Оценка активностей контрольных образцов, измеренных на РУБ-01-П1.

Импортируем библиотеки

In [ ]:
```
import matplotlib.pyplot as plt
from turtle import color
import pandas as pd
import numpy as np
import seaborn as sns
import plotly.express as px
from plotly.subplots import make_subplots
import plotly.graph_objects as go
# print(plt.style.available)
plt.style.use('ggplot')
```

Строим функцию разделения данных по нуклиду

In [ ]:
```
def K_Sr_split(data):
    data_K = data[data['sorce'].str.contains('K')]
    data_Sr = data[data['sorce'].str.contains('Sr')]
    return data_K, data_Sr
```

Строим функций вычисления относительной и абсолютной погрешности

In [ ]:
```
mass = [0.02, 0.05, 0.1, 0.15, 0.2, 0.25]
def relative_err_func(data, Act_BG):
    relative_err = ((data[mass] - Act_BG[mass]) * 100)/Act_BG[mass]
    relative_err['Total'] = relative_err.mean(axis = 1)
    relative_err['sorce'] = Act_BG['sorce']
    relative_err['sample_num'] = data['sample_num']
    return relative_err

def err_func(data, Act_BG):
    err = (data[mass] - Act_BG[mass])
    err['Total'] = err.mean(axis = 1)
    err['sorce'] = Act_BG['sorce']
    err['sample_num'] = data['sample_num']
    return err
```

Данные, полученные на базе БелГидроМет

In [ ]:
```
data = pd.DataFrame(columns=['sample_num', 0.02, 0.05, 0.1, 0.15, 0.200, 0.25])
data.loc[len(data.index)] = [1, 0.18, 0.23, 0.31, 0.54, 0.57, 0.64]
data.loc[len(data.index)] = [2, 0.37, 0.68, 1.58, 2.04, 2.61, 3.46]
data.loc[len(data.index)] = [3, 0.78, 1.29, 2.47, 4.35, 5.22, 5.84]
data.loc[len(data.index)] = [4, 1.52, 2.20, 4.31, 8.25, 9.10, 10.56]
data.loc[len(data.index)] = [5, 1.61, 4.39, 6.68, 10.03, 13.28, 15.36]
data.loc[len(data.index)] = [6, 0.52, 0.92, 1.52, 2.48, 2.61, 3.47]
data.loc[len(data.index)] = [7, 0.62, 0.78, 0.97, 1.14, 1.54, 1.83]
data.loc[len(data.index)] = [8, 0.28, 0.41, 1.01, 1.40, 1.68, 2.14]
data.loc[len(data.index)] = [9, 0.25, 0.70, 1.47, 1.67, 2.01, 2.50]
data.astype('float')
```

Out[ ]:

	sample_num	0.02	0.05	0.1	0.15	0.2	0.25
0	1.0	0.18	0.23	0.31	0.54	0.57	0.64
1	2.0	0.37	0.68	1.58	2.04	2.61	3.46
2	3.0	0.78	1.29	2.47	4.35	5.22	5.84
3	4.0	1.52	2.20	4.31	8.25	9.10	10.56
4	5.0	1.61	4.39	6.68	10.03	13.28	15.36
5	6.0	0.52	0.92	1.52	2.48	2.61	3.47
6	7.0	0.62	0.78	0.97	1.14	1.54	1.83
7	8.0	0.28	0.41	1.01	1.40	1.68	2.14
8	9.0	0.25	0.70	1.47	1.67	2.01	2.50

Данные по активности.

In [ ]:
```
Act = pd.read_csv('Activity_BelGIM_sorces.csv')
Act_BG = pd.DataFrame(columns=['sample_num', 0.02, 0.05, 0.1, 0.15, 0.200, 0.25])
Act_BG['sample_num'] = [1, 2, 3, 4, 5, 6, 7, 8, 9]
for i in data['sample_num']:
    for j in data.columns[1:]:
        a = float(Act['Activity'][Act['sample_num'] == i].values)
        Act_BG[j][i-1] = j * a

Act_BG['sorce'] = Act[Act.columns[0]]
data['sorce'] = Act[Act.columns[0]]
Act_BG_K, Act_BG_Sr = K_Sr_split(Act_BG)
data_K, data_Sr = K_Sr_split(data)

Act_BG
```

```
C:\Users\fitu2\AppData\Local\Temp\ipykernel_15044\2953894738.py:7: SettingWithCopyW
arning:
A value is trying to be set on a copy of a slice from a DataFrame

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stable/
user_guide/indexing.html#returning-a-view-versus-a-copy
  Act_BG[j][i-1] = j * a
```

Out[ ]:

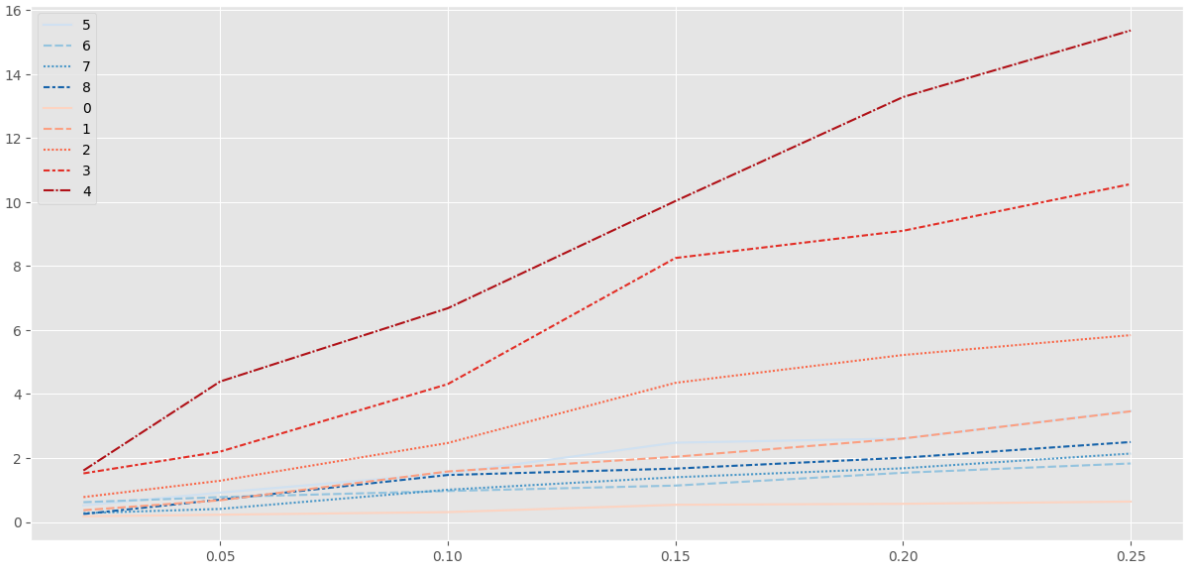
	sample_num	0.02	0.05	0.1	0.15	0.2	0.25	sorce
0	1	0.0426	0.1065	0.213	0.3195	0.426	0.5325	Sr_1_A=2.13
1	2	0.2192	0.548	1.096	1.644	2.192	2.74	Sr_2_A=10.96
2	3	0.4206	1.0515	2.103	3.1545	4.206	5.2575	Sr_3_A=21.03
3	4	0.6112	1.528	3.056	4.584	6.112	7.64	Sr_4_A=30.56
4	5	0.9914	2.4785	4.957	7.4355	9.914	12.3925	Sr_5_A=49.57
5	6	0.292	0.73	1.46	2.19	2.92	3.65	K_1_A=14.6
6	7	0.148	0.37	0.74	1.11	1.48	1.85	K_2_A=7.4
7	8	0.206	0.515	1.03	1.545	2.06	2.575	K_3_A=10.3
8	9	0.24	0.6	1.2	1.8	2.4	3.0	K_4_A=12

Визуальная оценка данных: как видно, данные, полученные от одного источника линейны в зависимости от массы навески

In [ ]:
```
fig = plt.figure(figsize=(15, 7))

sns.lineplot(data_K[mass].T, palette='Blues')
sns.lineplot(data_Sr[mass].T, palette='Reds')
```

Out[ ]: <AxesSubplot: >

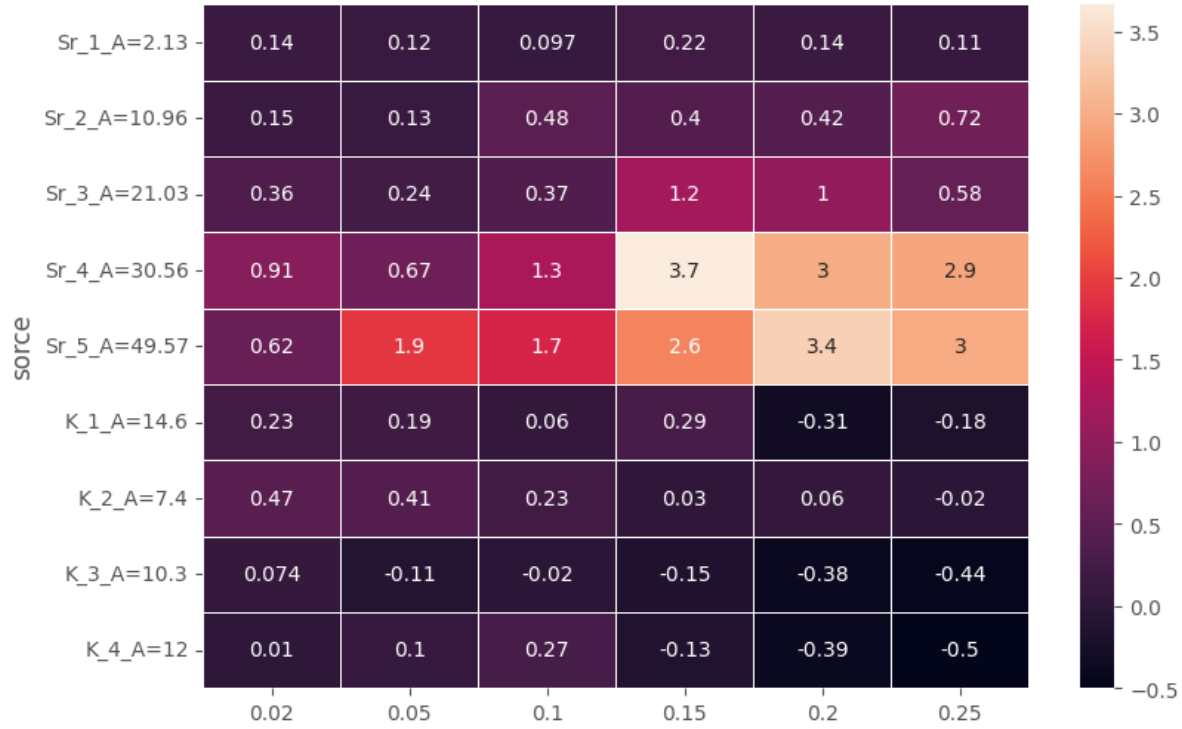


Абсолютная погрешность

In [ ]:
```
err = err_func(data, Act_BG)
err_K = err_func(data_K, Act_BG_K)
err_Sr = err_func(data_Sr, Act_BG_Sr)
```

In [ ]:
```
t = err[mass].astype('float')
t.index = err['sorce']
f, ax = plt.subplots(figsize=(9, 6))
sns.heatmap(t, annot=True, linewidths=.5, ax=ax)
```

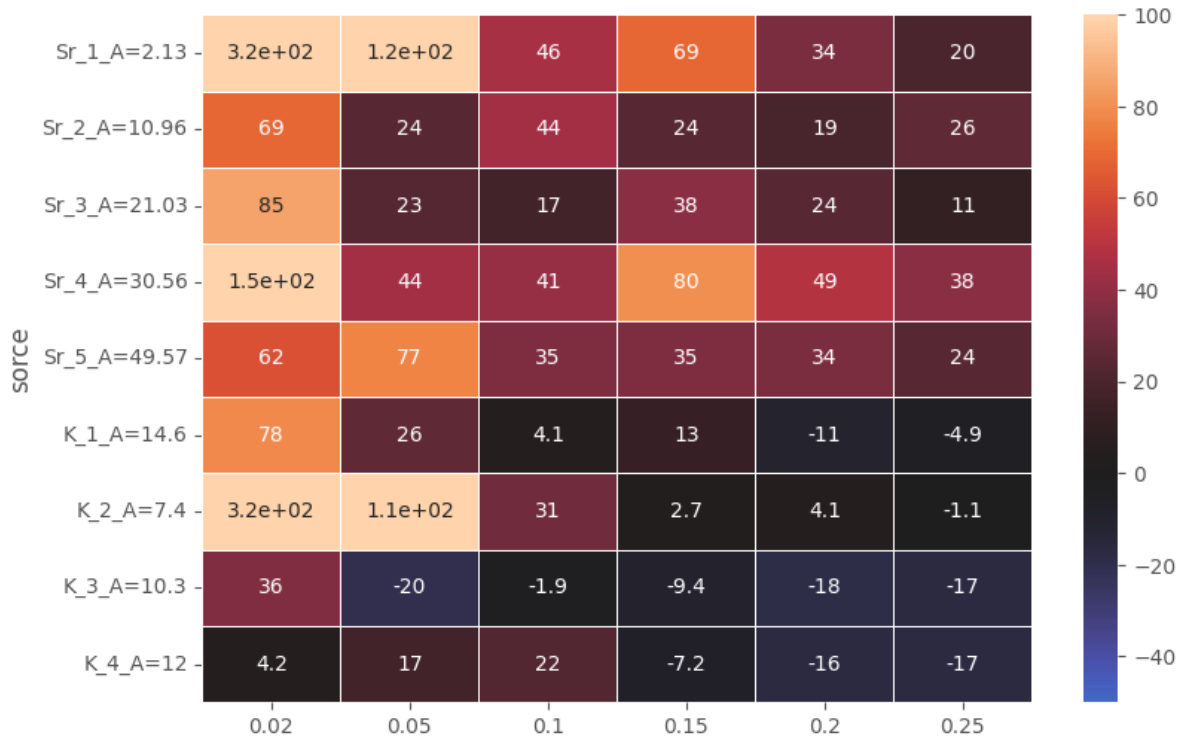
Out[ ]: <AxesSubplot: ylabel='sorce'>



Относительная погрешность

In [ ]:
```
relative_err_All = relative_err_func(data, Act_BG)
relative_err_K = relative_err_func(data_K, Act_BG_K)
relative_err_Sr = relative_err_func(data_Sr, Act_BG_Sr)
rt = relative_err_All[mass].astype('float')
rt.index = relative_err_All['sorce']
f, ax = plt.subplots(figsize=(9, 6))
sns.heatmap(rt, vmin=-50, vmax=100, center= 0, annot=True, linewidths=.5, ax=ax)
```

Out[ ]: <AxesSubplot: ylabel='sorce'>



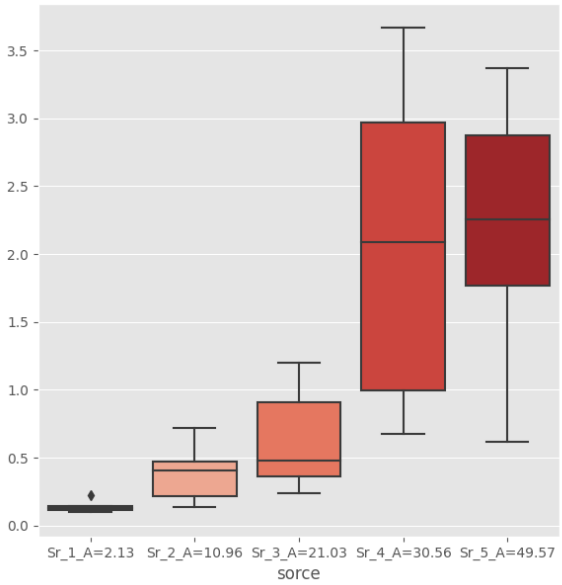
Распределение абсолютной погрешности.

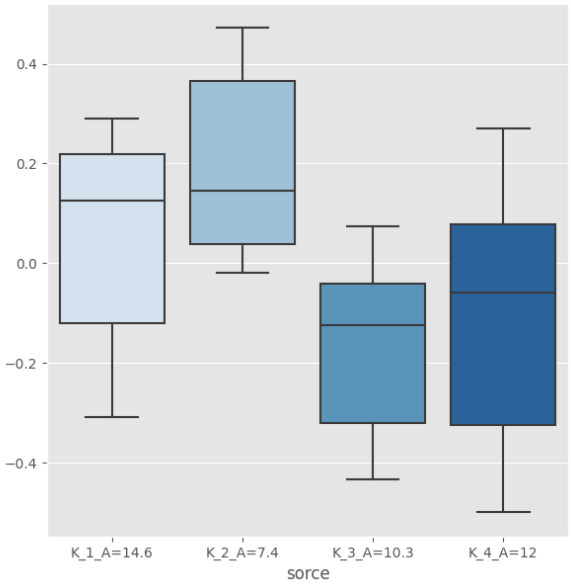
In [ ]:
```
d = err[mass].T
d.columns = err['sorce']
d_K = err_K[mass].T
d_K.columns = err_K['sorce']
d_Sr = err_Sr[mass].T
d_Sr.columns = err_Sr['sorce']
d.to_csv('err_RYP.csv')

fig, ax = plt.subplots(1, 2, figsize=(15, 7))

sns.boxplot(d_Sr, palette='Reds', ax=ax[0])
sns.boxplot(d_K, palette='Blues', ax=ax[1] )
```

Out[ ]:
```
<AxesSubplot: xlabel='sorce'>
```





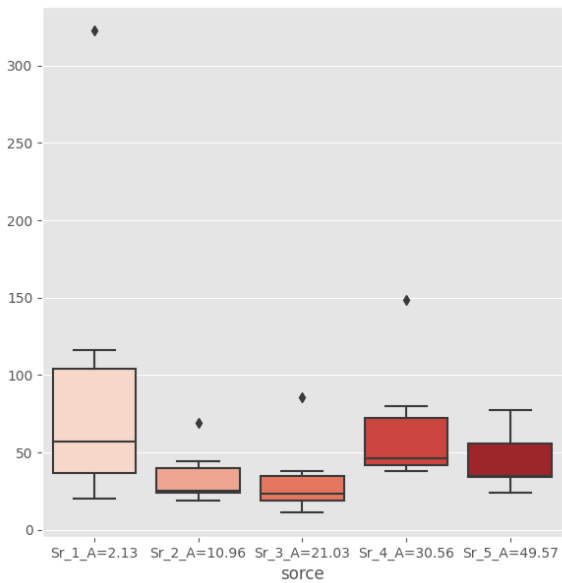
Распределение относительной погрешности.

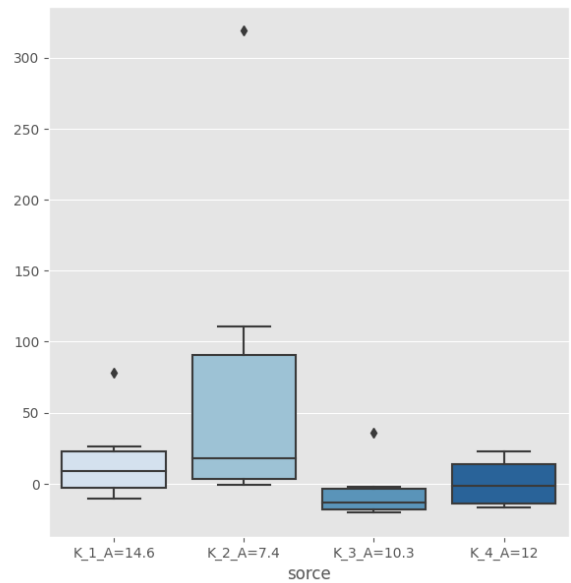
In [ ]:
```
relative_d = relative_err_All[mass].T
relative_d.columns = relative_err_All['sorce']
relative_d_K = relative_err_K[mass].T
relative_d_K.columns = relative_err_K['sorce']
relative_d_Sr = relative_err_Sr[mass].T
relative_d_Sr.columns = relative_err_Sr['sorce']

fig, ax = plt.subplots(1, 2, figsize=(15, 7))

sns.boxplot(relative_d_Sr, palette='Reds', ax=ax[0])
sns.boxplot(relative_d_K, palette='Blues', ax=ax[1] )

relative_d.columns = Act_BG['sorce']
relative_d.to_csv('relativ_err_RYP.csv')
```





In [ ]: