JPL

PRECISION TIME AND FREQUENCY TRANSFER UTILIZING SONET OC-3

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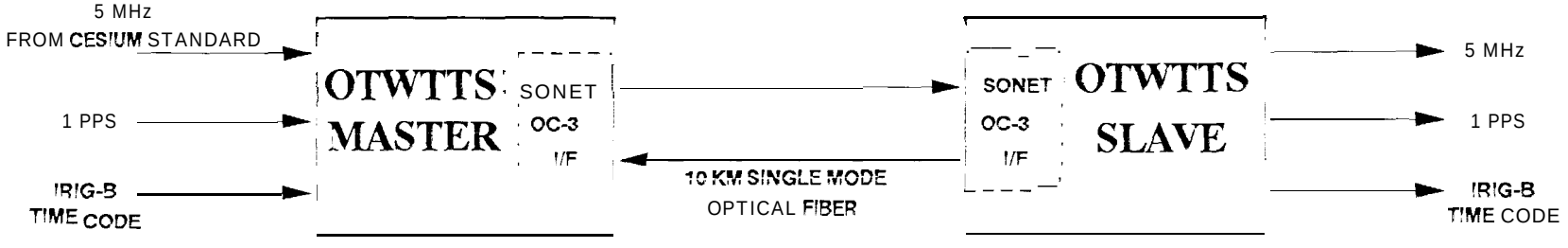
PTTI 1996

ORDER OF PRESENTATION

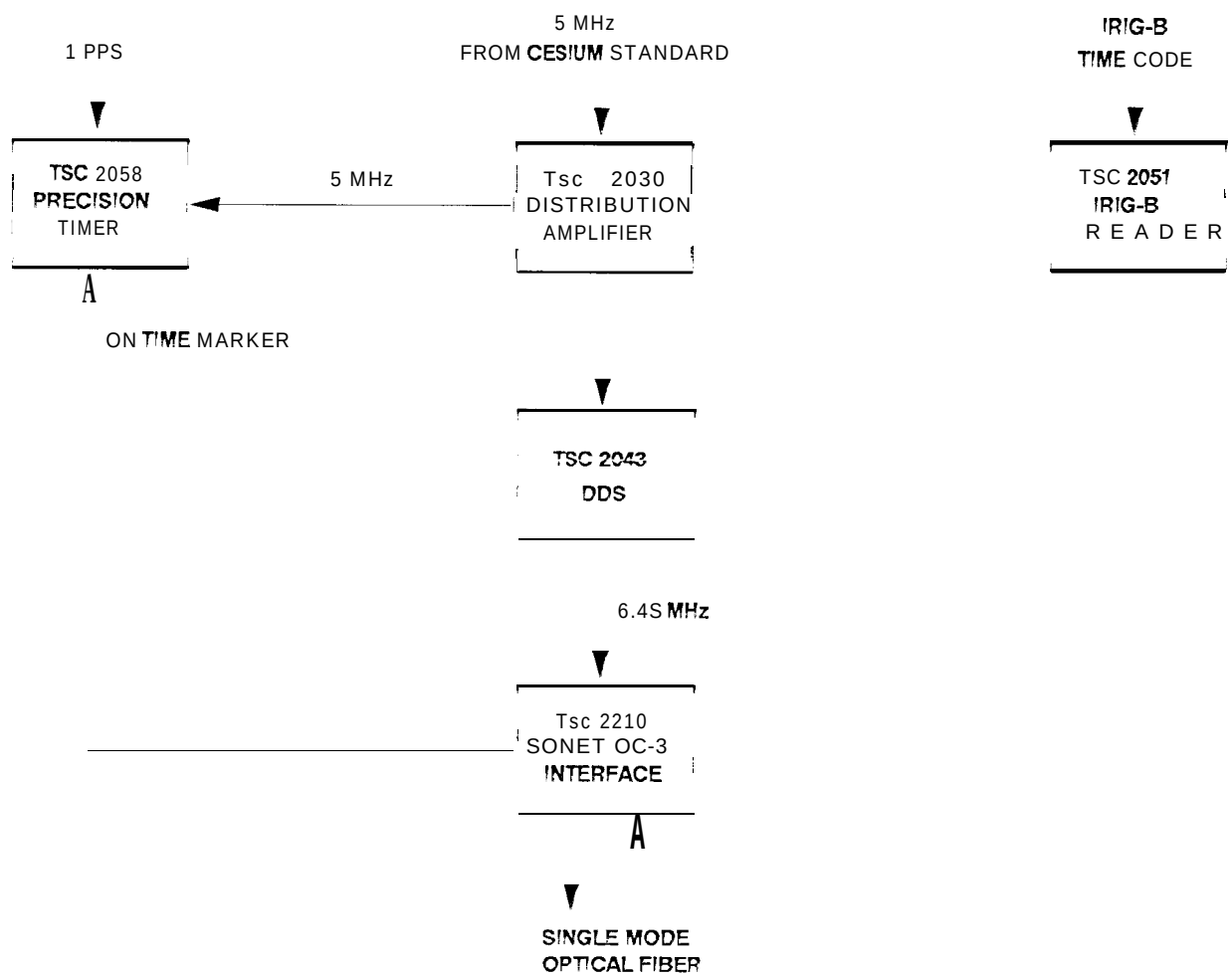
- OVERVIEW OF OTWTTS
- OTWTTS TEST SETUP
- TEST RESULTS
- SUMMARY

OTWTTS OVERVIEW

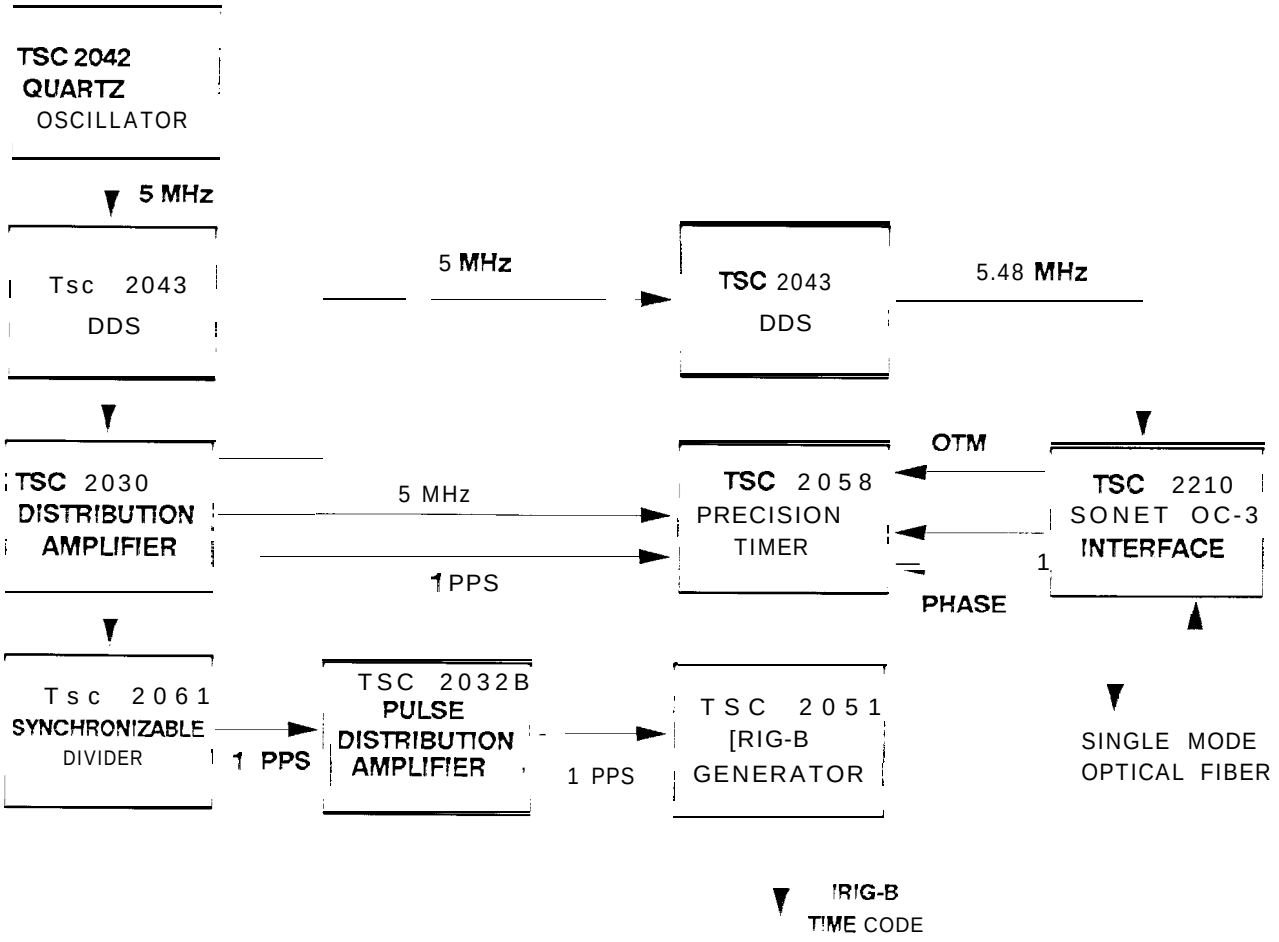
- PROVIDE REFERENCE FREQUENCY AND TIME TO REMOTE USERS LOCATED UP TO 10 KM DISTANCE FROM REFERENCE SOURCE
- TIME OF THE SLAVE 1 PPS IS STEERED TO THE MASTER 1 PPS
- NO DEGRADATION OF HP 5071 STABILITY AND PHASE NOISE PERFORMANCE
- USE STANDARD SINGLE MODE FIBER OPTIC CABLE
- UTILIZE COMMERCIAL SONET OC-3 EQUIPMENT



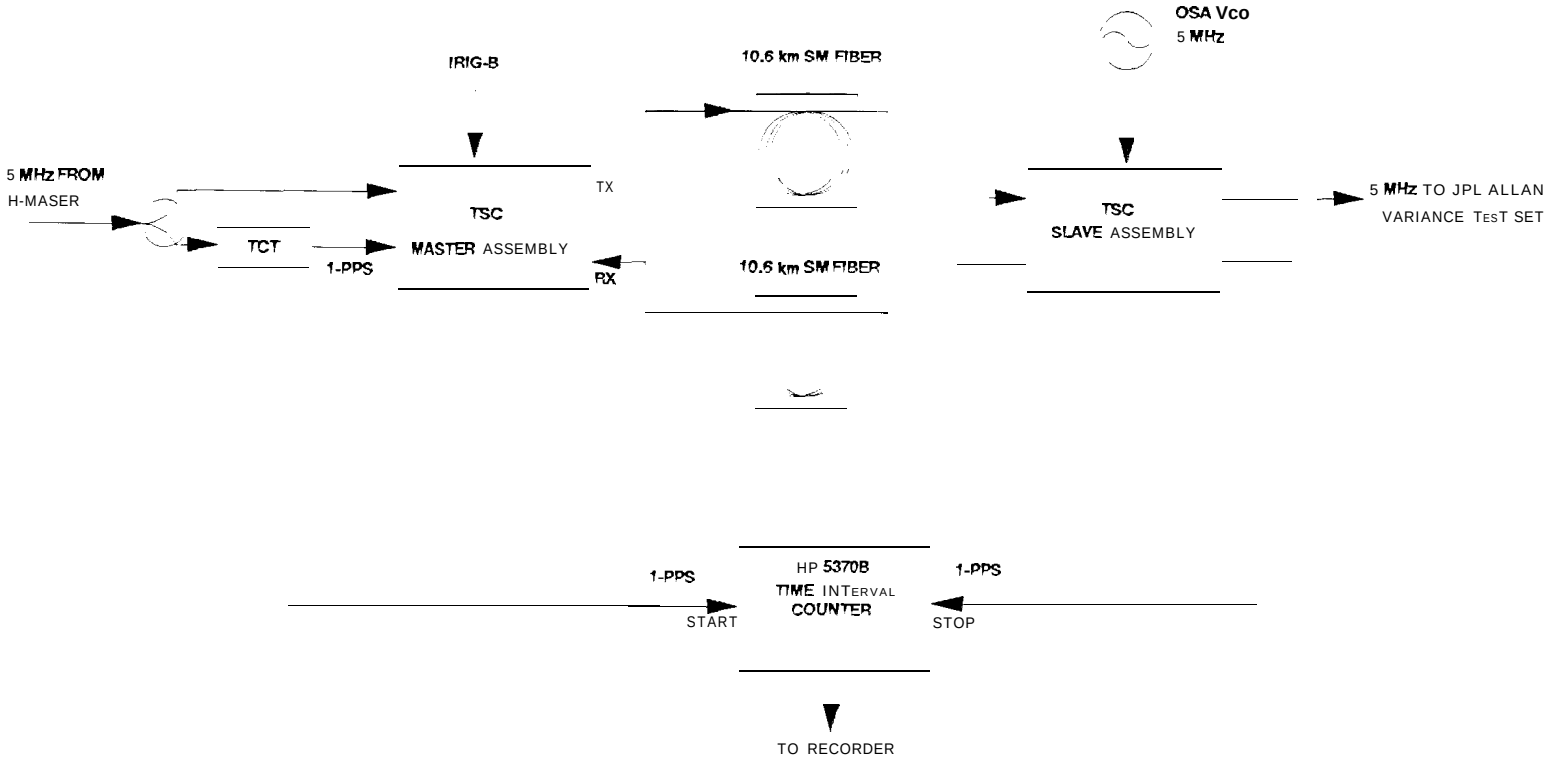
OTWTTS BLOCK DIAGRAM



OTWTTS MASTER UNIT BLOCK DIAGRAM



OTWTTS SLAVE UNIT BLOCK DIAGRAM



TEST CONFIGURATION FOR TSC MASTER-MAW TIME TRANSFER SYSTEM

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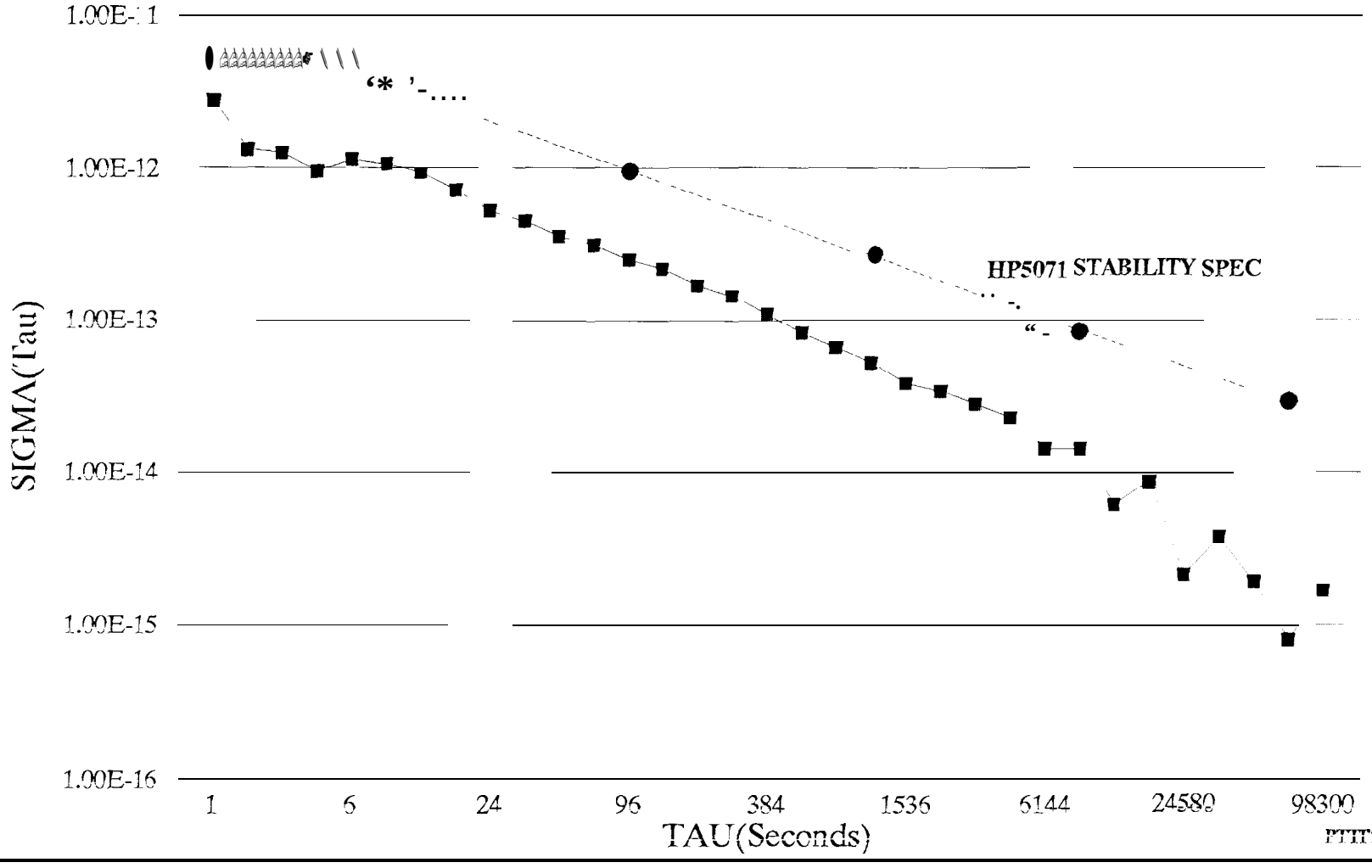
ALLAN DEVIATION

OTWTTS 5 MHz DISTRIBUTION



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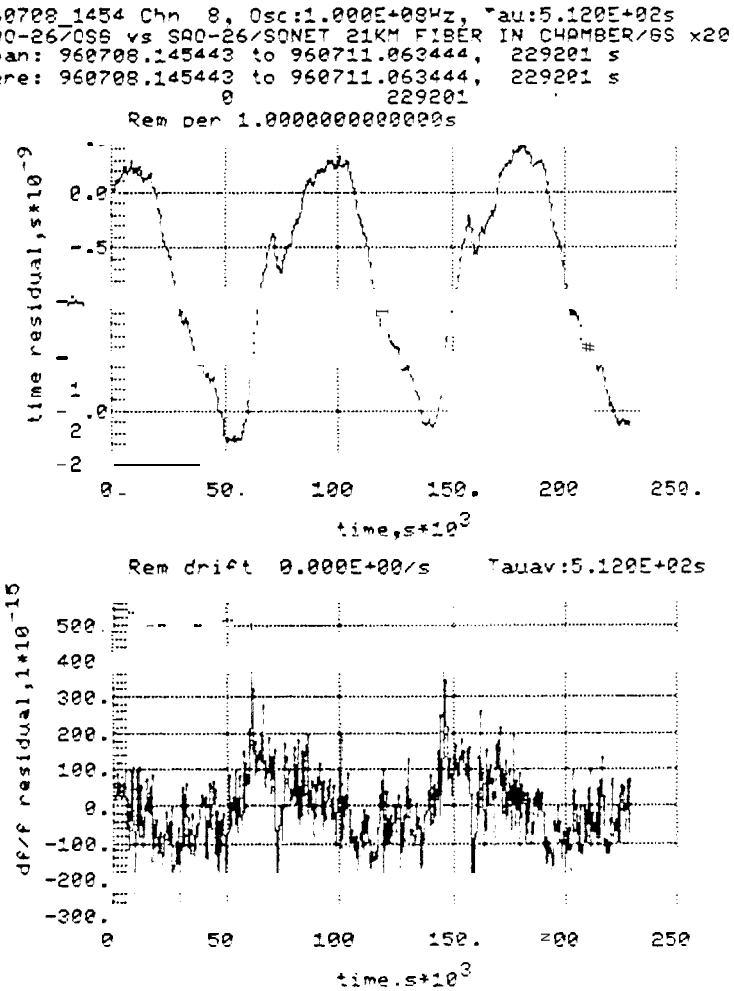
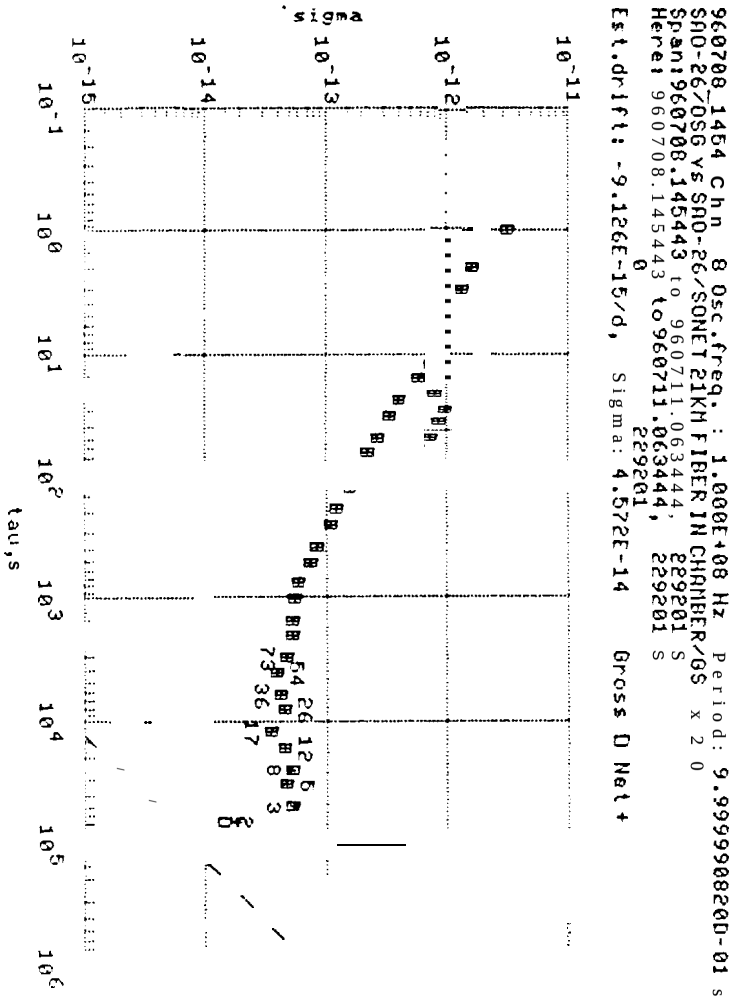
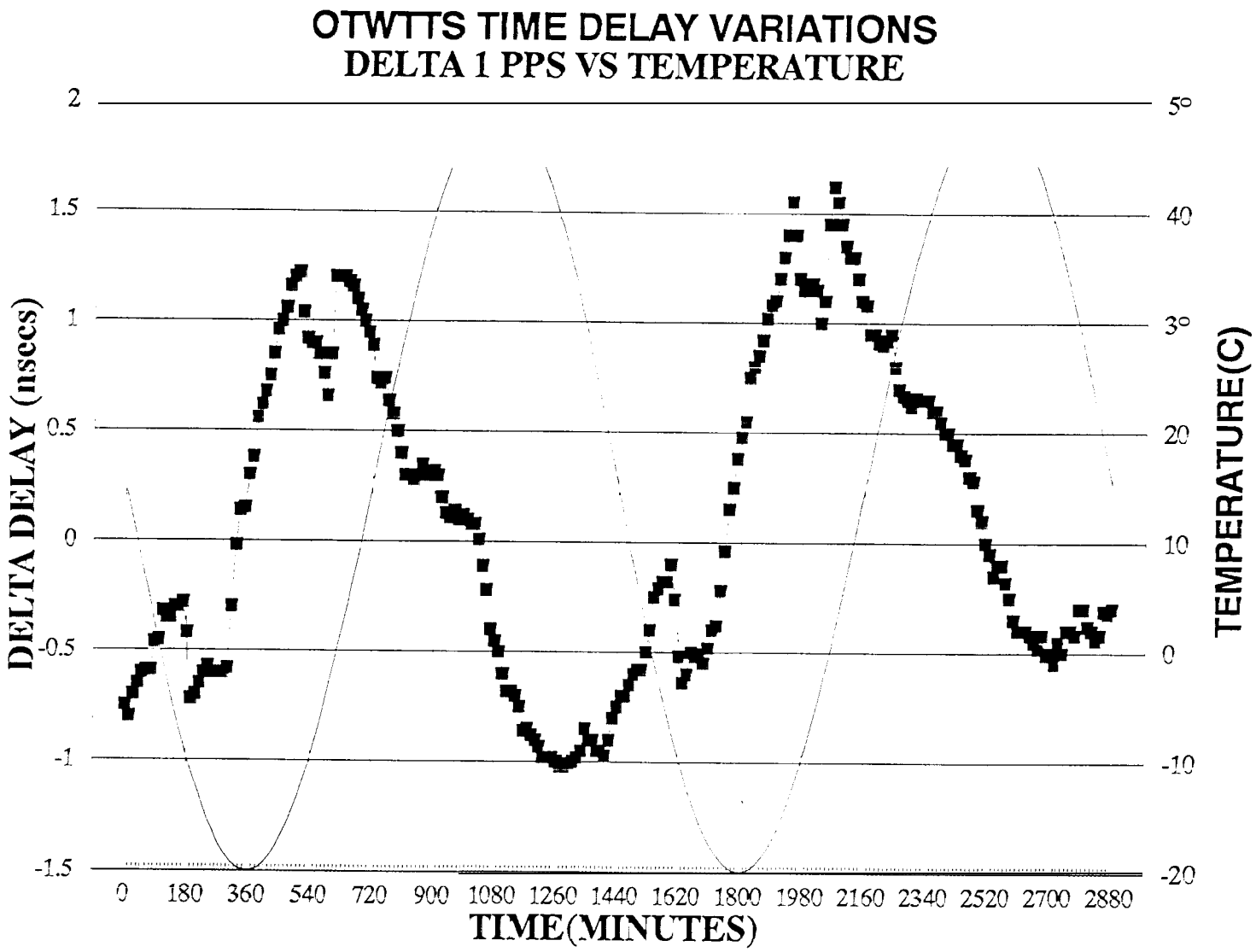
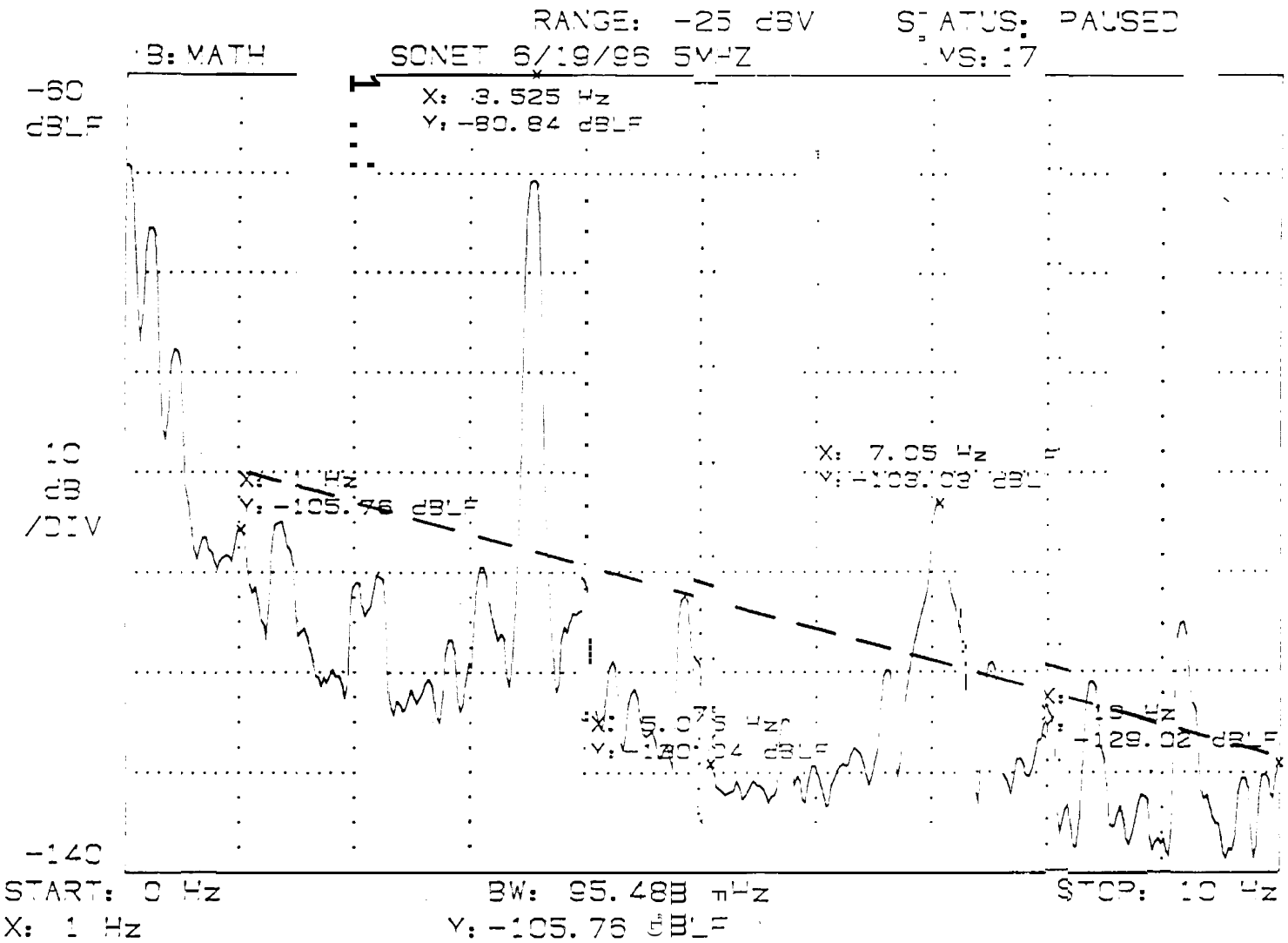


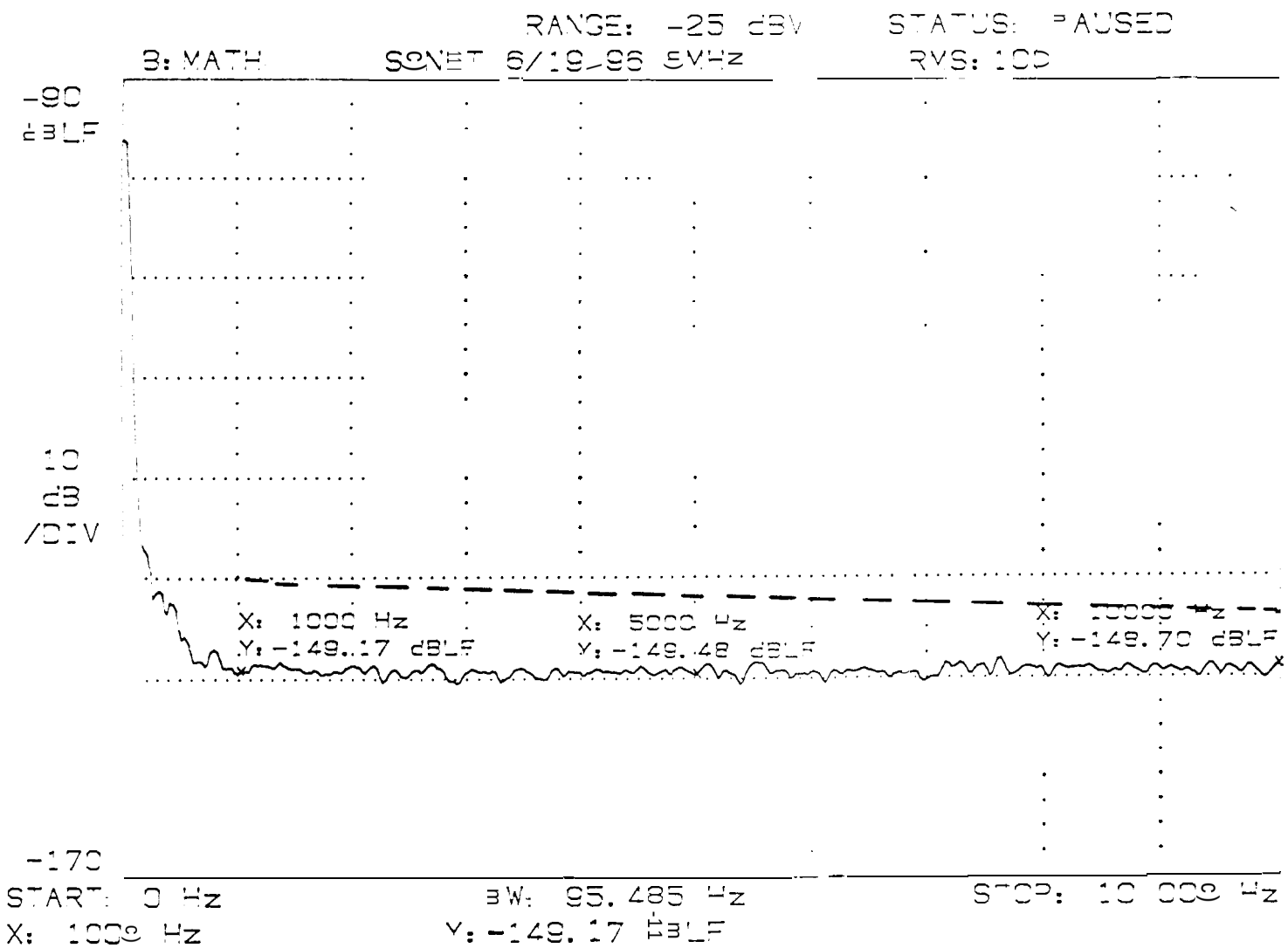


OTWTTS ALLAN DEVIATION, 10.6 KM FIBER, 70 DEGREE DELTA T


OTWTTS TIME DELAY VARIATIONS
DELTA 1 PPS VS TEMPERATURE
DELTA DELAY (nsecs)
2
1.5
1
0.5
0
-0.5
-1
-1.5
TEMPERATURE(C)
50
40
30
20
10
0
-10
-20
0 180 360 540 720 900 1080 1260 1440 1620 1800 1980 2160 2340 2520 2700 2880
TIME(MINUTES)



OTWTTS PHASE NOISE DENSITY: 0 TO 10 Hz



OTWTTS PHASE NOISE DENSITY, 0 TO 10 KHz

SUMMARY

- OTWTTS DOES NOT DEGRADE HP 5071 PERFORMANCE OVER SPECIFIED RANGE OF OPERATION
- WORST CASE SPURS ARE <-80 dBc
- JITTER OF TWO-WAY MASTER SLAVE 1 PPS < 100 ps rms
- DELAY VARIATIONS IN TWO-WAY MASTER SLAVE 1 PPS APPROXIMATELY 2 ns PP OVER 70 C FIBER TEMPERATURE CHANGE
- SONET OC-3 OPTICAL INTERFACE IS A VIABLE VEHICLE FOR TIME AND FREQUENCY TRANSFER