

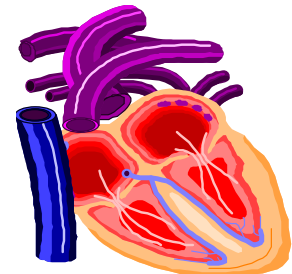
# **VR<sup>2</sup> Applications and Advantages in a GLP Safety Pharmacology Environment**



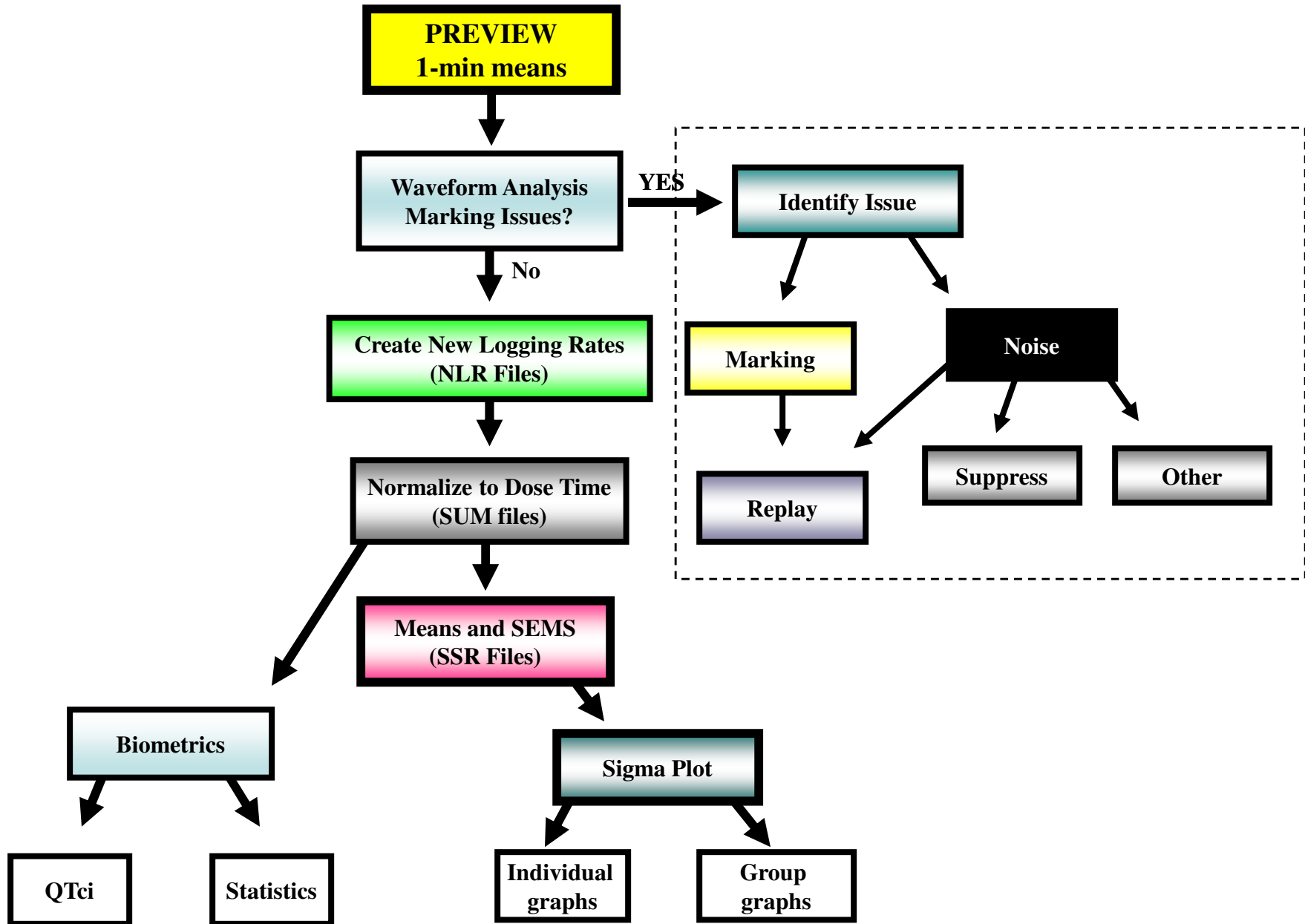
**Kim Hoagland, Ph.D.**  
**Safety and Exploratory Pharmacology**  
**Merck & Co.**

# **VR<sup>2</sup> Applications at Merck & Co.**

- **cardiovascular/respiratory telemetry studies conducted by Merck Safety Pharmacology**
- **Canine and NHP models**
- **Konigsberg T27F model implants for ABP, ECG, Temp, and ITP analysis (internal telemetry)**
- **ITS Telemetry and Physiojacket systems (external telemetry)**
- **GLP and non-GLP studies**



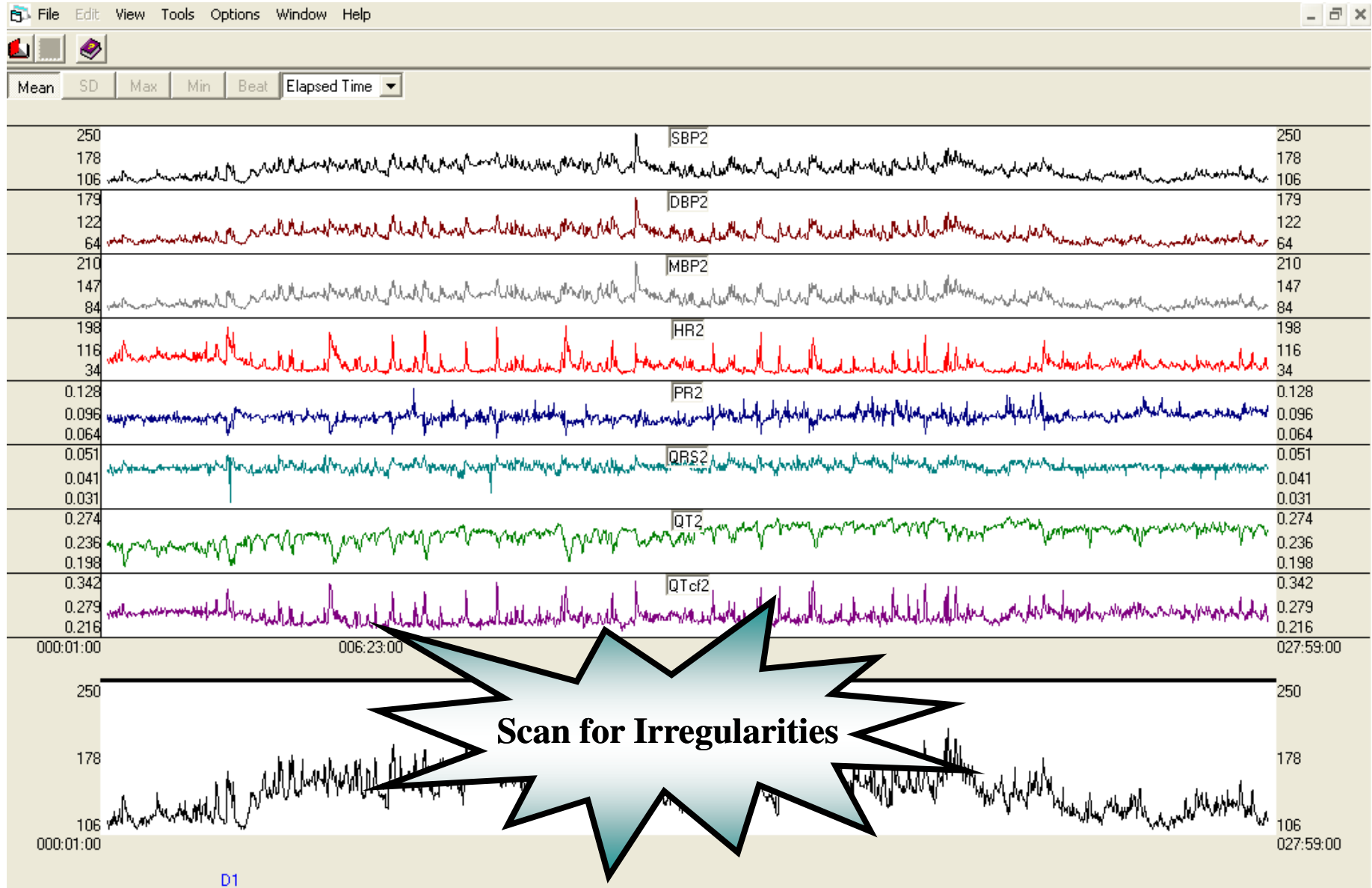
# Data Processing With VRR



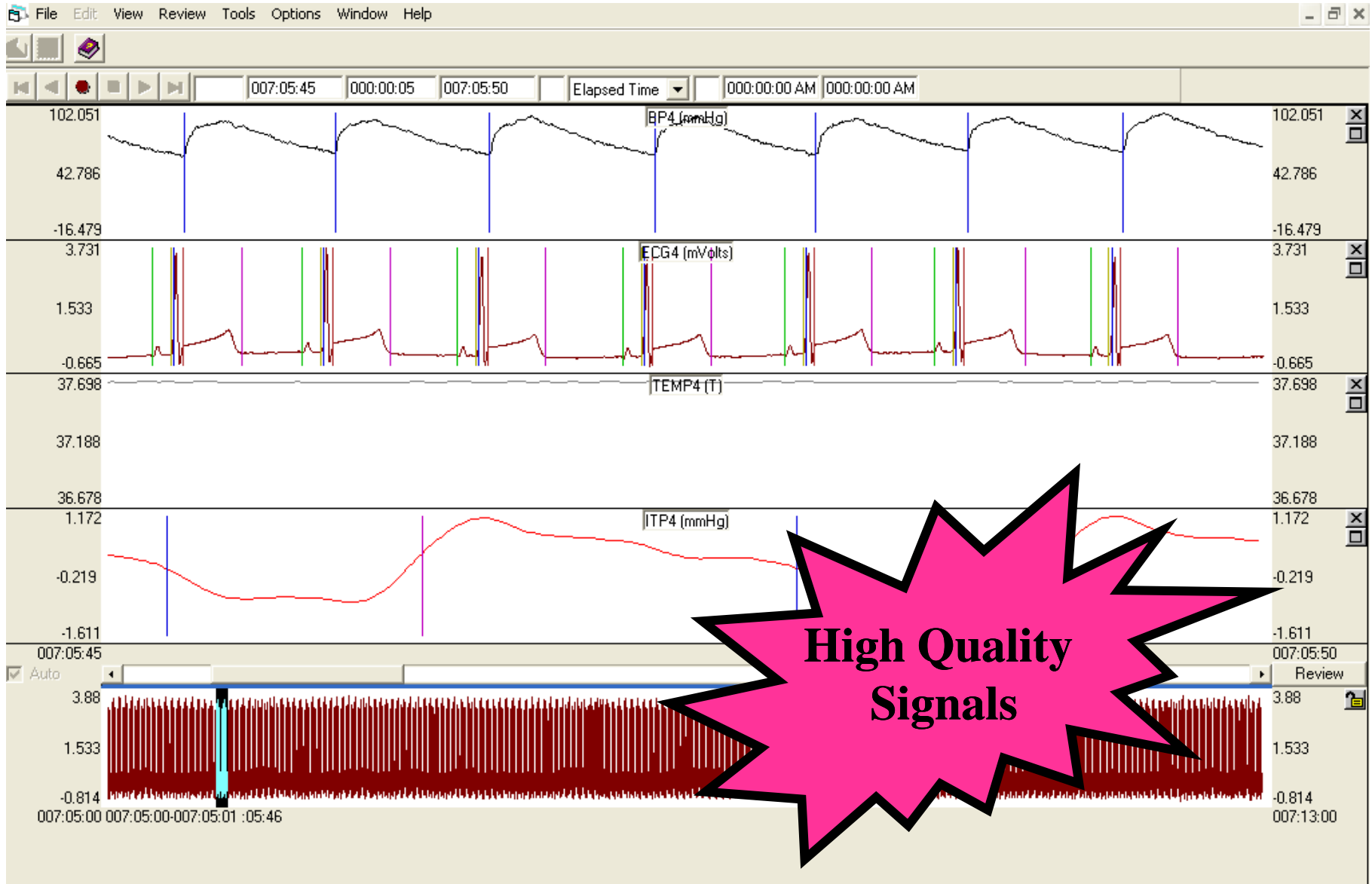
# Data Quality Improvements

- **Fast and efficient viewing of data trends via preview pane**
- **ECG and ABP Waveform Analysis...easy to hone in on areas of interest**
- **Diagnose problems...assess replay needs**
- **Easy suppression of noise**
- **Signal dropout detection**
- **Eliminates cut and paste/formula errors occurring in Excel**
- **Increased data throughput**

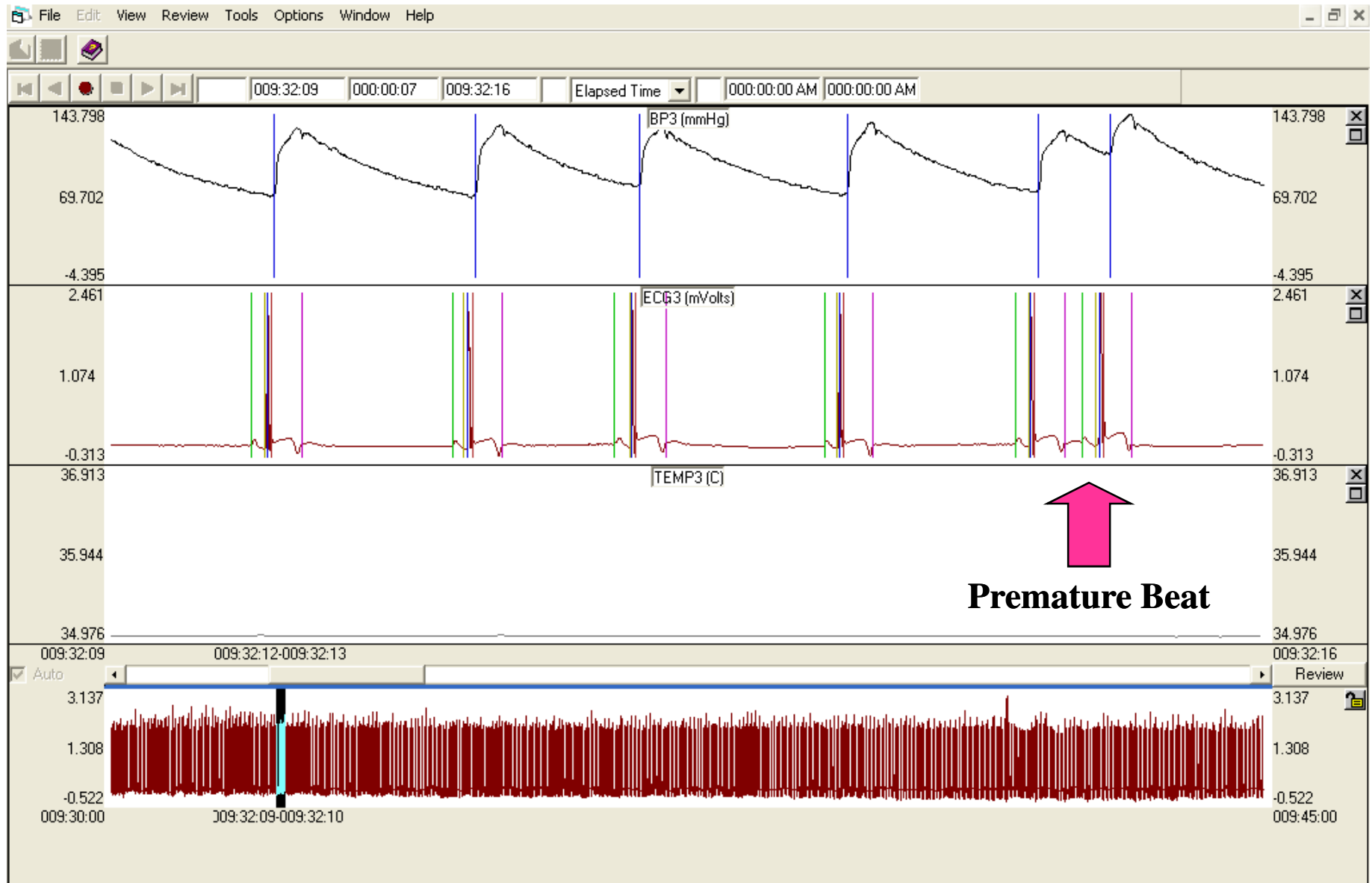
# Preview Pane (1-min means)



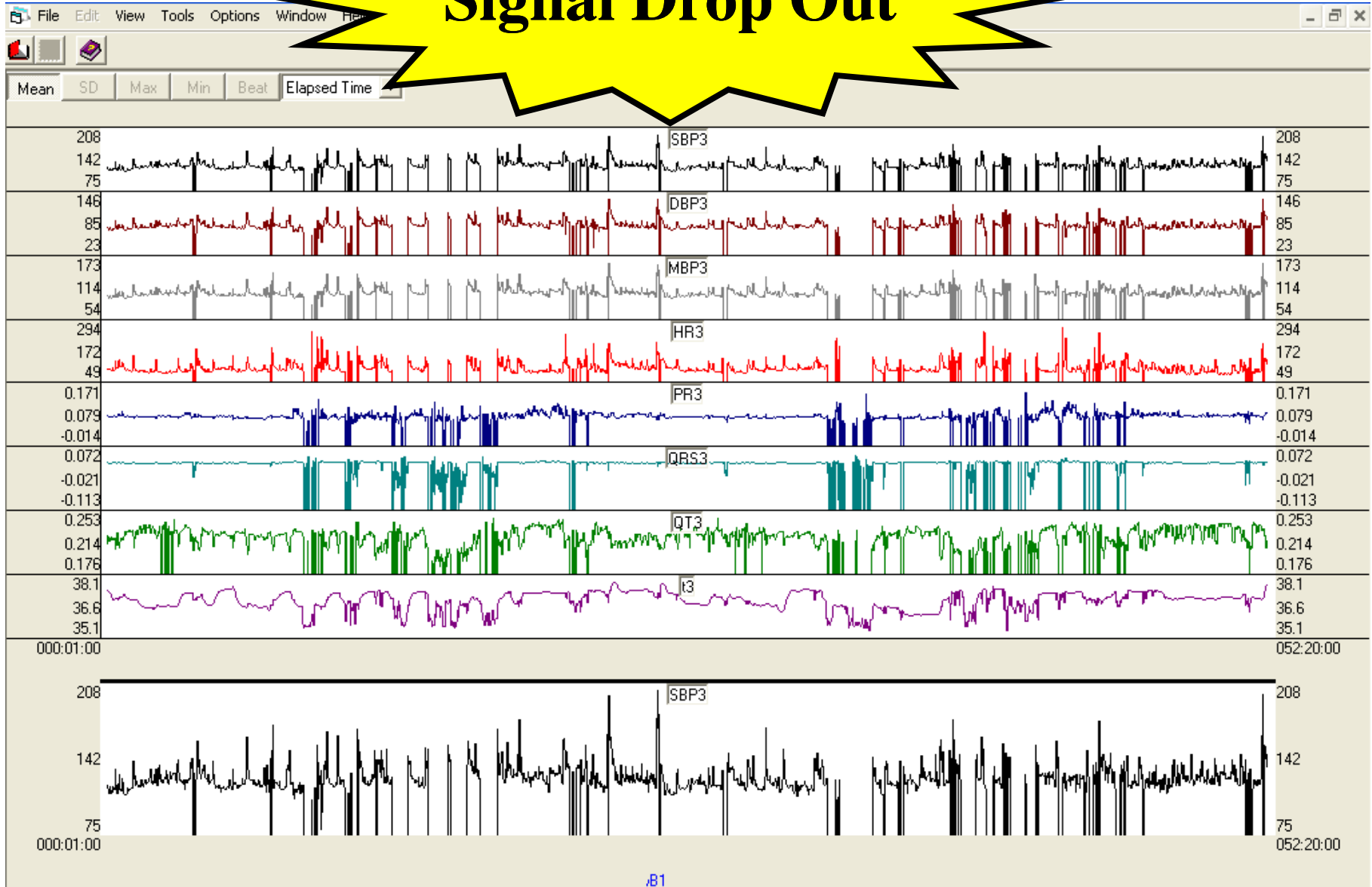
# Waveform Analysis/Review



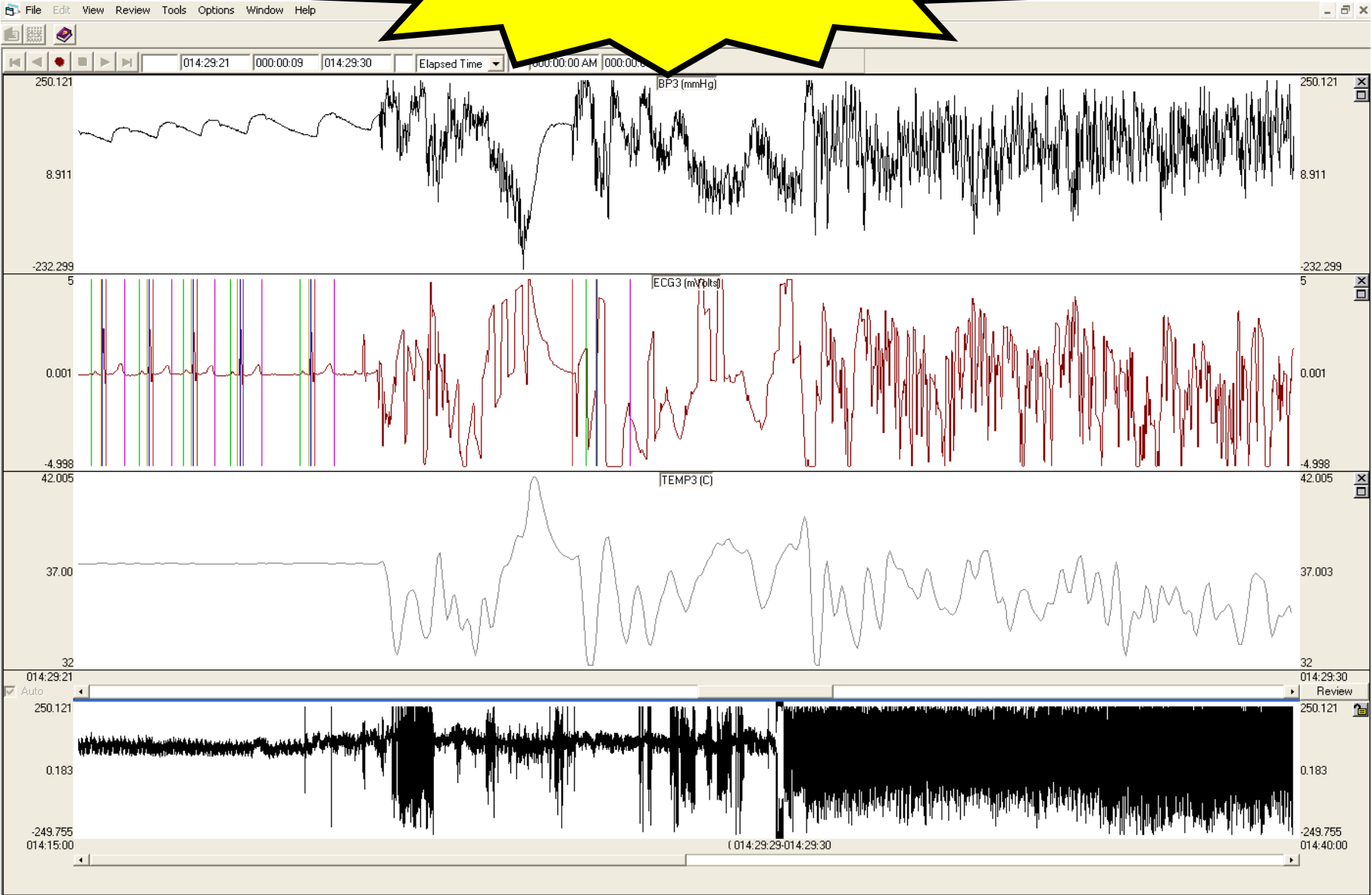
# Waveform Analysis: T-Wave Morphology



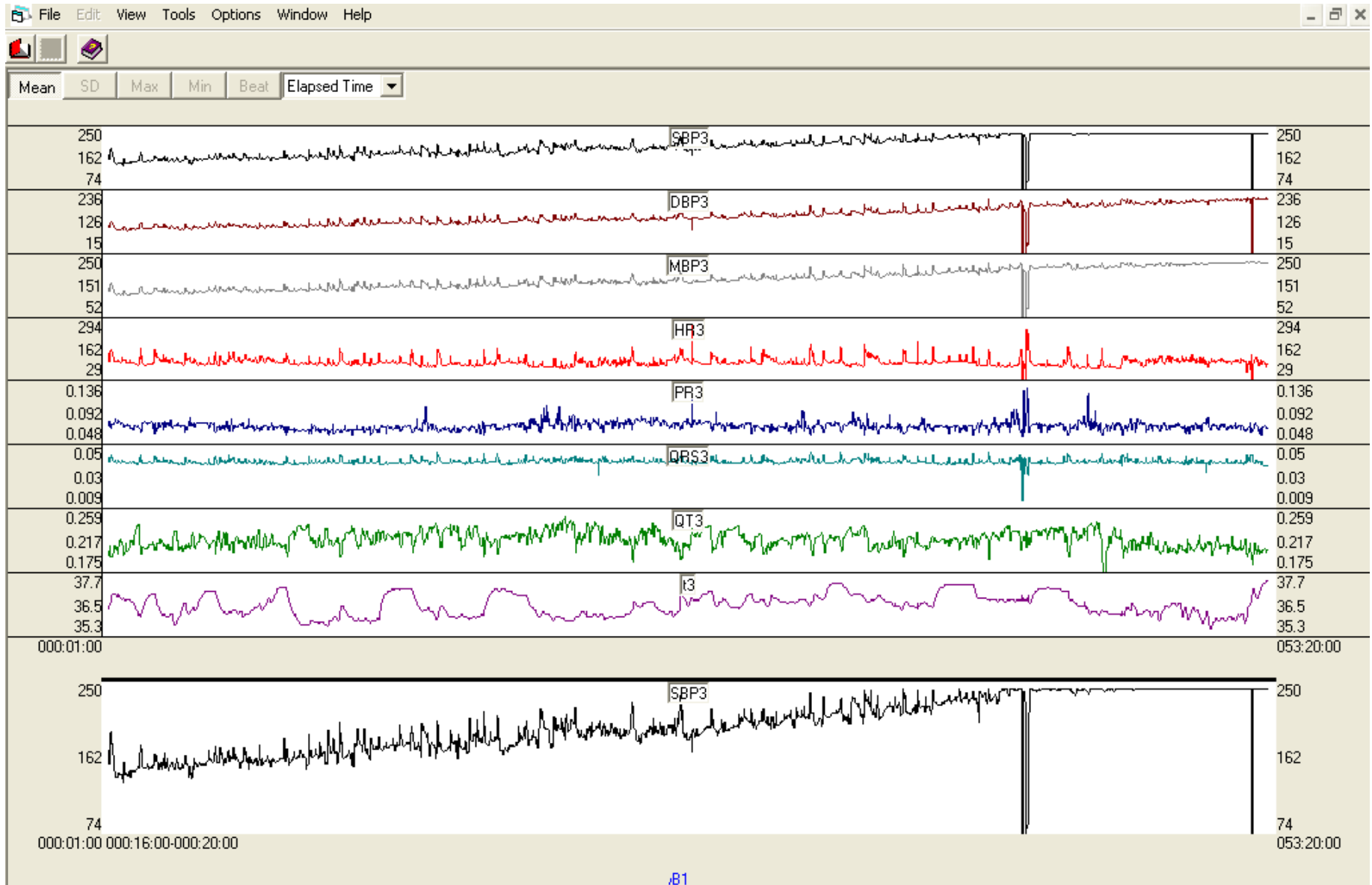
# Signal Drop Out



# Signal Drop Out



# Preview Pane: ‘Death of an Implant’



# VR<sup>2</sup> Enabled Efficiencies

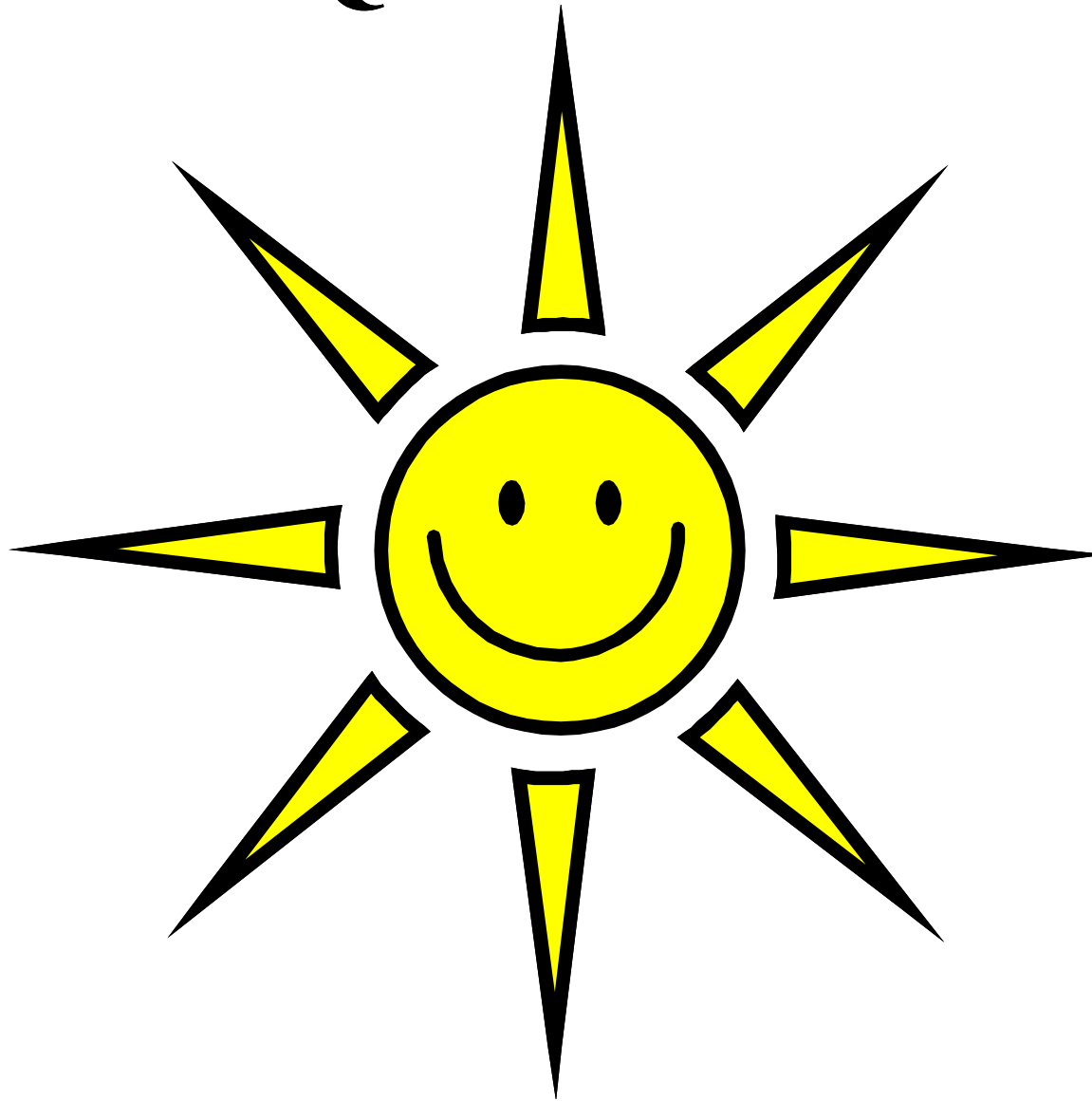
- **High throughput data analysis**
- **Improved replay assessment**
- **Instantaneous waveform review**
- **Virtually eliminates time spent on internal quality checks**
- **Statistical data generated in 24 hours, not 1 week (VR<sup>2</sup> files read directly into SAS)**
- **80% reduction in data analysis cycle time**

# VR<sup>2</sup> Advantages:

- **Highly efficient waveform analysis**
- **CFR Part 11 compliant, GLP validated**
- **Streamlined, high throughput data analysis**
- **Signal dropout/arrhythmia detection**
- **QA-friendly Excel output**
- **Improved stats process**
- **Significant decrease in study data turn around time while maintaining data quality**

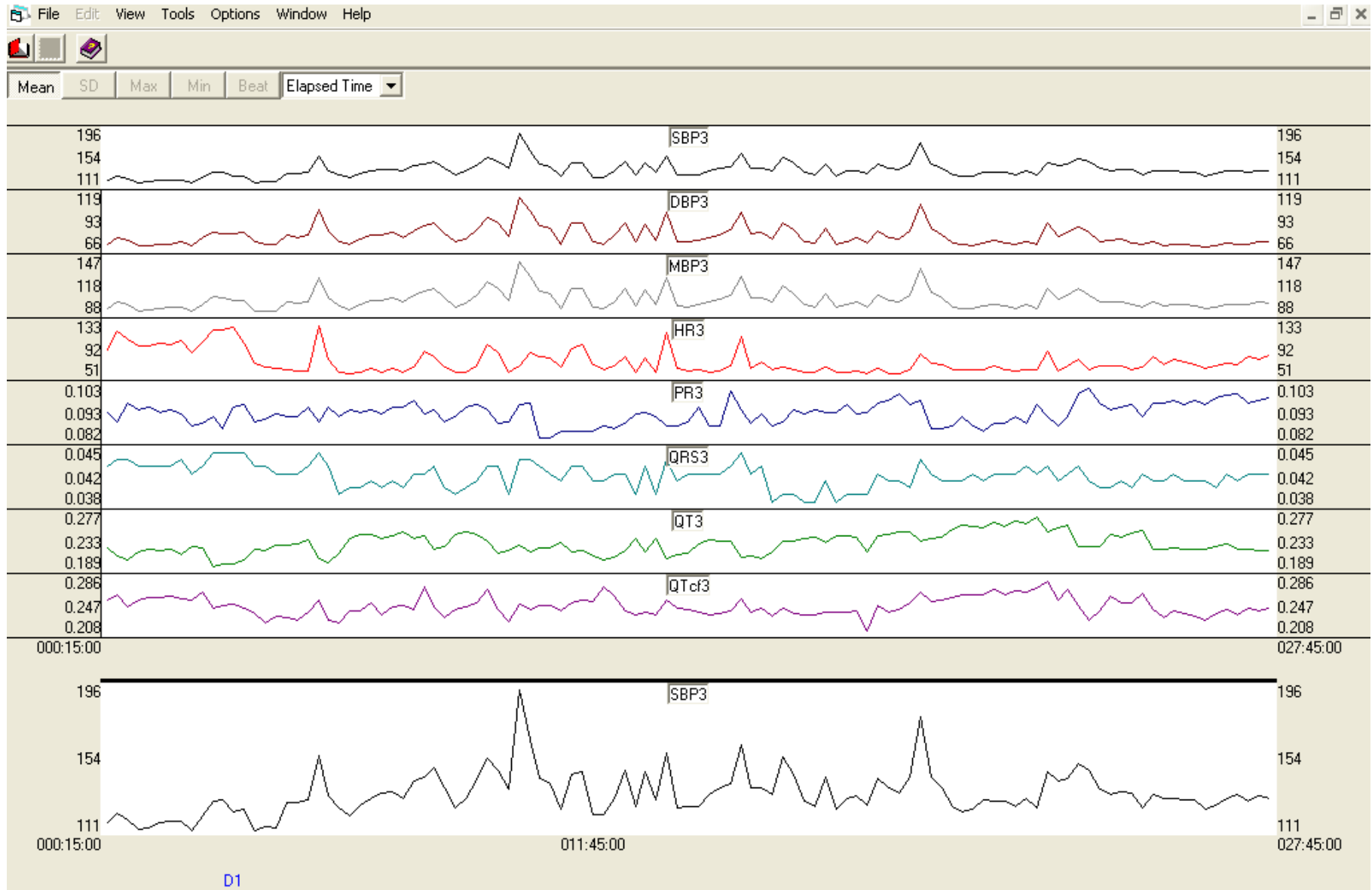


**Questions?**



# Backup Slides

# Preview Pane (15 min means)



# Waveform analysis: Noisy data



# Example of VR<sup>2</sup> protocol used to generate Summary files normalized to dose

		Line ID	Description	Start Time	Function	Duration	
		1	---	Predose	D1	Extract	-002:00:00
		2	---	Postdose	L1+000:15:00	Extract	024:00:00

# Example of SUM file Excel Output

## Data normalized to dose mark

BEGIN@Columns: 65												
Function	StartTime	Duration	Description	Line ID	SBP1	DBP1	MBP1	HR1	PR1	QRS1	QT1	QTcf1
Extract	001:00:00	000:00:00	Predose	---	105	69	88	81	0.107	0.044	0.236	0.262
Extract	001:15:00	000:00:00	Predose	---	107	70	89	84	0.107	0.044	0.239	0.267
Extract	001:30:00	000:00:00	Predose	---	109	71	91	83	0.106	0.044	0.236	0.266
Extract	001:45:00	000:00:00	Predose	---	115	75	95	95	0.102	0.045	0.231	0.27
Extract	002:00:00	000:00:00	Predose	---	115	75	95	89	0.11	0.043	0.235	0.269
Extract	002:15:00	000:00:00	Predose	---	111	71	91	76	0.106	0.045	0.245	0.269
Extract	002:30:00	000:00:00	Predose	---	123	80	102	105	0.101	0.044	0.221	0.266
Extract	002:45:00	000:00:00	Predose	---	126	83	105	109	0.104	0.044	0.226	0.272
Extract	003:00:00	000:00:00	Predose	---	136	92	114	116	0.103	0.045	0.239	0.289
Extract	003:15:00	000:00:00	Postdose	---	125	87	107	123	0.109	0.044	0.217	0.273
Extract	003:30:00	000:00:00	Postdose	---	110	73	91	60	0.12	0.042	0.248	0.248
Extract	003:45:00	000:00:00	Postdose	---	113	72	91	50	0.118	0.045	0.252	0.238
Extract	004:00:00	000:00:00	Postdose	---	126	78	98	50	0.108	0.046	0.255	0.242
Extract	004:15:00	000:00:00	Postdose	---	133	85	106	65	0.113	0.045	0.252	0.257
Extract	004:30:00	000:00:00	Postdose	---	150	94	118	63	0.108	0.043	0.239	0.245
Extract	004:45:00	000:00:00	Postdose	---	138	84	107	50	0.098	0.046	0.249	0.235
Extract	005:00:00	000:00:00	Postdose	---	143	84	109	49	0.095	0.046	0.248	0.233
Extract	005:15:00	000:00:00	Postdose	---	142	84	108	51	0.096	0.046	0.247	0.237
Extract	005:30:00	000:00:00	Postdose	---	153	97	121	74	0.106	0.045	0.242	0.254
Extract	005:45:00	000:00:00	Postdose	---	159	98	124	72	0.101	0.044	0.235	0.251
Extract	006:00:00	000:00:00	Postdose	---	146	88	113	54	0.103	0.045	0.242	0.234

# SSR File Excel Output Example

## Detailed header information helpful to QA

Number of Summary Files: 4													
Summary file name: T:\L-000341935 (L-NAME)\TT# 08-5619\085619C\Summary Results\SUM000\085619C.NLR000.SUM000.sm1													
Source File Name: t:\L-000341935 (L-NAME)\TT# 08-5619\085619C\New Logging Rates\NLR000\085619C.NLR000.DR1													
Protocol File Name: T:\L-000341935 (L-NAME)\TT# 08-5619\Low Dose Protocol.vrr													
Channel and subject info. from t:\L-000341935 (L-NAME)\TT# 08-5619\085619C\New Logging Rates\NLR000\085619C.NLR000.DR1:													
Summary file name: T:\L-000341935 (L-NAME)\TT# 08-5619\085619C\Summary Results\SUM000\085619C.NLR000.SUM000.sm2													
Source File Name: t:\L-000341935 (L-NAME)\TT# 08-5619\085619C\New Logging Rates\NLR000\085619C.NLR000.DR2													
Protocol File Name: T:\L-000341935 (L-NAME)\TT# 08-5619\Low Dose Protocol.vrr													
Channel and subject info. from t:\L-000341935 (L-NAME)\TT# 08-5619\085619C\New Logging Rates\NLR000\085619C.NLR000.DR2:													
Summary file name: T:\L-000341935 (L-NAME)\TT# 08-5619\085619C\Summary Results\SUM000\085619C.NLR000.SUM000.sm3													
Source File Name: t:\L-000341935 (L-NAME)\TT# 08-5619\085619C\New Logging Rates\NLR000\085619C.NLR000.DR3													
Protocol File Name: T:\L-000341935 (L-NAME)\TT# 08-5619\Low Dose Protocol.vrr													
Channel and subject info. from t:\L-000341935 (L-NAME)\TT# 08-5619\085619C\New Logging Rates\NLR000\085619C.NLR000.DR3:													
Summary file name: T:\L-000341935 (L-NAME)\TT# 08-5619\085619C\Summary Results\SUM000\085619C.NLR000.SUM000.sm4													
Source File Name: t:\L-000341935 (L-NAME)\TT# 08-5619\085619C\New Logging Rates\NLR000\085619C.NLR000.DR4													
Protocol File Name: T:\L-000341935 (L-NAME)\TT# 08-5619\Low Dose Protocol.vrr													
Channel and subject info. from t:\L-000341935 (L-NAME)\TT# 08-5619\085619C\New Logging Rates\NLR000\085619C.NLR000.DR4:													
BEGIN@Columns: 169													
StartTime	SBP	SBP-SD	SBP-SE	DBP	DBP-SD	DBP-SE	MBP	MBP-SD	MBP-SE	HR	HR-SD	HR-SE	PR
001:00:00	111		2.16	68		3.488	89.5		2.5	94		7.012	0.097
001:15:00	118		4.223	72.75		2.428	95		2.739	105		11.979	0.095
001:30:00	117.75		3.25	71.75		2.562	94.75		2.175	103.25		10.371	0.096
001:45:00	116.5		1.323	72.25		3.01	94.25		2.056	106		8.216	0.095
002:00:00	114.25		3.637	71		4.916	92.5		4.272	94.75		4.973	0.096