

Best practices for handling and usage

ECO Tags



RAIN RFID
ECO APPLICATION NOTE

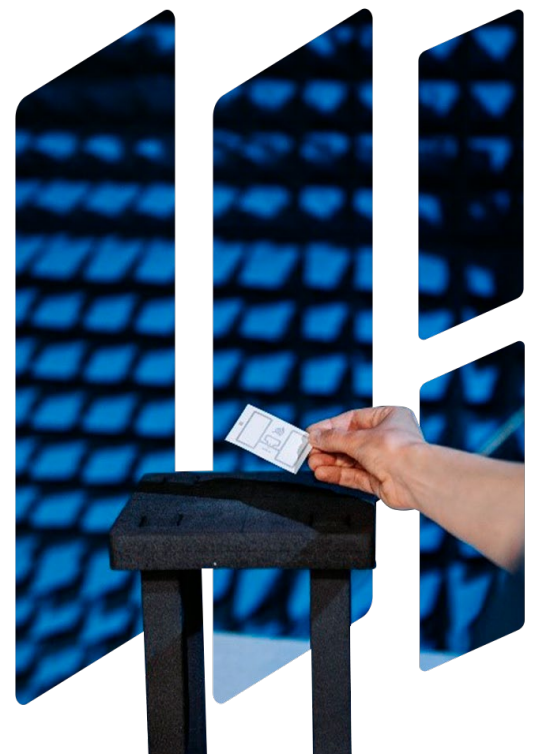
INTRODUCTION

RFID technology (Radio Frequency Identification) offers an efficient way to collect data, providing greater accuracy and speed in product identification and tracking. However, it requires specific care to ensure performance and durability.

This ECO Application Note provides detailed guidelines for the handling, storage, and application of ECO RFID tags, aiming to preserve their integrity and functionality throughout their lifecycle. It is also important to follow the use case guidelines introduced in the document.

Content

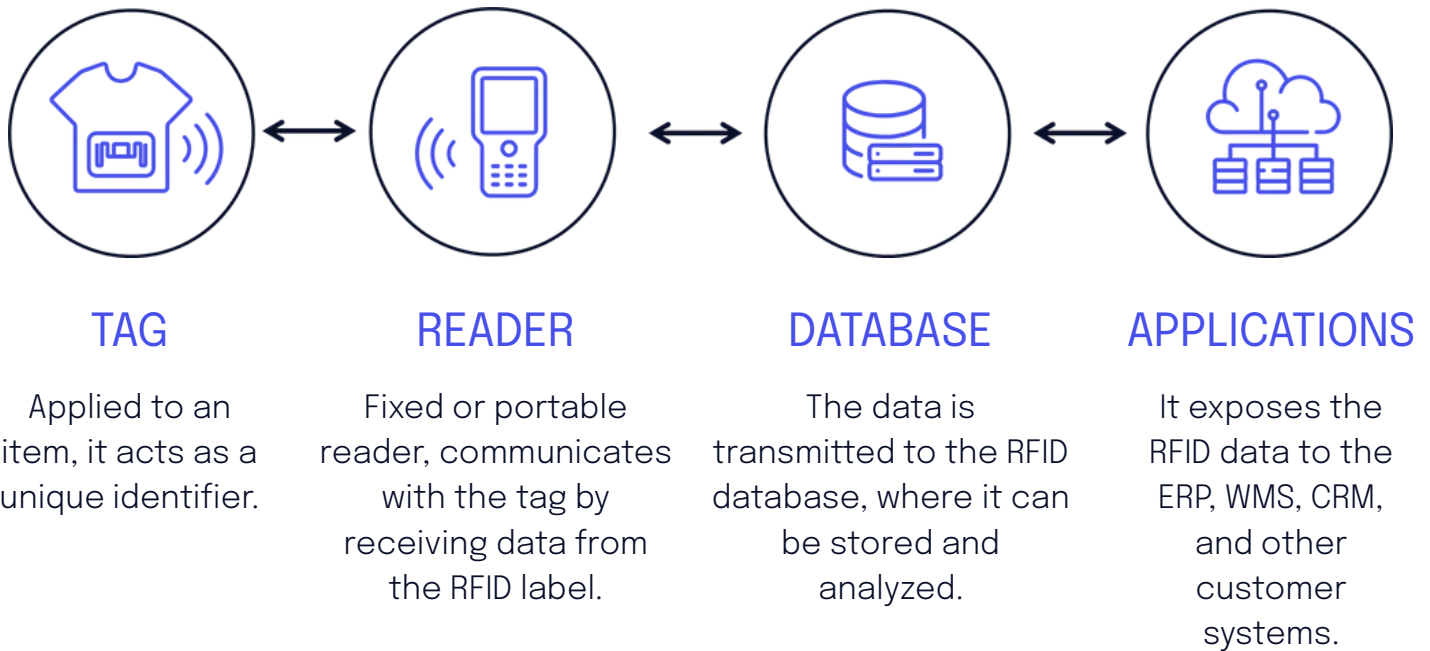
- RFID Introduction
- ECO Technology Introduction
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- RFID Printing
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RFID

Ultra High Frequency Radio Frequency Identification (UHF RFID) is a wireless technology that identifies and tracks objects using radio waves in the 860–960 MHz range. With read distances of several meters and the ability to capture data from many tags at once, UHF RFID is widely used in supply chain, retail, logistics, and manufacturing. Its main advantages are long range, speed, and low tag cost, though performance can be affected by materials like liquids and metals. Overall, UHF RFID provides an efficient and scalable way to improve visibility and automation across industries.

UNDERSTANDING RFID SYSTEM



TECHNOLOGY

ECO RFID TAG

DESCRIPTION

ECO tag technology is based on renewable paper-based materials and implemented in simplified single layer structure for sustainability, cost structure and simplified manufacturing process.

BENEFITS

ECO structure has following benefits compared to traditional PET inlays:

- Paper-based ECO can enable customer to meet their ESG goals through more sustainable structure utilizing fully additive production process.
- Paper-based structure makes ECO tags very tamper evident, which is beneficial in applications where re-locating the tag should be avoided.
- ECO dry inlay is biodegradable (see compliancy page for more)
- ECO tags can be recycled in normal paper and cardboard recycling processes.

SUITABLE USE CASES

Eco Tags are tested to withstand standard converting and label applicator processes, as well as indoor retail and logistics environments. Compared to PET-based tags, paper-based ECO tags are more sensitive to high humidity and are not suitable for applications involving heavy wrinkling. ECO tags are validated using below tests:

- Bending test
 - 225 bends for dry inlay and 450 bends for label format
- Temperature cycle test
 - -40°C...+85°C x 50 cycles
- Temperature / Humidity test (accelerated aging)
 - +85°C / 85% RH / 168h

TECHNOLOGY

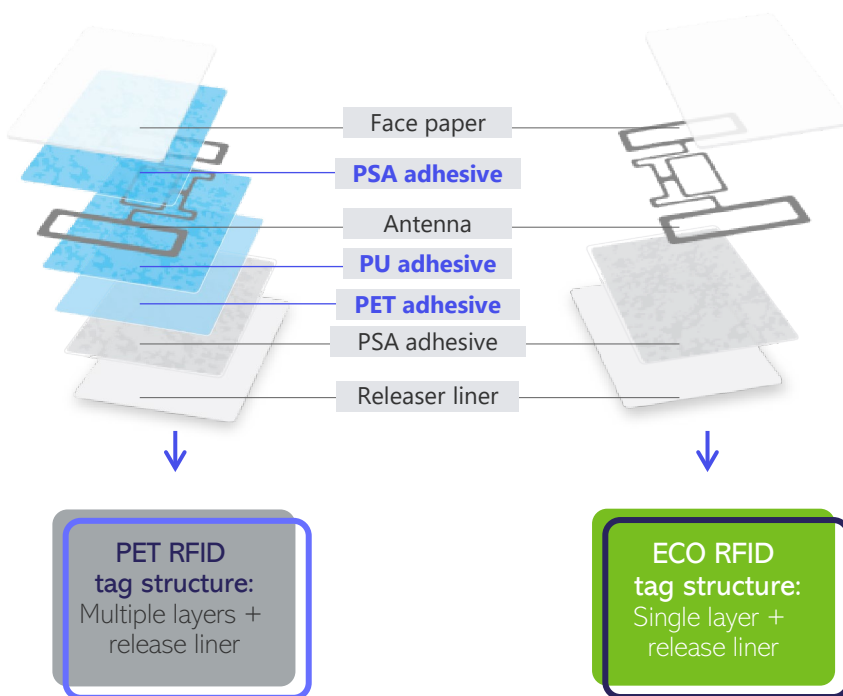
ECO RFID TAG

LIMITATIONS

ECO antenna material itself is less robust than traditional aluminum antenna. This should be taken into account if the final use cases involved mechanical stress, such as wrinkling the tag.

ECO antennas are paper-based which makes them more vulnerable against high-humidity environments. Paper absorbs moisture and changes its behavior over time. ECO still withstands temperature cycling, but with limited number of cycles. This needs to be considered for the final use case.

STRUCTURE



ECO TAG COMPLIANCES

REACH

REACH Regulation (EC No. 1907/2006 – Regulation concerning the Registration, Evaluation, Authorization and Restriction of Chemical) provides that all Substances of Very High Concern (SVHC) must be approved for specific use- Based on the information from our raw material suppliers we confirm that ECO RFID standard dry inlay and label materials do not contain any substances included on the Candidate List of SVHCs (incl. Annex XIV, Authorization) in concentrations above the concentration limits mentioned in Article 56 (6) of the REACH Regulation nor substances included in Annex XVII, Restrictions, where the restriction is applicable on our use.

RoHS

ECO RFID tag materials are in accordance with European Directive 2011/65/EU of the European Parliament and of the Council of 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment amended by the directive EU 2015/863, and comply with the maximum concentration values of lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls (PBB), polybrominated diphenyl ethers (PBDE) and of the phthalates DEHP, BBP, DBP and DIBP.

Halogen free

Halogens are chemical elements which, during combustion, can spread extremely harmful fumes, attack building components and computer hardware, and cause casualties by emitting toxic gases. Halogen substances of fluorine, chlorine, bromine, and iodine are not intentionally added or used in the ECO antenna materials, and the total content is < 1500ppm. Thus based on IEC 61249-2-21 definition ECO RFID tag materials are halogen free.

Conflict minerals

Conflict resources are natural resources extracted in a conflict zone and sold to perpetuate the fighting. There have been international efforts to reduce trade in conflict resources, which try to reduce incentives to extract and fight over them. The four most commonly mined conflict minerals (known as 3TGs, from their initials) are cassiterite (for tin), wolframite (for tungsten), coltan (for tantalum), and gold, or their derivatives. US conflict minerals law, also known as Section 1502 of the Dodd-Frank Wall Street Reform and Consumer Act of 2010, requires electronics companies to verify and disclose their sources of the 3TGs as well as submit annual conflict minerals report identifying e.g. the source of the supplied metals. On 1 January 2021 a new law will also come into full force across the EU – the Conflict Minerals Regulation. The Conflict Minerals Reporting Template (CMRT) is a standardized reporting template developed by the Responsible Minerals Initiative (RMI) that facilitates the transfer of information through the supply chain regarding mineral country of origin and the smelters and refiners being utilized. Based on these reports from our raw material suppliers we can confirm that ECO antenna material is sourced from conflict free areas and is meeting international responsible sourcing standards.

Recycling

ECO RFID Tags can be recycled in the paper and cardboard recycling process according to below test:

- PTS RH 021/97 Recycling criteria for recovered paper utilization, testing done by Mönchengladbach SCM (Including Re-pulpability and screening test. Sheet adhesion/ potential stickiness test)

Biodegradability

ECO RFID dry inlay is biodegradable based on below tests:

- ASTM D6400 (2019), Standard Specification for Labeling of Plastics Designed to be Aerobically Composted in Municipal or Industrial Facilities, testing done by OWS (Organic Waste System)
- EN 13432 (2000), Requirements for packaging recoverable through composting and biodegradation, testing done by OWS
- ISO 17088 (2012), Specifications for compostable plastics, testing done by OWS

CE

ECO Tags are in conformity with the essential requirements and other relevant requirements of the RED (Directive 2014/53/EU). The product is in conformity with the following standards and/or other normative documents:

ETSI EN 302 208 V3.3.1

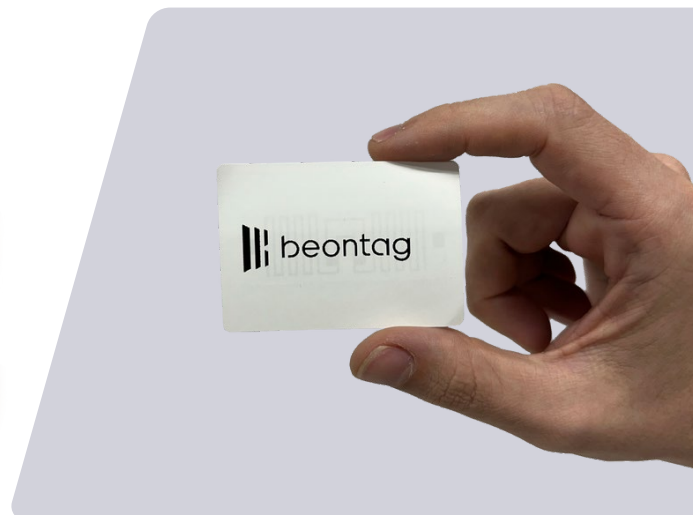
BEST HANDLING PRACTICES

Upon receiving

Check the condition of the tags by inspecting the packaging, physical integrity, and visual quality to identify any damages or defects. If any irregularities are found, immediately contact Beontag via email, providing details of the issue and supporting evidence, such as images, videos, or documents (as per the claim procedure). The more complete the information, the more efficient the resolution will be.

In storage

- Store the RFID tags in dry locations, protected from direct exposure to sunlight, moisture, and sudden temperature changes.
- Keep the tags away from dust, chemicals, and residues that could damage the electronic components.
- The recommended storage temperature is between 15°C and 25°C, with a relative humidity range of 20% to 50%.
- Place the rolls of tags horizontally on appropriate shelves, avoiding overloading, deformation, or excessive pressure.



BEST HANDLING PRACTICES

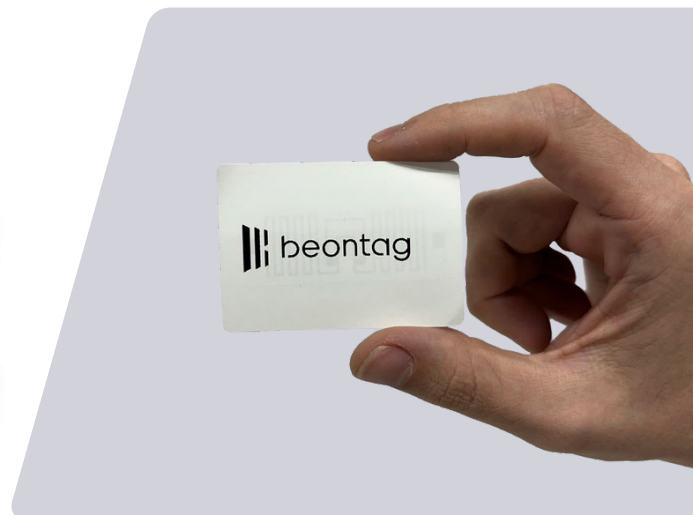
Orientation of the roll

The rolls should be stored horizontally to prevent deformation or stress that could affect the integrity of the tags.

In environments with low humidity (below 35%), it is recommended to use antistatic gloves when handling the tags to prevent electrostatic discharges that could damage the RFID chips, especially if they are in dry-inlay format (where the chip is fully exposed).

Handling of the roll

- Handle the rolls horizontally to avoid telescoping.
- Handle the tags by the edges, avoiding contact with the chips and the adhesive area.
- Do not apply pressure or bend the tags, as this may damage the antenna and/or its connection to the chip. When stacking, ensure that the tags are not excessively compressed.
- Avoid touching the adhesive area of the tags to preserve their bonding capacity and prevent contamination that could affect adhesion.
- Ensure the environment is organized and that operators are properly trained.

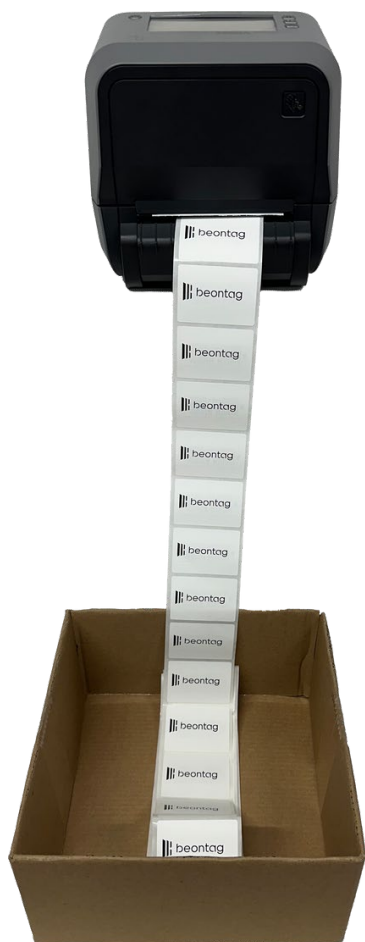


RFID

PRINTING

Printing on RFID tags requires specific care to ensure the functionality and legibility of the information.

Ensure that the printing area is kept away from the chip region of the inlay to avoid damage or interference. Printing on IC location may also cause visual defect on the printing quality. Adjust the layout to position barcodes, QR codes, and other visual information outside this area. For printer-specific instructions, please reach out to your printer supplier or Beontag for further guidelines.



Storage

Tags that have already gone through the printing and encoding processes should be stored in boxes free from contaminants to preserve their integrity and functionality.

Rewind the tags onto the original core, keeping the same orientation, or carefully fold them on top of each other. Avoid excessive bending or creasing that could cause physical damage to the inlay or compromise the RFID reading.



USE CASE

QUALIFICATION

It is important that ECO Tags are tested thoroughly in the final application to ensure their suitability into final use case. Please follow this process to ensure the suitability.

1. Qualification batch

First test batch is recommended to be about 50k tags. This batch should be thoroughly evaluated to ensure following:

- Mechanical robustness. Ensure paper-based ECO technology offer durable enough solution to withstand the potential mechanical stress coming from the handling of tagged items.
- Environmental impact. Ensure that ECO tags are tested in all environments it will face during the life-time, including any high-humidity environments.
- Performance. Ensure that the selected ECO tag model offers reading performance that is required by the end user for reliable process.

2. Mass-production

After Qualification batch is validated, it is OK to move into mass-production with final volumes.



TROUBLESHOOTING

To ensure an efficient and swift analysis of your issue, follow the guidelines below when reporting.

Problem description

Contact your sales representative and provide a detailed description of the identified nonconformity and batch ID the issue is related to. Be sure to include the following:

- The nature of the defect (such as functionality issues, visual inconsistencies, or variations in quality or performance).
- For customers using printers, include the brand and model of the equipment used, along with the settings applied during operation.

Visual Evidence

Send clear videos and/or photos that highlight the identified nonconformity, as well as the identification label inside the roll's core, ensuring the control number is legible. Please note that the identification label inside the core corresponds to the same label found on the outside of the box.

Nonconforming quantity

Provide the total number of items with issues, clearly specifying the scope of the occurrence.

Shipment of material for analysis

When requested, send representative samples of the identified issue for technical analysis. The exact quantity required will be provided in advance by your Beontag contact to ensure an accurate and efficient evaluation.



Example of Identification label inside the roll's core.
Visual look of the label may vary.



BEONTAG TECHNICAL SUPPORT

If you have any questions or issues related to ECO RFID tags, please contact your Beontag sales representative.

We are here to help you!

Building a seamless world by expanding communication
between companies, products and people

