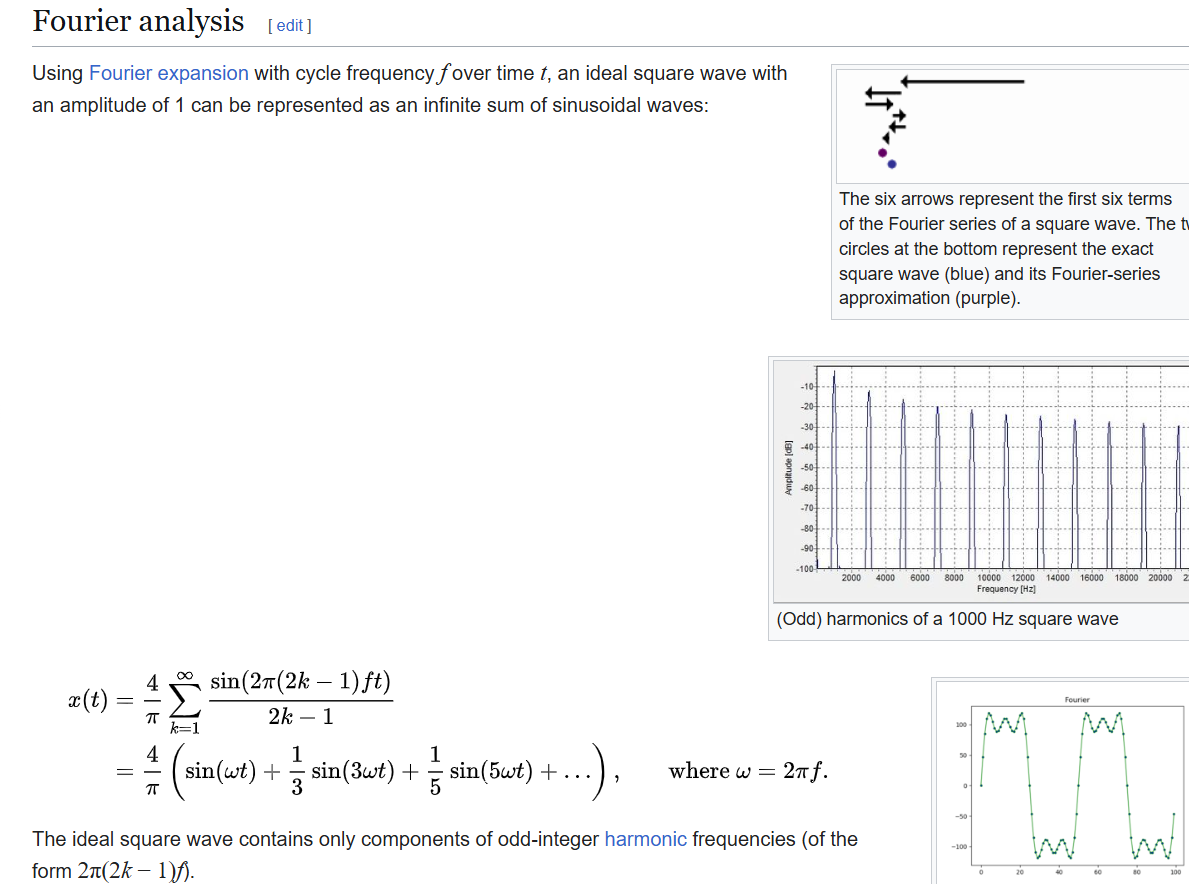
Ở đây mình giới thiệu về sine wave và square wave  
<https://ccrma.stanford.edu/~jos/st/Sinusoids.html>

A **square wave** is a [non-sinusoidal periodic waveform](https://en.wikipedia.org/wiki/Non-sinusoidal_waveform) in which the amplitude alternates at a steady [frequency](https://en.wikipedia.org/wiki/Frequency) between fixed minimum and maximum values, with the same duration at minimum and maximum. In an ideal square wave, the transitions between minimum and maximum are instantaneous.

The square wave is a special case of a [pulse wave](https://en.wikipedia.org/wiki/Pulse_wave) which allows arbitrary durations at minimum and maximum amplitudes. The ratio of the high period to the total period of a pulse wave is called the [duty cycle](https://en.wikipedia.org/wiki/Duty_cycle). A true square wave has a 50% duty cycle (equal high and low periods).

Square waves are often encountered in [electronics](https://en.wikipedia.org/wiki/Electronics) and [signal processing](https://en.wikipedia.org/wiki/Signal_processing), particularly [digital electronics](https://en.wikipedia.org/wiki/Digital_electronics) and [digital signal processing](https://en.wikipedia.org/wiki/Digital_signal_processing). Its [stochastic](https://en.wikipedia.org/wiki/Stochastic) counterpart is a [two-state trajectory](https://en.wikipedia.org/wiki/Two-state_trajectory).





An ideal mathematical square wave changes between the high and the low state instantaneously, and without under- or over-shooting. This is impossible to achieve in physical systems, as it would require infinite bandwidth.

### Sampling rate and aliasing

Sampling rate

Định nghỉa

Công thức

Công dụng

<https://de.wikipedia.org/wiki/Nyquist-Shannon-Abtasttheorem>

<https://webdemo.inue.uni-stuttgart.de/webdemos/02_lectures/uebertragungstechnik_1/sampling_theorem/index.php?id=2>

Alias

Định nghỉa

Công thức

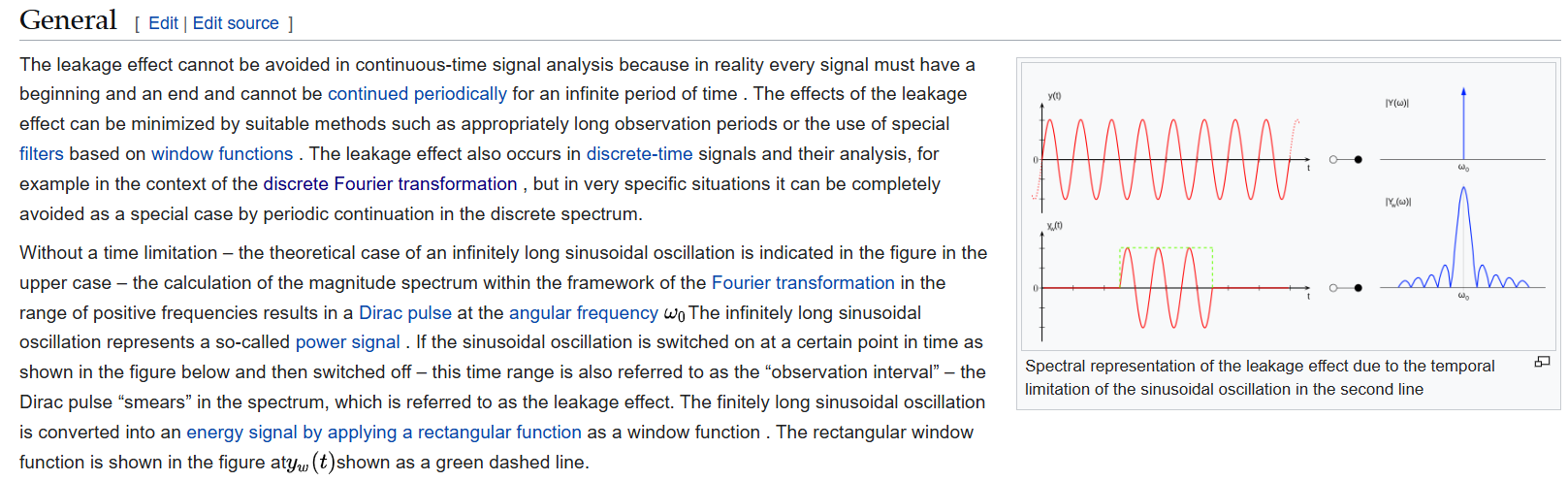
Công dụng

<https://de.wikipedia.org/wiki/Alias-Effekt>

<https://en.wikipedia.org/wiki/Aliasing>

### Leakage effect

<https://de.wikipedia.org/wiki/Leck-Effekt>



# Experiment

## Measurement of exp 1

### Description of experiment

### Results – diagram, table, graphics

### 3.1.3. Discussion of results

## Measurement of exp 1

### Description of experiment

#### Exercise 2 part a

#### Exercise 2-part b

### Results – diagram, table, graphics

### Discussion of results

## Measurement of exp 3

### Description of experiment

#### Exercise 3 part a

#### Exercise 3 part b

### Results – diagram, table, graphics

### 3.1.3. Discussion of results

# Summary and Outlook

# References