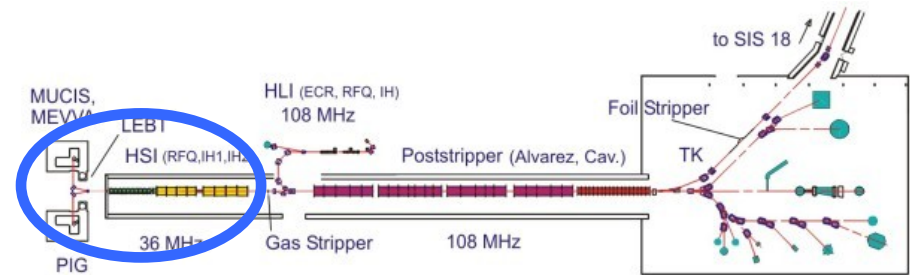
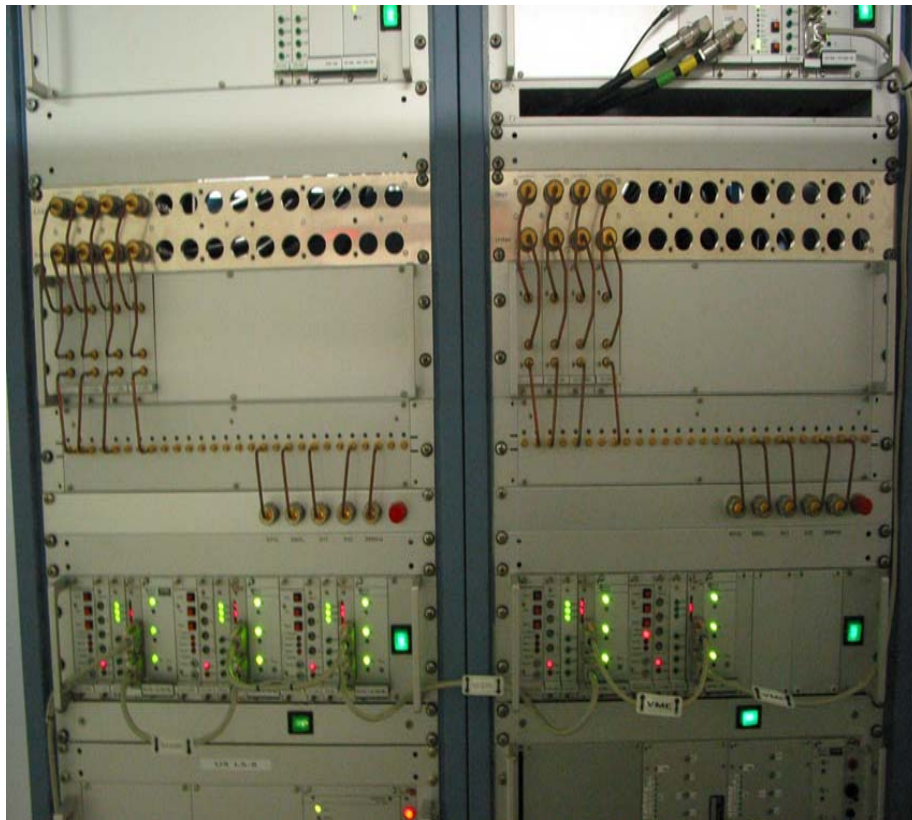


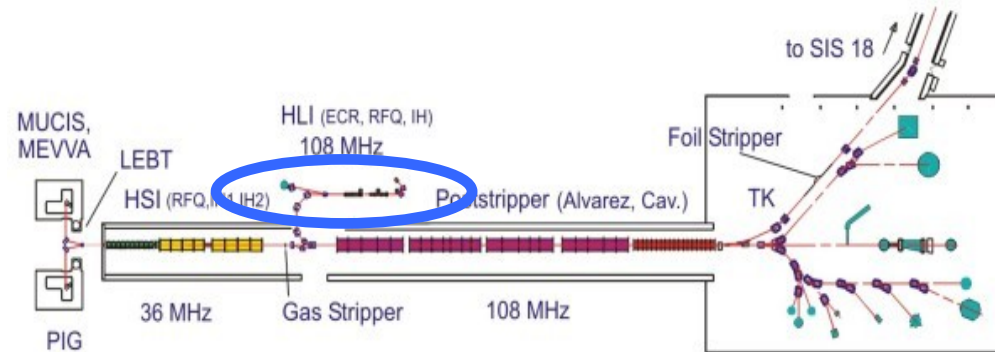
- Installations
- Blockdiagram of BPM setup
- Operating
- TOF measurement
- Characteristics of pickups & amplifiers
- Connectors & Cables

Installation for injector HSI



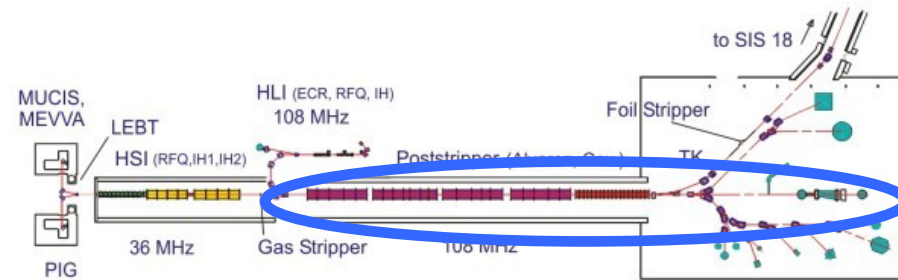
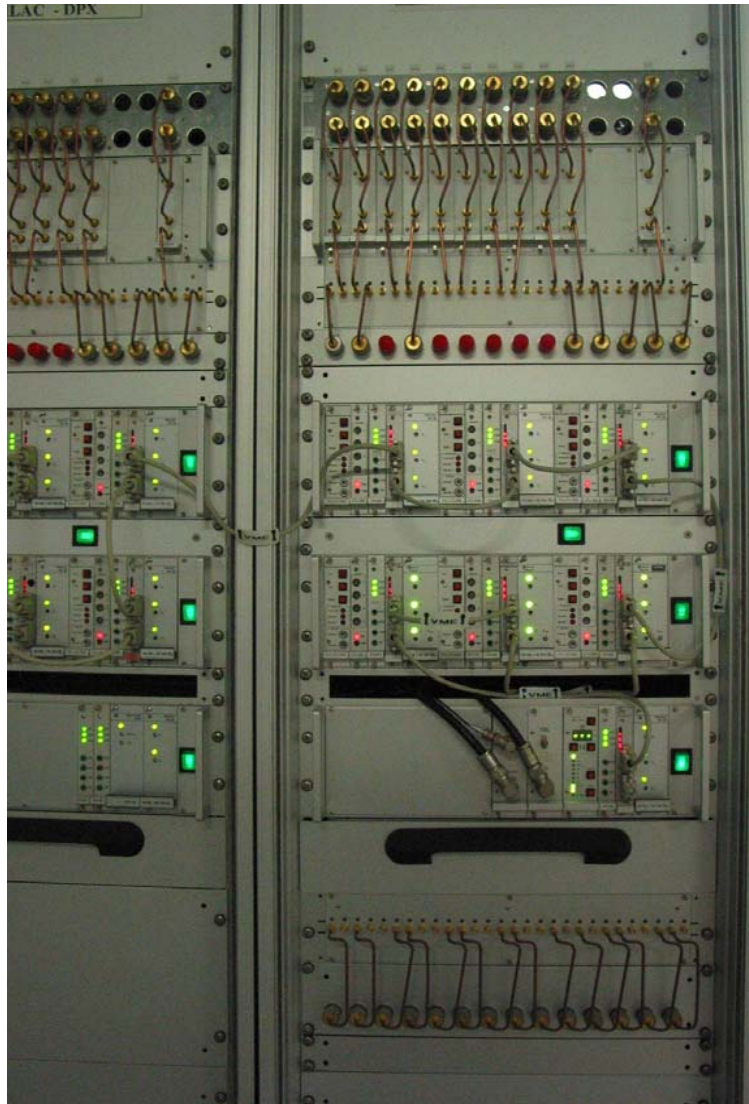
capabilities:
time of flight
beam position
beam intensity
rf-phase relation

Installation for injector HLI



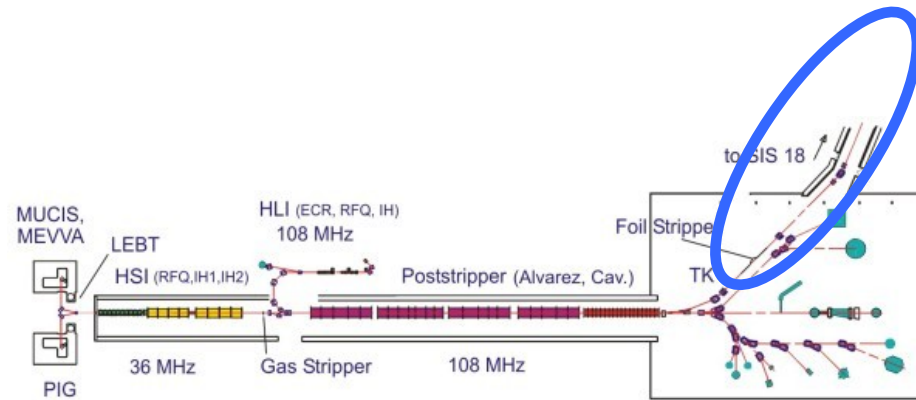
capabilities:
time of flight
rf-phase relation
rf-macropuls demodulation

Installation for poststripper and experiment



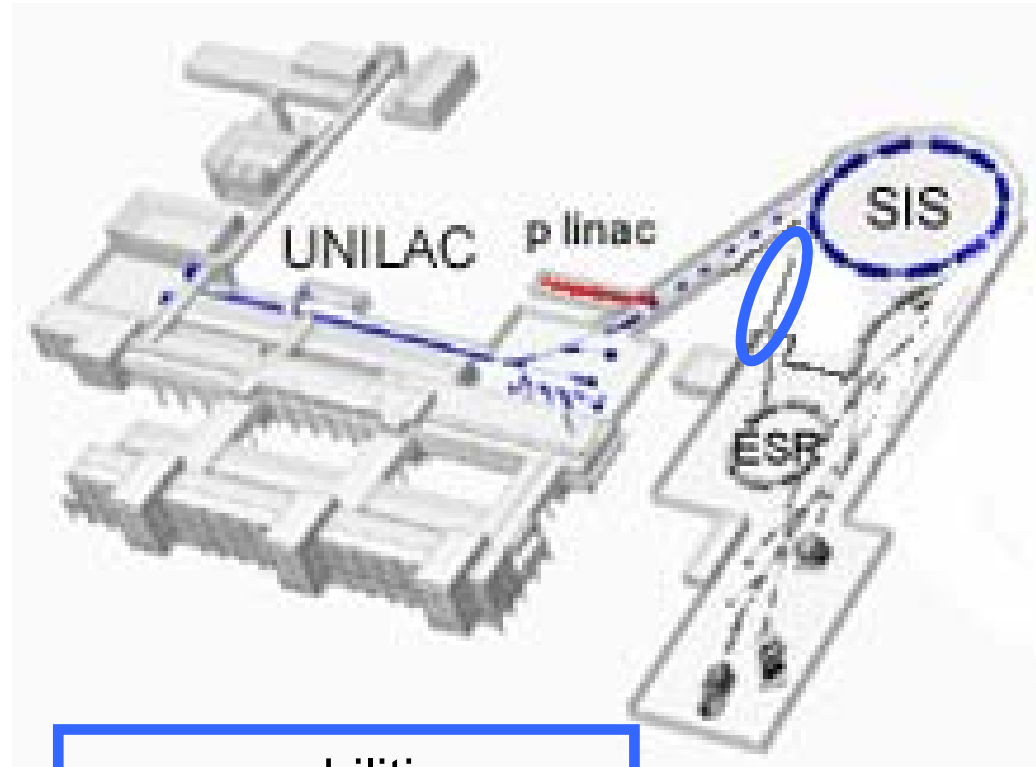
capabilities:
time of flight
beam position
rf-phase relation

Installation for transfer line



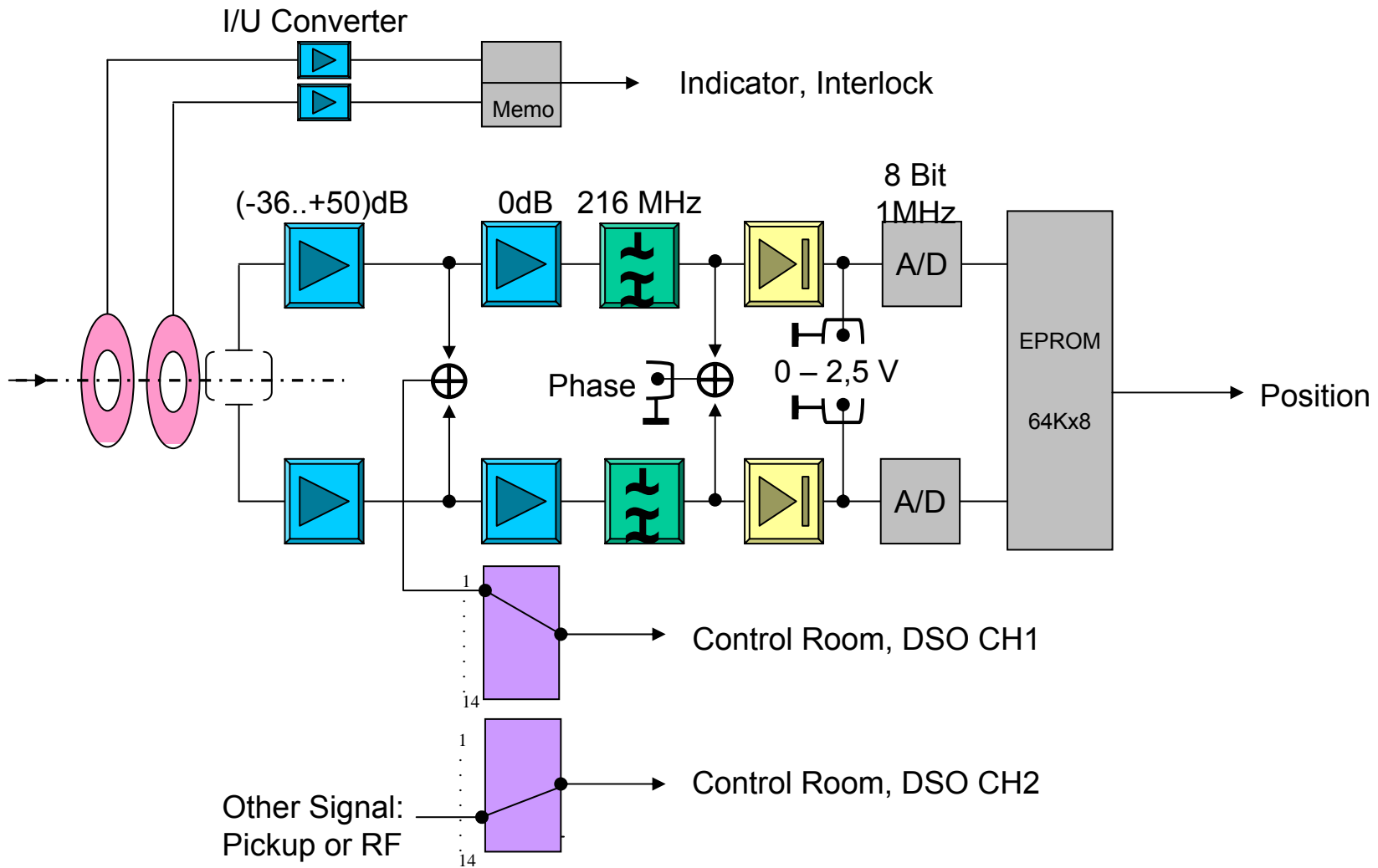
capabilities:
time of flight
beam position

Installation for Hitrap



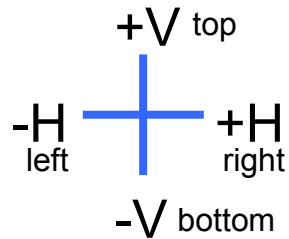
capabilities:
time of flight
rf-phase relation

Blockdiagram of BPM setup



Operating workplace (Unilac)

convention:



LC display

LC display



online positionmonitor

bunch observation

(Poststripper & Transfer Line)

bunch observation

(Injectors HSI & HLI)

auxiliary

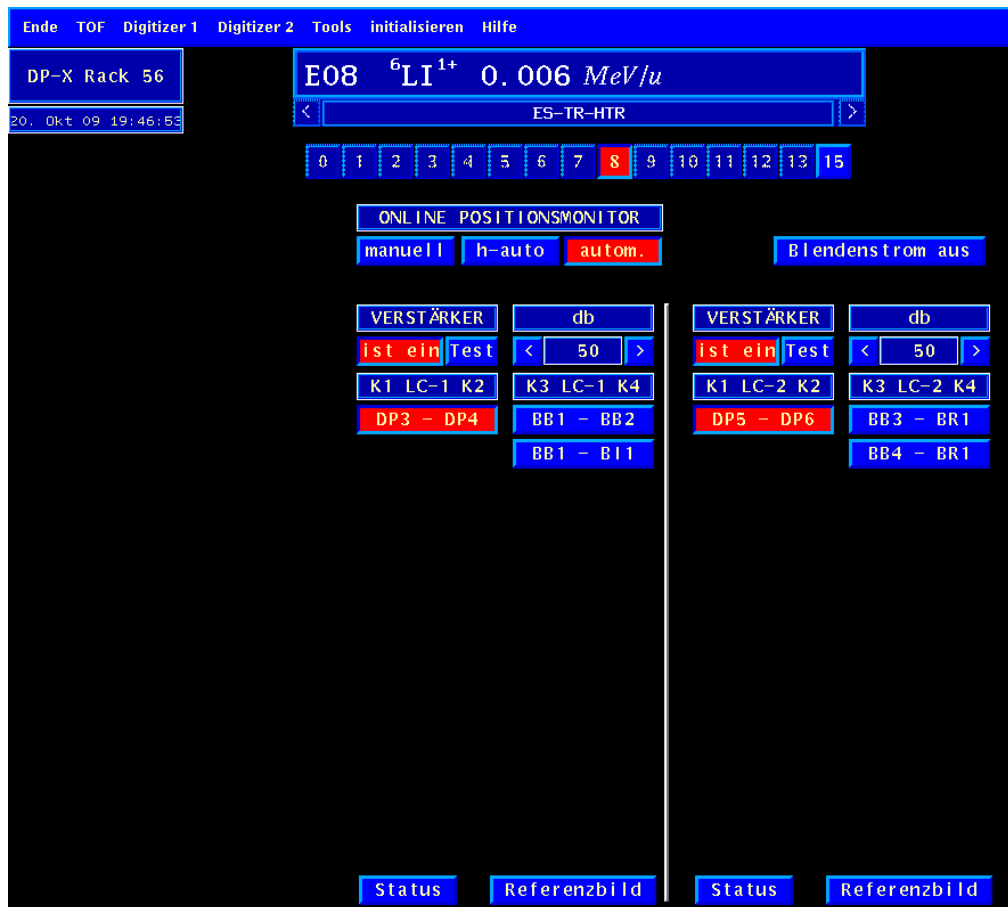
Operating program (Unilac)

The screenshot displays the Unilac operating program interface. At the top, it shows menu options: "Ende", "TOF", "Digitizer 1", "Digitizer 2", "Tools", "initialisieren", and "Hilfe". The main display area includes:

- DP-X Rack 1
- U08 ²³⁸U ⁷³⁺ 11.137 MeV/u
- 6. Dez 06 11:45:48
- UR-SU-TK
- A row of buttons numbered 0 to 15, with button 8 highlighted in red.
- TRIGGER section with buttons for SD, Chop-H, HF, Chop-TK, and Blendenstrom aus.
- ONLINE POSITIONSMONITOR section with buttons for manuell, h-auto, and autom.
- Three columns of VERSTÄRKER (amplifier) controls, each with a "db" value and a "Test" button. The first column shows a value of 26, the second 20, and the third 32.
- Trigg.Delay controls for D1 + Pos.Prestrripper, D2 + Pos.Poststrripper, and Positionsmonitor TK, each with a digital display and +/- buttons.
- Status and Referenzbild buttons for each section.

controlpanel for pickup selection,
 controlled sections:
 injector, poststripper, transfere line
 pulldown menue for TOF calculation,
 pulldown menue for DSO control,
 pickup menue depending on beamline,
 automatic gain control for BPM,
 manual gain control for selected pickups
 variable propagation delay for trigger

Operating program (Hitrap)



program modified and adapted to operate Hitrap-pickups

DSO control and measurements via „remote desktop“

Operating program (reference picture)

Ende Gesamtüberblick Initsatz Global Strahlzeit

U05

U11 UL-SU-TKU ^{238}U 73+ 11.1150 MeV/u

S08 SIS-TS-HHD ^{238}U 73+ 1000.0000 MeV/u

S09 SIS-TS-HFS ^{238}U 73+ 1000.0000 MeV/u

DP - X

Ende TOF Digitizer 1 Digitizer 2 Tools initialisieren Hilfe

DP-X Rack 13

U09 ^{238}U 73+ 11.115 MeV/u

20. Okt 09 19:30:55

UL-SU-TKU

0 1 2 3 4 5 6 7 8 9 10 11 12 13 15

TRIGGER SD

Chop-H HF Chop-TR

ONLINE POSIT

manuell h-a

VERSTÄRKER

ist aus Test

K1	D1	K2	K1	D1	K2
RFQ - H3	IH I - IH II	S4/9-S4/7			
SL - H3	RFQ - 36	S4/9-A1/1			
H4 - H3	SL - 36	S4/9- A I			
H4 - IH II	IH I - 36	A2/2-A3/3			
H4 - S2		A4/4-T1/1			
S1 - S2		T1/0-T1/1			
		T1/0-T1/2			
		T1/0-T2/Y			
		T1/0-T2/2			

Trigg.Delay D1 + Pos.Prestripper

2 0 . 0 0 [µs]

Trigg.Delay D2 + Pos.Poststripper

2 0 . 0 0 [µs]

Trigg.Delay Positionsmonitor TK

2 0 . 0 0 [µs]

Status Referenzbild

Status Referenzbild

Status Referenzbild

S9 - A I

AI

S9

Δ: 120ps

Ch1 50.0mVΩ 100mVΩ M 10.0µs Aux J 400mV

D 1.00ns Aux J 400mV

1 May 2001 19:14:16

DECTerm

Operating program (pickup status)

Ende TOF Digitizer 1 Digitizer 2 Tools initialisieren Hilfe

DP-X Rack 13

20. Okt 09 19:28:49

U09 ²³⁸U ⁷³⁺ 11.115 MeV/u

UL-SU-TKU

0 1 2 3 4 5 6 7 8 9 10 11 12 13 15

TRIGGER

Chop-H HF

K1 D1 K2

RFQ - H3

SL - H3

H4 - H3

H4 - IH 11

H4 - S2

S1 - S2

Gerätstatus

Elektronik: UT1DP0X

T1/0	SW ok	HW ok	no Intlk	remote	Netz ein
HW LSB	HW Tunnel	remote	Blende	Mux.	Summ.
Verst.					

Elektronik: UY2DP2X

Y2/2	SW ok	Hardware	no Intlk	remote	Netz ein
HW LSB	HW Tunnel	remote	Blende	Mux.	Summ.
Verst.					

Ende

strom aus

D2 K4

T1/0-T1/1	108 - A I	TK4/1-TK4/2
T1/0-T1/2	108 - A IIb	TK5/2-TK6/1
T1/0-T2/Y	108 - A IV	TK5/2-TK7/3
T1/0-Y2/2	108 - 36	

Trigg.Delay D1 + Pos.Prestripper

+	+	+	+	+	+
20.00 [µs]					
-	-	-	-	-	-

Status Referenzbild

Trigg.Delay D2 + Pos.Poststripper

+	+	+	+	+	+
20.00 [µs]					
-	-	-	-	-	-

Status Referenzbild

Trigg.Delay Positionsmonitor TK

+	+	+	+	+	+
20.00 [µs]					
-	-	-	-	-	-

Status Referenzbild

Operating program (DSO control)



The screenshot shows the DSO control software interface. A blue overlay lists the following trigger options:

- TOF mit Phasenachsentriggerung
- TOF intern getriggert
- Makropuls
- Flattop Tanksignal
- Single shot Trigger
- Hardcopy
- Reset Average
- Akustische Strahlüberwachung

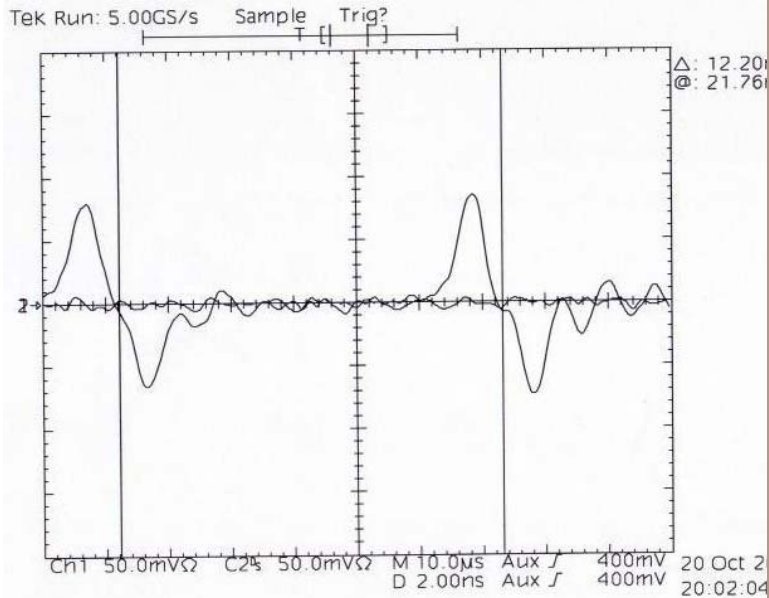
The background interface includes a menu bar with 'Ende TOF Digitizer 1 Digitizer 2 Tools initialisieren Hilfe', a status bar with 'DP-X Rack 13' and '20. Okt 09 19:32:09', a 'TRIGGER' button, 'Chop-H' and 'HF' buttons, a '11.115 MeV/u' display, a 'UL-SU-TKU' dropdown, a numeric keypad, a table of parameters, and a 'Trigg.Delay D1 + Pos.Prestripper' section with '+' and '-' buttons and a '20.00 [µs]' display.

K1	D1	K2	K1	D1	K2	
RFQ	-	H3	IH	I	-IH	I
SL	-	H3	RFQ	-	36	
H4	-	H3	SL	-	36	
H4	-	IH	I	-	36	
H4	-	S2				
S1	-	S2				

Trigg.Delay D1 + Pos.Prestripper
20.00 [µs]

Status Referenzbild

Typical time of flight measurement



DP - X

Ende TOF Digitizer 1 Digitizer 2 Tools initialisieren Hilfe

DP-X Rack 13 U07 ²³⁸U ³⁰⁺ 11.442 MeV/u

27. Okt 09 12:41:21 UL-SU-TKU

0 1 2 3 4 5

TRIGGER SD ONLINE POSIT
 Chop-H HF Chop-TK manuell h-au

TOF o. TG

MHz 36 10S

Obergrenze
 ++ +++++
 1 2 . 5 8 6 2 [MeV/u]
 -- --

T-Fein
 +++ ++
 1 2 . 2 0 [ns]
 -- --

Untergrenze
 ++ +++++
 1 0 . 2 9 7 8 [MeV/u]
 -- --

A4/4 - T1/1 :ERS beachten

Druck Übernahme in INIT Ende

Autom. Messung Auswertung Ende monitor TK

++++ ++ 4 0 . 0 2 [μ s]
 -- --

++++ ++ 5 0 . 0 0 [μ s]
 -- --

++++ ++ 6 0 . 0 0 [μ s]
 -- --

Status Referenzbild Status Referenzbild Status Referenzbild

Ergebnis der TOF-Messung ohne TG

Messung mit A4/4 - T1/1 (Abst. 13422.0 [mm])

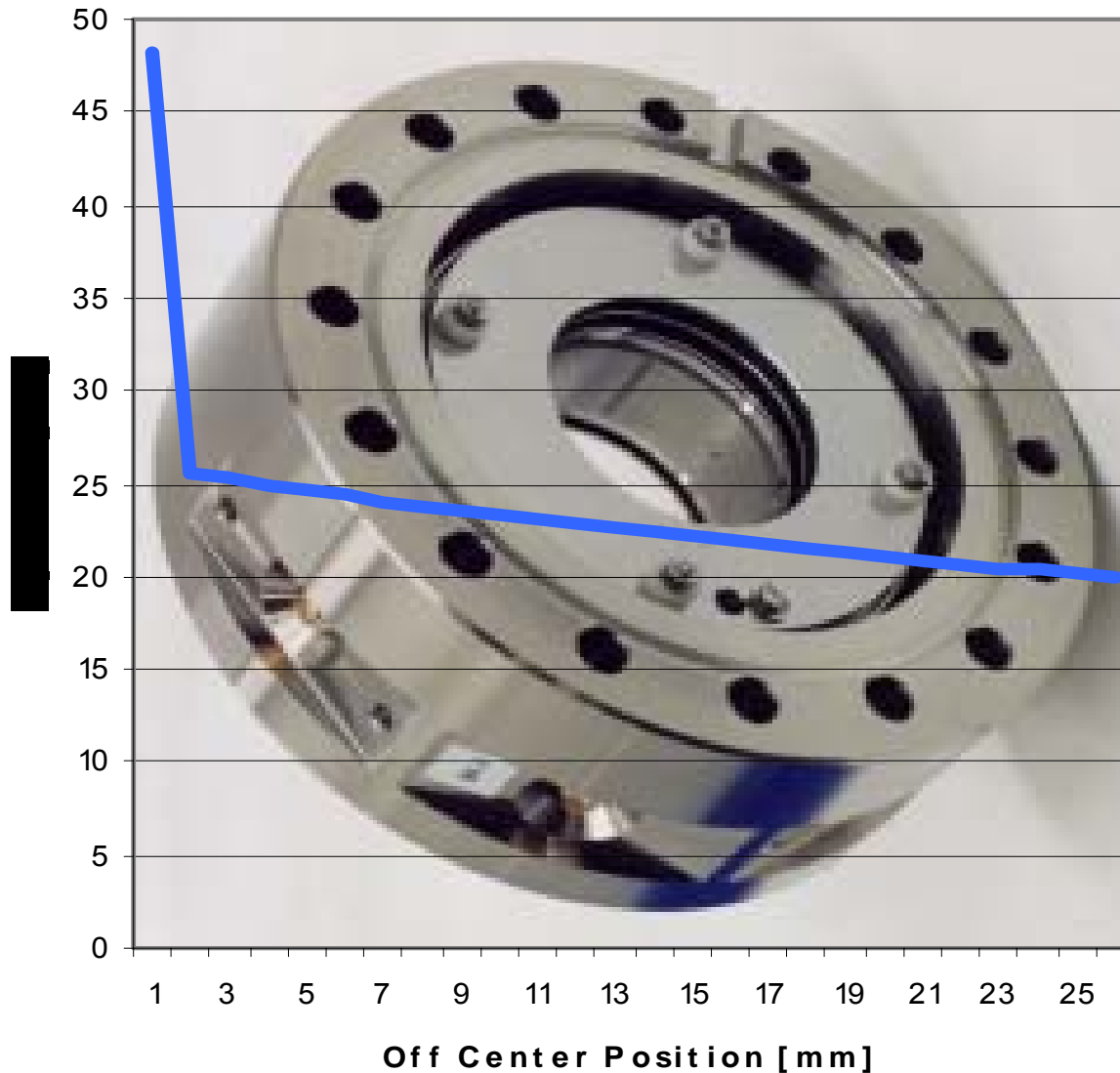
Energie [MeV/u]	β	$\beta \cdot \lambda$ [mm]	Bunche N=	Laufzeit [ns]
11.39	0.155	1285.53	10	288.932

Characteristics, amplifiers



50 Ω in- and output
(-36...0)dB, 6dB steps
+50dB/bypass
GaAs switches
46dB dynamic
20dBm max. input
16dBm max. output
+/- 0,05dB mismatch
20....950 MHz bandwidth
1nV/ $\sqrt{\text{Hz}}$ input noise

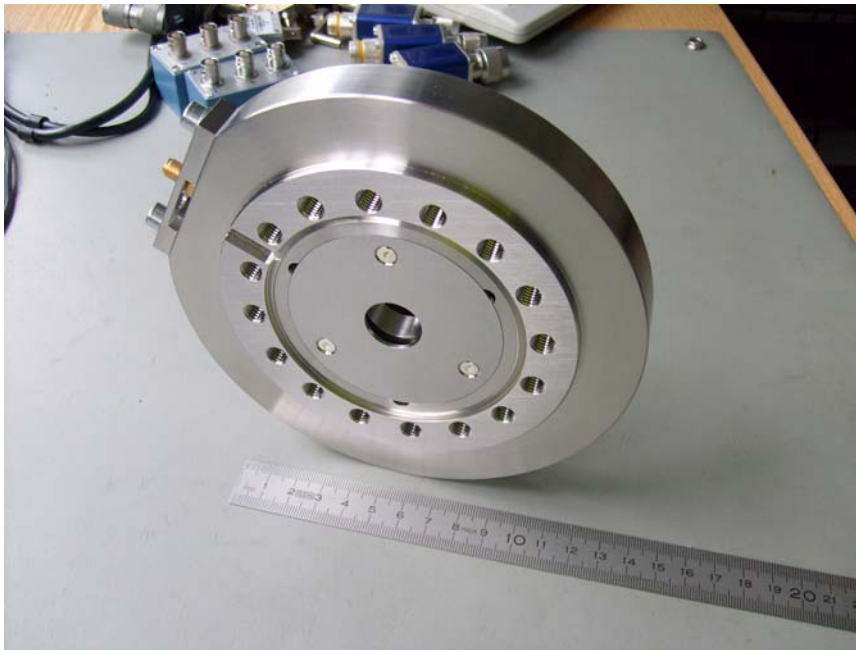
Characteristics, dynamic range for 1mm resolution



8 bit system,
50mm aperture

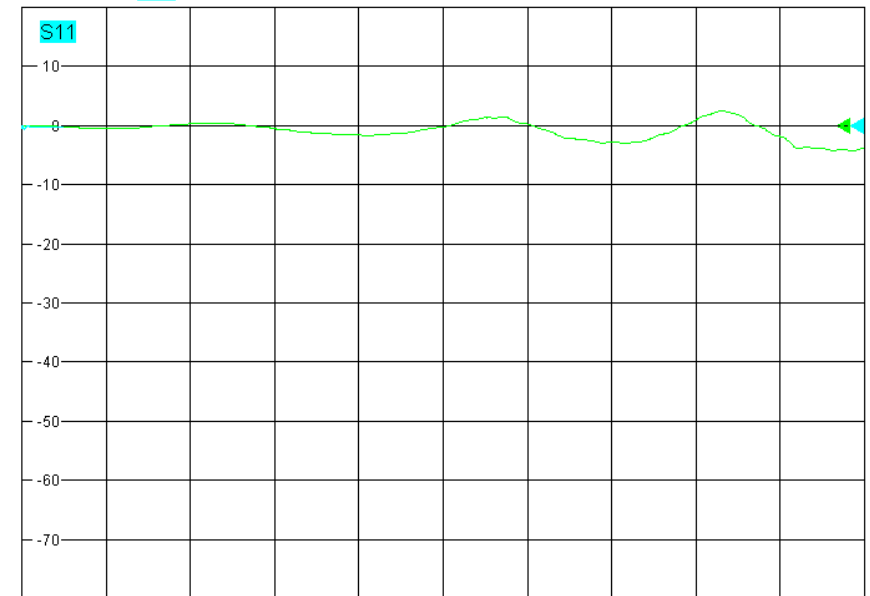
in use for:
injector HSI,
poststripper,
transfere line

Characteristics, S11



Trc1 S11 dB Mag 10 dB / Ref 0 dB Cal
Mem2[Trc1] S11 dB Mag 10 dB / Ref 0 dB

1



Ch1 Start 150 kHz Pwr 50 dBm Stop 4 GHz
5/19/2008, 12:22 PM

Pickup with closed ring used at Hitrap (not a BPM)

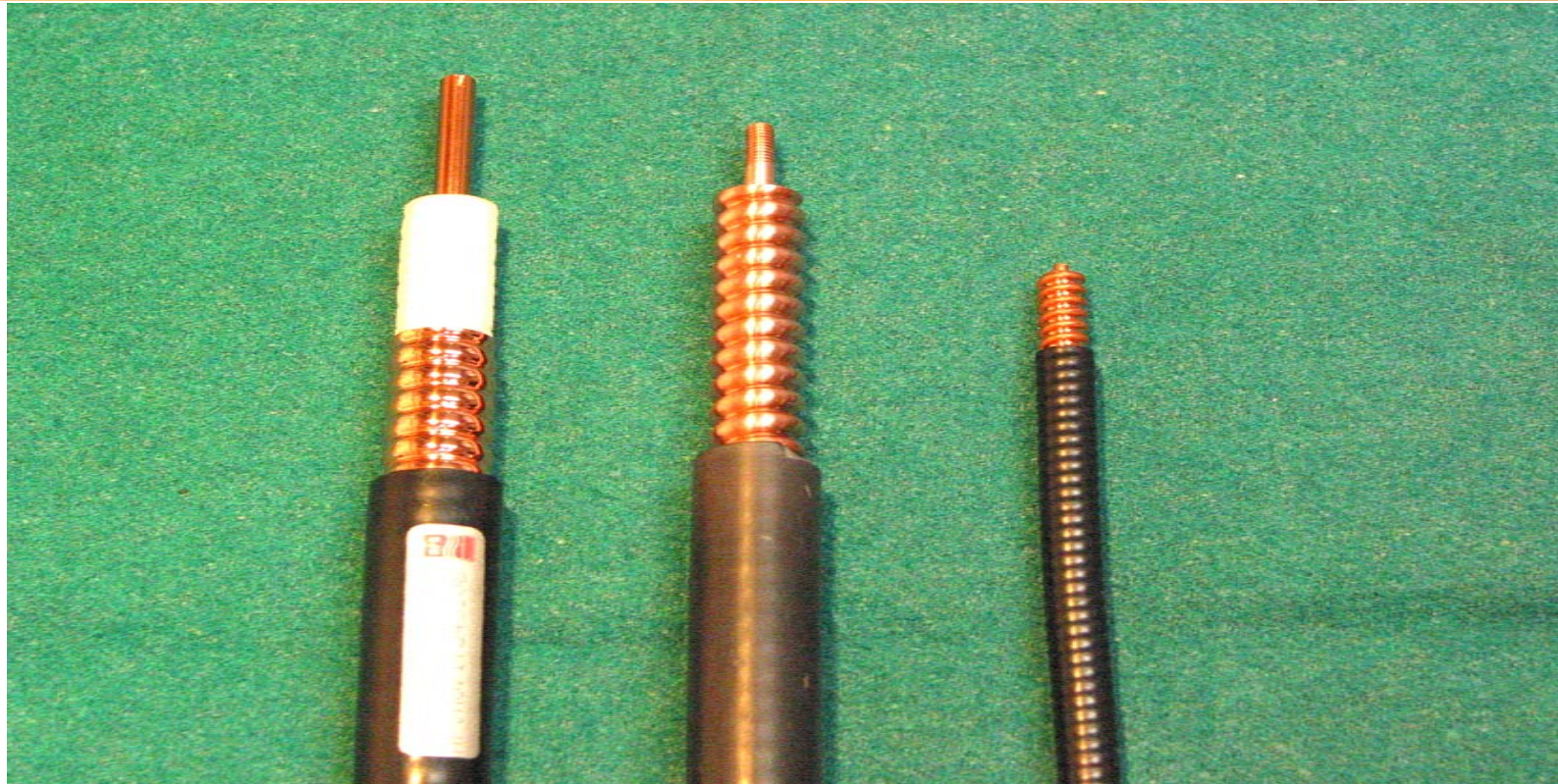
Cables, transition time matching

place for adjustment of cable length



matching with a TDR allows
+/-10ps relative accuracy for
90m 3/8" Heliflex

Cables



1/2" HeliMax

Andrew LDF series
not used
no helical shield

3/8" Heliflex

RFS HCA 38 air coax
long distances, 90m
Amplifier <-> DSO

1/4" HeliMax

Andrew FSJ series
short distances, 5m
Pickup <-> Amplifier

Cables, FSJ1-50 specs

Impedance: 50+/-1 Ohms

velocity: 84%c

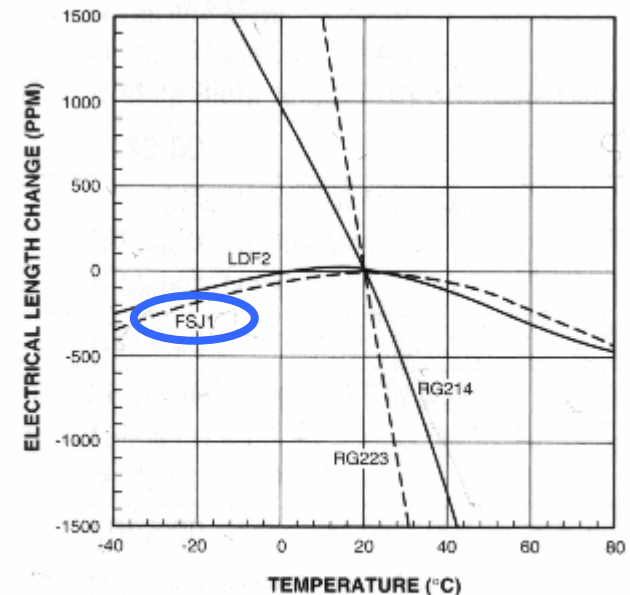
attenuation @1GHz: 19.6dB/100m

minimum bend radius: 25mm

phase stability with temperature

phase stability with bending

foam dielectric



ANDREW

Cables, HCS38-50 specs

Impedance: 50+/-1 Ohms

velocity: 89%c

attenuation @1GHz: 9.1dB/100m

minimum bend radius: 50mm

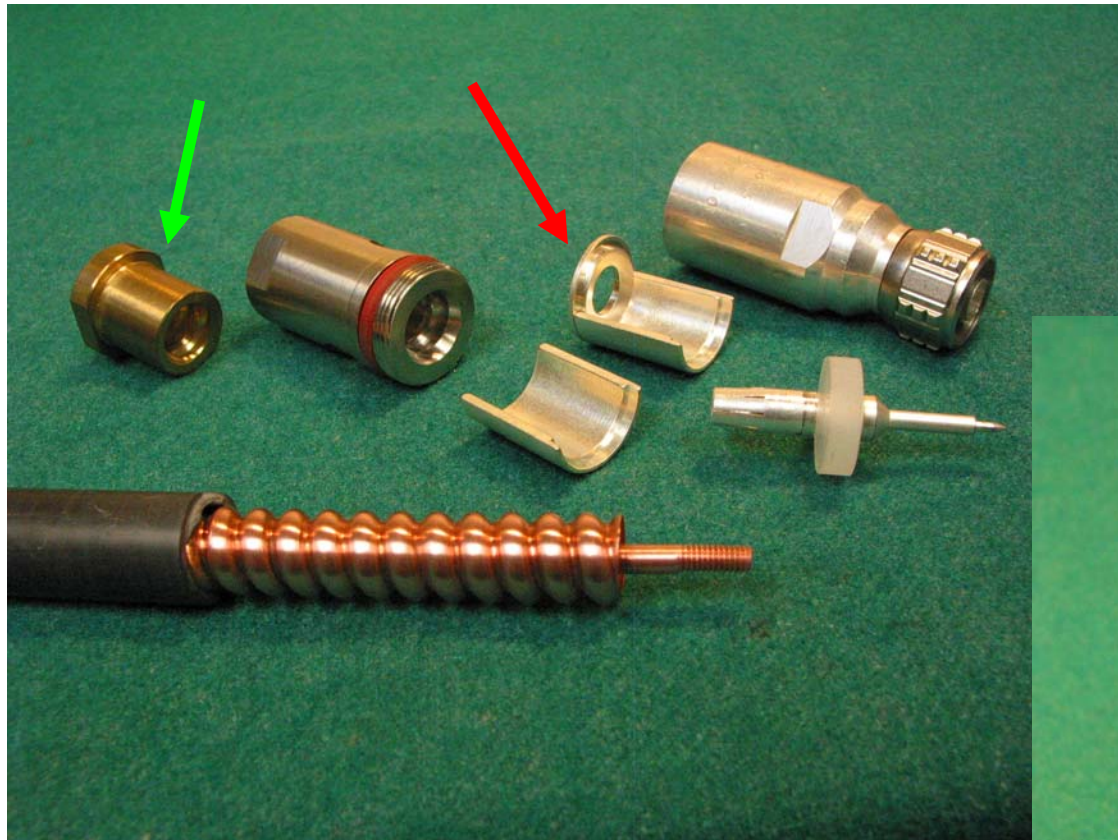
air dielectric



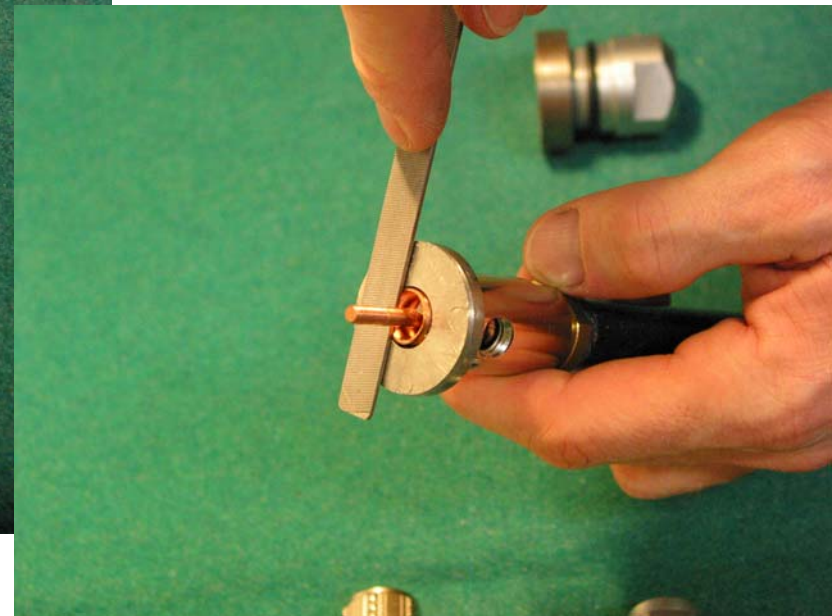
HELIFLEX® Cable



Modified connector from Spinner



Modifications:
Remove **Cone**
Add **Custom Plug**



Questions ?



Thanks for yours attention