

## TAP 6 Demo Quick Tour

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## 1. Example Path Profile

**Objective**: Add basic facility information to the Fixed Facility database and draw a path profile.

**Procedure:** Draw a path profile between the sites:

Transmitter at: Training Centennial Site 39 33 09 N latitude 104 44 51 W longitude (WGS84 coordinates) 455MHz Antenna center 50 ft Above Ground Level *Receiver at:* Training Aurora Site 39 43 42 N latitude 104 57 18 W longitude (WGS84 coordinates) 455MHz Antenna Center 30 ft Above Ground Level

Note that all values and settings discussed in this article are for illustration purposes only. It is important for you to determine the particular settings and values applicable to your equipment and application when using TAP.



1. From the TAP6 menu, click the Path button:

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File Path Ar	ea Map In	termod	3DDisplay	Utilities	Configuration	Editors	Help
Path Area	Hap	3DD	Refresh				
Click for Path Recent F Recent M Recent Ir	and Link Bud ath Studies IAP Studies atermod Studies	get function	ons				

2. The HDPath form is displayed:

SoftWright HDPath Rev 835	The second large large large second large without a				
File Configuration Help					
Fixed Facility - Transmit	Path: 75.68 km; Azimuth 359.65, Angle -0.50; Reverse 179.65, Angle 0.50	Fixed Facility - Receive			
Description         Site         Transmitter         Transmitter Antenna         Receiver Antenna (Primary)         Receiver Losses (Primary)         Receiver Antenna (Primary)         Receiver Antenna (Diversity)         Receiver Gains (Diversity)         Receiver Gains (Diversity)         Receiver Digital Specs         Filing Information	2688m         -2688m           2625m         -2625m           250m         -2625m           250m         -2625m           238m         -2438m           2375m         -2375m           2313m         -2313m           2250m         -2313m           2125m         -2313m           2003m         -2188m           125m         -2063m           2003m         -2063m           1938m         -1875m           1875m         -1875m	Description         Site         Transmitter         Transmitter Antenna         Receiver Antenna (Primary)         Receiver Casses (Primary)         Receiver Casses (Diversity)         Receiver Casses (Diversity)         Receiver Gains (Diversity)         Receiver Digital Specs         Filing Information			
6 Records DEMO Cheyenne Mountain Test Facility New Edit Copy Delete Save Cancel	+ Expand All - Collapse All Units Topo Data Fresnel Propagation Model Surface Features Land Use	6 Records DEMD Castle Rock Test Facility ed			



- 3. Note the four basic areas of the form:
  - The Fixed Facility for the transmitting site is shown on the left side of the form.
  - The Fixed Facility for the receiving site is shown on the right side of the form.
  - The parameters for the path profile are shown in the lower half of the center of the form.
  - The path profile graphic is shown in the upper half of the center of the form.
- 4. (Depending on the configuration of your TAP software, a default path may be shown when the form is loaded, or a blank graphic. If a default path is shown, just ignore the graphic and follow the steps listed below.)
- 5. To add a new facility to the Fixed Facility database, click the New button at the bottom of the Fixed Facility interface on the left (Transmit) side of the HDPath form:

SoftWright HDPath Rev 835	And and a second s	
File Configuration Help		
	>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>	
Fixed Facility - Transmit	Path: 75.68 km; Azimuth 359.65, Angle -0.50; Reverse 179.65, Angle 0.50	Fixed Facility - Receive
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	2688m - 2688m	
	2625m -2625m	
Description	2563m-) -2563m -2500m	Description
Site	2500m	Site
Transmitter	2375m	_ Transmitter
Transmitter Losses	2313m2313m	Transmitter Losses
Transmitter Antenna	2250m	Transmitter Antenna
Receiver Antenna (Primary)	2188m	Receiver Antenna (Primary)
Receiver Losses (Primary)	2125m2125m	Receiver Losses (Primary)
Beceiver Antenna (Diversitu)	2063m2063m	Beceiver antenna (Diversitu)
Beceiver Losses (Diversity)	2000m-	Beceiver Losses (Diversity)
Receiver Gains (Diversity)	1938m1938m 1975m - 1975m	Receiver Gains (Diversity)
Receiver	1912	Receiver
Receiver Digital Specs	0km 10km 20km 30km 40km 50km 60km 75.68km	Receiver Digital Specs
Filing Information		Filing Information
	Path Settings	
	+ Expand All - Collapse All	
	Units	
	Topo Data	
	Fresnel	
	Propagation Model	1
6 Records	Surface Features	6 Hecords
DEMO Cheyenne Mountain Test Facility	Land Use	DEMO Castle Rock Test Facility ed
New Edit Copy Delete Save Cancel		New Edit Copy Delete Save Cancel
Create a new facility record	,	

- 6. (Both the Transmitter and the Receiver side of the HDPath form are connected to the same database. We are just using the Transmitter side to avoid confusion.)
- 7. When the New button is clicked, a record is created. Notice that the other Fixed Facility interface (the Receiver side of the form) is dimmed out. You can only edit one record at a time in the database.
- 8. If the Description section of the form is not expanded, click the "Description" heading so you can view the contents of that section.



9. An ID or index key is created automatically for the record. Enter the description for the site, such as "TRAINING Centennial Site"

SoftWright HDPath Rev 835	Safes Fields Fields Fields Fields				
File Configuration <u>H</u> elp					
Fixed Facility - Transmit	Path: 75.68 km; Azimuth 359.65, Angle -0.50; Reverse 179.65, Angle 0.50	Fixed Facility - Receive			
	2698m         -2688m           2653m         -2653m           2553m         -2653m           2553m         -2503m           2375m         -2375m           2375m         -2375m           2375m         -2375m           2375m         -2313m           2250m         -2375m           2180m         -2180m           2250m         -2003m           2000m         -2003m           1938m         -1938m           1813m         10km         20km           0km         10km         20km           938m         -1938m         -1875m           1813m         10km         20km         50km           1813m         10km         20km         50km           1813m         10km         20km         50km           1813m         10km         10km         50km           1813m         10km         10km         50km	Description Site Transmitter Transmitter Transmitter Transmitter Commonstrate			
7 Records	Surface Features	6 Records			
DEMO Cheyenne Mountain Test Facility	Land Use	DEMO Castle Rock Test Facility ed			
New Edit Copy Delete Save Cancel		New Edit Copy Delete Save Cancel			

10. If necessary, click the Site section so you can view the contents of that section. Since the coordinates we have are WGS84, and that is the default datum, it is not necessary to change the setting. For other coordinate systems you could click the Coordinate System lookup button ("…") to select a different system:

SoftWright HDPath Rev 835	· · · · · · · · · · · · · · · · · · ·				
File Configuration Help					
Fixed Facility - Transmit	Path: 75.68 km; Azimuth 359.65, Angle -0.50; Reverse 179.65, Angle 0.50	Fixed Facility - Receive			
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	2625m2625m				
Description	2563m2563m	Description			
ID 0000031	2500m2500m	Site			
Doso TBAINING Centennial Site	2438m2438m	Transmitter			
	23/5m	Transmitter Losses			
Edit Date   3723/2013 6:05:36 PM	22510m2250m	Transmitter Antenna			
Site	2188m2188m	Receiver Antenna (Primary)			
Latitude	2125m2125m	Receiver Losses (Primary)			
Longitude	2063m2063m	Receiver Gains (Primary)			
LL84 : WGS84 Lat/Long's, Degrees, -B0 🚳	2000m	Receiver Antenna (Diversity)			
==> +180	1938m- V	- Beceiver Gains (Diversity)			
Site Elev ft 💌	18/5m	Receiver			
Transition	1813m 0km 10km 20km 30km 40km 50km 60km 75.68km	- Receiver Digital Specs			
		- Filing Information			
Transmitter Antenna	Path Settings				
Receiver Antenna (Primary)	+ Expand All - Collapse All				
- Receiver Losses (Primary)					
Receiver Gains (Primary)	Units				
Receiver Antenna (Diversity)	Topo Data				
Receiver Losses (Diversity)	Fresnel				
Receiver Gains (Diversity)	Propagation Model	1			
7 Records	Surface Features	6 Records			
DEMO Cheyenne Mountain Test Facility	Land Use	DEMO Castle Rock Test Facility ed			
4		4			
New Edit Copy Delete Save Cancel		New Edit Copy Delete Save Cancel			

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11. The Coordinate System selection form is shown below:

Select Coordinate System	
Group Latitude/Longitude (LL) Coordinate System LL84	•
Description LL84 WGS84 Lat/Long's, Degrees, -180 ==> +180 Datum: WGS84 Mentor Software DEGREE	
Cancel	Continue

12. Enter the coordinates of the Centennial site:39 33 09 N latitude104 44 51 W longitude

SoftWright HDPath Rev 835	a man have been been been been without a	
File Configuration <u>H</u> elp		
Fixed Facility - Transmit	Path: 17 25 km; Azimuth 216 49 Angle 6 69; Reverse 36 42 Angle -6 69	- Fixed Facility - Beceive
Description		Description
ID 0000031		Site
Desc TRAINING Centennial Site		- I ransmitter
Edit Date 3/23/2013 6:05:36 PM		- I ransmitter Losses
Site		President Antenna
		- Receiver Antenna (Primary)
Latitude 39 33 9.00 N		- Densiver China (Drimany)
Longitude 104 44 51.00 W		Receiver Antenna (Diversitu)
LL84 : WGS84 Lat/Long's, Degrees, -180		- Receiver Lesses (Diversity)
==> +180		- Beceiver Gains (Diversity)
Site Elev ft 💌		Beceiver
		Beceiver Digital Specs
		Filing Information
Transmitter Losses	Path Settings	
Province Antenna	+ Expand All · Collapse All	
Receiver Antenna (Primary)		
- Receiver Gains (Primary)	Units	
- Beceiver Antenna (Diversitu)	Topo Data	
- Beceiver Losses (Diversitu)	Fresnel	
Receiver Gains (Diversity)	Propagation Model	
7 Records	Surface Features	6 Records
DEMO Cheyenne Mountain Test Facility	Land Use	DEMO Castle Rock Test Facility ed
New Edit Conv Delete Save Cancel		New Edit Conv Delete Save Cancel
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13. When the coordinates are entered, you can click the Site Elevation lookup ("…") button to get the elevation from the available topographic elevation data files:

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File Configuration <u>H</u> elp		
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Fixed Facility - Leasmit	Path: 17 25 km: Azimuth 216 49 Angle 6 69: Beverse 36 42 Angle 6 69	Fixed Facility - Receive
		D
ID 0000031		- Transmitter
Desc TRAINING Centennial Site		
Edit Date 3/23/2013 6:05:36 PM		Transmitter Antenna
Site		- Receiver Antenna (Primary)
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Latitude 33 3.00 N		- Receiver Gains (Primary)
Longitude 104 44 51.00 W		Receiver Antenna (Diversity)
LL84 : WGS84 Lat/Long's, Degrees, -180		Receiver Losses (Diversity)
		Receiver Gains (Diversity)
Site Elev 5053.16 ItALC		Receiver
Transmitter		Receiver Digital Specs
Transmitter Losses	Path Sattings	Filing Information
Transmitter Antenna	r aur scrungs	
- Receiver Antenna (Primary)	+ Expand All · Collapse All	
Receiver Losses (Primary)		
Receiver Gains (Primary)	Units	
Receiver Antenna (Diversity)	Topo Data	
Receiver Losses (Diversity)	Fresnel	
☐ Receiver Gains (Diversity) ──── ▼	Propagation Model	
7 Records	Surface Features	6 Records
DEMO Cheyenne Mountain Test Facility	Land Use	DEMO Castle Rock Test Facility ed
4		4
New Edit Copy Delete Save Cancel		New Edit Copy Delete Save Cancel
	]	

14. Next to the Site Elevation Lookup button, you will see "CALC," indicating that the elevation was calculated from available topographical data. If you have a known elevation for the site from a map, survey, or other source, you can enter the value manually. It would then say "SPEC" next to the button.



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File Configuration <u>H</u> elp		
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Fixed Facility - Transmit	Path: 17.25 km; Azimuth 216.49, Angle 6.69; Reverse 36.42, Angle -6.69	Fixed Facility - Receive
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ID 0000031		_ Site
Desc TRAINING Centennial Site		_ Transmitter
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		- Receiver Losses (Primary)
Latitude 39 33 9.00 N		Beceiver Gains (Primary)
Longitude 104 44 51.00 W		- Receiver Antenna (Diversity)
LL84 : WGS84 Lat/Long's, Degrees, -180		Receiver Losses (Diversity)
		Receiver Gains (Diversity)
Site Elev 6053.15 Itt 💌 LALL		Receiver
Transmitter		Receiver Digital Specs
TPO V 🗸	Path Settings	Filing Information
Freg 455.00000 MHz	+ Expand All · Collapse All	
Div Freq MH2		[
Transmitter Losses	Units	
Transmitter Antenna	Topo Data	
Receiver Antenna (Primary)	Fresnel	
Receiver Losses (Primary)	Propagation Model	
7 Records	Surface Features	6 Records
DEMO Cheyenne Mountain Test Facility	Land Use	DEMO Castle Rock Test Facility ed
		4
New Edit Copy Delete Save Cancel		New Edit Copy Delete Save Cancel
	1	

15. In the Transmitter section, enter the frequency (455MHz):

16. The frequency value is needed when a profile is drawn if we want to see the Fresnel zone clearance along the path. (Additional information will be added later.)



17. In the Transmitter Antenna section, enter the antenna height above ground level (50 ft AGL). Note that you now have multiple sections open. You may wish to collapse the Description, Site, and Transmitter sections, since you are done entering information into these, for now. You can expand/collapse each section by clicking on the section title.

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File Configuration <u>H</u> elp		
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Fixed Facility - Transmit	Path: 17.25 km; Azimuth 216.49, Angle 0.60; Reverse 36.42, Angle -0.60	Fixed Facility - Receive
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Description		Description
Site		Site
		_ Transmitter
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		- Beceiver Gains (Primary)
Antenna		- Receiver Antenna (Diversity)
		Receiver Losses (Diversity)
Maj Lobe dBd 👻 📈		Receiver Gains (Diversity)
		Receiver
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7 Records	Surface Features	6 Records
DEMO Cheyenne Mountain Test Facility	Land Use	DEMO Castle Rock Test Facility ed
4		•
New Edit Copy Delete Save Cancel		New Edit Copy Delete Save Cancel



18. At the bottom of the Fixed Facility interface, click the Save button to write the new record to the database. (The Cancel button is used to abandon the changes made to the record.) If you just entered a value in a box, be sure to click in another box prior to saving. This will ensure that the value is saved.

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File Configuration <u>H</u> elp		
<b>96 8 10 / 00 * 6</b>	<u>&gt;                                      </u>	
Fixed Facility - Transmit	Path: 17.25 km; Azimuth 216.49, Angle 0.60; Reverse 36.42, Angle -0.60	Fixed Facility - Receive
Description		Description
Site		_ Site
Transmitter		_ Transmitter
Transmitter Losses		Transmitter Losses
Transmitter Antenna		Transmitter Antenna
Ant Hgt 50.00 ft 🔻 AGL 💌		Heceiver Antenna (Primary)
		- Heceiver Losses (Primary)
Antenna		- Receiver Gains (Primary)
<u>,                                     </u>		Receiver Antenna [Diversity]
		Receiver Losses (Diversity)
		- Receiver Gains (Diversity)
Mounting		- Receiver Digital Space
Orient Mech Tilt		- Filing Information
Elec Tilt Azimuth	Path Settings	
Inverted Pol None	+ Expand All - Collapse All	
Hide preview Azim Elev		-
	Units	
	Topo Data	
	Fresnel	
	Propagation Model	
7 Records	Surface Features	6 Records
DEMO Cheyenne Mountain Test Facility	Land Use	DEMO Castle Rock Test Facility ed
4		4
New Edit Copy Delete Save Cancel		New Edit Copy Delete Save Cancel
Save the curr	ent record	



19. On the Receiver side of the form, click the New button to create a new record:

SoftWright HDPath Rev 835	to begin form they had been model for any beauty	
	<u>an n z u u u u u u u u u u u u u u u u u </u>	
Fixed Facility - Transmit	Path: 17.25 km; Azimuth 216.49, Angle 0.54; Reverse 36.42, Angle -0.54	Fixed Facility - Receive
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Description		Description
Site		Site
		- Transmitter
Transmitter Losses		Transmitter Losses
Transmitter Antenna		Transmitter Antenna
		Receiver Antenna (Primary)
Ant Hgt 3000   ft 💌   AGL 💌		Receiver Losses (Primary)
Antenna		Receiver Gains (Primary)
		Receiver Antenna (Diversity)
		Receiver Losses (Diversity)
Maj Lobe dBd 👻 🖂		Receiver Gains (Diversity)
Advanting		Receiver
Driver March Til		Receiver Digital Specs
Chen Till Animati	Bath Cattings	Filing Information
Elec Tilt Azimuth	Fran Setungs	
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Hide preview Azim Elev		
	Units	
	Topo Data	
	Fresnel	
	Propagation Model	J
7 Records	Surface Features	7 Records
TRAINING Centennial Site	Land Use	DEMO Castle Rock Test Facility ed 🔹
New Edit Com Delete Sam Concel		New Edit Conv Delete Save Concel
Lan Copy Delete Save Cancel		Create a new facility record



20. Enter the parameters for the other site:

Desc:	Training Aurora Site
Latitude:	39 43 42 N
Longitude:	104 57 18W
Datum:	(WGS84 coordinates)
Receiver Frequency:	455MHz

Receiver (Primary) Antenna: 30 ft Above Ground Level

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File Configuration <u>H</u> elp		
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Fixed Facility - Transmit P	ath: 26.43 km; Azimuth 317.69, Angle -4.03; Reverse 137.56, Angle 4.03	Fixed Facility - Receive
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Image: Street of the street	Path Settings         + Expand All         • Collapse All         Units         Topo Data         Fresnel         Propagation Model         Surface Features         Land Use	→ → → → → → → → → → → → → → → → → → →



21. Click the Save button to save the new record:

SoftWright HDPath Rev 835	A Real Color Bar Sol Color Color Without -	
File Configuration <u>H</u> elp		
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Fixed Facility - Transmit	Path: 26.43 km; Azimuth 317.69, Angle -4.03; Reverse 137.56, Angle 4.03	Fixed Facility - Receive
[F] + - [E] 투)에 제외 제 주 [		ㅋ ㅋ ㅋ ㅋ ㅋ ㅋ ㅋ ㅋ ㅋ
Description		Description
Site		ID 0000032
Transmitter		Dono TRAINING Aurora Site
Transmitter Losses		
Transmitter Antenna		Edit Date 372372013 6:40:33 PM
Ant Hat 50.00 ft 💌 AGL 💌		Site
,		Latitude 39 43 42.00 N
Antenna		Lonaitude 104 57 18.00 W
		LL84 : WGS84 Lat/Long's, Degrees, -180
Mailaba dBd 💌 XI		==> +180
		Site Elev 5314.96 ft 💌 CALC
Mounting		Transmitter
Orient Mech Tilt		Transmitter Losses
Elec Tilt Azimuth	Path Settings	Transmitter Antenna
Inverted Pol None	+ Expand All - Collapse All	Receiver Antenna (Primary)
Hide preview Azim Elev		Ant Hot 30.00 It VIAGI VI
	Units	
	Topo Data	Req Field dBu
	Fresnel	Antenna
	Propagation Model	
/ Hecords	Surface Features	8 Hecords
TRAINING Centennial Site	Land Use	DEMO Castle Rock Test Facility ed
4		<u> ۲</u>
New Edit Copy Delete Save Cancel		New Edit Copy Deleta Save Cancel
·		Save the current rec

22. Click the Draw button (the small pencil icon on the toolbar at the top of the HDPath form) to draw the profile:

SoftWright HDPath Rev 835	· · · · · · · · · · · · · · · · · · ·	
File Configuration Here		
	NNN 🔊 🔍 🗐 🔊 🗗 🖓 🖉	
Fixed Facility - Liansu	Path: 26 43 km: Azimuth 317 69 Angle 0.50: Beverse 137 56 Angle 0.50	- Fixed Facility - Receive
Draw the profile		
- Description		- Description
Desc TRAINING Centennial Site		Desc THAINING Autora Site
Edit Date 3/23/2013 6:39:06 PM		Edit Date 3/23/2013 6:47:33 PM
Site		Site
Latitude 39 33 9.00 N		Latitude 39 43 42.00 N
Longitude 104 44 51.00 W		Longitude 104 57 18.00 W
LL84 : WGS84 Lat/Long's, Degrees, -180		LL84 : WGS84 Lat/Long's, Degrees, 180
==> +180		==> +180
Site Elev 6053.15 ft 💌 CALC		Site Elev   5314.96   ft 💌 CALC
Transmitter		- Transmitter
Transmitter Losses	Path Sattings	Transmitter Losses
Transmitter Antenna	+ Evpand óll - Collanse óll	Transmitter Antenna
Receiver Antenna (Primary)		Receiver Antenna (Primary)
Receiver Losses (Primary)		Receiver Losses (Primary)
Receiver Gains (Primary)		Receiver Gains (Primary)
Receiver Antenna (Diversity)		Receiver Antenna (Diversity)
Receiver Losses (Diversity)		Receiver Losses (Diversity)
Perceiver Gains (Diversity)	Propagation Model	Perceiver Gains (Diversity)
o necolas		o necoras
TRAINING Centennial Site		TRAINING Aurora Site
4		
New Edit Copy Delete Save Cancel		New Edit Copy Delete Save Cancel

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23. The path profile is drawn, and when you move the mouse over the graphic, the location of the mouse on the path is shown in the "Mouse Location on Path" form:



24. Click the Zoom button on the top toolbar.

SoftWright HDPath Rev 835	A Description of the second se	
File Configuration Help		
Fixed Facility - Transmit	Path: 26.43 km, 2 zimuth (17.69, Angle -0.50; Reverse 137.56, Angle 0.50	Fixed Facility - Receive
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	1875m	
	1850m	
Description	1825m1825m	Description
ID 0000031	1800m1800m	ID 0000032
Desc TRAINING Centennial Site	1775m1775m	Desc TRAINING Aurora Site
Edit Date 3/23/2013 6:39:06 PM	1750m1750m	Edit Date 3/23/2013 6:47:33 PM
Site	1725m— —1725m	Site
Latitude 39 33 9.00 N	1700m1700m	Latitude 39 43 42.00 N
Longitude 104 44 51.00 W	1675m— —1675m	Longitude 104 57 18.00 W
LL84 : WGS84 Lat/Long's, Degrees, -180	1650m1650m	LL84 : WGS84 Lat/Long's, Degrees, -180
Site Elev 6053.15 ft 💌 CALC	1625m- 1600m	Site Elev 5314.96 ft 💌 CALC
Transmitter	0km 10km 20km 26.43km	_ Transmitter
Transmitter Losses	Path Settings	Transmitter Losses
Transmitter Antenna	+ Expand All · Collapse All	Transmitter Antenna
Receiver Antenna (Primary)		Receiver Antenna (Primary)
Receiver Losses (Primary)	Units	Receiver Losses (Primary)
- Receiver Antenna (Diversitu)	Topo Data	Beceiver Antenna (Diversitu)
Receiver Losses (Diversity)	Fresnel	Receiver Losses (Diversity)
Receiver Gains (Diversity)	Propagation Model	Receiver Gains (Diversity)
8 Records	Surface Features	8 Records
TRAINING Centennial Site	Land Use	TRAINING Aurora Site
•		•
New Edit Copy Delete Save Cancel		New Edit Copy Delete Save Cancel
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25. When you click that button you will be prompted to draw a box (mouse down for one corner, drag to the opposite corner) to zoom into the profile:

SoftWright HDPath Rev 835	A Description of the second seco	
File Configuration Help		
Fixed Facility - Transmit	Path: 26.43 km; Azimuth 317.69, Angle -0.50; Reverse 137.56, Angle 0.50	Fixed Facility - Receive
-+-====================================	Draw a rectangle to show the portion of the profile you want. Right-click to cancel.	- + - = = 4 - 4 - 5
	1875m	
	1850m	
Description	1825m - 1825m	Description
ID 0000031	1000-	ID 0000032
Desc TBAINING Centennial Site		Desc TBAINING Aurora Site
E-th D-sto 2/22/2012 6:39:06 PM	-1//5m	E-th D-sto 2/22/2012 6:47:22 PM
	1750m1750m	Eult Date 3/23/2013 0.47.33 FM
Site	1725m1725m	Site
Latitude 39 33 9.00 N	1700m1700m	Latitude 39 43 42.00 N
Longitude 104 44 51.00 W	1675m1675m	Longitude 104 57 18.00 W
LL84 : WGS84 Lat/Long's, Degrees, -180	1650m1650m	LL84 : WGS84 Lat/Long's, Degrees, -180
	1625m	==> +180
Site Elev  6053.15   It 💌 CALC	1600m1600m	Site Elev  5314.96   It 💌 CALC
Transmitter	0km 10km 20km 26.43km	- Transmitter
Transmitter Losses	- Path Sattings	Transmitter Losses
Transmitter Antenna	+ Expand áll - Collanse áll	Transmitter Antenna
Receiver Antenna (Primary)		Receiver Antenna (Primary)
Receiver Losses (Primary)		Receiver Losses (Primary)
Receiver Gains (Primary)		Receiver Gains (Primary)
Receiver Antenna (Diversity)		Receiver Antenna (Diversity)
Receiver Losses (Diversity)	Presnel	Receiver Losses (Diversity)
Receiver Gains (Diversity)	Surface Features	Perceiver Gains (Diversity)
	Junace   calues	
TRAINING Centennial Site		TRAINING Aurora Site
4		4 · · · ·
New Edit Copy Delete Save Cancel		New Edit Copy Delete Save Cancel

26. You can Right-Click to cancel the zoom out and restore the original scale.



SoftWright HDPath Rev 835	A Description of the local data and the second data and the second data and the second data and the second data	
File Configuration Help		
	Dette 20 42 have the 217 00 datable 2 50. Description 127 50, datable 2 50.	Final Facility Banadian
Reverse the path	Fam. 26.43 km, Azimum 317.63, Angle 40.30, Neverse 137.36, Angle 0.30	
	1075m	
	1850m1850m	
	1825m— — — — — — — — — — — — — — — — — — —	
10 0000031	1800m1800m	ID 0000032
Desc TRAINING Centennial Site	1775m—	Desc TRAINING Aurora Site
Edit Date 3/23/2013 6:39:06 PM	1750m1750m	Edit Date 3/23/2013 6:47:33 PM
Site	1725m1725m	Site
Latitude 39.33 9.00 N	1700m1700m	Latitude 39 43 42.00 N
Longitude 104 44 51.00 W	1675m— —1675m	Longitude 104 57 18.00 W
LL84 : WGS84 Lat/Long's, Degrees, -180	1650m1650m	LL84 : WGS84 Lat/Long's, Degrees, -180
Site Elev 6053.15 ft 💌 CALC	1625m- 1600m- 1600m-	Site Elev 5314.96 ft 💌 CALC
Transmitter	0km 10km 20km 26.43km	- Transmitter
Transmitter Losses	Path Settings	Transmitter Losses
Transmitter Antenna	+ Expand All · Collapse All	Transmitter Antenna
Receiver Antenna (Primary)		Receiver Antenna (Primary)
Receiver Losses (Primary)		Receiver Losses (Primary)
Receiver Gains (Primary)	Tono Data	Receiver Gains (Primary)
Receiver Antenna [Diversity]	Freenel	Receiver Antenna (Diversity)
Receiver Losses (Diversity)	Propagation Model	Receiver Losses (Diversity)
8 Records	Surface Features	8 Records
	Land lise	
TRAINING Centennial Site		TRAINING Aurora Site
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27. To see the reverse path, click the Reverse Path button:



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File Configuration Help		
Fixed Facility - Transmit	Path: 26.43 km; Azimuth 137.56, Angle 0.49; Reverse 317.69, Angle -0.49	Fixed Facility - Receive
	1850m	<u>⊨ + - ≣ <b>≣ A</b> 35 ∿</u> Ø
Description	1825m	Description
	1800m1800m	
10 000032	1775m1775m	
Desc HAINING Aurora Site	1750m	Desc   I HAINING Centennial Site
Edit Date 3/23/2013 6:47:33 PM		Edit Date 3/23/2013 6:39:06 PM
Site	1725m1725m	Site
Latitude 39 43 42.00 N	1700m1700m	Latitude 39 33 9.00 N
Longitude 104 57 18.00 W	1675m1675m	Longitude 104 44 51.00 W
LL84 : WGS84 Lat/Long's, Degrees, -180	1650m1650m	LL84 : WGS84 Lat/Long's, Degrees, -180
==>+180	1625m—/	
Site Elev  5314.96   It 💌 CALC	1600m	Site Elev 6053.15   It 💌 CALC
Transmitter	0km 10km 20km 26.43km	- Transmitter
Transmitter Losses	Path Sattings	Transmitter Losses
Transmitter Antenna	+ Evoand All - Collarse All	Transmitter Antenna
Receiver Antenna (Primary)		Receiver Antenna (Primary)
Receiver Losses (Primary)		Receiver Losses (Primary)
Receiver Gains (Primary)		Receiver Gains (Primary)
Receiver Antenna (Diversity)		Receiver Antenna (Diversity)
Receiver Losses (Diversity)	Fresnel	Receiver Losses (Diversity)
Heceiver Gains (Diversity)	Propagation Model	Receiver Gains (Diversity) ▼
o Hecords	Surface Features	o Hecoras
TRAINING Aurora Site	Land Use	TRAINING Centennial Site
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New Edit Copy Delete Save Cancel		New Edit Copy Delete Save Cancel
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28. The path is drawn from the Aurora Site to the Centennial site.

- 29. Note that the Fixed Facility records have separate data values for the Transmitter Antenna height and the Receiver Antenna height. Since we have not yet entered a value for the Transmit Antenna height at the Aurora site or for the Receive Antenna height at the Centennial site, the path profile is drawn with heights of zero at each end.
- 30. Also, since no transmitter frequency was entered for the Aurora site (only the receiver frequency), no Fresnel zone is shown for this path. The transmitter frequency is used to determine the Fresnel zone on the profile.
- 31. Click the Reverse Path button again to restore the Centennial to Aurora path profile.



32. In the Path Settings section of the form (below the profile graphic) click the Topo Data header to expand that section:

SoftWright HDPath Rev 835	A Contract of the Contract of	-	
File Configuration Help			
	NN 2 2 4 E S 7 4 ?		
Fixed Facility - Transmit	Path: 26.43 km; Azimuth 317.69, Angle -0.50; Reverse 137.56, Angle 0.50	[	Fixed Facility - Receive
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	1875m	875m <sup>l</sup>	
	1850m1	850m .	
Description	1825m	825m	Description
ID 0000031	1800m11	800m	ID 0000032
Desc TRAINING Centennial Site	1775m	775m	Desc TRAINING Aurora Site
Edit Date 3/23/2013 6:39:06 PM	1750m1:	750m	Edit Date 3/23/2013 6:47:33 PM
Site	1725m11	725m	Site
Latitude 39 33 9.00 N	1700m11	700m	Latitude 39 43 42.00 N
Longitude 104 44 51.00 W	1675m11	675m	Longitude 104 57 18.00 W
LL84 : WGS84 Lat/Long's, Degrees, -180	1650m1	650m	LL84 : WGS84 Lat/Long's, Degrees, -180
Site Elev 6053.15 ft 👻 CALC	1625m-	625m	Site Elev 5314.96 ft 👻 CALC
	1600m	600m	
Transmitter	UKM 10KM 20KM 26.43Kr	n	Transmitter
Transmitter Losses	Path Settings		Transmitter Losses
Transmitter Antenna	+ Expand All - Collapse All		Transmitter Antenna
Receiver Antenna (Primary)			Receiver Antenna (Primary)
Receiver Losses (Primary)		_ <b>^</b>	Receiver Losses (Primary)
Receiver Gains (Primary)		- 11	Receiver Gains (Primary)
Receiver Antenna (Diversity)	Topo Data		Receiver Antenna (Diversity)
Receiver Losses (Diversity)	Step 0.10 km 👻		Receiver Losses (Diversity)
Receiver Gains (Diversity)	Later FCC Internalistics (Inscisted)		Receiver Gains (Diversity)
8 Records	Interp FLC Interpolation (4 points)	1	8 Records
TBAINING Centennial Site	Eff Curv 1.333		TBAINING Aurora Site
	3s; 30m; 30s; VMB; DTED;		
	FLT; BIL; HGT		
	☐ Bend Line of Sight	ſ	
New Edit Copy Delete Save Cancel			New Edit Copy Delete Save Cancel
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33. Enter a different earth curvature value, 0.667, ("2/3 earth"). Click the Draw button to redraw the profile with the new setting:

SoftWright HDPath Rev 835	A Contract of the second secon	
File Configuration Help		
	NN 2 2 9 1 1 S 7 8 ?	
Fixed Facility - Transmit	Path: 26.43 km; Azimuth 317.69, Angle -0.50; Reverse 137.56, Angle 0.50	Fixed Facility - Receive
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	1875m	
	1850m	,
Description	1825m	Description
ID 0000031	1000-	ID 0000032
Desc TBAINING Centennial Site	-1800m	Desc TBÁINING Áurora Site
	1//5m1//5n	
Edit Date 3/23/2013 6:33:06 PM	1750m1750n	Edit Date 3/23/2013 6:47:33 PM
Site	1725m— — — — — — — — — — — — — — — — — — —	Site
Latitude 39 33 9.00 N	1700m1700n	h Latitude 39 43 42.00 N
Longitude 104 44 51.00 W	1675m1675n	Longitude 104 57 18.00 W
LL84 : WGS84 Lat/Long's, Degrees, -180	1650m1650n	LL84 : WGS84 Lat/Long's, Degrees, -180
==> +180	1625m	==> +180
Site Elev 6053.15 ft 💌 CALC	1600mm 1600mm	Site Elev 5314.96 ft 💌 CALC
Transmitter	0km 10 <mark>km 20km 26.43km</mark>	- Transmitter
Transmitter Losses	- Path Sattings	Transmitter Losses
Transmitter Antenna	+ Evpand óll - Collapse óll	Transmitter Antenna
Receiver Antenna (Primary)		Receiver Antenna (Primary)
Receiver Losses (Primary)		Receiver Losses (Primary)
Receiver Gains (Primary)		Receiver Gains (Primary)
Receiver Antenna (Diversity)	l lopo Data	Receiver Antenna (Diversity)
Receiver Losses (Diversity)	Step 0.10 km 💌	Receiver Losses (Diversity)
☐ Receiver Gains (Diversity)	Interp FCC Interpolation (4 points)	Receiver Gains (Diversity) ▼
8 Records	//	8 Records
TRAINING Centennial Site		TRAINING Aurora Site
4 <b>•</b>	FLT; BIL; HGT	4
	Bend Line of Sight	
New Edit Copy Delete Save Cancel		New Edit Copy Delete Save Cancel
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- 34. You can see that the earth curvature reference line at the bottom of the graphic shows the increased effect of the new value.
- 35. You can also see that more of the Fresnel zone is obstructed with this value of effective earth curvature. Different values of earth curvature are used to represent different values of atmospheric conditions and the resultant refraction effects.



## 2. Calculate Path Profile Field Strength

**Objective**: Compute RF field strength values on a path profile.

**Procedure**: Add transmitter information to the Fixed Facility database record for the TRAINING Centennial site created in Lab 100 and compute field strength at the receiver location on the path as well as at points along the path.

The additional necessary transmitter information includes:

Transmitter Power Output (TPO)	10 Watts
Losses:	0.5dB Connector Loss
Transmission Line Type:	Andrew LDF2-50 3/8" Foam
Transmission Line Length:	65 feet
Antenna Library File:	Celwave Base Station VHF-UHF
Antenna Description:	ALR10-A PENETRATOR FOR
	UHF WIDEBAND APPLICATIONS

Note that all values and settings discussed in this article are for illustration purposes only. It is important for you to determine the particular settings and values applicable to your equipment and application when using TAP.



1. In HDPath, select the sites to view the profile between the Centennial site and the Aurora site (created in Lab 100):



For the start of this example, be sure the "Use Surface Features" box and the "Include Land Use Data" box are not checked.



2. To add more information to the Centennial transmitter site, be sure that is the site on the Transmit side of the HDPath form and click Edit:

SoftWright HDPath Rev 835	A Contract Concentration of the Contract of th				
File Configuration <u>H</u> elp	File Configuration Help				
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Fixed Facility - Transmit	Path: 26.43 km; Azimuth 317.69, Angle -0.50; Reverse 137.56, Angle 0.50	Fixed Facility - Receive			
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	1875m1875r	n			
	1850m	n			
Description	1825m—	Description			
ID 0000031	1800m1800r	n Site			
Desc TRAINING Centennial Site	1775m1775r	_ Transmitter			
Edit Date 3/23/2013 6:39:06 PM	1750m -1750m	Transmitter Losses			
Site	1725m-	Beceiver Antenna (Primary)			
1 - 10 - 17 - 29 - 22 - 9 - 00 NI	17201- 17201-	Receiver Losses (Primary)			
Latitude 35 33 5.00 N		Receiver Gains (Primary)			
Longitude 104 44 51.00 W	16/5m16/5r	Receiver Antenna (Diversity)			
LL84 : WG584 Lat/Long's, Degrees, -180	1650m1650r	Receiver Losses (Diversity)			
Site Elev 6053.15 ft 💌 CALC	1625m-	Receiver Gains (Diversity)			
	1600m	Bessive Distal Course			
Transmitter		Filing Information			
Transmitter Losses	Path Settings				
- Resolution Antenna -	+ Expand All · Collapse All				
- Beceiver Losses (Primaru)		<b>•</b>			
Receiver Gains (Primary)	Presnel	-			
- Receiver Antenna (Diversity)	Surface Eastures				
Receiver Losses (Diversity)	Ille Surface Features				
Receiver Gains (Diversity)	C:\Users\Dubic\Documents\S\/TAP\$\SUBEACE\Training DBE	-			
8 Records	C:\Users\Public\Documents\SWTAP6\SURFACE\Training_DBF	8 Records			
TRAINING Centennial Site		TRAINING Aurora Site			
4		4			
	Land Use				
	Include Land Use Data				
Nev Edit Copy Delete Save Cancel	Losses TIA TR8 (Revised)	New Edit Copy Delete Save Cancel			
cut the current record					

3. In the Transmitter section of the facility, set the units to W (Watts) and enter the TPO of 10 Watts:

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File Configuration <u>H</u> elp		
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Fixed Facility - Transmit	Path: 26.43 km; Azimuth 317.69, Angle -0.50; Reverse 137.56, Angle 0.50	Fixed Facility - Receive
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	1875m	
	1850m	
Description	1825m	Description
ID 0000031	1800m1800m	Site
Desc TRAINING Centennial Site	1775m1775m	Transmitter
Edit Date 3/23/2013 6:39:06 PM	1750m	Transmitter Losses
Site	1735m 1725m	- Beceiver Antenna (Primary)
L (0) L 20 22 0 00 N	1720	- Receiver Losses (Primary)
Latitude 39 33 9.00 N	1700m	Receiver Gains (Primary)
Longitude 104 44 51.00 W	16/5m 16/5m	Receiver Antenna (Diversity)
LL84 : WG584 Lat/Long's, Degrees, -180	1650m1650m	Receiver Losses (Diversity)
Site Flev 6053.15 ft 💌 CALC	1625m-	Receiver Gains (Diversity)
	1600m	- Receiver Digital Cases
Transmitter	UKM 10KM 20KM 26.43KM	- Filing Information
	Path Settings	T milg finomation
Freq 455.00000 MHz	+ Expand All - Collapse All	
Div Freq MHz	France	
Transmitter Losses	Propagation Model	
Transmitter Antenna	Surface Features	
Receiver Antenna (Primary)	Use Surface Features	
Receiver Losses [Primary]	C\LIsers\Public\Documents\SWTAP6\SUBEACE\Training DBE	
8 Records	C:\Users\Public\Documents\SWTAP6\SURFACE\Training 2.DB	8 Records
TRAINING Centennial Site		TRAINING Aurora Site
		4
	Land Use	
	Include Land Use Data	
New Edit Copy Delete Save Cancel	Losses TIA TR8 (Revised)	New Edit Copy Delete Save Cancel
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Fixed Facility - Transmit	Path: 26.43 km; Azimuth 317.69, Angle -0.50; Reverse 137.56, Angle 0.50	Fixed Facility - Receive
H + - II IA 35 K 8		
	1850m-	
Site	-1825m	Description
Latitude 39.33.9.00 N	1000m	Site
Langhuda 104 44 51 00)//	1775-	Transmitter
LI 84 : W/SS84 at/l ond's Degrees 199		Transmitter Losses
==> +180	-1750m	Transmitter Antenna
Site Elev 6053.15 ft 💌 CALC	-1/25m-	- Receiver Losses (Primary)
	1700m1700m	Beceiver Gains (Primary)
Transmitter	1675m1675m	- Receiver Antenna (Diversity)
	1650m1650m	Receiver Losses (Diversity)
Freq  455.00000 MHz	1625m— — — — — — — — — — — — — — — — — — —	Receiver Gains (Diversity)
Div Freq MHz	1600m-1-1600m	Receiver
Transmitter Losses	0km 10km 20km 26.43km	Receiver Digital Specs
Circulator dB	Path Settings	Filing Information
Connector 0.50 dB	+ Expand All · Collapse All	
Jumper dB		-
Combiner	Fresnel	
Misc 1	Propagation Model	
	Sunder Fedures	
MISC 2 J dB	CVUIses/Definition DRE	•
Records	C:\Users\Public\Documents\SWTAP6\SURFACE\Training.DBF	8 Records
TRAINING Centennial Site		TRAINING Aurora Site
4		4

4. In the Transmitter Losses section, enter 0.5dB for connector losses in the system.

5. In the Transmitter Losses section under Line 1, click the lookup ("…") button to select the transmission line you want to use:

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File Configuration <u>H</u> elp		
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Fixed Facility - Transmit	Path: 26.43 km; Azimuth 317.69, Angle -0.50; Reverse 137.56, Angle 0.50	Fixed Facility - Receive
H 🕈 - 📰 🚊 🗛 🗃 🖌		
	1875m	
	1850m	
Transmitter Losses	1825m	Description
Circulator	1800m	_ Site
Connector 0.50	1775m1775m	
	1750m1750m	Transmitter Antenna
Jumper db	1725m1725m	Receiver Antenna (Primary)
Combiner dB	1700m1700m	Receiver Losses (Primary)
Misc 1 dB	1675m1675m	Receiver Gains (Primary)
Misc 2 dB	1650m1650m	- Receiver Antenna (Diversity)
Line 1	1625m-	Receiver Gains (Diversity)
	1600m	Receiver
	0km 10km 20km 26.43km	Receiver Digital Specs
	Path Settings	Filing Information
	+ Expand All · Collapse All	
Line 2		
	Fresnel	
Length ft 💌	Propagation Model	
Loss dB 455.00MHz	Surface Features	
	Cit Learch Publich Decurrental Stu/TAPC/STUPEACE/Training DPE	
8 Records	C:\Users\Public\Documents\SWTAP6\SURFACE\Training_DB	8 Records
TRAINING Centennial Site		TRAINING Aurora Site
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	Land Use	
	Include Land Use Data	
New Edit Copy Delete Save Cancel	Losses TIA TR8 (Revised)	New Edit Copy Delete Save Cancel

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(Note you can also enter an estimated line loss directly. The lookup function is used to select a particular transmission line type and length to compute the loss value.)

6. Scroll down the list to find the Andrew LDF2-50 3/8" Foam line. Click the line to highlight it:

 Select Transi	mission Line		-	-			
Andrew	EW220 H	Ellipt	ical	Waveguide	e, 21.	2-23.6 GHz	-
Andrew	FSJ1-50	1/4"	Super	flexible	Foam	Dielectric	
Andrew	FSJ4-50B	1/2"	Super	flexible	Foam	Dielectric	
Andrew	LDF2-50	3/8"	Foam	Dielectr:	Lc 50-	-ohm	
Andrew	LDF4-50A	1/2"	Foam	Dielectr:	ic 50-	-ohm	
Andrew	LDF5-50A	7/8"	Foam	Dielectr	ic 50-	ohm	
Andrew	FT5-50	7/8"	High-	Temperati	ire Fo	am Dielect	r
Andrew	LDF6-50	1-1/4	Foa	am Dielect	tric 5	0-ohm	
Andrew	LDF7-50A	1-5/8	B" Foa	am Dielect	tric 5	0-ohm	-
Cancel		0	.5 MHz to	13000 MHz		Continu	e

Click the Continue button to select the line type you have highlighted.

The TAP installation includes sample transmission line files. You should verify the current manufacturer's specifications for your application.



File Configuration Help		
Fined Facility - Transmit	Path: 26.43 km; Azimuth 317.69, Angle 0.50; Reverse 137.56, Angle 0.50	Fixed Facility - Receive
Divred     Mil2       Transmitter Losses     dB       Circulator     dB       Jumper     dB       Jumper     dB       Misc 1     dB       Misc 2     dB       Line 1     LmsAND00       012000035       Andrew LDF2:50     3/8" Foam Diele       Length     5500       R        Loss     1.50       dB     455,00MHz	1825m     -1825m       1825m     -1825m       1800m     -1800m       1775m     -1775m       1750m     -1775m       1725m     -1725m       1725m     -1725m       1700m     -1725m       1700m     -1725m       1650m     -1650m       1650m     -1650m       1650m     -1650m       1625m     -1625m       1600m     10km     20km       26 43km     -1600m       Path Settings     + Expand All	Description     Site     Transmitter     Transmitter     Transmitter     Transmitter     Antenna     Transmitter     Antenna     Receiver Antenna     Paceiver Gains (Primary)     Receiver Antenna (Diversity)     Receiver Gains (Diversity)     Receiver Gains (Diversity)     Receiver Digital Specs     Filing Information
Line 2	C Kydriu Xii CUllique All      Fresnel      Propagation Model      Use Surface Features      C:\Users\Public\Documents\SWTAP6\SURFACE\Training.DBF      C:\Users\Public\Documents\SWTAP6\SURFACE\Training.DBF      Land Use     Include Land Use Data     Losses TIA TR8 (Revised)     T	8 Records TRAINING Aurora Site ▲ New Edit Copy Delete Save Car

7. Enter the length of the transmission line (65 feet for this example):



8. When you move the mouse cursor out of the box for the line length, the loss value is computed:

SoftWright HDPath Rev 835	the business includes and the same the same state	
File Configuration Help	· · · · · · · · · · · · · · · · · · ·	
- Eined Facility - Jeansmit	Rath: 26 42 km Azimuth 217 69, Ande -0.50; Reverse 127 56, Ande 0.50	- Finad Facility - Receive
	Taur. 20.43 Mil, Azindar 317.03, Angle 10.30, Hevelse 137.30, Angle 0.30	
	1875m1875m	
	1950	
Divined Miliz	1036m 1036m	Description
Transmitter Losses	102011-	_ Site
Circulator	-1800m-	- Transmitter
Connector 0.50 dB	-1775m	Transmitter Losses
Jumper dB	1750m1750m	Transmitter Antenna
Combiner	1725m1725m	Receiver Antenna (Primary)
Mine 1	1700m1700m	Receiver Losses (Primary)
	1675m1675m	Receiver Antenna (Diversity)
Misc 2 dB	1650m1650m	Receiver Losses (Diversity)
Line 1 LmsAND00 0120000035	1625m	Receiver Gains (Diversity)
Andrew LDF2-50 3/8" Foam Diele	1600m 1600m	Receiver
Length 65.00 ft 👻	0km 10km 20km 26.43km	Receiver Digital Specs
Loss 1.50 dB 455.00MHz	Path Settings	Filing Information
	+ Expand All · Collapse All	
Line 2		
	Fresnel	
Length ft 💌	Fropagation model	
Loss dB 455.00MHz	I Ise Surface Features	
· · · · · · · · · · · · · · · · · · ·	C\Users\Public\Documents\SWTAP6\SUBFACE\Training DBE	1
8 Records	C:\Users\Public\Documents\SWTAP6\SURFACE\Training 2.DB	8 Records
TRAINING Centennial Site		TRAINING Aurora Site
٩ ( )		
	Land Use	
	Include Land Use Data	
New Edit Copy Delete Save Cancel	Losses TIA TR8 (Revised)	New Edit Copy Delete Save Cancel

If you want to enter a loss value manually, this is the box where you would type it. Note that when you enter a value, the line type information is removed to avoid confusion with computed values.



9. In the Transmitter Antenna section, click the lookup ("...") button to select the antenna you want to use.

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Fixed Facility - Transmit	Path: 26.43 km; Azimuth 317.69, Angle -0.50; Reverse 137.56, Angle 0.50	Fixed Facility - Receive			
	1875m— — — — — 1875m				
	1850m				
	1825m1825m	- Description			
Transmitter Losses	1990-	Site			
Transmitter Antenna		Transmitter			
Ant Hgt 50.00 ft 💌 AGL 💌	1//5m1//5m	- Transmitter Losses			
	1750m1750m	Transmitter Antenna			
Antenna	1725m1725m	Receiver Antenna (Primary)			
	1700m1700m	Receiver Losses (Primary)			
Mai Lobe dB V	1675m1675m	Receiver Gains (Primary)			
	1650m1650m	Receiver Antenna [Diversity]			
Mounting	1625m	Receiver Costes (Diversity)			
Orient Mech Tilt		Beceiver			
Elec Tilt Azimuth	1600m 1600m 1600m 1600m	Receiver Digital Specs			
Inverted Pol None		- Filing Information			
Hide preview Azim Elev	Path Settings				
	+ Expand All · Collapse All				
	Example A				
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	Surface Features				
	Fille Confere Freebook				
Radome dB 👻					
8 Records	C:\Users\Public\Documents\SWTAP6\SURFACE\Training.DBF C:\Users\Public\Documents\SWTAP6\SURFACE\Training.2DB	8 Records			
TRAINING Centennial Site		TRAINING Aurora Site			
	   and   se				
	Include Land Use Data				
New Edit Copy Delete Save Cancel	Losses TIA TR8 (Revised)	New Edit Copy Delete Save Cancel			

If you do not know the specific antenna you want to use, you can enter a gain value directly in the "Maj Lobe" box in this section. A manually entered value will assume an isotropic omnidirectional antenna with equal gain in all directions. If you want to use a directional pattern (including the vertical plane pattern for an omni-directional antenna), you must use the antenna lookup function.

The TAP installation includes several sample antenna library files. You should verify the current manufacturer's specifications for your application. You can also add or modify antenna library patterns as described in other FAQs.



10. Select the antenna library from the list displayed (Celwave Base Station VHF-UHF):

A	Antenna Library to Open - 31 files						
	Path						
	C:\Users\Public\Documents\SWTAP6\ANTENNAS\A	MS????.DBF					
	Select File						
	Description	File					
	0404 Bluewave	AMSZ0047.DBF					
	0404 Celwave Base Station 800-900	AMSZ0022.DBF					
	0404 Celwave Base Station Maximizer	AMSZ0023.DBF					
	0404 Celwave Base Station Microtenna	AMSZ0024.DBF					
	0404 Celwave Base Station PCS	AMSZ0025.DBF					
	0404 Celwave Base Station Penetrator	AMSZ0026.DBF					
	0404 Celwave Base Station VHF-UHF	AMSZ0027.DBF					
	0404 Celwave Microwave Grid	AMSZ0028.DBF	-				
	Cancel New File	Contin	Cancel New File Continue				

11. The antenna library will be displayed. Select the desired antenna from the list (ALR10-A PENETRATOR FOR UHF WIDEBAND APPLICATIONS). Click the selection button at the left end of the row line to highlight it:



Click the Close button (near the middle on the right side of the form) to select this antenna.



12. The antenna gain information and a thumbnail of the directional pattern information are displayed for the Fixed Facility:





e Configuration Help	· · · · · · · · · · · · · · · · · · ·	
inad Eacility - Transmit	Path: 26 43 km: A time th 217 59 Ande 0.50; Reverse 127 56 Ande 0.50	- Finad Facility - Bacaina
	Pari, 20.43 Kill, Azinium 317.03, Angle 4.30, Neverse 137.36, Angle 0.30	
	1075 1075	
	-10/5	m
DIVITED IVITZ	1850m-  -1850	Jm
Transmitter Losses	1825m— — — — — — — — — — — — 1825	5m Description
Transmitter Antenna	-1800 -1800	Om Site
	1775m—	m Transmitter
Ant Hgt 50.00 ft 💌 AGL 💌	1750~	
	1730	Popojuor Antonno (Primoru)
AMS20027  2002700035	-1/20	Beceiver Losses (Primary)
ALR10-A PENETRATOR FOR UF	1700m1700	m Receiver Costes (Primary)
Maj Lobe 12.30 dBd 👻 🗶	1675m1675	Beceiver Antenna (Diversitu)
Harmstein .	1650m	m _ Beceiver Losses (Diversity)
	1625m-	m Beceiver Gains (Diversity)
	1000-	- Receiver
Elec I ilt Azimuth	0km 10km 20km 26.43km	Receiver Digital Specs
Inverted Pol None -	<u> </u>	- Filing Information
Hide preview Azim Elev	Path Settings	
	+ Expand All - Collapse All	
	Freshel	
	Propagation Model	
	Surface Features	
Radome dB 👻	Use Surface Features	
ecords	C:\Users\Public\Documents\SWTAP6\SURFACE\Training.DBF	8 Records
AINING Centennial Site		TRAINING Aurora Site
Anning Centennial site		ThAINING Adiola site
•		Image: A state of the state
	Land Use	
	Include Land Use Data	
New Edit Copy Delete Save Cancel	Losses TIA TR8 (Revised)	<ul> <li>New Edit Copy Delete Save Can</li> </ul>

13. Click the Draw button again to redraw the path.

Note the green line in the Azimuth pattern thumbnail showing the azimuth of the path. The azimuth value is also shown in the label above the profile graphic.



14. In order to orient the antenna major lobe of this directional pattern, click the "Set TX antenna for path" button (the "**T**" button ).

SoftWright HDPath Rev 835	A CONTRACTOR OF A CONTRACTOR O	
File Configuration <u>H</u> elp	-	
Fixed Facility - Transmit	Path: 26.43 km; Azimuth 317.69, Angle -0.50	Fixed Facility - Receive
H + - III 특히 정정 등 중	Set TX antenna for path	= = =
	1875m1875m	
	1850m	
Divited Militz	1825m	Description
Transmitter Losses	1000	_ Site
Transmitter Antenna		Transmitter
Ant Hgt 50.00 ft 💌 AGL 💌	-1//5m	Transmitter Losses
	1750m1750m	Transmitter Antenna
Antenna AMSZ0027 Z002700035	1725m1725m	Receiver Antenna (Primary)
ALR10-A PENETRATOR FOR UF	1700m1700m	- Receiver Costes (Primary)
Maj Lobe 12.30 dBd 👻 🗶	1675m1675m	- Receiver Antenna (Diversity)
Mounting	1650m1650m	- Receiver Losses (Diversity)
Drient Mech Tilt	1625m	Receiver Gains (Diversity)
Elec Tilt Azimuth	1600m1600m	Receiver
Inverted Pol None	0km 10km 20km 26.43km	Receiver Digital Specs
Hide preview Azim Elev	) – Path Settings	Filing Information
	+ Expand All · Collapse All	
		-
	Fresnel	-
	Propagation Model	
	Surface Features	
Radome dB 👻	Use Surface Features	-
8 Records	L:\Users\Public\Documents\SWTAP6\SURFACE\Training.DBF C:\Users\Public\Documents\SWTAP6\SURFACE\Training.DBF	8 Records
TRAINING Centennial Site		TRAINING Aurora Site
	/ I and Use	
	Include Land Use Data	
New Edit Copy Delete Save Cancel	Losses TIA TR8 (Revised)	New Edit Copy Delete Save Cancel

You may get the following confirmation dialog box. If so, click OK.



You can also enter the antenna mounting values manually if desired.



The orientation is the adjustment of the antenna pattern from the library (usually, but not always, with the major lobe to the north). The antenna pattern from the library file is rotated by the amount of the Orientation value. The azimuth value remains for reverse compatibility.

15. Note that as the TPO value, losses, and the antenna gain are adjusted, the program updates the Effective Radiated Power value. This is the ERP relative to an ideal dipole.

softWright HDPath Rev 835	3. 3. 7. man count count count				
File Configuration Help					
Fixed Facility - Transmit	Path: 26.43 km; Azimuth 317.69, Angle -0.50; Reverse 137.56, Angle 0.50	Fixed Facility - Receive			
🛏 🕈 🗏 🗏 🛋 🏹 🖨					
	1875m1875	im [			
	1850m 1850	)m			
Transmitter Antenna	1825m	Description			
Ant Hgt 50.00 ft 💌 AGL 💌	1800m1800	m Site			
	1775m	_ Transmitter			
Antenna AMSZ0027 Z002700035	1750-	Transmitter Losses			
ALR10-A PENETRATOR FOR UF	1730111730	Beceiver Antenna			
Maj Lobe 12.30 dBd 👻 🗶	172011-	Beceiver Losses (Primary)			
Mounting	1/UUm1/UL	m Receiver Gains (Primary)			
Orient 317.69 Mech Tilt-0.5	1675m1675	Receiver Antenna (Diversity)			
Elec Tilt Azimuth 317.69	1650m1650	Receiver Losses (Diversity)			
Inverted Pol None	1625m-	m Receiver Gains (Diversity)			
Hide preview Azim Elev	1600m - 19km - 20km - 20km	m Receiver			
	UKM IUKM 20KM 26.43KM	- Filing Information			
	Path Settings	rning moniation			
	+ Expand All · Collapse All				
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	Presnel				
Radome dB	Surface Features				
ERP 50.30 dBm 💌	Ise Surface Features				
-Passiuar Antonna (Drimaru)	C:\Users\Public\Documents\SWTAP6\SUBFACE\Training.DBF				
8 Records	C:\Users\Public\Documents\SWTAP6\SURFACE\Training 2.DB	8 Records			
TRAINING Centennial Site		TRAINING Aurora Site			
4		4			
	Land Use				
	Include Land Use Data				
New Edit Copy Delete Save Cancel	Losses TIA TR8 (Revised)	New Edit Copy Delete Save Cancel			
Save the current	record				

16. Click the Save button to save the changes to the Centennial site record. (The record may have already saved when you set the TX antenna orientation.)



	The Review Country Country Country		
SoftWright HDPath Rev 835			
File Configuration Help			
Fixed Facility - Transmit	Path: 26.43 km; Azimuth 317.69, Angle -0.50; Reverse 137.56, Angle 0.50	Fixed Facility - Receive	
+-= 👬 🗛 🕹 🚣 🎒			
	1875m— — — — — — — — — — — — — — — — — — —		
Terresition deleges	1850m		
	1825m1825m	Description	
Ant Hgt 50.00 ft 💌 AGL 💌	1800m1800m	Site	
Antenna Augzagaz	1775m1775m	_ Transmitter	
AMSZU027 JZ002700035	1750m1750m	Transmitter Antenna	
ALR10-A PENETRATOR FOR UF	1725m	Receiver Antenna (Primary)	
Maj Lobe 12.30 dBd 💌 🖄 📖	1700m - 1700m	Receiver Losses (Primary)	
Mounting	1675m	Receiver Gains (Primary)	
Orient 317.69 Mech Tilt 0.5	1050	Receiver Antenna (Diversity)	
Elec Tilt Azimuth 317.69	1650m	Receiver Losses (Diversity)	
Inverted Pol None -	1620m-	Receiver Gains (Diversity)	
Hide preview Azim Elev	1600m-1 1 1 1 1600m 0km 10km 20km 26.43km	Beceiver Digital Specs	
		Filing Information	
	Path Settings		
	+ Expand All · Collapse All		
	·		
	Units		
Radome dB	Topo Data	-	
ERP 50.30 dBm 💌	Fresnel		
Descritor Antonno (Primoru)	Propagation Model	0 Decenter	
	Model Longley-Rice		
I HAINING Centennial Site	Template Hata/Davidson	I HAINING Aurora Site	
<u>▲</u>	Longley-Rice	• •	
	Rounded Obstacle =		
New Edit Conv Delete Save Cancel	Shadow - Fixed Angle	New Edit Conv Delete Save Concel	
wew cur copy belete save cancer	Specialized Mobile Radio	The copy Delete Save Cancer	

17. In the Propagation Model section, select the Longley-Rice model.

Several propagation models are available in TAP. There are numerous FAQs that describe each model and compare the models. Longley-Rice is used for this example. You should select the model best suited to your application.



18. Each propagation model has various parameters associated with the model. These parameters are contained in templates, enabling you to have multiple standard configurations you can create. For this example, click the lookup ("...") button to display the available Longley-Rice templates. (This window may display behind the HDPath window.)

Longley-Rice Parameters Template				
Template Description				
Description: LR Defaults				
Polarization.				
Polarization (Horizontal or Vertical): V 💌				
Retractivity and Climate				
Surface Ns (N-units): 300.9000 Effective Earth Curvature (K): 1.3333				
Sea Level No (N-Units): 0.0000 Climate Code (1 - 7): 5 Continental Temperate				
Ground Parameter				
Relative Permittivity: 15.00 Average ground  Conductivity (Siemens/m): 0.005 Average grour				
Variability         Mode: 11         Situation (%)         Time (%)				
Individual Visituation Variability 90.00 90.00				
New         Edit         Copy         Del         Eind         Save         Cancel         Close         I<         > >I				

Select the LR Defaults template and click the Close button. These values are used for this example. You should select values that are most suited to your application.



- 19. Now that the Fixed Facility transmit information and propagation model settings have been entered, you have several ways to compute the field strength values associated with this path.
- 20. First, if you want to know the field strength value at the receiver location at the end of the path, click the "Calc Field at RX Location" button:

📚 SoftWright HDPath Rev 835				
File Configuration Help				
Fixed Facility - Transmit	Path: 26.43 km; Azimuth 317.69, Angle -0.50; Reverse 137.56, Angle 0.50	Fixed Facility - Receive		
+-= 14 3 5 5		+-= 👬 🕹 🕹 🐜 🔿		
	1875m			
Transmitter Antonna	1850m			
	1825m	Description		
Ant Hgt 50.00 ft 💌 AGL 💌	1800m1800m	- Site		
Antenna AMSZ0027 Z002200025	1775m1775m	Transmitter Losses		
	1750m1750m	Transmitter Antenna		
ALRIGA PENETRATOR FOR OF	1725m1725m	Receiver Antenna (Primary)		
Maj Lobe 12.30   dBd 💌 🛆	1700m1700m	Receiver Losses (Primary)		
Mounting	1675m	Receiver Gains (Primary)		
Orient 317.69 Mech Tilt -0.5	1650m1650m	- Receiver Antenna (Diversity)		
Elec Tilt Azimuth 317.69	1625m-	Beceiver Gains (Diversity)		
Inverted Pol None -	1600m	Receiver		
Hide preview Azim Elev	0km 10km 20km 26.43km	Receiver Digital Specs		
	Path Sattings	Filing Information		
	+ Evnand áll - Collanse áll			
		_		
Badome	Topo Data			
FBP 50.30	Fresnel			
- Possiuer Antonno (Primaru)	Propagation Model			
8 Records	Model Longley-Rice	8 Records		
TRAINING Centennial Site	Template LR Defaults	TRAINING Aurora Site		
	Constant Height			
New Edit Copy Delete Save Cancel		New Edit Copy Delete Save Cancel		


21. The program will compute the field strength and display the details:

Field Strength Calculation	X
TX Facility at TRAINING Centennial Site 39 33 9.00 N 104 44 51.00 W WGS 84 Frequency: 455.00000 MHz ERP: 50.3000 dBm TX Ant: ALR10-A PENETRATOR FOR UHF WIDEBAND APPLICATIONS Orient: 317.69 M Tilt: -0.5 on Az 317.69	*
RX Facility at TRAINING Aurora Site 39 43 42.00 N 104 57 18.00 W WGS 84 RX Antenna: 30.00ft AGL	
Path: 26.43 km Azimuth: 317.69° Topo Data Step: 0.10 km Effective Earth Curvature: 1.3330 Topo Data: 3s; 30m; 30s; VMB; DTED; FLT; BIL; HGT Interpolation: FCC Interpolation (4 points)	
<ul> <li>TX Site MSL adjusted to: 6053.15 ft</li> <li>TX Ant: 6103.15tt MSL (Site 6053.15ft + 50.00ftAGL)</li> <li>Ant: ALR10-A PENETRATOR FOR UHF WIDEBAND APPLICATIONS</li> <li>Drientation: 317.69</li> <li>Mech Tilt -0.50 on Azimuth 317.69</li> <li>RX Ant: 5344.96ft MSL (Site 1620.00m + 9.14mAGL)</li> <li>Azimuth: 317.689</li> <li>Propagation Model: Longley-Rice</li> <li>LR Defaults</li> <li>TX Antenna Gain: Az 0.00 dB; EI -0.30 dB (angle = -0.501)</li> <li>Free Space Field: (50.001 dBm @ 16.421 mi) 68.48 dBu</li> <li>Additional Estimated transmission loss :20.53 dB</li> <li>Line-of-sight path</li> <li>LR Mode: 11</li> </ul>	
Individual; No Location Var Polarization: V Surface Refrac: 0.00(300.90) Permittivity: 15.00 Conductivity: 0.0050 Climate: Continental Temperate Confidence: 90.00 Reliability: 90.00 Path terrain Delta-H: 228.44 ft Effective antenna heights: 190.72 ft 15.15 m <u>Net received field: 47.95 dBu</u>	
Receiver Input Power: -80.26dBm Total RX Gains: 2.15dB Total RX Losses: 0.00dB Margin -80.26dB for input requirement 0.00dBm	*
Print	Close

The actual content of the details will be different for different propagation models, but the site and path information, and the "Net received field" are displayed for each model.

22. If this path is intended as a point to point link, then the field strength at the receiver location may be all you need to know. (Note this does not yet include the receiver specifications, loss values, antenna gain, etc. Those values are discussed in the Link Budget lab.)



- 23. On the other hand, if you are interested in the field strength along the path, HDPath also enables you to make those calculations. (For example, if the Centennial site was also going to be used for mobile communications as well.)
- 24. For example, suppose you want to know the field strength at points along the path with an antenna height of six feet above ground. In the Propagation Model section, click the "Show Field at Mouse Cursor" box, and check the "Constant Height" box. Enter a value of 6ft.

🔹 SoftWright HDPath Rev 835				
File Configuration Help				
	NNN 2 Q 🗐 🔊 7 🕸 ?			
Fixed Facility - Transmit	Path: 26.43 km; Azimuth 317.69, Angle -0.50; Reverse 137.56, Angle 0.50	Fixed Facility - Receive		
+ - 📃 🏦 🛤 🚡 🛃 🌆 🚳		- + - = 💷 🐴 🚡 🗸 🔿		
	1875m			
	1850m-(			
Transmitter Antenna	1825m	Description		
Ant Hgt 50.00 ft 💌 AGL 💌	1800m1800m	Site		
Automa Income Income	1775m1775m	Transmitter		
Antenina JAMSZ0027 JZ002700035	1750m1750m	Transmitter Antenna		
ALR10-A PENETRATOR FOR UF	1725m1725m	Receiver Antenna (Primary)		
Maj Lobe 12.30 dBd 💌 🔀 📖	1700m -1700m	Receiver Losses (Primary)		
Mounting	1675m	Receiver Gains (Primary)		
Orient 317.69 Mech Tilt -0.5	1950m - 1950m	Receiver Antenna (Diversity)		
Elec Tilt Azimuth 317.69	1030m	Receiver Losses (Diversity)		
Inverted Pol None 💌		Beceiver		
Hide preview Azim Elev	1600m - 1600m - 1600m - 1600m - 1600m	Receiver Digital Specs		
	 	Filing Information		
	Path Settings			
<b>1</b>	+ Expand All · Collapse All	_		
	Units			
	Topo Data			
FDD 50.20	Fresnel			
	Propagation Model			
8 Records	Model Longley-Rice	8 Records		
TBAINING Centennial Site	Template LR Defaults	TBAINING Aurora Site		
	Calc Field at RX Location			
	Show field at mouse cursor			
	Constant Height			
New Edit Copy Delete Save Cancel	6.00 ft ▼ AGL ▼	New Edit Copy Delete Save Cancel		

(If the constant height box is not checked, the field is computed at the mouse location above the terrain on the drawing.)

25. Now when you move the mouse on the drawing you will notice a delay while the field strength is calculated at each location. (Be sure the Mouse Location on Path form is open. If it is not, the field is not computed. You can force the form to open again by clicking the Draw button with the pencil icon on the toolbar near the top of the HDPath form.)



26. You can expand the size of the form to display the computed field value at the bottom of the information as you move the mouse along the path. When you left click at a location, the calculation details are opened in a Notepad file:

```
X
 SWPrnFil - Notepad
File Edit Format View Help
Left-Click profile to print text;
                                                                  ÷
Right-Click profile to toggle full form view;
         <== 23.00km 1661.67m (1666.30m) 3.42km ==>
Path data interpolation: FCC Interpolation (4 points)
Effective earth curvature: 1.333
39 42 19.99N
                104 55 40.92W
                                    LL 84
Mouse: 14.67 m AGL
Terrain:
                  1647.00 m MSL
         1659.11 m MSL
LOS:
         1651.642 m MSL
Adj:
clear:
         7.47 m
                  0.17 Fresnel*
Additional clearance for 0.50F1:
                                               -14.70 m
TX Facility at TRAINING Centennial Site
39 33 9.00 N 104 44 51.00 W LL84
Frequency: 455.00000 MHz ERP: 50.3000 dBm
Field Calc at 23.00km 1.83m AGL
Topo Data Step: 0.10 km Effective Earth Curvature: 1.33
Topo Data: 3s; 30m; 30s; VMB; DTED; FLT; BIL; HGT
Interpolation: FCC Interpolation (4 points)
TX Site MSL adjusted to: 6053.15 ft
TX Ant: 6103.15ft MSL (Site 6053.15ft + 50.00ftAGL)
Ant: ALR10-A PENETRATOR FOR UHF WIDEBAND APPLICATIONS
Orientation: 317.69
            Mech Tilt -0.50 on Azimuth 317.69
RX Site MSL adjusted to: 1647.00 m
RX Ant: 5409.54ft MSL (Site 1647.00m + 1.83mAGL)
Azimuth: 317.689
Propagation Model: Longley-Rice
LR Defaults
TX Antenna Gain: Az 0.00 dB; El -0.29 dB (angle = -0.
Free Space Field: (50.008 dBm @ 14.292 mi) 69.69 d
Additional Estimated transmission loss :16.88 dB
                                                        69.69 di
Line-of-sight path
LR Mode: 11
         Individual; No Location Var
Polarization: V
Surface Refrac: 0.00(300.90)
Permittivity: 15.00 Conductivity: 0.0050
Climate: Continental Temperate
Confidence: 90.00 Reliability: 90.00
Path terrain Delta-H: 250.03 ft
Effective antenna heights: 177.41 ft
                                               17.23 m
Net received field: 52.82 dBu
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                              111
                                                               Þ
```



The computed values at each location can be compared to the Required Field value computed for various mobile units (as described in several FAQs) to determine if sufficient field strength is available at locations of interest.

27. When you are through computing the field values along the path you should uncheck the "Show Field at Mouse Cursor" box.

🕸 SoftWright HDPath Rev 835					
File Configuration Help					
Fixed Facility - Transmit	Path: 26.43 km; Azimuth 317.69, Angle -0.50; Reverse 137.56, Angle 0.50	Fixed Facility - Receive			
	1875m— — — — — 1875	im +-E EA 35 % 8			
	18500-	m			
Transmitter Antenna	1825m	Description			
Ant Hgt 50.00 ft 👻 AGL 💌	1800-	Site			
	1775m1775	Transmitter			
Antenna AMSZ0027 Z002700035	1750m	Transmitter Losses			
ALR10A PENETRATOR FOR UF	1725m1725	m Receiver Antenna (Primary)			
Maj Lobe 12.30 dBd 💌 🔀	1700 - 1700	Receiver Losses (Primary)			
Mounting	1675m1675	Receiver Gains (Primary)			
Orient 317.69 Mech Tilt -0.5	1650m	Receiver Antenna (Diversity)			
Elec Tilt Azimuth 317.69	1625m	Receiver Losses [Diversity]			
Inverted Pol None -	1000	Receiver			
Hide preview Azim Elev	0km 10km 20km 26.43km	Receiver Digital Specs			
h	_ Path Sattings	Filing Information			
	+ Expand All · Collapse All				
	Topo Data				
Radome	Fresnel				
ERP 50.30 dBm -	Propagation Model				
8 Becords	Model Longley-Rice	8 Becords			
TBAINING Centennial Site	Template LR Defaults	TBÁINING Aurora Site			
	Calc Field at RX Location				
	Show field at mouse cursor				
	Constant Height				
New Edit Copy Delete Save Cancel	6.00 ft y AGL y	▼ New Edit Copy Delete Save Cancel			



## 3. Example Microwave Link Budget

- **Objective**: Compute a microwave path link budget and check the path for potential reflection points.
- **Procedure**: Using the sites created for Section 1 (Path Profile), add microwave facilities and compute the path reliability with the Microwave Link Budget function.

The microwave facilities at the same locations are:

	Centennial Site TX	Aurora Site RX
Frequency:	6.1GHz	6.1Ghz
TPO:	1Watt	
Receiver Sensitivity:		-110dBm
Antenna Gain	45dBi	45dBi
Antenna Height:	400 ft AGL	1020 ft AGL
Transmission Line:	Andrew EWP52S	Andrew EWP52S
	Elliptical Waveguide	Elliptical Waveguide
Line Length:	420 ft	1030 ft

Note that all values and settings discussed in this article are for illustration purposes only. It is important for you to determine the particular settings and values applicable to your equipment and application when using TAP.



1. In HDPath, select the sites to view the profile between the Centennial site and the Aurora site (including the Centennial transmitter information added in Lab 300):

SoftWright HDPath Rev 835	* • • • • • • • • • • • • • • • • • • •			
File Configuration Help				
Fixed Facility - Transmit	Path: 26.43 km; Azimuth 317.69, Angle -0.50; Reverse 137.56, Angle 0.50	Fixed Facility - Receive		
🛏 + - 🔚 🎼 🛤 🖪 🗳 🌆 🚳				
	1875m— —1875m			
	1850m			
Description	1825m	Description		
ID 0000031	1800m1800m	ID 0000032		
Desc TRAINING Centennial Site	1775m1775m	Desc TRAINING Aurora Site		
Edit Date 3/23/2013 10:06:58 PM	1750m1750m	Edit Date 3/23/2013 11:04:48 PM		
Site	1725m1725m	Site		
Latitude 39.33.9.00 N	1700m	Latitude 39.43.42.00 N		
Law Shut- 104 44 51 001/	1675m	Law shude 104 57 19 00 \v(		
LL 94 : WGS94 Lat/Long's Degrees -190	1050	LL 94 : WGS94 Lat/Lang's Degrees -190		
==> +180		=> +180		
Site Elev 6053.15 ft 💌 CALC	1620m	Site Elev 5314.96 ft 💌 CALC		
Transmitter	1600m1600m1600m1600m1600m1600m1600m1600m1600m1600m	- Transmitter		
Transmitter Losses				
Transmitter Antenna	Path Settings	Transmitter Antenna		
- Receiver Antenna (Primary)	+ Expand All - Collapse All	Receiver Antenna (Primary)		
- Receiver Losses (Primary)		Receiver Losses (Primary)		
Receiver Gains (Primary)		Receiver Gains (Primary)		
Receiver Antenna (Diversity)	Topo Data	Receiver Antenna (Diversity)		
Beceiver Costes (Diversity)	Propagation Model	Receiver Losses (Diversity)		
8 Records	Surface Features	8 Records		
TRAINING Centennial Site	Land Use	TRAINING Aurora Site		
New Edit Copy Delete Save Cancel		New Edit Copy Delete Save Cancel		
	]			

2. It is common to share towers at common base stations by mounting antennas at different heights on the tower. When this is the circumstance, you can use the Fixed Facility interface Copy function to make a duplicate record with the same coordinates (representing the same tower or other mounting location). Then you can edit the new record to make the necessary changes.



3. Click the Copy button near the bottom of the Fixed Facility interface for the Centennial site on the left side of the HDPath form:

🕸 SoftWright HDPath Rev 835				
File Configuration Help				
	N N N & Q 🗉 🕥 🕸 🖗 ?			
Fixed Facility - Transmit	Path: 26.43 km; Azimuth 317.69, Angle -0.50; Reverse 137.56, Angle 0.50	Fixed Facility - Receive		
🛏 + - 🔚 🗄 🗛 🕹 🖧 🍡 🎒		- + - = = A 3 5 5 5		
	1875m			
	1850m			
Description	1825m1825m	Description		
ID 0000031	1800-	ID 0000032		
Desc TRAINING Centennial Site	1775m	Desc TRAINING Aurora Site		
Edit Date 3/23/2013 10:06:58 PM		Edit Date 3/23/2013 11:04:48 PM		
Site	1/50m1/50m	Site		
	1725m1725m			
Latitude 39 33 9.00 N	1700m1700m	Latitude 39 43 42.00 N		
Longitude 104 44 51.00 W	1675m— —1675m	Longitude 104 57 18.00 W		
LL84 : WGS84 Lat/Long's, Degrees, -180	1650m1650m	LL84 : WGS84 Lat/Long's, Degrees, -180		
	1625m			
Site Elev  6053.15   ft 💌 UALU	1600m-1-1600m	Site Elev  5314.96   It 💌 UALU		
Transmitter	0km 10km 20km 26.43km	- Transmitter		
Transmitter Losses	) ⊤ Path Settings	Transmitter Losses		
Transmitter Antenna	+ Expand All · Collapse All	Transmitter Antenna		
Receiver Antenna (Primary)		Receiver Antenna (Primary)		
Receiver Losses (Primary)	Unite	Receiver Losses (Primary)		
Receiver Gains (Primary)	Tono Data	Receiver Gains (Primary)		
Receiver Antenna (Diversity)	Freenel	Receiver Antenna (Diversity)		
Beceiver Gains (Diversity)	Propagation Model	Beceiver Gains (Diversity)		
8 Records	Surface Features	8 Records		
TRAINING Centennial Site	Land Use	TBAINING Aurora Site		
· ·		• •		
New Edit Copy Delete Save Cancel		New Edit Copy Delete Save Cancel		
Copy the current record to create	a new record			



4. A new record is created, with a new ID assigned, and the description as "Copy of ..." the original record description:

SoftWright HDPath Rev 835	* ***** > 2.7. men			
File Configuration Help				
	ଇଇଇାଇ 🔊 🔍 🗐 🔊 ଅବାର 🔋			
Fixed Facility - Transmit	Path: 26.43 km; Azimuth 317.69, Angle -0.50; Reverse 137.56, Angle 0.50	Fixed Facility - Receive		
日 + - 티 王러 집집 % 중		= 트레 집집 및 Ə		
	1875m			
	1850m-(			
Description	1825m	Description		
ID 0000033	1800m1800m	ID 0000032		
Desc Copy of TRAINING Centennial Site	1775m	Desc TRAINING Aurora Site		
Edit Date 3/23/2013 10:06:58 PM	1750m	Edit Date 3/23/2013 11:04:48 PM		
Site	1725m - 1725m	Site		
Lupute 20.22.0.00 M	1720	Laborate 20 42 42 00 M		
	1075	Latitude 33 43 42.00 N		
Longitude 104 44 51.00 W	16/5m	Longitude 104 57 18.00 W		
==> +180	1650m1650m	==> +180		
Site Elev 6053.15 ft 💌 CALC	1625m-	Site Elev 5314.96 ft 👻 CALC		
	1600m 1600m 1600m 26 43km			
Transmitter		Transmitter		
Transmitter Losses	Path Settings	- I ransmitter Losses		
- Receiver Antenna	+ Expand All · Collapse All	- Popoiuor Antonno (Primoru)		
Beceiver Losses (Primary)		Beceiver Losses (Primary)		
- Receiver Gains (Primary)	Units	Receiver Gains (Primary)		
Receiver Antenna (Diversity)	Topo Data	Receiver Antenna (Diversity)		
Receiver Losses (Diversity)	Fresnel	Receiver Losses (Diversity)		
Receiver Gains (Diversity)	Propagation Model	Receiver Gains (Diversity)		
9 Records	Surface Features	8 Records		
Copy of TRAINING Centennial Site	Land Use	TRAINING Aurora Site		
		d b		
New Edit Copy Delete Save Cancel		New Edit Copy Delete Save Cancel		

Note that the coordinates and other site information are the same as the original Centennial site.



5. Change the description to indicate the function of the new facility record: "TRAINING Centennial Microwave Site"

😵 SoftWright HDPath Rev 835				
File Configuration Help				
	🖂 🖂 🜌 🔍 🗐 🕥 🕸 🛠 ?			
Fixed Facility - Transmit	Path: 26.43 km; Azimuth 317.69, Angle -0.50; Reverse 137.56, Angle 0.50	Fixed Facility - Receive		
H + - 🗉 🗄 A 6 🔽 🖨		日 ㅋㅋㅋ 雪려 집 집 중 좋		
	1875m			
	1850m			
Description	1825m	Description		
ID 0000033	1800m	ID 0000032		
Desc TRAINING Centennial Microwave	1775m	Desc TRAINING Aurora Site		
Edit Date 3/23/2013 10:06:58 PM	1750-	Edit Date 3/23/2013 11:04:48 PM		
Site	1700m 1750m	_ Site		
	1/25m1/25m			
Latitude 39 33 9.00 N	1700m1700m	Latitude 39 43 42.00 N		
Longitude 104 44 51.00 W	1675m1675m	Longitude 104 57 18.00 W		
LL84 : WGS84 Lat/Long's, Degrees, -180	1650m1650m	LL84 : WGS84 Lat/Long's, Degrees, -180		
Ch. El., 2052 15	1625m-	Char Eline 5214 96 (h		
	1600m 1600m			
Transmitter	0km 10km 20km 26.43km	Transmitter		
Transmitter Losses	Path Settings	Transmitter Losses		
Transmitter Antenna	+ Expand All - Collapse All	Transmitter Antenna		
Receiver Antenna (Primary)		Receiver Antenna (Primary)		
Receiver Losses [Primary]	Units	Receiver Losses (Primary)		
Beceiver antenna (Diversitu)	Topo Data	Beceiver Antenna (Diversitu)		
Beceiver Losses (Diversitu)	Fresnel	Beceiver Losses (Diversity)		
- Receiver Gains (Diversity)	Propagation Model	Receiver Gains (Diversity)		
9 Records	Surface Features	8 Records		
Copy of TRAINING Centennial Site	Land Use	TRAINING Aurora Site		
New Edit Copy Delete Save Cancel		New Edit Copy Delete Save Cancel		
	1			



6. In the Transmitter section, change the values for this example:
1.0 Watt Transmitter Power Output
6.1GHz (6100MHz)





7. In the Transmitter Losses section under Line 1, note that the loss value has been recomputed for the new frequency. Since we are using different transmission line for this microwave example, click the lookup button ("…") to select the line type:



8. Find the specified line (Andrew EWP52S Elliptical Waveguide) and click the line to highlight it:

	Select Transi	mission Line	· · · ·		
	Andrew	EW37	Elliptical	Waveguide,	3.4-4.2 GHz 🔺
	Andrew	EW44	Elliptical	Waveguide,	4.4-5.0 Ghz
ł	Andrew	EWP44	Elliptical	Waveguide,	4.4-5.0 Ghz
	Andrew	EWS44	Elliptical	Waveguide,	4.4-5.0 Ghz
	Andrew	EW52	Elliptical	Waveguide,	5.6-6.425 Ghz
	Andrew	EWP52	Elliptical	Waveguide,	5.6-6.425 Ghz
	Andrew	EWP52S	Elliptical	Waveguide,	5.6-6.425 Ghz
	Andrew	EW63	Elliptical	Waveguide,	5.925-7.125 GH
	Andrew	EWP63	Elliptical	Waveguide,	5.925-7.125 GH -
l	Cancel		5600 MHz	to 6425 MHz	Continue

Click the Continue button to select the line type.



9. Enter the line length for this example **420 ft**:

softWright HDPath Rev 835	· · · · · · · · · · · · · · · · · · ·	
File Configuration Help		
Fixed Facility - Transmit	Path: 26.43 km; Azimuth 317.69, Angle 0.50; Reverse 137.56, Angle 0.50	Fixed Facility - Receive
H + - II IA 집집 % 중		
	1875m— —1875m	
	1850m	
Transmitter 🔺	1825m	Description
TPO 1.00 W 💌	1800m1800m	ID 0000032
Freq 6100.00000 MHz	1775m1775m	Desc TRAINING Aurora Site
Div Freq MHz	1750m1750m	Edit Date 3/23/2013 11:04:48 PM
Transmitter Losses	1725m - 1725m	Site
Circulator dB	1700m -1700m	Latitude 39.43.42.00 N
Connector 0.50 dB	1675m - 1675m	Langitude 104 57 19 00 1/
Jumper dB	1050m	LL 84 : W/GS84 Lat/Long's Degrees -180
Combiner	1625m	=> +180
Mire 1		Site Elev 5314.96 ft 💌 CALC
	0km 10km 20km 26.43km	Transmitter
	Bath Cattions	Transmitter Losses
Line 1 LmsAND00 0120000014	+ Evpand All - Collapse All	Transmitter Antenna
Andrew EWP52S Elliptical Waveg		Receiver Antenna (Primary)
Length 420.00 ft 💌	Ilaia	Receiver Losses (Primary)
Loss 5.00 dB 6100.00MHz	Tono Data	Receiver Gians (Primary)
	Fresnel	Beceiver Losses (Diversity)
Line 2	Propagation Model	Receiver Gains (Diversity)
9 Records	Surface Features	8 Records
Copy of TRAINING Centennial Site	Land Use	TRAINING Aurora Site
<>		
New Edit Copy Delete Save Cancel		New Edit Copy Delete Save Cancel
	,	

Note that the line loss value is recomputed for the new length, frequency, and line type. Also, be sure to **remove the 0.5dB Connector loss** value, since that loss was not a part of this example, but the value was copied when we made the new record. Whenever you use the facility copy function, remember that all parts of the record are being copied and you may need to edit or remove information that does not apply to the new site record.



10. In the Transmitter Antenna section of the Centennial Microwave record, we still have the UHF antenna specified for the previous record. To remove this antenna information, click the "**X**" button next to the antenna gain value:



11. Click OK to confirm that you want to remove the antenna:





12. While directional antenna pattern information can be added for microwave link budget calculations, the general assumption is that the high-gain, narrow-beamwidth antennas are properly aligned and the directionality off-axis is not a factor. In this case, the major lobe gain can be entered without the need to actually lookup the microwave antenna pattern. First set the units to **dBi** (usually the units used for microwave antennas), then enter the gain specified for this example **45dBi** 

SoftWright HDPath Rev 835	SoftWright HDPath Rev 835			
File Configuration <u>H</u> elp				
	🖂 🖂 🜌 🔍 🗐 🚭 🗣 😭			
Fixed Facility - Transmit	Path: 26.43 km; Azimuth 317.69, Angle -0.50; Reverse 137.56, Angle 0.50	Fixed Facility - Receive		
🛏 🕈 - 🗐 🗄 레 집 집 🔽 🖨		🕒 비니티 티와 외의 전 🕘		
	1875m— —1875m			
	1850m-(			
- Transmitter Antenna	1825m1825m	Description		
	1800m	ID 0000032		
Ant Hgt 50.00 ft 💌 AGL 💌	1775m	Desc TRAINING Aurora Site		
Antenna	1750-	Edit Date 3/23/2013 11:04:48 PM		
	1730m 1730m	Site		
	1720m1720m			
MajLobe 45.00 dBi 💌 🗙	1700m1700m	Latitude 39 43 42.00 N		
Mounting	1675m1675m	Longitude 104 57 18.00 W		
Orient O Mech Tilt O	1650m1650m	LL84 : WGS84 Lat/Long's, Degrees, -180		
Elec Tilt O Azimuth O	1625m	Car Flow 5214.96		
Inverted Pol -	1600m 1 1 1 1600m			
Hide preview Azim Elev	0km 10km 20km 26.43km	Transmitter		
	Path Settings	Transmitter Losses		
	+ Expand All - Collapse All	Transmitter Antenna		
		Receiver Antenna (Primary)		
	Units	Beceiver Losses (Primary)		
	Topo Data	- Beceiver Antenna (Diversity)		
Radome dB	Fresnel	Receiver Losses (Diversity)		
ERP 67.85 dBm 💌 👻	Propagation Model	Receiver Gains (Diversity)		
9 Records	Surface Features	8 Records		
Copy of TRAINING Centennial Site	Land Use	TRAINING Aurora Site		
New Edit Copy Delete Save Cancel		New Edit Copy Delete Save Cancel		
	,			

Since no pattern information is being used, you can also remove the Orientation value for the antenna, since it will not be used.



13. In the Transmitter Antenna height, enter the specified value **400ft AGL** 

SoftWright HDPath Rev 835			
File Configuration <u>H</u> elp			
Fixed Facility - Transmit	Path: 26.43 km; Azimuth 317.69, Angle -0.50; Reverse 137.56, Angle 0.50	Fixed Facility - Receive	
H + - E 토씨 집집 K 중		日 ㅋㅋ目 目에 외의 제 속	
	1875m— — — — — — — — — — — — — — — — — — —		
	1850m		
Transmitter Antenna	1825m— — — — — — — — — — — — — — — — — — —	Description	
	1800m	ID 0000032	
Ant Hgt 400.00 Itt V AGL V	1775m— — — — — — — — — — — — — — — — — — —	Desc TRAINING Aurora Site	
Antenna	1750m1750m	Edit Date 3/23/2013 11:04:48 PM	
, <u>, , , , , , , , , , , , , , , , , , </u>	1725m1725m	Site	
Mailaha (15.00 dB; w X	1700m1700m	Latitude 39 43 42.00 N	
	1675m1675m	Longitude 104 57 18 00 W	
Mounting	1050	LIS4: WGS84 at/Long's Degrees 180	
Orient O Mech Tilt O	1030IIF - 1630III	==> +180	
Elec Tiltju Azimuthju		Site Elev 5314.96 ft 💌 CALC	
	0km 10km 20km 26.43km	Transmitter	
Hide preview Azim Elev			
	- Path Settings	Transmitter Antenna	
	+ Expand All · Collapse All	Receiver Antenna (Primary)	
		Receiver Losses (Primary)	
		Receiver Gains (Primary)	
Radome		Receiver Antenna (Diversity)	
ERP 67.85 dBm 👻	Propagation Model	Receiver Losses (Diversity)	
9 Records	Surface Features	8 Records	
Copy of TBAINING Centennial Site	Land Use	TBAINING Aurora Site	
*F		* · · · · · · · · · · · · · · · · · · ·	
New Edit Copy Delete Save Cancel		New Edit Copy Delete Save Cancel	

(As elsewhere in this example, this value is for illustration only. There are very few 400 foot towers in Centennial, and even fewer 1000 foot towers in Aurora. The values will be used to illustrate the Reflection Analysis later in this Lab.)



SoftWright HDPath Rev 835		
File Configuration Help		
Fixed Facility - Transmit	Path: 26 43 km: Azimuth 317 69 Angle -0.50: Beverse 137 56 Angle 0.50	Fixed Facility - Receive
	1875m	-1875m
	1850m-	-1850m
	1825m-	-1825m Description
	1800m-	-1800m ID 0000032
Ant Hgt 400.00 ft 💌 AGL 💌	1775m	-1775m Desc TRAINING Aurora Site
Antenna	1750-	-1750m Edit Date 3/23/2013 11:04:48 PM
	1735m	1725m Site
		1720 L
Maj Lobe 45.00   dBi 💌 🗶	1//U0m-	1075
Mounting	16/5m-	-16/5m Longitude 104 5/ 18.00 W
Orient 0 Mech Tilt 0	1650m-	-1650m LL84 : WG584 Lat/Long's, Degrees, -180
Elec Tilt 0 Azimuth 0	1625m-	-1625m Site Elev 5314.96 ft ▼ CALC
Inverted Pol	1600m 10km 20km 26.4	-1600m
Hide preview Azim Elev		_ Transmitter
	Path Settings	Transmitter Losses
	+ Expand All · Collapse All	Receiver Antenna (Primary)
		Receiver Losses (Primary)
, , , , , , , , , , , , , , , , , , , ,	Units	- Receiver Gains (Primary)
Radomo dR	Topo Data	Receiver Antenna (Diversity)
EBP 67.85	Fresnel	Receiver Losses (Diversity)
9 Becords	Propagation Model	8 Becords
Converte TRAINING Contennial City	and lise	TRAINING Aurors City
Copy or i mativitivo Centenniai Site	,	
<u>∢</u> →		
New Edit Copy Delete Save Cancel		New Edit Copy Delete Save Cancel
Save the current r	ecord	

14. Click the Save button to save the changes to the new record:



15. Now make a copy of the Aurora Site on the Fixed Facility – Receive interface on the right side of the HDPath form:

SoftWright HDPath Rev 835		
File Configuration Help		
	C C C C C C C C C C C C C C C C C C C	- Finad Facility Bagging
	Path. 26.43 km; Azimuth 317.63, Angle -0.73; Neverse 137.56, Angle 0.73	
	1075 1075	
	19/0m 19/0m 19/0m 19/0m	
	1925m 1925m	
Description	1900m 1900m	Description
ID 0000033	1875m1875m	ID 0000032
Desc TRAINING Centennial Microwave	1850m	Desc TRAINING Aurora Site
Edit Date 3/24/2013 12:05:39 AM	1825m	Edit Date 3/23/2013 11:04:48 PM
Site	1800m	Site
	1750m1750m	
Latitude 39 33 9.00 N	1725m— — — — — — — — — — — — 1725m	Latitude 39 43 42.00 N
Longitude 104 44 51.00 W	1700m1700m	Longitude 104 57 18.00 W
LL84 : WGS84 Lat/Long's, Degrees, -180	1675m	LL84 : WGS84 Lat/Long's, Degrees, -180
==> +180	1650m	==> +180
Site Elev 6053.15 ft 💌 CALC	1625m	Site Elev 5314.96 ft 💌 CALC
	0km 10km 20km 26.43km	- Transmitter
Transmitter Losses		
Transmitter Antenna	Path Settings	
- Receiver Antenna (Primary)	+ Expand All · Collapse All	Beceiver Antenna (Primary)
Receiver Losses (Primary)		Receiver Losses (Primary)
- Receiver Gains (Primary)	Units	Receiver Gains (Primary)
Receiver Antenna (Diversity)	Topo Data	Receiver Antenna (Diversity)
Receiver Losses (Diversity)	Fresnel	Receiver Losses (Diversity)
Receiver Gains (Diversity)	Propagation Model	Receiver Gains (Diversity)
9 Records	Surface Features	9 Records
TRAINING Centennial Microwave Site	Land Use	TRAINING Aurora Site
		•
New Edit Copy Delete Save Cancel		New Edit Copy Delete Save Cancel
	1	the current record to create a



16. Make the changes to the new record:

Description:	TRAINING Aurora Microwave Site
Receiver Frequency:	6100MHz
Receiver Sensitivity:	-110dBm
Receiver Antenna (Primary) Height:	1020 ft AGL
Receiver Antenna (Primary) Gain:	45dBi
Receiver Losses (Primary) Line:	Andrew EWP52S
Receiver Losses (Primary) Line Length:	1030 feet

SoftWright HDPath Rev 835		
File Configuration <u>H</u> elp		Scroll UP for
	NNN 🔊 🔍 🗐 🔊 🗗 🚯 ?	
Fixed Facility - Transmit	Path: 26.43 km; Azimuth 317.69, Angle -0.73; Reverse 137.56, Angle 0.73	Fixed Facility - "Receiver
E + - E 토음 정정 정 중		두 ㅋㅋ= ㅋㅋ ㅋㅋ ㅋ
	1975m	Antenna –
	1950m	Drive en alle e estiere
- Description	1925m	Primary Section
ID 0000033	1900m	Andrew EWP 525 Elliptical waveg
Doco TRAINING Centennial Microwave	1850m	Length 1030.00  ft
	1825m	Loss 12.26 dB 6100.00MHz
Edit Date 372472013 12:05:39 AM	1800m1800m	
Site	1775m1775m	
Latitude 39 33 9.00 N	1/50m175	
L ongitude 104 44 51.00 W	1720m	Length ft 💌
LL84 : WGS84 Lat/Long's Degrees -180	1675m1675m	Loss dB 6100.00MHz
==> +180	1650m1650m	Beceiver Gains (Primaru)
Site Elev 6053.15 ft 💌 CALC	1625m-	Beceiver Antenna (Diversity)
	1600m-1-1600m 0km 10km 20km 26.43km	Receiver Losses (Diversity)
- I ransmitter		Receiver Gains (Diversity)
Transmitter Losses	Path Settings	Receiver
- Beceiver Antenna (Primaru)	+ Expand All · Collapse All	Freq 6100.00000 MHz
Beceiver Losses (Primaru)		BX Imped 50.00 Ohms
Receiver Gains (Primary)	Units	
Receiver Antenna (Diversity)	Topo Data	
Receiver Losses (Diversity)	Fresnel	Receiver Digital Specs
Receiver Gains (Diversity)	Propagation Model	Filing Information ▼
9 Records	Surface Features	10 Records
TRAINING Centennial Microwave Site	Land Use	Copy of TRAINING Aurora Site
New Edit Copy Delete Save Cancel		New Edit Copy Delete Save Cancel
	)	

Remember to remove the antenna pattern reference (the "X" button) and the 0.5dB connector loss value. Note that the Required Field value is recomputed as you make changes to the record, such a frequency, line specification, antenna gain, etc.

Note that if you change the antenna height before you change the length of the transmission line, you will get a warning (that you can disregard) that the line length is less than the antenna height.

Click the Save button to save the changes to the new record.



17. With all the changes made, it is clear that the path between the two antennas provides line-of-sight and Fresnel clearance.

SoftWright HDPath Rev 835		
File Configuration <u>H</u> elp		
	> [> [> ] 🔊 🔍 🗐 🔊 🔊 🚯 ? ]	
Fixed Facility - Leansmit	Path: 26 43 km; Azimuth 317 69 Angle -0.08; Beverse 137 56 Angle 0.08	Fixed Facility - Receive
	1975m— — — — — — — — — — — — — — — — — — —	
	1950m	
Description	1925m—	Description
	1900m	
ID 0000033	1875m - 1875m	ID 0000034
Desc TRAINING Centennial Microwave	1850m-1	Desc TRAINING Aurora Microwave Site
Edit Date 3/24/2013 12:05:39 AM	1825m	Edit Date 3/24/2013 12:15:57 AM
Site	1775m-	Site
	1750m	
Latitude 39 33 9.00 N	1725m	Latitude 39 43 42.00 N
Longitude 104 44 51.00 W	1700m	Longitude 104 57 18.00 W
LL84 : WGS84 Lat/Long's, Degrees, -180	1675m-	LL84 : WGS84 Lat/Long's, Degrees, -180
==> +180	1650m 1650m	==> +180
Site Elev 6053.15 ft 💌 CALC	1600m	Site Elev 5314.96 ft 💌 CALC
	0km 10km 20km 26.43km	- Transmitter
Transmitter Losses		
Transmitter Antenna	Path Settings	Transmitter Antenna
Beceiver Antenna (Primary)	+ Expand All - Collapse All	Receiver Antenna (Primary)
Receiver Losses (Primary)		Receiver Losses (Primary)
- Receiver Gains (Primary)	Units	Receiver Gains (Primary)
- Receiver Antenna (Diversity)	Topo Data	Receiver Antenna (Diversity)
- Receiver Losses (Diversity)	Fresnel	Receiver Losses (Diversity)
Receiver Gains (Diversity)	Propagation Model	Receiver Gains (Diversity)
10 Records	Surface Features	10 Records
TRAINING Centennial Microwave Site	Land Use	TRAINING Aurora Microwave Site
4		•
New Edit Copy Delete Save Cancel		New Edit Copy Delete Save Cancel
	J	

Microwave Link Budget calculations must be based on adequate path clearance. The statistical portions of the calculations (such as outage times and reliability) assume a clear path. While additional losses can be added later, obstructed line-of-sight or even partial Fresnel zone obstructions (0.5 of the first Fresnel zone) will violate the assumptions used for the microwave reliability calculations and make the results suspect.



18. To actually compute the Link Budget for the path, click the Microwave Link Budget button on the toolbar near the top of the HDPath form:

SoftWright HDPath Rev 835	· · · · ·		
File Configuration Help			
Fixed Facility - Transmit	Path: 26.43 km: Azimuth 317.69. Angle -0.08: Reverse 137.56, Angle 0.08	Fixed Facility - Receive	
- + - = = = 44 3 3 3	Compute path Microwave Link Budget	🕞 ㅋㅋ===================================	
	1975m— — — — — — — — — — — 1975m		
	1950m		
- Description	1925m—	- Description	
	1900m		
	1875m	10 0000034	
Desc TRAINING Centennial Microwave	1850m 1850m	Desc TRAINING Aurora Microwave Sits	
Edit Date 3/24/2013 12:05:39 AM	1800m	Edit Date 3/24/2013 12:15:57 AM	
Site	1775m-	Site	
1 0 1 20 22 0 00 N	1750m—	1 0 1 0 10 10 10 00 N	
Latitude 39 33 9.00 N	1725m1725m	Latitude 39 43 42.00 N	
Longitude 104 44 51.00 W	1700m	Longitude 104 57 18.00 W	
LL84 : WGS84 Lat/Long's, Degrees, 180	1675m 1675m	LL84 : WGS84 Lat/Long's, Degrees, 180	
==> +180	1650m 1650m 1650m	==> +180	
Site Elev  6053.15   ft 💌 CALC	1600m	Site Elev 5314.96 ft 💌 CALC	
Transmitter	0km 10km 20km 26.43km	- Transmitter	
Transmitter Losses	B-4 C-41	Transmitter Losses	
Transmitter Antenna		- Transmitter Antenna	
- Receiver Antenna (Primary)	+ Expand All - Collapse All	Receiver Antenna (Primary)	
Receiver Losses (Primary)		Receiver Losses (Primary)	
Receiver Gains (Primary)	Units	Receiver Gains (Primary)	
Receiver Antenna (Diversity)	Topo Data	Receiver Antenna (Diversity)	
Receiver Losses (Diversity)	Fresnel	Receiver Losses (Diversity)	
Receiver Gains (Diversity)	Propagation Model	Receiver Gains (Diversity)	
10 Records	Surface Features	10 Records	
TRAINING Centennial Microwave Site	Land Use	TRAINING Aurora Microwave Site	
4			
New Edit Copy Delete Save Cancel		New Edit Copy Delete Save Cancel	
	1		

The subtle difference between the Microwave button and the VHF/UHF Link Budget button to its right is the fact that the VHF/UHF button has a peak blocking the line of sight.





19. The Microwave Link Budget form is displayed:

Microwave Link Budget         Image: State Configuration Recalc           Front .CSV File Configuration Recalc         Prevails 137 55, Angle 0.08         Prevails 137 55, Angle 0.08           Front .CSV File Configuration Recalc         Prevails 137 55, Angle 0.08         Prevails 137 55, Angle 0.08           Losser         Prevails 137 55, Angle 0.08         Prevails 137 55, Angle 0.08         Prevails 137 55, Angle 0.08           Absorption [0.00 dB Cade         Cade         1950m         1950m           Adjamment [0.00 dB Cade         Ternin (a) [1.000 Cade         1950m         1950m           Adjamment [0.00 dB Cade         Receiver (Primary)         1950m         1950m           Latitude 33 33 0.0 N         334 34 200 N         104 57 18.00 W         105 57 AM           Longbrude 104 457 100 W         104 57 18.00 W         104 57 18.00 W         106 56 4           Longbrude 104 457 100 OM 0.00         104 57 18.00 W         108 58 4         108 58 4           Site Elevation [50315 A E Cale Ander Add. In 10200 OR AGL         100 0.00         100 0.00         100 0.00           Antenna 0.00         0.00         1700m         1650m         1650m         1650m           Antenna 0.00         0.00         0.00         17000m         1600         1600           Antenna 0.00         0.00 <td< th=""><th>SoftWright HDPath Rev 835</th><th></th><th>1 1 84</th><th></th></td<>	SoftWright HDPath Rev 835		1 1 84	
Pint         CSY File         Configuration         Recail           From:         TRAINING careval         Microwave Site           To:         TRAINING careval         From:         Training (a) 1000           Absorption (0.00)         dB         Cabo         -1375m           Absorption (0.00)         dB         2352500000         3372833333           Longitude [104 44 51.00 /// 104 5571 18.00 /// 104 5571 18.00 /// 104 5571 18.00 /// 104 5571 18.00 /// 104 5571 18.00 /// 104 5571 18.00 /// 104 5571 18.00 /// 104 5571 18.00 /// 104 5571 18.00 /// 104 5571 18.00 /// 104 5571 18.00 /// 104 5571 18.00 /// 104 5571 18.00 /// 104 557 18.00 /// 104 557 18.00 /// 104 557 18.00 /// 104 557 18.00 /// 104 557 18.00 /// 104 557 18.00 /// 104 557 18.00 /// 104 557 18.00 /// 104 557 18.00 /// 104 577 18.00	Microwave Link Budget			
Prim:         Current Functionare Site           Form:         TRAINING Centernial functionare Site           Lesses         Terrain (a) 1000           Absorption (0.00         dB           Other (0.00         dB           Other (0.00         dB           State         Induktica Second           Induktica Second         Transmitter           Automa         303 30.0 N           State         Induktica Second           Induktica Second         10740/HIG Second           Induktica Second         10740/HIG Second           Induktica Second         303 30.0 N           State         Induktica Second           Induktica Second         10740/HIG Second           Induktica Second         10740/HIG Second           Bearing (1) 317.56         1074/HIG Second           Antenna Centerie         400.00 R AGL			- <b>B</b> 2	
From: TRAINING Carternial Microwave Site <ul> <li>To: TRAINING Aurora Microwave Site</li> <li>Casses</li> <li>Absorption (0.00, d8</li> <li>Cade</li> <li>Absorption (0.00, d8</li> <li>Casses</li> <li>Absorption (0.00, d8</li> <li>Casses</li> <li>Absorption (0.00, d8</li> <li>Casses</li> <li>Francin (a) 1000</li> <li>Casses</li> <li>Absorption (0.00, d8</li> <li>Casses</li> <li>Absorption (0.00, d8</li> <li>Casses</li> <li>Terranitier</li> <li>Terranitier</li> <li>Receiver (Pinnay)</li> <li>Site Transmitter</li> <li>Antenna Center (400.00 n.AsL</li> <li>Torasmitter</li> <li>Antenna (0.00</li> <li>Colo (0.00, 0.00)</li> <li>Free (MHz) (500.00)</li> <li>Antenna (10, 0.00)</li> <li>Colo (0.00, 0.00)</li> <li>Free (MHz) (500.00)</li> <li>Antenna (10, 0.00)</li> <li>Colo (0.00, 0.00)</li> <li>Free (MHz) (500.00)</li> <li>Antenna (10, 0.00)</li> <li>Colo (0.00, 0.00)</li> <li>Free (MHz) (500.00)</li> <li>Antenna (10, 0.00)</li> <li>Colo (0.00)</li> <li>Free (MHz) (500.00)</li> <li>Colo (0.00)</li> <li>Free (MHz) (500.00)</li> <li>Colo (0.00)</li> <li>Free (MHz) (500.00)</li> <li>Antenna (10, 0.00)</li> <li>Colo (0.00)<th>Print .CSV File Configuration Recaid</th><th></th><th>Payara 127 EC Anala 0.09</th><th>Finad Fasility Basaina</th></li></ul>	Print .CSV File Configuration Recaid		Payara 127 EC Anala 0.09	Finad Fasility Basaina
Losser       Autorial Microwave Site         Losser       Abcroption [000] dB       Cale         Abcroption [000] dB       Cale         Abcroption [000] dB       Cale         Abcroption [000] dB       Cale         Other [000] dB       Cale         Image: transmitter       Transmitter         Norganization [000] dB       Pathware (Finance)         Image: transmitter       Receiver (Finance)         Longitude 104 44 51:00 W       104 57:18:00 W         Lat (Dec 39:552500000)       39:728333333         Longitude 104 44 51:00 W       104 57:18:00 W         Longitude 104 44 51:00 W       104 57:18:00 W         Longitude 104 45:10:00 W       104 57:18:00 W         Longitude 104 45:10:00 W       102:00 RAGL         Site Elevation (05:15:16:n       137:65         Antenna Center 400:00 RAGL       100:00:00:00         Freq (MHz) 610:00:0000       610:00:0000         Freq (MHz) 610:00:0000       610:00:00000         F	From: TRAINING Centennial Microwave Site		Heverse 137.36, Angle 0.06	Fixed Facility - Necelye
Losses         Reliability Factors           Absorption [0.00] dB         Calc           Rain [0.00] dB         Calc           Absorption [0.00] dB         Calc           Ster         FRAINING Concernent           Absorption [0.00] dB         Ster           Transmitter         Receiver (Primacy)           Ster         FRAINING Concernent           Latitude         33 33 00 N           Latitude         33 33 00 N           Latitude         33 43 42.00 N           Longitude [104 457 18.00 W           Longitude [104 57 18.00 W <tr< th=""><th>To: TRAINING Aurora Microwave Site</th><th></th><th></th><th>H + - 🗏 👫 🐴 🕹 🗳 🦮 🔿</th></tr<>	To: TRAINING Aurora Microwave Site			H + - 🗏 👫 🐴 🕹 🗳 🦮 🔿
Absorption       0.00       dB       Cele       1950m         Rain       0.00       dB       Cele       1950m         Absorption       0.00       dB       Cele       1950m         Other       0.00       dB       Cele       1950m         Image       Image       0.00       Cele       1950m         Image       Image       0.00       Cele       1950m         Image       Image       1640100       Cele       1950m         Image       Image       1640100       Cele       1950m         Image       1640100       1640100       Cele       1640100         Image       1640100       164000       164000       164000         Image       1640100       164000       164000       16400       16400         Image       108       108       1650m       1625m       162	Losses	Reliability Factors		
Abgruent       0.00       de       Climate (b)       0.250       Cale         Algrment       0.00       de       Climate (b)       0.250       Cale         Algrment       0.00       de       Climate (b)       0.250       Cale         Algrment       0.00       de       Climate (b)       0.250       Cale         Transmitter       Receiver (Primary)       Climate (b)       0.250       Cale       0.000034         Ste       TRAINING Centerment       Receiver (Primary)       1825m       -1825m       -1825m         Latitude       333 33 0.00 N       33 43 42.00 N       -1725m       -1725m       -1725m         Latitude       333 33 0.00 N       33 43 42.00 N       -1725m       -1725m       -1725m         Ste       Elevation       6053 15 ft       5314 96 ft       - Cale       -1725m         Ste       Elevation       6053 15 ft       5314 96 ft       - Cale       -1825m         Antenna       Colo 00 ft AGL       1020 00 AGL       -1725m       -1825m       -180       -1825m         Antenna       0.00       0.00       -1725m       -1625m       -1625m       -1625m       -1625m       -1625m       -1625m       -1625m <td< th=""><th>Absorption 0.00 dP Calc</th><th>Terrein (s) 1.000</th><th>-1950m</th><th></th></td<>	Absorption 0.00 dP Calc	Terrein (s) 1.000	-1950m	
Han 1000 d8       Limate (b) (0.250       Limate (b) (0.250       Limate (b) (0.250         Algoment (D00 d8       Transmitter       Receiver (Primacy)       Han 1000       Han 1000         Ste TRANNIG Cancernal       TRANNIG Aurora       Han 1000       Han 1000       Han 1000         Lattude 39 33 00 N       39 143 42 00 N       Han 1000       Han 10000       Han 10000       Han 10000       <			-1925m	Description
Algement         UUUU         dB           0 ther         0.00         dB           0 ther         0.00         dB           1         Transmitter         Receiver (Primacy)           1         Site         Transmitter           1         Latitude         33 33 300 N         33 43 42.00 N           1         Latitude         33 33 33 33 33 33 33 33 33 33 33 33 33	Rain U.UU dB	Llimate (b) [0.250	-1900m	ID 0000034
Other         0.00         dB           I         Transmitter         Receiver (Primary)         Italitude         33 3 3 0 N         39 43 42 00 N         Edt Date         3/24/2013 12:15:7 AM           I         Latitude         33 3 3 0 N         39 43 42 00 N         Italitude         3/3 42 00 N         Edt Date         3/24/2013 12:15:7 AM           I         Latitude         33 3 3 0 N         39 43 42 00 N         Italitude         3/3 43 42 00 N           Latitude         3/3 9 30 N         3/3 43 42 00 N         Italitude         3/3 43 42 00 N           Latitude         3/3 9 30 N         3/3 43 42 00 N         Italitude         3/3 43 42 00 N           Latitude         3/3 9 30 N         3/3 43 42 00 N         Italitude         3/3 42 00 N           Latitude         1/0 4 57 18 00 W         Italitude         Italitude         3/3 43 6 R           Anterna         0.00         0.00         Italitude         1/3 43 6 R         CALC           Anterna         0.00         0.00         Italitude         1/4 57 18 00 W         Italitude           Anterna         0.00         0.00         Italitude         1/4 57 18 00 W         Italitude         Italitude         Italitude         Italitude         Italitalitalitalitalitalitalitalital	Alignment 0.00 dB		-1950m	Deve TRAINING Aurora Microwaya Styl
Iteranities         Receiver (Primary)           Site         FF8ANING Centerrist         TRANNING Aurora           Latitude         33 39 00 N         39 43 42 00 N           Lat (Dec         39 555500000         39 72833333           Longitude         104 44 51 00 W         104 57 18 00 W           Longitude         104 44 51 00 W         104 57 18 00 W           Longitude         104 44 51 00 W         104 57 18 00 W           Site         Feature         11650m           Site         Feature         11620 00 # AGL           Site         Feature         104 95 718 00 W           Longitude         104 45 71 80 0W         Latitude           Site         Feature         148 WGS 84           WGS 84         WGS 84         WGS 84           Site         Feature         514 5314 96 ft           Antenna         1020 00 # AGL         1202 00 # AGL           Path Angie         0.00         0.00           Freq [MH2]         Filo 0.0000         6100.00000           Freq [MH2]         100 0000         6100.00000           Antenna         -         -           Antenna         -         -           Antenna         -         - <th>Other 0.00 dB</th> <th></th> <th>-1825m</th> <th>Desc Theining Autora Microwave Site</th>	Other 0.00 dB		-1825m	Desc Theining Autora Microwave Site
Site         THAINING Centernal         THAINING Centernal         THAINING Centernal         THAINING Centernal         THAINING Centernal         Site	Transmitter	Beceiver (Primary)	-1800m	Edit Date 3/24/2013 12:15:57 AM
Latitude         39 33 30.0 N         39 43 42.00 N           Lat (Dec         33 552500000         39.726333333           Longitude         104 44 51.00 W         104 57 18.00 W           Longitude         104 44 51.00 W         104 57 18.00 W           Lat (Dec         33.552500000         -1725m           John         104 44 51.00 W         104 57 18.00 W           Lat (Dec         104.747500000         -104.955000000           John         VGS 84         VGS 84           Site Elevation         005315 fr         5314 496 ft           Antenna         0.00         0.00           Path Angle         0.08         0.08           Antenna         100.00000         6100.00000           Transmitter         -         Transmitter           Transmitter         -         Transmitter           Transmitter         -         -           Receiver Antenna         0.00         0.00           Transmitter         -         -           Antenna         -         -           Materna         -         -           Antenna         -         -           Materna         -         -           Ant Gain (Major 4	Site TRAINING Centennial	TRAINING Aurora	-1775m	Site
Lat (Dec       39.552500000       39.72833333         Longitude       104 45 10.0 W       104 57 18.00 W         Longitude       104 47 5700000       104 95500000         Datum       WGS 84       WGS 84         Site Elevation       6053.15 ft       5314.96 ft         Antenna Center       400.00 ft AGL       1020.00 ft AGL         Bearing (T)       317.69       137.56         Antenna       0.00       0.00         Path Angle       0.08       0.08         Antenna       0.00       6100.00000         Freq (MHz)       6100.00000       6100.00000         Freq (MHz)       6100.00000       6100.00000         Materna       110.000 dBm       Receiver Losses (Primary)         Receiver Losses (Primary)       Receiver Losses (Diversity)         Receiver Gains (Diversity)       Receiver Gains (Diversity)         Receiver Gains (Diversity)       Receiver Gains (Diversity)         Receiver Gains (Diversity)       V         Antenna       4         Line 1       Andrew EWP52S         Antene       10 Records         Line 1       10 Records         Line 1       1226 dB	Latitude 39 33 9.00 N	39 43 42.00 N	-1750m	
Longitude         104 45 100 W         104 57 18:00 W           Longitude         104 457 18:00 W         104 575 18:00 W           Longitude         104 747500000         104 95500000           Datum W55 84         WGS 84           Site Elevation         6053.15 ft         5314.96 ft           Antenna Conter         400.00 ft AGL         1020.00 ft AGL           Bearing [T]         177.65         20km         26.43km           Antenna 1000         0.00         107.55         74.4425           Antenna 110         0.00         0.00         74.642           Freq (MHz)         5100.00000         6100.00000         6100.00000           Tx Power         1.000 W         110.000 dBm         Receiver Antenna (Diversity)           Receiver Gains (Primary)         Receiver Gains (Primary)         Receiver Gains (Diversity)           Receiver Gains (Diversity)         Receiver Gains (Diversity)         Receiver Gains (Diversity)           Receiver Gains (Along 45.00 dBi         45.00 dBi         45.00 dBi         10 Recods           Transmitter         10 Recods         10 Recods         10 Recods           Transmitter         10 Recods         10 Recodes         10 Recodes           Line 1 Andrew EWP52S         Andrew EWP52S	Lat (Dec 39.552500000	39.728333333	-1725m	Latitude 39 43 42.00 N
Lon (Dec       104 95500000         Datum       WGS 84       WGS 84         Site Elevation (505315 ft       5314.96 ft         Antenna Center       400.00 ft AGL       1020.00 ft AGL         Beaing [1] 317.69       137.55         Antenna 0.00       0.00         Path Angle       0.08         Antenna 10:00       0.00         Featige [1] 317.69       137.55         Antenna 10:00       0.00         Path Angle       0.08         Antenna 10:00       0.00         Frage [MHz]       100.00000         File/Dip       110.0000         Antenna       110.00000         File/Dip       110.00000         Antenna       110.00000         Antenna       110.000 dBm         Receiver 1.00000       1100.00000         Antenna       110.000 dBm         Ant Gain (Alogi 45.00 dBi       45.00 dBi         Ant Gain (Alogi 45.00 dBi       45.00 dBi         Ant Gain (Alogi 45.00 dBi       45.00 dBi         Line 1 Length       42.000 ft         Line 1 Length       42.000 ft         Line 1 Length       42.000 ft         Line 1 Length       420.00 ft         Line 1 Length<	Longitude 104 44 51.00 W	104 57 18.00 W	-1700m	Longitude 104 57 18.00 W
Datum         WGS 84         WGS 84           Site Elevation         6053.15 ft         5314.96 ft           Antenna Conter 400.00 ft AGL         1020.00 ft AGL         11620m           Bearing (T)         317.58         137.56           Antenna Conter 400.00 ft AGL         20km         26.43km           20km         26.43km         Transmitter           Path Angle         0.08         0.08           Antenna Tift         0.00         0.00           Freq (MHz)         6100.00000         6100.00000           TX Power         1.000 W         Receiver Antenna (Primary)           Receiver Losses (Primary)         Receiver Losses (Primary)           Receiver Losses (Diversity)         Receiver Losses (Diversity)           Receiver Losses (Diversity)         Receiver Losses (Diversity)           Receiver Gains (Primary)         Receiver Cains (Primary)           Receiver Losses (Diversity)         Receiver Losses (Diversity)           Receiver Gains (Along 45.00 dBi         45.00 dBi           Ant Gain (Along 45.00 dBi         45.00 dBi           Line 1         Anterne KVP52S           (Linet File/ID)         LinsAND00           Line 1 Andrew EWP52S         Andrew EWP52S           Use 3         0.08 <th>Lon (Dec -104.747500000</th> <th>-104.955000000</th> <th>-1675m</th> <th>LL84 ; WGS84 Lat/Long's, Degrees, -180</th>	Lon (Dec -104.747500000	-104.955000000	-1675m	LL84 ; WGS84 Lat/Long's, Degrees, -180
Site Elevation       6053.15 ft       5314.96 ft         Antenna Center       400.00 ft AGL       1020.00 ft AGL         1020.00 ft AGL       1020.00 ft AGL       1200.00 ft AGL         20km       26.43km       11620m         110000       0.00       1100.000         110000       0.00       1100.0000         110000       6100.00000       6100.00000         110000       6100.00000       6100.00000         110000       6100.00000       6100.00000         110000 dBm       110.000 dBm       Receiver Losses (Primary)         Receiver Losses (Primary)       Receiver Losses (Diversity)         Receiver Losses (Diversity)       Receiver Losses (Diversity)         Receiver Gains (Diversity)       Receiver Gains (Diversity)         Receiver Gains (Diversity)       Receiver Gains (Diversity)         Receiver Gains (Diversity)       Receiver Gains (Diversity)         Receiver Gains (Along 45.00 dBi       45.00 dBi         Ant Gain (Along 45.00 dBi       45.00 dBi         Line 1       Andrew EWP52S         (Line 1 File/ID)       LineAND00         Line 1 Loss 50.0 dB       1226 dB         Line 1 Loss 50.0 dB       1226 dB	Datum WGS 84	WGS 84	-1650m	==> +180
Antenna Center 400.00 RAGL       1020.00 RAGL         Bearing [T]       317.69         Antenna 0.00       0.00         Path Angle       0.08         Antenna 10.00       0.00         Fransmitter       Insamitter         Antenna 110       0.00         Freq (MHz)       6100.00000         File       110.000 dBm         RX Threshold       110.000 dBm         Receiver 1000W       110.000 dBm         Antenna       Periver I.000W         Antenna       Periver I.000W         Antenna       Periver I.000W         Antenna       Periver I.000 dBm         Antenna       Periver I.000 dBm         Antenna       Periver I.000 dBm         Antenna       Periver Gains (Diversity)         Receiver Gains (Diversity)       Receiver Gains (Diversity)         Receiver Gains (Diversity)       Receiver Gains (Diversity)         Receiver Gains (Along 45:00 dBi       45:00 dBi         Ant Gain (Along 45:00 dBi       45:00 dBi         Line 1 Andrew EWP52S       Andrew EWP52S         (Line1 File/ID)       LmsAND00         Line 1 Longth 420:00 R       1030:00 R         Line 1 Longth 420:00 R       1030:00 R         Line	Site Elevation 6053.15 ft	5314.96 ft	-1625m	Site Elev 5314.96 ft 💌 CALC
Bearing [T]       317.56         Antenna       0.00         Freq (HHz)       5100.00000         File (HHz)       5100.00000         Antenna       1.000 W         Receiver 1.000 W       Receiver 1.000 W         Receiver 1.000 W       Receiver 1.000 dBm         Antenna       1.000 dBm         Ant Gain (Major 45.00 dBi       45.00 dBi         Ant Gain (Along 45.00 dBi       45.00 dBi         Line 1       Andrew EWP52S         (Line1 File/ID)       LmsAND00         Line 1 Loss 5.00 dB       1226 dB         Line 1 Loss 5.00 dB       1226 dB	Antenna Center 400.00 ft AGL	1020.00 ft AGL		
Antenna 0.00       0.00         Path Angle       0.08         Antenna Tifi       0.00         Freq (MHz)       6100.00000         File       6100.00000         File       6100.00000         Antenna       110.000 dBm         Antenna	Bearing (T) 317.69	137.56	20km 26.43km	- Transmitter
Path Angle         0.08         0.08           Antenna Titi         0.00         0.00           Freq (MHz)         5100.00000         6100.00000           TX Power         1000 W         Receiver Losses (Primary)         Receiver Losses (Primary)           Receiver Gains (Primary)         Receiver Gains (Primary)         Receiver Gains (Diversity)         Receiver Gains (Diversity)           Antenna	Antenna 0.00	0.00	_	Transmitter Losses
Antenna Tili 0.00       0.00         Freq (MHz)       6100.00000         TX Powei       1.000 w/         RX Threshold       -110.000 dBm         Antenna       -         (Ant File/ID)       -         Ant Gain (Major       45.00 dBi         45.00 dBi       45.00 dBi         45.00 dBi       45.00 dBi         Line 1       Andrew EWP52S         (Line1 File/ID)       LmsAND00         Line1 Loss       500 dB         12.26 dB       -	Path Angle -0.08	0.08		Transmitter Antenna
Freq (MHz) 5100.00000       6100.00000         TX Power       1.000 W         RX Threshold       -110.000 dBm         Anterna       -         (Ant File/ID)       -         Ant Gain (Major       45.00 dBi         Ant Gain (Major       45.00 dBi         Ant Gain (Major       45.00 dBi         Line 1       Andrew EWP52S         (Line1 File/ID)       -         Line1 Loss       500 dB         Line1 Loss       500 dB         Line1 Loss       500 dB	Antenna Tilt 0.00	0.00		Receiver Antenna (Primary)
IX Power       1.000 W         RX Threshold       -110.000 dBm         RX Threshold       -110.000 dBm         Anterna       -         (Ant File/ID)       -         Ant Gain (Along 45.00 dBi       45.00 dBi         Ant Gain (Along 45.00 dBi       45.00 dBi         Line 1       Andrew EWP52S         (Line1 File/ID)       -         Line1 Length       420.00 ft         Line1 Length       422.60 dB         Line1 Length       1226 dB         Line1 Length       22.80 dB	Freq (MHz) 6100.00000	6100.00000		Beceiver Losses (Primary)
HX Threshold       -110.000 dbm         HX Threshold       -110.000 dbm         Antenna       -         (Ant File/ID)       -         Ant Gain (Major 4500 dbi       45.00 dbi         Ant Gain (Along 45.00 dbi       45.00 dbi         Line 1 Andrew EWP52S       Andrew EWP52S         (Line1 File/ID)       LmsAND00         Line1 Length       420.00 ft         Line1 Loss 500 dB       1226 dB	IX Power 1.000 W	440,000 /0		Beceiver Gains (Primary)
Anterna       Interna         (Ant File/ID)       Receiver Losses (Diversity)         Ant Gain (Major 45:00 dBi       45:00 dBi         Ant Gain (Along 45:00 dBi       45:00 dBi         Ant Gain (Along 45:00 dBi       45:00 dBi         Line 1 Andrew EWP52S       Andrew EWP52S         (Line1 File/ID)       LmsAND00         Line1 Loss 5:00 dB       12:26 dB         Line1 Loss 5:00 dB       12:26 dB	HX I hreshold	-110.000 dBm		Beceiver Antenna (Diversitu)
Ant Gain (Along 45.00 dBi 45.00 dBi Ant Gain (Along 45.00 dBi 45.00 dBi Line 1 Andrew EWP52S Andrew EWP52S (Line 1 File/ID) LmsAND00 LmsAND00 Line 1 Loss 500 dB 12.26 dB Line 1 Loss 500 dB 12.26 dB Line 1 Copy Delete Save Cancel	A-1			Beceiver Losses (Diversity)
Ant Gain (Along 45:00 dBi         45:00 dBi         45:00 dBi         10 Records           Ant Gain (Along 45:00 dBi         45:00 dBi         10 Records         10 Records           Line 1 Andrew EWP52S         Andrew EWP52S         Andrew EWP52S         10 Records           Line 1 Length 420:00 ft         1030:00 ft         1030:00 ft         1000 ft           Line 1 Length 420:00 ft         1030:00 ft         1030:00 ft         1000 ft           Line 1 Length 50:00 // Lines 5:00 // Lines 10:00 // Lines 10:00 // Lines 5:00 // Lines 10:00 // Lines 10:	(Ant File/ID)			Beceiver Gains (Diversity)
Ant Gain (Along 45:00 dBi 45:00 dBi Line 1 Andrew EWP52S Andrew EWP52S (Line 1 File/ID) LmsAND00 LmsAND00 Line 1 Longth 42:00 /t 1030:00 /t Line 1 Longth 42:00 /t 1030:00 /t	Ant Gain (Major 45.00 dB)	45.00 dBi		10 Becords
Line 1     Andrew EWP52S     Andrew EWP52S     Andrew EWP52S       Line 1     Line 1     Line 1     Line 1       Line 1     Line 1     Line 1     Line 1       Line 1     Line 1     Line 1     Line 1       Line 1     Line 1     Line 1       Line 1     Line 1     Line 1       Line 1     Line 1     Line 1       Line 1     Line 1     Line 1       Line 1     Line 1     Line 1       Line 1     Line 1     Line 1       Line 1     Line 1     Line 1       Line 1     Line 1     Line 1	Ant Gain (Along 45.00 dBi	45.00 dBi		
Line 1         Andrew EWP52S         Andrew EWP52S           (Line1 File/ID)         LmsAND00         LmsAND00           Line1 Length         420.00 ft         1030.00 ft           Line1 Length         50.0dB         12.26 dB		10.00 001		TRAINING Aurora Microwave Site
(Line1 File/ID)         LmsAND00         LmsAND00           Line1 Length         420.00 ft         1030.00 ft           Line1 Loss         5.00 dB         12.26 dB	Line 1 Andrew EWP52S	Andrew EWP52S		•
Line1 Length         420.00 R         1030.00 R           Line1 Loss         5.00 dB         12.26 dB	(Line1 File/ID) LmsAND00	LmsAND00		
Line1 Loss 5.00 dB 12.26 dB New Edit Copy Delete Save Cancel	Line1 Length 420.00 ft	1030.00 ft		
New Eait Copy Delete Save Cancel	Line1 Loss 5.00 dB	12.26 dB		New Edit Conv Delete Save Concel
	1:	+		The concert copy belete save cancel



20. The Microwave Link Budget form enables you to enter additional details about the particular path and conditions for the link budget. You can scroll to the bottom of the form to see the computed Reliability as a percentage value:

Ticrowave Link Budg	get		
Print .CSV File Conf	iguration Recalc		
From: TRAINING Cente	ennial Microwave Site		
To: TRAINING Auror	a Microwave Site		
,			
		- Heliability Factor	x
Absorption 0.00 dB	Calc	Terrain (a) 1.000	Calc
Rain 0.00 dB	Calc	Climate (b) 0.250	Calc
Alignment 0.00 dB			
Other 0.00 dB			
	Transmitter	Receiver (Primary)	-
Radome Loss	0.00 dB	0.00 dB	
Gain1		dB	
Gain2		dB	
Bassing (T)	217.00	107.50	
Distance	317.03 20.42 km	137.36 20.42 km	
Distance	20.43 KIII	20.43 KIII	
Absorption Loss		0.00 dB	
Bain Loss		0.00 dB	
Alianment Loss		0.00 dB	
Other Loss		0.00 dB	
Free Space Loss		136.61 dB	
Total Gains dBm		120.00	
Total Loss dB		153.87	
Received Signal		-33.87	
Unfaded Fade		76.13	
Terrain Factor (a)	1.000		
Climate Factor (b)	0.250		
Undp (TFM)		4.120E-10	
Reliability (%)		99.999999959	
Outage (sec/yr)		0	
			-
P			



## 4. Example Area Coverage Study

**Objective**: Run an area coverage radial study from HDCoverage.

Procedure: Using the Centennial site created in previous sections, create a radial study with 72 radials, computing the field strength every 0.1 mile, out a distance of 30 miles. Determine the coverage for a handheld unit 6-feet above the ground, requiring 0.5uV input and having a 0dB gain antenna.

Note that all values and settings discussed in this article are for illustration purposes only. It is important for you to determine the particular settings and values applicable to your equipment and application when using TAP.

1. From the TAP6 menu form, click the Area button:





2. The HDCoverage function is displayed:



Note the four basic areas of the form:

- The Fixed Facility for the base station site is shown on the left side of the form.
- The Mobile Facility information is shown on the right side of the form.
- The parameters for the coverage study are shown in the lower half of the center of the form.
- The map graphic is shown in the upper half of the center of the form.



3. To run a coverage study, a TAP "Task" must be created. If the Task section is collapsed, click the heading to expand the section:





4. On the toolbar near the top of the form, click the New button:

SoftWright HDCoverage Rev 380		
File Configuration Map <u>H</u> elp		
Fixed Facility		Nobile Facility
	🔍 🖑 🛌 🕑 🥩 🧶 🔍 🐄 🛫 🍠 37 17 46.46N 108 33 58.51W 400.59 km Azimuth 234.97 from DEMO Castle Rock Test Facility ed	/ <mark> - + - <u> </u>                                    </mark>
Description       ID         ID       0000026         Desc       JEMD Castle Rock Test Facility ef         Edit Date       3/28/2006 12:33:25 PM         Site       Latitude         Latitude       39 25 39.00 N         Longitude       104 52 0.01 W         LL:       Generic Lat/Long's, Degrees, -180         => +180       Site Elev         Site Elev       6611.33         Transmitter       Transmitter         Transmitter Antenna       Receiver Losses         Receiver Losses (Primary)       Receiver Losses (Diversity)         Receiver Cains (Diversity)       Site Receiver Gains (Diversity)	Coverage Study Settings         + Expand All         Collapse All         Task         Task         Task         VauloDraw         Text Dut:         Parameters Dnly	Description ID 0000002 Desc SAMPLE Hand held with minimal boi Transmitter Losses Transmitter Antenna Receiver Antenna Receiver Gains Receiver
10 Records	Topo Data	2 Records
DEMO Castle Rock Test Facility ed	Propagation Model: LR (LR Defaults)	SAMPLE Hand held with minimal body losse
•	Surface Features	
New Edit Copy Delete Save Cancel	Land Use	New Edit Copy Delete Save Cancel



5. A Task ID will be assigned. Enter a description for the study as "TRAINING Radial Study Centennial":



The Task Description is used later in TAP when you want to find this study to draw a map or other uses. The description you use should be something that will be helpful to you when you need to refer back to a study.

Be sure the AutoDraw box is checked so the study will be displayed in HDMapper when completed.



6. In the Fixed Facility section on the left side of the form, use the pulldown list near the bottom to select the Centennial facility (created in previous section):



This example will use an existing Fixed Facility record. For more details on creating a new record for a facility, see Section 1.



7. When a Fixed Facility is selected, the program will display a map of the area (if the shapefiles for the area are available). The button with the pin icon in the map toolbar can be clicked to display the site location (the green triangle shown below):





8. With the Zoom button (the magnifying glass icon on the map toolbar) depressed, draw a rectangle on the area you want to enlarge on the map. Click a point on the map and hold the mouse button down to drag a rectangle over the area. Release the mouse button to complete the rectangle and zoom into the map.





9. Click the Propagation Model section in the Coverage Study portion of the form to open that section. In the pulldown list, select the Longley-Rice model:



Several propagation models are available in TAP. There are numerous FAQs that describe each model and compare the models. Longley-Rice is used for this example. You should select the model best suited to your application.



10. Each propagation model has various parameters associated with the model. These parameters are contained in templates, enabling you to have multiple standard configurations you can create. For this example, click the lookup ("...") button to display the available Longley-Rice templates.

Longley-Rice Parameters Template
Template Description
Polarization
Polarization (Horizontal or Vertical): V 💌
Refractivity and Climate
Surface Ns (N-units):       300.5000       Effective Earth Curvature (K):       1.3333         Sea Level No (N-Units):       0.0000       Climate Code (1 - 7):       5 Continental Temperate
Ground Parameters
Relative Permittivity: 15.00 Average ground   Conductivity (Siemens/m): 0.005 Average grour
Mode:       11       Situation (%)       Time (%)         Individual       ▼       No Situation Variability       90.00       90.00         ▼       No Location Variability       Confidence (%)       Reliability (%)
Record Controls
New         Edit         Copy         Del         Find         Save         Cancel         Close         I<         > >

Select the LR Defaults template and click the Close button. These values are used for this example. You should select values that are most suited to your application.



11. The selected template description is displayed in the Propagation Model section.





12. The Mobile Facility record needs to be created for the mobile we want for this study. In the Mobile Facility section on the right side of the HDCoverage form, click the New button near the bottom to create a new record:





13. In the Description section, enter a description for the mobile: "Basic Handheld"





14. In the Transmitter section, enter the frequency (455 MHz) and the handheld power (1W). The power for the mobile is needed if we decide later to do TalkBack calculations:




15. In the Transmitter Antenna section, enter the height for the mobile (6ft AGL) and the antenna gain (0dBd). (No Transmitter losses are included in this example.) Note that the ERP is computed (1W) based on the TPO and gains and losses associated with the mobile transmitter information. When you start entering values in the facility database, you may get warnings to let you know that you have incomplete information for a TalkOut study. You can disregard these. They will resolve when you fill in all of your information; they mostly serve as reminders.

SoftWright HDCoverage Rev 380	But The all	
File Configuration Map <u>H</u> elp		
Fixed Facility		Mobile Facility
+-=====================================	<u> Q_{\}                                    </u>	
		Ne BY immediates using
Description		Description
ID 0000031		ID 0000003
Desc TRAINING Centennial Site		Desc TRAINING Basic Handheld
Edit Date 3/23/2013 10:06:58 PM		
Site	┝━━┥╭ <b>╯┉┉┉</b> ╼╲╼╴╚	
Latitude 39 33 9.00 N	Ind south I	Freq 455.00000 MHz
Longitude 104 44 51.00 W		Transmitter Losses
LL84 : WGS84 Lat/Long's, Degrees, 180		Transmitter Antenna
==> +180		Height 6.00 ft - AGL -
Site Elev 6053.15 ft 💌 CALC		
Trapsmitter	- Coverage Study Setting	Ant Gain 0.00 dBd
	+ Evoand All - Collapse All	ERP 1.00 W 💌
Transmitter Antenna		Receiver Antenna
Receiver Antenna (Primary)	Task	Receiver Losses
Receiver Losses (Primary)	Coverage Area	Receiver Gains
Receiver Gains (Primary)	Topo Data	Receiver
- Receiver Antenna (Diversity)	Propagation Model: LR (LR Defaults)	
Receiver Losses (Diversity)	Model Longley-Rice	
Receiver Gains (Diversity)		
10 Records		3 Records
TRAINING Centennial Site		SAMPLE Hand held with minimal hody losse
	Surface Features	Same Le Hand Hold Warminillar body losse
	Land Use	4 Þ
New Edit Copy Delete Save Cancel	]	New Edit Copy Delete Save Cancel

Note that for mobile units, the Transmitter Antenna height is used for both the transmit and receive mobile antennas.



16. In the Receiver section, enter the frequency (455MHz) and impedance (50Ohms). Be sure the Sensitivity units are microVolts (uV) and enter the 0.5uV value (Select the desired units first, then enter the value.):





17. In the Receiver Antenna section, enter the antenna gain (0dBd). Note that the Required Field value is computed based on the receiver sensitivity and the gain and loss values associated with the mobile receiver information.





18. Click the Save button near the bottom of the Mobile Facility database interface to save this record.







19. In the Coverage Area section, click the Radial Study  $\mathbb{K}$  button:



20. Since the specifications for this example are in miles, be sure the units are set to "mi":





21. Since we want to compute the coverage along uniformly spaced radials, click the Number button:



22. Enter the number of radials to compute (72 for this example):





23. Enter the length of the radials you want to compute (30 miles in this example):



24. When the distance for the radials has been entered, the radials are added to the list:





25. You can see the area to be covered on the map by checking the "Draw on map" box:





26. On the toolbar near the top of the form click the Save button to save the parameters for this study:





27. Depending on your configuration settings for HDCoverage, you <u>may or may not</u> see the following warning message



This message warns you if the settings needed for Talkback (sometimes called "Talk-In") have not been set. Since we will not be computing the Talkback for this study, click OK to continue. Talkback calculations will be discussed in Lab 800.)

28. When you are ready to run the study, click the Run button on the toolbar near the top of the form:



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29. The Tasks to Run form will be displayed:

Task(s) to Run		
0000002 TRAIN	VING Radial Study Centennial	
Cancel	Close HDCoverage when running Tasks Run in silent mode	Continue

This form shows the Tasks that have been created but not yet run, with the Tasks created during the current HDCoverage session marked with a checkbox. To start the marked tasks, click the Continue button.

30. The study will take a few seconds to set up, then a progress form will be displayed:

ſ	Compute Longley-Rice Field	
	TRAINING Radial Study Centennial	
	Azimuth 255.000 (52 of 72)	
	72%	1
	Estimated time remaining 00:00:02	



31. When the study is complete, HDMapper will be loaded to display the coverage map. The map may be exported to Google Earth using one click of the Google Earth icon.



- 32. This map shows the results for the study, based on the Required Field value computed for the mobile facility. The locations marked in green (note the legend on the left) indicate points on the radials where the computed field strength meets or exceeds the required field value. At the red locations, the field strength is below the required value.
- 33. You can also display multiple field strength levels.