Fermilab

LHC 4.8 GHz Schottky Commissioning

Ralph J. Pasquinelli

Andreas Jansson

April 8-15, 2010

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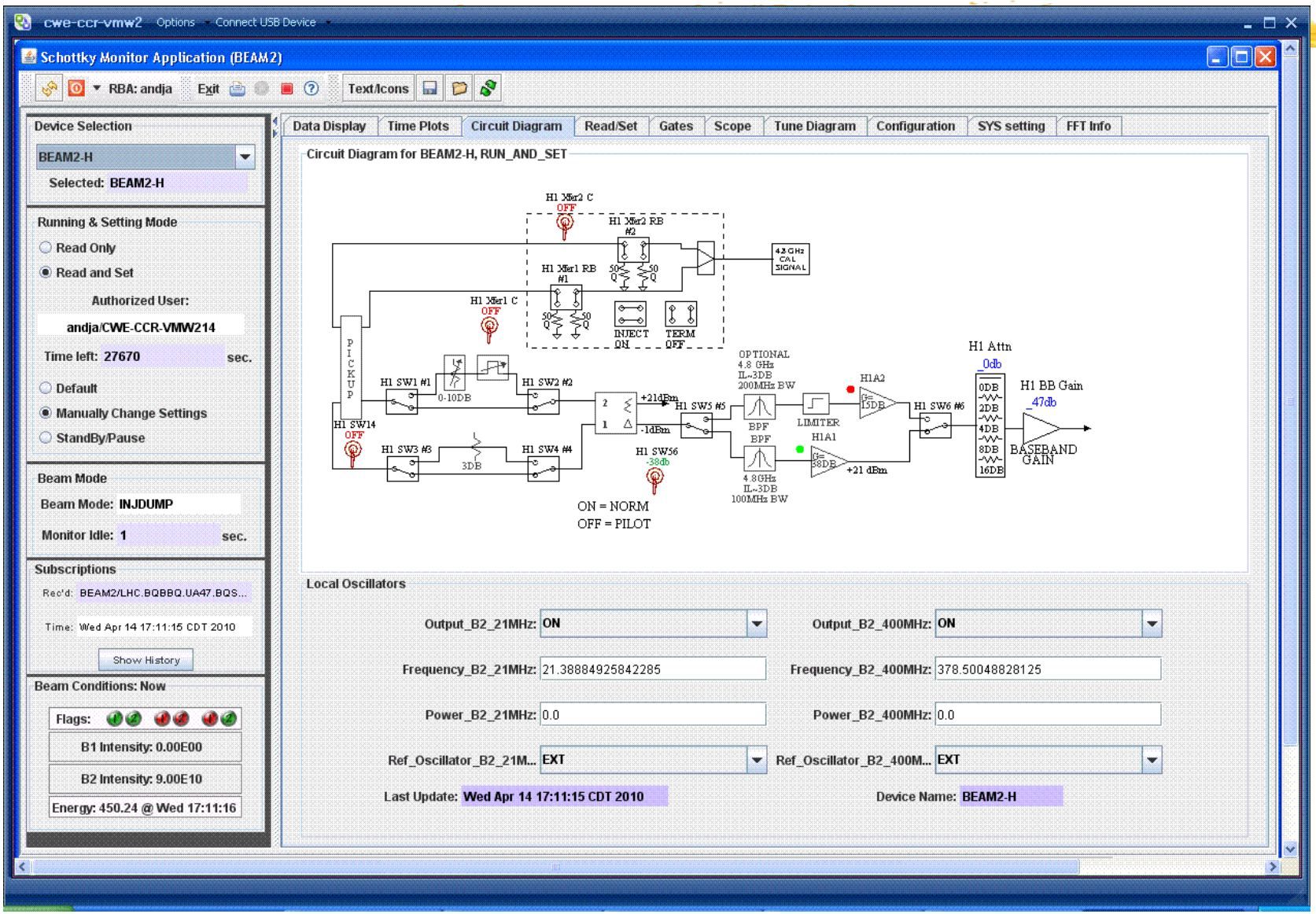
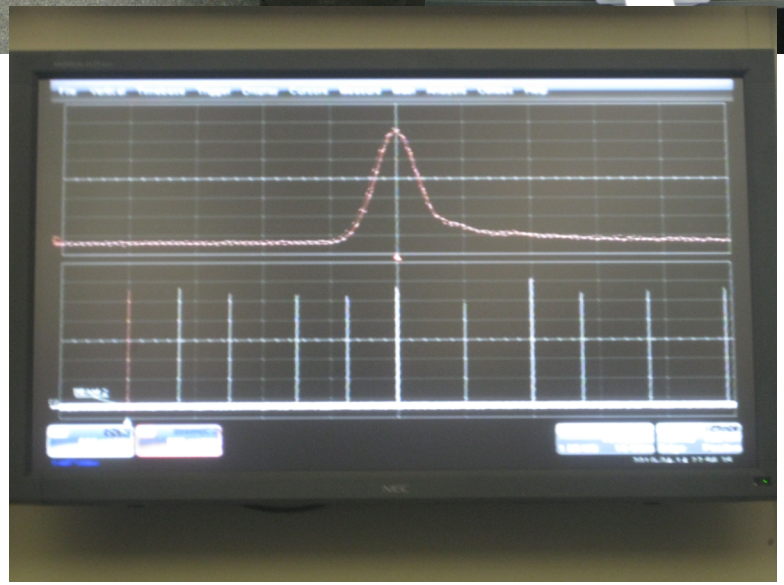
Typical GUI Hardware Page



CCC



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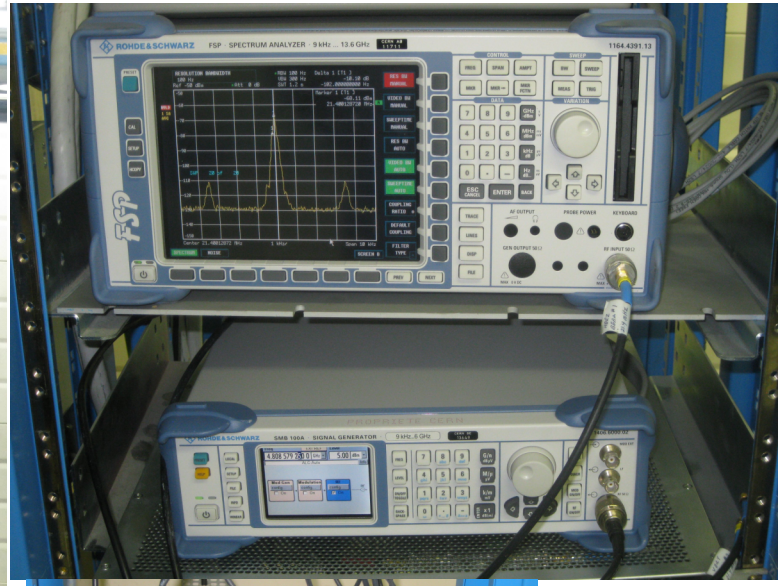
Service Building Point 4



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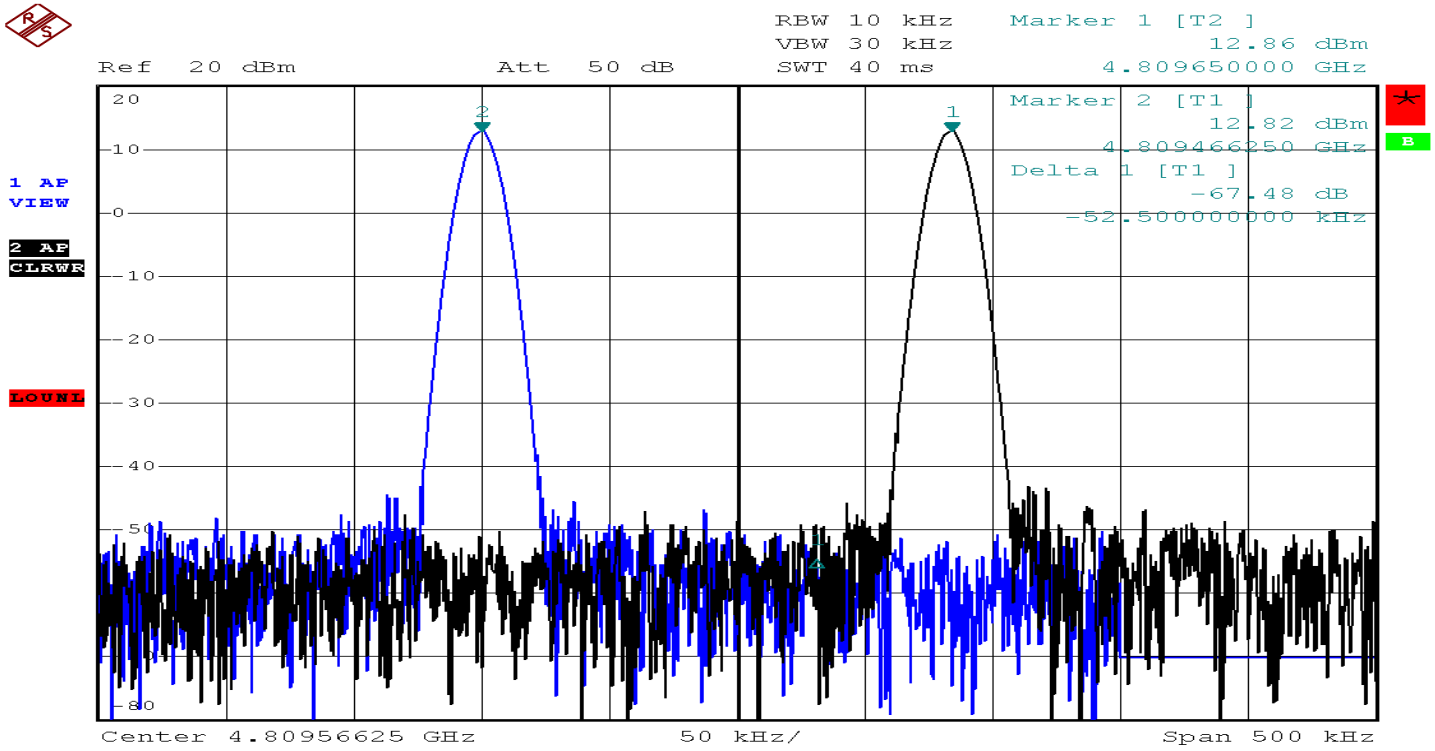
Calibration signal generator with 10 MHz ext ref from Beam 1 Tracking RF frequency change



10mhzB1

Date: 9.APR.2010 11:49:10

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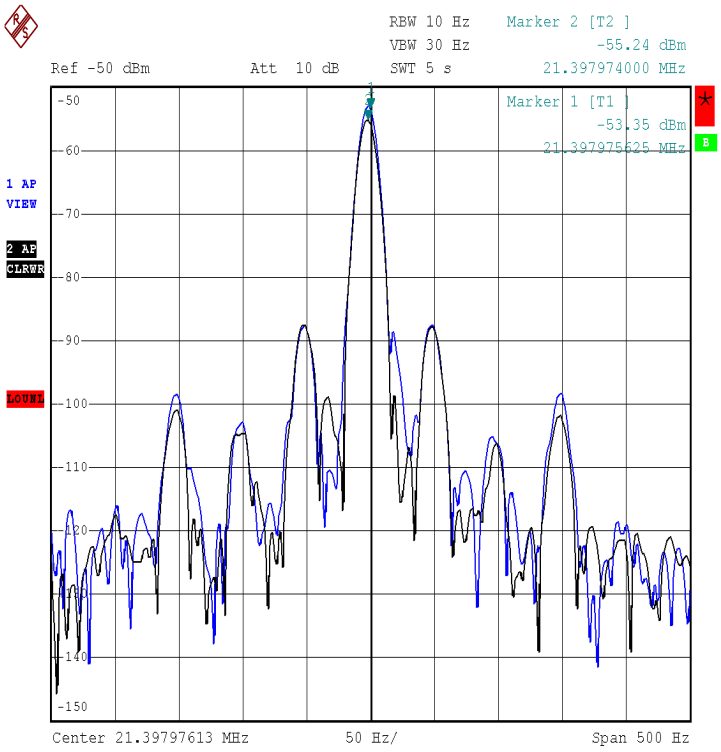
Beam 2 cal signals to 21.4 MHz IF
Sidebands are line harmonics on sig gen
Vertical higher IL due to 7/8" cable plant

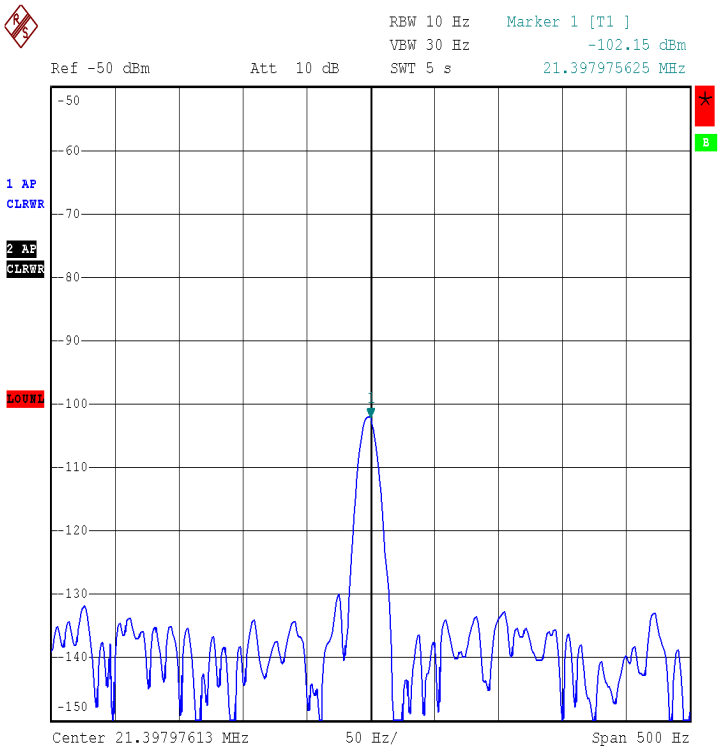
Horizontal



10mhzB1

Date: 9.APR.2010 12:32:00

Vertical



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Date: 9.APR.2010 12:29:17

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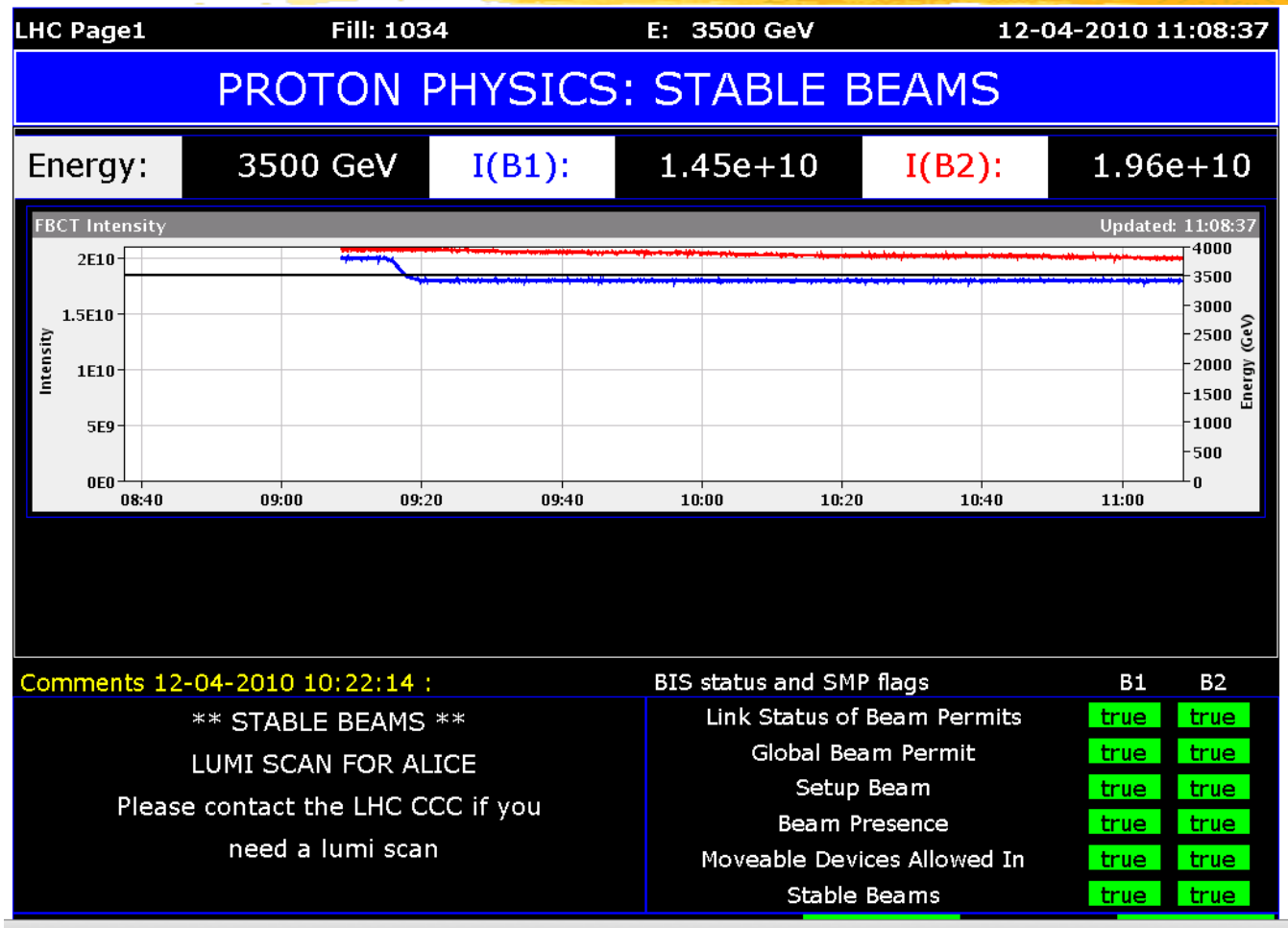
2x2 store 3.5 TeV



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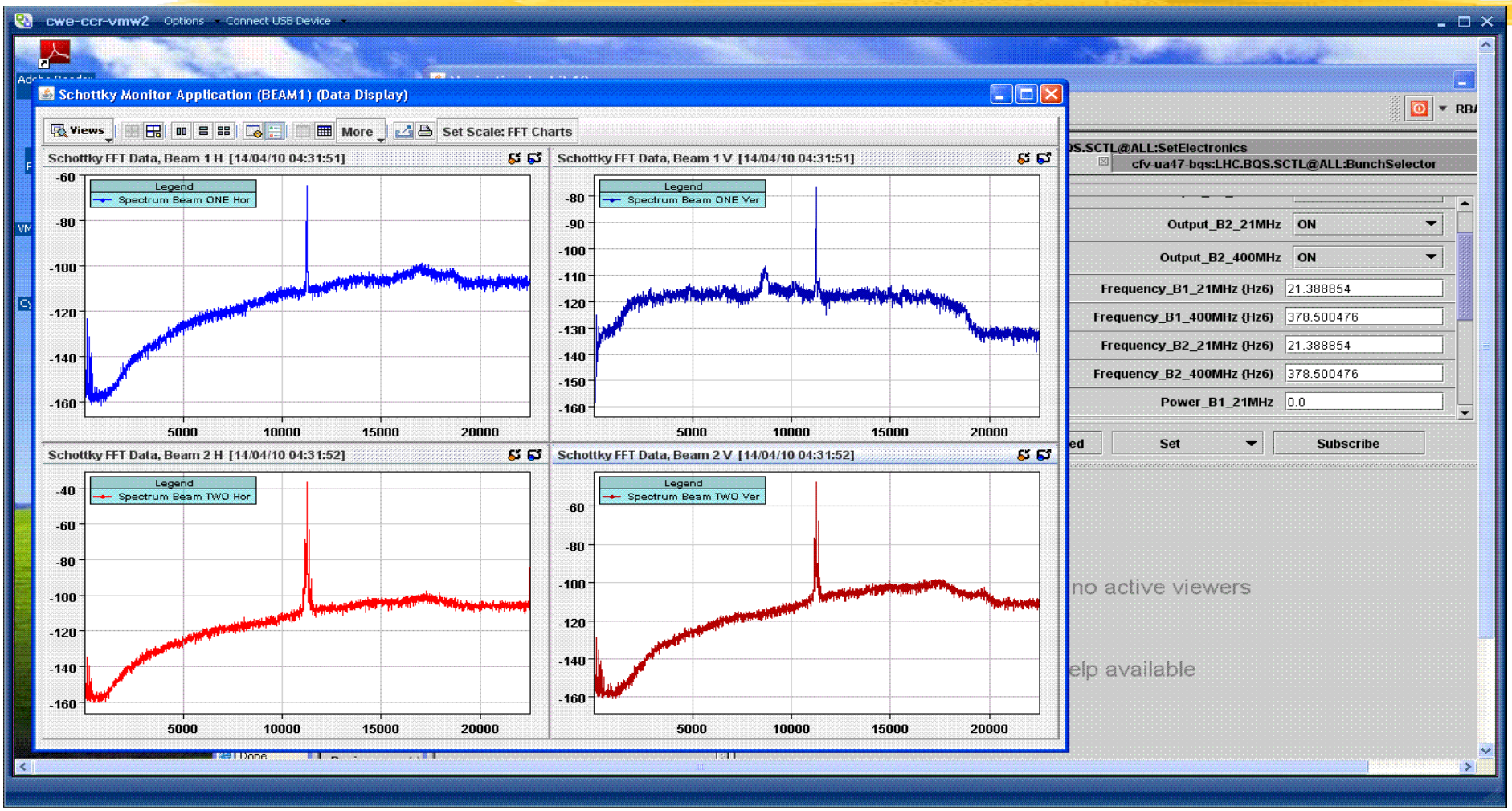
Un-gated base band signals 2x2 store
NOTE LO frequencies set for revolution Frequency of 11245 Hz



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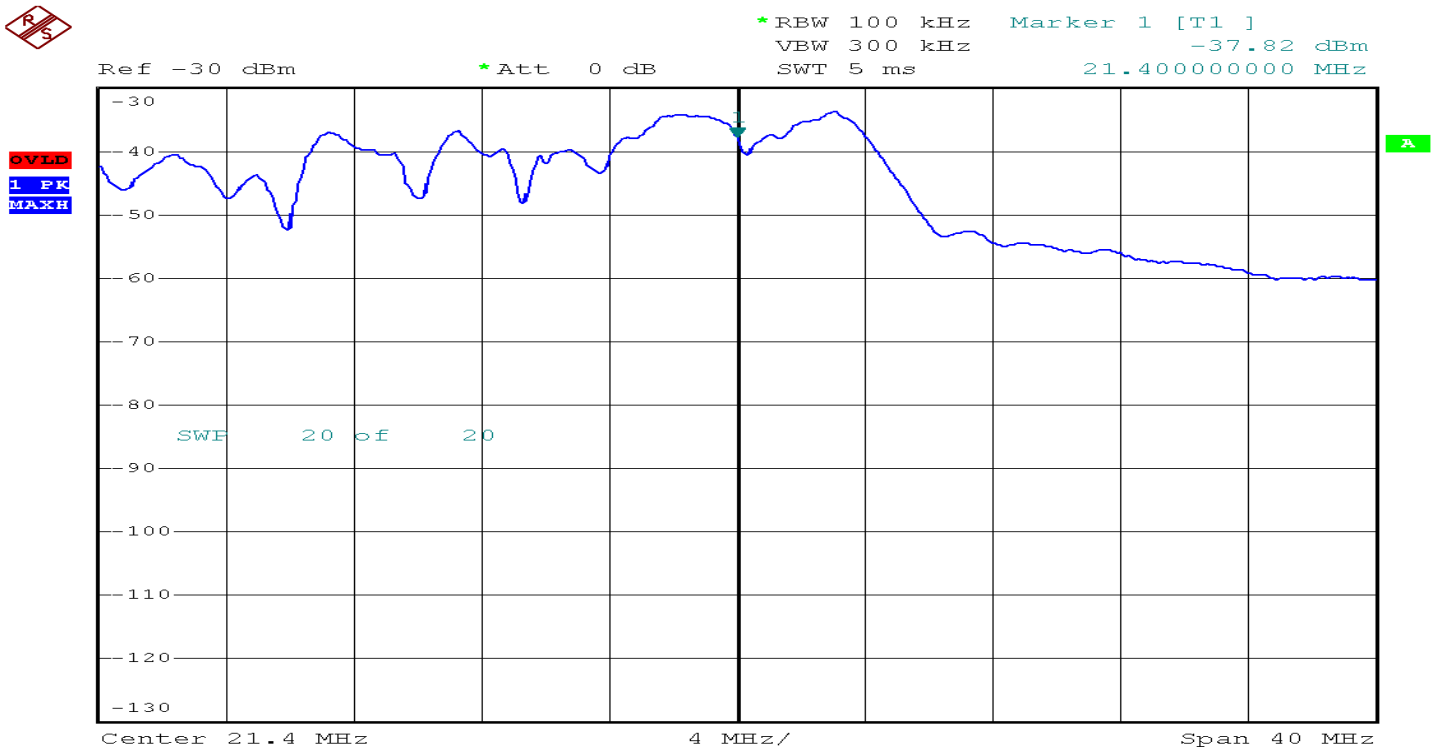
HB2 21.4 MHz IF with arbitrary 378 MHz LO



10mhzB1

Date: 12.APR.2010 11:10:30

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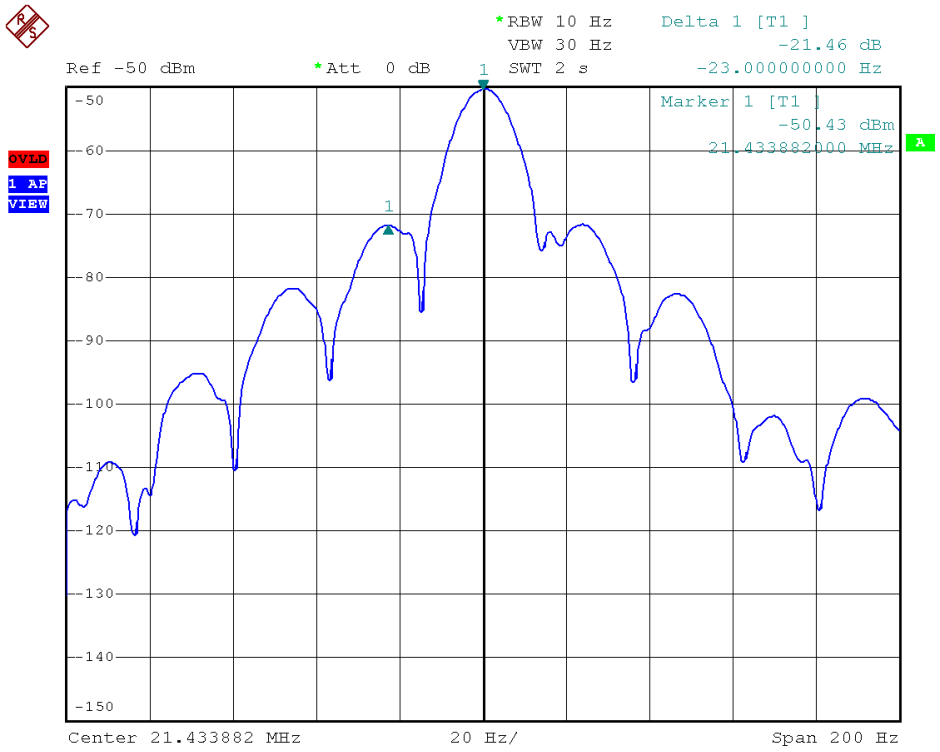
HB1 21.4 MHz IF



Synchrotron f @ 3.5 TeV

Freq=23 Hz

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Date: 12.APR.2010 16:13:25

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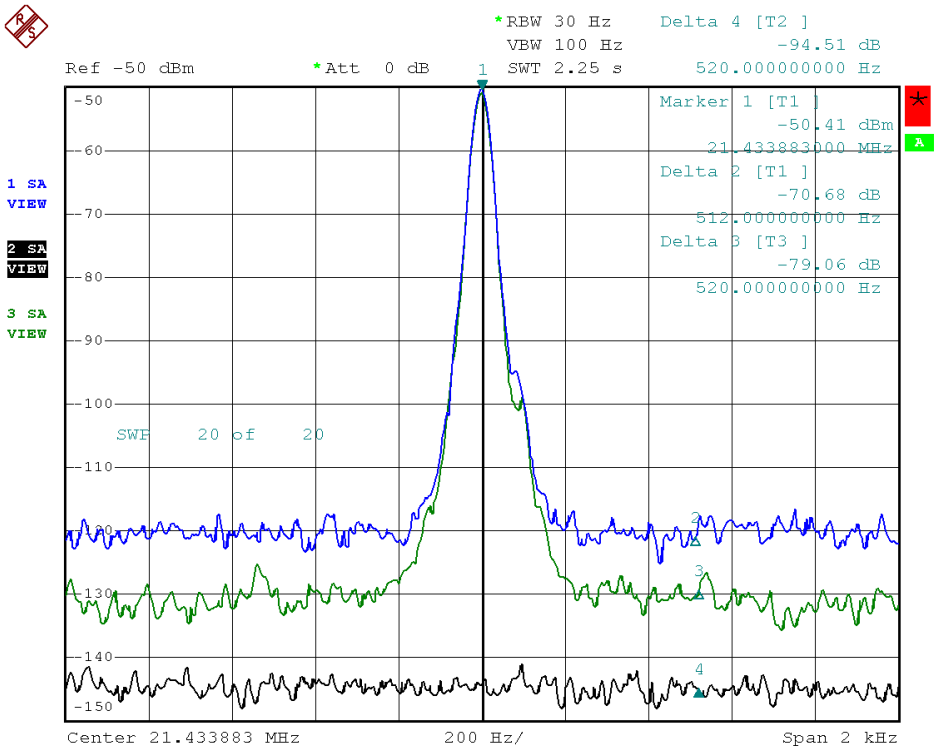
HB1 21.4 MHz IF



Gate on full time blue

Gate Table green

SA noise floor black

Max noise reduction with gating observed to be approximately 10 dB

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Date: 12.APR.2010 15:30:02

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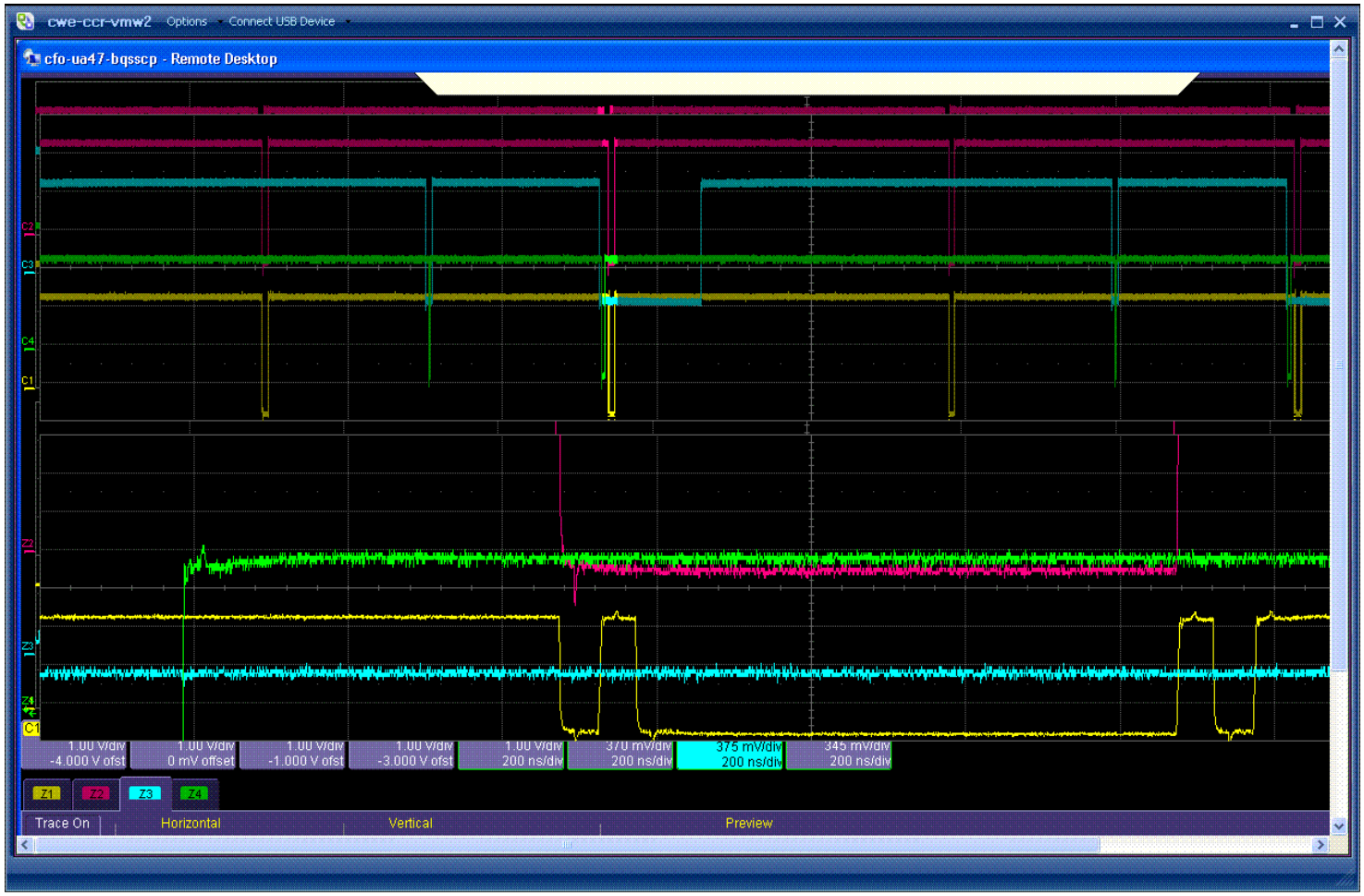
Debugging Gates using Tunnel Scope
Bouncing (yellow) was a software error
Scope is essential for gating studies



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Bunch loading table for 2x2 store

```
Scheme 2x2_a, december 2009, 1 colliding pair in all IPs:

     (NB: maximum acceptable now: B1 30986, B2: 30950)

*****************************************************************
*  NOTE: to get the same scheme without overinjection:          *
*    - just add +1000 to all RF bucket numbers                  *
*    - in addition there will be a pilot bunch (5e9 p/bch)      *
*      in RF bucket 1 for each beam                             *
*****************************************************************

                              RF Bucket
 inj 1      1     ring_1            1          25       1
 inj 1      2     ring_2            1          25       1
 inj 2      3     ring_1        17851          25       1
 inj 2      4     ring_2         8911          25       1

Bunch crossings:

d = displacement relative to IP in meters
    (negative is anticlockwise)

                                      d     Beam1           Beam2

  good collision in IR1:              0 m   bucket     1 and bucket     1
  good collision in IR2:              0 m   bucket     1 and bucket  8911
  good collision in IR8:              0 m   bucket 17851 and bucket  8911
```

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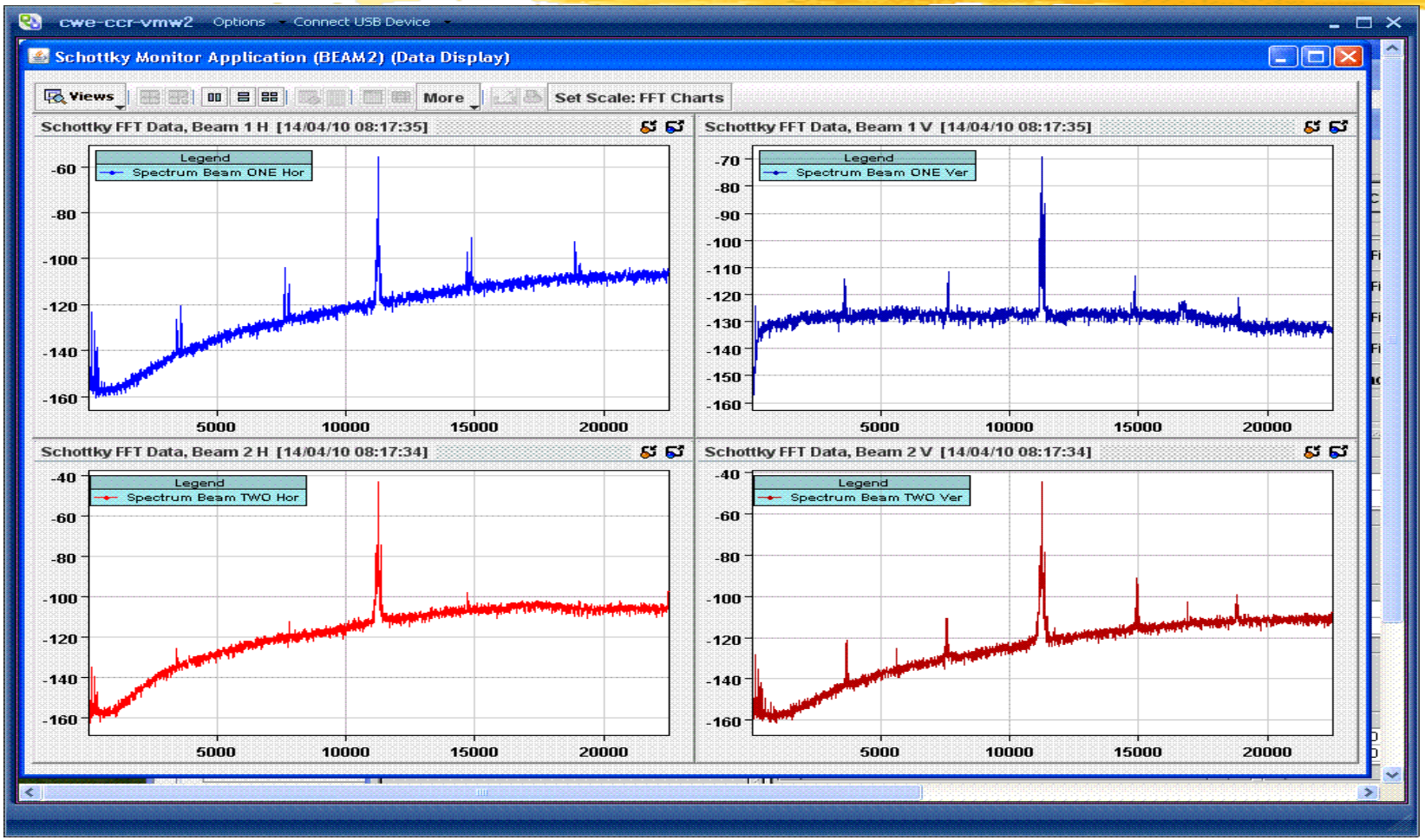
Baseband 2x 2 store 3.5 TeV with gating. Vertical Band 1 has modified daughter card which looks good. Need to modify others.



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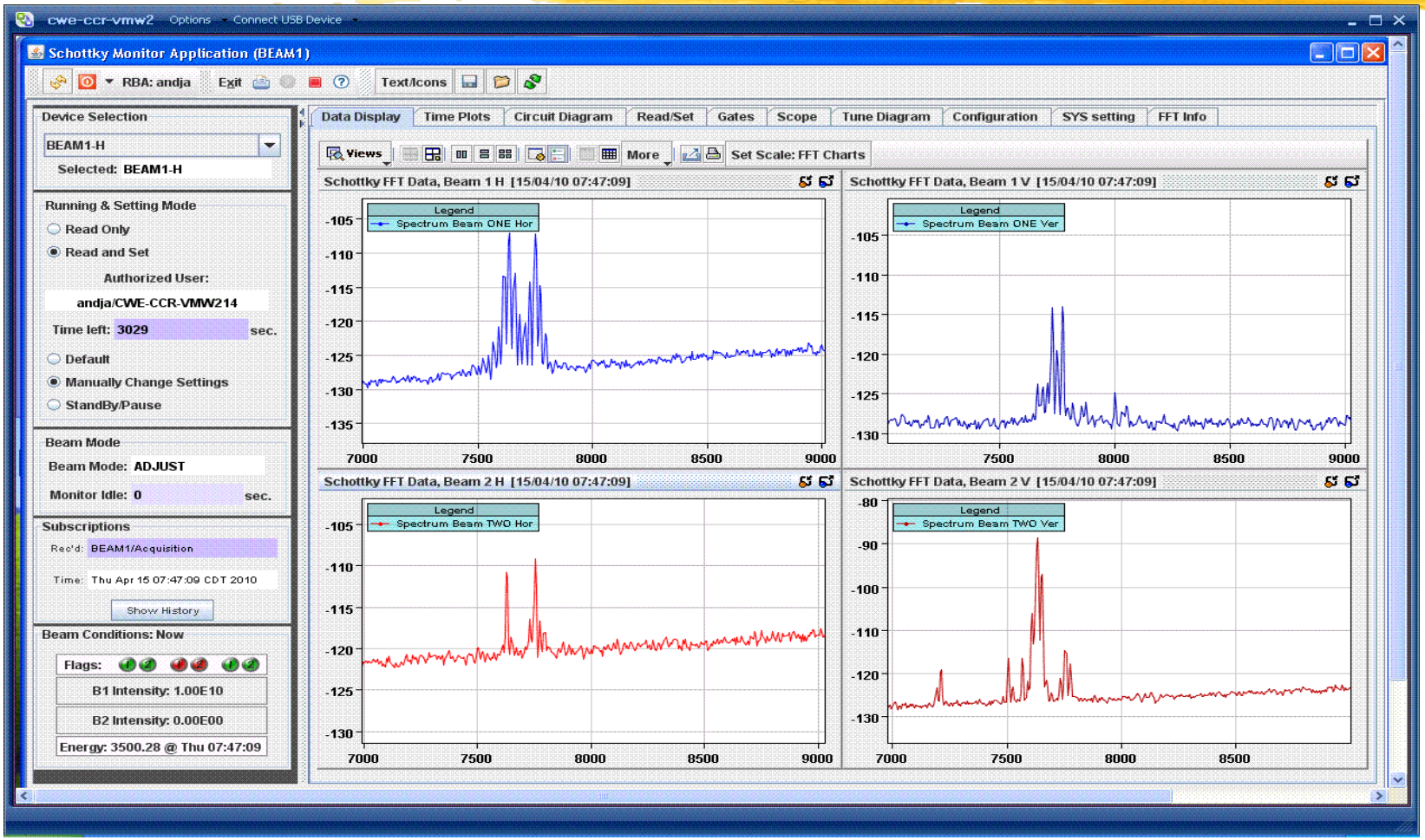
Zoom in on sideband with FNAL GUI



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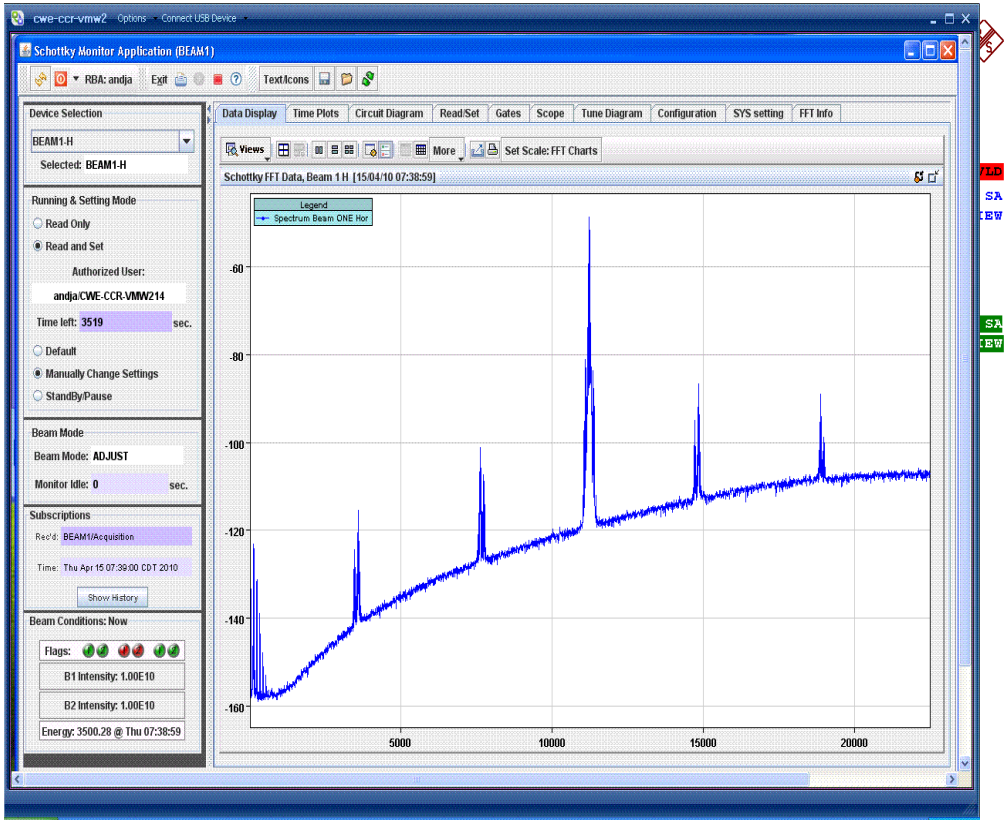
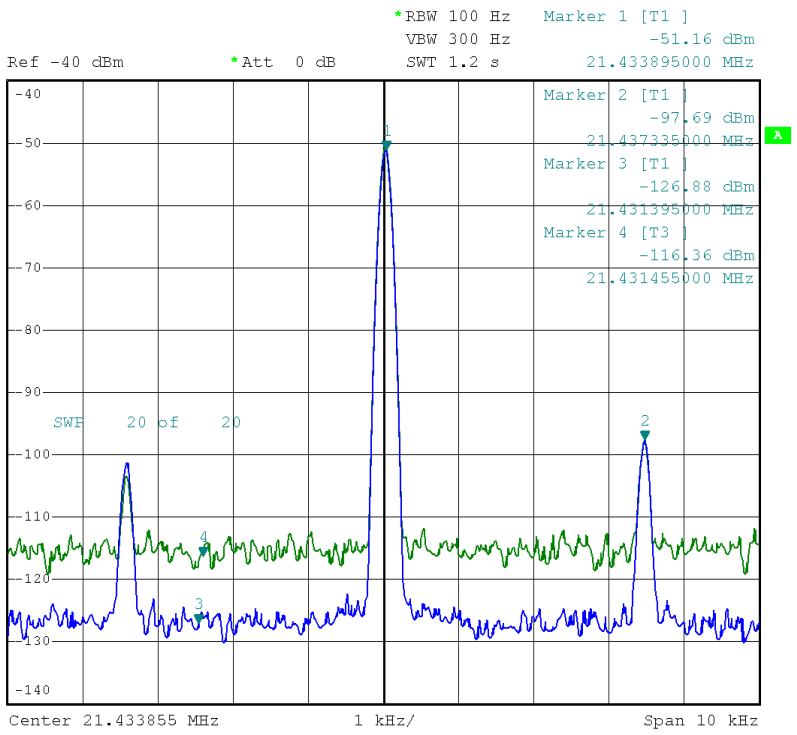
Signal to Noise Limitations with Gating





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Date: 12.APR.2010 13:01:22

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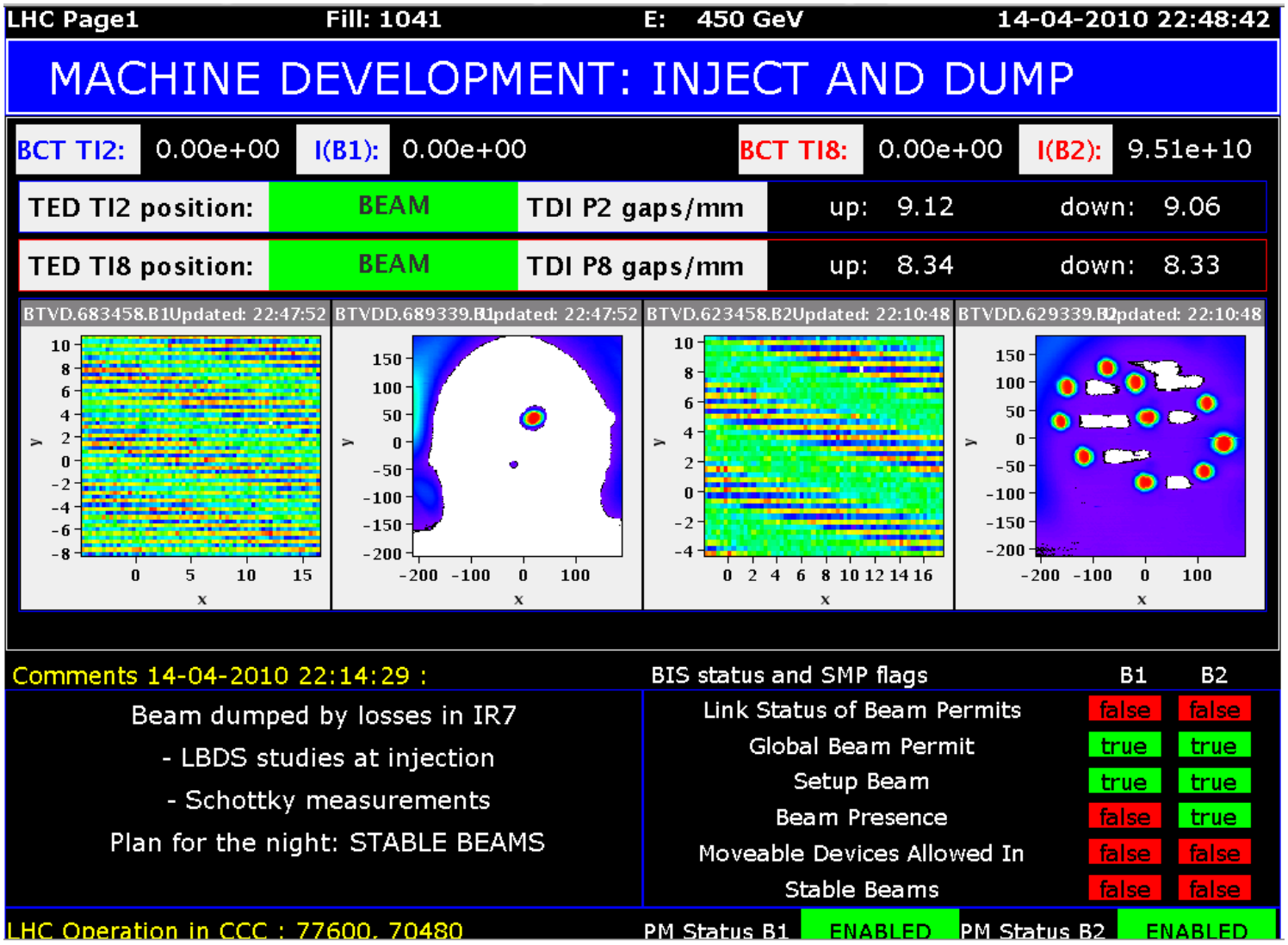
Dedicated 10 bunch store 450 GeV



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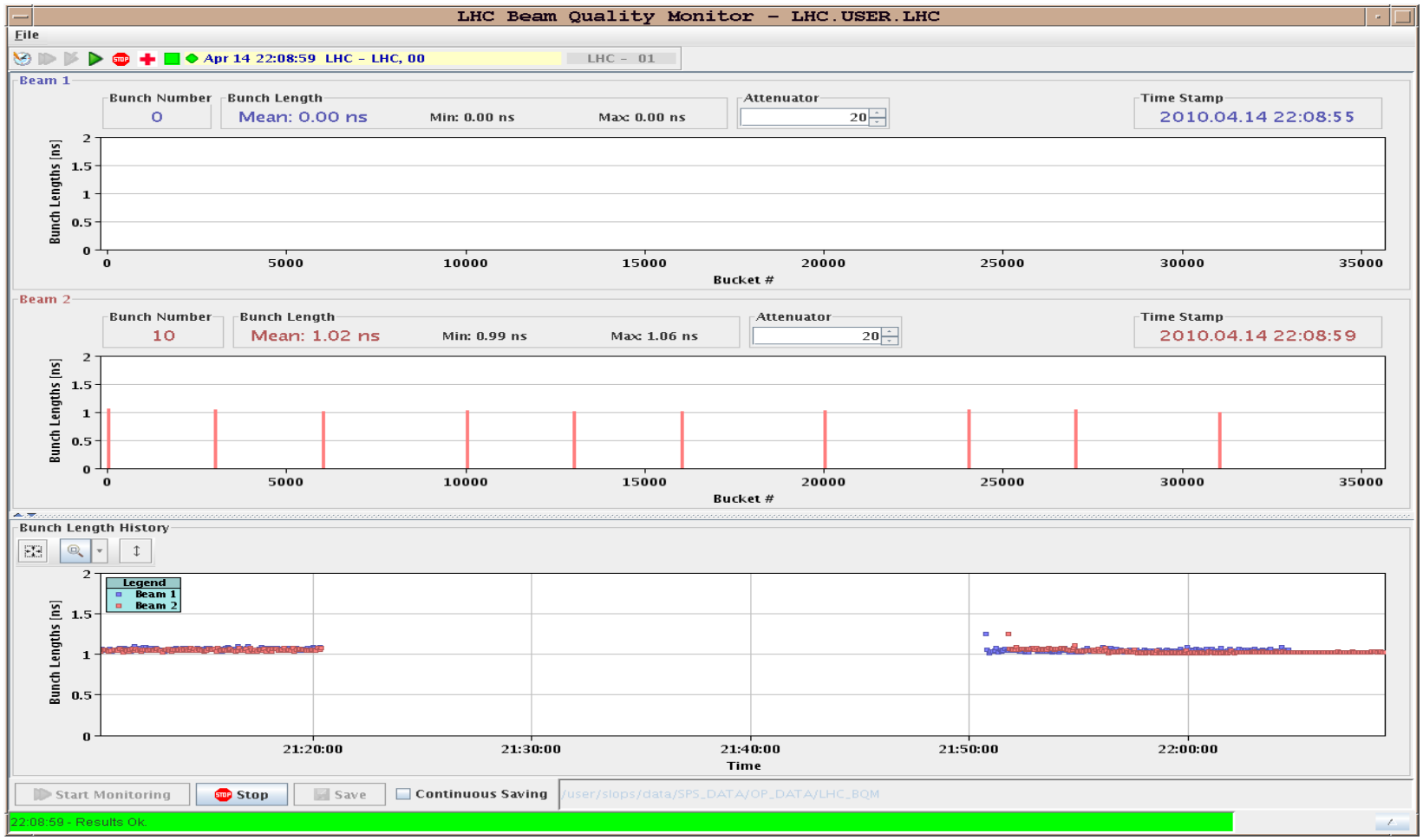
10 bunches approximately 10^{11} total



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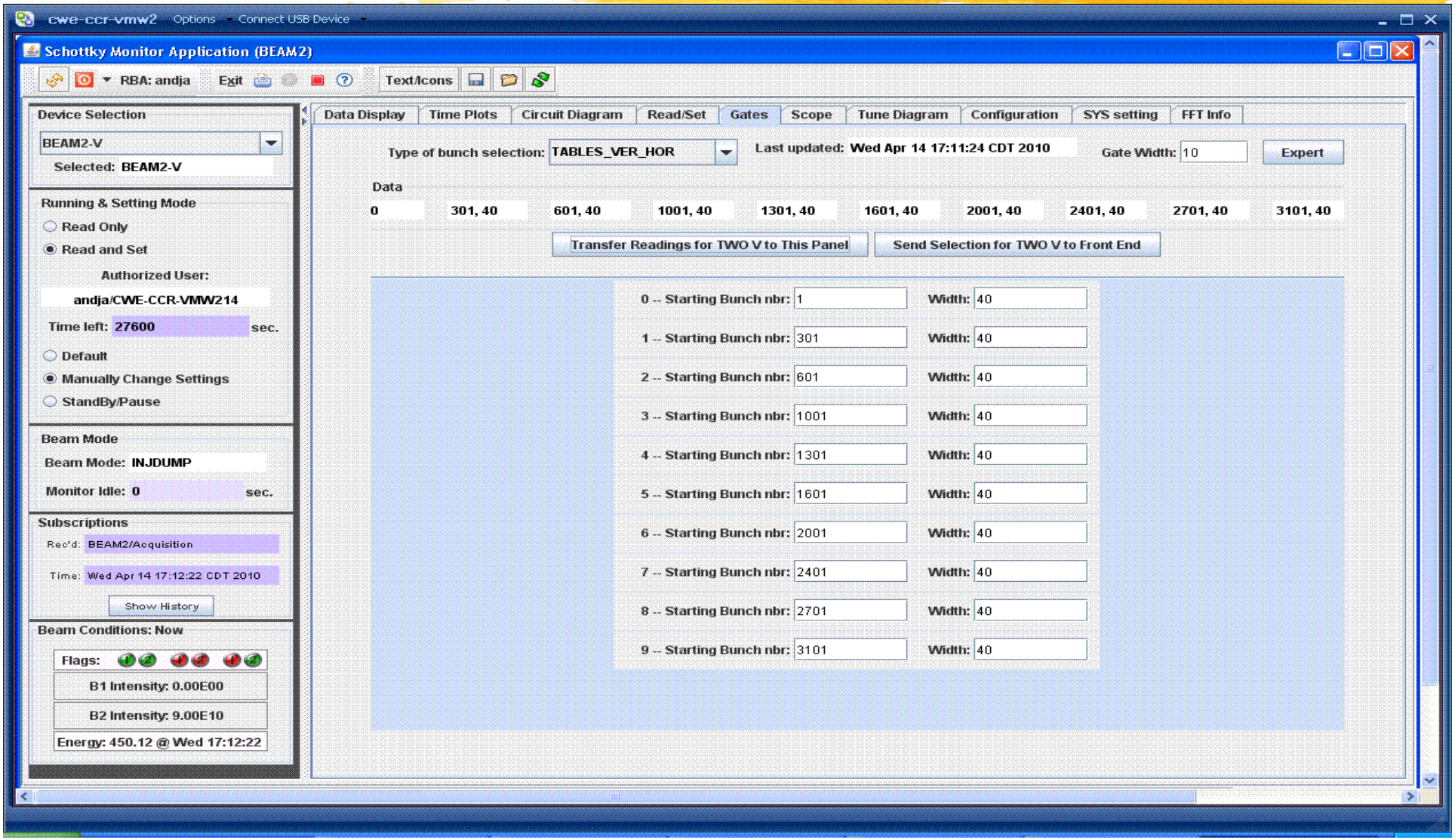
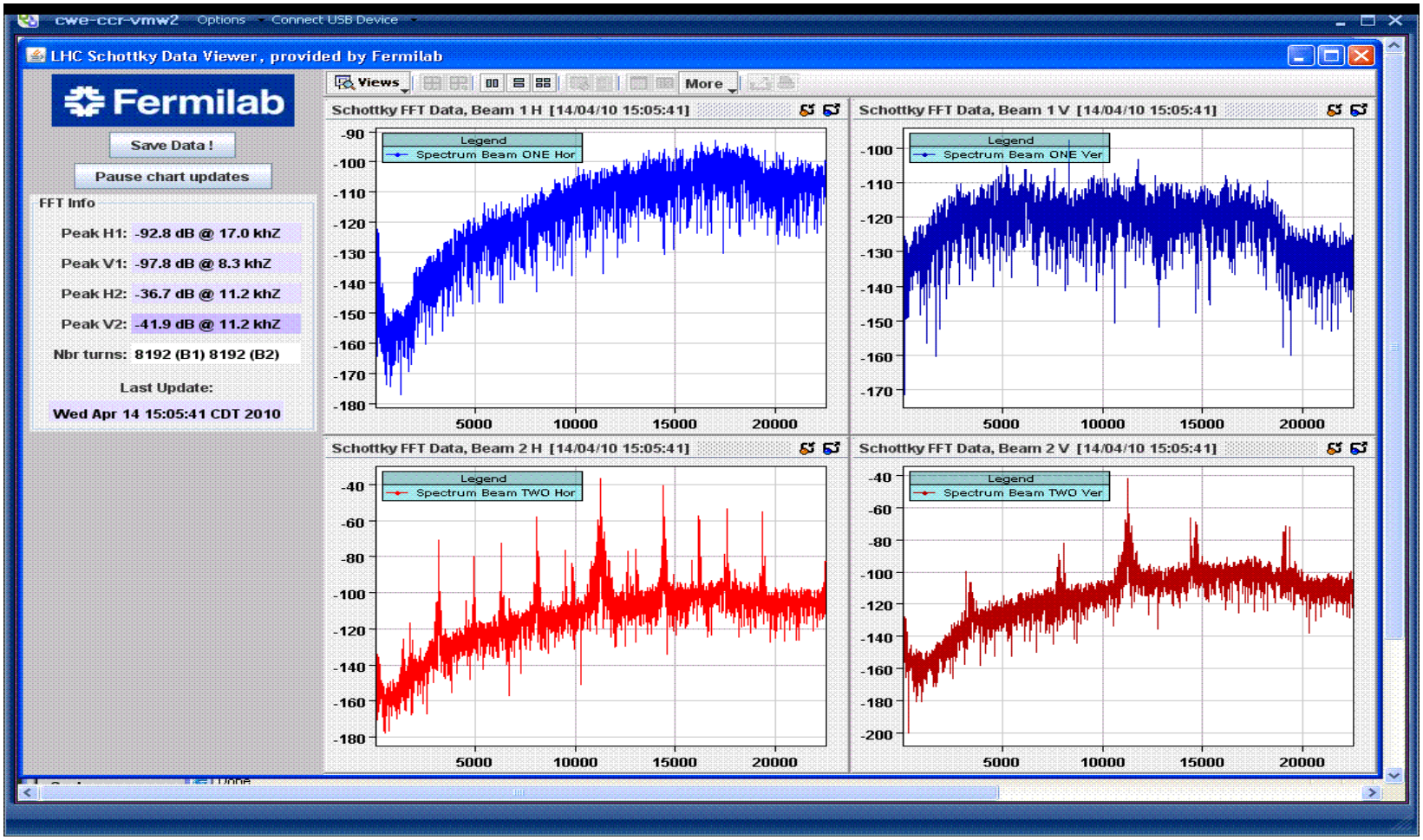
Beam 2: 10 Bunch store 450 GeV Vertical gate settings



First Schottky Signals FNAL GUI app
10 Bunches Beam 2: 450 GeV



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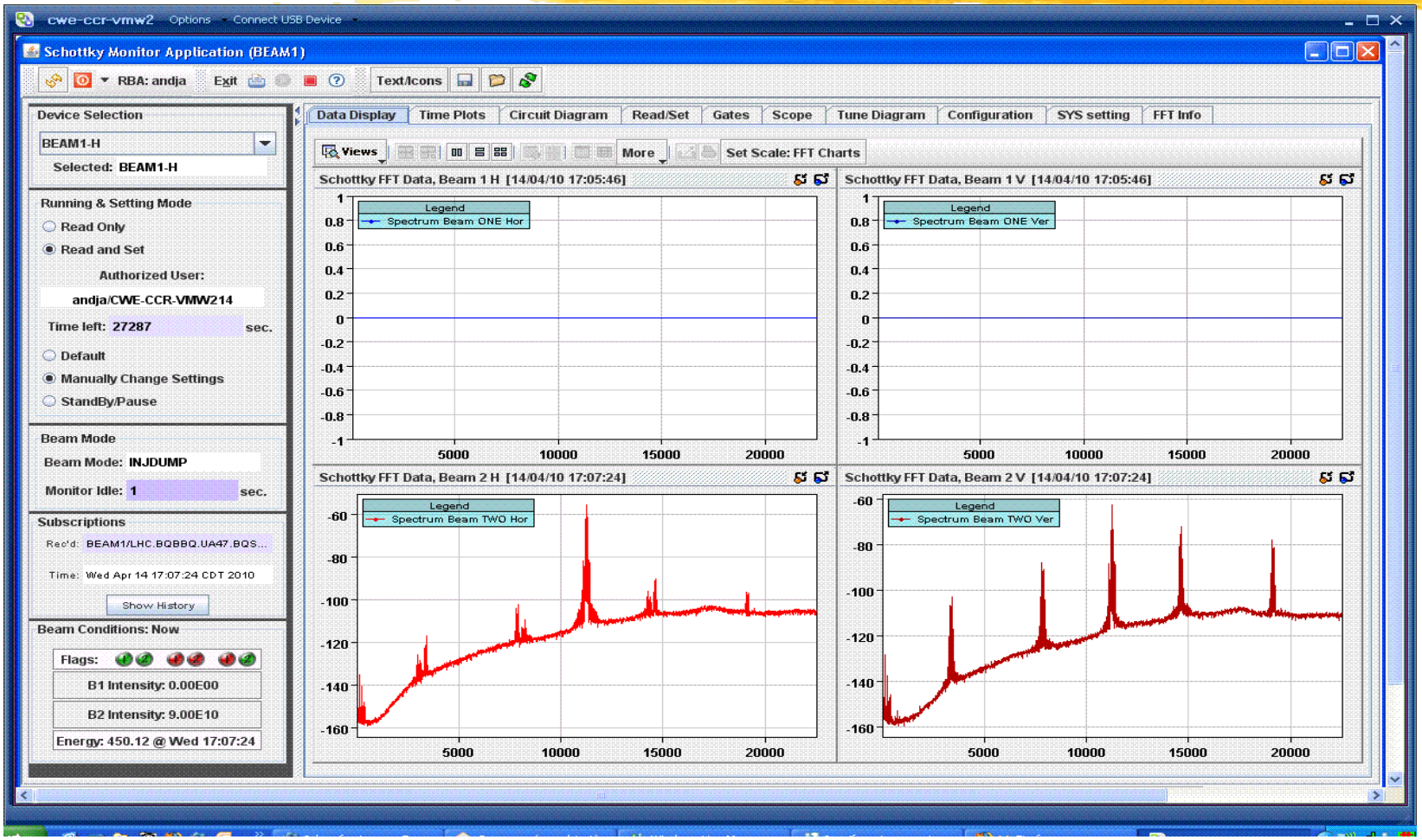
First Schottky Signals 10 Bunches Beam 2: 450 GeV with averaging Measured Accurate Tunes



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