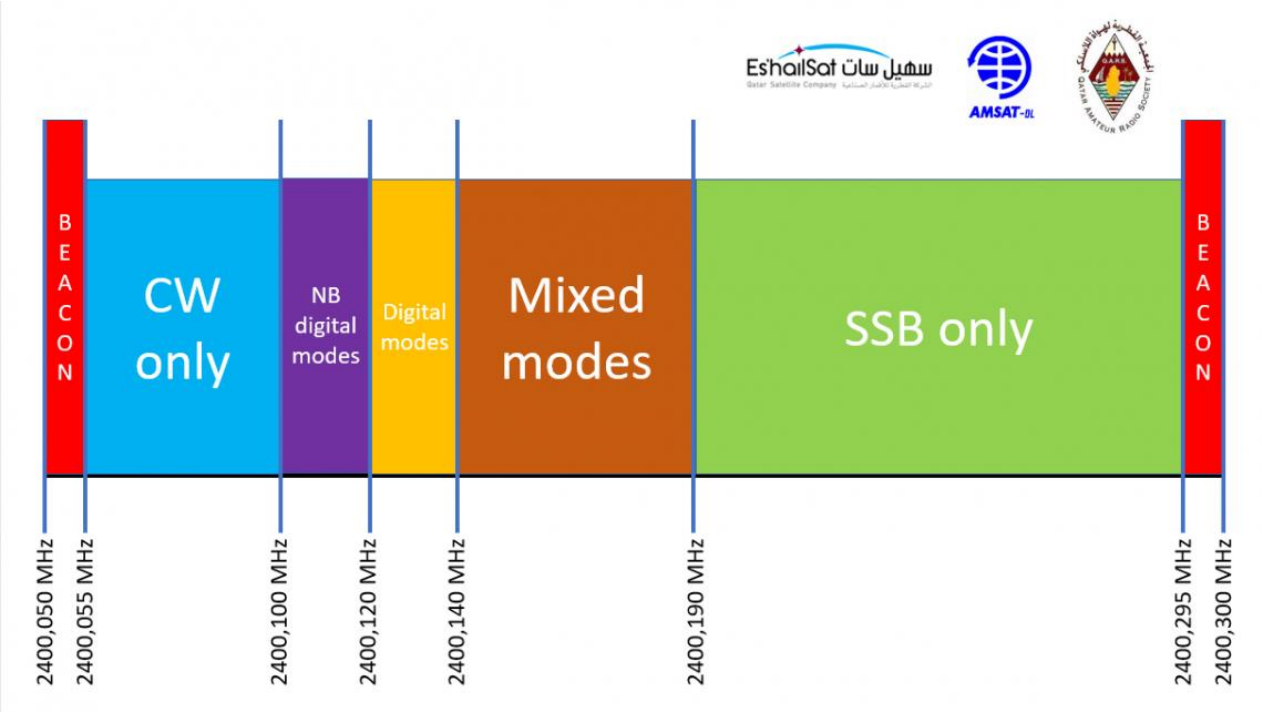
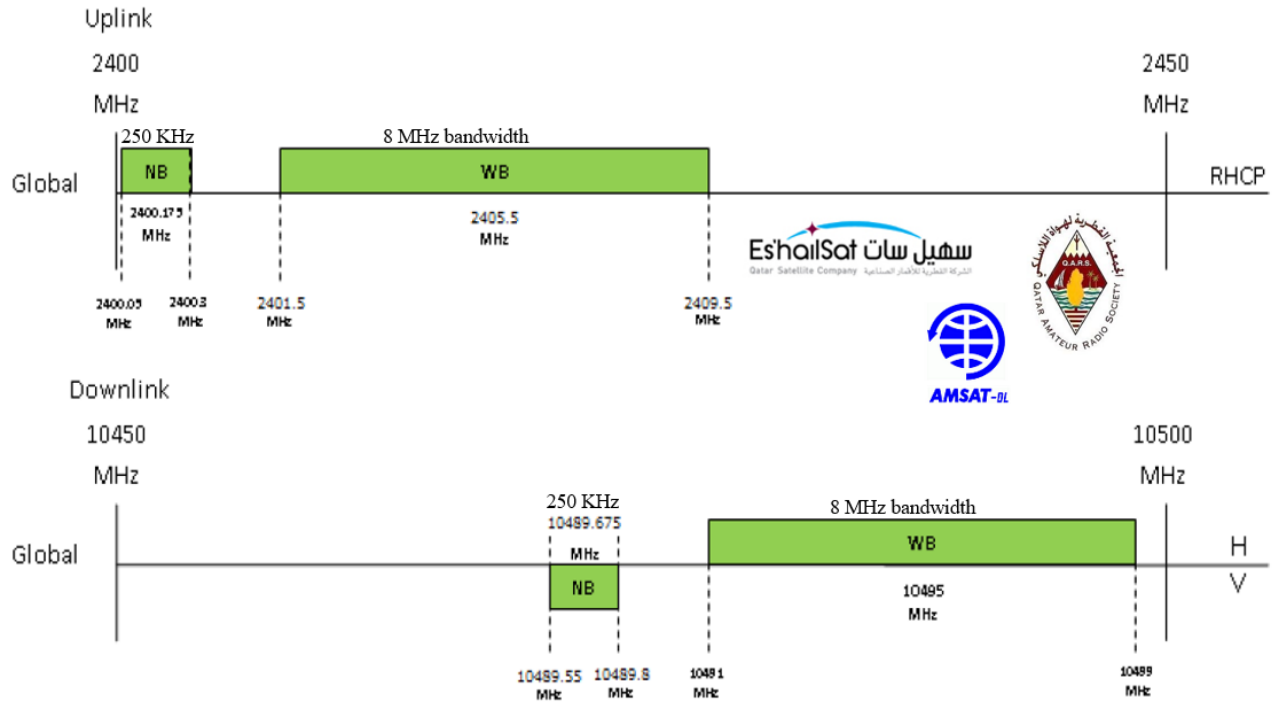
QO-100

P4-A NB Transponder Band Plan and Operating Guidelines

This guide is being issued as an initial document in advance of the launch and commissioning of the Es'hail-2 spacecraft. This will enable potential users to be informed about the plans and operating procedures that should be adopted. It is expected that the document will be updated regularly to take into account the operational experience.





Xpdr	U/L FREQUENCY (MHz)				D/L FREQUENCY (MHz)				LO	BW
No	Pol	Begin	Center	End	Pol	Begin	Center	End	(MHz)	(MHz)
NB	RHCP	2400.05	2400.175	2400.3	V	10489.55	10489.675	10489.8	8089.5	0.25
WB	RHCP	2401.5	2405.5	2409.5	H	10491	10495	10499	8089.5	8

This chart shows the two transponders, their passbands and uplink and downlink polarisations. Note that, unlike the linear transponders on most other amateur satellites, these transponders are not inverting.

The two amateur band transponders on Es'hail-2 are a hosted payload being provided by the Qatar Satellite Company - Es'hailSat and the Qatar Amateur Radio Society (QARS) in co-operation with AMSAT-DL. It is vital that operators respect this facility and refrain from any activity that might cause offense, or which is outside the terms of their amateur radio licence.

Es'hail-2/P4-A Narrowband Transponder Operating Guidelines and Band Plan

The narrowband transponder is intended for conventional analogue and narrowband digital signals.

No transmissions should be made beyond the nominal edges of the transponder passbands. In particular, no operation should take place below the lower beacon nor above the upper beacon.

No uplinks should result in downlink signals that are stronger than these beacons. In the event that such signals are detected, they will be marked by a "LEILA" siren. When they have been marked by "LEILA", operators should immediately reduce their uplink power (ERP).

No FM transmissions should be made to Es'hail-2 as these would use excessive power and bandwidth.

Although there is no formal bandplan, the following details are provided for initial guidance.

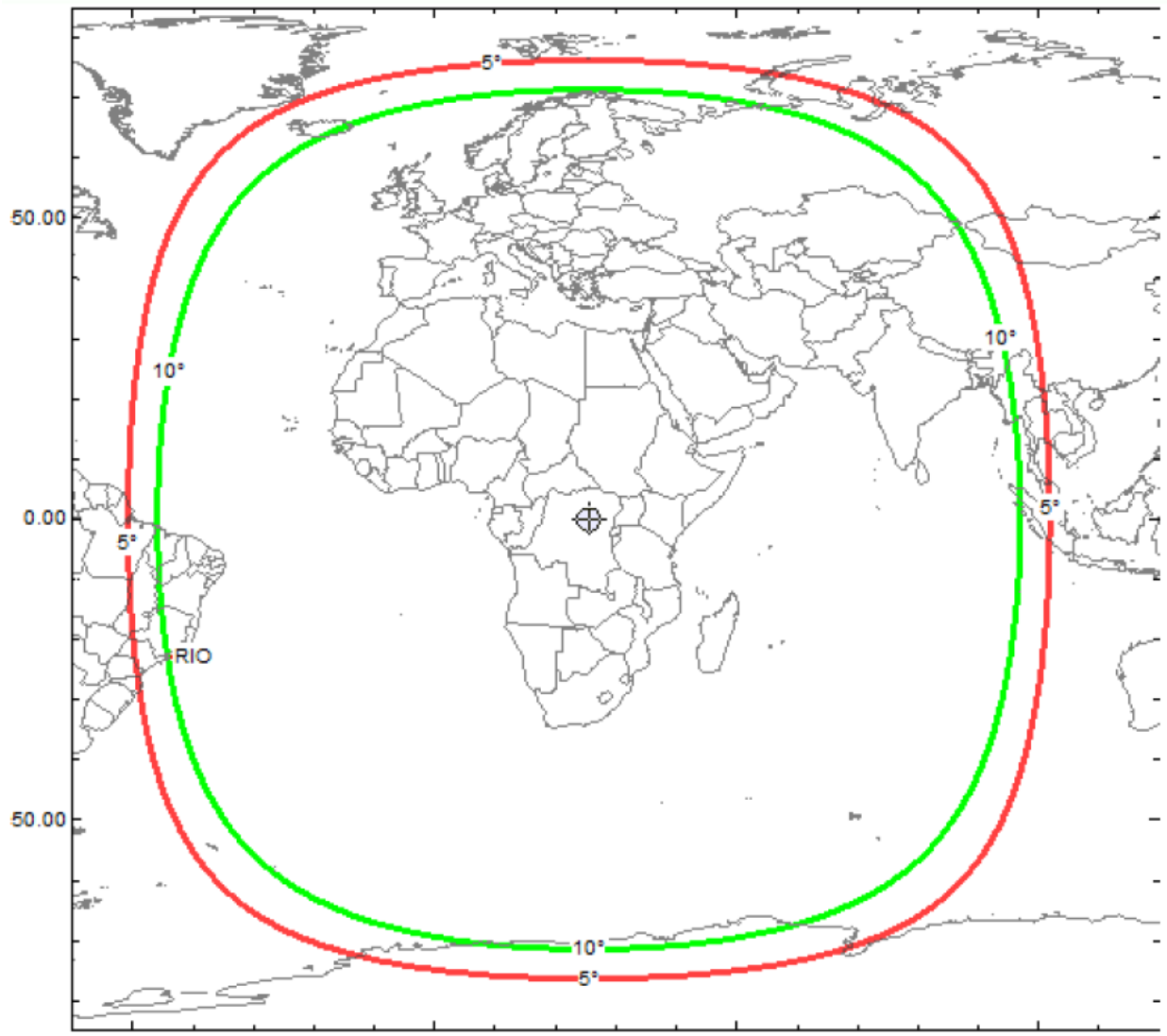
Uplink [MHz]	Downlink [MHz]	Available Bandwidth [kHz]	Notes
	10489,550 – 10489,555	do not transmit	Lower beacon, 400 bit/s BPSK or CW
2400,055 – 2400,100	10489,555 – 10489,600	45	CW Only
2400,100 – 2400,120	10489,600 – 10489,620	20	narrowband digimodes (500 Hz max. BW)
2400,120 – 2400,140	10489,620 – 10489,640	20	digimodes (2700 Hz max. BW)
2400,140 – 2400,190	10489,640 – 10489,690	50	mixed modes (2700 Hz max. BW)
2400,190 – 2400,295	10489,690 – 10489,795	105	SSB only
	10489,795 – 10489,800	do not transmit	Upper Beacon, 400 bit/s BPSK or CW

- above Frequencies are preliminary and will be confirmed/updated after launch.
- NO FM mode is allowed on the transponder.
- No transmission below the lower beacon and no transmission above the upper beacon.
- The NB transponder is a bent-pipe transponder and non-inverting.
- Uplink polarization is RHCP (right-hand circular polarization).
- Downlink polarisation for the NB transponder is V (vertical linear polarisation).
- Monitor the beacons and keep your own signal level below, otherwise you might trigger LEILA warnings.
- Please use minimum uplink power (ERP) .

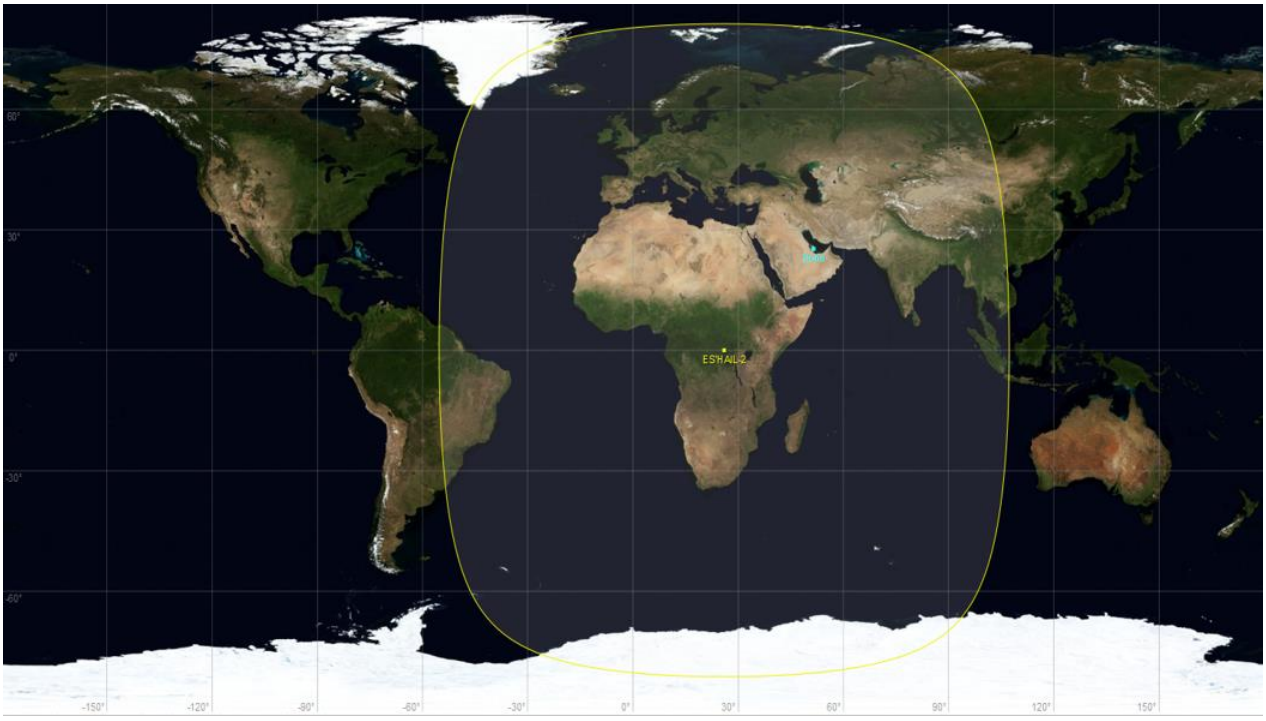
- Full-Duplex operation is mandatory (you must be able to monitor your own downlink while transmitting!)
- The beacons are modulated in 400 bit/s BPSK (similar to the P3-satellites) or in CW.
- The beacons are generated by the groundstation and will provide selected telemetry from the main satellite related to our amateur radio transponders. Details are still to be defined and will be published later.

coverage map

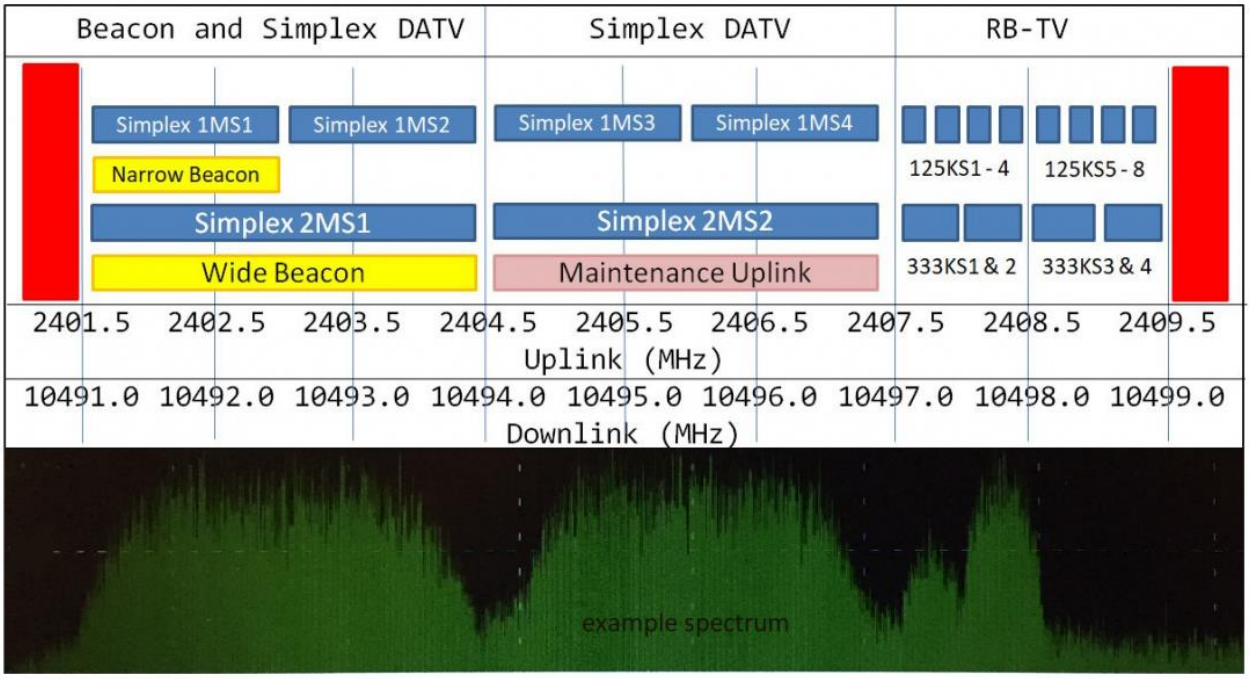
This map shows the coverage expected using the global beams on the spacecraft. For broadcast satellites it is usual to show the coverage down to 5 degrees elevation, but it is expected that well sited locations may provide access beyond that shown. The actual limits and power/dish sizes required will not be known until after commissioning.



Here is another map shopwing the maximum possible visibility area at 0° elevation angle:


60°
30°
0°
-30°
-60°
-150°
-120°
-90°
-60°
-30°
0°
30°
60°
90°
120°
150°
ES'HAIL-2

P4-A WB Transponder Band Plan and Operating Guidelines



The following operating guidelines and proposed bandplan are designed to enable the most efficient use of the 8MHz wide transponder for all users. It is expected that these initial guidelines will be further developed after commissioning.

coordination

Due to the very large number of variations of transmission parameters, it is essential that all users notify their transmission parameters on the co-ordination chat room page that has been established by AMSAT-DL and the BATC at <

Transponder Usage

As a general principle, the transponder should be only be used for short-duration tests and contacts.

The only long duration (more than 10 minute) transmissions should be:

- The TV beacon channel uplinked from Qatar or Bochum.

- Video of the live proceedings of AMSAT and Amateur TV Lectures and Conferences of wide interest. Examples might include:
    - National AMSAT Conferences
    - National Amateur TV Conventions

The following content is unacceptable:

- Recordings of events, or broadcast of events not explicitly concerned with Amateur Satellites or Amateur TV
- Transmission of any copyright material (such as movies or TV channels)
- The relaying of terrestrial Amateur TV Repeaters is discouraged unless the content is of exceptional amateur radio interest.

transmission power

All uplink transmissions should use the minimum power possible. No transmissions should have a downlink signal with a higher power density than the Beacon - the web-based spectrum monitor will enable users to set their uplink power to achieve this.

transmission modes

Transmissions should use DVB-S2 where possible. For normal standard definition transmissions, 2 MS is the maximum symbol rate that should be used.

To enable easy decoding PIDs should be set as: Video 256, Audio, 257, PMT 32 or 4095, PCR 256 or 258. Service Name should be set to CallSign. PMT PIDs 4000 - 4010 should not be used. Users are encouraged to experiment with higher-order DVB-S2 modes at lower symbol rates (for example 333 KS 32APSK) to conserve bandwidth for other users.

On Wednesdays (UTC time), experimenters are encouraged to try other modes - perhaps 6 MS using the whole transponder for brief (less than 10 minute) periods. It is essential that users to announce their plans on the chat room page, and to always monitor it.

beacon

The beacon will initially run 24/7, but it is anticipated that, as more users become active, this will be reduced to a shorter period every hour.

Initial tape plan

1. the maintenance uplink will only be used very occasionally, but users are requested to give it absolute priority when notified.

2. DVB-S2 users are requested to use the steepest roll-off that their equipment is capable of to reduce the possibility of adjacent channel interference.

3. recommended spot frequencies for various usages and symbol rates are listed below

4. uplink 2401.5 - 2409.5 RHCP, downlink 10491 - 10499 Horizontal.

Role	Symbol Rate	Uplink freq	Downlink freq	Designer	Notes
beacon wide	2MS	2403.0	10492.5	2MS1	Initial Beacon Mode
Beacon Narrow	1MS	2402.25	10491.75	1MS1	Possible future beacon mode
simplex	2MS	2403.0	10492.5	2MS1	Only available outside beacon hours
simplex	2MS	2406.0	10495.5	2MS2	
simplex	1MS	2402.25	10491.75	1MS1	Only available outside beacon hours
simplex	1MS	2403.75	10493.25	1MS2	Only available outside beacon hours or when beacon is in narrow mode
simplex	1MS	2405.25	10494.75	1MS3	Only available if 2MS2 not in use
simplex	1MS	2406.75	10496.25	1MS4	Only available if 2MS2 not in use
simplex	333KS	2407.75	10497.25	333KS1	
simplex	333KS	2408.25	10497.75	333KS2	
simplex	333KS	2408.75	10498.25	333KS3	
simplex	333KS	2409.25	10498.75	333KS4	
simplex	125KS	2407.625	10497.125	125KS1	Only available if 333KS1 not in use
simplex	125KS	2407.875	10497.375	125KS2	Only available if 333KS1 not in use
simplex	125KS	2408.125	10497.625	125KS3	Only available if 333KS2 not in use
simplex	125KS	2408.375	10497.875	125KS4	Only available if 333KS2 not in use
simplex	125KS	2408.625	10498.125	125KS5	Only available if 333KS3 not in use
simplex	125KS	2408.875	10498.375	125KS6	Only available if 333KS3 not in use
simplex	125KS	2409.125	10498.625	125KS7	Only available if 333KS4 not in use
simplex	125KS	2409.375	10498.875	125KS8	Only available if 333KS4 not in use