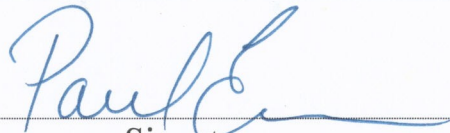

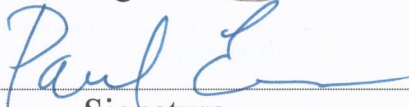
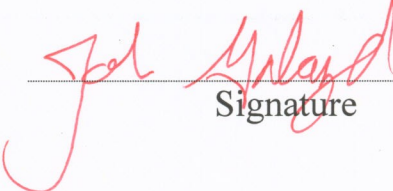


<b>LCLS Physics</b>		
<b>Requirements Document #</b>	<b>1.3-008</b>	<b>Linac</b>
		<b>Revision 0</b>
<b><u>Electron Dump-Line Requirements</u></b>		
Paul Emma (Author)	 Signature	5/6/04 Date
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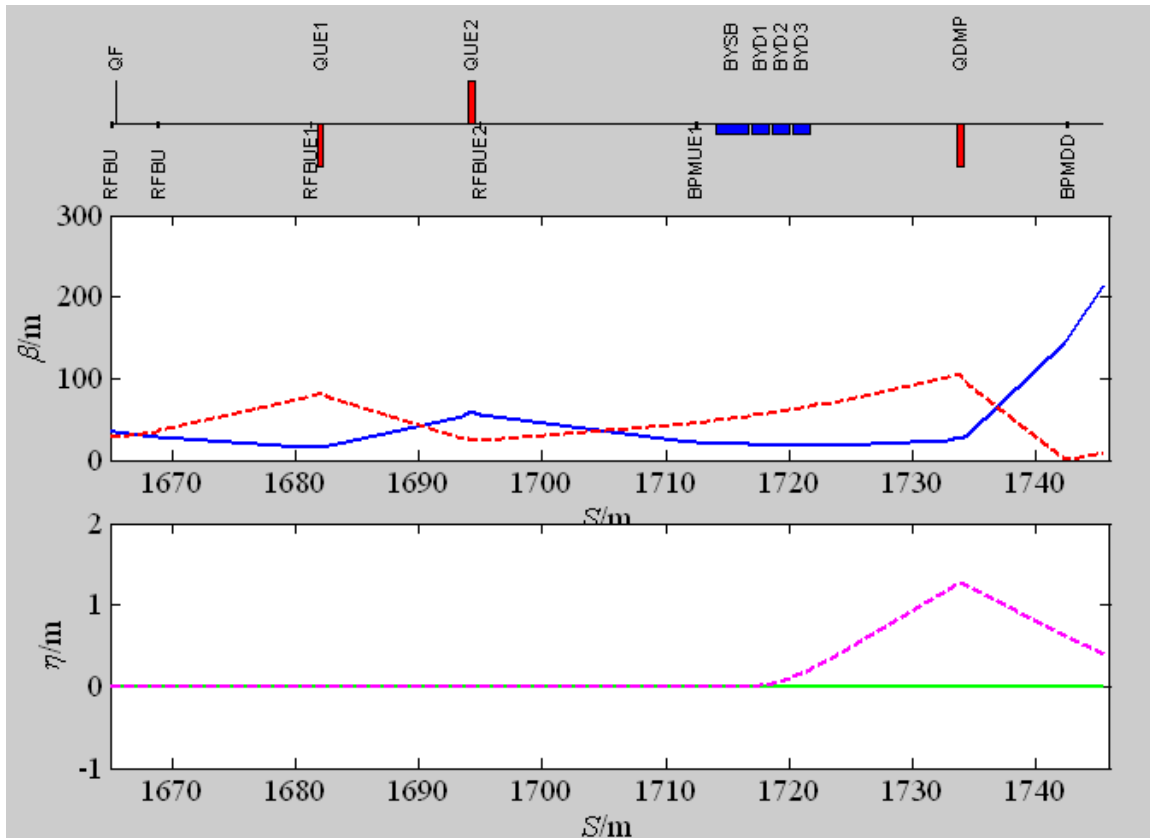
**Brief Summary:** This specification summarizes physics requirements for the electron dump beamline.

**Keywords:** Linac, Transport

**Key WBS#'s:** 1.3

## Electron Dump-Line Requirements

The electron dump-line is composed of three vertical dipole magnets and three quadrupole magnets, as shown in Figure 1 below. The purpose of this beamline is to discard the 14-GeV, 1-nC electron bunch, at a repetition rate of 120 Hz (1.7 kW of average power), separating the electron beam from the x-ray FEL radiation prior to the experimental hutches.



**Figure 1:** Electron dump-line schematic layout with optical functions and device names. The plot starts at the last FEL undulator quadrupole (“QF”) with the blue rectangles as the vertical bend magnets.

The dump-line must include:

- Vertical bending to separate the electron and photon beams
- Safety systems to protect users from the electron beam (see Safety-Dump Requirements Document)
- BPMs downstream of the undulator to support beam-based alignment in the undulator
- OTR screen monitor to measure the beam energy spread after the FEL
- Beam dump with average power rating 5 kW to allow for long term flexibility

Table 1 lists some of the main parameters of the dumpline.

**Table 1:** Dump-line parameters (1 nC, 120 Hz).

<b>Parameter Description</b>	<b>Symbol</b>	<b>Value</b>	<b>Unit</b>
Electron energy range	$E$	4.5 to 14	GeV
Active length of system	$L$	77	m
Relative energy spread of $e^-$ bunch (rms)	$\sigma_E/E$	<0.1	%
Bend angle of each of 3 vertical dipoles	$ \theta_y $	1.667	deg
Maximum beam power of 1-nC bunch at 120 Hz	$P_b$	1.7	kW
Dump power rating	$P_d$	5	kW