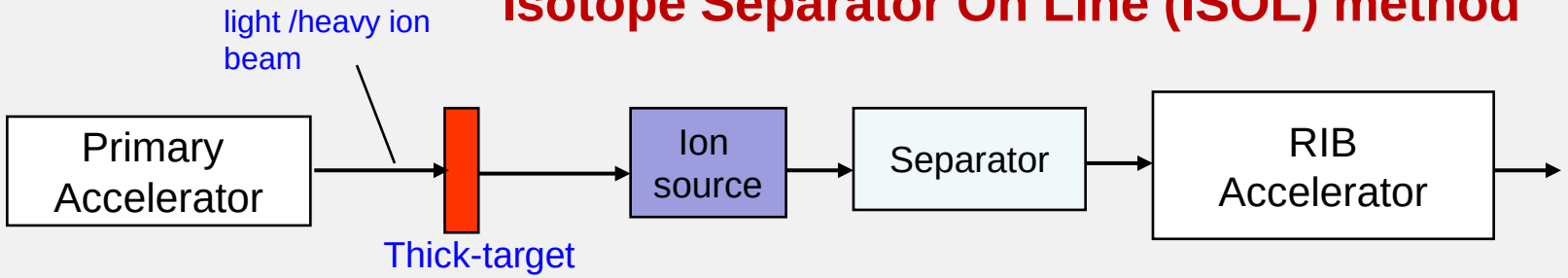
How to produce RIB?

Two methods for RIB production

Isotope Separator On Line (ISOL) method

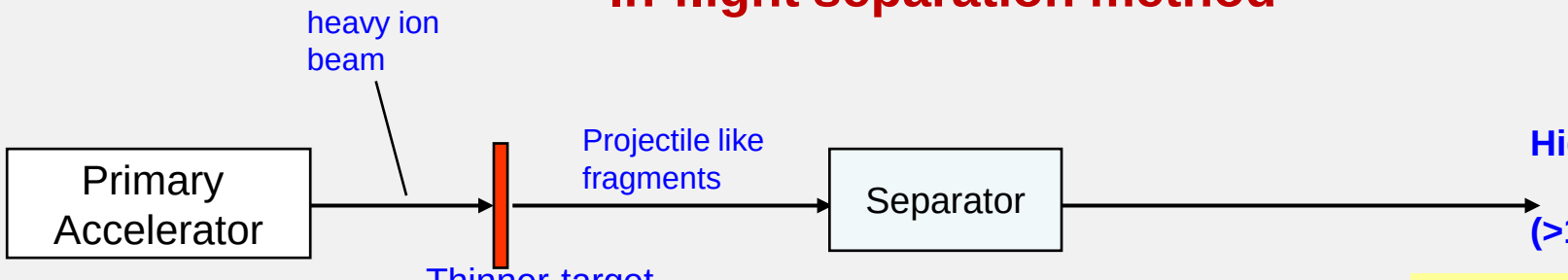


CN/Spallation/fission/ fragmentation of target nuclei

Online : primary accelerator & RIB accelerator operate simultaneously

High beam purity, quality , But element dependent intensity, $T_{1/2}$ limit ≥ 1sec

In-flight separation method



Fragmentation of beam nuclei

Isotones cannot be separated; rejection of primary beam a challenge

No ion-source, so all elements transported, no half-life limit But lower beam purity, quality

Challenges

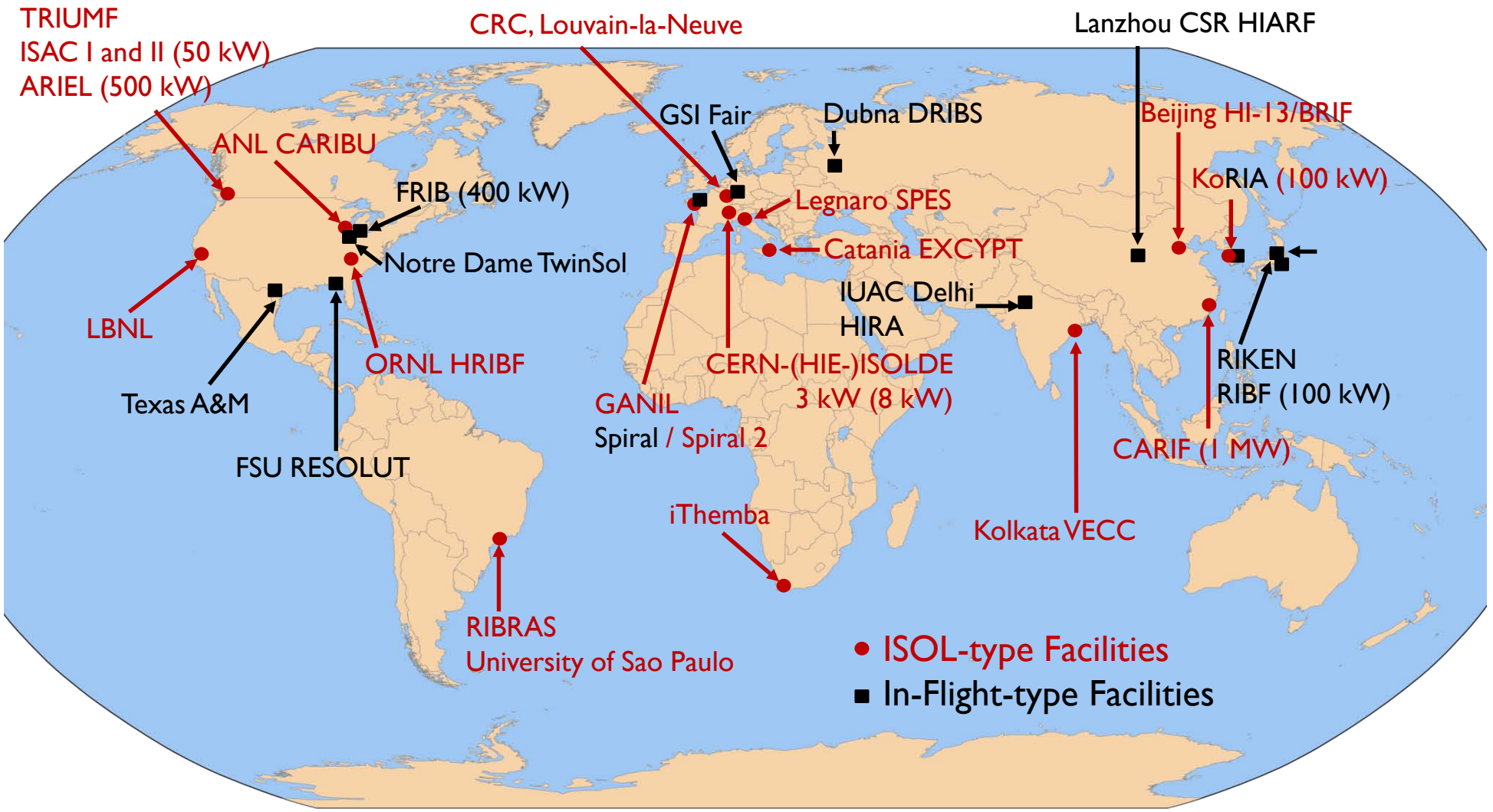
Increase RIB intensity & find new ideas for experiments with low intensity beams

$$I_{RIB} = I_{primary} \times N_{target} \times \text{Production cross-section} \times \text{efficiency factor}$$

- **High intensity primary beam**
- **Development of thick, porous and refractory targets that can handle high power beams**
- **Efficient ionization, separation & post-acceleration of RIB (ISOL) & high acceptance, good separation (IF) for facility**
- **State of the art detector systems (traps, arrays, isotope/isobar separators, fragment separators, storage rings) & New ideas to improve S/N ratio**

RIB development is highly R&D intensive.
But new techniques are continuously evolving

Rare Isotope Production Facilities World-Wide



Source: Introduction to ISOL Target Stations, Alexander Gottberg, Bill Paley, June 22, 2015