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**OPTICAL RADIATION MEASUREMENT AND  
DOSIMETRY: GENERAL PROCEDURES AND  
SOURCE/WORKPLACE-SPECIFIC CHALLENGES**

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Optical Radiation

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Why Measure Optical Radiation?

Environmental vs Personal Exposure Assessments

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## Optical Radiation

Wavelength range 100/180 nm to 1 mm

Ultraviolet range 100/180 nm to 400 nm

UV-C 100/180 nm to 280 nm

UV-B 280 nm to 315 nm

UV-A 315 nm to 400 nm

Visible range 360/400 nm to 700/830 nm

Infrared range 700 nm to 1 mm

IR-A 700/780 nm to 1400 nm

IR-B 1400 nm to 3  $\mu\text{m}$

IR-C 3  $\mu\text{m}$  to 1 mm



## Sources

Natural

Solar



Artificial

Laser



Non-Laser





## Why Measure Optical Radiation?

Product Performance

Product Classification

Laser Classes (Class 1, 1M, 2, 2M, 3R, 3B or 4)

Non-laser Risk Groups (Exempt, RG 1, 2 or 3)

Hazard Quantification and Risk Assessment



## Environmental vs Personal Exposure Assessments

### Laser Radiation

Probability of Exposure is Low, but Consequence may be High



### Non-Laser Radiation

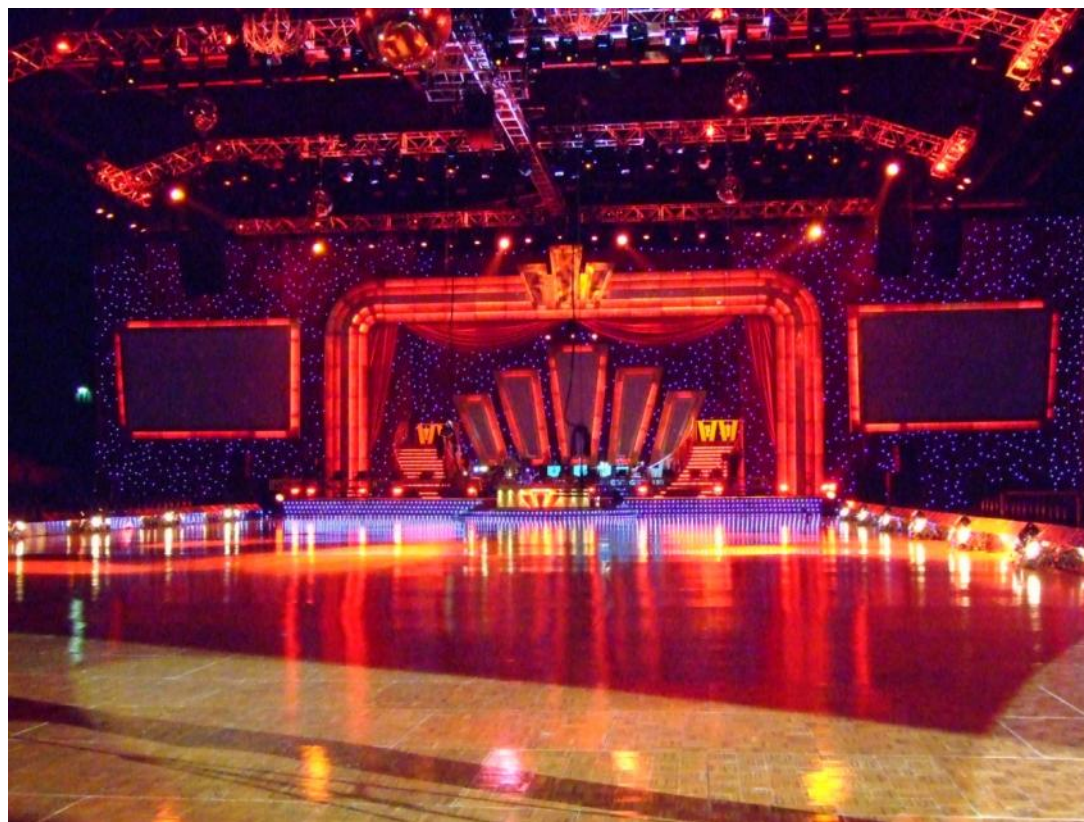
Probability of Exposure may be High, but Consequence tends to be Low





## Workplace Specific Challenges

Multiple Sources





## Workplace Specific Challenges

### Laser

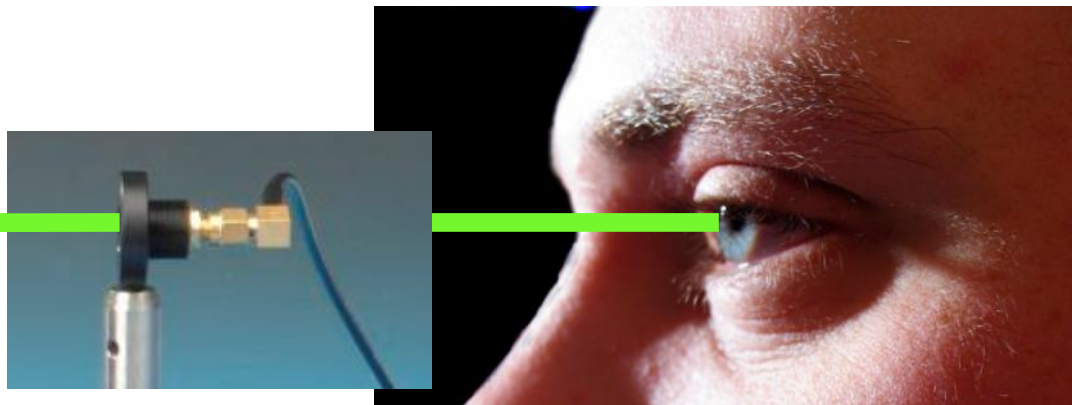
Product (Source) – Classification (1, 1M, 2, 2M, 3R, 3B, 4)

Personal exposure - ?

None (if you stay out of the way of the beam)

Assume worst case

compare with Exposure Limit Value



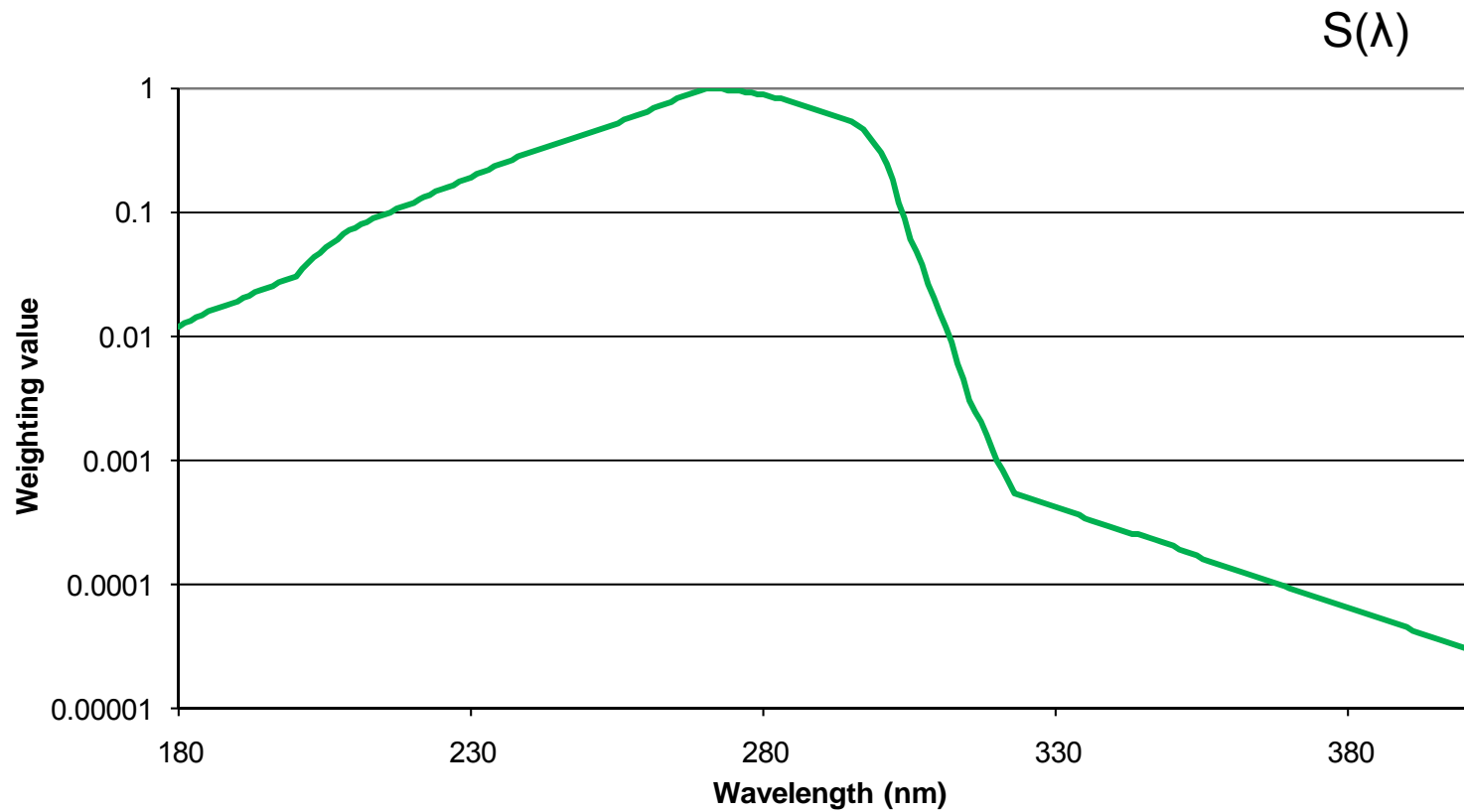




## Workplace Specific Challenges

### Non-Laser Optical Radiation

#### Spectral Irradiance





## Workplace Specific Challenges

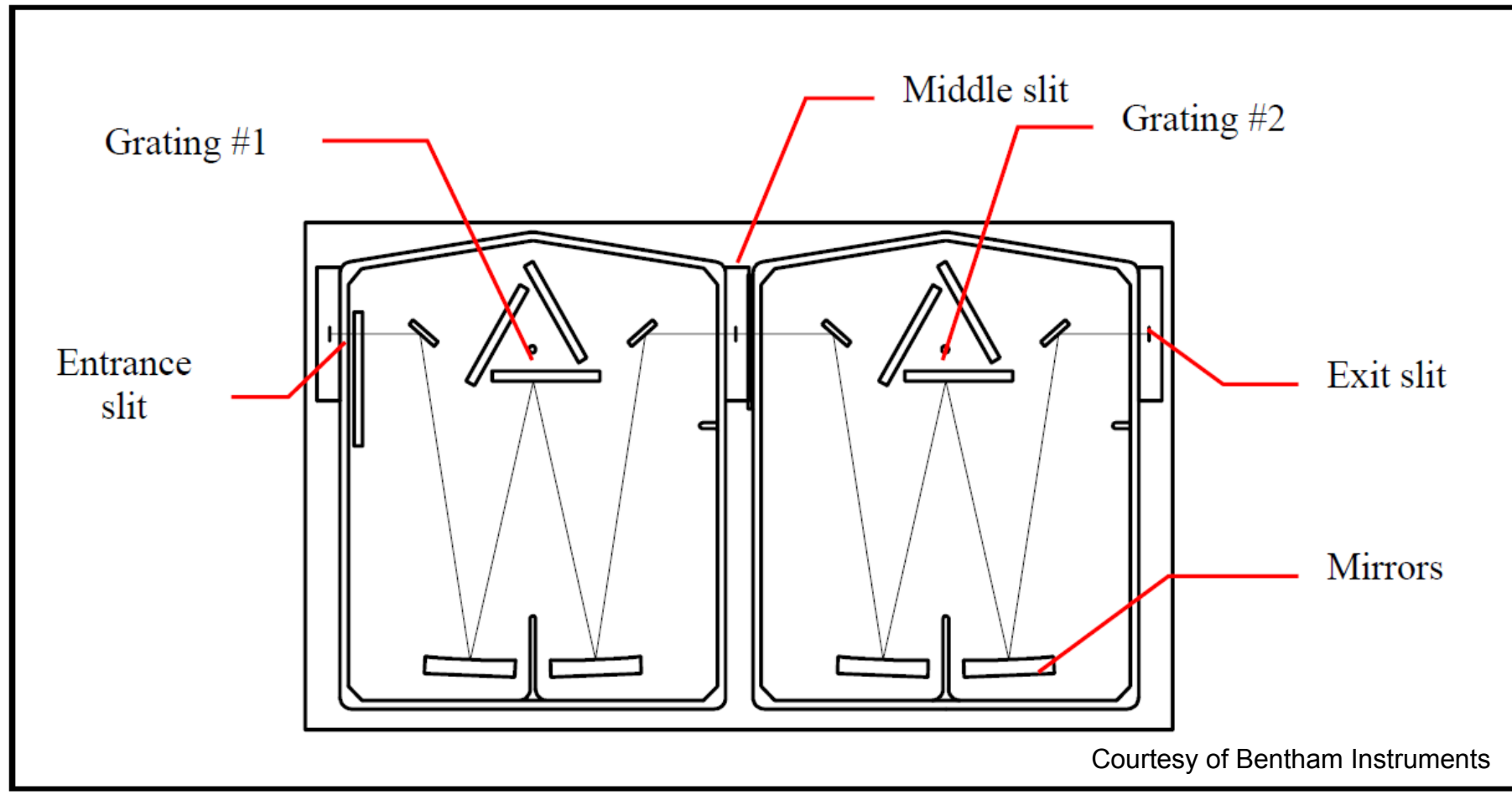
### Measuring Spectral Irradiance





## Workplace Specific Challenges

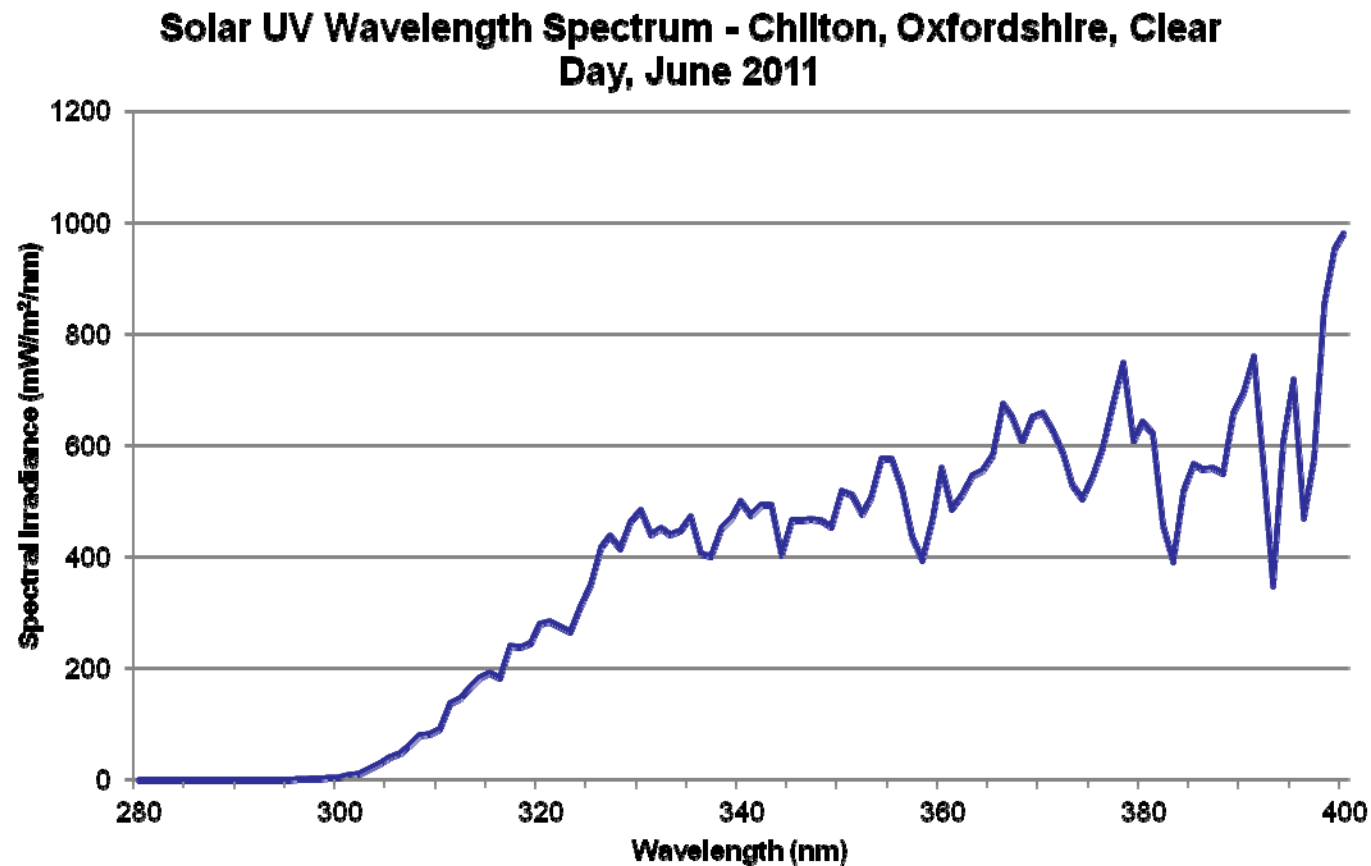
### Measuring Spectral Irradiance





## Workplace Specific Challenges

### Measuring Spectral Irradiance

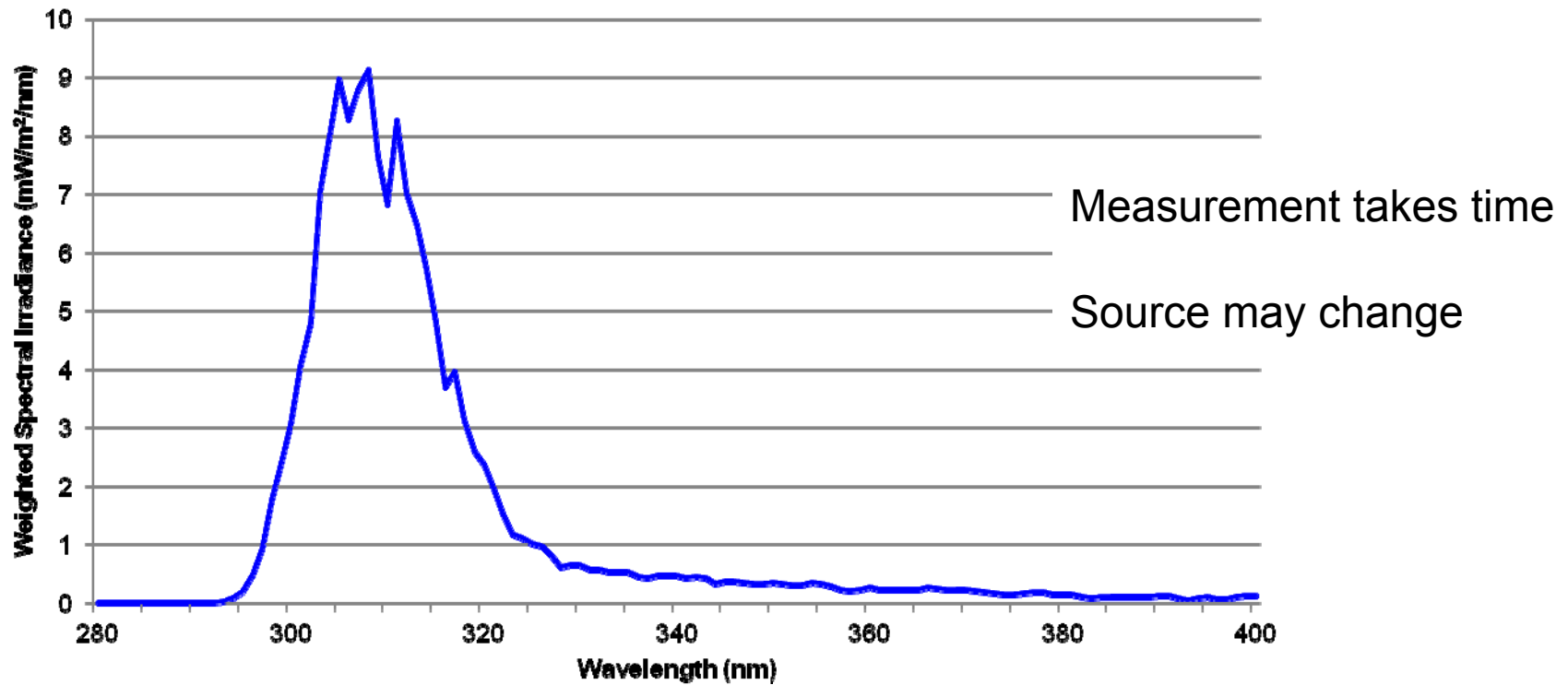




## Workplace Specific Challenges

### Measuring Spectral Irradiance

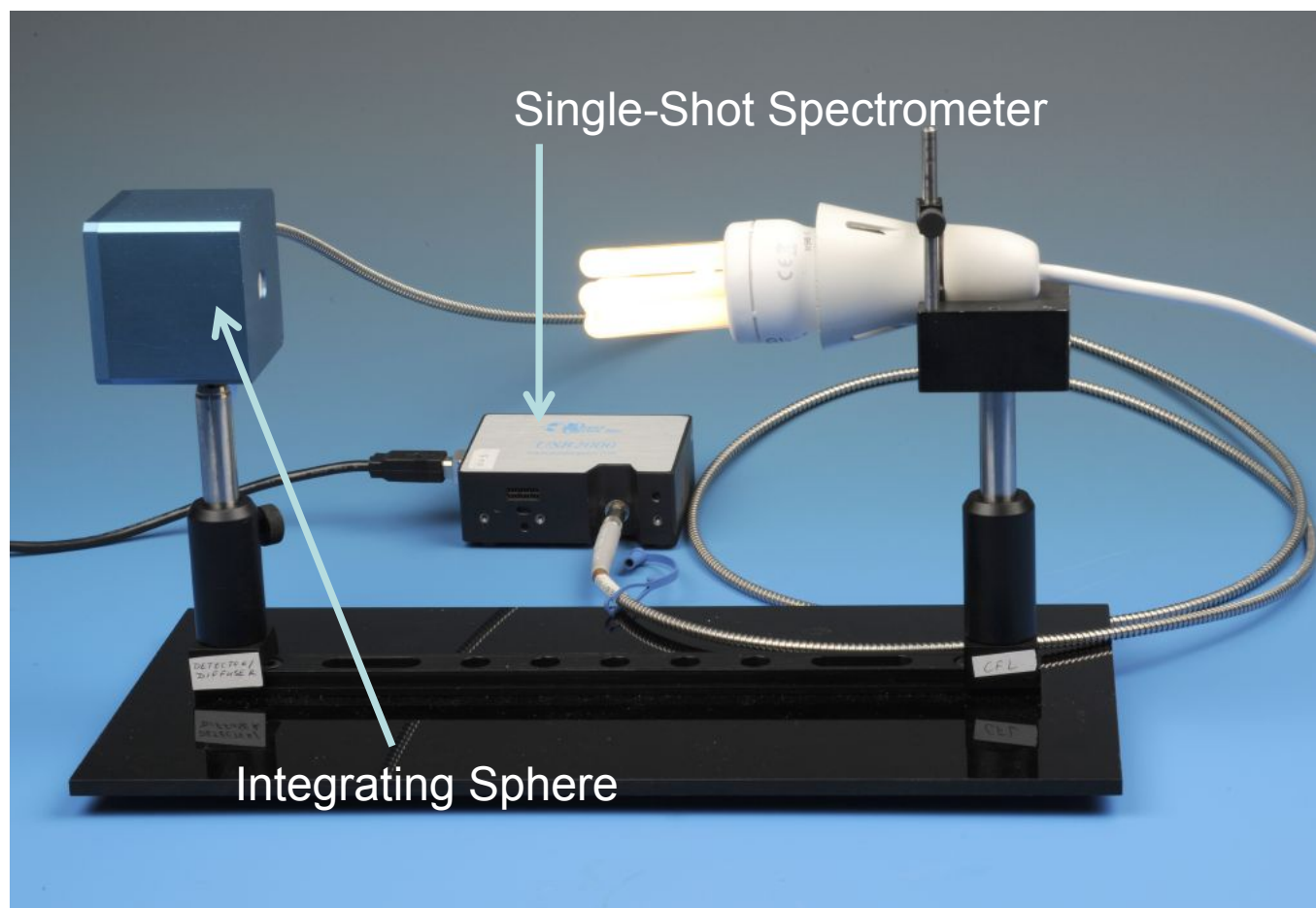
**Weighted Solar UV Spectrum - Chilton, Oxfordshire, Clear Day,  
June 2011**





## Workplace Specific Challenges

### Measuring Spectral Irradiance

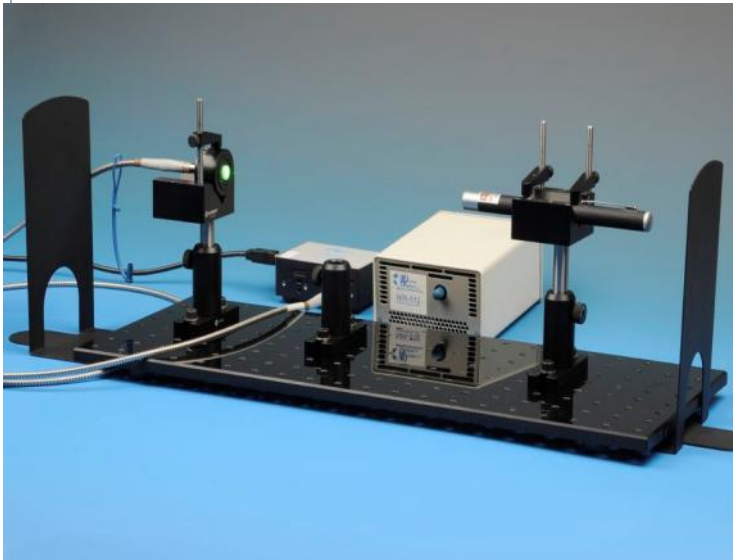




## Workplace Specific Challenges

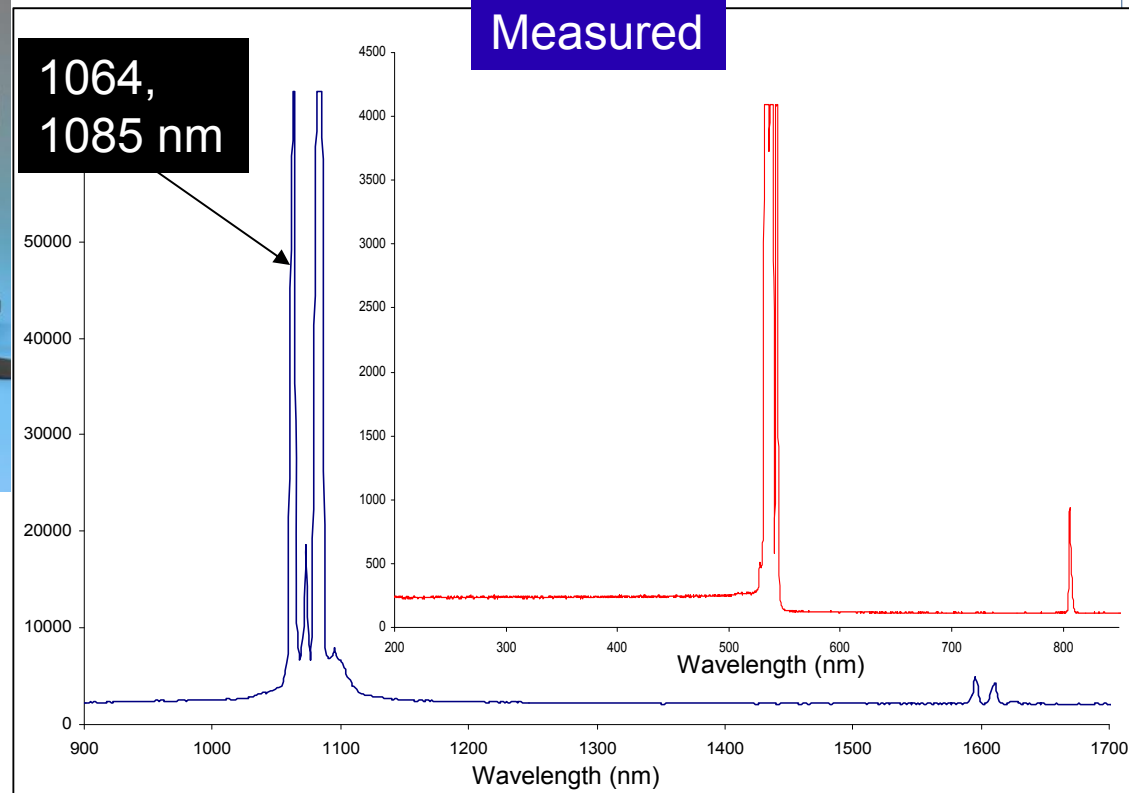
Also useful for lasers

*Label information: 532 nm*



In addition to 532 nm, this laser pointer emits:

- 808 nm (pumping)
- 1064nm
- 1085 nm





## Workplace Specific Challenges

### Measuring Personal Exposure



Critical Organ –  
Eyes or Skin?







## Workplace Specific Challenges

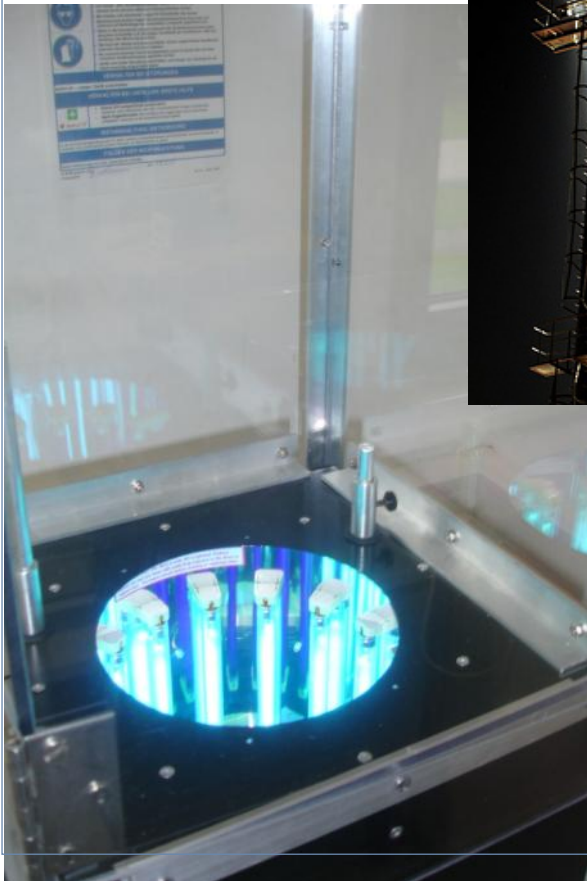
### Measuring Personal Exposure





## Workplace Specific Challenges

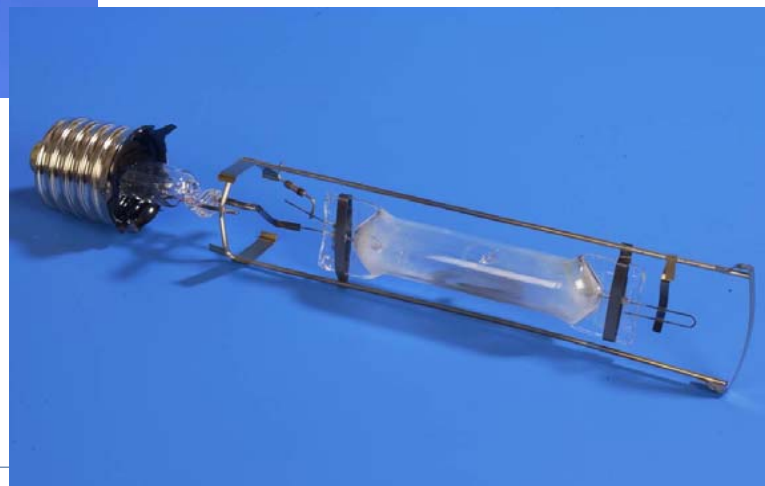
Common Sense





## Workplace Specific Challenges

Reasonably foreseeable failure conditions





## Summary

Optical Radiation – UV, Visible, Infrared

Sources – Natural, Laser, Non-Laser

Why Measure Optical Radiation?

Environmental vs Personal Exposure Assessments

Workplace Specific Challenges

Thank you for listening – [john.ohagan@hpa.org.uk](mailto:john.ohagan@hpa.org.uk)