HTS Ka band
Added bandwidth offering more choice for the Maritime and Energy market.

Torbjörn Johnsson, Sr. Sales Manager Maritime
• Who we are.
• THOR 7 HTS Ka band
  - Ka-band Service offerings
  - ESA propagation study
• Summary
Company overview

• Owns and operates the THOR satellite fleet at 1˚West and 4˚West
• 160 employees located in Norway and the UK
• 100% owned by Telenor Group, one of the world’s major mobile operators
• Established offshore position in Northern Europe for maritime VSAT services
  – Wholesales satellite capacity and services across the globe to the majority of industry distributors
• Teleport facilities reaching 1/3 of the world’s satellites
  – Operations 24/7 365 days a year
• Our target market is Northern Europe, Mediterranean Sea and the Middle East
• Thor 7 Ka band will **more than double** to total amount of our today Ku band capacity.
• We will have the Ka band service ready by the end of the Q3 2015
Telenor’s latest satellite

Key data:

- **Thor 7 Launch-date 15 April 2015**
  IOT followed by Alfa and Beta test. Estimated time for in service, end of Q3 2015.

- **Total capacity up to 9,000 Mbps in Ka**
  Up to 600Mbps in our standard Ku satellite

- **Fixed cost monthly fee**
  Unlimited usage as today in Ku

- **Competitive price**
  30% more competitive than our Ku band
Coverage details

Key data:
- Thor 7 Ka band map
- Thor Ku band map

Spots beams
example of North Atlantic
Technology

Key data:

- **iDirect** Velocity (HTS, high throughput satellite)
- **X7** modems, Ku band compatible
- **Web based** monitoring
- **Co-branded** portal
- **Maps** of remote locations
- **Tables & Smartphones** ready
Maritime VSAT Antennas

• Cobham SATCOM becomes first antenna vendor approved for TSBc’s THOR 7 satellite
  • Sailor 900 upgradable/Ka-only antenna approved
  • Intellian V100 antenna approved
  • Other antennas in the evaluation stage

• Initial focus on ~ 1m antennas, expect smaller antennas around 65 cm in size to also be available
• For Ka-band, standard configuration is 5 Watt BUC from either JRC or Agilis

Achievable download speed:
~60 cm antenna: 10’s of Mbps
~100 cm antenna: 10’s of Mbps

Achievable upload speed:
~60 cm antenna: 2-3 Mbps
~100 cm antenna: 5-6 Mbps
Thor 7 Service Portfolio

iDirect Managed Services
- Pre-defined coverage
- Pre-defined bandwidth packages
- Wide range of bandwidth profiles

iDirect VNO Wholesale services
- Customised coverage
- Customised bandwidth packages
- Customised monitoring
- FULL VNO Administrative privileges

SCPC and Hosted services (Steerable beam)
- Satellite capacity
- Equipment hosting
- Access to Telenor’s backbone infrastructure
More choice
Example of Managed Packages

• Simple entrance solution:
  • Entire Thor 7 coverage
  • Standard service profiles
  • New full monitoring tools
  • Higher customized bandwidth profiles available case by case

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<th>60 cm antennas: Outbound / Inbound Kbps</th>
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Example CIR/MIR Ratio: 1:4 or 1:10
Ka-band Radio characterization for SatCom services in arctic and high latitude regions (ESA ARTES 5.1)
95 % of the time !
Rain Fade attenuation

- Satellite Power
  - Average of 10 dB more than Ku-Band
- Dual teleport location
  - 30Km distance

✓ Adaptive level control at the satellite
✓ Adaptive antenna diversity
✓ Adaptive outbound
✓ Adaptive inbound
SatCom services in arctic and high latitude regions

- TSBc is leading a consortium running a Ka-band propagation campaign.
  Sites at:
  - Nittedal and Hønefoss (diversity)
  - Røst, Vadsø and Isfjord Radio (Maritime users)
- High-end propagation terminal
- Campaign ending 2015/early 2016
- First results to be published at EuCap 2015
Measurement stations

Elevation angle contours for Ka-Sat (at 90° E)

Propagation terminals
- Nittedal
- Eggemoen
- Røst
- Vadsø
- Isfjord Radio
Røst and Vadsø matches quite well with ITU-R predictions. For low margin systems, other effects than rain like clouds are important in coastal areas such as Røst and Vadsø, while scintillation and multi path are dominant at Isfjord.

Data is still under processing.
HTS GW site diversity
Preliminary result for Nittedal – Hønefoss
Example is shown for a period with heavy rain in 2014 (Aug)

Year 14 month 08

Up to 10 dB attenuation @ 99,9% yearly time (8 hours)

Up to 10 dB attenuation @ 99,9% yearly time (52 mins)

Diversity improvement
One year data (Nov. 2013 – Oct. 2014)

Dual Teleport/ site diversity:

- Outage due to rain will be reduced from 8h to 52min.

Martime:

- Røst and Vadsø matches quite well with ITU-R data and confirm our predictions.
Conclusions

• Thor 7
  • More bandwidth and more choices.
  • Ka-Band will meet the growing demand for broadband communications in Northern Europe Energy and Maritime Market.

  • More satellite power and the latest advance in iDirect technology
  • Dual teleport solution. Reduce outage time with 90%.
  • Recent test results from ESA propagation study confirms performance.

Reliable and stable satellite communications from Telenor.
Welcome to contact:

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