

FFTTOOL

- **Takes an array of data, and run analysis program over it.**
- **Time analysis:**
DC level, RMS, Peak to peak, maximum, minimum
- **Bits analysis**
Stuck bits, funny patterns, bits set to '1'
- **Frequency analysis**
Main frequency, Harmonics behavior, noise presence, undesired frequencies,
- **Plots**
Data, spectrum, signal information, bits plots, one run summary plots
- **Web interface**
- **<http://hep.pa.msu.edu/~benitez/ffttool/runs/>**
- **Integration to the online testing**
Run the program on the fly.

Log file

```
*****
***** FFT TOOL *****
*****
INPUTFILE: AdcDump_V1_2_B_20050208.dat;3073
SPECTRUM FILE: SN6_InEM00_OutEM00_1800mV_2_0MHz_spectrum.dat
ERROR FILE (THIS FILE): SN6_InEM00_OutEM00_1800mV_2_0MHz.err
CARDID: ADF2_SN#6
CHANNEL 1: TT_EM_0_0
CHANNEL 2: TT_EM_0_0
GENERATOR FREQUENCY: 2.0000
GENERATOR AMPLITUDE: 1800.0000

)) TIME ANALYSIS ...

DC component: 92.603
Power value: 19288.648
Peak to peak value: 271.000
Maximum value: 287.000
Minimum value: 16.000

**** DC value level test ****
TEST FAILED - DC value 92.60 is out of the range [480.00 - 500.00]

**** RMS value test ****
TEST FAILED - RMS value 103.51 is not within the range [240.00 - 266.00]

**** Peak to peak value test ****
TEST FAILED - Peak to peak value 271.00 is within the range [278.12 - 307.40]

**** Saturation test ****
TEST PASSED - Maximum and minimum are inside the acceptable range

**** Two consecutive values test ****
Error!!! two consecutive data are equal to each other = 277.000000 at [ 32]
Error!!! two consecutive data are equal to each other = 277.000000 at [ 912]
Error!!! two consecutive data are equal to each other = 277.000000 at [ 1352]
...
TEST FAILED

**** Three consecutive values test ****
TEST PASSED - FOUND NONE

**** ARE BITS HAVING SAME VALUE ****
Possible error bits stucked at 0 bit # D0 , length 50 position 1507
...
***** Error !! the bit D4 is always on the same level = 1
***** Error !! the bit D9 is always on the same level = 0
TEST FAILED
***** How often each one of the bits is set to '1' HIGH *****
1) Bit D0 = 962 times = 23.49 %
2) Bit D1 = 950 times = 23.19 %
...
10) Bit D9 = 0 times = 0.00 %
```

comments

- *RUN ID: Unique identifier*
- *Signal Characterization*
- *DC test: 490 ± 10 counts*
- *RMS test: 253 ± 5 %*
- *Peak to peak test: $2(rms * Sqr(2)) \pm 5\%$*
- *Saturation: $Max < 1024$, $Min > 0$*
- *Two consecutives: inside 5% to 95%*
If array [i]==array[i+1]
- *Three consecutives...*
- *Stuck bits?*
- *Bits set to one? Zero?*

***** BITS STATISTICS *****

** Number of times bits have same value**

Bit # x Bit #

Bit #	-D0-	-D1-	-D2-	-D3-	-D4-	-D5-
-D0-	0	3104	3172	3208	962	3190
-D1-	0	3154	950	3206	3211	3246
-D2-	0	0	0	3176	914	3196
-D3-	0	0	0	0	958	3150

•Bits correlation..

Bit # x Bit #

Only data range > 512

No test will be executed, since the range of the values are not big enough - peak to peak < 512
TEST PASSED

)) FREQUENCY ANALYSIS ...

***** DC Component *****

Amplitude of DC component

139.408 49.374 dB 0.010823 %

•Zero frequency amplitude

***** MAIN FREQ *****

Main FREQ 2.0003

•Main freq (Highest peak)

***** FREQ DIFF *****

Frequency difference (Main freq spectrum - Input freq generator)

0.0003 MHz 0.014 %

Compare with generator freq

***** SPECTRUM *****

First 10 peaks are located at:

1) Location: 270	Frequency: 2.0003 MHz	Amplitude 14.6738 % <-> 121.4952 dB
2) Location: 540	Frequency: 4.0006 MHz	Amplitude 7.8532 % <-> 115.2437 dB
...		
10) Location: 1266	Frequency: 9.3791 MHz	Amplitude 0.1653 % <-> 76.6373 dB

•Signal Spectrum,
num peaks found > 1 ?

***** HARMONICS *****

First 7 Harmonics:

1) Harmonic 1	Frequency: 2.0003 MHz	Amplitude 9.9543 % <-> 117.6147 dB
2) Harmonic 2	Frequency: 4.0006 MHz	Amplitude 5.5070 % <-> 111.6947 dB
...		
7) Harmonic 7	Frequency: 14.0020 MHz	Amplitude 0.3236 % <-> 83.3535 dB

•Harmonics

Second to first ratio

***** SECOND TO FIRST HARMONIC RATIO*****

TEST FAILED - The difference second to first harmonic is 5.919968 dB,
which is smaller than the threshold 40.000 dB value
first 117.614662 dB, second 111.694695 dB

•New frequencies?

***** NEW FREQUENCIES APPEARING ON TO THE SPECTRUM *****

>> Frequency: 4.0006 MHz	Amplitude 7.853 % <-> 115.244 dB
>> Frequency: 6.0008 MHz	Amplitude 1.556 % <-> 99.058 dB
...	
>> Frequency: 12.3425 MHz	Amplitude 0.364 % <-> 84.516 dB

***** CROSS TALK *****

Main freq (0.0000 MHz) - freq generator (2.0000 MHz) = 2.0000 MHz
Amplitude of the frequency 2.000 MHz is = 0.0594 % <-> 10.0328 dB

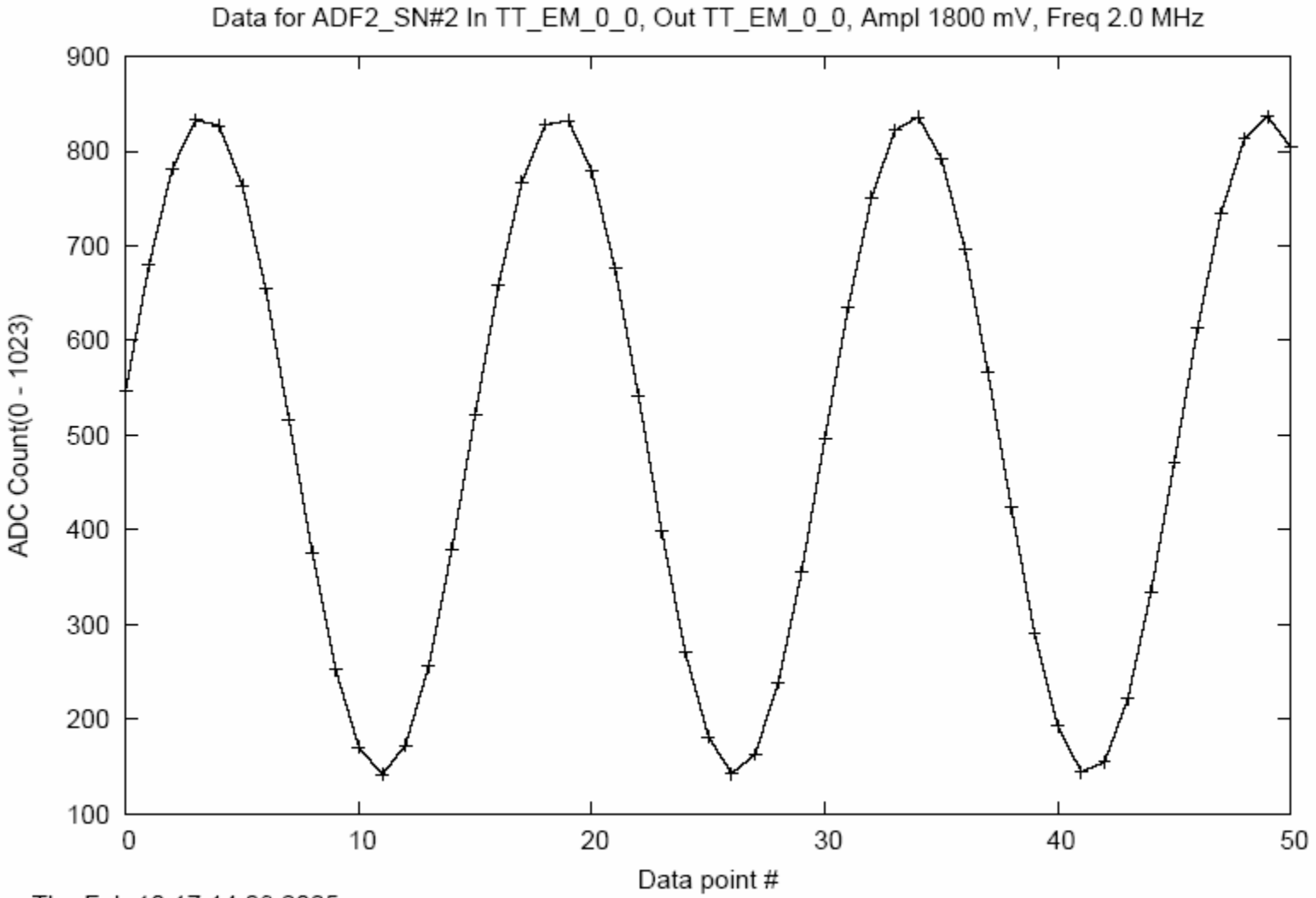
•Cross talk, Func. Gen. frequency component?

**** RMS value test *****

TEST PASSED - RMS value 0.06 is within the range [-1.00 - 1.00]

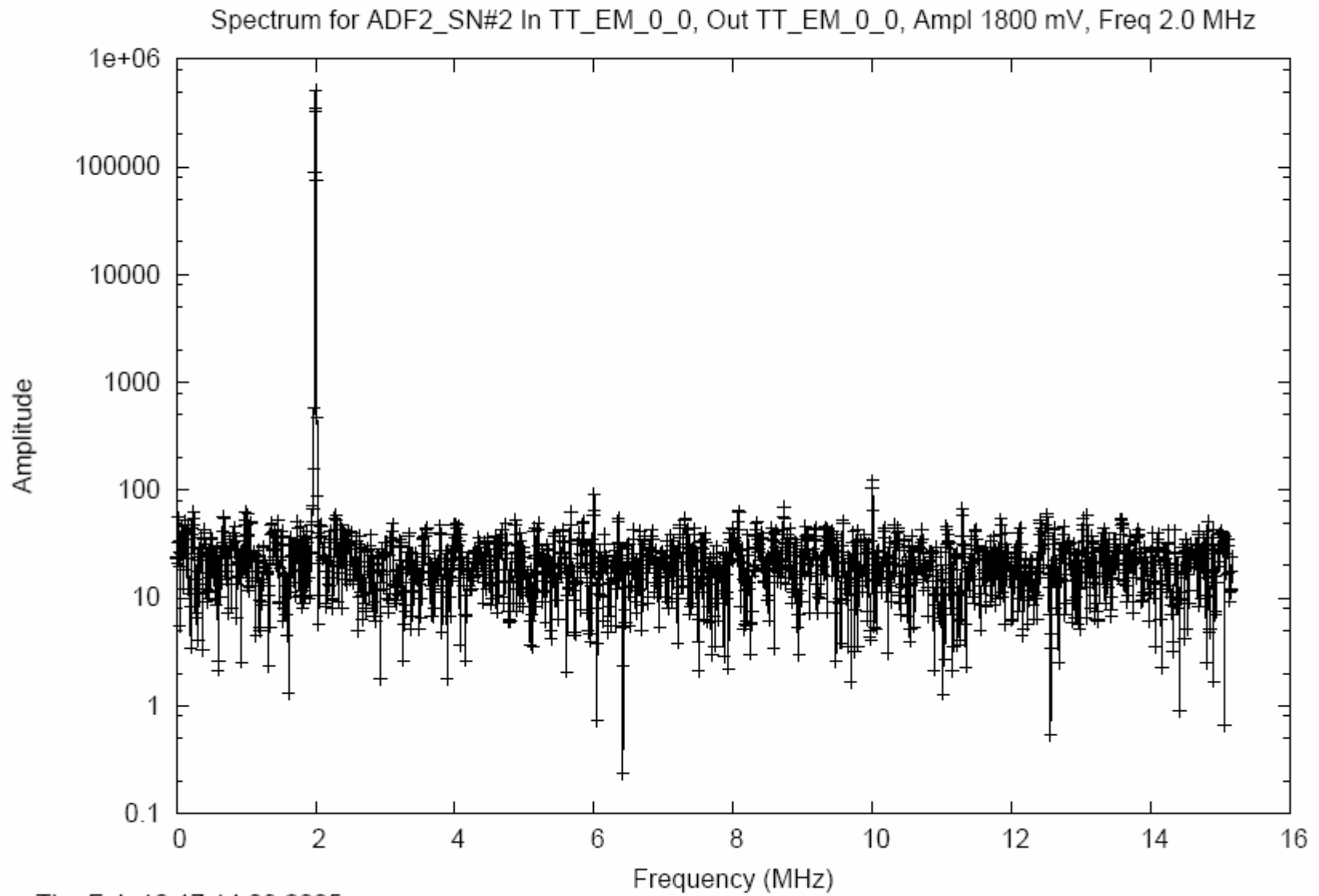
•What's rms value for channel? > 1 count?

DATA 2 MHz, 1800 mV



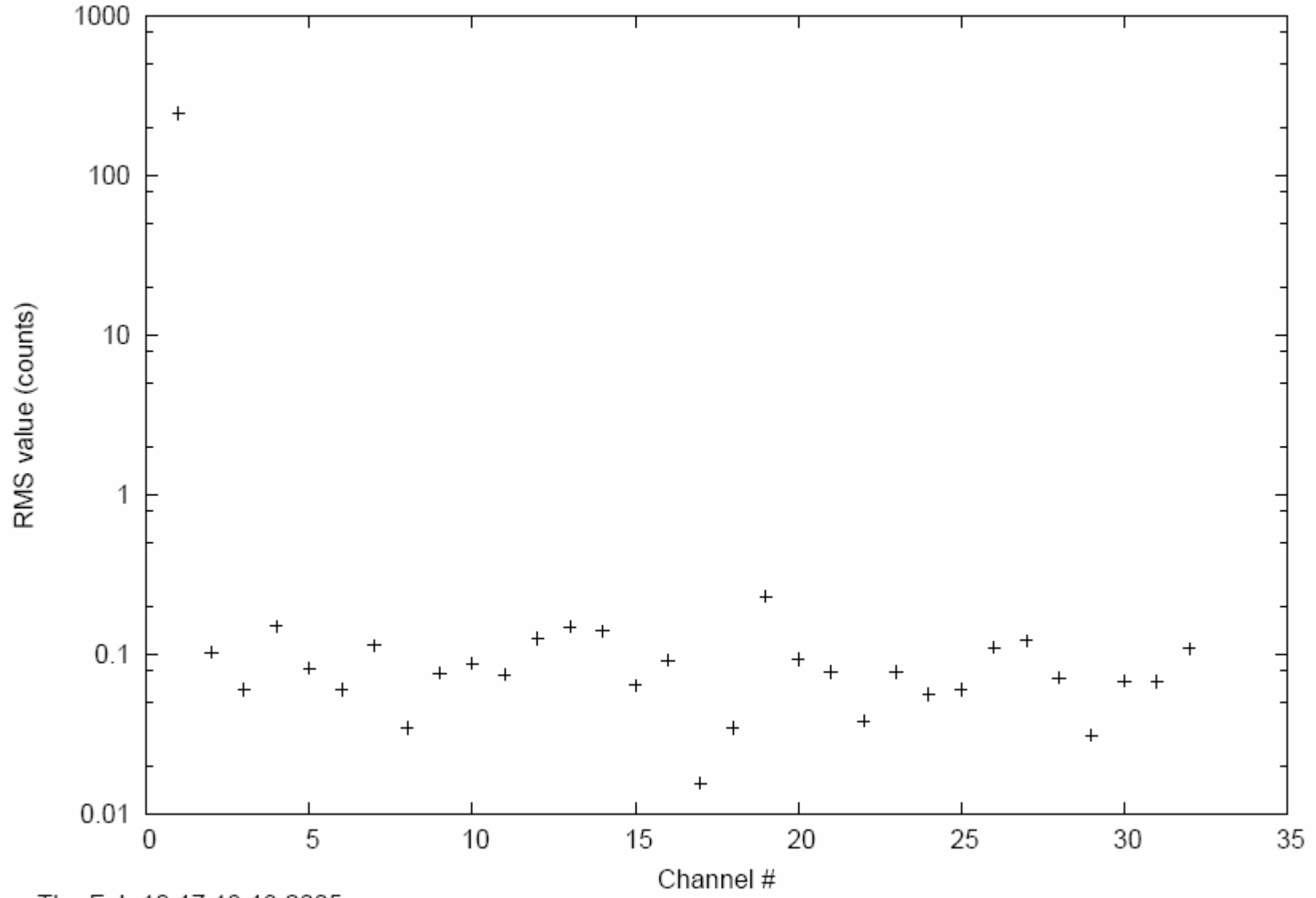
Thu Feb 10 17:14:08 2005

Spectrum 2 MHz, 1800 mV Y Log



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RMS Input channel EM (0,0) , Output 32 channels

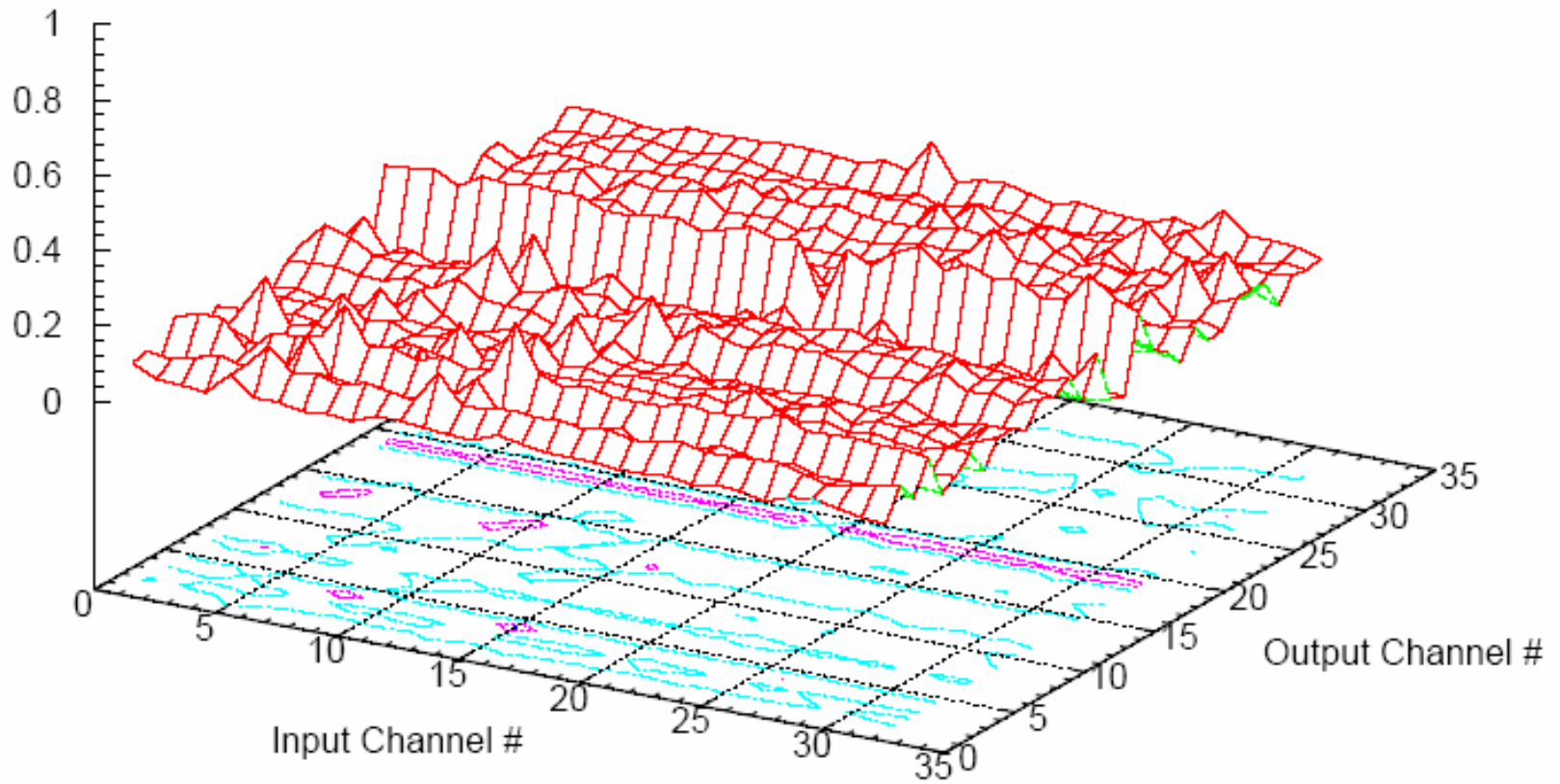


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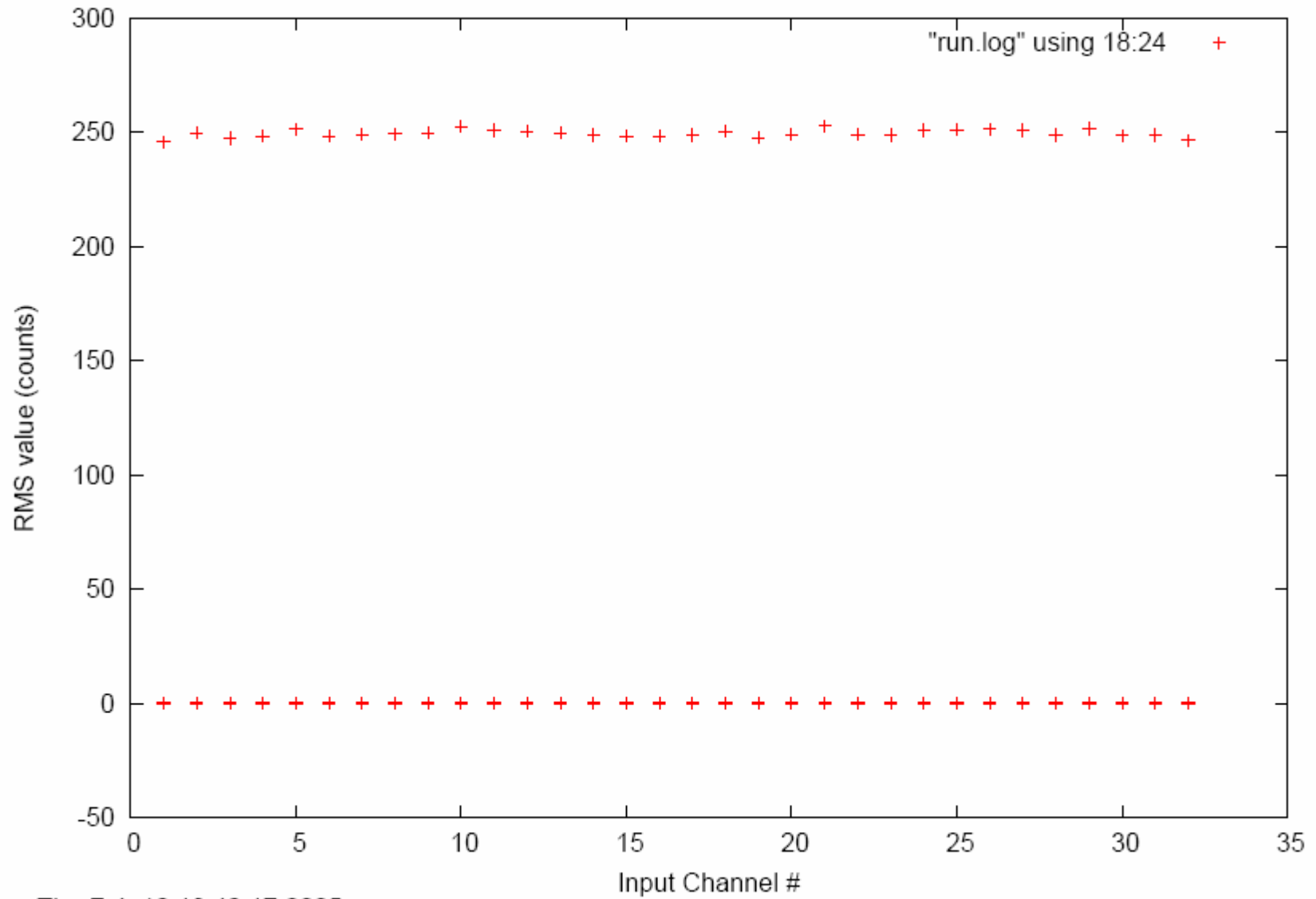
RMS Input channel EM (0,0) , Output 32 channels

RMS value (counts)

0.1



RMS Input channel EM (0,0) , Output 32 channels



Thu Feb 10 18:42:17 2005