

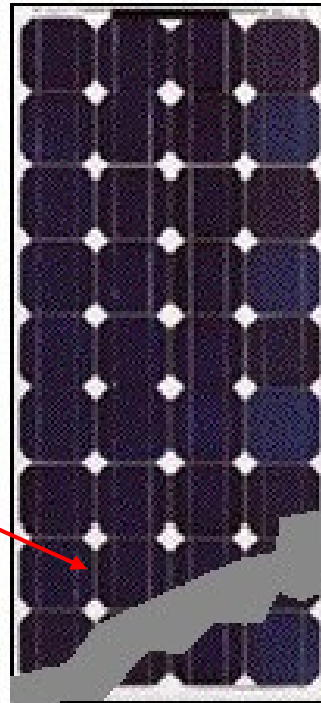
# SOLAR MODULE MOUNTING STRUCTURES FOR OFF-GRID SYSTEMS

# Mounting solar modules

- Orientation – South / North  $\pm 30^\circ$
- Correct tilt angle for the design month to within  $\pm 10^\circ$ 
  - The tropics
  - Avoid all shade
- Ventilation to avoid high temperatures
- Support structure to withstand high winds
- Structure should generally be galvanised or of aluminium
- Lightning protection may be necessary

# Effect of shade on solar modules

Even a small shadow like this can reduce the amount of electricity a module produces by 80-90%



# Module mounting methods



[www.greensystems.co.uk](http://www.greensystems.co.uk)

- Free-standing (ground)
- Pole mounts
- Tracking mounts
- BIPV
- PV slates & tiles
- Roof mounting

# Ground mounting of solar modules

- Convenient
- Space usually available for off-grid
- Optimum orientation and tilt angle easily achieved
- Shade may be a problem
- Modules accessible which may be an advantage or a disadvantage







## Pole mounted solar modules

- Optimum orientation or tilt angle easily achieved
- Easy to install at unvisited sites
- Can be free standing or on the side of a building
- Suitable only for one or two modules per pole normally





## Roof mounting of solar modules

- Not that common for stand-alone
- Gap needs to be left between roof and structure to ensure ventilation
- Roof may not be at optimum orientation or tilt angle
- Scaffolding required



A grid -tied roof mounted system by  
[www.greensystems.co.uk](http://www.greensystems.co.uk)



# BIPV - Laminates



Centre for Alternative Technology, Wales  
BIPV is not common in off-grid systems





Solar slates in stand-alone system, Mark Hankins' house, author of *Solar Electric Systems for Africa* - “We will be using MPPT trackers from Phocos to convert the power from the PV strings to 12VDC”

## Tracking mounts (manual)

- Not that difficult to build
- Tracking mounts can increase output by 30% or more



Adjustable angle



Fixed angle

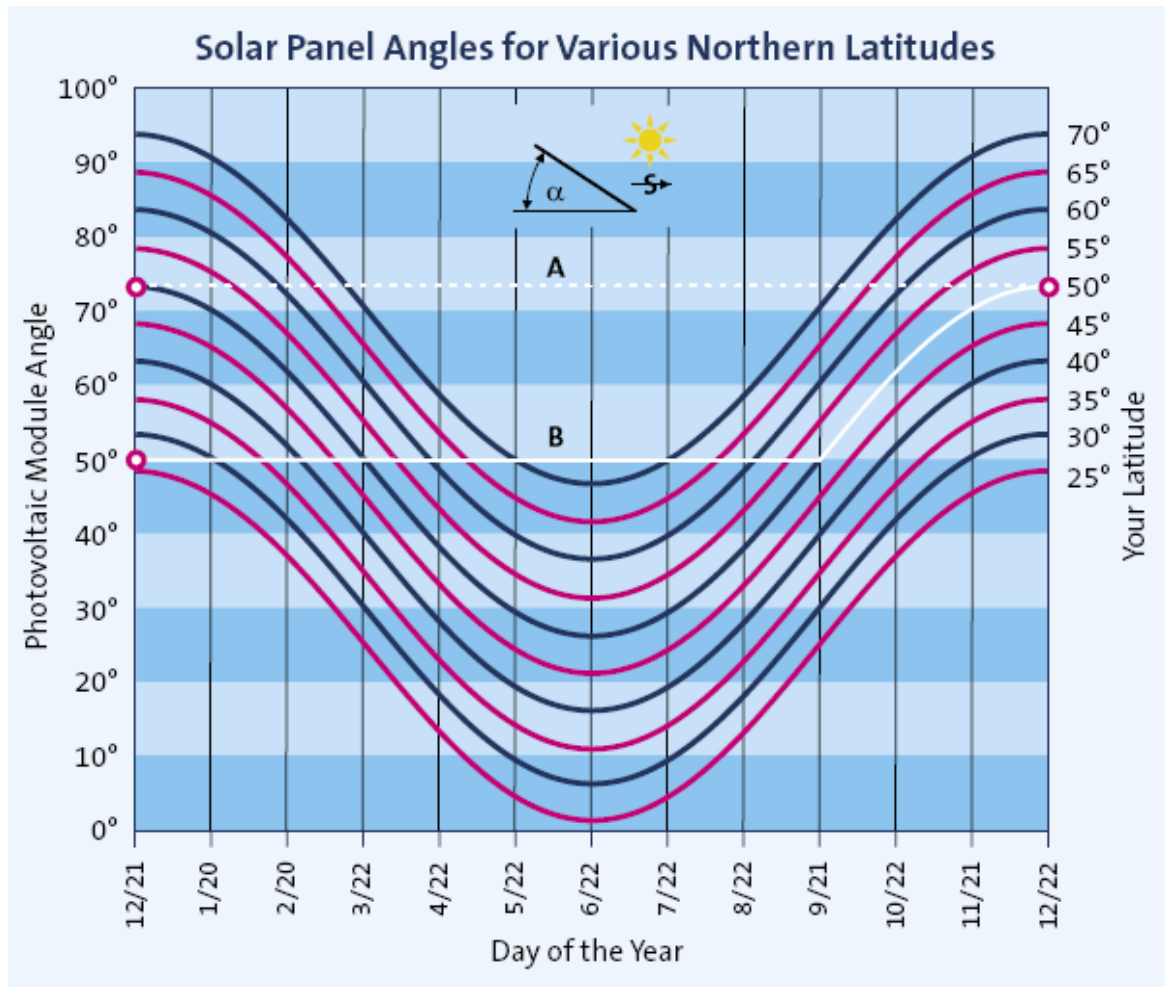


## Tracking mounts - automatic

- Remote location
  - Ease of repair?
  - Spare parts?
- Cost has to be balanced against achieving the same result by adding extra modules to the array



# Optimum angles for stand-alone



Not valid in  
the tropics

# Angles & orientation: the tropics

- Consult local dealer
- Rule of thumb: facing the equator at an angle of latitude plus  $10^{\circ}$
- Ideally should face that part of the sky where the sun is during the least sunny months ..
- Not flat, rain water needs to be able to clean the module
- Tracking pole mount
  - best potential output,
  - can follow the sun during the day and over the year
  - also best ventilation



## Angle & orientation – no choice

- If modules have to be fixed to a roof (fixed angle, fixed orientation), the best way to estimate output is to use
  - Tables
  - PVGIS
  - Simulation software

# Mount materials

Steel – galvanised

Steel – painted

Aluminium

Wood



# Making mounting structures locally

- Usually possible
- Steel or wood can be used
- Aluminium easy to work but expensive
- Allow for expansion of metal – holes in steel should be big enough to allow expansion of module aluminium frame
- Extra holes often need to be drilled in aluminium module frames (warranty?)



# Factory-made mounting structures

- Very large range available
- Saves on installation time
- Particularly preferable for large installations
- Available from module providers
- Customised also possible
- Advisable for large installations





## Module - supporting frame

SGM 4 – Item No. 10060

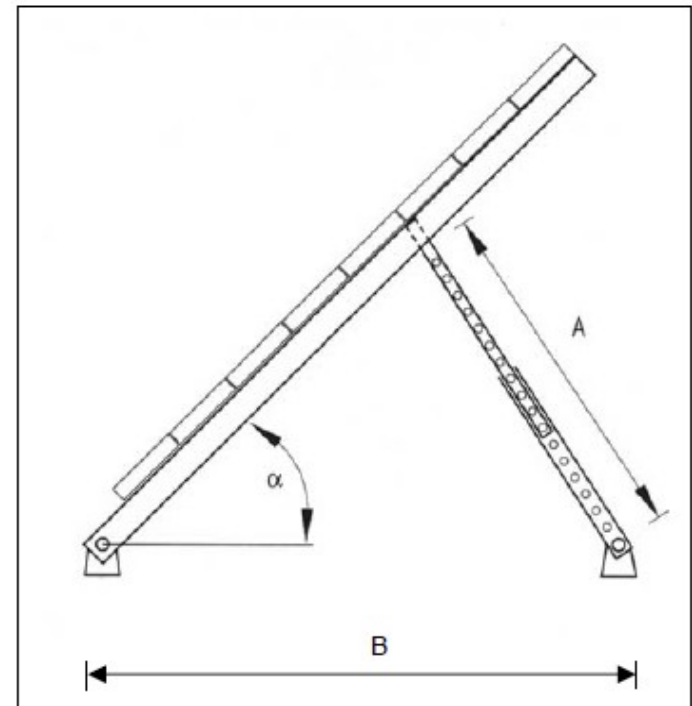
SGM 8 – Item No. 10061

The module - supporting frames are light, stable and corrosion-resistant. They offer a sure module anchorage and keep wind speeds of up to 200 km/h and all other extreme weather conditions reliably suited. The racks are easy in mounting and are also easy to transport in impracticable terrain.

The module – supporting frames are available in two sizes:

- SGM 8: for the assembling of 1 - 4 modules AS 120
- SGM 4: for the assembling of 1 - 2 modules AS 120

These module – supporting frames are also suitable distinguished for big photovoltaic-systems. These shall be elevated on a flat roof.





# Factory-made mounting structures



Advisable for large installations  
Photo: *Sollatek*