Reading performance of animal radio frequency transponders

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Innovative Modern Agriculture - Wageningen

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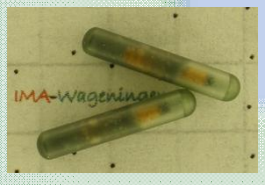
Animal Identification standards: ISO 11784 & ISO 11785

ISO 11784: Radiofrequency identification of animals – Code structure

ISO 11785: Radiofrequency identification of animals – Technical concept

- HDX
- FDX-B



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Animal Identification standards: Test procedures

Test procedures:

- Developed by
  - ISO TC23\SC19\WG3
  - ICAR
- Procedures for:
  - Transponders
  - Transceivers
- Guaranteeing worldwide readability
- Making a founded selection of the available products
- Registration authority: ICAR (www.icar.org)

International Organization for Standardization

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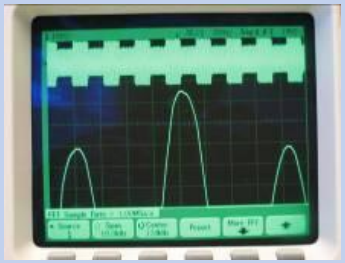
ISO 11784 & ISO 11785 conformance testing

ISO 24631-1: Radiofrequency identification of animals -- Part 1: Evaluation of conformance of RFID transponders with ISO 11784 and ISO 11785 (including granting and use of a manufacturer code)



- Readability check:
  - Read by reference reader
  - Telegram structure
  - Identification code
  - CRC calculation (cycle redundancy check)
- Quality check
  - Resonance frequencies
  - Modulation side bands
- Responsibility has been taken for guaranteeing uniqueness ID
  - Country codes [001 .. 899 (ISO 3166) + 12 digit id code] ← Uniqueness of codes national responsibility!!!!
  - Manufacturer code [901 .. 998 + 12 digit id code]
  - Shared manufacturer code [900 + specific 12 digit id code]

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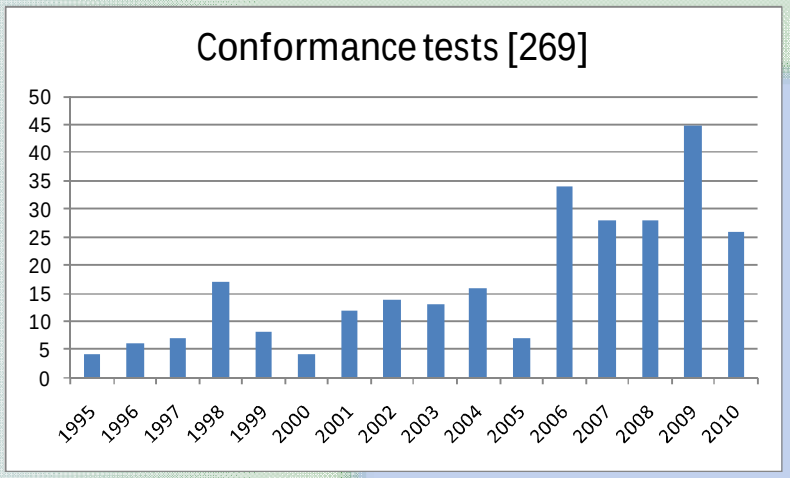
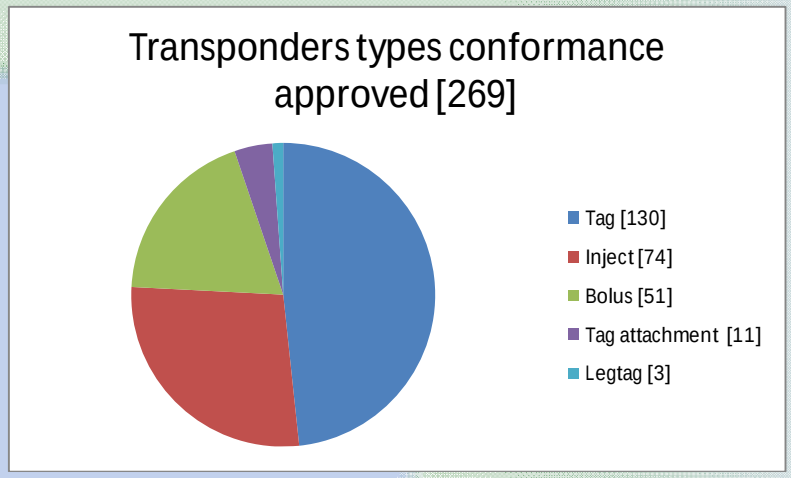
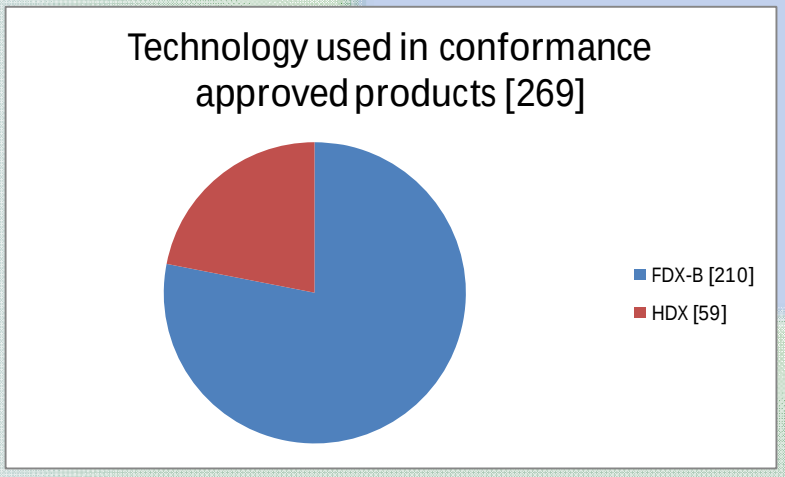
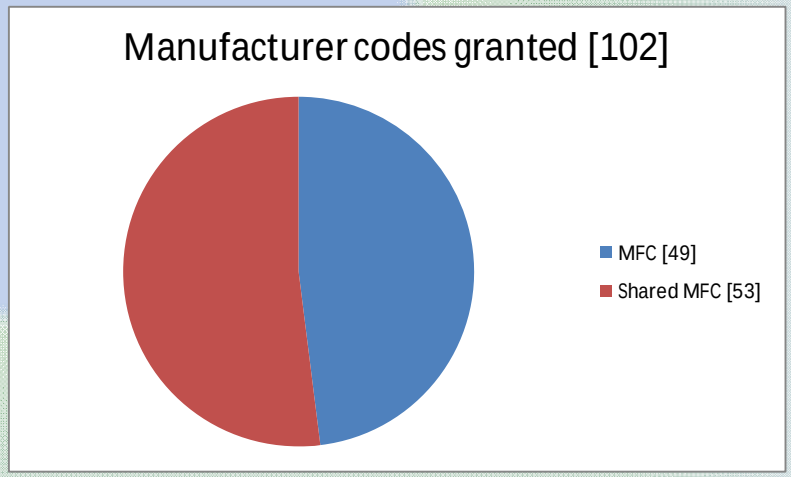
ISO 24631-1 conformance tested products 2010-06









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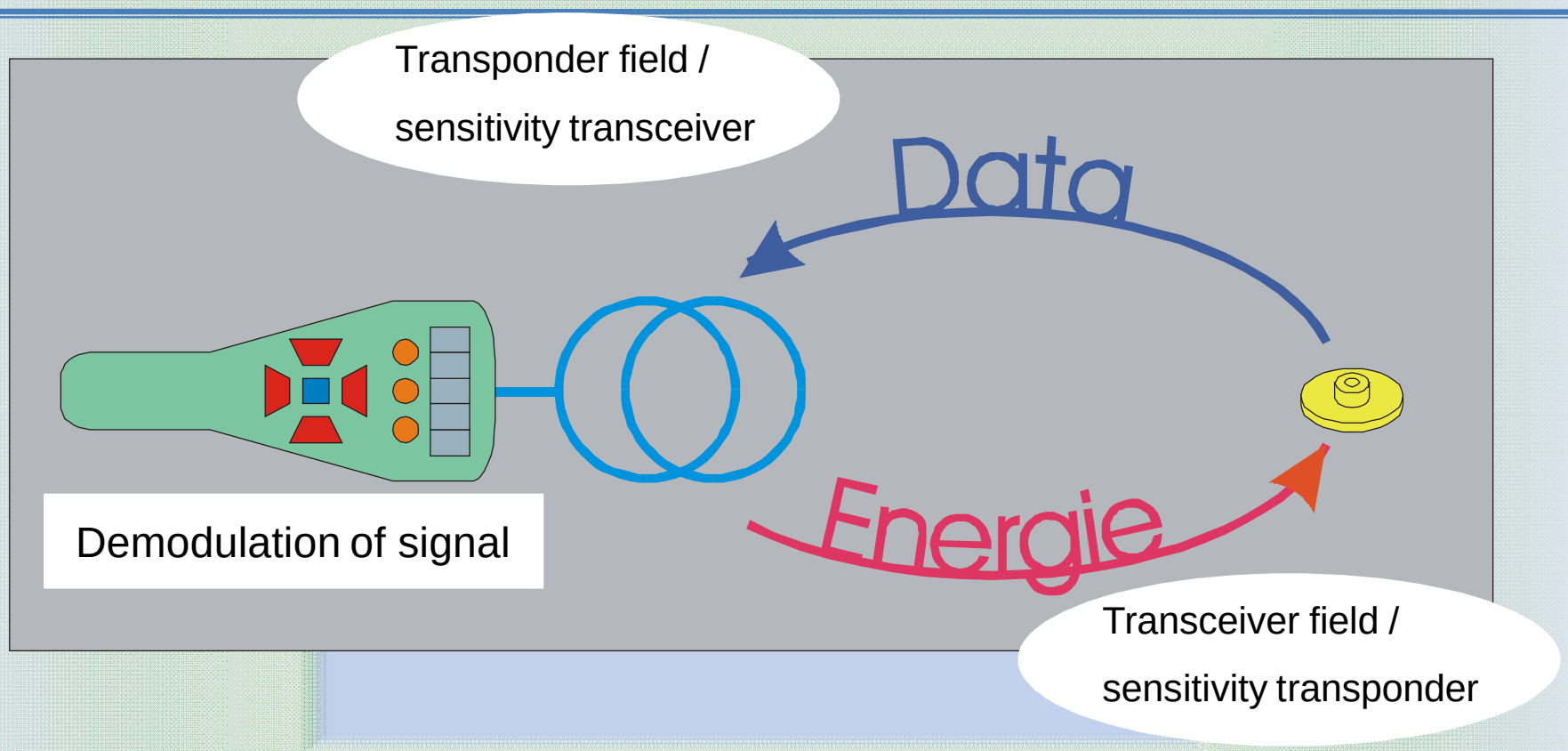
Principle of RFID (reading process)



Readability influenced by transceiver & transponder

➔ Independent testing

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Possible approach for testing

- Test every reader with every transponder
  - Complex
  - Expensive
  - What to use as approval criteria
- Use a ‘golden reader’ as reference
  - Who will provide such a reader (RFID manufacturer?)
  - Will it be available for every test center
  - How to calibrate
- Approach was chosen to measure physical parameters

“Electronic passports” and item management

➔ test procedures measuring physical parameters

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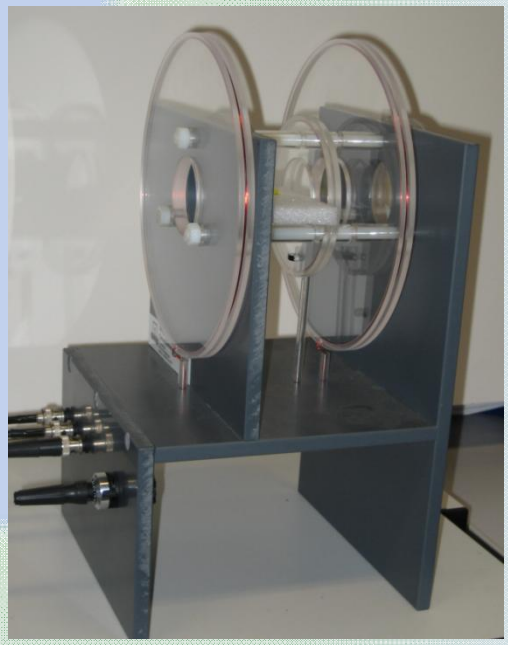
ISO 11784 & ISO 11785 performance testing transponders

ISO 24631-3: Radiofrequency identification of animals -- Part 3: Evaluation of performance of RFID transponders conforming with ISO 11784 and ISO 11785

Parameters measured:

- Transponder minimum activating field strength
  - (energy needed for full telegram)
- Transponder modulation amplitude
  - (strength of the transponder signal)
- FDX-B bit length stability
- HDX frequency stability
  - (correct tuning antenna circuit)



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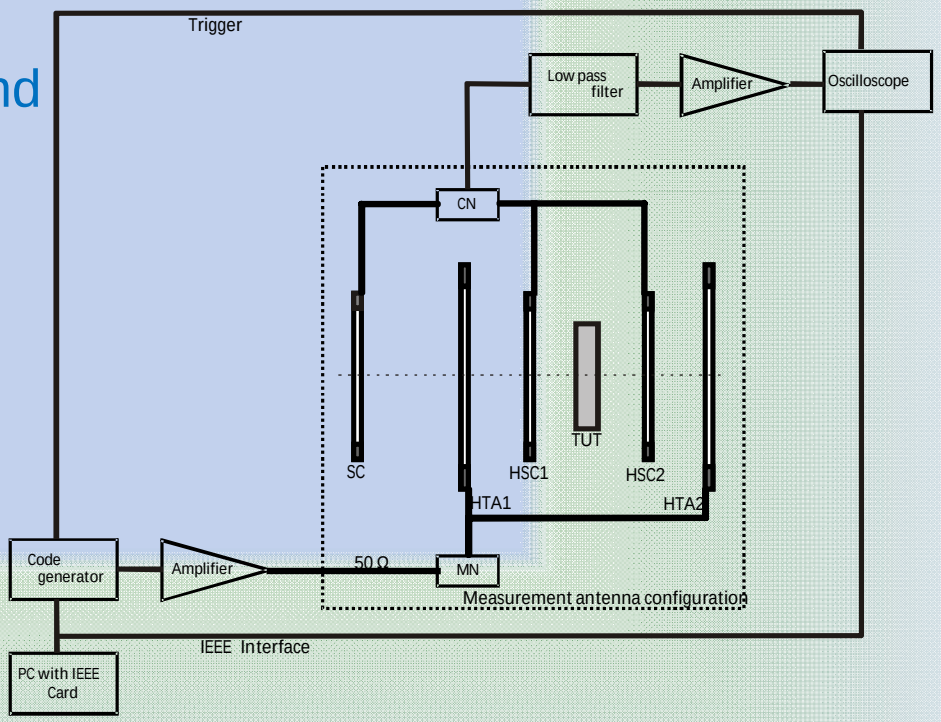
ISO 24631-3 test configuration

"Helmholtz Coils":

- Configuration can easily be configured
- Generates reproducible field
- Independent from a reader brand
- Balanced for FDX-B & HDX



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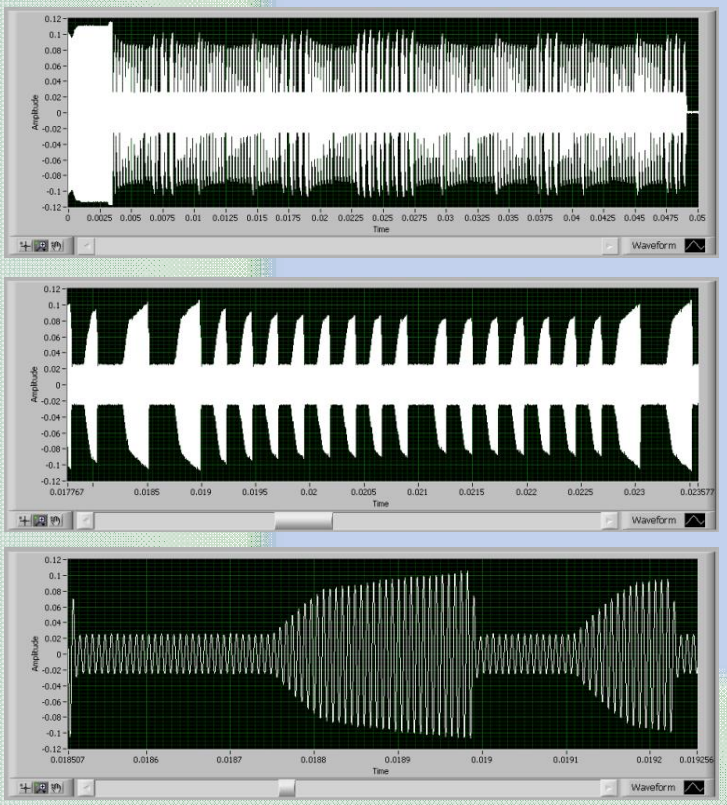
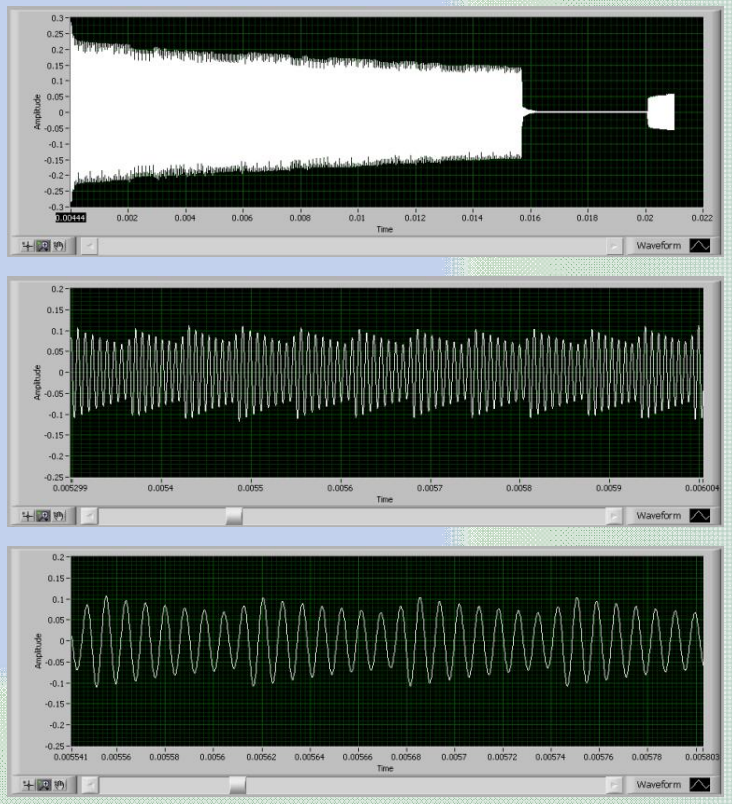
Transponder bit stream

FDX bit stream



HDX bit stream



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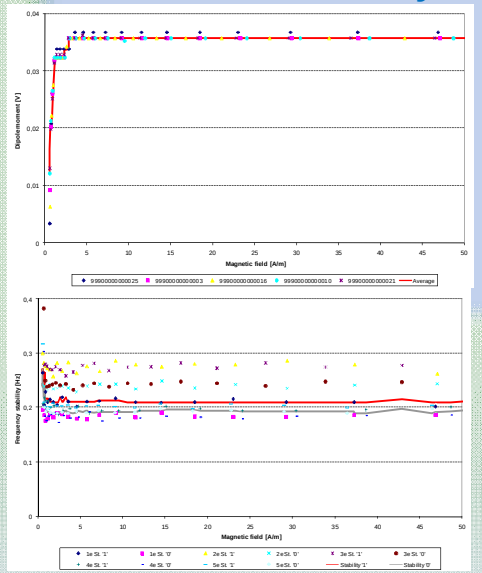
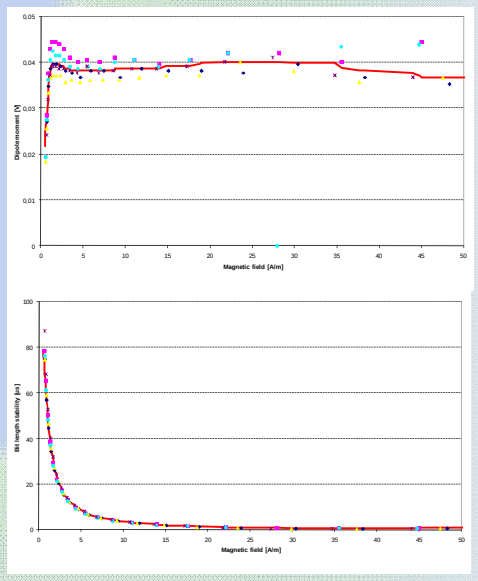
ISO 24631-3 information about:

- Transponder = f (field strength conditions)
  - ➢ Estimation of the readability range of the transponder
- Transponder modulation amplitude
  - ➢ Estimation of the impact of electromagnetic disturbances on readability
- FDX-B bit length stability / HDX frequency stability
  - ➢ Estimation of the readability of the transponder

HDX:



FDX:



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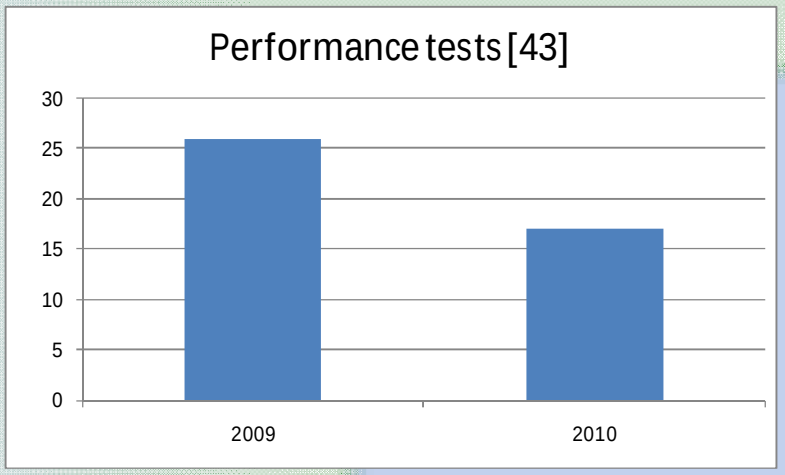
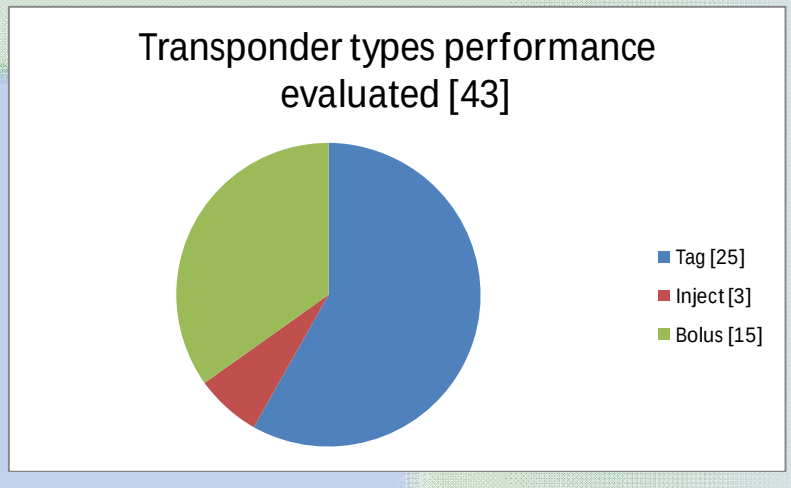
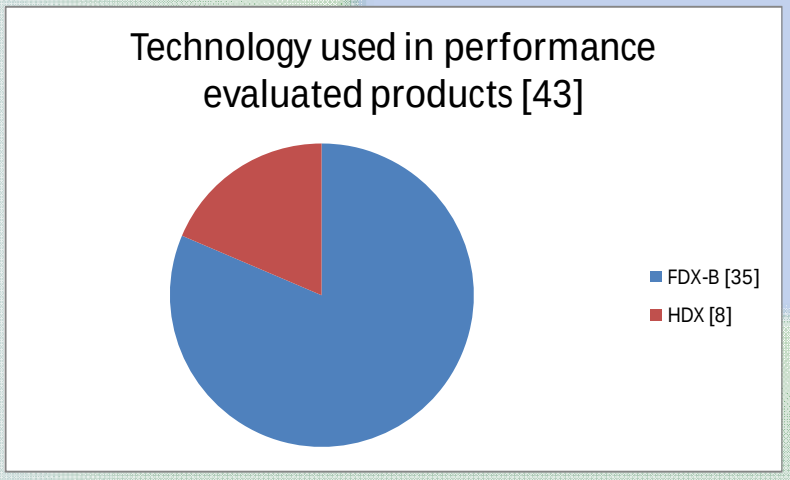
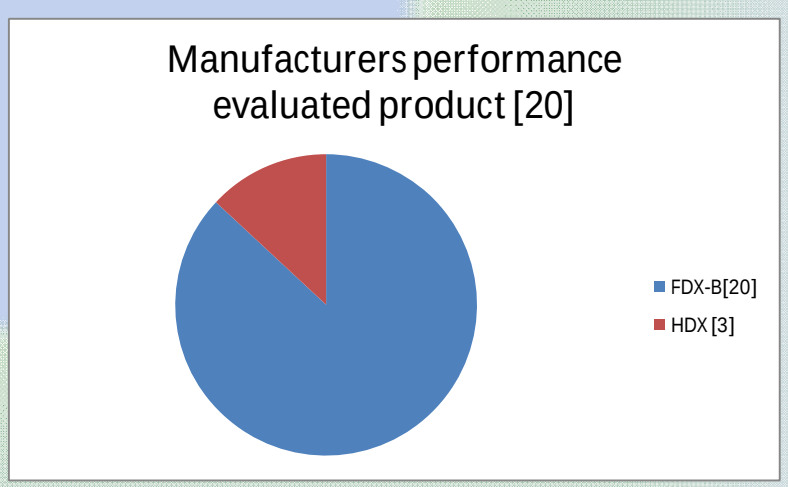
ISO 24631-3 performance tested products 2010-06









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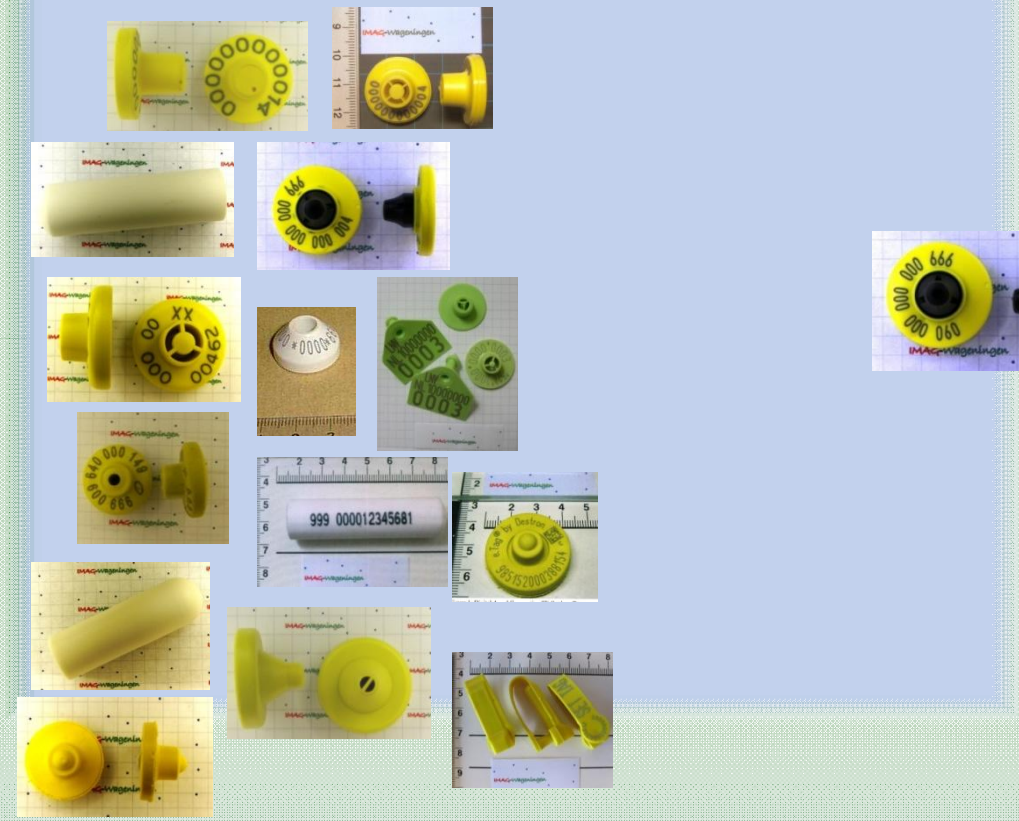
Transponders that have been performance tested

Activation field & Modulation amplitude
Reading distance

Transceivers

FDX (14)



HDX (5)

Ear tag: 15, bolus: 4 (3 transponders of every type)

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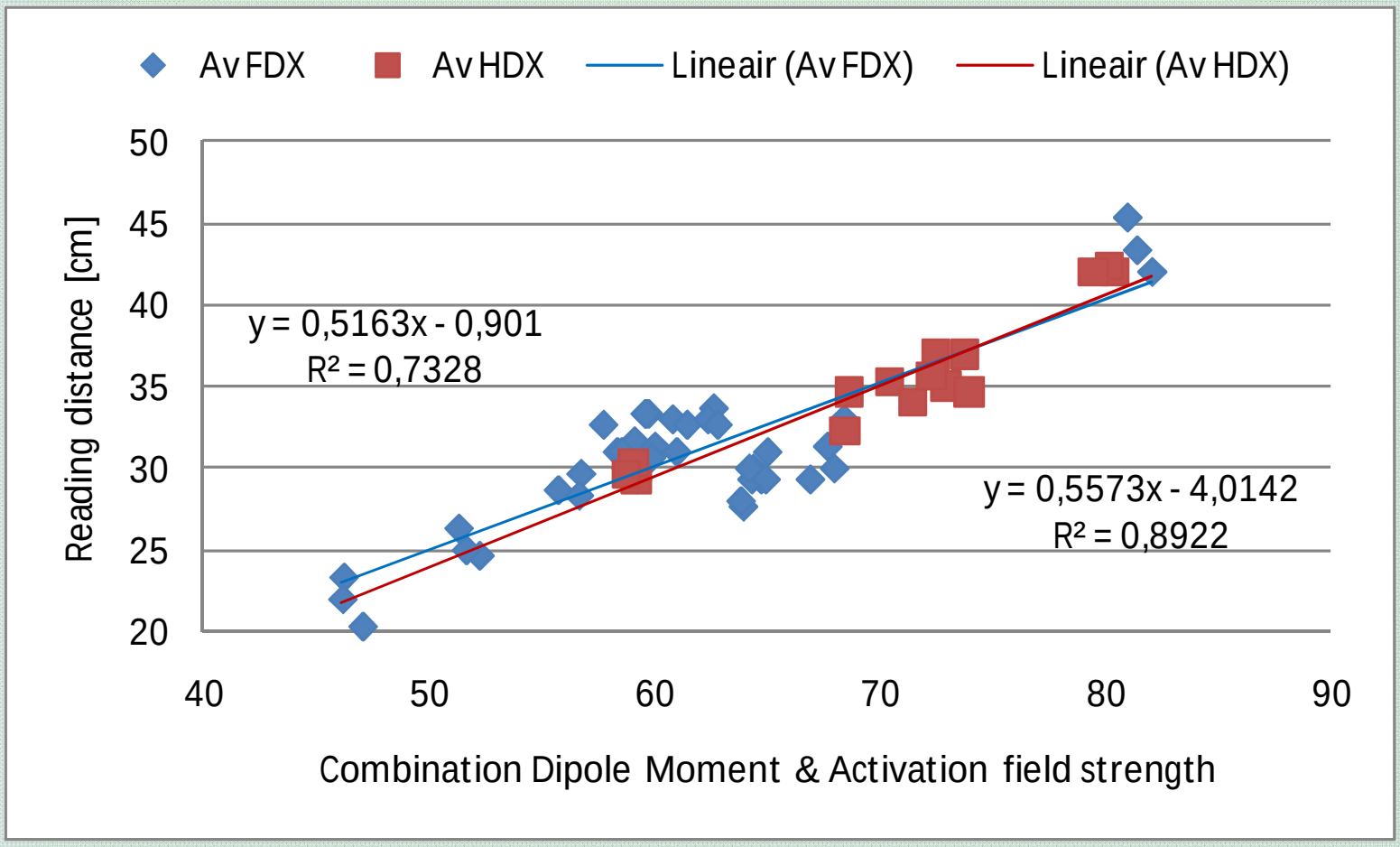
Combination of Activation field & Modulation amplitude



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ISO 11784 & ISO 11785 test procedures transceivers

ISO 24631-2: Radiofrequency identification of animals -- Part 2: Evaluation of conformance of RFID transceivers with ISO 11784 and ISO 11785

- Already 4 transceivers have been conformance evaluated

ISO 24631-4: Radiofrequency identification of animals -- Part 2: Evaluation of performance of RFID transceivers conforming with ISO 11784 and ISO 11785

- No transceivers have been performance tested so far.

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Conclusions and remarks

ISO 24631-1 transponder conformance test

- Procedure already in use for 15 years
- Number of tests per year is increasing

ISO 24631-3 transponder performance test

- Technology independent
- Test results are reproducible
- Equipment is not complex & commercially available
- Test results show high correlation with reading distance
- Since beginning of last year high number of test performed

ISO 24631-2 transceiver conformance test

- First products have been conformance approved

ISO 24631-3 transponder performance test

- Procedure is available
- At this stage no products tested

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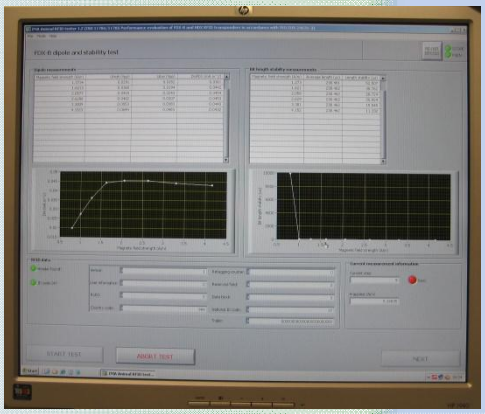
Questions

Programmable code generator Agilent 33220A

Agilent 54622D Oscilloscope

Amplifier Research 25A250A amplifier



Labview 8.2 software IMA Wageningen

Helmholtz coils IMA Wageningen

Rohde & Schwarz UHF attenuator

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