Příloha č. 1 k závaznému návrhu smlouvy o dílo – technické parametry nabízeného plnění v souladu s čl. 3.1 zadávací dokumentace

3.1 Technical specification of the modernization of the radar network CZRAD 2013 – 2015

Requirement / Specification	Compliance and Response	Reference
Subject of delivery is the complete Exchange of 2 precipitation measuring radars (hereinafter referred „radars" or „radar systems") of the CHMI placed on • the hill Skalky (Drahan Highlands, 730 m above sea level, hereinafter referred „Skalky) and • the hill Praha (Brdy Highlands, 860 m above sea level, hereinafter referred „Brdy") for the new pulse, polarimetric Doppler radars working in the range C. The radars will be operated in the fully unattended operation and will be remote controlled from the radar centre in Prague-Libuse. There are requested the radars from the same producer, of the same type and with the same HW and SW configuration for both sites.	This proposal contains two new and complete WRM200 Dual Polarization Doppler Weather Radars for CHMI at Skalky and Praha (Brdy) sites working in the rage C, operated in the fully unattended operation and will be remote controlled from the radar centre in Prague-Libuse. The radars will be from the same producer, of the same type and with the same HW and SW configuration for both sites.	Comply
As a part of the radar systems on both sites there are requested the new backup power supplies (UPS) enabling keeping operation of radars and the necessary related technologies (e.g. transmission lines) for the time at least 30 minutes in case of the power failure.	For the both sites the new back-up power supply (UPS) systems are proposed. This UPS can provide full radar operation (including communication devices) for period of minimum of 30 minutes in case of power breaks.	Comply.
The delivery includes the equipment of the radar centre in Prague-Libuse with three (3) Linux servers for the supplier´s applications run (data processing, generating of user outputs, data presentation etc.)	The proposal includes three Linux servers for Prague-Libuse radar centre for data processing, product generation, data dissemination and data presentation.	Comply.
In addition to assembly and installation of the new radars, their setting and putting into operation (performing of the acceptance tests) there is requested the disassembly of the old radars and their ecological liquidation.	The disassembly and ecological liquidation of the old radar equipment is included into content of this proposal.	Comply.

The usable parts from the old radars will stay after the disassembly at the contracting authority.	After the disassembly of the old systems all usable parts will be belong the contracting authority.	Comply.

Delivery specification – Technical Parameters

A) Radar system

Requirement / Specification	Compliance and Response	Reference
➢ The pulse fully Doppler polarimetric radar system working in the C band, in the frequency ranges at least 5.5-5.7GHz shall be delivered.	The proposed WRM200 system frequency range is 5.5 – 5.7 GHz shall be delivered.	Comply. *WRM200 Data Sheet*
➢ The radar shall enable the polarimetric measuring in the simultaneous (STAR – Simultaneous Transmission And Reception) and LDR (Linear Depolarization Ration – signal transmitted only with the horizontal polarization, received both polarizations) mode, the both modes must be switchable by SW switch for individual elevation of the volumetric measurement.	The WRM200 radar operates in either STAR mode (simultaneous transmit and receive of H and V) or LDR mode (linear depolarization mode, during which H alone is transmitted and both are received). This mode is selectable by software (by means of the mode switch) for individual elevation of the volumetric measurements.	Comply. *WRM200 Data Sheet*
➢ The radar shall perform the digital signal processing starting at the intermediate frequency;	The digital signal processing is performed from the 60Mz intermediate frequency (IF) signals.	Comply. *WRM200 Data Sheet*
➢ The Contractual Authority requests the digital receiver and signal processing system from the same producer;	The WRM200 is equipped with the RVP900 Intermediate Frequency Digital Receiver (IFDR) as well as with the RCP8 Radar Control Processor which have been designed and manufactured by Vaisala.	Comply. *RVP900 Data Sheet* *WRM200 Technical Description* *RCP8 Data Sheet*
➢ Output of volumetric data and user's products shall be in a digital form	The proposed WRM200 provides radar volume data and products in the digital form.	Comply. *IRIS Data Sheet*
➢ Technical radar parameters shall ensure detection of every important hydrometeorological phenomenon over the radar	The WRM200 can detect precipitation with intensity of 0.05 mm/h at a distance of 260 km. In addition to that even more sensitivity can be gained with enhanced reflectivity estimator,	Comply. *WRM200 Detectability Calculation*

horizon and estimation of precipitation till the distance up to 260 km.	which for example covers the 3 dB loss of sensitivity in STAR mode.	*Vaisala Dual Polarization Enhanced Reflectivity*

B) Radar system construction

Requirement / Specification	Compliance and Response	Reference
➢ All the Equipment components shall be fully new and their age must not exceed 12 months on the day of FAT – acceptance tests fulfilment. The Contracting Authority explicitly highlights that no prototypes and refurbished components from the older equipment can be used;	All the components are new and their age will not exceed 12 months on the day of FAT. Also no prototype or refurbished components are used.	Comply.
➢ The maximum power input of all the devices ensuring the24-hours radar operation (thus radar including CHMI technologies for data distribution) must not exceed 14kW, from this the CHMI devices which are necessary for radar data distribution have the maximum power input 2kW.	The maximum total power consumption of WRM200 radar is no more than 3.7 kW, Radome heating 2 kW + additional extra load 2 kW	Comply *WRM200 Data Sheet*
➢ The Equipment shall be adapted to the power supply network with parameters in accordance to CZ standard" ČSN EN 50160". Power supply voltage is three-phase 230/400V 50Hz five wires circuit, where the neutral wire N and the protective wire PE are separated;	The proposed WRM200 system can be connected to the power supply network - three-phase 230/400V 50Hz 5 wires circuit, where the neutral wire N and the protective wire PE are separated. **The all electrical installation will be certified according to CZ standards by the independent certified company.** **Vaisala products are compliant with EU standards and therefore can be suppose that we already fulfil the CZ standards as well.**	Comply. *WRM200 Technical Description* *Electrical Safety*
➢ All the electrical devices shall meet the following legislation eventually the other related regulations; • the Act No. 205/2002 Coll. (about the technical requirements on products, as	The proposed system is protected from the discharges caused by the lightning strikes to the tower construction. E.g. the radome is provided with the lightning rod assembly which is connected to the common grounding point of the system.	Comply. *WRM200 Technical Description* *WRM200 Declaration of*

amended)and the Government Regulation No. 616/2006 Coll. (about the technical requirements on products with respect to the electromagnetic compatibility) • ČSN EN 62305 (about the lighting protection); • The Government Regulation No. 106/2010 Coll. (about the non-ionizing radiation protection);	**The all electrical installation and lighting protection will be certified according to CZ standards by the independent certified company.** For the non-ionizing radiation protection parameters – see the reports Ionizing Radiation Report and Weather Radar Safety Measurement Report	*Conformity* *EMC Tests* *Ionizing Radiation Report* *Weather Radar Safety Measurement Report*
➢ All the radar devices in the technological room shall be connectable to the common equipotential bus.	All radar equipment will be connected to the common equipotential copper ring as required.	Comply.
➢ The maximum surface load of the floor must not exceed 400kg/m². The total dimension of all the radar cabinets must not exceed 2000mm in height, 2500mm in width and 1200mm in depth.	The maximum permitted floor surface load of 400 kg/m² will not be exceeded. The proposed WRM200 radar cabinet (transceiver) dimensions are 1800 mm in height, 600 mm in width and 1150 mm in depth. The maximum weight of the cabinet is 380 kg.	Comply. *WRM200 Data Sheet*
➢ The radar cabinets with the installed technology must meet the range of working temperatures +10°C - +35°C and humidity 10% - 90%.	The operating temperature range of the radar cabinet is from +10°C to +40°C and humidity 0% - 95%.	Comply. *WRM200 Data Sheet*
➢ The radar shall be constructed as the modular system so that will be possible to upgrade the single parts, e.g. antennas, transceivers, receivers, signal processing, processing PC in the future.	The proposed WRM200 construction is modular which allows upgrading of the antennas, transmitters, receivers, signal processing or processing PCs separately in the future.	Comply. *WRM200 Technical Description*
➢ Connectors must be distinguished according to the key so that the wiring by mistake is excluded.	All interconnection cables with connectors are provided with keying to prevent misconnections.	Comply.
➢ The connectors must withstand the repeated connecting and disconnecting (in frame of maintenance requests) without damage and reduction of features.	No damages or reduction of operation will happen for connectors in case of repeated connections or disconnections.	Comply.

➢ All the connectors and measuring points are to be easily accessible; the access must be described in details in the technical documentation.	All connectors and measuring points are easily accessible for the maintenance of system and it is described in technical documentation – Maintenance manual	Comply. *WRM200 Maintenance Manual*
➢ All the radar components including connectors, cabling, circuit boards etc. must be clearly identifiable and described. The Contracting Authority requires that all the labels of the radar components shall be in English language;	All radar components, connectors, cables, circuit boards and units are clearly labelled and described in English for easy identification.	Comply. *WRM200 Maintenance Manual, page 122*
➢ After an interruption of the power supply system shall allow automatic sequencing (soft start) and start of operational measurement.	After the total interrupt of power supply the proposed radar system will start automatically to operate in the normal "safe operation" mode.	Comply. *WRM200 User's Guide, page 44*
➢ Safety precautions – all the devices which can be damaged themselves or cause any harm to the health of operators (e.g. accest to the modulator) shall include the safety protection („safety interlock");	All devices which can cause any harm to the health of operators in case of damages are provided with the "safety interlock" features. E.g. The WRM200 transmitter system includes inherent self-protecting circuits against faults of the transmitter. Also protection to prevent potential exceeding of duty cycles is included.	Comply. *WRM200 Technical Description, page 32*
➢ The noise level of the radar cabinets must not exceed 70dBA measured 1 meter in front the cabinet. The supplier will made the necessary measuring during the SAT and will provide measuring protocol.	Vaisala Weather Radar WRM200 airborne noise emissions were measured 2007-02-05, according to the Machinery directive 98/37/EC. The noise level of the proposed radar cabinet is less than 70dBA measured at 1 m distance from the cabinet front side. **This measurement can be done during the SAT and measurement report can be done by the independent organisation certified for this measurement**	Comply. *WRM200 Cabinet Noise Measurement Report*
➢ The radar shall be constructed for the uninterrupted 24 hours operation;	The radar is constructed for the uninterrupted 24 hours operation	Comply. *WRM200 Technical Description*
➢ The mechanically stressed parts (e.g. gears, motors) are to have the life time of 100 000 hours minimum without fault and degradation which could impact	All mechanically stressed parts have life time more than 100 000 hours without faults or degradation.	Comply. *WRM200 MTBF Assessment*

on the operative measuring.		
➢ By the supplier recommended maintenance shutdowns must not cause outages of the operative radar measurements exceeding 1% of the total time of the operative measurements, i.e. 7 hours for months maximum.	The recommended preventive maintenance interval is once per year for the WRM200 radar. The radar shutdown period will be no longer than 4 hours during the annual preventive maintenance (down time is less than 0.05% yearly).	Comply. *WRM200 Maintenance Manual, pages 17, 53, 60, 127*
➢ The supplier is obliged (in frame of his Offer (to the Annex No. 1 to the binding draft of Contract) to state the list of all components (exchangeable parts, which can be delivered as the spare parts) whose cost is higher than 3000 EUR and to state the meantime between failures (MTBF) for all these components;	The MTBF figures are given with this proposal including also MTBF figures separately for components which value is more than 3000 EUR. See the reference documents	Comply. *WRM200 MTBF Assessment* *MTBF for spares*
➢ The Contracting Authority highlights that there are not acceptable components in the radar more expensive than 3000 EUR whose MTBF is less than 20,000 hours;	The proposed system doesn't contain any components (valued more than 3000 EUR) which MTBF is less than 20000 hours.	*Comply* *MTBF for spares* *WRM200 MTBF Assessment*
➢ The supplier must guarantee availability of the spare parts for the period 15 years minimum from the SAT signature.	The Supplier hereby guarantee the availability of the spare parts for the proposed WRM200 radar is in minimum 15 years after the SAT signature.	Comply.
➢ As a part of radar delivery the maintenance tools are requested which are necessary for access to all the measuring points and for the necessary exchange of any component.	The maintenance tool set for access to all measuring points and for necessary exchange work of any component is proposed with the WRM200 and will be delivered.	Comply. *Sales offer, hand tool set*
➢ The radar must include the „network power switch" allowing the remote switch on and switch off of the important radar blocks by mean of commands being passed through the PC network (including the documentation for the appropriate connecting the interface of the third parties). Network power switch must include at least 2 free positions for	All the main functional modules of Vaisala Weather Radar can be switched off/on or reseted over the network using the radar software. These modules include the radar transmitter, digital receiver, signal processing and control computer and antenna/pedestal drivers. In addition, Vaisala Weather Radar system provides the possibility to connect at least 8 external control or status signals, which can then be controlled and monitored through the radar BITE system. These enable the	Comply. *WRM200 Users Guide* *RCP8 User's Manual*

the appropriate connecting of the CHMI technologies.	control and monitoring of external site specific hardware. External control connectors are available in RCP8 connector panel linked to cabinet connector panel. Several connector protocols are available. Network power switch is not needed in WRM200 radar.	

C) Transceiver

Requirement / Specification	Compliance and Response	Reference
➢ The transceiver shall be of the type coaxial magnetron with the solid state modulator;	The proposed WRM200 transmitter tube type is coaxial magnetron with the solid state modulator.	Comply. *WRM200 Technical Description*
➢ The coaxial magnetron shall have the minimum lifetime 50 000 hours	The proposed WRM200 transmitter tube type is coaxial magnetron which minimum life time is 50 000 hours. The rated magnetron maximum power is 350 kW but Vaisala uses of 250 kW transmitter power which will continue the expected life time of the magnetron to be more than 50 000 hours.	Comply. *WRM200 Technical Description*
➢ Modulator shall be of the solid-state type or IGBT (i.e semiconductor switching);	The proposed Magnetron modulator is solid-state type. Thyratrons are not used.	Comply. *WRM200 Technical Description, page 43*
➢ Transmitting frequency shall be in the range C, adjustable in the range of frequency 5.5-5,7GHz	The proposed WRM200 radar transmitter frequency range is 5.5 – 5.7 GHz.	Comply. *WRM200 Data Sheet*
➢ The total pulse transmit power shall be of at least 250 kW, the stability of the radio performance shall be 0.2 db in normal operating conditions and the time interval 1 month.	Comply. The total pulse power output of the proposed WRM200 transmitter is in minimum 250 kW and stability of the radio performance is 0.2 db in the normal operating conditions and the time interval 1 month.	*WRM200 Technical Description* *WRM200 Transmitter Pulse to Pulse Power Stability*
➢ The transmitter shall enable using at minimum 3 lengths of pulse in ranges 0.4-0.5, 0.8-1 and 1,8- 2 µs, switching over the pulse length must be possible by means of SW setting without necessity of the HW intervention	Comply. The proposed transmitter supports 4 different pulse lengths preselected from the range of 0.5µs to 2.0 µs, being 0.5 µs, 0.8 µs, 1.0 µs and 2.0 µs. The pulse length can be user selected through the sw menu.	*WRM200 Data Sheet*

	The preselected pulse width can be tuneable without any changes to the transmitter hardware.	
➢ Repeating frequency (PRF) shall be user-adjustable in range 250-2400Hz, switching of the repeating frequency shall be possible by means of SW setting in frame of the measuring scenario without necessity of the HW intervention;	The maximum duty cycle of the proposed transmitter is 0.12% which allows the PRF to be as shown below: With 0.5 µs pulse length the PRF can be 200 -2400 Hz. With 0.8 µs pulse length the PRF can be 200 -1500 Hz. With 1.0 µs pulse length the PRF can be 200 -1200 Hz. With 2.0 µs pulse length the PRF can be 200 - 600 Hz. (e.g. for 0.8 us pulse the max. PRF is: 0.0012 / 0.0000008 s = 1500 1/s)	Comply. *WRM200 Technical Description*
➢ The transmitter shall allow the dual-PRF mode, minimum in configuration 2:3, 3:4, 4:5	Dual PRF at ratios of 2:3, 3:4 and 4:5 are provided for 2X, 3X, and 4X velocity/range unfolding.	Comply. *RVP900 Data Sheet*
➢ The transmitter shall include the continual monitoring of the transmitted (forward, FWD) and reverse (REV) power. The radar shall enable the automatic shutdown of the transceiver in case of exceeding the voltage standing waves ratio, VSWR limit value;	Radar software and hardware are continuously monitoring system parameters. In case of values are exceeding set limits necessary actions are carried out e.g. in case of transmitter problems the transmitter power is automatically switched off. Automatically monitored parameters include: - Tx FWD & REV power - Temperatures - Belt tightness - VSWR (max. 1.2 but typically tunable to be less 1.15) - Transmitter duty cycle - Transmitter voltages and currents - Antenna speed - etc. When a critical fault or combination of faults is detected, the Radar Control Processor (RCP8) outputs the appropriate control to stop antenna motion and de-radiate the transmitter ("Shutdown" state).	Comply. *WRM200 Technical Description* *WRM200 User's Guide Chapter 4, Operation* *RCP8 User's Guide.*
➢ The spurious emissions must not exceed -90 dBc for transmitting frequencies in range 5600 – 5650	Vaisala Weather Radars WRM200 is designed to comply with the EUMETNET "Recommendation on C-Band Meteorological	Comply. *WRM200 Technical*

MHz, see ERC/REC 74-01;	radars design to ensure global and long-term coexistence with 5 GHz RLAN". In addition, Vaisala Weather Radars' transmission spectrum complies with the "more drastic" requirement of 100 dB discrimination given in ECC Recommendation 74-01. This will give the owner of the Vaisala Weather Radar a strong argument when discussing with the National Radio Authorities, should an interfering transmitter appear.	*Description*
➢ Coherence of the transmitted signal shall ensure the resulting clutter suppression ratio 40 dB at minimum;	The clutter suppression capability of the proposed system is better than 40 dB. The measurable WRM200 radar system phase stability is better than 0.5 degrees. Key components for the system phase stability are the synthesizer used in STALO and the transmitter phase stability. The system coherence (phase stability) of WRM200 system is confirmed at the factory with a delay line test setup. A 3 µs delay line (from Tensolite) produces a "target" at 450 meters range. IRIS Ascope utility is used to determine the phase stability of the radar system. Also the RVP00 takes full advantage of adaptive frequency domain clutter filters, such as the Vaisala patented GMAP algorithm. GMAP has been extensively tested the U.S. NEXRAD radar network and will routinely reject up to 55 dB of clutter (with Klystron transmitter).	Comply. *WRM200 Data Sheet* *RVP900 User's Manual Chapter 5* *WRM200 Technical Description*

D) Waveguide line

Requirement / Specification	Compliance and Response	Reference
➢ The maximum total attenuation of the waveguide line in condition of the concrete installations (two-way i.e in the transmitting and receiving direction) including rotating joints and potential filters must not exceed 4 dB. the Supplier shall prove the schedule of the attenuation of the individual waveguide parts in the Annex No. 1	Comply. The total two-way complete waveguide assembly attenuation is less than 4.0 dB with the assumed 4 m long waveguide line between the WRM200 Radar cabinet and WRP211 pedestal. Detailed calculation with maximum attenuation of each component is presented with the attached WRM200 Waveguide Power Loss Calculation. This real attenuation can be measured during the SAT. See Annex No. 1 of the binding contract	*WRM200 Waveguide Power Loss Calculation*

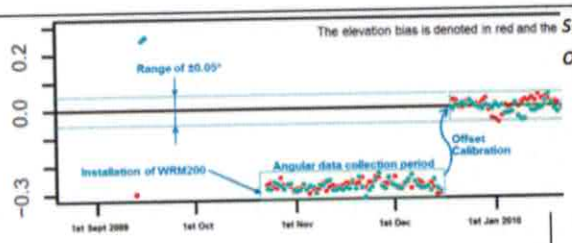
to the binding draft of Contract;		
➢ Any waveguide components, couplers, gaskets, etc. may not require replacement more frequently than once every three (3) years.	All waveguide components are designed or selected so that the life time is more than 10 years.	Comply. *WRM200 Maintenance Manual*
➢ The waveguide must be equipped with the automatic pressurization/ dehydrator (drier) which excludes possibility of condensation and damage of the waveguide	The waveguide assembly is equipped with the dehydrator which supplies pressurized and dried air into the waveguide components.	Comply. *WRM200 Technical Description*
➢ The waveguide pressure shall be constantly monitored; the transmitting shall be shot down at declining below the minimum limit or at exceeding the maximum pressure limit.	The dehydrator supplies pressurized, dry air into the waveguide structure to prevent condensation or moisture from building up. The status of the waveguide dehydrator is monitored continuously through the radar BITEX-system and if the pressure limits are reached the transmission will be switched off.	Comply. *WRM200 Technical Description*
➢ As a part of the waveguide the directional couplers are requested which allowed the external measuring of the power and line attenuation in the forward and reverse direction. Attenuation values of the directional couplers shall be stated in the documentation in dB with accuracy to two (2) decimal places.	The directional couplers, included in the Vaisala Weather Radar for easy calibration, have extremely low loss. If we count for the max. return loss, attenuation in the short waveguide path and the power coupled to the sample channel, the total attenuation is in the order of 0.015 dB. Please see the attached component specification and datasheet for full specifications.	Comply. *WRM200 Maintenance manual* *WRM200 Waveguide Power Loss Calculation* *Credo wan Loop couplers* *Directional coupler specification*

E) Antenna and antenna drive

Requirement / Specification	Compliance and Response	Reference
➢ Antenna shall be parabolic with gain 44,5 dB at minimum;	The proposed antenna WRA211 is Center-fed parabolic reflector type dish antenna with diameter of 4.5 m and gain always more than 45 dB. The most important part of dual polarization radar is the antenna. It's vital that the antenna has a proven low side lobe levels, excellent cross polarization isolation characteristics, and that	Comply. *WRM200 Technical Description* *WRM200 Data Sheet*

	the pointing angle of the two polarizations matches. In fact the antenna beam patterns are the limiting factors in quality of the polarimetric variables, namely differential reflectivity, differential phase and co-polar correlation coefficient and therefore the antenna design and quality are key issues for the overall radar performance.	
➢ Beam width max. 1^0 in horizontal and vertical direction	The beam width of the proposed antenna is less than 1.0 degrees.	Comply. *WRM200 Data Sheet*
➢ Difference between the beam width horizontal polarization and the beam width vertical polarization must not exceed $0,1^0$;	The beam width difference between horizontal and vertical polarization is less than 0.1^0.	Comply. *WRM200 Technical Description*
➢ Cross-polarization of antenna must be bigger than 35dB	The proposed antenna integrated cross-polarization isolation is more than 35dB.	Comply. *WRM200 Data Sheet*
➢ Antenna Gain difference for radiation by the horizontal and vertical polarization shall be less than 0,2dB;	The proposed antenna gain difference between the horizontal and vertical direction is less than 0,2dB	Comply. *WRM200 Technical Description*
➢ Level of the first side lobes radiation must not exceed -28dB from the middle radiated power in the beam axis	The proposed antenna first side lobe levels at the main polarization planes are < -28 dB closer than 2.5 ° from the centre of the main beam axis.	Comply. *WRM200 Technical Description, p. 18*
➢ Radiation level in the second and other side lobes must not exceed -33dB from the middle radiated power in the beam axis.	The proposed antenna side lobe levels are much better level than required. Side lobes at the main polarization planes are: < -28 dB closer than 2.5 ° from the centre of the main beam < -40 dB more than 5.0 ° from the centre of the main beam Envelope curve, in dB scale, linearly declining between 2.5° and 5.0 ° points.	Comply. *WRM200 Technical Description, p. 18*
➢ In the angular sector 10^0-180^0 from the main beam axis the level of the single maximums must not exceed -40dB from the middle radiated power in the antenna beam axis.	The proposed Vaisala's antenna, WRA111, fulfils the following minimum specifications: <-28 dB at ±2.5 deg. from main lobe axis and <-40 dB at ±5.0 deg. from main lobe	Comply. *WRM200 Technical Description, p. 18*

	axis and envelope curve, in dB scale, linearly declining between 2.5 and 5.0 degree points.	
➢ The Supplier shall define in the Annex No. 1 to the binding draft Contract the safe distance for operation and presence of persons from all devices that emit radiation.	The safety distance of the proposed WRM200 Weather Radar (in the beam's direct line) is 240 m (with 250 kW transmitting power and 4.5 m antenna with beam of 1 degree). It is based on the reference levels defined by the ICNIRP (International Commission on Non-Ionizing Radiation Protection) on the power density at 2-300 GHz, General public exposure: 10 W/m2, 6 min average. The side lobes of the antenna are very low and the safety distance from the side lobes is less than 30 meters. Also, the back lobe of the antenna is very low and the safety distance is less than 30 m. **The radar cabinet does not have a specific safety distance. The radar cabinet door can be opened when the radar is running.** Vaisala radar is in EMC shielded cabinet. There are not that kind of components that would emit and safety distance would needed. So you can open the cabinet door as well as the radar is running.	Comply. *WRM200 Users Guide*
➢ The supplier shall deliver in frame of the acceptance tests FAT the diagram of the antenna radiation characteristics measured by the certificated company;	Vaisala will deliver the antenna radiation characteristics measurement report. This report is available during the FAT. An example about this report is attached.	Comply. *WRM200 antenna example test results*
➢ the antenna drive must allowed the antenna setting in range of elevation -2° - +90° and the full rotation in azimuth 0° - 360°	The proposed pedestal vertical steering range is from -2° to 108 ° and accuracy is better than 0.1°. The proposed pedestal azimuth steering range (rotating) is full 360 °	Comply. *WRM200 Technical Description, p. 28*
➢ The total setting accuracy of the elevation and the antenna drive azimuth (including servomechanism) must be better than 0,1°.	Pointing accuracy and agility of the belt driven pedestal system is excellent. Reason for this is that there are 2 belts on axis. One belt drives clockwise and the other one counterclockwise. This way there is no backlash (which is typical for gear driven systems) in the drive system and the tension of the belt is kept constant. The pointing accuracy better than 0.1° for both azimuth and elevation can be easily achieved as shown in the Figure below.	Comply. *WRM200 Technical Description, p. 22 – 23* *Weather radar pointing and calibration level adjustment by*

	 The report – "Weather radar pointing and calibration level adjustment by solar observations and pair-wise comparison of reflectivity – ERAD 2010" made by Finnish Met. Institute in 2010 shows that accuracy of the Vaisala's Antenna /pedestal is better than 0.05°. The Vaisala's WRM200 has installed to FMI's Vantaa radar location in 2009 October and since that the data is collected as shown above. This pointing accuracy better than ±0.1° can be demonstrated and proved during the FAT and SAT tests.	*solar observations*
➢ Antenna drive must allow both manual and automatic control	The automatic and manual control of the antenna drive can be done through the provided Antenna Utility,	Comply. *WRM200 Technical Description, p.73*
➢ The antenna rotation speed in azimuth must be adjustable in the range minimum 0°/s - 36°/s with accuracy 1°/s	The antenna rotation speed is from 0 to 40°/s with accuracy better than 1°/s.	Comply. *WRM200 Technical Description, p.26*
➢ The antenna rotation speed in elevation must be adjustable in the range 0°/s - 20°/s with accuracy 1°/s	The antenna scanning speed (elevation) is from 0 to 40°/s with accuracy better than 1°/s.	Comply. *WRM200 Technical Description, p.26*
➢ Reposition the antenna by 2°/s with an accuracy of 0.1 ° shall be made within 1.5 s;	The proposed antenna set up time for the 5 degrees step is less than 1 second and with accuracy of 0.1 degree.	Comply. *WRM200 Technical Description, p.26*
➢ indication of the current position of the antenna in azimuth and elevation must be expressed with an accuracy of 0.1 ° or better, this information must be available in both monitoring and managing the	Antenna pointing is expressed with required accuracy and can be monitored with antenna utility in real time. Information is recorded in raw files.	*IRIS and RDA Utilities manual, Chapter 3 Antenna Utility* *IRIS*

software and recorded together with individual beams in raw value data; ;		*Programmers Manual, Chapter 4 Data Formats*
➢ In case of exceeding the set limit values of the elevation or of the maximum rotation speed the movement of the antenna must be automatically switched off.	The orientation of the radar antenna and pedestal is monitored by digital optical encoder angle sensors that are located on the pedestal. The mechanisms protecting the antenna include an acceleration limit, over speed check, and elevation soft limits. In addition to software safety features, there are hardware limit switches for elevation. These together protect the antenna so that if the set limits are reached then the movement of antenna is automatically stopped. The antenna position is expressed with an accuracy of 0.1° for azimuth and elevation angles. This angle information is available for both monitoring and for managing the software. This angle information is recorded together with radar raw data.	Comply. *WRM200 Technical Description IRIS Product and Display Manual, chapter 3, Configuring IRIS Products & Chapter 3.12, RAW: Raw Data*
➢ Antenna drive and its control shall allow in the permanent automatical operation the measuring of the actual scenario of the operative volume measuring of the network CZRAD in the total time less than 4min 30sec, the description of the volume measuring is in the Annex No. 9 of this Tender Documentation;	According to Annex No. 9 there are 12 angles all together. With the settings specified WRM200 total scanning time is 3 min 45 sec. Approximately 22 s/elevation for the slices number 6 to 12, 17 s/elevation for the slices number 4 and 5 and 12 s/elevation for the slices number 1 to 3. WRM200 can fulfil the scanning strategy of CZRAD presented in Annex No. 9.	Comply. *IRIS Radar Manual, Chapter7, Configuring Radar tasks*
➢ The Contracting Authority requires the safety interlock installation for switching off the antenna movement and transmitting RF power during the entry (opening the door) to the antenna room;	The proposed antenna and pedestal design includes the safety interlock circuitry. One automatic manual Safety Interlock switch is located at the entrance door to the radome. The second interlock switch is incorporated with the Pedestal Protection Unit (PPU) which is installed inside the radome close to the pedestal. The safety interlock stops the transmitter and antenna immediately without causing overload or harm to the system.	Comply. *WRM200 Technical Description, p. 26 & 27*
➢ The Contracting Authority requires the installation of the manual switch of the movement in elevation, movement in azimuth and one main switch for all the antenna mechanics;	Antenna can be controlled manually in azimuth and elevation directions.	Comply. *IRIS and RDA Utilities manual, Chapter 3 Antenna Utility* IRIS *Radar*

		Manual, Chapter 7.1.2 Antenna/Radar Control
➢ The radar shall be equipped with the function sun-tracking (check of the proper adjustment of the antenna direction with help of sun) and with the support for the geographical placement of the radar sites (Skalky, Brdy);	The WRM200 system contains the SUNCAL calibration task which performs a raster scan in azimuth and elevation in the approximate location of the sun and then performs a best fit to determine the precise position of the sun for antenna alignment check. The SUNCAL can run automatically on a pre-defined schedule. The SUNCAL utility is a stand-alone program that performs sector scans of the sun's position and outputs calibration data. The utility is supplied with both the RDA and IRIS releases and will work with the RVP900 signal processor and any antenna controller accessible via the antenna library. The SUNCAL utility can be run interactively from a command line and does not use a graphical interface. It can also be inserted into the Task Scheduler as an Exec Task and run on a routine basis. The SUNCAL utility outputs a BEAM product. The BEAM product will contain SNR data with no thresholding and can be viewed on an IRIS system, but is not automatically inserted into an IRIS product directory. The BEAM product is then processed to produce a final calibration results file. On dual-polarization radars, SUNCAL can output a second BEAM product containing LDRH data. This is used to compute the LDR offset.	Comply. *WRM200 Technical Description, p. 71* *IRIS RDA Utilities, chapter 3.5 Running Antenna in Sun Tracking Mode* *IRIS RDA Utilities, chapter 11, Suncal Utility* *IRIS and RDA Dual Polarization User's Manual, Chapter 2.10 Calibration Considerations*
➢ Engine, gearbox and other mechanical apparatus must be easily accessible and assembled like a puzzle, their prescribed maintenance interval must not be shorter than every 6 months.	The proposed pedestal is designed so that all the preventive and corrective maintenance actions are possible inside the radome, with standard tools, without lifting the pedestal for interchanging of e.g. rotary joint, the motor, a drive belt, etc. The scheduled maintenance of the proposed WRM200 consists of maintenance tasks that are carried out yearly, every three or five years.	Comply. *WRM200 Technical Description, p. 24* *WRM200 Maintenance Manual, p. 60, Yearly Maintenance*
➢ As a part of the Equipment the maintenance tools are requested which are necessary for access to all the mechanical parts. The maintenance and access	All necessary maintenance tools and cables with adapters are provided with the radar delivery. The maintenance manual will be part of the documentation.	Comply. *Sales offer* *WRM200 Maintenance*

description to the parts of radar and parts exchange shall be a part of the delivered documentation by the Bidder;		*Manual*
➢ Any mechanical rotation system (gear, engine, etc.) must allowed exchange of lubricants, oils etc.; for this exchange the respective tools are requested (i.e lubricator, oiler, set of keys for access) This Exchange must not be prescribed more often than 1 time in a 6 months.	The proposed antenna pedestal does not have any need for lubrication oil. This reduces remarkably risk to e.g. waveguides as well as reduces maintenance costs.	Comply. *WRM200 Technical Description, p. 22*
➢ The maximal permissible antenna weight with the antenna mechanism is 2000 kg	The total weight of the proposed antenna and pedestal is 1530kg.	Comply. *WRM200 Data Sheet*
➢ The working range of temperatures of the antenna, antenna mechanics and pedestal in case of the non-temperate Radom must be -35°C - +50°C and humidity 0% - 90%, without condensation	The environmental working temperature of the proposed antenna pedestal is -40°C - +55°C and humidity 0% - 95%, without condensation.	Comply. *WRM200 Data Sheet*

F) Radome

Requirement / Specification	Compliance and Response	Reference
➢ The radome construction must be of the type quasi-random, optimized for the frequency range C	The proposed 6.7 m diam. quasi random panel radome is designed for C-band frequency range and Dual polarization use.	Comply. *Radome Technical Specification, TSWE0005-REV01, p. 6*
➢ Radome must not put the dust through, must be water resistant, resistant to wind of speed up to 40 m/s and maximum wind gusts 65 m/s, radome working temperature range must be -35°C - 60°C, humidity range 10-100% (including the possible wind- or ice cover)	The proposed radome fulfils the following specifications: - Water hydrophobicity ASTM-D5725. The surface finishing (GELCOAT) allows the water to drip down, which prevents the formations of puddles. - Maximum wind speed up to 66.6 m/s (240 km/h) - Temperature range from –61°C to +70°C. - Humidity range 0 - 100 % - Snow or ice load up to 350 kg/m^2 The proposed radome has been designed	Comply. *Radome Technical Specification, TSWE0005-REV01, p. 7* *Radome Structural Analysis, REWE0002-REV00*

	by FEA (finite element analysis) considering a wind speed of 240 Km/hr and snow/ice load of 350 Kg/m2. Resistance to blowing sand and dust, low and high temperatures, solar radiation, water penetration, blowing rain, fluids, ecc have been tested in accordance with MIL-STD-810. Once Purchase Order is received, FDS ITALY can provide both the Radome Environmental Report and Structural Report.	
➢ The dry radome must not cause the one-way attenuation bigger than 0,3dB, the one-way attenuation caused by radome must not be bigger that 0,5dB at rain intensity of 10mm/H and 0,8dB at 50mm/h. The real attenuation of the dry radome will be check by the supplier during the acceptance test SAT;	The proposed radome fulfil the following attenuation specifications: - One-way (dry) attenuation in maximum 0.2 dB - One-way attenuation with 10mm/h rain in maximum 0.5 dB - One-way attenuation with 50mm/h rain in maximum 0.6 dB - The one way attenuation in dry conditions can be presented by the FDS ITALY (subcontractor for the Radome) according to the FAT test results	Comply. *Radome Electromagnetical Analysis, REWE0004-REV00 Page 33*
➢ The boresight error caused by the radome must not exceed 0.1 deg.	The boresight error: BSErms: < 0,05 mrad BSEmax: <0,15 mrad it is less than 0.1 deg. (1.7 mrad).	Comply. *Radome Technical Specification, TSWE0005-REV01, p. 9*
➢ The radome surface must be water repellent and resistant to exhalants.	The radome surface is GELCOAT finished (preventing water sheeting under rain) which is water repellent material and which allows the water to drip down, which prevents the formations of puddles. FDS radome materials have been subjected to many environmental tests as per MIL-STD-810G Meth. 504.1. Concerning fluids contact, the radome successfully passed the tests with the following fluids: ▯ fuel (kerosene) JP-8 (NATO F-34) ▯ hydraulic oils (mineral based)) NATO H515 ▯ lubricating oils (internal combustion engine) NATO O-1236 ▯ de-icings (NATO S-1746_DTD900/4907-JSD AL34)	Comply *Radome Technical Specification, TSWE0005-REV01, p. 7*

➢ There must not appear wear and tear and degradation of the mechanical and electrical radome properties due to load ice layers up to 5 cm in thickness and falling hail to the diameter of 5 cm for the expected life time (10 years at minimum).	The expected life of the structure of the radome is 20 years with the environmental conditions as specified in this tender. Thickness of ice - 75 mm The proposed radome has been structural verified by FEA with a ice load of 350 g/m2. Radome materials have been subjected to icing/freezing rain test (MIL-STD-810G M521.3). The external radome finishing exhibits a low level of adhesion of ice. Mechanical properties do not degrade in case of such ice layers and hail. Regarding Electrical /EM properties, the ice on radome surface is an additional layer with its own dielectric properties and will influence the EM performance of the radome. In order to maintain the EM performance of the radome, the radome external surface must be cleaned from ice with the use of de-icing fluids. The radome panel can withstand the action of de-icing (performed test as per MIL-STD-810G M504.1) hail diameter - 30 mm diameter, perpendicular impact , speed 80 Km/hr. Our panels have been subjected to hail tests with hailstones of 30 mm diameter at 80 Km/hr without any sign of damage. In case of hailstones with a diameter of 50 mm which produce the same impact energy, the same behaviour is expected.	Comply. *Radome Technical Specification, TSWE0005-REV01, p. 7* *Radome Environmental Report, REGE0001-REV01*
➢ The inner radome diameter must be sufficient for access to all the installed devices and for the prospective manual antenna rotation during the maintenance works.	The proposed radome diameter is 6.7 m which is almost 1.5 times bigger than the antenna diameter allowing manual antenna rotation during the maintenance of the system.	Comply. *Radome Technical Specification, TSWE0005-REV01, p. 6*
➢ Radome must have the ventilation system preventing the water condensation and mold development.	The radome is equipped with a zenith hatch in size app 600 x 600 mm with an integrated vent allowing the air to flow out from the radome. This zenith vent/hatch, in conjunction with an air access in the tower, can provide a natural ventilation to the radome.	Comply. *Radome Technical Specification, TSWE0005-REV01,page 10* *FDS Radome Interface*
➢ In case of heating the power consumption must not exceed the average age value of 2kW, the	The radome is equipped with the internal heating (3 fan heaters) which average power consumption is no more than 2 kW and the	Comply. *Radome Technical Specification,*

maximum peak value of the power consumption must not exceed 10 kW.	maximum peak consumption is no more than 10 kW.	*TSWE0005-REV01, p. 12*
➢ The radome must include the suitable protection against lightning. This protection must be of such a construction solution that the radar measurement cannot be affected.	The radome is equipped with the single lightning rod assembly. Two down conductors (50 mm2 copper cables) goes down from the zenith lightning rod to the radome base circle for potential equalization.	Comply. *Radome Technical Specification, TSWE0005-REV01,page 11*
➢ The radome shall be marked on its top with light according to ICAO Annex 14, Chapter 6(as the National Aviation Regulation L14, Hlava 6 – see http://lis.rlp.cz/predpisy/predpisy/dokumenty/L/L-14/data/effective/hl6.pdf - two red signal lights now) , check of lights function shall be placed on the floor, pedestal of the antenna mechanics or in the technological room. These lights shall be controlled by the automatic day and night lighting system.	The radome is provided with a dual flight obstruction LED light system which fulfils ICAO Annex 14 recommendations. This warning light system is installed at the top of radome. The light is controlled automatically by a day / night control switch.	Comply. *Radome Technical Specification, TSWE0005-REV01,page 11, option 2* *WRM200 Technical Description, p. 28*
➢ It is necessary to realize the mounts on the inner side of radome canopy for the lights Exchange – they enable gripping the ladder so it is in accordance to the provisions said in the act No. 262/2006 Coll. and Government Regulation No. 101/2005 Coll. ,Government Regulation No. 362/2005 Coll.;	The radome is supplied with the internal ladder which allows maintenance of the flight obstruction light. The internal ladder is made of 3 extendable pieces of aluminium allowing interior access to the hatch at the radome zenith. The ladder can be attached to the hatch bar when in use, otherwise it can be lied on the radome ground or other suitable place. The radome zenith hatch is provided with a metal robust bar where the foldable aluminium ladder can be hooked up. This bar is provided with a "side-blocking system" avoiding any ladder movements.	Comply. *Radome Technical Specification, TSWE0005-REV01,page 10*
➢ The lights must have the power 10W at maximum and the life time 50 000 hours minimum (we expect the LED lights type A with the low luminance, homologated for use in the civil aviation).	The proposed light system (dual light) total power consumption is less than 2.5 W and expected life time more than 100.000 hours.	Comply. *OBELUX LI-10-DCW-PCFL Datasheet*
➢ The radome shall have output to the gallery (hatch) of the tower. The output shall be placed in the point	We propose a base hatch 800 x 800 mm installed on one of the base pentagon panel of the radome. The hatch is installed at a	Comply. *Radome Technical Specification,*

of output staircase to the gallery (hatch) of the radar tower. The bottom edge of the output shall be at maximum 70 cm over the staircase. The output shall enable the passing through of the cube with measurements 70 cm x 70 cm x 70 cm at minimum. The Contracting Authority explicitly highlights the Suppliers that these measurements are binding and recommends to the Suppliers to measure the places of fulfilment properly during the site survey.	vertical height of 50 cm from the base of the radome.	*TSWE0005-REV01,page 10* *DWGE0112-REV00 –boční výlez*
➢ The radome entry from the lower technological room must be equipped with the safety protection (safety-interlock) for switching off the antenna rotation and RF signal transmitting.	The radome entry from the lower technological room is equipped with the safety interlock switch which will prevent the antenna and transmitter operation when the entry hatch is open.	Comply. *WRM200 Technical Description, p. 28*

G) Receiver

Requirement / Specification	Compliance and Response	Reference
➢ The delivery of the radar must include the digital receiver (full digitalization on intermediate frequency, converter 14bit A/D at minimum)	The Vaisala receiver down-converts the received RF signal (H & V + Burst) to 60 MHz IF where it is digitized in the RVP900™ Intermediate Frequency Digital Receiver (IFDR) with resolution of 16-bit A/D-conversion and then processed by the RVP900™ to produce I and Q and, ultimately the moments (intensity, velocity, spectrum width, dual pol parameters and HydroClass).	*Comply* *WRM200 Technical Description*
➢ Receiver must enable to perform polarimetric measurement	The proposed WRM200 Dual Polarization Radar receiver performs full polarimetric measurement.	*Comply* *WRM200 Technical Description*
➢ Minimum detectable signal at the pulse length 2μs must not be bigger than – 112 dBm;	The minimum detectable signal is -115 dBm with 2 μs pulse.	*Comply* *WRM200 Technical Description*
➢ Dynamic range must not be lower than 99dB with linearity better than 0.2 dB	The dynamic range of the proposed receiver is better than 99 dB with linearity better than 0.1 dB.	Comply. *WRM200 Data Sheet*

		WRM200 Technical Description
➢ Low noise receiver with the noise Nr. max 2.5 dB	The noise figure of the proposed receiver is better than required being less than 2 dB.	Comply *WRM200 Data Sheet*
➢ The radar shall include the function of the receiver auto calibration (with possibility of its manual switching from the radar centre;	The integrated and calibrated signal generator (with CW and pulsed modes) is provided for the system calibration. The WRM200 includes the following calibration utilities. - ZAUTO, calibrates the slope and offset of a test signal within a receiver linear range. - ZCAL, allows the user to manually modify the calibration file (is useful when first setting up a system, before final calibration). - ZDRcal, utility is a stand-alone program that performs sequences of vertical scan measurements, accumulates and analyzes qualified data for the purpose of monitoring the radar ZDR calibration (for calibration of the total transmit and receive differential gain). Calibration task can be scheduled or it can be run manually from the radar centre.	Comply. *IRIS RDA Utilities Manual, Chapter 13, ZAUTO Utility, pages 277 - 296* *Chapter 14, ZCAL Utility, p. 297 - 300* *Chapter 15, ZDRcal Utility, pages 301 - . 312*
➢ deviations between the receiver calibration for horizontal and vertical polarization must not exceed 0.2 dB in the whole dynamic range and time interval 1 month	See the reference document. Reference document shows two figures which show that receiver stability is not exceeding 0.2 db in one month of the period. The first figure shows that channel balance on azimuth and elevation is not exceeding the 0.2 dB. The second figure of LDR offset proves that bias does not exceed the 0.2 dB in one month of period.	Comply *Receiver stability*
➢ Time stability of the receiver calibration better than 0.2 dB in the standard operating condition and the time interval of 1 month	See the reference document. Reference document shows two figures which show that receiver stability is not exceeding 0.2 db in one month of the period. The first figure shows that channel balance on azimuth and elevation is not exceeding the 0.2 dB. The second figure of LDR offset proves that bias does not exceed the 0.2 dB in one month of period.	Comply. *Receiver stability*
➢ Image frequency ratio shall be 70 dB in minimum;	The image rejection capability of the proposed receiver is >80 dB. Together with the provided antenna filters the image rejection is >100 dB.	Comply. *WRM200 Data Sheet*

➢ The radar shall include the automatic frequency control AFC with the possibility to switch to the manual mode	AFC is not applied during data collection unless the frequency drifts by a selectable large amount as described below (informally referred to as "panic mode"). AFC outer tolerance during data processing: 50.0 KHz. In general, the AFC feedback loop is active only when the RVP900 is not processing data rays. This is because the Doppler phase measurements are seriously degraded whenever the AFC control voltage makes a change. To avoid this, the AFC loop is only allowed to run in between intervals of sustained data processing. This is fine as long as the host computer allows a few seconds of idle time every few minutes; but if the RVP900 were constantly busy, the AFC loop would never have a chance to run. This question allows you to place an upper bound on the frequency error that is tolerated during sustained data processing. AFC is guaranteed to be applied whenever this limit is exceeded. Limits: 15 to 4000 KHz. The DAFC (digital AFC interface) takes the digital AFC signal that is output from the IFD on a coax and converts it to the parallel TTL signals necessary to control the digital STALO. Since the IFD is mounted adjacent to the STALO in the receiver enclosure, the digital cable run is very short. This completely eliminates the jitter (and attendant phase error) associated with analogue control units.	Comply. *Reference: RVP900 User's Manual, Section 3.2.6*
➢ Receiver coherency will be realised digitally.	This can be done with the ascope utility.	Comply. *IRIS and RDA Utilities Manual, Chapter 4.7.3., Phase and Amplitude Stability Checks*
➢ The total phase stability of the radar system (including transmitter, receiver and digitalization) must be better than 0.6^{o}rms.	The total system coherency is better than 0.5^{o} rms	Comply. *WRM200 Data Sheet*

H) Signal processor

Requirement / Specification	Compliance and Response	Reference
➢ Signal processor must ensure the evaluations of the following values at least:		
• uncorrected reflectivity in both polarizations Uh, Uv (without suppression of the ground clutters);	RVP900 data parameters dBT, dBTh and dBTv. dBT is uncorrected reflectivity. H and V are horizontal and vertical signals.	Comply. *RVP900 Users Manual, Chapter 2.9.6.Output Data*
• Corrected reflectivity in both polarizations Zh, Zv (i.e. with suppression of the ground clutters);	RVP900 data parameters dBZ, dBZh and dBZv.	Comply *RVP900 Users Manual, Chapter 2.9.6. Output Data*
• Doppler radial speed V	RVP900 data parameter V.	Comply. *RVP900 Users Manual, Chapter 2.9.6. Output Data*
• Doppler spectrum width of the W speeds	RVP900 data parameter W.	Comply. *RVP900 Users Manual, Chapter 2.9.6. Output Data*
• Index of the signal quality SQI;	RVP900 data parameter SQI.	Comply. *RVP900 Users Manual, Chapter 2.9.1.6. Tresholding*
• ZDR differential reflectivity	RVP900 data parameter ZDR	Comply. *RVP900 Users Manual, Chapter 2.9.5. Polarization Mode Processing*
• Linear depolarization ratio LDR	RVP900 data parameter LDR.	Comply. *RVP900 Users Manual, Chapter 2.9.5. Polarization Mode Processing*
• phase difference PhiDP (ϕdp) and specific phase difference KDP;	RVP900 data parameters PHIDP and KDP.	Comply. *RVP900 Users Manual, Chapter 2.9.5. Polarization*

		Mode Processing
• correlation coefficient RhoHV (⍰HV, co-polar correlation coefficient);	RVP900 data parameter RHOHV.	Comply. *RVP900 Users Manual, Chapter 2.9.5. Polarization Mode Processing*
➢ signal processor must enable filtering non-meteorological targets from the measured data by means of:		
• Doppler filter for deleting of the immobile ground reflections, signal processing of the Doppler data in the time and frequency domain (with filter depth up to 50 dB)	IIR Clutter filters (40 dB and 50 dB) and fixed or adaptive width and GMAP (>55 dB rejection) clutter filters are applied in RVP900 signal processor including phase coded second trip filtering. The clutter filtering approaches in standard and dual pol processing are all DFT/FFT based. The clutter filters fall into three categories: •Fixed width - a predetermined number of spectrum points is removed about zero velocity with interpolation over the resulting gap. This is used for standard and dual pol processing. •Variable width - similar to the fixed width approach except that a variable number of spectrum points is removed about zero velocity using an adaptive algorithm to determine the width of the clutter. This is used for standard and dual pol processing. •Gaussian model adaptive filtering- This approach actually does the processing twice, first with a Hamming Window and then with either a Blackman or Rectangular window the 2nd time. The final result is then selected based on the measured CSR by the two approaches. The benefit is that the least agressive window can be used depending on how much clutter is actually present to provide the best statistics of the final estimates. Another feature of the approach is that a Gaussian model is used to iteratively interpolate over the filter gap. GMAP performance has been well documented by several independent authorities. The original evaluation to ascertain the functionality for the U.S. WSR-	*Comply* *RVP900 User's Manual, Chapter 6.2.5: Clutter Filtering Approaches*

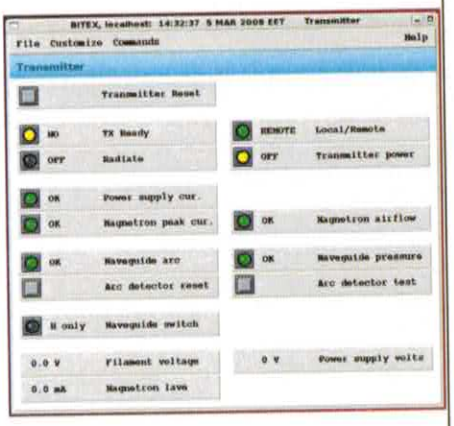
	88D by the Radar Operations Center can be found in: Ice, R. L., G. T. McGehee, R., D. Rhoton, D. S. Saxion, D. A. Warde, R. G. Guenther, D. Sirmans, and D.Rachel, 2005, Radar Operations Center (ROC) Evaluation of New Signal Processing Techniques for the WSR-88D, Proceedings of 21st International Conference on Interactive Information Processing Systems for Meteorology, Oceanography, and Hydrology.	
• speckle removal filter for deleting of the isolated pixels (random noise)	Two types of speckle filters are provided: •1-D Removes any single bin that is bounded by two thresholded bins. •2-D Uses a 3x3 azimuth/range filter to remove single point targets and interpolate single point gaps surrounded by valid data.	*Comply* *RVP900 User's Manual, Chapter 6.4.3. Speckle Filters*
• filtering of non-meteorological targets on the base of Polarimetric parameters (hydrometeor classification, ρ_{HV} or derived)	Also polarization echo identification in HydroClass algorithm can be used as a clutter filter. The hypothesis of bulk precipitation can be tested against the one of non meteorological signal by using a continuous smooth metric called the polarimetric meteorological index (PMI), derived from corresponding fuzzy rule strengths. The moment data is flagged and can be removed, bin-by-bin, when PMI is below a configurable threshold, accordingly. PMI is implemented as one of the tresholding options in RVP900 signal processor. Together with clutter filtering the requested >60 dB capacity can be achieved.	*Comply* *Mitigation of Wind Turbine Echo with WRM200*
• thresholding with LOGZ, CCOR(CSR), SQI	For data quality control, each RVP900 output parameter can be qualified, that is, either accepted or rejected for output, based on four threshold criteria: LOG (Signal+Noise)-to-Noise Ratio LOG SQI Signal Quality Index SQI CCOR Clutter Correction CCOR SIG Weather Signal Power SIG PMI Polarimetric Meteo Index PMI The calculation of the measured levels (for example, SQI) for each of these qualifications has been described in previous sections of	Comply. *RVP900 User's Manual, Chapter 6.4 Thresholding*

	this chapter. All four qualification criteria can be switched on and off independently, the threshold levels (for example, SQIthresh) can each be set independently.	
➢ Signal processor must enable the real-time Zh reflectivity data correction and ZDR difference reflectivity data correction for attenuation by influence of the strong precipitations by means of the measured values (PhiDP / KDP)	Attenuation due to intervening hydrometeors and parameters in the attenuation formula for the intervening hydrometeors shall be selectable by the user. For attenuation correction there are two choices: •Classical "Hitschfeld-Borden" technique implemented in the IRIS/Radar software. Ref: IRIS Utilities Manual, Section 9.7.8. The reference describes the adjustable parameters. •Dual Polarization Attenuation Correction based on PHIDP. This uses a proprietary technique wherein the differential phase shift is used to estimate the attenuation. Dual Polarimetric attenuation correction is a collection of algorithms may be performed in real-time within the RVP900 Signal Processors or within the IRIS application software. The RDA software gives the advantage of immediate corrections applied with the signal processor being available on real-time data output. The IRIS processing has the advantage that the original Z and ZDR moments are uncorrected for attenuation. IRIS then makes new data types. This allows users to compare the results of the correction. There are numerous studies in the literature on this which are based on the fact that attenuation is related (nearly linearly) to the total amount of differential phase to a range bin, multiplied by a coefficient often called "alpha". The proprietary part is the method that is used to obtain the value of alpha by checking against what the Hitschfeld-Borden method would have calculated for attenuation, i.e., a consistency check. For a general description see the textbook by Bringi and Chandrasekar section 7.4.1.	*Comply* *IRIS and RDA Dual Polarization Users Manual, Chapter 3. Attenuation correction of Z*
➢ Each of the filtering and correcting algorithms must be switchable on /	In Hybrid Tasks mode it is possible to configure the task settings individually for	Comply. *IRIS Radar*

switchable off and configured by user separately for each elevation of the volume measurement	every angle.	*Manual, Chapter 7 Configuring Radar Tasks*
➢ radial resolution of the polar data must be 125 m minimum	Minimum radial resolution of RVP900 is 15 m.	Comply. *RVP900 Datasheet*
➢ number of the evaluable radial bins in the beam must be 2500 minimum	RVP900 maximum number of range bins is 4200.	Comply. *RVP900 Datasheet*
➢ Number of tangentially averaged samples (pulses) for evaluations of the radiolocation values in the radar beam shall be adjustable in the range 20-512;	RVP900 maximum range is 1024 km.	Comply. *RVP900 Datasheet*
➢ It shall be possible to adjust parameters of the radial and azimuthal averaging of data;	This can be done during the task configuration settings of the radar.	*RVP900 User's Manual, Chapter 6.3.2 Range Averaging and Clutter Microsuppression, Chapter 2.9.1.2 Time (Azimuth) Averaging* *IRIS Radar Manual, Chapter 7, Configuring Radar Tasks*
➢ data resolution of the output data must be 8bit (256 levels) at minimum, reflectance data in steps at least 0.5 dBZ, linear radial velocity data cover the whole Nyquist velocity range	RVP900 provides 16-bit data resolution and reflectivity data in 0.01 dB steps and 0.01 m/s for radial velocity covering entire Nyqvist velocity range.	Comply. *RVP900 Datasheet* *IRIS Programmers Manual, Chapter 4.3.5 2-byte Deformation Format*

CH) Control processor

Requirement / Specification	Compliance and Response	Reference
➢ Control processor must include a built-in test device (BITE) for local and remote monitoring, respectively controlling all the basic parameters of the radar such as:	Control processor includes a built-in test device (BITE) for local and remote monitoring, respectively controlling all the basic parameters of the radar	comply

• switching and switching off the radar system; • switching and switching off the radar transmitter; • switching and switching off the antenna drive; • current and expected position of the antenna in azimuth and elevation; • current and expected speed of antenna movement; • safety protections status ,interlocks status (antenna, transmitter); • pulse length; • repetition frequency PRF; • terminal voltage of all the voltage sources; • magnetron current and modulator voltage • transmitting power; • VSWR; • status of the local oscillator and AFC lock; • frequency of the transmitted pulse, IF frequency; • magnetron preheating status; • dehydrator status and pressure in the wave guide; • magnetron cooling status; • radar control processor status; • digital signal processor status;	The bitex utility provides a graphical user interface for the display of status information reported by Built-In Test Equipment (BITE) integrated into the radar and associated systems and reported via the RCP. Bitex also allows for operator initiated commands to be sent to these BITE units (again via the RCP). BITE information is collected by the RCP8 from various physical interfaces to the radar system. • Discrete signals (TTL, RS422, switch closure to ground or DC voltage). • Discrete or analog signals multiplexed in the CAN Bus pedestal interface. • Analog voltages from power supplies or other sensors.  The RCP8 then forwards "BITE Packets" to the radar control workstation which is running the BITEX utility which provides a graphical user interface for monitoring of the system and for setting the IRIS alert status. An example of a BITEX maintenance screen is shown here for the transmitter. The square buttons provide control features. The status lights can be configured for red, yellow, green or neutral. Analog status is shown numerically such as voltage or current and can have two levels of fault.	Comply. *WRM200 Technical Description, Chapter 8 BITE Features and Message Log Files* *IRIS/RDA Utilities Manual, Chapter 5 Bitex Utility* *WRM200 System Status Monitoring*
➢ Complete list of the monitored parameters shall be presented by the Supplier in the Annex No. 1 to the binding draft of Contract.	Complete list of the monitored parameters is in the Annex No. 1 to the binding draft of Contract.	Comply. WRM200 Monitored Parameters *WRM200 Users*

		Manual, Chapter 4, Monitoring System Operation
➢ The Supplier shall pre-set limits for evaluation of the individual error status limit values shall by changeable by user;	Limits are always pre-set when radar is installed and they can be later on changed by user.	Comply. *IRIS/RDA Utilities Manual, Chapter 5 Bitex Utility*
➢ The radar shall enable the calibration with the internal signal generator, or its verification by an external generator;	Either external signal generator or optionally integrated signal generator in the radar cabinet can be used.	Comply. *WRM200 Technical Description, Chapter 9 ZAUTO - Calibration*

I) SW/PC HW

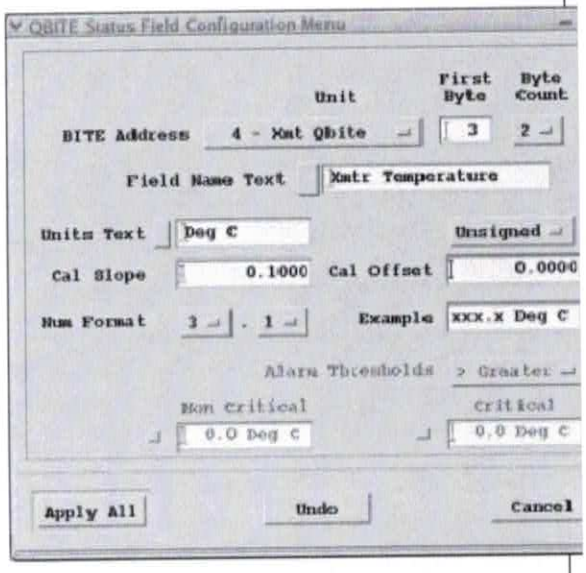
Requirement / Specification	Compliance and Response	Reference
➢ SW/PC HW will be delivered at least in the following configuration:		
• 1x Linux server for Brdy radar with installed SW for manual (interactive) control and radar monitoring and SW for administration and controlling of the periodic measuring and processing/sending of the measured data	Included in the radar cabinet.	Comply. *RVP902 server computer data sheet*
• 1x Linux server for Skalky radar with installed SW for manual (interactive) control and radar monitoring and SW for administration and controlling of the periodic measuring and processing/sending of the measured data	Included in the radar cabinet.	Comply. *RVP902 server computer data sheet*
• 1x Linux server for Praha-Libus radar centre with installed SW for remote	DELL Power Edge T320 Intel XEON E5-24xx Power Edge T320,Intel Xeon E5-24xx v2 Processors,	

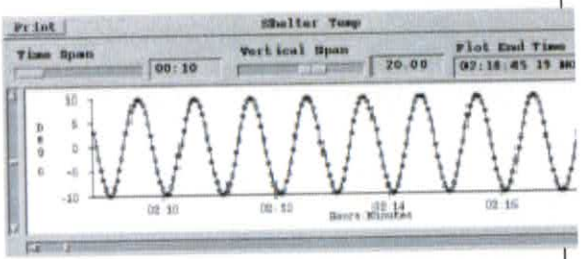
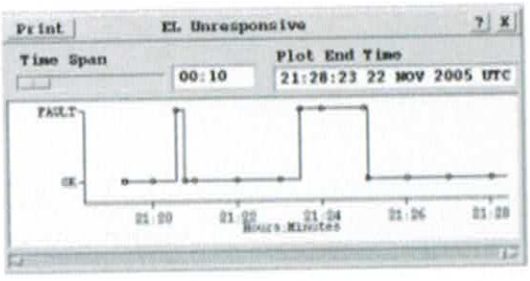
manual (interactive) control and monitoring of both radars, SW for remote controlling of periodic measuring of both radars and SW for creating advanced radar products from both radars	TPM 3Yr Basic Warranty-Next Business Day-Minimum Warranty 3Yr Pro Support and next Business Day-On-Site Service Decline Proactive Maintenance On-Board Broadcom 5720 Dual port 1GBE 3.5" Chassis with up to 8 Hot-Plug Hard Drives C8-RAID 1 for H310/H710,2 SAS/SATA/SSD HDDs. PERC H310 Adapter RAID Controller (RAID 0,1,5,6,10,50,60) **Processor** Intel Xeon E5-2407v,2,40GHz,10M Cache,6.4GT/s,QPI,80W **Memory** (3) 4GB RDIMM,1600MHz,,Low Volt, Single Rank,x8 Data Width 1600 MHz RDIMMs (2) 1TB,SATA.3,5",7.2k rpm, Hard Drive(Hot-Plug) DVD ROM SATA, Internal Tower Chassis, No Casters Dual, Hot-plug, Redundant Power Supply(1+1),495W (2) European Power Cord 220V Red Hat Enterprise Linux 6.4 Factory Install, Red Hat Enterprise Linux,1-2 socket,1 Yr Subscription and Licence,1 virtual guest Red Hat Enterprise Linux 6 Media Only X86_64,No Subscription, Factory Install **Display** 24" LCD DELL P2414H,IPS,16:9,Pivot,Full HD,DVI **Warranty** + 2Yr Pro Support ,Next Business Day, On-Site, for DELL Power Edge T320	
• 2x SW license for remote manual (interactive) control and monitoring of both radars – without HW – it will be installed by employees of the CHMI radar department on their notebooks from the installation media delivered by the Supplier;	2 x IRIS SW will be delivered for control and monitoring of the radars.	Comply. *System Block Diagram*
➢ The integral part of the delivery shall be the installation media and SW installation manual.	Installation CDROM for the software and software installation manual will be provided	Comply. *Software installation*

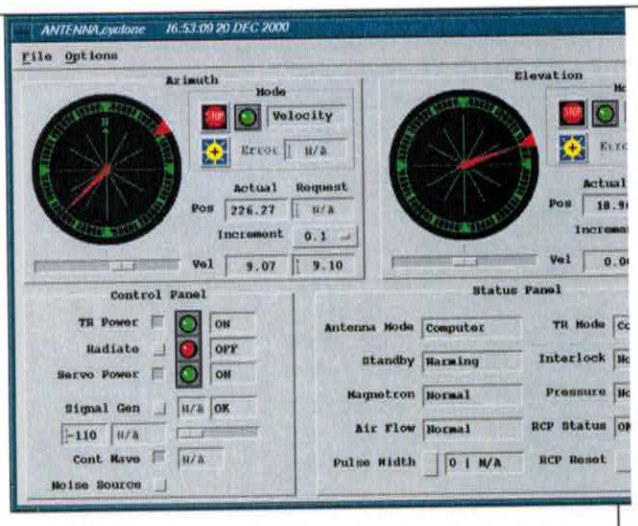
		manual
➢ all the SW must work in the operating system Linux compatible with Red Hat Enterprise Linus 6 distributions and higher;	IRIS operated on the latest version of CentOS and Red Hat platforms.	Comply. *IRIS Radar Manual*
➢ all the SW/HW must be able to operate in the recent data network configuration of the Contracting Authority: • access to the date networks is in the upper technological rooms (1st floor under the antenna mechanics) to the 100Mbit switch – there is 16 IP addresses at minimum on the each radar station at disposal in the address space 192.168.960/26 (Skalky) and 192.168.96.64/26 (Brdy) • transmission path between the radar stations and the radar centre – primary path 2Mbit/s at minimum, spare path 128 kBit/s at minimum	The HW and SW delivered is able to operate in the data network configuration of the end user	Comply. *WRM200 Radar Block Diagram*
➢ HW of the Linux servers must have enough configuration to be able to fulfil the stated tasks with a reserve. It have to be Standard PC x86, 64bit or 32bit architecture;	HW of the Linux servers will have enough configuration to be able to fulfil the stated tasks with a reserve. It have to be Standard PC x86, 64bit or 32bit architecture;	Comply.
➢ There shall be installed the Linux operating system with distributions on servers Red Hat Enterprise Linux 6 and higher (for example Red Hat EL or CentOs);	Will be installed the Linux operating system with distributions on servers Red Hat Enterprise Linux 6 and higher (for example Red Hat EL or CentOs);	Comply. *IRIS Radar Manual*

J) SW for local and remote manual (interactive) control and monitoring of the radar

Requirement / Specification	Compliance and Response	Reference
➢ SW must allowed minimum		
➢ Switching on-switching off of the single radar parts	Transmitter, RVP900 IFDR, signal processor computer, radar control processor and	Comply. *IRIS Radar*

	antenna/pedestal motor drivers can be restarted individually. Other radar parts can be switched on/off during the radar restart process, which can be done also by mobile phone i.e. GSM connection.	*Manual*
➢ monitoring of the radar status (BITE information	The RCP8 collects status information from various subsystems in the form of analog or discrete variables and transmits them to Bitex which performs the following functions: •Determines if a fault is critical or non-critical (warning or information). •Signals IRIS via the signals.dat filter which can be configured to take different actions when a fault occurs (such as ignore it or exec an arbitrary script). •IRIS then Logs the fault in the IRIS Message Log File. •Bitex Logs all communication in a special Bitex Log file. In the case of analog values, Bitex also adds calibration information and allows two thresholds to be set for information and warning. An example of the configuration menu for an analog input is shown below:  The Bitex logs, generated daily, serve as the input for the time history displays in Bitex. When the operator clicks on a Bite widget, a pop-up window of the time history is shown. This	Comply. *IRIS/RDA Utilities Manual, Chapter 5 Bitex Utility* *WRM200 User's Guide, Chapter 4, Monitoring System Operation.*

	supports zoom and time span selection. The examples below are for the cases of a discrete and an analog input. The Log files are stored in ASCII format so they can be browsed and searched using standard editing tools.   	
➢ calibration of receiver by means of the internal signal generator;	Full remote control of the radar system is offered. Also the radar includes a software controllable signal generator allowing remote calibration. The IRIS ZAUTO utility interfaces with the provided signal generator, couplers, cables, controls and software during a calibration. An operator may use the ZAUTO utility to manually step through the calibration process or the ZAUTO utility may follow a pre-set configuration for automatic calibration. The automatic calibration may be inserted into an operation schedule where IRIS will initiate the task. The calibration data is written to disk with a time stamp.	Comply. *WRM200 Maintenance Manual, Chapter 3 Automatic Calibration Option*
➢ antenna position and movement control	This is part of the IRIS software features. It can be done with IRIS antenna utility.	Comply *IRIS and RDA Utilities Manual, Chapter 3 Antenna Utility*

	 Antenna Utility	
➢ setting of parameters of measuring and signal processing	This is part of the IRIS software features, which allows user to set all parameters for measuring and signal processing.	Comply. *IRIS Radar Manual, Chapter 7 Configuring Radar Tasks*
➢ displaying of the actual measured data (in mode A-scope, PPI, RHI at minimum)	A-scope, PPI, RHI, Hybrid (3D rotation mode) and Exec (Automatic sun-tracking) scanning modes are available.	Comply. *IRIS Radar Manual, Chapter 7, Antenna/Radar Control*
➢ calibration of the geometric antenna setting (alignment) by the sun observation (sun tracking)	Pedestal alignment is based on sun tracking utility.	Comply. *IRIS and RDA Utilities Manual, Chapter 11, Suncal Utility*
➢ Log of all the errors shall be performed to the text files, the form description of these log files shall be the integral part of the delivery;	See item "Monitoring of the radar status (BITE information)".	Comply. *IRIS/RDA Utilities Manual, Chapter 5 Bitex Utility* *WRM200 User's Guide, Chapter 4, Monitoring System Operation.*

K) SW for administration of the periodic measurement

Requirement / Specification	Compliance and Response	Reference
➢ SW for administration of the periodic measurement shall allow the following functions at minimum:		
➢ monitoring/displaying of the basic radar parameters	SW for administration of the periodic measurement allows the monitoring/displaying of the basic radar parameters	Comply. *IRIS Product and Display Manual*
➢ definition of the volume measurements (sequence of PPI scans, single PPI scans, RHI scans) with the possibility of the detailed setting of measurement parameters (range, PRF, dual PRF mode, pulse length, averaging of samples, signal filtering and thresholding of data, ...) separately for each elevation.	SW for administration of the periodic measurement allows the definition of the volume measurements (sequence of PPI scans, single PPI scans, RHI scans) with the possibility of the detailed setting of measurement parameters (range, PRF, dual PRF mode, pulse length, averaging of samples, signal filtering and thresholding of data, ...) separately for each elevation.	Comply. *IRIS Radar Manual, Chapter 8.5 TSC Monitor Menu*
➢ possibility to of define the volume measurement from the higher elevations to the lower-ones.	SW for administration of the periodic measurement allows the possibility to of define the volume measurement from the higher elevations to the lower-ones.	Comply. *IRIS Radar Manual, Chapter 7 Configuring Radar Tasks*
➢ the ability to perform multiple scans in frame of the regular scheduler	SW for administration of the periodic measurement allows the the ability to perform multiple scans in frame of the regular scheduler	Comply. *IRIS Radar Manual, Chapter 7 Configuring Radar Tasks* *IRIS Radar Manual, Chapter 8.5 TSC Monitor Menu*
➢ the ability to divide scans into the sectional sub scans with the immediate output of the volume data;	SW for administration of the periodic measurement allows the ability to divide scans into the sectional sub scans with the immediate output of the volume data;	Comply. *IRIS Radar Manual, Chapter 7 Configuring*

		Radar Tasks
➢ generating files from volume measurements of individual moments	SW for administration of the periodic measurement allows the generating files from volume measurements of individual moments	Comply. *IRIS Radar Manual, Chapter 7 Configuring Radar Tasks* *IRIS Product and Display Manual, Chapter 3 Configuring IRIS Products*
➢ the possibility of converting volume data into HDF5 format according to the specification EUMETNET-OPERA (ODIM HDF5) – see: http://www.eumetnet.eu/sites/default/files/OPERA 2008 03 WP2.1b ODIM H5 v 2.1.pdf	HDF5 format can be converted according to EUMET-OPERA data information model specification.	Comply. *IRIS and RDA Utilities Manual, Chapter 10.9 IIRIS Output Devices Setups*
➢ possibility to send the volume data (in original or in the ODIM HDF5 form) to the net placing (FTP minimum) immediately after the measuring the single elevations and simultaneously after finishing of the whole or sectional scans	You can send one or more existing products or data files to a network device, or one or more future versions of a product to a network device at one or more sites. FTP and other protocols are available.	Comply. *IRIS Product and Display Manual, Chapter 7.3 Sending a Product to a Device*
➢ possibility to run users scripts immediately after measuring each elevation and also after completion of whole or partial scans (measured file name is passed as a script parameter)	IRIS Output Device setup allows to setup user scripts to be applied for the measured data.	Comply. *IRIS and RDA Utilities Manual, Chapter 10.9 IIRIS Output Devices Setups*
➢ possibility to generate the basic products (at least PPI, RHI, Column Maxima) from the volume measurement	SW for administration of the periodic measurement allows the possibility to generate the basic products (at least PPI, RHI, Column Maxima) from the volume measurement	Comply. *IRIS Product and Display Manual, Chapter 3 Configuring IRIS Products*

➢ evaluation of the hydrometeors type from the Polarimetric data	The proposed system contains Vaisala's hydometeors classification feature called HydroClass. the HydroClass is a fuzzy logic approach that combines the dual polarization measurements (based on polarimetric parameters like ZDR, ΦDP, KDP and σHV) to determine the predominant scatterer type. The categories are: Rain, Snow, Wet Snow, Graupel, Hail, Non-Meteorological (ground clutter, sea clutter, birds, insects, chaff, ships, aircraft, etc.). A major advantage of HydroClass is the improvement in data quality that can be achieved by thresholding the data to remove non-meteorological targets. This is done as part of the RVP900 thresholding. In addition Vaisala's fuzzy logic classifier for hydrometeors has been enhanced to provide additional characterizations of the atmosphere. There is a new mode of classification which characterizes the meteorological data as convective vs. stratiform and light rain, medium rain, heavy rain, and large drops.	Comply. *HydroClass Brochure* *IRIS and RDA Dual Polarization User's Manual, Chapter 4, Hydroclass, p. 57 ... 142*
➢ possibility to correct attenuation of data of reflectance on attenuation in precipitations with help of Polarimetric values	The implemented reflectivity attenuation correction algorithm is based on polarimetric methodology with the proposed WRM200 radar system.	Comply. *Attenuation Correction of C-Band Weather Radars – Application Note*

L) SW for creating of the advanced products

Requirement / Specification	Compliance and Response	Reference
➢ SW must allowed minimum	SW for creating of the advanced products will allowed following	Comply.
➢ volume data processing from the both radars	The proposed software can process volume data from the both radars.	Comply. *IRIS Product and Display Manual*
➢ possibility to generate products from all evaluated radiolocation values (including polarimetric)	Supplier's proposal contains IRIS Analysis Radar Product Generating (RPG) software which can generate needed products from all evaluated moments (including polarimetric) volume	Comply. *IRIS Product and Display Manual*

volume measurement	measurement.	
➢ creating at least of the following products (for radiolocation values where it makes sense) PPI, RHI, Column Maxima, Echo Top, CAPPI, Pseudo CAPPI, BASE, VIL, Surface rain intensity, rain accumulation, sector winds, VAD/VVP, user defined Cross-sections	All required products can be created with the proposed IRIS Analysis software like: - **PPI, RHI** - The system generates PPI, RHI, images for Z, V , σ and Polarimetric products after applying different corrections to raw data. - **MAX** - IRIS can compute the maximum values of the base elements (Z, V, and σ) within horizontal and vertical columns between users defined heights. The MAX product provides an easy-to-interpret presentation of the echo height and intensity in a single display. - **Echo Top** - The user may select the reflectivity threshold for definition of the echo top. The TOPS product is a display image of the height of the highest occurrence of a selectable threshold dBZ contour. - **CAPPI, Pseudo CAPPI** – CAPPI is a horizontal cut through the atmosphere (moments on horizontal surface), therefore, it requires a PPI volume scan at multiple elevation angles. The number of angles and their spacing depends on the range and height of the CAPPI you want to produce. In the IRIS the CAPPI Fill field uses the highest elevation angle to fill the near ranges, and the lowest elevation angle to fill the far ranges, eliminating the black areas. This approach is called "Pseudo CAPPI." - **BASE** - The BASE product is used to detect the base of echoes. The user can specify a "dBZ Contour" for the base. - **VIL** - The IRIS VIL product shows vertically integrated liquid within a user defined layer. The VIL product can computes integrated values over an altitude interval or layer in the atmosphere. It can compute integrated liquid, or integrated reflectivity. - **SRI** – IRIS will convert reflectivity data into rainfall rate using a user defined Z-R relationship. Rainfall rate is then displayed on same projection to the terrain surface. Surface rainfall rate may also be corrected assuming a vertical reflectivity profile. We	Comply. *IRIS Product and Display Manual, section 2, products:* *PPI* *RHI* *MAX* *TOPS* *CAPPI* *Pseudo CAPPI* *BASE* *VIL* *SRI* *RAIN1* *RAINN* *WIND* *VAD/VVP* *XSECT*

	have significantly changed the way how rainfall rates are calculated in the IRIS system. Previously IRIS supported the standard R(Z) and R(KDP) relationship. In addition to these, IRIS now supports combinations of moments for inferring rainfall rate such as R (KDP, ZDR) and R (Z, ZDR). - **rain accumulation** – IRIS CAPPI products with rainfall rate derived from Polarimetric data may be used as input to the rain accumulation products, **RAIN1** and **RAINN**. User may define precipitation accumulation period from 15 minutes to 1 hour. - **sector winds** – IRIS **WIND** product can be configured to measure any sector(s). Also it can measure horizontal wind vectors at user defined layer height and displayed with wind barbs. - **VAD/VVP** – The IRIS VVP algorithm is similar to the so-called VAD technique, except that it is an improved analytical approach. For details on the technique, refer to Waldteufel and Corbin (1979, Journal of Applied Meteorology, p. 532). The VVP/VAD product can also show reflectivity, vertical wind speed, convergence & divergence, axis of dilatation, and deformation for fixed elevations. The data may be displayed as wind barbs or wind strings. - **user defined Cross-sections** - The XSECT product features Live IRIS support. The cross-section window updates instantly as the section line is moved by mouse control in the basic product display. The XSECT product is similar to an RHI in that it shows a range-height representation or vertical "slice" of a radar parameter. Unlike the RHI, the antenna is not scanned in elevation. Rather the cross section is constructed from a PPI volume scan. This means that if you are running a standard volume scan at regular intervals, an XSECT can be constructed without having to schedule a special RHI TASK. If polar data is not available, the cross section can be constructed from a suitable 3D CAPPI	

	product.	
➢ creating of merged information from the individual products of several radars;	Any IRIS radar product can be overlaid or underlaid with other products. Also IRIS can merge other external data such as lightning data, satellite data, sounding data.	Comply. *IRIS Product and Display Manual*
➢ the possibility of processing volume data from other radars in ODIM HDF5 form	IRIS Analysis can process also volume data from other radars when data is coming into IRIS in ODIM HDF5 format.	Comply.

M) Backup power supplies UPS

Requirement / Specification	Compliance and Response	Reference
➢ UPS online type	UPS Eaton 9355-15-NT-5-32x9Ah	Technický list
➢ UPS must be able to ensure the 30 minutes run of radar and all the CHMI devices necessary for the radar data distribution (the maximum power consumption of the CHMI devices is 2kW)	Eaton baterie pro 9x55-BAT5-96x7Ah zabezpečí 30 minut zálohy pro požadovaný příkon	Technický list
➢ Output power from UPS must not be lower than 1.3 multiple of the maximum power consumption of all the devices ensuring the operation of the radar and data distribution (CHMI, 2kW) including the appropriate radome heating.	Výkon UPS je 15 kVA což pokrývá potřebou zátěž The maximum total power consumption of WRM200 radar is no more than 3.7 kW, Radome heating 2 kW + additional extra load 2 kW	Technický list
➢ Request: UPS must have own implemented isolation transformer	UPS will have own implemented isolation transformer	Technický list
➢ UPS shall allow the five wired switching (three phase input 400 V);	UPS allows the five wired switching (three phase input 400 V);	Technický list
➢ UPS must allowed to send warning through SMS gateway, and shall include the web interface accessible via TCP/IP;	UPS allows to send warning through SMS gateway, and shall include the web interface accessible via TCP/IP – Eaton komunikační karta	Technický list
➢ Information about UPS status shall be available on data interface through SNMP protocol;	Information about UPS status will be available on data interface through SNMP protocol	Technický list
➢ UPS shall have possibility of	UPS will have possibility of connecting to the	Technický

connecting to the local diesel generator and shall be able to control its starting and switching off.	local diesel generator and shall be able to control its starting and switching off	list

N) Requirements for the spare parts to radars

Requirement / Specification	Compliance and Response	Reference
➢ The integral part of the delivery shall be the set of spare parts to radars in the value of 1,775% of the total tender value;	According to the Annex No. 2 to the contract	Comply. List of spares
➢ The Supplier is obliged to specify the set of spare parts in the Annex No. 1 of the binding draft of Contract;	According to the Annex No. 1 to the contract	Comply. List of spares
➢ The Supplier is obliged to compose the set of spare parts with regard to the MTBF of the individual parts;	The set of the spare parts was made with regard to the MTBF of the individual parts	Comply. MTBF for spares

O) Requirements for Linux servers for the radar centre:

Requirement / Specification	Compliance and Response	Reference
➢ The delivery shall include three (3) pcs of Linux servers for the following applications of the Contracting Authority operated in the radar centre at observatory Prague-Libus;	The delivery will includes three (3) pcs of Linux servers for the following applications of the Contracting Authority operated in the radar centre at observatory Prague-Libus; Pls. see server for the radar centre specification	Comply
➢ every server must include minimum	every server will includes a minimum or better – offered **DELL Power Edge T620 Intel Xeon E-26xxv2 Processors**	Comply
• two physical processors – each with eight cores and HyperThreading support, server INTEL architecture (every on power level minimum like Intel Xeon E5-2665)	• two physical processors – each with eight cores and Hyper Threading support, server INTEL architecture (every on power level minimum like Intel Xeon E5-2665)	Comply
• 64GB DDR3 RAM	• 64GB DDR3 RAM	Comply

• 2x 300GB SAS 15K RPM HDD hot-plug	• 2x 300GB SAS 15K RPM HDD hot-plug	Comply
• 6x 1TB Near-Line SAS 7.2K RPM HDD hot-plug	• 6x 1TB Near-Line SAS 7.2K RPM HDD hot-plug	Comply
• SAS controller driver with hardware RAID-1	• SAS controller driver with hardware RAID-1	Comply
• 2x 1Gbit Ethernet card	• 2x 1Gbit Ethernet card	Comply
• 4x USB 2.0	• 4x USB 2.0	Comply
• DVD/CD drive	• DVD/CD drive	Comply
• graphical card	• graphical card	Comply
• platform management compatible with IPMI 2.0	• platform management compatible with IPMI 2.0	Comply
• redundant dual supply, hot-plug	• redundant dual supply, hot-plug	Comply
• cabinet in tower-design	• cabinet in tower-design	Comply
• 24" LCD monitor (FullHD, IPS or PVA technology)	• 24" LCD monitor (Full HD, IPS or PVA technology)	Comply
• keyboard, mouse	• keyboard, mouse	Comply
• Five (5) years extended guarantee with Exchange of the faulty part up to 4 hours at the Customer	• Five (5) years extended guarantee with Exchange of the faulty part up to 4 hours at the Customer	Comply
• Linux operating system compatible with RedHat Enterprise Linux 6 and higher (i.e. with RedHat EL or CentOS) with 5 years support;	• Linux operating system compatible with RedHat Enterprise Linux 6 and higher (i.e. with RedHat EL or CentOS) with 5 years support;	Comply
✓ The servers can include the more advanced technologies on the higher power level.	The servers will include the more advanced technologies on the higher power level.	Comply

P) Documentation

Requirement / Specification	Compliance and Response	Reference
✓ The Contracting Authority highlights that all the documentation to the Equipment shall be issued in English language and delivered in printed and electronic form (including schema). It shall contain at least the following parts:	The documentation to the Equipment shall be issued in English language and delivered in printed and electronic form (including schema). The documentation for the parts delivered from CZ market will in Czech language. It shall contain at least the following parts:	Comply.
• operator´s manual – containing instructions and operations necessary for the complete control of the system of the meteorological radar	operator´s manual – containing instructions and operations necessary for the complete control of the system of the meteorological radar	Comply. *WRM200 User's Guide*
○ It contains instructions for the basic system setting and data processing. There will be issued the specific value of the important parameters.	It contains instructions for the basic system setting and data processing. There will be issued the specific value of the important parameters.	Comply. *WRM200 User's Guide*
○ Working procedures of the system check and accuracy measurement	Working procedures of the system check and accuracy measurement	Comply.*WRM200 User's Guide*
• technical manual containing the detailed description of the single devices and their maintenance	technical manual containing the detailed description of the single devices and their maintenance	Comply. *WRM200 Maintenance Manual*
○ Description and principle of each functional unit;	Description and principle of each functional unit;	Comply. *WRM200 Maintenance Manual*
○ Detailed and clear description of the electrical circuits including diagrams, control test points, values and waveforms.	Detailed and clear description of the electrical circuits including diagrams, control test points, values and waveforms.	Comply. *WRM200 Maintenance Manual*
○ Description of the functional board realization including the detailed connecting schema. In case of black boxes description of the inner	Description of the functional board realization including the detailed connecting schema. In case of black boxes description of the inner functions and definition of the input and output values and	Comply. *WRM200 Maintenance Manual*

functions and definition of the input and output values and variables values.	variables values.	
○ Description of installation, setting, instructions for operation, periodic maintenance and periodic diagnostics	Description of installation, setting, instructions for operation, periodic maintenance and periodic diagnostics	Comply. *WRM200 Maintenance Manual* *WRM200 Installation Manual*
○ Description of solution of the typical problems	Description of solution of the typical problems	Comply. *WRM200 Maintenance Manual*
▪ Software manual containing description of programmes, algorithms and data for the signal processing, data collecting, products creating and radar control.	Software manual containing description of programmes, algorithms and data for the signal processing, data collecting, products creating and radar control.	Comply. *IRIS Product and Display Manual* *IRIS Programmer's Manual* *IRIS Radar Manual* *IRIS and RDA Dual Polarization Manual* *IRIS and RDA Utilities Manual* *RCP8 User's Manual* *RVP900 User' Manual* *Software Installation Manual*
○ complete description of the program function, structures, controlling environment, run and data organizing.	complete description of the program function, structures, controlling environment, run and data organizing.	Comply.
○ detailed description of algorithms for data processing	detailed description of algorithms for data processing	Comply.

○ detailed description of file forms for rough, product, controlling and auxiliary data so that it is possible to proceed them with the own software.	detailed description of file forms for rough, product, controlling and auxiliary data so that it is possible to proceed them with the own software.	Comply.
○ description of the interface of the single SW modules	description of the interface of the single SW modules	Comply.
○ There shall be upgraded the documentation in case of the software modification.	There shall be upgraded the documentation in case of the software modification.	Comply.
➢ One draft copy of all the documentation in printed and electronic form will be delivered to the Contractual Authority at least 3 months prior to FAT. Final version of documentation in three printed copies and electronic form will be delivered prior to radar installation itself.	The full documentation of the proposed WRM200 system includes the following manuals: WRM200 Installation Manual WRM200 User's Guide WRM200 Maintenance Manual For IRIS, RVP900 and RCP8 there are following 8 manuals: IRIS Product and Display Manual IRIS Programmer's Manual IRIS Radar Manual IRIS and RDA Dual Polarization Manual IRIS and RDA Utilities Manual RCP8 User's Manual RVP900 User' Manual Software Installation Manual One draft copy of full documentation (in printed and in electronic form) will be delivered to CHMI at least 3 months prior to FAT. The final versions with three printed copies and electronic copy will be delivered prior the radar installation.	Comply.
➢ The documentation approval by the Contractual Authority must be part of the approval procedure (FAT/SAT)	The documentation approval is a part of the FAT / SAT approval procedures.	Comply. *WRM200 FAT and SAT ProceduresWRM200 OT Procedures* *WRM200 FAT and SAT SW features*

➢ The Contractual Authority reserves the right to copy the all technical documentation or its part in electronic and paper form for the internal use.	CHMI has rights to copy all technical documentation or its part for their internal use.	Comply.
➢ The Contracting Authority will require the documentation upgrade which will be effected:		
○ The documentation should be upgraded:	The documentation will be upgraded in the following case in minimum:	Comply.
○ simultaneously with the appropriate HW and SW exchange	In case of software or hardware upgrade(s) with the delivered system.	Comply.
○ in case of its evident inaccuracy or incompleteness what shall be announced by the Contracting Authority to the Bidder	In case of errors, inaccuracy or incompleteness with the documentation.	Comply.

Q) Requirements for training

Requirement / Specification	Compliance and Response	Reference
• The Contracting Authority requires the training of the respective persons, i.e. at minimum HW training for 2 persons and SW training for 2 persons prior to FAT (for each radar separately);	This proposal contains HW training for 2 persons and SW training for 2 persons. The training sessions will be done prior to FAT for both radars separately.	Comply.
• in extent 80 hours at least (including FAT performance)	The proposal contains FAT for 2 days / radar and factory training for HW (4 days) and for SW (4 days) being totally 10 days (2 weeks). FAT and factory training sessions will be performed for both radars separately.	Comply.
• Place of realization: at producer´s facility – practical training will be performed on the radar which will be subject for FAT and for delivery to the Contracting Authority;	Hardware (HW) factory hands-on practical training will be done with the radar which is subject for FAT and delivery to the CHMI.	Comply.
• all the recommended maintenance acts will be performed by the Supplier and	All recommended maintenance actions will be done by Vaisala and CHMI has rights to make video recording about these maintenance	Comply.

the Contracting Authority has right to take the acoustic and video recording;	actions.	
• The Bidder is obliged to cover at its own cost the presence of technicians of the Contracting Authority on training and FAT (i.e. transport, accommodation, daily allowances for 4 persons);	All expenses of the Contractual Authority technicians (4 persons) will be covered by Omnipol during the FAT and factory training (flight tickets, local transportation, accommodation and daily allowance).	Comply..
• Training for operators (for each radar separately)	Operators training will be done for each radar separately.	Comply.
• in extend of 16 hours at least	The extent of the operators training is 2 days in minimum.	Comply.
• Performance after the successful SAT fulfilment in the radar centre in Prague-Libus.	Operators training will be performed after the radar successful SAT in the radar centre in the Praha-Libus.	Comply.

R) Requirements for acceptance tests

Requirement / Specification	Compliance and Response	Reference
• Supplier must ensure the successful fulfilment of the FAT (Factory acceptance test) and SAT (Site acceptance test)	Both FAT (Factory Acceptance Test) and SAT (Site Acceptance Test) are included into this proposal.	Comply.
• supplier will check all the mechanical parts of the radio locator including the operational fillings	The FAT and SAT test procedures contain all appropriate mechanical parts tests as well as operational tests.	Comply *WRM200 FAT and SAT Procedures* *WRM200 OT Procedures* *WRM200 FAT and SAT SW features*
• supplier will perform all the available measurement of the transmitter and receiver (transmitted power, frequency stability, stability of intermediate frequency, local oscillator's stability, receiver dynamics, amplification of LNA, signal-to-	All tests including all the available measurement of the transmitter and receiver (transmitted power, frequency stability, stability of intermediate frequency, local oscillator's stability, receiver dynamics, amplification of LNA, signal-to-noise ratio, MDS etc.) are included into test procedures.	Comply. *WRM200 FAT and SAT Procedures* *WRM200 OT Procedures* *WRM200 FAT*

noise ratio, MDS etc.)		*and SAT SW features*
• supplier will perform the antenna check (stabile run, gain measurement, beam width, the main lobe from the side lobes ratio, limits for antenna movement, speed in elevation and azimuth);	The following antenna checks are included into test procedures (stabile run, amplification, beam width, the main lobe from the side lobes ratio, limits for antenna movement, speed in elevation and azimuth).	Comply. *WRM200 FAT and SATProcedures* *WRM200 OT Procedures* *WRM200 FAT and SAT SW features*
• supplier will perform the control check of all the controlling elements.	All appropriate radar controlling elements tests are included into test procedures.	Comply. *WRM200 FAT and SAT Procedures* *WRM200 OT Procedures* *WRM200 FAT and SAT SW features*
• supplier will perform the functional check of all the SW parts	All appropriate functional check of software are included into test procedures	Comply. *WRM200 FAT and SAT Procedures* *WRM200 OT Procedures* *WRM200 FAT and SAT SW features*
➢ supplier will financially cover the presence of technicians of the Contractual Authority on FAT (transport, accommodation, daily allowance for 4 persons)	The costs of Contractual Authority technicians (four persons) will be covered by the Supplier (flight tickets, local transportation, accommodation and daily allowance) will be covered by OMNIPOL.	Comply.
➢ The SAT acceptance will include the 48-hours trouble-free radar operation, simulating the standard operating conditions and expected outer infrastructure troubles (for example power supply interruption or failure data networks);	The SAT procedures include also 48 hours (trouble-free) operational tests.	Comply. *WRM200 FAT and SAT Procedures*
➢ Supplier is obliged to issue the list and description of all the basic operations and measurement s	OMNIPOL will issue the list and description of all the basic operations and measurement s performed during FAT/SAT in the Annex Nol. 1 to	Comply. *WRM200 FAT*

	performed during FAT/SAT in the Annex Nol. 1 to the binding draft of Contract.. The Contracting Authority reserves the right to require the selected Bidder as Contractor for performing of another operations and measurement provided that the list and description of the basic operations and measurements seems not to be sufficient from the point of view of the Contracting Authority.	the binding draft of Contract. – pls see Annex No. 1. Omnipol/Vaisala agree that the Contracting Authority has the right to require performing of another operations and measurement provided that the list and description of the basic operations and measurements seems not to be sufficient from the point of view of the Contracting Authority.	*and SAT Procedures* *WRM200 OT Procedures* *WRM200 FAT and SAT SW features*

S) Requirements for warranty

Requirement / Specification	Compliance and Response	Reference
• The Contracting Authority requires the warranty for quality of the Equipment for five (5) years period; the integral part of the warranty service of the Equipment are especially the following services:	This proposal includes the extended 5 years warranty. Attached document Service description_CHMI_Radar_2014 describes the included services in detail.	*Comply.* *Service description_ CHMI_Radar _2014*
• solution of problems via HelpDesk (response up to 24 hours on working days)	Supplier / Vaisala technical support with next business day response time.	*Comply.* *Service description_ CHMI_Radar _2014* *1.2.1*
• SW upgrade free of charge	Free of charge SW updates.	*Comply.* *Service description_ CHMI_Radar _2014* *1.2.3*
• free of charge delivery of the necessary spare parts in case of radar failure	Vaisala warranty conditions extended to 5 years.	*Comply.* *Service description_ CHMI_Radar _2014* *1.2.2*

• quick availability of spare parts – delivery of the spare part up to three (3) working days on request of the Contractual Authority	Next business day deliveries for spare parts from Vaisala inventory in Vantaa, Finland.	*Comply.* *Service description_ CHMI_Radar _2014* *1.2.4*
• servicing intervention (free of charge) of the Supplier's technician on the radar site up to seven (7) calendar days after request of the contractual authority in case the solution by own means of the contractual authority is not possible	Vaisala-certified personnel will commence travelling within seven (7) business days after escalating the request to Vaisala Field Service.	*Comply.* *Service description_ CHMI_Radar _2014* *1.2.5*

T) Requirements for assembly and installation

Requirement / Specification	Compliance and Response	Reference
➢ Supplier shall ensure the complete exchange of the old radars on the radar stations Brdy and Skalky for the new-ones including the connected acts. The measurement of the physical disposals of the radar stations for the problem less transport and installation of the single parts is on Supplier's responsibility.	This proposal includes the complete exchange of the old radar systems on Brdy and Skalky radar sites for the new dual polarization radar types.	Comply.
➢ The old radars shall be completely disassembled by the Supplier and ecologically disposed pursuant to applicable law of the Czech Republic (in particular Act No. 185/2001 Coll.). The Supplier shall issue the protocol of this ecological disposal and shall hand it over to the Customer.	The old radars will be completely disassembled by the OMNIPOL . OMNIPOL will organised ecologically disposed pursuant according to the applicable law of the Czech Republic (in particular Act No. 185/2001 Coll.). The sub-supplier of the ecologically disposed pursuant according to the applicable law of the Czech Republic will issue the protocol and it will be over handed to the Customer.	Comply.
➢ Assembly and installation of the new radar will be completely carried out by the Supplier including all the necessary connected works, including transport of material to the final	Assembly and installation of the new radar will be completely carried out by the OMNIPOL and the sub suppliers including all the necessary connected works, including transport of material to the final concrete site of assembly.	Comply.

concrete site of assembly.		
➢ The Supplier is obliged to declare in the Offer the possibility of the installation of delivered radar systems in the existing premises of the radar stations – the Contracting Authority shall enable the visitation of radar sites in the predetermined terms within the tender process.	OMNIPOL hereby declares the possibility of the installation of delivered radar systems in the existing premises of the radar stations The declaration is based on the site surveys conducted at the existing radar sites Brdy and Skalky. The construction drawing were not given.	Comply
➢ The Supplier is obliged to submit in frame of its Offer the "Plan of Radars Exchange" including:	All required information is included into this proposal- see below:	Comply.
• tentative time schedule, which shall be elaborated by weeks;	tentative time schedule, is be elaborated by weeks;	Comply. *Schedule CHMI Brdy and Skalky*
• method of transport to the installation site	All goods will be transported by a truck to the installation site.	Comply.
• way of shift of the single parts to the technological rooms and of the antenna to the top of tower;	Lifting of the antenna/pedestal is described in the WRM200 Installation Manual. The WRM200 radar cabinet is moved to equipment room by the lift	Comply. *WRM200 Installation Manual*
• method of antenna and new radome fixing on the recent towers	Please see the enclosed antenna / pedestal and the radome installation drawings.	Comply. *Site Measures of Brdy and Skalky Radars* *WRM200 Installation Manual* *Radome Technical Manual*
• weight and measures of the single radar components (cabinet transmitter-receiver, antenna, radome (after unpacking and installation)	The weight and measures of the all single radar components are given in WRM200 User´s Guide	Comply *WRM200 User's Guide. Chapter 6 Technical Data*
• placement of radar cabinets in the technological rooms of the radar towers	We hereby declare that the new radar cabinet can be placed in the technological rooms of the radar towers.	Comply

• method of the radar connection to the power supply network	WRM200 System Block diagram	Comply WRM200 System Block Diagram
• This document ("Plan of Radars Exchange") shall be the integral part of the Bidder´s Offer while it shall be dated and signed by the Bidder or by the person authorized to act on behalf of the Bidder.	The document ("Plan of Radars Exchange") is the integral part of the OMNIPOL´s Offer. It is dated and signed by the authorized person at OMNIPOL.	Comply

Picture 1 - definition of the current operating volume measurement CZRAD : Please see antenna and drive technical specification

	Slice 1	Slice 2	Slice 3	Slice 4	Slice 5	Slice 6	Slice 7	Slice 8	Slice 9	Slice 10	Slice 11	Slice 12
Elevation	21.6	13.7	8.7	6.3	4.5	3.2	2.2	1.7	1.3	0.9	0.5	0.1
Stop Range	120	120	120	180	180	260	260	260	260	260	260	260
Range Step	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Range Sampling	1	1	1	1	1	1	1	1	1	1	1	1
High PRF	1180	1180	1180	800	800	576	576	576	576	576	576	576
Staggering	None	None	None	None	None	None	None	None	None	None	None	None
Low PRF	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*
Dual PRF Mode (°)	Adaptive	Adaptive	Adaptive	Adaptive	Adaptive	Adaptive	Adaptive	Adaptive	Adaptive	Adaptive	Adaptive	Adaptive
Dual PRF Z Corr. Thr. (°)	2	2	2	2	2	2	2	2	2	2	2	2
Dual PRF Correction (°)	Active	Active	Active	Active	Active	Active	Active	Active	Active	Active	Active	Active
Dual PRF Correction Mode (°)	3x3 Median	3x3 Median	3x3 Median	3x3 Median	3x3 Median	3x3 Median	3x3 Median	3x3 Median	3x3 Median	3x3 Median	3x3 Median	3x3 Median
Pulse Width	0.8 micros. (15...	0.8 micros. (15...	0.8 micros. (15...	0.8 micros. (15...	0.8 micros. (15...	0.8 micros. (15...	0.8 micros. (15...	0.8 micros. (15...	0.8 micros. (15...	0.8 micros. (15...	0.8 micros. (15...	0.8 micros. (15...
Doppler Filter	Active	Active	Active	Active	Active	Active	Active	Active	Active	Active	Active	Active
Filter Width	1.25 m/s (3)	1.25 m/s (3)	1.25 m/s (3)	2.12 m/s (6)	2.12 m/s (6)	2.14 m/s (8)	2.14 m/s (8)	2.14 m/s (8)	2.14 m/s (8)	2.75 m/s (10)	2.75 m/s (10)	2.75 m/s (10)
Filter Depth (°)	40dB	40dB	40dB	40dB	40dB	40dB	40dB	40dB	40dB	40dB	40dB	40dB
DFT Filter	Off	Off	Off	Off	Off	Off	Off	Off	Off	Off	Off	Off
Filter Width	*1.25 m/s (3)*	*1.25 m/s (3)*	*1.25 m/s (3)*	*2.12 m/s (6)*	*2.12 m/s (6)*	*2.14 m/s (8)*	*2.14 m/s (8)*	*2.14 m/s (8)*	*2.14 m/s (8)*	*2.75 m/s (10)*	*2.75 m/s (10)*	*2.75 m/s (10)*
DFT Weight (°)	*Rectangular*	*Rectangular*	*Rectangular*	*Rectangular*	*Rectangular*	*Rectangular*	*Rectangular*	*Rectangular*	*Rectangular*	*Rectangular*	*Rectangular*	*Rectangular*
Spatial Filter	Active	Active	Active	Active	Active	Active	Active	Active	Active	Active	Active	Active
Filter Mode (°)	Average of nei...	Average of nei...	Average of nei...	Average of nei...	Average of nei...	Average of nei...	Average of nei...	Average of nei...	Average of nei...	Average of nei...	Average of nei...	Average of nei...
Spatial Min. (°)	3	3	3	3	3	3	3	3	3	3	3	3
Spatial Max. (°)	5	5	5	5	5	5	5	5	5	5	5	5
Speckle Filter	Active	Active	Active	Active	Active	Active	Active	Active	Active	Active	Active	Active
Antenna Speed	25.7	25.7	25.7	22.9	22.9	19.2	19.2	19.2	18	18	15	15
Angle Synchronization	Off	Off	Off	Off	Off	Off	Off	Off	Off	Off	Off	Off
Time-Sampling	46	46	46	35	35	30	30	30	32	32	38	38
Angle-Step	*1.00186*	*1.00186*	*1.00186*	*1.00188*	*1.00188*	*1*	*1*	*1*	*1*	*1*	*0.989583*	*0.989583*
CCOR	25	25	25	25	25	25	25	25	25	25	25	25
SQI1	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
SQI2	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
LOG	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Mask-UZ (°)	UZ-LOG	UZ-LOG	UZ-LOG	UZ-LOG	UZ-LOG	UZ-LOG	UZ-LOG	UZ-LOG	UZ-LOG	UZ-LOG	UZ-LOG	UZ-LOG
Mask-CZ (°)	CZ-LOG; CCOR	CZ-LOG; CCOR	CZ-LOG; CCOR	CZ-LOG; CCOR	CZ-LOG; CCOR	CZ-LOG; CCOR	CZ-LOG; CCOR	CZ-LOG; CCOR	CZ-LOG; CCOR	CZ-LOG; CCOR	CZ-LOG; CCOR	CZ-LOG; CCOR
Mask-V (°)	SQI1	SQI1	SQI1	SQI1	SQI1	SQI1	SQI1	SQI1	SQI1	SQI1	SQI1	SQI1
Mask-W (°)	SQI1	SQI1	SQI1	SQI1	SQI1	SQI1	SQI1	SQI1	SQI1	SQI1	SQI1	SQI1