



U.S. Department of Transportation  
**Federal Motor Carrier Safety Administration**

# Field Study of the Efficacy of the New Restart Provision for Hours of Service

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Office of Research and Information Technology

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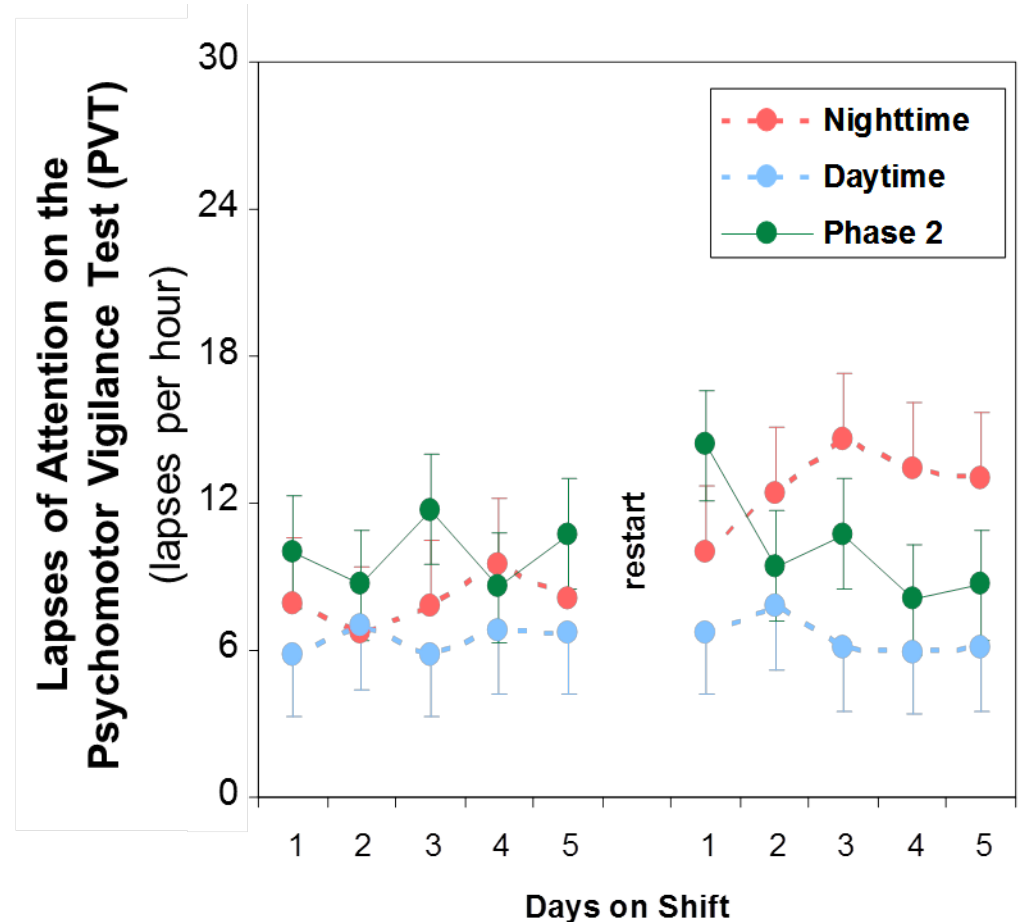


# Background – Laboratory Study Results

## Investigation into Motor Carrier Practices to Achieve Optimal CMV Driver Performance, Phases I & II

**Phase I:** The 34-hour restart was effective at mitigating sleep loss and consequent performance impairment for daytime drivers, but not for nighttime drivers.

**Phase II:** A 2-night restart for nighttime drivers was more effective at maintaining optimal performance from duty cycle to duty cycle.



# MAP-21 Field Study Mandate

- New restart provision for hours of service (HOS) requires commercial motor vehicle (CMV) drivers to have at least two nighttime periods from 1 a.m. until 5 a.m. in their restart break.
- The Moving Ahead for Progress in the 21st Century Act (MAP-21) mandated a field study to expand upon the results of the laboratory-based studies.

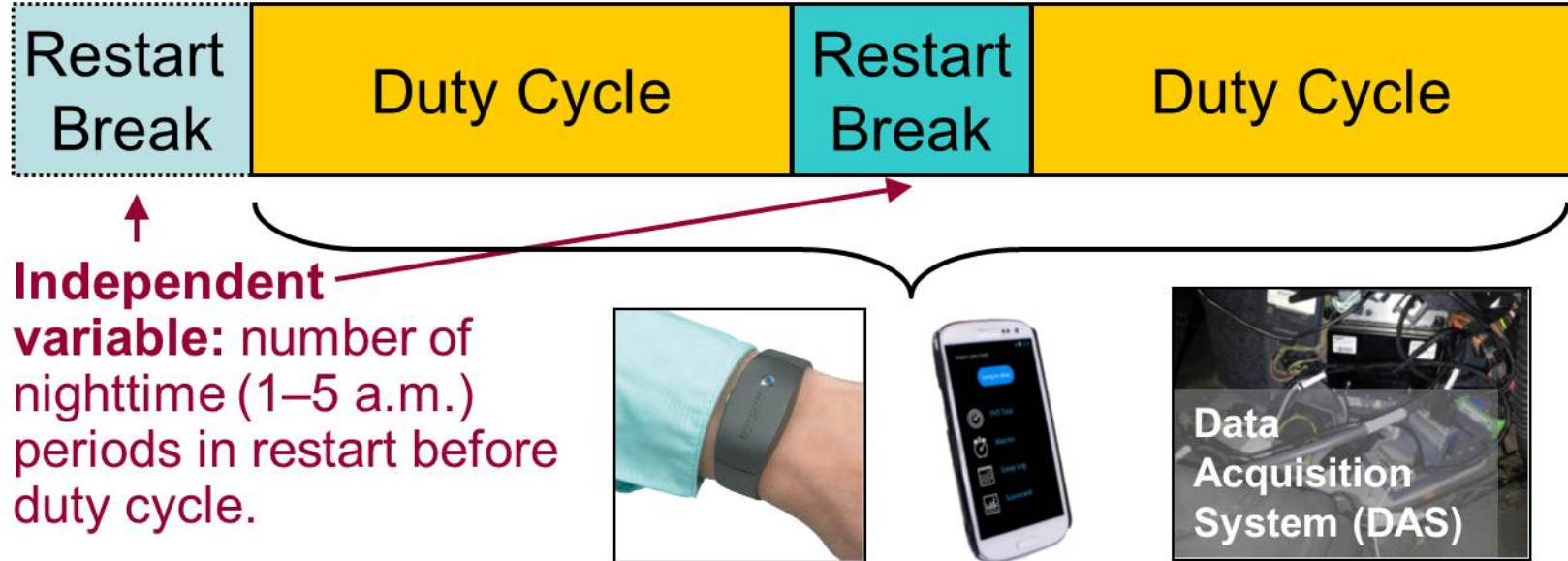
# MAP-21 Field Study Mandate, continued

- MAP-21 required that:
  - The field study be consistent with the laboratory study methodology.
  - The data be representative of drivers affected by the maximum driving time requirements.
  - The analyses be statistically valid.
  - The field study follow the design of the “Scheduling & Fatigue Recovery Project.”



- Study design and results were reviewed by an expert peer review team.

# Naturalistic Field Study



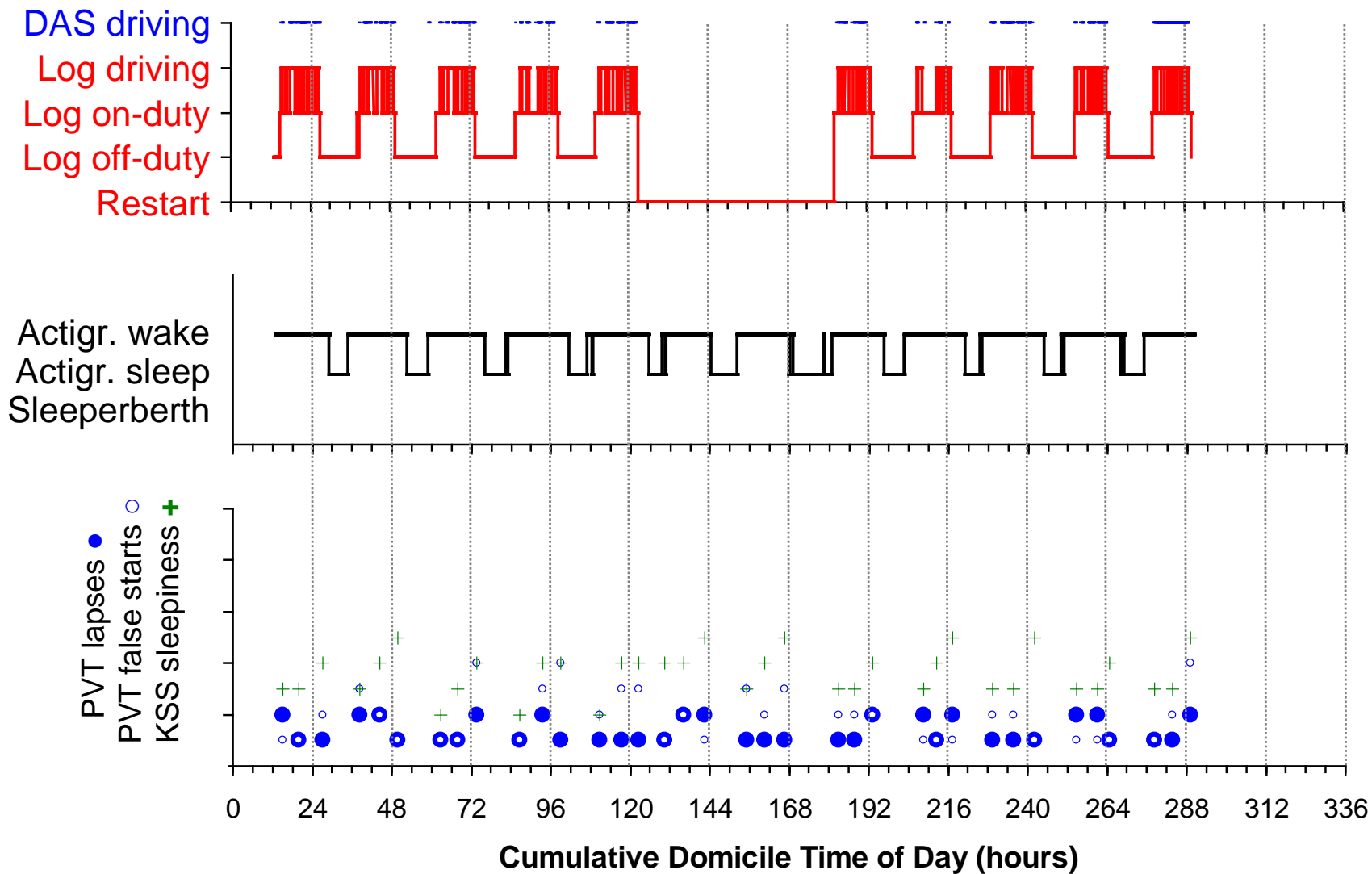
## Measurements:

- Duty/driving logs.
- Wrist activity monitoring of sleep/wakefulness.
- Performance on the 3-minute Psychomotor Vigilance Test (PVT).
- Subjective sleepiness on the Karolinska Sleepiness Scale (KSS).
- Variability in lateral lane position (i.e., lane deviation) of the truck.
- Daily real-time quality control and post-duty phone contact with drivers.

# Measurements

- Drivers' duty/driving logs.
- Continuous wrist activity monitoring of sleep/wakefulness.
- Performance measurement on a Psychomotor Vigilance Test (PVT), 3 times per day.
- Subjective sleepiness on the Karolinska Sleepiness Scale (KSS), 3 times per day.
- Continuous assessment of lane deviation (i.e., variability in lateral lane position) of the truck.
- Daily real-time quality control and daily post-duty phone contact between drivers and researchers.

# Example De-identified Driver Data Set



# Participating Drivers and Data Set

- 106 drivers (ages 24–69) completed the study (100 men, 6 women).
- CMV experience ranged from less than 1 to 39 years (mean 12.4 years).
- Operations included local (44), regional (26), and over-the-road (36).
- Mean study participation was 11.9 days (standard deviation: 1.5 days).
- Total driver days: 1,260.
- Total number of PVT/KSS tests: 3,169.
- Total DAS-recorded truck miles: 414,937.



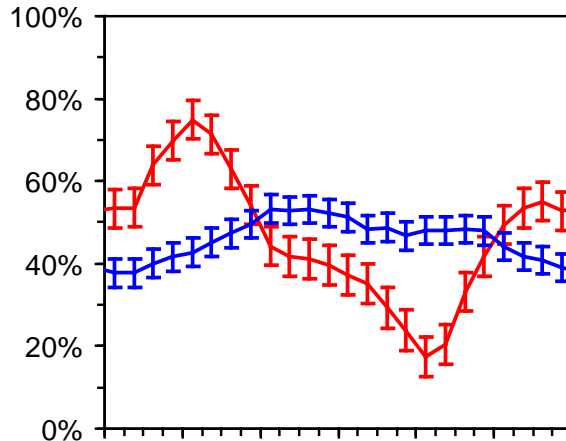
# Participating Drivers and Data Set, continued

- Duty cycles preceded by a restart break with only 1 nighttime period: 71.
- Duty cycles preceded by a restart break with more than 1 nighttime period: 141.
- Data collection was completed before the compliance date of the new rule.
- Data were analyzed within and between subjects by whether the driver would have had to extend his/her restart to be compliant with the new rule.

# Results for Time on Duty and for Driving

## On Duty

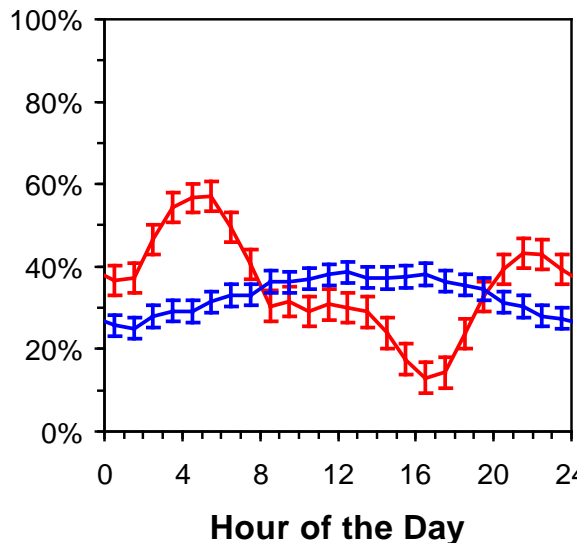
(% of total driver hours by hour of the day)



- 1 nighttime period (1–5 a.m.) in prior restart break
- more than 1 nighttime period (1–5 a.m.) in prior restart break

## Driving

(% of total driver hours by hour of the day)

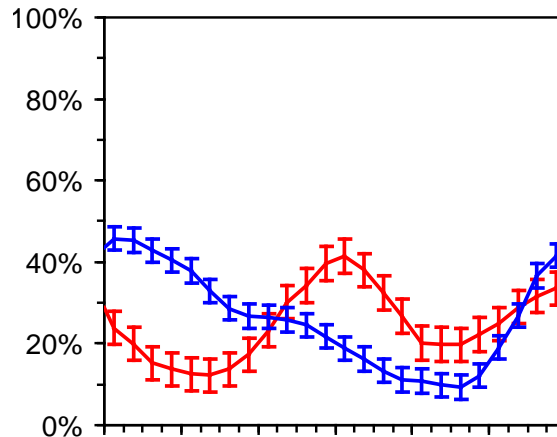


*All results shown involve statistically significant interactions of condition (one versus more than 1 night in the restart break) by time of day.*

# Results for Sleep (Wrist Activity Monitor)

## Sleep during Duty Cycles

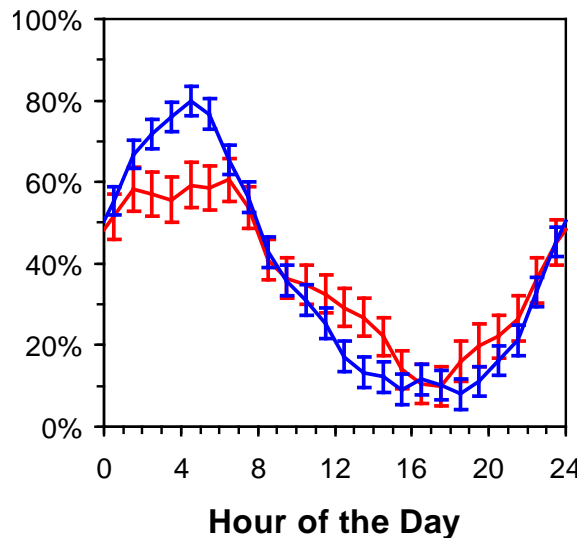
(% of total driver hours by hour of the day)



- 1 nighttime period (1-5 a.m.) in restart break
- More than 1 nighttime period (1-5 a.m.) in restart break

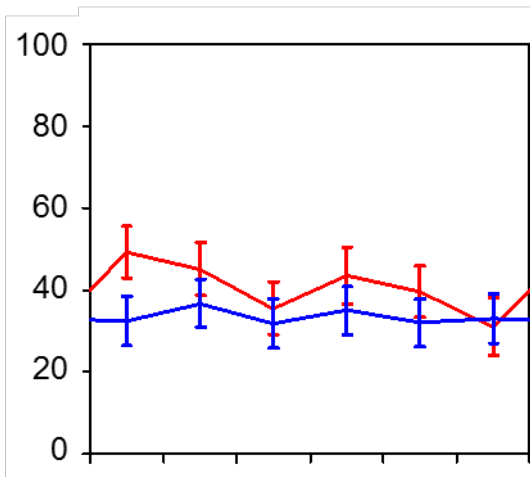
## Sleep during Restart Break

(% of total driver hours by hour of the day)



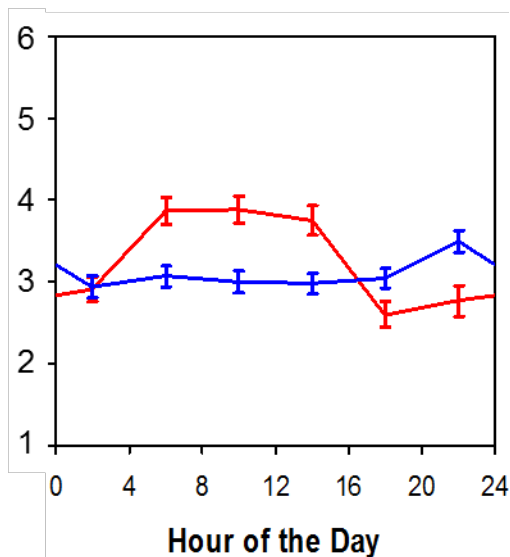
# Results for Fatigue (PVT, KSS, Truck)

**Lapses of Attention on the Psychomotor Vigilance Test (PVT)**  
(lapses per hour)

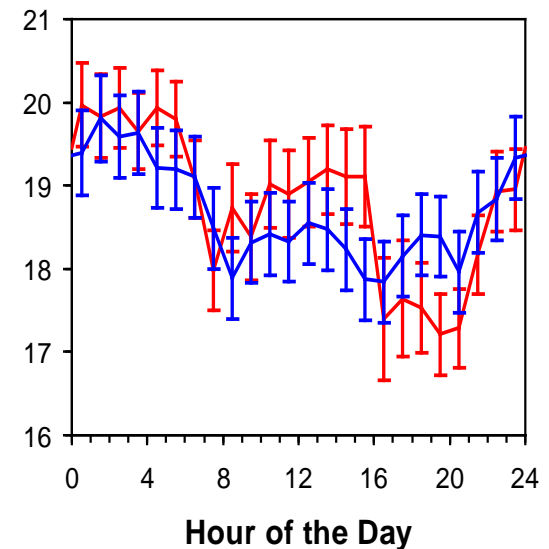


- 1 nighttime period (1–5 a.m.) in prior restart break
- More than 1 nighttime period (1–5 a.m.) in prior restart break

**Subjective Sleepiness on the Karolinska Sleepiness Scale (KSS)**



**Lane Deviation on Straight Road Segments**  
(cm)



# Conclusions

- The duty and driving log data indicated that the new restart rule affects primarily nighttime drivers – and thus captures the intended driver groups.
- The objective sleep data indicated that in nighttime drivers, sleep occurs predominantly at night during the restart break, which implies that the new restart rule provides greater opportunity for sleep recuperation.
- The objective fatigue data and subjective sleepiness data showed that the new restart rule may mitigate fatigue effectively in nighttime drivers.

# Conclusions, continued

- In summary, this naturalistic field study showed that having at least 2 nighttime periods from 1 a.m. until 5 a.m. in the restart break helps to mitigate fatigue for nighttime drivers, both objectively and subjectively, by increasing the total amount of sleep obtained during the restart break.
- The field study results are in line with the earlier laboratory studies of the restart break and provide evidence in support of the efficacy of the new restart provision.

# Contact Information

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