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Complete Theory of Down-Conversion, and a Comparison with Carrier Multiplication

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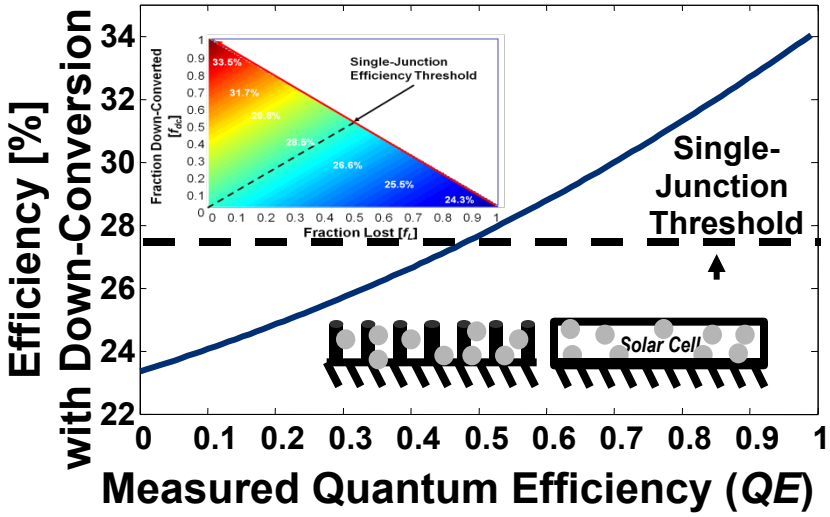

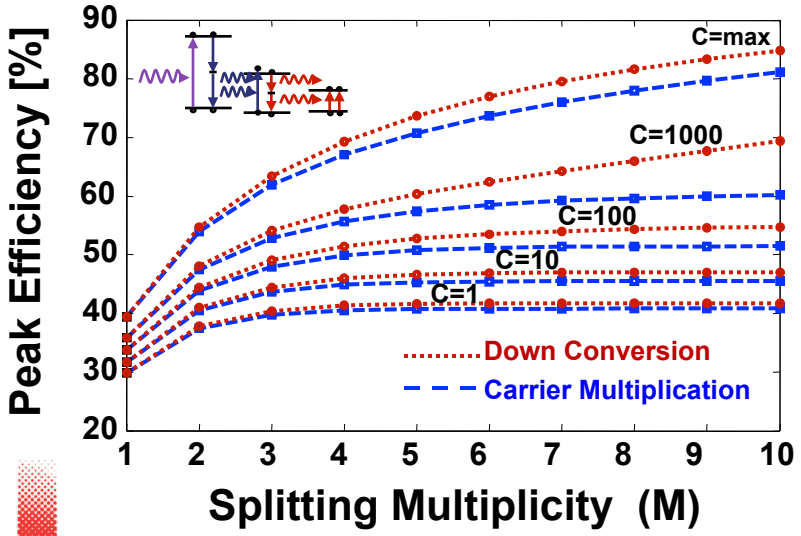

Achievements:

We have developed a rigorous theoretical analysis of the Down-Conversion process, as well as a new means of comparing different 3rd Generation concepts using a **thermodynamic approach**.

For Down-Conversion, we added the possibility of **internal losses and inefficiencies**, to understand what the material requirements of such a layer would be. We also recommend the use of **nanoparticles** for this layer to overcome issues of internal backscattering.

Significance:

For Down-Conversion to be effective, ***at least a 50% quantum efficiency of the process must occur***, otherwise the overall efficiency will be reduced.
DC ***outperforms*** CM at **all** concentration levels, as well as cascading splitting levels due to **entropic gain**.

*Abrams, Niv & Zhang, **J. Appl. Phys. 109**, 114905 (2011)*
*Abrams, Niv, Gharghi, Gladden & Zhang, **submitted**, 2011*
*Abrams, Niv, Gharghi, Gladden & Zhang, **IEEE-PVSC-37**, 2011*