Frequency Supportability Request Form

CLASSIFICATION

REQUEST FOR FREQUENCY SUPPORTABILITY
DEMANDE DE DISPONIBILITE DE FREQUENCES

DATE	PAGE
08 May 2019	

TO - *A* :	FROM (Office making request) *DE (Bureau qui présente la demande):*

1-EQUIPMENT NOMENCLATURE AND/OR MODEL NUMBER
DESIGNATION DU MATERIEL ET NUMERO DE MODELE

FLIR Systems Inc. R70 Class 1 Unmanned Aerial System (UAS) in a quadcopter configuration.

2-STATUS OF SUPPORTABILITY REQUEST (Check one)
CENTRE DE DEMANDE (Cochez une seule case)

☐	EXPERIMENTAL RESEARCH OR EXPLORATORY DEVELOPMENT *RECHERCHE EXPERIMENTALE OU DEVELOPPEMENT PRELIMINAIRE*	☐	ADVANCED OR ENGINEERING DEVELOPMENT *DEVELOPPEMENT AVANCE OU INGENIERIE*	x	OPERATIONAL *UTILISATION OPERATIONNELLE*

1 - EQUIPMENT USAGE - *UTILISATION DU MATERIEL*

3-FUNCTION AND PURPOSE - *FONCTION ET BUT*
All weather UAS designed for ISTAR and Radio Communications Node operational purposes.

4-METHOD OF OPERATION - *MODE DE FONCTIONNEMENT*

UAS aircraft operated by a user equipped with a C2 tablet via a radio/data communications link paired between a base station radio and a radio on the aircraft.

5-EXTENT OF USE - *EXTENSION DE L'UTILISATION*

Intermittent use to meet operational demand and tempo. Persistent use could be maintained with addition of tether equipment (in development) which will become available for this system, or through continuous in-air replacement feature when operating independently of said tether system.

6-OPERATIONAL ENVIRONMENT - *MILIEU D'UTIILISATION*

Amphibious landing operations; Defence or attacking of strategic, operational or tactical target areas; Sea areas; Field army; SOF

7-GEOGRAPHICAL AREA OF EXPERIMENTAL RESEARCH OR DEVELOPMENTAL EVALUATION -
REGION GEOGRAPHIQUE DE LA RECHERCHE EXPERIMENTALE OU DE L'EVALUATION DU DEVELOPPEMENT

Research and development (R&D) of the R70 UAS was conducted principally in Ontario, Canada and elsewhere in North America. Further R&D of new payloads and concepts is possible within the Netherlands.

8-GEOGRAPHICAL AREA OF OPERATIONAL USE – *REGION GEOGRAPHIQUE DE L'UTILISATION OPERATIONNELLE*

R70 UAS is designed for operational in all global areas of operation. For training and development in the territory of the Netherlands it is expected to be used in Ministry of Defence controlled areas. The operational range of the aircraft is currently 20km (single vector and without loiter).

9-NUMBER OF EQUIPMENTS IN INITIAL PHASE – *NOMBRE D'APPAREILS PENDANT LA PHASE INITIALE*
Up to 50 x R70 systems

10-NUMBER OF THESE EQUIPMENTS PLANNED FOR OPERATIONAL USE - *NOMBRE D'APPAREILS PREVU POUR L'UTILISATION OPERATIONNELLE*
Up to 250 x R70 systems

11- NUMBER OF THESE EQUIPMENTS OPERATING SIMULTANEOUSLY IN THE SAME ELECTROMAGNETIC ENVIRONMENT -
NOMBRE D'APPAREILS FONCTIONNANT SIMULTANEMENT DANS LE MEME MILIEU ELECTROMAGNETIQUE
Up to 16 x R70 aircraft may be controlled simultaneously by a single operator on a single mission.

12-TARGET DATE FOR THE START AND END OF EXPERIMENTAL OR DEVELOPMENTAL EVALUATION -
DATE PREVUE POUR LE COMMENCEMENT ET LA FIN DE L'EVALUATION EXPERIMENTALE OU DE L'EVALUATION OU DEVELOPPEMENT

08 May 2019			
13-TARGET DATE FOR OPERATIONAL USE - *DATE PREVUE D'UTILISATION OPERATIONNELLE*			
08 May 2019			
14-PREVIOUS APPLICATION NUMBER - *NUMERO DE L'ANCIEN FORMULAIRE*			
☐ CONTINUED UNCHANGED *RESTE EN VIGUEUR*	☐ SUPERSEDED *EST REMPLACE*	☐ RELATED *DEMEURE CONNEXE*	☒ NONE *AUCUN*

CLASSIFICATION

INSTRUCTIONS FOR COMPLETING FREQUENCY SUPPORTABILITY FORM

1. Type in classification and downgrading stamp and insert nomenclature and equipment type, e.g., AN/FPS-16 Instrumentation Radar. Indicate by check mark whether for Experimental Research or Exploratory Development. Advanced or Engineering Development, or Operational. The classification of the title will be appropriately indicated. Classified information contained in the completed form will be indicated either as a general statement in the Remarks paragraph such as "The purpose, functions ... are classified ..... ." or by an enumeration of the applicable paragraphs and subparagraphs with their classification, or the classification may be marked alongside each entry on the form.

EXPERIMENTAL RESEARCH OR EXPLORATORY DEVELOPMENT

2.a. To test the feasibility of new techniques or concepts of natural phenomena and environment and efforts towards solution of problems in the physical behavioural and social sciences that have no direct military application.

b. To test the feasibility of adapting conventional techniques to new purposes prior to projection into development planning includes all effort!directed toward solution of specific military problems, short or major development projects.

ADVANCED OR ENGINEERING DEVELOPMENT

a. To develop equipment which have moved into the development of hardware for experimental or operational test.
b. To modify existing operational equipment for improved performance.
c. To develop programs being engineered for service use but which have not yet been approved for production and service deployment.
d. To continue development of equipment/systems that have been approved for production and service use.

OPERATIONAL

To operate and test equipment which have passed the development phase and are planned for operational use for:

(1) Tactical and training purposes.
(2) Non-tactical purposes such as for test range instrumentation purposes.

3. Describe the function and purpose to be performed as specifically as possible. For example, Guided Missile Control Radar; Troposcatter Communications equipment; provides acquisition and tracking information; short range communications; telemetry for quality control.
4. Describe the method of operation. For example: Radar activates beacon transponder in missile with coded pulses; Beacon provides missile track; Radar also transmits coded pulse command signals to missile beacon receiver for guidance.
5. Describe operational extent of usage. For example: Continuous or intermittent-expected duty cycle during mission; expected number of hours of operation per day or other appropriate time period; Indicate any conditions governing intermittent use; When appropriate, describe mission phase during which system operates.
6. Give brief description of ultimate operational environment. For example: Amphibious landing operations; Defence of strategic target area; sea areas; field army. Provide any additional environment factors pertinent to a meaningful assessment of electromagnetic compatibility such as: specific vehicle/platform types; expected mobility; or other factors affecting the environment variability.
7. State geographical area used for experimental research or development.
8. State geographical area for potential use. Provide latitude and longitude of centre of operational area and radius of operation in kilometres.
9. List number of equipment's planned for experimental or developmental phase.
10. List number of equipment's planned for operational use.
11. Indicate maximum number of these equipment's which will be operating simultaneously in the same environment. For example: 3 missiles will be flown simultaneously in an operating area.
12. Indicate the dates on which it is expected that experimental or developmental phase will start and finish.
13. Indicate target date for operational use as defined in item 6.

CLASSIFICATION

TRANSMITTER EQUIPMENT CHARACTERISTICS
CARACTERISTIQUES DU MATERIEL EMETTEUR

PAGE

1. Nomenclature, Manufacturer's Model No. - *Désignation, no de modèle du fabricant:*
RM-2250

2. Manufacturer's Name - *Nom du fabricant:*
Doodle Labs

3. Transmitter installation - *Installation émettrice:*
Inside a base station and a flyer/aircraft

4. Transmitter Type - *Type d'émetteur:*
Transmitter follows Wi-fi Standards 802.11n

5. Tuning Range - *Gamme d'accord:*
2200-2300Mhz

6. Method of Tuning - *Méthode d'accord:*
Crystal

7. RF Channeling Capability - *Répartition des voies RF:*
20 Channels of 5Mhz each or 10 Channels of 10MHz each – user selected

8. Emission Designator(s) - *Identificateur(s) d'émission:*

9. Frequency Tolerance - *Tolérance de fréquence:*

Not Applicable

10. Filter employed - *Filtre utilisé:* Yes - *Oui* [✓] No - *Non* [ ]

11. Spread Spectrum - *Spectre étalé:* Yes - *Oui* [ ] No - *Non* [✓]

12. Emission Bandwidth - *Largeur de bande de l'émission:* Calculated - *Calculée* [ ] Measured - Mesurée [✓]

(a)	-3 dB	4.24MHz
(b)	-20 dB	4.7MHz
(c)	-40 dB	10.83MHz
(d)	-60 dB	788MHz
(e)	OCCBW	4.8MHz

Larg. de bande occupée

13. Maximum Bit Rate - *Débit binaire maximal:*
80Mbps

14. Modulation Techniques and Coding - *Techniques de modulation et de codage:*
BPSK, QPSK, 16QAM, 64 QAM

15. Maximum modulation Frequency - *Fréquence de modulation et de codage:*
2300MHz

16. Pre-emphasis - *Préaccentuation:* Yes - *Oui* [ ] No - *Non* [ ]

17. Deviation Ratio - *Rapport/de déviation:*

18. Pulse Characteristics - *Caractéristiques des impulsions:*

(a) Rate - *Fréq. de récurrence* _____
(b) Width - *Durée* _____
(c) Rise Time - *Telmps de montée* _____
(d) Fall Time - *Temps de descente* _____
(e) Comp Ratio - *Rapport/de comp.* _____
Larg. de bande occupée

19. Power - *Puissance:*

0.1 W or 1.0 W as selected by the user

(a) Mean - *Moyenne* _____
(b) PEP - *En crête* _____

20. Output Device - *Dispositif de sortie:*

21. Harmonic Level - *Niveau des harmoniques:*

(a) 2nd - *2e* *-64.4dBc @ 6750MHz* _____
(b) 3rd - *3e* *-57.58 @ 9000MHz* _____
(c) Other - _____

22. Spurious Level - *Niveau du rayonnement non essentiel:*

No spurious noted

24. Remarks - *Remarques:*

CLASSIFICATION

TRANSMITTER EQUIPMENT CHARACTERISTICS

1. Enter the government assigned equipment designation. If above is not available, enter the manufacturer's model number, e.g. MIT502, and complete item 2. If above is not available enter a short descriptive title, e.g. ATS-6 telemetry transmitter.
2. Enter if available. If a manufacturer's model number is listed in item 1, this item must be completed.
3. List specific type(s) of vehicle(s), ship(s), plane(s) or building(s) etc. where the transmitter(s) will be installed.
4. Enter the generic class of the transmitter, e.g. Frequency scan, Scan While Track Radar, Monopulse Tracker, AM or PM communications. In addition, for radar enter the radar type e.g. Non-FM Pulse, FM-Pulse, Frequency Hopping, CW or FM-CW.
5. Enter the frequency range through which the transmitter is capable of being tuned, e.g. 225-400 MHz. For equipment designed to operate only at a single frequency, enter the frequency indicate units e.g. kHz, MHz or GHz.
6. Enter the method of tuning, e.g. crystal, synthesiser or cavity. If the equipment is not readily tuneable in the field. Indicate in Remarks (item 23) the complexity factors such as skill levels involved, major assemblies involved, time required and location (factory or depot) where equipment is to be tuned.
7. Describe the RF channelling capability. For uniformly spaced channels, enter the centre frequency of the first channel and channel spacing e.g. first channel 406MHz, 100kHz increments; for continuous tuning, enter the lowest frequency and the word "continuous"; for others, such as SSB or cases where channel selection is under software control, enter a detailed description in Remarks (23), e.g. degraded channels, internal hardwiring limitations or lockout capability for frequency hopping systems.
8. Enter the emission designator(s) including the necessary bandwidth for each designator e.g. 16K0F3E. For systems with a frequency hopping mode as well as a non-hopping mode, enter the emission designators for each mode. Identify each mode such as hopping or non-hopping.
9. Enter the frequency tolerance, i.e. the maximum departure of a transmitter from its assigned frequency after normal warm-up time has been allowed. Indicate the units in part per million (ppm) for all emission types except single side band, which shall be indicated in Hertz (Hz).
10. Check the appropriate box.
11. Check the appropriate box. If YES see instructions for item 14.
12. Enter the emission bandwidths for which the transmitter is designed at the -3, -20 and -60dB levels and the occupied bandwidth. The bandwidth at -40dB shall also be entered for pulse radar transmitters. The emission bandwidth is defined as that appearing at the antenna terminals and includes any significant attenuation contributed by filtering in the output circuit or transmission lines. Values of emission bandwidth specified should be indicated as calculated or measured by checking the appropriate block. Note that the occupied bandwidth (item 12(e)) is defined as the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5% of the total mean power radiated.
13. Enter the maximum information bit rate for digital equipment, in bits per second. If spread spectrum is used, enter the bit rate after encoding.
14. Describe in detail the modulation and/or coding techniques employed. For complex modulation schemes such as direct sequence spread spectrum, frequency hopping, frequency agile, provide information relating to hop rate, processing gain, clock rate, No of hop sets, No of frequencies per hop set, etc. If too lengthy, use item 23.
15. For frequency or phase-modulated transmitter, enter the maximum modulation or base band frequency. The frequency is assumed to be the frequency at -3dB point on the high frequency side of the modulator response curve. Indicate the units, e.g. Hz, kHz or MHz.
16. For frequency or phase modulated transmitter check the appropriate block to indicate whether pre-emphasis is available.
17. For frequency or phase modulated transmitter enter the deviation ratio computed with the formula:

    $$\text{Deviation ratio} = \frac{\text{maximum frequency deviation}}{\text{maximum modulation frequency}}$$

18. For pulse modulated transmitters
    a. enter the pulse repetition rate in pulses per second (pps)
    b. enter the pulse width at the half voltage levels in usec
    c. enter the pulse rise time in microseconds (usec). This is the time duration for the loading edge of the voltage pulse to rise from 10% to 90% of its peak amplitude
    d. enter the pulse fall time in microseconds (usec). This is the time duration for the training edge of the voltage pulse to fall from 90% to 10% of its peak amplitude
    e. enter the maximum pulse compression ratio if applicable.

    For coded pulse waveform see instructions for item 14.
19. Enter the mean power delivered to the antenna terminals for all AM and FM emissions or the peak envelope power (PEP) for all other classes of emissions. If there are any unique situations such as interrupted CW, provide details in Remarks (23). Indicate the units e.g. W or kW.
20. Enter a description of the device used in the transmitter output stage e.g. ceramic diode, reflex klystron, transistor or TWT.
21. Enter the harmonic level of the 2nd and 3rd harmonics in dB relative to the fundamental. Enter in item (c) the relative level in dB of the highest-powered harmonic above the 3rd.
22. Enter the maximum value of spurious emission in dB relative to the fundamental which occurs outside the -60dB point on the transmitter fundamental emission spectrum (item 12) and does not occur on a harmonic of the fundamental emission spectrum (item 12) and does not occur on a harmonic of the fundamental frequency. Indicate in kHz or MHz the location of the spurious from the fundamental frequency.
23. Remarks.

CLASSIFICATION

RECEIVER EQUIPMENT CHARACTERISTICS
CARACTERISTIQUES DU MATERIEL RECEPTEUR

PAGE

1. Nomenclature, Manufacturer's Model No. - *Désignation, no de modèle du fabricant:* **RM-2250**	2. Manufacturer's Name - *Nom du fabricant:* **Doodle Labs Inc**
3. Receiver installation - *Installation réceptrice:* **Unmanned Aerial Vehicle, Mobile Base station,**	4. Receiver Type - *Type récepteur:*
5. Tuning Range - *Gamme d'accord:* ***2200-2300MHz***	6. Method of Tuning - *Méthode d'accord:* **Crystal**
7. RF Channeling Capability - *Répartition des voies RF:* 2200MHz, 2205,MHz 2210MHz. . .2295MHz with 5MHz bandwidth on each channel	8. Emission Designator(s) - *Identificateur(s) d'émission:*
9. Frequency Tolerance - *Tolérance de fréquence:*	
10. If Selectivity - *Sélectivité FI:* 1st *1ère* 2nd *2e* 3rd *3e* (a) -3 dB (b) -20 dB _____ (c) -70 dB _____	11. RF Selectivity - *Sélectivité RF:* Calculated ☐ *Calculée* Measured ☐ Mesurée (a) -3 dB (b) -20 dB (c) -60 dB
12. If Frequency - *Fréquence intermédiaire:* (a) 1st - *1ère* (b) 2nd - *2e* (c) 3rd - *3e*	13. See instructions / *Voir instructions* 14. See instructions / *Voir instructions*
15. Oscillator Tuned - *Oscillateur accordé:* 1st *1ère* 2nd *2e* 3rd *3e* (a) Above Tuned Frequency *au -dessus de la fréq. d'accord* ☐ ☐ ☐ (b) Below Tuned Frequency *au-dessous de la fréq. d'accord* ☐ ☐ ☐ (c) Either Above or Below the Freq. *soit au-dessus, soit au-dessous de la fréq. d'accord* ☐ ☐ ☐	16. Maximum Bit Rate - *Débit binaire maximal:* 17. Sensibility - *Sensibilité:* (a) Sensibility - *Sensibilité* ***-98 dBm*** _____ (b) Criteria - *Critère* ***Bit Error rate*** _____ (c) Noise Fig - *Facteur de bruit* ***4*** _____dB (d) Noise Temp - *Temp. de bruit* _____kelvins
18. De-emphasis - *Désaccentuation:* Yes - *Oui* ☐ No - *Non* ☐	20. Spurious Rejection - *Rejet des fréquences parasites:*
19. Image Rejection - *Rejet de fréquence image:*	
21. Remarks - *Remarques:*	

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RECEIVER EQUIPMENT CHARACTERISTICS

1. Enter the alphanumeric equipment designation. If above is not available, enter the manufacturer's model number e.g. MIT502 and complete item 2. If above is not available, enter a short descriptive title e.g. GPS receiver. A separate receiver submission is required for each receiver in a complex system e.g. radar ECCM receivers.
2. Enter the manufacturer's name if available. If a manufacturer's model number is listed in item 1, this item must be completed.
3. List specific type(s) of vehicle(s), ship(s), plane(s) or building(s) etc. where the receiver(s) will be installed.
4. Enter the generic class e.g. Dual conversion super-heterodyne or homodyne.
5. Enter the frequency range through which the receiver is capable of being tuned e.g. 225-400 MHz. For equipment designed to operate only at a single frequency, enter this frequency. Indicate units: kHz, MHz or GHz.
6. Enter the method of tuning e.g. crystal, synthesiser or cavity. If the equipment is not readily tuneable in the field, indicate in Remarks (21), the complexity of tuning include complexity factors, such as skill levels involved, major assemblies involved, time required and location (factory or depot) where equipment is to be tuned.
7. Describe the RF channelling capability. For uniformly spaced channels, enter the centre frequency of the first channel and channel spacing e.g. first channel 408 MHz, 100 kHz increments, for continuous tuning, enter the lowest frequency and the words "continuous", for others, including cases where channel selection is under software control, enter a detailed description in Remarks (21).
8. Enter the emission designator(s) including the necessary bandwidth for each designator e.g. 16K0F3E. For systems with a frequency hopping mode as well as non-hopping modes, enter the emission designators for each mode.
9. Enter the frequency tolerance, i.e., the maximum departure of a receiver from its assigned frequency after normal warm-up time has been allowed. Indicate the units in parts per million (PPM) for all emission types except single side band, which shall be indicated in Hertz (Hz).
10. Enter the bandwidth for each IF stage at -3, -20 and -60dB levels. Indicate units, e.g. kHz or MHz.
11. Enter the bandwidth at -3, -20 and -60dB levels. The RF bandwidth includes any significant attenuation contributed by filtering in the input circuit or transmission line. Values of RF bandwidths specified should be indicated as calculated or measured by checking the appropriate block. Indicate units, e.g. kHz or MHz. Enter the pre-selection type, e.g. tuneable cavity.
12. Enter the tuned frequency of the 1st, 2nd and 3rd IF stages. Indicate units, e.g. kHz or MHz.
13. and 14. Intentionally left blank to match US form.
15. Check the appropriate block to indicate the location of the 1st, 2nd and 3rd oscillator frequencies with respect to the associated mixer input signal.
16. Where applicable, enter the maximum bit rate (BPS) that can be used. If spread spectrum is used, enter the bit rate after decoding. Describe any error detecting/correcting codes in Remarks (21).
17. a. enter the sensitivity in dBm.
    b. specify criteria used, e.g. 12dB SINAD (signal + noise + distortion over noise + distortion)
    c. if the receiver is used with terrestrial systems, enter the receiver noise figure in dB.
    d. if the receiver is used with space or satellite earth stations, enter the receiver noise temperature in Kelvin.
18. For frequency modulated or phase modulated receivers indicate whether de-emphasis is available.
19. Enter the image rejection is the ratio of the image frequency signal level required to produce a specified output, to the desired signal level required to produce the same output.
20. Enter the spurious rejection in dB. Enter the single level of spurious rejection that the receiver meets of exceeds at all frequencies outside the -60dB IF bandwidth. Spurious rejection is the ratio of a particular out-of-band frequency signal level required to produce a specified output, to the desired signal level required to produce the same output.
21. Remarks.

CLASSIFICATION

ANTENNA EQUIPMENT CHARACTERISTICS
CARACTERISTIQUES DU MATERIEL D'ANTENNE

PAGE

1.
Transmitting *Emission* [ ] Receiving *Réception* [ ] Transmitting and Receiving *Emission et réception* [x]

2. Nomenclature, Manufacturer's Model No. - *Désignation, no de modèle du fabricant:*
LM252

3. Manufacturer's Name - *Nom du fabricant*
Aeryon Labs Inc and LM Technologies

4. Frequency Range - *Gamme de fréquences:*
2200-2550MHz for Aeryon custom manufactured
24000-2500MHz for LM Technologies

5. Type:
Dipole

6. Polarization – *Polarisation:*
Vertical

8. Gain: **-2 dB peak,, isotropic**

(a) Main Beam
Faisceau

(b) 1st Major Side Lobe
1er lobe latéral important

9. Beamwidth - *Largeur du faisceau:*

(a) Horizontal **360**

(b) Vertical **78**

7. Scan Characteristics – *Caractéristiques de balayage:*

(a) Type
(b) Vertical Scan:
Balayage vertical: _____
(1) Max Elev
Angle de site max. _____
(2) Min Elev
Angle de site min. _____
(3) Scan Rate
Vitesse de balayage _____
(c) Horizontal Scan:
Balayage horizontal: _____
(1) Sector Scanned
Secteur balayé _____
(2) Scan Rate
Vitesse de balayage _____
(d) Sector Blanking
Effacement de secteur Yes *Oui* [ ] No *Non* [✓]

21. Remarks – *Remarques:*

Aircraft Uses custom Antenna manufactured inhouse at FLIR UAS ULC in Waterloo, ON Canada, whereas the base station unit uses LM Technologies LM252. Both antennas are dipoles and isotropic in pattern.

(a)

(b)

CLASSIFICATION

ANTENNA EQUIPMENT CHARACTERISTICS

1. Check the appropriate block to indicate the type of antenna. For multi-antenna system, use one page for each antenna.
2. Enter the assigned alphanumeric equipment designation. If above is not available, enter the manufacturer's model number e.g. DS6558 and complete item 3. If above is not available, enter a short descriptive title e.g. ATS-6 Telemetry antenna.
3. Enter the manufacturer's name if available. If a manufacturer's model number is listed in item 2, this item must be completed.
4. Enter the range of frequencies for which the antenna is designed. Indicate units e.g. kHz or MHz.
5. Enter the generic name or describe general technical features e.g. Horizontal, Log periodic, Cassegrain with polarisation twisting, Whip, Phased Array or Conformal Array.
6. Enter the polarisation: if circular, indicate whether it is left or right hand.
7. a. If this antenna scans, enter the type of scanning, e.g. vertical, horizontal, vertical and horizontal.
   b. Vertical scan:
      (1) enter the maximum elevation angle in degrees (positive or negative referenced to the horizontal) that the antenna can scan.
      (2) enter the minimum elevation angle in degrees (positive or negative referenced to the horizontal) that the antenna can scan.
      (3) enter the vertical scanning rate in scans per minute.
   c. Horizontal scan:
      (1) enter the angular scanning range in degrees of the horizontal sector scanned.
      (2) enter the horizontal scan rate in scans per minute.
   d. Indicate if antenna is capable of being sector blanked. If yes, enter details in Remarks (10).
8. a. Enter the maximum gain in dB relative to an isotropic radiator (dBi).
   b. Enter the nominal gain of the 1st major side lobe in dBi and the angular displacement from the main beam in degrees.
9. Enter the -3dB beam width in degrees.
10. Use this item to describe any unusual characteristics of the antenna, particularly as they relate to the assessment of electromagnetic compatibility. Use this item to amplify or clarify any of the information provided above. In addition, enter the following information if applicable:
    a. the front to back ratio in dB for directional antennas used in Radio Relay circuits.
    b. for phased array antennas, enter:
       (1) mode of operation, single or multiple beam;
       (2) single beam parameters;
       (3) multiple beam parameters:
          (a) polarisation of each beam;
          (b) gain of each beam;
          (c) beam width of each beam;
          (d) scan characteristics of each beam (refer to item 7).