



AIRPORT & SEAPORT SECURITY

HOMELAND PROTECTION

BORDER SECURITY

www.tudor-tech.ch

TUDOR TECH ML64^{TT} ROBOTIC SCANNING SYSTEM



The only scanner in the world fully remote operated by a single operator from a safe distance, ensuring total protection against ionizing radiation



The increasing growth of terrorist activities, contraband and illegal transportation drives the demand for high performance security systems. Special attention needs to be paid to the area of international cargo transport that is usually the preferred vector for the contraband with weapons, radioactive and explosive materials, narcotics and other forbidden material, easy to be hidden inside large volume of goods. The daily increasing volume of transported cargo makes it impossible to physically inspect all suspicious transports.

TUDOR TECH's award winning technology provides a safe, reliable and optimized solution in terms of throughput of more than 200 scanned long vehicles / hour.

It is the most technologically advanced Linear Accelerator (LINAC) scanner available in the world market with impressive image analysis capabilities that ensure the highest productivity for cargo inspection applications without compromising the safety and security of the operators.

TUDOR Tech's internationally patented remote operation principle is a unique feature with positive impact on operation costs, making it the only mobile scanner that guarantees zero professional radiation exposure for its operators and total protection against incidents caused by dangerous cargo or terrorist attempts targeting security checkpoints.

Having gathered a consistent amount of international awards including The World Intellectual Property Organization „Invention of the year“ award, TUDOR SCAN TECH's proven concept has received international validation both from the scientific community and from security professionals on all continents.

MOBILITY is a key aspect in today's border security with ever increasing threats, with fast paced changes in the rules and standards of security and safety.

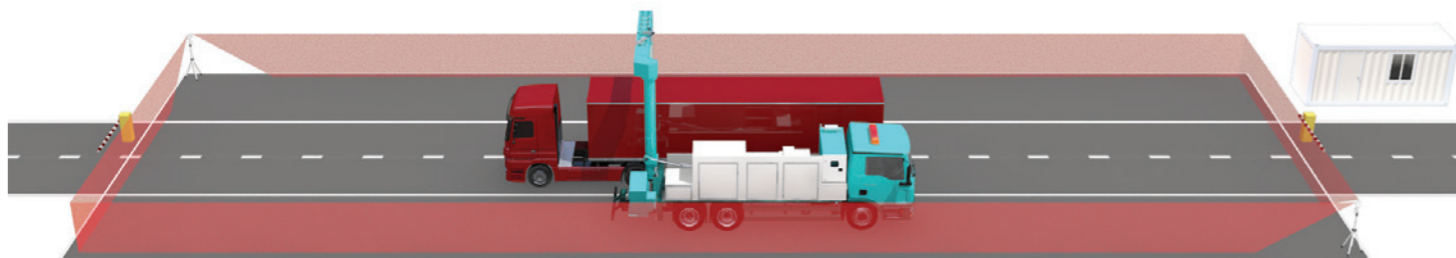
TUDOR Tech ML64 is a highly versatile mobile imaging system, allowing 3 operating modes:



1. One by one scanning of stationary vehicles (optimized solution in terms of penetration and image);



2. Sequential scanning of a number of vehicles placed in a line for a higher throughput;



3. Drive through scanning in portal mode (the inspected trucks can be driven by their driver at low speed of 5 to 15 km/hour that generates an optimized solution in terms of throughput of more than 200 long vehicles/hour). In Drive through scanning mode it is scanned only the cargo, for radiation safety reasons the driver cabin being excepted from scanning.

Maximum Safety

TUDOR Tech ML64 fully eliminates the risk of professional or accidental exposure to ionizing radiation by controlling all scanning processes from a Mobile Command and Control Center (MCCC) or a Fixed Command and Control Center (FCCC) that can be supplied in various configurations. The MCCC, or the FCCC are placed safely outside the Exclusion Area during scanning and is carried by the Mobile Scanning Unit (MSU) in transport mode.

The operation fully automated, interactive and extremely simple, based on the principle of touching intuitive icons and displaying permanently the status of the system, as well as the sequence in progress. The scanning arm is automatically deployed in just a few minutes by simply touching an intuitive icon on the operator interface.

The essential difference between all competitor systems and TUDOR Tech ML64 is that it doesn't need a driver to control the truck's movement (direction, sense, brakes, engine's parameters etc.)

Intuitive Operation

The 3D interface of the application is very intuitive, indicating at each step the correct course of action, and not leaving room for mistake. It will only allow inputs that are expected by the system at that moment.

The system runs self-test sequences on start-up, providing real-time status information of all subsystems. The operators command the conversion of the Mobile Scanning Unit from "Transport configuration" to "Scanning configuration" by simply touching the appropriate icon.

The software control application is displayed on a touch-screen monitor and manages the Mobile Scanning Unit's movement, the video surveillance, the Automation Protection of the Exclusion Area (APEA), the barriers' remote operation and the automation of the scanning process.

Mobility / Versatility

All the components of the Mobile Scanning Unit (MSU) are assembled on a truck chassis, resulting in an extremely versatile and mobile robotized scanning system.

MSU's engine is EURO-6 compliant and powers the whole scanning system. The end user can choose between several worldwide truck manufacturers, according to local support and service facilities.

These functions are managed by a "driverless" subsystem that controls all the commands and parameters of the truck. In scan mode the operator initiates the scan procedure just by touching the corresponding virtual button, on the touch screen display, inside the MCCC or FCCC and the process is executed in a fully automated sequence, providing to the operator real time data by graphic animation and sound signals.

TUDOR Tech ML64 uses a high-resolution transmission imaging system comprising in-house designed electronics and a dual-energy 6/4 MeV Linear Accelerator (LINAC) that is able to handle the most difficult situations and very high density cargo.

Compared with any competitor product, TUDOR Tech ML64 offers fast, reliable, and safe operation, providing at the same time the advantage of at least 2 times lower total cost of operation for a life time of 10 years.

All commands and status of the sub-systems are registered in a "black-box" file. The service menu and the content of the "Black-box" can be remotely administrated and interrogated by supervisors.

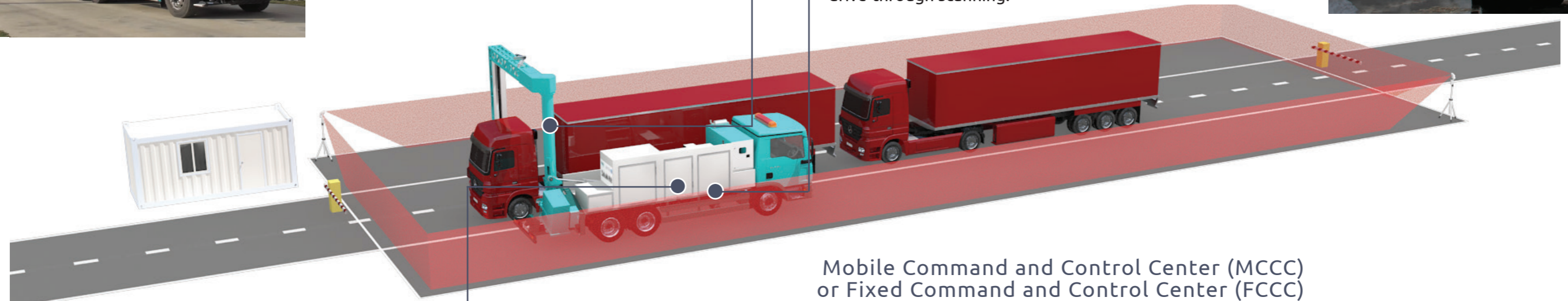


Mobile Scanning Unit (MSU)



A lightweight, highly versatile scanner fully operated from a safe distance.

TUDOR Tech ML64 offers best-in-class fuel economy both in transport and in operation due to its low weight of approximately 24 tons.



Remote Operation

Unique feature on the market, remote operation is the defining feature of TUDOR Tech ML64. It ensures total radiation safety for the operators and unprecedented protection from terrorist explosion of scanned vehicles.

The MCCC or the FCCC are permanently connected to the MSU through advanced and redundant state-of-the-art encrypted wireless communication technologies through which all commands and data are safely transferred.

When integrated into advanced Integrated Border Management systems TUDOR Tech ML64 can also be operated through a secured internet connection from anywhere in the world or supervised in real-time for prevention of corrupt practices.



The dual-energy imaging provides the material discrimination in four categories (organic, inorganic, metals and heavy metals) by using a color map, allowing the fast identification of threats such as explosives or other IED components. It also gives the operator an important tool to identify other dangerous items such as weapons or contraband.

Ultra-fast sampling electronics and highly sensitive detector arrays ensure the best possible imaging performance even in drive-through scanning.

Mobile Command and Control Center (MCCC) or Fixed Command and Control Center (FCCC)

Mobile Command and Control Center (MCCC) or Fixed Command and Control Center (FCCC).

TUDOR Tech ML64 is operated away from the scanned vehicle without human presence in the Exclusion Area and at a safe distance from a possible terrorist detonation.

The operator is provided with a touch-based interface that controls the scanner's movement and ensures fast image analysis through multiple enhancement tools. All commands are given



through the operating interface and performed by the scanner through automated processes that replace the traditional driver.

By default, the MCCC is available as a rugged pelican-case, and FCCC as an office container endowed with accommodation facilities and all the necessary operational equipments. Depending on customer requirements, MCCC and FCCC could be customized in other various versions.

Imaging System



Software

The software control application has three levels of security access (Operator, Administrator and Service) and actions to be performed are limited to the specific levels. The operator can start the software control application only by using an authorization password for authentication.

The software images' analyzing application displays the radiographed target's image in black and white, with options for filtering and magnifying, respectively the color image resulted through the discrimination filter's applying, on different type of materials: organic, inorganic, metals, heavy metals. The operator can apply the available different filters and processing algorithms in order to improve the penetration or image quality just by touching intuitive icons on the Graphic User interface.

The image is processed in a proprietary format and can be exported to bmp, jpeg or other usual formats.



A versatile graphical user interface allows the operator to remotely control all aspects of the scanner operation from a safe distance. The traditional driver is replaced by autonomous robotic systems that ensure the system is operated safely at all times.

The system is able to acquire textual and image data that describes the items being scanned and the operator can classify large amounts of data thanks to an intuitive gesture based interface.



The operator can see at a glance the current state of the system and has easy access to all the parameters that determine the throughput and image quality. All the operations are logged for review or subsequent training.

A touch based interface is used to explore the high resolution radiographic image. The operator can apply standard and custom image enhancement operations, can perform measurements and can review the parameters of the system at the time the image was taken. The image can be annotated and saved for review or printed.



Construction accessories – standard view



Small truck loaded with goods and test objects - material separation view



Construction accessories – material separation view

Customized Command and Control Centers

Depending on the type of application and scanning site location, our customers may choose from different types of command and control centers. For MCCC, the standard pelican-case provides core functionality and efficient operation in military environments with minimal effort from the crew.

For cases requiring more flexibility, a separate van can be supplied for operating TUDOR Tech ML64 and for additional purposes such as a full mobile checkpoint with increased screening capabilities as following: radiation detection, baggage and parcel screening, explosives & narcotics trace detection, document analysis and mobile surveillance.

A towable caravan used like MCCC could be the perfect solution for semi-permanent scanning locations providing an autonomous & comfortable climate-controlled environment for the operator.

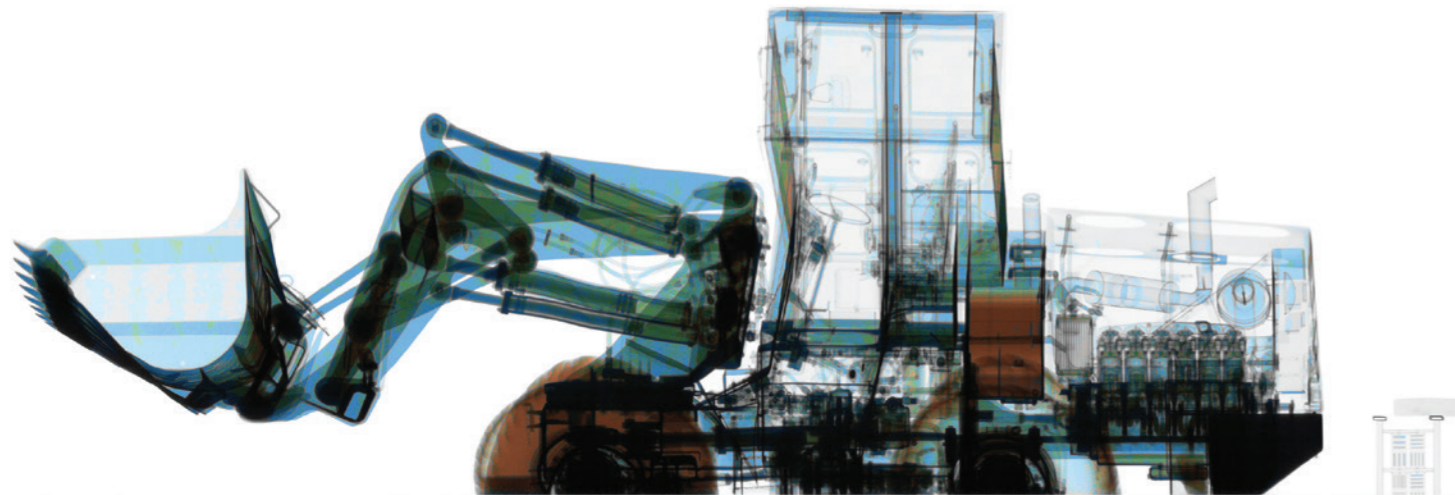
For FCCC there are available different sizes and models of office containers, allowing accommodation and operating facilities for one or more operators.

Dual-energy & high resolution imaging

The Dual-Energy Linear Accelerator Unit produces a fan-shaped radiation beam that is carefully oriented in order to achieve the best possible image quality and to cover the entire scanned vehicle from the axles to its top without any image cut-off. The Linear Accelerator unit delivers two interlaced levels of energy – 6 and 4 MeV – in order to achieve material discrimination.

The material discrimination feature provides extra information for the operators that can easily evaluate the radiography and establish a more accurate threat level by knowing whether the suspect area is organic, light organic or inorganic. With most of explosives being organic, this feature is extremely useful in identifying bulk explosives and IEDs.

Radiographic image of an excavator - material separation view



Command and Control Center's Integration

Effective supervision of scanning activities and prevention of corrupt practices has always been a serious concern for border control authorities.

This is an advanced and unique feature as all cargo and vehicle scanners currently in operation are constantly monitored by the Integrated Border Management structure in the headquarters of the National Authority.

TUDOR Tech ML64 scanners can be remotely supervised in real time from a central management location with or without knowledge of the operators and can even be operated from the supervisor console.

Additional integration options include automatic traffic management systems, under-vehicle inspection, radiation detection and nuclear, chemical and biological detection capabilities.

Imaging performance

Type of X-Ray source:	Linear Accelerator (LINAC) with dual energy interlaced pulses;
Energy:	6 / 4 MeV, interlaced;
Penetration:	320 mm in steel;
Wire resolution in air:	1 mm;
Contrast sensitivity:	1% at 10% penetration; 1.5% at 50% penetration; 4% at 80% penetration;
Material separation:	4 classes;

Radiation Safety

Level of radiation for the operator: natural level, no professional exposure;
 Dose of radiation to public outside the Exclusion Area: less than 1 mSv/year according to IAEA, GSR3;
 Radiation Monitoring: individual monitoring for each operator;
 No human presence inside the Exclusion Area.

The Vehicle

Chassis:	3-axle, 26 t GVM. Computer-managed speed, steering and braking during the scanning process. Left or right hand drive. Various manufacturers and models depending on specific local conditions;
Dimensions (LxWxH):	10 m x 2.5 m x 4 m (in transport configuration);
Environmental:	Euro-6 compliant;
Fuel consumption:	Less than 15l/h in One by One or Sequential scanning modes.

Operating Features

Principle of operation:	transmission imaging. Remote operation is performed via secured wireless technology or via internet connection;
Scanning Frame dimensions:	4.25 m width x 5.1 m height; different dimensions available on request;
Time to deploy:	Maximum 15 minutes from arrival on site by automated process control;
Crew requirements:	1 operator/shift;
Vehicles inspection mode:	one by one and sequential scanning modes for stationary vehicles, drive through scanning mode for moving vehicles;
Throughput:	30 to 200 trucks/containers/hour according to the length of each scanned object and scanning mode;
Scanning Speed:	in One by One or Sequential scanning modes: 0.8 to 2,9 km/h; in Drive-through scanning mode: 5 to 15 km/h;
Automatic recognition of:	the truck's license plates (LPR cameras), the containers' codes (CCR cameras);
Warning lights and audible alarm indicating „Radiation on status“;	
Safety features:	Exterior lighting for night time operation;
Digital video surveillance subsystem, allowing the operator to monitor the scanning area;	
Operating temperature:	between - 30 °C and + 55 °C; (extreme conditions kits are available on request);
Relative Humidity:	0-100%.



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