

# PCM Ceiling Panels as a Renovation Solution in hybridGEOTABS Buildings

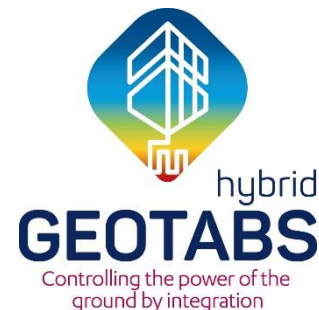
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# Why radiant heating and cooling systems?

- Integration of renewable energy resources
- Transferring peak loads to off-peak hours, and peak load reductions
- Favorable operating conditions for heating and cooling plants
- Smaller-capacity heating and cooling plants, and downsized ventilation systems
- Reduced total energy use
- Less space requirement, lowered construction heights and saved building materials
- Free use of space, no cleaning requirements, quiet operation
- Uniform temperature distribution, reduced risk of draught, and reduced vertical air temperature differences
- Initial, operational, and energy cost savings

# Radiant heating and cooling systems

- Similar system to TABS
  - With similar benefits
  - Can be used both in renovation cases and new buildings?
- Radiant ceiling panels with Phase Change Materials (PCM)

# Phase Change Materials (PCM)

- Organic or inorganic materials
- Utilization of latent heat (mainly)
- Passive or active use
- Thermal mass enhancement
- Temperature control of indoor spaces
- Management of the cooling load
- Potential use in light-weight buildings and renovation of buildings

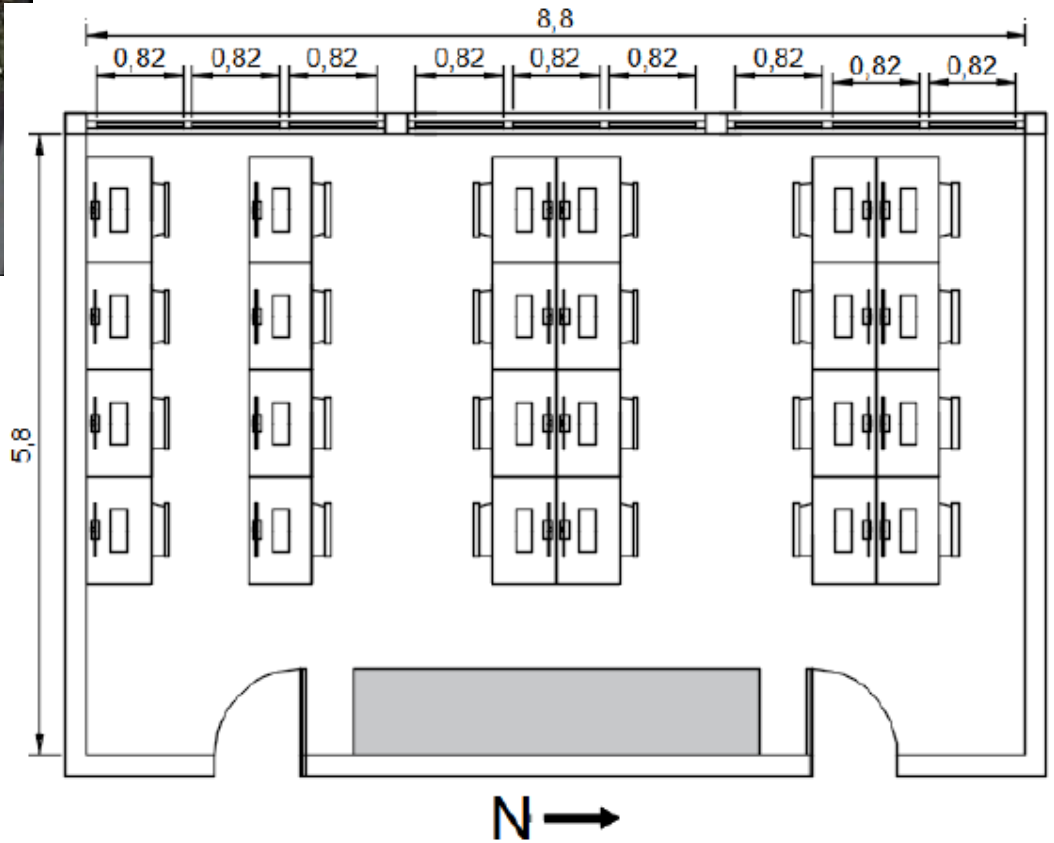
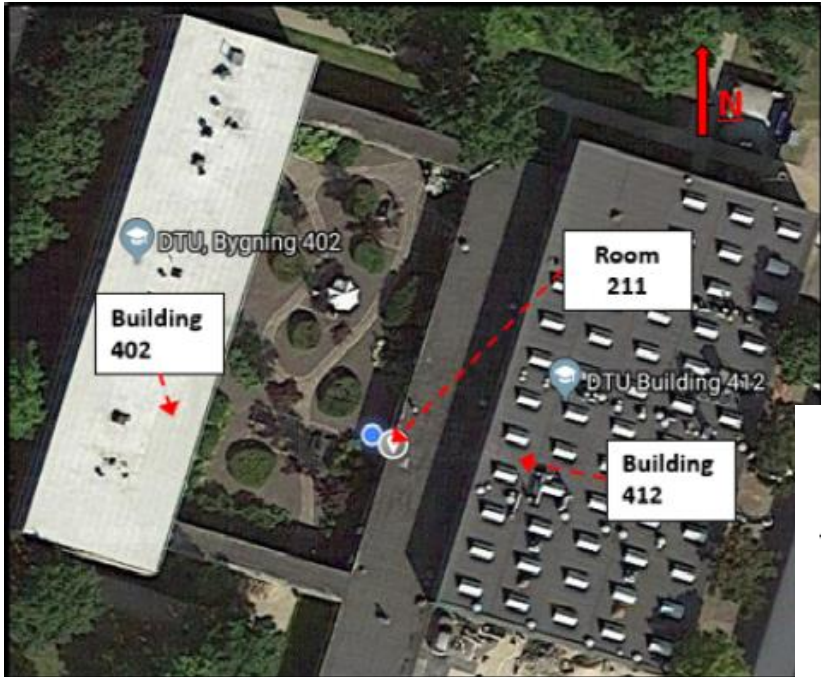
## Main goals

- Development of a new solution (Phase Change Material-PCM ceiling panels)
  - To address implementation limitations and constraints in new buildings and renovation
- Characterize the performance of the new PCM panels
  - Climate chamber measurements
  - Parametric analyses through validated simulation models

# The new PCM panels



## Case study



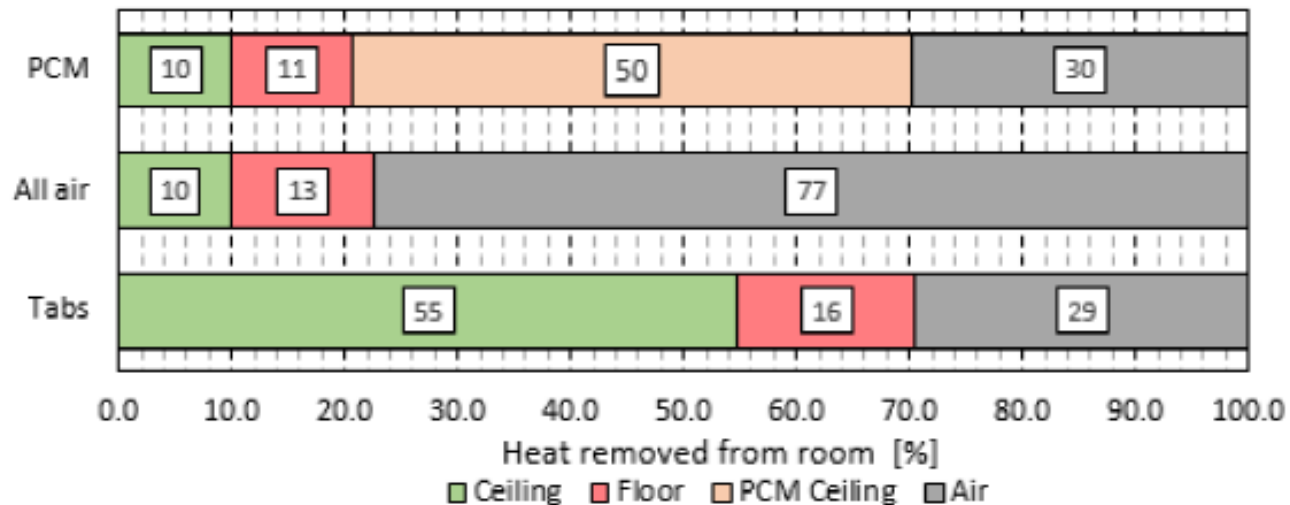
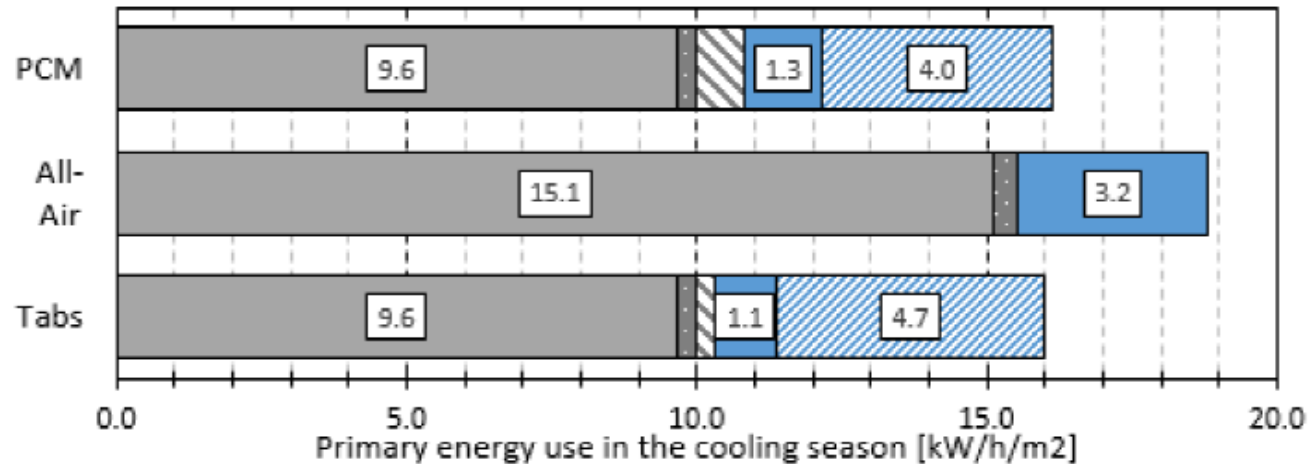
# Case study





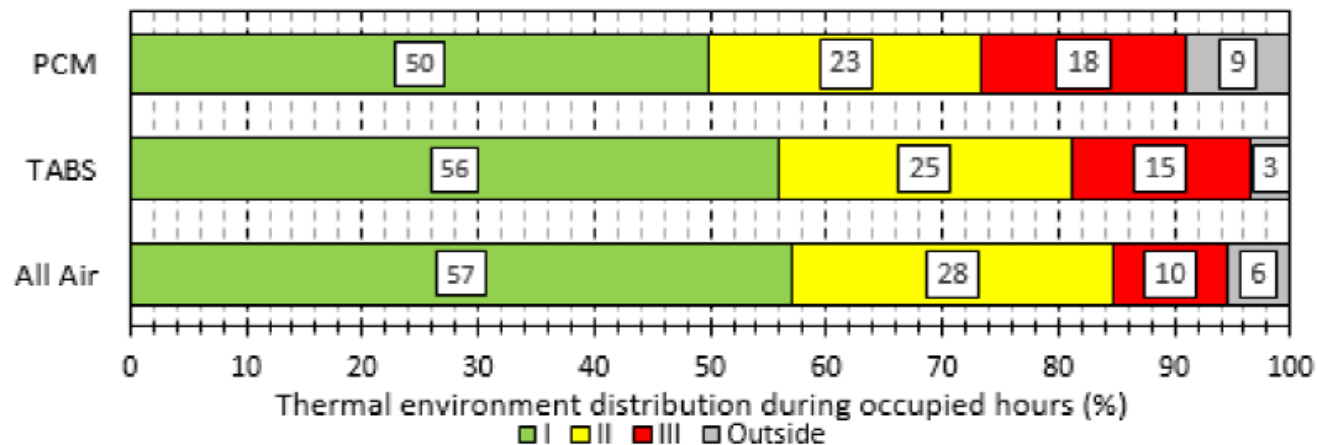
# Performance of the new PCM panels - simulations

- “PCM ceiling panels work like TABS”

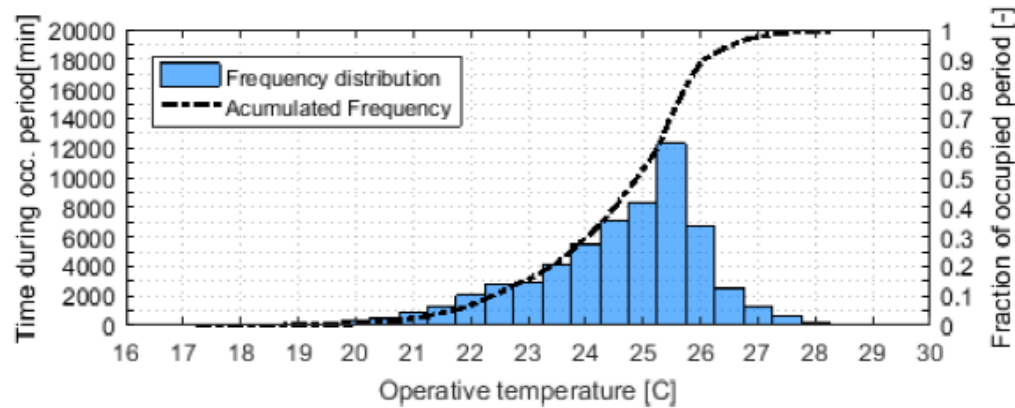


# Performance of the new PCM panels - simulations

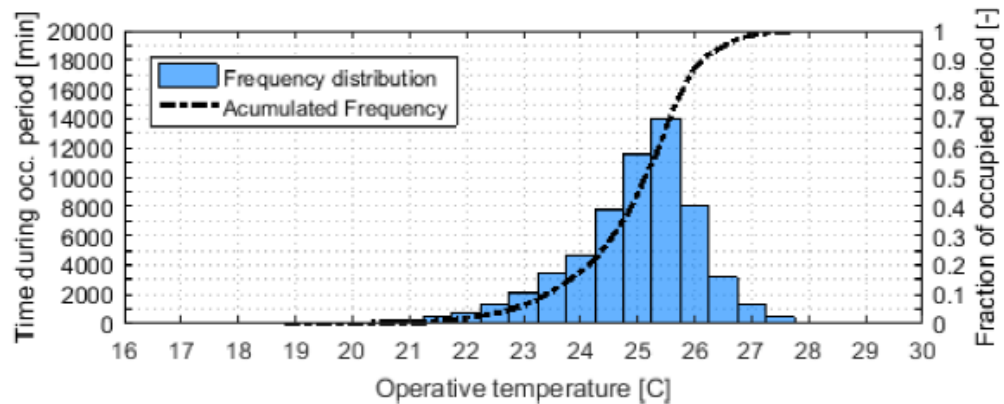
- "PCM ceiling panels work like TABS"



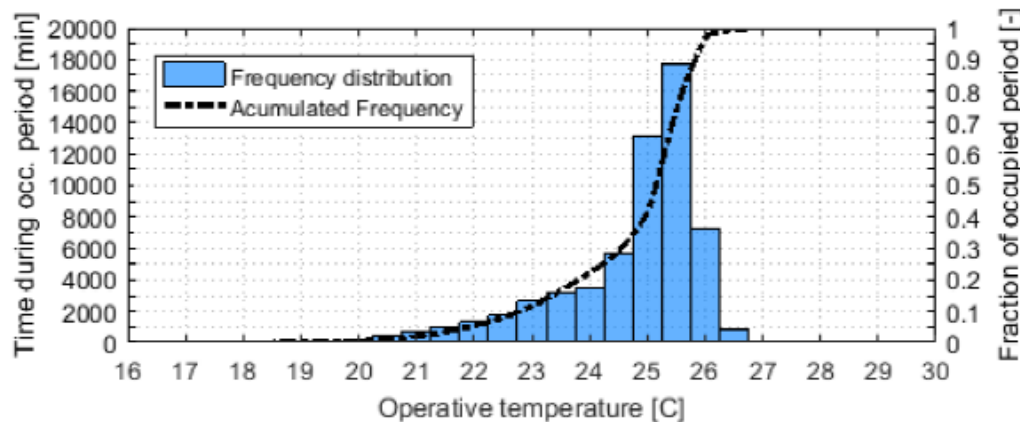
# Performance of the new PCM panels - simulations



PCM



TABS



All-air

# Ongoing work



# Ongoing work



## Summary and future outlook

- PCM ceiling panels work like TABS
- Similar benefits to TABS
- Applicable in renovation of buildings
- Possibility of coupling with renewable energy resources (i.e. PV/T in our case)
- Design, dimensioning and control methodology needed
- Working & successful examples needed
- Long-term measurements needed
- Detailed economic analyses needed



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# Thank you for your attention!

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