

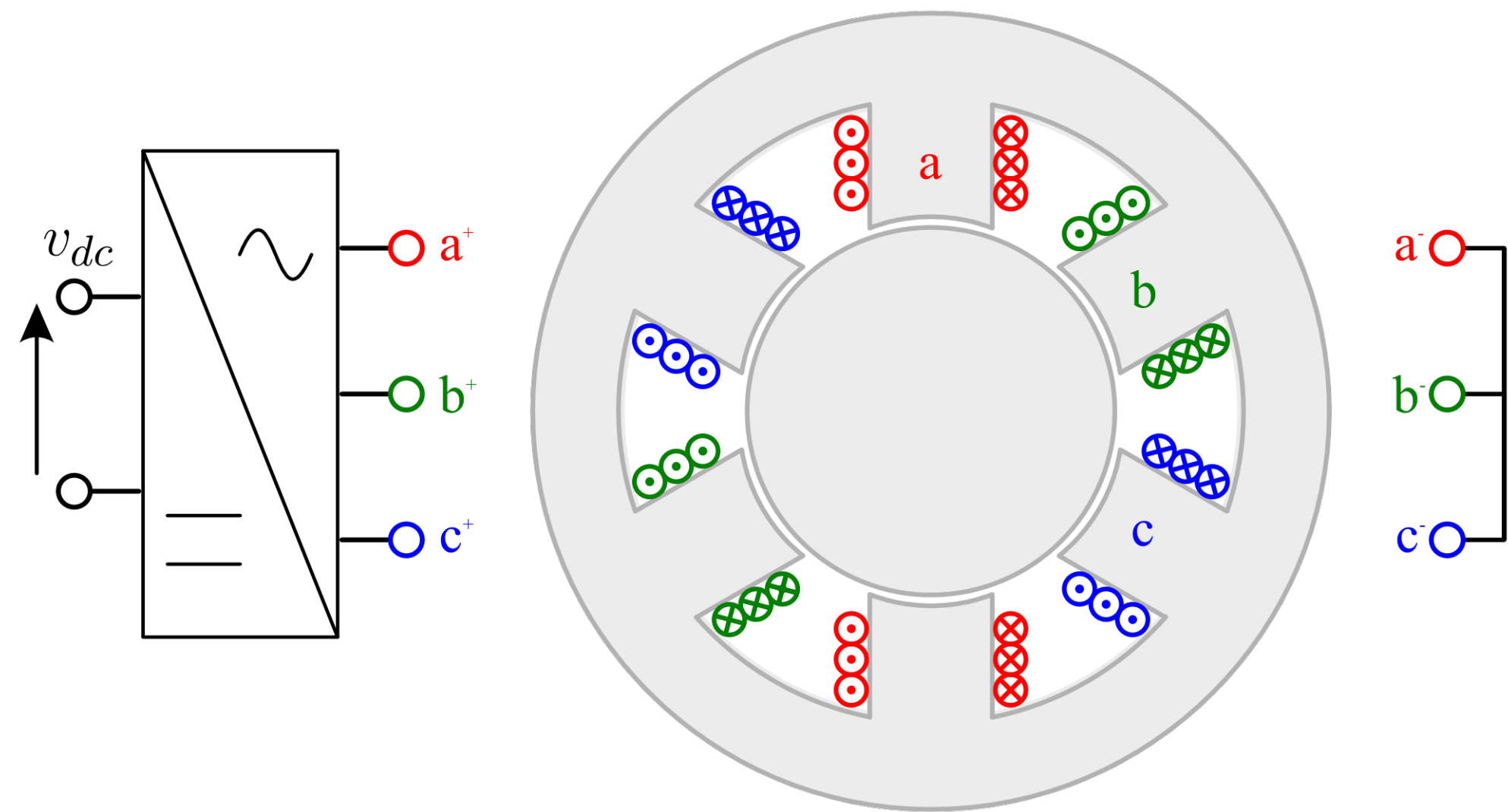
CTAF - Electric Traction Chain with Segmented Power Supply

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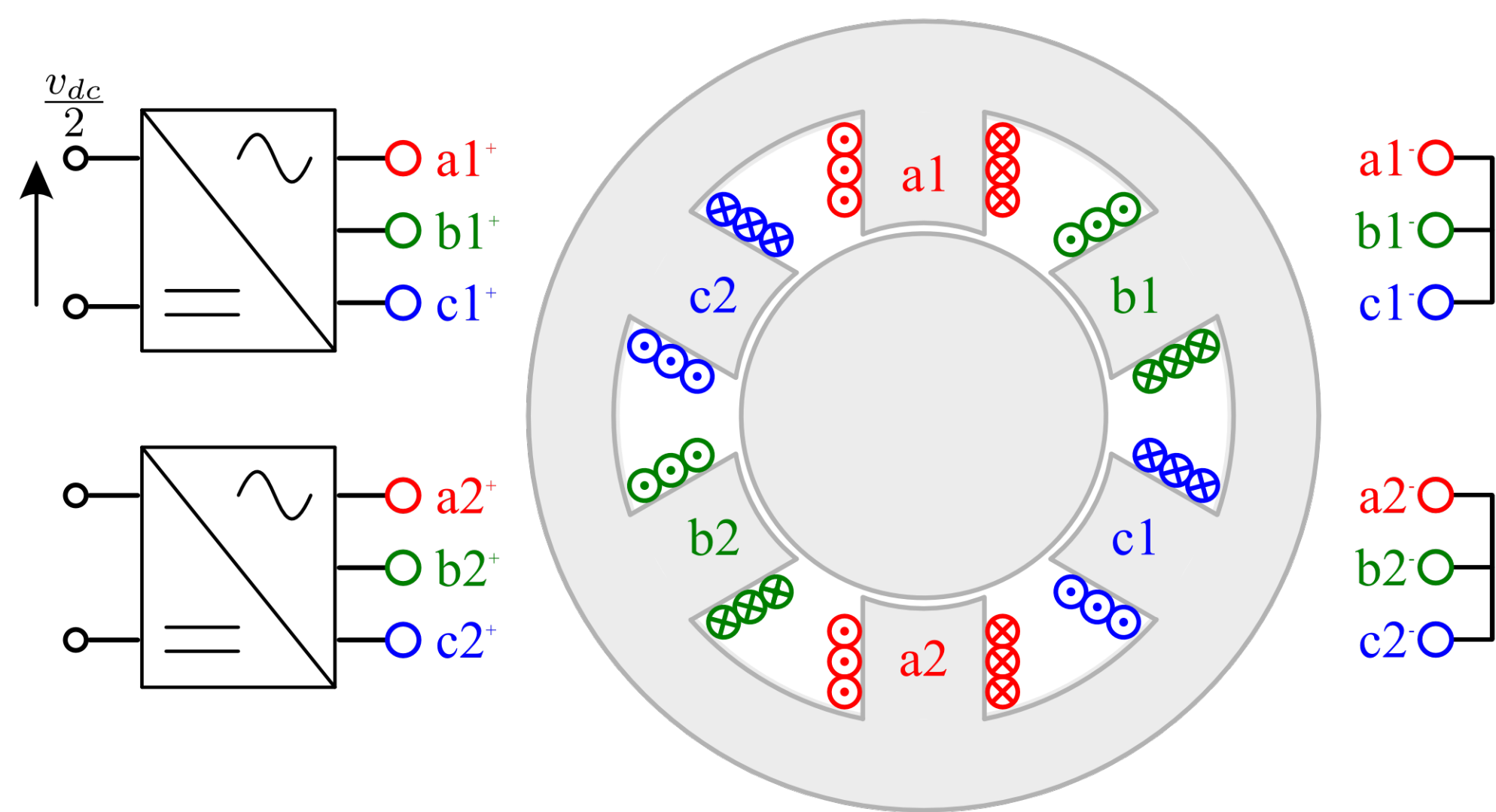
Concept

Conventional machine



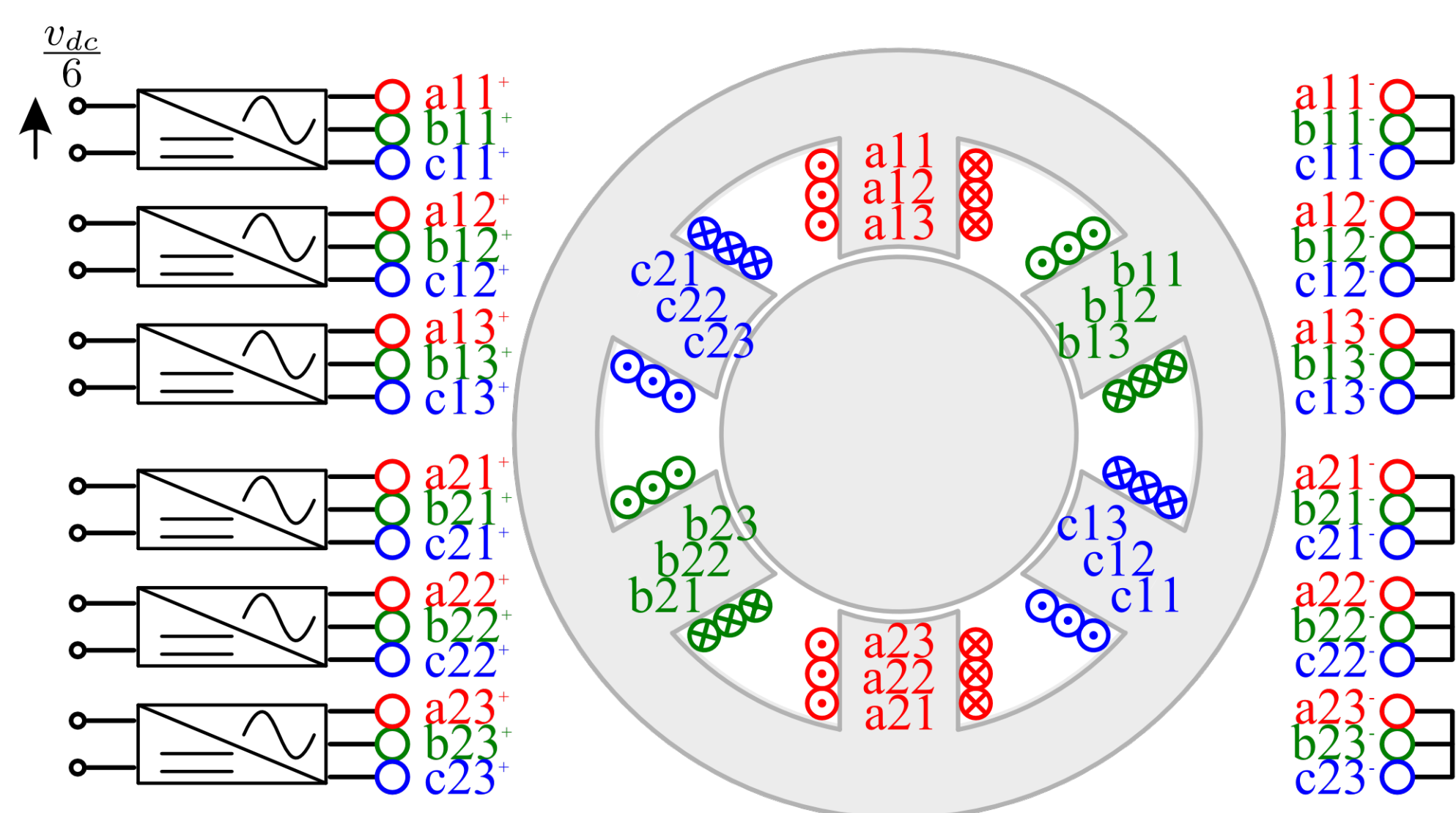
- 2-pole 3-ph machine (for the sake of example)
- 3 windings
- 6 terminals
- 1x 3-phase converter
- DC-side voltage v_{dc}

Split the windings by coil (state of the art)



- Sub-winding a1 split into a1 and a2
- 6 sub-windings
- 12 terminals
- 2x 3-ph converters
- DC-side voltage $v_{dc}/2$
- ↳ limited by nb of coils

Split the windings by bundle of turns (CTAF)



- Sub-winding a1 split into a11, a12 and a13
- 18 sub-windings
- 36 terminals
- 6x 3-ph converters
- DC-side voltage $v_{dc}/6$
- ↳ limited by nb of turns

Advantages

1. Low voltage traction chain
2. Improved availability rate
3. Reduced stress on the insulation
4. Multi-source power supply
5. Additional degrees of freedom
6. Low power per switch
7. Improved filling factor
8. Improved compactness
9. Suitable for wide-bandgap semicond.

Drawbacks

1. Large number of sensors
2. Difficulty of synchronization
3. Rethinking the control
4. Complex connections
5. Electromagnetic compatibility
6. Isolation of a defective cell
7. Consumption of copper
8. Difficulty of recycling

Obstacles

- Modeling of the traction chain
- Implementation of the hierarchical control (healthy & degraded mode)
- Auxiliary functions offered by DoF
- Impact design & quality of the connections and sensors
- Co-optimization of the converter-machine & eco-design

Overview of the collaboration

