



Cable Parameters of the EIC IR Cable Magnets

Ramesh Gupta March 21, 2022



Overview and Guidelines

- Initial cable parameters chosen for all cable magnets. Current choice is LHC ~15 mm wide cable.
- Two keystone angles considered one for dipoles (larger coil radius), and another for quadrupoles (smaller coil radius). Examine if a single choice can serve both.
- Initial cross-section of all five cable magnets visualized. These are not optimized cross-section. They are only meant to check if the cable choice is correct and if the same cable can be used for dipoles and quadrupoles.
- 2 K option provides choice of single layer or double layer coils for some quadrupoles. Dipoles are single layer as they have penalty of margin.
- These cable choices are fixed based on the previous work to help move the other aspects of the design (mechanical engineering, CAD models, etc.).
- They will be changed only if there is a good reason to do that as changing them impact the related work performed in parallel.



LHC Style Cable used in Quad & Dipole (based on full keystone for Q2pF and B1ApF)

	🕞 Cable Geom	etry									
	No Name	height	width_i	width_o	ns	transp.	degrd Comment				
	1 EICLHO	B 15.1	1.816	1,984	28	115	5 LHC IN KEYSTOE FOR EIC DIPOLE				
	1 EICLHO	Q 15.1	1.79	2.01	28	115	5 LHC IN KEYSTONE FOR EICIR QUAD	Keystone	one angle for cable width << coil readius		
	1 EICLHO	01 15,1	1,786	2,014	28	115	5 LHC CABLE KEYSTOR FOR EIC 4.2K	Reyscone			
	2 EIC364	2 19,4	1,773	2,027	36	115	3 EIC 36 STRAND @4.2K			QZPF	втарь
	3 EIC361	8 19.4	1,773	2,027	36	115	3 EIC 36 STRAND @1.8K	Cable heig	nt 🛛	15.1	15.1
	4 EIC364	2A 19.4	1,788	2,012	36	115	3 EIC 36 STRAND 04.2K 2 Layers	Cable mid-	thickness	1.9	1.9
	5 CABLEC	1 15.1	1,736	2,064	28	115	5 MB INNER LAYER,STR01	Insul (one		0.12	0 12
	6 CABLEC	2 15.1	1,362	1,598	36	100	5 MB OUTER LAYER,STR01			0.12	0.12
	7 SINGLE	0,94	0,94	0,94	1	0	O SINGLE STRAND	Coll I.r.		140	185
	8 GSI1CA	B 9.74	1.061	1,271	30	74	0 GSI001 (RHIC) CABLE				
	9 GSI001	9,73	1.111	1,321	30	74	0 GSI001 following Wanderer				
	10 20MMCF	BLE 20	1.736	2,172	37	0	0 20mm cable	Avg Pad		147 55	102 55
	11 20MMCE	NOK 20	13.8	13.8	280	0	0 7x20mm cable, no keystone	Avg Kau		147.55	192.55
	12 20MMCF	B2 20	1.8	2	37	0	0 20 mm cable 2	dt		0.2190	0.1678
	T Cable Definition									1.790	1.816
								width o		2.010	1.984
	No Name	Cable Geom.	Strand Fil	ament Insul	Trans	Quench Mat.	T_o Comment				
	1 EICLHO	B2K EICLHCB	STREIC1 NBT	II ALLPOLY	IL TRANS1	NONE	2 LHC INNER FOR EIC IR QUA	AD @2k	lote: Kev	stone	s are
	2 EICLHO	Q2K EICLHCQ	STREIC1 NBT	II ALLPOLY	IL TRANS1	NONE	2 LHC INNER FOR EIC IR DIF	POLE			
	3 LHCIN4	2K EICLHC01	STREIC1 NBT	II ALLPOLY	IL TRANS1	NONE	4.2 LHC INNER FOR EIC @4.2K	reduce		ed tor EIC	
LHC 🖂	VELLON	IN CABLE01	STRO1 NBT	II ALLPOLY	IL TRANS1	NONE	1,9 V6-1 DESIGN DIPOLE INNER	2			
	5 YELLON	OU CABLEO2	STR02 NBT	IO ALLPOLY	DL TRANS1	NONE	1.9 V6-1 DESIGN DIPOLE OUTER	2			

Cales considered for EIC: "EICLHCB2K" and "EICLHCQ2K" (EICLHCB and EICLHCQ) Similar to LHC inner: "YELLONIN" (CABLE01)



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Q1ApF with LHC Style/Width Cable (inner layer)

Double Layer with Quadrupole Cable (fully keystone for Q2ApF)



Keystone looks OK



Implement the current yoke geometry Adjust Bo for effective length



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Reduce gap between 2 layers March 22, 2022 ⁴

Q1ApF with LHC Style Cable

Q1ApF is the smallest aperture EIC IR cable magnet B1ApF is the largest aperture EIC IR cable magnet

Keystone still looks OK



This implies that we may be able to do with one type of cable

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Cable Parameters of the EIC IR Cable Magnets

Q2pF with LHC Style Fully Keystoned Cable for Quad



Q2pF with LHC Style Keystoned for B1ApF Dipole

Double Layer with Dipole Cable



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National Laboratory

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Extra Slides

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