photobiologyLamps Version 0.1.14
Catalogue of Lamps

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1 Introduction

We will plot the emission spectra of the different lamps for which data is provided in the pacakge. We plot side-by-side the lamp output as spectral energy irradiance and as spectral photon irradiance. All spectra are normalized to an area of one under the whole curve.

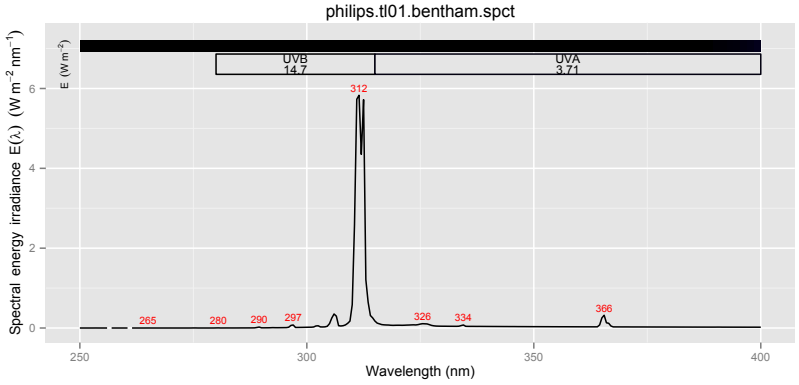
```
library(ggplot2)
library(photobiology)
library(photobiologyLamps)
library(photobiologygg)
```

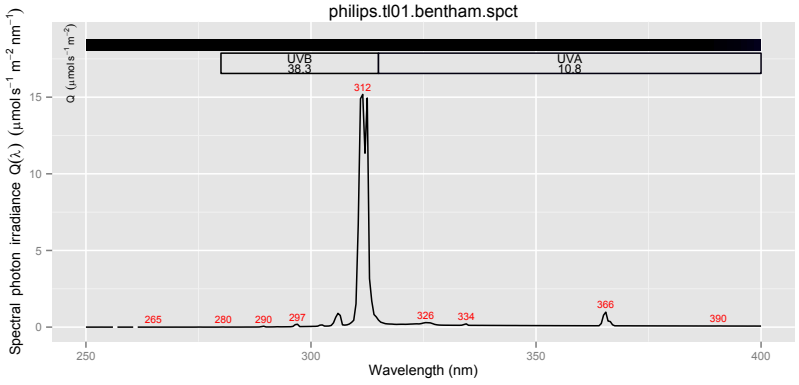
We define a function to do the actual plotting so as to not repeat code, and to make changes easier in the future.

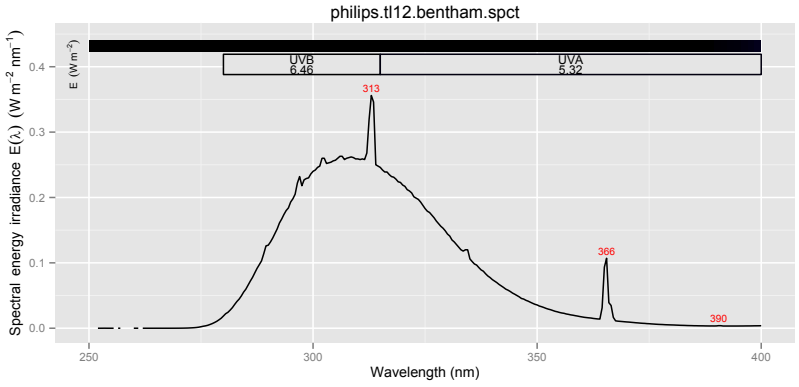
```
lamp.plotter <- function(lamp.name, w.low=250.0, w.high=900.0, scaled="area"){
  w.band <- waveband(c(w.low, w.high))
  object.name <- paste(lamp.name, ".spct", sep="")
a.spct <- copy(get(object.name))
# a.spct <- trim_spct(a.spct, w.band, fill = NA)
e2q(a.spct, byref=TRUE)
print(plot(a.spct, unit="energy") + labs(title=object.name) + theme_grey(10))
print(plot(a.spct, unit="photon") + labs(title=object.name) + theme_grey(10))
}
```

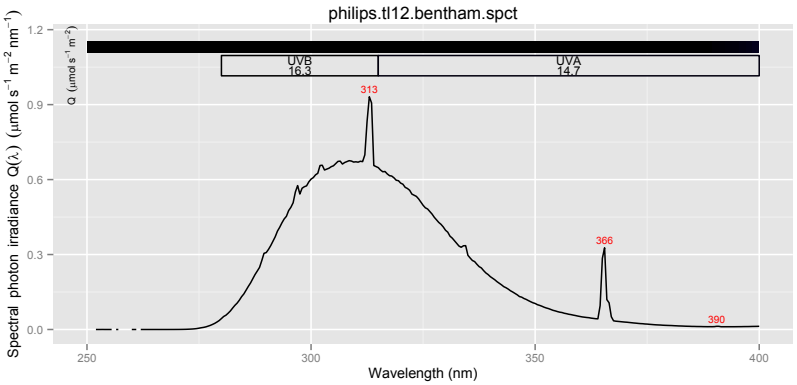
2 UV-B lamp spectra

```
UVB.lamps <- c("philips.tl01.bentham", "philips.tl12.bentham")
for (lamp in UVB.lamps) {
  lamp.plotter(lamp.name=lamp)
}
```

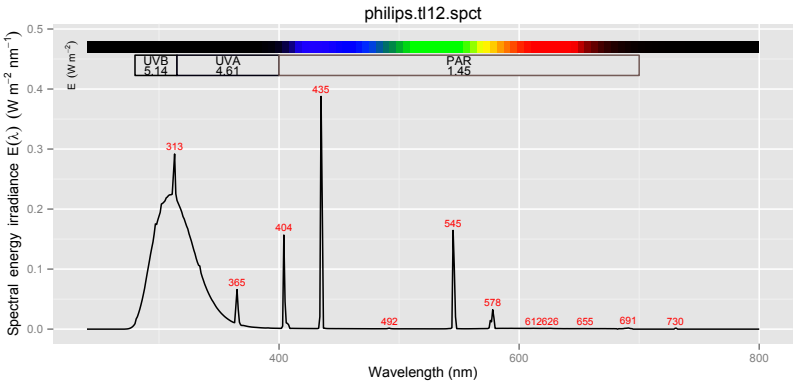


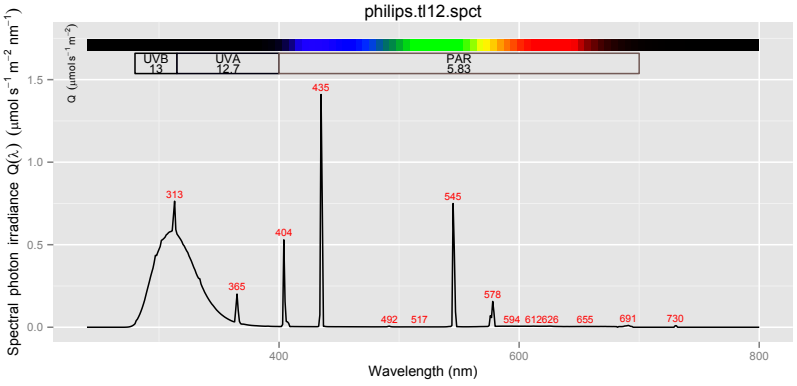


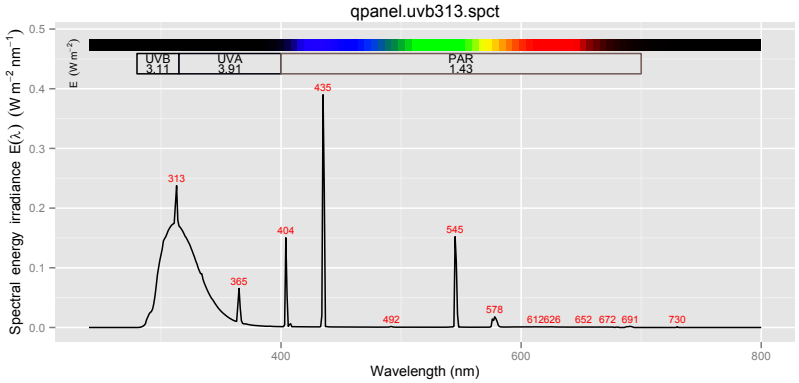


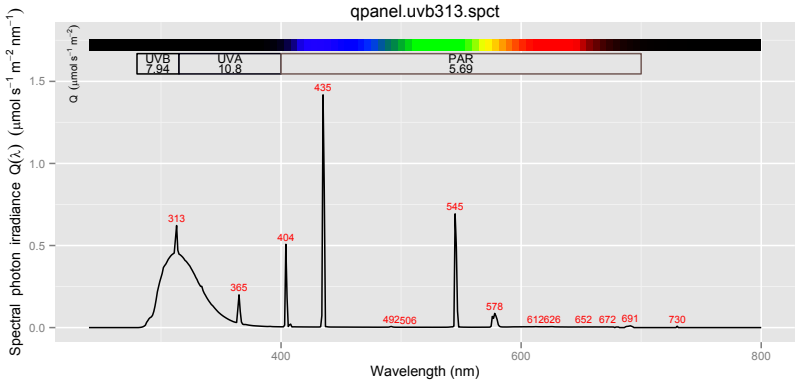



```
UVB.M.lamps <- c("philips.tl12", "qpanel.uvb313")
for (lamp in UVB.M.lamps) {
  lamp.plotter(lamp.name=lamp)
}
```

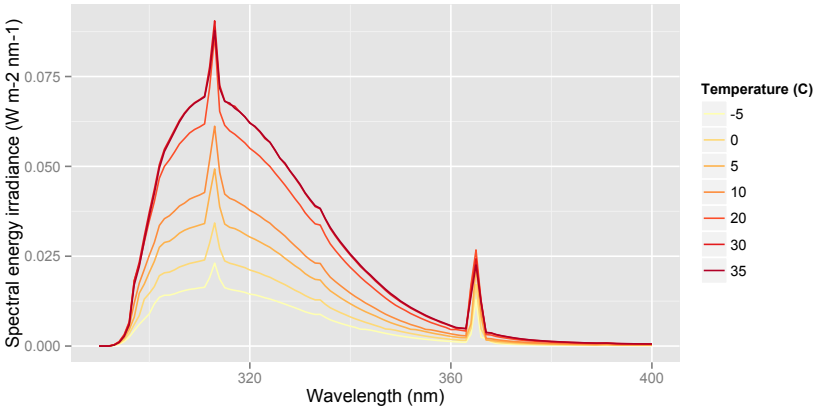






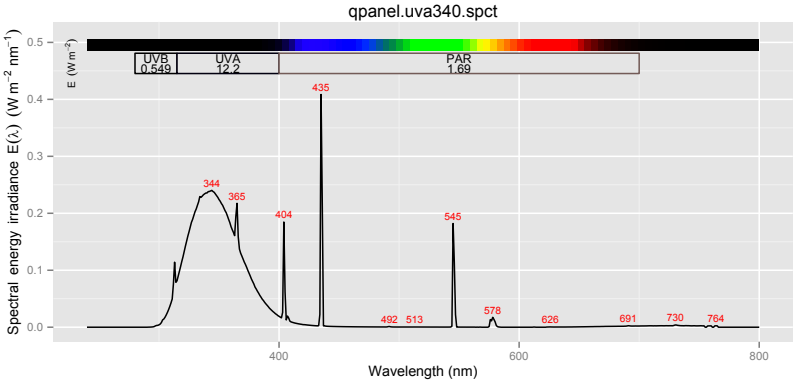


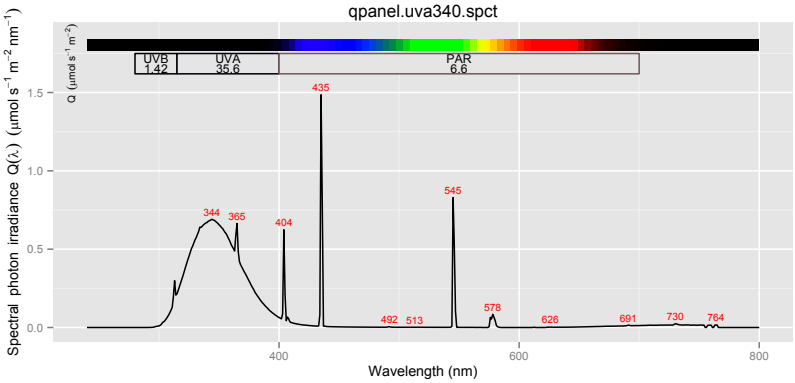

```
fig_temp <- ggplot(data=qpanel.uvb313.temperature.dt,
                   aes(x=w.length, y=s.e.irrad, colour=factor(temperature))) +
               scale_colour_brewer(type="seq", palette="YlOrRd")
fig_temp <- fig_temp + geom_line() +
  labs(x="Wavelength (nm)", y="Spectral energy irradiance (W m-2 nm-1)",
       colour="Temperature (C)")
print(fig_temp)
```



3 UV-A lamp spectra

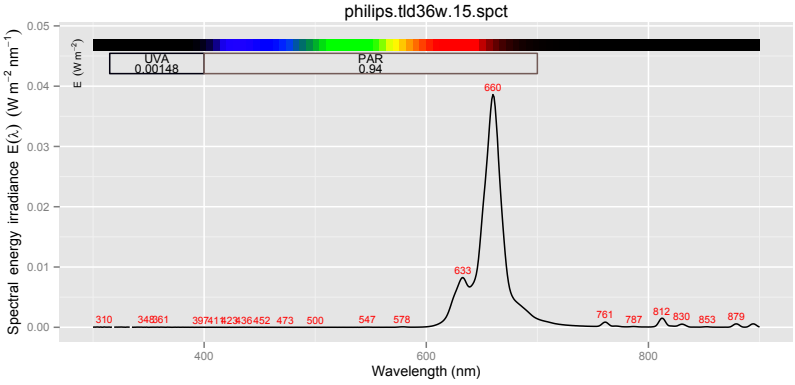
```
UVA.lamps <- c("qpanel.uva340")
for (lamp in UVA.lamps) {
  lamp.plotter(lamp.name=lamp)
}
```

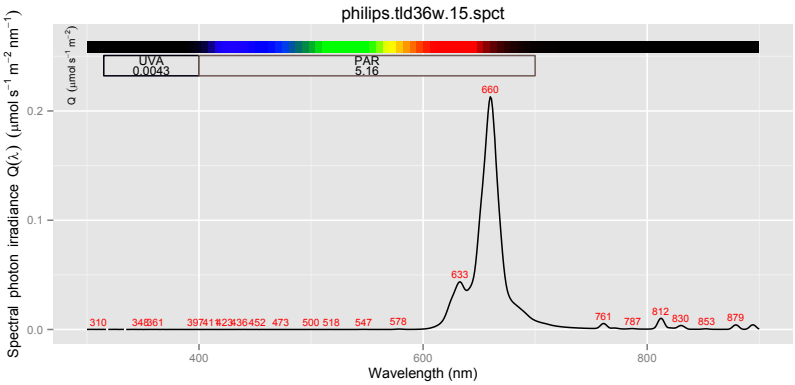


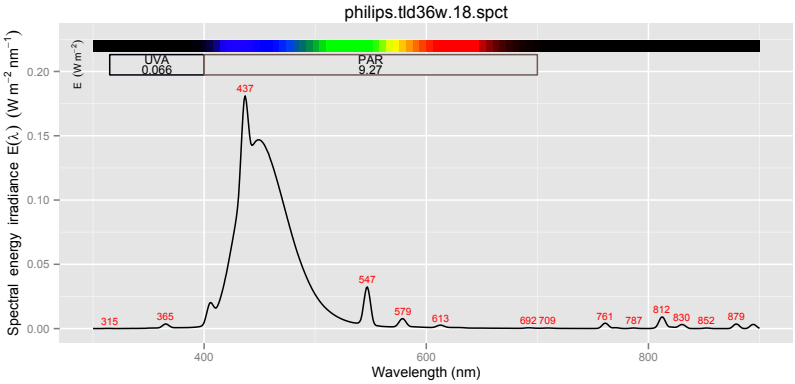


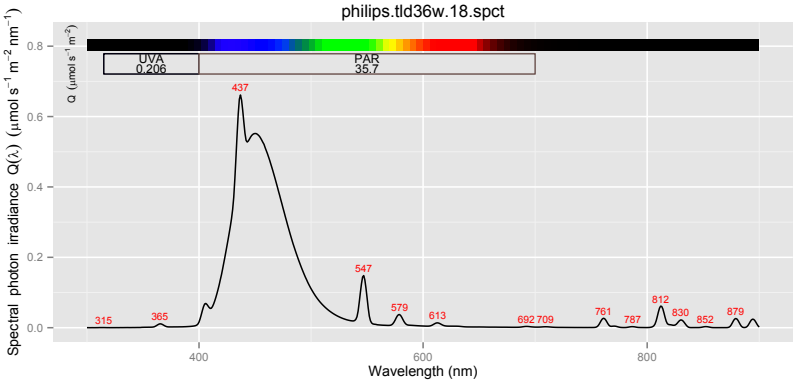
4 Narrow spectrum VIS lamps

```
colour.lamps <- c("philips.tld36w.15", "philips.tld36w.18")
for (lamp in colour.lamps) {
  lamp.plotter(lamp.name=lamp)
}
```





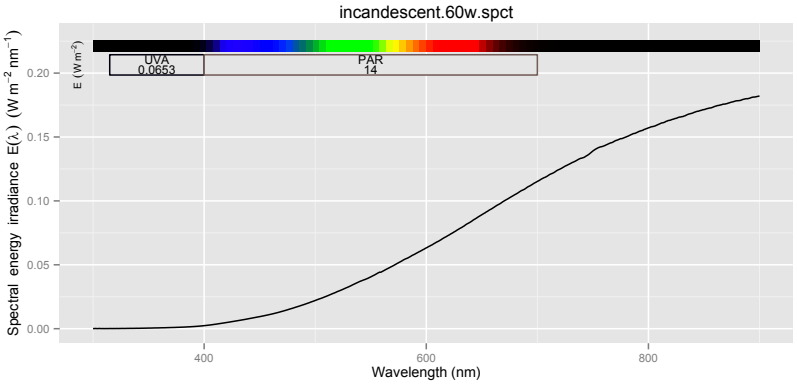


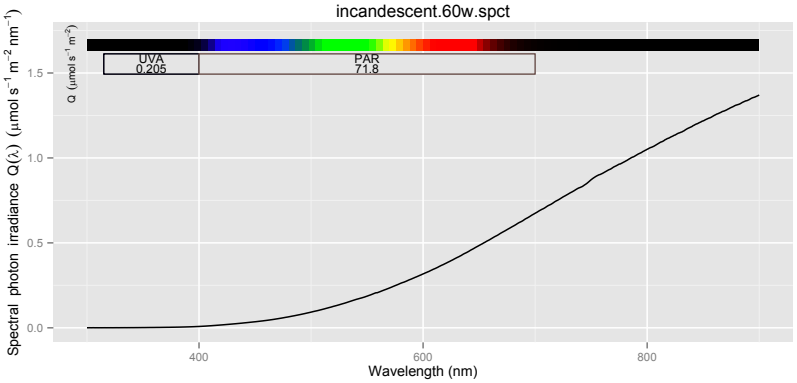


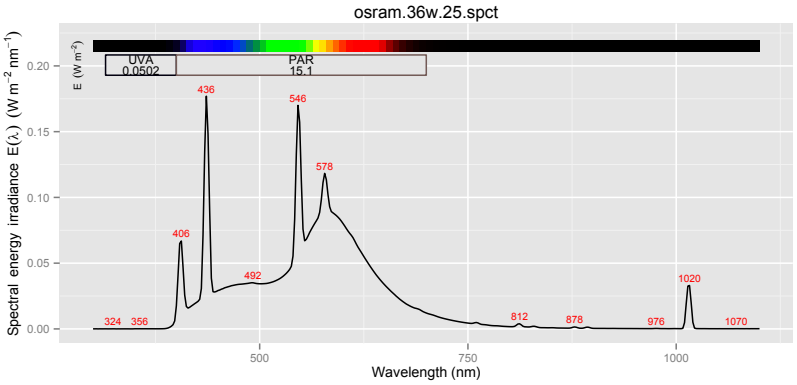
5 Broad VIS lamps

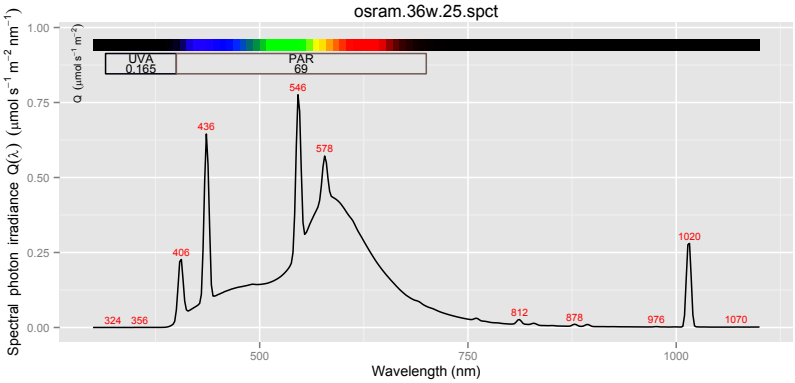
```
white.lamps <- c("incandescent.60w", "osram.36w.25", "philips.pls11w.827",
                 "philips.tld36w.83", "philips.tld36w.865", "philips.tld36w.89",
                 "philips.tld36w.92", "philips.tll36w.950", "sylvania.215w.vho")
```

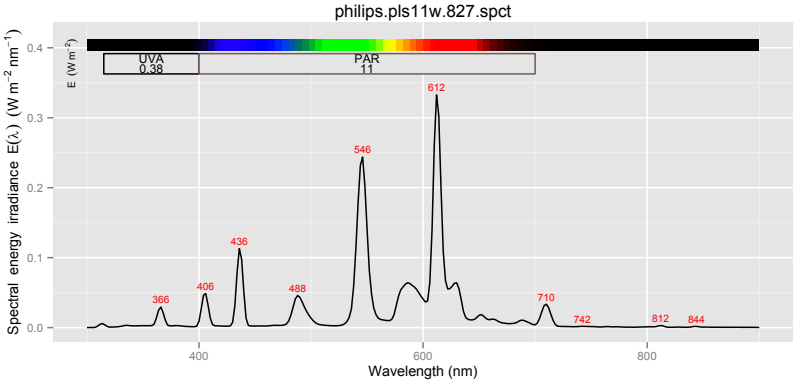
```
for (lamp in white.lamps) {
  lamp.plotter(lamp.name=lamp)
}
```

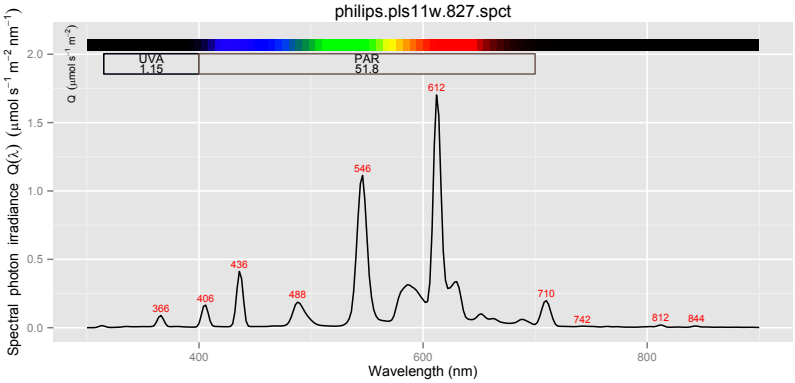


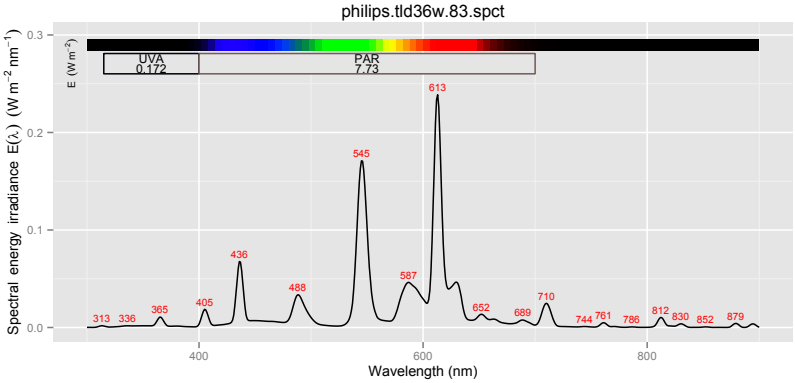


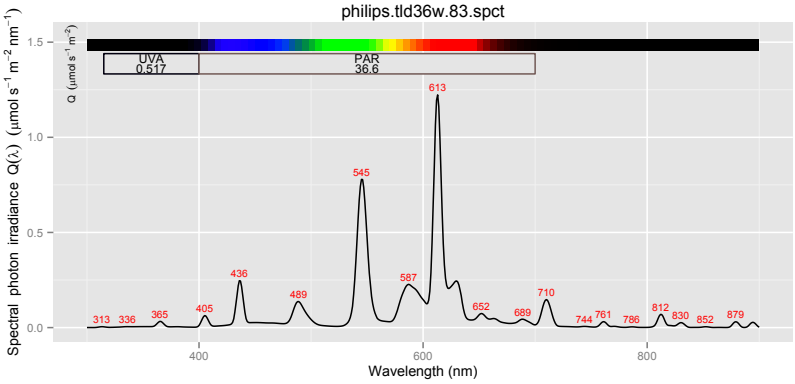


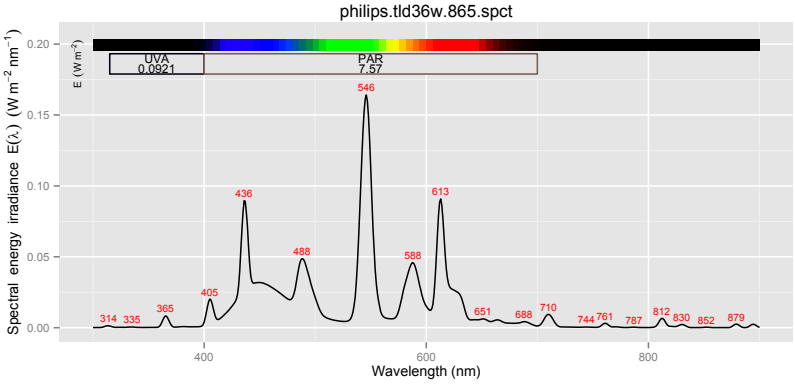

osram.36w.25.spct
UVA
0.165
PAR
69
Q (µmol s⁻¹ m⁻²)
Spectral photon irradiance Q(λ) (µmol s⁻¹ m⁻² nm⁻¹)
Wavelength (nm)
546
436
578
406
1020
324
356
812
878
976
1070

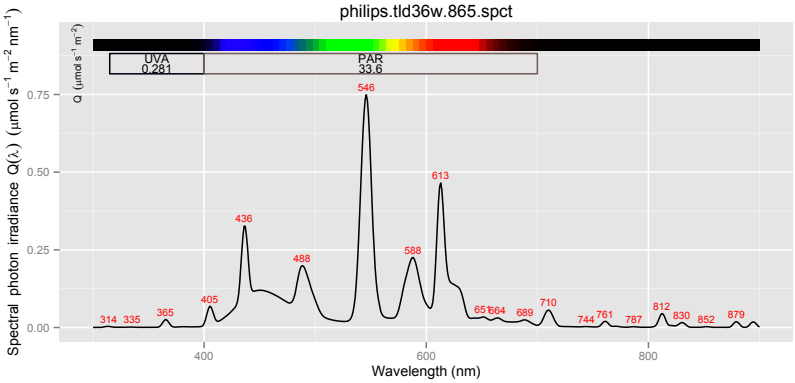

philips.pls11w.827.spct
UVA
0.38
PAR
11
E (W m⁻²)
Spectral energy irradiance E(λ) (W m⁻² nm⁻¹)
Wavelength (nm)
612
546
436
366
406
488
710
742
812
844

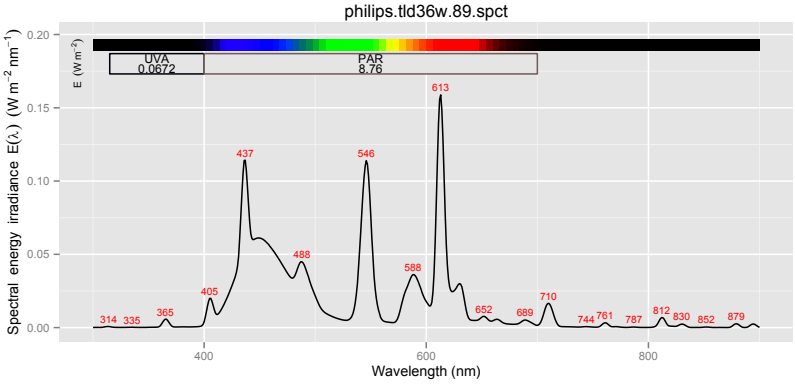

philips.pls11w.827.spct
UVA
1.15
PAR
51.8
Q (µmol s⁻¹ m⁻²)
Spectral photon irradiance Q(λ) (µmol s⁻¹ m⁻² nm⁻¹)
Wavelength (nm)
612
546
436
366
406
488
710
742
812
844

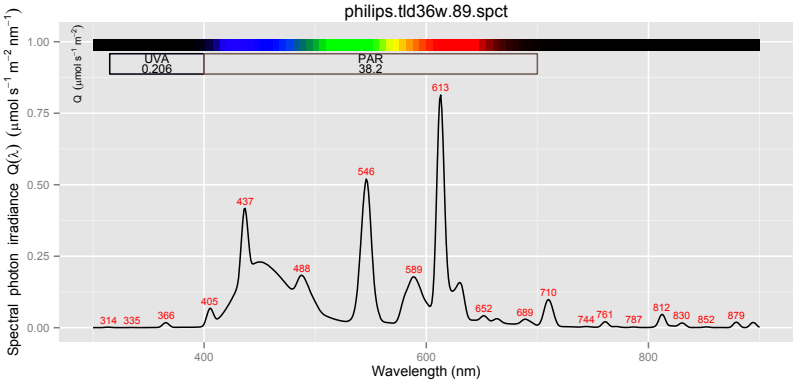

philips.tld36w.83.spct
UVA
0.172
PAR
7.73
E (W m⁻²)
Spectral energy irradiance E(λ) (W m⁻² nm⁻¹)
313 336 365 405 436 488 545 587 613 652 689 710 744 761 786 812 830 852 879
Wavelength (nm)

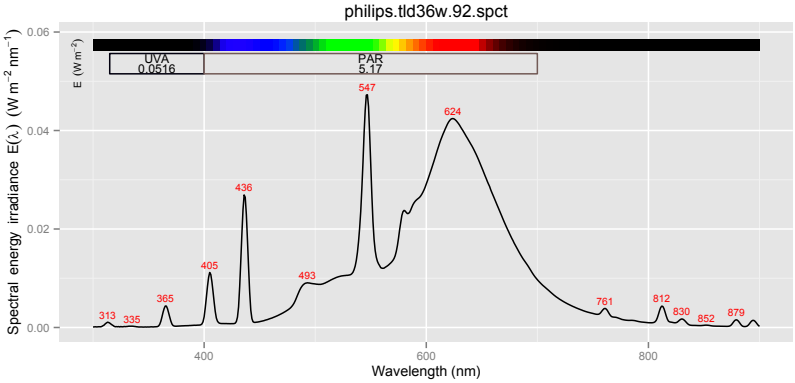

philips.tld36w.83.spct
UVA
0.517
PAR
36.6
Q (µmol s⁻¹ m⁻²)
Spectral photon irradiance Q(λ) (µmol s⁻¹ m⁻² nm⁻¹)
313 336 365 405 436 489 545 587 613 652 689 710 744 761 786 812 830 852 879
Wavelength (nm)

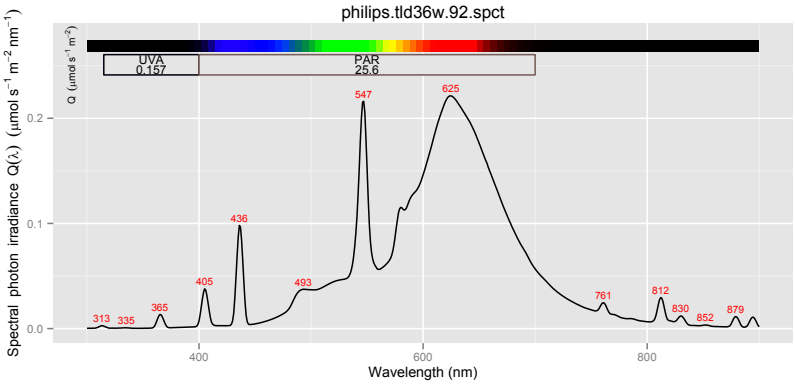

philips.tld36w.865.spct
UVA
0.0921
PAR
7.57
E (W m⁻²)
Spectral energy irradiance E(λ) (W m⁻² nm⁻¹)
314 335 365 405 436 488 546 588 613 651 688 710 744 761 787 812 830 852 879
Wavelength (nm)

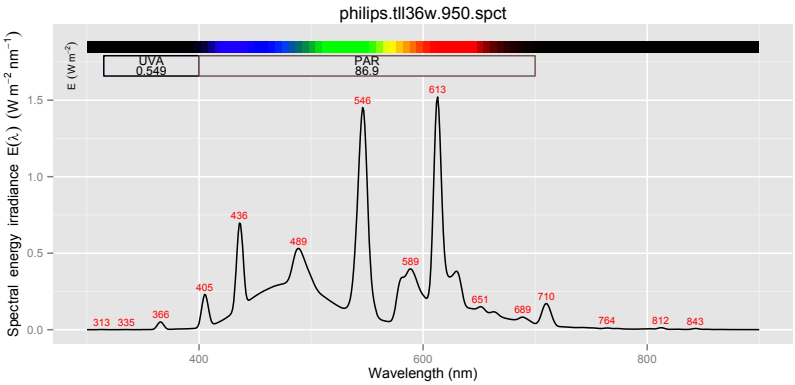

philips.tld36w.865.spct
UVA
0.281
PAR
33.6
Q (µmol s⁻¹ m⁻²)
Spectral photon irradiance Q(λ) (µmol s⁻¹ m⁻² nm⁻¹)
0.00
0.25
0.50
0.75
546
613
436
488
588
314 335 365 405 652 664 689 710 744 761 787 812 830 852 879
400
600
800
Wavelength (nm)

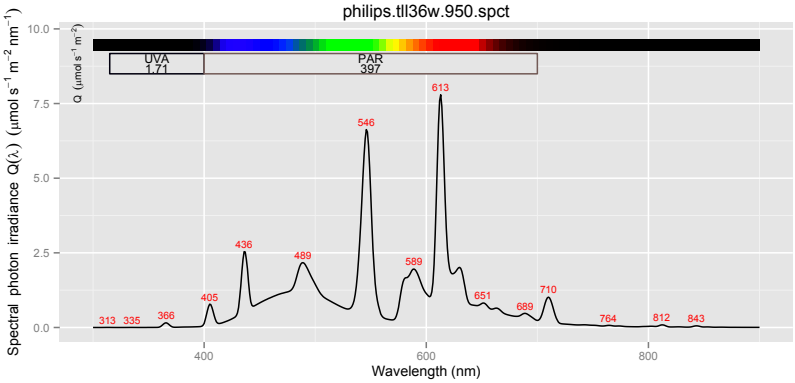

philips.tld36w.89.spct
UVA
0.0672
PAR
8.76
E (W m⁻²)
Spectral energy irradiance E(λ) (W m⁻² nm⁻¹)
0.00
0.05
0.10
0.15
0.20
613
437
546
488
588
314 335 365 405 652 689 710 744 761 787 812 830 852 879
400
600
800
Wavelength (nm)

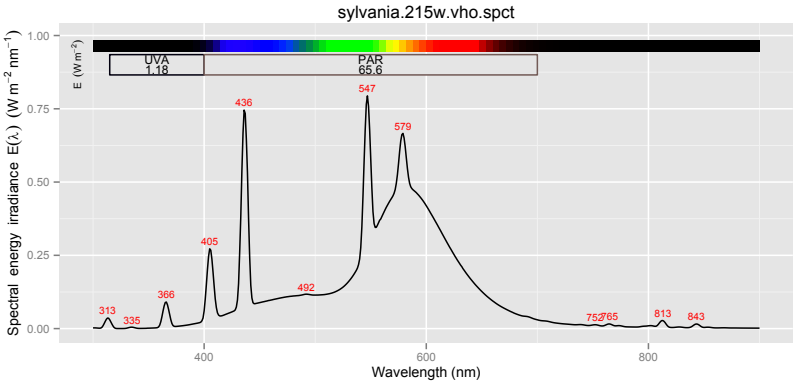

philips.tld36w.89.spct
UVA
0.206
PAR
38.2
Q (µmol s⁻¹ m⁻²)
Spectral photon irradiance Q(λ) (µmol s⁻¹ m⁻² nm⁻¹)
0.00
0.25
0.50
0.75
1.00
613
546
437
488
589
314 335 366 405 652 689 710 744 761 787 812 830 852 879
400
600
800
Wavelength (nm)

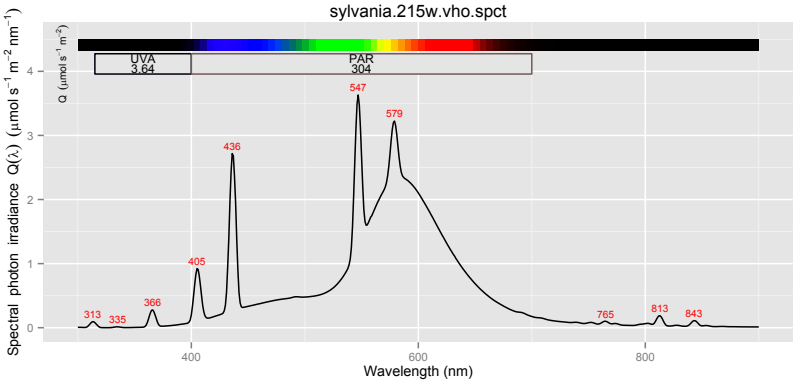

philips.tld36w.92.spct
UVA
0.0516
PAR
5.17
E (W m⁻²)
Spectral energy irradiance E(λ) (W m⁻² nm⁻¹)
0.06
0.04
0.02
0.00
313
335
365
405
436
493
547
624
761
812
830
852
879
400
600
800
Wavelength (nm)


philips.tld36w.92.spct
UVA
0.157
PAR
25.6
Q (µmol s⁻¹ m⁻²)
Spectral photon irradiance Q(λ) (µmol s⁻¹ m⁻² nm⁻¹)
0.2
0.1
0.0
313
335
365
405
436
493
547
625
761
812
830
852
879
400
600
800
Wavelength (nm)


philips.tll36w.950.spct
UVA
0.549
PAR
86.9
E (W m⁻²)
Spectral energy irradiance E(λ) (W m⁻² nm⁻¹)
1.5
1.0
0.5
0.0
313
335
366
405
436
489
546
589
613
651
689
710
764
812
843
400
600
800
Wavelength (nm)



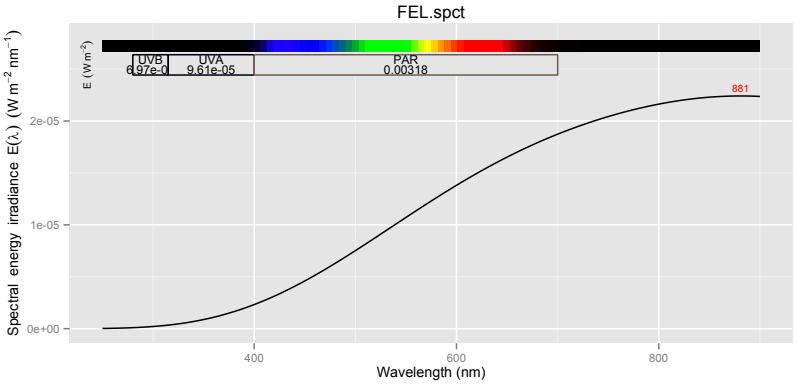


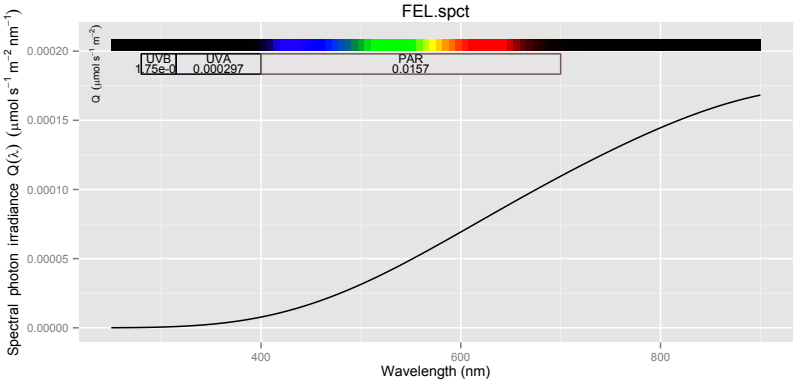


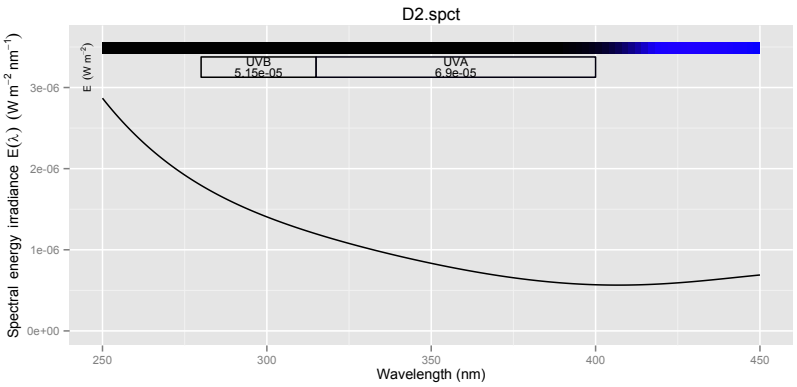
6 Calibration lamps

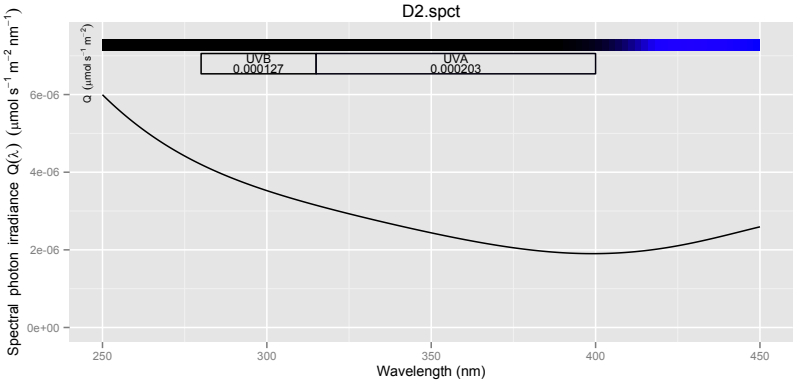
```
FEL.spct <- FEL_spectrum(250:900)
D2.spct <- D2_spectrum(250:900)
calibration.lamps <- c("FEL","D2")
```

```
for (lamp in calibration.lamps) {
  lamp.plotter(lamp.name=lamp, scaled=NULL)
}
```








D2.spct
UVB
0.000127
UVA
0.000203
Q (μmol s⁻¹ m⁻²)
Spectral photon irradiance Q(λ) (μmol s⁻¹ m⁻² nm⁻¹)
6e-06
4e-06
2e-06
0e+00
250
300
350
400
450
Wavelength (nm)