

Main tools for ECGLab

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01

Basic edit tools

1.Template classification--- auto classification and manual classification



First classification



Secondary classification

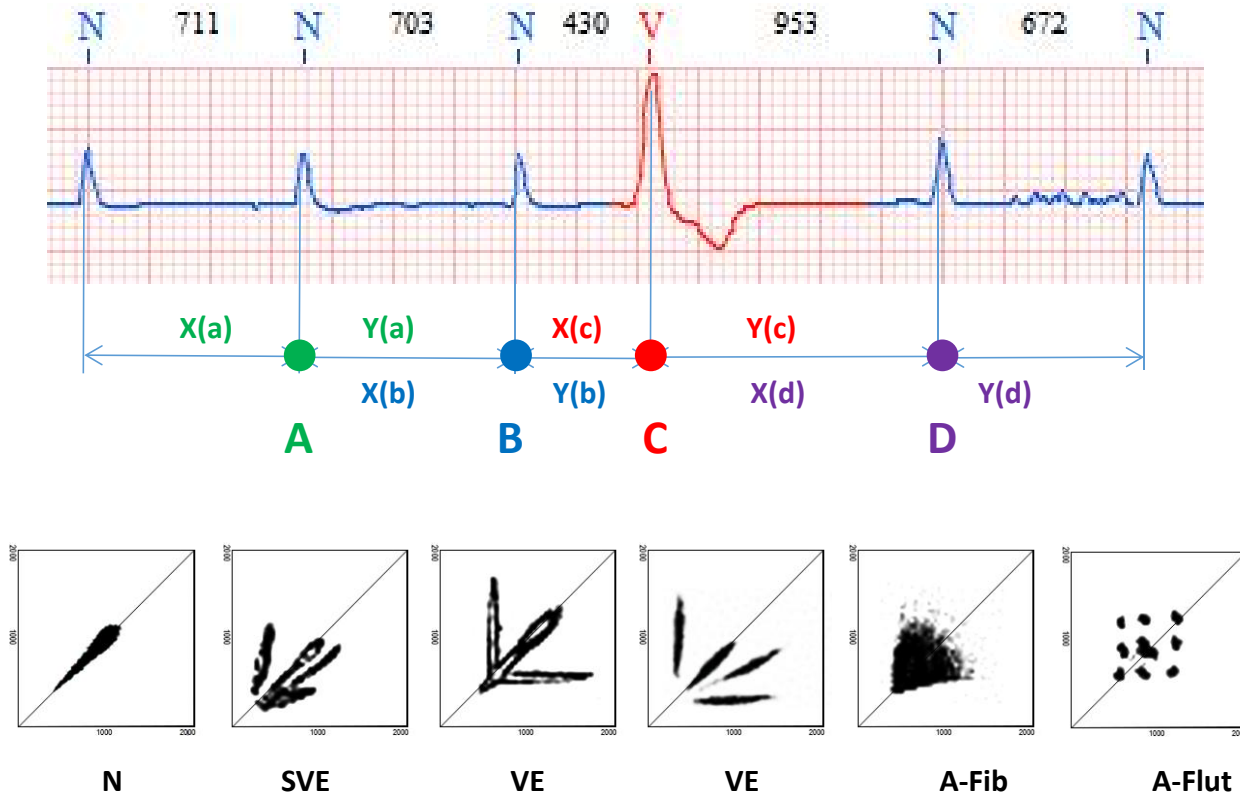
The software classify QRS into different folder according to the shape and you can check them from vertical and horizontal direction at the same time,also you can double click and edit in the secondary classified folder if there are too many numbers.

classify the same shape and make batch audit

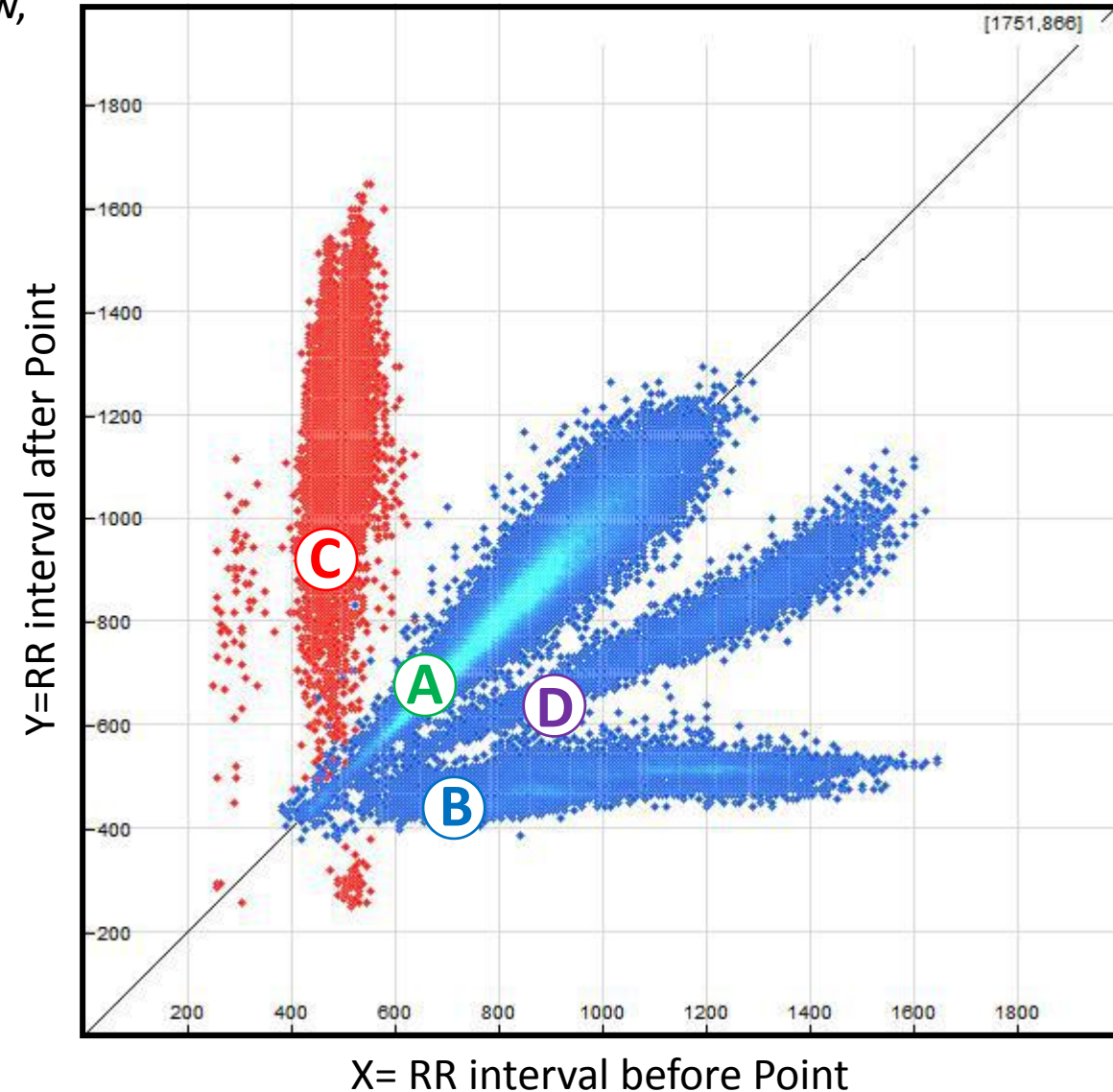
2.Lorenz Plot--- Rapid diagnosis based on overall shape, correct wrong marks by region

Principle: mark every beat as a point on a graph follow rule below,
 $X(n) = \text{interval } (n-1 \text{ to } n)$ $Y(n) = \text{interval } (n \text{ to } n+1)$

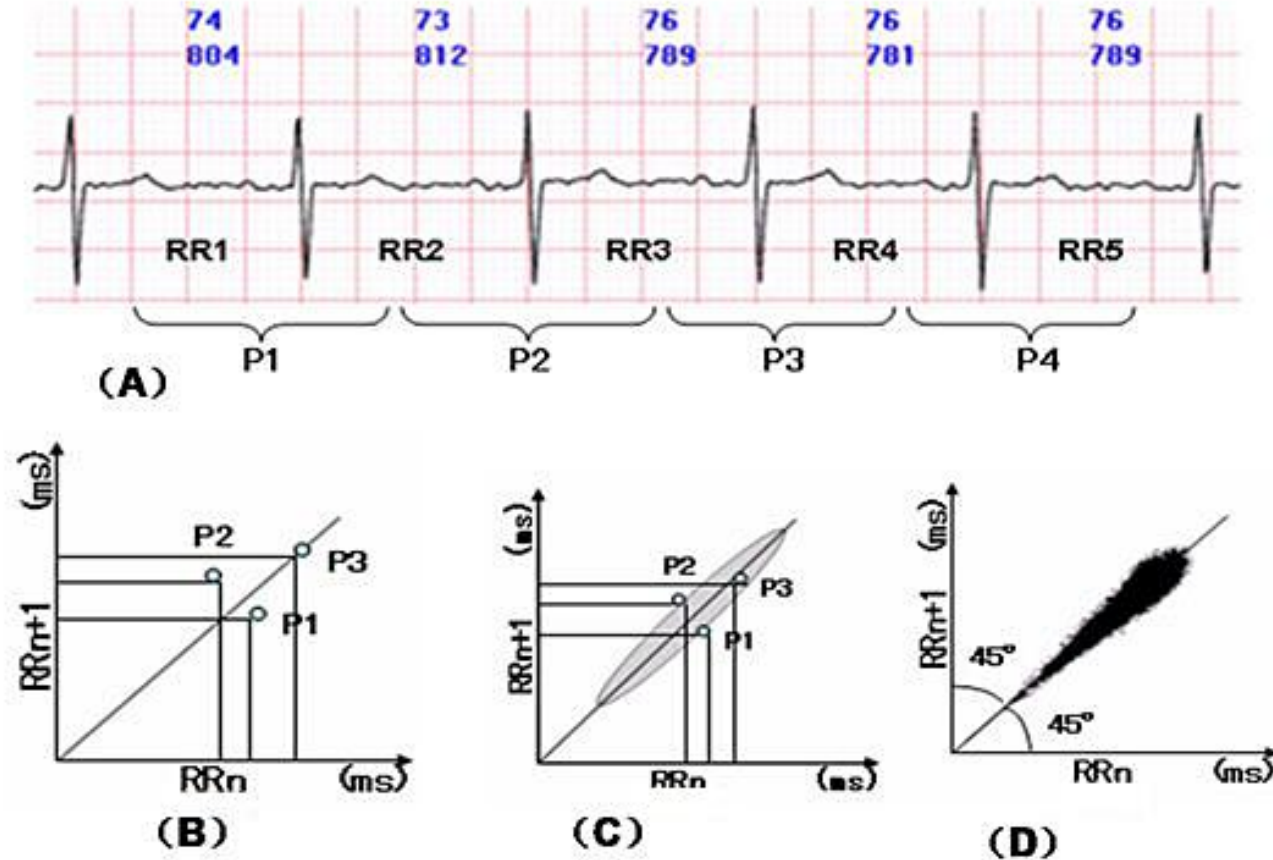
it will form certain shapes due to different arrhythmias.



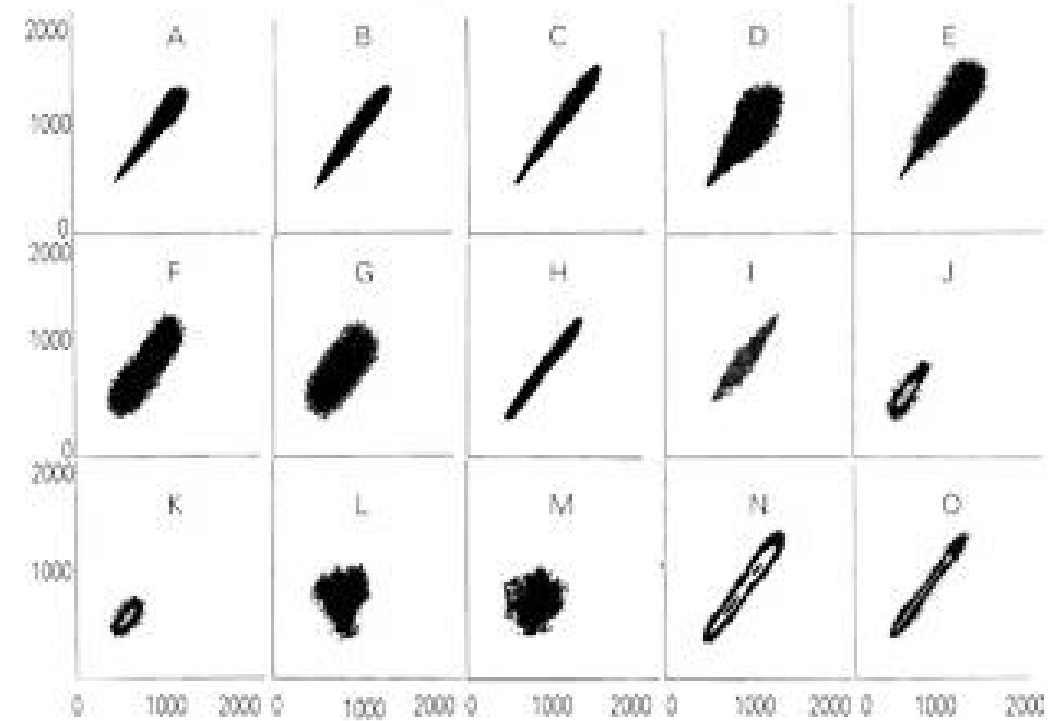
Typical ECG in Lorenz Plot



2.Lorenz Plot--- Rapid diagnosis based on overall shape, correct wrong marks by region



Sinus rhythm in Lorenz Plot

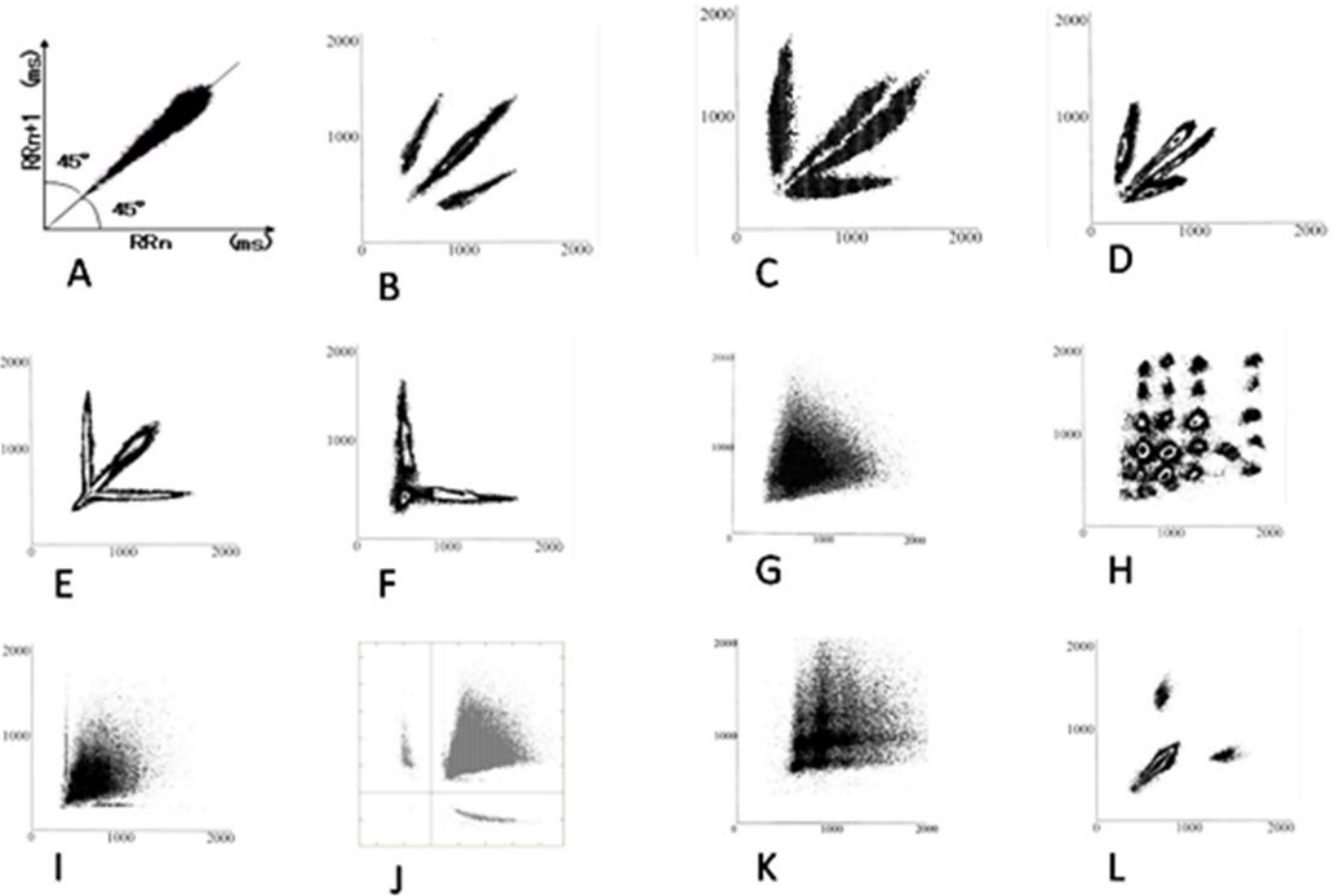


Different forms of Sinus rhythm in Lorenz Plot

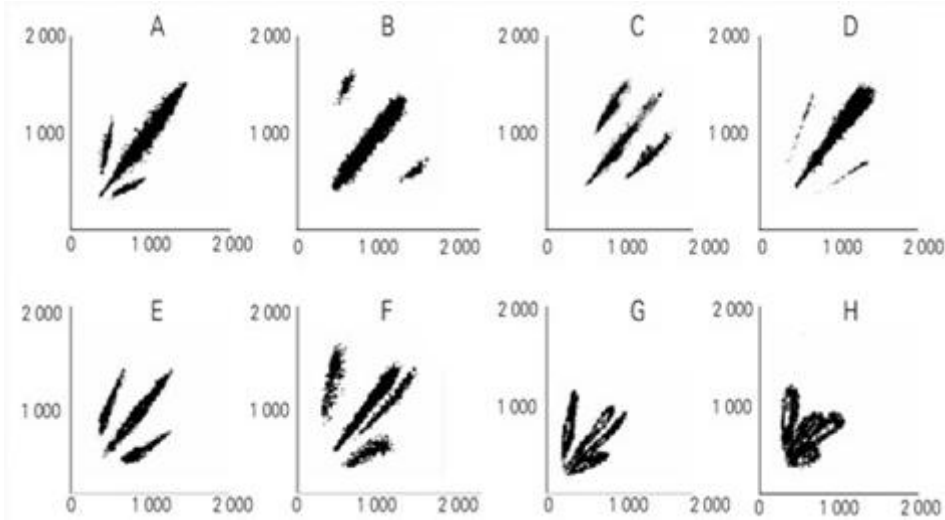
All scatter plots are located on a 45° straight line and symmetrically distributed.

2.Lorenz Plot--- Rapid diagnosis based on overall shape, correct wrong marks by region

- A** Normal sinus rhythm
- B** Sinus rhythm with Supraventricular premature beats
- C** Sinus rhythm with ventricular premature beats
- D** Sinus rhythm with supraventricular premature beats with intraventricular aberrant conduction
- E** Sinus rhythm with trigeminy of ventricular premature beat
- F** continuous bigeminy of ventricular premature beat
- G** Persistent Atrial Fibrillation
- H** Persistent Atrial Flutter
- I** Atrial Fibrillation with Ventricular premature beat
- J** four quadrant pattern, Atrial Fibrillation with aberrant ventricular conduction
- K** Atrial Fibrillation with Atrial Flutter
- L** Sinus rhythm with second degree sinoauricular block



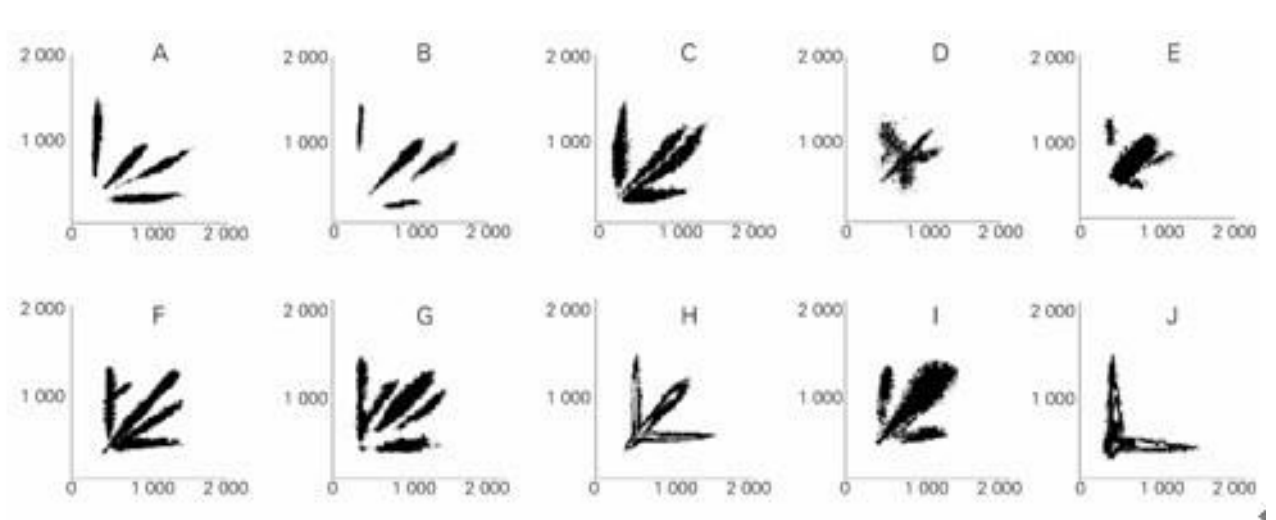
2.Lorenz Plot--- Rapid diagnosis based on overall shape, correct wrong marks by region



Typical sinus rhythm with SVE in lorenz Plot



A ~ E---Sinus rhythm with SVE
A --- Fast sinus rhythm with SVE bigeminy
B ---Slow sinus rhythm with SVE bigeminy
F, G, H --- Sinus rhythm with frequent SVE,SVE bigeminy.

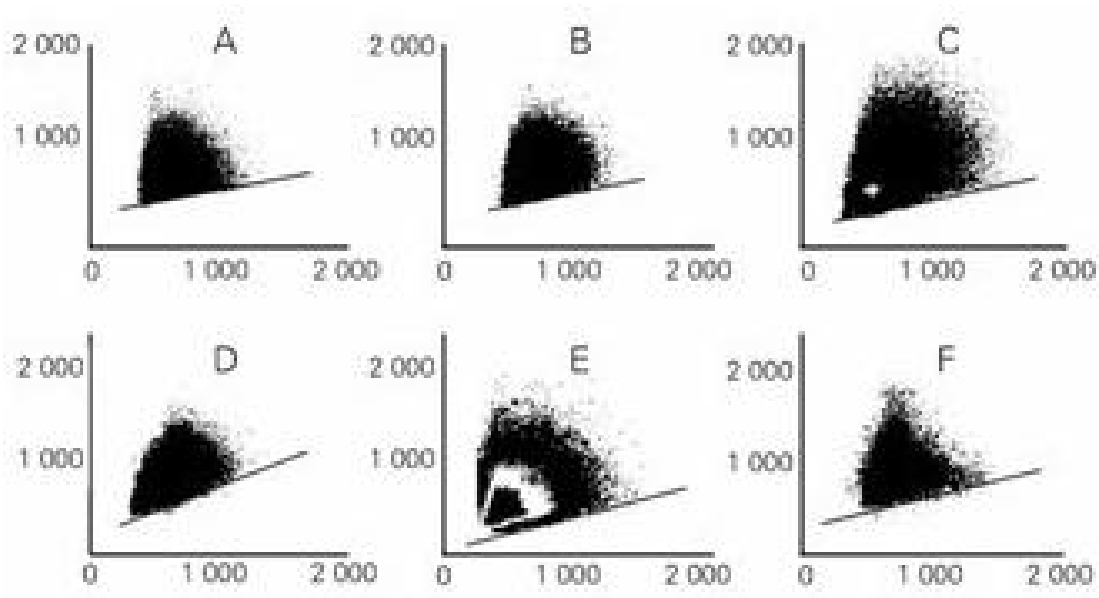


Typical sinus rhythm with VE in lorenz Plot

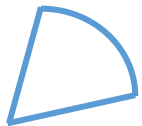


A, B, C, E, F, G --- sinus rhythm with frequent VE or ventricular bigeminy ;
G ---Sinus rhythm with VE and SVE;
H---sinus rhythm with ventricular bigeminy ;
J---Ventricular bigeminy

2.Lorenz Plot--- Rapid diagnosis based on overall shape, correct wrong marks by region

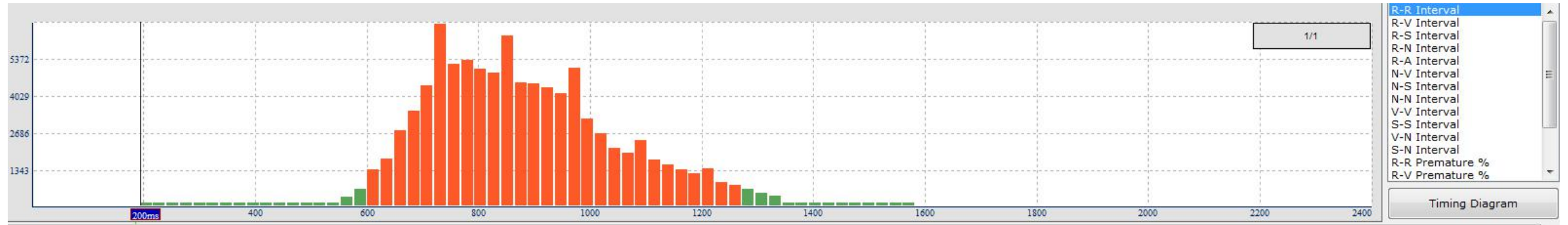


Typical A-fib in lorenz Plot

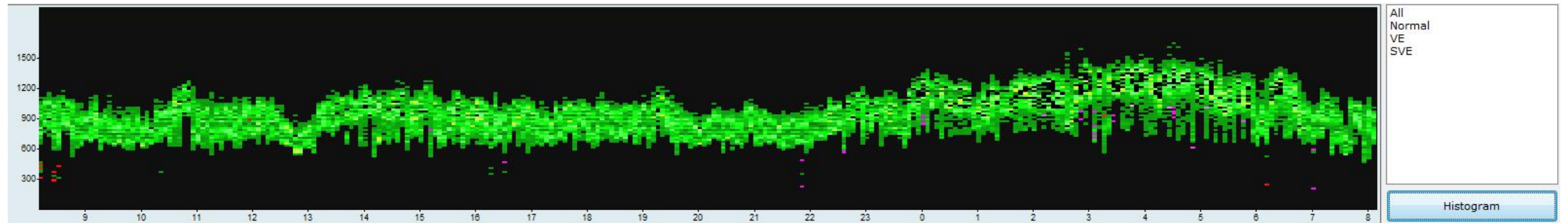


Different forms of Sinus rhythm in Lorenz Plot, looks like a fan

3. Histogram--- Check all kinds of interval according to demand,find artifacts and missed mark

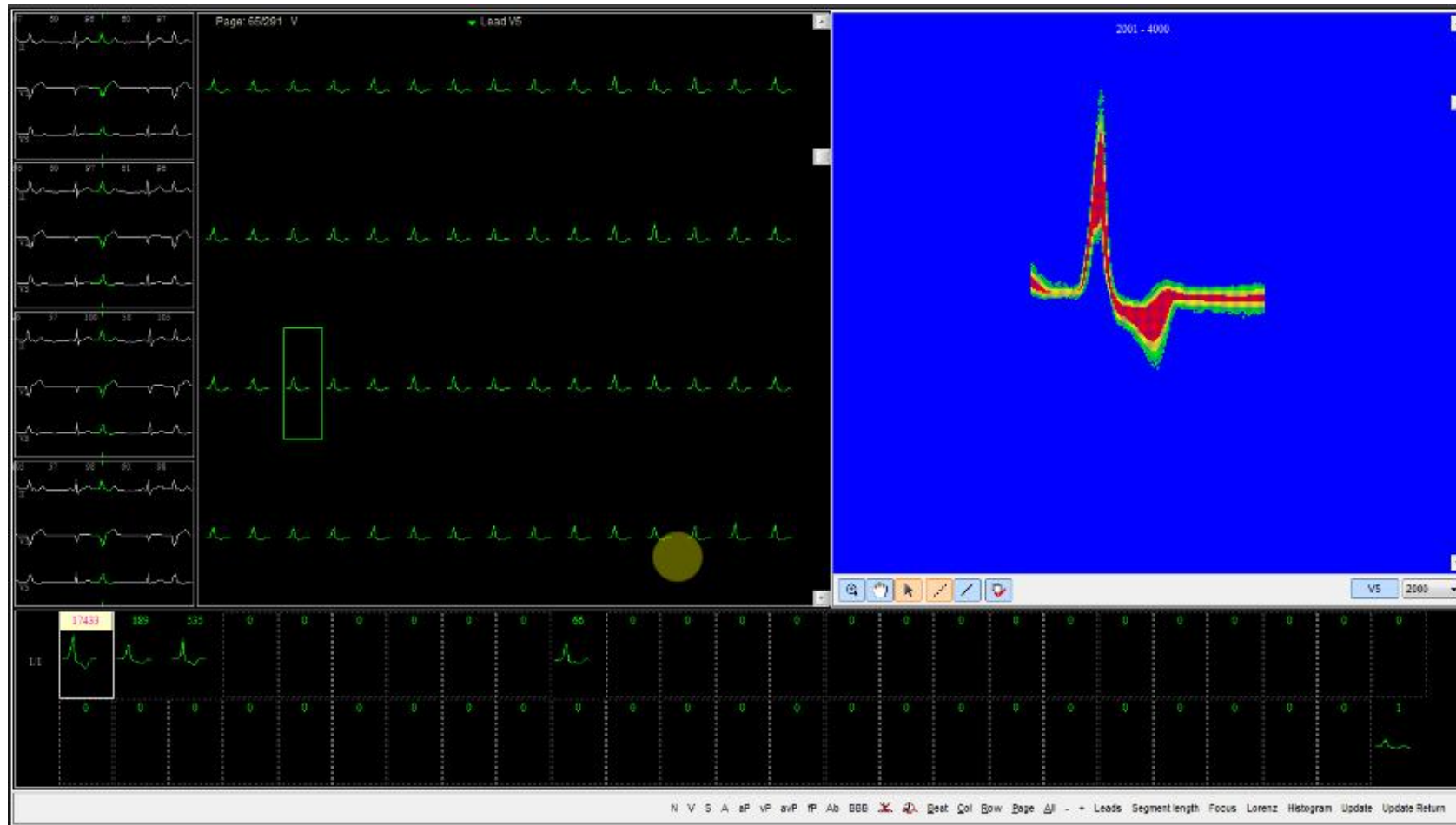


All kinds of histogram according to different statistical methods



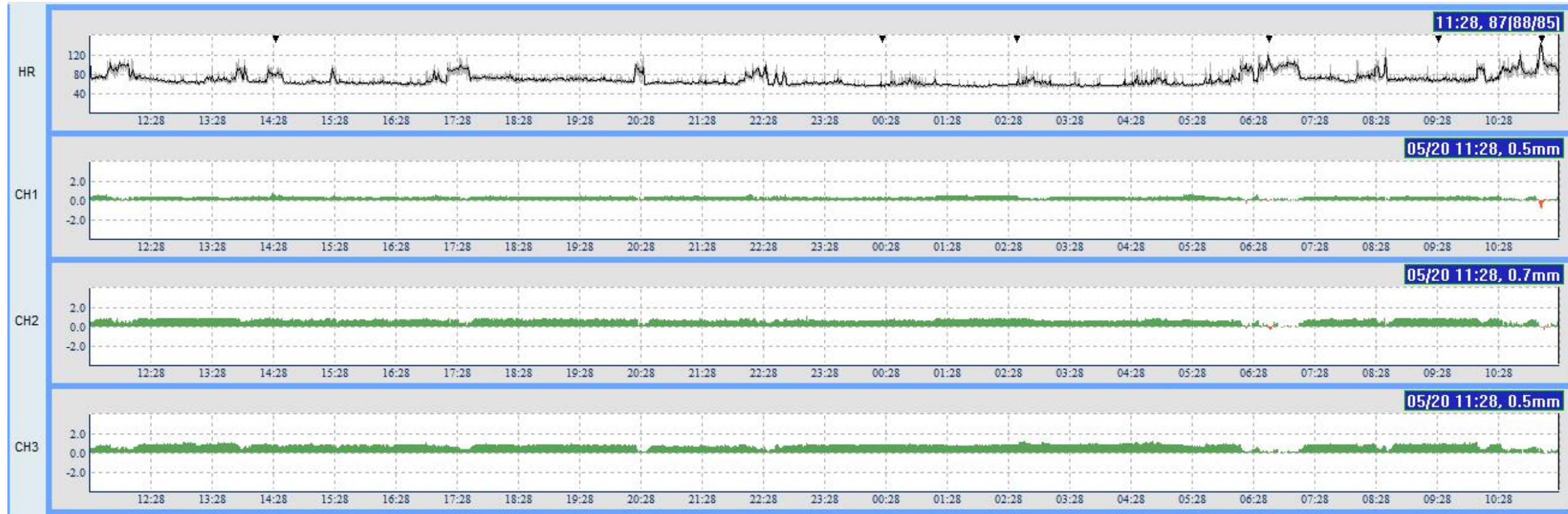
RR interval distribution

4.Focus Tool--- Pick out the unusual waveform quickly



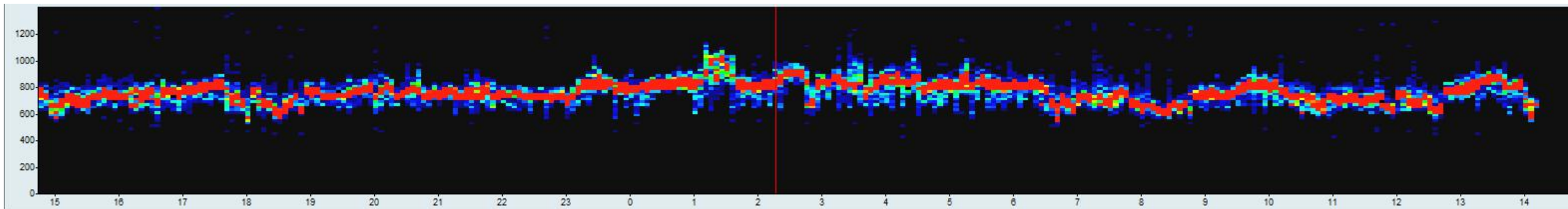
Principle: overlap all waveform according to the order of P-QRS-T ,so you can pick out the unusual waveform from large amount of beats easily.

5.ST measument--- analysis ST segment

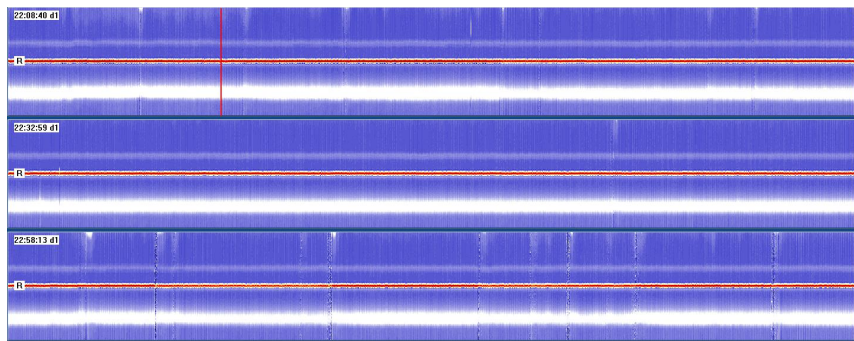


ST-segment changes (elevation and depression)

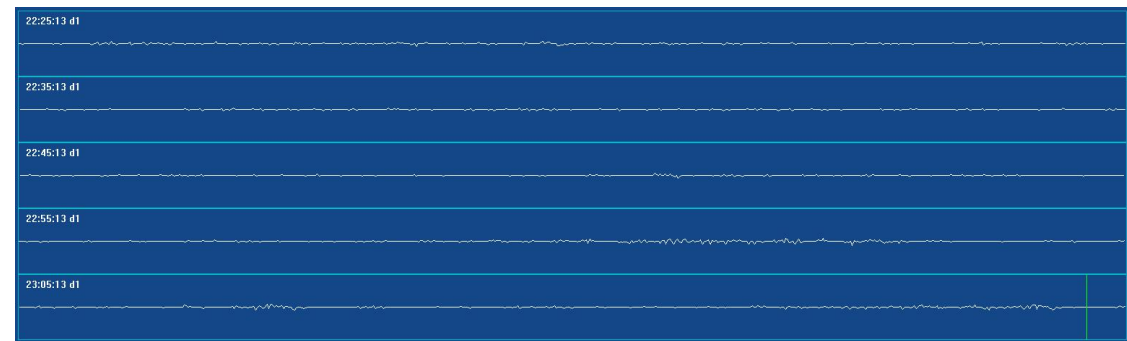
6.A-Fib/Flut analysis---- check if the patient have A-fib/Flut



RR Trend (fulltime)



Waterfall Tools (RR tend 20 min/line)



RR Trend (10min/line)

Principle:
The Horizontal axis represents time and the vertical axis is RR interval value, make all RR interval value as a point and overlap every 5 mins' RR interval in the same vertical value. The distribution density from high to low are expressed with color from red-orange-yellow-green-blue. If there's red line from begin to end, there can be no A-Fib/Flut.

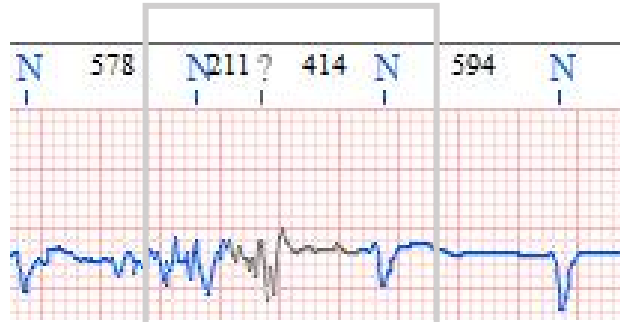
Quick judgement whether the patient have A-Fib/Flut by overview, once confirmed, use the 2 additional tools to pick out short A-Fib/Flut period



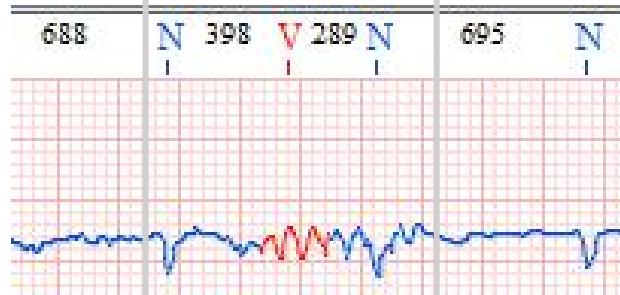
02

How to use the edit tools

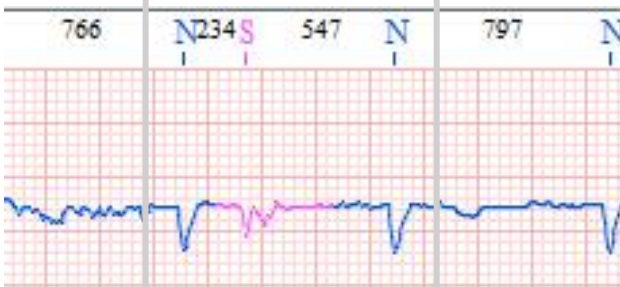
1.Check out Artifact



Artifact--?



Artifact--V



Artifact--S

Feature

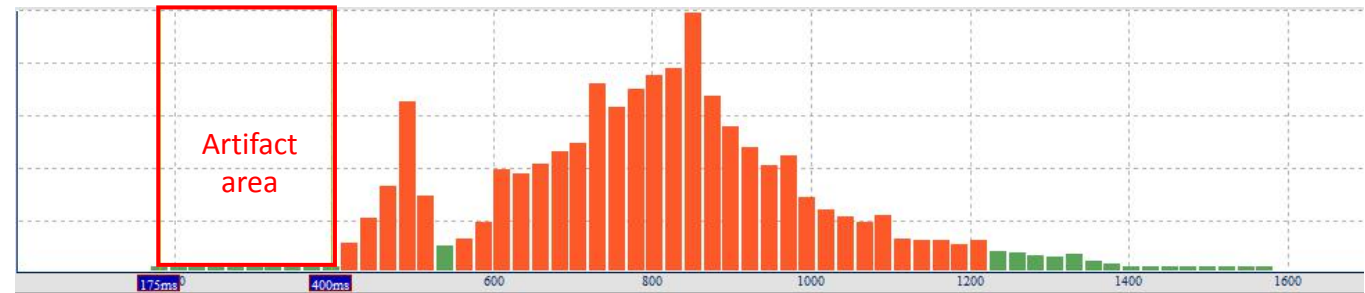
RR interval especially short if it's artifact, check out and delete them.

Useful tool 1---- Histogram

R-R interval $< 400\text{ms}$

V-N interval $< 600\text{ms}$ the V mostly is Artifact

S-N interval $< 600\text{ms}$ the S mostly is Artifact



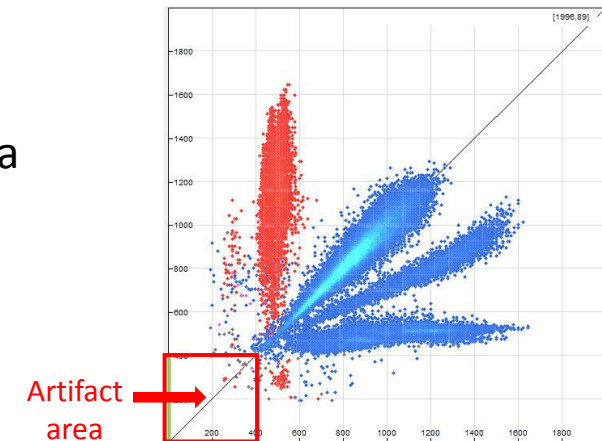
Useful tool 2----Lorenz Plot

Check the points in the below area

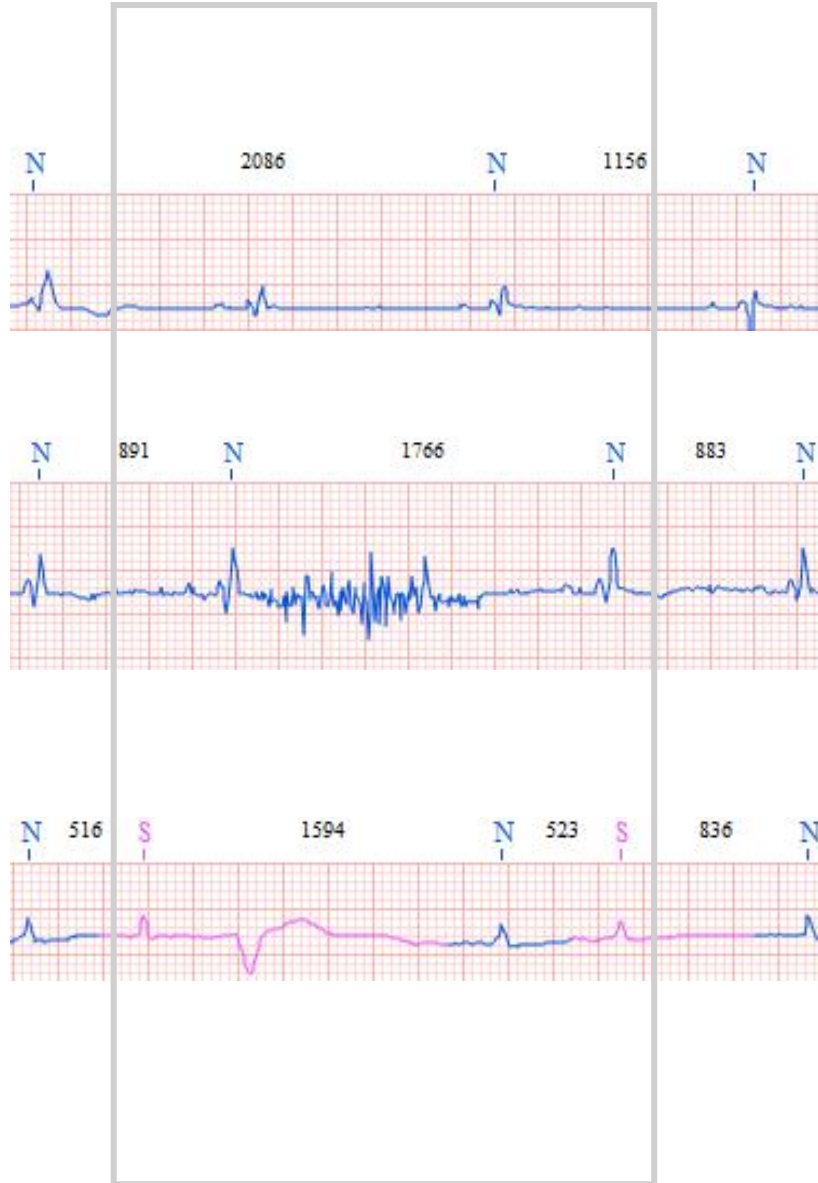
$X \& Y < 400\text{ms}$

$X < 600\text{ms} \& X > Y$

$Y < 600\text{ms} \& Y < X$



2.Check out mark missing

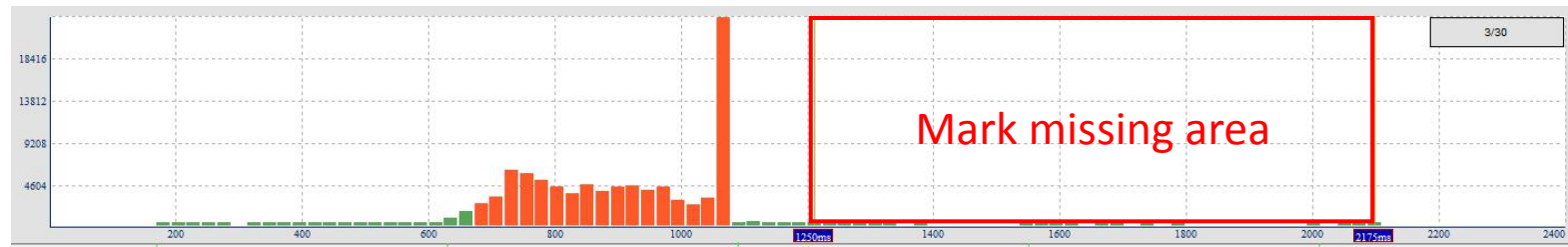


Feature

RR interval especially short if there is mark missing, check out and add the mark

Useful tool 1. Histogram & Timing diagram

Check R-R interval from the longest RR period, there can be mark missing.



Histogram



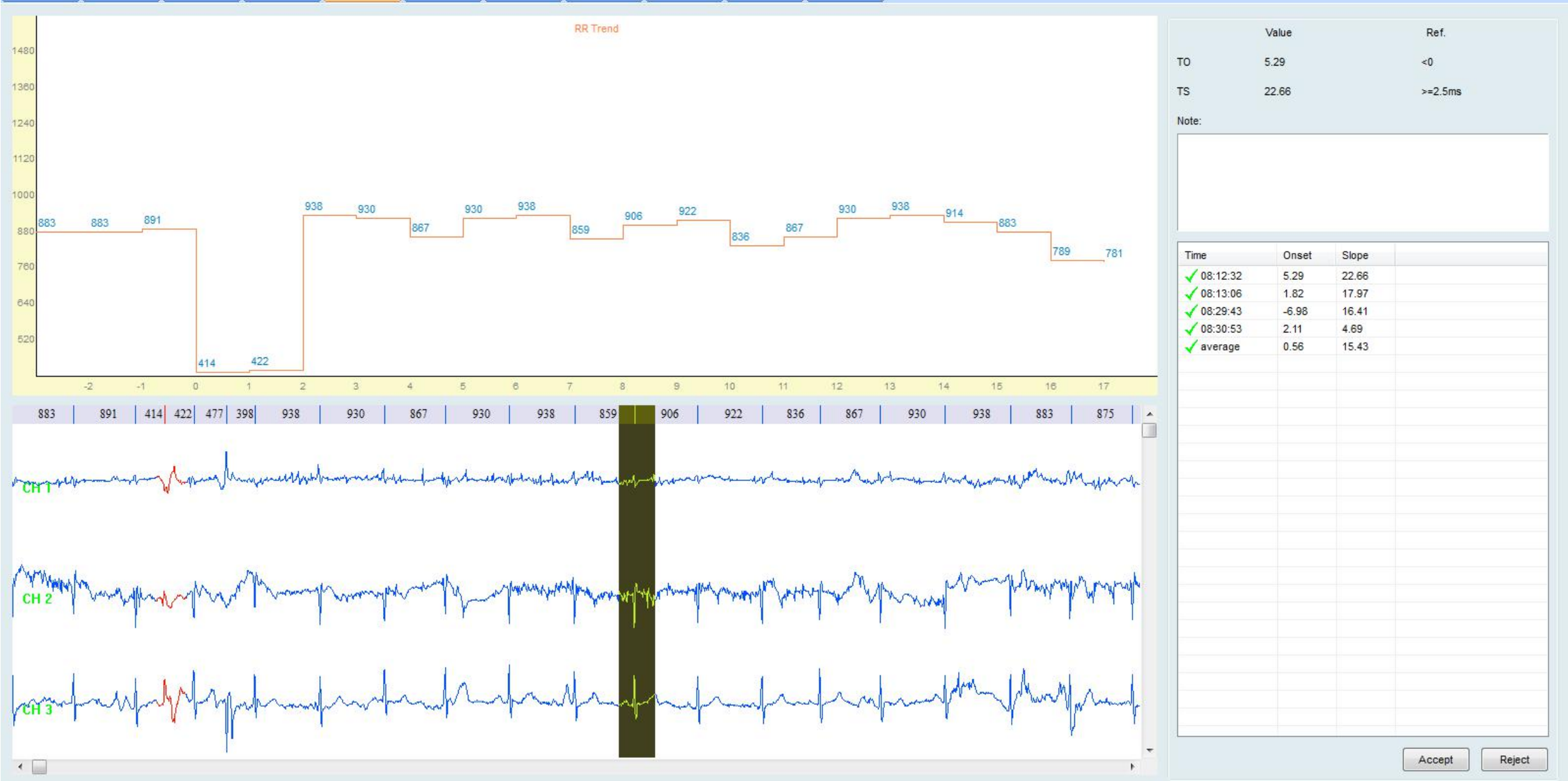
Timing diagram in Lorenz plot tool



03

Additional auxiliary tools

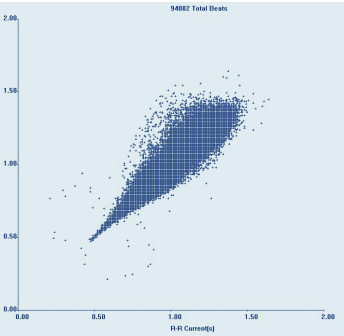
Heart rate turbulence(HRT)



Obstructive sleep apnea(OSA)



Heart rate variability(HRV)



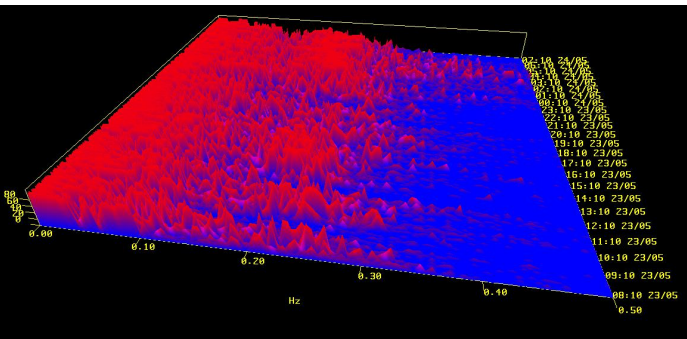
Lorinz plot



Time Domain plots



Circadian Plots



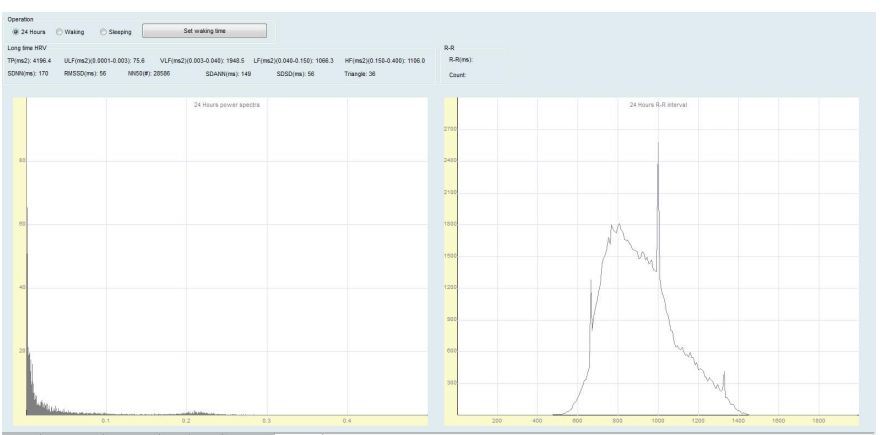
3D Plot

Time	SDNN(ms)	RMSSD(ms)	SDSD(ms)	MNSD(s)	pnNSD(%)	Tr index	MeanRR(%)	Beats/s
2305 08:10	84	79	81	68	25.22	17.74	851	337
2305 08:15	84	85	85	143	45.54	17.44	857	314
2305 08:20	71	67	67	143	46.13	17.22	872	310
2305 08:25	125	51	58	63	19.09	23.57	881	338
2305 08:30	142	84	60	72	20.40	27.15	838	353
2305 08:35	67	58	57	88	28.76	13.91	861	306
2305 08:40	63	51	50	92	28.11	18.89	864	316
2305 08:45	139	48	48	72	20.38	25.38	842	305
2305 08:50	87	42	42	78	20.32	19.68	804	374
2305 08:55	88	40	40	58	14.87	18.79	882	376
2305 09:00	55	36	36	54	14.59	13.21	810	370
2305 09:05	91	52	51	96	27.35	21.94	858	351
2305 09:10	103	58	56	99	28.53	22.24	884	333
2305 09:15	86	28	27	33	8.29	22.11	758	398
2305 09:20	79	36	36	55	14.82	20.61	810	371
2305 09:25	81	38	38	54	14.83	16.84	780	385
2305 09:30	61	30	30	28	6.96	14.38	746	403
2305 09:35	52	29	29	23	5.53	12.06	706	398
2305 09:40	74	30	30	32	7.92	16.83	743	404
2305 09:45	74	35	35	55	14.87	16.82	770	391
2305 09:50	72	32	32	47	11.75	13.79	750	400
2305 09:55	89	33	34	47	12.48	17.23	780	379
2305 10:00	52	27	27	25	6.04	14.28	725	414
2305 10:05	68	33	32	53	13.86	13.38	770	388
2305 10:10	39	23	23	61	2.86	11.47	728	413
2305 10:15	77	51	51	101	27.90	14.48	831	362
2305 10:20	64	48	48	90	25.79	13.96	857	349
2305 10:25	52	42	42	63	24.96	13.86	873	348
2305 10:30	93	58	58	113	32.47	16.57	883	348
2305 10:35	104	71	72	144	46.30	23.82	969	311
2305 10:40	127	84	84	151	48.19	27.91	907	288
2305 10:45	58	79	71	139	50.73	15.22	1098	274
2305 10:50	68	72	72	152	55.68	14.37	1183	273
2305 10:55	156	51	51	61	25.85	16.86	882	352
2305 11:00	117	50	50	97	28.61	24.21	887	339
2305 11:05	84	48	48	92	28.21	17.55	857	351
2305 11:10	84	49	49	82	27.30	16.85	883	337
2305 11:15	111	43	43	77	20.59	22.00	808	374

RR table

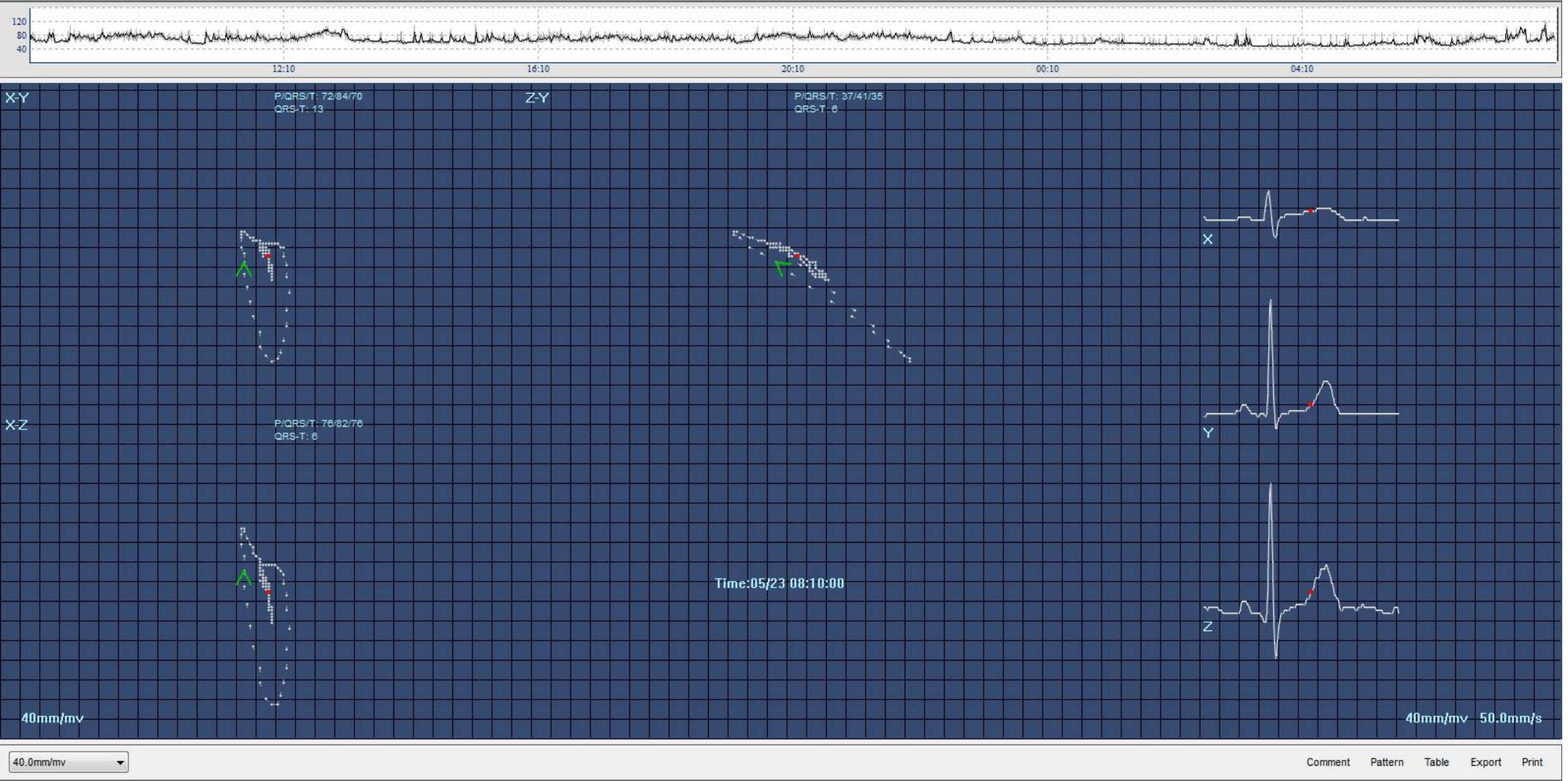
Time	ULF(mHz)	LF(mHz)	HF(mHz)	TH(mHz)	Ratio SP	LF(n)	HF(n)	Normal Beats
2305 08:10	2084.78	1171.20	852.82	4543.21	3.72	57.46	41.83	100.000
2305 08:15	1148.58	840.48	1347.62	3383.63	1.48	37.60	60.30	100.000
2305 08:20	1111.58	839.59	1257.72	3214.78	1.55	39.91	59.79	100.000
2305 08:25	2583.21	1135.55	380.87	4102.74	6.46	74.24	25.76	100.000
2305 08:30	5538.67	690.89	432.22	6861.78	14.41	61.52	38.48	100.000
2305 08:35	486.46	793.47	122.22	2483.77	1.92	38.14	65.34	100.000
2305 08:40	1382.21	1162.37	640.25	3182.82	3.93	54.31	39.30	100.000
2305 08:45	2319.37	1358.91	581.43	4258.71	6.20	69.64	30.36	100.000
2305 08:50	1879.80	1745.48	561.39	3355.61	4.91	64.18	35.80	100.000
2305 08:55	2386.34	1225.80	337.99	4050.80	10.43	72.09	19.90	100.000
2305 09:00	795.26	1286.84	265.73	2388.40	7.87	62.88	16.98	100.000
2305 09:05	1408.97	1408.97	684.88	3818.84	5.35	58.80	28.18	100.000
2305 09:10	3050.21	1570.53	913.33	6813.89	5.96	53.00	30.82	100.000
2305 09:15	2620.29	985.46	178.39	4584.06	20.26	69.35	12.55	100.000
2305 09:20	2242.88	1225.58	343.82	3812.28	10.14	72.83	20.09	100.000
2305 09:25	2084.78	1263.53	258.75	3182.15	11.14	80.88	16.87	100.000
2305 09:30	2189.48	983.30	280.21	3391.16	11.84	75.17	23.32	100.000
2305 09:35	888.11	838.36	285.35	1947.29	6.18	73.32	23.29	100.000
2305 09:40	2187.90	1071.99	218.33	3055.31	14.93	81.37	16.57	100.000
2305 09:45	1824.48	1291.27	312.32	3425.51	9.98	75.91	18.36	100.000
2305 09:50	1442.85	1743.45	482.85	3182.33	10.86	72.51	24.99	100.000
2305 09:55	1880.22	796.01	289.90	2864.92	6.47	67.19	24.47	100.000
2305 10:00	1085.75	774.68	189.68	2145.45	10.96	72.29	15.83	100.000
2305 10:05	1880.20	482.88	164.27	1880.20	9.30	62.60	22.29	100.000
2305 10:10	785.75	443.80	96.27	1324.34	12.77	80.90	17.55	100.000
2305 10:15	795.16	1238.65	1122.21	3144.83	1.78	51.86	46.98	100.000
2305 10:20	780.75	561.17	543.60	1877.72	2.44	50.57	48.83	100.000
2305 10:25	682.09	614.47	682.09	1882.95	2.24	51.17	47.44	100.000
2305 10:30	2179.11	1608.68	181.98	3119.83	3.57	54.70	36.11	100.000
2305 10:35	2084.81	1938.78	1615.88	6039.37	2.98	53.49	44.48	100.000
2305 10:40	896.67	533.85	1231.99	2378.91	1.80	28.40	65.53	100.000
2305 10:45	828.83	588.45	1239.82	2278.36	0.83	28.97	70.90	100.000
2305 10:50	1110.17	755.38	1401.15	3276.76	1.33	34.87	64.67	100.000
2305 10:55	2588.41	1959.03	6155.17	9358.01	1.45	76.24	23.76	100.000
2305 11:00	5782.74	1948.25	851.73	7748.83	8.83	63.61	43.52	100.000
2305 11:05	1238.81	1222.82	784.27	3238.15	3.88	60.58	39.35	100.000
2305 11:10	2147.82	1239.97	787.00	4184.13	4.42	60.90	37.67	100.000
2305 11:15	1875.74	1875.74	1875.74	1875.74	1.00	1875.74	1875.74	100.000

Spectral table



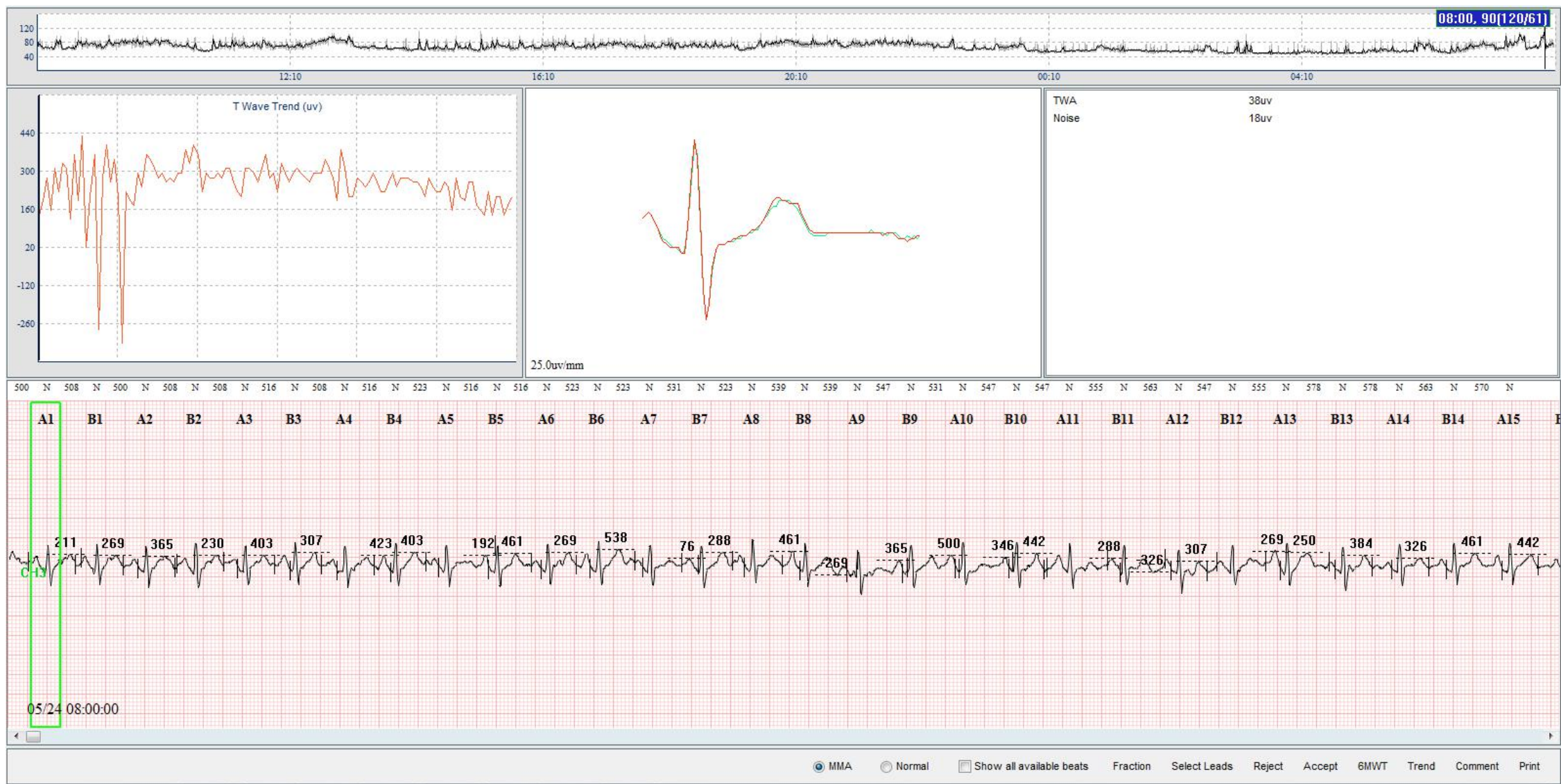
24 hour plt

Vectorcardiogram(VCG)



T-wave Alternans(TWA)

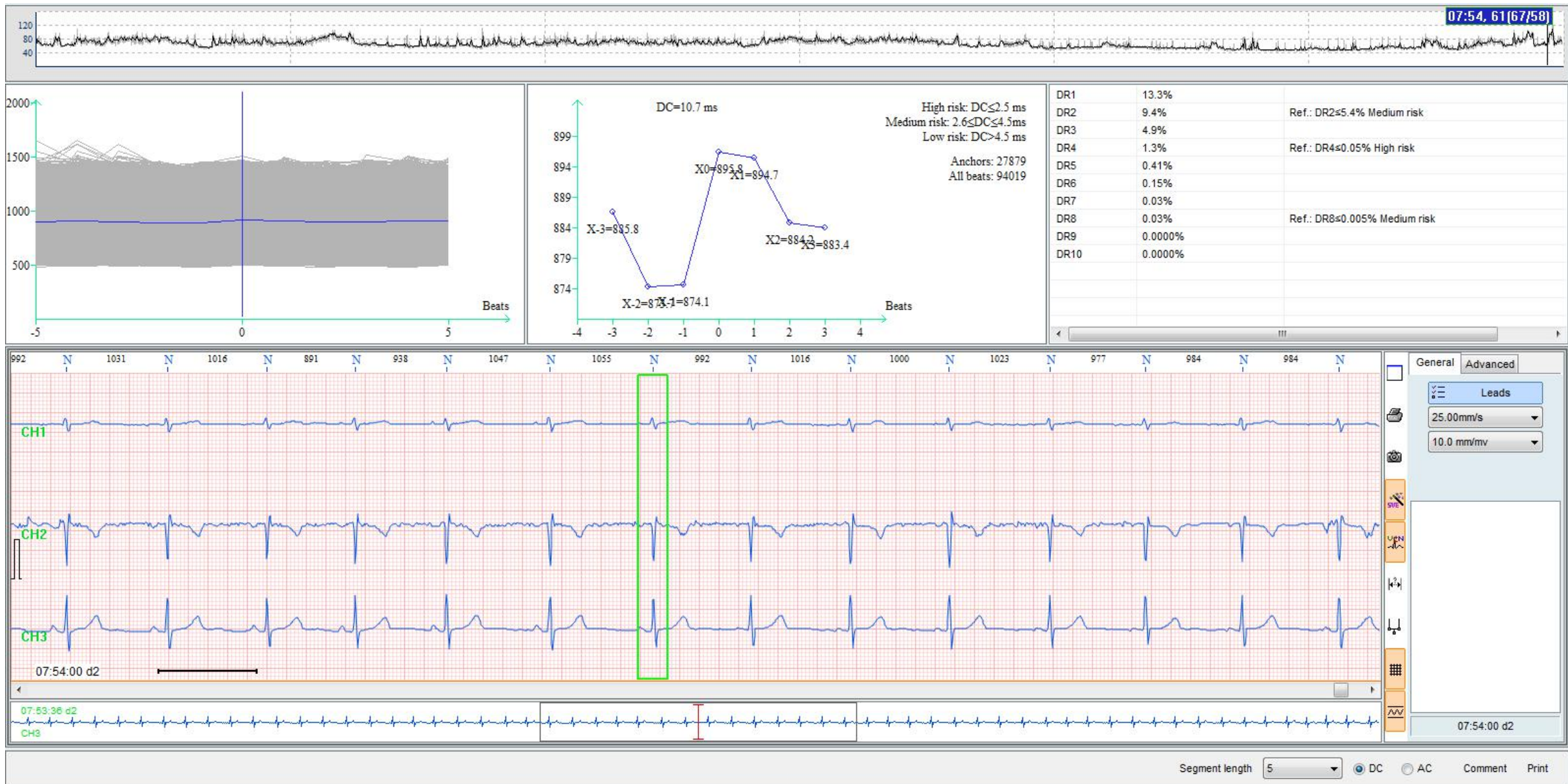
TWA is a marker for ventricular tachycardia and ventricular fibrillation in ischemic cardiac muscle,
TWA is also an indicator of predicting the malignant arrhythmia and sudden death.



Late potentials(SAECG)



Deceleration Capacity of Heart Rate



THANKS

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