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SMART MAP BASED EW DISPLAY SUBSYSTEM (EWDS)

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Abstract: ***Electronic Warfare (EW) is to exploit enemy's electromagnetic emissions in all parts of electromagnetic spectrum to provide intelligence on enemy's order of battle, intensions and capabilities and to use countermeasures to deny effective use of communications and weapon systems while protecting one's own effective use of same spectrum. EW is categorized into three major categories - Electronic Warfare support measures, Electronic Countermeasuresand Electronic Counter-Counter Measures. ESM is that division of EW involving actions taken to search for, intercept, locate and immediately identify radiated electromagnetic energy for the purposes of immediate threat recognition and tactical employment of forces. Situation view displays emitter information with respect to their angle of arrival and radiated frequency. Alphanumeric view displays attributes of the emitter (e.g., frequency, pulse width, amplitude, angle of arrival, pulse repetition frequency and time of arrival) in alphanumeric format. Map view presents the platform movement and localized emitter data on the map. Map view shall have capability to read shape and vector file format of map data.EWDS of ESM system shall search every emitter data update in both Hostile and Priority librariesfor emitter Identification. Itshall has capability to add, modify and delete libraryrecords.Current ESM systems are reporting multiple tracks for single frequency agile emitter. This paper focuses in design and development of Smart map based EW Display Subsystem (EWDS) of ESM system. As part of the scope of this paper, simulator for radar data generation is developed. Radar data simulator is interfaced with Smart map based EWDS of ESM system on Ethernet.***

Index terms: Electronic Warfare (EW), Electronic Warfare support measures (ESM), Electronic Counter measures (ECM) and Electronic Counter-Counter Measures (ECCM), EWDS.

I. INTRODUCTION

Electronic Warfare: Exploit the enemy's Electromagnetic emissions in all parts of the EM spectrum in order to provide intelligence on the enemy's order of battle, intentions and capabilities and to use countermeasures to deny effective use of communications and weapon systems while protecting one's own effective use of the same spectrum.

EW involves a variety of concepts and definitions of many terms which make the subject difficult to comprehend by laymen. Recognizing this problem, the US Joint Chiefs of Staff issued a document, which embodied the basic terms of EW and their definitions.

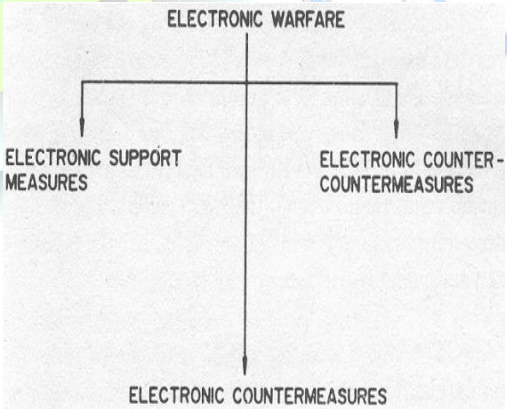

Fig.1Typesof Electronic Warfare systems

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i. Electronic Support (ES)
Also referred to as Electronic Support Measures (ESM). Search for, intercept, identify, and locate sources of radiated electromagnetic energy for the purpose of immediate threat recognition.

3 groups

- Signals Intelligence (SIGINT)
- Communications Intelligence (COMINT)
- Electronics Intelligence (ELINT)

ii. Electronic Attack (EA)
Division of Electronic Warfare (EW) involving the use of electromagnetic energy, directed energy, or anti-radiation weapons to attack personnel, facilities, or equipment with the intent of degrading, neutralizing, or destroying enemy combat capability. EA is considered a form of fires.

iii.Electronic Self Protection (EP)
Division of electronic warfare involving actions taken to protect personnel, facilities, and equipment from any effects of friendly, neutral, or enemy use of the EMS, as well as naturally occurring phenomena that degrade, neutralize, or destroy friendly combat capability.

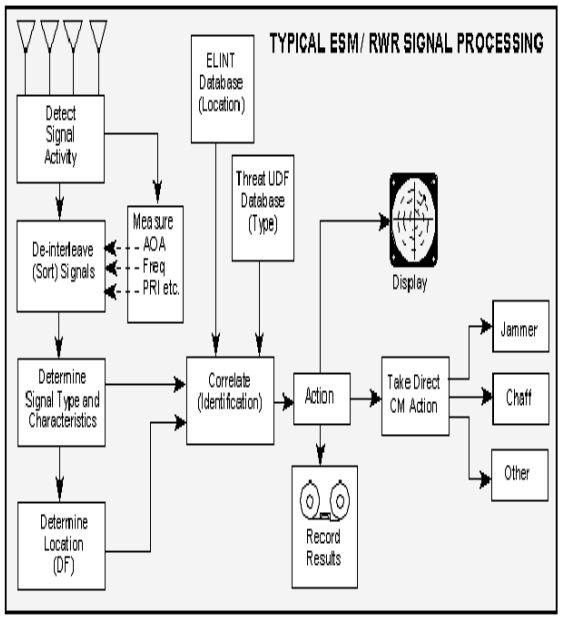

Fig.2 Typical ESM/RWR signal processing

Electronic support measures (ESM)and radar-warning receivers (RWR) place great demands on range, selectivity and processing capacity.
The BOW family of advanced ESM and RWR products make up a high-performance system with excellent performance in combination with modular design and very good growth potential. BOW is one of the most powerful ESM and RWR systems presently available.

II.RELATED WORK

2.1 EW Design Philosophy

Design philosophy basically determines, first, which EW techniques are to be incorporated into or closely coupled to a hardware so as to make it effective against various threats, and secondly, how they are to be interfaced with the rest of the system. Current EW systems are viewed from mission requirement point of view. How a particular threat {e.g. missile, tactical communications, anti-tank weapons) against air, naval or army platform is met effectively has remained. the crux of the EW problem since beginning. Many EW techniques have been evolved over the years to counter such threats. Design philosophy has primarily been the key basis for the development of all these EW tactics. From the discussion on the current EW scene, it is obvious that EW mission requirements are pursuing two distinct EW design philosophies-the stand-alone EW philosophy and the suppression of enemy air defense (SEAD) EW philosophy [1].
The stand-alone EW, also called 'self-protection EW' design philosophy meets one type of EW mission requirement. The primary aim of EW in this mission is to provide protection or survival of the system against a particular threat. The stand-alone EW design philosophy, in fact, is a carry-over from the electronic threat environment which existed from World War II through the mid-1960s.
This philosophy still exists and that is why, most current platforms (aircraft, ships and troops) which operate against enemy actions have as a minimum requirement a radar warning receiver (RWR) with at least quadrant threat direction-finding capability [2]. The threat warning function is many times coupled with a defensive capability in the form of a self-protection jammer in combination with decoys, such as chaff or flares or which can divert weapons from

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the intended target. However, it is difficult for anyone platform (particularly airborne platforms which have weight limitations) to carry enough EW to encounter today's sophisticated threats, even in a survival sense.

2.2 EW Integration Technology

The integration of E0/IR systems and RF systems, into a single hardware is another emerging design technology for the future EW systems. Such integration allows multi-sensor fusionand correlation which vastly improves total system performance and reliability [3][4]. To be more cost-effective, integrated EW /EOW is used as a force multiplier.

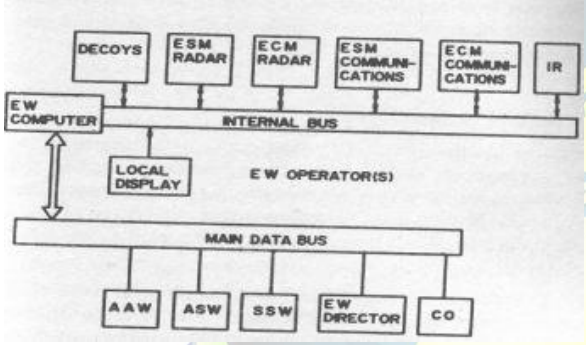

Fig.3 EW Integration Technology

Also, the integrated use of EO/IR and RF allows the optimum deployment of expendables and monitoring of their effectiveness against a threat has shown in the **Fig 3.** Integration can also provide defense against anti-radiation threats and optimum use of ECM [3].

III.EXISTINGWORK

[1] John Counsell, Steve Smith University of the West of England, Bristol, "Displaying LiDAR Data for Interactive Web-Based Modeling of the Environment" [1].

The paper describes an approach developed in the VEPs project that switches on the LiDAR data for trees and buildings removed from the DTM in the 3D Scene. This data can then be used to visually judge the appropriate height and form of buildings and trees [1]. A set of web-based interactive tools have been developed to enable users to freely adjust the scale and mass of structures and vegetation to match the selected point cloud area, substantially improving the quality of presence and accuracy of the resulting model.

[2] D. R. JARMAN," The Display of Automatically Processed Radar Information" [2].

In this paper consists of a central equipment and a number of display consoles. The central equipment contains a master timing unit, a buffer store, a symbol generator and a digital/analogue converter, and it generates all the timing waveforms, deflection waveforms and brightening waveforms which are required by the consoles [2]. The consoles themselves are all similar and contain the cathode-ray tube driving circuits together with display selection facilities and a means of injecting information manually into the computer.

[3] Jeffrey Merrill Manager, ATE Systems Engineering "Electronic Countermeasures (ECM) Technique Measurements and Automation Methods "

This paper will discuss generic ECM system measurement methods and their automation for use in Test Program Set (TPS) applications. Specifically, ECM technique measurements will be discussed. An overview will be provided on Northrop Grumman's ECM Techniques Analyzer (ECMTA)[3]. The architecture will be discussed along with its measurement capabilities and application to TPS use. The ECMTA supports a variety of test needs and has been provided to multiple Customers in order to support EW Jammer programs and lab applications. The ECMTA incorporates a modular tuned receiver architecture that allows COTS modules to be reconfigured via software to form the desired measurement instrument capability.

[4] Steven P. Harrison Maxim F. van Norden "Electronic Chart Display Overlay Development at the Naval Oceanographic Office for Use in Tactical Applications "[4].

The present STOIC product cannot be simultaneously viewed with other geospatial data, such as route plans, order of battle, or terrain information, as required for achieving intelligence dominance of the battlespace. In addition, the Navy is now transitioning to electronic navigation using Digital Nautical Charts (DNCsQ and plans to be fully

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operational with Electronic Chart Display and Information Systems-Navy (ECDIS-N) on all ships by fiscal year 2004 [4].

[5] W.C. Baker. B.Sc." ESM systems applications".

This paper discusses various roles for ESM within the electronic battle, to demonstrate the requirements and constraints imposed on ESM system design by platforms and the environments within which they operate [5]. The design considerations for each application are outlined, showing the need for antenna, receiver and signal processing time against wanted signals, while operating in an environment containing a large number of concurrent background signals [5].

[6] F. Trotta5 1 Electronica S.p.A., ELT, Rome, Italy "High Resolution ESM/ELINT DOA Estimation with Super-Heterodyne Multi-Octave Antenna System "[6]. This paper describes compact antenna system architecture for DOA estimation in electronic warfare environments. The single antenna modules are intended to cover a certain frequency range each.

[7]Radar is a technology used in many aspects of modern life, with many diverse civilian and military applications. Although radars have been around since 1904, much work is still spent today designing, building, testing, and implementing new radars and developing new and more powerful radar signal processing techniques [7]. Radar signal processing is still a very active area of research. This super-heterodyne approach allows covering a bandwidth larger than four octaves. The novelty of the presented structure, with respect to typical ESM/ELINTapproaches, lies in a spatially shared solution for the intermediate and high-band arrays by means of an interdigitated architecture [7].

[8]Radar waveform analysis is the ambiguity function it is an important tool, first introduced by Woodward [8]. The ambiguity function characterizes the matched filter output of a radar waveform and is useful for analyzing resolution and ambiguities in delay and Doppler [8].

IV.PROPOSED IMPLEMENTATION

The ESM function provides self-protection by warning the crew of immediate threats and, through classifying emissions, select appropriate countermeasures. In map view presents the platform movement and localized emitter data on the map. QGIS is an Open Source Geographic Information System in map terminology for track, route and way point.EWDS of ESM system shall search every emitter data update in both hostile and priority libraries for emitter identification. Current ESM systems are reporting multiple tracks for single frequency agile emitter. EWDS of ESM system such that it shall be able to report single track even if ESM system reports multiple tracks for the same frequency agile emitter. As part of the scope of this project, simulator for radar data generation is developed.

4.1Algorithm

1. Start
2. In EWDS the Omni Antenna will detect the signal activity.
3. The sort signals are De-interleaved.
3. It determine the signal type and characteristics.
4. It determines the Location.
5. After location determines it will correlate with the action and display the map as well as it records the results has shown in **Fig.4.**
6. Take direct CM Action with the different process.
   -Jammer
   -Chaff
7. Stop

Has shown in the **Fig.2.**

4.2 Qt Framework

Qt makes it easy to address the latest UI paradigm shifts that touch screens and tablets require. Qt for Application Development enables you to develop applications with intuitive user interfaces for multiple targets, faster than ever before. Everything you need is here to have your designers and programmers work iteratively in a seamless workflow, from an idea to deploying the application to the target platform.

- It is an open source.
- It is an independent cross platform.
- It complies in windows, Linux, iPhone etc;
- Qt supports multiple platforms.
- Qt provides user friendly.

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- It is very easy to design, develop and deploy and all other embedded devices.
- The typical emitter characteristics that an ESM system can measure for pulse radar are
  - i. Frequency
  - ii. Amplitude(Power)
  - iii. Direction of Arrival(DOA) also called Angle of Arrival(AOA)
  - iv. Time of Arrival(TOA)
  - v. Pulse Repetition Interval (PRI)
  - vi. PRI type
  - vii. Pulse Width(PW)
  - viii. Scan type and Rate

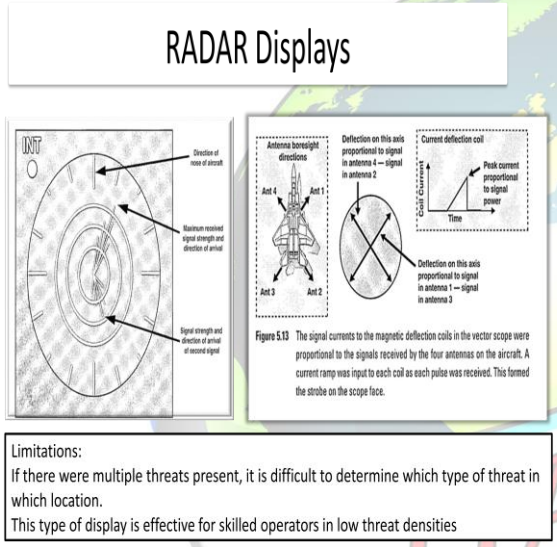

Fig.4 Pulse position indicator (PPI) or raw video

4.3 Smart Map

Based On Multi-dimensional GIS Platform, Smart Mapping Integrates Multi-source, Multi-scale, Multi-temporal, Multi-structure Layers of Data.Smart Mapping from MAPUNI Combing Cloud Computing, Internet of Things, Real-time Data Acquisition, Modeling Techniques, Data Analysis, Three-dimensional Simulation and Other Cutting-edge Technologies to Deeper.

The Spatial Data Mining, Smart Mapping of MAPUNI Can Provide Visual Decision Support and Information Services for Situation Monitoring, Agricultural Assessment, Forest Fire Prevention, Environmental Protection, Flood Control and Drought, Urban Planning, Telecommunications and Construction of Power Facilities, Urban Management and other Industrial Applications and Public Information.

Electronic Support System

Table:1 software development environment and hardware development environment

S.No	Software Engineering Phase	Tool
1.	Requirements capturing and Managing	IBM Rational DOORs 9.5
2.	Design Phase: Modeling of Software	IBM Rational Rhapsody8.0.4
3	Development Phase: Software Development	Integrated Development Environment: C 5.4 Compiler :Mingw Operating System : RHEL 7.0

Hardware Environment

1	Processor	Intel i5 3.25 GHz
2	RAM	8GB
3	Hard disk	500 GB
4	Communication Interfaces	Giga bit Ethernet LAN : 1No RS 232-1No
5	Graphics Card	1GB Graphics Intel card
6	Monitor	LCD Monitor with minimum 1280 x 1024 resolution

Software Development Environment

In Below**Fig.5.** we show user management system which is accessed by clients as well as main authority which is shown as below,

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USER MANAGEMENT

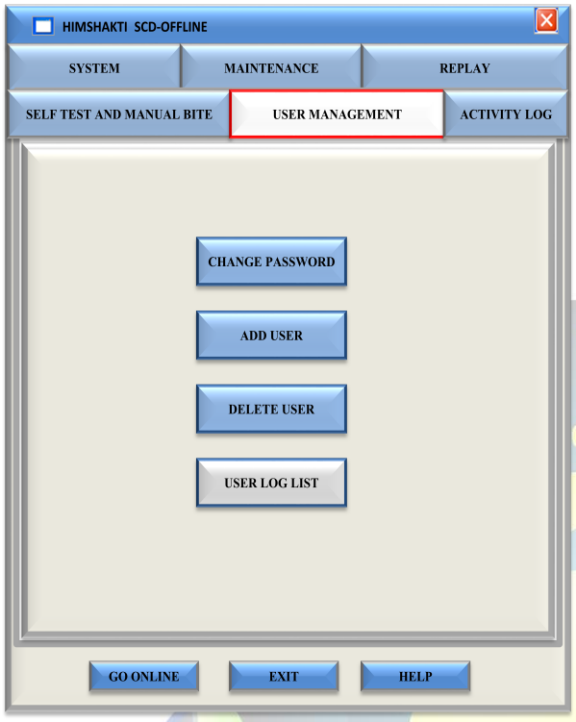

Fig.5 user module for the proposed work

Proposed work is shown above**Fig.5** in User Management module. Which will give access to users.

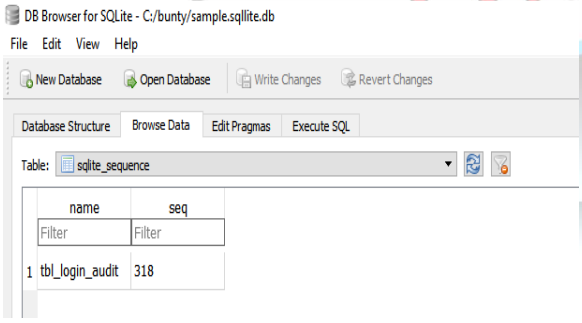

Fig.6 DB browser for SQLite details a file with the total sequence number.

CLIENT MODULE

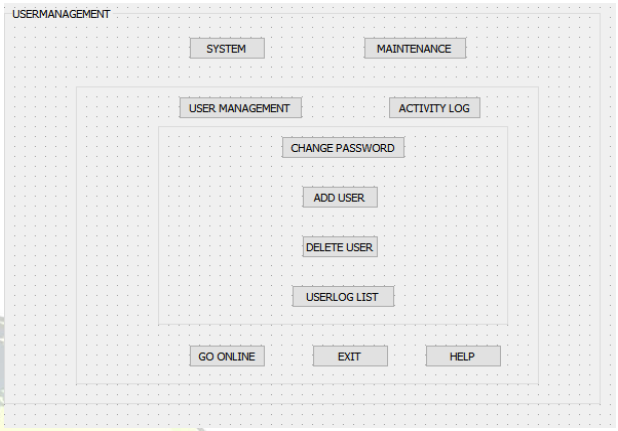

Fig.7 client module for proposed work

Client module for proposed work is as shown in above figure.

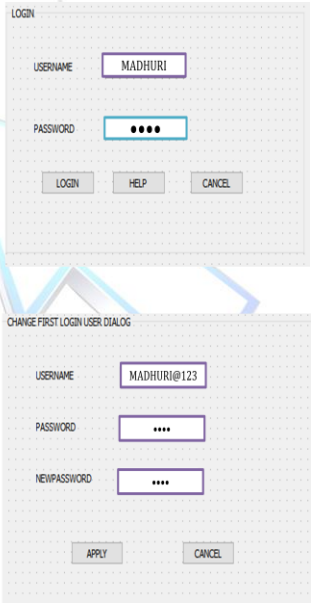

Fig.8 a) Login by the user b) change login id and password.

Above figure will show that the access to users as well if in case password is lost how to access the system, and how we can change the password for more security.

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As per the requirement we can add the users and delete the user from proposed system.

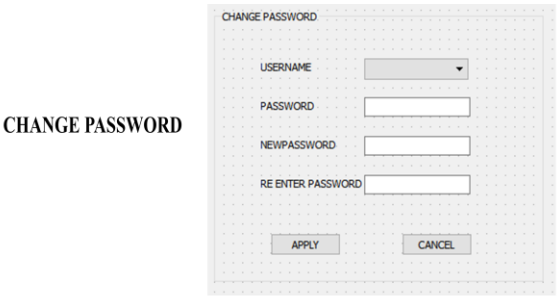

Fig.9 a) change the password b) check the user loglist

After changing the password, we can also get access to check the loglist

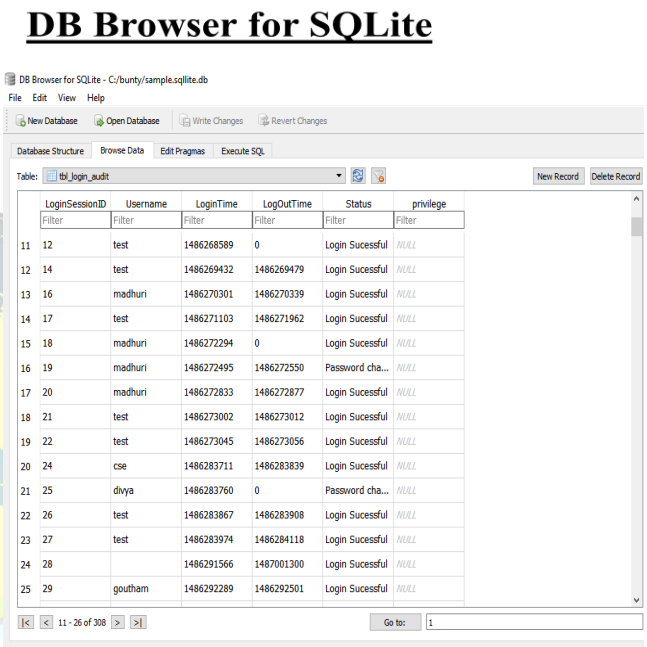

Fig.11DB browser for SQLite

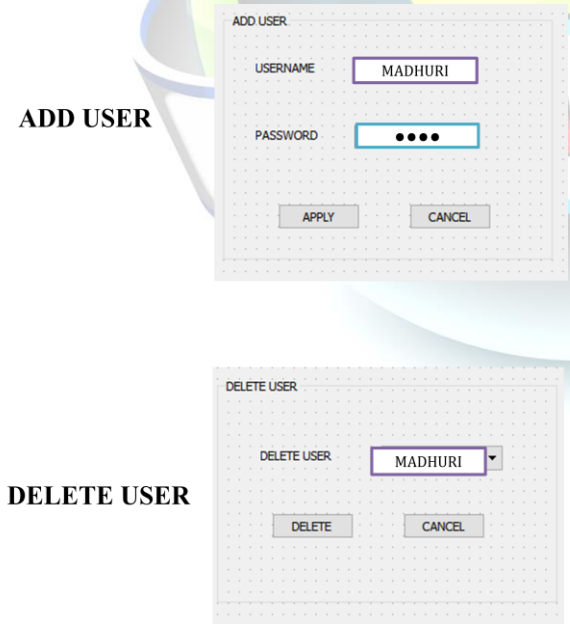

Fig.10 Add user and delete user

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Fig.12DB browser for SQLite representing all username and passwords.

MySQL development cycle is for the purpose of the document is to facilitate community involvement, for example by providing feedback on pre-releases and making contributions to upcoming releases, through explaining how MySQL Server versions are developed.Feature development happens as follows: A MySQL feature is specified in a Work log entry has shown in **Fig.11** and **Fig12**. The Work log entry undergoes specification, design, architecture and QA reviews (but not necessarily in a strict sequence) has shown in **Fig.6**. The MySQL feature is implemented in a feature tree. Feature trees are created from and kept in sync with the MySQL main development tree, which is called TRUNK. When a feature has been implemented, it undergoes a code review. When the code review is done, the feature tree is handed over to QA (quality assurance). QA tests the feature, the implementer fixes bugs, and QA eventually "signs off" the feature. Once the feature is signed off, it is merged into TRUNK. This way, TRUNK will accumulate features and bug fixes over time. Extensive regression testing is performed on TRUNK all the time, keeping TRUNK close to Release Candidate (RC) quality at all times.

In the proposed work by we used Electronic Warfare(EW) is to exploit enemy's electromagnetic emissions in all parts of electromagnetic spectrum to provide intelligence on enemy's order of battle, intensions and capabilities and to use countermeasures to deny effective use of communications and weapon systems while protecting one's own effective use of same spectrum.EW is categorized into three major categories - Electronic Warfare support measures (ESM), Electronic Countermeasures (ECM) and Electronic Counter-Counter Measures(ECCM). Map view presents the platform movement and localized emitter data on the map. Map view shall have capability to read shape and vector file format of map data. Map features like Zoom in, zoom out, Panning, Annotation are provided in Map view. EWDS of ESM system manages 5000 radar library records of which 500 are Hostile and 4500 records are Priority. Judicious color attributes will be associated with the tactical data to draw immediate attention of operator in dense EW environment.

The proposed work display is shown below in **Fig.13**

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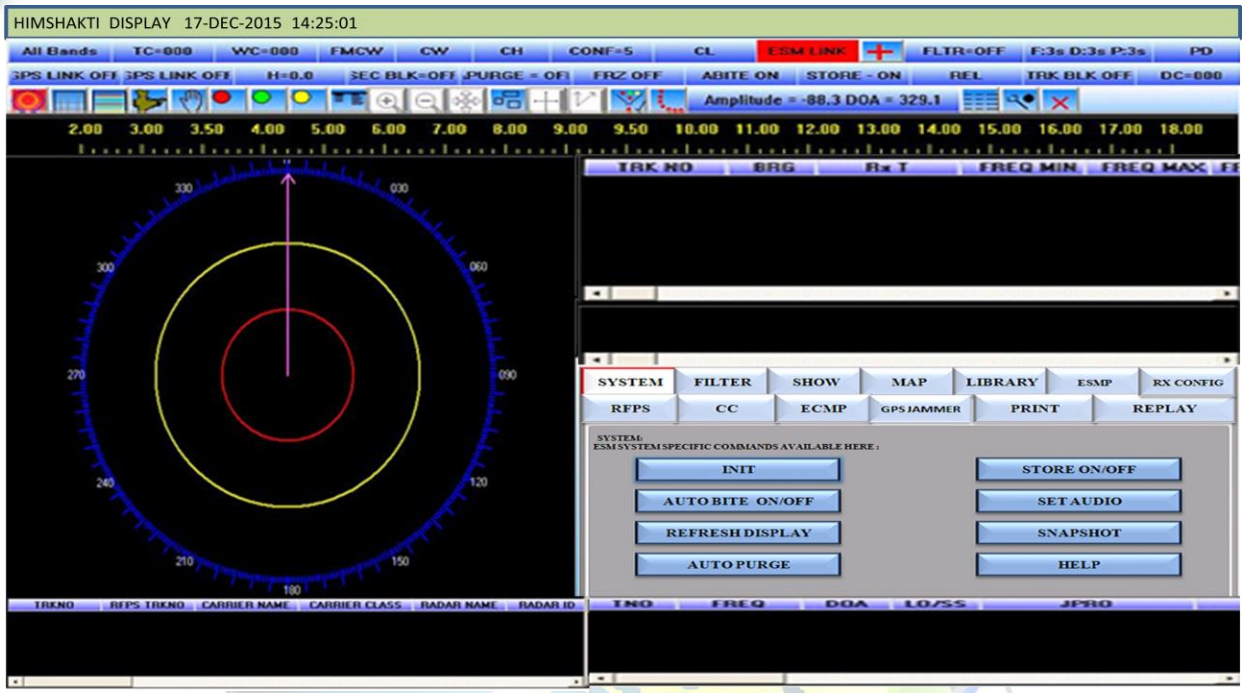

Fig.13 proposed work display

V.CONCLUSION

This paper focuses in design and development of Smart map based EW Display Subsystem (EWDS) of ESM system. As part of the scope of this paper, simulator for radar data generation is developed. Radar data simulator is interfaced with Smart map based EWDS of ESM system on Ethernet. With the use of hardware and software development we can prove the proposed work is robust under different implementation scenarios. The proposed work is robust and give better evaluation of system. Many possible future work possible for proposed work.

REFERENCES

[1] John Counsell, Steve Smith University of the West of England, Bristol, "Displaying LiDAR Data for Interactive Web-Based Modeling of the Environment".
[2] D. R. JARMAN," The Display of Automatically Processed Radar Information".
[3] Jeffrey Merrill Manager, ATE Systems Engineering "Electronic Countermeasures (ECM) Technique Measurements and Automation Methods "
[4] Steven P. Harrison Maxim F. van Norden "Electronic Chart Display Overlay Development at the Naval Oceanographic Office for Use in Tactical Applications ".
[5] W.C. Baker. B.Sc." ESM systems applications".
[6] F. Trotta5 1 Electronic S.p.A., ELT, Rome, Italy "High Resolution ESM/ELINT DOA Estimation with Super-Heterodyne Multi-Octave Antenna System "
[7] Electronics Special Issue Radio and Radar Signal Processing 2017.
[8] Bufler, T.D.; Narayanan, R.M.; Sherbondy, K.D. Sudoku inspired designs for radar waveforms and antenna arrays. Electronics 2017.