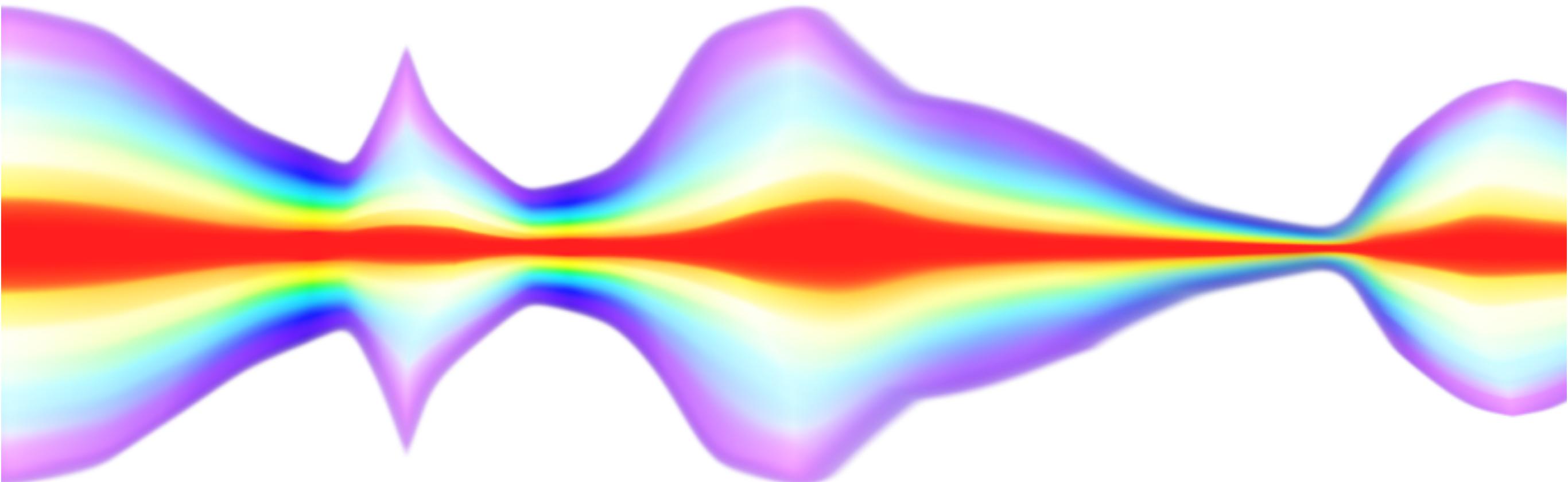


Light Log

Brighten your day

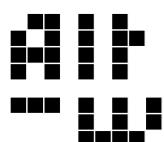


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Supported by New Media Scotland's Alt-w Fund with investment from the Scottish Government

Introduction

What is Light Log?

- Continuous, ambient light recording device
- Wearable
- Low cost (~£10 BOM)
- Tangible device
- Physical computing
- Open Source, Open Hardware

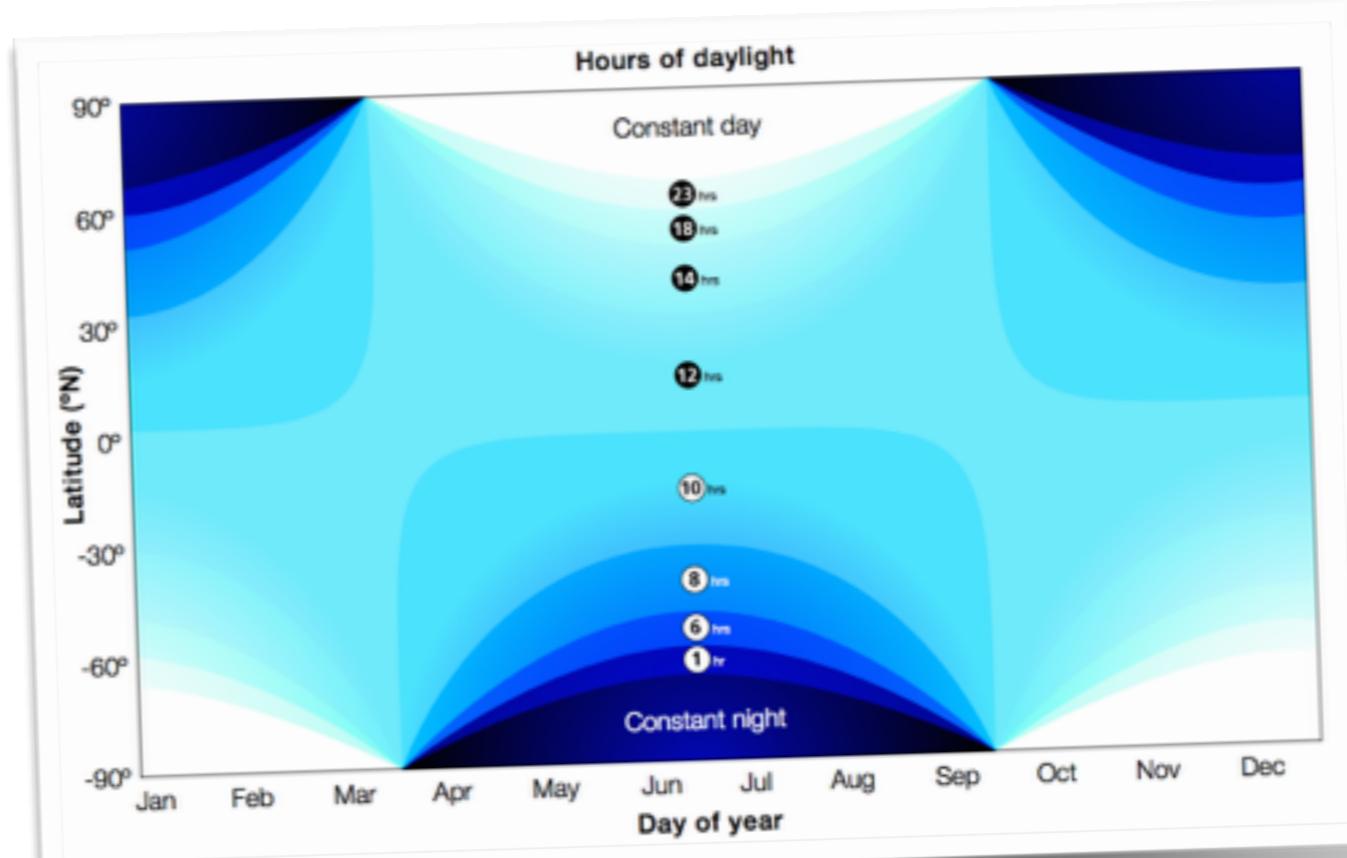
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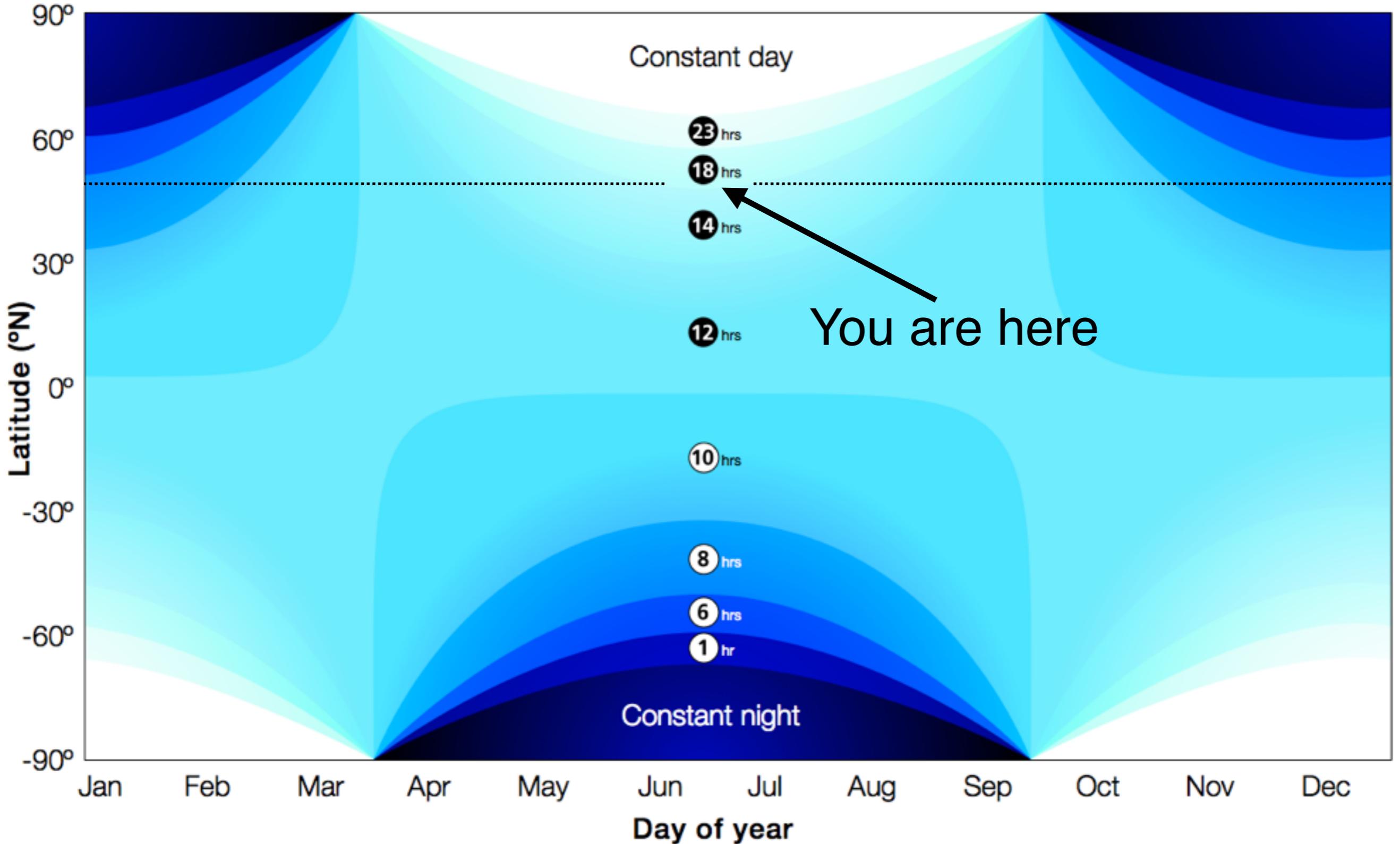
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Who is it for?

- Those affected by Seasonal Affective Disorder (SAD)
 - *"Thought to be linked to reduced exposure to sunlight during the shorter days of the year"* –NHS Choices
 - 2 million people in the UK (12 million in Northern Europe)
 - above 30° north or below 30° south of the equator
- Winter Blues (Sub-syndromal Seasonal Affective Disorder)
 - Up to 20% of population (SAD Association)
- Light sensitivity
 - Medication
 - Medical conditions
- Health and wellbeing
 - Vitamin-D light exposure
 - Life-logging, Quantified Self
 - Shift workers
- Light research (101 units @ TU/e)



Hours of daylight



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Why log light?

- Allows the wearer to monitor & modify behaviour
 - Improve sleep quality
 - Sleep disrupted by more serious conditions
 - Alzheimer's disease, Parkinson's disease
 - Improve energy levels / alertness
 - Vitamin-D light exposure
 - Manageable quantity of data
 - Data suitable for machine learning, auto tagging
 - Minimal impact on other individuals privacy

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How does it help?

- Easy & objective automatic recording of light
 - Minimal user interaction needed
- Provides visualisation promoting +'ve behaviour
 - Reach daylight goal exposure
 - Minimise light pollution prior to sleep
 - Other... (events, vitamin-D, outdoor activity)
- Allows user to objectively compare data with others
- Provides data for further research

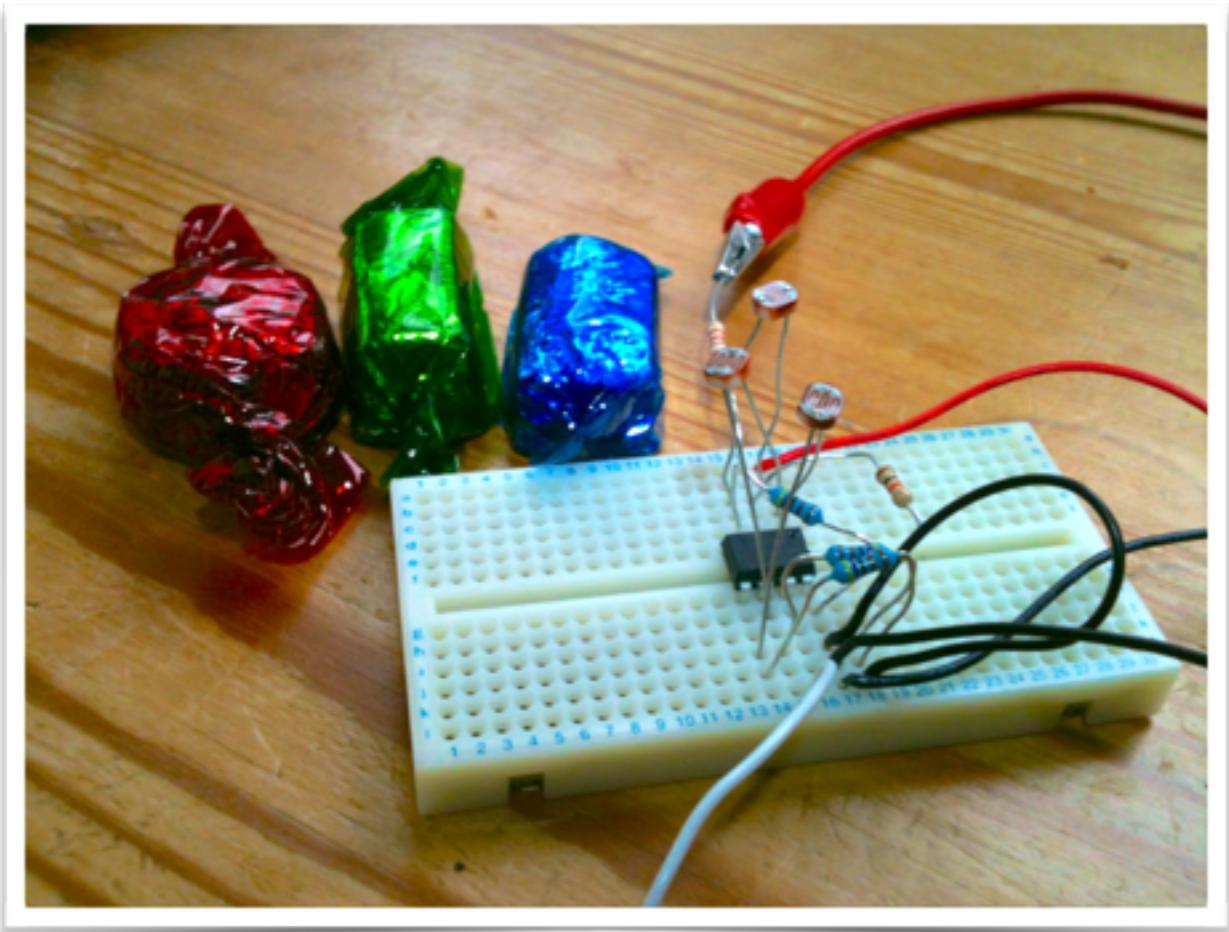
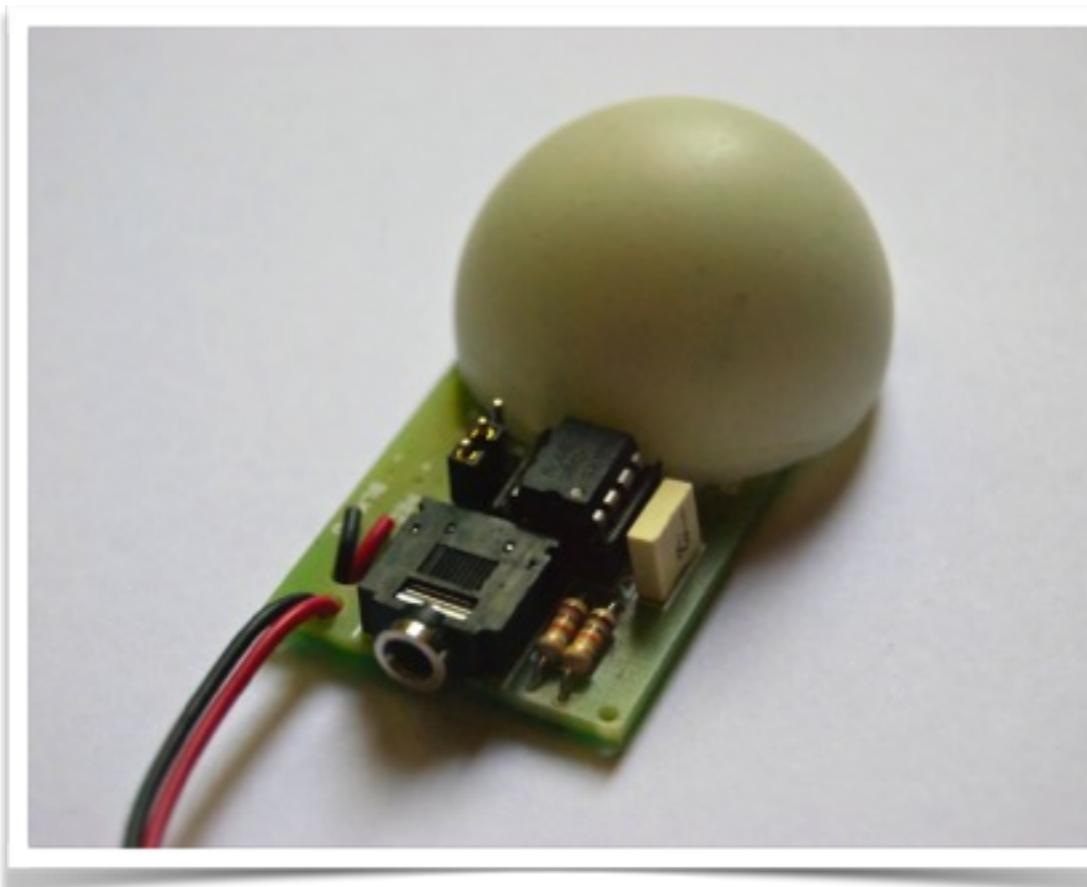
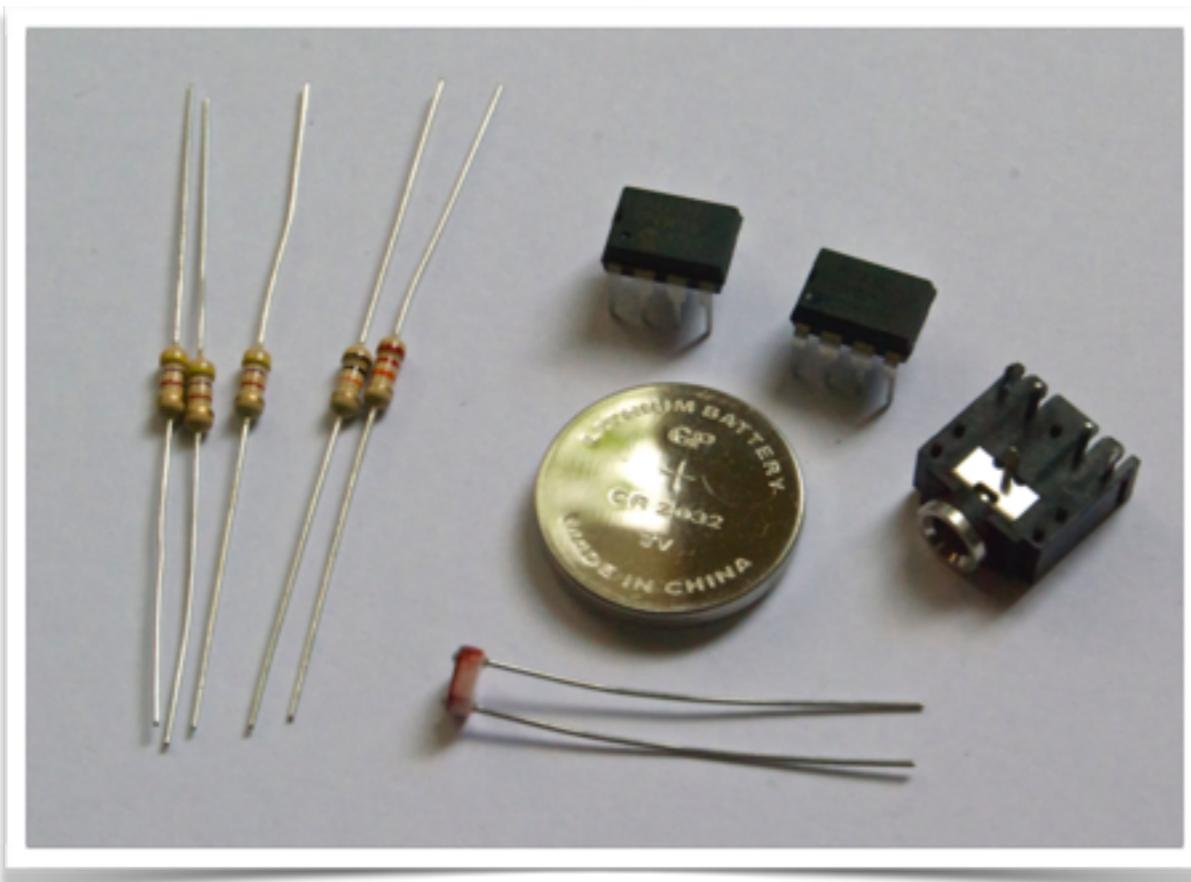
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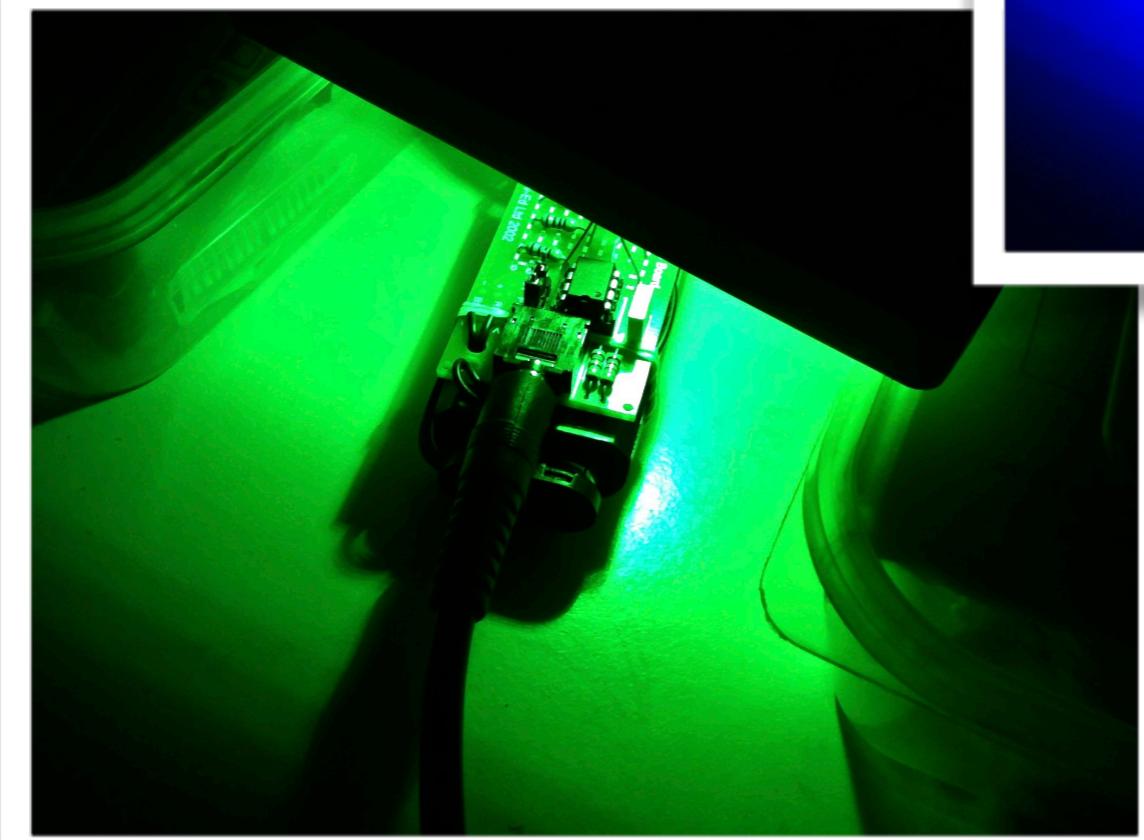
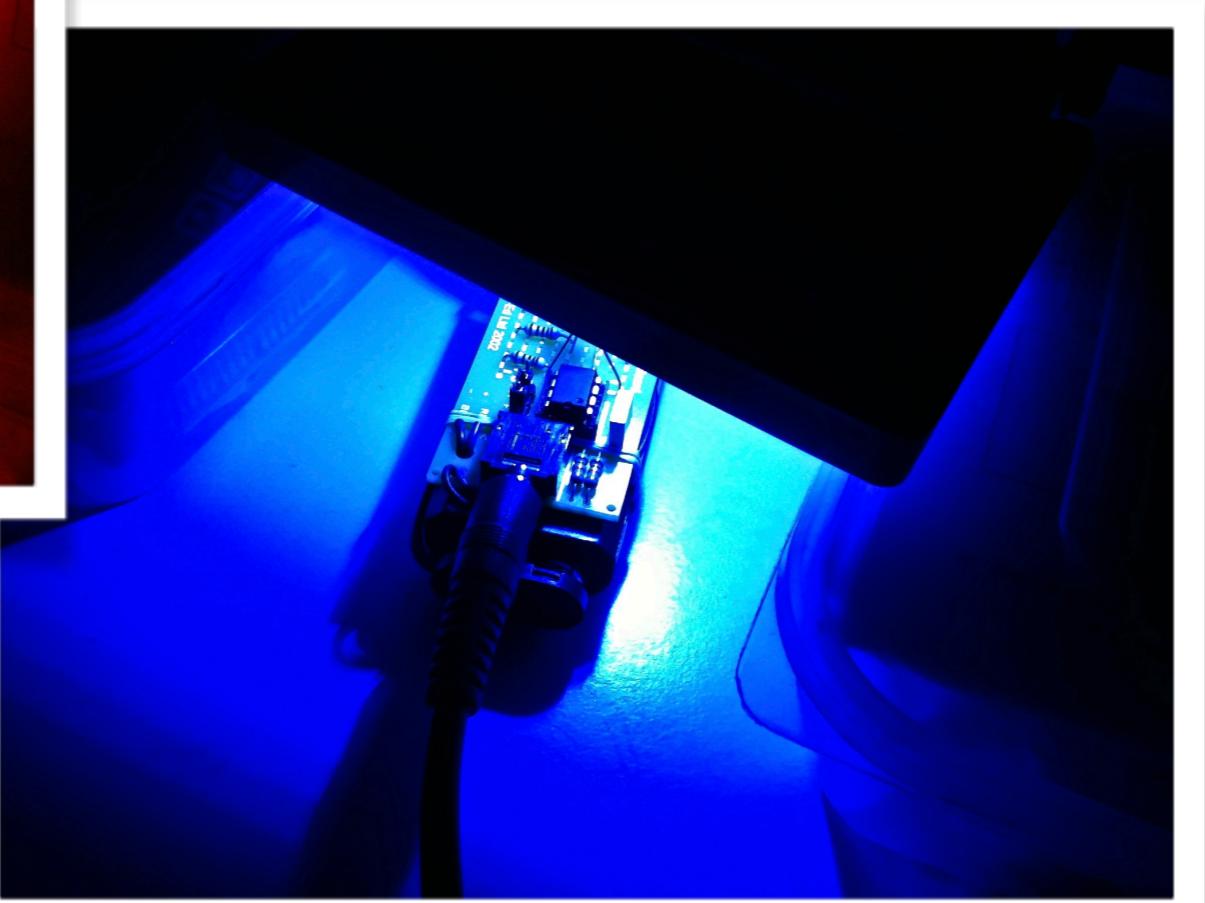
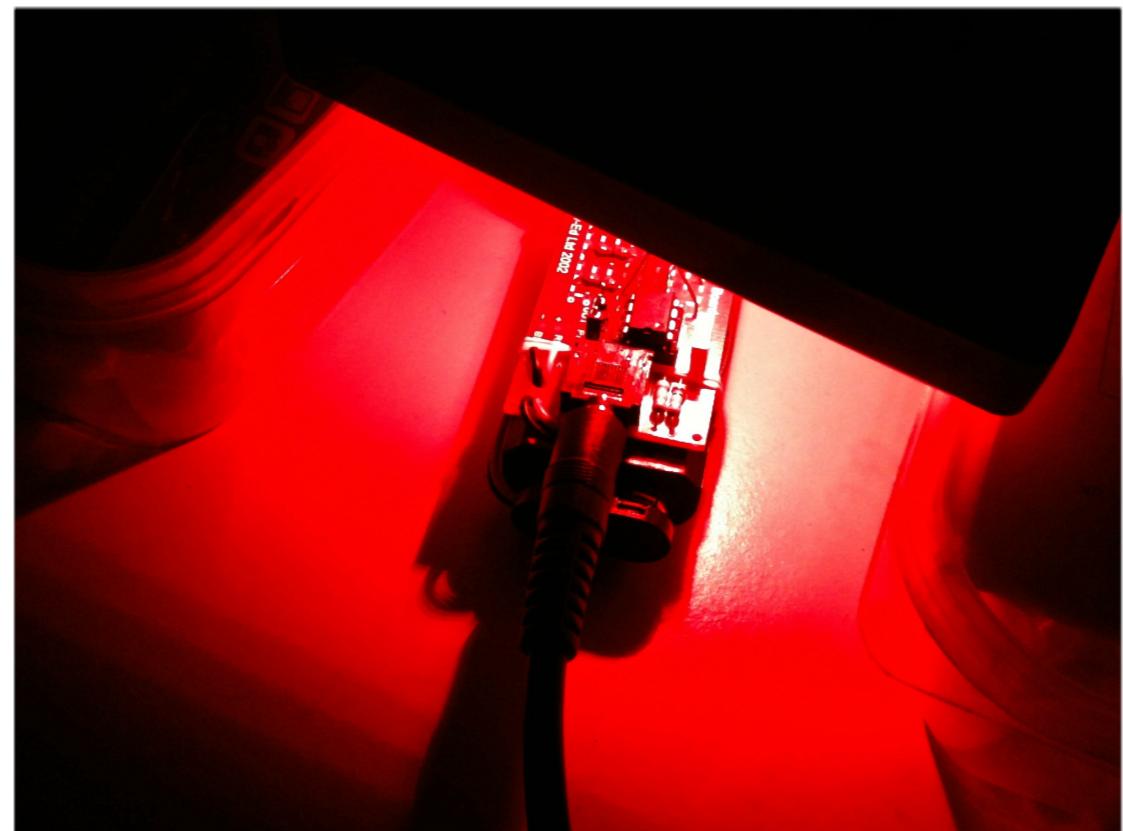
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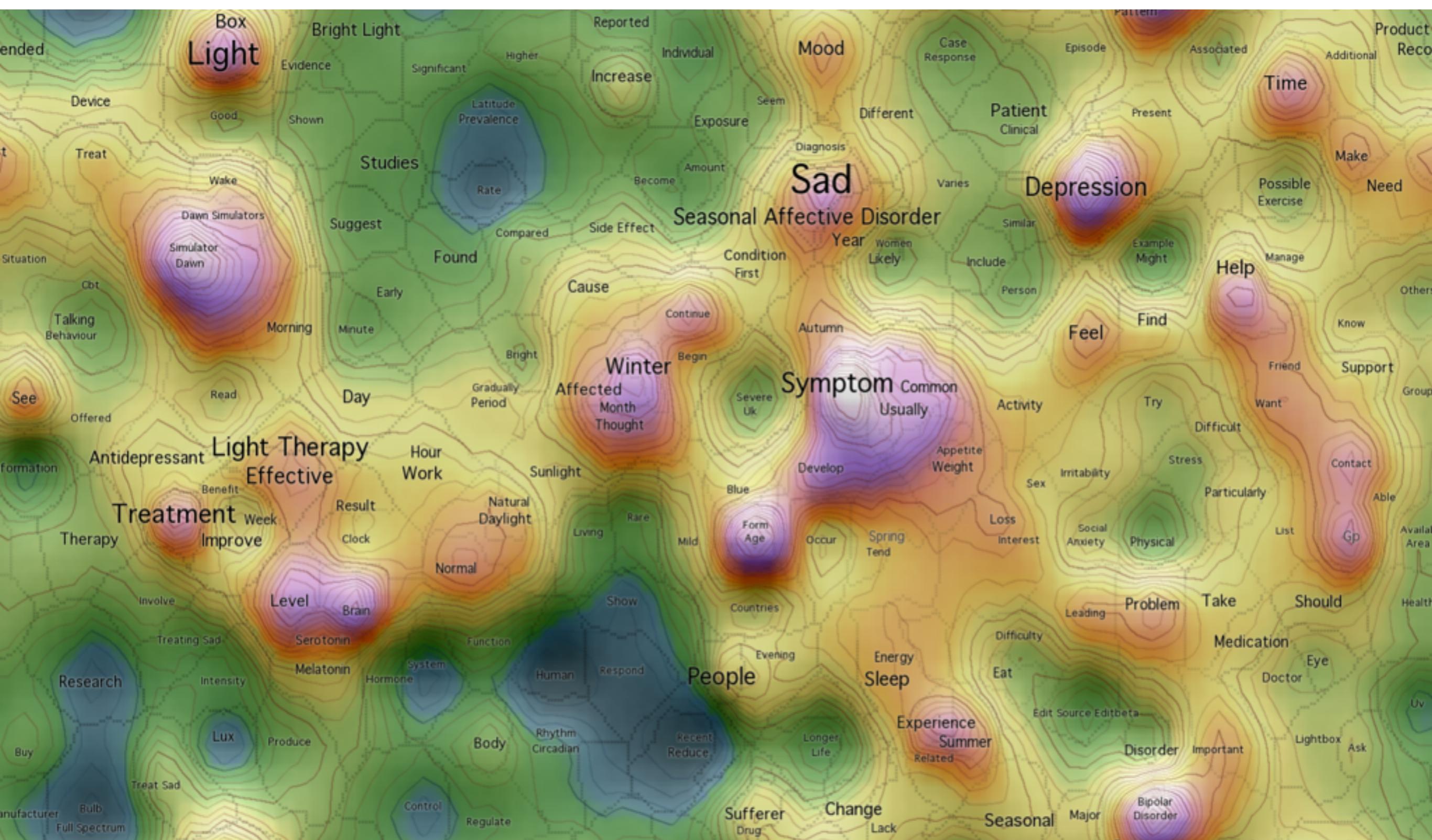


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Light related devices

- Dimesimeter, (Rensselaer Institute)
- Daysimeter, (Rensselaer Institute)
- Sunsprite (GoodLux Technology)
- JUNE (Netatmo)
- MY UV PATCH (L'ORÉAL)





Seasonal Affective Disorder research
(self organising map ~250 terms)

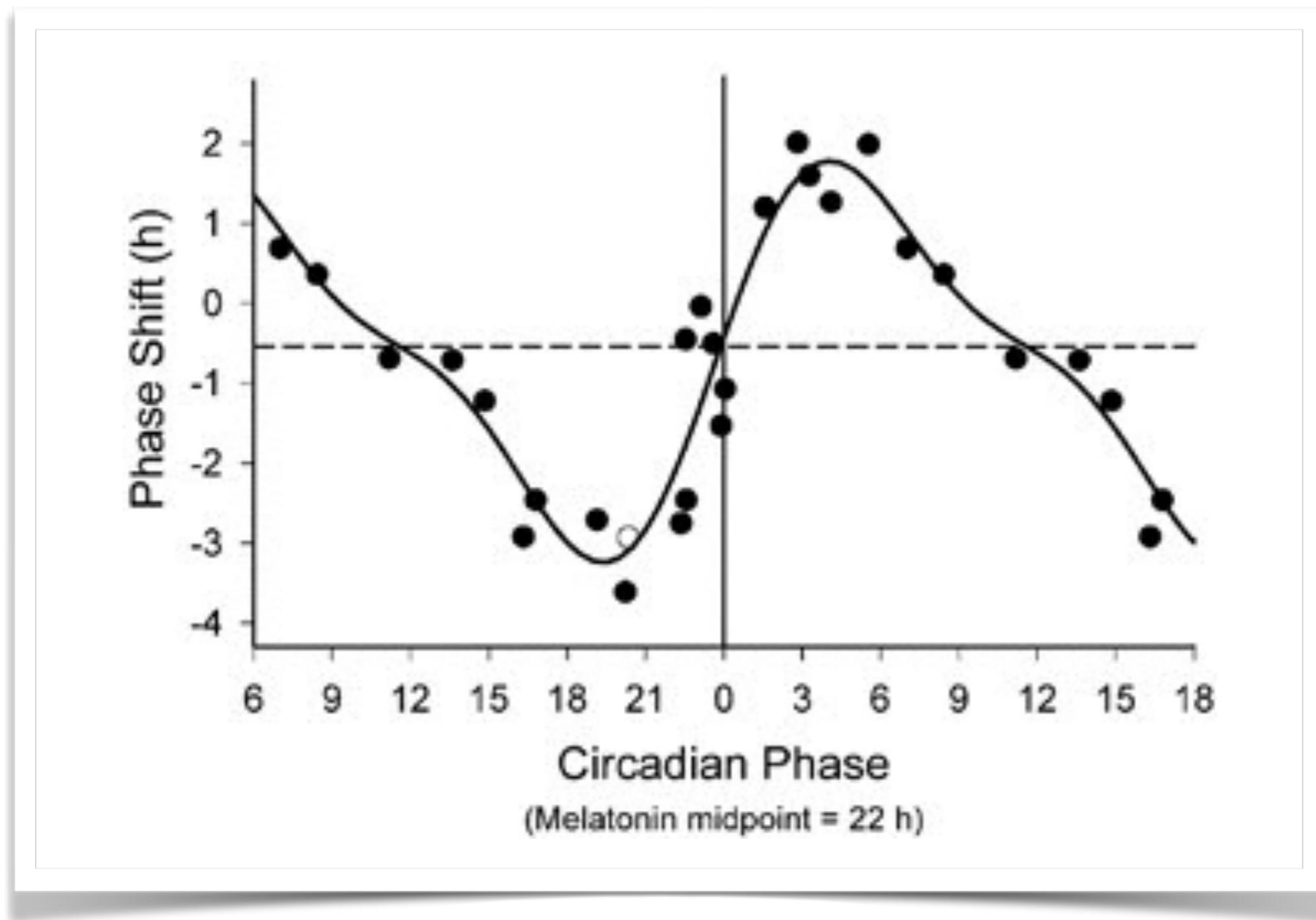
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“...circadian disruption negatively affects human health...”

–Mark S Rea*, Andrew Bierman, Mariana G Figueiro and John D Bullough: A new approach to understanding the impact of circadian disruption on human health. Journal of Circadian Rhythms, 2008



Sat Bir S Khalsa, Megan E Jewett, Christian Cajochen, and Charles A Czeisler: A phase response curve to single bright light pulses in human subjects. *The Journal of Physiology*, 2003

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Lux

Indirect sunlight
10,000-25,000 lx

Light therapy
2,500-10,000 lx

Overcast day 100-1,000 lx

Office 320-500 lx

Home lighting 50-150 lx

Dim laptop screen 18 lx

Twilight 10 lx

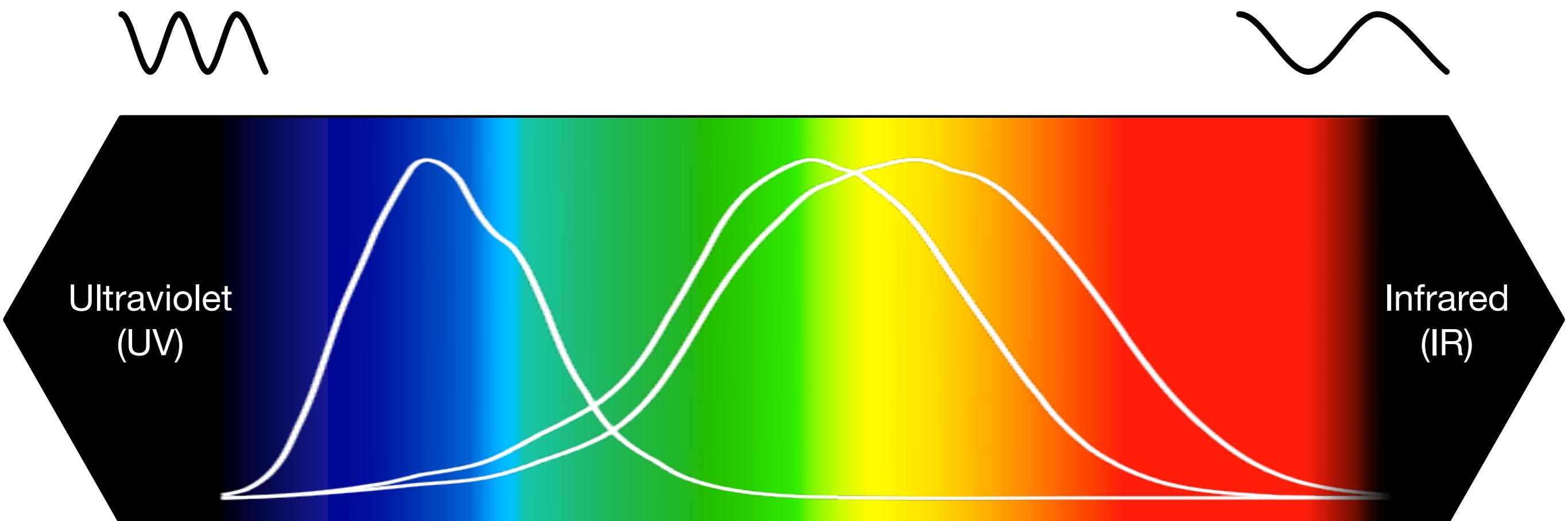
Full moon 1 lx

Direct sunlight
32,000-130,000 lx

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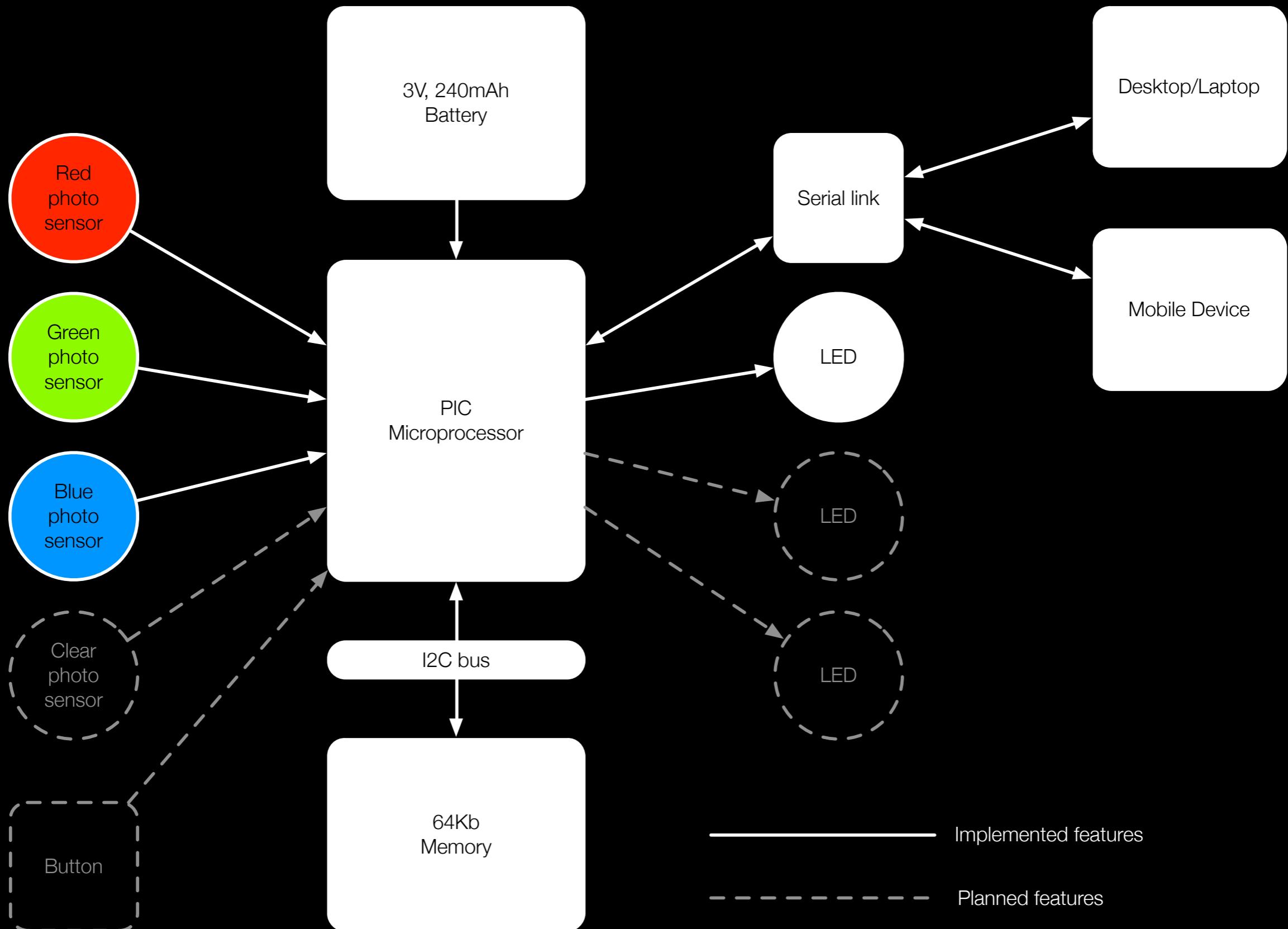
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Colour

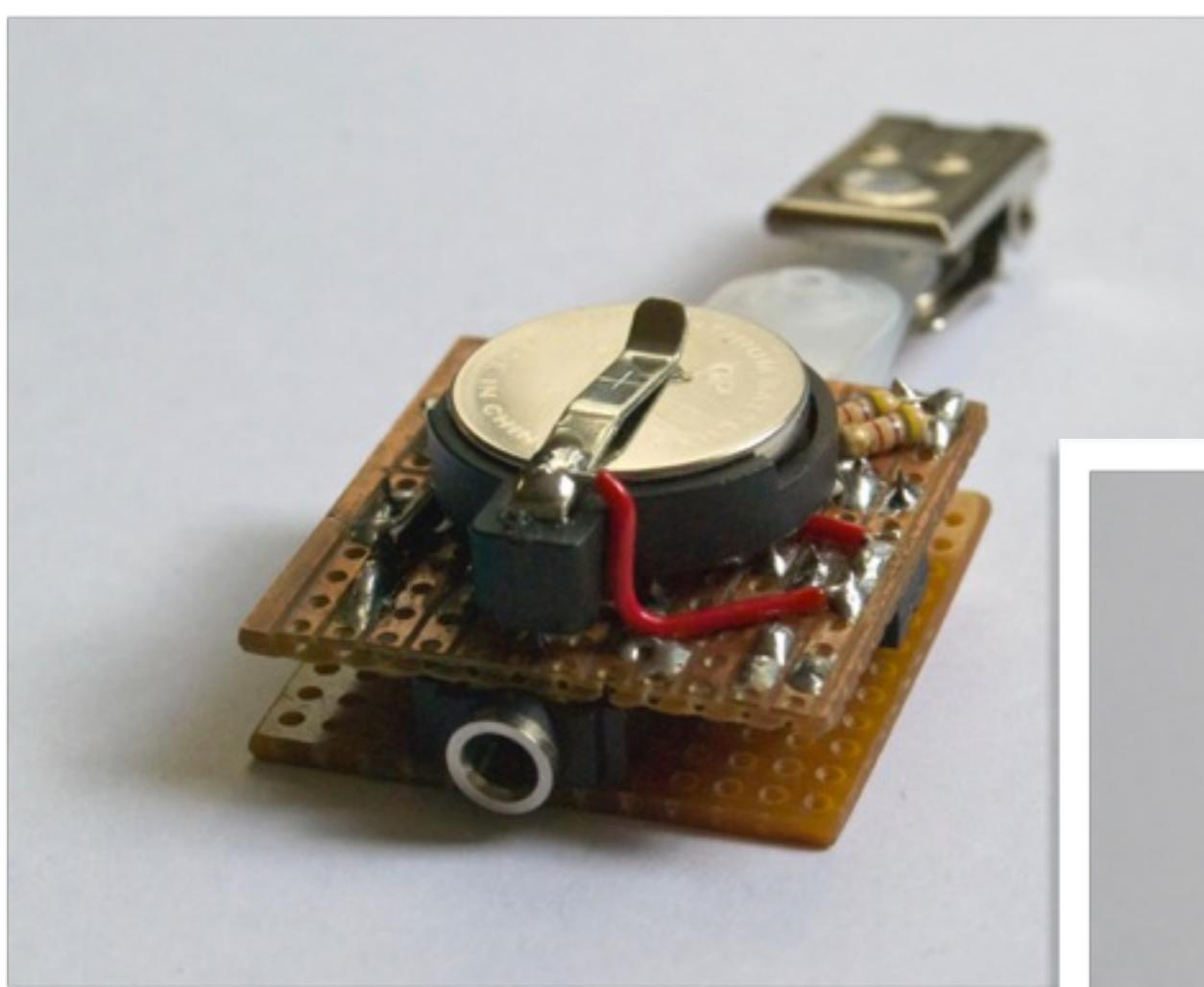
Clear blue sky 10,000–27,000 K

Shade in daylight 7,500 K
LCD / CRT 5,500-10,500 K
Daylight overcast 6,500 K
Midday sun 5,500-6,000 K
Moonlight 4,000 K
Incandescent light bulb 2,700-3,300 K
Candle, sunset/sunrise 1,850 K
Match flame 1,700 K

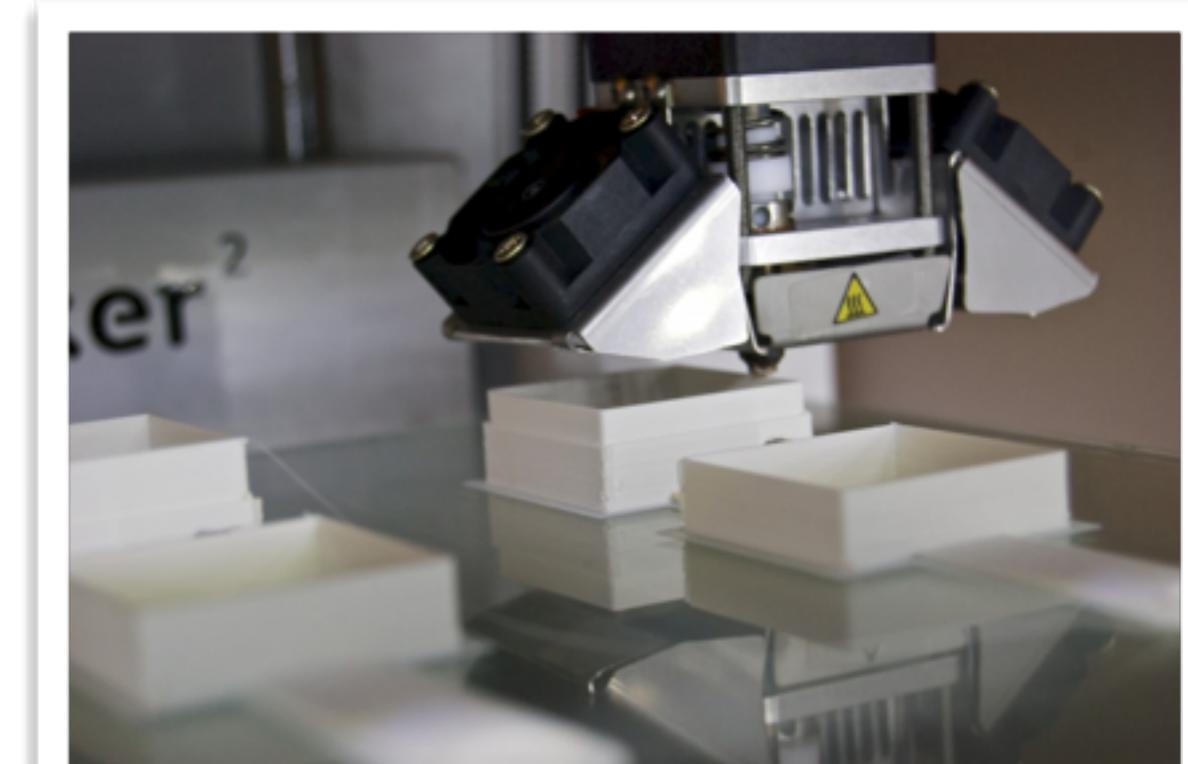
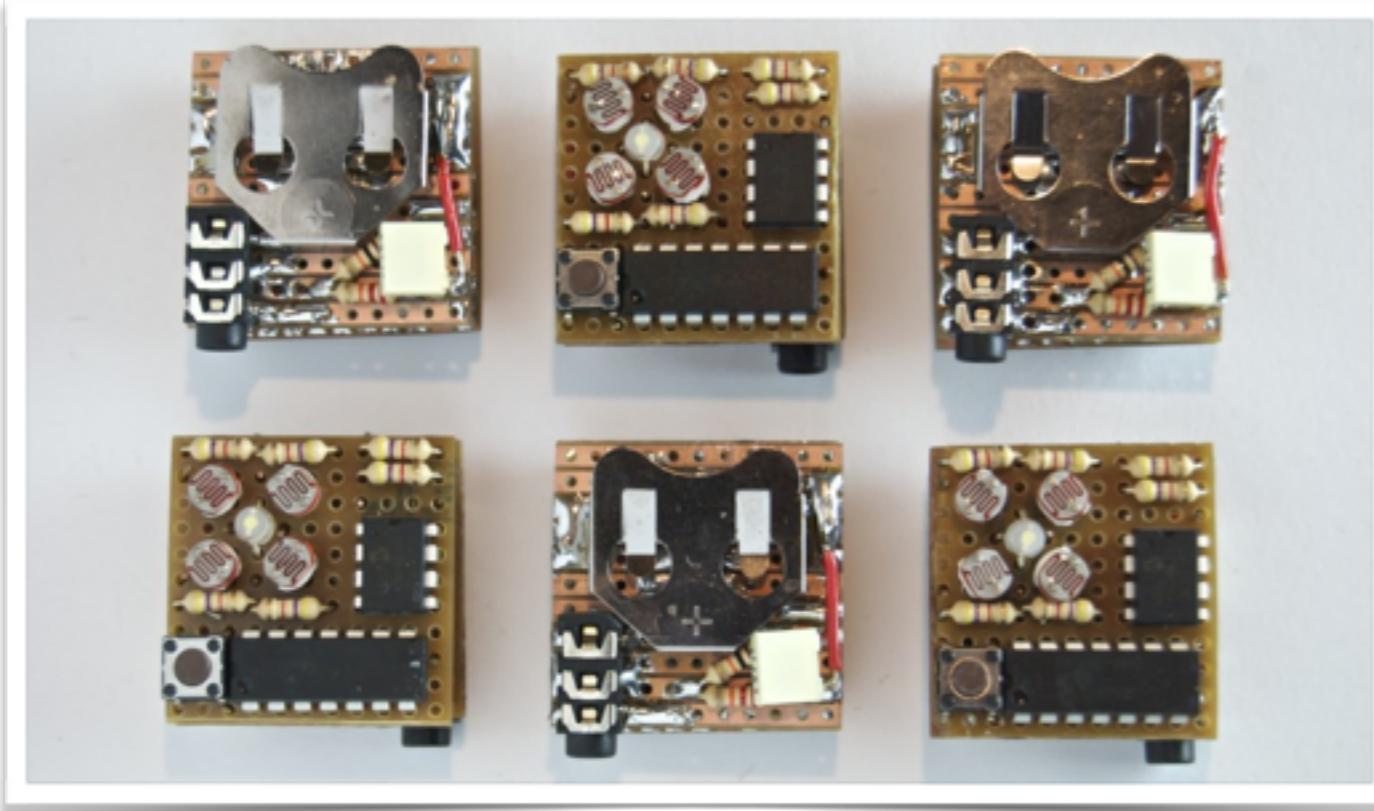
Gas-emission lighting
Fluorescent & neon lighting



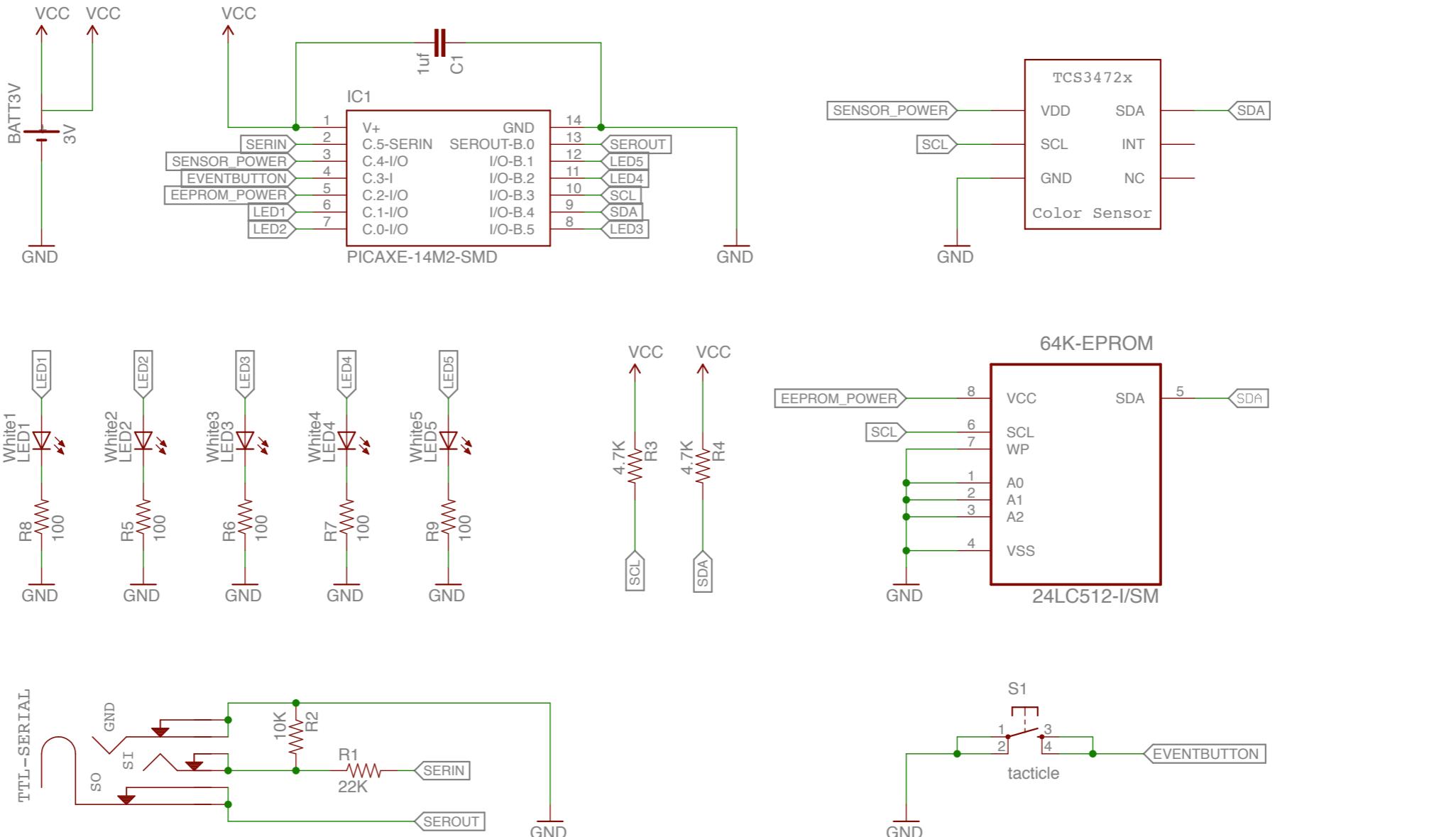
Block diagram



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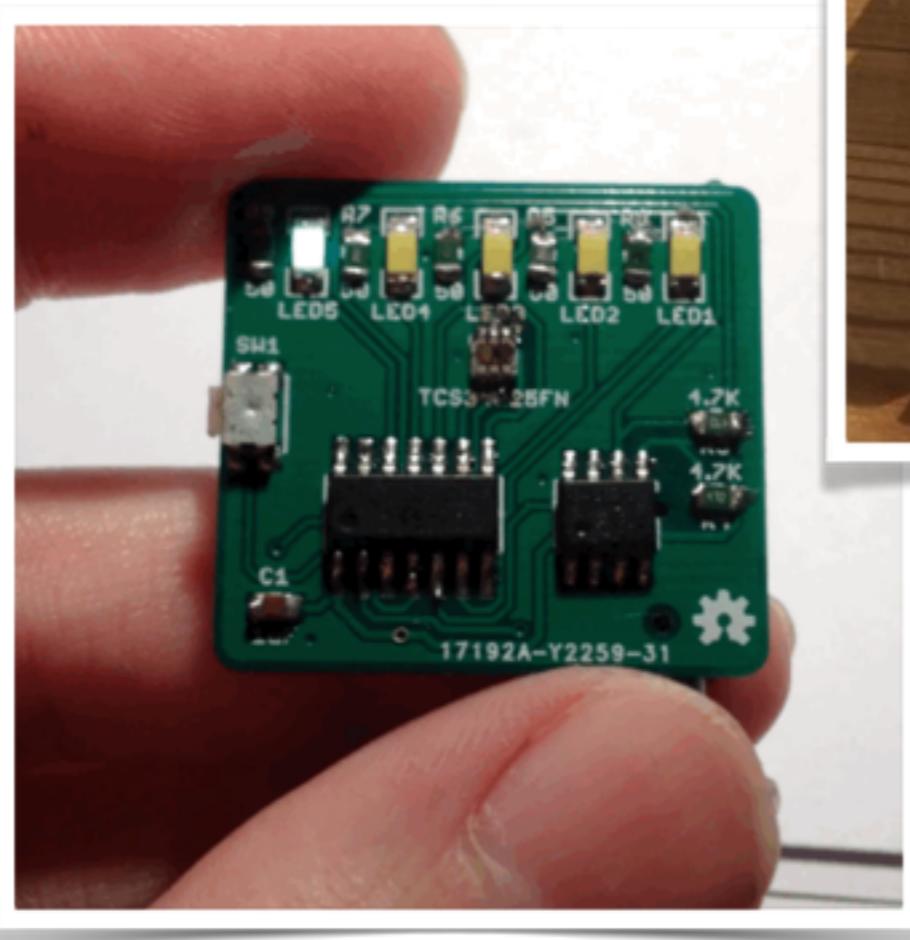
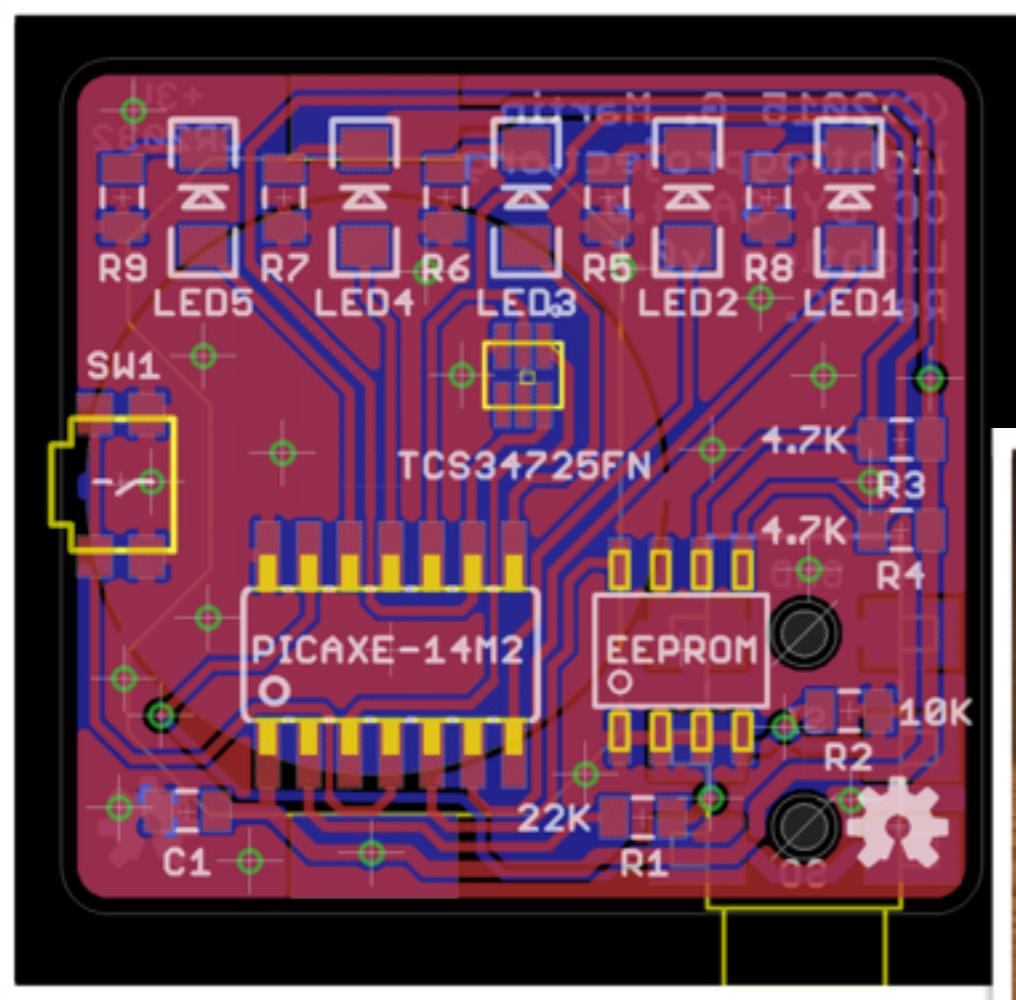
Design by:
Gary C. Martin

REV:
v0.6C

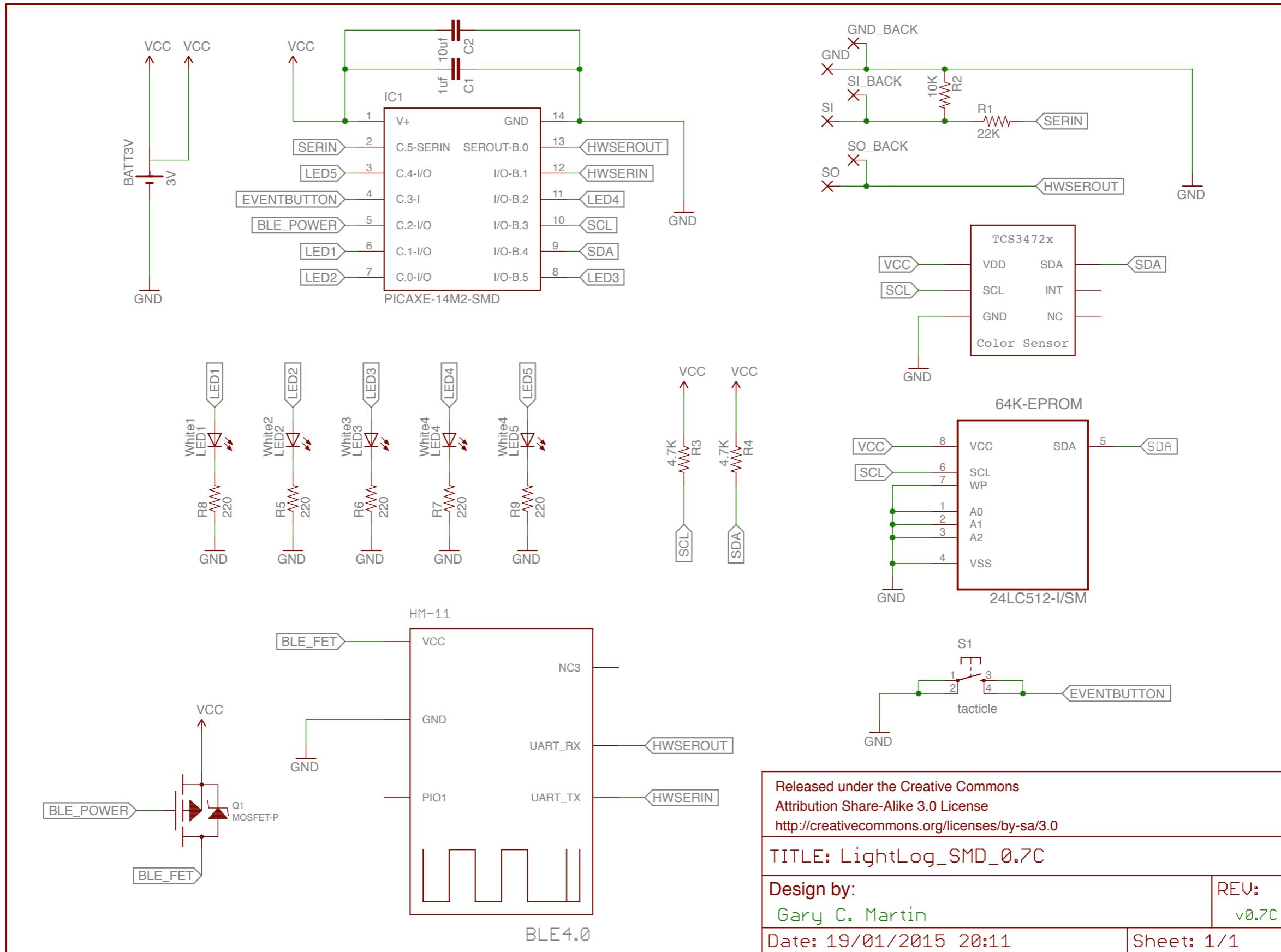
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Sheet: 1/1





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Design by:
Gary C. Martin

REV:
v0.7C

Date: 19/01/2015 20:11

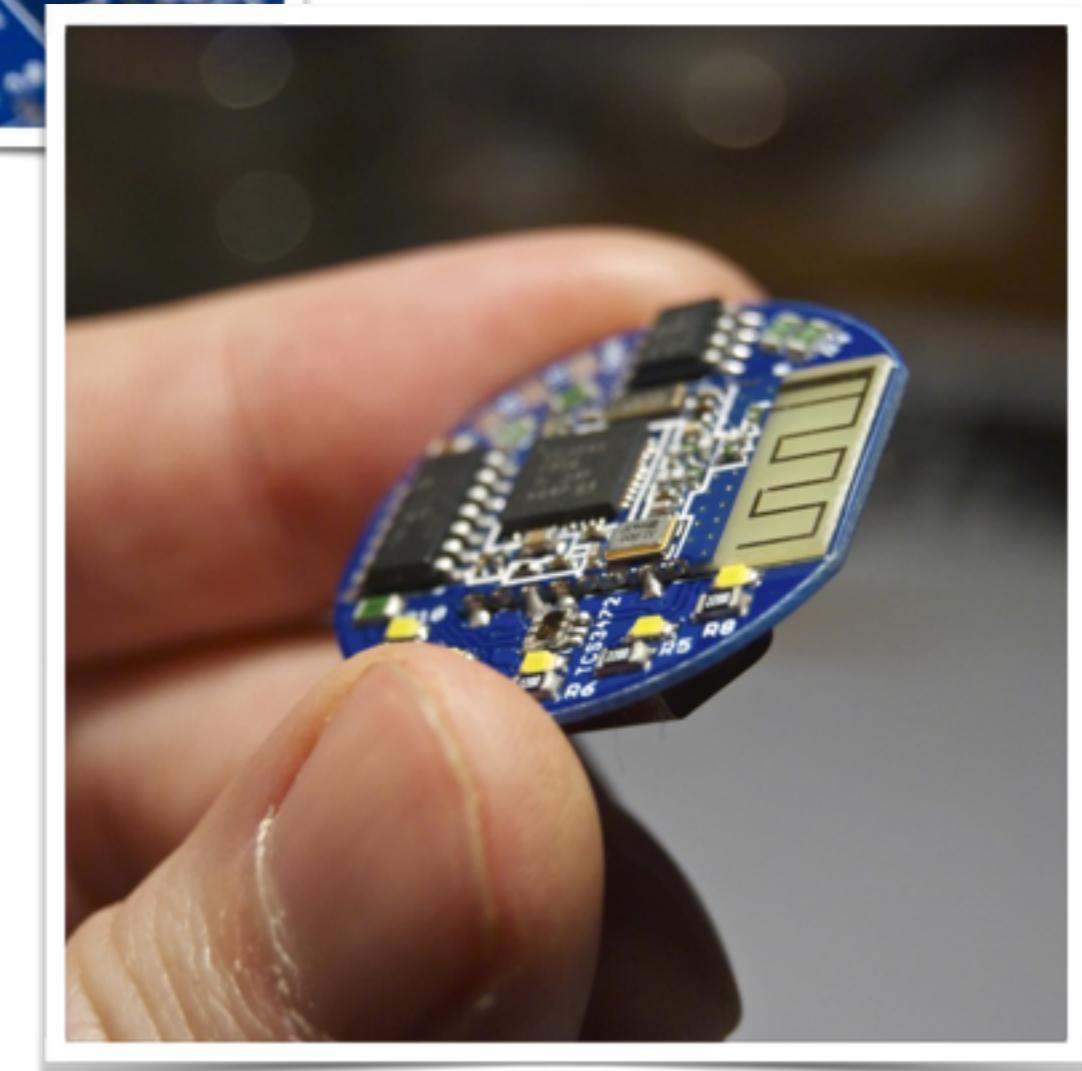
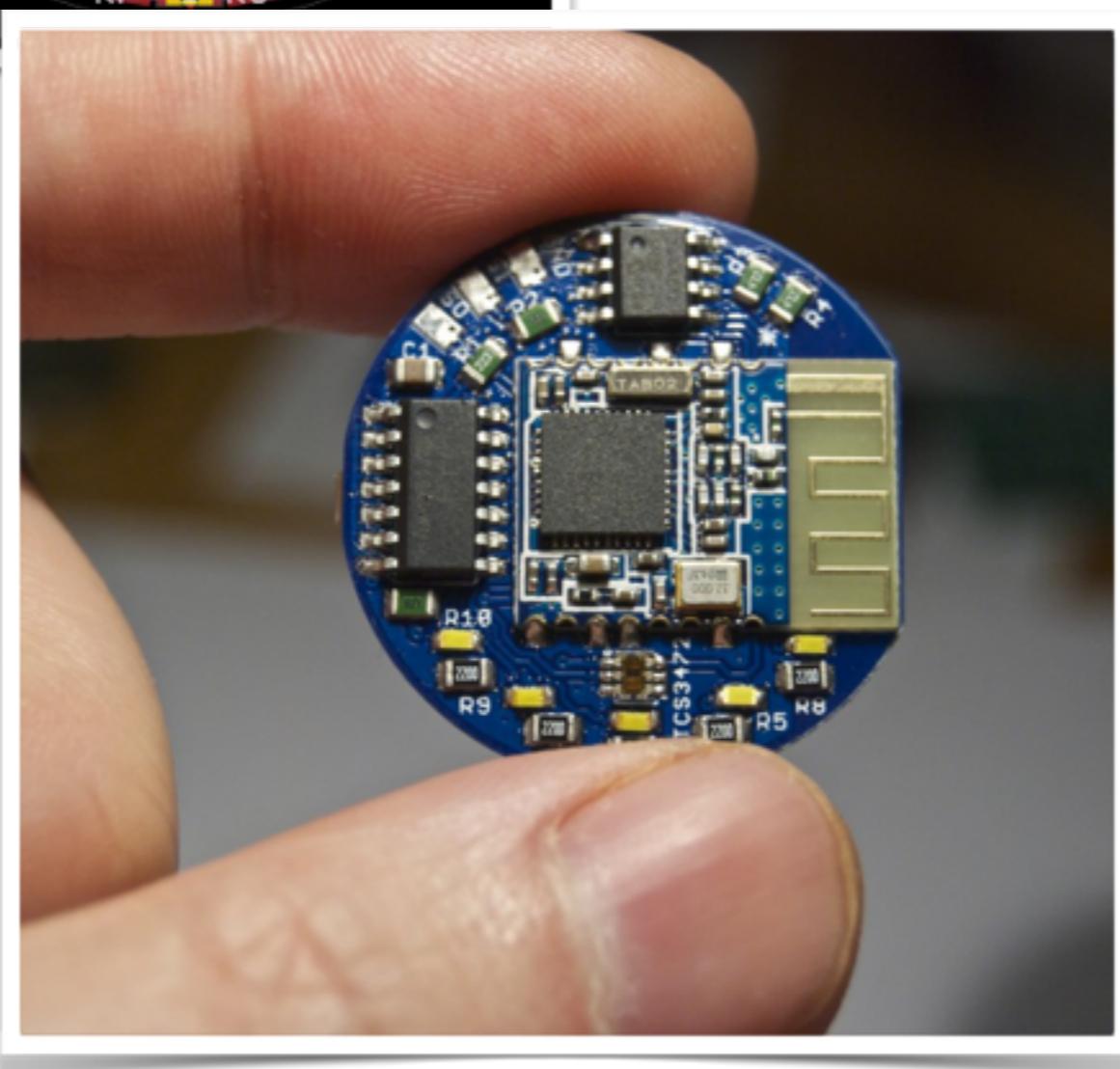
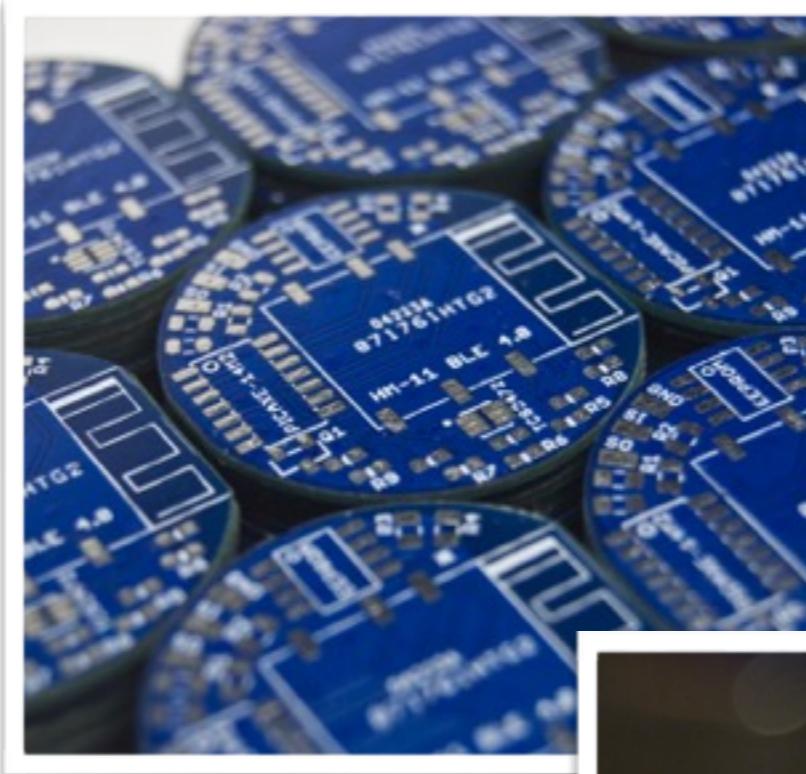
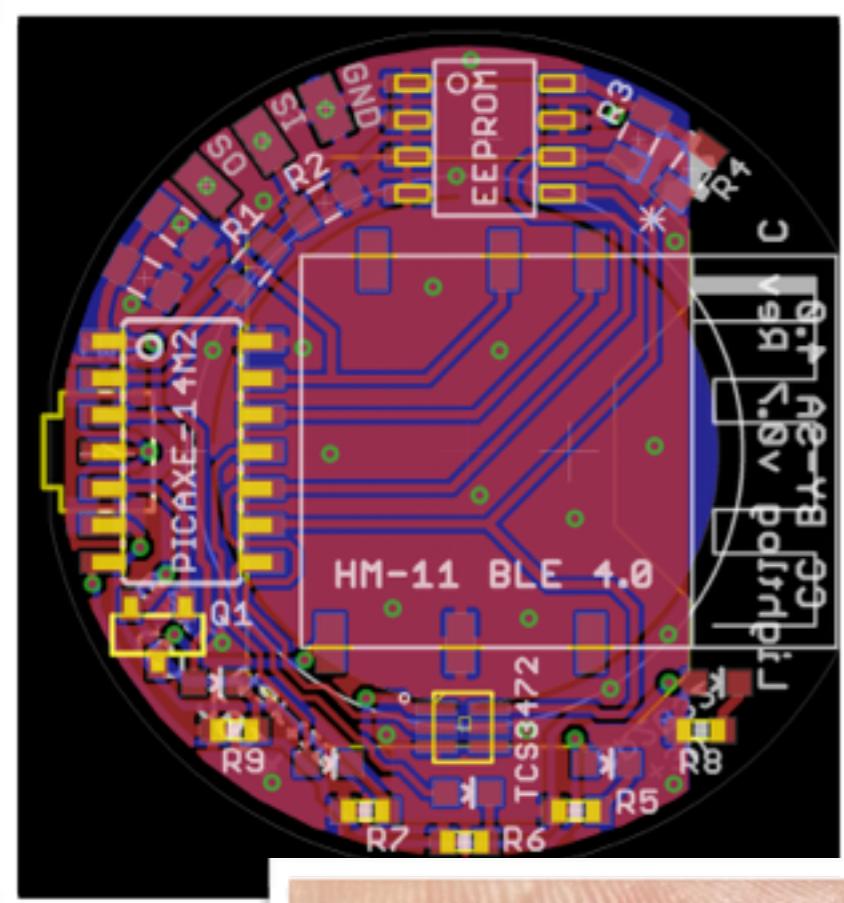
Sheet: 1/1

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https://github.com/garycmartin/lightlogproject/tree/master/circuit_design

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Signals in the data

- Activity data (moving vs. stationary)
- Colour change vs. lux variation
 - TV / video / computer game playing?
- Outdoor vs. indoor
 - Large change in magnitude is easy to detect
- Outdoor environment
 - Sunny blue sky vs. cloudy & overcast
- Sunrise & sunset
- Environment / location changes
 - Auto tagging via machine learning
- Going to bed, and getting up

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0 3 6 9 12 15 18 21 0



8:16 sun rise
7h 30m daylight

Nov 28th 2013

15:46 sun set
16h 30m night



8:18 sun rise
7h 27m daylight

Nov 29th 2013

15:45 sun set
16h 33m night



8:20 sun rise
7h 24m daylight

Nov 30th 2013

15:44 sun set
16h 36m night

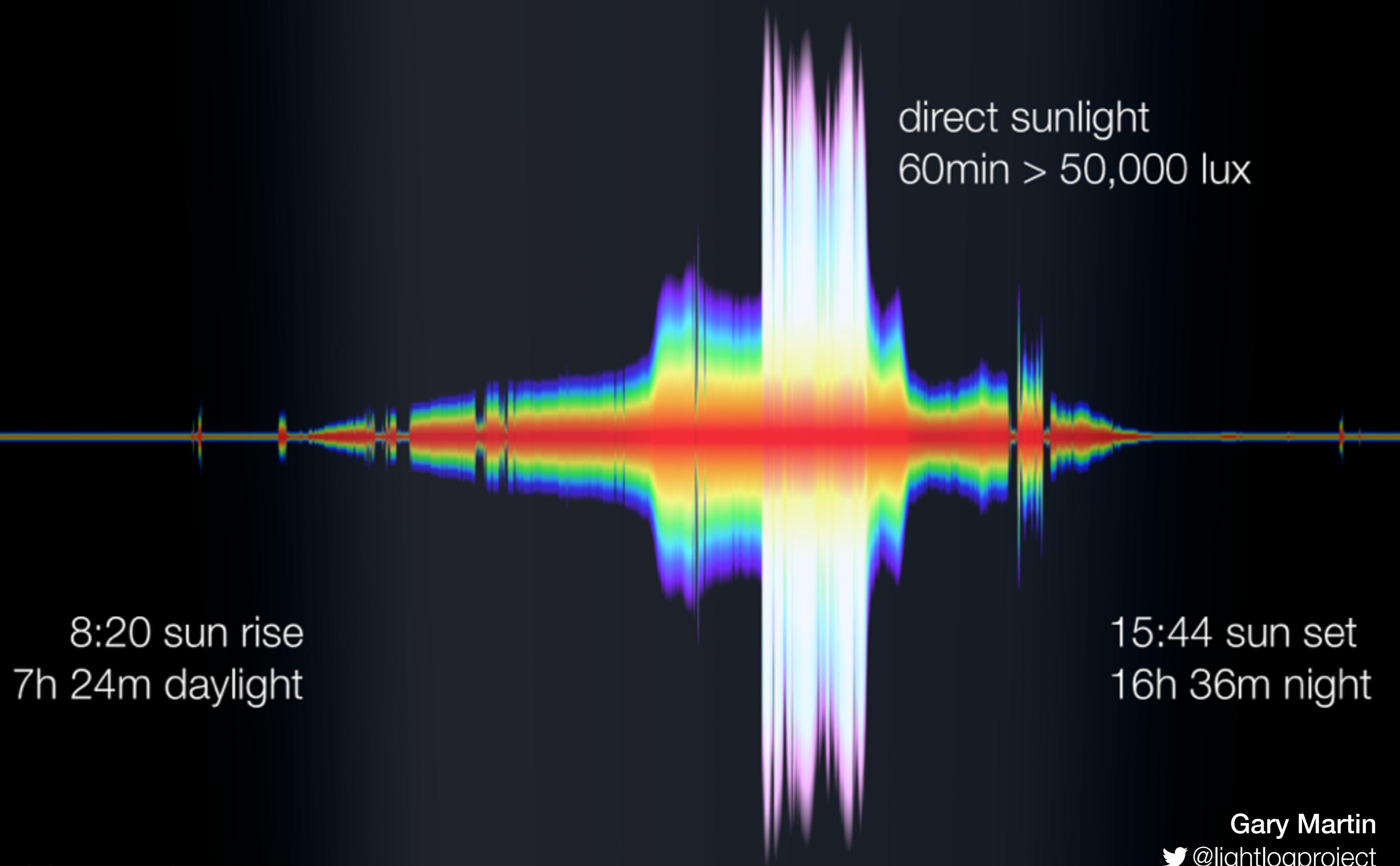


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6 7 8 9 10 11 12 13 14 15 16 17 18



8:20 sun rise

7h 24m daylight

15:44 sun set

16h 36m night

Nov 30th 2013

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Friday 20th March 2015

10k lx
5k lx
2.5k lx

2.5k lx
5k lx
10k lx

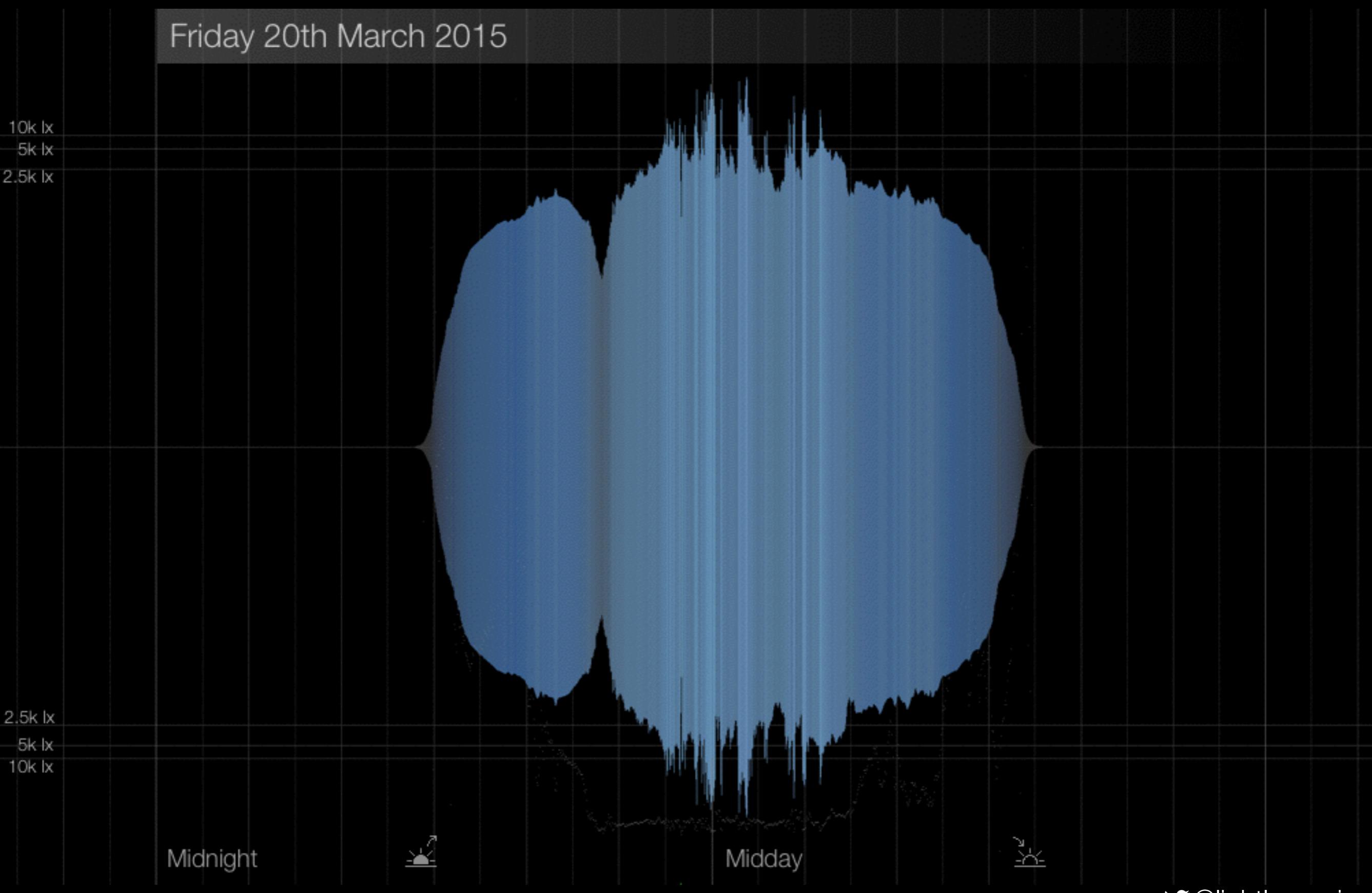
Midnight

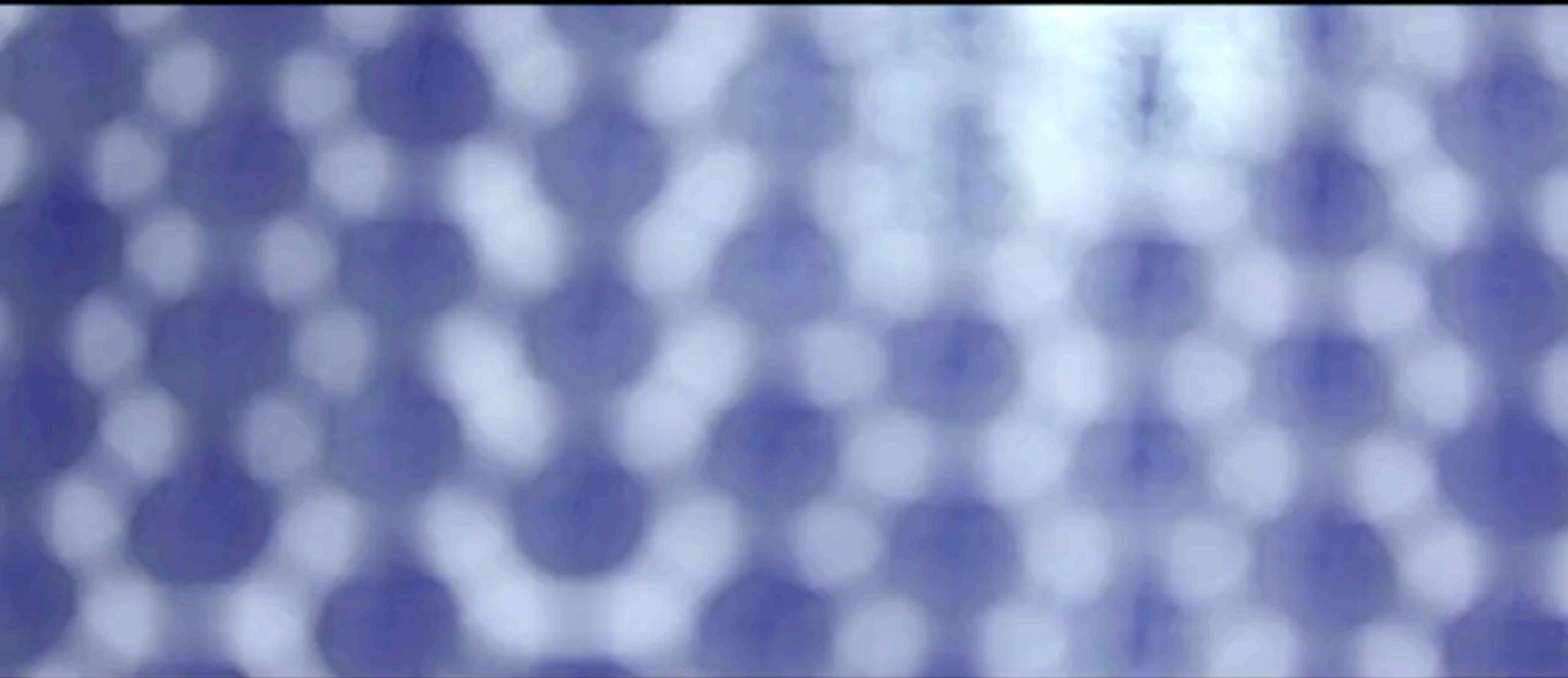


Midday



Friday 20th March 2015





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Acknowledgements



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with investment from the Scottish Government



New Media Scotland



Project Ginsberg

Centre for Design Informatics

Scottish Government



NHS 24



Creative Scotland

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