



# Light and Lighting Research and Networking

17 / 18 April  
Lunds Tekniska Högskola

Light  
Collaboration  
Network

## Welcome







1

## Light and Lighting – Research and Networking Programme



Light  
Collaboration  
Network

### Monday 17<sup>th</sup> April

- 8:30 Coffee and Registration
- 9:00 Welcome by Light Collaboration Network
- 9:15 Presentations
- 10:00 Break
- 10:30 Presentations
- 12:00 Lunch
- 13:30 Presentations
- 15:00 Break
- 15:30 Panel Discussion
- 16:30 Closing
- 18:00 Mingle & Networking
- 18:30 Dinner at Bryggan Restaurant, IKDC, for those who booked

### Tuesday 18<sup>th</sup> April

- 8:30 Coffee and Registration
- 9:00 Welcome by Light Collaboration Network
- 9:15 Presentations
- 10:00 Break
- 10:30 Presentations
- 12:00 Lunch
- 13:15 Presentations
- 14:00 Round Table Discussion
- 15:00 Break
- 15:15 Lab tour
- 16:30 Closing

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2

1

# Light Collaboration Network

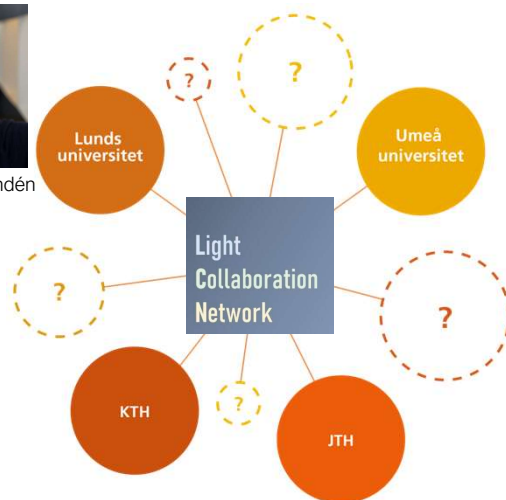
for Research and Education



Hillevi Hemphälä



Johannes Lindén



Katharina Wulff



Stuart Wales  
Communication



Ute Besenecker



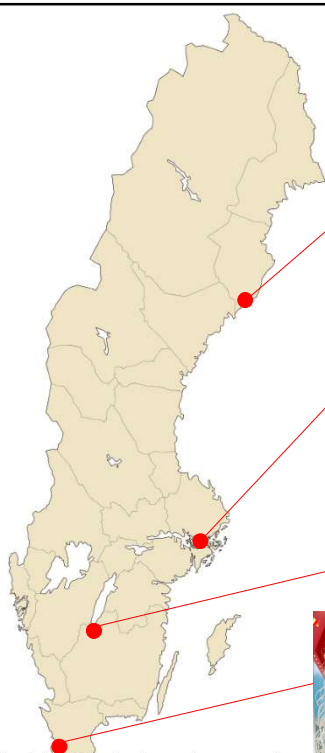
Myriam Aries

With funding from



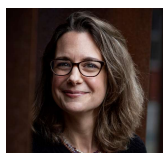
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3



## Katharina Wulff

Associated professor for Chronobiology and Sleep  
Umeå University



## Ute Besenecker

Associated professor in Lighting Design  
KTH Royal Institute of Technology  
School of Architecture, Stockholm



## Myriam Aries

Professor in Lighting Science  
Jönköping University, School of Engineering



## Hillevi Hemphälä

Associated professor in Visual Ergonomics



## Johannes Lindén

Researcher, PhD Physics  
Div. Ergonomics and Aerosol Technology, LTH  
Lund University

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4

2

# Light Collaboration Network

for Research and Education

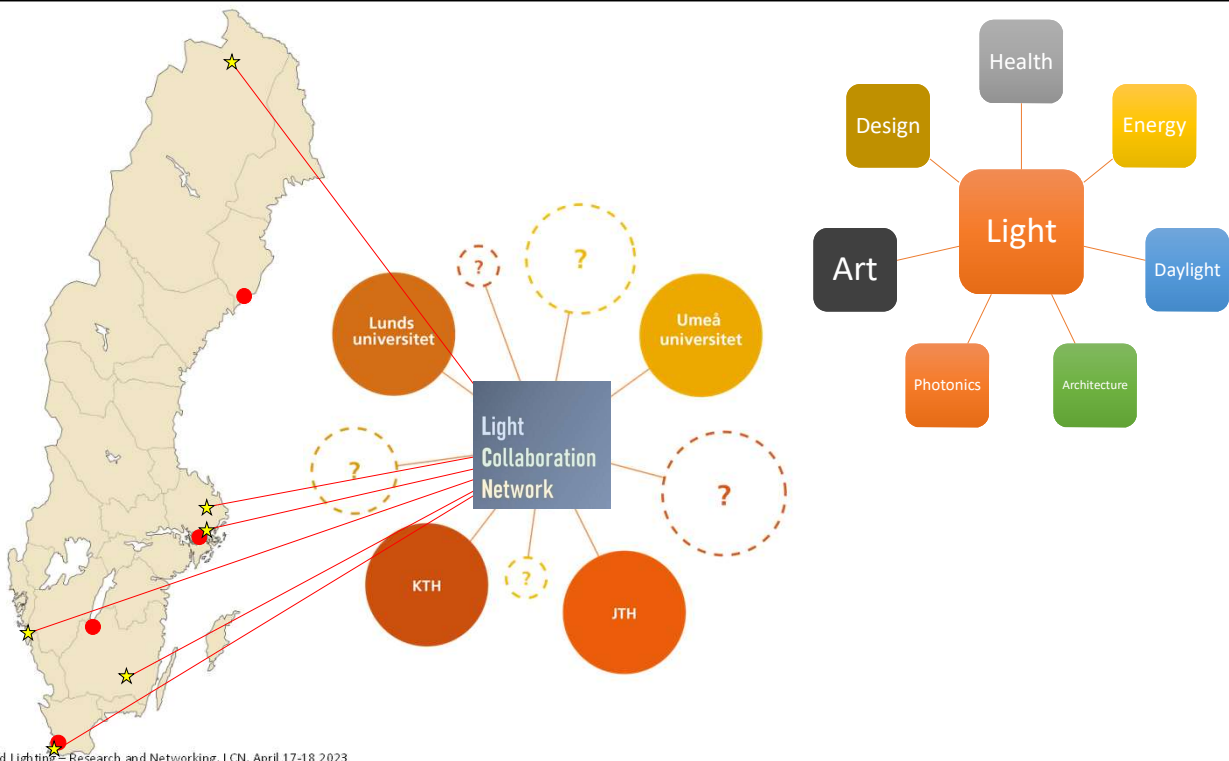
- An interdisciplinary light research network to
  - promote research collaboration
  - improve communication
  - exchange of knowledge and education
- Emerged from a common interest to integrate complementary expertise
- Open for anyone who works with light and lighting
  - architects, lighting designers, ophthalmologists, physicists, biologists, manufacturers, etc.
- Funded by the Belysningsstiftelsen



<https://omvarldsbevakning.byggjanst.se/artiklar/2021/januari/nytt-netverk-ska-framja-liusforskning/>  
<https://ljuskultur.se/artiklar/ett-netverk-for-att-sprida-lius/>

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5



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6

3

# Light Collaboration Network

## Time line



Research meeting  
11<sup>th</sup> November 2021

Along the table agenda:  
• Welcome  
• State of the art  
• Networking



Online Light Lunches



Columns in magazine Ljuskultur

**Integrative Lighting**



2021 jan  
launching

11 nov -21  
Research meeting

21-23 Sept -22  
Network session at Light Symposium Copenhagen

3 juni -21  
Symposium



Symposium 3<sup>rd</sup> June 2021

Along the table agenda:  
• Welcome  
• Presentations on light- interaction between Academia and Industry  
• Networking  
• Meet potential collaborators

March -22  
1st IRL meeting in Umeå




12 maj -22 Half day conferece Jönköping



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7



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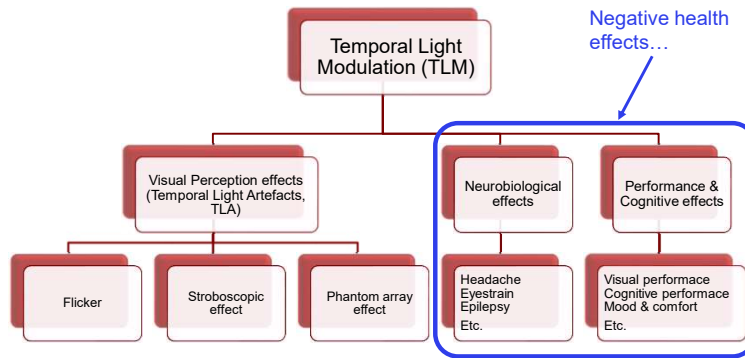
## Flicker and the brain – a project using MR-camera

Project: fMRI-flicker – How flicker effects the brain



8

# Flicker – or Temporal Light Modulation to be correct



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9

# EU legislation on eco-design

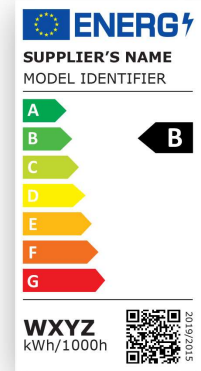
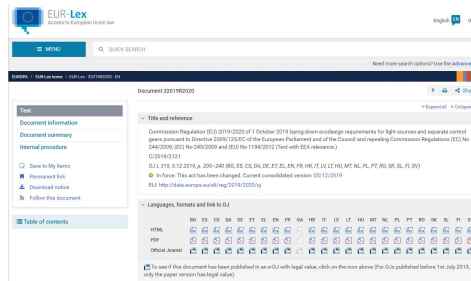
New ecodesign directive contains legislation on levels of flicker and stroboscopic visibility.

Note: At full load.

TLA	Limit
Flicker	$P_{st}^{LM} \leq 1$
Stroboscopic Visibility	$M_{vs} \leq 0.9$ Expected $M_{vs} \leq 0.4$ from sept 2024

Enter into force September 2021

Expected  $M_{vs} \leq 0.4$  in 2024



[https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.L\\_.2019.315.01.0209.01.ENG&toc=OJ.L:2019:315:TOC](https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.L_.2019.315.01.0209.01.ENG&toc=OJ.L:2019:315:TOC)  
<https://ec.europa.eu/energy/en/regulation-laying-down-ecodesign-requirements-1-october-2019>

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10

5

10



# Flicker Explained

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11

## Flicker Explained – Reports



*The medium report*

**Flicker Explained – Guide to IEC 61547 for the lighting industry**

Intended for lighting industry



*The heavy report*

**Flicker Explained – Interpretation of the Technical Report IEC 61547**

Intended for technical committees



Available at Lund University Research Portal

*The light report*

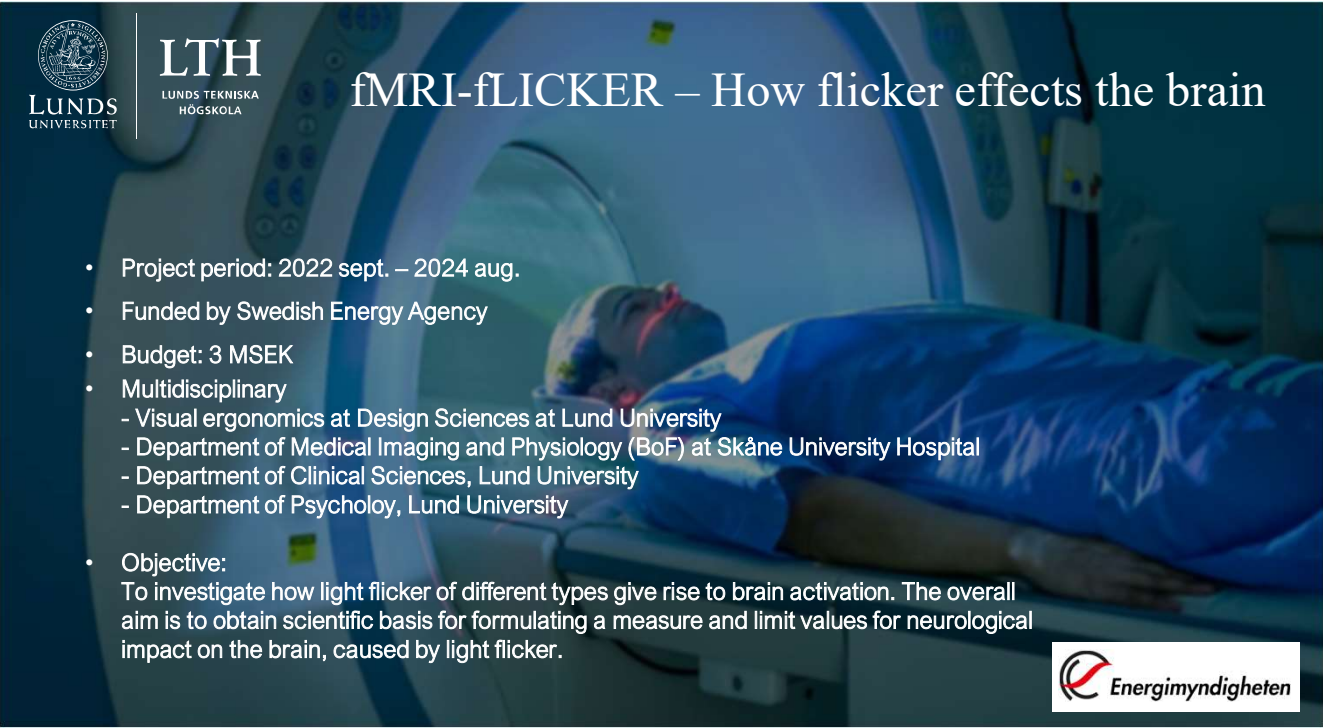
**Flicker – a technical overview**

Intended for anyone interested



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12




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## fMRI-flicker – How flicker effects the brain

- Project period: 2022 sept. – 2024 aug.
- Funded by Swedish Energy Agency
- Budget: 3 MSEK
- Multidisciplinary
  - Visual ergonomics at Design Sciences at Lund University
  - Department of Medical Imaging and Physiology (BoF) at Skåne University Hospital
  - Department of Clinical Sciences, Lund University
  - Department of Psychology, Lund University
- Objective:  
To investigate how light flicker of different types give rise to brain activation. The overall aim is to obtain scientific basis for formulating a measure and limit values for neurological impact on the brain, caused by light flicker.

 Energimyndigheten

13

## Pre-tests

2021 Christmas calendar episode of LTH  
5 min youtube clip (in Swedish)



<https://youtu.be/zkY5FW00GPY>



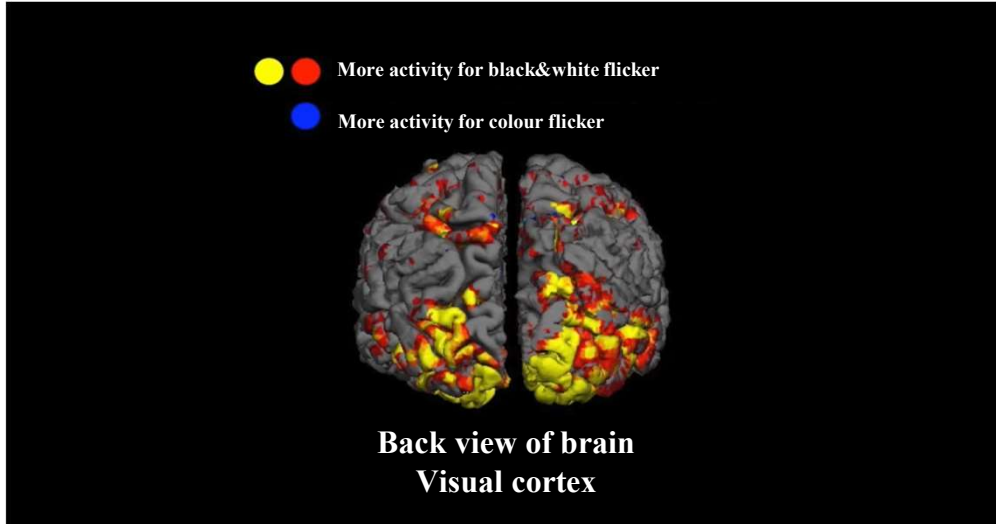
Or search "LTH julkalender flimmer"

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14

7

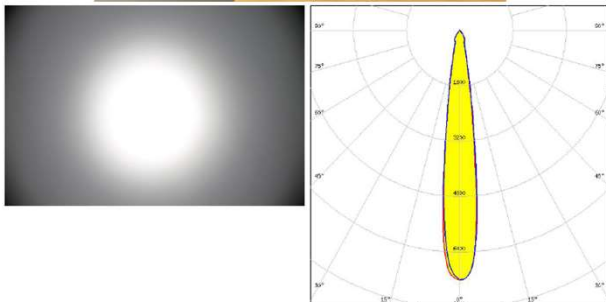
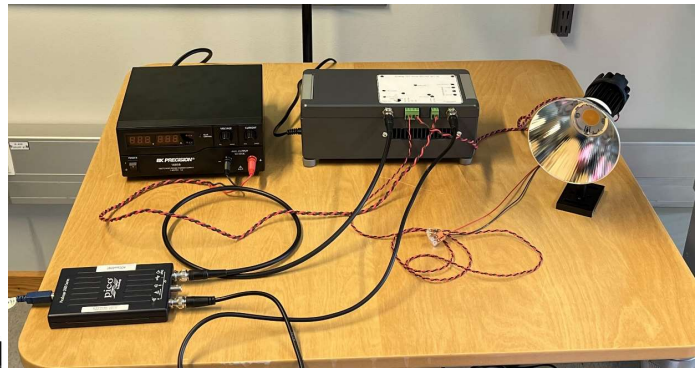
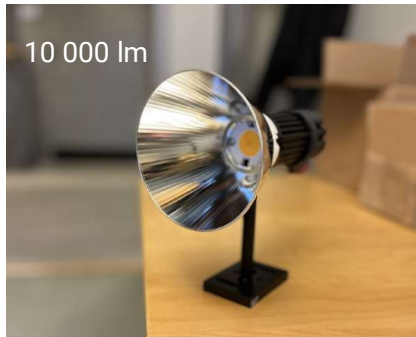
# Pre-tests



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15

# Flickering light source



16



# fMRI-flicker – how flicker effects the brain



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17

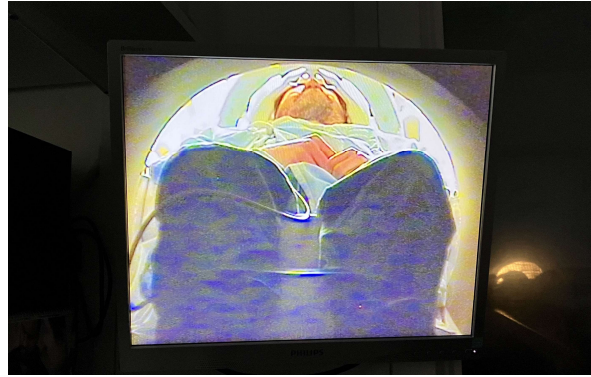
# fMRI-flicker – how flicker effects the brain



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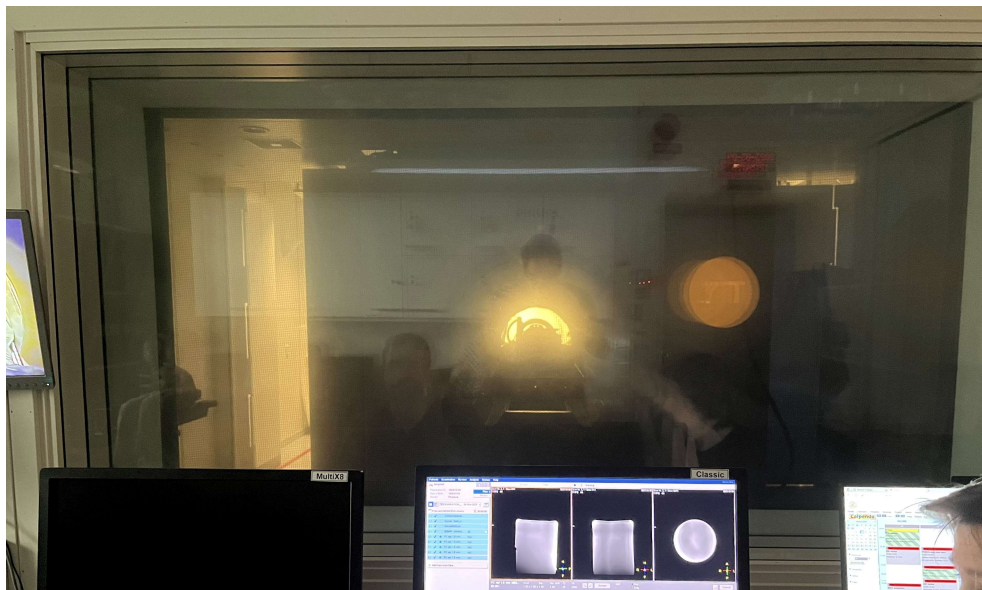
18

# fMRI-flicker – how flicker effects the brain



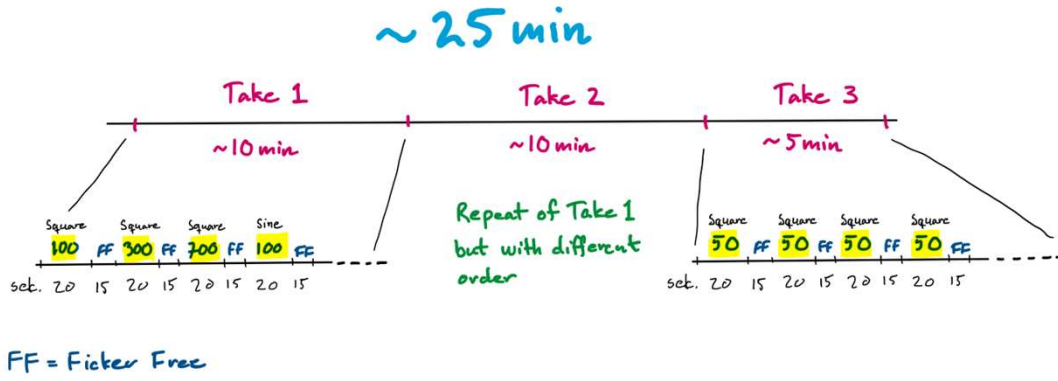
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# fMRI-flicker – how flicker effects the brain



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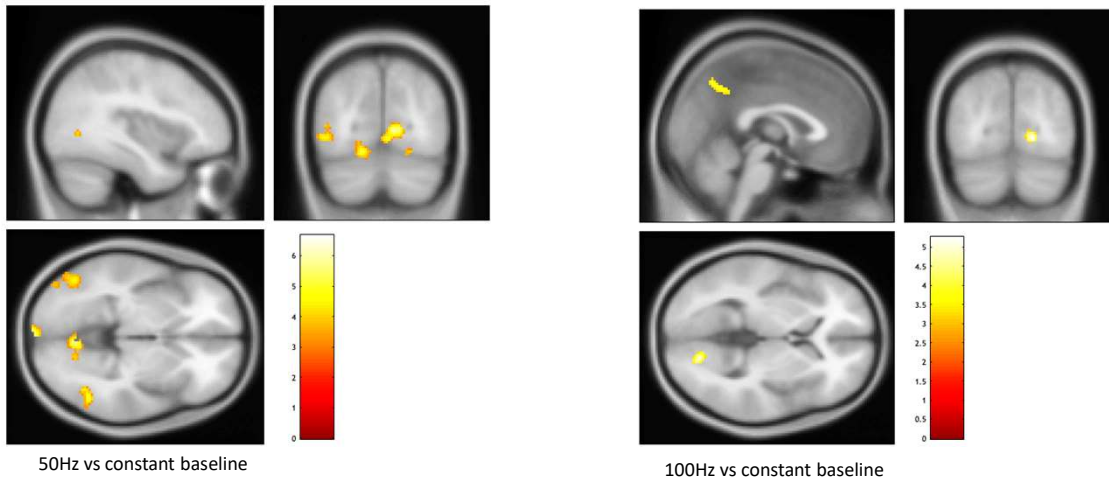
# Sketch of sequence



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21

# First test results



50Hz vs constant baseline

100Hz vs constant baseline

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22

11





# Light and Lighting Research and Networking

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## Welcome



23



REMEMBER TO GET SOME LIGHT

DURING THE FIKA BRAKE!



Light  
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Network

24

12