

# 12.9 Interference calculations

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# 12.9.1 Introduction

The Interference Calculation Engine (ICE) is that part of the SEAMCAT architecture which calculates for generic victim receiver the probability of being impacted by the sum of the simulated interference power. The calculated result is commonly called "Interference probability" or "probability of interference", in fact it is the probability of exceeding the limit of one of the interference criteria given for the victim receiver.

Regarding the definition of the Radio Regulations (RR) Article 1.166

*The effect of unwanted energy due to one or a combination of emissions, radiations, or inductions upon reception in a radiocommunication system, manifested by any performance degradation, misinterpretation, or loss of information which could be extracted in the absence of such unwanted energy.*

Administrations may have to distinguish between permissible interference (RR 1.167) and accepted interference (RR 1.168).

Details of the interference calculation algorithm are given in ANNEX 2:.

# 12.9.2 Interference calculation GUI

When the simulation is finished, the dRSS and the iRSS vectors are stored. You may proceed to use the facilities of the Interference Calculation Engine (ICE) in order to evaluate the probability of interference for the simulated scenario.

The probability of interference is calculated by the ICE with the following choice of input parameters:

- Calculation mode: compatibility or translation;
- Which type of interference signal is considered for calculation: unwanted, blocking, intermodulation, overloading or their combination;
- Interference criterion:  $C/I$ ,  $C/(N+I)$ ,  $(N+I)/N$  or  $I/N$ .

If more than one interference calculation was done (i.e. with different combination of interference criterion), you may scroll through all of them by using the Previous / Next buttons.

Interference calculation results:

- single interference probability value (compatibility mode);
- probability as function of the translation parameter (translation mode).

When the compatibility mode is chosen, a single-figure estimate of the probability of interference is calculated;

When the Translation mode is chosen, you may calculate and display as chart the probability of interference as function of one of the following input parameters:

- Output power of Interfering transmitter;
- Blocking response level of Victim receiver;
- Intermodulation response level of Victim receiver.

You are able to save the results of the translation mode using the “save translation button”.

The screenshot shows the 'Interference Calculations' panel with the following components:

- Calculation Mode:** Radio buttons for 'Compatibility' (1) and 'Translation' (2).
- Signal type:** Checkboxes for 'Unwanted' (3), 'Blocking', 'Overloading', and 'Intermodulation'.
- Interference Criterion:** Radio buttons for 'C/I' (4), 'C/(I+N)', '(N+I)/N', and 'I/N', each with a corresponding dB input field.
- General:** Input fields for 'Events' (5), 'Events (dRSS ...)' (6), and 'Sensitivity (dBm)'.
- Interference Calculation Engine Control (7):** A row of buttons: Start, Stop, First, Previous, Next, Last, and Delete. The status 'ICEConfiguration 3 of 3' is shown on the right.
- Translation Parameters (8):** A list box containing 'Blocking response level / Victim link', 'Intermodulation response level / Victim link', and 'Power supplied / Generic System'. Below are input fields for 'Min (dBm or dB)' (0), 'Max (dBm or dB)' (100), and '# Points' (100).
- Results:**
  - Compatibility (single result) (9):** A 'Probability' input field.
  - Translation (probability function of translation parameter) (10):** A graph with 'Probability (%)' on the y-axis (0.00 to 1.00) and 'Translation points (dBm or dB - depending on the selected translation parameter)' on the x-axis (0.0 to 1.0).
  - Save translation results (11):** A button at the bottom of the Results section.

Figure 271: Interference calculation panel

Table 61: Parameters to calculate the probability of interference

ID	Description	Comments
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<b>1</b>	Calculation mode/ Compatibility:	Compatibility: Gives the probability of being interfered by the Blocking interference and/or by the Unwanted interference and/or by intermodulation interference. The result is a probability of interference.
<b>2</b>	Calculation mode/ Translations:	In this case all the following parameters should be independent from frequencies: Receiver blocking response mask, Receiver intermodulation rejection mask, power distribution of interfering transmitter, Unwanted emission floor mask. Calculation of the probability of interference as a function of the reference parameters (Power supplied by the It for the unwanted, Blocking response level of the Vr for the Blocking, And intermodulation rejection level for the Vr). These parameters are varying on user-defined definition domain defined by the number of points where the software has to calculate the probability. The result is a graph.
<b>3</b>	Signal type	Choose the interference studied: Unwanted and/or Blocking and/or Intermodulation and Overloading in case simulated.
<b>4</b>	Interference criterion	Choose between C/I, C/(N+I), (N+I)/N, I/N)
<b>5</b>	Events	Total number of simulated events, in case Translation multiplied by the number of points
<b>6</b>	Events (dRSS > sensitivity)	It represents the number of events taken into account for the calculation. The accuracy of the calculated results relates to this ratio, i.e. the less this number the higher the inaccuracy.
<b>7</b>	Calculation control	Delete a result, and see the last results
<b>8</b>	Translation parameters: If translation was chosen	Number of points between the min and max, where the software will calculate the probability.
<b>9</b>	Result / Compatibility	Probability of interference: 1 - always interfered, 0 - never interfered

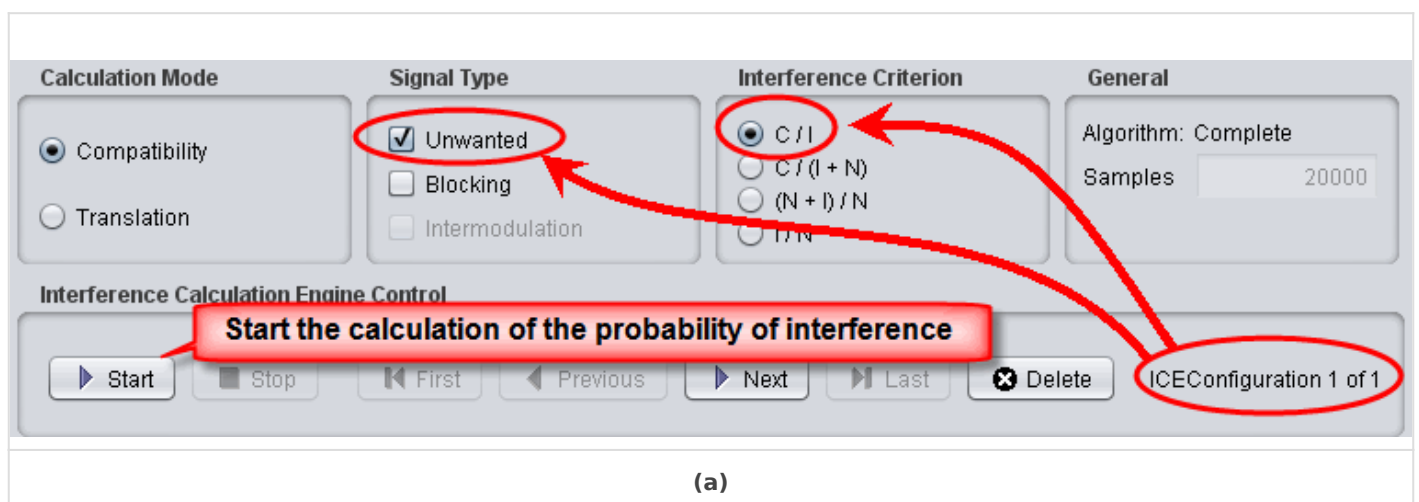
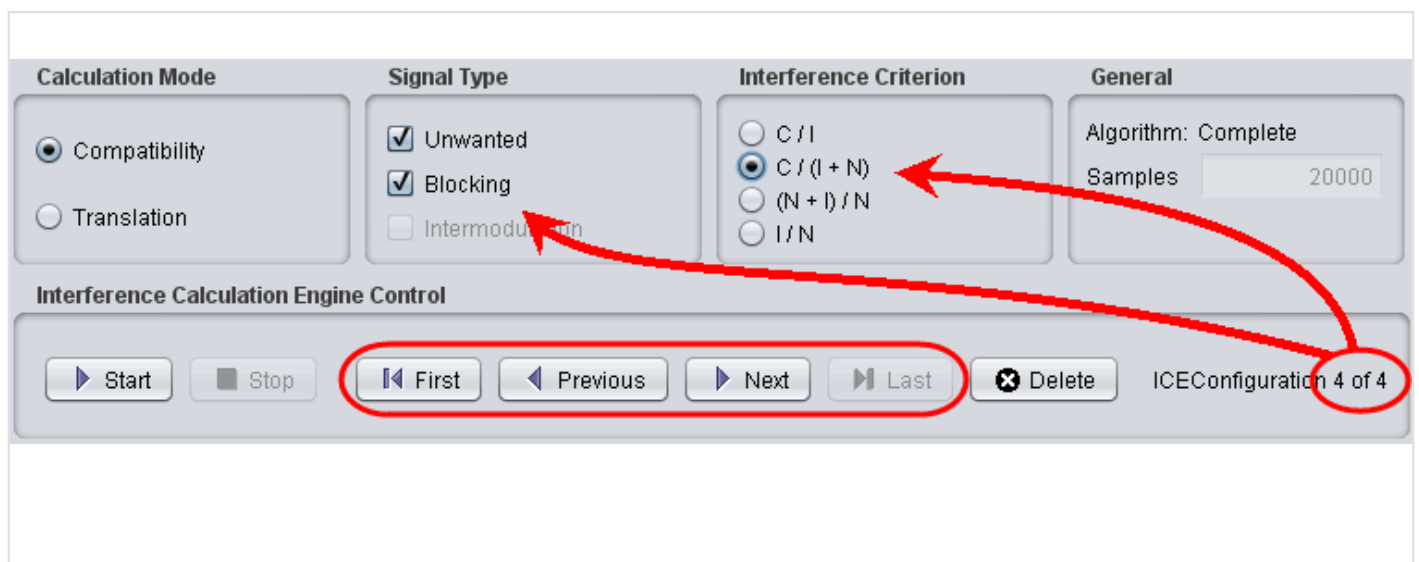
<b>10</b>	Result / Translation	Gives the graph, showing the resulting probability of interference vs. the selected values of translation parameter. The average of the graph depends of the number of points, but the higher the number is, the longer the calculations are.
<b>11</b>	Save translation button	You are able to save the results of the translation mode

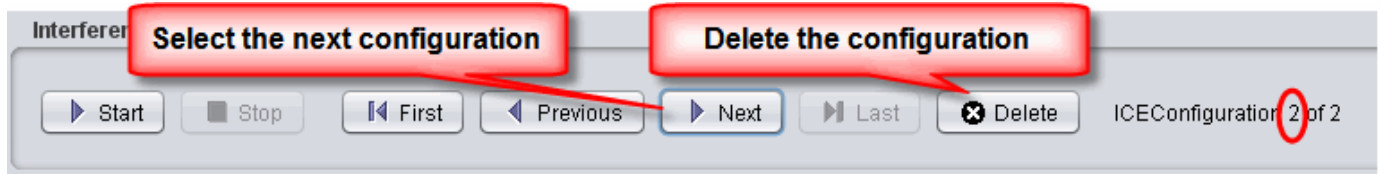


# 12.9.3 Interference

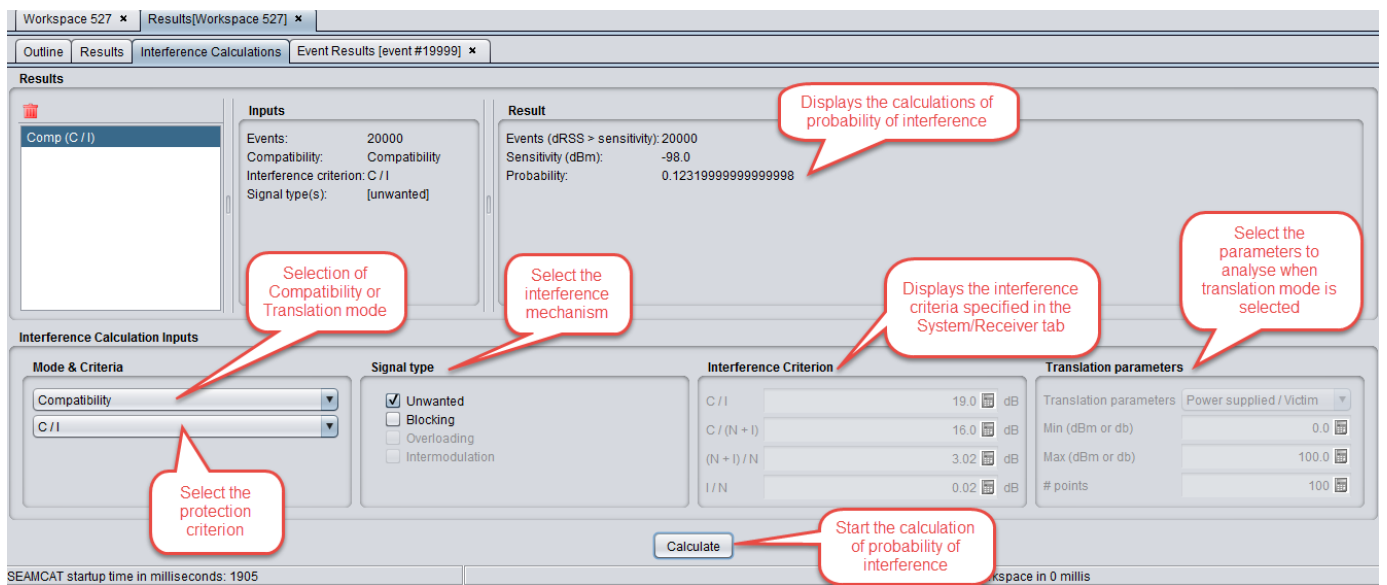
## Calculation Engine Control

It allows to the calculation of the probability of interference for several ICE configurations (i.e. different signal types, interference criteria, etc..) for the same simulation. Figure 272 presents how the control box is used.





(b)



(c)

**Figure 272: Use of the Interference Calculation Engine (ICE)**

When the translation mode is activated, the overloading feature is deactivated as shown in Figure 273.

**Interference Calculation Inputs**

Mode & Criteria	Signal type	Interference Criterion	Translation parameters																				
Translation C/I	<input checked="" type="checkbox"/> Unwanted <input type="checkbox"/> Blocking <input type="checkbox"/> Overloading <input type="checkbox"/> Intermodulation	<table border="1"> <tr> <td>C / I</td> <td>19.0</td> <td>dB</td> </tr> <tr> <td>C / (N + I)</td> <td>16.0</td> <td>dB</td> </tr> <tr> <td>(N + I) / N</td> <td>3.02</td> <td>dB</td> </tr> <tr> <td>I / N</td> <td>0.02</td> <td>dB</td> </tr> </table>	C / I	19.0	dB	C / (N + I)	16.0	dB	(N + I) / N	3.02	dB	I / N	0.02	dB	<table border="1"> <tr> <td>Translation parameters</td> <td>Power supplied / Victim</td> </tr> <tr> <td>Min (dBm or db)</td> <td>Blocking response level / Victim</td> </tr> <tr> <td>Max (dBm or db)</td> <td>Intermodulation response level / Victim</td> </tr> <tr> <td># points</td> <td>100</td> </tr> </table>	Translation parameters	Power supplied / Victim	Min (dBm or db)	Blocking response level / Victim	Max (dBm or db)	Intermodulation response level / Victim	# points	100
C / I	19.0	dB																					
C / (N + I)	16.0	dB																					
(N + I) / N	3.02	dB																					
I / N	0.02	dB																					
Translation parameters	Power supplied / Victim																						
Min (dBm or db)	Blocking response level / Victim																						
Max (dBm or db)	Intermodulation response level / Victim																						
# points	100																						

Calculate

**Figure 273: When translation is activated, the overloading feature is de-activated**