



DAFNE LINAC

Description, installation and operational status

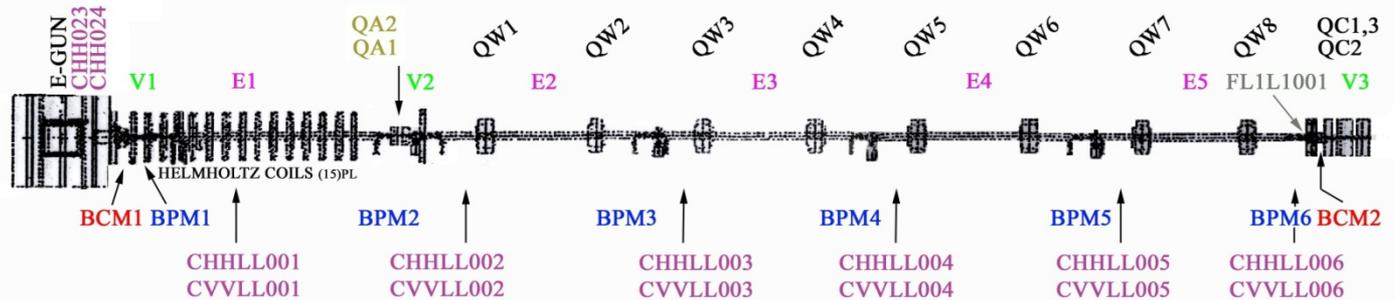
B. Buonomo for the DAFNE LINAC group



OUTLINE

LINAC Layout
Modulator
RF system
Klystron Operation
Pulse compression
Diagnostics and Timing
Electron GUN
Control and operations

LINAC high current beam line



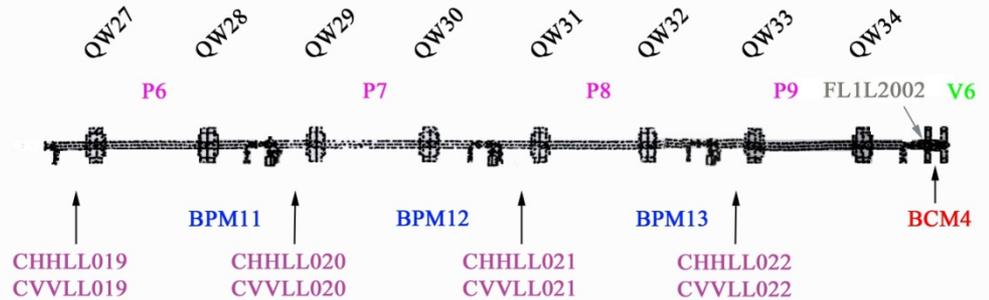
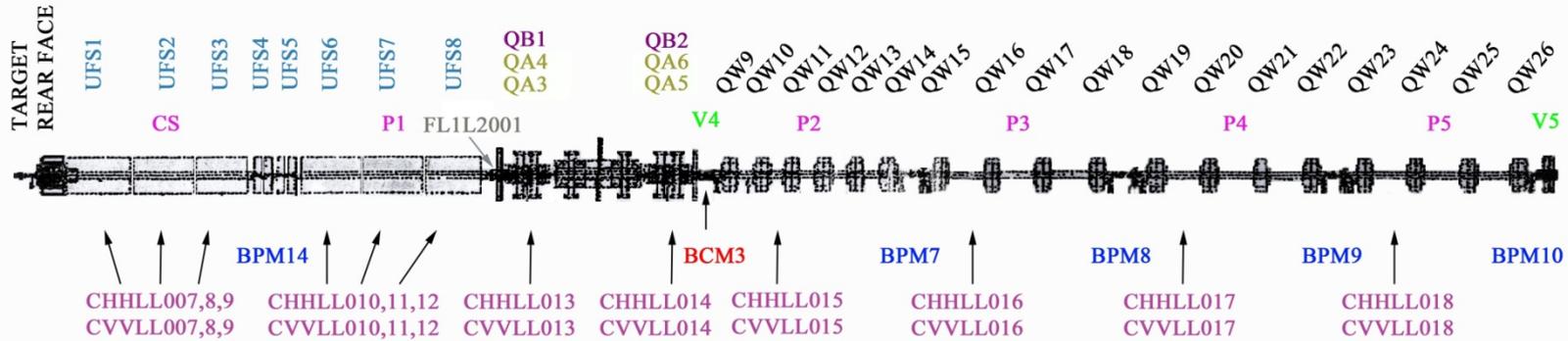
Bucking Coil **Focusing Coil**

The magnetic system starts with bucking coil at the exit of the gun to reduce the field at cathode to near zero

14 Helmholtz coils : uniform field around prebuncher, buncher and first acc. structure

Quadrupole triplet is used before the positron converter in order to focus the beam down to 1 mm

LINAC high energy beam line

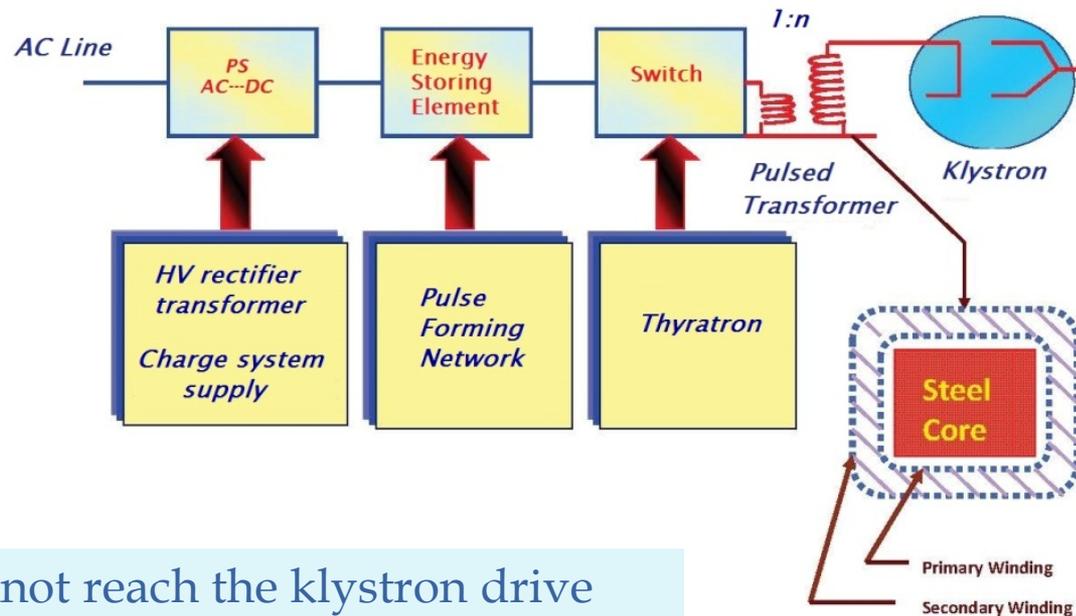


tungsten-rhenium (2 radiation lengths)
target is used for the pair production

flux concentrator jointly with DC
solenoid magnets generate the 5 T peak
magnetic field necessary for the positron capture.

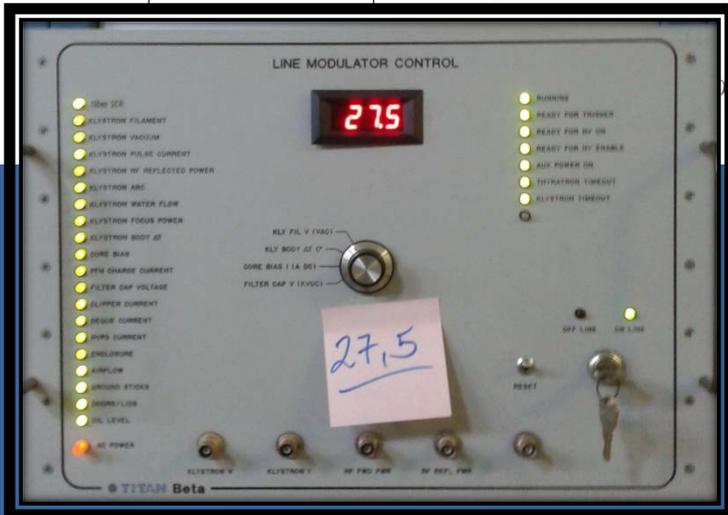
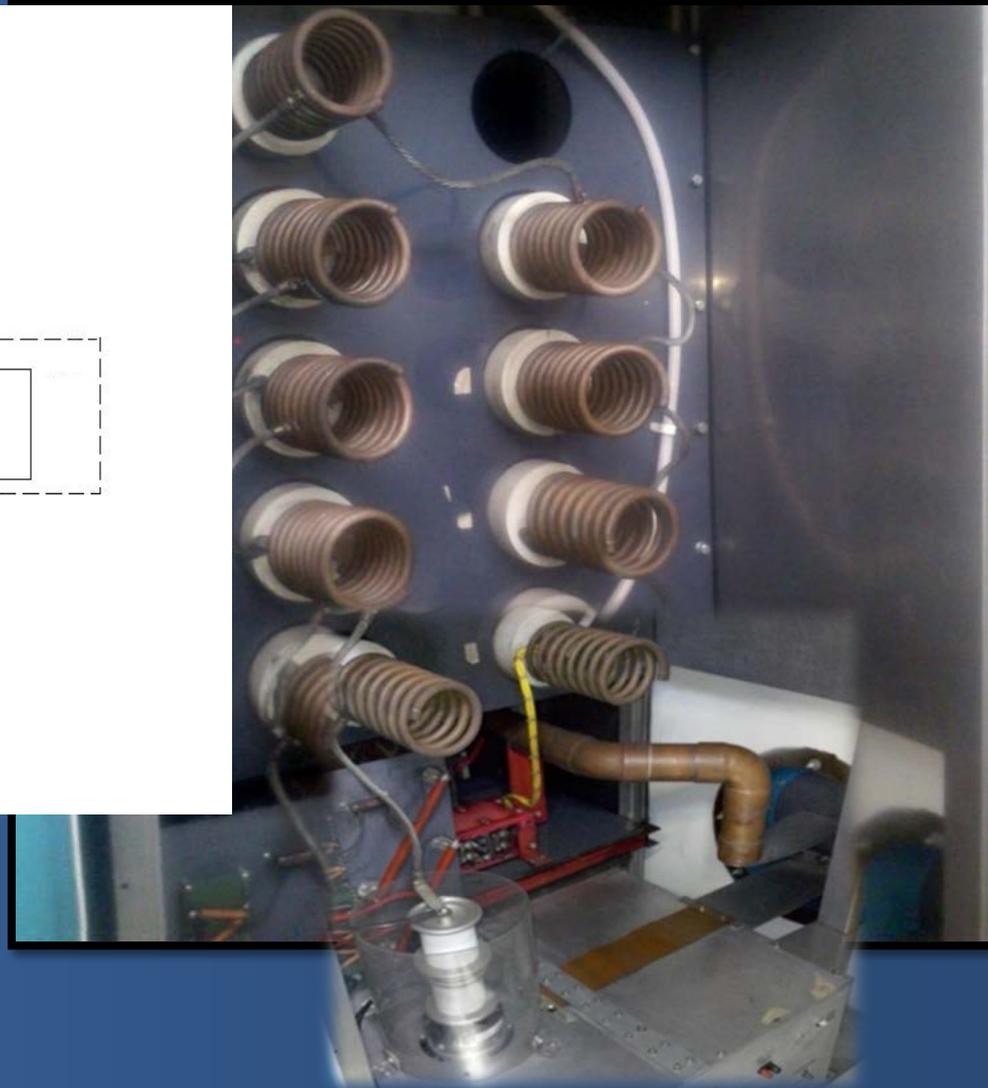
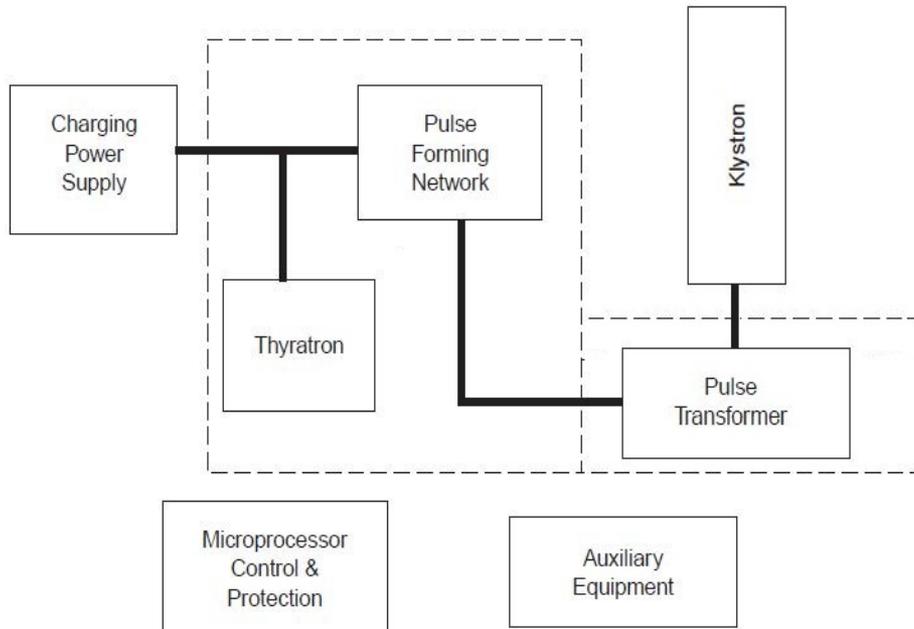
Line type Modulators layout

The modulator is the DC power supply which drives the klystron beam.

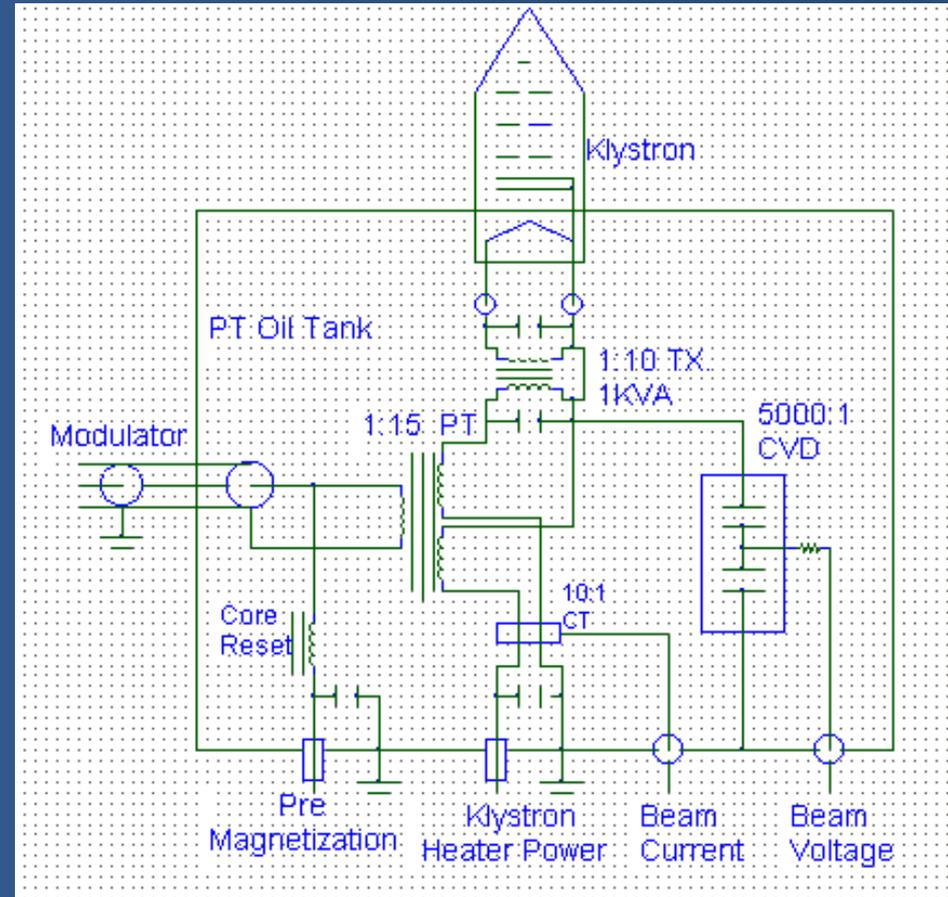
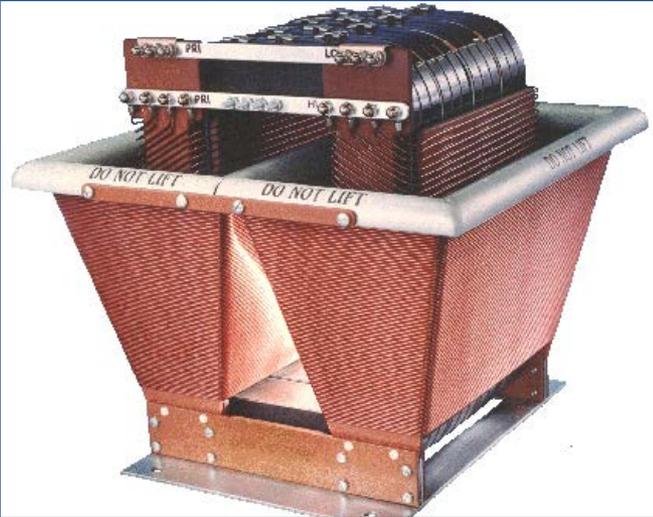


Typically it cannot reach the klystron drive voltage directly .
A transformer is needed to reach the desired voltage.

Line type Modulators layout



Oil Tank circuit

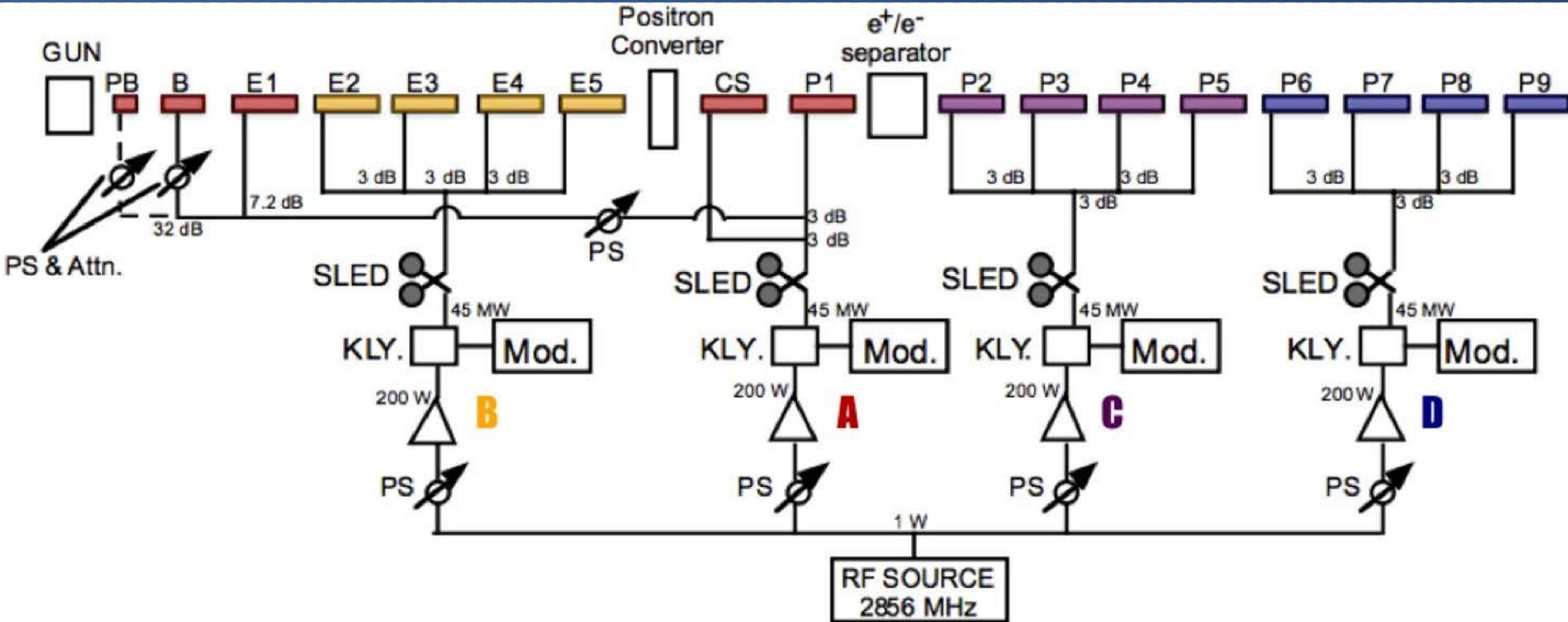


Modulators parameters

Klystron	TH2128C
PFN voltage pulse width(μs)	4,5
PFN Cell capacitance (nF)	68
PFN Cell inductance(μH)	2
Pulse transformer ratio	1:12
Thyratron peak current (A)	4300
Thyratron Peak voltage (kV)	50
Beam voltage flat top(μs)	4.5
Pulse rise time (10%-90%) (μs)	0.4
Pulse fall time (10%-90%) (μs)	0.5
Pulse voltage variation (%)	± 0.1
Pulse repetition rate (Hz)	50
Modulator charging time (ms)	10



LINAC RF layout



The positron buncher section is a standard SLAC $2\pi/3$ structure, which can operate as a standard section with higher than normal gradient (60 MW, 26 MeV/m)



LINAC RF components

RF Components:

Driver amplifier to power klystron

Klystron is used to generate high peak power (A small accelerator)

Need to transport power to the accelerating structure

Waveguide is used (under vacuum) to propagate and guide electromagnetic fields

Windows (dielectric material, low loss ceramic) are used to isolate sections of the waveguide

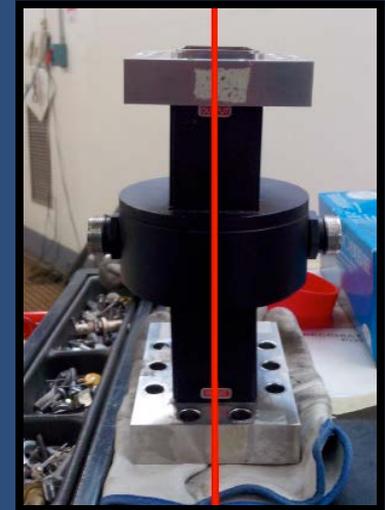
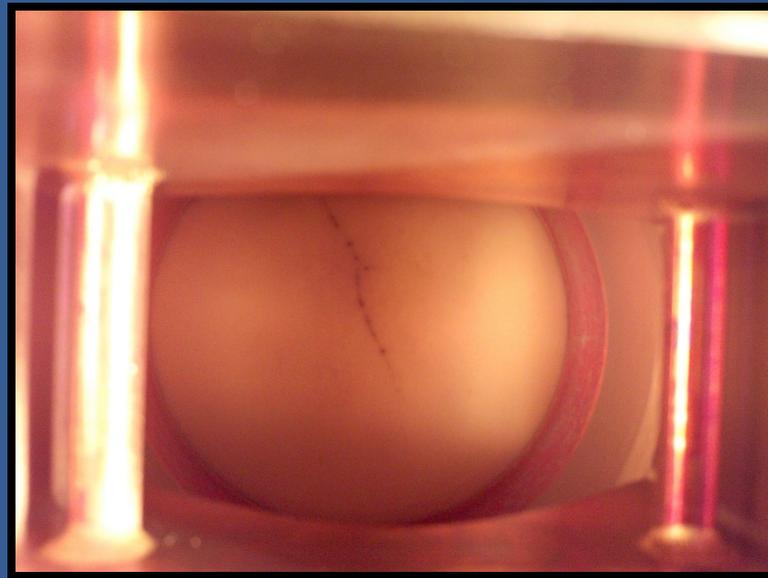
Termination loads (water loads) are used to provide proper rf match and to absorb wasted power

Power splitters are used to divide power in different branches of the waveguide run

LINAC RF components



LINAC RF components

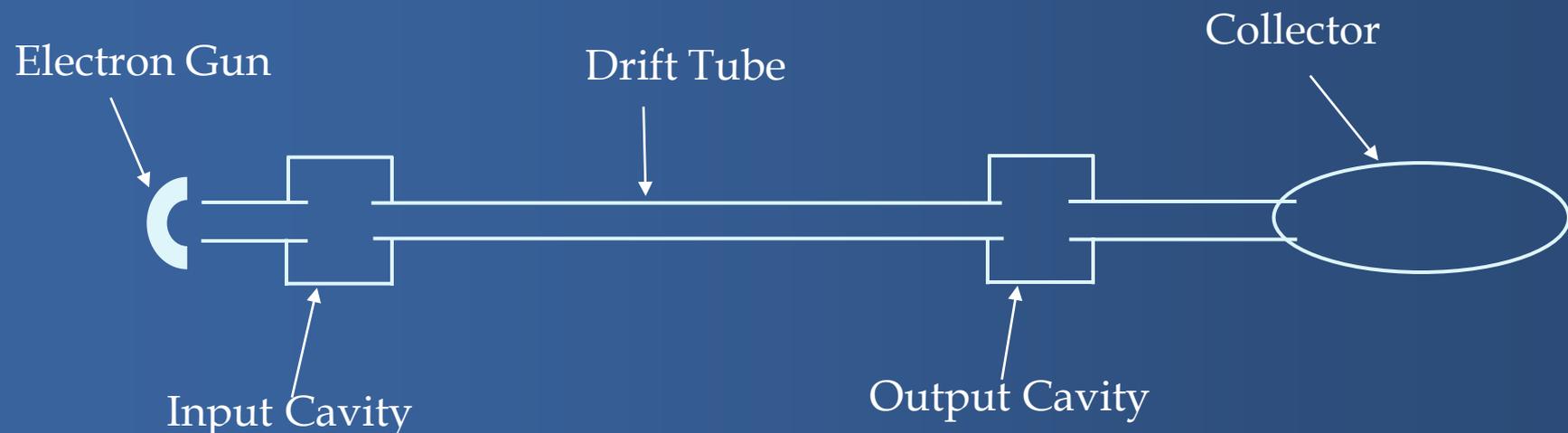


Klystrons

Klystrons have been the principal source of high-power (>1 MW) RF since the beginning of time, and no alternative technology appears poised to replace them.

What are klystrons?

A klystron is a narrow-band vacuum-tube amplifier at microwave frequencies (an electron-beam device).



How the Klystron works

- ▣ DC Beam at high voltage (<500 kV, < 500 A) is emitted from the gun
- ▣ A low-power signal at the design frequency excites the input cavity
- ▣ Particles are accelerated or decelerated in the input cavity, depending on phase/arrival time
- ▣ Velocity modulation becomes time modulation in the long drift tube (beam is bunched at drive frequency)
- ▣ Bunched beam excites output cavity at design frequency (beam loading)
- ▣ Spent beam is stopped in the collector.





Klystron data sheet

PARAMETER	Unit	TH2128C	5045
Center Frequency	MHz	2856	2856
Peak output power	MW	45	65
Peak average power	KW	10	90
RF pulse width	μ s	4.5	3.5
Peak beam voltage	kV	320	350
Peak beam current	A	360	414
Microperveance	μ A/V ^{3/2}	2.0	2.0
Heater voltage	V	20~30	15
Heater current	A	20~28	35
Focusing currents	A	40	15
Peak driver power	W	200	350
Gain	dB	54	53
Efficiency	%	43	45
Pulse repetition rate	Hz	50	120

Pulse compression

Room-temperature accelerator structures require a short pulse of high RF power to reach their desired gradients.

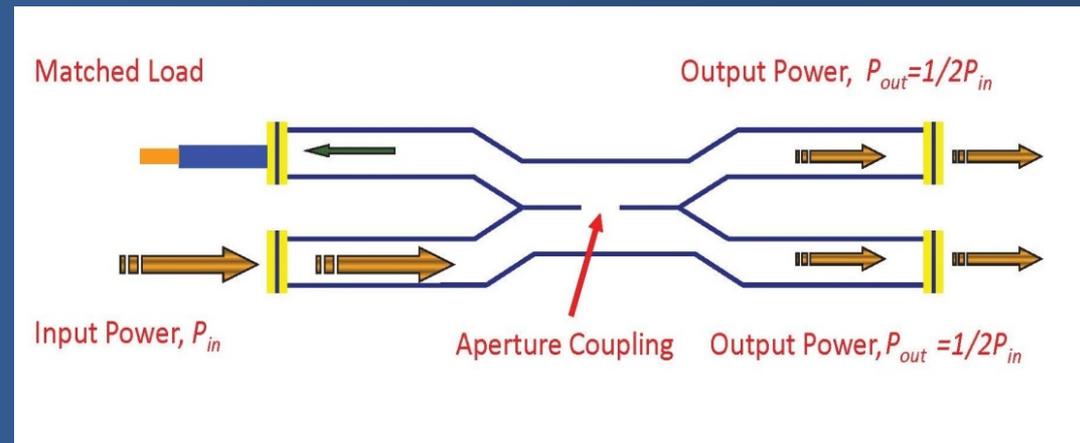
Klystrons run efficiently when they produce a long pulse of relatively low power (minimize inefficiency from modulator rise/fall time etc).

Matching these different time structures is done by pulse compression.

Pulse compression in turn relies on the magic of the 3-db directional coupler to succeed.

The 3-db coupler is a passive device with 4 input/output ports passing thru a central nexus:

The key feature of the coupler is that the diagonal pathways are longer by 90° than the straight pathways.



What does that do for us?

SLED pulse compression



Power from port 1 will be split and flow equally to ports 2 and 3, but with a phase shift.

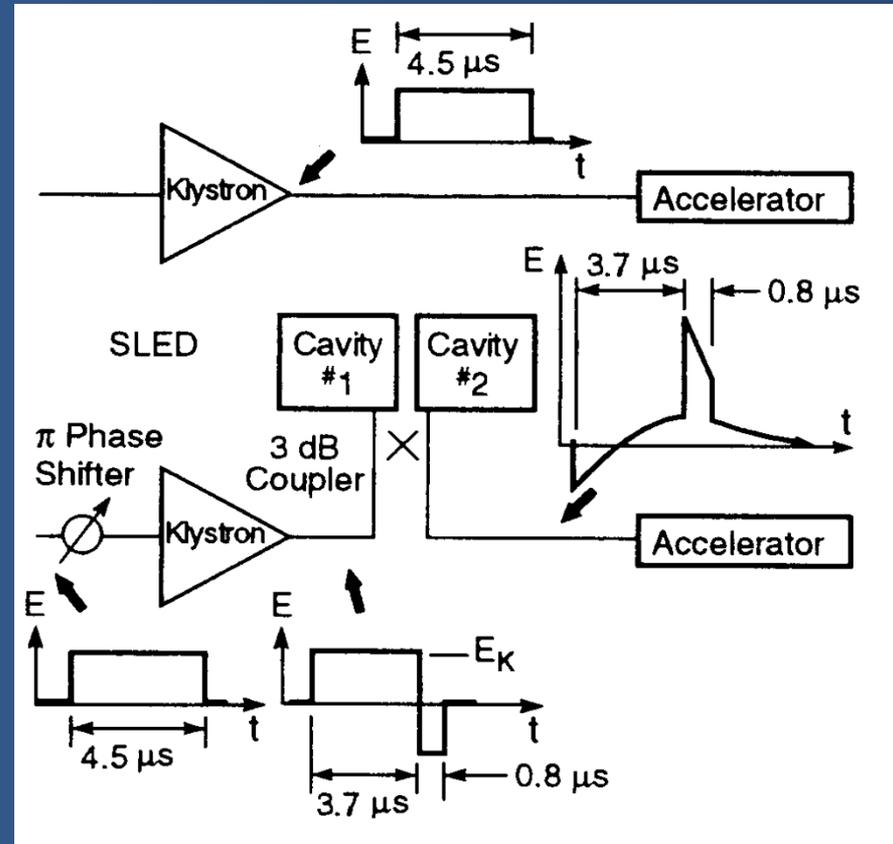
If equal power is introduced at ports 1 and 4, but with a 90° phase shift between them, it will flow entirely to either port 2 or port 3.

If power is introduced at port 1, and perfect reflectors are placed at the end of lines 2 and 3, the reflected power will recombine constructively at port 4 (if the reflectors are placed the same distance from the center of the coupler).

SLED pulse compression

Power from the klystron goes to 2 resonant cavities for storage because the cavity coupler reflects almost all power, there's a surge of reflected energy which goes to the accelerator.

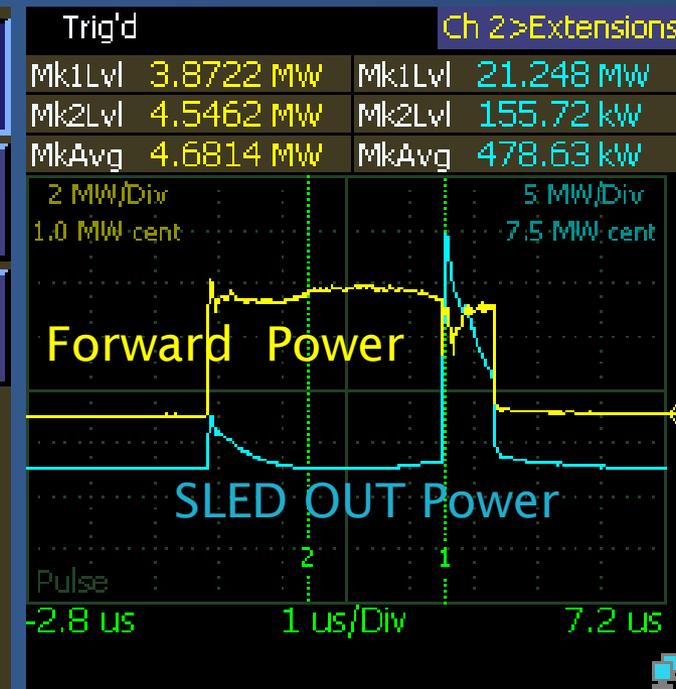
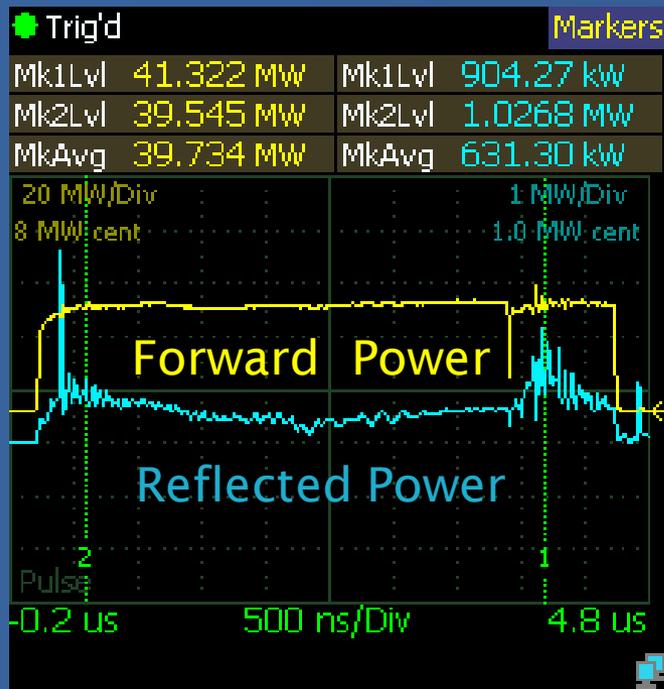
As the SLED system fills, its emitted power destructively interferes with the klystron reflected power. At some point in the klystron pulse, the phase of the klystron is reversed so that the stored energy interferes constructively...





SLED pulse compression

Power Meter Measurements



Units
Watts

Corrections
Menu

Averaging
8

Define Pulse
Menu

More
1 of 2

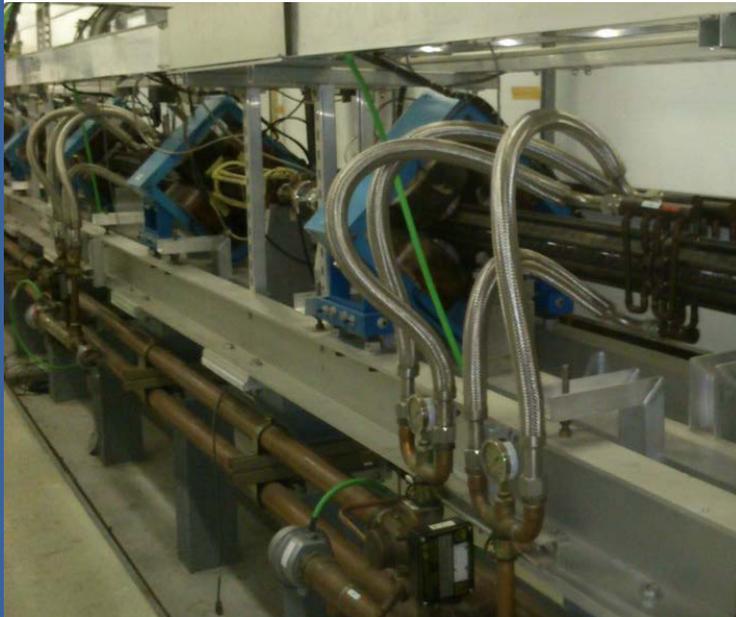
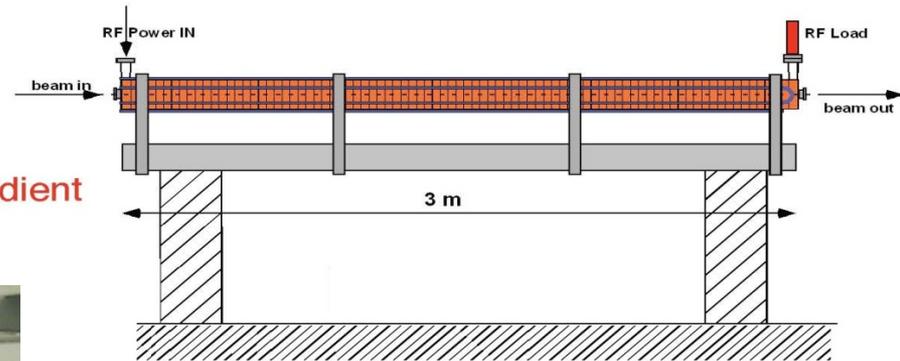
KLYSTRON D

KLYSTRON A

The SLAC structure

Main parameters of the DAPHNE-Linac Accelerating Structures

- SLAC-type
- Frequency 2856 MHz
- Disk-loaded – 86 RF cells
- phase shift per cell $2\pi/3$
- Traveling Wave – Constant Gradient
- 3 mt length - copper guide



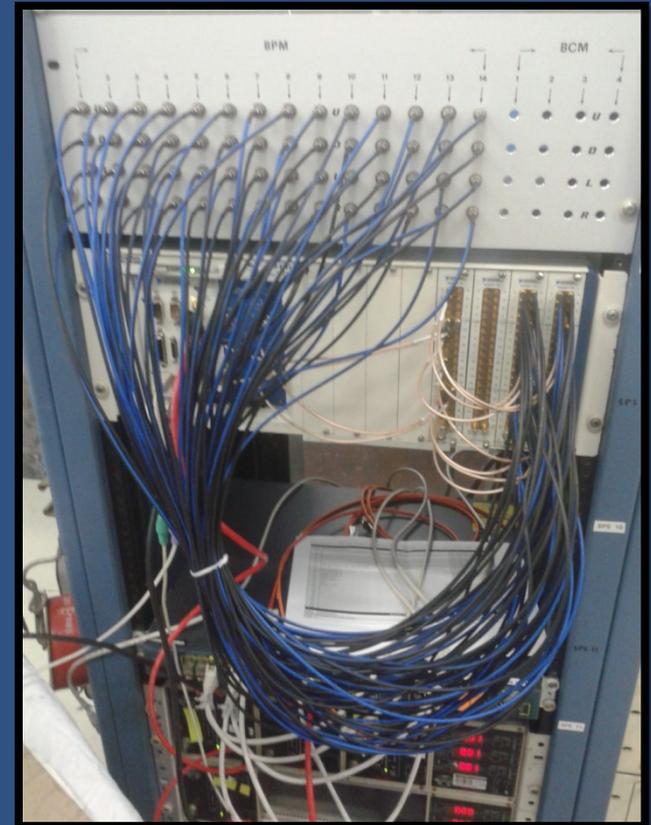


The SLAC structure

Parameter	Symbol	Unit	Value
Frequency	$\omega/2\pi$	MHz	2856
Length	L	m	3.048
Cell Radius	b	cm	4.17--4.09
Iris Radius	a	cm	1.31--0.96
Cell Length	d	cm	3.50
Phase Advance per Cell	ψ	-	$2\pi/3$
Disc Thickness	h	cm	0.584
Quality Factor	Q	-	13,000
Shunt Impedance per Meter	r_1	M Ω /m	52--60
Filling Time	t_f	nsec	830
Group Velocity	v_{gr}	% c	2.0--0.65
Attenuation	τ	"nepers"	0.57
Typical Unloaded Gradient	G_0	MV/m	21
Typical Input Power	P_0	MW	45

Diagnostics and Controls

- System flags
- Beam current monitor
- LINAC Software control system
- Hardware and software integration beam position monitor
- New Nd-YAG (Ce) Flag for beam identification
- BPM improvement
- New LINAC SubSystem VLAN
- Fiber connection to extend instrumentation reliability
- New server to improve stability and development



Timing

- DAFNE reference \emptyset_4 for the injection systems
- Conditioned \emptyset_4 -> DELAYED LINAC SYS SIGNAL (moves all the LINAC stuff together to match ACCUMULATOR phase)
 - DELAYED GUN SIGNAL -> LINAC SYS REFERENCE (once optimized, not moved for months)
 - BTF REFERENCE -> USER needs DELAYED LINAC SYS

\emptyset_4 -> T (ref. time on Stanford 3001)

LINAC Sys -> B (T + Delay on stanford 3001)

LINAC GUN -> A (B + Delay on stanford 3001)

HODOSCOPE -> C (A + Delay on stanford 3001)

HODOSCOPE -> D (C + Delay on stanford 3001)



DDG3001 on Delays.vi



Timing

LINAC Sys-> REF. TIME: Mod A, B, C, D &
Amp RF A, B, C, D & PSK A, B, C, D
RF source
Positron Modulator

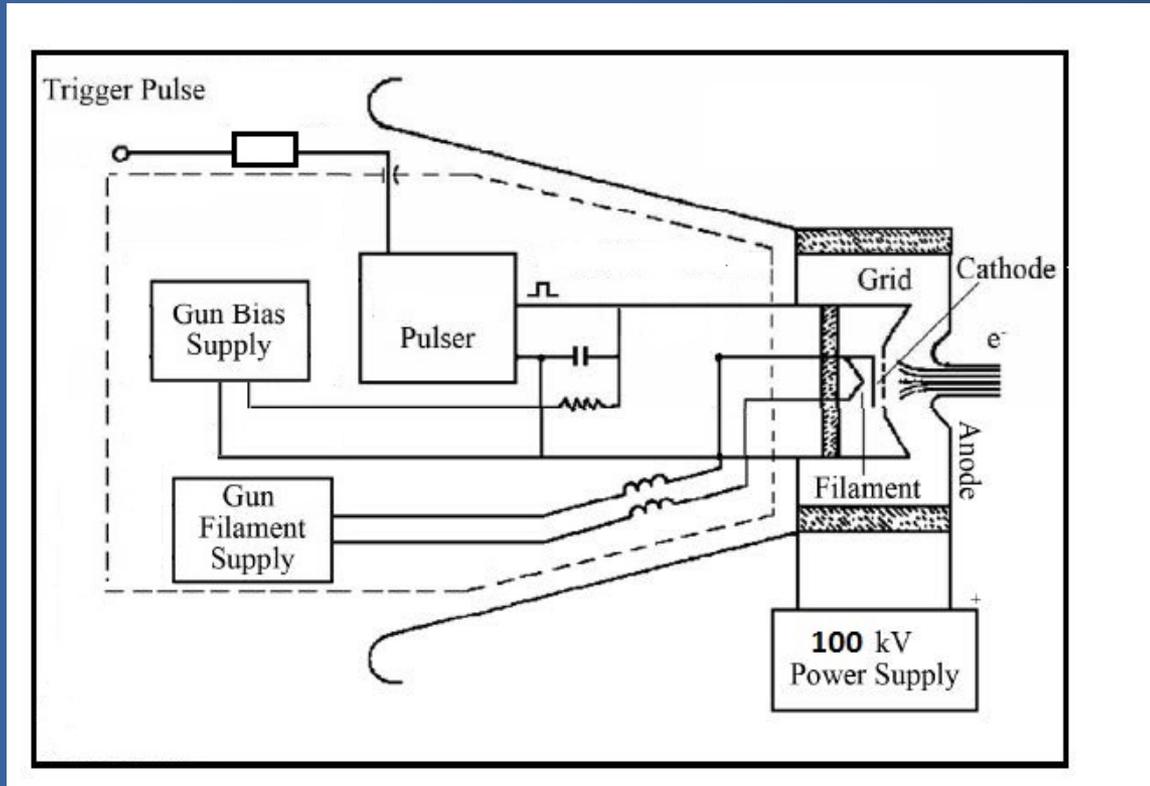
LINAC GUN-> REF. TIME: GUN Pulser



Electron gun electronics



Electron gun electronics



- The E-GUN injector floating deck is controlled by fiber-optical coupled link (ETH fiber+GPIB)
- replacement of cathode socket
 - installation of new gun pulser
 - New filament and bias power supply
 - Developing of software and implementation



Cathode parameters

Cathode Area 2.0 cm²

Max emission current 12 A

Heater 5.8 A, 6 V

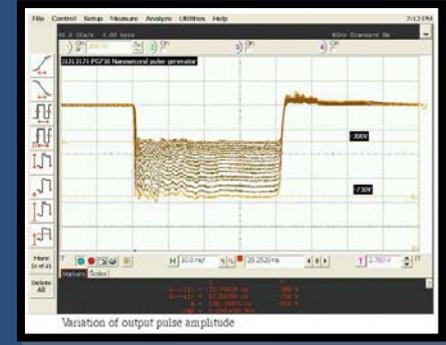
With a gun current of 7 A,
80% can be captured and
accelerated

Parameters	Characteristics
Gun type	Thermionic triode electron gun
Cathode	Y796 (EIMAC) dispenser
Filament heating power	35 W
Acceleration potential	120 kV
Beam current	12 A
Emission current density	10 A/cm ²
Grid bias voltage	0 - 500 V

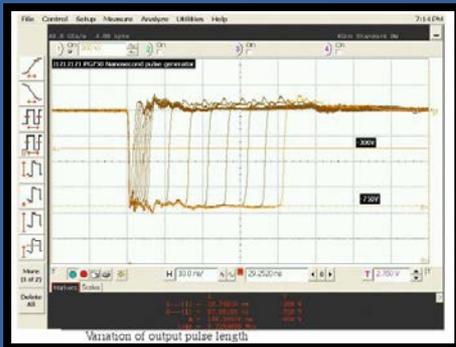


New electron gun pulser

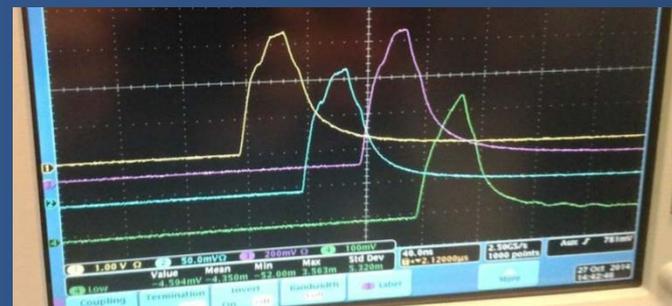
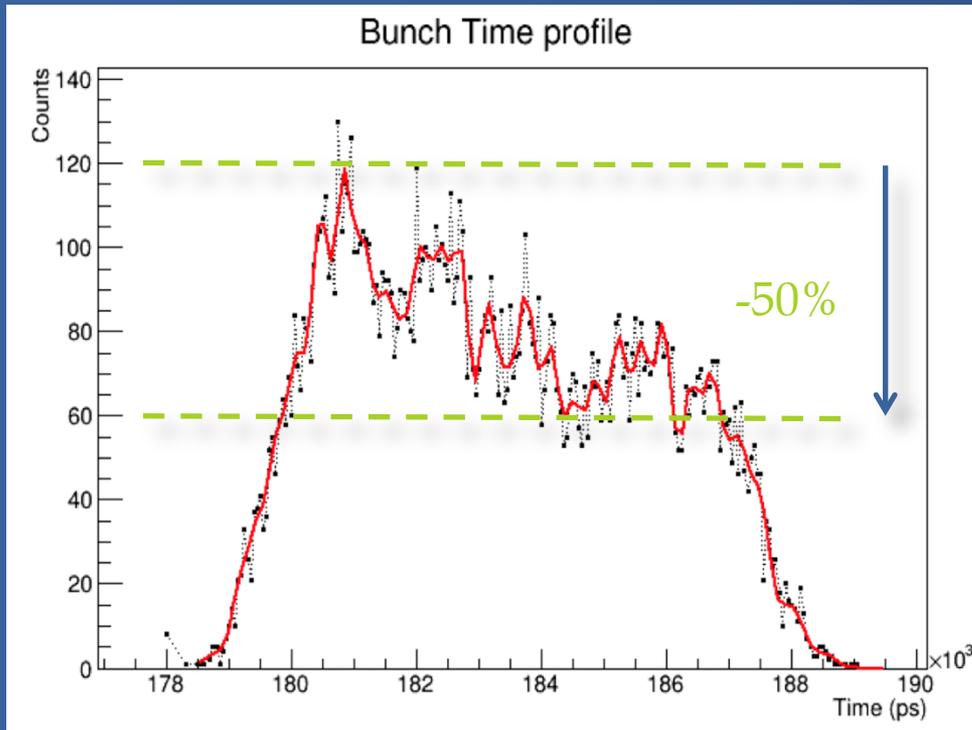
- Kentech PG750 pulser
 - improving stability and reliability
 - new possible matching condition
 - fine tuning of the gun pulse
- Developing of software and its implementation
- Gun equipment control via new ETH fiber+GPIB



Amplitude : adjustable from 300 to 750 V in steps of 30 V
 Pulse width 1.5 to 40 ns in steps on 0.5 ns
 Pulse shape: rectangular
 Flatness +/- 10%
 Max. rep. rate 50 Hz
 Jitter ~20 ps

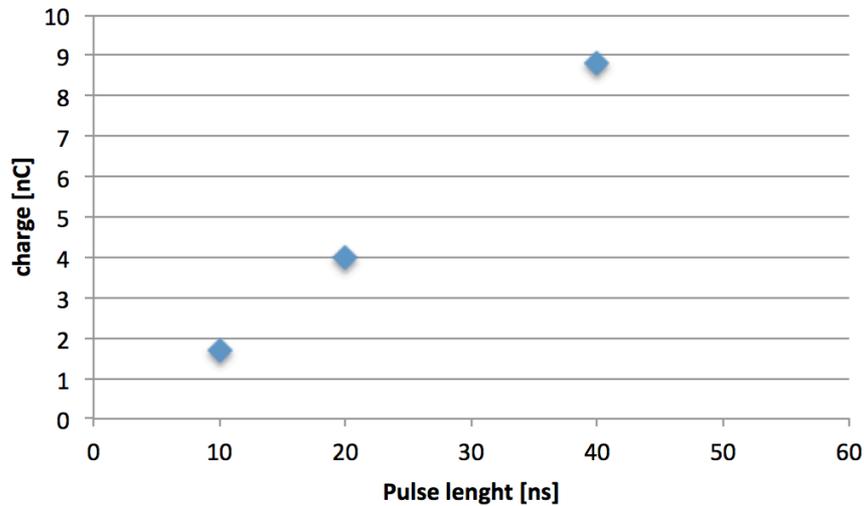


Bunch structure

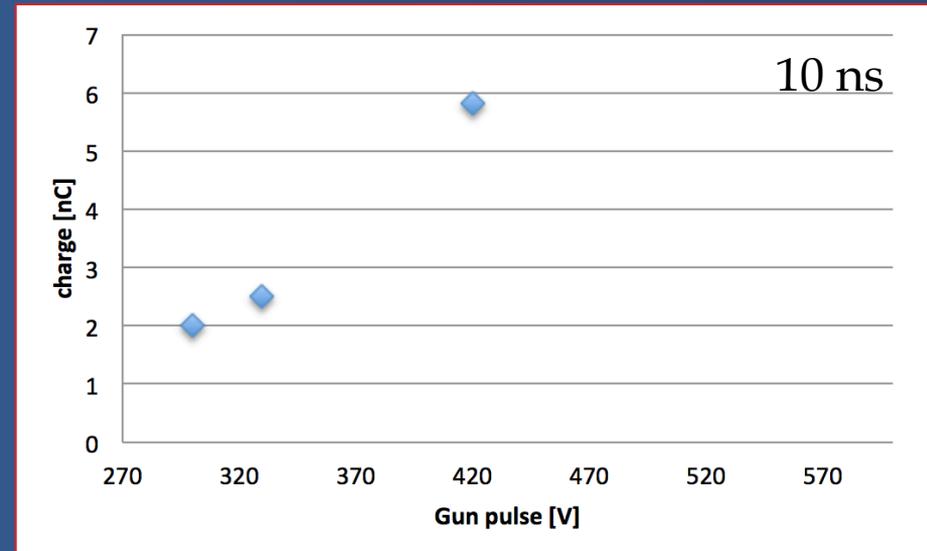
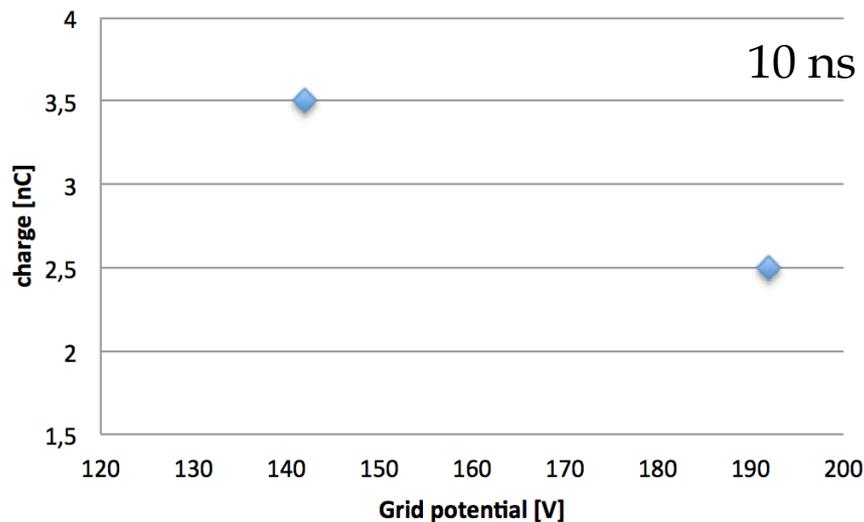
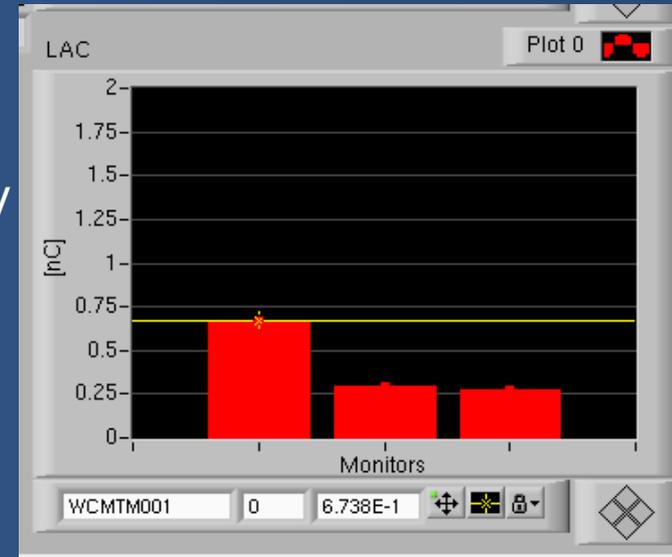


Current monitors

Bunch charge vs. length



$E = 725 \text{ MeV}$

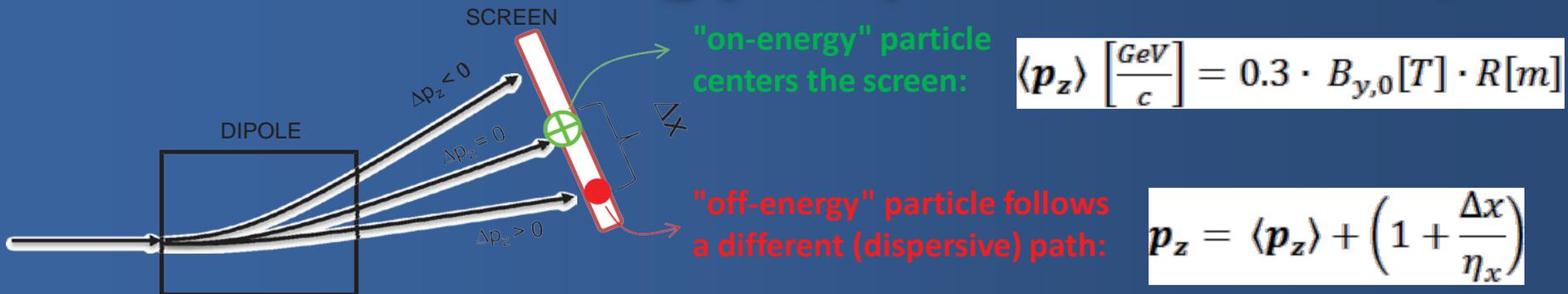


DAFNE LINAC



	Design	Operational
Electron beam final energy	800 MeV	510 MeV
Positron beam final energy	550 MeV	510 MeV
RF frequency	2856 MHz	
Positron conversion energy	250 MeV	220 MeV
Beam pulse rep. rate	1 to 50 Hz	1 to 50 Hz
Beam macropulse length	10 nsec	1.4 to 40 nsec
Gun current	8 A	8 A
Beam spot on positron converter	1 mm	1 mm
norm. Emittance (mm. mrad)	1 (electron) 10 (positron)	< 1.5
rms Energy spread	0.5% (electron) 1.0% (positron)	0.5% (electron) 1.0% (positron)
electron current on positron converter	5 A	5.2 A
Max output electron current	>150 mA	500 mA
Max output positron current	36 mA	85 mA
Transport efficiency from capture section to linac end	90%	90%
Accelerating structure	SLAC-type, CG, $2\pi/3$	
RF source	4 x 45 MWp sledded klystrons TH2128C	

Mean energy (Spectrometer)



- **How to proceed:**

1. geometry of the ref. trajectory (Θ , R) is fixed by the mechanical assembly,
2. B_y is chosen to center the *beam* onto the detector (screen or BPM),
3. calculate $\langle p_z \rangle$.

- **Measurement errors:**

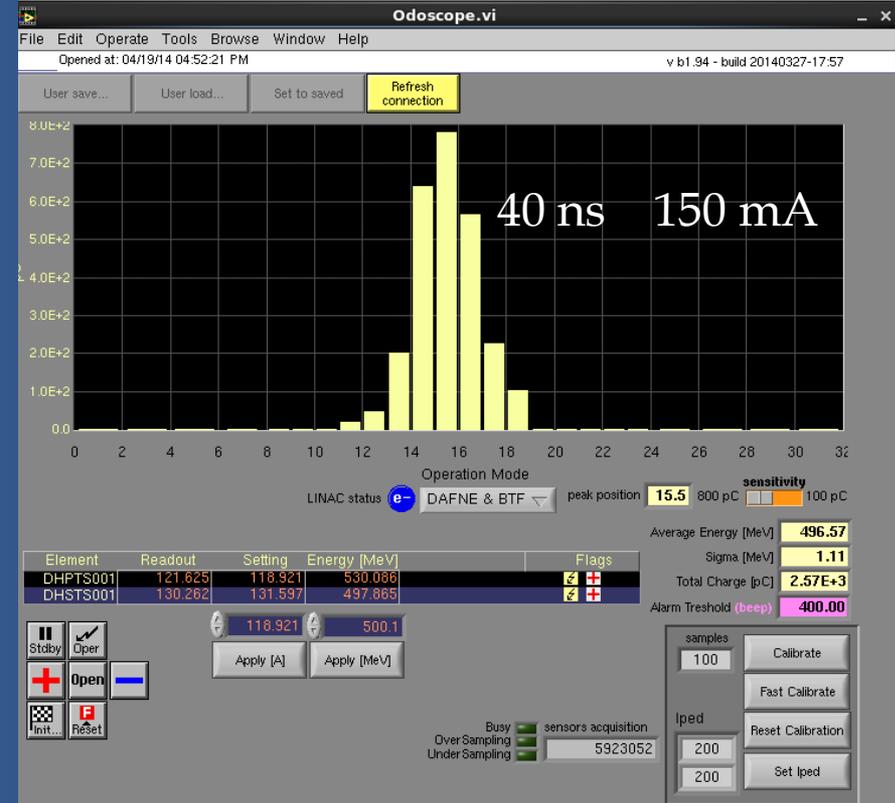
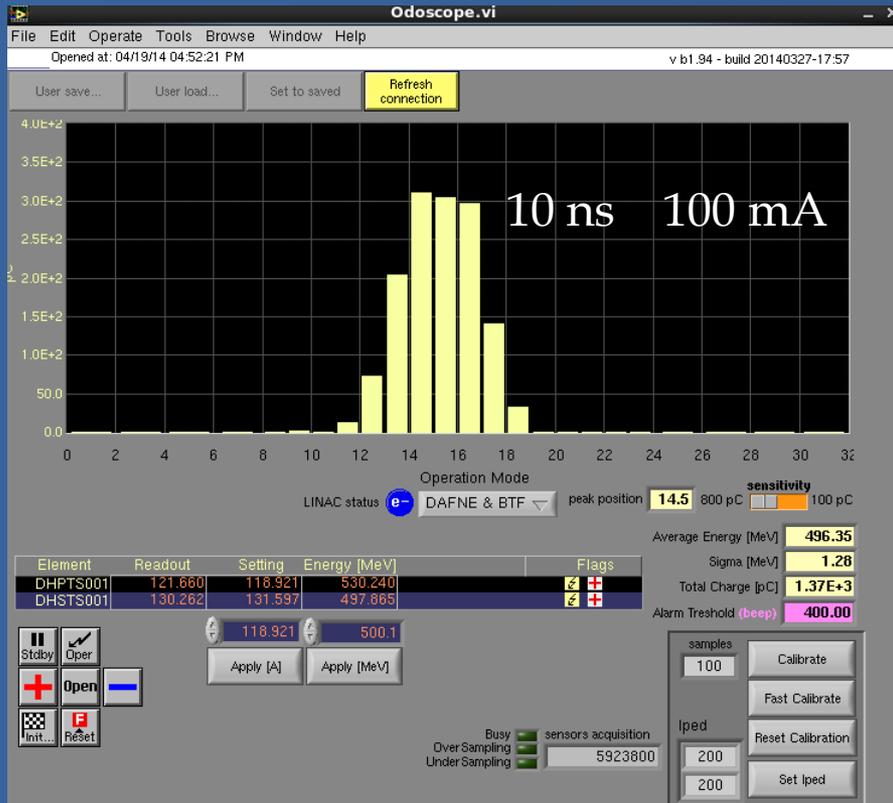
- trajectory distortion before I after the dipole magnet,
- dipole field calibration errors (vs. the supplying current),
- misalignment of the dipole I detector.

Typical error is of the order of 1 MeV at energies higher than tens of MeV.



Energy spread

Measurement of beam energy spread @ 500 MeV





ELECTRON mode: SYSTEM

Applications Places System 2:18 PM

SYSTEM

Manual Switch e-

AC ON RDY FOR HV ENABLE Vacuum Valves Open Magnet Ramping Auto Switch

Gun Fault Display Sub-System Component

RF Power is ramping Gun Filament is ramping SYSTEM RESET SYSTEM FAULT

Show Camac Signals

Pos Conv Target

SYSTEM SUMMARY

OK AUX ON AUX OFF LOAD SETUP Enabled SAVE SETUP

ENABLED MOD/RF ON MOD/RF OFF Print Current Set Print Saved Setup

ENABLED INJECTOR TRIGGER ON INJECTOR TRIGGER OFF

INJECTOR	*****LINE MODULATORS*****				*****MAGNETS*****			POSITRON MODULATOR	RF SYS	TRIGGER CHASSIS	VACUUM	WATER	
	A	B	C	D	#1	POS	#2						
ON LINE													
AUX ON OK													
RDY FOR HV ENABLE													
RDY FOR HV ON													
RDY FOR TRIGGER													

Electron Beam Operation Since Startup: 10:54 hh:mm

Positron Beam Operation Since Startup: 06:35 hh:mm

Last Loaded Set: Primary ELECTRON1_50Hz_Mode Setup

Hardware Loop Rate: 1.81 Hz

User Loop Rate: 0.60 Hz

Last Saved Set:

SYS GUN MOD MG1 MG2 MG3 POS RF VAC HTR W1 W2

LabVIEW (13) Starting Take Screenshot



ELECTRON mode: Gun

Applications Places System 2:19 PM

GUN

AC ON RDY FOR HV ENABLE Vacuum Valves Open Magnet Ramping Complete

e-

Gun Fault Display

FIRST FAULT STATUS
Sub-System:
Component:

SYSTEM RESET SYSTEM FAULT

ENABLED MOD/RF ON MOD/RF OFF

ENABLED INJECTOR TRIGGER ON INJECTOR TRIGGER OFF

INJECTOR SUMMARY

- ON LINE
- AUX ON OK
- READY FOR HV ENABLE
- READY FOR HV ON
- READY FOR TRIGGER
- INJECTOR TRIGGER ON
- SAFETY SWITCH OPEN
- SAFETY SWITCH CLOSED

GUN VAC VPS1: nA
GUN VAC VPS2: nA

RF Power is ramping

FILAMENT

	Voltage	Current	HV	Ave I	Bias	Pulse Width	Pulse Amplitude
OPERATING	<input type="text" value="5.60"/> V	<input type="text" value="5.41"/> A	<input type="text" value="83.4"/> KVDC	<input type="text" value="0.00"/> mA	<input type="text" value="222.0"/> VDC	<input type="text" value="10.0"/> nsec	<input type="text" value="300"/> V
SET			<input type="text" value="86.0"/>		<input type="text" value="222.0"/>	<input type="text" value="10.0"/>	<input type="text" value="300"/>
Loaded			<input type="text" value="86.0"/>		<input type="text" value="202.0"/>		

SYS GUN MOD MG1 MG2 MG3 POS RF VAC HTR W1 W2

LabVIEW (13) Starting Take Screenshot



ELECTRON mode: MOD

Applications Places System 2:20 PM

MODULATOR'S

FIRST FAULT STATUS

AC ON RDY FOR HV ENABLE Vacuum Valves Open Magnet Ramping Complete

Gun Fault Display

Sub-System

Component

ENABLED MOD/RF ON MOD/RF OFF

ENABLED INJECTOR TRIGGER ON INJECTOR TRIGGER OFF

I.Pump Current

RF Power is ramping Gun Filament is ramping

SYSTEM RESET SYSTEM FAULT

	A	B	C	D
ON LINE	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
AUX ON OK	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
RDY FOR HV ENABLE	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
RDY FOR HV	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
RDY FOR TRIGGER	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
RUNNING	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
KLYSTRON HV	<input type="text" value="283"/>	<input type="text" value="283"/>	<input type="text" value="285"/>	<input type="text" value="285"/>
SET POINT HV	<input type="text" value="31.8"/>	<input type="text" value="31.5"/>	<input type="text" value="28.3"/>	<input type="text" value="29.2"/>
Loaded Setpoint	<input type="text" value="31.8"/>	<input type="text" value="31.5"/>	<input type="text" value="28.3"/>	<input type="text" value="29.2"/>
Temperature Deg. C	<input type="text" value="26.3"/>	<input type="text" value="-177.8"/>	<input type="text" value="24.1"/>	<input type="text" value="727.0"/>

KLY FILAMENT KLY VACUUM KLY PULSE CURRENT KLY RF REFL POWER W.G. ARC KLY WATER FLOW KLY FOCUS POWER KLY BODY DELTA T CORE BIAS PFN CHG CURRENT FILTER CAP VOLTAGE CLIPPER CURRENT DEQUE CURRENT HVPS I ENCLOSURE

SYS GUN MOD MG1 MG2 MG3 POS RF VAC HTR W1 W2

LabVIEW (13) Starting Take Screenshot



ELECTRON mode: MAG.1

Applications Places System 2:21 PM

LOW ENERGY MAGNETS

AC ON ● Magnet Ramping Complete ●

RF Power is ramping Gun Filament is ramping

MOD/RF ON **MOD/RF OFF**

INJECTOR TRIGGER ON **INJECTOR TRIGGER OFF**

Gun Fault Display

FIRST FAULT STATUS Sub-System

Component

SYSTEM RESET SYSTEM FAULT ●

Gun Fault Display

SYSTEM RESET SYSTEM FAULT ●

FEEDBACKS		SET I AMP	Start I AMP	Ganged
BC	0.00	0.00	0.00	OFF
FC	0.01	0.00	0.00	OFF
HC1	53.42	55.00	55.00	OFF
HC2	29.93	30.30	30.30	OFF
HC/H1,H2	28.57	28.70	28.70	OFF
HC3	32.07	32.60	32.60	OFF
HC4	9.03	9.10	9.10	OFF
HC5	32.14	38.00	38.00	OFF
HC6	29.79	30.00	30.00	OFF
HC7	15.50	15.60	15.60	OFF
HC8,9,10	10.13	10.50	10.50	OFF
HC11,12,13	0.11	0.00	0.00	OFF
UFS 1,2	14.75	10.00	10.00	OFF
UFS 3,4,6	13.12	10.00	10.00	OFF
UFS 5,7,8	16.04	10.00	10.00	OFF

Set All Magnets to Zero! !

Set Start I to Current Set Points !

Revert to Start I Values !

NO

Apply Magnet Group Scaling

Ganged Quadrupole Scaling (Times)

Ganged Air Core Scaling (Times)

FEEDBACKS		SET I AMP	Start I AMP	Ganged
QA1	2.63	2.69	2.69	OFF
QA2	2.66	2.98	2.98	OFF
QW1	4.33	4.50	4.50	OFF
QW2	4.65	4.80	4.80	OFF
QW/3,4	3.67	3.80	3.80	OFF
QW/5,6	4.74	5.10	5.10	OFF
QW7	1.84	2.00	2.00	OFF
QW8	2.57	2.70	2.70	OFF
QC/1,3	0.59	0.75	0.75	OFF
QC2	1.24	1.33	1.33	OFF

UFS DC Enable ●

O/TEMP. I/L

ALL H.C.'s ●

QW 1-4,5-8 ●

QA1,2 ●

QC 1-QC 3 ●

Target + Flux Conc. ●

UFS 1-5 ●

UFS 6-8 ●

AIR CORE MAGNETS

BC FC HC1 HC2 HC3 HC4 HC5 HC6 HC7 HC8 HC9 HC10 HC11 HC12 HC13 QA1 QA2 S11 S12 X1,V1 X2,V2 QW1 QW2 S13 S14 X1,V1 X2,V2 QW3 QW4 S15 S16 X1,V1 X2,V2 QW5 QW6 S17 S18 X1,V1 X2,V2 QW7 QW8 S19 S20 X1,V1 X2,V2 QW9 QW10 S21 S22 X1,V1 X2,V2 QW11 QW12 S23 S24 X1,V1 X2,V2 QW13 QW14 S25 S26 X1,V1 X2,V2 QW15 QW16 S27 S28 X1,V1 X2,V2 QW17 QW18 S29 S30 X1,V1 X2,V2 QW19 QW20 S31 S32 X1,V1 X2,V2 QW21 QW22 S33 S34 X1,V1 X2,V2 QW23 QW24 S35 S36 X1,V1 X2,V2 QW25 QW26 S37 S38 X1,V1 X2,V2 QW27 QW28 S39 S40 X1,V1 X2,V2 QW29 QW30 S41 S42 X1,V1 X2,V2 QW31 QW32 S43 S44 X1,V1 X2,V2 QW33 QW34 S45 S46 X1,V1 X2,V2 QW35 QW36 S47 S48 X1,V1 X2,V2 QW37 QW38 S49 S50 X1,V1 X2,V2 QW39 QW40 S51 S52 X1,V1 X2,V2 QW41 QW42 S53 S54 X1,V1 X2,V2 QW43 QW44 S55 S56 X1,V1 X2,V2 QW45 QW46 S57 S58 X1,V1 X2,V2 QW47 QW48 S59 S60 X1,V1 X2,V2 QW49 QW50 S61 S62 X1,V1 X2,V2 QW51 QW52 S63 S64 X1,V1 X2,V2 QW53 QW54 S65 S66 X1,V1 X2,V2 QW55 QW56 S67 S68 X1,V1 X2,V2 QW57 QW58 S69 S70 X1,V1 X2,V2 QW59 QW60 S71 S72 X1,V1 X2,V2 QW61 QW62 S73 S74 X1,V1 X2,V2 QW63 QW64 S75 S76 X1,V1 X2,V2 QW65 QW66 S77 S78 X1,V1 X2,V2 QW67 QW68 S79 S80 X1,V1 X2,V2 QW69 QW70 S81 S82 X1,V1 X2,V2 QW71 QW72 S83 S84 X1,V1 X2,V2 QW73 QW74 S85 S86 X1,V1 X2,V2 QW75 QW76 S87 S88 X1,V1 X2,V2 QW77 QW78 S89 S90 X1,V1 X2,V2 QW79 QW80 S91 S92 X1,V1 X2,V2 QW81 QW82 S93 S94 X1,V1 X2,V2 QW83 QW84 S95 S96 X1,V1 X2,V2 QW85 QW86 S97 S98 X1,V1 X2,V2 QW87 QW88 S99 S100 X1,V1 X2,V2 QW89 QW90 S101 S102 X1,V1 X2,V2 QW91 QW92 S103 S104 X1,V1 X2,V2 QW93 QW94 S105 S106 X1,V1 X2,V2 QW95 QW96 S107 S108 X1,V1 X2,V2 QW97 QW98 S109 S110 X1,V1 X2,V2 QW99 QW100 S111 S112 X1,V1 X2,V2 QW101 QW102 S113 S114 X1,V1 X2,V2 QW103 QW104 S115 S116 X1,V1 X2,V2 QW105 QW106 S117 S118 X1,V1 X2,V2 QW107 QW108 S119 S120 X1,V1 X2,V2 QW109 QW110 S121 S122 X1,V1 X2,V2 QW111 QW112 S123 S124 X1,V1 X2,V2 QW113 QW114 S125 S126 X1,V1 X2,V2 QW115 QW116 S127 S128 X1,V1 X2,V2 QW117 QW118 S129 S130 X1,V1 X2,V2 QW119 QW120 S131 S132 X1,V1 X2,V2 QW121 QW122 S133 S134 X1,V1 X2,V2 QW123 QW124 S135 S136 X1,V1 X2,V2 QW125 QW126 S137 S138 X1,V1 X2,V2 QW127 QW128 S139 S140 X1,V1 X2,V2 QW129 QW130 S141 S142 X1,V1 X2,V2 QW131 QW132 S143 S144 X1,V1 X2,V2 QW133 QW134 S145 S146 X1,V1 X2,V2 QW135 QW136 S147 S148 X1,V1 X2,V2 QW137 QW138 S149 S150 X1,V1 X2,V2 QW139 QW140 S151 S152 X1,V1 X2,V2 QW141 QW142 S153 S154 X1,V1 X2,V2 QW143 QW144 S155 S156 X1,V1 X2,V2 QW145 QW146 S157 S158 X1,V1 X2,V2 QW147 QW148 S159 S160 X1,V1 X2,V2 QW149 QW150 S161 S162 X1,V1 X2,V2 QW151 QW152 S163 S164 X1,V1 X2,V2 QW153 QW154 S165 S166 X1,V1 X2,V2 QW155 QW156 S167 S168 X1,V1 X2,V2 QW157 QW158 S169 S170 X1,V1 X2,V2 QW159 QW160 S171 S172 X1,V1 X2,V2 QW161 QW162 S173 S174 X1,V1 X2,V2 QW163 QW164 S175 S176 X1,V1 X2,V2 QW165 QW166 S177 S178 X1,V1 X2,V2 QW167 QW168 S179 S180 X1,V1 X2,V2 QW169 QW170 S181 S182 X1,V1 X2,V2 QW171 QW172 S183 S184 X1,V1 X2,V2 QW173 QW174 S185 S186 X1,V1 X2,V2 QW175 QW176 S187 S188 X1,V1 X2,V2 QW177 QW178 S189 S190 X1,V1 X2,V2 QW179 QW180 S191 S192 X1,V1 X2,V2 QW181 QW182 S193 S194 X1,V1 X2,V2 QW183 QW184 S195 S196 X1,V1 X2,V2 QW185 QW186 S197 S198 X1,V1 X2,V2 QW187 QW188 S199 S200 X1,V1 X2,V2 QW189 QW190 S201 S202 X1,V1 X2,V2 QW191 QW192 S203 S204 X1,V1 X2,V2 QW193 QW194 S205 S206 X1,V1 X2,V2 QW195 QW196 S207 S208 X1,V1 X2,V2 QW197 QW198 S209 S210 X1,V1 X2,V2 QW199 QW200 S211 S212 X1,V1 X2,V2 QW201 QW202 S213 S214 X1,V1 X2,V2 QW203 QW204 S215 S216 X1,V1 X2,V2 QW205 QW206 S217 S218 X1,V1 X2,V2 QW207 QW208 S219 S220 X1,V1 X2,V2 QW209 QW210 S221 S222 X1,V1 X2,V2 QW211 QW212 S223 S224 X1,V1 X2,V2 QW213 QW214 S225 S226 X1,V1 X2,V2 QW215 QW216 S227 S228 X1,V1 X2,V2 QW217 QW218 S229 S230 X1,V1 X2,V2 QW219 QW220 S231 S232 X1,V1 X2,V2 QW221 QW222 S233 S234 X1,V1 X2,V2 QW223 QW224 S235 S236 X1,V1 X2,V2 QW225 QW226 S237 S238 X1,V1 X2,V2 QW227 QW228 S239 S240 X1,V1 X2,V2 QW229 QW230 S241 S242 X1,V1 X2,V2 QW231 QW232 S243 S244 X1,V1 X2,V2 QW233 QW234 S245 S246 X1,V1 X2,V2 QW235 QW236 S247 S248 X1,V1 X2,V2 QW237 QW238 S249 S250 X1,V1 X2,V2 QW239 QW240 S251 S252 X1,V1 X2,V2 QW241 QW242 S253 S254 X1,V1 X2,V2 QW243 QW244 S255 S256 X1,V1 X2,V2 QW245 QW246 S257 S258 X1,V1 X2,V2 QW247 QW248 S259 S260 X1,V1 X2,V2 QW249 QW250 S261 S262 X1,V1 X2,V2 QW251 QW252 S263 S264 X1,V1 X2,V2 QW253 QW254 S265 S266 X1,V1 X2,V2 QW255 QW256 S267 S268 X1,V1 X2,V2 QW257 QW258 S269 S270 X1,V1 X2,V2 QW259 QW260 S271 S272 X1,V1 X2,V2 QW261 QW262 S273 S274 X1,V1 X2,V2 QW263 QW264 S275 S276 X1,V1 X2,V2 QW265 QW266 S277 S278 X1,V1 X2,V2 QW267 QW268 S279 S280 X1,V1 X2,V2 QW269 QW270 S281 S282 X1,V1 X2,V2 QW271 QW272 S283 S284 X1,V1 X2,V2 QW273 QW274 S285 S286 X1,V1 X2,V2 QW275 QW276 S287 S288 X1,V1 X2,V2 QW277 QW278 S289 S290 X1,V1 X2,V2 QW279 QW280 S291 S292 X1,V1 X2,V2 QW281 QW282 S293 S294 X1,V1 X2,V2 QW283 QW284 S295 S296 X1,V1 X2,V2 QW285 QW286 S297 S298 X1,V1 X2,V2 QW287 QW288 S299 S300 X1,V1 X2,V2 QW289 QW290 S301 S302 X1,V1 X2,V2 QW291 QW292 S303 S304 X1,V1 X2,V2 QW293 QW294 S305 S306 X1,V1 X2,V2 QW295 QW296 S307 S308 X1,V1 X2,V2 QW297 QW298 S309 S310 X1,V1 X2,V2 QW299 QW300 S311 S312 X1,V1 X2,V2 QW301 QW302 S313 S314 X1,V1 X2,V2 QW303 QW304 S315 S316 X1,V1 X2,V2 QW305 QW306 S317 S318 X1,V1 X2,V2 QW307 QW308 S319 S320 X1,V1 X2,V2 QW309 QW310 S321 S322 X1,V1 X2,V2 QW311 QW312 S323 S324 X1,V1 X2,V2 QW313 QW314 S325 S326 X1,V1 X2,V2 QW315 QW316 S327 S328 X1,V1 X2,V2 QW317 QW318 S329 S330 X1,V1 X2,V2 QW319 QW320 S331 S332 X1,V1 X2,V2 QW321 QW322 S333 S334 X1,V1 X2,V2 QW323 QW324 S335 S336 X1,V1 X2,V2 QW325 QW326 S337 S338 X1,V1 X2,V2 QW327 QW328 S339 S340 X1,V1 X2,V2 QW329 QW330 S341 S342 X1,V1 X2,V2 QW331 QW332 S343 S344 X1,V1 X2,V2 QW333 QW334 S345 S346 X1,V1 X2,V2 QW335 QW336 S347 S348 X1,V1 X2,V2 QW337 QW338 S349 S350 X1,V1 X2,V2 QW339 QW340 S351 S352 X1,V1 X2,V2 QW341 QW342 S353 S354 X1,V1 X2,V2 QW343 QW344 S355 S356 X1,V1 X2,V2 QW345 QW346 S357 S358 X1,V1 X2,V2 QW347 QW348 S359 S360 X1,V1 X2,V2 QW349 QW350 S361 S362 X1,V1 X2,V2 QW351 QW352 S363 S364 X1,V1 X2,V2 QW353 QW354 S365 S366 X1,V1 X2,V2 QW355 QW356 S367 S368 X1,V1 X2,V2 QW357 QW358 S369 S370 X1,V1 X2,V2 QW359 QW360 S371 S372 X1,V1 X2,V2 QW361 QW362 S373 S374 X1,V1 X2,V2 QW363 QW364 S375 S376 X1,V1 X2,V2 QW365 QW366 S377 S378 X1,V1 X2,V2 QW367 QW368 S379 S380 X1,V1 X2,V2 QW369 QW370 S381 S382 X1,V1 X2,V2 QW371 QW372 S383 S384 X1,V1 X2,V2 QW373 QW374 S385 S386 X1,V1 X2,V2 QW375 QW376 S387 S388 X1,V1 X2,V2 QW377 QW378 S389 S390 X1,V1 X2,V2 QW379 QW380 S391 S392 X1,V1 X2,V2 QW381 QW382 S393 S394 X1,V1 X2,V2 QW383 QW384 S395 S396 X1,V1 X2,V2 QW385 QW386 S397 S398 X1,V1 X2,V2 QW387 QW388 S399 S400 X1,V1 X2,V2 QW389 QW390 S401 S402 X1,V1 X2,V2 QW391 QW392 S403 S404 X1,V1 X2,V2 QW393 QW394 S405 S406 X1,V1 X2,V2 QW395 QW396 S407 S408 X1,V1 X2,V2 QW397 QW398 S409 S410 X1,V1 X2,V2 QW399 QW400 S411 S412 X1,V1 X2,V2 QW401 QW402 S413 S414 X1,V1 X2,V2 QW403 QW404 S415 S416 X1,V1 X2,V2 QW405 QW406 S417 S418 X1,V1 X2,V2 QW407 QW408 S419 S420 X1,V1 X2,V2 QW409 QW410 S421 S422 X1,V1 X2,V2 QW411 QW412 S423 S424 X1,V1 X2,V2 QW413 QW414 S425 S426 X1,V1 X2,V2 QW415 QW416 S427 S428 X1,V1 X2,V2 QW417 QW418 S429 S430 X1,V1 X2,V2 QW419 QW420 S431 S432 X1,V1 X2,V2 QW421 QW422 S433 S434 X1,V1 X2,V2 QW423 QW424 S435 S436 X1,V1 X2,V2 QW425 QW426 S437 S438 X1,V1 X2,V2 QW427 QW428 S439 S440 X1,V1 X2,V2 QW429 QW430 S441 S442 X1,V1 X2,V2 QW431 QW432 S443 S444 X1,V1 X2,V2 QW433 QW434 S445 S446 X1,V1 X2,V2 QW435 QW436 S447 S448 X1,V1 X2,V2 QW437 QW438 S449 S450 X1,V1 X2,V2 QW439 QW440 S451 S452 X1,V1 X2,V2 QW441 QW442 S453 S454 X1,V1 X2,V2 QW443 QW444 S455 S456 X1,V1 X2,V2 QW445 QW446 S457 S458 X1,V1 X2,V2 QW447 QW448 S459 S460 X1,V1 X2,V2 QW449 QW450 S461 S462 X1,V1 X2,V2 QW451 QW452 S463 S464 X1,V1 X2,V2 QW453 QW454 S465 S466 X1,V1 X2,V2 QW455 QW456 S467 S468 X1,V1 X2,V2 QW457 QW458 S469 S470 X1,V1 X2,V2 QW459 QW460 S471 S472 X1,V1 X2,V2 QW461 QW462 S473 S474 X1,V1 X2,V2 QW463 QW464 S475 S476 X1,V1 X2,V2 QW465 QW466 S477 S478 X1,V1 X2,V2 QW467 QW468 S479 S480 X1,V1 X2,V2 QW469 QW470 S481 S482 X1,V1 X2,V2 QW471 QW472 S483 S484 X1,V1 X2,V2 QW473 QW474 S485 S486 X1,V1 X2,V2 QW475 QW476 S487 S488 X1,V1 X2,V2 QW477 QW478 S489 S490 X1,V1 X2,V2 QW479 QW480 S491 S492 X1,V1 X2,V2 QW481 QW482 S493 S494 X1,V1 X2,V2 QW483 QW484 S495 S496 X1,V1 X2,V2 QW485 QW486 S497 S498 X1,V1 X2,V2 QW487 QW488 S499 S500 X1,V1 X2,V2 QW489 QW490 S501 S502 X1,V1 X2,V2 QW491 QW492 S503 S504 X1,V1 X2,V2 QW493 QW494 S505 S506 X1,V1 X2,V2 QW495 QW496 S507 S508 X1,V1 X2,V2 QW497 QW498 S509 S510 X1,V1 X2,V2 QW499 QW500 S511 S512 X1,V1 X2,V2 QW501 QW502 S513 S514 X1,V1 X2,V2 QW503 QW504 S515 S516 X1,V1 X2,V2 QW505 QW506 S517 S518 X1,V1 X2,V2 QW507 QW508 S519 S520 X1,V1 X2,V2 QW509 QW510 S521 S522 X1,V1 X2,V2 QW511 QW512 S523 S524 X1,V1 X2,V2 QW513 QW514 S525 S526 X1,V1 X2,V2 QW515 QW516 S527 S528 X1,V1 X2,V2 QW517 QW518 S529 S530 X1,V1 X2,V2 QW519 QW520 S531 S532 X1,V1 X2,V2 QW521 QW522 S533 S534 X1,V1 X2,V2 QW523 QW524 S535 S536 X1,V1 X2,V2 QW525 QW526 S537 S538 X1,V1 X2,V2 QW527 QW528 S539 S540 X1,V1 X2,V2 QW529 QW530 S541 S542 X1,V1 X2,V2 QW531 QW532 S543 S544 X1,V1 X2,V2 QW533 QW534 S545 S546 X1,V1 X2,V2 QW535 QW536 S547 S548 X1,V1 X2,V2 QW537 QW538 S549 S550 X1,V1 X2,V2 QW539 QW540 S551 S552 X1,V1 X2,V2 QW541 QW542 S553 S554 X1,V1 X2,V2 QW543 QW544 S555 S556 X1,V1 X2,V2 QW545 QW546 S557 S558 X1,V1 X2,V2 QW547 QW548 S559 S560 X1,V1 X2,V2 QW549 QW550 S561 S562 X1,V1 X2,V2 QW551 QW552 S563 S564 X1,V1 X2,V2 QW553 QW554 S565 S566 X1,V1 X2,V2 QW555 QW556 S567 S568 X1,V1 X2,V2 QW557 QW558 S569 S570 X1,V1 X2,V2 QW559 QW560 S571 S572 X1,V1 X2,V2 QW561 QW562 S573 S574 X1,V1 X2,V2 QW563 QW564 S575 S576 X1,V1 X2,V2 QW565 QW566 S577 S578 X1,V1 X2,V2 QW567 QW568 S579 S580 X1,V1 X2,V2 QW569 QW570 S581 S582 X1,V1 X2,V2 QW571 QW572 S583 S584 X1,V1 X2,V2 QW573 QW574 S585 S586 X1,V1 X2,V2 QW575 QW576 S587 S588 X1,V1 X2,V2 QW577 QW578 S589 S590 X1,V1 X2,V2 QW579 QW580 S591 S592 X1,V1 X2,V2 QW581 QW582 S593 S594 X1,V1 X2,V2 QW583 QW584 S595 S596 X1,V1 X2,V2 QW585 QW586 S597 S598 X1,V1 X2,V2 QW587 QW588 S599 S600 X1,V1 X2,V2 QW589 QW590 S601 S602 X1,V1 X2,V2 QW591 QW592 S603 S604 X1,V1 X2,V2 QW593 QW594 S605 S606 X1,V1 X2,V2 QW595 QW596 S607 S608 X1,V1 X2,V2 QW597 QW598 S609 S610 X1,V1 X2,V2 QW599 QW600 S611 S612 X1,V1 X2,V2 QW601 QW602 S613 S614 X1,V1 X2,V2 QW603 QW604 S615 S616 X1,V1 X2,V2 QW605 QW606 S617 S618 X1,V1 X2,V2 QW607 QW608 S619 S620 X1,V1 X2,V2 QW609 QW610 S621 S622 X1,V1 X2,V2 QW611 QW612 S623 S624 X1,V1 X2,V2 QW613 QW614 S625 S626 X1,V1 X2,V2 QW615 QW616 S627 S628 X1,V1 X2,V2 QW617 QW618 S629 S630 X1,V1 X2,V2 QW619 QW620 S631 S632 X1,V1 X2,V2 QW621 QW622 S633 S634 X1,V1 X2,V2 QW623 QW624 S635 S636 X1,V1 X2,V2 QW625 QW626 S637 S638 X1,V1 X2,V2 QW627 QW628 S639 S640 X1,V1 X2,V2 QW629 QW630 S641 S642 X1,V1 X2,V2 QW631 QW632 S643 S644 X1,V1 X2,V2 QW633 QW634 S645 S646 X1,V1 X2,V2 QW635 QW636 S647 S648 X1,V1 X2,V2 QW637 QW638 S649 S650 X1,V1 X2,V2 QW639 QW640 S651 S652 X1,V1 X2,V2 QW641 QW642 S653 S654 X1,V1 X2,V2 QW643 QW644 S655 S656 X1,V1 X2,V2 QW645 QW646 S657 S658 X1,V1 X2,V2 QW647 QW648 S659 S660 X1,V1 X2,V2 QW649 QW650 S661 S662 X1,V1 X2,V2 QW651 QW652 S663 S664 X1,V1 X2,V2 QW653 QW654 S665 S666 X1,V1 X2,V2 QW655 QW656 S667 S668 X1,V1 X2,V2 QW657 QW658 S669 S670 X1,V1 X2,V2 QW659 QW660 S671 S672 X1,V1 X2,V2 QW661 QW662 S673 S674 X1,V1 X2,V2 QW663 QW664 S675 S676 X1,V1 X2,V2 QW665 QW666 S677 S678 X1,V1 X2,V2 QW667 QW668 S679 S680 X1,V1 X2,V2 QW669 QW670 S681 S682 X1,V1 X2,V2 QW671 QW672 S683 S684 X1,V1 X2,V2 QW673 QW674 S685 S686 X1,V1 X2,V2 QW675 QW676 S687 S688 X1,V1 X2,V2 QW677 QW678 S689 S690 X1,V1 X2,V2 QW679 QW680 S691 S692 X1,V1 X2,V2 QW681 QW682 S693 S694 X1,V1 X2,V2 QW683 QW684 S695 S696 X1,V1 X2,V2 QW685 QW686 S697 S698 X1,V1 X2,V2 QW687 QW688 S699 S700 X1,V1 X2,V2 QW689 QW690 S701 S702 X1,V1 X2,V2 QW691 QW692 S703 S704 X1,V1 X2,V2 QW693 QW694 S705 S706 X1,V1 X2,V2 QW695 QW696 S707 S708 X1,V1 X2,V2 QW697 QW698 S709 S710 X1,V1 X2,V2 QW699 QW700 S711 S712 X1,V1 X2,V2 QW701 QW702 S713 S714 X1,V1 X2,V2 QW703 QW704 S715 S716 X1,V1 X2,V2 QW705 QW706 S717 S718 X1,V1 X2,V2 QW707 QW708 S719 S720 X1,V1 X2,V2 QW709 QW710 S721 S722 X1,V1 X2,V2 QW711 QW712 S723 S724 X1,V1 X2,V2 QW713 QW714 S725 S726 X1,V1 X2,V2 QW715 QW716 S727 S728 X1,V1 X2,V2 QW717 QW718 S729 S730 X1,V1 X2,V2 QW719 QW720 S731 S732 X1,V1 X2,V2 QW721 QW722 S733 S734 X1,V1 X2,V2 QW723 QW724 S735 S736 X1,V1 X2,V2 QW725 QW726 S737 S738 X1,V1 X2,V2 QW727 QW728 S739 S740 X1,V1 X2,V2 QW729 QW730 S741 S742 X1,V1 X2,V2 QW731 QW732 S743 S744 X1,V1 X2,V2 QW733 QW734 S745 S746 X1,V1 X2,V2 QW735 QW736 S747 S748 X1,V1 X2,V2 QW737 QW738 S749 S750 X1,V1 X2,V2 QW739 QW740 S751 S752 X1,V1 X2,V2 QW741 QW742 S753 S754 X1,V1 X2,V2 QW743 QW744 S755 S756 X1,V1 X2,V2 QW745 QW746 S757 S758 X1,V1 X2,V2 QW747 QW748 S759 S760 X1,V1 X2,V2 QW749 QW750 S761 S762 X1,V1 X2,V2 QW751 QW752 S763 S764 X1,V1 X2,V2 QW753 QW754 S765 S766 X1,V1 X2,V2 QW755 QW756 S767 S768 X1,V1 X2,V2 QW757 QW758 S769 S770 X1,V1 X2,V2 QW759 QW760 S771 S772 X1,V1 X2,V2 QW761 QW762 S773 S774 X1,V1 X2,V2 QW763 QW764 S775 S776 X1,V1 X2,V2 QW765 QW766 S777 S778 X1,V1 X2,V2 QW767 QW768 S779 S780 X1,V1 X2,V2 QW769 QW770 S781 S782 X1,V1 X2,V2 QW771 QW772 S783 S784 X1,V1 X2,V2 QW773 QW774 S785 S786 X1,V1 X2,V2 QW775 QW776 S787 S788 X1,V1 X2,V2 QW777 QW778 S789 S790 X1,V1 X2,V2 QW779 QW780 S791 S792 X1,V1 X2,V2 QW781 QW782 S793 S794 X1,V1 X2,V2 QW783 QW784 S795 S796 X1,V1 X2,V2 QW785 QW786 S797 S798 X1,V1 X2,V2 QW787 QW788 S799 S800 X1,V1 X2,V2 QW789 QW790 S801 S802 X1,V1 X2,V2 QW791 QW792 S803 S804 X1,V1 X2,V2 QW793 QW794 S805 S806 X1,V1 X2,V2 QW795 QW796 S807 S808 X1,V1 X2,V2 QW797 QW798 S8



ELECTRON mode: MAG.2

Applications Places System 2:22 PM

IR MAGNETS

AC ON ● Magnet Ramping Complete ●

RF Power is ramping ■ Gun Filament is ramping ■

MOD/RF TRIGGER ON ● MOD/RF TRIGGER OFF ■

INJECTOR TRIGGER ON ● INJECTOR TRIGGER OFF ■

Gun Fault Display ■ e-

FIRST FAULT STATUS

Sub-System

Component

SYSTEM RESET ■ ● SYSTEM FAULT

Set All Magnets to Zero! ■ !

Set Start I to Current Set Points ■ !

Revert to Start I Values ■ !

NO ■

Apply Magnet Group Scaling

FEEDBACKS	SET I AMP	Start I AMP	Ganged
UFS 1,2 14.71	10.00	10.00	OFF
UFS 3,4,6 12.71	10.00	10.00	OFF
UFS 5,7,8 16.29	10.00	10.00	OFF

Ganged Air Core Scaling (Times)

0.0 1.0 2.0 3.0 1.00

Ganged Quadrupole Scaling (Times)

0.0 1.0 2.0 3.0 1.00

FEEDBACKS	SET I AMP	Start I AMP	Ganged
QA3,4 1.50	1.53	1.53	OFF
QB1 1.97	2.00	2.00	OFF
DBM1-4 0.05	0.00	0.00	OFF
QA5 3.48	3.56	3.56	OFF
QA6 0.34	0.35	0.35	OFF
QB2 3.66	3.70	3.70	OFF

UFS DC Enable ●

O/TEMP. I/L

QB1-QA3,4 ●

DBM1-4 ●

QB2-QA5,6 ●

Iron Core Magnets

S14				S15				S16				S17			
X1,V1	X2,V2														
UFS 1	UFS 2	UFS 3	UFS 4	UFS 5	UFS 6	UFS 7	UFS 8	QA 3	QA 4	QA 5	QA 6	QB 1	QB 2	QB 3	QB 4

MAGNET POSITION AS THEY APPEAR ON THE ACCELERATOR

■ SYS
 ■ GUN
 ■ MOD
 ■ MG1
 ■ MG2
 ■ MG3
 ■ POS
 ■ RF
 ■ VAC
 ■ HTR
 ■ W1
 ■ W2



ELECTRON mode: MAG.3

Applications Places System 2:23 PM

HIGH ENERGY MAGNETS

AC ON Magnet Ramping Complete

MOD/RF ON MOD/RF OFF

INJECTOR TRIGGER ON INJECTOR TRIGGER OFF

RF Power is ramping Gun Filament is ramping

Gun Fault Display

FIRST FAULT STATUS
Sub-System
Component

SYSTEM RESET SYSTEM FAULT

Set All Magnets to Zero! (Red !)

Set Start I to Current Set Points (Orange !)

Revert to Start I Values (Yellow !)

Apply Magnet Group Scaling (NO)

Ganged Quadrupole Scaling (Times) 1.00

FEEDBACKS	SET I AMP	Start I AMP	Ganged
QW9	0.8	1.0	OFF
QW10	1.5	1.7	OFF
QW11-14	1.7	2.0	OFF
QW15	1.8	2.0	OFF
QW16	6.7	7.0	OFF
QW17	4.8	5.0	OFF
QW18	3.2	3.5	OFF
QW19-22	8.6	9.0	OFF
QW23,24	3.9	4.0	OFF
QW25	11.0	11.0	OFF
QW26	7.9	8.0	OFF
QW27	5.0	5.0	OFF
QW28	6.8	7.0	OFF
QW29,30	7.8	8.0	OFF
QW31,32	8.8	9.0	OFF
QW33,34	15.7	16.0	OFF

O/TEMP. I/L

QW 9-15
QW16-18
QW19-22
QW23-24
QW27-28
QW29-30
QW31-32
QW33-34

Iron Core Magnets

QW 9 S18 X1,V1 QW 10 QW 11 QW 12 QW 13 QW 14 QW 15 S18 X2,V2 QW 16 QW 17 QW 18 QW 19 S19 X1,V1 QW 20 QW 21 QW 22 QW 23 S19 X2,V2 QW 24 QW 25 QW 26 S110 X1,V1 QW 27 QW 28 S110 X2,V2 QW 29 QW 30 S111 X1,V1 QW 31 QW 32 S111 X2,V2 QW 33 QW 34

MAGNET POSITION AS THEY APPEAR ON THE ACCELERATOR

SYS GUN MOD MG1 MG2 MG3 POS RF VAC HTR W1 W2



ELECTRON mode: RF

Applications Places System 2:16 PM

RADIOFREQUENCY

AC ON RDY FOR HV ENABLE Vacuum Valves Open Magnet Ramping Complete

ENABLED **MOD/RF ON** **MOD/RF OFF**

ENABLED **INJECTOR TRIGGER ON** **INJECTOR TRIGGER OFF**

RF DRIVE SUMMARY		RF AMPLIFIER STATUS			
		A	B	C	D
ON LINE	<input checked="" type="checkbox"/>				
AUX OK	<input checked="" type="checkbox"/>				
DRIVE RDY	<input checked="" type="checkbox"/>				
HV O/I	<input checked="" type="checkbox"/>				
DRIVE FAULT	<input checked="" type="checkbox"/>				

FIRST FAULT STATUS

Sub-System:

Component:

SYSTEM RESET SYSTEM FAULT

Gun Fault Display:

Gun Filament is ramping

2.8559100000000E+09 GHZ

SYNTHESIZER MHZ

Loaded

RF DRIVE A
PB,B,E1,CS,P1

Power %: PHASE DEG:

RF DRIVE B
E2-E5

Power %: PHASE DEG:

RF DRIVE C
P2-P5

Power %: PHASE DEG:

RF DRIVE D
P6-P9

Power %: PHASE DEG:

OPERATING
SET
Ramp Set
Loaded

I.Pump Current:

I.Pump Current:

Power (%)

BUNCHER	PBUNCHER
<input type="text" value="49.0"/>	<input type="text" value="66.7"/>
SET <input type="text" value="49.0"/>	SET <input type="text" value="67.0"/>
Loaded <input type="text" value="49.0"/>	Loaded <input type="text" value="67.0"/>

PHASE SHIFTERS (Degrees)

BUNCHER	PBUNCHER	CS,P1 (E1)
<input type="text" value="155.9"/>	<input type="text" value="313.2"/>	<input type="text" value="255.9"/>
SET <input type="text" value="55.0"/>	SET <input type="text" value="120.0"/>	SET <input type="text" value="254.0"/>
Loaded <input type="text" value="55.0"/>	Loaded <input type="text" value="120.0"/>	Loaded <input type="text" value="254.0"/>

LabVIEW (13) Starting Take Screenshot



ELECTRON mode: VAC

Applications Places System 2:24 PM

VACUUM

AC ON Vacuum Valves Open ENABLED **MOD/RF ON** **MOD/RF OFF**

Gun Fault Display

Sub-System

Component

RF Power is ramping Gun Filament is ramping

SYSTEM RESET SYSTEM FAULT

I.G. # 1	I.G. # 2	I.G. # 3	VPS # 1 E GUN V1/GUN	VPS # 3 P1 SPLITTER E1	VPS # 4 E1	VPS # 5 E2 IN	VPS # 6 E3 IN	VPS # 7 E4 IN	VPS # 8 E5 IN	VPS # 9 E5 OUT	VPS # 10 PC IN
500.91	2.82	1.15	0.00	0.00	0.82	0.00	4.02	0.46	0.03	0.02	5.47
<input checked="" type="checkbox"/>											

VPS # 11	I.P. # 12 POSITRON CONVERTER	VPS # 13	VPS # 14 P1 OUT	VPS # 15 P2 IN	VPS # 16 P3 IN	VPS # 17 P4 IN	VPS # 18 P5 IN	VPS # 19 P6 IN	VPS # 20 P7 IN	VPS # 21 P8 IN	VPS # 22 P9 IN
1.80	0.28	0.04	9.54	5.95	1.63	1.40	7.11	0.00	0.57	0.21	0.00
<input checked="" type="checkbox"/>											

VPS # 23 P9 OUT	VPS # 24 RF WG E1-SHF	VPS # 25 RF WG CS-P1	VPS # 26 RF WG E2-E5	VPS # 27 RF WG P2-P5	VPS # 28 RF WG P6-P9	VPS # 29 ELBOW A	VPS # 30 ELBOW B	VPS # 31 ELBOW C	VPS # 32 ELBOW D	VPS # 33 CAP SEC	VPS # 34 KLY A
0.00	2.45	0.06	4.80	11.24	1.22	0.00	0.00	4.63	1.67	1.65	0.51
<input checked="" type="checkbox"/>											

VPS # 35 KLY B	VPS # 36 KLY C	VPS # 37 KLY D	VPS # 38 SLED B OUT	VPS # 39 SLED A OUT	VPS # 40 SLED C OUT	VPS # 41 SLED D OUT
1.30	0.21	2.77	1.64	0.36	4.64	0.00
<input checked="" type="checkbox"/>						

VAC VALVE MONITOR AND CONTROL

	1	2	3	4	5	6
OPEN	<input checked="" type="checkbox"/>					
CTRL SW	<input type="checkbox"/>					
CLOSE	<input type="checkbox"/>					
	E GUN	E1 - E2	E5 OUT	P1 - P2	P5 -P6	P9 OUT

Print Vacuum Values

SYS GUN MOD MG1 MG2 MG3 POS RF VAC HTR W1 W2



ELECTRON mode: HTR

Applications Places System 8:45 AM

SECTION'S TEMPERATURE

AC ON

Gun Fault Display

FIRST FAULT STATUS

Sub-System

Component

SYSTEM RESET SYSTEM FAULT

	P.B. / B	E1	E2	E3	E4	E5	CS	P1	P2	P3	P4	P5	P6	P7	P8	P9
TEMP - DEG C	44.03	43.84	44.20	43.80	44.20	44.26	43.73	44.22	43.81	44.10	44.03	44.18	43.73	43.99	43.48	44.29
SET POINT %	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Control buttons: SYS, GUN, MOD, MG1, MG2, MG3, POS, RF, VAC, HTR, W1, W2



POSITRON mode: SYSTEM

Applications Places System 2:04 PM

SYSTEM

Stop e+
Manual Switch

AC ON ● RDY FOR HV ENABLE ● Vacuum Valves Open ● Magnet Ramping ● Auto Switch ■

SYSTEM SUMMARY

OK ● **AUX ON** **AUX OFF**

ENABLED ● **MOD/RF ON** **MOD/RF OFF**

ENABLED ● **INJECTOR TRIGGER ON** **INJECTOR TRIGGER OFF**

LOAD SETUP ● **ENABLED** **SAVE SETUP**

Print Current Set **Print Saved Setup**

FIRST FAULT STATUS

Sub-System
Component

RF Power is ramping Gun Filament is ramping

SYSTEM RESET ● **SYSTEM FAULT**

● Show Camac Signals

● Pos Conv Target

INJECTOR	*****LINE MODULATORS*****				*****MAGNETS*****			POSITRON MODULATOR	RF SYS	TRIGGER CHASSIS	VACUUM	WATER	
	A	B	C	D	#1	POS	#2						
●	ON LINE												
●	AUX ON OK												
●	RDY FOR HV ENABLE												
●	RDY FOR HV ON												
●	RDY FOR TRIGGER												

Electron Beam Operation Since Startup
06:10 hh:mm

Hardware Loop Rate
1.65 Hz

Positron Beam Operation Since Startup
16:21 hh:mm

User Loop Rate
0.59 Hz

Last Loaded Set
Pos_prova_BPM12_11_2014

Last Saved Set
/home/dante/LinacControls/Linac/setups/
Primary POSITRON_50Hz_Mode Setup

SYS
GUN
MOD
MG1
MG2
MG3
POS
RF
VAC
HTR
W1
W2

LabVIEW (13) Starting Take Screenshot



POSITRON mode: GUN

Applications Places System 2:05 PM

GUN

AC ON RDY FOR HV ENABLE Vacuum Valves Open Magnet Ramping Complete **e+**

Gun Fault Display

FIRST FAULT STATUS
Sub-System:
Component:
SYSTEM RESET SYSTEM FAULT

ENABLED **MOD/RF ON** **MOD/RF OFF**

ENABLED **INJECTOR TRIGGER ON** **INJECTOR TRIGGER OFF**

INJECTOR SUMMARY

- ON LINE
- AUX ON OK
- READY FOR HV ENABLE
- READY FOR HV ON
- READY FOR TRIGGER
- INJECTOR TRIGGER ON
- SAFETY SWITCH OPEN
- SAFETY SWITCH CLOSED

GUN VAC VPS1: nA
GUN VAC VPS2: nA

RF Power is ramping

FILAMENT

	Voltage	Current	HV	Ave I	Bias	Pulse Width	Pulse Amplitude
OPERATING	<input type="text" value="5.44"/> V	<input type="text" value="5.41"/> A	<input type="text" value="88.0"/> KVDC	<input type="text" value="0.00"/> mA	<input type="text" value="142.0"/> VDC	<input type="text" value="10.0"/> nsec	<input type="text" value="540"/> V
SET			<input type="text" value="90.0"/>		<input type="text" value="142.0"/>	<input type="text" value="10.0"/>	<input type="text" value="540"/>
Loaded			<input type="text" value="90.0"/>		<input type="text" value="142.0"/>		

SYS GUN MOD MG1 MG2 MG3 POS RF VAC HTR W1 W2

LabVIEW (13) Starting Take Screenshot



POSITRON mode: MOD

Applications Places System 1:52 PM

MODULATOR'S

FIRST FAULT STATUS

AC ON RDY FOR HV ENABLE Vacuum Valves Open Magnet Ramping Complete

e+

Gun Fault Display

Sub-System

Component

ENABLED MOD/RF ON MOD/RF OFF

ENABLED INJECTOR TRIGGER ON INJECTOR TRIGGER OFF

I.Pump Current

RF Power is ramping Gun Filament is ramping

SYSTEM RESET SYSTEM FAULT

	A	B	C	D
ON LINE	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
AUX ON OK	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
RDY FOR HV ENABLE	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
RDY FOR HV	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
RDY FOR TRIGGER	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
RUNNING	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
KLYSTRON HV	<input type="text" value="303"/>	<input type="text" value="302"/>	<input type="text" value="304"/>	<input type="text" value="304"/>
SET POINT HV	<input type="text" value="34.2"/>	<input type="text" value="33.7"/>	<input type="text" value="30.5"/>	<input type="text" value="31.5"/>
Loaded Setpoint	<input type="text" value="34.2"/>	<input type="text" value="33.7"/>	<input type="text" value="30.5"/>	<input type="text" value="31.5"/>
Temperature Deg. C	<input type="text" value="27.4"/>	<input type="text" value="-178.1"/>	<input type="text" value="25.2"/>	<input type="text" value="727.0"/>

KLY FILAMENT KLY VACUUM KLY PULSE CURRENT KLY RF REFL POWER W.G. ARC KLY WATER FLOW KLY FOCUS POWER KLY BODY DELTA T CORE BIAS PFN CHG CURRENT FILTER CAP VOLTAGE CLIPPER CURRENT DEQUE CURRENT HVPS I ENCLOSURE

SYS GUN MOD MG1 MG2 MG3 POS RF VAC HTR W1 W2

LabVIEW (13) Starting Take Screenshot



POSITRON mode: MAG.1

Applications Places System 1:52 PM

LOW ENERGY MAGNETS

AC ON ● Magnet Ramping Complete ●

RF Power is ramping Gun Filament is ramping

MOD/RF ON MOD/RF OFF

INJECTOR TRIGGER ON INJECTOR TRIGGER OFF

+ +

FIRST FAULT STATUS Sub-System

Gun Fault Display

Component

SYSTEM RESET ● SYSTEM FAULT

FEEDBACKS				SET I AMP	Start I AMP	Ganged
BC	0.00	0.00	0.00	OFF		
FC	0.00	0.00	0.00	OFF		
HC1	26.27	27.00	27.00	OFF		
HC2	31.94	32.00	32.00	OFF		
HC/H1,H2	59.42	60.00	60.00	OFF		
HC3	14.63	15.00	15.00	OFF		
HC4	29.79	30.00	30.00	OFF		
HC5	19.73	20.00	20.00	OFF		
HC6	29.86	30.00	30.00	OFF		
HC7	20.03	20.00	20.00	OFF		
HC8,9,10	9.60	10.00	10.00	OFF		
HC11,12,13	4.48	5.00	5.00	OFF		
UFS 1,2	240.40	240.00	240.00	OFF		
UFS 3,4,6	208.25	210.00	210.00	OFF		
UFS 5,7,8	214.15	215.00	215.00	OFF		

Set All Magnets to Zero! !

Set Start I to Current Set Points !

Revert to Start I Values !

NO

Apply Magnet Group Scaling

Ganged Quadrupole Scaling (Times)

0.0 1.0 2.0 3.0

Ganged Air Core Scaling (Times)

0.0 1.0 2.0 3.0

FEEDBACKS				SET I AMP	Start I AMP	Ganged
QA1	1.23	1.25	1.25	OFF		
QA2	1.48	1.80	1.80	OFF		
QW1	2.39	2.50	2.50	OFF		
QW2	4.83	5.00	5.00	OFF		
QW/3,4	8.71	9.00	9.00	OFF		
QW/5,6	9.49	10.00	10.00	OFF		
QW7	8.76	9.00	9.00	OFF		
QW8	14.60	15.00	15.00	OFF		
QC/1,3	2.86	2.99	2.99	OFF		
QC2	4.44	4.53	4.53	OFF		

UFS DC Enable ●

O/TEMP. I/L

ALL H.C.'s ●

QW 1-4,5-8 ●

QA1,2 ●

QC 1-QC 3 ●

Target + Flux Conc. ●

UFS 1-5 ●

UFS 6-8 ●

AIR CORE MAGNETS

BC	FC	HC 1	HC 2	HC H1	HC H2	HC 3	HC 4	S11	HC 5	HC 6	HC 7	HC 8	HC 9	HC 10	HC 11	HC 12	HC 13	QA 1	QA 2	S12	QA 3	QA 4	S13	QA 5	QA 6	S14	QA 7	QA 8	S15	QA 9	QA 10	S16	QA 11	QA 12	S17	QA 13	QA 14	S18	QA 15	QA 16	S19	QA 17	QA 18	S20	QA 19	QA 20	S21	QA 21	QA 22	S22	QA 23	QA 24	S23	QA 25	QA 26	S24	QA 27	QA 28	S25	QA 29	QA 30	S26	QA 31	QA 32	S27	QA 33	QA 34	S28	QA 35	QA 36	S29	QA 37	QA 38	S30	QA 39	QA 40	S31	QA 41	QA 42	S32	QA 43	QA 44	S33	QA 45	QA 46	S34	QA 47	QA 48	S35	QA 49	QA 50	S36	QA 51	QA 52	S37	QA 53	QA 54	S38	QA 55	QA 56	S39	QA 57	QA 58	S40	QA 59	QA 60	S41	QA 61	QA 62	S42	QA 63	QA 64	S43	QA 65	QA 66	S44	QA 67	QA 68	S45	QA 69	QA 70	S46	QA 71	QA 72	S47	QA 73	QA 74	S48	QA 75	QA 76	S49	QA 77	QA 78	S50	QA 79	QA 80	S51	QA 81	QA 82	S52	QA 83	QA 84	S53	QA 85	QA 86	S54	QA 87	QA 88	S55	QA 89	QA 90	S56	QA 91	QA 92	S57	QA 93	QA 94	S58	QA 95	QA 96	S59	QA 97	QA 98	S60	QA 99	QA 100	S61	QA 101	QA 102	S62	QA 103	QA 104	S63	QA 105	QA 106	S64	QA 107	QA 108	S65	QA 109	QA 110	S66	QA 111	QA 112	S67	QA 113	QA 114	S68	QA 115	QA 116	S69	QA 117	QA 118	S70	QA 119	QA 120	S71	QA 121	QA 122	S72	QA 123	QA 124	S73	QA 125	QA 126	S74	QA 127	QA 128	S75	QA 129	QA 130	S76	QA 131	QA 132	S77	QA 133	QA 134	S78	QA 135	QA 136	S79	QA 137	QA 138	S80	QA 139	QA 140	S81	QA 141	QA 142	S82	QA 143	QA 144	S83	QA 145	QA 146	S84	QA 147	QA 148	S85	QA 149	QA 150	S86	QA 151	QA 152	S87	QA 153	QA 154	S88	QA 155	QA 156	S89	QA 157	QA 158	S90	QA 159	QA 160	S91	QA 161	QA 162	S92	QA 163	QA 164	S93	QA 165	QA 166	S94	QA 167	QA 168	S95	QA 169	QA 170	S96	QA 171	QA 172	S97	QA 173	QA 174	S98	QA 175	QA 176	S99	QA 177	QA 178	S100	QA 179	QA 180	S101	QA 181	QA 182	S102	QA 183	QA 184	S103	QA 185	QA 186	S104	QA 187	QA 188	S105	QA 189	QA 190	S106	QA 191	QA 192	S107	QA 193	QA 194	S108	QA 195	QA 196	S109	QA 197	QA 198	S110	QA 199	QA 200	S111	QA 201	QA 202	S112	QA 203	QA 204	S113	QA 205	QA 206	S114	QA 207	QA 208	S115	QA 209	QA 210	S116	QA 211	QA 212	S117	QA 213	QA 214	S118	QA 215	QA 216	S119	QA 217	QA 218	S120	QA 219	QA 220	S121	QA 221	QA 222	S122	QA 223	QA 224	S123	QA 225	QA 226	S124	QA 227	QA 228	S125	QA 229	QA 230	S126	QA 231	QA 232	S127	QA 233	QA 234	S128	QA 235	QA 236	S129	QA 237	QA 238	S130	QA 239	QA 240	S131	QA 241	QA 242	S132	QA 243	QA 244	S133	QA 245	QA 246	S134	QA 247	QA 248	S135	QA 249	QA 250	S136	QA 251	QA 252	S137	QA 253	QA 254	S138	QA 255	QA 256	S139	QA 257	QA 258	S140	QA 259	QA 260	S141	QA 261	QA 262	S142	QA 263	QA 264	S143	QA 265	QA 266	S144	QA 267	QA 268	S145	QA 269	QA 270	S146	QA 271	QA 272	S147	QA 273	QA 274	S148	QA 275	QA 276	S149	QA 277	QA 278	S150	QA 279	QA 280	S151	QA 281	QA 282	S152	QA 283	QA 284	S153	QA 285	QA 286	S154	QA 287	QA 288	S155	QA 289	QA 290	S156	QA 291	QA 292	S157	QA 293	QA 294	S158	QA 295	QA 296	S159	QA 297	QA 298	S160	QA 299	QA 300	S161	QA 301	QA 302	S162	QA 303	QA 304	S163	QA 305	QA 306	S164	QA 307	QA 308	S165	QA 309	QA 310	S166	QA 311	QA 312	S167	QA 313	QA 314	S168	QA 315	QA 316	S169	QA 317	QA 318	S170	QA 319	QA 320	S171	QA 321	QA 322	S172	QA 323	QA 324	S173	QA 325	QA 326	S174	QA 327	QA 328	S175	QA 329	QA 330	S176	QA 331	QA 332	S177	QA 333	QA 334	S178	QA 335	QA 336	S179	QA 337	QA 338	S180	QA 339	QA 340	S181	QA 341	QA 342	S182	QA 343	QA 344	S183	QA 345	QA 346	S184	QA 347	QA 348	S185	QA 349	QA 350	S186	QA 351	QA 352	S187	QA 353	QA 354	S188	QA 355	QA 356	S189	QA 357	QA 358	S190	QA 359	QA 360	S191	QA 361	QA 362	S192	QA 363	QA 364	S193	QA 365	QA 366	S194	QA 367	QA 368	S195	QA 369	QA 370	S196	QA 371	QA 372	S197	QA 373	QA 374	S198	QA 375	QA 376	S199	QA 377	QA 378	S200	QA 379	QA 380	S201	QA 381	QA 382	S202	QA 383	QA 384	S203	QA 385	QA 386	S204	QA 387	QA 388	S205	QA 389	QA 390	S206	QA 391	QA 392	S207	QA 393	QA 394	S208	QA 395	QA 396	S209	QA 397	QA 398	S210	QA 399	QA 400	S211	QA 401	QA 402	S212	QA 403	QA 404	S213	QA 405	QA 406	S214	QA 407	QA 408	S215	QA 409	QA 410	S216	QA 411	QA 412	S217	QA 413	QA 414	S218	QA 415	QA 416	S219	QA 417	QA 418	S220	QA 419	QA 420	S221	QA 421	QA 422	S222	QA 423	QA 424	S223	QA 425	QA 426	S224	QA 427	QA 428	S225	QA 429	QA 430	S226	QA 431	QA 432	S227	QA 433	QA 434	S228	QA 435	QA 436	S229	QA 437	QA 438	S230	QA 439	QA 440	S231	QA 441	QA 442	S232	QA 443	QA 444	S233	QA 445	QA 446	S234	QA 447	QA 448	S235	QA 449	QA 450	S236	QA 451	QA 452	S237	QA 453	QA 454	S238	QA 455	QA 456	S239	QA 457	QA 458	S240	QA 459	QA 460	S241	QA 461	QA 462	S242	QA 463	QA 464	S243	QA 465	QA 466	S244	QA 467	QA 468	S245	QA 469	QA 470	S246	QA 471	QA 472	S247	QA 473	QA 474	S248	QA 475	QA 476	S249	QA 477	QA 478	S250	QA 479	QA 480	S251	QA 481	QA 482	S252	QA 483	QA 484	S253	QA 485	QA 486	S254	QA 487	QA 488	S255	QA 489	QA 490	S256	QA 491	QA 492	S257	QA 493	QA 494	S258	QA 495	QA 496	S259	QA 497	QA 498	S260	QA 499	QA 500	S261	QA 501	QA 502	S262	QA 503	QA 504	S263	QA 505	QA 506	S264	QA 507	QA 508	S265	QA 509	QA 510	S266	QA 511	QA 512	S267	QA 513	QA 514	S268	QA 515	QA 516	S269	QA 517	QA 518	S270	QA 519	QA 520	S271	QA 521	QA 522	S272	QA 523	QA 524	S273	QA 525	QA 526	S274	QA 527	QA 528	S275	QA 529	QA 530	S276	QA 531	QA 532	S277	QA 533	QA 534	S278	QA 535	QA 536	S279	QA 537	QA 538	S280	QA 539	QA 540	S281	QA 541	QA 542	S282	QA 543	QA 544	S283	QA 545	QA 546	S284	QA 547	QA 548	S285	QA 549	QA 550	S286	QA 551	QA 552	S287	QA 553	QA 554	S288	QA 555	QA 556	S289	QA 557	QA 558	S290	QA 559	QA 560	S291	QA 561	QA 562	S292	QA 563	QA 564	S293	QA 565	QA 566	S294	QA 567	QA 568	S295	QA 569	QA 570	S296	QA 571	QA 572	S297	QA 573	QA 574	S298	QA 575	QA 576	S299	QA 577	QA 578	S300	QA 579	QA 580	S301	QA 581	QA 582	S302	QA 583	QA 584	S303	QA 585	QA 586	S304	QA 587	QA 588	S305	QA 589	QA 590	S306	QA 591	QA 592	S307	QA 593	QA 594	S308	QA 595	QA 596	S309	QA 597	QA 598	S310	QA 599	QA 600	S311	QA 601	QA 602	S312	QA 603	QA 604	S313	QA 605	QA 606	S314	QA 607	QA 608	S315	QA 609	QA 610	S316	QA 611	QA 612	S317	QA 613	QA 614	S318	QA 615	QA 616	S319	QA 617	QA 618	S320	QA 619	QA 620	S321	QA 621	QA 622	S322	QA 623	QA 624	S323	QA 625	QA 626	S324	QA 627	QA 628	S325	QA 629	QA 630	S326	QA 631	QA 632	S327	QA 633	QA 634	S328	QA 635	QA 636	S329	QA 637	QA 638	S330	QA 639	QA 640	S331	QA 641	QA 642	S332	QA 643	QA 644	S333	QA 645	QA 646	S334	QA 647	QA 648	S335	QA 649	QA 650	S336	QA 651	QA 652	S337	QA 653	QA 654	S338	QA 655	QA 656	S339	QA 657	QA 658	S340	QA 659	QA 660	S341	QA 661	QA 662	S342	QA 663	QA 664	S343	QA 665	QA 666	S344	QA 667	QA 668	S345	QA 669	QA 670	S346	QA 671	QA 672	S347	QA 673	QA 674	S348	QA 675	QA 676	S349	QA 677	QA 678	S350	QA 679	QA 680	S351	QA 681	QA 682	S352	QA 683	QA 684	S353	QA 685	QA 686	S354	QA 687	QA 688	S355	QA 689	QA 690	S356	QA 691	QA 692	S357	QA 693	QA 694	S358	QA 695	QA 696	S359	QA 697	QA 698	S360	QA 699	QA 700	S361	QA 701	QA 702	S362	QA 703	QA 704	S363	QA 705	QA 706	S364	QA 707	QA 708	S365	QA 709	QA 710	S366	QA 711	QA 712	S367	QA 713	QA 714	S368	QA 715	QA 716
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POSITRON mode: MAG. 2

Applications Places System 1:53 PM

IR MAGNETS

AC ON ● Magnet Ramping Complete ●

RF Power is ramping ■ Gun Filament is ramping ■

MOD/RF TRIGGER ON MOD/RF TRIGGER OFF

INJECTOR TRIGGER ON INJECTOR TRIGGER OFF

e+

Gun Fault Display

Set All Magnets to Zero! !

Set Start I to Current Set Points !

Revert to Start I Values !

NO

Apply Magnet Group Scaling

FIRST FAULT STATUS

Sub-System

Component

SYSTEM RESET ● SYSTEM FAULT

● UFS DC Enable

O/TEMP. I/L

● QB1-QA3,4

● DBM1-4

● QB2-QA5,6

FEEDBACKS	SET I AMP	Start I AMP	Ganged
UFS 1,2 240.42	240.00	240.00	OFF
UFS 3,4,6 208.83	210.00	210.00	OFF
UFS 5,7,8 213.96	215.00	215.00	OFF

AIR CORE MAGNETS

Ganged Air Core Scaling (Times)

0.0 1.0 2.0 3.0 1.00

Ganged Quadrupole Scaling (Times)

0.0 1.0 2.0 3.0 1.00

FEEDBACKS	SET I AMP	Start I AMP	Ganged
QA3,4 3.24	3.20	3.20	OFF
QB1 3.49	3.56	3.56	OFF
DBM1-4 6.87	7.00	7.00	OFF
QA5 5.09	5.16	5.16	OFF
QA6 1.31	1.35	1.35	OFF
QB2 4.45	4.50	4.50	OFF

Iron Core Magnets

S14			S15			S16			S17								
X1,V1	X2,V2																
UFS 1	UFS 2	UFS 3	UFS 4	UFS 5	UFS 6	UFS 7	UFS 8	QA 3	QB 1	QA 4	DBM1	DBM2	DBM3	DBM4	QA 5	QB 2	QA 6

MAGNET POSITION AS THEY APPEAR ON THE ACCELERATOR

SYS
GUN
MOD
MG1
MG2
MG3
POS
RF
VAC
HTR
W1
W2

LabVIEW (13)

Starting Take Screenshot



POSITRON mode: MAG. 3

Applications Places System 2:01 PM

HIGH ENERGY MAGNETS

AC ON Magnet Ramping Complete

RF Power is ramping Gun Filament is ramping

MOD/RF ON MOD/RF OFF

INJECTOR TRIGGER ON INJECTOR TRIGGER OFF

Gun Fault Display

FIRST FAULT STATUS
Sub-System
Component

SYSTEM RESET SYSTEM FAULT

Set All Magnets to Zero! (Red !)

Set Start I to Current Set Points (Orange !)

Revert to Start I Values (Yellow !)

Apply Magnet Group Scaling (NO)

Ganged Quadrupole Scaling (Times)
0.0 1.0 2.0 3.0 1.00

FEEDBACKS	SET I AMP	Start I AMP	Ganged
QW9	6.7	7.0	OFF
QW10	20.3	21.0	OFF
QW11-14	14.0	14.5	OFF
QW15	15.6	16.0	OFF
QW16	18.1	18.5	OFF
QW17	10.3	20.5	OFF
QW18	12.0	12.5	OFF
QW19-22	15.5	16.0	OFF
QW23,24	14.6	15.0	OFF
QW25	10.5	10.5	OFF
QW26	11.3	11.5	OFF
QW27	16.2	16.5	OFF
QW28	14.6	15.0	OFF
QW29,30	20.0	20.5	OFF
QW31,32	18.2	18.5	OFF
QW33,34	20.5	21.0	OFF

O/TEMP. I/L

QW 9-15
QW16-18
QW19-22
QW23-24
QW27-28
QW29-30
QW31-32
QW33-34

Iron Core Magnets

QW 9 S18 X1,V1 QW 10 QW 11 QW 12 QW 13 QW 14 QW 15 S18 X2,V2 QW 16 QW 17 QW 18 QW 19 S19 X1,V1 QW 20 QW 21 QW 22 QW 23 S19 X2,V2 QW 24 QW 25 QW 26 S110 X1,V1 QW 27 QW 28 S110 X2,V2 QW 29 QW 30 S111 X1,V1 QW 31 QW 32 S111 X2,V2 QW 33 QW 34

MAGNET POSITION AS THEY APPEAR ON THE ACCELERATOR

SYS GUN MOD MG1 MG2 MG3 POS RF VAC HTR W1 W2



POSITRON mode: POS

Applications Places System 2:03 PM

FLUX CONCENTRATOR

AC ON RDY FOR HV ENABLE Vacuum Valves Open Magnet Ramping Complete e+

Gun Fault Display

Sub-System

Component

RF Power is ramping Gun Filament is ramping

SYSTEM RESET SYSTEM FAULT

MOD/RF ON MOD/RF OFF

INJECTOR TRIGGER ON INJECTOR TRIGGER OFF

MODULATOR I/L STATUS

THY FIL	CAP BANK CHG	OUTPUT CURRENT	DISCHARGE CAP I	FWD THY 1 CURRENT	FWD THY 2 CURRENT	FWD THY 3 CURRENT	FWD THY 4 CURRENT
<input checked="" type="checkbox"/>							
FWD THY 5 CURRENT	FWD THY 6 CURRENT	FWD THY 7 CURRENT	FWD THY 8 CURRENT	REV THY 1 CURRENT	REV THY 2 CURRENT	AIR FLOW	ENCLOSURE
<input checked="" type="checkbox"/>							

MODULATOR SUMMARY

ON LINE

AUX OK OPERATING VOLTAGE- KVDC

RDY FOR HV ENABLE SET VOLTAGE FILTER CAP KVDC

RDY FOR HV Loaded

RDY FOR TRIG Temperature Deg. C

SYS GUN MOD MG1 MG2 MG3 POS RF VAC HTR W1 W2

LabVIEW (13) Starting Take Screenshot



POSITRON mode: RF

Applications Places System 1:51 PM

RADIOFREQUENCY

AC ON RDY FOR HV ENABLE Vacuum Valves Open Magnet Ramping Complete

ENABLED MOD/RF ON MOD/RF OFF

ENABLED INJECTOR TRIGGER ON INJECTOR TRIGGER OFF

RF DRIVE SUMMARY		RF AMPLIFIER STATUS			
		A	B	C	D
ON LINE	<input checked="" type="checkbox"/>				
AUX OK	<input checked="" type="checkbox"/>				
DRIVE RDY	<input checked="" type="checkbox"/>				
HV O/I	<input checked="" type="checkbox"/>				
DRIVE FAULT	<input checked="" type="checkbox"/>				

FIRST FAULT STATUS

Sub-System:

Component:

SYSTEM RESET SYSTEM FAULT

Gun Fault Display:

Gun Filament is ramping

2.8559100000000E+09 GHZ

SYNTHESIZER MHZ

Loaded

RF DRIVE A		RF DRIVE B		RF DRIVE C		RF DRIVE D		
Power %	PHASE DEG	Power %	PHASE DEG	Power %	PHASE DEG	Power %	PHASE DEG	
46.3	236.6	38.5	299.8	7.4	23.8	37.0	191.5	OPERATING
<input type="text" value="77.0"/>	<input type="text" value="237.0"/>	<input type="text" value="82.0"/>	<input type="text" value="300.0"/>	<input type="text" value="81.0"/>	<input type="text" value="23.6"/>	<input type="text" value="67.0"/>	<input type="text" value="192.0"/>	SET
<input type="text" value="77.0"/>	<input type="text" value="237.0"/>	<input type="text" value="82.0"/>	<input type="text" value="300.0"/>	<input type="text" value="81.0"/>	<input type="text" value="23.6"/>	<input type="text" value="67.0"/>	<input type="text" value="192.0"/>	Ramp Set
<input type="text" value="77.0"/>	<input type="text" value="237.0"/>	<input type="text" value="82.0"/>	<input type="text" value="300.0"/>	<input type="text" value="81.0"/>	<input type="text" value="23.6"/>	<input type="text" value="67.0"/>	<input type="text" value="192.0"/>	Loaded

I.Pump Current

I.Pump Current

Power (%)

BUNCHER	PBUNCHER
<input type="text" value="51.7"/>	<input type="text" value="67.0"/>
SET <input type="text" value="55.0"/>	SET <input type="text" value="70.0"/>
Loaded <input type="text" value="55.0"/>	Loaded <input type="text" value="70.0"/>

PHASE SHIFTERS (Degrees)

BUNCHER	PBUNCHER	CS,P1 (E1)
<input type="text" value="152.2"/>	<input type="text" value="313.8"/>	<input type="text" value="242.0"/>
SET <input type="text" value="60.0"/>	SET <input type="text" value="153.0"/>	SET <input type="text" value="240.0"/>
Loaded <input type="text" value="60.0"/>	Loaded <input type="text" value="153.0"/>	Loaded <input type="text" value="240.0"/>

LabVIEW (13) Starting Take Screenshot



Special thanks to
All the members of the DAFNE
LINAC group