Voyantic

# Tagformance® Pro Readformance Protocol Analyzer

RAIN RFID and NFC Testing and Measurement Systems for Research & Development

ES France - Département RF & Hyperfréquences - 127 rue de Buzenval BP 26 - 92380 Garches
Tél. 01 47 95 99 60 - Fax. 01 47 01 16 22 - e-mail: hyper@es-france.com - Site Web: www.es-france.com

ES France - Département RF & Hyperfréquences - 127 rue de Buzenval BP 26 - 92380 Garches
Tél. 01 47 95 99 60 - Fax. 01 47 01 16 22 - e-mail: hyper@es-france.com - Site Web: www.es-france.com

# Contents

# TAGFORMANCE PRO

ES France - Département RF & Hyperfréquences - 127 rue de Buzenval BP 26 - 92380 Garches
Tél. 01 47 95 99 60 - Fax. 01 47 01 16 22 - e-mail: hyper@es-france.com - Site Web: www.es-france.com


# All-in-one RFID Test and Measurement System for Research & Development

Voyantic Tagformance Pro is a complete measurement solution for evaluating the performance of RFID tags. The system consists of the Tagformance Pro measurement device, one or more software packages, and accessories that complete the system.

Whether you focus on tag design, item tagging, protocol testing, technical sales or academic research, we can provide you with the most suitable software tools and hardware accessories.

ES France - Département RF & Hyperfréquences - 127 rue de Buzenval BP 26 - 92380 Garches
Tél. 01 47 95 99 60 - Fax. 01 47 01 16 22 - e-mail: hyper@es-france.com - Site Web: www.es-france.com

# Features & Benefits

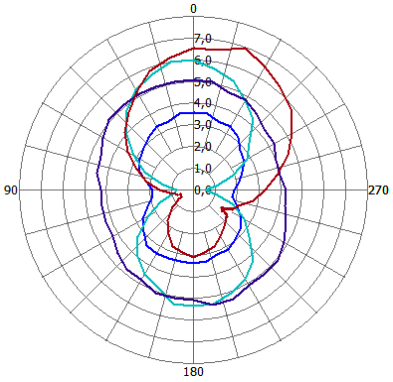
## Key Features and Functionalities

- **Easy to use** solution with **unbeatable measurement accuracy**
- Analyze tuning, sensitivity and radiation pattern of RFID and NFC tags
- Test the effect of materials, orientation, behavior in a population, and compare performance between different tag designs
- Study different tagging strategies, and evaluate and grade performance of tagged items
- Look into tag memory contents and investigate chip performance
- Verify tag designs and check emissions against official EMC directives

ES France - Département RF & Hyperfréquences - 127 rue de Buzenval BP 26 - 92380 Garches
Tél. 01 47 95 99 60 - Fax. 01 47 01 16 22 - e-mail: hyper@es-france.com - Site Web: www.es-france.com

## Gain Full Visibility into Tag Performance

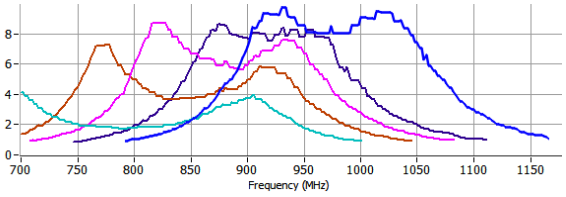
There are several factors affecting the performance of RFID and NFC tags. Tune your tags correctly, and characterize them for sensitivity, backscatter strength and load modulation.




Different orientation patterns of UHF tags

## Speed up Your Time to Market

With Tagformance Pro you get instant feedback on new tag designs. Performance of a new tag design can be tested in a few seconds, allowing for rapid prototyping.




Read range and tuning of a UHF tag on different materials

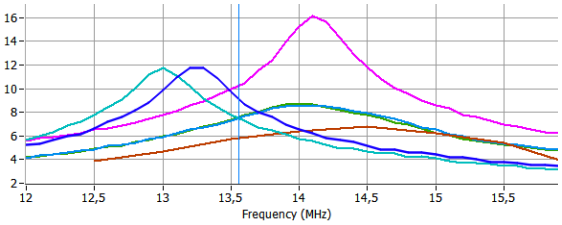
## Use a Single Tool for All RFID Tags

Use the same test system for all RFID tags: UHF, HF or NFC. Tagformance Pro supports all widely used RFID protocols.


RFID measurement cabinet in a lab

## Conduct Cost-efficient Comparison and Selection

Different tags work in different applications and choosing the right one can be a nightmare. Minimize trial-and-error and choose your tags with professional test equipment.




Read range and tuning of different HF tags

## Implement High Quality RFID Systems

Using high-quality professional testing equipment results in better performance. When tags are designed and selected with Voyantic Tagformance Pro, you can deliver high-quality and realiable RFID systems.

## Gain Competitive Advantage

Boost the efficiency of your technical sales by providing customers comprehensive performance data to help them make more informed decisions.

ES France - Département RF & Hyperfréquences - 127 rue de Buzenval BP 26 - 92380 Garches
Tél. 01 47 95 99 60 - Fax. 01 47 01 16 22 - e-mail: hyper@es-france.com - Site Web: www.es-france.com

## HARDWARE LICENSES

- **Tagformance Pro HW license (UHF 800-1000 MHz)** — TF-HWL-UHF

  800 MHz – 1000 MHz hardware license is compatible with UHF Standard antenna.

- **Tagformance Pro HW license (UHF 600-1300 MHz)** — TFHW-PWB

  600 MHz – 1300 MHz hardware license is compatible with UHF Wideband antenna. Wideband gives additional visibility to frequency domain and is recommended for testing tags with high detuning, such as tags for glass and rubber.

- **Tagformance Pro HW license and Threshold Sweep (UHF 860-960 MHz)** — TF-HWL-STARTER

  860 MHz – 960 MHz hardware license covers UHF RFID reader frequencies. The license includes Threshold sweep software.

- **Tagformance Pro HW license (HF 10 MHz - 30 MHz)** — TF-HWL-HF

# HARDWARE

ES France - Département RF & Hyperfréquences - 127 rue de Buzenval BP 26 - 92380 Garches
Tél. 01 47 95 99 60 - Fax. 01 47 01 16 22 - e-mail: hyper@es-france.com - Site Web: www.es-france.com

## HARDWARE SPECIFICATIONS

| | |
|---|---|
| UHF Frequency Range: | Standard Sweep range: 800 MHz – 1000 MHz<br>Extended Sweep range: 600 MHz – 1300 MHz<br>Resolution: 100 kHz |
| UHF Output Power: | Typical radiated max 36 dBm (see manual for details),<br>with High Power Kit over 40 dBm<br>Minimum: -20 dBm (port)<br>Resolution: 0.1 dB, Accuracy: +/-1 dB<br>Repeatability: <0,5dBm (typical)* |
| UHF Receiver: | Sensitivity: better than -85dBm (typical) for Class1 Gen2,<br>max input +18 dBm<br>Resolution: 0.1 dB, accuracy +/-1 dB<br>Repeatability: <0,5dBm (typical)* |
| HF/NFC Frequency: | Sweep range: 10 MHz – 30 MHz<br>Resolution: 10 kHz |
| HF/NFC Output Power: | -10 dBm ... +25 dBm<br>Resolution: 0.1 dB, Accuracy: +/-1 dB |
| HF/NFC Receiver: | Max input power +25 dBm |
| Dimensions: | 185 x 90 x 220 mm |
| Connectors: | 4 RF ports: N-type (UHF TX, UHF RX, HF TX, HF RX)<br>PC interface: Ethernet (RJ-45)<br>Power: 18 VDC, 5A<br>Digital analog I/O: 25-pin D-sub<br>RS232: 9-pin D-sub , e.g. RFU |

*Test-retest variation depends on, for example, the test setup, the tested tag, and the protocol settings.

ES France - Département RF & Hyperfréquences - 127 rue de Buzenval BP 26 - 92380 Garches
Tél. 01 47 95 99 60 - Fax. 01 47 01 16 22 - e-mail: hyper@es-france.com - Site Web: www.es-france.com

We offer six software suites and various extensions:

## UHF SOFTWARE LICENSES

- **Tag Designer Suite** TF-SW-TDS

  A software suite focusing on the performance of one RAIN RFID tag at a time. Verify tag designs, produce performance data for tag datasheets,compare tags and define how a tag performs on dfferent items.

- **Application Development Suite** TF-SW-ADS

  A software suite focusing on the RAIN RFID application. Includes applications for optimizing antenna placement, studying interferences and for studying performance of tag populations.

- **Protocol Testing Suite** TF-SW-PTS

  A software package focusing on the IC. Includes applications for looking into tag response details to various commands, and for memory and memory content of the ICs.

- **Tagged-Item Grading Suite** TF-SW-TGS

- **ARC Pre-compliance Testing Suite** TF-SW-ARC

  Tagged-Item Grading Suite and ARC pre-compliance Testing Suite are applications for characterizing tag and tagged item performance according to performance standards.

- **UHF Extensions**

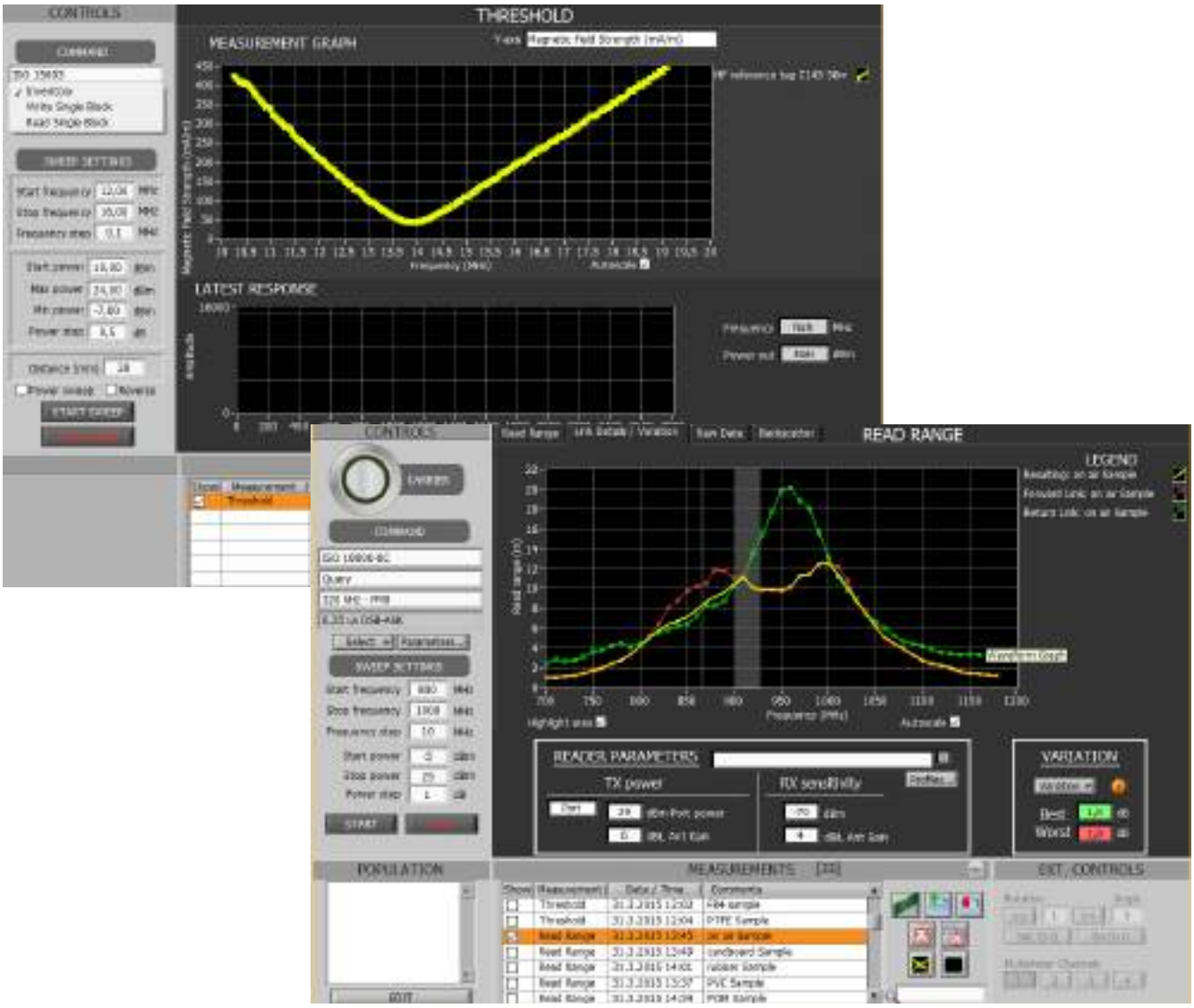
  Various extensions enhance the functionalities of the main software suites. These can be used for further automation, and for including additional protocols for the test system.

## HF SOFTWARE

- **Performance Measurement Suite** TFH-SW-PER

# SOFTWARE

ES France - Département RF & Hyperfréquences - 127 rue de Buzenval BP 26 - 92380 Garches
Tél. 01 47 95 99 60 - Fax. 01 47 01 16 22 - e-mail: hyper@es-france.com - Site Web: www.es-france.com




Tagformance software comes with an intuitive GUI for running the measurements and analysis of the performance data. The system is designed to minimize user errors and measurements are easy to repeat with the same settings. Informative, visual representation of the measurement results helps with the analysis.

The UHF software enables the user to remove unwanted environmental and system factors in order to get correct absolute results, regardless of path loss and typical reflections in the test environment.

Data can be analysed within the user interface, exported to other applications, and shared shared via e-mail as .tff files. Tagformance software can also be used without hardware in viewer mode for data analysis.

# UHF Software: Tag Designer Suite

## THRESHOLD


The Threshold measurement sweeps through the selected frequency range and detects the minimum required transmit power for the correct tag response at each frequency point.

These threshold sweep curves give a clear view of the tag's tuning and sensitivity. In the above example, it can be clearly seen how the acetal plastic tunes the tag towards lower frequencies.

The test can be done using EPC Class1 Gen2 (ISO 18000-6C) with several commands and data rates. ISO 18000-6B, GB/T29768, Brazilian protocols such as SINIAV, support for custom commands and support for custom protocols are also available.

The command set and the protocol support are the same throughout the Tag Designer Suite. Results can be expressed as transmit power, backscatter power, dRCS, read range, backscatter range, power on tag, etc.

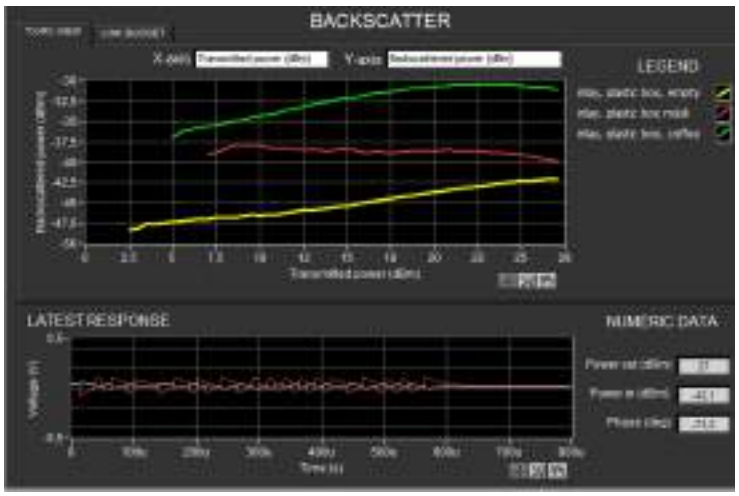
Verify performance and tuning of new tag designs
Measure the detuning and read range of a tag on different items and materials
Compare tags, tag positions and antennas from a reader's point of view
Compare simulated and measured results

ES France - Département RF & Hyperfréquences - 127 rue de Buzenval BP 26 - 92380 Garches
Tél. 01 47 95 99 60 - Fax. 01 47 01 16 22 - e-mail: hyper@es-france.com - Site Web: www.es-france.com

## BACKSCATTER

The Backscatter measurement performs a power sweep on a selected frequency while measuring the tag's response signal strength. The point where the curve starts is the threshold point.

This measurement helps to ensure that the tag performs continuously on all power levels.

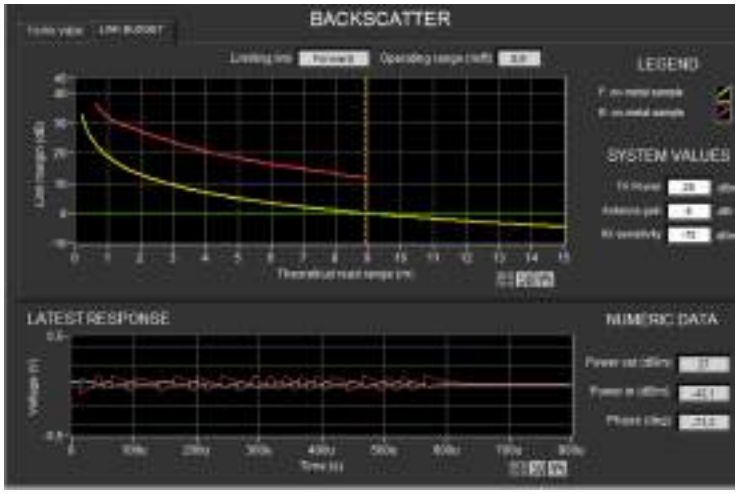



Measure the tag's power response
Check for continuous operation at all transmit powers
Study close coupling of tags

## BACKSCATTER LINK BUDGET

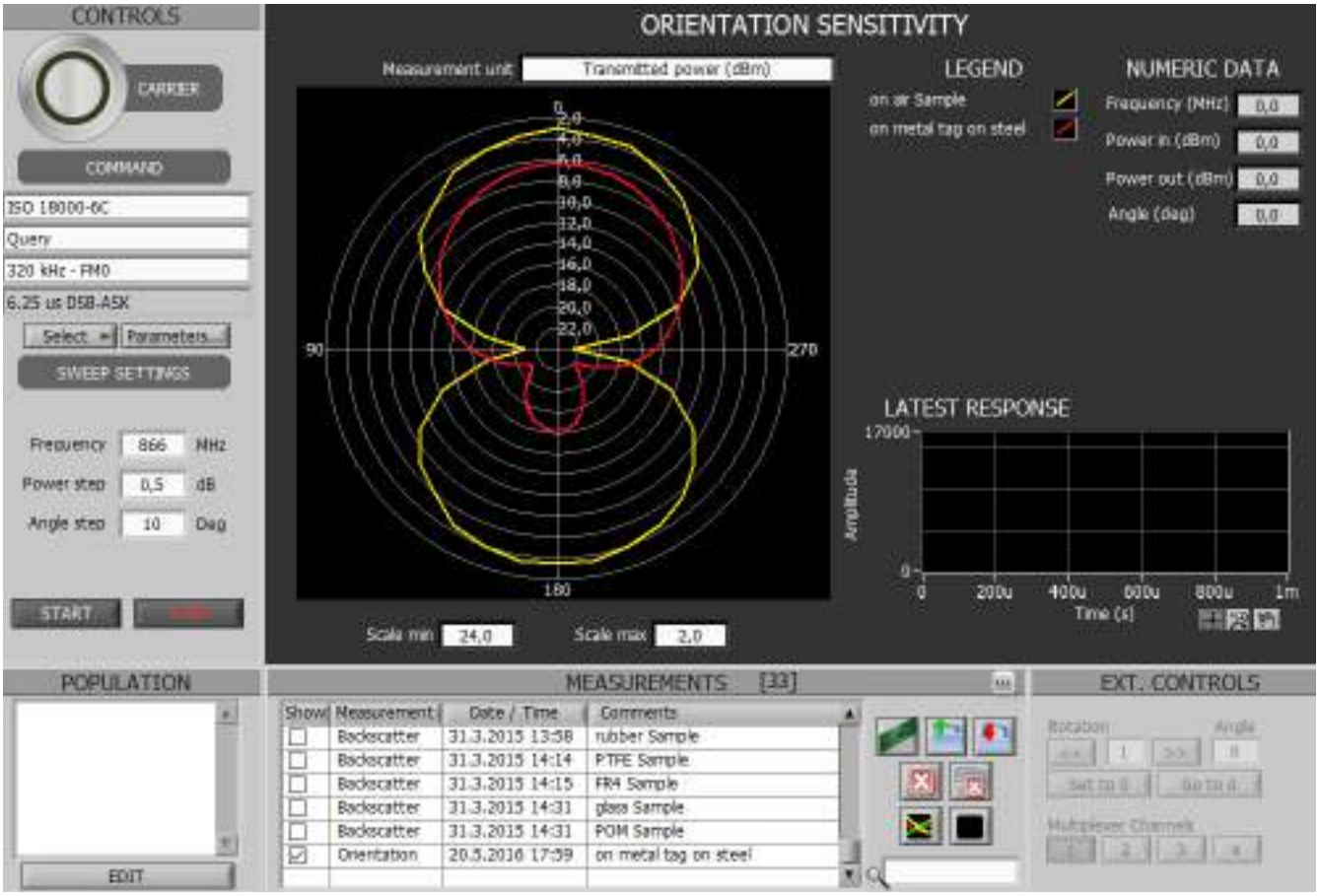
This is an easy tool for simulating how the measured tag would perform in an application with given reader transmit power, antenna gain, and receiver sensitivity.

The software calculates the operating range and indicates whether the forward or reverse link is the limiting factor.




Find out easily whether the tag is forward or reverse link limited
Check the expected read range and link margin with a given reader
Compare different tags with specific system values (or vice versa)

## ORIENTATION SENSITIVITY

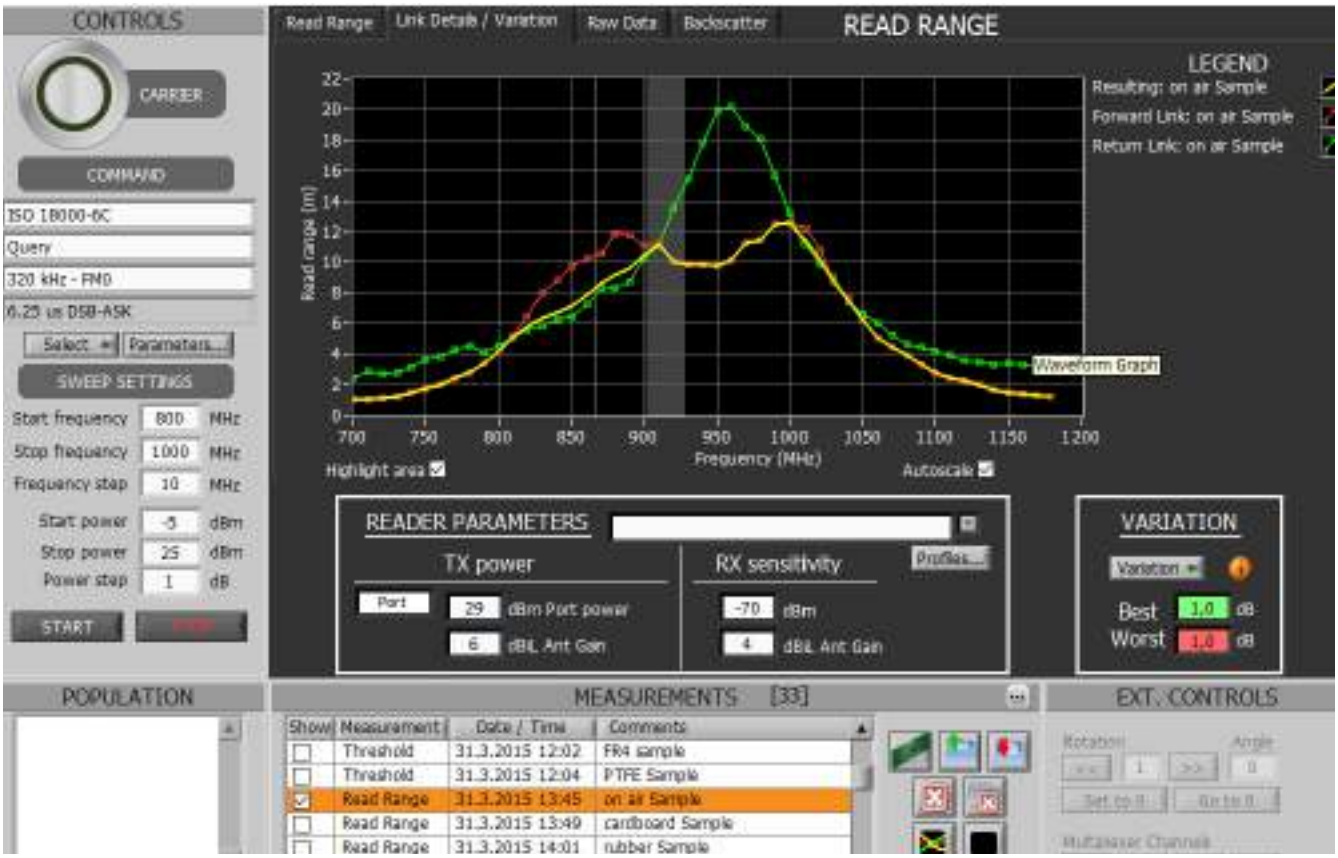



The Orientation Sensitivity measurement enables automated radiation pattern measurements for tags and tagged objects. The Voyantic RFID Measurement Cabinets with the tag rotation and stand-alone Tag Rotation System integrate seamlessly with this measurement.

Measure the radiation pattern of tags and tagged objects, also in tag populations
Find out the optimal placement for a tag on a chosen item
Experiment the effect of tagged item shapes and materials on the radiation pattern

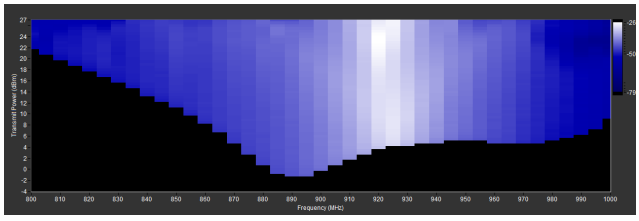
ES France - Département RF & Hyperfréquences - 127 rue de Buzenval BP 26 - 92380 Garches
Tél. 01 47 95 99 60 - Fax. 01 47 01 16 22 - e-mail: hyper@es-france.com - Site Web: www.es-france.com

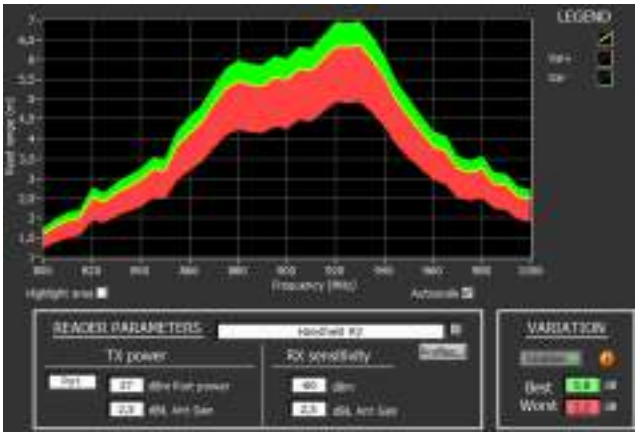
## READ RANGE




The Read Range measurement enables easy read range calculation on a frequency range with set reader transmit power and sensitivity specified by the user. The measurement allows quick estimation of the system level performance with a given tag and RFID reader.

The Raw data mode (below) shows the power response as a function of frequency. This allows excellent visibility to the tag's behavior through the frequency and power range. Select+query command (optional) can be used to analyze tags in a population for continuity of the response.



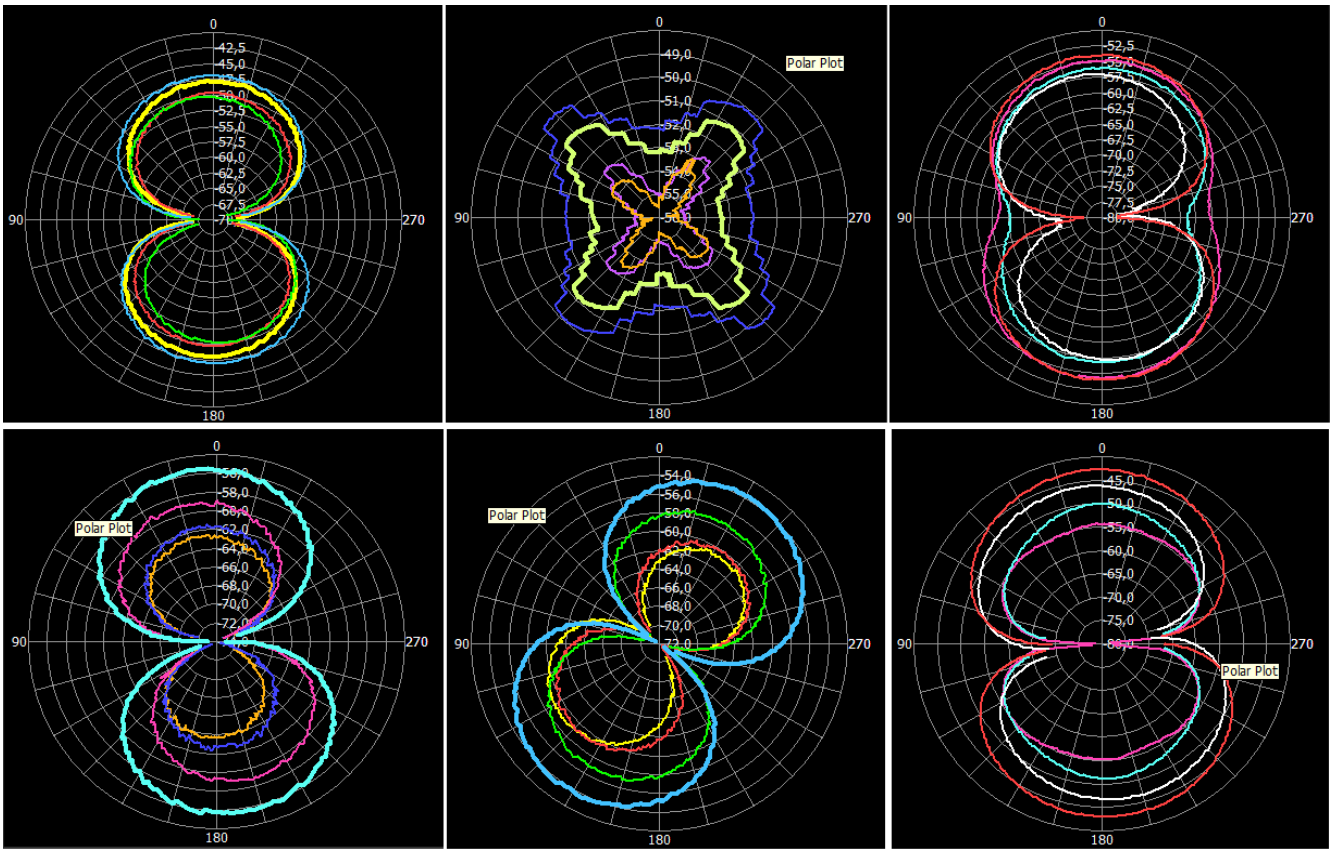



Check the System Level Expected Read Range with given reader parameters
AND effect on the operating range caused by production variation
Verify your tag choice with application-specific objects and reader parameters
Study the backscatter behavior in detail with raw data mode

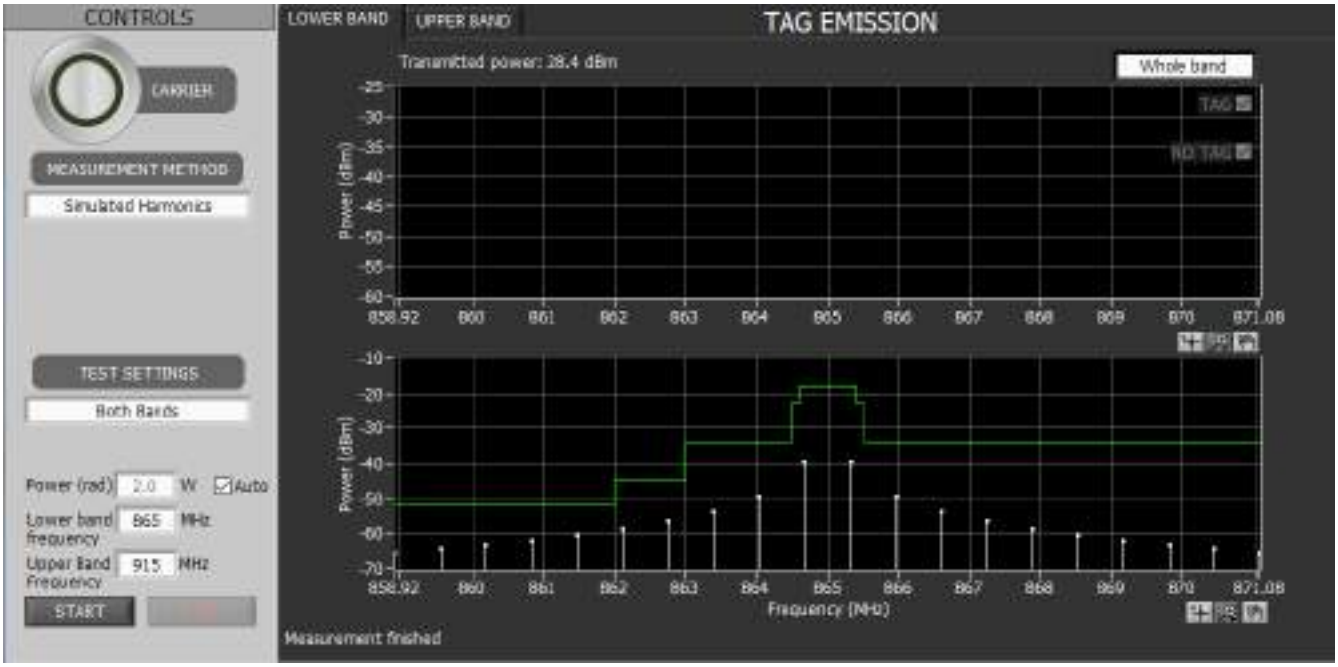
ES France - Département RF & Hyperfréquences - 127 rue de Buzenval BP 26 - 92380 Garches
Tél. 01 47 95 99 60 - Fax. 01 47 01 16 22 - e-mail: hyper@es-france.com - Site Web: www.es-france.com

## TAG EMISSION TESTING

Tag Designer Suite includes functionalities to quickly assess Backscatter signal strength and approximate unwanted emissions against the RED standard (ETSI EN 302 208 v.3.1.1) at lower (865-868 MHz) and higher (915-921 MHz) ETSI bands. (see pictures 1&3)




Picture 1. Orientation patterns show the direction of the strongest radiation

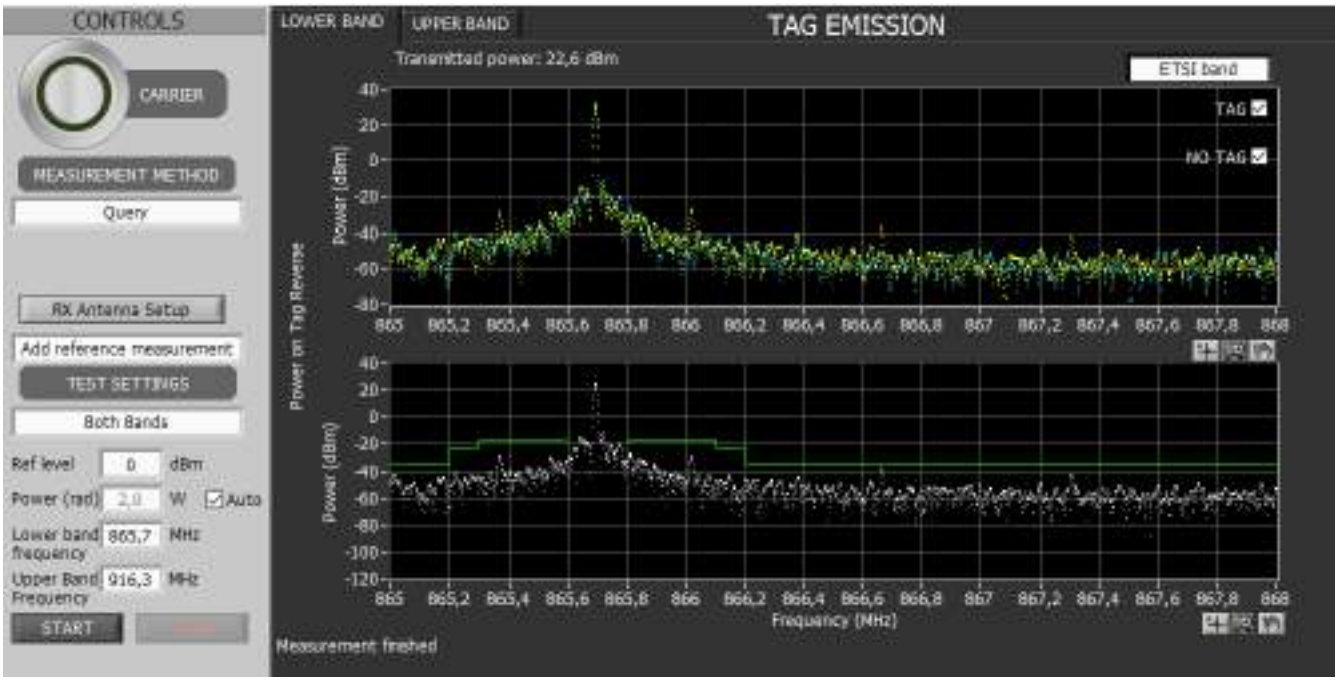



Picture 2. Calculated approximate emissions with Tag Designer Suite

ES France - Département RF & Hyperfréquences - 127 rue de Buzenval BP 26 - 92380 Garches
Tél. 01 47 95 99 60 - Fax. 01 47 01 16 22 - e-mail: hyper@es-france.com - Site Web: www.es-france.com

Adding ETSI RED Kit [TFP-AC-RED] accessories enables more accurate measurements of unwanted emissions. (Picture 4)

Picture 3. ETSI RED Kit accessories




Picture 4. Measured tag emissions with ETSI RED Kit

# UHF Software: Application Development Suite

## POPULATION MANAGEMENT

TF-SW-POS

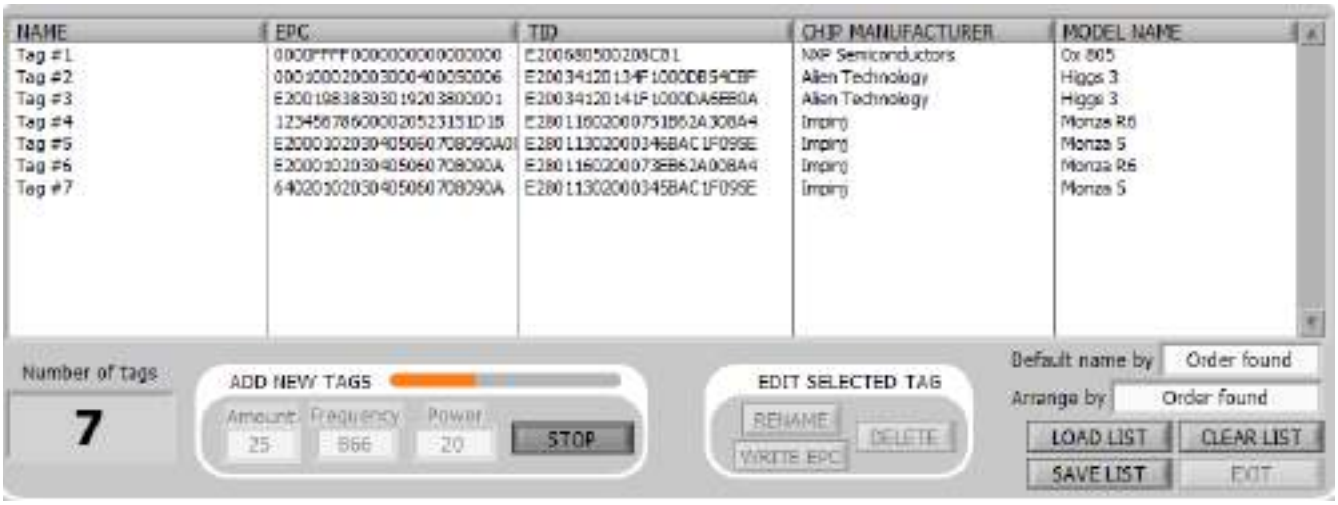

Population Management enables addressing individual tags in tag populations. It is a standard feature of the Application Development Suite and is also available separately to supplement the Tag Designer Suite.

Population Management contains Population Editor, which is a powerful tool for managing tag populations. It can be used to inventorying tags, editing the population list, and editing EPC content of tag populations as well as single tags.

It stores the TID numbers of the inventoried tags and shows the chip manufacturer and model in a readable format.

Population Management can be used with the following measurements:

- Threshold Sweep
- Backscatter Sweep
- Orientation Sensitivity
- Read Range
- Response Test

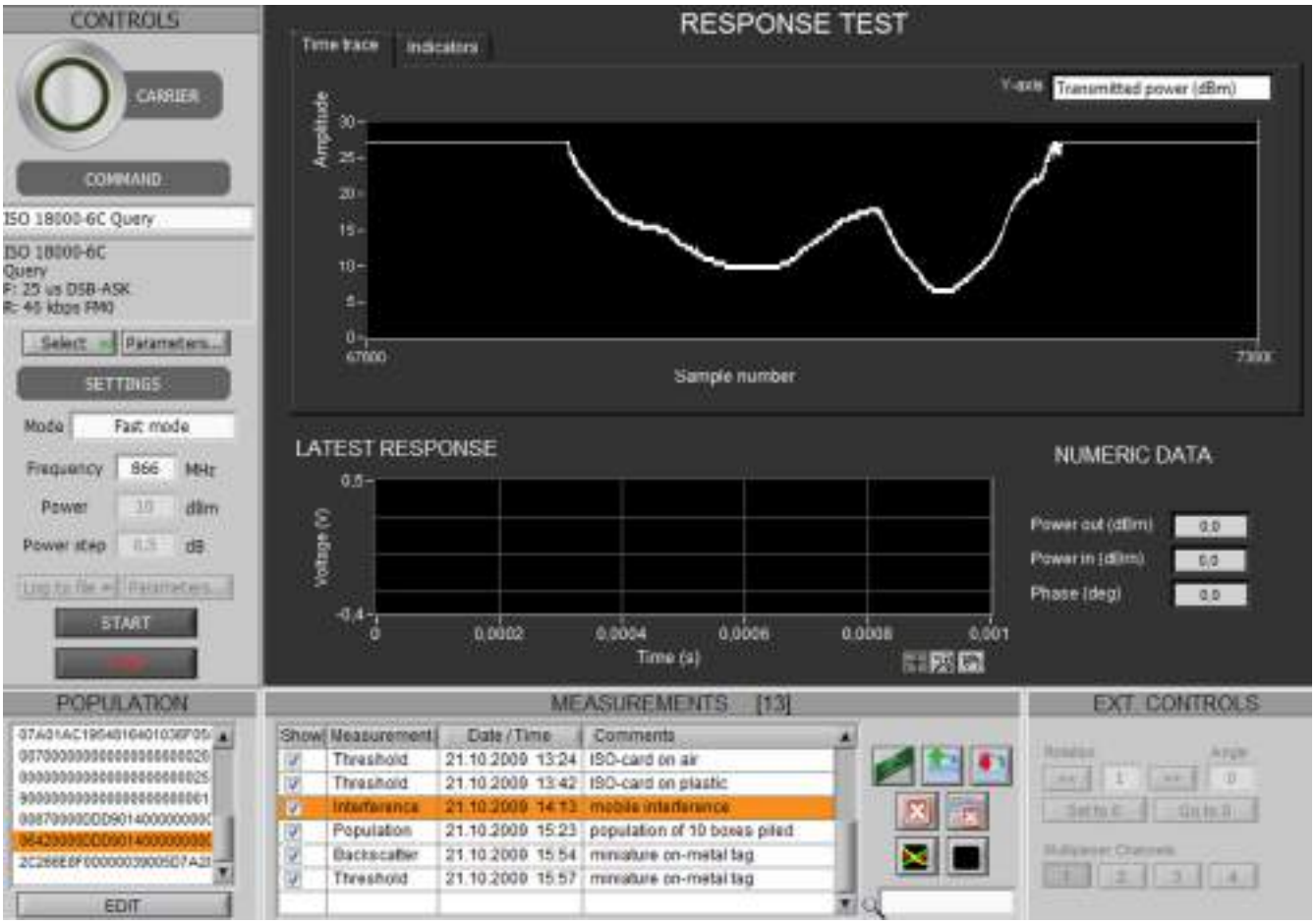



Measure characteristics of a single tag in a larger population
Study how well tags perform in populations
Inventory tag populations automatically with Population Editor

ES France - Département RF & Hyperfréquences - 127 rue de Buzenval BP 26 - 92380 Garches
Tél. 01 47 95 99 60 - Fax. 01 47 01 16 22 - e-mail: hyper@es-france.com - Site Web: www.es-france.com

## RESPONSE TEST

TF-SW-FRT



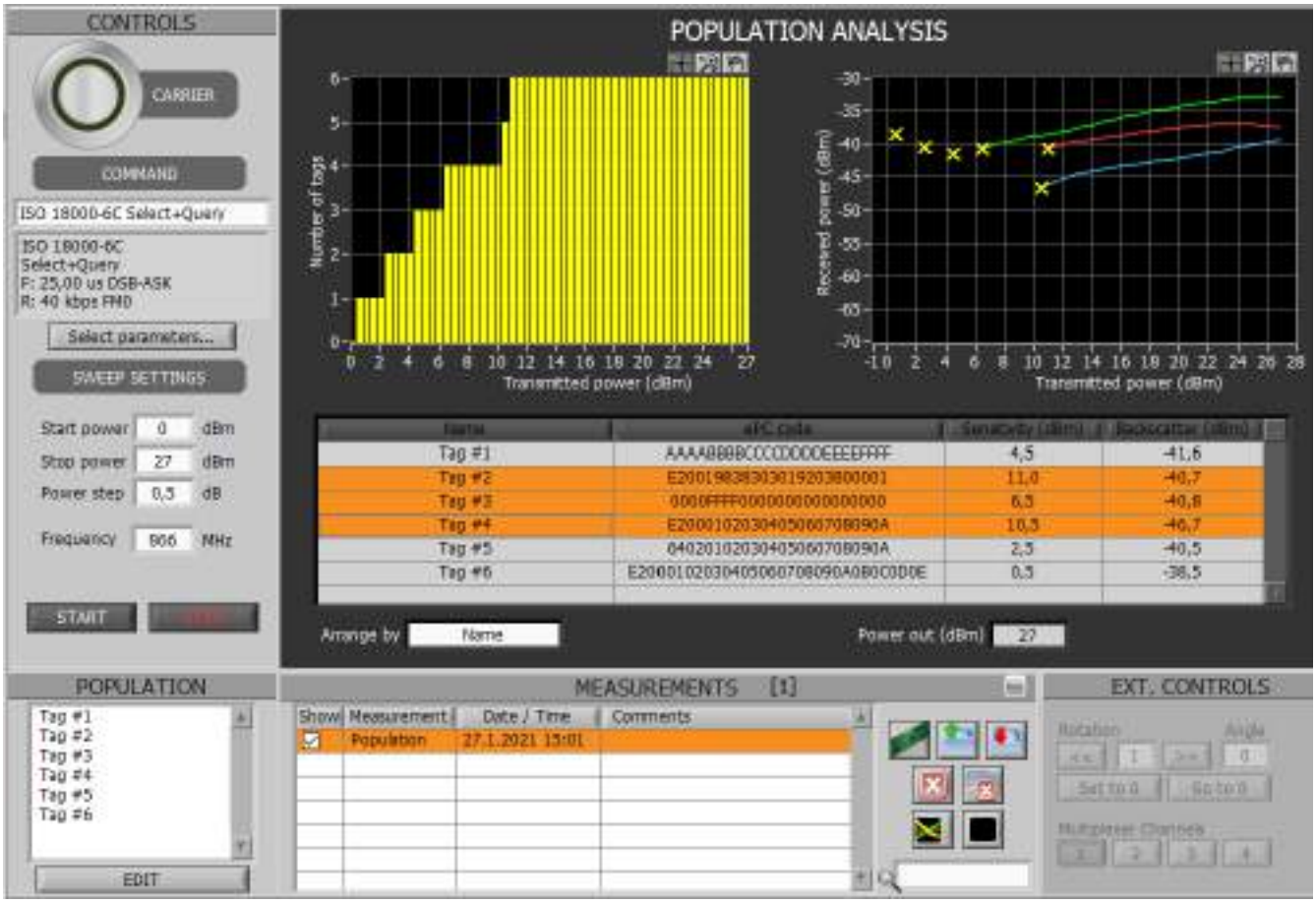

The Response Test has different modes:

- Constant Power
  Uses given power and frequency.
- Follow Threshold
  Follows the threshold transmit power of the selected tag.

Select (by EPC code) command can be used to follow one specific tag in the tag population. In the above example, a tagged item passes by the reader antenna in an environment with metal surfaces.

The minimum required power to read the tag was ~7dBm, while ~22dBm transmit power would ensure long and continuous identification time.

Dynamically follow the weakest tag as the population passes the portal
Determine the required reader power to achieve the desired read area
Compare tags, tag positions and portal configurations from a reader's point of view




The Population Analysis polls (select+query) all the tags in the tag list defined in population editor using different transmit power levels. Threshold power and backscatter signal strength are shown for all tags revealing the potential weakest links in the population. The weakest links can be further studied using the response test.

The graph on the left shows the number of tags read at each transmit power level. The right-hand graph plots the threshold point for both transmitted and backscattered power for each tag. It also plots the backscattered power as a function of transmitted power (red, blue and green curve in the picture). The tag list can be sorted by EPC, sensitivity and backscattered power.

Learn how to build item-level tagged pallets
Study reader zoning and power margins for successful reads and to avoid stray readings
Study close coupling of tags

## INTERFERENCE MEASUREMENT

TF-SW-INT

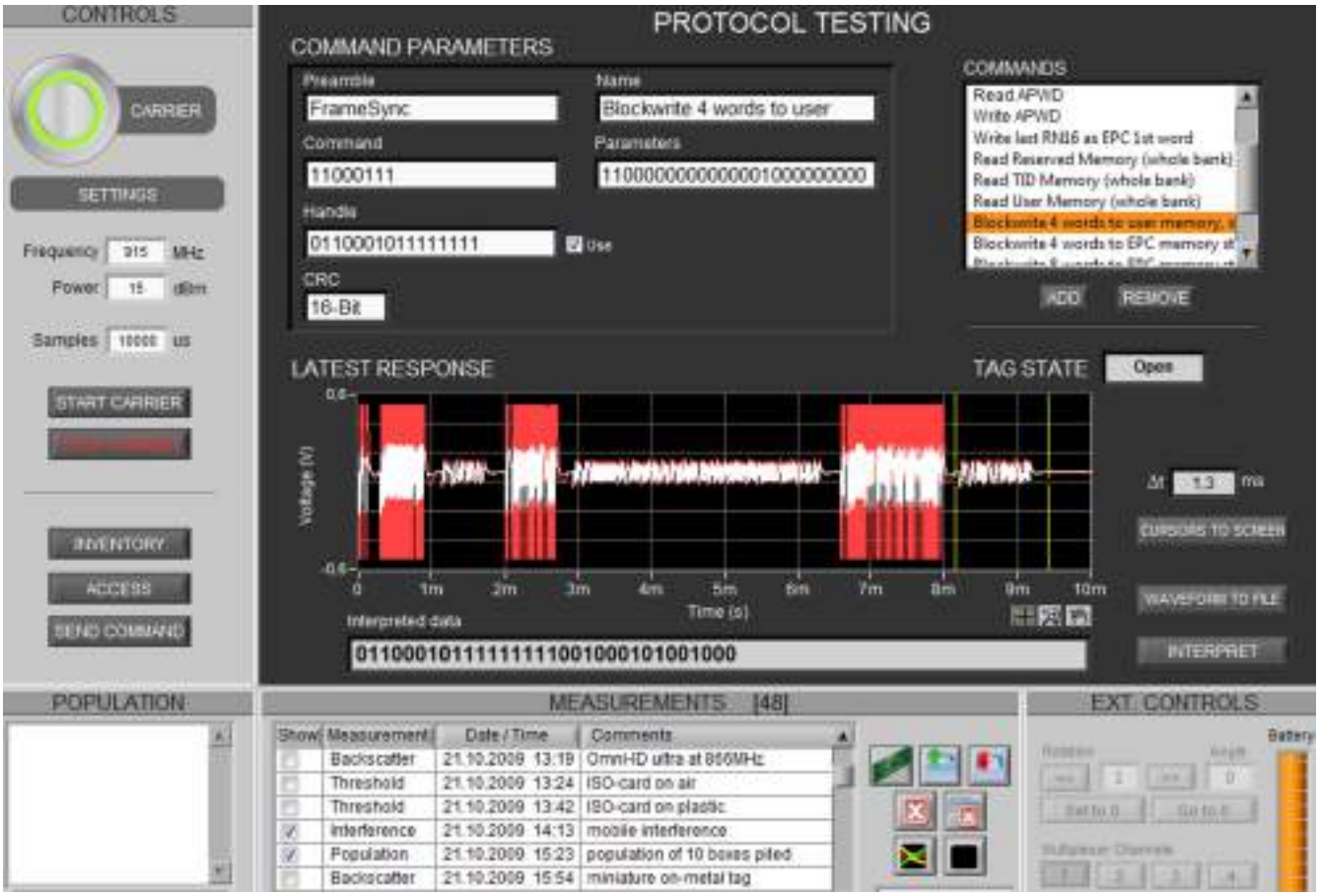

The Interference measurement scans the given frequency range to reveal interfering inband RF activity. Continuous sweep and peak hold functions help to record the interference for extended periods of time. The signal level will reveal if the interfering transmitters are likely to pose a problem.

Detect at the project planning stage the other nearby users of UHF RFID
Monitor the channel allocation of nearby readers to select free channel slots
Listen in reader-tag communication
Check for abnormal interferences within a measurement lab

ES France - Département RF & Hyperfréquences - 127 rue de Buzenval BP 26 - 92380 Garches
Tél. 01 47 95 99 60 - Fax. 01 47 01 16 22 - e-mail: hyper@es-france.com - Site Web: www.es-france.com

# UHF Software: Protocol Testing Suite

**PROTOCOL TESTING** TF-SW-PTS




Using the Protocol Testing Suite, arbitrary commands within and beyond the EPC Gen2 protocol can be sent to the tag. Created custom commands can be saved to the commands list to make them available every time you open the software. The received answers can be analyzed visually and decoded with the interpret tool.

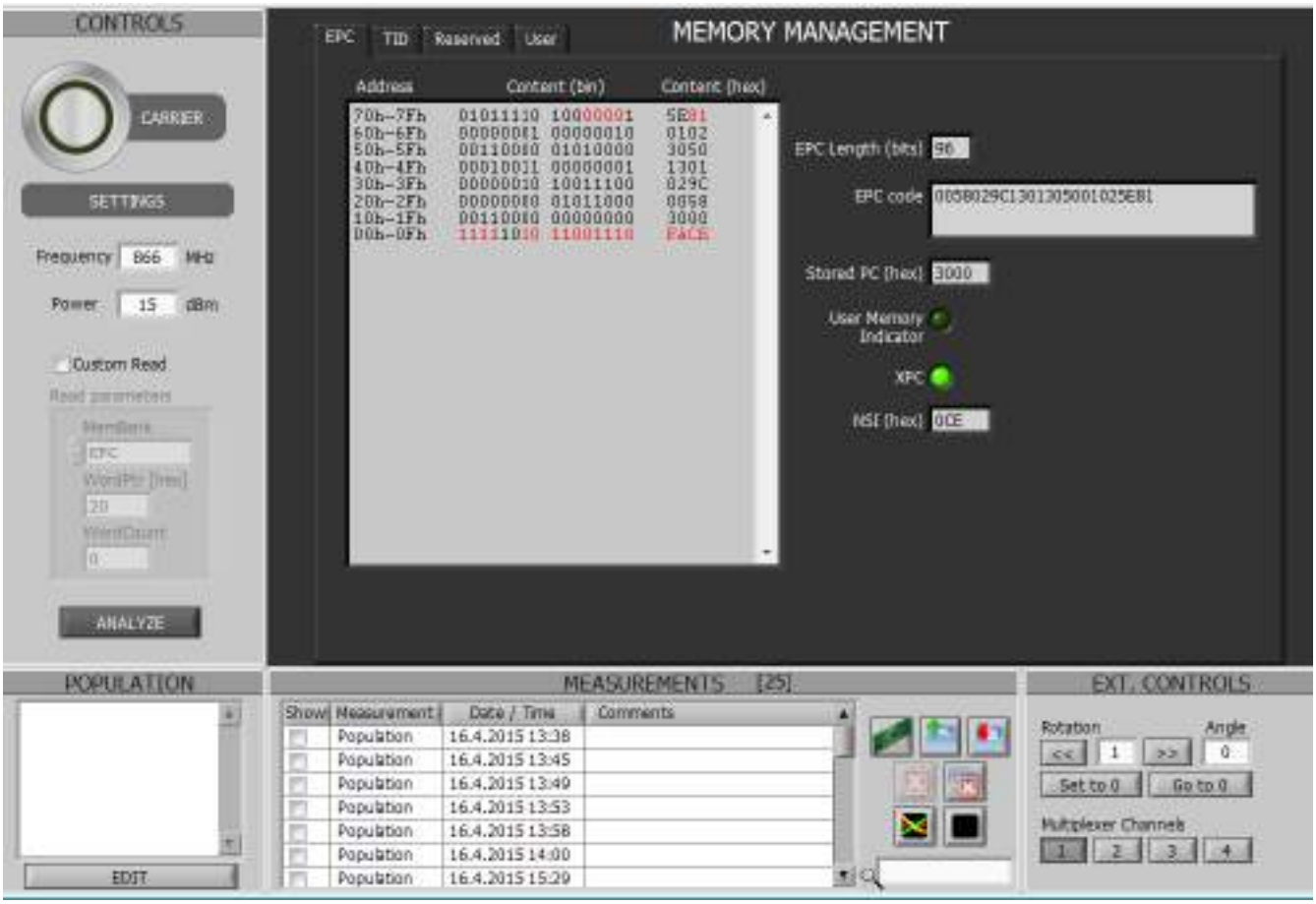
In the above example, the inventory command is being sent to a tag using 915 MHz frequency and 15 dBm transmit power. After the inventory, the handle is updated automatically to the handle field to be available for the following commands. The interpret function is set to interpret the handle and CRC-16 bits from the waveform.

Investigate how your tag responds to proprietary custom commands
See the timing and waveforms of the tag responses; test the write time
Check the state machine of the IC
Test tags with special features, such as sensors

ES France - Département RF & Hyperfréquences - 127 rue de Buzenval BP 26 - 92380 Garches
Tél. 01 47 95 99 60 - Fax. 01 47 01 16 22 - e-mail: hyper@es-france.com - Site Web: www.es-france.com

## MEMORY MANAGEMENT

TF-SW-MEM




Memory Management is a tool for analyzing the memory of EPC Class1 Gen2 tags. The software reads EPC, TID Reserved and User memory banks, or a customized section of the memory with a single button press.

Memory contents are shown in binary and hex formats. Some content is also analyzed and interpreted: for example, chip type and chip manufacturer are shown. Memory management is a perfect tool for comparing tag data.

The application highlights differences in data between consecutive tag reads. The functionality can be used for example in sensor

- Analyze the tags memory content
- Check the chip information
- Check locking status
- Compare tag data

ES France - Département RF & Hyperfréquences - 127 rue de Buzenval BP 26 - 92380 Garches
Tél. 01 47 95 99 60 - Fax. 01 47 01 16 22 - e-mail: hyper@es-france.com - Site Web: www.es-france.com

# UHF Software: Tagged-Item Grading Suite

## TAGGED-ITEM GRADING

TF-SW-TGS


The Tagformance Tagged-Item Grading Suite is 100% aligned with the GS1 Tagged-Item Performance Protocol (TIPP) concept and the related test methodology. The Tagformance system simplifies complex RF tests and brings high-quality testing to the reach of anyone. Testing time is reduced to a few minutes.

Automated test procedures, open file formats, and clear reporting ensure that results are accurate and test data can be easily shared between retailers and their suppliers. Tagged-item grading returns clear information on which grades the tagged item passes. If one of the grades would be failed, the software allows easy access to the raw data, to check which particular test results did not meet the protocol specification.

Grade verification is a fast way to check if a tagged item passes or fails a specifically selected grade.

Check that the tagged item meets the TIPP grade requirement set

Analyze the weakest read angle and possible test that causes the tagged item to fail to comply with the set grade requirement

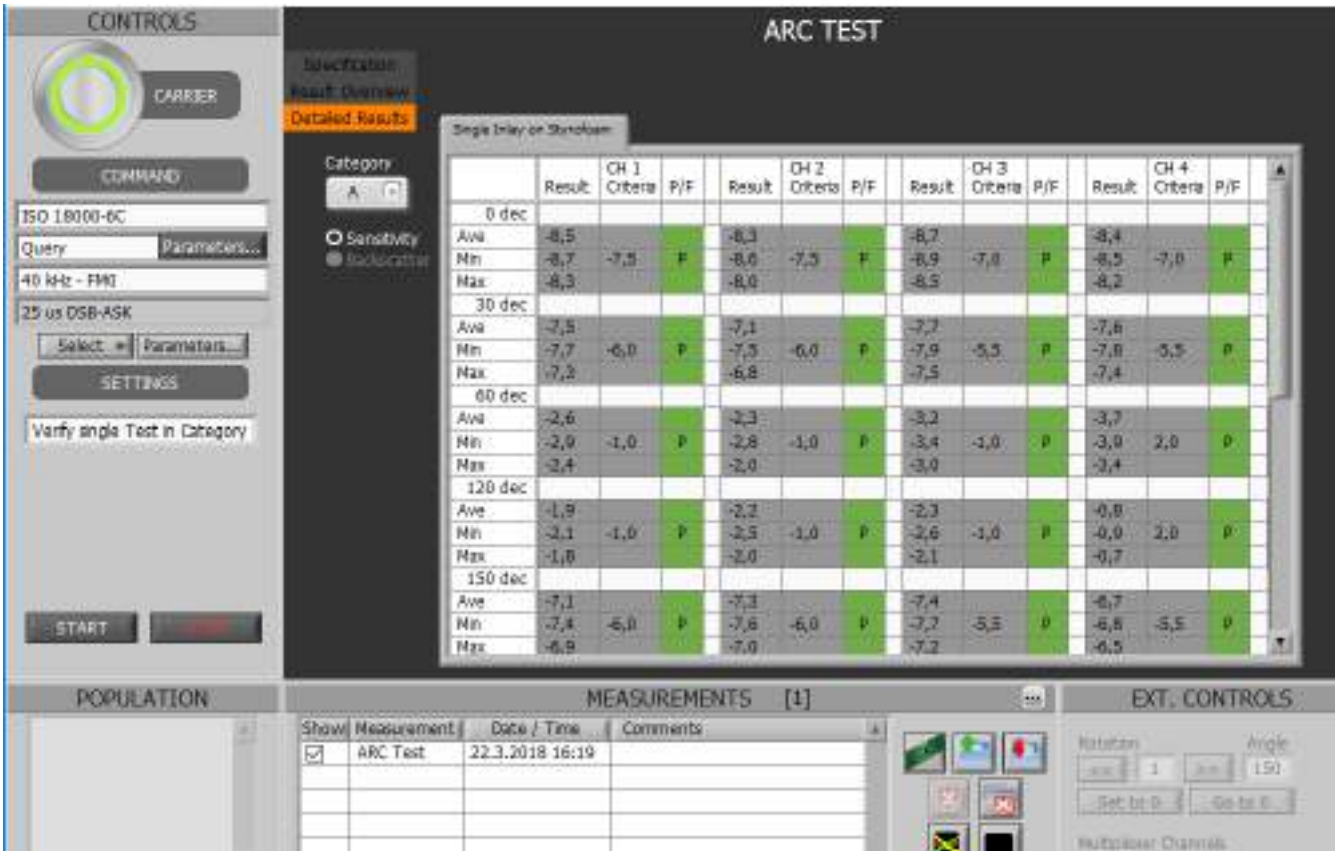
Grade your tagged items, by defining exactly which TIPP grade it complies with

ES France - Département RF & Hyperfréquences - 127 rue de Buzenval BP 26 - 92380 Garches
Tél. 01 47 95 99 60 - Fax. 01 47 01 16 22 - e-mail: hyper@es-france.com - Site Web: www.es-france.com

# UHF Software: ARC Pre-compliance Testing Suite

## ARC PRE-COMPLIANCE TESTING

TF-SW-ARC




ARC Program is a tag certification program managed by Auburn University ARC RFID Lab. ARC Program is used by retail companies (mainly in the USA) for ensuring that tagged products meet their performance requirements.

ARC pre-complience testing software is a quick way to test new RFID tags against ARC RFID Lab category limits. The test time is shortened to a fraction compared to the method where a test pattern is created with scripts or composed of individual tests. The ARC pre-testing SW produces results automatically in easy formats, there is no need for additional data processing.

ARC test software is compatible with Tagformance Pro with Tagged-Item Grading Setups. ARC software requires 4-antenna setup and rotation table.

Using the fast ARC pre-testing software before submitting tags for certification reduces the risk of receiving unexpected test results from final tests. Quick testing speeds up the development cycle by providing quick feedback on design alternatives. Designers see quickly the performance criteria where targets are not met, or where safety margin between performance and limit is lower than desired.

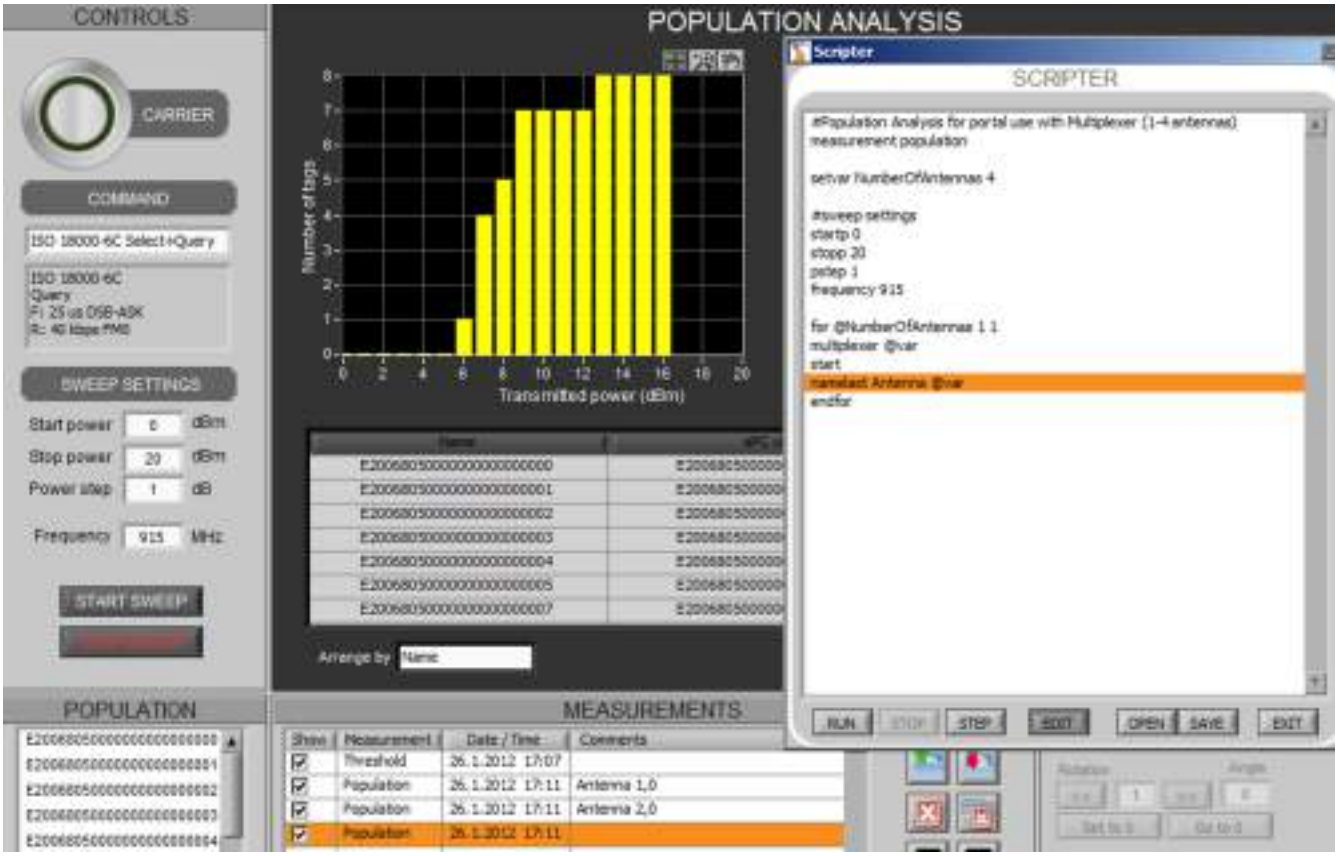
- Shorten the RAIN RFID tag development time and time to market
- Quickly test new tag designs against ARC RFID Lab category limits
- Set safety margins for category limits
- Understand result variation due to human effects
- Save developments costs and avoid unnecessary certification test rounds

ES France - Département RF & Hyperfréquences - 127 rue de Buzenval BP 26 - 92380 Garches
Tél. 01 47 95 99 60 - Fax. 01 47 01 16 22 - e-mail: hyper@es-france.com - Site Web: www.es-france.com

# UHF Extensions

## SCRIPTER

TF-SW-SCR




Scripter is a time saver when you need to run the same set of measurements for a large number of tags. Using measurement workflows will also make your routine measurements systematic and reduce errors. Scripter can be used with all measurements in Tag Designer Suite and with Population Analysis.

Get systematic with measurement workflows

Save time by automating measurements

Make routines less prone to human errors

## API

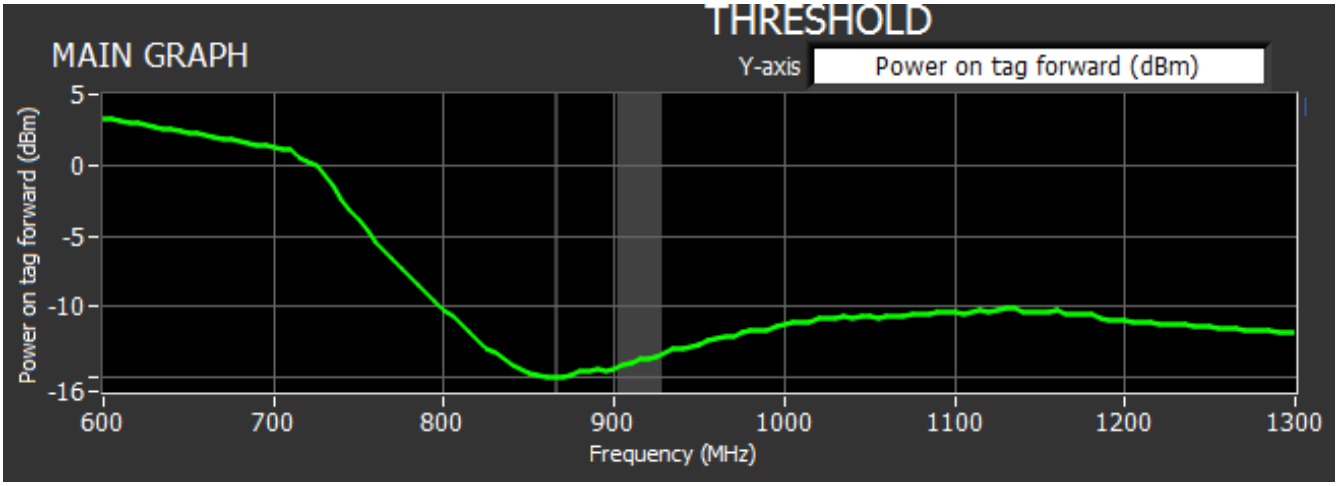
TFP-SW-UHFAPI

The API is a low-level TCP/IP protocol interface that allows user to e.g. set frequency, set power and send commands.

With the API it is possible to write your own test software, for example, to create test applications that are not currently included in the Tagformance software suites. The API works with any programming language that is able to access TCP, e.g. C#, Visual Basic, C++, and LabVIEW.

## WIDEBAND SWEEP RANGE 600-1300 MHZ

TF-SW-PWB




The Wideband Sweep Range offers more than three times the visibility in frequency domain compared to the standard range.

It is ideal for inlay designers as the materials can easily de-tune the inlays more than 100 MHz.

## ADDITIONAL PROTOCOLS

TF-SW-GB, TF-SW-6B

As an addition to ISO 18000-6C (EPC Class 1 Gen 2), we offer optional support for ISO 18000-6B, Brazilian protocols such as SINIAV and GB/T29768 protocols for the measurements functionalities in Tag Designer Suite and part of the Application Development Suite.

## CUSTOM COMMANDS

TF-SW-CUS

### EPC

Gen2 tags accept most commands in an open or secured state. With the EPC Custom Command option, it is possible to create EPC commands to be used in TDS test applications.

Commands can be sequenced in order to test commands accessible over multi-step communication process

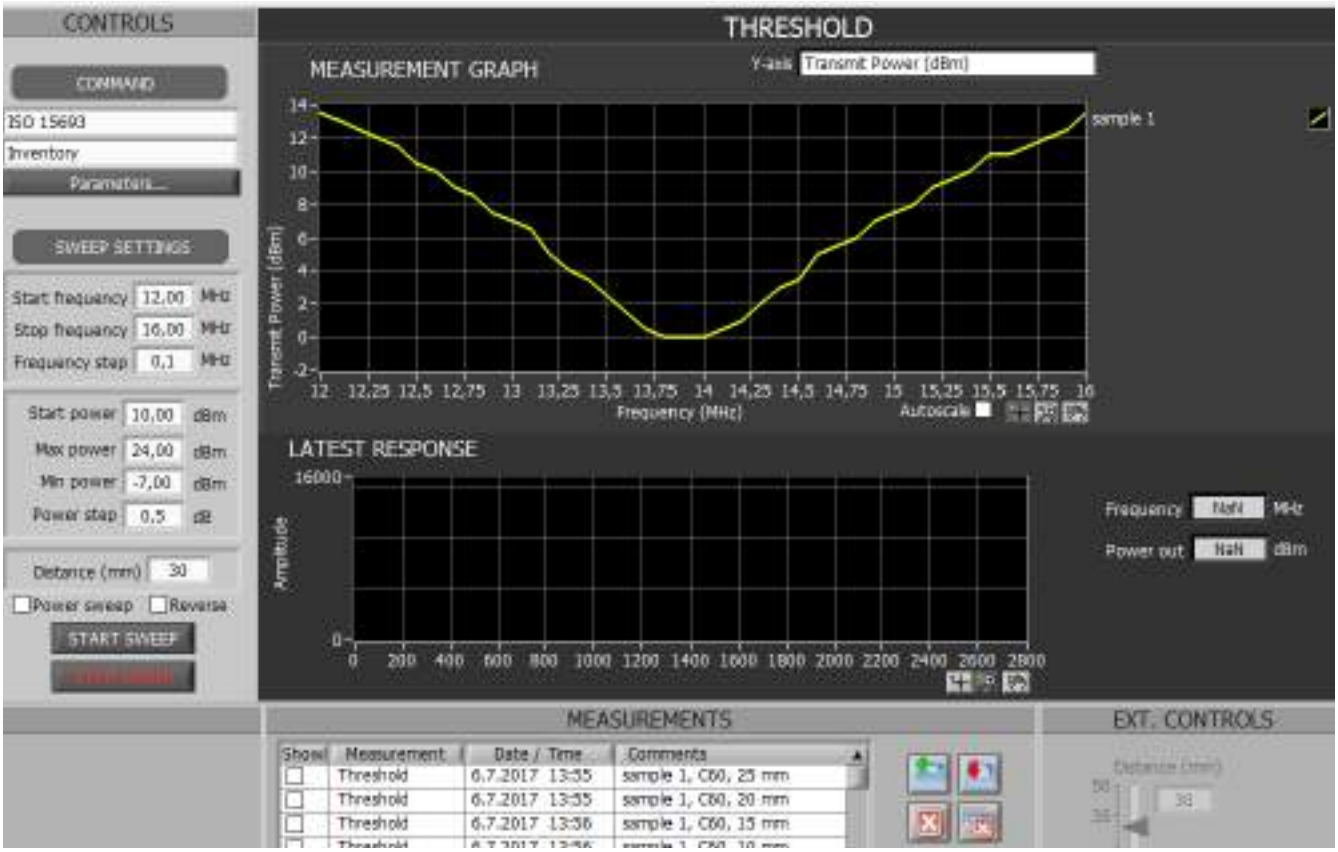
### NON-EPC

With this option, it is possible to create commands that do not follow the EPC standard, and to use the commands in TDS test applications.

ES France - Département RF & Hyperfréquences - 127 rue de Buzenval BP 26 - 92380 Garches
Tél. 01 47 95 99 60 - Fax. 01 47 01 16 22 - e-mail: hyper@es-france.com - Site Web: www.es-france.com

# HF Software: Performance Measurement Suite

**THRESHOLD** TFH-SW-PER




HF RFID / NFC performance testing is a repeatable way to test the tags. The system provides instant feedback on new tag designs, allowing quick prototyping and benchmarking tags for a certain application.

Tag sensitivity is measured with a threshold sweep from 10 to 30 MHz.

Measure the magnetic field strength required to wake up the tag and the load modulation at the threshold power. The read range with profiled reader devices can also be calculated. Magnetic field estimation is only available with C60 and C145 HF antennas.

Supported protocols include ISO 15693, ISO14443A, ISO14443B, Sony Felica, and ISO 18000-3.

Benchmark tags and tag designs

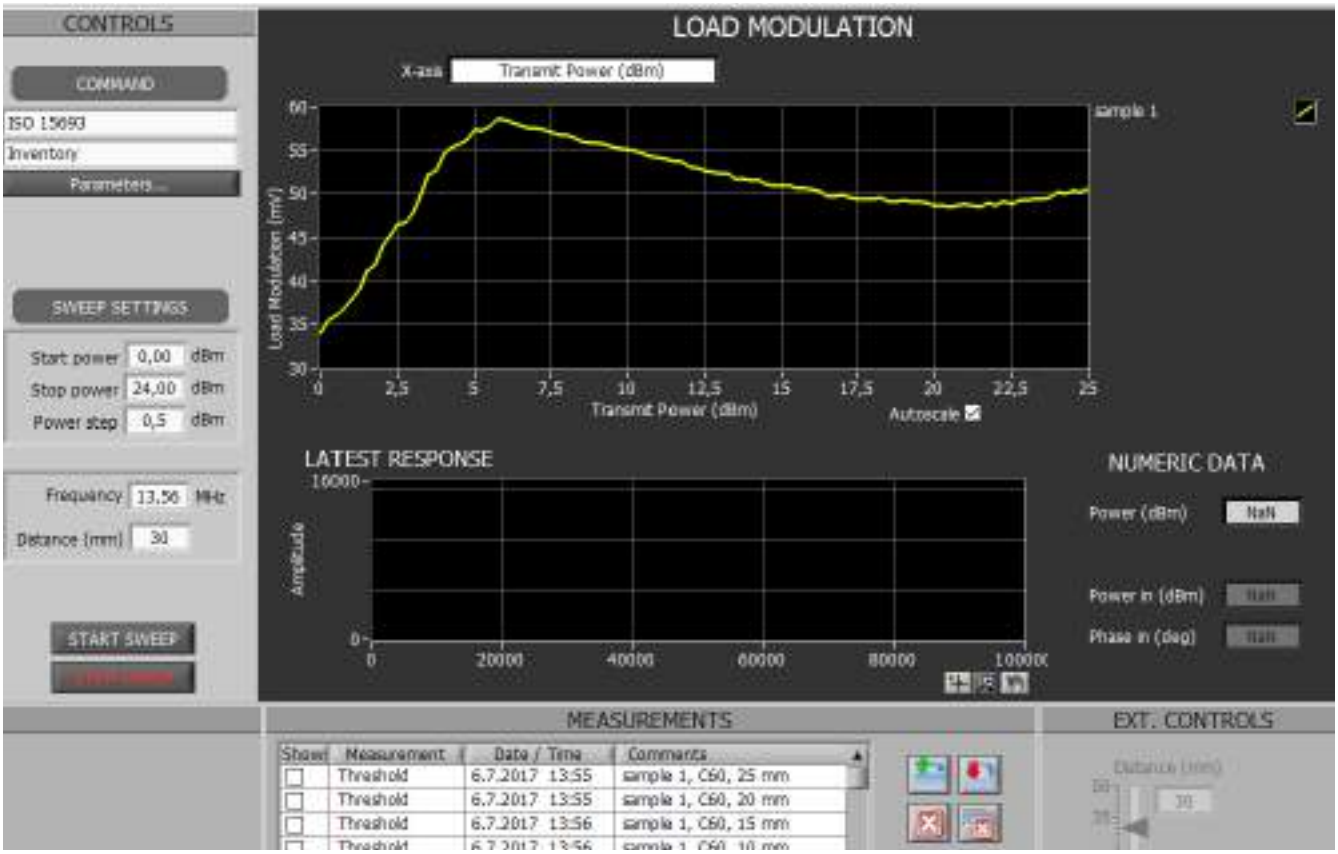
Gain visibility into tag performance

Select tags cost-efficiently

ES France - Département RF & Hyperfréquences - 127 rue de Buzenval BP 26 - 92380 Garches
Tél. 01 47 95 99 60 - Fax. 01 47 01 16 22 - e-mail: hyper@es-france.com - Site Web: www.es-france.com

## LOAD MODULATION

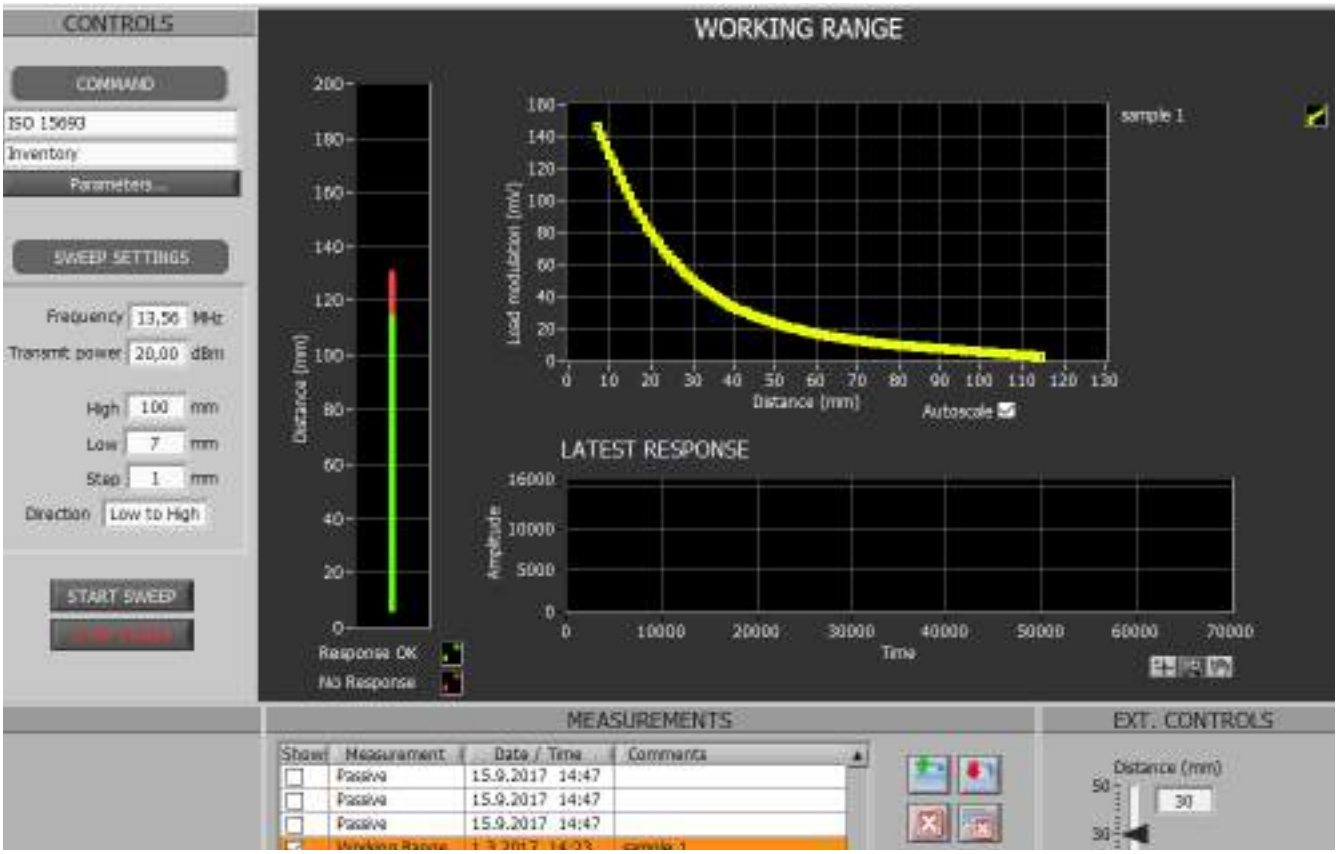
TFH-SW-PER




With this separate measurement mode, the load modulation strength of the tag can be measured separately in relation to the transmitted power to the tag, at a defined frequency. It allows defining how much above the threshold the transmitted power has to be set, to achieve the strongest modulation strength and checking that the modulation keeps stable when transmit power increases. The load modulation can also be plotted in relation to magnetic field strength on the tag.

Find the optimal power level to communicate with the tag

Ensure that the tag performs continuously on all power levels




The working range test is used for comparing tag performance at different distances in practice. This test mode is available only with the Distance Control Kit (see page 41), which holds the tag and adjusts the distance between the tag and the measurement antenna.

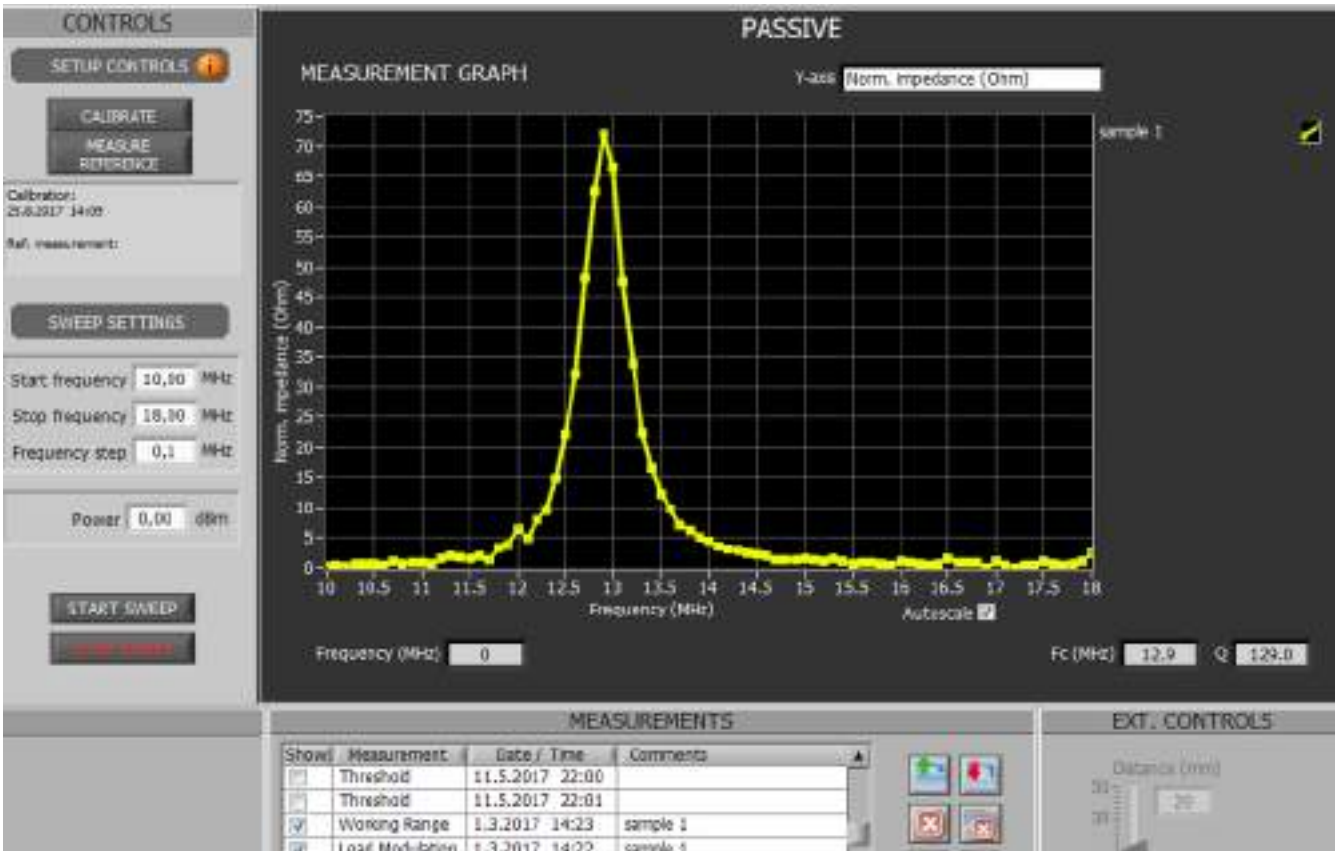
The load modulation is measured in relation to the distance with a user defined distance range and step size. Frequency and transmitted power used are constant, but can be set by the user.

Measure working range with antenna tag combination

Verify tag operability at target distance

## PASSIVE MEASUREMENT

TFH-SW-PER




HF RFID / NFC performance testing is most reliably done with active protocol based measurement, but Tagformance Pro allows also traditional passive testing.

This is especially useful if HF antennas without the IC chip would need to be tested.

Conduct also traditional passive measurement for tags

Measure plain HF antennas without chip

## UHF Accessories

### Anechoic Chambers

| | |
|---|---|
| • RFID Measurement Cabinet | TF-HW-SC |
| • C50 cabinet | TF-AC-C50 |
| • C100 chamber | TF-AC-C100 |
| • C150 chamber | TF-AC-C150 |

### Accessory Kits

| | |
|---|---|
| • Wideband Kit | TF-AC-WBK |
| • Tag Rotation System | CA-HW-ROT |
| • Hand Carry Kit | TFP-AC-UHFS |
| • Field Engineer's Kit | TF-AC-FEK |
| • ETSI RED Test Kit | TFP-AC-RED |

### Components

## HF Accessories

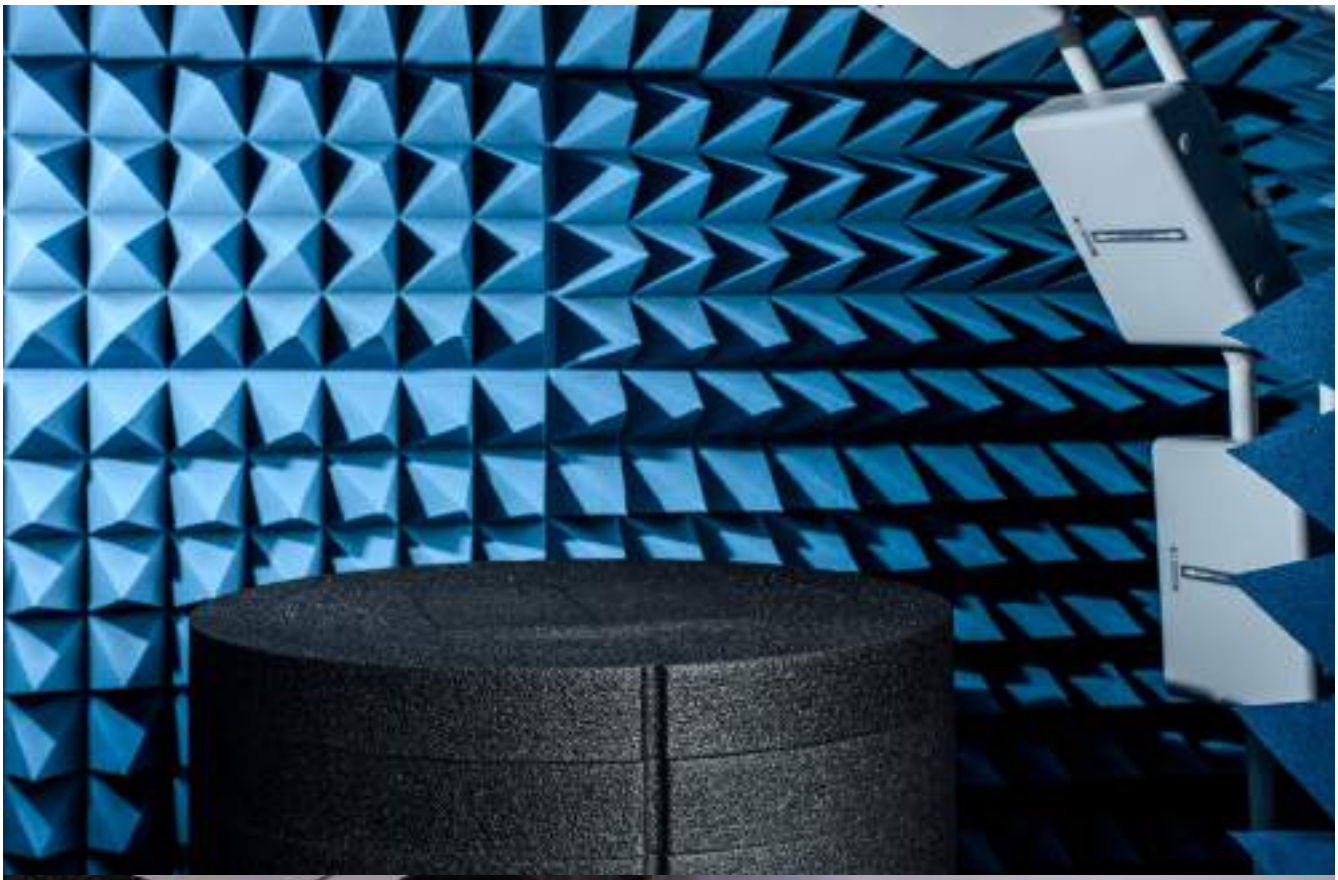
### Accessory Kits

| | |
|---|---|
| • Hand Carry Kit | TFP-AC-HF |
| • Distance Control Kit | TFH-AC-DCK |

### Components

# ACCESSORIES

ES France - Département RF & Hyperfréquences - 127 rue de Buzenval BP 26 - 92380 Garches
Tél. 01 47 95 99 60 - Fax. 01 47 01 16 22 - e-mail: hyper@es-france.com - Site Web: www.es-france.com



Whether you are setting up a lab or taking your measurements to field, our accessories are there to complement your Tagformance Pro Measurement System. We have put a lot of thought into our measurement accessories so that you could use your expertize and effort in tags, RFID applications - or whatever it is that you do - instead of worrying about the measurement tools.

# UHF Accessories: Anechoic Chambers and Cabinets

The RFID measurement cabinets and chambers reduce outside interferences and improve measurement accuracy. They provide an excellent and cost efficient measurement setup bringing the advantages of an anechoic room to your office space with a fraction of the cost. You can be confident that you have an efficient working setup at all times. The absorbers are especially designed for UHF RFID testing.

The standard RFID Mesurement cabinet is a desktop cabinet desined for testing tags only. It has a rotation table, and tests tags from one antenna angle.

C50, C100 and C150 cabinets and chambers have a rotation table, and can test tags or tagged items from four antenna angles. These cabinets are compatibe with the ARC and TIPP measurements. For bigger items a bigger chamber is needed.

**AVAILABLE ADD-ONS:**

- Antenna assemblies with quick release mount and easy 90 degree polarization change
- Automated tag rotation system with adjustable RF friendly tag platform

## RFID MEASUREMENT CABINET

TF-HW-SC

### Electrical Specifications

**Absorber lining:** Fully covering
**Absorber type:** Pyramidal electromagnetic
**Back wall absorber:** 30 cm (12")
- reflectivity
  800-1000 MHz: -34 dB or less

**Rest of the absorbers:** 10 cm (4")
- reflectivity
  800-1000 MHz: -16 dB or less

**Leakage:**
- maximum: 41 dBuV/m
- typical: 35 dBuV/m (at 3 m distance, 800-1000 MHz, using 27 dBm TX power and standard patch antenna)

### Mechanical Dimensions

**Size:** 120 x 80 x 80 cm (47" x 31" x 31")
**Material:** Stainless steel
**Door:** Shielded, opening 45 x 45 cm (17.7" x 17.7")
**Standard measurement distance:** 45 cm (17.7")
**RF connectors:** 2 x N-type feed-through

ES France - Département RF & Hyperfréquences - 127 rue de Buzenval BP 26 - 92380 Garches
Tél. 01 47 95 99 60 - Fax. 01 47 01 16 22 - e-mail: hyper@es-france.com - Site Web: www.es-france.com

## C50 RFID MEASUREMENT CABINET

TF-AC-C50

**Measurement distance:** 50cm
**Multiplexer:** TF-AC-MX4
**Antenna assembly:** 4 Channel Kit for C50 Cabinet TF-AC-4A50. (The Kit includes four standard patch antennas, antenna mount, RF cables and a UHF circulator.)

**Rotation system:** TC-AC-ROT50; Ø 500mm; load at center: max 10kg recommended, absolute max 20kg, (limit is lower off the center)
**Size:** 155 x 150 x 110 cm (61" x 59" x 43")
**Delivery:** Delivery as one piece

## C100 RFID MEASUREMENT CHAMBER

TF-AC-C150

**Measurement distance:** 100cm
**Multiplexer:** TF-AC-MX4
**Antenna assembly:** 4 Channel Kit for C100 Chamber TF-AC-4A100. (The Kit includes four standard patch antennas, antenna mount, RF cables and a UHF circulator.)

**Rotation system:** TC-AC-ROT50; Ø 600mm; load at center: max 10kg recommended, absolute max 20kg, (limit is lower off the center)
**Size:** 230 x 250 x 170 cm (91" x 98" x 67")
**Delivery:** Delivery as one piece or installed on site (installation terms apply)

C50

C100

## C150 RFID MEASUREMENT CHAMBER

TF-AC-C100

**Measurement distance:** 150cm
**Multiplexer:** TF-AC-MX4
**Antenna assembly:** 4 Channel Kit for C50 Chamber TF-AC-4A150. (The Kit includes four standard patch antennas, antenna mount, RF cables and a UHF circulator.)

**Rotation system:** TC-AC-ROT50; Ø 600mm; load at center: max 10kg recommended, absolute max 20kg, (limit is lower off the center)
**Size:** 300 x 320 x 200 cm (118" x 126" x 79")
**Delivery:** Installed on site (installation terms apply)

## ADD-ONS FOR RFID MEASUREMENT CABINETS

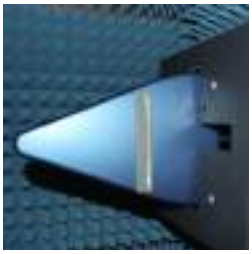
### Standard Antenna Assembly for Cabinets

CA-AN-SR


Assembly Contents:
- Standard Patch Antenna 800-1000 MHz
- Antenna Mount
- RF Cables
- UHF Circulator

### Wideband Antenna Assembly for Cabinets

CA-AN-WB




Assembly Contents:
- Wideband Antenna 600-1300 MHz
- Antenna Mount
- RF Cables
- Directional Coupler

### Tag Rotation System for RFID Measurement Cabinet

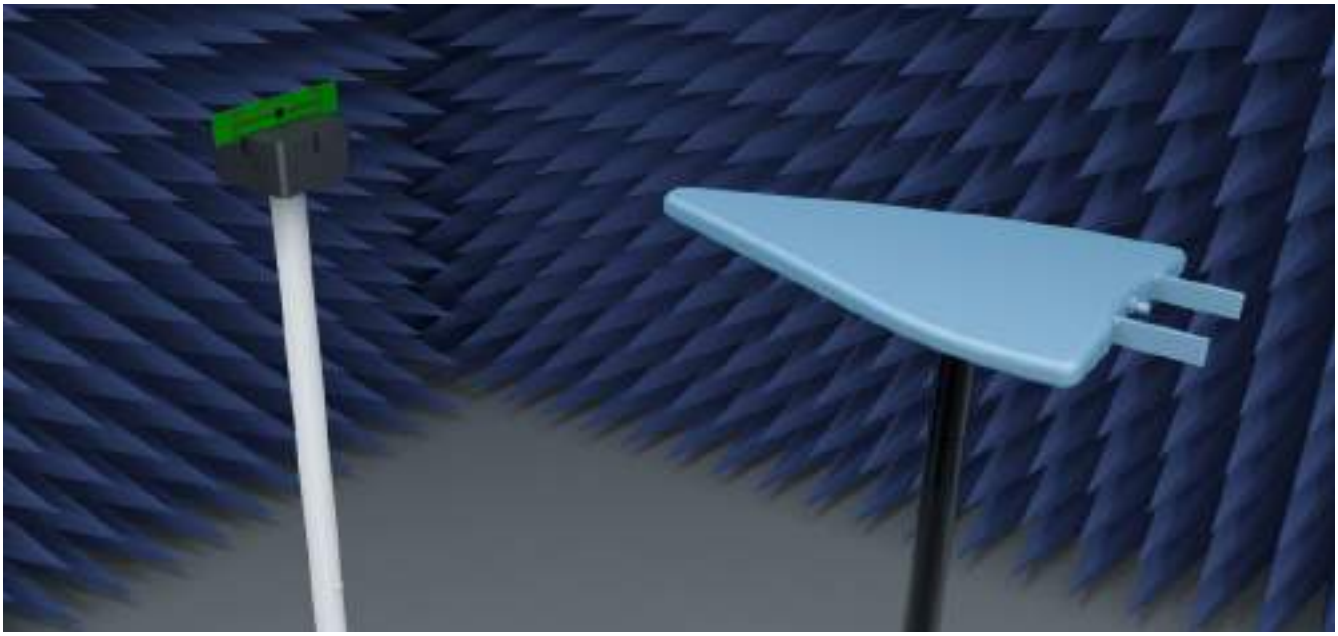
CA-HW-ROT


Assembly Contents
- Stepper, driver and DAQ-pack
- Drive Shaft
- Orientation Platform with belt drive
- USB and power cables

ES France - Département RF & Hyperfréquences - 127 rue de Buzenval BP 26 - 92380 Garches
Tél. 01 47 95 99 60 - Fax. 01 47 01 16 22 - e-mail: hyper@es-france.com - Site Web: www.es-france.com

# UHF Accessories: Kits

**Wideband Kit** TF-AC-WBK



Wideband Kit is an out of the box antenna solution for wideband measurements. Used with the Wideband Sweep Range (Tagformance Pro option), the Wideband Kit extends your laboratory measurement system to the 600-1300 MHz range. Wideband range is ideal especially for inlay development.

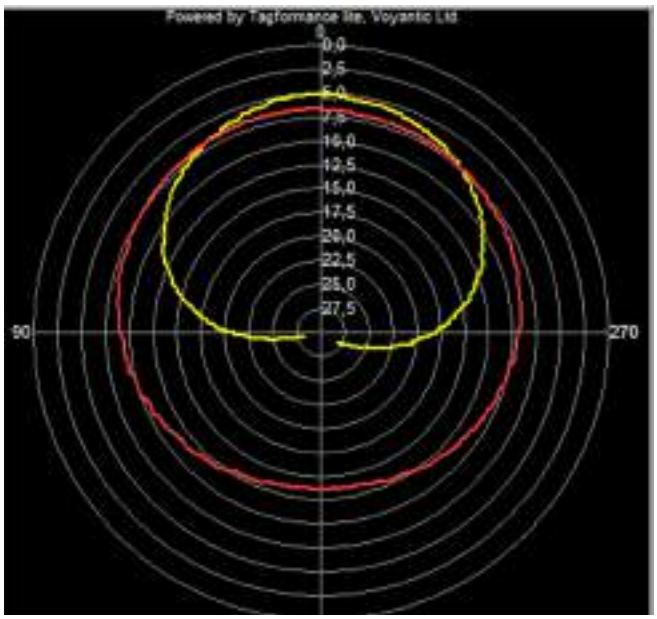
## KIT CONTENTS

- Directional Coupler
- Wideband Antenna 600-1300 MHz
- RF Cable 1.8 m (6 ft)
- Antenna Stand 50-150 cm (2 to 5 ft)
- Tag Stand 50-150 cm (2 to 5 ft)
- Tag Stand tabletop setup 35 cm (13.8″)
- Water and shockproof carrying case

ES France - Département RF & Hyperfréquences - 127 rue de Buzenval BP 26 - 92380 Garches
Tél. 01 47 95 99 60 - Fax. 01 47 01 16 22 - e-mail: hyper@es-france.com - Site Web: www.es-france.com

## TAG ROTATION SYSTEM (STAND-ALONE)

TF-AC-ROT




The Tag Rotation System supplements the Tag Designer Suite's Orientation Sensitivity measurement. It is a very straightforward solution - just connect the power and the USB and you have the capability to do automated Orientation Sensitivity measurements. The adjustable RF friendly platform integrates seamlessly with Tagformance.

## TECHNICAL DETAILS

- Diameter: 50 cm (19.7")
- Load capacity: 20 kg (44 lbs)
- Angle steps: 1, 5, 10, 15 or 30 degrees
- 5m USB 2.0 type-A cable
- Power supply 110/240VAC input

ES France - Département RF & Hyperfréquences - 127 rue de Buzenval BP 26 - 92380 Garches
Tél. 01 47 95 99 60 - Fax. 01 47 01 16 22 - e-mail: hyper@es-france.com - Site Web: www.es-france.com

## HAND CARRY KITS

The Hand Carry Kit offers the easiest and the most affordable starter setup for running basic measurements with Tagformance Measurement Software. This kit will easily follow you wherever your measurement needs may take you.

### HAND CARRY KIT WITH STANDARD ANTENNA

TFP-AC-UHFS

#### KIT CONTENTS

- Circulator with attenuator and RF cable
- Standard Patch antenna 800-1000 MHz
- RF Cable 1.8 m (6 ft)
- Tag Stand (RF-friendly foam)
- Rugged, waterproof carrying case

A combined kit, Hand Carry Kit UHF and HF (TFP-AC-UHFHF), is available and includes both Hand Carry Kit UHF (TFP-AC-UHFS) and Hand Carry Kit HF (TFP-AC-HF) accessories.

### HAND CARRY KIT WITH WIDEBAND ANTENNA

TF-HW-HWB

#### KIT CONTENTS

- Directional Coupler
- Wideband Antenna 600-1300 MHz
- RF Cable 1.8 m (6 ft)
- Tag Stand (RF-friendly foam)
- Rugged, waterproof carrying case

## FIELD ENGINEER'S KIT

TF-AC-FEK

The Field Engineer's Kit offers a bistatic (dual antenna) setup, as well as a circulator for monostatic measurements. Tag and antenna stands are provided for quick and flexible setup. On top of that, the Field Engineer's Kit also includes the same mini setup for inlay and on-metal tags as the Hand Carry Kit.

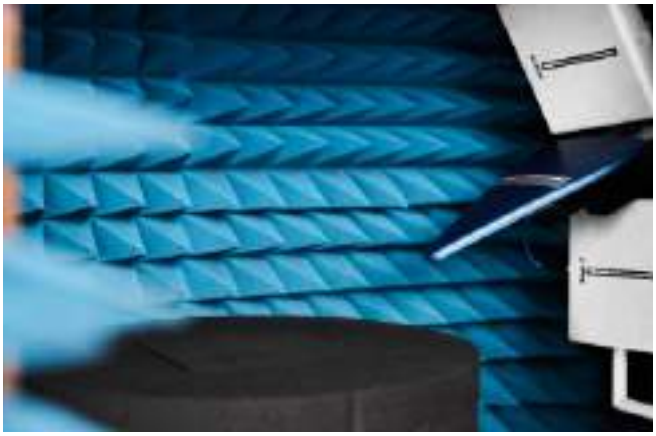
### KIT CONTENTS

- Circulator with attenuator and RF-cable
- 2 x Standard Patch antenna 800-1000 MHz
- 2 x RF Cable 1.8 m (6 ft)
- Antenna Stand 50-150 cm (2 to 5 ft)
- Tag Stand 50-150 cm (2 to 5 ft)
- Mini Tag Stand 10-30 cm (4" to 12")
- Rugged, waterproof carrying case
- Measurement tape

ES France - Département RF & Hyperfréquences - 127 rue de Buzenval BP 26 - 92380 Garches
Tél. 01 47 95 99 60 - Fax. 01 47 01 16 22 - e-mail: hyper@es-france.com - Site Web: www.es-france.com

## ETSI RED TEST KIT

TFP-AC-RED



RED is the Radio Equipment Directive 2014/53/EU applying to all radio equipment that is used in Europe. The directive aims at utilizing the limited frequency spectrum that we have, at the maximum benefit to those utilizing the spectrum according to regulations.

This means that various radio systems can co-exist and be relied on, and do not put the health of users at risk.

## TEST SETUP

Voyantic Tagformance with the ETSI RED Test Kit supports multiple test setups.

- The test can be made with and without the High Power Kit
- The test can be made with one or two antenna configuration

The chamber size and distance between the tag and the antenna define which setup should be used.

## KIT CONTENTS

- Wideband antenna with cabinet mount
- 1.8 m N-SMA RF cable
- Directional coupler
- 35 cm N-N RF cable
- N-SMAf adapter
- 6 dB attenuator
- Spectrum analyzer with USB3 cable
- Trigger wire from Spectrum Analyzer to Tagformance

# UHF Accessories: Components

## MULTIPLEXER

TF-AC-MX4

The Multiplexer is especially developed for UHF RFID testing purposes in a laboratory environment. Multiplexer connects to a PC via USB and integrates with the Tagformance software.

### SPECIFICATIONS

- Impedance: 50 Ohm
- Frequency range: DC – 18 GHz
- Insertion loss: 0.2 dB typ.
- Isolation: 85 dB typ.
- Switching speed: 20 milliseconds
- Dimensions: 8.5 x 17 x 23.5 cm ( 3.3" x 6.7" x 9.3")
- Connectors: N-female

### DELIVERY CONTENTS

- Multiplexer unit
- 5 x RF cables (N-male to N-male)
- Power source and cable
- USB cable

## HIGH POWER KIT

TFP-HW-HPK2

The High Power Kit extends the output power range of the Tagformance system to 36 dB TX (>40 dBm typical radiated power).

The Power Amplifier is calibrated and can be enrolled into the Maintenance Program with the Tagformance Pro for annual calibration and extended warranty. The frequency range is 600-1300 MHz.

### DELIVERY CONTENTS

- Power Amplifier with power cable
- 3 x RF cables (N-male to N-male)
- 15 dB attenuator
- RF coupler

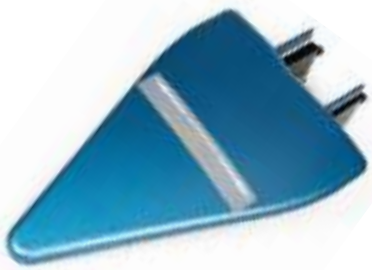
## STANDARD PATCH ANTENNA (800-1000MHZ)

AN-FF-SR

| | |
|---|---|
| Frequency range: | 800-1000 MHz |
| Dimensions: | 20 x 20 x 4.3 cm (7.9" x 7.9" x 1.7") |
| Gain: | 8 dBi nominal, actual gain curve is delivered with Tagformance system |
| Polarization: | linear, vertical |
| Connector: | N-type (female) |

## WIDEBAND ANTENNA (600-1300MHZ)

AN-FF-WB



| | |
|---|---|
| Frequency range: | 600-1300 MHz |
| Dimensions: | 34 x 20 x 2.5 cm (13.4" x 7.9" x 1") |
| Gain: | 5 dBi nominal, actual gain curve is delivered with Tagformance system |
| Polarization: | linear, horizontal |
| Connector: | SMA-type (female) |

## CIRCULAR POLARIZED ANTENNA (800-1000MHZ)

AN-FF-CIR

| | |
|---|---|
| Frequency range: | 800-1000 MHz |
| Dimensions: | 25 x 25 x 4.5 cm (9.8" x 9.8" x 1.8") |
| Gain: | 8 dBi typical |
| Polarization: | circular |
| Connector: | N-type (female) |

## SNOOP PRO NEAR FIELD COUPLING ELEMENT

AN-SP-D10

Snoop Pro is developed for testing inlays and tags with a dipole antenna. The unique structure enables accurate testing based on electrical field. The changeable shielding plate shields out the adjacent tags and enables measuring only the one of interest.
Connector: SMA-female

ES France - Département RF & Hyperfréquences - 127 rue de Buzenval BP 26 - 92380 Garches
Tél. 01 47 95 99 60 - Fax. 01 47 01 16 22 - e-mail: hyper@es-france.com - Site Web: www.es-france.com

## UHF REFERENCE TAG

TF-AC-WBT


The reference tag is used with Tagformance system "measured path loss" functionality to compensate for the reflections in the environment. This procedure allows achieving corresponding results independent of the measurement lab used.

## RF CABLE

TF-AC-CB6

| | |
|---|---|
| Length: | 1.8 m (6 ft) |
| Cable loss: | 0,7 dB (600-1300 MHz) |
| Connector options: | N-male to N-male<br>N-male to SMA-male<br>SMA-male to SMA-male |

## UHF CIRCULATOR

TF-AC-CIRC

| | |
|---|---|
| Frequency range: | 800-1000 MHz |
| Impedance: | 50 Ohm |
| Isolation TX to RX: | >20 dB (with 50 Ohm load) |
| Insertion loss TX to ANT: | 0.2 dB |
| Insertion loss ANT to RX: | 0.2 dB |
| Maximum input power: | 10 Watt (+40 dBm) |
| Ambient operation temp: | 0-50°C |

Delivery contents:

- UHF Circulator unit
- N-male to N-male adapter
- RF cable (N-male to N-male)
- 6dB attenuator (50 Ohm)

ES France - Département RF & Hyperfréquences - 127 rue de Buzenval BP 26 - 92380 Garches
Tél. 01 47 95 99 60 - Fax. 01 47 01 16 22 - e-mail: hyper@es-france.com - Site Web: www.es-france.com

## DIRECTIONAL COUPLER

TF-AC-DCP

| | |
|---|---|
| Frequency range: | 600-1300 MHz |
| Impedance: | 50 Ohm |
| Insertion loss TX to ANT: | 1.2 dB |
| Insertion loss ANT to RX: | 6.5 dB |
| Maximum input power: | 250 Watt (+54 dBm) |

Delivery contents

- Directional Coupler unit
- 2 x RF cable (N-male to N-male)

## REFERENCE MATERIAL SET

TF-AC-RMS

When an RFID tag is attached to an item, the antenna tuning and overall performance of the tag changes. The change varies by material and may be significant. Voyantic Reference Material Set can be used to evaluate these changes. Using the same reference materials guarantees comparable results between different sites. Sheet size: 130x130mm

Materials included in the set:

| | |
|---|---|
| • Cardboard | thickness 2mm, density 0.75 g/cm$^3$ |
| • Glass | thickness 4mm, 73% silicon dioxide, 15% sodium carbonate, 10% calcium carbonate, 2% additives |
| • PTFE | thickness 4mm, density 2.18g/cm$^3$, Guarniflon PTFE G400 |
| • Rubber | thickness 2mm, density 1.55g/cm$^3$, SBR standard |
| • Fiberglass | thickness 3.2mm, density 1.85 g/cm$^3$, Ventec VT-481 |
| • Polycetal | thickness 4mm, density 1.41g/cm$^3$, Ertacetal C |
| • PVC | thickness 4mm, density 1.4g/cm$^3$, Etradur |
| • Stainless steel | thickness 1mm |

## CONNECTIORIZED TAG

TF-AC-CTA

Connectorized tag with 0dB attenuation can be used for measuring UHF RFID reader antennas with Tagformance Pro.

ES France - Département RF & Hyperfréquences - 127 rue de Buzenval BP 26 - 92380 Garches
Tél. 01 47 95 99 60 - Fax. 01 47 01 16 22 - e-mail: hyper@es-france.com - Site Web: www.es-france.com

# HF Accessories: Kits

## HAND CARRY KIT HF

TFP-AC-HF

The Hand Carry Kit for HF measurements includes all essential accessories to measure HF RFID / NFC tags' performance. With this kit we also recommend the Distance Control Kit, which can be fitted in the same same carrying case.

### KIT CONTENTS

- Loop antenna C145
- Loop antenna C60
- Antenna cable N-SMA
- HF Coupler
- 50 ohm termination
- Rugged, waterproof carrying case

A combined kit, Hand Carry Kit UHF and HF (TFP-AC-UHFHF), is available and includes both Hand Carry Kit UHF (TFP-AC-UHFS) and Hand Carry Kit HF (TFP-AC-HF). The Distance Control Kit (TFH-AC-DCK) can be fitted in this combi kit as well.

## DISTANCE CONTROL KIT

TFH-AC-DCK

Automated Distance Control Kit is an easy way to adjust the distance between the measurement antenna and the tag to be tested. The measurement distance can be set repeatedly to correct value.

The working range measurement in HF RFID Performance Measurement Suite uses the Automated Distance Control Kit.

### KIT CONTENTS

- Mechanics
- Power supply
- RS232 cable
- USB/RS232 adapter

# HF Accessories: Components

## HF ANTENNA C60

PART-TFH-HCK-C60

The HF antenna C60 is a loop antenna with 60 mm diameter. It is optimized for Tagformance measurements and is connected with an SMA connector.

### DELIVERY CONTENTS

- C60 antenna
- C60 spacer foam

## HF ANTENNA C145

PART-TFH-HCK-C145

The HF antenna C145 is a loop antenna with 145 mm diameter. It is optimized for Tagformance measurements and is connected with an SMA connector.

### DELIVERY CONTENTS

- C145 antenna
- C145 spacer foam

## SNOOP PRO HF ANTENNA

AN-SP-HF

Snoop Pro HF is developed for testing HF inlays and tags. The structure contains two separate coil structures optimized for testing tags of different size. The changeable shielding plates enable measuring only the tag of interest, and the opening is optimized based on the tag size. Connector: SMA-female

## HF COUPLER

TFP-AC-HFC

Frequency range: 10-30MHz
Impedance: 50 Ohm

### DELIVERY CONTENTS

- HF RFID Coupler
- RF cable (N-male to N-male), 33cm
- N-male to N-male adapter

## HF REFERENCE TAG

TFP-AC-HTA

The HF RFID reference tag is used for verifying that HF RFID measurement setup is correctly installed. The reference tag uses ISO 15693 protocol.

# READFORMANCE V2

The Voyantic Readformance is a system for RAIN RFID reader characterization and benchmarking. It can be used in reader development, reader selection and manufacturing.

The system enables verifying the transmit power, and determining the sensitivity of readers, both conductively and in the radiated field. The system also provides means for monitoring and analyzing the communication between the reader and a tag.

## Key Functionalities

- Verify the transmit power
- Determine the reader sensitivity
- Analyze the effect of backscatter attenuation and phase shifting
- Perform both conductive (readers with antenna connectors) and radiated field (readers with integrated antennas) measurements
- Use different reader parameters
- Record and analyze the communication between the reader and a tag (with Protocol Analyzer extension)

Conductive measurement setup

Radiated measurement setup

ES France - Département RF & Hyperfréquences - 127 rue de Buzenval BP 26 - 92380 Garches
Tél. 01 47 95 99 60 - Fax. 01 47 01 16 22 - e-mail: hyper@es-france.com - Site Web: www.es-france.com

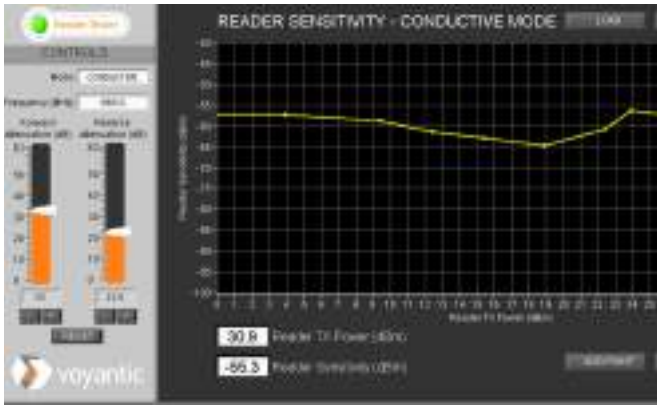
## READFORMANCE TEST SYSTEM

RT-BS-RTS

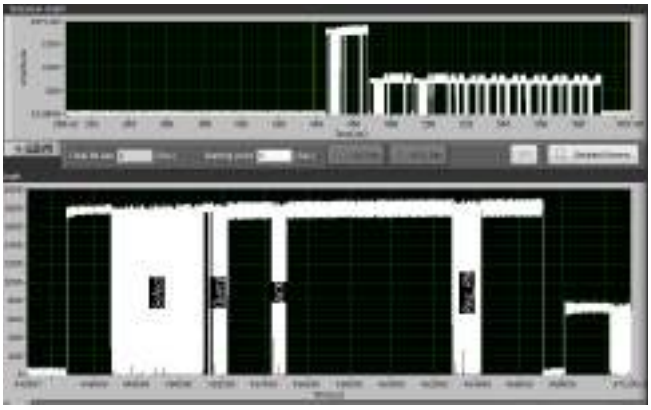
## DELIVERY CONTENTS

- Readformance test Unit
- Connectorized tag
- USB cable
- Readformance software
- Standard patch antenna
- RF cable, 1.8 cm, N-N
- Rugged, waterproof carrying case
- Foam stand (foam stand comes inside the carrying case)

With Protocol Analyzer extension reader to tag communication can be recorded and analyzed. You can see sent commands, their data contents, and timing parameters. The visibility to communication helps in problem solving and in optimizing reader firmware and software. See details under Protocol Analyzer section.




Readformance graphical user interface



Protocol Analyzer reveals communication details

# PROTOCOL ANALYZER

Protocol Analyzer can be used to record, visualize and analyse EPC Gen2 UHF RFID communication between a tag and a reader. You can see sent commands as waveforms. The system automatically parses commands of selected recordings, and analyzes and shows the commands' data contents and timing parameters, as well as tag responses with their contents and timing parameters.

Visibility into the reader-tag communication helps with troubleshooting. Knowing exactly what is going on between the tag and the reader enables optimizing reader firmware and software for highest speeds and best system performance. The recordings can be saved and shared easily.

The system consists of hardware and software components.

## Features & Benefits

- Gain better visibility into the reader-tag communication.
- Benchmark RAIN RFID readers
- See details of reader to tag communication and analyze timings
- Troubleshoot RFID systems
- Make quick analysis between RFID reader's HW and FW revisions

### PROTOCOL ANALYZER HARDWARE

SN-HW-SYS

Using protocol analyzer in radiated mode

Using protocol analyzer in conductive mode

### DELIVERY CONTENTS FOR RADIATED MODE

- Airspy with a USB cable and antenna for conductive mode
- Directional coupler
- 35 cm N-N cable
- SMA-SMA adapter
- 1 m N-SMA RF cable

Note: if the reader and the antenna have other connector types, an additional adapter/cable may be needed.

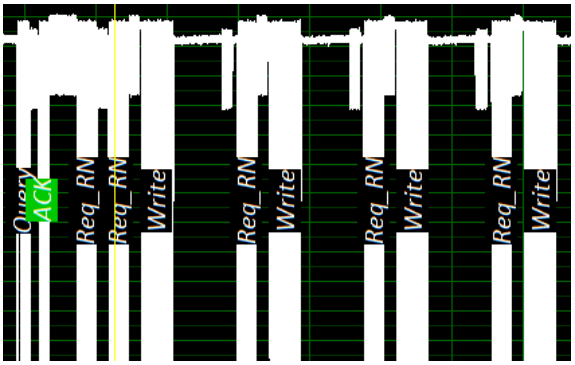
Note: Airspy is available at the Airspy webstore

ES France - Département RF & Hyperfréquences - 127 rue de Buzenval BP 26 - 92380 Garches
Tél. 01 47 95 99 60 - Fax. 01 47 01 16 22 - e-mail: hyper@es-france.com - Site Web: www.es-france.com

## PROTOCOL ANALYZER SOFTWARE

SN-SW-SYS

Protocol analyzer Graphical User Interface




Automatic parsing of reader commands and tag responses

## Benefits

- Get instant visibility to the RF interface
- Improve RFID system performance by knowing what reader does and how tags respond
- Save time in troubleshooting RFID systems
- Write reader software more efficiently

```
ACK:
Starting time(us): 510496
Random Number:0100001101011001

    ACK response:
    Number of bits: 128
    PC code: 0011000000000000
    Number of bits of data: 96
    User memory indicator: No data available
    XPC: Not used
    Number system indicator: 000000000
    EPC: E2004205E99060140078B7309
    PackedCRC: Matched

----------------------------------------

Frame_sync:
Start time(us): 510496
Delimiter: 11,00
Tari: 13,00
pw: 2,70
RTcal: 30,90

    BLF(kbps): 162,940
    Encoding type: M2 Extended
```

Protocol and timing analysis

ES France - Département RF & Hyperfréquences - 127 rue de Buzenval BP 26 - 92380 Garches
Tél. 01 47 95 99 60 - Fax. 01 47 01 16 22 - e-mail: hyper@es-france.com - Site Web: www.es-france.com

## Confidence

Access to priority support with professional consulting services gives you confidence that your system is always performing to the highest standards.

## Reliability

Extended warranty covers all hardware and accessories ensuring reliable, uninterrupted operations.

## Accuracy

Annual calibration with Calibration Certificate and a spare device during service ensures you always get maximum accuracy.

## Continuity

Access to performance improvements via regualar software updates ensures you keep up with the industry development.

# MAINTENANCE PROGRAM

ES France - Département RF & Hyperfréquences - 127 rue de Buzenval BP 26 - 92380 Garches
Tél. 01 47 95 99 60 - Fax. 01 47 01 16 22 - e-mail: hyper@es-france.com - Site Web: www.es-france.com

The Maintenance Program is designed to make owning and using Voyantic measurement systems as **easy and carefree** as possible. You can concentrate on your core business as we take care of the measurement equipment and train you to use them efficiently.

## TECHNICAL SUPPORT

The online support and training are available through web conferencing, email and phone. Whenever you face a problem, uncertainty or just want to have a second opinion, we are pleased to consult your case.

## EXTENDED WARRANTY

Devices enrolled in the maintenance program are eligible for extended warranty. The extended warranty covers any hardware issues induced in normal use. We will either repair or replace your device or accessories and provide you with a replacement unit during maintenance.

## ANNUAL CALIBRATION

As a maintenance customer, you are entitled to send your unit once a year for annual calibration to Voyantic. For the period the device is in calibration you will receive a free replacement unit sent to you on Voyantic's account, and sent back on your own account.

After the calibration, you will receive a certificate of the calibrations as well as a calibration report.

## SOFTWARE UPDATES

To better serve the industry, we strive towards continuous development. To keep on pace with the customer requirements, we release software updates frequently. Maintenance customers receive all software updates without an additional charge.

| | NO MAINTENANCE | MAINTENANCE PROGRAM CUSTOMERS |
|---|---|---|
| **SOFTWARE UPDATES** | • Software updates need to be purchased separately | ✓ Annual software **updates are included** |
| **CALIBRATION TRACE** | • Factory calibration of a new device is valid for the first twelve months<br>• Calibrations need to be purchased separately | ✓ **Annual calibrations** done with a traceable certificate<br>✓ **Spare device** provided for free during the calibration service |
| **WARRANTY** | • One year standard hardware warranty covering only manufacturing and material errors | ✓ **Extended warranty** is valid for the entire Maintenance Program<br>✓ Extended warranty also **covers errors and accidental damage beyond material and manufacturing errors*** |
| **TECHNICAL SUPPORT** | • Support enquiries available via email | ✓ **Online, email or phone support and custom online trainings** available upon request<br>✓ Technical support **response time within one business day**<br>✓ **Professional consulting** on test results available upon request |

*Terms and conditions apply

ES France - Département RF & Hyperfréquences - 127 rue de Buzenval BP 26 - 92380 Garches
Tél. 01 47 95 99 60 - Fax. 01 47 01 16 22 - e-mail: hyper@es-france.com - Site Web: www.es-france.com

Voyantic solutions are designed to speed up development, improve production quality, and increase sales of RFID technology. We have a proven track record with hundreds of solutions delivered to more than 30 countries around the globe. We continuously invest in R&D and improve the technology. Our distributor network brings our products & support to customers worldwide.

Voyantic

Voyantic Ltd. • Tel. +358 20 788 81 90

ES France - Département RF & Hyperfréquences - 127 rue de Buzenval BP 26 - 92380 Garches
Tél. 01 47 95 99 60 - Fax. 01 47 01 16 22 - e-mail: hyper@es-france.com - Site Web: www.es-france.com