Report Production procedure @ ESO
User Guide

Author: Francesco Andreetto
PhD Student @ UniBo
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Introduction

Hi! Welcome to the tutorial on how to produce the Reports for the LNAs chain tests performed at ESO ALMA Laboratory!
I hope you can find here all the info you need, if something goes wrong feel free to contact me at francesco.andreetto2@unibo.it I will be happy to help!

0. Setting the environment

It is always recommended to work in a protected environment. If you don't have one already here you can see how to create one.
Open the **Anaconda Prompt** from "Start" as Administrator.

Create a virtual environment called ESO by digiting:

```
conda create --name ESO python=3.9
```

Activate the virtual environment:

```
conda activate ESO
```

Install packages using:

```
conda install ……
```

Some of them might be:

- ★ pathlib
- ★ rich

Also these two commands might be needed:

```
conda install -c conda-forge python-docx
conda install -c conda-forge pypdf2
```

Once you have your environment ready with the packages, you can start with the preparation of the files needed for the report.

1. Preparation

The longest part is the preparation, it can require some time. Have fun! 😀

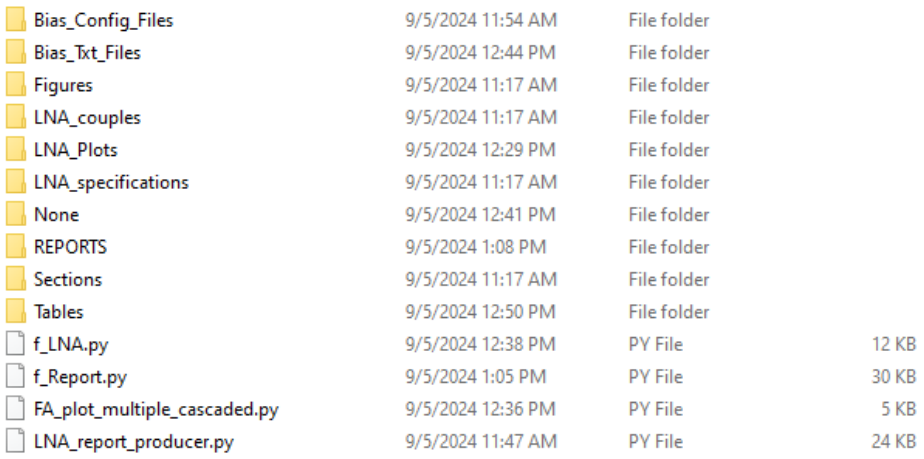
1.1 Python Scripts

The python scripts you need are four, be sure to have those in your directory:

1. `f_LNA.py`
2. `FA_plot_multiple_cascaded.py`
3. `f_Report.py`
4. `LNA_report_producer.py`

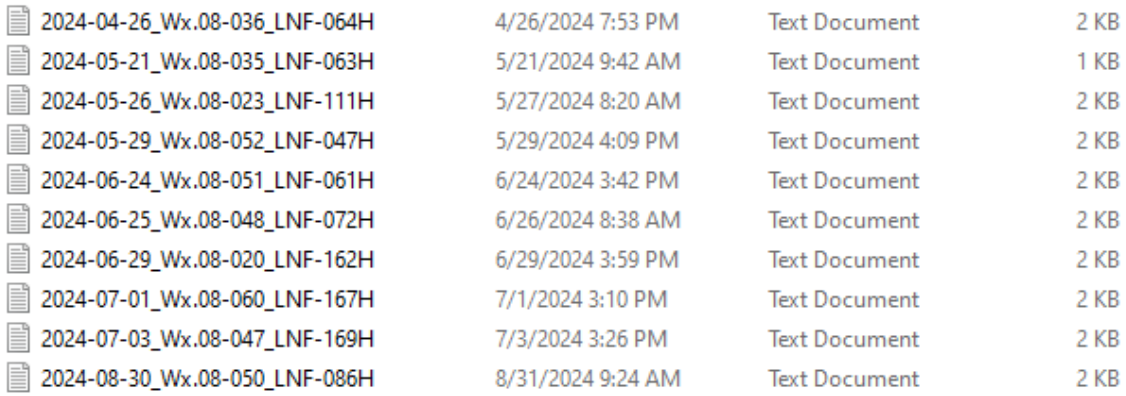
1.2 Directories

Then, you will need these directories:



1.2.1 Bias Configuration Files

The dir `Bias_Config_Files` must contain all the configuration files:



They are produced by the measuring procedure and can be found on the Lab computer at C:\Data\Measurements

These files are used to populate the table of the **Read Out Values** in the section 4 of the Report and following. Those values are for reference only, they are not necessarily taken with the final optimized bias settings.

A configuration file per LNA is needed and the content of each of those is something like that:

```
Date:       2024-04-26

LNAs configuration:         Wx.08-036_LNF-064H
Variable temperature load:  Kooi

50K stage:  294.84 K
4K  stage:  293.86 K
VTL  temp:  297.54 K
LNA  temp:  -1.00 K

LNA_1_Vd1:  0.60 V
LNA_1_Id1:  3.61 mA
LNA_1_Vg1:  0.15 V
LNA_1_Vd2:  0.90 V
LNA_1_Id2:  9.70 mA
LNA_1_Vg2:  0.16 V
LNA_1_Vd3:  0.80 V
LNA_1_Id3:  4.82 mA
LNA_1_Vg3:  0.16 V

LNA_2_Vd1:  0.70 V
LNA_2_Id1:  3.03 mA
LNA_2_Vg1:  0.26 V
LNA_2_Vd2:  1.40 V
LNA_2_Id2:  6.01 mA
LNA_2_Vg2:  0.12 V
LNA_2_Vd3:  1.20 V
LNA_2_Id3:  7.05 mA
LNA_2_Vg3:  0.33 V

Output power:  -37.25 dBm

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Date:       2024-04-26

LNAs configuration:         Wx.08-036_LNF-064H
Variable temperature load:  Kooi

50K stage:  34.58 K
4K  stage:  4.14 K
VTL  temp:  4.12 K
LNA  temp:  -1.00 K

LNA_1_Vd1:  0.60 V
LNA_1_Id1:  3.62 mA
LNA_1_Vg1:  0.29 V
LNA_1_Vd2:  0.90 V
LNA_1_Id2:  9.70 mA
LNA_1_Vg2:  0.30 V
LNA_1_Vd3:  0.80 V
LNA_1_Id3:  4.81 mA
LNA_1_Vg3:  0.29 V

LNA_2_Vd1:  0.70 V
LNA_2_Id1:  3.03 mA
LNA_2_Vg1:  0.34 V
LNA_2_Vd2:  1.40 V
LNA_2_Id2:  5.98 mA
LNA_2_Vg2:  0.19 V
LNA_2_Vd3:  1.20 V
LNA_2_Id3:  7.04 mA
LNA_2_Vg3:  0.40 V

Output power:  -32.04 dBm

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```

1.2.2 Bias Txt Files

The dir `Bias_Txt_Files must` contain all the bias files:

These files are produced during the measuring procedure and can be found on the Lab computer at C:\Data\Measurements

Gotta catch'em all!

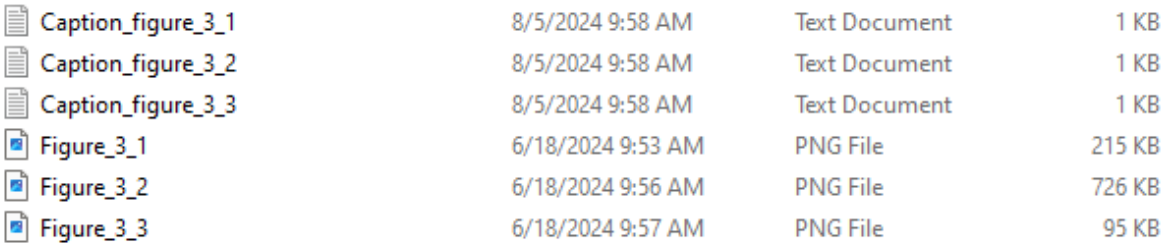
Those files are used for two tasks:

1. To produce the plots of the Gain and Noise Temperature in function of the frequency.

2. To fill the table with the best bias configuration used in the tests. In fact, every file name contains the best bias configuration for that specific chain, meaning that the chain performs the best with those values: low Noise Temperature and Uniform Gain among all the Band.

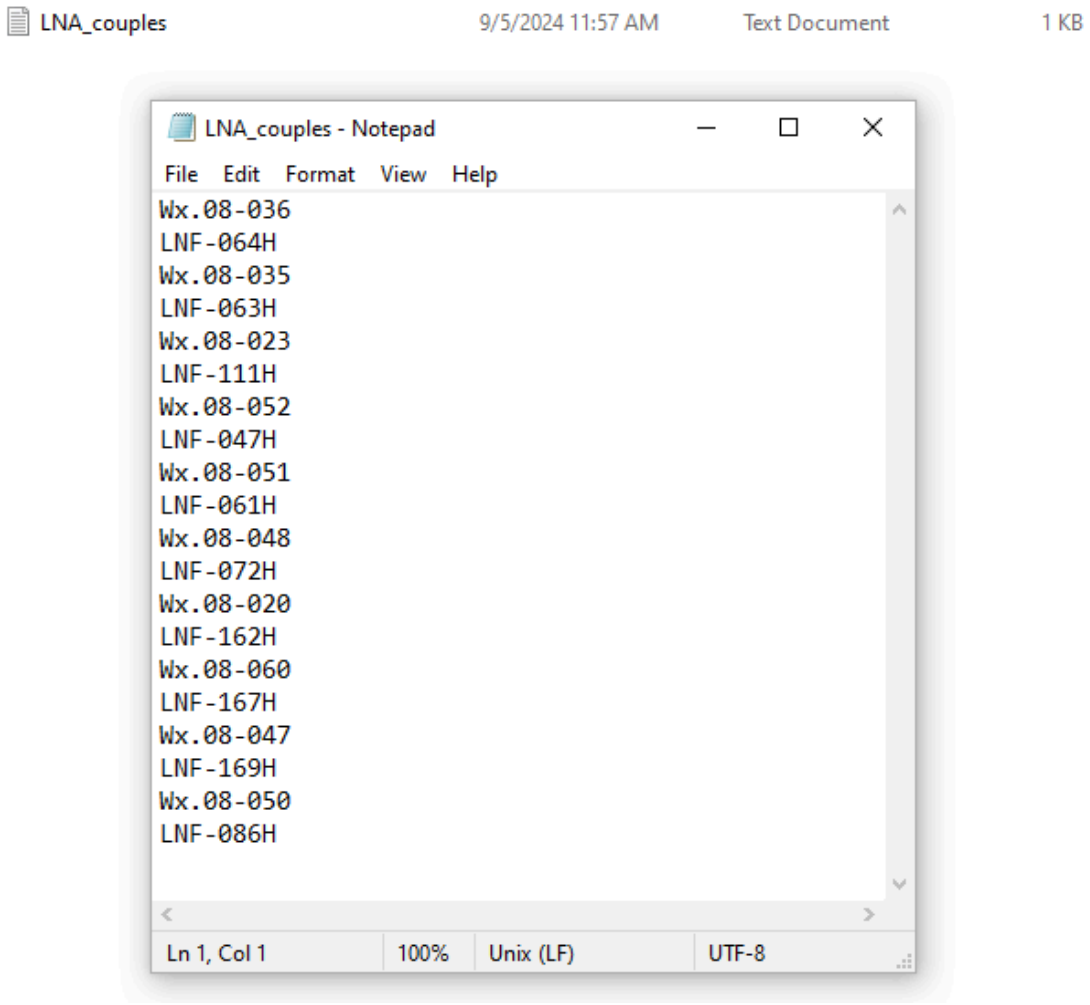
1.2.3 Figures

The `Figures` dir must contain figures and captions for the figures. Just copy these files from a previous Batch directory: they are unchanged 🙂



1.2.4 LNA_Couples

The `LNA_Couples` dir must contain only a txt file on which are written the names of the LNAs of the batch arranged as follows:



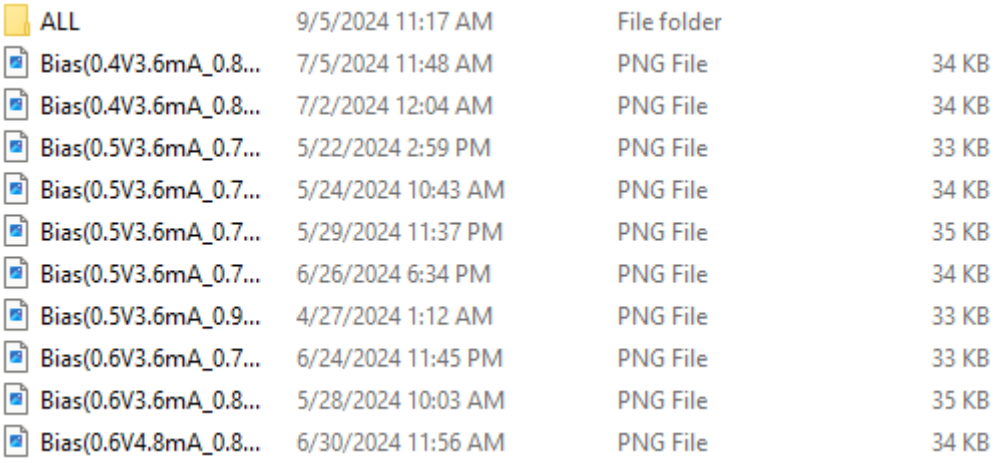
Note that:

1. On even lines there is always the MPI amplifier name, on Odd lines there is always the LNF amplifier name.

2. Do not leave white spaces or white lines at the beginning of the file or between two LNAs' names

1.2.5 LNA_Plots

The `LNA_Couples` dir must contain a dir called ALL and the plots of the Gain and Noise Temperature in function of the frequency of every chain.



ALL	9/5/2024 11:17 AM	File folder	
Bias(0.4V3.6mA_0.8...	7/5/2024 11:48 AM	PNG File	34 KB
Bias(0.4V3.6mA_0.8...	7/2/2024 12:04 AM	PNG File	34 KB
Bias(0.5V3.6mA_0.7...	5/22/2024 2:59 PM	PNG File	33 KB
Bias(0.5V3.6mA_0.7...	5/24/2024 10:43 AM	PNG File	34 KB
Bias(0.5V3.6mA_0.7...	5/29/2024 11:37 PM	PNG File	35 KB
Bias(0.5V3.6mA_0.7...	6/26/2024 6:34 PM	PNG File	34 KB
Bias(0.5V3.6mA_0.9...	4/27/2024 1:12 AM	PNG File	33 KB
Bias(0.6V3.6mA_0.7...	6/24/2024 11:45 PM	PNG File	33 KB
Bias(0.6V3.6mA_0.8...	5/28/2024 10:03 AM	PNG File	35 KB
Bias(0.6V4.8mA_0.8...	6/30/2024 11:56 AM	PNG File	34 KB

Those files can be obtained in two ways:

1. They are produced automatically by the measuring procedure and can be found on the Lab computer at C:\Data\Measurements

2. Can be produced with the `FA_plot_multiple_cascaded.py` script once you collect all Bias files in a folder. It will take a few minutes more but it is really nice indeed. Do as follows:

- Go to: Start >> Search >> Anaconda Prompt
- Run it as Administrator.
- Activate the virtual environment by digiting:
  `conda activate ESO`
- Then navigate to the folder where you placed your script.
  `Default Example: C:\Users\Operator\Desktop\Python_Scripts`
- Run the script passing the folder where you placed your bias txt files:
  `python FA_plot_multiple_cascaded.py --path path/to/the/bias/txt/files/`

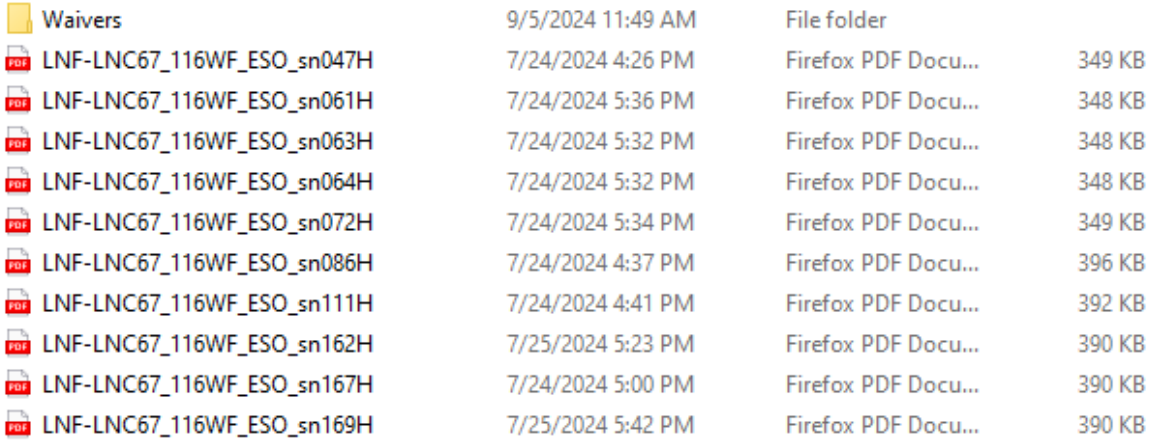
  `Default Example: python FA_plot_multiple_cascaded.py --path New_Batch\Bias_Txt_Files`
- Enter the folder and select in the “Results” folder the plots you need.
  At this point of the report production (2024-09-05) you only need those without the specification lines (80% and 100%) so just avoid those.
  Maybe they will come useful in the future, maybe not 🙂
- You will find in the same “Results” folder the plot with all the curves. Rename that one as `“Plot_All.png”` and copy it in a new folder called `“LNA_Plots/ALL”.`
  The code will pick up this png for the last section of the report.

- You are done: your plots are really nice this way! 😁 Note that their names are different from the ones obtained with the previous method as they all start with “Single_Plot”. No worries: the code is smart enough to accept it 😉

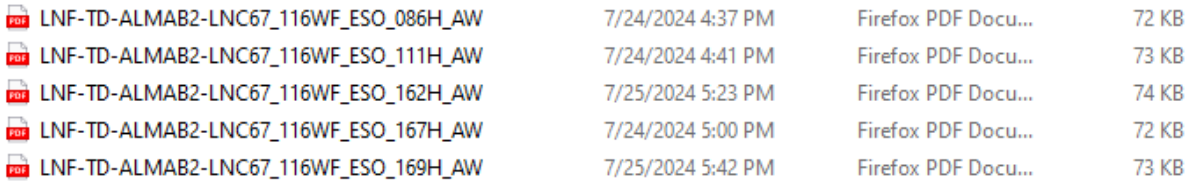
1.2.6 LNA_Specifications

The `LNA_Specifications` dir must contain two dir:

The `LNF_Specifications` dir must contain the specs files for each single LNF LNA and a dir with the waivers:

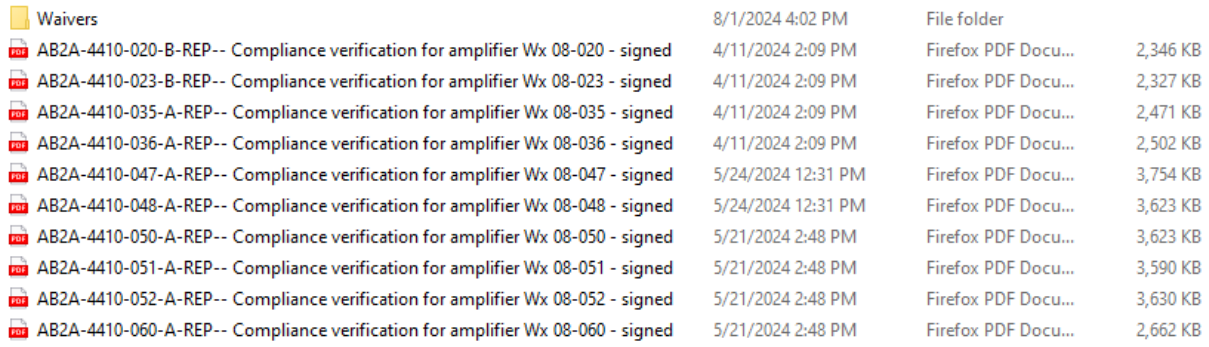


Waivers files have a different name and can be easily recognized:



Note that you usually don’t have the waivers files for all the LNAs.

The `MPI_Specifications` dir must contain the specs files for each single MPI LNA and a dir with the waivers:



Up to now we don't have waivers files from MPI. Let's hope that once we receive them they will have a suitable format. If that will not be the case, please be prepared to modify the function `create_waivers_file` in the script `f_Report.py` or write me if you prefer 🙂

1.2.7 REPORTS

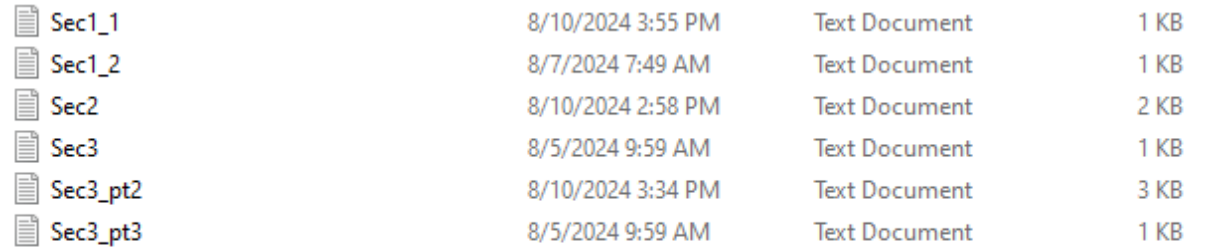
The `REPORTS` dir must contain the template for the report named as showed:

Please do not modify the name of the template. If you do so because you like another more it's ok but be aware of changing it also in the `LNA_report_producer.py` in the Report Production section (around line 78).

The script will duplicate this template and write in the new document called "LNA_Report" all the information that will be produced.

1.2.8 Sections

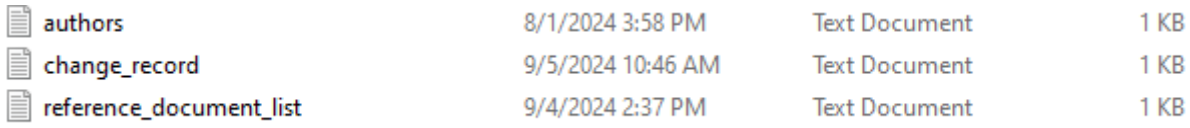
The `Section`s` dir must contain these files:



Just copy these files from a previous Batch directory: they are unchanged so please do not modify them 🙂

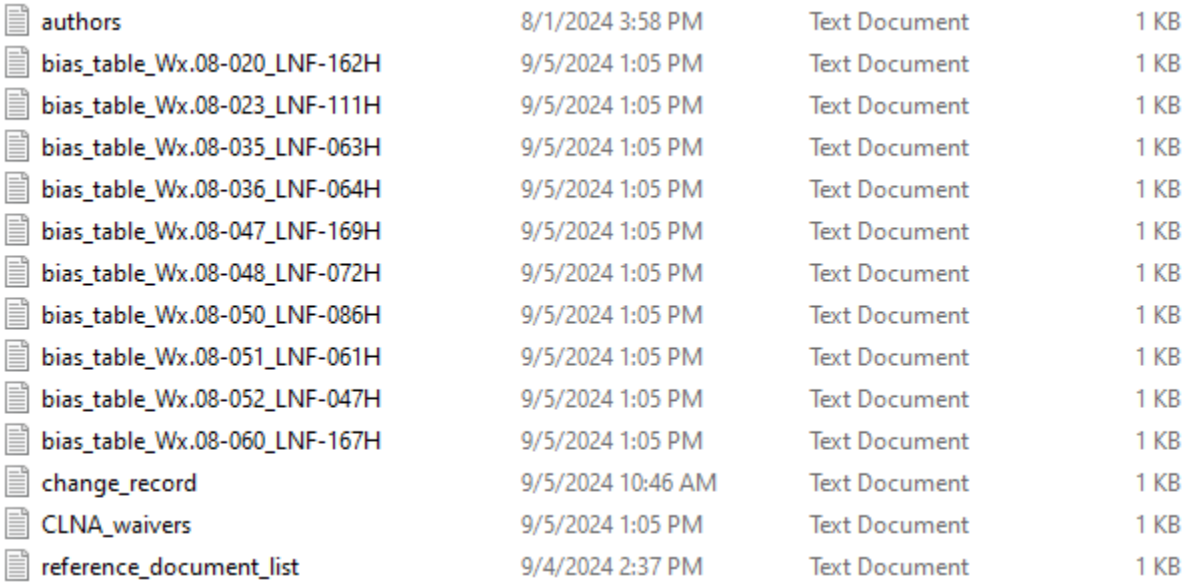
1.2.9 Tables

The `Tables` dir must contain these three files:



Just copy these files from a previous Batch directory: if something changed from the previous Report (i.e. an Author) feel free to modify them 😉

All the other files used to fill the tables will be produced during the procedure. In the end your `Tables` dir will be something like this:



2. Run the script

It is now time to run the script. Do as follows:

- Go to: Start >> Search >> **Anaconda Prompt**
- Run it as Administrator.
- Activate the virtual environment by digiting:
  `conda activate ESO`
- Then navigate to the folder where you placed your script.
  `cd Users/Operator/Desktop/my_folder/`

`Default Example:`
`cd C:\Users\Operator\Desktop\Python_Scripts\Report_Script\New_Batch`

- Run the code:
  `python LNA_report_producer.py`
  If you face a **Permission Denied** don't panic: you just have to close this Word file.
- After around 20 seconds you can find your resulting report in the folder "REPORTS"

— End of the document —

If something went wrong, check if the one you are reading is the final version of the procedure! You can find this document online at the following link: https://docs.google.com/document/d/1JuIKi3SuXUUqKhdzp8eB7WSPmT4JXkS-nISKNs9vWPY/edit?tab=t.0