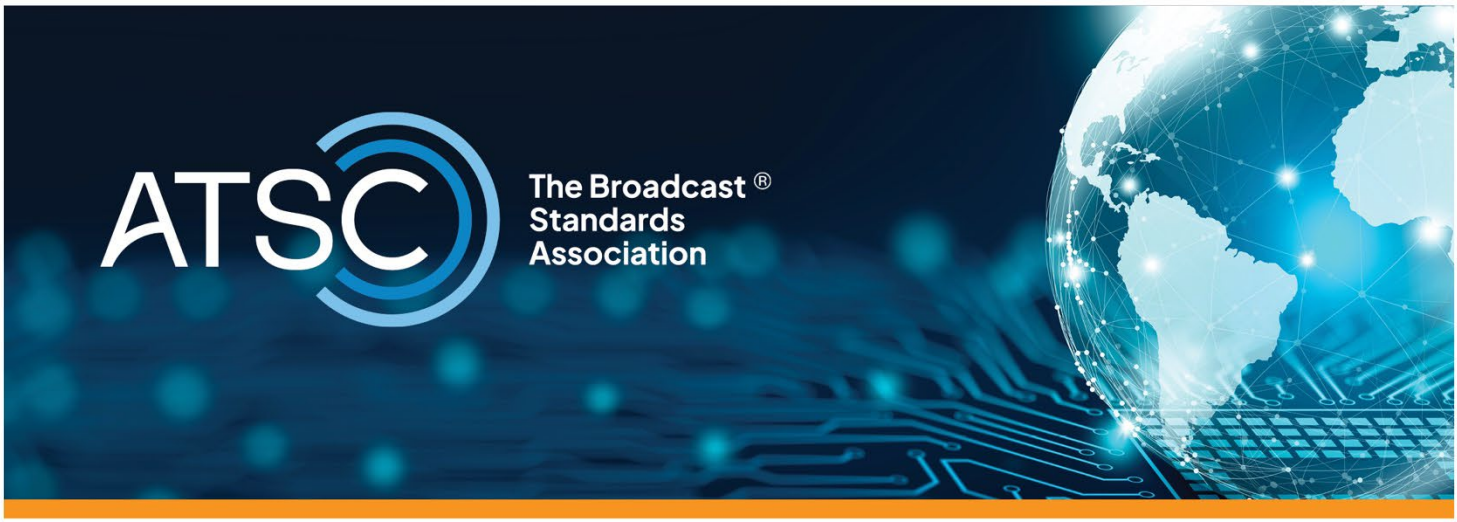

Approved Changes to A/322, Physical Layer Protocol

TG3-201r12
11 June 2026

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Revision History

Version	Date
Release 2	24 March 2020
Release 3	20 January 2021
Release 4	29 July 2022
Release 5	24 November 2022
Release 6	28 March 2023
Release 7	3 April 2024
Release 8	13 September 2024
Release 9	28 July 2025
Release 10	26 January 2026
Release 11	14 April 2026
Release 12	11 June 2026

Approved Changes to A/322, Physical Layer Protocol

1. SCOPE

This document describes changes made to A/322, "Physical Layer Protocol," since the 2017 version (dated 6 June 2017) was approved and adopted by reference in the FCC rules 47 CFR § 73.682. The summarized changes that were provided to the ATSC membership with the ballot of each revision are copied below. Note that these summaries are not intended to describe all of the details and ramifications incorporated in the changes. They are intended to provide a general overview of the nature of the changes of each given revision.

2. LIST OF CHANGES

2.1 Revision of A/322:2017 with Amendment No. 1

Approved 26 December 2018

TG3/S32 had been collecting editorial changes against the June 2017 version of A/322 for over one year. All of the changes are clarifications, notes, typos, and small corrections. All of the changes were felt to be minor by the originating TG3/S32 Specialist Group.

2.2 Revision of A/322:2018

Approved 23 January 2020

Since A/322:2018 was published, errata, and request for further clarifications were reported by TG3/S32 committee members and vendors. There were eight errata items reported and agreed to. In summary, the errata items were:

- Typo in Figure 4.1.
- Clarification of available cells in the last Preamble symbol (Section 7.2.5.2).
- Clarification of dummy modulation values (Section 7.2.6.5).
- Correction of concatenated code term (Section 3.4).
- Missing bracket in Annex G.1.
- Correction of BICM term.
- Clarification of L1D_plp_fec_block_start
- Correction of NoC value in Section 7.2.3.

2.3 Revision of A/322:2020

Approved 20 January 2021.

Since A/322:2020 was published, errata, and request for further clarifications were reported by TG3/S32 committee members and vendors. There were five errata items reported and agreed to. In summary, the errata items were:

- Clarification of Type A LDPC Encoding (Section 6.1.3.1).
- Correction of Group-Wise Interleaver (Section 6.2.2).
- Correction and Clarification of Type B Block Interleaver (Section 6.2.3.2)
- Editorial fixes (missing underbar, small letter fix) in Section 7.2.3
- Correction of Frequency Interleaver (Section 7.3).

2.4 Administrative Update A/322:2022-03

Normative and informative references to other ATSC standards and recommended practices updated to reference current version documents. No other changes.

2.5 A/322:2022-03 Amendment No. 1

Approved 24 November 2022.

This amendment clarified time expressions and references in A/322. The rationale for changes is as follows:

1) The TG3/S33 group was recently looking at TAI time and how ATSC specifies it. Currently A/322 has `L1D_time_sec` which uses the 32 LSBs of PTP epoch and parenthetically suggests PTP time. But the PTP time is only an informative reference, not normative in A/322. A/331 has System Time Fragment and talks of the same 32 bits, but no normative statement. It is suggested having A/322 change the PTP reference from informative to normative. In addition, semantics of `L1D_time_sec` needs to be modified to avoid confusion.
2) There are A/322 signaling fields controlled by A/324 (e.g., MISO related fields, TxID controls, etc.). It is suggested having A/322 change reference [4] from informative to normative.

The changes described in this amendment are backward-compatible relative to the previously published version of the standard to which this Amendment pertains. The suggested changes were approved by ATSC on 24 November 2022.

2.6 Administrative Update A/322:2023-03

Normative and informative references to other ATSC standards and recommended practices updated to reference current version documents. No other changes.

2.7 Administrative Update A/322:2024-04

Normative and informative references to other ATSC standards and recommended practices updated to reference current version documents. No other changes.

2.8 A/322:2024-04 Amendment No. 1

Approved 13 September 2024

This amendment specified MIMO, Channel Bonding, LDM, and their combinations in the physical layer, in order to support a significant throughput increase or spectral flexibility. This amendment also added TxID signal generation complying with MIMO signals.

In A/322, optional technologies MIMO and Channel Bonding nearly double the capacity by introducing additional spatial and frequency resources; LDM in A/322 enables enhanced performance based on spectrum reuse multiplexing. Despite these advantages, combining LDM, MIMO, and Channel Bonding is precluded or limited in A/322. The changes described in this document were developed in order to enable the combinations among LDM, MIMO, and Channel Bonding. This amendment also added necessary descriptions lacking in the currently published version of the standard, regarding MIMO and Channel Bonding operations. Descriptions for TxID are additionally revised to enable related functionality in MIMO transmission.

The changes described in this amendment are backward-compatible to the currently published version of the standard to which this Amendment pertains and any previously approved Amendments for that standard; however, currently deployed receivers would not have the capability of decoding the signal generated by this amendment. These changes would not affect any receiver's ability to demodulate signals not encoded using MIMO or CB.

2.9 Administrative Update A/322:2025-07

Normative and informative references to other ATSC standards and recommended practices updated to reference current version documents. No other changes.

2.10 A/322:2024-09 Amendment No. 1

Approved 28 July 2025

This amendment mainly corrects errata items found in the MIMO, Channel Bonding, LDM combinations in the physical layer. The amendment also fixes errata items for Subframe and Frame term additions, and LDM Core layer <= Enhanced Layer SNR description.

In A/322, optional combinations among LDM, MIMO, and Channel Bonding are being implemented, and clarifications, typos and optimizations were made to fix errata items. This amendment fixes all items found to date in these combinations, along with clarifications in Subframe and Frame term additions and LDM Core Layer <= Enhanced Layer SNR. These fixes clarify meanings and intent of LDM, MIMO, and CB combinations along with some optimizations for implementation ease.

The changes described in this document are backward-compatible to the currently published version of the standard to which this Amendment pertains and any previously approved Amendments for that standard; however, currently deployed receivers would not have the capability of decoding the signal generated by this amendment. These changes would not affect any receiver's ability to demodulate signals not encoded using MIMO, LDM, or Channel Bonding.

2.11 A/322:2025-07a Amendment No. 1

Approved 26 January 2026

This document corrects errata items found in MIMO scattered pilot pattern 4_2 with 32K FFT in the physical layer. In A/322, an optional MIMO technology typo for scattered pilot 4_2 usage in 32K FFT is corrected. It conflicts with continual pilot patterns for MIMO usage and should not be available for implementation usage.

2.12 Administrative Update A/322:2026-04

Normative and informative references to other ATSC standards and recommended practices updated to reference current version documents. No other changes.

2.13 A/322:2026-04 Amendment No. 1

Approved 11 June 2026

This amendment defines and clarifies the required usage of the bootstrap to remove ambiguity when heterogeneous physical-layer waveforms are time-multiplexed within a single RF channel. Specifically, it prevents misinterpretation that frames carrying non-ATSC 3.0 physical-layer waveforms may omit bootstrap transmission. This amendment clarifies that each frame, regardless of the post-bootstrap physical-layer waveform type, shall begin with a bootstrap, and clarifies understanding for bootstrap usage in time-multiplexed operation with multiple signal types.

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