

Annex A

MICROWAVE MINIMUM TECHNICAL REQUIREMENTS

Cr. no.	Specifications
1.	GENERAL REQUIREMENTS
1.1	<p>Besides traditional challenges, currently, the escalation of events in the region, the evolution of the crime phenomenon and the intensification of the migration flow, the exchange of information and its security represent a new challenge.</p> <p>The rapid transfer of information is a necessity identified by institutional experts and represents a pressing priority for the Institution. Lately, the development of this segment slowed down, especially the development of IT elements, communications and their security, including modern elements of information technology, a transformation that requires modernization and improvement of telecommunications networks.</p> <p>Given the fact that all fields of activity require information processing and transfer internally and externally, we can say that nowadays information is very valuable and one of the most important resources. Therefore, it must be stored, processed and transferred at a professional level, under conditions that ensure correctness and accuracy.</p> <p>In view of the above, the information cannot be transferred in real time, therefore, stakeholders are forced to make decisions "blindly" without knowing all the details. These decisions are translated into measures and services, which affect the population of the eligible area. The eligible area faces problems of migration, drug trafficking, human trafficking, smuggling of various goods and trafficking in stolen vehicles. In addition, the lack of specific communication infrastructure and its security increases the time required to check vehicles and people at border crossing points. This directly affects waiting time at border crossing points and mobility in the border area.</p> <p>Some segments of the current network do not provide an adequate level of capacity for data exchange. The transfer capacity provided does not meet current technological requirements and operational needs. The BPGI's communications infrastructure in the eligibility area does not fully meet operational needs to meet the challenges of cross-border crime as well as to reduce response time in emergencies.</p> <p>The following major development directions emerge from the above:</p> <ul style="list-style-type: none"> - Modernizing (increasing capacity) segments of the data transport network (microwave) of the Inspectorate; - Equipping the Inspectorate's cars with special work seats, with video surveillance system, including communication channel with the operating center (HQ); - Acquiring IT solutions for management, centralized processing of video streams and information on the positioning of the Inspectorate teams; - Developing an IT solution capable of integrating information systems of the Inspectorate;
1.2	<p>QUALITY REQUIREMENTS</p> <p>To implement the project infrastructure, the following aspects should be considered:</p> <ul style="list-style-type: none"> • all technical requirements are minimal and mandatory;

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	<ul style="list-style-type: none"> all equipment offered must be compatible with the electricity supply standards available in the Republic of Moldova; all equipment must be new and unused; all equipment must be of international brand type; systems/equipment offered must necessarily correspond to the manufacturer's technical sheets; mounting and commissioning of the offered systems will be carried out by the supplier's specialized staff; supplier will provide commissioning and post-implementation technical assistance throughout the infrastructure warranty period; supplier participating in the project will be provided the quality management standard - ISO 9001 and information security management standard - ISO 27001.
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2.	Modernizing (increasing capacity) segments of the data transport network (microwave);
2.1	<p>General description</p> <p>The purchase of goods and services necessary for the increase of capacity and speed of data transfer on the problematic segments up to date in the Inspectorate's network. The offered equipment must belong to the same manufacturer as the existing one, in order to maintain full interoperability between the existing and the new equipment. The requested microwave transport equipment is in 2+0 XPIC configuration, with native Ethernet modems, which can ensure the transport of an aggregated Ethernet traffic with speeds of 500 Mbps. Split-mount architecture in the sense that each radio modem module installed in the indoor unit (IDU) will be connected to the outdoor unit (ODU) using 10mm or better RG8 coaxial cable for carrying intermediate frequencies and for powering the radio unit. The system must allow local and remote soft looping at the outdoor radio unit (ODU) level with the possibility of fault monitoring, control and diagnosis. The system must allow local and remote soft looping at the intermediate frequency (IF) level with the possibility of fault monitoring, control and diagnosis. The distribution of data traffic on the two V-and H-polarization will be done at the physical level (L1 Link Aggregation), equally, so that the loading is symmetrical.</p> <p>Modernization includes the replacement of existing equipment. The equipment will be mounted and offered by the supplier.</p>
2.2	<p>Technical and quantitative description</p> <ul style="list-style-type: none"> - 16 links with a capacity of 500 Mbps;
2.3	<p>Equipment construction:</p> <p>"Split mount" type (supports any environmental conditions) in the working frequency band of 7GHz - 25 GHz.</p>

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2.4	Characteristics of frequency, modulation and radio channel width: <ul style="list-style-type: none"> • Rx/Tx difference according to ETSI; • The equipment must support the configuration of the radio channel width of 28MHz and 56MHz; • To achieve an aggregate throughput of 500 Mbps, each channel must support a minimum capacity of 250 Mbps.
2.5	Software-configurable transmit power in steps, in amounts of maximum 1dBm; Have automatic transmit power regulation by using the ATPC (Automatic Transmit Power Control) function; Provide and enable the simultaneous operation of adaptive modulation schemes and automatic power regulation through ATPC to provide a high degree of radio link availability in the event of changes in propagation conditions caused by environmental conditions. Allow a minimum transmit power of 23 dBm in the modulation configuration that allows the equipment to operate at 250 Mbps per polarization when the channel width is both 28 MHz and 56 MHz.
2.6	The system must allow radio units to be connected to a single antenna on both V-and H-polarization.
2.7	Compliance with current versions of applicable standards (ITU-T, ITU-R, ETSI, IEEE, etc.). The following standards will be considered in particular: <ul style="list-style-type: none"> • EN 301 489-4 • EN 301 489-1 • EN 60950-1 • IEC 60950-1 • UL 60950-1 • EN 60950-22 • UL 60950-22

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2.8	<p data-bbox="342 231 768 263">INDOOR EQUIPMENT (IDU)</p> <ul style="list-style-type: none"> <li data-bbox="383 272 600 300">• 19-inch rack. <li data-bbox="383 311 1081 338">• Modular structure on the same indoor construction. <li data-bbox="383 349 1240 376">• The modular structure will integrate the following components: <ul style="list-style-type: none"> <li data-bbox="472 387 938 414">1. Indoor equipment supply (IDU): <ul style="list-style-type: none"> <li data-bbox="555 426 2033 491">a) IDU will be equipped with two power ports, which allow the simultaneous powering of the equipment from two distinct sources; <li data-bbox="555 502 1659 529">b) The equipment will have two power modules to ensure power module redundancy. <li data-bbox="555 541 1594 568">c) The power supply modules will be powered by -48 Vdc with positive ground; <li data-bbox="472 579 929 606">2. Redundant processing modules. <li data-bbox="472 617 2024 683">3. Radio modem modules will be equipped with 1 (one) IF interface. The number of radio modules is sized according to the following criteria: <ul style="list-style-type: none"> <li data-bbox="555 694 1451 721">a) Two modules for each RF direction departing from a 2+0 line end. <li data-bbox="555 732 1525 759">b) Depending on the number of RF directions, for each individual location. <li data-bbox="555 770 2033 836">c) The radio modem modules will ensure remote powering of external radio units (ODU) through the same coaxial cable that also ensures the transport of intermediate frequencies. <li data-bbox="555 847 1951 912">d) In order to use CCDP, the radio modem will have XPIC technology implemented to filter the interference between the two V and H polarizations. <li data-bbox="383 924 607 951">• XPIC will be: <ul style="list-style-type: none"> <li data-bbox="555 962 898 989">a) Configurable software. <li data-bbox="555 1000 1525 1027">b) Physically interconnected between two radio modules of a 2+0 link end. <li data-bbox="383 1038 2002 1200">• The configuration of the 2+0 XPIC radio lines must ensure redundancy and allow the operation of the radio link to at least half capacity (250Mbps) in case of failure of one of the following components: <ul style="list-style-type: none"> <li data-bbox="488 1109 712 1136">○ Modem mode <li data-bbox="488 1147 887 1174">○ Outdoor Radio Unit (ODU) <li data-bbox="488 1185 636 1212">○ IF cable

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2.9	<p>TECHNICAL SPECIFICATIONS OF SWITCH FUNCTIONS AND ETHERNET INTERFACES</p> <ul style="list-style-type: none"> • The modules or equipment that provide Ethernet switch functions and their interfaces must provide at least 4 Ethernet ports for data traffic (does not include the management and/or local access port), of which 2 FastEthernet or GigabitEthernet type ports, RJ-45 connector, "built-in" or "electric SFP" solution, • Non-blocking architecture for the switching matrix. • Switching IP/MPLS packets, configuring L3 VPN (OSPF, IS-IS) services. • Defining at least 8 CoS priority classes, each class having its own "queue". • Ethernet Private Line/E-LINE according to MEF 6 definitions. • Ethernet Private LAN/E-LAN according to MEF 6 definitions. • Port mirroring. • 802.1Q • All Ethernet ports must allow: <ol style="list-style-type: none"> 1. Access and trunk mode configuration. 2. Encapsulation of traffic with VLAN tags (802.1q). 3. Packet priority identification based on the PCP (802.1q), DSCP (IPv4 and IPV6), EXP (MPLS) field. 4. Addressing 4094 unique VLANs. 5. Simultaneous configuration of minimum 1000 VLANs. 6. Minimum 16000 MAC address table input. 7. Link Aggregation Control Protocol (LACP 802.3ad) between 2 Ethernet ports on the same module and/or on different modules. 8. Packet prioritization based on the PCP (CoS), DSCP (IPv4 and IPv6) or EXP (MPLS) field.
2.10	<p>OUTDOOR RADIO EQUIPMENT</p> <ul style="list-style-type: none"> • ODU must be provided with a reception level measurement point through a dedicated connector. • The connection between the indoor unit and the ODU unit will be made with a coaxial cable for the transport of intermediate frequencies and the remote power supply of the ODU unit, sized to ensure good operation for lengths of up to 200 meters. • The system must allow outdoor radio units (ODUs) to be connected to a single antenna via a symmetrical coupler on both H and V polarizations.

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2.11	<p>The possibility to store the full working configuration of a radio relay terminal in the form of a file, for its replication in different locations.</p> <p>The possibility to read a configuration file from a failed drive to load it into the replaced one. The possibility to read/load equipment configuration without connecting a power source.</p> <p>The possibility to store and display statistical data in accordance with the SNMP standard.</p>
2.12	<p>The free firmware upgrade assurance of all indoor/outdoor units during the equipment warranty period. The firmware will be upgraded by the technical staff of the purchaser, by loading the firmware on the units, using exclusively the remote and local management applications provided. The bidder will notify the purchaser of the appearance of all major firmware releases and will provide it with the necessary files, as well as the release notes developed by the manufacturer.</p> <p>A firmware upgrade means a firmware variant that eliminates bugs and malfunctions found in the operation of the equipment.</p>
2.13	<p>The offered radio relays must be administered locally, with the help of a local management application with a graphical interface, access to the interface of this application being restricted with username and password; the local management application can be a dedicated software (if this is the case, this application will be provided without any licensing restrictions) or a general-purpose application available within the Windows operating system (telnet, tftp, etc.)</p>
2.14	<p>The equipment will ensure operation in the 2+0 working regime using the XPIC solution or equivalent.</p> <p>Configurable software.</p> <p>Physically interconnected between two radio modules of a 2+0 link end.</p> <p>The type of equipment offered (product name/code according to the manufacturer's documentation) would be specified, if all mandatory technical requirements and those for which the bidder assumes exceeding the required minimum values were met.</p>
2.15	<p>Environment conditions:</p> <ul style="list-style-type: none"> - Operation: ETSI 300 019-2-4 class 4.1 and above; - Storage: ETSI 300 019-1-1 class 1.2 and above; - Transport: ETSI 300 019-1-2 class 2.3 and above;
2.16	Maximum consumption of 160 W per terminal/direction (2+0 XPIC configuration) under the required gain conditions.
2.17	The connection (ODU) will be made through a coaxial cable.
2.18	The equipment will implement an adaptive modulation mechanism, which will allow error-free transmission of traffic, in case of worsening propagation conditions.
2.19	Forward Error Correction (FEC) to improve BER performance.

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2.20	Local management can be done on a dedicated port (serial RS 232, or USB, or Ethernet 10/100 BaseT RJ 45 connector) or inband on one of the Ethernet traffic ports.
2.21	Remote management can be done on a dedicated port (Ethernet 10/100 BaseT RJ 45 connector) or inband on one of the Ethernet traffic channel. In the latter case, the management traffic will be tagged 802.1q and the management VLAN can be prioritized. The remote management configuration modes will be detailed. The OAM system shall comply with 802.1ag and Y.1731 standards or equivalent.
2.22	For the links in the 7 GHz and 25 GHz bands, the equipment offered and delivered must cover all the working frequencies used by the purchaser, the working frequency can be set with the help of the local and remote management software application. The same model/constructive variant of equipment will be offered for both requested frequency bands, for all radio links for the purpose of this project. The connection of the equipment is made by a Generic Ethernet Device, which can be a switch or router. ODU must be provided with a reception level measurement point through a dedicated connector. The system must allow outdoor radio units (ODUs) to be connected to a single antenna on both H- and V-polarization.
2.23	Supported standards or their equivalent with minimum requirements integrated under: <ul style="list-style-type: none"> – Radio frequencies: ETSI EN 302 217, – Working temperature range, – with the guarantee of preserving the functional characteristics: according to ETSI EN 300 019-2-4 Class 4.1 – Continuous conditions: - 300÷+400C (without solar radiation) – Extended continuous conditions: - 45°C to +55°C (without solar radiation) – Relative humidity: 100% maximum – Tightness: EN60529, IP code IP65 – Storage: EN 300 019-01-01, Class 1.2 – Transport: EN 300 019-01-02, Class 2.3 – Vibrations and shocks: EN 300 019-2-4 Test 4.1 CLASS 4M5 – EMC/EMI: EN 300330, EN 303413, EN 301 489-1 and EN 301 489-4
2.24	ODU connection ports: will be specified according to the constructive solution offered

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2.25	<p>Antennas</p> <ul style="list-style-type: none"> • Antenna type: with solid radome; • Cross-polarization attenuation: min. 30 dB; • VSWR max. 1.4 ± 0.2; • Electrical Compliance ETSI 302 217 Class 2-3; • Operating frequency: 7GHz and 15GHz; • Antenna diameter: 0.3-1.8m; • The antennas will be equipped with a secondary radiation reduction system. <p>The antennas will be "high performance" antennas recommended by the manufacturer for the construction of transport networks and will at least comply with the following technical specifications: Minimum ETSI class 3, with the possibility of working in the environment with very high radio interference. Dual V&H polarization regardless of frequency band and antenna size.</p>
2.26	<p>The antennas will be fully equipped for mounting on a cylindrical support between $\varnothing 60\text{mm}$ and $\varnothing 114\text{mm}$. The antennas greater than 1.2m exclusively will be provided with a system for stiffening the position in the horizontal plane (counter-winding).</p>
2.27	Antenna survival conditions according to the ETSI EN 300 833 standard.

List of locations and relevant information per location

NO	LINK_A	LINK_B	Frequency_T X	Frequency_RX	Existing (Mbps)	New (Mbps)
1	Giurgiulesti_PCTF	Giurgiulesti_SPF	23583,00	22575.00	15	500
2	Giurgiulesti_SPF	GF08_Giurgiulesti	23583.00	22575.00	15	500
3	GF08_Giurgiulesti	SloboziaMare	14949.00	14459.00	30	500
4	GF09_Brinza	Brinza_SPF	23583.00	22575.00	30	500
5	Cahul_SPF	Cahul_DR	14445.00	14935.00	70	500
6	Cahul_SPF	Cahul_PCTF	23583.00	22575.00	30	500
7	Leuseni	Leuseni_PCTF	22575.00	23583.00	30	500
8	GF18_Petresti	Sculeni_SPF	14459.00	14949.00	70	500
9	Sculeni_SPF	Sculeni_PCTF	23583.00	22575.00	70	500
10	GF-Vancicauti	Ocnita_SPF	11245.00	10715.00	100	500
11	GF-Vancicauti	Briceni_Rososani	10715.00	11245.00	100	500
12	Ocnita_SPF	IP01	12765.00	13031.00	100	500
13	IP01	GF-Otaci	13031.00	12765.00	100	500
14	IP01	Ip05	11245.00	10715.00	100	500
15	Ip05	SorocaRC	10715.00	11245.00	100	500
16	GF-Otaci	Otaci_Moghiliov	22526.00	23534.00	50	500