Custom Commands

Extend Tagformance Testing Capability
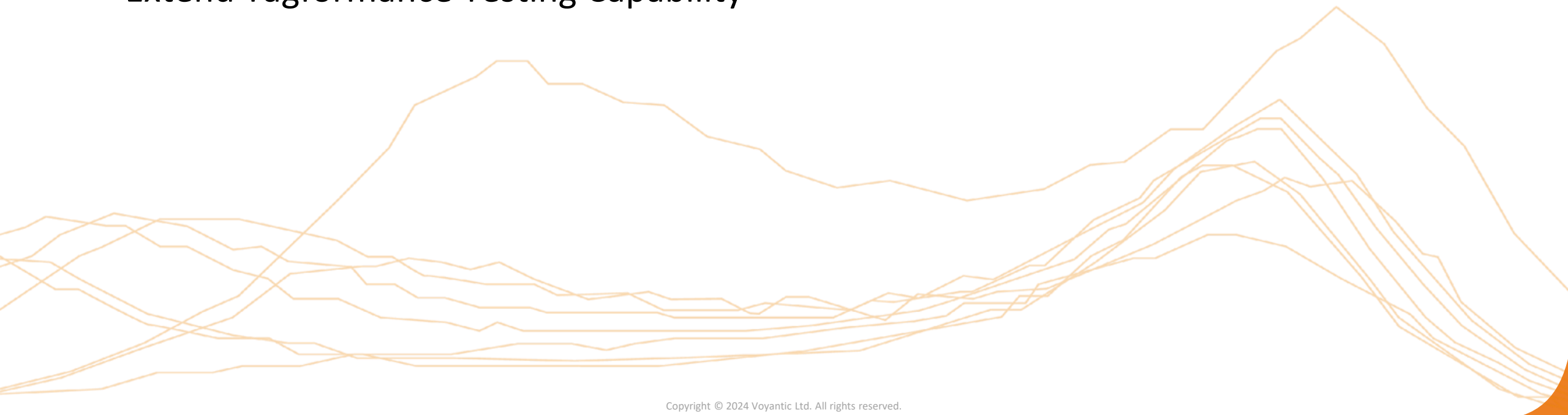
360° Performance Testing Capability

- Threshold
- Backscatter
- Orientation
- Read range

- Response test
- Population analysis
- Interference

Performance

Applications

RFID standards

Regulatory

- TIPP
- ARC

- Tag emission

Voyantic
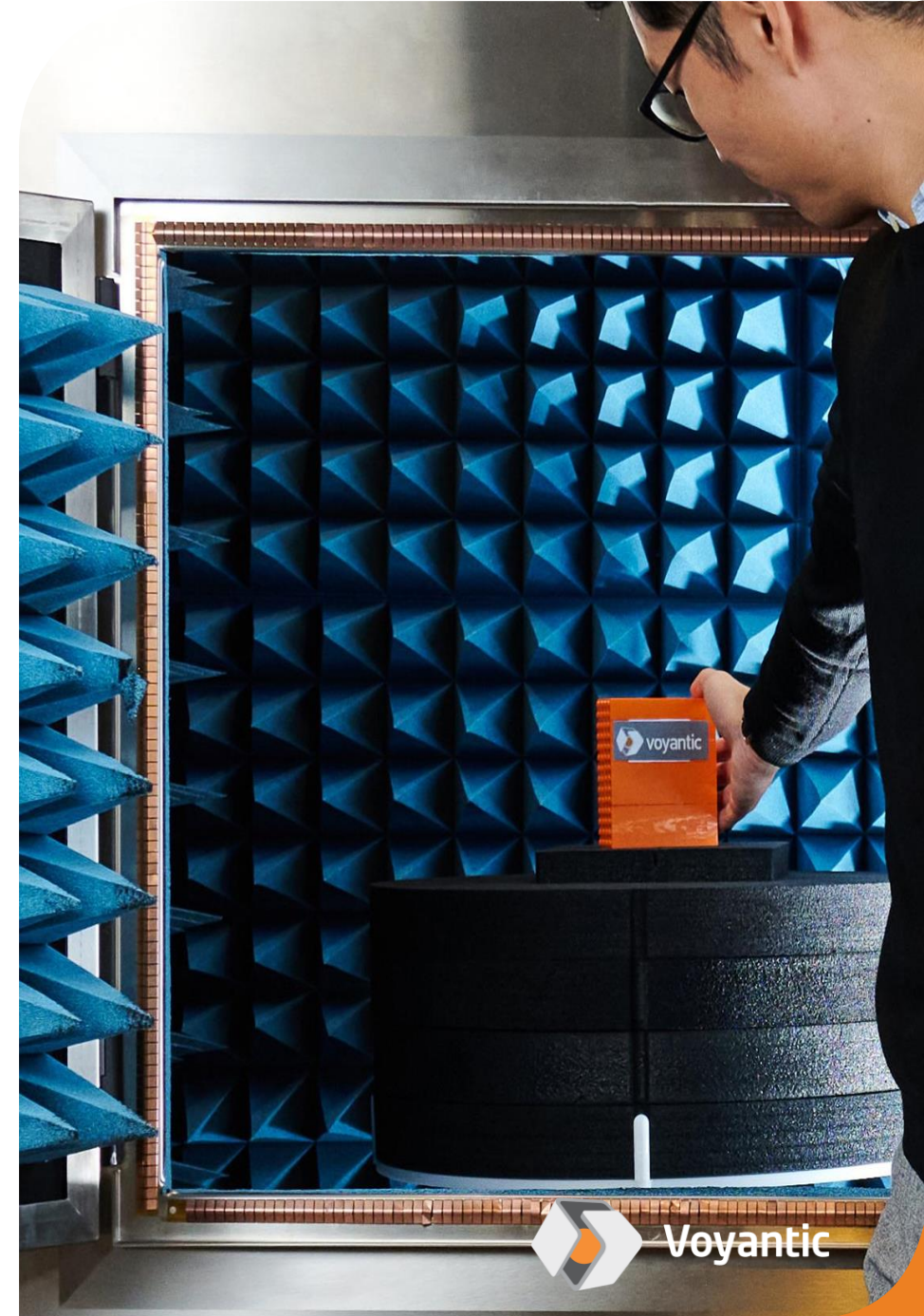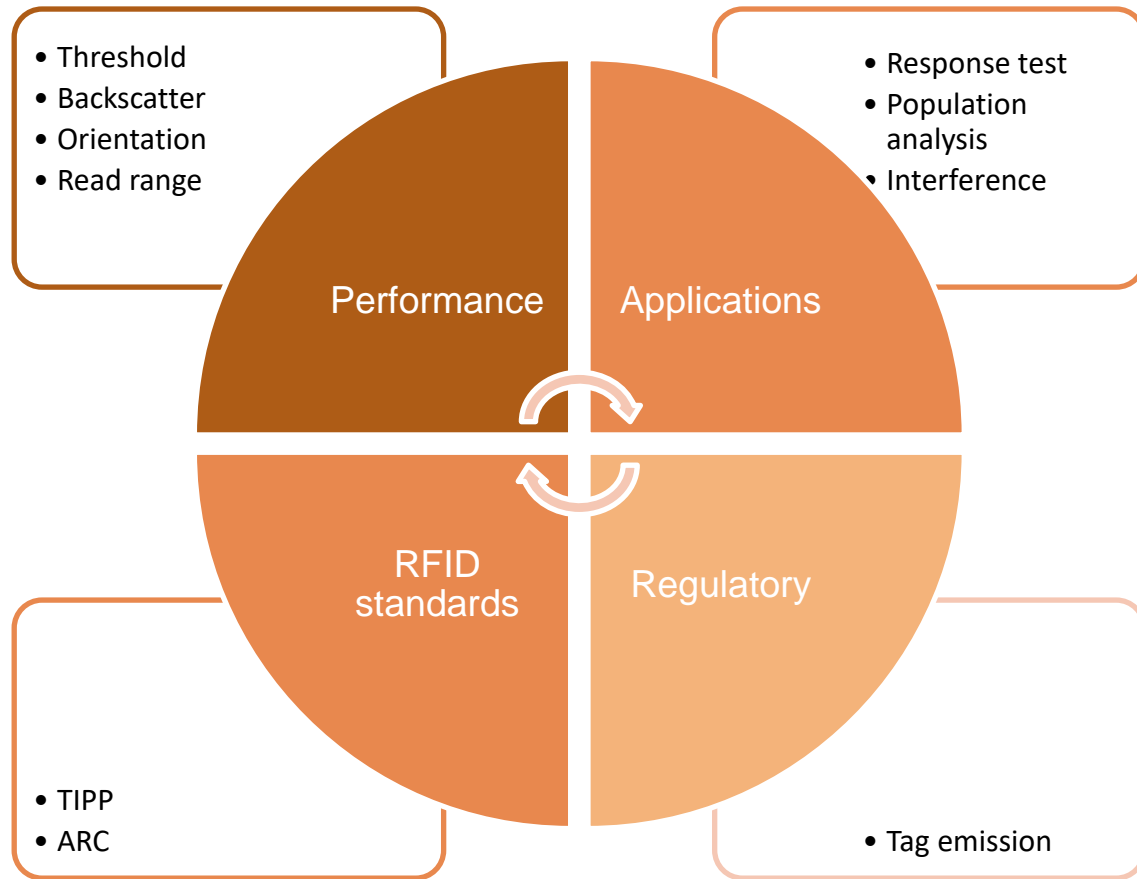
BUT what if you need something special?

- Special or new commands, e.g., QueryX, QueryY, ReadVar
- Combination of commands and special sequences
- Exciting tag with just a pulse or other custom pattern
- Custom carrier reset and power-up patterns
- Carrier level shifts during command
- Non-standard modulation depth
- Exotic data-rates and timings
- Custom pulse shapes
- Emulation of TX filtering effects
- ...

Custom commands add more flexibility to testing and provide an option to meet more special testing needs!

Voyantic

Two Alternatives to Customize Testing

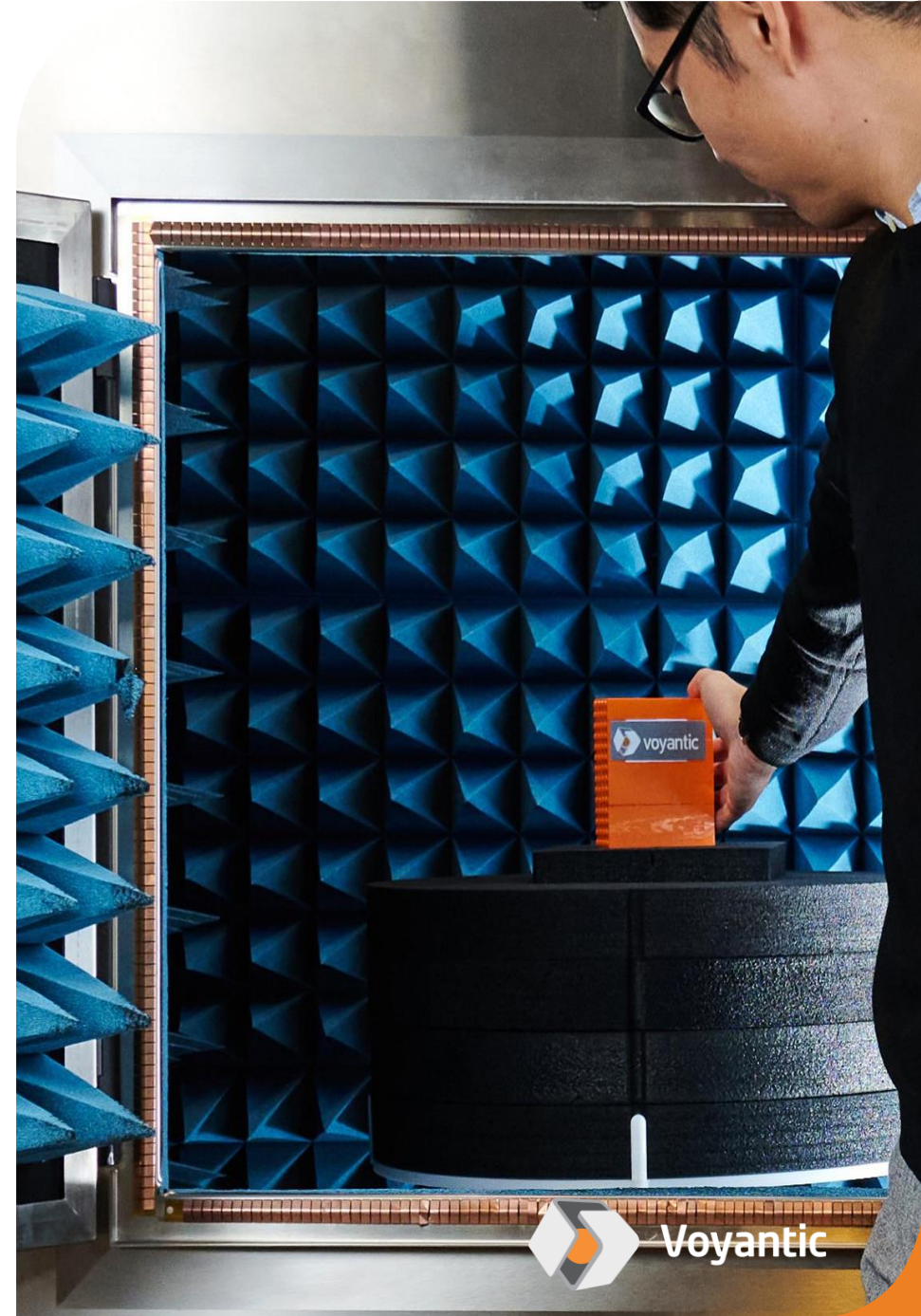| Custom command waveform	Custom command sequence
User-defined modulation waveform	User-defined combination of commands provided as a sequence
Control over timings and modulation levels (attenuation)	Control over command bits and prior set of commands
Useful for testing with different modulation pattern characteristics, pulse shapes, timings, and new commands	Useful for testing e.g., gen2 inventory-based commands and others which are not intended to be used alone
Cannot be combined with other commands!	Support for ISO18000-6C only!

Voyantic

Easy to Use

Create custom command using a standard text editor

Save custom command file to Tagformance Data folder

Choose custom command to be used in a test like any of the in-built command options

Voyantic

Custom Command Waveform

Provides access to the carrier modulation pattern

Voyantic

File Syntax

custom_command M4 320k query with 1,9dB field-strength adjust - Notepad

File Edit Format View Help

```
Custom Command File
Version 2
Command mode    1
Name    0-25 M4 320kHz QUERY with 1,9dB field-strength adjustment (cdbt: 1,8ms, cbc: 2,5ms)
Description      F:3,2us DSB-ASK R:320 kbps M4
Timings 1800    1000    1000    500     12,5    3,2     3,2     13,9    3,2     21,8    3,2
Attenuation     25      0       0       1,9     25      1,9     25      1,9     25      1,9
Interpret       gen2    320     EXT-PREAMBLE    Miller4
```

Header
- Specifies custom command type

Name
- Defines the name
- Name is shown in GUI drop-down menu

Description
- A free-text field defining link parameters

Timings and Attenuation
- Modulation levels and timings define modulation waveform
- Attenuation defines the modulation level as attenuation in dB
- Timing defines how long the defined level is kept set in us

Interpret
- Defines how the tag reply is interpreted (pass/fail)
- Envelope: Tag reply is detected in a user-defined window.
  - Required input: response delay and length
- Gen2: Tag reply is detected using Tagformance Query-detection algorithm.
  - Required input: BLF, preamble, and modulation type

Voyantic

File Syntax

Version 2 Mode 1: Custom command waveform with control over timings and modulation levels

custom_command M4 320k query with 1,9dB field-strength adjust - Notepad

File   Edit   Format   View   Help

```
Custom Command File
Version 2
Command mode    1
Name    0-25 M4 320kHz QUERY with 1,9dB field-strength adjustment (cdbt: 1,8ms, cbc: 2,5ms)
Description     F:3,2us DSB-ASK R:320 kbps M4
Timings 1800    1000    1000    500     12,5    3,2     3,2     13,9    3,2     21,8    3,2
Attenuation     25      0       0       1,9     25      1,9     25      1,9     25      1,9
Interpret       gen2    320     EXT-PREAMBLE    Miller4
```

"Interpret" accepts either *"envelope"* or *"gen2"*
- *"envelope"* expects 2 tab delimited values, *"T1"* and *"Length"*
- *"gen2"* expects 3 tab delimited values, *"BLF"*,*"preamble"* and *"modulation type"*. These values are case sensitive.
  - *"BLF"* is either 40, 320 or 640, Miller4 supports only 320
  - *"preamble"* is EXT-PREAMBLE or PREAMBLE
  - *"modulation type"* is FM0 or Miller4, Miller4 supports only EXT-PREAMBLE for *"preamble"*

COMMAND

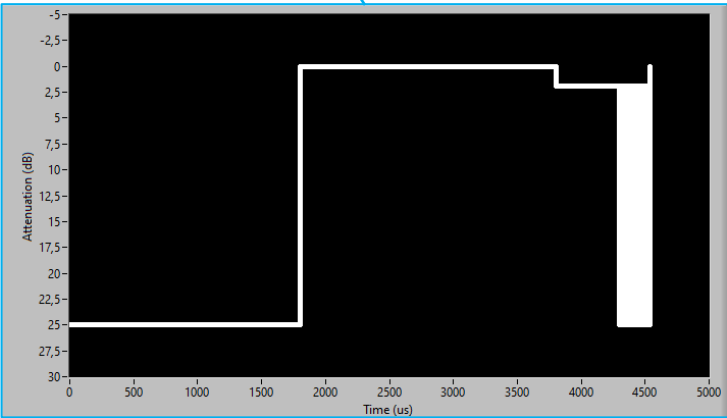Custom command

0-25 M4 320kHz QUERY with 1,

F:3,2us DSB-ASK

R:320 kbps M4

Select ►   Pa

0-25 M4 320kHz QUERY with 0,5dB field-strength adjustment (cdbt: 1,8ms, cbc: 2,5ms)
0-25 M4 320kHz QUERY with 1,5dB field-strength adjustment (cdbt: 1,8ms, cbc: 2,5ms)
1,6-25 M4 320kHz QUERY (cdbt: 1,8ms)
✓ 0-25 M4 320kHz QUERY with 1,9dB field-strength adjustment (cdbt: 1,8ms, cbc: 2,5ms)
0-25 M4 320kHz QUERY with 1dB field-strength adjustment (cdbt: 1,8ms, cbc: 2,5ms)
1,6-25 M4 320kHz QUERY with 1,6dB/1ms power boost
0-25 M4 320kHz QUERY (cdbt: 1,8ms, cbc: 2,5ms)

Voyantic

How to Use?

1. Choose custom command from the protocol menu

COMMAND

Custom command

0-25 M4 320kHz QUERY with 1,

F:3,2us DSB-ASK

R:320 kbps M4

Select ▶   Parameters...

ISO 18000-6C
ISO 18000-6B
Tag-talks-only
GB/T 29768-2013
SINIAV
✓ Custom command

2. Choose the right custom command waveform from the command menu

0-25 M4 320kHz QUERY with 0,5dB field-strength adjustment (cdbt: 1,8ms, cbc: 2,5ms)
0-25 M4 320kHz QUERY with 1,5dB field-strength adjustment (cdbt: 1,8ms, cbc: 2,5ms)
1,6-25 M4 320kHz QUERY (cdbt: 1,8ms)
0-25 M4 320kHz QUERY with 1,9dB field-strength adjustment (cdbt: 1,8ms, cbc: 2,5ms)
0-25 M4 320kHz QUERY with 1dB field-strength adjustment (cdbt: 1,8ms, cbc: 2,5ms)
1,6-25 M4 320kHz QUERY with 1,6dB/1ms power boost
0-25 M4 320kHz QUERY (cdbt: 1,8ms, cbc: 2,5ms)

SWEEP SETTINGS

Start frequency   800   MHz

Stop frequency   1000   MHz

Frequency step   5   MHz

Power step   0,1   dB

START   STOP

Start Sweep

3. Run test normally like with any other test command

Voyantic
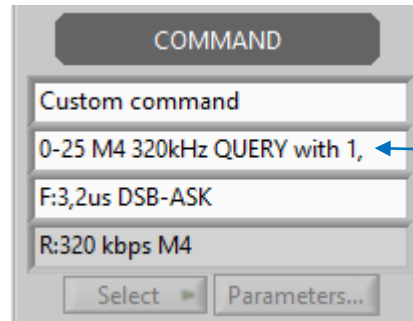
Waveform Preview

Right-click the command menu to preview of the custom command waveform
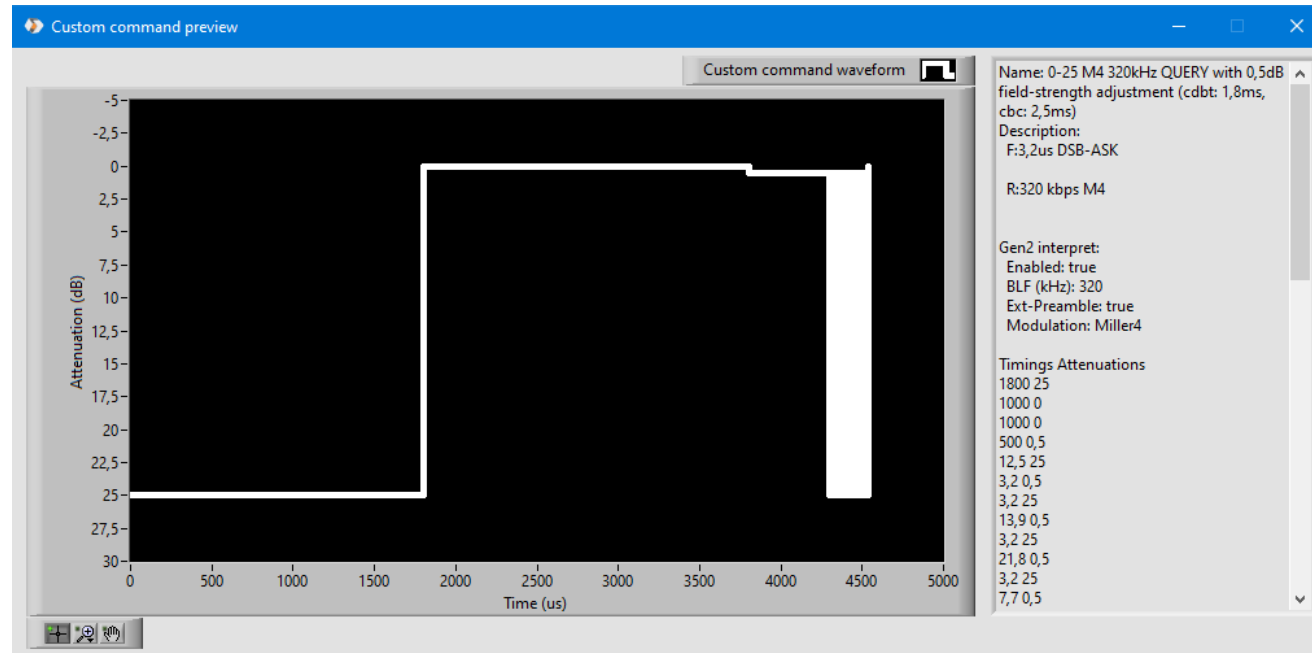
The custom waveform list is updated at the software launch or if the protocol is switched back and forth. So, you don't need to restart the software to update the custom command list.

Important Details

Parameter	Allowed range
Waveform length	Maximum 50'000 samples
Timings	Minimum level length - 0,2us (continuous waveform, **recommended**) - 12,5ns (not to be used continuously)
Modulations	Power resolution 0,1dB
Other	If number of samples is an odd number, the software will automatically add one sample to the end leaving carrier at 0dB attenuation level To avoid automatic fill, define waveform with an even number of samples and end the waveform with sample which with length 1 and attenuation of preference Always include the word "custom_command" in the file name to allow Tagformance detect the file

Voyantic
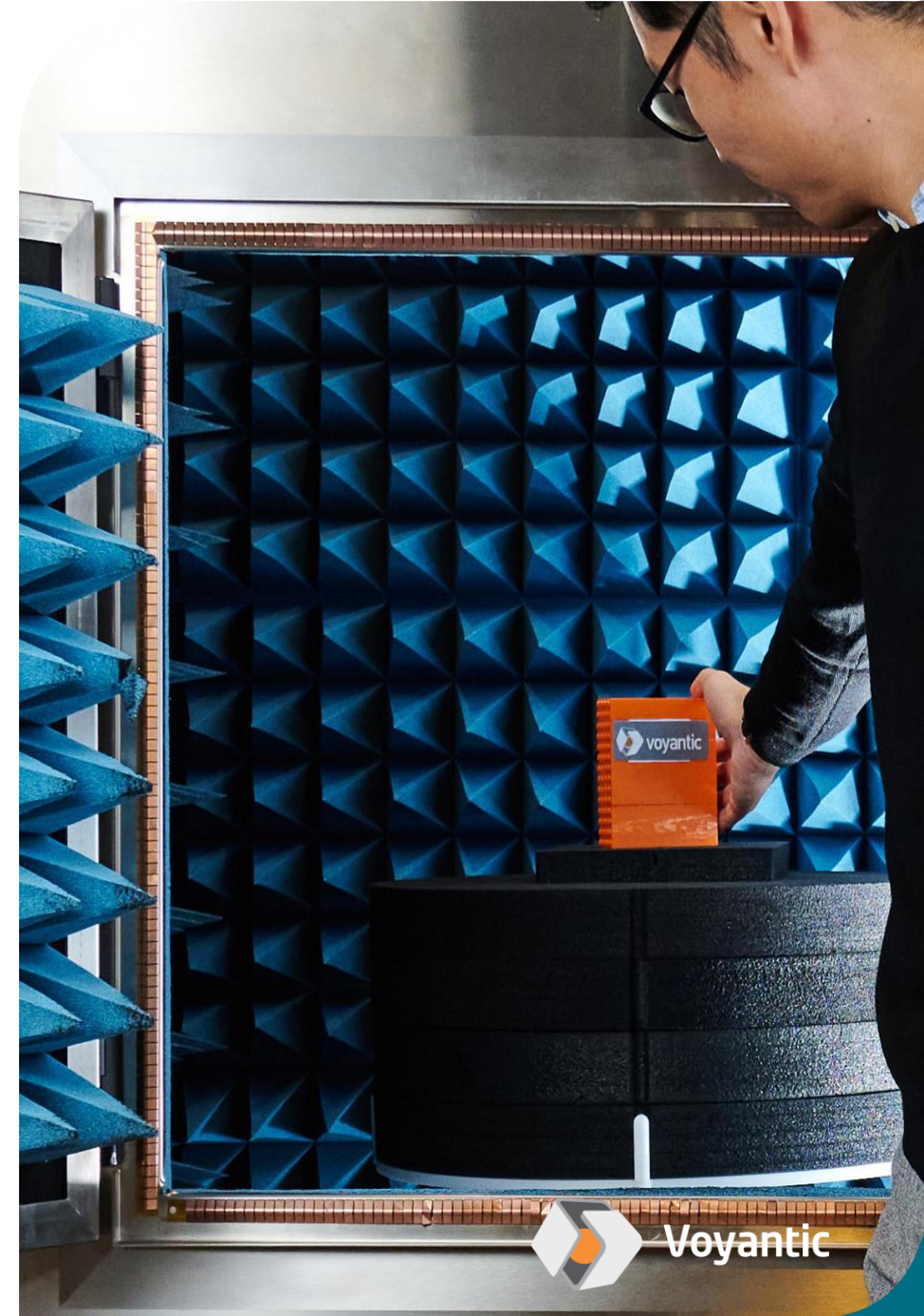
Custom Command Sequence

Give possibility to combine a set of commands into a sequence

File Syntax

A Notepad window titled "Gen2_custom_command_sequen..." showing:

```
Custom Command File
Version 3
Name      Custom Sequence Example - Read

[Cmd Order]
1 = Inventory
2 = Req_RN
3 = custom_built_Read

[Inventory]
Sel = 0
Session = 0
Target = A

[custom_built_Read]
Bits1 = 11000010100000000000000001
Bits2
Handle = 1
CRC-16 = 1
Length = 6000
Condition = CRC_OK
ResponseDataMask = 1    16
```

Ln 1, Col 1   100%   Windows (CRLF)   UTF-8

Header
- Specifies custom command type

Name
- Defines the name
- Name is shown in GUI drop-down menu

Cmd Order
- Ordered list of commands in the sequence

Inventory
- Defines parameters for the inventory
- Required input: Sel, Session, Target

Custom_built_ReadVar
- Defines custom command (ReadVar)
- Required input: bits, handle (yes/no), crc-16 (yes/no), Conditions (i.e., interpret acceptance criteria), Response data mask (i.e., how to cut bits from the interpreted response)

Voyantic

File Syntax

Version 23 Mode 1 : Custom command sequence

Gen2_custom_command_sequen...

File Edit Format View Help

```
Custom Command File
Version 3
Name    Custom Sequence Example - Read

[Cmd Order]
1 = Inventory
2 = Req_RN
3 = custom_built_Read

[Inventory]
Sel = 0
Session = 0
Target = A

[custom_built_Read]
Bits1 = 1100001010000000000000001
Bits2
Handle = 1
CRC-16 = 1
Length = 6000
Condition = CRC_OK
ResponseDataMask = 1      16
```

Ln 1, Col 1   100%   Windows (CRLF)

COMMAND

ISO 18000-6C

Custom Sequence Example -

40 kHz - FM0

25 us DSB-ASK

Select ▶

✓ Query
Read
Write
Custom Sequence Example
Custom Sequence Example - Read
Custom Sequence Example - ReadVar (untested)

Command sequence is Inventory, ReqRN, and custom_built_Read

Table 6-33: *Query* command

	Command	DR	M	TRext	Sel	Session	Target	Q	CRC
# of bits	4	1	2	1	2	2	1	4	5
description	1000	0: DR=8 / 1: DR=64/3	00: M=1 / 01: M=2 / 10: M=4 / 11: M=8	0: no pilot tone / 1: use pilot tone	00: All / 01: All / 10: ~SL / 11: SL	00: S0 / 01: S1 / 10: S2 / 11: S3	0: A / 1: B	0–15	CRC-5

Table 6-52: *Read* command

	Command	MemBank	WordPtr	WordCount	RN	CRC
# of bits	8	2	EBV	8	16	16
description	11000010	00: Reserved / 01: EPC / 10: TID / 11: User	Starting address pointer	Number of words to read	handle	CRC-16

"Length": Time [μs] from the end of the command to the expected end of the response
"Condition": Conditions for accepting the response. Possible choice:
- CRC_OK
- BIT_EQUALS N   X
  - where *N* is the bit index and *X* is 0 or 1
- ENVELOPE   XXX   ZZZ
 - where *XXX* is the response start time in μs and *ZZZ* the response length in μs
"ResponseDataMask": (optional) By defining the data mask, it is possible to plot the response data to the graph as integer. The preamble is already filtered out before the data mask, thus the index of *0* is the first bit after the preamble.
- parameters *A   B*
  - where *A* is the bit index and *B* is the number of bits

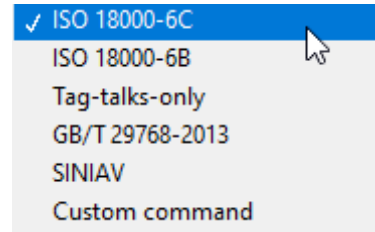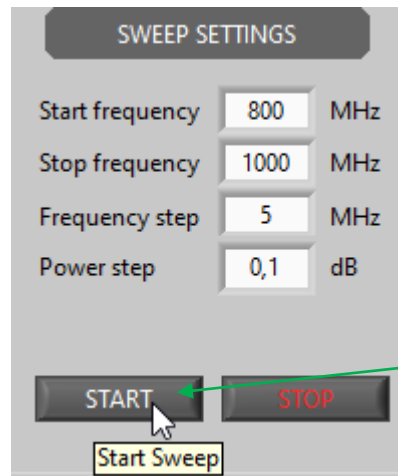Source: https://ref.gs1.org/standards/gen2/3.0.0/
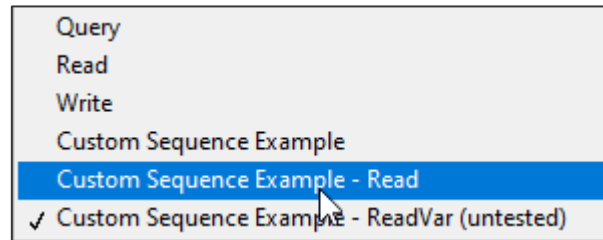
Voyantic

How to Use?
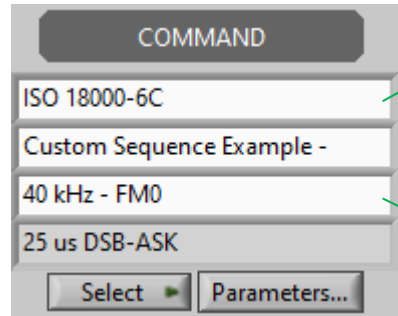
1. Choose ISO18000-6C from the protocol menu

2. Choose the right custom command sequence waveform from the command menu

3. Run test normally like with any other test command

Important Details

Parameter	Allowed range
Protocol support	Only ISO18000-6C is supported
Other	Take care to define mask for the interpretation right. Data index 0 is the first bit after preamble, which is the status/error bit. The actual data typically starts from bit index 1 Always include the word "custom_command" in the file name to allow Tagformance detect the file

Voyantic

Application Examples

1. The effect of field adjustment to tag performance
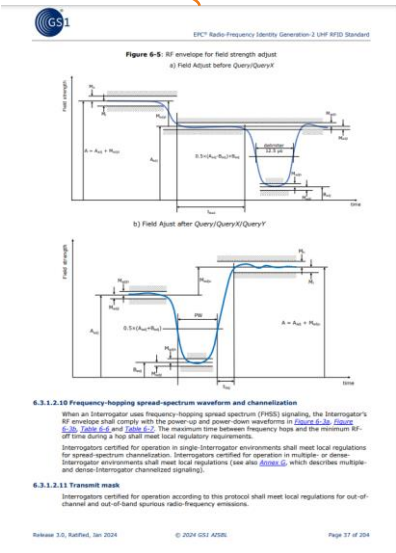
2. Test with a command: Read

Voyantic

Example 1

Testing of Field adjustment for tag performance using custom command waveform

custom_command M4 320k query with 1,9dB field-strength adjust - Notepad

```
Custom Command File
Version 2
Command mode     1
Name     0-25 M4 320kHz QUERY with 1,9dB field-strength adjustment (cdbt: 1,8ms, cbc: 2,5ms)
Description      F:3,2us DSB-ASK R:320 kbps M4
Timings 1800     1000     1000     500      12,5     3,2      3,2      13,9     3,2      21,8     3,2
Attenuation      25       0        0        1,9      25       1,9      25       1,9      25       1,9
Interpret        gen2     320      EXT
```
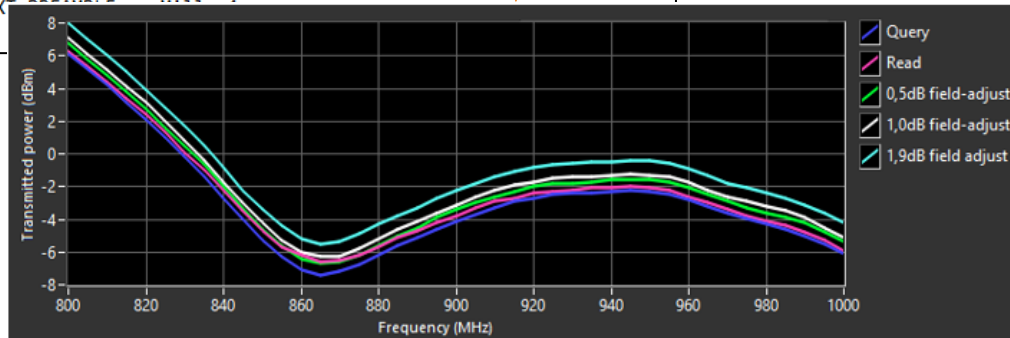

Command	866MHz	915MHz	928MHz
M4 320k Query	-7,36	-2,9	-2,44
M4 320k Read	-6,58	-2,7	-2,24
M4 320k Query w. 0,5dB field-adjust	-6,68	-2,3	-1,8
M4 320k Query w. 1dB field-adjust	-6,3	-1,9	-1,44
M4 320k Query w. 1,9dB field-adjust	-5,48	-1,1	-0,64

https://ref.gs1.org/standards/gen2/3.0.0/

Example 2

Test with a command: Read, using a custom command sequence

Custom Command File
Version 3
Name   Custom Sequence Examp...

[Cmd Order]
1 = Inventory
2 = Req_RN
3 = custom_built_Read

[Inventory]
Sel = 0
Session = 0
Target = A

[custom_built_Read]
Bits1 = 11000010100000000000000001
Bits2   Read-cmd TID wPtr_0 wCount_1
Handle = 1
CRC-16 = 1
Length = 6000
Condition = CRC_OK
ResponseDataMask = 1   16

Read 1 word from TID memory bank, starting from word pointer 0

Record 6000 samples (Fs = 2MHz, require CRC to match

Return: 16 bits starting from index: 1

Contact us to learn more

voyantic.com/contact

Voyantic