MAASC Medical Alarm Audibility System Checker

Tutorial

Introduction

This tutorial shows how to use MAASC and its feature.

Make sure the software and all requirements are installed.

For more information, see the FAQ

Creation

There are severals ways to create a configuration:

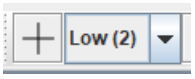
- Create a new one
- Open an existing one
- Import alarms from an alarm configuration file by drag'n'drop or the import button

In this tutorial, we will use the 3 methods. When you open the software, a new configuration is created.

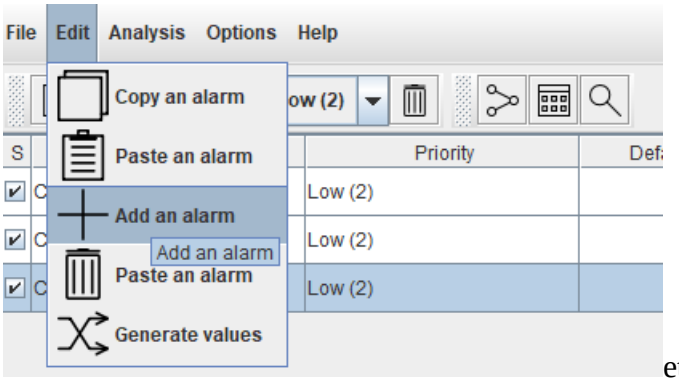
Edition

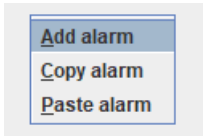
Let's begin by adding 3 Low(2) priority alarms.

First, select with the combobox the Low(2) priority.

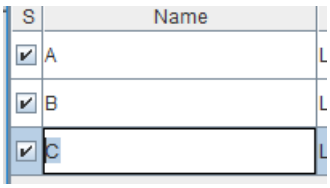


Then, add an alarm by clicking on the + button, or in the onglet Edition > Add an alarm, or by right clicking on the empty panel and clicking on Add an alarm.



et


Once created, change the name of the alarms. 2 alarms SHOULD NOT have the same name. You can edit the cells of a table to modify an alarm or an event



Let's now edit the default volume, tone duration and tone spacing of each alarm. You can do this by double clicking on the cells.

We want these values :

S	Name	Priority	Default Volume (dB)	Default Tone Duration (s)	Default Tone Spacing (s)	Play	Delete
☑	A	Low (2)	80	0,25	0,1	▷	🗑
☑	B	Low (2)	60	0,15	0,05	▷	🗑
☑	C	Low (2)	85	0,2	0,075	▷	🗑

When you change a default attribbut of an alarm, you change the values of each event of the alarm, except the ones which were already changed.

You can change the values of the duration, tone, volume, spread, spacing of each event in the 2nd table

Let's change the tone of each alarm event that way :

Alarm A :

Tone (Hz)
c : 261.63
fsharp : 369.99

Alarm B :

Tone (Hz)
Other : 277.0
Other : 277.0

Alarm C :

Tone (Hz)
C : 523.25
d : 293.66

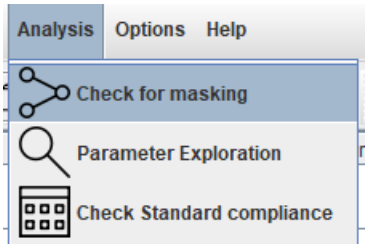
You have now a configuration with 3 differents Low(2) priority alarms, with different values. Let's see what can we analyse with that !

You should save this configuration file with the save button

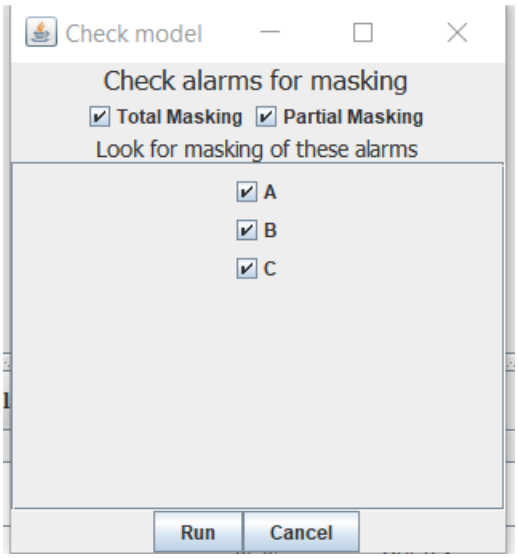
Analysis

For the purpose of the tutorial, the norm isn't complied at the moment. Let's first take a look at the masking possible, then we will correct the configuration in order to make it compliant to the norm

Launch a Masking check analysis by clicking on the button or in Analysis > Check for masking

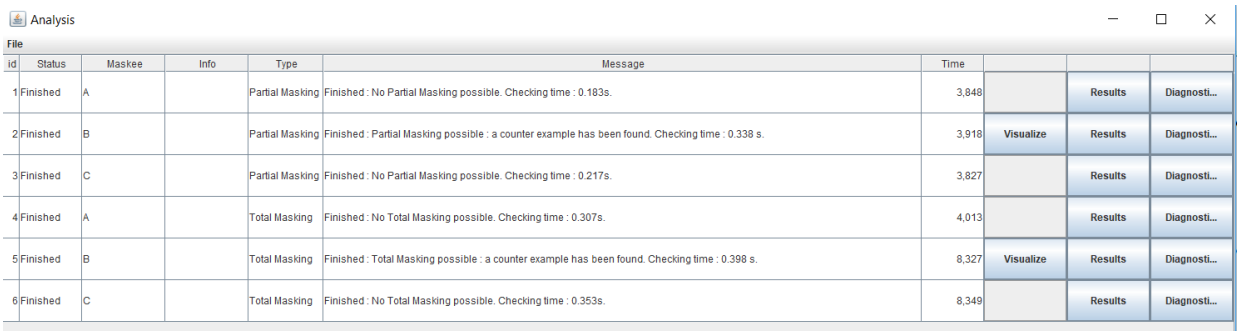


The Launch window appears, you can select if you want to check a Total and/or a Partial Masking and the alarms that you want to check the masking on



Click Run

A Status window appears, wait for some seconds. If errors occured, you might want to look at the FAQ, your installation could be incorrectly done



id	Status	Maskee	Info	Type	Message	Time			
1	Finished	A		Partial Masking	Finished : No Partial Masking possible. Checking time : 0.183s.	3,848		Results	Diagnosti...
2	Finished	B		Partial Masking	Finished : Partial Masking possible : a counter example has been found. Checking time : 0.338 s.	3,918	Visualize	Results	Diagnosti...
3	Finished	C		Partial Masking	Finished : No Partial Masking possible. Checking time : 0.217s.	3,827		Results	Diagnosti...
4	Finished	A		Total Masking	Finished : No Total Masking possible. Checking time : 0.307s.	4,013		Results	Diagnosti...
5	Finished	B		Total Masking	Finished : Total Masking possible : a counter example has been found. Checking time : 0.398 s.	8,327	Visualize	Results	Diagnosti...
6	Finished	C		Total Masking	Finished : No Total Masking possible. Checking time : 0.353s.	8,349		Results	Diagnosti...

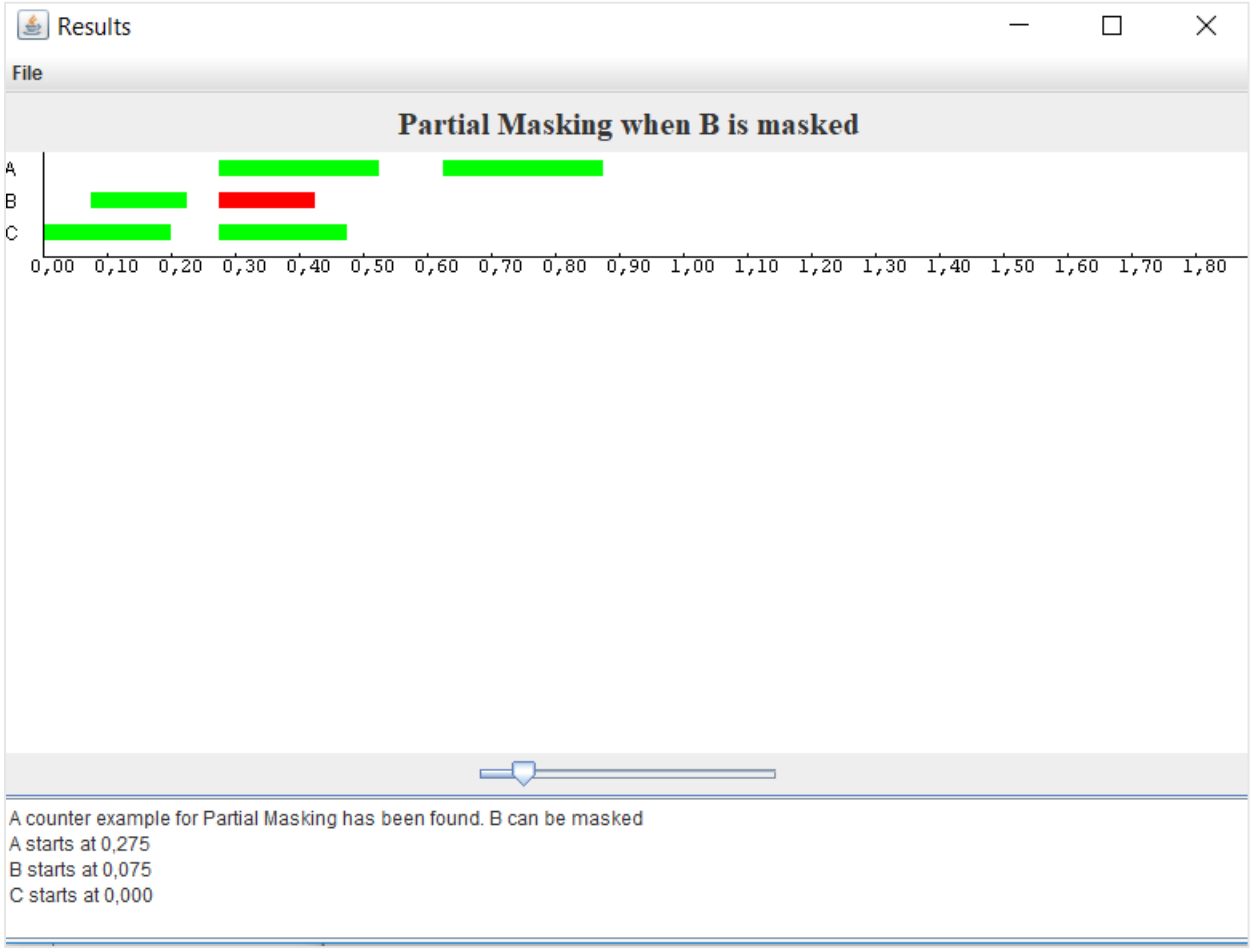
Each Analysis refers to a Total Masking or Partial Masking and on a particular alarm that can be masked.

The message : No [type] Masking possible indicates that no masking for this alarm and this type of analysis is possible. The checking time represents the time SAL used to check the model.

The message : [type] Masking possible : a counter example has been found indicates that SAL found a counter example and a masking is possible. You can visualize it by clicking on visualize.

The visualization shows the counter example : you can print it as image or export it into an Excel file by clicking on File > ...

Each SAL check generates 2 files : a .out file the results file, with the results of the analysis (counter example or nothing) and the .err diagnostics with the logs of the SAL check. You can open these files in the Status table.

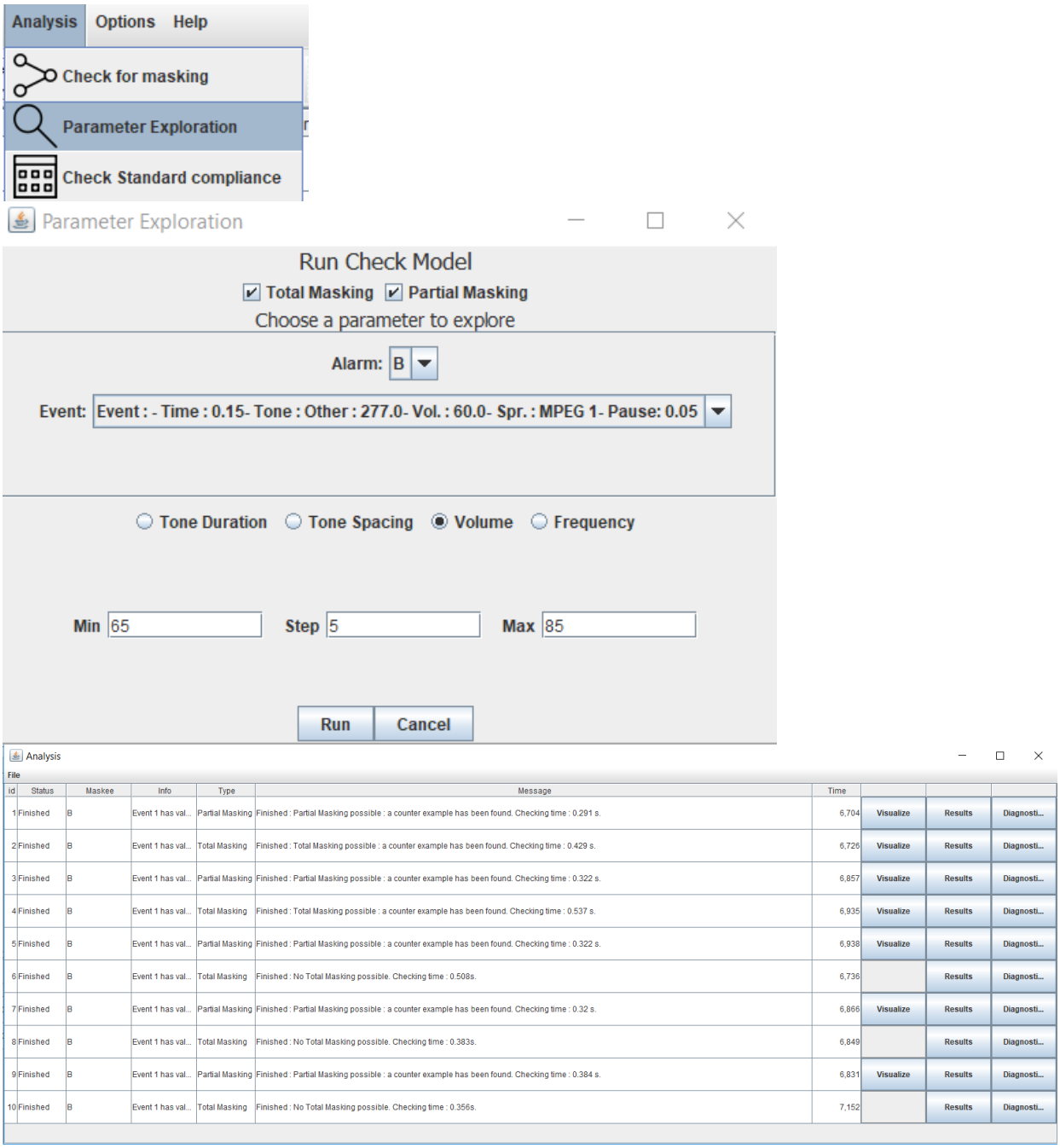


So, our configuration can create a masking phenomenon. We need to fix this.

Let's try the parameter exploration (You can close the status window)

You can open the Launch Parameter Exploration window by clicking this button or Analysis > Parameter Exploration

We saw that only B could be masked, let's try to counter that by exploring his volume parameter, on the first event



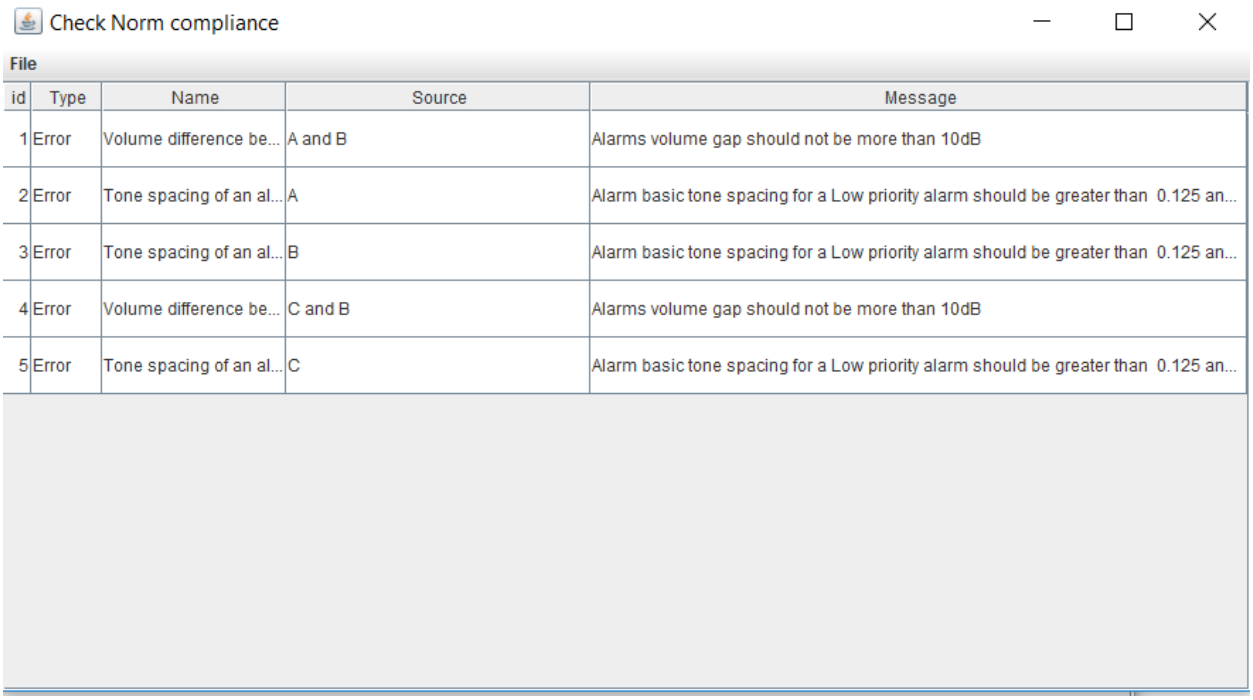
The Status window appears to show with which parameter the alarm cannot be masked

You can now change the event variables in order to not mask the B alarm ! Relaunch the Check for masking analysis to see if the alarm can be masked.

The IEC 60601-1-8 International Medical Alarm Standard

MASASC lets you check that a modeled configuration is consistent with the IEC 60601-1-8 International Medical Alarm Standard. By clicking on the Standard Check button you can display a table with every non-compliant attribute.

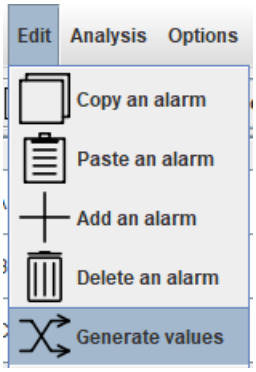
Here our default tone spacing are not compliant with the norm recommendation on the Low priority alarm.



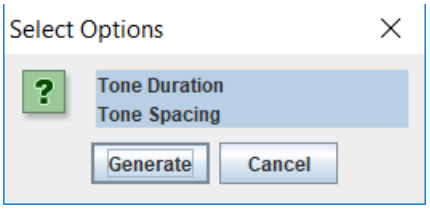
id	Type	Name	Source	Message
1	Error	Volume difference be...	A and B	Alarms volume gap should not be more than 10dB
2	Error	Tone spacing of an al...	A	Alarm basic tone spacing for a Low priority alarm should be greater than 0.125 an...
3	Error	Tone spacing of an al...	B	Alarm basic tone spacing for a Low priority alarm should be greater than 0.125 an...
4	Error	Volume difference be...	C and B	Alarms volume gap should not be more than 10dB
5	Error	Tone spacing of an al...	C	Alarm basic tone spacing for a Low priority alarm should be greater than 0.125 an...

An easy way to fix that is to use the Generate Values feature

You can find it in Edition > Generate Values



The next window shows the variables to change: Tone Spacing and/or Tone Duration. It will change these values for every selected alarms, and generate a value that is compliant to the norm. Reminder: it will change all the event unchanged values of the alarms selected

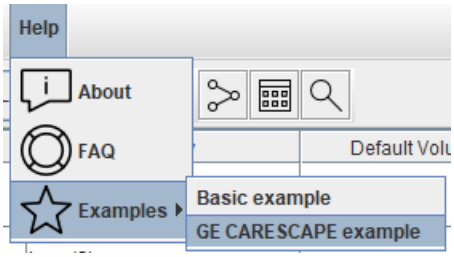


You can now launch the Norm Checker again to see if your configuration respect the norm.

Default Tone Duration (s)	Default Tone Spacing (s)
0,145	0,136
0,213	0,198
0,205	0,138

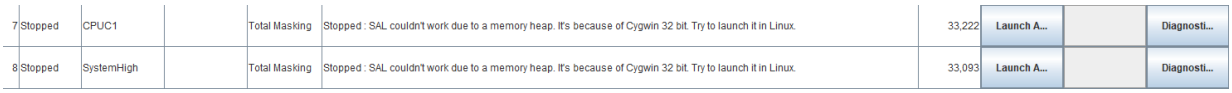
A real example

Some examples can be found in Help > Example > ..., choose GE Carescape



It's a real example, used ..... that shows some masking

If you are on Windows, you can encounter some problem checking for total masking, due to the limitation of CYGWIN:



For this reason we encourage users to run MAASC on Linux when evaluating industrial applications.