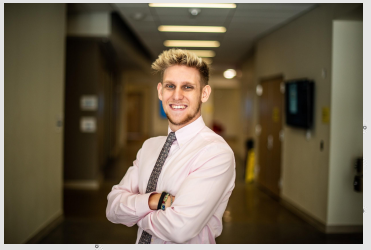
# SpectralSearch Presentation 2

Bandr Alswyan, Ryan Chu, Thomas Horgan & Sheng Kai Liao

# WELCOME! Here are your presenters:

Bandr AlSwyan

Sheng Kai Liao



Thomas Horgan

Ryan Chu

# Recap: Who is the client?

**Client Information:**

Our client is (cascading down):

United States Department of Energy (DOE)

Office of Energy Efficiency and Renewable Energy (EERE)

Building Energy Research & Development

Building Technology Office

For succinctness, the client is referred to as “the client” or “DOE” in the rest of this document.

**DOE Contacts:**

Dr. Wyatt Merrill
Company: Department of Energy Building Technologies Office
Website: https://www.energy.gov/eere/buildings/building-technologies-office

# Recap: What do they want? (Product Vision)

a searchable database of spectral power distributions (SPD) from commercial LEDs that has the ability to derive lighting qualities (TM30, CRI, color temperature, etc.) directly from the SPD and the ability to export the data unlike private sector firms and general energy companies or databases technology firms who might charge too much for such a product. The product should undergo user testing to ensure import/export capabilities as well as correct and accurate SPD calculations. The end goal will look to not only calculate SPD metrics but also compare SPD values through different mediums of light.

# Recap: What do the client require from our team (Now)?

- An accurate (SPD) calculator to calculate certain lighting metrics and an advanced light mechanics.
- Update the function standard into the TM30 protocol (IES Technical Memorandum).
- Cleaning the application and shaping the performance of it.
- Include Things like (Gambot of the light (RG) and Fidelity (RF) ) into the calculator.
- Clean the field. We need to clan and shape the website to meet accurate numbers when modeling including cleaning of the unneeded fields to avoid collecting unnecessary data.
- We need to figure out **How can we take the SPD and calculate these things that are part of the TM30 protocol in an accurate manner** since the client does not know how to calculate these things himself, nor is an industry standard calculator available prior to us exist, so we have to learn it to transmit it to the application for him.

# Equations & TM30

Fidelity (Rf)

**10*Log(exp((100-6.73*Average(CES1-CES99))/10)+1**

CES calculation

Power(Power(J'test-J'ref)+Power(a'test-a'ref)+Power(b'test-b'ref)

J', a', b' calculations

J', a', b' = (1+100*0.007)*J/(1+0.007*J)

- J, a, b =100*(A/Aw)^(.69*z)
  - A = (2*R'a+G'a+(1/20)*B'a-0.305)*Nbb
  - Aw = (2*R'aw+G'aw+(1/20)*B'aw-0.305)*Nbb
  - z = 1.48+n^(1/2)

For the Fidelity equation, we went into breaking down the main equation listed in bold above and determined what missing/unknown variables needed to be addressed. Our goal is to either create placeholders for said variables within our application or try and link a functional sheet with the calculations to our program.

Gamut (Rg)

**100 x At/Ar ------> 100*SUMPRODUCT(Difference a' test values,Difference b' test** values)/SUMPRODUCT(Difference a' ref values,Difference b' ref values)

For the Gamut Index, the two main unknown variables we are working with at the moment are At and Ar, these variables consist of polygon area calculations that take in arrays of a' and b' values, takes the difference of them, sums them and then multiplies them by each other. Our goal, similar to the Fidelity index, will be to create placeholders for the array of A test and A reference area values, code in those difference calculations and allow the code to take in these unknown variables. As of now we also look to hopefully link a functional sheet with these calculations.

# Where are we now? (Our current progress)

- We improved the app end appearance and functionality.
- We fixed a major search database bug.
- We reorganized the pages to meet the requirement of the client.
- We implemented a new feature that allow the process of the CSV format files to be handled into the calculator.
- We achieved more work and progress on the TM30 equations.
- We are now working on getting a more spreadsheet like functions into the application. Including (viewing, filtering and control).

# Recap: What is the client end goal with us?

- Our client essentially is attempting to create a library that has the purpose of providing information on data concerning lighting quality metrics pertaining to SPDs, allowing easy access to specific calculations and specifications of a variety of different lighting tools.
- This has the potential of:
  - Speeding up the workflow of the individuals in the industry
    - Ease of data access & calculations
  - Providing a centralized database for individuals to access the TM - 30 standard metrics derived from SPD data
- A proper SPD calculator that's able to calculate specific lighting metrics.
  - For a less experienced personnel in the field it's tough to navigate these lighting metrics and data as well as make these calculations

# Updated: What is the client end goal with us?

- Our client updated the goal to include prioritizing calculating Fidelity and Gamut regarding the TM30.
- Working on having outputs that show SPD data and their different effect on different mediums.
- Categorizing the information within the database to be more user friendly and easy to work with.

# Recap: Brief Summary Of The Meetings With The Client

**Meeting 1 (Wednesday Sep 9th, 2020)**

Establish initial contact with the client, introduce the group and have the client present their needs and goals for the product.

**Meeting 2(Monday Sep 28th, 2020)**

Going off our clients previous requests and explaining the current state of the product including showcasing how the application work and going through new asks and updates from them. Deliverables: 20 page PDF help manual of how to install/run the application.

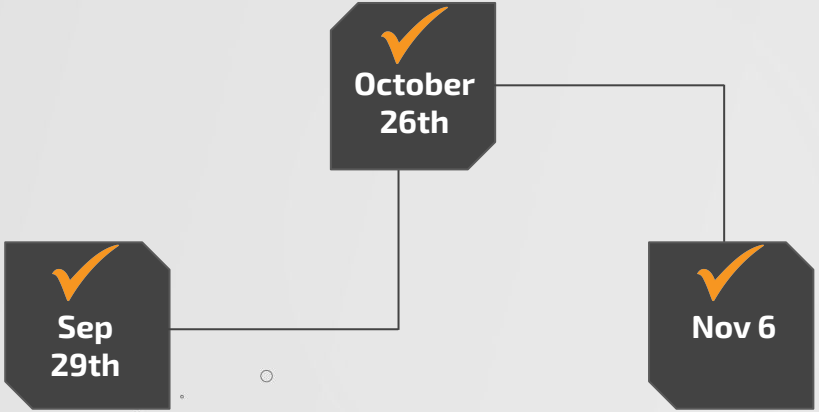
# Updated: Brief Summary Of The Meetings With The Client

## Meeting 3
## (Monday Oct 26, 2020)

The CSV upload function was presented to the client. The team was provided with further information on the equations pertaining to TM-30 calculations. Due to an issue with GitHub the client was not able to access the current version of the software. The client left us with a new requests, asking us to include a filter function in order to give a better user experience in navigating through the information within the database.

# Recap: Milestone

After numerous recommendations from client, our main goals for October and the next Client update are a fully functional Upload feature and Corrected TM-30 standard metrics that the product will output




First testing meeting with client: Fixed bugs and functionality issues to have a presentable, testable product ready to show the client

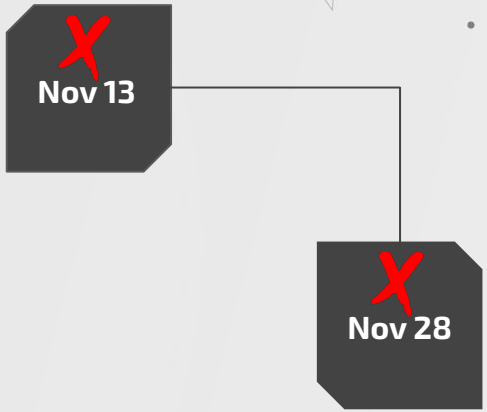
Main product function should be in place by this point, both backend and frontend enhancements will be discussed at this point following presentation 2

# Milestone: Complications

With close to full functionality, The team will aim to add more advanced features such as specific spectral data output and how it might seem to different mediums i.e the human eye, plants. The team will also work on enhancing the database and the user interface.

Why we think this might not be possible:

- Time Constraints due to learning curve in the knowledge of the “math behind the calculation”.
- Limited Knowledge on TM-30.
- Limited Resources pertaining the TM-30-18 equations.
- Complexity in driving a functional model.




By this point at the end of the semester, the team will have taken the clients final input following October 26th meeting and have done their best to add as many advancements as time allows by this point. The web app should be able to successfully take in any spectral data (Wavelength & Intensity), both accurately & cleanly present all metrics

# Expected New Milestones

- So here is the new updated milestone for the next parts.

Continuing the learning of the TM-30 protocol and attempt to create a functional driven calculator using the resources that the client provided.

**Nov 13**

**Nov 28**

By this point at the end of the semester, the team will have taken the clients an input. The web app should be able to be  take in some spectral data (Wavelength & Intensity), both accurately & cleanly present all metrics

# Recap: System architecture

- **Front end architecture consists of:**
  - A web application including a searchable lighting quality database; A TM-30 protocol metrics calculator as well as an upload feature to input new Spectral data into the SpectraSearch database.
  - The upload feature require a user login while other like the calculator and search bar does not. These can be accessed from the top left corner of the web Application. Only the login and logout is located on the right top side.
  - Information about the web application is included in main page as well.
  - Built on Javascript and React with HTML code.
  - A CSV upload feature is undergoing the works and has been included in the calculate page.

# Updated: System architecture

- **Front end architecture consists of:**
  - A CSV upload feature has been included and competed in the calculate page.
  - A filter function is under the works at the moment. This will allow the user to easily reach to the data they require to search.
  - The interface has been enhanced to cover the requirement of the client and user norms.

# Recap: System architecture

- **Back end architecture consists of:**
  - React code that supplies the calculator and metric displays with correct equations, data values and graph features to allow the web app to correctly pull in, calculate and display the correct metrics, spectrum colors, and graphed values.
  - The sql code includes multiple variables that allow for the presentable SPD data on the front end. The sql code is being derived using AMPPS PHPMyAdmin.
  - Sql files and code that currently have example lighting metric data stored that is used to supply the web application with the correct values used to present the metrics when someone searches the database.
  - Javascript code is responsible for the display of the website, processing of information and connecting database through out PHPMyAdmin all the way to managing URL render and organizing the sql code.

# Recap: Technical

- What a user need to know to use our application:
  - We have offered a basic setup and implement manual to client and he can give it to anyone he desire to start using the application designed.
- What other developers need to know before jumping into the application:
  - Fundamental skills of Javascript and React.
  - Fundamental knowledge of SQL/PHPMyAdmin.
  - Familiar with HTML & Programing Structure.
- How will your customer maintain what you have?
  - Stand alone open source application and/or on the DOE servers (Customer still not sure).

# Updated: Technical

- For Javascript and React: developers should be able to understand the programming structure and language so that they are able to add new features to the application.
  - The developer should have an understanding of Javascript in the web building realm and the ability to tailor the application with other component such as the database (PHP My Admin) or etc….
  - React Native: Developer should have an understanding of how to use the library to enhance the user interface development process as needed.

# Technical
# (package and accomodation tutorial)

- React package that are in the use:
  - Semantic-ui-react: This is used for building the look of the front end, such as the search bar, dropdown & the interactive Icon.
    Reference: https://react.semantic-ui.com/
  - Html2canvas: This package provide all the need functions that allow the app to transform the webpage into a PDF format file.
    Reference:https://html2canvas.hertzen.com/
  - Recharts: We use this package to visualize the data that is being calculated using the calculation function.
    Reference:https://recharts.org/en-US/guide
- Accommodated tutorial:
  - http://www.ies.org/redirect/tm-30/
  - https://www.energystar.gov/sites/default/files/asset/document/TM-30%20ES%20%28Final%29_0.pdf

# Technical
# (TM - 30 Protocol)

- TM-30 protocol:
  - TM-30 protocol is the major method which client wanted to implited into calculation functionality.

| CIECAM02 Calculations: Reference Illuminant | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| X | 94.8607 | 64.7357 | 31.6812 | 6.2007 | 38.5678 | 19.5825 | 17.8805 | 13.4852 | 12.5531 | 4.7698 | 48.4032 | 25.9270 | 33.2235 | 12.2857 | 40.8411 | 37.7326 | 14.9459 | 16.2070 | 20.9923 | 38.3100 | 32.7611 | 62.7631 | 48.8974 | 71.4732 | 69.0708 | 37.2086 | 66.7085 | 37.7901 |
| Y | 100.0000 | 59.5285 | 22.6825 | 5.4855 | 31.8045 | 12.7637 | 15.0858 | 8.9815 | 8.8205 | 4.9714 | 35.9543 | 17.9277 | 22.9365 | 10.2831 | 41.1158 | 36.3247 | 12.8487 | 13.9901 | 19.8600 | 33.7709 | 28.0550 | 56.0292 | 42.9412 | 74.0038 | 68.3232 | 33.8985 | 65.9034 | 40.2412 |
| Z | 106.1479 | 65.0022 | 24.0817 | 5.4057 | 31.2083 | 10.1999 | 13.3981 | 5.8796 | 6.0718 | 5.0989 | 19.4872 | 7.7176 | 9.2958 | 5.0849 | 37.8679 | 27.5020 | 5.8099 | 6.5889 | 12.1374 | 13.3346 | 5.4223 | 18.8891 | 11.4959 | 57.2653 | 31.4348 | 5.9349 | 22.1403 | 25.4679 |
| Xw | 94.8607 | 94.8607 | 94.8607 | 94.8607 | 94.8607 | 94.8607 | 94.8607 | 94.8607 | 94.8607 | 94.8607 | 94.8607 | 94.8607 | 94.8607 | 94.8607 | 94.8607 | 94.8607 | 94.8607 | 94.8607 | 94.8607 | 94.8607 | 94.8607 | 94.8607 | 94.8607 | 94.8607 | 94.8607 | 94.8607 | 94.8607 | 94.8607 | 94.8607 |
| Yw | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 |
| Zw | 106.1479 | 106.1479 | 106.1479 | 106.1479 | 106.1479 | 106.1479 | 106.1479 | 106.1479 | 106.1479 | 106.1479 | 106.1479 | 106.1479 | 106.1479 | 106.1479 | 106.1479 | 106.1479 | 106.1479 | 106.1479 | 106.1479 | 106.1479 | 106.1479 | 106.1479 | 106.1479 | 106.1479 | 106.1479 | 106.1479 | 106.1479 | 106.1479 | 106.1479 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| k | 0.0020 | 0.0020 | 0.0020 | 0.0020 | 0.0020 | 0.0020 | 0.0020 | 0.0020 | 0.0020 | 0.0020 | 0.0020 | 0.0020 | 0.0020 | 0.0020 | 0.0020 | 0.0020 | 0.0020 | 0.0020 | 0.0020 | 0.0020 | 0.0020 | 0.0020 | 0.0020 | 0.0020 | 0.0020 | 0.0020 | 0.0020 | 0.0020 | 0.0020 |
| FL | 0.7937 | 0.7937 | 0.7937 | 0.7937 | 0.7937 | 0.7937 | 0.7937 | 0.7937 | 0.7937 | 0.7937 | 0.7937 | 0.7937 | 0.7937 | 0.7937 | 0.7937 | 0.7937 | 0.7937 | 0.7937 | 0.7937 | 0.7937 | 0.7937 | 0.7937 | 0.7937 | 0.7937 | 0.7937 | 0.7937 | 0.7937 | 0.7937 | 0.7937 |
| n | 0.2000 | 0.2000 | 0.2000 | 0.2000 | 0.2000 | 0.2000 | 0.2000 | 0.2000 | 0.2000 | 0.2000 | 0.2000 | 0.2000 | 0.2000 | 0.2000 | 0.2000 | 0.2000 | 0.2000 | 0.2000 | 0.2000 | 0.2000 | 0.2000 | 0.2000 | 0.2000 | 0.2000 | 0.2000 | 0.2000 | 0.2000 | 0.2000 | 0.2000 |
| Nbb | 1.0003 | 1.0003 | 1.0003 | 1.0003 | 1.0003 | 1.0003 | 1.0003 | 1.0003 | 1.0003 | 1.0003 | 1.0003 | 1.0003 | 1.0003 | 1.0003 | 1.0003 | 1.0003 | 1.0003 | 1.0003 | 1.0003 | 1.0003 | 1.0003 | 1.0003 | 1.0003 | 1.0003 | 1.0003 | 1.0003 | 1.0003 | 1.0003 | 1.0003 |
| Ncb | 1.0003 | 1.0003 | 1.0003 | 1.0003 | 1.0003 | 1.0003 | 1.0003 | 1.0003 | 1.0003 | 1.0003 | 1.0003 | 1.0003 | 1.0003 | 1.0003 | 1.0003 | 1.0003 | 1.0003 | 1.0003 | 1.0003 | 1.0003 | 1.0003 | 1.0003 | 1.0003 | 1.0003 | 1.0003 | 1.0003 | 1.0003 | 1.0003 | 1.0003 |
| z | 1.9272 | 1.9272 | 1.9272 | 1.9272 | 1.9272 | 1.9272 | 1.9272 | 1.9272 | 1.9272 | 1.9272 | 1.9272 | 1.9272 | 1.9272 | 1.9272 | 1.9272 | 1.9272 | 1.9272 | 1.9272 | 1.9272 | 1.9272 | 1.9272 | 1.9272 | 1.9272 | 1.9272 | 1.9272 | 1.9272 | 1.9272 | 1.9272 | 1.9272 |
| R | 95.2355 | 62.4554 | 29.0495 | 6.0226 | 36.8575 | 18.1769 | 17.4079 | 12.7856 | 12.0021 | 4.8030 | 47.7511 | 25.4477 | 32.6901 | 12.5948 | 41.4419 | 38.7892 | 15.5286 | 16.8491 | 21.9439 | 40.4160 | 35.1792 | 66.9954 | 52.4126 | 74.8677 | 74.8617 | 40.8654 | 73.6005 | 40.8442 |
| G | 103.6535 | 55.8982 | 16.3595 | 4.9818 | 27.0423 | 7.9503 | 13.1092 | 5.7937 | 6.1775 | 5.1140 | 27.0947 | 12.2372 | 15.6154 | 8.8423 | 41.2893 | 35.2803 | 11.3302 | 12.3839 | 19.0162 | 30.4526 | 24.6057 | 51.0646 | 38.5586 | 75.6823 | 67.5722 | 31.3989 | 65.0700 | 41.8757 |
| B | 106.0305 | 64.9270 | 24.0854 | 5.4091 | 31.2385 | 10.2630 | 13.4345 | 5.9446 | 6.1286 | 5.0962 | 19.7979 | 7.9111 | 9.5531 | 5.1772 | 37.9210 | 27.6526 | 5.9330 | 6.5217 | 12.2690 | 13.6874 | 5.8121 | 19.5258 | 12.0358 | 57.5355 | 32.0494 | 6.4090 | 22.8692 | 25.7057 |
| Rw | 95.2355 | 95.2355 | 95.2355 | 95.2355 | 95.2355 | 95.2355 | 95.2355 | 95.2355 | 95.2355 | 95.2355 | 95.2355 | 95.2355 | 95.2355 | 95.2355 | 95.2355 | 95.2355 | 95.2355 | 95.2355 | 95.2355 | 95.2355 | 95.2355 | 95.2355 | 95.2355 | 95.2355 | 95.2355 | 95.2355 | 95.2355 | 95.2355 | 95.2355 |
| Gw | 103.6535 | 103.6535 | 103.6535 | 103.6535 | 103.6535 | 103.6535 | 103.6535 | 103.6535 | 103.6535 | 103.6535 | 103.6535 | 103.6535 | 103.6535 | 103.6535 | 103.6535 | 103.6535 | 103.6535 | 103.6535 | 103.6535 | 103.6535 | 103.6535 | 103.6535 | 103.6535 | 103.6535 | 103.6535 | 103.6535 | 103.6535 | 103.6535 | 103.6535 |
| Bw | 106.0305 | 106.0305 | 106.0305 | 106.0305 | 106.0305 | 106.0305 | 106.0305 | 106.0305 | 106.0305 | 106.0305 | 106.0305 | 106.0305 | 106.0305 | 106.0305 | 106.0305 | 106.0305 | 106.0305 | 106.0305 | 106.0305 | 106.0305 | 106.0305 | 106.0305 | 106.0305 | 106.0305 | 106.0305 | 106.0305 | 106.0305 | 106.0305 | 106.0305 |
| Rc | 100.0000 | 65.5800 | 30.5028 | 6.3239 | 38.7014 | 19.0863 | 18.2788 | 13.4252 | 12.6026 | 5.0433 | 50.1401 | 26.7208 | 34.3255 | 13.2249 | 43.5152 | 40.7298 | 16.3055 | 17.6920 | 23.0417 | 42.4380 | 36.9391 | 70.3470 | 55.0347 | 78.6132 | 78.6069 | 42.9099 | 77.2826 | 42.8876 |
| Gc | 100.0000 | 53.9279 | 15.7829 | 4.8062 | 26.0891 | 7.6700 | 12.6471 | 5.5895 | 5.9598 | 4.9337 | 26.1397 | 11.8058 | 15.0650 | 8.5306 | 39.8339 | 34.0367 | 10.9308 | 11.9474 | 18.3459 | 29.3792 | 23.7384 | 49.2647 | 37.1995 | 73.0147 | 65.1905 | 30.2922 | 62.7764 | 40.3997 |
| Bc | 100.0000 | 61.2343 | 22.7156 | 5.1015 | 29.4618 | 9.6793 | 12.6704 | 5.6065 | 5.7800 | 4.8064 | 18.6719 | 7.4611 | 9.0098 | 4.8828 | 35.7642 | 26.0799 | 5.5956 | 6.1508 | 11.5712 | 12.9090 | 5.4816 | 18.4153 | 11.3512 | 54.2632 | 30.2266 | 6.0445 | 21.5685 | 24.2437 |
| Rcw | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 |
| Gcw | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 |
| Bcw | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 |
| Xc | 100.0000 | 68.0352 | 33.1846 | 6.5237 | 40.5301 | 20.5508 | 18.8244 | 14.1815 | 13.2083 | 5.0305 | 51.0824 | 27.3606 | 35.0703 | 13.0095 | 43.1254 | 39.9191 | 15.8471 | 17.1849 | 22.2550 | 40.6834 | 34.8717 | 66.7360 | 52.0255 | 75.7247 | 73.5071 | 39.6916 | 71.1465 | 40.1743 |
| Yc | 100.0000 | 59.7490 | 22.9710 | 5.5171 | 32.0629 | 13.0021 | 15.2076 | 9.1510 | 8.9651 | 4.9743 | 36.5063 | 18.2695 | 23.3798 | 10.4006 | 41.2132 | 36.5042 | 12.9883 | 14.1397 | 19.9911 | 34.1252 | 28.4201 | 56.6197 | 43.4397 | 74.2066 | 68.7657 | 34.2771 | 66.3966 | 40.3653 |
| Zc | 100.0000 | 61.2341 | 22.6801 | 5.0914 | 29.3921 | 9.6001 | 12.6166 | 5.5313 | 5.7133 | 4.8034 | 18.3264 | 7.2510 | 8.7315 | 4.7817 | 35.6664 | 25.8935 | 5.4621 | 6.0066 | 11.4221 | 12.5308 | 5.0747 | 17.7395 | 10.7834 | 53.9220 | 29.5615 | 5.5514 | 20.7973 | 23.9722 |
| Xcw | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 |
| Ycw | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 |
| Zcw | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 |
| R' | 100.0010 | 62.8620 | 26.9745 | 5.9429 | 35.5731 | 16.2117 | 16.8211 | 11.3964 | 10.8746 | 5.0097 | 43.6175 | 22.6795 | 29.0885 | 11.8595 | 42.3952 | 38.6702 | 14.6947 | 15.9665 | 21.5478 | 38.3804 | 32.7715 | 63.6218 | 49.3555 | 76.3949 | 73.6987 | 38.6476 | 71.8361 | 41.5811 |
| G' | 100.0000 | 57.9137 | 20.6103 | 5.2660 | 29.9931 | 11.1094 | 14.2562 | 7.8270 | 7.8391 | 4.9535 | 32.3129 | 15.6689 | 20.0134 | 9.5402 | 40.5163 | 35.2270 | 11.9820 | 13.0624 | 19.0731 | 31.6159 | 25.8540 | 52.4905 | 39.9510 | 72.9163 | 65.8566 | 31.6996 | 63.1888 | 39.6484 |
| B' | 100.0000 | 61.2341 | 22.6801 | 5.0914 | 29.3921 | 9.6001 | 12.6166 | 5.5313 | 5.7133 | 4.8034 | 18.3264 | 7.2510 | 8.7315 | 4.7817 | 35.6664 | 25.8935 | 5.4621 | 6.0066 | 11.4221 | 12.5308 | 5.0747 | 17.7395 | 10.7834 | 53.9220 | 29.5615 | 5.5514 | 20.7973 | 23.9722 |
| R'w | 100.0010 | 100.0010 | 100.0010 | 100.0010 | 100.0010 | 100.0010 | 100.0010 | 100.0010 | 100.0010 | 100.0010 | 100.0010 | 100.0010 | 100.0010 | 100.0010 | 100.0010 | 100.0010 | 100.0010 | 100.0010 | 100.0010 | 100.0010 | 100.0010 | 100.0010 | 100.0010 | 100.0010 | 100.0010 | 100.0010 | 100.0010 | 100.0010 | 100.0010 |
| G'w | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 |
| B'w | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 |
| R'a | 13.0473 | 10.8151 | 7.6712 | 4.1470 | 8.5845 | 6.2359 | 6.3303 | 5.4029 | 5.3009 | 3.8694 | 9.3255 | 7.1487 | 7.9103 | 5.4911 | 9.2185 | 8.8806 | 5.9915 | 6.1974 | 7.0014 | 8.8535 | 8.3030 | 10.8679 | 9.8051 | 11.7030 | 11.5341 | 8.8785 | 11.4153 | 9.1462 |
| G'a | 13.0472 | 10.4618 | 6.8758 | 3.9485 | 8.0094 | 5.3471 | 5.9181 | 4.6375 | 4.6404 | 3.8518 | 8.2556 | 6.1501 | 6.7941 | 5.0261 | 9.0504 | 8.5505 | 5.5141 | 5.7113 | 6.6623 | 8.1828 | 7.5400 | 10.0531 | 8.9989 | 11.4845 | 11.0208 | 8.1916 | 10.8378 | 8.9712 |

# Recap: Potential issue or risks

A. **Issue:** Communication issues due to pandemic and social distancing
**Fallback:** With increased mandates pushing social distancing due to the Coronavirus pandemic mostly all of group communication and client communication is now digital. With this in mind group members must work harder and smarter to increase communication to decrease loss of efficiency and communication errors that may come with this issue. Weekly meetings and deadlines as showcased above will be set up at least a week ahead of time and contact with clients will also be set up in a timely manner to ensure nothing is lost in digital communication.

A. **Issue:** Loss of support and findings towards the DOE
**Fallback:** With increased attention and funding toward other government organizations focused on coronavirus efforts the DOE may see decreased funding and therefore support for this project. The solution here will be for our group to work with what resources and progress the project currently has and hope to not see decreased support and resources from the DOE. If we see decreased support from the governmental organizations we will have to work to make a more generalised database product that could work for other non governmental agencies.

A. **Issue:** Technical Integration with in the DOE infrastructure
**Fallback**: Technical issues may be raised during the implementation of our project into the DOE infrastructure. This might be either due to incompatibility with the tools and services they have or that they are not ready for such an integration.

A. **Issue:** Not uploading/input incorrect data into the program
**Fallback:** This upload feature on the web app will require, in its current state, a specified form of data inputted (first column is wavelength, second column is intensity) via CSV file for example. We will start by creating a functional upload feature presuming the user is inputting only wavelength and intensity data values and also clearly state on the web app to upload in this way.

A. **Issue:** Team issues
**Fallback**: If problems arise either with team members not being able to finish their part before the next sprint or team members are falling behind in keeping up with project work we will, as a group all work together to help the group member catch up and finish their part because the team cannot be successful if we are all at different points in our progress. This may include issues in pushing/pulling new code, solving code problems or other issues regarding team communication and progress. These problems will all be addressed as a team and solved as a team. If a team member leaves the team or does not come to any meetings all work from their end will be redistributed among the rest of the current team members

A. **Issue:** Software issues such as lost code or slow runtimes
**Fallback:** If any code is lost we will have the last updated piece of code from github as all of our progress will be continually updated through their, if any slow run times are found with the code we will work as a group to either determine if the problem is with the hardware it is run on or if its a bug in the code itself.

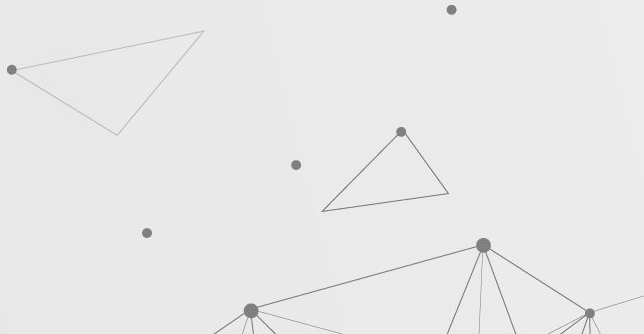
A. **Issue:** Time zone issues
**Fallback**: With multiple group members being in various time zones we will always implement strict but reasonable timelines for submitting work to keep progress on track and set meetings ahead of time.

A. **Issue:** Not knowing enough about the subject proposed by the client
**Fallback:** Learn more and try to adapt and do review & revise session more often.

# Updated: Potential issue or risks

**Issue:** Understanding ™-30 data and equations and all of the in depth pieces that come with that..
**Fallback:** Learn more about these equation extends and get help from the client where needed.

# Any Question?



# Thank You