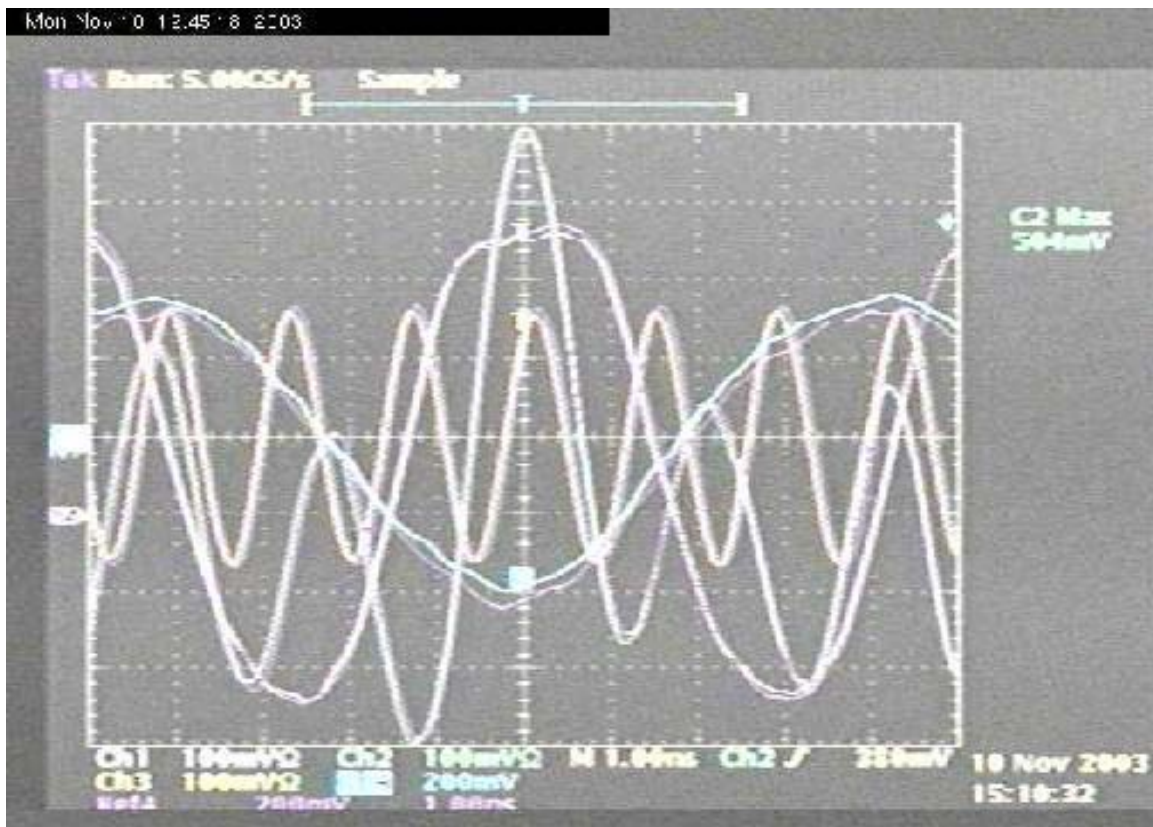# Injector RF/TGAS/Subharmonic Bunchers
J. Turner, A. Brachmann

Recently there have been power dips and subsequent timing and SHB problems. Here is some guidance to help diagnose and repair some of these problems:

1. You need too look at the video of Ron Akre's RF scope: 0-53, and the CID HP Scope 3-32. The RF Scope should look like the picture in Accelerator Elog 10-Nov-03 12:07.

2. Resetting the dividers:

The RF scope (0-53) has 4 saved traces and 4 active traces. This scope triggers on the fiducial (marker) on the 476 MHz (the peak in the middle of the scope). It also includes 119 MHz, 178.5 MHz (SHB and TGAS RF), and 714 MHz (Damping Ring RF).

The important thing here is the relationships (phase stability) between the frequencies. (If all the active traces are offset the same amount from the saved traces, that's ok.) Two of these frequencies (the 178.5 and 714 MHz) are generated with dividers which can be reset with a trigger. The trigger is TRIG 213 in LI00 which is part of VDU 214 in LI00. To reset, you select Beam Code 11, and select TRIG 213, and reactivate(, then deactivate) the TRIG.

If these traces don't look right after this procedure, you need to contact Ron Akre.

3. Getting TGAS re-programmed:

Warning (and explanation):
If the RF Scope shows the different frequencies have phase shift with relation to each other, then DON'T continue, you will only dig a hole. A given TGAS calibration relies on a fixed phase relationship between 119 and 178.5 MHz RF. TGAS has a 178.5 MHz phase shifter and a TRIG (119 MHz) which get moved in a complicated way in order to produce a smooth time deformation when the TGAS timing knob is turned.

Occasionally power dips make the beam go to the wrong time out of the gun due to TGAS losing its marbles. Go look at the CID HP scope: "Video Index", "LI00-1 Scope Index", "CID HP SETUPS", push the top left "TGun Gap Scav (BC 11)" button. The scope should look like the middle trace in the picture in the Accelerator ELOG from 9-Nov-03 5:26:19 (in ELOG lingo this is folder 2003, subfolder 45, book 11.09a). That is, the pulse begins to go down about a nanosecond from the left edge of the screen.
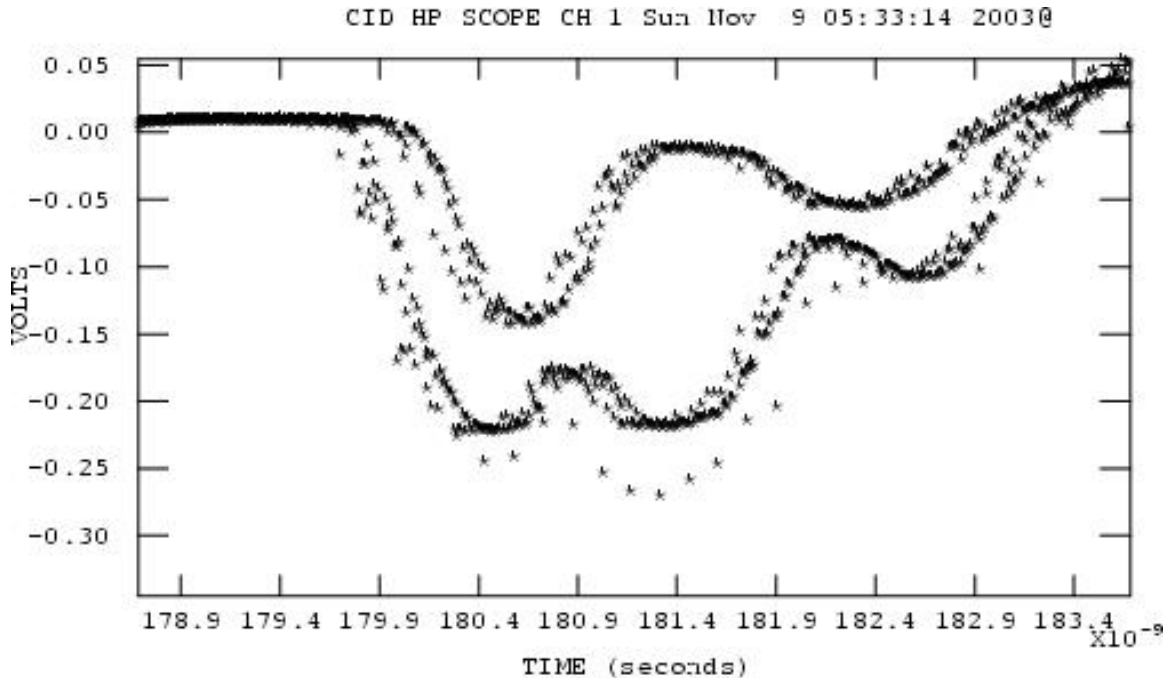
9-NOV-03 05:26:19

If the pulse is not at the right time, and the RF scope traces are right with respect to each other, then the old database can be re-stuffed into the TGAS module by running the calibration procedure, but NOT accepting any new calibration:

Push Modulator OFF on klystron K02, then go to "Injector Index", "TGun Pulser Panel", select "TGAS 2 (T402)", enter "Beam Prompt" 11 (select beam code 11), go to "TGAS DIAGS PANEL", push "CALIB TGAS", tell it who you are and "no" to resetting the divide by 16. IF the program asks you to "accept new calibration" say "NO". If it asked about the calibration, then it failed and something else is wrong and you need to get help. Page Axel Brachmann, Jim Turner, or Mike Stanek. If it success, then you will get a picture like the one in Accelerator Elog 9-Nov-03 5:25:13.

4. Getting SHBs up:

SHBs are virtual klystrons, with PADs, phase trim. They also have "slow feedbacks" which adjust their HVs to keep the amplitudes steady. If the PAD shows no amplitude, it may be that the DAC for the HV has gone to zero with some power spike, so trimming the power supply will make it OK. Go to the "Injector Index", "CID RF Phase" panel, select "SHB1 HV AMPL

5", and push "TRIM VDES". Select "SHB2 HV AMPL 6" and "TRIM VDES".

5. Making sure all is right.

Go to the CID HP Setups panel and push the "GAP 540 SCAV" button. You should get a picture (on 3-32) which looks like the top trace in the picture in the Accelerator Elog at 9-Nov-03 5:28:55.

CID HP SCOPE CH 3 Sun Nov 9 05:35:50 2003@
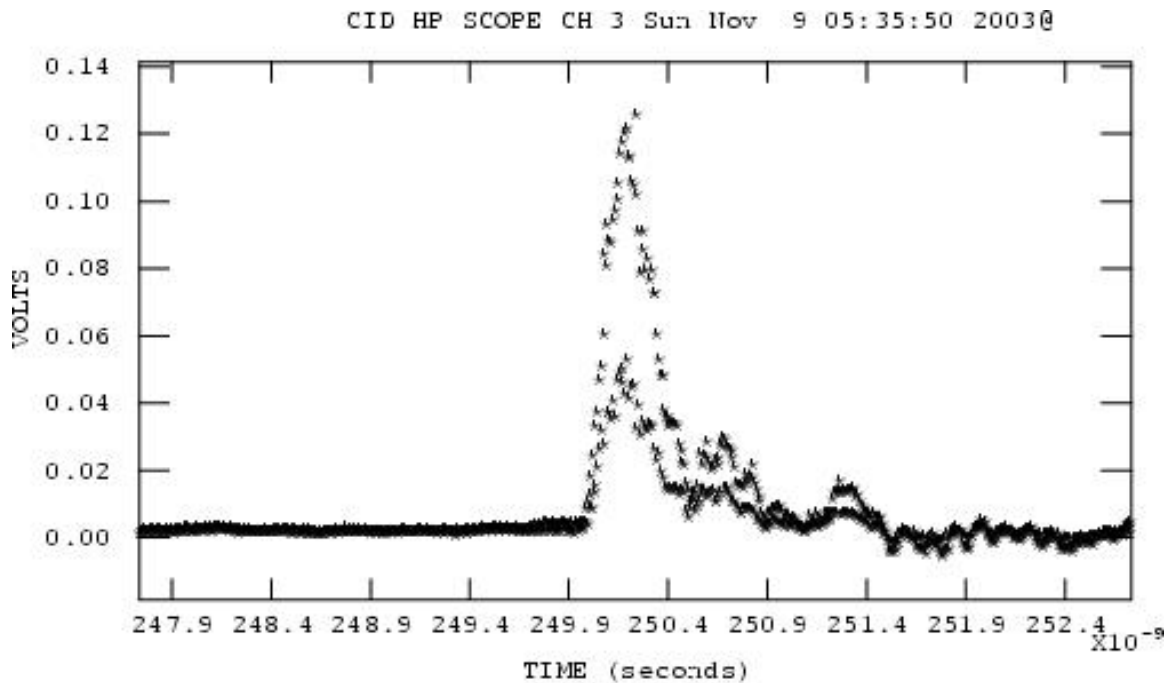
9-NOV-03 05:28:55

If the timing was wrong from TGAS, the trace may be 1/2 amplitude, but at the same time. This is because the SHB RF has a period of 5.6 nS and can capture some beam even when it is coming out of the gun a nS or two wrong. Don't change the SHB phases. Holes have been dug recently doing that. If there are 2 roughly equal size pulses, the SHB2 may be not functioning.

Feel comfortable calling for help. Many different things can go wrong here, so we need to hold the setup we have steady, understand what goes wrong, and put it right.