

Solar Simulation and Transport Vibration – “*THE REAL LIFE*”

An enlightening view on the road of weathering and transport simulation possibilities

Mark de Waard

&

Vincent Rius



rycobel**group**



Meten



Verbeteren



Service

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- Rycobel
 - Who and What
- Weathering Simulation
 - What and How
- Transport Simulation
 - How and Why

Rycobel History

1950

Roots in
Textile

1950

Use of Nylon
requires to
control static
electricity.
Start of
division
'improve'
1960

Awareness of
quality and
requirement for
test equipment.
Accelerated
weathering is
the start of
division
'measure'
1970



1975

1988

US Test equipment for
Sheet material



Move to the new premises at
Nijverheidslaan Deerlijk
1991

1990

2002

2005

2010

2016

Brazilian test equipment for
paper & pulp
2003

US instrument for vibration
and transport simulation
2004

Achieved ISO9001:2000
2005

French sister company
Equintech sarl
2006

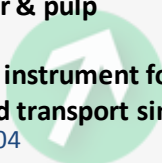
Installation of new office
space on the first floor
2007

ISO9001:2008
2009

Australian instruments
for leak testing
2009

Dutch sister company
Rycobel BV
2010

Expansion of
sales territory
textile testing
2015



Rycobel

Mission



Rycobel brings competitive advantage by
supplying and maintaining  equipment to
measure  and improve  product
characteristics

Rycobel

Departments



Rycobel TEAM

Integrity, Experience, Engagement, Teamwork, Helpful



**MEASURE YOUR PRODUCT
CHARACTERISTICS**



**IMPROVE YOUR PRODUCT
CHARACTERISTICS**

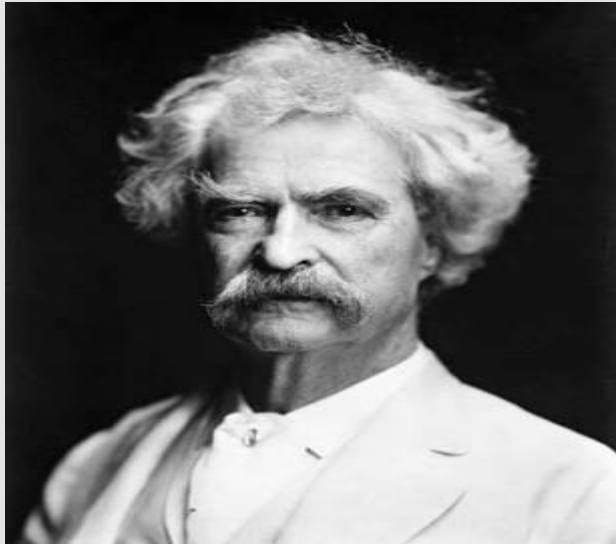


**AFTER SALES SERVICE &
CALIBRATION**

Testing



“Climate is what we expect,
Weather is what we get.”



*Mark Twain,
Author, 1835 - 1910*

“Prediction is difficult,
especially if it is about the future”



*Niels Bohr,
Nobel Price in Physics 1922*

Testing

Why ?



PRIMARY REASON:

- *To reduce the risk of product failure and associated warranty costs, brand image, market position, profit loss and legal liability*

ADDITIONAL REASONS:

- Meet code, buyer or other compliance requirements
- Discover and mitigate failure modes
- Conform to voluntary consensus standards or specifications
- Demonstrate durability and performance
- Benchmark competitors or your products
- Test to various climates, predict service life
- Improve product or reduce cost



Weathering Testing



100

 **ATLAS**
MATERIAL TESTING SOLUTIONS

Years of Innovation

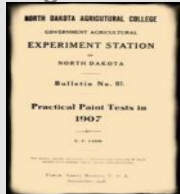
 **ATLAS**
MATERIAL TESTING SOLUTIONS



Weathering Testing History



Fargo ND test



Enclosed Carbon Arc



South Florida site



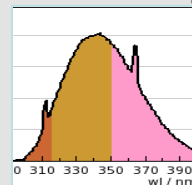
Xenon Arc



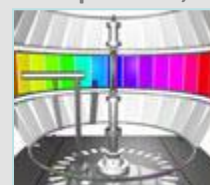
Controlled E



UVA-340 lamp



Full Spectrum, S3T



1916

1927

1934

1958

1984

2009

2014

1906

1919

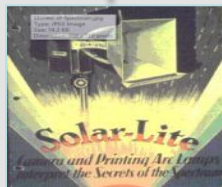
1931

1954

1979

1987

2010-2011



Lab Light-fastness



Lab weathering



Sunshine Carbon Arc
& DSET Arizona site



ASTM G90



FS-40 UVB lamps



UAWS

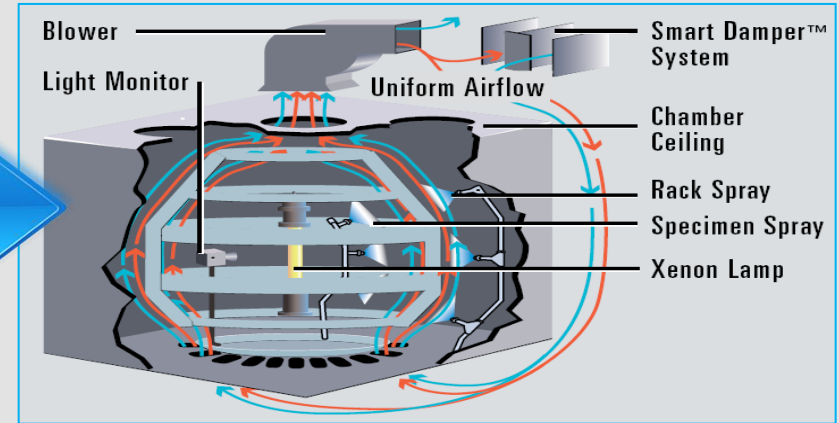


UA-EMMA

100+ year history of formal weathering testing

Weathering Testing

Bringing the Outdoors into the Lab



Laboratory weathering instruments deliver simulated solar radiation, heat and moisture in a controlled, reproducible way to both eliminate natural outdoor weather variability and provide test acceleration through increased stress levels.

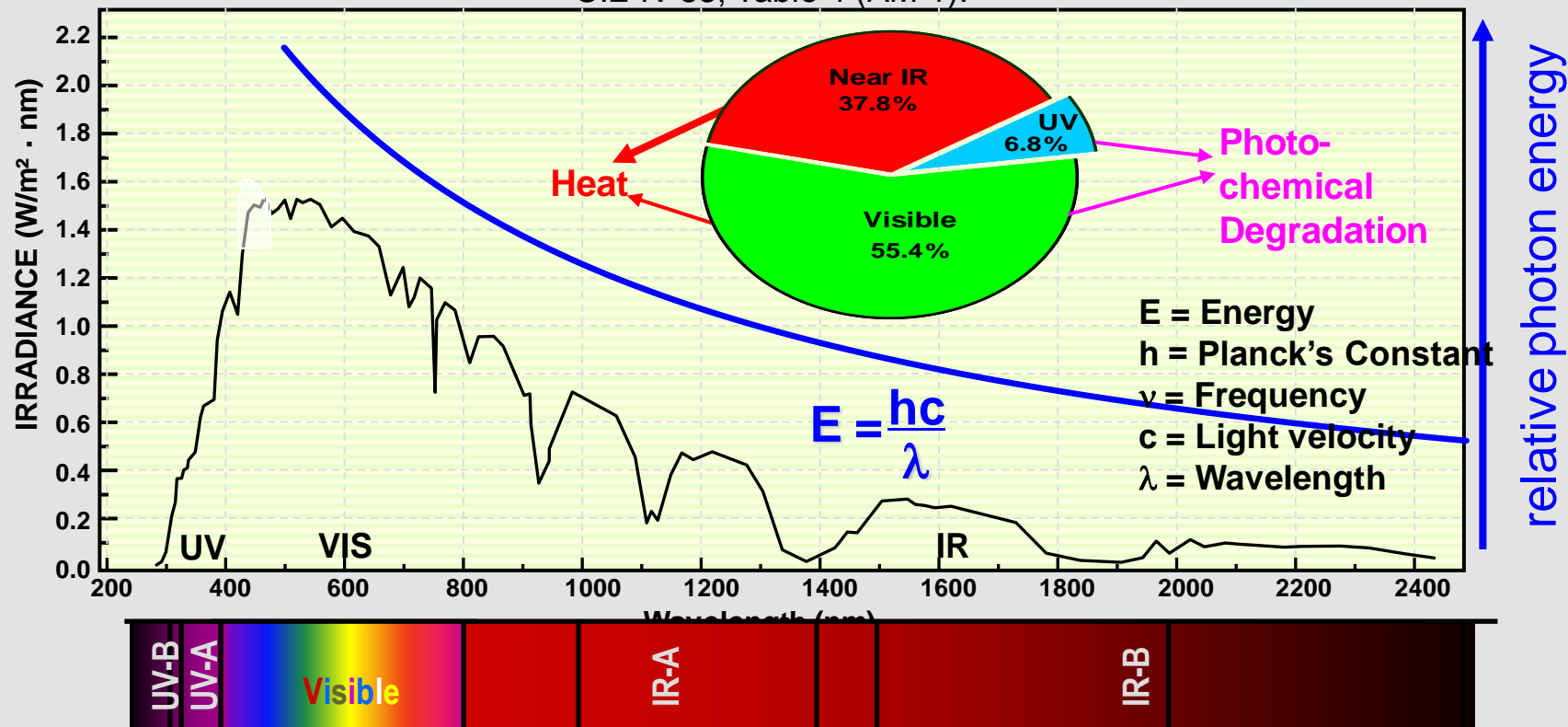
How well this is accomplished differentiates instruments and manufacturers.

Weathering Testing

What Light is Right ?



CIE N°85; Table 4 (AM 1):



Weathering Testing

Primary Factors of Weather



Radiation

- Quantity
- Intensity
- Spectral power distribution



Temperature

- Min/Max
- Duration
- Cycles



Water

- Quantity
- Duration
- Phase
- Cycles

Chemical Aging

Thermo-mechanical Aging

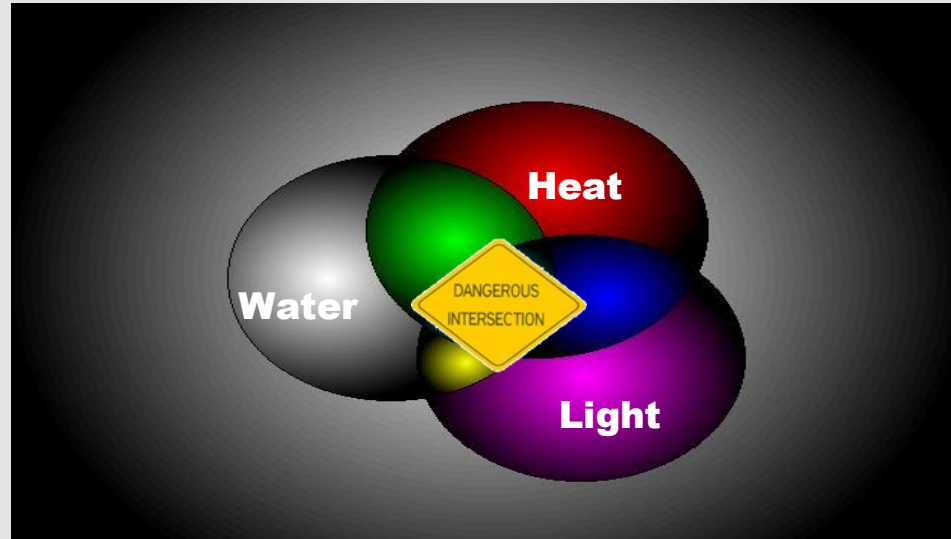
(+ secondary weather factors)



Synergy & Interactions



“The combined effects of the whole are greater than the sum of the parts”



Testing individual factors, such as UV, heat or moisture in isolation may **misrepresent** the combined environment and lead to **misleading test results**

Weathering Testing

Materials and Components



All materials and components used have to be tested according to their weather ageing to make sure they do not fail prematurely (within the warranty period):

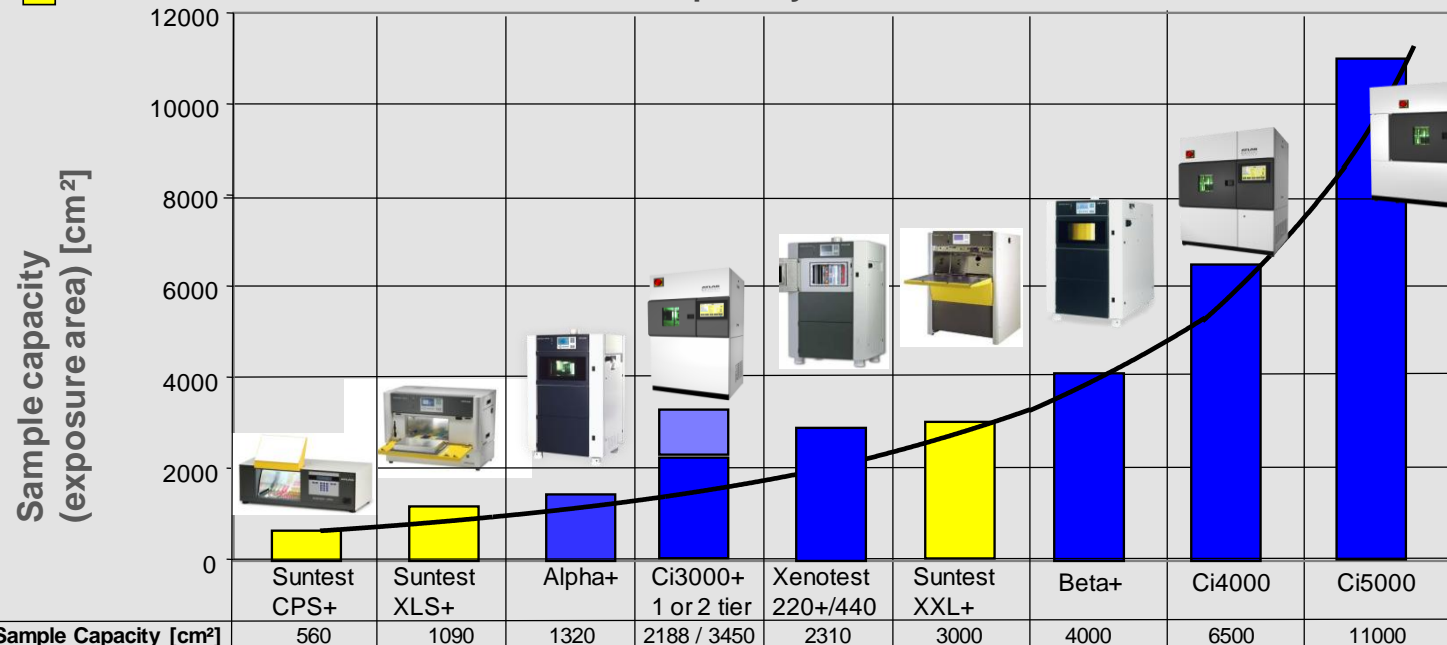
- Coated metal housing
- Coated plastic housing
- Display, screen
- Cables, switches, lock
- Connectors
- Sealants, seals
- etc.



Weathering Testing Equipment



- Xenon arc instruments with rotating sample rack
- Xenon arc instruments with static flat sample tray



UVTest



SEPAP

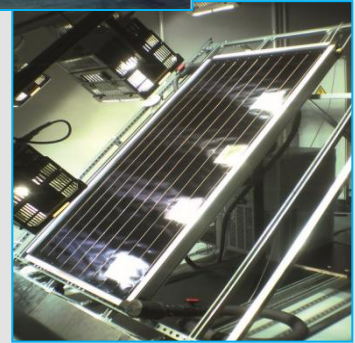


Weathering Testing

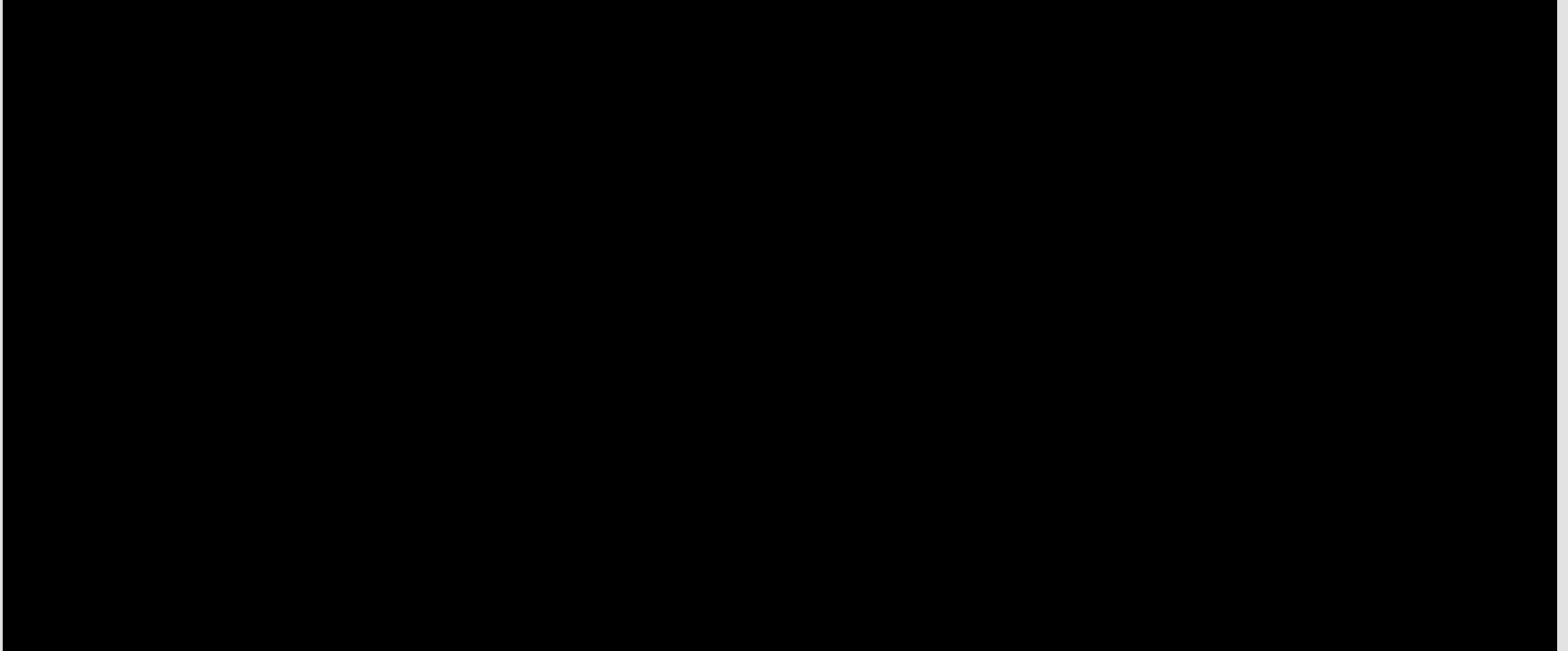


Equipment

Atlas Custom Systems lighting for solar-thermal (MH lamps) or full-spectrum solar simulation (MHG lamps) and light soaking applications



Transport Testing



Transport Testing

History



Lansing - Michigan
Home of Michigan State
University
School of Packaging

+

Monterey - California
Naval Post Graduate School
Aerospace Engineers

Transport Testing



What type of information are we interested in (next to °C / %rH / kPa) ?

➤ Shock (incl. drop height if appl.)

Shock pulses are described by their:

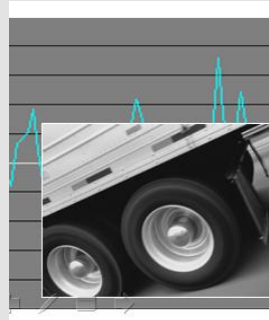
- Acceleration Amplitude
- Duration
- Wave Shape (half sine/square)



➤ Vibration

Vibration is described by:

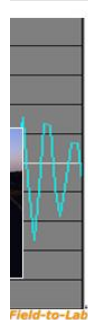
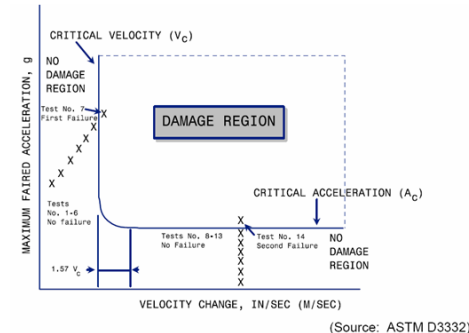
- Acceleration Amplitude
- Frequency
- Type (sine/random)



Product Fragility

Damage Boundary

Any **shock** to the product which can be plotted inside this Boundary will cause damage!



Transport Testing

Monitor / Measure



Monitoring Instruments



VS

Measuring Instruments



- ✓ Our Environment is Known
- ✓ We want to Evaluate
- ✓ Make sure everything goes OK

- ✓ Our Environment is UNKnown
- ✓ Fact-Finding
- ✓ Analyze Shipments

Transport Testing

UPS case



Purpose: Monitor road conditions in and around Shanghai area (local traffic only) and compare those to results in USA → wouldn't a standard (ISTA) be sufficient ?

Most standards were developed in the 1980s...in the United States, for US roads and under US conditions



2x

+ GPS



for 3 months

Transport Testing

UPS case - 30,000 foot view



Transport Testing

UPS case - Analysis

The detailed analysis is proprietary information and belongs to UPS,
I *can* share the overall PSD data with this group, which will follow next



Channel 3 – most severe data → vertical orientation

Ch1 & ch2 → longitudinal & transversal

High peak @ 2-3 Hz (vertical) → Spring resonance

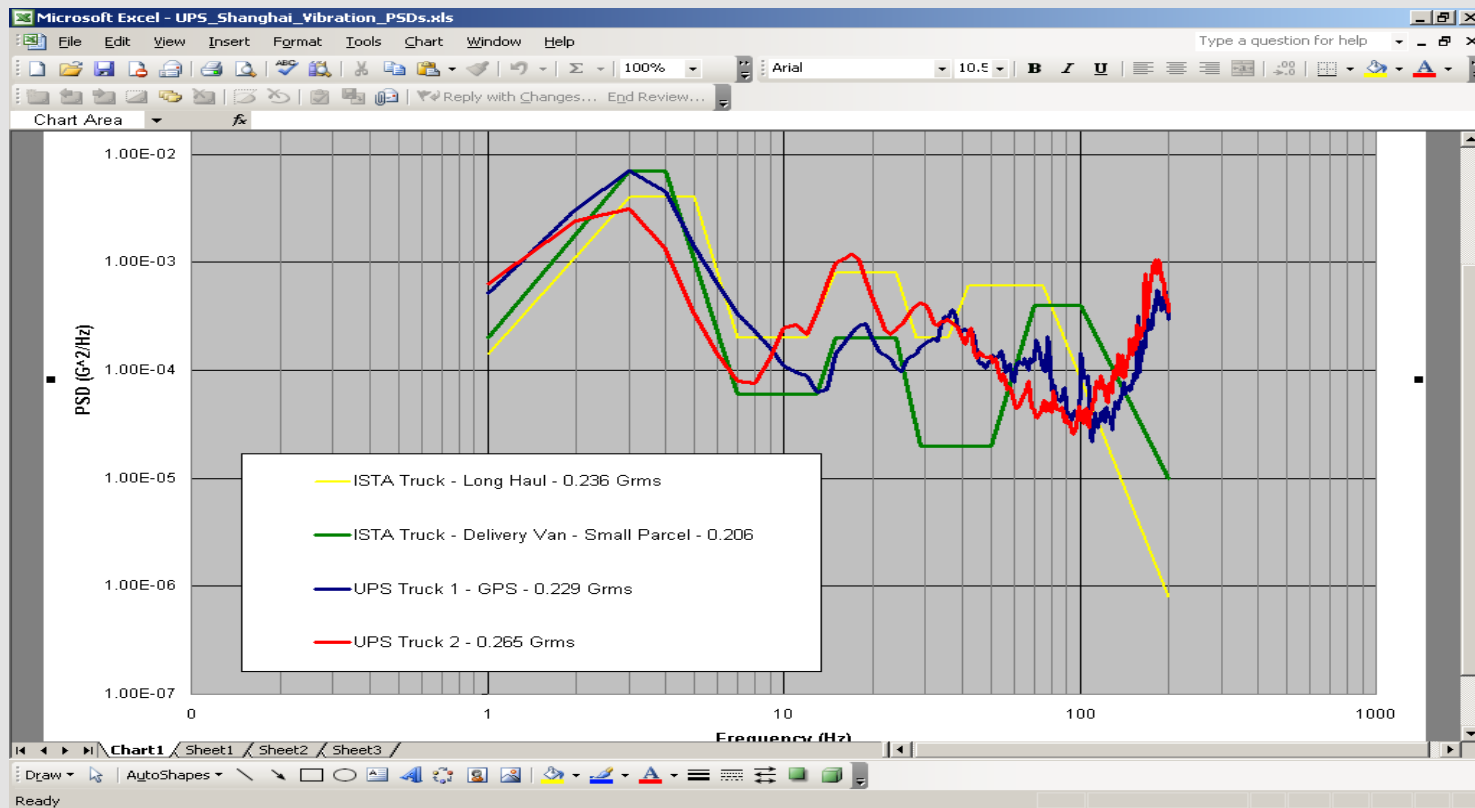
Resonance peak @ 19 Hz (all 3 channels) → Tire resonance

Resonance peak @ 180 Hz → Mechanical resonance (??)

Beyond that → Harmonics

Transport Testing

UPS case – CN vs. USA/ISTA



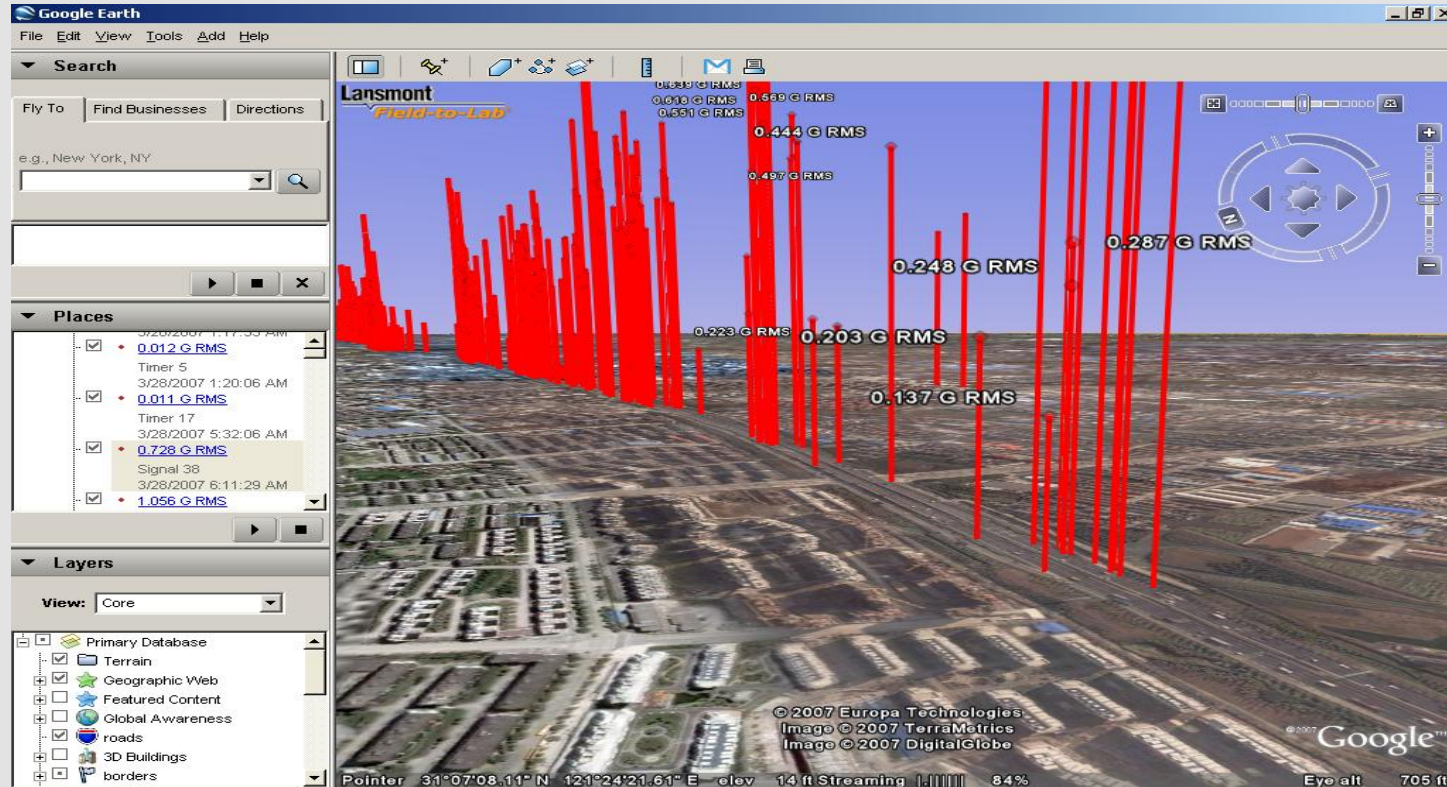
Transport Testing

UPS case - GPS



Transport Testing

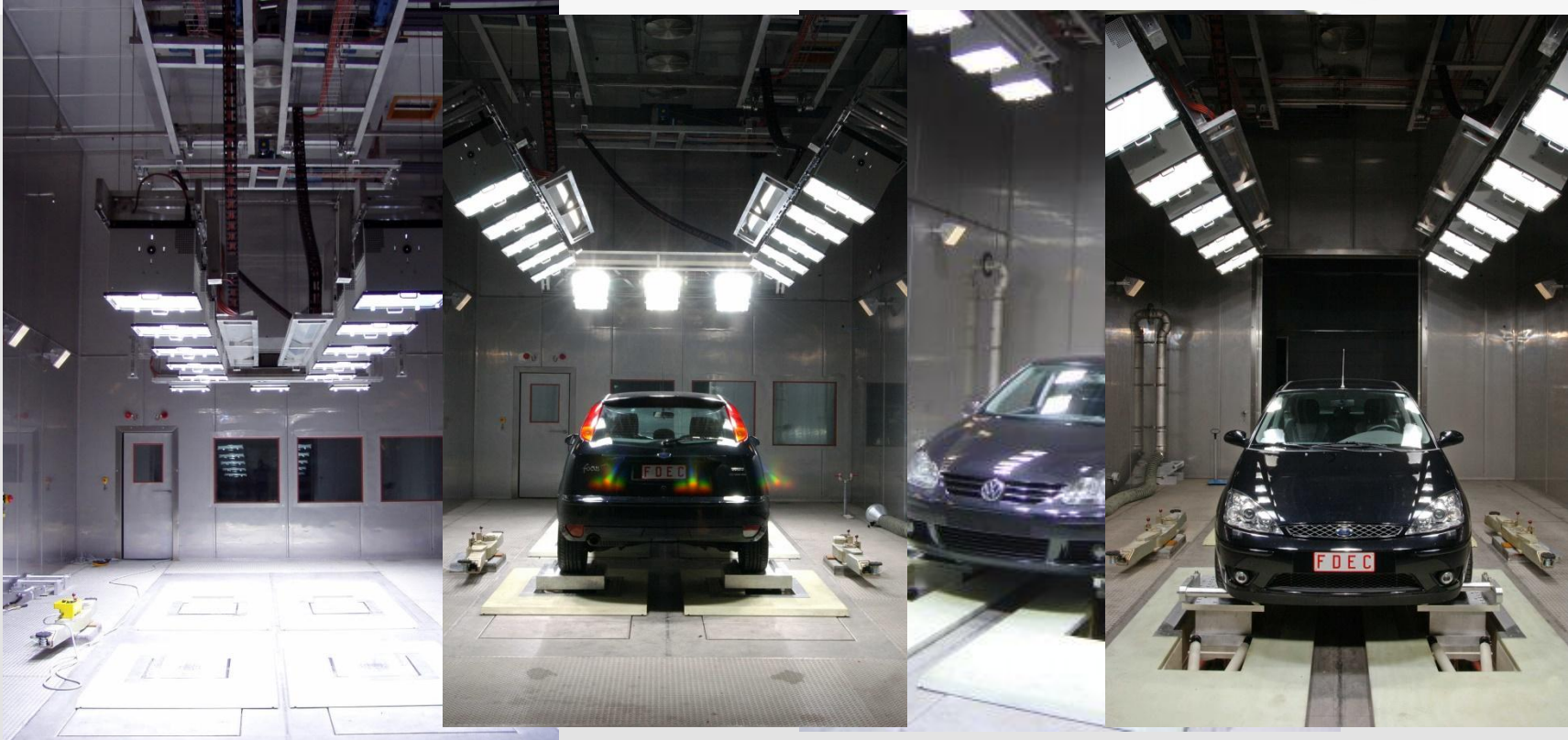
UPS case - GPS



M
O
R
E

C
A
S
E
S

Now Combine



THX



rycobelgroup



Meten



Verbeteren



Service

EMAIL
INFO@RYCOBEL.COM

WEBSITE
WWW.RYCOBEL.COM

