Accessory Pathway Ablation in Ebstein's Anomaly

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Why make a special case of Ebstein's?

- Historically lower success rate than for usual R sided APs
- Often multiple APs
- Difficult signals due to anatomical & electrophysiological considerations
- "Perfect storm" for AVRT means often highly symptomatic patients

Anatomical Considerations

- It is not simply the valve being displaced, as many books suggest!
- Fibrous AV ring is in normal position
- Hinge points of TV are apically displaced
- The ‘atrialised’ section of RV demonstrates fibrosis and myocyte loss

EP Considerations

- AV node is compressed and the central fibrous body malformed.
- Right bundle is fibrotic or occasionally totally absent
- Hence 15-35% show first degree HB & RBBB is present in 75-80%
- HV interval is usually normal

EP Considerations

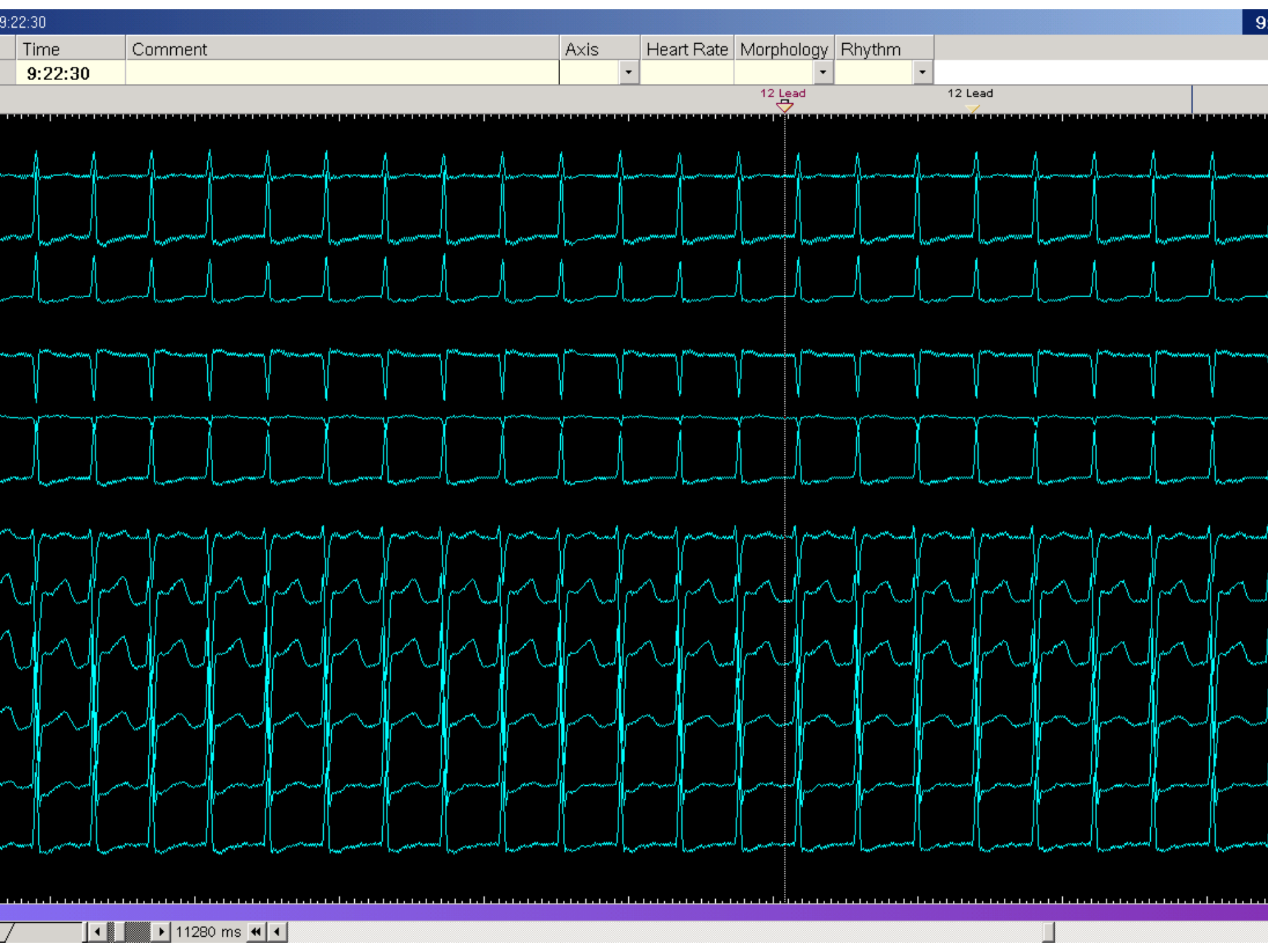
- The AV delay + R sided AP has thus been termed the “perfect storm” for re-entrant tachycardia
- APs are largely in the inferior part of the TV ring, and are more often multiple. L sided APs are also more common than in the standard population

EP Considerations

- APs occur in 10-21% of Ebsteins
- Often conduct very slowly retrogradely giving a “Long Rp tachycardia”
- AP A-V conduction is almost always brisk, hence mapping in SR, AVRT and A pacing should be fine, but V pacing may be misleading – beware AVN damage!

Case 1

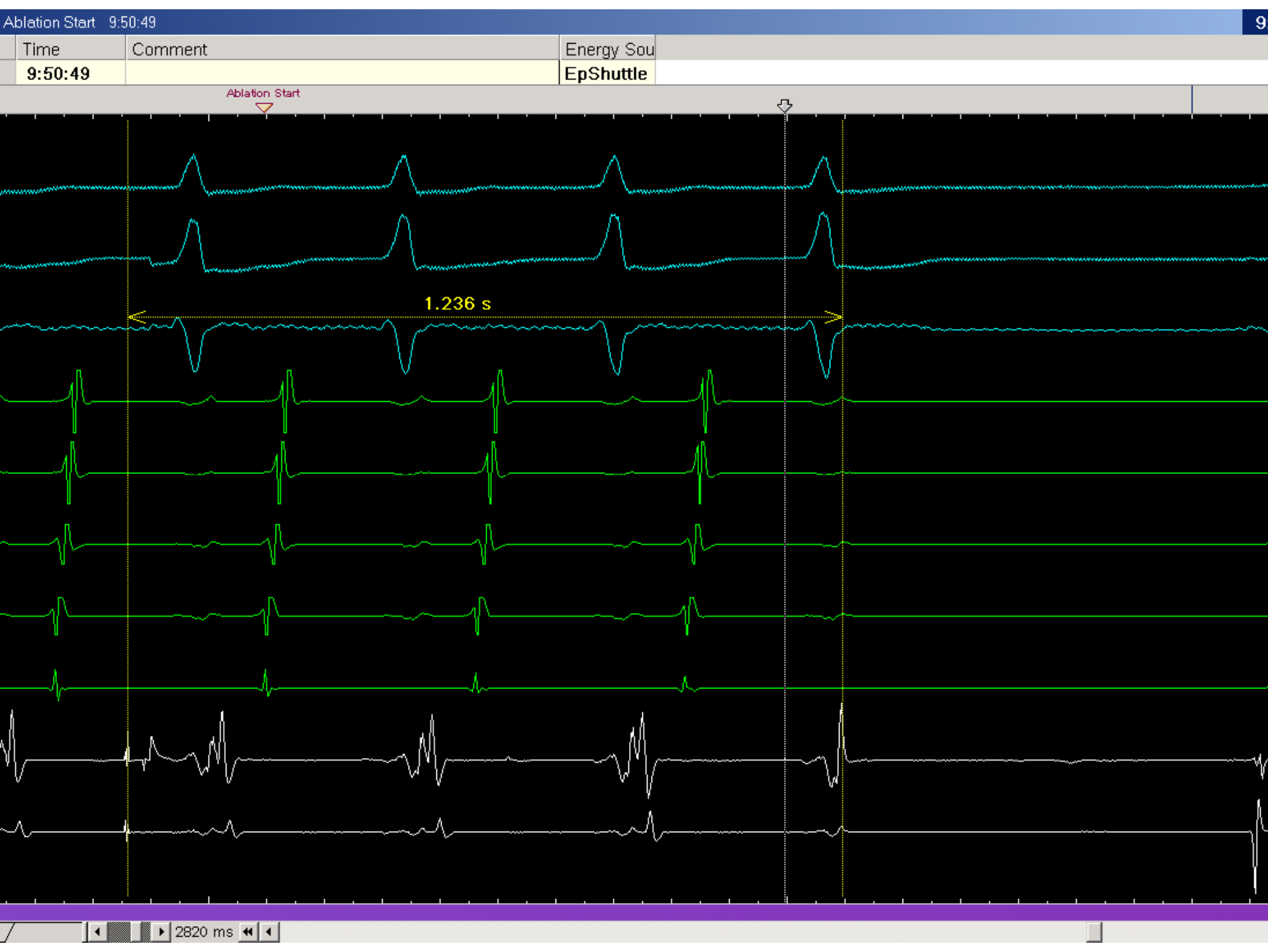
- 28 year old male
- Presented with SVT
- Routine echo confirmed ‘mild’ Ebsteins


9:22:30
9
Time
Comment
Axis
Heart Rate
Morphology
Rhythm
9:22:30
12 Lead
12 Lead
11280 ms

23:27 9

Time	Comment
9:23:27	Long VA tachycardia.

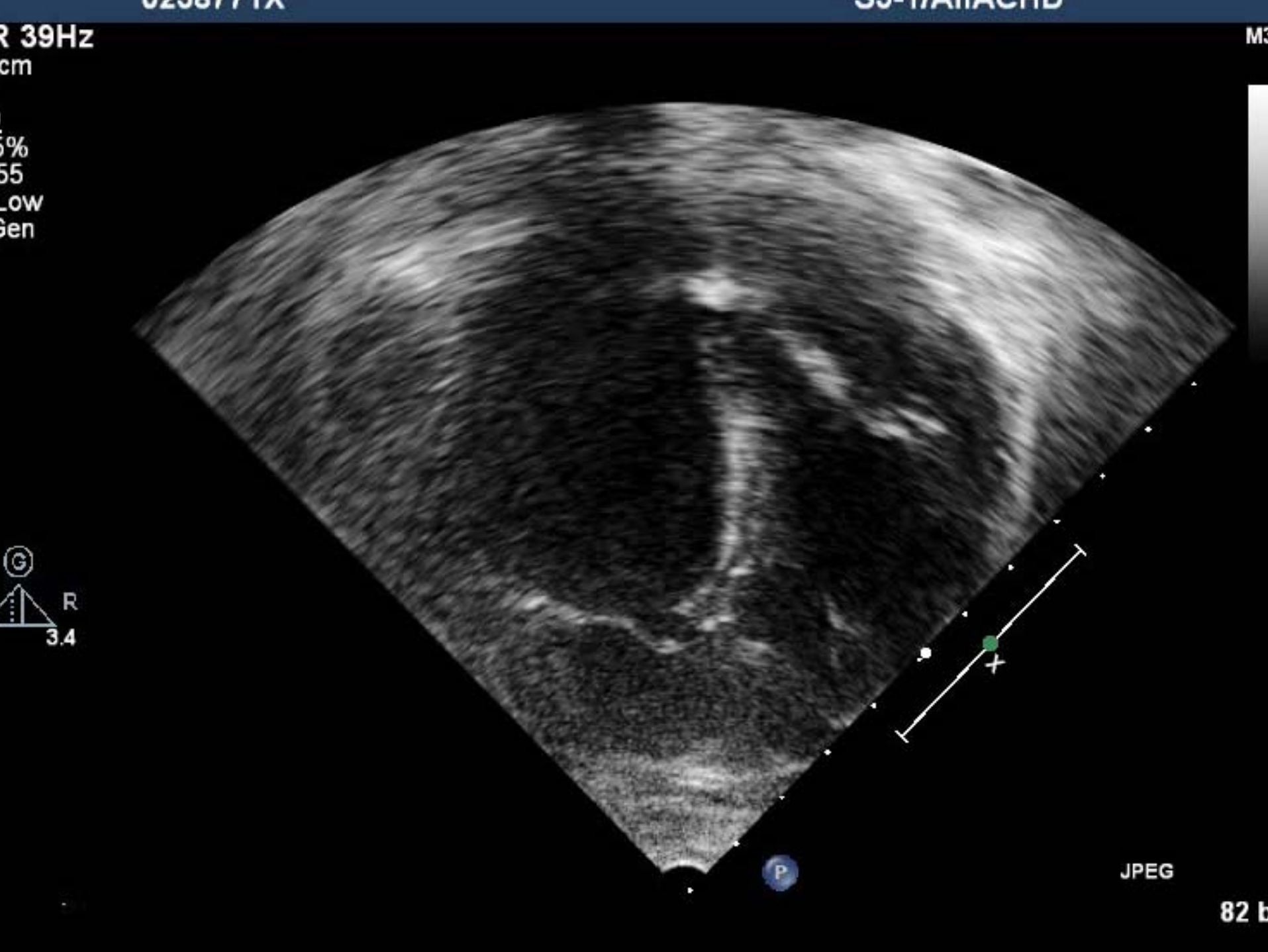

Ablation Start 9:50:49
9
Time
Comment
Energy Sou
9:50:49
EpShuttle
2820 ms


Ablation Start 9:50:49
9
Time
Comment
Energy Sou
9:50:49
EpShuttle
Ablation Start
1.236 s
2820 ms


Ablation Start 9:50:49
9
Time
Comment
Energy Sou
9:50:49
EpShuttle
art
2820 ms

Case 2

- 20 year old female
- Neonatal murmur
- Found to have secundum type ASD and ‘moderate’ Ebstein’s anomaly


R 39Hz
cm
%
55
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G
R
3.4
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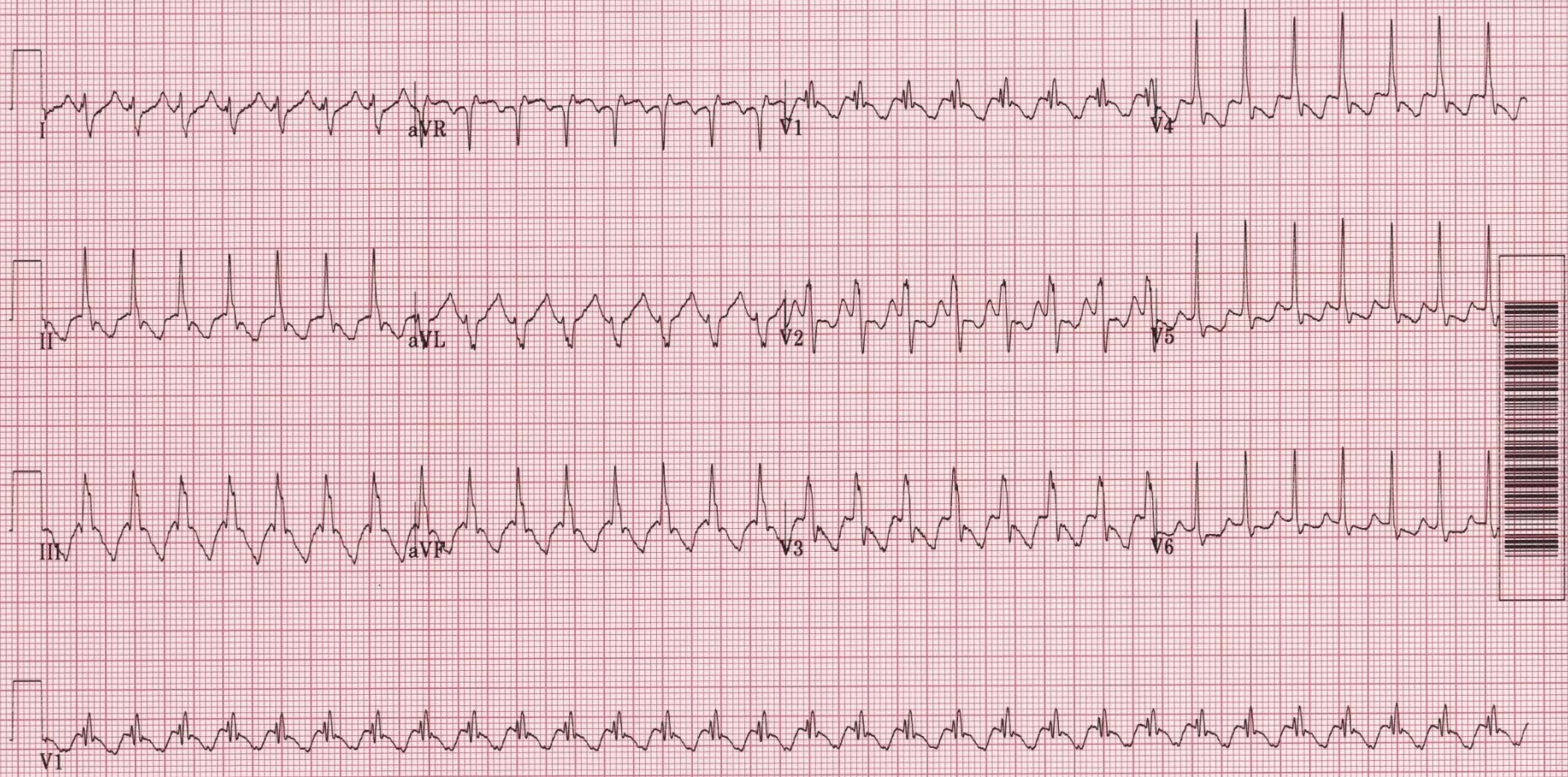
JPEG
82 b

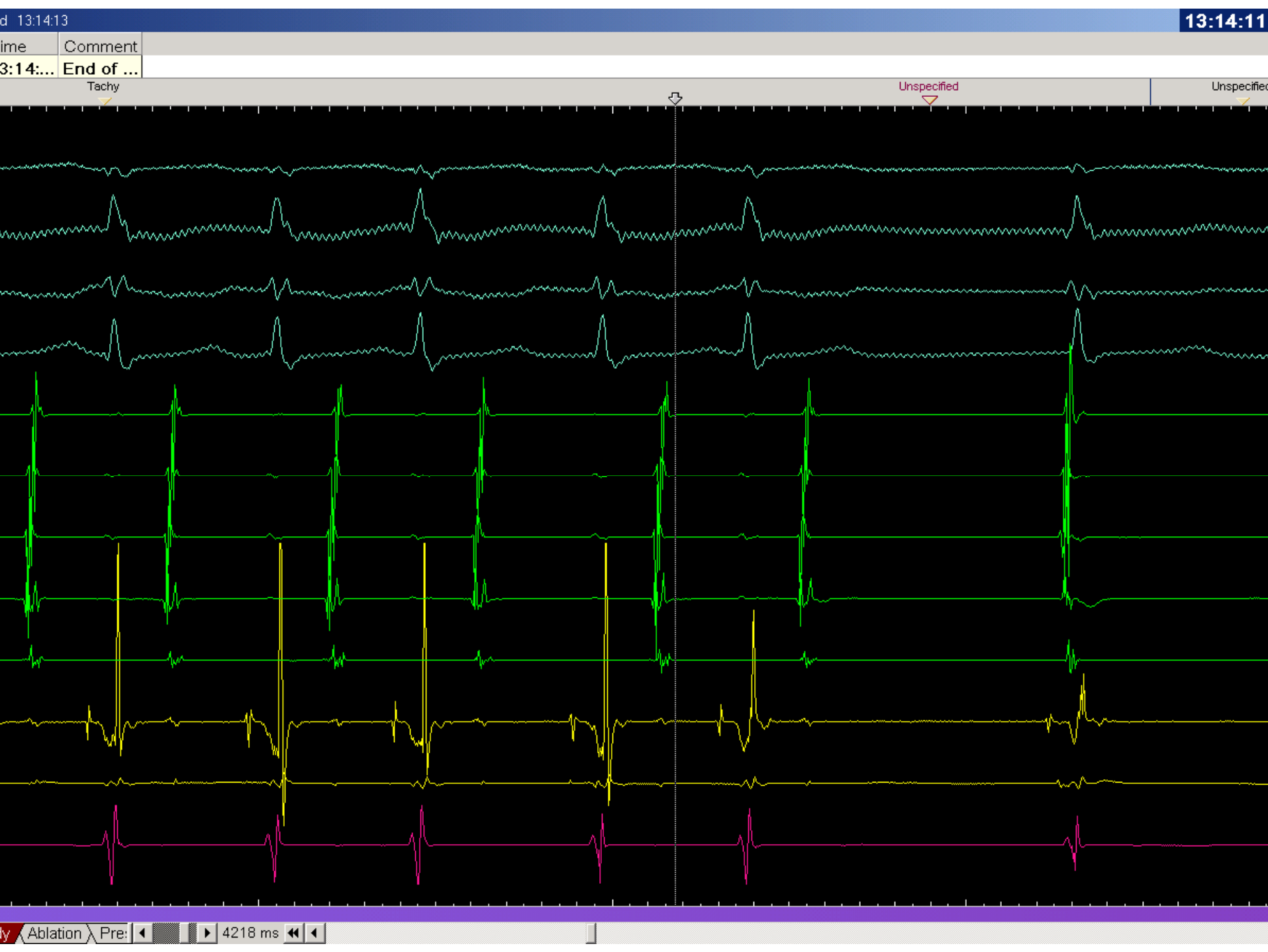
Referred by:

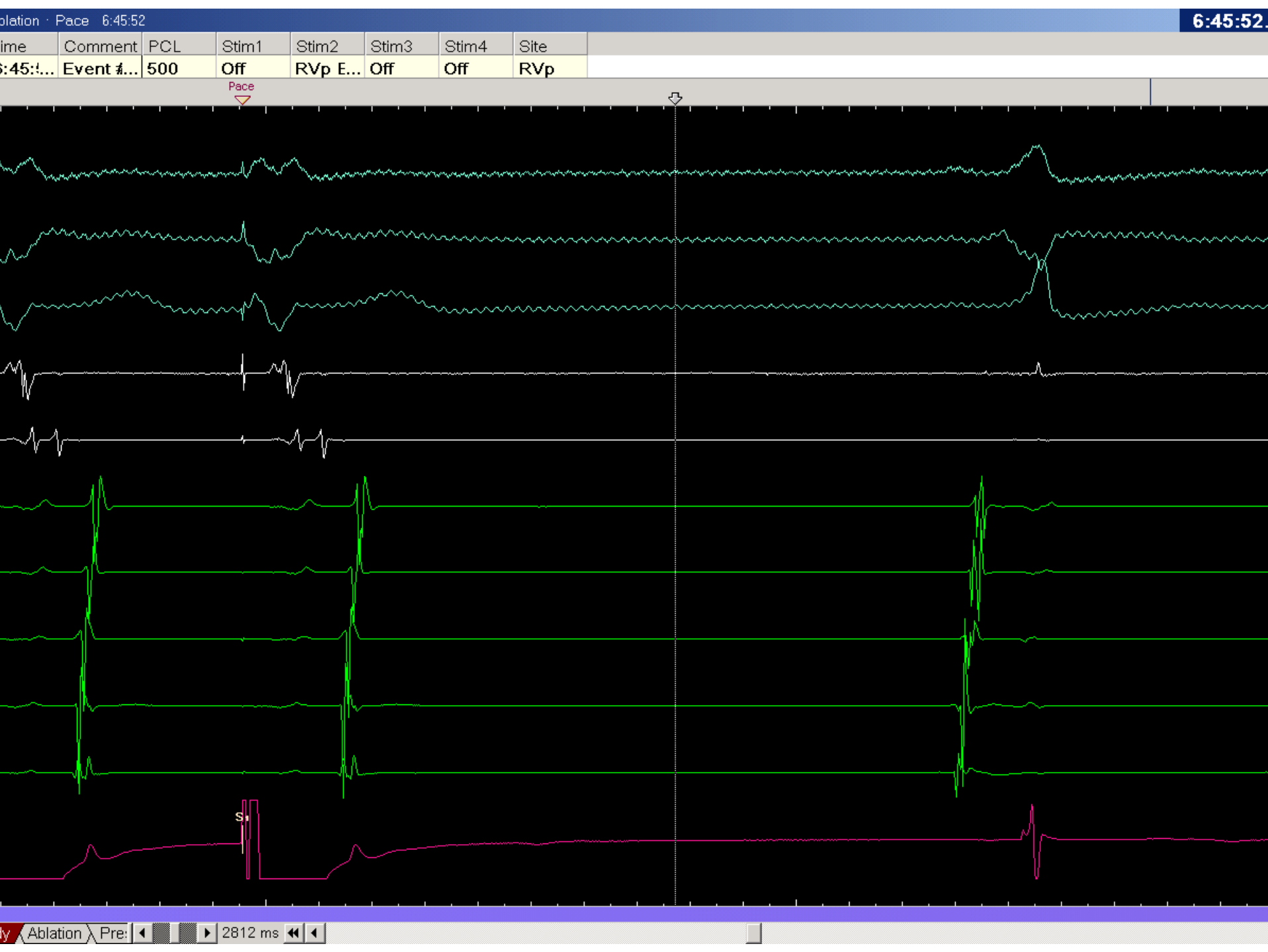
Unconfirmed

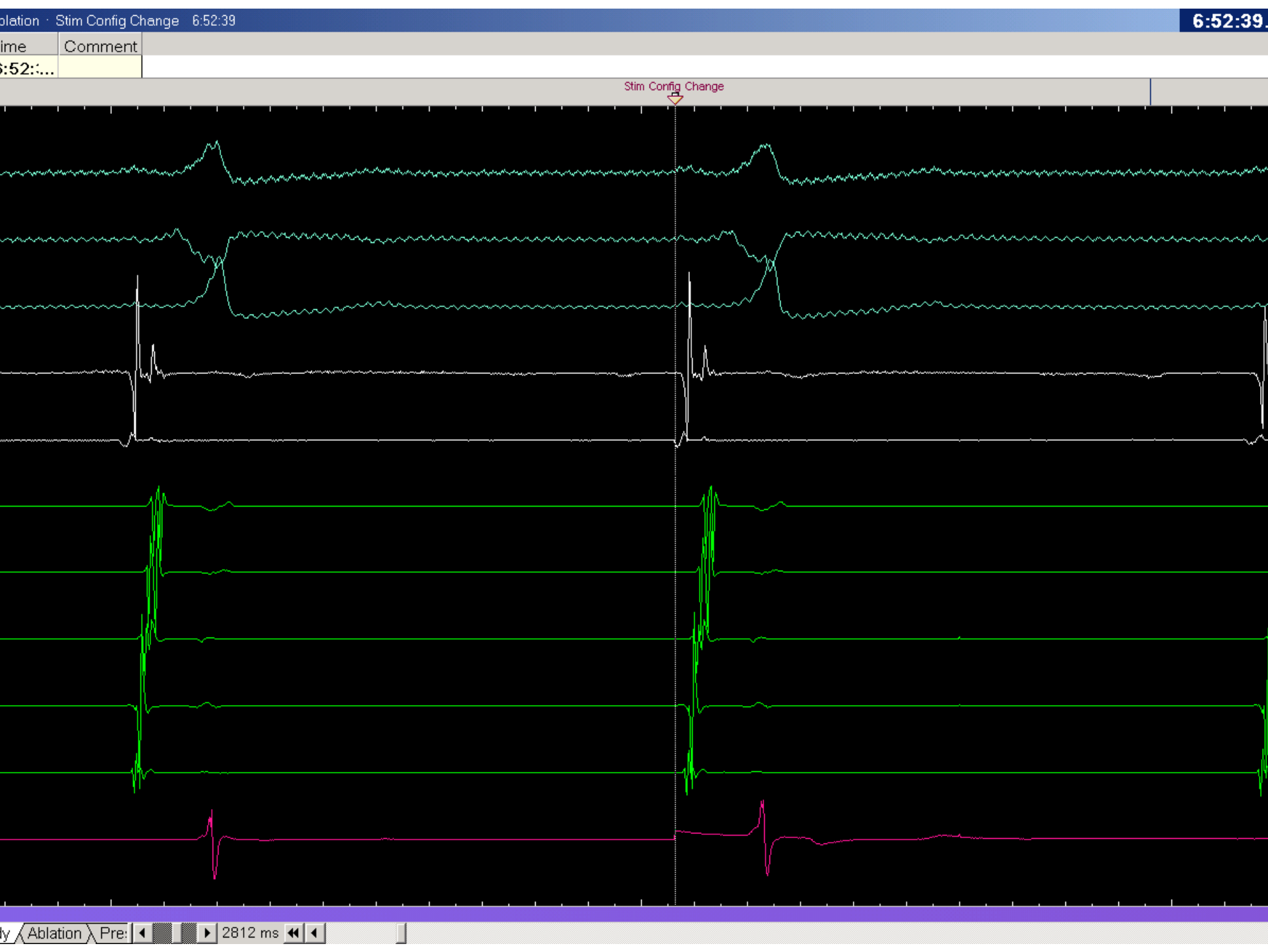
Tachy.



150 Hz 25.0 mm/s 10.0 mm/mV 4 by 2.5s + 1 rhythm ld MAC55 009A 12SL™v237


d 13:14:13
13:14:11
ime
Comment
3:14:...
End of ...
Tachy
Unspecified
Unspecifie
Ablation
Pre:
4218 ms


blation · Pace 6:45:52
6:45:52
ime
Comment
PCL
Stim1
Stim2
Stim3
Stim4
Site
:45:...
Event ...
500
Off
RVp E...
Off
Off
RVp
Pace
S1
Ablation
Pre:
2812 ms


blation · Stim Config Change 6:52:39
6:52:39
ime
Comment
:52:...
Stim Config Change
ly
Ablation
Pre:
2812 ms


lation · Pace 7:02:17
7:02:16
ime
Comment
PCL
Stim1
Stim2
Stim3
Stim4
Site
:02:...
Event #...
500
CS 9-...
Off
Off
Off
CS 9-...
Pace
S
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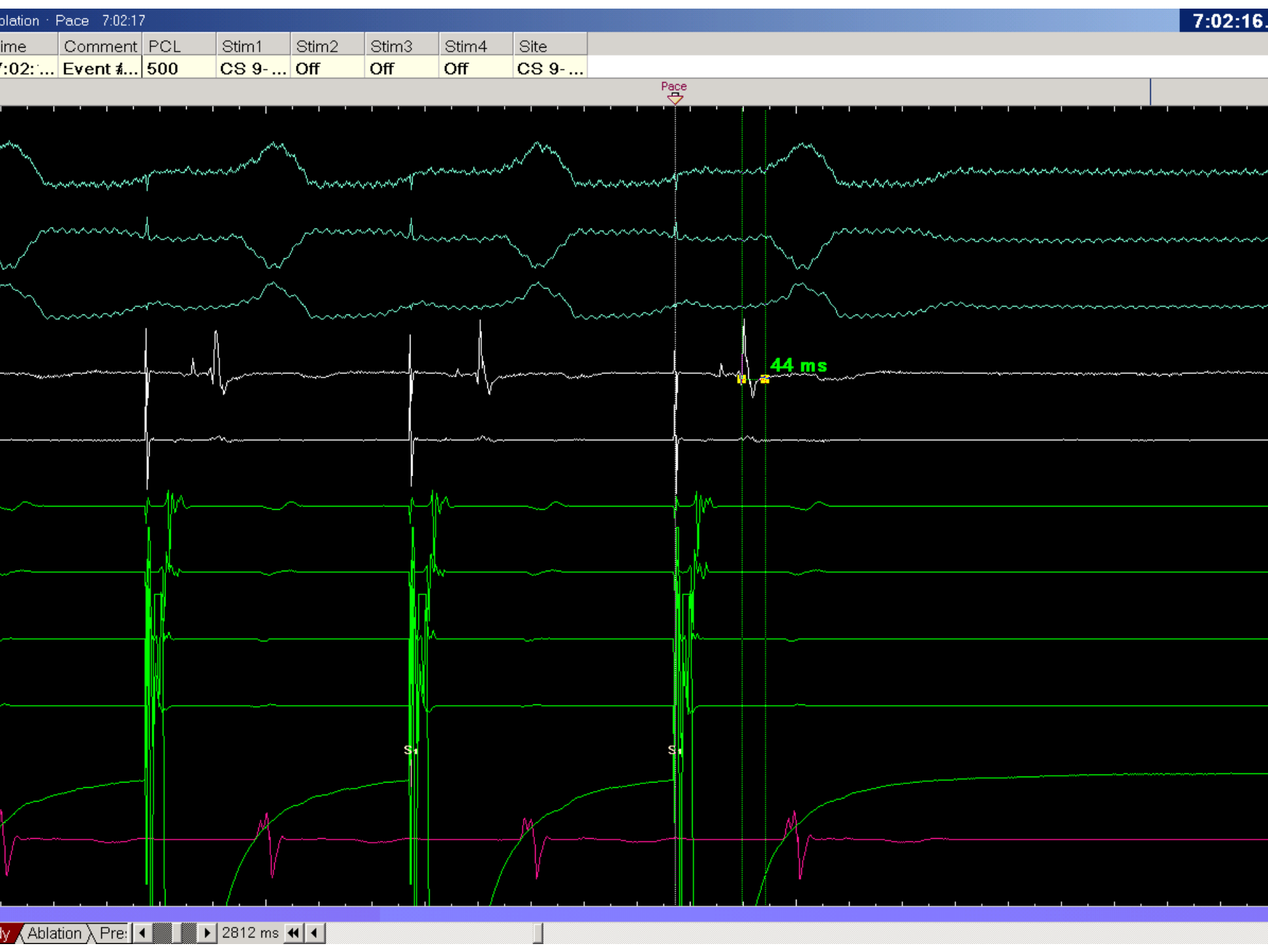
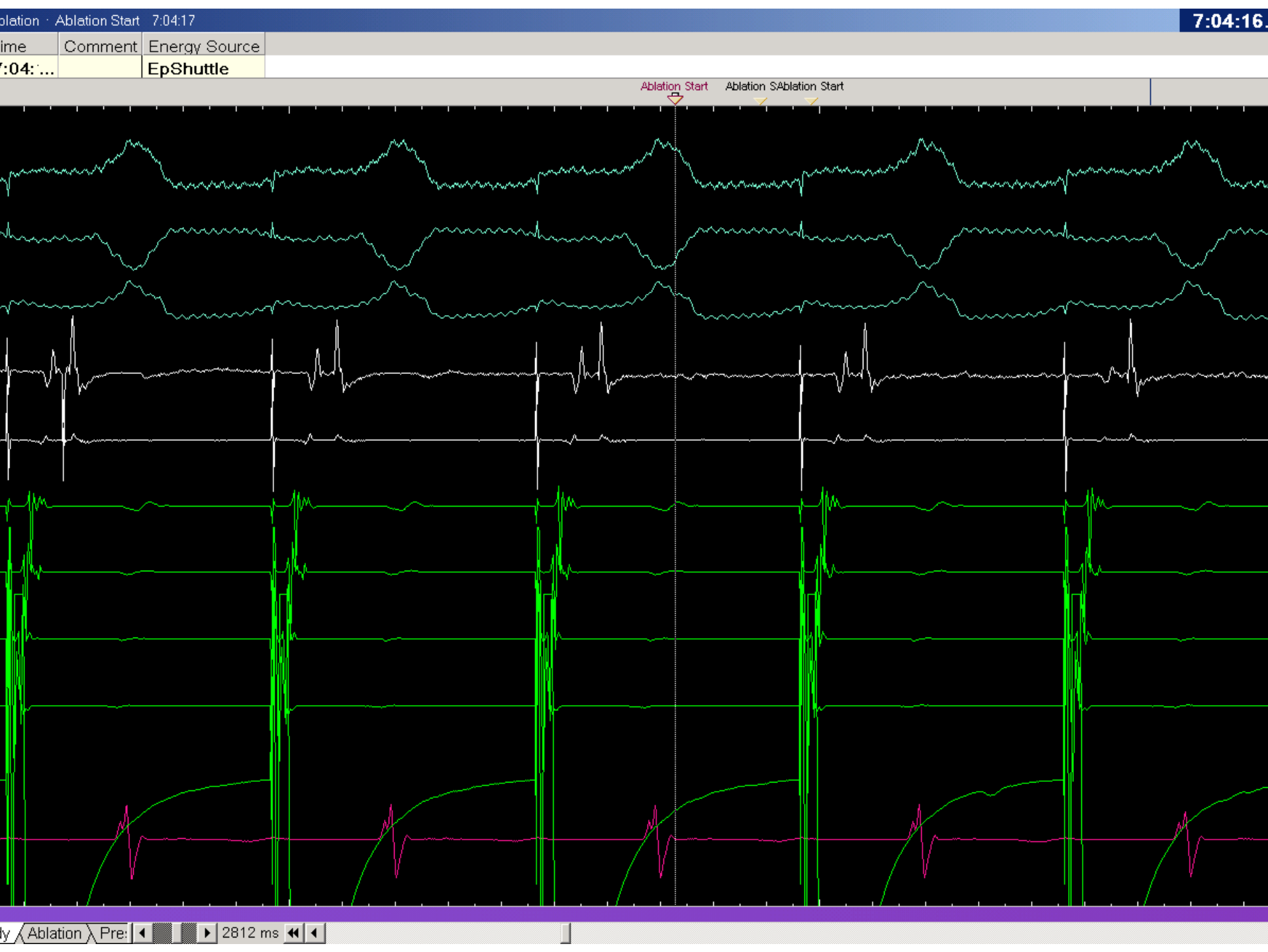
Ablation
Pre:
2812 ms

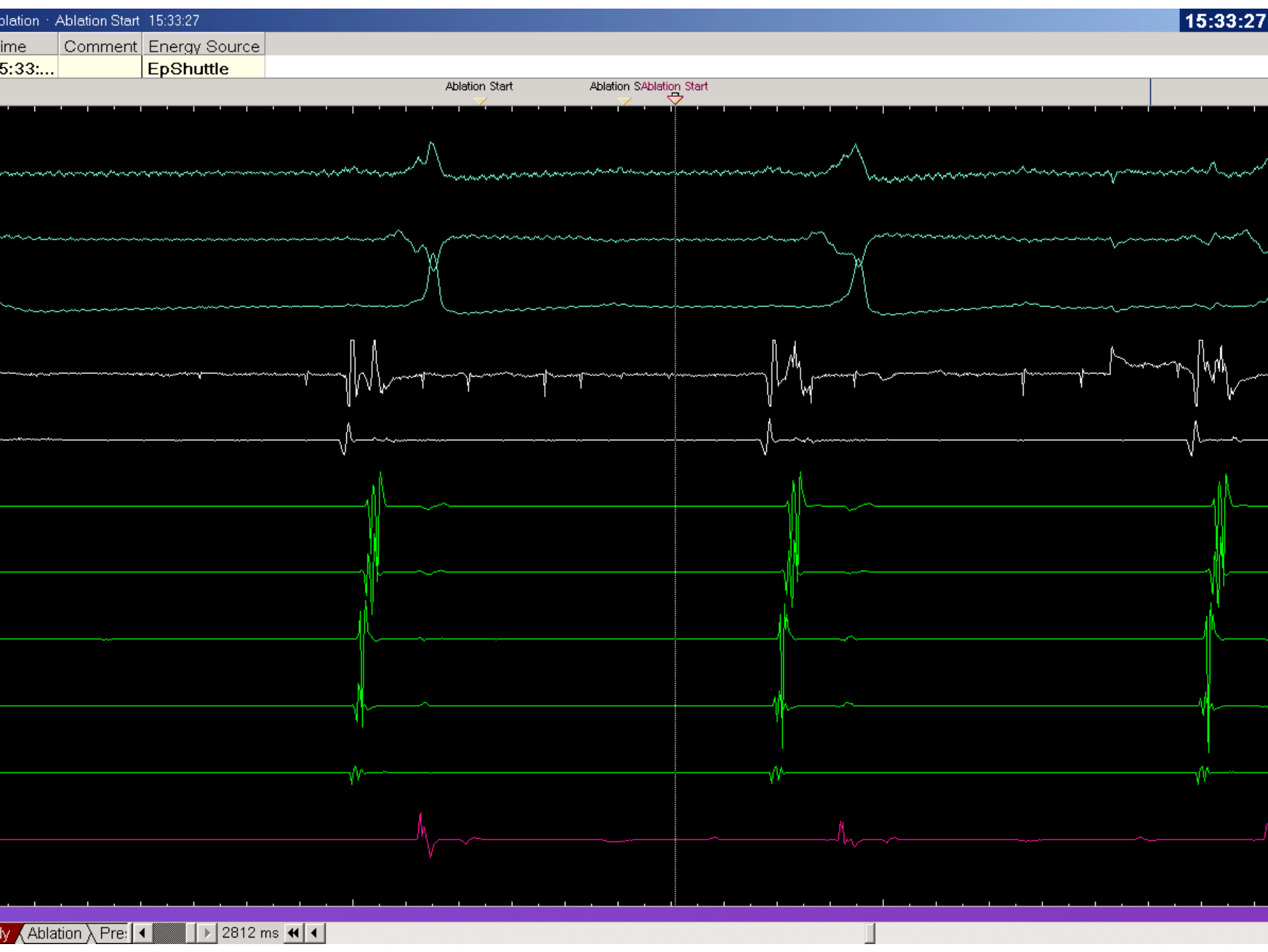

lation · Pace 7:02:17
7:02:16
ime
Comment
PCL
Stim1
Stim2
Stim3
Stim4
Site
:02:...
Event #...
500
CS 9-...
Off
Off
Off
CS 9-...
Pace
44 ms
S
S
Ablation
Pre:
2812 ms

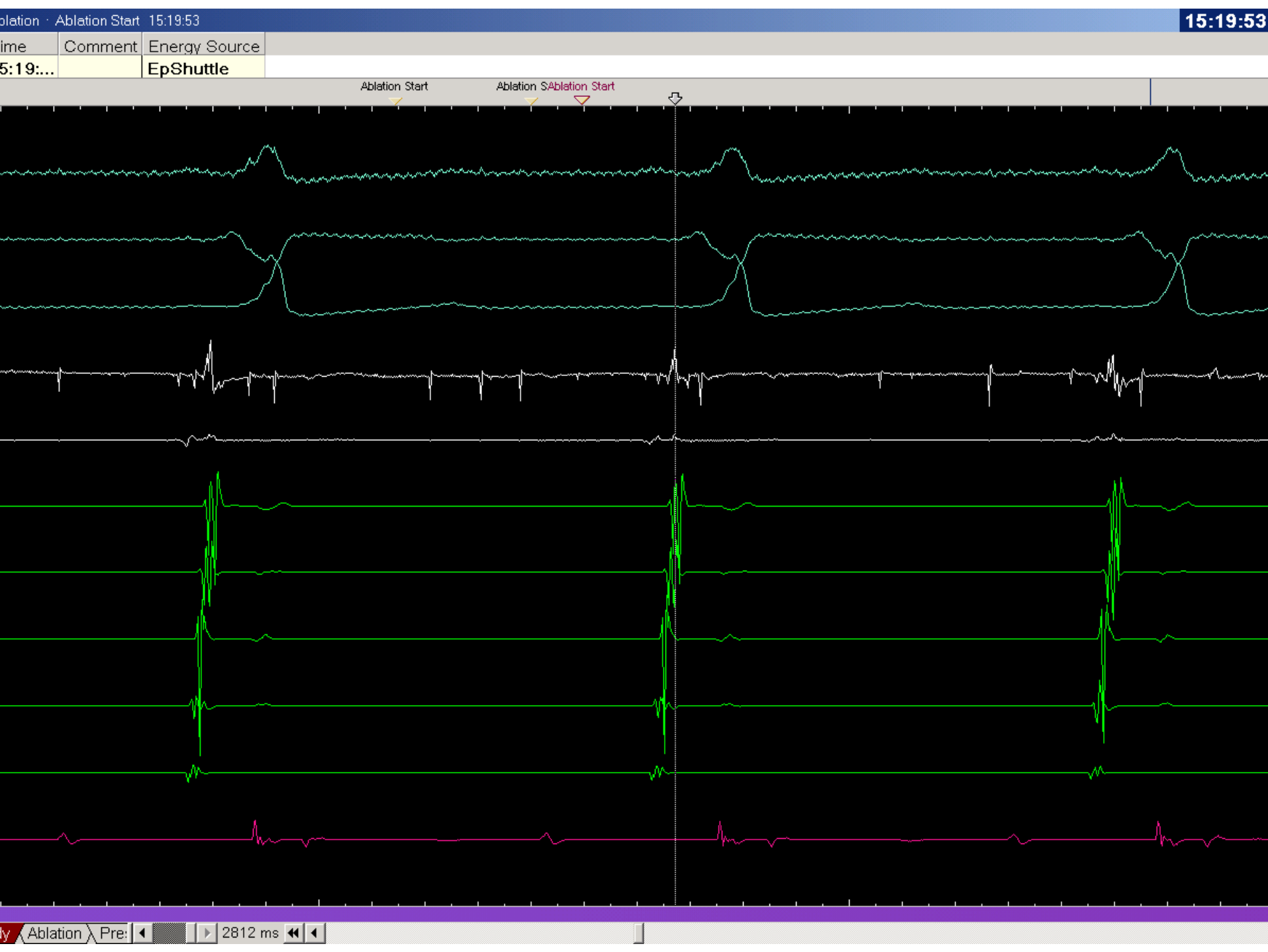

lation · Ablation Start 15:19:53
15:19:55
ime
Comment
Energy Source
5:19:...
EpShuttle
AblatioAbAblation Start
6.360 s
Ablation
Pre:
11248 ms

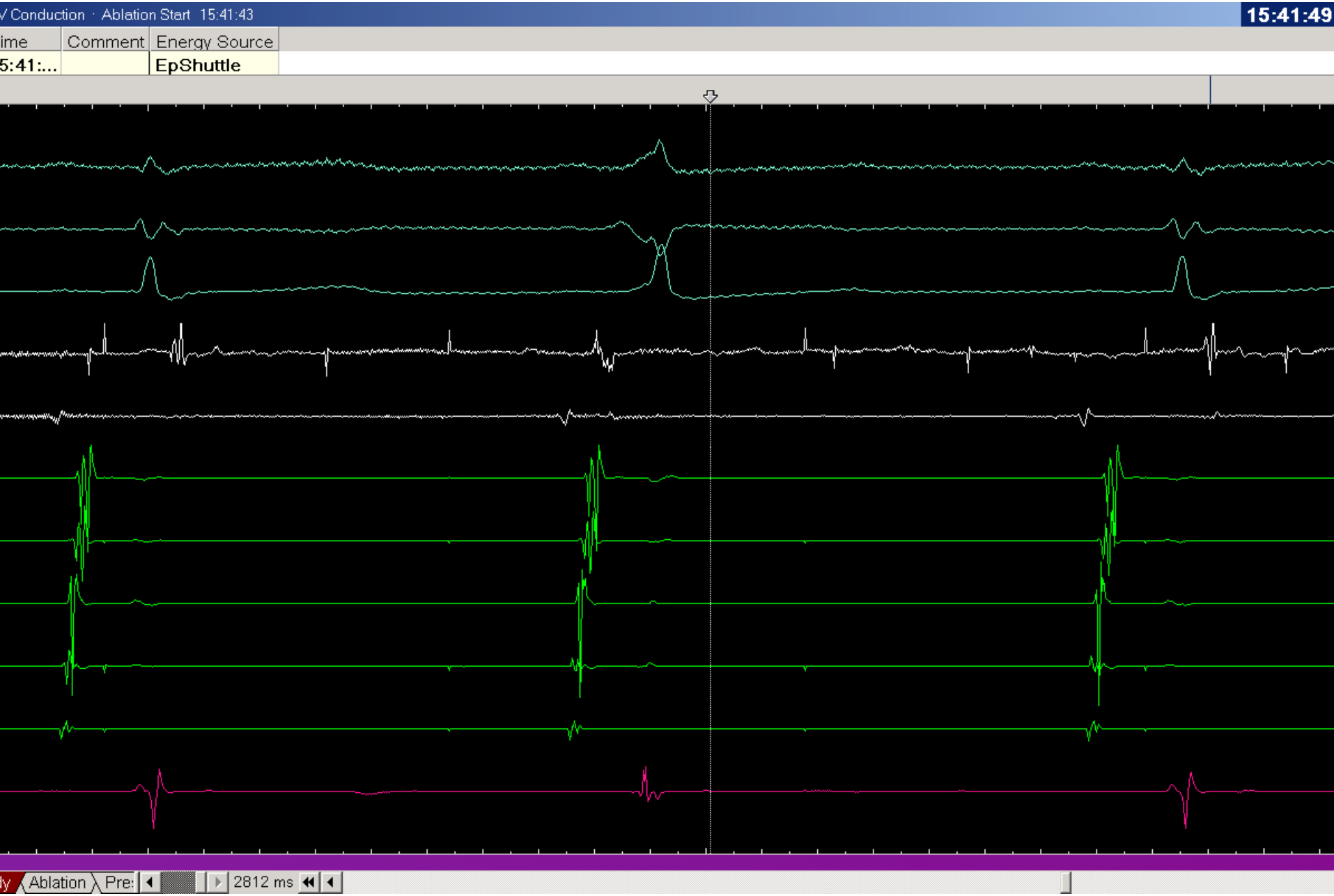
- Early block, but early return when RF off
- Next position at almost 6 o clock in the isthmus


lation · Ablation Start 7:04:17
7:04:16.
ime
Comment
Energy Source
:04:...
EpShuttle
Ablation Start
Ablation SAblation Start
Ablation
Pre:
2812 ms

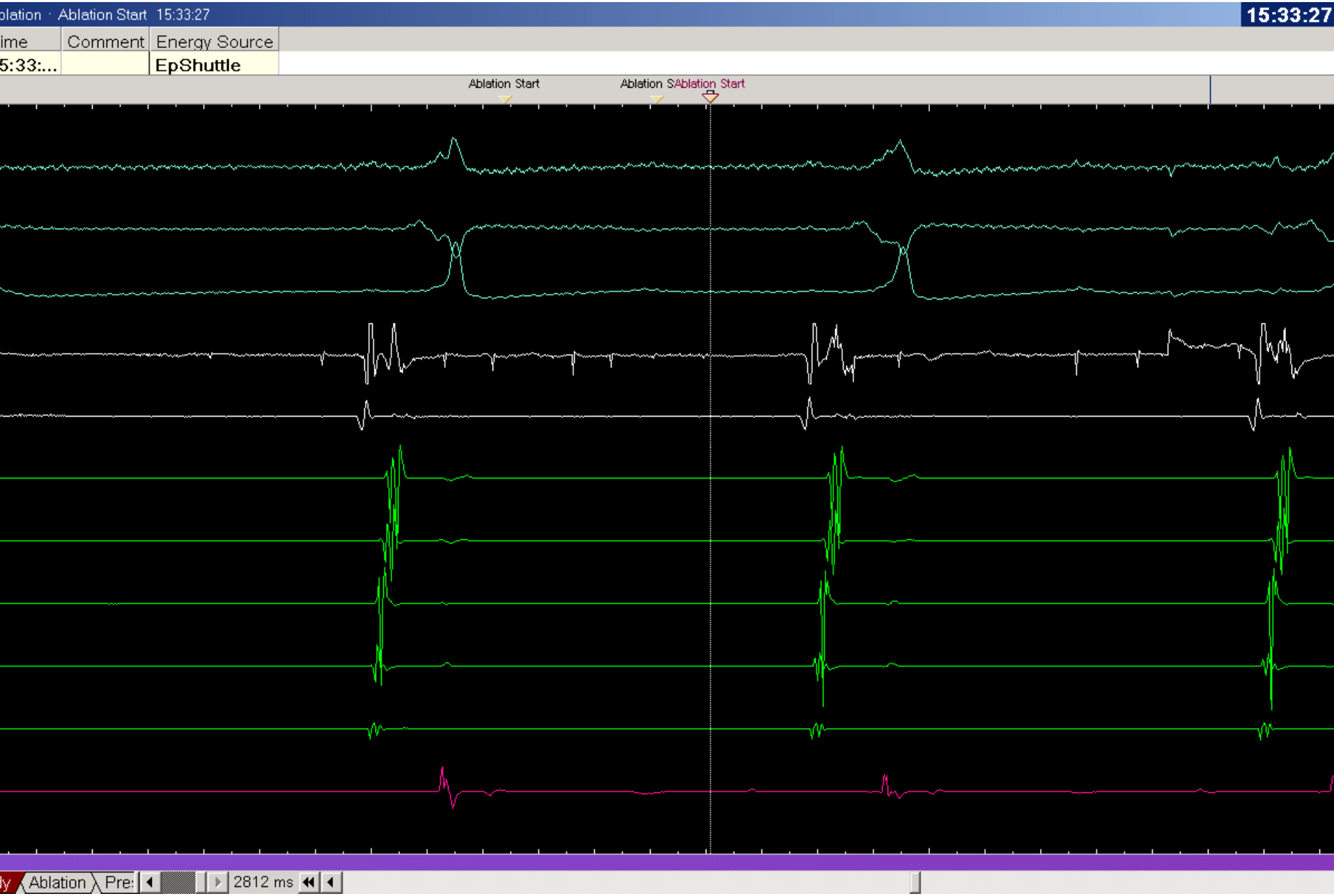
- Moving to 7 o clock on AV ring


olation · Ablation Start 15:33:27
15:33:27
ime
Comment
Energy Source
5:33:...
EpShuttle
Ablation Start
Ablation SAblation Start
Ablation
Pre:
2812 ms

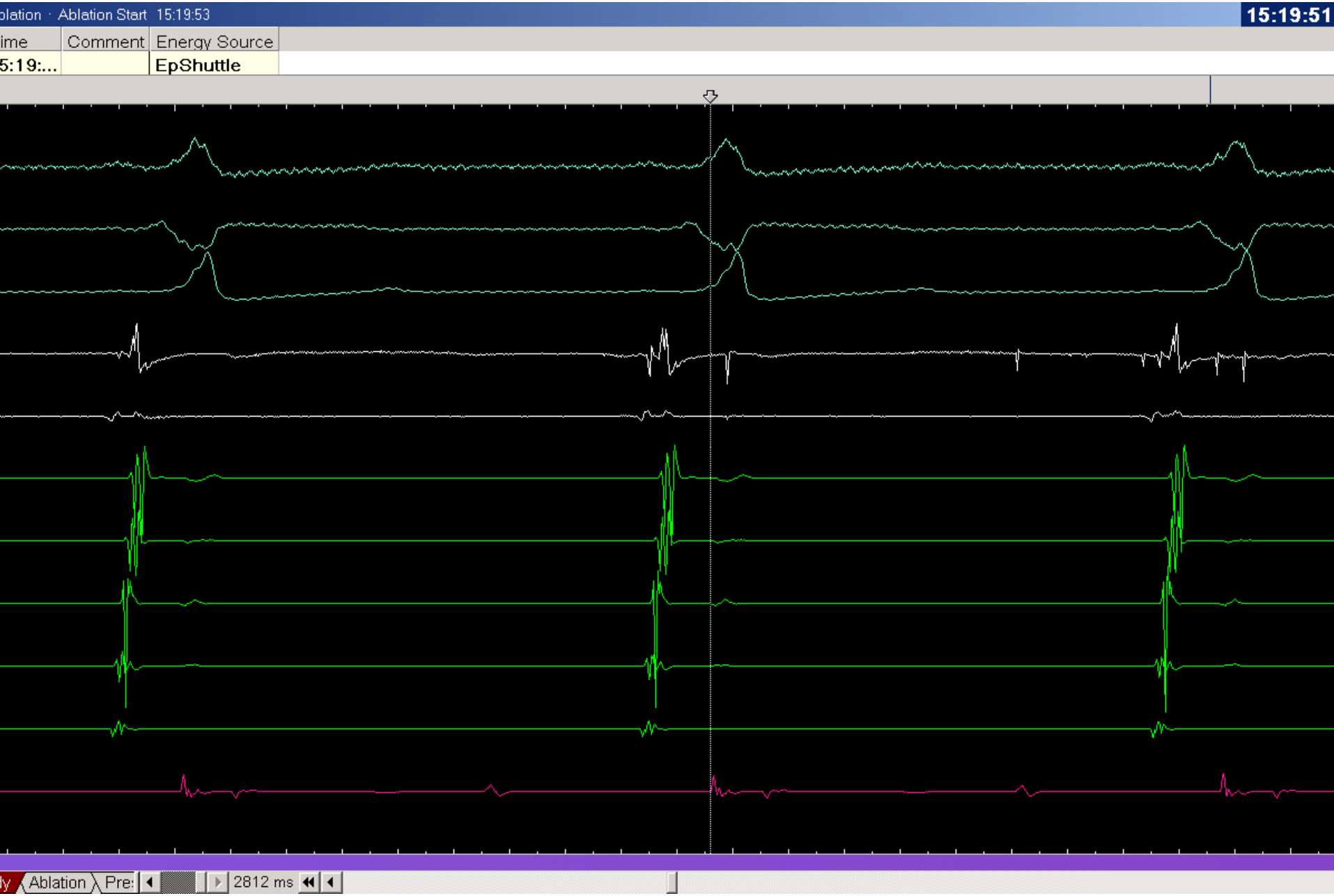

blation · Ablation Start 15:19:53
15:19:53
ime
Comment
Energy Source
5:19:...
EpShuttle
Ablation Start
Ablation SAblation Start
Ablation
Pre:
2812 ms


V Conduction · Ablation Start 15:41:43
15:41:49
ime
Comment
Energy Source
5:41:...
EpShuttle
Ablation
Pre:
2812 ms


V Conduction · Ablation Start 15:41:43
15:41:49
ime
Comment
Energy Source
5:41:...
EpShuttle
Ablation
Pre:
11248 ms


blation · Ablation Start 15:33:27
15:33:27
ime
Comment
Energy Source
5:33:...
EpShuttle
Ablation Start
Ablation SAblation Start
Ablation
Pre:
2812 ms

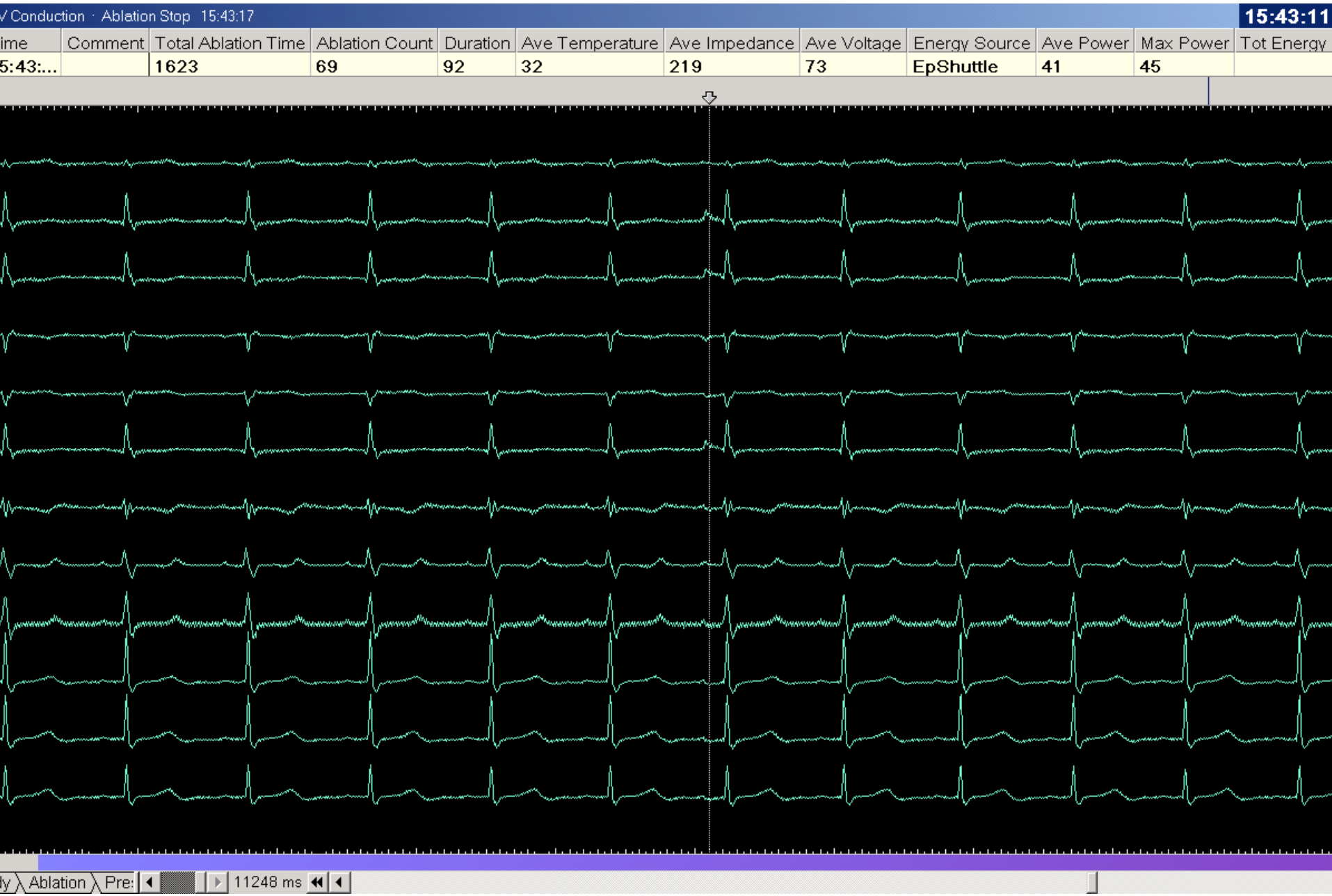

olation · Ablation Stop 15:34:04
15:33:37
ime | Comment | Total Ablation Time | Ablation Count | Duration | Ave Temperature | Ave Impedance | Ave Voltage | Energy Source | Ave Power | Max Power | Tot Energy
5:34:... | | 1531 | 67 | 35 | 31 | 225 | 64 | EpShuttle | 34 | 45 |
Ablation
Pre:
11248 ms

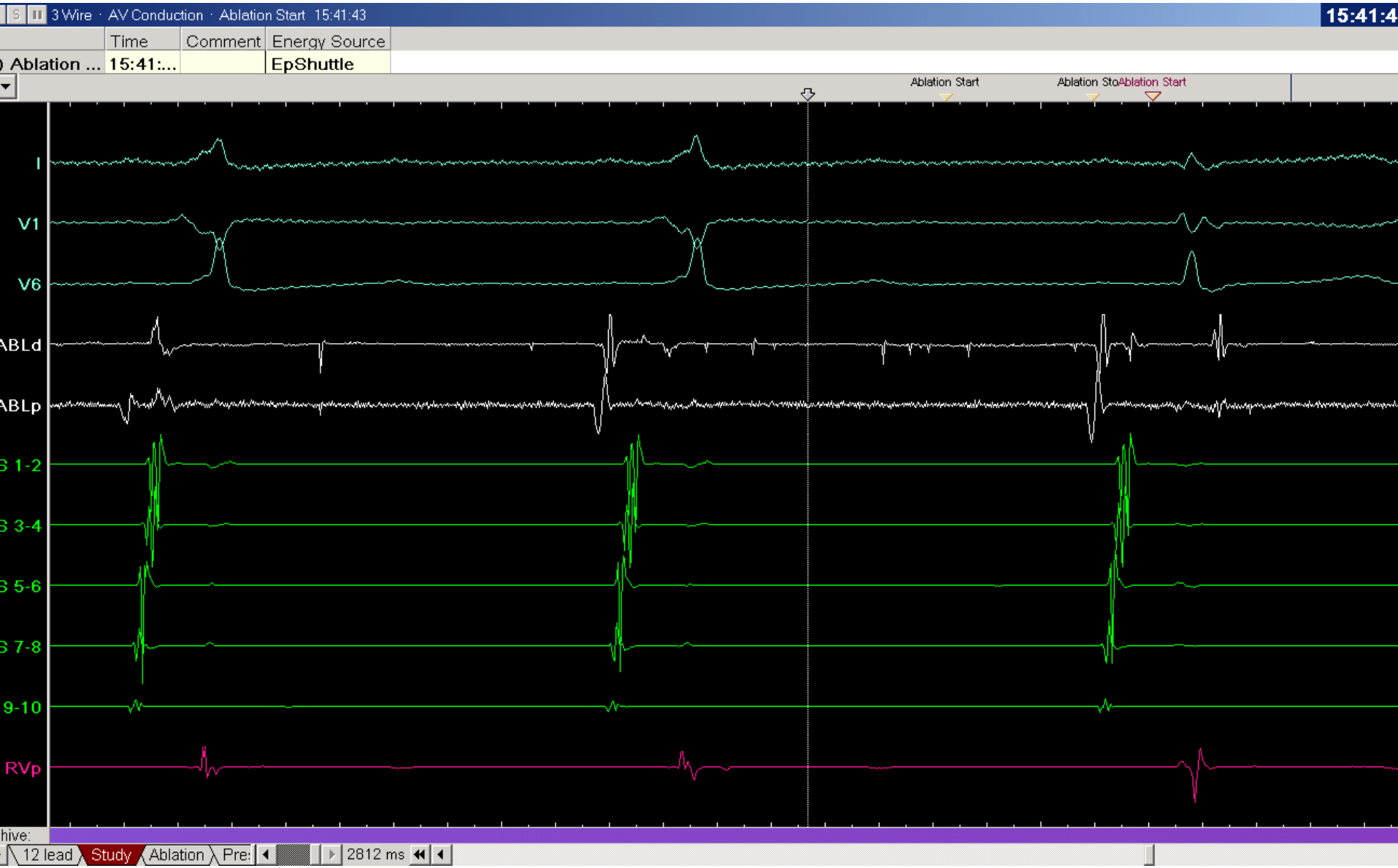

olation · Ablation Start 15:19:53
15:19:51
ime
Comment
Energy Source
5:19:...
EpShuttle
ly
Ablation
Pre:
2812 ms


blation · Ablation Start 15:19:53
15:19:57
ime
Comment
Energy Source
5:19:...
EpShuttle
AblatioAbAblation Start
Ablation
Pre:
11248 ms


blation · Ablation Stop 15:21:27
15:21:26
ime | Comment | Total Ablation Time | Ablation Count | Duration | Ave Temperature | Ave Impedance | Ave Voltage | Energy Source | Ave Power | Max Power | Tot Energy
5:21:... | | 1207 | 57 | 92 | 31 | 228 | 68 | EpShuttle | 32 | 35 |
Ablation Stop
ly
Ablation
Pre:
11248 ms


V Conduction · Ablation Start 15:41:43
15:41:40
ime
Comment
Energy Source
5:41:...
EpShuttle
36 ms
38 ms
Ablation
Pre:
2812 ms


V Conduction · Ablation Stop 15:43:17
15:43:11
ime | Comment | Total Ablation Time | Ablation Count | Duration | Ave Temperature | Ave Impedance | Ave Voltage | Energy Source | Ave Power | Max Power | Tot Energy
5:43:... | | 1623 | 69 | 92 | 32 | 219 | 73 | EpShuttle | 41 | 45 |
ly
Ablation
Pre:
11248 ms


3 Wire · AV Conduction · Ablation Start 15:41:43
15:41:4
Time
Comment
Energy Source
) Ablation ...
15:41:...
EpShuttle
Ablation Start
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V1
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ABLd
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S 5-6
S 7-8
9-10
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hive:
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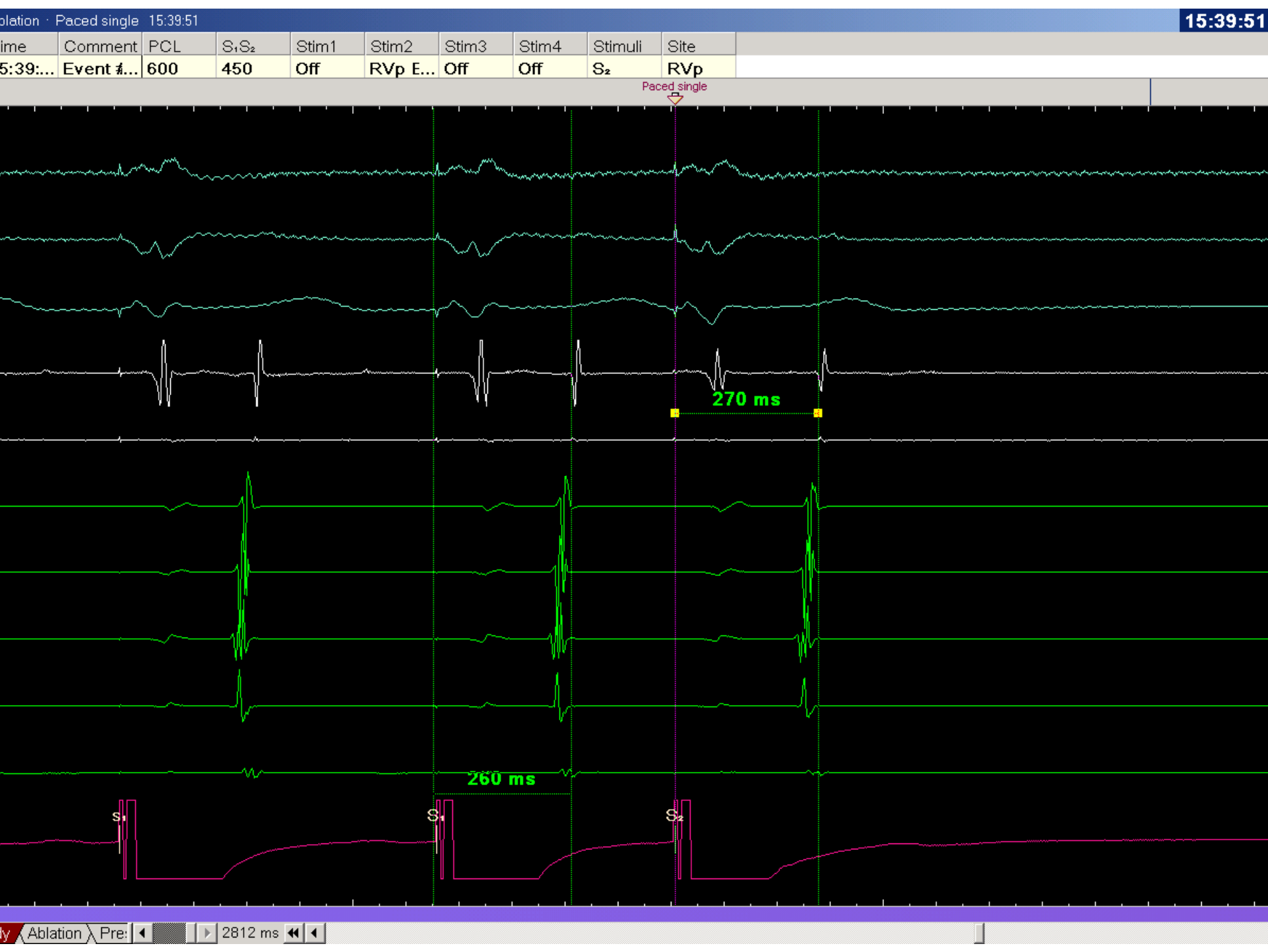
Ablation
Pre:
2812 ms


olation · Ablation Start 15:33:27
15:33:32
ime
Comment
Energy Source
5:33:...
EpShuttle
3.544 s
8.800 s
Ablation
Pre:
11248 ms


olation · Ablation Stop 15:34:04
15:34:03
ime
Comment
Total Ablation Time
Ablation Count
Duration
Ave Temperature
Ave Impedance
Ave Voltage
Energy Source
Ave Power
Max Power
Tot Energy
5:34:...
1531
67
35
31
225
64
EpShuttle
34
45
Ablation Stop
Ablation
Pre:
2812 ms


blation · Paced single 15:39:51
15:39:51
ime | Comment | PCL | S1S2 | Stim1 | Stim2 | Stim3 | Stim4 | Stimuli | Site
5:39:... | Event #... | 600 | 450 | Off | RVp E... | Off | Off | S2 | RVp
Paced single
270 ms
260 ms
S1
S1
S2
Ablation
Pre:
2812 ms


V Conduction · Paced single 15:40:44
15:40:44
ime | Comment | PCL | S1S2 | Stim1 | Stim2 | Stim3 | Stim4 | Stimuli | Site
5:40:... | Event #... | 600 | 400 | CS 9-... | Off | Off | Off | S2 | CS 9-...
Paced single
S1
S1
S2
ly | Ablation | Pre:
2812 ms

Strategies to help improve success

- Consider using a mapping system to tag good signals
- Halo-style catheter
- Cardima Pathfinder in RCA if RCA is dominant
- Cryo-catheter if stability a problem (esp. in TR and RVOT obstruction)