Dynamic Range Specifications

Bunched Beam : 4 Bunches separated by 398 ns with
sigma_t = 25ns to 50ns
Determine the position of Total Injected Particles
ranging from 20e10 to 30e10

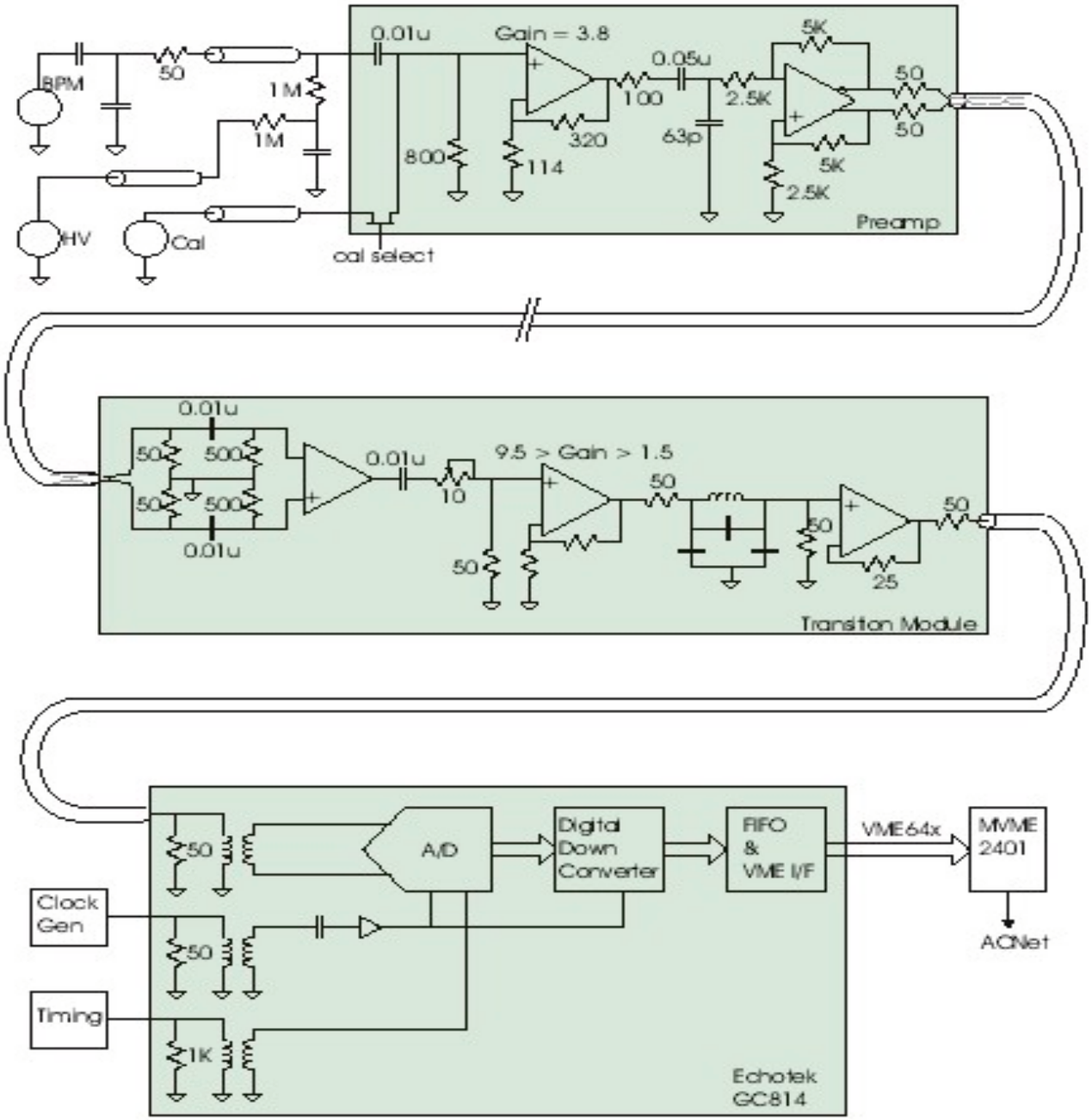
Un-Bunched Beam (cold Beam and Hot Beam): Resolve a
position for 20e10 to 400e10 stored particles.
Barrier Bucket Separation of 1824ns to 11172ns

Absolute Position Measurement = +/- 1.0 mm +/- 5%
Relative Position Measurement = +/- 0.4 mm +/- 5%

Proposed Hardware Items to Meet Dynamic Range Specifications

- Pre-Amplifiers: There are 244 required and available, they need to be modified.
- Transition Modules: Must design and build 488 channels and assemble their crates.
- Digital down converter Boards: Purchase 61 DDC 8-channel boards and their VME64X crates.

A Channel Signal Path

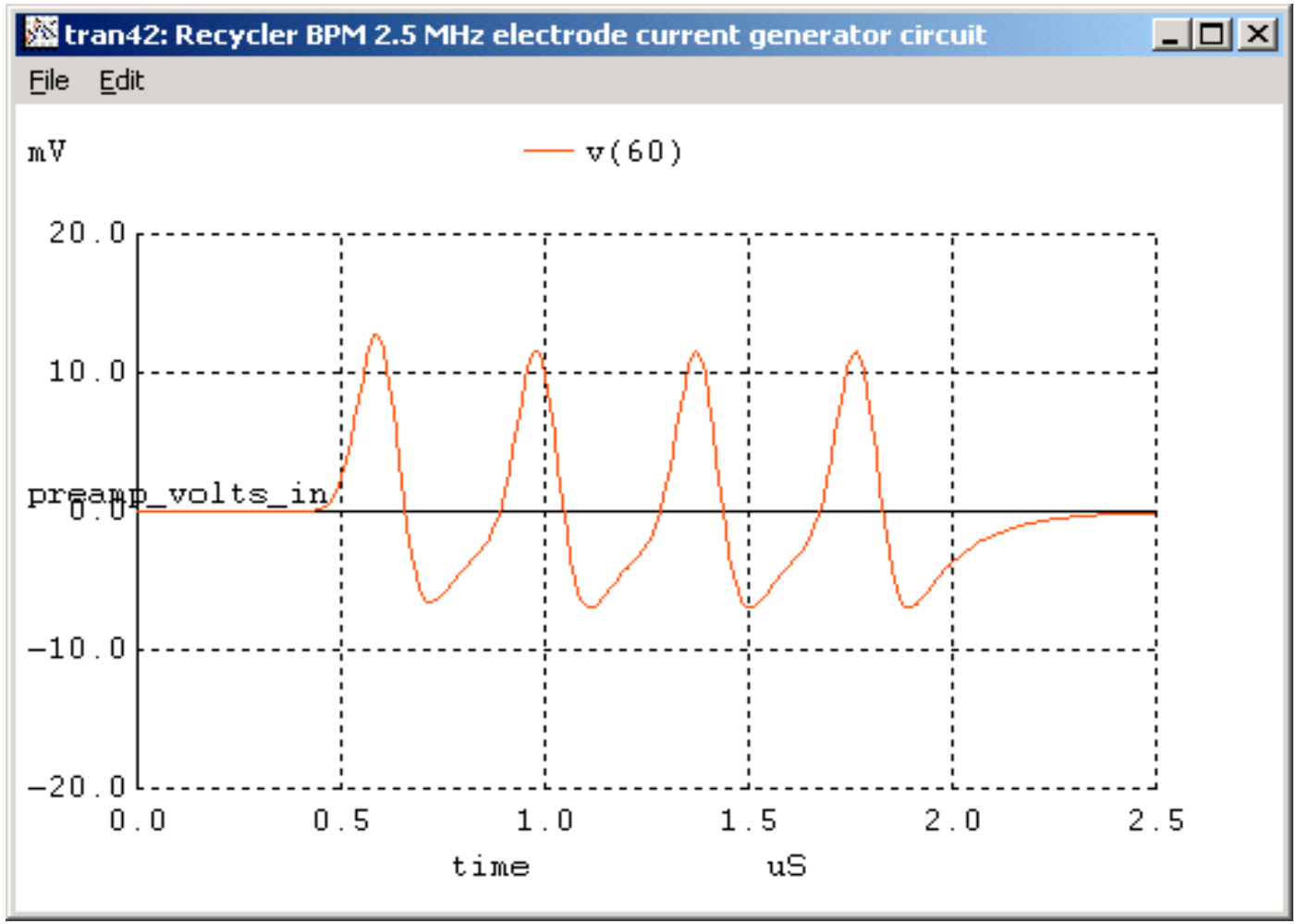


The next 5 slides show bunched and un-bunched beam voltages at the pre-amp
npedance. They are created using
e, derived from the expression
below.

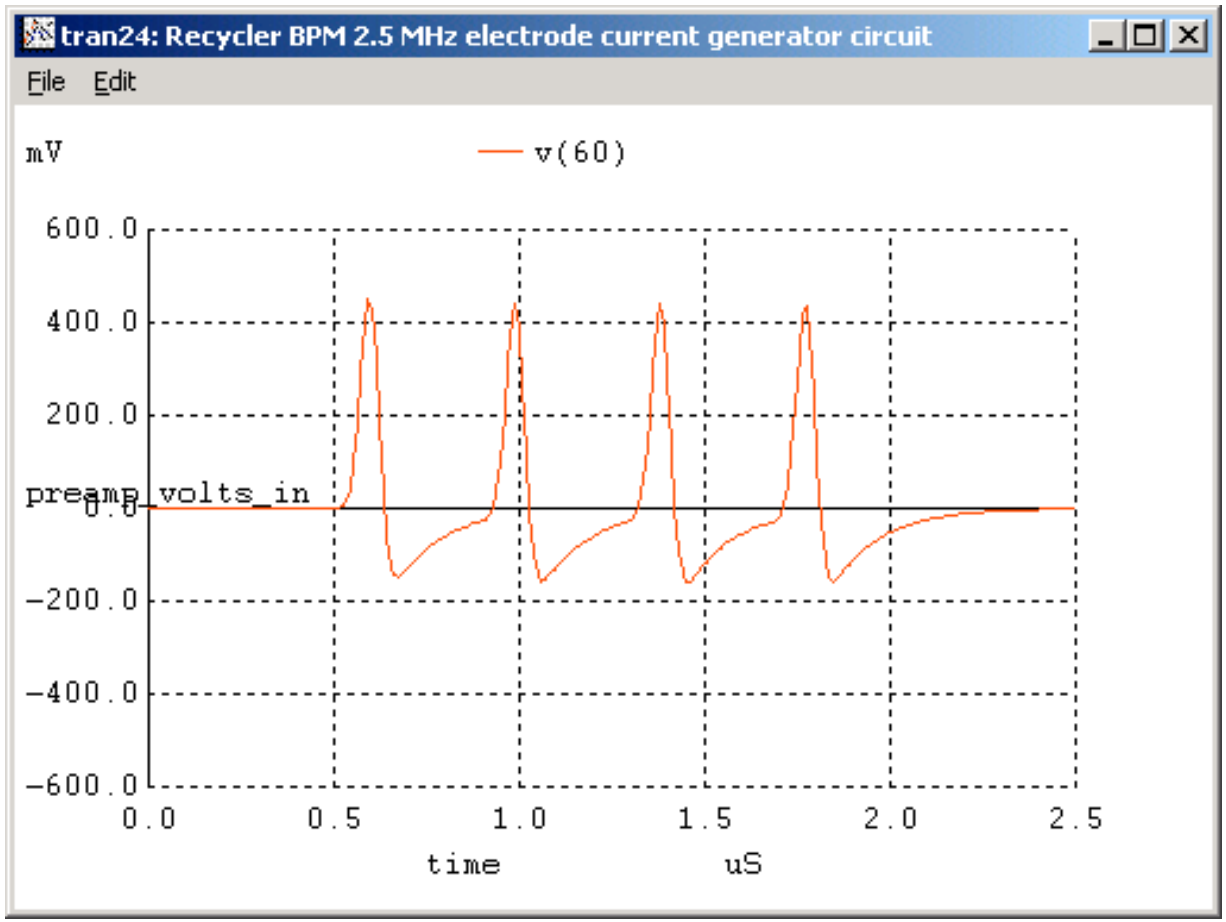
Input voltage set by derivative of beam times the bpm length and the terminating resistor at the pre-amp .

$$Vshunt = \frac{di(b)}{dt} \quad \frac{l}{2 \quad c} Z_{shunt}$$

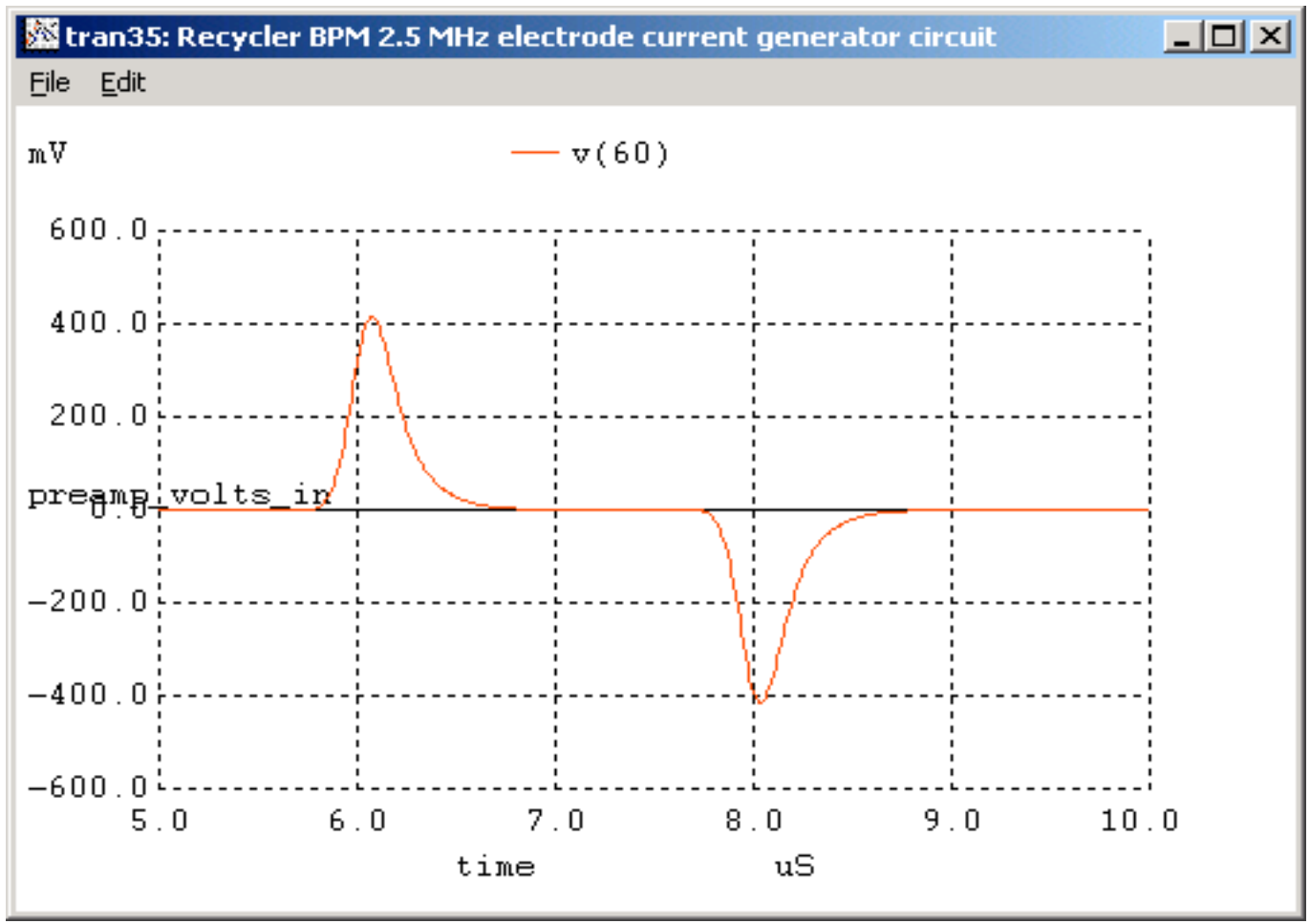
4 Bunches 2e10 Tot. Inj Part. sigmat=50ns



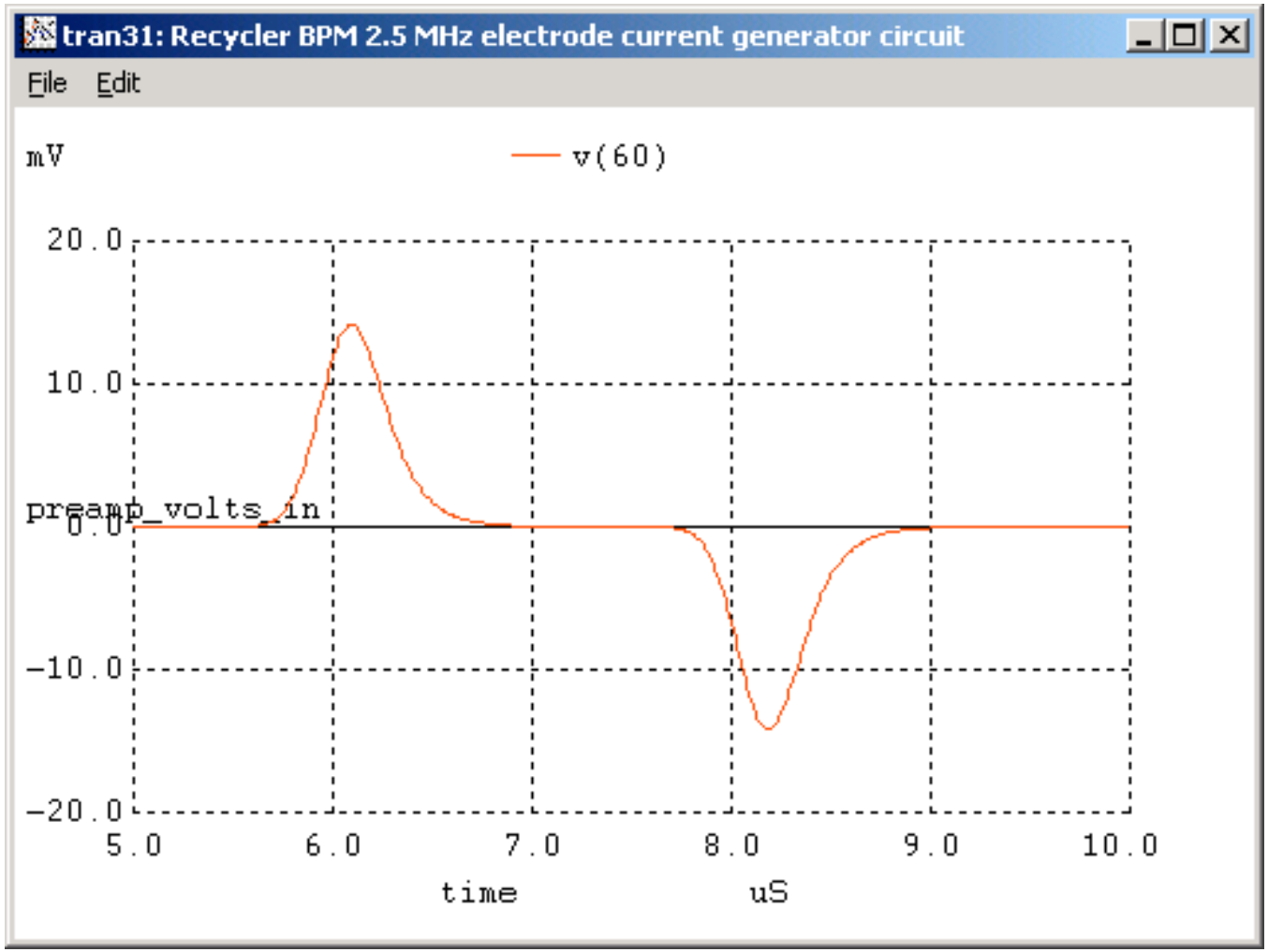
4 Bunches 30e10 Tot. Inj Part. Sigmat=25ns



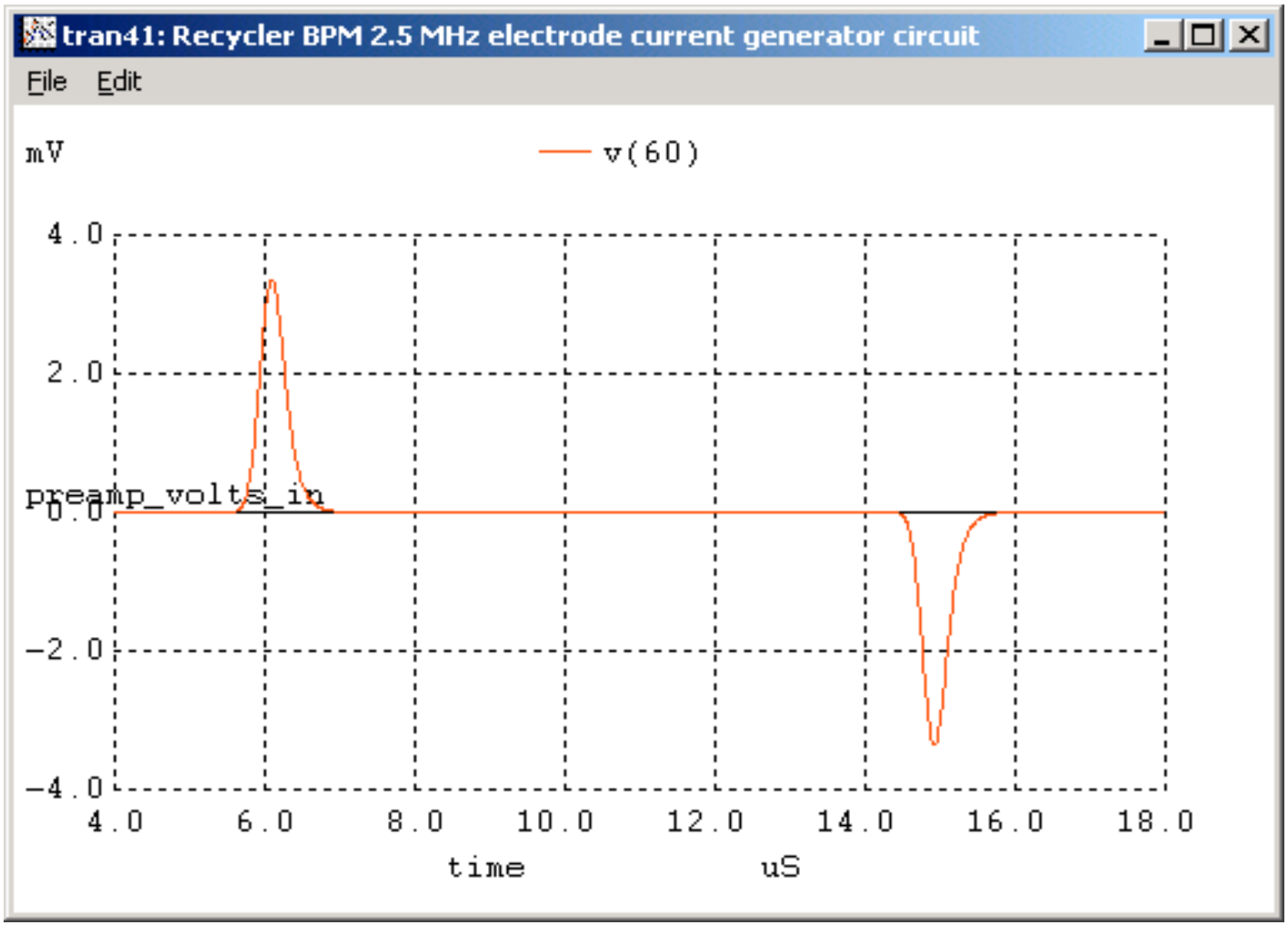
Cold Beam (Un-bunched)
400e10 Stored in 1962 ns 340ns edges



Cold Beam (Un-Bunched)
20e10 in 2094 ns 566 ns edges



Cold Beam (Un-Bunched)
20e10 in 8830 ns 566 ns edges



Frequency Measurement of One Channel in the Pre-Amp

Pre-Amp gain set by total inj. Intensity of 30e10 on-center.

Pre-Amp must not Saturate when beam is near a plate.

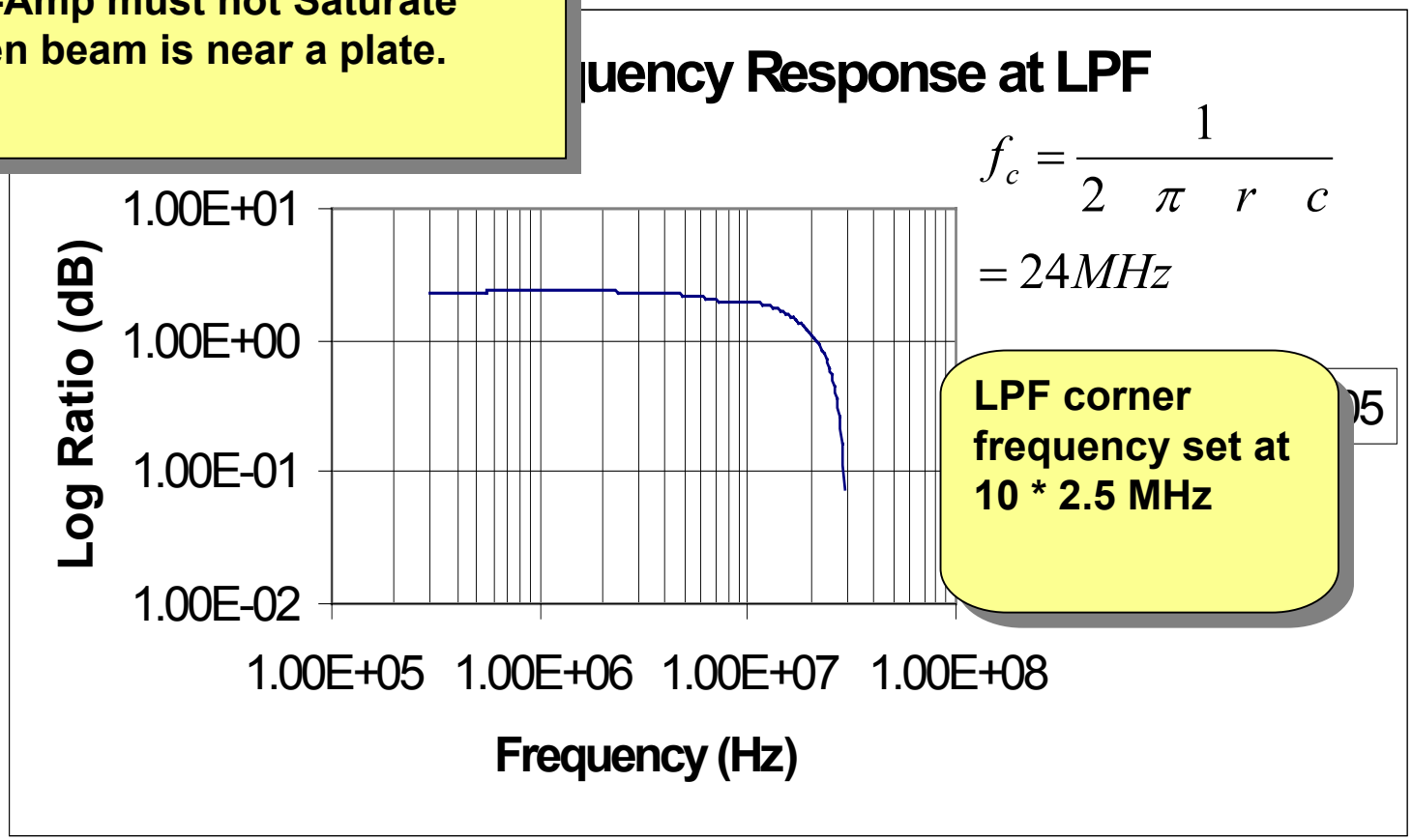
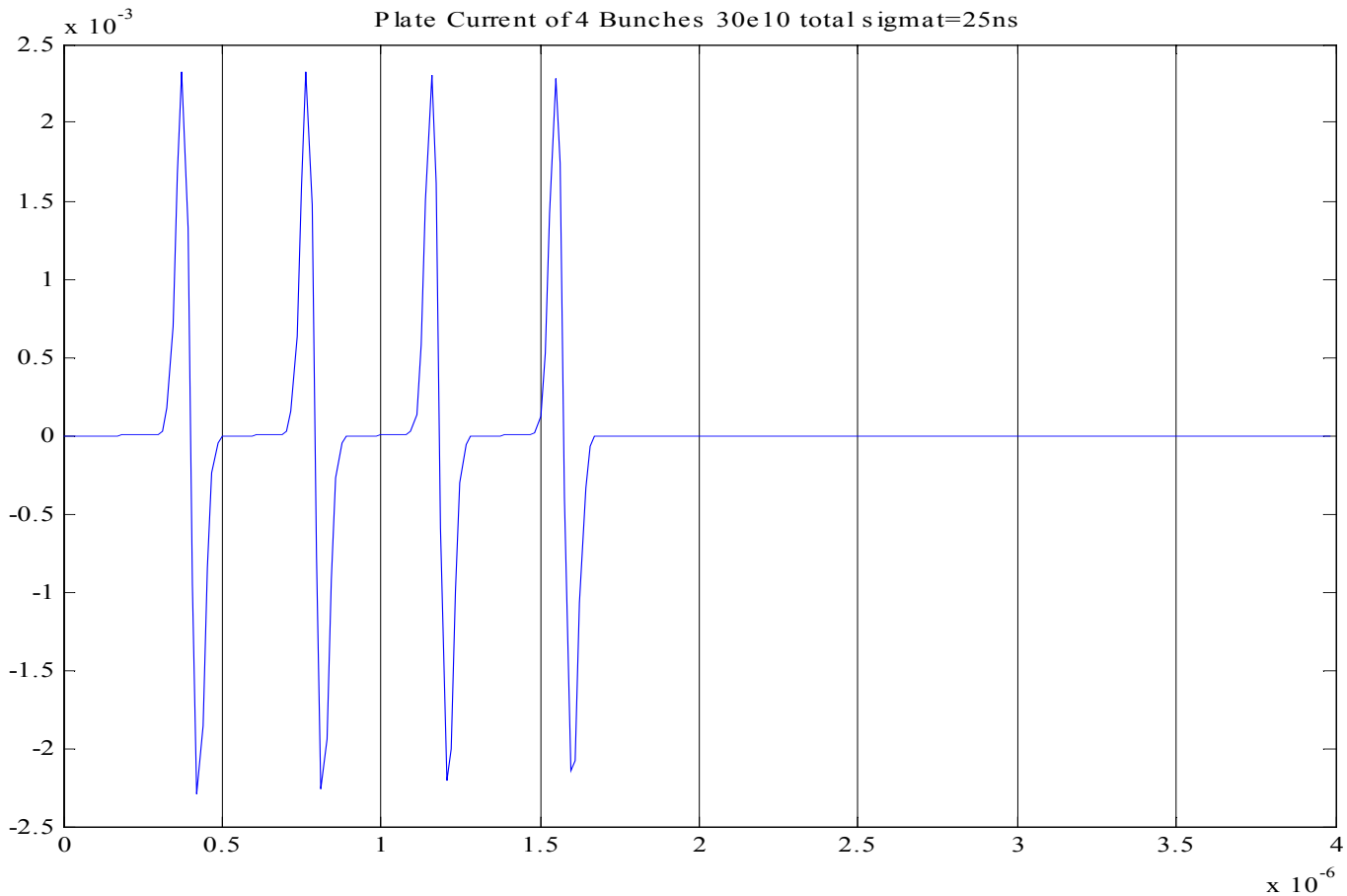
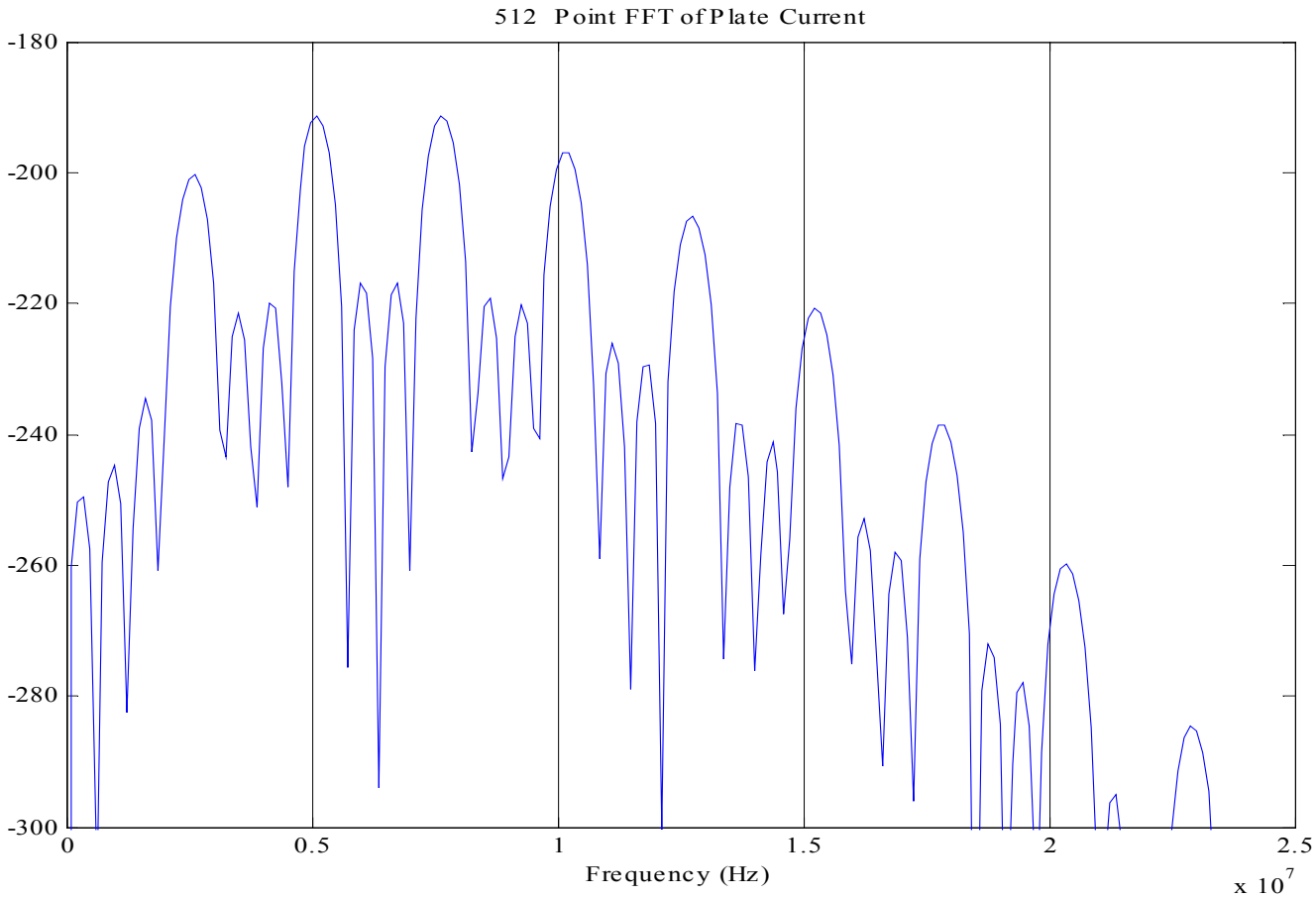


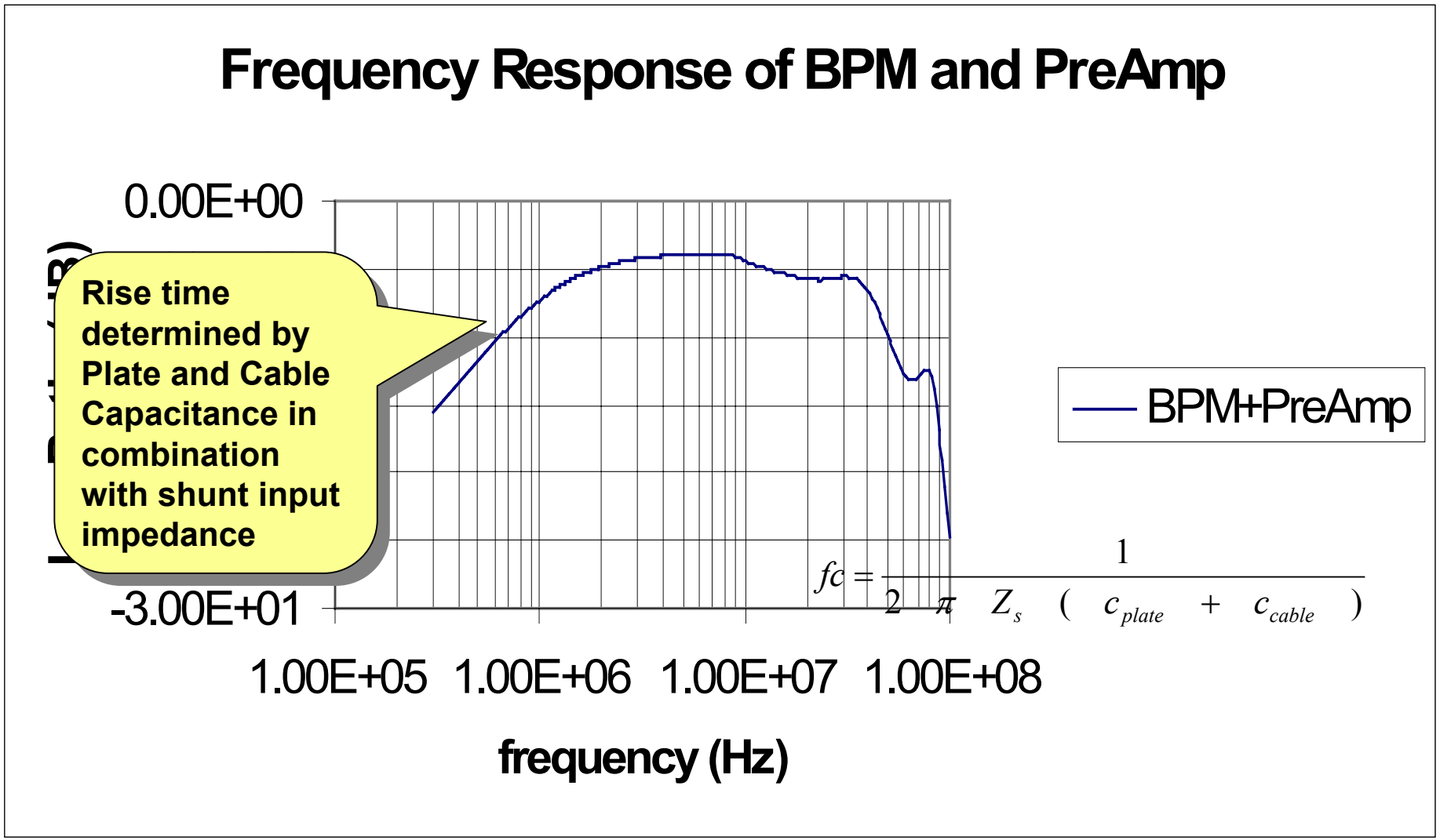
Plate Current of 4 Bunches



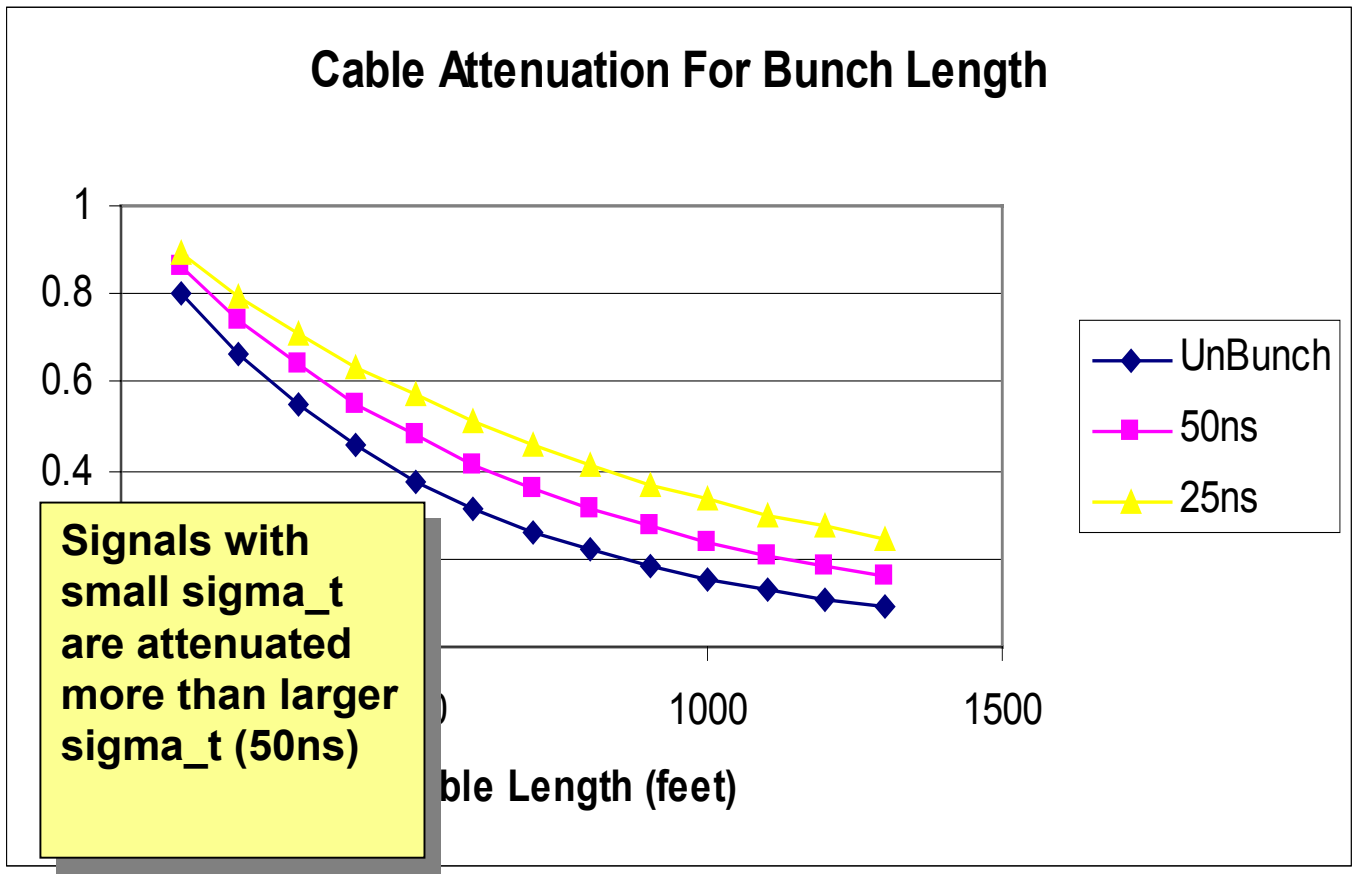
Frequency Content of Signal at Input of Pre-Amp



Frequency Response Measurement of the BPM and the Pre-Amp



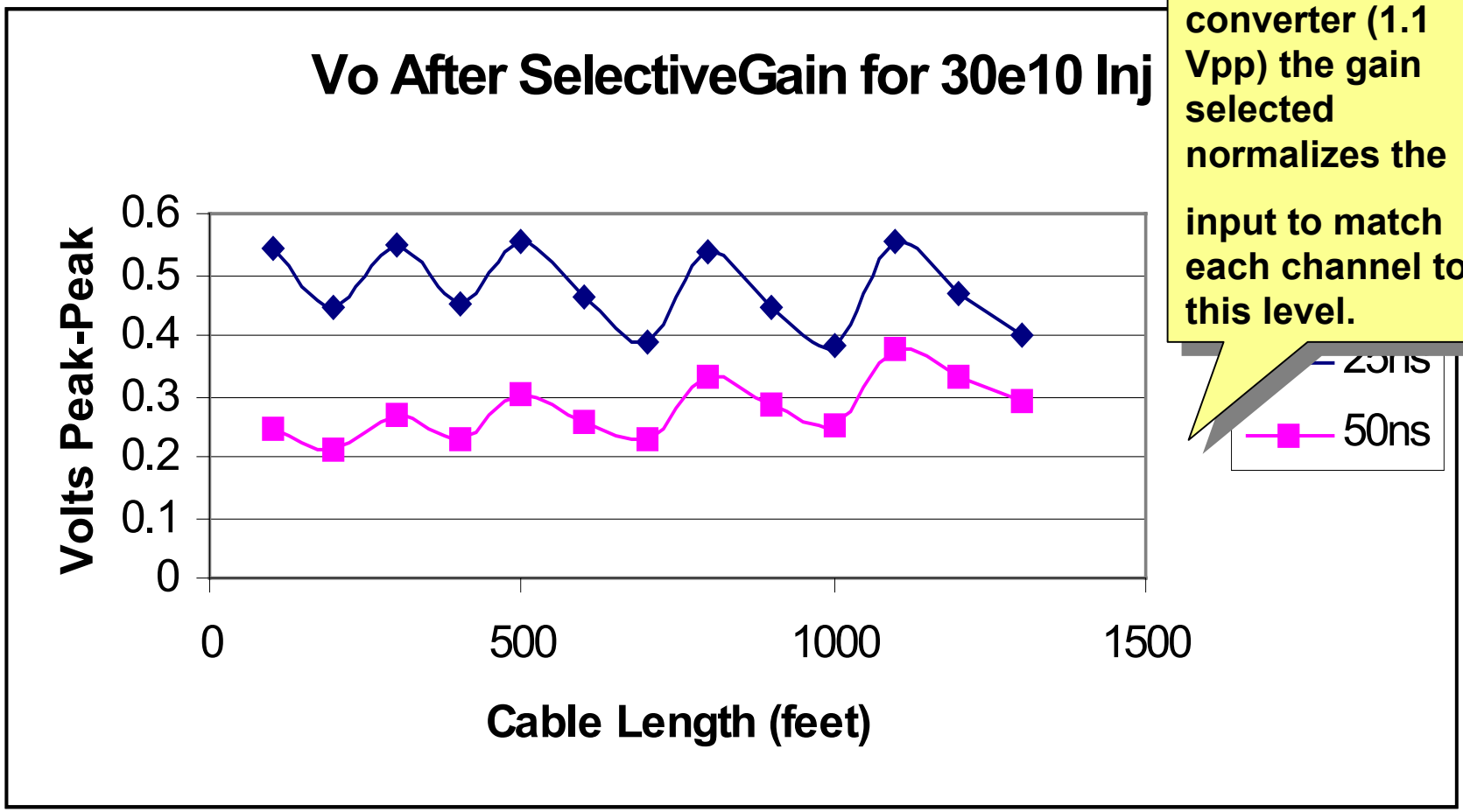
Signal Attenuation Due ToDatalene Twisted Pair Between Pre-Amp Output and Transition Module Input



Transition Module Tasks

- Match the cable Impedance.
- Compensate for Cable Attenuation.
- Band limit the signal with an anti-aliasing filter.
- Provide access to the raw signal.

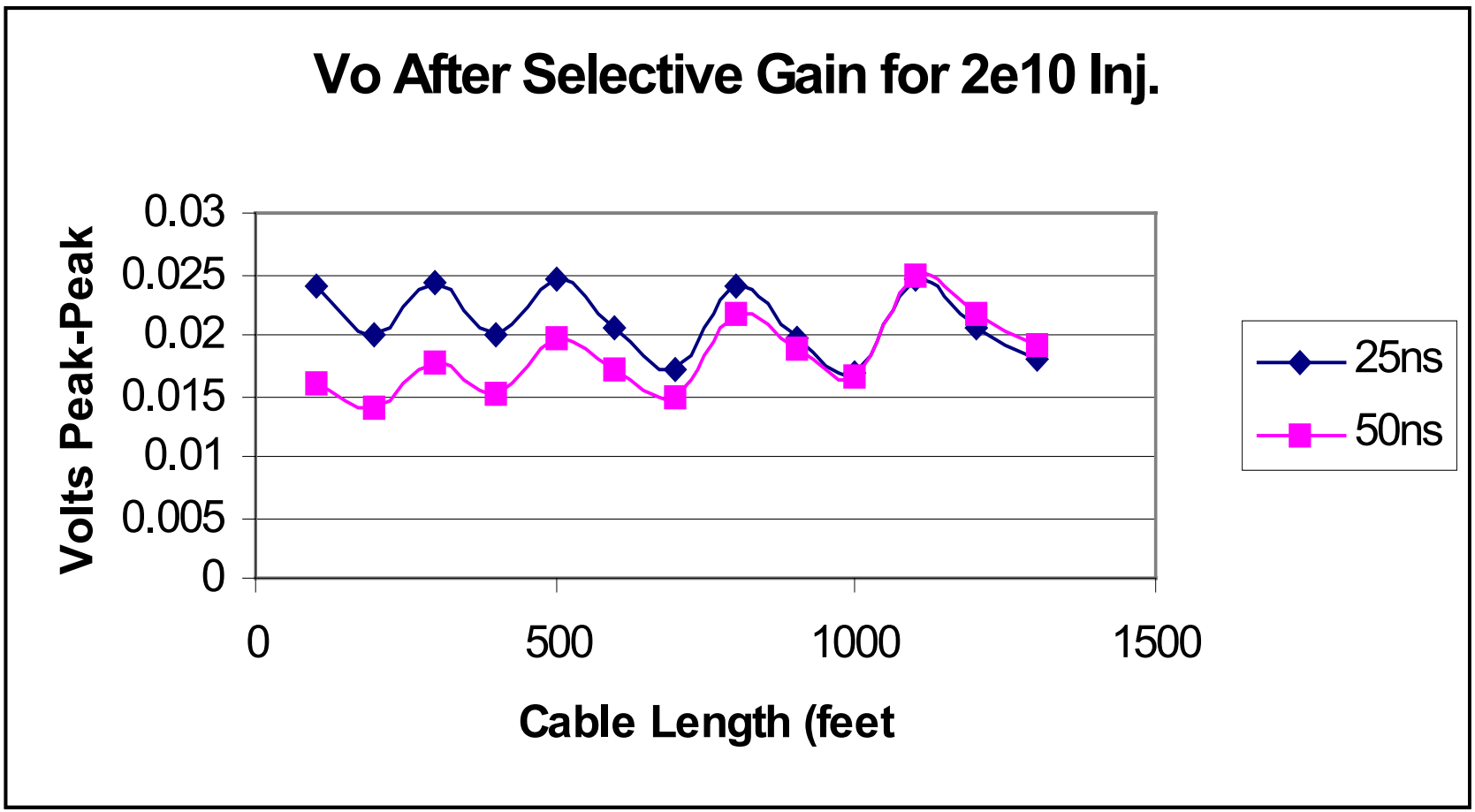
Cable Attenuation Compensation in the Transition Module



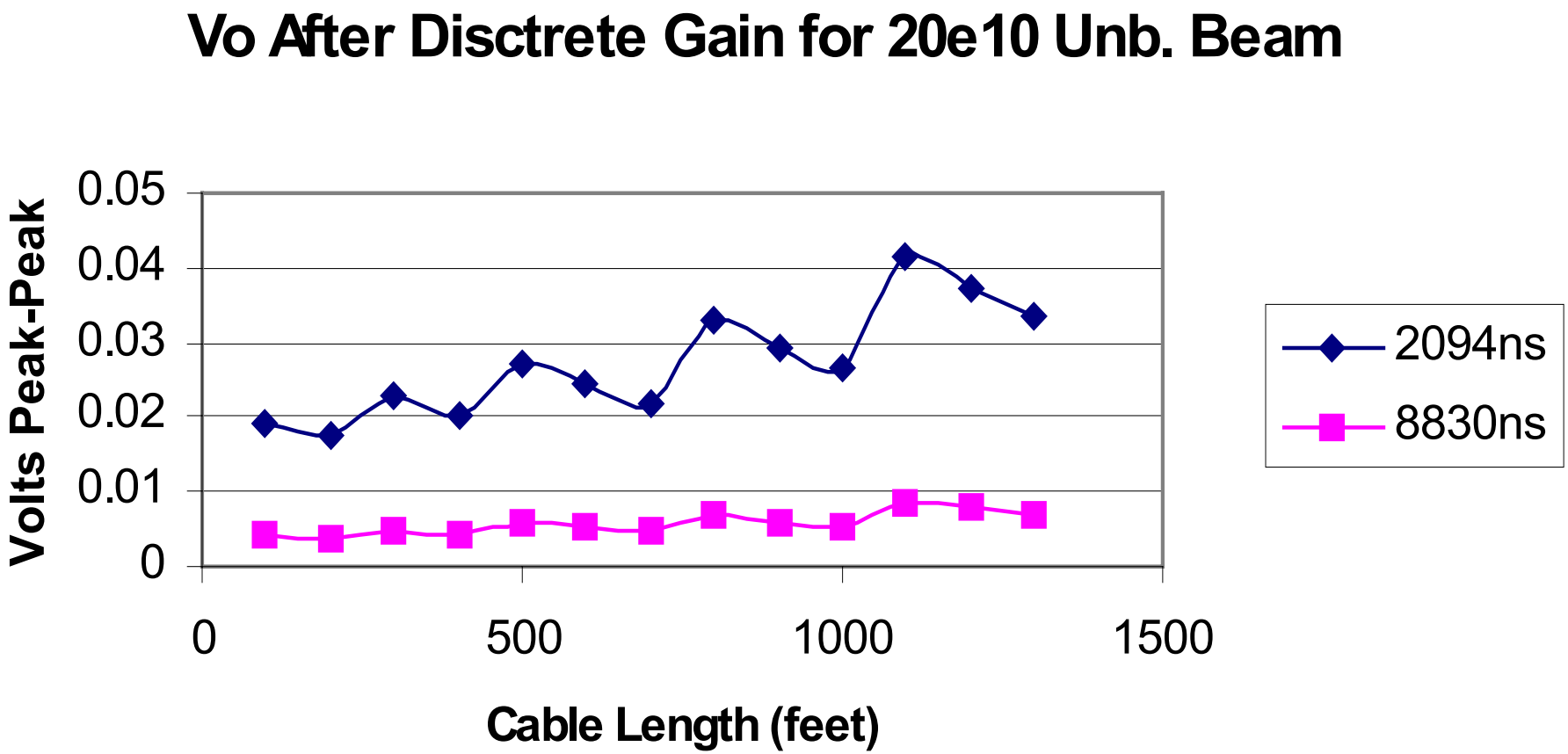
To use the full dynamic range of the A/D converter (1.1 Vpp) the gain selected normalizes the

input to match each channel to this level.

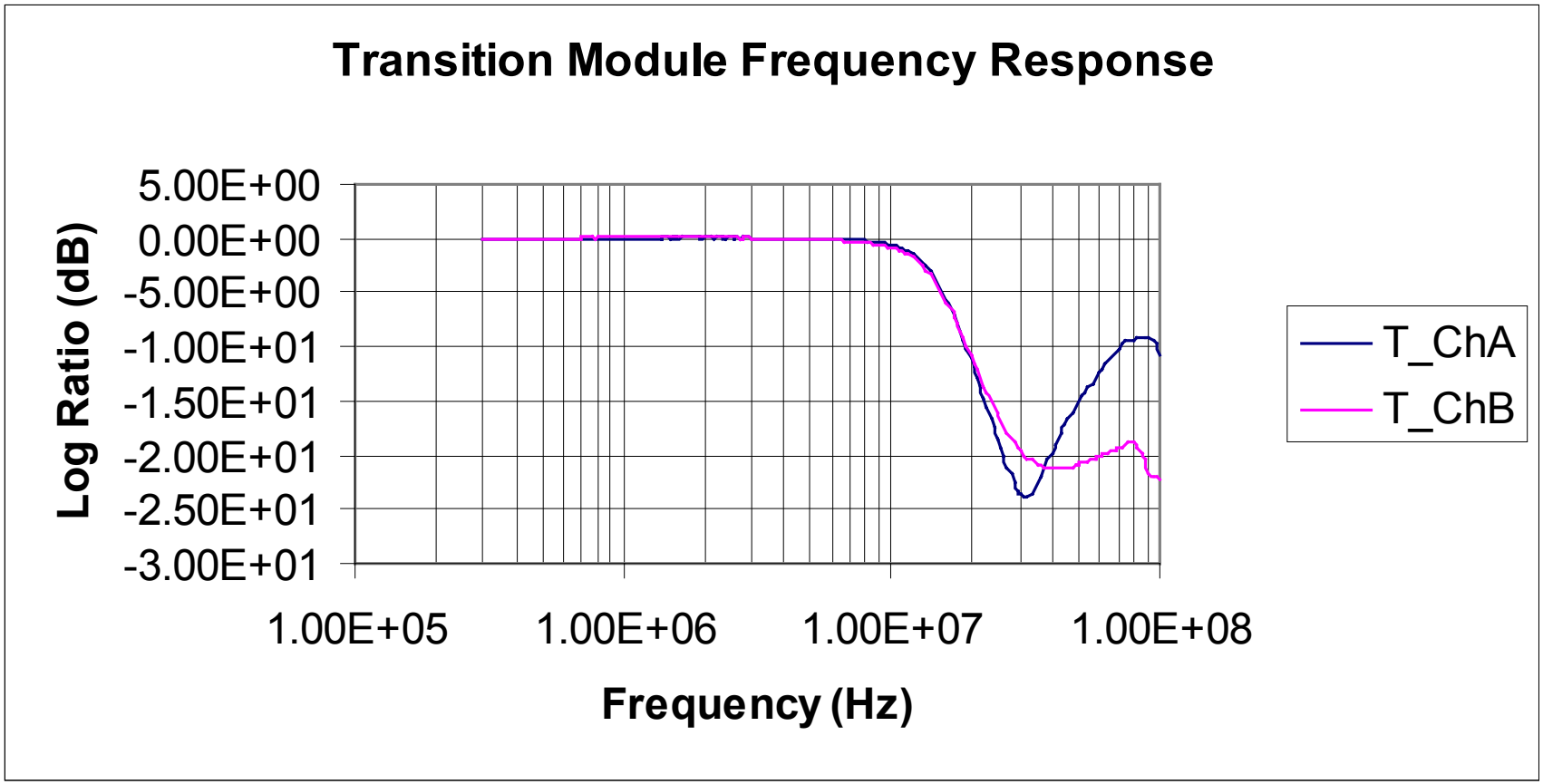
Cable Attenuation Compensation For 4 Bunch Beam Voltages



Cable Attenuation Compensation For Un-Bunched Beam Voltages



Frequency Response Measurement of a 2-Channel Prototype Transition Module



Transition Modules Required

Service Bulding	VME64 Crates/Build	Transition Crates/Build	DDC Channels/Bd	DDC Channels Crate 1	DDC Channels Crate 2	Transition Modules
MI-10	1	1	9	72		14
MI-20	2	1	11	72	16	14
MI-30	2	1	12	80	16	14
MI-40	2	1	10	72	8	14
MI-50	1	1	9	72		14
MI-60	1	1	10	80		14