



Measuring pulsed (PWM) light sources (LED)

Measuring continuous LED pulses. Pulse width and frequency.

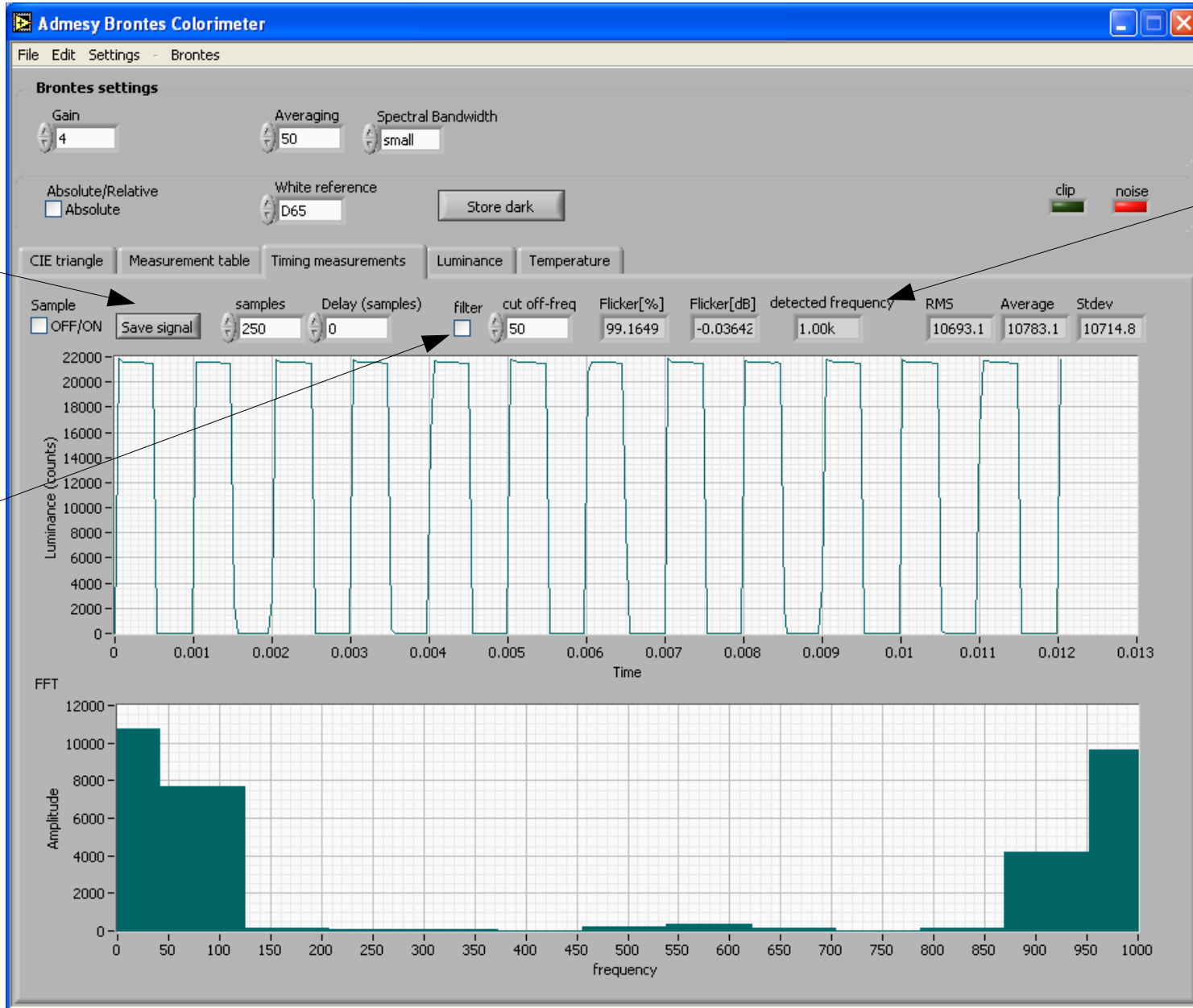
Using the Brontes main application, it is possible to measure timing related signals of light sources (LED, displays etc).

It is presented in scope mode with some basic analysis like frequency, flicker (LCD), RMS and average values.

The Brontes sample speed is 18.000 Samples/s at 16bit resolution.

The example screenshot on the next page shows the Brontes measuring a 1kHz block signal connected directly to a LED.

For the example RED powerled was used. The LED was positioned directly in front of the Brontes colorimeter.



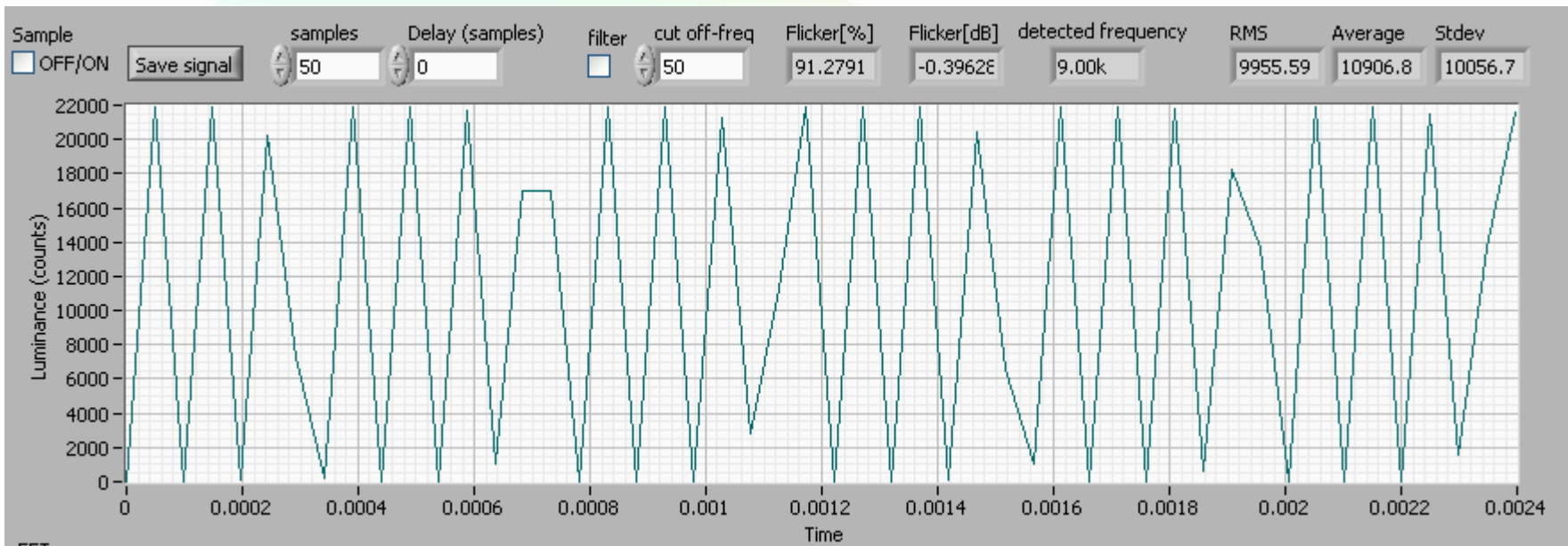
Possible to save the raw data

Low pass filter, needed for flicker measurement to compensate for human eye frequency (speed) response.

1kHz detected

Highest possible frequency

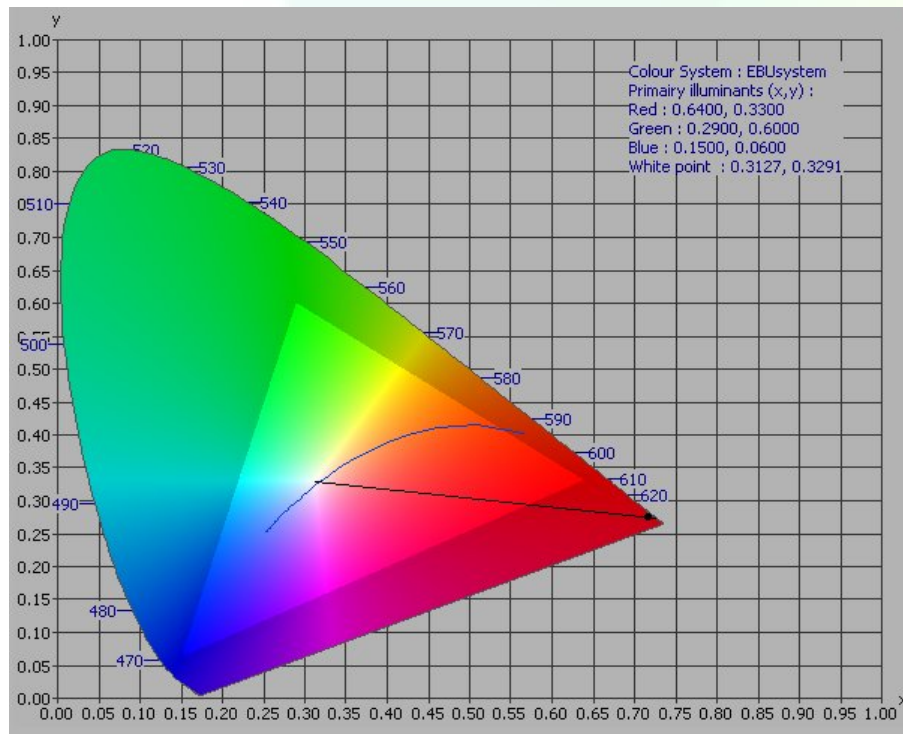
Since the Brontes maximum sampling speed is 18kHz, it can detect frequencies up to about 9Khz well.



Colour measurement of a pulsed LED.

The sample speed of the Brontes is fixed and X,Y,Z will be sampled very shortly after each other. The latter should be kept in mind when measuring fast switching RGB sources as the measured colour point may be affected by this way of measurement.

For a single LED is however possible to average a large number of measurements and measure the colour point and dominant wavelength of this LED.



Colour table

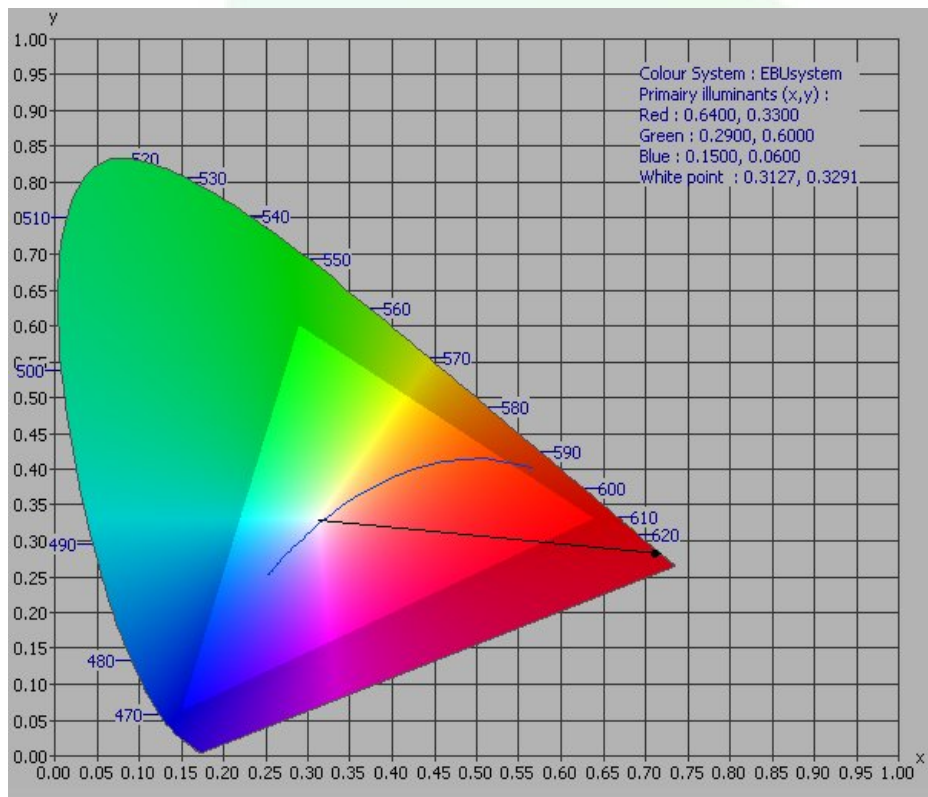
X	72525.480
Y	27835.900
Z	777.987
x	0.7171
y	0.2752
u'	0.5892
v'	0.5088
L	741.4
a	1304.8
b	920.6
L	741.4
u	3772.1
v	389.5
L	741.4
C	1596.9
H	35.2
C.Temp	0
d.WL	649.9
pe	0.98
CRI(Ra)	NaN

LED at 5000kHz block.

Colour measurement reproducibility
 ± 0.0005 x,y

High frequencies may affect the measured colour.

Below, the measurement on the same LED as previous page is show using a 100 khz block signal.



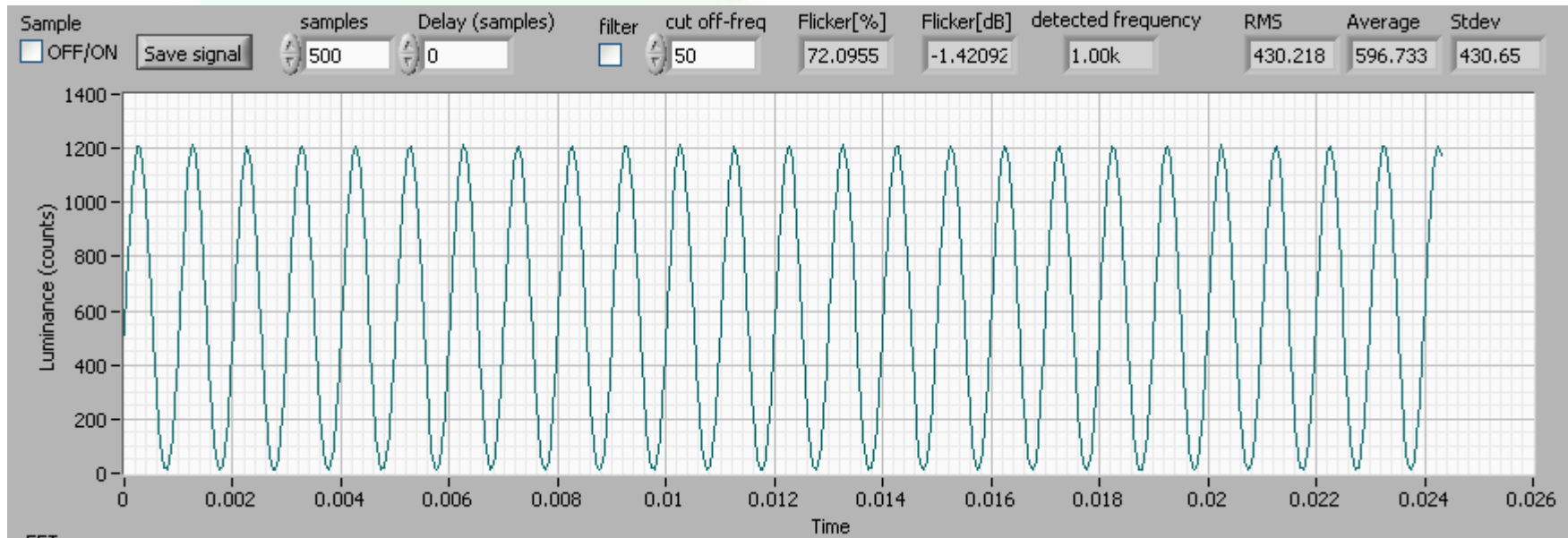
Colour table	
X	68852.110
Y	27446.570
Z	597.818
x	0.7106
y	0.2833
u'	0.5710
v'	0.5121
L	737.9
a	1241.6
b	946.9
L	737.9
u	3579.6
v	419.6
L	737.9
C	1561.5
H	37.3
C.Temp	0
d.WL	638.4
pe	0.98
CRI(Ra)	NaN

A small shift in colour can be observed.

Stability of the measurement is however equal to the one on the previous page.

For both block signal measurements ,an averaging of 5000 measurements was used (sampling time a little under 1 second).

Below, a 1kHz sine wave signal was applied to the same LED.



Final notes

- It is possible to trigger a measurement (3.3V trigger input is available).
- It is possible to measure pulse width (PWM) but it has not been implemented as a measurement value in the software yet (but can be added).