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5/30/2007

Stacktail Beam Transfer Function Measurement Procedure

Initial Conditions

1. Stacking off.
   - ARF1 off (A:R1HLSC = OFF)
   - Stacktail off (A:SPPS01 = OFF, make sure A:SPAM09 is still on)
   - Pulsed devices off
   - Stacktail monitor ACL script OFF
2. Small amount (> 7 mA) of $\bar{p}$ beam cooled into the core.

Measurements to be made

f_{rev}	Measurements	Beam Intensity	Notes
Core	Stacktail Legs 1, 2, and 3	7.0 mA	
628890 Hz	Core 2-4 GHz Δp Core 4-8 GHz Δp Stacktail Legs 1, 2, and 3	3.5 mA	
628865 Hz	Stacktail Legs 1, 2, and 3	200 μA	Blow up beam longitudinally after measurements complete. Add 90 psec to A:CMTM01.
628840 Hz	Stacktail Legs 1, 2, and 3	50 μA	On resonance Osc Pwr = -20 dB No longitudinal cooling. Do leg 3 first, then leg 2, then leg 1

Measurement Procedure

1. Initial Move (beam on core orbit)
   a. Set P142 to "normal" mode (A:VSARST = 0)
   b. Measure core frequency (A:CENFRQ)
   c. Turn off core cooling
   d. Move beam to target f_{rev}
      Run P-BAR Sequencer (Mode 2) aggregate "Move Beam with ARF3"
2. Set up 4-8 GHz Δp cooling at target f_{rev} using the procedure given below (except at f_{rev} = 628840 Hz).
3. Scrape tails of beam longitudinal distribution. Scrape beam until A:IBEAM is at the prescribed intensity (see table under Measurements to be made).
   Use the table below for *approximate* guidance as to where to place the scrapers:

f_{rev}	A:LJ314	A:RJ314
628897 Hz	62.6 mm	81.5 mm
628890 Hz	52.4 mm	74.1 mm
628865 Hz	30.0 mm	39.9 mm
628840 Hz	5.3 mm	15.7 mm

4. Remove scrapers
5. Save "before measurement" longitudinal profile (SA4) using P44.
6. Turn off stacktail notch filter long legs (A:SPXFL1, A:SPXFL2, A:SPXFL3 to position 1)
7. Perform single band BTF to determine the off-resonance measurement frequency.
8. Perform broad band BTF (1.5 – 4.5 GHz) measurements both on resonance and off resonance.
9. Save "after measurement" longitudinal profile (SA4) using P44.

Setting up 4-8 GHz Δp core cooling

f_{rev}	A:MARAYD	A:CMTM01
628897 Hz	-37.6 mm	317 psec
628890 Hz	-28.9 mm	330 psec
628865 Hz	-0.7 mm	358 psec

1. Move 4-8 GHz core Δp pickup over beam
   a. Record A:MARAYD and A:CMTM01 core orbit settings.
   b. Set A:MARAYD according to the above table
   c. For revolution frequencies not in the table, set A:MARAYD to approximately the position corresponding to the present revolution frequency given by:

   $$\Delta x = -\frac{D}{\eta}\frac{\Delta f}{f}$$

   where D = 10.0 m and η = 0.0138. The pickup moves outward (Δx > 0) as f_{rev} decreases.

   d. Observe CP48-SCH on SA1
      • Set A:RLLFS0 to the present value of f_{rev}.
      • Load P41 file 22 to SA1
   e. Adjust A:MARAYD until notch is at center of screen
2. Set A:CMTM01.
   a. Set A:CMTM01 according to the above table
   b. For revolution frequencies not in the table, use the following to determine the delay change relative to the core setting:

   $$\Delta t = \tfrac{1}{2}\left(\frac{1}{f_{rev}} - \frac{1}{f_{core}}\right)$$

3. Turn on A:CMPS01
4. Observe beam longitudinal profile on SA4. Verify average frequency of distribution is not changing before beginning BTF measurements.

Measure Stacktail Notch Filters

Setup P31 as follows:

1. System Select = MANUAL
2. Measurement Type = One Band Manual
3. Start frequency = 1500 MHz
4. Stop frequency = 4500 MHz
5. No. Points = 401

Filter 1

1. Switch settings:
   - NA OUT → SP24-FSW
   - NA IN → SP24-PF1
   - Set A:SP2T01 to position 1
2. Calibration:
   Turn long leg off (A:SPXFL1 to position 1)
3. Measurement:
   - A:SPXFL1 → 2 (long leg ON)
   - A:SPXFS1 → 1 (Short leg OFF)
4. Restore:
   - A:SP2T01 → 2
   - A:SPXFS1 → 2

Filter 2

1. Switch settings:
   - NA OUT → SP24-FSW
   - NA IN → SP24-PF2
   - Set A:SP2T02 to position 1
2. Calibration:
   Turn long leg off (A:SPXFL2 to position 1)
3. Measurement:
   - A:SPXFL2 → 2 (long leg ON)
   - A:SPXFS2 → 1 (Short leg OFF)
4. Restore:
   - A:SP2T02 → 2
   - A:SPXFS2 → 2

Filter 3

1. Switch settings:
   - NA OUT → SP24-TRO
   - NA IN → SP24-PF3
   - Set A:SPXM01 to position 1
   - Verify that A:SPPS01 is ON
2. Calibration:
   Turn long leg off (A:SPXFL3 to position 1)
3. Measurement:
   - A:SPXFL3 → 2 (long leg ON)
   - A:SPXFS3 → 1 (Short leg OFF)
4. Restore:
   - A:SP2T03 → 2
   - A:SPXM01 → 2

Things to put back

1. Scrapers all the way out
2. Turn ON Stacktail notch filter long legs
3. Set A:RLLFS0 = 628897.5 Hz
4. Restore ARF2:
   a. A:R2DDS1 = 628897.5 Hz
   b. A:R2HLSC ON
5. Restore 4-8 GHz core Δp cooling:
   a. Set A:MARAYD to its original position
   b. Set A:CMTM01 to its original value
6. Restore bunch rotation display to SA1 (Load P188 file 99)
7. Turn on core cooling
8. Turn on ARF1
9. Return VSA to stacktail monitoring