VHF Simulcast Surface Coverage add-on to existing TeNSr backbone system

RF Design & Integration Inc.
Wireless System Solutions

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Reasons for the add-on

• Improvement of Surface Radio Communications Coverage
• Addition of duplex repeater operation
• Replacement of outdated equipment
• Addition of simulcast conventional coverage while using an existing system backbone for cost considerations
• Use of existing sites that are owned or under lease
Control Point Add-on
Co-located RF Add-on

Prime and Slave loopback DSM cards are located in the same chassis and are treated just as if the site was not co-located.

Existing Premsys Channel Bank with DSM II cards

VHF MASTR III Station 1-4

To/From Multicoupler/Combiner

GPS

Efratom 5Mhz Reference

1 PPS Signal

Timed TX Audio

E Lead/PTT

Voted RX audio wired directly to Harris T1 Channel Bank Via Optical mux

Audio/PTT fan out to remote sites via T1

Tx audio via Optical Mux/Harris T1 Channel bank

Convex Audio Dist/PTT

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Co-located Simulcast control point RF site
Typical RF Surface Site

Existing
Premises
Channel Bank with DSM II Card

Verizon T1 line to and from control point

Tx / Rx Audio and E Lead
PTT to Each Station

Eratom 5MHz Reference

GPS

Rx Antenna

Tx Antenna

MASTR III
VHF Station 1

MASTR III
VHF Station 2

MASTR III
VHF Station 3

MASTR III
VHF Station 4

TX-RX

VHF Multicoupler/Combiner

Simulcast VHF Remote surface site
Additional Site on Surface Simulcast System

• Due to physical space and leasing constraints an additional site was installed for the simulcast conventional system
• The backbone for this site needed to be duplicated
• Cost to add this site was a concern
• A Spectracom Model 8197 GPS/Rb Master Oscillator was added and used in conjunction with an additional DSM II / TeNSr channel bank
Add-on site Backbone Block Diagram

Spectracom 8197

5 MHz Outputs

Spectracom 1 PPS output via DB 9 connector to 50 ohm BNC connector cable

DSM II (1PPS) Input

TeNSr

DSM II
Tunnel coverage extension using RF/Fiber technology with Simulcast Surface System backbone
RF-to Optical / Optical-to-RF Block Diagram
RF-to-Optical Downlink Fiber

Transmitter Inputs to combiner set at equal levels based on individual combiner channel losses

Adjustable directional coupler

Coupler adjusted to produce 0 to -10 dB out of the following 3 way splitter @ 0 db loss

3 way splitter

Most fiber optic systems utilize 0 to -10 Db maximum RF input carrier level to fiber optic head end

Downlink section of 3 site RF to Optical Tray

Optical down links to Site 1 / 2 / 3
Optical to RF conversion loss = 1db / 2db
Optical-to-RF Uplink

Due to the nature of Fiber optical amplifiers band width being 96 MHz to 1 GHz and associated losses, at remote ends, it is not uncommon to see -80 to -120 dBm noise floor. The gain at the remote side should be adjusted down while increasing the gain at the local side to ensure the needed carrier to be at least 10 dBm out of the noise floor.

Due to the nature of Optical fiber attenuation Link budget 1 DB of optical loss ~ 26 dB of RF Loss Care must be given as to Optical vs RF losses to produce the gain needed without overloading the optical front end of the remote side. Most high end Biamp in the system will include an AGC circuit to clamp high RF input levels.
Fiber / RF Remote Site
Questions?

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