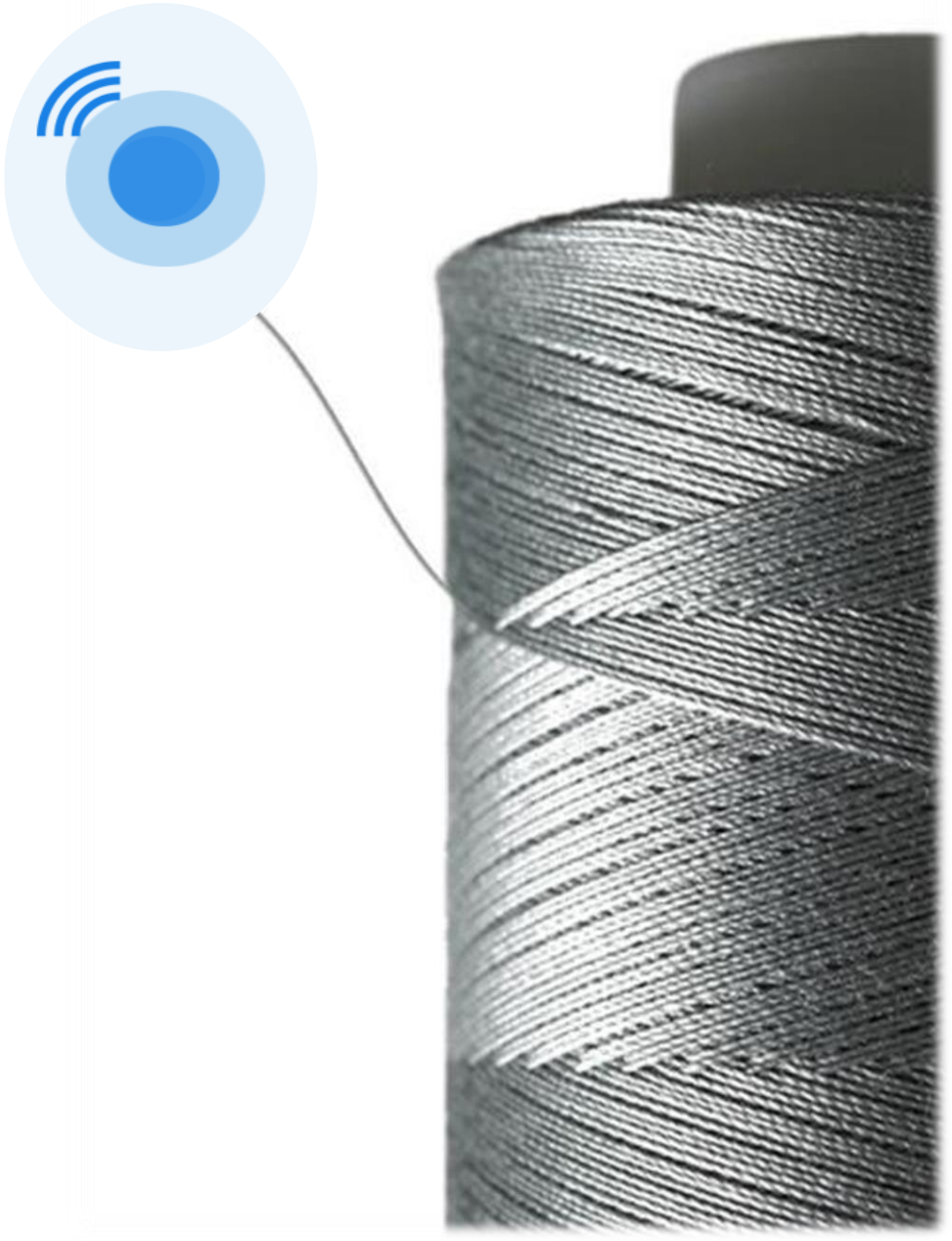
Primo1D

The E-Thread ® Company



E-Thread™ technology: a revolutionary toolkit to embed electronics at the heart of everyday objects

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Leti Innovation Days
July 3rd, 2018

Vision & Mission

Our Vision: Connect every day objects to the IOT

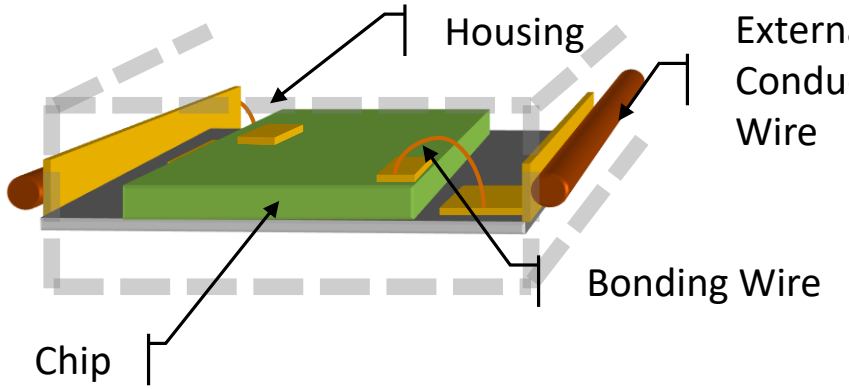
Our Mission: Enable new value creation & use thru embedded E-Thread™ devices

Our unique solution: *The E-Thread™* Yarn

- Electronics embedded into a textile yarn, in a unique form factor.
- Easy to integrate into garments, and plastics objects
- Invisible, inseparable, durable
- Fits any shape & surface

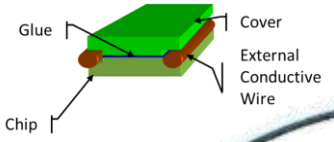
A technology from the CEA–Leti, Strongly protected by 15 international patents

A disruptive packaging technology

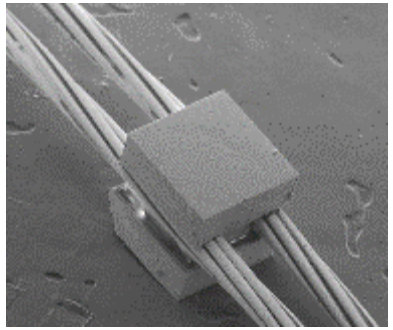


Classical Chip Packaging

10X size reduction



E-Thread™ Chip Packaging

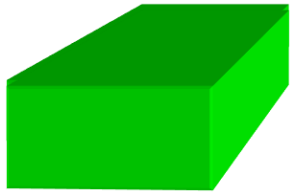


Metal antennas connected on E-Thread™ Chip

E-Thread™ concept

Components

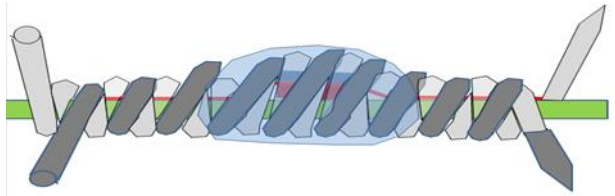
Cover Wafer
Active Wafer
Wires



Process steps

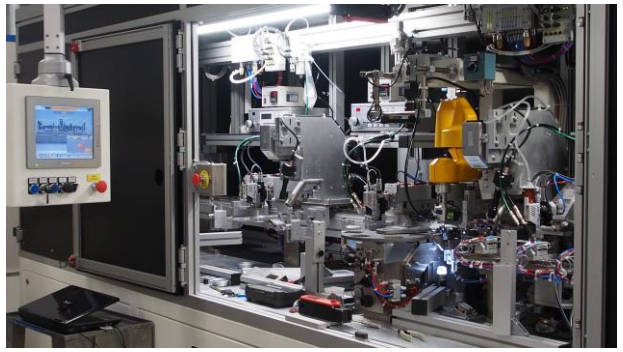
Etching
Polymer deposition
Bonding
Conductive wire insertion

Textile yarn wrapping



A competitive and scalable industrial model

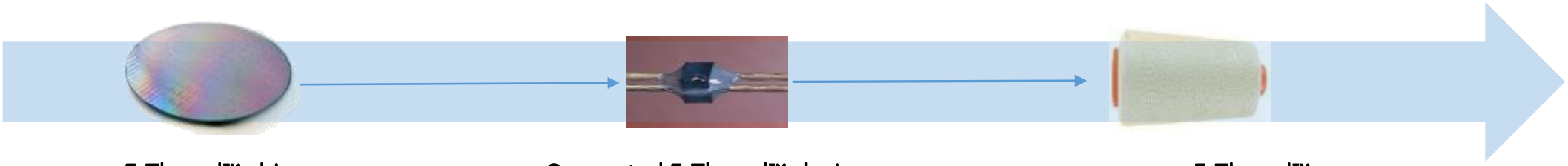
Semiconductor processing



Assembly line

Spinning process

Key steps



E-Thread™ chip

Connected E-Thread™ device

E-Thread™ yarn

Partners

cea leti

Impinj

EFi AUTOMOTIVE

AXANDUS L'ACCÉLÉRATEUR INDUSTRIEL

MASSEBEUF FILS TECHNIQUES

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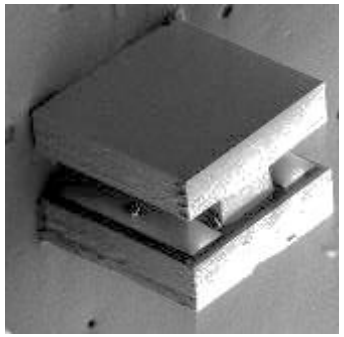
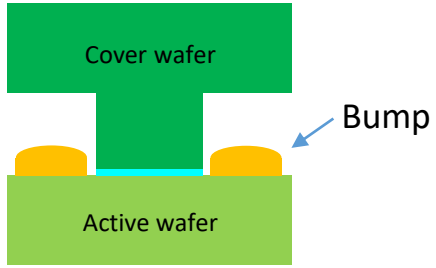
E-Thread™ wafer level process



E-Thread™ *chip*

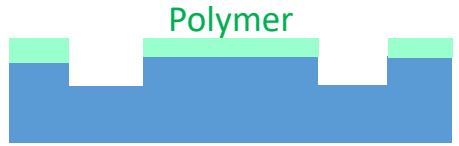


Front-end wafer

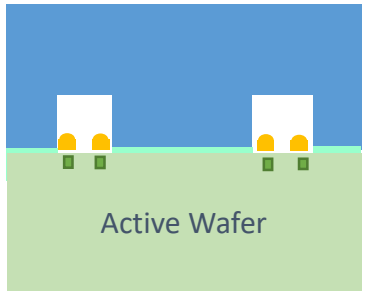
Bumping

Bare Si wafer

Deep etching



Polymer dep



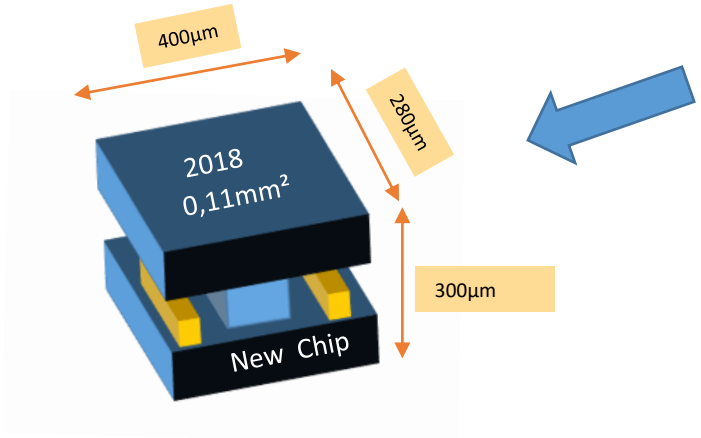
Alignement & Wafers bonding

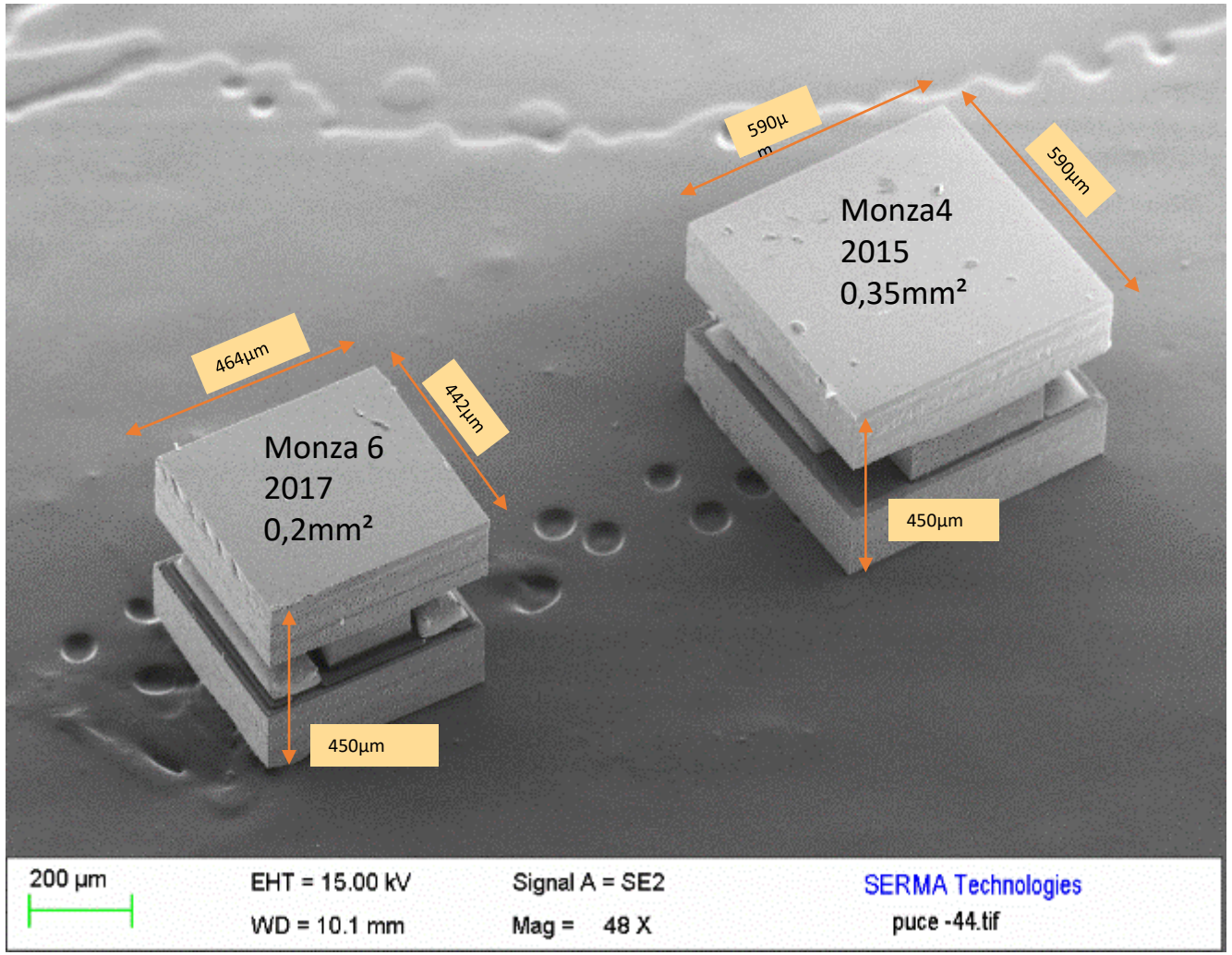
Grinding & Dicing

Standard MEMS & Back-end process Done in CEA Leti facilities & Industrial Partners.

E-Thread™ Chip Downsizing Evolution

Last Generation of E-Threat ™ die under development.
Based on new RFID chip.
1st samples Q4 2018





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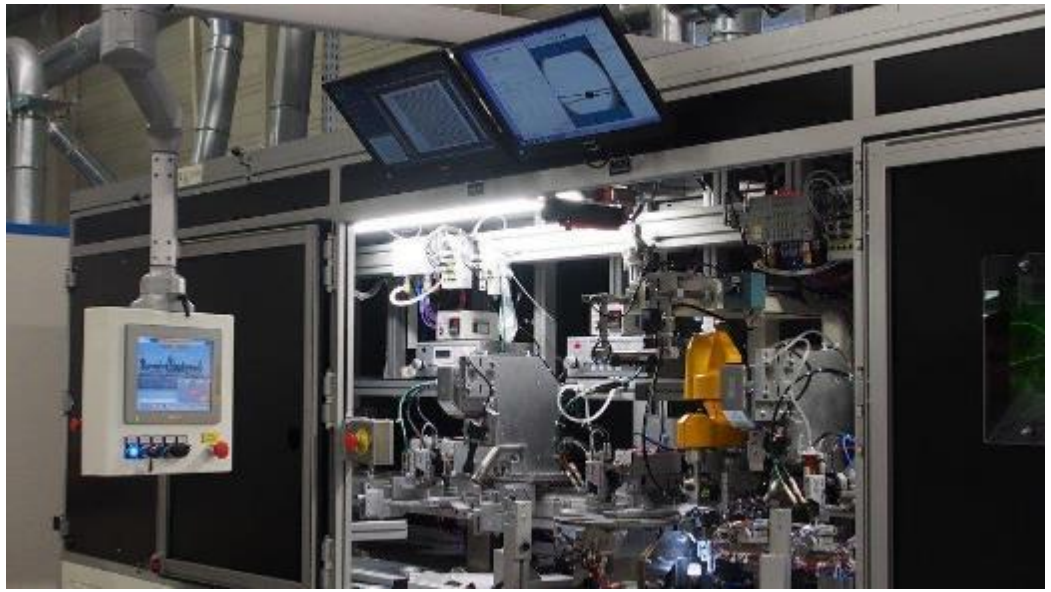
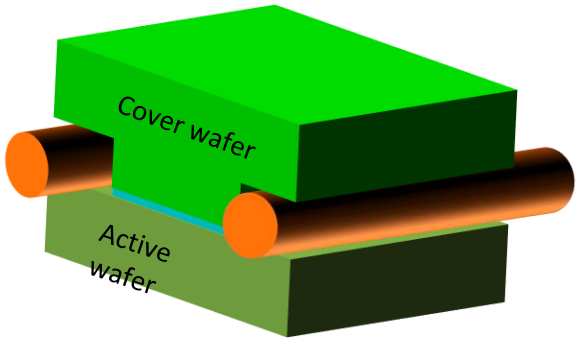
E-Thread™ Assembly Process



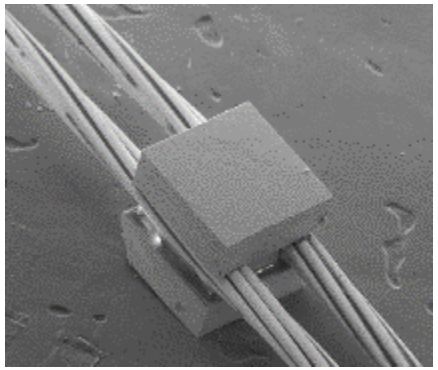
Roll to roll fully automated process to ensure product quality and repeatability

Proprietary equipment design

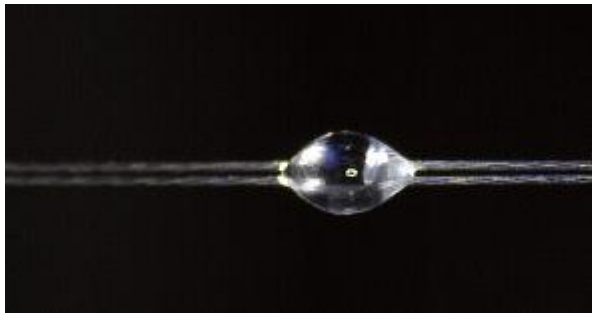


Connected E-Thread™ device

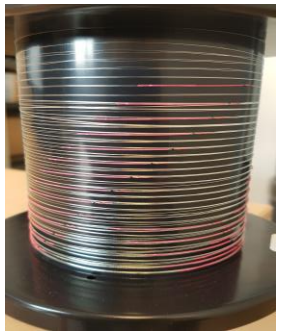
Wire to chip connexion



Epoxy encapsulation



Spool conditioning



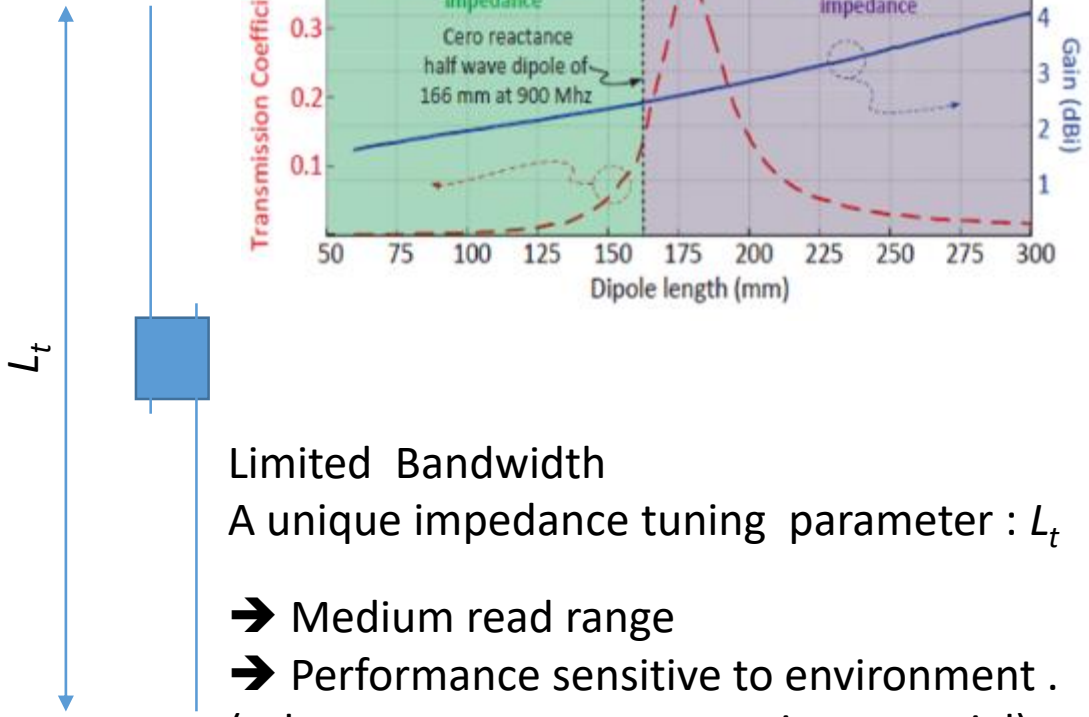
E-Thread™ yarn wrapping process

Conventional yarn spinning process Done at textile partners

Spool conditioning E-Thread™ Yarn

Antenna geometry and performance

Dipole Geometry



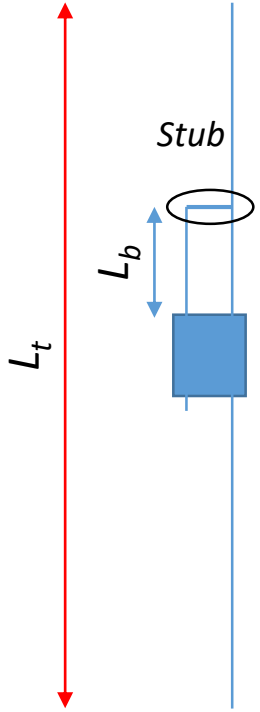
Limited Bandwidth

A unique impedance tuning parameter : L_t

➔ Medium read range

➔ Performance sensitive to environment .
(other tags, waves propagation material)

Adaptation stub Geometry



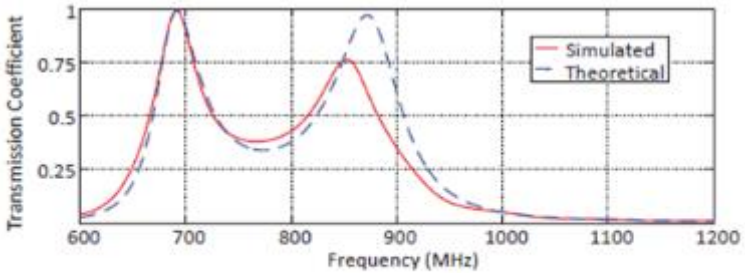


Fig. 5. Comparison of theoretical and simulated power transmission coefficient of stub matched antenna and RFID chip.

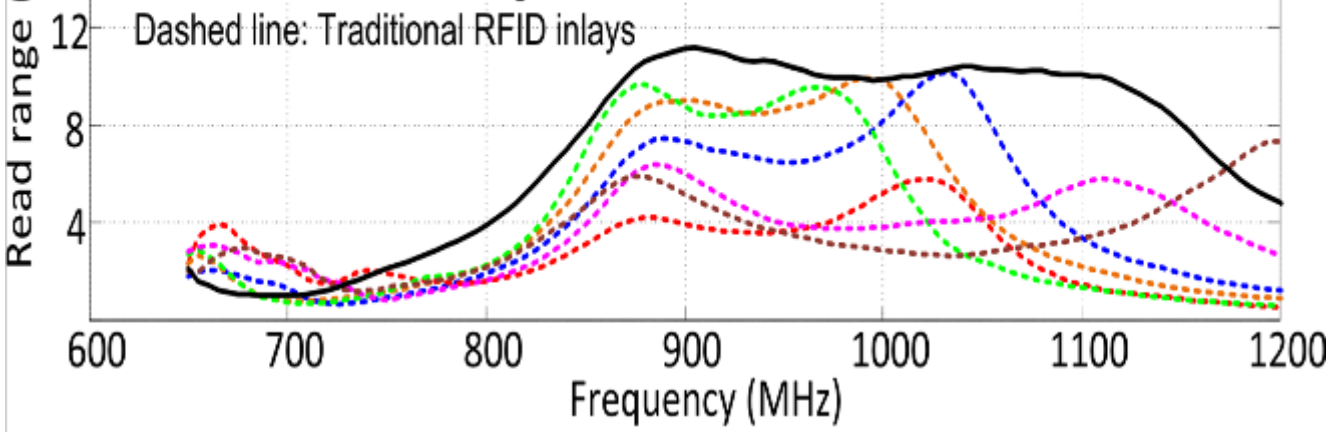
Wide Bandwidth

2 impedance adaptation parameters : L_t, L_b

➔ higher read range

➔Reduced environment sensitivity

E-Thread™ Technology for every day objects…



An innovative packaging method to integrate the RFID UHF tags inside a variety of objects;
Such as garments, polymer parts, shoes, twines & cables…

The RFID Yarn presents higher read range in a wideband frequency range compared to traditional RFID inlays

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More than RFID… passive RFID sensors

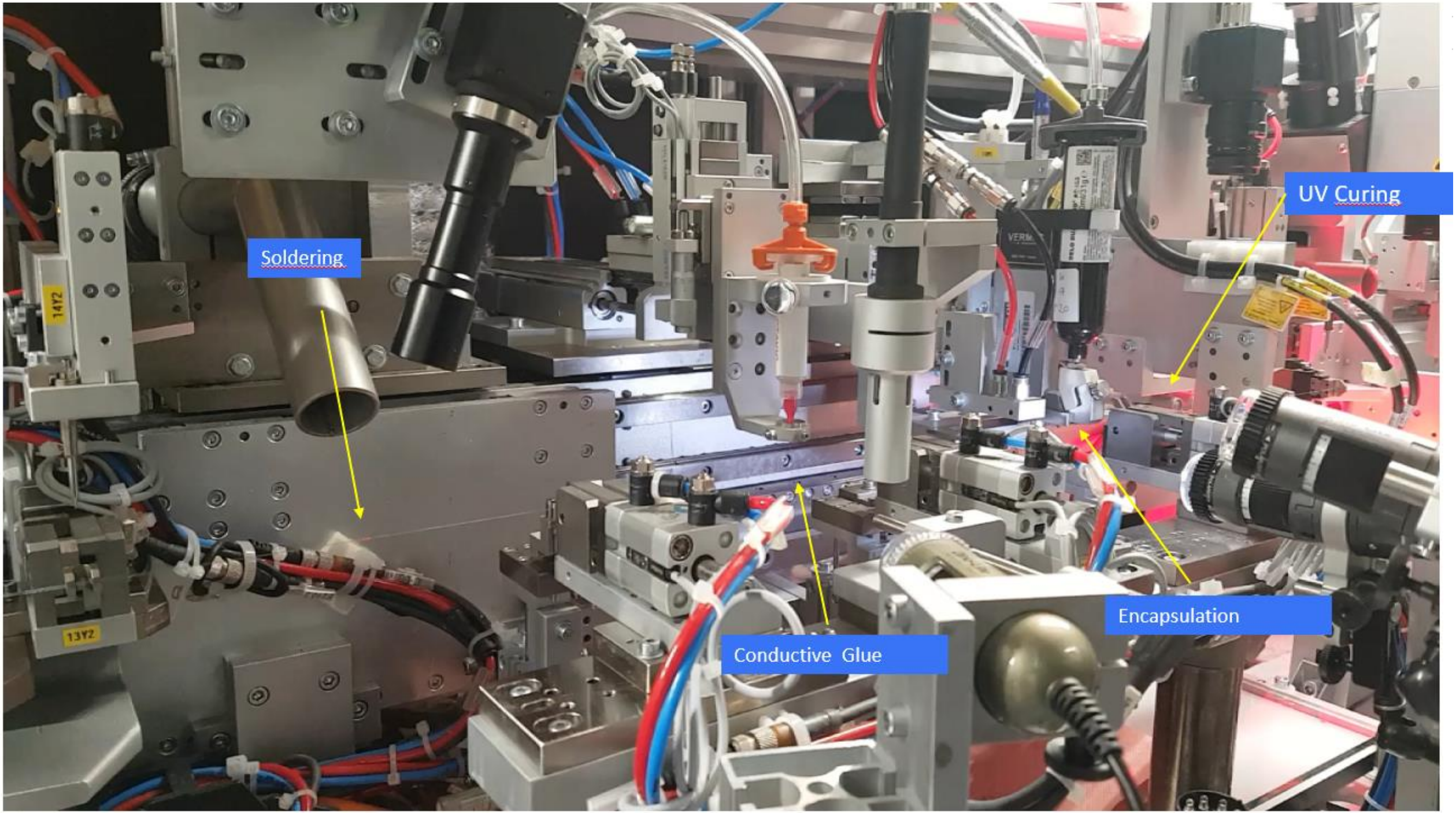
RFID Temperature sensor integrated in a yarn

Length: *13 cm*

Accuracy: *0,5°C*

Energy: *No power supply (Passive device)*

Typical read range: *5 meters*


Soldering
UV Curing
Conductive Glue
Encapsulation

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THANK YOU !