Documentation on GE06Calc

User Manual

Terrestrial Services Department

Broadcasting Division

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Contents

1   General Introduction

GE06Calc is a PC based application designed to assist administrations in simulating their calculations related to the GE06 Digital Plan for sound and television broadcasting services.

GE06Calc tool is designed to be applied for:

1) Unofficial conformity examination;

2) Viewing compatibility analysis results.

To be able to examine notices subject to unofficial conformity examination for GE06D, **please first install the BR IFIC (Terrestrial) DVD applications and database on your PC**. Conformity examinations will be performed considering the GE06 Plans and MIFR data on the BRIFIC DVD.

From GE06Calc release version 1.5.4.3, the BRIFIC installation is no longer necessary to display the results of the compatibility analysis.

The program is available in English, French, Russian, Arabic and Spanish, as translation resources permit.

Please note that you will be automatically prompted to download any available updates.

2   GE06Calc features

2.1   Unofficial Conformity examination

GE06Calc is intended to be an easy-to-use tool for administrations to unofficially examine the conformity of notices with respect to the GE06 Plan before sending them to the BR.

The application reads electronic notice files and performs <u>unofficial conformity examinations</u> with respect to the GE06 Plan, for notices to be examined for conformity under Article 4 or Article 5 of the GE-06 Agreement.

Conformity examinations will be performed considering the GE06 Plan and relevant MIFR data on the BR IFIC DVD.

<u>Important</u>: The BR IFIC database must be installed before starting *GE06Calc*. The installation procedure is described at:

https://www.itu.int/en/ITU-R/terrestrial/broadcast/GE06Calc/Docs/Using%20BRIFIC%20with%20GE06Calc.pdf

2.2   Display Compatibility Analysis Results

The *GE06Calc* application reads the compatibility analysis database file obtained from the *GE06D Compatibility Analyses* jobs available under https://www.itu.int/ITU-R/eTerrestrial/ECalculations (eBroadcasting web application). The compatibility analysis can involve notices (additions, modifications and suppressions) from one or several administrations, which are then "applied" to a snapshot of the current status of the GE06 Plan. (A compatibility analysis is performed on a subset of frequency ranges, either within Band III or within Bands IV and V, depending on input data provided by administrations).

The results of a compatibility analysis are stored in an MS Access database file (MDB format) together with the input data for the calculation, including all the relevant GE06D entries and modifications in process (within a 1000 km boundary) in the relevant frequency band(s).

The GE06Calc application has been enhanced to consider the specificities of the 3 different types of GE06D compatibility:
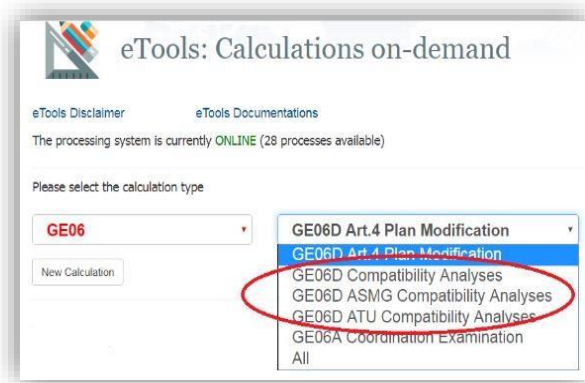
The general **GE06D Compatibility analysis**, for all the countries which are party to the GE06-Agreement, can examine all the requirements in the GE06 planned bands (i.e. 174-230 MHz and 470-862 MHz).

The **ASMG** and **ATU compatibility analyses**, considering the technical criteria defined by the regional groups for coordinating the necessary modifications to the GE06 Digital Plan, are only available in the band 470-694 MHz. Those examinations can accept flexible channels. The concept of flexible channel is described below (see page 20).

3   Description of the GE06Calc functionalities

3.1   Main Menu

*   ***File Menu Item***: the user can select 2 possible options:
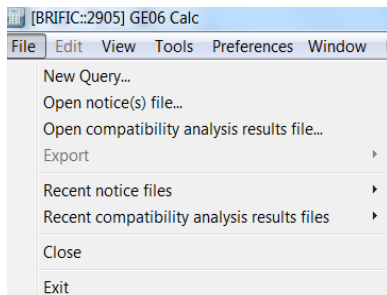
–   "Open notice file…" to upload a notice file to be submitted to the unofficial conformity examination in the GE06 Frequency Bands.

–   "Open compatibility analysis results file…." for the selection of the compatibility analysis results MS Access mdb previously downloaded from *eTools*.

–   The application keeps track of the databases or notice files previously opened.

*   **Tools Menu Item**: The user can select to run the conformity examination from this menu item

*   **Preferences Menu Item**: The user can adapt the software regarding various options (language – colors – display formats)

*   **Help Menu Item**:
    –   ***Table of Contents*** shows the documentation.
    –   ***About GE06 Calc*** shows the version of the software. It should correspond to the version announced on the web at
        https://www.itu.int/en/ITU-R/terrestrial/broadcast/Pages/Services.aspx
    –   ***Release Notes*** keeps you informed on the reasons for a new release (new enhancements, bug fixes etc...)

3.2   How to run the unofficial conformity examination

3.2.1   Get started

The data is loaded in 3 steps:
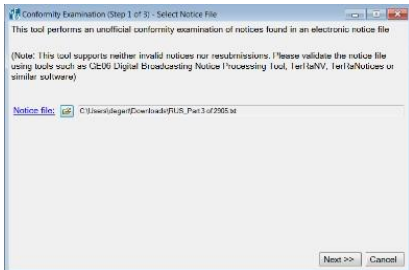
Step 1: Please select the notice file to be examined. The notice file should contain notices to be examined for conformity under either Article 4 or Article 5 of the GE-06 Agreement, but not both at the same time. There is no such limitation when sending the notice file to the BR. The notice(s) to be examined have to be previously validated using *TerRaNotices* (available from the BR IFIC DVD) or the online validation available at https://www.itu.int/ITU-R/eTerrestrial
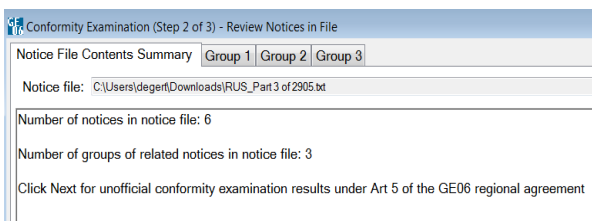
Step 2: The notice file is read and the content is displayed and linked notices are grouped. In step 2 of the conformity examination, please review the contents of the notice file, as parsed by the tool. In particular, please check that related notices ha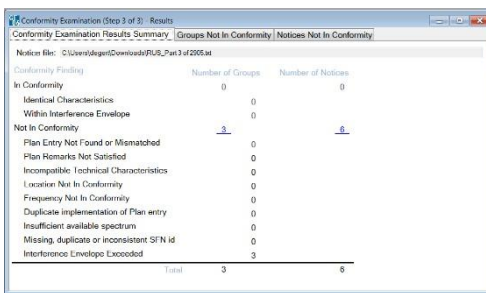ve been grouped together as intended. At this stage, only notices contained in the notice file are shown. The user interface has a limitation of 100 related groups of notices per notice file. Please note that there is no such limitation for notice files sent to the BR.
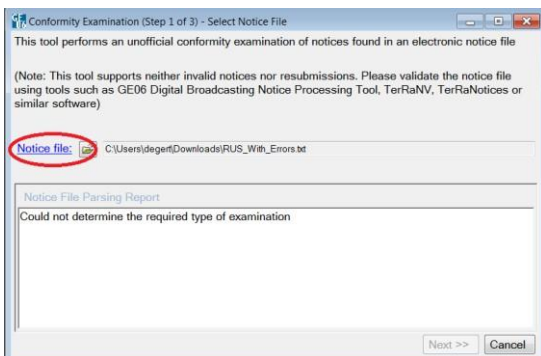
If there are any problems in parsing the file, the problem report is shown and the "Next" button is disabled. If the problem is easy to correct, you can click on the "Notice file:" link to open your default editor for text (*.txt) files and make the correction. Clicking on the "Notice file:" link will also re-enable the "Next" button. Otherwise, please select a different notice file

Step 3: Click next. The conformity examination is run as per Section II of Annex 4 of GE-06 Agreement and the results are displayed. There may be a slight delay since the tool needs to prepare auxiliary databases.

3.2.2 Conformity Examination results

Step 1: A summary is displayed to explain the results of the examination for the notices organized in groups. The summary screen has statistics on different reasons for notices not being in conformity. Please note that certain groups of related notices may have several simultaneous reasons for not being in conformity. In cases where the corresponding plan entry was found, the related notices/entries are displayed as two lists, one for the proposed implementation, and the other for the Plan entry. If applicable, the implementation list will show other already published notices and/or recorded Master International Frequency Register (MIFR) entries (for Article 5 conformity) or other related converted assignments recorded in the Plan (for Article 4 conformity).
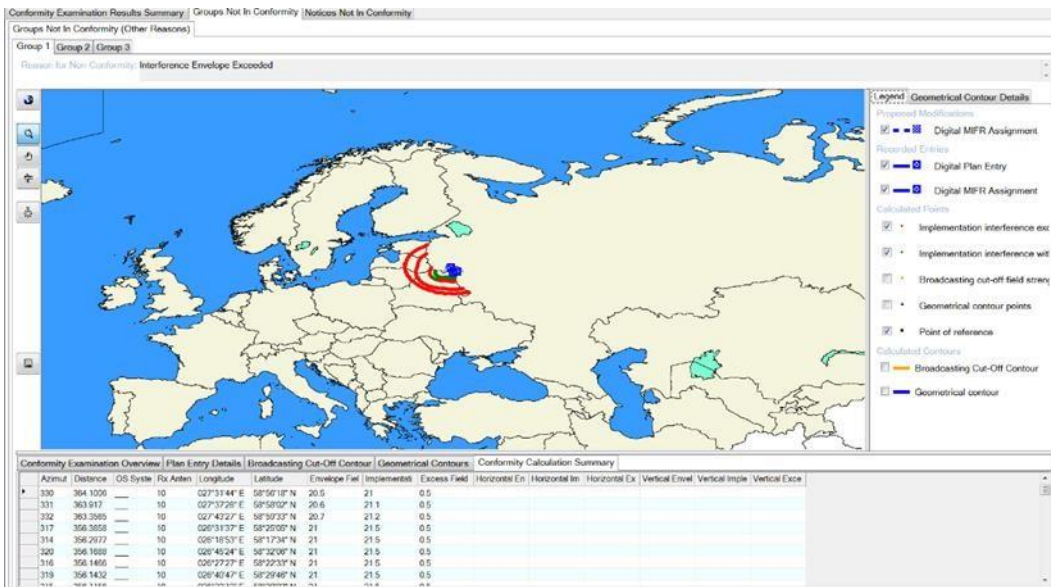
Step 2: If the envelope is calculated, the field strength values of the plan entry and of the implementation are calculated at each point of the broadcasting cut-off field strength contour, and at all the points on geometric contours (60, 100, 200, 300, 500, 750 and 1 000 km) lying within the cut-off field strength contour and reaching outside the administration boundary. The points where the field strength is exceeded are displayed in red on the map.

The user can decide which information should be displayed on the map in the "Legend" tabulation in the right-hand part of the screen.

3.3 Tools dedicated to the compatibility analysis

3.3.1 Get started

Prepare your notice file that contains one or more electronic notices and upload it on eTools (eBroadcasting web application). Once the calculation is finished, download the resulting zipped MS Access database file and save it on your computer.

Upon selecting the unzipped MS Access database file through "open Compatibility analysis results file…" from the menu shown in section 3.1 above, the Compatibility Status Selection Criteria screen is shown, from where many other functionalities become available. Most of the features are available from context menus (right-click) in tables and from the graphical display.

The selection is performed against the information present in the MDB file.

3.3.2 GE06Calc Compatibility Status: features
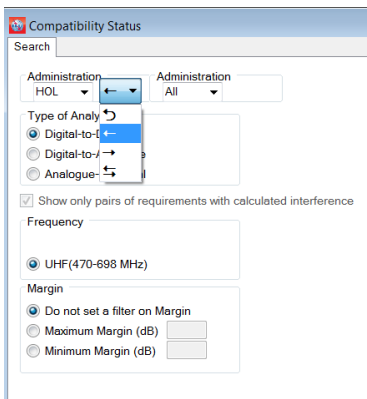
The arrows represent the direction (to →, from ↰, to & from ⇄, internal incompatibilities ↺). In the example above we are selecting all the DTT frequency assignments affecting the DTT stations of UZB. Only DTT entries are displayed if the type of analysis selected is Digital-to-Digital.

If Other Primary Services, recorded or published in Part A of the List (GE06L), for the neighbouring countries, are identified as potential interferers, they are displayed if the user selects "Digital-to-Other-Services" or "Other Services-to-Digital".

The compatibility analysis is performed on a subset of frequency ranges, either VHF or UHF frequency bands.
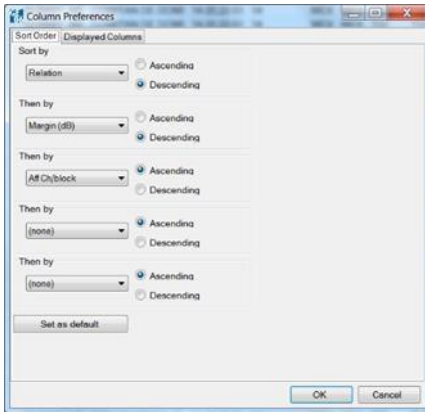
Once the selection is confirmed, a list of affected and interfering frequency assignments/requirements is shown to the user in accordance with the selection criteria.

When flexible channels (See Section 4 below) are submitted, the columns affected and/or interfering channel can show more than one channel.

As previously mentioned, most of the features are available from context menus (right-click):

Additional features: a left-mouse click on the columns opens a dialog for the user to select the column preferences (sort order and displayed columns). If the user wants the application to "remember" those changes, he/she should click on the button "set as default".

3.3.2.1   How to use the Coverage Analysis screen
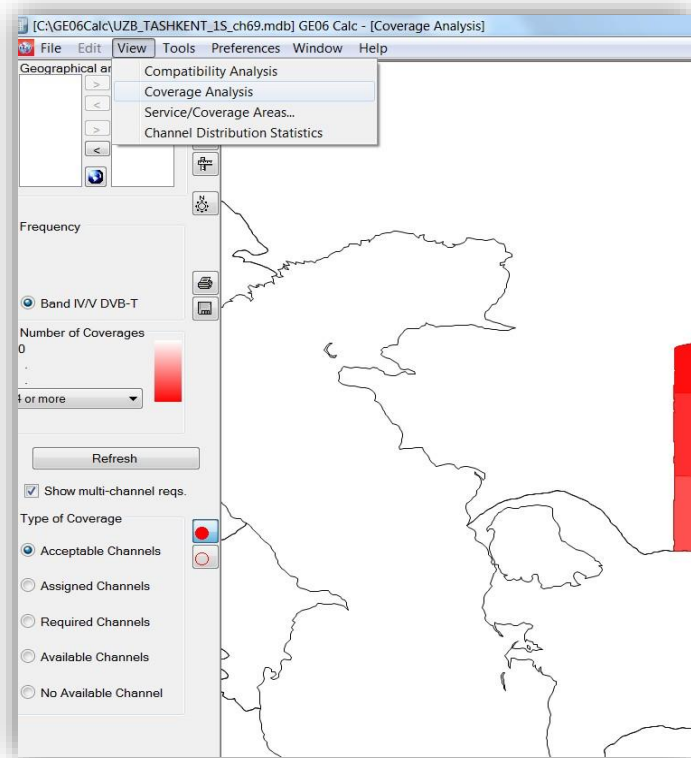
The Coverage Analysis screen displays the number of coverages at a given point in a geographic area, that is, the sets of requirements whose service area covers the point.

The intensity of the color in a given point corresponds to the number of coverages, i.e. a darker color means more coverages. For the legend to be correct, the selected maximum must be equal to or greater than the maximum number of actual coverages, which requires some trials on the part of the user.

It is possible to easily compare acceptable channels from the input data and available/assigned channels from the analysis results by clicking on the corresponding radio button. More details on the actual coverages may be obtained by right-clicking on a given point. A pop-up list appears, showing the number of coverages at the point, as well as the following information for each coverage:

• **_Adm_**: Administration identifier.

• **_Adm Ref Id_**: unique identifier from the input data.

• **_Acceptable or Available Channels or Assigned Channel_**: The acceptable channels from input data or the available channel or assigned channel from the analysis/synthesis results (see definition further down).

3.3.2.2   How to use the Service/Coverage Areas screen
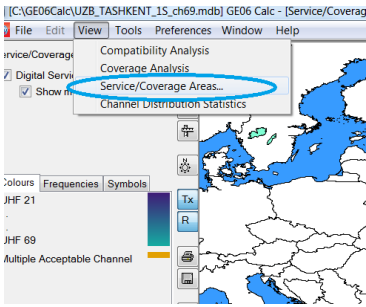
The Service/Coverage Area screen shows the coverage/service area for individual OPS assignments, present in the database and showing incompatibilities with the DTT requirements submitted to the compatibility analysis, with filtering by TV channel
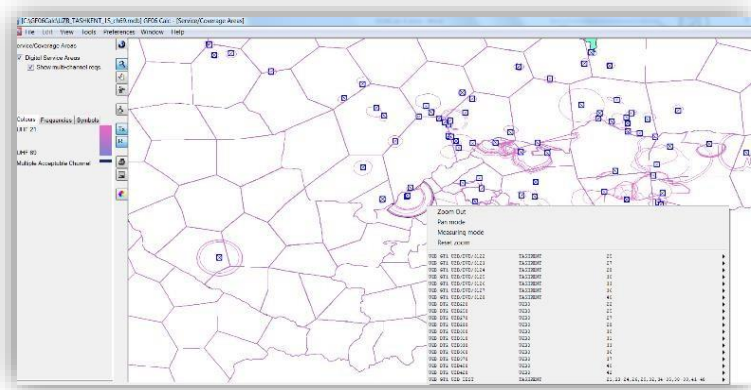
Details of the requirement or compatibility analysis details can be invoked from the context menu either from the summary list or by right-clicking on the map.

3.3.2.3   How to use the channel distribution statistics screen
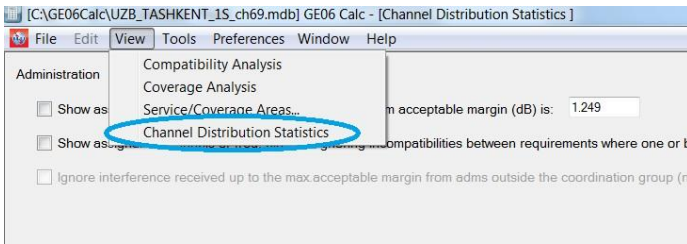
Step 1: A selection criteria screen is shown, from where the statistics are calculated:
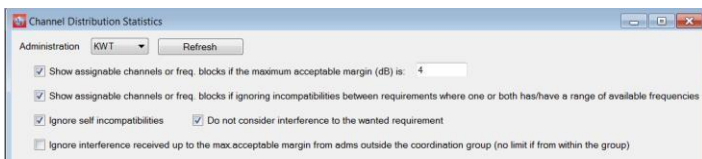
The statistics are available for a specific administration, selected in the dropdown box. The list of available administrations is based on the requirements submitted to the compatibility analysis in *eTools*. If the user submits only one file of notices representing her/his country requirements, the selection screen will show only one administration.

The Maximum Acceptable Margin, also called limiting margin: An allowance has been made for interference in the preparation of the Plan. For this purpose, a concept of limiting margin has been introduced. The term "limiting margin" is to be interpreted in the sense

- in the case of wanted digital terrestrial broadcasting, the limiting value of the margin has been taken to be 1.25 dB
- in the case of wanted other primary terrestrial assignments, the limiting value of the margin has been taken to 1.0 dB

A possible relaxation can be considered for the limiting margin. This is described in the document

available at:

https://www.itu.int/en/ITU-R/terrestrial/broadcast/ASMG/Documents/info/INFO-5-E.pdf

Such a relaxation can be captured (in the example above a limiting margin of 4 dB was captured), which will have an impact on the statistics. It is important to note that all the incompatibilities above 1.25 dB are shown in the detailed results. Selecting a higher value of limiting margin/maximum acceptable margin only has an impact on the "Channel Distribution statistics" where a channel which was not assignable for a 1.25 dB limiting margin may become assignable if the level of interference considered is higher (i.e. the limiting margin is higher).

Filtering option having an impact on the statistics:

- Selecting a high margin, disregarding self-incompatibilities between stations within an administration, ignoring incompatibilities must be done with great care.

- Selecting a limiting margin above 4 dB is not advisable as it represents a high level of interference.

- Disregarding interference received is appropriate under specific terrain conditions (e.g. if there are natural obstacles at the border between two countries).

- Self-incompatibilities should be resolved before bringing a frequency assignment into operation.

- Ignoring requirements with flexible channels is possible if the box "Show assignable channels " if ignoring incompatibilities between requirements where one or both has/have a range of available frequencies" is selected.

The list of possible filters depends on the decision of the regional frequency coordination group. For the *ASMG compatibility analysis*, the tool is taking into account the recommendations and technical criteria agreed by the frequency coordination meeting available at:
https://www.itu.int/en/ITU-R/terrestrial/broadcast/ASMG/Documents/info/INFO-9.pdf

For the ATU compatibility analysis (Sub-Saharan Africa), the GE06Calc software has been modified (from version 1.5.4.5) to apply the maximum margin captured in the statistics to the interference received from an administration outside the Sub-Saharan African countries up to the maximum acceptable margin captured (e.g. if the maximum acceptable margin is 4 dB, any interfering margin of 4 dB or less received from any administration outside the Sub-Saharan African countries is disregarded for the definition of "assignable channel"). Please note that an interference generated to an administration outside the Sub-Saharan African countries is still limited to the 1.25 dB protection margin.

Step 2: When the user clicks on the *Refresh button*, the channel distribution statistics are shown:

In this example,

- 59 requirements have been submitted

- 5 requirements do not have any available channel (see column "no available channel or frequency block"). This is because these channels are already assigned to the same site and/or to the neighboring countries that are not part of this planning exercise and the level of interference

generated to the stations of those countries outside the planning area is higher than the 1.25 dB limiting margin considered for the development of the Plan or to 1dB limiting margin if some Other Primary Services of neighboring countries are involved.

•   The 5 requirements above are also considered in the column identifying the total number of requirements having "No assignable channel or frequency block". The additional 8 requirements are those having incompatibilities generating levels of margin above the maximum acceptable margin captured in the previous step.

•   The requirements in the column "Having an assignable channel or frequency block" are generating (or receiving) levels of interference below the limiting/maximum acceptable margin.

Clicking on the number of assignments/allotments in one of the columns will take the user to the detailed results.

3.3.3   General Analysis Results (GAR)

3.3.3.1   How to get to the "General Analysis Results" (GAR)

•   **Show General Analysis Results** can be invoked from the context menu, no matter which selection has been made in the "View" menu.

a)   From "Compatibility Analysis" – Right – mouse click on a table row.

b)   From "Coverage Analysis" – Right- mouse click on the map where coverages are displayed, then, position the mouse on an entry in the list of stations covering that area:
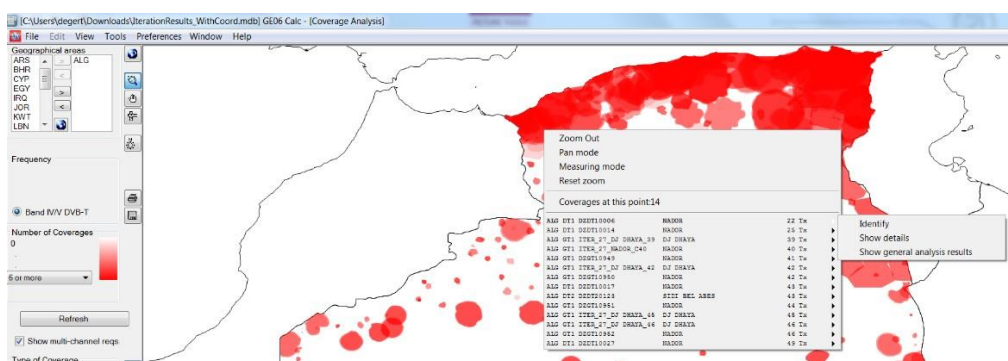
c)   From "Service/Coverage Areas": same as above.

d) From Channel Distribution Statistics:

The user can double-click on a row or click on the right mouse button.

3.3.3.2 Interpretation of the compatibility analysis results displayed in the "General Analysis Results" (GAR)

- When the user clicks on the hyperlinks representing statistics on the number of assignments or allotments, based on the selection criteria, the details of those are shown

- Double click on the row to get the results of the calculations for a specific requirement (i.e. UM AL AISH on channel 38, highlighted below)

- The General Analysis Results for this assignment Will appear as shown below:

The digital requirement under consideration can be identified (service area flashes) by clicking on the button "identify current requirement service area" (in blue on the picture).

3.3.3.3   Analysis of the results

In most cases, the General Analysis Results contain "Digital Interferers" and "Digital Affected" tabulations, where:

–   "Digital Interferers" contains the list of digital assignments, in process or recorded in the GE06D Plan, and the digital requirements which are affecting the digital requirement under consideration (incoming interference margin > 1.25 dB);

–   "Digital Affected" contains the list of digital assignments, in process or recorded in the GE06D Plan, and the digital requirements which are affected by the digital requirement under consideration (outgoing interference margin > 1.25 dB).

One or both tabs can be missing if the digital requirement under consideration does not suffer or/and cause any interference from/to digital assignments/requirements (calculated margins below 1.25 dB) on that specific channel.

In the case where digital interferers and/or digital affected are present, the analysis starts with the column "Relation". Three relation types are possible, namely:

–   "Overlap" – means that the service/coverage areas of two transmitters are overlapping. The selected channels therefore are not suitable for the digital requirement under consideration. However, in some cases, due to terrain shielding, this can be possible after more detailed calculations involving terrain profiles.

–   "Tx inside" – this case is worse than "Overlap". The transmitter site is located inside the service/coverage area of the interfering/affected assignment/requirement.

–   "Interference". In this case only, the margin is calculated and reflected in the column "Margin".

There may be 2 cases:

Case 1: Calculated margins in both directions (incoming and outgoing interference) do not exceed the maximum acceptable margin selected by the user in the "Channel Distribution Statistics".
The channel is compatible and it can be assigned to the digital requirement under consideration.

Case 2: The calculated margin in one or both directions exceeds the maximum acceptable margin. Several situations are possible:

a)   Self-Interference: The interference involves the digital requirement under consideration and digital assignment/requirement of the same administration. It is the responsibility of the administration to decide on this situation.

b)   The digital requirement under consideration is affecting assignment/requirement from a neighboring administration. In that case, a modification to the technical characteristics may help (reduction of maximum ERP, revision of the transmitting antenna pattern etc.) to

reduce the interference in the direction of the affected assignment/requirement of another administration. Please note that such a modification cannot be made directly in **GE06Calc**; the notice containing the revised notice should first be submitted to **eTools** for a new compatibility analysis. If the results are satisfactory, the notice should be retained in the file to be submitted to the BR for its recording into the Plan. If not, the parameters can be reviewed, and the calculations should re-run until the results are satisfactory.

c)   The digital requirement under consideration is receiving interference from recorded assignment(s) or requirement(s) of another administration. The administration seeking for this specific channel can accept this higher level of incoming interference if the terrain profile between both sites is preventing interference.

More detailed calculations, using external software packages considering digital terrain profiles, may be performed. Furthermore, in all the above situations, except a), bilateral/multilateral coordination may be needed to obtain the best possible results.

–   "Other Services Interferers", which contains the list of Other Primary Services (OPS), in process or recorded in the GE06L List which are affecting the digital requirement under consideration (incoming interference margin > 1.25 dB);

–   "Other Services Affected", which contains the list of Other Primary Services (OPS), in process or recorded in the GE06L List which are affected by the digital requirement under consideration (outgoing interference margin > 1 dB).

Those tabs will not appear if the digital requirement under consideration does not suffer or/and cause any interference from/to Other Primary Services.

When considering the OPS, the goal is to protect them. Consequently, when the proposed requirement produces, on an OPS a neighboring country, an interference margin greater than 1 dB on a specific channel, the channel is identified as "unavailable" to the digital requirement. In other words, the channel cannot be assigned when it is interfering with the Other Primary Services of the neighboring administrations.

On the other hand, interference received from OPS (OPS interferer) as well as internal incompatibilities (OPS to digital and digital to OPS) are not setting the channel as unavailable to the digital requirement.

In the example below, channels 40 and 45 cannot be assigned to the requirement from AZE (see available channels) because it is interfering with the OPS of IRN on channel 40 and RUS on channel 45 (see Other Services affected).
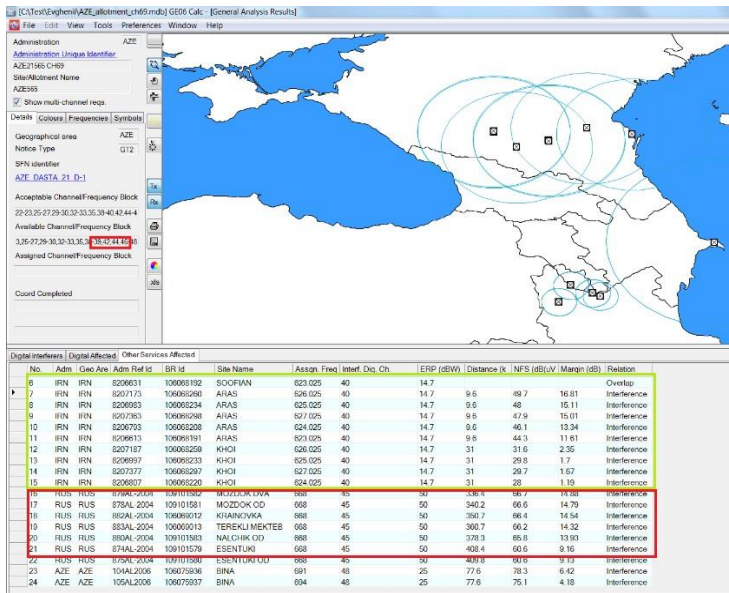
3.3.4 Detailed Analysis Results (DAR)

The value indicated in the column "Margin" represents a calculated margin for the most affected point on the edge of the service area. To see calculated margins for all affected points, where the calculated margin value is higher than 1.25 dB, it is necessary to carry out the detailed analysis of the results.

To see the DAR:

In the GAR window, select the assignment/requirement of interest and right-mouse click on it. In the context menu, select the "Detailed Analysis Results" option.
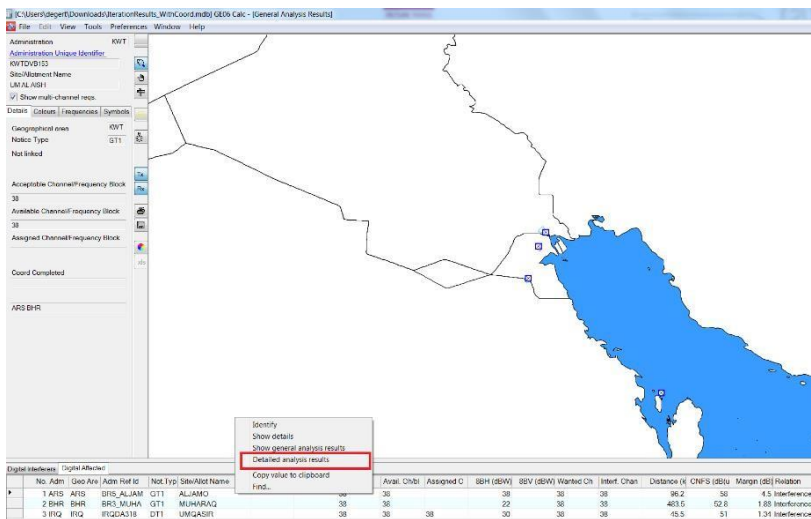
The following window will appear, where the details are indicated. The worst-case point of the service/coverage area of the affected digital requirement under consideration is surrounded in blue.

```
DetailedAnalysis

Requirement under investigation:                    Digital Affected:
UM AL AISH                                          ALJAMO

Running directory: C:\Users\degert\AppData\Local\Apps\2.0\8CXJD5BR.1R9\O8KDAL61.P3V\ge06..tion_b7fbca5f18417bb9_0001.0005_317c308b9f03aa
command for named approach: C:\Users\degert\AppData\Local\Apps\2.0\8CXJD5BR.1R9\O8KDAL61.P3V\ge06..tion_b7fbca5f18417bb9_0001.0005_31
\d2duhf ALJAMO
Extracting digital requirements from database
starting req2bin.exe  completed in  1.91
starting station_name.bat  completed in  1.1
Detailed analysis results file name:  C:\Users\degert\AppData\Local\Apps\2.0\8CXJD5BR.1R9\O8KDAL61.P3V\ge06..tion_b7fbca5f18417bb9_0001.0005
\20191022_1644\uhf_d2d_out.uhf


  Any potentially interfering requirements are listed


KWT  KWTDVB153          UM AL AISH                   chan  38   prt  33.8 dB
adm  identifier         pol                    erph  erpv      erp  effht    bear  dist cnfs  margin  ang wtplng wtplat
KWT  KWTDVB153          H                      30.0 -99.9   D   29.7   14.3  193.4  94.4  57.0   3.89 170.0  47.47  28.94
KWT  KWTDVB153          H                      30.0 -99.9   D   29.6   13.8  194.0  96.2  58.0   4.50  80.0  47.46  28.93
KWT  KWTDVB153          H                      30.0 -99.9   D   29.5   13.1  194.9  96.4  57.7   4.32 190.0  47.45  28.93
KWT  KWTDVB153          H                      30.0 -99.9   D   29.4   12.3  195.9  98.6  57.2   3.99 200.0  47.42  28.91
KWT  KWTDVB153          H                      30.0 -99.9   D   29.3   11.5  196.9  97.9  57.0   3.85 210.0  47.41  28.92
KWT  KWTDVB153          H                      30.0 -99.9   D   29.2   10.7  197.9  97.0  55.8   3.23 220.0  47.39  28.94
KWT  KWTDVB153          H                      30.0 -99.9   D   29.1   10.0  198.8  96.2  52.0   1.62 230.0  47.38  28.95
```

4   Some definitions:

Acceptable Channel

Refers to the channel(s) which is/are notified by the administration for a digital requirement.

If the submitted frequency requirement is a flexible channel, the frequency channels already in the GE06D Plan for that transmitter site (identified by the location) are discarded.

Flexible Channel

In the case where the user wants to analyze the situation of a digital requirement for all the acceptable frequency channels of the UHF frequency band, the requirement should contain the following information:

–   for UHF: channel 69, frequency 858 MHz

This option is only valid for the ATU/ASMG compatibility analyses.

The compatibility analysis software will scan the band on a channel-by-channel basis to assess incompatibilities. In this case, the software is calculating the service area of the digital requirement, taking into account the lowest acceptable frequency (i.e. the worst-case scenario).

Available (Av) Channel

Refers to the channel(s) among the list of Acceptable Channels, which are determined by the planning software to be compatible with other primary services in the GE06L List, hence available for assigning to a digital requirement.

Assignable Channel

Refers to the channel(s) among the list of Available Channels, which are determined by the planning software to be compatible with assignments and requirements to digital broadcasting services and other primary services.

In the case where there is no Available Channel identified for a digital requirement due to incompatibilities with assignments to digital and/or other primary services in the List, it is not possible to assign a channel to the digital requirement

Assigned (As) Channel

Refers to the frequency channel, among the list of Available Channels, which is already assigned to a digital assignment recorded in the Master Register.

Affected (Aff) Channel

Refers to the channel of the digital or OPS assignments or requirements of the affected administration, which is identified by the compatibility analysis.

Interfering (Int) Channel

refers to the channel of the interfering digital or OPS assignments or requirements of another administration (the same administration if self-incompatibility is considered), which is identified by the compatibility analysis.

_____