



# eltic-Plus<sup>+</sup>

Smart Connected World



Celtic-Plus Event  
28-29 April 2016, Stockholm

## Smartly connected world based on low threshold Ge on Si laser

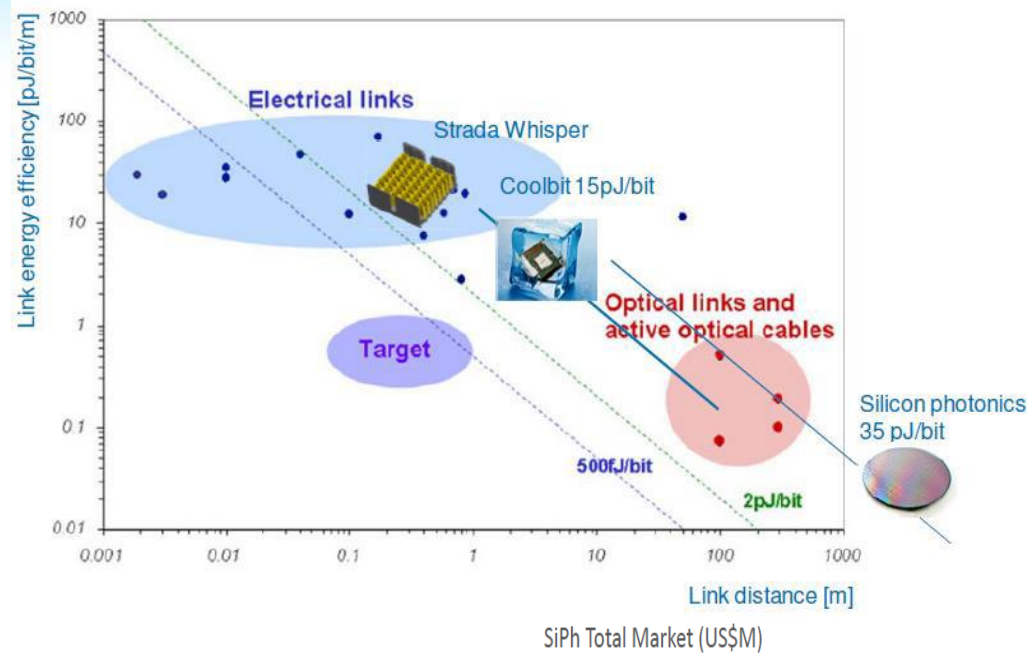
*Wan-Gyu Lee and National NanoFab Center  
Wan-Gyu LEE*



NNFC, Where Nanotechnology Meets

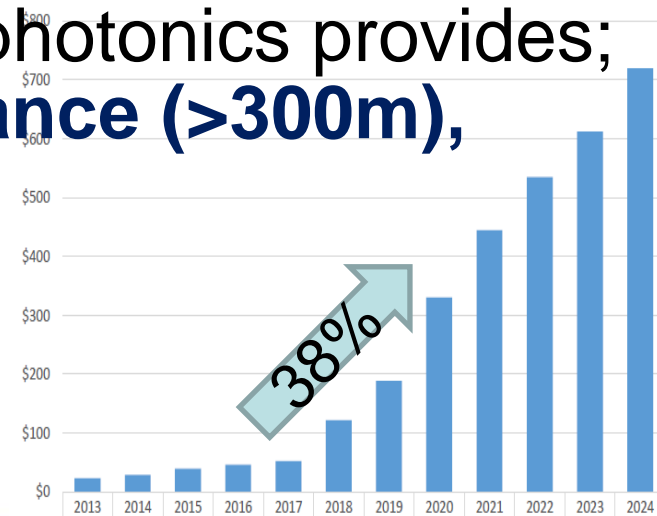


- One of the most efficient solutions for the increasing demand in bandwidth, distance, and energy consumption; data centers face.

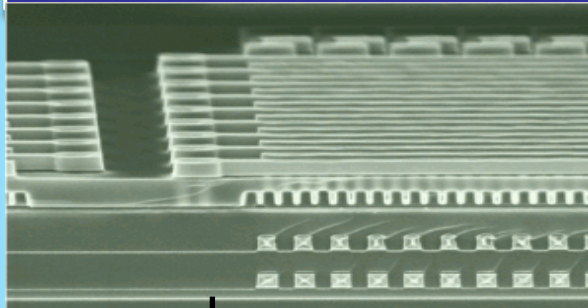


- The lowest power Ge laser on Si photonics provides; **single mode optics, longer distance (>300m), highest data rates (100Gbps).**

- Si photonics markets will grow very fast; 38% in CAGR.

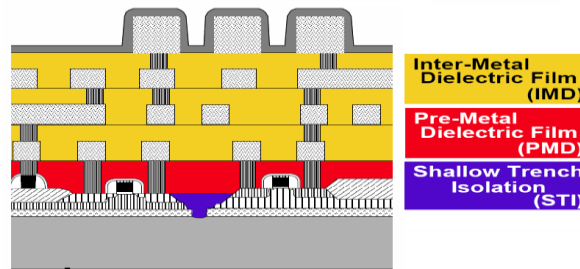


**Development of 3D-IC Technology & Vertical Device**  
(Cooperated with Besang Inc. & SNF)

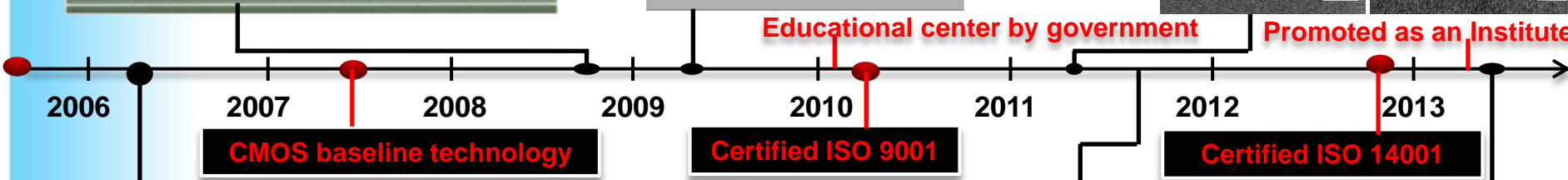
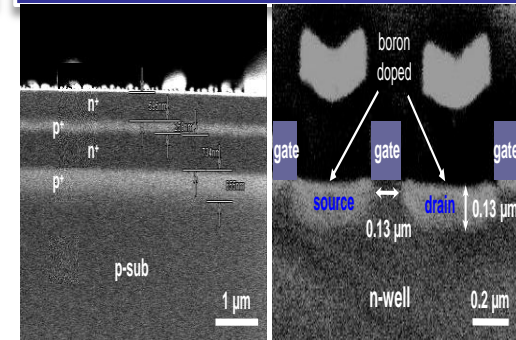


**Development of SOD Material**  
(Joint R&D with A, B Inc.)

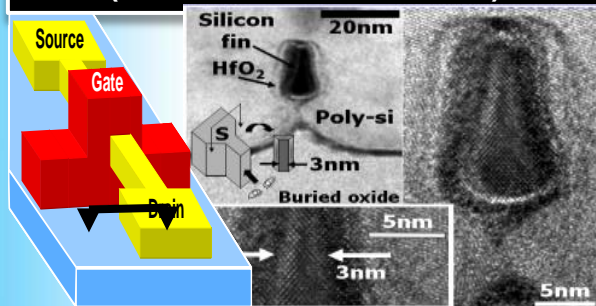
**Polysilazane SODs' Application**  
~ All Dielectrics in Devices



**Development of 2D Dopant Profile Techniques (NNFC)**



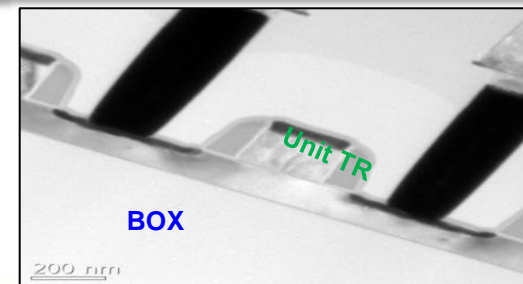
**Development of Smallest 3nm FinFet in the world**  
(Collaborated with KAIST)



**Development of Portable Barcode for the identification of species and the place of origin using DNA chip and Lab-on a chip**



**Technology transfer for mass production of 180nm SOI RF (to Magnachip)**



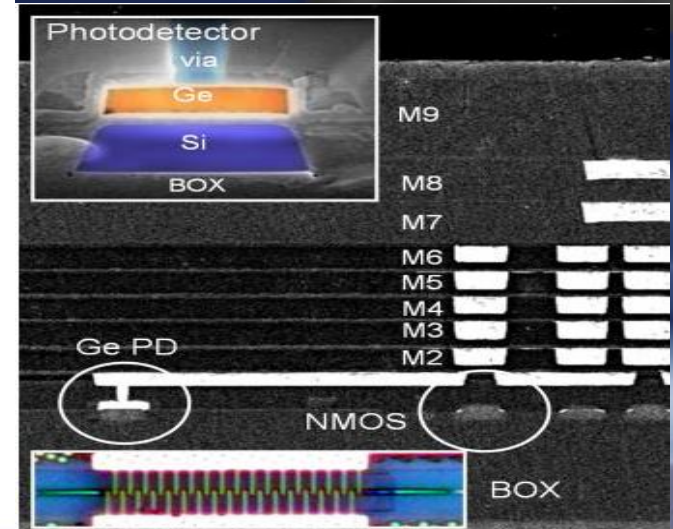
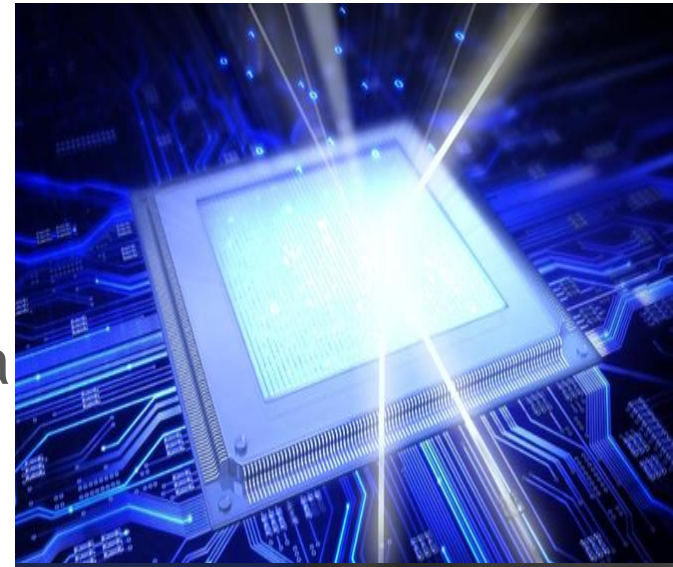
# Proposal Introduction (1)

- Smartly connected world based on low threshold Ge on Si laser.
- **Vision:** Smartly connected world between multiple big data with low power processing
- **Motivation:** Si technology evolves to higher value systems, through monolithic integration of electronics & photonics together into one platform .
- **Content:** to realize
  - Defect free high doping
  - Optimum confinement of electrons & holes
  - State-of-the art Ge epitaxy on Si



# Proposal Introduction (2)

- Expected outcome:
  - Monolithically integrated Ge on Si laser operating at room temperature with 1/100 low threshold power providing an energy efficient processing of big data from the connectivity of IoT
- Impacts:
  - Higher optical functions
  - Architecture change in data center
  - cost/operation cut
- Schedule:
  - 1/10 current threshold power @2018
  - 1/50 current threshold power @2019



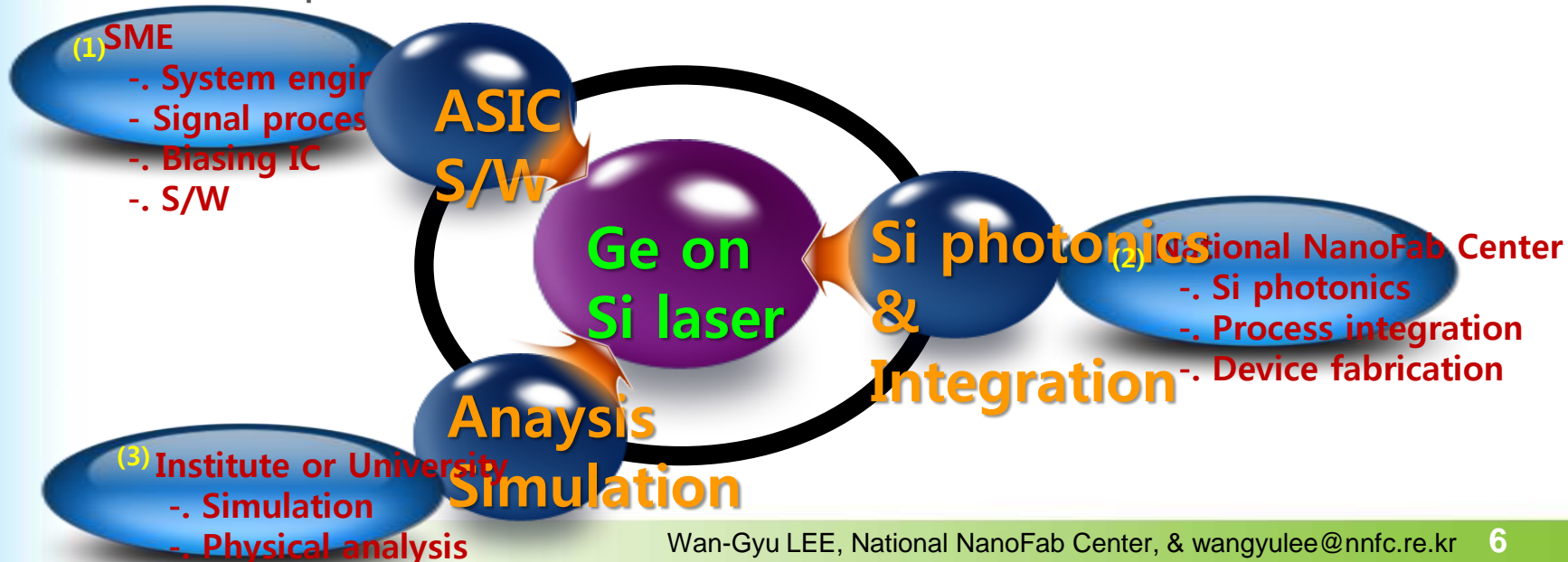


Celtic-Plus

# Partners



- NNFC has been looking for research and business partners who will collaborate in convergence technology of Ge epitaxy on Si photonics & Si electronics, as well as R & D prototype & production technology, IPR sharing, joint venture or venture companies.
- ; system engineering that adopt Si photonics allowing much faster digital signaling than is currently possible with optical interconnection
- ; manufacturer who wants to adopt monolithic opto-electronic devices in a low cost Si process



# Contact Info

For more information and for interest to participate please contact:



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