# Ranging Calibration using SDK

The process of calibrating the ranging application using the SDK must be performed manually directly in the code, as no dedicated routine for this process has been implemented so far. The calibration is simply an offset of the distance estimated by the radio, so it is considered constant regardless of the distance. The value of the offset depends on each radio, as it is purely a factor of the properties of the chip, so it is important to perform this process with each radio.

Note: Although the offset is constant regardless of the distance, it is possible that the error of the measurements is greater the farther away the radios are, this is due to multipaths and external interferences to the system. Therefore, it is important to select the most appropriate calibration distance based on the application to be performed.

1. The process starts with the opening of the *ranging* library, and the file *ranging_cfg.h*
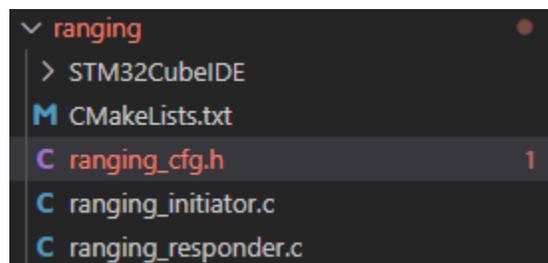
2. Inside the configuration file the following line can be located:

```
#define USER_DEFINED_RANGING_OFFSET    (int32_t)(-1073.35 * RANGING_SCALING)
```

   In this example the value -1073.35 it is the ranging offset; this value needs to be updated to have a calibrated system.

3. Change the ranging offset value to zero, flash the boards and prepare the setup.

```
#define USER_DEFINED_RANGING_OFFSET    (int32_t)(0 * RANGING_SCALING)
```

4. The setup should follow these recommendations:

- The radio should be set at the same height. The recommended height is anything greater than 1 meter.
- Avoid placing them on a surface like a table, it-s preferable to use plastic poles for this task.

- A clear line of sight between the radios makes sure that ranging measurement are valid.
- The radio should be set at the same height. The recommended height is anything greater than 1 meter.
- Avoid placing them on a surface like a table. Try fixing the radios to a post or a tripod.
- A clear line of sight between the radios makes sure that ranging measurement are valid.

5. Start the ranging measurements and collect the data for at least 1000 measurements.

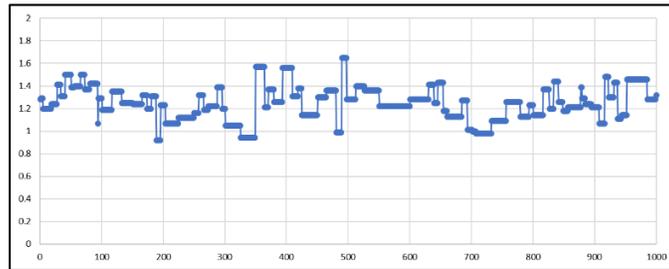6. Obtain the mean value of all the measurements and follow this equation:

Offset_Value = Calibration_distance - Mean_Measurements_Value

7. Replace the new Offset_Value using the negative sign in the code and your system will be ready to be used.
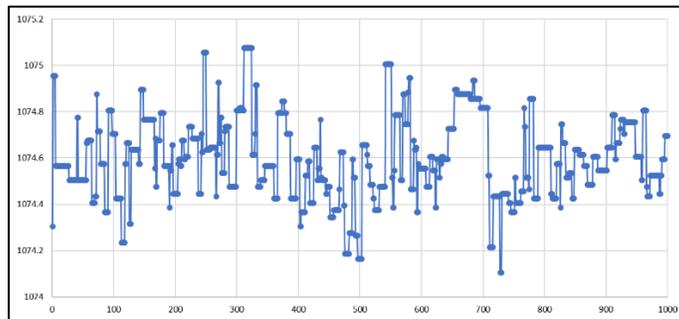
Example

Real position: 2m

```
#define USER_DEFINED_RANGING_OFFSET    (int32_t)(-1073.35 * RANGING_SCALING)
```


Average: 1.247 m

```
#define USER_DEFINED_RANGING_OFFSET    (int32_t)(0 * RANGING_SCALING)
```
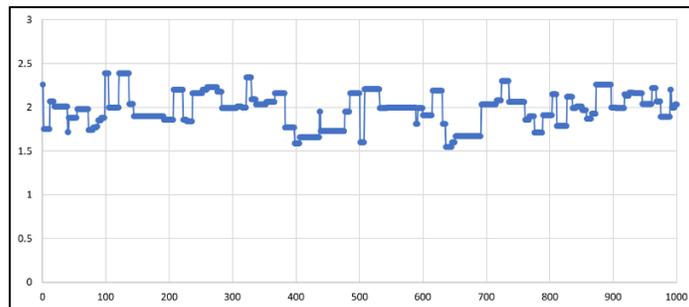

Average: 1074.597

Offset_Value = 2 - 1074.597

Offset_Value = -1072.597

```
#define USER_DEFINED_RANGING_OFFSET    (int32_t)(-1072.597 * RANGING_SCALING)
```


Average: 2.01m