

**RETURN BIDS TO:
RETOURNER LES SOUMISSIONS À:**

**Bid Receiving
PWGSC
33 City Centre Drive
Suite 480C
Mississauga
Ontario
L5B 2N5
Bid Fax: (905) 615-2095**

**REQUEST FOR PROPOSAL
DEMANDE DE PROPOSITION**

**Proposal To: Public Works and Government
Services Canada**

We hereby offer to sell to Her Majesty the Queen in right of Canada, in accordance with the terms and conditions set out herein, referred to herein or attached hereto, the goods, services, and construction listed herein and on any attached sheets at the price(s) set out therefor.

**Proposition aux: Travaux Publics et Services
Gouvernementaux Canada**

Nous offrons par la présente de vendre à Sa Majesté la Reine du chef du Canada, aux conditions énoncées ou incluses par référence dans la présente et aux annexes ci-jointes, les biens, services et construction énumérés ici sur toute feuille ci-annexée, au(x) prix indiqué(s).

Comments - Commentaires

Title - Sujet Dual Polarization Upgrade Package	
Solicitation No. - N° de l'invitation K3D33-141001/A	Date 2014-09-19
Client Reference No. - N° de référence du client K3D33-141001	
GETS Reference No. - N° de référence de SEAG PW-\$TOR-031-6670	
File No. - N° de dossier TOR-4-37057 (031)	CCC No./N° CCC - FMS No./N° VME
Solicitation Closes - L'invitation prend fin at - à 02:00 PM on - le 2014-10-07	Time Zone Fuseau horaire Eastern Daylight Saving Time EDT
F.O.B. - F.A.B. Plant-Usine: <input type="checkbox"/> Destination: <input checked="" type="checkbox"/> Other-Autre: <input type="checkbox"/>	
Address Enquiries to: - Adresser toutes questions à: Schmidt, Jeff	Buyer Id - Id de l'acheteur tor031
Telephone No. - N° de téléphone (905) 615-2058 ()	FAX No. - N° de FAX (905) 615-2060
Destination - of Goods, Services, and Construction: Destination - des biens, services et construction: DEPARTMENT OF THE ENVIRONMENT 4905 Dufferin Street Downsview Ontario M3H5T4 Canada	

Instructions: See Herein

Instructions: Voir aux présentes

Vendor/Firm Name and Address

**Raison sociale et adresse du
fournisseur/de l'entrepreneur**

Delivery Required - Livraison exigée See herein	Delivery Offered - Livraison proposée
Vendor/Firm Name and Address Raison sociale et adresse du fournisseur/de l'entrepreneur	
Telephone No. - N° de téléphone Facsimile No. - N° de télécopieur	
Name and title of person authorized to sign on behalf of Vendor/Firm (type or print) Nom et titre de la personne autorisée à signer au nom du fournisseur/ de l'entrepreneur (taper ou écrire en caractères d'imprimerie)	
Signature	Date

Issuing Office - Bureau de distribution

Public Works and Government Services Canada
Ontario Region
33 City Centre Drive
Suite 480
Mississauga
Ontario
L5B 2N5

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K3D33-141001/A

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File No. - N° du dossier

TOR-4-37057

Buyer ID - Id de l'acheteur

tor031

Client Ref. No. - N° de réf. du client

K3D33-141001

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TITLE – Dual Polarization Measurement Upgrade Unit

PART 1 - GENERAL INFORMATION

1. Introduction

The bid solicitation is divided into six parts plus attachments and annexes, as follows:

- Part 1 General Information: provides a general description of the requirement;
- Part 2 Bidder Instructions: provides the instructions, clauses and conditions applicable to the bid solicitation;
- Part 3 Bid Preparation Instructions: provides bidders with instructions on how to prepare their bid;
- Part 4 Evaluation Procedures and Basis of Selection: indicates how the evaluation will be conducted, the evaluation criteria that must be addressed in the bid, and the basis of selection;
- Part 5 Certifications: includes the certifications to be provided;
- Part 6 Resulting Contract Clauses: includes the clauses and conditions that will apply to any resulting contract.

The Annexes include the Statement of Work, the Basis of Payment, Evaluation, Project Schedule and any other annexes.

2. Summary

The Meteorological Service of Canada (MSC) of Environment Canada (EC) will be upgrading a portion of Canada's Doppler Weather Radar Network by adding Dual Polarization measurement capabilities at specific sites across Canada identified in Section 9 Option for Additional Systems, Item 9.10, Table 1: Proposed Upgrade Sites.

This requirement is for the supply, delivery, installation, training, maintenance and successful acceptance testing by Environment Canada of one (1) Prototype Dual Polarization measurement upgrade unit with the option to purchase eleven (11) additional units.

The Prototype Dual Polarization measurement upgrade unit must be received and start-up tested by the Bidder no later than 26 weeks after award of contract.

The Work is to be performed during the period of contract award to August 31, 2016.

The overall prototype system must be delivered to Environment Canada and installed at the evaluation site in Exeter, ON where it will undergo a series of acceptance tests carried out by the contractor under the supervision of the EC team. It must also include a demonstration of the calibration procedures. Acceptance of the system will only occur once all specifications have been met. The warranty period will commence upon final acceptance by Environment Canada.

An Optional Site Visit will be held on October 16th, 2014. The site visit will begin at 10:00 AM.

Bidders must provide a list of names, or other related information as needed, pursuant to section 01 of Standard Instructions 2003.

The requirement is subject to the provisions of the Agreement on Internal Trade (AIT).

Due to the nature of the bid solicitation, bids transmitted by facsimile to PWGSC will not be accepted.

3. Debriefings

Bidders may request a debriefing on the results of the bid solicitation process. Bidders should make the request to the Contracting Authority within 15 working days of receipt of the results of the bid solicitation process. The debriefing may be in writing, by telephone or in person.

PART 2 - BIDDER INSTRUCTIONS

1. Standard Instructions, Clauses and Conditions

All instructions, clauses and conditions identified in the bid solicitation by number, date and title are set out in the [Standard Acquisition Clauses and Conditions Manual](https://buyandsell.gc.ca/policy-and-guidelines/standard-acquisition-clauses-and-conditions-manual) (<https://buyandsell.gc.ca/policy-and-guidelines/standard-acquisition-clauses-and-conditions-manual>) issued by Public Works and Government Services Canada. Bidders who submit a bid agree to be bound by the instructions, clauses and conditions of the bid solicitation and accept the clauses and conditions of the resulting contract.

The [2003](#) (2014-06-26) Standard Instructions - Goods or Services - Competitive Requirements, are incorporated by reference into and form part of the bid solicitation.

Subsection 5.4 of [2003](#), Standard Instructions - Goods or Services - Competitive Requirements, is amended as follows:

Delete: sixty (60) days

Insert: one hundred and eighty (180) days

2. Submission of Bids

Bids must be submitted only to Public Works and Government Services Canada (PWGSC) Bid Receiving Unit by the date, time and place indicated on page 1 of the bid solicitation.

Due to the nature of the bid solicitation, bids transmitted by facsimile to PWGSC will not be accepted.

3. Former Public Servant

Contracts awarded to former public servants (FPS) in receipt of a pension or of a lump sum payment must bear the closest public scrutiny, and reflect fairness in the spending of public funds. In order to comply with Treasury Board policies and directives on contracts awarded to FPS, bidders must provide the information required below before contract award. If the answer to the questions and, as applicable the information required have not been received by the time the evaluation of bids is completed, Canada will inform the Bidder of a time frame within which to provide the information. Failure to comply with Canada's request and meet the requirement within the prescribed time frame will render the bid non-responsive.

Definitions

For the purposes of this clause, "former public servant" is any former member of a department as defined in the [Financial Administration Act](#), R.S., 1985, c. F-11, a former member of the Canadian Armed Forces or a former member of the Royal Canadian Mounted Police. A former public servant may be:

- a. an individual;
- b. an individual who has incorporated;
- c. a partnership made of former public servants; or

- d. a sole proprietorship or entity where the affected individual has a controlling or major interest in the entity.

"lump sum payment period" means the period measured in weeks of salary, for which payment has been made to facilitate the transition to retirement or to other employment as a result of the implementation of various programs to reduce the size of the Public Service. The lump sum payment period does not include the period of severance pay, which is measured in a like manner.

"pension" means a pension or annual allowance paid under the [Public Service Superannuation Act](#) (PSSA), R.S., 1985, c.P-36, and any increases paid pursuant to the [Supplementary Retirement Benefits Act](#), R.S., 1985, c.S-24 as it affects the PSSA. It does not include pensions payable pursuant to the [Canadian Forces Superannuation Act](#), R.S., 1985, c.C-17, the [Defence Services Pension Continuation Act](#), 1970, c.D-3, the [Royal Canadian Mounted Police Pension Continuation Act](#), 1970, c.R-10, and the [Royal Canadian Mounted Police Superannuation Act](#), R.S., 1985, c.R-11, the [Members of Parliament Retiring Allowances Act](#), R.S., 1985, c.M-5, and that portion of pension payable to the [Canada Pension Plan Act](#), R.S., 1985, c.C-8.

Former Public Servant in Receipt of a Pension

As per the above definitions, is the Bidder a FPS in receipt of a pension? **Yes () No ()**

If so, the Bidder must provide the following information, for all FPS in receipt of a pension, as applicable:

- a. name of former public servant;
- b. date of termination of employment or retirement from the Public Service.

By providing this information, Bidders agree that the successful Bidder's status, with respect to being a former public servant in receipt of a pension, will be reported on departmental websites as part of the published proactive disclosure reports in accordance with [Contracting Policy Notice: 2012-2](#) and the [Guidelines on the Proactive Disclosure of Contracts](#).

Work Force Adjustment Directive

Is the Bidder a FPS who received a lump sum payment pursuant to the terms of the Work Force Adjustment Directive? **Yes () No ()**

If so, the Bidder must provide the following information:

- a. name of former public servant;
- b. conditions of the lump sum payment incentive;
- c. date of termination of employment;
- d. amount of lump sum payment;
- e. rate of pay on which lump sum payment is based;
- f. period of lump sum payment including start date, end date and number of weeks;
- g. number and amount (professional fees) of other contracts subject to the restrictions of a work force adjustment program.

For all contracts awarded during the lump sum payment period, the total amount of fees that may be paid to a FPS who received a lump sum payment is \$5,000, including Applicable Taxes.

4. Enquiries - Bid Solicitation

All enquiries must be submitted in writing to the Contracting Authority no later than ten (10) calendar days before the bid closing date. Enquiries received after that time may not be answered.

Bidders should reference as accurately as possible the numbered item of the bid solicitation to which the enquiry relates. Care should be taken by bidders to explain each question in sufficient detail in order to enable Canada to provide an accurate answer. Technical enquiries that are of a proprietary nature must be clearly marked "proprietary" at each relevant item. Items identified as "proprietary" will be treated as such except where Canada determines that the enquiry is not of a proprietary nature. Canada may edit the question(s) or may request that the Bidder do so, so that the proprietary nature of the question(s) is eliminated and the enquiry can be answered to all bidders. Enquiries not submitted in a form that can be distributed to all bidders may not be answered by Canada.

5. Applicable Laws

Any resulting contract must be interpreted and governed, and the relations between the parties determined, by the laws in force in Ontario.

Bidders may, at their discretion, substitute the applicable laws of a Canadian province or territory of their choice without affecting the validity of their bid, by deleting the name of the Canadian province or territory specified and inserting the name of the Canadian province or territory of their choice. If no change is made, it acknowledges that the applicable laws specified are acceptable to the bidders.

6. Optional Site Visit

It is recommended that the Bidder or a representative of the Bidder visit the evaluation site. Arrangements have been made for the site visit to be held at the Exeter Radar Site (43.37199 Latitude North and -81.38056 Longitude West) Exeter, ON on October 16th, 2014. The site visit will begin at 10:00 AM.

Bidders are requested to communicate with the Contracting Authority no later than 2 business days before the Site Visit to confirm attendance and provide the name(s) of the person(s) who will attend. Bidders may be requested to sign an attendance sheet. Bidders who do not attend or do not send a representative will not be given an alternative appointment but they will not be precluded from submitting a bid. Any clarifications or changes to the bid solicitation resulting from the site visit will be included as an amendment to the bid solicitation.

NOTE: Should a heavy rainfall and/or harsh weather conditions occur which would not allow the Radar to be shut down, an alternate Optional Site Visit will be held at the Exeter Radar Site (43.37199 Latitude North and -81.38056 Longitude West) Exeter, ON on October 17th, 2014. The site visit will begin at 10:00 AM.

Bidder's who have communicated to the Contracting Authority will be advised should the site visit on October 16th be cancelled.

PART 3 - BID PREPARATION INSTRUCTIONS

1. Bid Preparation Instructions

Canada requests that bidders provide their bid in separately bound sections as follows:

Section I: Technical Bid (3 hard copies)

Section II: Financial Bid (1 hard copy)

Section III: Certifications (1 hard copy)

Prices must appear in the financial bid only. No prices must be indicated in any other section of the bid.

Canada requests that bidders follow the format instructions described below in the preparation of their bid:

- (a) use 8.5 x 11 inch (216 mm x 279 mm) paper;
- (b) use a numbering system that corresponds to the bid solicitation.

In April 2006, Canada issued a policy directing federal departments and agencies to take the necessary steps to incorporate environmental considerations into the procurement process [Policy on Green Procurement](http://www.tpsgc-pwgsc.gc.ca/ecologisation-greening/achats-procurement/politique-policy-eng.html) (<http://www.tpsgc-pwgsc.gc.ca/ecologisation-greening/achats-procurement/politique-policy-eng.html>). To assist Canada in reaching its objectives, bidders should:

- 1) use 8.5 x 11 inch (216 mm x 279 mm) paper containing fiber certified as originating from a sustainably-managed forest and containing minimum 30% recycled content; and
- 2) use an environmentally-preferable format including black and white printing instead of colour printing, printing double sided/duplex, using staples or clips instead of cerlox, duotangs or binders.

Section I: Technical Bid

In their technical bid, bidders should demonstrate their understanding of the requirements contained in the bid solicitation and explain how they will meet these requirements. Bidders should demonstrate their capability and describe their approach in a thorough, concise and clear manner for carrying out the work.

The technical bid should address clearly and in sufficient depth the points that are subject to the evaluation criteria against which the bid will be evaluated. Simply repeating the statement contained in the bid solicitation is not sufficient. In order to facilitate the evaluation of the bid, Canada requests that bidders address and present topics in the order of the evaluation criteria under the same headings. To avoid duplication, bidders may refer to different sections of their bids by identifying the specific paragraph and page number where the subject topic has already been addressed.

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Section II: Financial Bid

Bidders must submit their financial bid in accordance with Annex B, Basis of Payment & Schedule of Milestones. The total amount of Applicable Taxes must be shown separately.

Section III: Certifications

Bidders must submit the certifications required under Part 5.

PART 4 - EVALUATION PROCEDURES AND BASIS OF SELECTION

1. Evaluation Procedures

- (a) Bids will be assessed in accordance with the entire requirement of the bid solicitation including the technical and financial evaluation criteria.
- (b) An evaluation team composed of representatives of Canada will evaluate the bids.

1.1 Technical Evaluation

1.1.1 Mandatory Technical Criteria

See Annex C, Evaluation, Technical Evaluation

1.1.2 Point Rated Technical Criteria

See Annex C, Evaluation, Technical Evaluation

1.2 Financial Evaluation

1.2.1 Mandatory Financial Criteria

- a) Bidders must submit pricing in accordance with Annex B, Basis of Payment & Schedule of Milestones, with their bid at bid closing;
- b) Prices must be in Canadian dollars, FOB Destination. Transportation charges, customs duties and Excise taxes are included and Applicable Taxes are extra.

1.2.2 Evaluation

- a) The Total Evaluated Price is the aggregate of the Extended Prices for all items in the Firm and Optional Requirements at Annex B, Basis of Payment & Schedule of Milestones.

The Extended Price is calculated by multiplying the Quantity by the Firm Unit Price.

For Section 3, Training, the Evaluated Price is the Firm Training Cost.

For Section 4, Travel and Living Expenses, the Extended Price is the sum of all the Travel Costs per location.

- b) SACC Manual clause A0220T (2014-06-26) Evaluation of Price – Bid

2. Basis of Selection - Highest Combined Rating of Technical Merit and Price

2.1 To be declared responsive, a bid must:

- a. comply with all the requirements of the bid solicitation; and
- b. meet all mandatory criteria; and

- c. obtain the required minimum of 75 points overall for the technical evaluation criteria which are subject to point rating.

The rating is performed on a scale of 115 points.

- 2.2 Bids not meeting (a) or (b) or (c) will be declared non-responsive.
- 2.3 The selection will be based on the highest responsive combined rating of technical merit and price. The ratio will be 60% for the technical merit and 40% for the price.
- 2.4 To establish the technical merit score, the overall technical score for each responsive bid will be determined as follows: total number of points obtained / maximum number of points available multiplied by the ratio of 60%.
- 2.5 To establish the pricing score, each responsive bid will be prorated against the lowest evaluated price and multiplied by the ratio of 40%.
- 2.6 For each responsive bid, the technical merit score and the pricing score will be added to determine its combined rating.
- 2.7 Neither the responsive bid obtaining the highest technical score nor the one with the lowest evaluated price will necessarily be accepted. The responsive bid with the highest combined rating of technical merit and price will be recommended for award of a contract.

The table below illustrates an example where all three bids are responsive and the selection of the contractor is determined by a 60/40 ratio of technical merit and price, respectively. The total available points equal 135 and the lowest evaluated price is \$45,000 (45).

Basis of Selection - Highest Combined Rating Technical Merit (60%) and Price (40%)

		Bidder 1	Bidder 2	Bidder 3
Overall Technical Score		115/135	89/135	92/135
Bid Evaluated Price		\$55,000.00	\$50,000.00	\$45,000.00
Calculations	Technical Merit Score	$115/135 \times 60 = 51.11$	$89/135 \times 60 = 39.56$	$92/135 \times 60 = 40.89$
	Pricing Score	$45/55 \times 40 = 32.73$	$45/50 \times 40 = 36.00$	$45/45 \times 40 = 40.00$
Combined Rating		83.84	75.56	80.89
Overall Rating		1 st	3 rd	2 nd

PART 5 - CERTIFICATIONS

Bidders must provide the required certifications and associated information to be awarded a contract.

The certifications provided by bidders to Canada are subject to verification by Canada at all times. Canada will declare a bid non-responsive, or will declare a contractor in default in carrying out any of its obligations under the Contract, if any certification made by the Bidder is found to be untrue, whether made knowingly or unknowingly, during the bid evaluation period or during the contract period.

The Contracting Authority will have the right to ask for additional information to verify the Bidder's certifications. Failure to comply and to cooperate with any request or requirement imposed by the Contracting Authority may render the bid non-responsive or constitute a default under the Contract.

1. Certifications Required Precedent to Contract Award

1.1 Integrity Provisions - Associated Information

By submitting a bid, the Bidder certifies that the Bidder and its Affiliates are in compliance with the provisions as stated in Section 01 Integrity Provisions - Bid of Standard Instructions [2003](#). The associated information required within the Integrity Provisions will assist Canada in confirming that the certifications are true.

1.2 Federal Contractors Program for Employment Equity - Bid Certification

By submitting a bid, the Bidder certifies that the Bidder, and any of the Bidder's members if the Bidder is a Joint Venture, is not named on the Federal Contractors Program (FCP) for employment equity "[FCP Limited Eligibility to Bid](#)" list (http://www.labour.gc.ca/eng/standards_equity/eq/emp/fcp/list/inelig.shtml) available from [Employment and Social Development Canada \(ESDC\) - Labour's](#) website.

Canada will have the right to declare a bid non-responsive if the Bidder, or any member of the Bidder if the Bidder is a Joint Venture, appears on the "[FCP Limited Eligibility to Bid](#)" list at the time of contract award.

PART 6 - RESULTING CONTRACT CLAUSES

The following clauses and conditions apply to and form part of any contract resulting from the bid solicitation.

1. Statement of Work

The Contractor must perform the Work in accordance with the Statement of Work at Annex A and the Contractor's technical bid entitled _____, dated _____.

1.1 Optional Goods and/or Services

The Contractor grants to Canada the irrevocable option to acquire the goods, services or both described at Annex B, Basis of Payment & Schedule of Milestones, of the Contract under the same conditions and at the prices and/or rates stated in the Contract. The option may only be exercised by the Contracting Authority and will be evidenced, for administrative purposes only, through a contract amendment.

The Contracting Authority may exercise the option at any time before the expiry of the Contract by sending a written notice to the Contractor.

2. Standard Clauses and Conditions

All clauses and conditions identified in the Contract by number, date and title are set out in the [Standard Acquisition Clauses and Conditions Manual](https://buyandsell.gc.ca/policy-and-guidelines/standard-acquisition-clauses-and-conditions-manual)(<https://buyandsell.gc.ca/policy-and-guidelines/standard-acquisition-clauses-and-conditions-manual>) issued by Public Works and Government Services Canada.

2.1 General Conditions

2030 (2013-06-26), General Conditions - Higher Complexity - Goods, apply to and form part of the Contract.

2.2 Supplemental General Conditions

4001 (2013-01-28) Hardware Purchase, Lease and Maintenance, apply to and form part of the Contract.

4010 (2012-07-16) Services – Higher Complexity, apply to and form part of the Contract.

3. Security Requirement

There is no security requirement applicable to this Contract.

4. Term of Contract

4.1 Period of the Contract

The Work is to be performed during the period of contract award to August 31, 2016.

4.2 Delivery Date – Prototype Dual Polarization measurement capability upgrade unit in accordance with Item 1.1 at Annex B, Basis of Payment & Schedule of Milestones.

All the deliverables must be received on or before _____ (No later than 26 weeks after award of contract, date inserted at time of Contract award)

4.3 Delivery Date – Three (3) Optional Dual Polarization measurement capability upgrade units including 1 spare; in accordance with Item 2.1 at Annex B, Basis of Payment & Schedule of Milestones.

All the deliverables must be received on or before March 31, 2016, upon receipt of contract amendment exercising the option.

4.4 Delivery Date – Remaining Optional Dual Polarization measurement capability upgrade units including 1 spare in accordance with Items 2.2 to 2.9 Annex B, Basis of Payment & Schedule of Milestones.

All the deliverables must be received on or before August 31, 2016, upon receipt of contract amendment exercising the option

5. Authorities

5.1 Contracting Authority

The Contracting Authority for the Contract is:

Name: Jeff Schmidt
Title: Supply Specialist
Public Works and Government Services Canada
Acquisitions Branch
Address: 33 City Centre Dr
Mississauga, ON L5B 2N5

Telephone: 905-615-2058
Facsimile: 905-615-2060
E-mail address: jeff.schmidt@pwgsc.gc.ca

The Contracting Authority is responsible for the management of the Contract and any changes to the Contract must be authorized in writing by the Contracting Authority. The Contractor must not perform work in excess of or outside the scope of the Contract based on verbal or written requests or instructions from anybody other than the Contracting Authority.

5.2 Project Authority (Environment Canada Representative)

The Project Authority for the Contract is:

Name: _____
Title: _____
Organization: _____
Address: _____
Telephone: _____
Facsimile: _____
E-mail address: _____

The Project Authority is the representative of the department or agency for whom the Work is being carried out under the Contract and is responsible for all matters concerning the technical

content of the Work under the Contract. Technical matters may be discussed with the Project Authority, however the Project Authority has no authority to authorize changes to the scope of the Work. Changes to the scope of the Work can only be made through a contract amendment issued by the Contracting Authority.

5.3 Technical Authority (*Environment Canada Representative*)

The Technical Authority for the Contract is:

Name: _____
Title: _____
Organization: _____
Address: _____

Telephone: ____ - ____ - ____
Facsimile: ____ - ____ - ____
E-mail address: _____

The Technical Authority named above is the representative of the department or agency for whom the Work is being carried out under the Contract and is responsible for all matters concerning the technical content of the Work under the Contract. Technical matters may be discussed with the Technical Authority, however the Technical Authority has no authority to authorize changes to the scope of the Work. Changes to the scope of the Work can only be made through a contract amendment issued by the Contracting Authority.

5.4 Contractor's Representative

Name: _____
Title: _____
Organization: _____
Address: _____

Telephone: ____ - ____ - ____
Facsimile: ____ - ____ - ____
E-mail address: _____

Additional Contractor Representative (*if applicable*)

Name: _____
Title: _____
Organization: _____
Address: _____

Telephone: ____ - ____ - ____
Facsimile: ____ - ____ - ____
E-mail address: _____

6. Proactive Disclosure of Contracts with Former Public Servants

By providing information on its status, with respect to being a former public servant in receipt of a *Public Service Superannuation Act* (PSSA) pension, the Contractor has agreed that this information will be reported on departmental websites as part of the published proactive

disclosure reports, in accordance with [Contracting Policy Notice: 2012-2](#) of the Treasury Board Secretariat of Canada.

7. Payment

7.1 Basis of Payment - Firm Price, Firm Unit Price(s) or Firm Lot Price(s)

For the Work described in Section 1, Firm Requirement, Section 2, Optional Requirement, and Section 3, Training, of Annex B, Basis of Payment:

In consideration of the Contractor satisfactorily completing all of its obligations under the Contract, the Contractor will be paid firm unit prices, as specified in Annex B, Basis of Payment & Schedule of Milestones, for a cost of \$ _____. Customs duties are included and Applicable Taxes are extra.

For the firm price portion of the Work only, Canada will not pay the Contractor for any design changes, modifications or interpretations of the Work unless they have been approved, in writing, by the Contracting Authority before their incorporation into the Work.

7.2 Limitation of Price

Canada will not pay the Contractor for any design changes, modifications or interpretations of the Work unless they have been approved, in writing, by the Contracting Authority before their incorporation into the Work.

7.3 Milestone Payments

1. Canada will make milestone payments in accordance with the Schedule of Milestones detailed in the Contract and the payment provisions of the Contract, up to 90 percent of the amount claimed and approved by Canada if:
 - a. an accurate and complete claim for payment using form [PWGSC-TPSGC 1111](#), Claim for Progress Payment, and any other document required by the Contract have been submitted in accordance with the invoicing instructions provided in the Contract;
 - b. the total amount for all milestone payments paid by Canada does not exceed 90 percent of the total amount to be paid under the Contract;
 - c. all the certificates appearing on form [PWGSC-TPSGC 1111](#) have been signed by the respective authorized representatives;
 - d. all work associated with the milestone and as applicable any deliverable required have been completed and accepted by Canada.
2. The balance of the amount payable will be paid in accordance with the payment provisions of the Contract upon completion and delivery of all Work required under the Contract if the Work has been accepted by Canada and a final claim for the payment is submitted.

7.4 Limitation of Expenditure

For the Work described in Section 4, Travel and Living Expenses of Annex B, Basis of Payment:

The Contractor will be reimbursed for the costs reasonably and properly incurred in the performance of the Work, as determined in accordance with the Basis of Payment in Annex B, to a limitation of expenditure of \$_____ (*amount to be inserted at contract award*). Customs duties are included and Applicable Taxes are extra.

Canada will not pay the Contractor for any design changes, modifications or interpretations of the Work, unless they have been approved, in writing, by the Contracting Authority before their incorporation into the Work.

7.5 Limitation of Expenditure – Limitation of Price

Canada will not pay the Contractor for any design changes, modifications or interpretations of the Work unless they have been approved, in writing, by the Contracting Authority before their incorporation into the Work

8. Invoicing Instructions - Progress Payment Claim

1. The Contractor must submit a claim for payment using form [PWGSC-TPSGC 1111](#), Claim for Progress Payment.

Each claim must show:

- a. all information required on form [PWGSC-TPSGC 1111](#);
 - b. all applicable information detailed under the section entitled "Invoice Submission" of the general conditions;
 - c. the description and value of the milestone claimed as detailed in the Contract.
2. Applicable Taxes must be calculated on the total amount of the claim before the holdback is applied. At the time the holdback is claimed, there will be no Applicable Taxes payable as it was claimed and payable under the previous claims for progress payments.
 3. The Contractor must prepare and certify one original and two (2) copies of the claim on form [PWGSC-TPSGC 1111](#), and forward it to the Project Authority identified under the section entitled "Authorities" of the Contract for appropriate certification after inspection and acceptance of the Work takes place.

The Project Authority will then forward the original and two (2) copies of the claim to the Contracting Authority for certification and onward submission to the Payment Office for the remaining certification and payment action.
 4. The Contractor must not submit claims until all work identified in the claim is completed.

9. Certifications

9.1 Compliance

The continuous compliance with the certifications provided by the Contractor in its bid and the ongoing cooperation in providing associated information are conditions of the Contract. Certifications are subject to verification by Canada during the entire period of the Contract. If the Contractor does not comply with any certification, fails to provide the associated information, or if it is determined that any certification made by the Contractor in its bid is untrue, whether made

knowingly or unknowingly, Canada has the right, pursuant to the default provision of the Contract, to terminate the Contract for default.

10. Applicable Laws

The Contract must be interpreted and governed, and the relations between the parties determined, by the laws in force in _____.

11. Priority of Documents

If there is a discrepancy between the wording of any documents that appear on the list, the wording of the document that first appears on the list has priority over the wording of any document that subsequently appears on the list.

- (a) the Articles of Agreement;
- (b) the supplemental general conditions 4001 (2013-01-28) Hardware Purchase, Lease and Maintenance;
- (c) the supplemental general conditions 4006 (2010-08-16) Contractor to Own Intellectual Property Rights in Foreground Information
- (d) the supplemental general conditions 4010 (2012-07-16) Services – Higher Complexity
- (e) the general conditions 2030 (2013-06-26), General Conditions - Higher Complexity – Goods;
- (f) Annex A, Statement of Work;
- (g) Annex B, Basis of Payment & Schedule of Milestones;
- (h) the Contractor's bid dated _____.

12. SACC Manual Clauses

12.1 Electrical Equipment

All electrical equipment supplied under the Contract must be certified or approved for use in accordance with the [Canadian Electrical Code](#), Part 1, before delivery, by a certification organization accredited by the Standards Council of Canada.

13. Foreign Nationals (Canadian Contractor)

SACC Manual clause [A2000C](#) (2006-06-16) Foreign Nationals (Canadian Contractor)

OR

13. Foreign Nationals (Foreign Contractor)

SACC Manual clause [A2001C](#) (2006-06-16) Foreign Nationals (Foreign Contractor)

14. Insurance

SACC Manual clause [G1005C](#) (2008-05-12) Insurance

15. Liquidated Damages

1. If the Contractor fails to deliver and install goods within the time specified in the Contract, the Contractor agrees to pay to Canada liquidated damages in the amount of \$3,000.00

for each calendar day of delay. The total amount of the liquidated damages must not exceed 10% percent of the contract price.

2. Canada and the Contractor agree that the amount stated above is their best pre-estimate of the loss to Canada in the event of such a failure, and that it is not intended to be, nor is it to be interpreted as, a penalty.
3. Canada will have the right to hold back, drawback, deduct or set off from and against the amounts of any monies owing at any time by Canada to the Contractor, any liquidated damages owing and unpaid under this section.
4. Nothing in this section must be interpreted as limiting the rights and remedies which Canada may otherwise have under the Contract.

ANNEX A STATEMENT OF WORK

Dual Polarization Measurement Capability Upgrade

1. Introduction

The Meteorological Service of Canada (MSC) of Environment Canada (EC) is seeking to upgrade a portion of Canada's Doppler Weather Radar Network by adding Dual Polarization measurement capability at specific sites.

The mandate of the Meteorological Service of Canada (MSC) is to enhance public safety and informed decision making by issuing weather warnings; forecasting weather, ice and wave conditions; supporting critical weather-sensitive government services; monitoring atmospheric conditions and predicting the state of the climate; monitoring water levels, and providing scientific research for service improvement and policy advice.

Within EC, and part of the Meteorological Service of Canada, the National Radar Program (NRP) manages and administers the Government of Canada's Weather Radar Network. The network consists of 28 sites strategically located across Canada; each containing standardized transmitter, receiver and computer hardware along with common data processing software.

Dual Polarization of Weather Radars is an emerging trend that provides additional scientific tools for weather forecasters and analyzers to immediately assess current atmospheric conditions. Currently, Canada's Weather Radar Network measures atmospheric conditions using horizontally polarized signals only. With dual polarization radar, increased information will be available including information about the shape of the hydrometeors by transmitting both horizontally and vertically polarized signals. Current active research in dual-polarization radar includes winter precipitation, quantitative precipitation estimates and particle type identification.

The current MSC NRP radar network uses three types of antenna pedestals, however because of their size, NRP has determined that only 10 sites utilizing the Andrew 6.2 meter Weather Seeker CLP65 Antenna Pedestal (abbreviated to 98A) are suitable for the planned Dual Polarization upgrade.

2. Objectives

The Meteorological Service of Canada (MSC) of Environment Canada (EC) will be upgrading a portion of Canada's Doppler Weather Radar Network by adding Dual Polarization measurement capability at specific sites across Canada identified in Section 9 Option for Additional Systems, Item 9.10, Table 1: Proposed Upgrade Sites.

The upgraded C-Band Doppler Dual Polarization Weather System must be fully operational both with an on-site operator and from a remote location twenty four hours per day 365 days per year and must operate in harsh Canadian environments. The system must operate with a very high level of reliability and stability.

The overall prototype system must be delivered to Environment Canada and installed at the evaluation site near Exeter, ON where it will undergo a series of acceptance tests carried out by the contractor under the supervision of the EC team. Testing must also include a demonstration of the calibration procedures. Acceptance of the system will only occur once all specifications

have been met. The warranty period will commence upon final acceptance by Environment Canada.

The existing 98A antenna/pedestal is a typical elevation axis over azimuth axis with a single waveguide rotary joint in the elevation axis and a single rotary joint and slip ring assembly in the azimuth axis. The new dual polarization waveguide matrix and the equipment box containing dual channel receiver must be mounted above the existing elevation rotary joint in an Antenna Mounted Receiver configuration. This requirement is to eliminate any possible H and V channel variations due to differences in rotary joints were there to be two elevation rotary joints or a dual channel waveguide azimuth rotary joint.

EC's goal is to maintain uniformity with the rest of the network for sparing, training, maintenance and other downstream purposes. For those reasons, scope of the dual polarization upgrade is limited. All existing connections inside the transmitter cabinet and the computer rack must not be changed.

The Contractor's work is limited to the space inside antenna radome except that the contractor may add necessary data communication, networking equipment and GFE RVP902 signal processor computer (RVP computer) located inside the radar building/trailer.

3. Mandatory Technical Specifications

3.1 General Mandatory Specifications

- 3.1.1 Waveguide matrix must be installed above the elevation rotary joint;
- 3.1.2 Equipment Enclosure must be installed above the elevation rotary joint;
- 3.1.3 Existing elevation rotary joint must not be modified or moved from current position;
- 3.1.4 Azimuth rotary joint (if replacement of existing azimuth rotary joint is needed) must be installed in such way that does not require any relocation of the existing slip ring;
- 3.1.5 Azimuth rotary joint (if replacement of existing azimuth rotary joint is needed) must be installed in such way that does not require major modifications to the antenna pedestal structure.

Major Modification is defined as: A modification that results in a permanent and irreversible change to an existing component of the radar pedestal that is not one of the components being replaced by this upgrade. Such modifications include but are not limited to cutting, drilling, tapping, and welding operations performed on components of the existing radar pedestal. Adaptors, brackets, and other removable features are allowed provided the other aspects of these specifications are respected.

Where a permanent modification involving drilling and or tapping is determined to be necessary by the Contractor, the required change must be submitted in writing to the Project Authority. Approval may be granted provided the following conditions are met prior to implementing the change:

- i. approval by the project authority has been given in writing;

- ii. The operation can be completed in the field with no risk to quality, and the operation does not compromise the structural or functional integrity of the component being modified;
 - iii. The operation has been reviewed and approved by a qualified engineer from Environment Canada prior to making any such changes;
- 3.1.6 All equipment supplied by the contractor must fit through the existing radome hatch opening. The radome hatch opening dimensions are: 75 cm x 120 cm.

Note that the radome space is accessed through a stair case attached to this hatch opening. Refer to Appendix 1 to Annex A: Radome Hatch Photos;
- 3.1.7 GFE RVP902 signal processor computer (RVP computer) must be installed inside the computer rack located in the radar building/trailer;
- 3.1.8 GFE provided IRIS/RDA software must be used to acquire and process data, directly control the radar, and perform diagnostic and radar calibrations and cannot be modified;
- 3.1.9 Upgraded dual polarized system must produce the following output variables: Z, T, V, W, SQI, ZDR, RHOHV, PHIDP, KDP;
- 3.1.10 Output Data must be in Iris Raw data format;
- 3.1.11 The Contractor must not add additional signal processors;
- 3.1.12 RVP901 (IFDR) has 20 miscellaneous TTL I/O lines, 20 differential Line pairs and 6 analog inputs. Only those I/O lines must be used for any status, monitoring or control purposes inside the enclosure box;
- 3.1.13 Connection between waveguide –to-coax transitions and the bulk head enclosure must use high quality cable with a maximum attenuation of 0.3 dB/1m for each: H, V, and burst signal;
- 3.1.14 Stable Local Oscillator (STALO) must be controlled by the RVP901 (IFDR) using digital control interface (tuning);
- 3.1.15 Data Link must support error free gigabit Ethernet communication between RVP901 (IFDR) located at the antenna pedestal and RVP902 (RVP Computer) located inside radar building/trailer
- 3.2 Mandatory Technical Specifications**
 - 3.2.1 All modifications performed in this upgrade must not restrict the current Elevation and Azimuth range of motion described in Table D.1 “Pedestal Assembly Specifications” Technical Specification Document. The Elevation total range limit is the “Hard stop limit” (Appendix 4 to Annex A, Section 4).
 - 3.2.2 Any mass added to the dynamic sections of the pedestal must maintain the existing elevation centre of gravity as identified in Appendix 2 to Annex A, NRP-DP-1000-01, 98A Counterweight Structure) The current 98A pedestal has removable counterweight plates that combined, create a balancing moment of 342kg•m. Some or all of these

counterweight plates must be removed to balance out the additional equipment mass added to the sections of the pedestal moving in elevation.

Any equipment added to the section of the pedestal moving only in Azimuth that has a mass greater than 5kg (cables excluded) must only be located behind the Elevation axis (non-dish side) and must not exceed a total mass of 100kg, nor have its centre of mass located more than 1m from the Azimuth axis.

- 3.2.3 Difference in losses in H and V path (Vertical Transmit Loss H+V) between cross coupler at the edge of the antenna reflector and to the transition between waveguide to coax transition must be equal or less than 0.35 dB.
- 3.2.4 Overall waveguide loss measured between forward port of the transmitter cabinet directional coupler and the H channel cross coupler at the edge of the antenna dish must be no more than 0.6 dB higher than waveguide loss for existing single polarization radar measured between the same points, excluding 3 dB Magic Tee Loss.
Existing waveguide loss is 1.4 dB and it will be verified and measured before the radar upgrade.
- 3.2.5 All additional waveguide parts installed in transmit path by the contractor must be rated to work with a 350 kW magnetron.
- 3.2.6 All equipment installed at the antenna must operate at 120 VAC and total power consumption cannot exceed 1200 W.
- 3.2.7 All equipment that requires 120 VAC connections must have current and valid Canadian Standards Association (CSA) certification STD C22.2 NO 60950-1 or alternative already accepted as equivalent by CSA, at the time of delivery.
- 3.2.8 All installed equipment must operate in the ambient temperature range -20 °C to + 40 °C
- 3.2.9 All installed equipment humidity operating range must be 15% to 95 % Relative Humidity (RH)
- 3.2.10 All installed equipment non-operating temperature range must be -40 °C to +55 °C

3.3 Mandatory Waveguide Matrix Technical Specifications

- 3.3.1 Waveguide matrix must be constructed to operate in simultaneous transmit and receive (STAR) mode (H+V transmits simultaneously)
- 3.3.2 Magic tee must equally split power and have the following specifications:
 - i. Minimum isolation between E & H arms [dB]: minimum of 30
 - ii. Minimum isolation between Co-linear arms [dB]: 16
 - iii. Unbalance Max [dB]: maximum of 0.15
 - iv. VSWR Max (H Arm): maximum of 1.3
 - v. VSWR Max (E Arm): maximum of 1.5
- 3.3.3 Waveguide matrix must incorporate TR cells/limiters that provide adequate receiver protection and with sufficient recovery time to allow for ZDR offset calibration using birdbath method. Maximum TR cell recovery time must not exceed 6 micro seconds;

- 3.3.4 TR cell/limiter must be passive type;
- 3.3.5 TR cell/limiter must not contain or exceed licensed quantity of radioactive isotope according to the Canadian Standards- Canada's Nuclear Safety and Control Act, Regulation SOR/2000-207 titled "Nuclear Substances and Radiation Devices";
- 3.3.6 Waveguide matrix must incorporate waveguide band pass filters with following or better characteristics:
- i. Centre Frequency 5620 MHz;
 - ii. Relative 3dB bandwidth 50 MHz (5595 – 5645 MHz);
 - iii. Insertion loss at centre frequency;
 - iv. Less than 0.5 dB;
 - v. Maximum VSWR at centre frequency 1.5:1;
 - vi. Minimum stop band rejection: 21 dB.
- 3.3.7 Waveguide matrix must allow for RF transmit pulse sample (burst pulse) monitoring. Burst sampling port must be located before HV Split;

3.4 Mandatory Equipment Box Technical Specifications

- 3.4.1 Output of receiver down convertor must be 60MHz IF signals on H, V and burst channels;
- 3.4.2 RVP901 (IFDR) must use 10 MHz external reference clock to phase lock the RVP901 (IFDR) sampling in each channel to the Stable Local Oscillator (STALO);
- 3.4.3 Equipment enclosure must be temperature controlled and maintain stable internal temperature within +/- 2 °C or less as required for optimal component performance over required operating temperature range. A temperature probe used to verify required temperature specification must be placed at STALO. This temperature monitoring must utilize RVP901 (IFDR) I/O pins.
- 3.4.4 All electronic equipment (including down convertor components, LNA, preamplifiers, RVP901 (IFDR) and STALO) must be inside the climate controlled enclosure. This excludes power supplies that may be packaged separately. If packaged in separate box, maximum dimension of this additional box must not exceed (W x D x H) 40 x 25 x 45 cm and can only contain power supplies and communication (networking) equipment and operate in the ambient temperature range -20 °C to +40 °C;
- 3.4.5 Must incorporate a built in remote single point receiver calibration capability using Zauto IRIS/RDA utility;

3.5 Mandatory Dynamic Range, Minimum Detectable Signal (MDS) and STALO Specifications

- 3.5.1 Dynamic range of the receiver chain must be 94 [dB] @ 0.8 us pulse or better for both H and V channels;
- 3.5.2 MDS must be (-114) [dBm] @ 0.8 us pulse or better for both H and V channels;
- 3.5.3 STALO minimum step must be 100 kHz or lower;

3.5.4 STALO phase noise of a minimum:

- i. (-60) dBc for offset of 10 Hz; and
- ii. (-80) dBc for offset of 100 Hz; and
- iii. (-100) dBc for offset of 100KHz or more

3.5.5 STALO must have monitoring capabilities that identify internal error conditions and is available for external electronic monitoring. External monitoring must utilize RVP901 (IFDR) I/O pins.

3.6 Other Mandatory Requirements

3.6.1 Existing radar status (analog and digital) and control signals (pulse width control) are connected using the existing RCP8 I/O 62 panel. The contractor must ensure that those connections remain unchanged and that they are used in the same capacity and maintain the same functionality after the upgrade;

3.6.2 The contractor must use existing slip ring for all electrical, control and status connections between the radar building/trailer and equipment installed at the antenna.

The Following slip ring connections are available:

- 7 power connection, each rated at 20A@120VAC
- 3 video channels (total 6 connections), each rated 10V max, 50 Ohms, bandwidth (@-3dB) 5 MHz, Noise 0.6mV@ 200mA max. Channel crosstalk suppression 50 dB minimum;

3.6.3 When installed on the pedestal, equipment must include provisions to prevent vibrations from the antenna drive system from being directly transmitted to any sensitive equipment. Vibration isolating mounts, positive latching/locking electrical connections, and thread locking fasteners must be used. A sample vibration report is attached in Appendix 3 which demonstrates the typical level of vibration encountered on a 98A pedestal;

3.6.4 Waveguide components are pressurized from the magnetron flange to the antenna feed horn. All components must be able to operate at maximum pressure of 5 psi.

3.7 Mandatory Maintenance Requirements

3.7.1 System must be designed such that regular onsite service by the operator is not required more frequently than an interval of one visit every 4 months. (i.e. Designed for no more than 3 onsite maintenance visits per year.

4. Deliverables

4.1 Must provide one (1) completed Dual Polarization upgrade unit containing the following:

4.1.1 All equipment as identified in Section 3.3, Mandatory Waveguide Matrix Technical Specifications;

4.1.2 Temperature controlled equipment box containing analog receiver, down-converter, IFDR, STALO, applicable control and diagnostic circuitry and applicable power supplies as identified in Section 3.4, Mandatory Equipment Box Technical Specifications;

-
- 4.1.3 If using external power supply equipment box, as identified in Section per 3.4, Mandatory Equipment Box Technical Specifications (specifically 3.4.4) this box must contain power supplies needed for equipment box operations.
 - 4.1.4 Data transmission link and associated connections,
 - 4.1.5 Interconnect cables used to connect waveguide matrix to the equipment box as identified in Section 3.1, General Mandatory Specifications item 3.1.4;
 - 4.1.6 Waveguide parts and components used to connect waveguide matrix to the dual polarization feed horn and elevation rotary joint;
 - 4.1.7 Associated cabling, connectors, mechanical parts required for installation and operations;
 - 4.2 Installation of the dual polarization feed horn and associated mechanical and waveguide parts. Dual polarization feed horn is supplied as GFE (Appendix 4 to Annex A, Government Furnished Equipment);
 - 4.3 Installation and integration of the dual polarization upgrade unit.
 - 4.4 Must provide a detailed factory acceptance test procedure for Dynamic Range, MDS Test, Phase Noise Test and Remote Calibration Capability Test identified in Appendix 5 to Annex A, Section 1;
 - 4.5 Must complete a system calibration and testing in accordance with Appendix 5 to Annex A, Acceptance Testing;
 - 4.6 Must provide a system Performance verification document containing factory acceptance test results, results of vibration test and environmental chamber tests results;
 - 4.7 Documentation must be in English and include the following:
 - 4.7.1 Circuit diagrams one (1) in each of the following formats: softcopy in CAD file format, PDF and hardcopy. (preferably OrCAD® design files)
 - 4.7.2 Mechanical drawings one (1) in each of the following formats: softcopy in DXF file format for 2D drawings and IGES file format for 3D drawing;
 - 4.7.3 Report on calibration checks and procedures and acceptable limits;
 - 4.7.4 Report on proof of performance check procedures and results one (1) soft and one (1) hardcopy.
 - 4.7.5 Documented procedures for testing and evaluating all new individual components to the required performance specification;
 - 4.7.6 Documented procedures for removal and installation of new individual components or modules;

- 4.7.7 Bill of Materials (BOM) including vendor and part number for all used parts: one (1) softcopy in Excel spreadsheet file format;
- 4.8 Contractor must provide training for EC staff (approximately 10 people and estimated at 5 days). This training must include a demonstration of the hardware and software, including calibration procedures. Training location will be at one of the following locations depending on EC operational requirements:
- 4905 Dufferin Street, Toronto, ON, Canada M3H 5T4;
 - Evaluation site – Exeter, ON.
- 4.9 Contractor must provide a price list for long lead time items, spare parts and parts with highest wear and tear, within twenty (20) days of contract award;
- 4.10 Progress Report Meetings
- 4.10.1 Environment Canada and Contractor must meet on a monthly basis to discuss the progress of the Contract. Meeting may be in person or via conference call. The dates and times may be mutually convenient for Environment Canada and the Contractor however, Environment Canada has the authority to schedule an in person meeting or conference call.
- 4.11 The Contractor must visit the Exeter, ON evaluation site after contract award to meet with Environment Canada staff to discuss installation requirements. Travel and accommodation for contractor personnel will be covered by the contractor.

5. Support Provided by Canada

- 5.1 Environment Canada staff will be present at the installation site(s) and will monitor progress and provide any clarification to installation crew regarding current equipment;
- 5.2 Any installation/contractor staff must participate in a one (1) hour safety orientation provided by EC personnel upon entering each site.

6. Government Furnished Equipment (GFE)

See Appendix 4 to Annex A

7. Mandatory Installation Requirements

The dual polarization upgrade must connect to the existing radar at the following points:

- 7.1 120V Power: EC will provide 120VAC power, up to 10A, at a connector and pin numbers to be specified, on the output (rotating side) of the azimuth slip ring.
- 7.2 System Trigger: EC will provide an RG-59, 50 Ohm coaxial cable run from the transmitter modulator to a BNC connector to be specified, on the output (rotating side) of the azimuth slip ring. The RVP901 (IFDR) must generate the system trigger;

- 7.3 Transmit Power: The waveguide matrix transmit power input must connect to the output side (antenna side) of the existing elevation rotary joint. The Contractor is responsible for procuring and installing necessary waveguide parts to connect the output side of the elevation rotary joint to the waveguide matrix. The existing waveguide between that point and the cross guide coupler at the edge of the antenna reflector must be removed. The existing H channel cross guide coupler must also be removed and replaced. The contractor is responsible for supplying and installing all necessary waveguide parts including cross guide couplers. Cross guide coupler for both H and V channel must have N type connector style;
- 7.4 H Waveguide Channel: The H waveguide channel from the waveguide matrix must connect to the existing H channel waveguide at the edge of the antenna reflector through a new cross guide coupler.
- 7.5 Feed Horn and Strut: The existing H only feed horn and the lower strut must be removed and replaced by the new GFE dual polarization feed horn, strut and waveguide assembly.
- 7.6 V Waveguide Channel: The V waveguide channel from the waveguide matrix must connect to the new GFE V channel waveguide at the edge of the antenna reflector through a new cross guide coupler.
- 7.7 EC will supply as GFE necessary waveguide pieces that connect dual polarization feed horn and cross guide coupler at the edge of antenna for both H and V channels. The Contractor is responsible for procuring waveguide pieces for both H and V channels that connect cross guide coupler to the waveguide matrix. The Contractor must minimize use of flex waveguide between the cross guide coupler at the edge of the antenna and the waveguide matrix in both H and V channels.
- 7.8 Local (No internet connection) 100BaseTX Network: EC will provide a 100BaseTX network cable at the base of the pedestal.
- 7.9 Control and Status. Aside from system trigger for which a separate cable is provided, all other control and status information to and from dual polarization upgrade equipment must be transmitted by IRIS/RDA internal network packets.
- 7.10 The Contractor must successfully pass the following start-up tests described in Appendix 5 to Annex A, Acceptance Testing:
- a) Item 2.1, Installation check and power up test; and
 - b) Item 2.2, Control and status functionality test

8. Acceptance Testing

See Appendix 5 to Annex A

9. Option for Additional Systems

Environment Canada has an expectation of high quality dual polarization data. Environment Canada understands that combining government furnished equipment and the contractor's equipment and designs may require additional development by the contractor to achieve satisfactory data quality.

EC may exercise the options for additional units if the following criteria are met:

- 9.1 All requirements listed at Section 3, Mandatory Requirements are met.
- 9.2 The first unit purchased (prototype unit) passes all factory and field acceptance testing as specified in Section 9, Factory Acceptance Testing and Appendix 5 to Annex A Acceptance Testing.
- 9.3 The Contractor can demonstrate the upgraded system performance when transmitting in H channel only is equal to or better than the existing single polarized radar. Parameters whose performance will be evaluated are:
 - Measured Noise Level for each pulse width (0.8 us, 1.6 us and 2.0us);
 - Zcal value (Minimum detectable range at 1km) for each pulse width (0.8 us, 1.6 us and 2.0us);
 - Phase noise for 0.8 us pulse width.
- 9.4 Differential Reflectivity (ZDR) offset calculated using Birdbath method is within +/- 1.1 dB;
- 9.5 Zcal for upgraded dual polarized radar transmitting in H only is comparable to the Zcal achieved with existing single polarized radar for each tested pulse width (0.8us, 1.6 us and 2.0us). The expectation is that at maximum Zcal must be no more than 0.6 dB higher than Zcal achieved with existing single polarized radar. This reduction is due to allowable Waveguide loss increase as specified in the Section 3, Mandatory Technical Specification item 3.2.4;
- 9.6 Zcal for H channel for the upgraded dual polarized radar transmitting in H+V only must be at maximum 3.6 dB higher than the Zcal achieved with existing single polarized radar when transmitting in H channel only. The difference is reduced power level due to H and V power splitting (3 dB) and allowable waveguide loss increase. This is applicable for each tested pulse width (0.8us, 1.6 us and 2.0us);
- 9.7 While there are no performance values to compare for V channel, it is expected that Zcal for V channel must be at maximum 3.95 dB higher than the Zcal achieved with existing single polarized radar when transmitting in H channel only. The difference is reduced power level due to H and V power splitting (3 dB) and allowable waveguide loss increase (0.6 dB) and for Vertical Transmit Loss H+V as specified in Section 3 Mandatory Technical Specification item 3.2.3. This is applicable for each tested pulse width (0.8us, 1.6 us and 2.0us);
- 9.8 The minimum detectable signal (MDS) at 50 km derived from data created during operational radar scans must be consistent and agree with calculated MDS value which is based on Zcal value for each pulse width (0.8 us, 1.6 us and 2.0us). Calculated MDS at 50km = $Zcal + [20 \cdot \log(50)]$;

Note that the same transmitter will be used for single polarized base line performance tests and dual polarized H channel transmission performance tests. Currently, EC is using RVP8 IFDR at the evaluation site.
- 9.9 Examples of calibration values are included in Appendix 4 to Annex A, Government Furnished Equipment for reference purposes.
- 9.10 The locations of the 10 upgrade installation sites are:

Table 1: Proposed Upgrade Sites			
Site Name	Latitude North	Longitude West	Nearest City
Bethune Weather Radar	50.57117	-105.18267	Regina, SK
Britt Weather Radar	45.79313	-80.53378	Parry Sound, ON
Exeter Weather Radar (evaluation site)	43.37199	-81.38056	Exeter, ON
Franktown Weather Radar	45.04099	-76.11623	Ottawa, ON
Gore Weather Radar	45.09853	-63.70431	Halifax, NS
Marble Mountain Weather Radar	48.93025	-57.83462	Cornerbrook, NL
Mt. Sicker Weather Radar	48.86092	-123.75669	Duncan, BC
Strathmore Weather Radar	51.20622	-113.39916	Calgary, AB
Val d'Irène Weather Radar	48.48055	-67.60089	Amqui, Mont Joli, QC
Woodlands Weather Radar	50.15297	-97.77994	Winnipeg, MB
Environment Canada Downsview Office (two spare units)	SEE NOTE 1		4905 Dufferin Street, Toronto, ON, Canada M3H 5T4

NOTE 1: The units for the Environment Canada Downsview Office require factory acceptance testing only and will not be subject to installation, or other acceptance testing procedures.

Solicitation No. - N° de l'invitation
K3D33-141001/A

Amd. No. - N° de la modif.

Buyer ID - Id de l'acheteur
tor031

Client Ref. No. - N° de réf. du client
K3D33-141001/A

File No. - N° du dossier
TOR-4-37057

CCC No./N° CCC - FMS No/ N° VME

APPENDIX 1 TO ANNEX A RADOME HATCH PHOTOS

See attached document

Solicitation No. - N° de l'invitation
K3D33-141001/A

Amd. No. - N° de la modif.

Buyer ID - Id de l'acheteur
tor031

Client Ref. No. - N° de réf. du client
K3D33-141001/A

File No. - N° du dossier
TOR-4-37057

CCC No./N° CCC - FMS No/ N° VME

APPENDIX 2 TO ANNEX A
NRP-DP-1000-01, 98A COUNTERWEIGHT STRUCTURE

See attached document.

Solicitation No. - N° de l'invitation
K3D33-141001/A

Amd. No. - N° de la modif.

Buyer ID - Id de l'acheteur
tor031

Client Ref. No. - N° de réf. du client
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APPENDIX 3 TO ANNEX A
98A RADAR PEDESTAL VIBRATION AUDIT REPORT

See attached document.

APPENDIX 4 TO ANNEX A GOVERNMENT FURNISHED EQUIPMENT

Environment Canada manages and administers the Government of Canada's Weather Radar Network. Each radar site contains standardized transmitter, receiver, antenna/pedestal and computer hardware along with common data processing software.

Transmitter cabinet and computer rack are located inside the radar building/trailer at each site.

The transmitter cabinet contains:

- 250 kW coaxial magnetron model CPI SFD-373;
- High Voltage Power Supply (Pulse Systems PS-1879);
- Hard tube modulator;
- RF waveguide components, cross coupler and circulator.

The computer rack contains the following components:

- Antenna Control Unit (ACU);
- Antenna drive amplifiers for both axis;
- Radar Control Processor Computer - (RCP8 computer);
- Local Host Computer running IRIS, RDA software and utilities;
- RCP8 I/O 62 panel used for monitoring and control purposes.

The ACU is integral part of Andrew antenna. The ACU provides positioning data for both axes in digital format via I/O 62 panel to the RCP8 computer. It also receives commands from and provides status info to the RCP8 computer via standard RS232 port. The standard IRIS/RDA software provides all necessary functionality and interfaces to communicate with the ACU unit. EC will provide the following equipment as Government Furnished Equipment (GFE). For the same reasons of maintaining uniformity with the rest of the network, the contractor must not change or substitute these components:

- EC will provide Dual polarization Antenna Feed Horn assembly (ASC part number AACL175559) comprising the feed horn, replacement strut and waveguide from the feed horn to the cross guide coupler at edge of the reflector in both H and V channel. The contractor is responsible for the feed horn installation and procurement and installation of associated waveguide parts between the cross guide coupler at the edge of the antenna and waveguide matrix in both H and V channel.
- RVP901 (IFDR) digital receiver and signal processor including dual polarization license and 60 MHz antialiasing filters for H, V and burst channel. RVP901 (IFDR) is equipped with 120 VAC power module providing necessary DC voltages for proper IFDR operations. RVP901 (IFDR) saturation level is +8dBm @50 Ohms. Down convertor output IF signals levels for each channel (H, V and burst) must be optimized for RVP901 (IFDR) proper operation
- RCP8 I/O panel
- I/O 62 card
- RVP902 signal processor computer (RVP computer) running RDA software and utilities
- Radar Control Processor Computer - (RCP8 computer) running RDA software and utilities
- Local Host Computer running IRIS, RDA software and utilities
- Red Hat OS6 (server type) or equivalent CentOS operating system

- Applicable IRIS/RDA and utility software - version 8.12.9 or newer

Note: Radar Control Computer (RCP8 computer) might be combined with Local Host Computer at EC discretion. In this case, term Combo Host/RCP commuter will be used instead Local Host Computer.

1. Reference Values

2014-08-04 – WSO (date calibration was completed).

EC personnel will perform full single polarized radar calibration at the evaluation site prior to upgrade. Results of this calibration will be used as base line for values that are referenced in Appendix 5 to Annex A, Acceptance Testing.

Table 2: Evaluation Site Single Polarization Reference Values	
Fwd Insertion Loss [dB]	
Coupler [dB]	29.98
Attenuator [dB]	19.72
Cable [dB]	3.71
Total Fwd Insertion Loss [dB]	53.41
Rvs Insertion Loss [dB]	
Coupler [dB]	29.78
Attenuator [dB]	9.79
Cable [dB]	3.4
Total Rvs Insertion Loss [dB]	42.97
Antenna Coupler Port Loss [dB]	
Coupler	30.10
Attenuator	19.97
Antenna Coupler Port Loss [dB]	50.07
One Way W/G Loss [dB]	1.4
One Way Radome Attenuation [dB]	0.2

Horizontal	0.8us	1.6us	2.0us
PRF [us]	834	1668	4000
Cal Width [us]	0.81	1.68	2.01
Leading [us]	0.086	0.084	0.08
Trailing [us]	0.354	0.332	0.316
Meter Read (F) [dBm]	-0.65	-1.36	-4.75
Meter Read (R) [dBm]	-15.88	N/A	N/A

Avg Pwr (F) [dBm]	52.76	52.05	48.66
Avg Pwr (R) [dBm]	27.09	N/A	N/A
VSWR	1.11:1	N/A	N/A
Duty Cycle [dB]	30.15	29.97	32.99
Peak Fwd (M) [dBm]	82.91	82.02	81.65
Peak Fwd (M) [kW]	195.4	159.2	146.2
Tx Ref Cal Peak [dBm]	81.94	81.39	81.14
Tx Ref Cal Peak [kW]	156.3	137.7	130
Burst Pulse and Filters			
IFD FIR [us]	2.000	3.030	3.000
IFD BW [MHz]	1.048	0.633	0.490
IFD Gain	Zero	-78	Zero
IFD Burst Pwr [dB]	-7.92	-7.36	-6.87
IFD Burst Loss [dB]	0.97	0.63	0.51
Finite BW Loss [dB]	0.97	0.63	0.51
Zauto Calibration (Single Point)			
Radar Const [dB]	64.96	62.34	61.81
Slope	0.974	1.0000	1.0000
Noise [dBm]	-77.23	-79.38	-80.44
I/O [dB]	-109.98	-112.13	-113.19
ZCAL [dB]	-45.02	-49.79	-51.38
Fit sd	0.00	0.00	0.00
Phase Noise			
Phase1 AZ	73.38°		
Phase1 EL	0.7°		

Phase1 Range [km]	11.50
Phase1 Value	0.58°
Phase2 AZ	73.4°
Phase2 EL	0.93°
Phase2 Range [km]	7.25
Phase2 Value	0.53°

2. EC Dual Polarized Radar Calibration Values

Table 3: EC dual polarized radar calibration values		
Horizontal	0.8us	1.6us
PRF [us]	840.5	2500
Cal Width [us]	0.81	1.61
Leading [us]	0.05	0.048
Trailing [us]	0.226	0.245
Meter Read (F) [dBm]	2.65	0.6
Meter Read (R) [dBm]	-2.13	N/A
Avg Pwr (F) [dBm]	52.65	50.60
Avg Pwr (R) [dBm]	28.17	N/A
VSWR	1.08:1	N/A
Duty Cycle [dB]	30.16	31.91
Peak Fwd (M) [dBm]	82.81	82.51

Table 4: EC dual polarized radar FIR filter values				
	Horizontal		Vertical	
	0.8us	1.6us	0.8us	1.6 us
IFD FIR [us]	1.05	2	1.05	2
IFD BW [MHz]	1.27	0.664	1.27	0.664

IFD Burst Pwr [dB]	-6.840	-7.04	-6.840	-7.04
Finite BW Loss [dB]	0.13	0.13	0.13	0.13

Table 5: EC dual polarized radar zauto results				
	Horizontal		Vertical	
	0.8us	1.6us	0.8us	1.6 us
Radar Constant [dB]	65.87	63.29	69.17	66.59
Slope	1	1	1	1
Noise [dBm]	-80.14	-83	-80.24	-83.05
I/O [dBm]	-108.47	-111.31	-108.45	-111.20
Zcal [dBZ]	-42.60	-48.02	-39.28	-44.60

Table 6: EC dual polarized radar power measurement		
	0.8us	1.76us
Reference Point Peak Power [kW]	100.72	91.85

Table 7: EC dual polarized radar phase noise measurements		
	Range [km]	Phase Noise [deg]
Target 1	31.75	0.513
Target 2	45	0.83
Target 3	27.625	0.6

3. Task Configuration Parameters

Table 8: Task Configuration Parameters					
	CONVOL	DOPVOL1_A	DOPVOL1_B	DOPVOL1_C	DOPVOL2
Scan Mode	PPI Full	PPI Full	PPI Full	PPI Full	PPI Full
Resolution	1	0.5	0.5	0.5	1
Elevation	24 angles	1 angle @ 0.0	1 angle @ 1.5	1 angle@ 3.5	1 angle @ 0.0
Scan Speed [deg/sec]	36	5.6	5.6	5.6	15
Pulse Width [us]	1.64	0.8	0.8	0.8	0.8
Polarization	H+V	H+V	H+V	H+V	H+V
Velocity Unfolding	None	4:3	4:3	4:3	None
PRF [Hz] (Max/Min)	400/400	1190/892	1190/892	1190/892	1190/1190

Table 8: Task Configuration Parameters					
	CONVOL	DOPVOL1_A	DOPVOL1_B	DOPVOL1_C	DOPVOL2
Unamb. Vel [m/s]	5.3	47.6	47.6	47.6	15.9
Proc. Mode	PPP	RPHASE	RPHASE	RPHASE	RPHASE
Start Range [km]	0	0	0	0	0
Bin Spacing [m]	250	125	125	125	500
Range Avg/Smth	4	4	4	4	2
Max. Range [km]	249.83	112.4	112.4	112.4	225.5
Unamb. Range [km]	374.74	125.96	125.96	125.96	126
Samples	16	64	64	64	80
Filter Dop	None	3	3	3	4
Input Bins	1000	900	900	900	452
Output Bins	250	225	225	225	226
Data	2Z, T, V, W, SQI ZDR, Kdp, Phidp, RhoHv	Z, T, V, W	Z, T, V, W	Z, T, V, W	Z, T, V, W
T	LOG	LOG	LOG	LOG	LOG
Z	SQI & LOG & CSR	LOG & CSR	LOG & CSR	LOG & CSR	LOG & CSR
V	SQI & LOG & CSR	SQI & CSR	SQI & CSR	SQI & CSR	SQI & CSR
W	SQI & LOG & CSR	SIG & SQI & LOG	SIG & SQI & LOG	SIG & SQI & LOG	SIG & SQI & LOG
ZDR	SQI & LOG & CSR	LOG	LOG	LOG	LOG
LOG [dB]	2.5	3	3	3	1.5
SIG [dB]	5	5	5	5	5
CSR [dB]	25	25	25	25	40
SQI [dB]	0.05	0.4	0.4	0.4	0.4
Speckle	Z, V	Z, V	Z, V	Z, V	Z, V

4. Andrew Antenna Characteristics

The following table describes the pedestal dynamic operation:

Table D.1 Pedestal Assembly Specifications		
Motion Maximums	Azimuth	Elevation
Travel (deg)	No maximum, 360° continuous travel - both directions	Operationally: -3° to +90° Limit Switch Setting: -3.5° to +90.5° Soft Stop Limit: -4.0° to +92.0° Hard Stop Limit: -7.0° to +95.0°
Velocity (deg/sec)	±36.0°/s	±15.0°/s
Acceleration (deg/sec ²)	±18.0°/s ²	±12.0°/s ²

APPENDIX 5 TO ANNEX A

Acceptance Testing

Attached drawing, documentation and dimensions are believed to be accurate, but it is the contractor's responsibility to verify all dimensions upon contract award.

The evaluation site for the prototype will be at Exeter Radar Site (N:43.37199/W:-81.38056) operating at 5.620 GHz.

All dual polarization equipment supplied and installed by the contractor will be subject to factory, start-up and field acceptance testing.

All components of the prototype system purchased must pass factory acceptance tests under the supervision of EC personnel prior to being shipped to the evaluation site.

EC reserves the right to modify/change acceptance test procedures after contract award and the Contractor's design is known. In the case of any omissions in proposed testing procedures, EC will use the existing internal Technical Manual and GFE applicable test procedures and manuals to perform tests in question.

RVP901 (IFDR), RVP902 signal processor computer, Radar Control Processor computer, Local Host Computer, RCP8 I/O 62 panel and I/O 62 card will be provided to the contractor for factory acceptance testing no later than 4 weeks after contract award. EC personnel will provide the necessary support for computer setup and software installation if requested by the contractor. EC will provide initial generic parameters for the signal processor (dspix settings), RCP8, bitex and other applicable setup parameters.

For the evaluation of the first installation, the contractor must install all equipment, verify operation and produce required data in a time frame that must not exceed three weeks and demonstrate that the system passes all start-up tests in accordance with Section 2.1 and 2.2 of Appendix 5 to Annex A, Acceptance Testing. This timeframe includes feed horn and waveguide installation.

The duration of field acceptance testing for the prototype systems, commencing after contractor installation period, is expected to take 3 weeks in total.

The duration of the field acceptance testing for subsequent optional units is expected to take 2 weeks in total for each installation.

EC may take up to 6 weeks to review the data generated from the field acceptance testing of the prototype unit. The Contractor is not required to be on-site during this 6 week period but is required to be on site for all field acceptance testing periods.

While the requirement for operational dual polarized radar is to operate in fixed STAR mode (H+V transmit simultaneously), the first unit (prototype unit) must operate in Horizontal transmit only mode. The purpose of Horizontal transmit only mode is to allow EC to directly compare upgraded dual polarized radar transmitting in H only with existing single polarized radar and to conduct the following field tests:

- Appendix 5 to Annex A, Acceptance Testing 2.8, Peak Power at the H channel antenna cross coupler
- Appendix 5 to Annex A, Acceptance Testing 2.10, Waveguide Loss

- Appendix 5 to Annex A, Acceptance Testing 2.12, Horizontal Transmit loss H+V

The Contractor must propose an appropriate method of switching upgraded dual polarized radar to Horizontal transmit only mode. After successfully passing required field tests, Horizontal transmit only mode is not required and must be removed or disabled.

1. Factory Acceptance Test

The following factory testing procedure must be completed and accepted within 3 days of being started. The following factory acceptance tests will be conducted jointly by the contractor with supervision by the designated EC personnel. EC reserves the right to change/modify the proposed procedures.

1.1 Temperature Test

The purpose of this test is to verify that a stable temperature inside the Equipment Box can be maintained with all equipment installed and powered on as specified in Section 3.4, Mandatory Equipment Box Technical Specifications. The contractor must produce environmental chamber test results in the form of pdf document. The pdf document must also include a full description of the performed test(s) (test setup and list of used equipment).

1.2 Power up test and system functional test

The purpose of the software functionality test is to verify that all associated software is running properly.

IRIS/RDA software incorporates the Andrew antenna simulator, which allows for system functional level bench test.

1.3 Dynamic Range and MDS Test

See Section 2.17, Calibration, Dynamic Range Check and MDS Check for reference. Detailed procedure for factory acceptance Dynamic Range and MDS Test must be developed and provided to EC within 3 weeks from the date of receipt of the Contractor design details.

1.4 Phase Noise Test

See Section 2.19, Phase Noise Test for reference. Detailed procedure for factory acceptance Phase Noise Test will be developed and provided to EC within 3 weeks from the date of receipt of the Contractor design details.

1.5 Remote Calibration Capability Test

See Section 2.18, Remote Calibration Capability Test for reference. Detailed procedure for factory acceptance Remote Calibration Capability Test will be developed and provided to EC within 3 weeks from the date of receipt of the Contractor design details.

2. Field Acceptance Test

The following Field test procedures must be completed in the order listed. Failure to complete any one step may affect later tests. If any individual testing step does not pass, the problem must be corrected and the test repeated until the step is successful.

2.1 Installation check and power up test

The purpose of this test is to ensure that all connections are in place and that RVP901 (IFDR), RVP902, Radar Control Processor (RCP8) and Local Host Computer properly power up and communicate. This test will also verify that various IRIS/RDA utilities can be accessed and configured.

2.2 Control and status functionality test

Existing radar status (analog and digital) and control signals are connected using the GFE RCP8 I/O 62 panel. The purpose of this test is to ensure that bitex, antenna and ascope utilities can be used to control the radar site and read the status signal. Note that this test requires the transmitter to be ON.

2.3 Site Measurements

Site measurements (evaluation site): All power levels and losses must be measured and noted prior to installation and field acceptance testing. These measurements will be done jointly by the designated EC representative and the contractor selected personnel following procedures described in EC Technical Manual. The pertinent column of the EC Technical Manual will be provided within 2 weeks of contract award.

2.4 Power Measurements

The purpose of this test is to measure peak power(s) and calculate all necessary parameters and losses as described below needed for full radar calibration.

2.5 Pulse width and PRF measurement

Purpose of this test is to measure Pulse Width (PW) and Pulse Repetition Frequency (PRF). Those values are used to calculate Peak Power for all applicable pulse widths and PRF's

Follow procedure described in Technical Manual TM 15-02-04V4 Section 4.1.2 Pulse Measurements

Table 9: Pulse Width and PRF			
Nominal pulse width [us]	Measured Pulse Width [us]	Nominal PRF [Hz]	Measured PRF [Hz]
0.8		1190	
1.6		400	
2.0		250	

2.6 Peak Power at forward port of the transmitter cabinet directional coupler

Purpose of this test is to measure and calculate Peak Power at the forward port of the transmitter cabinet. Forward Port Peak Power value is used for calibration and loss calculation purposes.

Note that power must be measured for all applicable pulse widths (0.8 us, 1.6us, 2.0us)

Follow procedure described in Technical Manual TM 15-02-04V4 Section 4.1.2 Pulse Measurements

Table 10: Power at transmitter cabinet directional coupler forward port			
Nominal Pulse Width/PRF	Measured Average Power [dBm]	Peak Power [dBm]	Peak Power [kW]
0.8us/1190 Hz			
1.6us/400 Hz			
2.0us/250Hz			

2.7 Peak Power at reverse port of the transmitter cabinet directional coupler

Purpose of this test is to measure and calculate VSWR (*Voltage Standing Wave Ratio*). Note that power must be measured for 0.8 us pulse width only

2.8 Peak Power at the H channel antenna cross coupler

Purpose of this test is to measure and calculate Peak Power at the H channel antenna cross coupler. H channel antenna cross coupler Peak Power value is used for calibration and loss calculation purposes

Note that power must be measured for all applicable pulse widths (0.8 us, 1.6us, 2.0us)

2.9 Peak Power at the V channel antenna cross coupler

Purpose of this test is to measure and calculate Peak Power at the V channel antenna cross coupler. V channel antenna cross coupler Peak Power value is used for calibration and loss calculation purposes.

Note that power must be measured for all applicable pulse widths (0.8 us, 1.6us, 2.0us)

2.10 Waveguide Loss

The purpose of this test is to verify waveguide loss and ensure that overall increase in waveguide loss is within specified range as identified in Section 3, Mandatory Technical Specification item 3.2.4.

2.11 Vertical Transmit loss H+V

The purpose of this test is to calculate Vertical Transmit loss. Acceptable value is defined in Section 3, Mandatory Technical Specification item 3.2.3.

2.12 Horizontal Transmit loss H+V

The purpose of this test is to calculate Horizontal Transmit loss (verify that Magic Tee equally divides RF power in H channel).

2.13 Burst Pulse Alignment Setup and Validation

Burst pulse alignment setup and validation test must be performed to ensure that the burst pulse is present and that amplitude is sufficient for normal operation. This test also aligns the burst pulse in the burst pulse sample window.

2.14 Bandwidth Filter Adjustment and Validation

The purpose of the Bandwidth Filter Adjustment and Validation test is to set and verify bandwidth filter settings for each pulse width.

2.15 AFC Functional Test

The purpose of this test is to verify the Automated Frequency Control (AFC) loop ability to track the burst pulse frequency.

2.16 IF Signal Level Check

The purpose of the IF Signal Level Check is to verify that the input signal level is optimized for RVP901 operation.

2.17 Calibration, Dynamic Range Check and MDS Check

The purpose of the Calibration, Dynamic Range Check and MDS check is to:

- Calibrate receiver (reflectivity calibration) - zauto method using external RF Signal generator for each pulse width (0.8 micro second, 1.6 micro seconds and 2.0 microseconds) and for both channels (H and V)
- Verify the receiver dynamic range
- Calculate MDS and confirm it is within specification

2.18 Remote Reflectivity Calibration Capability Test

Detailed procedure for Remote Calibration Capability Test will be developed once design details are known.

The purpose of the remote calibration test is to:

- a) Verify that calibration can be performed remotely and/or from local computer without use of external equipment (such as signal generator and power meter) using zauto utility.
- b) Verify that remote reflectivity calibration results (Zcal and Io) are within 1 dB of calibration results obtained during reflectivity calibration as described in Section 2.17 Calibration, Dynamic Range Check and MDS Check.

Note that reflectivity calibration and results comparison must be done for each pulse width (0.8, 1.6 and 2.0 microseconds) and for both channels (H and V).

2.19 Phase Noise Test

The purpose of this test is to verify stability of the STALO. For proper velocity calculations and for ground clutter rejection, it is required that the radar's STALO maintain a stable frequency. Method of verification is done by using 0.8 us pulse @1190Hz and using ascope utility and selecting a distinguishable point target.

EC routinely performs phase noise testing as part of regular maintenance. The same point target and the same ascope settings shall be used for this test.

EC understands that phase noise measurement is sensitive to weather conditions and the quality of the point target. If environmental and target requirement does not allow for proper phase noise measurement, EC is willing to consider other ways to measure phase noise. This might include use of the delay line to verify and measure phase noise.

2.20 Suncal Calibration

The purpose of this test is to ensure that antenna pointing accuracy has not changed after the upgrade. Results of this test will be compared to the suncal results run prior to the radar upgrade. Suncal Calibration scan will be scheduled to run in the morning, noon and afternoon over the course of 1 week using existing (prior to upgrade) suncal executable task settings.

2.21 Task Execution Verification

Purpose of the Task Execution Verification is to ensure that all radar tasks are running within specified time and according to the automated schedule after the upgrade.

2.22 Moment Data Verification

Upgraded dual pol radar must produce following output variables (8 and 16 bit data format):

- Z
- T
- V
- W
- SQI
- ZDR
- RHOHV
- PHIDP
- KDP

2.23 Communication

Reliable communication between RVP901 (IFDR) and RVP902 computer is essential for uninterrupted radar operation.

If there is interruption in communication between the RVP901 (IFDR) and RVP902 computer, the RVP900 process is interrupted and the radar will stop executing its tasks.

No such interruption in communication is acceptable for operational radar.

Communication between the Antenna mounted equipment and radar/trailer building equipment will be monitored over 1 month period of time. Contractor will have opportunity to rectify any communication issue within 48 hours of notification.

2.24 Reflectivity calibration repeatability

EC will perform 3 reflectivity calibrations using zauto utility and using the same test equipment (see Section 2.17 Calibration, Dynamic Range Check and MDS Check) during one month period to verify that reflectivity calibration results can be repeated consistently. Zcal and Io values must not differ more than +/- 1 dB from reference values established during reflectivity calibration described in Section 2.17 Calibration, Dynamic Range Check and MDS Check. Contractor will have opportunity to rectify any issue within 48 hours of notification.

Note that Reflectivity calibration repeatability test and results comparison must be done for each pulse width (0.8, 1.6 and 2.0 microseconds) and for both channels (H and V).

ANNEX B BASIS OF PAYMENT & SCHEDULE OF MILESTONES

Prices are firm, all-inclusive in Canadian dollars, FOB Destination. Transportation charges, customs duties and Excise taxes are included and Applicable Taxes are extra.

1. Firm Requirement

Item #	Requirement	Quantity	Firm Unit Price	Extended Price
1.1	Prototype Dual Polarization Measurement Capability Upgrade Unit For the supply, delivery, installation, maintenance and successful acceptance testing (completed by Environment Canada) of one (1) Prototype Dual Polarization measurement unit upgrade within 26 weeks of contract award, in accordance with all the requirements in Annex A, Statement of Work. The Contractor will be charged in accordance with Section 15, Liquidated Damages of the Contract, for delivery after 26 weeks of contract award.	1	\$ _____	\$ _____

1.2 Following the successful Factory Acceptance Testing completed on-site at the Contractor's location in accordance with Section 1, Factory Acceptance Test of Appendix 5 to Annex A, Acceptance Testing, a milestone payment of 40% of the firm price will be issued.

1.3 Following the supply, delivery, installation and successful start-up testing completed by the Contractor, a milestone payment of 30% of the firm unit price will be issued.

1.4 Following the successful acceptance testing by Environment Canada, a milestone payment of 30% of the firm unit price will be issued.

2. Optional Requirements

Canada reserves the right to order and or all options during the period of the Contract.

Item #	Requirement	Quantity	Firm Unit Price	Extended Price
2.1	Dual Polarization Measurement Capability Upgrade Units For the supply, delivery, installation, maintenance and successful EC acceptance testing completed for two (2) Dual Polarization Measurement Capability Unit upgrades prior to 31			

	March 2016 in accordance with all the requirements in Annex A, Statement of Work to the following sites:			
	Franktown Weather Radar - Ottawa, ON	1	\$ _____	\$ _____
	Bethune Weather Radar - Regina, SK	1	\$ _____	\$ _____
	For the supply, delivery, maintenance and successful factory testing completed for one (1) Dual Polarization Measurement Capability upgrade unit delivered to Environment Canada Downsview location as identified in Section 9.10 of the Statement of Work prior to 31 March 2016 in accordance with all the requirements in Annex A, Statement of Work. The Contractor will be charged in accordance with Section 15, Liquidated Damages of the Contract, for delivery after 31 March 2016.	1	\$ _____	\$ _____
TOTAL EXTENDED PRICE				\$

Item #	Requirement	Quantity	Firm Unit Price	Extended Price
	Dual Polarization Measurement Capability Upgrade Units			
	For the supply, delivery, installation, maintenance and successful EC acceptance testing completed for remaining Dual Polarization measurement capability unit upgrades prior to 31 August 2016, in accordance with all the requirements in Annex A, Statement of Work.			
2.2	Britt Weather Radar – Parry Sound, ON	1	\$ _____	\$ _____
2.3	Gore Weather Radar – Halifax, NS	1	\$ _____	\$ _____
2.4	Marble Mountain Weather Radar -	1	\$ _____	\$ _____

2.5	Cornerbrook, NL			
2.6	Mt. Sicker Weather Radar – Duncan, BC	1	\$ _____	\$ _____
2.7	Strathmore Weather Radar – Calgary, AB	1	\$ _____	\$ _____
2.8	Val d'Irène Weather Radar – Amqui, Mont Joli, QC	1	\$ _____	\$ _____
2.9	Woodlands Weather Radar - Winnipeg, MB	1	\$ _____	\$ _____
	For the supply, delivery, maintenance and successful factory acceptance testing for one (1) Dual Polarization Measurement Capability Unit upgrade delivered to Environment Canada Downsview location as identified in Section 9.10 of the Statement of Work prior to 31 August 2016 in accordance with all the requirements in Annex A, Statement of Work.	1	\$ _____	\$ _____
	The Contractor will be charged in accordance with Section 15, Liquidated Damages of the Contract, for delivery after 31 August 2016.			
TOTAL EXTENDED PRICE				\$

3. Training

Item #	Requirement	Firm Training Cost
3.1	Firm, all-inclusive price, including all travel and accommodation, in accordance with Section 4.8 of the Statement of Work, the Contractor must provide training for Environment Canada staff (approximately 10 people for an estimated 5 days) on the hardware and software, including calibration procedures.	\$ _____

4. Travel and Living Expenses

For the installation of all Dual Polarization units. Travel is in Canadian dollars incurred during the Contractor's installation and acceptance testing periods.

The Contractor will be reimbursed its authorized travel and living expenses reasonably and properly incurred in the performance of the Work, at cost, without any allowance for profit and/or administrative overhead, in accordance with the meal, private vehicle and incidental expenses provided in Appendices B, C and D of the National Joint Council Travel Directive and with the

other provisions of the directive referring to "travellers", rather than those referring to "employees".

All travel must have the prior authorization of the Project Authority.

All payments are subject to government audit.

Estimated Cost:

Item #	Location	Travel Cost (Estimated)
4.1	Bethune Weather Radar	\$
4.2	Britt Weather Radar	\$
4.3	Exeter Weather Radar (evaluation site)	\$
4.4	Franktown Weather Radar	\$
4.5	Gore Weather Radar	\$
4.6	Marble Mountain Weather Radar	\$
4.7	Mt. Sicker Weather Radar	\$
4.8	Strathmore Weather Radar	\$
4.9	Val d'Irène Weather Radar	\$
4.10	Woodlands Weather Radar	\$
4.11	Installation meeting with Environment Canada in accordance with Section 4.11 of the Statement of Work.	
TOTAL EXTENDED PRICE		\$

TOTAL EVALUATED PRICE \$
(AGGREGATE OF EXTENDED PRICES 1 + 2 + 3 + 4)

ANNEX C
EVALUATION

SECTION 1 - TECNICAL EVALUATION AND BASIS OF SELECTION

PART 1 – EVALUATION CRITERIA

1. Mandatory Requirements

At bid closing time, the Bidder must:

- Comply with the following Mandatory Requirements; and
- Provide the documentation which may include but is not limited to discussion points, equipment specifications, charts and diagrams to support compliance.

Proposals will be evaluated first on the basis of the mandatory requirements. Failure on the part of the bidder to meet one (1) or more of the mandatory requirements will result in the proposal being deemed non-compliant and ineligible for further consideration or evaluation. The bidder should indicate the page number and section for each criteria in their proposal.

1.1 Mandatory General Requirements

Item #	Mandatory Requirements	Identify where the supporting documentation is located in the package (page(s) numbers)
1.1.1	The Bidder must submit a Project Schedule in accordance with Annex D, Project Schedule with their bid to highlight their project timelines and delivery dates for each Project Milestone.	Page(s) and/or Section number: _____
1.1.2	The Bidder must provide a Project Plan as to how the resulting contract will be managed. The Plan must outline how the Bidder intends to:	Page(s) and/or Section number: _____

	<p>i. Utilize tools and management processes to ensure the timelines and scope of the Dual Polarization measurement upgrade to be more effective by assigning resources and managing timelines;</p> <p>ii. Identify, select and deploy the appropriate resource in a timely manner to meet the Project Schedule in Annex D, Project Schedule;</p> <p>iii. Manage quality assurance/quality control practices in providing resources for installation and delivery of equipment;</p> <p>iv. Detailed delivery, installation timelines and allocation of resources to install Dual Polarization on all 10 locations with considerations of locations, weather and time of year;</p> <p>v. Manage contingency plans/practices to ensure resource availability, parts availability and resource replacement; and</p> <p>vi. Manage process of issue escalation and dispute resolution.</p> <p>The following contents must be included in the proposed plan:</p> <p>Work Plan: The work plan must demonstrate an understanding of all of the overall objectives and technical aspects of the work as detailed in the Statement of Work, along with a demonstrated understanding of the logistical, and administrative aspects of the work. This includes but is not limited to elements such as: the overall project objectives, the technical requirements of each of the sections in the SOW,</p> <p>Project Schedule: The Project Schedule must include an action plan showing how the goods and services will be performed and completed on schedule. Major milestones corresponding to each major task and deliverable must be clearly identified in the action plan along with</p>	
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	implementation strategies shown in sequence by fiscal year.	
1.1.3	The Bidder must provide, with their bid, a block diagram to identify Dual Polarization upgrade parts in their bid. The diagram must consist of the following: one (1) high level block diagram, one (1) block diagram providing details of the Wave Guide matrix and one (1) block diagram providing details of the Equipment Box.	Page(s) and/or Section number: _____
1.1.4	The Bidder must provide a list of all components/bill of materials for the Prototype Dual Polarization unit.	Page(s) and/or Section number: _____

1.2 Mandatory Technical Specifications

1.2.1 General Mandatory Specifications

Item #	Mandatory Specifications	Identify where the supporting documentation is located in the package (page(s) numbers)
1.2.1	Experience in designing and installing C or S band dual polarization weather radar or experience upgrading existing C or S band single polarized weather radar to the dual polarized radar. Bidders must demonstrate that they have delivered one (1) dual polarized radar or dual polarized radar upgrade to a national weather service within last 5 years	Page(s) and/or Section number: _____
1.2.2	Waveguide matrix must be installed above elevation rotary joint. The Bidder must show in their Functional Diagram of RF Path (from radome floor to feed horn) how they will meet the requirement.	Page(s) and/or Section number: _____
1.2.3	Equipment Enclosure must be installed above elevation rotary joint. The Bidder must show in their Functional Diagram of RF Path (from radome floor to feed horn) how they will meet the requirement.	Page(s) and/or Section number: _____
1.2.4	Existing elevation rotary joint must not be modified or moved from current	

	position;	Page(s) and/or Section number: _____
1.2.5	<p>The Bidder must show in their Functional Diagram of RF Path (from radome floor to feed horn) how they will meet the requirement.</p> <p>Azimuth rotary joint (if replacement of existing azimuth rotary joint is needed) must be installed in such way that does not require any relocation of the existing slip ring.</p> <p>The Bidder must show in their Functional Diagram of RF Path (from radome floor to feed horn) how they will meet the requirement.</p>	Page(s) and/or Section number: _____
1.2.6	<p>Azimuth rotary joint (if replacement of existing azimuth rotary joint is needed) must be installed in such way that does not require major modifications to the antenna pedestal structure.</p> <p>The Bidder must show in their Functional Diagram of RF Path (from radome floor to feed horn) how they will meet the requirement.</p>	Page(s) and/or Section number: _____
1.2.7	<p>All equipment supplied by the contractor must fit through the existing radome hatch opening. The radome hatch opening dimensions are: 75 cm x 120 cm.</p> <p>Note that the radome space is accessed through a stair case attached to this hatch opening. Refer to Appendix 1 to Annex A, Radome Hatch Photos.</p> <p>Bidder must provide a discussion point on how they will meet this requirement.</p>	Discussion Point:
1.2.8	<p>GFE RVP902 signal processor computer (RVP computer) must be installed inside the computer rack located in the radar building/trailer;</p> <p>Bidder must provide a block diagram and description on how the GFE RVP902 will communicate with equipment installed at the antenna.</p>	Page(s) and/or Section number: _____
1.2.9	<p>GFE provided IRIS/RDA software must be used to acquire and process data, directly control the radar and perform diagnostic and radar calibrations and cannot be modified by a third party.</p> <p>Bidder must provide a discussion point on how they will meet this requirement.</p>	Discussion Point:

1.2.10	Upgraded dual polarized system must produce the following output variables: Z, T, V, W, SQI, ZDR, RHOHV, PHIDP, KDP.	Discussion Point:
1.2.11	Bidder must provide a discussion point on how they will meet this requirement. Output Data must be in Iris Raw data format.	Discussion Point:
1.2.12	Bidder must provide a discussion point on how they will meet this requirement. The Bidder must not add additional signal processors; The Bidder must show in their Block Diagram and provide a description on how they will meet the requirement.	Page(s) and/or Section number: _____
1.2.13	RVP901 (IFDR) has 20 miscellaneous TTL I/O lines, 20 differential Line pairs and 6 analog inputs. Only those I/O lines must be used for any status, monitoring or control purposes inside the enclosure box; The Bidder must show in their Block Diagram and provide a description on how they will meet the requirement.	Page(s) and/or Section number: _____
1.2.14	Connection between waveguide –to-coax transitions and the bulk head enclosure must use high quality cable with a maximum attenuation of 0.3 dB/1m for each: H, V and burst signal. The Bidder must provide proposed cable specification.	Page(s) and/or Section number: _____
1.2.15	Stable Local Oscillator (STALO) must be controlled by the RVP901 (IFDR) using digital control interface (tuning). The Bidder must show in their Block Diagram how they will meet the requirement.	Page(s) and/or Section number: _____
1.2.16	Data Link must support error free gigabit Ethernet communication between RVP901 (IFDR) located at the antenna pedestal and RVP902 (RVP Computer) located inside radar building/trailer Bidder must provide a block diagram and description on how the GFE RVP902 will communicate with equipment installed at the antenna. The block diagram	Page(s) and/or Section number: _____

	must clearly identify all components in communications path between RVP901 and RVP902 (RVP Computer). Bidder also must provide applicable components specification that must show that data link can support gigabit Ethernet communication.	
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1.3 Mandatory Technical Specifications

Item	Mandatory Specifications	Identify where the supporting documentation is located in the package (page(s) numbers)
1.3.1	<p>All modifications performed in this upgrade must not restrict the current Elevation and Azimuth range of motion described in Section 4, Andrew Antenna Characteristics, Appendix 4 to Annex A, Government Furnished Equipment. The Elevation total range limit is the "Hard stop limit"</p> <p>Bidder must provide a discussion point on how they will meet this requirement.</p>	Discussion Point:
1.3.2	<p>Any mass added to the dynamic sections of the pedestal must maintain the existing elevation centre of gravity as identified in Appendix 2 to Annex A NRP-DP-1000-01, 98A Counterweight Structure. The current 98A pedestal has removable counterweight plates that combined, create a balancing moment of 342kg•m. Some or all of these counterweight plates must be removed to balance out the additional equipment mass added to the sections of the pedestal moving in elevation.</p> <p>Any equipment added to the section of the pedestal moving only in Azimuth that has a mass greater than 5kg (cables excluded) must only be located behind the Elevation axis (non-dish side) and must not exceed a total mass of 100kg, nor have its centre of mass located more than 1m from the Azimuth axis.</p> <p>Bidder must provide weight of equipment they will be placing on pedestal and must indicate on block diagram where equipment will be located.</p>	Page(s) and/or Section number: _____

1.3.3	<p>Difference in losses in H and V path (Vertical Transmit Loss H+V) between cross coupler at the edge of the antenna reflector and to the transition between waveguide to coax transition must be equal or less than 0.35 dB.</p> <p>Bidder must provide a discussion point on how they will meet this requirement.</p>	Discussion Point:
1.3.4	<p>Overall waveguide loss measured between forward port of the transmitter cabinet directional coupler and the H channel cross coupler at the edge of the antenna dish must be no more than 0.6 dB higher than waveguide loss for existing single polarization radar measured between the same points, excluding 3 dB Magic Tee Loss.</p> <p>Existing waveguide loss is 1.4 dB and it will be additionally verified and measured before the radar upgrade.</p> <p>Bidder must provide a discussion point on how they will meet this requirement.</p>	Discussion Point:
1.3.5	<p>All additional waveguide parts installed in transmit path by the contractor must be rated to work with 350 kW magnetron.</p> <p>Bidder must provide a discussion point on how they will meet this requirement.</p>	Discussion Point:
1.3.6	<p>All equipment installed at the antenna must operate at 120 VAC and power consumption cannot exceed 1200 W.</p> <p>Bidder must provide a discussion point on how they will meet this requirement.</p>	Discussion Point:
1.3.7	<p>All equipment that requires 120 VAC connections must have current and valid Canadian Standards Association (CSA) certification STD C22.2 NO 60950-1 or alternative already accepted as equivalent by CSA, at the time of delivery.</p> <p>Bidder must provide a discussion point on how they will meet this requirement.</p>	Discussion Point:

1.3.8	All installed equipment must operate in the ambient temperature range -20 °C to + 40 °C. Bidder must provide a discussion point on how they will meet this requirement.	Discussion Point:
1.3.9	All installed equipment humidity operating range must be 15% to 95 % Relative Humidity (RH). Bidder must provide a discussion point on how they will meet this requirement.	Discussion Point:
1.3.10	All installed equipment non-operating temperature range must be -40 °C to +55 °C. Bidder must provide a discussion point on how they will meet this requirement.	Discussion Point:

1.4 Mandatory Waveguide Matrix Technical Specifications

Item	Mandatory Specifications	Identify where the supporting documentation is located in the package (page(s) numbers)
1.4.1	Waveguide matrix must be constructed to operate in simultaneous transmit and receive (STAR) mode (H+V transmits simultaneously). The Bidder must show in their Wave Guide Matrix Assembly Drawing identifying all parts and dimensions how they will meet the requirement.	Page(s) and/or Section number: _____
1.4.2	Magic tee must equally split power and have following specification: Minimum isolation between E & H arms [dB]: minimum of 30; Minimum isolation between Co-linear arms [dB]: 16; Unbalance Max [dB]: maximum of 0.15; VSWR Max (H Arm): maximum of 1.3; VSWR Max (E Arm): maximum of 1.5. Bidder must provide proposed Magic tee specification.	Page(s) and/or Section number: _____

1.4.3	Waveguide matrix must incorporate TR cells/limiters that provide adequate receiver protection and with sufficient recovery time to allow for ZDR offset calibration using birdbath method. Maximum TR cell recovery time must not exceed 6 microseconds;	Page(s) and/or Section number: _____
1.4.4	The Bidder must provide a specification of the TR cells/limiters TR cell/limiter must be passive type. The Bidder must provide a specification of the TR cells/limiters	Page(s) and/or Section number: _____
1.4.5	TR cell/limiter must not contain or exceed licensed quantity of radioactive isotope according to the Canadian standards- Canada's Nuclear Safety and Control Act, Regulation SOR/2000-207 titled "Nuclear Substances and Radiation Devices."	Page(s) and/or Section number: _____
1.4.6	The Bidder must provide a specification of the TR cells/limiters Waveguide matrix must incorporate waveguide band pass filters with following characteristics: <ul style="list-style-type: none"> • Centre Frequency 5620 MHz • Relative 3dB bandwidth 50 MHz (5595 – 5645 MHz) • Insertion loss at centre frequency less than 0.5 dB • Maximum VSWR at centre frequency 1.5:1 • Minimum stop band rejection 21 dB. The Bidder must provide waveguide filter specification.	Page(s) and/or Section number: _____
1.4.7	Waveguide matrix must allow for RF transmit pulse sample (burst pulse) monitoring. Burst sampling port must be located before HV Split. The Bidder must show in their Wave Guide Matrix Assembly Drawing identifying all parts and dimensions how they will meet the requirement	Page(s) and/or Section number: _____

1.5 Mandatory Equipment Box Technical Specification

Item	Mandatory Specifications	Identify where the supporting documentation is located in the package (page(s) numbers)
1.5.1	Output of receiver down converter must be 60MHz IF signals on H, V and burst channels. Bidder must provide a discussion point on how they will meet this requirement	Page(s) and/or Section number: _____
1.5.2	RVP901 (IFDR) must use 10 MHz external reference clock to phase lock the RVP901 (IFDR) sampling in each channel to the Stable Local Oscillator (STALO). The Bidder must show in their Equipment Box Diagram and discussion point how they will meet the requirement.	Page(s) and/or Section number: _____
1.5.3	Equipment enclosure must be temperature controlled and maintain stable internal temperature within +/- 2 °C or less as required for optimal component performance over required operating temperature range. A temperature probe used to verify required temperature spec must be placed at STALO. This temperature monitoring must utilize RVP901 (IFDR) I/O pins. The Bidder must show in their Equipment Box Block Diagram and discussion point how they will meet the requirement.	Page(s) and/or Section number: _____
1.5.4	All electronic equipment (including down converter components, LNA, preamplifiers, RVP901 (IFDR) and STALO) must be inside the climate controlled enclosure. This excludes power supplies that may be packaged separately. If packaged in separate box, maximum dimension of this additional box must not exceed (W x D x H) 40 x 25 x 45 cm and can only contain power supplies and communication (networking) equipment and operate in the	Page(s) and/or Section number: _____

	ambient temperature range -20 °C to +40 °C. The Bidder must show in their Equipment Box Block Diagram how they will meet the requirement. If additional power supply box is used, the power supply box Block Diagram and interconnect wiring diagram between Equipment and powers supply box must show how the will meet requirement. Must incorporate a built in remote single point receiver calibration capability using zauto IRIS/RDA utility.	
1.5.5	The Bidder must show in their Equipment Box Block Diagram and draft single point calibration procedure how they will meet the requirement.	Page(s) and/or Section number: _____

1.6 Mandatory Dynamic Range, Minimum Detectable Signal (MDS) and STALO Specifications

Item	Mandatory Specifications	Identify where the supporting documentation is located in the package (page(s) numbers)
1.6.1	Dynamic range of the receiver chain must be 94 [dB] @ 0.8 us pulse or better for both H and V channels.	Discussion Point:
1.6.2	Bidder must provide a discussion point on how they will meet this requirement. MDS must be (-114)[dBm] @ 0.8 us pulse or better for both H and V channels. Bidder must provide a discussion point on how they will meet this requirement. STALO minimum step must be 100kHz or lower.	Discussion Point:
1.6.3	Bidder must provide the STALO specification and description on how they will meet the requirement.	Page(s) and/or Section number: _____
1.6.4	STALO phase noise of a minimum: (-60) dBc for offset of 10 Hz and (-80) dBc for offset of 100 Hz and (-100) dBc for offset of 100kHz or more. Bidder must provide the STALO specification and description on how they will meet the requirement.	Page(s) and/or Section number: _____

1.6.5	<p>STALO must have monitoring capabilities that identify internal error conditions and is available for external electronic monitoring. External monitoring must be utilized using RVP901 (IFDR) I/O pins.</p> <p>The Bidder must provide the STALO specification and Equipment Box Block Diagram showing how their equipment is connected to RVP901.</p>	Page(s) and/or Section number: _____
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1.7 Mandatory Installation Requirements

The dual polarization upgrade must connect to the existing radar at the following points:

Item	Mandatory Specifications	Identify where the supporting documentation is located in the package (page(s) numbers)
1.7.1	120V Power. EC will provide 120VAC power, up to 10A, at a connector and pin numbers to be specified, on the output (rotating side) of the azimuth slip ring.	Discussion Point:
1.7.2	Bidder must provide a discussion point on how they will meet this requirement. System Trigger. EC will provide an RG-59 50 Ohm coax run from the transmitter modulator to a BNC - connector to be specified, on the output (rotating side) of the azimuth slip ring. The RVP901 (IFDR) will generate the system trigger.	Discussion Point:
1.7.3	Bidder must provide a discussion point on how they will meet this requirement. Transmit Power. The waveguide matrix transmit power input must connect to the output side (antenna side) of the existing elevation rotary joint. The Bidder is responsible for procuring and installing necessary waveguide parts to connect output side of the elevation rotary joint to the waveguide matrix. The existing waveguide between that point and the cross guide coupler at the edge of the antenna reflector must be removed. The existing H channel cross guide coupler must also be removed and replaced. The bidder is responsible for supplying and installing all necessary waveguide parts including cross guide couplers. Cross guide coupler for both H and V channel must have N type connector style.	Page(s) and/or Section number: _____
	The Bidder must show in their Functional Diagram of RF Path (from radome	

	<p>floor to feed horn) how they will meet the requirement. The Bidder must indicate cross guide coupler part number.</p>	
1.7.4	<p>H Waveguide Channel. The H waveguide channel from the waveguide matrix must connect to the existing H channel waveguide at the edge of the antenna reflector through a new cross guide coupler.</p> <p>The Bidder must show in their Functional Diagram of RF Path (from radome floor to feed horn how they will meet the requirement.</p> <p>Feed Horn and Strut. The existing H only feed horn and the lower strut must be removed and replaced by the new GFE dual polarization feed horn, strut and waveguide assembly.</p> <p>The Bidder must show in their Functional Diagram of RF Path (from radome floor to feed horn how they will meet the requirement.</p>	<p>Page(s) and/or Section number: _____</p>
1.7.5	<p>V Waveguide Channel. The V waveguide channel from the waveguide matrix must connect to the new GFE V channel waveguide at the edge of the antenna reflector through a new cross guide coupler.</p> <p>The Bidder must show in their Functional Diagram of RF Path (from radome floor to feed horn how they will meet the requirement.</p>	<p>Page(s) and/or Section number: _____</p>
1.7.6	<p>EC will supply the necessary Government Furnished Equipment waveguide pieces that connect dual polarization feed horn and cross guide coupler at the edge of antenna for both H and V channels. The bidder is responsible for procuring waveguide pieces for both H and V channels that connect cross guide coupler to the waveguide matrix. The bidder must minimize use of flex waveguide between the cross guide coupler at the edge of the antenna and the waveguide matrix in both H and V channels.</p> <p>The Bidder must show in their Functional Diagram of RF Path (from radome floor to feed horn how they will meet the requirement.</p>	<p>Page(s) and/or Section number: _____</p>
1.7.7	<p>Control and Status. Aside from system trigger for which a separate cable is provided, all other control and status information to and from dual polarization upgrade equipment must be transmitted by IRIS/RDA internal network packets.</p> <p>Bidder must provide a discussion point on how they will meet this requirement.</p>	<p>Discussion Point:</p>
1.7.8		

2. Point Rated Technical Criteria

Bidders must achieve a minimum of 75 points out of 115 to be considered responsive.

Item	Specification	Points Available	Identify where the supporting documentation is located in the package (page(s) numbers)
2.1	Bidders should demonstrate experience in designing and installing C or S band dual polarization weather radar or experience in upgrading existing single polarized C or S band weather radars to the dual polarized radar to national meteorological services within the last 5 years.	10 points: 10 or more installed dual polarization radars or dual polarization upgrades in last 5 years; 5 points: 5-9 installed dual polarization radars or dual polarization upgrades in last 5 years; 2 points: 2-4 installed dual polarization radars or dual polarization upgrades in last 5 years.	
2.2	Total losses for connection between waveguide –to-coax transitions and bulk head enclosure in H and V channel should not exceed 0.75 dB	10 points for less than or equal to 0.45 dB loss 5 points for greater than 0.45 dB loss and greater than or equal to 0.6 dB loss 2 points for greater than 0.6 dB loss and less than or equal to 0.75 dB loss	
2.3	Enclosure box should have user settable protection at either high or low temperatures (minimum low of 0 ⁰ C and maximum high of 40 ⁰ C). When temperature reaches user adjustable high set temperature point, power to everything inside enclosure box except active cooling/heating element	10 points for protection at high and low temperature protection	

	should be turned off. When temperature reaches user adjustable low temperature set point, power to LNA(S) should be turned off.	5 points for only one of high or low temperature protection	
2.4	Installed equipment should operate at extended operating temperature range -30 °C to +45 °C	Extended operating temperature range -30 °C to +45 °C – 10 points Doesn't operate in temperature range of -30 °C to +45 °C – 0 points	
2.5	Waveguide Matrix dimensions (W x D x H) excluding waveguide pass band filters should not exceed 850 x 350 x 600 mm	Dimensions not exceeding 850 x 350 x 600 mm – 10 points Dimensions exceed 850 x 350 x 600 mm – 0 points	
2.6	The Enclosure box dimensions (W x D x H) should not exceed 850 x 420 x 620 mm	Dimensions not exceeding 850 x 420 x 620 mm – 10 points Dimensions exceed 850 x 420 x 620 mm – 0 points	
2.7	Combined Weight of Waveguide Matrix and Equipment Box and optional power supply box (if used) should not exceed more than 60 kg.	Does not exceed 60kg – 10 points Exceeds 60kg – 0 points	
2.8	Down conversion process should include dual stage IF conversion process.	Includes dual stage IF conversion process – 20 points Does not include dual stage IF conversion process – 0 points	

2.9	Equipment Enclosure should include additional space to accommodate EC equipment. Maximum dimension of EC equipment will not exceed 200 x 200 x 150 mm. EC installed equipment does not affect power and temperature evaluation requirements.	Equipment Enclosure includes additional space - 5 points	
2.10	Equipment Enclosure should have spare bulk head connector (minimum 5 pins connector) for EC use;	Extra space not provided – 0 points 5 or more pins connector or more - 5 points; Fewer than 5 pins connectors – 0 points	
2.11	References See Section 3, Reference Evaluation	15 points	
TOTAL POINTS			/ 115

3. REFERENCE EVALUATION

Reference Check: 15 Points Available in this Category (No minimum point score)

Bidders should submit contact details for 3 customers who will act as references and who have Dual Polarization weather radar upgrades built and installed by the bidder. EC will conduct a telephone interview where the identified reference contact would be asked to provide yes or no answers. Results from all three reference contacts will be added together to determine an overall category result.

Bidders should supply a written list specifying (at minimum) each of the following details:

- (a) Customer (Company) Name,
- (b) Reference Contact Person Name and E-mail Address
- (c) Contract Number
- (d) Number of systems built and installed
- (e) Contract Amount (\$)

The reference will be contacted for verification purposes. If the reference contact person cannot be reached after three (3) attempts, the bid will be assigned no points for this reference.

Reference Evaluation

Solicitation No. - N° de l'invitation K3D33-141001/A	Amd. No. - N° de la modif.	Buyer ID - Id de l'acheteur tor031
Client Ref. No. - N° de réf. du client K3D33-141001/A	File No. - N° du dossier TOR-4-37057	CCC No./N° CCC - FMS No/N° VME

(b) Did the Bidder take corrective measures to ensure compliance with the contract specifications, and then pass acceptance tests? (Bidder will score one (1) point for a "Yes" response) Yes: _____ No: _____

Score: _____

Score for this Submission Evaluation _____ (Maximum 5 points)

ANNEX D PROJECT SCHEDULE

The Bidder must submit with their bid to highlight their project timelines for each Project Milestone.

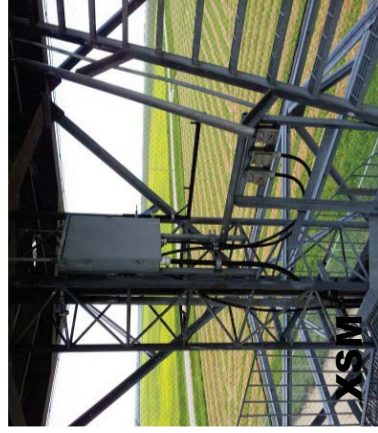
No.	Project Milestones	Milestone Date
1	Develop Project Charter	
2	Project Plan	
3	Design Plans	
4	Manufacturing/Production	
5	Factory Acceptance Test	
6	Delivery, Installation and start up testing of Dual Polarization Prototype (must be delivered, installed and pass start-up test completed by Bidder).	3 weeks (maximum)
7	Environment Canada's review of data from acceptance test period	6 weeks (approximately)
8	Delivery of 3 dual polarization upgrade units to Environment Canada by 31 March 2016 to the following locations: Franktown Weather Radar - Ottawa, ON Bethune Weather Radar - Regina, SK Location 3 –Delivery and Factory Acceptance tested to Environment Canada Downsview Office, 4905 Dufferin Street, Toronto, ON, Canada M3H 5T4	
9	Installation and successful acceptance testing of 2 units by 31 March 2016 (Franktown Weather Radar - Ottawa, ON and Bethune Weather Radar - Regina, SK)	Approximately 2 weeks per site.
10	Delivery of remaining 8 units, which includes 1 spare unit.	
11	Installation and acceptance testing of 7 units (Annex B Basis of Payment & Schedule of Milestones. Section 2 Optional Requirements)	2 weeks (approximately) per installation
12	Training of Environment Canada staff	TBD
13	Project Closing: Delivery of any documentation, closing meeting, and closure of all open action items.	

Appendix 1 to Annex A
Radome Hatch Opening

750mm x 1200mm

Accessed through a split door hatch connected to a steep stair case which attaches to the intermediate deck below the radome floor.

These photos are from several different 98A sites.



REVISION HISTORY:			
REV	DESCRIPTION	DATE	INITIALS
00	DRAWING CREATED	06-FEB-14	P.L.
01	REVISED CG TOLERANCE ISSUED	19-FEB-14	P.L.

NOTES:

- THIS DRAWING DESCRIBES THE COUNTER WEIGHT STRUCTURE OF THE 98A WEATHER SEEKER RADAR PEDESTAL.
- DIMENSIONS ARE BASED ON ORIGINAL PRODUCTION DRAWINGS AND HAVE NOT BEEN VERIFIED AGAINST THE AS-BUILT CONDITION. THEY ARE PROVIDED FOR REFERENCE ONLY.
- EQUIPMENT MOUNTED IN OR ON THE COUNTER WEIGHT STRUCTURE MUST:
 - NOT LIMIT ANTENNA RANGE OF MOTION AS DESCRIBED IN THE SPECIFICATIONS.
 - NOT CREATE HAZARDOUS PINCH POINT CONCERNS THROUGH THE FULL ANTENNA RANGE OF MOTION.
 - MAINTAIN THE CENTRE OF GRAVITY POSITION WITHIN THE FOLLOWING TOLERANCES:
 - (A) $\pm 8.00\text{mm}$
 - (B) $\pm 12.00\text{mm}$
 - (C) $\pm 20.00\text{mm}$
- THE TOTAL COUNTERWEIGHT STRUCTURE MASS MUST BE MAINTAINED $\pm 3.00\text{kg}$. COUNTER WEIGHT PLATES AND COUNTER WEIGHT TRIM PLATES MAY BE REMOVED AND/OR MODIFIED.
- A 3D STEP FILE OF THE COUNTERWEIGHT STRUCTURE AS SHOWN IN THIS DRAWING IS AVAILABLE UPON REQUEST FOR REFERENCE ONLY.

**DO NOT SCALE
REFERENCE ONLY**

DRAWN BY:

MODEL FILE NAME:

98A_Counterweight.stp



ALL DIMENSIONS IN
MILLIMETERS UNLESS
OTHERWISE SPECIFIED



Environment
Canada

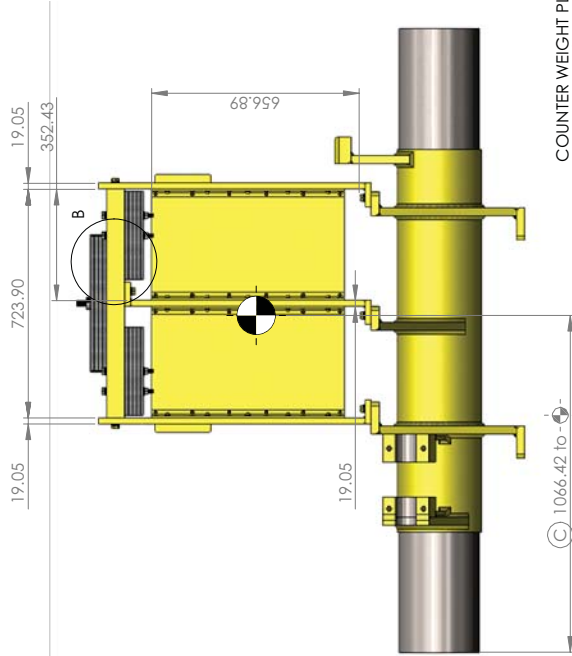
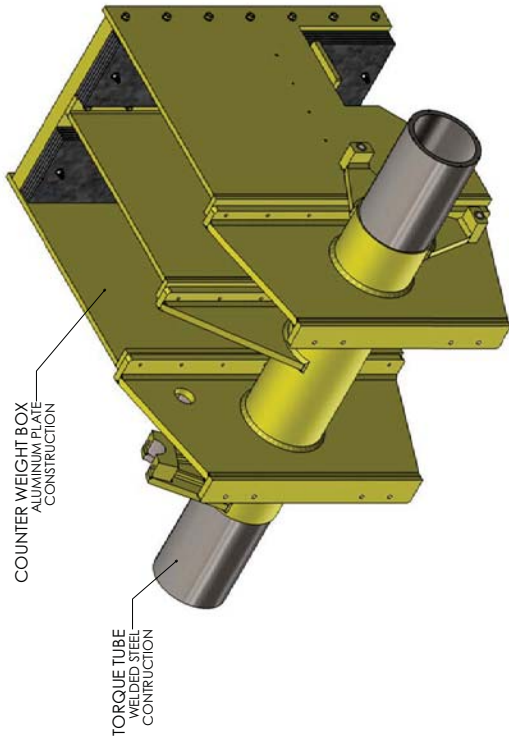
Meteorological Service of Canada
Service Météorologique du Canada

TITLE: Appendix 2 to Annex A

98A COUNTERWEIGHT STRUCTURE

DRAWING NUMBER: REVISION:

NRP-DP-1000 01



COUNTER WEIGHT TRIM PLATE

12.7mm THICK
18.75kg EACH
4 PIECES, REMOVABLE

MAIN COUNTER WEIGHT

57.15mm THICK
343.3kg
1 PIECE FIXED

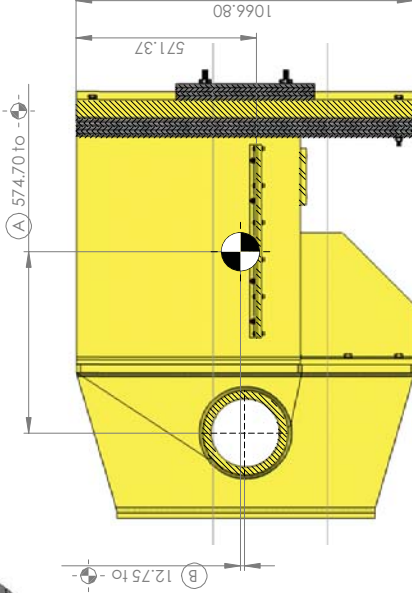
COUNTER WEIGHT PLATE

12.7mm THICK
29.5kg EACH
8 PIECES, REMOVABLE

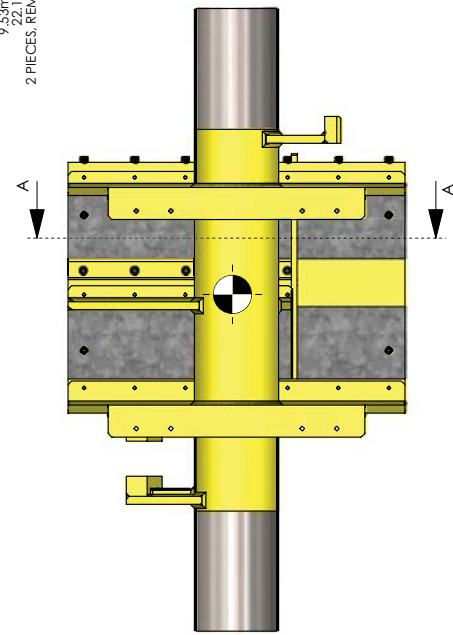
COUNTER WEIGHT PLATE

9.53mm THICK
22.1kg EACH
2 PIECES, REMOVABLE

DETAIL B



SECTION A-A



Appendix 3 to Annex A 98A Radar Pedestal Vibration Audit Report

1.0 Purpose:

Sample vibration levels in the counter weight area of the 98A Weather Seeker radar pedestal during a normal 10 minute radar scan. This information will be used to provide a design baseline for vibration sensitive equipment that may be mounted in this area.

2.0 Equipment:

The following equipment was used to record the data compiled in this report:

Data Recorder: imc CS-7008-1 data acquisition unit (SN 125694)



Figure 1 - Front and Back images of the IMC CS-7008 DAQ

Accelerometer: Dytran 7523A1 (SN 2976) triaxial DC response accelerometer



Figure 2 - Image of the Dytran 752 series
Triaxial Accelerometer

3.0 Setup:

Data Recorder: The raw voltage signals from each axis of the sensor were scaled inside the DAQ from “m/s²” into “g” with no filtering. Each channel was set up to record at a sampling rate of 10kHz. Calibration was performed using a level surface and gravity.

Accelerometer: The accelerometer was mounted to the counterweight frame as shown in the photo below. Cyanoacrylate glue was used to make a rigid connection to a flat section of the central counterweight web. This location was chosen because it was representative of the worst case location in the general area where the proposed equipment would be mounted.

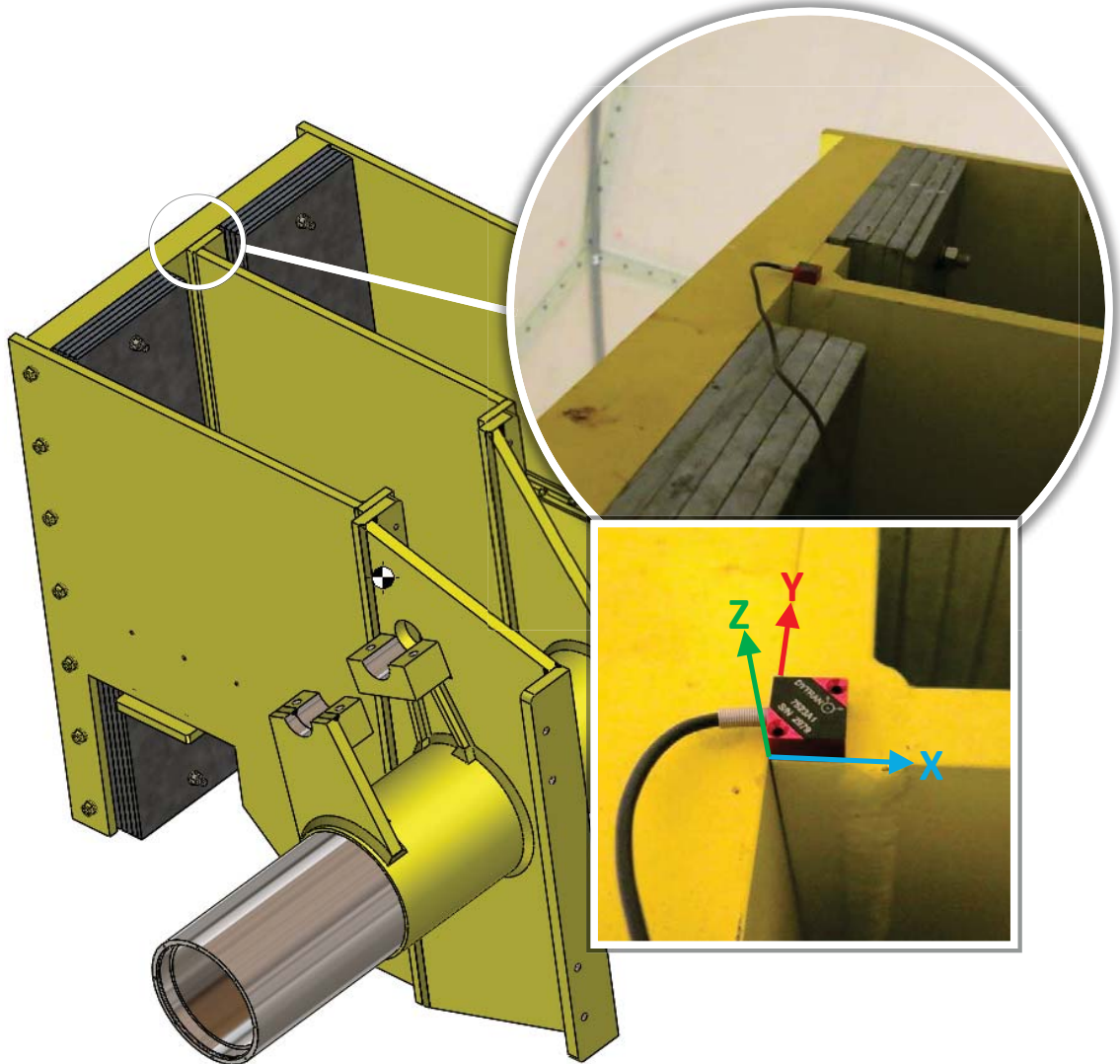


Figure 3 - Installation position and orientation of triaxial accelerometer

4.0 Data Post Processing:

The data was recorded directly to a laptop hard drive connected to the IMC DAQ. Additional pedestal

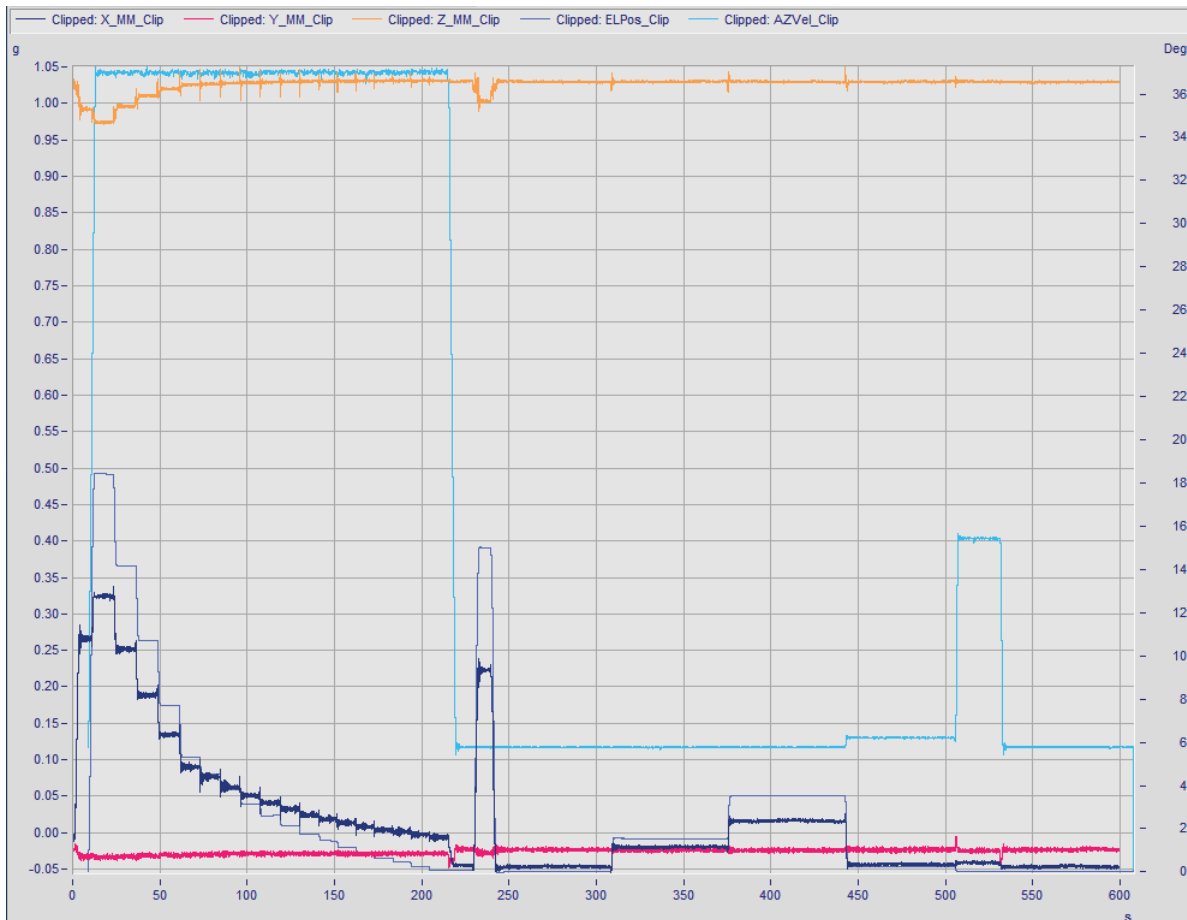
motion data was retrieved from the ANTPlot function in the form of a text file. The acceleration data and ANTPlot data were both loaded into the imc post processing software FAMOS Professional (V6.1 R5)

4.1 Time Domain Data:

A moving mean reduction was applied to the raw accelerometer data for each axis using a window size of 0.04 seconds and a reduction width of 0.04 seconds (MvMean function)

Data from ANTPlot (approx. 25Hz sample rate) was synchronized with the accelerometer data manually (using Cut function and adjusting “x0” in channel properties)

An output plot and table were generated. The data table was also converted to excel and plotted.



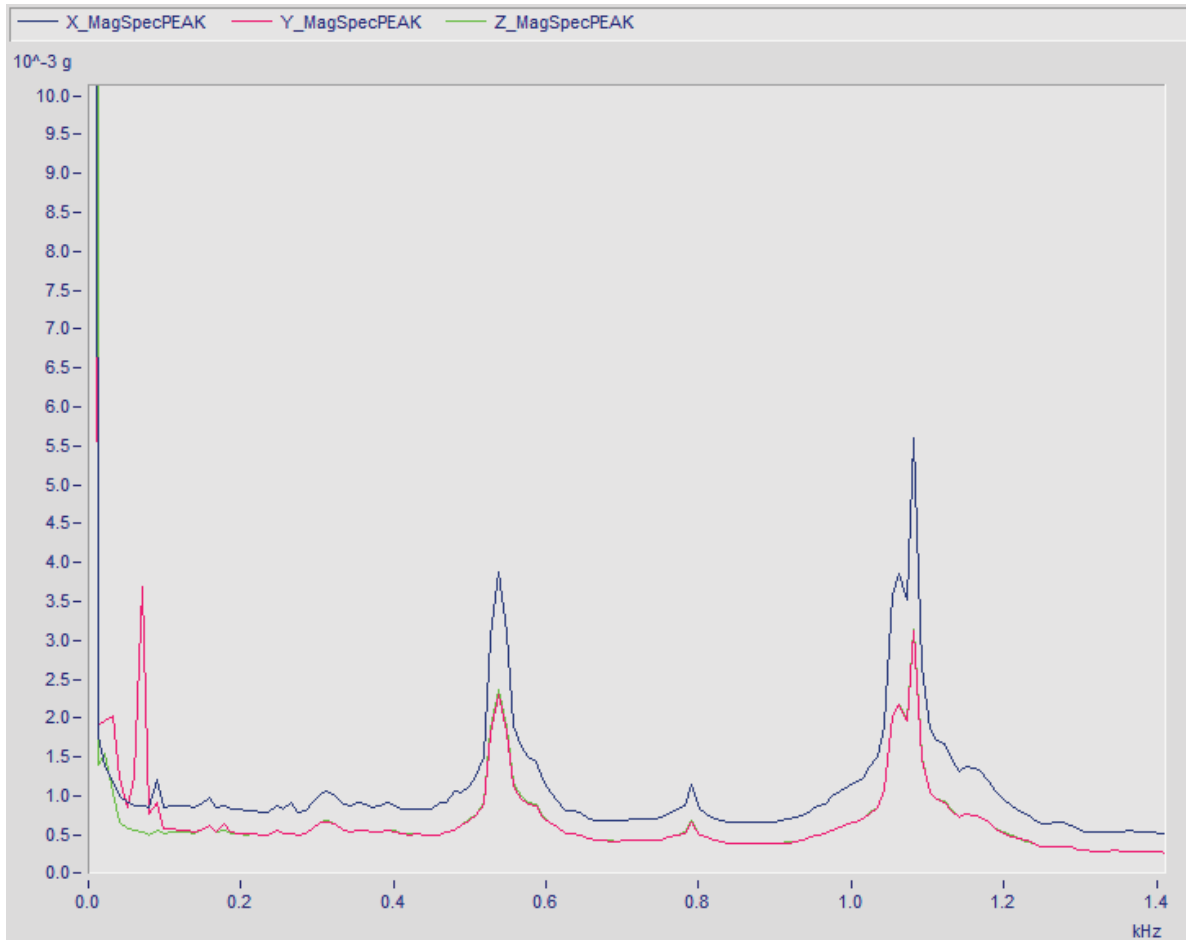
4.1.1 Observations:

- Note that the Z-axis data shows a 1g offset; this is expected as each axis was calibrated 90deg to the direction of gravity.
- The centripetal force created by Azimuth velocity is captured in the X-axis acceleration data, and to some degree in the Z-axis as Elevation angle increases. This force produces the appearance of an additional step in the elevation scan as Azimuth velocity increases.
- Azimuth speed change is shown in the Y-axis acceleration curve.

- In each acceleration channel, vibration levels are relatively low ($<0.1g$)

4.2 Frequency Domain:

The raw accelerometer data for each axis was ingested into an amplitude spectrum computation where harmonics are determined as peak magnitudes. The averaging is then taken of as many spectra as there are windows within the waveform. For this function (AmpSpectrumPeak_1) the window width was set to 1024 points, a Rectangular windowing function was used for the FFT, and no overlapping was applied to the time windows. All spectra were summarized through averaging.



4.2.1 Observations:

- Y-axis data shows excitation at approximately 68Hz, while all 3 axis show peaks at 537Hz and 1084hz. Amplitude is very low $<0.1g$.

5.0 Summary and Conclusions

The acceleration data recorded is representative of a well-tuned pedestal during its standard 10 minute

scan. The level of vibration observed may be considered as typical, noting that in abnormal conditions vibration levels can increase temporarily.

To ensure durability and reliability, all vibration sensitive equipment must be protected by design features such as isolating mounts, positive latching/locking electrical connections, and thread locking fasteners. Particular attention must be paid to components whose resonant frequencies -or orders of that frequency- that lie near the excitations identified in this report.

The raw data channels as recorded can be made available on request in Matlab5 (.mat) or FAMOS (.dat) format.

An excel file has been compiled with the post processed data and plots and is included with this report.

6.0 Appendices

Refer to microsoft excel file "98A Radar Pedestal Vibration Audit Data.xlsx" for plots and post processed data tables.