SAND2015-0556R

Sandia Collaboration notes with Vladimir Glebov from LLE Data from Satire Shots 2751 and 2752

Gordon Chandler Notes

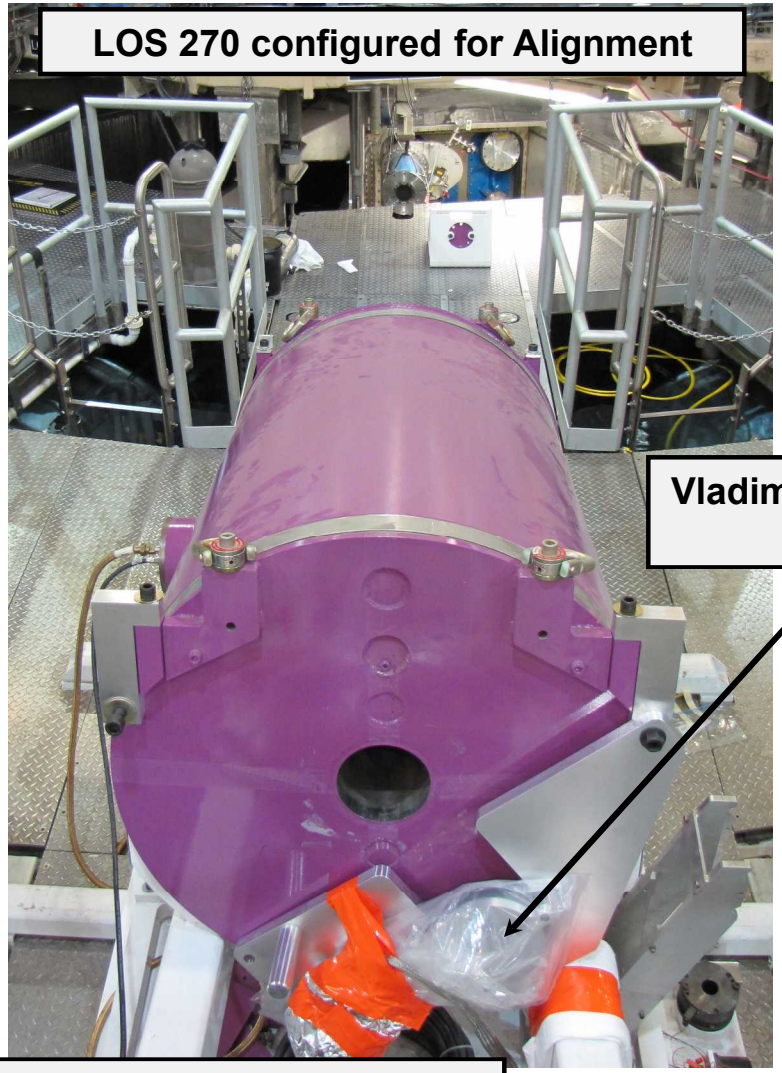
1/8/15

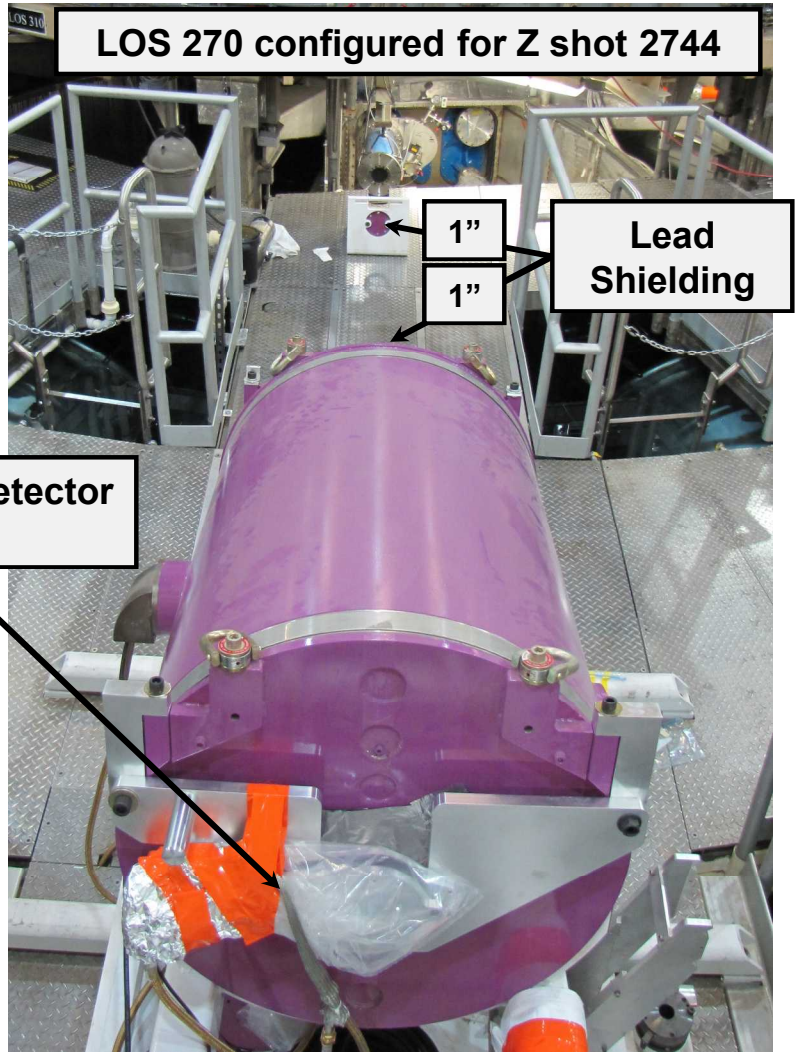
Sandia National Laboratories is a multi-program laboratory managed and operated by Sandia Corporation, a wholly owned subsidiary of Lockheed Martin Corporation, for the U.S. Department of Energy's National Nuclear Security Administration under contract DE-AC04-94AL85000.

Dave Ampleford's Satire shots 2751 and 2752 were used to compare Bremsstrahlung singles between the NTF27 detectors

- These shots were taken on 12/15/14 and 12/16/14
- All the waveform data is collected as OUO on these shots but these waveforms should not be sensitive
- We wanted to compare directly the bremsstrahlung sensitivities in a linear regime of the NTF2701, NTF2702, and the NTF2703 (with Vladimir's 6x1LC detector) to compare the signals.
  - Unsaturated signals were obtained on shot 2752
- The data for shot 2752 indicates a relatively good pulse-shape comparison over most of the first bremsstrahlung peak but with:
  - the NTF2703 detector having a slightly narrower pulse-width: 6.7 vs 8.3 ns.
  - The NTF2703 detector having an 'anomalous' temporally resolved second feature (~50 ns later & ~30 ns wide) of comparable amplitude to the first brems pulse.
    - Is this scattered bremsstrahlung photons that get into the unshielded detector?

The LOS 270 nTOF diagnostic setup with Vladimir's 6x1LC detector installed

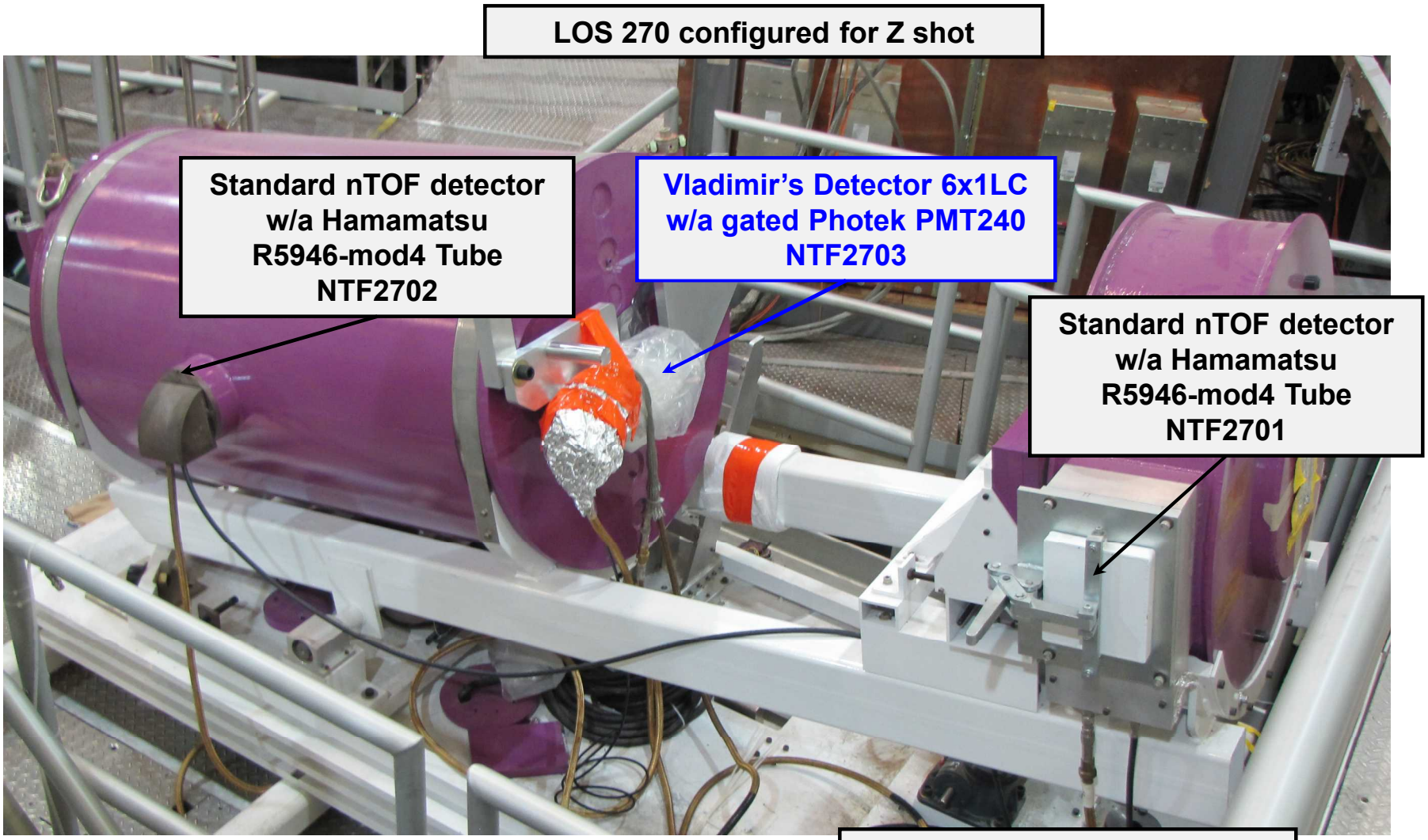




Vladimir's Detector 6x1LC

Z MagLIF shot 2744; 12/3/14

The LOS 270 nTOF diagnostic setup with Vladimir's 6x1LC detector installed

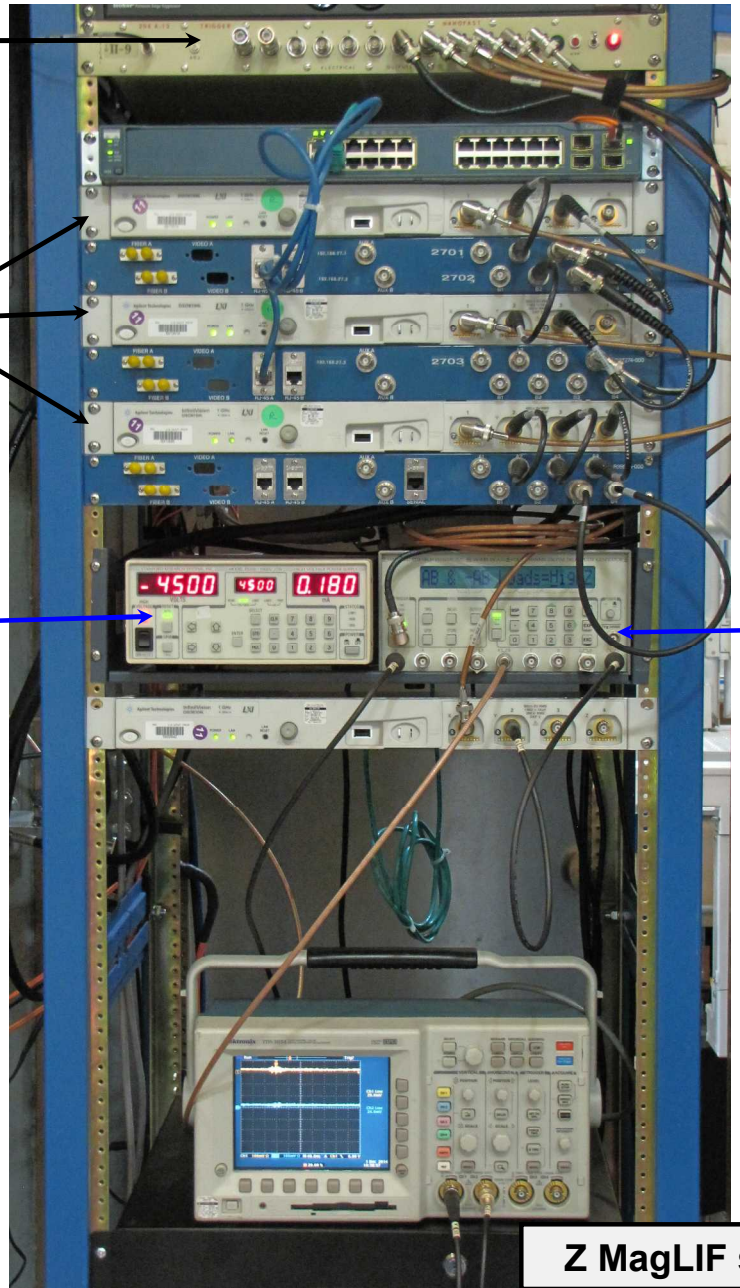


The LOS 270 nTOF Screen-box setup

Common Ref. Timing system

Agilent DSO6104L digitizers

High Voltage Supply for Vladimir's 6x1LC nTOF w/a gated Photek PMT240 NTF2703



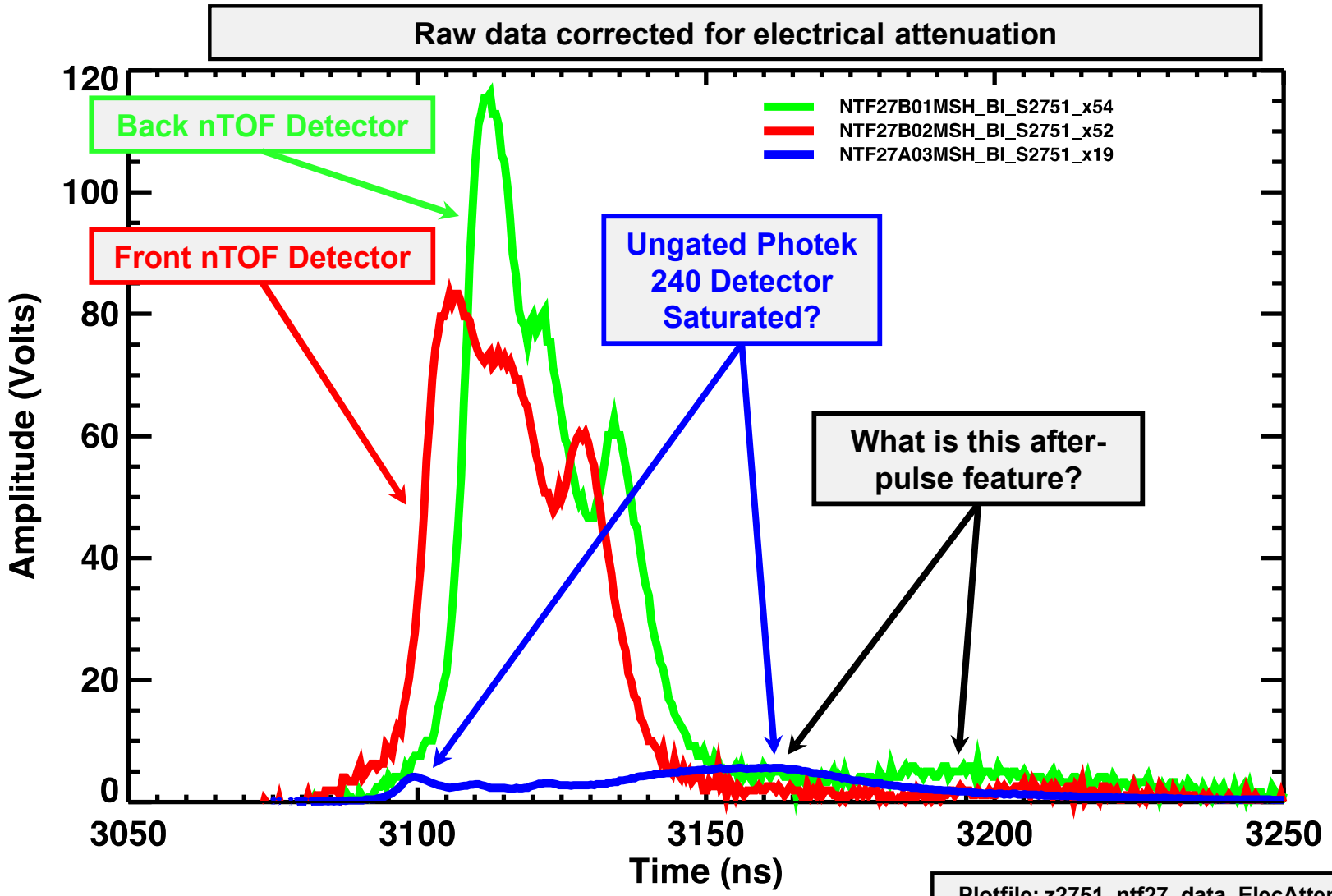
Stanford digital delay generator to generate PMT240 gate pulse

Z MagLIF shot 2744; 12/3/14

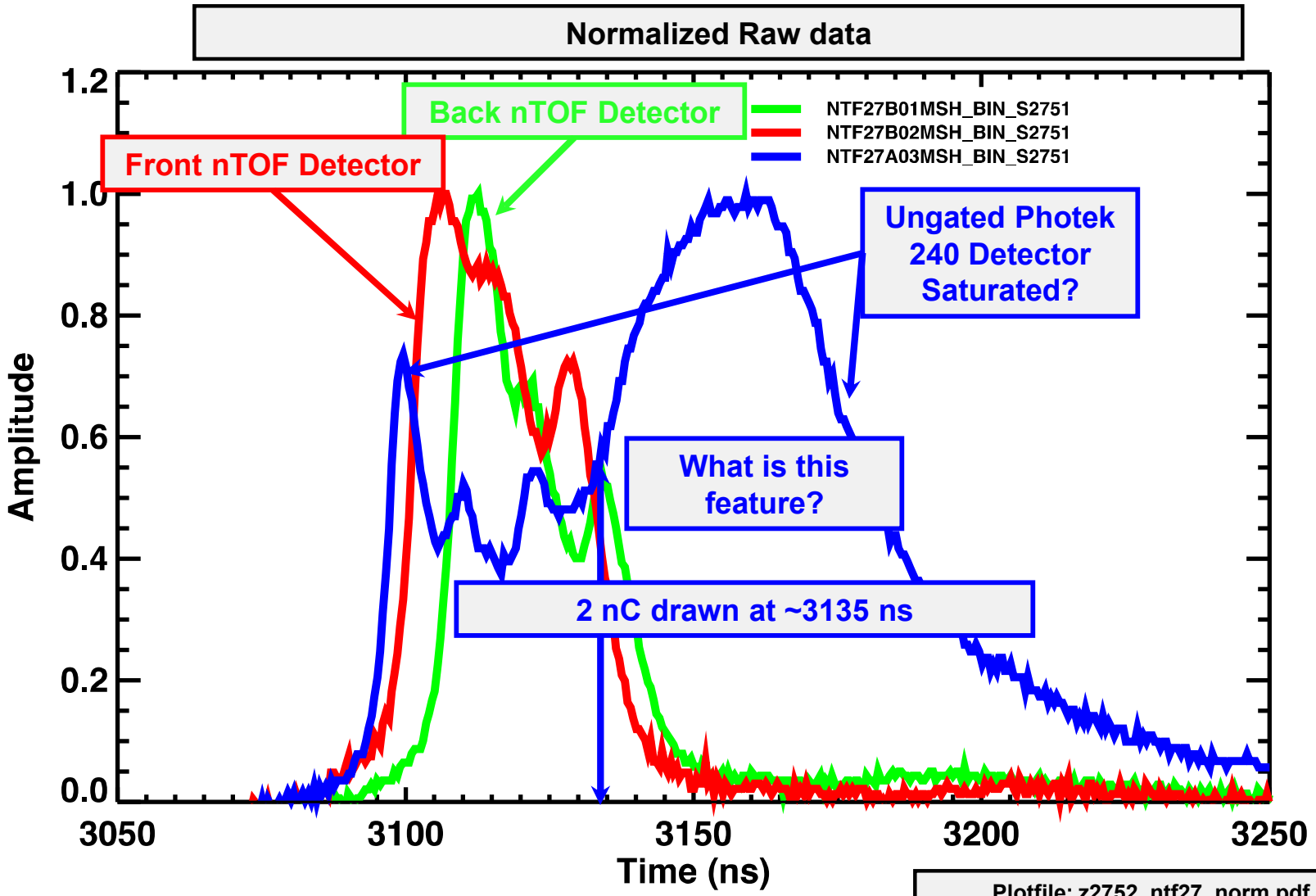
The nTOF 270 setup parameters for shot Z2751

Detector Signal	NTF Detector ID	PMT ID	Scintillator	PMT Type	PMT Bias (kV)	Detector Distance (cm)
NTF01	D1	D1	BC422Q1%	R5946mod4	-1.9	1146
NTF02	D2	D2	BC422Q1%	R5946mod4	-1.2	945
NTF03	VG-6x1LC	PMT240-01	BC408	Photek 240	-3.5	1034

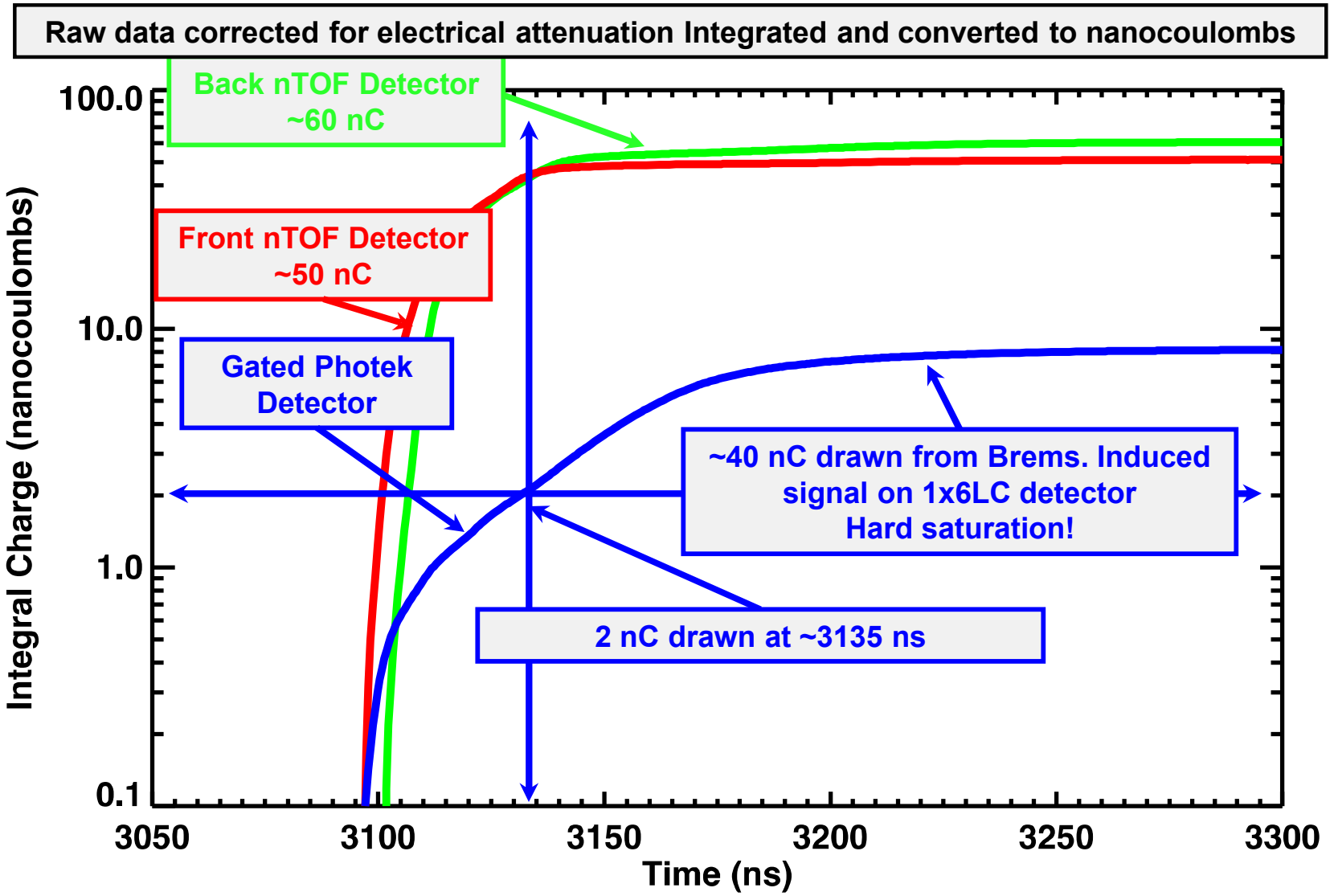
On Satire OUO Z2751 Brems radiation pulse we tested nTOF 270 for relative detector responses without gating



On Satire OUO Z2751 Brems radiation pulse we tested nTOF 270 for relative detector responses without gating: Normalized



Integrals of nTOF 270 Z2751 shot data

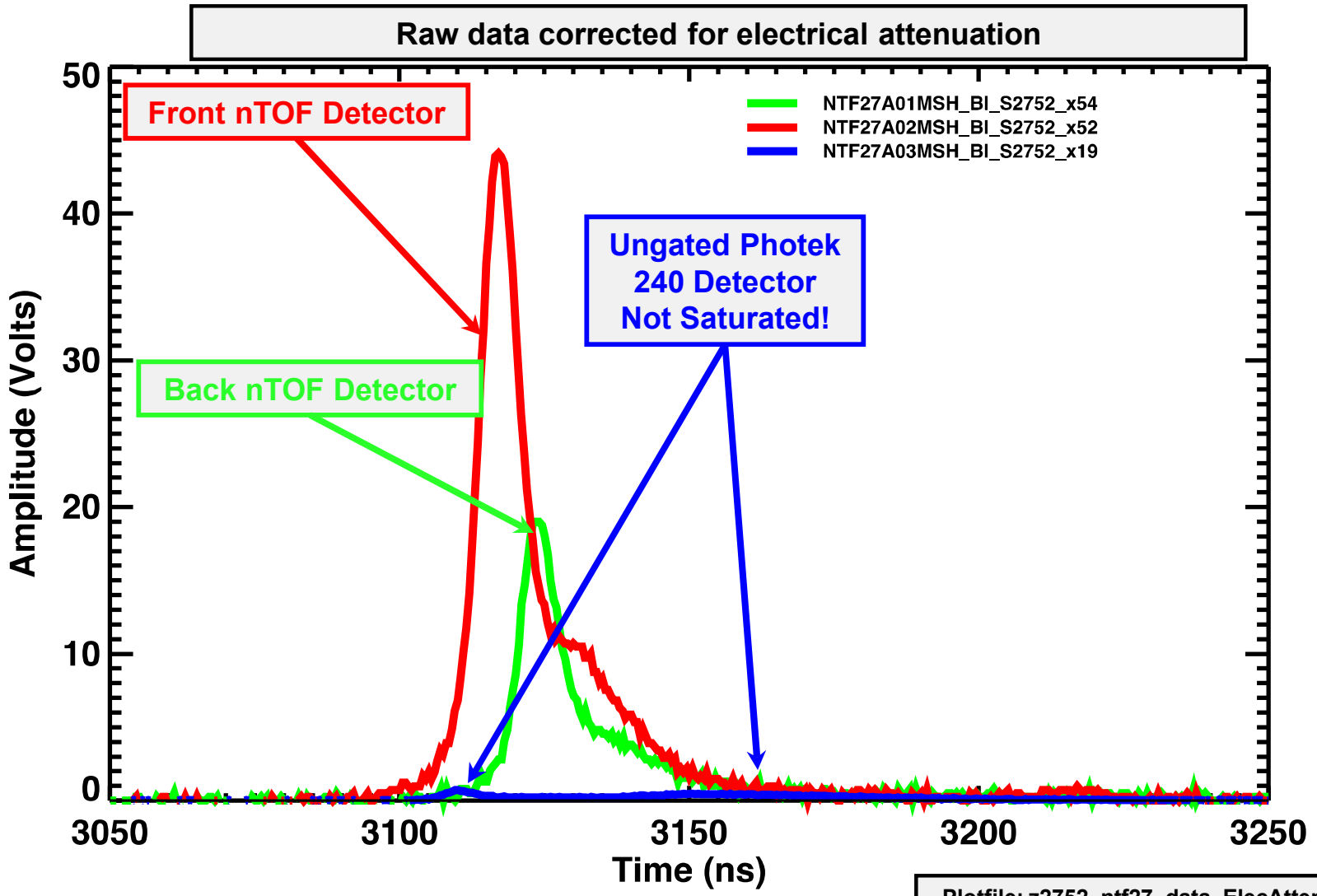


Plotfile: NTF27_data_ElecAtten_S2744_Int.pdf

The nTOF 270 setup parameters for shot Z2752

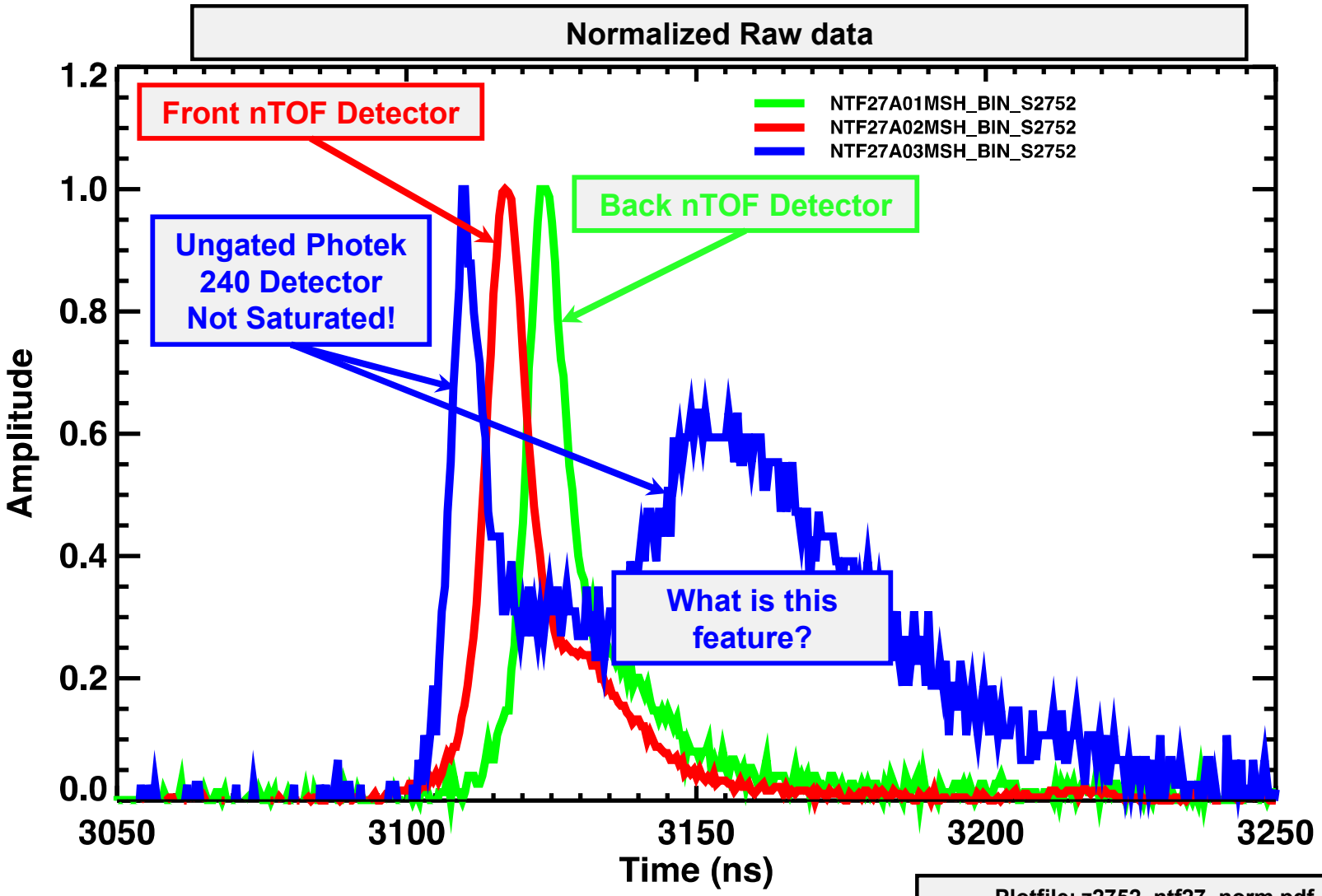
Detector Signal	NTF Detector ID	PMT ID	Scintillator	PMT Type	PMT Bias (kV)	Detector Distance (cm)
NTF01	D1	D1	BC422Q1%	R5946mod4	-1.4	1146
NTF02	D2	D2	BC422Q1%	R5946mod4	-1.0	945
NTF03	VG-6x1LC	PMT240-01	BC408	Photek 240	-3.2	1034

On Satire OUO Z2752 Brems radiation pulse we tested nTOF 270 for relative detector responses without gating



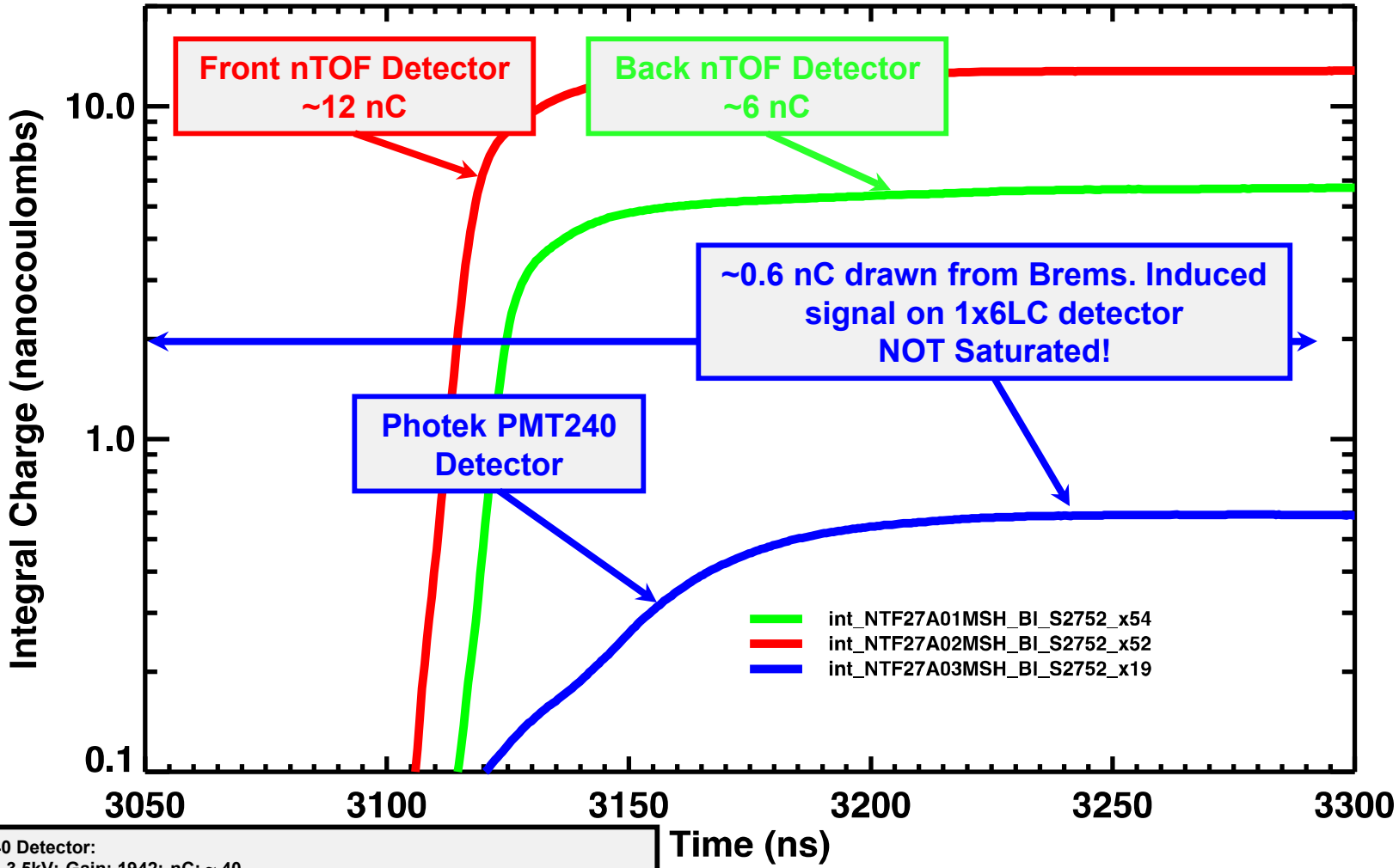
Plotfile: z2752_ntf27_data_ElecAtten.pdf

On Satire OUO Z2752 Brems radiation pulse we tested nTOF 270 for relative detector responses without gating: Normalized



Integrals of nTOF 270 Z2752 shot data indicate the PMT240 detector is not saturated!

Raw data corrected for electrical attenuation Integrated and converted to nanocoulombs



Photek PMT240 Detector:
Bias on 2751: -3.5kV; Gain: 1942; nC: ~ 40
Bias on 2752: -3.2kV; Gain: 293; nC: ~ 0.6 equivalent to: 4 nC for shot 2751 bias: Note brems pulse shape was very different on the 2 shots.

Plotfile: z2752_ntf27_data_ElecAtten_int.pdf

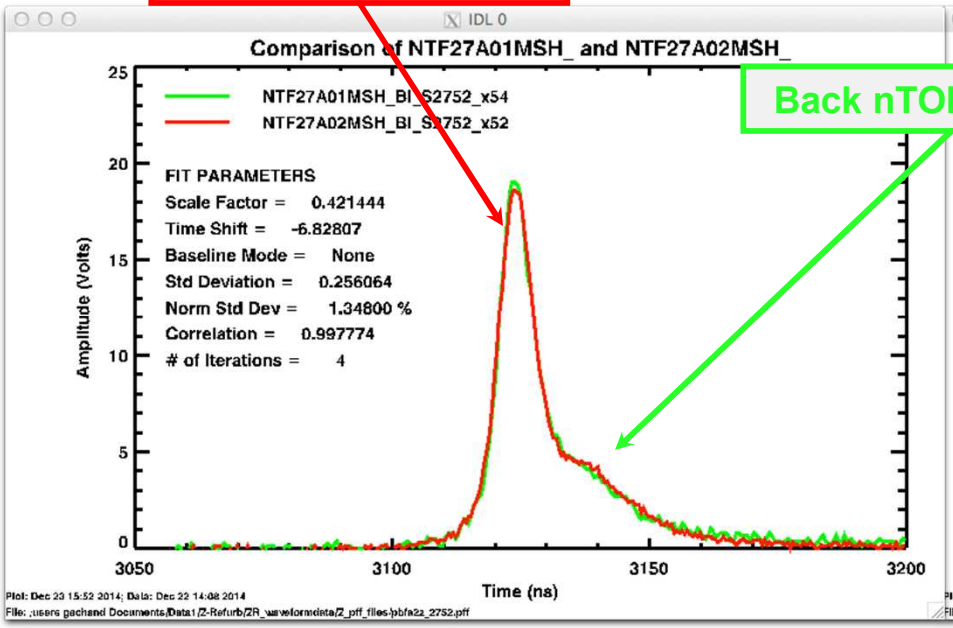
nTOF 270 Z2752 data comparing NTF01 and NTF02 & NTF03 data

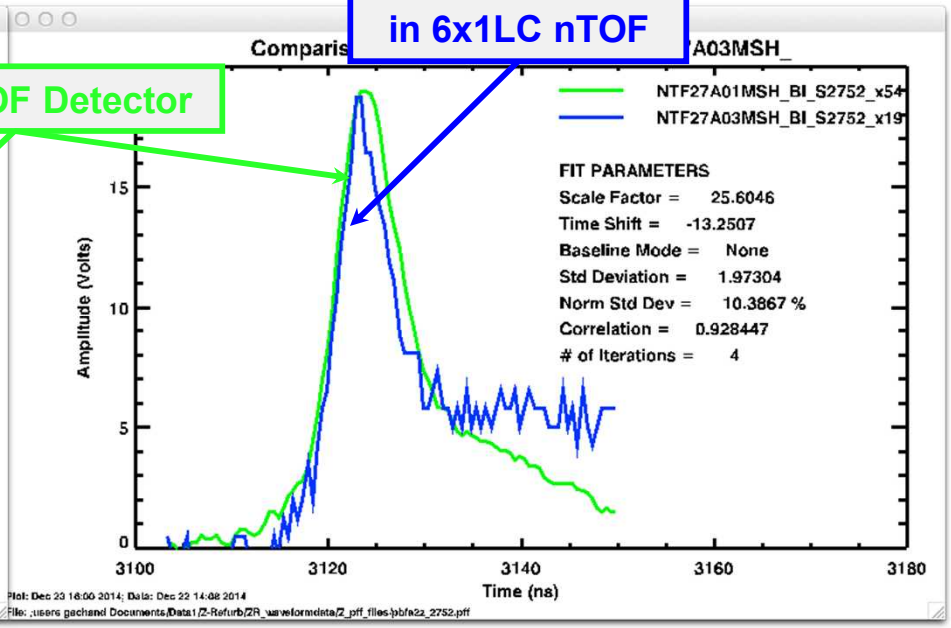
Used Raw data corrected for electrical attenuation w/the IDL/PHIDL COM routine

Front nTOF Detector

Back nTOF Detector

Ungated Photek Detector in 6x1LC nTOF





The comparison between NTF01 (back) and NTF02 (front) detectors indicates:

1. **Very similar brems. Pulse-shapes on both detectors on this shot with the signal amplitudes obtained.**
2. **The time-shift of 6.8 ns to line up the two traces is consistent with the photon TOF of 7 ns.**

The comparison between NTF01 (back) and NTF03 (6x1LC) detectors from 3090-3150 ns indicates:

1. **The Initial pulse on the 6x1LC nTOF with the Photek 240 PMT appears to have a similar but slightly narrower profile: 6.7 vs 8.3 ns or ~1.6 ns narrower.**
2. **The second feature seen on the Photek detector is not observed on the R5964mod4 detector**
    1. **What is that feature?**