*Knowledge Implementations, Inc.*
Fiber Optic and Communications Systems Engineering/Marketing

Submittal to IEEE 802.4.L

from
Larry Van Der Jagt

July 24

regarding

PROPOSED TESTING AT GENERAL MOTORS OSHAWA PLANT

In order to obtain information regarding the time domain characteristics of the impulse noise in the frequency band of interest for a radio based local area network a test jig has been developed. The attached figure illustrates the basic building blocks which will be used to perform the tests. This test jig has also been designed to provide information concerning the delay spread which is exhibited by the Oshawa Plant environment.

The first of the two tests which will be run is an attempt to monitor impluse noise characteristics in the 915 Mhz band and the 2.5 Ghz band. This will be accomplished by downconverting the band of interest which has been isolated using bandpass filters towards baseband. This low frequency signal then will be monitored using a digital storage oscilloscope to trigger on impulses greater in magnitude than a certain size. This should provide amplitude and duration information about the impulse noise which will be present in the environment. The plan is to execute these tests at a number of locations throughout the plant to isolate the sources of the noise and to determine whether this impairment will be of significant consequence to the design of the network equipment. The band of interest is selected by using the appropriate local oscillator and bandpass filters. In the 915 Mhz band modified cellular radio antennaes will be used and in the 2.5 Ghz range an printed circuit antennae built by Hughes will be used.

In order to obtain information regarding delay spread an arbitrary function generator will be used in conjuction with an up converter to transmit signals which can then be monitored at the receiver. For the purposes of this test a simple balanced modulator approach is utilized to perform the translation. For delay spread testing the receiver consists of an I and Q detector with the intent being that frequency locked local oscillators will be generated using synthesized frequency generators with the external clock sync cabled from one generator to the other. This provides the means to actually transmit and receive data and pulses. It is intended that the I and Q will be combined using computer analysis during post test analysis of the data. Delay spread measurements will be done in the 915Mhz band. Tests will be performed at a variety of locations within the plant with the intention being that post test computer analysis will be performed to determine what impact the superposition of multiple transmitters will have on the delay spread at a given location.

32 Conklin Road, Warwick, New York 10990 (914) 986-3492

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The potential also exists if the equipment is available to utilize a network analyzer equipped with a time domain analysis capability to sweep the band of interest and obtain a direct reading of the delay spread. Since the band of interest is narrow and our license does not permit transmission outside of this band the resolution of the information obtained will not be particularly high, however, it has been pointed out that since actual operation will be in only this band that the delay spread which is seen by the actual equipment will only be resolvable to this degree.

It is currently the intent to execute these test during the week of July 24-28, 1989. Any input regarding the methodology proposed or potential improvements or other possible tests given this test basic test jig are welcome.

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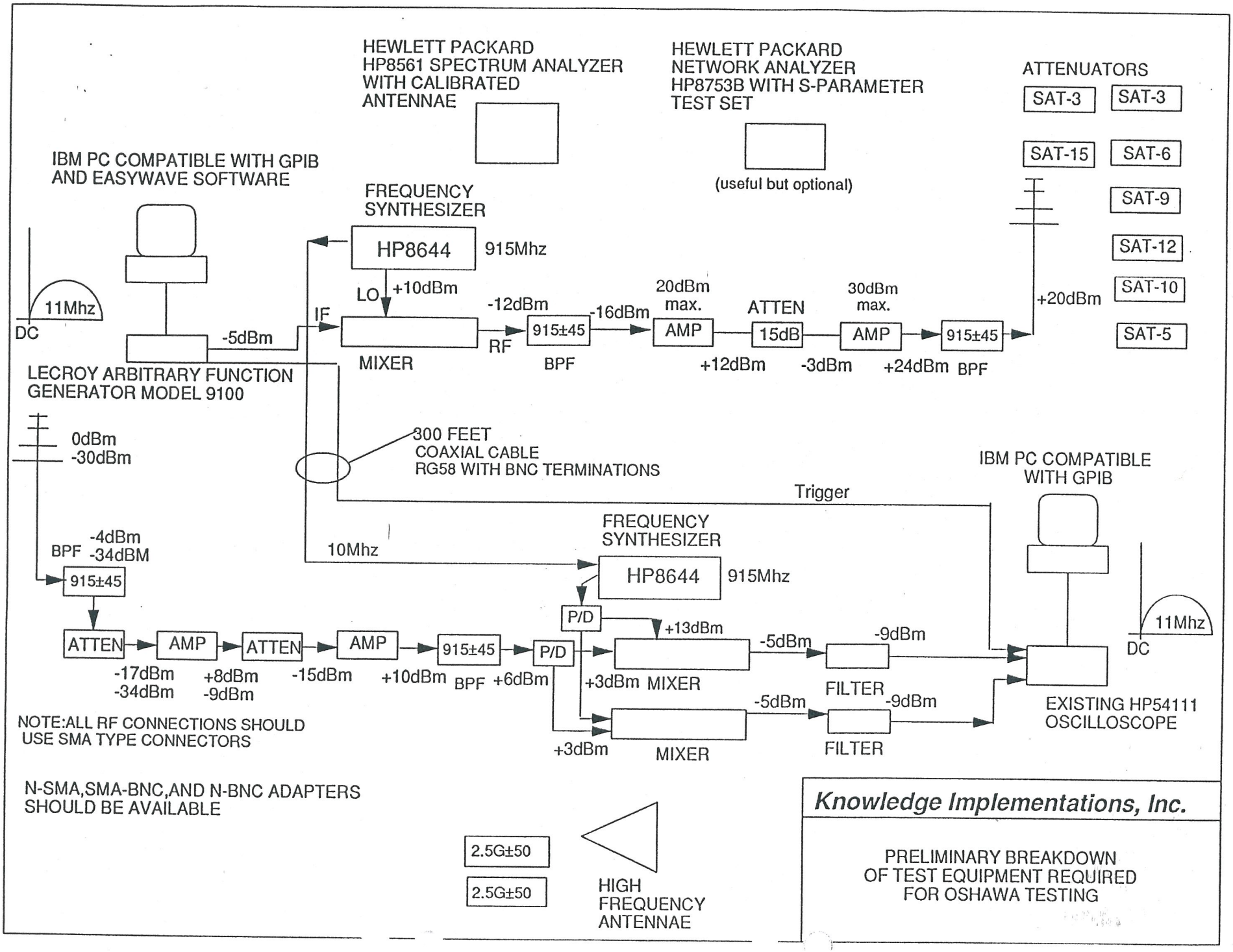
HEWLETT PACKARD
HP8561 SPECTRUM ANALYZER
WITH CALIBRATED
ANTENNAE
HEWLETT PACKARD
NETWORK ANALYZER
HP8753B WITH S-PARAMETER
TEST SET
(useful but optional)
ATTENUATORS
SAT-3
SAT-3
SAT-15
SAT-6
SAT-9
SAT-12
SAT-10
SAT-5
IBM PC COMPATIBLE WITH GPIB
AND EASYWAVE SOFTWARE
FREQUENCY
SYNTHESIZER
HP8644
915Mhz
LO
+10dBm
11Mhz
DC
IF
-5dBm
-12dBm
-16dBm
20dBm
max.
ATTEN
30dBm
max.
+20dBm
RF
915±45
MIXER
BPF
AMP
15dB
AMP
915±45
+12dBm
-3dBm
+24dBm
BPF
LECROY ARBITRARY FUNCTION
GENERATOR MODEL 9100
0dBm
-30dBm
300 FEET
COAXIAL CABLE
RG58 WITH BNC TERMINATIONS
IBM PC COMPATIBLE
WITH GPIB
Trigger
FREQUENCY
SYNTHESIZER
10Mhz
HP8644
915Mhz
-4dBm
BPF -34dBM
915±45
P/D
+13dBm
-5dBm
-9dBm
ATTEN
AMP
ATTEN
AMP
915±45
P/D
-17dBm
-34dBm
+8dBm
-9dBm
-15dBm
+10dBm
BPF +6dBm
+3dBm
MIXER
FILTER
11Mhz
DC
-5dBm
-9dBm
+3dBm
MIXER
FILTER
EXISTING HP54111
OSCILLOSCOPE
NOTE:ALL RF CONNECTIONS SHOULD
USE SMA TYPE CONNECTORS
N-SMA,SMA-BNC,AND N-BNC ADAPTERS
SHOULD BE AVAILABLE
2.5G±50
2.5G±50
HIGH
FREQUENCY
ANTENNAE
Knowledge Implementations, Inc.
PRELIMINARY BREAKDOWN
OF TEST EQUIPMENT REQUIRED
FOR OSHAWA TESTING