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1 Definition of Terms

Active list: Different for each UE. When a UE is dropped in the network, it connects to all the BS (i.e. 19 or 57). The connect procedure involves the calculation of the path loss. The UE sort all the connections by path loss so that the first item of the list is the one with the shortest path loss. In the CDMA module only two BSs which are within the handover margin can be added to the active list. In the OFDMA module, there is no limitation on the number of BSs.

User: Person using SEAMCAT

UE: User Equipment (i.e. mobile in CDMA network)

Optimal Capacity: The number of UEs per cell that a given CDMA network is able to serve under "ideal" conditions without any external interference.

2 Introduction

In order to make use to the full extent of the information provided by SEAMCAT GUI interface, this contribution presents and also provides the users with the information that can be extracted when conducting CDMA simulations.

The purpose of this document is to be used as a guide document while using the CDMA module of SEAMCAT.

Note: Most of the information (i.e. graphics) in this document is based on SEAMCAT 3.2 but unless explicitly stated all elements are also available in version 3.1.x

The CDMA GUI interface can be divided into four logical parts:

1) Pre-simulation parts

   This part of the GUI is used to assist the user when configuring the workspace. All CDMA specific GUI elements are available as part of either VictimLink or InterferingLink configuration dialogs.

2) Simulation parts

   Simulation GUI elements are shown during the simulation and are used to provide information about what SEAMCAT is doing. Since CDMA simulation can take much longer than "classic/traditional" (i.e. non-CDMA) SEAMCAT simulations there are special GUI parts used to provide information to the user.

3) Results

4) Detailed information on the last snapshot

   After a simulation these GUI parts are used to provide access to calculated results but also detailed insight into the last snapshot of the simulation. Inspecting the last snapshot is considered a good way to validate the configuration of the simulated workspace.

This document is a complement to the user manual on the CDMA simulation algorithms that can be found at http://seamcat.iprojects.dk/wiki/Manual/Algorithms/CDMA which was a compilation of STG(03)12rev1 and STG(03)13rev1.

3 Pre-simulation

3.1 Reference cell

Part of configuring a CDMA network is selecting the reference cell. The reference cell is used by SEAMCAT to measure results and all none reference cells are used to provide a prober interference background to the reference cell.

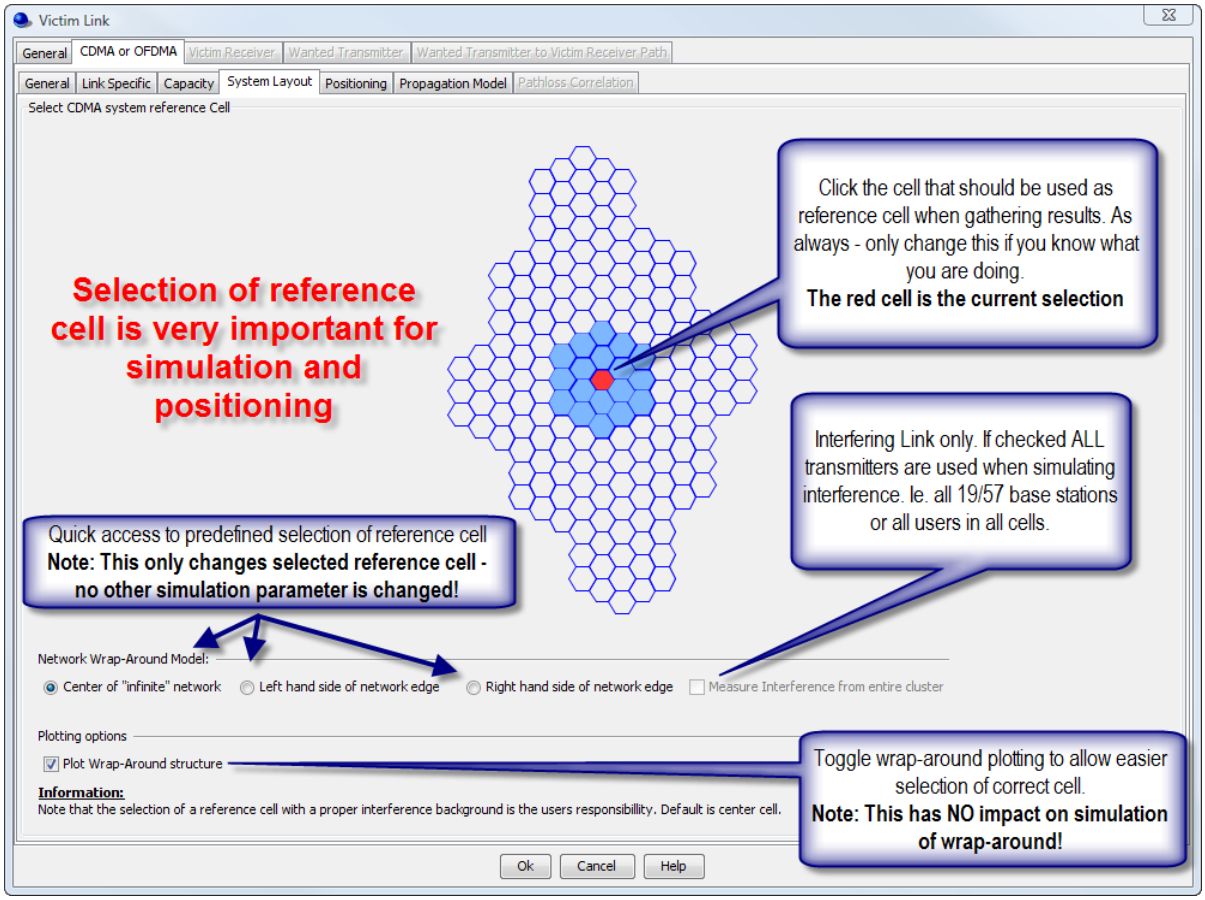

Figure 1: Reference cell selection.

Note: when "Measure interference from entire cluster" is checked, all the transmitters are used when simulating the interference (i.e. all the 19/57 BS or all the Ues in all the cells). When it is not checked, it is only the reference cell which is the interferer. This feature only applies when a CDMA network is the source of interference.

3.2 Capacity

The capacity of the simulated system is dependent on all other settings and cannot always be easily deducted from these. Therefore SEAMCAT has a feature that allows for automatic determination of capacity. This is also known as simulation of non interfered capacity and is enabled by default. Figure 2 shows the settings used to configure the capacity andTable 1 provides detailed descriptions for all the parameters.

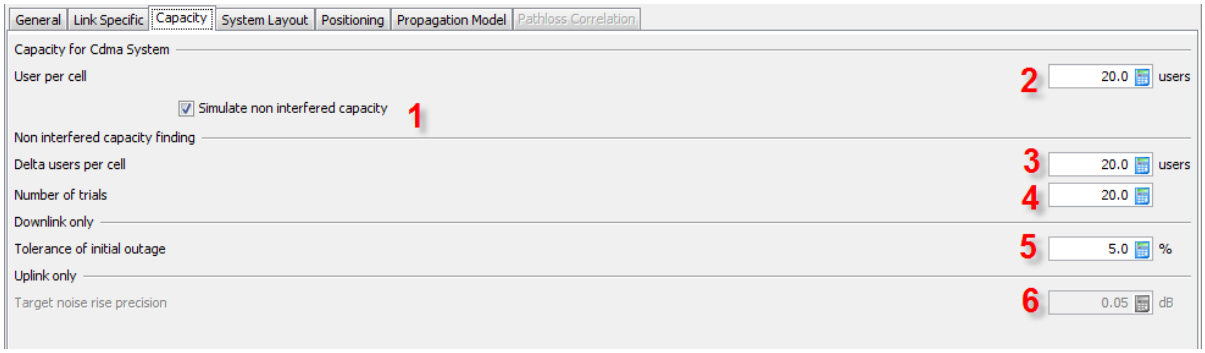

Figure 2: CDMA Capacity settings

Parameter	Description
1 – Simulate non interfered capacity	Toggles automatic capacity finding. If the optimal capacity for the current scenario is known (this is often the case when running consecutive simulations with the same system) there is no need to simulate – as the simulation process can be quite lengthy. When this checkbox is disabled SEAMCAT uses the value entered in 2 – "Users per cell" as the capacity per cell.
2 – Users per cell	If capacity simulation is enabled this indicates the starting point of the simulation. Selecting the right starting point can speed up the capacity finding. If capacity simulation is disabled the value in this field is the actual value used by SEAMCAT. **Note:** • **SEAMCAT does NOT change this input value into the result of the simulation!** • **Users per cell is equal to UE per Base Station. SEAMCAT consider each Base station as its own cell.**
3 – Delta users per cell	When SEAMCAT tries to find the optimal capacity it adjust the number of UEs per cell starting with this value. A proper value here can speed up capacity finding.
4 – Number of trials	When finding the optimal capacity SEAMCAT runs this (i.e. Number of trials) many snapshots of every value of UEs per cell before deciding whether or not the current value is the optimal capacity. Generally larger numbers mean greater precision but also longer time needed by the algorithm.
5 – Tolerance of initial outage	Downlink only – The tolerance of initial outage is the percentage of UEs that can be dropped before SEAMCAT determines that the tested number of UEs cannot fit into the

	system (i.e. 20 user_per_cell * 19 BS = 380 UEs, if 5% or less of 380 UEs are dropped, the system is considered able to handle/service 20 UEs per cell). SEAMCAT will adjust the value of UEs per cell untill a value is found which in 80% of the specified number of trials is able to handle the tested number of UEs per cell. This parameter allows for UEs in "extreme" pathloss situations to be "ignored" from the optimal capacity finding.
6 – Target noise rise precision	Uplink only – the precision used when comparing the noise rise of the filled system with target noise rise set under the "Link Specific" tab (uplink part of general tab in3.1.x.

Table 1: CDMA Capacity parameters

4 Simulation

4.1 Capacity finding

When starting a simulation involving one or more CDMA systems SEAMCAT will begin with checking if any of the CDMA systems have the "Simulate non interfered capacity" feature enabled (this is the default setting).

The purpose of this is to find the non interfered capacity system with the current configuration. The capacity is found by gradually filling system with users while measuring system outage. For every number of users a certain number of trials are run and then the number of "successful" trials is compared to a predefined success criterion. In current version only the number of trials is configurable by user – success criterion is fixed at 80%. This means that optimal capacity of a downlink system is defined as the capacity which system is able serve without any outage in 80% of trials.

For each CDMA system needing to have its optimal capacity simulated the screen shown in will appear for downlink and for uplink systems.

Note: This step can be quite time consuming.

Listing 1 - Example on how SEAMCAT determines "optimal capacity" – using the values from Figure 2 and :

- Users (UEs) per cell = 20
- Number of trial = 20
- Delta number of users (UEs) per cell = 20
- Tolerance of initial outage: 5%
- Number of base stations = 19

1. Run [number of trials] with 20 UEs per cell

    a. Each "trial" consist of the following high-level steps:

        i. Generate CDMA system as specified in scenario

        ii. Add [UE per cell] x [number of base stations] = 380 UEs

        iii. Run power balancing without adding any external interference

        iv. After power balancing note if the percentage of dropped UEs is below 5%. [1]

        v. Count the number of successful trials and see if it is still possible to reach the 80% target.

            A. After 17 trials SEAMCAT concludes it is not possible to reach 80% and 20 UEs per cell is less than the specified systems optimal capacity[2]

            B. Adjust [UE per cell] by adding [delta UE per cell] (20 + 20 = 40) and go to step 2.

2. Run [number of trials] with 40 UE per cell

    a. Same as step (a) above – but now the system is filled with 40 x 19 = 760 UE and allowed outage is 5% of 760 (38 UEs)

        A. After running 5 trials of which none have been successful SEAMCAT determines that the system is filled with too many users

        B. Adjust [delta UEs per cell] by dividing with 2 (20/2 = 10)

        C. Adjust [UEs per cell] by subtracting [delta UEs per cell] (40 – 10 = 30) and go to step 3

3. Run [number of trials] with 30 UEs per cell

    a. System is filled with (30 x 19 = 570) and tolerance is 28 UEs

        A. After running 5 trials of which none have been successful SEAMCAT determines that the system is filled with too many UEs

        B. Adjust [delta UEs per cell] by dividing with 2 (10/2 = 5)

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[1] With 380 UEs in the system and a tolerance of 5%– no more than 19 UEs can be dropped during power balancing if trial is to be considered successful

[2] As more than 80% is already successful there is no need to simulate more trials

C. Adjust [UEs per cell] by subtracting [delta UEs per cell] (30 – 5 = 25) and go to step 4

4. Run [number of trials] with 25 UEs per cell

    a. System is filled with (25 x 19 = 475) and tolerance is 23 UEs

        A. After running 10 trials 5 of them have been unsuccessful so SEAMCAT determines that the system is filled with too many UEs

        B. Adjust [delta UEs per cell] by dividing with 2 (5/2 ~ 3)

        C. Adjust [UEs per cell] by subtracting [delta UEs per cell] (25 – 3 = 22) and go to step 5

5. Run of [number of trials] with 22 UEs per cell

    a. System is filled with (22 x 19 = 418) and tolerance is 20 UEs

        A. After 17 trials SEAMCAT concludes it is not possible to reach 80% and 20 UEs per cell is less than the specified systems optimal capacity

        B. Adjust [delta UEs per cell] by dividing with 2 (3/2 ~ 2)

        C. Adjust [UEs per cell] by adding [delta UEs per cell] (22 + 2 = 24) and go to step 6

6. Run of [number of trials] with 24 UEs per cell (**This is the end of Figure 3**)

    a. *For the purpose of this example we assume that 24 UE per cell is the optimal capacity for the tested system*.

    b. After 20 trials we assume that 16 trials were successful – so optimal capacity finding is terminated and SEAMCAT starts the actual simulation.

Figure 3 – Non interfered capacity finding – Downlink (See: Table 2)

Table 2 – Elements of the downlink non interfered capacity finding screen

ID	Description
1	Dial indicating the number of trials completed with the current capacity. This dial will range from 0 to the number of trials entered as value "4" on Figure 2. Note: SEAMCAT does not always simulate all the trials – target is 80% success and if for example 5 out of 20 have already failed – SEAMCAT does not simulate the rest of the trials.
2	Dial indicating the current number of users being tested. Range is dynamic and dial is mainly intended as easy visual indicator of values being tested.
3d	In downlink SEAMCAT tries to find the number of users that can fit into the system in 80% of the trials. The red area indicates that less than 80% has been reached (i.e. to many users in the system – or not all trials yet complete) – the green area is 80% (16 trials with the default settings). The yellow area indicates that more than 80% of the trials are successful (to few users in the system). SEAMCAT stops when this dial stops in the green area after all trials completed. SEAMCAT tries to detect when no more trials with a tested value is needed to adjust to the next value. Example: If 40 users per cell are being tested for 20 trials and the first 5 trials are unsuccessful it is not possible to reach 80% success rate and there is no need to simulate the last 15 trials. Regardless of the result of the last 15 trials SEAMCAT will conclude that fewer users per cell is needed. If more than 80% successrate is reached before all trials are simulated also there are no need to simulate the rest of the trials.
4d	The bar chart gives information on previous values tested. The Y axis is the number of successful trials and the X axis is the number of users per cell being tested. This gives insight into how the algorithm oscillates to find the optimal capacity. In the example SEAMCAT first tested 20 users per cell and after 17 successful trials (less than 5% of users were dropped) decided to test users per cell +the specified value for delta users per cell (20) = 40 users per cell. When testing with 40 users per cell SEAMCAT did not find any successful trials and adjusted the delta users per cell value by dividing with 2 and subtracting this value from users per cell. When testing with 30 users per cell still no successful trials were found and users per cell was again adjusted with a modified delta per users value – leading to a users per cell value of 25 being tested

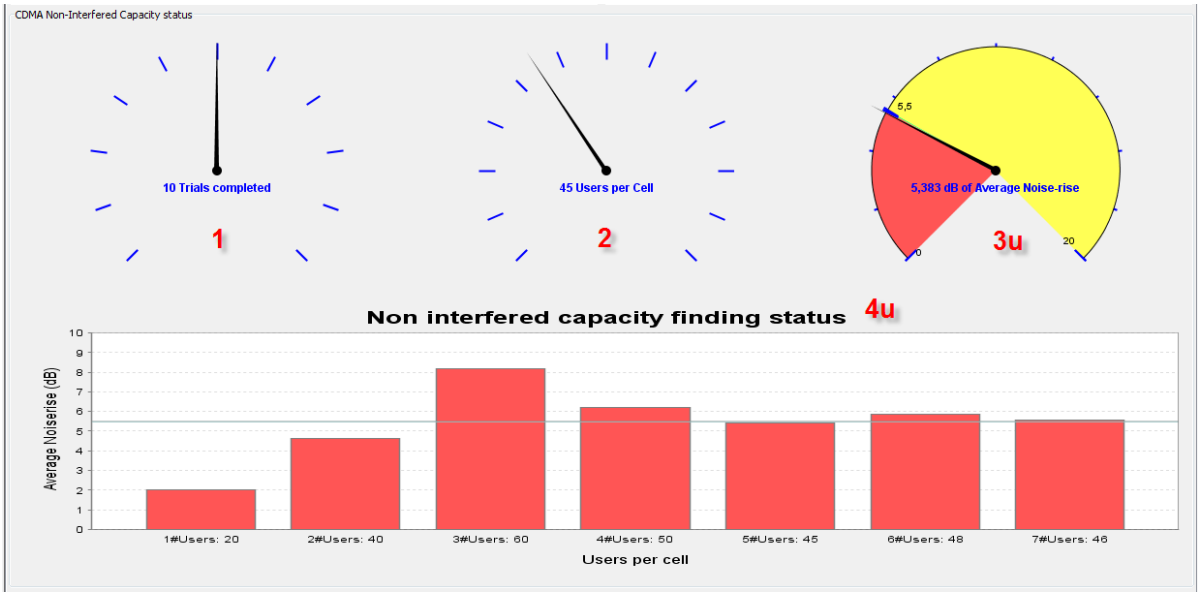


Figure 4 – Non interfered capacity finding – Uplink (See: Table 3)

Table 3 - Elements of the uplink non interfered capacity finding screen

ID	Description
1	Dial indicating the number of trials completed with the current capacity. This dial will range from 0 to the number of trials entered as value "4" on Figure 2.
2	Dial indicating the current number of users being tested. Range is dynamic and dial is mainly intended as easy visual indicator of values being tested.
3u	In uplink SEAMCAT tries to find the number of users that provide an average noise rise with the specified threshold. The needle shows the current value of average noise rise across the trials run. Red area indicates the noise rise is to low (to few users in the system) – green area is the target noise rise (plus/minus) the tolerance specified. Yellow area indicates to high average noise rise (to many users in the system). **Note: Noise rise is measured as the linear average of dB values – across all 19/57 base-stations** After every trial SEAMCAT calculates the average noise rise over the total number of trials and if this value is above the threshold restarts the simulation with a lower value of users per cell.
4u	The bar chart gives information on previous values tested. The Y axis is the average noise rise and the X axis is the number of users per cell being tested.

4.2 Snapshot simulation

Once SEAMCAT has determined the number of UEs per cell (either through simulation of optimal capacity (see Figure 22) or by value specified by the user) the actual simulation of snapshot begins. As with all scenarios this causes SEAMCAT to show the scenario outline (Figure 5 and Figure 6).

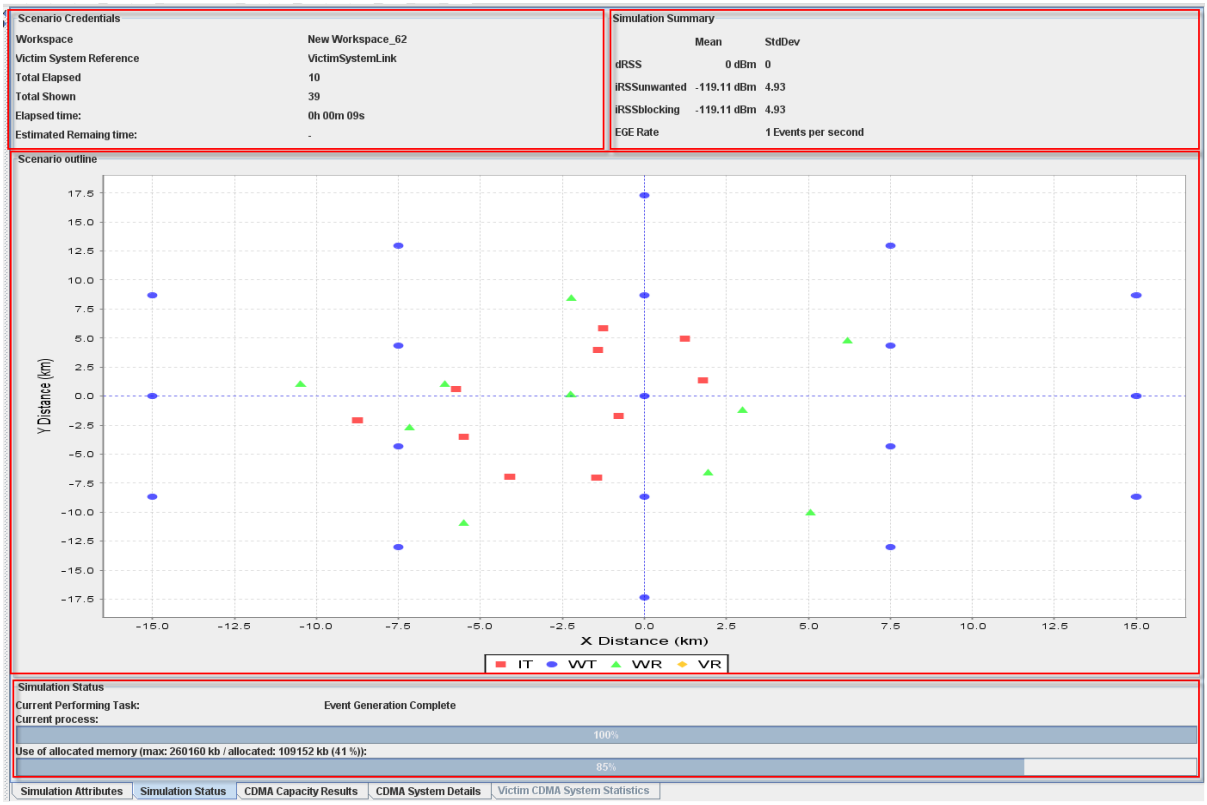


Figure 5: Standard SEAMCAT scenario outline

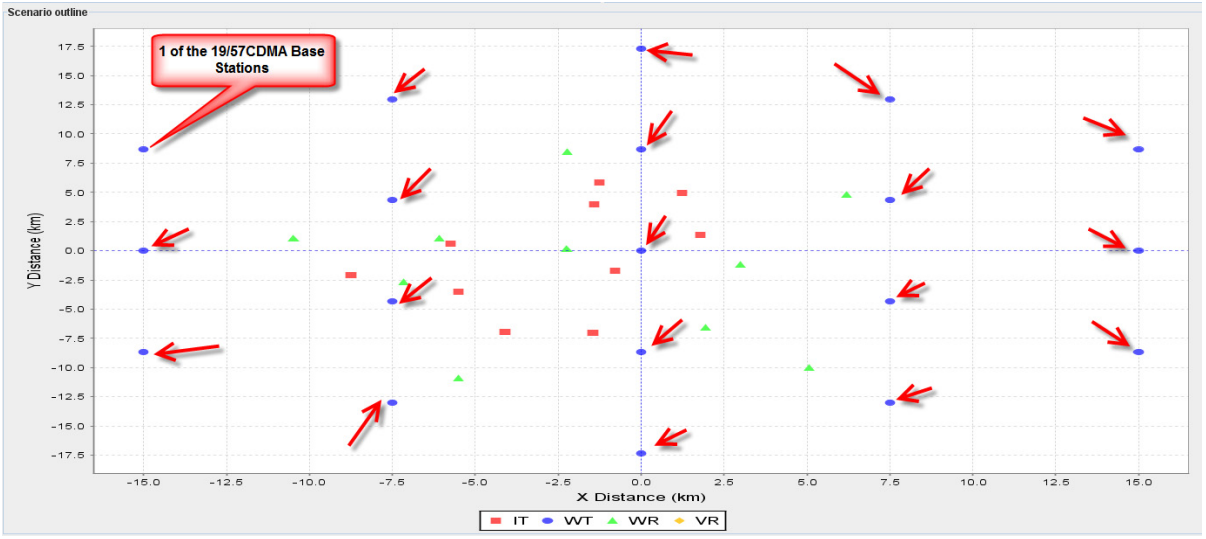


Figure 6: Example: CDMA Downlink as victim – Base-stations are shown as WT

Note:

- Only CDMA base-stations will appear in the outline. Dependent on the scenario the base-stations positioning will appear as shown in Table 4.
- The scenario outline always visualize the scenario from the perspective of the Wanted Transmitter in (0,0) (see Figure 6 and Figure 7) - see Table 4 for details on CDMA positioning.

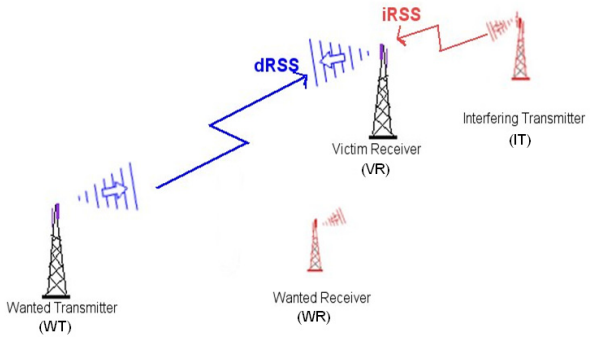


Figure 7: SEAMCAT illustration of the interferer and victim link

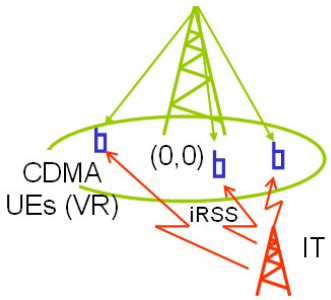
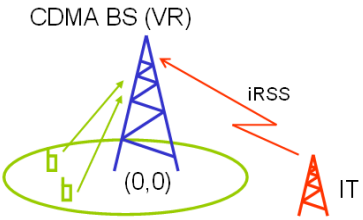
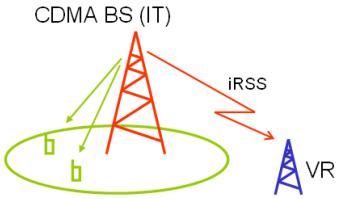
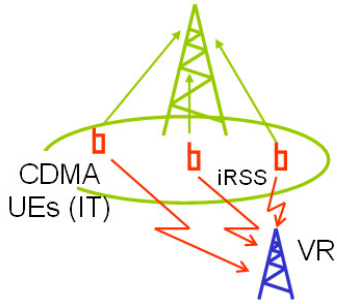
Scenario configuration	Base-Stations role	UE role	Positioning	Illustration
CDMA Downlink is victim	Wanted Transmitter	Victim Receiver	Reference cell is positioned in (0,0)	
CDMA Uplink is victim	Victim Receiver	Wanted Transmitter	Reference cell is positioned in (0,0)	
CDMA Downlink is interferer	Interfering Transmitter	Wanted Receiver	Relative to victim and reference cell	
CDM Uplink is interferer	Wanted Receiver	Interfering Transmitter	Relative to victim and reference cell	

Table 4: SEAMCAT role of CDMA elements

At the top of Figure 5 some intermediate results are available during the simulation. The top left contains the scenario credentials which is general scenario and simulation information (Figure 8). The values shown in Figure 8 are described in Table 4 below.

Figure 8: Scenario credentials

Parameter name	**Description**
Workspace	The name of the workspace
Victim System Reference	The name of the Victim Link
Total elapsed	Number of snapshots simulated so far
Total shown	Number of SEAMCAT elements shown in outline – for performance reasons this is limited to a maximum of 1000.
Elapsed time	The time the current simulation has been running.
Estimated Remaining Time	Calculated based on the elapsed time per snapshot so far and the number of remaining snapshots.

Table 5: Scenario credentials information

On the top right-hand side of Figure 5 the values shown in Figure 9 are visible.

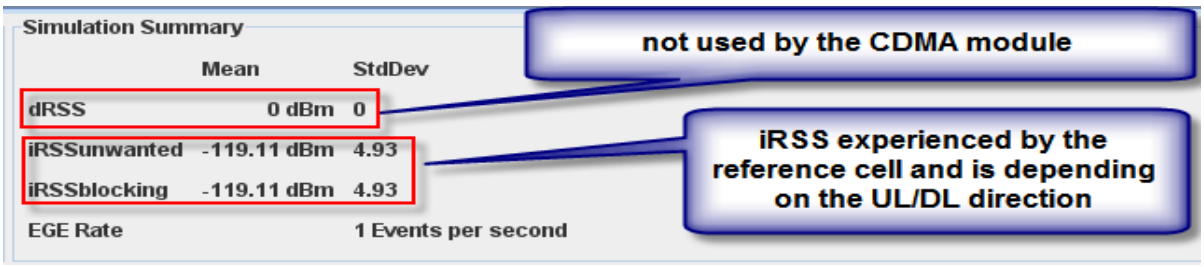


Figure 9: Simulation summary

Note: The mean of the dRSS and iRSS for non-CDMA and CDMA values, shown in Figure 9, are calculated by performing the linear average over dBm values as:

$$\overline{x_{[dB]}} = \frac{\sum_{l=1}^{L} X_{[dB]}}{L}$$

Note: The mean and std values are only for displaying purpose and should not be used for statistical processing. This is in line with the specification of Functional design (039SMC(01)) since the displayed values are in dB.

9.5.1 FR5010 : Signals display (intermediate results)

[…]

Output :

- Graphic display of the signal according to the selected representation mode.
- Mean and variance of the displayed signal

At the bottom of Figure 5 SEAMCAT shows two progress bars (see Figure 10). The top progress bar tracks the current task – i.e. the generation of snapshots.

The bottom progress bar tracks the amount of system memory available to and used by SEAMCAT. If simulating scenarios with many interfering links SEAMCAT might need more memory but this is very rarely necessary when working with CDMA.

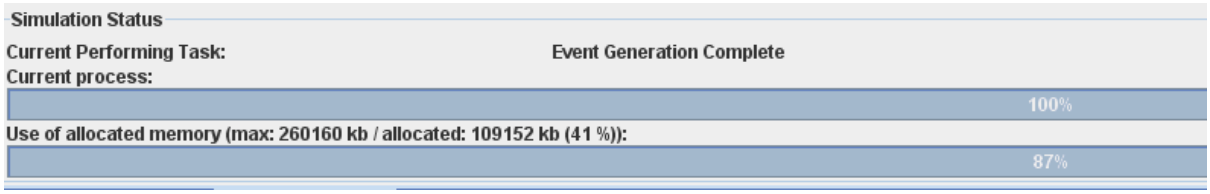


Figure 10: Simulation progress and memory consumption details

5 Results

Once SEAMCAT has completed the simulation, the results are shown as displayed in Figure 10 when the CDMA network is the victim. This figure presents the difference between the 2 power balancing process (1-initial power balancing, 2- power balancing after introduction of an external interference)

- Units: number of connected UE
- Initial capacity: Number of connected UE before any external interference is considered
- Interfered capacity: Results after External interference is applied
- Excess outage, users: How many UEs were dropped due to external interference

Note that when CDMA is interferer and the victim is "classic/traditional" (i.e. non-CDMA) SEAMCAT link there are no special CDMA results (except insight into the CDMA network simulated for the last snapshot).

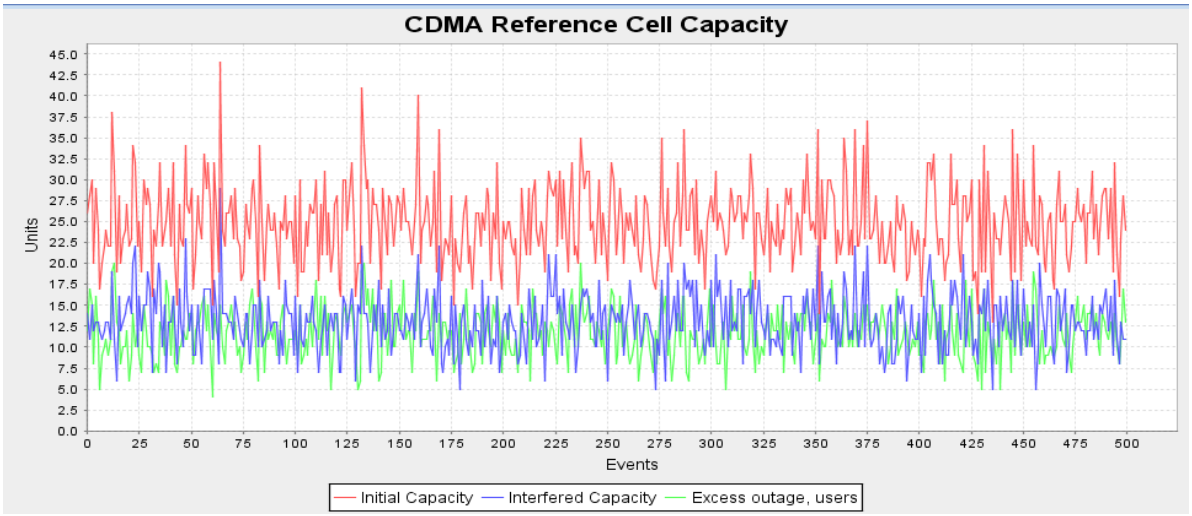


Figure 11: CDMA Reference cell capacity results

A more detailed description on how the capacity loss is computed is presented as shown in Figure 12.

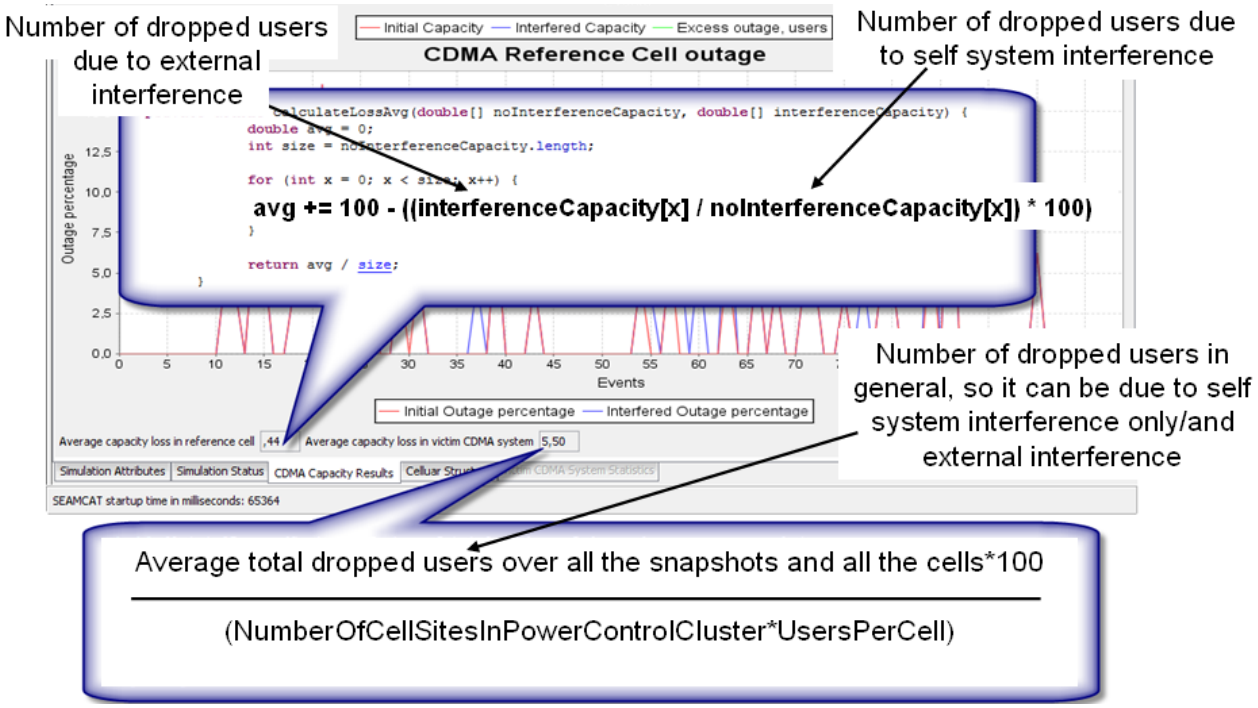


Figure 12: CDMA Victim results

The values shown are saved in a vector called "CDMA System capacity" (i.e. to be understood as "CDMA network capacity") and can be accessed as shown in Figure 13.

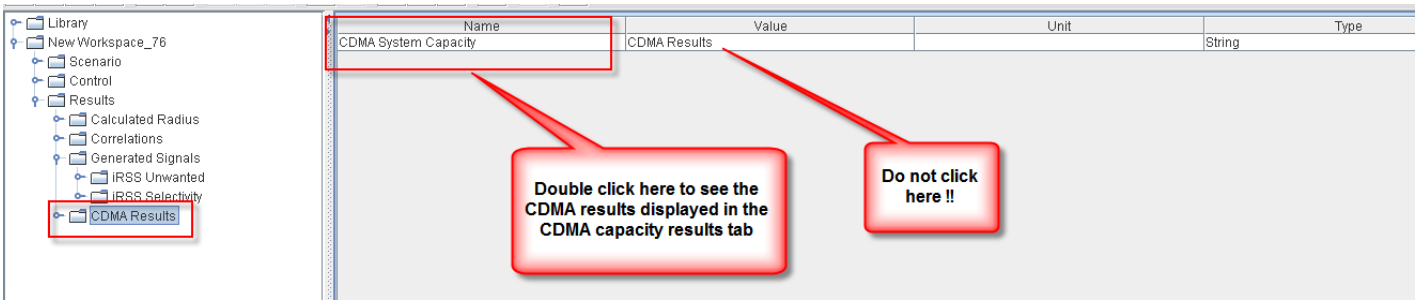


Figure 13: Access to CDMA capacity results

6 Detailed information on the last snapshot

6.1 Introduction

When a scenario contains one or more CDMA networks SEAMCAT preserves the status of the simulated systems for the last snapshot.

Note: This status is kept in memory only and cannot be accessed when loading results from a remote server or a saved workspace.

Note: When another simulation is run afterwards, the CDMA value of the snapshot are not displayed anymore.

Click the "CDMA System Details" tap shown in Figure 14 to switch the display to the CDMA details. *Please note that in SEAMCAT 3.2 this tap is named "Cellular Structure".*

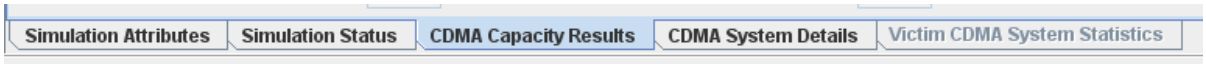


Figure 14: Tap strip at bottom of screen – used to switch between visual layouts

Clicking the tap brings focus to the screen shown in Figure 15. Please refer to Table 6 for details on the numbered elements.

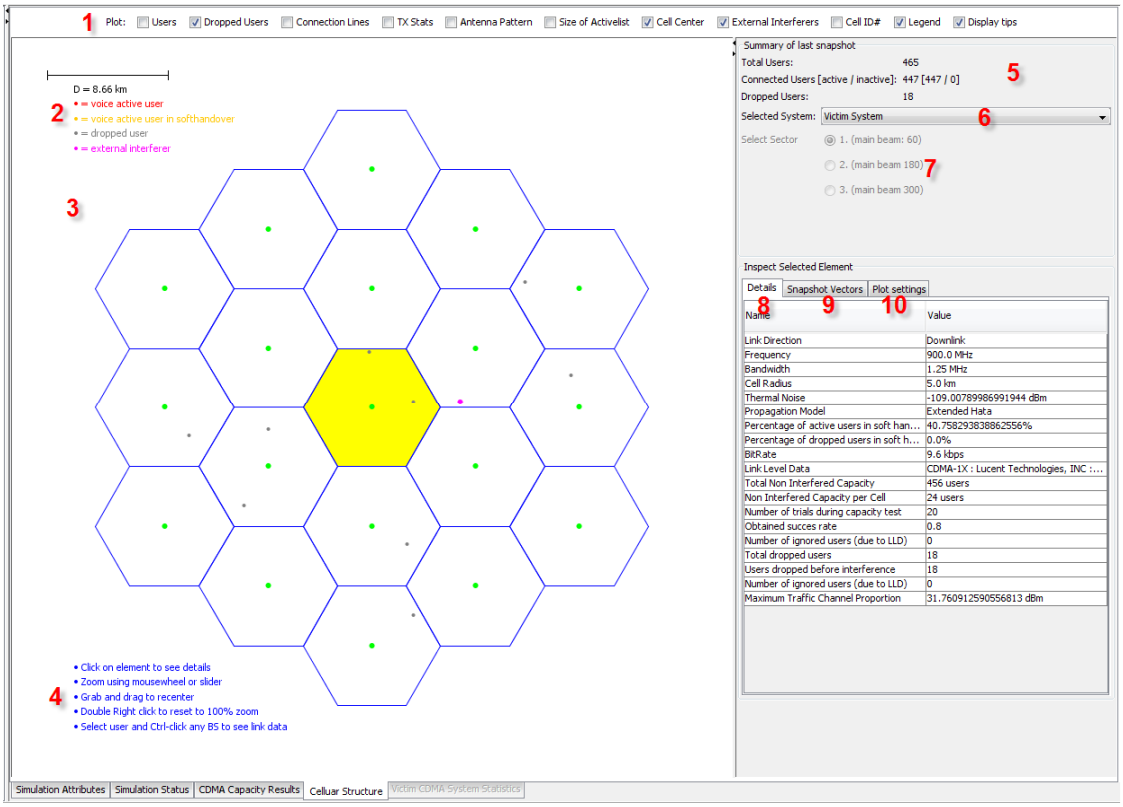


Figure 15: Cellular Structure (denotation of 3.2) / CDMA System Details (denotation of 3.1.44)

ID on Figure 15	Description
1	Plot configuration – determines what is shown in the main plot area. See section 6.2 (Plot configuration) below for details.
2	Legend – can be toggled from the plot configuration
3	Main plot area – provides visual information on the displayed CDMA network. See "Plot Area" section and Listing 1 below for details.
4	Tips – can be toggled from the plot configuration
5	Summary of snapshot – provides a few metrics on the capacity of the shown system. See "Snapshot Summary" section below for details.
6	Selection of displayed system. If more than one CDMA network is present in the scenario this is how to switch between them. See Figure 18 *Note: Only one CDMA network can be inspected at a time*
7	When tri-sector layout is used in the selected system this is used to select the sector of a selected base-station.
8	Details of selected element – click and element in the main plot area to view the details in this table. If no element is selected the table display general information about the displayed system. Please refer to Tables 8 to 11 for details on information shown and Listing 1 for details on how to select the correct element.
9	*Note: This is a SEAMCAT 3.2 only feature* Snapshot vectors provide access to a number of vectors collected in the last snapshot. ***Will be described later***
10	*Note: This is moved for SEAMCAT 3.2 – but features are the same* Allows for tweaking of how the system is displayed and how elements are selected. See "Plotting Options" section below for details

Table 6: Description of visual elements

6.2 Plot configuration

The top part of the detailed system information screen contains a range of checkboxes used to control which information is plotted (Figure 16). A full description of each checkbox is given in Table 7.

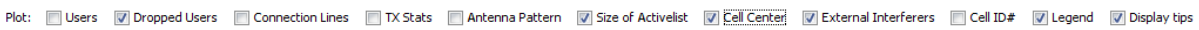


Figure 16: Plot configuration in SEAMCAT 3.2

Name	Description
Users	Plot active UEs across the entire system
Dropped users	Plot dropped UEs across the entire system
Connection lines	Plot active connections for all active UEs – this only shows if "UEs" are checked
TX stats	If system is downlink this toggles the display of the transmit power of each base-station. If system is uplink this toggles the display of the noise rise of each base-station as well as the total interference experienced by that base-station. Also the number of active UEs connected to each base-station is shown – regardless of link direction.
Antenna Pattern	Toggles a visual representation of the antenna pattern of the selected base-station. This is mostly interesting in tri-sector scenarios. The plot of the antenna pattern can be used to ensure that the correct sector is selected. (See Table 6 – ID 7) for details on how to change sector.
Size of activelist *(SEAMCAT 3.2 only)*	Toggles the display of the number of links in the displayed UEs' activelists.
Cell center	Toggles the display of base-station position within the cell.
External Interferers	Toggles the display of external interferers. This only has effect when CDMA is victim.
Cell ID#	Toggles the display of the internal SEAMCAT cell id next to the cell center
Legend	Toggles the display of the legend in the top left part of the main plot area
Display tips	Toggles the list of tips at the bottom left.

Table 7: Plot configuration elements

6.3 Snapshot Summary

Provides a few metrics on the capacity results of the last snapshot – as shown in Figure 17.

Figure 17: Snapshot summary

Name	Description
Total Users	The total number of UEs in the system (number of BS x UEs per cell)
Connected Users [active/ inactive]	Number of UEs connected (not dropped) • Active is voice active • Inactive is voice inactive The ratio of voice activity is set as an input parameter to the system. Note that only voice active UEs are used in the calculations and shown in the plot
Dropped Users	Number of UEs dropped after power balancing. If CDMA is victim it is the number of UEs dropped after introduction of interference. Note that uplink CDMA drops UEs based on the average noise rise in the system – so it is possible for a single interferer to "shut-down" the entire system (causing all UEs to be dropped).

Table 8: Snapshot summary description

6.4 CDMA network selection

If more than one CDMA network is available in the scenario the dropdown shown as #6 on Figure 15 is used to select the system shown in the details window.

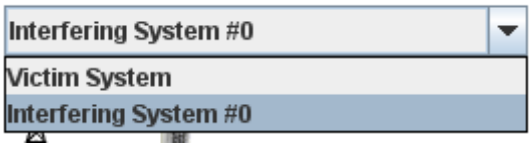


Figure 18: Selecting the active system

6.5 Plotting Options

The plotting options control how the system is shown in the main plot area and how the user selects elements from the system. The user can zoom in and out by using either the mouse wheel or the Zoom Factor slider shown in Figure 19.

Figure 19: Zoom factor

When clicking on a displayed item SEAMCAT tries to match the coordinates of the click to a CDMA element – selecting the first matched item. Elements are searched in the following order:

Listing 1: Detailed plot click search algorithm

1. If control key is pressed:
    a. If a UE is already selected try to select a link by matching click to one of:
        i. Base stations in active list of selected UE
        ii. Other base stations in the system
    b. If a base station is already selected try to select a link by matching click to one of:
        i. Active UEs connected to the selected base station
        ii. Dropped UEs who were connected to the selected base station
2. Try to match to Voice active UEs
3. Try to match to Dropped UEs
4. Try to match to Base stations
5. Try to match to External interferers
6. If a base station is already selected – try to select UE by matching click to one of
    a. Active UEs connected to the selected base station
    b. Dropped UEs who were connected to the selected base station

Note: Only elements shown in the plot is searched. I.e. if external interferers is not checked in Figure 16 step 5 above is skipped.

When SEAMCAT tries to match the click to an element it allows for a certain amount of uncertainty when matching the coordinates. This uncertainty is also called click radius to illustrate the effect of the actual click point being in the center of a circle used to search for CDMA elements. The click radius can be adjusted by the user and in combination with the zoom this allows for all elements to be selected using the algorithm supplied in Listing 1.

Figure 20: Click radius – used to control which element is selected

It is often the case that an element different than desired or no element at all is selected when clicking the plot. This problem is resolved by zooming in and possibly changing the click radius.

6.6 Plot Area

The main part of the CDMA network Details window is used by the main plot. The plot shows a visual representation of the last snapshot and should be used to validate that the input parameters actually corresponds to the system that should be simulated. The plot allows for heavy user interaction. A very basic example is shown in Figure 21 below.

When an element is clicked an selected using the main plot SEAMCAT updates the table shown in #8 in Figure 15.

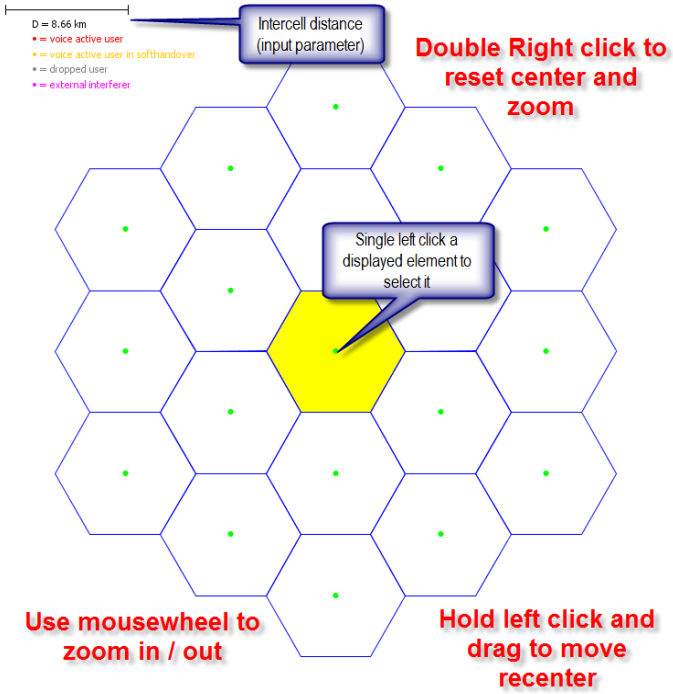


Figure 21: Main plot of CDMA network

6.7 Details of selected elements

When an item is selected in the main plot area its details are shown in the details table (Figure 15 #8). The values shown depend on the type of element. When no element is selected the system itself is considered to be selected and the table is as shown in Figure 22.

6.7.1 Details of CDMA network

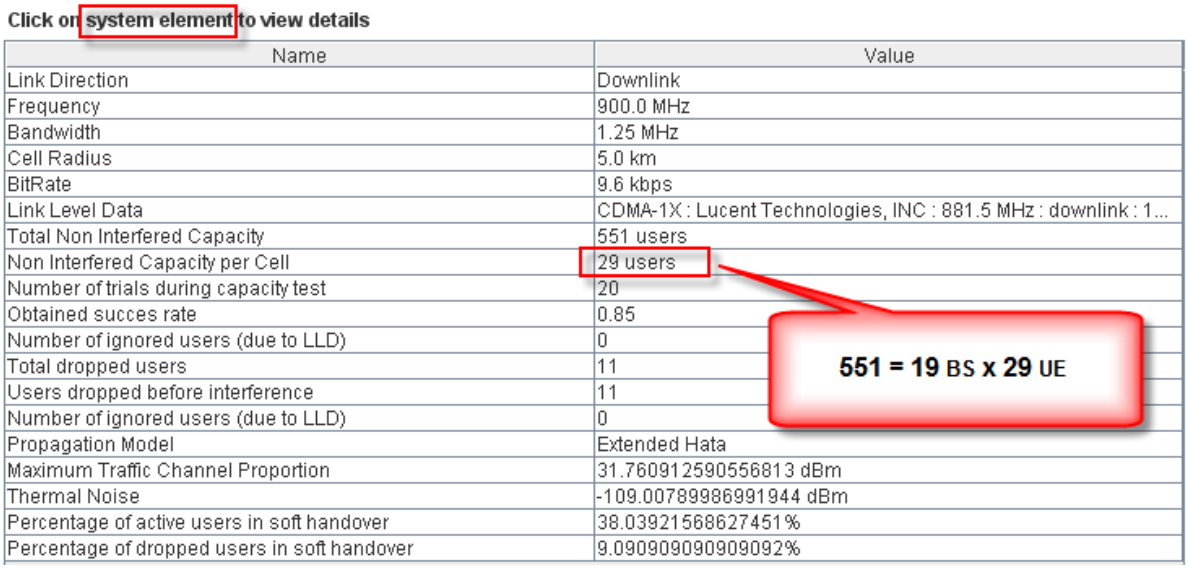
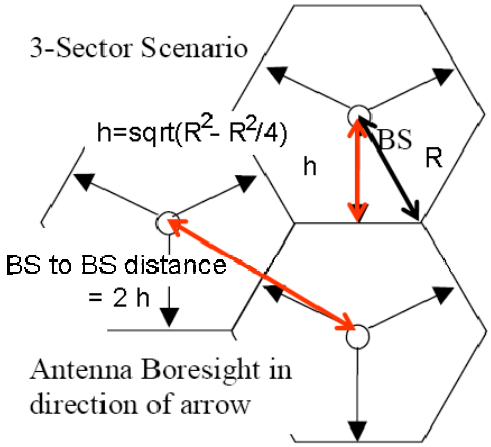


Figure 22: Downlink system details – see Table 9

Name	**Description**
Link direction	Link direction of the CDMA network
Frequency	Carrier frequency of the CDMA network as entered by the user
Bandwidth	Bandwidth of the system as entered by the user

Name	Description
Cell Radius	The cell radius of the CDMA network is based on 3GPP2 and is equivalent to R in the graphic below. 
Bitrate	Bit rate of the system as entered by the user. (used to calculate the system processing gain)
Link Level Data	Used to map the link level simulation (bit level) to the system level simulation (SIR level) as selected by the user
Total non interfered capacity	Same value as shown in the Snapshot summary.
Non interfered capacity per cell	Number of active UEs when the CDMA network is balanced. **Note: This is the result of the optimal capacity finding simulation – and the value to extract and input to reuse the result.**
Number of trials during capacity test	The number of trials input parameter
Obtained success rate	The result of optimal capacity finding for the capacity used. This can be different than the target (0.8 for downlink and target noise rise for uplink) if the algorithm has detected narrow oscillation (back and forth between the same values). Please refer to the CDMA specification for more details on this algorithm.

Name	Description
Number of ignored users (due to LLD)	Link level values are extrapolated from the values input and there is a build in hardcoded stop if a UE is requiring more than half of received signal to be the wanted signal. Any UEs requiring more than this limit is automatically dropped. This number counts the number of UEs in this snapshot dropped due to this limit.
Total dropped users	Total number of dropped UEs (both due internal and external interference)
Users dropped before interference	Number of UEs dropped by power balance before the introduction of external interference. Along with the total number of dropped UEs this gives insight into the impact of external interference compared to the internal interference.
Number of ignored users (due to LLD)	Duplicate – will be removed
Propagation model	The name of the selected propagation model for the system
Maximum traffic channel proportion	This is the maximum transmit power for a single traffic channel (UE) – deducted from the maximum transmit power for the base stations and the specified maximum traffic channel fraction.
Thermal noise	Calculated value of thermal noise – please refer to CDMA specification for details on how this is calculated.
Percentage of active users in soft-handover	Linear percentage of voice active UEs who are in soft-handover. This is very dependent on the selected propagation model.
Percentage of dropped users in soft-handover	Linear percentage of dropped UEs in soft-handover.

Table 9: Downlink system details

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6.7.2 Details of voice active user

When a voice active UE is clicked (Figure 23) the details shown in Figure 24, Figure 25 and Table 10 is shown.

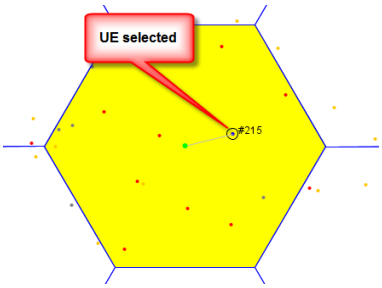


Figure 23: Voice active user selected

Clicked Element:

Connected - Voice Active User

Name	Value
Userid	215
Position	(1.6965480686923329, 0.4285128419296461)
Status	Connected
Speed	100.0 km/h
Geometry	16.86228896661603 dB
Achieved Ec/Ior	-28.57 dB
Required Ec/Ior	-28.597 dB
External interference	-111.512 dBm
Active List	1 connection(s)
Connection List	18 connection(s)
Is in softhandover	false
Total Power Received from Inactive Set	-66.26259081992328 dBm
Total Power Received from Active Set	-49.399941401096314 dBm
Traffic Channel Power	-77.97010914028175 dBm
Distance to first cell in active list	1.7498281644442424 km
Angle to first cell in active list	14.17524612680213°
Elevation angle to first cell in active list	0.0°
Connected sector of first cell in active list	N/A - Cell is Omni directional
Antenna Gain from first BS in active list	9.0 dB

Figure 24: Details of voice active user - downlink

Connected - Voice Active User

Name	Value
Userid	292
Position	(-0.12296265071105...
Status	Connected
Speed	30.0 km/h
Multi-Path	1
Achieved CI	6.7 dB
Required Eb/No	6.7 dB
Transmit Power	-23.7368962514248...
Active List	1 connection(s)
Connection List	18 connection(s)
Is in softhandover	false
Total Power Received from Inactive Set	Not applicable
Total Power Received from Active Set	Not applicable
Traffic Channel Power	Not applicable
Distance to first cell in active list	2.082983815294755...
Angle to first cell in active list	266.6157494132617°
Elevation angle to first cell in active list	0.0°
Connected sector of first cell in active list	N/A - Cell is Omni dir...
Antenna Gain from first BS in active list	9.0 dB

Figure 25: Details of voice active user - uplink

Name	Description	Link direction
Userid	UE ID in the CDMA network	General
position	(x,y) information in km	General
status	The UE can be one of connected / dropped / Not allowed to connect (see **Table 9** – ignored UEs for details).	General
Speed	Speed of the selected UE (from input distribution parameter)	General
Geometry	Calculated geometry. Please refer to CDMA specification for details.	Downlink
Achieved EC/Ior	Please refer to CDMA specification for details.	Downlink
Required EC/Ior	Extrapolated value from Link Level Data. Please refer to CDMA specification for details.	Downlink
External Interference	The level of external interference experienced by this UE	Downlink
Active list	Discontinued parameter – will be removed in 3.2	General
Connection list	Discontinued parameter – will be removed in 3.2	General
Is in soft-handover	True or false	General
Total power received from inactive list	Sum of inner system interference. This is the sum of received power from all base stations to which the selected UE is NOT connected.	Downlink
Total power received from active list	Sum of received power from connected base stations. This is includes the pilot power.	General
Traffic channel power	The sum of received traffic power from connected base stations. This is the wanted signal.	General
Distance to first cell in active set	Metric distance to the base station with the shortest distance in dB (pathloss)	General
Angle to first cell in active set	The Cartesian angle. Used when the base station antenna has a defined horizontal pattern	General
Elevation angle to first cell in active list	Only calculated and used when base station has a defined vertical pattern	General

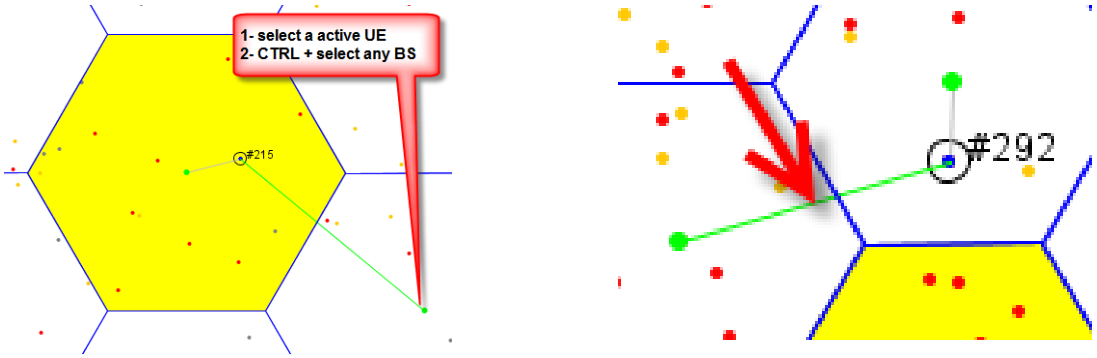
Name	Description	Link direction
Connected sector of first cell in active list	If tri-sector layout is used this indicates which sector the UE is connected to	General
Antenna gain from first BS in active list	Actual antenna gain to base station.	General
Multipath	Randomly selected value of 1 or 2 – used to determine Link Level Data.	Uplink
Achieved CI	Please refer to CDMA specification for details.	Uplink
Required Eb/No	Extrapolated value from Link Level Data. Please refer to CDMA specification for details.	Uplink
Transmit power	The actual transmit power of this UE	Uplink

Table 10: Parameters of voice active user details

(left blank)

6.7.3 Details of inactive link

When the active UE is selected, **CTRL and select any BS,** to display the details of the link between the two.



DL case **UL case**

Figure 26: inactive link

Clicked Element:

Inactive Link

Name	Value
Userid	215
In users active list	false
Cellid	6
Cell location id	6
Connected sector of cell location	0
User Position	(1.6965480686923329, 0.4285128419296461)
Cell Position	(7.5, -4.330127018922193)
Using WrapAround	false
Distance	7.504978857017966 km
BS antenna gain	9.0 dB
UE antenna gain	0.0 dB
Pathloss	123.35411282703316 dB
Effective Pathloss	123.35411282703316 dB
Horizontal Angle	140.64937328908627°
Vertical Angle	0.0°
Total Transmit Power	36.94308436746803 dBm
Power scaled down to max	false
Power scaled down to max by	
Total Received power	-77.41102845956513 dBm

Figure 27: Details of selected link

Name	**Description**
Userid	UE ID of selected UE
In user active list	False or True

Name	Description
Cell id	ID of the selected base station
Cell location id	In tri-sector scenarios the cell id is not always equal to the cell id. The cell locations range from 1 – 19.
Connected sector of cell location	The connected sector of the selected base-station
User position	(X,Y) in km
Cell Position	(X,Y) in km
Using wraparound	Is the link using wrap-around? Most often "long" connection are using wrap-around – but it really depends on the selected propagation model.
distance	The BS to UE distance
BS antenna gain	Calculated antenna gain for the base station
UE antenna gain	Antenna gain for the UE – input parameter
Path loss	Calculated pathloss in dB for the selected link.
Effective pathloss	Actual value of pathloss after adjustment for MCL
Horizontal angle	Angle from UE to BS
Vertical angle	Angle from UE to BS
Total transmit power	Transmit power of either base-station (downlink) or UE (uplink)
Power scaled down to max	Deprecated parameter – will be removed in 3.2
Power scaled down to max by	Deprecated parameter – will be removed in 3.2
Total received power	Power received on this link by either base-station (uplink) or UE (downlink)

Table 11: Parameters of selected link details

6.7.4 Details of CDMA cell

When **a BS is selected,** the following information is shown (Figure 29 and Figure 30):

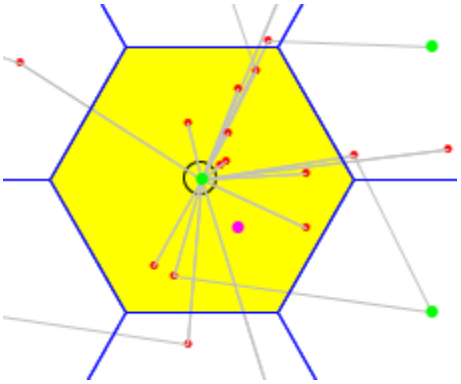


Figure 28: BS selected

Clicked Element:

CDMA Cell #0

Reference cell

Name	Value
Cell ID	0
Transmit Power	39.97350107251876 dBm
Number of served users	33 users
Antenna height	30.0 meters
Number of dropped users	8 users
Outage percentage	19.51219512195122 %
Position	(0.0, 0.0)
Pilot Channel Power	1.5 dBm
Overhead Channel Power	0.5 dBm
Number of active users	15 users
Active Connections	23 connections
Is Reference Cell	true

Figure 29: Downlink BS selected

Clicked Element:

CDMA Cell #0

UL example

Name	Value
Cell ID	0
Total Interference	-74.08095320316906 dBm
Number of served users	13 users
Antenna height	30.0 meters
Number of dropped users	11 users
Noise Rise over Thermal Noise	34.92694666675038 dB
Position	(0.0, 0.0)
InterSystem Interference	-Infinity dBm
External Interference, Unwanted	-77.0926500410552 dBm
External Interference, Selectivity	-77.0926500410552 dBm
Active Connections	0 connections
Is Reference Cell	true

Figure 30: Uplink base-station selected

Name	Description	Link direction
Cell ID	ID of selected base-station	General
Transmit power	Transmit power of the BS	Downlink
Total interference	Sum of internal and external interference at the BS	Uplink
Number of served users	Sum of voice active and voice inactive UEs	General
Antenna Height	Value from the input distribution	General
Number of dropped users	UEs dropped from the base-station	General
Outage percentage	Fraction of connected UEs that were dropped	Downlink
Noise rise over thermal noise	The noise rise experienced at the selected BS	Uplink
Position	(X,Y) in km	General
Pilot channel Power	Power for the pilot channel power as deducted from the pilot channel fraction and the maximum transmit power	Downlink
Overhead channel power	Power for the overhead channel as deducted from the overhead channel fraction and the maximum transmit power	Downlink
Number of active users	Number of connected UEs who has this BS as their primary link.	Downlink
Intersystem interference	Sum of interference from all UE's not connected to this BS	Uplink
External interference, Unwanted	Unwanted part of external interference	Uplink
External interference, Selectivity	Selectivity part of external interference	Uplink
Active connections	Number users connected to this BS (primary and secondary links)	General
Is Reference cell	When TRUE, then it is the reference cell	General

Table 12: Parameters of selected base-station

7 Conclusions

It is proposed that the content of this document (i.e. text an/or figures) be used for the on-line wiki manual

8 Reference

[1] SEAMCAT user manual (http://seamcat.iprojects.dk/wiki/Manual) also accessible via www.seamcat.org/xwiki

[2] STG(03)12rev1, CDMA Downlink Power Control Methodology for SEAMCAT (VOICE ONLY), Lucent Technologies

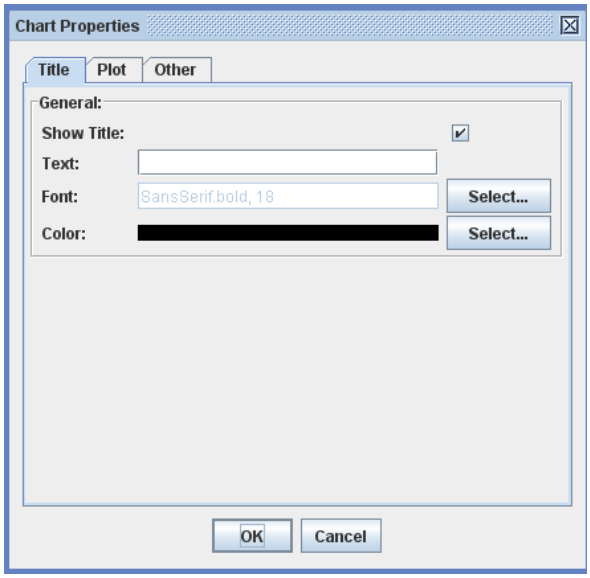
[3] STG(03)13rev1. CDMA Uplink Power Control Methodology for SEAMCAT (VOICE ONLY), Qualcomm

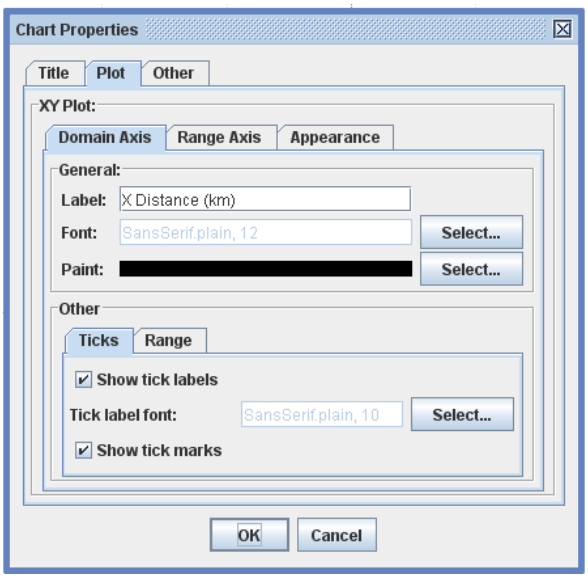
Annex 1

How to get the most of the chart/figures in SEAMCAT

Tip 1:

If you want to know the propertise, to change the titles name or to resize the axis of the graphic right click on the figure and you will get:





Tip 2: To **Zoom in**: right (or left) click on the mouse and select the area that you want to zoom on

Tip 3: To **Zoom out**: right (or left) click on the mouse move toward the upper left corner-