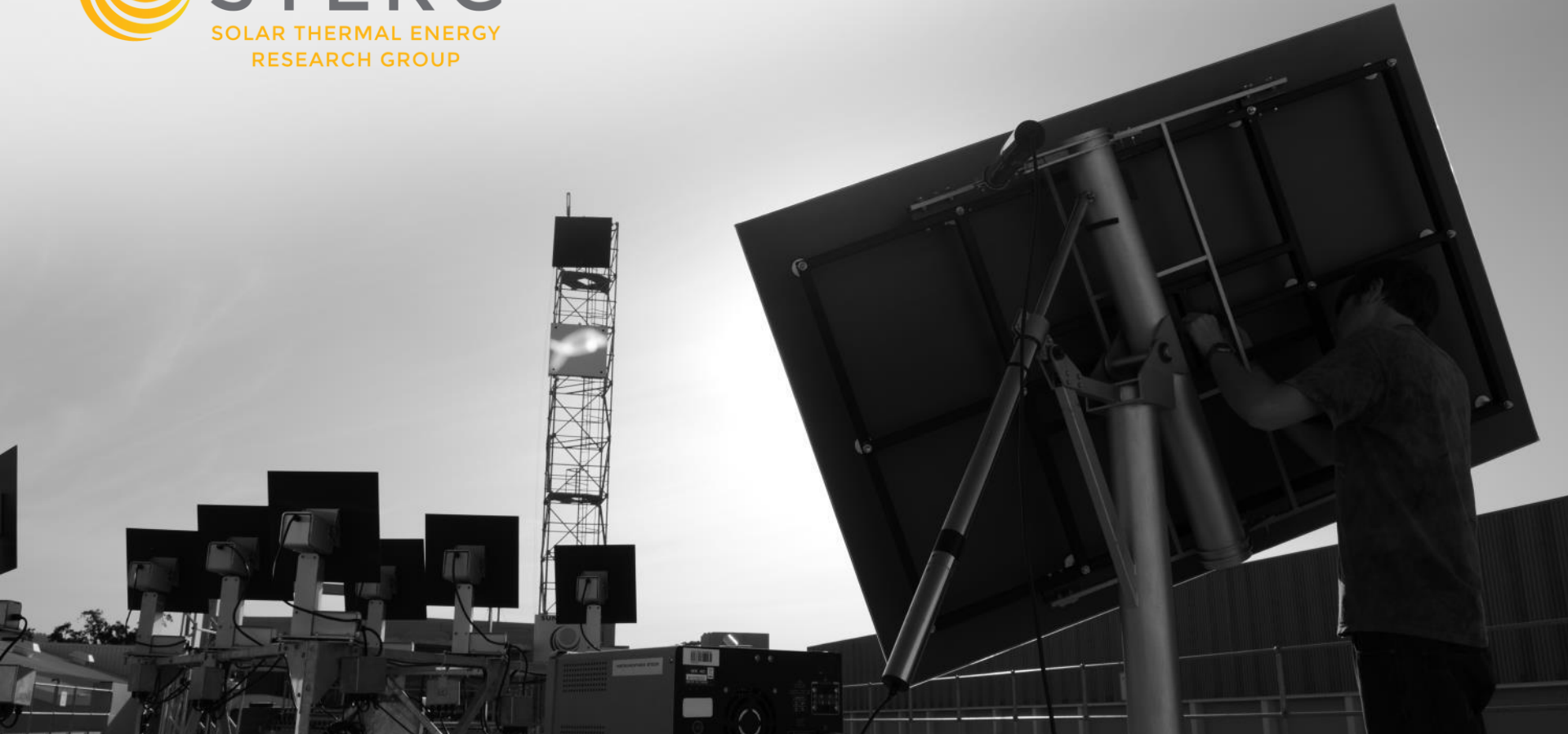




STERG

SOLAR THERMAL ENERGY
RESEARCH GROUP



Heliostat Field & Pod Placement


S-.J. Bode, Paul Gauché^{a,b}

^aSolar Thermal Energy Research Group (STERG),
University of Stellenbosch

^bTIA Helio100 project, University of Stellenbosch

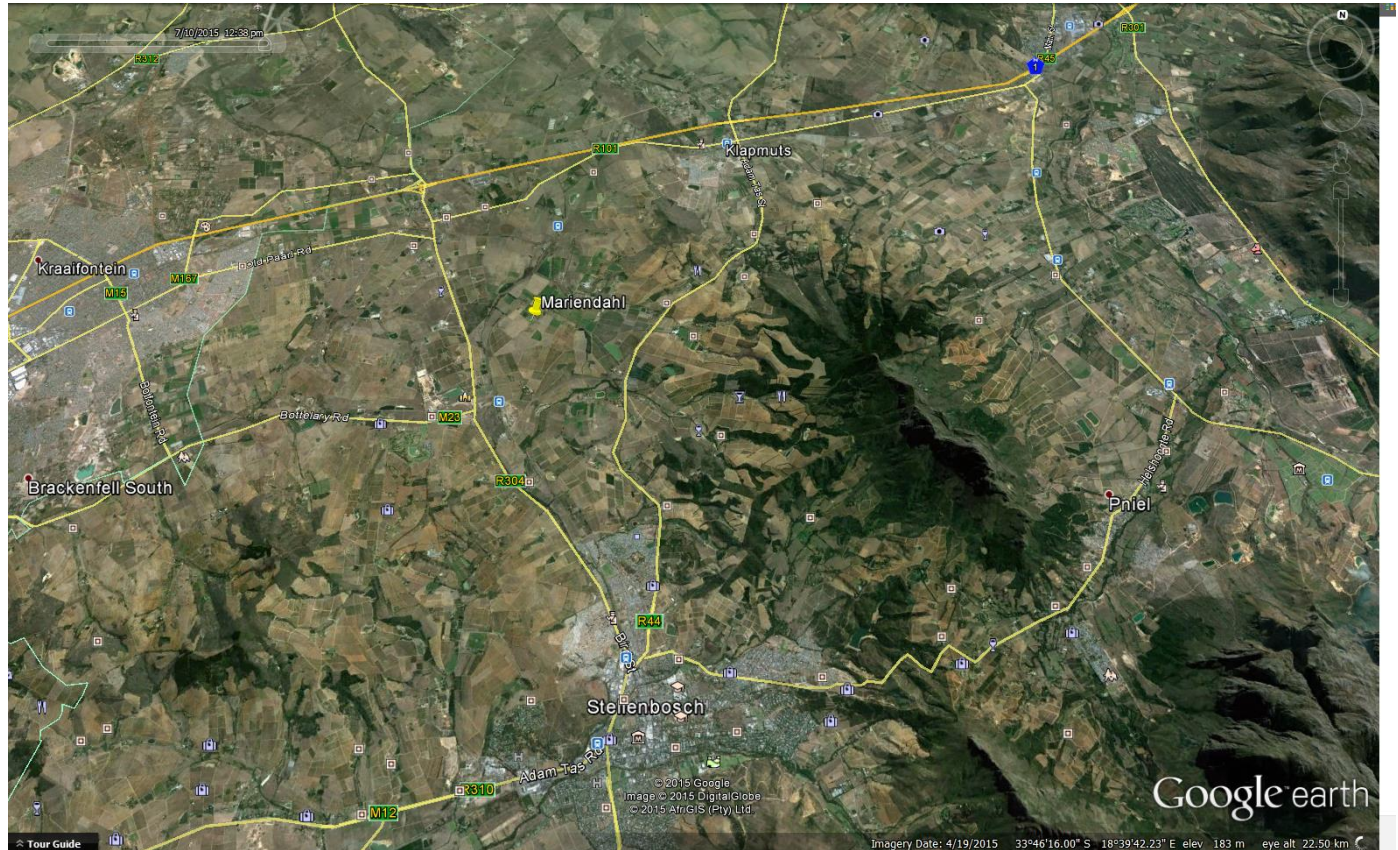
CONTENTS



- Quick overview of the  project
- Optimisation procedure
- Optimised results
- Where Helio100 is now

Helio100

Location



Helio100

SITE



Site

Piggery

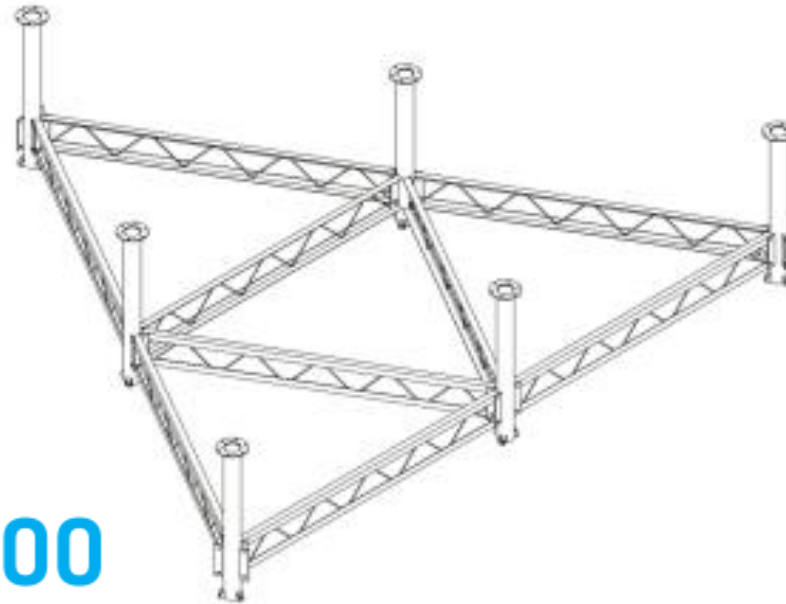


3rd Annual STERG
SolarPACES Symposium
14 & 15 July 2015
Stellenbosch, South Africa

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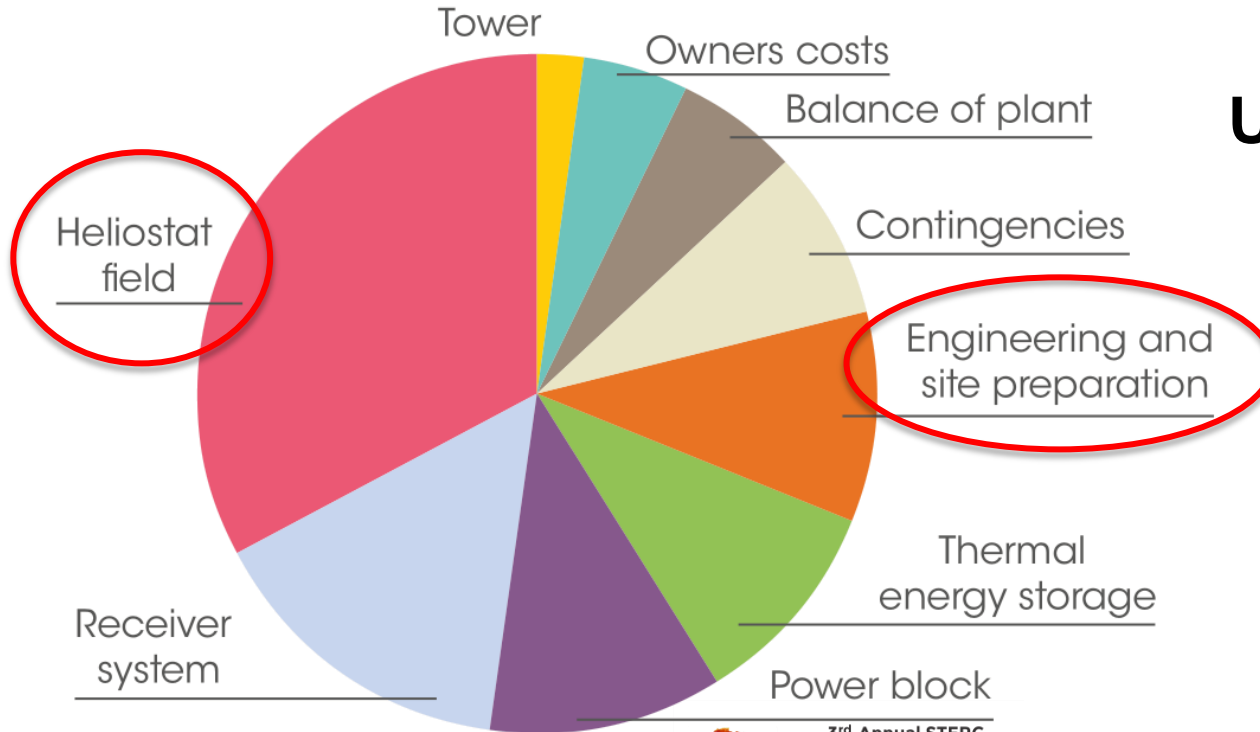
Pods



Why Pods?

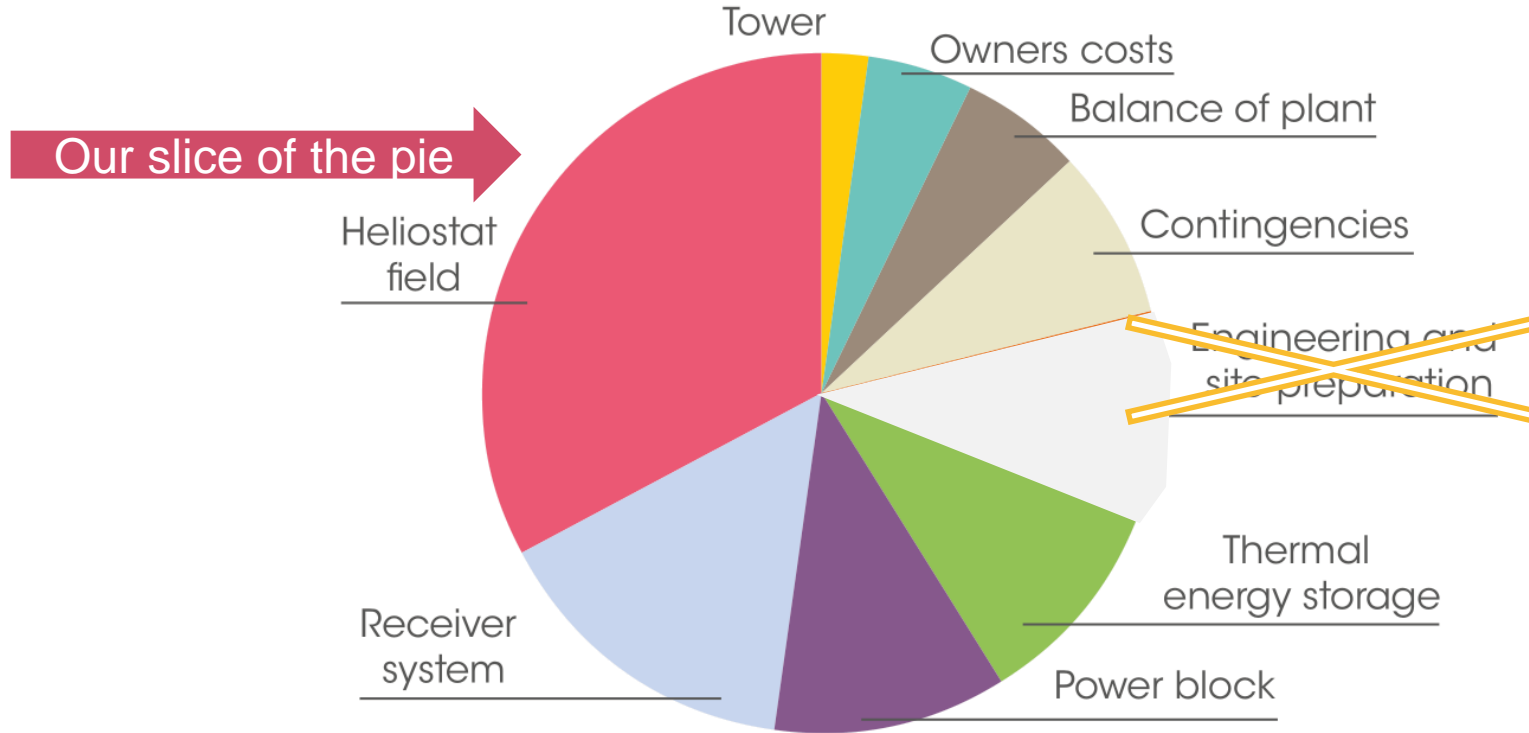


Solar Tower CAPEX



**~50% =
USD 2.15 trillion**

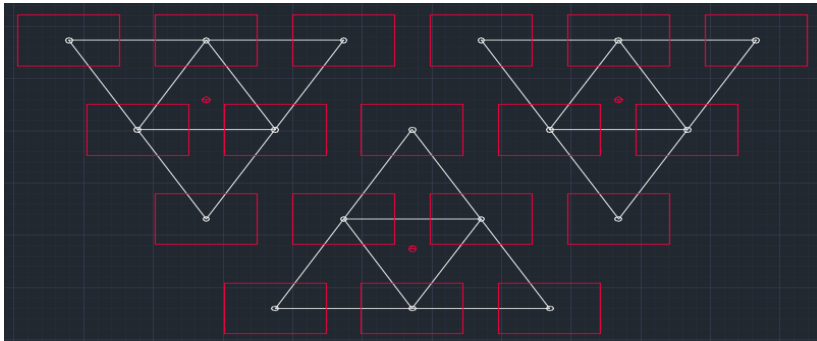
Why Pods?



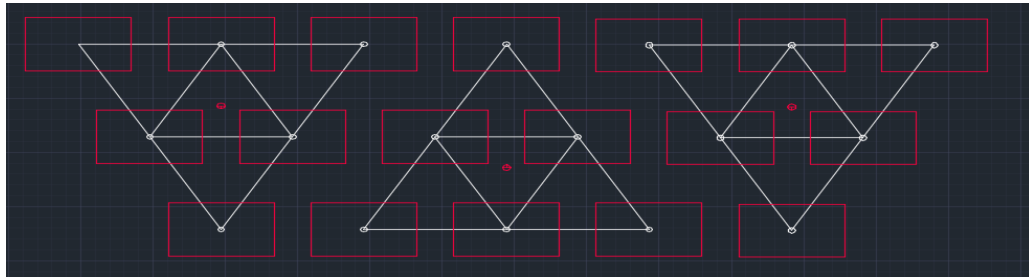
Field Layout Optimisation



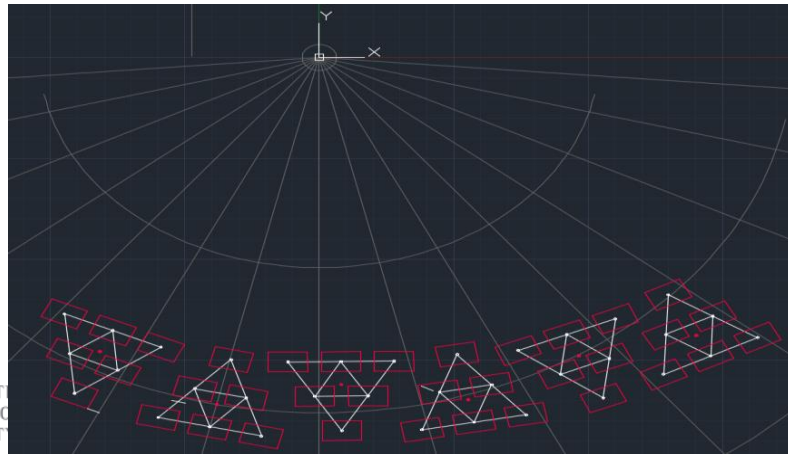
Pod Placement



Offset



Inline



Surround

OPTIMISATION PROCEDURE



- No standard procedure for optimisation of pods
- Little (or no) literature on pod optimisation
- High level *manual* optimisation for the field layout (Parametric study)
 - Begin with a ‘generic field’
 - Manually change variables and record affect on the power and efficiency
 - Iteratively keep changing variables to obtain an *feel* for the field

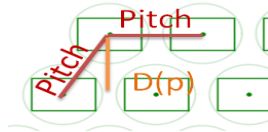
Optimisation Parameters



- Optimisation run to optimise:

i. Tower height

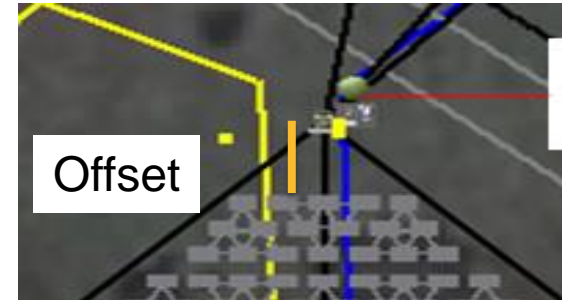
ii. Pitch



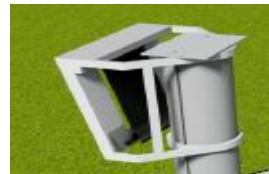
iii. Focal Distance



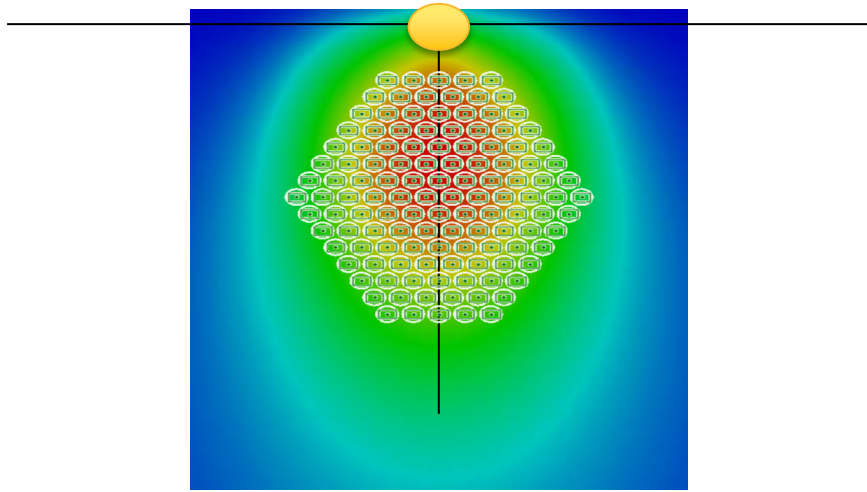
iv. Offset (distance from tower)



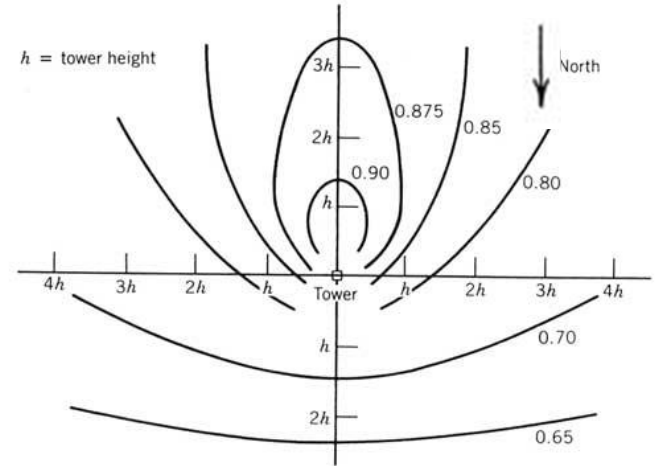
v. Receiver tilt angle



ANNUAL FIELD EFFICIENCY



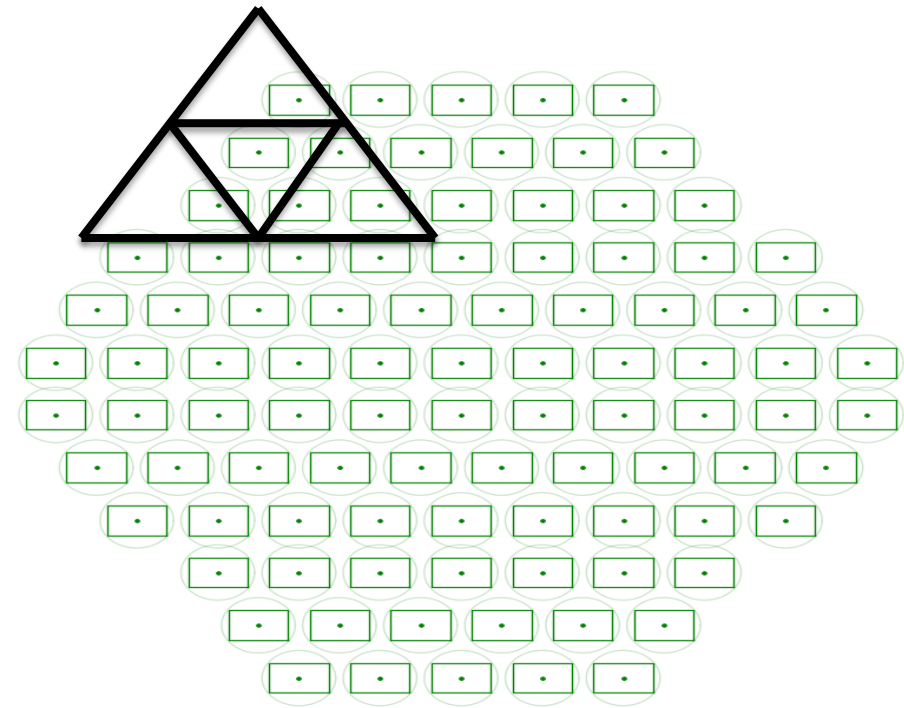
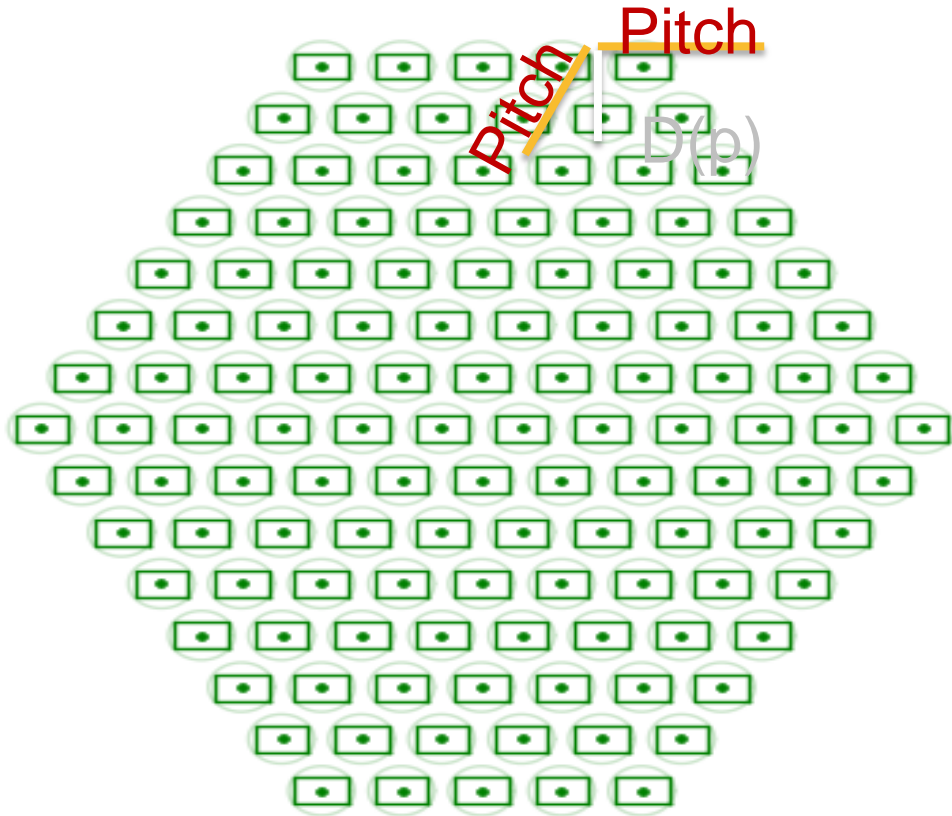
Annual combined efficiency



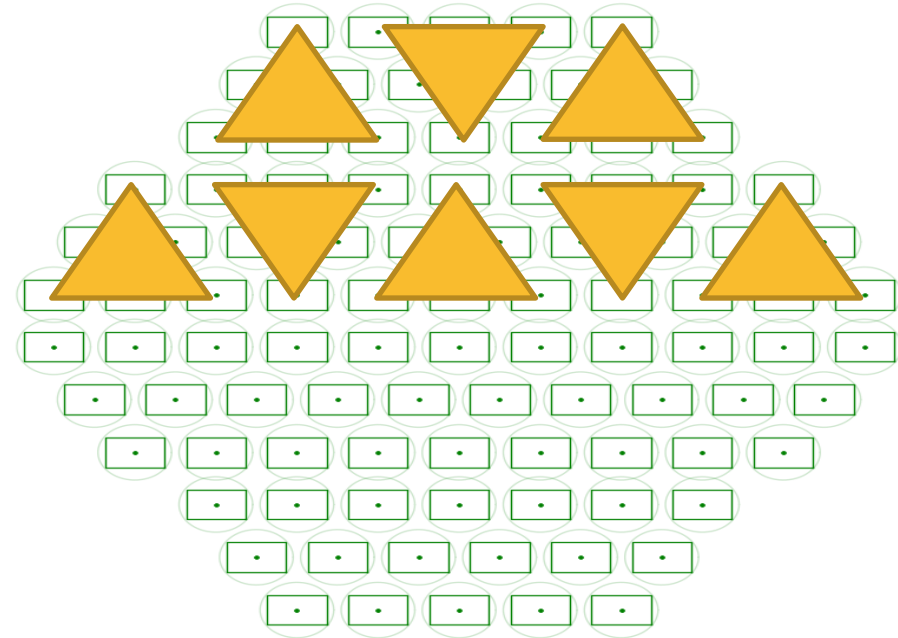
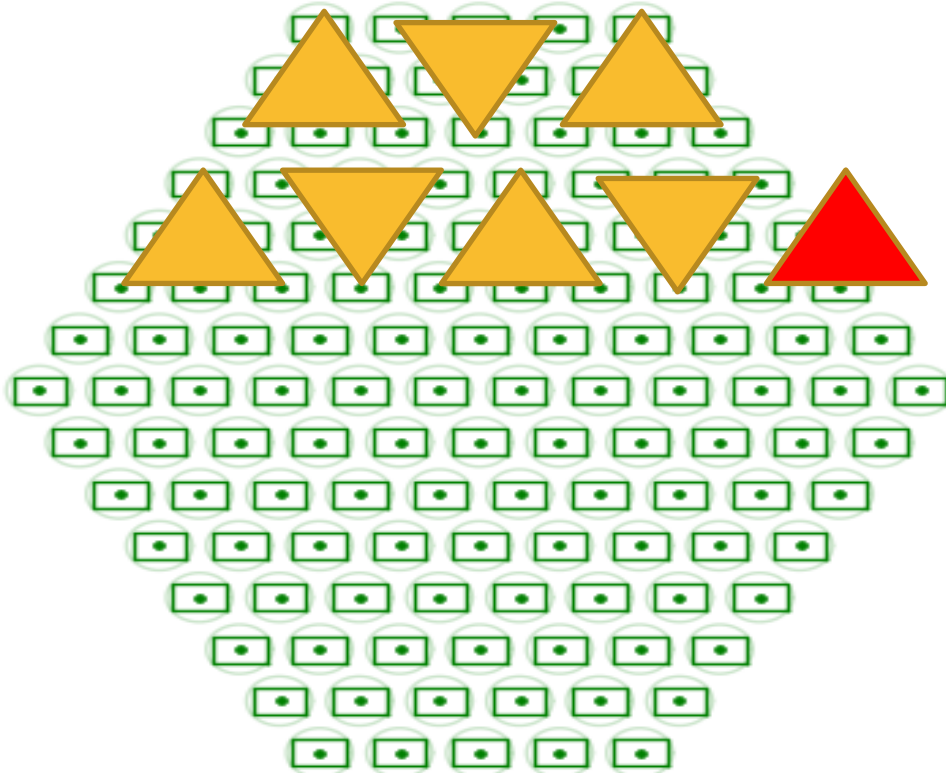
Cosine efficiency¹

¹Power from the Sun, Chapter 10

Procedure Inline = Generic

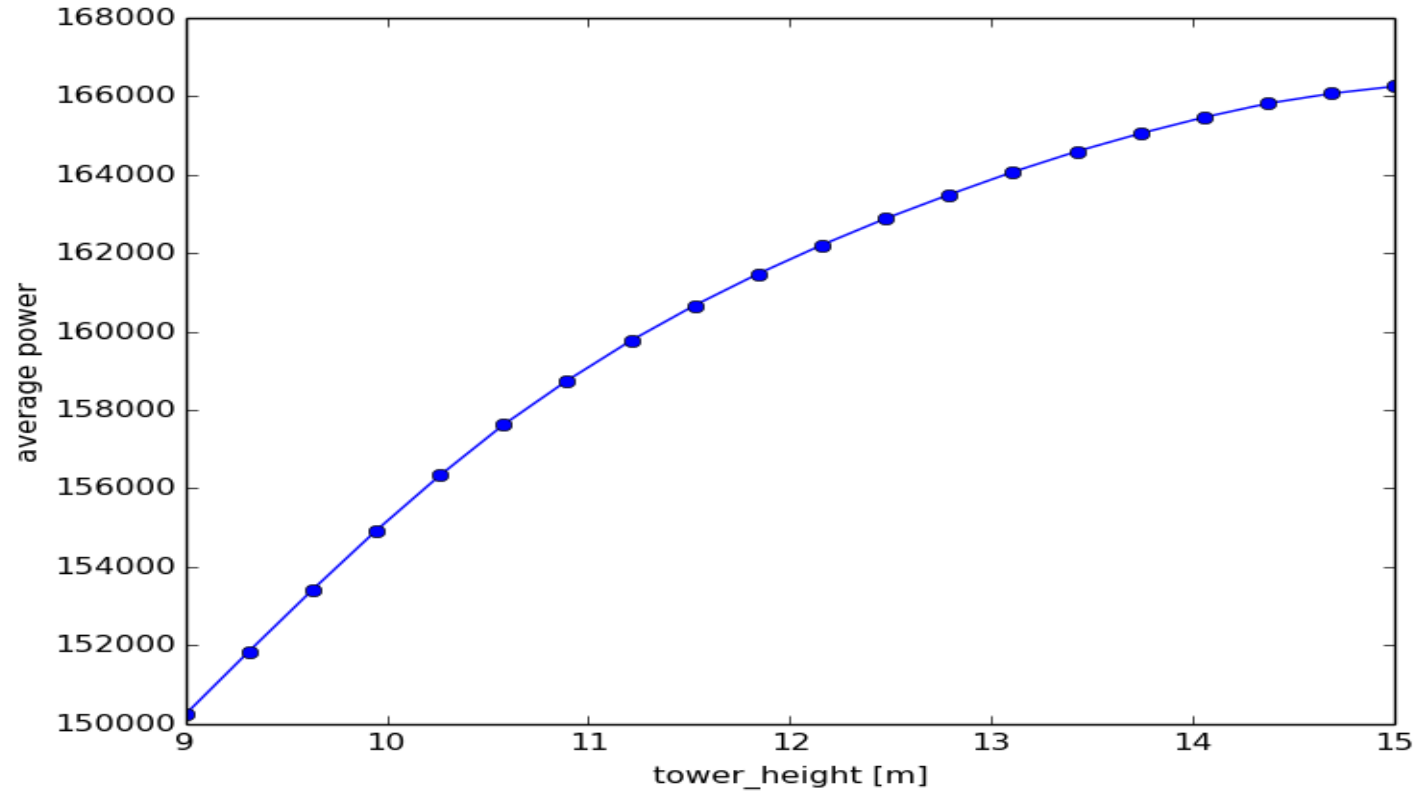


Procedure Inline = Generic

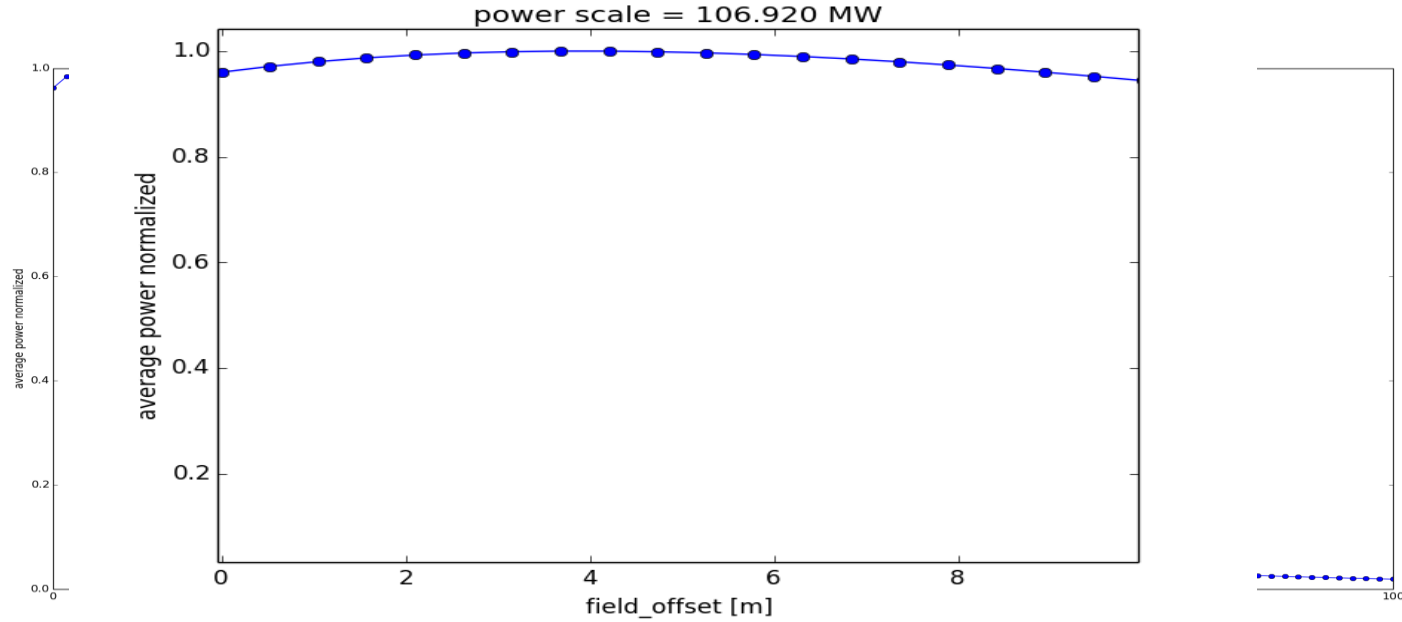


Results **SENSITIVITY STUDY**

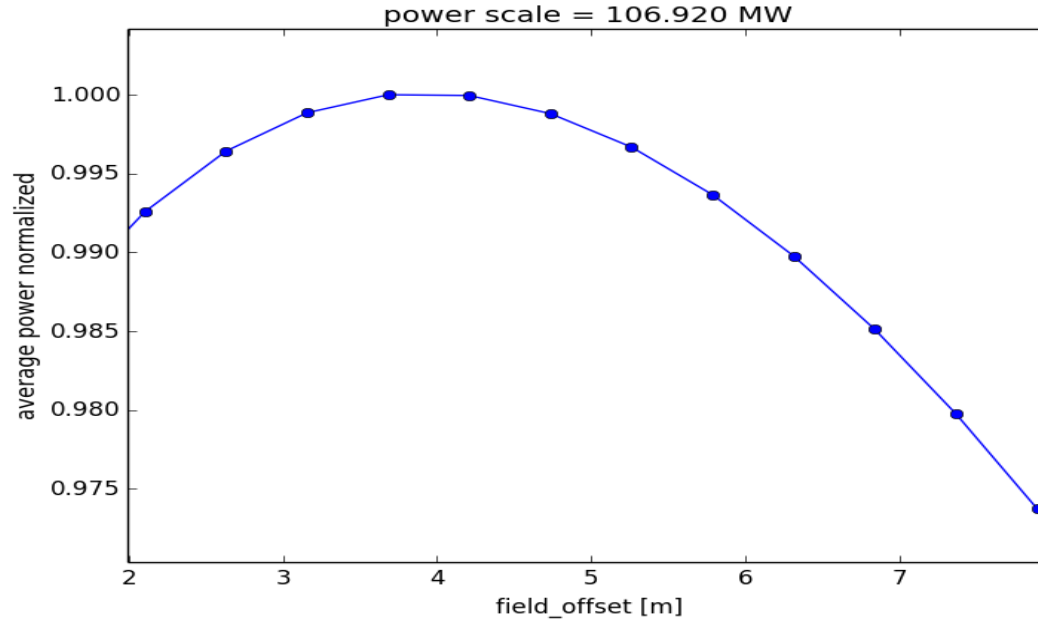
Tower Height



Field Offset

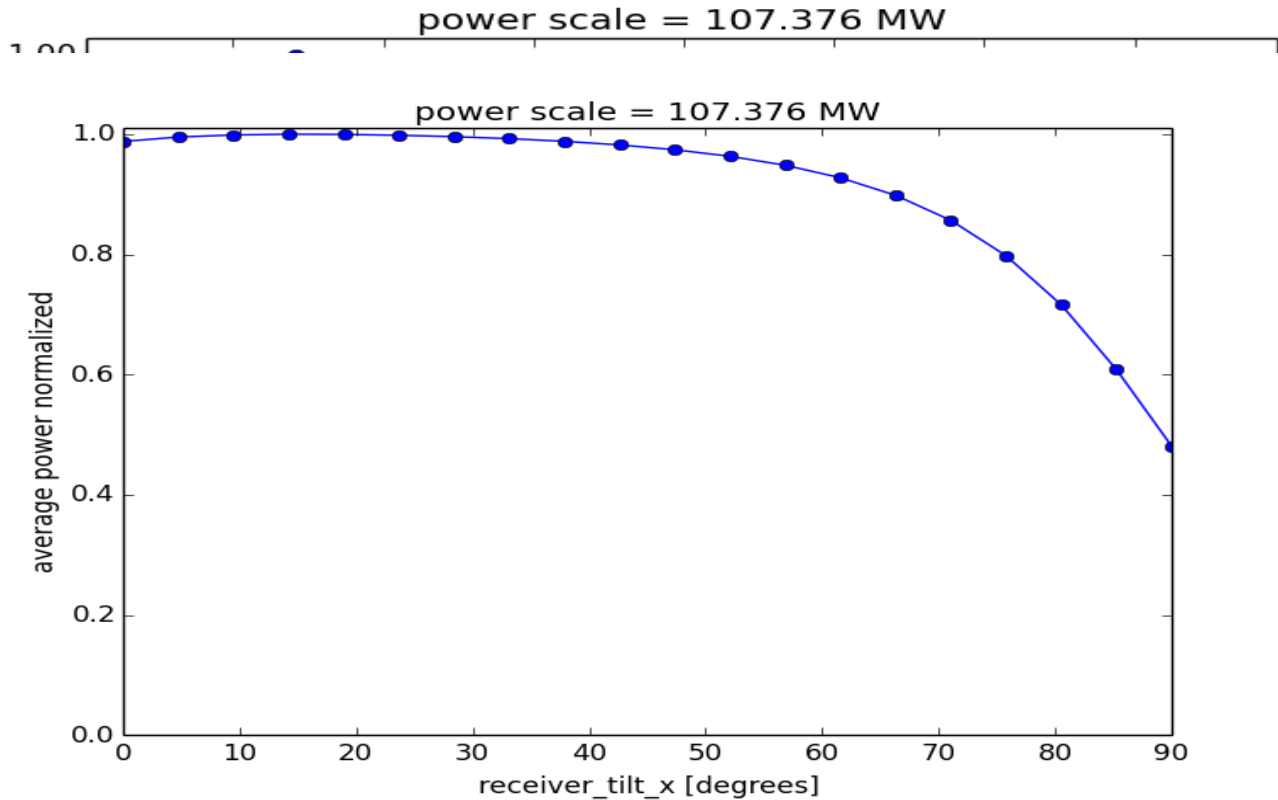


Field Offset

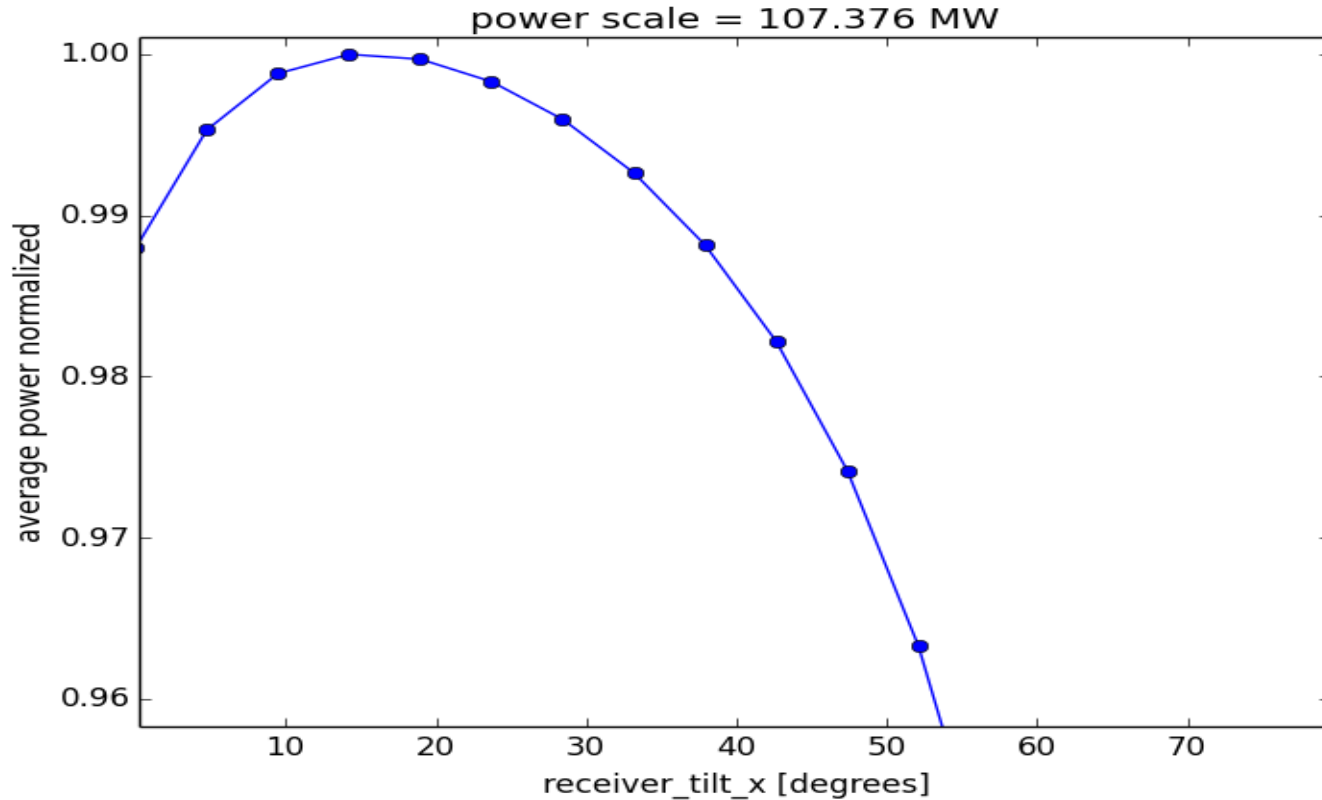


Field offset of 6m for practical reasons

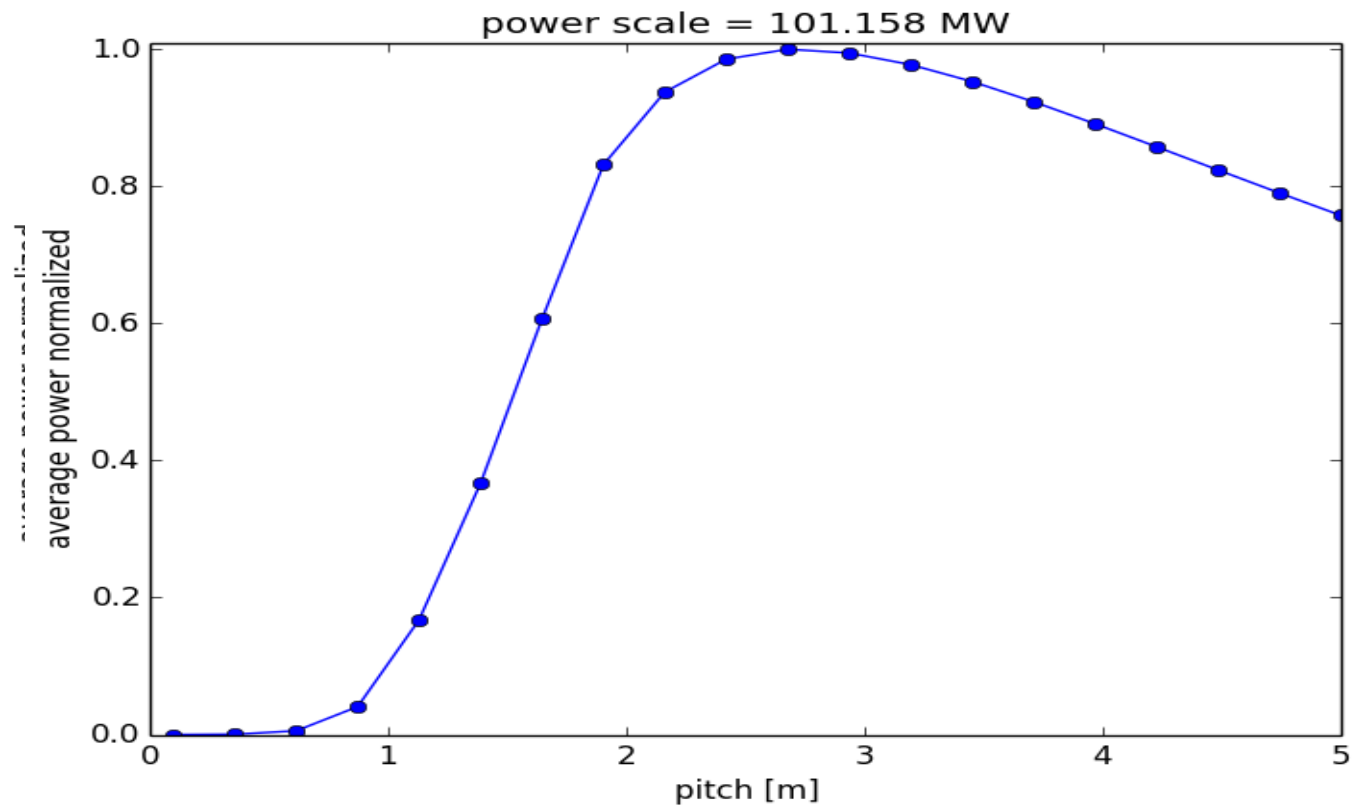
Receiver Tilt - Individual focal



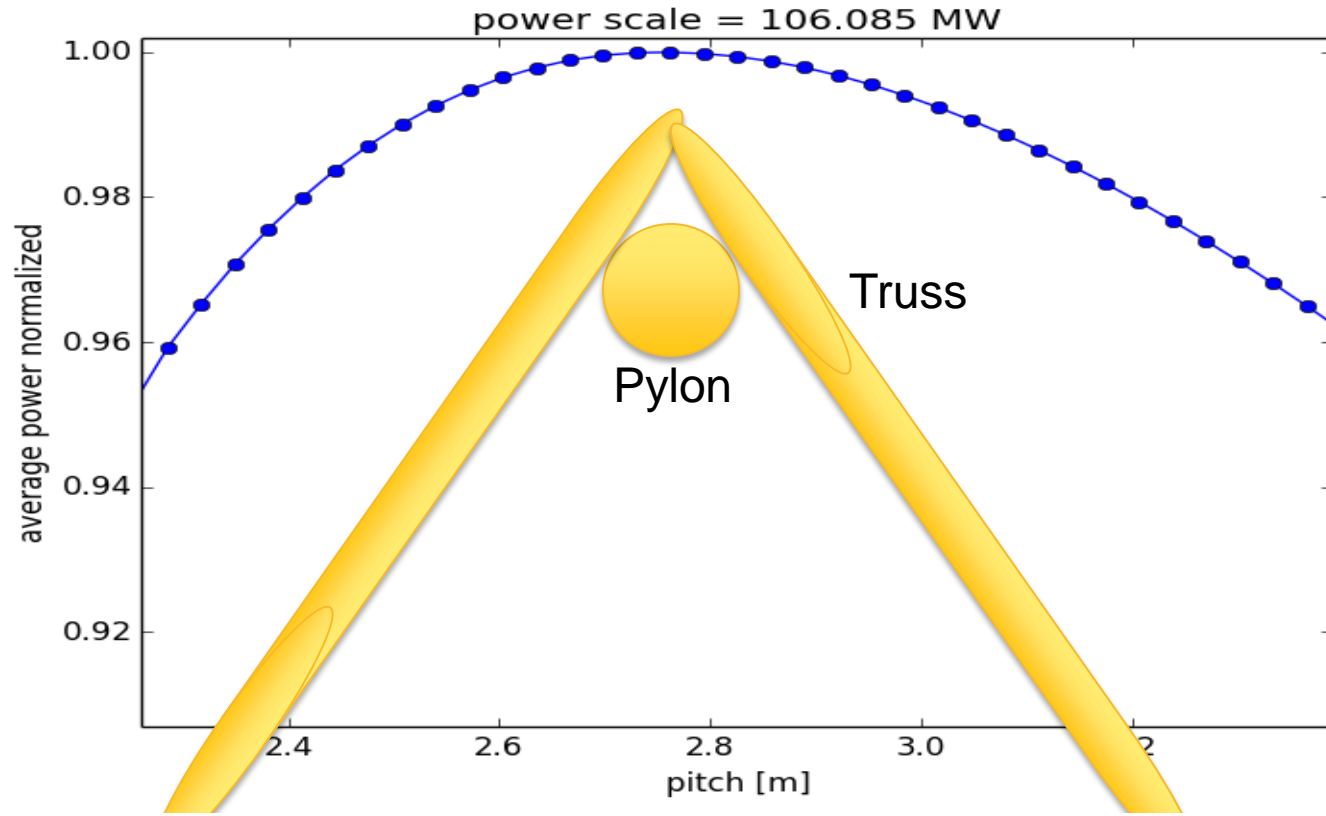
Receiver Tilt



Pitch

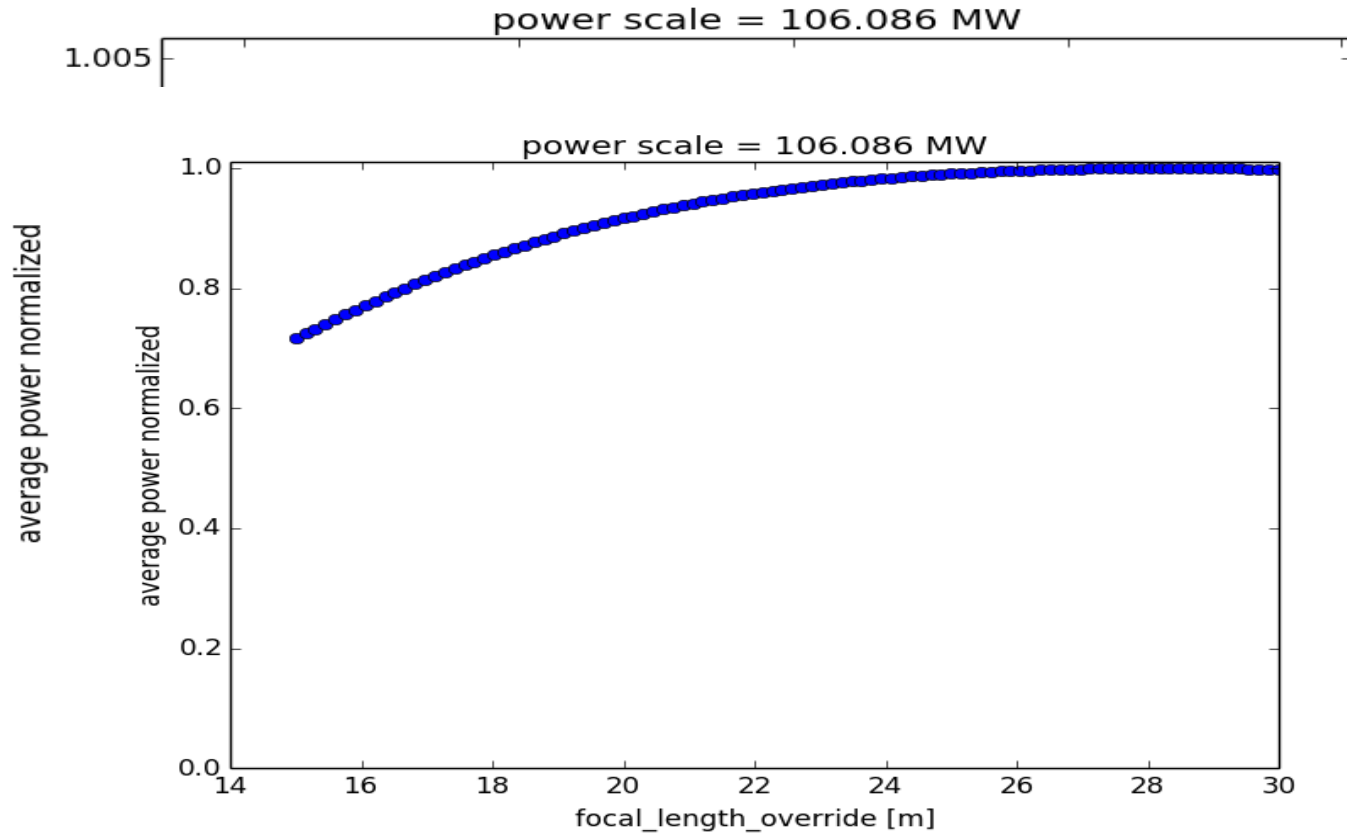


Pitch

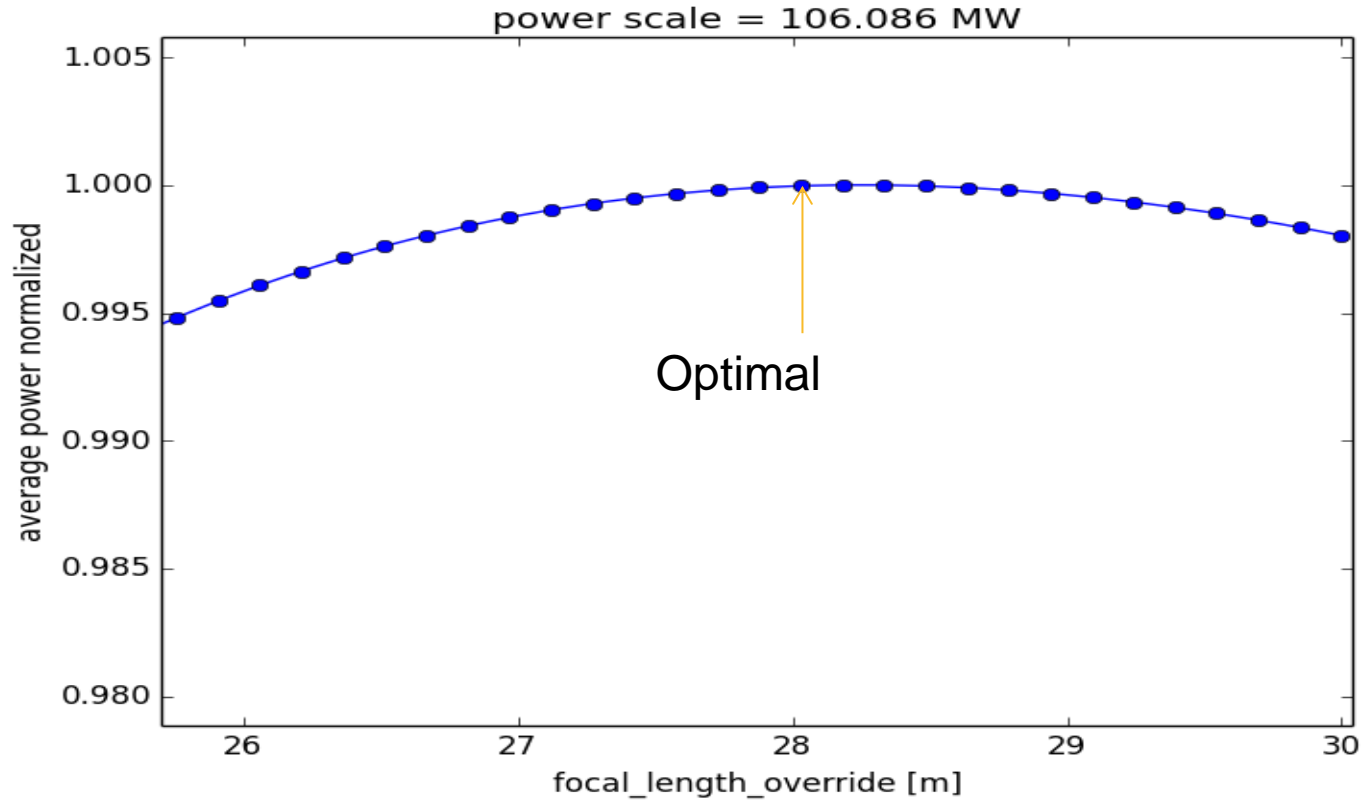


 Pitch of 2.7m = 3m for practical reason

Focal Length



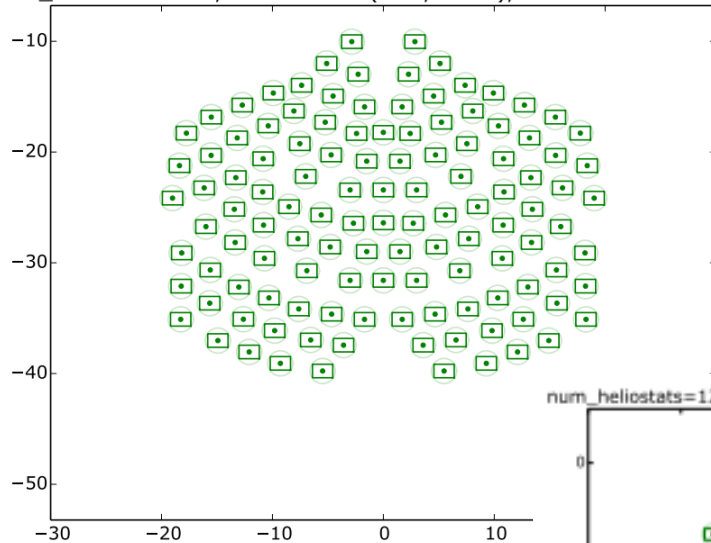
Focal Length



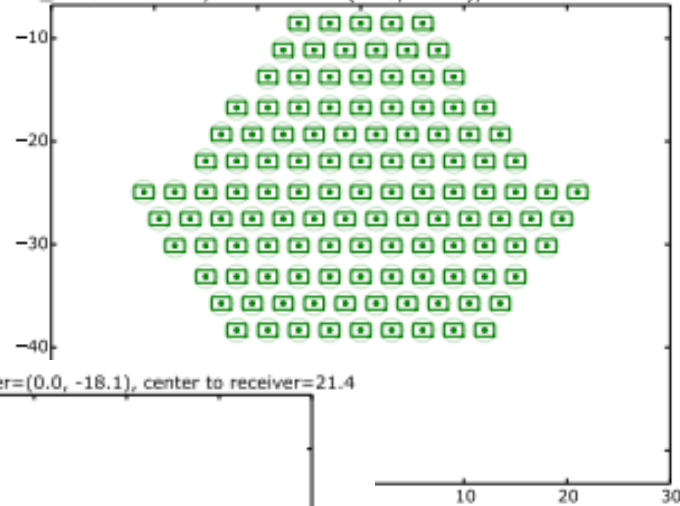
Various Pod Layouts



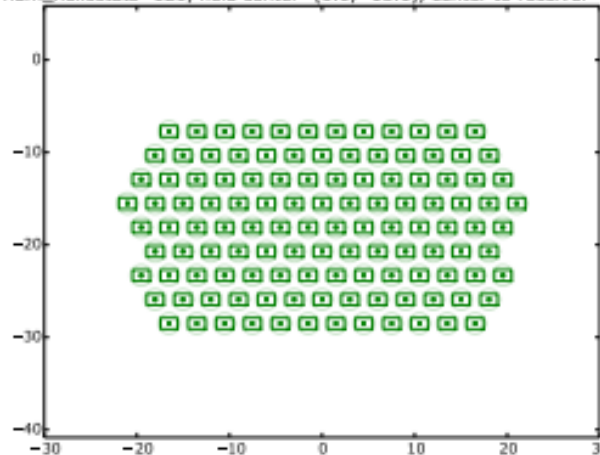
num_heliostats=120, field center=(-0.0, -25.6), center to receiver=28.1



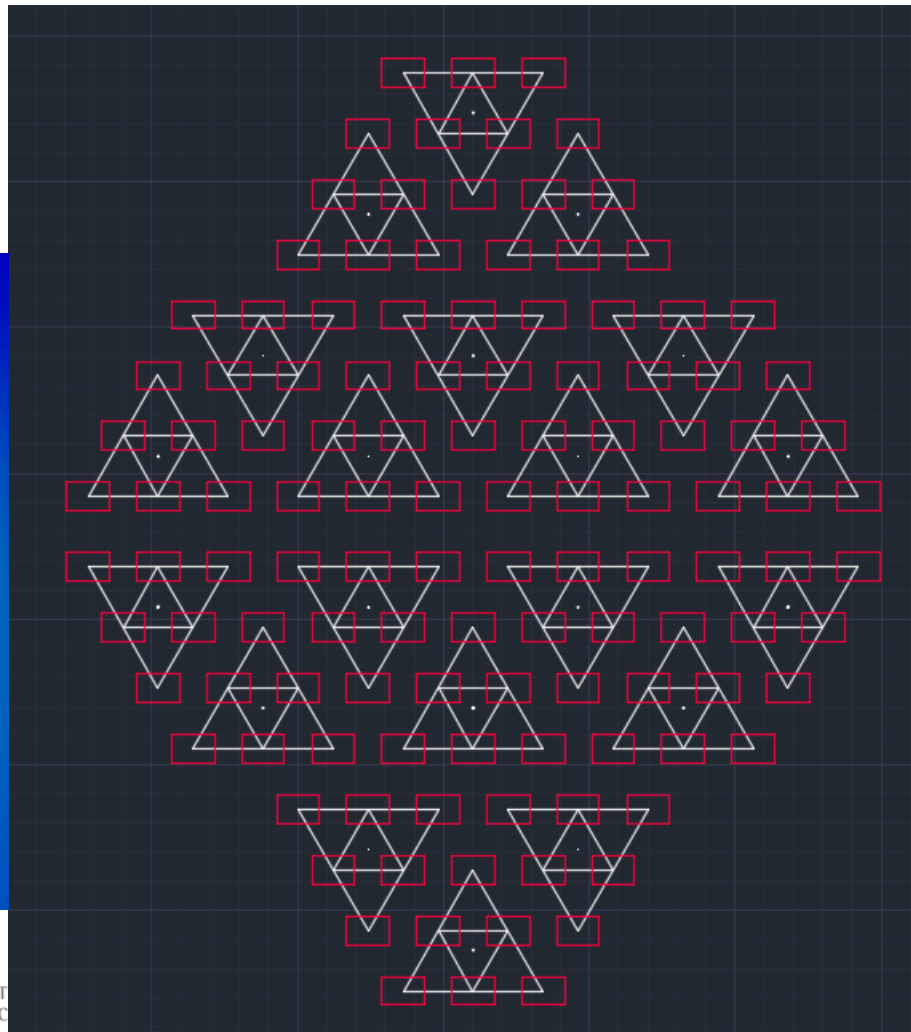
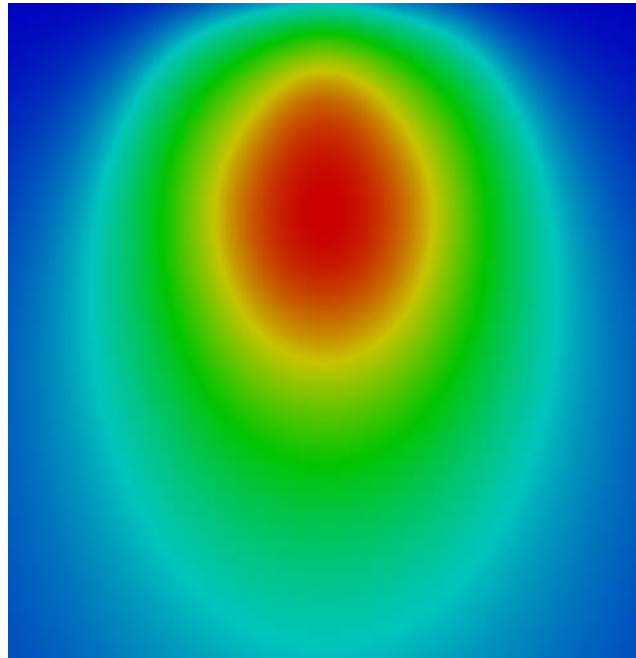
num_heliostats=120, field center=(-0.0, -25.1), center to receiver=27.7



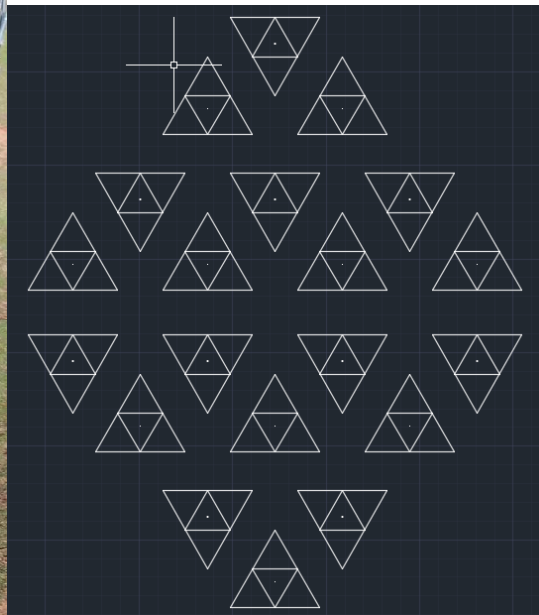
num_heliostats=120, field center=(0.0, -18.1), center to receiver=21.4



Final Pod Placement



Final Pod Placement



Current Status



Site Current Status





Thank You

ACKNOWLEDGEMENTS:

Technology Innovation Agency



CONTACT DETAILS:

Sebastian-James Bode
Solar Thermal Energy Research
Group (STERG)
Stellenbosch University
South Africa

bodesj@sun.ac.za
+27 (0)74 130 9442

visit us: concentrating.sun.ac.za