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Cable parameters for EuroCirCol dipoles

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Cable parameters

Critical current density @ 1.9 K, 16T (total)	2300 A/mm^2	
Degradation due to cabling	3%	
Minimum Cu/nonCu	0.8	also check 0.9-1.0
Maximum strand diameter	1.2 mm	also check 1.1 mm
Maximum (any) stress on conductor	200 MPa	
Maximum number of strands in a cable	40	check up to 60

Critical surface

$$B_{c2}(T) = B_{c20} \cdot (1 - t^{1.52})$$

$$J_C = \frac{C(t)}{B_p} \cdot b^{0.5} \cdot (1 - b)^2$$

$$C(t) = C_0 \cdot (1 - t^{1.52})^{\alpha} \cdot (1 - t^2)^{\alpha}$$

Where $t = \frac{T}{T_{c0}}$; $b = \frac{B_p}{B_{c2}(t)}$: with B_p as peak field on the conductor.

T_{c0}, B_{c20}, α, C_0 are fitting parameters computed from the analysis of measurements on the conductor.

For a reasonable estimate of the critical current density of a round wire, magnet designers can assume the following parameters: T_{c0} = 16 K, B_{c20} =29.38 T, α = 0.96, C_0 = 1.03*267845 A/mm^2 T. We assume that cable degradation is 3%. Self-field is included. With these assumptions, the critical current density at 1.9 K, 16 T is 2300 A/mm^2.

We assume that the cable can be produced either in rectangular shape or with a keystone angle. The keystone angle have to be sufficiently small to prevent a compaction c of the cable thin-edge larger than 0.14 (c =1-h/2d; where h is the cable thin edge thickness and d the wire diameter). As a reference, the keystone angle should not exceed 0.5°.

Thank you for your attention