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DISSERTATION

Cool Science

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“The Setesh guard’s nose drips.”
TEAL’C

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¹ 1 Electron beam setup

² 1.1 Charatarization of a working CRT

³ HAMEG HM507 oscilloscopes [1] were used for testing purposes. These contain a
⁴ D14-363GY/123[2] CRT hereinafter abbreviated as ‘D14’, ‘tube’, or ‘CRT’. Although
⁵ the HM507 has only a bandwidth of 0 MHz to 50 MHz, which is not sufficient for the
⁶ hyperfine splitting frequency of 461.7 MHz of ^{39}K , it was used nevertheless because of
⁷ its simple construction and availability. A schematic view of the device is shown in
⁸ fig. 1.1 with the back pin arrangement in fig. 1.2.

⁹ The voltages and currents of the necessary pins to drive the CRT were measured
¹⁰ using a 2.5 kV probe with an attenuation ratio of and are summarized in table 1.1. It
¹¹ was not possible to measure pin g3 directly. Therefore a HVPS (section 1.2) was used
¹² to set a voltage and the beam diameter was observed. The best focus was achieved
¹³ with the voltage mentioned in the table. The voltage offset of x-, and y-plates was not
¹⁴ possible to measure directly, since it varies with time to draw the necessary image on
¹⁵ the phosphor screen. The given values in table 1.1 are the mean of the minimum and
¹⁶ maximum measured voltage. The deflection coefficient is summarized in table 1.2.

<http://www.to>

model number

1:100 or 100:1

current?

1 Electron beam setup

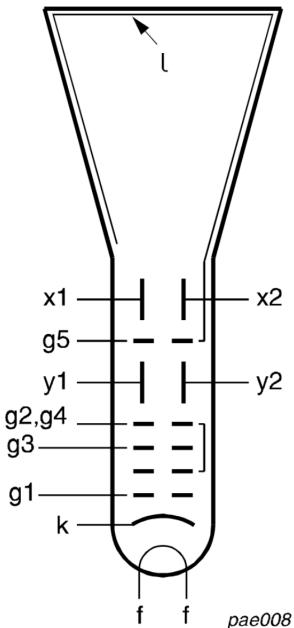


Figure 1.1: Electrode configuration (from [2])

how to cite figure

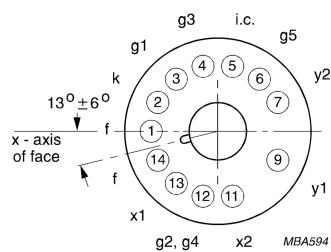


Figure 1.2: Pin arrangement, bottom view (from [2])

how to cite figure

Table 1.1: D14-363GY/123 CRT pin measurements

current empty or '-' symbol

number	pin	voltage/V	current/ μ A
1	f	-1.99×10^3	86.6×10^3
2	k	-2.00	-7.6
3	g1	-2.03	0
4	g3	-1.813×10^3	
5	i.c.	71.7	0.1
6	g5	64.0	7.2
7	y2	78	
9	y1	78	
11	x2	96	-
12	g2, g4	71.0	0
13	x1	96	-
14	f	-1.97×10^3	-86.2×10^3

Table 1.2: D14-363GY/123 deflection coefficient (from [2])

how to cite source

horizontal	M_x	19 V/cm
vertical	M_y	11.5 V/cm

1.2 High Voltage Power Supply HVPS

To produce high dc voltages to drive the CRT, four HCP 14-6500 power supplies[3] were used. They were named ‘HVPS 1’ to ‘HVPS 4’ and can provide up to ± 6.5 kV and 2 mA. To connect the output to the CRT pins, BNC cables were refitted with a save high voltage (SHV) connector on one side while on the other end the BNC connector was kept (fig. 1.3). A 6 kV probe was used to obtain the breakdown voltage, which is around 3 kV caused by the coaxial cable which was not built do sustain high voltages.

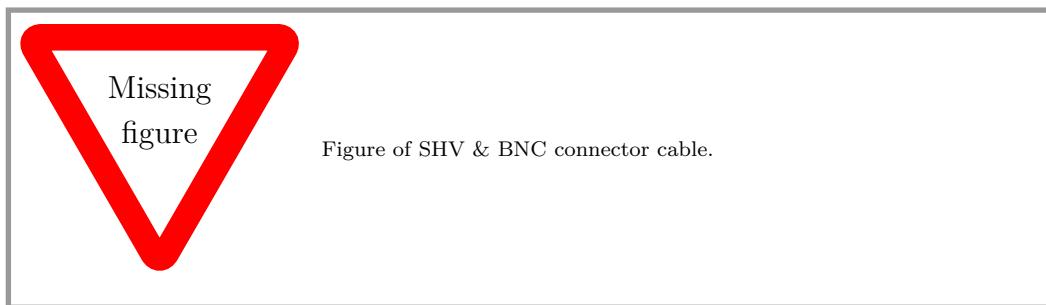


Figure 1.3: Coaxial cable with SHV and BNC connector.

1.2.1 Ripple measurement

Each power supply was measured for its ripple with a set voltage of 2 kV. A 2.5 kV probe (attenuation ratio)was connected to an oscilloscope set to ac coupling with a timescale of 1 ms. To get the electronic noise of the oscilloscope itself, the probe was shorted and the noise measured. A picture of a measurement is shown in fig. 1.4 with the values summarized in table 1.3.

Table 1.3: HVPS ripple

device	ripple/mV
short	116
HVPS 1	136
HVPS 2	138
HVPS 3	194
HVPS 4	204

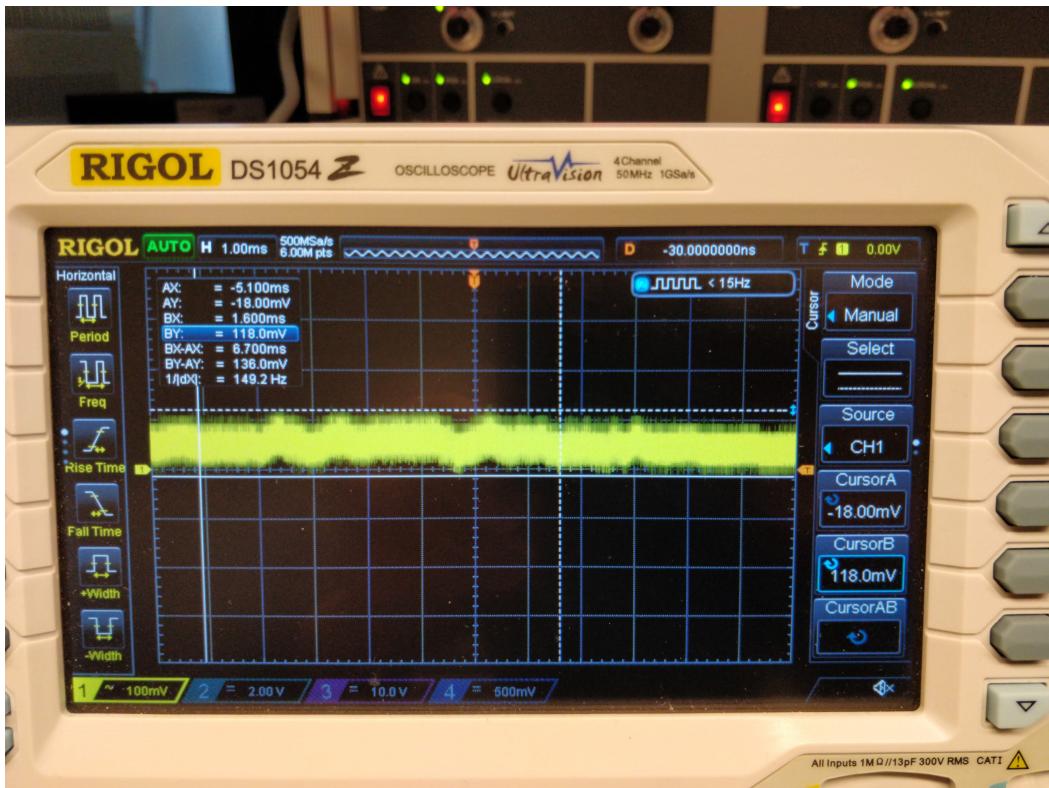


Figure 1.4: Measurement of HVPS ripple.

1.3 CRT wiring

- 1 A schematic of the supplied power is shown in fig. 1.5. A small ac or dc voltage
2 is necessary to drive the heater filament f. This part of the setup is explained in
3 section 1.4.
4

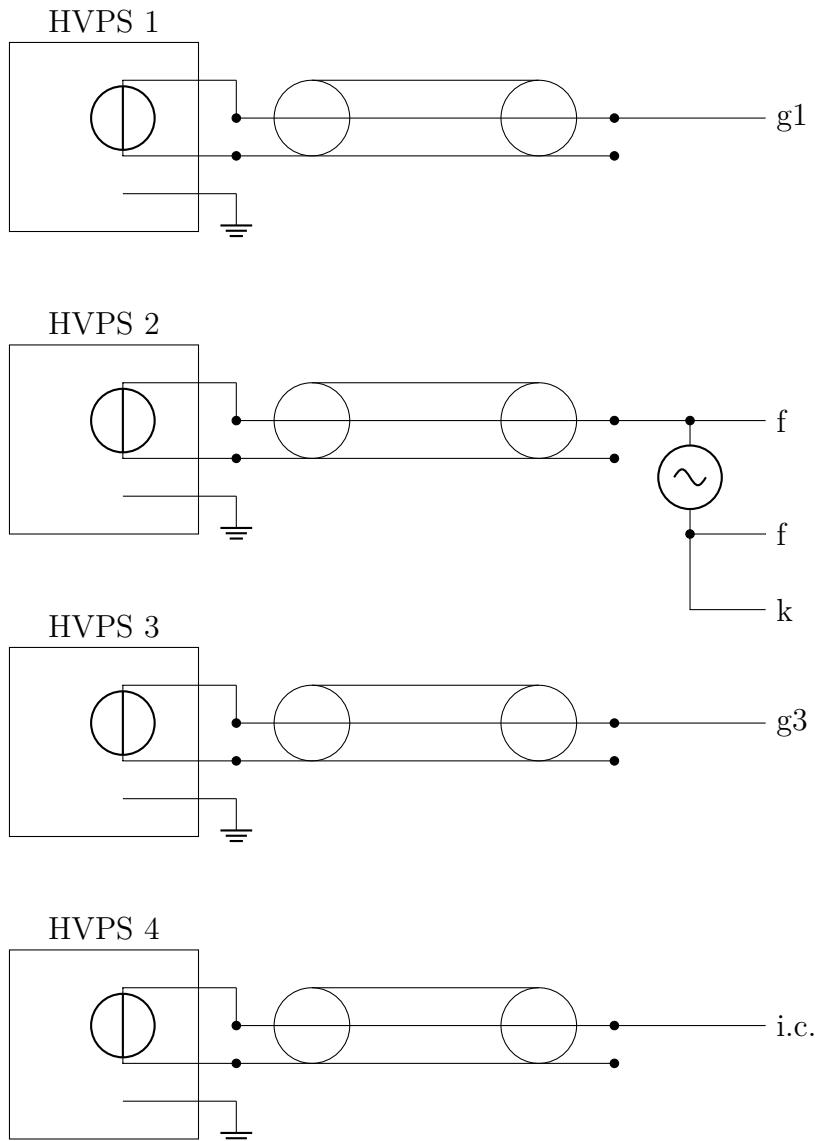


Figure 1.5: Schematics of supplying CRT pins with power.

1.4 Heater

Heater Wie sieht der Innen aus?

1

2

¹ Todo list

²	■ http://www.tobiastiecke.nl/archive/PotassiumProperties.pdf	1
³	■ model number	1
⁴	■ 1:100 or 100:1	1
⁵	■ current?	1
⁶	■ how to cite figure	2
⁷	■ how to cite figure	2
⁸	■ current empty or '-' symbol	3
⁹	■ how to cite source	3
¹⁰	■ find name of big yellow probe	4
¹¹	■ somewhere 2.5-4, find exact value	4
¹²	■ Figure: Figure of SHV & BNC connector cable.	4
¹³	■ 100:1 or 1:100	4

References

- [1] Rohde & Schwarz. *HM 507*. URL: https://cdn.rohde-schwarz.com/hameg-archive/HM507_english.pdf (visited on 03/28/2020).
1
2
- [2] Frank Philipse. *D14363GY123*. URL: <https://frank.pocnet.net/sheets/186/d/D14363GY123.pdf> (visited on 03/10/2020).
3
4
- [3] FuG Elektronik GmbH. *HVPS Series HCP*. URL: https://www.fug-elektronik.de/wp-content/uploads/pdf/Datasheets/EN/HCP_data_sheet.pdf (visited on 03/23/2020).
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