



# Webinar

Metrology

Speakers: Maxime Blin - BAT-EMC Support



# Rules

- Webcam and microphones are disabled
- Use the chat to ask questions during the presentation (english only)
- My colleagues will provide the answers



# Time Frame

- 40 Min Webinar
- 15 Min Questions



# Webinar Agenda

1. Who is Nexio?
2. What is metrology?
3. Decision chart
4. Metrology with BAT-EMC
5. Example with an ESD gun
6. Demonstration with a simulated surge generator
7. Automatic report



# Since 2003: Electromagnetism is our thing

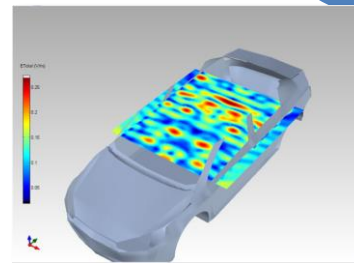
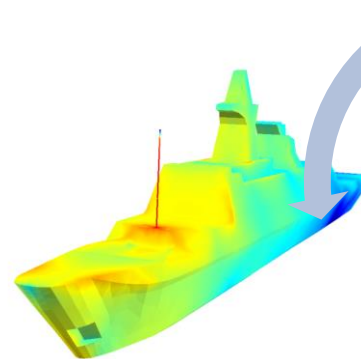
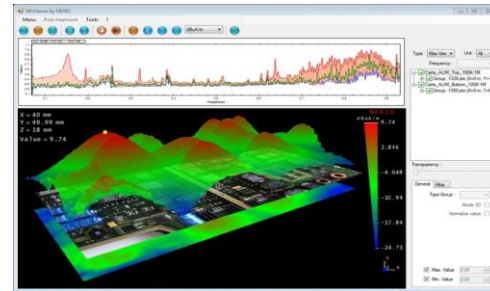
## INTERFERENCES

EMC  
Lightning  
ESD

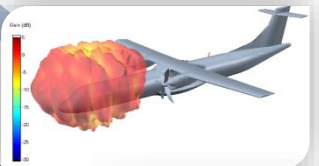
## PROPAGATION

Antenna  
Radio Frequency  
Stealthiness (RCS)

Employees: 90 – Turnover: 7M€  
250 Clients- 25 countries

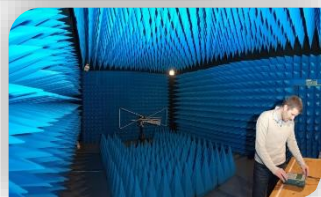
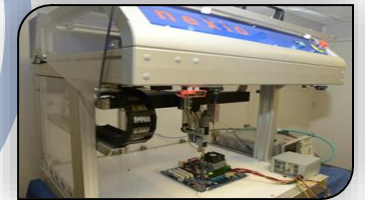


Products  
Test &  
Mesurement



Products  
Simulation

Engineering  
Analysis  
Simulation  
Tests



15 R&D Projects since 2008



# What is metrology?

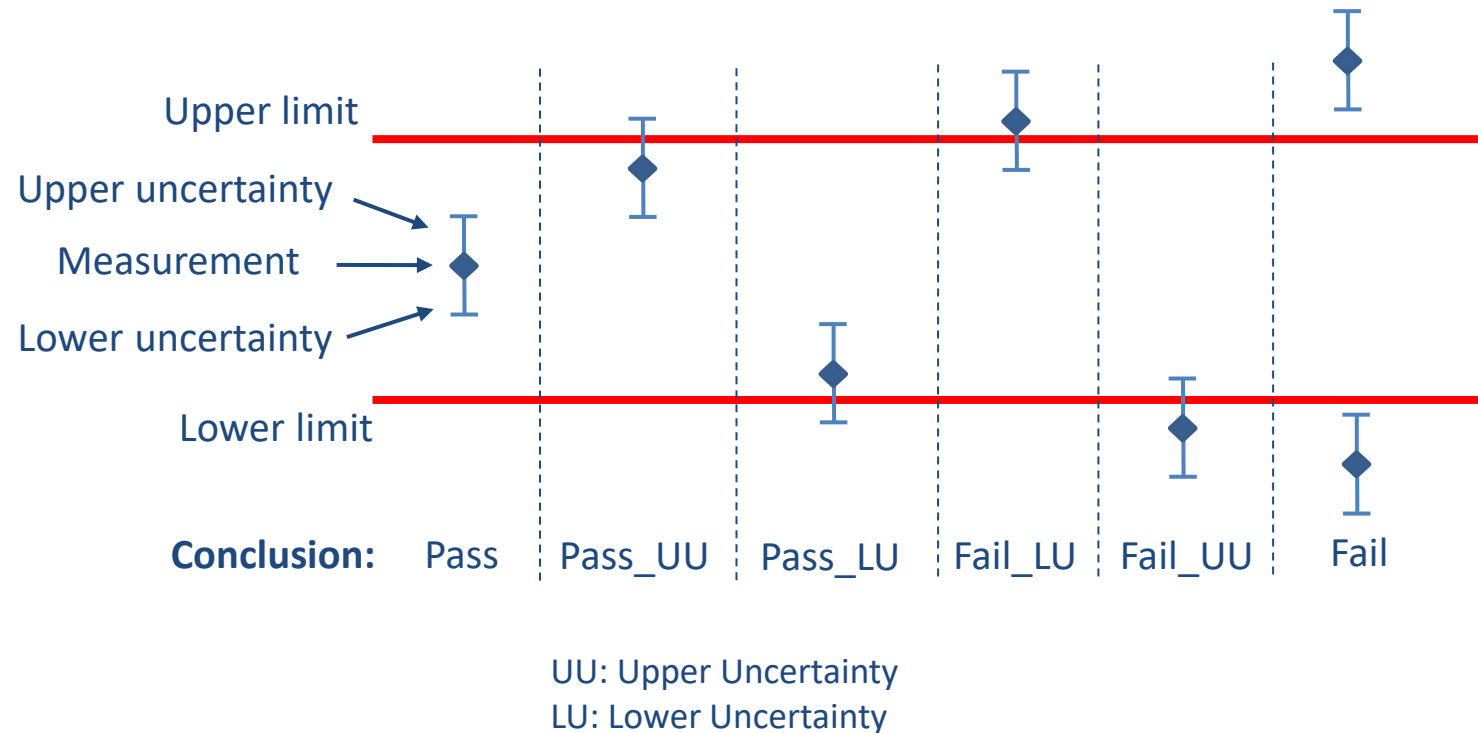
**Metrology** is « the scientific study of measurements and their application ; it covers theoretical and practical aspects of measurements, including all kind of **measurement uncertainties** and application domains ».

In metrology, a **measurement uncertainty** associated to a **measurement** « describes the range of significant values attributed to a measurable quantity, based on the information used »

*Source: Wikipedia*



# Decision diagram



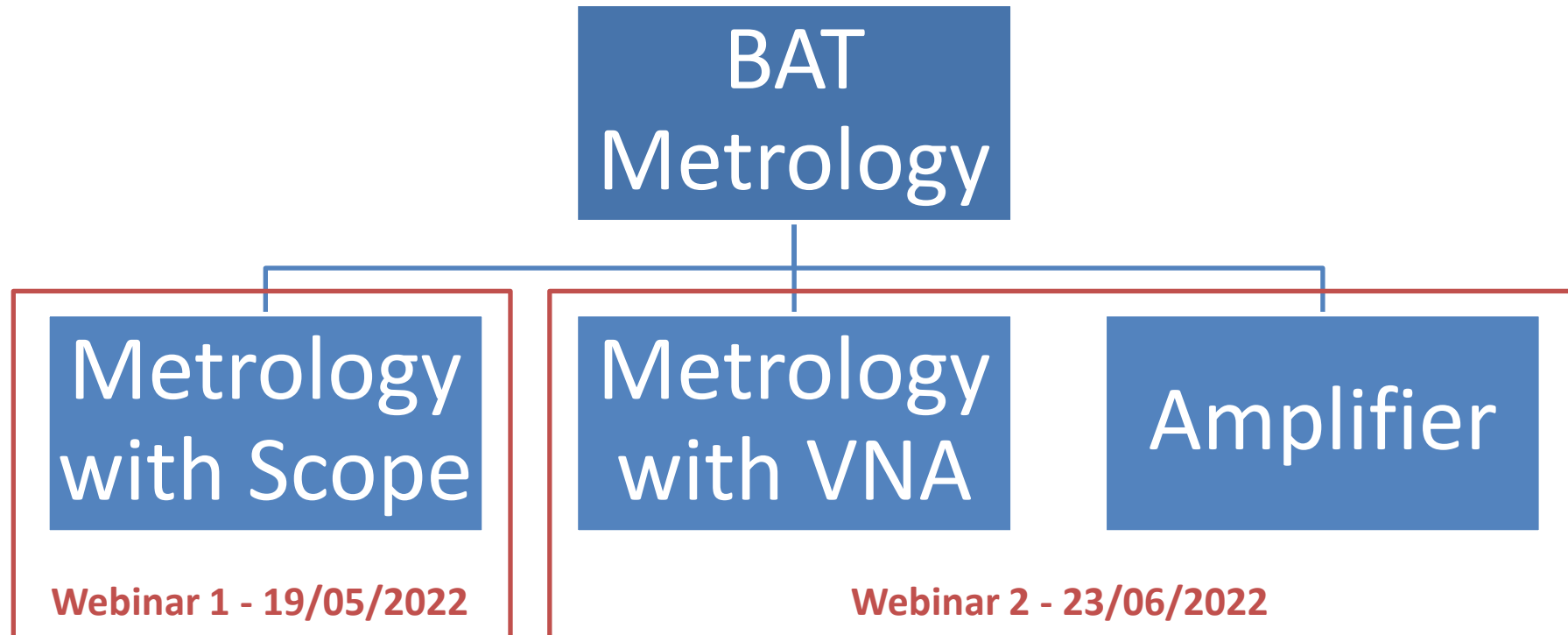
# Metrology introduction with BAT-EMC

- Measurement automation
- Limits and measurement uncertainty management
- Automatic conclusion
- Automatic report generation





# Several modules



# Metrology with Scopes

Check if the device complies with :

- Standard requirements
- Manufacturer specifications

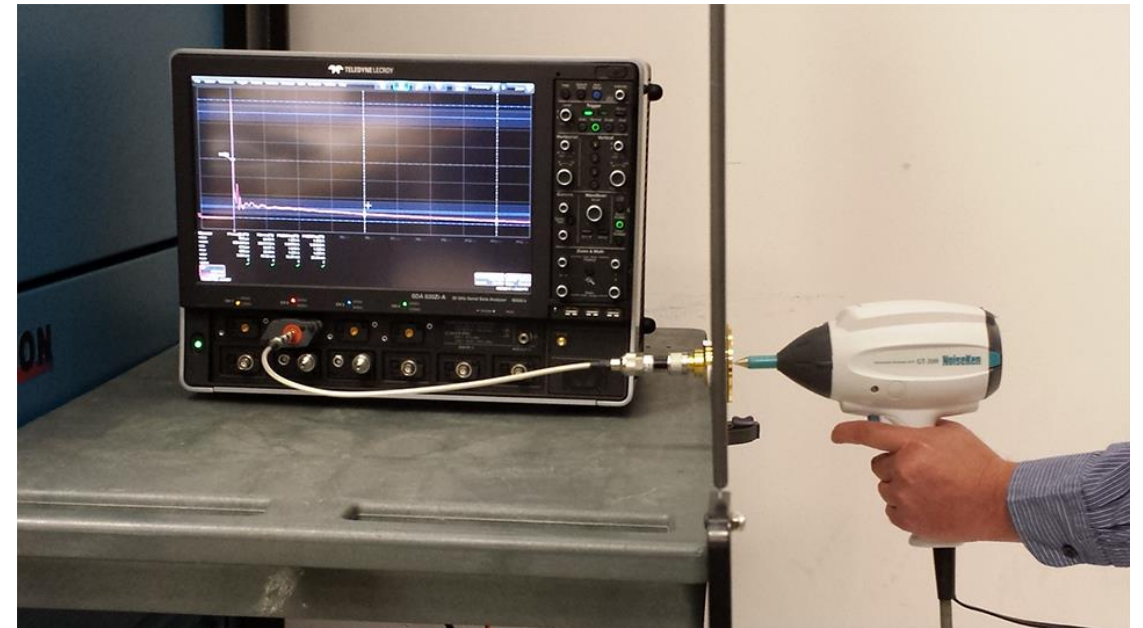
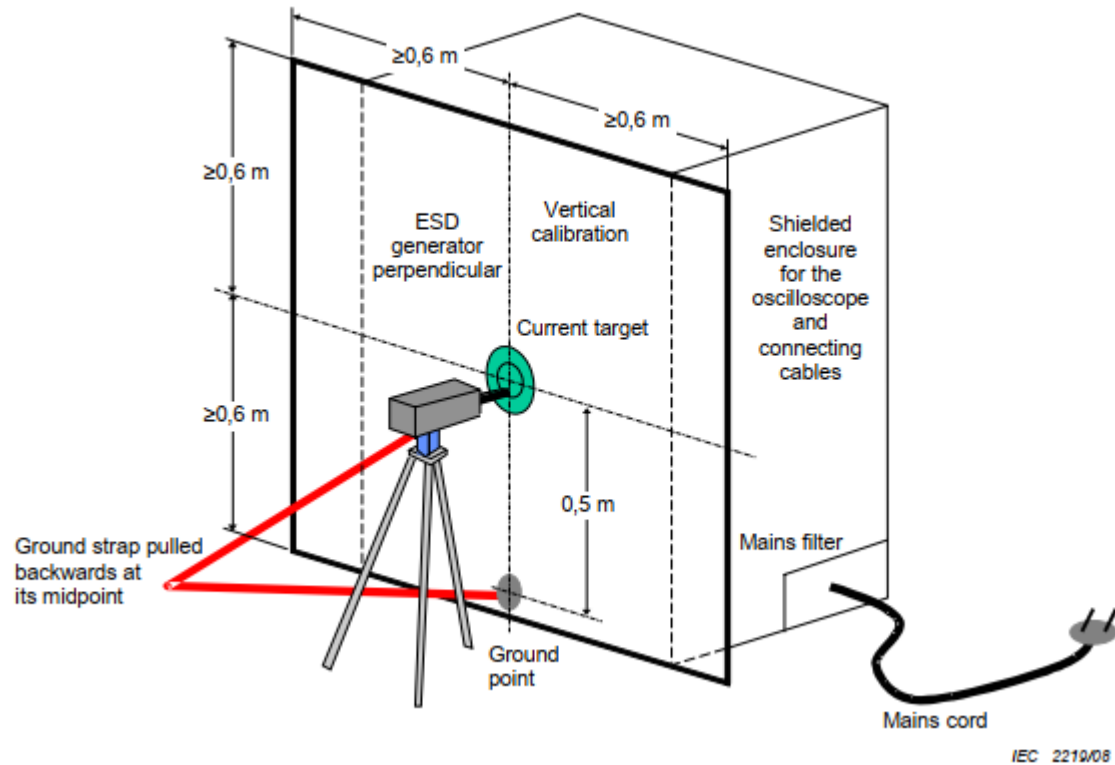


ESD Gun



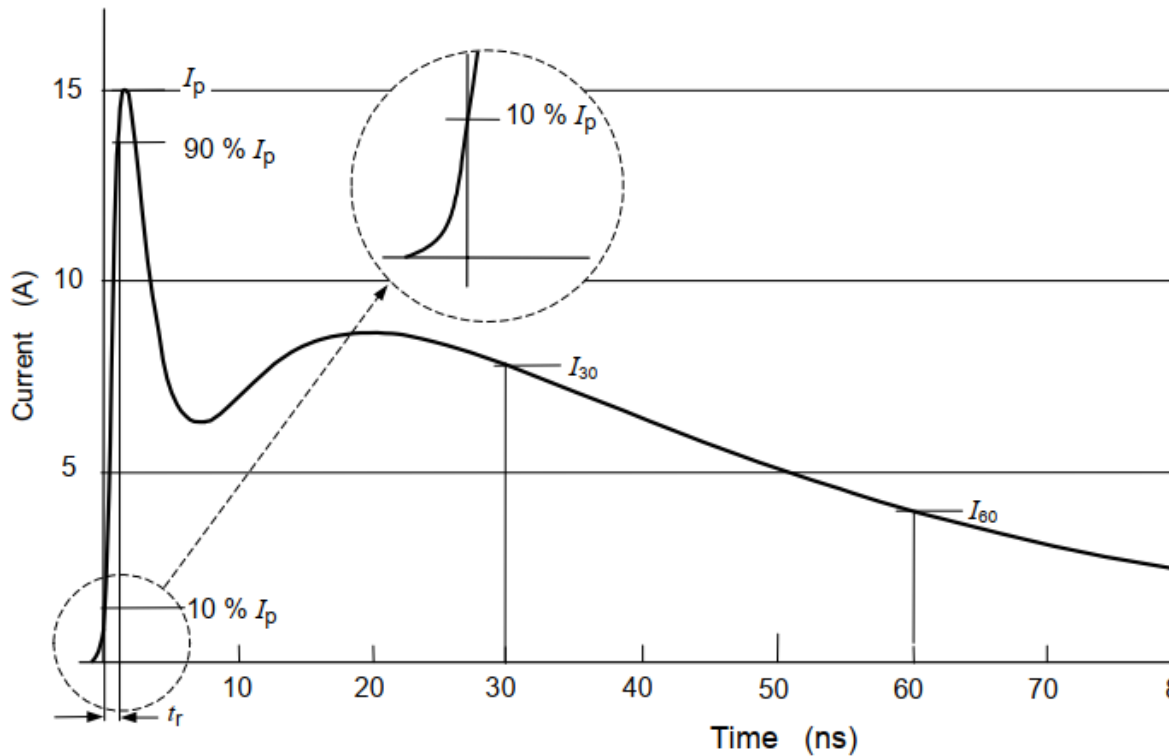
Transient Generator

# ESD Gun – Calibration method



# ESD – Limits and measured parameters

➤ IEC 61000-4-2:2008



## Parameters to be measured:

- First Peak current of discharge
- Rise time
- Current at 30ns
- Current at 60ns

## Several levels

Table 3 – Contact discharge current waveform parameters

Level	Indicated voltage kV	First peak current of discharge ±15 % A	Rise time $t_r$ (±25 %) ns	Current (±30 %) at 30 ns A	Current (±30 %) at 60 ns A
1	2	7,5	0,8	4	2
2	4	15	0,8	8	4
3	6	22,5	0,8	12	6
4	8	30	0,8	16	8

The reference point for measuring the time for the current at 30 ns and 60 ns is the instant when the current first reaches 10 % of the 1<sup>st</sup> peak of the discharge current.

NOTE The rise time,  $t_r$ , is the time interval between 10 % and 90 % value of 1<sup>st</sup> peak current.

*Ideal contact discharge current waveform at 4kV*

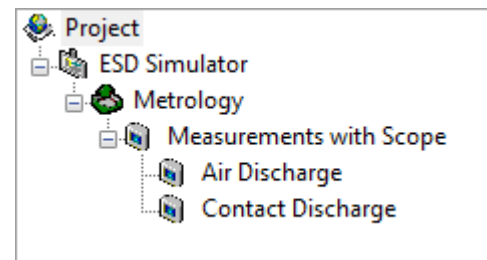
5 measurement for each level



# Measurement types

Two possible tests:

- Air discharge
- Contact discharge



# Test configuration

Measurement with Scope (Metrology) Help ?

Parameters | Follow-Up | External Equipments | Used Equipments | Attachments

Test Name: Contact Discharge | Test Number: 2 | State: Started | Conclusion: Inconclusive

Scope parameters

Name	Param Number	Factor	Operator	Operand	Unit	Enabled
Max	P1	1	Divide	0.094	A	<input checked="" type="checkbox"/>
Rise Time	RISE TIME	1	None		ns	<input checked="" type="checkbox"/>
Current at 30ns	ESD	Time(ns) 30	Divide	0.094	A	<input checked="" type="checkbox"/>
Current at 60ns	ESD	Time(ns) 60	Divide	0.094	A	<input checked="" type="checkbox"/>
Manual		1	None			<input type="checkbox"/>

Scope

Shape Number Of Points: 100000

Nb Measurements by Step: 10

Steps

- Step 1: +2 kV
- Step 2: -2 kV
- Step 3: +4 kV
- Step 4: -4 kV
- Step 5: +6 kV
- Step 6: -6 kV
- Step 7: +8 kV
- Step 8: -8 kV

Parameters to be measured

Number of measurements

Several levels



# Parameters: Detail

Scope to be used

Name	Param Number	Factor	Operator	Operand	Unit	Enabled
Max	P1	1	Divide	0.094	A	<input checked="" type="checkbox"/>
Rise Time	RISE TIME	1	None		ns	<input checked="" type="checkbox"/>
Current at 30ns	ESD Time(ns) 30	1	Divide	0.094	A	<input checked="" type="checkbox"/>
Current at 60ns	ESD Time(ns) 60	1	Divide	0.094	A	<input checked="" type="checkbox"/>
	Manual	1	None			<input type="checkbox"/>

Scope  
MSO6000

Shape Number Of Points  
100000

Nb Measurements by Step  
10

Scope number of points

Up to 5 parameters simultaneously

Calculation on measured values  
(ex: voltage to current, s to ns)

Specific functions RISE TIME et ESD: Values extracted from the instrument trace



# Limits and uncertainty

Table 3 – Contact discharge current waveform parameters

Level	Indicated voltage kV	First peak current of discharge $\pm 15\%$ A	Rise time $t_r$ $(\pm 25\%)$ ns	Current $(\pm 30\%)$ at 30 ns A	Current $(\pm 30\%)$ at 60 ns A
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The reference point for measuring the time for the current at 30 ns and 60 ns is the instant when the current first reaches 10 % of the 1<sup>st</sup> peak of the discharge current.

NOTE The rise time,  $t_r$ , is the time interval between 10 % and 90 % value of 1<sup>st</sup> peak current.

Measurement uncertainty of the laboratory

Limits and uncertainties											
Scope Parameters				Nominal Limit		Limits		Lower Uncertainty		Upper Uncertainty	
Name	Param Number	Factor	Unit	Value	+/- (%)	Lower	Upper	Percent	Fixed Value	Percent	Fixed Value
Max	P1	1	A	7.5	15	6.375	8.625	8.1		8.1	
Rise Time	RISE TIME	1	ns	0.8	25	0.6	1	14.2		14.2	
Current at 30ns	ESD 30	1	A	4	30	2.8	5.2	8.1		8.1	
Current at 60ns	ESD 60	1	A	2	30	1.4	2.6	8.1		8.1	

Example for a 2kV voltage

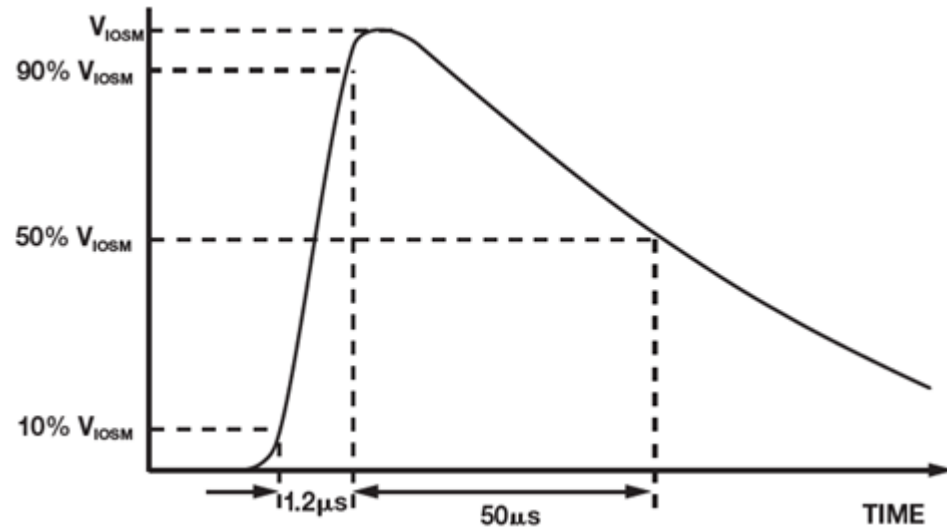
Calculated upper and lower limits





# Execution demonstration

➤ Surge simulation with a function generator



## Several levels

- 2V
- 5V

## Parameters to be measured

- Max
- Rise Time

## Limits

- ±10%
- ±10%

## Uncertainties

- ±5%
- ±10%

Number of measurements: 5



Automatic surge every 8s

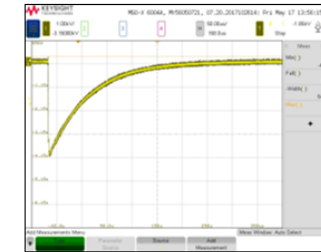


# TEST CONFIGURATION



# Automatic Report

- Report or certificate generation
- Use Aspose Technology
  - ✓ Fast
  - ✓ Highly configurable



Graph 6-5

### Direct Output - Open - 12Ω - Peak voltage

Test Level (kV)	EUT Setting (kV)	Nominal First Peak Current (A)	Lower Limit (A)	Measured (A)	Upper Limit (A)	Pass/Fail
-1	-1		-1.1	-1.0398	-0.9	PASS

### Direct Output - Open - 12Ω - Rise time

Test Level (kV)	EUT Setting (kV)	Nominal First Peak Current (A)	Lower Limit (A)	Measured (A)	Upper Limit (A)	Pass/Fail
-1	-1		0.84	1.45624	1.56	PASS_UU

### Direct Output - Open - 12Ω - Pulse width

Test Level (kV)	EUT Setting (kV)	Nominal First Peak Current (A)	Lower Limit (A)	Measured (A)	Upper Limit (A)	Pass/Fail
-1	-1		40	54.804	60	PASS_UU

### Direct Output - Open - 12Ω - Undershoot

Test Level (kV)	EUT Setting (kV)	Nominal First Peak Current (A)	Lower Limit (A)	Measured (A)	Upper Limit (A)	Pass/Fail
-1	-1		-300	28.2		PASS



# Conclusion

- Reduction of your test duration
- Quality improvement

	Manual including report	BAT-EMC Metrology including report
Surge Calibration	1 week	1 day
EFT Calibration	3 days	1/2 day
ESD Calibration	1 Day	1 hour

*Test duration reduction example*



# Special Thanks

**Special thanks to  
Teledyne Lecroy for the  
loan of the oscilloscope**

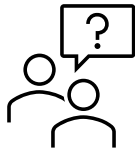


# To go further

## Contact Support BAT-EMC

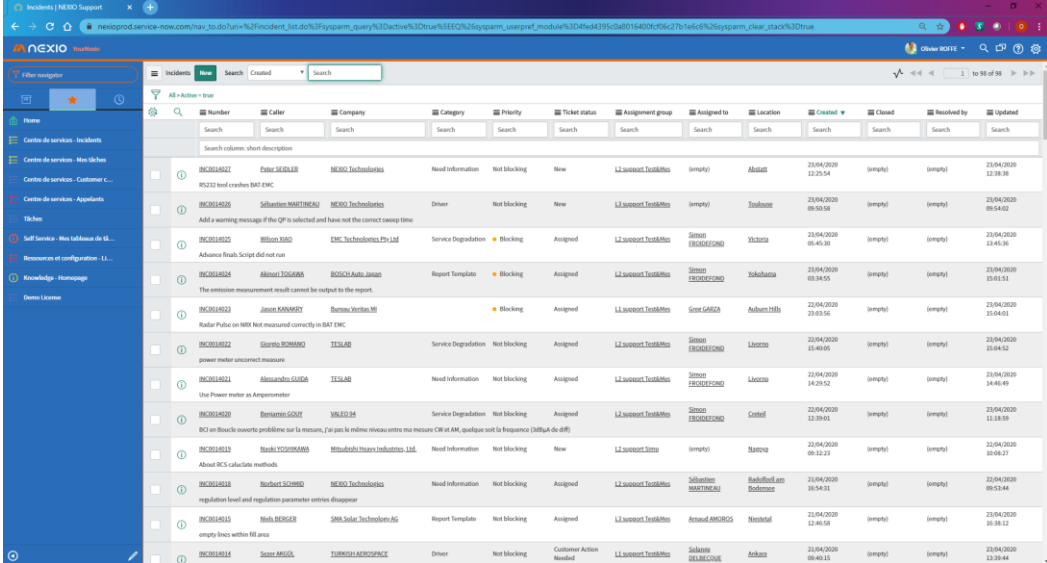


<https://www.nexiogroup.com>



<https://yournexio.com>

[sales@nexiogroup.com](mailto:sales@nexiogroup.com)



Number	Caller	Company	Category	Priority	Ticket status	Assignment group	Assigned to	Location	Created	Closed	Resolved by	Updated
INC014921	Felix SEVERE	NEXIO Technologies	Need Information	Not blocking	New	L2 support/Tickets	(empty)	Abaco	21/04/2020 12:25:54	(empty)	(empty)	21/04/2020 12:38:38
INC014920	Sébastien MONTREAU	NEXIO Technologies	Driver	Not blocking	New	L3 support/Tickets	(empty)	Indiane	21/04/2020 09:00:58	(empty)	(empty)	21/04/2020 09:54:02
INC014922	William BRAD	EMC Technologies Pty Ltd	Service Degradation	Blocking	Assigned	L2 support/Tickets	Simon ESCOFFIERO	Victoria	21/04/2020 08:45:30	(empty)	(empty)	21/04/2020 13:45:36
INC014924	Alexandre TOGAHBA	BOSS Auto Japan	Report Template	Blocking	Assigned	L2 support/Tickets	Simon ESCOFFIERO	Tokushima	21/04/2020 09:34:55	(empty)	(empty)	21/04/2020 09:51:51
INC014923	Jason BARNETT	Berman, Veritas MI	Report Template	Blocking	Assigned	L3 support/Tickets	Gene GAGER	Anderson Hills	21/04/2020 23:03:56	(empty)	(empty)	21/04/2020 05:04:01
INC014922	Stéphane SCHMIDT	TELEAD	Service Degradation	Not blocking	Assigned	L2 support/Tickets	Simon ESCOFFIERO	Lisieux	21/04/2020 15:40:05	(empty)	(empty)	21/04/2020 15:44:12
INC014921	Alexandre GUYON	TELEAD	Need Information	Not blocking	Assigned	L2 support/Tickets	Simon ESCOFFIERO	Lisieux	21/04/2020 14:26:52	(empty)	(empty)	21/04/2020 14:46:49
INC014920	Bernard GUYOT	VALCO 24	Service Degradation	Not blocking	Assigned	L2 support/Tickets	Simon ESCOFFIERO	Crestif	21/04/2020 13:39:01	(empty)	(empty)	21/04/2020 13:39:59
INC014919	Stéphane SCHMIDT	Mitsubishi Heavy Industries, Ltd.	Need Information	Not blocking	New	L2 support/Tickets	(empty)	Nantes	21/04/2020 09:52:23	(empty)	(empty)	21/04/2020 09:58:27
INC014918	Stéphane SCHMIDT	NEXIO Technologies	Need Information	Not blocking	Assigned	L2 support/Tickets	Sébastien MONTREAU	Buckfield-am Bodmer	21/04/2020 16:54:31	(empty)	(empty)	21/04/2020 09:53:44
INC014915	Math BERGER	SMA Solar Technology AG	Report Template	Not blocking	Assigned	L3 support/Tickets	Axelou BRINGS	Wessling	21/04/2020 12:40:58	(empty)	(empty)	21/04/2020 16:38:12
INC014914	Stéphane SCHMIDT	TURKISH AIRWAYS	Driver	Not blocking	Customer Action Needed	L1 support/Tickets	Sébastien ESCOFFIERO	Abaco	21/04/2020 09:40:15	(empty)	(empty)	21/04/2020 13:29:44

# Thank you for your participation !

## Any questions ?



## Next webinar June 23, 2022

