



# The evaluation of laser guidance systems for use on a self escape vehicle after an underground mine explosion

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**Simtars**



# Acknowledgments

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# Testing - Specification

- Distance – 30 m
- Environment
  - Dust – 25  $\mu\text{m}$  (mean)
  - Smoke – Black
    - White
- Targets
  - Rock – 0.5 m
  - "Human"
- Explosion protected
  - Lexan window
- Cost

# Systems

- Infrared
  - ❖ Explosion protected ??
  - ❖ Temperature differences
  - ❖ Cost
- Radar
  - ❖ Explosion protected ??
  - ❖ Yes/No
  - ❖ Cost
- Lasers
  - ❖ Explosion protected ??
  - ❖ Detect “objects”
  - ❖ Cost

# Testing - setup

- Open air  
40 m x 40 m grid
- Smoke (prop tube shed)  
White – wood  
Black – diesel & fuel  
Area – 33.5 m x 7 m x 2.7 m  
Tracks – 4, one meter apart
- Dust (containers)  
Concentration – 60 g/m<sup>3</sup>  
Mean size – 25 µm  
Area – 36 m x 2.5 m x 2.9 m  
Track – 1, centre line



# Rock on grid





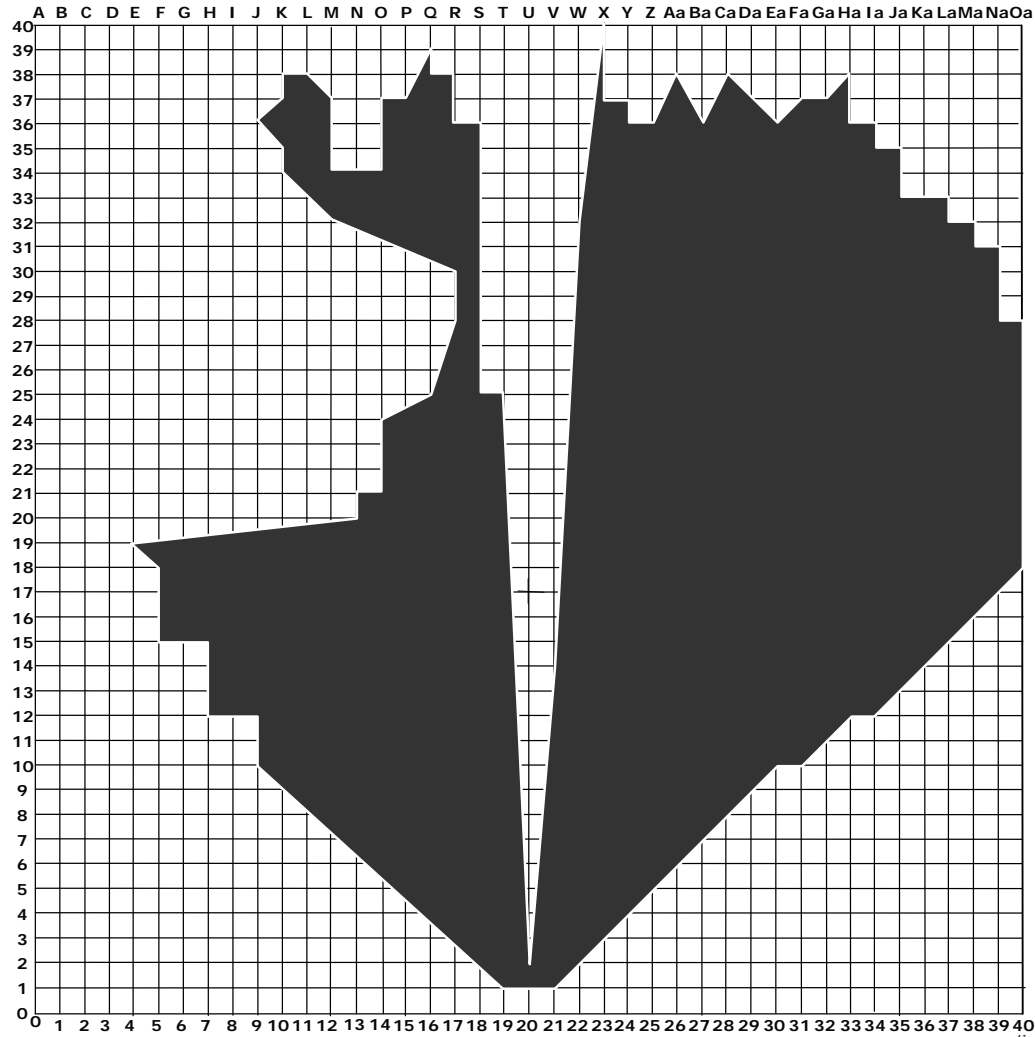
# Fred



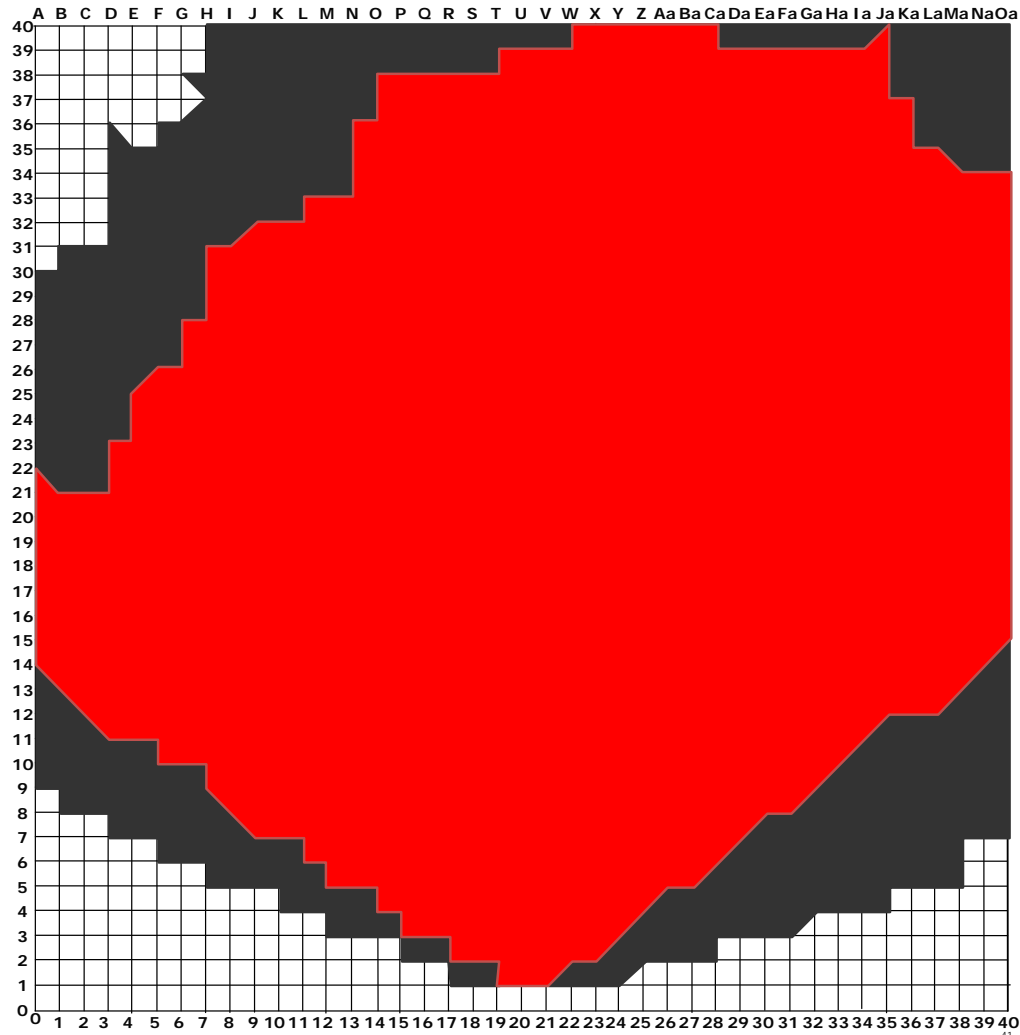




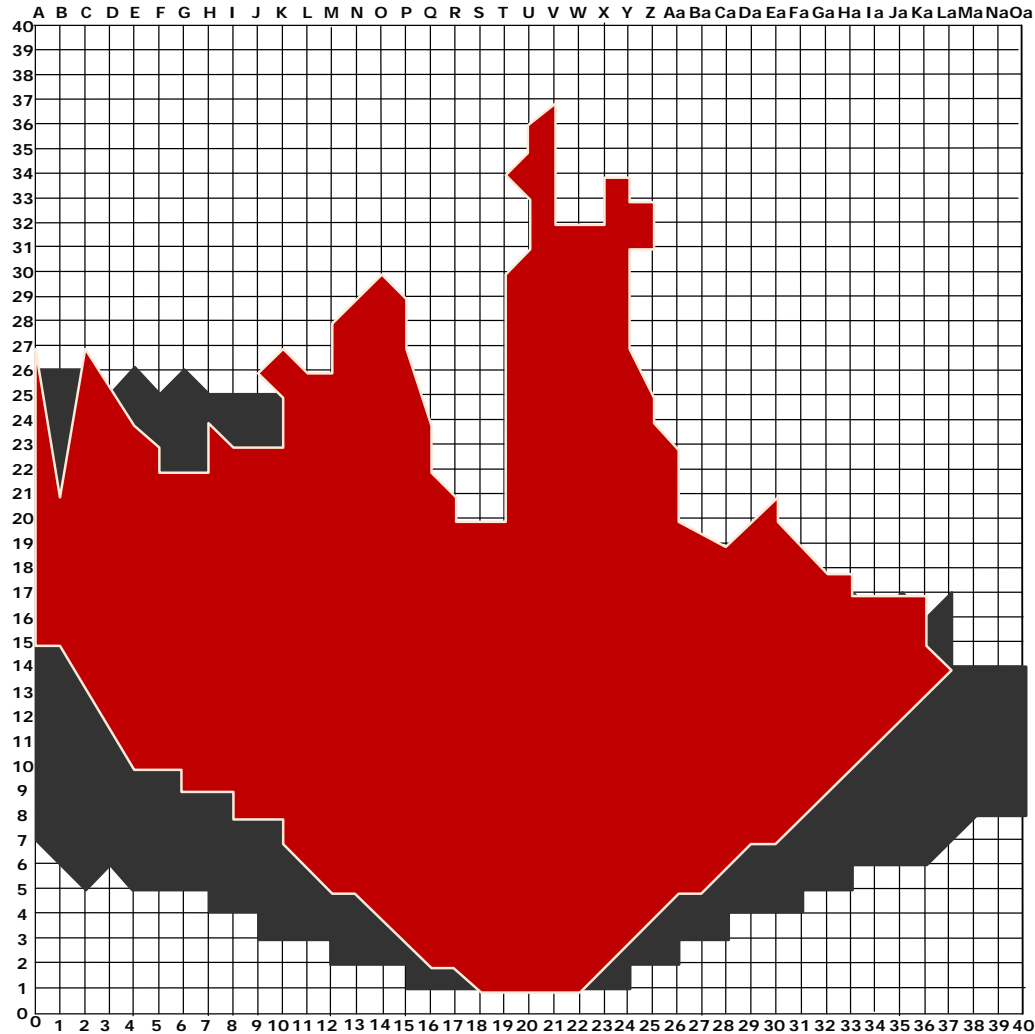
# LMS151; Lexan, Rock



# LMS511 HR; Lexan, Fred

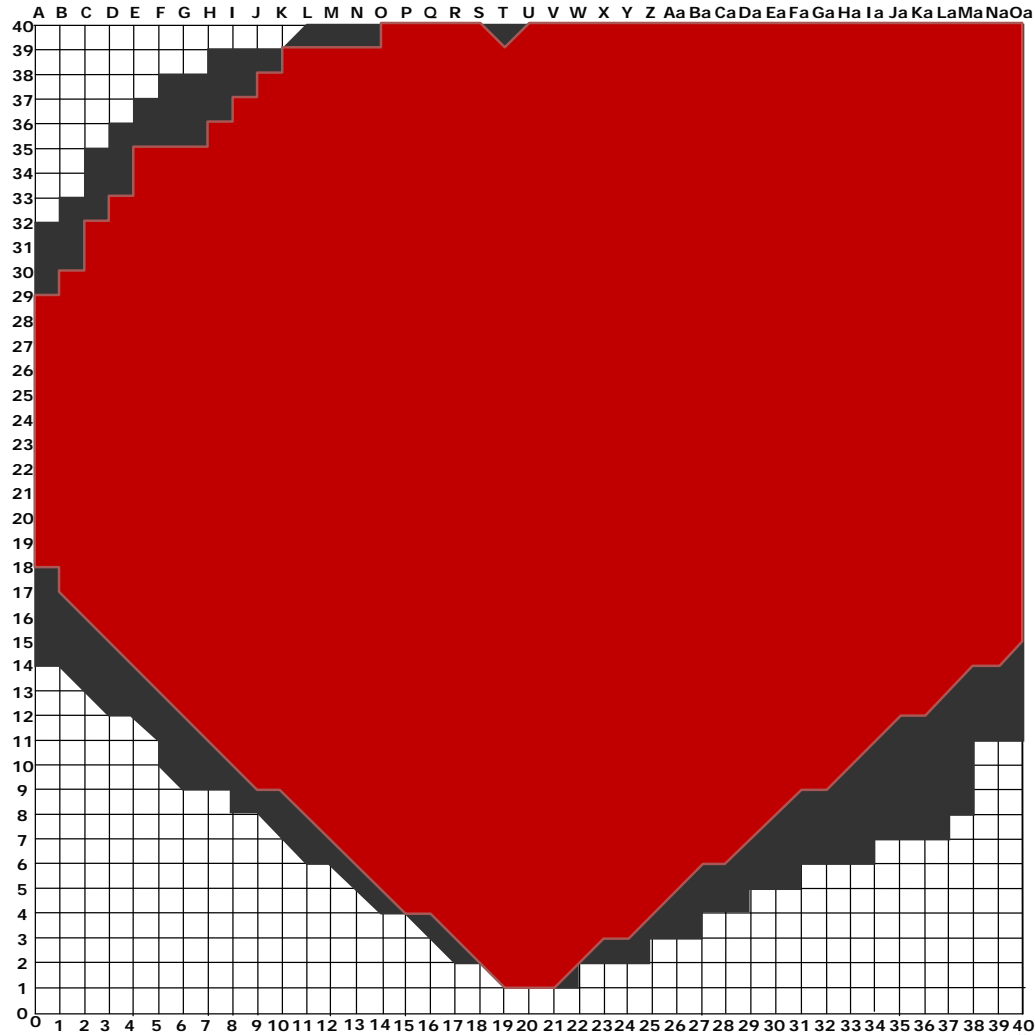


# LMS511 HR; Lexan, Rock

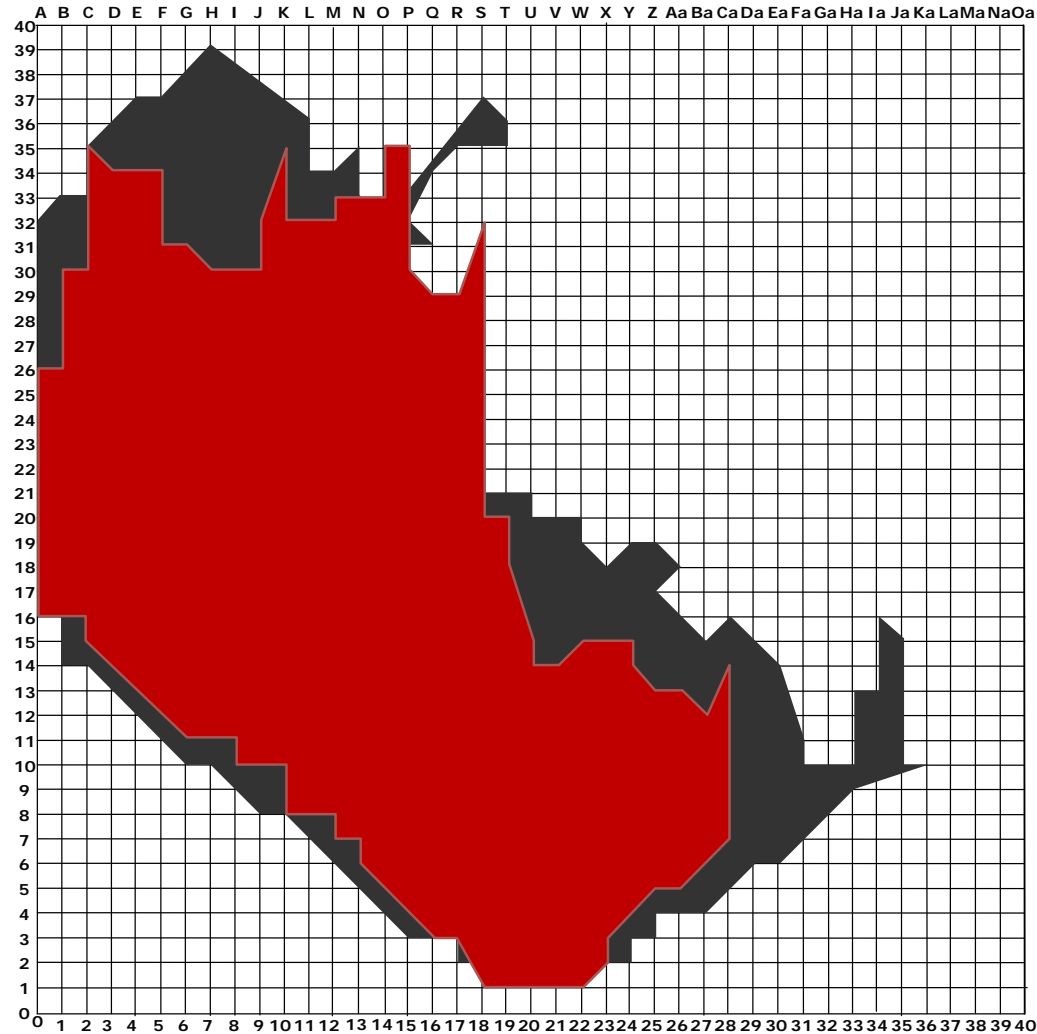




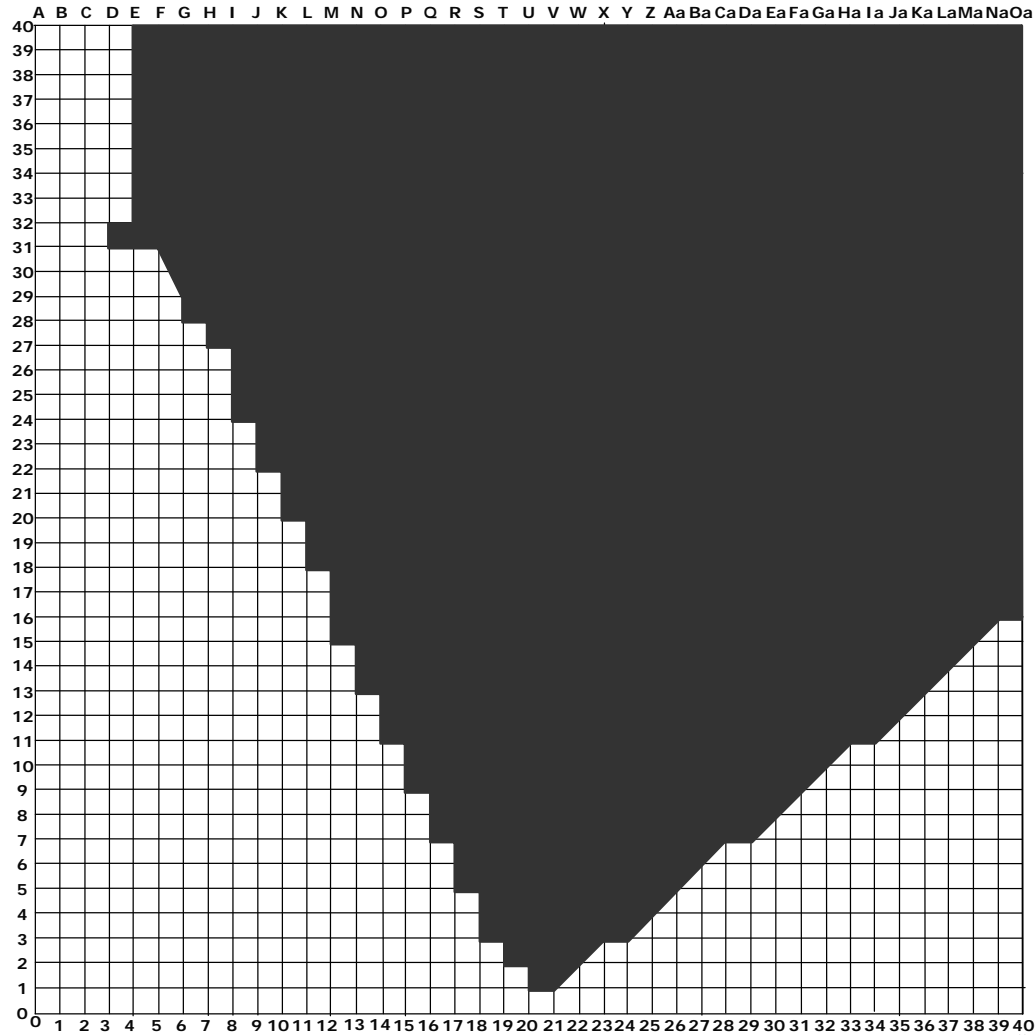
# LMS511 SR; Lexan, Fred



# LMS511 SR; Lexan, Rock

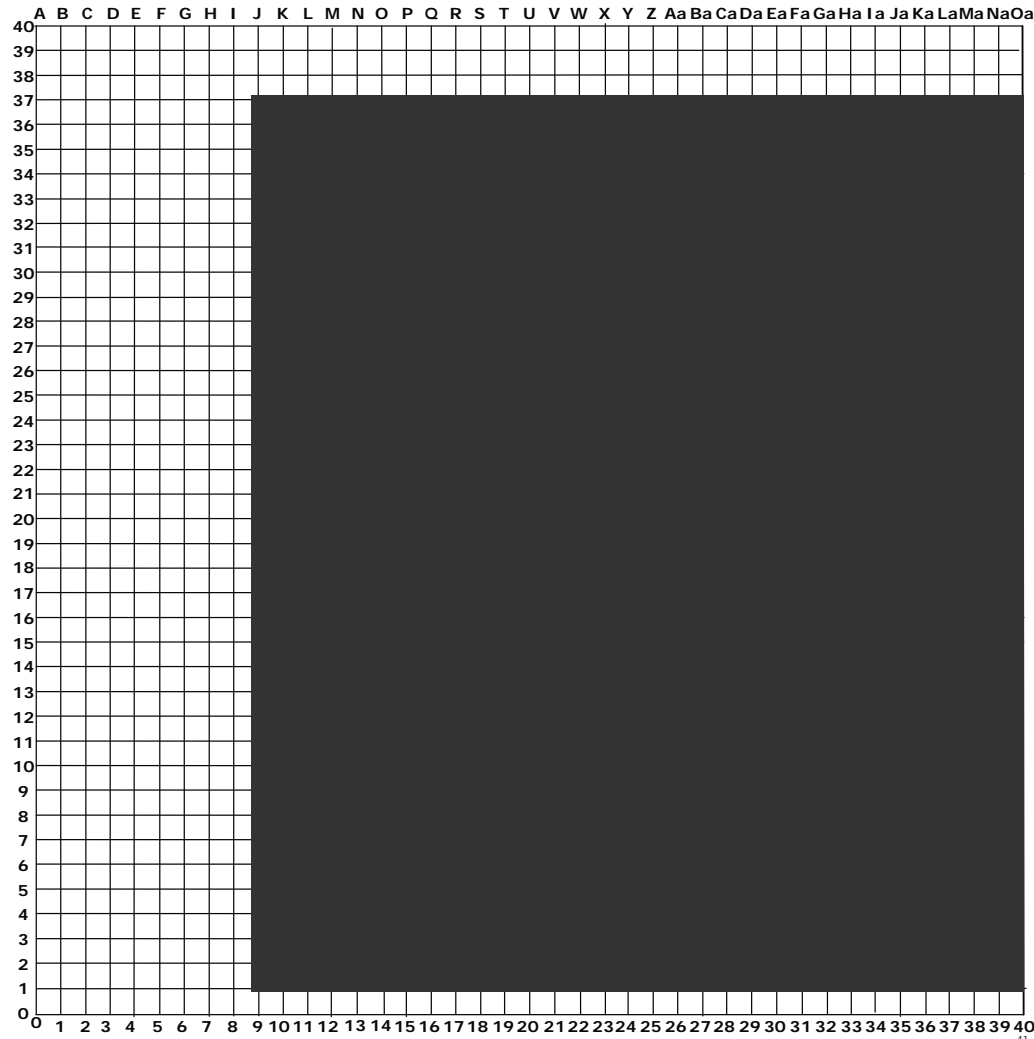


# LD-MRS; Lexan, Fred

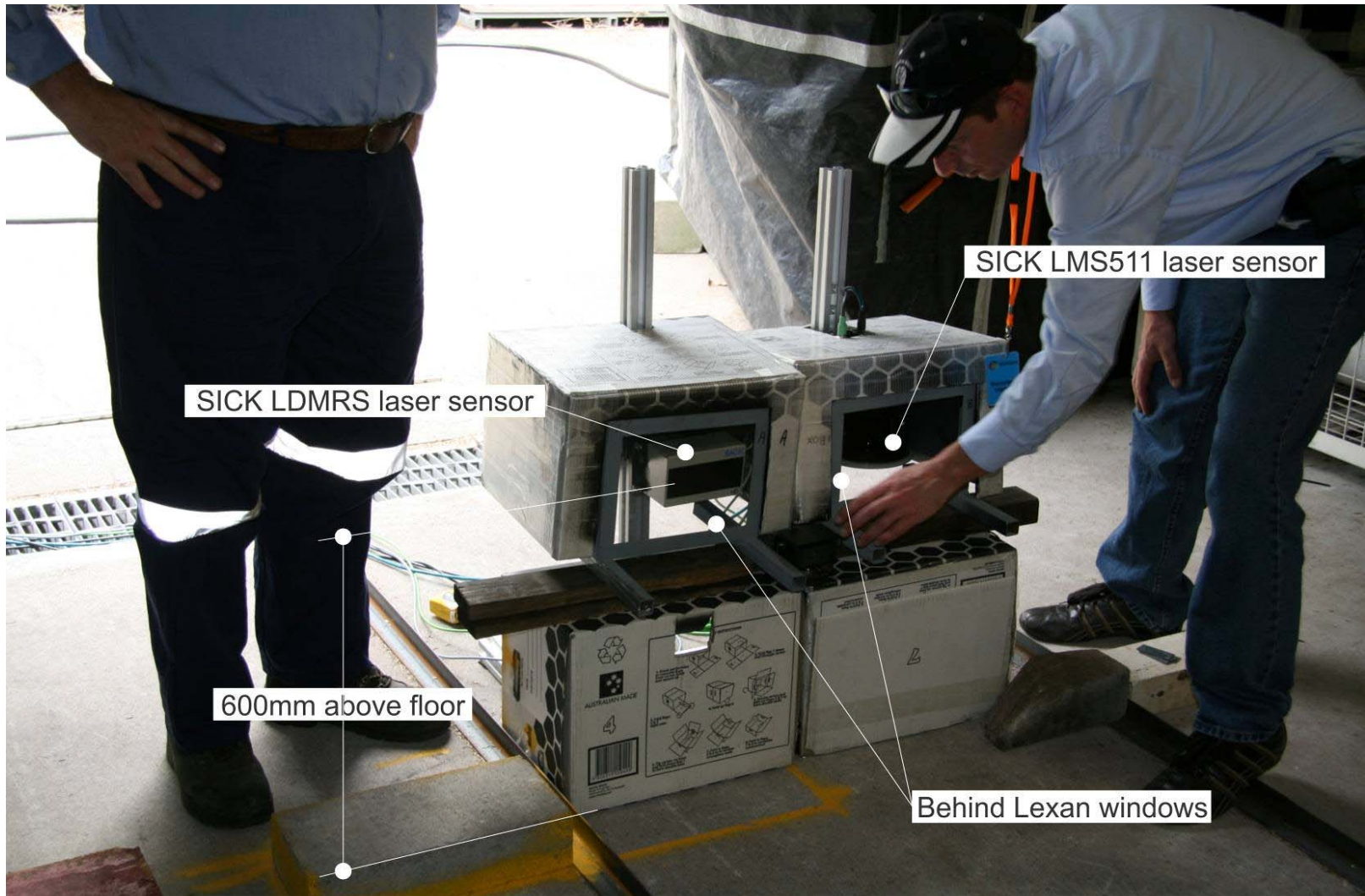




# LD-MRS; Lexan, Rock



# Smoke laser setup

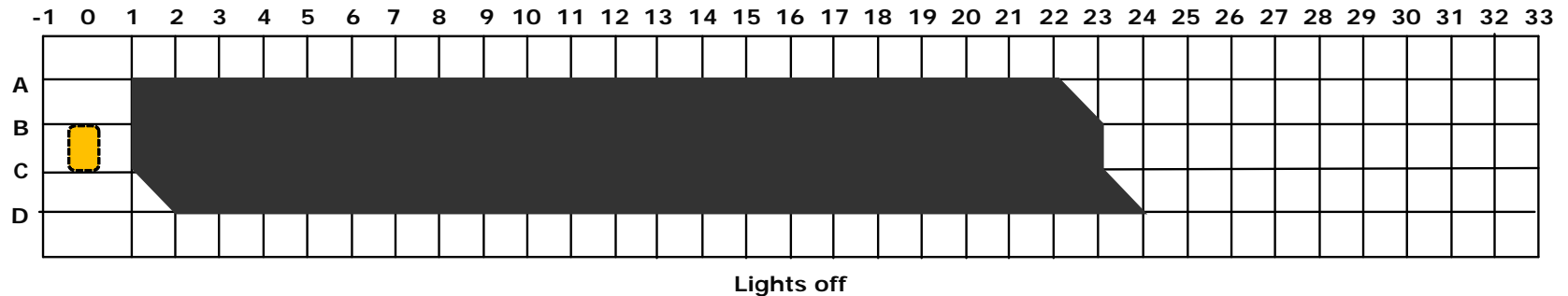
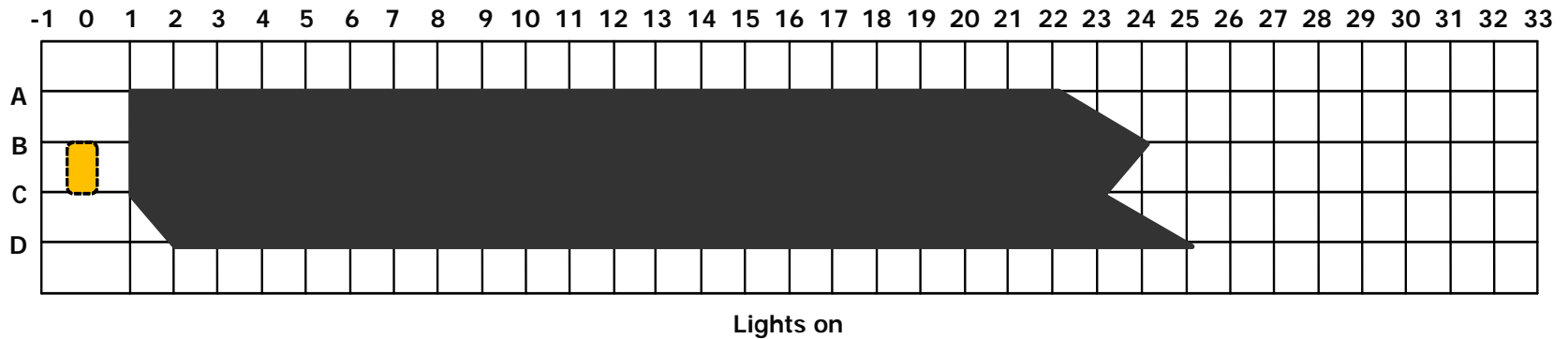


# Fred in prop tube shed

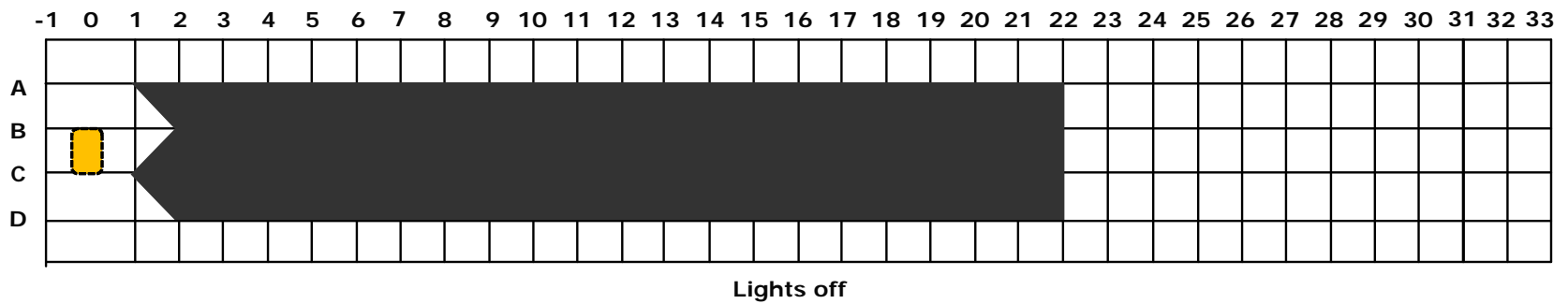
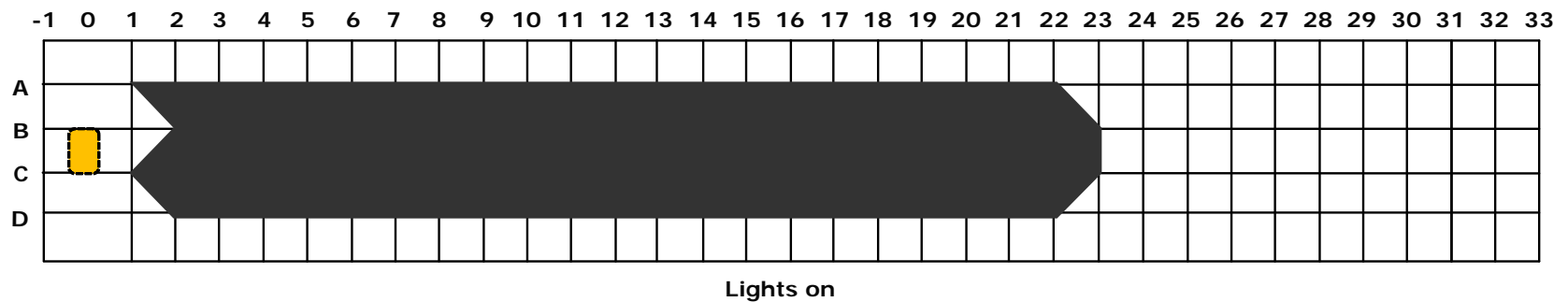




# LMS511; Fred, Reference Tests



# LMS511; Rock, Reference Tests



# White smoke generation

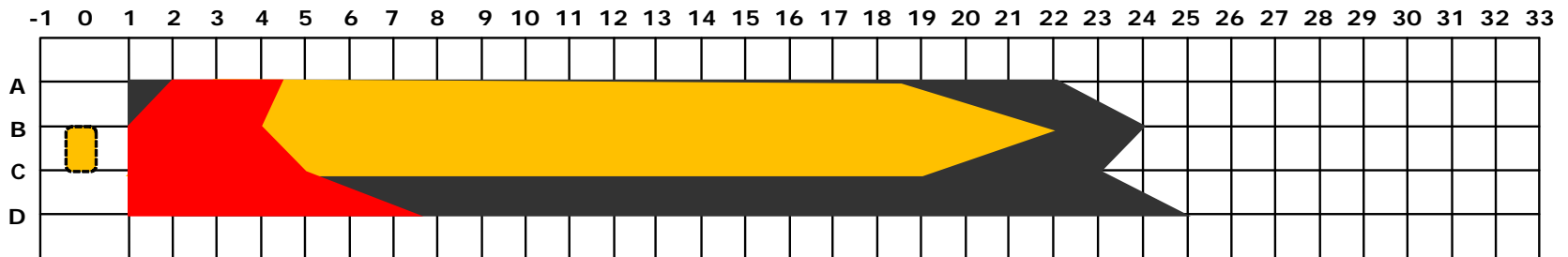




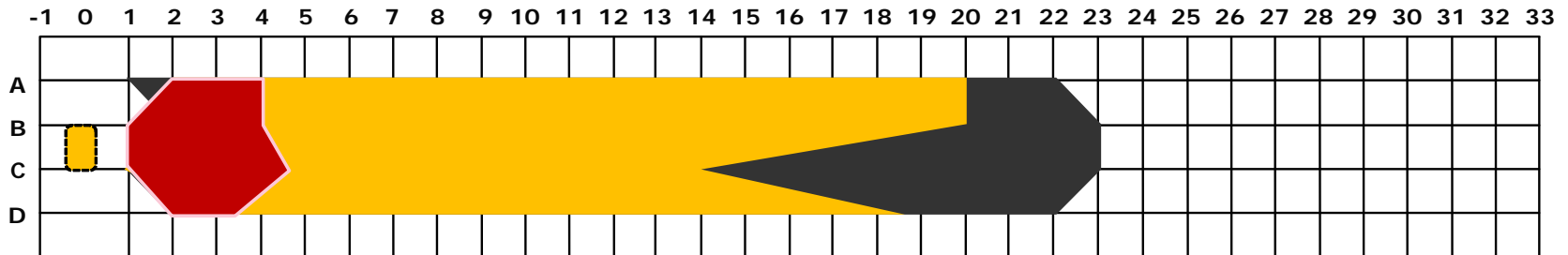
# Black smoke start



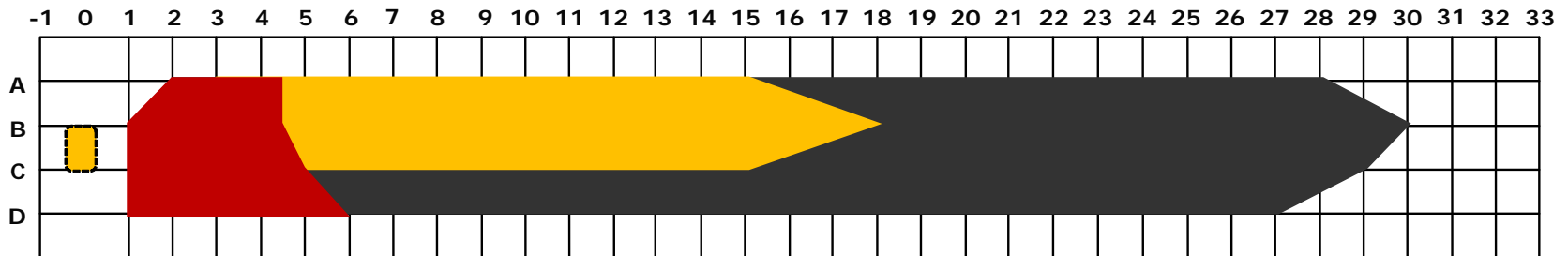
# LMS511; Fred, Reference, White smoke, Black smoke



# LMS511; Rock, Reference, White smoke, Black smoke

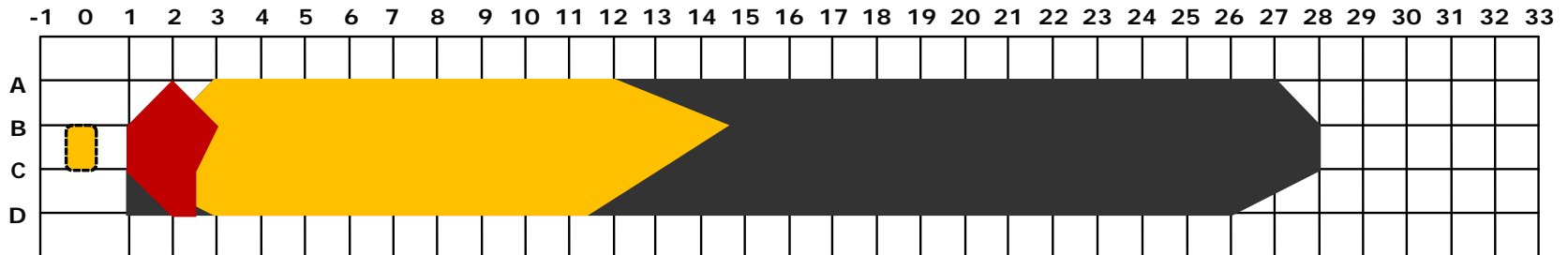


# LD-MRS; Fred, Reference, White smoke, Black smoke





# LD-MRS; Rock, Reference, White smoke, Black smoke



# Dust setup



# Exit light + "C"



# LD-MRS; Fred, Reference Tests



Doors open



Doors closed



EXIT light + "C"



# LD-MRS; Rock, Reference Tests



Doors closed



EXIT light + "C"

# Dust after ½ hour



# LMS511; Fred, Reference, Dust Tests



Doors closed

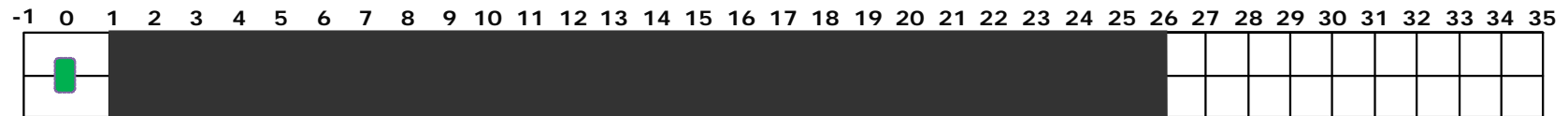


EXIT light + "C"

# LMS511; Rock, Reference, Dust Tests



Doors closed



EXIT light + "C"



# LD-MRS; Fred, Reference, Dust Tests



Doors closed

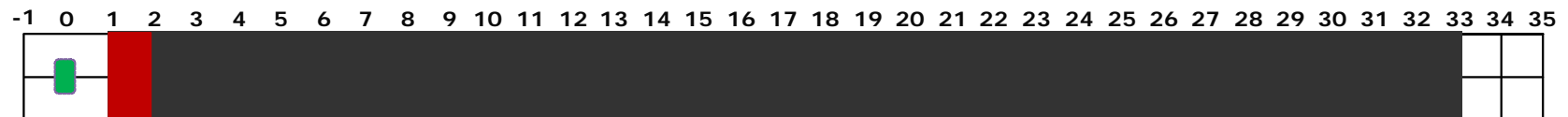


EXIT light + "C"

# LD-MRS; Rock, Reference, Dust Tests



Doors closed



EXIT light + "C"

# Conclusions

- Open air:
  - ❖ Lexan window – no effect on detection pattern
  - ❖ Distance
    - Rock – 35 m
    - "Human" – 35 m
- Smoke:
  - ❖ Lights no effect – distance 31.5 m (no smoke)
  - ❖ White smoke – distance 18 m
  - ❖ Black smoke – distance 5 m
- Dust:
  - ❖ No dust – distance 35 m
  - ❖ Dust – distance (3 – 5) m

# Way forward

- Track walls and 5 m ahead
- Track “objects”, ignore “noise”
- Investigate radar



# Thank you

