Chulalongkorn University

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Chulalongkorn University-**TSC**
collaboration on

Project : High efficiency space solar cell for TSC satellites

The Collaboration

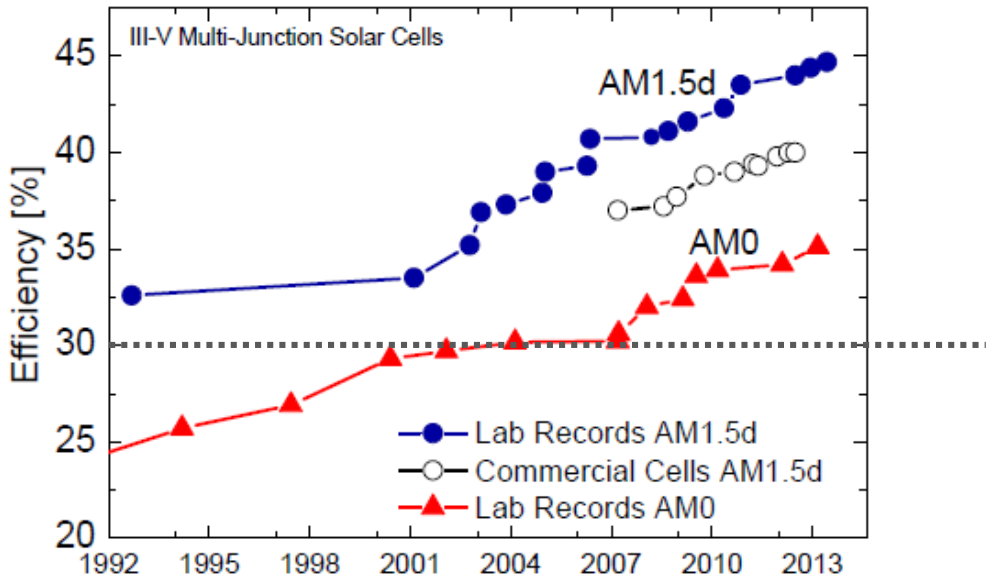
In collaboration with **TSC**, we would like to focus on the development of the *III-V semiconductor-based space solar cell* that can be used in NARIT and TSC space project.

The research and development of this III-V semiconductor-based space solar cell will include:

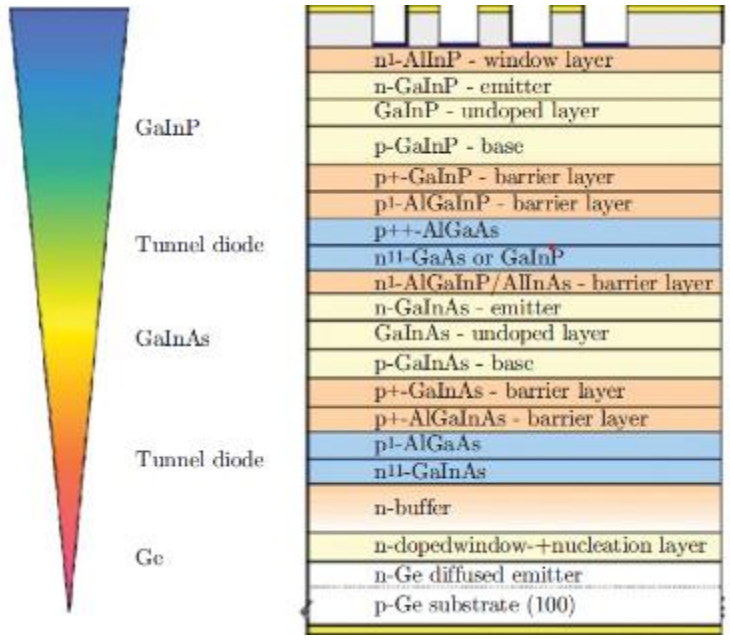
- Design and fabrication technology #designed and developed by Thai scientists
- Materials and device characterization and optimization
- The space solar cell prototypes #ready for large-scale production
- Space-device certified
- Cross technology incorporation #combine with other materials technologies

Concept design of space solar cell for TSC

- For space solar cell (operated under AM0), we now mainly focus on 3-junction cell



- Efficiency of 3-junction solar cell under AM0 (Space solar cell)



InGaP top junction

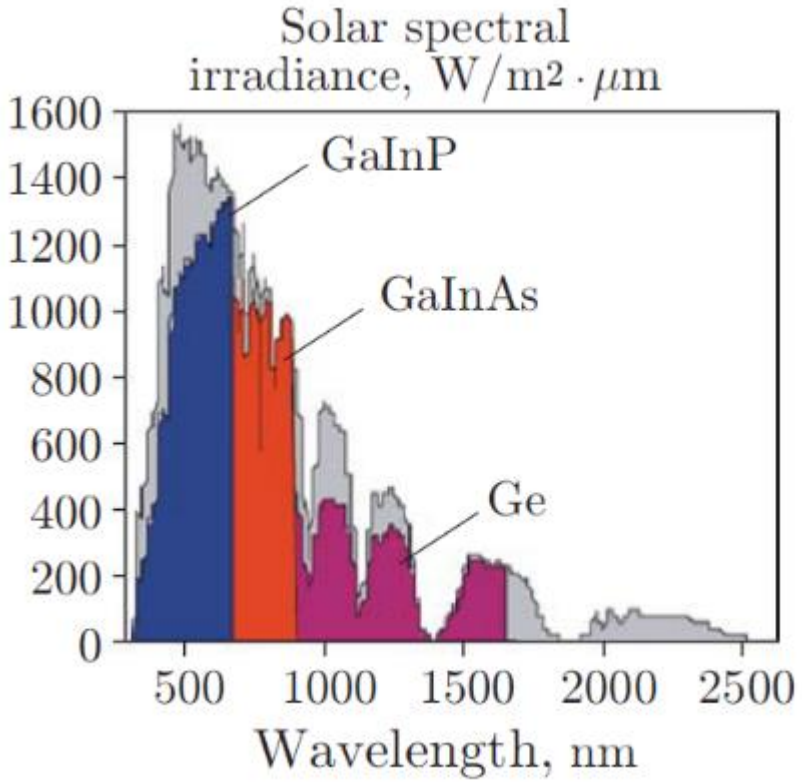
$In_{0.01}Ga_{0.99}As$ middle junction

Ge bottom junction

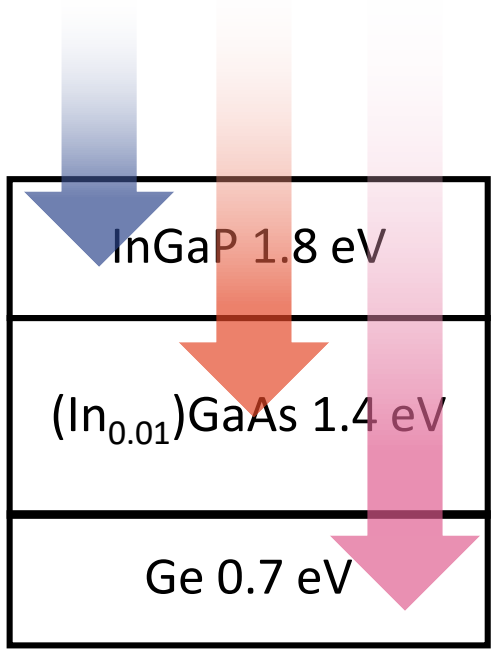
A. W. Bett, et al, Proc. of the 28th Europ. Photovoltaic Solar Energy Conference and Exhibition, Paris, France, 30 Sept.- 4 Oct., 2013, pp. 1–6.

Current generated in each junction

- Photon absorption and current generation in each junction



Solar spectrum



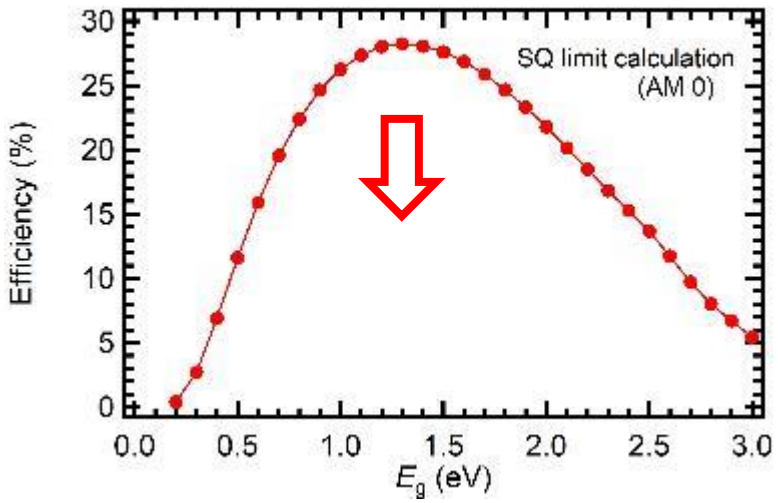
Efficiency **30 %** under AM0

- By average, it can be considered as each junction can be generated **10%** efficiency

⇩

- Target of 10% efficiency for GaAs single junction cell is satisfactory

Solar cell with additional physics phenomena



- This SQ maximum limit *only* consider

100% absorbed photon ⇨ Output current

In space

- There are other *unavoidable* physics phenomena in solar cell
  - Radiative recombination
  - Carrier transport (Mobility, drift velocity, etc.)
  - Impacts of the particles and radiation in space

} Decrease efficiency

There is an opportunity for research and development to improve the efficiency of available space solar cell! #incorporated design

Knowledge and knowhow can be transferred to many applications on earth! -> E-car charging station with solar cell