Development of a FPGA based RF control system for the S-DALINAC*

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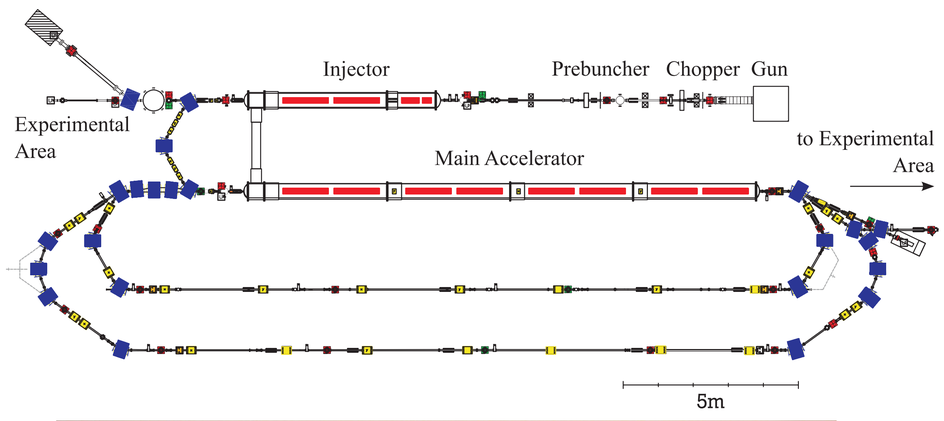
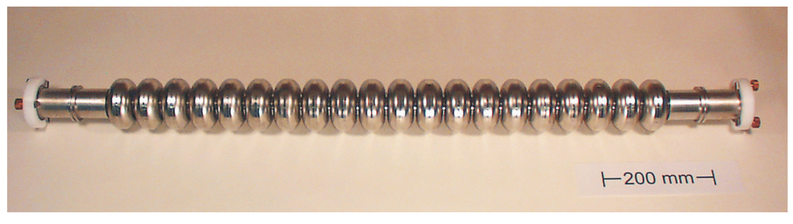
S-DALINAC



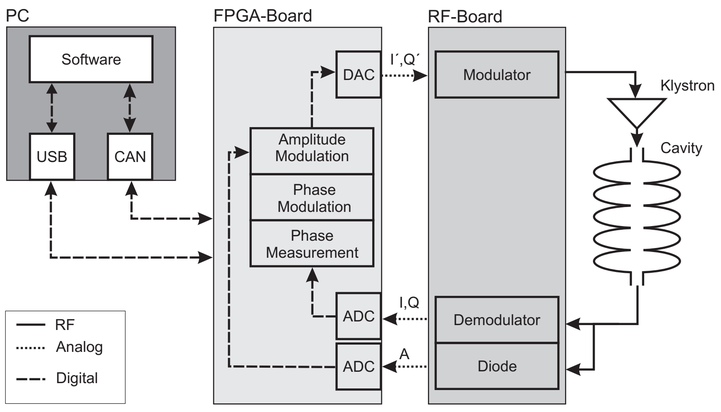


Maximum energy:	130 MeV		
Maximum beam current:	60 µA		
Operation mode:	c.w.		
Material:	Niobium (RRR=280)	Length:	1 m
Frequency:	2.9975 GHz	E_{acc}:	5 MV/m
Mode:	TM_{010},π	Q_0:	$3 \cdot 10^9$
Temperature:	2 K	Q_L:	$3 \cdot 10^7$

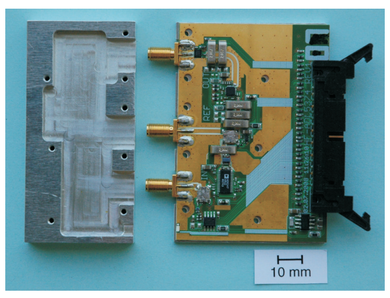
Outlook

- Development of a EPICS driver
- Online data analysis
- Algorithm changes for c.w. and p.m.

Setup

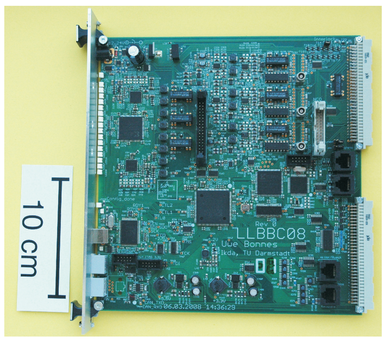


RF-BOARD



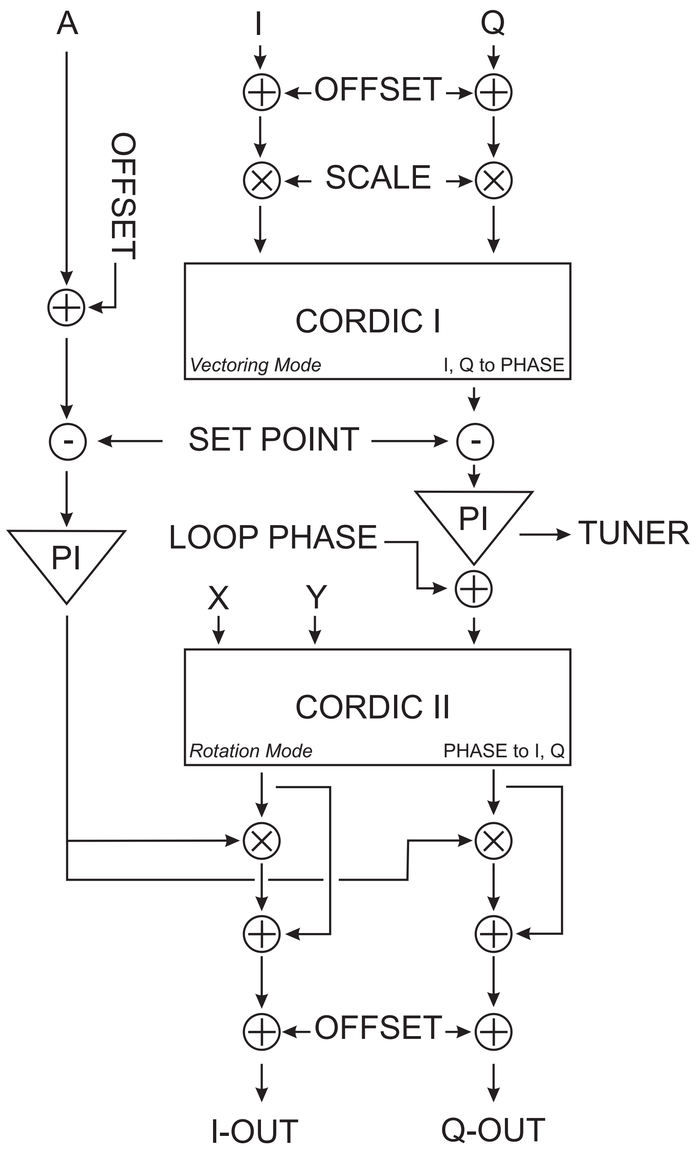
- Low noise
- Small temperature drifts
- Shielded modules
- Signal transmission RF-FPGA-board

FPGA-BOARD



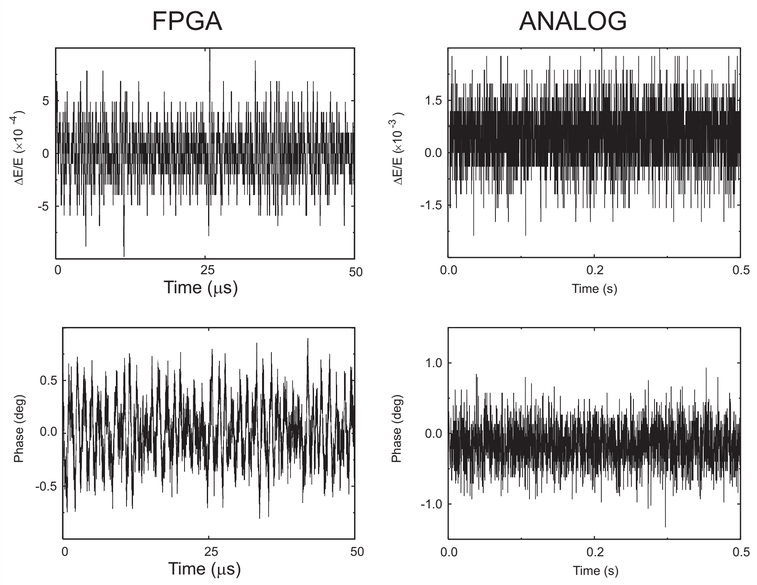
- FPGA based
- USB 2.0 interface
- Scalable system
- Many interfaces
- Base band

Algorithm



- Operation mode SEL / GDR
- Coordinate transformation
- Proportional integral controller

Measurements



	Specification	Analog	FPGA
Relative amplitude stability	$\frac{\Delta E}{E} = 10^{-4}$	$\pm 1 \cdot 10^{-3}$	$\pm 2.5 \cdot 10^{-4}$
Phase stability	$\Delta\varphi \leq 0.7°$	±0.4°	±0.3°

- Equivalent phase accuracy
- Better amplitude stability

Software

- Algorithm: VERILOG
- CAN bus: SOCKETCAN environment
- Microcontroller firmware: C
- User interface: C++ / Qt4
- Software oscilloscope: OSQOOP

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