Grundlagen der Navigation

Praktikum Versuch 4

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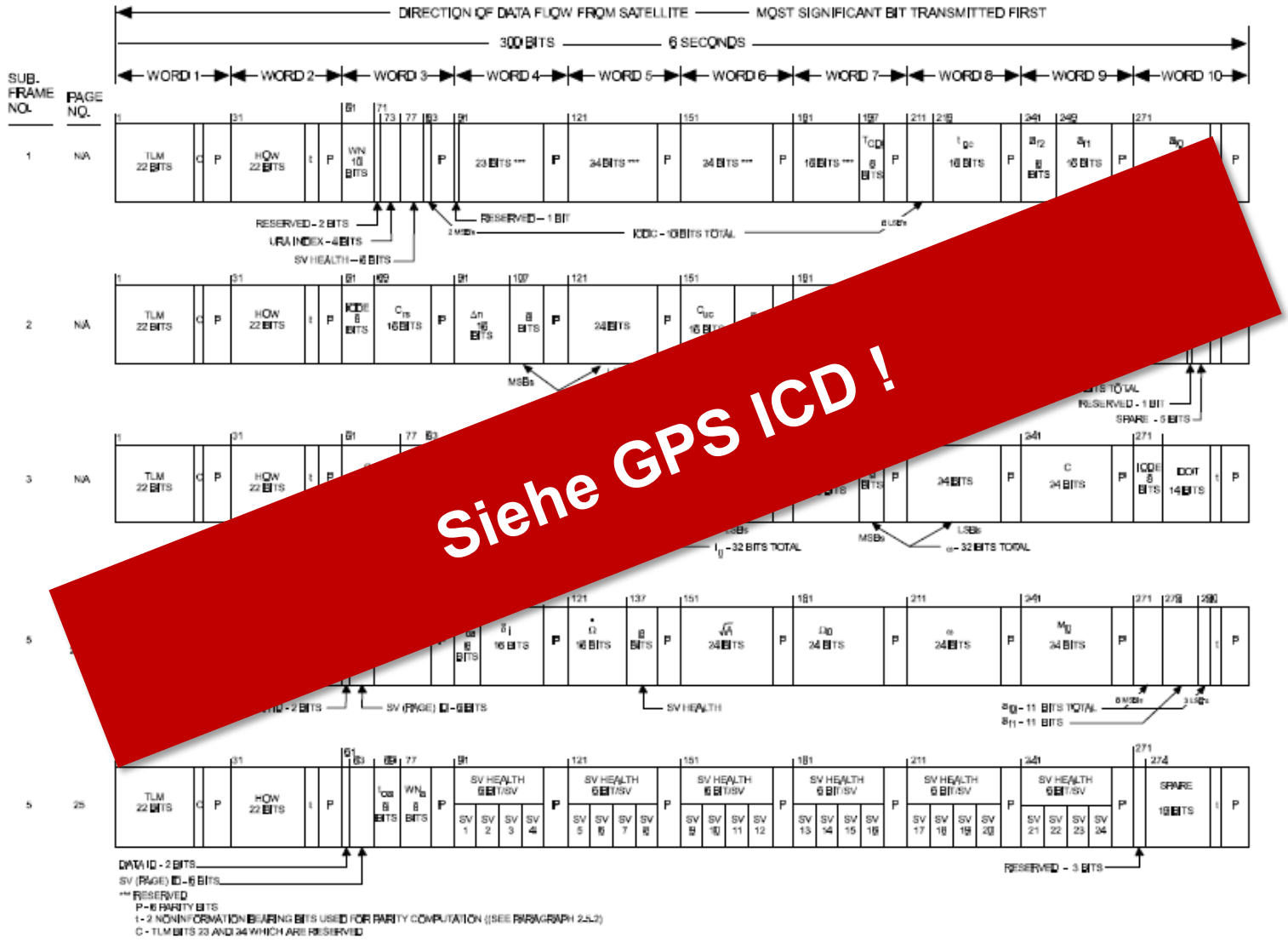
Übersicht: GdN Praktikum Versuch 4

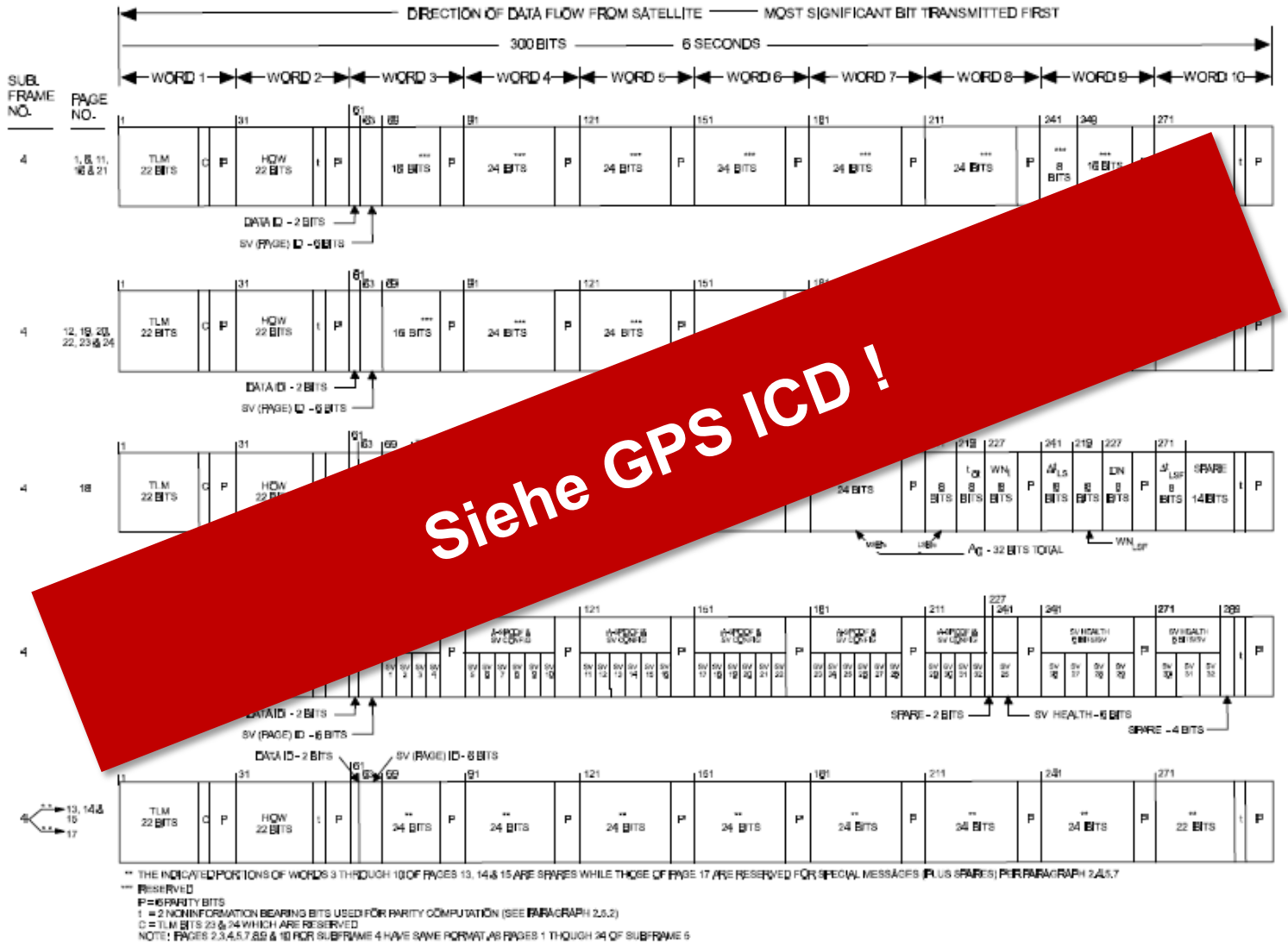
1. Format der Navigationsnachricht
2. Präambel und HOW
3. Ephemeriden Daten und Skalierung

Datenformat



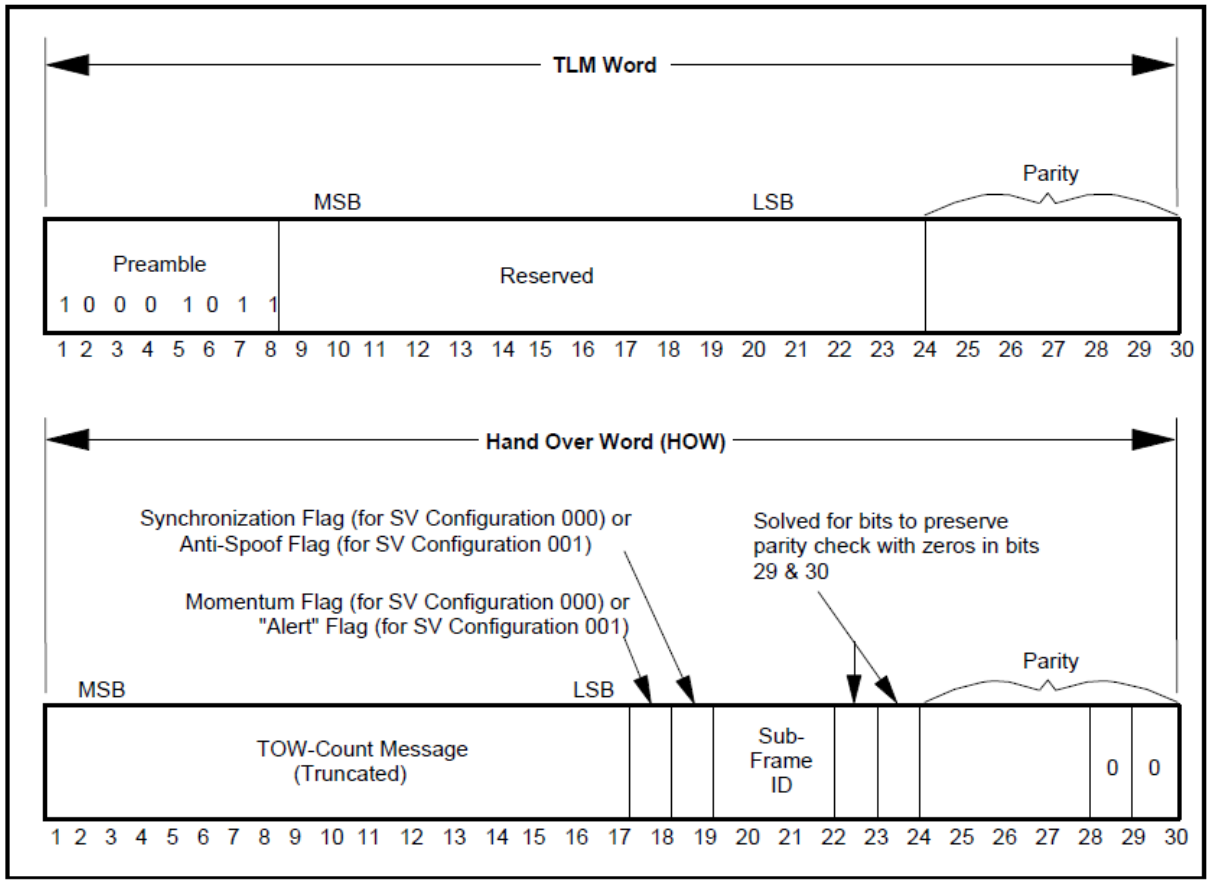
Siehe GPS ICD !

Datenformat



** THE INDICATED PORTIONS OF WORDS 3 THROUGH 10 OF PAGES 13, 14 & 15 ARE SPARES WHILE THOSE OF PAGE 17 ARE RESERVED FOR SPECIAL MESSAGES (PLUS SPARES) PER PARAGRAPH 2.5.7
*** RESERVED
P = 6 PARITY BITS
t = 2 NON-INFORMATION BEARING BITS USED FOR PARITY COMPUTATION (SEE PARAGRAPH 2.5.2)
0 = TLM BITS 23 & 24 WHICH ARE RESERVED
NOTE: PAGES 2, 3, 4, 5, 7, 8, 9 & 10 OF SUBFRAME 4 HAVE SAME FORMAT AS PAGES 1 THROUGH 24 OF SUBFRAME 5

Datenformat



Datenformat

Parameter	No. of Bits	Scale Factor (LSB)	Effective Range***	Units
Week No.	10	1		Week
satellite accuracy	4			(see text)
satellite health	6	1		discretes
T_{GD}	8*	2^{-31}		seconds
IODC	10			(see text)
t_{oc}	16	2^{4}	604,784	seconds
a_{f2}	8*	2^{-55}		sec/sec^2
a_{f1}	16*	2^{-43}		sec/sec
a_{f0}	22*	2^{-31}		seconds
IODE	8			(see text)
C_{rs}	16*	2^{-5}		meters
Δn	16*	2^{-43}		semi-circles/sec
M_0	32*	2^{-31}		semi-circles
C_{uc}	16*	2^{-29}		radians
e	32	2^{-33}	0.03	dimensionless
C_{us}	16*	2^{-29}		radians
$(A)^{1/2}$	32	2^{-19}		$meters^{1/2}$
t_{oe}	16	2^{4}	604,784	seconds
C_{ic}	16*	2^{-29}		radians
$(OMEGA)_0$	32*	2^{-31}		semi-circles
C_{is}	16*	2^{-29}		radians
i_0	32*	2^{-31}		semi-circles
C_{rc}	16*	2^{-5}		meters
ω	32*	2^{-31}		semi-circles
OMEGADOT	24*	2^{-43}		semi-circles/sec
IDOT	14*	2^{-43}		semi-circles/sec

* Parameters so indicated are two's complement, with the sign bit (+ or -) occupying the MSB;
** See Figure 2-8 for complete bit allocation in subframe;
*** Unless otherwise indicated in this column, effective range is the maximum range attainable with indicated bit allocation and scale factor.

Datenformat

$$D_1 = d_1 \oplus D_{30}^*$$
$$D_2 = d_2 \oplus D_{30}^*$$
$$D_3 = d_3 \oplus D_{30}^*$$
$$\bullet \quad \bullet$$
$$\bullet \quad \bullet$$
$$\bullet \quad \bullet$$
$$\bullet \quad \bullet$$
$$D_{24} = d_{24} \oplus D_{30}^*$$
$$D_{25} = D_{29}^* \oplus d_1 \oplus d_2 \oplus d_3 \oplus d_5 \oplus d_6 \oplus d_{10} \oplus d_{11} \oplus d_{12} \oplus d_{13} \oplus d_{14} \oplus d_{17} \oplus d_{18} \oplus d_{20} \oplus d_{23}$$
$$D_{26} = D_{30}^* \oplus d_2 \oplus d_3 \oplus d_4 \oplus d_6 \oplus d_7 \oplus d_{11} \oplus d_{12} \oplus d_{13} \oplus d_{14} \oplus d_{15} \oplus d_{18} \oplus d_{19} \oplus d_{21} \oplus d_{24}$$
$$D_{27} = D_{29}^* \oplus d_1 \oplus d_3 \oplus d_4 \oplus d_5 \oplus d_7 \oplus d_8 \oplus d_{12} \oplus d_{13} \oplus d_{14} \oplus d_{15} \oplus d_{16} \oplus d_{19} \oplus d_{20} \oplus d_{22}$$
$$D_{28} = D_{30}^* \oplus d_2 \oplus d_4 \oplus d_5 \oplus d_6 \oplus d_8 \oplus d_9 \oplus d_{13} \oplus d_{14} \oplus d_{15} \oplus d_{16} \oplus d_{17} \oplus d_{20} \oplus d_{21} \oplus d_{23}$$
$$D_{29} = D_{30}^* \oplus d_1 \oplus d_3 \oplus d_5 \oplus d_6 \oplus d_7 \oplus d_9 \oplus d_{10} \oplus d_{14} \oplus d_{15} \oplus d_{16} \oplus d_{17} \oplus d_{18} \oplus d_{21} \oplus d_{22} \oplus d_{24}$$
$$D_{30} = D_{29}^* \oplus d_3 \oplus d_5 \oplus d_6 \oplus d_8 \oplus d_9 \oplus d_{10} \oplus d_{11} \oplus d_{13} \oplus d_{15} \oplus d_{19} \oplus d_{22} \oplus d_{23} \oplus d_{24}$$

where:

$d_1, d_2, \cdots d_{24}$ are the source data bits

the symbol (*) is used to identify the last 2 bits of the previous word of the subframe,

$D_{25}, \cdots D_{30}$ are the computed parity bits

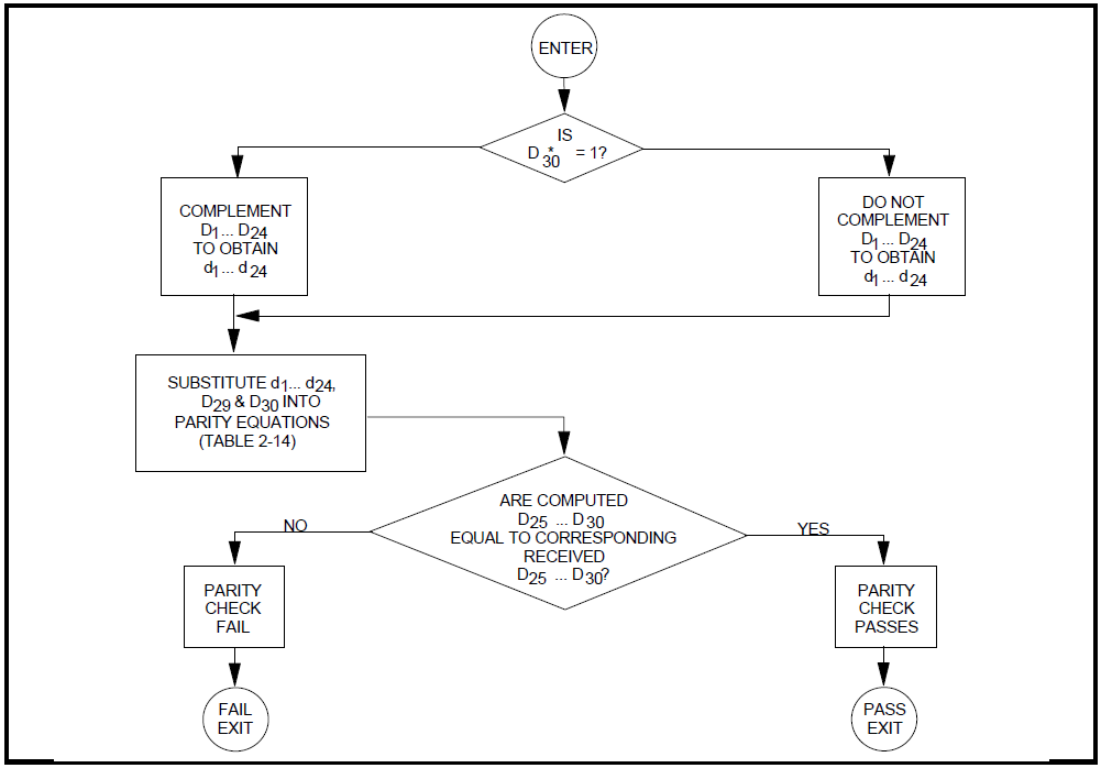
$D_1, D_2, D_3, \cdots D_{29}, D_{30}$ are the bits transmitted by the satellite, and

$\oplus$ is the "Modulo-2" or "Exclusive-Or" operation.

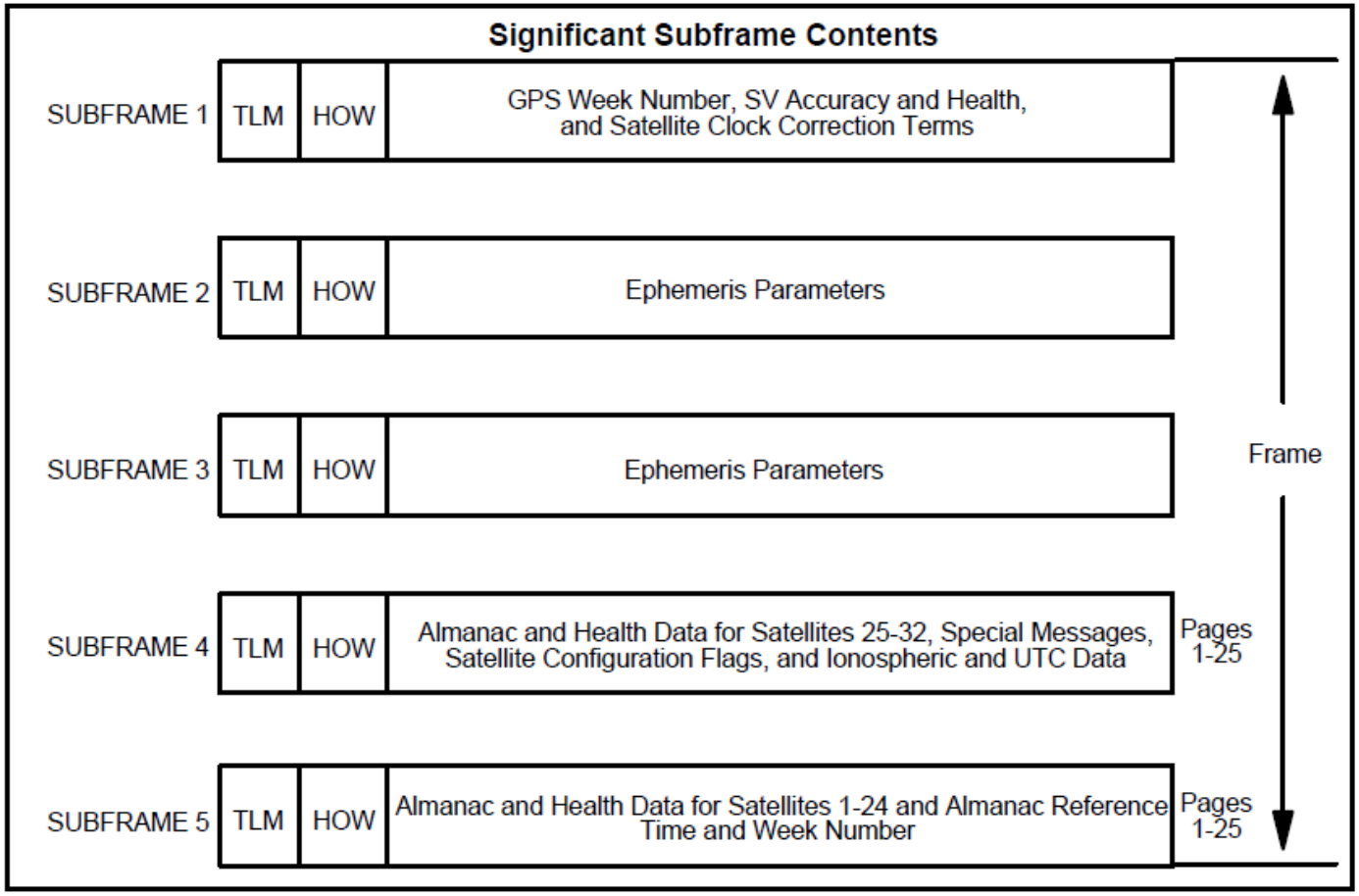
Datenformat

2.5.2 Parity Algorithm

The user must perform error detection of the decoded navigation data using the parity algorithm equations provided in Table 2-14. Figure 2-10 presents an example flow chart that defines one way of recovering data (d_n) and checking parity. The parity bit D^*_{30} is used for recovering raw data. The parity bits D^*_{29} and D^*_{30}, along with the recovered raw data (d_n) are modulo-2 added in accordance with the equations appearing in Table 2-14 for D_{25} . . . D_{30}, which provide computed parity to compare with transmitted parity D_{25} . . . D_{30}.



Datenformat



Ergebnisse

- Ergebnisse für die gegebene Datei `trackingResults.mat`
- PRN 4
- Beschränken Sie sich auf die Dekodierung
  - weekNumber
  - IODC
  - t_oe
  - M_0

```
weekNumber: 1869
  accuracy: 0
    health: 63
      T_GD: -6.5193e-009
      IODC: 242
      t_oc: 309600
      a_f2: 0
      a_f1: -5.3433e-012
      a_f0: -4.1692e-005
  IODE_sf2: 113
      C_rs: -56.4688
    deltan: 5.0624e-009
       M_0: 1.7685
      C_uc: -3.1218e-006
         e: 0.0120
      C_us: 8.2757e-006
     sqrtA: 5.1536e+003
      t_oe: 309600
      C_ic: -2.0862e-007
   omega_0: 1.4478
      C_is: -2.3469e-007
       i_0: 0.9405
      C_rc: 210.5938
     omega: 1.1158
  omegaDot: -8.2743e-009
  IODE_sf3: 113
      iDot: -7.7860e-011
```

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