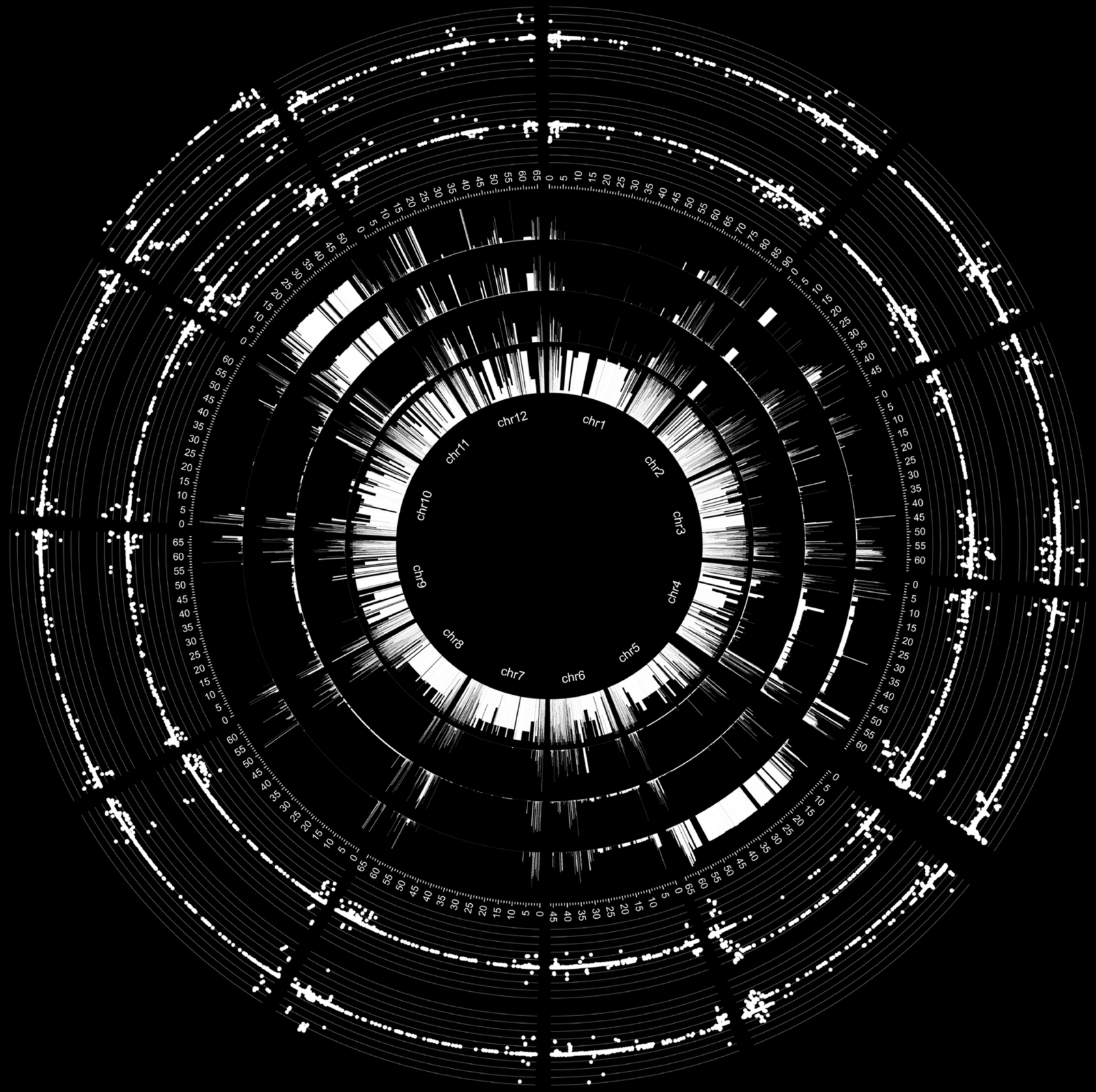


Introduction to Circos

Instructions

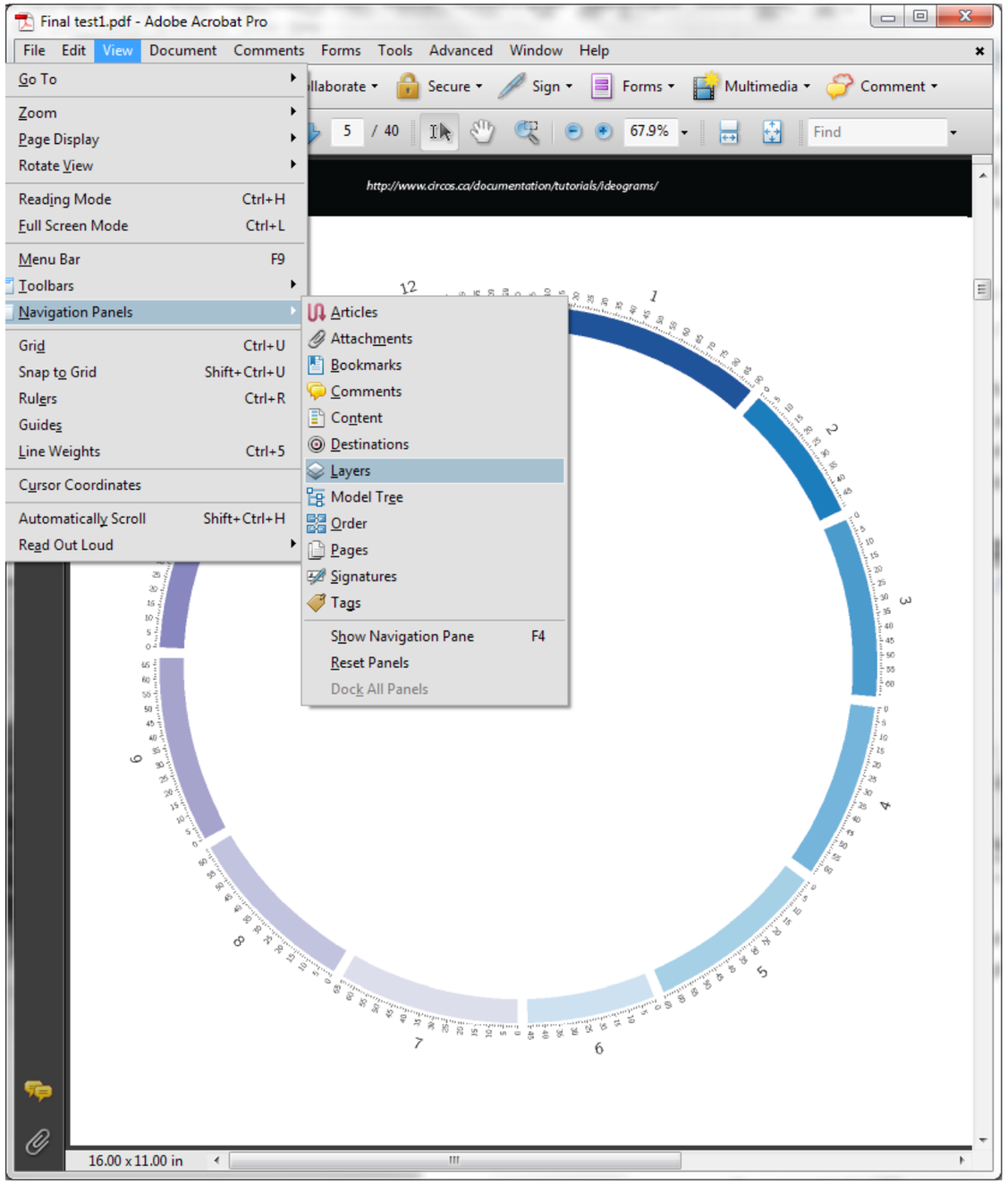
This tutorial is meant to be a quick introduction to the basics of Circos.

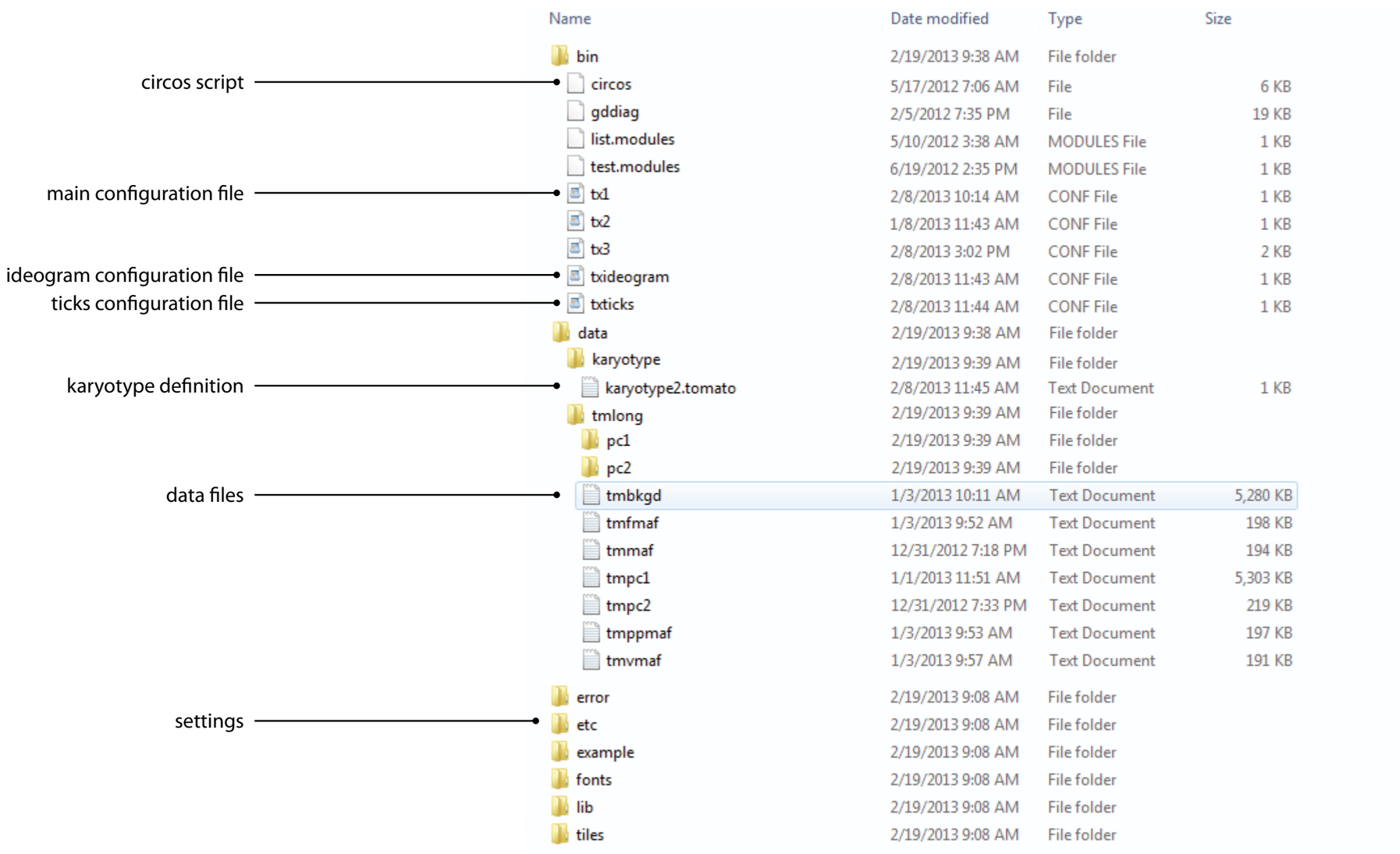
Slides are formatted to display a Circos image and its associated code side-by-side. As you click through the slides, the image and code will change and you can watch for movement and differences to determine which lines in the code change certain parts of the image. It might be helpful to click through the entire tutorial very quickly to get an overview of the Circos image, and then go back through in more detail.

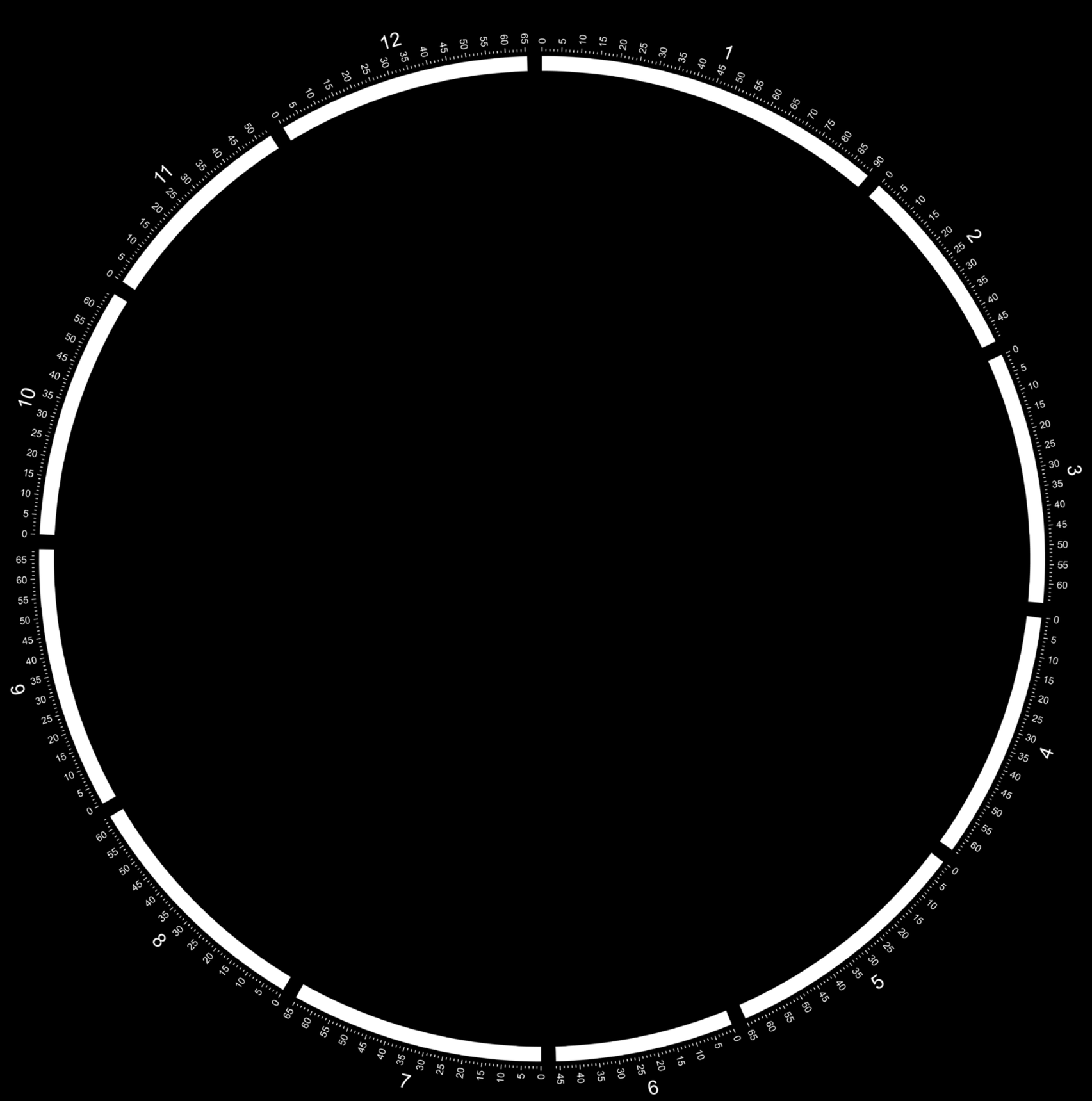
For more information on each slide, you can turn the "Comments" layer on in Adobe Acrobat.

The link at the top of each slide will open Martin Krzywinski's online Circos tutorials (from which this tutorial has been adapted) for very in-depth information.

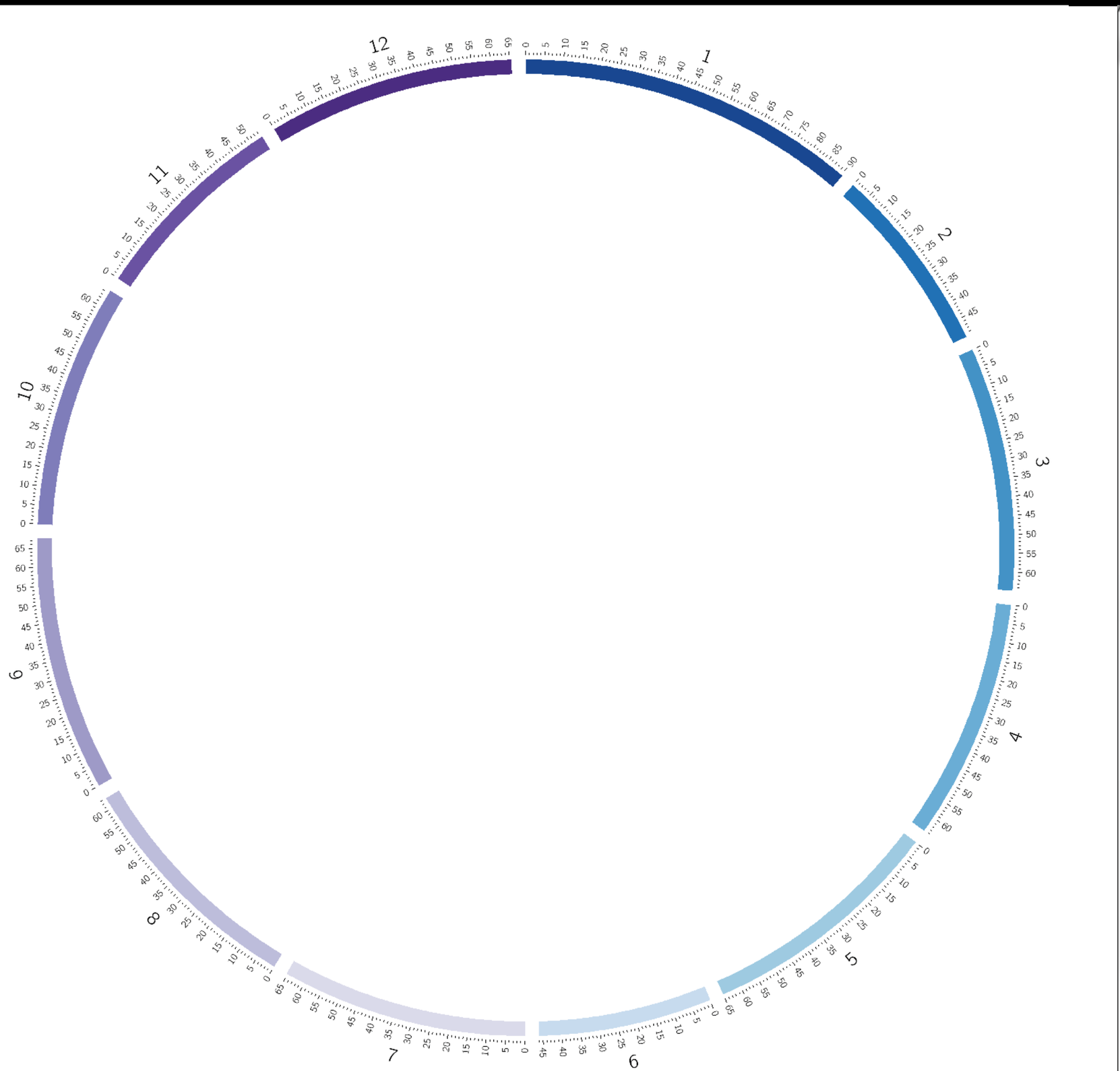
Krzywinski, M. et al. Circos: an Information Aesthetic for Comparative Genomics. Genome Res (2009) 19:1639-1645




circos script
main configuration file
ideogram configuration file
ticks configuration file
karyotype definition
data files
settings
Name
Date modified
Type
Size
bin 2/19/2013 9:38 AM File folder
circos 5/17/2012 7:06 AM File 6 KB
gddiag 2/5/2012 7:35 PM File 19 KB
list.modules 5/10/2012 3:38 AM MODULES File 1 KB
test.modules 6/19/2012 2:35 PM MODULES File 1 KB
tx1 2/8/2013 10:14 AM CONF File 1 KB
tx2 1/8/2013 11:43 AM CONF File 1 KB
tx3 2/8/2013 3:02 PM CONF File 2 KB
txideogram 2/8/2013 11:43 AM CONF File 1 KB
txticks 2/8/2013 11:44 AM CONF File 1 KB
data 2/19/2013 9:38 AM File folder
karyotype 2/19/2013 9:39 AM File folder
karyotype2.tomato 2/8/2013 11:45 AM Text Document 1 KB
tmlong 2/19/2013 9:39 AM File folder
pc1 2/19/2013 9:39 AM File folder
pc2 2/19/2013 9:39 AM File folder
tmbkgd 1/3/2013 10:11 AM Text Document 5,280 KB
tmfmaf 1/3/2013 9:52 AM Text Document 198 KB
tmmaf 12/31/2012 7:18 PM Text Document 194 KB
tmpc1 1/1/2013 11:51 AM Text Document 5,303 KB
tmpc2 12/31/2012 7:33 PM Text Document 219 KB
tmppmaf 1/3/2013 9:53 AM Text Document 197 KB
tmvmaf 1/3/2013 9:57 AM Text Document 191 KB
error 2/19/2013 9:08 AM File folder
etc 2/19/2013 9:08 AM File folder
example 2/19/2013 9:08 AM File folder
fonts 2/19/2013 9:08 AM File folder
lib 2/19/2013 9:08 AM File folder
tiles 2/19/2013 9:08 AM File folder



Configuration Files



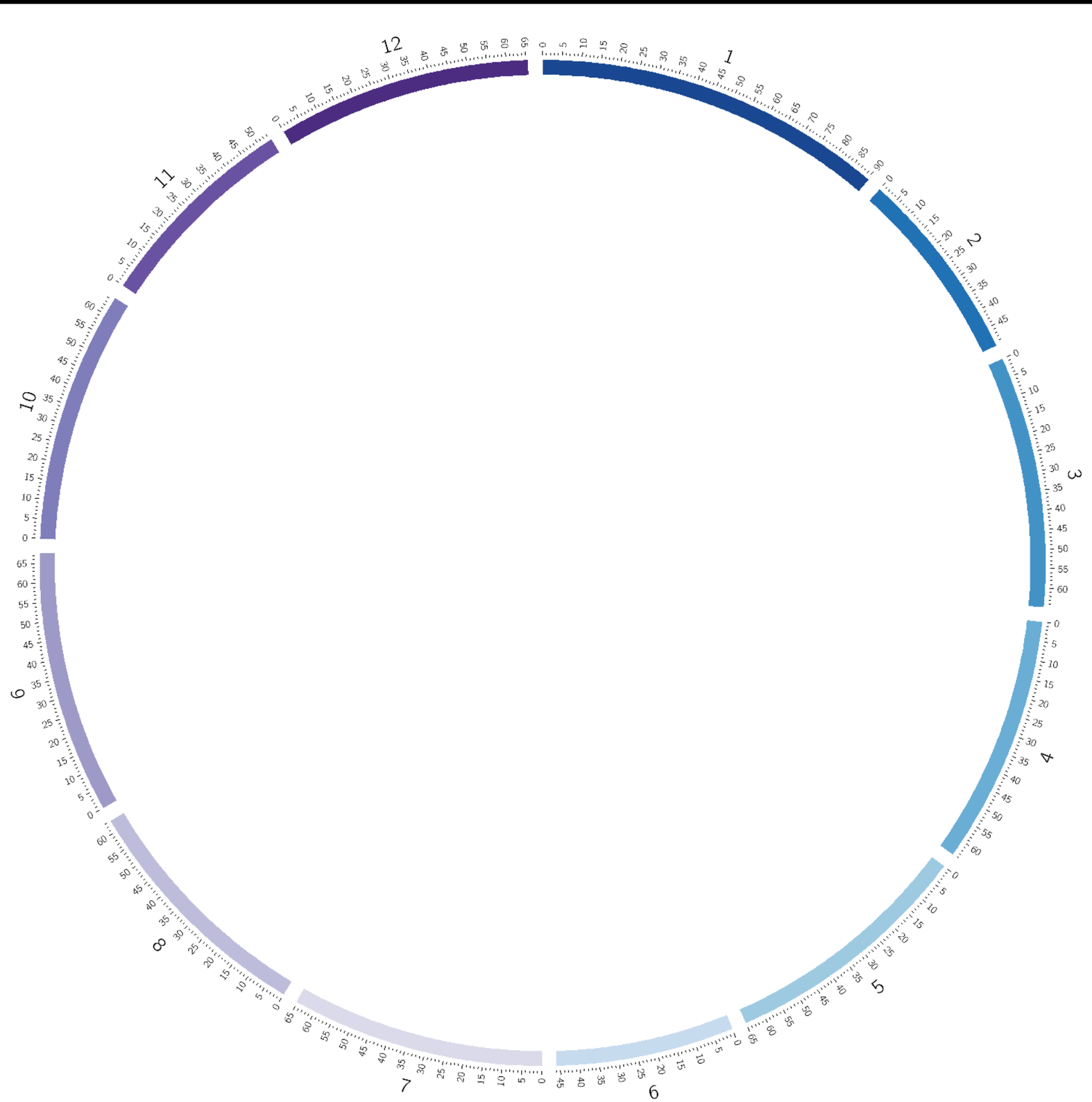
C:\C\Users\Brayton\Circos\c621\bin\tut1\tx1.conf - Notepad++

File Edit Search View Encoding Language Settings Macro Run Plugins
Window ? X

tx1.conf | txideogram.conf | txticks.conf | karyotype2.tomato.txt

```
1  karyotype = data/karyotype/karyotype2.tomato.txt
2
3  chromosomes_units = 1000000
4  chromosomes_display_default = yes
5
6
7  <<include txideogram.conf>>
8
9  <<include txticks.conf>>
10
11 <image>
12 <<include etc/image.conf>>
13 </image>
14
15 <<include etc/colors_fonts_patterns.conf>>
16
17 <<include etc/housekeeping.conf>>
```

Ln : 12 Col : 28 Sel : 0 | 0 Dos\Windows ANSI as UTF-8 INS



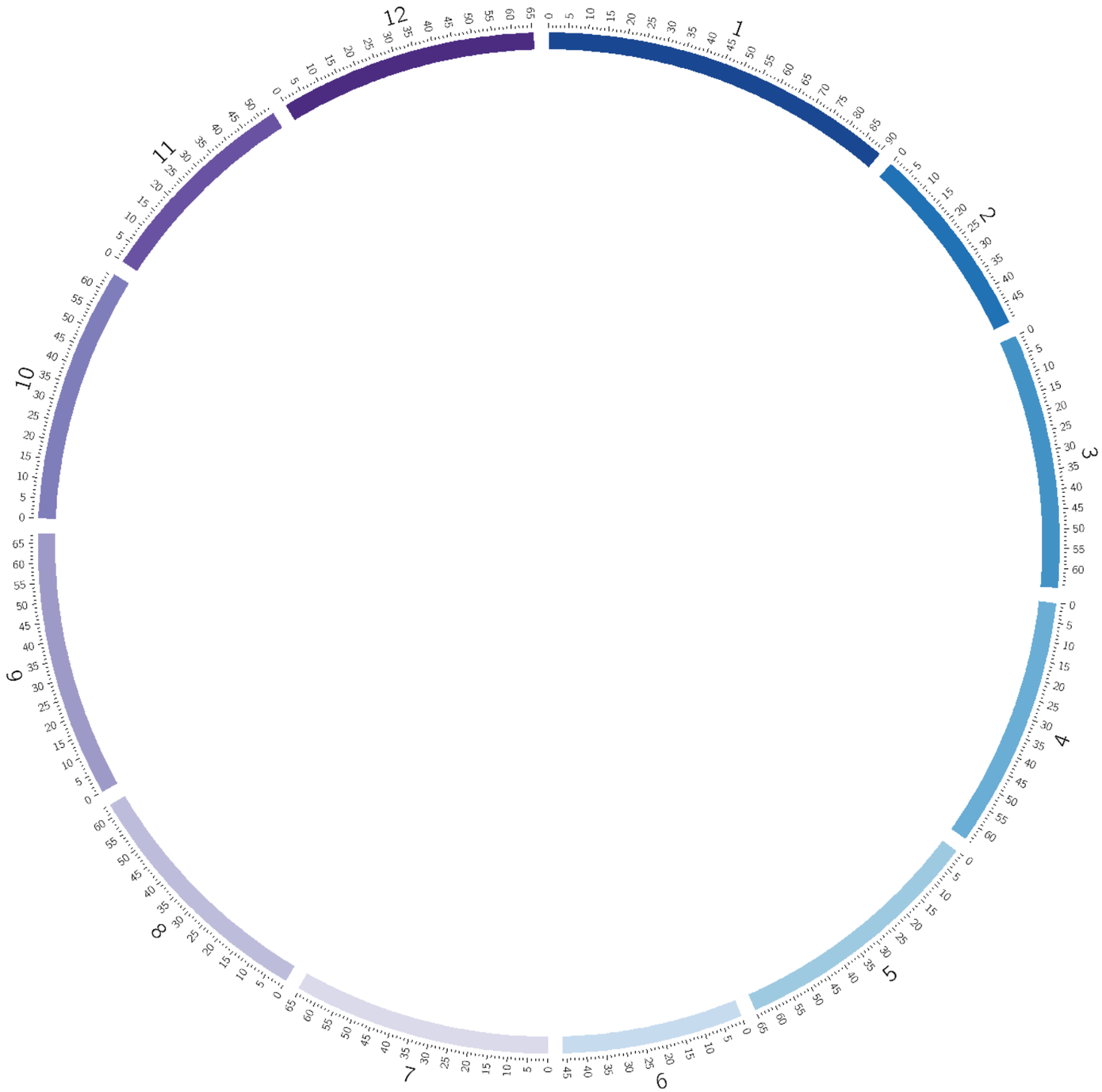
C:\C\Users\Brayton\Circos\c621\bin\tut1\txideogram.conf - Notepad++

File Edit Search View Encoding Language Settings Macro Run Plugins
Window ? X

tx1.conf | txideogram.conf | txticks.conf | karyotype2.tomato.txt

```
1  <ideogram>
2  show = yes
3  <spacing>
4  default = 0.005r
5
6
7  </spacing>
8
9  radius           = .9r
10 thickness        = 40p
11 fill             = yes
12
13
14
15 show_label       = yes
16
17 label_font       = default
18 label_radius     = 1.06r
19 label_size       = 40
20 label_parallel   = yes
21
22 show_bands = yes
23 fill_bands = yes
24
25 </ideogram>
```

Ln : 1 Col : 1 Sel : 0 | 0 Dos\Windows ANSI as UTF-8 INS



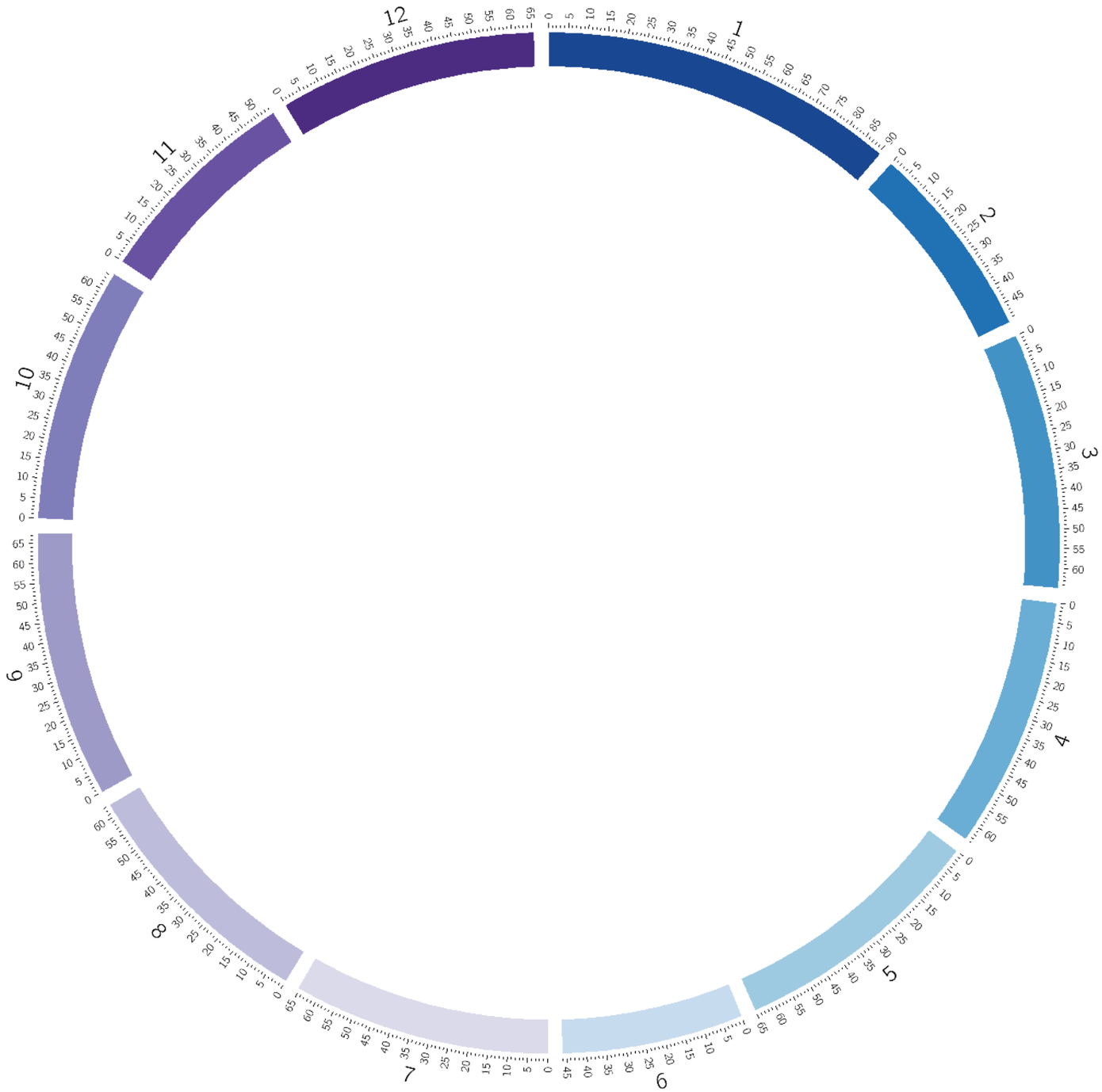
C:\C\Users\Brayton\Circos\c621\bin\tut1\txideogram.conf - Notepad++

File Edit Search View Encoding Language Settings Macro Run Plugins
Window ? X

tx1.conf | txideogram.conf | txticks.conf | karyotype2.tomato.txt

```
1  <ideogram>
2  show = yes
3  <spacing>
4  default = 0.005r
5
6
7  </spacing>
8
9  radius           = .8r
10 thickness        = 40p
11 fill             = yes
12
13
14
15 show_label       = yes
16
17 label_font       = default
18 label_radius     = 1.06r
19 label_size       = 40
20 label_parallel   = yes
21
22 show_bands = yes
23 fill_bands = yes
24
25 </ideogram>
```

Ln : 9 Col : 22 Sel : 0 | 0 Dos\Windows ANSI as UTF-8 INS



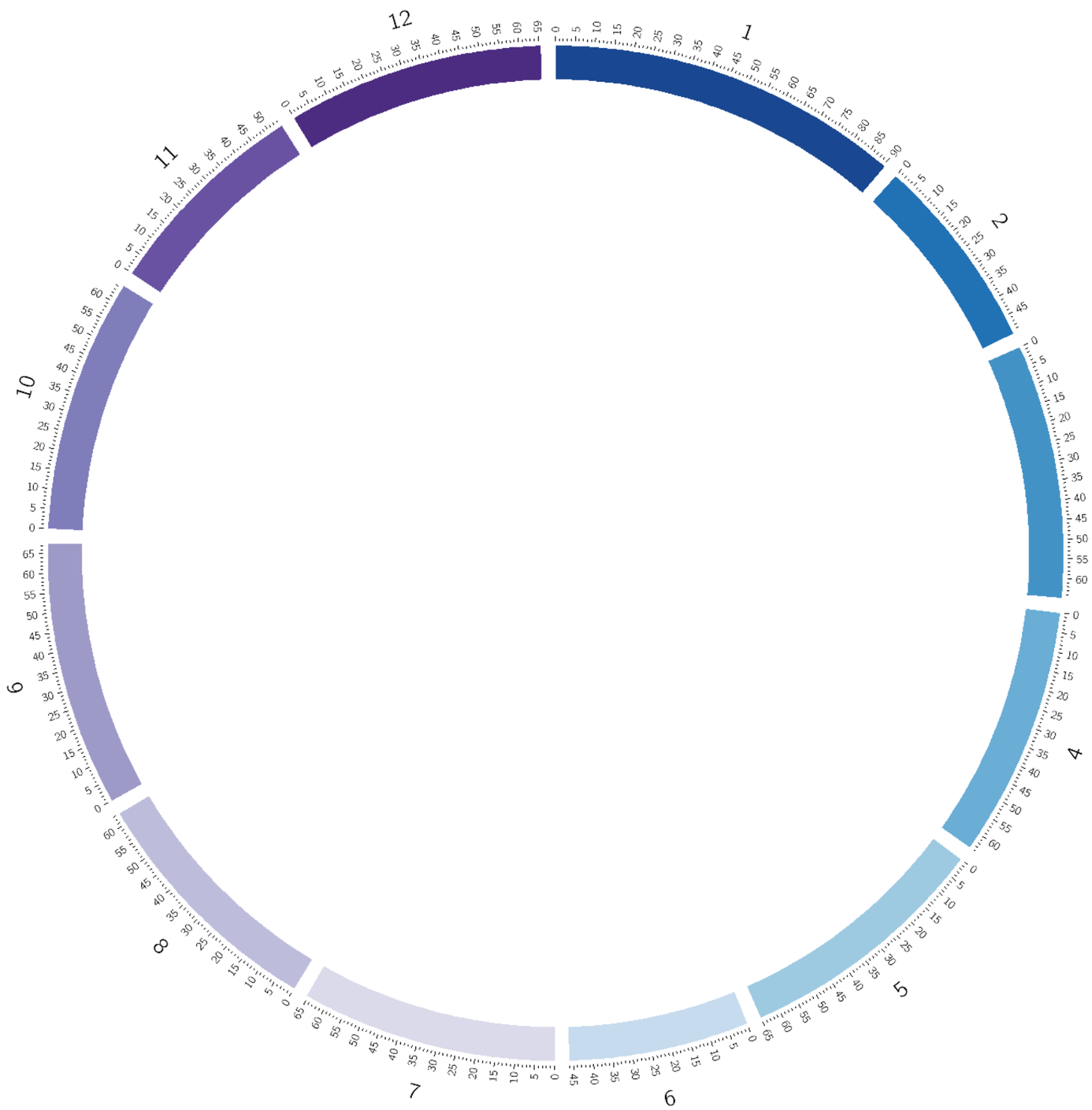
C:\C\Users\Brayton\Circos\c621\bin\tut1\txideogram.conf - Notepad++

File Edit Search View Encoding Language Settings Macro Run Plugins
Window ? X

tx1.conf | txideogram.conf | txticks.conf | karyotype2.tomato.txt

```
<ideogram>
show = yes
<spacing>
default = 0.005r


</spacing>

radius           = .8r
thickness        = 80p
fill             = yes



show_label       = yes

label_font       = default
label_radius     = 1.06r
label_size       = 40
label_parallel   = yes

show_bands = yes
fill_bands = yes

</ideogram>
```

Ln : 10 Col : 22 Sel : 0 | 0 Dos\Windows ANSI as UTF-8 INS



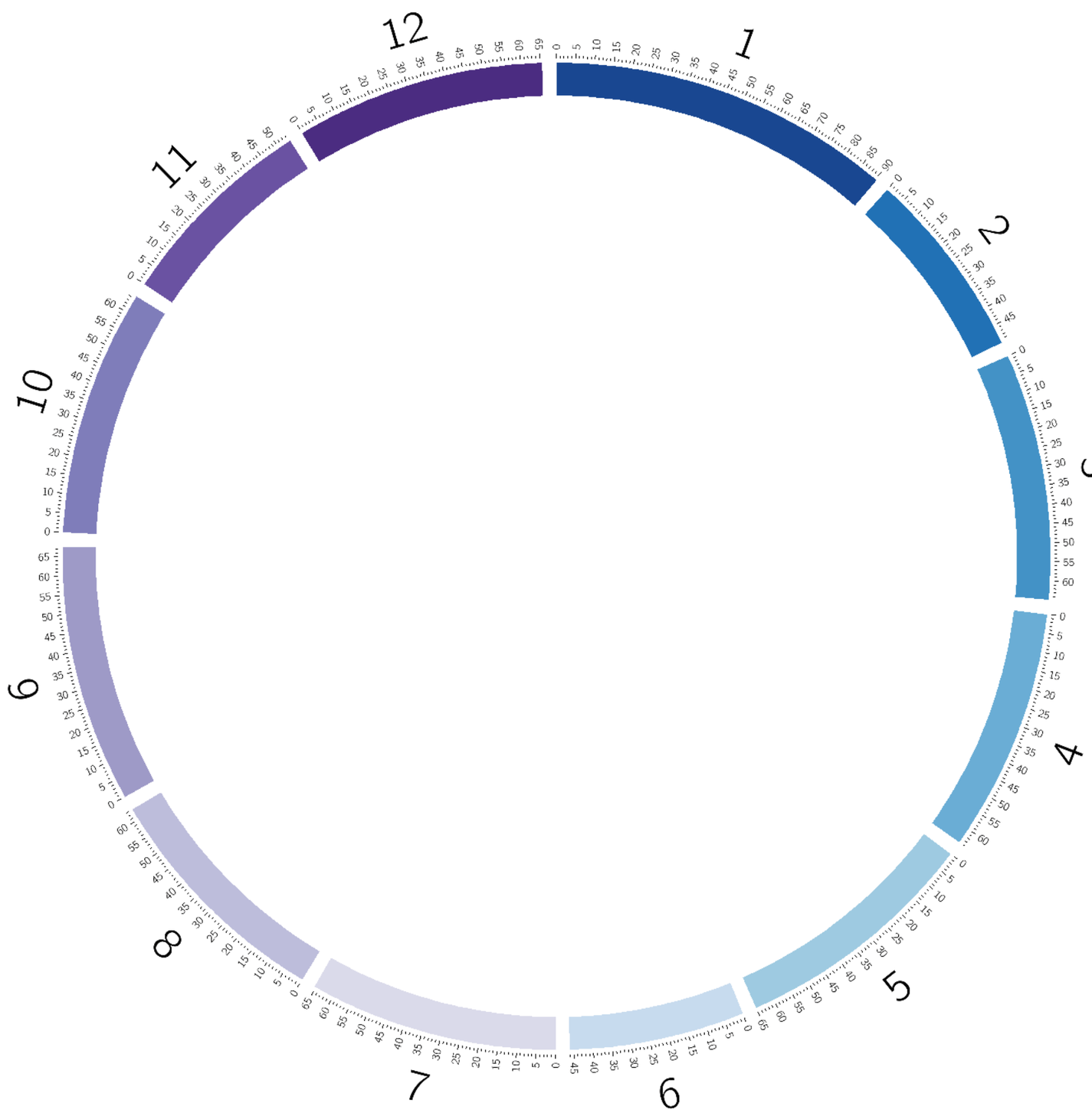
C:\C\Users\Brayton\Circos\c621\bin\tut1\txideogram.conf - Notepad++

File Edit Search View Encoding Language Settings Macro Run Plugins
Window ? X

tx1.conf | txideogram.conf | txticks.conf | karyotype2.tomato.txt

```
<ideogram>
show = yes
<spacing>
default = 0.005r


</spacing>

radius           = .8r
thickness        = 80p
fill             = yes



show_label       = yes

label_font       = default
label_radius     = 1.08r
label_size       = 40
label_parallel   = yes

show_bands = yes
fill_bands = yes

</ideogram>
```

Ln : 18 Col : 24 Sel : 0 | 0 Dos\Windows ANSI as UTF-8 INS



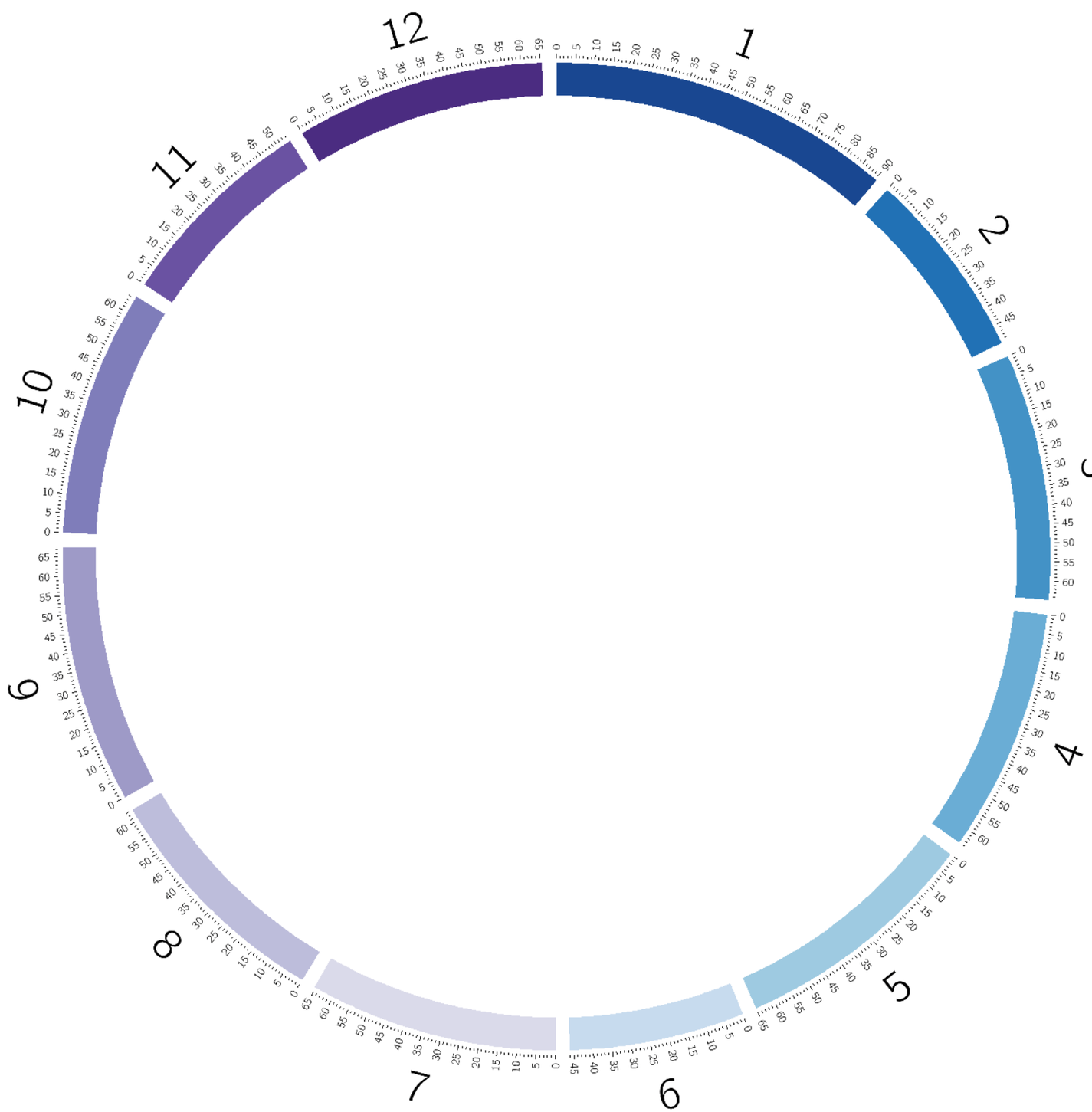
C:\C\Users\Brayton\Circos\c621\bin\tut1\txideogram.conf - Notepad++

File Edit Search View Encoding Language Settings Macro Run Plugins
Window ? X

tx1.conf | txideogram.conf | txticks.conf | karyotype2.tomato.txt

```
1  <ideogram>
2  show = yes
3  <spacing>
4  default = 0.005r
5
6
7  </spacing>
8
9  radius           = .8r
10 thickness        = 80p
11 fill             = yes
12
13
14
15 show_label       = yes
16
17 label_font       = default
18 label_radius     = 1.08r
19 label_size       = 80
20 label_parallel   = yes
21
22 show_bands = yes
23 fill_bands = yes
24
25 </ideogram>
```

Ln : 19 Col : 22 Sel : 0 | 0 Dos\Windows ANSI as UTF-8 INS



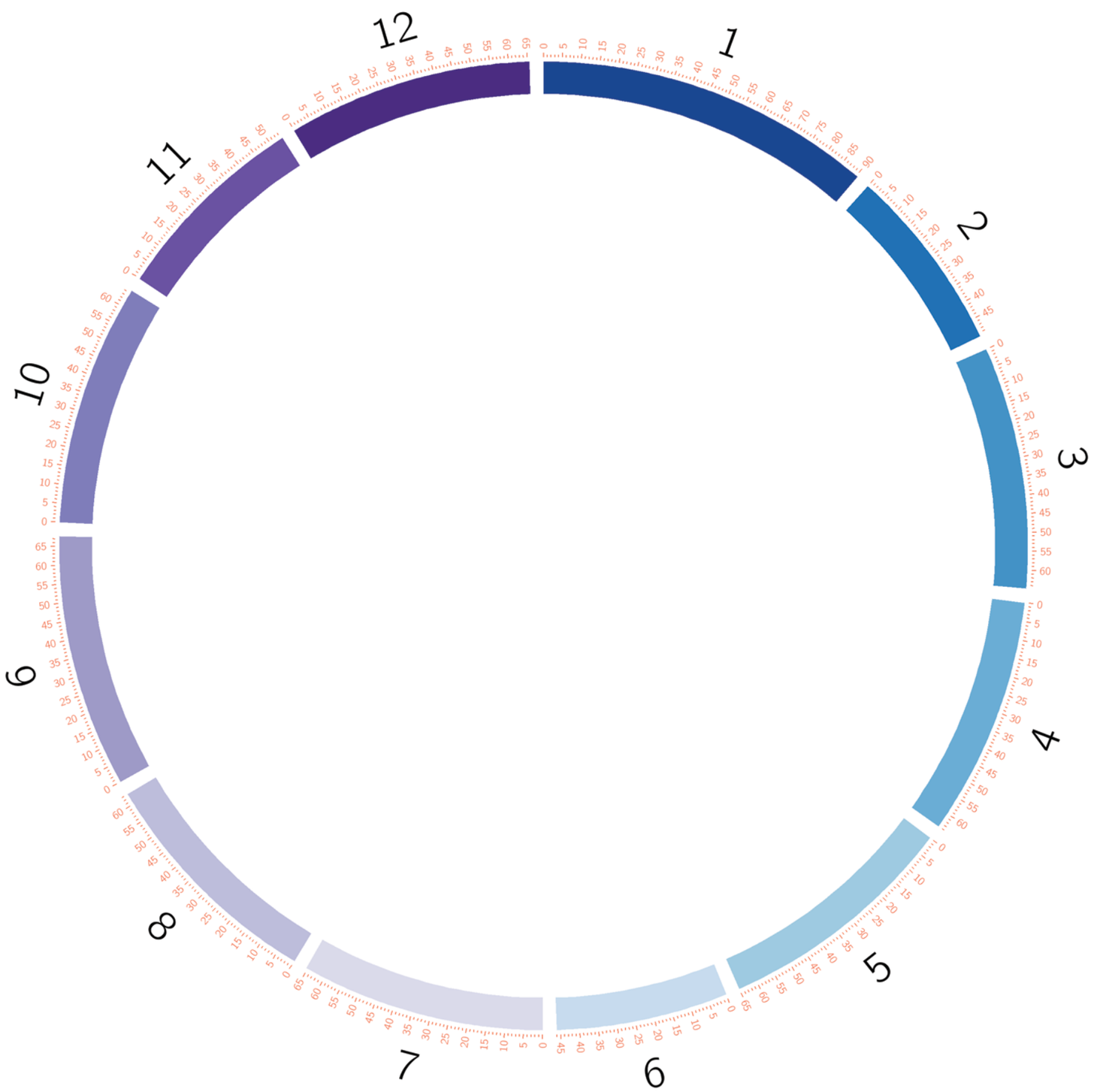
C:\C\Users\Brayton\Circos\c621\bin\tut1\txticks.conf - Notepad++

File Edit Search View Encoding Language Settings Macro Run Plugins
Window ? X

tx1.conf | txideogram.conf | txticks.conf | karyotype2.tomato.txt

```
1  show_ticks          = yes
2  show_tick_labels    = yes
3
4  <ticks>
5  radius           = 1.01r
6  color            = black
7  thickness        = 2p
8
9  multiplier       = 1e-6
10
11
12 format           = %d
13
14 <tick>
15 spacing = 1u
16 size = 5p
17 </ticks>
18
19 <tick>
20 spacing        = 5u
21 size           = 10p
22 show_label     = yes
23 label_size     = 20p
24 label_offset   = 10p
25 format         = %d
26 </tick>
27
28 </ticks>
```

Ln : 6 Col : 25 Sel : 0 | 0 Dos\Windows ANSI as UTF-8 INS



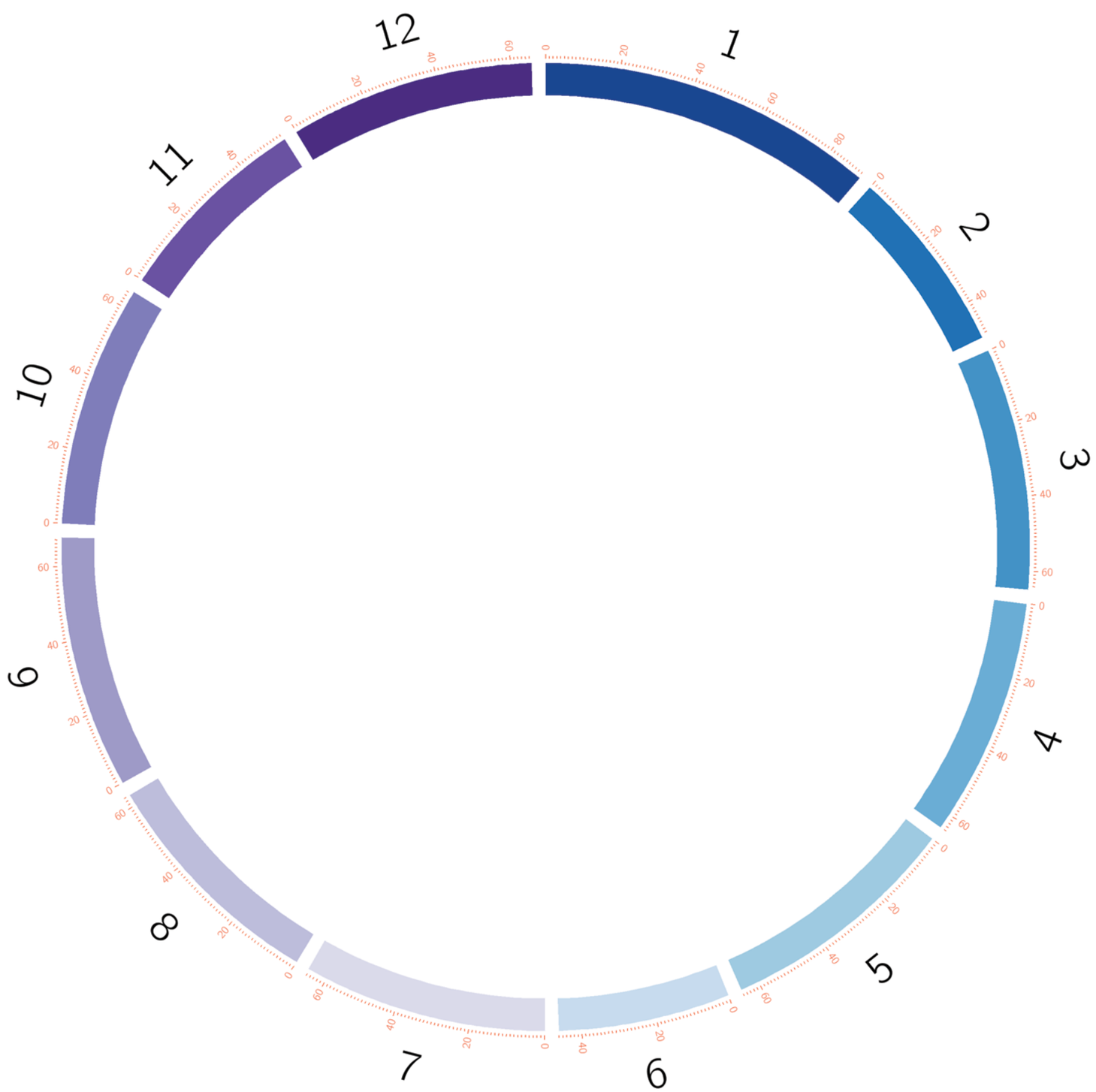
C:\C\Users\Brayton\Circos\c621\bin\tut1\txticks.conf - Notepad++

File Edit Search View Encoding Language Settings Macro Run Plugins
Window ? X

tx1.conf | txideogram.conf | txticks.conf | karyotype2.tomato.txt

```
1  show_ticks          = yes
2  show_tick_labels    = yes
3
4  <ticks>
5  radius           = 1.01r
6  color            = red
7  thickness        = 2p
8
9  multiplier       = 1e-6
10
11
12 format           = %d
13
14 <tick>
15 spacing = 1u
16 size = 5p
17 </ticks>
18
19 <tick>
20 spacing        = 5u
21 size           = 10p
22 show_label     = yes
23 label_size     = 20p
24 label_offset   = 10p
25 format         = %d
26 </tick>
27
28 </ticks>
```

Ln : 6 Col : 23 Sel : 0 | 0 Dos\Windows ANSI as UTF-8 INS



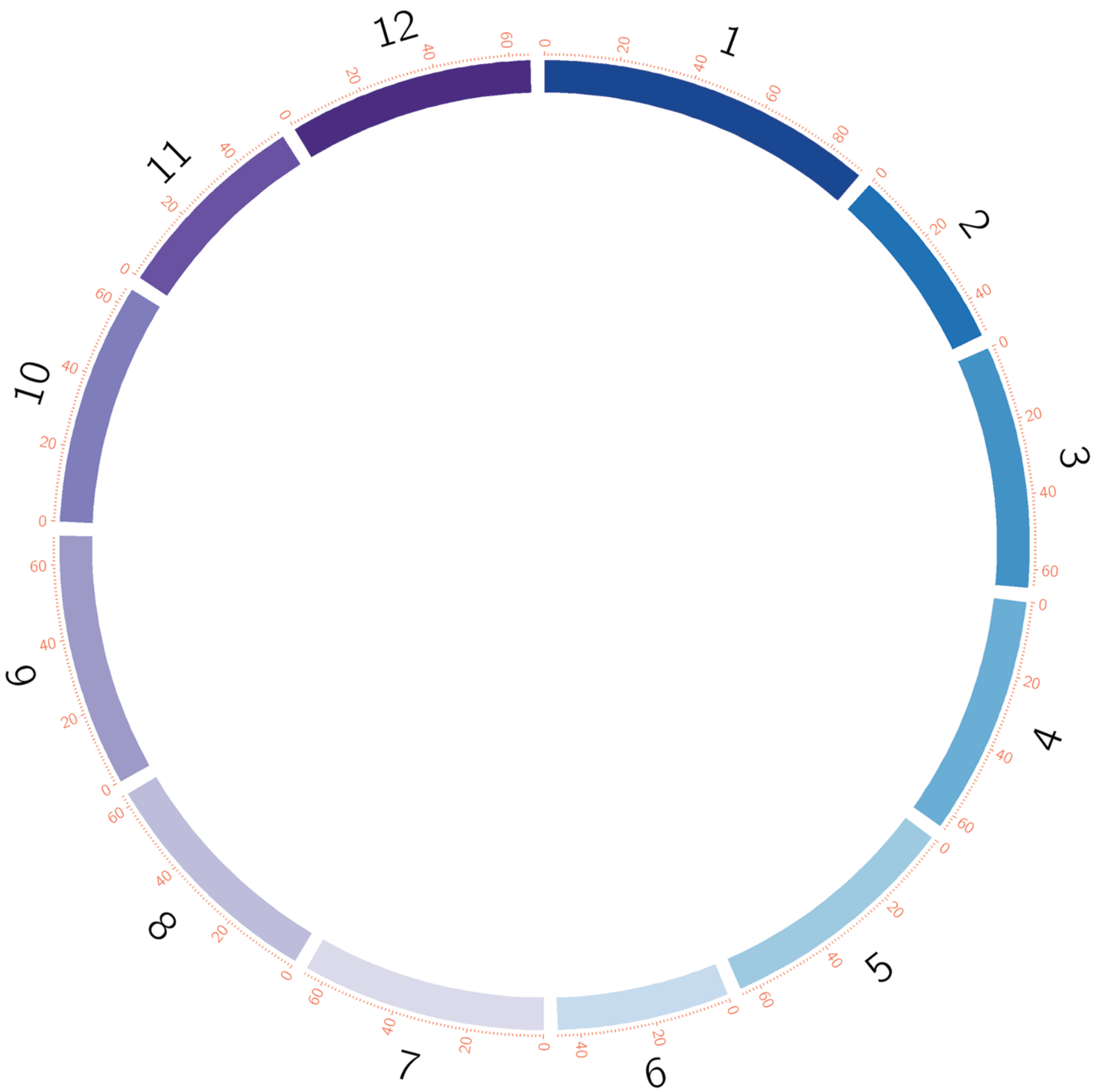
C:\C\Users\Brayton\Circos\c621\bin\tut1\txticks.conf - Notepad++

File Edit Search View Encoding Language Settings Macro Run Plugins
Window ? X

tx1.conf | txideogram.conf | txticks.conf | karyotype2.tomato.txt

```
1  show_ticks          = yes
2  show_tick_labels    = yes
3
4  <ticks>
5  radius           = 1.01r
6  color            = red
7  thickness        = 2p
8
9  multiplier       = 1e-6
10
11
12 format           = %d
13
14 <tick>
15 spacing = 1u
16 size = 5p
17 </ticks>
18
19 <tick>
20 spacing        = 20u
21 size           = 10p
22 show_label     = yes
23 label_size     = 20p
24 label_offset   = 10p
25 format         = %d
26 </tick>
27
28 </ticks>
```

Ln : 20 Col : 20 Sel : 0 | 0 Dos\Windows ANSI as UTF-8 INS



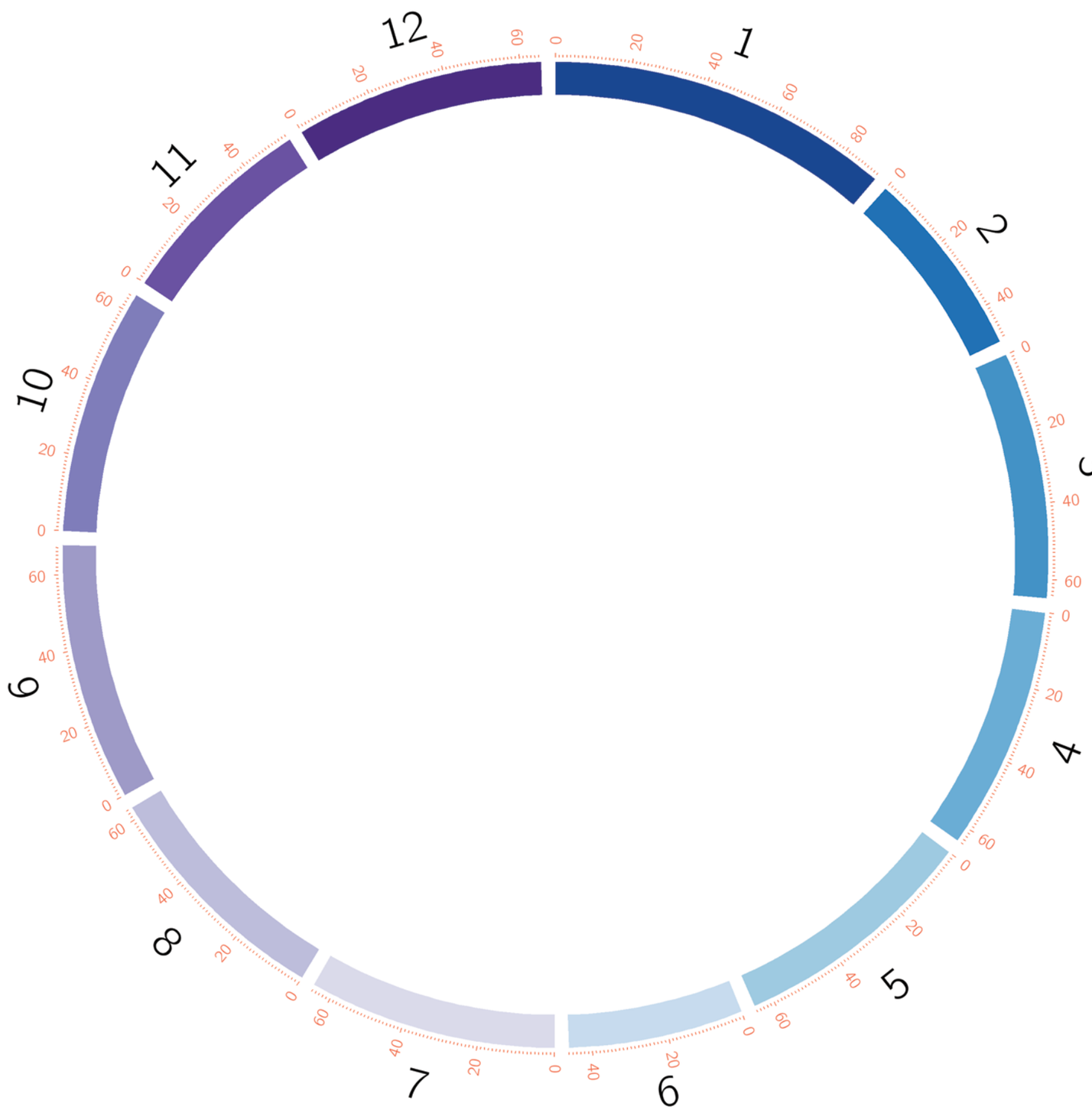
C:\C\Users\Brayton\Circos\c621\bin\tut1\txticks.conf - Notepad++

File Edit Search View Encoding Language Settings Macro Run Plugins
Window ? X

tx1.conf | txideogram.conf | txticks.conf | karyotype2.tomato.txt

```
1  show_ticks          = yes
2  show_tick_labels    = yes
3
4  <ticks>
5  radius           = 1.01r
6  color            = red
7  thickness        = 2p
8
9  multiplier       = 1e-6
10
11
12 format           = %d
13
14 <tick>
15 spacing = 1u
16 size = 5p
17 </ticks>
18
19 <tick>
20 spacing        = 20u
21 size           = 10p
22 show_label     = yes
23 label_size     = 30p
24 label_offset   = 10p
25 format         = %d
26 </tick>
27
28 </ticks>
```

Ln : 23 Col : 20 Sel : 0 | 0 Dos\Windows ANSI as UTF-8 INS



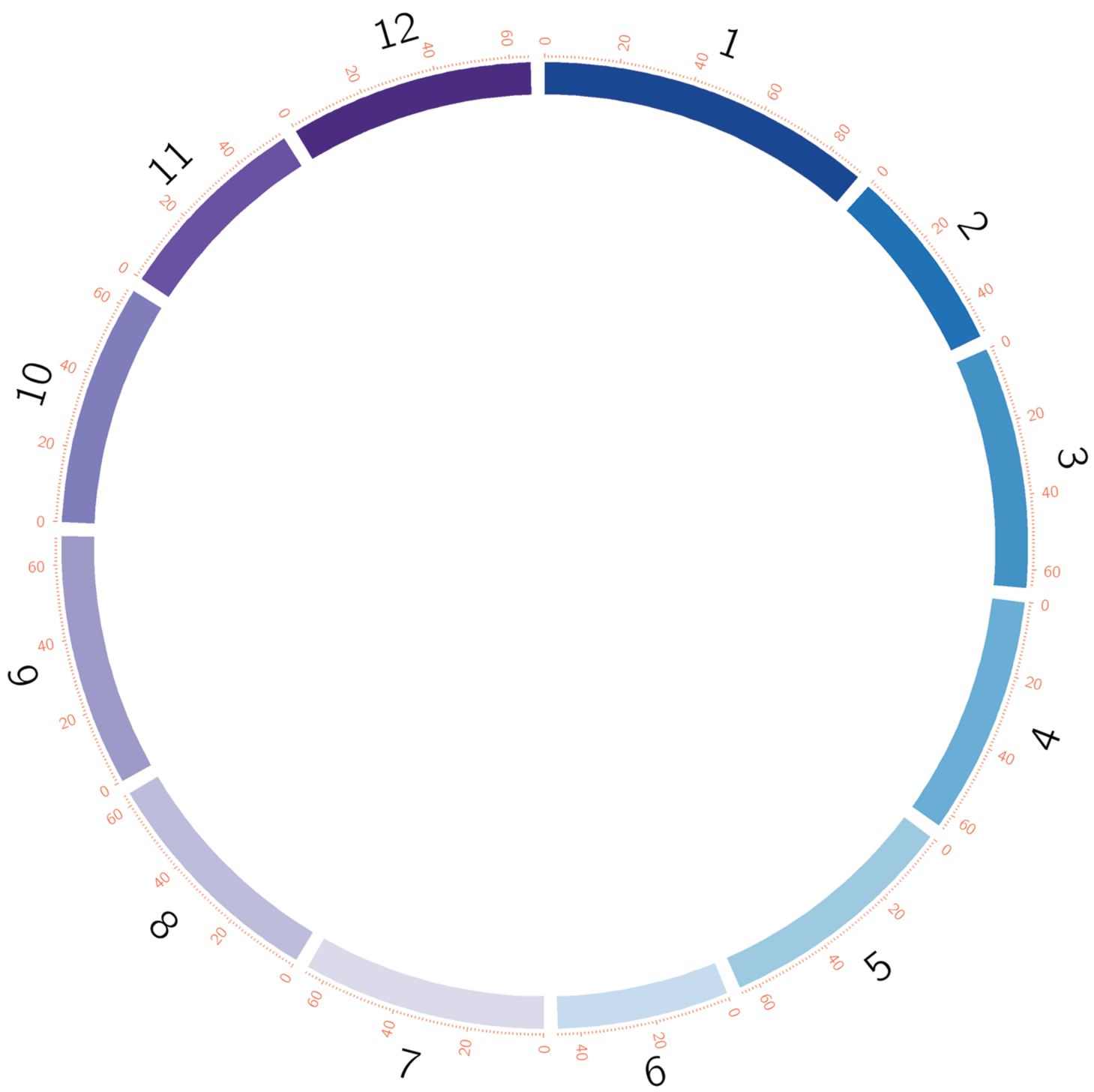
C:\C\Users\Brayton\Circos\c621\bin\tut1\txticks.conf - Notepad++

File Edit Search View Encoding Language Settings Macro Run Plugins
Window ? X

tx1.conf | txideogram.conf | txticks.conf | karyotype2.tomato.txt

```
1  show_ticks          = yes
2  show_tick_labels    = yes
3
4  <ticks>
5  radius           = 1.01r
6  color            = red
7  thickness        = 2p
8
9  multiplier       = 1e-6
10
11
12 format           = %d
13
14 <tick>
15 spacing = 1u
16 size = 5p
17 </ticks>
18
19 <tick>
20 spacing        = 20u
21 size           = 10p
22 show_label     = yes
23 label_size     = 30p
24 label_offset   = 20p
25 format         = %d
26 </tick>
27
28 </ticks>
```

Ln : 24 Col : 20 Sel : 0 | 0 Dos\Windows ANSI as UTF-8 INS



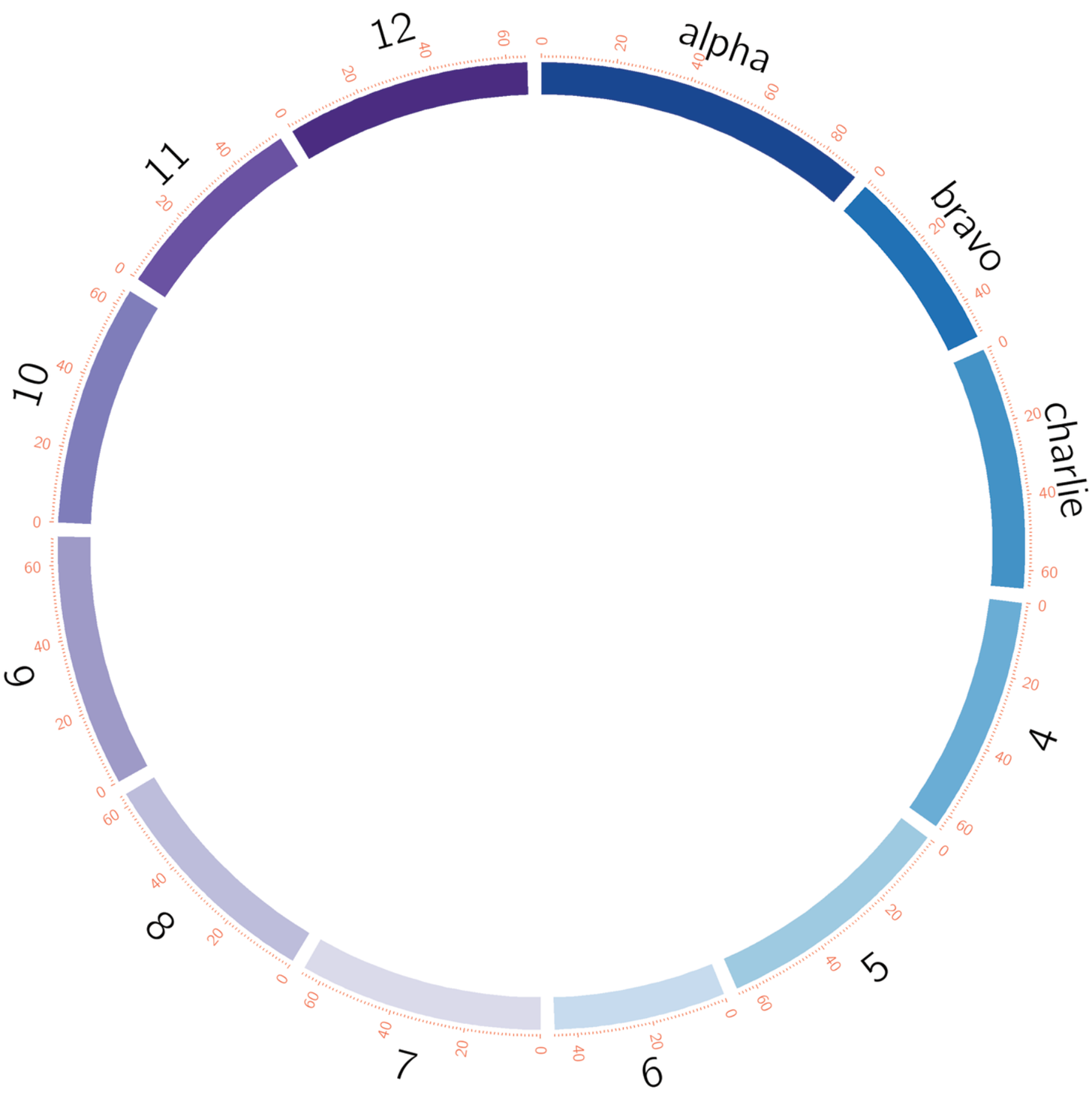
C:\C\Users\Brayton\Circos\c621\data\karyotype\karyotype2.tomato.txt -...

File Edit Search View Encoding Language Settings Macro Run Plugins Window ? X

tx1.conf | txideogram.conf | txticks.conf | karyotype2.tomato.txt

```
1  chr - CH01  1  0  90304244  vvdblue
2  chr - CH02  2  0  49918294  vdblue
3  chr - CH03  3  0  64840714  dblue
4  chr - CH04  4  0  64064312  blue
5  chr - CH05  5  0  65021438  lblue
6  chr - CH06  6  0  46041636  vlblue
7  chr - CH07  7  0  65268621  vlpurple
8  chr - CH08  8  0  63032657  lpurple
9  chr - CH09  9  0  67662091  purple
10 chr - CH10 10  0  64834305  dpurple
11 chr - CH11 11  0  53386025  vdpurple
12 chr - CH12 12  0  65486253  vvdpurple
13
14
15
16
17
18
19
20
21
22
23
24
25
```

Ln : 1 Col : 1 Sel : 0 | 0 Dos\Windows ANSI as UTF-8 INS



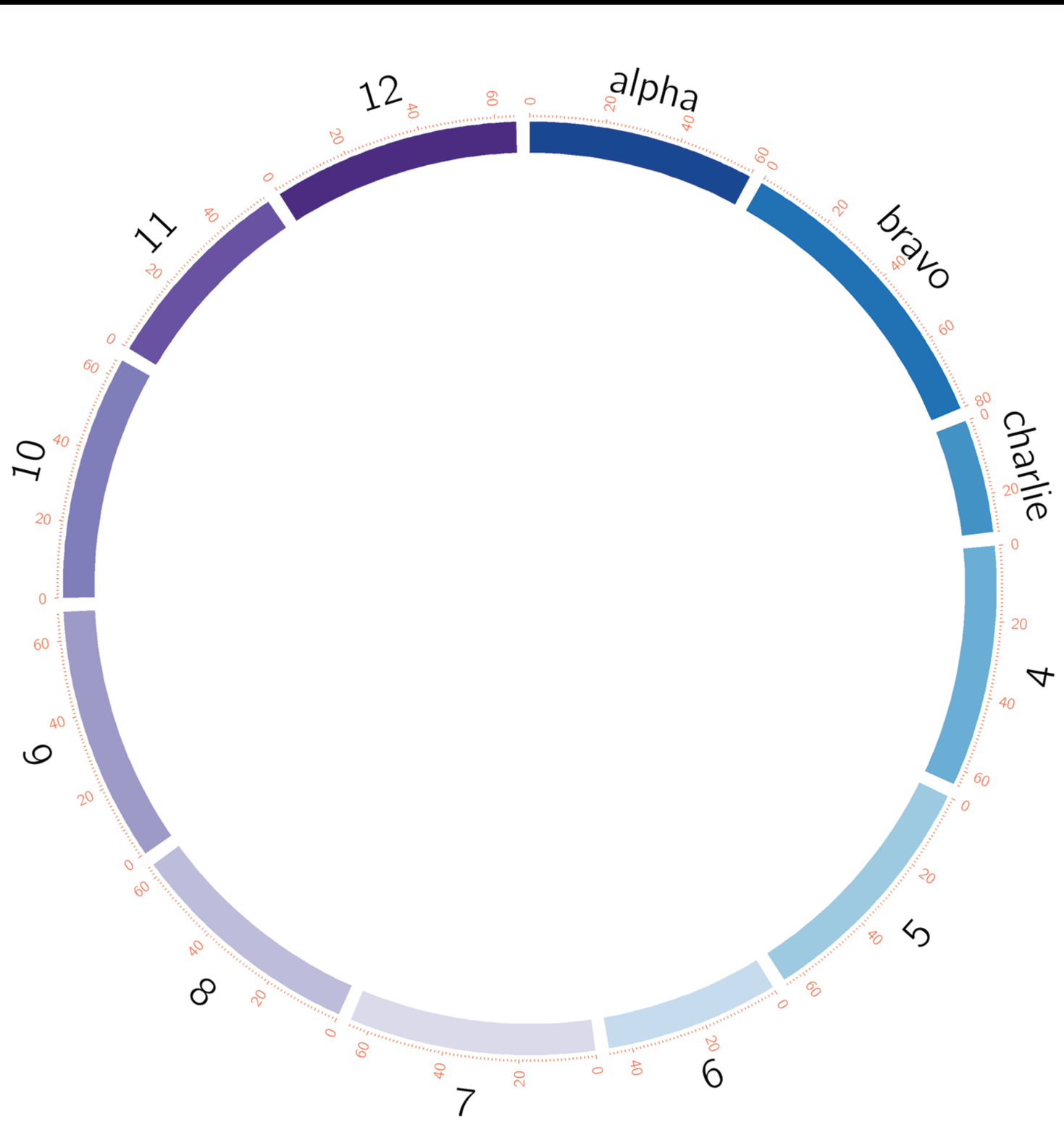
C:\C\Users\Brayton\Circos\c621\data\karyotype\karyotype2.tomato.txt -...

File Edit Search View Encoding Language Settings Macro Run Plugins Window ? X

tx1.conf | txideogram.conf | txticks.conf | karyotype2.tomato.txt

```
1  chr - CH01 alpha 0  90304244 vvdblue
2  chr - CH02 bravo 0  49918294 vdblue
3  chr - CH03 charlie 0  64840714 dblue
4  chr - CH04 4  0  64064312 blue
5  chr - CH05 5  0  65021438 lblue
6  chr - CH06 6  0  46041636 vlblue
7  chr - CH07 7  0  65268621 vlpurple
8  chr - CH08 8  0  63032657 lpurple
9  chr - CH09 9  0  67662091 purple
10 chr - CH10 10 0  64834305 dpurple
11 chr - CH11 11 0  53386025 vdpurple
12 chr - CH12 12 0  65486253 vvdpurple
13
14
15
16
17
18
19
20
21
22
23
24
25
```

Ln : 3 Col : 24 Sel : 0 | 0 Dos\Windows ANSI as UTF-8 INS



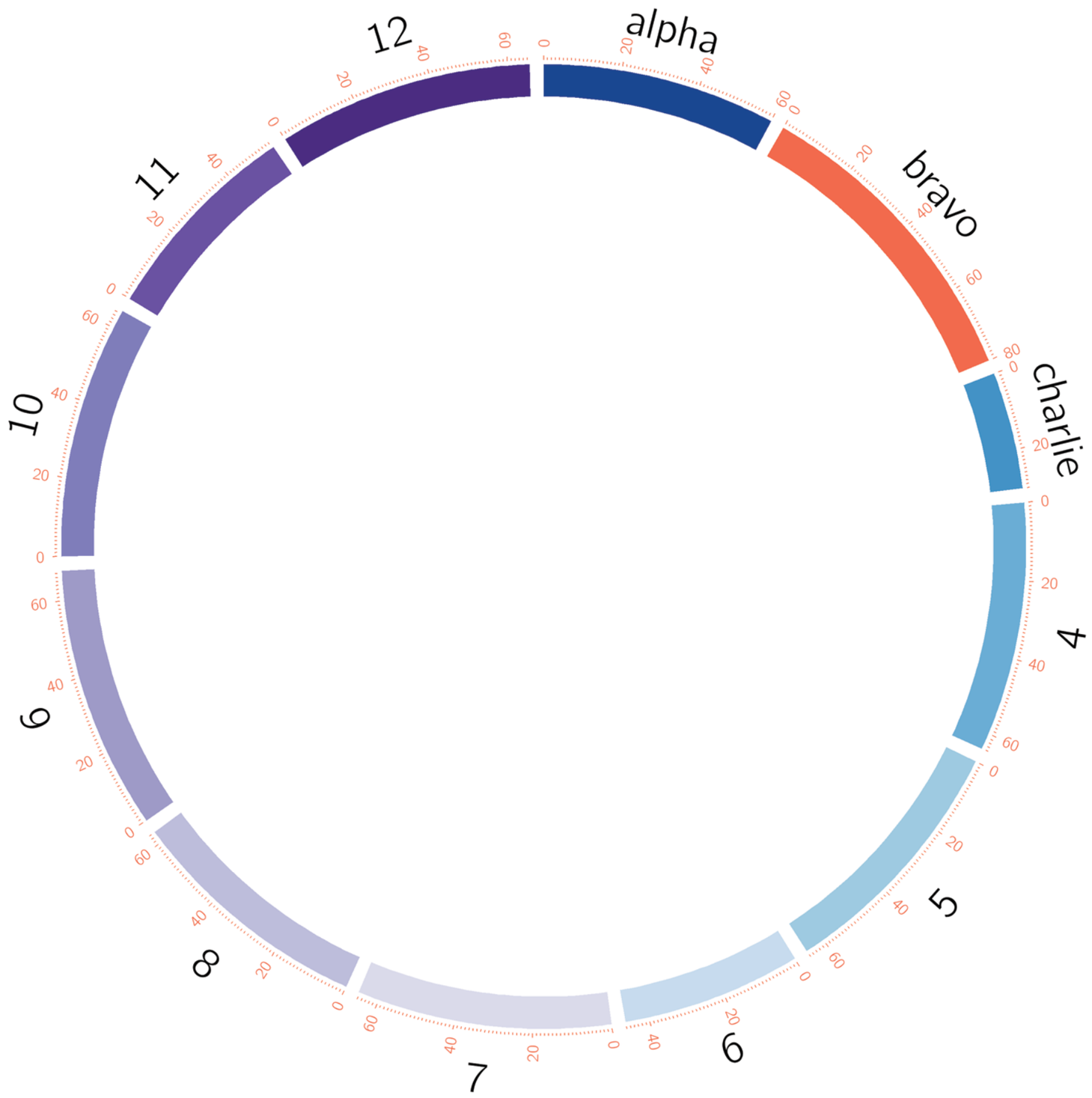
C:\C\Users\Brayton\Circos\c621\data\karyotype\karyotype2.tomato.txt -...

File Edit Search View Encoding Language Settings Macro Run Plugins Window ?

tx1.conf | txideogram.conf | txticks.conf | karyotype2.tomato.txt

```
1  chr - CH01 alpha  0  60000000  vvdblue
2  chr - CH02 bravo  0  80000000  vdblue
3  chr - CH03 charlie 0 30000000  dblue
4  chr - CH04 4  0  64064312  blue
5  chr - CH05 5  0  65021438  lblue
6  chr - CH06 6  0  46041636  vlblue
7  chr - CH07 7  0  65268621  vlpurple
8  chr - CH08 8  0  63032657  lpurple
9  chr - CH09 9  0  67662091  purple
10 chr - CH10 10 0  64834305  dpurple
11 chr - CH11 11 0  53386025  vdpurple
12 chr - CH12 12 0  65486253  vvdpurple
13
14
15
16
17
18
19
20
21
22
23
24
25
```

Ln : 3 Col : 37 Sel : 0 | 0 | Dos\Windows | ANSI as UTF-8 | INS



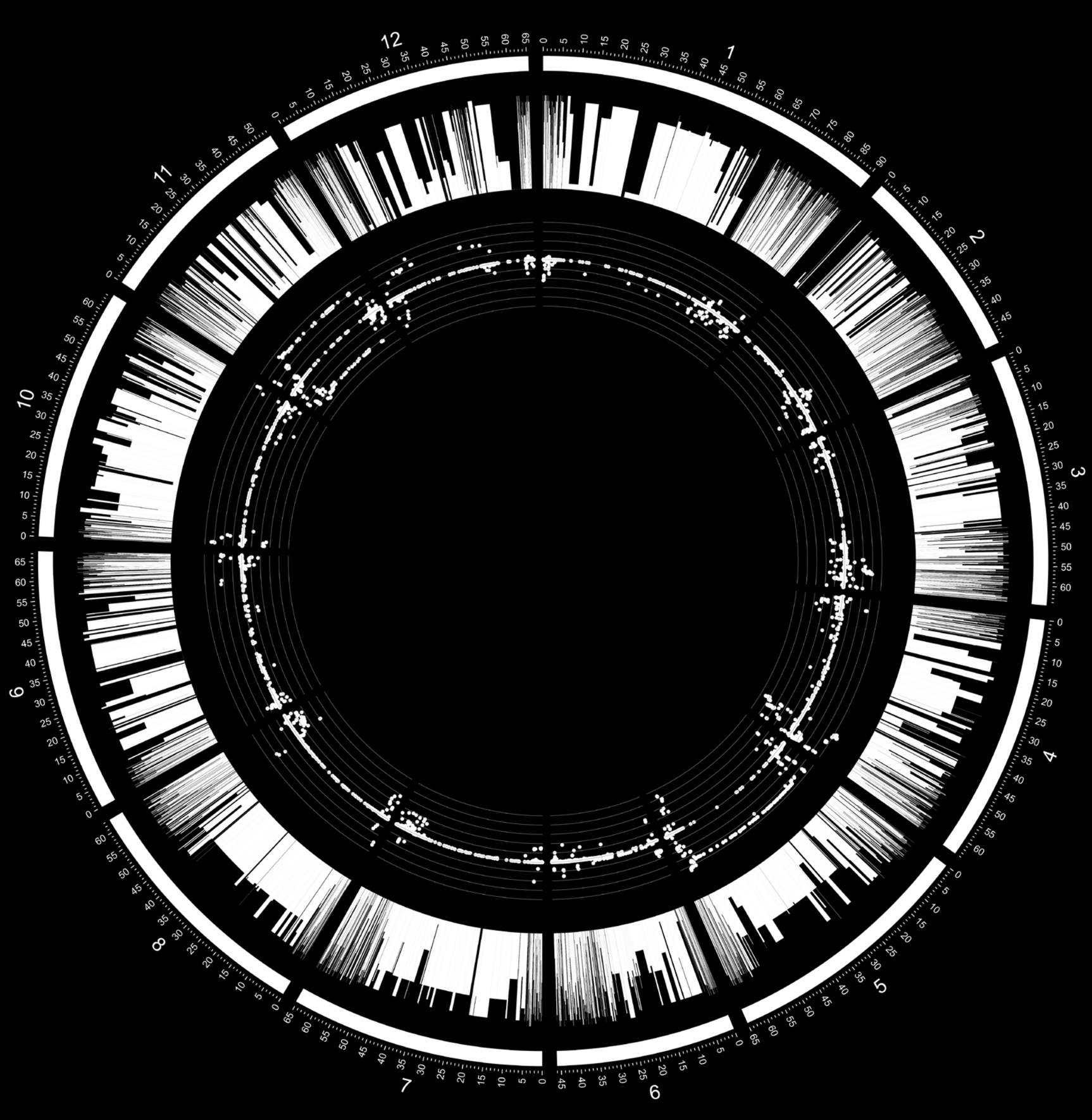
C:\C\Users\Brayton\Circos\c621\data\karyotype\karyotype2.tomato.txt -...

File Edit Search View Encoding Language Settings Macro Run Plugins Window ? X

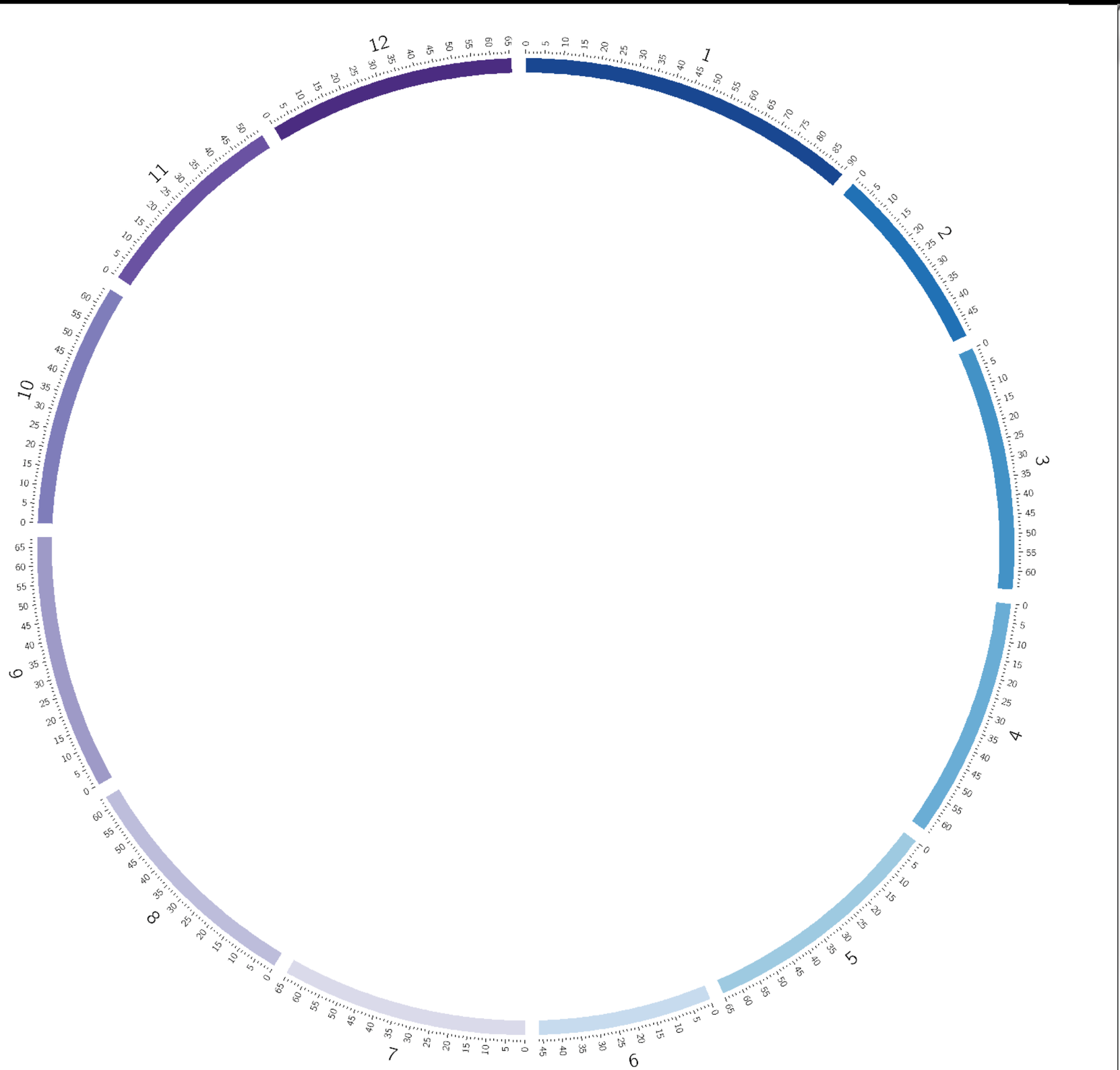
tx1.conf | txideogram.conf | txticks.conf | karyotype2.tomato.txt

```
1  chr - CH01 alpha  0  60000000  vvdblue
2  chr - CH02 bravo  0  80000000  red
3  chr - CH03 charlie 0 30000000  dblue
4  chr - CH04 4  0  64064312  blue
5  chr - CH05 5  0  65021438  lblue
6  chr - CH06 6  0  46041636  vlblue
7  chr - CH07 7  0  65268621  vlpurple
8  chr - CH08 8  0  63032657  lpurple
9  chr - CH09 9  0  67662091  purple
10 chr - CH10 10 0  64834305  dpurple
11 chr - CH11 11 0  53386025  vdpurple
12 chr - CH12 12 0  65486253  vvdpurple
13
14
15
16
17
18
19
20
21
22
23
24
25
```

Ln : 2 Col : 44 Sel : 0 | 0 Dos\Windows ANSI as UTF-8 INS



2D Data Tracks



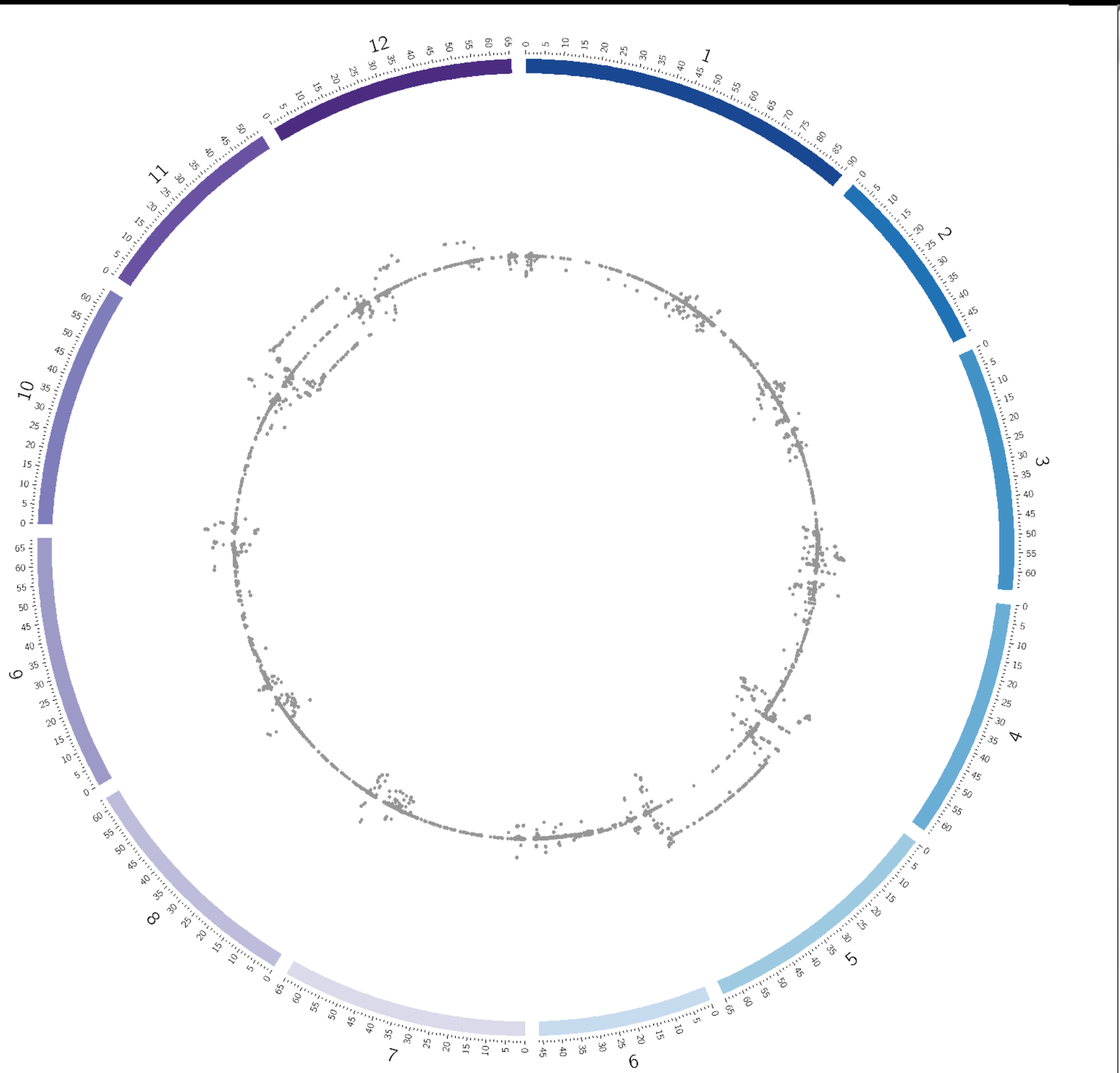
C:\C\Users\Brayton\Circos\c621\bin\tx2.conf - Notepad++

File Edit Search View Encoding Language Settings Macro Run Plugins
Window ? X

tx2.conf

```
1  karyotype = data/karyotype/karyotype2.tomato.txt
2
3  chromosomes_units = 1000000
4  chromosomes_display_default = yes
5
6
7  <<include txideogram.conf>>
8
9  <<include txticks.conf>>
10
11 <image>
12 <<include etc/image.conf>>
13 </image>
14
15 <<include etc/colors_fonts_patterns.conf>>
16
17 <<include etc/housekeeping.conf>>
```

Ln : 6 Col : 1 Sel : 0 | 0 Dos\Windows ANSI as UTF-8 INS



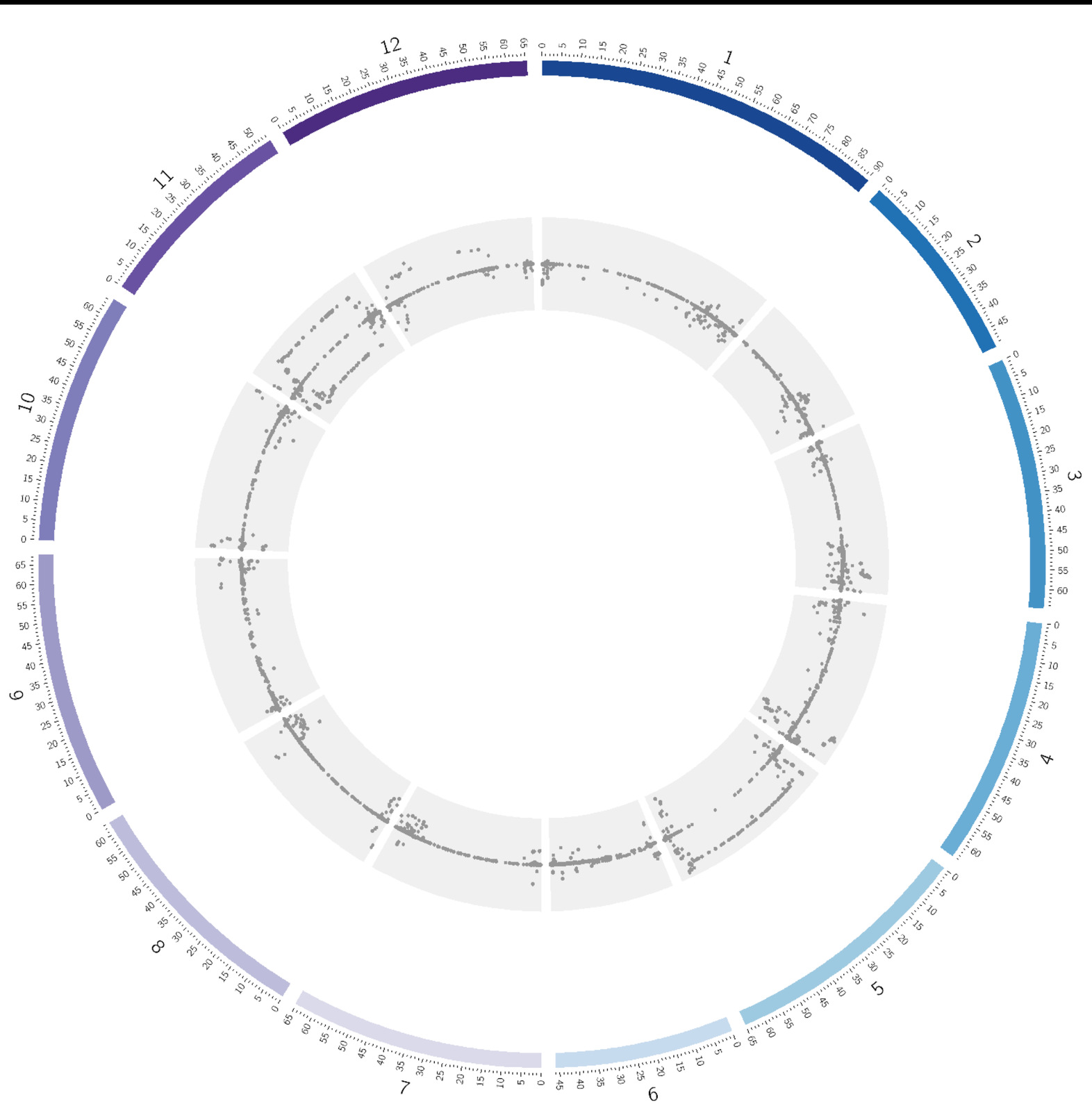
C:\C\Users\Brayton\Circos\c621\bin\tx2.conf - Notepad++

File Edit Search View Encoding Language Settings Macro Run Plugins
Window ? X

tx2.conf

```
1  karyotype = data/karyotype/karyotype2.tomato.txt
2
3  chromosomes_units = 1000000
4  chromosomes_display_default = yes
5
6  <plots>
7
8  <plot>
9  type = scatter
10 file = data/tmlong/pc1/pmpc1.txt
11 r1   = 0.71r
12 r0   = 0.52r
13 min  = -.05
14 max  = .05
15 </plot>
16
17 </plots>
18
19 <<include txideogram.conf>>
20
21 <<include txticks.conf>>
22
23 <image>
24 <<include etc/image.conf>>
25 </image>
26
27 <<include etc/colors_fonts_patterns.conf>>
28
29 <<include etc/housekeeping.conf>>
```

Ln : 8 Col : 1 Sel : 0 | 0 Dos\Windows ANSI as UTF-8 INS



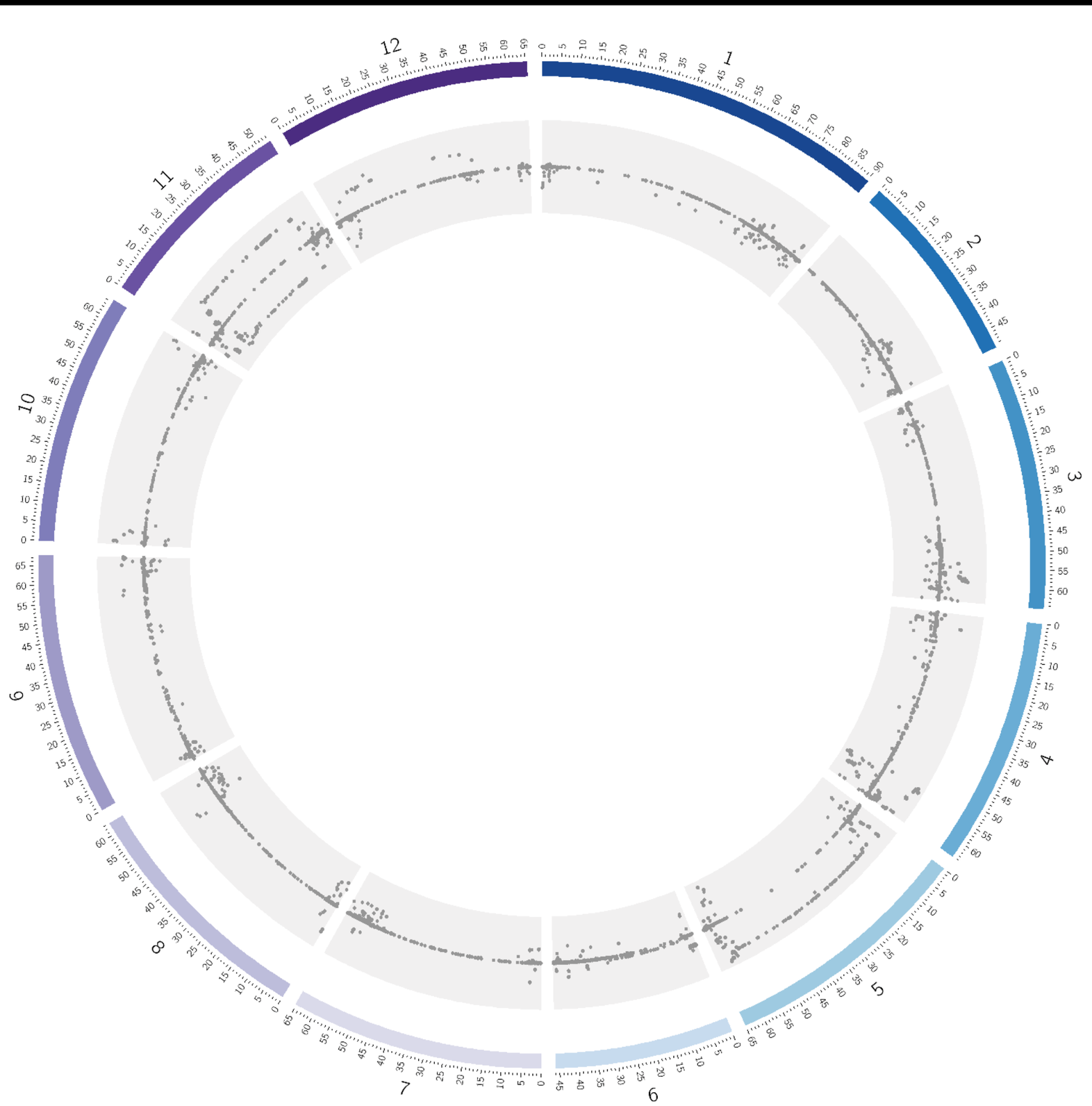
C:\C\Users\Brayton\Circos\c621\bin\tut1\tx2.conf - Notepad++

File Edit Search View Encoding Language Settings Macro Run Plugins
Window ? X

tx2.conf

```
1  karyotype = data/karyotype/karyotype2.tomato.txt
2
3  chromosomes_units = 1000000
4  chromosomes_display_default = yes
5
6  <plots>
7
8  <plot>
9  type = scatter
10 file = data/tmlong/pc1/pmpc1.txt
11 r1   = 0.71r
12 r0   = 0.52r
13 min  = -.05
14 max  = .05
15
16 <backgrounds>
17 <background>
18 color = vvlgrey
19 </background>
20 </backgrounds>
21 </plot>
22
23 </plots>
24
25 <<include txideogram.conf>>
26
27 <<include txticks.conf>>
28
29 <image>
30 <<include etc/image.conf>>
31 </image>
32
33 <<include etc/colors_fonts_patterns.conf>>
34
35 <<include etc/housekeeping.conf>>
```

Ln : 16 Col : 1 Sel : 0 | 0 Dos\Windows ANSI as UTF-8 INS



C:\C\Users\Brayton\Circos\c621\bin\tut1\tx2.conf - Notepad++

File Edit Search View Encoding Language Settings Macro Run Plugins
Window ? X

tx2.conf

```
1  karyotype = data/karyotype/karyotype2.tomato.txt
2
3  chromosomes_units = 1000000
4  chromosomes_display_default = yes
5
6  <plots>
7
8  <plot>
9  type = scatter
10 file = data/tmlong/pc1/pmpc1.txt
11 r1   = 0.91r
12 r0   = 0.72r
13 min  = -.05
14 max  = .05
15
16 <backgrounds>
17 <background>
18 color = vvlgrey
19 </background>
20 </backgrounds>
21 </plot>
22
23 </plots>
24
25 <<include txideogram.conf>>
26
27 <<include txticks.conf>>
28
29 <image>
30 <<include etc/image.conf>>
31 </image>
32
33 <<include etc/colors_fonts_patterns.conf>>
34
35 <<include etc/housekeeping.conf>>
```

Ln : 12 Col : 12 Sel : 0 | 0 Dos\Windows ANSI as UTF-8 INS

C:\C\Users\Brayton\Circos\c621\bin\tut1\tx2.conf - Notepad++

File Edit Search View Encoding Language Settings Macro Run Plugins
Window ? X

tx2.conf

```
1  karyotype = data/karyotype/karyotype2.tomato.txt
2
3  chromosomes_units = 1000000
4  chromosomes_display_default = yes
5
6  <plots>
7
8  <plot>
9  type = scatter
10 file = data/tmlong/pc1/pmpc1.txt
11 r1   = 0.91r
12 r0   = 0.72r
13 min  = -.05
14 max  = .02
15
16 <backgrounds>
17 <background>
18 color = vvlgrey
19 </background>
20 </backgrounds>
21 </plot>
22
23 </plots>
24
25 <<include txideogram.conf>>
26
27 <<include txticks.conf>>
28
29 <image>
30 <<include etc/image.conf>>
31 </image>
32
33 <<include etc/colors_fonts_patterns.conf>>
34
35 <<include etc/housekeeping.conf>>
```

Ln : 14 Col : 12 Sel : 0 | 0 Dos\Windows ANSI as UTF-8 INS

C:\C\Users\Brayton\Circos\c621\bin\tut1\tx2.conf - Notepad++

File Edit Search View Encoding Language Settings Macro Run Plugins
Window ? X

tx2.conf

```
1  karyotype = data/karyotype/karyotype2.tomato.txt
2
3  chromosomes_units = 1000000
4  chromosomes_display_default = yes
5
6  <plots>
7
8  <plot>
9  type = scatter
10 file = data/tmlong/pc1/pmpc1.txt
11 r1   = 0.91r
12 r0   = 0.72r
13 min  = -.05
14 max  = .05
15
16 <backgrounds>
17 <background>
18 color = vvlgrey
19 </background>
20 </backgrounds>
21 </plot>
22
23 </plots>
24
25 <<include txideogram.conf>>
26
27 <<include txticks.conf>>
28
29 <image>
30 <<include etc/image.conf>>
31 </image>
32
33 <<include etc/colors_fonts_patterns.conf>>
34
35 <<include etc/housekeeping.conf>>
```

Ln : 14 Col : 12 Sel : 0 | 0 Dos\Windows ANSI as UTF-8 INS

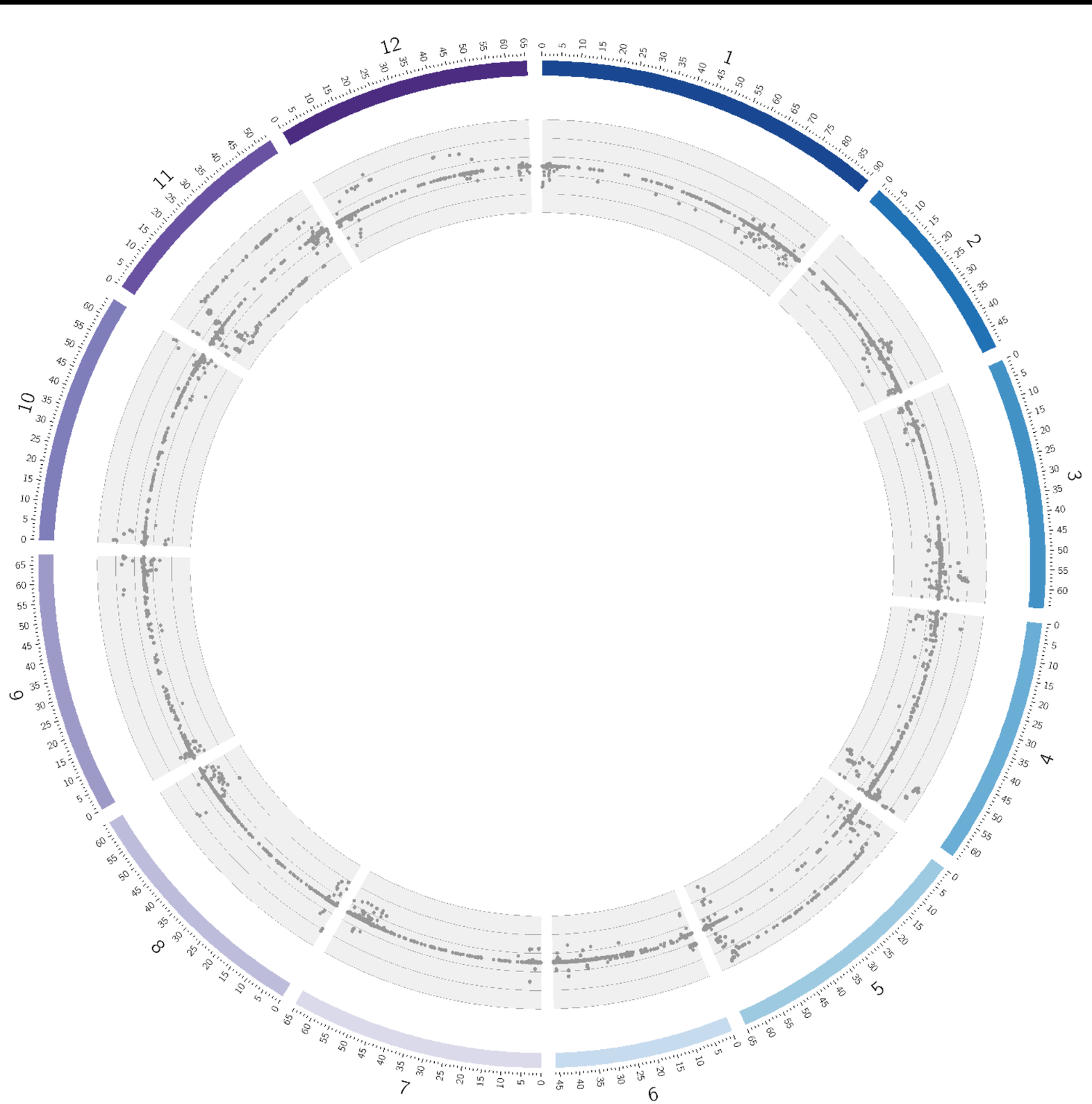
C:\C\Users\Brayton\Circos\c621\bin\tut1\tx2.conf - Notepad++

File Edit Search View Encoding Language Settings Macro Run Plugins
Window ? X

tx2.conf

```
1  karyotype = data/karyotype/karyotype2.tomato.txt
2
3  chromosomes_units = 1000000
4  chromosomes_display_default = yes
5
6  <plots>
7
8  <plot>
9  type = scatter
10 file = data/tmlong/pc1/pmpc1.txt
11 r1   = 0.91r
12 r0   = 0.72r
13 min  = -.05
14 max  = .05
15
16 <axes>
17 <axis>
18 thickness = 1
19 color = grey
20 spacing = .01
21 min  = -.05
22 max  = .05
23 </axis>
24 </axes>
25
26 <backgrounds>
27 <background>
28 color = vvlgrey
29 </background>
30 </backgrounds>
31 </plot>
32
33 </plots>
34
35 <<include txideogram.conf>>
36
37 <<include txticks.conf>>
38
39 <image>
40 <<include etc/image.conf>>
41 </image>
42
43 <<include etc/colors_fonts_patterns.conf>>
44
45 <<include etc/housekeeping.conf>>
```

Ln : 24 Col : 8 Sel : 0 | 0 Dos\Windows ANSI as UTF-8 INS



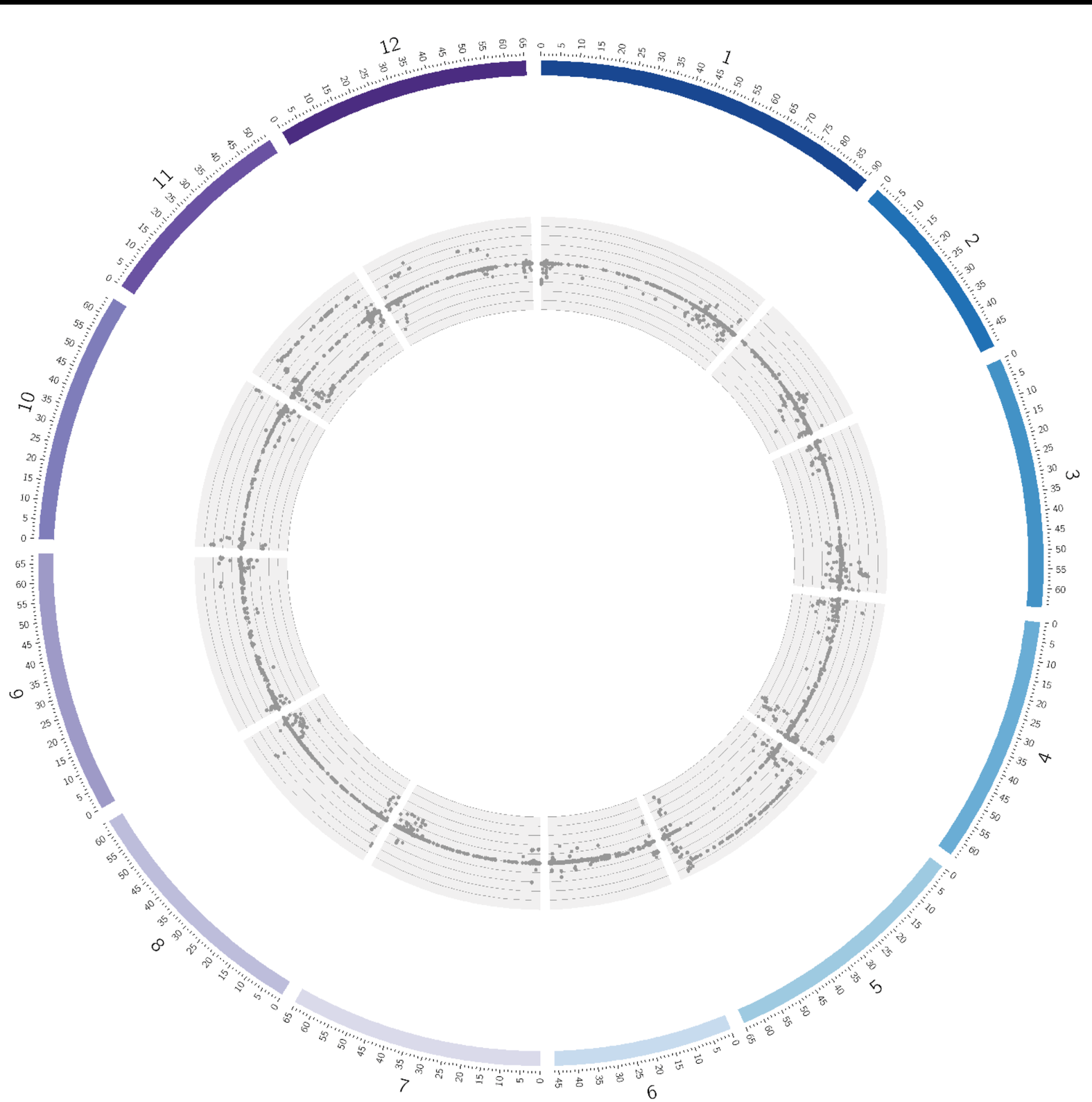
C:\C\Users\Brayton\Circos\c621\bin\tut1\tx2.conf - Notepad++

File Edit Search View Encoding Language Settings Macro Run Plugins
Window ? X

tx2.conf

```
karyotype = data/karyotype/karyotype2.tomato.txt

chromosomes_units = 1000000
chromosomes_display_default = yes

<plots>

<plot>
type = scatter
file = data/tmlong/pc1/pmpc1.txt
r1   = 0.91r
r0   = 0.72r
min   = -.05
max   = .05

<axes>
<axis>
thickness = 1
color = grey
spacing = .02
min   = -.05
max   = .05
</axis>
</axes>

<backgrounds>
<background>
color = vvlgrey
</background>
</backgrounds>
</plot>

</plots>

<<include txideogram.conf>>

<<include txticks.conf>>

<image>
<<include etc/image.conf>>
</image>

<<include etc/colors_fonts_patterns.conf>>

<<include etc/housekeeping.conf>>
```

Ln : 20 Col : 14 Sel : 0 | 0 Dos\Windows ANSI as UTF-8 INS



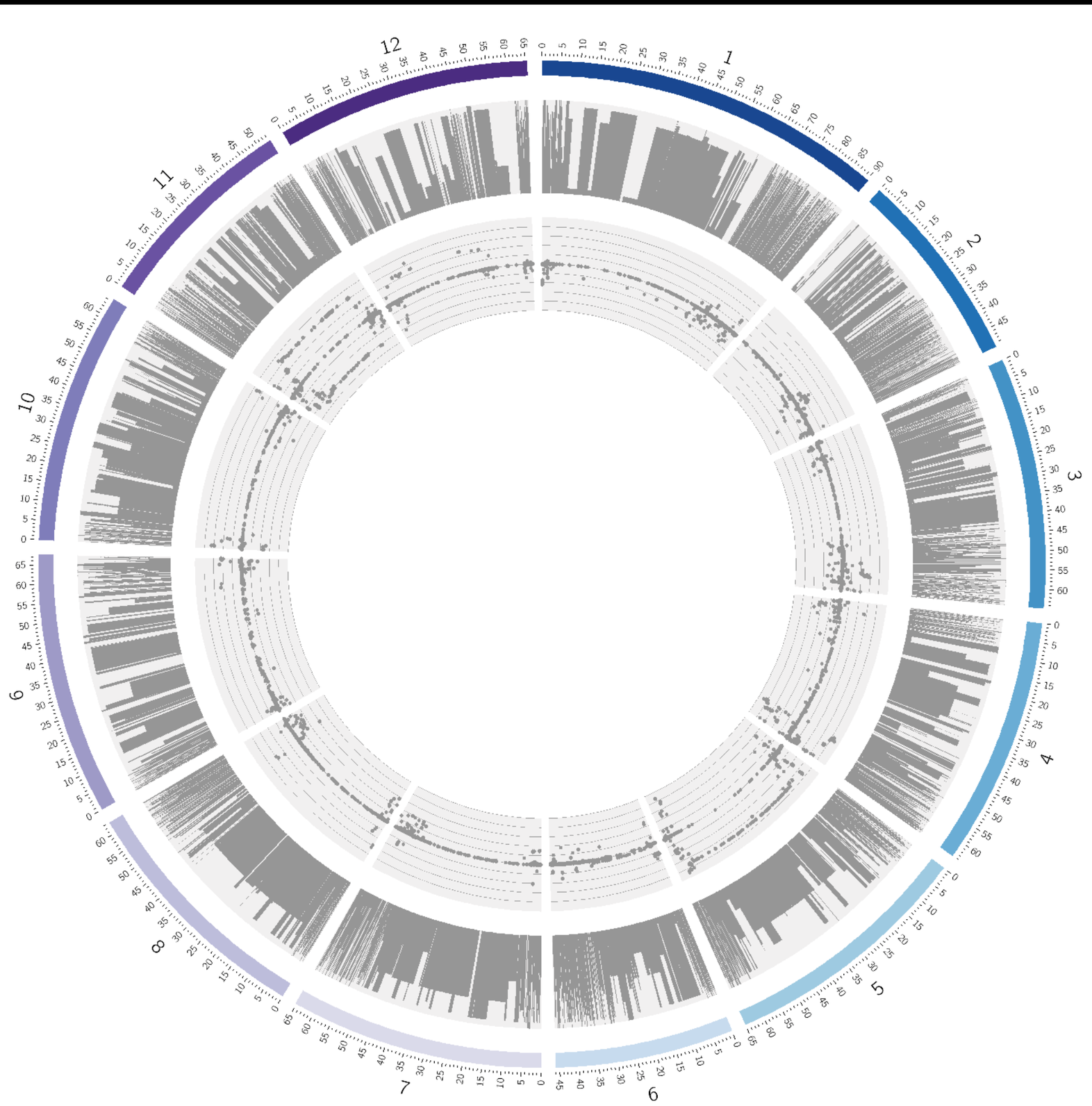
C:\C\Users\Brayton\Circos\c621\bin\tut1\tx2.conf - Notepad++

File Edit Search View Encoding Language Settings Macro Run Plugins
Window ? X

tx2.conf

```
1  karyotype = data/karyotype/karyotype2.tomato.txt
2
3  chromosomes_units = 1000000
4  chromosomes_display_default = yes
5
6  <plots>
7
8  <plot>
9  type = scatter
10 file = data/tmlong/pc1/pmpc1.txt
11 r1   = 0.71r
12 r0   = 0.52r
13 min  = -.05
14 max  = .05
15
16 <axes>
17 <axis>
18 thickness = 1
19 color = grey
20 spacing = .01
21 min  = -.05
22 max  = .05
23 </axis>
24 </axes>
25
26 <backgrounds>
27 <background>
28 color = vvlgrey
29 </background>
30 </backgrounds>
31 </plot>
32
33 </plots>
34
35 <<include txideogram.conf>>
36
37 <<include txticks.conf>>
38
39 <image>
40 <<include etc/image.conf>>
41 </image>
42
43 <<include etc/colors_fonts_patterns.conf>>
44
45 <<include etc/housekeeping.conf>>
```

Ln : 7 Col : 1 Sel : 0 | 0 Dos\Windows ANSI as UTF-8 INS



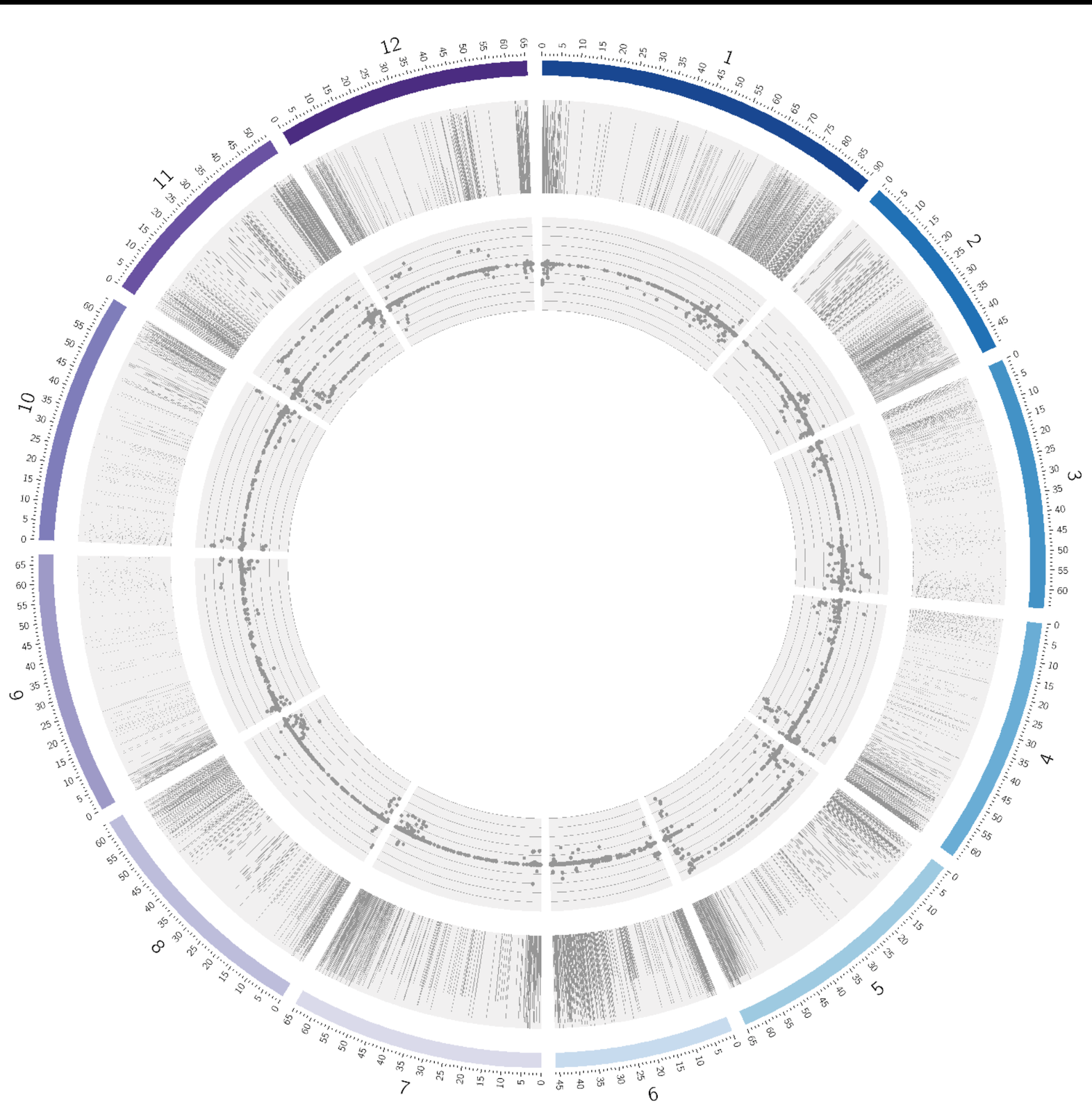
C:\C\Users\Brayton\Circos\c621\bin\tut1\tx2.conf - Notepad++

File Edit Search View Encoding Language Settings Macro Run Plugins
Window ? X

tx2.conf

```
karyotype = data/karyotype/karyotype2.tomato.txt

chromosomes_units = 1000000
chromosomes_display_default = yes

<plots>

<plot>
type = histogram
file = data/tmlong/tmppmaf.txt
extend_bin = yes
r1   = 0.95r
r0   = 0.76r
fill_color = grey
min   = 0
max   = 1
thickness = 0

<backgrounds>
<background>
color = vvlgrey
</background>
</backgrounds>

</plot>

<plot>
type = scatter
file = data/tmlong/pc1/pmpc1.txt
r1   = 0.71r
r0   = 0.52r
min   = -.05
max   = .05

<axes>
<axis>
thickness = 1
color = grey
spacing = .01
min   = -.05
max   = .05
</axis>
</axes>

<backgrounds>
<background>
```

Ln:9 Col:8 Sel:0|0 Dos\Windows ANSI as UTF-8 INS



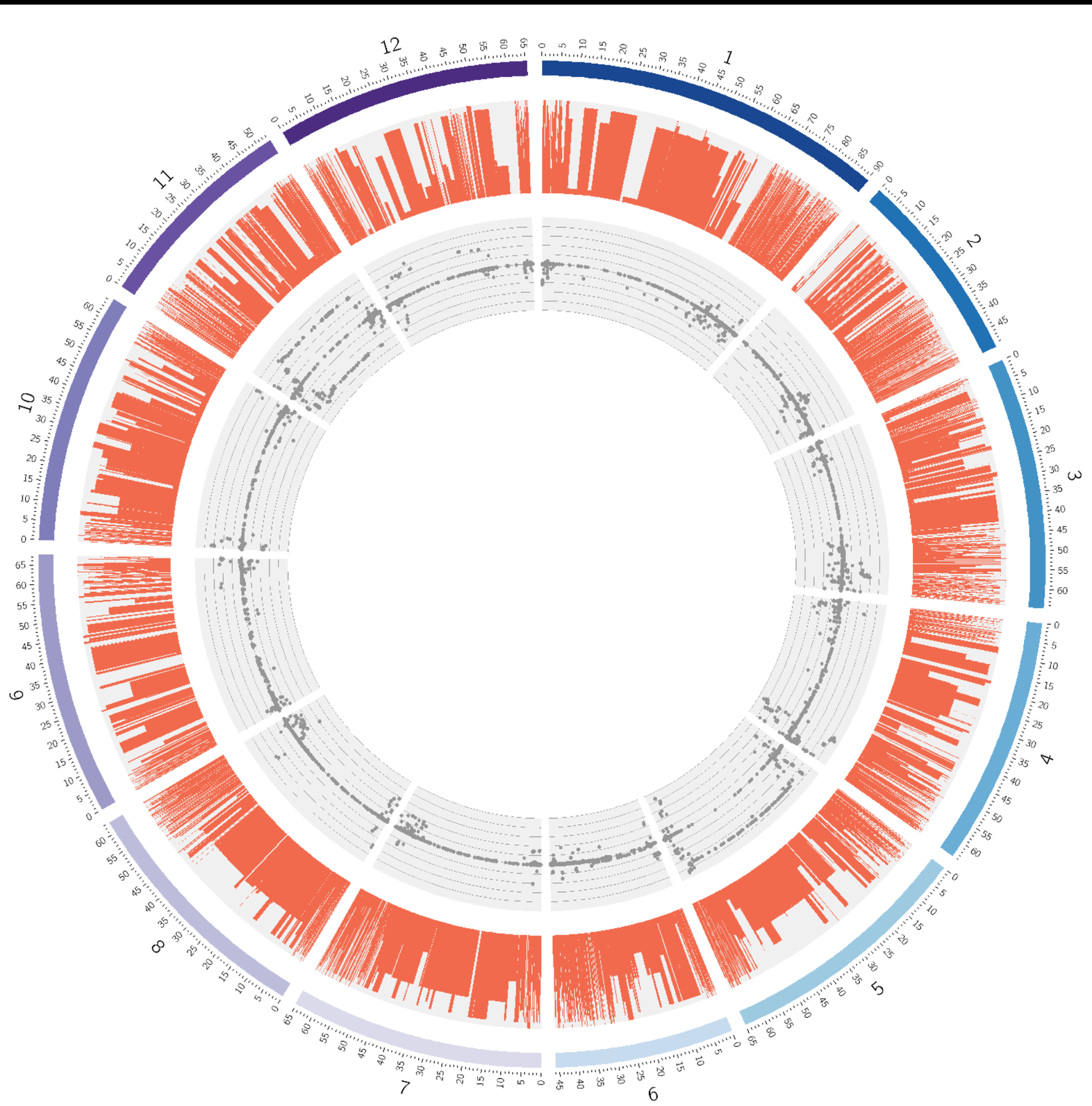
C:\C\Users\Brayton\Circos\c621\bin\tut1\tx2.conf - Notepad++

File Edit Search View Encoding Language Settings Macro Run Plugins
Window ? X

tx2.conf

```
karyotype = data/karyotype/karyotype2.tomato.txt

chromosomes_units = 1000000
chromosomes_display_default = yes

<plots>

<plot>
type = histogram
file = data/tmlong/tmppmaf.txt
extend_bin = no
r1   = 0.95r
r0   = 0.76r
fill_color = grey
min   = 0
max   = 1
thickness = 0

<backgrounds>
<background>
color = vvlgrey
</background>
</backgrounds>

</plot>

<plot>
type = scatter
file = data/tmlong/pc1/pmpc1.txt
r1   = 0.71r
r0   = 0.52r
min   = -.05
max   = .05

<axes>
<axis>
thickness = 1
color = grey
spacing = .01
min   = -.05
max   = .05
</axis>
</axes>

<backgrounds>
<background>
```

Ln : 11 Col : 16 Sel : 0 | 0 Dos\Windows ANSI as UTF-8 INS



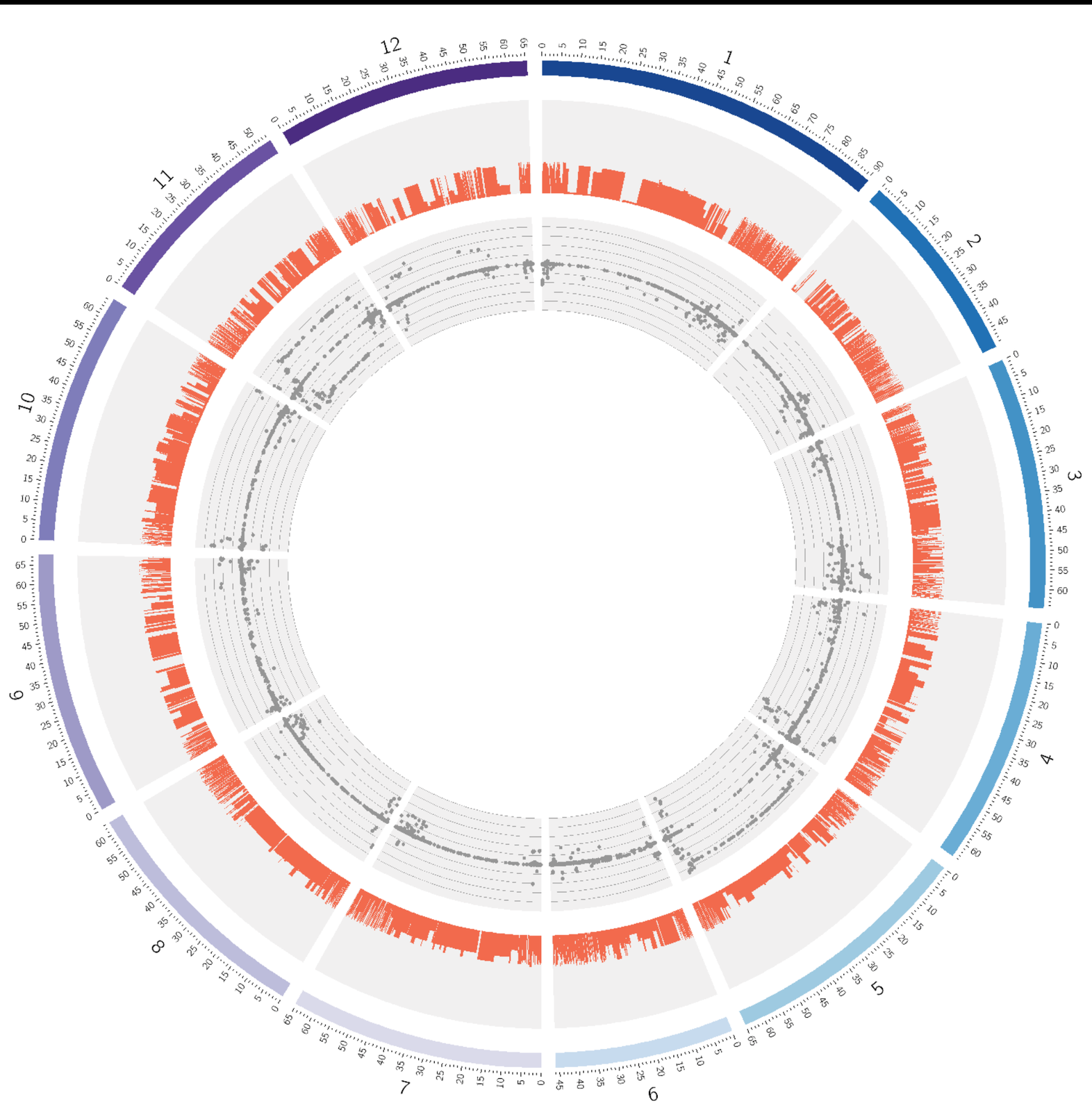
C:\C\Users\Brayton\Circos\c621\bin\tut1\tx2.conf - Notepad++

File Edit Search View Encoding Language Settings Macro Run Plugins
Window ?

tx2.conf

```
karyotype = data/karyotype/karyotype2.tomato.txt

chromosomes_units = 1000000
chromosomes_display_default = yes

<plots>

<plot>
type = histogram
file = data/tmlong/tmppmaf.txt
extend_bin = yes
r1   = 0.95r
r0   = 0.76r
fill_color = red
min   = 0
max   = 1
thickness = 0

<backgrounds>
<background>
color = vvlgrey
</background>
</backgrounds>

</plot>

<plot>
type = scatter
file = data/tmlong/pc1/pmpc1.txt
r1   = 0.71r
r0   = 0.52r
min   = -.05
max   = .05

<axes>
<axis>
thickness = 1
color = grey
spacing = .01
min   = -.05
max   = .05
</axis>
</axes>

<backgrounds>
<background>
```

Ln : 14 Col : 17 Sel : 0 | 0 Dos\Windows ANSI as UTF-8 INS



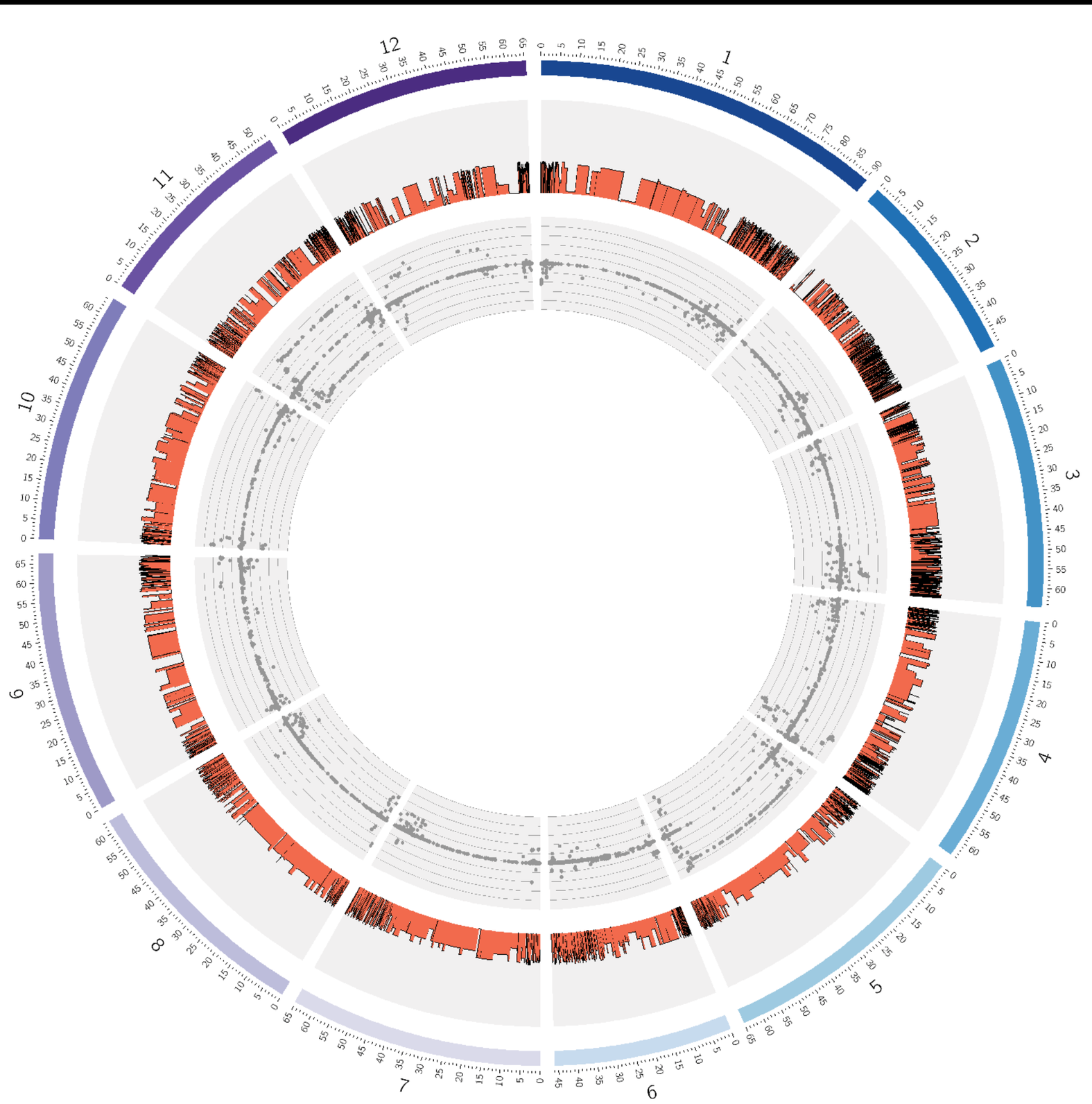
C:\C\Users\Brayton\Circos\c621\bin\tut1\tx2.conf - Notepad++

File Edit Search View Encoding Language Settings Macro Run Plugins
Window ? X

tx2.conf

```
1  karyotype = data/karyotype/karyotype2.tomato.txt
2
3  chromosomes_units = 1000000
4  chromosomes_display_default = yes
5
6  <plots>
7
8  <plot>
9  type = histogram
10 file = data/tmlong/tmppmaf.txt
11 extend_bin = yes
12 r1   = 0.95r
13 r0   = 0.76r
14 fill_color = red
15 min   = 0
16 max   = 3
17 thickness = 0
18
19 <backgrounds>
20 <background>
21 color = vvlgrey
22 </background>
23 </backgrounds>
24
25 </plot>
26
27 <plot>
28 type = scatter
29 file = data/tmlong/pc1/pmpc1.txt
30 r1   = 0.71r
31 r0   = 0.52r
32 min   = -.05
33 max   = .05
34
35 <axes>
36 <axis>
37 thickness = 1
38 color = grey
39 spacing = .01
40 min   = -.05
41 max   = .05
42 </axis>
43 </axes>
44
45 <backgrounds>
46 <background>
```

Ln : 16 Col : 10 Sel : 0 | 0 Dos\Windows ANSI as UTF-8 INS



C:\C\Users\Brayton\Circos\c621\bin\tut1\tx2.conf - Notepad++

File Edit Search View Encoding Language Settings Macro Run Plugins
Window ? X

tx2.conf

```
karyotype = data/karyotype/karyotype2.tomato.txt

chromosomes_units = 1000000
chromosomes_display_default = yes

<plots>

<plot>
type = histogram
file = data/tmlong/tmppmaf.txt
extend_bin = yes
r1   = 0.95r
r0   = 0.76r
fill_color = red
min   = 0
max   = 3
thickness = 2

<backgrounds>
<background>
color = vvlgrey
</background>
</backgrounds>

</plot>

<plot>
type = scatter
file = data/tmlong/pc1/pmpc1.txt
r1   = 0.71r
r0   = 0.52r
min   = -.05
max   = .05

<axes>
<axis>
thickness = 1
color = grey
spacing = .01
min   = -.05
max   = .05
</axis>
</axes>

<backgrounds>
<background>
```

Ln : 17 Col : 14 Sel : 0 | 0 Dos\Windows ANSI as UTF-8 INS

CH01	11759320	11759320	0.06	CH01	57066163	57066163	0.94	CH01	69459986	69459986	0.8
CH01	11927861	11927861	0.94	CH01	57222923	57222923	0.94	CH01	69658001	69658001	0
CH01	15586886	15586886	0.06	CH01	57854572	57854572	0	CH01	69685040	69685040	0
CH01	16810275	16810275	0.8	CH01	58342063	58342063	0.93	CH01	69750028	69750028	0.88
CH01	18519338	18519338	0	CH01	58787733	58787733	0.06	CH01	69750774	69750774	0
CH01	18523311	18523311	0.8	CH01	59255792	59255792	0.06	CH01	70092344	70092344	1
CH01	19489954	19489954	0.94	CH01	59384176	59384176	0.87	CH01	70104358	70104358	0.64
CH01	26851884	26851884	0.87	CH01	60364930	60364930	0.4	CH01	70221328	70221328	0.64
CH01	26852331	26852331	0.87	CH01	60821980	60821980	0.87	CH01	70262679	70262679	0.25
CH01	26852478	26852478	0	CH01	60848526	60848526	0.06	CH01	70262715	70262715	0
CH01	27984729	27984729	0.06	CH01	61478405	61478405	0.87	CH01	70364448	70364448	0.94
CH01	32850662	32850662	0.87	CH01	61724919	61724919	0.06	CH01	70427671	70427671	0.93
CH01	33683757	33683757	0.87	CH01	61725342	61725342	0	CH01	70517306	70517306	0.93
CH01	33906385	33906385	0.87	CH01	61733174	61733174	0.43	CH01	70520733	70520733	0.94
CH01	35649562	35649562	0.87	CH01	62161144	62161144	0.33	CH01	70579788	70579788	0.63
CH01	37548404	37548404	0.87	CH01	62269009	62269009	1	CH01	70681256	70681256	0.54
CH01	38118538	38118538	1	CH01	62357642	62357642	0.64	CH01	70866325	70866325	0
CH01	38118752	38118752	0.07	CH01	62494428	62494428	0.94	CH01	70868364	70868364	0.93
CH01	38274943	38274943	1	CH01	62812605	62812605	0.43	CH01	70953609	70953609	0
CH01	38276275	38276275	0	CH01	64684744	64684744	0	CH01	70997065	70997065	0
CH01	38321555	38321555	0.94	CH01	66643933	66643933	0	CH01	71011308	71011308	0.87
CH01	39141802	39141802	0.87	CH01	67037778	67037778	0	CH01	71087799	71087799	0.94
CH01	40682991	40682991	0.87	CH01	67366372	67366372	0	CH01	71090567	71090567	0
CH01	40909901	40909901	0.87	CH01	67409900	67409900	0.53	CH01	71186551	71186551	0.06
CH01	41869529	41869529	0	CH01	67484116	67484116	0.94	CH01	71215963	71215963	0.27
CH01	41869916	41869916	0.88	CH01	67512282	67512282	0	CH01	11759320	11759320	0.06
CH01	42528683	42528683	0.87	CH01	67740131	67740131	0.57	CH01	11927861	11927861	0.94
CH01	46195561	46195561	0.88	CH01	67740717	67740717	0	CH01	15586886	15586886	0.06
CH01	46498051	46498051	0	CH01	67801048	67801048	0.25	CH01	16810275	16810275	0.8
CH01	46543829	46543829	0	CH01	67855513	67855513	1	CH01	18519338	18519338	0
CH01	46543936	46543936	1	CH01	68105119	68105119	0.47	CH01	18523311	18523311	0.8
CH01	46551964	46551964	0.93	CH01	68232912	68232912	1	CH01	19489954	19489954	0.94
CH01	47929046	47929046	0.87	CH01	68270005	68270005	0.88	CH01	26851884	26851884	0.87
CH01	48834883	48834883	0.8	CH01	68673362	68673362	0.2	CH01	26852331	26852331	0.87
CH01	49192308	49192308	0.87	CH01	68747882	68747882	1	CH01	26852478	26852478	0
CH01	49449705	49449705	0.87	CH01	68772808	68772808	0	CH01	27984729	27984729	0.06
CH01	49888798	49888798	0.87	CH01	68772978	68772978	0	CH01	32850662	32850662	0.87
CH01	50765599	50765599	0.88	CH01	68904199	68904199	0.29	CH01	33683757	33683757	0.87
CH01	51270739	51270739	0.87	CH01	68944253	68944253	0.87	CH01	33906385	33906385	0.87
CH01	52336702	52336702	0	CH01	69046367	69046367	0	CH01	35649562	35649562	0.87
CH01	52336736	52336736	0.87	CH01	69077812	69077812	0.94	CH01	37548404	37548404	0.87
CH01	52731583	52731583	0.87	CH01	69168820	69168820	0.38	CH01	38118538	38118538	1
CH01	54508769	54508769	0.6	CH01	69231690	69231690	0.79	CH01	38118752	38118752	0.07
CH01	55576360	55576360	0.36	CH01	69333877	69333877	0.88	CH01	38274943	38274943	1
CH01	56522504	56522504	0.87	CH01	69456866	69456866	0	CH01	38276275	38276275	0

Data Format

Data Categories

These five categories are used to enter data for all 2D data tracks. All categories except options are required.

Chromosome Name – tells Circos on which ideogram to attach the data point. This name must be the same as the one specified in the karyotype.txt file. It is a good practice to have some form of letter identifier in front of the number to allow you to identify the data at a later time.

Start Position – basepair point on the chromosome at which the data point is located.

End Position – base pair point that allows Circos to display the data with a width.

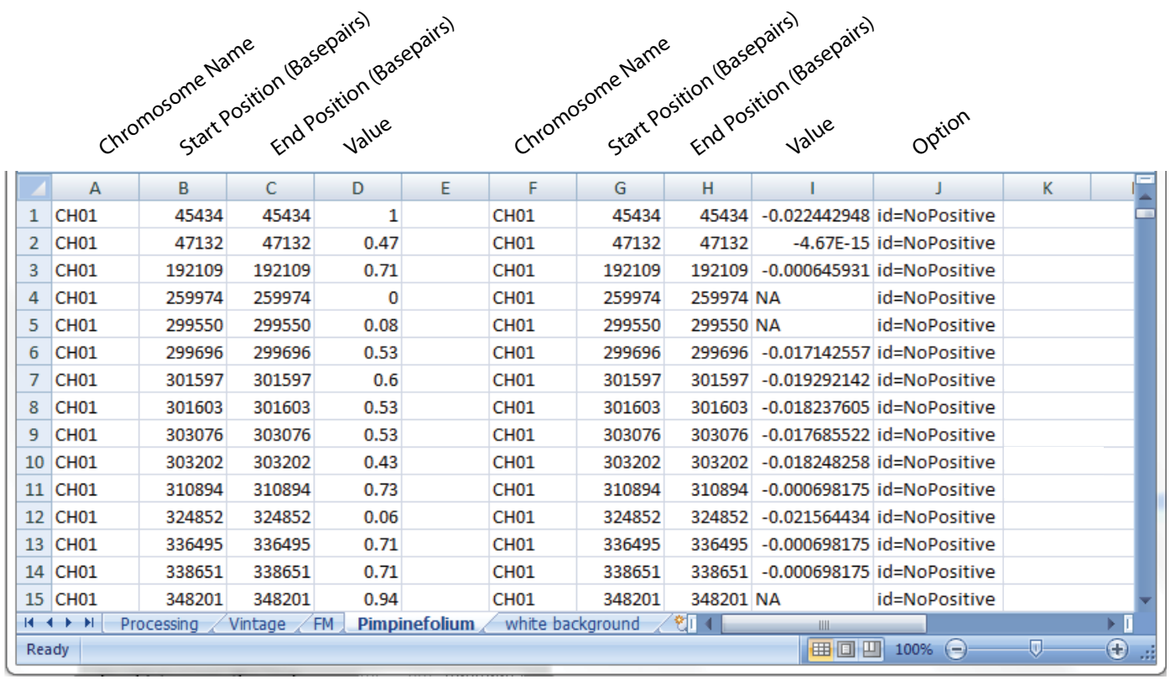
If the end position is the same as the start position, bins will be displayed as single pixel lines. For a larger width, a good starting point is to add 1,000,000 basepairs to the end position.

Value – your data for that basepair point. Circos only reads numbers in the Value column, so if you have data points with an NA value, or another kind of text entry, use Excel's Replace function to delete these entries. Here I have replaced "NA" with "0".

Option – based on the text identifier you enter here, Circos will later format your data point in whatever way you specify in a rule.

The option column can have a number of different formatting data, including color, size, glyph, and here, an identifier. You can enter any word/text you want for the option identifier, but it must be preceeded by an "id=" for Circos to read it.

Circos requires a separate data file for every plotted track, thus the repetition of chromosome name and positional information. In this tutorial there are 2 tracks, and thus two sets of data, each in their own file, are required.



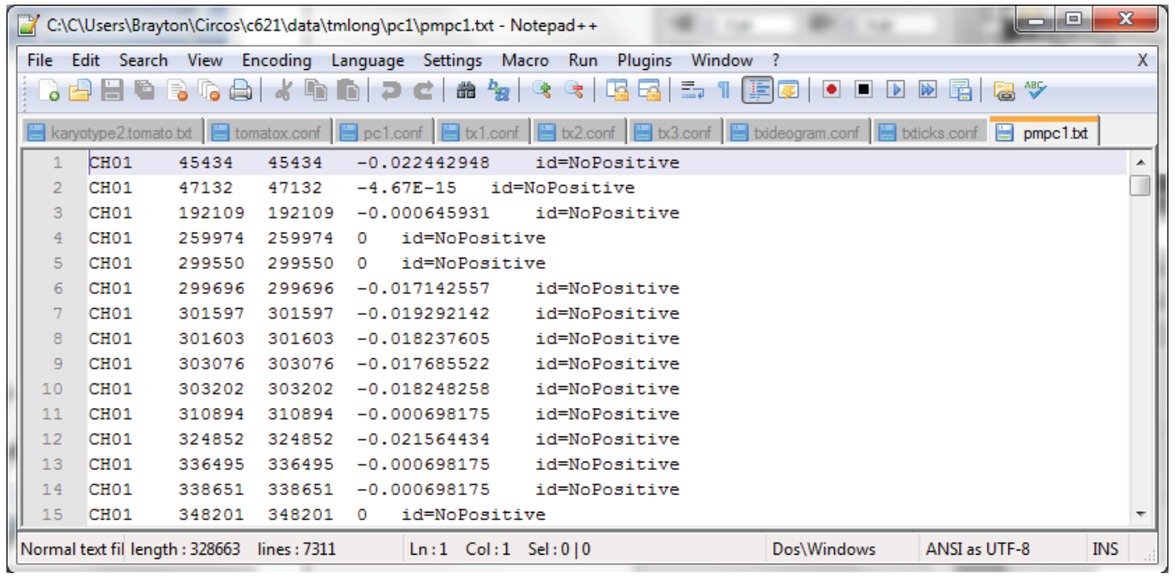
	A	B	C	D	E	F	G	H	I	J
1	CH01	45434	45434	1		CH01	45434	45434	-0.022442948	id=NoPositive
2	CH01	47132	47132	0.47		CH01	47132	47132	-4.67E-15	id=NoPositive
3	CH01	192109	192109	0.71		CH01	192109	192109	-0.000645931	id=NoPositive
4	CH01	259974	259974	0		CH01	259974	259974	NA	id=NoPositive
5	CH01	299550	299550	0.08		CH01	299550	299550	NA	id=NoPositive
6	CH01	299696	299696	0.53		CH01	299696	299696	-0.017142557	id=NoPositive
7	CH01	301597	301597	0.6		CH01	301597	301597	-0.019292142	id=NoPositive
8	CH01	301603	301603	0.53		CH01	301603	301603	-0.018237605	id=NoPositive
9	CH01	303076	303076	0.53		CH01	303076	303076	-0.017685522	id=NoPositive
10	CH01	303202	303202	0.43		CH01	303202	303202	-0.018248258	id=NoPositive
11	CH01	310894	310894	0.73		CH01	310894	310894	-0.000698175	id=NoPositive
12	CH01	324852	324852	0.06		CH01	324852	324852	-0.021564434	id=NoPositive
13	CH01	336495	336495	0.71		CH01	336495	336495	-0.000698175	id=NoPositive
14	CH01	338651	338651	0.71		CH01	338651	338651	-0.000698175	id=NoPositive
15	CH01	348201	348201	0.94		CH01	348201	348201	NA	id=NoPositive

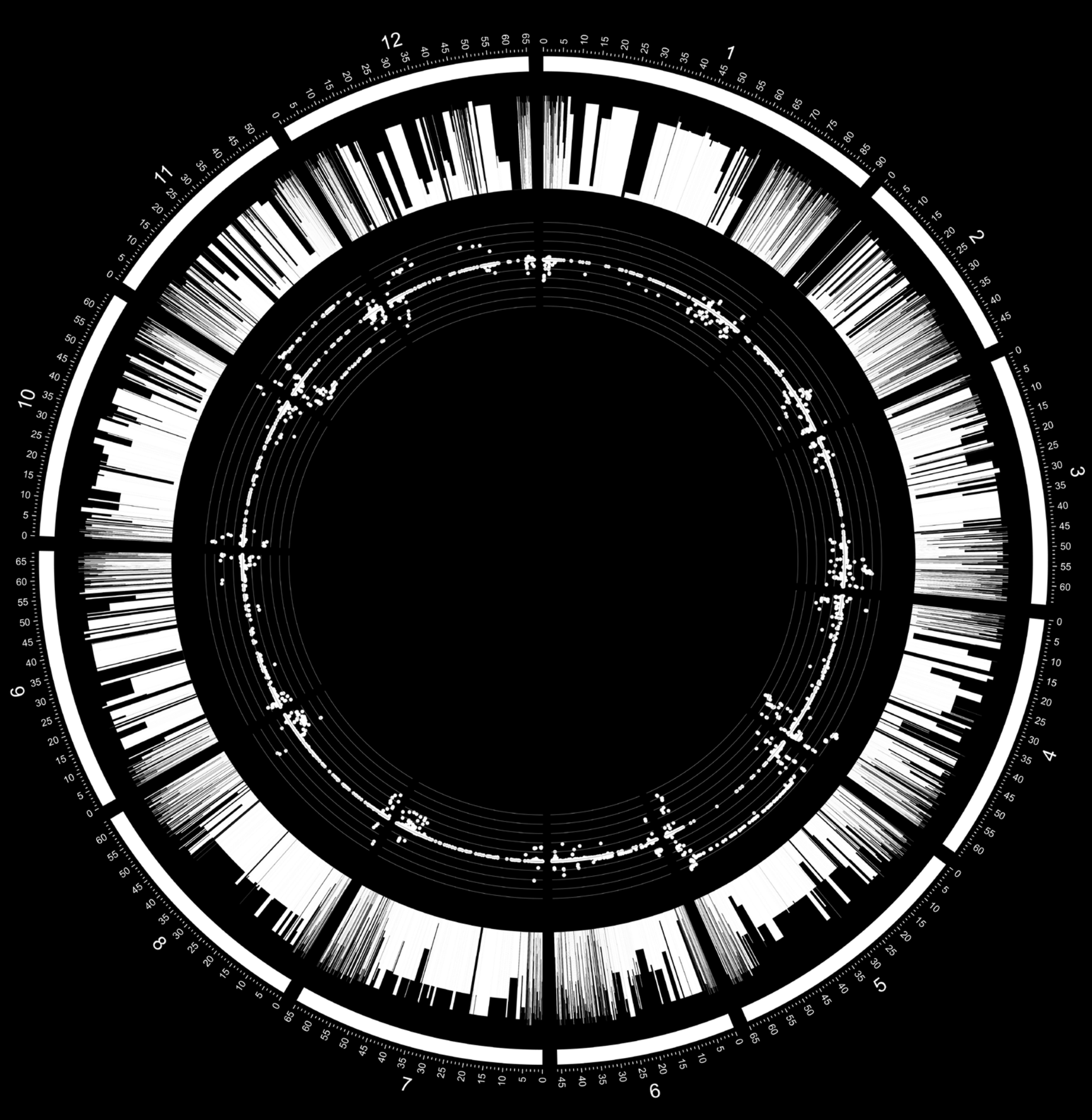
.txt Files

Once you have the data formatted in Excel, you can either: copy-paste plot data to a text editor like Notepad++ and save as a .txt file; or, put each plot's data in a separate worksheet and use the included Excel macro to save each worksheet as a .txt file. Make sure that any text that isn't data, such as column headings, has a # in front of its row (only one # is needed for the row).

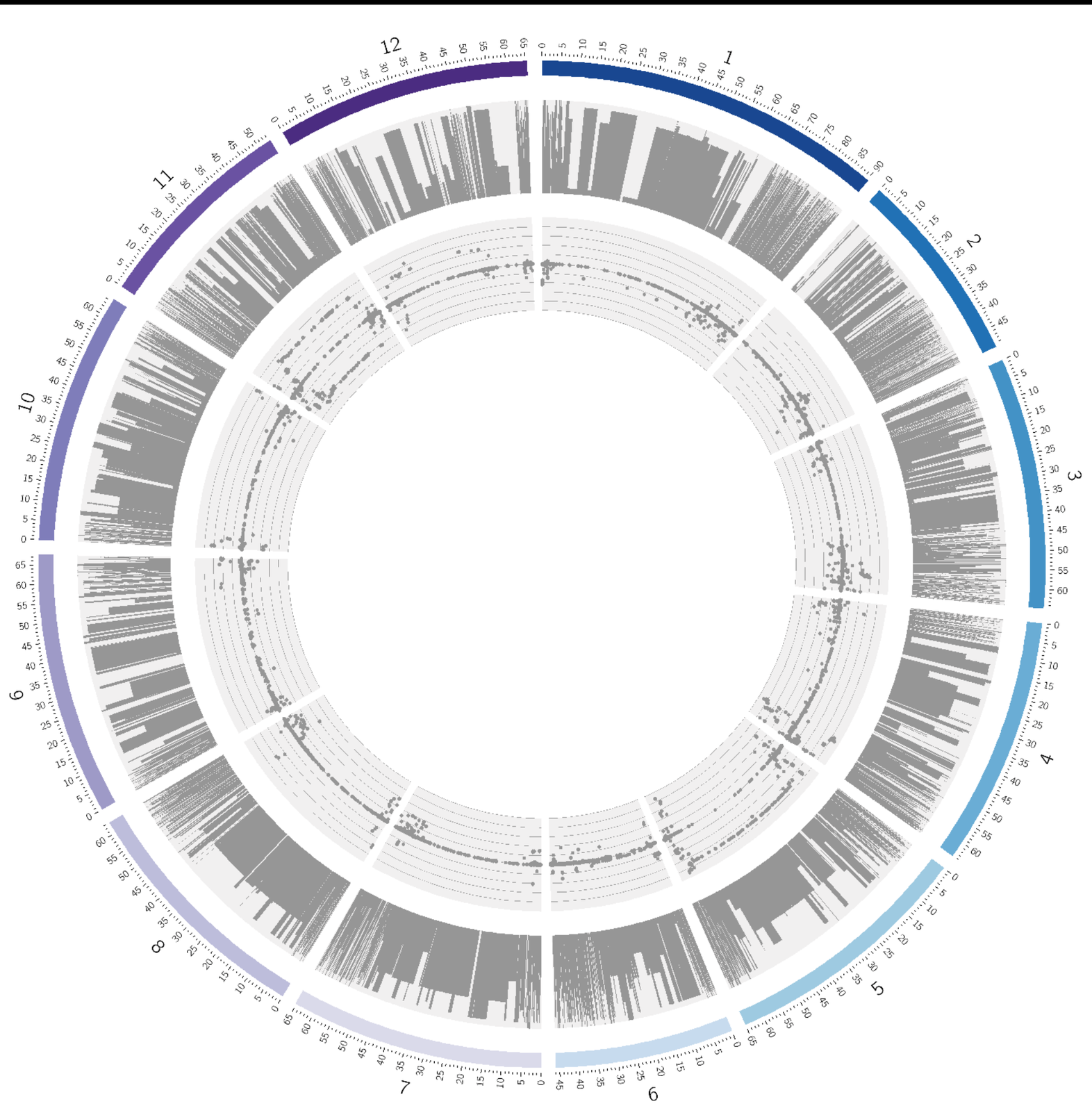
Your data files should be placed inside the "data" folder within the main Circos folder. Within "data" there can be as many folders as you need to organize your files.

Circos only reads numbers in the Value column, so if you have data points with an NA value, or another kind of text entry, use Notepad++'s Replace function to delete these entries. Here I have replaced "NA" with "0".





Rules



C:\C\Users\Brayton\Circos\c621\bin\tut1\tx2.conf - Notepad++

File Edit Search View Encoding Language Settings Macro Run Plugins
Window ? X

tx2.conf

```
karyotype = data/karyotype/karyotype2.tomato.txt

chromosomes_units = 1000000
chromosomes_display_default = yes

<plots>

<plot>
type = histogram
file = data/tmlong/tmppmaf.txt
extend_bin = yes
r1   = 0.95r
r0   = 0.76r
fill_color = grey
min   = 0
max   = 1
thickness = 0

<backgrounds>
<background>
color = vvlgrey
</background>
</backgrounds>

</plot>

<plot>
type = scatter
file = data/tmlong/pc1/pmpc1.txt
r1   = 0.71r
r0   = 0.52r
min   = -.05
max   = .05

<axes>
<axis>
thickness = 1
color = grey
spacing = .01
min   = -.05
max   = .05
</axis>
</axes>

<backgrounds>
<background>
```

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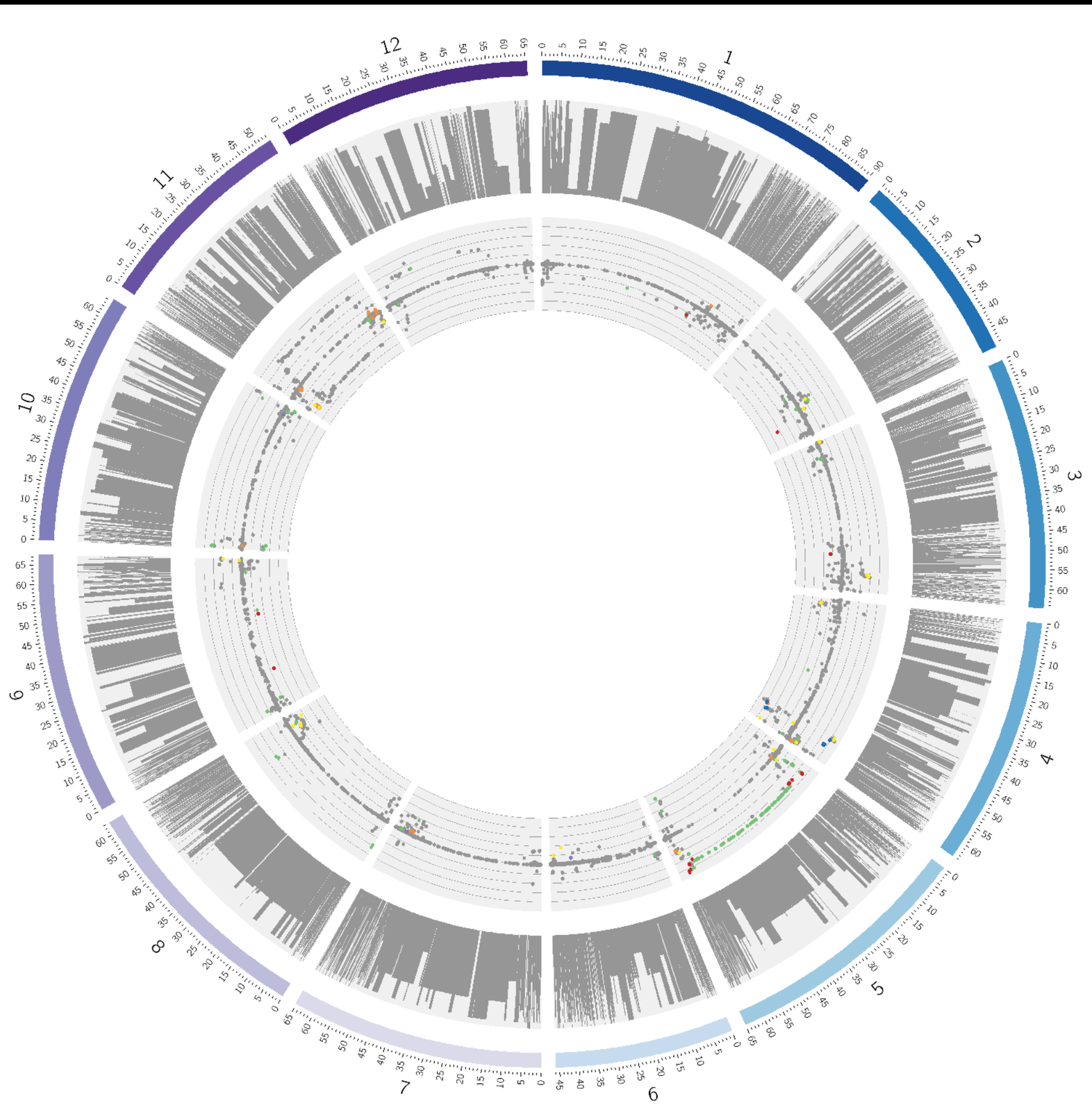

C:\C\Users\Brayton\Circos\c621\bin\tut1\tx3.conf - Notepad++

File Edit Search View Encoding Language Settings Macro Run Plugins
Window ? X

tx3.conf

```
1  karyotype = data/karyotype/karyotype2.tomato.txt
2
3  chromosomes_units = 1000000
4  chromosomes_display_default = yes
5
6  <plots>
7
8  <plot>
9  type = scatter
10 file = data/tmlong/pc1/pmpc1.txt
11 r1   = 0.71r
12 r0   = 0.52r
13 min  = -.05
14 max  = .05
15
16 <rules>
17
18 <rule>
19 condition  = var(id) eq "NoPositive"
20 z = 5
21 flow = continue
22 </rule>
23
24 <rule>
25 condition  = var(id) eq "FMvsProcandVin"
26 fill_color = dpurple
27 z = 45
28 flow = continue
29 </rule>
30
31 <rule>
32 condition  = var(id) eq "FMvsVin"
33 fill_color = orange
34 z = 50
35 flow = continue
36 </rule>
37
38 <rule>
39 condition  = var(id) eq "ProcvsFM"
40 color = green
41 z = 55
42 flow = continue
43 </rule>
44
45 <rule>
46 condition  = var(id) eq "ProcvsFMandVin"
```

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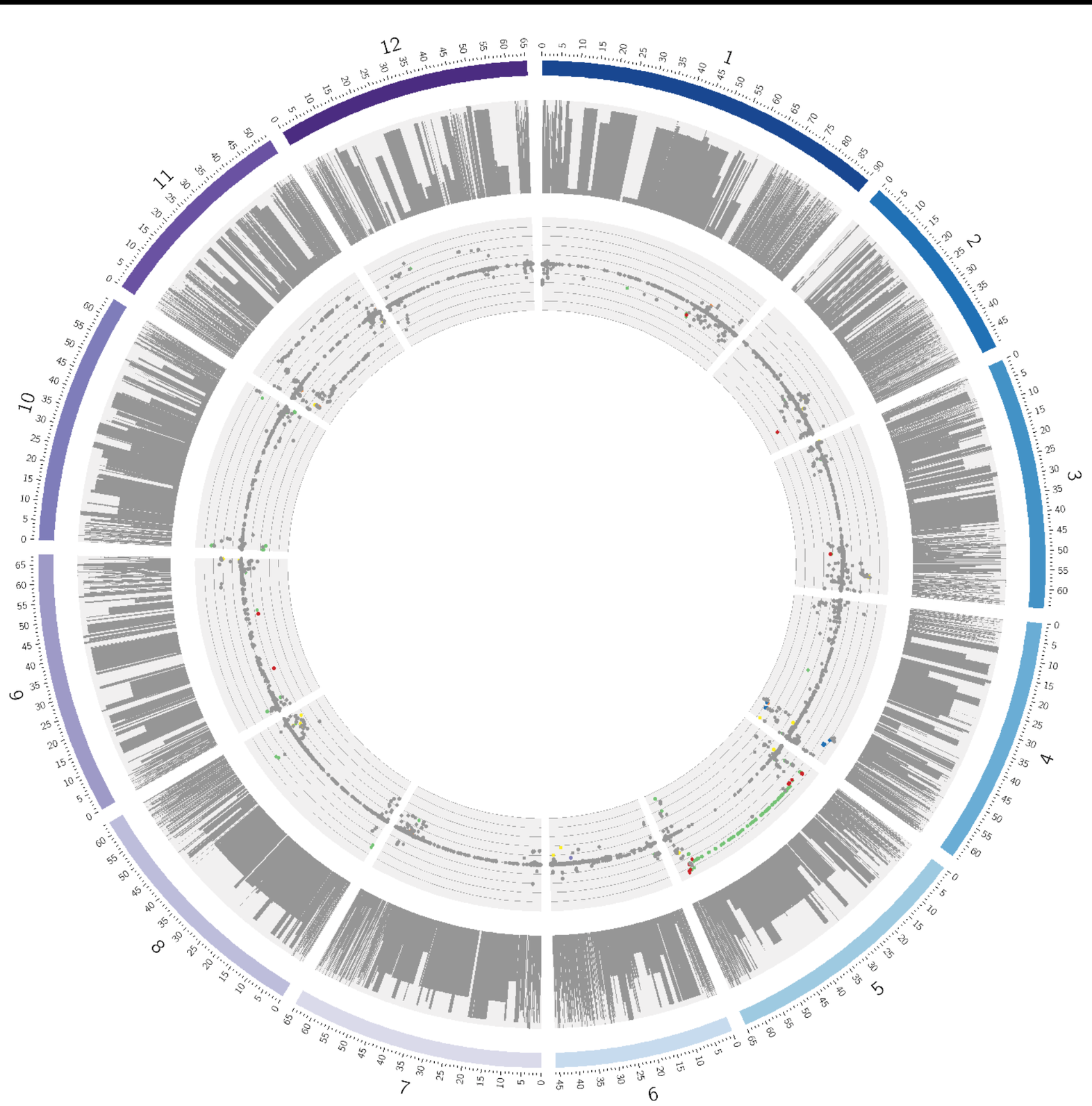


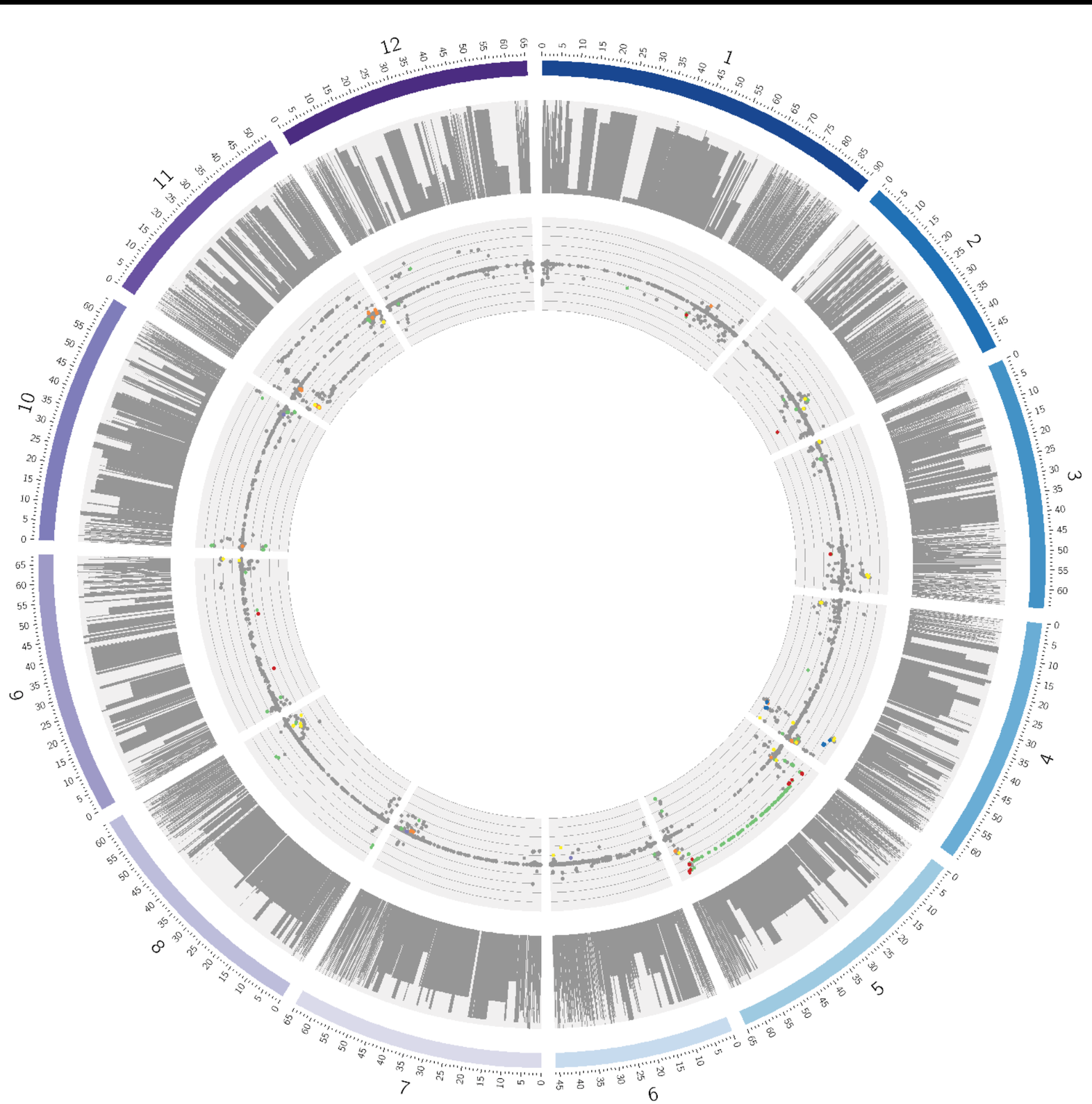
C:\C\Users\Brayton\Circos\c621\bin\tut1\tx3.conf - Notepad++

File Edit Search View Encoding Language Settings Macro Run Plugins
Window ? X

tx3.conf

```
karyotype = data/karyotype/karyotype2.tomato.txt

chromosomes_units = 1000000
chromosomes_display_default = yes

<plots>

<plot>
type = scatter
file = data/tmlong/pc1/pmpc1.txt
r1   = 0.71r
r0   = 0.52r
min   = -.05
max   = .05

<rules>

<rule>
condition  = var(id) eq "NoPositive"
z = 100
flow = continue
</rule>

<rule>
condition  = var(id) eq "FMvsProcandVin"
fill_color = dpurple
z = 45
flow = continue
</rule>

<rule>
condition  = var(id) eq "FMvsVin"
fill_color = orange
z = 50
flow = continue
</rule>

<rule>
condition  = var(id) eq "ProcvsFM"
color = green
z = 55
flow = continue
</rule>

<rule>
condition  = var(id) eq "ProcvsFMandVin"
```

Ln : 20 Col : 8 Sel : 0 | 0 Dos\Windows ANSI as UTF-8 INS



C:\C\Users\Brayton\Circos\c621\bin\tut1\tx3.conf - Notepad++

File Edit Search View Encoding Language Settings Macro Run Plugins
Window ? X

tx3.conf

```
1  karyotype = data/karyotype/karyotype2.tomato.txt
2
3  chromosomes_units = 1000000
4  chromosomes_display_default = yes
5
6  <plots>
7
8  <plot>
9  type = scatter
10 file = data/tmlong/pc1/pmpc1.txt
11 r1   = 0.71r
12 r0   = 0.52r
13 min  = -.05
14 max  = .05
15
16 <rules>
17
18 <rule>
19 condition  = var(id) eq "NoPositive"
20 z = 5
21 flow = continue
22 </rule>
23
24 <rule>
25 condition  = var(id) eq "FMvsProcandVin"
26 fill_color = dpurple
27 z = 45
28 flow = continue
29 </rule>
30
31 <rule>
32 condition  = var(id) eq "FMvsVin"
33 fill_color = orange
34 z = 50
35 flow = continue
36 </rule>
37
38 <rule>
39 condition  = var(id) eq "ProcvsFM"
40 color = green
41 z = 55
42 flow = continue
43 </rule>
44
45 <rule>
46 condition  = var(id) eq "ProcvsFMandVin"
```

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