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March 25.2003

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MAR 25 2003

FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF THE SECRETARY

Ms. Marlene H. Dortch
Secretary
Federal Communications Commission
445 12th Street, S.W., Room TW-A325
Washington, D.C. 20554

Re: *Ex Parte*
In the Matter of Revision of Part 15 of the Commission's Rules
Regarding Ultra-Wideband Transmission Systems
ET Docket No. 98-153

Dear Ms. Dortch:

This *ex parte* reports that on March 24, 2003, Harry Ng of PanAmSat Corporation faxed the attached information to Ron Chase of the Office of Engineering & Technology. Mr. Chase requested this information from Mr. Ng during their previously reported meeting on March 21, 2003. The information consists of sample results using the executable files that the undersigned provided in an *ex porte* filing dated February **4,** 2003.

Respectfully submitted,

Joseph A. Godles
Attorney for PanAmSat Corporation

cc: Ron Chase

This panel calculates the ultra-wideband (UWB) signal level..... fcc-pk-dith.mcd
as the uwb device walks around the earth station (circumference-angle)
at a constant distance to the earth station.

sample calculation for Table 2 / elevation = 5-degrees / PRF = 0.1 MHz
-- dithered / average power --- at a distance (hd) = 110 m ---

earth station bandwidths and antenna center-line height.....

$bwif := 50.0 \cdot 10^6$ .....IF bandwidth (Hz)

$dtr := \frac{\pi}{180}$ $rtd := \frac{180}{\pi}$

$bwef := 1.0 \cdot 10^6$ .....reference bandwidth (Hz)

$clevi := 5.0$ .....e/s elevation angle relative to the horizontal plane (deg)

$csh := 7.5$ ..... the height of the earth station antenna center-line (rn)

$itn := -10.0$ .....acceptable interference level (UN)

UWB parameters and earth station antenna off-axis angle and path loss.....

$eirp := 0.0 - 0.0$ ....the peak-EIRP of the UWB unit (dBm/50MHz).....

$prf := 0.10 \cdot 10^6$ .....the pulse repetition frequency (Hz)

$hd := 110.0$ ....horizontal-distance between the e/s and the UWB unit (m)

$uwbh := 15$ .....the uwb unit height (m)

$f := 3950.0$ .....operating frequency (MHz)

....the uwb device height is lower than the els antenna center-line...add the angles.....

$alpha := atan\left(\frac{esh - uwbh}{hd}\right)$ $alphad := alpha \cdot rtd$ $alphad = 3.122$ ....uwb unit eleangle

$dist := \frac{hd}{cos(alpha)}$ $dist = 110.164$ ....distance between e/s and UWB (m)

$ele := clevi + alphad$ $ele_r := ele \cdot dtr$ $ele = 8.122$ ....the effective ele-angle

$t := 0, 1 .. 90$ ....the circumpherence angle (deg) $tt := 0, 5 .. 90$

$d(t) := acos(cos(ele_r) \cdot cos(t \cdot dtr))$ $dd(t) := d(t) \cdot rtd$ ....the off-axis angle (radians)

$$g32(t) := \begin{cases} 32 - 25 \cdot log(dd(t)) & \text{if } dd(t) \le 48 \\ -10 & \text{otherwise} \end{cases}$$

..... actual ant-gain towards Me UWB

page- 1- *left*

1 a

$$lp := \begin{cases} 20\cdot\log\left(f\cdot\frac{dist}{1000}\right) + 32.45 & \text{if } dist < 1800 \\ 20\log(f) + 38.5\log\left(\frac{dist}{1000}\right) + 32.45 - 5 & \text{otherwise} \end{cases}$$

<<<.....free-space path loss (dB)

<<<....after Fresnel-zone path

lp = 85.223

BWCF for peak-power in 50MHz to average Dower in 1MHz (NTIA pg-D-2).....

$prf2 := 2.0\cdot prf$

$$bwcfp := \begin{cases} 10 + 10\cdot\log\left(\frac{bwif}{bwref}\right) & \text{if } bwif < prf2 \\ 10\cdot\log\left(\frac{bwif\cdot bwif}{0.2\cdot bwref\cdot prf}\right) & \text{if } bwif \geq prf2 \end{cases}$$

bwcfp = 50.969

bandwidth correction factor BWCF) for Average EIRPnon-dithered signal (3.5.1.1/pg 3-5)

$$bwcfa := 10\cdot\log\left(\frac{bwif}{bwref}\right)$$

bwcfa = 16.99

....the effective average-EIRP/MHz is >>>>>> EIRPeff := eirp − bwcfj

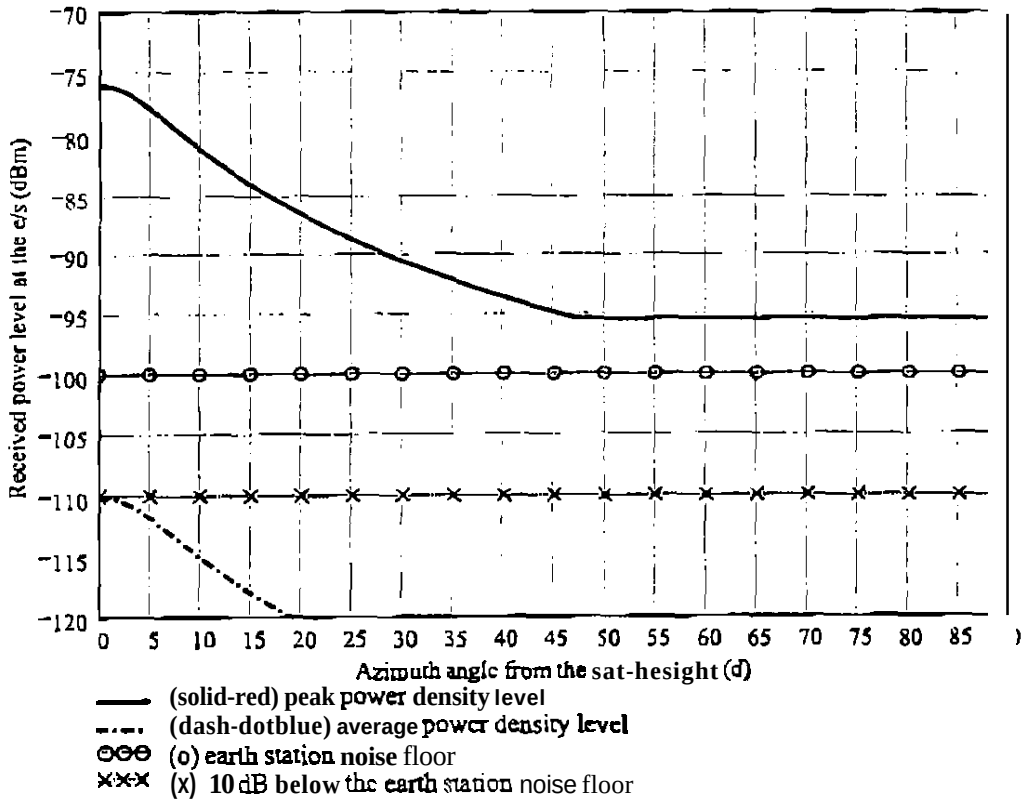
delEIRPeff := EIRPeff − (41.2

delEIRPeff = −9.719

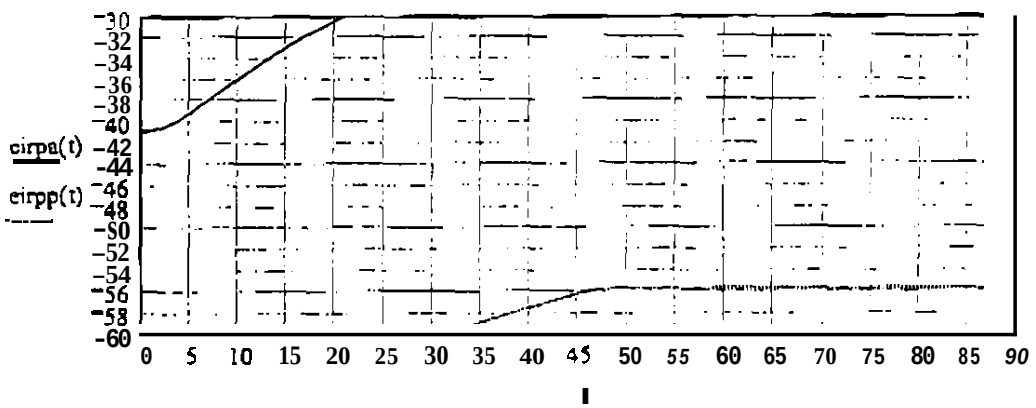
rev-level as the uwb unit walks around the earth station

$pav(t) := (eirp - bwcfp) + bwcfa - lp + g32(t)$ ....received average-power

$ppk(t) := eirp - lp + g32(t)$ ....received peak-power ....



$eirpa(t) := noise - bwcfa - g32(t) + lp$ $\qquad$ $eirpp(t) := noise - bwcfp - g32(t) + lp$



(a)

The bandwidth for the noise floor has been changed to 50 MHz

earth station antenna system-tempcomputation, noise floor and interference level.....

operator := 4.0 ....oparatro to select the "tsky" either compute or "otherwise" value.....

$$tsky := \begin{cases} 76.8 - 4.624 \cdot elcvi + 0.125 \cdot elevi^2 - 0.001138 \cdot elcvi^3 & \text{if } (3.6 < operator < 5) \\ 50.0 & \text{otherwise} \end{cases}$$

tsky = 56.663

WG1loss := 0.2 ....waveguide-1 loss (dB)

LNAnf := 1.0 ....LNA nosie figure (dB)

reference to the output *of the* antenna..... To := 290

Tsys = tsky + To(WG1LR-1) + (Tlna/WG1GR)

$$WG1LR := 10^{\left(\frac{WG1loss}{10}\right)}$$ WGILR = 1.047 .....waveguide-I loss ratio

$$WG1GR := 10^{\left(\frac{-WG1loss}{10}\right)}$$ WGIGR = 0 955 ....waveguide-1 gain ratio = 1/WG1LR

$$TLNA := \left(10^{\frac{LNAnf}{10}} - 1.0\right) \cdot To$$ TLNA = 75.088 .....LNA temperture

$$tsys := tsky + To \cdot (WG1LR - 1) + \frac{TLNA}{WG1GR}$$ tsys = 148.957

noise := −228.6 + 10·log(bwif·tsys) + 30 noise = −99.88 .....e/s noise floor (dBm)

int := itn + noise int = −109.88 .....interference level (dBm)

page-2- right

(a)

$$lpfs := 20 \cdot \log\left(f \cdot \frac{dist}{1000}\right) + 32.45 \qquad lpfs = 85.223$$

$$lpfz := 20\log(f) + 38.5\log\left(\frac{dist}{1000}\right) + 32.45 - 5 \qquad lpfz = 62.5$$

3 EIRPeff = −50.969 <<<<<and the permited level is 41.25

5)

<<<<<excess dB above the average-EIRP .....
....in order to keep both peak and the average power densities to
....within the allowable limit (p=0 dBm/50MHz & a=-41.25 dBm/MHz),
.....it is necessary *to* adjust the peak input power level to ensure that
....the resultant average-power level is within the limit of 41.3 dBm/MHz

ppk(0) = −15.964

pav(0) = −109.944

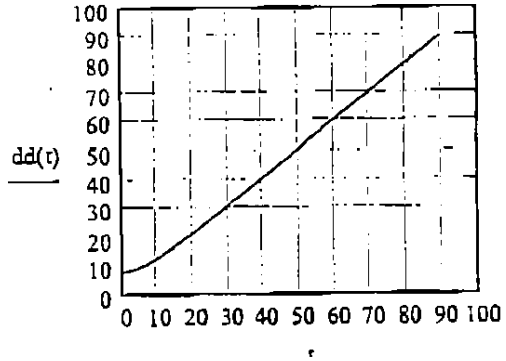
.....
To fii three figures in a single page,
the height of the figure must be limited
to 2.8cm hight and the legend is limited
to three curves

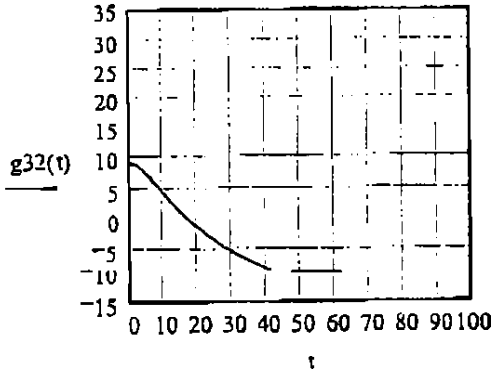
page-2- right

(a)

noisc = *−99.88*

int = −109.88





(a)

This panel calculates the ultra-wide-band (UWB) signal level..... fcc-pk-dith.mcd
as the **uwb** device **walks** around the **earth** station (circumference-angle)
at a constant distance to the earth station.

sample calculation for Table 2 / elevation = 5-degrees / PRF = 0.1 MHz
-- dithered / peak power --- at a distance (hd)= 4400 m ---

earth station bandwidths and antenna center-line height. .....

$bwif := 50.0 \cdot 10^6$ .....IF bandwidth (Hz)

$dtr := \frac{\pi}{180}$ $rtd := \frac{180}{\pi}$

$bwef := 1.0 \cdot 10^6$ .....reference bandwidth (Hz)

$elevi := 5.0$ .....e/s elevation angle relative to the horizontal plane (deg)

$esh := 7.5$ .....the height of the earth station antenna center-line (m)

$itn := -10.0$ .....acceptable interference level (I/N)

UWB parameters and **earth** station antenna off-axis angle and path **loss**.....

$eirp := 0.0 - 0.0$ .....the peak-EIRP of the UWB unit (dBm/50MHz).....

$prf := 0.10.106$ .....the pulse repetition frequency (Hz)

$hd := 4400.0$ .....horizontal-distance between the e/s and the UWB unit (m)

$uwbh := 1.5$ .....the uwb unit height (m)

$f := 3950.0$ .....operating frequency (MHz)

.....the uwb device height is lower than the e/s antenna center-line ...add the **angles**.....

$alpha := atan\left(\frac{esh - uwbh}{hd}\right)$ $alphad := alpha \cdot rtd$ $alphad = 0.078$ .....uwb unit **ele-angle**

$disr := \frac{hd}{cos(alpha)}$ $dist = 4.4 \times 10^3$ .....distance between e/s and UWB (m)

$elc := elevi + alphad$ $elcr := ele \cdot dtr$ $ele = 5.078$ .....the effective eleangle

$r := 0, 1 .. 90$ .....the circumpherence angle (deg) $tt := 0, 5 .. 90$

$d(t) := acos(cos(elcr) \cdot cos(t \cdot dtr))$ $dd(t) := d(t) \cdot rtd$ .....the off-axis angle (radians)

$$g32(t) := \begin{cases} 32 - 25 \cdot log(dd(t)) & \text{if } dd(t) \le 48 \\ -10 & \text{otherwise} \end{cases}$$

.actual ant-gain towards the UWB

page- 1- left

(5)

$$lp := \begin{cases} 20\cdot\log\left(f\cdot\frac{dist}{1000}\right) + 32.45 & \text{if } disr < 1800 \\ 20\log(f) + 38.5\log\left(\frac{dist}{1000}\right) + 32.45 - 5 & \text{otherwise} \end{cases}$$

<<<.....free-space path loss (dB)

<<<.....after Fresnel-zone path

lp = 124.155

BWCF for peak-power in 50MHz to average power in 1MHz (NTIA pg-D-2).....

$prf2 := 2.0\cdot prf$

$$bwcfp := \begin{cases} 10 + 10\cdot\log\left(\frac{bwif}{bwref}\right) & \text{if } bwif < prf2 \\ 10\cdot\log\left(\frac{bwif\cdot bwif}{0.2\cdot bwref\cdot prf}\right) & \text{if } bwif \geq prf2 \end{cases}$$

bwcfp = 50.969

bandwidth correction factor BWCF) for Average EIRPnon-dithered signal (3.5.1.1/pg 3-5)

$$bwcfa := 10\cdot\log\left(\frac{bwif}{bwref}\right)$$

bwcfa = 16.99

.....the effective average-EIRP/MHz is >>>>>> EIRPeff := eirp − bwcf

delEIRPeff := EIRPeff − (-41.2

delEIRPeff = −9.719

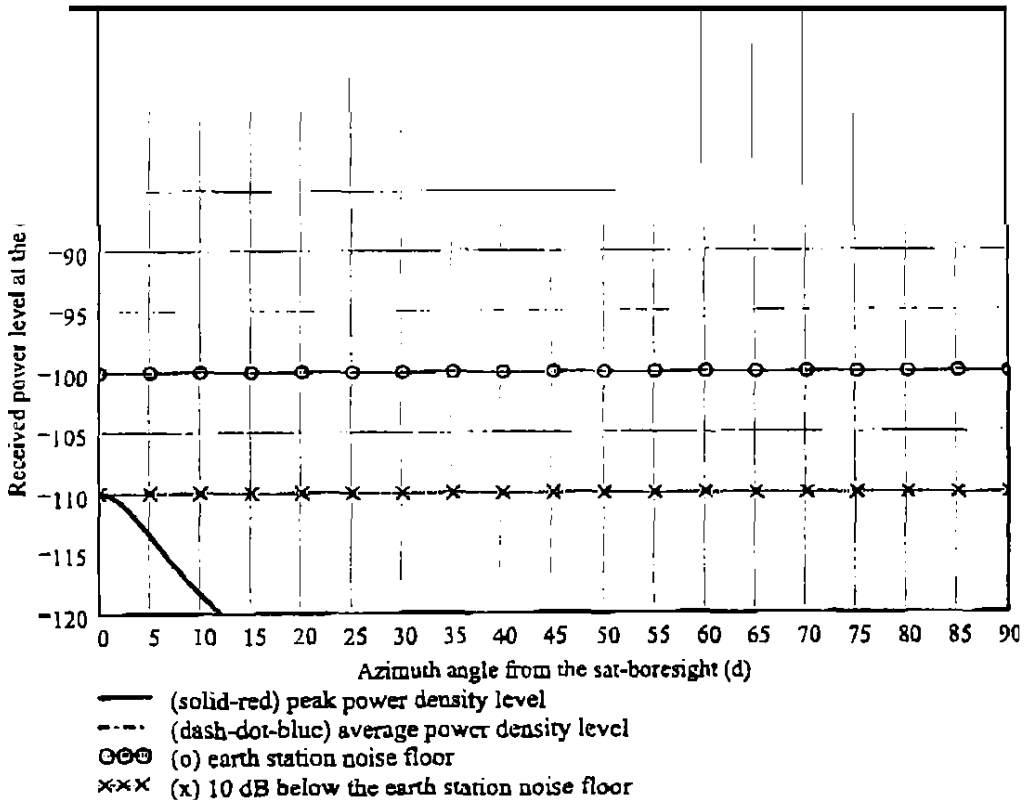
rev-leve as the uwb unit walks around the earth station

pav(t) := (eirp − bwcfp) + bwcfa − lp + g32(t) **....received average-power**

ppk(t) := eirp − lp + g32(t) **.....received peak-power....**

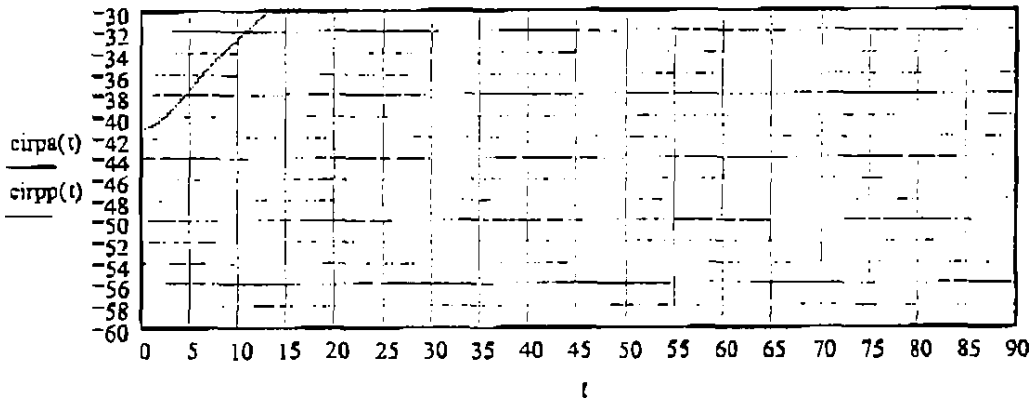
page-2- left

(b)



eirpa(t) := noise − bwcfa − g32(t) + lp

eirpp(t) := noise − bwcfp − g32(t) + lp



page- 3 " left

(b)

The bandwidth for the noise floor has been changed to 50 MHz

---

earth station antenna system-tempcomputation, noise floor and interference level.....

operator := 4.0 .....operatm to select the "tsky" either compute or "otherwise" value .....

$$tsky := \begin{cases} 76.8 - 4.624 \cdot elevi + 0.125 \cdot elevi^2 - 0.001138 \cdot elevi^3 & \text{if } (3.6 < operator < 5) \\ 50.0 & \text{otherwise} \end{cases}$$

tsky = 56.663

WG1loss := 0.2 .....waveguide-I loss (dB)

LNAnf := 1.0 .....LNA nosie figure (dB)

reference to the output ofthe antenna..... To := 290

Tsys = tsky + To(WG1LR-1) + (Tlna/WG1GR)

$$WG1LR := 10^{\left(\frac{WG1loss}{10}\right)}$$ WG1LR = 1.047 .....waveguide-1 loss ratio

$$WG1GR := 10^{\left(\frac{-WG1loss}{10}\right)}$$ WG1GR = 0.955 .....waveguide-I gain ratio = 1/WG1LR

$$TLNA := \left(10^{\frac{LNAnf}{10}} - 1.0\right) \cdot To$$ TLNA = 75.088 .....LNA temperture

$$tsys := tsky + To \cdot (WG1LR - 1) + \frac{TLNA}{WG1GR}$$ tsys = 148.957

noise := -228.6 + 10·log(bwif·tsys) + 30 noise = -99.88 ....e/s noise floor (dBm)

int := itn + noise int = -109.88 ....interference level (dBm)

page-1- right

(b)

$$lpfs := 20 \cdot \log\left(f \cdot \frac{dist}{1000}\right) + 32.45 \qquad lpfs = 117.251$$

$$lpfz := 20\log(f) + 38.5\log\left(\frac{dist}{1000}\right) + 32.45 - 5 \qquad lpfz = 124.155$$

EIRPeff = *-50.969* <<<<<and the permited level is -41.25

5)

<<<<<excess dB above the average-EIRP.....
....In order to keep both peak and the average Dower densities to
.....within the allowable limit (p=0 dBm/50MHz & a=-41.25 dBm/MHz),
.....it is necessary *to* adjust the peak input power level to ensure that
.....the resultant averagepower level is within the limit *of* 41.3 dBm/MHz

ppk(0) = -109.797

pav(0) = -143.777

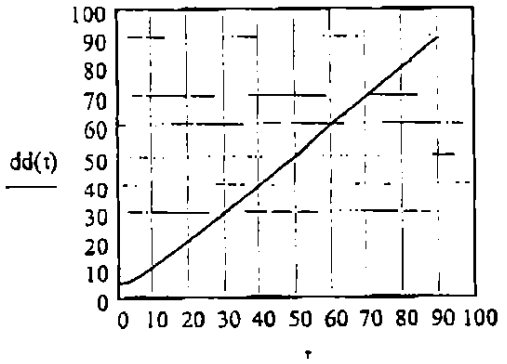
.....
To fit three figures in a single page,
the height of the figure must be limited
to 2.8cm hight and the legend is limited
to three curves
.....

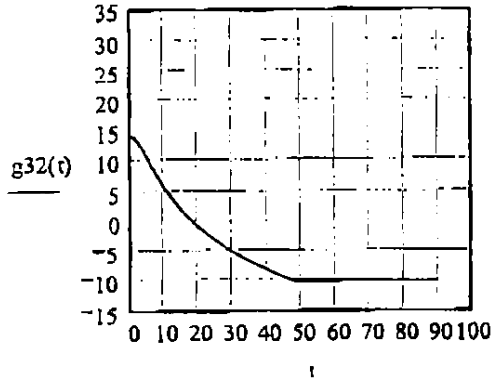
page-2 - right

(b)

noise = −99.88

int = -109.88





page-3 - right

(b)

This panel calculates the ultra-wideband (UWB) signal level..... fcc-pk-nondither.mcd
as the uwb device walks around the earth station (circumference-angle).....angle-d-pfd.mcd.....
at a constant distance to the earth station. The uwb EIRP is based on
the average and peak EIRP adopted by FCC. See >>>>>>>>>>>>
Ref. NTIA-01-43 Section 3: average-pg-3-5& peak-pg3-6

iii)if1

example calculation Table 2 / elevation = 5 degrees / PRF = 0.1 MHz -- non dithered --- average power --- at a distance (hd) = 110 m

earth station bandwidths and antenna enter-line height.....

$bwif := 50.0 \cdot 10^6$ .....IF bandwidth (Hz)

$dtr := \frac{\pi}{180}$ $rtd := \frac{180}{\pi}$

$bwref := 1.0 \cdot 10^6$ .....reference bandwidth (Hz)

$elevi := 5.0$ .....e/s elevation angle relative to the horizontal plane (deg)

$esh := 7.5$ .....the height of the earth station antenna center-line (m)

$itn := -10.0$ .....acceptable interference level (UN)

UWB parameters and earth station antenna off-axis angle and path loss.....

$eirp := 0.0 - 0.0$ ....the peak EIRP of the UWB unit (dBm/50MHz).....

$prf := 0.10 \cdot 10^6$ ....the pulse repetition frequency (Hz)

$hd := 110.0$ ....horizontal distance between the e/s and the UWB unit (m)

$uwbh := 1.5$ .....the uwb unit height (m)

$f := 3950.0$ .....operating frequency (MHz)

....the uwb device height is lower than the e/s antenna centor-line ...add the angles.....

$alpha := atan\left(\frac{esh - uwbh}{hd}\right)$ $alphad := alpha \cdot rtd$ $alphad = 3.122$ ....uwb unit ele-angle

$disr := \frac{hd}{cos(alpha)}$ $disr = 110.164$ ....distance between e/s and UWB (m)

$ele := elevi + alphad$ $eler := ele \cdot dtr$ $ele = 8.122$ .....the effective eleangle

$t := 0, 1 .. 90$ .....the circumpherence angle (deg) $tt := 0, 5 .. 90$

$d(t) := acos(cos(eler) \cdot cos(t \cdot dtr))$ $dd(t) := d(t) \cdot rtd$ ....the off-axis angle (radians)

$g32(t) := \begin{cases} 32 - 25 \cdot log(dd(t)) & \text{if } dd(t) \le 48 \\ -10 & \text{otherwise} \end{cases}$ ....actual ant-gain towards the UWB

page- 1- right

$lp := \begin{cases} 20 \cdot log\left(f \cdot \frac{dist}{1000}\right) + 32.45 & \text{if } dist < 1800 \end{cases}$ ..free-space path loss (dB)

(C)

$$20\log(f) + 38.5\log\left(\frac{dist}{1000}\right) + 32.45 - 5 \quad \text{otherwise}$$ ....after Fresnel-zone path loss (dB)

bandwidth correction factor BWCF) for Average EIRPnon-dithered signal (3.5.1.1/pg 3-5)

$$bwcfa := \begin{cases} 0 & \text{if } [(bwif \le prf) \wedge (bwref < prf)] \\ 10\cdot\log\left(\frac{prf}{bwref}\right) & \text{if } [(bwif > prf) \wedge (bwref \ge prf)] \\ 10\cdot\log\left(\frac{bwif}{prf}\right) & \text{if } [(bwif > prf) \wedge (bwref < prf)] \\ 10\cdot\log\left(\frac{bwif}{bwref}\right) & \text{if } [(bwif > prf) \wedge (bwref \ge prf)] \end{cases}$$

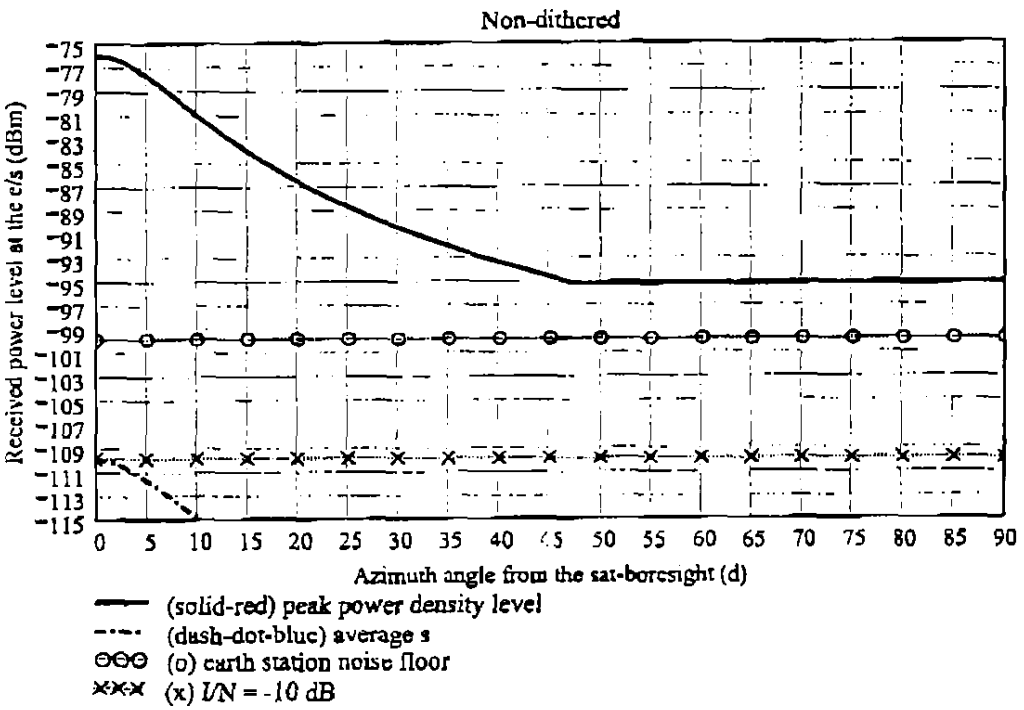
lp = 85.223

bwcfa = 16.99

Interference level as the uwb unit walks around the earth station....no corretion for peak....

$pav(t) := (eirp - bwcfp) + bwcfa - lp + g32(t)$ .....average EIRP

$ppk(t) := eirp - lp + g32(t)$ .....peak EIRP



page-2- left

(c)

page - 3 - left

(c)

.. The bandwidth for the noise floor has been changed to 50 MHz
i) the first step is to input the peak-power level into "eirp"
i) the second step is to check the average-level and to ensure
that the level is within the allowable *limit of* -47.25 dBm/MHz
:he average-level exceeded 41.25, adjust the peak-level

earth station antenna system-tempcornputation. noise *floor* and interference level.....

operator := 4.0 ....operatro to select the "tsky" either compute or "otherwise" value.....

$$tsky := \begin{cases} 76.8 - 4.624 \cdot elevi + 0.125 \cdot elevi^2 - 0.001138 \cdot elevi^3 & \text{if } (3.6 < operator < 5) \\ 50.0 & \text{otherwise} \end{cases}$$

tsky = 56.663

WG1loss := 0.2 ....waveguide-1 loss (dB)

LNAnf := 1.0 .....LNA nosie figure (dB)

reference *to* the output *of* the antenna..... To := *290*

Tsys = tsky + To(WG1LR-1) + (Tlna/WG1GR)

$$WG1LR := 10^{\left(\frac{WG1loss}{10}\right)}$$ WG1LR = 1.047 ..... waveguide-1 loss ratio

$$WG1GR := 10^{\left(\frac{-WG1loss}{10}\right)}$$ WG1GR = *0.955* .....waveguide-1 gain ratio = 1/WG1LR

$$TLNA := \left(10^{\frac{LNAnf}{10}} - 1.0\right) \cdot To$$ TLNA = 75.088 .....LNA temperture

$$tsys := tsky + To \cdot (WG1LR - 1) + \frac{TLNA}{WG1GR}$$ tsys = 148.957

noise := *-228.6* + 10·log(bwif·tsys) + 30 noise = -99.88 ..... e/s noise floor (dBm)

int := *in* + noise int = -109.88 .....interference level (dBm)

(c)

peap power in a 50MHz to average power in 1MHz (NTIA Appendix-D **pg.D-1)**.....

$prf45 := 0.45 \cdot prf$

$$bwcfp = \begin{cases} 0 & \text{if } (bwif \le prf45) \wedge (bwef < prf) \\ 10\log\left(\frac{prf}{bwref}\right) & \text{if } (bwif \le prf45) \wedge (bwref \ge prf) \\ 20\log\left(\frac{bwif}{prf45}\right) & \text{if } (prf45 < bwif) \wedge (bwref < prf) \\ 10\log\left(\frac{bwif \cdot bwif}{bwref \cdot 0.2 \cdot prf}\right) & \text{if } (prf45 \le bwif) \wedge (bwref \ge prf) \end{cases}$$

$bwcfp = 50.969$

$averageEIRP := eirp - bwcfp$

$averageEIRP = -50.969$ $\quad$ $delAEIRP := averageEIRP - (-41.25)$

$delAEIRP = -9.719$

it is necessary to keep both the peak and the average EIRP
..,..to within **the** specified limt of (p=0 dBm/50MHz & 41.25 **dBm/MHz).**
.....**if** the average-EIRP **level** is exceeded (delAEIRP>0), it is
.....necessary to reduce the input peak-power level to make
....the resulting average-EIRP to -41.25 dBm/MHz. .....

$pav(0) = -109.944$

.....

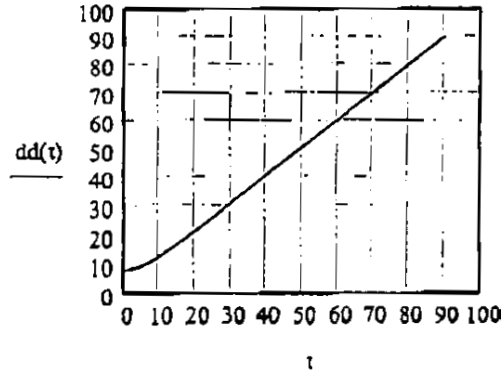
To fit three figures in a single page,
the height of the figure must be limited
to 2.8cm **hight** and the legend is limited
to **three curves**

.....

$ppk(0) = -75.964$

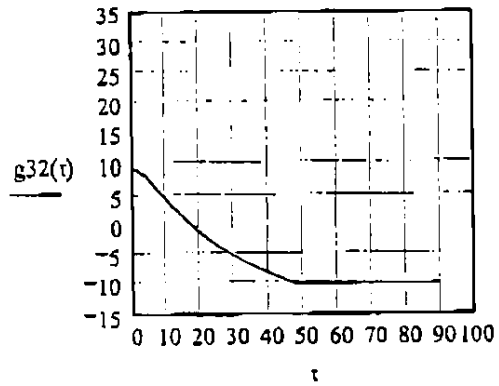
$noise = -99.88$

$int = -109.88$



page - 2 - right

(c)



page - 3 - right

(c)

This panel calculates the ultra-wide-band (UWB) signal level..... fcc-pk-nondither.mcd
as the uwb device walks around the earth station (circumference-angle)..... angle-d-pfd.mcd.....
at a constant distance to the earth station. *The uwb* EIRP *is* **based** *on*
the average and peak EIRP adapted by FCC. See >>>>>>>>>>> ii
Ref: NTIA-01-43 Section 3: average-pg-3-5 & peak-pg3-6

iii) if 1

example calculation Table 2 / elevation = 5 degrees / PRF = 0.1 MHz
--- non dithered --- peak power --- at a distance (hd) = 4400 m

earth station bandwidths and antenna center–line height.....

$bwif := 50.0 \cdot 10^6$ .....IF bandwidth (Hz)

$dtr := \frac{\pi}{180}$ $rtd := \frac{180}{\pi}$

$bwref := 1.0 \cdot 10^6$ .....reference bandwidth (Hr)

$elevi := 5.0$ .....e/s elevation angle relative to the horizontal plane (dog)

$esh := 7.5$ .....the height of the earth station antenna center-line (m)

$im := -10.0$ .....acceptable interference level (I/N)

UWB parameters and earth station antenna off-axis angle and path loss.....

$eirp := 0.0 - 0.0$ ....the peak EIRP *of the* UWB unit (dBm/50MHz).....

$prf := 0.10 \cdot 106$ .....the pulse repetition frequency (Hz)

$hd := 4400.0$ .....horizontal-distance between the e/s and the UWB unit (m)

$uwbh := 1.5$ ....the uwb unit height (m)

$f := 3950.0$ .....operating frequency (MHz)

.....the uwb device height is lower than the e/s antenna center-line ..add the angles.....

$alpha := atan\left(\frac{esh - uwbh}{hd}\right)$ $alphad := alpha \cdot rtd$ $alphad = 0.078$ .....uwb unit ele-angle

$dist := \frac{hd}{cos(alpha)}$ $dist = 4.4 \times 10^3$ .....distance between e/s and UWB (m)

$ele := elevi + alphad$ $eler := ele \cdot dtr$ $ele = 5.078$ .....the effective ele-angle

$t := 0, 1 .. 90$ ....the circumpherence angle (deg) $\tau := 0, 5 .. 90$

$d(t) := acos(cos(eler) \cdot cos(t \cdot da))$ $dd(t) := d(t) \cdot rtd$ ....the off-axis angle (radians)

$$g32(t) := \begin{cases} 32 - 25 \cdot log(dd(t)) & \text{if } dd(t) \le 48 \\ -10 & \text{otherwise} \end{cases}$$

.....actual ant-gain towards the UWB

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$$lp := \left| 20 \cdot log\left(f \cdot \frac{dist}{1000}\right) + 32.45 \right. \text{ if } dit < 1800$$

...free-space path lass (dB)

(d)

$$20\log(f) + 38.5\log\left(\frac{dist}{1000}\right) + 32.45 - 5 \quad \text{otherwise}$$ .....after Fresnel-zone path loss (dB)

bandwidth correction factor BWCF) for Averaae EIRPnon-dithered signal (3.5.1.1/pg 3-5)

$$bwcfa := \begin{cases} 0 & \text{if } [(bwif \le prf) \wedge (bwref < prf)] \\ 10\cdot\log\left(\frac{prf}{bwref}\right) & \text{if } [(bwif \le prf) \wedge (bwref \ge prf)] \\ 10\cdot\log\left(\frac{bwif}{prf}\right) & \text{if } [(bwif > prf) \wedge (bwref < prf)] \\ 10\cdot\log\left(\frac{bwif}{bwref}\right) & \text{if } [(bwif > prf) \wedge (bwref \ge prf)] \end{cases}$$

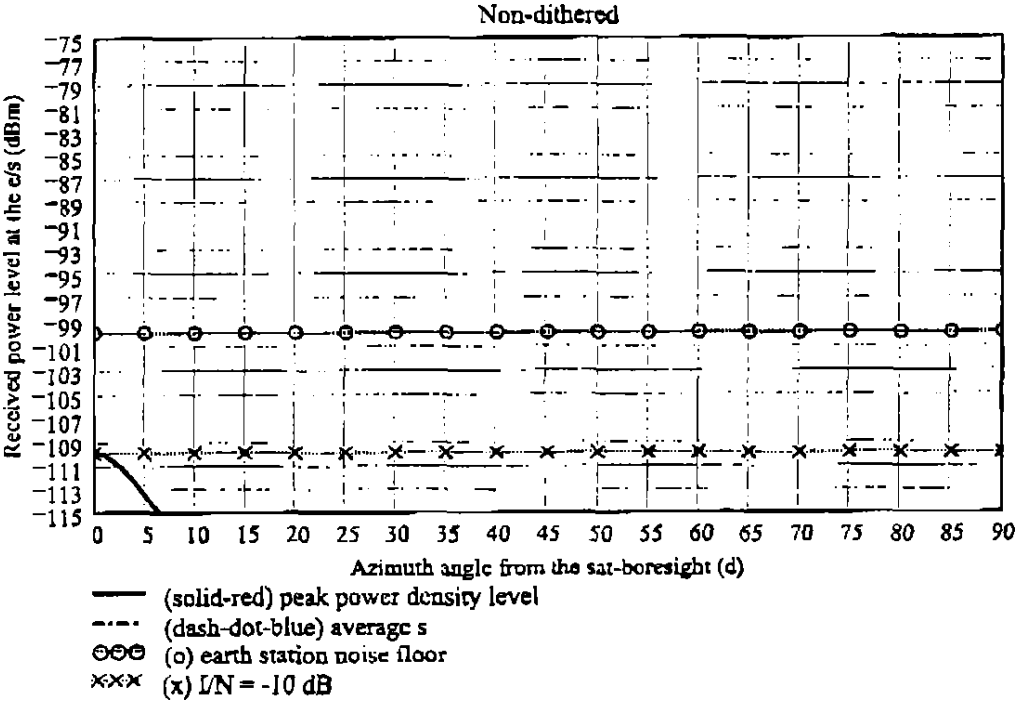
$lp = 124.155$

$bwcfa = 16.99$

Interference level as the uwb unit walks around the earth station....no corretion for peak....

$pav(t) := (cirp - bwcfp) + bwcfa - lp + g32(t)$ .....average EIRP

$ppk(t) := cirp - lp + g32(t)$ .....peak *EIRP*



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(d)

page - 3 - left

(d)

... The bandwidth *for* the noise floor has been changed to 50 MHz
i) the first step is to input the peak-power level into "eirp"
i) the second step is to check the average-level and to ensure
that the level is within the allowable limit of 41.25 dBm/MHz
:he average-level exceeded 41.25, adjust the peak-level

earth station antenna system-tampcomputation, *noise floor* and interference level...........

operator := 4.0 .....aperatro to select the "tsky" either compute or "othewise' value.....

$$tsky := \begin{cases} 76.8 - 4.624\cdot elevi + 0.125\cdot elevi^2 - 0.001138\cdot elevi^3 & \text{if } (3.6 < operator < 5) \\ 50.0 & \text{otherwise} \end{cases}$$

tsky = 56.663

WG1loss := 0.2 .....waveguide-1 loss (dB)

LNAnf := 1.0 .....LNA nosie figure (dB)

reference to the output of the antenna.. To := *290*

Tsys = tsky + To(WG1LR-1) + (Tlna/WG1GR)

$$WG1LR := 10^{\left(\frac{WG1loss}{10}\right)}$$ WG1LR = 1.047 ....waveguide-1 loss ratio

$$WG1GR := 10^{\left(\frac{-WG1loss}{10}\right)}$$ WG1GR = 0.955 .....waveguide-1 gain ratio = 1/WG1LR

$$TLNA := \left(10^{\frac{LNAnf}{10}} - 1.0\right)\cdot To$$ TLNA = 75.088 .....LNA temperture

$$tsys := tsky + To\cdot(WG1LR - 1) + \frac{TLNA}{WG1GR}$$ tsys = 148.957

noise := −228.6 + 10·log(bwif·tsys) + 30 noise = −99.88 .....e/s noise floor (dBm)

int := im + noise int = −109.88 .....interference level (dBm)

page-1- left

(d)

peap power in a 50MHz to average power in 1MHz (NTIA Appendix-D pg.D-1).....

$prf45 := 0.45 \cdot prf$

$$bwcfp := \begin{cases} 0 & \text{if } (bwif \le prf45) \wedge (bwref < prf) \\ 10\log\left(\frac{prf}{bwref}\right) & \text{if } (bwif \le prf45) \wedge (bwref \ge prf) \\ 20\log\left(\frac{bwif}{prf45}\right) & \text{if } (prf45 < bwif) \wedge (bwref < prf) \\ 10\log\left(\frac{bwif \cdot bwif}{bwref \cdot 0.2 \cdot prf}\right) & \text{if } (prf45 \le bwif) \wedge (bwref \ge prf) \end{cases}$$

$bwcfp = 50.969$

$averageEIRP := eirp - bwcfp$

$averageEIRP = -50.969$ $\quad$ $delAEIRP := averageEIRP - (-4125)$

$delAEIRP = -9.719$

it is necessary to keep both the peak and the average EIRP
.....to within the specified limt of (p=0 dBm/50MHz & 41.25 dBm/MHz).
.....*if* the average-EIRP level is exceeded (delAEIRP>0), *it* is
.....necessary to reduce the input peak-power level to make
.....the resulting average-EIRP to -41.25 dBm/MHz.....

$pav(0) = -143.777$

.....

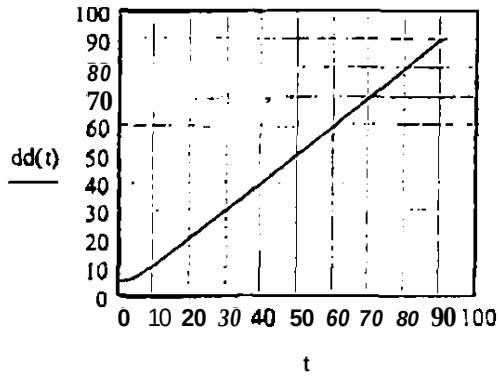
To fit three figures in a single page,
the height of the figure must be limited
to 2.8cm hight and the legend is limited
to three curves

.....

$ppk(0) = -109.797$

$noise = -99.88$

$int = -109.88$



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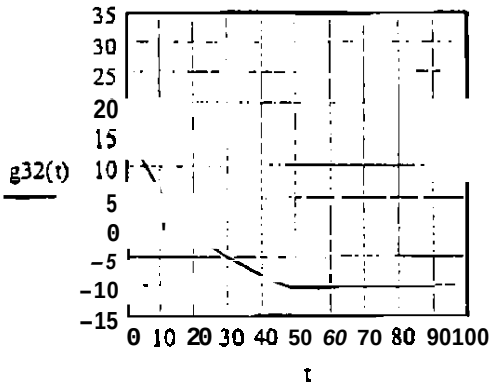
(d)



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(d)