Objective-1: Automation of the rotating magnet
e.g. we want to set \phi degree in PC, and the stepper motor should set to \phi in steps of 0.1 degrees or so

Components:
(1) Sample on the stage for measurement,
(2) Helmholtz coils for creating DC magnetic field
(3) Helmholtz Coils (electromagnet) on the stepper motor with gears
(4) Drivers and connections

The idea is the following:
- The DC motor is instructed by the PC to rotate, which essentially means that the electromagnet on the motorized stage is rotating. This will create a rotating magnetic field in the xy plane, which we can control electronically.
- The DM556 driver is needed to control the stepper motor.
- Arduino/~~Raspberry Pi~~ needed for communication between DM556 and the PC.
- The interface should be based on Python

Objective-1: “RH sweep using B2900 and Nanovoltmeter
e.g. we want to measure R while sweeping the magnetic field for different values of \phi (0,30,60,…)

Parts:

- Controlling stage/magnetic field direction (check slide 2)
- Controlling the magnitude of the field (by PBZ60)
- Measurement of R (either by B2900, Nanovolemeter, SR830/860)

Experiments:

- Set \phi value (call the routine functions)
- Set current (say, I=1mA) from B2900 or an equivalent and measure V1 using B290 and V2 by using nanovoltmeter
- Do a live plotting of H vs R and keep saving the data
- Then channe \phi=\phi2

Note that: there are several setting for each instruments which have to selected initially. This is not mentioned in this flowchart

Objective-1: RH sweep using B2900 and Nanovoltmeter

1. Initialize the motor/driver and stage (some sort of prechecking e.g. \phi=0 initially, etc.
2. Initialize the field. It basically enables Kikosui and sets ups its functionalities such as current, voltage limits, whether it's a current or voltage source, what's the mode, etc?
3. Initializing the B2900 (setting the I-V limits, modes, sweep rate, accuracy, speed, sensitivity, etc)
4. Initializing nanovoltmeter (voltage sensitivity, speed, gain, filters and other functionalities)

Maybe these will be separate functions to be called

"Set I_B2900=0.1 mA (this function sets the current with all other inputs from initialization)
Delay_I_B2900=0.1sec
{ for \phi=0 to 360 in steps of 90 degrees set angle =phi
Delay_stage=0.1 sec

#R vs H loop begins
{for H=0.1T to -0.1T insteps of 0.01T, set-field=xx
Delay_field=0.01 sec
"measure_V1" (measuring V1 using the B2900: It means that a function will be called)
"measure_V2" (measuring V2 using the nanovoltmeter: It means that a function will be called)
Store V1 and V2 in a text and csv files (# check other parameters to be saved)
make a like plot V1 and V2 as a function of H (# make sure that the captions are proper)
} # R vs H loop ends for a given value of \phi
Save text file # give a file name something like this: sample_name_\phi(i)
Save csv file # give a file name something like this: sample_name_\phi(i)
Save figure file # give a file name something like this: sample_name_\phi(i)
} # end of the phi loop

This will be a good start since B2900 is already interfaced. You can add the nanovoltmeter Keysight: 34420A

Objective-2: RH rotation using B2900 and Nanovoltmeter
e.g. we want to measure R by rotating the magnetic field for different of different magnitudes)

Parts:

- Controlling stage/magnetic field direction (check slide 2)
- Controlling the magnitude of the field (by PBZ60)
- Measurement of R (either by B2900, Nanovolemeter, SR830/860)

Experiments:

- Set magnetic field to a some value, e.g.=0.1T
- Set the device current from B2900 to say 1 mA.
- Set the angle phi=0 deg and measure V1 and V2 using B2900 and nanovoltmeter
- Do a live plotting of \phi vs R and keep saving the data
- Change phi=10 degree and do the same measurement and the process goes on: say phi=0 to 360 in steps of 10
- Set magnetic field to a some value, e.g.=0.2T and the process continues from 0.1 to 0.5T in steps of 0.01Tesla.