

Chip Simulation for Virtual ECUs



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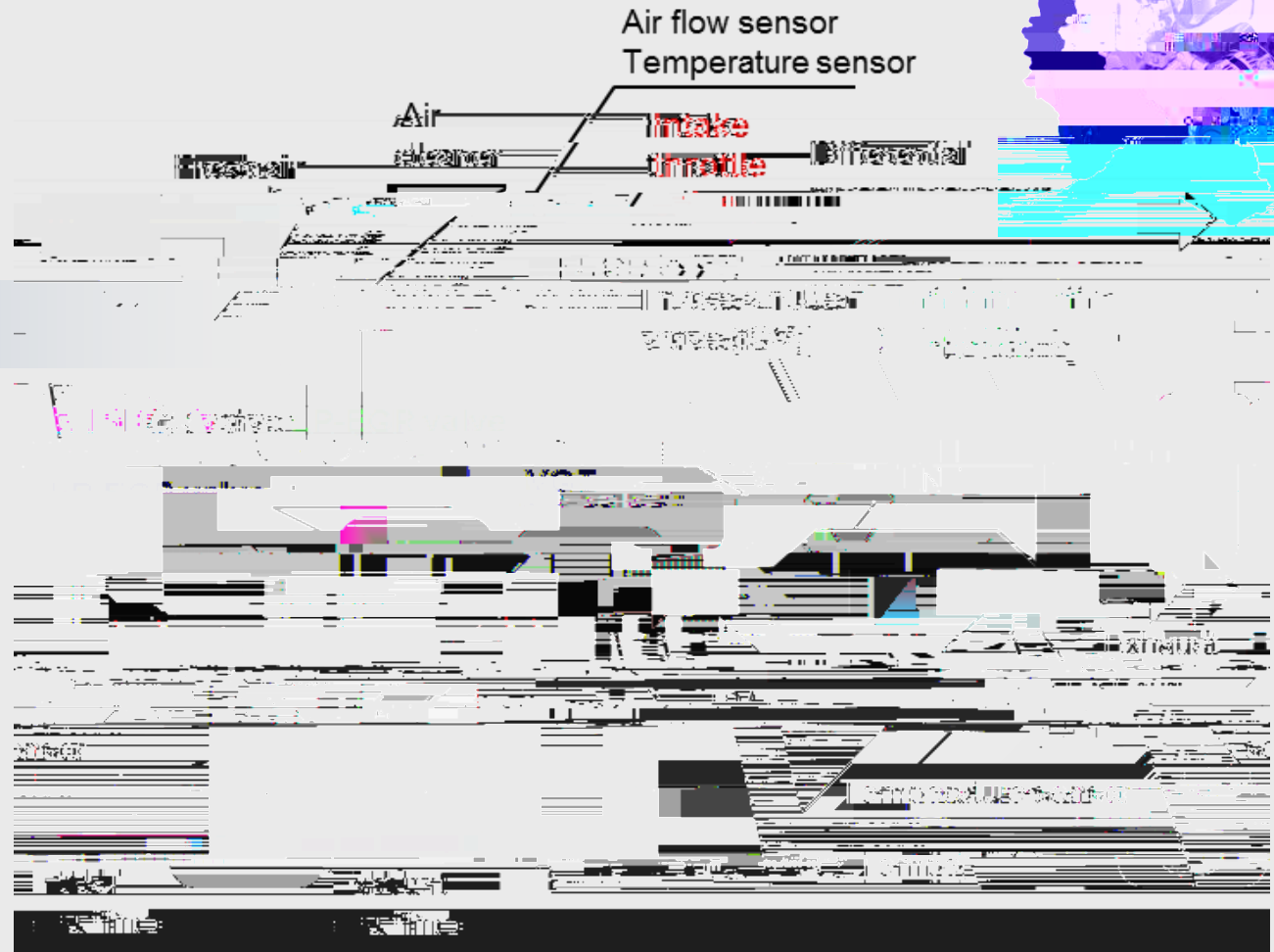
Background

2018 model new Civic

Fuel economy (CO₂) Modified NEDC

91 g/km (6MT, Sedan)
93 g/km (6MT, Hatchback)
109 g/km (9AT)

1.6L diesel engine



Exhaust emissions

Euro6d-TEMP



Civic

Passed RDE regulation and achieved 91 g/km

Method for calibration and validation

Tests on road	Chassis dynamometer (vehicle) + vehicle simulation	Engine test bed (engine) + vehicle simulation	
	Vehicle s		

Necessity of model utilization for efficient development

Background

Concept of model based simulation environment

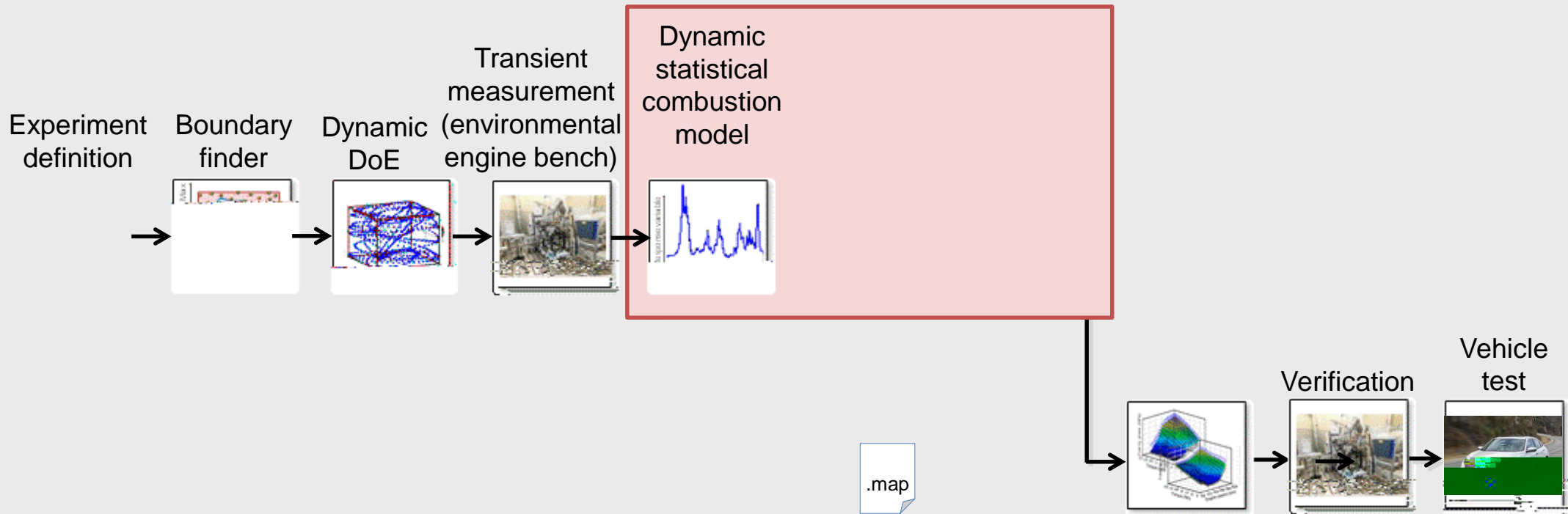
Engine simulation model

- ECU model
- Combustion model
- Catalyst model

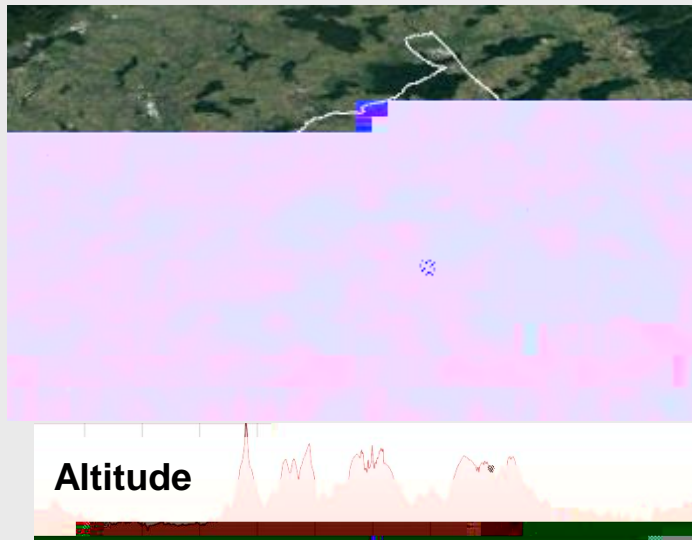
RDE simulation combined with vehicle simulation model

Summary

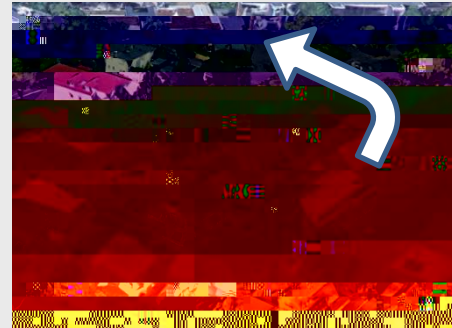
Flowchart of model utilization



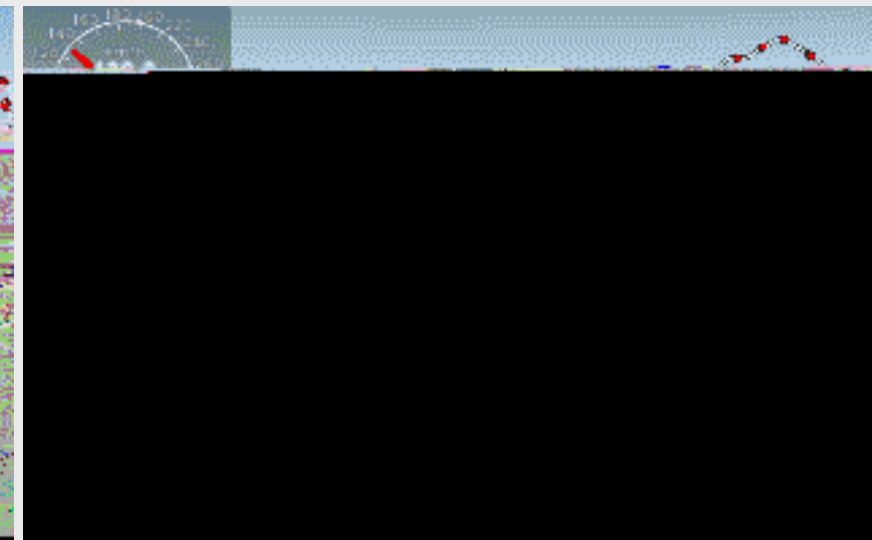
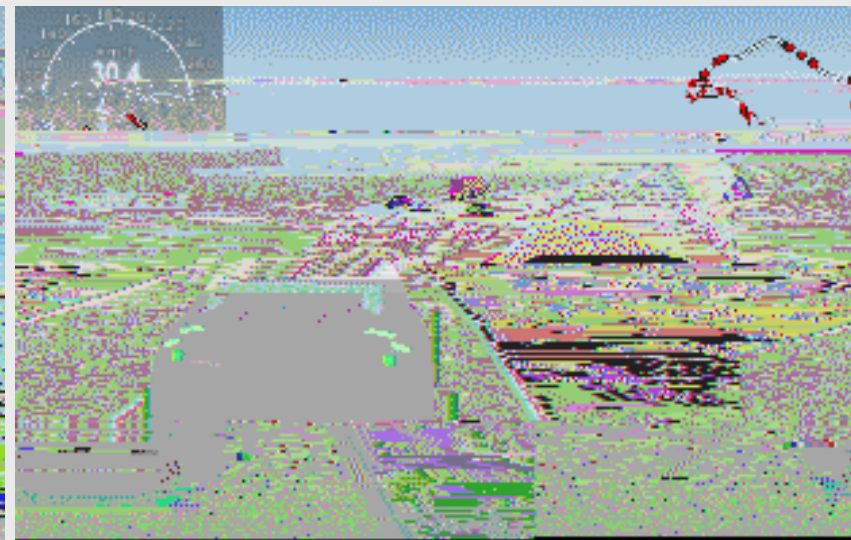
Vehicle simulation for RDE route



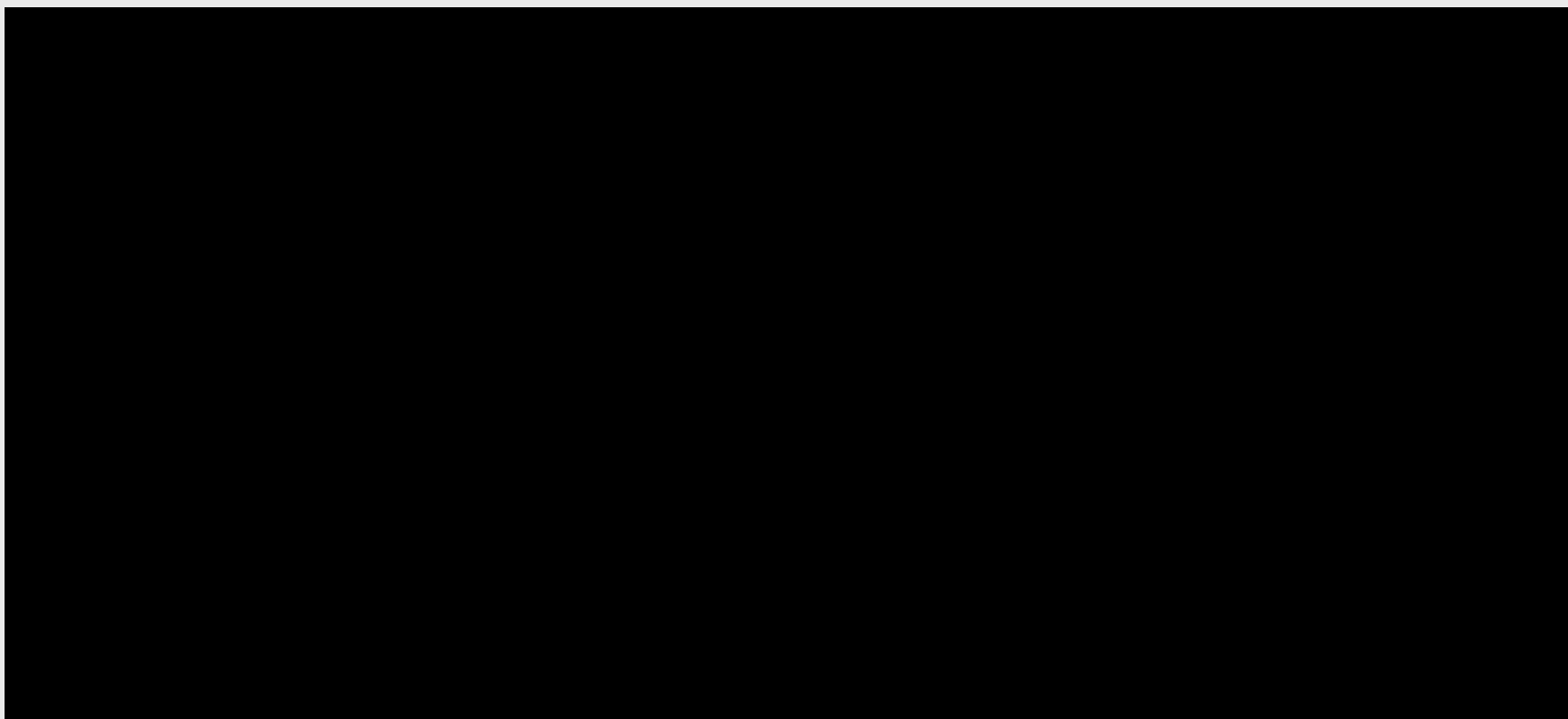
Digital map



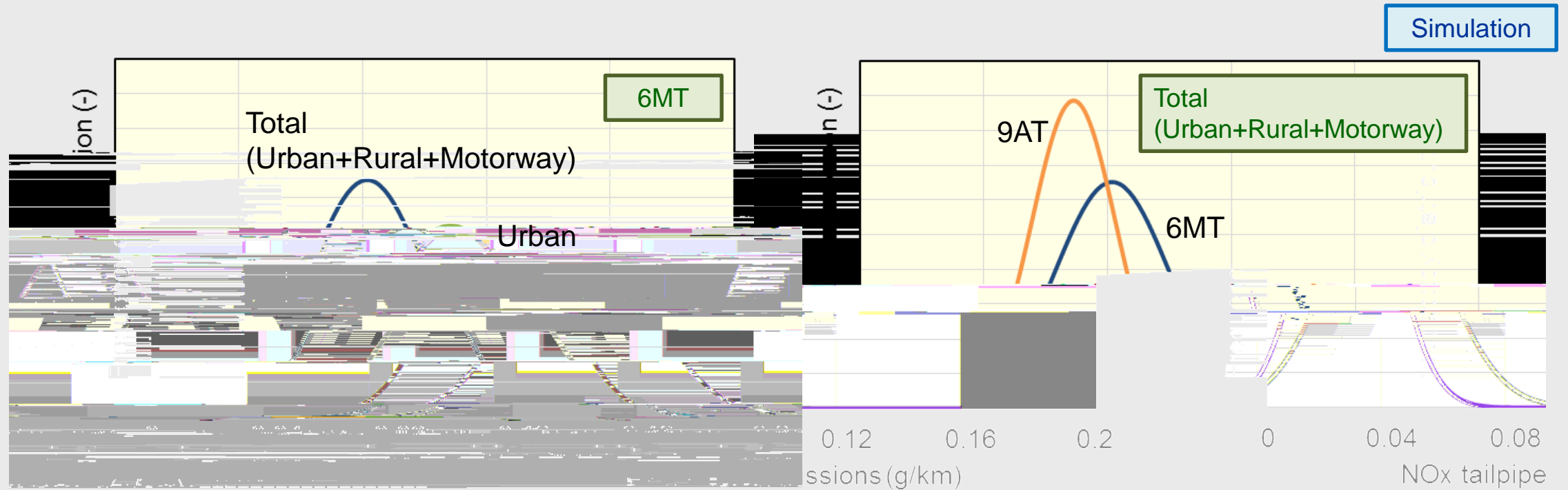
Simulation



Generation of vehicle speed by vehicle, driver, route, and traffic models



Evaluation of emission robustness



It is a challenge to sufficiently validate RDE performance under all conditions through road tests during vehicle development due to wide range of validating conditions.

A model based development technology was established to simulate, verify and calibrate the emissions performance of a vehicle.

RDE performance could be accurately predicted by coupling a vehicle driving simulation with an engine simulation that includes an ECU model, combustion model (dynamic data based statistical model), and exhaust aftertreatment(en-US)>> BDC q0.0000

Thank you very much for your kind attention.

