NANOSCALE CMOS IMPULSE RADAR
- FROM RESEARCH TO PRODUCT

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NOVELDA AS

- A fabless semiconductor company specializing in Nanoscale wireless low-power technology for ultrahigh-resolution impulse radar

- Developing CMOS impulse radar standard components, as well as Application Specific Integrated Circuits

- Applications for our technology spans a wide range of areas from medical and industrial high precision sensors to personalized wireless healthcare and more
COMPANY BACKGROUND

Founded in September 2004 by:

- Dag T. Wisland – CEO/Associate professor Univ. of Oslo
- Tor Sverre Lande – Professor Univ. of Oslo
- Einar Nygård – Industrial IC management / Entrepreneur
- Eirik Næss-Ulseth – Business developer / Entrepreneur

Mission to develop:

- Single chip CMOS systems based on impulse radio technology
- Low-energy, short-range, high-precision, high speed, impulse RADAR
- Unique implementation, based on high-speed continuous-time signal processing
- R&D driven development
  - EU/RCN/IN projects

novelda
NANOSCALE IMPULSE RADAR
IMPULSE RADAR PRINCIPLE

Transmitted Pulse (Tx)

Received Pulse (Rx)
FROM RESEARCH TO PRODUCT

Samuel Morse – Pulse coding

Heinrich Hertz – Pulse comm.

Guglielmo Marconi – Radio system

Idea
Market need
Enabling technology
People – Competence
R&D

Soft funding
VC funding
Subcontractors
Competitive advantages

Novelda NVA6100
Nanoscale Impulse Radar
ENABLING TECHNOLOGY

Question:
- How to capture electromagnetic pulses traveling with speed of light achieving millimeter spatial resolution
- Keep a small physical size and low unit cost

Answer: Nanometer CMOS technology (<90 nm)

Silicon bar
Material technology

Nanoelectronic system design (IP)
Advanced CMOS production

Final IC product
Advanced packaging
THE RIGHT PEOPLE AND PARTNERS

- **Competence** – 3 Ph.D, 11 M.Sc
- **Creativity** – Have fun at work
- **Cooperation** – Universities, research institutes, customers, subcontractors and internally
**RESEARCH AND DEVELOPMENT**

- **Goal:** Get and maintain the leading position

- **Challenges:**
  - High costs
    - R&D investments: > NOK 40 mill.
    - CMOS mask cost: > NOK 3 mill.
    - Development tools: ~ NOK 1.5 mill. per year
  - High technical risk
  - Hard to raise VC money

- **Opportunities:**
NVA6100 NANOSCALE IMPULSE RADAR

- Based on University research
- Further developed in BIA project
- **Single chip** Impulse RADAR
- Close Range Operation 0-60m
- High-resolution, sub millimeter
- High speed > 30GHz sampling rate
- Depth perception, 512 simultaneous depths
- Low energy
- Small size, CMOS
APPLICATION EXAMPLES

AUTOMATION
- Gas/fluid
- Level detection/gauging
- Automotive
- Inspection

HEALTH & RESCUE
- Monitoring vital Signs;
  breath, pulse,
  blood pressure,
  stress, sleep, etc
- Diagnostic sensors

GREEN
- Energy automation
- Snow measurements
- Structures

DEFENSE
- Soldier monitoring
- Surveillance
- Line of sight and
  through the wall
APPLICATION EXAMPLES
REMOTE PULSE MEASUREMENTS

- Non-invasive
- Measures mechanical movement
  - Improved diagnostics quality
  - Early sign disease detection
- Skin/Fat/Tissue penetration
  - Ultra Wideband Radio
- Low cost (Single IC)
  - Physicians
  - Sport/Leisure
- Low energy / Small size
  - Long battery lifetime
  - Sport watch
THANK YOU FOR YOUR ATTENTION