A-B Plots Update

Workshop at LASA

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S. Farinon[2], F. Mariani[1], S. Mariotto[3] , A. Pampaloni[2], T. Salmi[4]

[1]Sapienza University of Rome
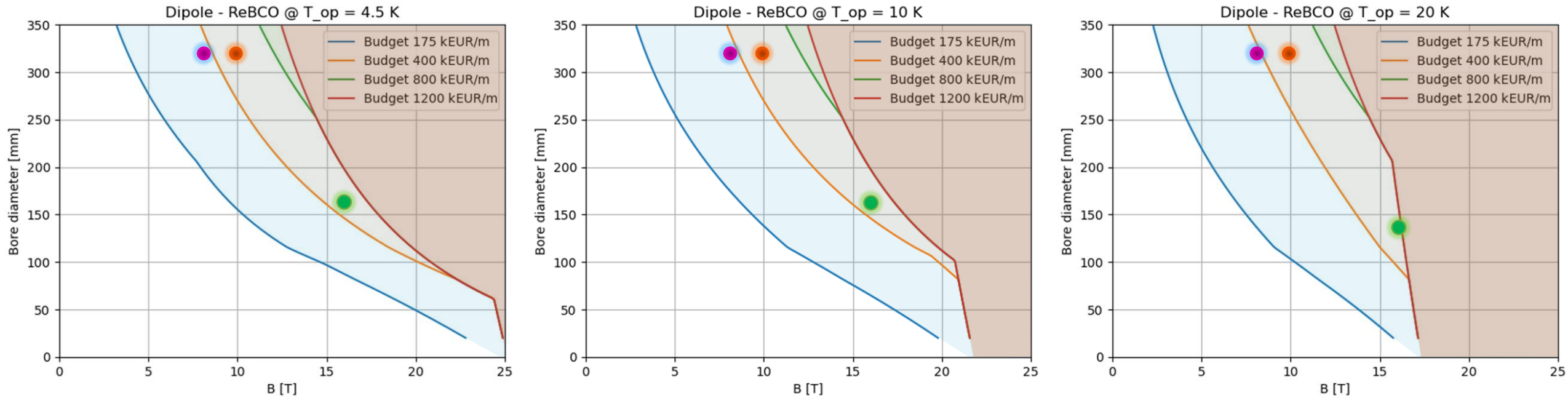[2]INFN – Genoa
[3]INFN and University of Milan
[4]Tampere University
[5]CERN

November 2024

Dipole - ReBCO @ T_op = 4.5 K

Dipole - ReBCO @ T_op = 10 K

Dipole - ReBCO @ T_op = 20 K

Summary of cost assumptions:

- We use the ReBCO's aspirational cost 2500 EUR/kg
  - Today's price is around 8000 EUR/kg
- The starting budget of 175 kEUR/m for each magnet is taken from the FCC cost model
  - We can assume a higher budget than FCC because we have a smaller circumference and less magnets.
- Cryogenic, protection and shielding costs are not taken into account.

Summary of assumptions:

- Single sector coil dipole
- Maximum stress: 400 MPa
- Fujikura Tape for the J_c fit
- Roebel cable
- Non-insulated or Metal-insulated cable
- Maximum coil width: 80 mm

Final Focusing: (v 0.8)
- 8.1 T, 320 mm
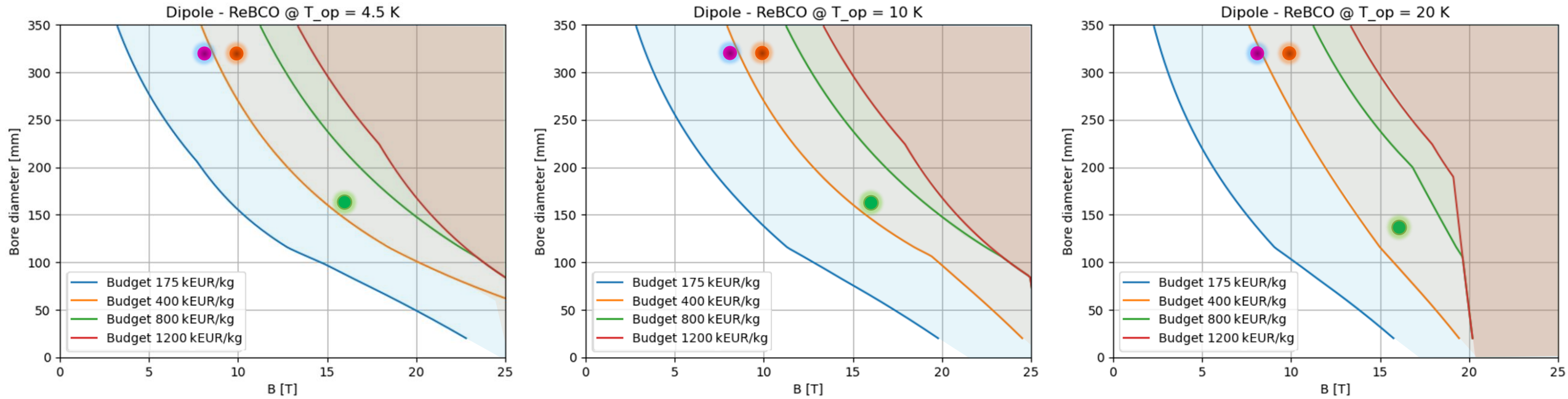- 9.7 T, 320 mm

Arc: (v 0.7)
- 16 T, 160 mm
  (140mm @ 20K)

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Summary of assumptions:
- Single sector coil dipole
- Maximum stress: 400 MPa
- Fujikura Tape for the J_c fit
- Roebel cable
- **Non-insulated or Metal-insulated cable**
- Maximum coil width: 120 mm

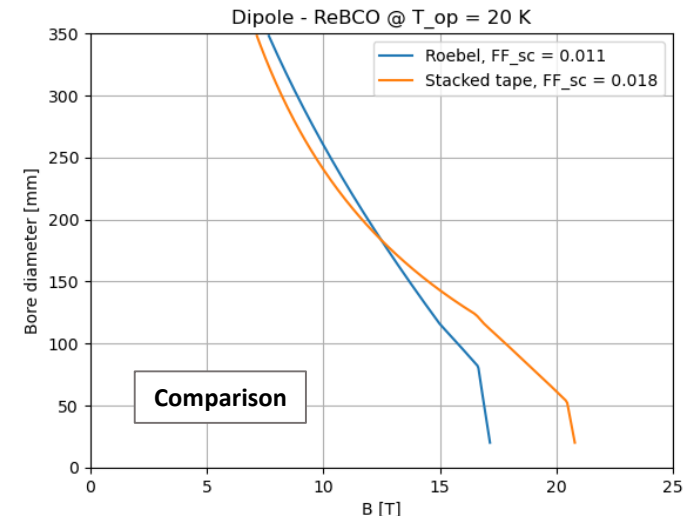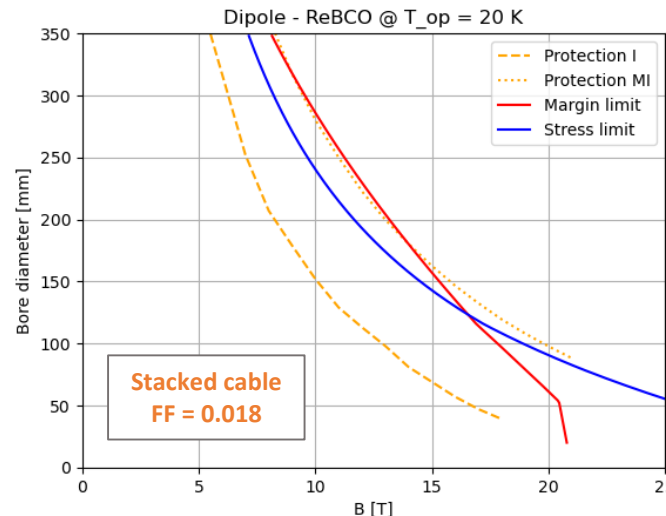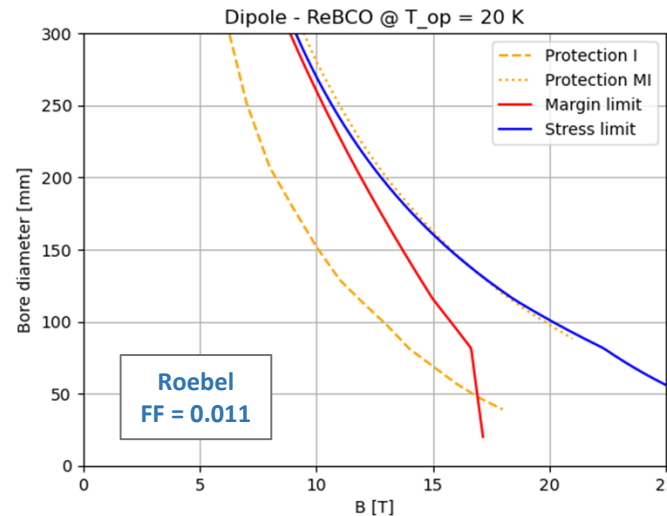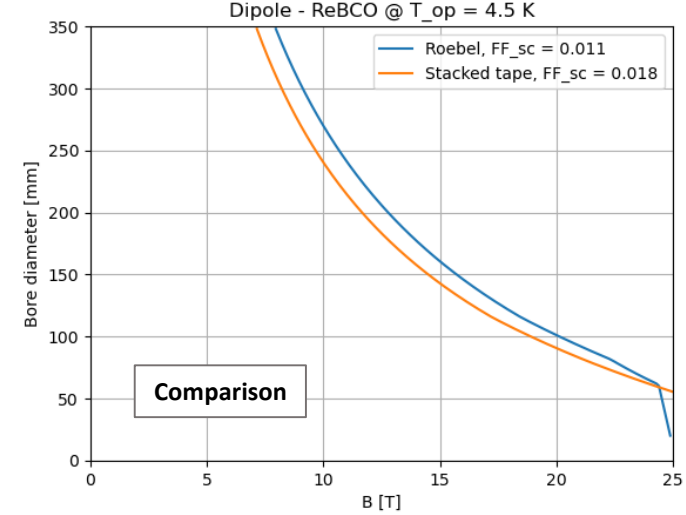**Final Focusing: (v 0.8)**
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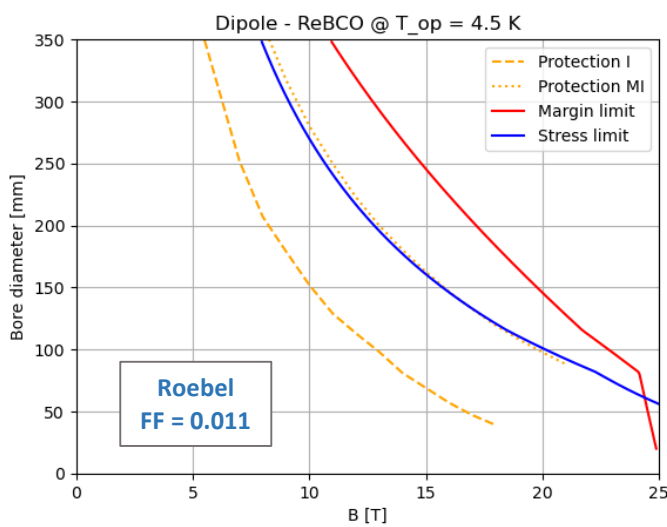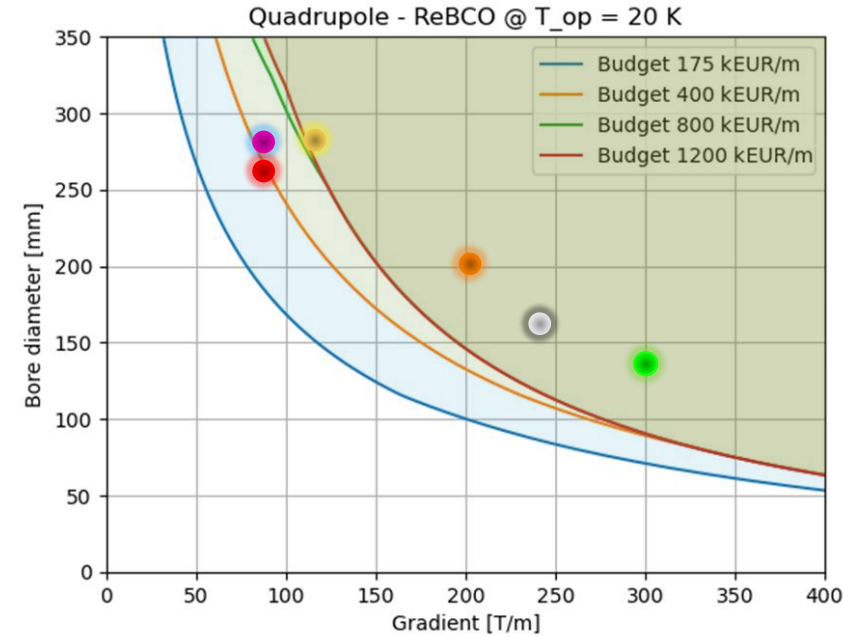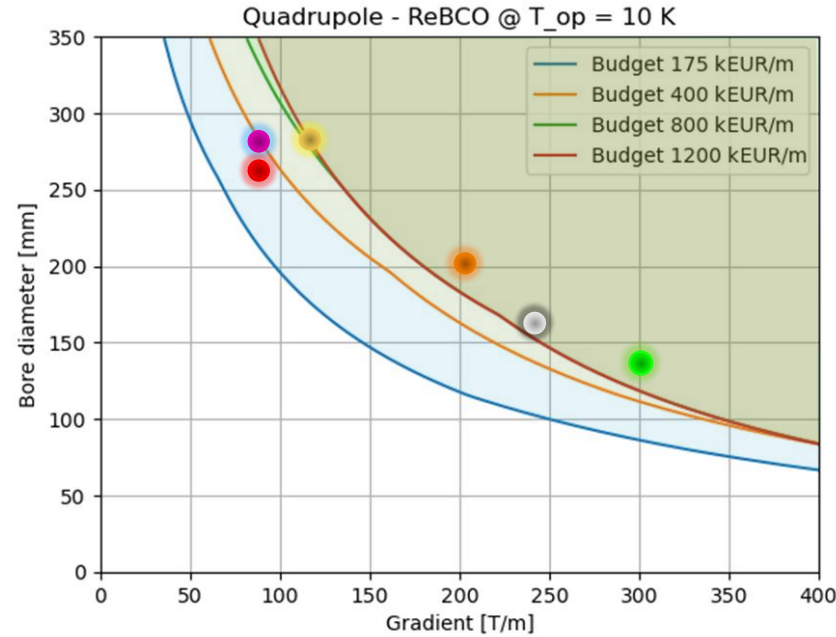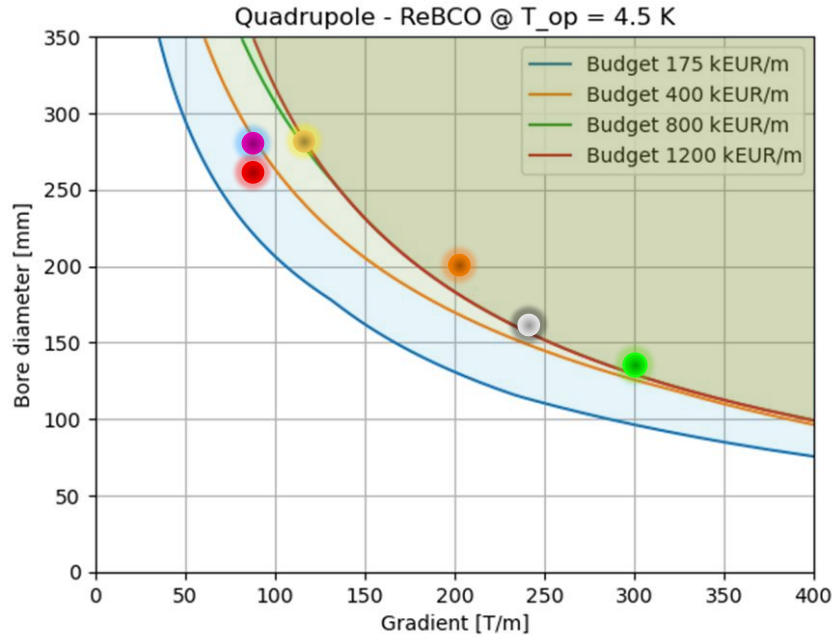- 9.7 T, 320 mm

Arc: (v 0.7)
- 16 T, 160 mm
  (140mm @ 20K)

Dependence on cable type

Summary of assumptions:

- Single sector coil dipole
- Maximum stress: 400 MPa
- Fujikura Tape for the J_c fit
- Stacked tape cable
- **Non-insulated or Metal-insulated cable**
- Maximum coil width: 80 mm

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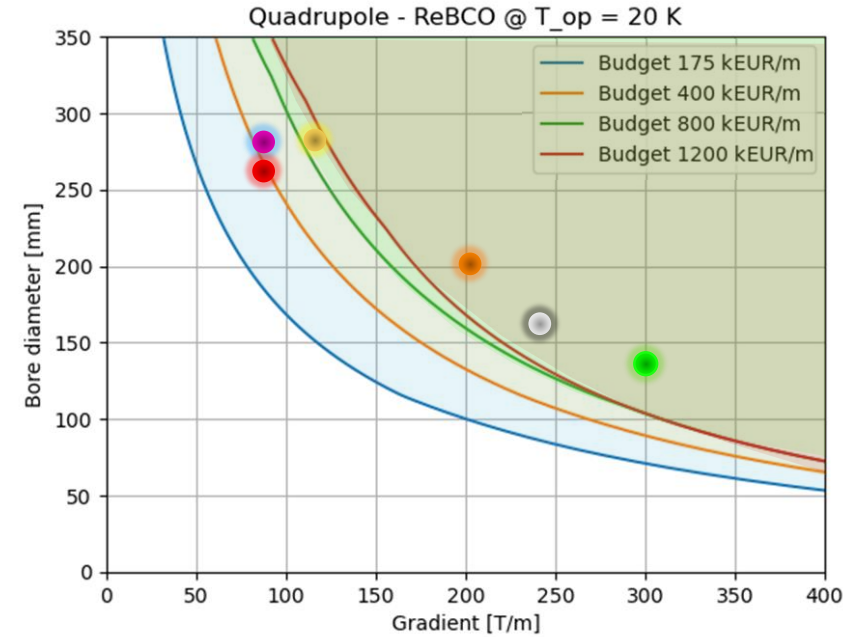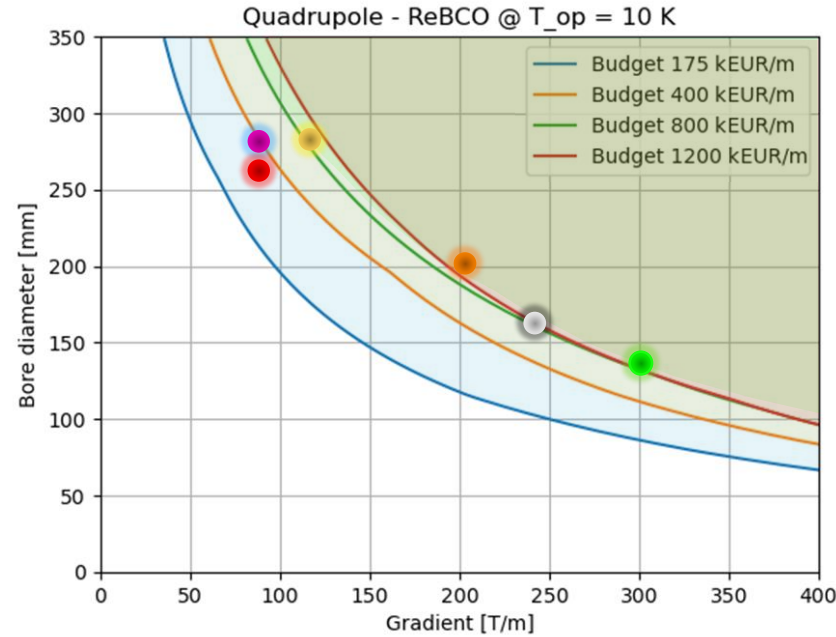
Summary of assumptions:
- Single sector coil quadrupole
- Maximum stress: 400 MPa
- Fujikura Tape for the J_c fit
- Roebel cable
- Non-insulated or Metal-insulated cable
- Maximum coil width: 80 mm

Final Focusing: (v 0.8)
- 85 T/m, 280 mm
- 85 T/m, 266 mm
- 115 T/m, 290 mm
- 205 T/m, 204 mm
- 242 T/m, 172 mm
- 300 T/m, 140 mm

Quadrupole - ReBCO @ T_op = 4.5 K | Quadrupole - ReBCO @ T_op = 10 K | Quadrupole - ReBCO @ T_op = 20 K

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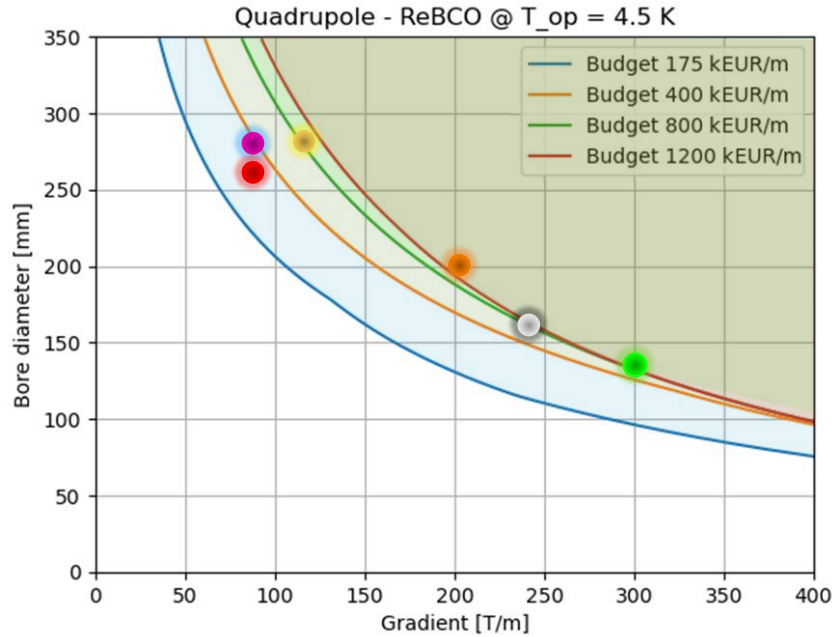- Cryogenic, protection and shielding costs are not taken into account.

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Dependence on cable type

Summary of assumptions:

- Single sector coil dipole
- Maximum stress: 400 MPa
- Fujikura Tape for the J_c fit
- <mark>Stacked tape cable</mark>
- **Non-insulated or Metal-insulated cable**
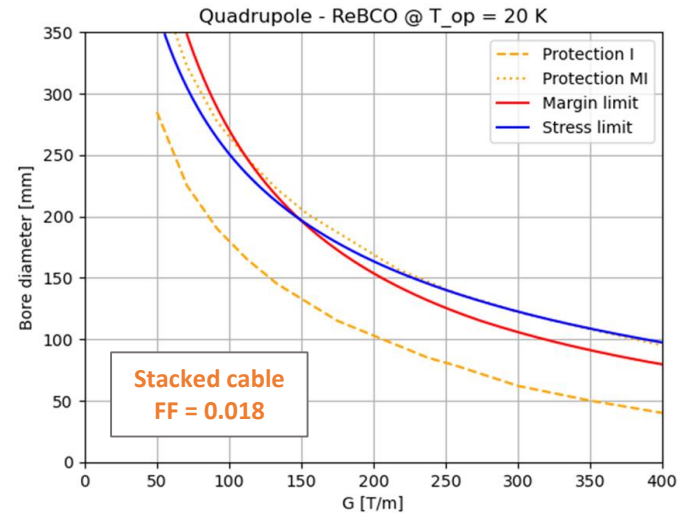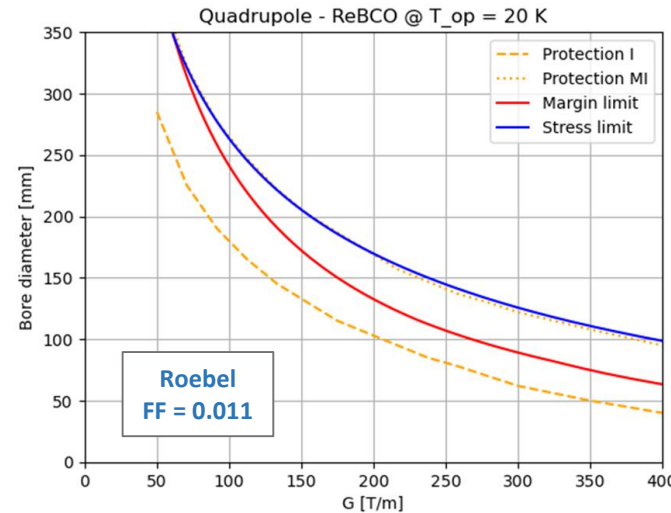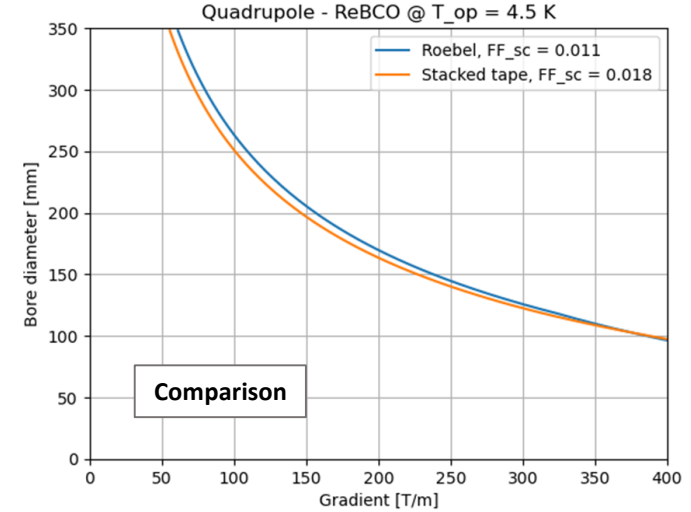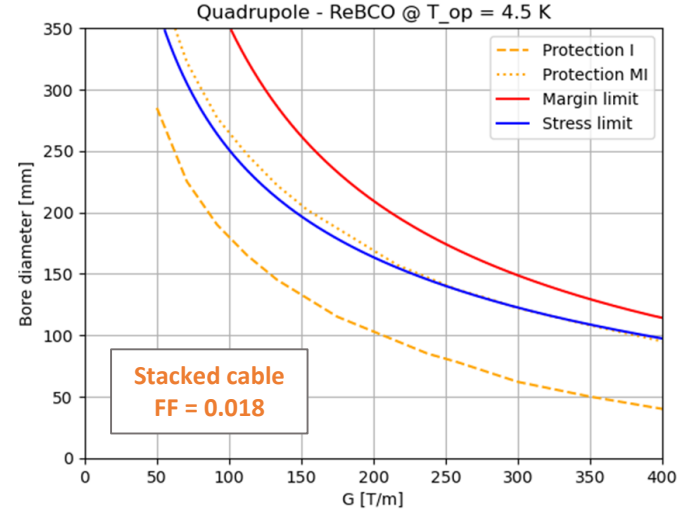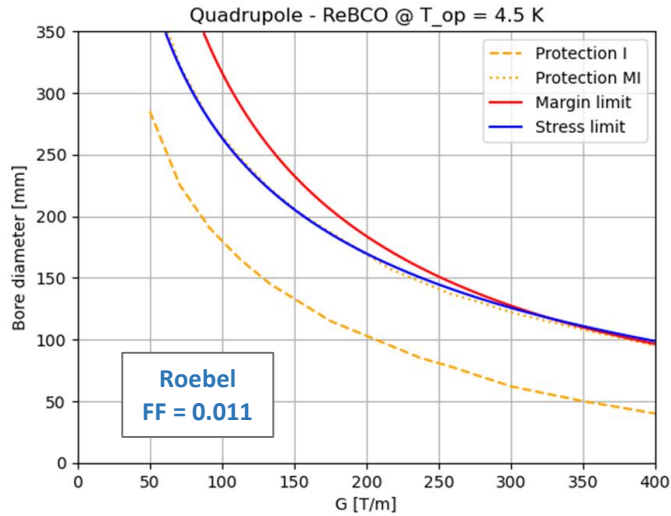- Maximum coil width: 80 mm

Conclusions
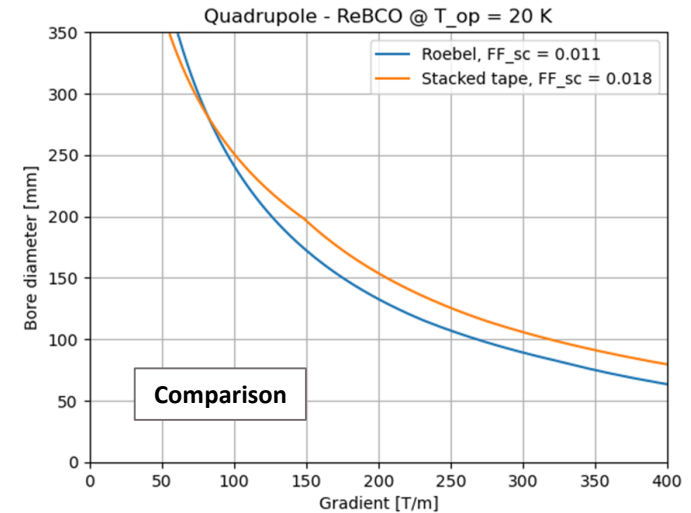
- Does it make sense to proceed with an evaluation on the block coil?
How could we possibly add uncertainty bands on the plots?

- Protection curves depend only on a1, w and material properties (ff), right?
(If not, we need the metal/not-insulated curves for the different cases.)

- We are assuming non-insulated magnets as the baseline.
Do we continue along this line, or do we bring back insulated LTS and HTS?

- For the A-B plot I'm still using roebel cable.
Do we align with the assumptions of Luca and Francesco?
(If yes, I need new protection curves).

THANK YOU
FOR YOUR ATTENTION

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