POWER+ID
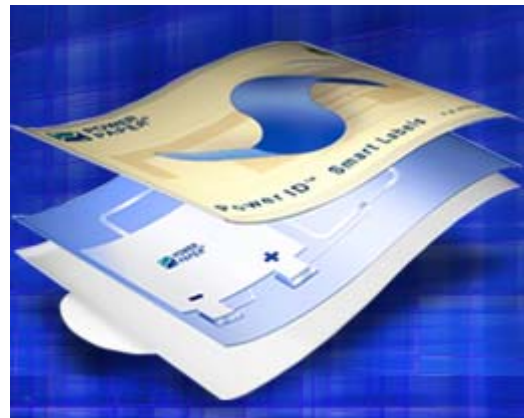
powerful, reliable, asset visibility

Gidy Weisglass

European Sales Director

PowerID Division

POWER PAPER®

POWER+ID
powerful, reliable, asset visibility

About Power Paper

- **Breakthrough micro-power source technology**

    - **Ink-based, thin and flexible energy cells**

- **Founded:** 1997, headquartered in Israel

- **Employees:** 100+ and growing

- **Funding:** $69 M

- **Investors:** Amadeus, PolyTechnos, Millennium, Bank of America, Yasuda, Apax, Clal, Toppan Forms & others

- **Business Divisions:**
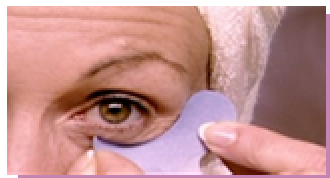
PowerCosmetics™

Empowering cosmetic and topical delivery

POWER+ID
powerful, reliable, asset visibility
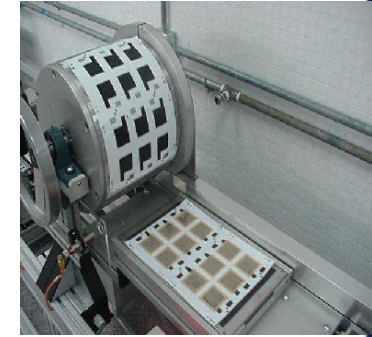
PowerID™ Smart Labels

Power Paper Core Technology

- Ink-based energy cells (batteries) printed onto any surface or integrated into the device
- Highly elastic, **thin and flexibility**
- **Environment-friendly**, contains no hazardous materials
- Mass-produced at pennies per micro-power source
- Easy to customize shape and
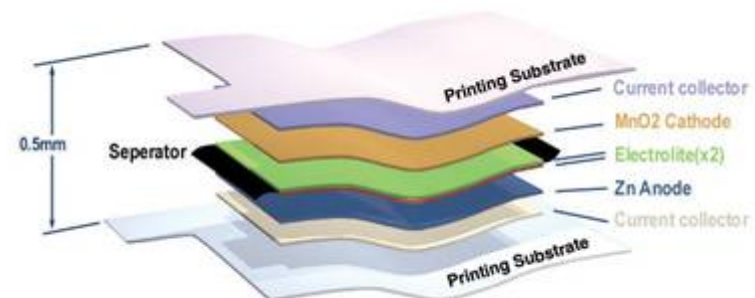
Authorized Battery Manufacturers

- Low-cost production using conventional printing processes
  - Roll-to-roll: **High volume**

    Capacity = ~350 m units per year

  - Plate-sheet: **Low volume**

    Capacity = ~80 m units per year

  Capacity = ~10 m units per year
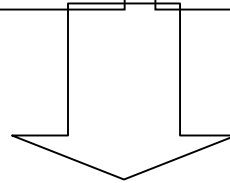   Location: Israel

Radio Frequency Identification (RFID) Overview

- **Active Tag**
  - **Independent**
  - Contains a battery, chip, and antenna
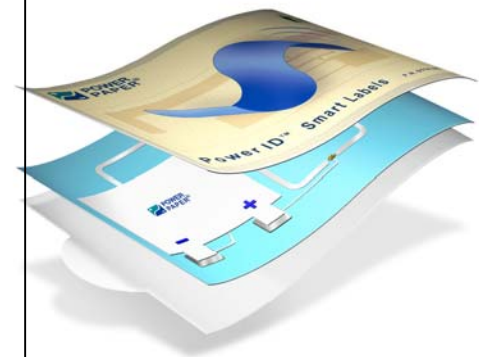 - Transmits in *pre-defined* frequency and RF power

- **Passive Label**
  - **Dependent**
  - Contains a chip and antenna
  - Backscatters in reader's frequency

- **Battery-Assisted, Passive Labels**
  - **Dependent**
  - Thin battery, chip, and antenna
 - Backscatters in reader's frequency

PowerID™ Battery-Assisted Label

- Components:
  - UHF EM Marin chip
  - Printable antenna
  - Printable, disposable power source
  - Gen.2 will be available around mid 2007

	Read Only Range		Read/Write Range	
	Passive	PowerID™	Passive	PowerID™
EU standard (2 W)	3.5 meters (14 feet)	18 meters (60 feet)	2 meters (6.56 feet)	15 meters (50 feet)
USA Standard (4 W)	4 meters	18+ meters (60 feet)	2.5 meter	15+ meters (50 feet)

POWER ID
powerful, reliable, asset visibility

PowerID: Battery-Assisted, Passive RFID Technology
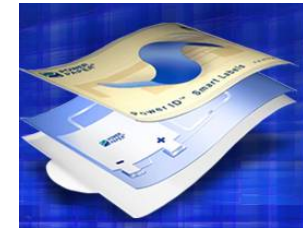
- Battery-assisted label addresses traditional performance problems of passive RFID
  - Label does not reach "excitation level"
  - Label unable to communicate with reader due to challenging environment

- PowerID acts like a passive label, BUT provides **superior performance**
  - Reads tough products
  - Range – Up to 30 meters

- EPCglobal C1G2 compliant: mid-2007

- Target applications: High value assets in challenging environments
  - Cost: ~ $1.00 for high quantities

Power Paper's PowerID is the only available battery-assisted, passive solution in the UHF range

PowerID: Tracking High Value Assets in Challenging Environments

Retail	CPG	Auto	Postal
Carton Level	Container Level	Item Level	Mail Bags
Pallet Level	Container Level	Car Parts	In Process (Mail Chute)

Challenge 1: "Waking up" the label

Labels do not reach power excitation level

- Range

- Product materials (liquids, metals, etc.)

- Environment

- Packaging materials (metal cans, foils, plastic)

- "Sandwich" effect

- Orientation

- Movement speed

Reader

T1 T2 T3 T4
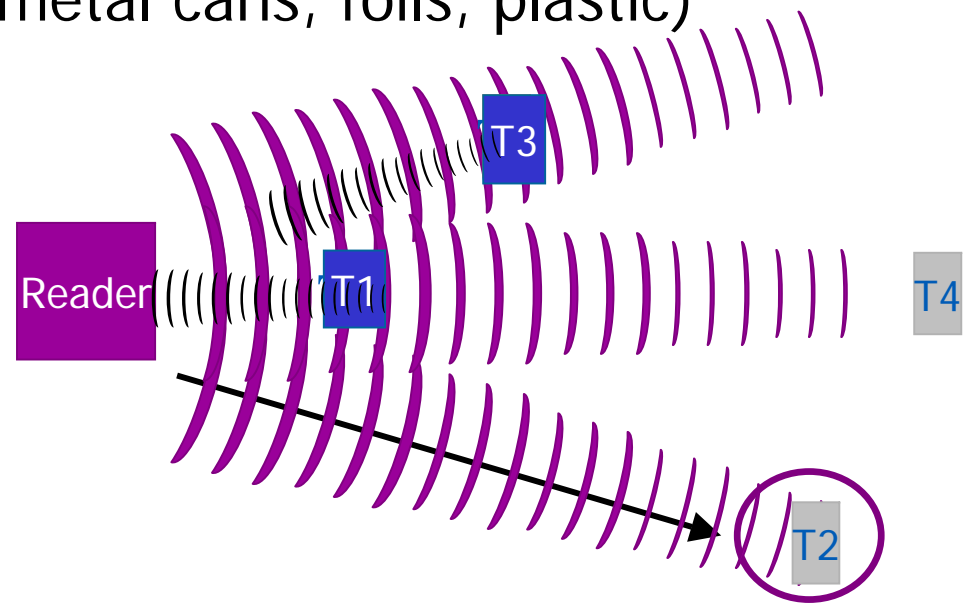
PowerID Solution

Battery eliminates the need for label to collect energy from the reader

- Longer range, stronger signal
- Overcomes:
  - Product and packaging materials (Liquids, metal etc.)
  - Environment interference
  - "Sandwich" effect
  - Orientation of antenna
  - Movement speed

Reader

T1

T2

T3

T4

12m/35ft
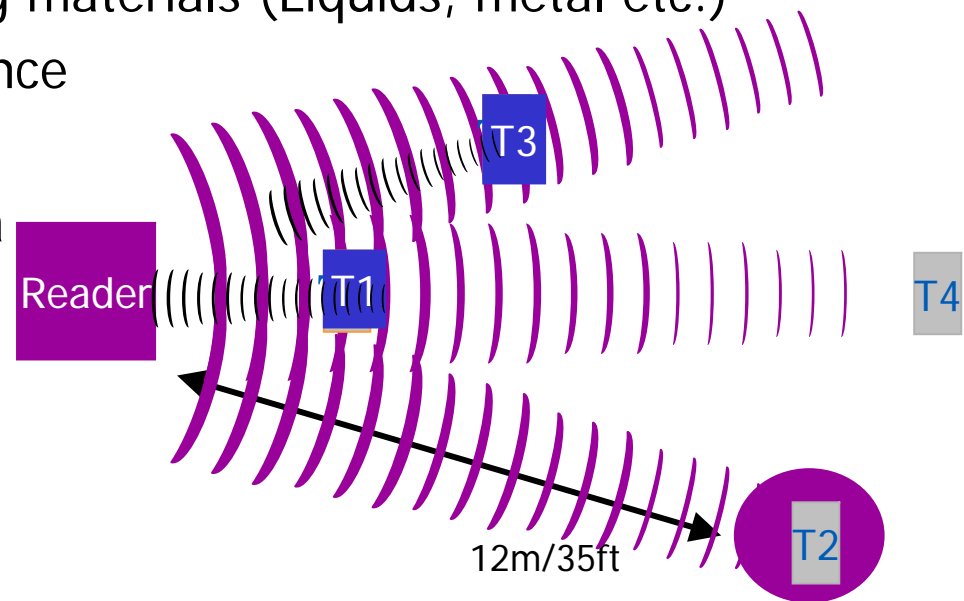
Challenge 2: Weak Backscatter Signal

Reader does not detect label's backscatter low/poor signal

- Antenna is optimized primarily for energy collection and less for backscatter signal level (trade-off)

- Environmental and product / packaging interference

- "Sandwich" effect

- Orientation

Reader | T1 | T3 | T4 | T2
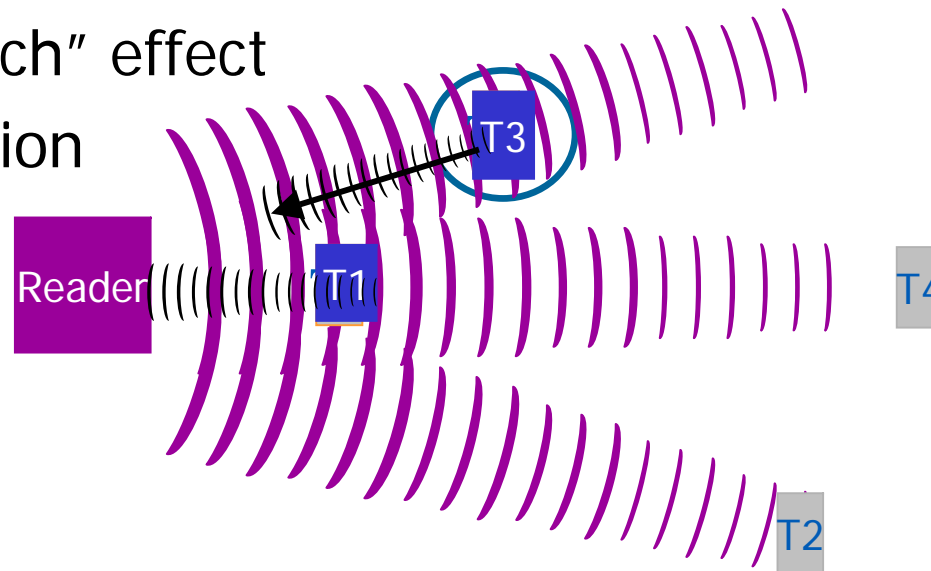
PowerID Solution

Antenna is optimized for maximum signal level

- Antenna optimized for high backscatter signal level with improved modulation depth (s/n ratio) and range

- Overcomes environmental and product / packaging interference, "sandwich" effects, orientation

T3

Reader

T1

T4

T2

12m/35ft
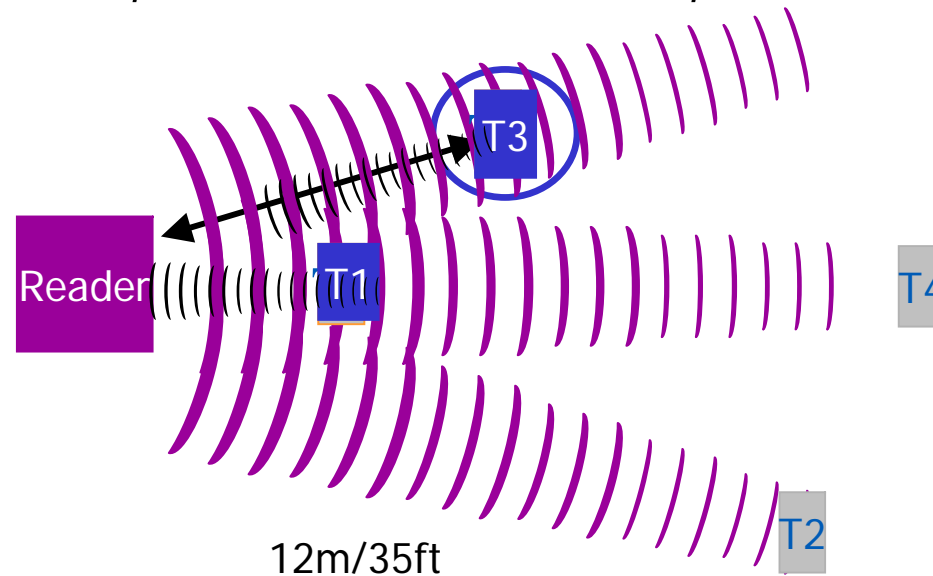
Challenge 3: Limited operability worldwide

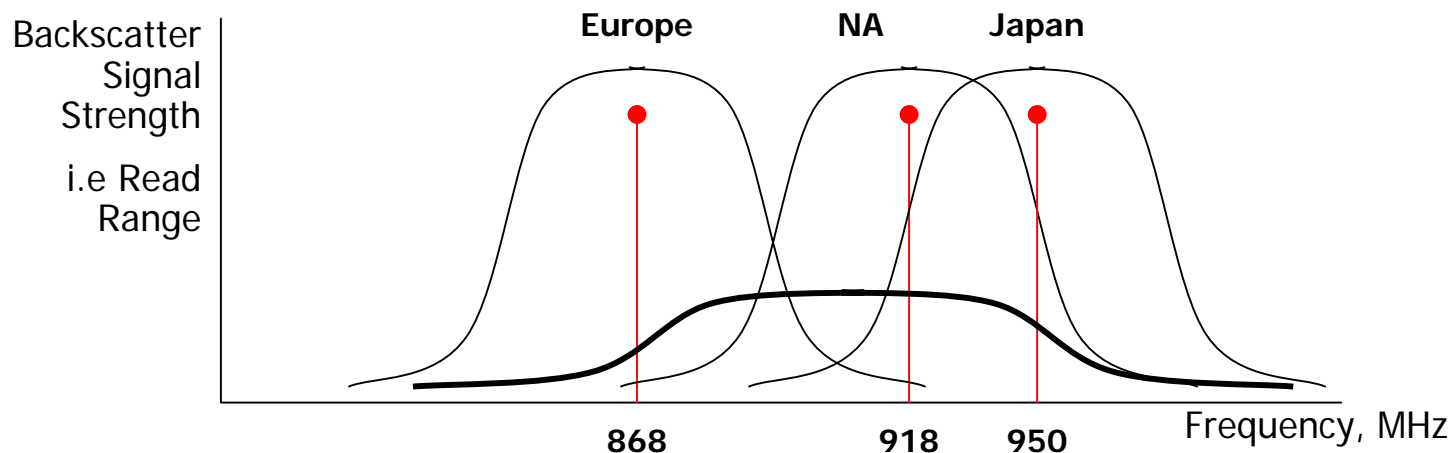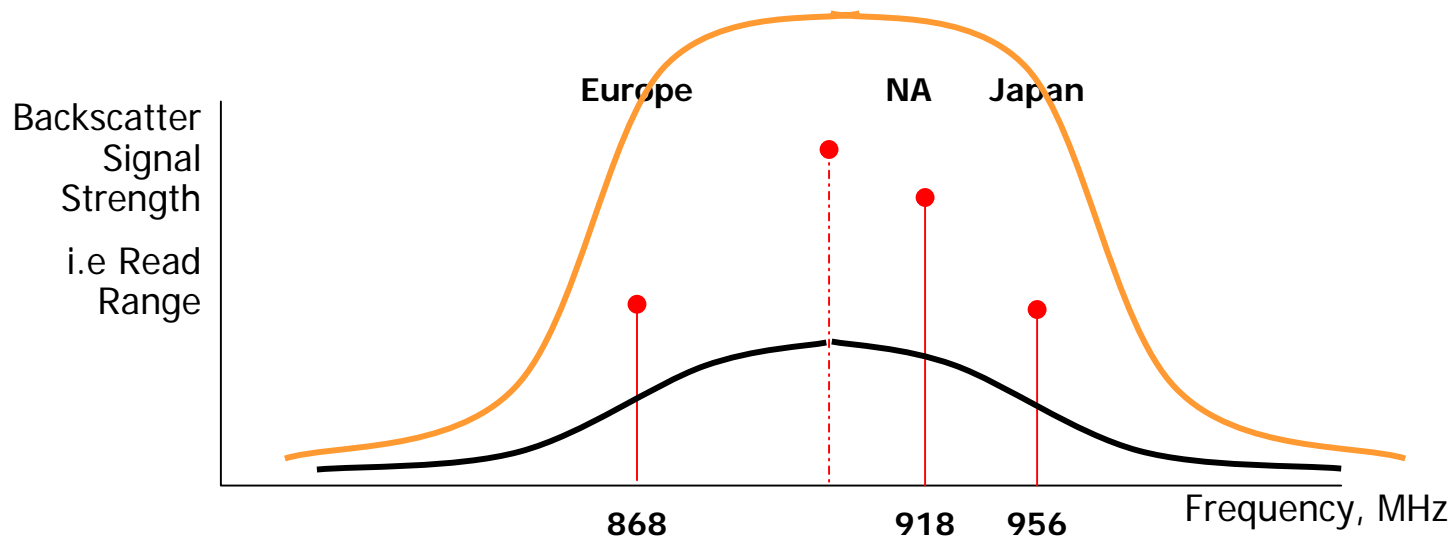## Label is optimized to specific regional frequency band

- Narrow responsive bandwidth ~868 or ~921, but not both

- Label antenna is optimized for energy collection

- Limiting the frequency bandwidth

- A label will not perform with every reader

Backscatter Signal Strength

i.e Read Range

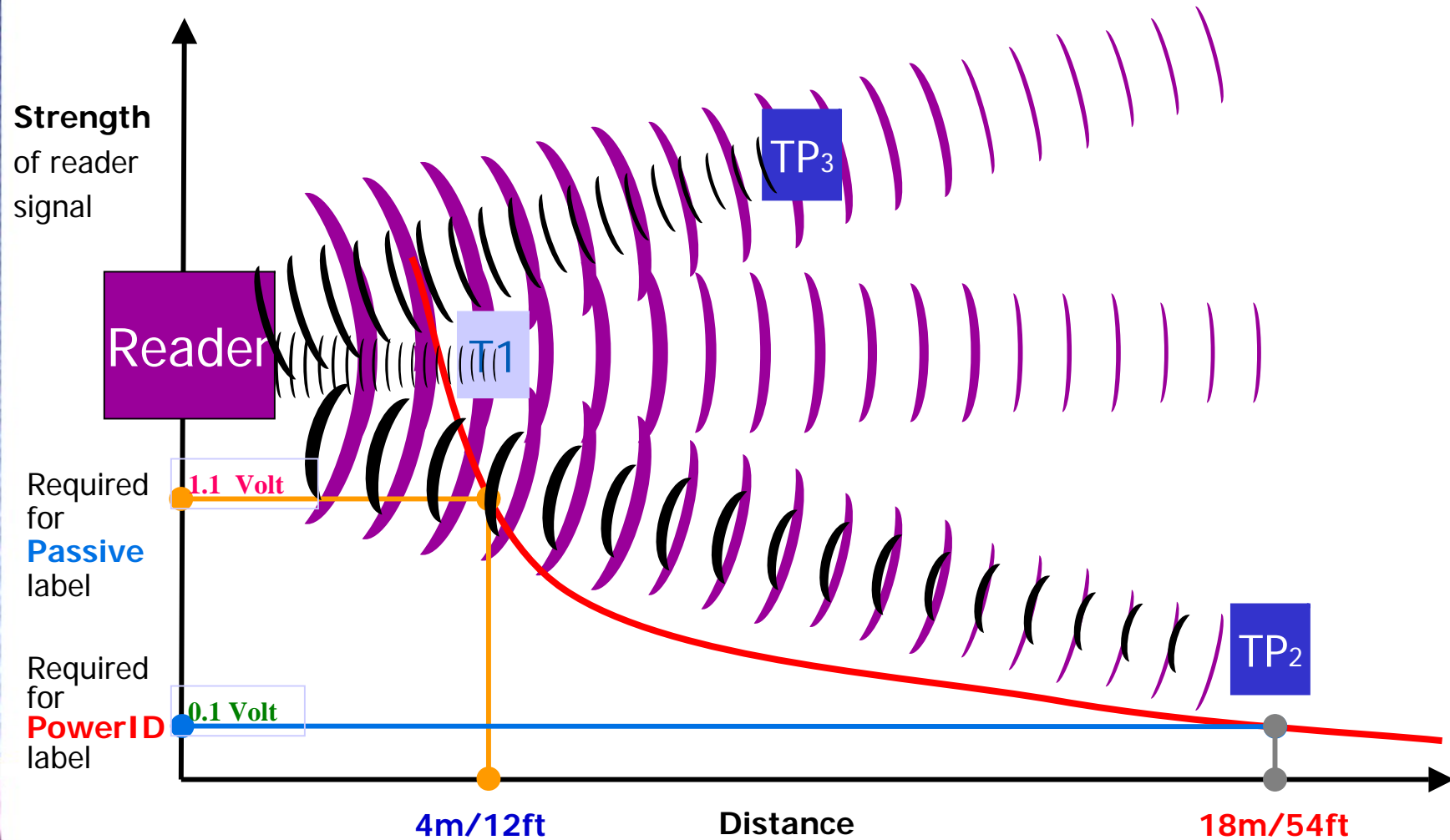Europe   NA   Japan

868   918   950   Frequency, MHz

PowerID Solution

Antenna designed to operate in a wide UHF frequency bandwidth

- Responsive bandwidth ~850 to ~960
- Label antenna is optimized for energy backscatter
- PowerID labels will perform well everywhere

Europe   NA   Japan

Backscatter
Signal
Strength

i.e Read
Range

868   918   956   Frequency, MHz

How it works: PowerID

Strength
of reader
signal

Reader

TP₃

T1

Required for **Passive** label — 1.1 Volt

Required for **PowerID** label — 0.1 Volt

TP₂

4m/12ft

Distance

18m/54ft

POWER ID
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PowerID: Projects in various vertical challenging niche markets.

Retail	CPG	Auto	Printing/Postal
Carton Level	Container Level	Item Level	Mail Bags
Pallet Level	Container Level	Car Parts	Paper rolls

Challenging Environment

Field Testing

![PowerID logo - powerful, reliable, asset visibility]

Automotive

Paper Manufacturing

Field Testing

![POWER ID - powerful, reliable, asset visibility]

Postal

Media

Computer equipment – comparison table

Summary of the test results. Average percentages of detected equipment.

Supplier	LCD Screens	CRT Screens	Desktops	Printers	Laptops
A	% 45	% 100	% 97	% 88	-
B	% 10	% 100	% 73	% 85	-
PowerPaper	**% 98**	% 100	% 98	**% 100**	**% 96**

Case Study –
Mixed pallets and
Inventory -
Big logistic company

RFID Label Requirements

- 1 label per pallet (anywhere on it = orientation insensitive)
- Read ranges
  - Tracking: 3m (dock door)
  - Inventory: 10m
- No decrease in current forklift speed (up to 8 m/s)
- Reading rate: 99.7%
- Upgradeable to EPC C1G2 and next
- Tag cost: ~0.8 € in millions

Pallet Tracking Pilot

Loading controlled by RFID (NBG ID patent) real speed

Logistic Provider's Retail Supply Chain

- **Challenges**
  - **Inventory**: Barcode reading by workers on forklift for 40.000 pallets = time & frequency
  - **Pallet tracking**: Pallets missing or sent to wrong retail locations = routing costs, out of stocks, etc.

- **Proposed solution**
  - **Inventory**: Long range RFID and dedicated reader that can be used by any forklift
  - **Pallet tracking**: Identify pallet with retail location

- **Operational requirement**
  Real time location

Inventory Pilot

Cross-reference shelf location with pallet

+

Taking inventory with RFID-enabled forklift

=

Inventory management and location

Technologies Chosen

- RFID Label: UHF battery-assisted RFID (PowerID)
  - No equivalent in performance
  - Environment-friendly = Compliant with food pallets

- Inventory: RFID-enabled forklift
  - 1 reader, 4 antennas
  - Laptop with NBG ID software
  - 100% reading

Mixed Pallets tracking: Dock door loading monitor
  - Pallet destination light signal system
  - 1 reader, 4 antennas
  - 99.7% reading.

FAQs

- How long does the label's battery last?
- What happens when the battery dies?
- Can batteries be recharged or replaced?
- Will I get an indication for low battery?
- What are PowerID's manufacturing capabilities?
- Are PowerID labels EPC Gen 2 compatible?
- Are PowerID labels compatible with other systems?
- Can labels be purchased without readers?
- Can I limit labels range of reading? (close dock doors, etc.).
- Form factor.
- Customized labels.
- Where is PowerID used today?.
- QUALIFICATION issues.

Thank you!

21 Yegia Kapayim Street

PO Box 3353

Petah Tikva, Israel

Tel: +972-3-920-4200

Fax: +972-3-920-4222

gidy@powerpaper.com