



News on Adapter Board impedance matching and HDI testing

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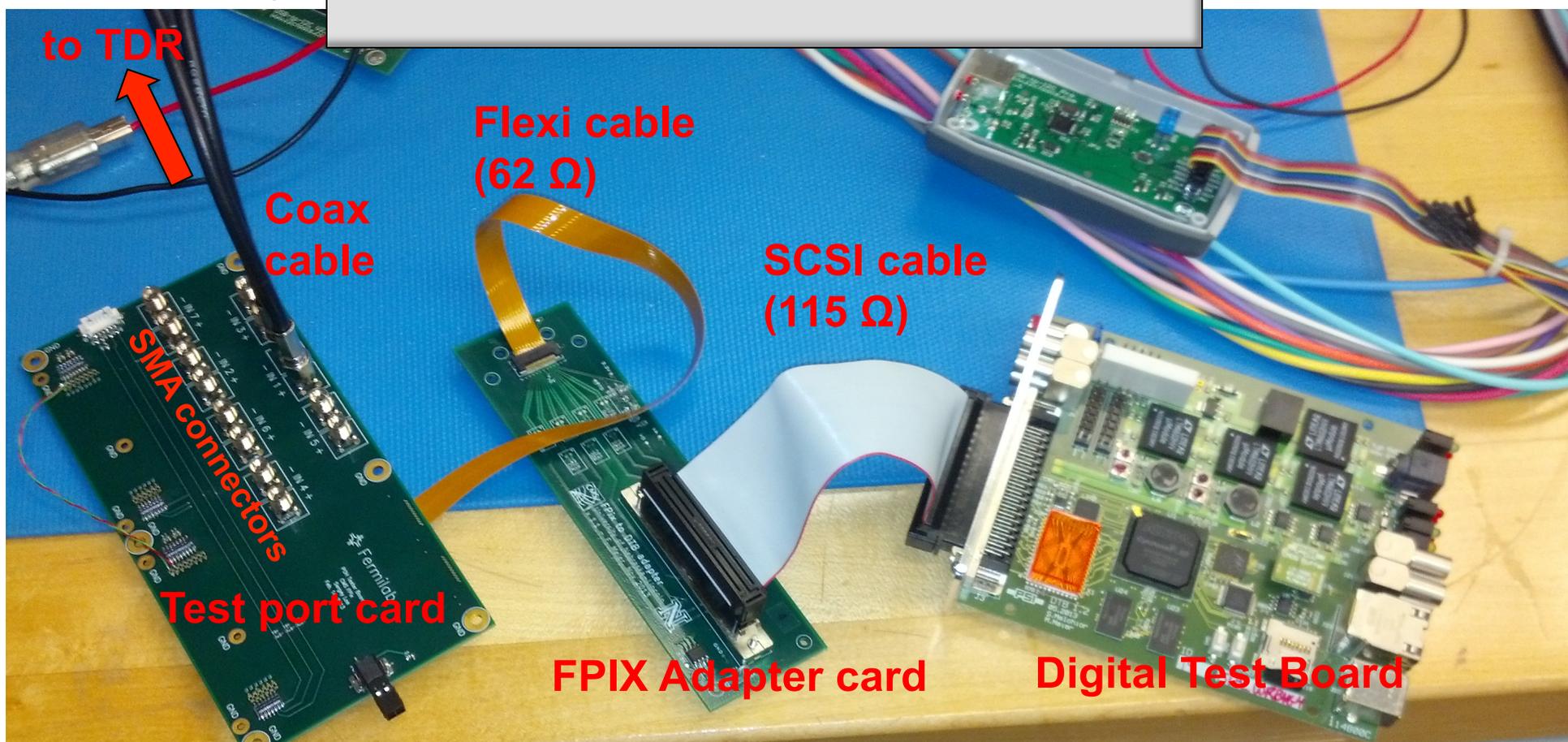
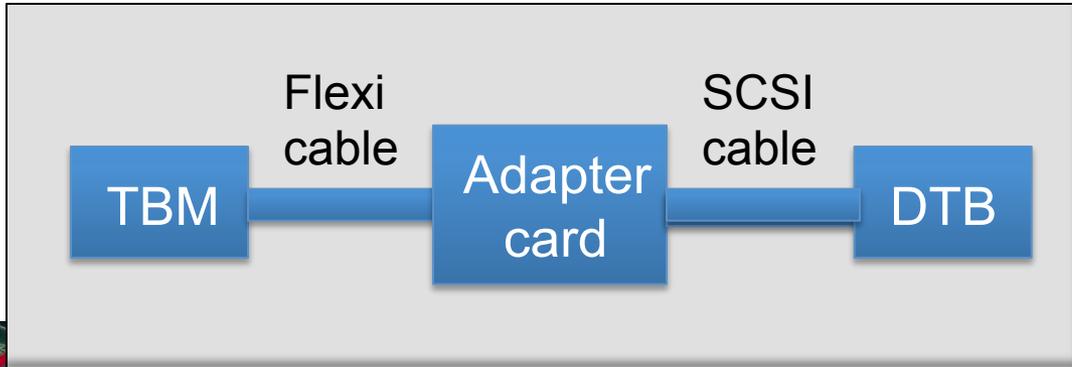
University of Nebraska Lincoln

(On behalf of SIDET team)

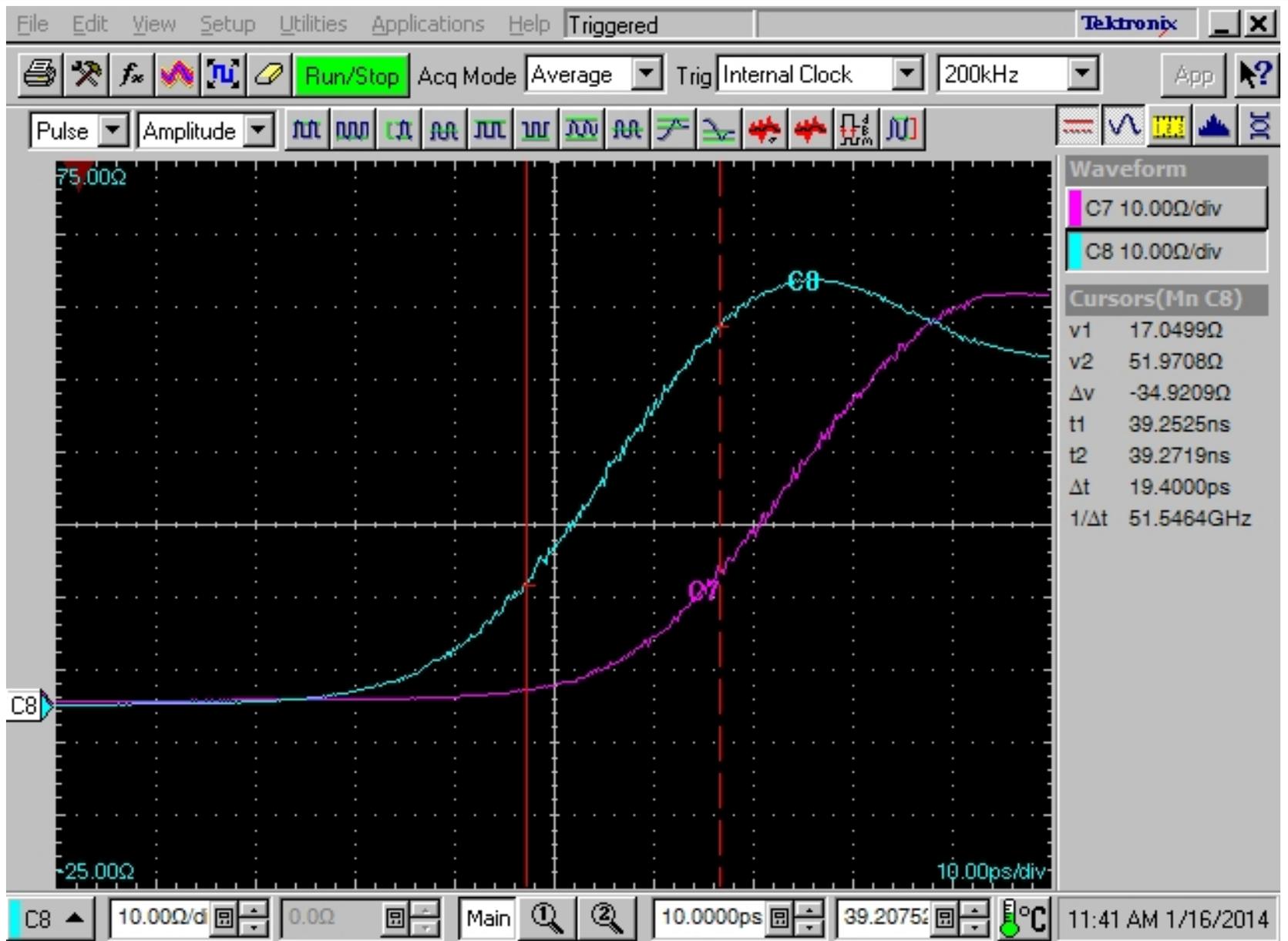
January 17 , 2014

- ❑ Impedance matching of FPix adapter card
- ❑ Changes to the adapter card
- ❑ Analog and Digital signals with the modified adapter card
- ❑ Status of the last four TBM08's
- ❑ Results with new TBM08's

TDR: Time Domain Reflectometry



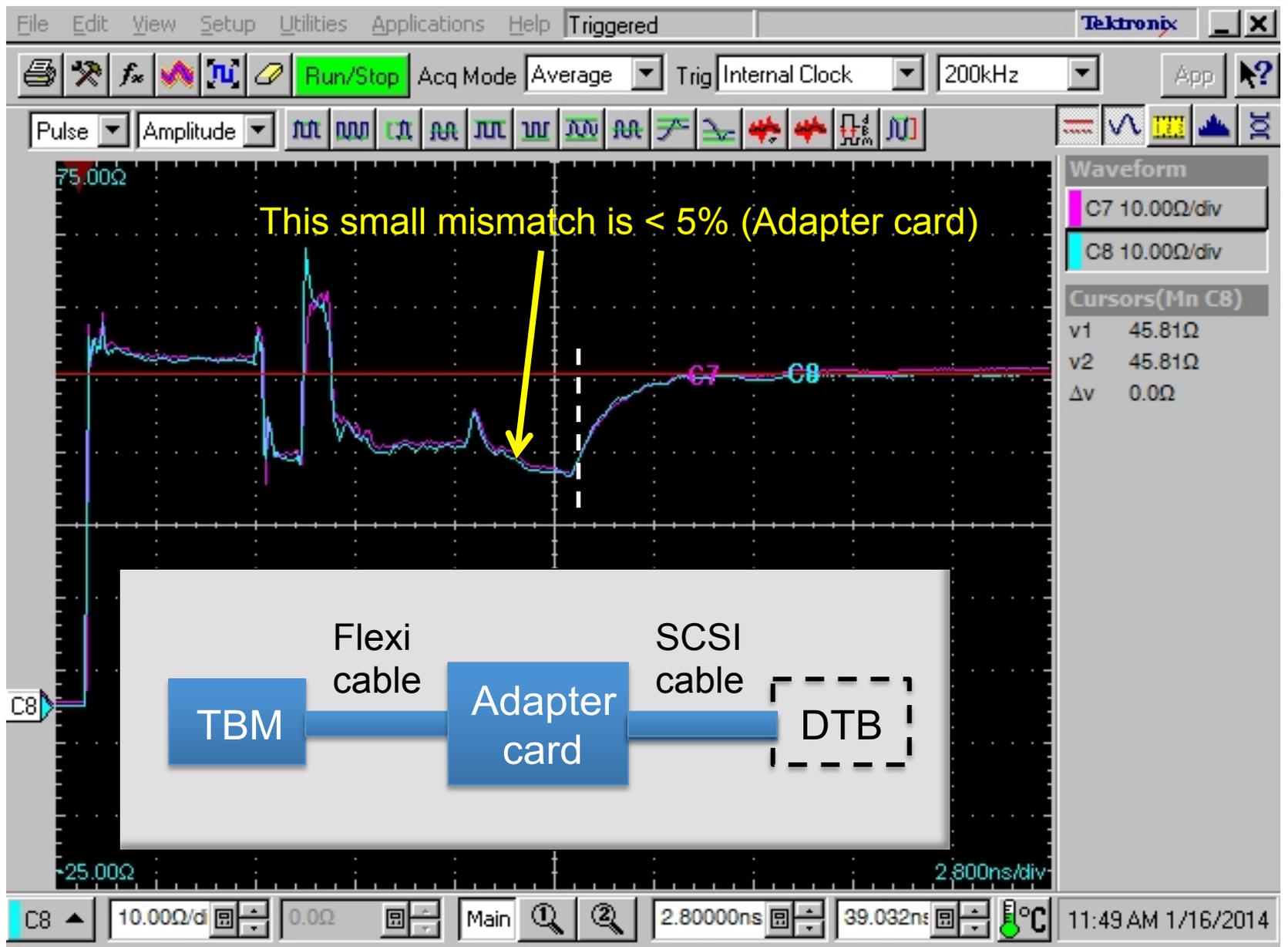
Incident pulse from TDR



Adapter card unconnected to flex cable



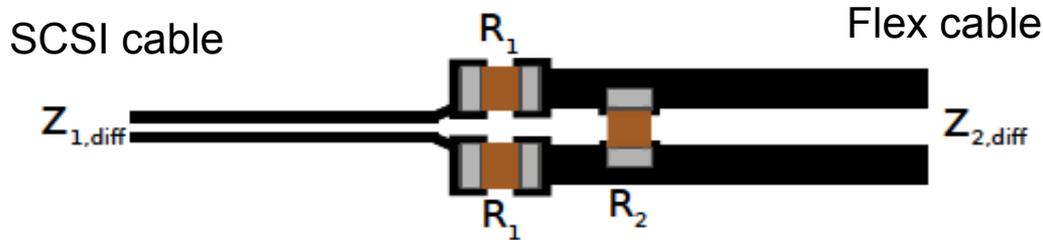
DTB unconnected



After connecting DTB



Impedance matching



Connection	Impedance Z
SCSI 68 pin	115 Ω
SMK flex cable	60 Ω

Resistor	value
R_1	39 Ω
R_2	91 Ω

As in Frank's adaptor card

$$Z_1 = 2R_1 + \frac{1}{1/R_2 + 1/Z_2} = 115 \Omega$$

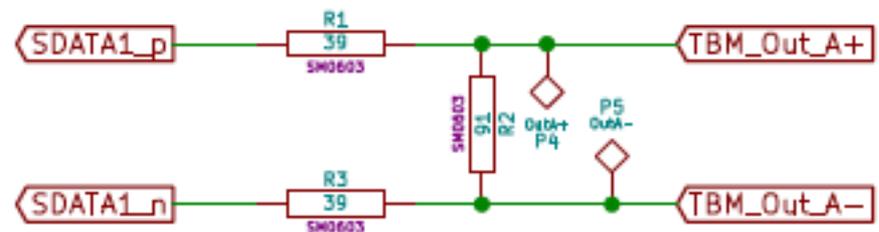
$$Z_2 = \frac{1}{\frac{1}{2R_1 + Z_1} + \frac{1}{R_2}} = 62 \Omega$$

We tried different combination of the resistances (R_1 , R_2) for SDATA1

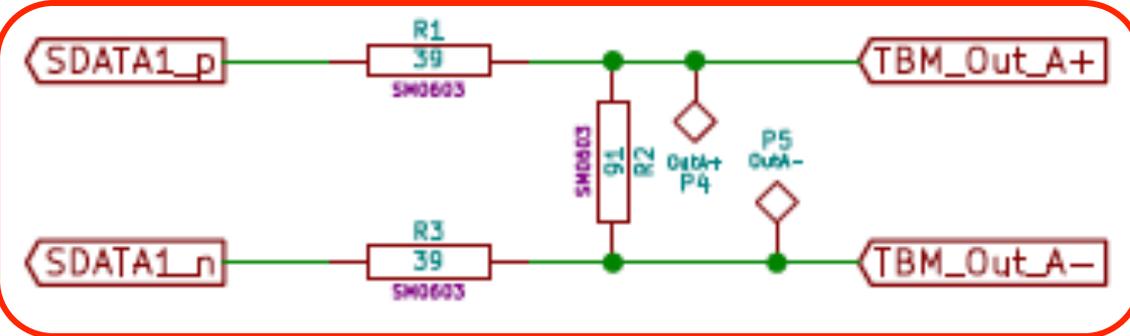
Goal was to lower the total resistance and thereby enhancing the signal

DTB

TBM

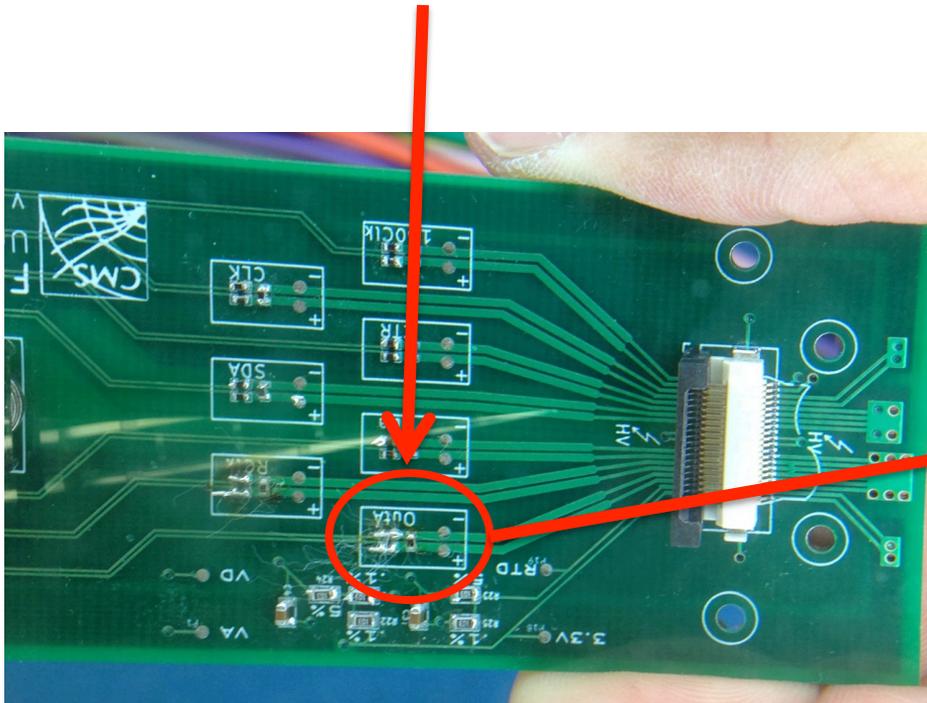


Try $R_1=0 \Omega$, $R_2=120 \Omega$ (default $R_1=39 \Omega$, $R_2=91 \Omega$)

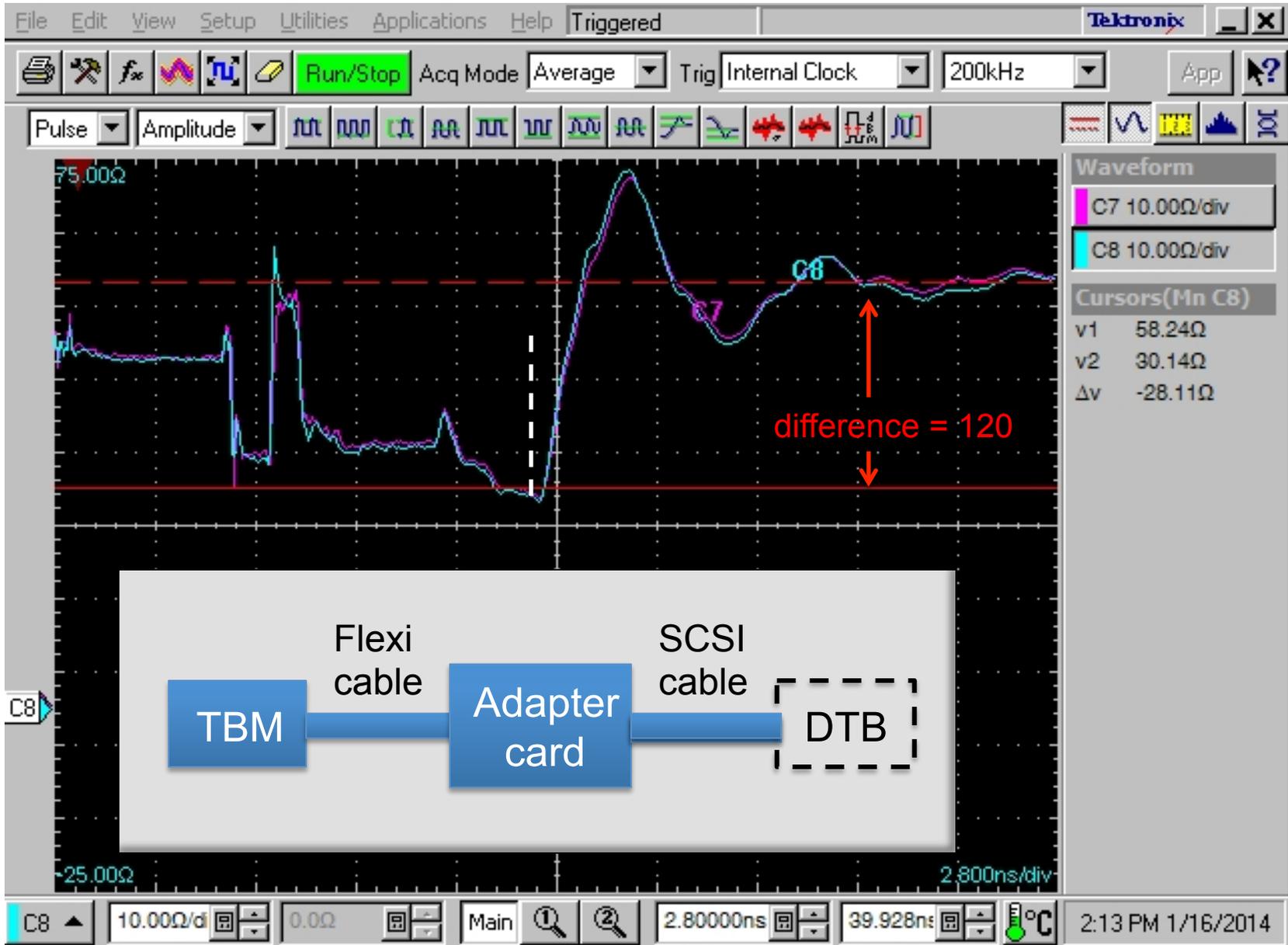


Resulting $R_{total} = 120 \Omega$
which is in || to SCSI

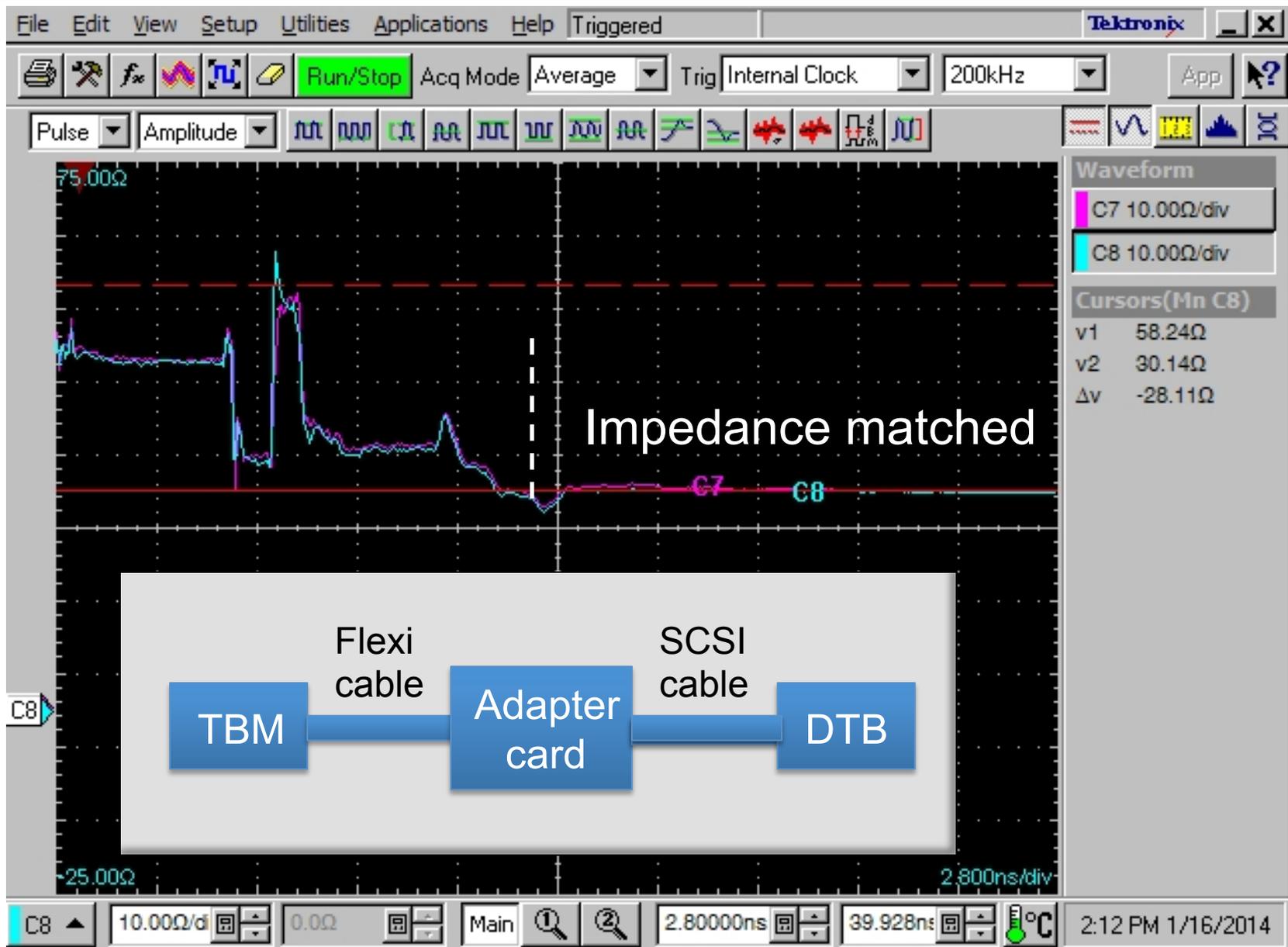
Resulting Impedance $\sim 60 \Omega$
which matched with Flexi cable



DTB unconnected w/ SDATA1 $R_{total} = 120 \Omega$



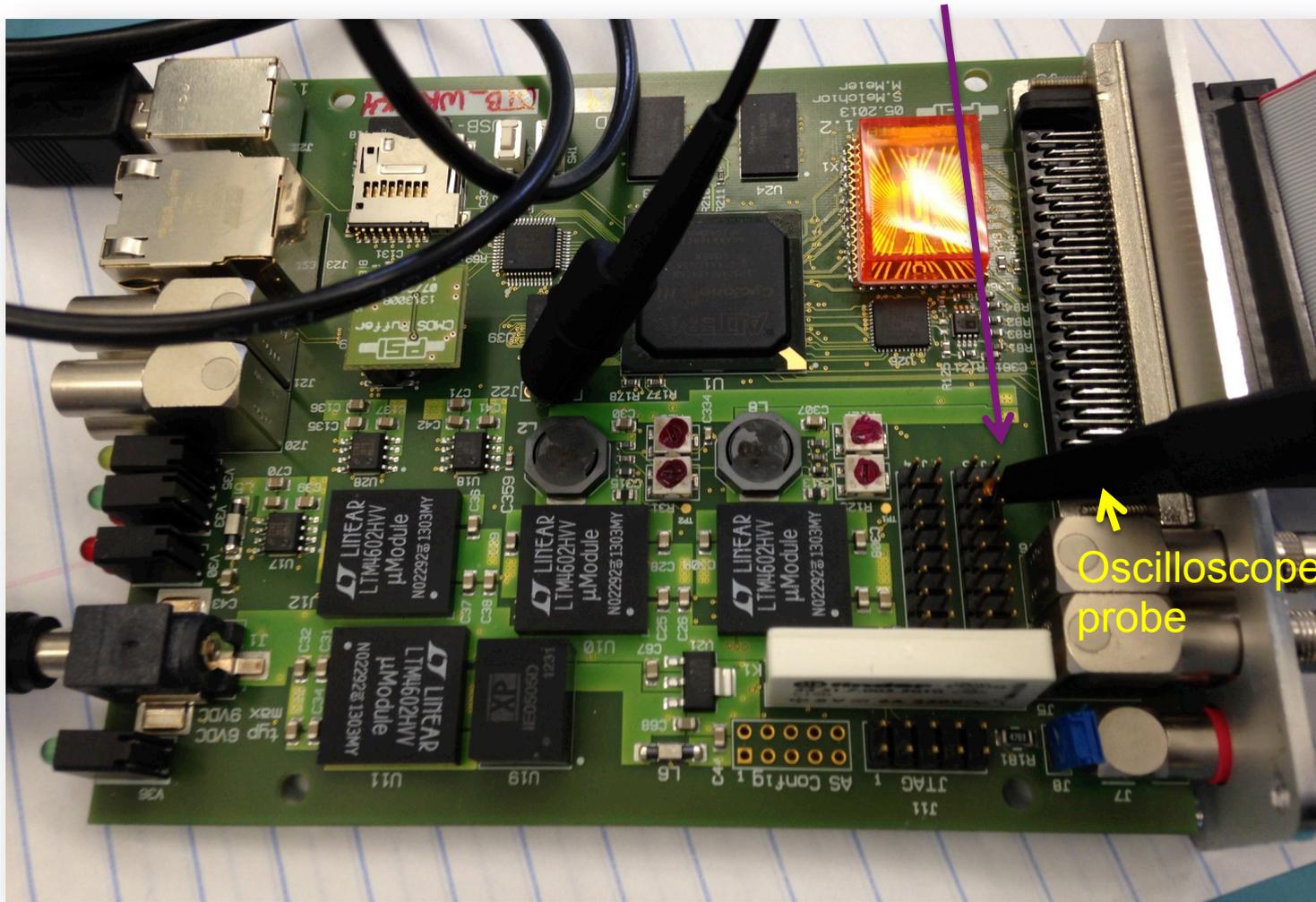
Full chain w/ SDATA1 $R_{total}=120\ \Omega$

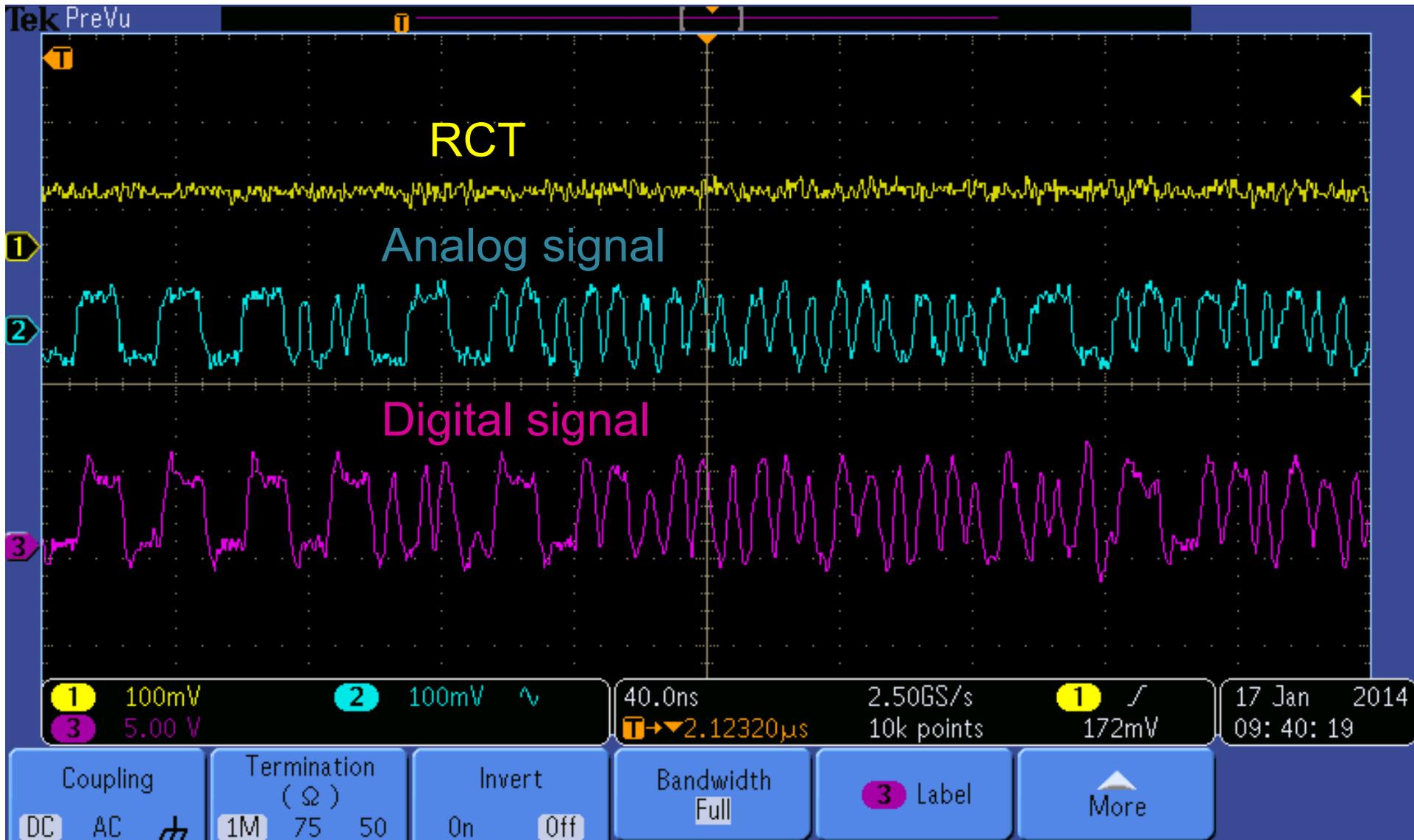


Good News:

- Making changes to the resistors for SDATA1 in the Adapter card showed good result.
- The signal is enhanced and now the analog and digital signal looks similar.
- The decoding is also working fine for both the cores.

- To collect the digital signal from DTB – we need to collect it from the relevant pin inside the DTB and not from the D1 line outside the box – as the NIOS can not handle the high output rate of TBM08. So how the Digital signal is collected:





TBM A

1111111110111111
1110000000001000
0000100000111111
1011000100000000

TBM B

1111111110111111
1110000000001000
0000101111111111
1011000100100000

- Decoding done with Robert's DESER400

TBM HEADER

EVT

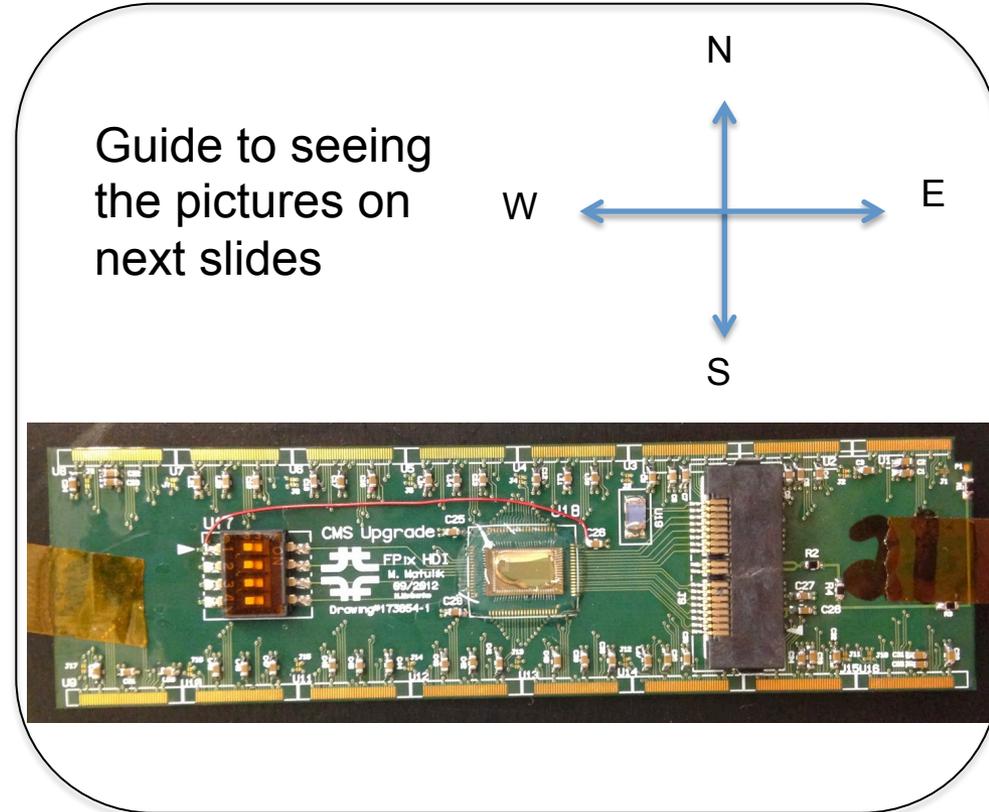
ROC

TBM TRAILER

Errors are shown with
underline

(Observation as of 01/15/13)

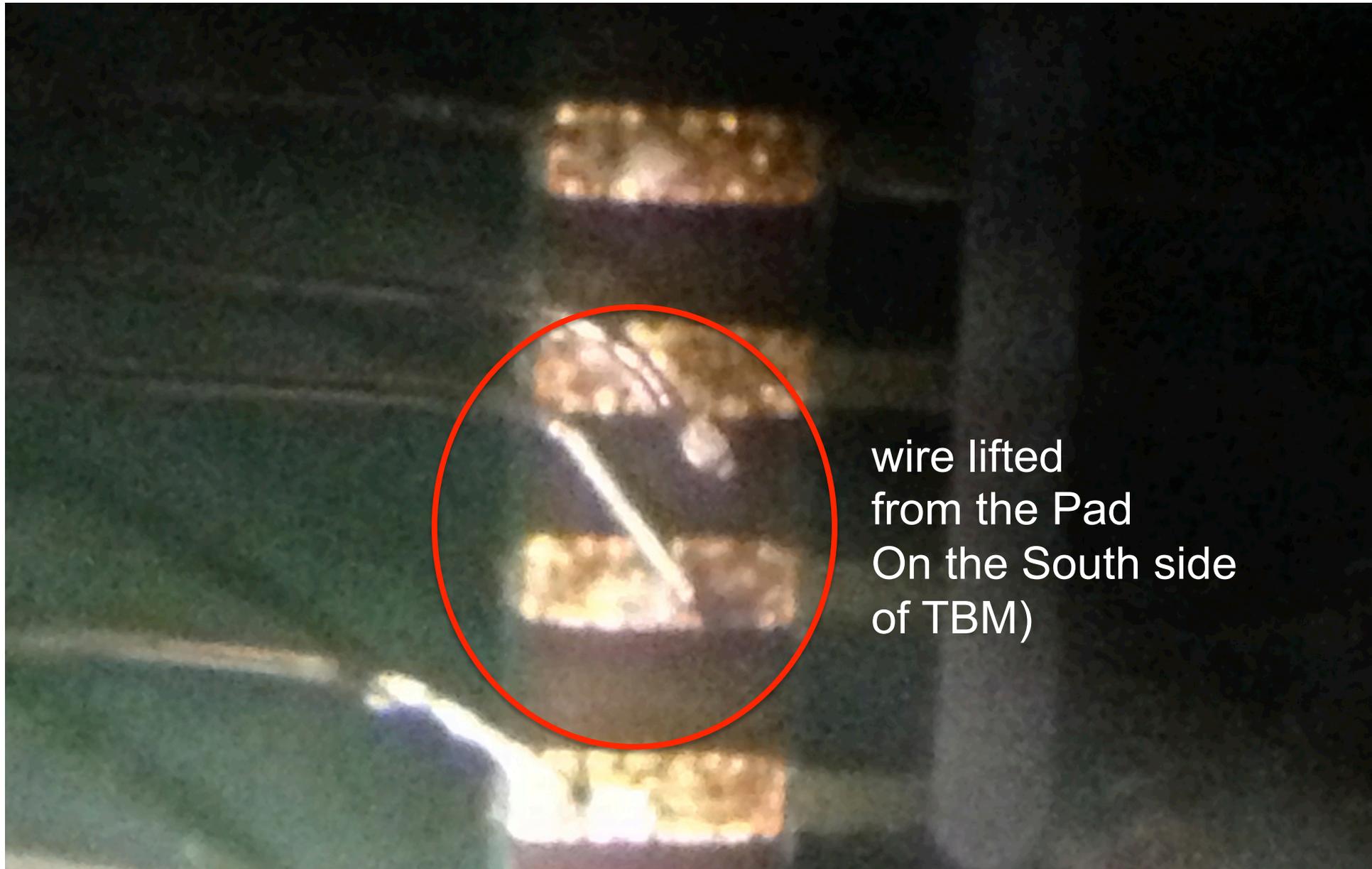
HDI#	Current drawn	In Oscilloscope
18	> 20 mA	Looks OK
19	> 20 mA	Looks OK
22	> 20 mA	Looks OK
23	> 20 mA	Looks OK



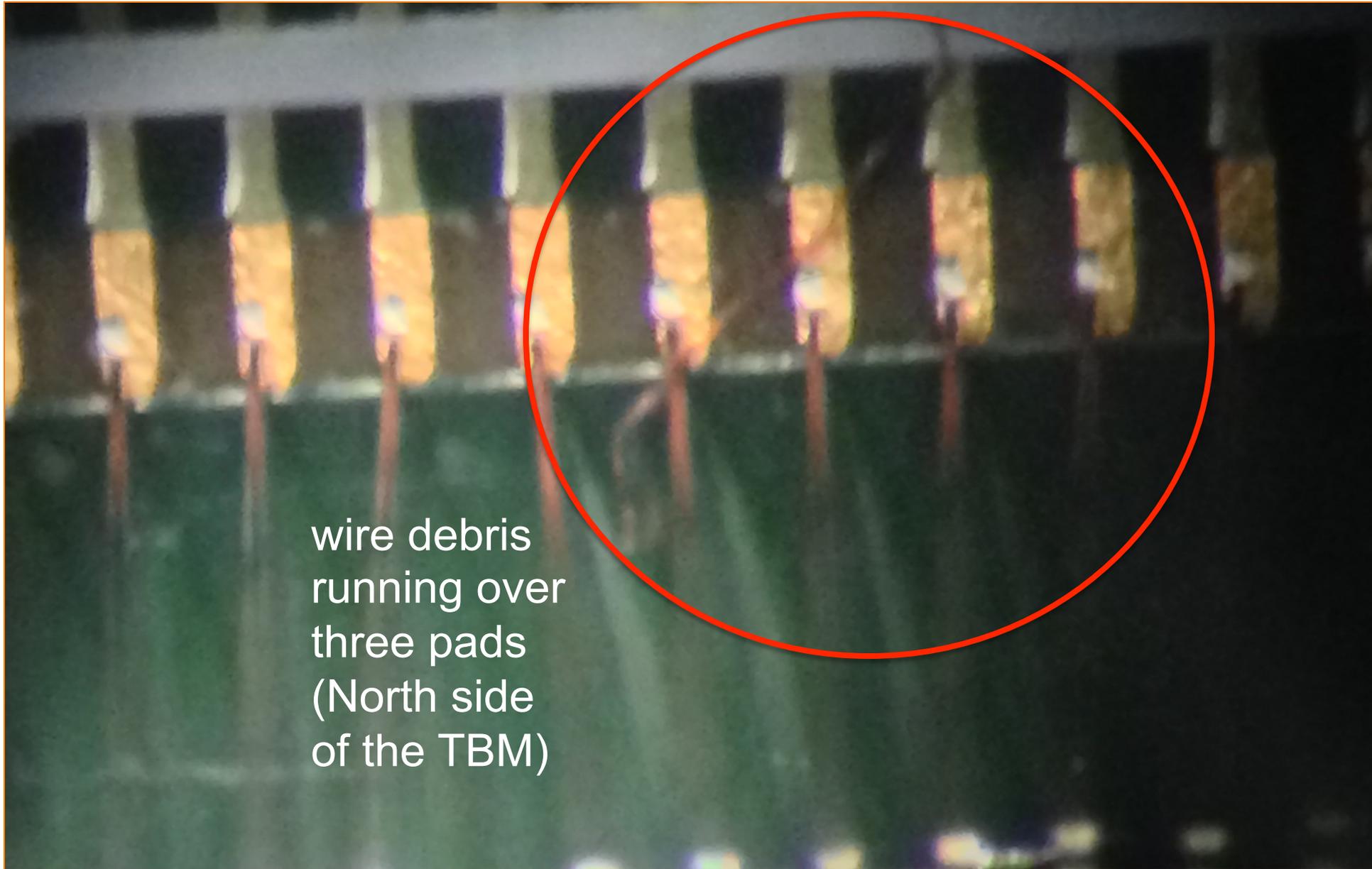
- When tested on 01/17/13 – two of them showed bad signal – on investigation we found that wire bonds were lifted/displaced in two of them – see following slides:



wire lifted
from the Pad
East side of TBM



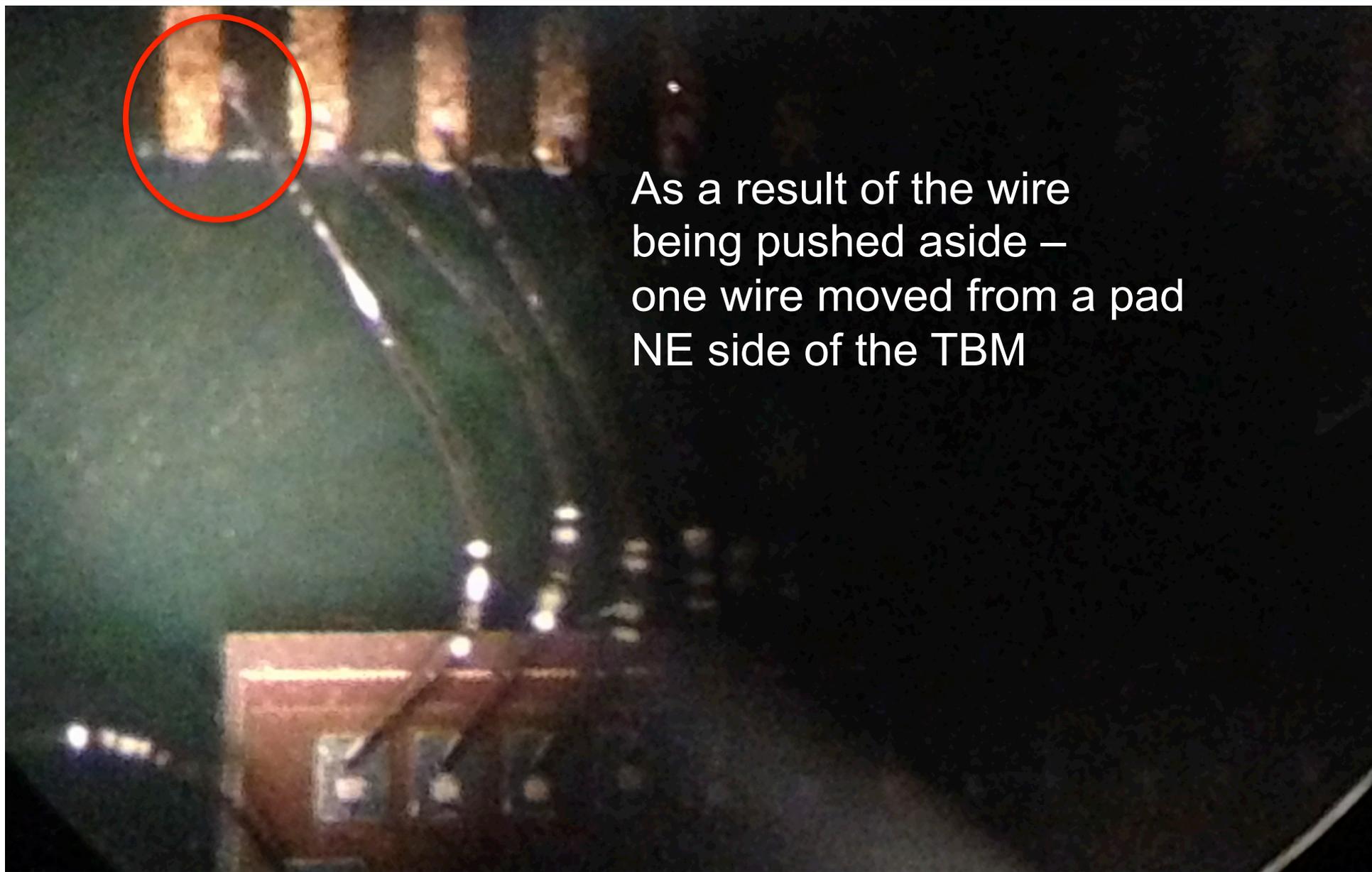
wire lifted
from the Pad
On the South side
of TBM)



wire debris
running over
three pads
(North side
of the TBM)



wires got twisted
(looks like the soldering
wire or something just
pushed them together)
NE side of TBM

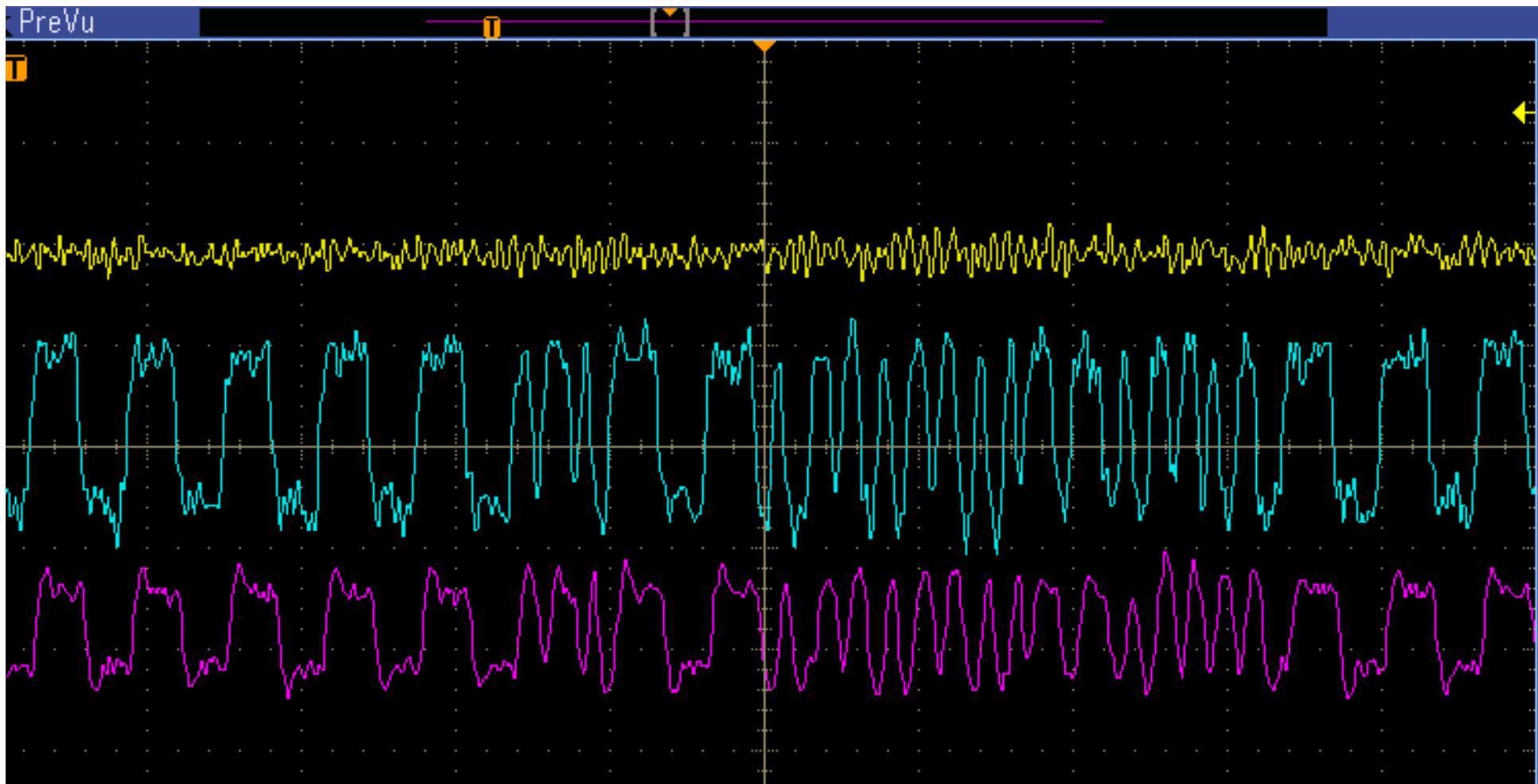


As a result of the wire being pushed aside – one wire moved from a pad NE side of the TBM

- ❖ Possible sources for the damage of wire bonds:
 - These 4 HDI's were not encapsulated
 - Handling of the HDI – transport to a different place to solder the 2.5 V
 - While soldering the 2.5 V wire
 - Most importantly, while putting the flexi cable in the SMK connector on HDI during testing
 - Moreover, while testing the HDI's are placed on the Kapton foil for electrical isolation – to do this we take out the HDI from the ESD safe boxes and put them on the foil

- Immediate Remedy: As these are not encapsulated we can get them wire bonded again

- Results from the two good HDI's:
 - HDI #19, #23



1 50.0mV Ω	2 50.0mV	40.0ns	2.50GS/s	1 /	17 Jan 20
3 5.00 V		1 \rightarrow ∇ 2.08760 μ s	10k points	100mV	15:08:00
Coupling AC	Termination (Ω) 1M 75 50	Invert On Off	Bandwidth Full	3 Label	More

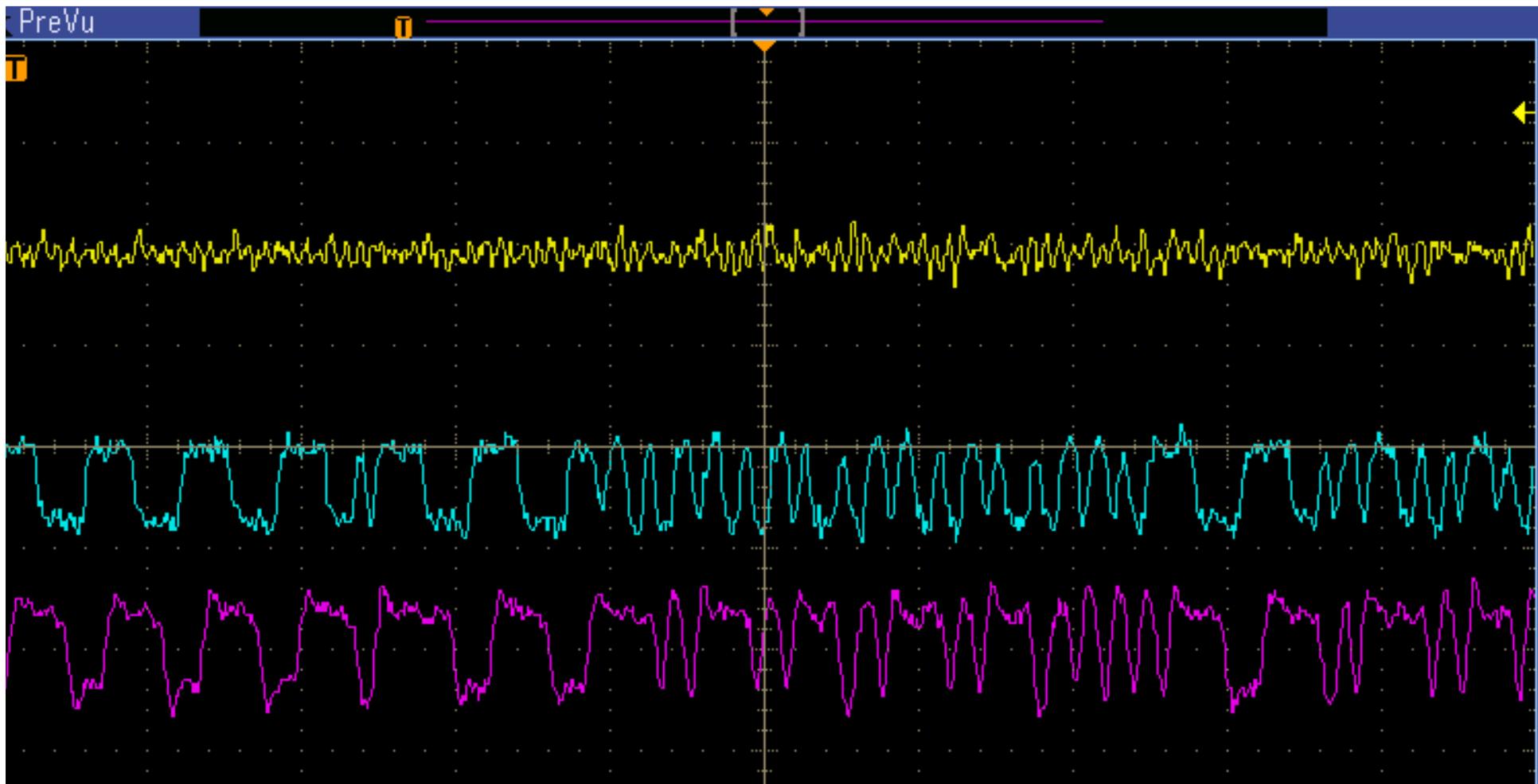
```
> dread 0
#samples: 5  remaining: 0
FFDF=1111111111011111
F004=1111000000000100
05FF=0000010111111111
D890=1101100010010000
3FFF=0011111111111111

> dread 1
#samples: 6  remaining: 0
FFDF=1111111111011111
F005=1111000000000101
07FF=0000011111111111
FDFF=1111110111111111
F890=1111100010010000
3FFF=0011111111111111
```

TBM A looks Good
TBM B shows the header
but the trailer is confused
– to be understood



HDI#23



1 50.0mV Ω	2 100mV	40.0ns	2.50GS/s	1 /	17 Jan 20
3 5.00 V		1 → ▾ 2.14760 μs	10k points	100mV	15: 18: 26
Coupling AC	Termination (Ω) 1M 75 50	Invert On Off	Bandwidth Full	3 Label	More

```
> dstop
> dread 0
#samples: 4  remaining: 0
FBFE=1111101111111110
0080=0000000010000000
87FB=1000011111111011
1007=0001000000000111

> dread 1
#samples: 4  remaining: 0
FBFE=1111101111111110
0080=0000000010000000
87FB=1000011111111011
1007=0001000000000111
```

TBM A, B both cores
show the header
but the trailer is confused –
to be understood

Back up



Summary - 1

HDI#	Current drawn	In Oscilloscope	through Deserializer DESER	Conclusion
21	> 20 mA	Looks OK	TBM A decoder error*	Good
			TBM B OK	
25	~ 1 mA	No signal		Bad
30	> 20 mA	Looks OK	TBM A not triggering	Under investigation
			TBM B header looks strange	
32	~ 13 mA	No signal		Bad
20	> 20 mA	Looks OK	TBM A OK	Under investigation
			TBM B not triggering	
24	> 20 mA	No signal		Bad

Robert is currently upgrading the firmwire once again and we need to test with that when it is available.

* if the decoder does not receive a good signal it can not decode properly? – under investigation