



CMAS

compact Monitoring and Analysis Solution

cMAS is a highly integrated, modular and flexible HVUHF radio monitoring solution. It is designed for application in civilian and military environments at government agencies, defence signal corps, homeland security agencies and telecommunication authorities.

Due to its scalability cMAS fulfils the requirements for signal processing capabilities of standalone wideband working positions, deployable unmanned surveillance sensors, mobile tactical interception platforms and strategic reconnaissance systems.

- Detection of all activities in the monitored band
- Monitoring of communication networks and frequency bands
- Detection of rarely appearing signals
- Multi-stage classification concept
- Automatic demodulation and decoding of recognised signals
- Storage of results: IF, AF, decoded text
- Job-based control with defined depth of analysis and results
- Compact hardware for stand-alone or system integrated usage

Communication and reconnaissance

Communication changed significantly in the last decades. Satellite communication and internet technology are the trends of the last years. However, hundred thousands of HF, VHF and UHF transmissions are still on air and have to be monitored in order to draw conclusions for actions and preventive measures. For this the monitoring of HF, VHF, UHF signals is an important part of strategic and tactical reconnaissance and of border surveillance.

Especially in tactical out of area operations unknown electromagnetic environments have to be analysed without any preknowledge. To operate radio monitoring in a border surveillance system unmanned operation is needed and signals of interest or the gathered information have to be

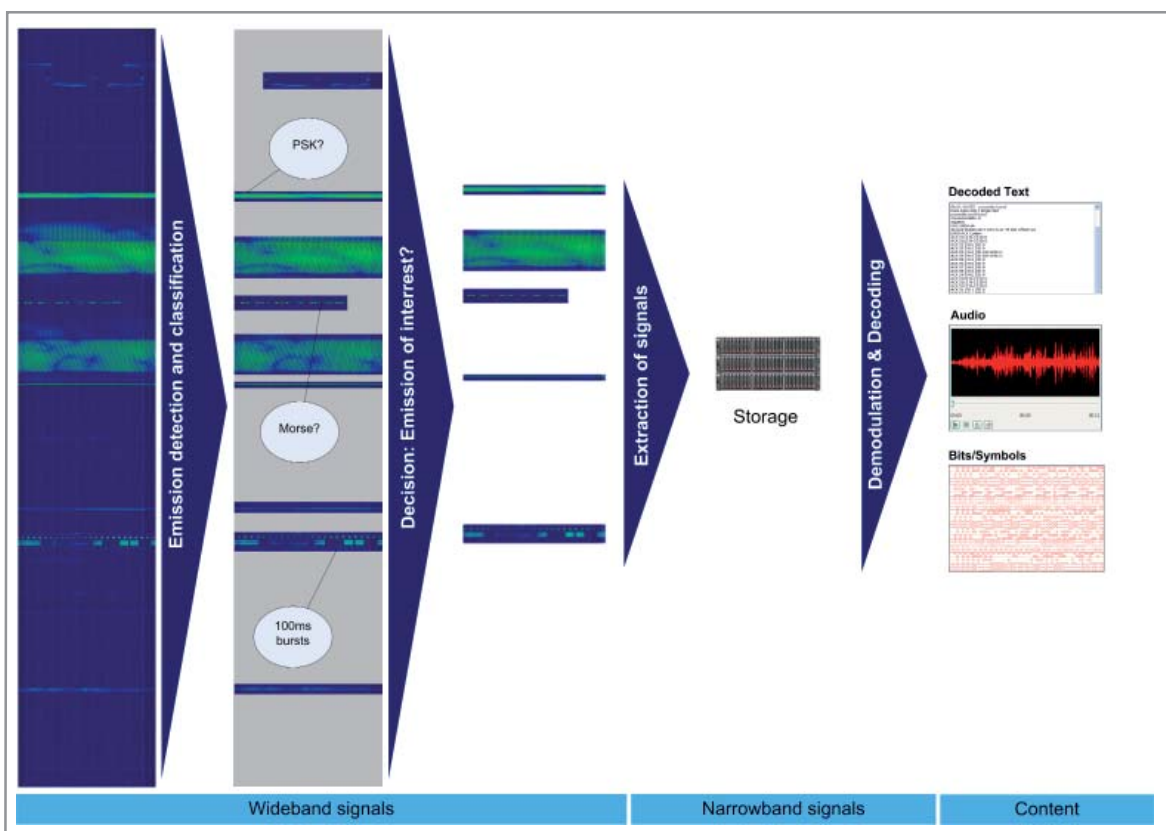
transferred via data links with low transfer rates. Key requirements of strategic intelligence are the reliability of the results and the monitoring of thousands of well-known frequencies. cMAS technology has been successfully deployed to strategic and tactical interception systems and to border surveillance systems.

To roll out reconnaissance systems for all of these areas of application cMAS provides the necessary functionalities: determination of frequency allocation, recording of signal scenarios and signals of interest, automatic processing of digital and analogue signals up to decoded text or hearable voice, selection of interesting signals for listening in or technical analysis.



cMAS is designed to power single user workplaces, semi-mobile unmanned platforms and high-end acquisition systems

Automation of radio monitoring



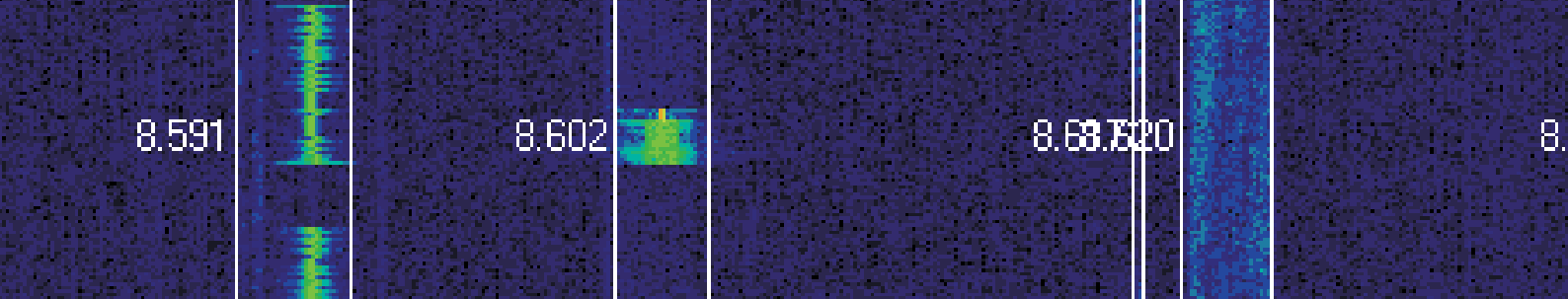
Fully automatic processing of signal scenarios down to the content of a single signal

cMAS automates the standard workflow of radio monitoring. In the interesting frequency range the signal scenario is monitored. Detected activities are classified. If the activity is a signal of interest it is recorded, demodulated to listen in or passed to decoding. The gathered results are stored to a database. Standard signals and frequencies are automatically

processed. This enables the operator to concentrate on the detection and analysis of unknown signals.

The entire functionality is also available for manual, semi-automatic and automatic operation: from interactive signal analysis up to fully automatic signal search, interception and production.





Use Cases

Determination of frequency allocation

cMAS provides the capabilities to provide an overall survey of the signal environment without having any preknowledge about the frequency allocation. In this use case the system searches for energy in a predefined frequency range and determines if the energy could be a signal. The detected

energy is processed up to the level of information that is parameterised for this job: signal detection, specific signal parameters (e.g. SNR, bandwidth), modulation type or transmission method. If parameterised in the job short recordings of the signals are stored in the storage server.

Automatic search and production of known signal types

cMAS is able to search in a predefined frequency range for well-known signal types. This feature includes the search for speech transmissions and for all signals matching a list of transmission methods of interest. The system will run in automatic mode, search for all signals using one of these transmission methods in the defined frequency range, extract and store these signals in a storage server. Job results in form of decoded text or demodulated audio signals are stored in the storage server for evaluation.

Typical job parameters

- List of transmission methods
- Various recognition parameters
- Frequency range
- Minimal SNR level
- Maximal processing length for one signal
- Maximal resource usage

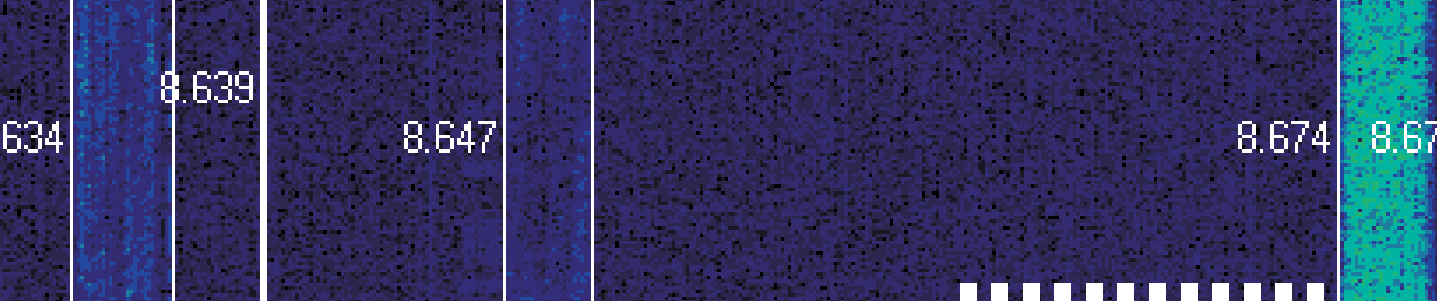
Automatic search and recording of unknown signal types

In this use case cMAS is operated to search for unknown signals without having a known modem list. Only some signal parameters like bandwidth or burst duration are known and will be used to detect and extract the signals. The system will run in automatic mode, search for all signals with these parameters in the defined frequency range, extract and store matching signals in its storage server. Once unknown signals have been analysed and the parameters of the transmission method are determined,

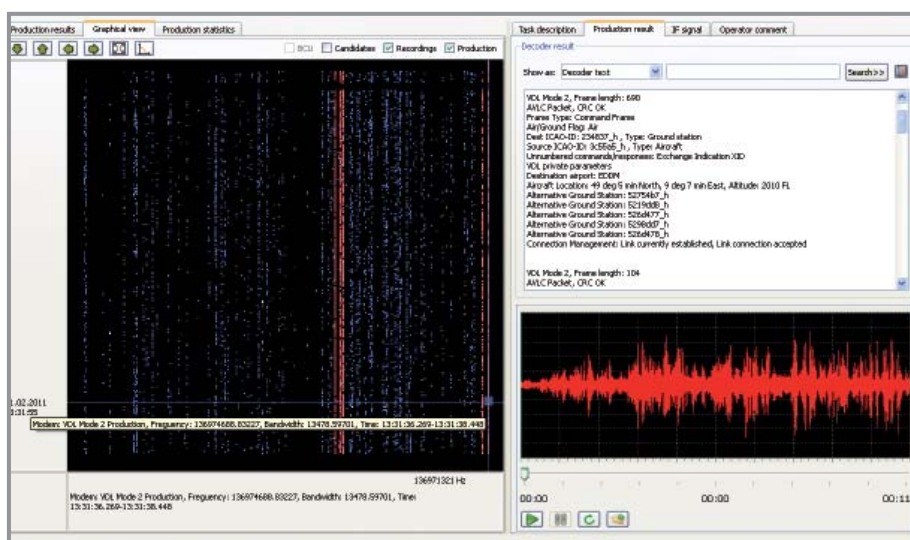
a new transmission method description can be created in the systems knowledge base.

Typical job parameters

- Frequency range
- Minimal SNR level
- Job priority
- Signal parameters: bandwidth range and burst duration range
- Maximal resource usage



Determination of frequency allocation in the HF range: every color indicates a detected signal and a recognised transmission method



Air traffic surveillance in the VUHF range: recognised digital signals (red) and analogue signals (blue) with access to message text and demodulated speech



Use Cases

Automatic frequency monitoring with production

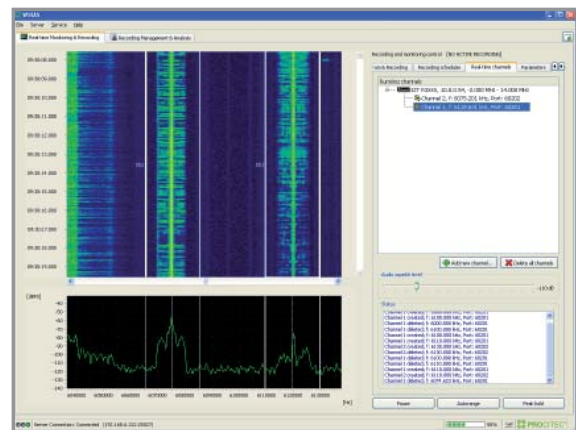
For some operations it is necessary to monitor special frequencies. After starting a frequency monitoring job, the defined frequencies are constantly checked for signal activity. In case of activity the signal is processed without delay. If the type of the active signal matches the list of interesting transmission methods the signal is recorded, demodulated and decoded.

Typical job parameters

- Frequency, list of frequencies
- List of transmission methods with various recognition parameters
- Maximal signal bandwidth

Manual online monitoring of frequencies

For visual real-time monitoring of the electromagnetic spectrum an online spectrogram is provided. The operator observes the current signal scenario in a waterfall display. Zoom and cursor functionality allow for rough estimation of signals. The operator selects signals of interest directly in the online spectrogram for listening or to pass them to narrowband analysis software for technical analysis, demodulation or decoding.



Selection of signals of interest for online listening or realtime narrowband analysis

Recording and offline analysis of frequency ranges

The recording of frequency ranges is triggered by system events, is parameterised as a time based job or is started manually by an operator observing a frequency range. For evaluation the operator uses an offline spectrogram for a quick overview and navigation within the recorded signal

scenarios. Specific emissions can easily be selected and highlighted. For each marked signal of interest a description and text annotation can be added. Selected signals can be exported to file or streamed to arbitrary external signal analysis tools.



We focus on developing software and system solutions for telecommunication engineering, which serve to detect and process communication signals. As technology leader in the field of knowledge-based recognition and processing of modems, we implement systems for both current and future challenges. The most important feature of our software is to provide security: On the one hand our solutions are highly available, reliable, and powerful – on the other hand our solutions contribute to governmental users' information superiority and, as a result, to national security, too. Our scope of products comprises modern technical radio signal analysis workstations up to fully automatic radio monitoring systems.

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