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Subject:	Pharus Ignis 4 - PI4 - A digital modulation (MGM) for beacon purposes		
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(Read in conjunction with SC11_C5_28 Introduction of a 1 minute mixed beacon mode (CW & MGM))



Pharus Ignis 4 - PI4 - A digital modulation (MGM) for beacon purposes

A beacon call sign consist of an ITU compliant call sign and in some odd cases extended with a /B to indicate the call sign is used for beacon purposes.

Therefore, a call sign may consist of up to eight characters, named char0 to char7. Shorter call signs are right justified and padded with spaces from left. The characters in the call sign are then:

- Numbers: 0 to 9, i.e. 10 characters
- Letters: A to Z (capitals only), i.e. 26 characters
- Special characters: space /, i.e. 2 characters

In total, a vocabulary of 38 characters is needed. The vocabulary is converted into numeric values according to the following table.

Character	Value	Character	Value	Character	Value
0	0	D	13	Q	26
1	1	E	14	R	27
2	2	F	15	S	28
3	3	G	16	T	29
4	4	H	17	U	30
5	5	I	18	V	31
6	6	J	19	W	32
7	7	K	20	X	33
8	8	L	21	Y	34
9	9	M	22	Z	35
A	10	N	23	Space	36
B	11	O	24	/	37
C	12	P	25		

A message length (call sign) of eight characters and vocabulary of 38 characters results in 38^8 equivalent to 4 347 792 138 496, combinations, or $38^8 - 1$ if an empty (all space) message is excluded. 42 bits can represent either number.

A PI4 message might on special occasions be used for other purposes than a call sign by using the following syntax:

- //Extension, can be used if eight characters are not enough to contain the call sign. Then the complete call sign consists of the concatenated Extension and Call sign strings, e.g. Z7IGY/MM and ___//OX/O can be transmitted for the complete call sign OX/OZ7IGY/MM
- Space/Locator, e.g. _/JO55WM
- /SpaceMessage, e.g.
 - Power supply voltage [V]: /_PS13V8
 - Power supply current [A]: /_PS04A2
 - Solar power [kW]: /_SUN1K5
 - Wind power [kW]: /_WND0K4
 - Battery level [%]: /_BAT098
 - Temperature, positive [°C]: /_TMPO40
 - Temperature, negative [°C]: /_TMNE05
 - Humidity [%]: /_HUMI62
 - Output power [W]: ___/_P25W
 - Output power [dBm]: /_P20DBM
 - Return loss [dB]: /_RL21DB
 - SWR [decimal]: /_SWR1D3
 - "Something" is unlocked: /_UNLOCK
 - VCO is unlocked: /_VCOULK
 - GPS error: /_GPSERR
 - Beacon is in error: ___/_ERROR
 - Beacon is in protected mode: /_PROTEC
 - Intrusion in cabinet/site: /_INTRUD
- QMessage, beacon specific compounded status message. An ITU compliant call sign never begins with a "Q", e.g.
 - QJN3NX10 could mean supply voltage is 13,8 V, current consumption is 4,2 A, battery level is 98%, temperature is 40 °C, output power is 25 W, SWR is 1,3, GPS is OK and no intrusion at the site

Where space is shown as an underscore "_" in the examples.

Special messages including preamble are, like the call sign, right justified and padded with spaces from left.

Call sign extension is sent just as frequent as the call sign. However, non call sign messages should not be sent too frequently. In most cases only the /_UNLOCK, /_GPSERR, /_ERROR messages are relevant for normal users. For a remote and difficult to access beacon it might be relevant to transmit status information from time to time.