

RaptorXR Case Study

Country: USA, Central Valley California

Agri-Business VHF-UHF Cross-band Broadband Link - Deployment and Performance Overview

RCS-0518-2

Date: 1 May 2018

Product Overview

Today's successful agri-business operations requires 7/24 access to reliable high-rate full-duplex broadband communications. This Study describes, in detail, the implementation of a 9 mile link in the heart of California's Central Valley using the RaptorXR broadband TVWS point-to-point radio operating in the VHF and UHF bands.



Agricultural communications offers terrain and operational challenges not met by microwave based systems. RaptorXR systems using VHF and UHF spectrum provides fixed, portable table and mobile connectivity in the most challenging applications

Table 1. Configuration and Performance Summary

- Line of Sight Range: 13.1 km (8.25 miles)
- Constant Full-duplex Data Rate: 22 Mbps

Ranch Base Station:

- Tx Center Frequency: 183 MHz
- Tx Average Output Power: 23 dBm @ 6 MHz
- Tx Antenna Gain: 10 dBi – Vertical Polarization
- Average Transmission Line Loss: 2 dB
- Tx EIRP: 31 dBm
- Rx Center Frequency: 531 MHz
- Rx Measured Noise Floor: -78 dBm @ 8 MHz
- Average Rx Signal: -80 dBm
- Rx Signal Range: -78 to -84 dBm
- Average Downlink Rate: 12 Mbps

Cell-Tower Internet Gateway

- Tx Center Frequency: 521 MHz
- Tx Average Output Power: 23 dBm @ 8 MHz (.316 RMS Watts)
- Tx Antenna Gain: 13 dBi – Horizontal Polarization
- Average Transmission Line loss: 2.5 dB
- Tx EIRP: 34.5 dBm
- Rx Center Frequency: 521 MHz
- Rx Measured Noise Floor: -91 dBm
- Average Rx Signal: -80 dBm
- Rx Signal Range: -79 to -82 dBm
- Average Uplink Rate: 10 Mbps

Deployment – System Commissioned: November 20, 2017

The deployment process consisted of four critical steps:

1. Selecting operating Channels: The FCC data base indicated that VHF hi-band channels 7 and 8 and UHF Channels 21 and 22 were available for fixed operation
2. A radio propagation simulation was done using Radio Mobile, a free application at <http://www.ve2dbe.com/english1.html>. The results of the simulation are shown in Figure 5. Simulation results predicted an average received signal levels of approximately -71 dBm for the VHF link and -80 for the UHF link.
3. The RaptorXR, in scanning mode, measured the local received noise floor power for both the VHF and UHF bands. The Rx signal power must exceed the noise floor power by 4-5 dB to sustain a minimum connectivity of 6 Mbps. Table 1 shows actual deployed operational parameters and received signal levels.
4. Figures 2 and 5 show the RaptorXR and antenna site configurations. Note the low ranch antenna height and the antenna pointing into trees, a operating condition not possible with microwave based systems.

Figure 2. RaptorXR Cross-Band VHF – UHF Point-to-Point Application

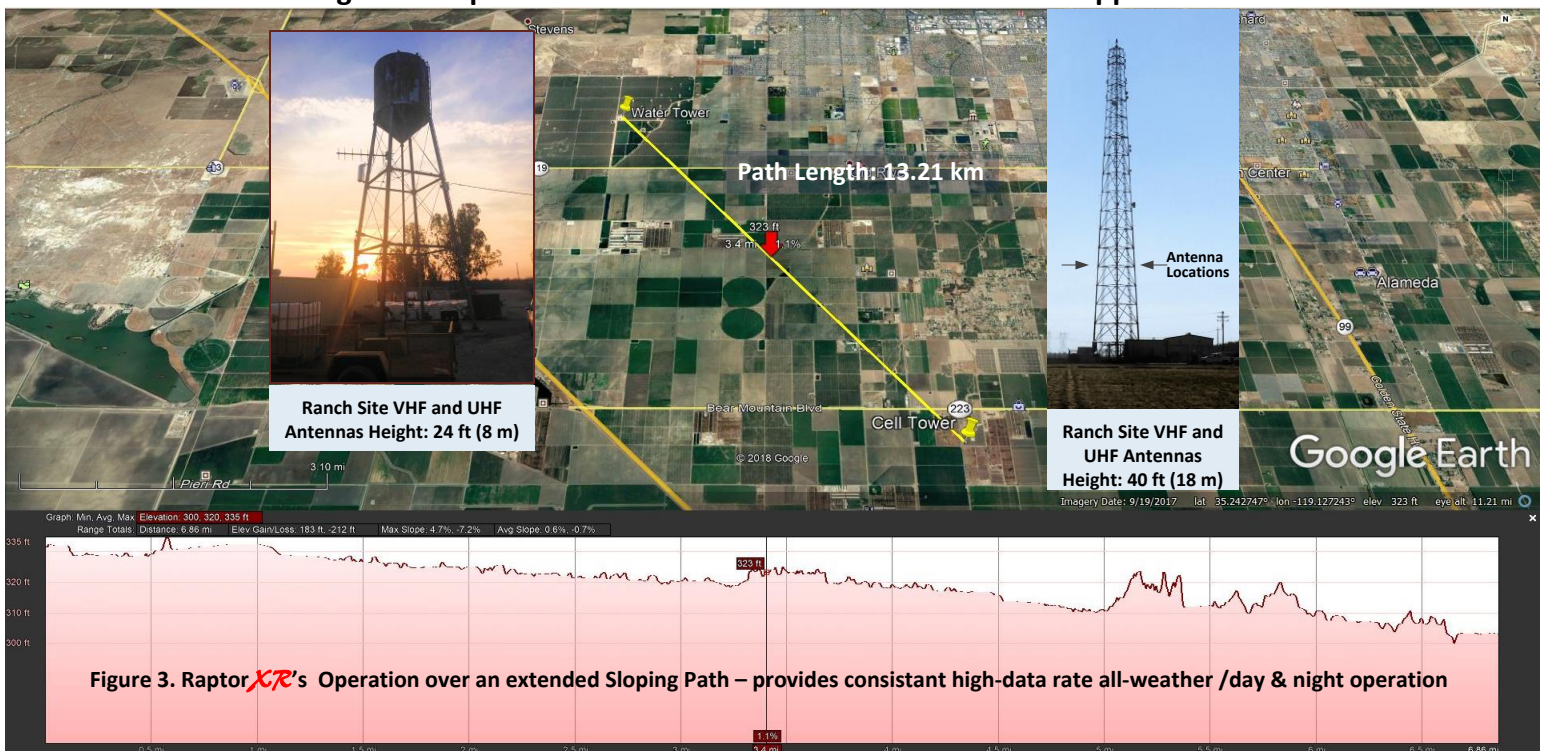


Figure 3. RaptorXR's Operation over an extended Sloping Path – provides constant high-data rate all-weather /day & night operation

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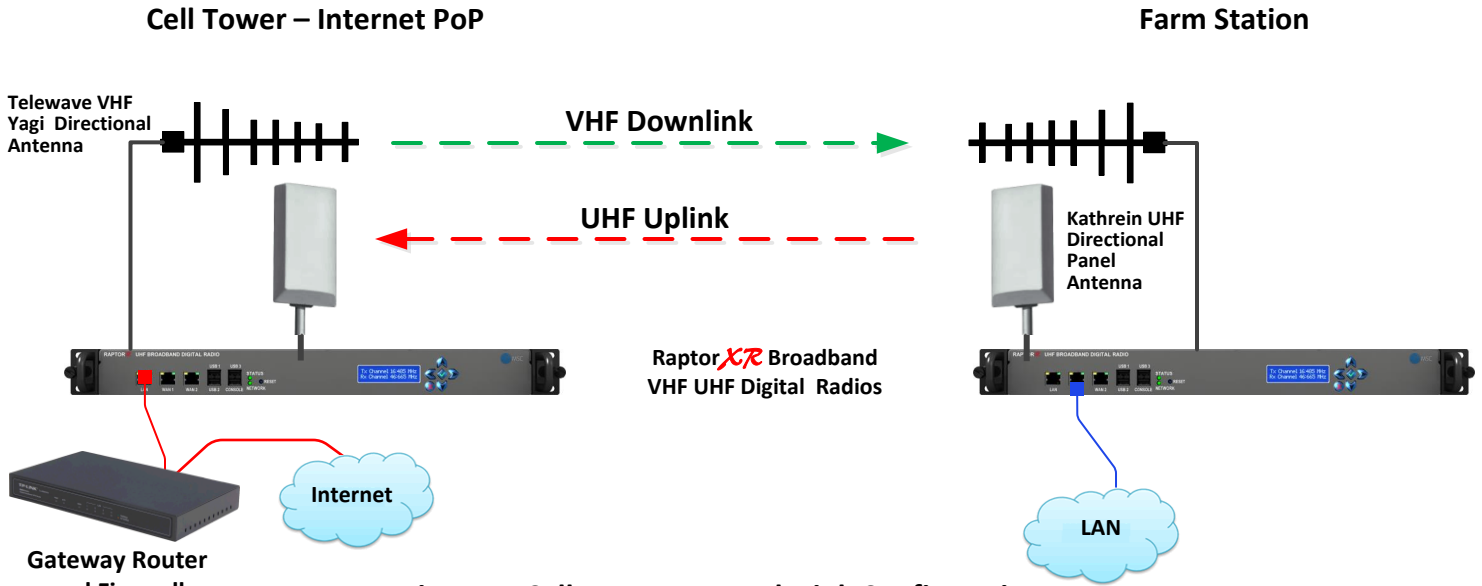


Figure 4. Cell-Tower to Ranch Link Configuration

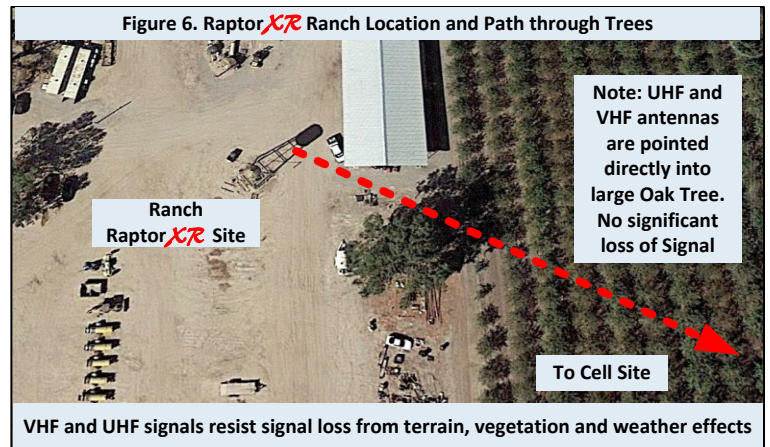
Figure 5. About the Raptor XR Broadband UHF Digital Radio



Raptor XR is a full-duplex broadband digital radio covering all domestic and international VHF and UHF TV spectrum channels. Raptor XR capabilities support:

- Full-duplex data rates from 35 Mbps @ 6 MHz BW to 43 Mbps at 8 Mbps.
- Transmission distances of 40+ km (25+ miles) with appropriate antenna and antenna height
- Excellent transmission over land and water

Data sheet: http://www.metricsystems.com/wp-content/uploads/2017/08/MSC_Raptor-XR-Domestic-UHF-Single-Link.pdf



VHF and UHF signals resist signal loss from terrain, vegetation and weather effects

Figure 7. Ranch to Cell-Tower End-to-End Propagation Summary

