



# Satellite options overview

Datawell - Oceanographic Instruments

## Satellite communication options

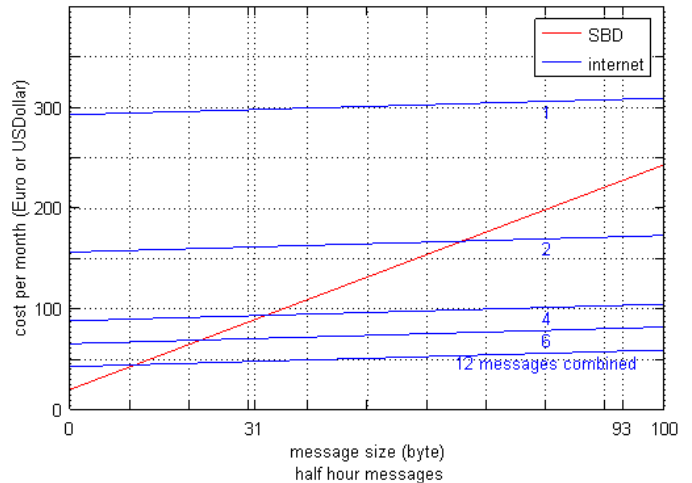
Datawell offers a choice of 3 satellite communication systems, in chronological order: Argos, Iridium internet and recently Iridium SBD. Each system will be discussed in short first, before giving an overview and drawing conclusions.

### Argos

The Argos satellite system has a long history of reliable service and has been available on Waveriders for over 3 decades. Short messages of 31 bytes are transmitted, repeating typically every 100 s. The message contains GPS position, wave parameters, sea surface temperature and, in the DWR4, also ACM current speed and direction. For earlier subscriptions with 20-bit Argos IDs, rather than 28-bit, a 32 byte message containing a compressed heave and directional spectrum can also be chosen. 8 Argos low-orbit satellites pass overhead in 10 minutes and receive the messages. Messages can be viewed on the Argos website and downloaded in a spreadsheet-format. With 2 passes per day per satellite on the equator and 14 passes on the poles, coverage is much better on the poles. Argos offers relatively low power operation due to low transmit power (0.5 W). However, due to satellite pass prediction or simply continuous satellite coverage, other satellite systems offer comparably low power operation, despite high transmit power (10 W). Argos charges a fixed rate of € or \$ 15 per day, but only if the buoy Argos transmitter is active. The transmitter is small enough to fit in the DWR-G4.

### Iridium internet and SBD

Iridium coverage is truly global, with a constellation of 66 satellites in total. It offers different services, two of which are implemented by Datawell. Iridium SBD (Short Burst Data) sends short messages and has become available on Waveriders only recently. Iridium internet works just like the GSM internet option and sets up a TCP/IP connection with a customer's PC server running Datawell iBuoy software. After initialisation, which typically takes 10 s, data may be transferred at a continuous rate of 150 bytes/second. Iridium internet is charged per minute, while Iridium SBD is charged per byte. The graph shows the cost per month of both services. Iridium SBD has a higher rate per byte and therefore a steeper curve (red). However, due to the initialisation time Iridium internet is



much more expensive for frequent, short messages of a few bytes (top blue line).

By combining several messages in one transfer the initialisation costs are lowered (other blue lines). As a result Iridium SBD is most suited for short, immediate data updates, whereas Iridium internet is advised for larger amounts of data or if 1-6 hour latency is acceptable. The Iridium SBD interfaces via email. Emails are received by Datawell sbdBuoy software which again integrates with W@ves21. At present the same Iridium modem is used for both services. Despite the same modem, customers cannot simply switch between services, since different buoy firmwares are required. The E-version contains Iridium internet and the B-version Iridium SBD. The modem is too large to fit the DWR-G4, but smaller (SBD) modems exist or are introduced (Iridium internet).

### Overview

The table below gives an overview of the various satellite communication systems offered on Datawell buoys. It is divided in 4 sections: satellite system, ground system, data and cost. The entries are based on Datawell experience and subscriptions.

For large amounts of (logger) data, Iridium internet is the only possibility on Waveriders. Even so, the service proves to be highly reliable in that each call results in successful data transfer. Likewise, Iridium SBD performance tests showed a constant 48 messages per day at half hour message intervals. Argos typically yields only 10 messages on 53° latitude. Still, for the



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small DWR-G4 buoy, Argos is the only satellite option. For short, immediate data updates Iridium SBD is most cost-efficient, otherwise Iridium internet is.

compare much more satellite communication systems come to the same conclusions [1], i.e. favouring Iridium SBD and Iridium internet.

This overview only considers satellite communication systems offered on Waverider buoys. However, Datawell has made a well-thought selection out of all available systems, of course. Experienced users who

[1] "Satellite communications systems buyers' guide", Michael Prior-Jones, British Antarctic Survey, [www.scor-int.org/Working\\_Groups/satellite-systems-buyers.pdf](http://www.scor-int.org/Working_Groups/satellite-systems-buyers.pdf)

	Satellite communication system	Argos	Iridium internet	Iridium SBD
satellite system	geographical coverage	global	global	global
	time coverage	not continuous <sup>1</sup> best on poles	continuous	continuous
	typical latency	1 hour	seconds	seconds
	bi-directional	no	yes	yes
ground system	buoys	all	all except DWR-G4	all except DWR-G4
	buoy firmware	...B...	...E...	...B...
	interface	Argos CLS website	permanently online PC	email provider
	software	any spread sheet	iBuoy	sbdBuoy
data	GPS position, wave param., sea surface temp.	yes (DMF <sup>2</sup> 3,5,6)	yes (DMF <sup>2</sup> 3,5,6)	yes (DMF <sup>2</sup> 3,5,6)
	heave and directional spectrum (no. frequency bins)	compres. (13) <sup>3</sup>	full (64) & compres. (27) (DMF <sup>2</sup> 0,9)	compres. (27) (DMF <sup>2</sup> 0,9)
	logger data	no	yes	no
	data availability	last ½ hour	last 6 hours <sup>4</sup> all logger data	last ½ hour
cost	energy consumption (mW)	60	74-8 <sup>5</sup>	50
	rate € or \$	15/day	1/minute 20/month	1.5/KByte 20/month
	cost € or \$/month compres. @ ½ hour (bytes per msg)	450 (32 bytes)	280-60 <sup>5</sup> (93 bytes)	230 (93 bytes)

<sup>1</sup> 16-104 passes/day (equator-pole)

<sup>2</sup> DMF Datawell Message Format message ID's

<sup>3</sup> only for 20-bit Argos ID allowing 32 byte message

<sup>4</sup> full spectrum only last ½ hour

<sup>5</sup> 1 compressed spectrum every ½ hour-combination of 12 compressed spectra every 6 hours