Selected topic:

Examples of lightning protection measures

for the incoming section OHL of power plant/substation

and for generators directly connected to OHL

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for the incoming section OHL of power plant/substation

and for generators directly connected to OHL

(1) Protection of 1-2 km incoming section of 35-66kV OHLs without ground wires

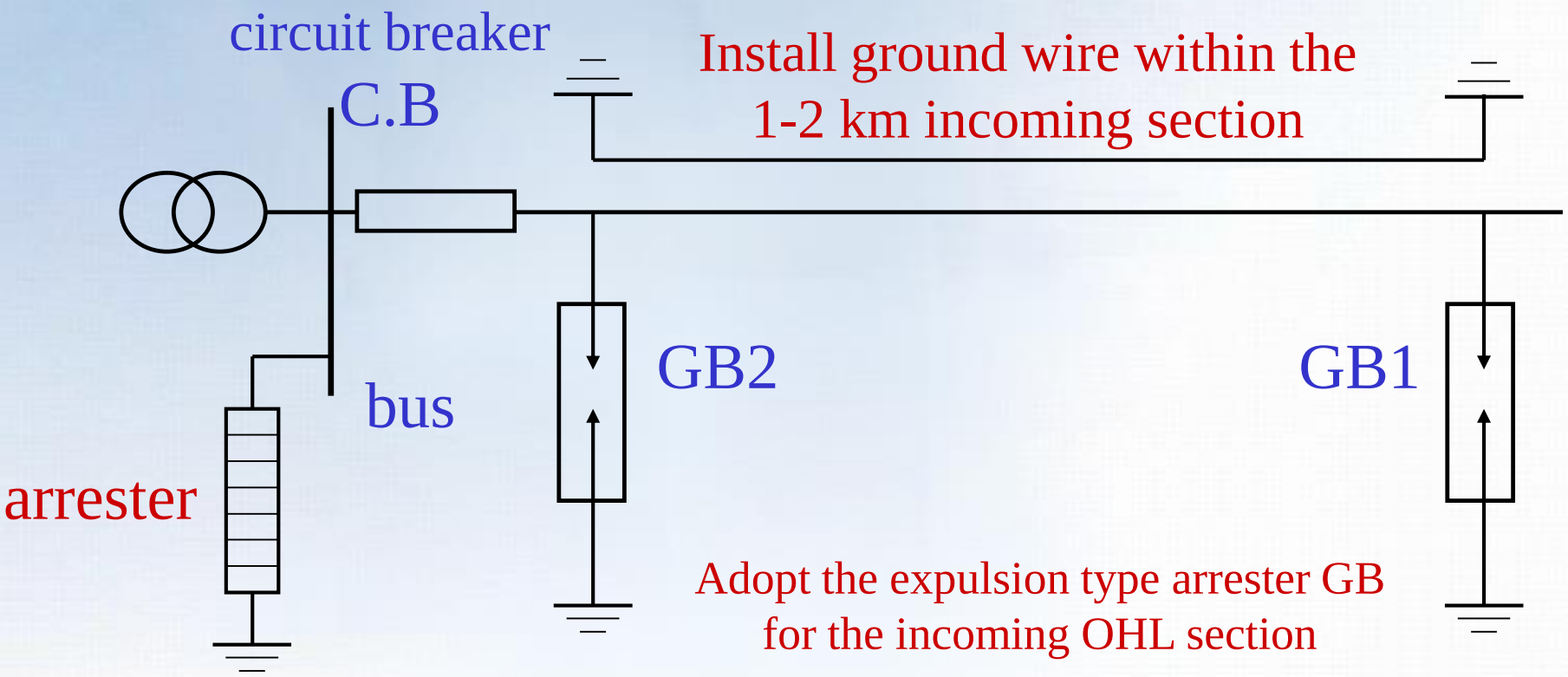
(2) Protection of OHLs (110kV and above) with ground wires

(3) Protection of power generator directly connected to OHL through a cable

What do these solutions mean?

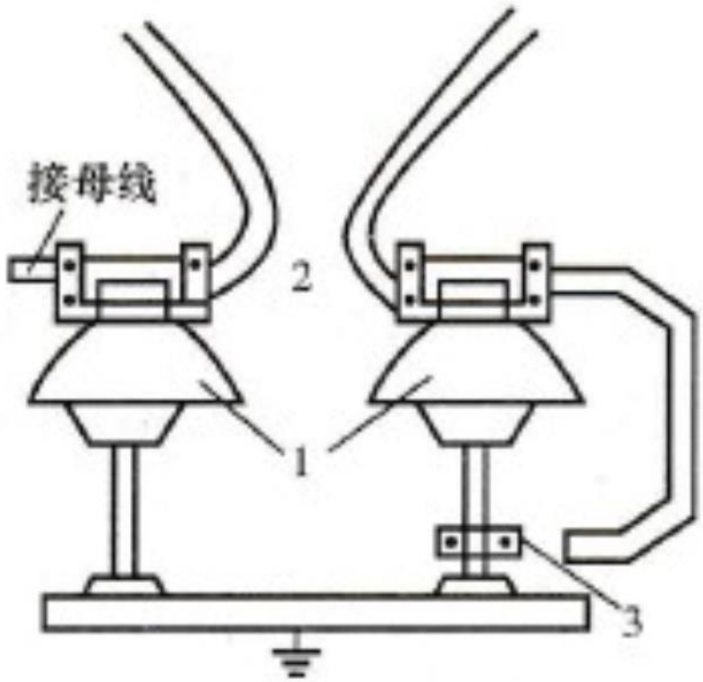
(1) Protection of 1-2 km incoming section of 35-66kV OHLs without ground wires

What does this solution mean?



Horn gap arrester 羊角间隙

1-insulator；2-main gap；3-additional gap



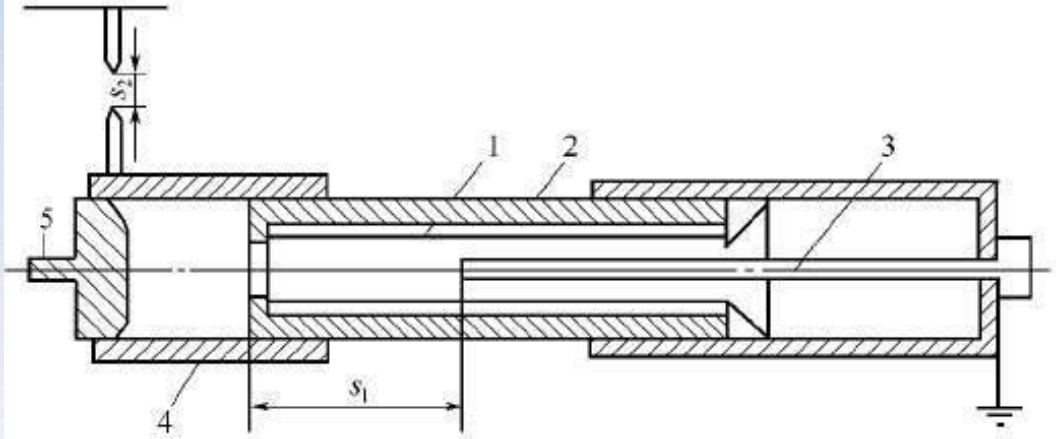


图 5-18　管式避雷器

1—产气管；2—胶木管；3—棒形电极；4—环形电极；

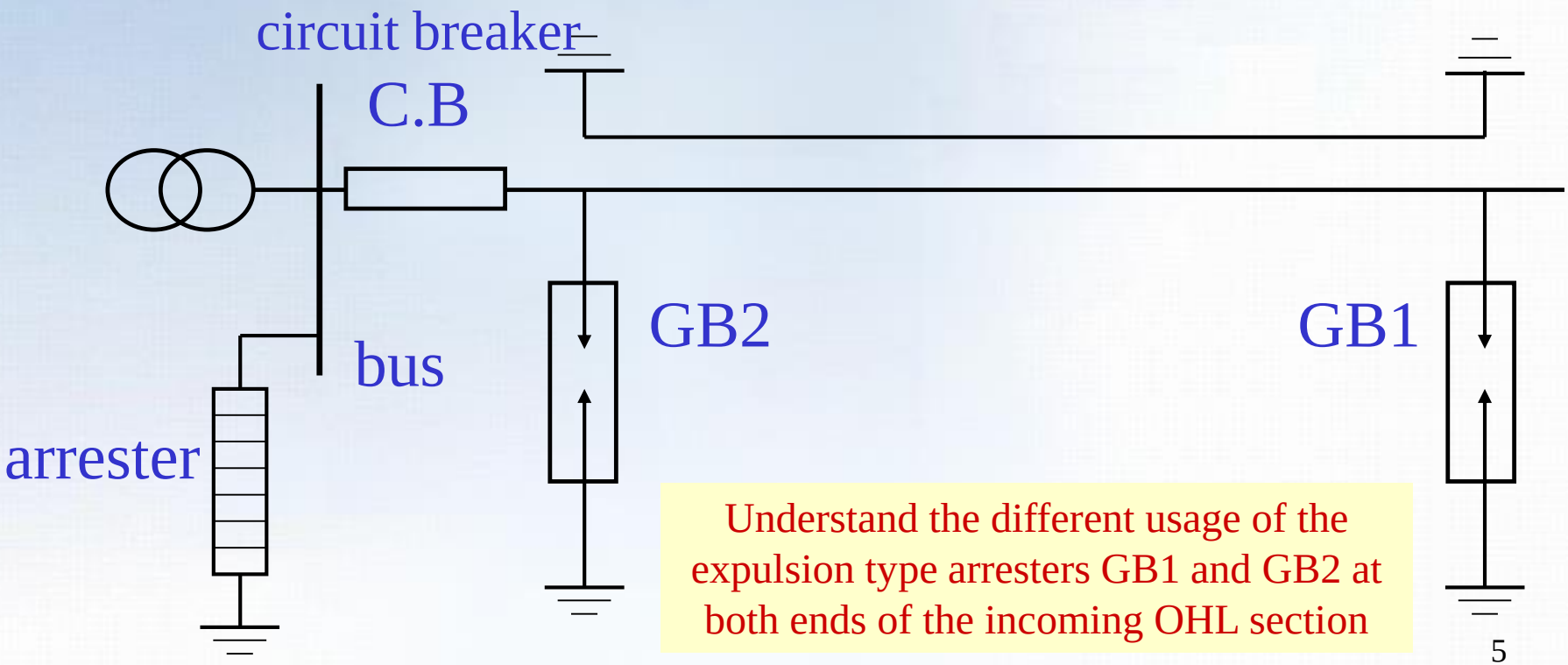
5—动作指示器；s_1—内间隙；s_2—外间隙

Expulsion type arrester

管式避雷器

(1) Protection of 1-2 km incoming section of 35-66kV OHLs without ground wires

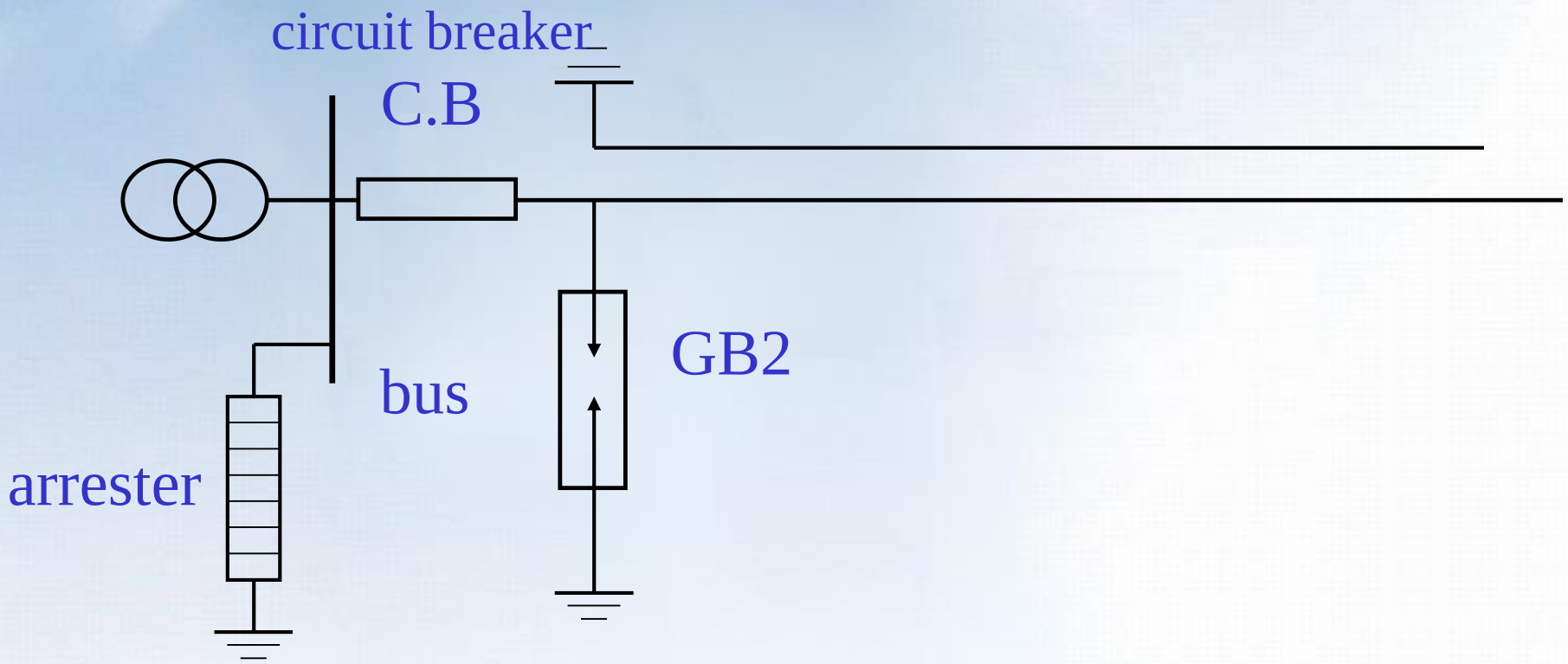
- The insulation level of OHL in high, then the voltage of incident wave is also high. Use the arrester GB1 to limit the wave voltage, GB1 will by pass part of the incident energy;
- When CB is open and line is energized, in order to prevent the follow up current caused by the flashover of insulator under the full voltage reflection, use GB2;
- When CB is closed, GB2 should not act under the incident wave. In order to prevent the possible damage to transformer by the chopped wave resulted from GB2.



Understand the different usage of the expulsion type arresters GB1 and GB2 at both ends of the incoming OHL section

(2) Protection of OHLs (110kV and above) with ground wires

Increase the lightning withstand level in the incoming section of OHL

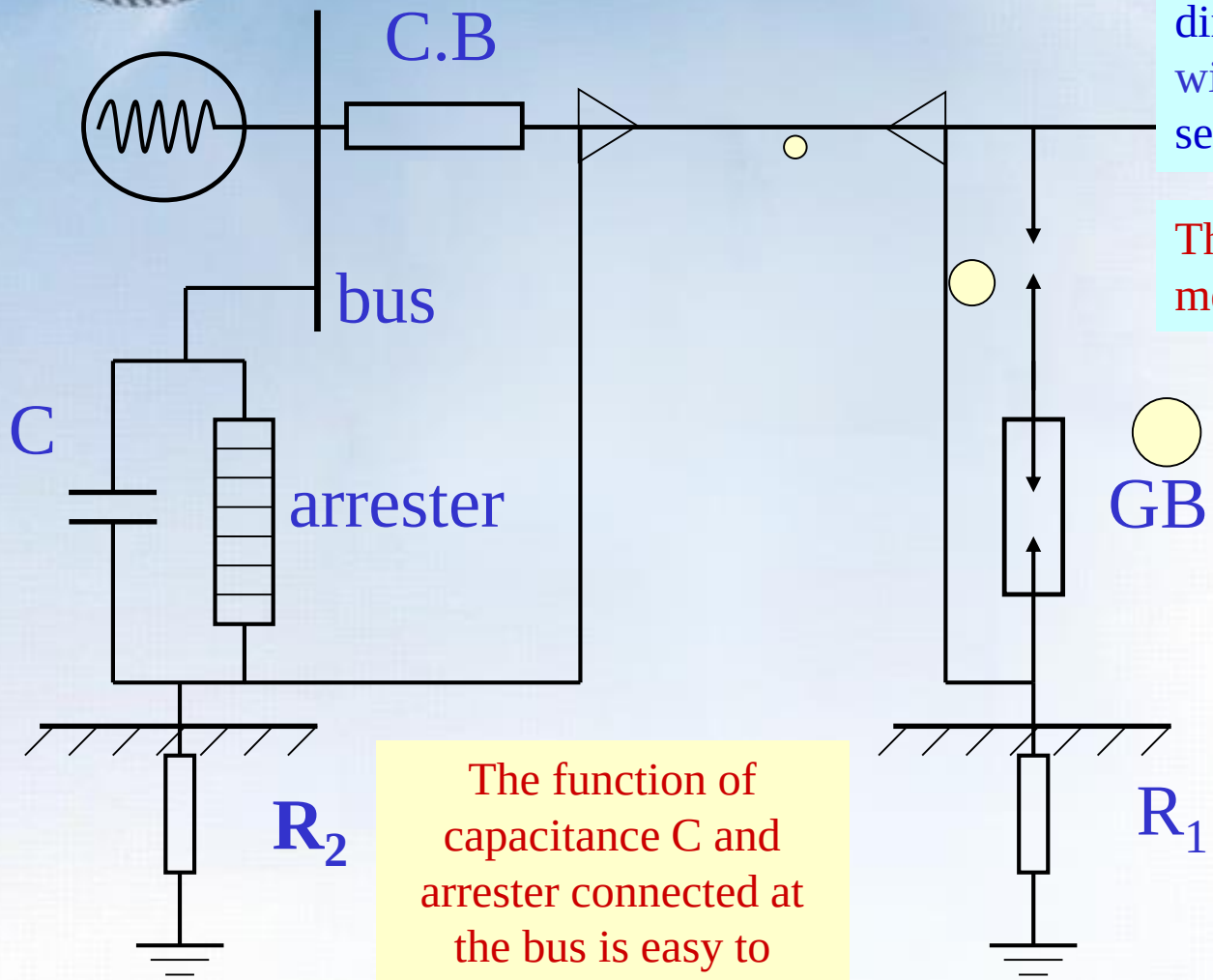


(3) Protection of power generator directly connected to OHL through a cable

The insulation level of 3-10kV power generator is low.

The "striking back" accident on the generator, which is directly connected to OHL, will take place, if the incoming section of OHLs is used.

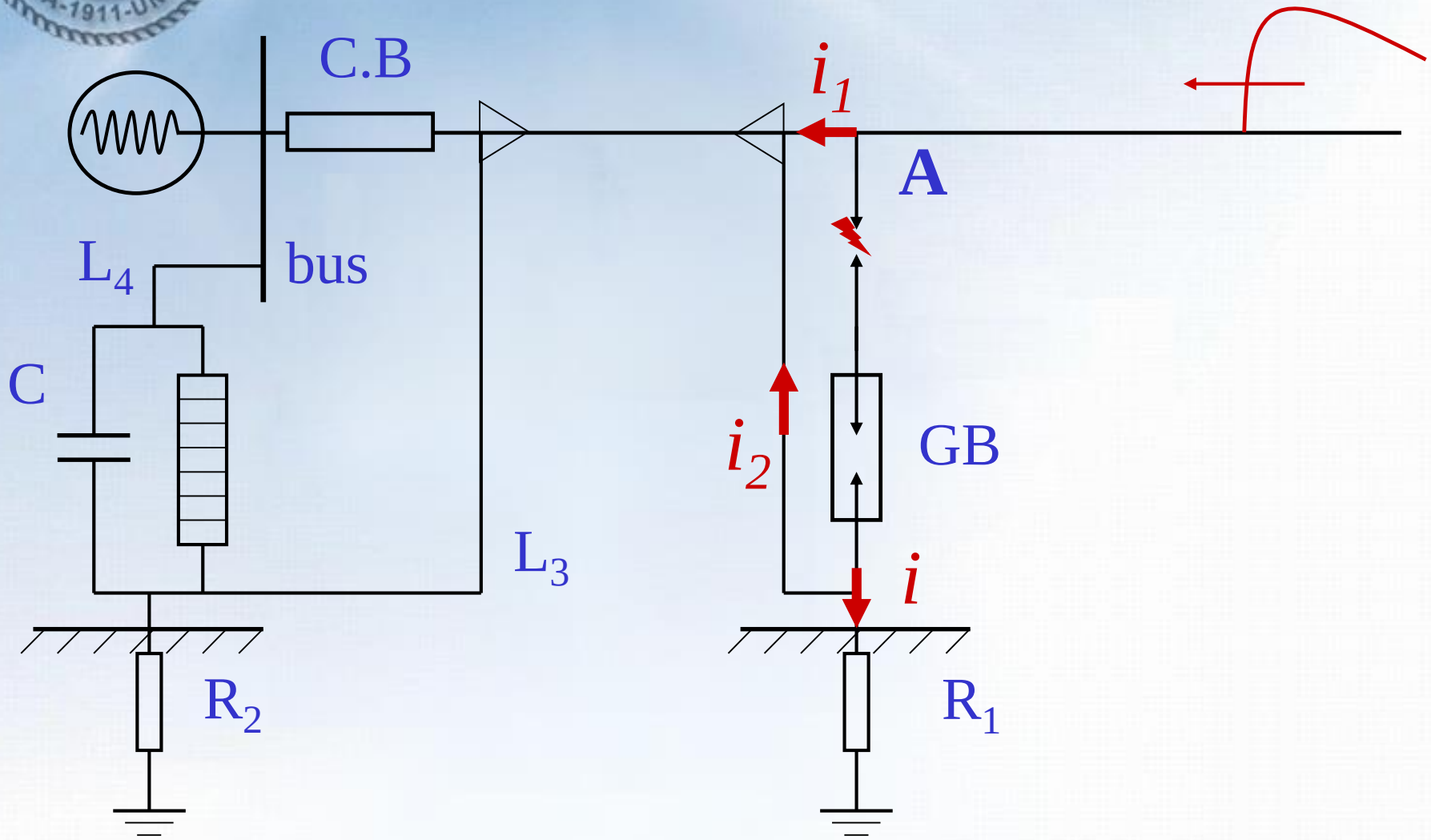
The cable section is a possible measures to solve this problem



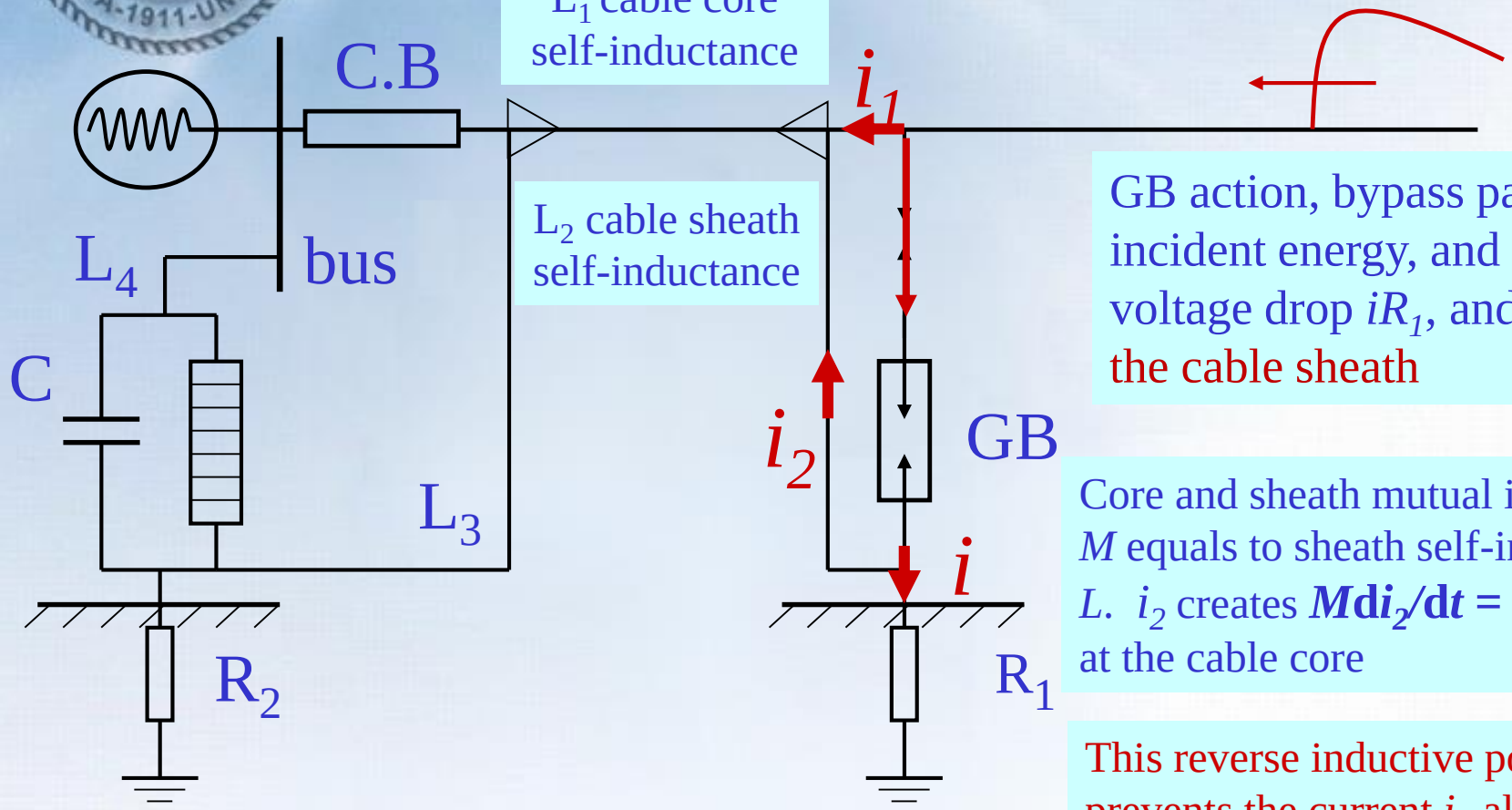
The function of capacitance C and arrester connected at the bus is easy to understand

What does this measure mean? Why the cable section can solve the problem?

(3) Protection of power generator directly connected to OHL through a cable



(3) Protection of power generator directly connected to OHL through a cable

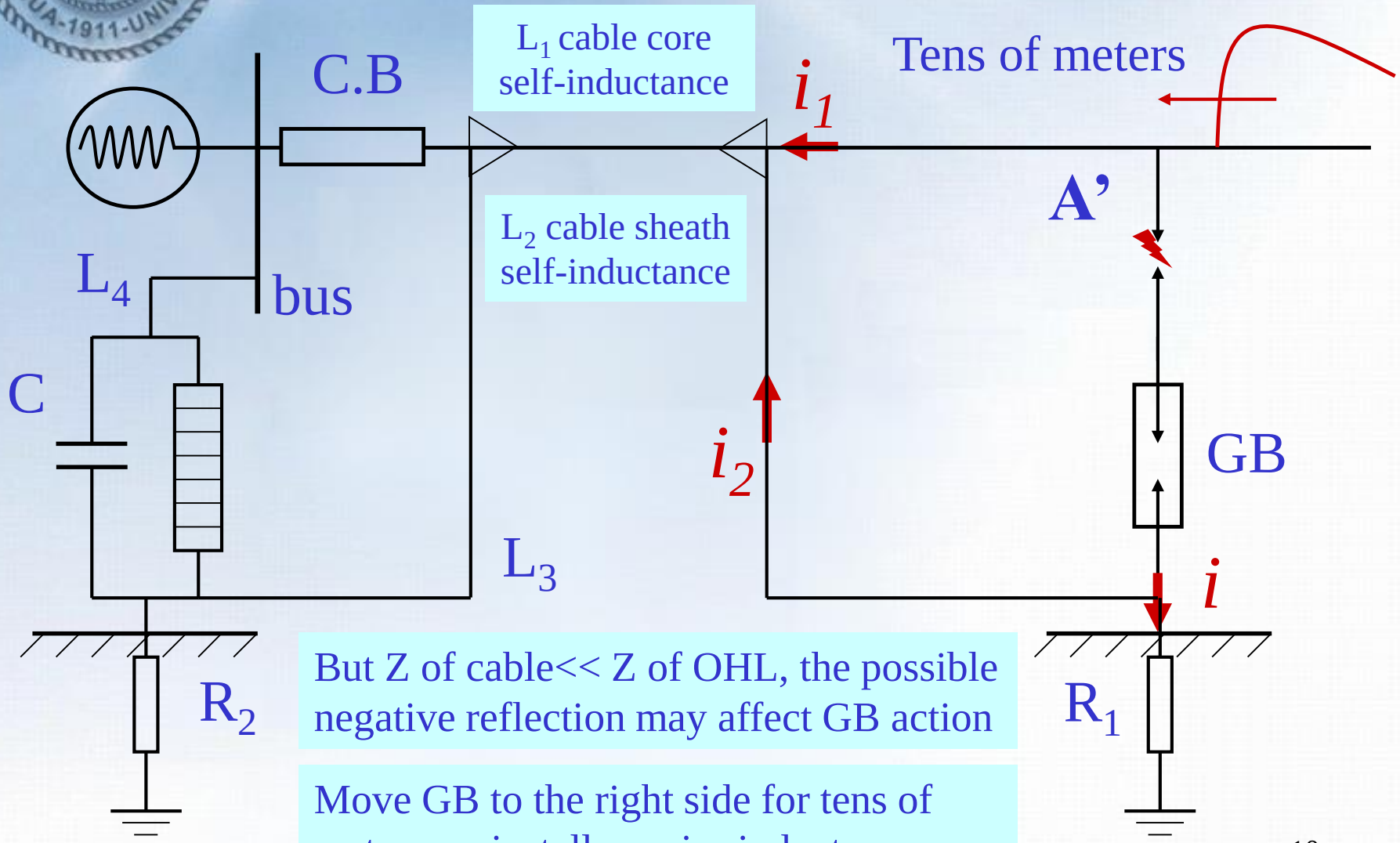


GB action, bypass part of incident energy, and creates voltage drop iR_1, and i_2 along the cable sheath

Core and sheath mutual inductance M equals to sheath self-inductance L. i_2 creates $\boldsymbol{M\mathrm{d}i_2/\mathrm{d}t = L_2\mathrm{d}i_2/\mathrm{d}t}$ at the cable core

This reverse inductive potential prevents the current i_1 along the cable core to the generator, which reduces the residual voltage of the arrester.

(3) Protection of power generator directly connected to OHL through a cable



But Z of cable<< Z of OHL, the possible negative reflection may affect GB action

Move GB to the right side for tens of meters, or install a series inductance