STK/Radar Search/Track Input Requirements for STK 12

All of the following options must be set for Radars, unless stated as optional. Below will show each panel where all of the Radar properties are set.

I. Basic Radar data:

- A. Monostatic or Bistatic
- B. Frequency
- C. Power
- D. Antenna Type, Properties and Orientation
- E. Constant Gains/Losses (optional)
- F. Jammer Information (optional)
- G. Modulator (optional)
- H. Receiver Properties
- I. System Temperature Properties and Parameters (optional)
- J. Spectrum Filters for transmit and receive side (optional)
- K. Polarization for Transmit and Receive Side (optional)
- L. Sensitivity Time Control (STC)
- M. Radar Cross Section of Target
- N. Fixed PRF or Continuous Wave?
- O. Pulse Repetition Frequency/Unambiguous Range/Unambiguous Velocity (for Fixed PRF)
- P. Pulse Width or Duty Factor (for Fixed PRF)
- Q. Probability of False Alarm
- R. Goal SNR with maximum number of Pulses or Fixed Number of Pulses
- S. Perfect Integrator/Constant Efficiency/Pulse Number Exponent/Integration Gain File
- T. Main Lobe Clutter with Bandwidth (optional)
- U. Side Lobe Clutter with Bandwidth (optional)
- V. Radar Clutter
- II. Environment data (optional)
- a. Clouds/Fog (optional)
- b. Rain (optional)
- c. Atmospheric absorption (optional)
- d. Urban and Terrestrial (optional)
- e. Tropospheric Scintillation (optional)
- f. Ionospheric Fading (optional)
- g. Custom Loss Models (optional)
- III. Sensors:
- a. Sensor Shape/Pattern
- b. Sensor Spin

STK/Radar Input Requirements for STK 12

All of the following options must be set unless this documents states that the options are optional I. Basic Radar data:

The following data are required as input to the Radar module in STK (Figure 1): A. Monostatic, Bistatic Transmitter, Bistatic Receiver or Multifunction

- B. Frequency or Wavelength C. Power

Basic	Providence			anna anna	
Definition	Type: Monostatic			49 A	
Refraction		N			
Description	Mode Antenna Transmitter Re	ceiver Jamming	Clutter		
= 2D Graphics					
Contours	Specs RF Filter Polarization	Additional Gains an	d Losses		
Boresight			-		
Access	Frequency	2.99792 GHz	197		
Multipath	Wavelength	0.1 m			
3D Graphics	C wavelength		100		
Attributes	Antenna Design Frequency:	2.99792 GHz	Ŧ		
Vector			1000		
Constraints	Power:	40 dBW	ę		
Basic					
Search/Track					
S/T w/Jamming					
S/T OrthoPol					
- S/T OrthoPol Jam					
 MFR Search/Track 					
MFR S/T w/Jamming					
SAR					
SAR w/Jamming					
SAR OrthoPol					
SAR OrthoPol Jam					
Bistatic					
Noise					~

Figure 1 – Radar Transmitter Inputs

elect Component						
Reference Type:						
Unlinked ~						
Antenna Models:						
Name	User Comment					
ITU-R S1528 1.2 Rectangular	ITU-R Recommendation S-1528 1.2 for modeling rectangular apertures					
ITU-R S1528 1.3	ITU-R Recommendation S1528 1.3 for modeling rectangular apertures					
🏟 ITU-R S465-5	ITU-R Recommendation S465-5 antenna pattern					
🏟 ITU-R \$465-6	ITU-R Recommendation S465-6 antenna pattern					
1TU-R S580-5	ITU-R Recommendation S580-5 antenna pattern					
1TU-R S580-6	ITU-R Recommendation S580-6 antenna pattern					
ITU-R S672-4 Circular	ITU-R Recommendation S672-4 for modeling circular apertures					
ITU-R S672-4 Rectangular	ITU-R Recommendation S672-4 for modeling rectangular apertures					
🍁 ITU-R S731	ITU-R Recommendation S731 antenna pattern					
Parabolic	Analytical model of a uniformly illuminated parabolic antenna					
🏟 Pencil Beam	Pencil beam antenna is a non-physically realizable antenna for analysis					
🏟 Phased Array	Models a phased array antenna					
Rectangular Pattern	Rectangular pattern antennas (Radar) similar to pencil beam pattern					
🏟 Remcom Uan Format	External antenna type for files arranged in complex *.uan format produced by Remcom					
Simple Optical	Simple optical antenna pattern					
Sinc Integer Power Aperture Circular	Circular sinc integer power antenna pattern					
Sinc Integer Power Aperture Rectangular	Sinc integer power aperture rectangular antenna pattern					
Sinc Real Power Aperture Circular	Circular sinc real power antenna pattern					
Sinc Real Power Aperture Rectangular	Sinc real power aperture rectangular antenna pattern					
🏟 Square Hom	Analytical model of a square horn antenna including side lobes					
A Tiers CDASD Earmat	External antonna data in Comolav Ticra GDAGD Format					

D Antenna Type (Figure 2). Properties (Figure 3) and Orientation (Figure 4)

Figure 2 – Available Antenna Types

Basic ^	Monostatic		10	A 01		^
Definition				• 🐼 📰 🖤 🖤		
Refraction						
Description	Mode Antenna Transr	nitter Receiver Jamr	ning Clutt	ter	N	
2D Graphics	Reference Type: Emb	ed 🖂 🖂			13	
- Contours						
Boresight	Model Specs Orienta	tion				
Access	Type: F	arabolic		12 149 44		
Multipath						
3D Graphics	Design Frequency	2 99792 GHz	Ψ			
Attributes	Design requency.					
Vector	Beamwidth:	5.89831 deg	₽	O Use Beamwidth		
Constraints						
Basic	Diameter.	1 m	₽.	Use Diameter		
- Search/Track	Main-John Cain	27 3466 dB		Ollisa Mainloha Gain		
- S/T w/Jamming	main loos dain.		hist	O ose main tobe dain		
- S/T OrthoPol	Efficiency:	55 %	₽			
- S/T OrthoPol Jam		20.40	1000			
MFR Search/Irack	Back-lobe Gain:	-30 GB	*	Use as mainlobe attenuation		
MFR S/T w/Jamming						
SAR SAR						
SAR W/Jamming						
SAR OrthoPol Ism						
Distatic						
Noise						~
Noise Y C						>

Figure 3 – Antenna Properties

Basic	Tune Monostatic		10		
Definition	Туре.		*** 67		
Refraction	and the second second				
Description	Mode Antenna Transm	itter Receiver Jamming	Clutter		
2D Graphics	Reference Type: Embe	d			
Contours					
Boresight	Model Specs Orientat	2n			
Access	Azimuth Elevation	~			
Multipath			-		
3D Graphics	Azimuth:	0 deg	Po Po	isition Offset	
Attributes	Elevation	90 deg	×	0 m 🔛	
Vector	Elevation.			0	
Constraints	About Boresight	Rotate	~ Y	: [om	
Basic			z	0 m 🔛	
Search/Track				Line (
S/T w/Jamming					
S/T OrthoPol					
S/T OrthoPol Jam					
MFR Search/Track					
MFR S/T w/Jamming					
SAR					
SAR w/Jamming					
SAR ORNOPOL					
Distatic					
Noico					
ivoise	1				>

Figure 4 – Antenna Orientation Inputs

Basic	Turne: Monostatic	A Cu C Ci	^
Definition	Type.	- 64 22 47 17	
Refraction			
Description	Mode Antenna Fransmitter Recei	ver Jamming Clutter	
2D Graphics	Specs RF Filter PolNization Ad	ditional Gains and Losses	
Contours	64		
Boresight	Post Transmit Gains/Losses		
Access	Identifier Gain	Add	
Multipath			
3D Graphics		Remove	
Attributes		Remove All	
Vector			
Constraints			
Basic			
Search/Track			
 S/T w/Jamming 	Total Gains/Losses	0 dB 👜	
S/T OrthoPol			
 S/T OrthoPol Jam 			
MFR Search/Track			
MFR S/T w/Jamming			
SAR			
SAR w/Jamming			
SAR OrthoPol			
SAR OrthoPol Jam			
Bistatic			
Noise			
RF Environment			,

E. Constant Gains/Losses (optional) (Figure 5 and 6)



Definition Refraction Description 22 Graphics Contours Boresight Access Multipath 30 Graphics Attributes Vector Constraints Basic Search/Track S/T OrthoPol Jam MFR Search/Track MFR Syrt w/Jamming SAR OrthoPol SAR OrthoPol Jam Bistatic Noise	Basic A	Type Monostatic		
Refraction Description 2D Graphics Specs RF Filter Polarization System Noise Temperature STC Additional Cains and Losses Contours Boresight Access Multipath 3D Graphics Add Attributes Vector Constraints Basic Search/Track S/T orthoPol S/T OrthoPol Total Gains/Losses MFR S/T w/Jamming SAR SAR OrthoPol SAR OrthoPol SAR OrthoPol Jam Bistatic Noise Noise	Definition	iype.	··· •• •• •• ••	
Description Mode Antenna Transmitter Keckwer Jamming Cutter 22D Graphics Contours Specs RF Filter Polarization System Noise Temperature STC Additional Gains and Losses Boresight Access Multipath Add 32D Graphics Add Remove Vector Constraints Basic Search/Track Search/Track Remove All S/T orthoPol S/T orthoPol S/T orthoPol Total Gains/Losses: 0 dB SAR W/Jamming SAR OrthoPol SAR OrthoPol SAR	Refraction			
22D Graphics Specs RF Filter Polarization System Noise Temperature STC Additional Cosins and Losses Boresight Access Multipath 33D Graphics Add Attributes Vector © Constraints Basic Saerch/Track Fremove All S/T orthoPol Total Gains/Losses: 0 dB Image: SAR OrthoPol SAR OrthoPol Jam SAR OrthoPol Jam Bistatic SAR OrthoPol Jam SAR OrthoPol Jam SAR OrthoPol Jam	Description	Mode Antenna Transmitter Receiver	Jamming Outter	
Contours Boresight Access Multipath 3D Graphics Attributes Vector Constraints Basic Search/Track S/T OrthoPol Jam MrR Search/Track MFR S/T w/Jamming SAR OrthoPol SAR OrthoPol SAR OrthoPol SAR OrthoPol Jam Bistatic Noise	2D Graphics	Specs RF Filter Polarization System	Noise Temperature STC Additional Gains and Losses	
Boresight Access Multipath a 3D Graphics Attributes Vector Constraints Basic Search/Track S/T OrthoPol Jam S/T OrthoPol Jam MFK Search/Track MFR S/T w/Jamming SAR w/Jamming SAR OrthoPol Jam Bistatic Noise	Contours	Dra Bassila Cainal assas	63	
Access Multipath 3D Graphics Attributes Vector Constraints Basic Search/Track S/T orthoPol S/T OrthoPol S/T OrthoPol Jam MFR Search/Track MFR SyT w/Jamming SAR SAR w/Jamming SAR OrthoPol SAR Ortho	Boresight	Pre-Receive Gains/Losses		
Multipath 3D Graphics Attributes Vector Constraints Basic Search/Track S/T w/Jamming S/T OrthoPol S/T OrthoPol Jam MFR Search/Track MKFR S/T w/Jamming SAR OrthoPol SAR OrthOP	Access	Identifier Gain	Add	
B D Graphics Attributes Attributes Vector Constraints Basic Search/Track Total Gains/Losses: S/T OrthoPol Jam MFR Search/Track SAR W/Jamming SAR OrthoPol Jam SAR OrthoPol Jam SAR OrthoPol Jam Bistatic Noise	Multipath		Domoio	
Attributes Vector Constraints Basic Search/Track Search/Track SfT OrthoPol Jam MFR Search/Track MFR S/T w/Jamming SAR W/Jamming SAR W/Jamming SAR OrthoPol Jam Bistatic Noise	B 3D Graphics		Barnove	
Vector Constraints Basic Search/Track S/T W/Jamming S/T OrthoPol Jam MFR Search/Track MFR S/T w/Jamming SAR w/Jamming SAR W/Jamming SAR OrthoPol Jam Bistatic Noise	Attributes		Remove All	
Constraints Basic Search/Track S/T w/Jamming S/T OrthoPol S/T OrthoPol Jam MFR Search/Track SAR w/Jamming SAR SAR OrthoPol	Vector			
Basic Search/Track S/T W/Jamming S/T OrthoPol Jam MFR Search/Track MFR S/T W/Jamming SAR SAR W/Jamming SAR OrthoPol SAR OrthoPol SAR OrthoPol SAR OrthoPol Jam Bistatic Noise	Constraints			
Search/Track S/T OrthoPol S/T OrthoPol Jam MFR Search/Track MFR S/T w/Jamming SAR SAR w/Jamming SAR SAR w/Jamming SAR OrthoPol SAR OrthoPol Noise	Basic			
S/T w/Jamming S/T OrthoPol S/T OrthoPol Jam MFR Search/Track MFR S/T w/Jamming SAR SAR w/Jamming SAR OrthoPol SAR OrthoPol Jam Bistatic Noise	Search/Track			
S/T OrthoPol Jam MFR Search/Track MFR S/T w/Jamming SAR w/Jamming SAR OrthoPol SAR OrthoPol Jam Bistatic Noise	S/T w/Jamming	Total Gains/Losses 0 dB	Ŧ	
S/T OrthoRol Jam MFR Search/Track MFR S/T w/Jamming SAR SAR OrthoPol SAR OrthoPol Jam Bistatic Noise	S/T OrthoPol		(Len4)	
MFR Search/Track MFR S/T w/Jamming SAR SAR orthoPol SAR OrthoPol Jam Bistatic Noise	S/T OrthoPol Jam			
MFR S/T w/Jamming SAR SAR w/Jamming SAR OrthoPol SAR OrthoPol Jam Bistatic Noise	MFR Search/Track			
SAR SAR W/Jamming SAR OrthoPol SAR OrthoPol Jam Bistatic Noise	MFR S/T w/Jamming			
SAR OrthoPol SAR OrthoPol Jam Bistatic Noise	SAK			
SAR OrthoPol Jam Bistatic Noise	SAR w/Jamming			
Bistatic Noise	SAR OrthoPol			
Noise	Distatio			
Noise	Distatic			
PE Environment Y 13	DE Environmont			>

Figure 6 – Pre Receive Gains/Losses

F. Jammer Information (optional) (Figure 7)

Basic ^	Type: Monostatic	^
Definition		
Refraction	Mode Antonna Transmitter Decement Jamming Clutter	
Description	Prove Partoning Hundringer Receiver	
2D Graphics	Use	
Contours		
Boresight	Selection filter.	
Access	There are no items to show. Select All Filters	
Multipath	Cioner dil Educe	
B 3D Graphics	CARGE PART HERE	
Attributes	Available Jammers Assigned Jammers	
Vector	There are no items to show There are no items to show	
Constraints		
Basic Caareb (Track		
Search/ Index		
S/T OrthoPol		
S/T OrthoPol Jam		
MFR Search/Track		
MFR S/T w/Jamming		
SAR		
SAR w/Jamming		
SAR OrthoPol		
SAR OrthoPol Jam		
Bistatic		
Noise		
RF Environment	<	>
OK Cancel	Apply Hole	

Figure 7 – Jammer Information

Radar1 : Basic Definition		— O 🗙
Basic Constraints Baric Constraints Basic Constraints Basic Search/Track S/T w/Jamming SAR OrthoPol Jam Bistatic Control SAR OrthoPol Jam Bistatic	Type: Monostatic	
Noise		
RF Environment	×	

Figure 8 – Modulator

H. Receiver Properties (Figure 9)

Basic	Turne Monostatic		2 0 0	1
- Definition	Type.			
- Refraction				
Description	Mode Antenna Transmitter Ne	Jamming Clutter		
E 2D Graphics	Speqs RF Filter Polarization	System Noise Temperature	STC Additional Gains and Losses	
- Contours	μζ.		1	
- Boresight	Antenna to LNA Line Loss:	U de		
- Access	INA Gain:	0 dB 😡	1	
Multipath	cret doni		-	
3D Graphics	LNA to Receiver Line Loss:	0 dB 🔛		
- Attributes				
Vector	Rain Model			
Constraints	Use			
Basic	Outage Percent: 0.100	1		
Search/Track				
- S/T w/Jamming				
- S/T OrthoPol				
S/T Orthopol Jam				
MER Search/ Irack				
SAR				
SAR w/lamming				
SAR OrthoPol				
SAR OrthoPol Jam				
Bistatic				
Noise				
RE Environment	<			>

Figure 9 – Receiver Properties

I. System Temperature Properties and Parameters (optional) (Figure 10 and Table 1)



Figure 10 – System Temperature Properties

Table 1 – System Temperature Parameters

Parameter	Description
Antenna to LNA Transmission Line Temperature	The physical temperature of the transmission line between the antenna and the LNA.
LNA Noise Figure	The noise figure represents the contribution to the total system noise by the gain stages of the receiver. It can be thought of as a factor that describes the noise level in a receiver relative to that in a theoretically perfect receiver. The noise figure is always greater than 0 dB.
LNA Temperature	The physical temperature of the low noise amplifier (LNA).
LNA to Receiver Transmission Line	The physical temperature of the transmission line between the LNA and the receiver.
Antenna Noise	Noise that the antenna picks up from radiating bodies within its radiation pattern - a function of the direction in which the antenna is pointing, its radiation pattern and the state of the surrounding environment. The following options are available:
	 Constant - Enter the desired value. Compute - Select whether to use Earth, Sun, Atmosphere, Urban Terrestrial, Rain,
	Clouds & Fog, Tropo Scintillation, and/or Cosmic Background noise in the calculation.
	You can also enter a constant value for Other Sources.
	Also, you can select an external antenna noise file. Click the ellipsis button to
	browse for the file name. The file allows you to specify the antenna noise temperature
	as a function of the ground elevation angle. Also, you can opt to take Sun and/or
	Rain noise into account. The Rain, Atmosphere, and external noise options are
	available only for facilities and targets, while Cosmic Background noise is available
	only for vehicles. Earth noise is always included in the calculation for facilities and
	targets.
Earth Temperature	If you select Compute and Earth under Antenna Noise, you can optionally set the Earth temperature at the local receiver level. To set the Earth temperature, clear Inherit from Scenario and enter a new value. The default value is 290 degrees Kelvin, which is the Earth's blackbody radiation temperature.

Basic ^	Type Monostatic		12 0 49 44	^
Definition				
Refraction	Mode Asterna Transmitter	acchurg Jamming	Clutter	
Description	mode Antenna Honoriter P	veceiver Jamining	Cotter	
2D Graphics	Specs RF Filter Polarization	Additional Gains a	and Losses	
Contours	20 MHz			
Boresight	Power Ampliner 30 Minz	· ·		
Access				
Multipath		N		
al 3D Graphics	Butterworth	W	星峰峰	
Vector	Linner Bandwidth Limit	20 MHz	100	
Constraints				
- Basic	Lower Bandwidth Limit	-20 MHz		
Search/Track	Danaturate	40 MHz		
S/T w/Jamming	Danowion.	10 10 4	Ψ.	
S/T OrthoPol	Insertion Loss	0 dB	(1)	
 S/T OrthoPol Jam 				
MFR Search/Track	Orden	4		
MFR S/T w/Jamming	Cut-off Frequency.	10 MHz	1	
SAR				
SAR w/Jamming				
SAR OrthoPol				
- SAR OrthoPol Jam				
Bistatic				
Noise				, v
RF Environment				,

J. RF Filters for transmit and receiver side (optional) (Figures 11, 12, and 13)

Figure 11 – Transmit Side Filter

Basic ^	Type: Monostatic		12 🗐 🧐 🥠		
Definition			Local Linear Manual Linear Linear		
Refraction	Mode Antenna Transmitter	Receiver Jamming	Clutter		
Description					
El 2D Graphics	Specs RF Filter Polarization	System Noise Te	nperature STC Additional	I Gains and Losses	
Contours	INA Bandwidth: 30 MHz	Ģ			
Boresigni					
Access					
B 2D Graphics			succession and and and and and and and and and an		
Attributor	Butterworth		回喉吻		
Vector	Linner Bandwidth Limit	20 MHz	(F)		
Constraints					
Basic	Lower Bandwidth Limit	-20 MHz			
Search/Track	Development.	40 Mil-17	67)		
S/T w/Jamming	bandwidth.	40.000 12	(F)		
S/T OrthoPol	Insertion Loss	0 dB	1		
S/T OrthoPol Jam			100		
MFR Search/Track	Order	4	1		
MFR S/T w/Jamming	Cut-off Frequency	10 MHz	1		
SAR			1.11		
SAR w/Jamming					
- SAR OrthoPol					
SAR OrthoPol Jam					
Bistatic					
Noise					
RF Environment	c l				>

Figure 12 – Receive Side Filter

inked V	
ilter Models:	r
Name	User Comment
Dessei	An analytical litter frequency response with linear phase in the passoand
Butterworth	General form of nth order Butterworth hiter with hat passoand and stopoand regions
Chebysnev	General form or nin order Chebysnev filter with equal hpple in the passband
Cosine vvindow	Models the application of a cosine window applied to the baseband signal to limit the requency spectrum
Catanal C	A filter requency response with ripple in both the pass and stop bands
Cxternal	A frequency response defined by an external point data file
	A fitter frequency response modeled using an nth order polynomial with a given set of complex coefficients
PIR Box Car	General FIR box-car niter
Gaussian Window	Models the application of a gaussian window applied to the baseband signal to limit the frequency spectrum
Hamming vvindow	Models the application of a namming window applied to the basedand signal stream to limit the frequency spectru
	A filter frequency response modeled using an nth order polynomial with a given set of complex coefficients
Raised Cosine	Raised Cosine filter. Roll of Factor is 0 - 1 and Symbol rate is symbols/sec.
RC Low-Pass	A filter frequency response generated from a first order RC circuit
Rectangular	Ideal rectangular filter with flat passband and stopband regions
Root Raised Cosine	Root Raised Cosine filter. Roll of Factor is 0 - 1 and Symbol rate is symbols/sec.
Scnpt	A script plugin
Sinc	General form of a sin(x)/x filter
Sinc Envelope Sinc	General form of a sin(x)/x filter

Figure 13 – Filter Types

Basic ^	Type o Monostatic		12 II 42 44	^
Definition *	.,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,			
Refraction	Made Astrony Transm	ther Deserves las	and the second	
Description	Mode Antenna Tronsin	Receiver Jar	nming Cutter	
2D Graphics	Specs RF Filter Pola	rization Additional	Gains and Losses	
Contours				
Boresight				
- Access	Linear		1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 -	
Multipath	Deference Avie	X Avie		
3D Graphics	meleterice yous.	0.000		
Attributes	Tilt Angle:	0 deg	192	
Vector			1 million	
Constraints				
Basic	N			
Search/Track	13			
S/T w/Jamming	Enable Orthogona	Polarization		
S/T OrthoPol	1			
S/T OrthoPol Jam				
MFR Search/Track				
MFR S/T w/Jamming				
SAR				
SAR w/Jamming				
SAR OrthoPol				
SAR OrthoPol Jam				
Bistatic				
Noise	,			, v
RF Environment	•			,

K. Polarization for Transmit and Receive Side (Optional) (Figures 14 and 15)



Basic ^	Turso: C Monostatic			^
Definition *	Type.		··· •• •• ••	
Refraction				
Description	Mode Antenna Transmit	ter Receiver Jammin	g Clutter	
∃ 2D Graphics	Specs RF Filter Polari	zation System Noise T	emperature STC Additional Gains and Losses	
Contours		to a first of the second s		
Boresight	Uuse	N		
Access	Linear	43	54 A	
Multipath		10000		
∃ 3D Graphics	Reference Axis:	X Axis	×.	
Attributes	Tilt Angle	0 deg	101	
Vector		in one		
Constraints	Cross-Pol Leakage	-60 dB	122	
Basic				
Search/Track				
S/T w/Jamming				
S/T OrthoPol	Enable Orthogonal	Polarization		
- S/T OrthoPol Jam				
MFR Search/Track				
MFR S/T w/Jamming				
SAR				
SAR w/Jamming				
SAR OrthoPol				
SAR OrthoPol Jam				
Bistatic				
Noise				~
RF Environment	<			>

Figure 15 – Receive Side Polarization

L. Sensitivity Time Control (Figure 16)

Basic ^	Made Antonna Transmitt	or Receiver Jammie	a Chitter			
Definition *	Mode Antenna Transmit	er Necewei Jämmin	ig Clutter			
Refraction	Specs RF Filter Polariz	ation System Noise T	emperature STC	Additional Gains and Los	ises	
Description						
E 2D Graphics	Enable Rf STC					
Contours	Decay Factor		N			
- Boresight			13			
Access						
Multipath	May Value :	30 dB	107	Start Dance	0.926 km	
3D Graphics	max tunue.		(<u>*</u> .)	chant Hunge .		
Attributes	Start Value :	10 dB		Stop Range :	92.6 km	
Vector	Atton Ston Size	1 dB	102			
Constraints	Haten, Step Size.					
Basic	Decay Factor:	2	197			
Search/Track						
S/T w/Jamming						
- S/T OrthoPol						
S/T OrthoPol Jam	Enable If STC					
MFR Search/Track	Dorany Easter		100			
MFR S/T w/Jamming	Decay racio					
SAR						
- SAR w/Jamming			1000		a week of the	
SAR OrthoPol	Max Value :	30 dB	14. 1	Start Range :	0.926 km	
- SAR OrthoPol Jam	Start Value -	10 dB	107	Stop Range :	92.6 km	
Bistatic						
Noise	Atten. Step Size:	1 dB	De .			
RF Environment	Decay Factor:	2	100			
Sun						
Temporal						
Advanced						
Zones						
Taracting V K						>

Figure 16 – STC

M. Radar Cross Section of Target (Figure 17)

Dusic	Type: Radar Cross	Section							
- Time									
- Units									
Database	MinFrequency Ma	xFrequ	ency ComputeTy	be SwerlingCa	se	Band Insert Para	ameters		-
- Earth Data	2.99792 Minz 3e-	FII MPL	2 Constant Val	ue u	-	Min Frequency	2.99792 N	1Hz 9	₽
- Terrain						Max Frequenc	3e+11 Mt	tz s	
- 3D Tiles						max riequene			20
 Global Attributes 						1.021	0.1.1.		1
Description						Insert	Delete	Merge	4
2D Graphics	Band Properties								
 Global Attributes 		2 907	92 MHz	Terral I					
Fonts	Min. Frequency:	2.337	26.3911.16	[07]					
3D Graphics	Max. Frequency:	3e+11	1 MHz	5					
Global Attributes	Swerling Case:	0		~					
- Fonts									
RF	Compute Type:	Const	tant Value	~					
Environment	Constant BCS	Value	0 dBsm	Ψ					
Radar Cross Section									
Radar Clutter									
DIS	-								
- Input									
Output									
Entity Filter									
- Entity Translation									
Network									
Parameter									
Aviator								N	
 Wind/Atmosphere 								43	

Figure 17 – Radar Cross Section Inputs

N. Fixed PRF or Continuous Wave? (Figure 18)

O. Pulse Repetition Frequency/Unambiguous Range/Unambiguous Velocity (for Fixed PRF) (Figure 18)

P. Pulse Width or Duty Factor (for Fixed PRF) (Figure 18)



Figure 18 – Radar Pulse Definition

Q. Probability of False Alarm (Figure 19)
---------------------------------	------------

Radar1 : Basic Definition		• >
Basic Definition	Type: Monostatic 🗱 🖬 🌒 🔷	·
Refraction		
Description	Mode Antenna Transmitter Receiver Jamming Clutter	
2D Graphics	Type: Search Track	
Contours		
Boresight	Waveform Doppler Eiltere	
Access	Copper mera	
Multipath	Fixed PRF ~	
3D Graphics		
Attributes	Pulse Definition Modulator Probability of Detection Pulse Integration Specs	
Vector		
Constraints	Non-constant False Alarm Rate	
Basic	0,0001	
Search/Track	Probability of Palse Alarm: 0.0001	
S/T w/Jamming		
- S/T OrthoPol		
S/T OrthoPol Jam		
MFR Search/Track		
MFR S/T w/lamming		
SAR		
SAR w/Jamming		
SAR OrthoPol		
SAR OrthoPol Jam		
Bistatic		
Noise		
RE Environment		
Sun		
Temporal		
Advanced	× .	>
	Analy Hale	

Figure 19 – Radar Probability of Detection

R. Goal SNR with maximum number of Pulses or Fixed Number of Pulses (Figure 20)

S. Perfect Integrator/Constant Efficiency/Pulse Number Exponent/Integration Gain File (Figure 20)

Basic	Mode Antenna Transmitter Receiver Jamming Clutter	
Definition	Antenna Hansinder Receiver Samming Clade	
Defraction	Type: Search Track 😫 🔛 🍪 🚸	
Description		
Description	Waveform Doppler Filters	
Capital Capita		
- Contours	Fixed PRF	
Boresignt		
- Access	Pulse Definition Modulator Probability of Detection Pulse Integration Specs	
Multipath		
3D Graphics	Goal SNR V	
Attributes		
- Vector	SNR: 16 dB 🛛	
Constraints		
Basic	Maximum Pulses: 512 👽	
 Search/Track 	Integrator Type	
 S/T w/Jamming 		
- S/T OrthoPol	Perfect	
 S/T OrthoPol Jam 		
MFR Search/Track	Constant Efficiency	
MFR S/T w/Jamming	C Exponent on Bridge Number 1	
SAR		
SAR w/Jamming	O Integration Gain File	
SAR OrthoPol		
SAR OrthoPol Jam	Reload	
Bistatic		
Noise	Non-Coherent Integration	
- RF Environment		
- Sun		
Temporal		~
Advanced V K		>

Figure 20 – Radar Pulse Integration

T. Main Lobe Clutter with Bandwidth (optional) (Figure 21)

U. Side Lobe Clutter with Bandwidth (optional) (Figure 21)



Figure 21 – Radar Doppler Filters

V. Radar Clutter (Figure 22)

ladar1 : Basic Definition				• 2
🖻 Basic	Type: Monostatic			
Definition				
Refraction		A DAMAS		
Description	Mode Antenna Transmitter Receiver	Jamming Clutter		_
2D Graphics	Enabled			
- Contours				
Boresight	and a second			
- Access	Clutter Geometry: Single Point			
Multipath				
B 3D Graphics			D	
 Attributes 			10	
Vector				
Constraints				
Basic				
 Search/Track 				
S/T w/Jamming				
S/T OrthoPol				
 S/T OrthoPol Jam 				
MFR Search/Track				
MFR S/T w/Jamming				
SAR				
- SAR w/Jamming				
SAR OrthoPol				
SAR OrthoPol Jam				
Bistatic				
Noise				
 RF Environment 				
- Sun				
Temporal	24			
Advanced	v <			>

Figure 22 – Radar Clutter

- II. Environment data (optional) (Figure 23): a. Clouds/Fog
- - Cloud Ceiling Layer Thickness

 - Cloud Temperature
 - Liquid Water Density
 - Water Content

b. Rain (Table 2)

- Surface Temperature

Basic						_
Time	Environmental Data Rain & Cloud &	Fog Atmospheric Absorpt	ion Urban &	Terrestrial Tropo Scintill	ation Iono Fading	Custo
Units	Dain Madel					
Database						
- Earth Data			-	Intel State State		
Terrain	110-R P618-12		+++ 61	12 99 99		
3D Tiles	Surface Temperature: 0	deaC III	1			
Global Attributes						
Description	Enable Cross Polarizatio	on Loss				
2D Graphics						
Global Attributes	Clouds and Fog Model					
Fonts	Use					
3D Graphics	11110 0910.7		the second	THE OWNER AND		
Global Attributes	110-13-1040-7		Arr 225	PT 45 45		
Fonts	Cloud Ceiling:	3 km	10			
Fruironmant		12-20	-			
Radar Cross Section	Cloud Layer Thickness:	0.5 km	1			
Radar Clutter	Cloud Temperature	0 degC	12			
DIS	orous remperature.					
Input	Liquid Water Content De	ensity Value		0.1 g/m ³		
Output	O Percent Time Liquid Wa	ster Exceeded Annual Ave	race	1 %		
- Entity Filter						
Entity Translation	O Percent Time Liquid Wa	iter Exceeded Monthly Av	erage	1%		
Network		Liquid Water Average Dat	a Month.	1		
Parameter				1		
Aviator V <						>

Figure 23 – RF Rain and Cloud Parameters

Name User Comment Description Source © CCIR 1983 CCIR 1983 ITU rain model CCIR 1983 ITU rain model Built-In © CCane 1982 Crane 1982 rain model Crane 1982 rain model Built-In © Crane 1982 Crane 1982 rain model Crane 1982 rain model Crane 1982 rain model Crane 1982 rain model	
Name User Comment Description Source © CCIR 1983 CCIR 1983 ITU rain model CCIR 1983 ITU rain model Built-In © CCare 1982 Crane 1982 rain model Built-In © Crane 1982 Crane 1982 rain model Built-In	
Name User Comment Description Source	
Name User Comment Description Source	
Crane 1982 Crane 1982 rain model Crane 1982 rain model Built-In	
Crane 1985 Crane 1985 rain model Crane 1985 rain model Built-In	
Vorane 1905 Crane 1905 rain moder Crane 1905 rain moder Duit-in	
ITU-R P618-10 ITU-R P618-10 rain model ITU-R P618-10 rain model Built-In	
WTU-R P618-12 ITU-R P618-12 rain model ITU-R P618-12 rain model Built-In	
Script Plugin Rain model script plugin Rain model script plugin Built-In	

Table 2 - Rain Models

- c. Atmospheric absorption (Figure 24 and Table 3)
 - Water Vapor Concentration
 - Surface Temperature
 - TIREM
 - Surface Humidity (TIREM)
 - Surface Conductivity (TIREM)
 - Surface Refractivity (TIREM)
 - Relative Permittivity (TIREM)
 - VOACAP
 - Sun Spot Number (VOACAP)
 - Man-made Noise (VOACAP)
 - Minimum Take-off Angle (VOACAP)
 - Required Reliability (VOACAP)
 - Required SNR (VOACAP)
 - Multipath Power Tolerance (VOACAP)
 - Multipath Delay Tolerance (VOACAP)
 - Coefficient Data Type (VOACAP)
 - Alternative Frequencies (VOACAP)

Basic	^		1
Time	Environmental Data Rain & Cloud & Fog Atmospheric Absorption Urban & Terrestrial Tropo Scintillation	Iono Fading	Custo
- Units			
Database	Use		
Earth Data	ITU-R P676-9		
Terrain			
3D Tiles	Use Fast Approx. Method 1-350 GHz		
 Global Attributes 	Use Seasonal/Regional Atmosphere Method		
Description	Cherre eperandi a fautari antegrane menea		
2D Graphics			
 Global Attributes 			
Fonts			
3D Graphics			
- Global Attributes			
Fonts			
🖃 RF			
Environment *			
 Radar Cross Section 			
Radar Clutter			
DIS			
Input			
Output			
 Entity Filter 			
 Entity Translation 			
Network			
Parameter			•
∃ Aviator	× <		>

Figure 24 – RF Atmospheric Loss Parameters

Table 3– Atmospheric absorption models

elect Component		>
Reference Type: Unlinked ~		
Atmospheric Absorp	tion Models:	Description
11U-R P676-9	ITU-R P676-9 gaseous absorption model	ITU-R P676-9 gaseous absorption model
Script Plugin	Atmospheric model script plugin	Atmospheric model script plugin
Simple Satcom	Simple Satcom gaseous absorption model	Simple Satcom gaseous absorption model
TIREM 3.31	TIREM 3.31 (Terrain Integrated Rough Earth Model) gaseous absorption model	TIREM 3.31 (Terrain Integrated Rough Earth Model) gaseour
VOACAP	VOACAP	VOACAP

- d. Urban and Terrestrial (Figure 25 and Table 4)
 - Two Ray
- i. Loss Factor ii. Surface Ten

Scenario5 : RF Environm	ent					
Basic	~	3				
Time		Environmental Data Rain & Cl	oud & Fog Atmos	pheric Absorption	Urban & Terrestrial Tropo Scintillation	Iono Fading Cust
Units						
Database		Use				
Earth Data		Two Ray			[2] [3] (4) (4)	
Terrain		inoriaj			and the little little little	
- 3D Tiles		Loss Factor.	1	19		
Global Attributes				-		
Description		Surface Temperature:	0 degC	8		
2D Graphics						
- Global Attributes						
Fonts						
3D Graphics						
Global Attributes						
Fonts						
🖃 RF						
Environment * *						
Radar Cross Section						
Radar Clutter						
I DIS						
Input						
Output						
Entity Filter						
Entry ranslation						
Parameter						
rarameter	~	1				,

Figure 25 – RF Urban and Terrestrial Loss Parameters

Table 4– Urban & T	Ferrestrial	models
--------------------	--------------------	--------

select component	3
Reference Type:	
Unlinked ~	N
Urban Terrestrial Propagation Loss Mode	is: G
Name	User Comment
🏘 Two Ray	Two Ray (Fourth Power Law) atmospheric absorption model
Urban Propagation Wireless InSite RT	Urban Propagation Wireless InSite RT (Wireless InSite real Time Library by Remcom) urban propa
<	
<	

- e. Tropospheric Scintillation (Figure 26)
 - Deep Fade
 - Surface Temperature
 - Tropospheric Fade Outage

- Percent Time Refractivity Gradient

Basic ^	Emirosmental Data Dain & Cloud	9 Ean Atmocharic	Abcorntion Jirban & Terrortrial Tr	one Sciptillation, Jone Ending, Curte
- Time	Environmental Data Rain & Cloud	a rog Annospheric	Absorption orban & refrestrial fr	upo sentimotori iono rading custo
Units				
Database	Use			
Earth Data	ITU-R P618-12		- 3 3 4 4	
- Ierrain			and some second sound sound and	
- SU Tiles	Compute Deep Fade			
Global Attributes	Surface Temperature:	0 degC	(B)	
=12D Graphics		0.1.0	(22)	
- Global Attributes	Tropo Fade Outage:	U.1.7a	101	
Fonts	Percent Time Refractivity	10 %	(m)	
3D Graphics	Gradient < - 100 N units/km:		Lau.	
Global Attributes	Fade depth for the average	ige vear		
Fonts	0.			
∃ RF	Pade depth for the avera	ige annual worst-mo	onth	
Environment * *				
Radar Cross Section				
Radar Clutter				
E DIS				
Input				
Output				
Entity Filter				
Natuork				
Parameter				
Aviator	¢			>
OK Canaal	August Marke			

Figure 26 – RF Tropospheric Scintillation Parameters



g. Custom Loss Models (Figure 28)

Basic ^							-
- Time	Environmental Data	Rain & Cloud & Fog	Atmospheric Absorption	Urban & Terrestrial	Tropo Scintillation	Iono Fading	Custo
Units							
Database	Use A:						
Earth Data		Reload					
Terrain				-			
- 3D Tiles	Use B:			1444			
Global Attributes		Reload					
Description							
∃ 2D Graphics	Use C:			1444			
Global Attributes		Reload					
Fonts							
∃ 3D Graphics							
Global Attributes							
Fonts							
⊡ RF							
Environment * *							
Radar Cross Section							
Radar Clutter			2				
I DIS			3				
- Input							
Output							
Entity Filter							
Entity Translation							
Network							
Parameter							~
■Aviator	<						>



III. Sensors:



Figure 29 – Sensor Shape

- b. Sensor Spin (Figure 30)
 - Scan Mode
 - Start/Stop Angle
 - Spin Rate
 - Initial Offset Angle
 - Spin Axis (Azimuth/Elevation)
 - Spin Axis Cone Angle

Basic ^			Pointin	ig Type: Spinning		~	
Definition	Calenian						
Location	Spinning						
Pointing *	Definition			Spin Axis	0.1	100	
Sensor AzEl Mask	Scan Mode:	Continuous	~	Azimuth:	0 deg	Ψ	
Refraction	Start Angle:	0 deg	191	Elevation:	90 deg	ę	
Resolution		10.000					
 Description 	Stop Angle:	360 deg	1	Cone Angle:	20 deg	₽	
2D Graphics		lo ot un luite	100				
Attributes	Spin Hate:	U.UT revs/min	4				
Projection	Initial Offset Angle:	0 deg	Ŧ				
- Boresight			100				
Display Times							
3D Graphics							
 Attributes 							
Projection					3		
Pulse							
Vertex Offset							
Vector							
Attitude Sphere							
Data Display							
Constraints							
Basic							
Sun							
Temporal							
Advanced							
	1						

Figure 30 – Sensor Spin Definition