ATDI
a Global Leader in **SPECTRUM MANAGEMENT**

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![ATDI]

Today's Agenda

1 Introducing ATDI

2 Automated Spectrum Management Solution

3 Products & Services

4 Solutions demo

A Annex – product descriptions & references

About
Us

RADIO NETWORK PLANNING AND MODELLING, SPECTRUM MANAGEMENT AND OPTIMISATION SOFTWARE SOLUTIONS

OUR SUCCESS REFLECTS OUR CUSTOMERS SUCCESS AND ENABLES THEM TO STAY COMPETITIVE IN A RAPIDLY CHANGING MARKET

ATDI are global leaders in the development and implementation of automated spectrum management solutions.

For over three decades we have backed nearly 100 spectrum regulation authorities. Our solutions continue to evolve to meet the growing needs of civil and defence regulators, in line with ITU guidelines.

We help spectrum managers control and optimise spectrum, enable frequency sharing and automate resource-intensive processes.

1. **Proven – 70% of our custom is repeat business**

2. **Experience - 100 spectrum managers / regulators - Repeat custom - Proven ability to adapt solutions**

3. **Ethos – Experience – Innovation – Challenge ideas can support change**
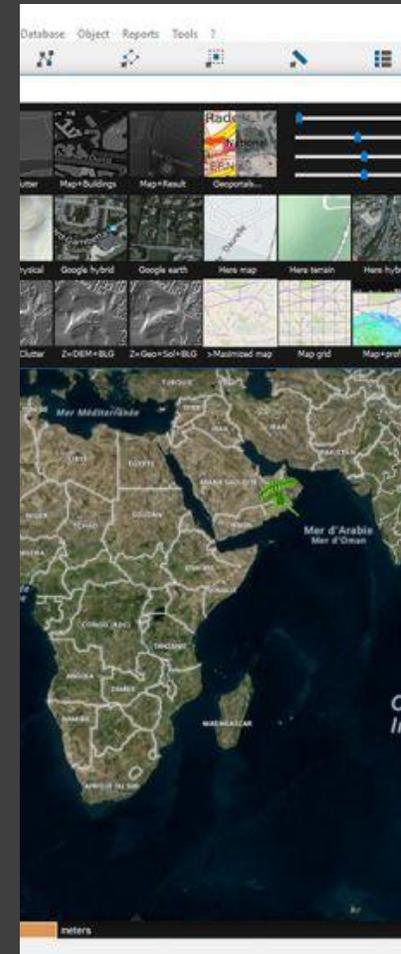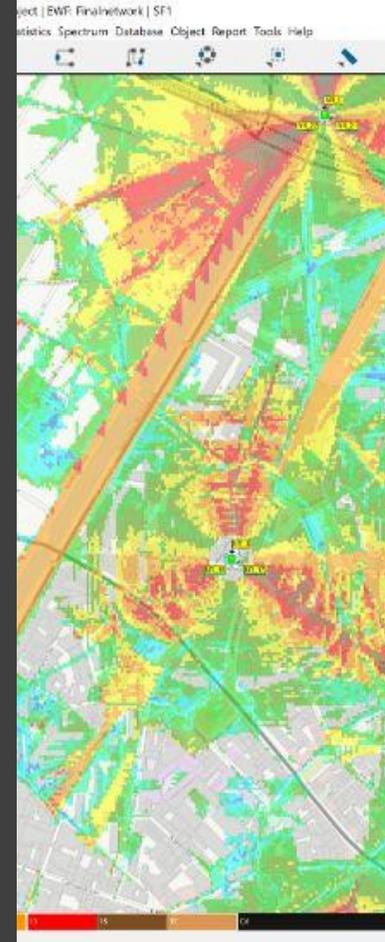
Our
Values & Contributions

- Dedicated R&D to enable we stay ahead of the game

- Solutions compatible with ITU regulations. Contributions to industry organisations including VP of ITU-R and ITU-D.

- Our team has an excellent understanding of our customers needs – how – discussions/industry experience and a desire to find the best fit (solution) for the end user

- Our team – built from diverse backgrounds enable us to draw from a wealth of knowledge and understanding of the industry and its requirements

- Work in partnership with our end users to ensure both pre-production, throughout project rollout and beyond.
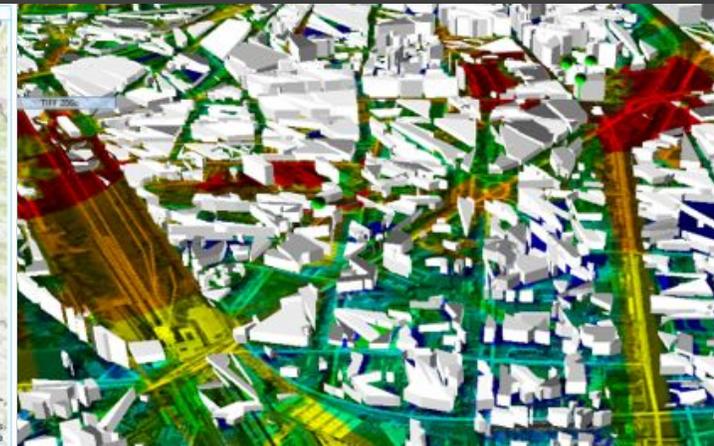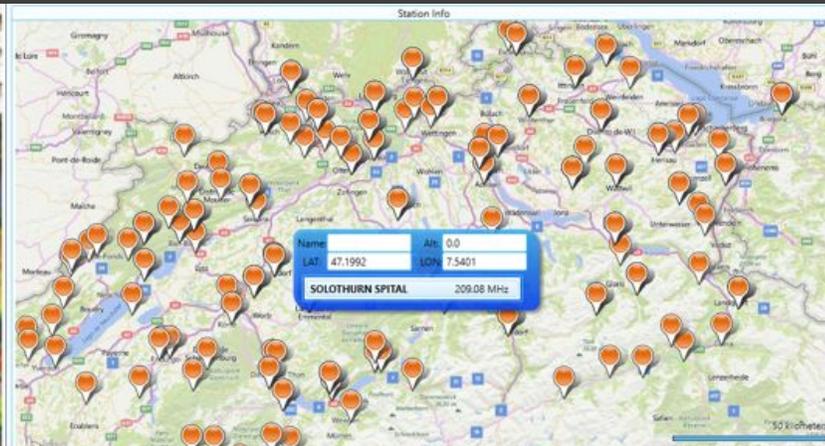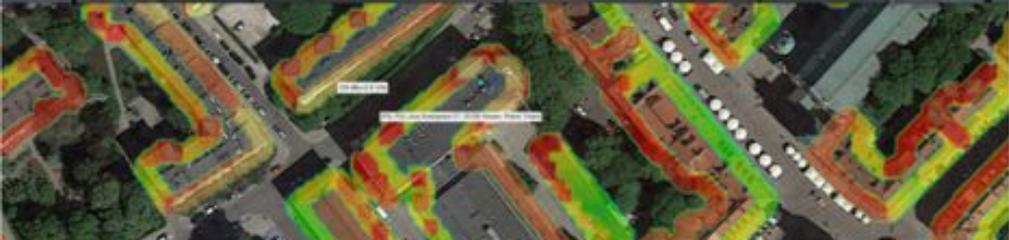
Our Offices
Global Footprint

- Allows us to leverage different time zones Provide support around the clock Response times fast

- Draw resources from across the group to support larger projects leverage expertise ensuring we offer the very best services to our end users

- Shared experiences – combining many man-years experience across the group. At every stage of the project (from project outset to going live) we aim to learn and improve our services. To do that we carry out regular internal project reviews and a group review at handover.

Automated
Spectrum Management Solution

ATDI

No two user requirements are the same

Our solutions allow the user to define their processes and procedures. Custom modifications offer flexibility and ensure the solution meets the end-user needs.

Our solutions allow spectrum manages to:

- **Control** the use of spectrum
- **Minimise** interference
- **Automate** frequency allocations and frequency sharing
- **Support** emerging technologies
- **Coordinate** the use of wireless spectrum with neighbours and other   administrations
- **Manage** back-office functions for admin, licensing and billing
- **Make** data exchanges with end-users
- **Interface** with monitoring solutions
- **Support** spectrum re-farming and auctions

ASMS
Supports the entire spectrum regulation lifecycle

ATDI

Establishing a framework to coordinate national, regional and cross-border interference

Managing applications & work processes inc: Spectrum > Dealers > Type Approval > Import Permits > numbering

Spectrum Regulatory Policy & Framework

License & assignment management

Spectrum Monitoring & enforcement

Database management & Control

Managing complaints Enforcing & regulating illegal emissions

Maintaining & controlling centralised database inc: radio system assets > users > spectrum allocations > spectrum monitoring

ATDI I Automated Spectrum Management

ASMS
Supports the entire spectrum management lifecycle

Watch the solution demonstration:
https://www.youtube.com/watch?v=qSdjJXevtns&list=PLap6vGTQpFveiKO3piYLSoG3vKl-luD8X&index=3

ATDI I Automated Spectrum Management

Application
Account registration, submission of online applications for all radio systems, TAIP, dealership, numbering and complaints

Rejection

Rejection

Validation
Application validation

Assessment
Spectrum allotment, coordination & assignment

Technical Framework, Technical assessment

Approval
Application approval or Rejection

Billing
Finance tool synchronisation
Online payment, integrated payment gateway, electronic receipts.

Spectrum Grant
License certificate, digital/electronic signature, QR codes.

Spectrum Grant
License certificate, digital/electronic signature, QR codes.

Spectrum Monitoring & enforcement

Spectrum DB update

① **Publishing** spectrum allocation policy, & usage

Centralised DB

COTS Products

Managing every aspect of the spectrum management lifecycle

HTZ Communications: spectrum engineering tool for complex spectrum analysis and assignment

ICS Manager/eManager: spectrum management platform for planning, coordination and allocation

ICS Monitoring – SDRN Control: spectrum monitoring solution to assess and control emissions

ICS RF allocations: to manage and publish frequency allocation tables

01

HTZ Communications

Comprehensive spectrum engineering tool supporting radio propagation between 10 KHz to 1 THz.
- Coexistence scenarios analysis
- spectrum re-farming
- interference mitigation measures
- policy framework

02

ICS manager/ICS eManager

Custom web-service portals for internal & external stakeholders.
- Configurable workflows
- Single-sign on, self-care account management
- Notifications, reminder & alerts
- Documents & digital certificates
- Billing & 3rd party finance system integration

03

ICS RF Allocations

Spectrum Allocations chart editor & publisher for printing & web interface
- Intuitive GUI
- Documents and foot-notes management
- Simple yet powerful search engine

04

ICS Monitoring – SDRN Control

Controls & manages spectrum monitoring network and database, regardless of equipment models and types
- Centralised mission planning & execution
- Automated spectrum usage and compliance analysis

Solution
Demonstration

Account Setup
00:00:00
Account dashboard
00:02:14
License applications
00:02:54

ATDI I Automated Spectrum Management
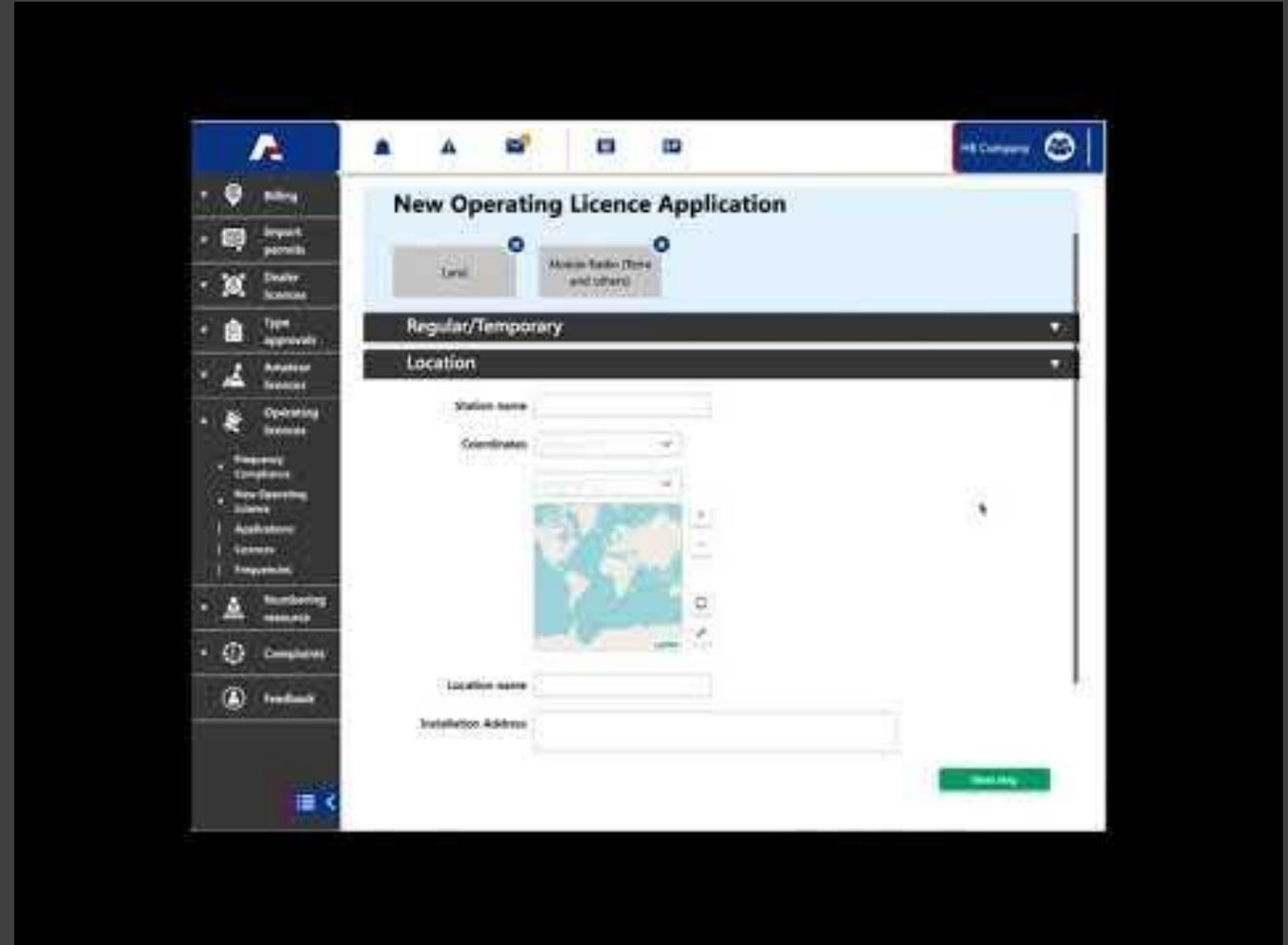
Solution
Demonstration

Application Technical Assessment (HTZ Communications integration)
00:05:23

ATDI ASMS WEB-SERVICE PORTAL DEMO
Application technical assessment
Automatic Frequency assignment
ICS manager integration with HTZ Communictionss
International coordination

Solution
Demonstration

Billing & Online payment
00:14:53

Our
Services

ATDI

Training
Customised training service online or onsite.

Support
24/7 global technical support via phone, email and web-conference

System Customisation
Business analysis, system design, architecture, customisation, integration, and configuration.

Spectrum consulting
Provide professional consulting services in spectrum engineering and management to solve any spectrum issues.

Cartographic data
Medium to High resolution DTM and Clutter library.
Cloud base digital map image streaming and cache support.

System Deployment & Maintenance
Support on Go-Live, Testing, and bug fixing.
On-going maintenance support with software updates.

The most comprehensive spectrum engineering solution

HTZ Communications provide multi-technology capability to manage any complex spectrum engineering scenarios for spectrum coordination and planning

HTZ Communications

ALL-IN-ONE TOOL FOR RADIO COMMUNICATION SERVICES

HTZ communications is new edition of world leading RF design and spectrum engineering solution includes several groundbreaking features such as **AUTOMATIC RADIO NETWORK PLANNING, GIS ENGINE WHICH ENABLES TO CREATE HIGH RESOLUTION** building information in raster from Digital Surface Model – DSM samples.

Our radio simulation software incorporates every aspect of radio propagation and ensures public, private, licensed or unlicensed radio communication networks offer a **HIGH DEGREE OF RELIABILITY**, are **CONTINUOUSLY AVAILABLE** and do not suffer from **HARMFUL INTERFERENCE**.

HTZ communications delivers an **UNMATCHED DEGREE OF PRECISION** and quality to users across the radio communications industry. The software incorporates features and functions to manage the latest technologies: **LTE-A, 5G and IoT low power WAN**. It also simulates PMR, drones, UAVs and radars to support the planning of radio networks from **1THz**. Best in class calculation speeds pixel by pixel, resulting from **massive processing** and **virtual machine licensing scheme**;

HTZ communications is capable of handling prospective planning, automatic frequency allocation, coverage optimization, carrier aggregation, throughput simulation, 3D coverage simulation including ground-air, air-air or sea-ground radio communication analysis; **Multiple technologies** can be simulated in the same project and coexistence of technologies or objects such as the impact of windfarms on airport radars or human exposure to electromagnetic fields can be analyzed.

HTZ Communications

Technologies managed in HTZ

- 2G/3G/4G/5G
- AM/FM/DAB/DTV
- TETRA/P25
- Microwave
- Satellite
- IoT (NB-IoT, LoRa, Mesh)
- Radar, Jammer
- Interception
- Direction Finder
- SRD/WIFI
- FWA/FBA
- LF/MF/VHF/UHF/SHF supporting Maritime and Aeronautical radios
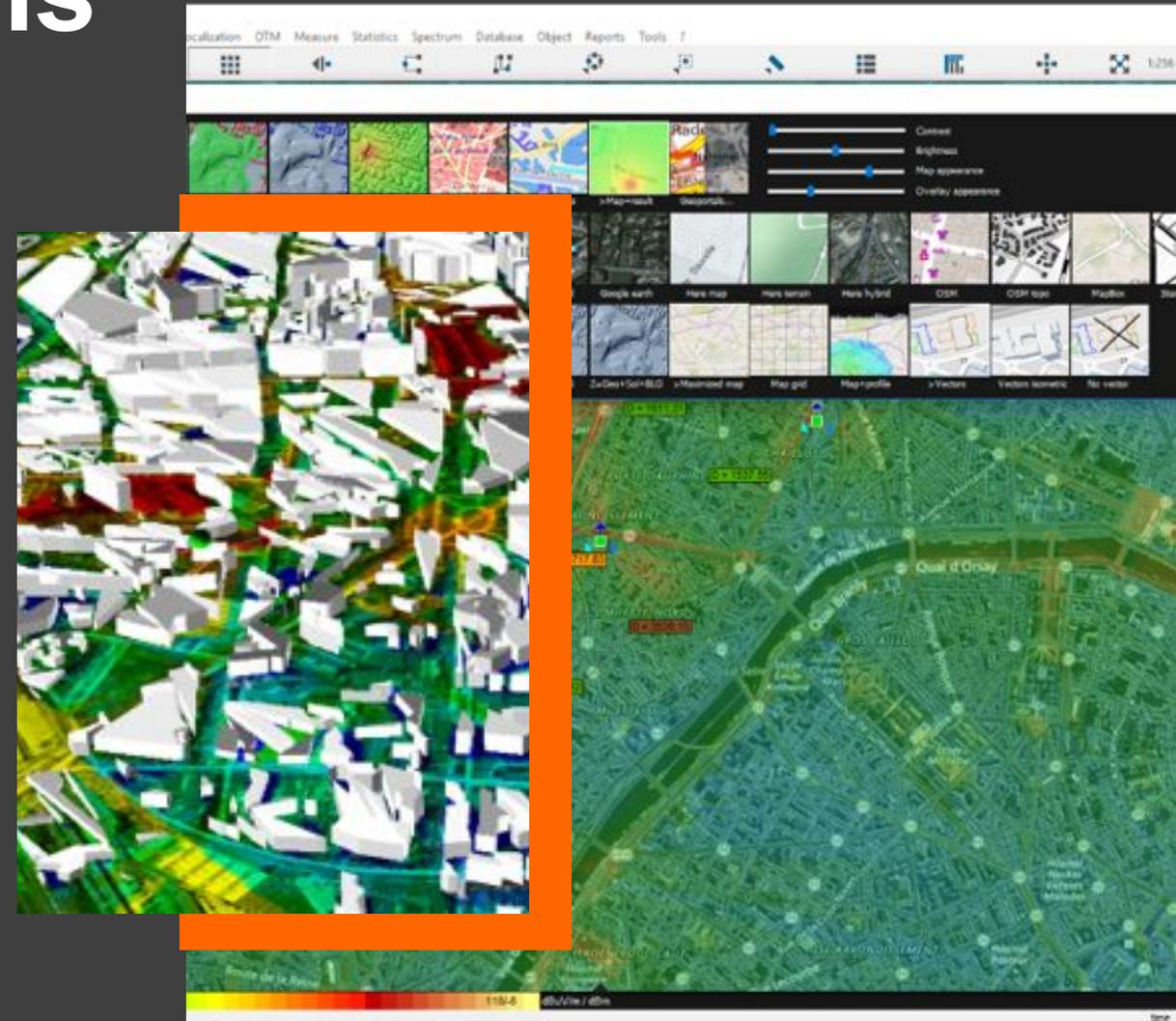
# HTZ Communications – Propagation models

1. **Free Space model**
2. **Diffraction models**
3. **Tropo-scattering models**
4. **Deterministic ITU Recommendations**
5. **Industry standard models**
6. **Specific/external & custom-built models**
7. **HF conductivity model**

Our recent Webinar:
5G network and airport radars coexistence analysis

https://www.youtube.com/playlist?list=PLap6vGTQpFvdjMyoxBCY418m04GJ_ubMv
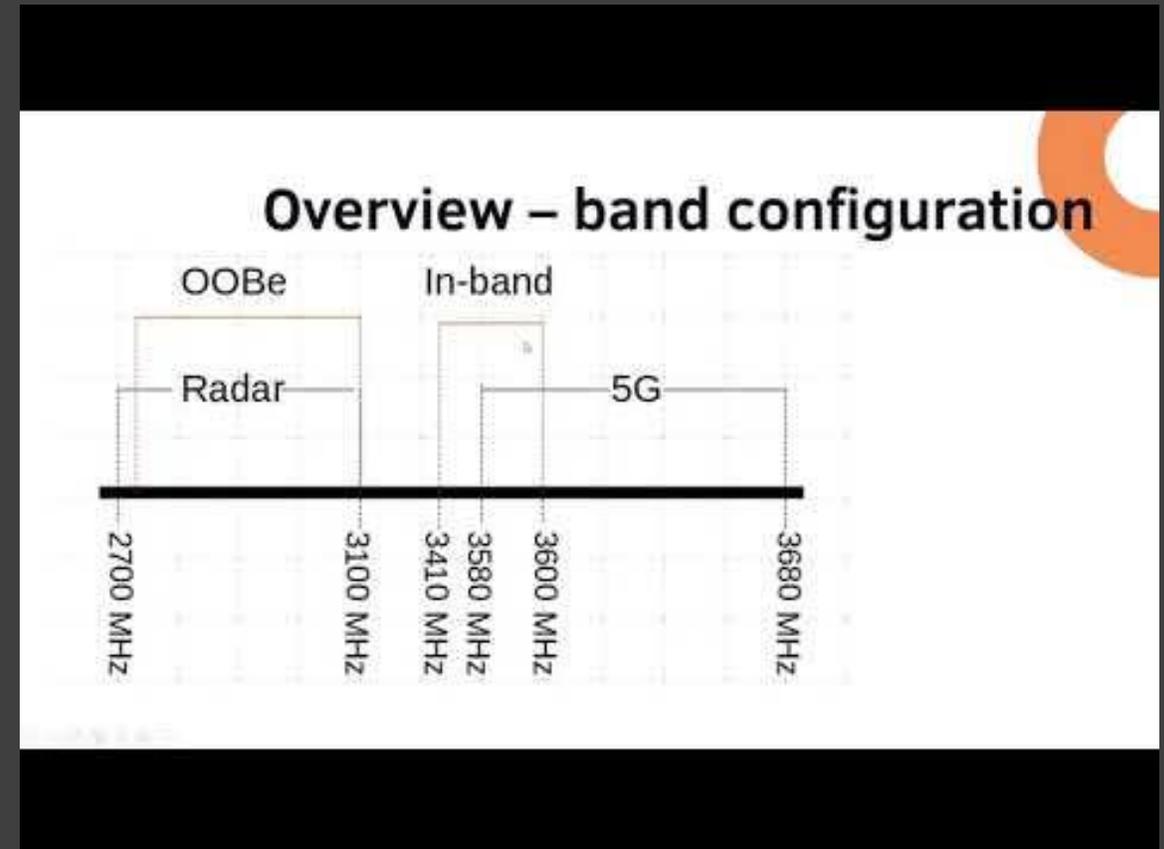
Spectrum-sharing strategy:
Area-wide apparatus licences (AWLs)

A short demo to illustrate how HTZ Communications manages
area-boundary contour analysis for Earth stations in the 26-28 GHz band,
based on the approach used by ACMA, Australia

Watch it on YouTube:
https://www.youtube.com/watch?v=5wzuaOLXXdg

**Full version of Hands-on AWL area boundary contour analysis
– 28 GHz GSO/NGSO FSS (AUSTRALIA)**
https://share.hsforms.com/196nlRSSfREGFz9uBNQoo5A5erjt

Integrated spectrum monitoring and big data control

ICS Monitoring SDRN which assesses spectrum use, monitors emissions and regulations the control of license emissions

ICS Monitoring - SDRN Control

- Full and real-time integration with licensed equipment database
- Automated storage of electromagnetic situation measurements and analysis data
- Establishes spectrum reference situation based on measurement results and propagation modelling
- Real-time spectrum analysis without interruption from measurements already launched
- Background mode measurements require no human intervention
- Integrated GIS (map layers and terrain data)
- Spectrum Occupancy measurements
- Detection of unauthorised emissions by comparing spectrum emissions
- with spectrum masks from authorised transmitters
- Licensed transmitter data collection and storage
- Compares spectrum emissions with reference spectrum masks
- Bandwidth measurements
- Frequency band scanning
- Localisation of unauthorised emissions
- Hybrid localisation (TDOA / AOA / POA / RSSI)
- HOMING (Machine learning algorithm – HTZ required)
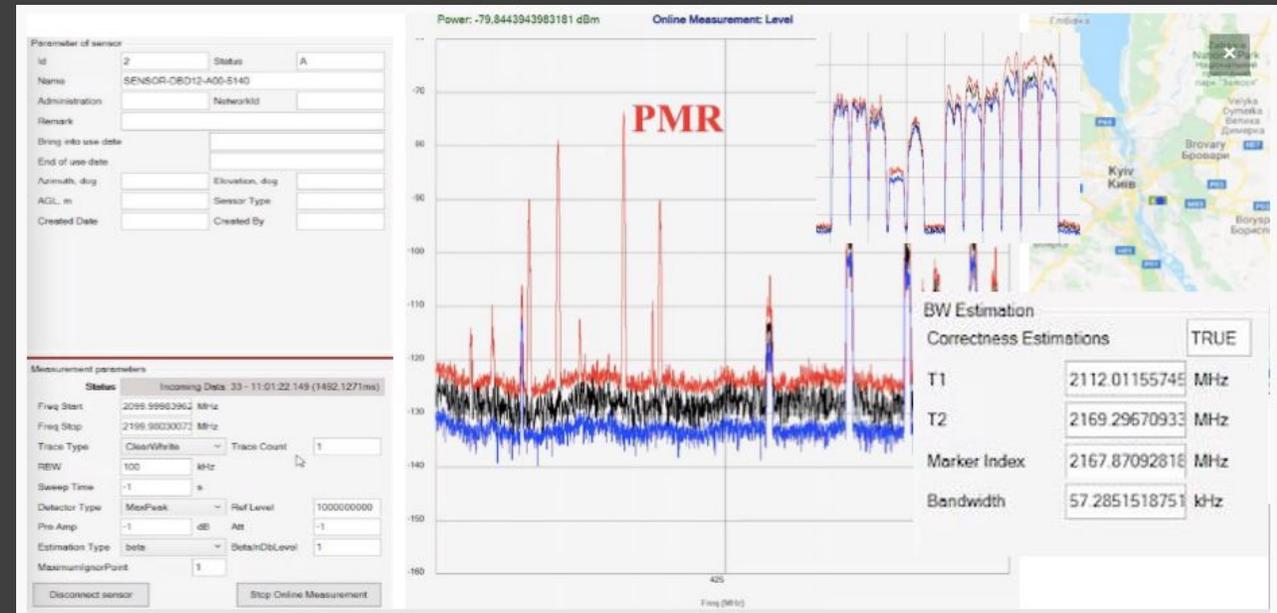
ICS Monitoring - SDRN Control

GATHERING BIG AMOUNT OF DATA FROM VARIOUS SOURCES

Spectrum licensing

Assignments

Monitoring

BIG DATA

Check

Estimate

Manage

Optimize
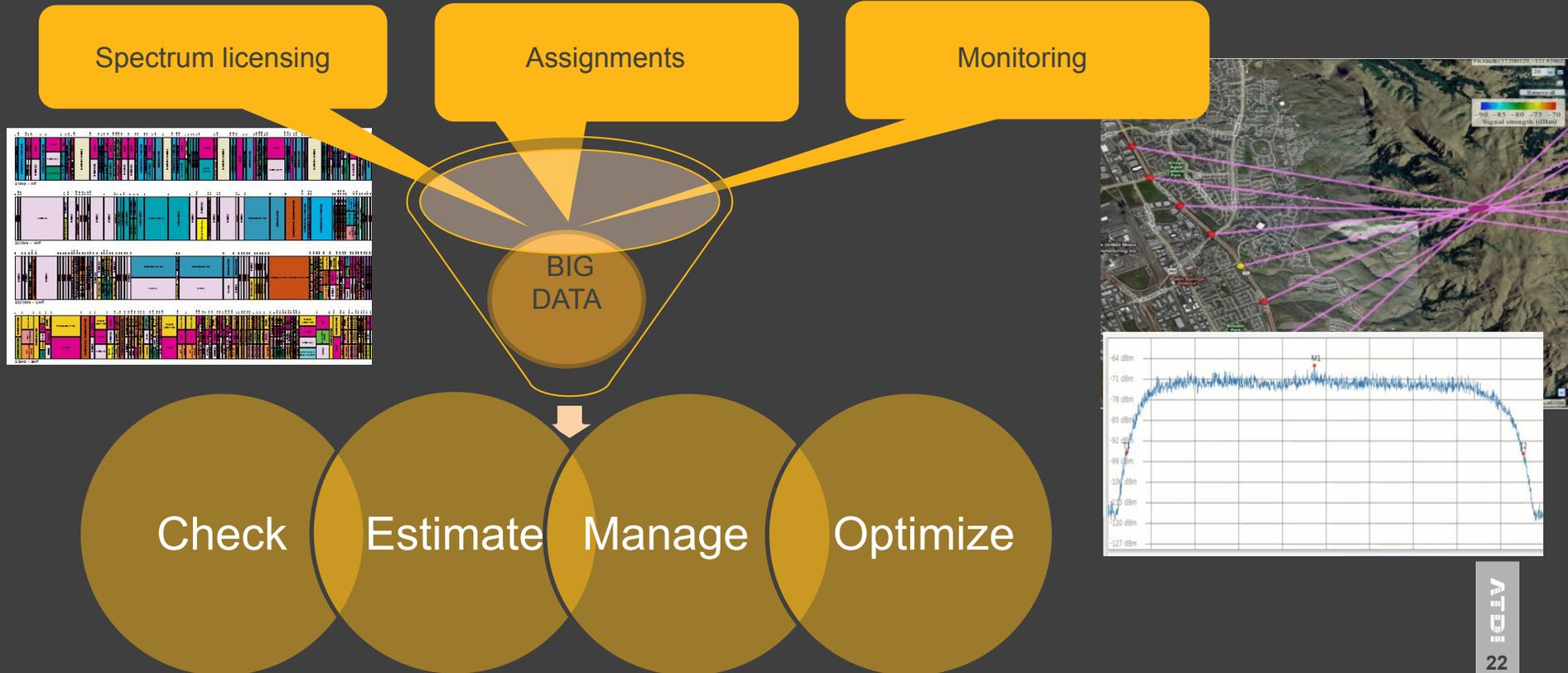
ICS Monitoring - SDRN Control

- **One single system gathering:**

  - Spectrum management and inventory data - **ICS MANAGER**
  - Measurements - **ICS MONITORING/SDRN CONTROL**
  - Emissions analysis based on inventory and measurements - **HTZ COMMUNICATIONS & HTZ WARFARE**

- **Multitask measurements**

- **Independency from measurement equipment**

- **Multithreading in measurement data processing**

- **Repeated usage of measurement data to obtain the necessary information**

- **Flexibility and scalability**

- **Automatic post-processing of measurement results**

Solution demonstration

Watch it on YouTube:
https://youtu.be/1hmy9TKS4oY

Measurement outcome and analysis
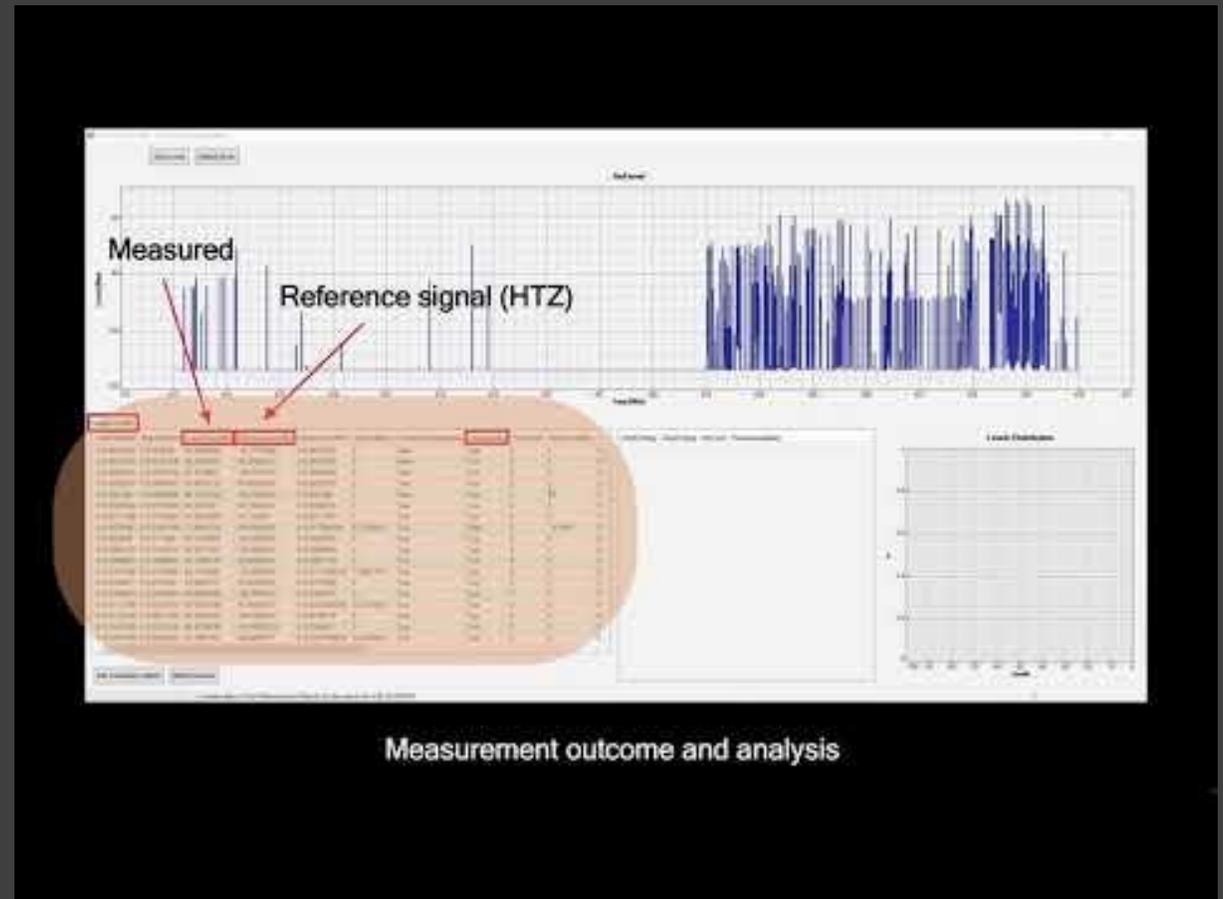
ICS manager/eManager

The only **PLATFORM** that is flexible to meet current and future **NEEDS OF REGULATORS** in all areas related to spectrum management and monitoring.

Its' powerful data engine manages all data related to spectrum management, while continuously monitoring the coherence of the data.

ICS MANAGER ALLOWS THE IMPLEMENTATION OF AUTOMATED PROCESSES FOR THE PURPOSES OF:

- Allocations and Applications Management
- Channeling Plans & Channel Allotments Management Operational Management for all Services
- International Coordination Management for all Services Notification Management
- Licensing Management
- Billing Management
- Workflow Management
- Internal System Management
- Technical Analyses Management with HTZ communications
- Monitoring Interface
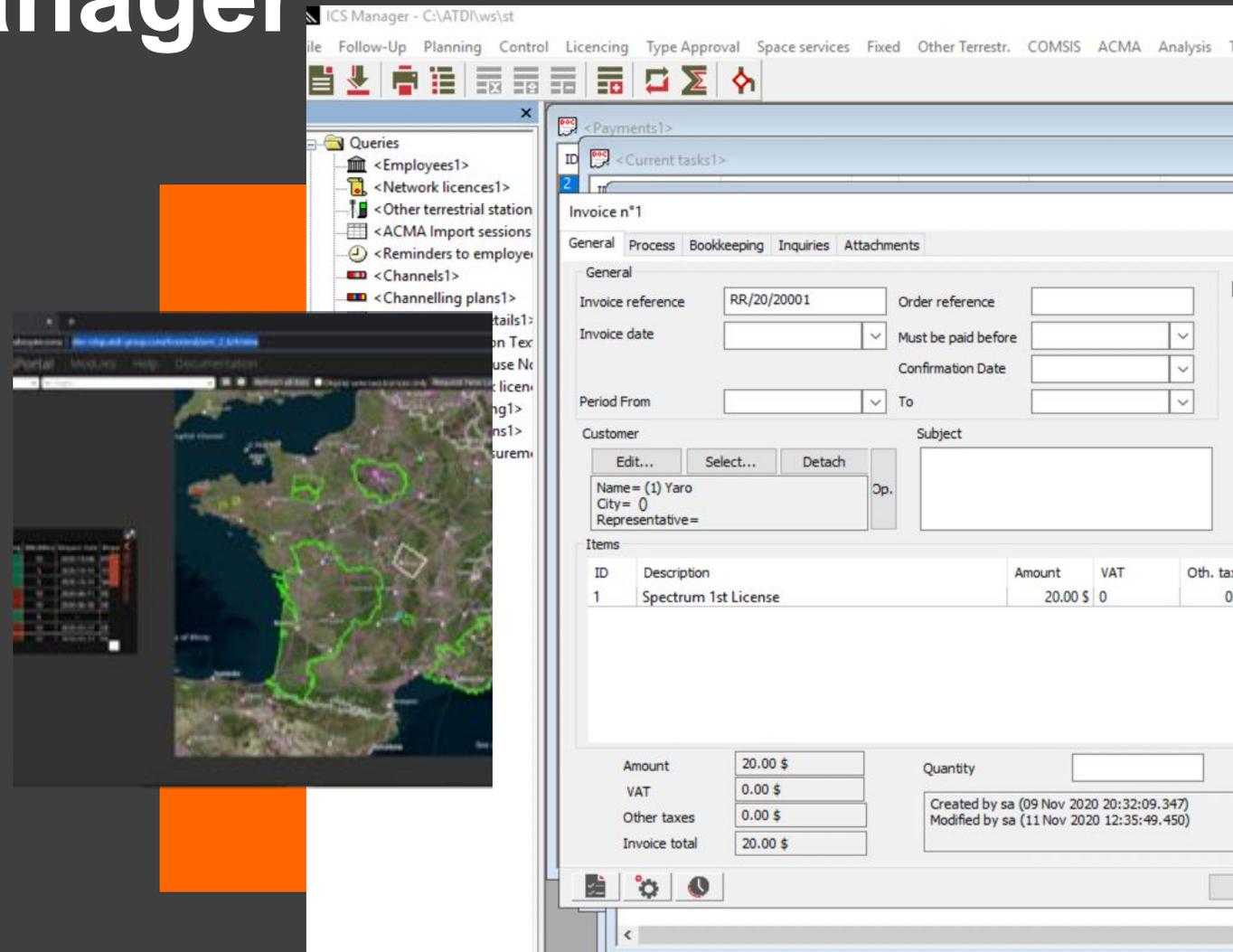
ICS manager/eManager

Customizable User Interface: ICS eManager is a flexible web-platform supporting any browsers, and device types.
The User Interface customization is available to adopt the corporate identification and purpose of the web-service.

- Account Management with SSO and Self-care Portal (External) and Business Applications Portal (Internal)
- Online applications
- Notification & reminders
- Billing
- License certificates
- Electronic Signature
- Electronic T&Cs
- Adaptative design

Creating and publishing Frequency allocation tables

Reviewing ICS RF Allocations to build and publish detailed documentation about a country's FAT in an easy-to-use spectrum allocation chart management solution

ICS RF Allocations

- Frequency allocation table display in a customisable matrix containing radio regulations and national allocation tables for all countries
- Show and filter data for all countries
- Add new records per frequency band such as ITU service, footnotes, hyperlinks, text, documents, EFIS applications
- Assemble reports based on Frequency Allocation Table (FAT)
- Interface Regulations (RIR) and other documents
- Export allocations and applications (XML EFIS format)
- Display and edit the Radio Interface Regulations with customisable filters
- Edit Radio Interface Regulations (RIR) headers and body separately
- Review Radio Interface Regulations (RIR) history table
- Report Radio Interface Regulations (RIR) data as PDF, XLS or HTML
- Detect documents and RIR not referenced by any frequency band
- Identify errors in hyperlinks within a frequency band
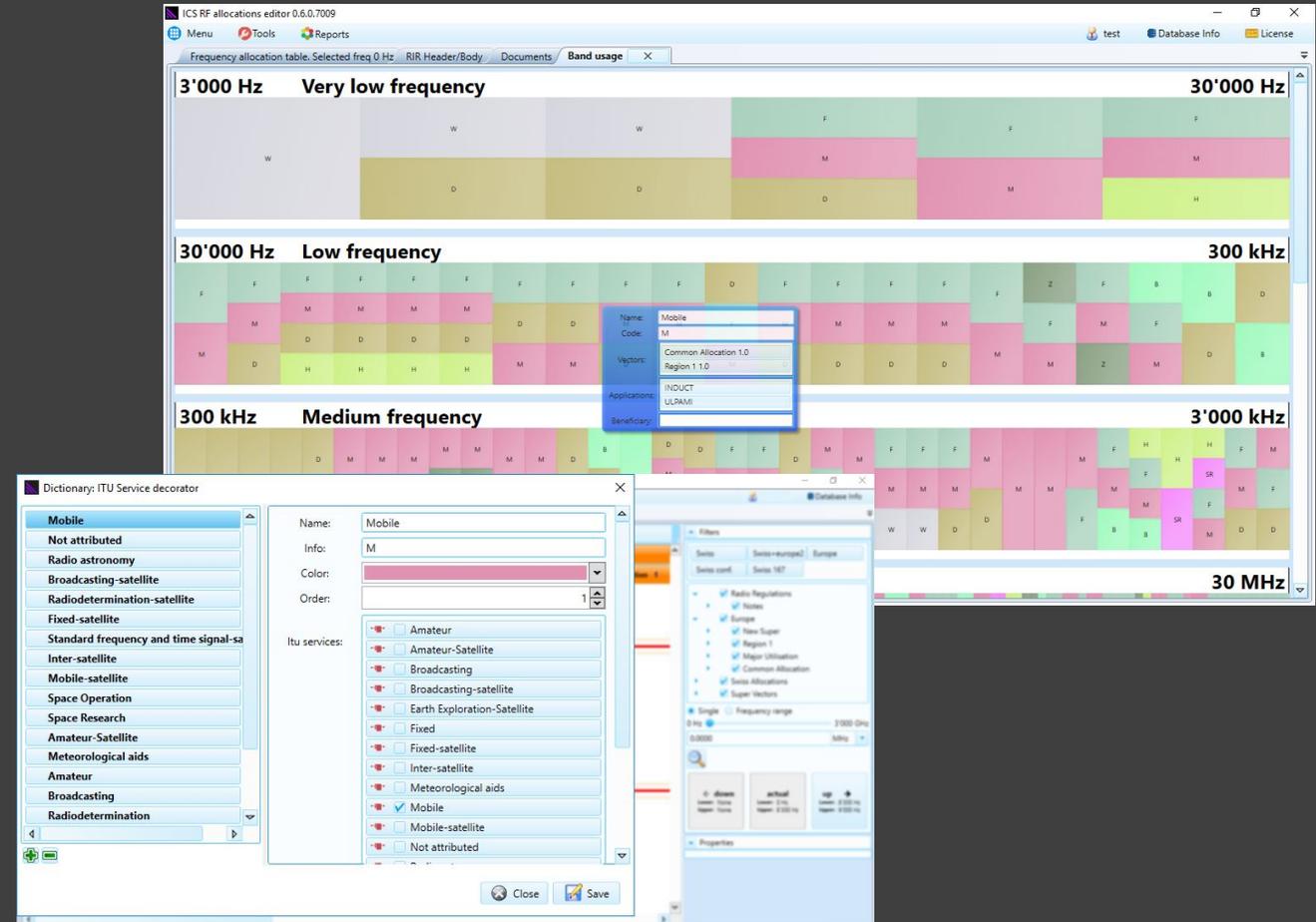
ICS RF Allocations

- Edit services and footnotes

- Modify existing records and track changes through a life cycle

- Alters text styles according to record state

- Create reports with or without highlighted changes

- Create and publish clear representations of specific applications within the same frequency band using floating windows

- Display simultaneously several frequency bands

- Report in DOCX, XLS or HTML formats

- Create a library of documents such as annexes, appendices, RIR

Solution demonstration

Watch it on YouTube:
https://www.youtube.com/watch?v=Xa31W_CSXVc
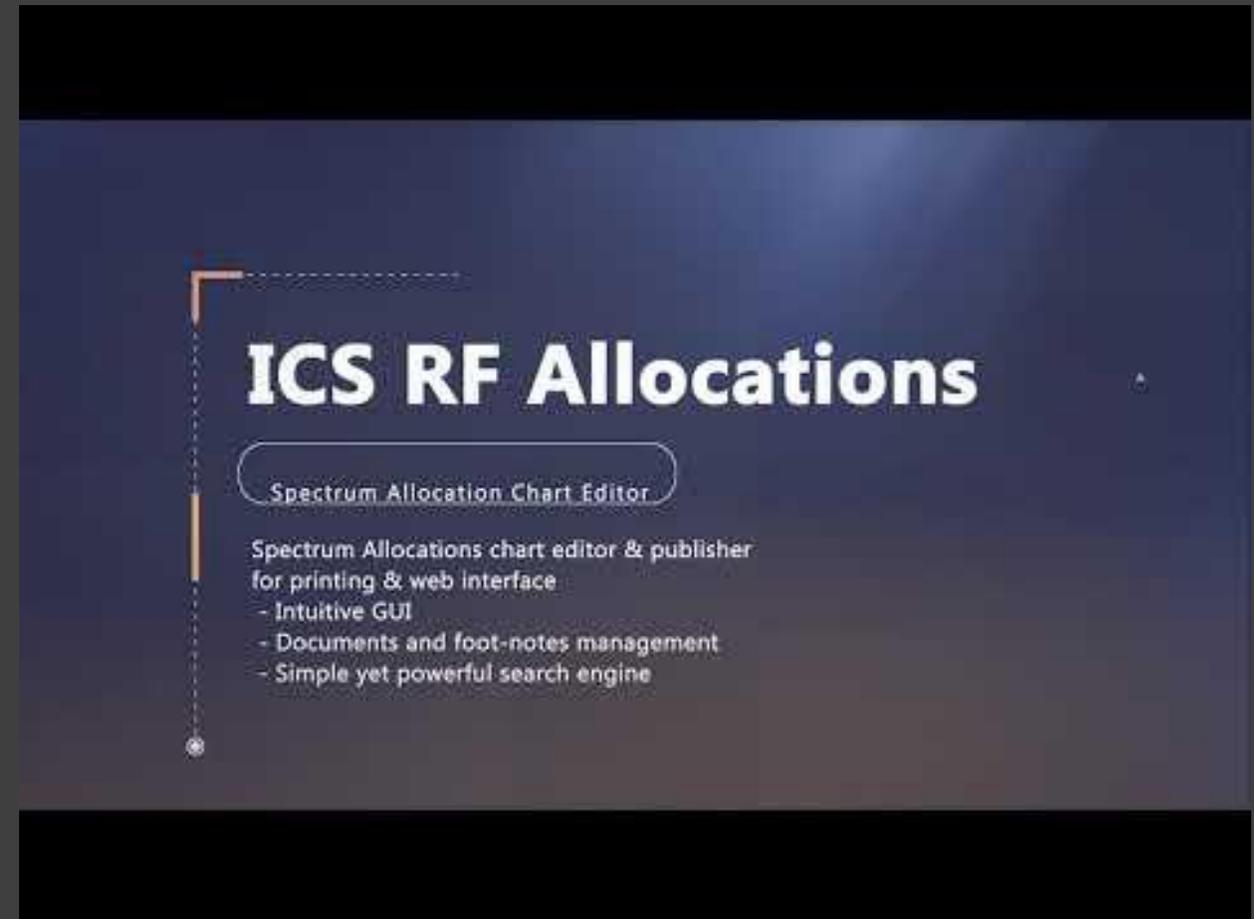
Annex

Use cases and references

References
Active customers in Civil Regulatory sector

Authority	Country	Spectrum Planning	Spectrum MGT
EUROPE			
OFCOM	United Kingdom	YES	YES
ANCOM	Romania	YES	YES
MITYC	Spain	YES	YES
Ministry of Transportation and Telecommunication	Greece	YES	YES
Ukrainian Radio Frequency Center	Ukraine	YES	YES
State Communications Inspection	Moldova	YES	YES
RATEL	Serbia	YES	YES
State Communications Inspection	Belarus	YES	YES
Ministry of Telecoms	Kazakhstan	YES	YES
RAK	Bosnia & Herzegovina	YES	YES
ANFR, National Frequencies Agency	France	YES	YES
CSA (Broadcast regulator of France)	France	YES	NO
ARCEP	France	YES	YES
Ministère intérieur	France	YES	YES
CNGF	France	YES	YES
BAKOM, Switzerland Spectrum Authority	Switzerland	YES	YES
Comreg	Ireland	YES	NO
Telecommunication Ministry	Cyprus	YES	NO
MCA, Regulator of Malta	Malta	YES	YES
CRC, Communication Regulation Commission	Bulgaria	YES	YES
PFS (Post and Telecoms Authority)	Iceland	YES	NO
Vinnustovnurin, Faroe Islands regulator	Faroe Islands	YES	NO
Servei de Telecomunicaciones d'Andorra	Andorra	YES	YES
NKOM	Norway	YES	YES
Generalitat de Catalunya (STSI – Catalunya – Spain)	Spain	YES	NO
Secretaria de Estado de Telecomunicaciones (SETSI – Spain)	Spain	YES	NO
Agency for Telecommunications, Broadcasting and Post (ATRP)	Slovenia	YES	YES
RRT	Lithuania	YES	YES
Ministry of Telecoms/DRI	Azerbaijan	YES	YES
GNCC	Georgia	YES	NO
EKIP	Montenegro	YES	YES
ILR	Luxembourg	YES	YES
Gouvernement Princier	MONACO	YES	NO
UKE (Polish Authority of Communication)	Poland	YES	NO
ENKOM	Switzerland	YES	NO

Authority	Country	Spectrum Planning	Spectrum MGT
Americas			
MINTIC	Columbia	YES	YES
SMA	Jamaica	YES	NO
MOC, Ministry Of Communication	Caribbean	YES	NO
Industry Canada (Regulator)	Canada	YES	NO
Asia & Oceania			
OFCA	Hong Kong	YES	NO
CTT	Macau	YES	NO
AiTi	Brunei Darussalam	YES	YES
SARFT, People's Republic of China	China	YES	NO
KCA, Korea Communications Agency	South Korea	YES	YES
ARFM	Vietnam	YES	NO
CRC	Mongolia	YES	NO
MPT	Laos	YES	YES
UNICON	Uzbekistan	YES	NO
NICTA	Papua New Guinea	YES	YES
MBIE	New Zealand	YES	NO
MCMC	Malaysia	YES	NO
OPT	New Caledonia	YES	NO
Africa			
NCC, Nigerian Communication Commission,	Nigeria	YES	NO
Botswana Telecommunications Authority –	Botswana	YES	NO
CA	Kenya	YES	YES
ARTP	Niger	YES	YES
POTRAZ	Zimbabwe	YES	YES
Regulator of Guinea Conakry	Guinea Conakry	YES	YES
ZICTA	Zambia	YES	NO
AIGF	Ivory Coast	YES	NO
Middle-East & North Africa			
ASBU, Arab States Broadcasting Union,	Tunisia	YES	NO
GCC Telecom Bureau - Gulf Cooperation Council Telecom Bureau	Gulf	YES	NO
ANBA, Algerian National Broadcast Authority, ASBU member	Algeria	YES	YES
TDA (Algeria Broadcast Authority)	Algeria	YES	YES
NTRA	Egypt	YES	NO
ARTP	Guinée	YES	YES

References
Use Cases 1

Customer	Description
arcep l'Autorité de régulation des électroniques et des Postes France Project: **Automated Civil Spectrum Management System**	**Project overview:** ARCEP is the French regulatory Authority responsible for issuing licenses, authorisations and managing interference and Quality of Service complaints for fixed, mobile and space services. In a recent audit, the ATDI solution was nominated the best ROI across the organisation. ATDI has worked in partnership with ARCEP for two decades to support their ongoing needs as a regulator, allowing them to optimise the solution to improve efficiency and effectiveness. ARCEP manage and maintain a database of transmitters and licenses and handle recurring administrative tasks such as the management and licensing of fixed and satellite services (VSAT), as well as PMR services in the 2.6 GHz band, billing and fee calculations. ANFR has two distinct licence applications; one for handling stations and the other for frequency assignments, coordination and notifications. The ATDI solution covers every aspect of their spectrum licensing management. The aim of the solution is to simplify ARCEP's processes through automated workflows which were customised to ARCEP's specific requirements. These workflows guide the user through the complete licensing process with ease. This simplified solution not only improved license application times but the overall efficiency of the organisation. HTZ communications (ATDI's radio planning and spectrum engineering tool) is used regularly by ARCEP's engineers to carry out various tasks like coexistence calculations between systems, automatic frequency assignment and interference analysis. The solution also includes an e-Licensing web portal for online applications, called ICS e-Manager. This facilitates online requests and manages licence applications (ADD/MOD/RENEW/SUPP) for fixed services (microwave links), PMR frequency allocations in 2.6 GHz TDD band and features an online fee calculator. The aim of this web portal is to dematerialise application requests for the creation, modification, deletion and renewal of frequencies. The overall impact of this software implementation was: • Less paper • Reduction in errors as the operator checks the sites, equipment, and antennas before sending. The project is covered by an ongoing maintenance contract and ATDI supplied extensive training courses for both the spectrum engineering and spectrum management functions.

References
Use Cases 2

Customer	Description
Authority for Info-communications Technology Industry (AITI) Brunei Darussalam Project: **Implementation of** **Backoffice system to improve efficiency & service delivery**	**Project Overview:** The Brunei national regulator upgraded its back-office systems to improve efficiency and service delivery. AITI has implemented an e-Service solution to transform its paper-based processes into an electronic format. The web-based solution was developed by ATDI for internal/intranet business web portals to manage their regulatory business processes. This solution aimed to automate interfaces with external applications and improve overall effectiveness and efficiency in the internal licensing process for any services, frequency/spectrum, and type approval, import permit, amateur radio, numbering, and complaint management. Several external existing systems integrations were implemented: • Spectrum regulation and resource management: ATDI's Automated Spectrum Management System featuring ICS manager + HTZ Communications. • Financial platform: MS Dynamics GP • Online payment integration with the local bank payment system using credit card and EFT options. • Bruneian customs office business web portal for seamless data exchange on Type Approval and Import Permit. Following the initial deployment in 2017, further developments to the business workflows and policies have been implemented, including improvements to the user experience through technologies like QR code and digital signatures. Further changes include improvements to business processes following the new regulatory rules/policies and enhancing the UX/UI. The 2nd phase delivery was completed at the beginning of 2021 and AITI received both training and support for the new system. Supplied continuous training and system maintenance support to date. 100% of the project was completed by ATDI

References
Use Cases 3

Customer	Description
UCRF UKRAINIAN STATE CENTRE OF RADIO FREQUENCIES Ukraine State Centre of Radio Frequencies (UCRF) Ukraine Project: Automated Radio Frequency Management System	**Project Overview:** For the past decade UCRF, the national spectrum regulator for Ukraine, has worked in partnership with ATDI to define workflows to improve their license applications process. The overall system supported functions to process applications including technical analysis, invoicing, fee calculations, license renewals, international coordination and ITU notifications. These were deployed via a standard workflow manager. ATDI's solution is fully integrated with a public-facing portal that provides e-services for citizens of the country, network operators and government bodies. The integration process with the public portal is based on two application servers, one (ICS web query) working in the local area network of regulatory authority and providing a program firewall, which manages the data requests from the second (web portal). The system interfaces with an external government service for user authentication, allowing access to profiles and the data related to companies, organisations and physical persons through secured channels. The supplied system covers every aspect of spectrum management, automates routine processes and interfaces with external governmental services such as the authentication service, registry of private persons and companies. The system also features customisable workflows, reports and integration with engineering modules for the technical assessment of applications.

Thank you!

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