



STAX Project – Data analysis and interactive data access

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POSTER

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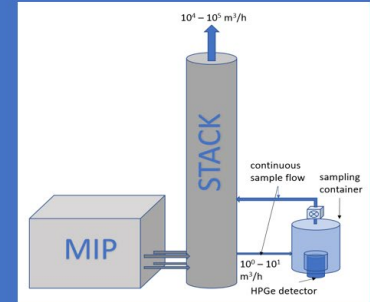


Emissions of Xenon isotopes from nuclear fission based medical isotope production is the main source of background in the IMS noble gas network. The global emissions of radioxenon from the major MIPs are about 10 higher than the emissions from all NPPs worldwide (Achim et al 2016, Gueibe et al 2017). The STAX project (Source Term Analysis of Xenon) aims at the characterization of the origin of the Xenon measured at IMS sites.

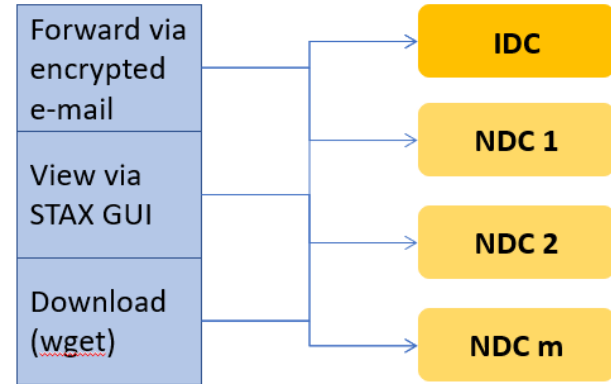
STAX is an experimental network of sensors to detect and quantify emissions of xenon isotopes from Medical Isotope Production (MIP) facilities and other nuclear facilities. Using results from atmospheric transport modelling, the impact on the measured concentrations at IMS sites can be estimated based on the measured emissions.

STAX network - technical design

- Radioxenon and other radionuclide emissions are measured by detectors installed in the stack of MIPs
- For sampling and measurement, gas is branched off the stack and flows continuously through a sampling chamber where it is measured by a HPGe detector system
- 96 samples with 15 minutes acquisition time are produced daily and sent to a central data server



- Data messages from the monitoring facilities to the data server are sent via authenticated and encrypted e-mail messages.
- MIP operators can set delay times for sending of messages, in order to allow for time for data review, before data are distributed further to authorized users.
- Data are only accessible to authorized users and access is approved for each individual facility separately, so that a given user only has access to the specifically assigned facilities.
- Data are accessible via email, download or can be viewed through the STAX GUI



Data Types

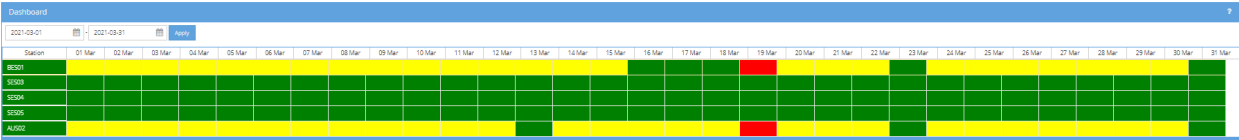
- 15 minutes emission values are reported once per day in a time series file in json format
- System specific State-of-Health data are transmitted every two hours
- Optional, spectra (phd) messages in text file format (STAX1.0) are sent every 15 minutes
- Alert messages are sent, triggered by user defined events

Except for the time series format, the format of the data messages is similar to IMS2.0 format conventions.

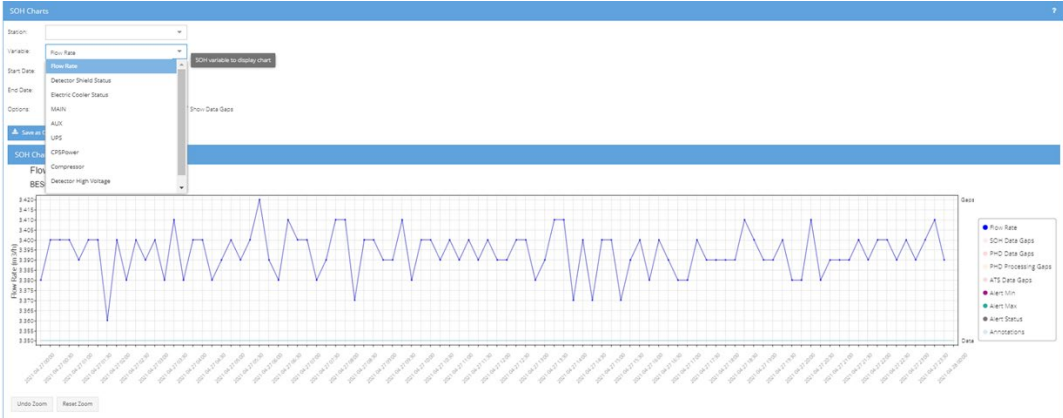
Data viewing (I)

Authorized users can view data via the web based STAX user interface, currently located at stax.isti.com, but will shortly be moved to www.staxdata.net. The STAX user interface provides data viewing tools to display emission data as well as data on the operational network status.

A dashboard view provides an overview on the overall operational status of the network



For viewing details on the State-of-Health data of individual STAX systems, such as air flow rate, power status or detector temperature, measurement system data can be viewed via the SOH chart interface:



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Emission data

An emission chart interface allows to view time series of emissions for all detected isotopes:



Each data point on the chart can be interactively accessed to retrieve its data and value, but also to access the corresponding spectrum chart and to download the associated time series data file.

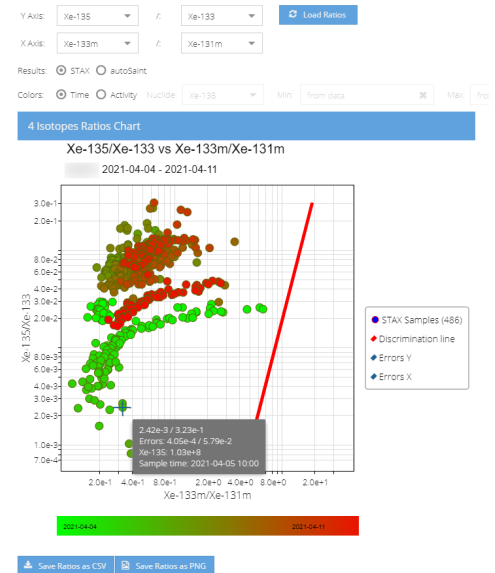
Isotope Ratios Chart interface

Any combination of the isotopes detected during the selected time period can be viewed via the Isotope Ratio Chart

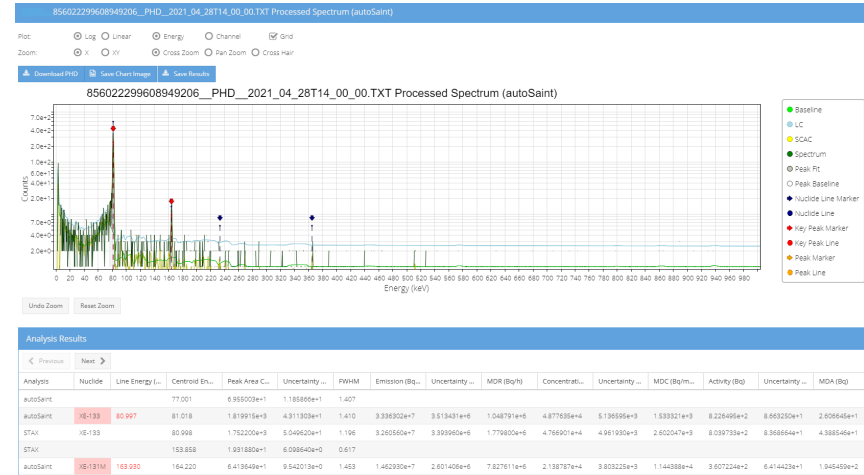
The temporal sequence of ratios can be visualized by a color scheme

Alternatively, to illustrate the temporal sequence, the activity of a selected isotope can be indicated by color

Data of individual data point as well as error bars can be viewed by mouse interaction



- A total of 96 spectra is produced daily per STAX facility, therefore data analysis is fully automated and no regular manual review of data is performed
- To increase the confidence in data quality, samples are analyzed twice in case raw spectra are transmitted to the STAX data server
- Initial data analysis is done at the emitter facility using the STAX measurement systems proprietary software
- Reanalysis is performed using the autosaint algorithm
- Results of both analyses and their differences can be viewed on the emission data chart as well as on the Spectrum viewing interface



References:

- Achim, P., Generoso, S., Morin, M., Gross, P., Le Petit, G., Moulin, C.: Characterization of Xe-133 global atmospheric background: implications for the international monitoring system of the comprehensive nuclear-test-ban treaty; J. Geophys Res-Atmos 121, 2016
- Gueibe, C., Kalinowski, M. B., Bare, J., Gheddou, A., Krysta, M., Kusmierczyk-Michulec, J.: Setting the baseline for estimated background observations at IMS systems of four radionuclide isotopes in 2014; J. Env. Rad., 178-179 (2017)