

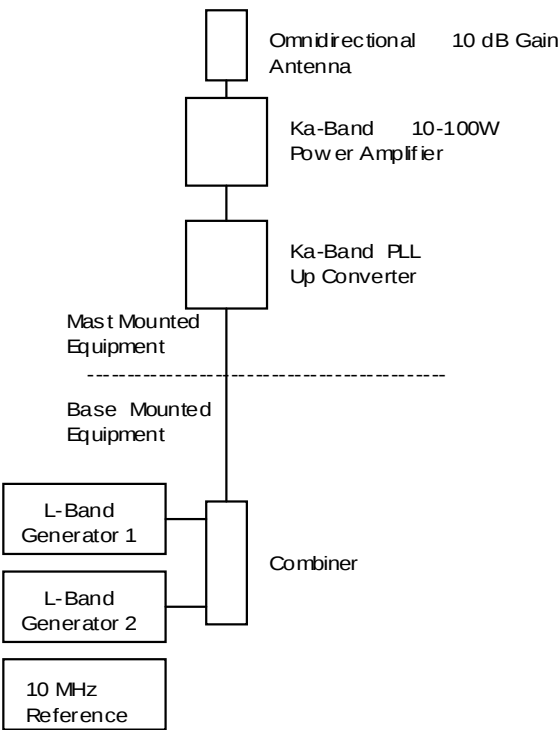
Ka-Band Propagation Study Proposal Outline
K.Banke 07/05/01

This is intended as an out line for a proposal for conducting one or two studies aimed at characterizing non line of sight Ka-Band propagation in the 27-31 GHz LMDS band region.

Two channel CW frequency selective fading/attenuation study.

This relatively simple study would designed be to collect data on the path attenuation and frequency selective characteristics of fading in this frequency range. The figure below is a block diagram of the anticipated hardware setup for this study.

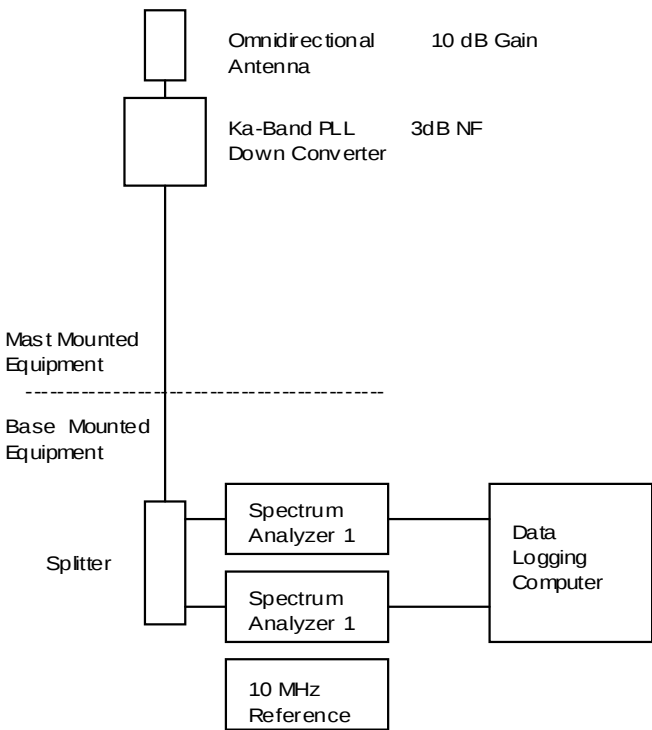
Two Frequency CW Ka-Band Transmitter



Portable Power source

Preliminary Block Diagram for Ka-Band Two Frequency CW Signal Propagation Study Proposal
K.Banke - 05/30/01

Two Frequency Ka-Band Receiver/Data Logger



Portable Power source

Two unmodulated CW signals of approximately equal amplitude and spaced some distance apart in frequency would be transmitted with a total combined ERP of up to 1000 dBW ERP using a 10 to 100 Watt PA into a 10 dB omni-directional antenna. The current plan is to use the output of two L-Band generators upconverted to Ka-Band (utilizing one half of a Ka-Band transceiver) and amplified. The upconverter would have a synthesized fixed frequency LO referenced to an ovenized 10 MHz oscillator (3×10^{-9}). The signals would be received with an identical antenna, down converted to L-Band and the levels monitored by two spectrum analyzers attached to data logging equipment which would be recording the sampled video output (amplitude data) at perhaps a 1000 samples per second rate onto a computer disk. Both the transmitter and receiver stations would be made portable and capable of having the antenna heights variable from 5 to 30 feet above ground level through the use of fixtures and/or trucks with manlift type capability. A number of site conditions will be tested to cover as many variations as practical of propagation around buildings and through foliage. The anticipated time to collect data in the field is 2 weeks once the equipment is setup and tested.

Once the equipment has been located for a test, the transmit frequencies would be set to be the same and data taken for a short period of time. Periodically the relative frequency difference between the two transmitted signal would be increased (stepped some fixed TBD amount – 0.1-1 MHz) and data again collected for some period until the desired range of frequency separation has been covered.

The upconverter, downconverter, PA and antennas would be commercial equipment probably purchased from Trackcom Systems International and/or mm-Tech, Inc. Data sheets are in hand for the equipment which would be used and are available on the web at from the URLs listed below. I currently have Pricing and availability for the potential Trackcom transceiver but I am still waiting for arrival of the mm-Tech quote on their upconverter, downconverter, 10W PA and omnidirectional antenna. The lead times from Trackcom is long (16 weeks) due to all of this equipment being made to order. It will remain to be seen if it's any less from mm-Tech, Inc.

Below is a list of the anticipated RF hardware and the URL where the data sheets can be found:

Omni Directional Antenna – mm-Tech, Inc model AN10NV360E11D (<http://www.mm-tech.com/omni.pdf>)

10W Solid State Amplifier - mm-Tech, Inc model AMPA131 (<http://www.mm-tech.com/ds-ampa131.pdf>)

Up converter/transceiver – Trackcom System International, Inc model TSI 1101-000-01 (HE Transceiver) (<http://www.trackcom-sys.ca/english/index.html>) or mm-Tech, Inc model OTRU001A1 (<http://www.mm-tech.com/DS-OTRUA.pdf>)

Wide-Band Propagation Study

This study would use utilize the same upconverter, amplifier, antenna, and down converter as described For the Two channel CW frequency diversity/attenuation study above. The anticipated transmit signal would be along the line of a BPSK signal modulated by a 63 bit long PN sequence at 100 MHz. The same range of antenna heights and site conditions would be used as in the above study. As much more information can be obtained from this type of study and the data reduction considerably more complex, a number of data collection/reduction iterations are apt to be performed over a period of several months.