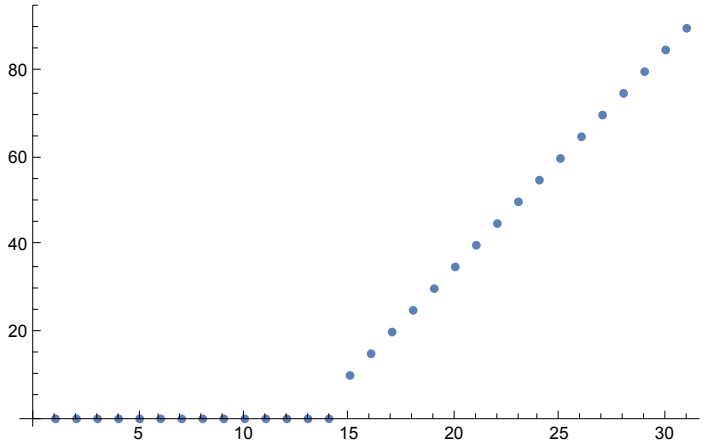
```
SetDirectory["~bastian/Desktop/wave_ranjit"];
Namelist = FileNames[]
Namelist // Length;
nfiles = %
```

```
{.DS_Store,
 Fluence-0-tct-1060nm-APD-1.4e14-200um-junct-57um-1600V-100um_tr.txt,
 Fluence-0-tct-1060nm-APD-1.4e14-200um-junct-57um-1600V-105um_tr.txt,
 Fluence-0-tct-1060nm-APD-1.4e14-200um-junct-57um-1600V-10um_tr.txt,
 Fluence-0-tct-1060nm-APD-1.4e14-200um-junct-57um-1600V-110um_tr.txt,
 Fluence-0-tct-1060nm-APD-1.4e14-200um-junct-57um-1600V-115um_tr.txt,
 Fluence-0-tct-1060nm-APD-1.4e14-200um-junct-57um-1600V-120um_tr.txt,
 Fluence-0-tct-1060nm-APD-1.4e14-200um-junct-57um-1600V-125um_tr.txt,
 Fluence-0-tct-1060nm-APD-1.4e14-200um-junct-57um-1600V-130um_tr.txt,
 Fluence-0-tct-1060nm-APD-1.4e14-200um-junct-57um-1600V-135um_tr.txt,
 Fluence-0-tct-1060nm-APD-1.4e14-200um-junct-57um-1600V-140um_tr.txt,
 Fluence-0-tct-1060nm-APD-1.4e14-200um-junct-57um-1600V-145um_tr.txt,
 Fluence-0-tct-1060nm-APD-1.4e14-200um-junct-57um-1600V-150um_tr.txt,
 Fluence-0-tct-1060nm-APD-1.4e14-200um-junct-57um-1600V-155um_tr.txt,
 Fluence-0-tct-1060nm-APD-1.4e14-200um-junct-57um-1600V-15um_tr.txt,
 Fluence-0-tct-1060nm-APD-1.4e14-200um-junct-57um-1600V-160um_tr.txt,
 Fluence-0-tct-1060nm-APD-1.4e14-200um-junct-57um-1600V-20um_tr.txt,
 Fluence-0-tct-1060nm-APD-1.4e14-200um-junct-57um-1600V-25um_tr.txt,
 Fluence-0-tct-1060nm-APD-1.4e14-200um-junct-57um-1600V-30um_tr.txt,
 Fluence-0-tct-1060nm-APD-1.4e14-200um-junct-57um-1600V-35um_tr.txt,
 Fluence-0-tct-1060nm-APD-1.4e14-200um-junct-57um-1600V-40um_tr.txt,
 Fluence-0-tct-1060nm-APD-1.4e14-200um-junct-57um-1600V-45um_tr.txt,
 Fluence-0-tct-1060nm-APD-1.4e14-200um-junct-57um-1600V-50um_tr.txt,
 Fluence-0-tct-1060nm-APD-1.4e14-200um-junct-57um-1600V-55um_tr.txt,
 Fluence-0-tct-1060nm-APD-1.4e14-200um-junct-57um-1600V-60um_tr.txt,
 Fluence-0-tct-1060nm-APD-1.4e14-200um-junct-57um-1600V-65um_tr.txt,
 Fluence-0-tct-1060nm-APD-1.4e14-200um-junct-57um-1600V-70um_tr.txt,
 Fluence-0-tct-1060nm-APD-1.4e14-200um-junct-57um-1600V-75um_tr.txt,
 Fluence-0-tct-1060nm-APD-1.4e14-200um-junct-57um-1600V-80um_tr.txt,
 Fluence-0-tct-1060nm-APD-1.4e14-200um-junct-57um-1600V-85um_tr.txt,
 Fluence-0-tct-1060nm-APD-1.4e14-200um-junct-57um-1600V-90um_tr.txt,
 Fluence-0-tct-1060nm-APD-1.4e14-200um-junct-57um-1600V-95um_tr.txt,
 simlandau1.dat, simlandau2.dat, simlandau.dat}
```

```
35
```

```
Clear[de];
de = ConstantArray[0, 31];
nfil = {4, 15};
AppendTo[nfil, Range[17, 31]];
nfil = Flatten[nfil];
filename = Namelist[[4]];
a = ToExpression[StringDrop[StringDrop[filename, 55], -9]];
de[[15]] = a;
filename = Namelist[[15]];
a = ToExpression[StringDrop[StringDrop[filename, 55], -9]];
de[[16]] = a;
Do[
  filename = Namelist[[i]];
a = ToExpression[StringDrop[StringDrop[filename, 55], -9]];
  de[[i]] = a;
, {i, 17, 31}];
ListPlot[de]
```

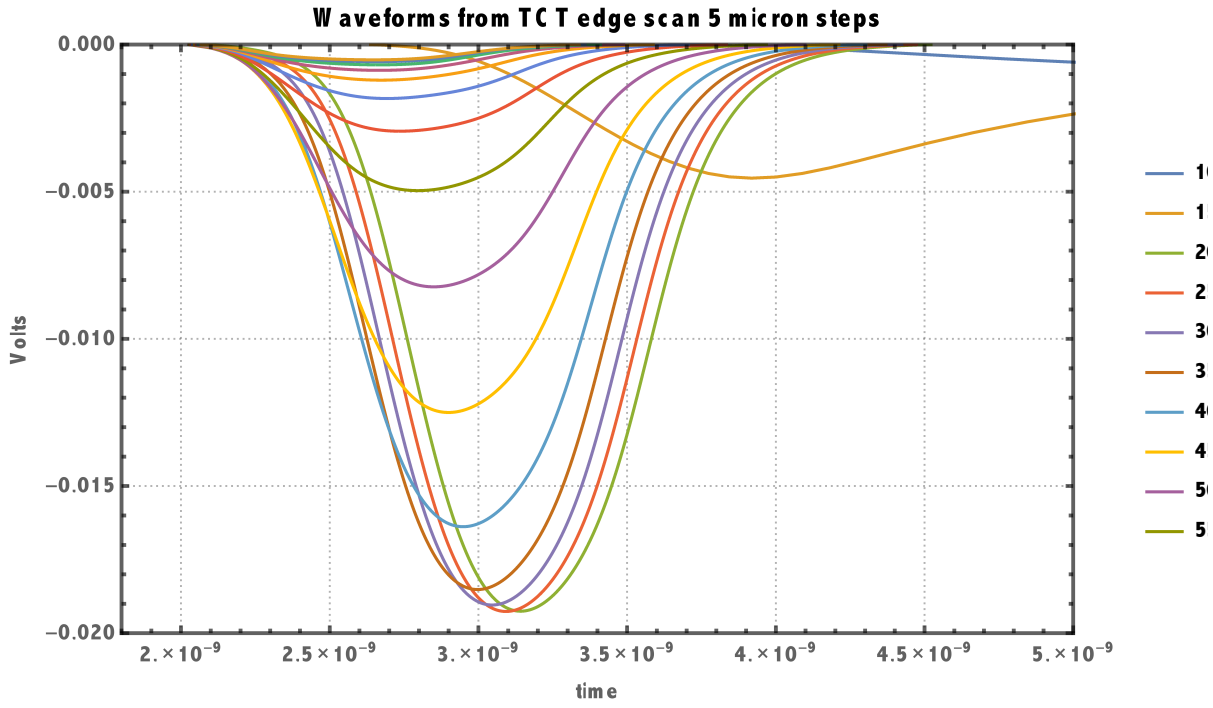



```
d = Drop[de, 14]
Dimensions[d]
```

```
{10, 15, 20, 25, 30, 35, 40, 45, 50, 55, 60, 65, 70, 75, 80, 85, 90}
```

```
{17}
```

```
time = ConstantArray[0, {17, 1223}]; v = ConstantArray[0, {17, 1223}];
scope = ConstantArray[0, {17, 1223, 2}];

Do[
  filename = Namelist[[nfil[[i]]]];
  data = Import[filename, "Table"];
  scopedata = Cases[data, {_?NumberQ, _?NumberQ}];
  scope[[i]] = scopedata;
  (*{time[[3]],v[[3]]}=scopedata*)
  , {i, 1, 17}];
```

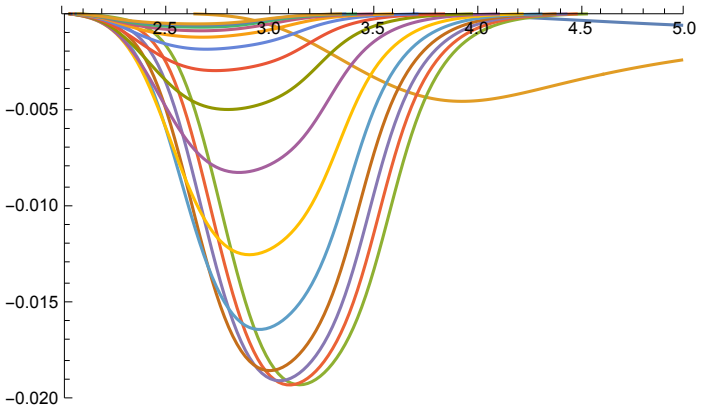



```
nent = Dimensions[scope[[1]]][[1]];
tt = Table[scope[[1, i, 1]], {i, 1, nent}] * 10^9;
vv = Table[scope[[1, i, 2]], {i, 1, nent}];
f = Interpolation[Transpose[{tt, vv}]];
f[[1]] = Interpolation[Transpose[{tt, vv}]];
g = Interpolation[Transpose[{tt, vv}]];
```

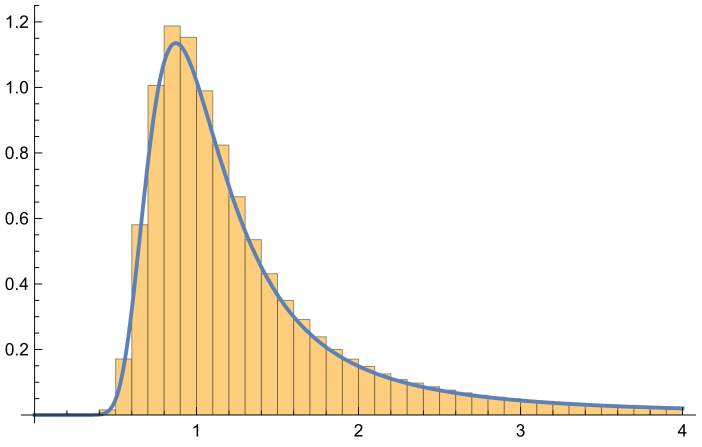
Save instead as digital samples with 20 picosecond sampling frequency. This deals with the problem of not being able to do simple operations
with Interpolation functions (ie like adding them to make a new function). The end result also looks like scope data so it will be easy to analyze.

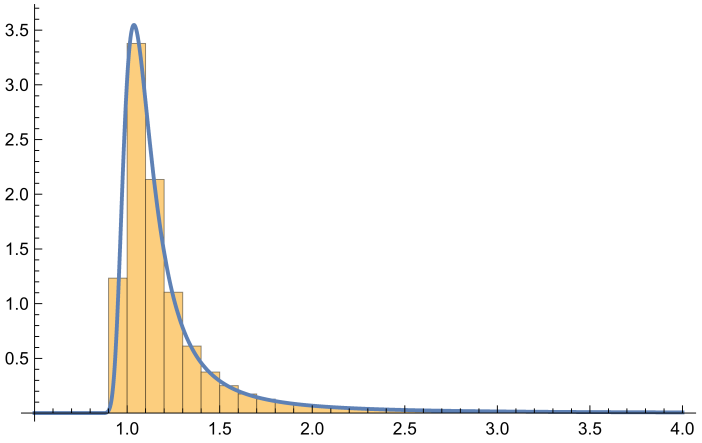
```
edgescan = ConstantArray[0, {17, 150}];
Do[
  nent = Dimensions[scope[[i]]][[1]];
  tt = Table[scope[[i, j, 1]], {j, 1, nent}] * 10^9;
  vv = Table[scope[[i, j, 2]], {j, 1, nent}];
f = Interpolation[Transpose[{tt, vv}]];
  edgescan[[i]] = Table[f[1.98 + j * 0.02], {j, 1, 150}];
  , {i, 1, 17}];

time = Range[150] * 0.02 + 1.98;
```

```
waveplot = Table[Transpose[{time, edgescan[[i]]}], {i, 1, 17}];

ListPlot[waveplot, Joined → True, PlotRange → {{2, 5}, {-.02, 0.}}]
```




```
(*σ=0.08;μ=1.2;*)
σ = 0.25; μ = 1.2;
data = RandomReal[LandauDistribution[μ, σ], 10^6];
Show[
 Histogram[data, {0.0, 4, 0.1}, "PDF", AxesOrigin → {0.0, 0}],
 Plot[PDF[LandauDistribution[μ, σ], x], {x, 0.0, 4},
  PlotRange → Full, PlotStyle → Thick, ImageSize → Large]]
```

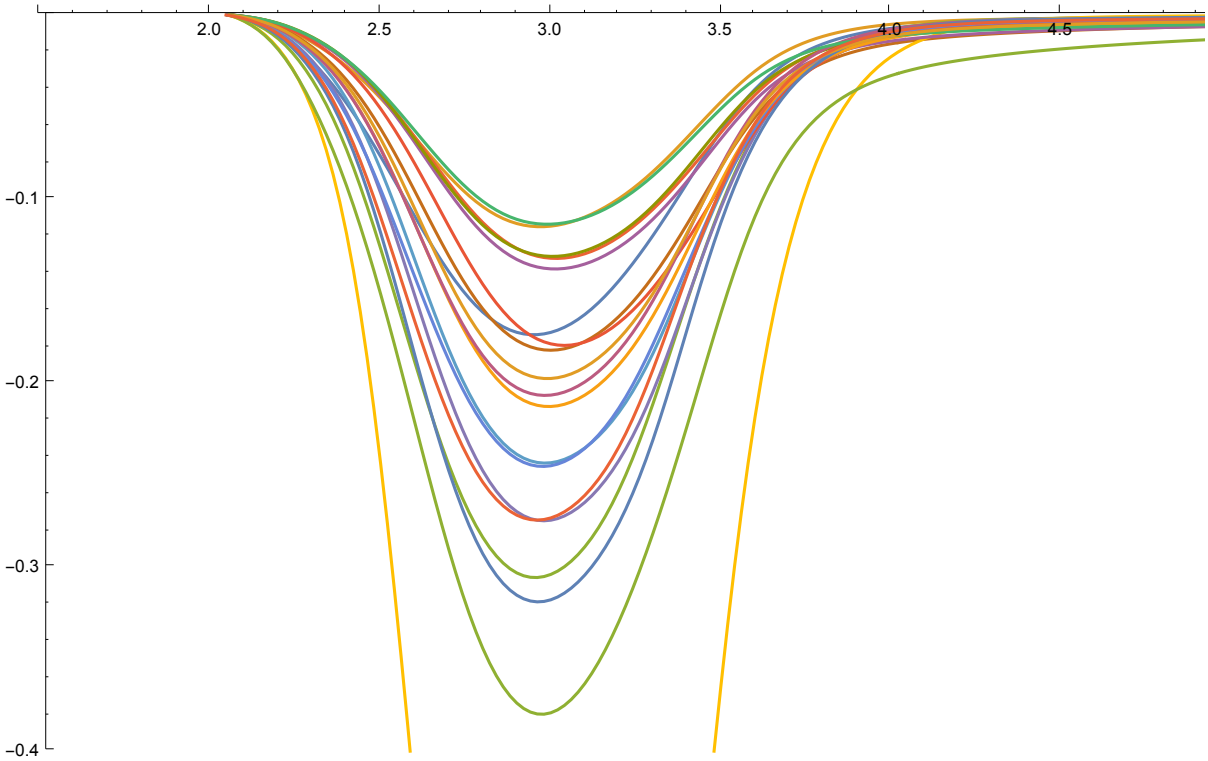




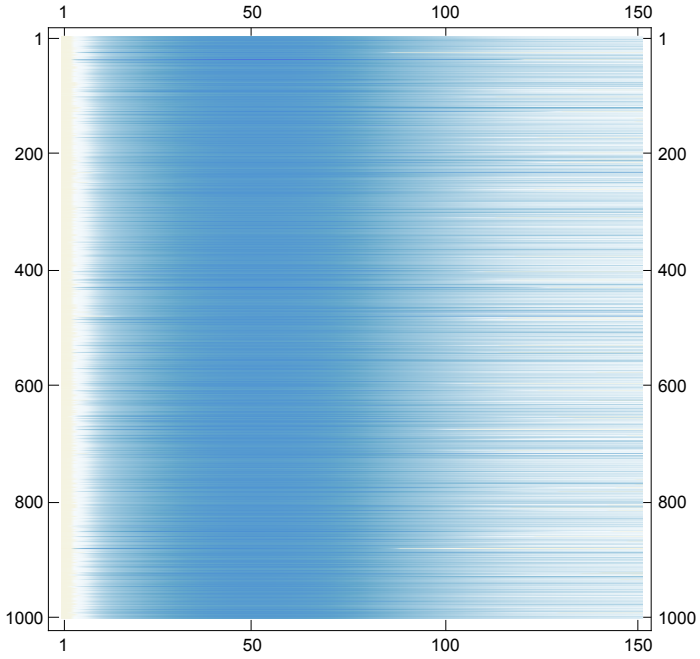
Now generate 100 waveforms with Landau fluctuations

introduced.

```
waveforms = ConstantArray[0, {1000, 150}];
Do[
  clusters = RandomReal[LandauDistribution[μ, σ], 17];
  waveforms[[i]] = clusters.edgescan;
  , {i, 1, 1000}];

ListPlot[{Transpose[{time, waveforms[[1]]}],
  Transpose[{time, waveforms[[2]]}], Transpose[{time, waveforms[[3]]}],
  Transpose[{time, waveforms[[4]]}], Transpose[{time, waveforms[[5]]}],
  Transpose[{time, waveforms[[6]]}], Transpose[{time, waveforms[[7]]}],
  Transpose[{time, waveforms[[8]]}], Transpose[{time, waveforms[[9]]}],
  Transpose[{time, waveforms[[10]]}], Transpose[{time, waveforms[[11]]}],
  Transpose[{time, waveforms[[12]]}], Transpose[{time, waveforms[[13]]}],
  Transpose[{time, waveforms[[14]]}], Transpose[{time, waveforms[[15]]}],
  Transpose[{time, waveforms[[16]]}], Transpose[{time, waveforms[[17]]}],
  Transpose[{time, waveforms[[18]]}], Transpose[{time, waveforms[[19]]}]},
 Joined → True, PlotRange → {{1.5, 5}, {-.4, 0.}}]
```

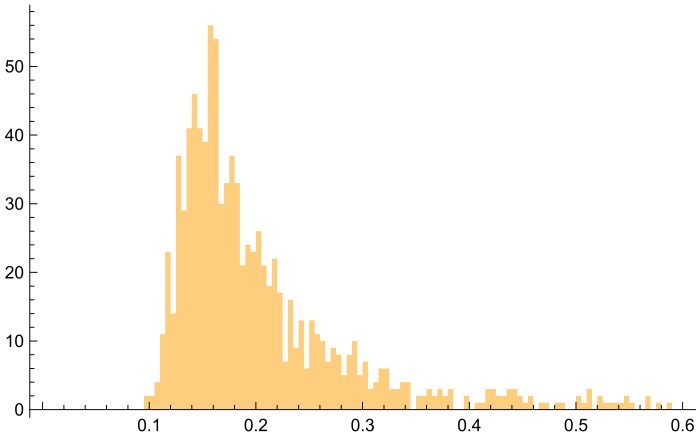


```
MatrixPlot[waveforms, AspectRatio → 1]
```



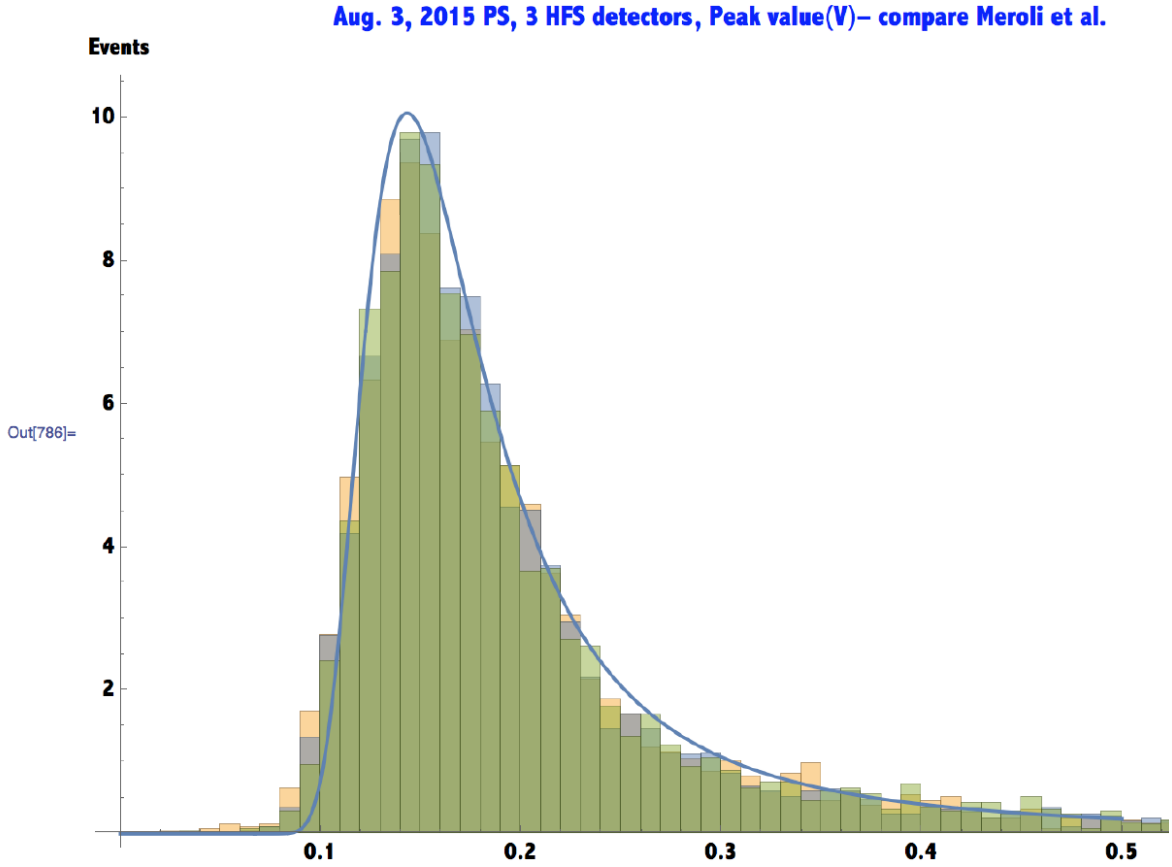
Definitely better with σ = 0.25 !

```
peakvalue = Table[Max[-waveforms[[i]]], {i, 1, 1000}];
Histogram[peakvalue, {0, 0.6, .005}]
```




```
Export["simlandau2.dat", waveforms, "tsv"];
```

Out[786]=


Aug. 3, 2015 PS, 3 HFS detectors, Peak value(V)– compare Meroli et al.
Events
10
8
6
4
2
0.1
0.2
0.3
0.4
0.5