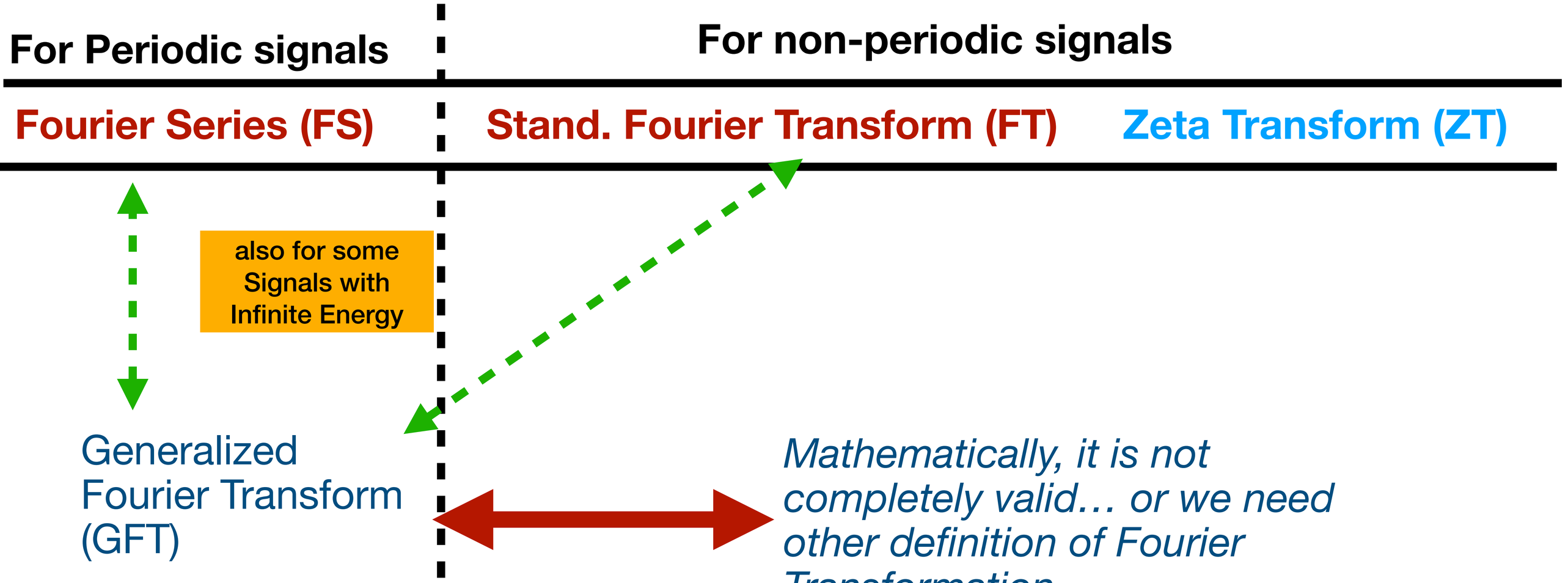
Standard Fourier Transform for signals defined in discrete time

Linear systems and circuit applications

Discrete Time Systems

Luca Martino — luca.martino@urjc.es — http://www.lucamartino.altervista.org

Transformations for signal in discrete time



Transformations for signal in discrete time

MOREOVER:

- Discrete Fourier Transform (DFT)

- Fast Fourier Transform (FFT) ==> Fast version of DFT

DFT “mathematically” very similar to (almost the same) Fourier Series for discrete time

Standard Fourier Transform

Discrete Time Systems

Standard Fourier Transform

DEFINITIONS: **(x[n] NON-periodic)**

Analysis Equation:

periodic with period 2π

Direct time ==> freq.

$$X(\Omega) = \sum_{n=-\infty}^{+\infty} x[n] e^{-j\Omega n}$$

Fourier Transform

Syntesis Equation:

Inverse freq. ==> time

$$x[n] = \frac{1}{2\pi} \int_{2\pi} X(\Omega) e^{j\Omega n} d\Omega$$

Inverse Fourier Transform

Standard Fourier Transform

Important properties:

$$X(\Omega) = X(\Omega + 2\pi)$$

periodic with period 2π

Existence (convergence of series of stand. FT)

$$X(\Omega) = \sum_{n=-\infty}^{+\infty} x[n]e^{-j\Omega n}$$

with the calculus rules you know for Series…. we need:

Both are sufficient conditions !!

$$\sum_{n=-\infty}^{\infty} |x[n]|^2 < \infty \text{ -Energía finita}$$

FINITE ENERGY

o

$$\sum_{n=-\infty}^{\infty} |x[n]| < \infty$$

…the for the convergence of the analysis equation (direct Fourier transformation)

Existence (convergence of series of stand. FT)

$$\sum_{n=-\infty}^{\infty} |x[n]|^2 < \infty \text{ -Energía finita}$$

FINITE ENERGY

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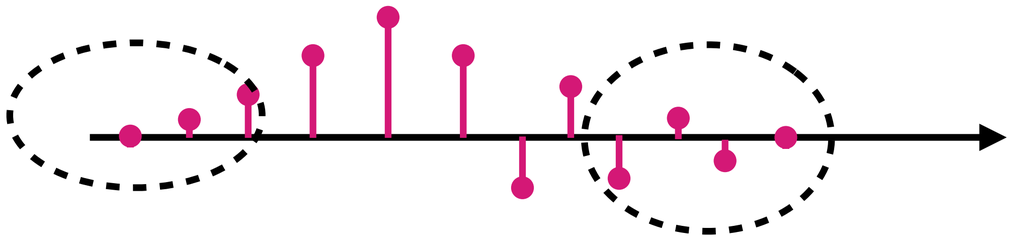
$$\sum_{n=-\infty}^{\infty} |x[n]| < \infty$$

what do they imply?

Convergence to zero at +Infty and -Infty



Questions?