## load and initialize

```
addpath myFunction\myftn
clearvars -except mapCD
fn = 'RawData\1T-TaS2(point defect)\mapCD.mat';
loadif(fn);
```

```
fldNm = 1×1 cell array
    {'mapCD'}
Your variables are:

fldNm  fn     mt
```

```
load RawData\'1T-TaS2(point defect)'\vDos.mat vDos
```

## Survey local maxima to define peak

1) it is effectively define positive band and negative band

2) un expected in gap state in T_A

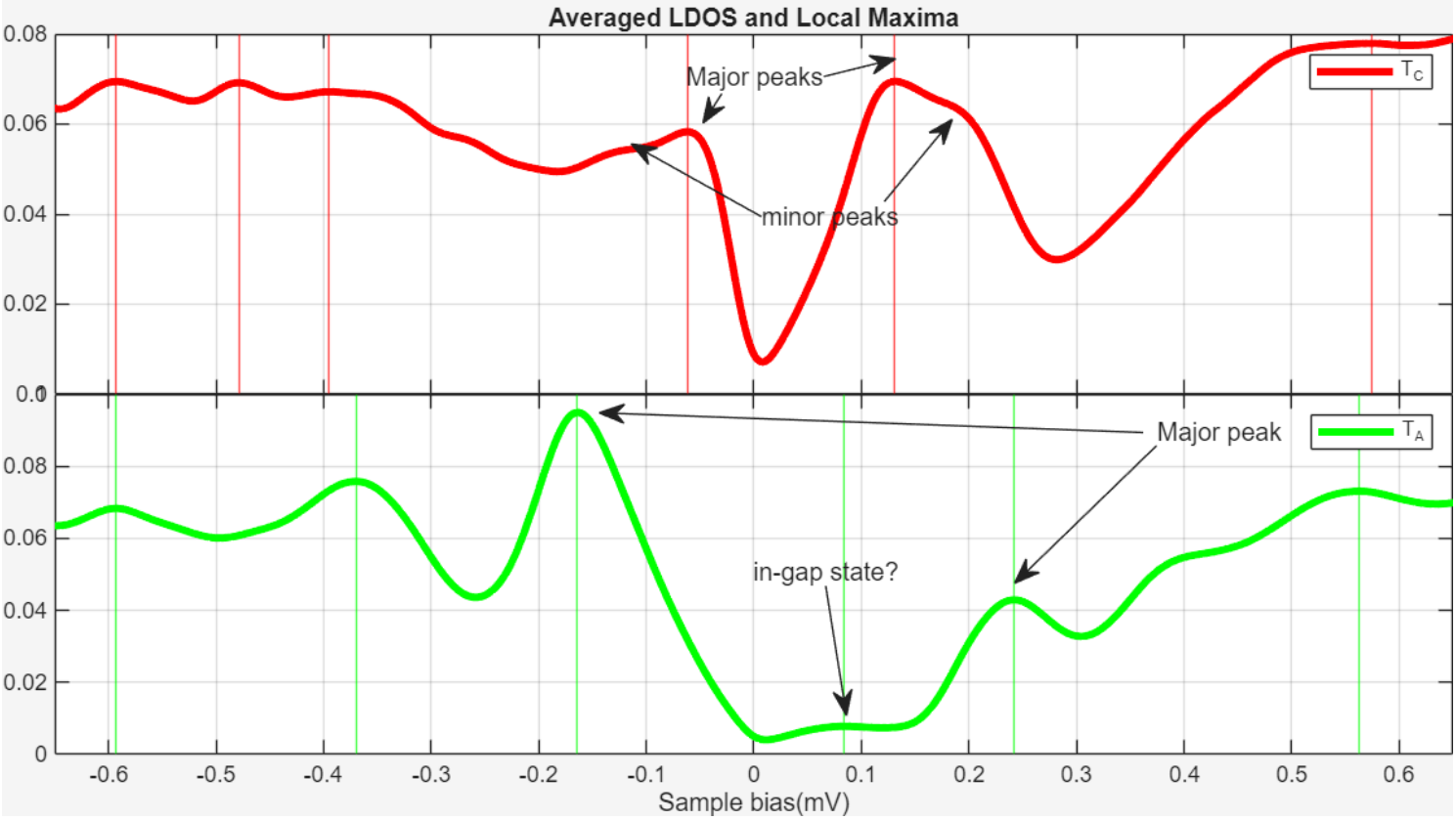
3) weak peak in T_C are not found by

```
gr  = groot();
gr.Units = "normalized";
mp = gr.MonitorPositions;
f1 = figure(1);
f1.Units  = "normalized";
f1.Position = secondNormalization(mp(3,:),[0 0 .3 .3]);
f1.Visible = "on";
```

```
clrs = ['r' 'g'];
nm = ["T_C","T_A"];
V = mapCD.V;
tiledlayout(2,1, 'Padding', 'none', 'TileSpacing', 'none');
for p = 1:2
    g = smm(mapCD.dt(p).G);
    nexttile;
    plot(V,g,Color=clrs(p),LineWidth=3)
    xlim([-1 1]*0.65)
    xticks(-0.6:0.1:0.6)

    box on
    grid on
    xlabel('Sample bias(mV)')
    xline(V(islocalmax(g)),Color=clrs(p))
    legend(nm(p))
end
annotation("textarrow", [0.7956 0.6979], [0.4538 0.2854], "String", "Major peak")
annotation("textarrow", [0.5677 0.582], [0.2821 0.123], "String", "in-gap state?")
```

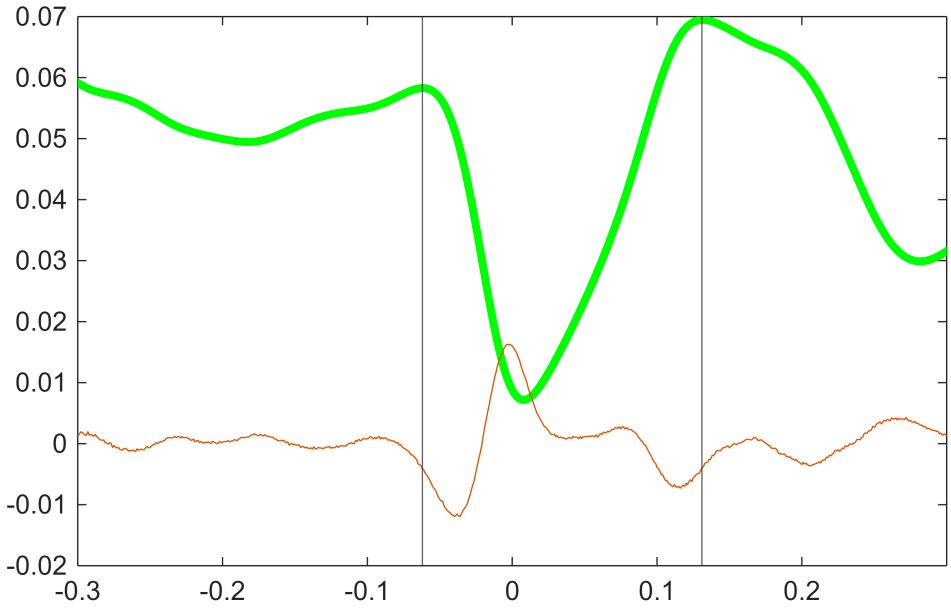
```
annotation("textarrow", [0.5664 0.6159], [0.9062 0.9281], "String", "Major peaks")
annotation("textarrow", [0.5234 0.4336], [0.7345 0.8237], "String", "minor peaks")
annotation("arrow", [0.7865 0.4115], [0.47 0.4942])
annotation("arrow", [0.4961 0.4831], [0.8853 0.8492])
annotation("arrow", [0.6081 0.6549], [0.7531 0.8538])
nexttile(1)
title("Averaged LDOS and Local Maxima")
```




## 2nd Derivative information to find buried peak

It is not that useful...

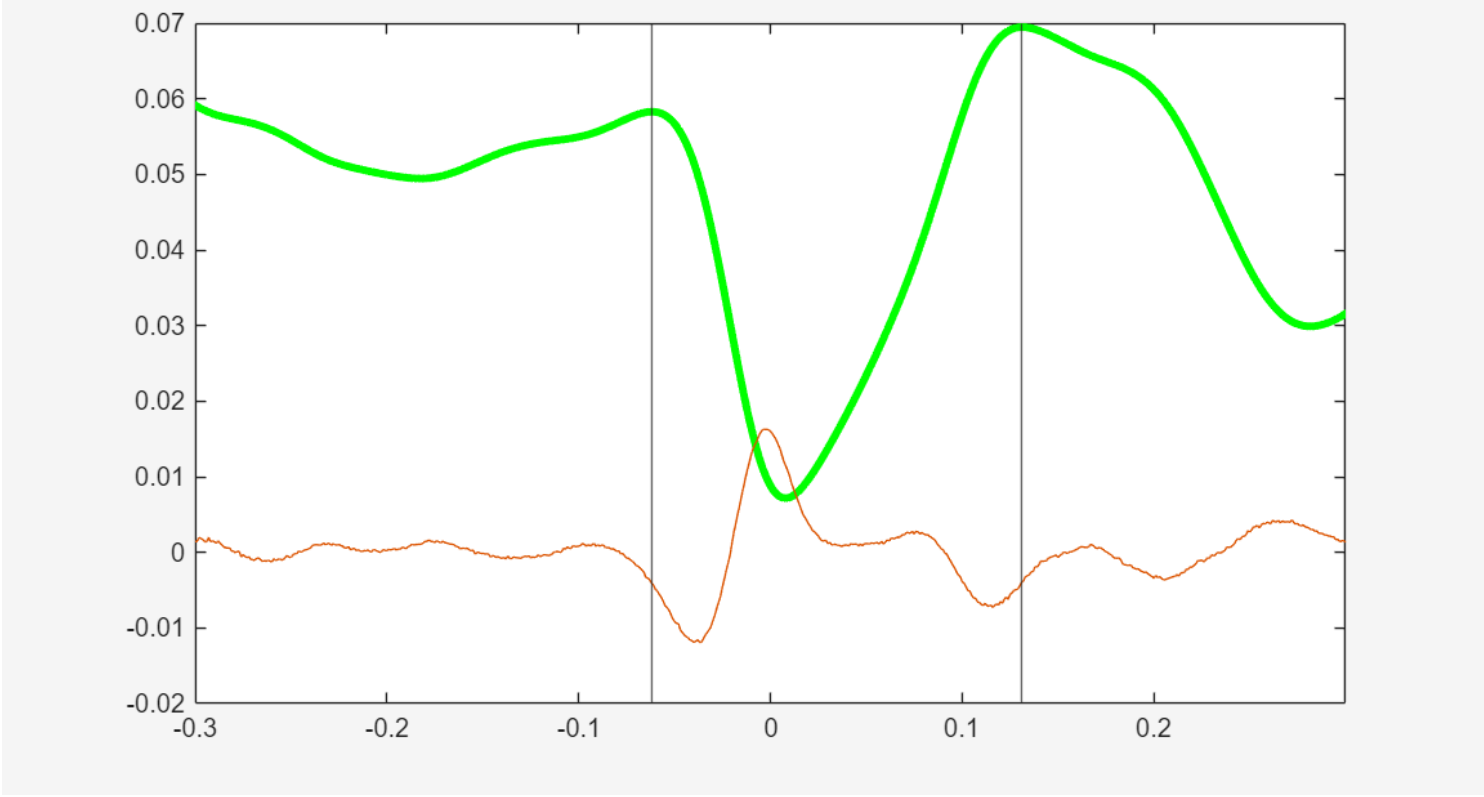
```
close
g = smm(mapCD.dt(1).G);
plot(V,g,Color=clrs(p),LineWidth=3)
hold on
plot(V,del2(g)*1000)
hold off
xlim([-1 1]*.3)
xline(V(islocalmax(g)))
```




## LDOS Histrogram vs LDOS Average

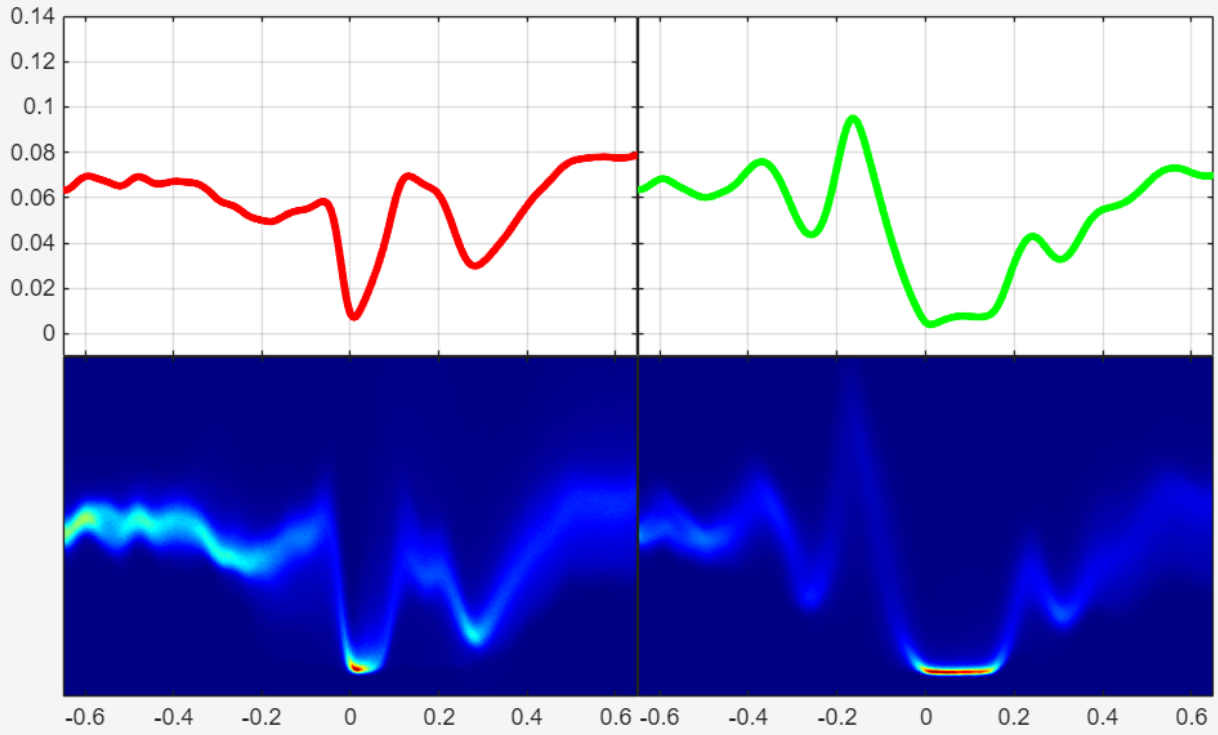
```
gr  = groot();
gr.Units = "normalized";
mp = gr.MonitorPositions;
f1 = figure(1);
f1.Units  = "normalized";
f1.Position = secondNormalization(mp(3,:),[0 0 .3 .3]);
f1.Visible = "on";
```

```
tiledlayout(2,2, 'Padding', 'loose', 'TileSpacing', 'none');
```




```
for isb = 1:2
    for jsb = 1:2
        % g = smm(mapCD.dt(p).G);
        nexttile;
        %
                % xlim([-1 1]*0.65)
        if isb == 1
            g = smm(mapCD.dt(jsb).G);
            plot(V,g,Color=clrs(jsb),LineWidth=3)
            grid on
            if jsb == 2
                yticklabels([])
            end
        elseif isb == 2
            drawVhis(vDos.dt(:,:,jsb),V,vDos.binCntr);
            xlim([-1 1]*0.65)
            colormap jet
            box on
            % hold on
            % g = smm(mapCD.dt(jsb).G);
            % plot(V,g,Color=clrs(jsb),LineWidth=3)
            % hold off
        end
        xlim([-1 1]*0.65)
        ylim([-0.01 0.14])
    end
```

```
end
```




Create Random Sampling points

```
rng(41);
rand_nums = rand(50,2,2);
szs(:,:,1) = size(mapCD.dt(1).Z);
szs(:,:,2) =  size(mapCD.dt(2).Z);
rand_pxls = round(rand_nums.*szs);
```

```
for p = 1:2
    subplot(1,2,p)
    imgfoo = mapCD.dt(p).Z;
    views(imgfoo)
    colormap('gray')
    hold on
    plot(rand_pxls(:,1,p),rand_pxls(:,2,p),'ro')
    hold off
    if p == 1
        tmpClim = gca().CLim
    elseif p == 2
        ax = gca();
        ax.CLim = tmpClim
    end
```

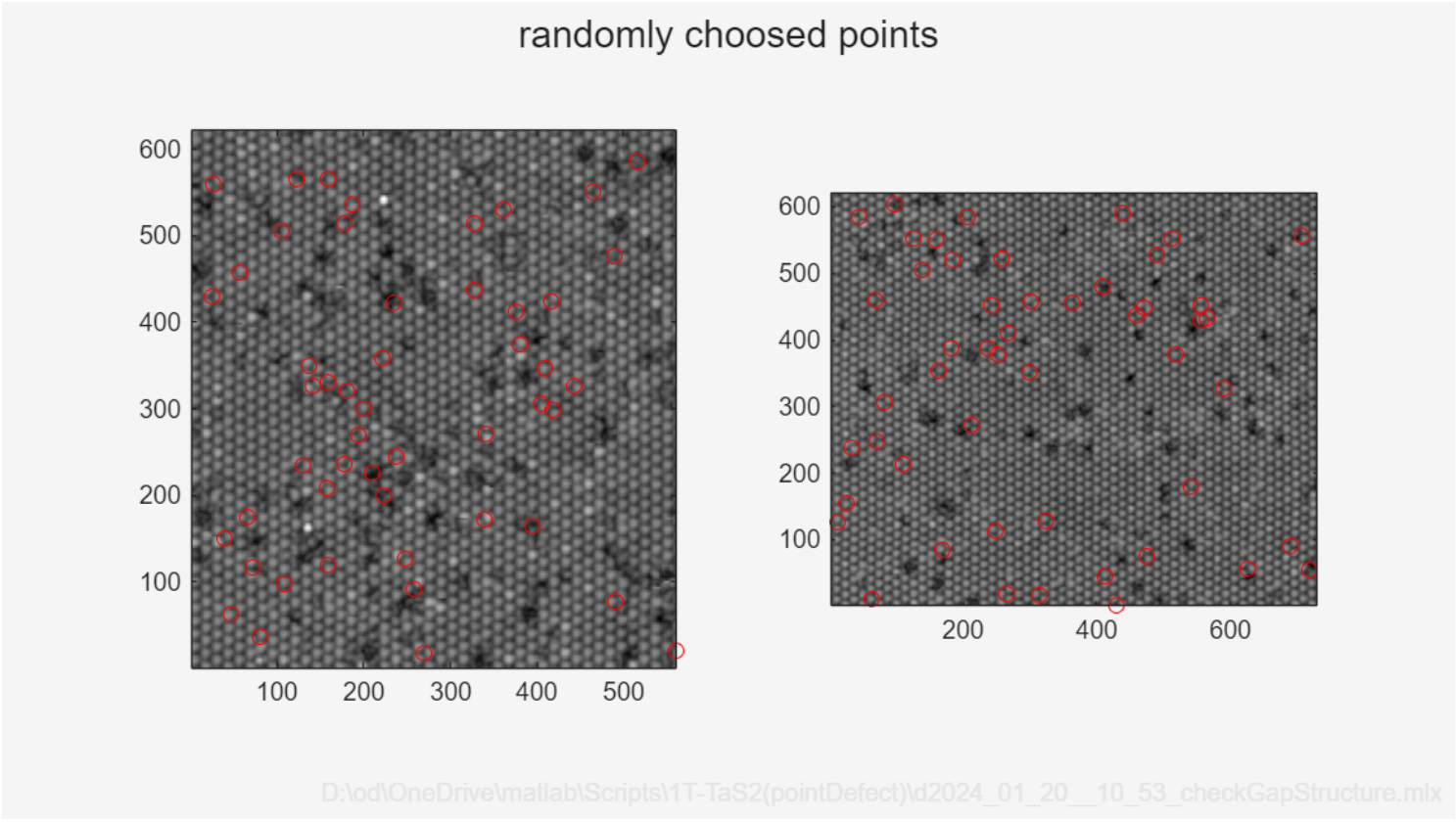
```
end
```

```
tmpClim = 1×2
    0.0167    0.2532
ax =
  Axes with properties:

            XLim: [0.5000 731.5000]
            YLim: [0.5000 621.5000]
          XScale: 'linear'
          YScale: 'linear'
    GridLineStyle: '-'
         Position: [0.5703 0.1100 0.3347 0.8150]
            Units: 'normalized'

  Show all properties
```

```
sgtitle('randomly choosed points')
waterMark()
```




```
psb = 0
```

```
psb =
0
```

```
% for isb = 1:2 %ca
%     for jsb = 1:2 %pn
%         subplot(2,2,psb)
%     end
% end
```

```
ph = 2
```

```
ph =
2
```

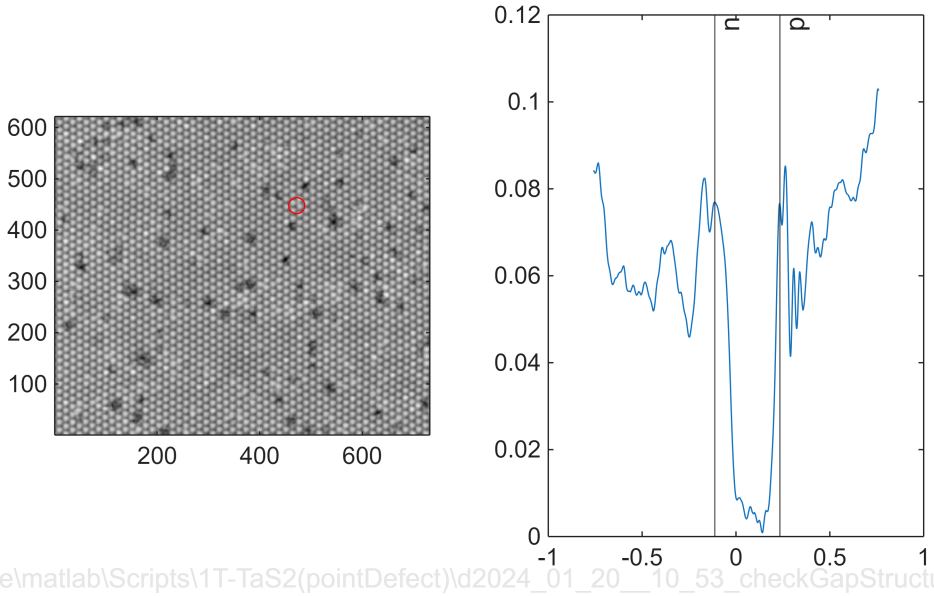
```
ipoint = 1
```

```
ipoint =
1
```

```
xpxl = rand_pxls(ipoint,1,ph);
ypxl = rand_pxls(ipoint,2,ph);
close
subplot(1,2,1)
imgfoo = mapCD.dt(p).Z;
views(imgfoo)
colormap('gray')
hold on
plot(xpxl,ypxl,'ro')
hold off


subplot(1,2,2)
imgfoo = mapCD.dt(p).Z;
V = mapCD.V;
g = squeeze(mapCD.dt(ph).G(xpxl,ypxl,:));
Gap_p = mapCD.dt(ph).Gap_p(xpxl,ypxl);
Gap_n = mapCD.dt(ph).Gap_n(xpxl,ypxl);
plot(V,g)
xline(Gap_p,'-','p')
xline(Gap_n,'-','n')

sgtitle('scheme of positive and negative band position')
waterMark()
```






```
% msb = 6
% nsb = 8
% p = 0
% for isb = 1:msb
%     for jsb = 1:nsb
%         p = p + 1;
%         subplot(msb,nsb,p);
%         xticks = [];
%         yticks = [];
%     end
% end
```

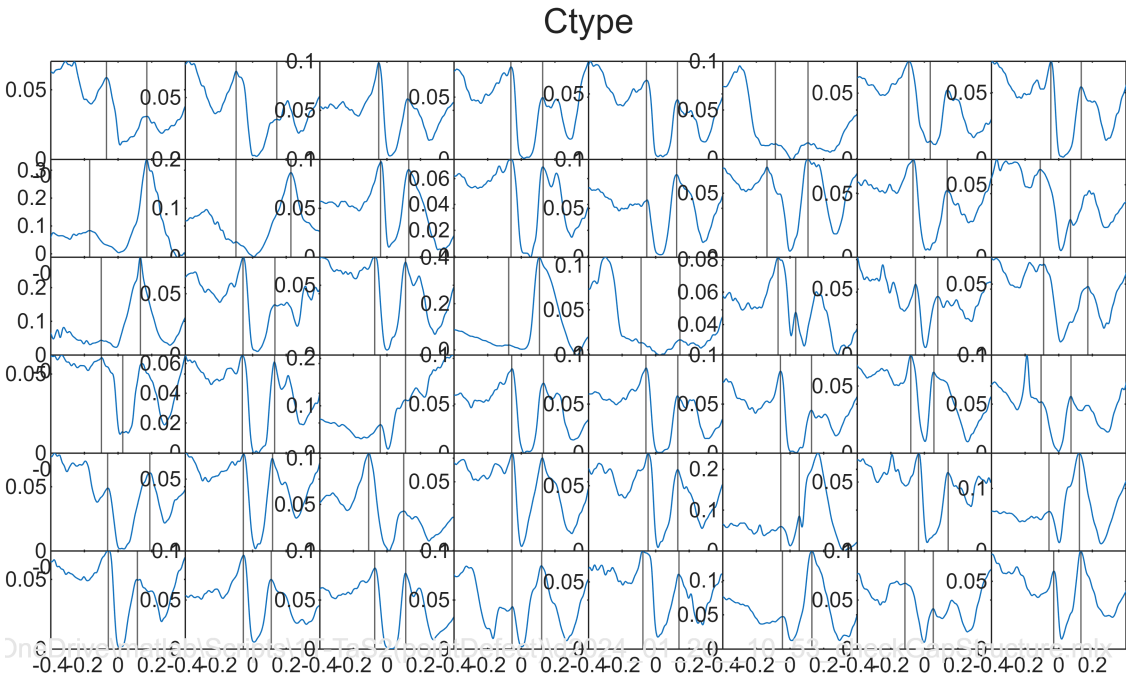
```
ph = 1
```

```
ph =
1
```

```
function multpleDraw(mapCD,rand_pxls,ph)
V = mapCD.V;
msb = 6
nsb = 8
sgtns = ["Ctype" 'Atype'];
tiledlayout(msb,nsb, 'Padding', 'none', 'TileSpacing', 'none');
for i=1:msb*nsb
    nexttile
    xpxl = rand_pxls(i,1,ph);
    ypxl = rand_pxls(i,2,ph);
```

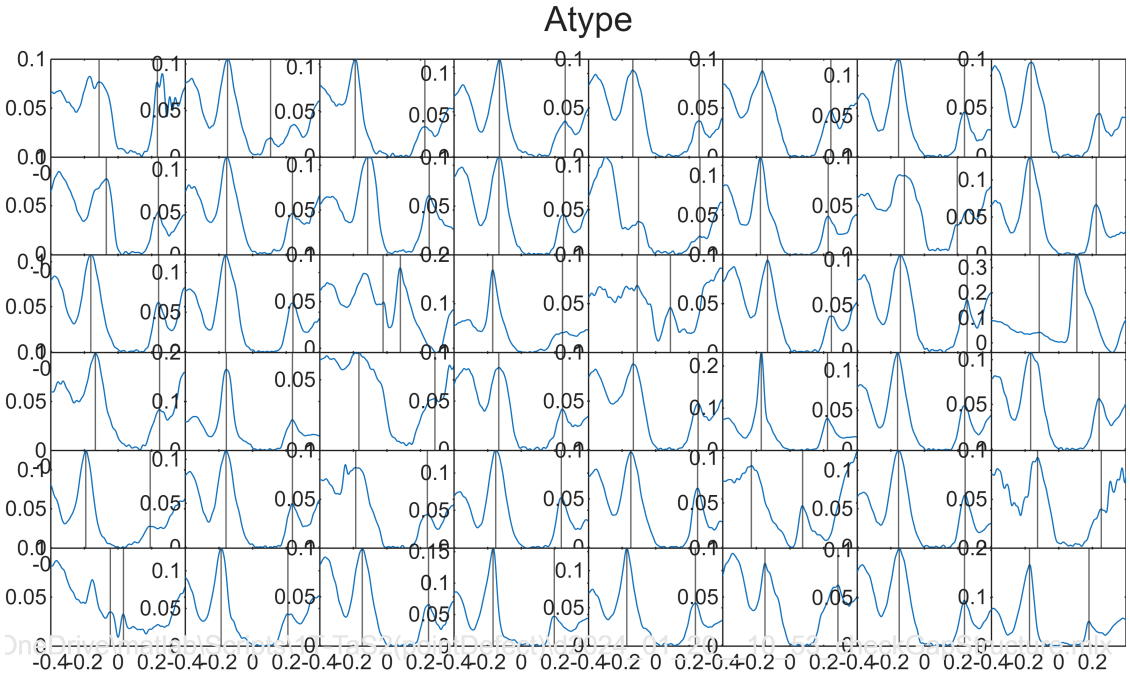
```
    g = squeeze(mapCD.dt(ph).G(xpxl,ypxl,:));
    Gap_p = mapCD.dt(ph).Gap_p(xpxl,ypxl);
    Gap_n = mapCD.dt(ph).Gap_n(xpxl,ypxl);
    plot(V,g);
    xline(Gap_p,'-')
    xline(Gap_n,'-')
    xlim([-1 1]*0.4)
end
sgtitle(sgtns(ph))
waterMark()
end
multpleDraw(mapCD,rand_pxls,1)
```

```
msb =
6
nsb =
8
```




```
multpleDraw(mapCD,rand_pxls,2)
```

```
msb =
6
nsb =
8
```


Atype