

# FEL Iron Quadrupole Operational Ranges

The following is a summary for the current ranges of the FEL quadrupoles. This analysis is based on the quadrupole k-values supplied by D. Douglas on April 2, 1997. The k-values are converted to the required current based on a typical field map of the given style. The range of required currents was determined for energies of 35, 42, and 79 MeV.

To lower the dynamic range (and thus improve reproducibility) the QB and QG styles are each split into two groupings of "*nominal field*" and "*weaker field*" magnets. The ranges of these are summarized below.

Operational Current Ranges (amps)						
Sub Grouping	QB magnets			QG Magnets		
	35 - 42 Mev		79 Mev	35 - 42 Mev		79 Mev
	min	max	max	min	max	max
<b>weaker</b>	0.15	0.54	1.01	0.17	0.37	0.69
<b>nominal</b>	0.83	1.89	3.55	0.64	2.12	3.99

Based on these numbers, spanning the energy range of 35 to 79 MeV is achievable. The following table contains the proposed current ranges for magnet measurements.

Magnet	Quantity	Current Range (amps)	Current Increment (amps)
QB - weak	2	± 1.0	0.1
QB - nominal	8	± 5.0	0.5
QG - weak	2	± 1.0	0.1
QG - nominal	17	± 5.0	0.5

The defined "*weak*" magnets are given in the following table. The magnets listed as "*weak/nominal*" have low k's but may vary depending on the given tune. D. Douglas has requested that these stay as "nominal" magnets and any errors encountered at low fields will be tolerated.

Weak	Weak/Nominal
MQB5F05	MQB2F04
MQB5F06	MQG1F05
MQG4F01	MQG2F07
MQG4F13	

Attached are the tables and plots used in the above summaries.