

**Design and Performance of a Permanent Magnetic  
Quadrupole for a Low Energy Linear Accelerator**

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5600 MB Eindhoven, The Netherlands - Permanent  
magnets which, at present, show the highest magnetic  
flux density, have been used in constructing a  
permanent magnetic quadrupole (PMQ). The PMQ is  
part of an electron irradiation facility for polymer  
research at the Eindhoven University of Technology.  
For polymer irradiation for which an even dose  
distribution is required, the PMQ is inserted and the  
electron beam will irradiate the target homogeneously.  
Design criteria of this quadrupole with an aperture  
radius of 50 mm will be discussed. The PMQ  
geometry has been optimised using CEDRAT finite  
element software. Mechanical alignment errors  
(0.15 mm) and variations in permanent magnetic  
properties (2%) have been assumed and their influence  
on the magnetic field has been simulated. Before  
insertion in the PMQ, the magnetic flux density of 16  
Neoflux (R) magnets  
(42 x 42 x 10 mm<sup>3</sup>) has been determined versus  
magnetic field and temperature. After construction the  
total focal strength of the quadrupole has been  
determined using the floating wire technique. The flux  
density has been measured using a Hall probe. Results  
show a magnetic field gradient which varies 0.5% for  
an inner radius of 25 mm. Alignment errors have been  
determined by comparing simulation and measurement.