TSG-RAN Working Group 1 meeting #10
Beijing, China
January 18 – January 21, 2000

TSGR1#10(00)0066

Agenda item: AH 8

Source: Nokia

Title: CR 25.212-037, CR 25.215-033: Removal of CM fixed gap position

Document for: Decision

Fixed gap position mode measurement cases can all be handled with adjustable position mode.

Gain in reduced signalling is very small as the choice between fixed and adjustable has to be signalled.

Thus, it is proposed to remove fixed gap positions to reduce complexity.

In addition, a small typing error in 25.212, figure 13, is corrected.

3GPP/SMG Meeting #10
Beijing, China, 18-21 Jan 2000

Document R1-00-0066
e.g. for 3GPP use the format TP-99xxx or for SMG, use the format P-99-xxx

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25.212	**CR**	**037**	Current Version: 3.1.0

GSM (AA.BB) or 3G (AA.BBB) specification number ↑ — *↑ CR number as allocated by MCC support team*

For submission to:	RAN # 7	for approval	X	strategic		(for SMG use only)
list expected approval meeting # here ↑		for information		non-strategic		

Form: CR cover sheet, version 2 for 3GPP and SMG The latest version of this form is available from: ftp://ftp.3gpp.org/Information/CR-Form-v2.doc

Proposed change affects: (U)SIM [ ] ME [ ] UTRAN / Radio [X] Core Network [ ]
(at least one should be marked with an X)

Source: Nokia **Date:** 04-Jan-2000

Subject: Removal of fixed gap position in 25.212

Work item:

Category: *(only one category shall be marked with an X)*

F	Correction		
A	Corresponds to a correction in an earlier release		
B	Addition of feature		
C	Functional modification of feature	X	
D	Editorial modification		

Release:

Phase 2	
Release 96	
Release 97	
Release 98	
Release 99	X
Release 00	

Reason for change: Fixed gap positions in compressed mode patterns are not needed as it can be expressed with flexible position parameters. UE complexity can be reduced by removing this option.

Clauses affected: 4.4, 4.4.1, 4.4.4, 4.4.4.1, 4.4.4.2, 4.4.4.3

Other specs affected:

Other 3G core specifications	X	→ List of CRs:	25.215-033
Other GSM core specifications		→ List of CRs:	
MS test specifications		→ List of CRs:	
BSS test specifications		→ List of CRs:	
O&M specifications		→ List of CRs:	

Other comments:

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Contents

Denote the number of bits available in the TFCI fields of one compressed radio frame by D and the number of bits in the TFCI field in a slot by N_{TFCI}. Denote by E the first bit to be repeated, $E=N_{first}N_{TFCI}$. If $N_{last}\neq 14$, then E corresponds to the number of the first TFCI bit in the slot directly after the TG. Denote the total number of TFCI bits to be transmitted by N_{tot}. If SF ≥ 128 then N_{tot} = 32, else N_{tot} = 128. The following relations then define the mapping:

$d_k = b_{(k \bmod 32)}$

where k = 0, 1, 2, …, min (E, N_{tot})-1 and, if E< N_{tot},

$d_{k+D-Ntot} = b_{(k \bmod 32)}$

where k = E, ..., N_{tot} -1.

DTX bits are sent on d_k where k = min (E, N_{tot}), ..., min (E, N_{tot}) +D - N_{tot} -1.

4.4 Compressed mode

In compressed mode, slots N_{first} to N_{last} are not used for transmission of data. As illustrated in figure 12, ~~which shows the example of fixed transmission gap position with single frame method,~~ the instantaneous transmit power is increased in the compressed frame in order to keep the quality (BER, FER, etc.) unaffected by the reduced processing gain. The amount of power increase depends on the transmission time reduction method (see section 4.4.3). What frames are compressed, are decided by the network. When in compressed mode, compressed frames can occur periodically, as illustrated in figure 12, or requested on demand. The rate and type of compressed frames is variable and depends on the environment and the measurement requirements.

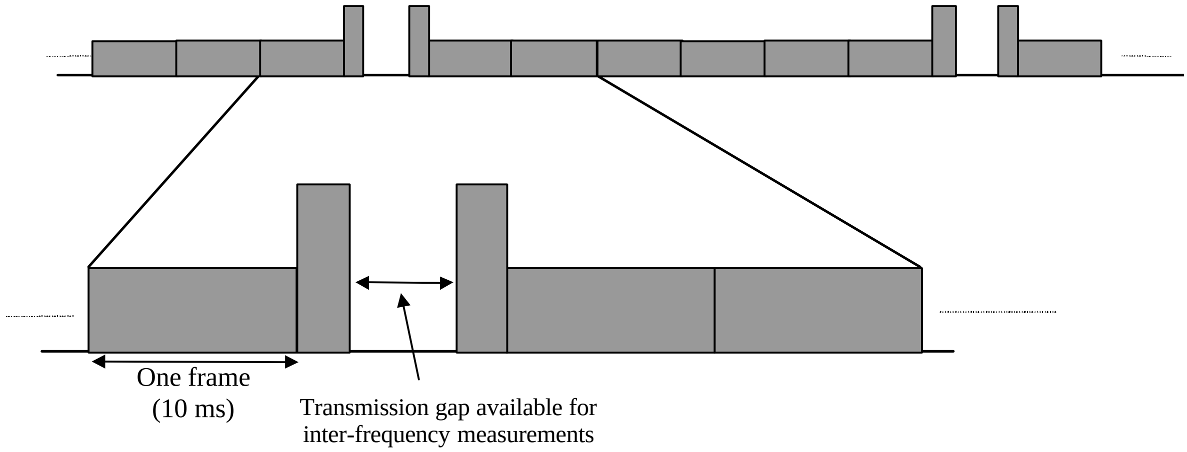


Figure 12: Compressed mode transmission

4.4.1 Frame structure in the uplink

The frame structure for uplink compressed mode is illustrated in figure 13.

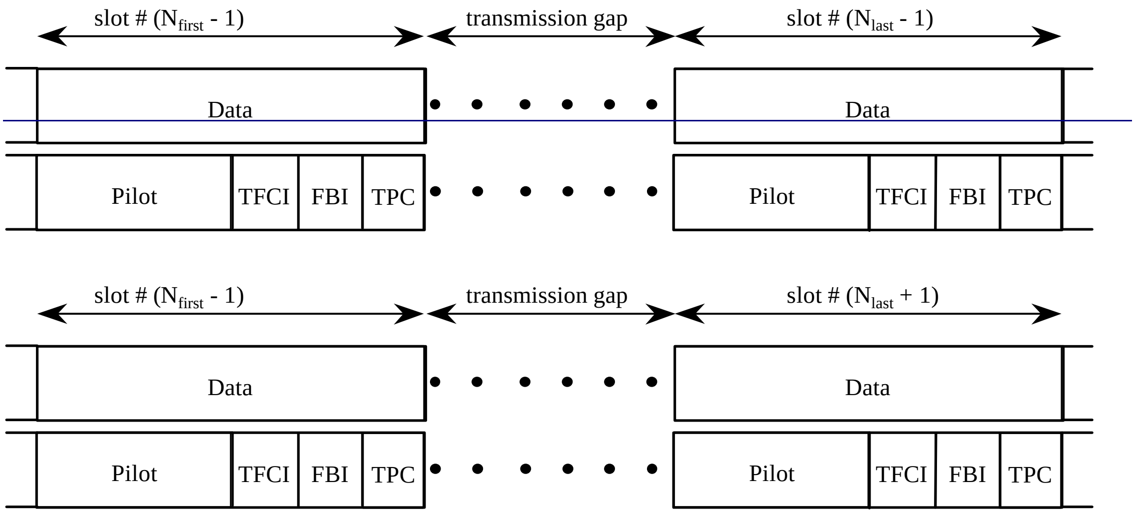
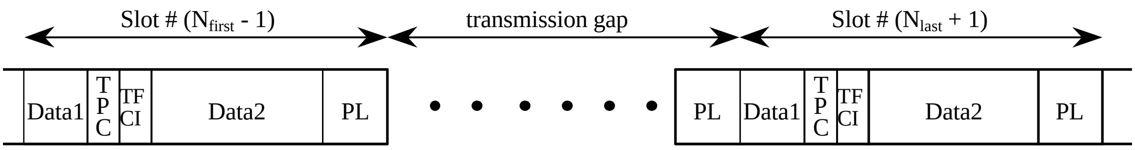


Figure 13: Frame structure in uplink compressed transmission

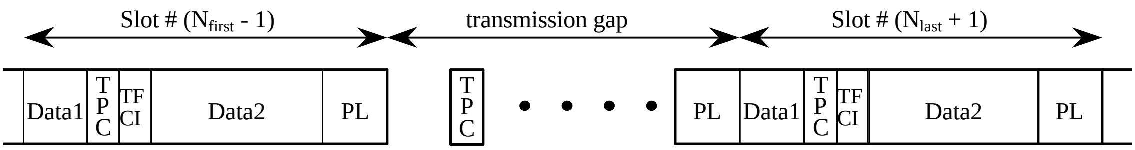
4.4.2 Frame structure types in the downlink

There are two different types of frame structures defined for downlink compressed mode. Type A maximises the transmission gap length and type B is optimised for power control.

- With frame structure of type A, the pilot field of the last slot in the transmission gap is transmitted. Transmission is turned off during the rest of the transmission gap (figure 14(a)).
- With frame structure of type B, the TPC field of the first slot in the transmission gap and the pilot field of the last slot in the transmission gap is transmitted. Transmission is turned off during the rest of the transmission gap (figure 14(b)).



(a) Frame structure type A



(b) Frame structure type B

Figure 14: Frame structure types in downlink compressed transmission

4.4.3 Transmission time reduction method

When in compressed mode, the information normally transmitted during a 10 ms frame is compressed in time. The mechanisms provided for achieving this are puncturing, reduction of the spreading factor by a factor of two , and higher layer scheduling. In the downlink, all methods are supported while compressed mode by puncturing is not used in the uplink. The maximum idle length is defined to be 7 slots per one 10 ms frame. The slot formats that are used in compressed mode are listed in [2].

4.4.3.1 Compressed mode by puncturing

During compressed mode, rate matching (puncturing) is applied for creating transmission gap in one frame. The algorithm for rate matching (puncturing) as described in section 4.2.7 is used.

4.4.3.2 Compressed mode by reducing the spreading factor by 2

During compressed mode, the spreading factor (SF) can be reduced by 2 during one radio frame to enable the transmission of the information bits in the remaining time slots of a compressed frame.

On the downlink, UTRAN can also order the UE to use a different scrambling code in compressed mode than in normal mode. If the UE is ordered to use a different scrambling code in compressed mode, then there is a one-to-one mapping between the scrambling code used in normal mode and the one used in compressed mode, as described in TS 25.213[3] section 5.2.1.

4.4.3.3 Compressed mode by higher layer scheduling

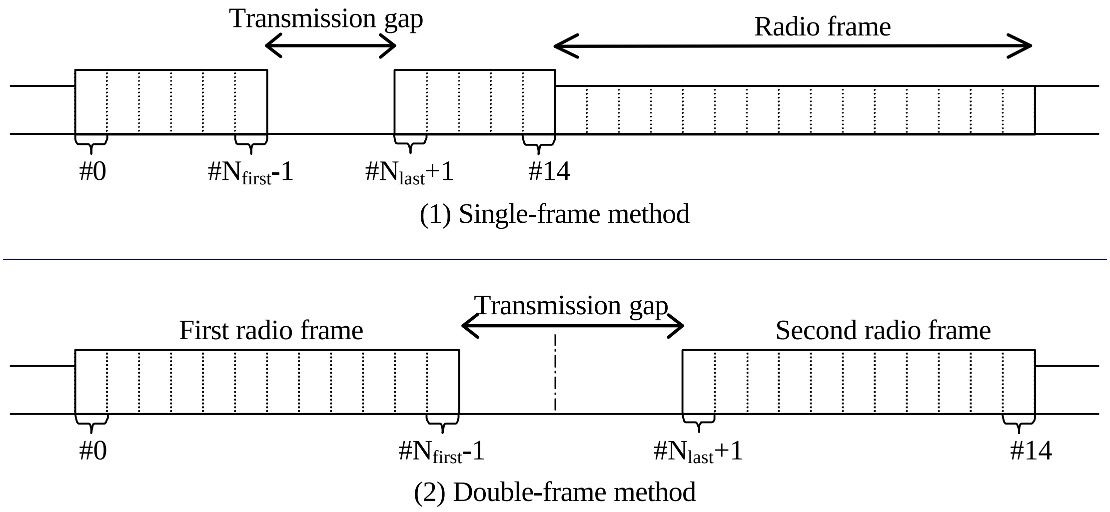
Compressed mode can be obtained by higher layer scheduling. Higher layers then set restrictions so that only a subset of the allowed TFCs are used in compressed mode. The maximum number of bits that will be delivered to the physical layer during the compressed radio frame is then known and a transmission gap can be generated.

4.4.4 Transmission gap position

Transmission gaps can be placed at ~~both fixed position and adjustable~~ positions as shown in figure 15 for each purpose such as interfrequency power measurement, acquisition of control channel of other system/carrier, and actual handover operation.

~~4.4.4.1 Fixed transmission gap position~~

~~The transmission gaps can be placed onto fixed positions. When using single frame method, the fixed transmission gap is located within the compressed frame depending on the transmission gap length (TGL) as shown in figure 15 (1). When using double frame method, the fixed transmission gap is located on the center of two connected frames as shown in figure 15 (2). Table 9 shows the parameters for the fixed transmission gap position case.~~



~~Figure 15: Fixed transmission gap position~~

Table 9: Parameters for fixed transmission gap position

	Single-frame method		Double-frame method	
TGL (slot)	N_{first}	N_{last}	N_{first}	N_{last}
3	7	9	14 in first frame	1 in second frame
4	6	9	13 in first frame	1 in second frame
7	6	12	12 in first frame	3 in second frame
10	N.A.	N.A.	10 in first frame	4 in second frame
14	N.A.	N.A.	8 in first frame	6 in second frame

4.4.4.2 Adjustable transmission gap position

Position of transmission gaps can be adjustable/relocatable for some purpose e.g. data acquisition on certain position as shown in figure 16. Parameters of the adjustable transmission gap positions are calculated as follows:

TGL is the number of consecutive idle slots during compressed mode,

TGL = 3, 4, 5, 7, 10, 14

N_{first} specifies the starting slot of the consecutive idle slots,

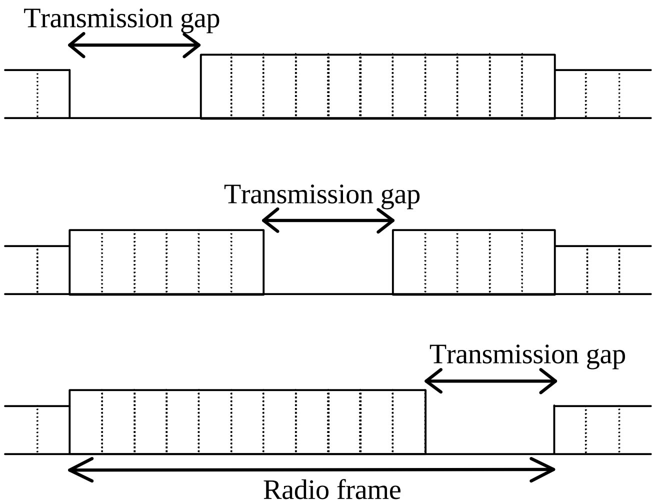
N_{first} = 0,1,2,3,…,14.

N_{last} shows the number of the final idle slot and is calculated as follows;

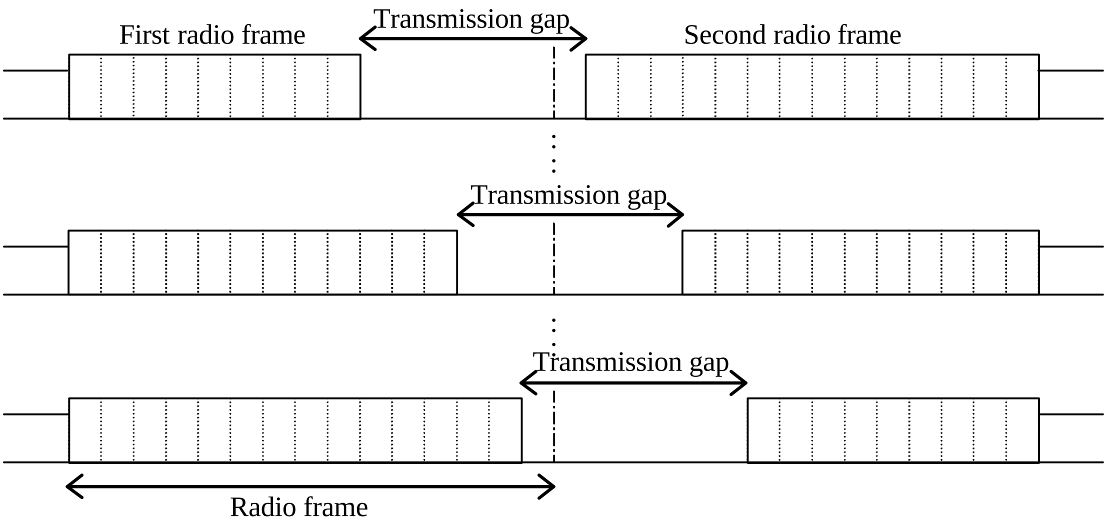
If N_{first} + TGL ≤ 15, then N_{last} = N_{first} + TGL –1 (in the same frame),

If N_{first} + TGL > 15, then N_{last} = (N_{first} + TGL – 1) mod 15 (in the next frame).

When the transmission gap spans two consecutive radio frames, N_{first} and TGL must be chosen so that at least 8 slots in each radio frame are transmitted.



(1) Single-frame method



(2) Double-frame method

Figure 16: Adjustable transmission gap lengths position

4.4.5~~4.3~~ Parameters for downlink compressed mode

Table 10 shows the detailed parameters for each transmission gap length for the different transmission time reduction methods.

Table 10: Parameters for compressed mode

TGL	Type	Spreading Factor	Idle length[ms]	Transmission time Reduction method	Idle frame Combining
3	A	512 – 4	1.73-1.99	Puncturing Spreading factor reduction by 2 Higher layer scheduling	(S) (D) =(1,2),(2,1)
	B	256- 4	1.60-1.86		
4	A	512 - 4	2.40-2.66		(S) (D) =(1,3),(2,2),(3,1)
	B	256- 4	2.27-2.53		
7	A	512 -4	4.40-4.66		(S) (D)=(1,6),(2,5),(3,4),(4,3),(5,2),(6,1)
	B	256- 4	4.27-4.53		
10	A	512 - 4	6.40-6.66		(D)=(3,7),(4,6),(5,5),(6,4),(7,3)
	B	256- 4	6.27-6.53		
14	A	512 - 4	9.07-9.33		(D) =(7,7)
	B	256- 4	8.93-9.19		

(S): Single-frame method as shown in figure 15 (1).

(D): Double-frame method as shown in figure 15 (2). (x,y) indicates x: the number of idle slots in the first frame, y: the number of idle slots in the second frame.

NOTE: Compressed mode by spreading factor reduction is not supported when SF=4 is used in normal mode.

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Beijing, China, 18-21 Jan 2000

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25.215 CR 033 Current Version: 3.1.0

GSM (AA.BB) or 3G (AA.BBB) specification number ↑ *↑ CR number as allocated by MCC support team*

For submission to: RAN # 7 — for approval [X] — for information [ ] — strategic [ ] — non-strategic [ ] *(for SMG use only)*

list expected approval meeting # here ↑

Form: CR cover sheet, version 2 for 3GPP and SMG The latest version of this form is available from: ftp://ftp.3gpp.org/Information/CR-Form-v2.doc

Proposed change affects: (U)SIM [ ] ME [ ] UTRAN / Radio [X] Core Network [ ]
(at least one should be marked with an X)

Source: Nokia **Date:** 04-Jan-2000

Subject: Removal of fixed gap position in 25.215

Work item:

Category: *(only one category shall be marked with an X)*

F	Correction	
A	Corresponds to a correction in an earlier release	
B	Addition of feature	
C	Functional modification of feature	X
D	Editorial modification	

Release:

Phase 2	
Release 96	
Release 97	
Release 98	
Release 99	X
Release 00	

Reason for change: Fixed gap positions in compressed mode patterns are not needed as it can be expressed with flexible position parameters. UE complexity can be reduced by removing this option.

Clauses affected: 6.1.1.2

Other specs affected:

Other 3G core specifications	X	→ List of CRs:	25.212-037
Other GSM core specifications		→ List of CRs:	
MS test specifications		→ List of CRs:	
BSS test specifications		→ List of CRs:	
O&M specifications		→ List of CRs:	

Other comments:

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6 Measurements for UTRA FDD

6.1 UE measurements

6.1.1 Compressed mode

6.1.1.1 Use of compressed mode/dual receiver for monitoring

A UE shall, on upper layers commands, monitor cells on other frequencies (FDD, TDD, GSM). To allow the UE to perform measurements, upper layers shall command that the UE enters in compressed mode, depending on the UE capabilities.

In case of compressed mode decision, UTRAN shall communicate to the UE the parameters of the compressed mode, described in reference [2], 25.212.

A UE with a single receiver shall support downlink compressed mode.

Every UE shall support uplink compressed mode, when monitoring frequencies which are close to the uplink transmission frequency (i.e. frequencies in the TDD or GSM 1800/1900 bands).

All fixed-duplex UE shall support both downlink and uplink compressed mode to allow inter-frequency handover within FDD and inter-mode handover from FDD to TDD.

> < WG1's note : the use of uplink compressed mode for single receiver UE when monitoring frequencies outside TDD and GSM 1800/1900 bands is for further study >

UE with dual receivers can perform independent measurements, with the use of a "monitoring branch" receiver, that can operate independently from the UTRA FDD receiver branch. Such UE do not need to support downlink compressed mode.

The UE shall support one single measurement purpose within one compressed mode transmission gap. The measurement purpose of the gap is signalled by upper layers.

The following section provides rules to parametrise the compressed mode.

6.1.1.2 Parameterisation of the compressed mode

In response to a request from upper layers, the UTRAN shall signal to the UE the compressed mode parameters.

The following parameters characterize a transmission gap :

- TGL: Transmission Gap Length is the duration of no transmission, expressed in number of slots.
- SFN: The system frame number when the transmission gap starts
- SN: The slot number when the transmission gap starts

With this definition, it is possible to have a flexible position of the transmission gap in the frame, as defined in [2].

The following parameters characterize a compressed mode pattern :

- TGP: Transmission Gap Period is the period of repetition of a set of consecutive frames containing up to 2 transmission gaps (*).
- TGL: As defined above
- TGD: Transmission Gap Distance is the duration of transmission between two consecutive transmission gaps within a transmission gap period, expressed in number of frames. In case there is only one transmission gap in the transmission gap period, this parameter shall be set to zero.
- PD: Pattern duration is the total time of all TGPs expressed in number of frames.

- SFN: The system frame number when the first transmission gap starts
- UL/DL compressed mode selection: This parameter specifies whether compressed mode is used in UL only, DL only or both UL and DL.
- Compressed mode method: The method for generating the downlink compressed mode gap can be puncturing, reducing the spreading factor or upper layer scheduling and is described in [2].
- ~~Transmit gap position mode: The gap position can be fixed or adjustable. This is defined in [2].~~
- Downlink frame type: This parameter defines if frame structure type 'A' or 'B' shall be used in downlink compressed mode. This is defined in [2].
- Scrambling code change: This parameter indicates whether the alternative scrambling code is used for compressed mode method 'SF/2'. Alternative scrambling codes are described in [3].
- PCM: Power Control Mode specifies the uplink power control algorithm applied during recovery period after each transmission gap in compressed mode. PCM can take 2 values (0 or 1). The different power control modes are described in [4].
- PRM: Power Resume Mode selects the uplink power control method to calculate the initial transmit power after the gap. PRM can take two values (0 or 1) and is described in [4].

In a compressed mode pattern, the first transmission gap starts in the first frame of the pattern. The gaps have a fixed position in the frames, and start in the slot position defined in [2].

(*): Optionally, the set of parameters may contain 2 values TGP1 and TGP2, where TGP1 is used for the 1st and the consecutive odd gap periods and TGP2 is used for the even ones. Note if TGP1=TGP2 this is equivalent to using only one TGP value.

In all cases, upper layers has control of individual UE parameters. The repetition of any pattern can be stopped on upper layers command.

The UE shall support [8] simultaneous compressed mode patterns which can be used for different measurements. Upper layers will ensure that the compressed mode gaps do not overlap and are not scheduled within the same frame. Patterns causing an overlap or too long gaps will not be processed by the UE and interpreted as a faulty message.

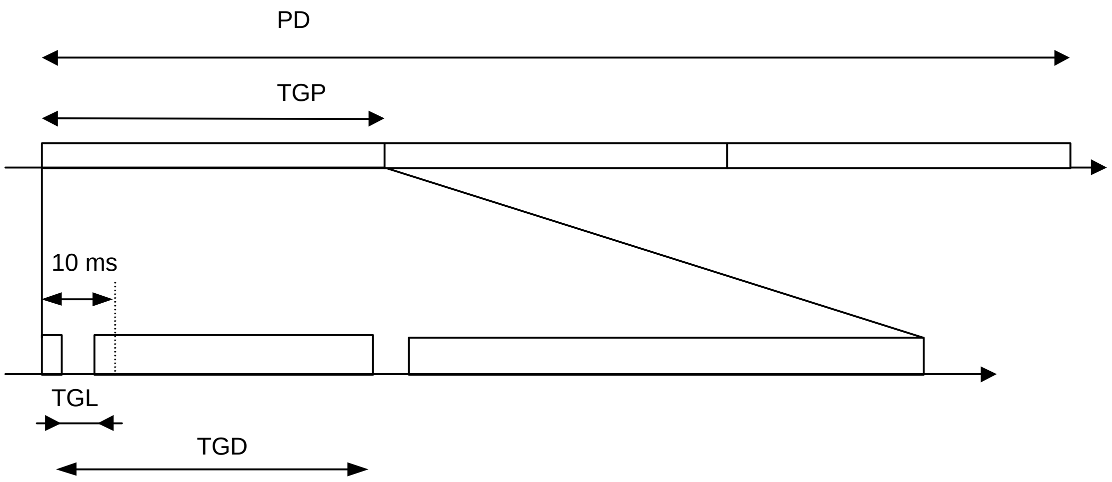

Figure 1 : illustration of compressed mode pattern parameters

6.1.1.3 Parameterisation limitations

In the table below the supported values for the TGL parameter is shown.