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Title	**Unifying the scan and sleep protocols**	
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Re:	IEEE P802.16e/D2-2004	
Abstract	Unifying sleep ad scanning mechanisms	
Purpose	The purpose of this document is to make change in the scanning and sleep MAC management protocol	
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Sleep and Scanning Unification

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Details:

Sleep mode and scanning are two separate mechanisms that enable an MSS to stay registered with a BS while being offline for a pre-registered period of time (without needing to actually do UL/DL data exchanges). The essential differences between the two mechanisms are:

1. During the 'offline' period an MSS may do nothing (save power) and/or scan, while it scans in the scanning interval.

This document will explain the motivation of unifying the two mechanisms, suggest a way to do that and will detail all changes required in standard to support that

Motivation:

1. Reduce complexity from the spec - right now there are two separate protocols.
2. In case of improvements in protocol will be done once for both.
3. Right now sleep is a more advanced protocol and all its features could be used by scanning.

Changes summary:

The change is basically to remove the scanning mechanism as it is today and use the sleep mechanism as is for both with small changes:

1. Have one Offline request response message for sleep, scanning or any other future required offline mechanism e.g. measurements.
2. Add in the request response a 2 bits field indicating what is the offline reason is it for scanning, sleep or any other future reason.
3. Increase the initial window option from 6 bits to 12 bits to enable the old scanning size.
4. Increase the 10 bits final window to 12 final window – for the same reason, to enable the old scanning values.

Changes Details to merge sleep and scanning:

Table 14a Page 11

Change “MOB-SLP-XXX” To “MOB-OFLN-XXX”
Change “Sleep XXXX message” TO “Offline XXXX message”
Remove MOB-SCN-REQ and MOB-SCN-RSP (types 54,55)

Section 6.3.2.3.47 Page 16

Original:

6.3.2.3.47 Sleep Request message (MOB-SLP-REQ)

MSS supporting sleep-mode uses the MOB-SLP-REQ message to request permission from the BS to enter sleep-mode. The MOB-SLP-REQ message is sent from the MSS to the BS on the MSS’s basic CID.

Table 92a—Sleep-Request (MOB-SLP-REQ) message format

Syntax	Size	Notes
SLP-REQ_Message_Format() {		
Management message type = 46	8 bits	
initial-sleep window	6 bits	
final-sleep window base	10 bits	
listening interval	4 bits	
final-sleep window exponent	3 bits	
reserved	1 bit	

Parameters shall be as follows:

Initial-sleep window
Requested start value for the sleep interval (measured in frames).
Final-sleep window base
Requested final value for the sleep interval (measured in frames).
Listening interval
Requested listening interval (measured in frames) to the MOB-SLP-REQ.
Final-sleep window exponent
Defines the factor by which the final-sleep window base is multiplied in order to calculate the final-sleep window. The following formula is used:
final-sleep window = final-sleep window base * 6(final-sleep window exponent)
}

Changed:

6.3.2.3.47 Offline Request message (MOB-OFLN-REQ)

MSS supporting offline-mode uses the MOB-OFLN-REQ message to request permission from the BS to enter offline-mode. The MOB-OFLN-REQ message is sent from the MSS to the BS on the MSS's basic CID.

Table 92a—Offline-Request (MOB-OFLN-REQ) message format

Syntax	Size	Notes
SLP-REQ_Message_Format() {		
Management message type = 46	8 bits	
Offline-type	2 bits	Sleep – 0, Scan – 1,
initial-offline window	12 bits	
final-offline window base	12 bits	
listening interval	4 bits	
final-offline window exponent	3 bits	
}		

Parameters shall be as follows:

Offline-type
Requested type of offline can be scan or sleep
Initial-offline window
Requested start value for the offline interval (measured in frames).
Final-offline window base
Requested final value for the offline interval (measured in frames).
Listening interval
Requested listening interval (measured in frames) to the MOB-OFLN-REQ.
Final-offline window exponent
Defines the factor by which the final-offline window base is multiplied in order to calculate the final-offline window. The following formula is used:
final-offline window = final-offline window base * 6(final-offline window exponent)

Section 6.3.2.3.48 Page 17

Original:

6.3.2.3.48 Sleep Response message (MOB-SLP-RSP)

The MOB-SLP-RSP message shall be sent from BS to a MSS on the MSS's basic CID in response to an MOB-SLP-REQ message, or may be sent unsolicited. The MSS shall enter sleep-mode using the parameters and Sleep ID (SLPID) indicated in the message. In the case where sleep is denied (After-REQ-action=1), it is recommended that the BS provide unsolicited MOB-SLP-RSP message.

Table 92b—Sleep-Response (MOB-SLP-RSP) message format

syntax	size	Notes
MOB-SLP-RSP_Message_Format() **{**		
Management message type = 47	8 bits	
Sleep-approved	1 bit	0: Sleep-mode request denied 1: Sleep-mode request approved
If (Sleep-approved == 0) {		

After-REQ-action	1 bit	0: The MSS may retransmit the MOB-SLP-REQ message after the time duration (REQ-duration) given by the BS in this message 1: The MSS shall not retransmit the MOB-SLP-REQ message and shall await the MOB-SLP-RSP message from the BS
REQ-duration	4 bit	Time duration for case where After-REQ-action value is 0.
reserved	2 bits	
}		
else {		
Start frame	6 bits	
initial-sleep window	6 bits	
final-sleep window	10 bits	
listening interval	4 bits	
final-sleep window exponent	3 bits	
SLPID	10 bits	
}		
}		

Parameters shall be as follows:

Sleep approved
The activation indication of the MSS when the MSS receives this message from the BS.
After-REQ-action
On MSS request to enter sleep mode rejected by the BS, indicate recourse action.
REQ-duration
Waiting value for the MOB-SLP-REQ message re-transmission (measured in MAC frames)
Start-frame
Lower 7 bits of the frame number in which the MSS shall enter into sleep mode.
Initial-sleep window
Start value for the sleep interval (measured in frames).
Final-sleep window base
Final value for the sleep interval (measured in frames).
Listening interval
Requested listening interval (measured in frames) to the MOB-SLP-REQ.
Final-sleep window exponent
Defines the factor by which the final-sleep window base is multiplied in order to calculate the final-sleep window. The following formula is used: final-sleep window = final-sleep window base * 6(final-sleep window exponent)
SLPID
This is a number assigned by the BS whenever an MSS is instructed to enter sleep-mode. This number shall be unique in the sense that it is assigned to a single MSS that is instructed to enter sleep-mode. No other MSS shall be assigned the same number while the first MSS is still in

Changed:

6.3.2.3.48 Offline Response message (MOB-OFLN-RSP)

The MOB-OFLN-RSP message shall be sent from BS to a MSS on the MSS's basic CID in response to an MOB-OFLN-REQ message, or may be sent unsolicited. The MSS shall enter offline-mode using the parameters and Offline ID (OFLNID) indicated in the message. In the case where offlline is denied (After-REQ-action=1), it is recommended that the BS provide unsolicited MOB-OFLN-RSP message.

Table 92b—Offline-Response (MOB-OFLN-RSP) message format

Syntax	size	Notes
MOB-OFLN-RSP_Message_Format() {		
Management message type = 47	8 bits	
Offline-type	2 bits	Sleep – 0, Scan – 1,
Offline-approved	1 bit	0: Offline-mode request denied 1: Offline-mode request approved
If (Offline-approved == 0) {		
After-REQ-action	1 bit	0: The MSS may retransmit the MOB-OFLN-REQ message after the time duration (REQ-duration) given by the BS in this message 1: The MSS shall not retransmit the MOB-OFLN-REQ message and shall await the MOB-OFLN-RSP message from the BS
REQ-duration	4 bit	Time duration for case where After-REQ-action value is 0.
}		
else {		
Start frame	6 bits	
Initial-offline window	12 bits	
final-offline window	12 bits	
listening interval	4 bits	
final-offline window exponent	3 bits	
OFLNID	10 bits	
reserved	6 bits	
}		
}		

Parameters shall be as follows:

Offline-type
Requested type of offline can be scan or sleep

Offline approved
The activation indication of the MSS when the MSS receives this message from the BS.

After-REQ-action
On MSS request to enter offline mode rejected by the BS, indicate recourse action.

REQ-duration
Waiting value for the MOB-OFLN-REQ message re-transmission (measured in MAC frames)

Start-frame
Lower 7 bits of the frame number in which the MSS shall enter into offline mode.

Initial-offline window
Start value for the offline interval (measured in frames).

Final-offline window base
Final value for the offline interval (measured in frames).

Listening interval
Requested listening interval (measured in frames) to the MOB-OFLN-REQ.

Final-offline window exponent
Defines the factor by which the final-offline window base is multiplied in order to calculate the final-offline window. The following formula is used: final-offline window = final-offline window base * 6(final-offline window exponent)

OFLNID

This is a number assigned by the BS whenever an MSS is instructed to enter offline-mode. This number shall be unique in the sense that it is assigned to a single MSS that is instructed to enter offline-mode. No other MSS shall be assigned the same number while the first MSS is still in

Section 6.3.2.3.49 Page 18

Original:

6.3.2.3.49 Traffic Indication message (MOB-TRF-IND)

This message is sent from BS to MSS on the broadcast CID. The message is intended for MSS's that are in sleep-mode, and is sent during those MSS's listening-intervals. The message indicates whether there has been traffic addressed to each MSS that is in sleep-mode and whether Periodic Ranging opportunity for each MSS exists or not within its own sleep interval. An MSS that is in sleep-mode during its listening-interval shall decode this message to seek an indication addressed to itself.
When an MSS awakens, it will check the frame number to ensure that it did not lose frame synchronization with the BS and read the two-bit SLPID indicator assigned to it, then take one of the following actions:

SLPID indicator 00

The MSS will have neither a periodic ranging opportunity nor PDU such as DL traffic. The MSS may return to sleep mode.

SLPID indicator 01

The MSS will not have a periodic ranging opportunity but it will have PDUs such as DL traffic so that the MSS shall transit to awake mode.

SLPID indicator 10

The MSS will have a periodic ranging opportunity, but it will not have PDUs such as additional MAC Management messages after successful periodic raging operation. The MSS shall read its 'Ranging Frame Offset' in the order of its SLPID among all the MSSs with their indicator set to '10' or '11'. MSS may return to and remain in sleep mode until the start of periodic ranging operation apart from the end of its listening interval as 'Ranging Frame Offset'. And then, it shall awaken to decode the UL-MAP for periodic ranging opportunity. Upon completion of the periodic ranging operation, it may return to sleep mode if not passed the sleep interval.

SLPID indicator 11

MSS will have a periodic ranging opportunity and PDUs such as additional MAC Management messages after successful periodic raging operation. Thus, it shall do the same operation as the case where the SLPID indicator is 10 except for remaining in an awake mode to receive the additional MAC Management message even after the completion of the periodic ranging operation.

If the MSS meets another listening interval during the periodic ranging operation, it shall monitor and decode MOB_TRF-IND message.

There are two formats for the MOB_TRF-IND message, indicated by the FMT field. When FMT=0, if it the MSS does not find its own SLPID in the MOB_TRF-IND message, it will consider this as a negative indication and shall return to sleep mode. When FMT=1, if the MSS does not find its own basic CID in the MOB_TRF-IND message, it will consider this as a negative indication and shall return to sleep mode.

Table 92c—Traffic-Indication (MOB-TRF-IND) message format

Syntax	Size	Notes
MOB-TRF-IND_Message_Format() {		
Management message type = 48	8 bits	
FMT	1 bit	0=SLPID based format, 1=CID based format
if (FMT == 0)		
SLPID bit-map	Variable	
} else {		
Num-pos	7 bits	Number of CIDs on the positive indication list
for (i=0; i<Num-pos; i++) {		
CID	16 bits	Basic CID of the SS

Parameters shall be as follows:

SLPID bit-map

The SLPID bit-map field is a variable length field (that is its length is determined by the number of SLPID currently assigned by the BS). The least-significant bit of the first byte in this field relates to SLPID=0, and subsequent bits relate to SLPID=1, etc.

The MSS that has been assigned SLPID=n by the SLP-RSP message shall interpret bit n (b_n) in the SLPID bit map in the following manner:

b_n = 0 means negative indication, MSS may return to sleep mode

b_n = 1 means positive indication, MSS shall awake

The BS shall consider the MSS to be out of sleep-mode, only after receiving any packet from any of the MSS connections.

Changed:

6.3.2.3.49 Traffic Indication message (MOB-TRF-IND)

This message is sent from BS to MSS on the broadcast CID. The message is intended for MSS's that are in offline-mode, and is sent during those MSS's listening-intervals. The message indicates whether there has been traffic addressed to each MSS that is in offline-mode and whether Periodic Ranging opportunity for each MSS exists or not within its own offline interval. An MSS that is in offline-mode during its listening-interval shall decode this message to seek an indication addressed to itself.
When an MSS get out of offline mode, it will check the frame number to ensure that it did not lose frame synchronization with the BS and read the two-bit OFLNID indicator assigned to it, then take one of the following actions:

OFLNID indicator 00

The MSS will have neither a periodic ranging opportunity nor PDU such as DL traffic. The MSS may return to offline mode.

OFLNID indicator 01

The MSS will not have a periodic ranging opportunity but it will have PDUs such as DL traffic so that the MSS shall transit to online mode.

OFLNID indicator 10

The MSS will have a periodic ranging opportunity, but it will not have PDUs such as additional MAC Management messages after successful periodic raging operation. The MSS shall read its 'Ranging Frame Offset' in the order of its OFLNID among all the MSSs with their indicator set to '10' or '11'. MSS may return to and remain in offline mode until the start of periodic ranging operation apart from the end of its listening interval as 'Ranging Frame Offset'. And then, it

shall awaken to decode the UL-MAP for periodic ranging opportunity. Upon completion of the periodic ranging operation, it may return to offline mode if not passed the offline interval.

OFLNID indicator 11

MSS will have a periodic ranging opportunity and PDUs such as additional MAC Management messages after successful periodic raging operation. Thus, it shall do the same operation as the case where the OFLNID indicator is 10 except for remaining in an online mode to receive the additional MAC Management message even after the completion of the periodic ranging operation.

If the MSS meets another listening interval during the periodic ranging operation, it shall monitor and decode MOB_TRF-IND message.

There are two formats for the MOB_TRF-IND message, indicated by the FMT field. When FMT=0, if it the MSS does not find its own OFLNID in the MOB_TRF-IND message, it will consider this as a negative indication and shall return to offline mode. When FMT=1, if the MSS does not find its own basic CID in the MOB_TRF-IND message, it will consider this as a negative indication and shall return to offline mode.

Table 92c—Traffic-Indication (MOB-TRF-IND) message format

Syntax	Size	Info
MOB-TRF-IND_Message_Format() {		
Management message type = 48	8 bits	
FMT	1 bit	0=OFLNID based format, 1=CID based format
if (FMT == 0) {		
OFLNID bit-map	Variable	
} else {		
Num-pos	7 bits	Number of CIDs on the positive indication list
for (i=0; i<Num-pos; i++) {		
CID	16 bits	Basic CID of the SS
}		
}		
}		

Parameters shall be as follows:

OFLNID bit-map

The OFLNID bit-map field is a variable length field (that is its length is determined by the number of OFLNID currently assigned by the BS). The least-significant bit of the first byte in this field relates to OFLNID=0, and subsequent bits relate to OFLNID=1, etc.
The MSS that has been assigned OFLNID=n by the OFLN-RSP message shall interpret bit n (b_n) in the OFLNID bit map in the following manner:

b_n = 0 means negative indication, MSS may return to offline mode

b_n = 1 means positive indication, MSS shall return online

The BS shall consider the MSS to be out of offline-mode, only after receiving any packet from any of the MSS connections.

Section 6.3.2.3.50 Page 21

Line 38 change “sleep mode” To “Offline Mode

Section 6.3.2.3.51 Page 21

Remove

Section 6.3.2.3.52 Page 22

Remove

Section 6.3.19 Page 34

Original:

6.3.19 Sleep-mode for mobility-supporting MSS

6.3.19.1 Introduction

Sleep-mode is a mode in which MSSs supporting mobility may power down, scan neighbor BSs, range neighbor BSs, conduct hand-over/network re-entry, or perform other activities for which the MSS will be unavailable to the Serving BS for DL or UL traffic. Sleep-mode is intended to enable mobility-supporting MSSs to minimize their power usage and to facilitate hand-over decision and operation while staying connected to the network. Implementation of sleep-mode is optional for the MSS and mandatory for the BS.

An MSS in sleep-mode shall engage in a sleep-interval, defined as a time duration, measured in whole frames, where the MSS is in sleep-mode. The sleep-interval is constructed of one or more variable-length, consecutive sleep-windows, with interleaved listening-windows. During a sleep-window, an MSS does not send or receive PDUs, and may power down one or more physical operation components, or may awaken forperiodic ranging. During a listening-interval, an MSS shall synchronize with the Serving BS downlink and listen for an appropriate MOB-TRF-IND traffic indication message. The MSS shall decide whether to stay awake or go back to sleep based on the value of its own 2-bit indicator in the SLPID bitmap in a MOB-TRF-IND from the Serving BS. During consecutive sleep-windows and listening-windows, comprising a single sleep-interval, sleepwindow shall be updated using the algorithm as defined in 6.4.17.2 Sleep window update algorithm.

Before entering sleep-mode the MSS shall inform the BS using MOB-SLP-REQ and obtain its approval. The Serving BS shall respond with an MOB_SLP_RSP message. The Serving BS may send an unsolicited MOB-SLP-RSP to the MSS to initiate MSS sleep-mode. After receiving an MOB-SLP-RSP message from the BS, an MSS shall enter sleep-mode by beginning sleep-interval at the appropriate frame prescribed by start-frame.

An MSS shall awaken, enter into an interleaved listening-window according to the sleep-interval, and check whether there were PDUs addressed for it and Periodic Ranging opportunity within the next sleep interval. The listening-window parameter defines the maximum number of whole frames the MSS shall remain awake waiting for an MOB-TRF-IND message. Traffic indication message (MOB-TRF-IND) shall be sent by the BS on the broadcast CID during each appropriate MSS listening window. If there is no SLPID to be addressed, the BS sends an empty indication message, that is, MOB_TRF-IND message without SLPID bitmap. The BS may buffer (or it may drop) incoming PDUs addressed to the sleeping MSS and shall send notification to the MSS in its listening-window about whether data has been addressed for it during an preceding interval. If such PDUs exist, or if the listening interval has

passed but the MSS didn't receive any TRF-IND message, the MSS shall remain awake, terminating the sleep-interval and re-entering Normal Operation.

If MSS finds that there will be a periodic ranging opportunity within next sleep window, then, it may return to sleep mode until the start of periodic ranging operation apart from the end of the negotiated listening interval as its own Ranging Frame Offset, and it shall awaken to decode the UL-MAP for periodic ranging opportunity. Upon completion of Periodic ranging operation, it may return to sleep mode if not passed the sleep interval or remain in awake mode based on its two–bit indicator in the SLPID bit-map.

An MSS may terminate sleep-mode and return to Normal Operation anytime (i.e. there is no need to wait until the sleep-interval is over). If a Serving BS receives a PDU from an MSS that is supposed to be in sleep mode, the BS shall assume that the MSS is no longer in sleep-mode, except for RNG-REQ and DBPC-REQ. Any UL message from the MSS to the Serving BS shall interrupt the sleep-interval, shall signal the Serving BS that the MSS is still active and connected and has not dropped connection during its sleep-interval.

Upon completion of sleep-interval, the MSS shall awaken and return to Normal Operation.

6.3.19.2 Sleep-window update algorithm

An MSS shall enter sleep-mode after receiving an SLP-RSP message from the BS. In the first time it enters sleep-mode, it shall use the initial-sleep window value for the sleep interval. If during the following listening interval the BS has not signaled that traffic has been addressed for the MSS, the MSS shall re-enter sleep mode and double the duration of the sleep-window. This procedure shall be repeated as long as the resulting sleep-window does not exceed the final-sleep window value. The following formula defines the calculation
of the duration of *kth* sleep-window - *Ik*:

I_0 = initial-sleep window
$I_k = min\ (2\ I \bullet k\text{-}1,$ final-sleep window) k>0 .

.
.
When the MSS has reached the final-sleep window size, it shall continue in sleep mode without further increasing the sleep-window. The next sleep window shall start from the end of the previous one.

6.3.19.3 Traffic indication signaling

A BS shall notify each MSS in sleep-mode, during its listening-interval, if traffic has been addressed to the MSS during any sleep-window iteration. The indication is sent on the MOB-TRF-IND broadcast message. The MSS shall examine the frame number from the PHY Synchronization Field during each listening-window and shall verify synchronization with the BS. If the expected frame number is different than the discovered frame number, the MSS shall return to Normal Operation. Upon detecting a changed DCD count in the DL MAP, the MSS shall remain awake until receiving the DCD message. Upon detecting the changed UCD count in UL MAP, the MSS shall remain awake until it has received a UCD message.

If the MSS receives a TRF-IND message with a negative indication, it may continue in sleep mode. For an example of sleep mode operation, see Annex D.

Changed:

6.3.19 Offline-mode for mobility-supporting MSS

6.3.19.1 Introduction

Offline-mode is a mode in which MSSs supporting mobility may power down, scan neighbor BSs, range neighbor BSs, conduct hand-over/network re-entry, or perform other activities for which the MSS will be unavailable to the Serving BS for DL or UL traffic. Offline-mode is intended to enable mobility-supporting MSSs to minimize their power usage and to facilitate hand-over decision and operation while staying connected to the network. Implementation of Offline-mode is optional for the MSS and mandatory for the BS.

An MSS in offline-mode shall engage in an offline-interval, defined as a time duration, measured in whole frames, where the MSS is in offline-mode. The offline-interval is constructed of one or more variable-length, consecutive offline-windows, with interleaved listening-windows. During an offline-window, an MSS does not send or receive PDUs, and may power down one or more physical

operation components, or may awaken for periodic ranging. During a listening-interval, an MSS shall synchronize with the Serving BS downlink and listen for an appropriate MOB-TRF-IND traffic indication message. The MSS shall decide whether to stay online or go back to offline based on the value of its own 2-bit indicator in the OFLNID bitmap in a MOB-TRF-IND from the Serving BS. During consecutive offline-windows and listening-windows, comprising a single offline-interval, ofline window shall be updated using the algorithm as defined in 6.4.17.2 offline window update algorithm.

Before entering offline-mode the MSS shall inform the BS using MOB-OFLN-REQ and obtain its approval. The Serving BS shall respond with an MOB_OFLN_RSP message. The Serving BS may send an unsolicited MOB-OFLN-RSP to the MSS to initiate MSS offline-mode. After receiving an MOB-OFLN-RSP message from the BS, an MSS shall enter offline-mode by beginning offline-interval at the appropriate frame prescribed by start-frame.

An MSS shall return online, enter into an interleaved listening-window according to the offline-interval, and check whether there were PDUs addressed for it and Periodic Ranging opportunity within the next offline interval. The listening-window parameter defines the maximum number of whole frames the MSS shall remain online waiting for an MOB-TRF-IND message. Traffic indication message (MOB-TRF-IND) shall be sent by the BS on the broadcast CID during each appropriate MSS listening window. If there is no OFLNID to be addressed, the BS sends an empty indication message, that is, MOB-TRF-IND message without OFLNID bitmap. The BS may buffer (or it may drop) incoming PDUs addressed to the offline MSS and shall send notification to the MSS in its listening-window about whether data has been addressed for it during an preceding interval. If such PDUs exist, or if the listening interval has passed but the MSS didn't receive any TRF-IND message, the MSS shall remain online, terminating the offline-interval and re-entering Normal Operation.

If MSS finds that there will be a periodic ranging opportunity within next offline window, then, it may return to offline mode until the start of periodic ranging operation apart from the end of the negotiated listening interval as its own Ranging Frame Offset, and it shall come online to decode the UL-MAP for periodic ranging opportunity. Upon completion of Periodic ranging operation, it may return to offline- mode if not passed the offline interval or remain in online mode based on its two–bit indicator in the OFLNID bit-map.

An MSS may terminate offline-mode and return to Normal Operation anytime (i.e. there is no need to wait until the offline-interval is over). If a Serving BS receives a PDU from an MSS that is supposed to be in offline mode, the BS shall assume that the MSS is no longer in offline-mode, except for RNG-REQ and DBPC-REQ. Any UL message from the MSS to the Serving BS shall interrupt the offline-interval, shall signal the Serving BS that the MSS is still active and connected and has not dropped connection during its offline-interval.

Upon completion of offline-interval, the MSS shall come online and return to Normal Operation.

6.3.19.2 Offline-window update algorithm

An MSS shall enter offline-mode after receiving an OFLN-RSP message from the BS. In the first time it enters offline-mode, it shall use the initial-offline window value for the offline interval. If during the following listening interval the BS has not signaled that traffic has been addressed for the MSS, the MSS shall re-enter offline mode and double the duration of the offline-window. This procedure shall be repeated as long as the resulting offline-window does not exceed the final-offline window value. The following formula defines the calculation
of the duration of *kth* offline-window - *Ik*:

I_0 = initial-offline window
$I_k = min\ (2\ I \bullet_{k-1},$ final-offline window) k>0 .

.
.
When the MSS has reached the final-offline window size, it shall continue in offline mode without further increasing the offline-window. The next offline window shall start from the end of the previous one.

6.3.19.3 Traffic indication signaling

A BS shall notify each MSS in offline-mode, during its listening-interval, if traffic has been addressed to the MSS during any offline-window iteration. The indication is sent on the MOB-TRF-IND broadcast message. The MSS shall examine the frame number from the PHY Synchronization Field during each listening-window and shall verify synchronization with the BS. If the expected frame number is different than the discovered frame number, the MSS shall return to Normal Operation. Upon detecting a changed DCD count in the DL MAP, the MSS shall remain online until receiving the DCD message. Upon detecting the changed UCD count in UL MAP, the MSS shall remain inline until it has received a UCD message.

If the MSS receives a TRF-IND message with a negative indication, it may continue in offline mode. For an example of offline mode operation, see Annex D.

Section 6.3.19 Page 34 - figures

Changes in the following figures:
Figures 141a, 141b, 141c, 141d, 141e, 141f, 141g
Change awake to online
Change awakening to online
Change sleep to offline
Change SLP to OFLN
Change SLPID to OFLNID

Section 6.3.20.1.2 page 41

Remove

Section 6.3.20.2 Page 42

Line 32 – change “Sleep-interval” To “Offline-interval”

Section 10.1 Page 81

Table 269a parameters and constants:

Original:

System	Name	Time Reference	Minimum Value	Default Value	Maximum Value
MSS	Min_Sleep_Interval	Minimum sleeping time allowed to MSS	2 Frames		
MSS	Max_Sleep_Interval	Maximum sleeping time allowed to MSS			1024 Frames
MSS	Listening_Interval	The time duration during which the MSS, after waking up and synchronizing with the DL transmissions, can demodulate downlink transmissions and decide whether to stay awake or go back to sleep			64 Frames

Changed:

System	Name	Time Reference	Minimum Value	Default Value	Maximum Value

MSS	Min_Offline_Interval	Minimum offline time allowed to MSS	2 Frames		
MSS	Max_Offline_Interval	Maximum offline time allowed to MSS			4096 frames
MSS	Listening_Interval	The time duration during which the MSS, after online and synchronizing with the DL transmissions, can demodulate downlink transmissions and decide whether to stay online or go back offline			64 Frames

Section 10.1 Page 81

Section 11.3.2.13.1 Page 84

Page 84 – Line 53 – Change “Sleep-mode” To “Offline-mode”
In the table in 11.3.2.13.1 in page 84 - Change “Sleep-mode” To “Offline-mode”

Section 11.3.2.13.2 Page 85

Original:

11.3.2.13.2 Sleep-mode recovery time

This field indicates the time requires for an MSS which is in a sleep-mode to return to awake-mode. This parameter is optional and may be used by the BS to determine the sleep interval windows sizes when initiating sleep-mode with an MSS.

Type	Length	Value	Scope
5.24.2	1	Number of frames required for the MSS to switch from sleep-mode to Normal Mode. Maximum value = 4 frames	REG- REQ

Changed:

11.3.2.13.2 Offline-mode recovery time

This field indicates the time requires for an MSS which is in a offline-mode to return to onnline-mode. This parameter is optional and may be used by the BS to determine the offline interval windows sizes when initiating offline-mode with an MSS.

Type	Length	Value	Scope
5.24.2	1	Number of frames required for the MSS to switch from offline-mode to Normal Mode. Maximum value = 4 frames	REG- REQ

Section 11.7.10.1 page 88

Original:

11.7.10.1 Sleep-mode supported

This field indicates whether or not the MSS supports sleep-mode. A bit value of 0 indicates “not supported” while 1 indicates it is supported.

Type	Length	Value
18	1	Bit #0: Mobility (handover) support Bit #1: Sleep-mode support

Sleep-mode recovery time

This field indicates the time required for an MSS which is in a sleep-mode to return to awake-mode. This parameter is optional and may be used by the BS to determine sleep interval window sizes when initiating sleep-mode with an MSS.

Type	Length	Value
19	1	Number of freames required for the MSS to switch from sleep-mode to awake-mide

Changed:

11.7.10.1 Offline-mode supported

This field indicates whether or not the MSS supports offline-mode. A bit value of 0 indicates “not supported” while 1 indicates it is supported.

Type	Length	Value
18	1	Bit #0: Mobility (handover) support Bit #1: Offline-mode support

Offline-mode recovery time

This field indicates the time required for an MSS which is in a offline-mode to return to online-mode. This parameter is optional and may be used by the BS to determine offline interval window sizes when initiating ofline-mode with an MSS.

Type	Length	Value
19	1	Number of frames required for the MSS to switch from offline-mode to online-mode

Annex E Page 106

Line 64 – change “sleep mode” to “offline mode”

In E.1 Page 107

Change the following figures:
Figure E.1, E.2, E.3, E.4, E.5, E.6, E.7
Change MOB-SCN-XX to MOB-OFLN-XX

In E.2 Page 117

Changes in the following figures:
Figures E.11, E.12, E.13
Change sleeping to Offline
Change sleep to offline
Change SLP to OFLN
Change awake to online

In F.1 page 120

Changes in the following figures:
Figure F.1, F.2, F.3
Change SCN_XXX to OFLN_XXX