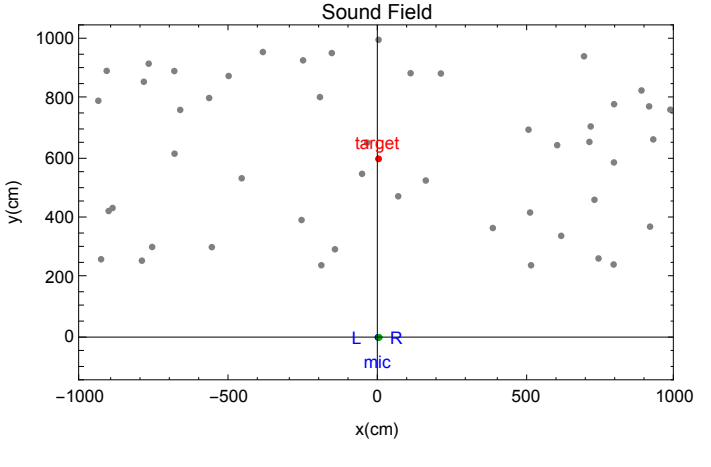
Coordinates

In[1898]:=
```
soundSpeed = 340 * 10^2; (* 340m/s *)
micDist = 4; (* 4cm *)
near = 200; far = 1000; (* 1m to 10m *)
magnify = (far/2)^3;
labelShift = 50;
nSource = 50;
micCoord = {{-micDist/2, 0}, {micDist/2, 0}};
tarCoord = {0, 3/5 far};
envSource = Transpose[RandomReal[#, nSource - 2] &
    {{-1, 1} far(* xRange *), {near, far}(* yRang
AppendTo[envSource, {0, far}];
points = {envSource, {tarCoord}, {micCoord[[1]]},
g1 = ListPlot[points, PlotStyle → {Gray, Red, Blue,
  AspectRatio → Automatic, PlotLabel → "Sound Fie
  FrameLabel → {"x(cm)", "y(cm)"}, AxesOrigin → {0
  PlotRange → {{-far, far}, {-3 labelShift, far + l
  Epilog → {Inset[Style["target", Red], tarCoord +
    Inset[Style["L       R\nmic", Blue], -{0, labe
```

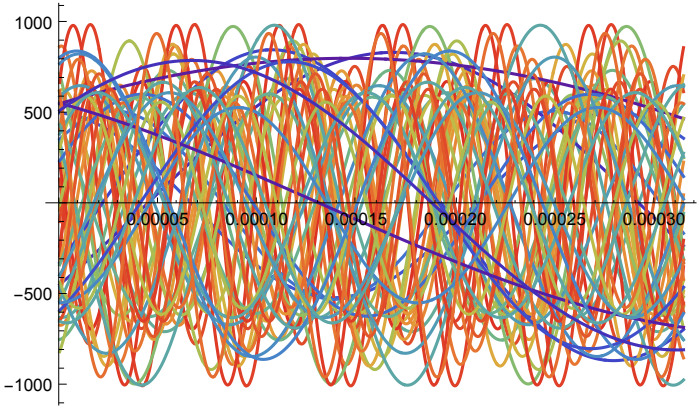
Out[1906]=



Source Wave Forms

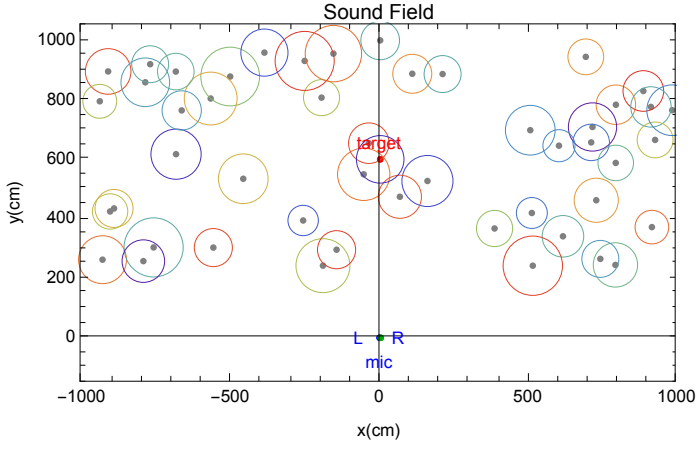
In[1907]:=
```
wave[amp_, f_, ϕ_, t_] := amp Sin[2 π f t + ϕ];
ampRange = {500, 1000};
fRange = {50, 20 000}(* 50Hz~20kHz *);
ϕRange = {0, 2 π};
randWavePar = {randAmp, randFreq, randPhase} =
    RandomReal[#, nSource] & /@ {ampRange, fRange, ϕ
randWaves = wave[#[[1]], #[[2]], #[[3]], t] & /@ Tra
Plot[randWaves, {t, 0, 2 Pi / fRange[[2]]},
 PlotStyle → Table[ColorData["Rainbow"][c / 20 000
```

Out[1911]=



In[1912]:=
```
g2 = Graphics[{ColorData["Rainbow"][#[[3]] / 20 00
     Transpose[{Append[envSource, tarCoord], rand
Show[
 g1,
 g2]
```

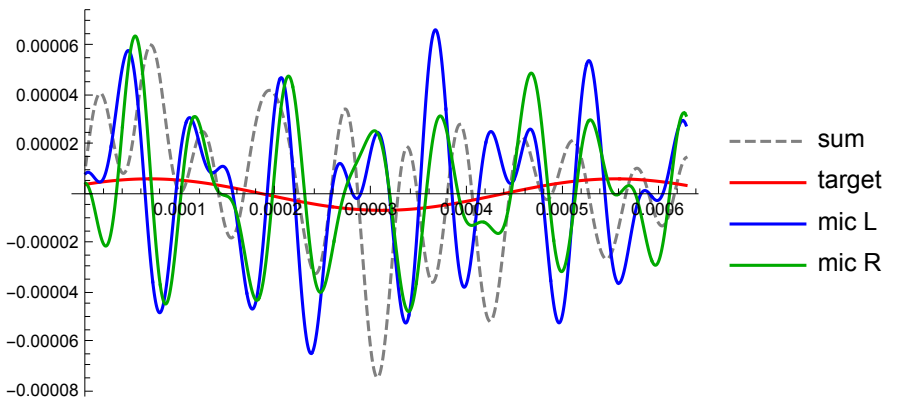
Out[1913]=



Received Waves

In[1914]:=
```
dist = N@Table[
    EuclideanDistance[#, micCoord[[c]]] & /@Append[envSource,
recAmp = randAmp / #^3 & /@dist;
recPhase = (* needs to be checked *)
  Table[Mod[2 π #[[1]] #[[2]]/soundSpeed + #[[3]], 2 π] & /@
    Transpose[{randFreq, dist[[i]], randPhase}], {i, 2}];
recWavePar = Table[{recAmp[[i]], randFreq, recPhase[[i]]}, {i,
recWaves =
  Table[wave[#[[1]], #[[2]], #[[3]], t] & /@Transpose[recWaveP
compare = Total[#] & /@{randWaves/magnify,
    {randWaves[[-1]]/magnify}, recWaves[[1]], recWaves[[2]]}
styles = {{Dashed, Gray}, Red, Blue, Darker@Green};
legends = {"sum", "target", "mic L", "mic R"};
Plot[compare, {t, 0, 2 π/(10 far)}, PlotStyle → styles,
 PlotLegends → LineLegend[styles, legends]]
```

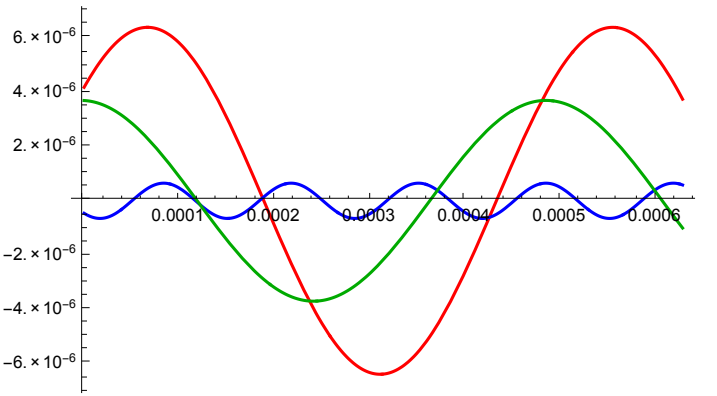
Out[1922]=



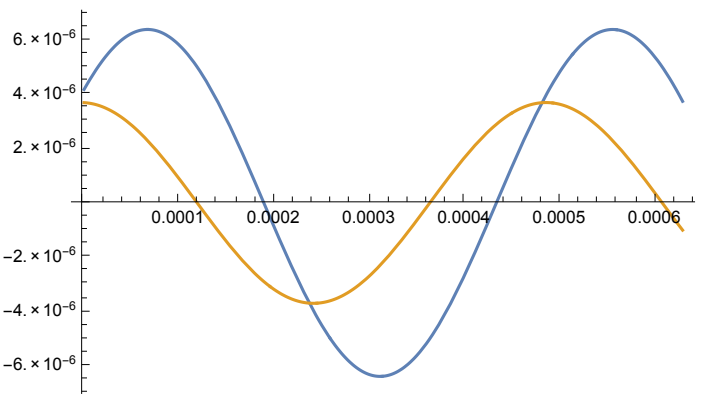
Filtering

In[1923]:=
```
(*tuneDist=4/5far;*)
filtered = Table[If[recPhase[[1, i]] == recPhase[[2, i]],
    recWavePar[[ ;; , ;; , i]], Nothing], {i, nSource}];
effect = Prepend[wave[#[[1]], #[[2]], #[[3]], t] & /@ filtered[
   randWaves[[-1]] / magnify];
styles = {Red, Blue, Darker@Green};
legends = {"target", "signal 1", "signal 2"};
Plot[effect, {t, 0, 2 π / (10 far)}, PlotStyle → styles,
 PlotLegends → LineLegend[styles, legends]]
major = SortBy[ filtered, First][[-1, 1]];
Plot[{randWaves[[-1]] / magnify,
  wave[#[[1]], #[[2]], #[[3]], t] & /@ {major}}, {t, 0, 2 π / (10 far)}]
```

Out[1927]=



Out[1929]=



In[1930]:=
```
Column[Play[#, {t, 0, 10 2 π / far}] & /@
  {Total[randWaves], Total[recWaves
   Total[effect[[2 ;;]]], (wave[#[[
```

Out[1930]=