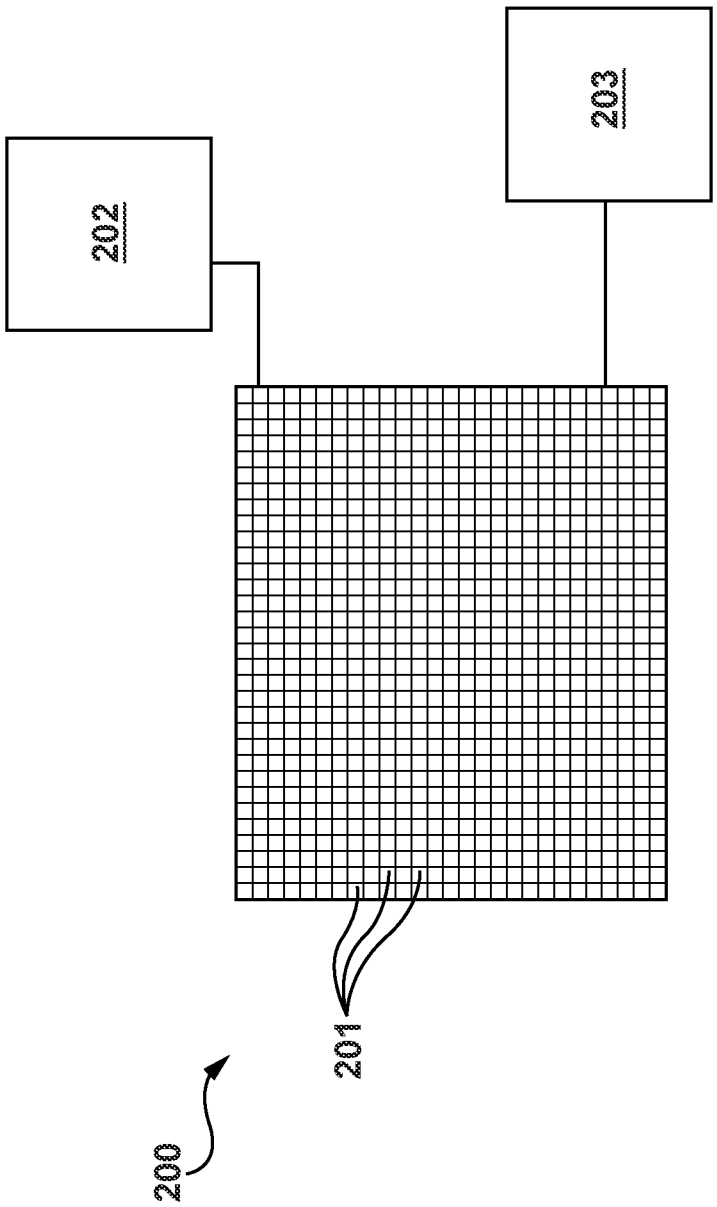


FIG. 1

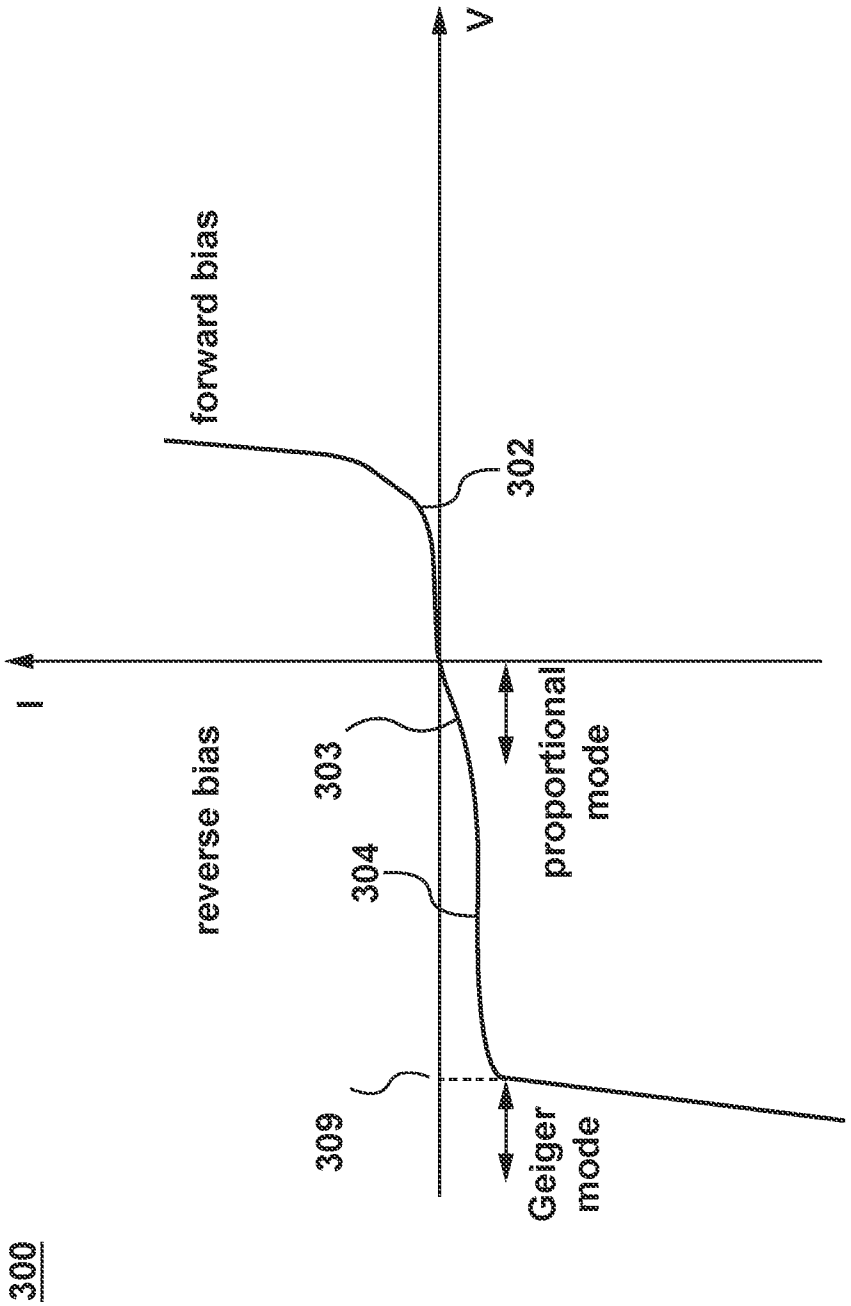

300
I
V
forward bias
reverse bias
302
303
304
309
proportional mode
Geiger mode

FIG. 2

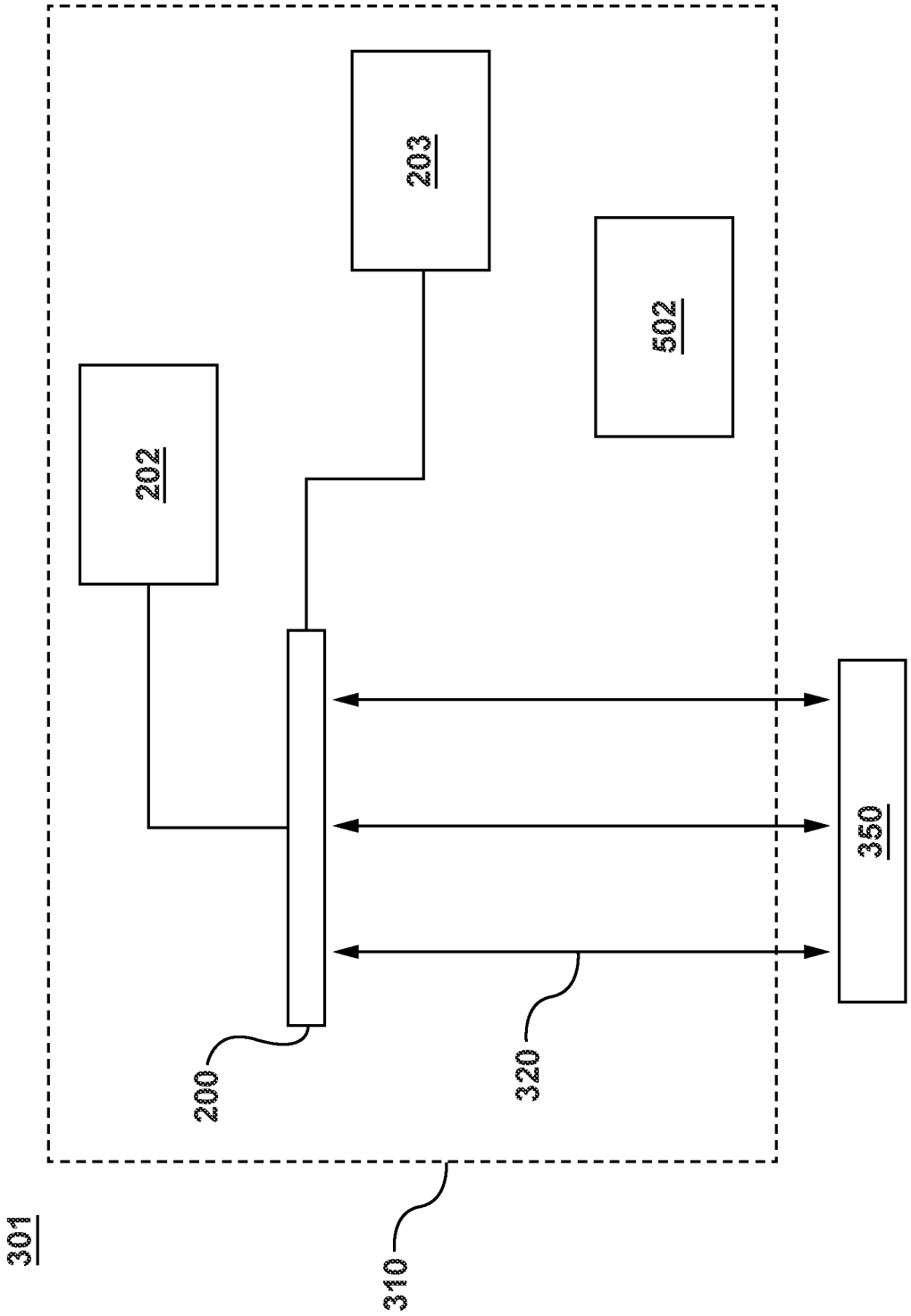


FIG. 3

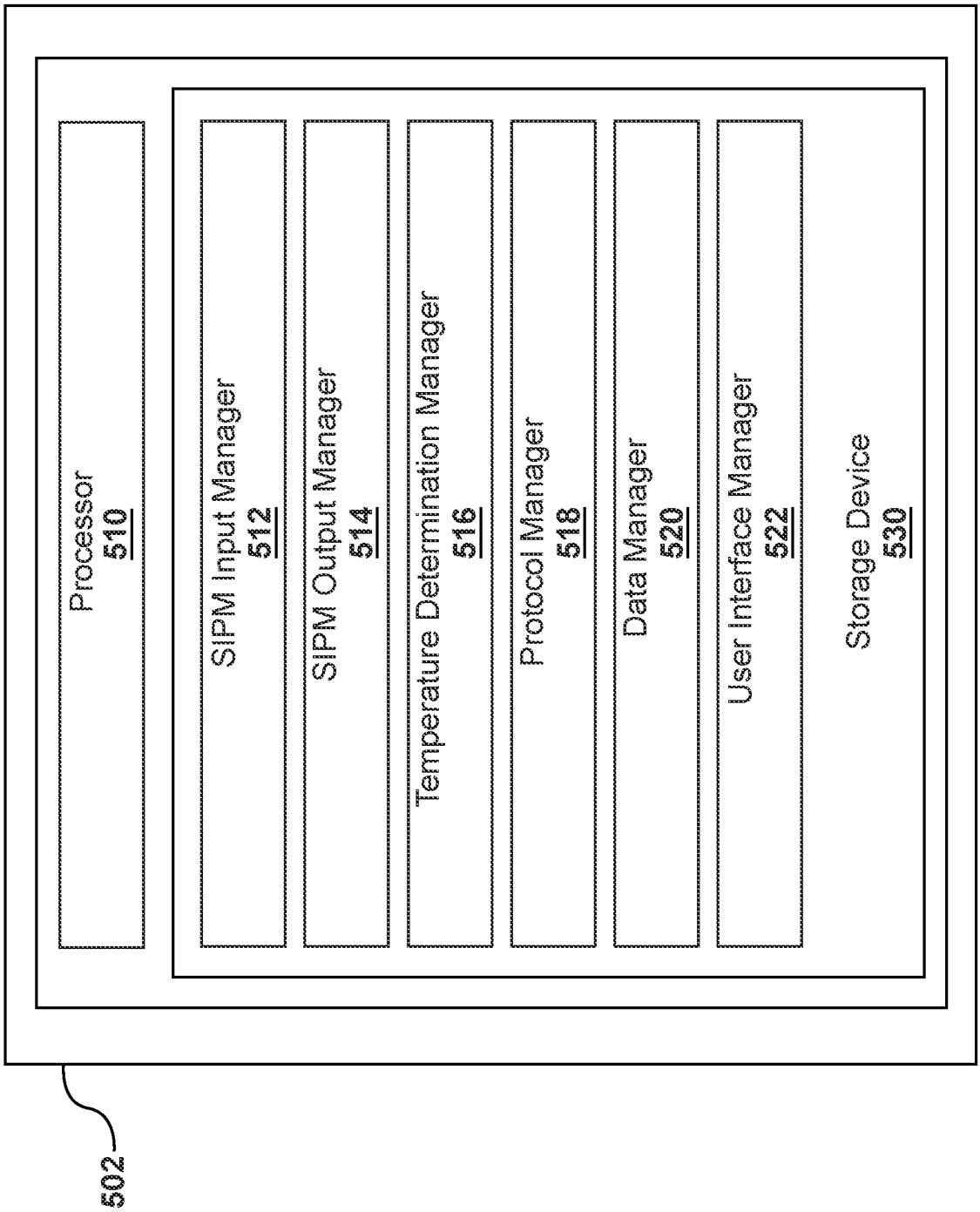

502
Processor
510
SIPM Input Manager
512
SIPM Output Manager
514
Temperature Determination Manager
516
Protocol Manager
518
Data Manager
520
User Interface Manager
522
Storage Device
530

FIG. 4

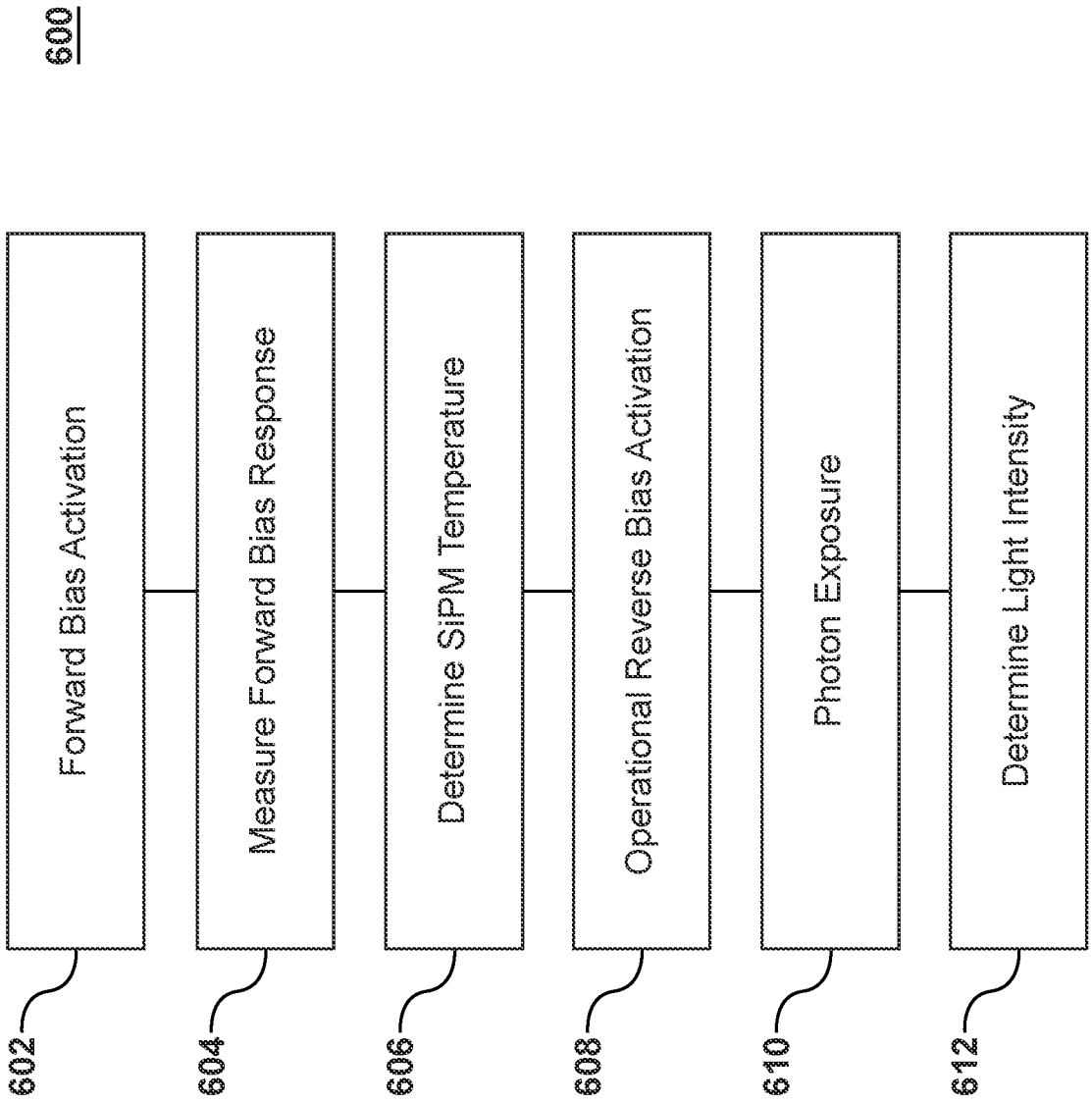

600
Forward Bias Activation
Measure Forward Bias Response
Determine SiPM Temperature
Operational Reverse Bias Activation
Photon Exposure
Determine Light Intensity
602
604
606
608
610
612

FIG. 5

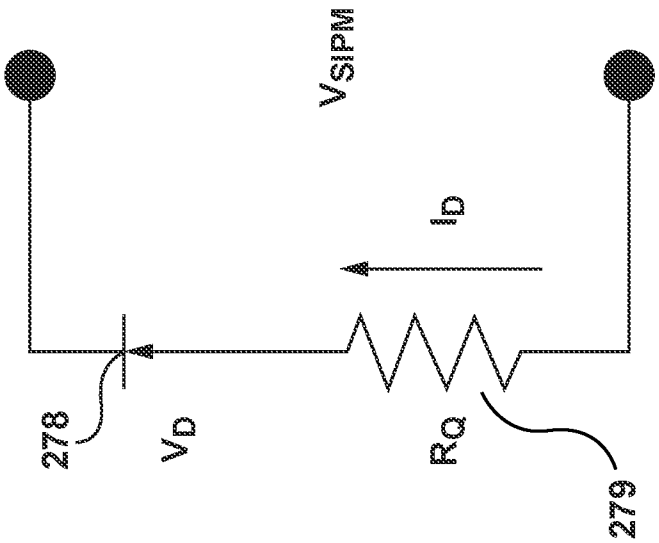


FIG. 6

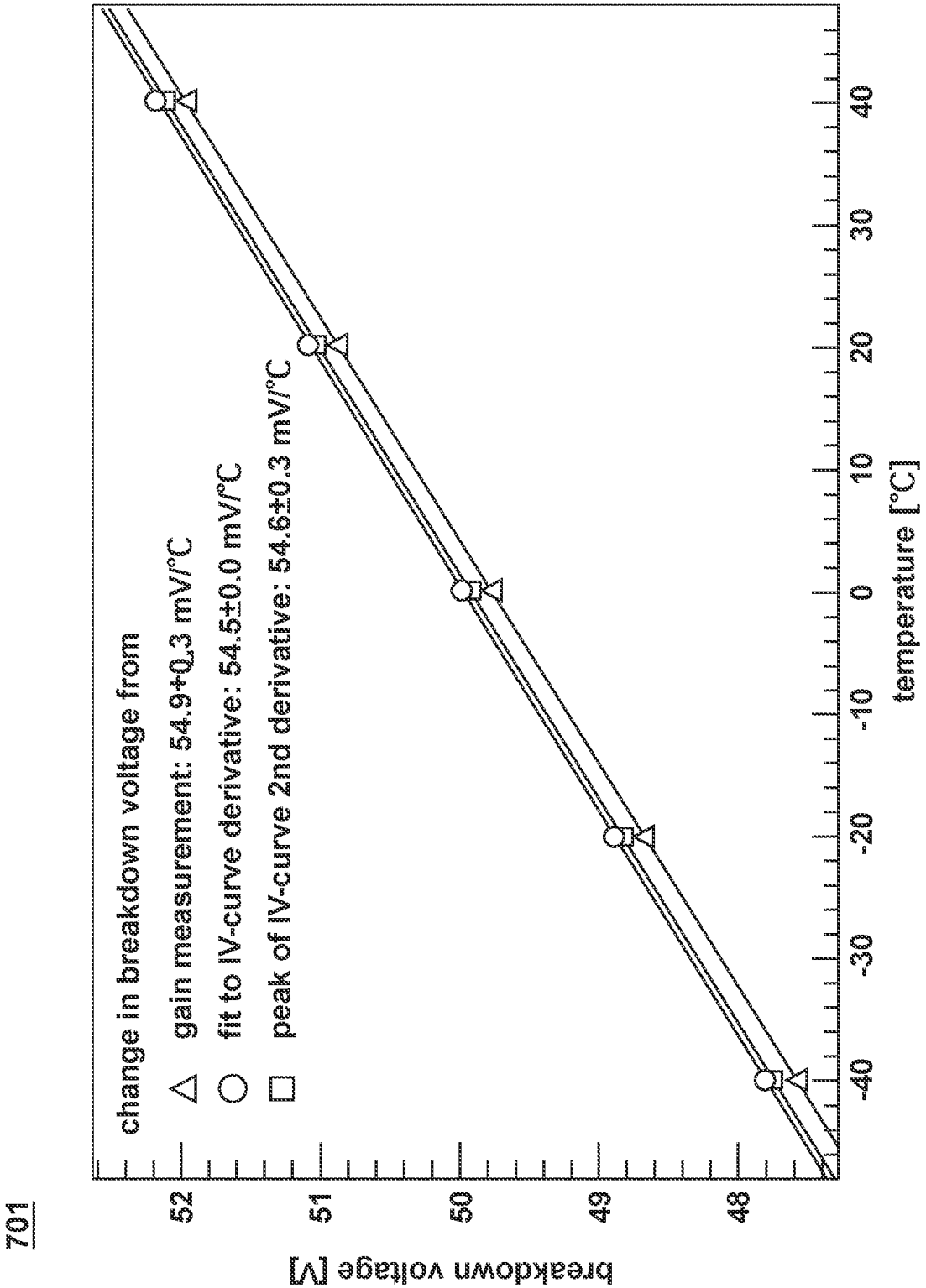

701
change in breakdown voltage from
gain measurement: 54.9+0.3 mV/°C
fit to IV-curve derivative: 54.5±0.0 mV/°C
peak of IV-curve 2nd derivative: 54.6±0.3 mV/°C
breakdown voltage [V]
52
51
50
49
48
temperature [°C]
-40
-30
-20
-10
0
10
20
30
40

FIG. 7

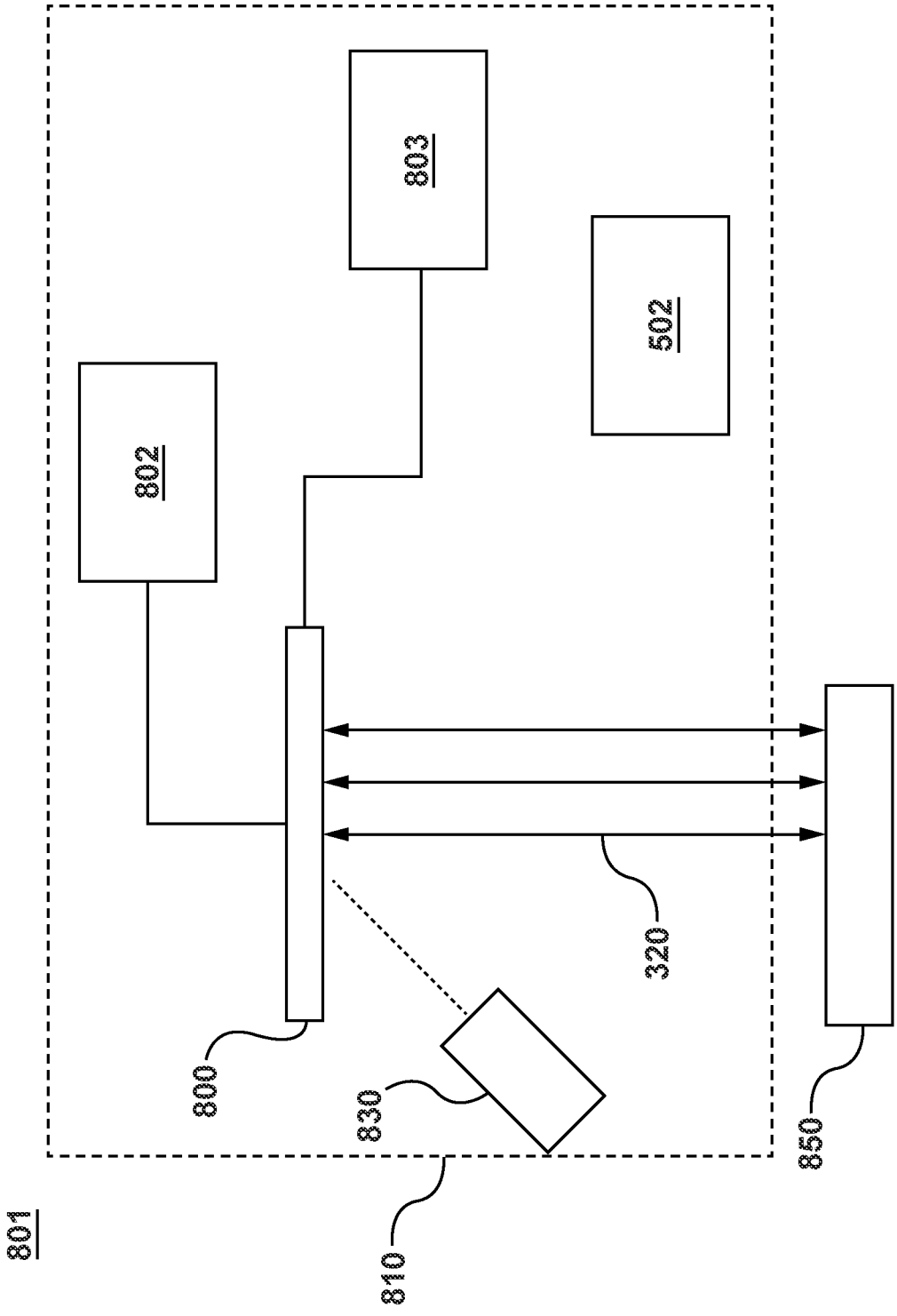


FIG. 8

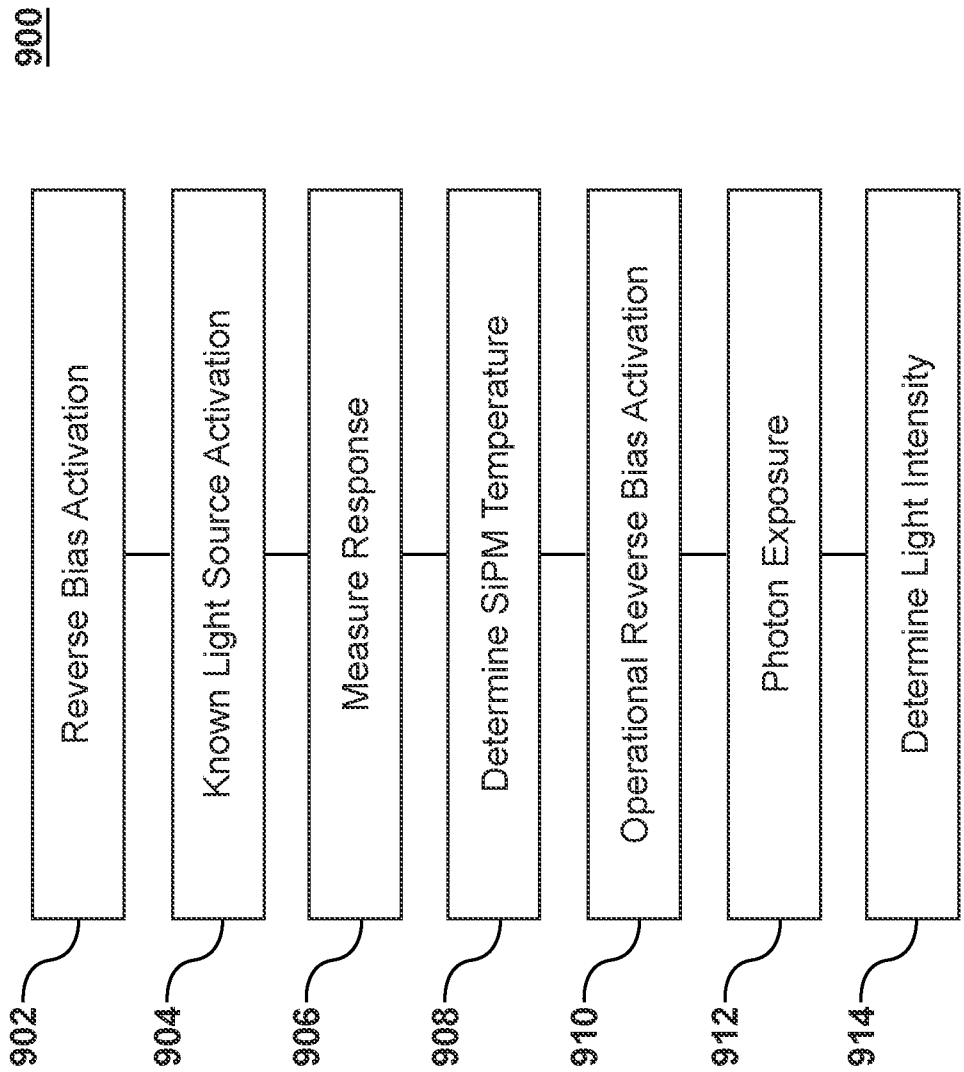

900
Reverse Bias Activation
Known Light Source Activation
Measure Response
Determine SiPM Temperature
Operational Reverse Bias Activation
Photon Exposure
Determine Light Intensity
902
904
906
908
910
912
914

FIG. 9

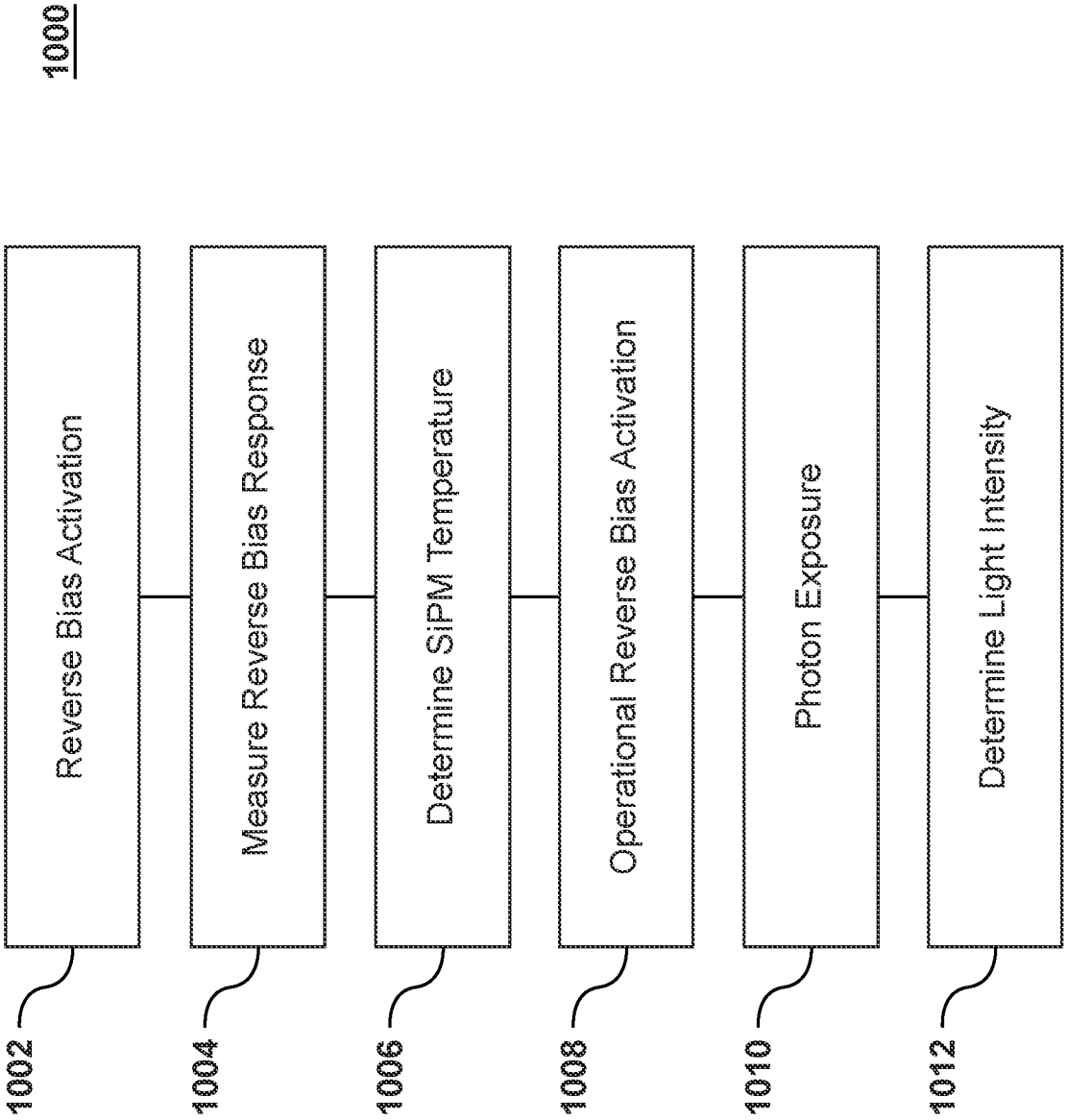

1000
Reverse Bias Activation
Measure Reverse Bias Response
Determine SiPM Temperature
Operational Reverse Bias Activation
Photon Exposure
Determine Light Intensity
1002
1004
1006
1008
1010
1012

FIG. 10

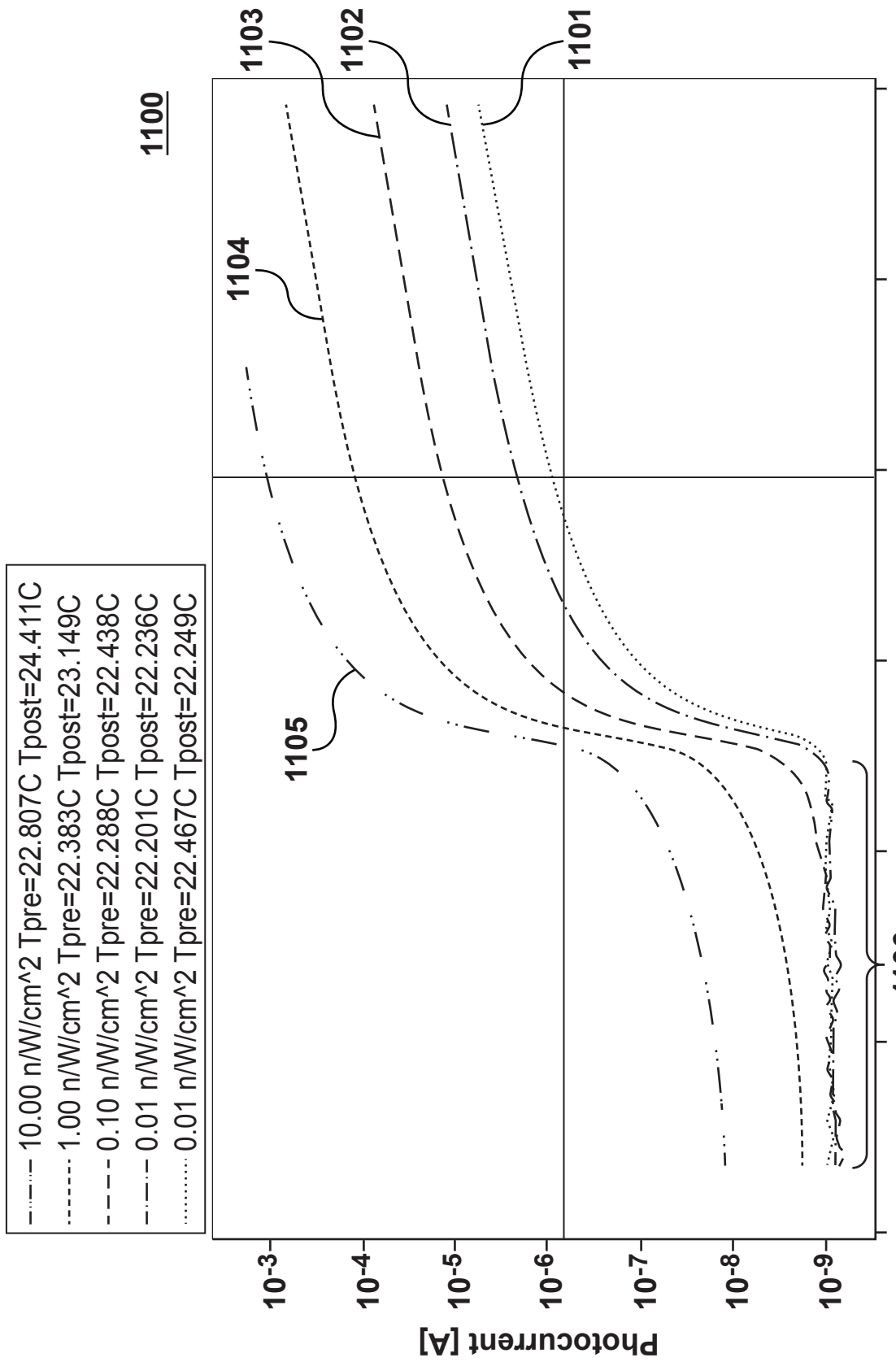

1100
1103
1102
1101
1104
1105
1106
10.00 n/W/cm^2 Tpre=22.807C Tpost=24.411C
1.00 n/W/cm^2 Tpre=22.383C Tpost=23.149C
0.10 n/W/cm^2 Tpre=22.288C Tpost=22.438C
0.01 n/W/cm^2 Tpre=22.201C Tpost=22.236C
0.01 n/W/cm^2 Tpre=22.467C Tpost=22.249C
Photocurrent [A]
10-3
10-4
10-5
10-6
10-7
10-8
10-9
Vbias [V]

FIG. 11

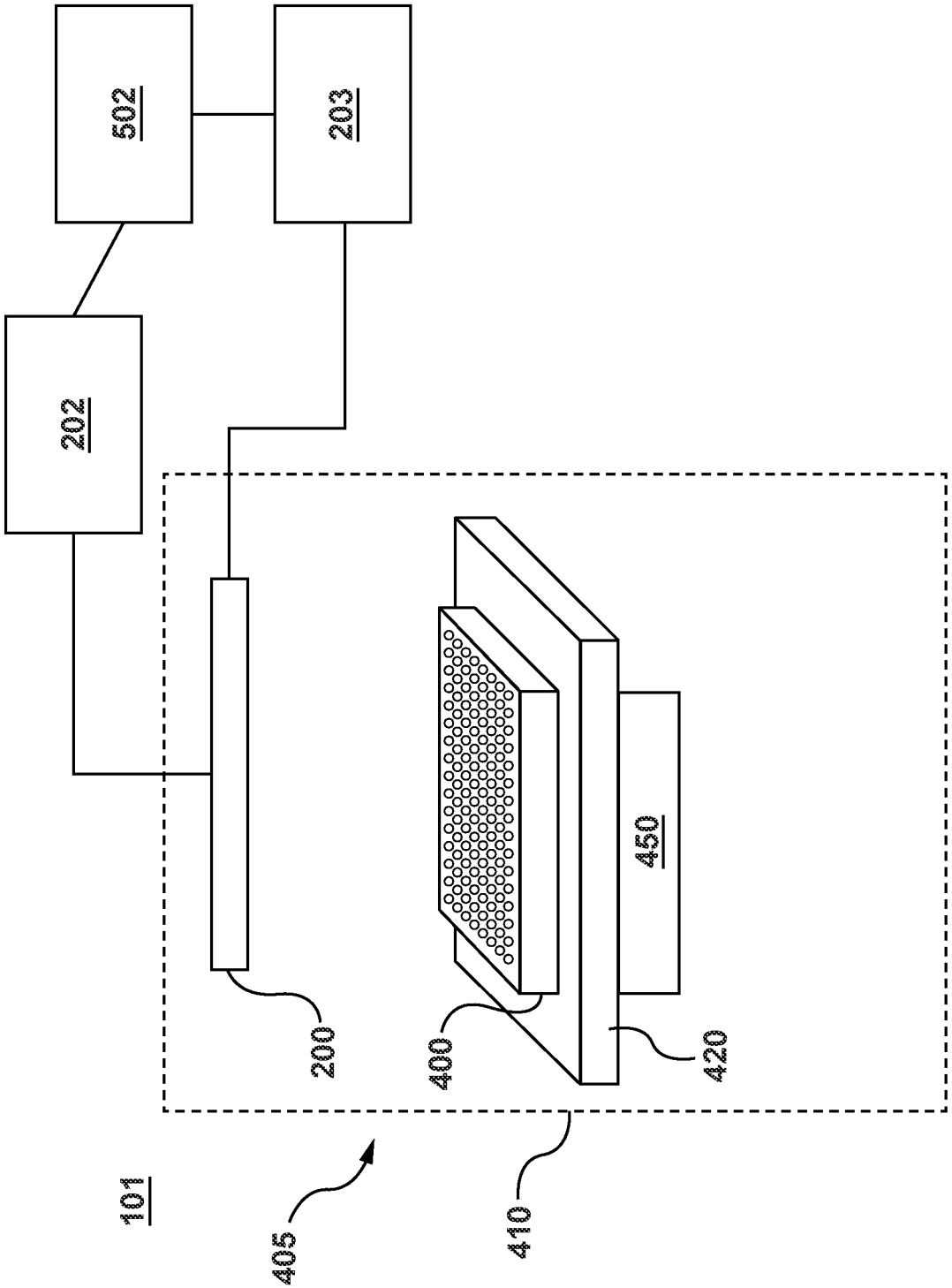


FIG. 12

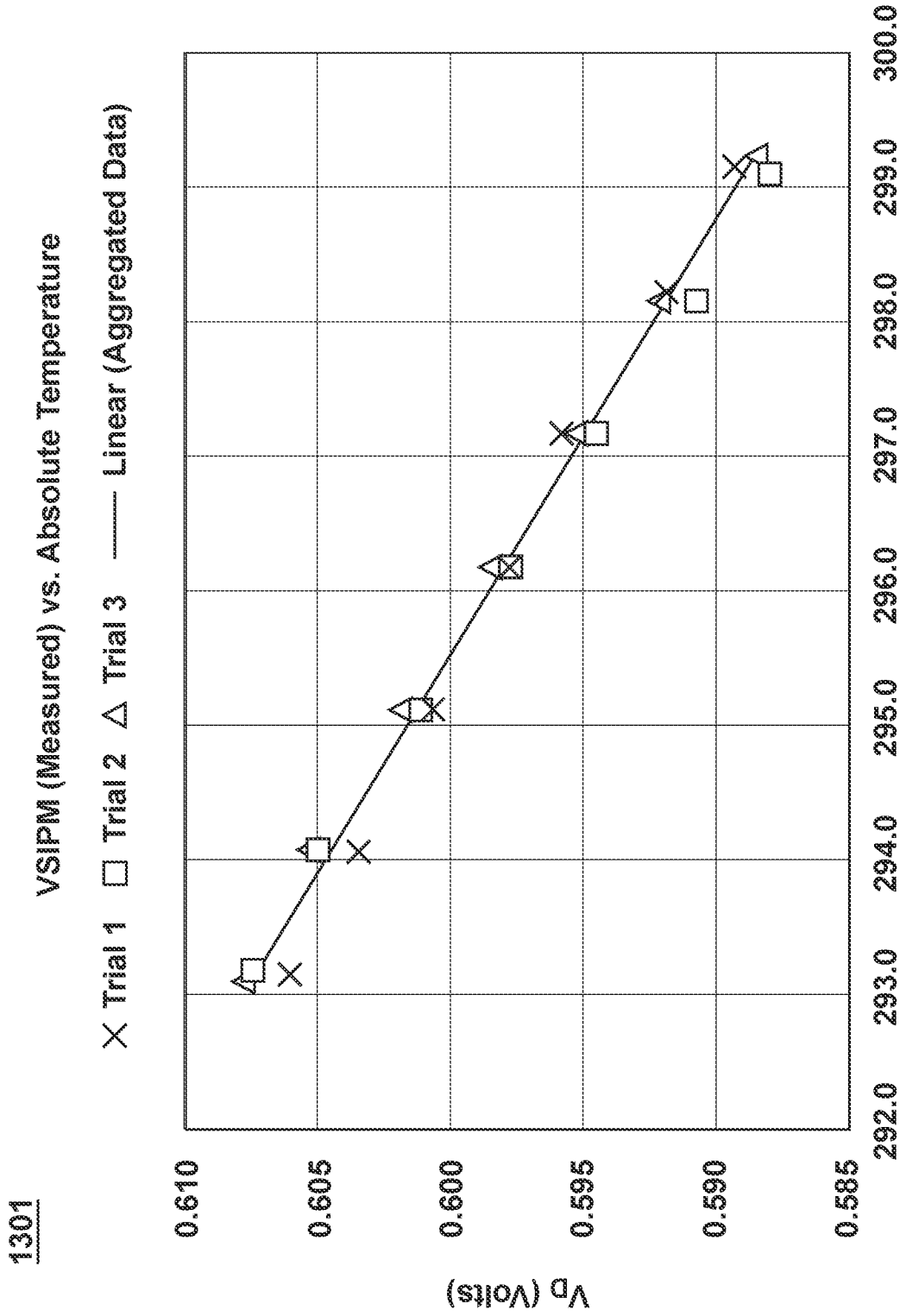

1301
VSIPM (Measured) vs. Absolute Temperature
Trial 1
Trial 2
Trial 3
Linear (Aggregated Data)
V_D (Volts)
0.610
0.605
0.600
0.595
0.590
0.585
292.0
293.0
294.0
295.0
296.0
297.0
298.0
299.0
300.0
Temperature (K)

FIG. 13

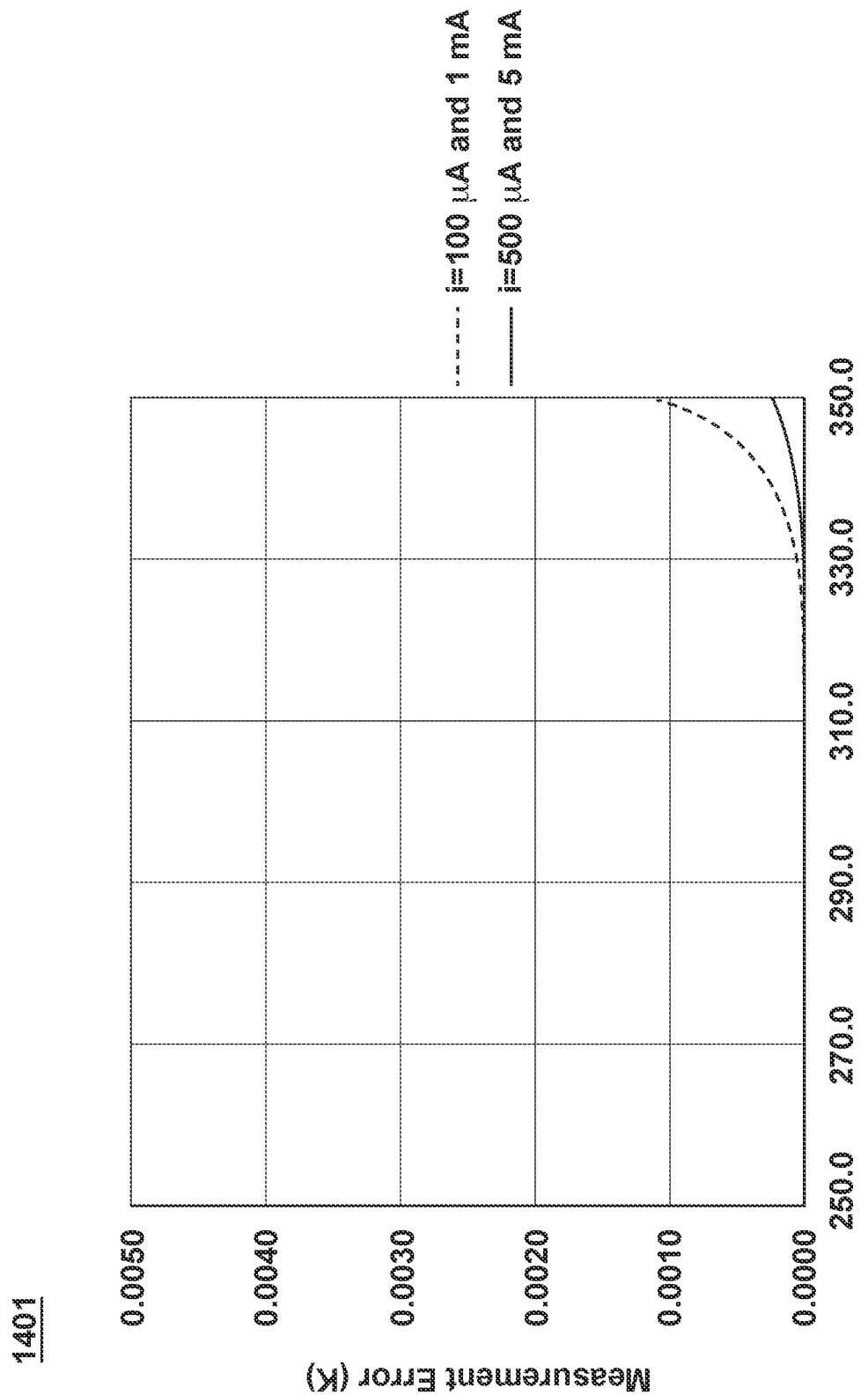

1401
Measurement Error (K)
0.0050
0.0040
0.0030
0.0020
0.0010
0.0000
250.0
270.0
290.0
310.0
330.0
350.0
Device Temperature (K)
i=100 µA and 1 mA
i=500 µA and 5 mA

FIG. 14

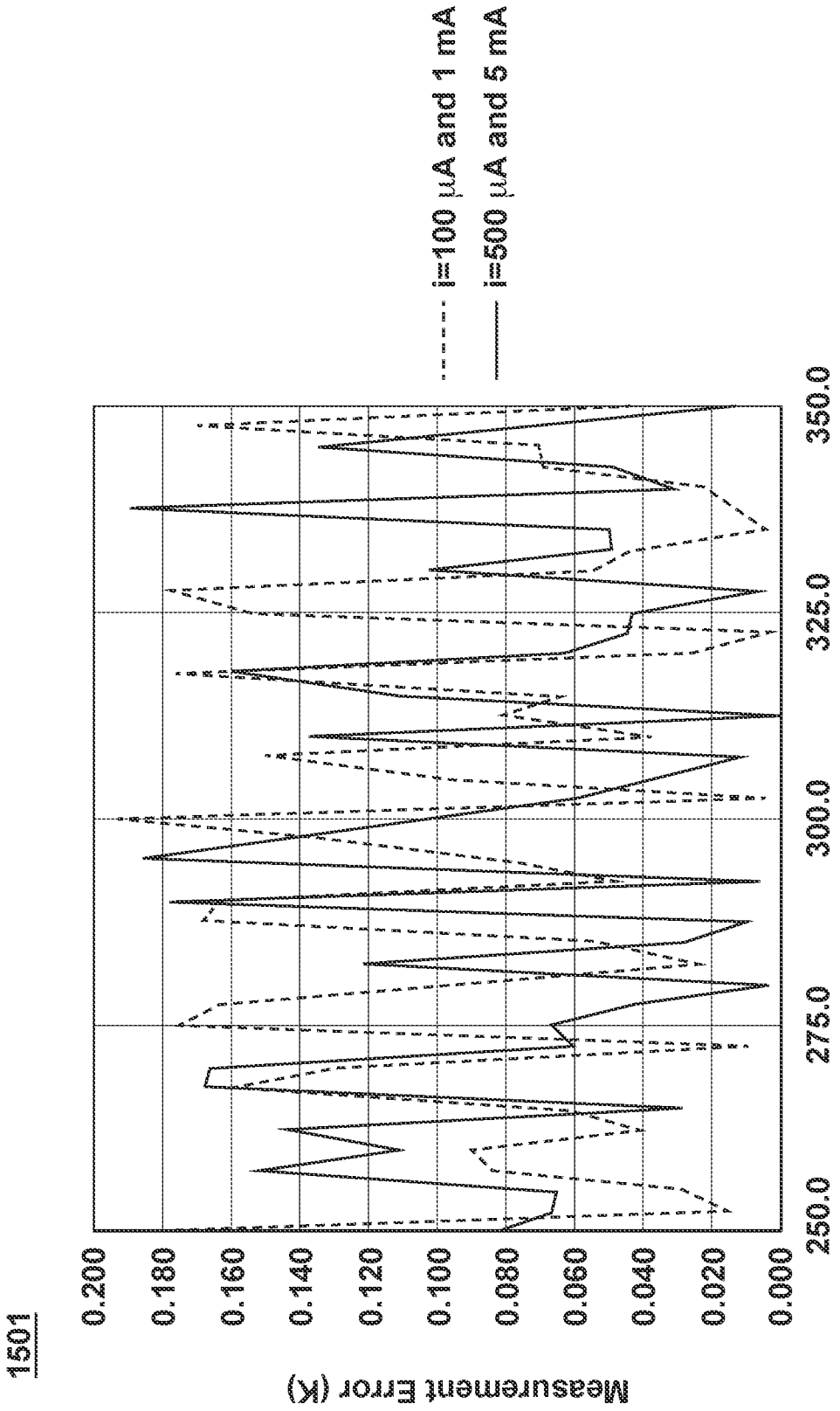

1501
Measurement Error (K)
0.200
0.180
0.160
0.140
0.120
0.100
0.080
0.060
0.040
0.020
0.000
250.0
275.0
300.0
325.0
350.0
Device Temperature (K)
i=100 µA and 1 mA
i=500 µA and 5 mA

FIG. 15

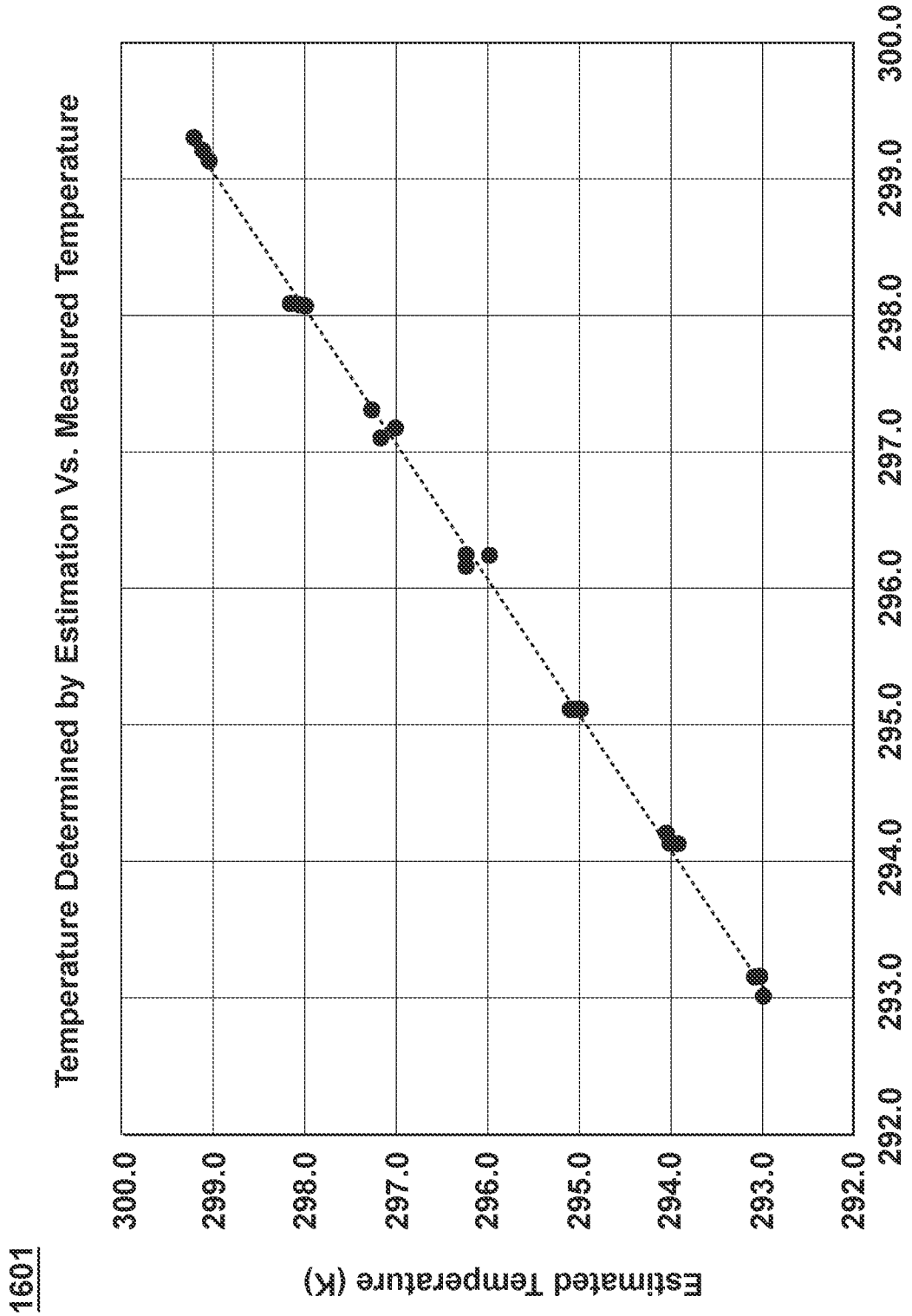

1601
Temperature Determined by Estimation Vs. Measured Temperature
Estimated Temperature (K)
300.0
299.0
298.0
297.0
296.0
295.0
294.0
293.0
292.0
292.0
293.0
294.0
295.0
296.0
297.0
298.0
299.0
300.0
Measured Temperature (K)

FIG. 16