WiFi Signal Issues

SolarInfo Wi-Fi (also known as Sungrow Wi-Fi dongles) is a wireless communication device compatible with Sungrow PV inverters and hybrid inverter. SolarInfo Wi-Fi is 2.4 GHz frequency device which allows both local visit and remote monitoring via www.solarinfobank.com or the App. For stable operation of the Sungrow monitoring system, a fair amount of signal strength is required.

Sungrow Wi-Fi dongles operate on the 2.4 GHz band and the maximum range is 120 meters of sight in clear air, without obstacles or interference. There are instances where customers report signal loss or poor reception. As the Wi-Fi signal is a radio frequency, it behaves in the same manner as your TV or car radio signal. Sometimes there are or circumstances where you may not get a proper signal.

There are a number of factors listed below that may affect the strength of your Wi-Fi signal and cause interruption.

Distance

The signal will reduce over distance at a logarithmic rate. i.e. most of the loss happens in the first few meters. The below chart is an example of how the signal behaves over distance. Note how the loss between 0 and 1m is much greater that the loss between 4 and 5m.
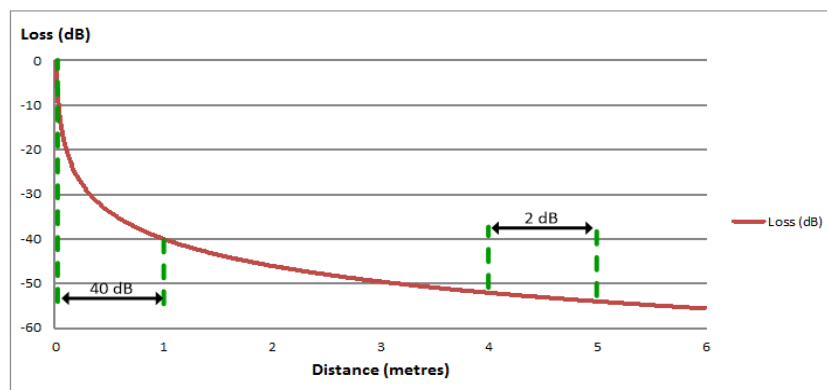

Figure 1 Loss of signal strength over distance [1]

Obstacles

The strength of a Wi-Fi signal depends largely on the obstacles it penetrates through while travelling. The signal strength reduces when passing through a solid object. Ordinary internal walls will reduce the signal strength by about -3 dB, which is approximately 50% of the signal strength.
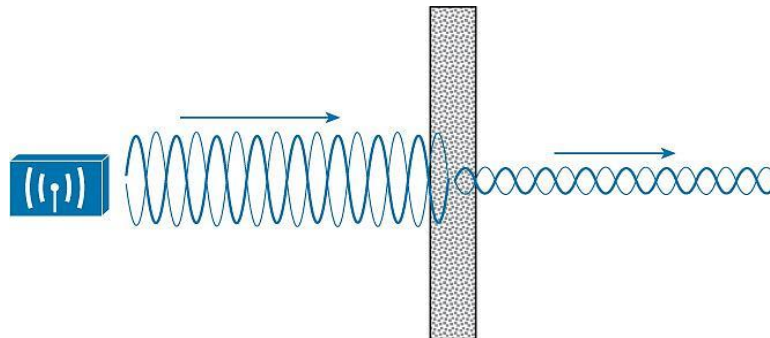

Figure 2 Loss of signal strength due to obstacles [2]

Wi-Fi signal also behaves differently with different type of material. Travelling through material like concrete wall has a very high loss whereas the loss for travelling through a non-tinted glass window is very low as shown in the figure 3 below.

WiFi Signal Loss in DB (decibels)

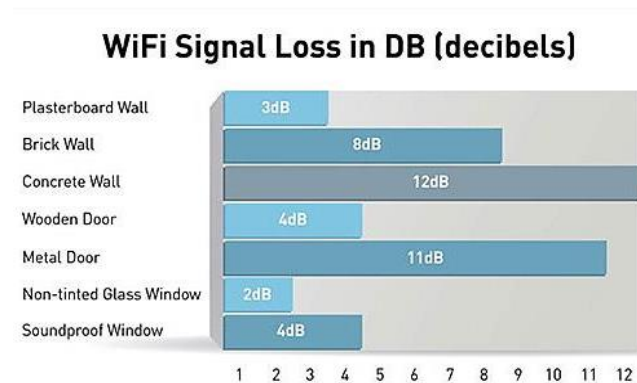| Material	Loss
Plasterboard Wall	3dB
Brick Wall	8dB
Concrete Wall	12dB
Wooden Door	4dB
Metal Door	11dB
Non-tinted Glass Window	2dB
Soundproof Window	4dB

Figure 3 Effect of signal strength travelling through different type of materials [3]

Therefore, distance and obstacle combined can reduce the signal significantly.

Reflections

In some rare instances, signal can also split and be reflected off another surface, and thus travel a slightly longer distance to the receiving modem. The reflected signal may reach the modem microseconds after the original signal and this can even have the effect of "cancellation" where the signals are exactly 180 degrees out of phase.
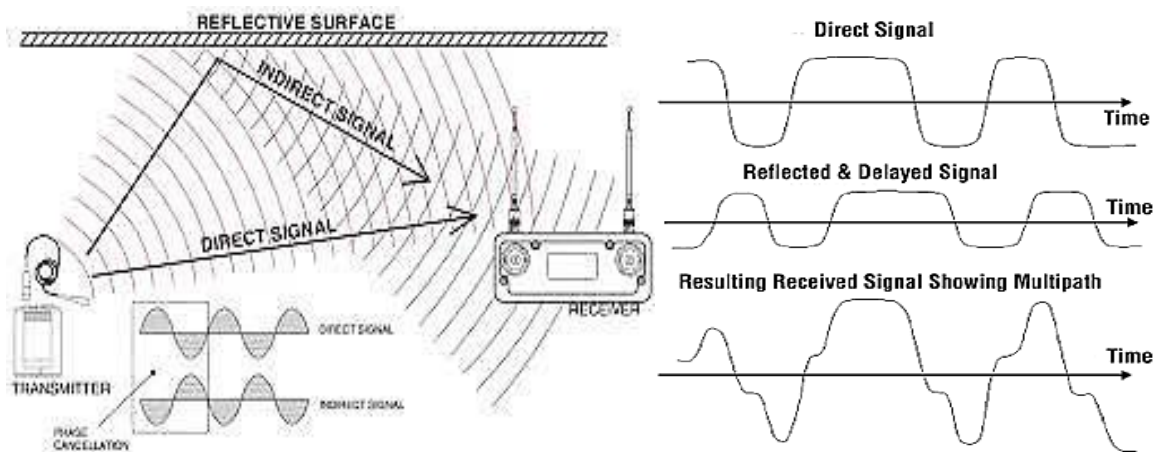

Figure 4 Effect of signal cancellation [4]

Interference

Wi-Fi signal can also drop due to interference caused by equipment working on same frequency. Therefore to reduce loss caused by interference, keep devices with same frequency at distant position.

All the factors mentioned above can have a detrimental effect on your Wi-Fi signal strength and quality and can slow your data transfer speed, or block the signal altogether. An 'Excellent' or a 'Good' signal will work appropriately and give you the expected results. Weaker signals (below 60 dBm) may not work effectively and will cause disturbance in the data transfer during wireless monitoring.

Excellent	Good	Fair	Weak
> -50 dBm	-50 to -60 dBm	-60 to -70 dBm	< -70 dBm

Figure 5 Wi-Fi signal strength [5]

Solutions:

There are a few steps that can be taken to improve the signal as follows:

➢ Move your modem closer to the inverter, or a position which gets better coverage (within 10m range).

➢ Purchase a Wi-Fi extender and place it half way between your inverter and modem.

➢ Install a higher gain antenna in your modem (if it has the facility).

➢ Hard-wire the inverter (SH5K hybrid inverter only) to the modem using either a patch lead, or a custom made Cat 5e cable.

References:

[1] https://www.ekahau.com/blog/2015/09/07/wi-fi-planning-walls-and-dbs-measuring-obstruction-losses-for-wlan-predictive-modelling/

[2] http://apprize.info/network/ccna/3.html

[3] http://www.starhub.com/personal/support/broadband/things-to-know-about-broadband/wireless-technologies-limitations-wi-fi.html

[4] https://www.rfvenue.com/blog/2014/12/15/the-top-three-wireless-microphone-problems-and-how-to-solve-them

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[5] https://www.netspotapp.com/what-is-rssi-level.html