STATUS OF THE CTF3/SLAC GUN

D. Yeremian

CTF3 Thermionic Gun Issues

Dian Yeremian
CERN, October 26, 2000

Who Does What?

Gun Parameters

What Next?

Who Does What?

SLAC will modify one of the NLCTA guns for CTF3

SLAC will condition this gun up to 150 KV

CERN (LAL) responsible for Beam current tests

CERN will buy appropriate number of cathodes

CERN/SLAC can join together for the purchase of a batch of 10 cathodes and devide among us. (~$3000/cathode)

How many cathodes does CERN want?

Any spare guns will be CERN (LAL) responsibility

NLCTA-Note #57

April 10th 1996

Subject: NLCTA Gun Tests.
Gun Lot A – Low Current

Authors: D. Yeremian

The gun for NLCTA phase 1 labeled **Gun Lot A – Low current** was HV processed, a new cathode, EIMAC Y796, was installed and activated with very successful results.

The gun for NLCTA phase 1 operation was received from Boeing in the summer of 1994. The electrode spacing was modified to operate in the space charge limited mode for 150 kV and 6.6 A, then the gun and ceramic were cleaned, baked, sealed, and pumped for approximately 1 year. The gun was installed on the NLCTA beam line girder 3A without a cathode on February 8th 1996. On February 13th it was vented to dry nitrogen to add some ion gauges and was pumped down again the same day. Girder 3A includes the beam line from the gun up to but not including the first prebuncher. It consists of the gun, the bucking coil, the gun lens, and the first two large solenoids. The beam line components include a gap monitor for current measurement at the gun and a faraday cup installed temporarily at the end. There is a profile monitor and a BPM upstream of the Faraday Cup.

The detailed data discussed in this report is in the NLCTA logbook 1, March 6th 1996.

March 6th 1996 Gun HV processing started

All the measurements were made using the High Voltage power supply meter for readings. Later power conversion calibrated the supply meter against the Ross high voltage divider. In this report where it is unspecified, the values quoted are the raw values from the HV power supply meter.

Initially we just wanted to put HV across the isolation transformer to make sure it can stand off 160 kV (It is rated at 175 kV).

At 11:45 am we put 155 kV across the deck with 50 μA leakage current still observable on the power supply meter. At about 1:00pm the same problem surfaced again. The power supply current limited at 200 μA and the voltage is down to 100 kV.

Make another entry for inspection. The isolation transformer under the deck felt cool and looked OK with no externally visible damage. But the Phenolic rod which connects the motor at ground level to the variac on the HV deck for the gun heater power supply voltage adjustment was very hot. Seems that Phenolic is not a very good insulator. Removed the phenolic rod to be replaced with Lucite in the future.

Still curious about the ever-present 50 μA leakage current at about 150 kV we disconnected the HV deck and transformer from the power supply and ran the power supply by itself. We still read the 50 μA leakage current on the meter and when you turn off the power supply it still takes about 15 seconds for the voltage to run down while the current disappears instantly.

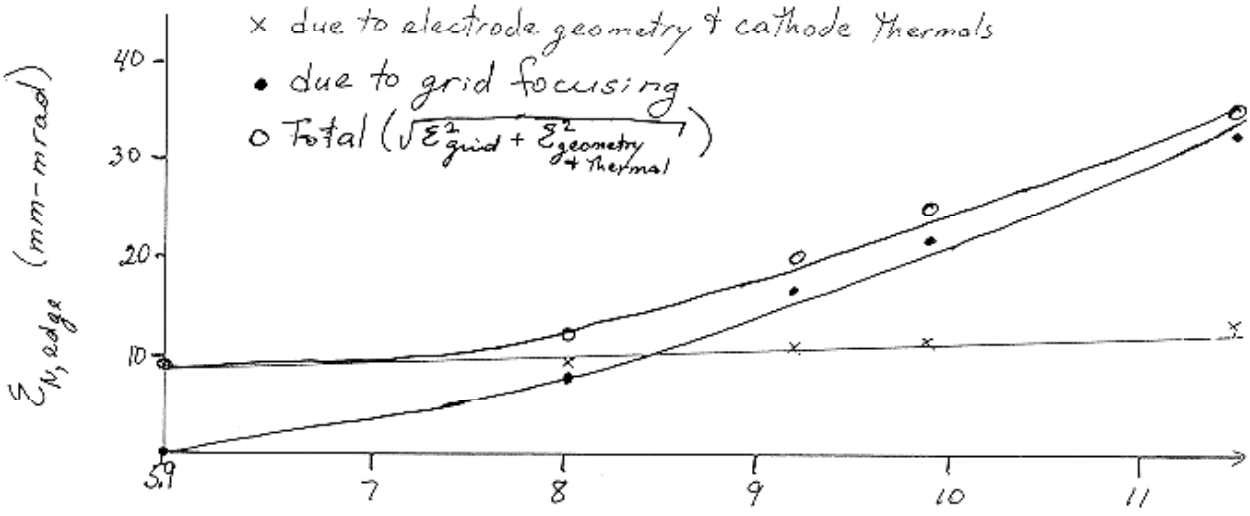
At 2:00pm connected the gun and the HV deck back to the power supply with the phenolic rod missing. Ran the voltage up to 160 kV very easily. At about 3:00pm the Vacuum was down to 4*10-8 Torr at 160 kV and 105 μA leakage current. The gun ran for almost the entire weekend at 160 kV.

Sunday March 10th 1996

On March 10th at about 6:00pm the gun was at 160 kV, with 50 μA leakage current and 5*10-9 Torr vacuum.

March 11th was devoted to installing a Lucite rode where the phenolic had been, checking the magnet polarities, and calibrating the Gun HV power supply with a Ross precision divider.

Thermionic Gun Emittance



(But Gun is running at 6 Amp grid limited)

CTF3
Dian Yeremian
CERN, Oct 26,

NLCTA Style Gun for CTF3.

$V = 140\,KV$

$K = 0,1755$ perv ($I_{schlin} = 9,2A$)

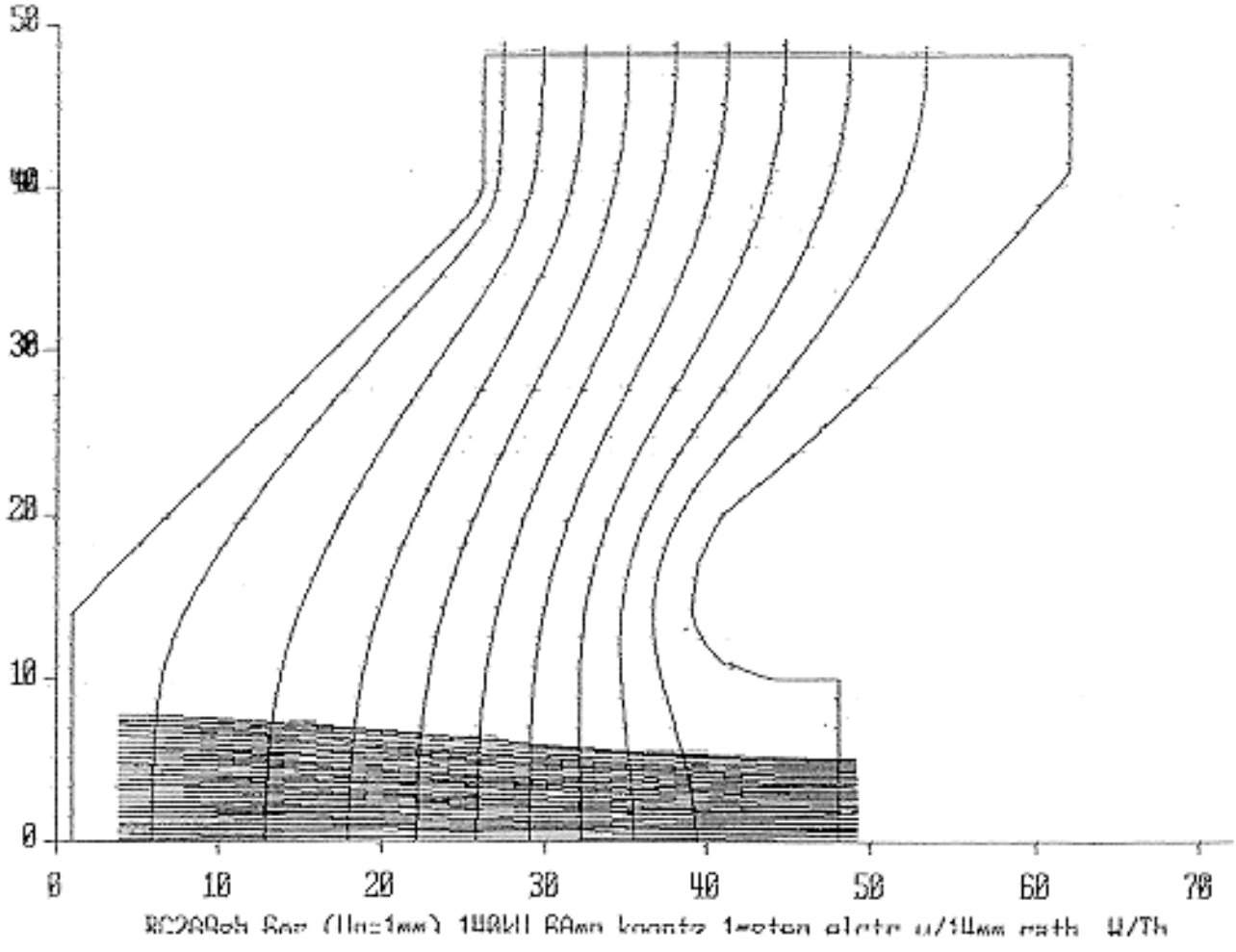
$I = 6\,A$

$\varepsilon_{N\,geom\&thermal} = 11\,mm\text{-}mrad$

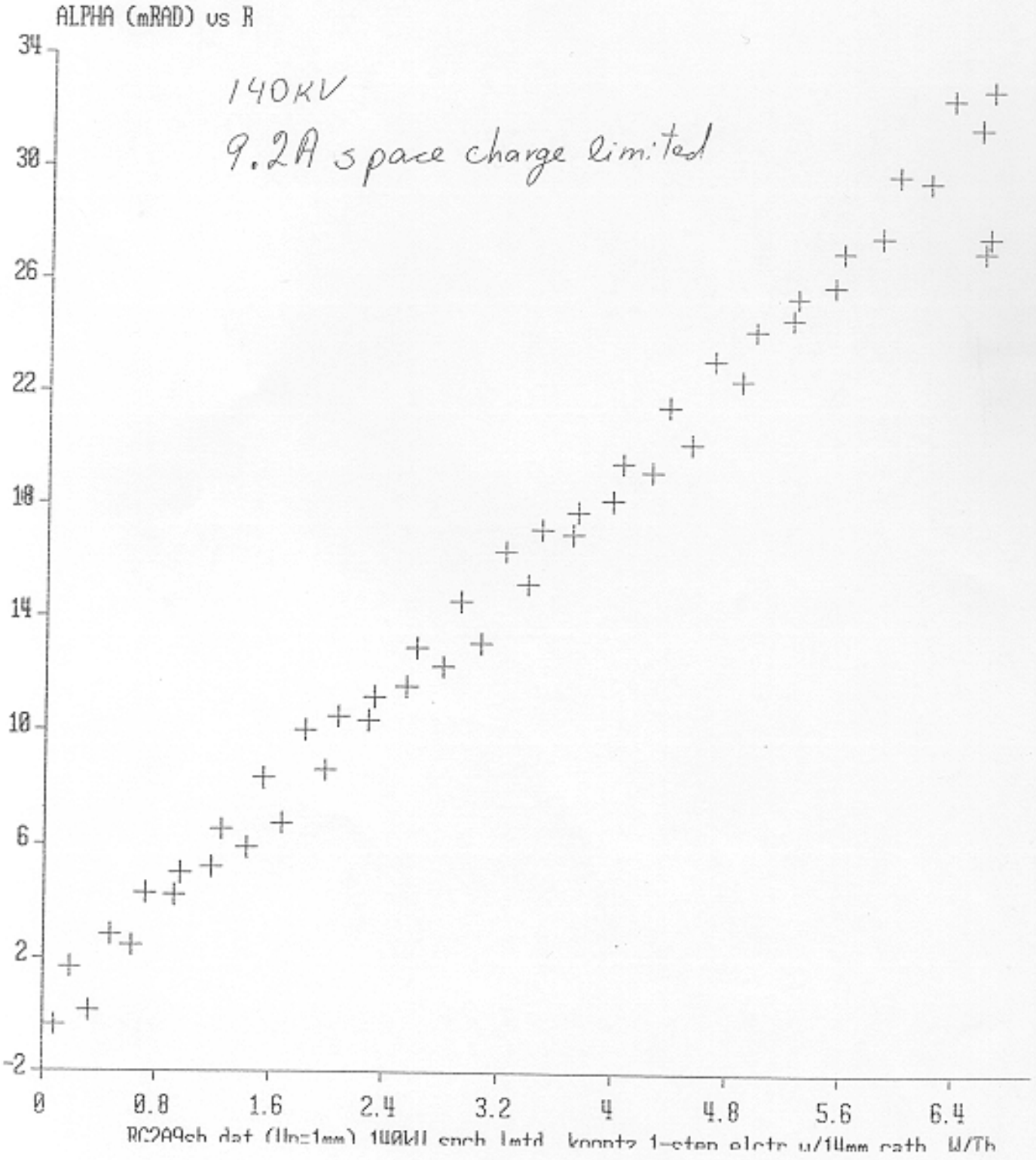
$\varepsilon_{N\,grid} = 17\,mm\text{-}mrad.$

$\varepsilon_{N\,TOT} = 20.2\,mm\text{-}mrad.$

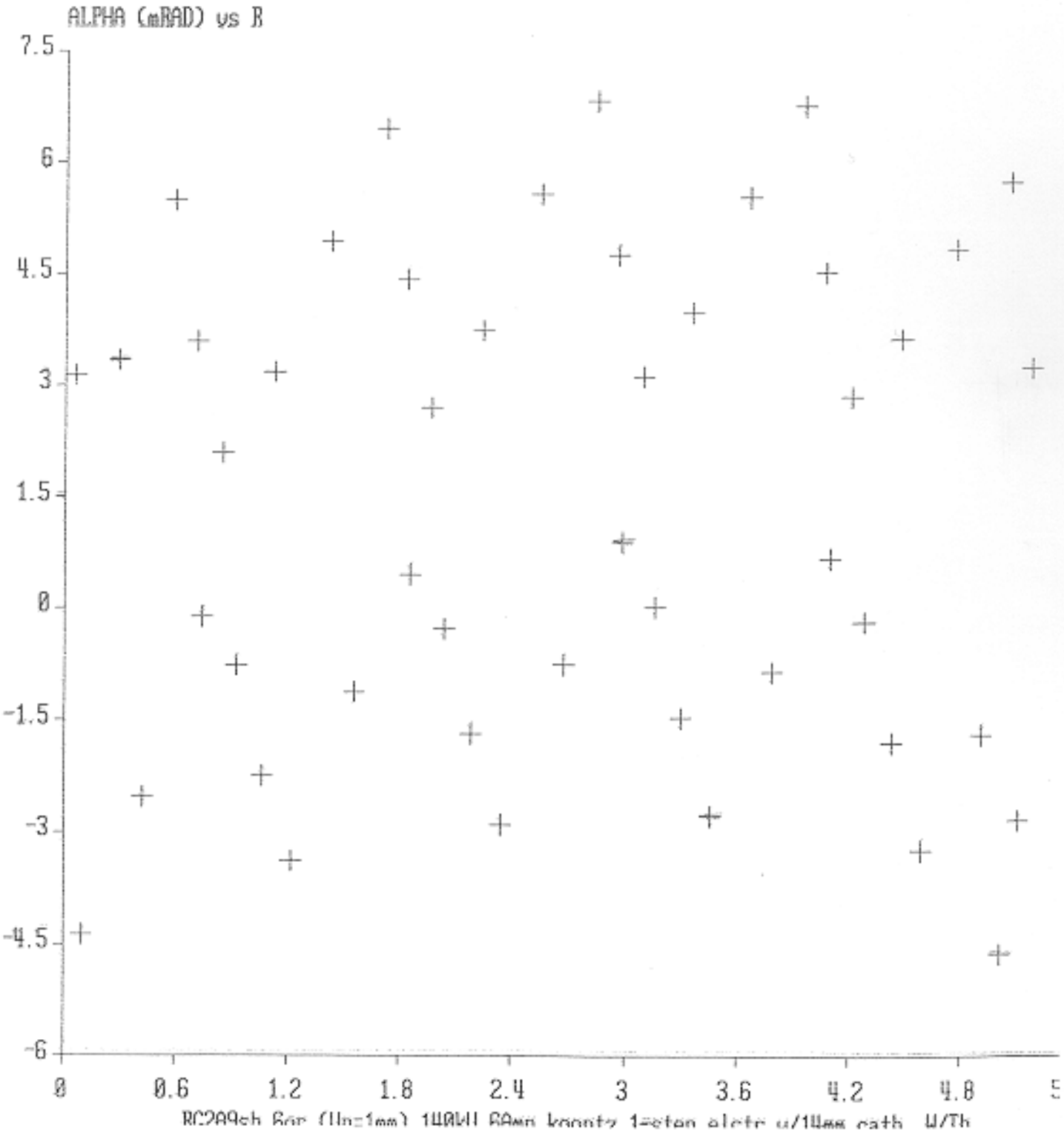
$\varepsilon_{g\,TOT} = 25,7\,mm\text{-}mrad.$



R62a 9sh, 6gr


ALPHA (mRAD) vs R
140KV
9.2A space charge limited
34
30
26
22
18
14
10
6
2
-2
0
0.8
1.6
2.4
3.2
4
4.8
5.6
6.4

140KV, Grid limited to 6A (Schlin is 9.2A)



Gun Parameters

V	**140 KV**
K	**0.1755**
μperv	
I space charge limit	**9.2 A**
I Grid Limit	**6 A**
Emittance (N, edge, geometry)	**11 mm-mrad**
Emittance (N, edge, grid)	**17 mm-mrad**
Emittance (N, edge total)	**20.2 mm-mrad**

What Next?

Decide on number of cathodes and whether want to joint order with SLAC

Start NLCTA gun modifications at SLAC (probably after January 2001

CERN (LAL) prepare for Beam tests.