

## **CTF3 INJECTOR DESIGN**

D. Yeremian

# **CTF3 Injector Design**

Dian Yeremian  
CERN, October 26, 2000

## **Introduction**

**Zeroth Order Design for Nominal Phase**

**What Next?**

## Introductions

Design for 3.5 A out of injector without excluding 5 A

1.5 GHz subharmonic buncher power not more than 400 KW

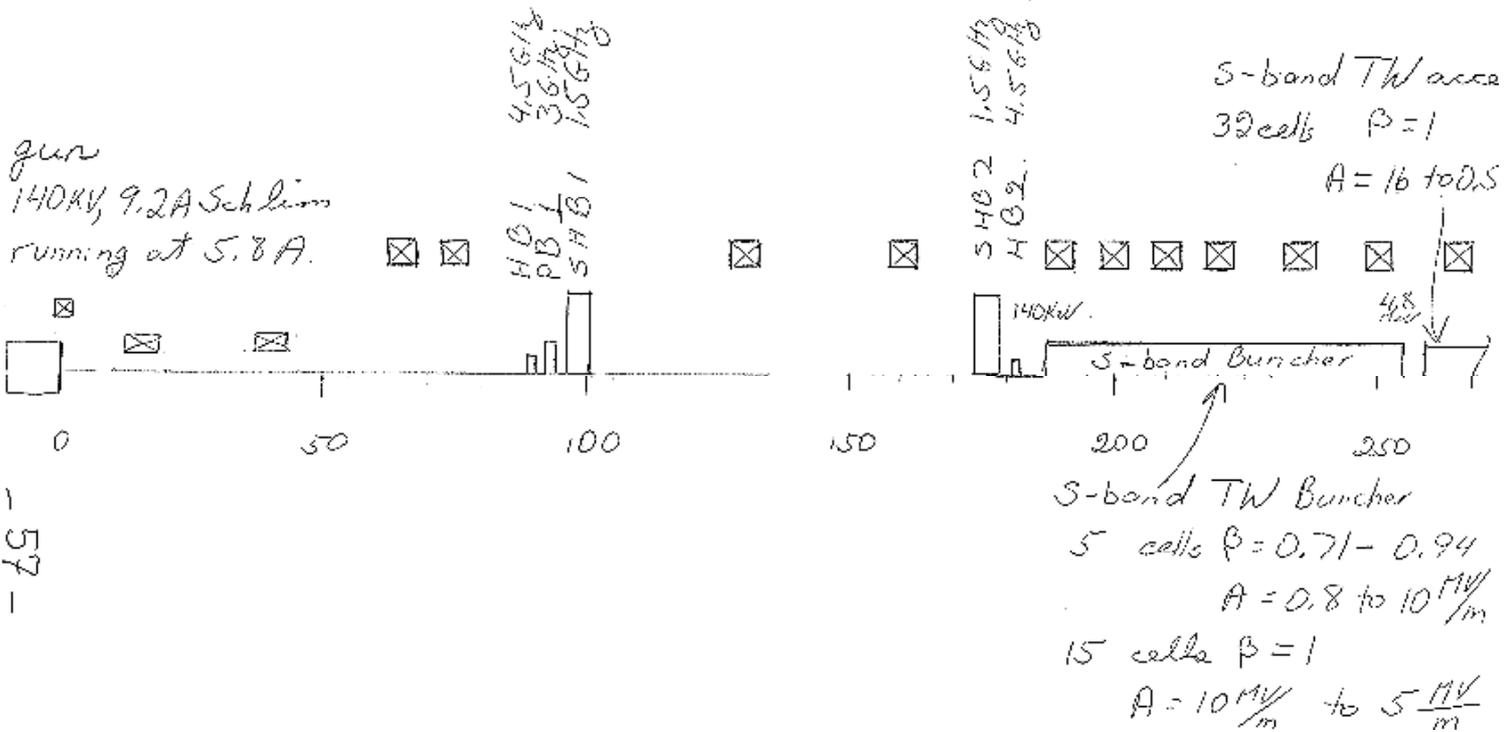
Minimize charge in Satellites

Make the Traveling Wave Buncher cavity phase velocity and amplitude schedule smooth and consistent with beam loading

Using

2	1.5 GHz buncher,
1	S-band buncher,
2	4.5 GHz bunchers

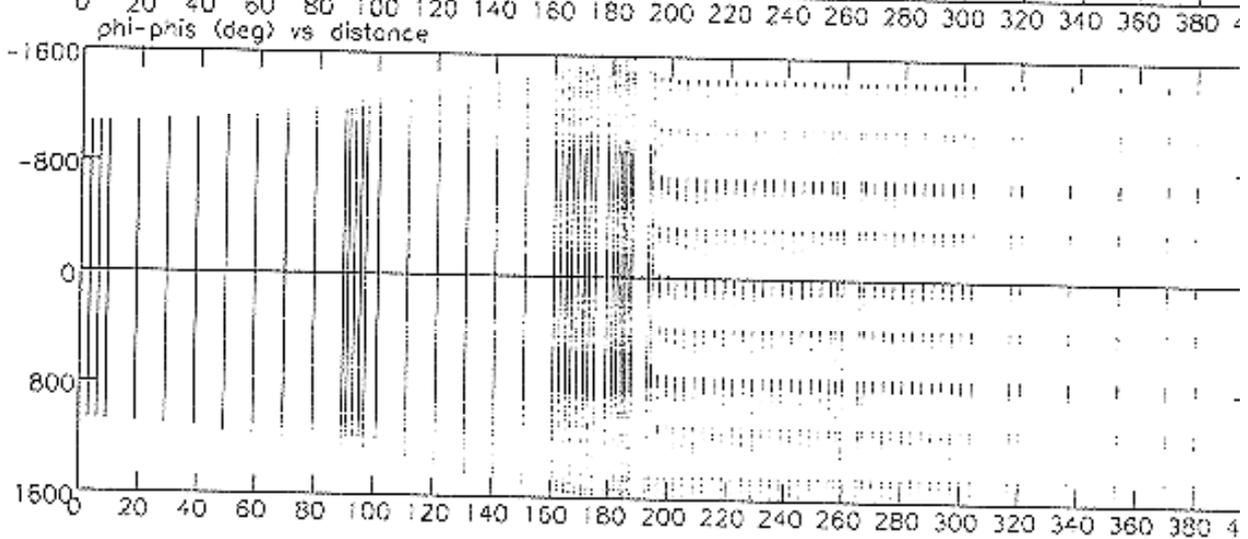
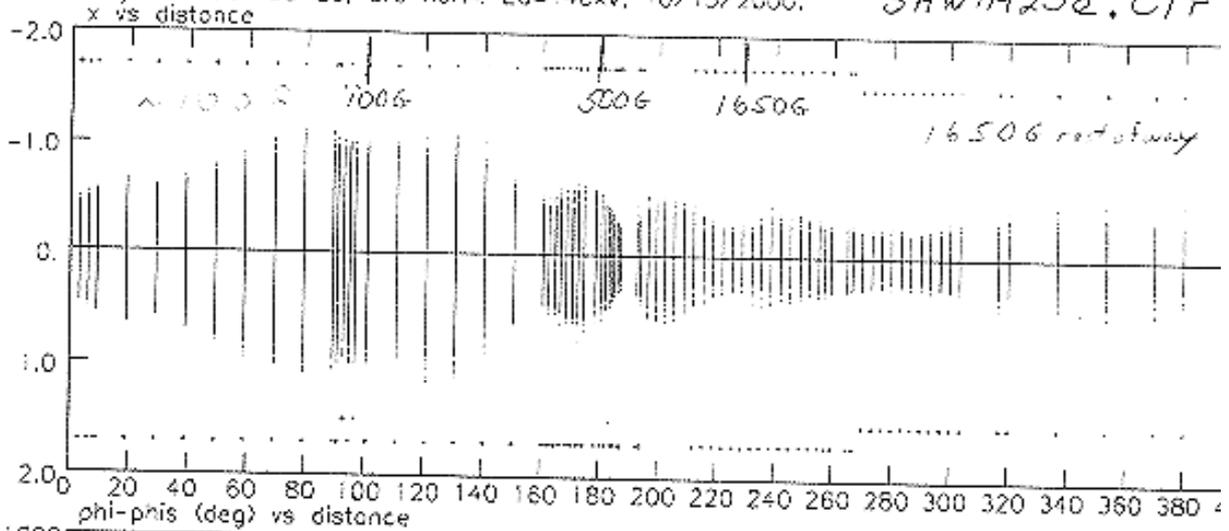
# CTF3 Injector with 2 Subharmonic Bunchers.



CTF3  
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 CERN Oct 26, 00

CTF3 injector with 2SHBs, 3rd harm. E0=140kV, 10/15/2000.

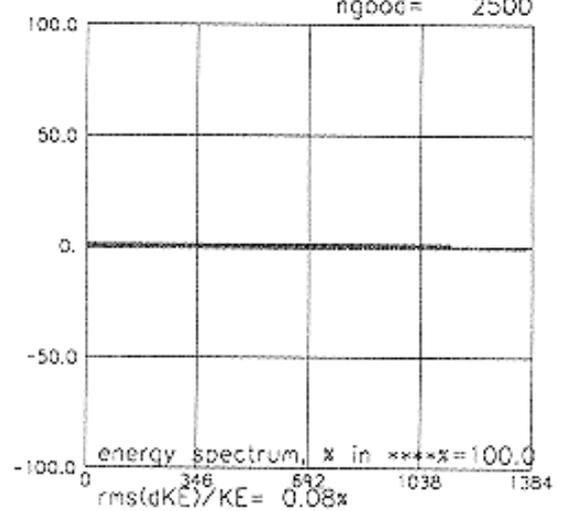
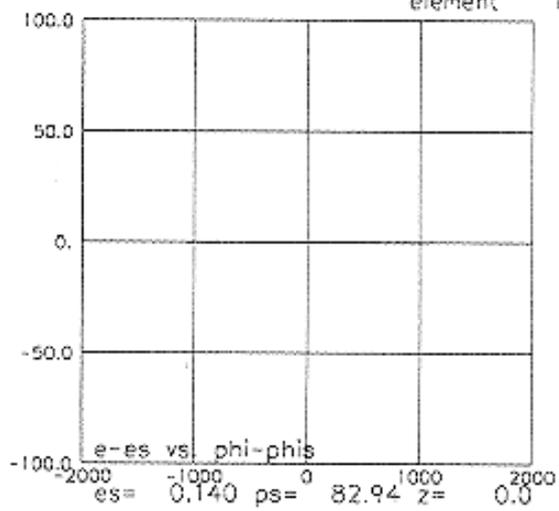
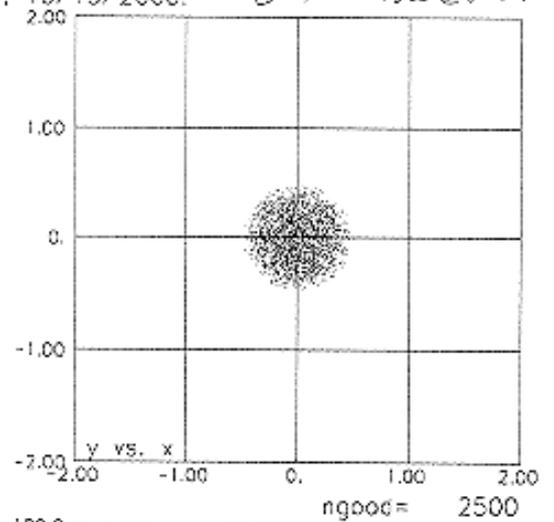
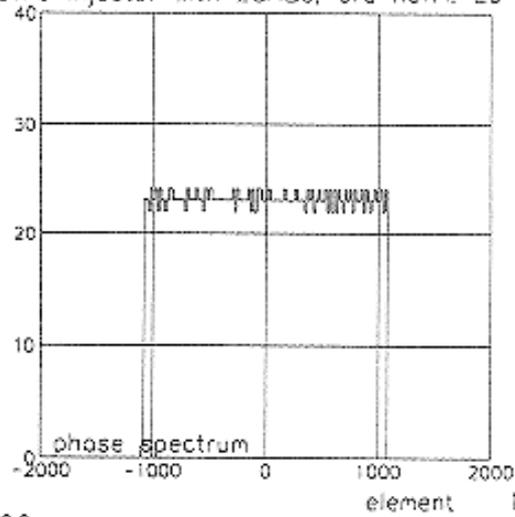
SAWTH25e.CTF



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CTF3 injector with 2SHBs, 3rd harm. EO=140kV, 10/15/2000.

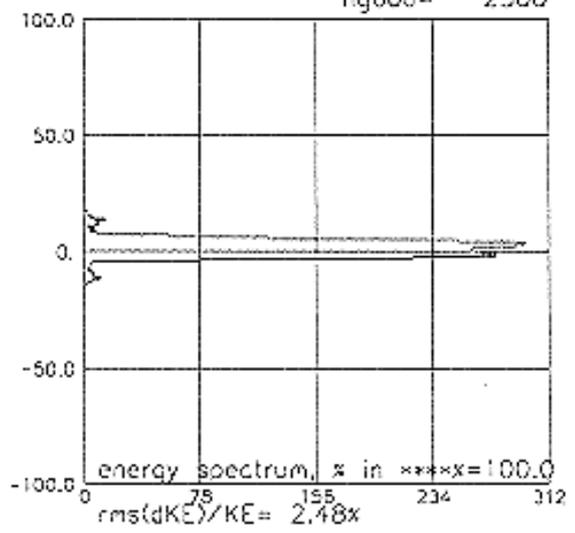
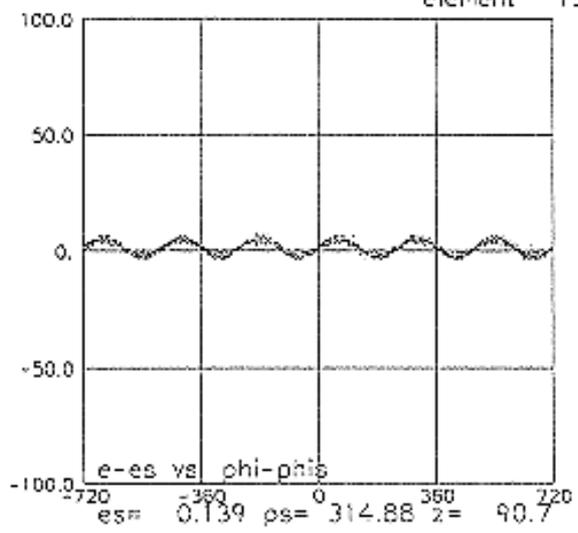
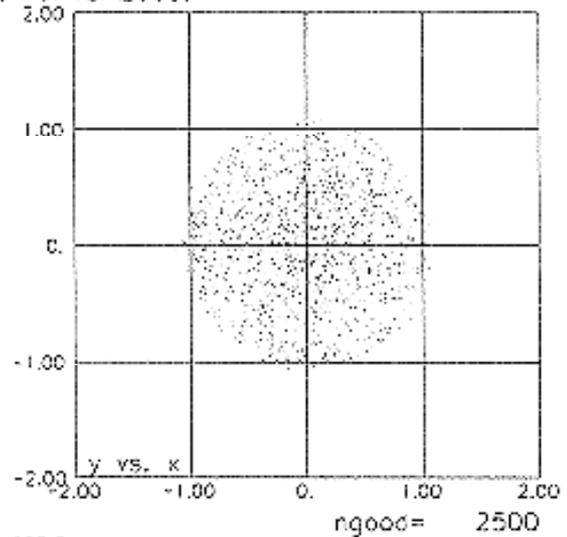
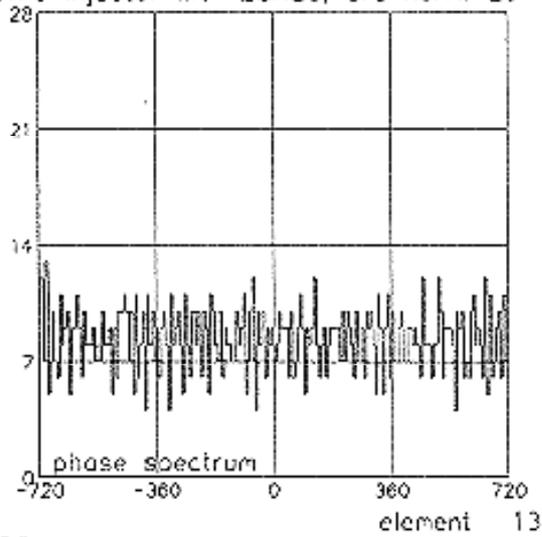
SAWTH25e.CTF3



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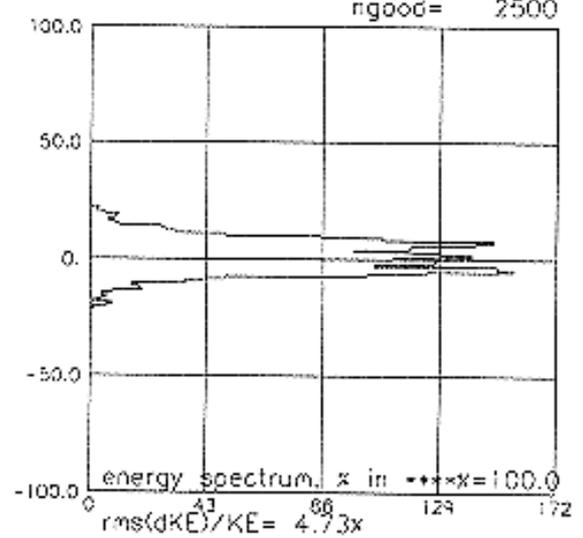
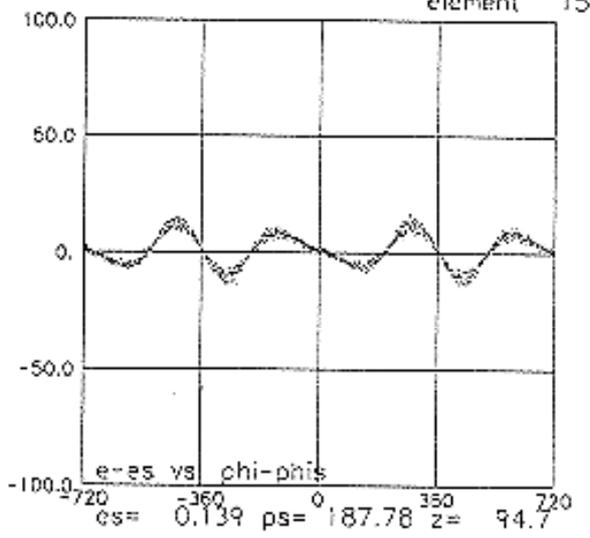
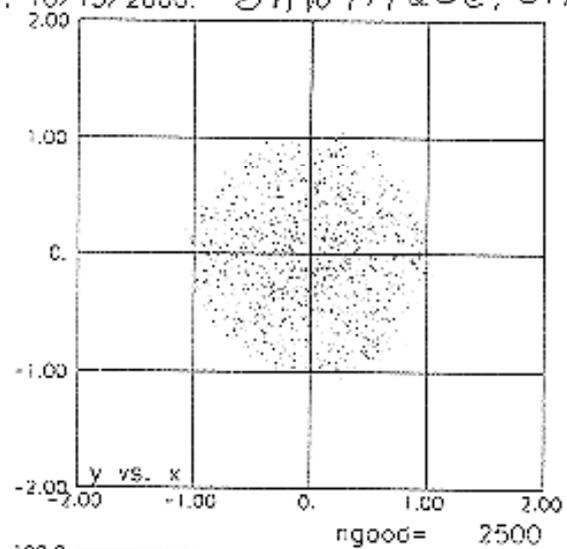
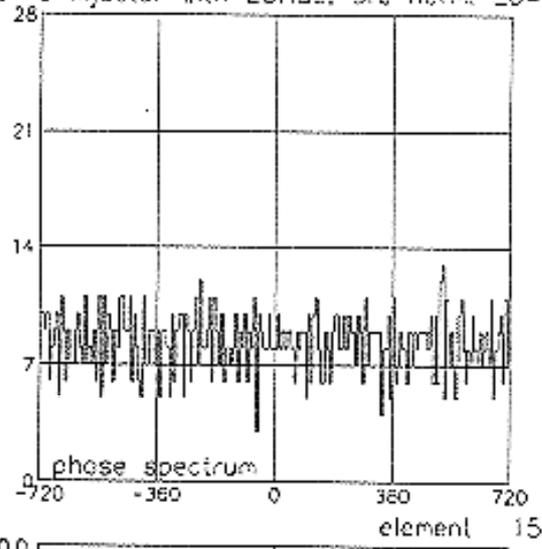
CTF3 injector with 2SHBs, 3rd harm. E0=140kV, 10/15/2000.

SAWTH2Se.CT



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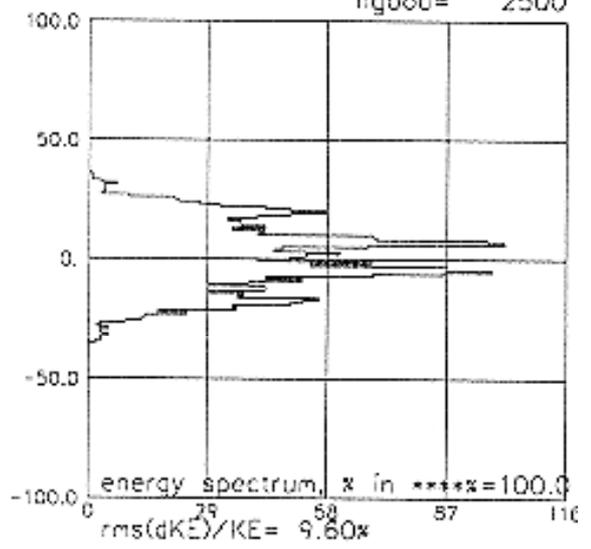
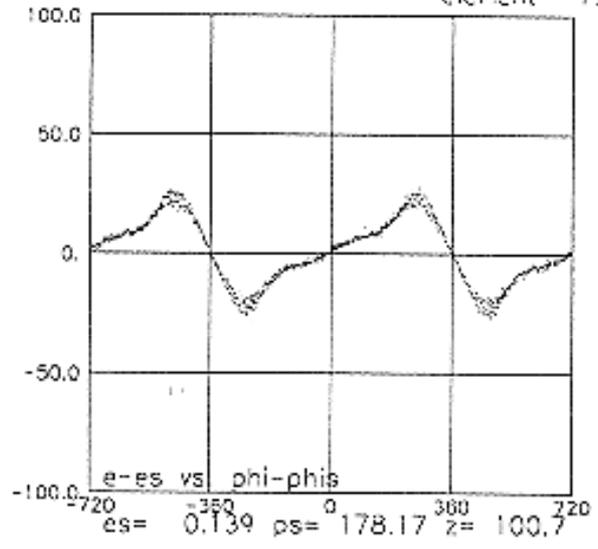
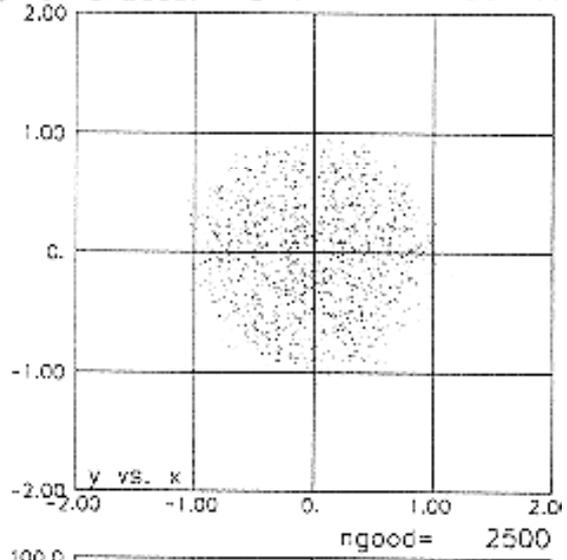
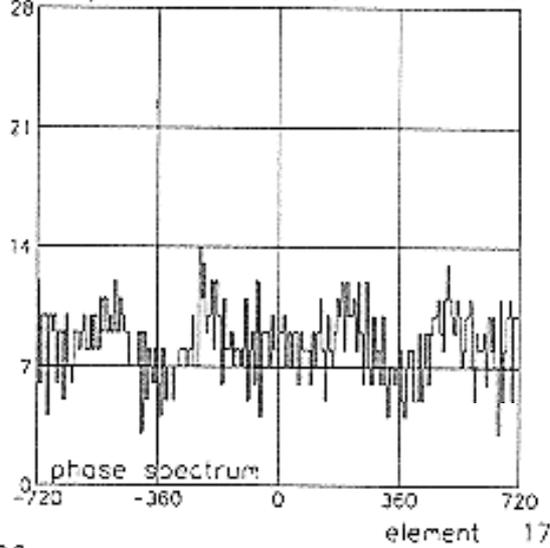
CTF3 injector with 2SHBs, 3rd harm. E0=140kV, 10/15/2000. *SAWTH 25e, CTI*



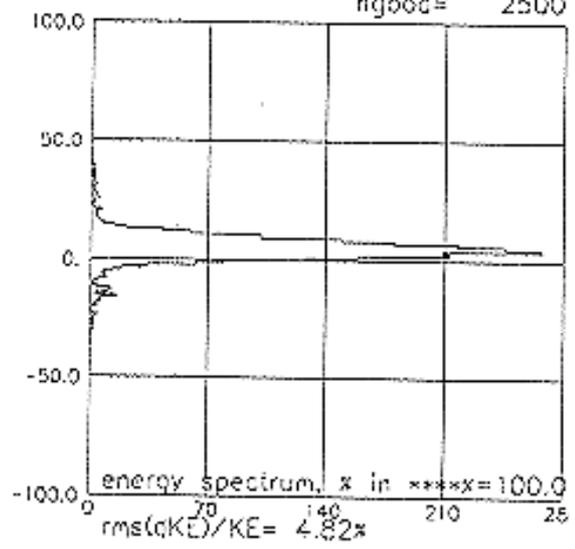
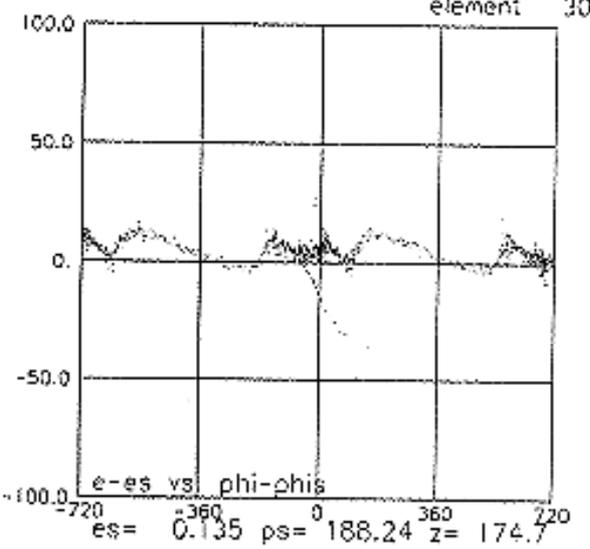
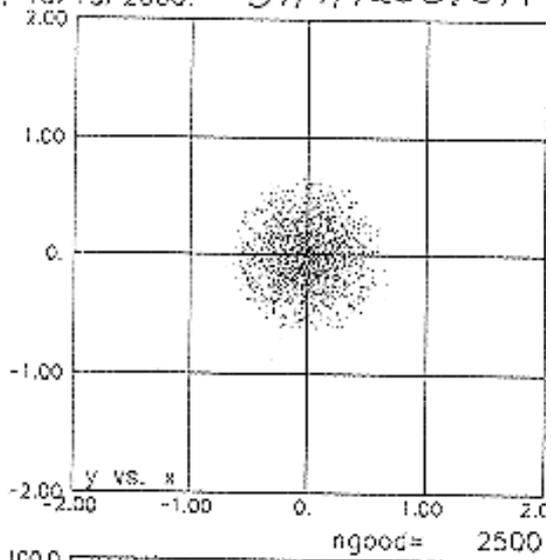
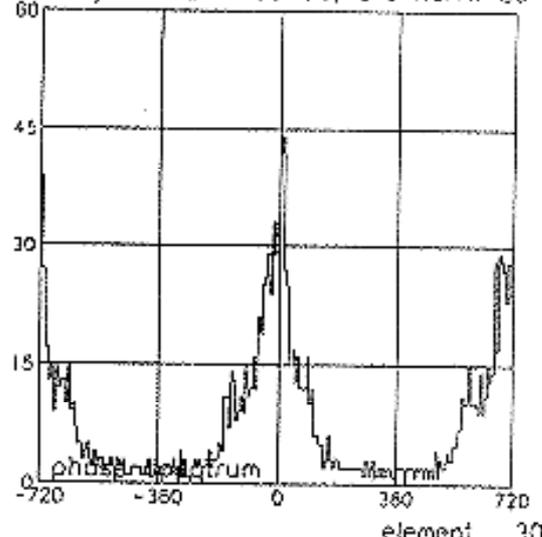
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CTF3 injector with 2SHBs, 3rd harm. E0=140kv, 10/15/2000. *SAWTH25e.cti*



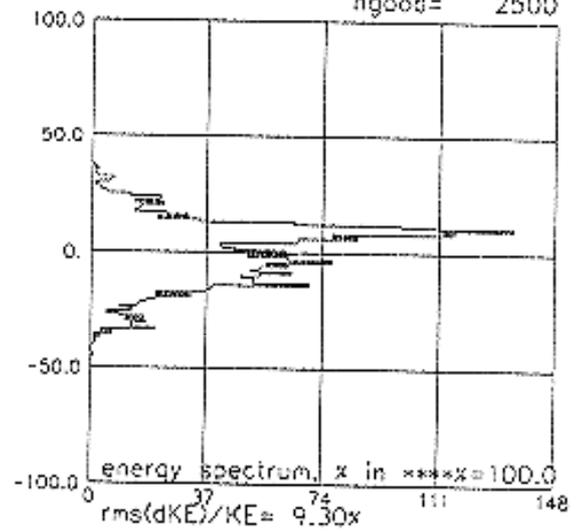
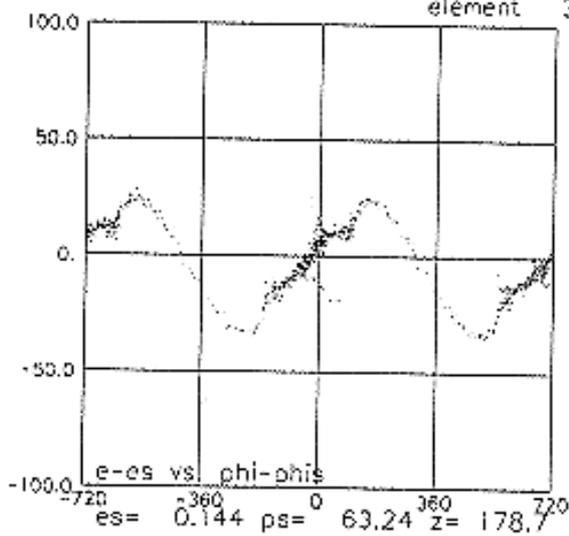
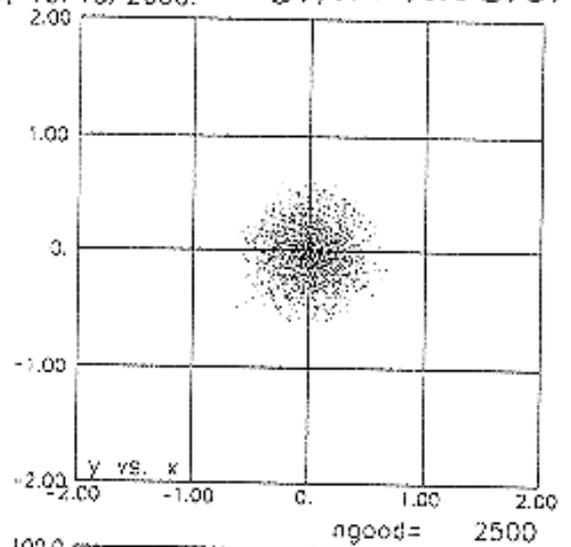
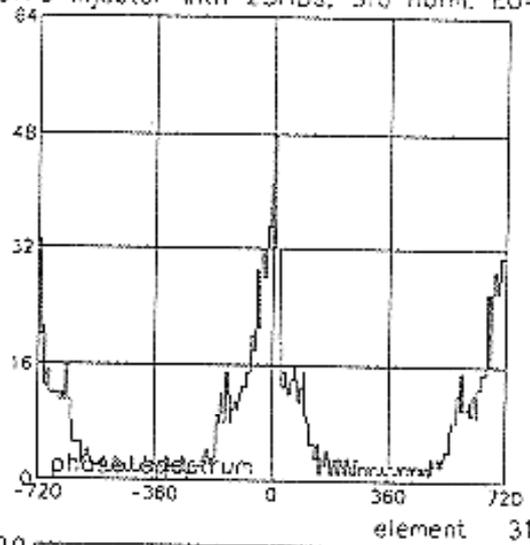
CTF3 injector with 2SHBs, 3rd harm. EO=140kV, 10/15/2000. SATH2Se.CTF



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CTF3 injector with 2SHBs, 3rd harm. E0=140kV, 10/15/2000.

SAWTH25e.CT

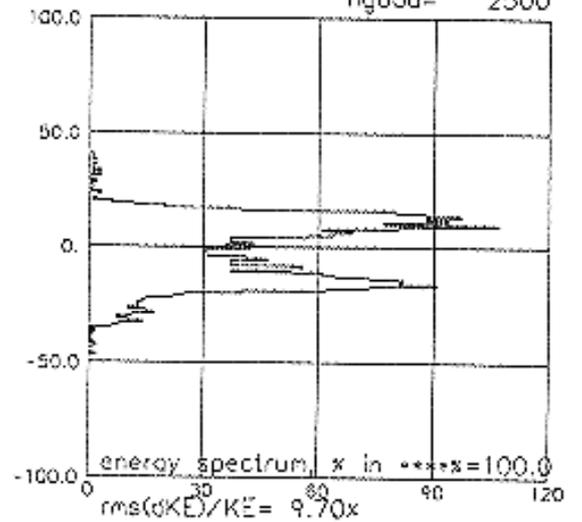
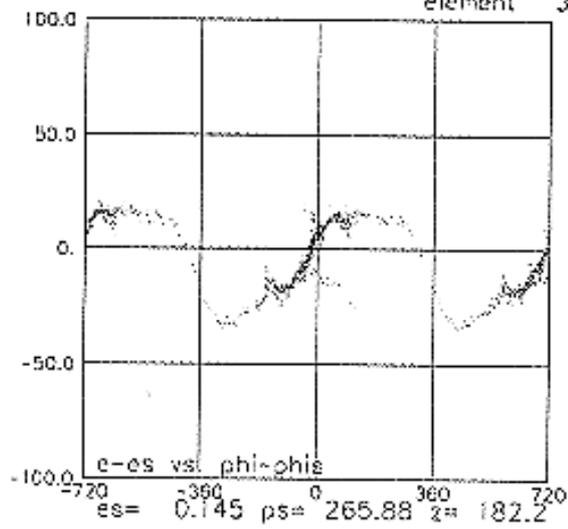
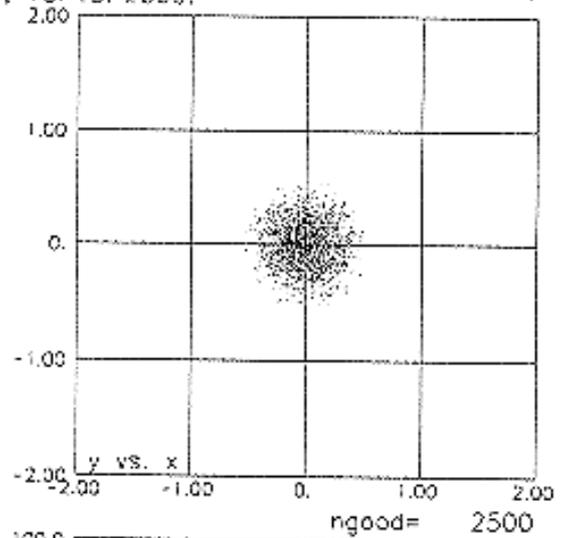
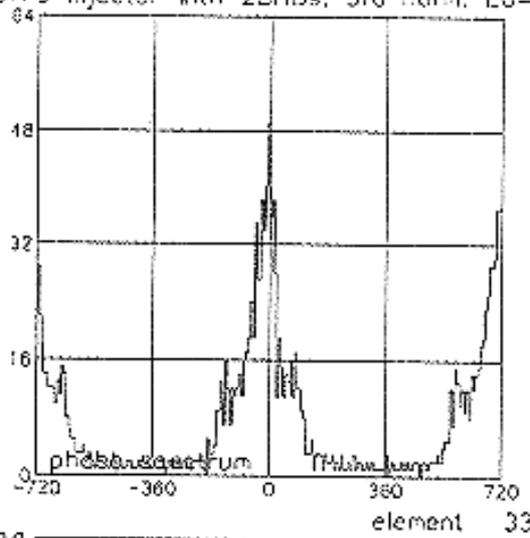


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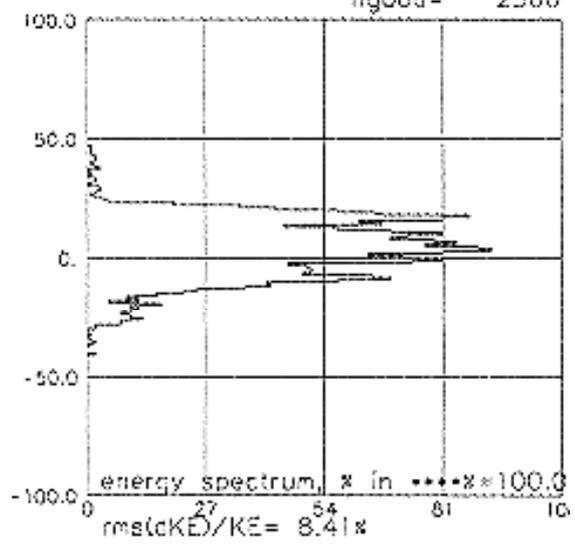
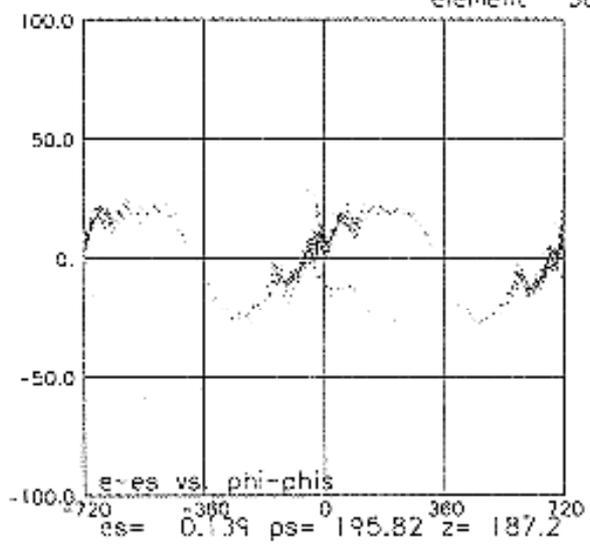
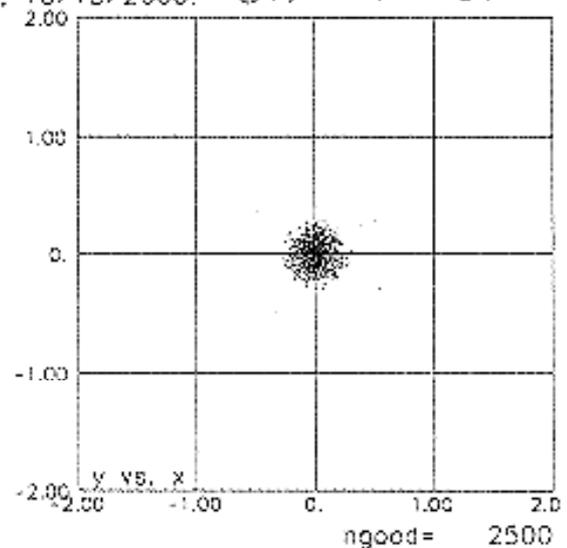
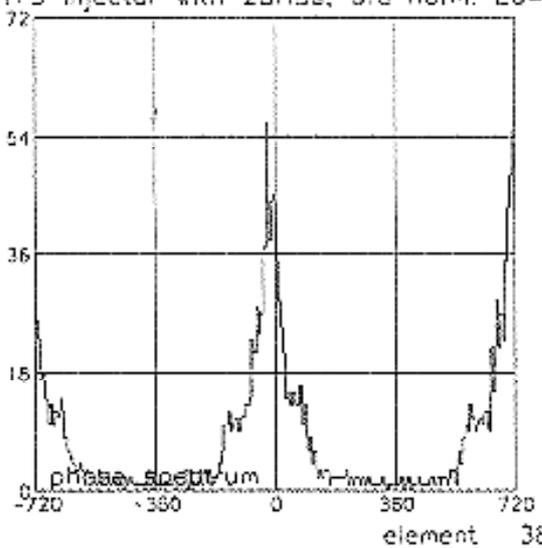
CTF3 injector with 2SHBs, 3rd harm. E0=140kv, 10/15/2000,

SAWTH25e.c7



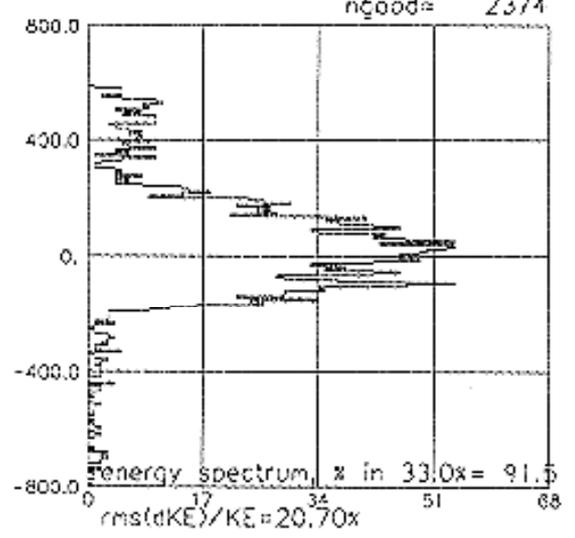
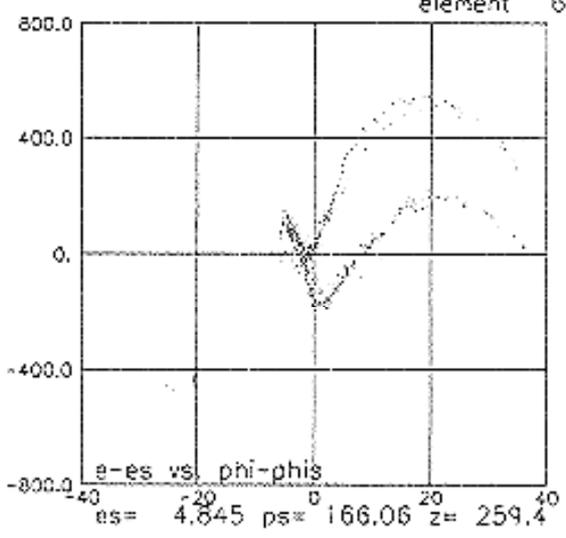
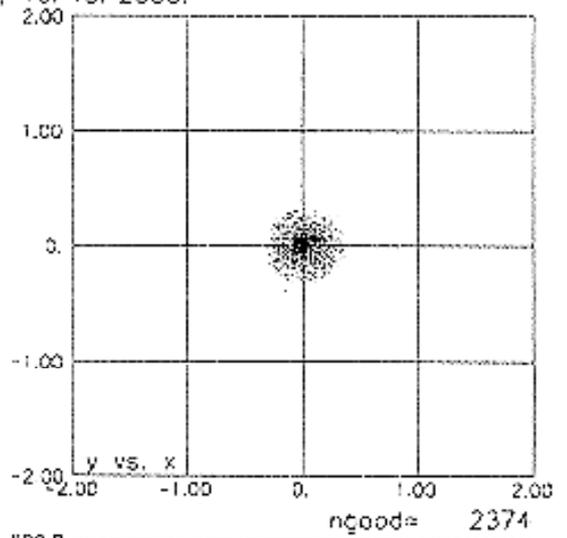
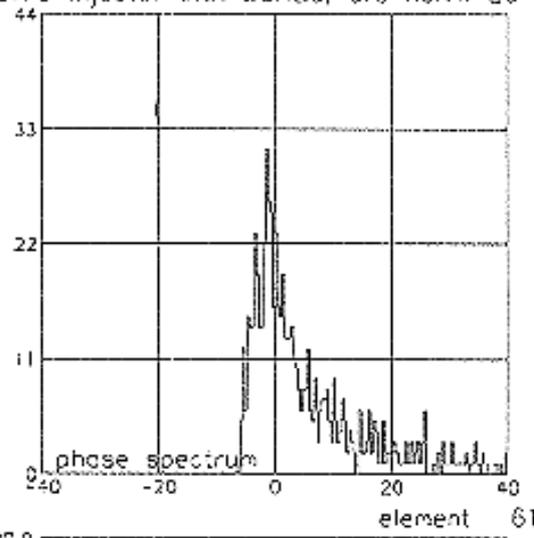
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CTF3 injector with 2SHBs, 3rd harm. E0=140kV, 10/15/2000. *SAWTH 2Se.cT*



CTF3 injector with 2SMBs, 3rd harm. EO=140kV, 10/15/2000.

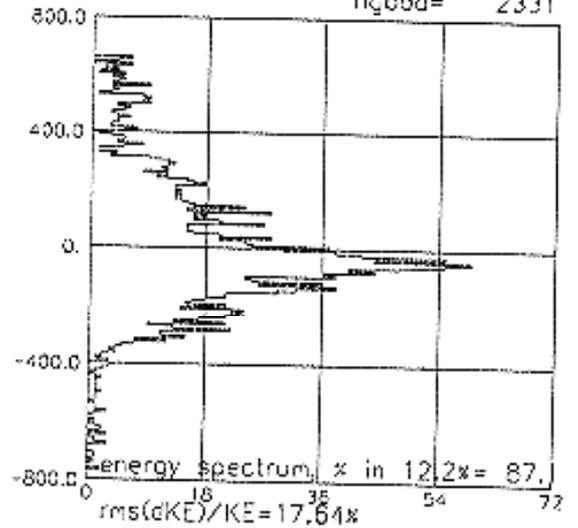
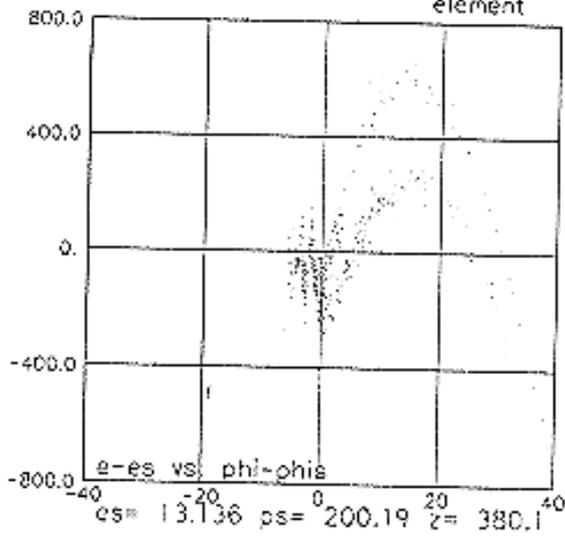
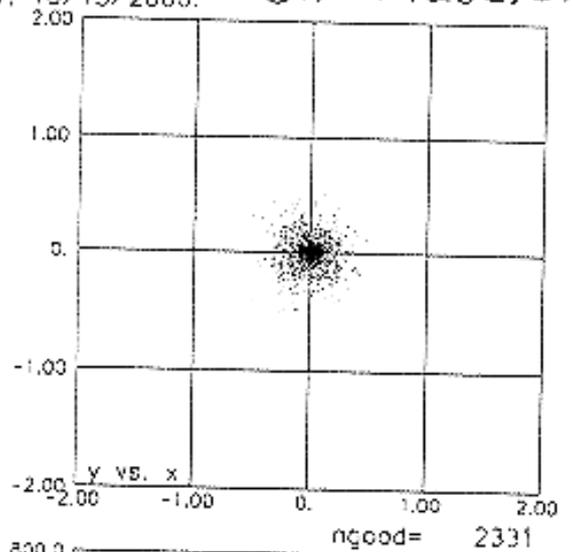
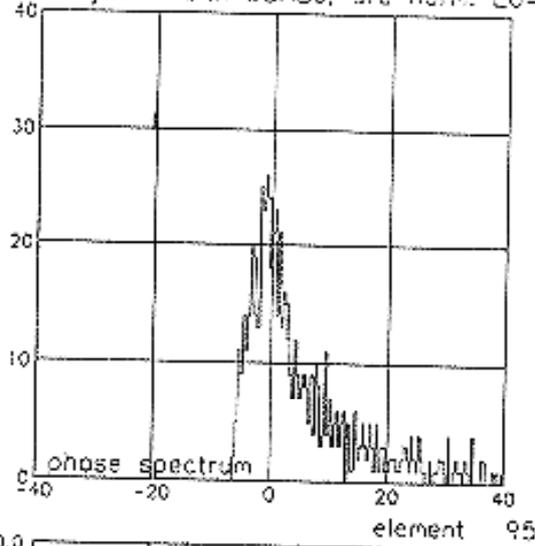
SAWTH25e.CT



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CTF3 injector with 2SHBs, 3rd harm. E0=140keV, 10/15/2000.

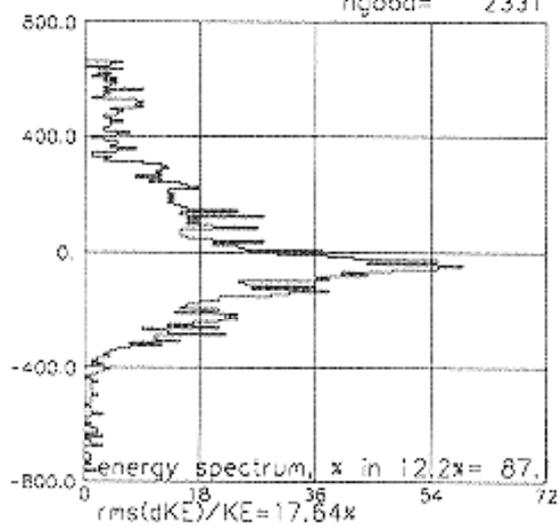
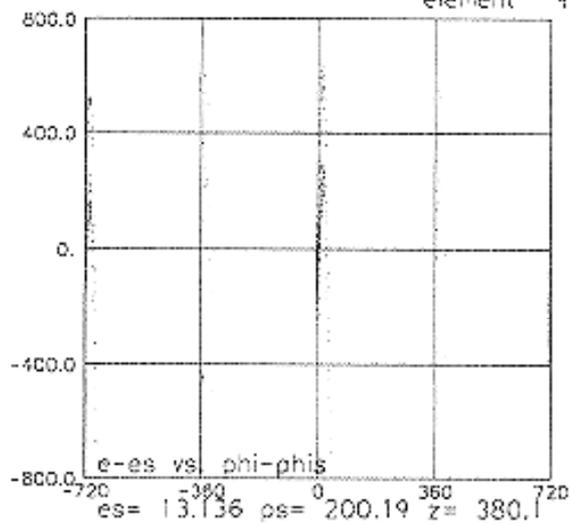
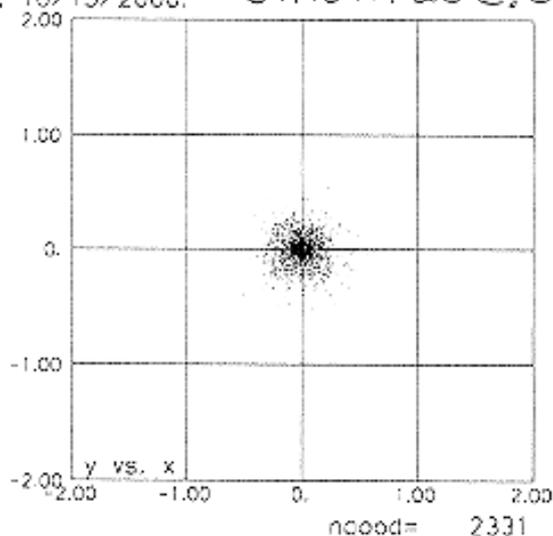
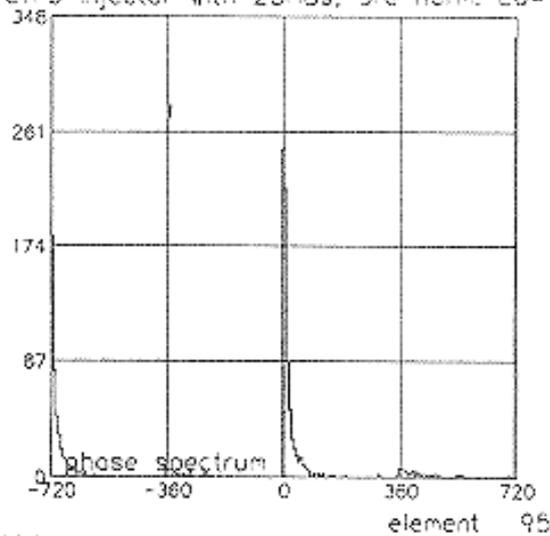
SAWTH25e.CTF



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CTF3 injector with 2SHBs, 3rd harm. E0=140kV, 10/15/2000.

SAWTH 25e.CT1



## Beam Parameters

Gun Current	5.8 A
Gun Emitt(edge, N)	20.3 mm-mrad
Total I Exit Accel 1	5.4 A
I in 20° S-band Exit Accel 1	3.7 A
charge in Satellite	3.5%
Emittance (N, RMS)	55 mm - mrad
Energy exit Accel 1	13 MeV
Energy spread main bunch (FWHM)	300 KV

## 1.5 GHz Buncher Parameters

	SHB 1	SHB 2
Gap length	4.0 cm	4.0 cm
Aperture R	1.7 cm	1.7 cm
Gap Voltage	16 KV	24 KV
Power needed	125 KW	280 KW

## 3 GHz Buncher Parameters

### S-band Prebuncher

Gap length	2.0 cm
Aperture R	1.5 cm
Gap Voltage	6.6 KV
Power needed	?

## 4.5 GHz Buncher Parameters

	HB 1	HB 2
Gap length	1.5 cm	1.5cm
Aperture R	1.5 cm	1.0 cm
Gap Voltage	2.5 KV	7.5 KV
Power needed	?	?

### 3 GHz Traveling Wave Buncher Parameters

Cell #	$\beta$ (v/c)	Gradient (MV/m)
1	0.71	8
2	0.76	8.5
3	0.82	9.0
4	0.88	9.5
5	0.94	10.0
6	1.00	10.0
7	1.00	10.0
8	1.00	10.0
9	1.00	10.0
10	1.00	10.0
11	1.00	9.5
12	1.00	9.0
13	1.00	8.5
14	1.00	8.0
15	1.00	7.5
16	1.00	7.0
17	1.00	6.5
18	1.00	6.0
19	1.00	5.5
20	1.00	5.0

## What Next?

Make more detailed design of the 2 and 3 SHB cases

Iterate with Prebuncher Buncher and Buncher designers

More careful look at Beam loading in Prebunchers and Buncher

Need to appoint a person who will design the prebunchers.

Take a more careful look at solenoid field and emittance

Make sure distance from Gun to Buncher are the same for both 2 and 3 SHB design cases

Make sure using the same Traveling Wave Buncher configuration

Design the Initial case with no Subharmonic bunching but for 5 A out of the first accelerator section in 20° S-band

All but the last item could be done by Christmas if there is close communication between parties involved.