

Tolling and Traffic Management Challenges

High-precision axle counting at multi lanes
without any installation in the road pavement

George Thiel – Traffic Industry Specialist
SICK, Incorporated

"SICK - the world's largest one-stop-shop for industrial lidar, radar and camera solutions"

SICK
Sensor Intelligence.

74 years of "Incredibly durable sensors known for toughness and quality"

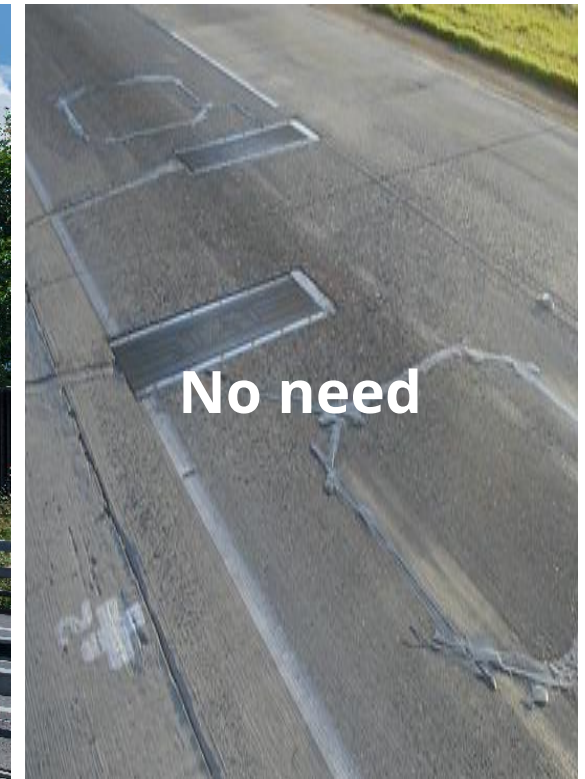


Axle counting solution

The challenge – Nonintrusive axle counting that is easy to Maintain

High precision axle counting at multi lanes
without any installation in the road pavement

Customers target:
«loop-less tolling»



Axle counting solution

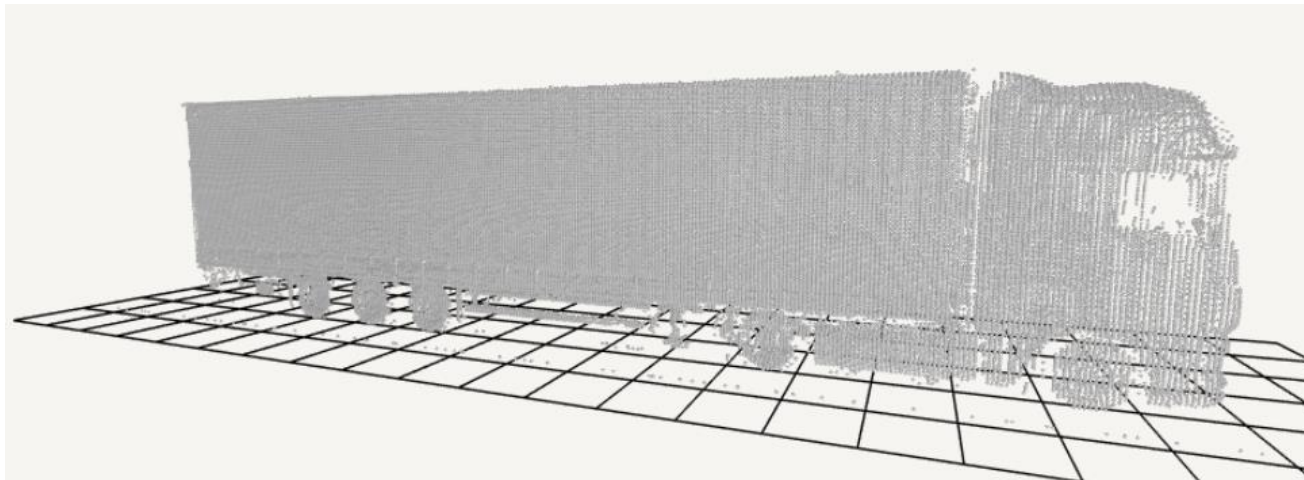
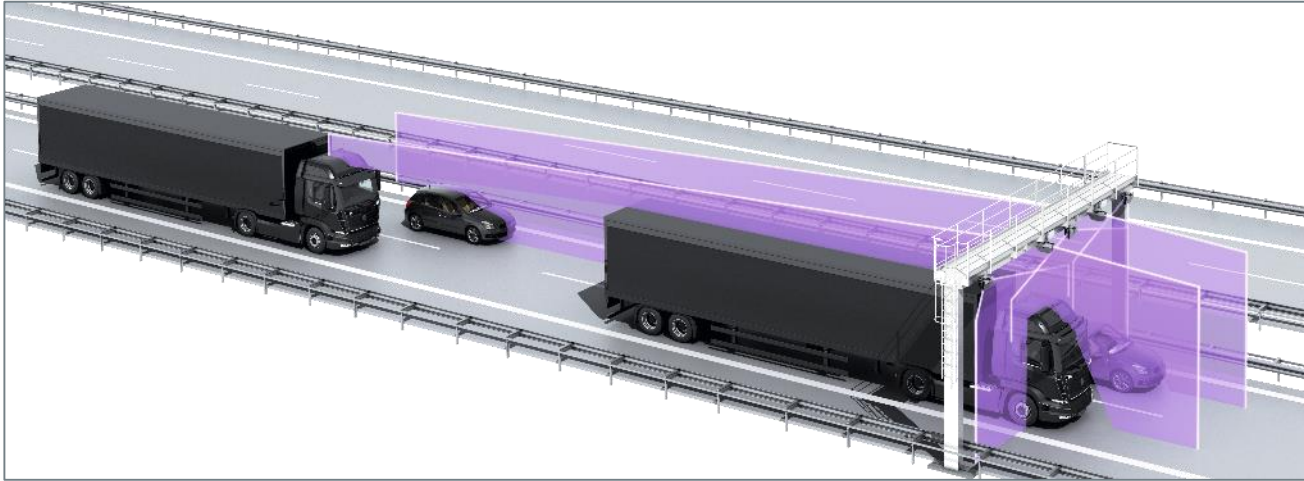
The approach – SICK profiling solution

SICK
Sensor Intelligence.



SICK system solutions

Profiling systems – LiDAR sensor fusion (FPS, TIC, VPS profiling solutions)



Start Time	› 2/17/2020, 1:05:56 PM
Lane	› 1
Driving Direction	› Normal
Category	› Semitrailer truck
Speed	› 53.10 MPH
Width	› 9.84 ft
Height	› 13.02 ft
Length	› 54.92
Axles	› 5

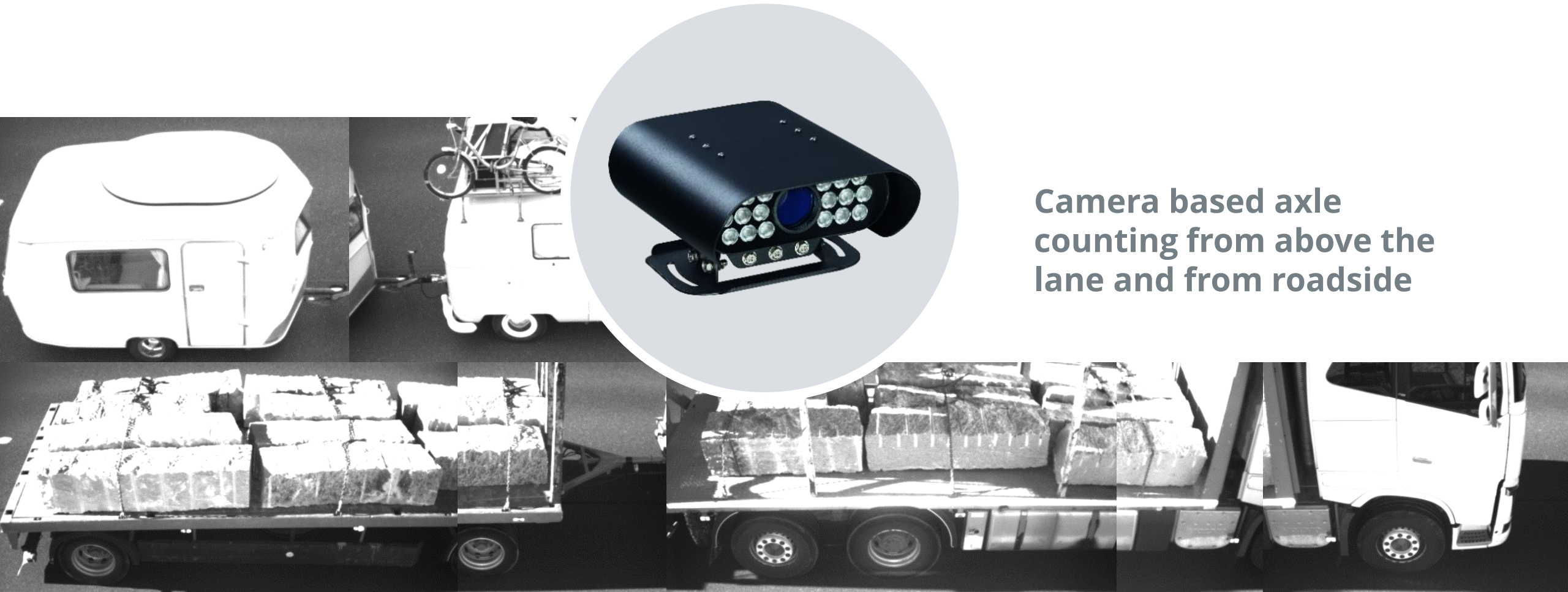
Axle counting solution

The approach – Vision based axle counter adder



Axle counting solution

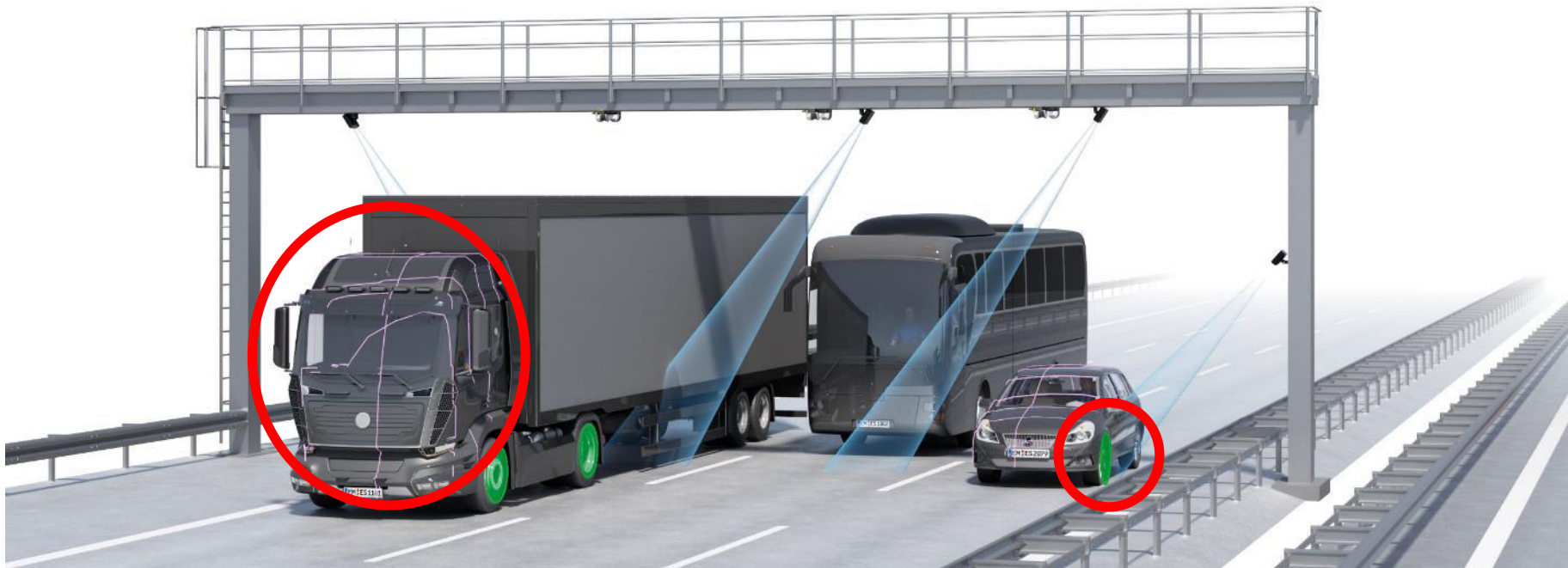
The approach – Vision based axle counter adder



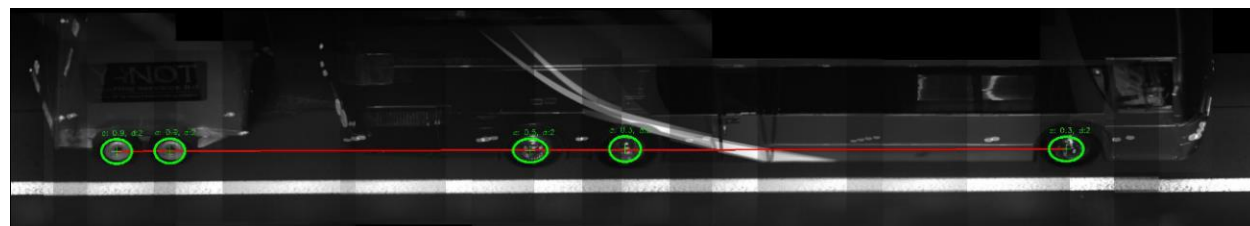
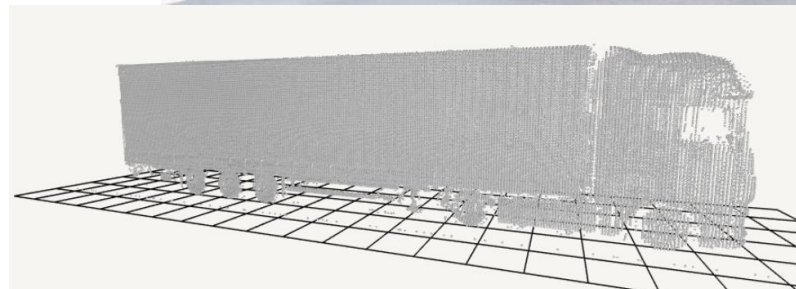
Camera based axle
counting from above the
lane and from roadside

Axle counting solution

System design for 3 lanes – redundant camera setup

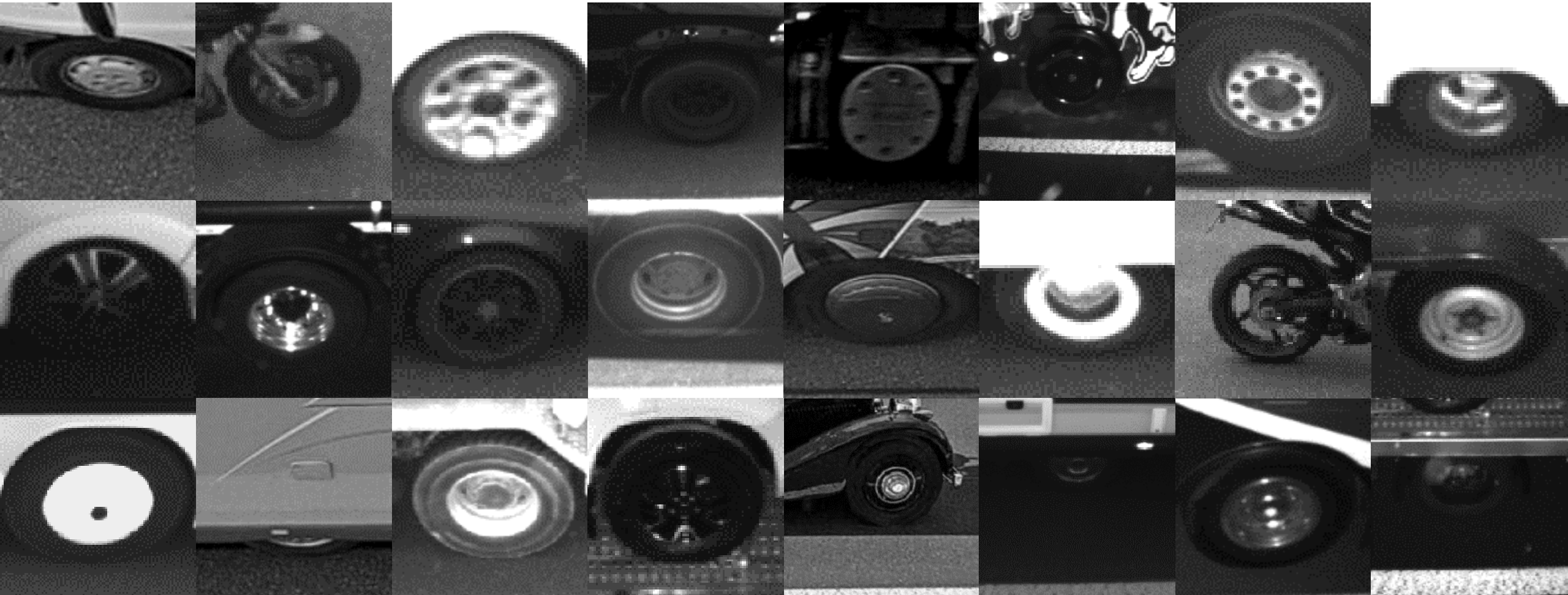


No. of lanes	3
Length	+
Width	(+)
Height	+
Classification	+
Axle counting	+



Axle counting solution

The challenge – Many Tire Types Throughout the World



Axle counting solution

The challenge – Data input at day and night

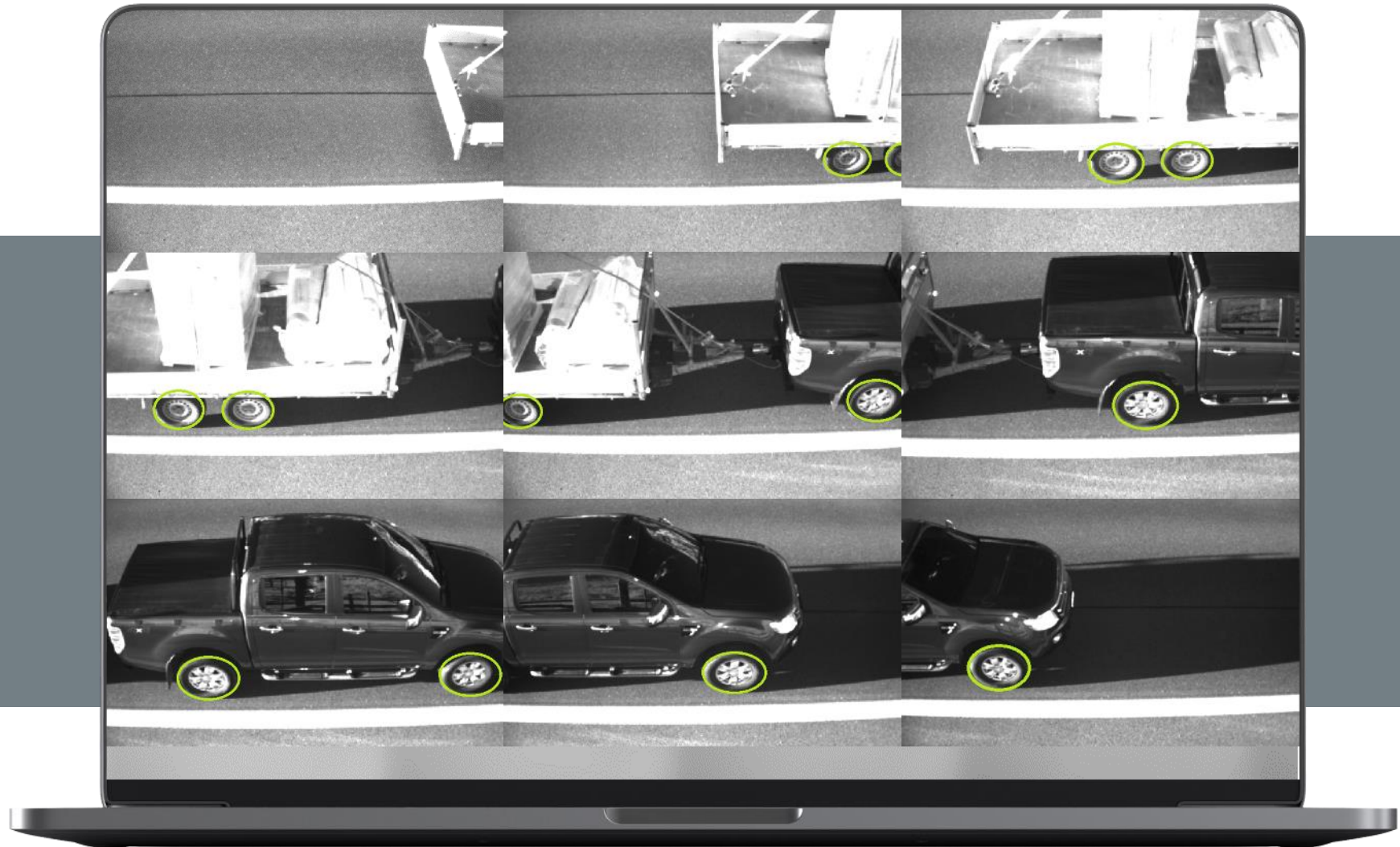


Axle counting 24/7



Axle counting

The challenge won –
Result at day time



Axle counting

The challenge won –
Result at night time



Axle counting solution

Summary

Performance

High counting accuracy
> 97% of detected axles
at speeds up to 112 MPH

Technology

Contact free detection without
any installation at road surface

Setup

Fast commissioning and
system setup via WEB interface

Axle counter Summary

Availability

Axle detection at day and night time
and each weather condition

Output

Data provided via TEMS Info interface

- › Number of axles per vehicle
- › Axle position

Installation

Above the lane and
road side installation

Axle counting solution

The offer – Do you have a SICK LMS511 in your tolling system?



At a Glance

- ✓ Highly precise classification in up to 30 different vehicle classes
- ✓ Lane changers & straddlers detection
- ✓ Reliable in free-flowing and stop-and-go traffic
- ✓ Works in all climate zones (-40°C ... $+60^{\circ}\text{C}$) thanks to expanded temperature range
- ✓ Data history of the last 50 vehicles detected
- ✓ Can be extended to include the axle counting function

At a Glance



- ✓ High detection rate based on Deep Learning
- ✓ Counting accuracy of more than 97%
- ✓ Vehicle speeds up to 180 km/h
- ✓ Detection of even extra-long vehicles with the stitching method, e.g. by putting several individual images into an overall image
- ✓ Optional second camera per lane as a back-up solution

The right system to ensure your success

SICK System Solution

George Thiel – Traffic Industry Specialist
SICK, Incorporated

Phone: 609-290-0921

Email: george.thiel@sick.com

Website: www.sick.com/traffic

