

# Second-Order (Alignment+. . .) Effects in NLC Main Linac

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1. What we did, what errors we examined
2. Results – bewildering series of plots
3. Conclusions/Discussion

## 1. What we did

To simulate the effect of errors on a misaligned, steered lattice, we:

- Performed “French Curve” alignment with perfect beamline, standard parameters for **BPMs**, movers, etc.
- Applied an error, performed tracking, examined results
- Repeated above 100 times for statistics

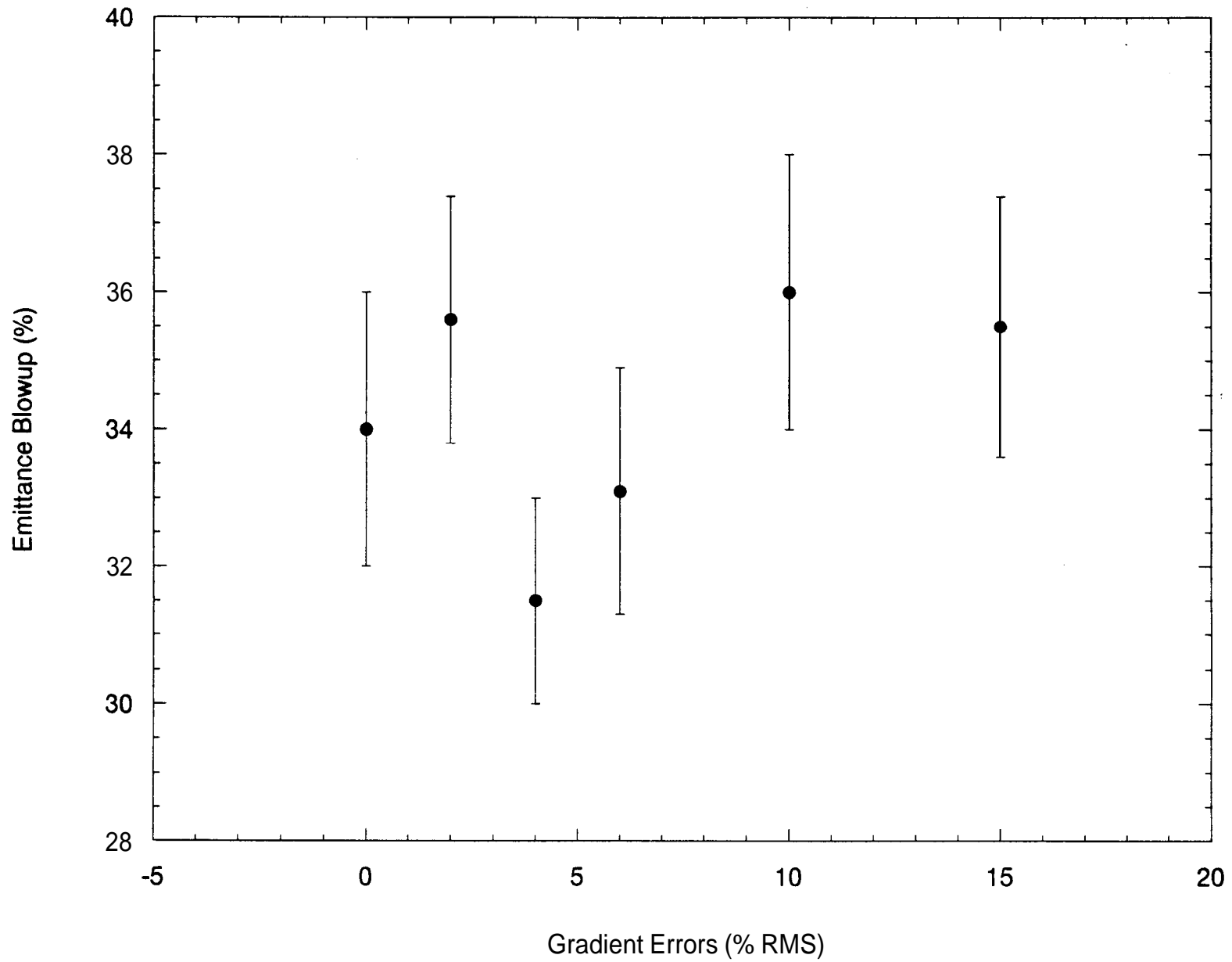
Errors considered:

Bunch length, charge, structure voltage (systematically low and randomly low/high), structure phase (systematic and random errors)

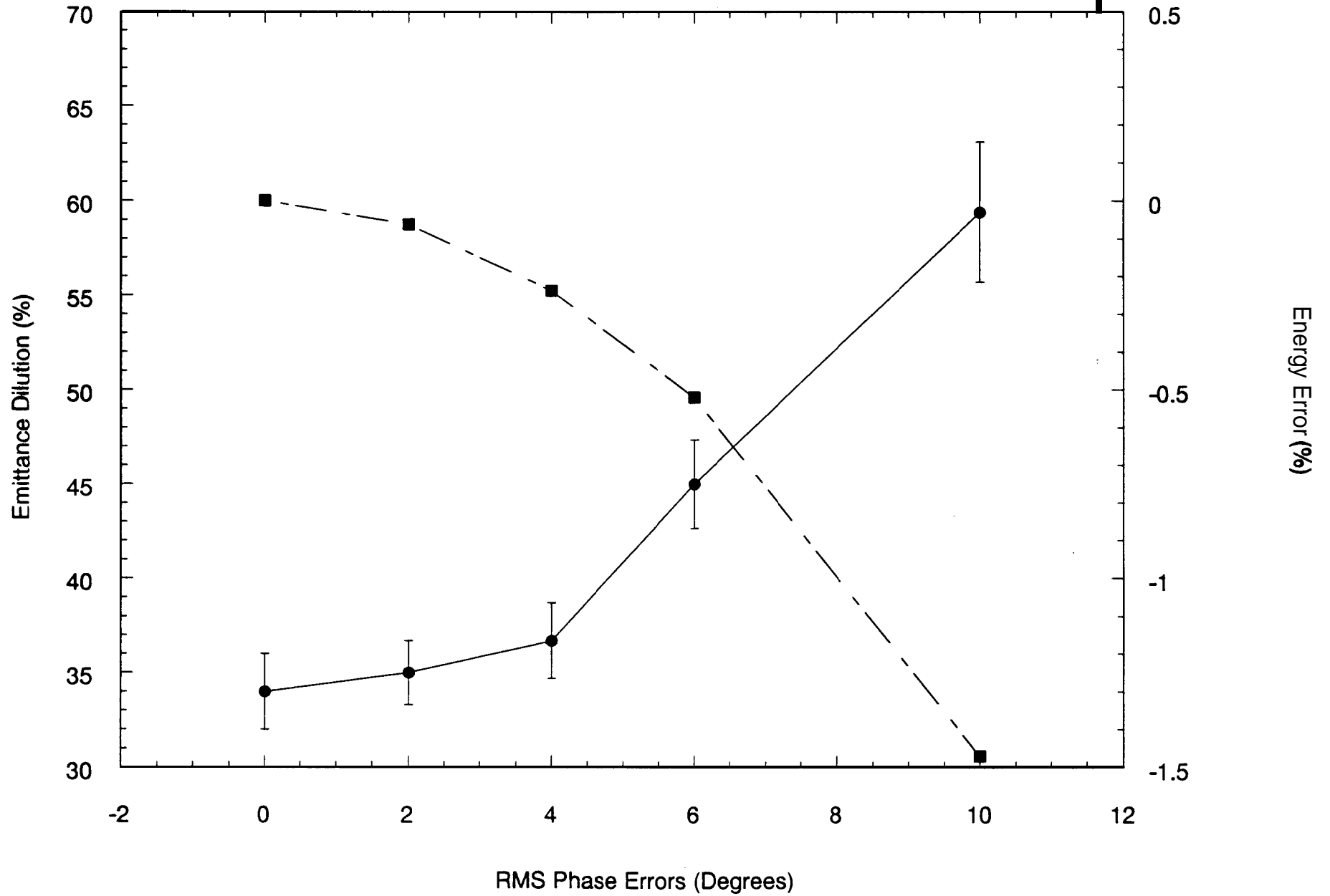
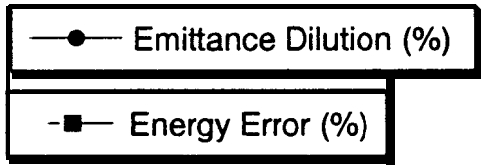
Note: Structure random errors were applied to each structure separately (ie, did *not* apply the same voltage/phase error to all structures on a girder or on a DLDS unit) – no provision for this in software yet

Note 2: Results are very fresh (computer is still warm from running jobs) – not much analysis has been done!

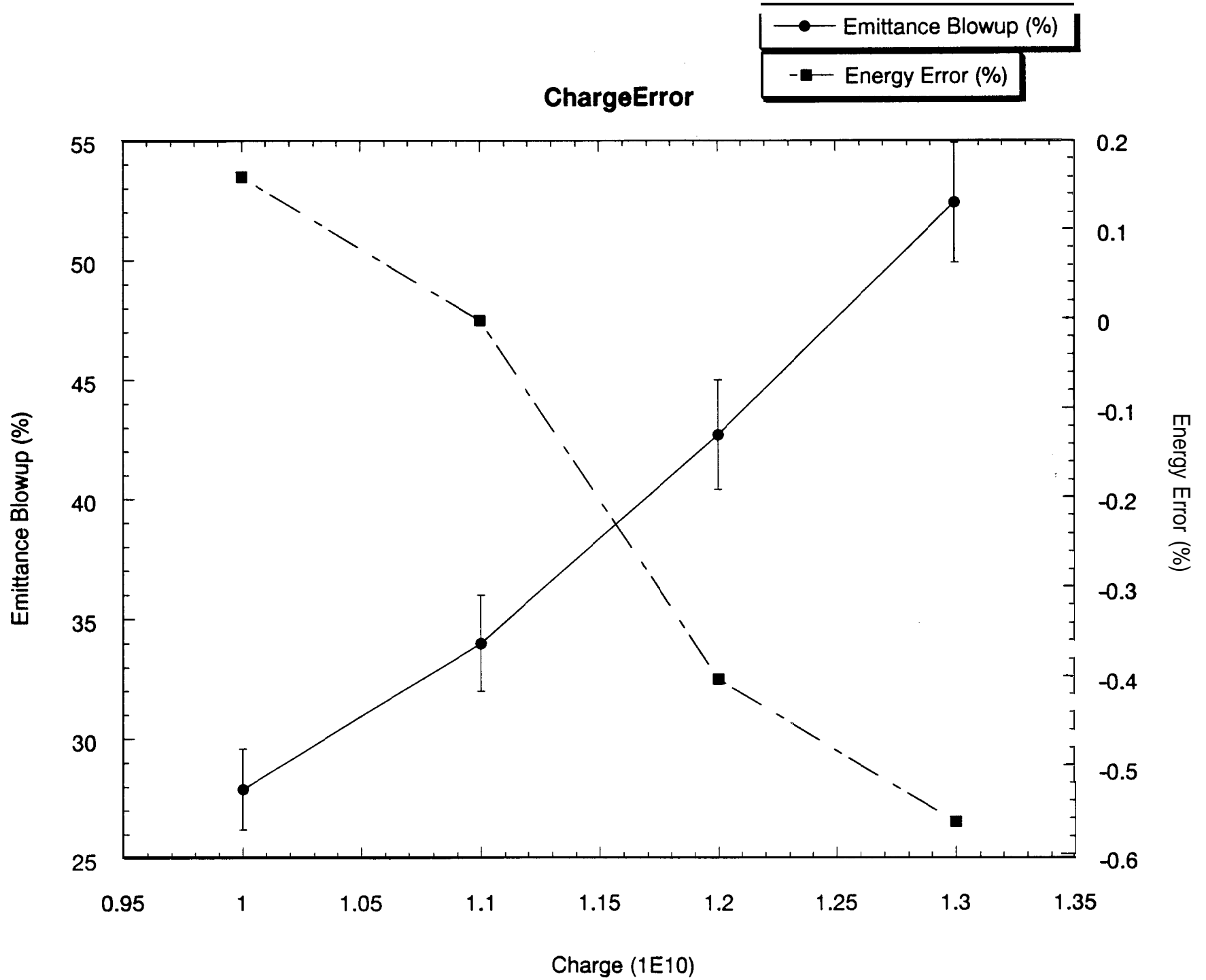
# Random Gradient Errors and Emittance



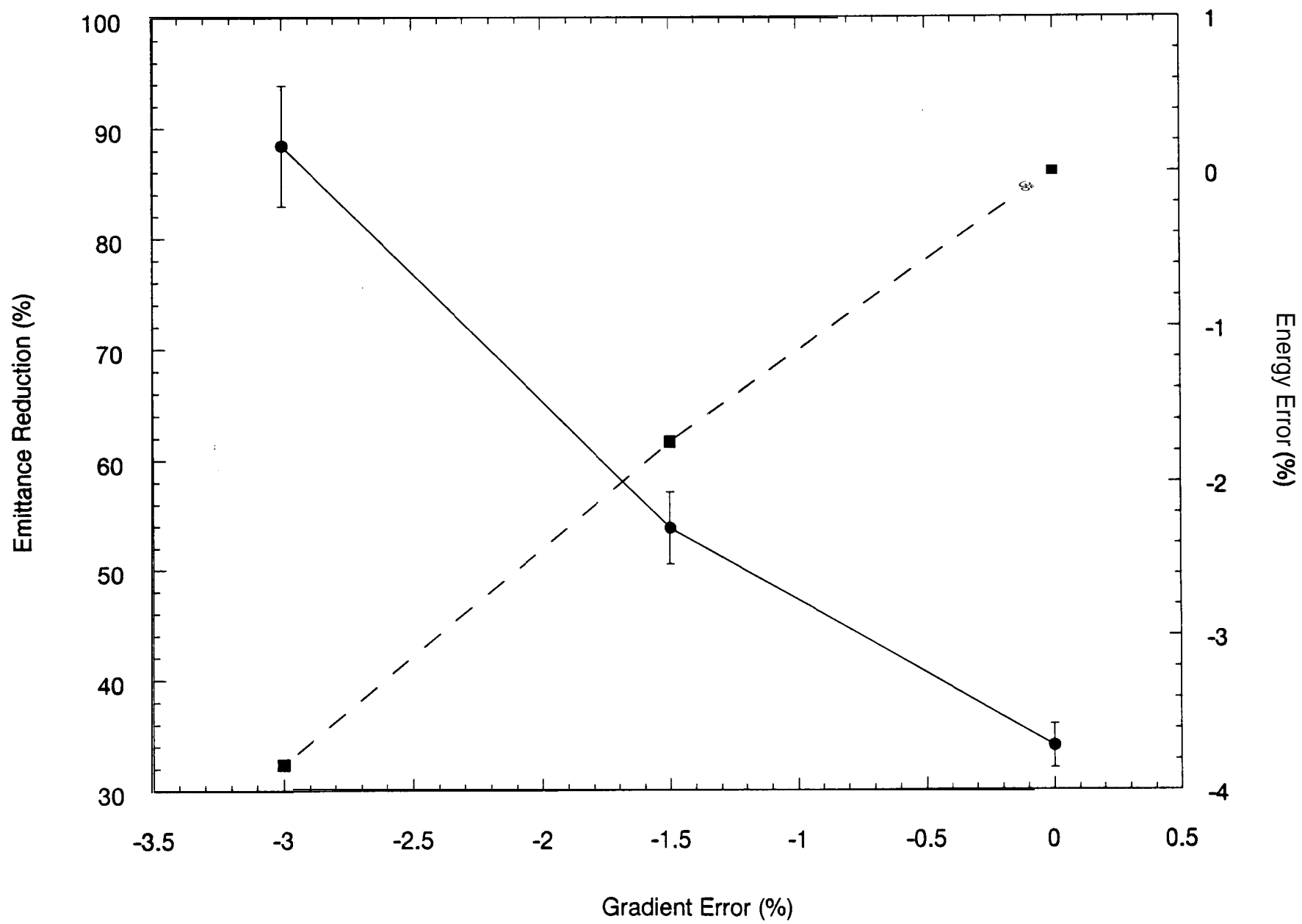
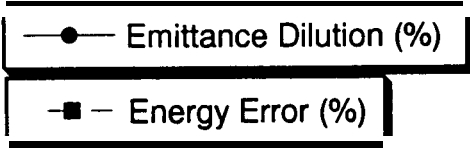
### Random Phase Errors



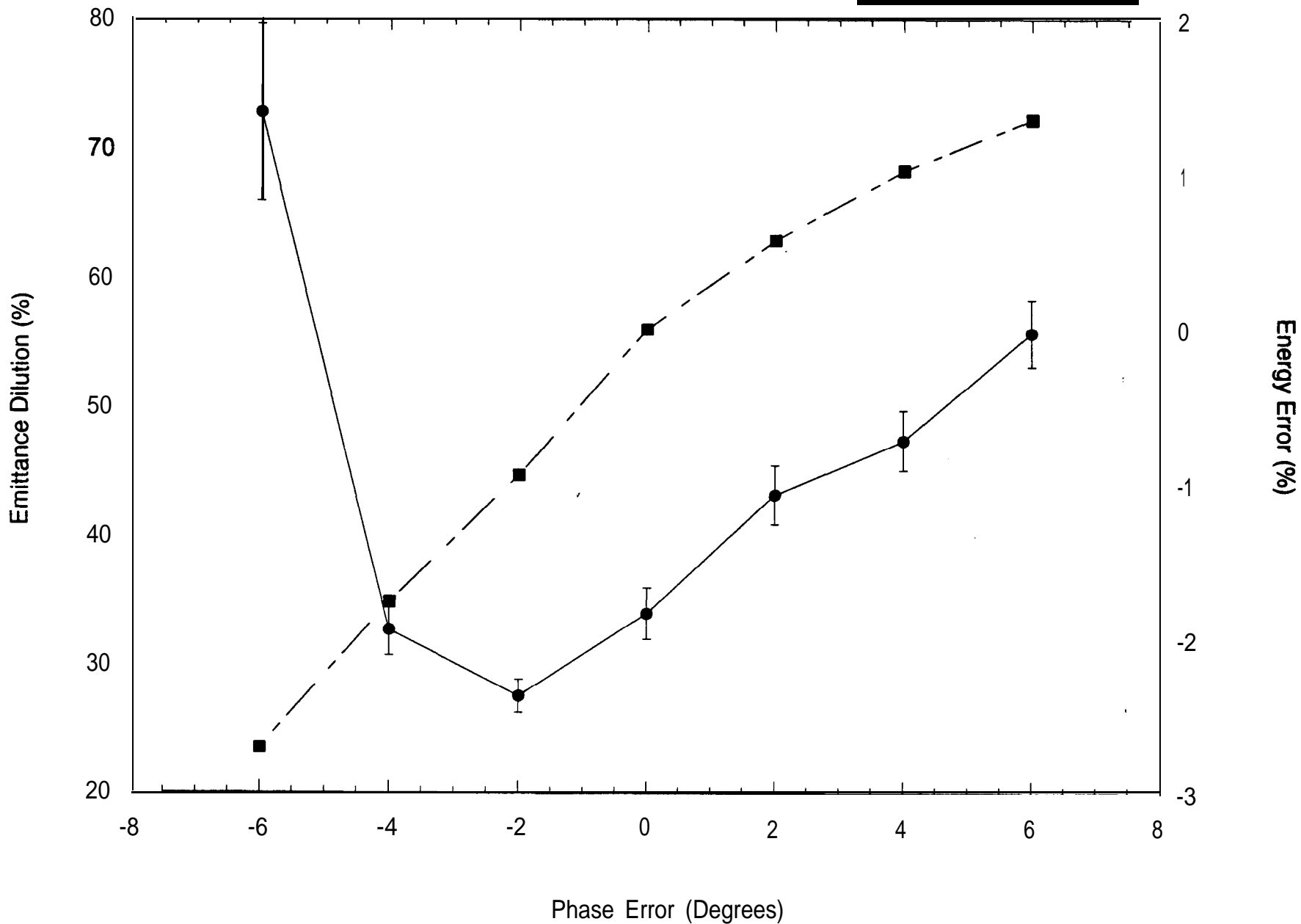
### ChargeError



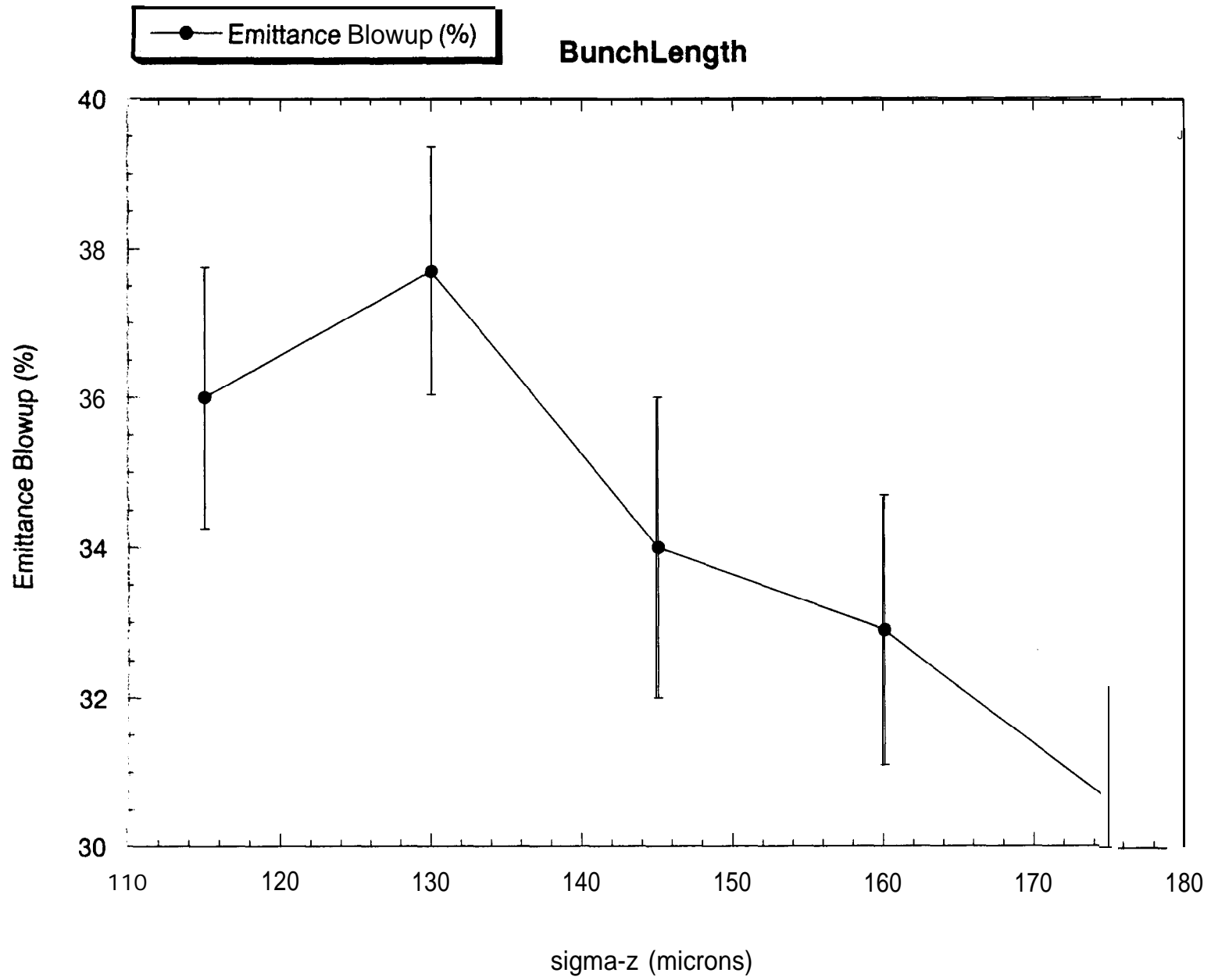
# SystGradient



### Systematic Phase Error







## Conclusions/Discussion:

Many errors (lower charge, for example) improved beam emittance; probably because energy spread reduced (so BNS less effective – need to consider alignment, error, and beam jitter!)

Bunch length and random errors in gradient appear benign

Higher charge, systematic lower gradients, and phase errors produce dilution, but tolerance probably set by energy or energy spread at end of linac, not emittance