A new high-performance dynamic plotter for Qt library

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Reasons for developing

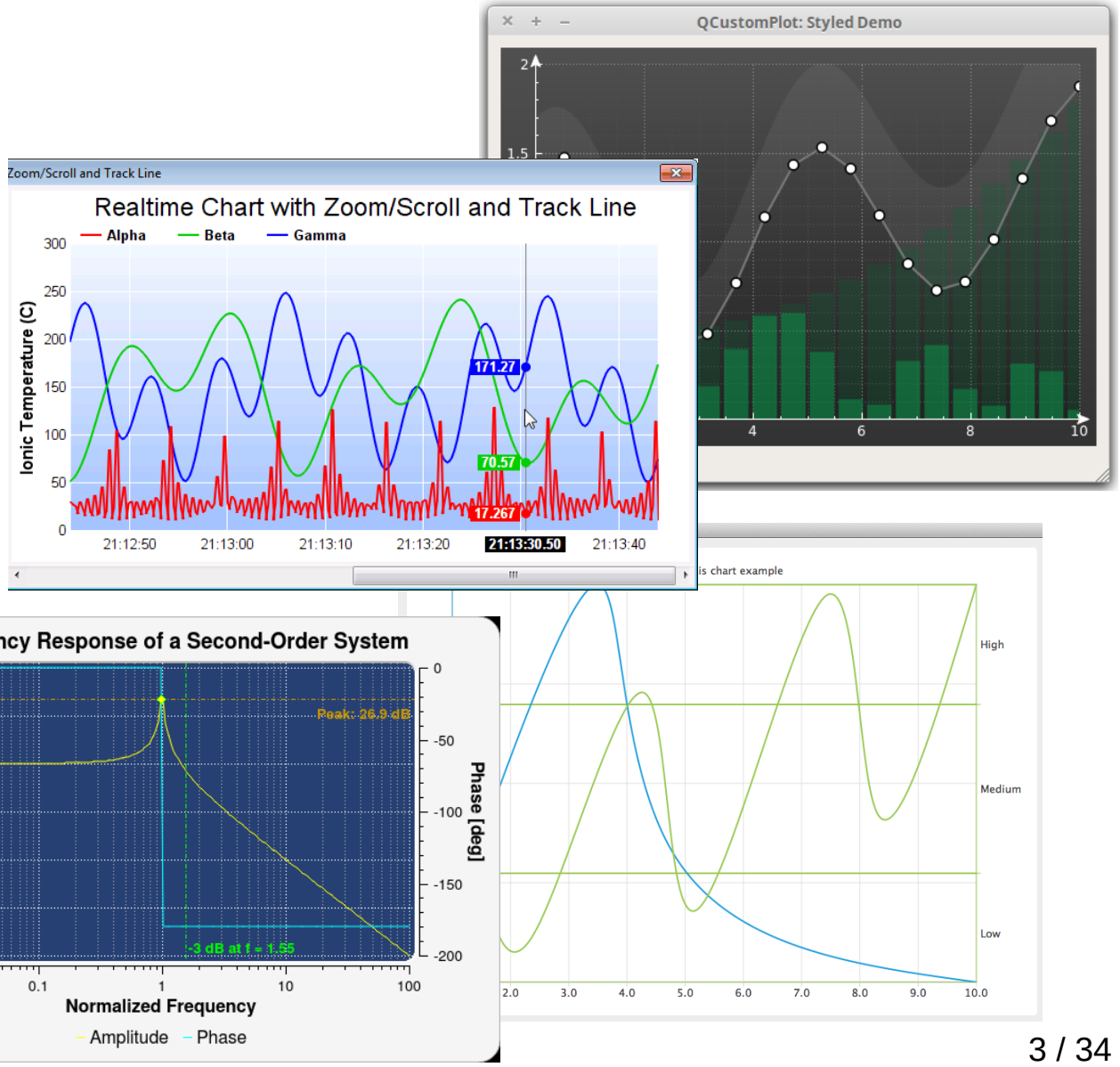
A new high-performance **dynamic plotter** for Qt library was developed because available free / open source Qt plotters had following disadvantages:

- Insufficient performance (limitations of use in real-time tasks);
- Limited graphics capabilities.

Source code of the developed project:
https://github.com/lattoo/plotter

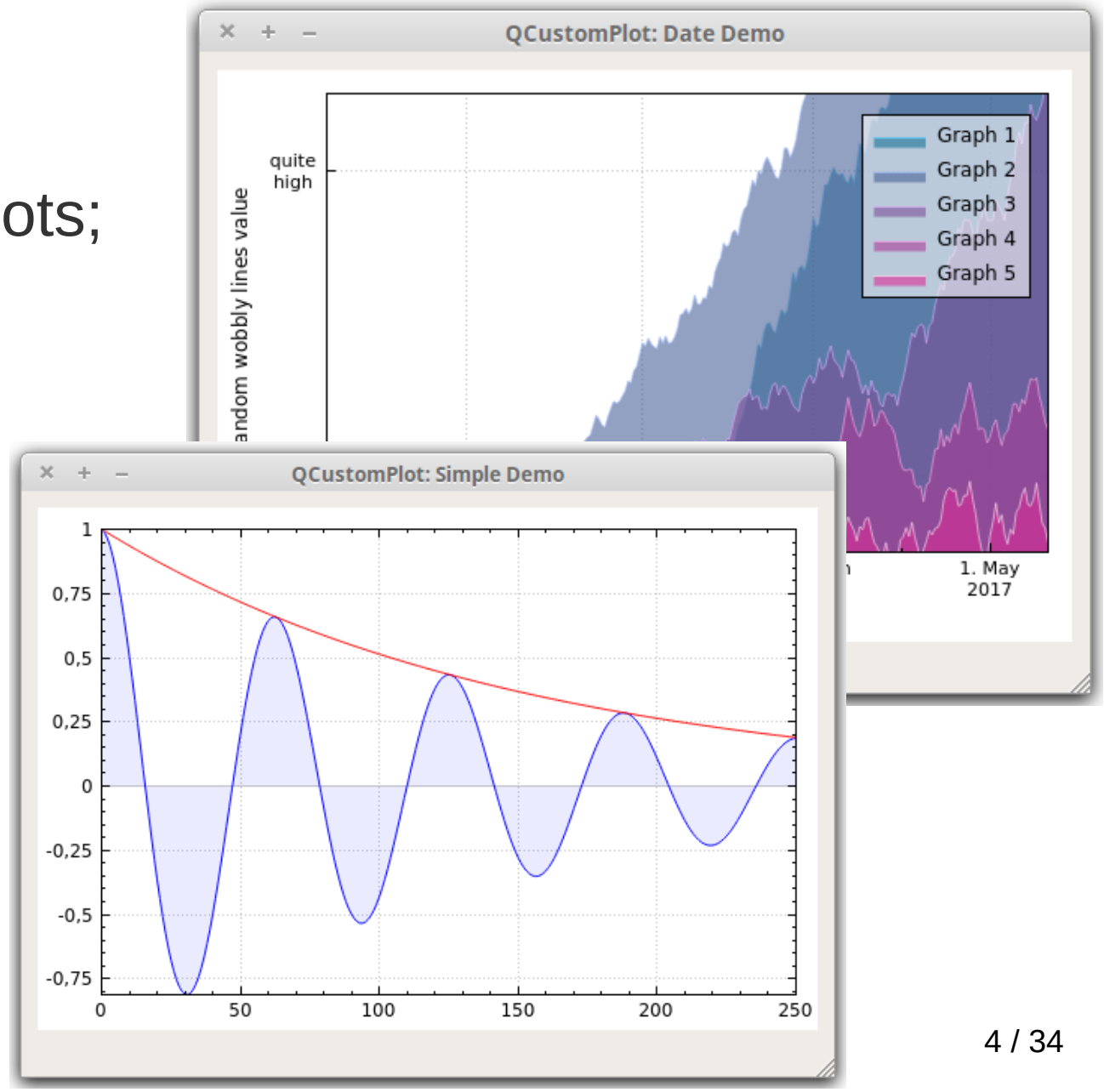
Available Plotters

- QCustomPlot;
- QCharts;
- Qwt;
- ChartDirector.



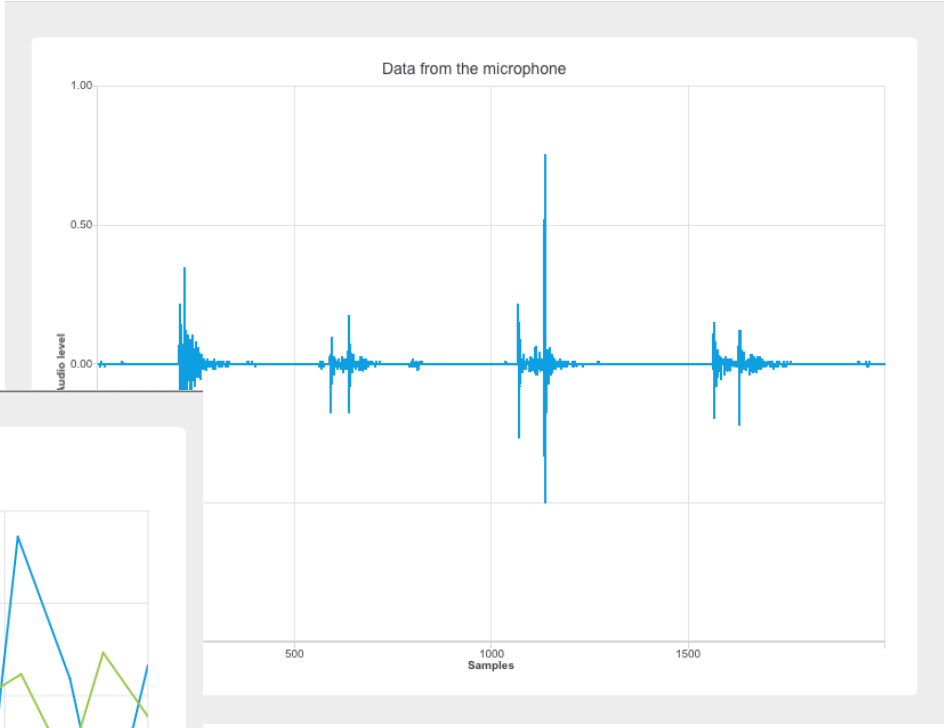
QCustomPlot

- Good looking plots;
- High flexibility;
- Not so fast.

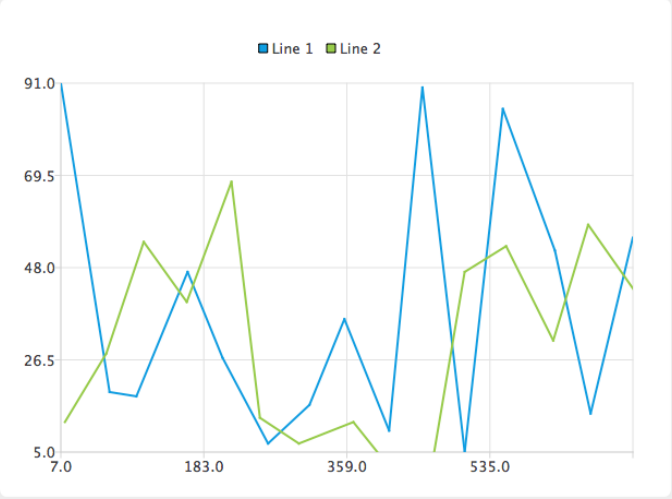


QCharts

- Default since Qt 5.6.0 release;
- So-so looking plots;
- Slow.

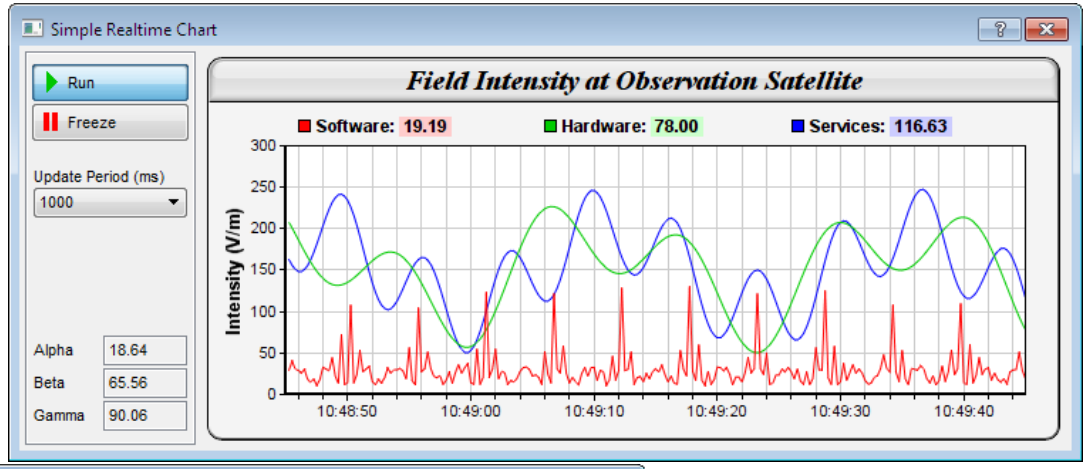


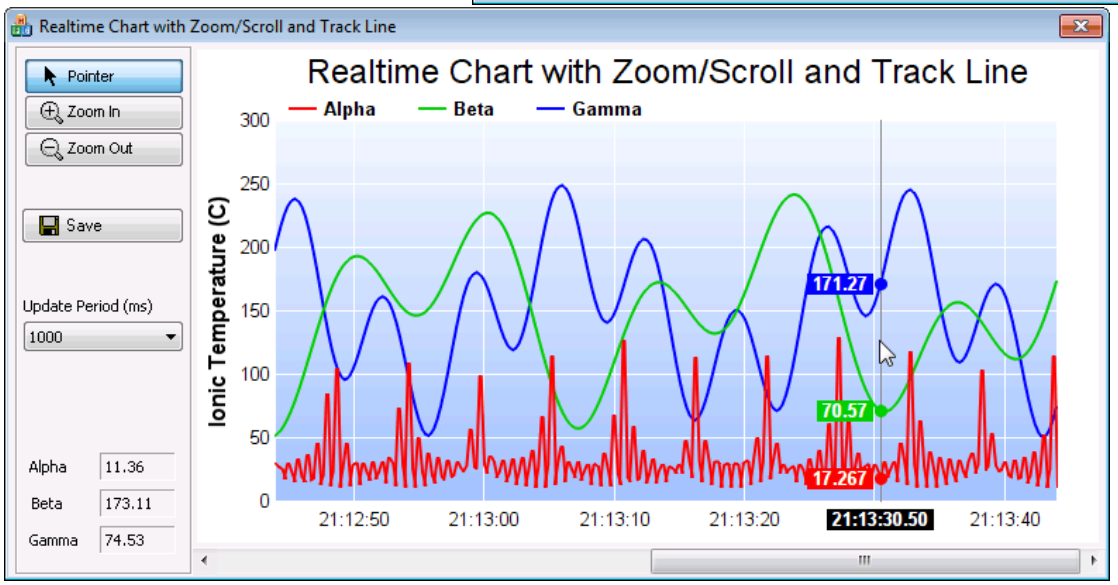
	x	y	x	y
1	7	91	12	12
2	67	19	63	28
3	100	18	109	54
4	163	47	162	40
5	206	27	217	68
6	262	7	252	13
7	313	16	300	7
8	356	36	367	12
9	411	10	405	3
10	452	90	462	0
11	504	5	504	47
12	551	85	555	53
13	615	52	613	31
14	659	14	656	58
15	711	55	719	41



ChartDirector

- Good looking plots;
- Proprietary software.

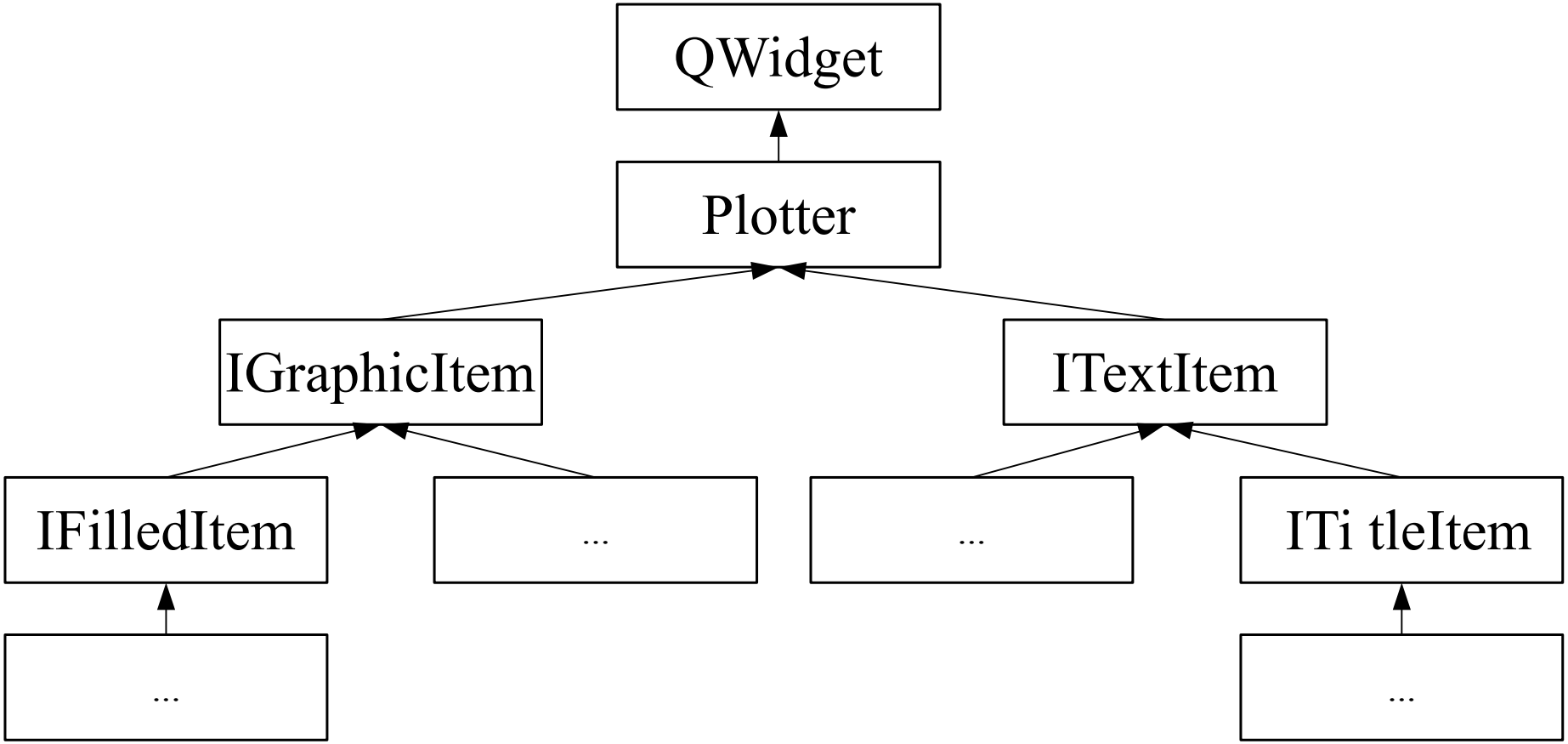




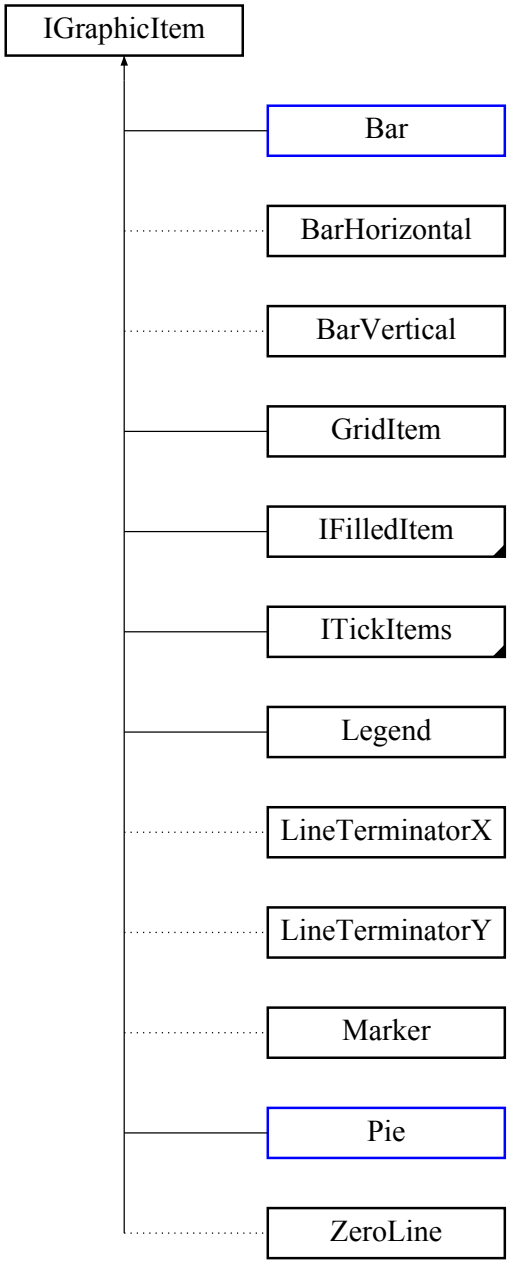
Choices for the implementation

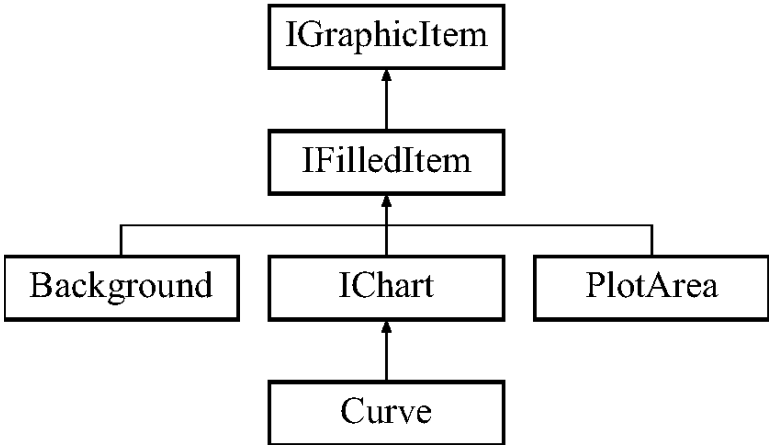
QML C++

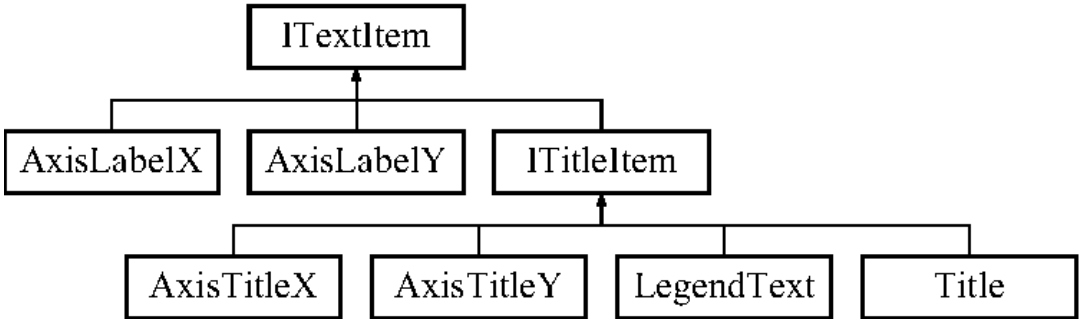
Architecture (fragment)



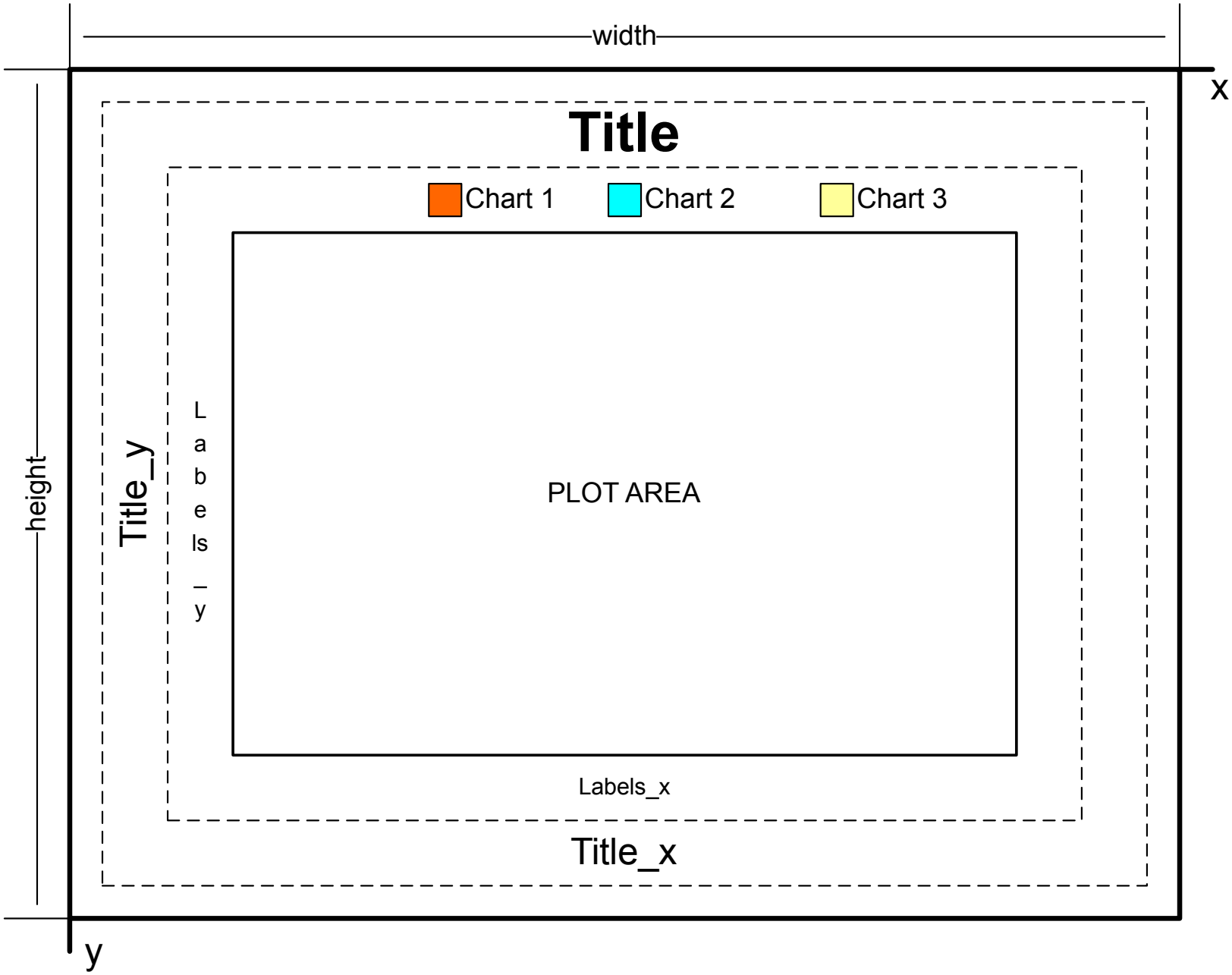
Architecture (complete view)





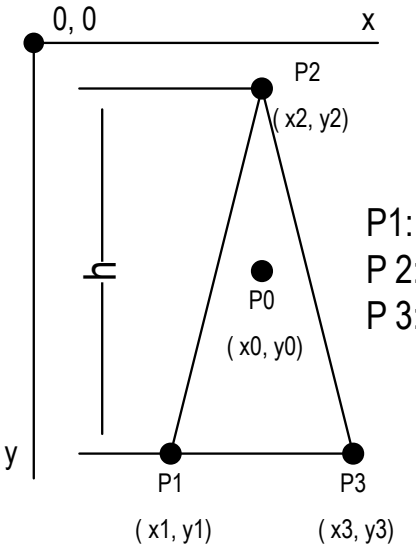


Plotter widget area

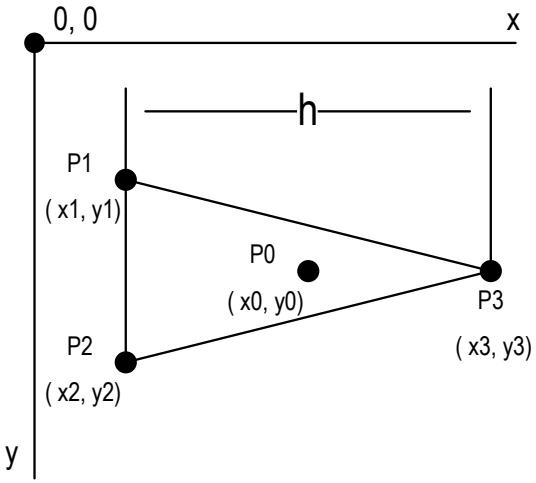


Plotter elements/Line terminators

ARROW

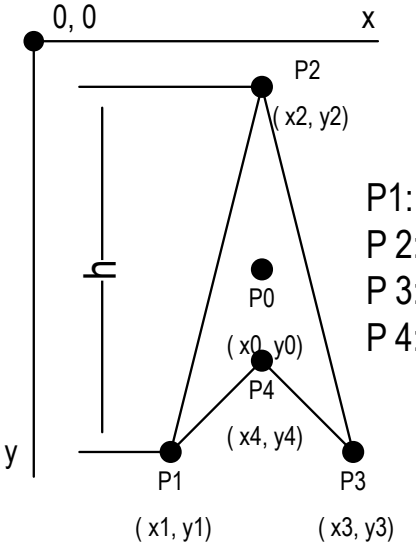


P1: x0 – h/4, y0 + h/2
P 2: x0 , y0 – h/2
P 3: x0 + h/4, y0 + h/2

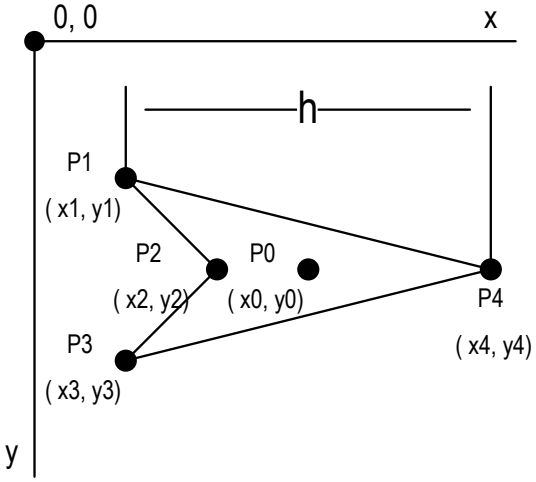


P1: x0 – h/2, y0 – h/4
P 2: x0 – h/2, y0 + h/4
P 3: x0 + h/2, y0

ARROW2



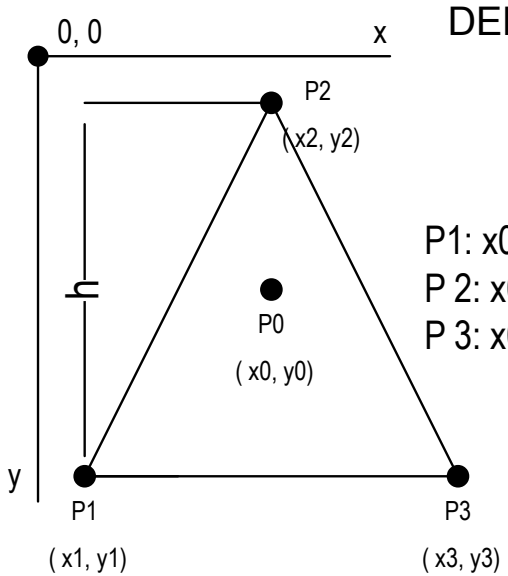
P1: x0 – 0.375h, y0 + h/2
P 2: x0 , y0 – h/2
P 3: x0 + 0.375h, y0 + h/2
P 4: x0 , y0 + h/4



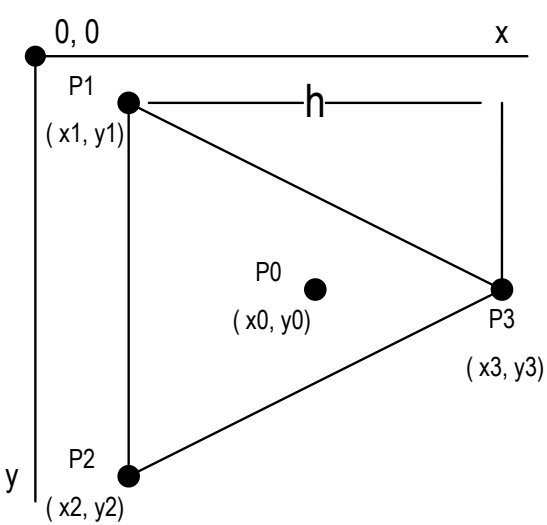
P1: x0 – h/2, y0 – 0.375h
P 2: x0 – h/4, y0
P 3: x0 – h/2, y0 + 0.375h
P 4: x0 + h/2, y0

Plotter elements/Line terminators

DELTA_ARROW

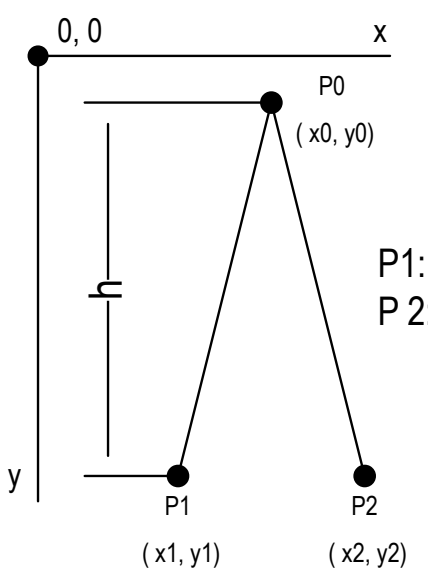


P1: x0 – h/2, y0 + h/2
P 2: x0 , y0 – h/2
P 3: x0 + h/2, y0 + h/2

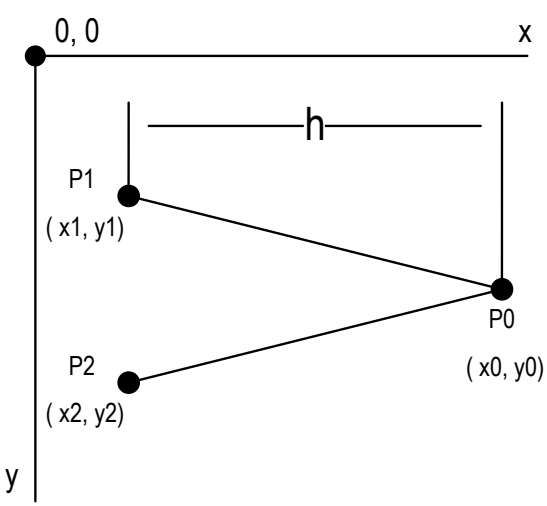


P1: x0 – h/2, y0 – h/2
P 2: x0 – h/2, y0 + h/2
P 3: x0 + h/2, y0

THIN_ARROW

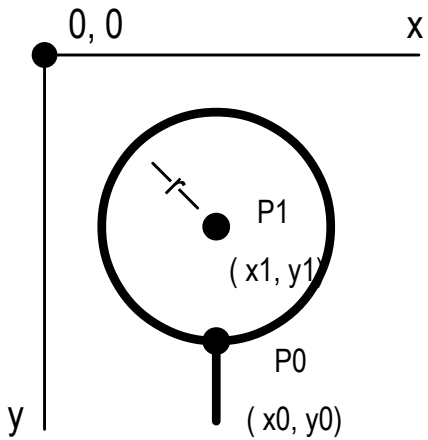


P1: x0 – h/4, y0 + h
P 2: x0 + h/4, y0 + h

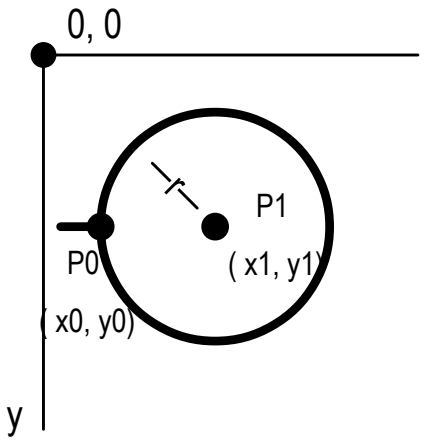


P1: x0 – h, y0 – h/4
P 2: x0 – h, y0 + h/4

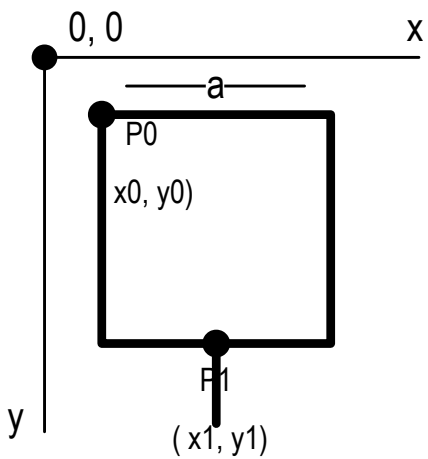
Plotter elements/Line terminators



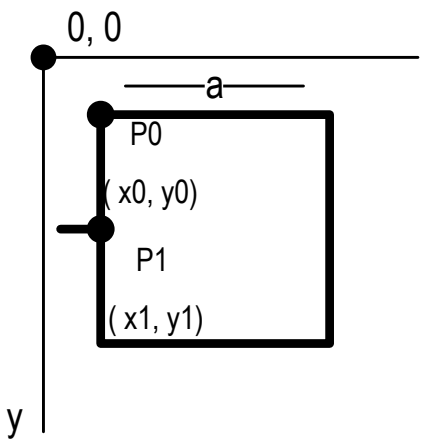
P1: x0, y0 – r



P1: x0 + r, y0



P1: x0 – a/2, y0 – a



P1: x0, y0 – a/2

2. Usage & examples

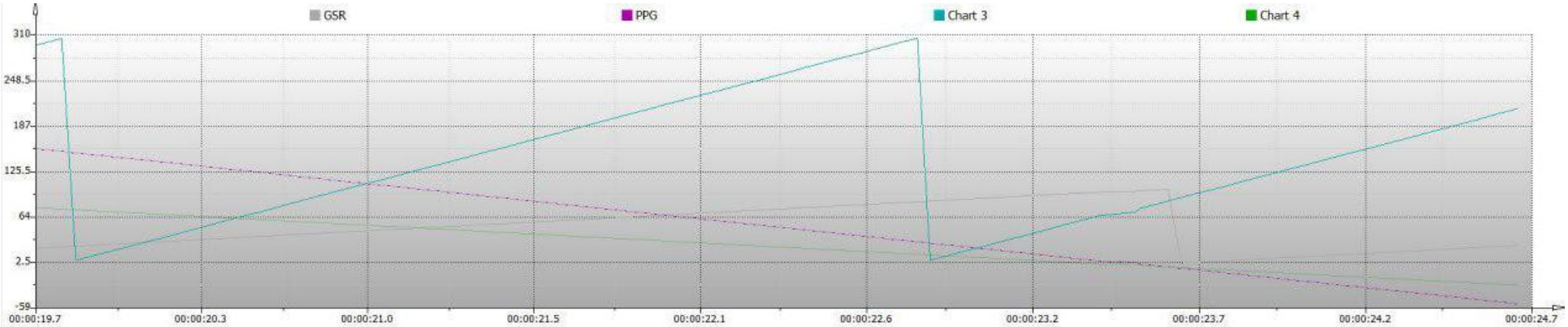
Get and try Plotter

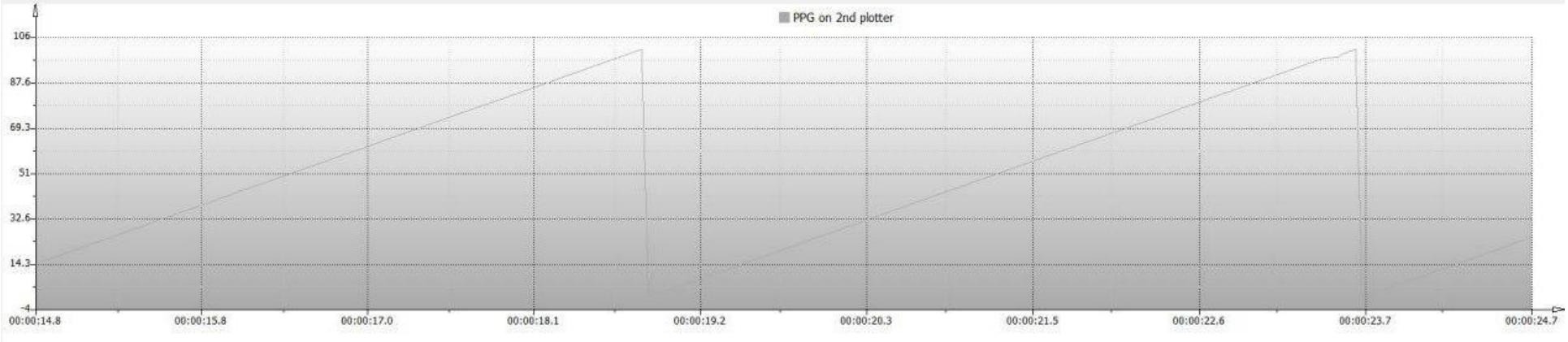
```
$ git clone https://github.com/lattoo/plotter
$ cd plotter
$ git checkout v.01
$ cd Examples/Plotter_pro
$ qmake Plotter.pro
$ make
```

Code example

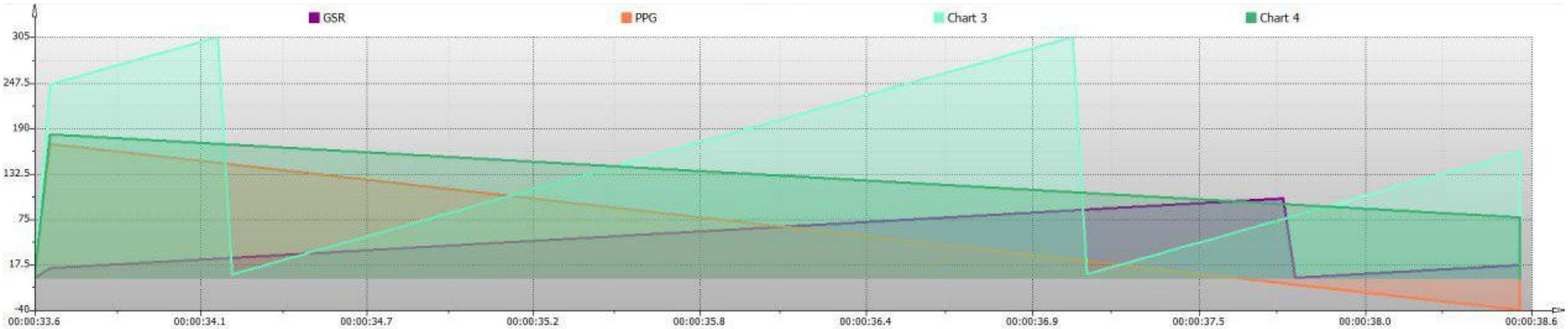
```
Plotter* plotter = new Plotter;
const QString chart_name = "Chart 1";
plotter->add_chart(chart_name);
const QPen pen = QPen(QColor(220, 170, 170), 1, Qt::SolidLine);
plotter->chart(chart_name)->set_pen(pen);
plotter->chart(chart_name)->add_data(x, y); // add new point
plotter→scroll_graph(); // scroll graph to dx position
plotter->replot;
```

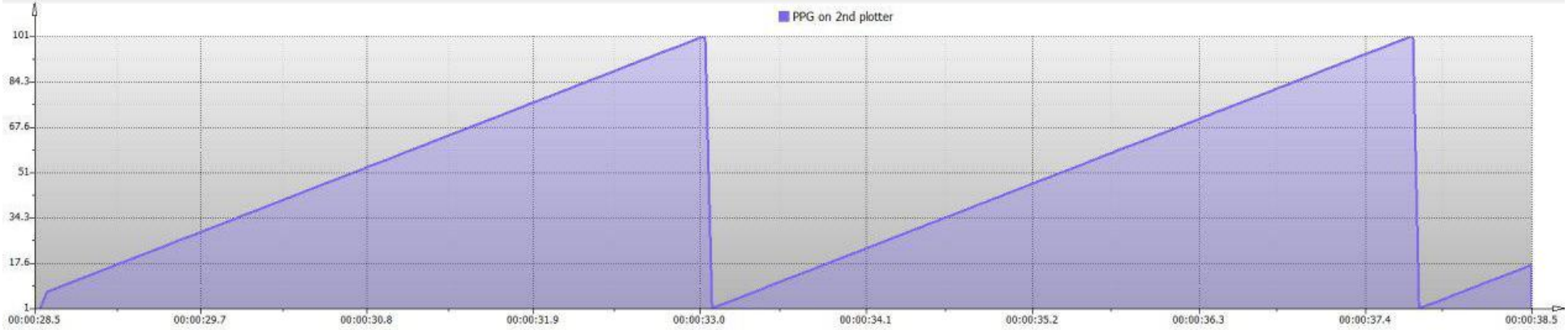
Examples


GSR
PPG
Chart 3
Chart 4
310
248.5
187
125.5
64
2.5
-59
00:00:19.7
00:00:20.3
00:00:21.0
00:00:21.5
00:00:22.1
00:00:22.6
00:00:23.2
00:00:23.7
00:00:24.2
00:00:24.7

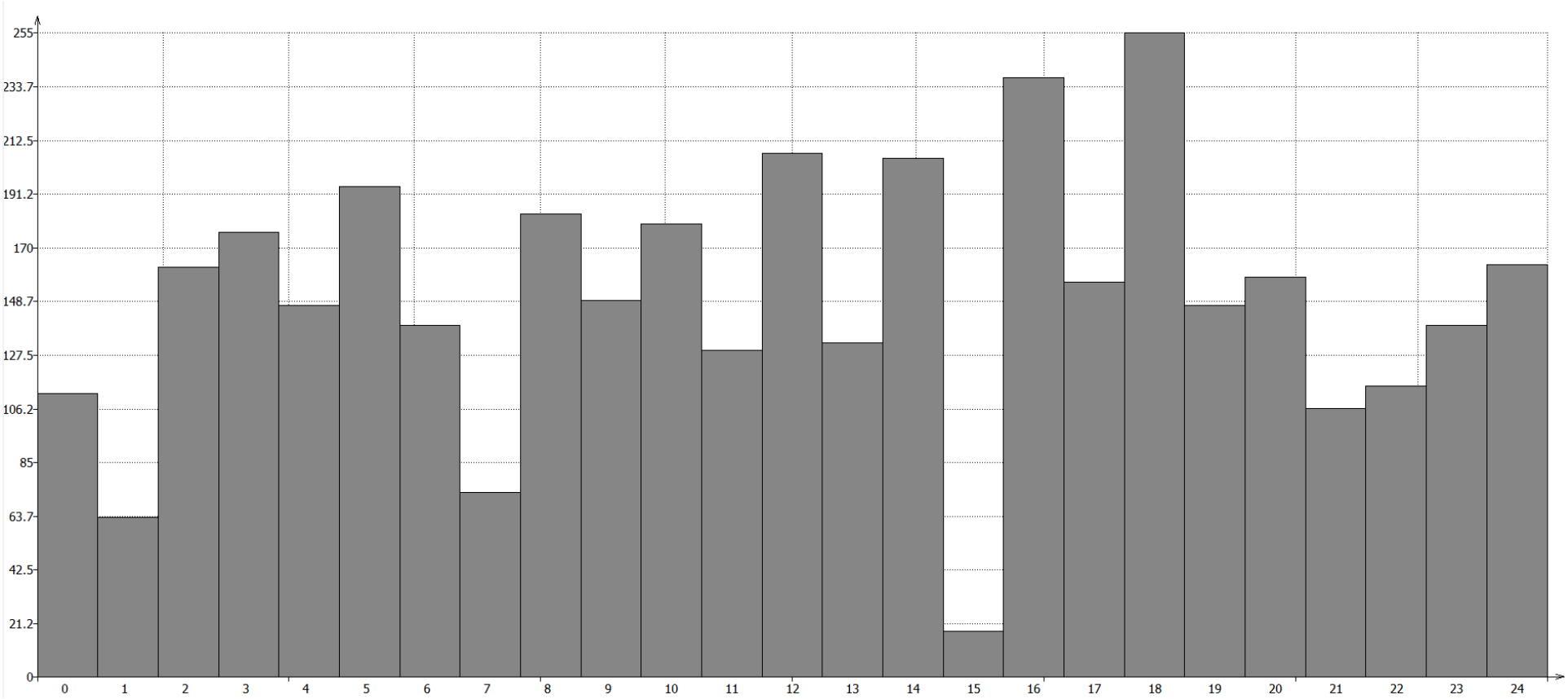

PPG on 2nd plotter
106
87.6
69.3
51
32.6
14.3
-4
00:00:14.8
00:00:15.8
00:00:17.0
00:00:18.1
00:00:19.2
00:00:20.3
00:00:21.5
00:00:22.6
00:00:23.7
00:00:24.7

Examples

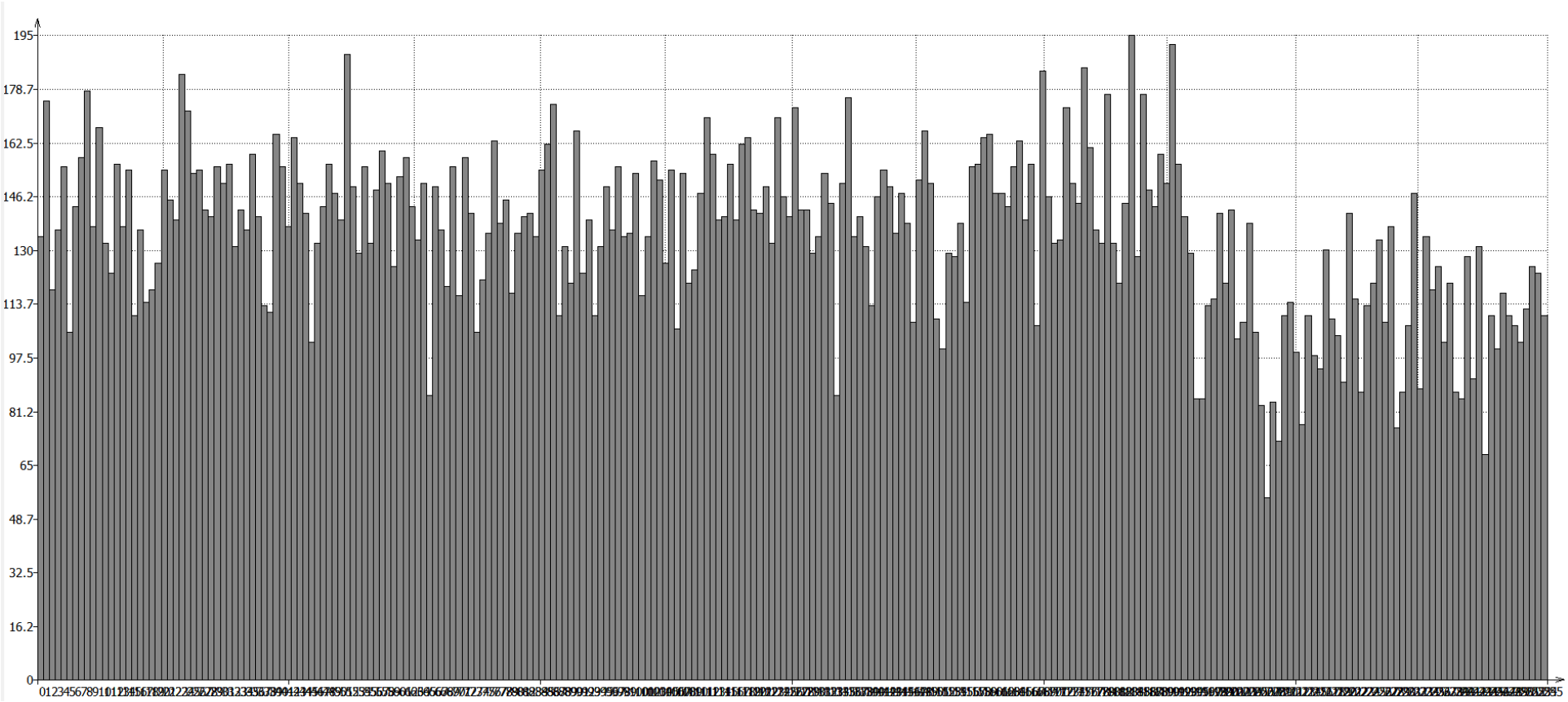

GSR
PPG
Chart 3
Chart 4
305
247.5
190
132.5
75
17.5
-40
00:00:33.6
00:00:34.1
00:00:34.7
00:00:35.2
00:00:35.8
00:00:36.4
00:00:36.9
00:00:37.5
00:00:38.0
00:00:38.6


PPG on 2nd plotter
101
84.3
67.6
51
34.3
17.6
1
00:00:28.5
00:00:29.7
00:00:30.8
00:00:31.9
00:00:33.0
00:00:34.1
00:00:35.2
00:00:36.3
00:00:37.4
00:00:38.5

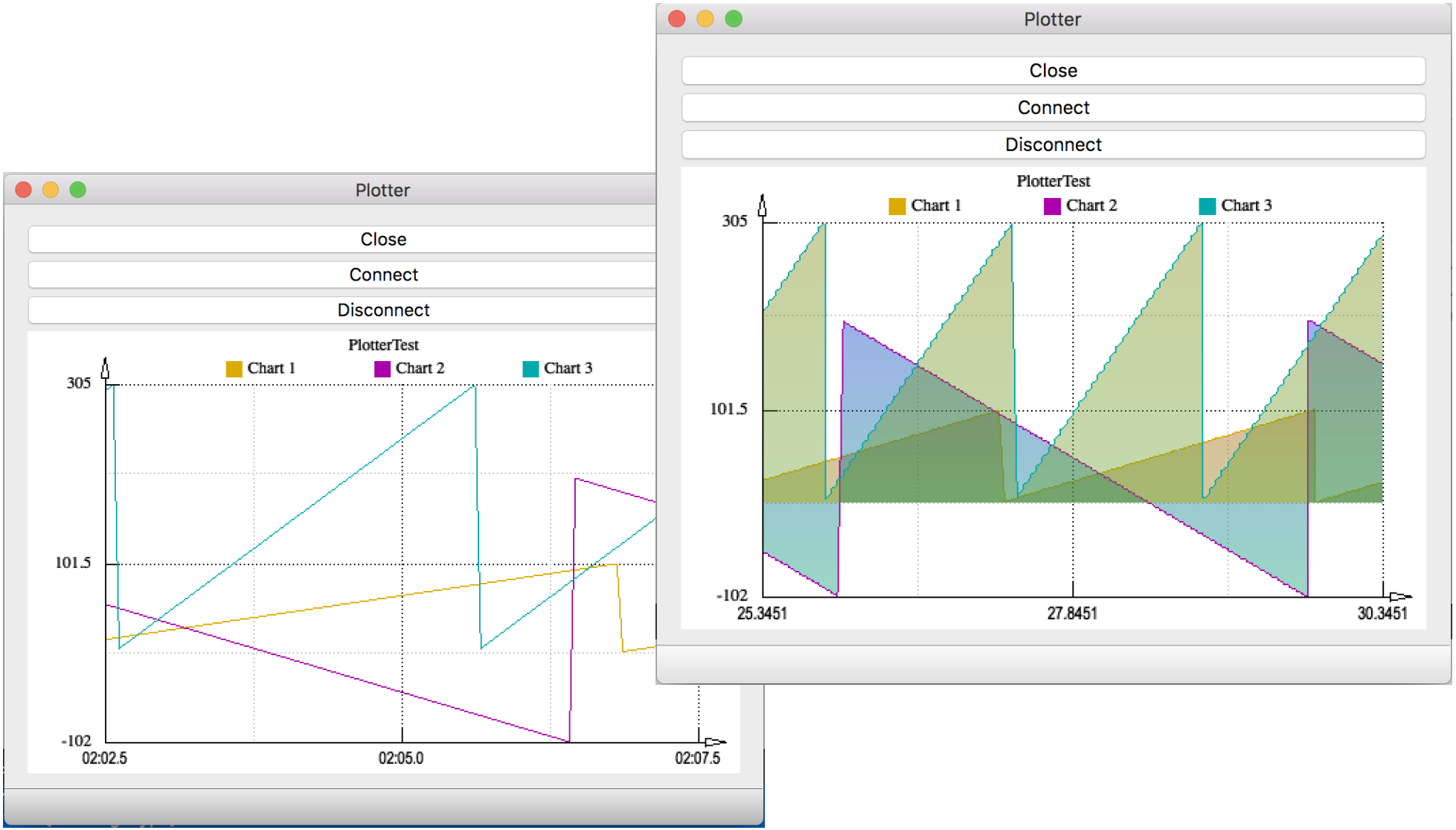
Examples


255
233.7
212.5
191.2
170
148.7
127.5
106.2
85
63.7
42.5
21.2
0
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24

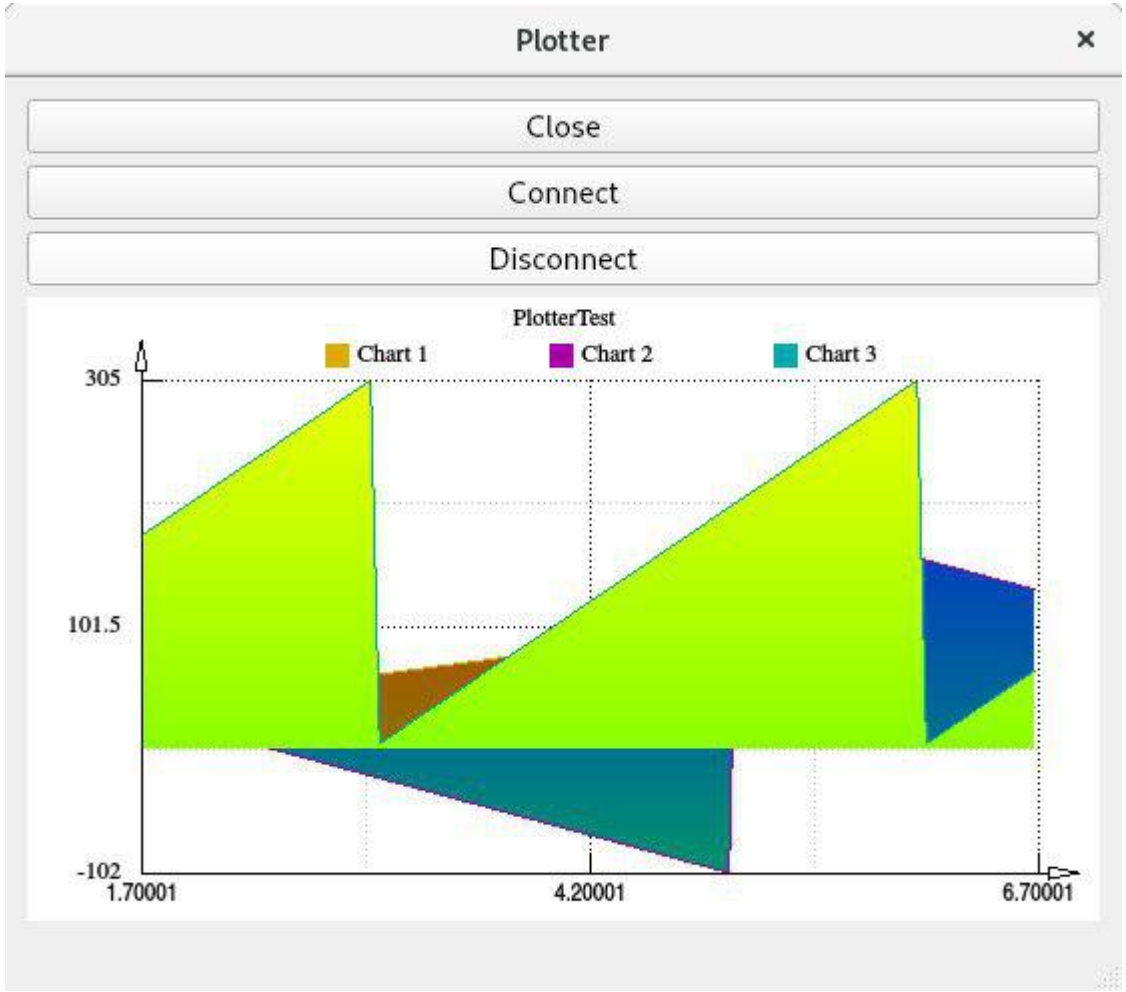
Examples



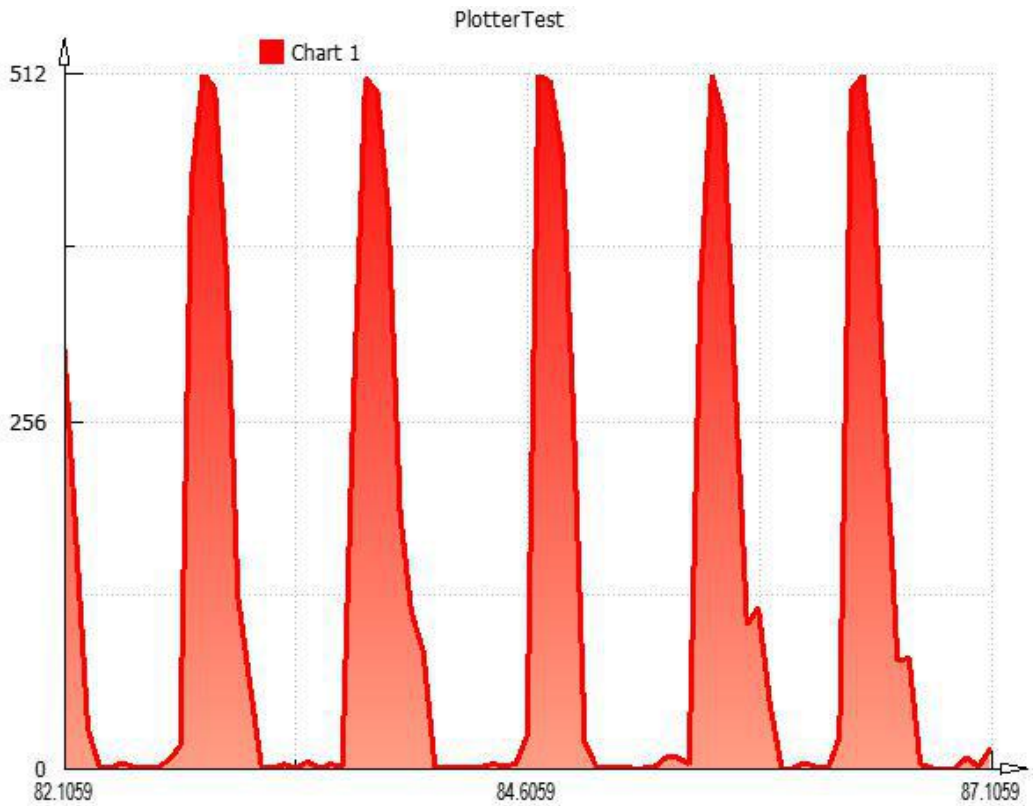
Examples / macOS Sierra

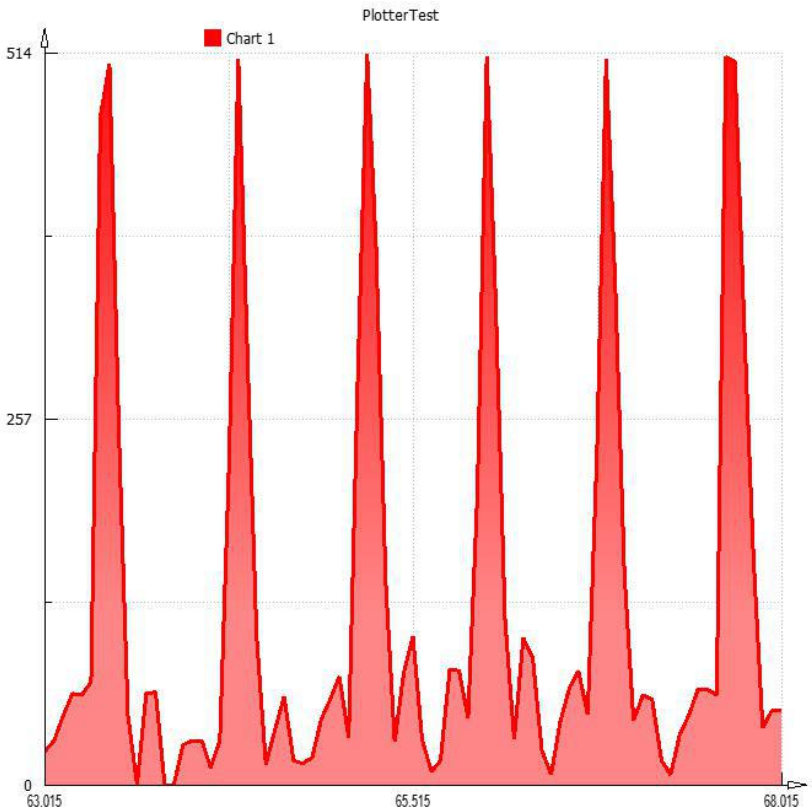


Examples / Archlinux

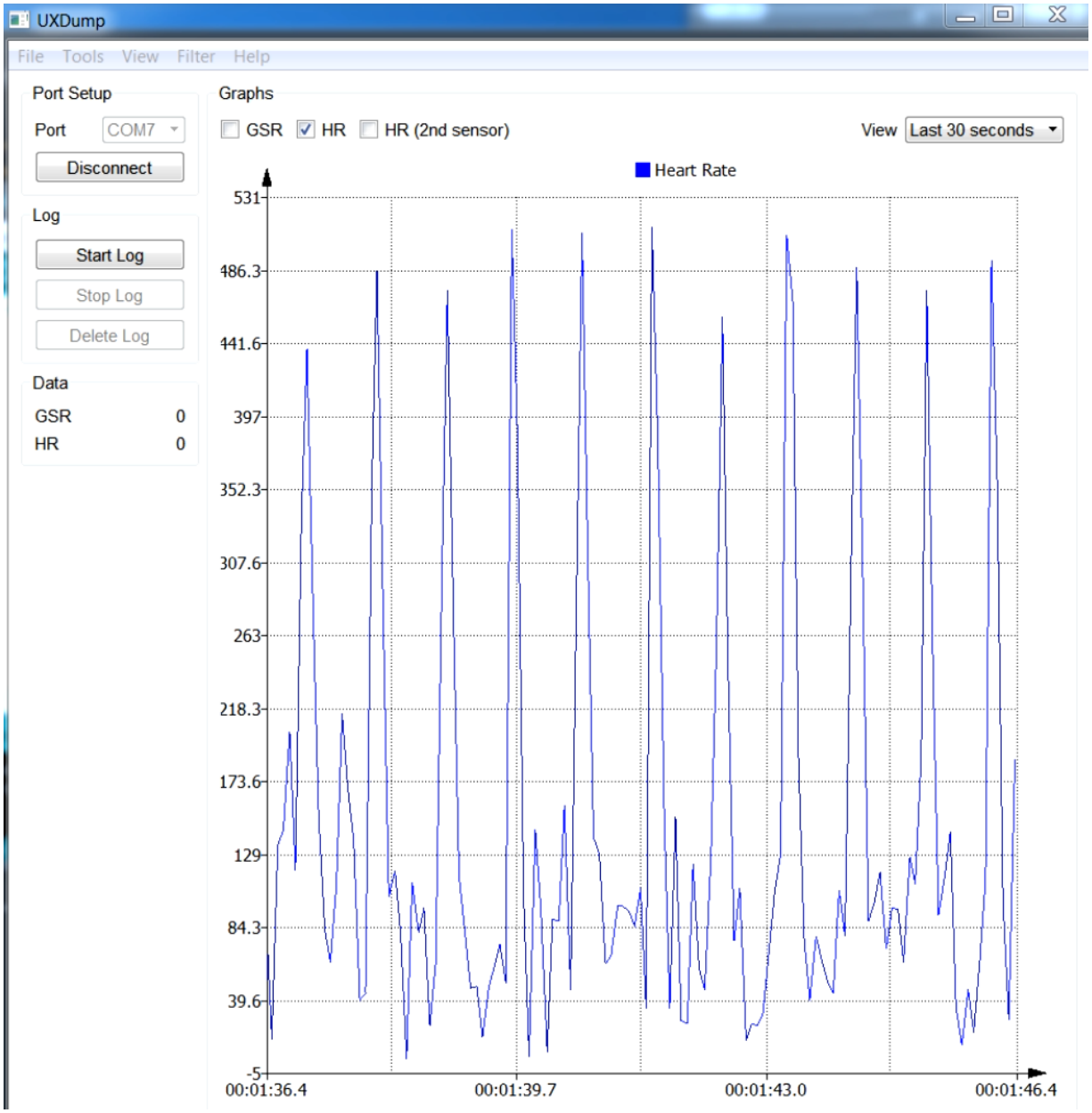


Examples — heart rate signal

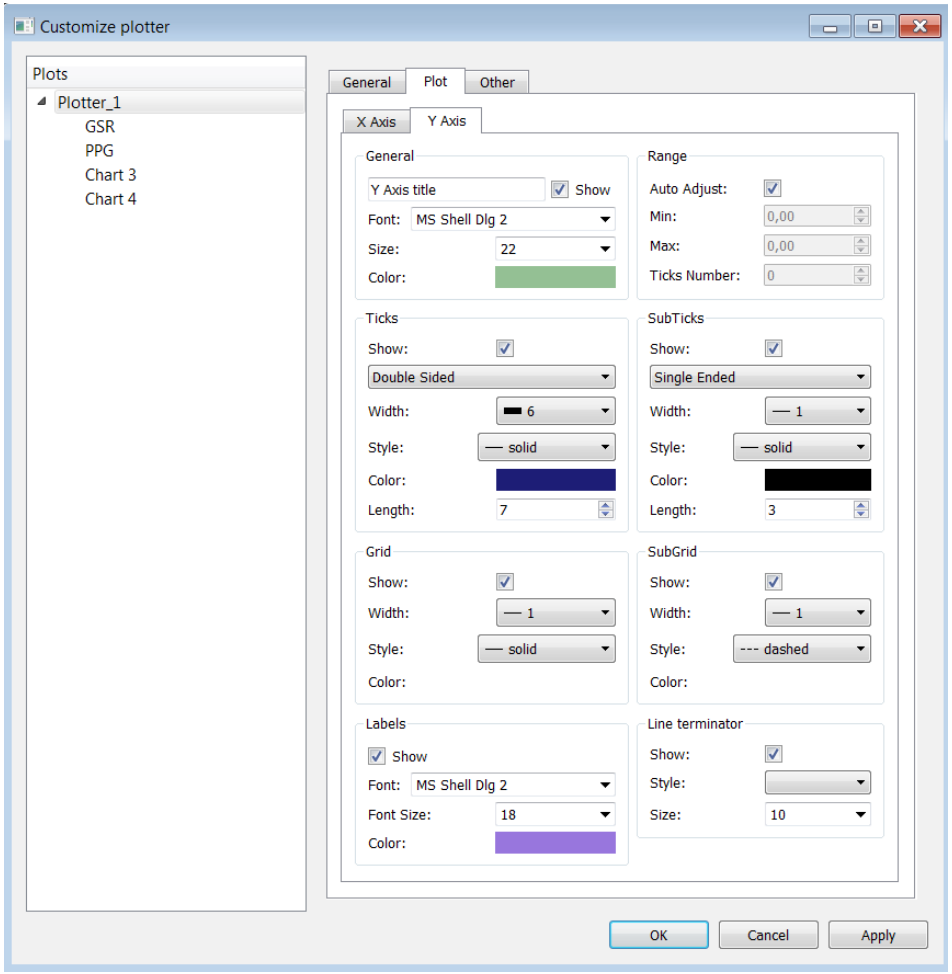


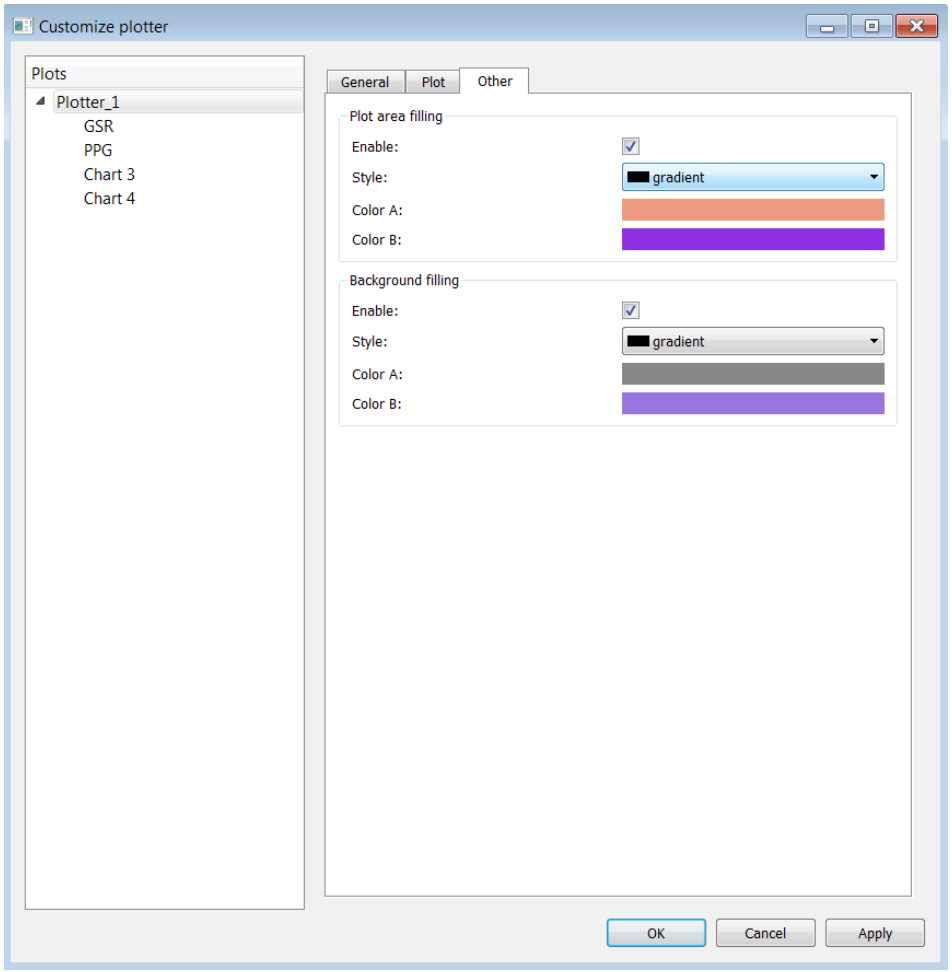


Examples - UXDump/Heart rate

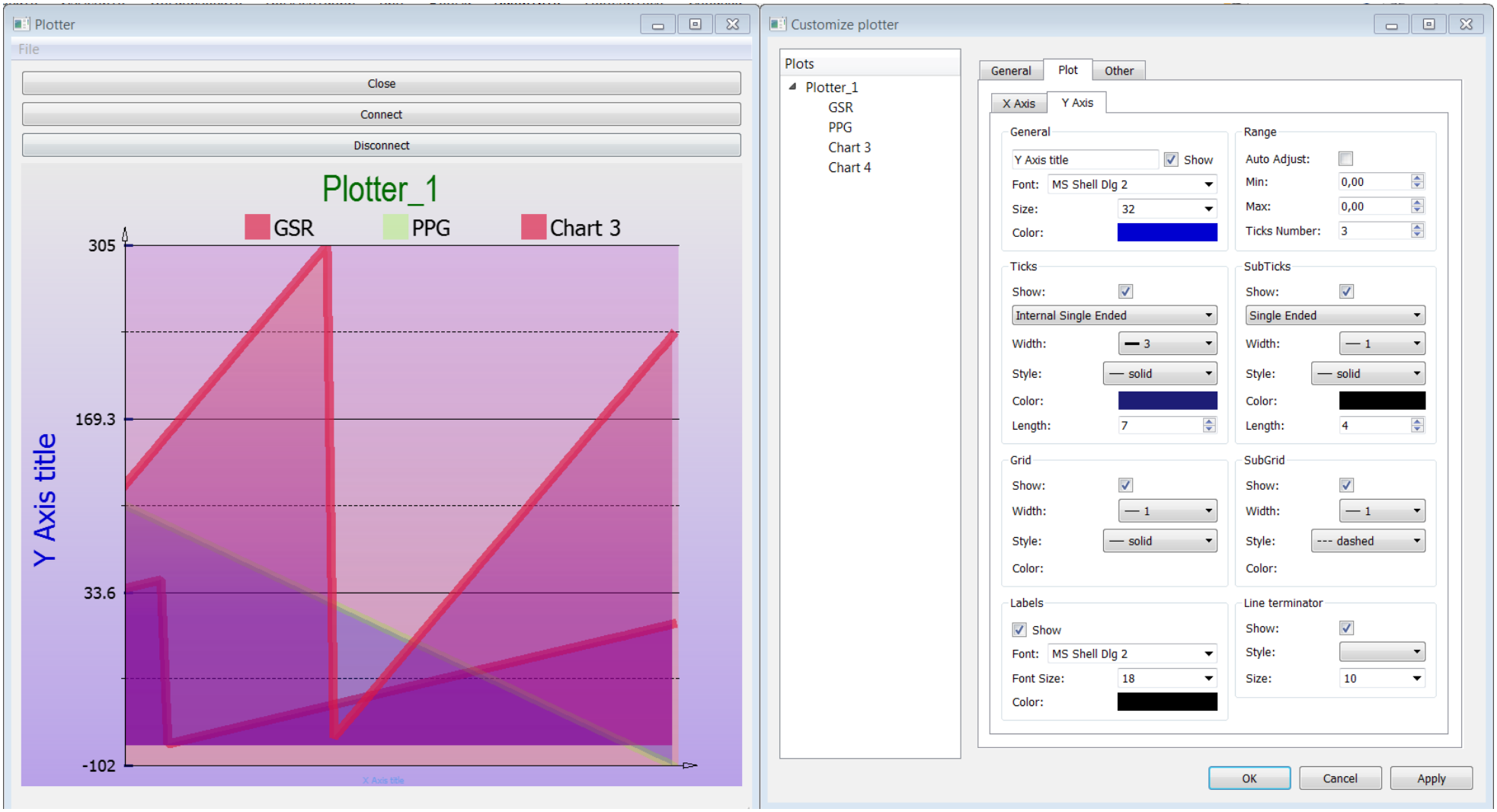


Plotter customization

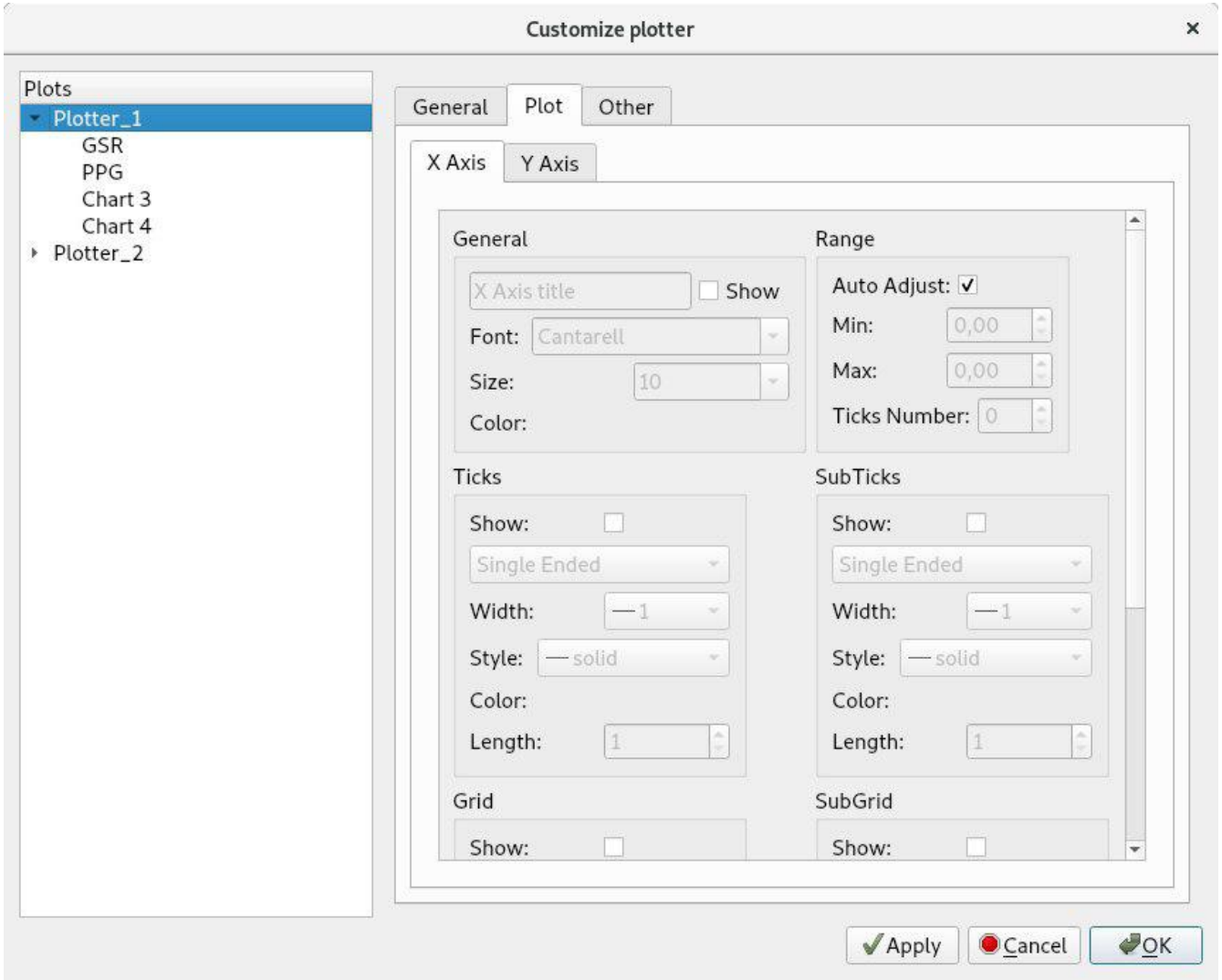




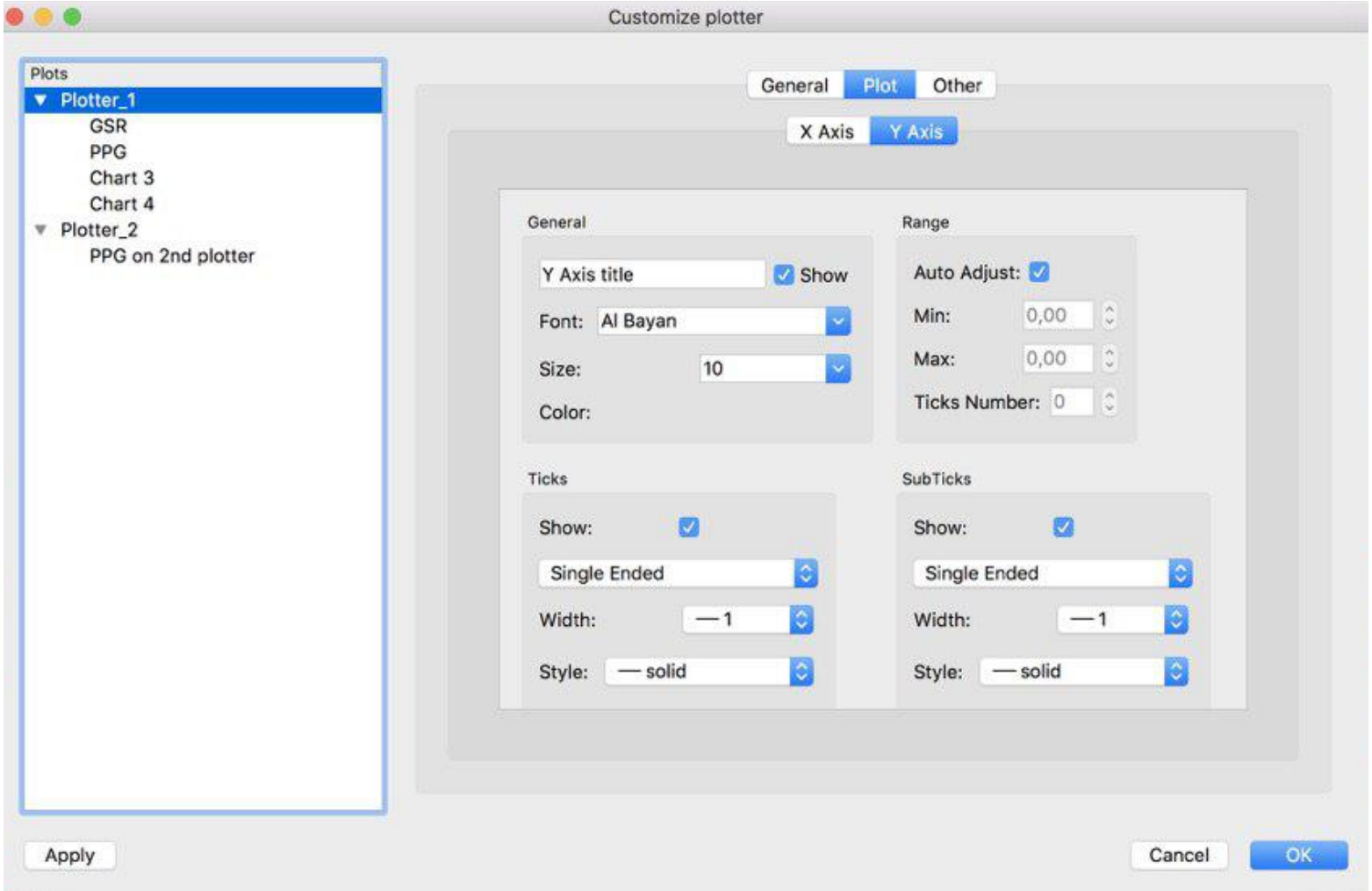
Examples


Plotter
File
Close
Connect
Disconnect
Plotter_1
GSR
PPG
Chart 3
305
169.3
33.6
-102
Y Axis title
X Axis title
Customize plotter
Plots
Plotter_1
GSR
PPG
Chart 3
Chart 4
General
Plot
Other
X Axis
Y Axis
General
Y Axis title
Show
Font: MS Shell Dlg 2
Size: 32
Color:
Range
Auto Adjust:
Min: 0,00
Max: 0,00
Ticks Number: 3
Ticks
Show:
Internal Single Ended
Width: 3
Style: solid
Color:
Length: 7
SubTicks
Show:
Single Ended
Width: 1
Style: solid
Color:
Length: 4
Grid
Show:
Width: 1
Style: solid
Color:
SubGrid
Show:
Width: 1
Style: dashed
Color:
Labels
Show
Font: MS Shell Dlg 2
Font Size: 18
Color:
Line terminator
Show:
Style:
Size: 10
OK
Cancel
Apply

Examples / Archlinux

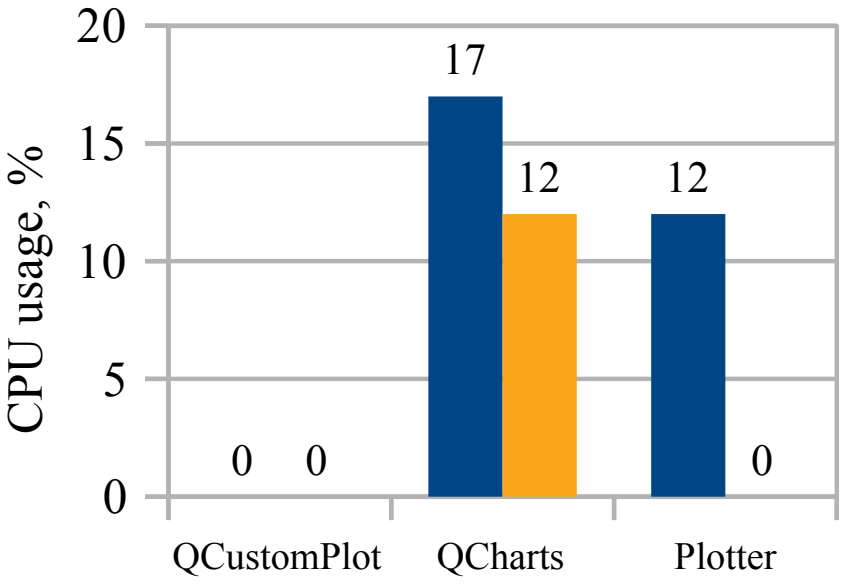


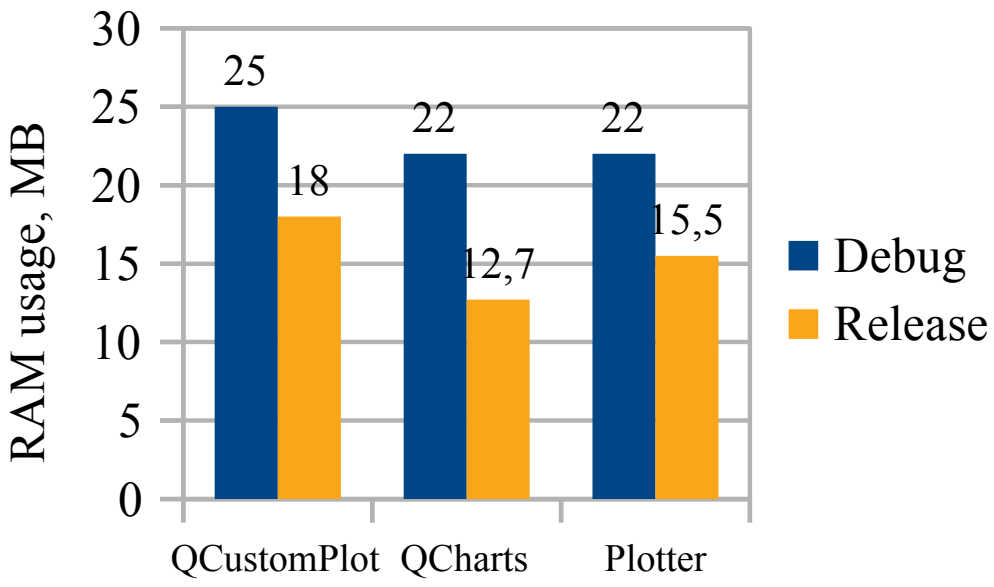
Examples / macOS Sierra



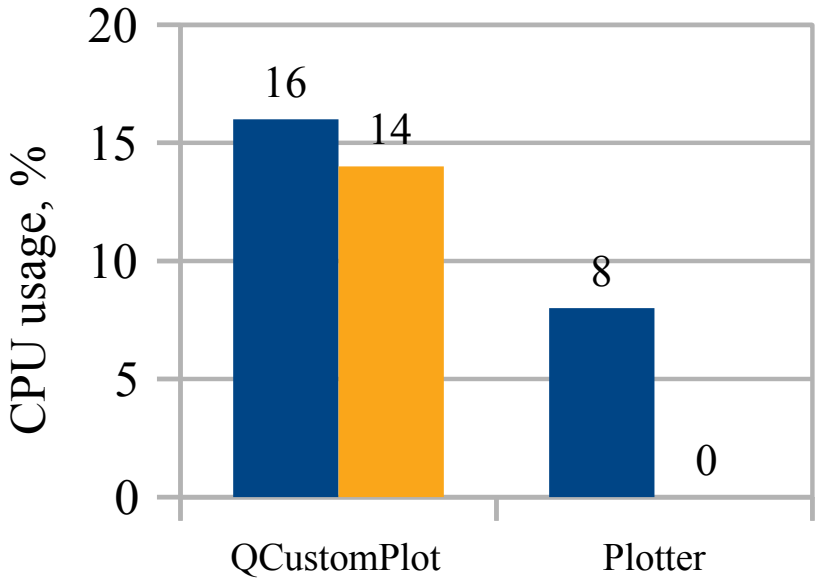
3. Performance comparison

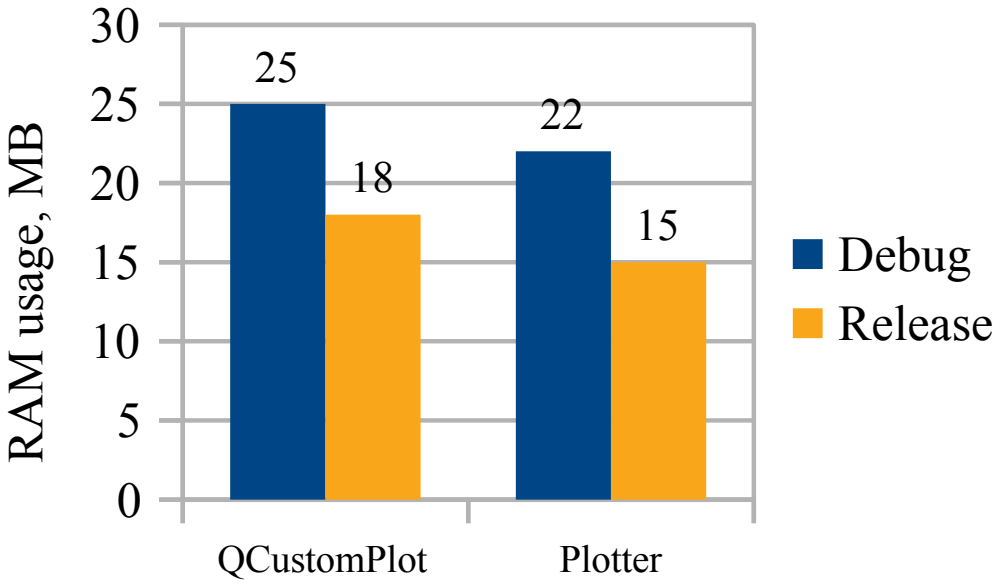
Windows 7 x32, basic plotting



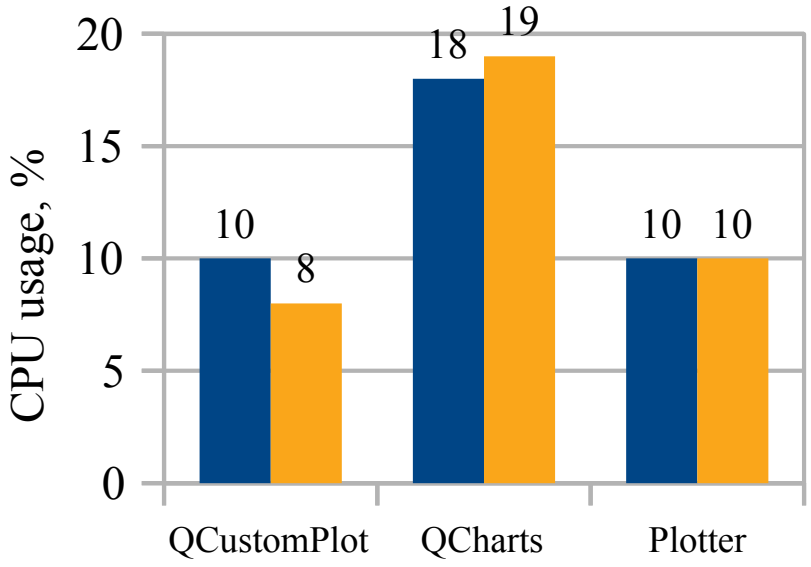


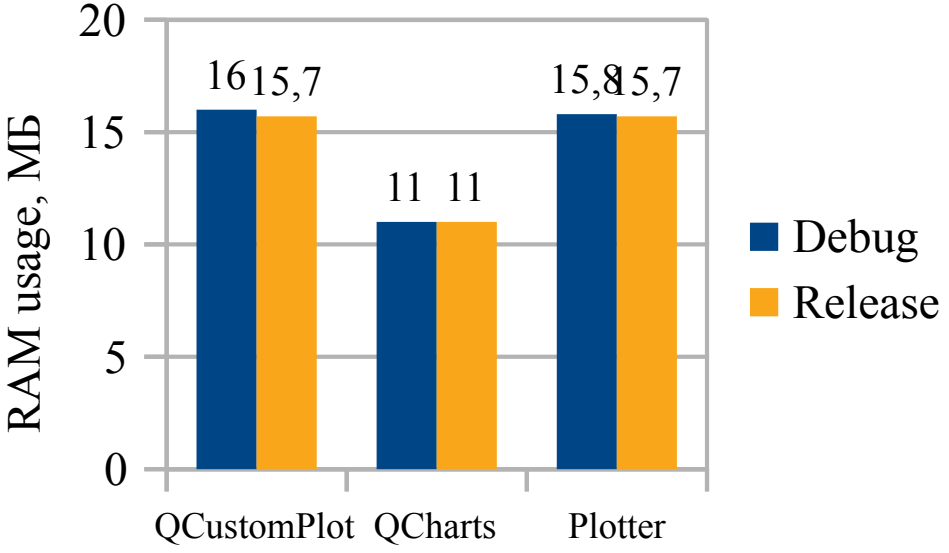
Windows 7 x32, visually enriched plotting



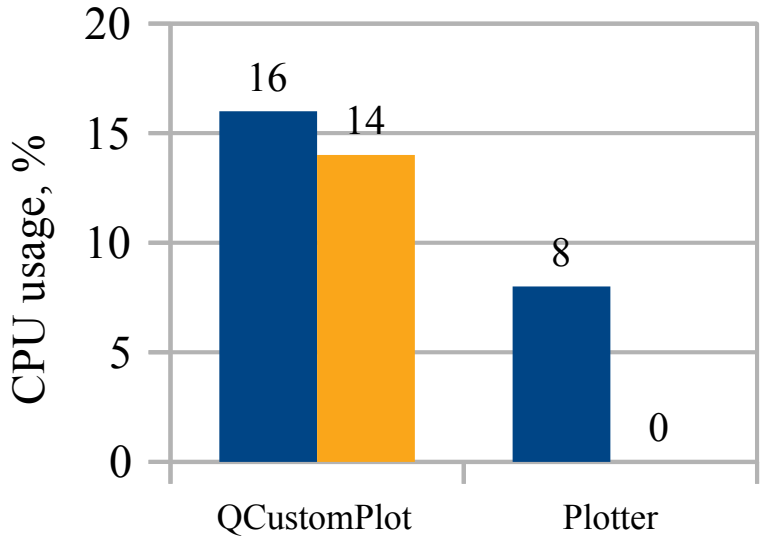


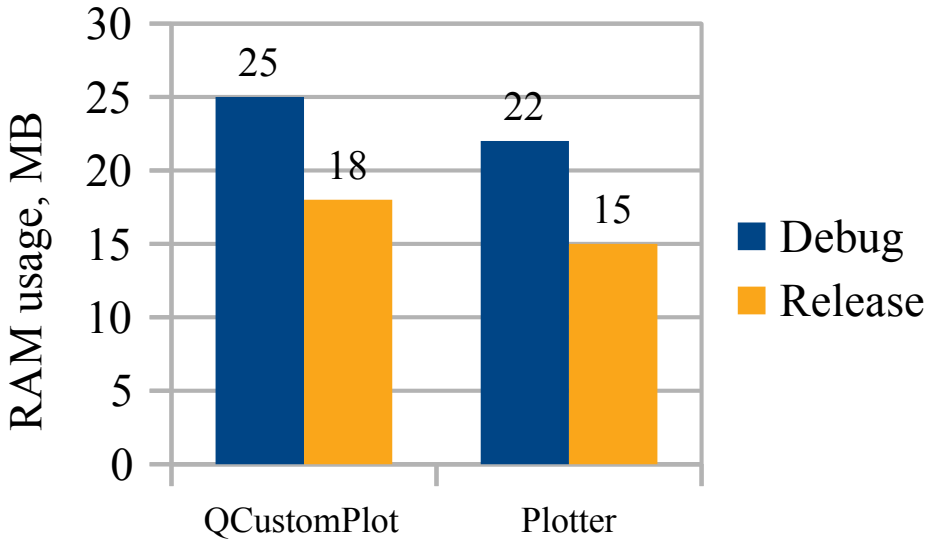
Ubuntu 17.10.1 x64, basic plotting

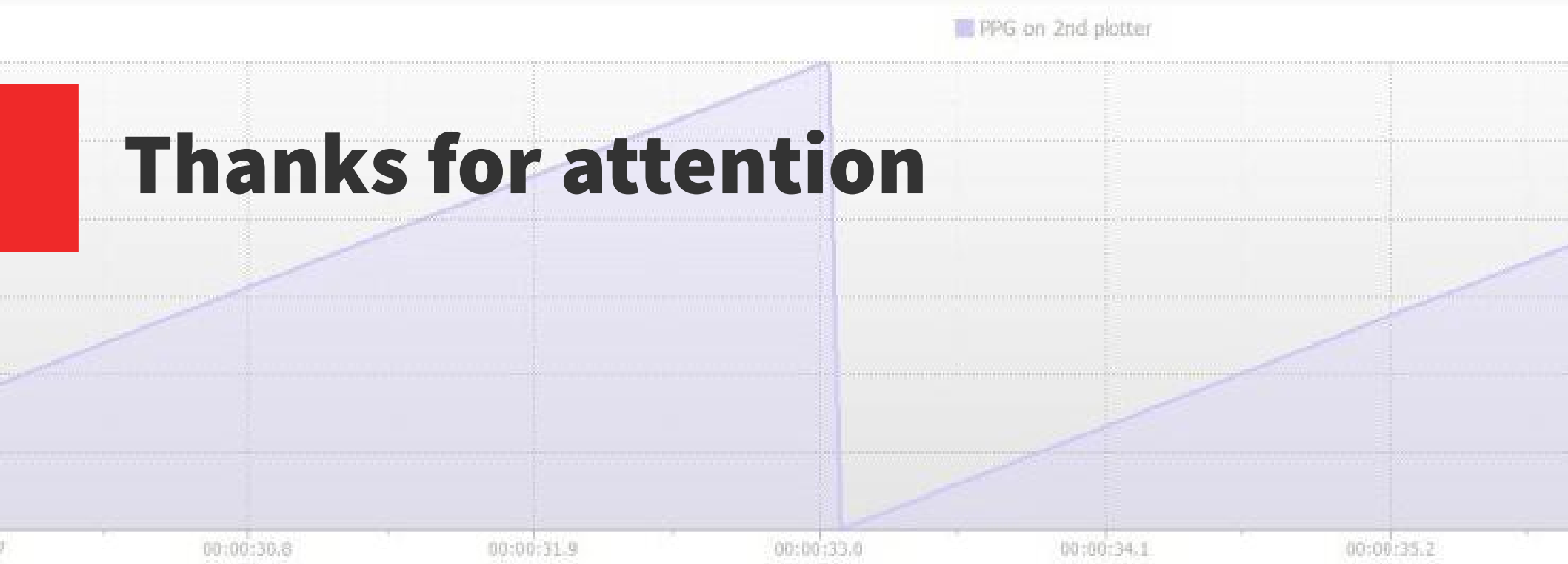




Ubuntu 17.10.1 x64, visually enriched plotting







Thanks for attention