

# Updated BST Message

Byte	Description	Beam	Data format	Update Rate	Info
0	GPS Absolute Time	1 OR 2	64 bits : UTC Format [Number of microseconds since 01/01/1970]	Turn	Automatic Update by BST Master Every Turn
1					
2					
3					
4					
5					
6					
7					
8	Turn Count Number	1 OR 2	0 .. 4294967294 (106 hours - reset on first injection)	Turn	Automatic Update by BST Master Every Turn
9					
10					
11					
11					
12	LHC Fill Number	1 = 2	32 bits : integer or Absolute Time with second resolution	On Change	BI Main Task
13					
14					
15					
16	Total Intensity	1	4 Bytes : integer * 10E8 charges	1Hz	BI Main Task
17					
18					
19					
20	Total Intensity	2	4 Bytes : integer * 10E8 charges	1Hz	BI Main Task
21					
22					
23					
24	Beam Momentum	1 = 2	2 bytes in GEV/c	1Hz	BI Main Task
25					
26	BST Master Status Register	1 OR 2	Bit Enumeration: Ring 1 or 2 or SPS, Master Running Flags, Test Bits...	Turn	BI Main Task
27	Machine Mode	1 = 2	Enumerated type: No beam, filling, ramping, physics,...	On Change	BI Main Task
28					
29	Particle Type	1	Enumerated type: proton, Pb, Sn, Kr, Ar, O, ..	On Change	BI Main Task
30	Particle Type	2	Enumerated type: proton, Pb, Sn, Kr, Ar, O, ..	On Change	BI Main Task
31-63	Used exclusively by AB/BI				

# Updated BST Message – Machine Mode

- Propose to transmit only “Beam Mode” NOT “Accelerator Mode”

## Beam Mode

What the LHC is doing		
1	NOMODE	No mode, data is not available, not set
2	SETUP	Setup
3	INJPILOT	Pilot injection
4	INJINTR	Intermediate injection
5	INJNOMN	Nominal injection
6	PRERAMP	Before ramp
7	RAMP	Ramp
8	FLATTOP	Flat top
9	SQUEEZE	Squeeze
10	ADJUST	Adjust beam on flat top
11	STABLE	Stable beam for physics
12	UNSTABLE	Unstable beam
13	BEAMDUMP	Beam dump
14	RAMPDOWN	Ramp down
15	RECOVERY	Recovering
16	INJDUMP	Inject and dump
17	CIRCDUMP	Circulate and dump
18	ABORT	Recovery after a beam permit flag drop
19	CYCLING	Pre-cycle before injection, no beam
20	WBDUMP	Warning beam dump
21	NOBEAM	No beam or preparation for beam

## Accelerator Mode

Machine mode		
1	NOMMODE	No valid machine mode
2	ACCESS	Access or about to access machine
3	SHUTDOWN	Machine shutdown
4	COOLDOWN	Cryo related before start up
5	CHECKOUT	Checking subsystems before startup
6	TEST	Ad-hoc tests with no beam
7	CALIB	Calibrating power converters
8	SETUP	Machine setup with beam
9	PROTPHYS	Proton physics
10	IONPHYS	Ion physics
11	TOTPHYS	Totem physics
12	MD	Machine development with beam
13	WARMUP	One ore more sectors warming up for repair
14	RECOVERY	Quench or cryo recovery
15	SECTDEP	Status dependent on sector modes

# Updated BST Message - Summary

- **Beam Mode changed to 2 bytes**
  - Propose to transmit only “Beam Mode”
  - “Accelerator Mode” NOT transmitted
- **Total Beam Intensity**
  - Initial info will come from 16 bit GMT telegram with resolution of  $10^{10}$  particles
    - This will give 0 for a single pilot!
  - BST transmission will remain as 4 bytes
    - Future implementation of a direct BI link from BCTs foreseen
    - Theoretical resolution of  $10^8$  particles
- **Is the byte order of the BST message already fixed for any experiment?**
  - BI would like the possibility to re-order the “general message” location in the **near future** to resolve some technical issues
- **LHC-BOB-ES-0001 – “The interface and structure of the machine beam synchronous timing message for the LHC experiments”** will be updated to reflect changes