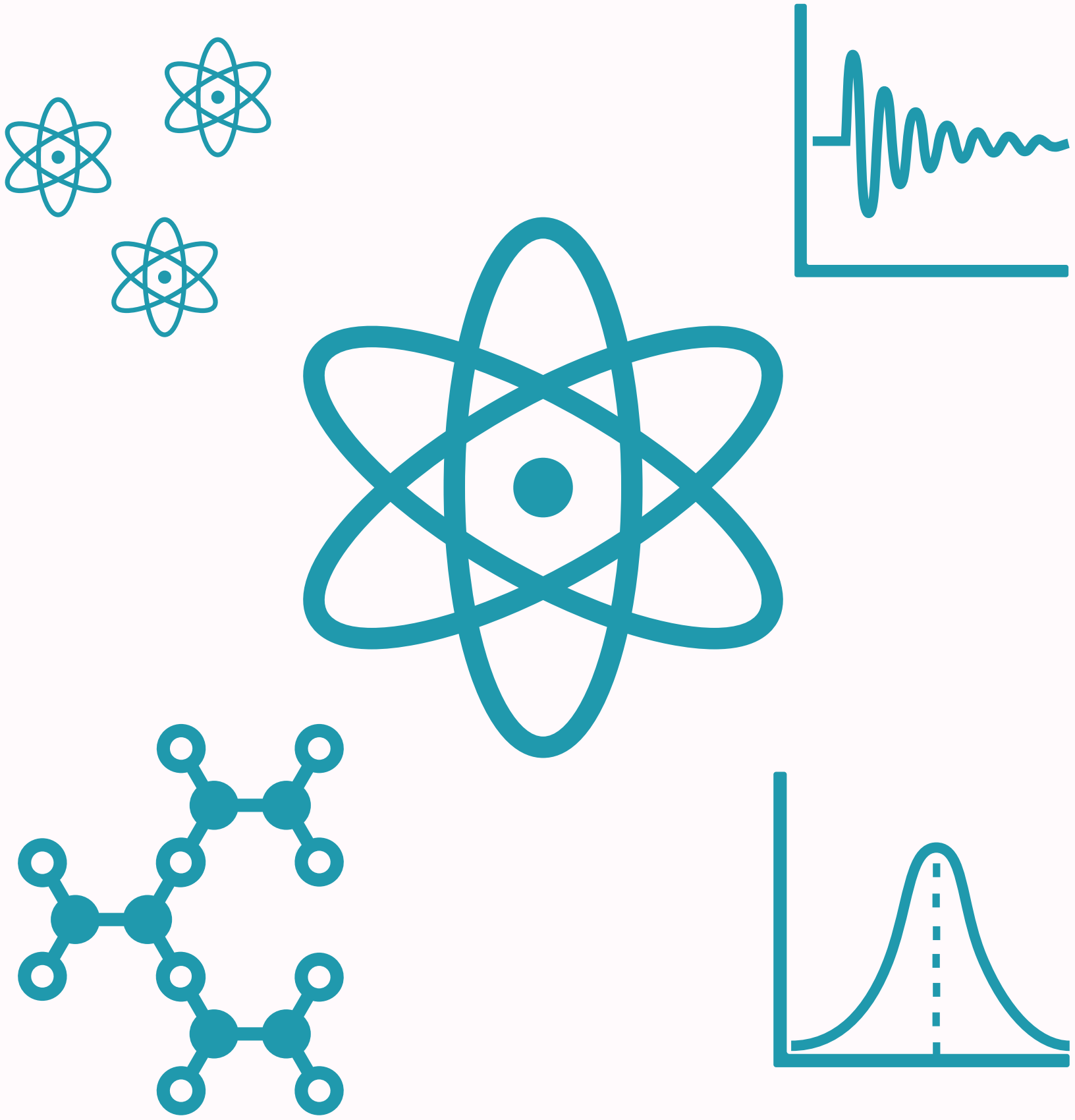
FOG CHAMBER

SOFTWARE INSTRUCTIONS



U.S. ATOMIC ENERGY COMMISSION / Division of Technical Information

U.S. Atomic Energy Commission

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FOG CHAMBER user manual

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This manual explains how to operate with the Apple][software.

No information about the interface is provided in this text,
please read more about the interfacing card in the
HARDWARE DOCUMENTATION MANUAL.

W E L C O M E

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FOG CHAMBER is a modified version of cloud chambers that you can connect to AppleII® computers.

This software translates the data from the chamber's sensors in trajectories displayed on your monitor, it is also able to drive the charge injector: you can easily execute new experiments using ONLY your keyboard.

C O O R D I N A T E S Y S T E M

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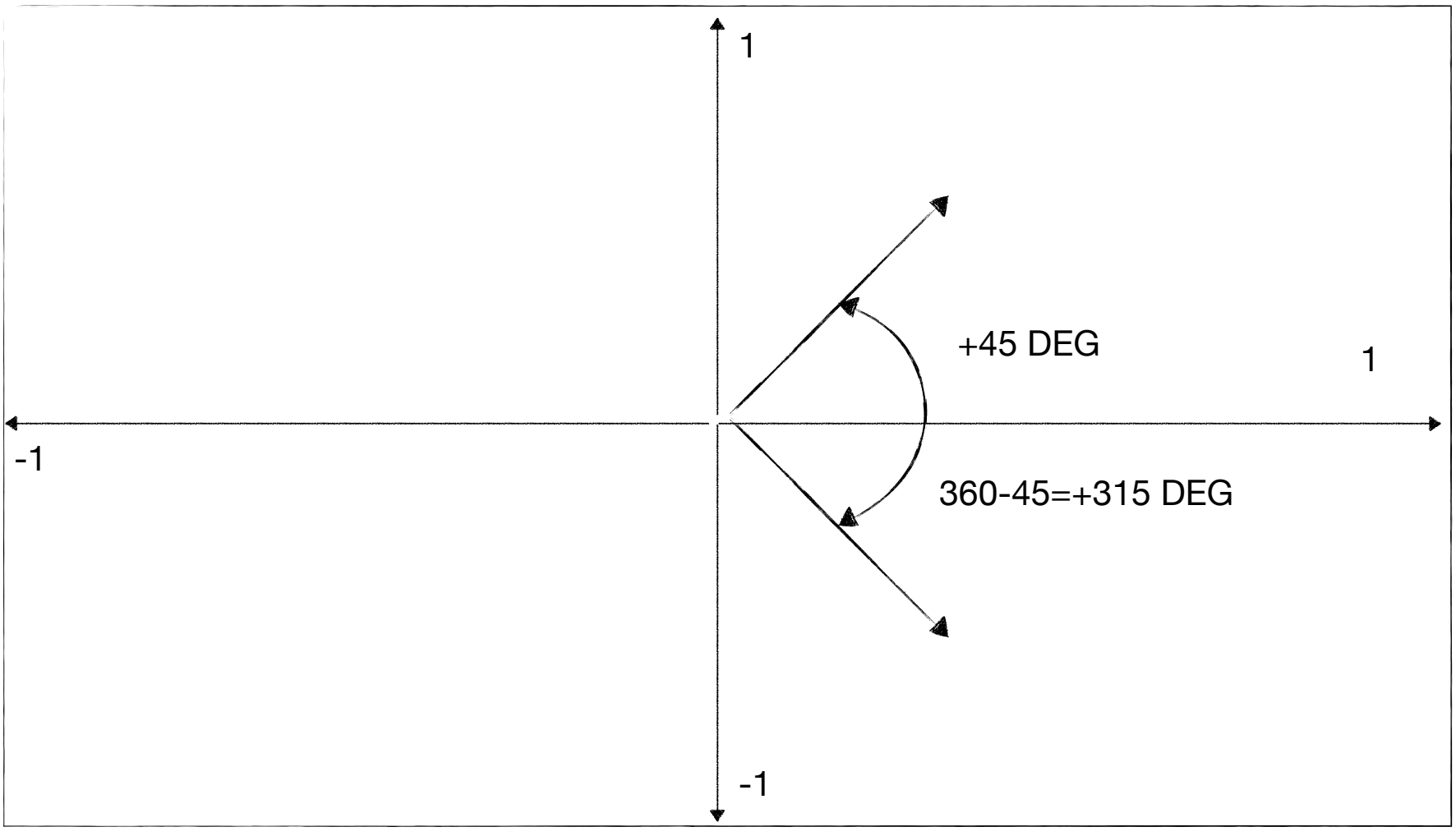
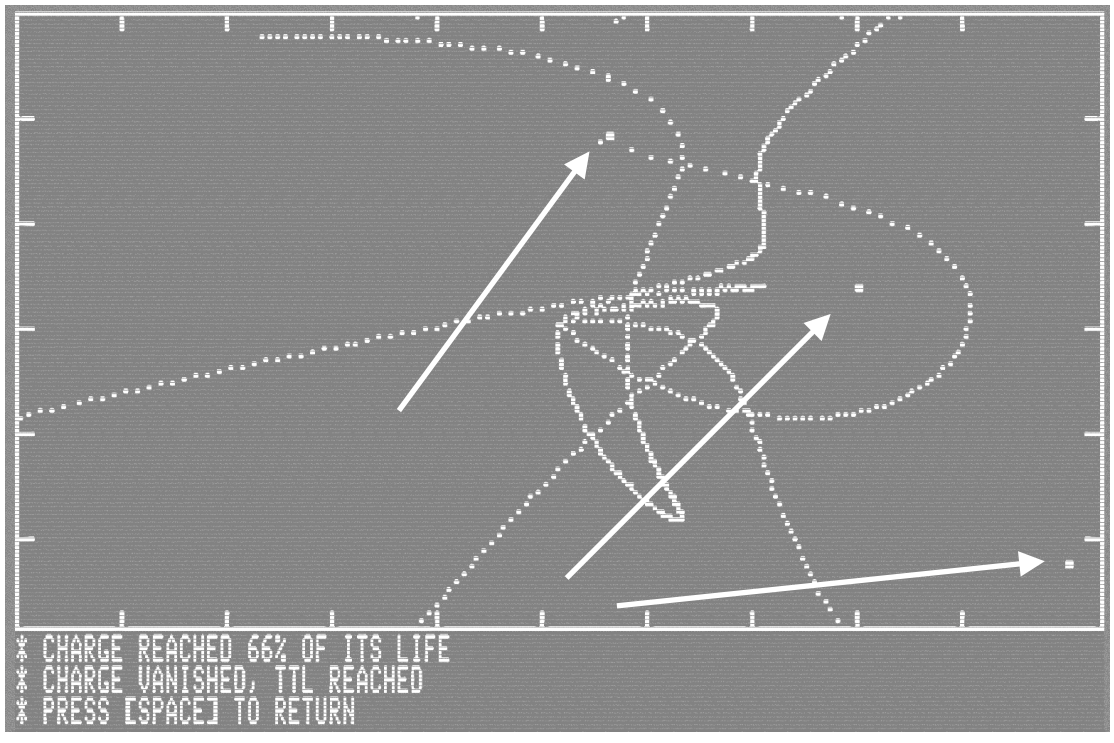


Your display covers all the space available into the chamber, unfortunately, the chamber is a square and your screen is a rectangle. So circles are drawn as ellipses.

The charge injector is located at (0,0), which is the center of your screen. It can rotate but cannot move.

P R A T I C E I S T H E B E S T T E A C H E R

In the beginning, you need to understand how to use the system and a test environment has been provided. Using option 1) the system will place 3 charges of unknown value in well defined positions. Your mission is to classify those charges: are they negative or positive? In the real experiment, either charge value and poison are unknown.



In the photo on the left, you can see the test environment of a running practice session.

Arrows are pointing the charges.

Trajectories' shape depends on several parameters that you can control, we see that later.

Injected charges don't last forever. After you fire them, the sensors will be able to capture about 200 samples, no more. If the charge hits a border, that is grounded, it will be destroyed.
Trajectories are kept between experiments, however, if you like you can clear them.
Experiments costs! Use less injections you can.
Once that charge values are identified, your result must be sent to the U.S. Atomic Energy Commission. Other scientists are connected to the chamber, they will share their information and you have to share yours. A s u c c e s s f u l e x p e r i m e n t i s w h e n a l l s c i e n t i s t s a g r e e o n t h e d a t a.

I N J E C T I O N P A R A M E T E R S

You can control * 3 * parameters:

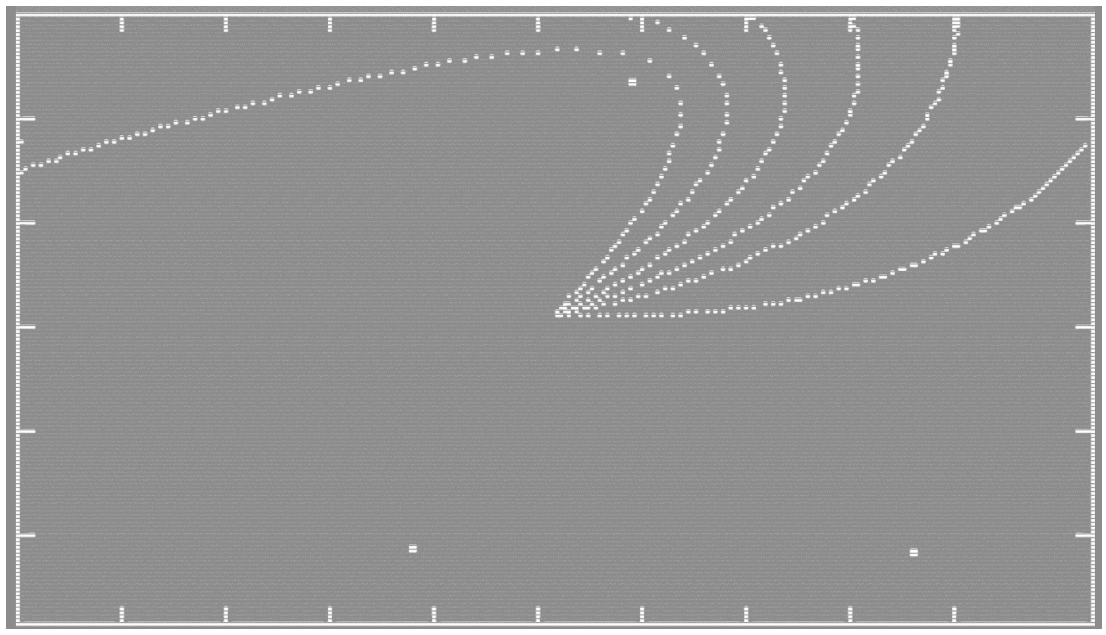
✤ vector (velocity) module (how big is the speed)

✤ vector (velocity) phase (the direction of the speed)

✤ amount of charge injected.

Trajectories' shape change depending on their values.

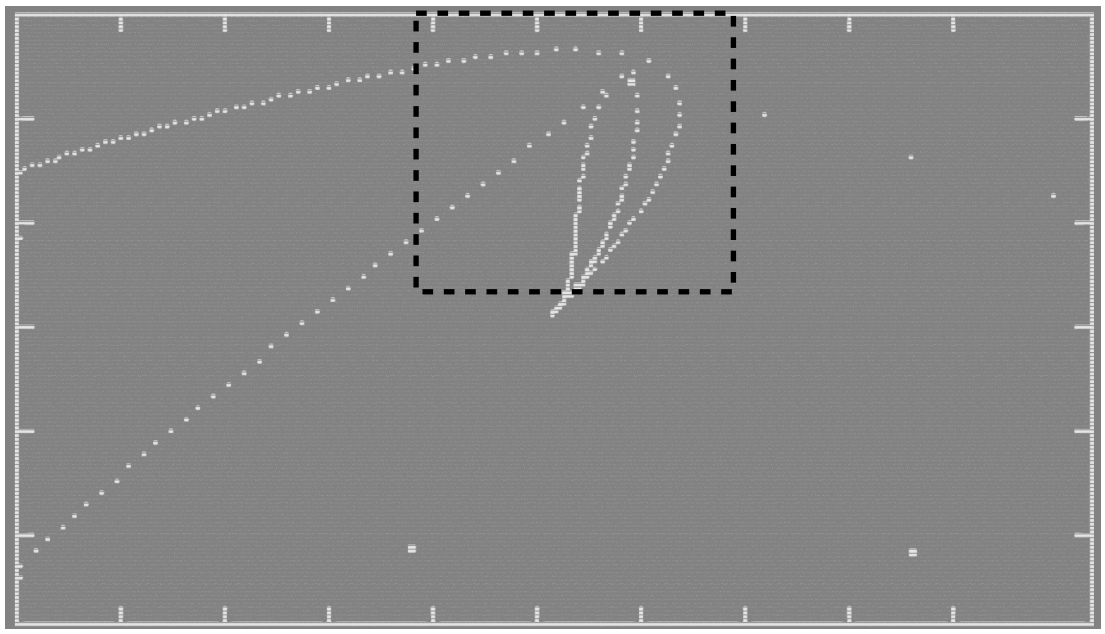
== PARAMETER VECTOR PHASE ==



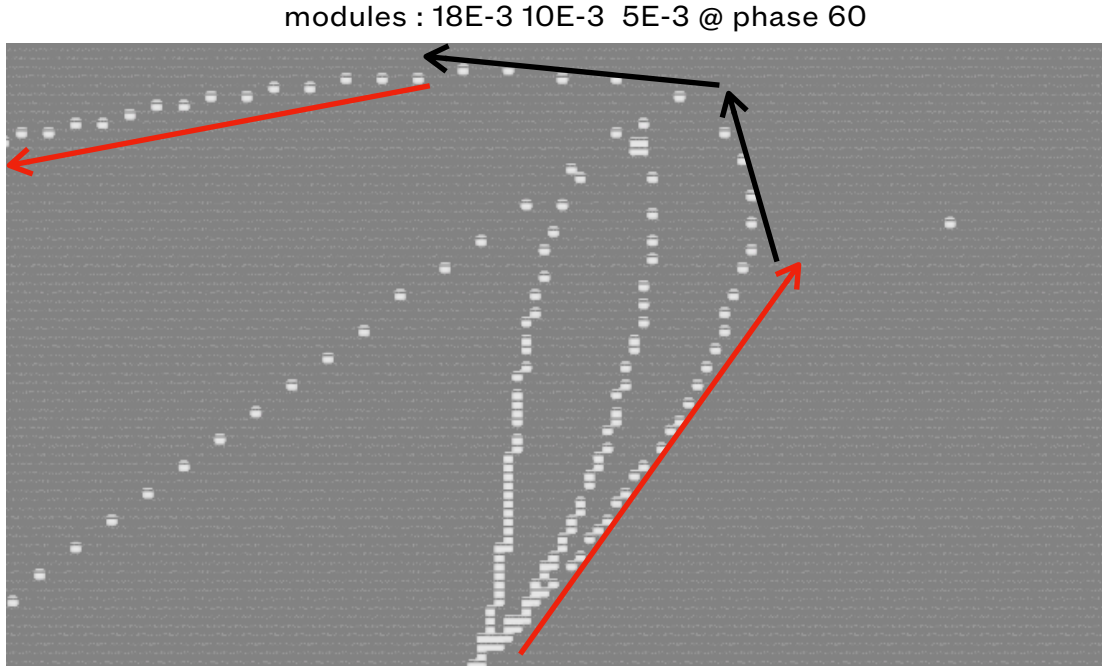
phase vector 10-20-30-40-50-60

In this photo, you can see that as the phase change as trajectory shape changes too. All these trajectories have the same vector module and the same amount of charge.
The phase is changing from 10 to 60. The important thing to pay attention to is that the trajectory looks attracted by the charge located in the middle of the screen: its sign does not equal the injected charge's one.

== PARAMATER VECTOR MODULE ==



modules : 18E-3 10E-3 5E-3 @ phase 60



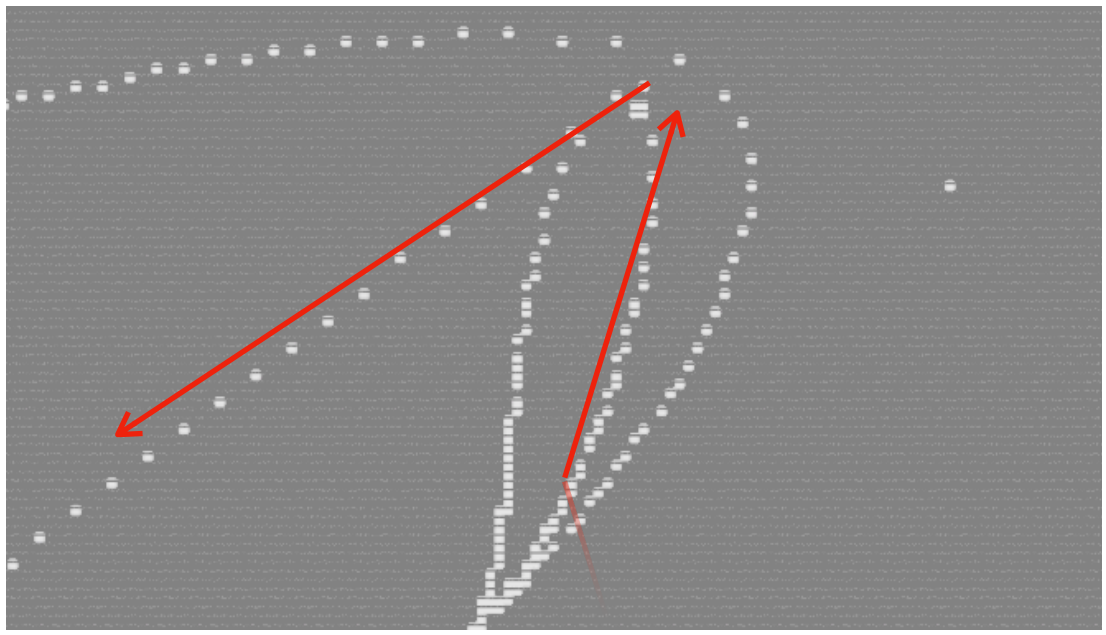
module 18E-3 phase 60

Now you can see the same test environment, where charges are injected at fixed phase (60) and charge and vector module is changing.

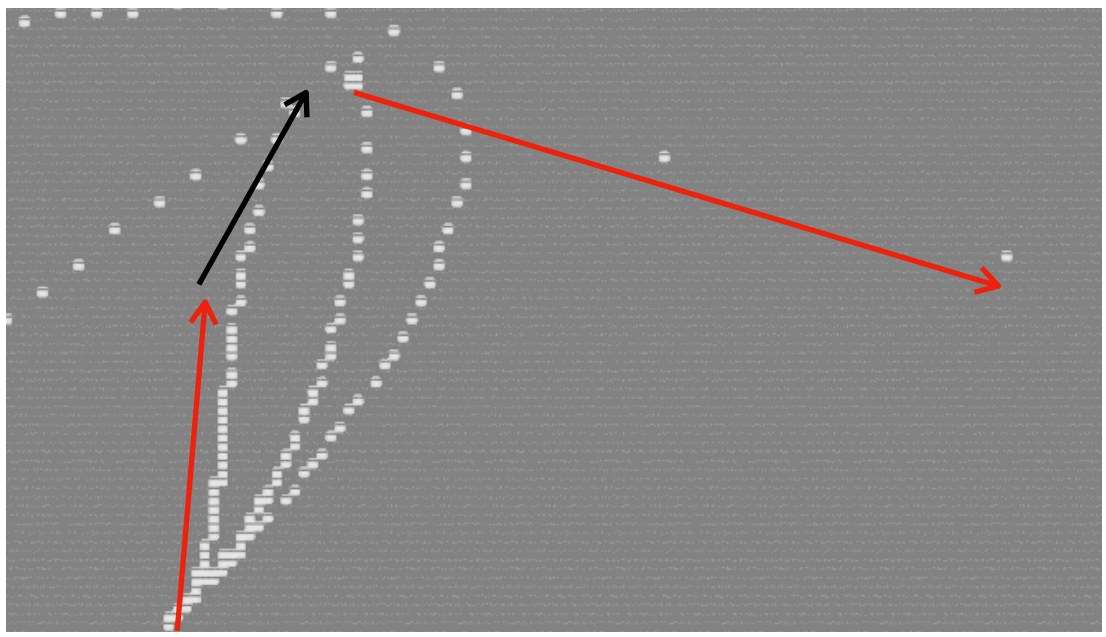
Vector modules are:

18e-3 = 0.018
10e-3 = 0.01
5e-3 = 0.005

Understand these trajectories is not easy. Let's start with the easy one: the vector phase changed because of the force between the charges. In this case, it took time and you can see a smooth curve.
If you carefully take a look at the vector drawn in red, you can see how big has been the phase change.
The Bigger the module the slower the phase change. In this experiment the module was 18e-3.



module 10e-3 phase 60



module 5e-3 phase 60

Now let's look the trajectory produced by vector module=10e-3, a slower speed.
It's happening the same as before but faster, in this case there is not "smooth" curve.
Distance between points tells how great is the vector module.
At the begin it was very slow, then it increased and, after the round, it was really bigger: so the injected charge get very close to the sample.
The rule is simple: lower modules allow the injected charge to get closer the sample.

Last trajectory used module=5e-3, so, the slowest speed.

Look how big was its speed after the turn around the sample!

EXECUTING AN EXPERIMENT

When you execute an experiment, it's better to use the scientific notation. Defaults are average values that are a good start point. Remember that 1e-4 is 0.0001 and 1e-3 is 0.001 that is 10x bigger.

```
Charge [-1,1] (1e-4): <press enter to keep the last one>
Module [-1,1] (0.018):
Phase [0,359](0):
```

After you inject the charge, these rows are printed on the screen:

```
* STARTING EXPERIMENT#1
* POSITIVE CHARGE INJECTED IN CHAMBER
* SPEED.VECT M=0.018, P=0, M(QT)=5.561
```

The last parameter is returned by a sensor that attempts to measure how much charge is in the chamber, however, its accuracy is not as good as we wish.

This parameter change also if you execute exactly the same experiment, the only thing you must know about it is that its average value is a good approximation of the real charge in the chamber. Unfortunately, this software version does not track its expected value, so write it somewhere and used a scientific calculator to compute its average value.

When the screen is black and you don't know the position of the charges, it will help you to understand if you are missing something.

P R O G R A M ' S M E N U

Pressing the ESC key you will get back. Repeatedly press ESC will exit the program, also CTRL + C will terminate the program.

Options available in the main menu:

[1] Easy mode

=> FC-MAIN

[2] Adventure mode

=> FC-MAIN

[3] Student mode

=> FC-MAIN

[4] Scientist mode

=> FC-MAIN

[5] Archivies

[1] DISK CATALOG

[2] LOAD AN OLD GAME

[C] Switch to 40/80 columns
(Apple IIc users can change the code to read the 80/40 key)

[I]nfo about the developer

FC-MAIN (Fog chamber operative menu)

[E]XECUTE

[G]O
allows you to start a new experiment

[C]LEAR
clears all the trajectories plotted

[S]OLVE
communicate to the scientific team your result,
you can do this once for game play, so be sure to have the correct data.

[F]ILE

[S]AVE
saves the sample information, trajectory are not saved, use [P]UT

[P]UT-SCR
allows you to save the screen inside one of six slots available,

[1][2][3][4][5][6]

[G]ET-SCR

allows you to load the screen from the image slots

[1][2][3][4][5][6]