Measurement Team 1 Report

Introduction:

Measurement team 1 is aimed to deal with all the sensors and the algorithms for calculating the required values for the cube sat in the following areas:

1. **GPS** (Longitude, Latitude, Altitude, SNR, Velocity, Satellite Numbers, Azimuth)
2. **Sun Radiation** (UV index, IR and visible light Intensity)
3. **Weather Monitoring** (Pressure, Humidity, Temperature)

Work assigned:

1. Interface all the sensors with Arduino UNO and calibrate the sensors.
2. Modify/Rewrite the libraries present for the sensors for the more accurate calculation.
3. Store the data from the sensors in an array format converting them to a binary array.
4. Sending the Data format to the on-board software team for decoding the information.

Work Completed:

1. Interface all the sensors with Arduino UNO and calibrate the sensors.
2. Modify/Rewrite the libraries present for the sensors for the more accurate calculation.

Requirement and Specifications:

1.SUNLIGHT SENSOR (Si1145):

- Using Digital sensor to avoid the Albedo effect.
- Can measure the level of UV radiation in any type of *light*.
- Sun sensor at different layers of the atmosphere.
- Communicates its information via the I^2C bus, making it compatible with all types of microcontrollers.
- Programming the sensor
- Problem with the ozone layer

2.WEATHER SENSOR (PHT sensor):

- BME280
- Low power consumption
- High accuracy, resolution and lower noise
- Provides both SPI and I^2C interfaces

3.GPS MODULE (NEO 6M):

- Excellent navigation performance even the most challenging environments.

- High-performance u-blox 6 positioning engine.
- Flexible and cost-effective receivers.

Power Requirements:

Sensor	Use	**Current Rating**	**Voltage Rating**	**Protocol**
Neo-6M	GPS	10mA	*2.7~ 6 VDC* *5V (we prefer)*	Serial Communication
BME-280	Pressure, Humidity and Temperature	2mA	5V	I2C
Sun Sensor	UV index, IR and Visible light measurement.	3.5mA	3.0 to 5.5 V	I2C

Specifications of Sensors:

GPS NEO-6M

Model	*Ublox NEO-6M*
Receiver Type	*50 Channels* *GPS L1 frequency, C/A Code* *SBAS: WAAS, EGNOS, MSAS*
Supply Voltage (V)	*2.7~ 6 VDC*
Main Chip	*NEO-6*
Sensitivity	*Cold Start (without aiding): -147 dBm* *Hot Start: -156 dBm* *Reacquisition: -160 dBm* *Tracking & Navigation: -161 dBm*
Navigation Update Rate	*5Hz*
Position Accuracy	*2 M and better with multiple good satellite signals*
Operating Temperature Range	*-24°C ~ 84°C*
Tracking Sensitivity	*-161 dBm*
Cold Start Time	*27s*
Warm Start Time	*27s*
Maximum Speed	*500 M/s*
Dimensions (mm) LxWxH	*Antenna – 25 x 25 x 7* *GPS Board – 22 x 30 x 4*
Weight (gm)	*12*

Sun Sensor:

Operating Voltage	3.0-5.5V
Working current	3.5mA
Wave length	280-950nm
Default I2C Address	0x60
Operating Temperature	-45-85°C

PHT Sensor:

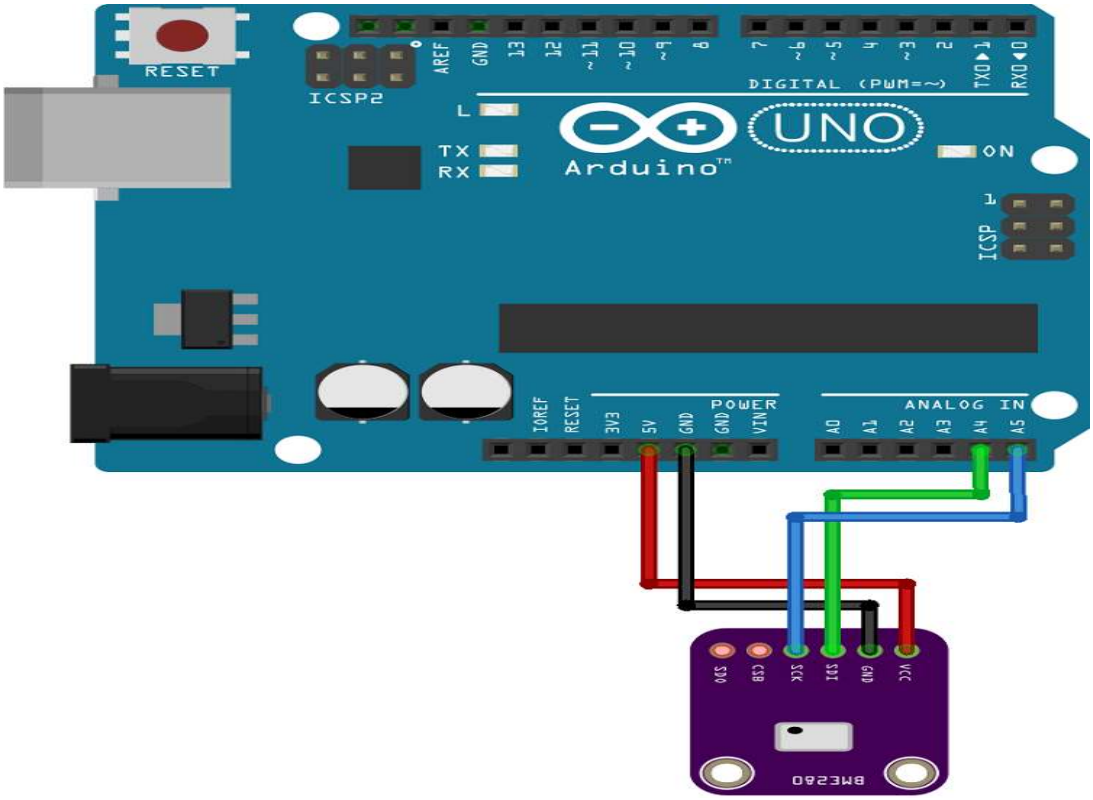
Supply Voltage: 1.8 - 5V DC

- Interface: I2C (up to 3.4MHz)
- Operational Range:
  - Temperature: -40 to +85°C
  - Humidity: 0-100%
  - Pressure: 300-1100 hPa
- Resolution:
  - Temperature: 0.01°C
  - Humidity: 0.008%
  - Pressure: 0.18Pa
- Accuracy:
  - Temperature: +-1°C
  - Humidity: +-3%
  - Pressure: +-1Pa
- I2C address
  - SDO LOW : 0x76
  - SDO HIGH: 0x77

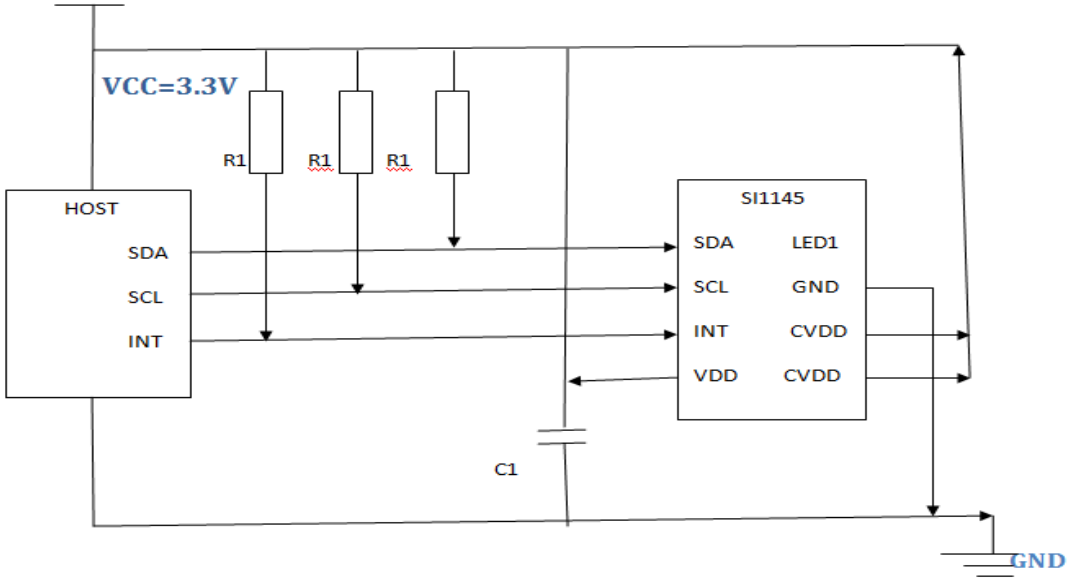
Components and Software used:

- Arduino IDE
- Proteus
- Fritzing

Circuit Diagrams:

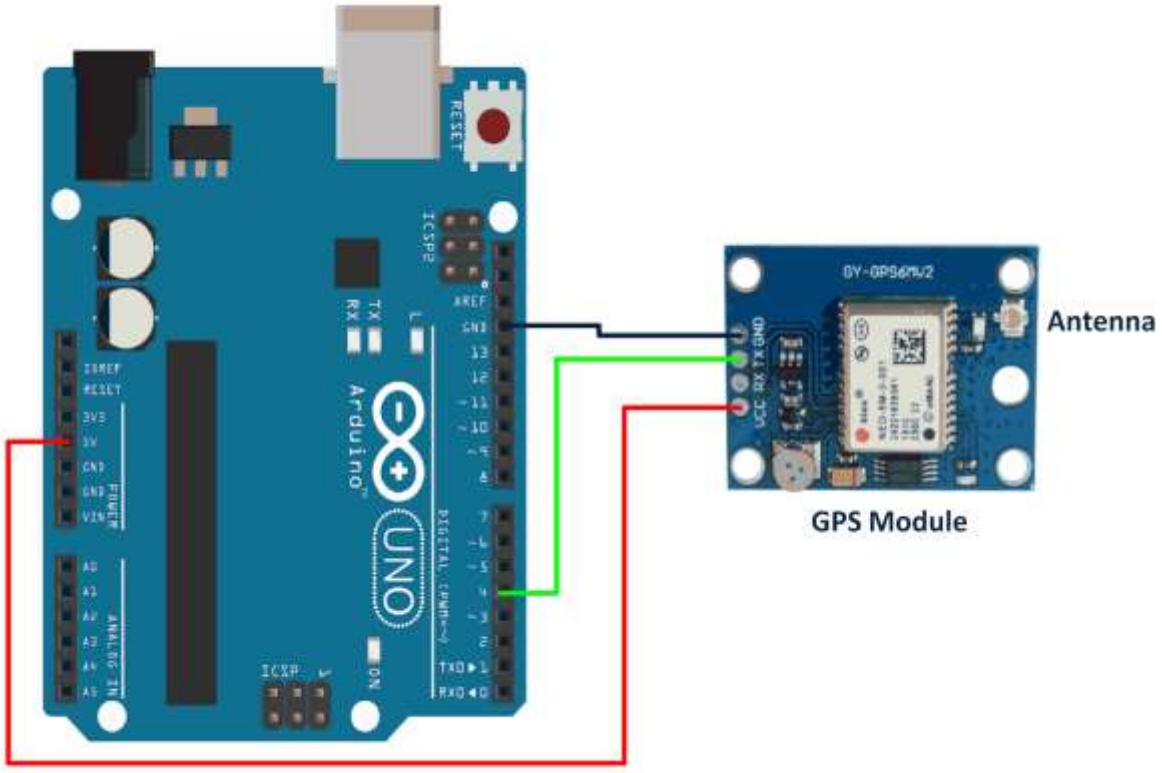


SI1145 BASIC APPLICATION



R1=4.7 Kohm; R2=30 ohm; c1=0.1 uF ; c2=15uF;

FIG: SI1145 BASIC APPLICATION



Software Requirements:

Proteus Professional(If available)

Interface Requirements from other groups:

Communication and onboard software team for the requirement of data format for their programs.

Plan of Action:

A week more time is required for completing a final code

All other teammates are inactive no one responds so require a week for coding.

Conclusion:

Measurement team 1 has completed all ground and in-depth research of the sensor libraries for accurate data and work to be done is data formatting for the easy and low power communication.