CELLONICS

A Technical Seminar Presentation

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· "NECESSITY IS THE MOTHER OF INVENTION"

·the saying goes.. Lets now see what this current invention of CELLONICS was for.

INTRODUCTION

- Cellonics allow modem speeds 1,000 times faster than our present modems.
- It is based on the way biological cells communicate with each other and nonlinear dynamical systems (NDS).
- Benefits are incredible speed, simplicity, and robustness.
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INTRODUCTION

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- The ASCII uses a combination of ones and zeros to display a single letter of the alphabet. The data is then sent over radio frequency cycle to its destination where it is then decoded.

- Human cells respond to stimuli and generate waveforms that consist of a continuous line of pulses separated by periods of silence. The Cellonics technology uses these pulse signals and apply them to the communications industry.

INTRODUCTION

- Nonlinear Dynamical Systems (NDS) are the mathematical formulations required to simulate the cell responses.

- It uses portable devices, and provide these devices with faster, better data for longer periods of time.
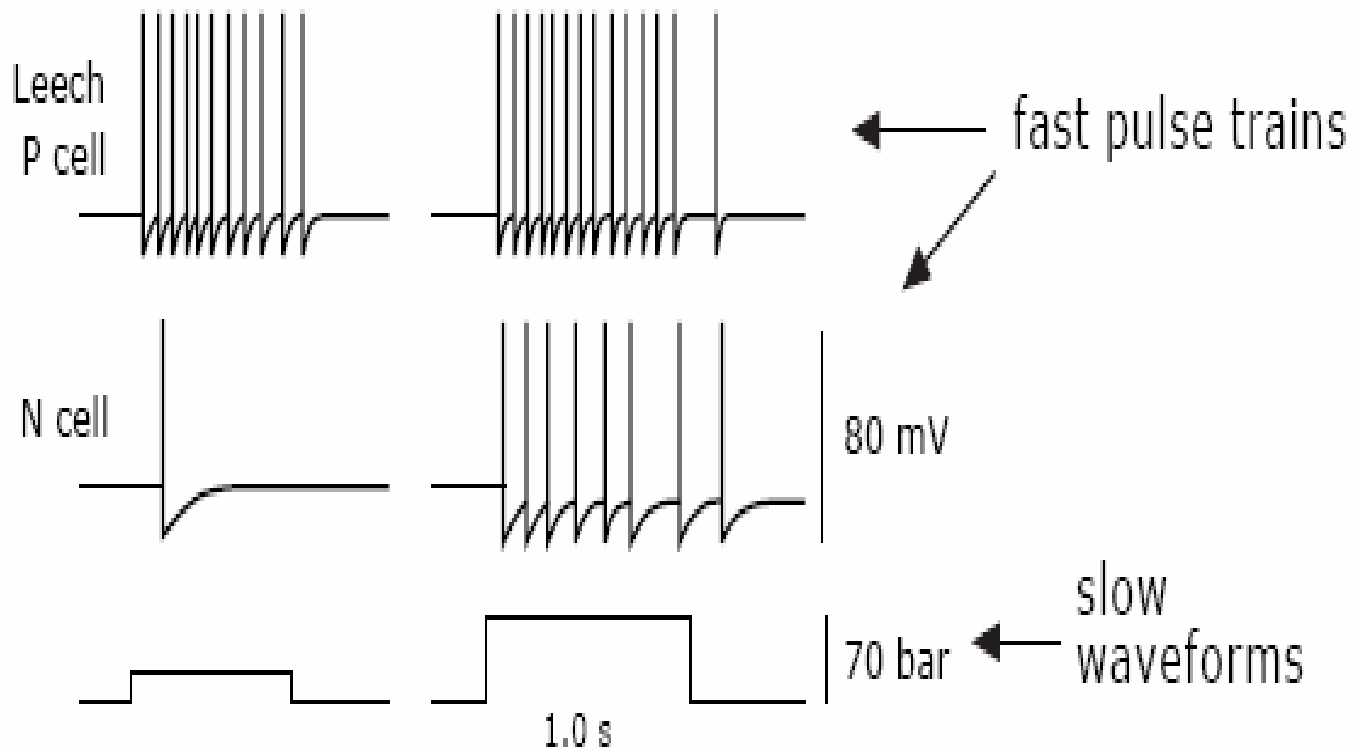
- It consumes very little power.

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PRINCIPLE OF CELLONICS TECHNOLOGY

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- Cellonics - Electronic cells.
- It has the ability to encode, transmit and decode digital information over a variety of physical channels.
- Wired and wireless communications are possible.
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# Measured ß-cell Response
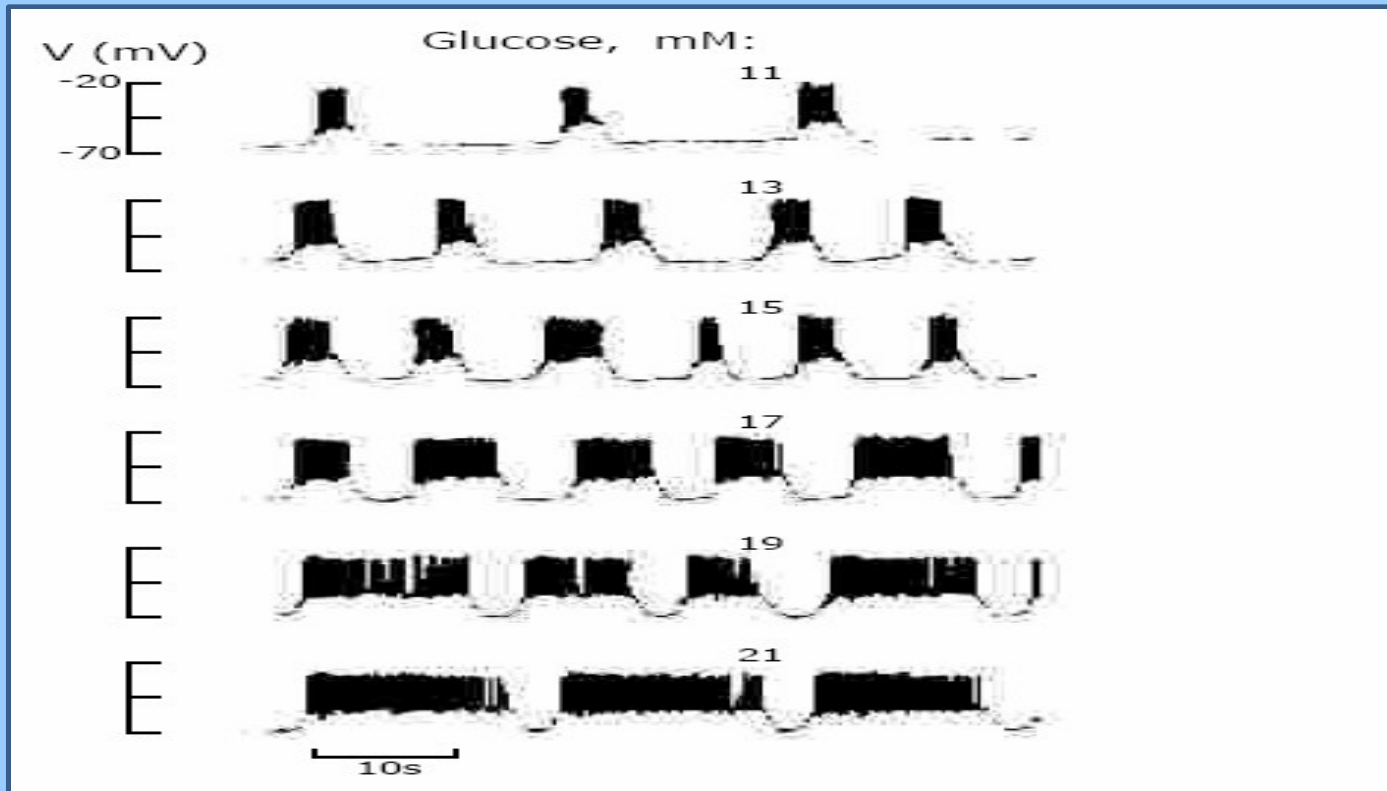
Leech & Nociceptor

- The Cellonics technology is a fundamental modulation and demodulation technique. The Cellonics receivers generate pulses from the received analog signal and performs demodulation based on pulse counting and related algorithms.
- The study of biological cell behavior is only an inspiration to the invention of Cellonics circuits. The Cellonics technology is not related to any neural network communications or neurophomic electronics.
- *Slow waveforms*: Analogue waveforms that vary slowly with time. These waveforms can be in any arbitrary shape.
- *Fast waveforms/fast pulse trains*: Waveform in the shape of pulses that

CELLONICS CIRCUITS
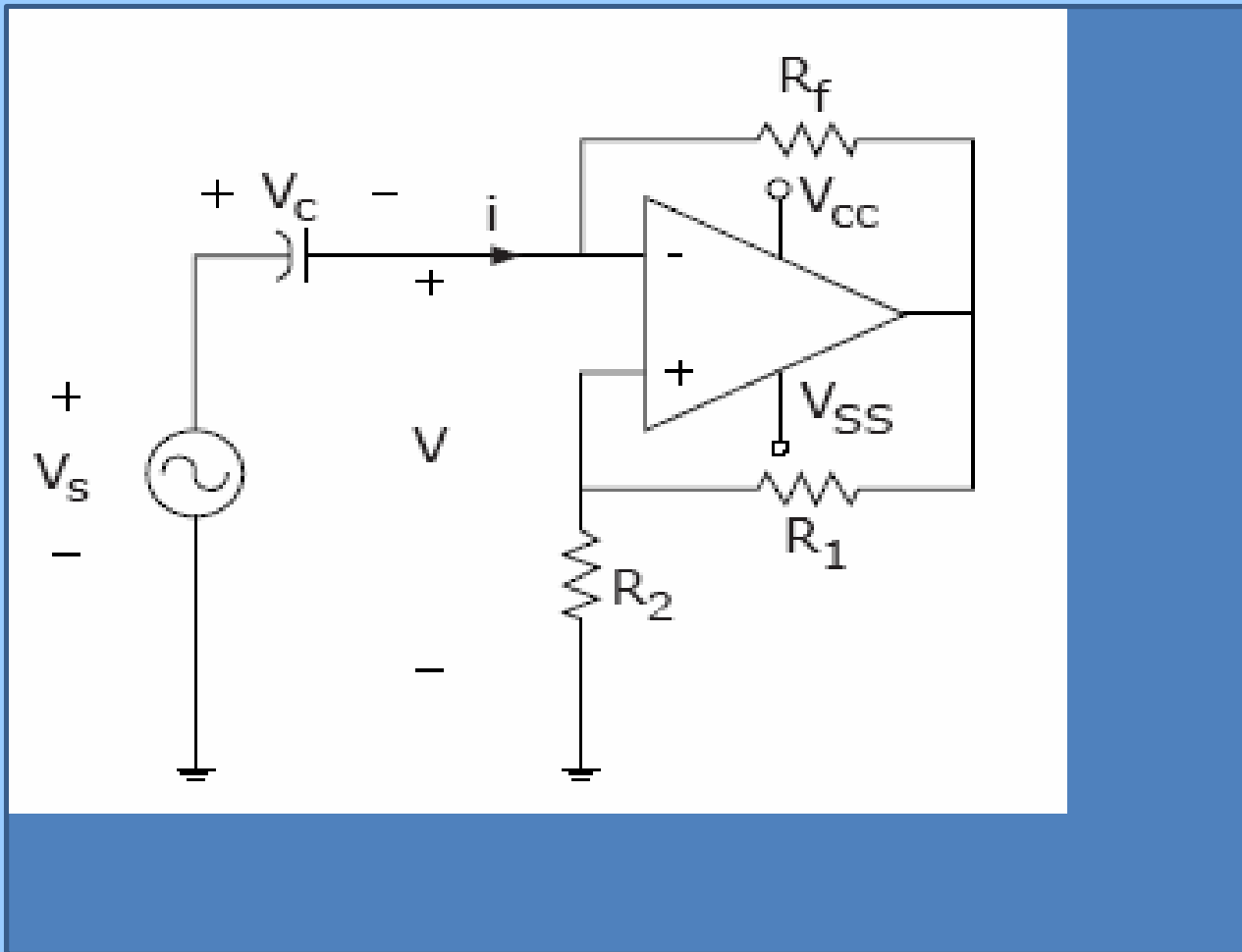
S-curve transfer characteristics
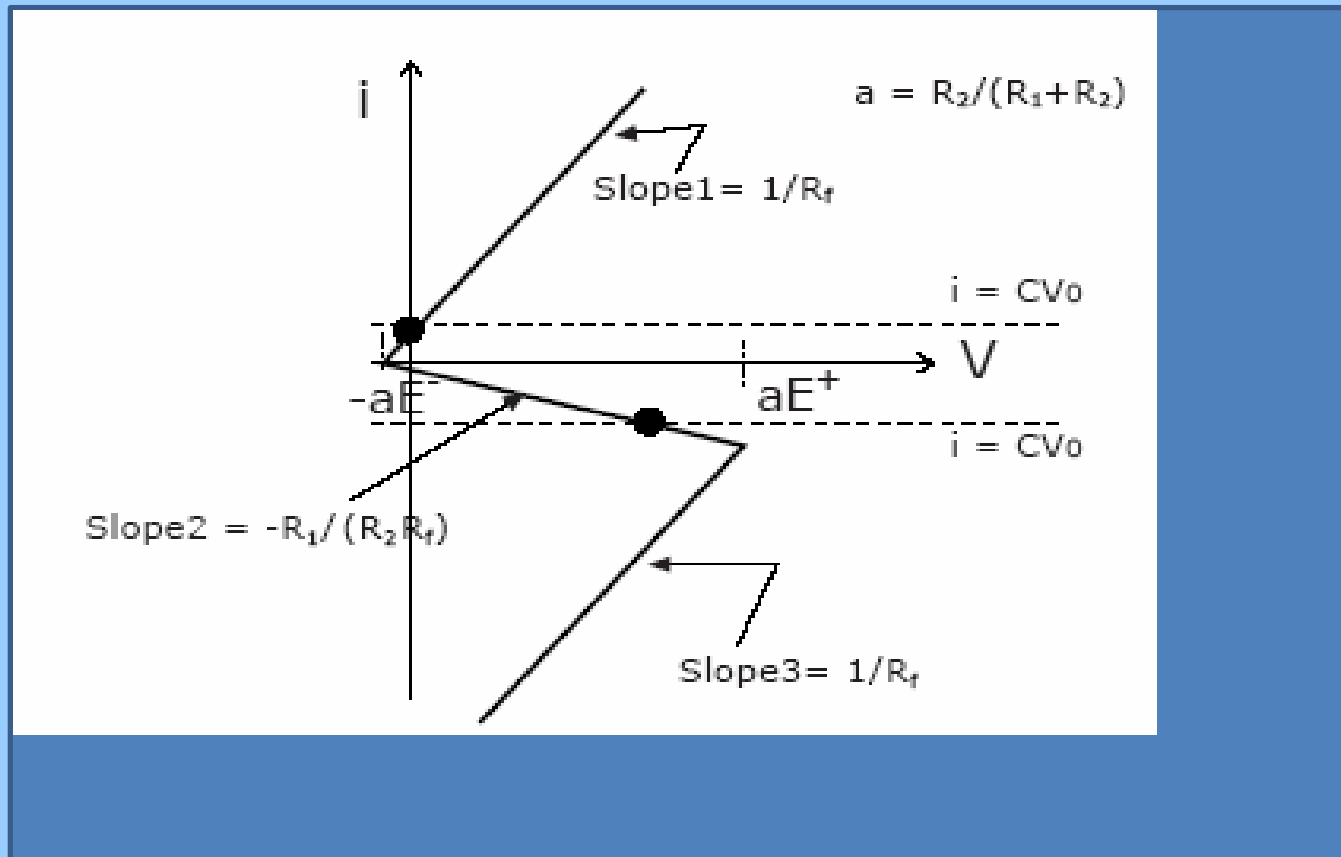
- The transfer characteristic consists of three different regions.
- The two lines at the top and bottom have positive slope '1/RF'.
- They represent the regions in which the Op-Amp is operating in the saturated (nonlinear) mode.
- The middle segment has a negative slope(Op-Amp operate linearly).
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- The rate of change of signal voltage 'Vs' is equal to 'V0' which is dependent upon the slope of the input triangular waveform.
- When the slope is positive, the Op-Amp is stable and outputs a constant saturation voltage.
- When slope is negative, the Op-Amp is unstable and the output would be oscillating.
- By controlling the duration of the negative slope, the number of pulses to be produced at the output of the Op-Amp can be controlled.
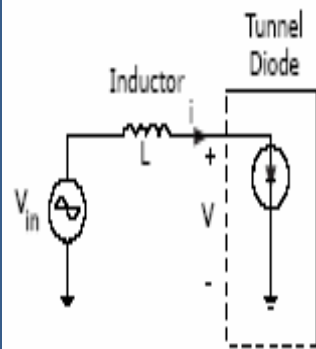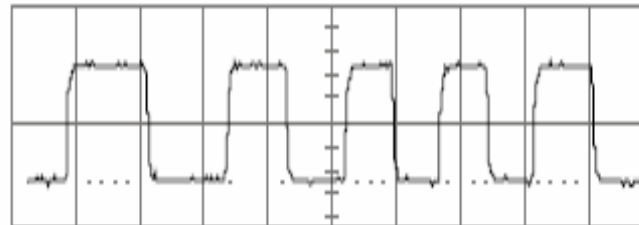-

N-curve transfer characteristics

- The transfer function of a Tunnel diode exhibits the "N- curve".

- By connecting an inductor and a tunnel diode in series, we can produce pulses that are separated by periods of silence.

- That would mimic the behavior of cells.
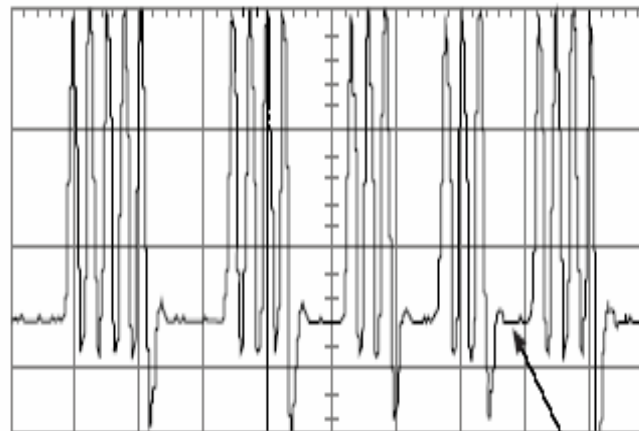
i

V

Tunnel Diode
I-V Characteristic

Inductor
L

i

Tunnel
Diode

V_in
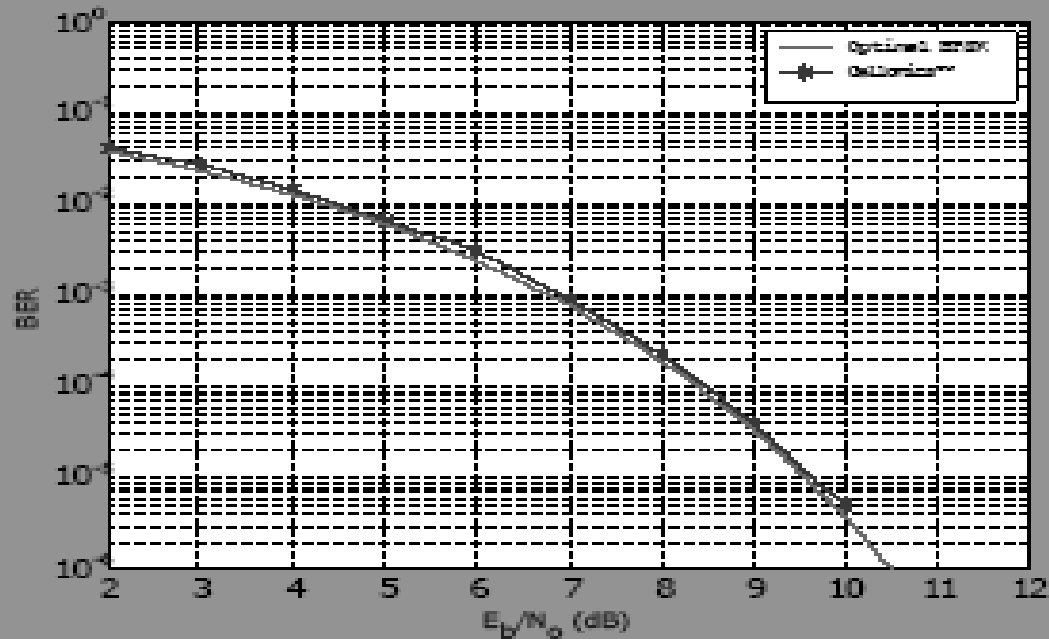
+

V

-

Tunnel
Diode

2

.2 µs
100mV

INPUT WAVES

B:M1

.2 µs
100mV

OUTPUT PULSES

silence period

PERFORMANCE OF CELLONICS RECEIVER :

# A) BER Performance in a Narrowband Communication System

- The performance of the Cellonics modulation is able to match the theoretical optimal BPSK modulation scheme .

- Cellonics receiver will have less implementation losses

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B) BER Performance in an Ultra Wideband

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- UWB is a new radio system that occupies an ultra wide bandwidth and it uses very short impulses of radio energy.
- It will cause little interference to the existing spectrum users.
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PROOF OF CONCEPT - DEMONSTRATION ON SYSTEMS

Narrowband Communication System
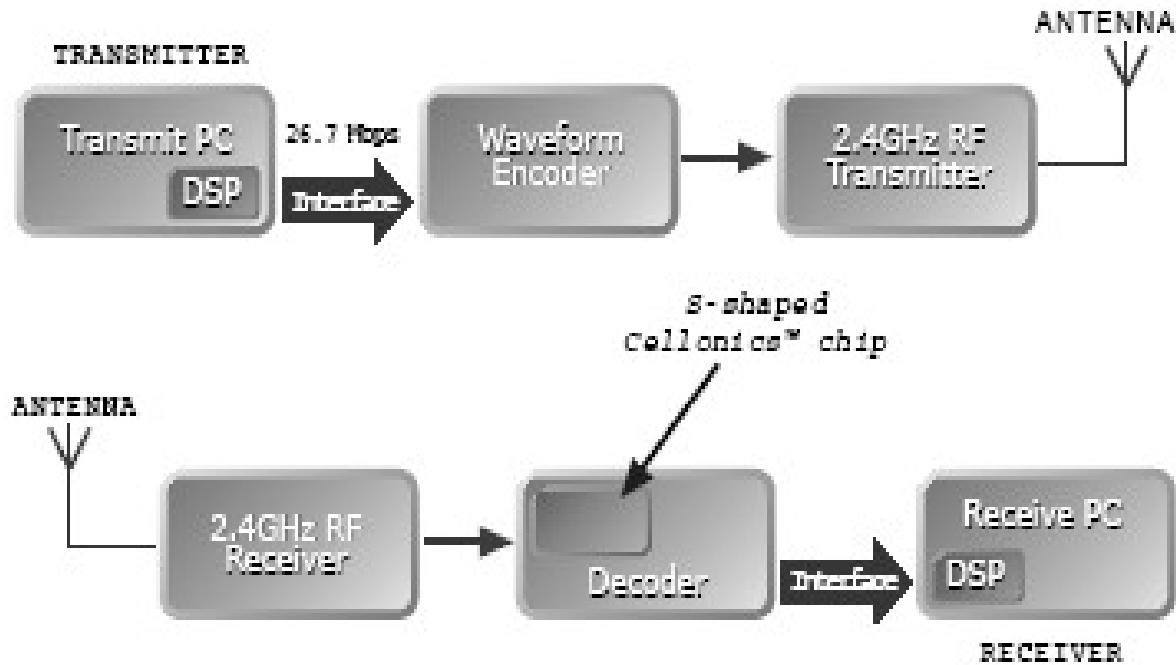
- **Transmitter and receiver comprise of three modules:**

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·1. The *PC/DSP module* :

·   This module provides a high-speed data
                        transmission interface
  with the transmit/receive PC .

·2. The *Base band transceiver module*:

·   The transceiver converts these data from
  the DSP into FSK-like waveforms.

·3. The *RF transmit/receive module*:

·   This part of the circuitry down converts the
  received signal using an AM envelope
  detector.

Ultra Wideband Video System
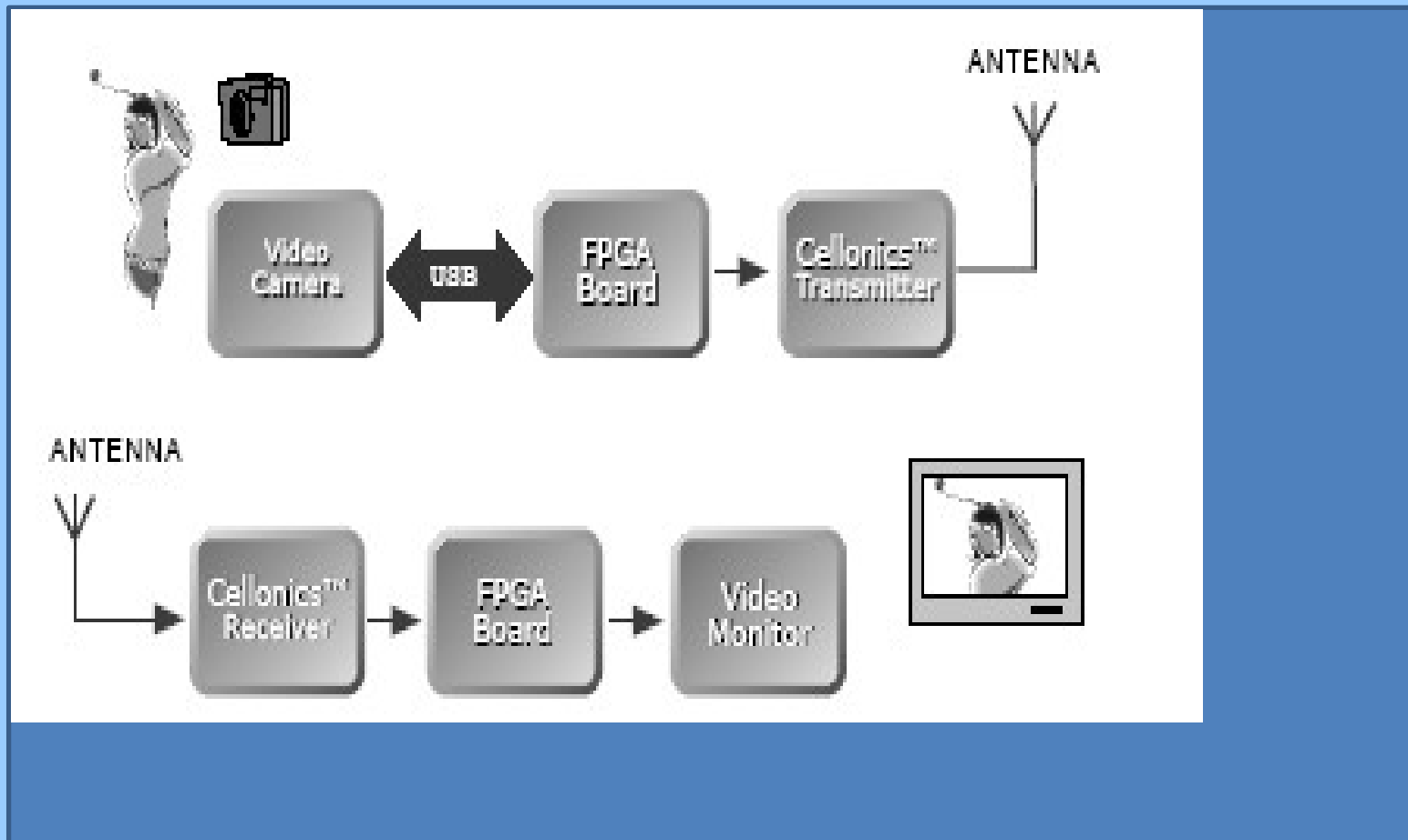
- Transmits real-time video images at a data rate of 12Mbps wirelessly to a video monitor.
- A simple web camera is used as the video capture source. The digital video information is fed into a pulse position modulation processing board (a Field Programmable Gate Array or FPGA board) via a USB connection before being frequency translated to a higher frequency band at a transmitter for sending over the air. The airborne signals are then detected by a UWB receiver and pulse position demodulated back into digital video information for display at a video monitor. In both instances, an ultra simple Cellonics Transmitter and a simple Cellonics receiver are used. The speed of the system is only

CELLONICS ADVANTAGES

- New Life to Communication Devices.
- Savings on Chip/ PCB Real Estate.
- Savings on Power.
- Savings in Implementation Time.
- Build or Rejuvenate your Products with Cellonics.
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CONCUSION

- The Cellonics communication method is one inspired by how biological cells signal. It is a fresh and novel look at how digital signals may be conveyed. In this digital day and age, it is timely; current digital communication designs are mostly derived from old analog signal methods. With the Cellonics method, much of the sub-systems in a traditional communication system are not required.

- Noise-generating and power-consuming systems such as voltage-controlled oscillators, PLLs, mixers, power amplifiers, etc., are eliminated. To a communications engineer, this is unheard off. One just doesn't build a communication device without an oscillator, mixer, or….

- Such is the revolutionary impact of Cellonics. Engineers will have to reform their thinking- that such a simple solution is possible

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THANK YOU