Framework Agreement
C and KU band over European region and Afghanistan

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1 General

1.1 Introduction

The Swedish Armed Forces (SwAF) is prepared to participate in peacekeeping missions in several countries under the umbrella of the United Nations (UN) and the European Union (EU).
Since 1995 satellite communications have come to play a more vital role in carrying out the missions.

1.2 Purpose of Acquisition

The purpose of this acquisition is to acquire a Framework Agreement which will guarantee the provision of satellite capacity over European Region and Afghanistan to SwAF personnel when needed.

The satellite capacity will occur in C- or Ku-band. Some of which are currently used for on-going missions and other needs to be available on a short notice when a mission is appointed to SwAF. The Theatres for on-going missions are well defined but for future missions there are no information at this point in time, therefore coverage over large area is needed.

Swedish Defence Materiel Administration (FMV) is the governmental party procuring materiel and services on behalf of the SwAF. This means that all contacts regarding this acquisition will go through FMV.

1.3 Communication description

SwAF use satellite communication in two ways with regard to this procurement. Primarily as an extension line of the SwAF Infrastructure between Sweden and the Joint Operation Area (JOA) and secondly in order to set up a local IP-network in Theatre.
For clarification, the SwAF equipment (terminals etc) that will be used during SwAF missions is owned by SwAF. **Due to Logistical and system safety reasons no equipment will be leased from third party. I.e. these cannot be switched to other equipment offered by any satellite operator or service provider**.

1.4 Acronyms and definitions

29W	Referring in here to orbital position of 29 degrees West
40E	Referring in here to orbital position of 40 degrees East
ABW	Allocated Bandwidth

C	Term referring to frequencies in the band 3.6-6.5 GHz
dB/K	Decibel per Kelvin (Unit for Figure of Merit)
dBW	Power unit in decibel
EIRP	Equivalent Isotropic Radiated Power
EU	European Union
FEC	Forward Error Correction
FHQ	Force Head Quarter
FMV	Försvarets Materielverk - Swedish Defense Materiel Administration
G/T	Gain over Temperature (Figure of Merit)
GHz	Gigahertz
HQ	Head Quarter
IP	Internet Protocol
ISO	International Standard Organization
JOA	Joint Operation Area
Kbit/s	Kilobit per second
Ku	Term referring to frequencies in the band 10.7-14.5 GHz
Lat	Latitude
LHCP	Left Hand Circular Polarization
Long	Longitude
Mbit/s	Megabit per second
MF	Main Force
MHz	Megahertz
NOC	Network Operation Center
PEB	Power Equivalent Bandwidth
QPSK	Quadrature Phase Shift Keying
RHCP	Right Hand Circular Polarization
RX	Receive
SoW	Statement of Work
SwAF	Swedish Armed Forces
TS	Technical Specification
TX	Transmit
UN	United Nations
X	Refers to linear horizontal polarization
Y	Refers to linear vertical polarization

1.5 Description of areas

Within this Framework Agreement there are difficulties such as describing the region for JOA or exact time frames for the Operation/Mission, although some places in the region are more likely than others. The interest can be that of a recognized international mission asked for by UN or EU, or training purpose with friendly nations, or setting up a local HQ or FHQ near a UN or EU-mission.

Figure 1 – Region of interest

1.6 Requirements

1.6.1 Mandatory and Desirable Requirements

One level of requirements is used in this specification. Mandatory requirements ("**shall**") must be fulfilled.

All Technical Specification requirements are labelled TS-x, where x is a running number. All Statement of Work requirements are labelled SoW-y, where y is a running number.

Section A – Technical Specification

The Technical specification is divided in several sub-sections, all of which will define a sub-set of the whole Framework Agreement.

2 Satellite Capacity

2.1 General Requirements

TS-1 When the link over the Satellite Capacity terminates in the SwAF Base Station in Enköping in Sweden the satellite orbital position **shall** be located between 29W- 40E.

2.2 Satellite Capacity

TS-2 The Contractor **shall** be prepared to provide Satellite Capacity in any of the frequency bands defined in sections 3.1 and 3.2 upon request from SwAF.

TS-3 Irrespective of frequency band, the leased slot **shall** be offered with a Power Equivalent Bandwidth (PEB) to Allocated Bandwidth (ABW) ratio lower than or equal to 2.0.

TS-4 Satellite Capacity **shall** be interpreted as transponder capacity in a footprint covering the locations of interest as defined in the sub-appendices.

3 Frequency bands

In this paragraph the frequency bands that are of interest for the Framework Agreement will be specified.

3.1 C-band

3.1.1 Frequency band

TS-5 Uplink frequency band **shall** occur in the band 5850 – 6450 MHz.

TS-6 Downlink frequency band **shall** occur in the band 3600 – 4200 MHz.

3.1.2 Technical requirements of the space segment

TS-7 The Contractor **shall** provide C-band Satellite Service with at least 99.5% availability for any carrier in the leased slot.

TS-8 The C-band Satellite Service **shall** use circular polarisation (LHCP or RHCP).

TS-9 Uplink and downlink **shall** occur in opposite polarisations.

TS-10 The C-band Satellite Service **shall** occur in one transponder. Cross strapping solution is not acceptable.

TS-11 If the provided satellite service extends beyond the specific transponder bandwidth the satellite service **shall** be split and located in separate transponders on the same satellite and same polarisations.

TS-12 The satellite providing the C-band Satellite Service **shall** be kept in station keeping mode (i.e. not inclined orbit).

3.1.3 Satellite Service and coverage area

TS-13 The Contractor **shall** provide C-band Satellite Service upon request in the JOA. Exact details of the JOA are defined in Sub-appendix 1.

TS-14 The provided C-band Satellite Service **shall** occur within one footprint.

TS-15 The provided satellite capacity **shall** cover both the JOA and Enköping in Sweden.

TS-16 The satellite and transponder provided for the Satellite Service **shall** not be changed during the time period of the mission.

TS-17 Commissioning of C-band Satellite Service **shall**, *upon availability*, occur within 15 days after order.

TS-18 The C-band Satellite Service **shall**, *upon availability*, be possible to ramp up or down in the transponder, within the time period of operation.

3.2 Ku-band

3.2.1 Frequency band

TS-19 Uplink frequency band **shall** occur in the band 13.75-14.5 GHz.

TS-20 Downlink frequency band **shall** occur in the band 10.95 - 11.7 GHz, 11.7 - 12.2 GHz or 12.5 - 12.75 GHz.

3.2.2 Technical requirements of the space segment

TS-21 The Contractor **shall** provide Ku-band Satellite Service with at least 99.5% availability for any carrier in the leased slot.

TS-22 The Ku-band Satellite Service **shall** use linear polarisation (X or Y).

TS-23 Uplink and downlink **shall** occur in opposite polarisations.

TS-24 The Ku-band Satellite Service **shall** occur in one transponder.

TS-25 The provided Ku-band Satellite Service **shall** occur within one footprint. Cross strapping solution is not acceptable.

TS-26 If the provided satellite service extends beyond the specific transponder bandwidth the satellite service **shall** be split and located in separate transponders on the same satellite and same polarisations.

TS-27 The satellite providing the Ku-band Satellite Service **shall** be kept in station keeping mode (i.e. not inclined orbit).

3.3 Ku-band Service

There are two scenarios of capacity needed. Scenario 1 refers to a fixed coverage over the whole region within which the satellite links from the connecting remote terminals terminates at the hub station in Enköping, and the Scenario 2 refers to spots over specified areas on demand.

3.3.1 Scenario 1 – Backhaul: Theatre-to-Sweden Satellite Service and coverage area

The Backhaul service supports for instance the Swedish ISAF-forces with access to Telephony, IP-access and Internet

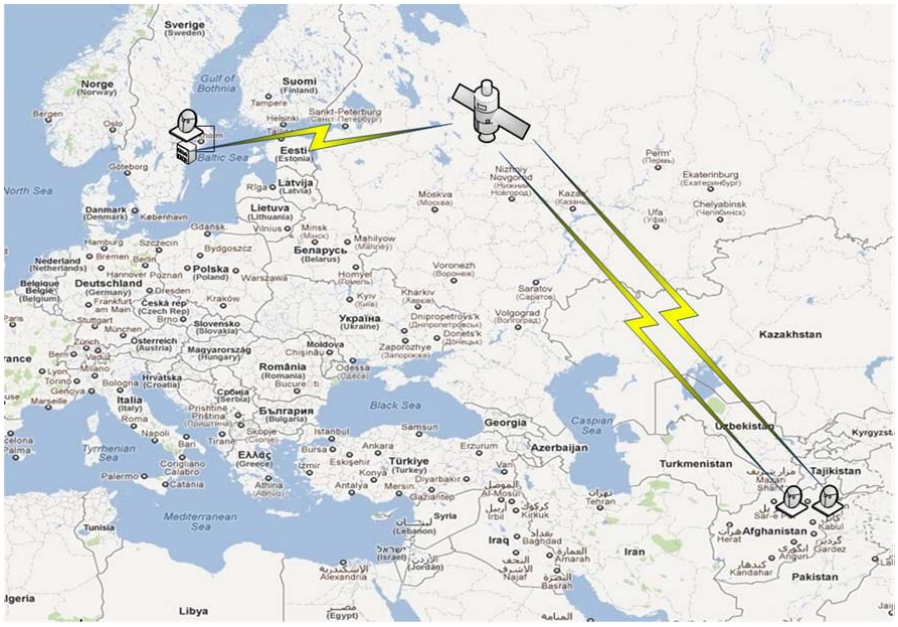

Figure 2 Example Backhaul: Afghanistan to Sweden

TS-28 The Contractor **shall** provide Ku-band Satellite Service covering the countries of interest as defined in Sub-appendix 1.

TS-29 The Ku-band Satellite Service may be divided in smaller blocks, however if the capacity is divided at least on block **shall** be 10MHz.

TS-30 If the Ku-band Satellite Service is divided according to TS-29, the other blocks **shall** be at least 5MHz.

TS-31 The satellite and transponder provided for the Satellite Service **shall** not be changed during the time period of the mission.

TS-32 Commissioning of Ku-band Satellite Service **shall** occur within 30 days after order.

TS-33 The Ku-band Satellite Service **shall**, *upon availability*, be possible to ramp up or down in the transponder, within the time period of operation.

3.3.2 Scenario 2 – In-Theatre-Services: Satellite Service and coverage area

The In-Theatre-Service makes it possible for the SwAF troops to set up and operate a standalone IP network over satellite. The IP network allows for small SwAF units to report back to Local FHQ in JOA.

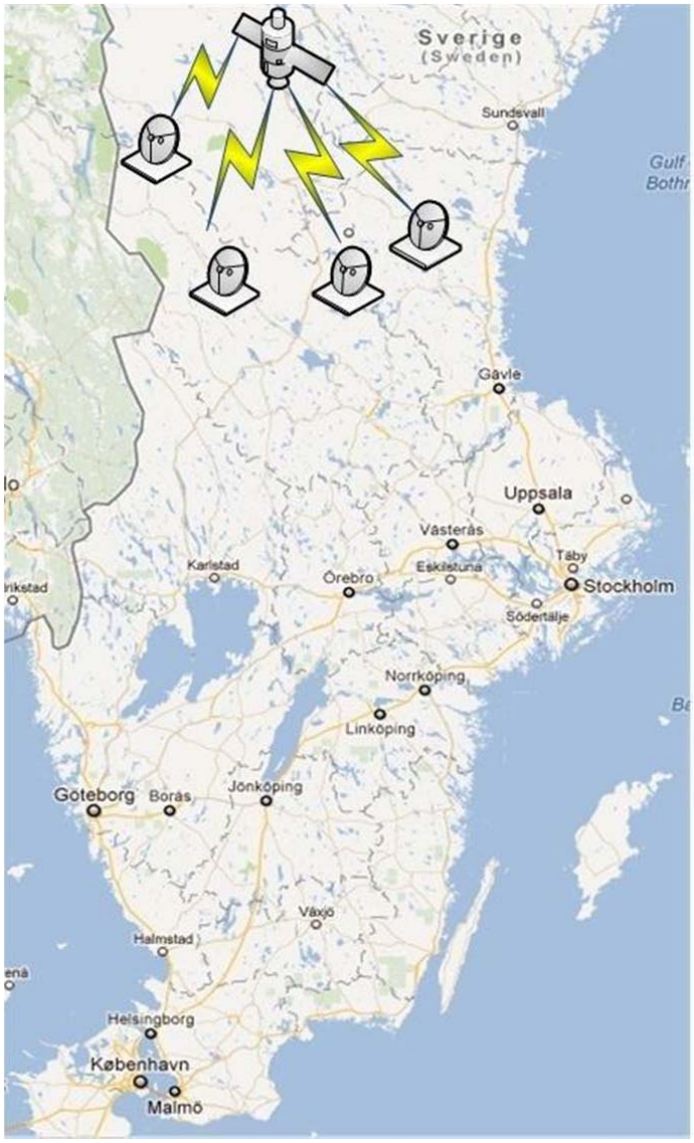

Figure 3 Example of In-Theatre-service.

TS-34 The Contractor **shall** provide Ku-band Satellite Service covering any spot area (In-Theatre-Services) within Europe or Afghanistan. The countries of interest are defined in Sub-appendix 1.

TS-35 The provided Ku-band Satellite Service **shall** occur within one footprint.

TS-36 The satellite and transponder provided for the Satellite Service **shall** not be changed during the time period of the mission.

TS-37 Commissioning of Ku-band Satellite Service **shall**, *upon availability*, occur within 15 days after order.

TS-38 The Ku-band Satellite Service **shall**, *upon availability*, be possible to ramp up or down in the transponder, within the time period of operation.

Section B – Statement of Work

This Statement of Work (SOW) describes the tasks and efforts the Tenderer shall perform during the time period of the Framework Agreement.

4 General

SoW-1 The Swedish or English language **shall** be used during the time period of the Framework Agreement. This includes, for example, plans, schedules, documentations, instructions, specifications, descriptions, reports or any other correspondence between SwAF and the Tenderer.

5 Project Management

5.1 Overview

This section contains FMV requirements for actions to be taken by the Tenderer to assure that the work is managed in a satisfying manner.
The section aims to guarantee that:

- Activities performed by the Tenderer in order to fulfil the contractual requirements for the capacity and lease matters are carried out according to FMV work philosophy.
- Responsibilities, authorities and means for cooperation between the Tenderer and FMV are declared.
- Time schedule (if and when necessary) and resource plan are maintained.

5.2 Project Organisation

SoW-2 The Tenderer **shall** appoint a Project Manager.

SoW-3 The Project Manager **shall** have the formal responsibility during the contractual time period of this Framework Agreement.

SoW-4 The Project Manager **shall** be the Tenderer's principle point of contact with FMV.

SoW-5 The Tenderer **shall** appoint a Quality Assurance Manager.

SoW-6 The Tenderer **shall** present a Project Organisation chart including the Project Manager, Quality Assurance Manager as well as other key personnel, key functions and/or key specialists.

SoW-7 The authority and responsibility of appointed personnel **shall** be specified.

SoW-8 The Project Organisation **shall** include subcontractors, if any.

5.3 Project Plan

SoW-9 The Tenderer **shall** prepare a Project Plan for the work within the Framework Agreement.

SoW-10 The Project Plan **shall** be submitted to FMV together with the Tender.

SoW-11 The Project Plan **shall** be maintained and updated throughout the time period of this Framework Agreement by the Tenderer. I.e. until the end of the contract including any options.

SoW-12 The Project Plan **shall** at least include:

- Project organisation, including the names of managers/key personnel and their respective responsibility and authority
- Points of contacts
- Staffing, including contract workers
- List of subcontractors
- Master Time Schedule (if needed), including main activities, main events and corresponding dates (this MTS can cover for example procedures when request for additional capacity arrives to Help Desk / NOC until capacity is delivered and all involved items)
- Progress monitoring
- Monitoring of subcontractors
- Communications plan (information and communications needs of FMV), in particular
    - Progress reporting
    - Progress meetings
    - Other meetings
- Quality assurance (QA)
  Included in the Work Plan or a separate QA Plan
- Configuration Management (CM)
  Included in the Work Plan or a separate CM Plan
- Risk Management.

5.4 Capacity and spectrum planning

SoW-13 The Tenderer **shall** submit together with the tender information, manuals or handbooks on procedures regarding authorisation of satellite terminals for use on the proposed satellites.

SoW-14 The Tenderer **shall** submit together with the tender procedures regarding spectrum planning of transponder capacity.

SoW-15 The Tenderer **shall** submit example link budgets for a TDMA network with the terminals as specified in Sub-appendix 2 and 3 Ku-band together with the tender. If worst case scenarios are used, this must be specified.

SoW-16 The Contractor **shall** submit example link budgets for the forward and return link between in JOA and Sweden with the terminals as specified in Sub-appendix 4 C-band together with the tender.

6 Help desk / NOC

SoW-17 The Tenderer **shall** present a manned Help Desk where technical problems can be handled 24/7 during time of contract.

SoW-18 The Help Desk **shall** submit a prioritised telephone number in order to reach the Help Desk / NOC promptly before line up.

SoW-19 The English language **shall** be used during time of contract when contacting the Help Desk / NOC.

SoW-20 If the Help Desk / NOC handles transmission planning based on FMV/SwAF input, the Contractor **shall** provide link budgets for all FMV/SwAF links in the transmission plan.

SoW-21 The Help Desk / NOC **shall** within 5 working days after signing the contract provide all necessary documents regarding line-up procedures, antenna registration, point of contact with telephone numbers, email address etc, if not already available.

SoW-22 The Help Desk / NOC **shall** within 5 working days after signing the contract provide necessary information to make all terminals operational when transponder capacity is needed, if not already available.

SoW-23 A yearly meeting **shall** be held at the premises of the Tenderer between FMV/SwAF and the Tenderer where any matter regarding the leased satellite capacity will be discussed, including such as the need to ramp up or ramp down the actual capacity.

7 Security

7.1 Quality system

SoW-24 The Tenderer **shall** have a quality system.

SoW-25 The Tenderer's quality system **shall** be in accordance with ISO 9001, or equivalent.

SoW-26 If the Tenderer applies a quality system different from ISO 9001, the Tenderer **shall** state in the quality plan which differences that exist and which measures that are to be taken to compensate for these differences.

7.2 Quality audit

SoW-27 FMV **shall** have the right to audit the Tenderer's quality system.

SoW-28 The quality audit **shall** take place upon request from FMV, at a date suitable for both parties.

SoW-29 Quality audit **shall** take place at the Tenderer's premises.

SoW-30 Quality audit **shall** be carried out by FMV or by any representative of FMV.

SoW-31 The quality audit **shall** have the right to assess the efficiency and compliance of the quality system.

SoW-32 The quality audit **shall** have the right to assess the totality of the quality system, certain processes/activities or certain products.

SoW-33 The Tenderer **shall** submit a presentation of the Quality System together with the tender.

Sub-appendices

Sub-appendix 1 – Joint Operation Area

This Sub-appendix describes the region of interest from SwAF point of view, and the countries belonging to that region. The interest can be that of a recognized international mission asked for by UN or EU, or training purpose with friendly nations, or setting up a local HQ or FHQ near a UN or EU-mission. The countries and international waters in bold have the highest priority regarding coverage.

Albania	**Finland**	Macedonia	**Serbia**
Andorra	France	Malta	Slovakia
Armenia	Georgia	Moldavia	Slovenia
Austria	Germany	Monaco	Spain
Belarus	Greece	Montenegro	**Sweden**
Belgium	Hungary	Netherlands	Switzerland
Bosnia and Herzegovina	Ireland	**Norway**	Turkey
Bulgaria	Italy	Poland	Ukraine
Croatia	**Latvia**	Portugal	**United Kingdom**
Czech	Liechtenstein	Romania	**Afghanistan**
Denmark	**Lithuania**	Russia	**Uzbekistan**
Estonia	Luxemburg	San Marino	**Turkmenistan**
Baltic Sea	**North Sea**	**Mediterranean Sea**	

Sub-appendix 2 – Backhaul Services Ku-band Satellite terminals

In order to verify that the provided capacity fulfils the FMV/SwAF requirements, the Contractor must provide link budget calculations for the following example locations and stations. Parameters to be used when calculating the links are found hereafter in this sub-appendix.

Technical parameters for Ku-band terminals in the service network (Backhaul Theatre-to-Sweden Services) with large remote antennas

When setting up a backhaul communication at Ku-band within a footprint that covers both Enköping in Sweden and the local FHQ the following terminals will be used.

Multi carrier Base Station @ SwAF home premises, Sweden

Location: Lat= 59.65, Long= 17.11
Base Station, Sweden
Antenna size: Vertex RSI 3.8m Batwing offset
BUC power: 125W (P1db – 99W)
EIRP max P-1dB: 72.5 dBW (65 dBW in multi carrier mode)
G/T typical: 30.8 dB/K @ 11 850 MHz
Modem: iDirect 5IF iNFINITY chassi with M1D1-T line cards
Modulation: QPSK
Code setting: Turbo code
FEC: 0.793 (TX - Outbound/Downstream carrier)
FEC: 0.66 (RX - Inbound/Upstream carrier)
No Mesh required

Remote Tactical Satellite Station 1
Location: Lat= 34.53, Long= 69.17 (Example)
TSS1
Antenna size: Vertex RSI 2.4m offset
BUC power: 25W (P1dB – 19.8W)
EIRP max: 62.5 dBW
G/T: 26.8 dB/K @ 11 850 MHz
Modem: iDirect 7350T iNFINITY modem concept
Modulation: QPSK
Code setting: Turbo code
FEC: 0.66 (TX - Upstream) / 0.793 (RX - Downstream)
No Mesh required

Remote Tactical Satellite Station 2
Location: Lat= 36.70, Long= 67.11 (Example)
TSS2
Antenna size: Vertex RSI 3.8m offset

BUC power:	40W (P1dB – 31.8W)
EIRP max P-1dB:	67.7 dBW
G/T:	30.8 dB/K @ 11 850 MHz
Modem:	iDirect iNFINITY modem concept
Modulation:	QPSK
Code setting:	Turbo code
FEC:	0.66 (TX - Upstream) / 0.793 (RX - Downstream)
No Mesh required	

Traffic considerations

Outbound carrier (Hub to remotes)	5Mbit/s
Inbound carrier 1 (remotes to Hub)	2Mbit/s
Inbound carrier 2 (remotes to Hub)	2Mbit/s

Technical parameters for Ku-band terminals in the service network (Backhaul Theatre-to-Sweden Services) with small remote antennas

When setting up a backhaul communication at Ku-band within a footprint that covers both Enköping in Sweden and the local FHQ the following terminals will be used. In this example the local FHQ is located offshore on a naval vessel.

Multi carrier Base Station @ SwAF home premises, Sweden

Location:	Lat= 59.65, Long= 17.11
Base Station, Sweden	
Antenna size:	Vertex RSI 3.8m Batwing offset
BUC power:	125W (P1db – 99W)
EIRP max P-1dB:	72.5 dBW (65 dBW in multi carrier mode)
G/T typical:	30.8 dB/K @ 11 850 MHz
Modem:	iDirect 5IF iNFINITY chassi with M1D1-T line cards
Modulation:	QPSK
Code setting:	Turbo code
FEC:	0.793 (TX - Outbound/Downstream carrier)
FEC:	0.66 (RX - Inbound/Upstream carrier)
No Mesh required	

Remote Tactical Maritime antenna 1

Location:	Lat= 56.10, Long= -0.0 (Example)
TSS1	
Antenna size:	SeaTel 4006 1.0m
BUC power:	8W (P1dB – 6.35W)
EIRP max P-1dB:	48 dBW
G/T:	17.9 dB/K @ 11 850 MHz (typical)
Modem:	iDirect 7350T iNFINITY modem concept
Modulation:	QPSK

Code setting: Turbo code
FEC: 0.66 (TX - Upstream) / 0.793 (RX - Downstream)
Cross pol: Rx: >30.0 dB Within -1 dB Contour (Eutelsat)
Tx: >26.0 dB Within -1 dB Contour (Eutelsat)
EIRP Density: 39.2 dBW/40 kHz @ Beam Edge (Eutelsat)
No Mesh required

Remote Tactical Maritime antenna 2
Location: Lat= 56.15, Long= -0.6 (Example)
TSS2
Antenna size: SeaTel 6006 1.5m
BUC power: 16W (P1dB – 12.7W)
EIRP max P-1dB: 57.8 dBW
G/T: 23.2 dB/K @ 11 850 MHz (typical)
Modem: iDirect iNFINITY modem concept
Modulation: QPSK
Code setting: Turbo code
FEC: 0.66 (TX - Upstream) / 0.793 (RX - Downstream)
Cross pol: Rx: >25.0 dB Within -1 dB Contour (Eutelsat)
Tx: >29 dB Within -1 dB Contour (Eutelsat)
EIRP Density: 43.0 dBW/40 kHz @ Beam Edge (Eutelsat)
No Mesh required

Traffic considerations
Outbound carrier (Hub to remotes) 2.5Mbit/s
Inbound carrier 1 (remotes to Hub) 2Mbit/s
Inbound carrier 2 (remotes to Hub) 0.5Mbit/s

Sub-appendix 3 – In-Theatre-services Ku-band Satellite terminals

In order to verify that the provided capacity fulfils the FMV/SwAF requirements, the Contractor must provide link budget calculations for the following example locations and stations. Parameters to be used when calculating the links are found hereafter in this sub-appendix.

Technical parameters for Ku-band terminals in the transmission network (In-Theatre-Services)

The following terminal will be used to set up a local transmission network in a Joint Operation Area. This is in-theatre service only.

Transportable Multi carrier local Hub station

Location:	Lat= 59.65, Long= 17.11 (Example)
Antenna size:	Vertex RSI 2.4 m
BUC power:	40W (P1dB – 31.8W)
LNB NF:	0.9dB
EIRP max:	65.0 dBW (reduced power in multi carrier mode)
G/T:	25.0 dB/K @ 12 GHz
Modem:	iDirect 5IF iNFINITY chassi with M1D1-T line cards

No Mesh required

Small size tactical mobile terminal (ST1)

Location:		Lat= 59.86, Long= 17.83 (Example)
Antenna size:		Tracstar 750P5 0.9x0.66m elliptical
BUC power:		40W (P1dB – 32W)
LNB NF:		0.8dB
EIRP max:		53.3 dBW
G/T:		19.5 dB/K @ 12 GHz
Modem:		iDirect iConnex 700 modem with Transec
Cross pol:	Rx:	22.4 dB On -1 dB Contour (Eutelsat)
	Tx:	22.4 dB On -1 dB Contour (Eutelsat)
EIRP Density:		41.0 dBW/40 kHz @ Beam Edge (Eutelsat) and satellite orbital separation ≥ 2.5° (Reason : Sidelobe Pattern)
		35.3 dBW/40 kHz @ Beam Edge (Eutelsat) and satellite orbital separation < 2.5° (Reason : Sidelobe Pattern)

No Mesh required

Medium size tactical mobile terminal (ST2

Location:	Lat= 59.34, Long= 16.85 (Example)
Antenna size:	Tracstar 1600P4MF 1.6m offset
BUC power:	40W (P1dB – 32W)

LNB NF:		0.8dB
EIRP max:		61 dBW
G/T:		23 dB/K @ 12 GHz
Modem:		iDirect iConnex 700 modem with Transec
Cross pol:	Rx:	22.3 dB On -1 dB Contour (Eutelsat Req)
	Tx:	30.0 dB On -1 dB Contour (Eutelsat Req)
EIRP Density:		45.5 dBW/40 kHz @ Beam Edge (Eutelsat Req) (Reason : Sidelobe Pattern)

No Mesh required

Traffic considerations

Outbound carrier (Hub to remotes)	2Mbit/s
Inbound carrier 1 (remotes to Hub)	0,5Mbit/s
Inbound carrier 2 (remotes to Hub)	1 Mbit/s

Sub-appendix 4 – C-band Satellite terminals

In order to verify that the provided capacity fulfils the FMV/SwAF requirements, the Contractor must provide link budget calculations for the following example locations and stations. Parameters to be used when calculating the links are found hereafter in this sub-appendix.

Technical parameters for C-band terminals

When setting up a backhaul communication within a footprint that covers both Enköping in Sweden and the local FHQ the following terminal may be used.

Multi carrier Base Station @ SwAF home premises, Sweden
Location: Lat= 59.65, Long= 17.11
Base Station, Sweden
EIRP max: 69.5 dBW (62 dBW in multi carrier mode)
G/T: 21.88 dB/K @ 4000 MHz
Antenna size: Vertex RSI 3.8m Batwing offset
SSPA: Advantech 250W
Modem: iDirect 5IF iNFINITY chassi with M1D1-T line cards
Modulation: QPSK
Code setting: Turbo code
FEC: 0.793 (TX - Outbound/Downstream carrier)
FEC: 0.66 (RX - Inbound/Upstream carrier)
No Mesh required

Remote Tactical Satellite Station 1
Location: Lat= 34.53, Long= 69.17 (Example)
TSS1
EIRP max: 58.9 dBW (52 dBW in multi carrier mode)
G/T: 20.5 dB/K @ 4000 MHz
Antenna size: Vertex RSI 2.4m offset
BUC: 40W (P1-32W)
Modem: iDirect 7350T iNFINITY modem concept
Modulation: QPSK
Code setting: Turbo code
FEC: 0.66 (TX - Upstream) / 0.793 (RX - Downstream)
No Mesh required

Remote Tactical Satellite Station 2
Location: Lat= 36.70, Long= 67.11 (Example)
TSS2

EIRP max:	68.9 dBW (62 dBW in multi carrier mode)
G/T:	20 dB/K @ 4000 MHz
Antenna size:	Vertex RSI 2.4m offset
BUC:	400W (P1dB – 317W)
Modem:	iDirect iNFINITY modem concept
Modulation:	QPSK
Code setting:	Turbo code
FEC:	0.66 (TX - Upstream) / 0.793 (RX - Downstream)

No Mesh required

Traffic considerations

Outbound carrier (Hub to remotes)	4Mbit/s
Inbound carrier 1 (remotes to Hub)	1Mbit/s
Inbound carrier 2 (remotes to Hub)	2Mbit/s