QDO

Siamese Twins

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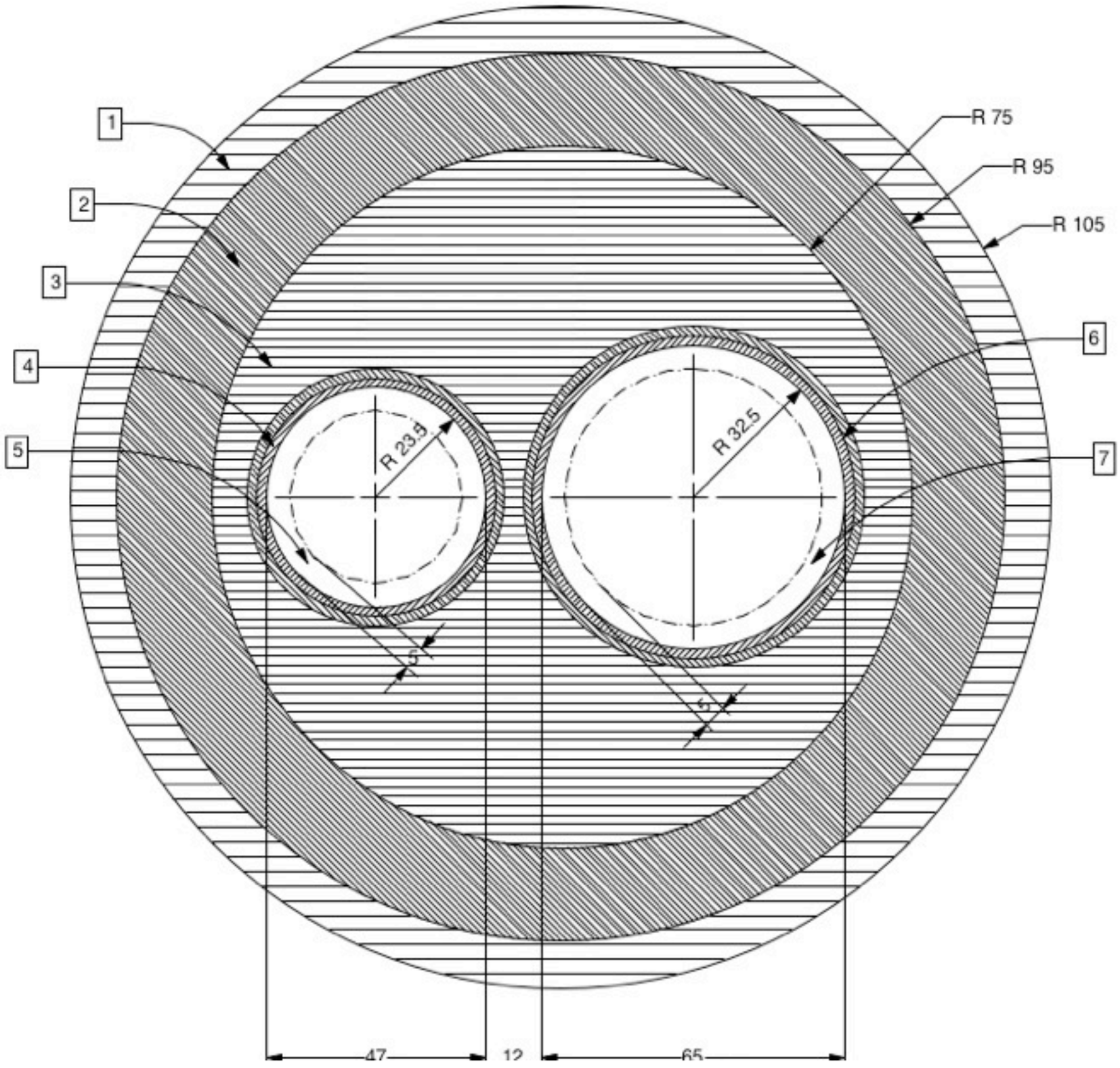
QD0: cold mass sketch

Notes
1. External collar
2. External quadrupole windings
3. Internal collar
4. HER Quadrupole windings
5. Cold to warm transition
6. LER Quadrupole windings
7. Cold to warm transition



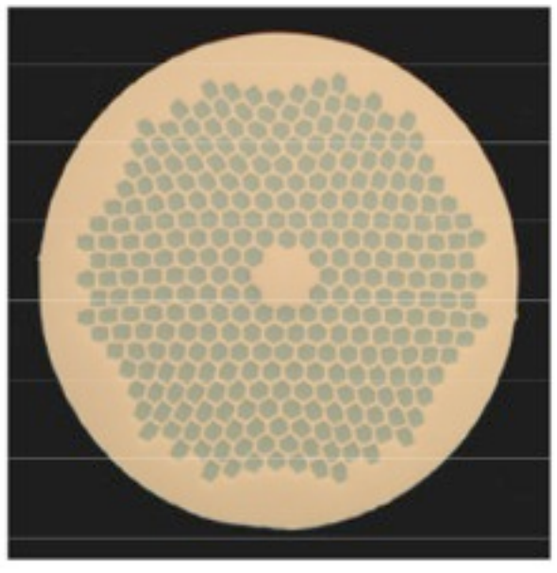
The quest of the SC wire

The problem *was:*

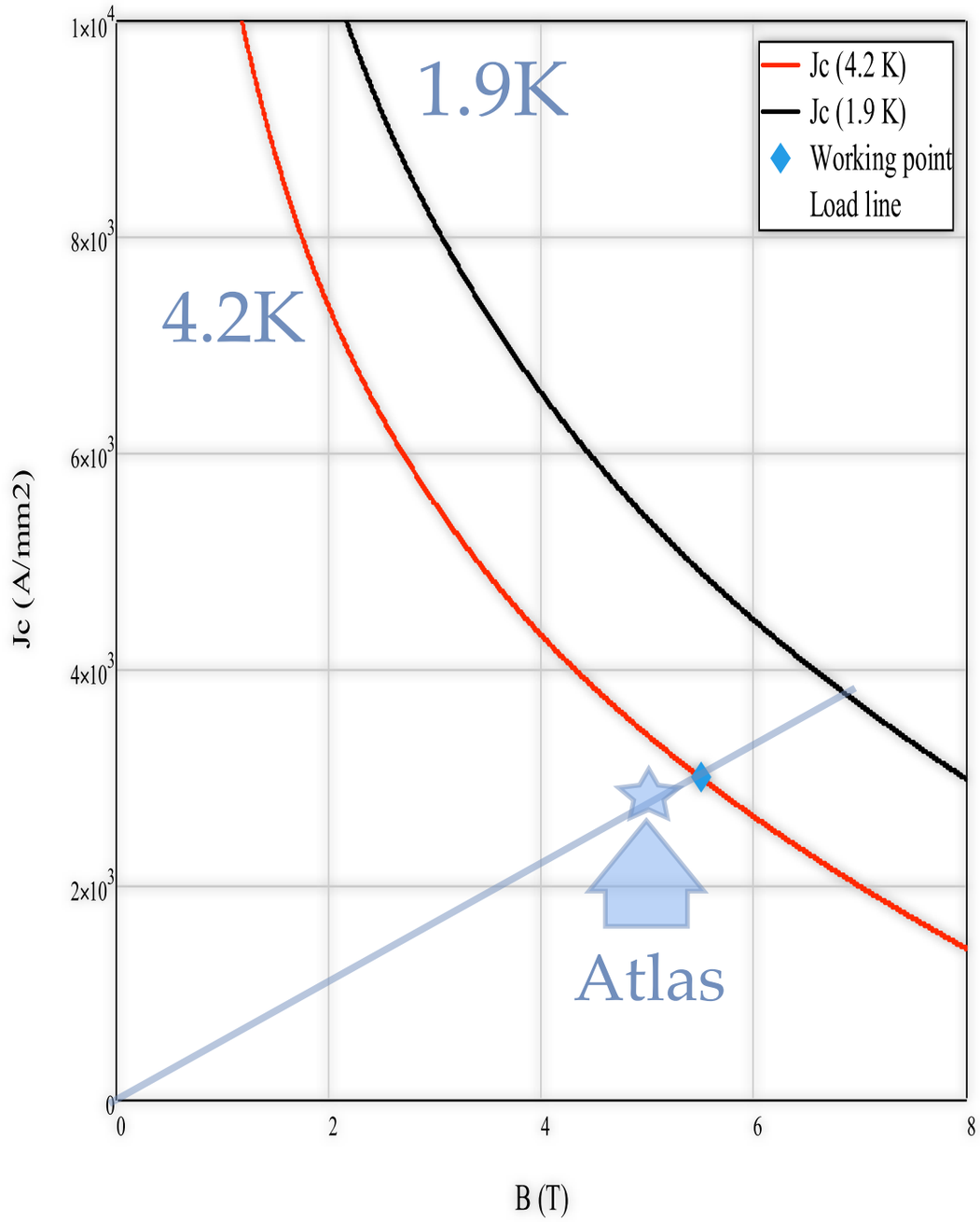
Find a commercially available SC wire phi< 1.3 mm able to carry ~2000 A @ B~5.5 T , T=1.9 K

This was the best candidate (google)

Special strands for high energy physics applications



ATLAS strand F306 Ø 1.30 mm
Cu : NbTi = 1.15
Ic = 1700 A @ 5 T; 4.2 K



Typical NbTi properties and Cu/SC ratio = 1 assumed.

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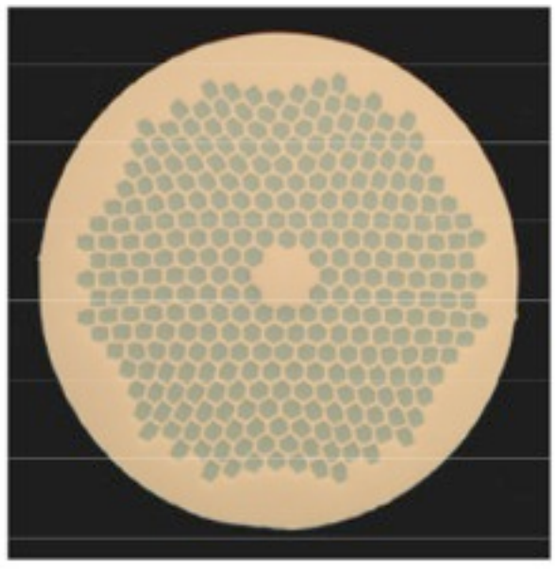

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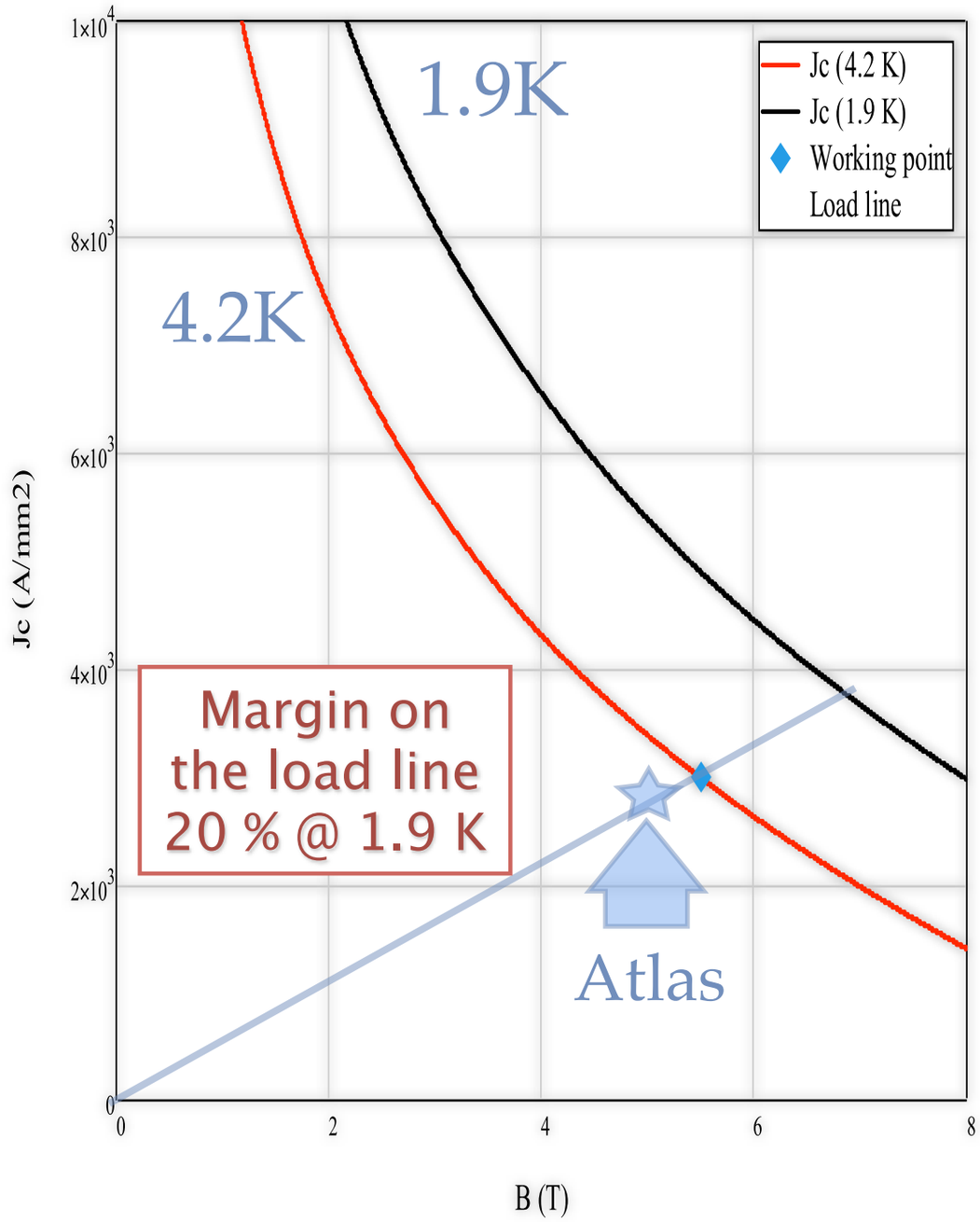


Typical NbTi properties and Cu/SC ratio = 1 assumed.

We have the wire!

- Last Wednesday afternoon, September the 15th Pasquale Fabbricatore told me that he got from Luvata several hundreds meters of the LHC dipoles NbTi SC wires (for free! We will have only to acknowledge Luvata in our future papers for their kind support.)

- Strand specifications:
  Cu/NbTi = 1.1, bare diameter 1.28mm
  Ic = 1960 A @ 4.2 K, 5T

Single quadrupole proto.

- Magnetic length: 50 cm
- Cold mass inner diameter: 50mm
- Windings thickness 6 mm
- Design gradient 0.50 T/cm

Prototype goals.

- Measure the achievable mechanical tolerances
- Develop a winding procedure
- Determine the maximum tolerable current in the wire
- Develop a quench detection and protection system
- Measure the field quality

Latest QD0 design optimization.

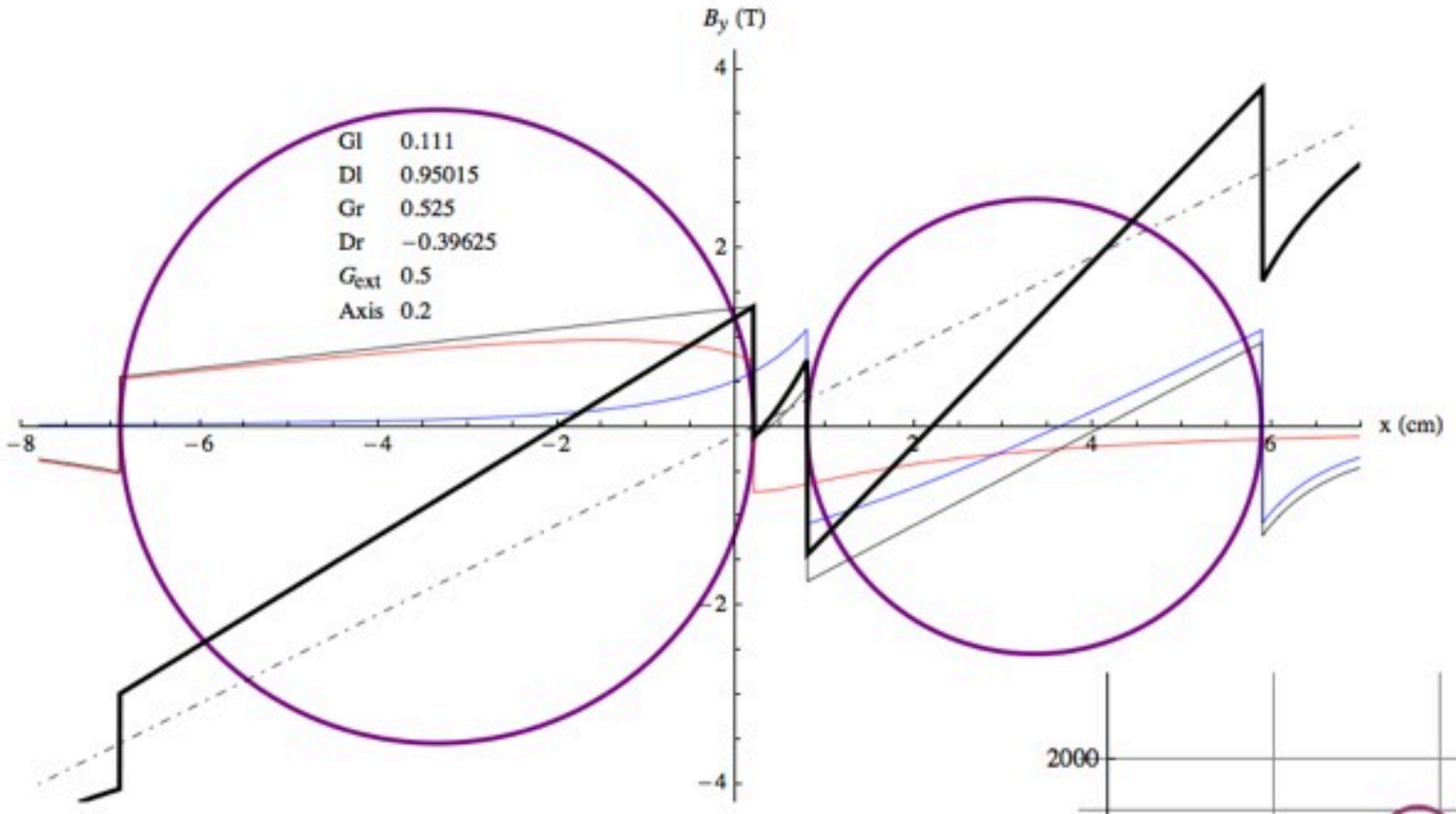
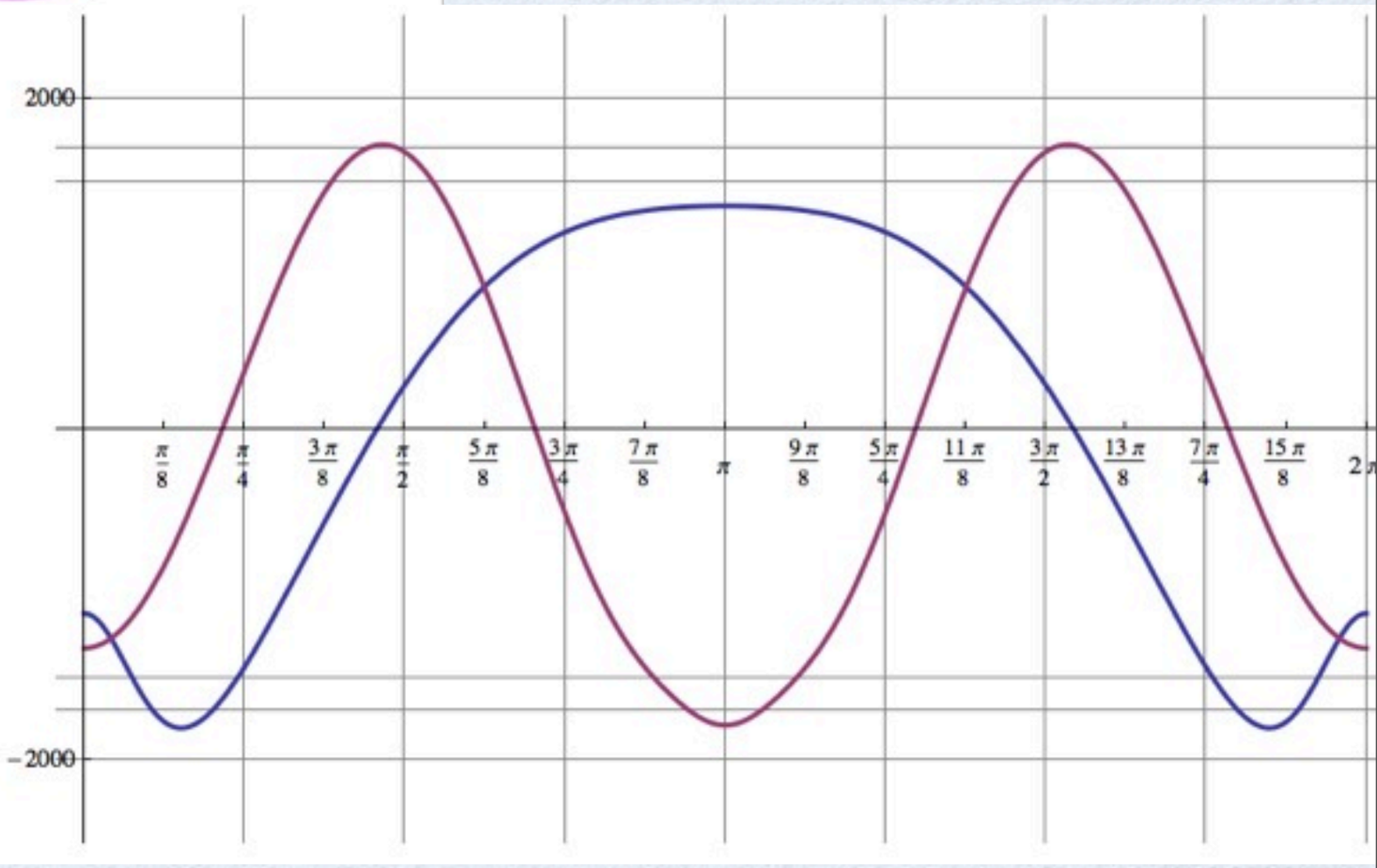


Table 2: Dimensions and field strengths of QD0, QF1.

	QD0		QF1	
	HER	LER	HER	LER
Cold mass inside R (mm)	22.5	32.5	50	
Cold mass outside R (mm)	28.5	38.5	60	
Length (m)	0.4		0.3	
Dist. from face to IP (m)	0.6		1.8	
Gradient (T/cm)	-1.025	-0.611	0.640	0.358
Field at inside R (T)	2.31	1.99	3.20	1.79



Thanks