CROATIAN POST AND ELECTRONIC COMMUNICATIONS AGENCY

HAKOM

Supervision Department

October 2011.

- The purpose of supervision is **to prevent unauthorized use of radio frequency spectrum and to protect authorized users**, but also represents a vital process which enables HAKOM experts dealing with planning and radio frequency harmonization to access measuring data.

- HAKOM performs **daily control and supervision** of the radio frequency spectrum

- These tasks are performed via established Frequency Monitoring Radiolocation System (**FMRS**)

- Each part of the system is equipped with sophisticated measuring equipment capable of registering even very low frequency signals, as well as determining the direction from which the signal is coming. Measuring at several locations enables direction finding of the signal and locating the source of electromagnetic radiation.

HAKOM responsibilities

- HAKOM performs measuring, testing, monitoring and **elimination of interferences** in the radio frequency spectrum, caused by communication or technical equipment. Interference is **reported by the licensee** for the use of radio frequency spectrum. In the case of general license, the interference shall be reported by the user of the interfered equipment.

- HAKOM performs **technical inspections on meeting the conditions of the license** for the use of radio frequency spectrum, issued on the basis of public tender or public auction. This technical inspection is performed by HAKOM commission, in accordance with the conditions and terms which are a constituent part of the license, upon receiving the application from the licensee.

- **Technical inspection of radio stations** is an instrument of control and supervision of using the radio frequency spectrum, and is applied only to broadcasting. HAKOM performs technical inspection ex officio upon receiving notification on putting the radio station into service. In addition to performing technical inspections of radio stations in broadcasting, HAKOM may perform technical inspection of any type of radio station if such inspection is deemed necessary or if HAKOM is performing regular control and supervision of the use of radio frequency spectrum. This means that the licensee does not submit request for technical inspection of radio station to HAKOM and that the technical inspection is not the condition for the commencement of the operation.

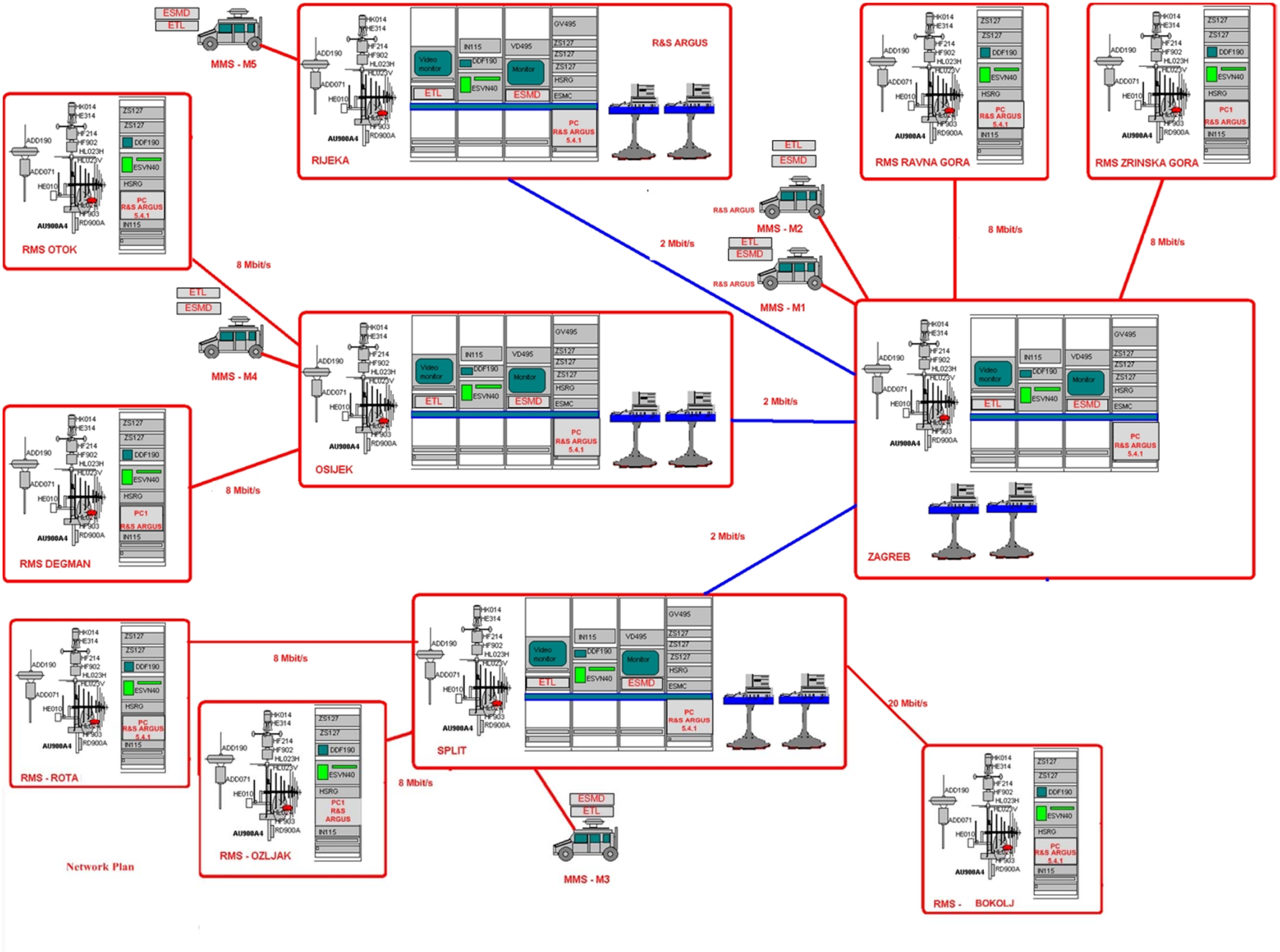
Supervision department

- Supervision deparment has 22 employees but 17 employees are responsible for solving interference problems and performing daily monitoring, control and supervision of the radio frequency spectrum and expert supervisions.
- MMS, RMS and measurement vehicles have monitoring and direction finding capabilities between **9 kHz up to 3 GHz** frequency range. HAKOM has additional instruments and antennas to measure frequencies up to 40 GHz.
- HAKOM employees have daily, weekly and monthly monitoring tasks plus they perform specific monitoring campaigns. Duties include: on-site inspections, RF spectrum monitoring, interference solving issues, expert supervisions.
- HAKOM also performs **expert supervision over the implementation of the Electronic Communications Act** and other regulations adopted pursuant to the Postal Act.

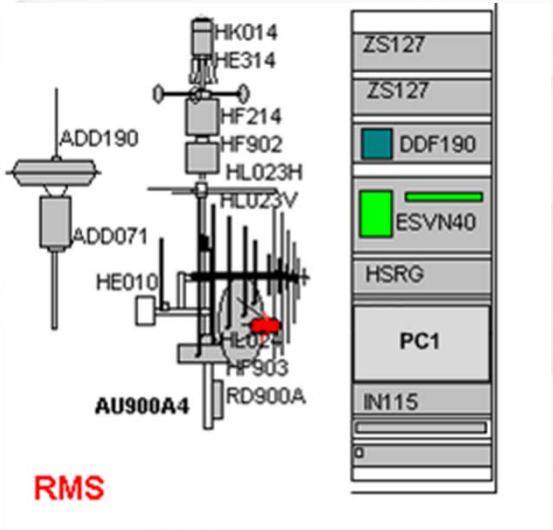
Frequency **M**onitoring **R**adiolocation **S**ystem (**FMRS**)

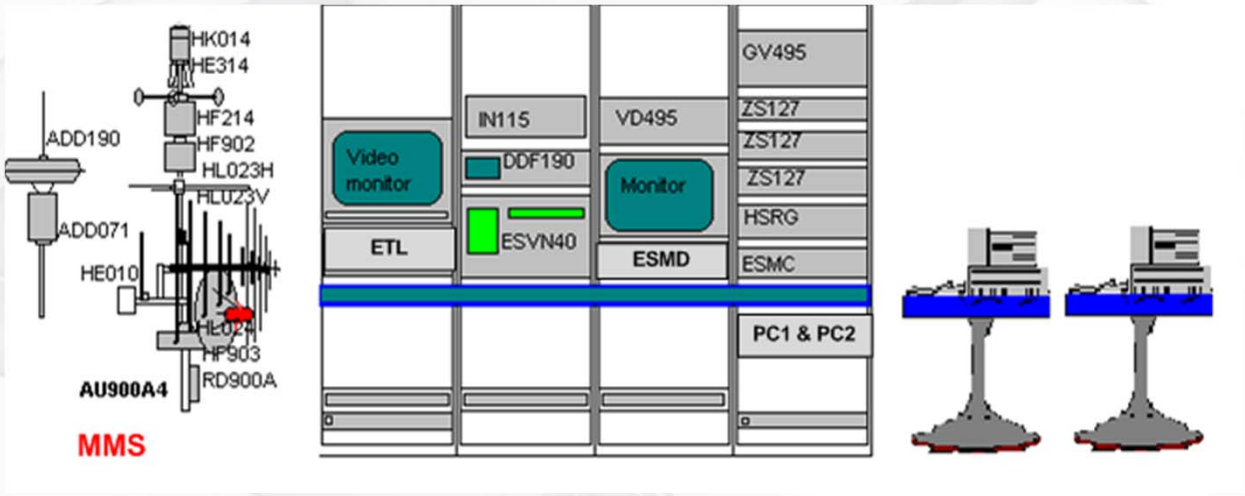
- Since June 1999. the **F**requency **M**onitoring **R**adiolocation **S**ystem (**FMRS**) delivered by Rohde & Schwarz GmbH & Co KG is in operation.
- FMRS is a nation-wide monitoring system that includes following three types of stations:
- **4** *Manned monitoring stations* (**MMS**)
- **6** *Remote monitoring stations* (**RMS**) (**+1** by the end of 2011.)
- **5** *Mobile monitoring stations* (**MS**)= *measurement vehicles*
- Software solution for radio monitoring and radiolocation system in operation is **ARGUS 5.4.1 SW by R&S**
- MMS and RMS are connected via HAKOM microwave links and all MMS are conneced with Zagreb via leased lines

Locations of MMS, RMS and MS on the map of Croatia

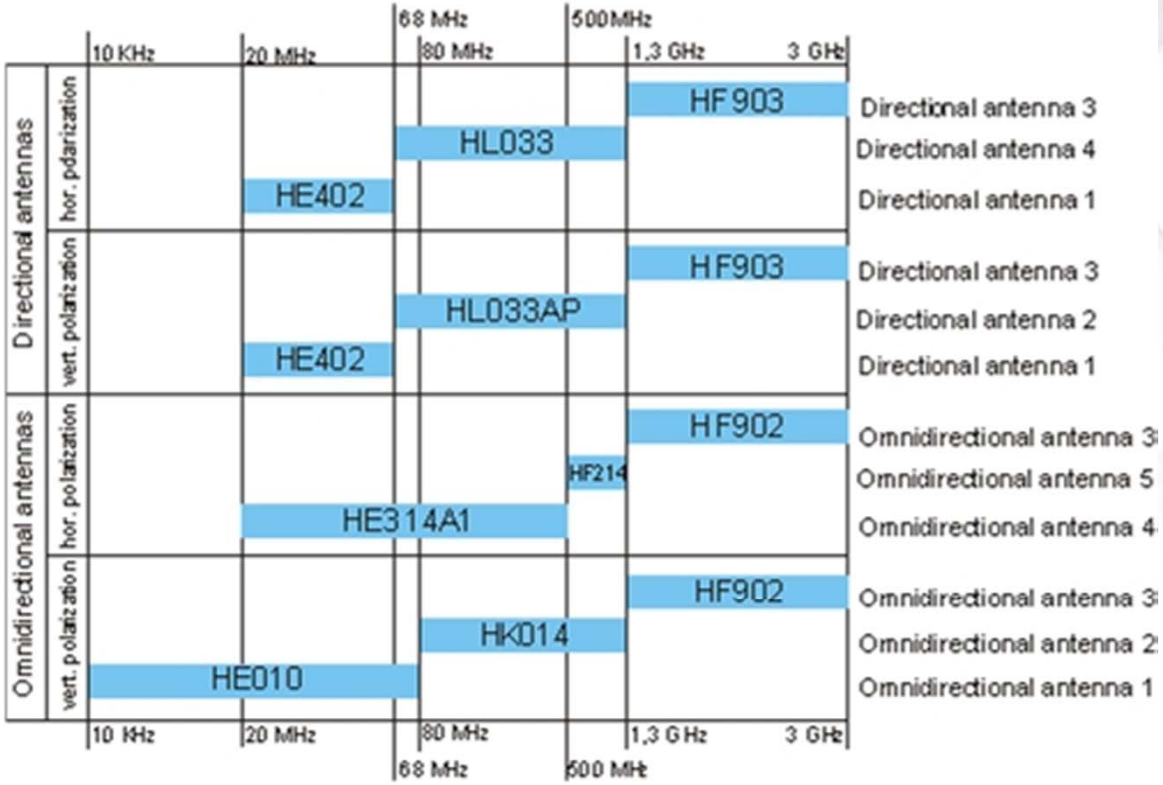

ESMD
ETL
MMS - M5
RIJEKA
R&S ARGUS
RMS RAVNA GORA
RMS ZRINSKA GORA
RMS OTOK
8 Mbit/s
2 Mbit/s
ETL
ESMD
R&S ARGUS
MMS - M2
MMS - M1
MMS - M4
OSIJEK
ZAGREB
RMS DEGMAN
SPLIT
RMS - ROTA
RMS - OZLJAK
20 Mbit/s
MMS - M3
RMS - BOKOLJ
Network Plan

MMS and RMS measurement equipment





Antenna system – AU900A4



RMS Ozljak

ADD190 + ADD071

MMS

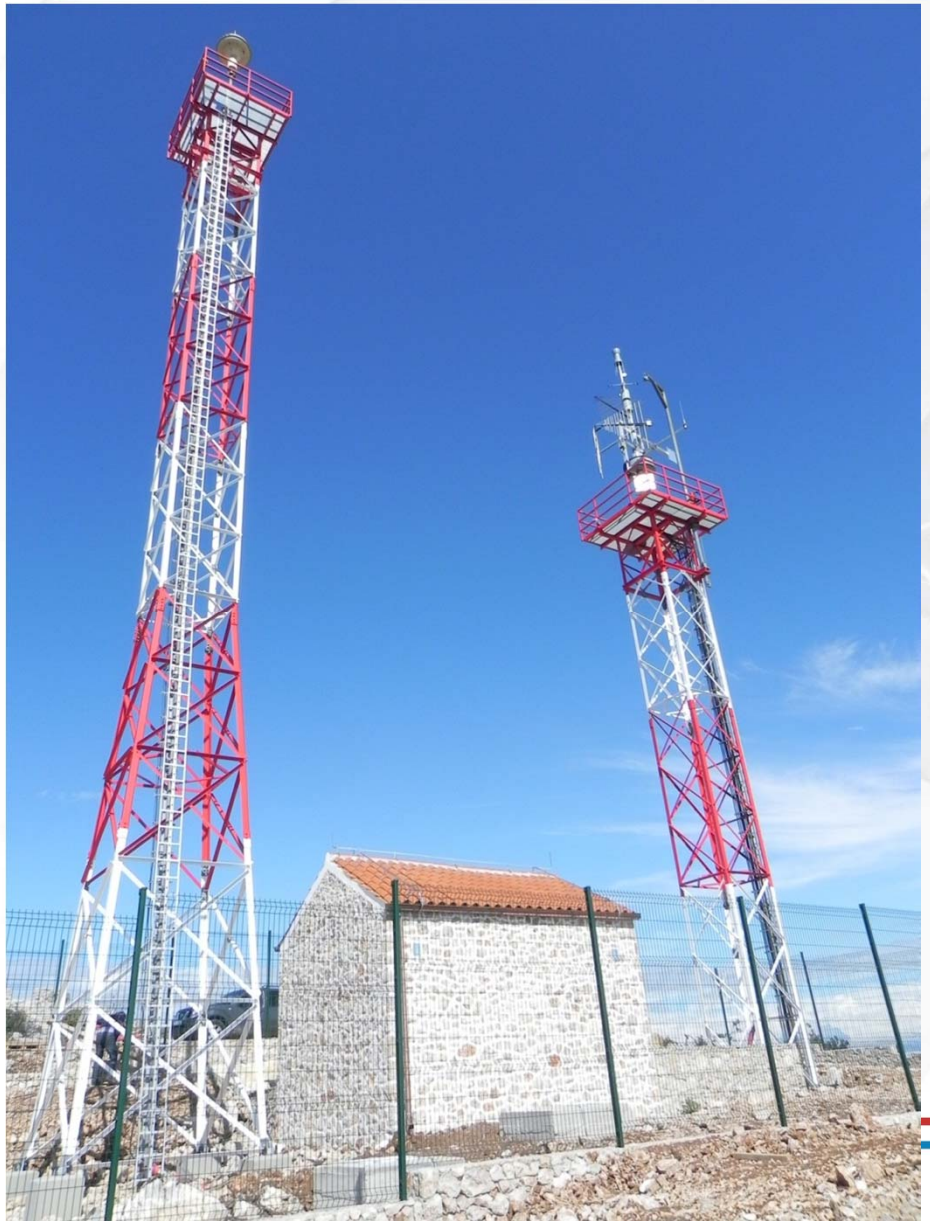
RMS

Measurement vehicle – MS (Mercedes Sprinter)

Mercedes Sprinter

Measurement vehicle – MS (Mercedes G300)

RMS Veliki Bokolj (solar power system with 2 wind turbines)



MMS RIJEKA

Upgrade of the FMRS

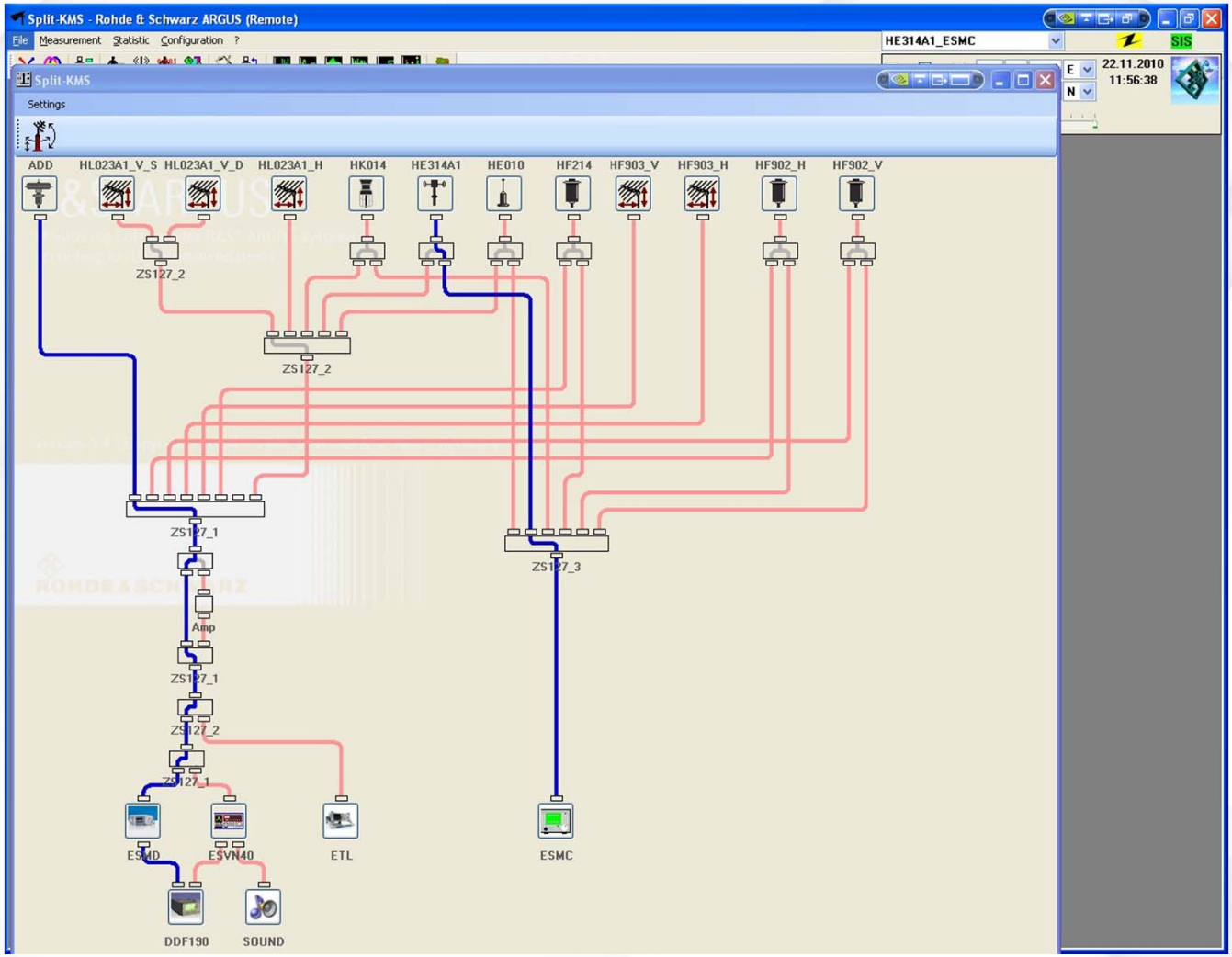
- In April 2010 HAKOM improved version of ARGUS and monitoring equipment
- Upgrade from ARGUS 3.6 to ARGUS 5.4
- Implementation of new ESMD receivers and ETL TV analyzers
- ARGUS 5.4 with ESMD receiver is a great improvement for control of the radio frequency spectrum

ARGUS

ARGUS is used for spectrum monitoring tasks:

- Everyday control measurements in AL band
- Weekly measurements in BC
- To measure deviation of FM stations
- Monitoring of field strength level of licensed FM/TV transmitters
- Measuring, testing, monitoring and elimination of interferences
- Specific monitoring campaigns like measurements of interferences from neighboring countries
- All kind of measurements of RF spectrum

ARGUS 5.4.1


Split-KMS - Rohde & Schwarz ARGUS (Remote)
File
Measurement
Statistic
Configuration
?
HE314A1_ESMC
SIS
22.11.2010
11:56:38
Split-KMS
Settings
ADD
HL023A1_V_S
HL023A1_V_D
HL023A1_H
HK014
HE314A1
HE010
HF214
HF903_V
HF903_H
HF902_H
HF902_V
ZS127_2
ZS127_2
ZS127_1
ZS127_3
Amp
ZS127_1
ZS127_2
ZS127_1
ESMD
ESVN40
ETL
ESMC
DDF190
SOUND

Improvements of FMRS during 2011.

- Three (3) new Mercedes G350 measurement vehicles (in operation until the end of the 2011)
- New RMS Veliki Bokolj located on island Pašman (in operation until the end of the 2011)

Thank you for your attention!

Questions???