

## The Solar radiation Sensor



The Radiation sensor rational:

the code gives us options

```
//  
// ads.setGain(GAIN_TWOTHIRDS); // 2/3x gain +/- 6.144V 1 bit = 3mV 0.1875mV (default)  
// ads.setGain(GAIN_ONE); // 1x gain +/- 4.096V 1 bit = 2mV 0.125mV  
// ads.setGain(GAIN_TWO); // 2x gain +/- 2.048V 1 bit = 1mV 0.0625mV  
ads.setGain(GAIN_FOUR); // 4x gain +/- 1.024V 1 bit = 0.5mV 0.03125mV  
// ads.setGain(GAIN_EIGHT); // 8x gain +/- 0.512V 1 bit = 0.25mV 0.015625mV  
// ads.setGain(GAIN_SIXTEEN); // 16x gain +/- 0.256V 1 bit = 0.125mV 0.0078125mV
```

Our

sensor: works on 277 $\mu$ V to W/m<sup>2</sup>

GAIN\_FOUR is within our desired range (+/- 1.024V) (I think we could have chosen another "Gain" and just followed accordingly in the calculation )

```
ADS1115_differential_Erez  
// Setting these values incorrectly may destroy your ADC!  
//  
//  
//  
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```

1 bit=0.03125mV

0.277 $\mu$ V =1w/m<sup>2</sup>

In the serial monitor we are receiving a reading of:

\IN0: 24 0.00V

-----  
\IN0: 24 0.00V

-----  
\IN0: 23 0.00V

-----  
\IN0: 25 0.00V

-----  
\IN0: 25 0.00V

-----  
\IN0: 24 0.00V

-----  
\IN0: 24 0.00V

#### What ADCs we have

Module:	Arduino	ESP32	ADS1115
ADC bits	10	12	16
Range (V)	0-5 0-1.1 0-reference (<5)	0-3.3	+/- 6.144V +/- 4.096V +/- 2.048V +/- <b>1.024V</b> +/- 0.512V +/- 0.256V
Accuracy	Good	Bad (noisy & no-linear)	excellent
Max resolution?			

Try calculating the max resolution

$$Resolution = \frac{Range}{2^{bit}}$$

We use the ADS1115 because it is 16 bits and can increase our resolution significantly and fits the 1.024V from GAIN\_FOUR.

See in code calculation for Voltage reading to W/m2 → MJ/m2\*day:

$rN = ((results * 0.03125) / 0.277) * 86400 / 1000000$

(where “results” is the Voltage output when the parameters above are used in the code,

((results\*0.03125)/0.277) converts voltage to W/m2

And \*86400/1000000 converts to MJ/m2\*day