ATSC Recommended Practice: A/327:2023-03 Amendment No. 1, "PHY Profiles"

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Advanced Television Systems Committee
1300 I Street, N.W., Suite 400E
Washington, D.C. 20005
202-872-9160

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Revision History

Version	Date
Amendment approved	16 June 2023

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1. OVERVIEW

1.1 Definition

An Amendment is generated to document an enhancement, an addition or a deletion of functionality to previously agreed technical provisions in an existing ATSC document. Amendments shall be published as attachments to the original ATSC document. Distribution by ATSC of existing documents shall include any approved Amendments.

1.2 Scope

This amendment is in response to New Project Proposal N-049. It describes various profiles of the physical layer.

1.3 Rationale for Changes

ATSC A/322 enables many possible PHY configurations. It is beneficial to the industry to define a manageable number of configurations to be supported by packagers and receivers.

1.4 Compatibility Considerations

It is expected that guidance provided in the proposed amendment will be backward compatible with existing broadcast emissions and plants and existing receivers in the field.

2. LIST OF CHANGES

Change instructions are given below in *italics*. Unless otherwise noted, inserted text, tables, and drawings are shown in blue; deletions of existing text are shown in ~~red strikeout~~. The text "[ref]" indicates that a cross reference to a cited referenced document should be inserted. Yellow highlighted references indicate the document editor should insert the appropriate internal document references.

2.1 Change Instructions

Add a new reference in Section 2 as follows:

[16] ATSC: "ATSC Recommended Practice: Techniques for Signaling, Delivery and Synchronization," Doc. A/351:2022-03, Advanced Television System Committee, Washington, D.C., 31 March 2022.

Modify Annex C as follows:

Annex C: ATSC 3.0 ~~Service Examples~~ Physical Layer Configurations

This Annex provides various Physical Layer configurations of one or more complete delivered products (as defined in 4.2.11). The first subsection defines a variety of syntax variations for receiver testing. The second subsection provides recommended structures for specific use cases.

C.1 EXAMPLE VARIATIONS

The configurations in this part of the Annex provide variations on the physical layer syntax suitable for exercising receiver robustness. These are a baseline set of configurations for which a broadcaster might consider there to be verified receiver support. This is not an exhaustive list, and many other physical layer configurations are available in the A/322 Standard for use. One might use this Annex to construct a physical layer configuration for deployment by starting with one of these configurations in this baseline set and then deviate by parameter modifications to optimize for the uniqueness of the deployment location (differences in terrain, ground clutter, building materials, etc.) and the types of services that are intended to be delivered (fixed, indoor, mobile, etc.).

C.1.1 ~~Single PLP~~Configuration: 1 PLP

This ~~example~~ provides ~~possible~~ physical layer parameter choices for a single PLP configuration for a single complete delivered product ~~service~~. The ~~intended service is a fixed service~~ configuration ~~that~~ has a similar coverage as ATSC 1.0 (i.e., 15 dB required SNR). Given this set ~~example~~ of physical layer parameters, the achievable data rate in the physical layer is around 25 Mbps. Therefore, a high quality 4K UHD ~~service~~ or multiple HD offerings ~~services~~ intended for fixed reception are feasible. Note that the required SNRs for each configuration were obtained from Annex A.

Table C.1.1 ~~Example of~~ Physical Layer Parameters for a Single-PLP ~~Service~~

Frame Length		245.185 ms (Including Bootstrap)
Bandwidth		6 MHz
Preamble Parameters	FFT Size	32K
	Guard Interval	GI6_1536
	Pilot Pattern	SP D_x=8
	Signaling Protection	L1-Basic / Detail Mode 1
	# of Preamble Symbols	1
	Reduced Carriers	None
Payload OFDM Parameters	FFT Size	32K
	Guard Interval	GI6_1536
	Pilot Pattern	SP D_x=16, D_y=2
	Pilot Boosting	No Pilot Boosting
	# of Payload Symbols	47

	Time Interleaver	CTI (1024 depth)
	Frequency Interleaver	On
	First / Last SBS	On / On
Payload BICM Parameters	Outer Code	BCH
	Inner Code	9/15 LDPC (64800)
	Constellation	256QAM
PHY Data Rate		25.158 Mbps
Required SNR (AWGN)	Simulation	15.7 dB
	Lab. Test	16.5 dB
	Field Test	16.8 dB
Required SNR (RC20)	Simulation	16.1 dB
	Lab. Test	17.1 dB
	Field Test	18.1 dB
Required SNR (RL20)	Simulation	18.1 dB
	Lab. Test	19.3 dB
	Field Test	18.0 dB

~~C.2 MULTIPLE PLP SUBFRAME SERVICE~~

~~This example provides possible physical layer parameter choices for a 2-PLP service, where each PLP is contained in a separate subframe. This multiple subframe configuration is useful when there are different intended services (e.g., mobile and fixed services) that require different waveform parameters such as FFT size, guard interval, or pilot patterns. In this example, PLP 0 is contained in the first subframe that may be suitable for mobile or indoor services using 8K FFT size and a denser pilot pattern. Conversely, PLP 1 in the second subframe may be suitable for a fixed service using 32K FFT size and a sparser pilot pattern.~~

~~Table C.2.1~~ ~~Example of Physical Layer Parameters for 2-Subframe Service~~

~~Frame Length~~			~~245.333 ms (Including Bootstrap)~~
~~Bandwidth~~			~~6 MHz~~
~~Preamble Parameters~~	~~FFT Size~~		~~8K~~
	~~Guard Interval~~		~~GI6_1536~~
	~~Pilot Pattern~~		~~SP D_x=4~~
	~~Signaling Protection~~		~~L1-Basic / Detail Mode 1~~
	~~# of Preamble Symbols~~		~~2~~
	~~Reduced Carriers~~		~~None~~
~~Payload OFDM Parameters~~	~~1st Subframe (PLP 0)~~	~~FFT Size~~	~~8K~~
		~~Guard Interval~~	~~GI6_1536~~
		~~Pilot Pattern~~	~~SP D_x=4, D_y=2~~
		~~Pilot Boosting~~	~~No Pilot Boosting~~
		~~# of Payload Symbols~~	~~51~~
		~~Time Interleaver~~	~~CTI (1024 depth)~~
		~~Frequency Interleaver~~	~~On~~
		~~First / Last SBS~~	~~Off / On~~
	~~2nd Subframe (PLP 1)~~	~~FFT Size~~	~~32K~~
		~~Guard Interval~~	~~GI6_1536~~
		~~Pilot Pattern~~	~~SP D_x=16, D_y=2~~
		~~Pilot Boosting~~	~~No Pilot Boosting~~

		# of Payload Symbols	34
		Time Interleaver	CTI (1024 depth)
		Frequency Interleaver	On
		First / Last SBS	On / On
Payload BICM Parameters	1st Subframe (PLP 0)	Outer Code	BCH
		Inner Code	8/15 LDPC (16200)
		Constellation	16QAM
	2nd Subframe (PLP 1)	Outer Code	BCH
		Inner Code	9/15 LDPC (64800)
		Constellation	256QAM
PHY Data Rate	1st Subframe (PLP 0)		2.620 Mbps
	2nd Subframe (PLP 1)		17.568 Mbps
Required SNR (AWGN)	1st Subframe (PLP 0)	Simulation	6.6 dB
		Lab. Test	7.4 dB
		Field Test	7.6 dB
	2nd Subframe (PLP 1)	Simulation	15.7 dB
		Lab. Test	16.5 dB
		Field Test	16.8 dB
Required SNR (RC20)	1st Subframe (PLP 0)	Simulation	7.0 dB
		Lab. Test	7.9 dB
		Field Test	8.6 dB
	2nd Subframe (PLP 1)	Simulation	16.1 dB
		Lab. Test	17.1 dB
		Field Test	18.1 dB
Required SNR (RL20)	1st Subframe (PLP 0)	Simulation	8.8 dB
		Lab. Test	9.8 dB
		Field Test	8.7 dB
	2nd Subframe (PLP 1)	Simulation	18.1 dB
		Lab. Test	19.3 dB
		Field Test	18.0 dB

C.31.2 Multiple 2-PLP TDMConfiguration: 2 PLPs TDM in 1 Subframe

This example provides possible physical layer parameter choices for a 2-PLP TDM configuration service using a single subframe. This multiple-PLP configuration uses the same waveform parameters (FFT size, guard interval and pilot patterns) for both PLPs, and hence, 16K FFT and D_x=6, D_y=2 are used for this example configuration to accommodate both mobile and fixed devices services. Due to the use of a multiple-PLP configuration within a subframe, the HTI mode is configured as the time interleaver choice, which requires an integer number of FEC Blocks allowing inevitable dummy modulation values at the end of a subframe.

Table C.3.1.2 Example of Physical Layer Parameters for 2-PLP TDM Service

Frame Length		245.704 ms (Including Bootstrap)
Bandwidth		6 MHz
Preamble Parameters	FFT Size	16K
	Guard Interval	GI6_1536
	Pilot Pattern	SP D_x=4
	Signaling Protection	L1-Basic / Detail Mode 1

	# of Preamble Symbols		1		
	Reduced Carriers		None		
Payload OFDM Parameters	FFT Size		16K		
	Guard Interval		GI6_1536		
	Pilot Pattern		SP D_x=8, D_y=2		
	Pilot Boosting		No Pilot Boosting		
	# of Payload Symbols		93		
	Time Interleaver		HTI (Cell Interleaver: On, CDL: Off)		
			# of TI Blocks	PLP 0	~~1~~ 2
				PLP 1	~~2~~ 3
			Max # of FEC Blocks	PLP 0	75
				PLP 1	110
			# of FEC Blocks	PLP 0	75
				PLP 1	110
	Frequency Interleaver		On		
	First / Last SBS		On / On		
Payload BICM Parameters	PLP 0	Outer Code	BCH		
		Inner Code	8/15 LDPC (16200)		
		Constellation	16QAM		
	PLP 1	Outer Code	BCH		
		Inner Code	9/15 LDPC (64800)		
		Constellation	256QAM		
PHY Data Rate	PLP 0		2.586 Mbps		
	PLP 1		17.320 Mbps		
Required SNR (AWGN)	PLP 0	Simulation	6.6 dB		
		Lab. Test	7.4 dB		
		Field Test	7.6 dB		
	PLP 1	Simulation	15.7 dB		
		Lab. Test	16.5 dB		
		Field Test	16.8 dB		
Required SNR (RC20)	PLP 0	Simulation	7.0 dB		
		Lab. Test	7.9 dB		
		Field Test	8.6 dB		
	PLP 1	Simulation	16.1 dB		
		Lab. Test	17.1 dB		
		Field Test	18.1 dB		
Required SNR (RL20)	PLP 0	Simulation	8.8 dB		
		Lab. Test	9.8 dB		
		Field Test	8.7 dB		
	PLP 1	Simulation	18.1 dB		
		Lab. Test	19.3 dB		
		Field Test	18.0 dB		

C.~~4~~1.3 ~~Multiple 2-PLP LDM~~Configuration: 2 PLPs LDM in 1 Subframe

This ~~example~~ provides possible physical layer parameter choices for a 2-PLP configuration ~~service~~ using a simple LDM ~~configuration~~ (i.e., PLP 0 in Core Layer and PLP 1 in Enhanced Layer within one subframe). This LDM configuration provides superior performance (around 5 dB SNR)

compared to the TDM ~~service examples~~ configuration described in C.~~2~~.1.2 and C.~~3~~2.1 of Annex C.

Table C.~~4~~.1.3 ~~Example of~~ Physical Layer Parameters for 2-PLP LDM ~~Service~~

Frame Length			245.704 ms (Including Bootstrap)
Bandwidth			6 MHz
Preamble Parameters	FFT Size		16K
	Guard Interval		GI6_1536
	Pilot Pattern		SP D_x=4
	Signaling Protection		L1-Basic / Detail Mode 1
	# of Preamble Symbols		1
	Reduced Carriers		None
Payload OFDM Parameters	FFT Size		16K
	Guard Interval		GI6_1536
	Pilot Pattern		SP D_x=8, D_y=2
	Pilot Boosting		No Pilot Boosting
	# of Payload Symbols		93
	Time Interleaver		CTI (1024 depth)
	Frequency Interleaver		On
	First / Last SBS		On / On
Payload BICM Parameters	Core PLP (PLP 0)	Outer Code	BCH
		Inner Code	4/15 LDPC (16200)
		Constellation	QPSK
	Enhanced PLP (PLP 1)	Outer Code	BCH
		Inner Code	9/15 LDPC (64800)
		Constellation	64QAM
	Injection Level		2.0 dB
PHY Data Rate	Core PLP (PLP 0)		2.497 Mbps
	Enhanced PLP (PLP 1)		17.320 Mbps
Required SNR (AWGN)	Core PLP (PLP 0)	Simulation	1.9 dB
		Lab. Test	3.0 dB
		Field Test	3.3 dB
	Enhanced PLP (PLP 1)	Simulation	15.8 dB
		Lab. Test	16.7 dB
		Field Test	16.9 dB
Required SNR (RC20)	Core PLP (PLP 0)	Simulation	2.1 dB
		Lab. Test	3.4 dB
		Field Test	4.3 dB
	Enhanced PLP (PLP 1)	Simulation	16.2 dB
		Lab. Test	17.3 dB
		Field Test	18.8 dB
Required SNR (RL20)	Core PLP (PLP 0)	Simulation	3.3 dB
		Lab. Test	7.0 dB
		Field Test	4.7 dB
	Enhanced PLP (PLP 1)	Simulation	18.3 dB
		Lab. Test	19.5 dB
		Field Test	18.7 dB

C.1.4 Configuration: 3 PLPs with 3 Subframes: Variety Quality of Service

This provides possible physical layer parameter choices for a 3-PLP configuration using the HTI mode in TDM configuration with multiple subframes. This TDM configuration allows each PLP to use different waveform parameters (FFT size, pilot pattern, or guard interval) for scale in service quality. In this configuration, PLP 0 is intended to be more robust as it uses 8K FFT and a denser pilot pattern. PLP 1 and PLP 2 are configured to have the same coverage (around 15~16 dB SNR) as this configuration intends a tower sharing use case such that each broadcaster's content should be delivered by a separate PLP. Note that service layer examples that require such 3-PLP configuration can be found in [16].

Table C.1.4 Physical Layer Parameters for 3-PLP TDM

Frame Length			244.77 ms (Including Bootstrap)
Bandwidth			6 MHz
Preamble Parameters	FFT Size		8K
	Guard Interval		GI4_768
	Pilot Pattern		SP D_x=4
	Signaling Protection		L1-Basic / Detail Mode 3
	# of Preamble Symbols		1
	Reduced Carriers		None
Payload OFDM Parameters	1st Subframe (PLP 0)	FFT Size	8K
		Guard Interval	GI4_768
		Pilot Pattern	SP D_x=8, D_y=2
		Pilot Boosting	No Pilot Boosting
		# of Payload Symbols	54
		Time Interleaver	HTI (# of TI Blocks: 2, # of FEC Blocks: 21)
		Frequency Interleaver	On
		First / Last SBS	Off / On
	2nd Subframe (PLP 1)	FFT Size	16K
		Guard Interval	GI4_768
		Pilot Pattern	SP D_x=8, D_y=4
		Pilot Boosting	No Pilot Boosting
		# of Payload Symbols	30
		Time Interleaver	HTI (# of TI Blocks: 3, # of FEC Blocks: 48)
		Frequency Interleaver	On
		First / Last SBS	On / On
	3rd Subframe (PLP 2)	FFT Size	32K
		Guard Interval	GI4_768
		Pilot Pattern	SP D_x=16, D_y=2
		Pilot Boosting	No Pilot Boosting
		# of Payload Symbols	20
		Time Interleaver	HTI (# of TI Blocks: 3, # of FEC Blocks: 65)
		Frequency Interleaver	On
		First / Last SBS	On / On
Payload BICM Parameters	1st Subframe (PLP 0)	Outer Code	BCH

		Inner Code	9/15 LDPC (64800)
		Constellation	16QAM
	2nd Subframe (PLP 1)	Outer Code	BCH
		Inner Code	9/15 LDPC (64800)
		Constellation	256QAM
	3rd Subframe (PLP 2)	Outer Code	BCH
		Inner Code	9/15 LDPC (64800)
		Constellation	256QAM
PHY Data Rate	1st Subframe (PLP 0)		3.30 Mbps
	2nd Subframe (PLP 1)		7.54 Mbps
	3rd Subframe (PLP 2)		10.21 Mbps
Required SNR (AWGN)	1st Subframe (PLP 0)	Simulation	7.5 dB
		Lab. Test	8.3 dB
		Field Test	8.5 dB
	2nd Subframe (PLP 1)	Simulation	15.7 dB
		Lab. Test	16.5 dB
		Field Test	16.8 dB
	3rd Subframe (PLP 2)	Simulation	15.7 dB
		Lab. Test	16.5 dB
		Field Test	16.8 dB
Required SNR (RC20)	1st Subframe (PLP 0)	Simulation	7.9 dB
		Lab. Test	8.9 dB
		Field Test	9.9 dB
	2nd Subframe (PLP 1)	Simulation	16.1 dB
		Lab. Test	17.1 dB
		Field Test	18.1 dB
	3rd Subframe (PLP 2)	Simulation	16.1 dB
		Lab. Test	17.1 dB
		Field Test	18.1 dB
Required SNR (RL20)	1st Subframe (PLP 0)	Simulation	9.8 dB
		Lab. Test	11.1 dB
		Field Test	10.2 dB
	2nd Subframe (PLP 1)	Simulation	18.1 dB
		Lab. Test	19.3 dB
		Field Test	18.0 dB
	3rd Subframe (PLP 2)	Simulation	18.1 dB
		Lab. Test	19.3 dB
		Field Test	18.0 dB

C.1.5 Configuration: 4 PLPs TDM in 1 Subframe

This provides possible physical layer parameter choices for a 4-PLP configuration using the HTI mode in a single subframe. This exercises the maximum number of PLPs receivers are expected to demodulate simultaneously, and hence a complete delivered product carried in multiple PLPs must conform to the time interleaving memory requirement (524288 cells). In this configuration, PLP 0 uses a very robust ModCod combination that provides a negative SNR but very small PLP capacity; therefore, it may be suitable to carry service signaling (e.g., LLS/LMT) only. PLP 3 is

also intended for robust delivery such as ESG or NRT services. Note that service layer examples that require such 4-PLP configuration can be found in [16] and Annex C.1.6.

Table C.1.5 Physical Layer Parameters for 4-PLP TDM

Frame Length			245.18 ms (Including Bootstrap)		
Bandwidth			6 MHz		
Preamble Parameters	FFT Size		16K		
	Guard Interval		GI4_768		
	Pilot Pattern		SP D_x=8		
	Signaling Protection		L1-Basic / Detail Mode 1		
	# of Preamble Symbols		1		
	Reduced Carriers		None		
Payload OFDM Parameters	FFT Size		16K		
	Guard Interval		GI4_768		
	Pilot Pattern		SP D_x=8, D_y=4		
	Pilot Boosting		1		
	# of Payload Symbols		97		
	Time Interleaver		HTI (Cell Interleaver: On, CDL: Off)		
			# of TI Blocks	PLP 0	2
				PLP 1	3
				PLP 2	3
				PLP 3	3
			Max # of FEC Blocks	PLP 0	4
				PLP 1	58
				PLP 2	58
				PLP 3	13
			# of FEC Blocks	PLP 0	4
				PLP 1	58
				PLP 2	58
				PLP 3	13
	Frequency Interleaver		On		
	First / Last SBS		On / On		
Payload BICM Parameters	PLP 0	Outer Code	BCH		
		Inner Code	3/15 LDPC (64800)		
		Constellation	QPSK		
	PLP 1	Outer Code	BCH		
		Inner Code	7/15 LDPC (64800)		
		Constellation	256QAM		
	PLP 2	Outer Code	BCH		
		Inner Code	7/15 LDPC (64800)		
		Constellation	256QAM		
	PLP 3	Outer Code	BCH		
		Inner Code	5/15 LDPC (64800)		
		Constellation	16QAM		
PHY Data Rate	PLP 0		0.2 Mbps		
	PLP 1		7.1 Mbps		
	PLP 2		7.1 Mbps		

	PLP 3		1.13 Mbps
Required SNR (AWGN)	PLP 0	Simulation	-4.0 dB
		Lab. Test	-2.9 dB
		Field Test	-2.8 dB
	PLP 1	Simulation	12.4 dB
		Lab. Test	12.9 dB
		Field Test	13.1 dB
	PLP 2	Simulation	12.4 dB
		Lab. Test	12.9 dB
		Field Test	13.1 dB
	PLP 3	Simulation	3.1 dB
		Lab. Test	3.8 dB
		Field Test	3.9 dB
Required SNR (RC20)	PLP 0	Simulation	-4.0 dB
		Lab. Test	-2.7 dB
		Field Test	-2.2 dB
	PLP 1	Simulation	12.7 dB
		Lab. Test	13.5 dB
		Field Test	14.3 dB
	PLP 2	Simulation	12.7 dB
		Lab. Test	13.5 dB
		Field Test	14.3 dB
	PLP 3	Simulation	3.3 dB
		Lab. Test	4.0 dB
		Field Test	4.6 dB
Required SNR (RL20)	PLP 0	Simulation	-3.5 dB
		Lab. Test	-1.6 dB
		Field Test	-2.3 dB
	PLP 1	Simulation	14.6 dB
		Lab. Test	15.5 dB
		Field Test	14.6 dB
	PLP 2	Simulation	14.6 dB
		Lab. Test	15.5 dB
		Field Test	14.6 dB
	PLP 3	Simulation	4.4 dB
		Lab. Test	5.2 dB
		Field Test	4.5 dB

C.1.6 Multiple PLPs Data Location

Care must be taken when using multiple-PLP configurations. A/322 has a strict requirement for time interleaving memory depth of 524288 cells (Section 7.1.2 of [3]) and when A/V services (as defined in A/331 [6] with video, audio, and/or captions) are combined with other data (e.g., program guides) to form a complete delivered product across several PLPs, this time interleaving memory constraint needs careful consideration. Receivers use the LLS/LMT to turn on relevant PLPs for complete delivered product rendering and if data is referenced outside that single delivered product PLP mapping, time interleaving depth may be exceeded.

Figure C.1 shows two complete delivered products carried by a 4-PLP configuration (as in Annex C.6). That is, service layer signaling (LLS/LMT) carried in the robust PLP (PLP 0) indicates the two complete delivered products where the first complete product is comprised of PLP 0 and PLP 1 and the second complete delivered product is comprised of PLP 0, PLP 2 and PLP 3. Figure C.1 illustrates a correct placement of service layer data as each of the complete delivered products meets the time interleaving memory requirement.

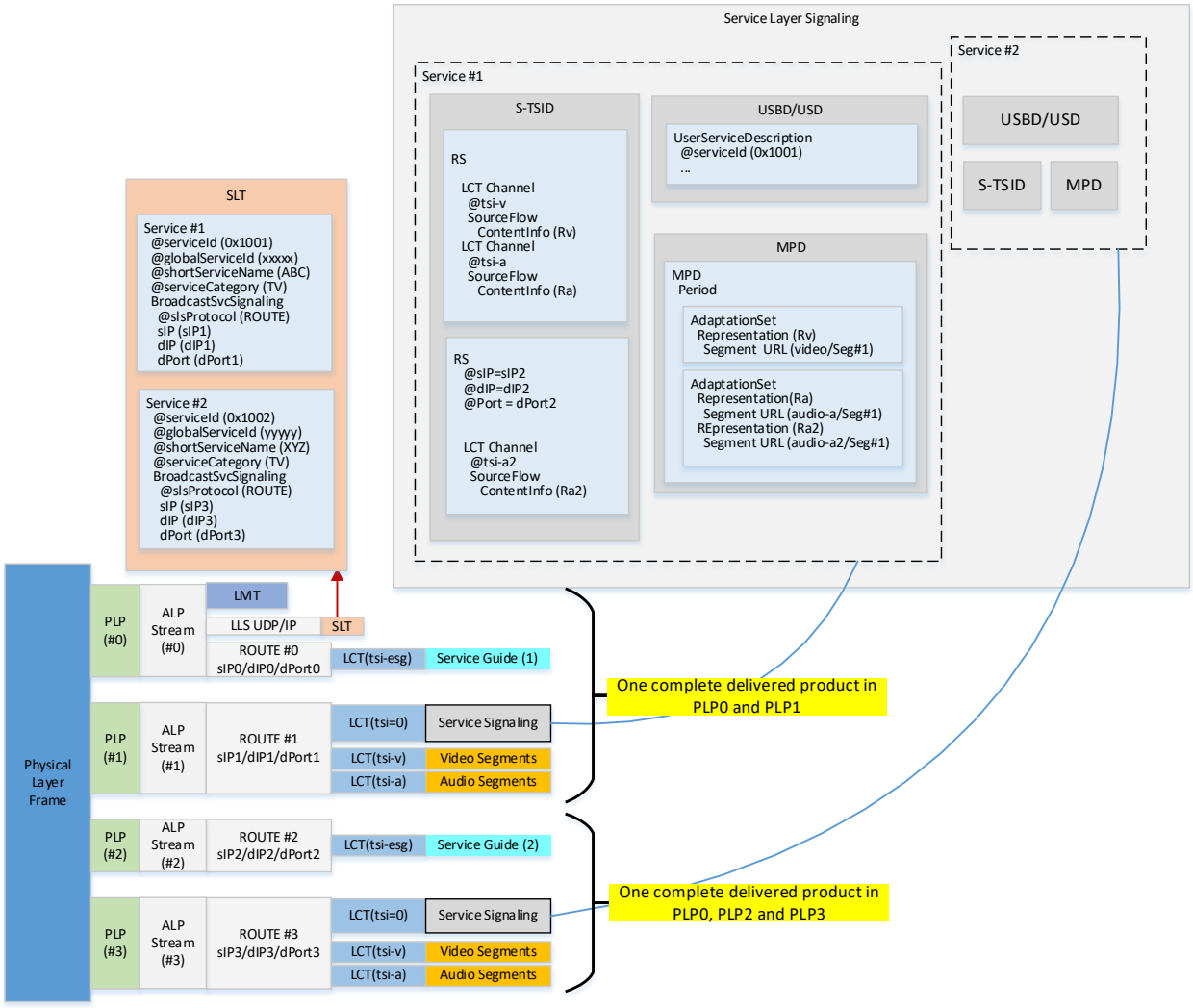

Figure C.1 4-PLP configuration with correct data placement.

Figure C.2 shows two complete delivered products in a 4-PLP configuration. In this configuration, a combined electronic service guide (ESG) including two complete delivered products is carried in PLP 2, and therefore, the first complete delivered product is comprised of PLP 0, PLP 1 and PLP 2, and the second complete delivered product is comprised of PLP 1, PLP 2 and PLP 3. This illustrates an incorrect placement of service layer data if the memory use of the first complete delivered product exceeds the time interleaving constraint.

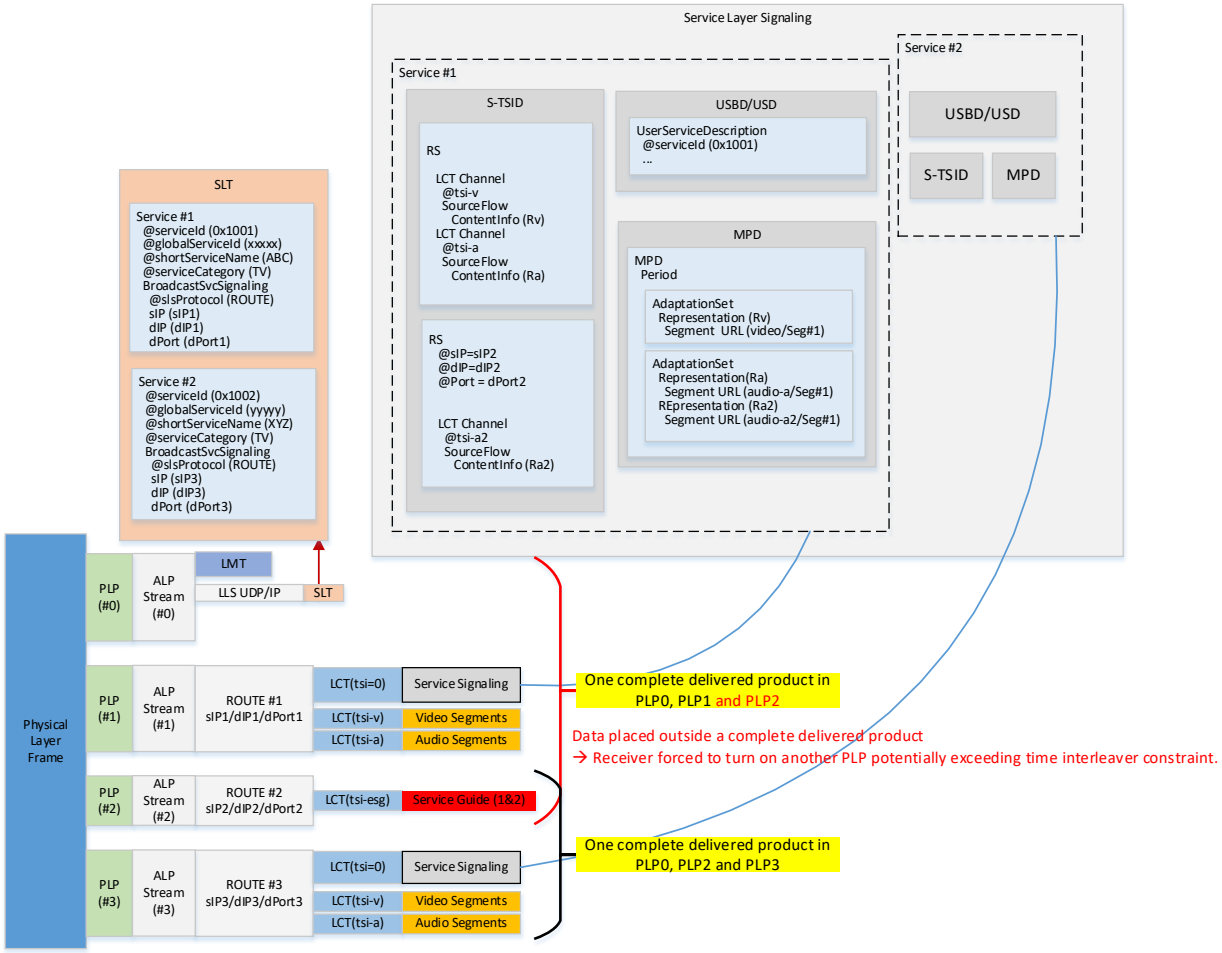

Figure C.2 4-PLP configuration with **incorrect** data placement.

C.2 RECOMMENDED STRUCTURES

This part of the Annex provides recommended physical layer structure suitable for specific use cases.

C.2.1 Structure: Services for Both Mobile and Fixed Receivers

This section provides a selection of possible physical layer parameter choices for services targeted at fixed and at mobile devices that should be a multiple-PLP configuration, in which at least one PLP is contained in a separate subframe. This configuration varies the FFT size and/or pilot patterns. In the example 2-PLP configuration in Table C.2.1, the parameters such as FFT and pilot pattern are adjusted for the separate subframes. PLP 0 is shown contained in the first subframe that could be suitable for mobile or indoor devices and uses 8K FFT size and a denser pilot pattern. Conversely, PLP 1 in the second subframe could be suitable for fixed devices using 32K FFT size and a sparser pilot pattern. Parameters may be modified based on other factors such as terrain, etc.

Table C.2.1 Physical Layer Parameters for 2-Subframes

Frame Length		245.333 ms (Including Bootstrap)
Bandwidth		6 MHz
Preamble Parameters	FFT Size	8K

	Guard Interval		GI6_1536
	Pilot Pattern		SP D_x=4
	Signaling Protection		L1-Basic / Detail Mode 1
	# of Preamble Symbols		2
	Reduced Carriers		None
Payload OFDM Parameters	1st Subframe (PLP 0)	FFT Size	8K
		Guard Interval	GI6_1536
		Pilot Pattern	SP D_x=4, D_y=2
		Pilot Boosting	No Pilot Boosting
		# of Payload Symbols	51
		Time Interleaver	CTI (1024 depth)
		Frequency Interleaver	On
		First / Last SBS	Off / On
	2nd Subframe (PLP 1)	FFT Size	32K
		Guard Interval	GI6_1536
		Pilot Pattern	SP D_x=16, D_y=2
		Pilot Boosting	No Pilot Boosting
		# of Payload Symbols	34
		Time Interleaver	CTI (1024 depth)
		Frequency Interleaver	On
		First / Last SBS	On / On
Payload BICM Parameters	1st Subframe (PLP 0)	Outer Code	BCH
		Inner Code	8/15 LDPC (16200)
		Constellation	16QAM
	2nd Subframe (PLP 1)	Outer Code	BCH
		Inner Code	9/15 LDPC (64800)
		Constellation	256QAM
PHY Data Rate	1st Subframe (PLP 0)		2.620 Mbps
	2nd Subframe (PLP 1)		17.568 Mbps
Required SNR (AWGN)	1st Subframe (PLP 0)	Simulation	6.6 dB
		Lab. Test	7.4 dB
		Field Test	7.6 dB
	2nd Subframe (PLP 1)	Simulation	15.7 dB
		Lab. Test	16.5 dB
		Field Test	16.8 dB
Required SNR (RC20)	1st Subframe (PLP 0)	Simulation	7.0 dB
		Lab. Test	7.9 dB
		Field Test	8.6 dB
	2nd Subframe (PLP 1)	Simulation	16.1 dB
		Lab. Test	17.1 dB
		Field Test	18.1 dB
Required SNR (RL20)	1st Subframe (PLP 0)	Simulation	8.8 dB
		Lab. Test	9.8 dB
		Field Test	8.7 dB
	2nd Subframe (PLP 1)	Simulation	18.1 dB
		Lab. Test	19.3 dB
		Field Test	18.0 dB

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