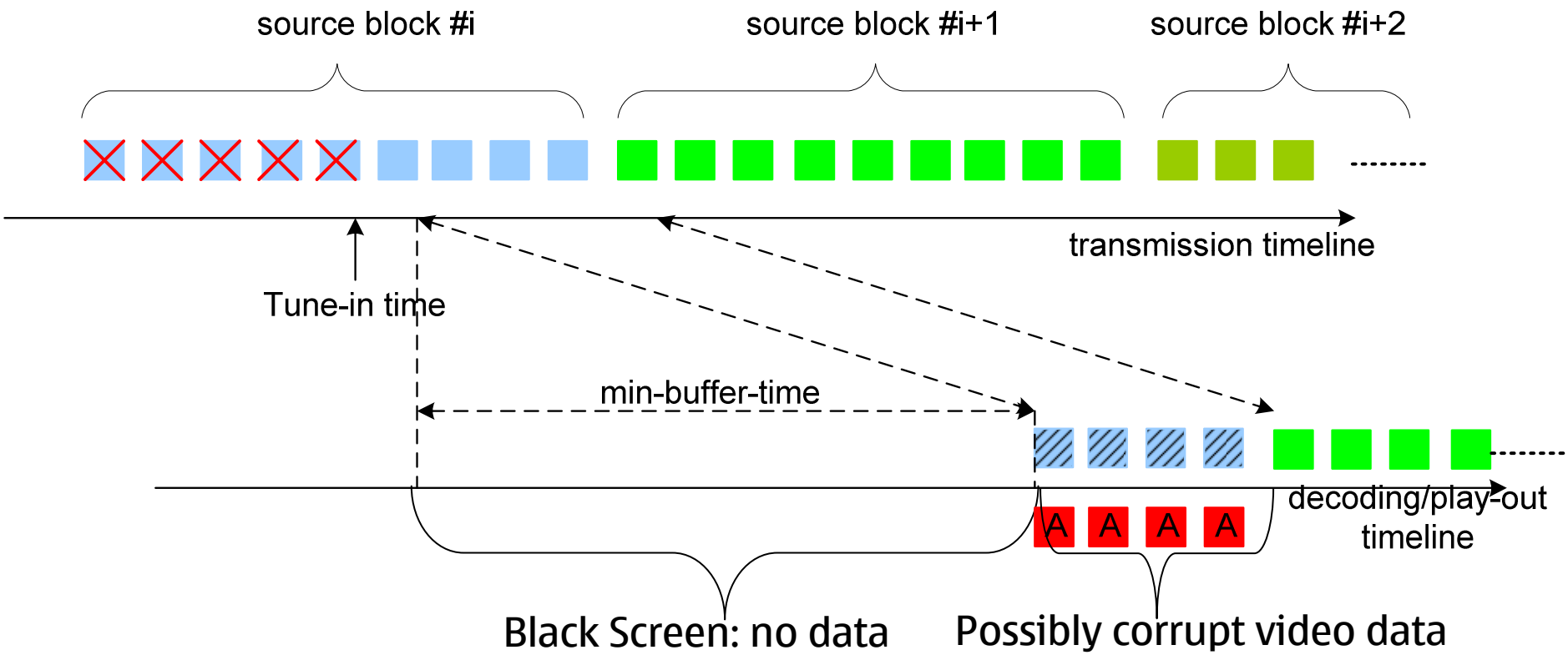
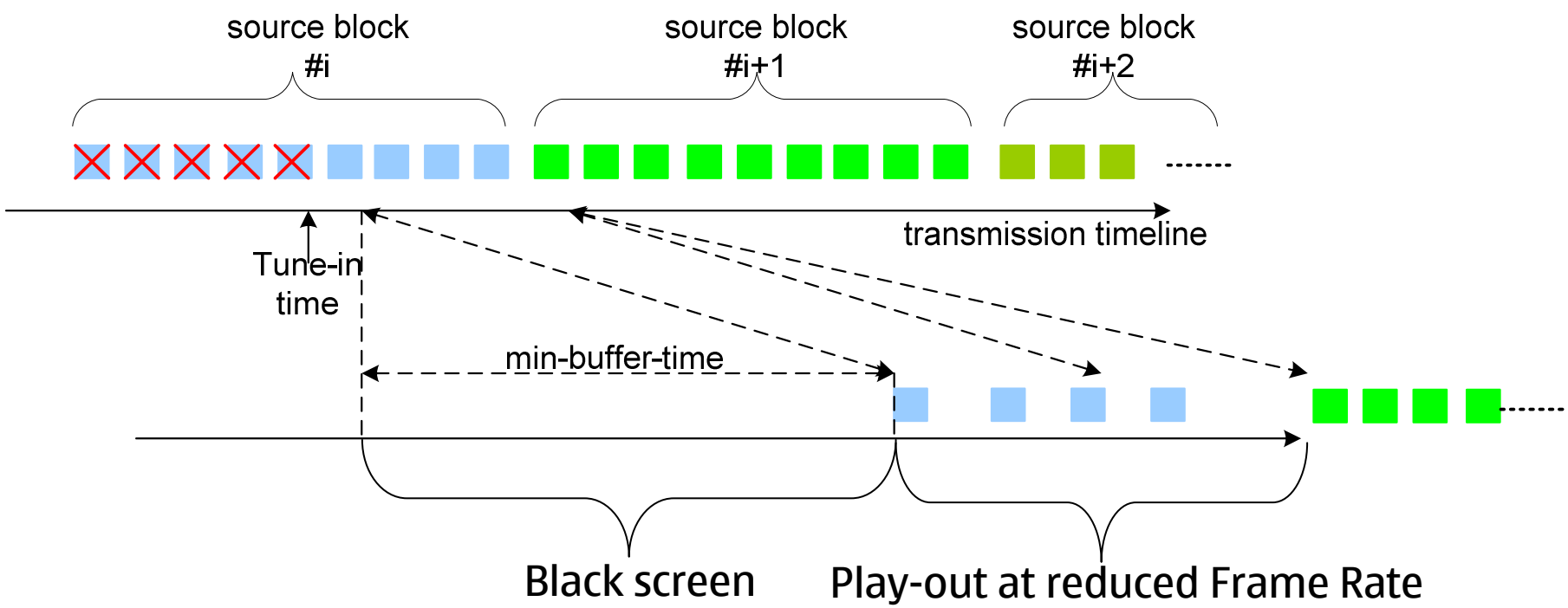
Non-Interleaved Mode



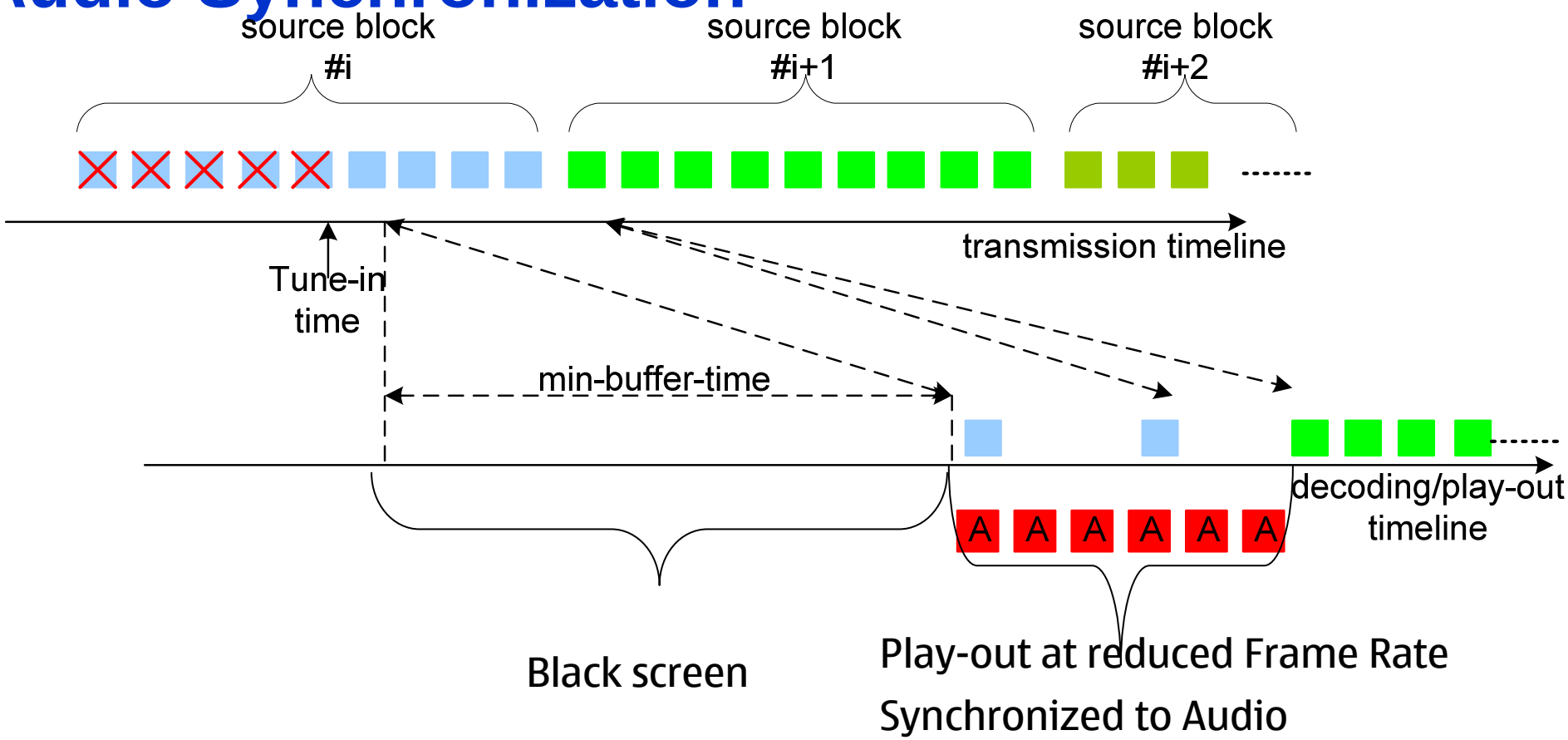
- UE may typically discard all units of the current source block and start with the next source block
- Alternatively, it may attempt decoding whatever media data was received. This may result in e.g. jerky picture

Interleaved Mode – Legacy UE
No Audio Synchronization



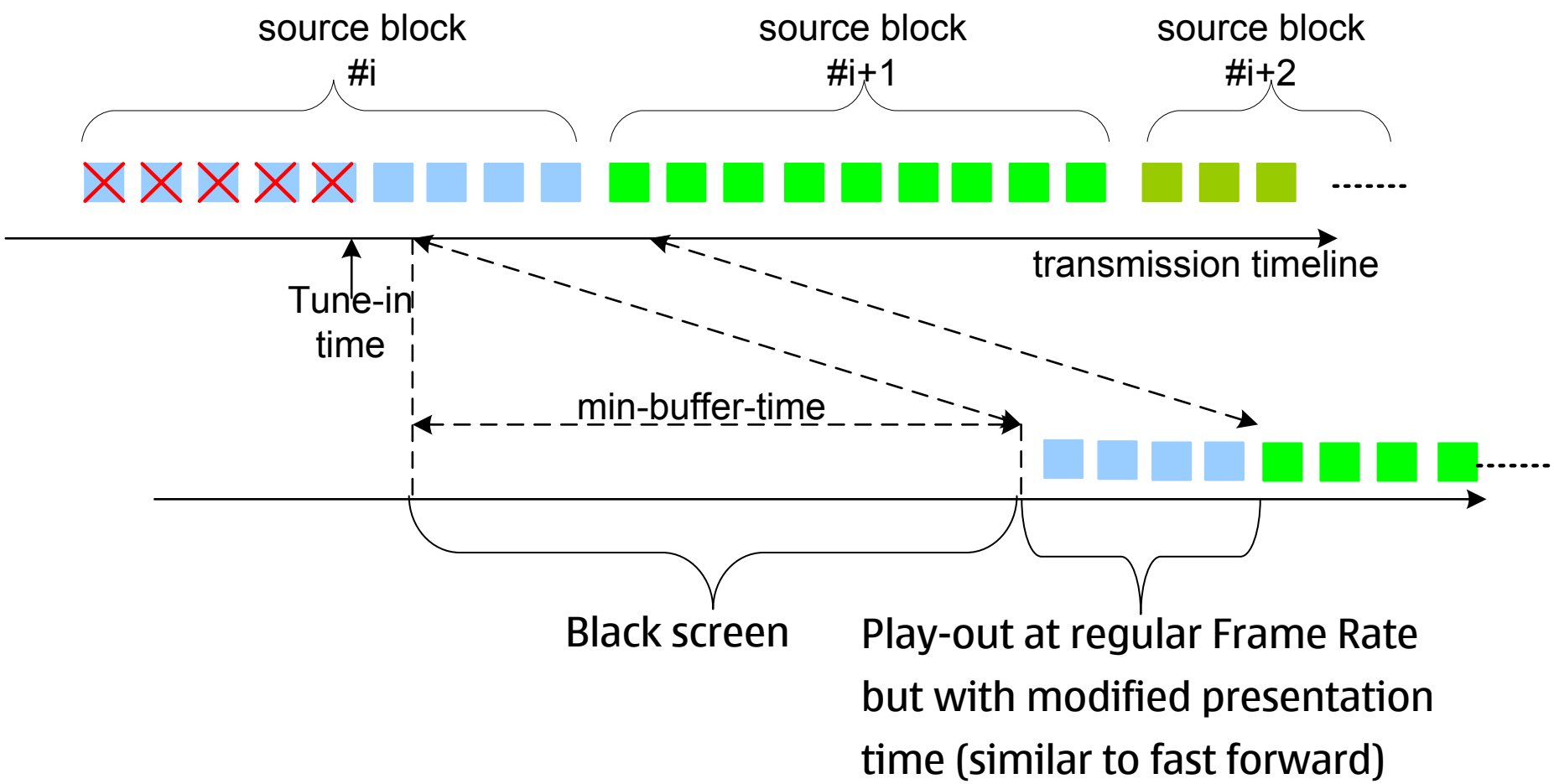
- Interleaved content may result in time shifted play-out of the content for legacy devices.
- UE will be able to play-out media data correctly received from source block i.

Interleaved Mode – Legacy UE Audio Synchronization



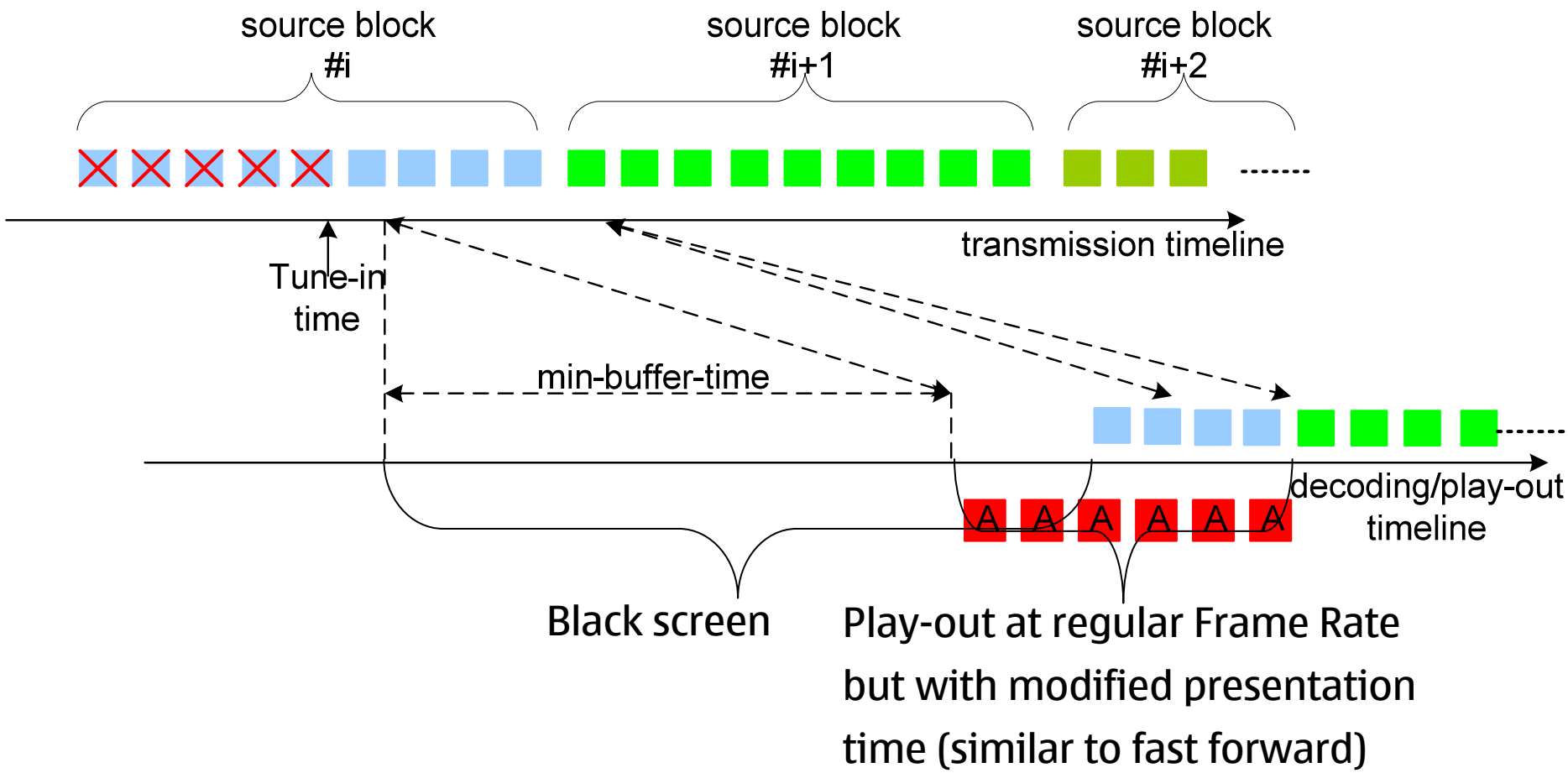
- Offset of time shift is based on media duration of audio
- Only a subset of the video data (that corresponds to the available audio) will be played out.

Interleaved Mode – Ericsson Proposal
No Audio Synchronization



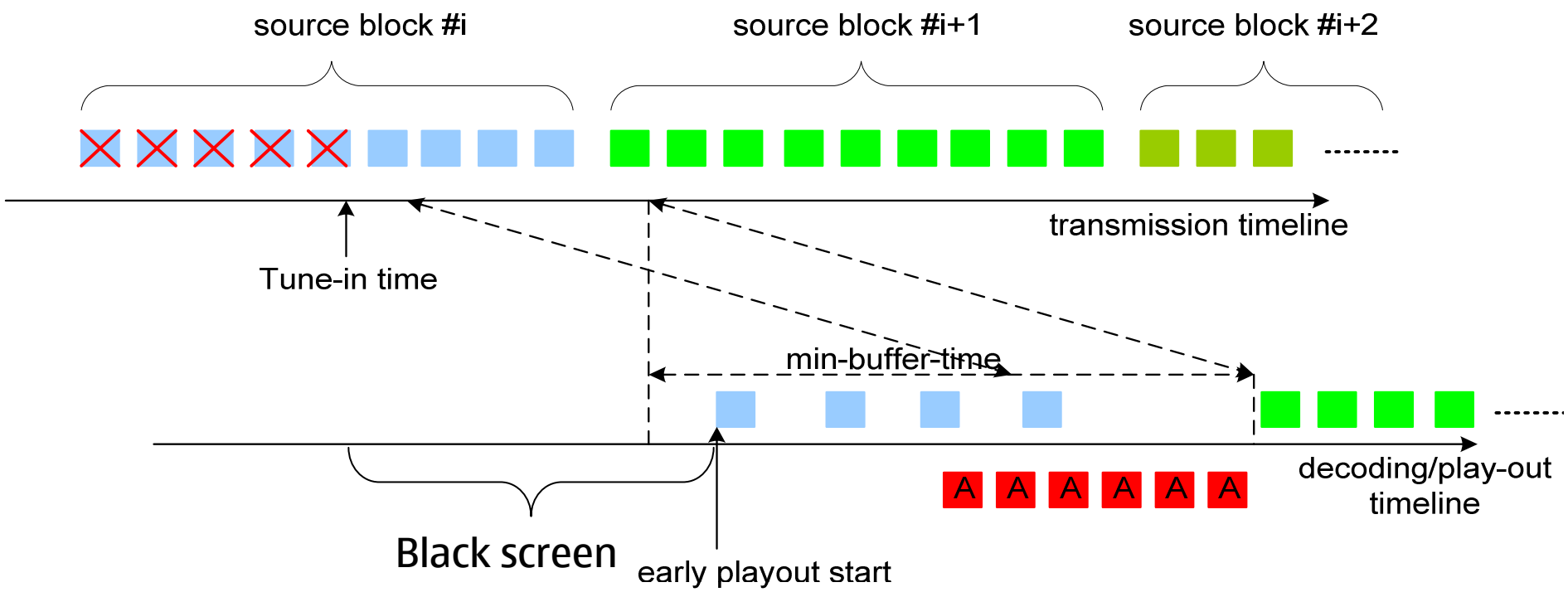
- Fast forward type play-out of video media data
- No time shift for UE that can update time-stamps

Interleaved Mode – Ericsson Proposal Audio Synchronization



- Fast forward type play-out of video media data
- Time-shift is caused by audio media data
- Longer (than min-buffer-time) black screen period

Interleaved Mode – Early Play-out



- Min-buffer time is respected starting from source block i+1
- Play-out of data from source block i may start earlier on UEs aware of the interleaving
- Reduced black screen period (shorter than min-buffer-time)

Conclusions

- UE aware of the interleaving may start as early as possible and still respect the indicated min-buffer time starting from the following source block
- No modifications to the RTP stream are necessary
- Shortest tune-in time for Interleaving-aware UEs, regular tune-in time for legacy terminals
- Audio stream typically controls the session play-out time line and as such, flexible RTP timestamps for video bring no benefit but result in out-of sync play-out.
- Proposal:
  - Signal to the UE that interleaving is being used for the purpose of tune-in time reduction for the current MBMS US
  - Indicate the possibility of early play-out start at the receiver
  - Leave actual play-out behavior to the player implementations

NOKIA