MOVING TO CI PLUS 2.0 USB

BENEFITS AND OPPORTUNITIES

DEUTSCHE TV-PLATTFORM

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1. Document goal

In March 2021, the Deutsche TV-Plattform (DTVP) conducted a CI Plus 2.0 workshop that was attended by more than 50 industry representatives. DTVP, with its more than 50 members from all areas of the media industry and beyond, focuses on promoting the exchange between market players and the audience, coordinating their specific concerns. The impulse to deal with CI Plus 2.0 came from the DTVP UHD working group.

Prior to the workshop, DTVP had received 22 well-founded replies to a CI Plus 2.0 survey, which underlines the great interest for the topic. The workshop in March and a subsequent workshop in May 2021 were used to present the results from that survey and to allow participants to introduce their views on CI Plus 2.0.

DTVP's goal is to foster the digitaltransformation process of the industry based on open standards and to provide a round table for the exchange between manufacturers, broadcasters, platform/infrastructure operators and other partners in the value chain. At the end of the second CI Plus 2.0 workshop it was agreed for DTVP to establish regular CI Plus 2.0 Round Table meetings with all interested members of the industry, to facilitate further discussion about CI Plus 2.0 and its potential market introduction in the DACH [1] region. The first DTVP CI Plus 2.0 Round Table meeting took place in June 2021.

This document presents the results of the DTVP work on CI Plus 2.0. It summarizes the benefits of CI Plus 2.0, shows potential introduction scenarios for CI Plus 2.0, and is intended to help the entire industry in the DACH region.

In addition, this document shall also help to derive important consumer-facing communication, to facilitate the introduction of CI Plus 2.0 in the DACH region. Eventually, it may also be helpful for other relevant stakeholders outside of the DACH region.

[1]   Germany (D), Austria (A), and Switzerland (CH).

2. Introduction

Support for an open interface socket is not only a legal requirement for TVs in Europe [2] but also a practical and commercial consideration, which is addressed by CI Plus. Since its launch over a decade ago, CI Plus has been deployed in over 40 countries, is supported by hundreds of Pay-TV and Free-To-View Operators and essentially all TV manufacturers. As such, a considerable install base of compatible TVs and CAMs exists today.

PCMCIA [3] CAMs deployed in the field can have long lifespans, e.g. up to 10 years, which must be considered when migrating to the new USB form factor introduced with CI Plus 2.0.

A transition from PCMCIA to USB will necessarily occur over several years, as support for CI Plus 2.0 is added to TVs, and USB CAM are launched to both replace current PCMCIA models, as well as to offer new and compelling features and services to users, as detailed in the next chapter.

[2]   "Any digital television set with an integral screen of visible diagonal larger than 30 cm which is put on the market for sale or rent in the Union is to be fitted with at least one open interface socket" as defined in Directive (EU) 2018/1972 of the European Parliament and of the Council of 11 December 2018 establishing the European Electronic Communications Code

https://tinyurl.com/euro-lex

[3]   Personal Computer Memory Card International Association (PCMCIA) interface, also known as PC Card interface, defined for use as a Common Interface (CI) physical layer in ETSI EN 50221 [1].

3. Benefits of CI Plus 2.0

3.1 General

Changing from PCMCIA to USB offers at a minimum equivalent CI Plus functionality, but more importantly brings many additional benefits due to the modern USB interface such as a more practical form factor, easier production and distribution. From a TV's perspective, ultimately, a significant space saving and a reduction in complexity can be achieved on TV circuit boards and I/O panels with the eventual removal of PCMCIA slots. As there will be a transition period due to existing deployments (see chapter 5.3) this benefit may take 10 years to fully achieve.

3.2 USB: interoperable and future-proof

USB is a future proof interface with an excellent track record for interoperability. It provides more bandwidth[4] than PCMCIA, the possibility of improved IP CAM connectivity[5], support for native multi-stream[6] and more, which enable more advanced uses of existing CI Plus features such as CICAM Player Mode[7].

[5] Gigabit Ethernet speeds can be achieved using Ethernet over USB with USB 3.x, but even with USB 2.0, speeds well over 200Mbps are achievable, whereas only 1Mbps throughput is required by CI Plus for the Low Speed Communication resource (see CI Plus Specification v1.3.2 [2], clause 14.1), as it was not intended to transfer of large amounts of data.

[6] See ETSI TS 103 605 [4], clause 7.3 and USB 3.2 [6], clause 8.12.1.4.

[7] See ETSI TS 103 205 [7], clause 8.

[4] While the PCMCIA transport interface supports 96Mbps in each direction (see CI Plus Specification v1.3.2 [2] clause 11.1.3 and Annex E.13) , USB offers much higher data rates from 480Mbps for USB 2.0 High-Speed [5] to 10Gbps for USB 3.1 SuperSpeed+ [6].
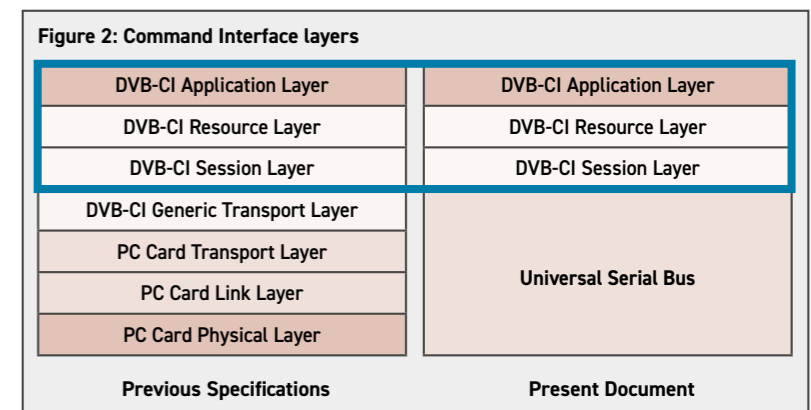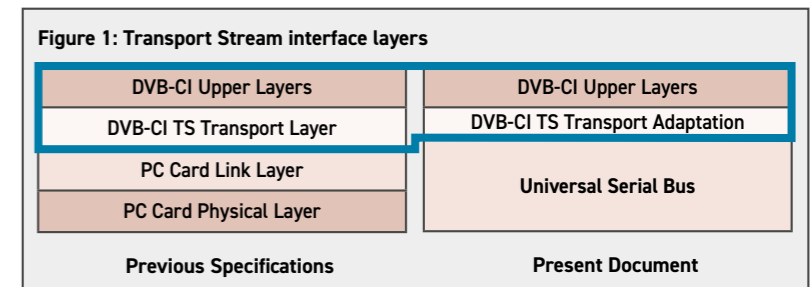
3.3 Builds on the maturity of the CI Plus standard

CI Plus 2.0 adds the benefits and functionality of the modern USB interface, without any loss of CI Plus features or security already introduced with previous versions of the CI Plus specification.

All CI Plus 1.4 features remain supported, as does the ECP security level.

Furthermore, as devices may use a common CI Plus implementation to support both PCMCIA and USB interfaces, this minimises the impact on implementation maturity and interoperability, as well as the effort necessary to add CI Plus 2.0 support to an existing CI Plus 1.4 implementation. As illustrated by figures 1 and 2 from ETSI TS 103 605 [4] reproduced below, the lower layers used by PCMCIA are replaced by native USB functionality, and the upper protocol layers are common for both interfaces (emphasis added), with only minor exceptions related to the packaging of TS data for USB bulk transfer, the management of the TS interface bandwidth and CAM reset behaviour.

Furthermore, for devices that only implement CI Plus 2.0, certain legacy functionality is not mandatory[8], which reduces the implementation effort required. Minimising the impact of the PCMCIA legacy on USB-only CI Plus 2.0 devices.

Figure 1: Transport Stream interface layers

DVB-CI Upper Layers	DVB-CI Upper Layers
DVB-CI TS Transport Layer	DVB-CI TS Transport Adaptation
PC Card Link Layer	Universal Serial Bus
PC Card Physical Layer	
Previous Specifications	**Present Document**

Figure 2: Command Interface layers

DVB-CI Application Layer	DVB-CI Application Layer
DVB-CI Resource Layer	DVB-CI Resource Layer
DVB-CI Session Layer	DVB-CI Session Layer
DVB-CI Generic Transport Layer	Universal Serial Bus
PC Card Transport Layer	
PC Card Link Layer	
PC Card Physical Layer	
Previous Specifications	**Present Document**

[8] Lower resource versions that are mandatory to implement for CI Plus devices that support the PCMCIA CI Plus interface, as defined in CI Plus Specification v1.4.4 [9] table 4.1, are not required for CI Plus devices that only support the USB CI Plus interface, as defined in in CI Plus Specification v2.0.2 [3] table 4.1.

3.4 User friendly USB "stick" form factor

Almost everyone has used a USB device or USB "stick" before, with a Type-A connector[9]. It is a ubiquitous and recognizable form factor. This makes the use of a CAM much less confusing or intimidating, and more comfortable to users. It also makes it much easier to move the CAM between TVs, such as between a living room and bedroom, or when travelling.

Smaller, and with a more customizable appearance[10] than PCMCIA, the USB "stick" form factor offers new branding and marketing opportunities.

[9] See USB 2.0 [5], clause 6.5.4 and ETSI TS 103 605 [4], clause 4.1.1

[10] Different shapes of housing can be used for the body of a USB CAM as long as the mechanical requirements are met (see ETSI TS 103 605 [3], clause 4.1.2), with different materials (e.g. plastics, metals) and different colours. All sorts of branding can be printed or affixed onto the housing in a variety of ways. A simple Internet image search reveals the many different and inventive forms used for USB flash drives (i.e. storage).

USB Type Connectors	USB 2.0	
Type A		
Type B		
Mini-B		
Micro-B		

3.5 Robustness

The USB Type-A connector has a proven robustness track record, and is one of the most commonly used connectors for all kinds of devices.

The move away from PCMCIA will eliminate the risk of bent pins and damage due to incorrect insertion (e.g. CAM not properly aligned or inserted the wrong way up), because PCMCIA connectors and receptacles are more fragile than USB Type-A connectors and receptacles. Indeed, USB is designed for easy and regular connection/disconnection, better for users who trans-fer their CAM between multiple TVs (e.g. living room, bedroom, when travelling), whereas PCMCIA is not.

Furthermore, the move to USB may also encourage the move away from the traditional smart-card form-factor, which is an additional source of user confusion, when inserted the wrong way up.

Such improvements in robustness will reduce the number of calls to TV manufacturer and operator customer support services.

3.6 Manufacturing and transport

There is widespread support for manufacturing USB devices, availability of reference designs and worldwide manufacturing capabilities. Resulting in a wide choice and facilitating local production and distribution. Whereas there are more limitations for PCMCIA.

Furthermore, smaller and lighter than PCMCIA, the USB "stick" form factor facilitates transport logistics.

3.7 Worldwide scope

While CI Plus is already a worldwide standard, it is predominantly adopted in Europe where PCMCIA has been used historically for the Common Interface. The move to USB will facilitate wider CI Plus deployment, by doing away with the dependency on the current PCMCIA interface. DACH will benefit from the economies of scale due to worldwide production.

Additionally, this facilitates implementation for manufacturers developing products for worldwide DVB markets.

Worldwide scale is already being demonstrated in India by the Telecom Regulatory Authority of India (TRAI), who has recommended introduction of mandatory support for CI Plus 2.0 and USB CAMs to the Ministry of Information and Broadcasting. Following consideration of this recommendation, they may request the Bureau of Indian Standards (BIS) to update the requirements for TVs, to include mandatory CI Plus 2.0 support as defined in ETSI TS 103 605 [4]. A decision is expected in 2022.

4. Comprehensive standards-based solution

3.8 Greener way to watch TV

From an ecological standpoint, a CAM has always been a greener solution than an STB, given a CAM's lower weight, smaller size and much lower power consumption (up to 7 times lower11). Moreover, the Remote-Control, electrical and network cables, and power supply unit of an STB contribute to its CO2 footprint. Whereas using a CAM eliminates that impact, representing a significant sustainability benefit for the Pay-TV ecosystem.

This is even truer with the USB form factor, as a USB CAM has fewer components than a PCMCIA CAM, a smaller PCB, and fewer parts than traditional PCMCIA CAMs, which further reduces e-waste.

11 https://www.smardtv.com/newsroom/white-paper-smardtv-tv-stick-2022
SmarDTV whitepaper "Is smart TV an operator controlled device?" page 11, #Being greener, 3rd paragraph

3.9 Facilitates customer support

With a USB interface, it is possible to connect USB CAMs to a PC for quick updates and diagnostics in case of an issue. This can eliminate the need for a replacement CAM or on-site support, both of which involve longer waiting times for customers.

Leveraging the standard CI Plus interface, a CI Plus CICAM can offer numerous features:

1. Single remote control operation: no need for an additional remote control, the viewer uses their TV's remote control and user interface to access and control the content and functionality offered by a CI Plus CAM connected to the TV.

2. Operator-managed channel list using CI Plus Operator Profile.
Support for a hybrid broadcast/broadband service list is possible using the DVB-I 12 and/or HbbTV standards.

3. Support for premium UHD/HDR content with CI Plus ECP.

4. Support for interactive services through HbbTV integration (CICAM App, Virtual Channel, HbbTV OpApp).

5. Operator UI look & feel on TV for the channel list, now & next, EPG, and more, through HbbTV OpApp installation offered by the CAM.

6. Support for both connected and non-connected setups using the CICAM Auxiliary File System, to store HbbTV App or HbbTV OpApp files.

7. Easy setup by connecting the CAM and following TV installation steps: no extra box with multiple cables to connect and configure.

8. Much lower power consumption than a typical HDMI STB and more eco-friendly (see chapter 3.8).

These features, combined with the benefits of USB described in the previous chapter, enable a CI Plus 2.0 USB CAM to offer a complete Pay-TV solution, in a user-friendly form factor. This standards-based approach enables a USB CAM to accommodate specific needs of operators, both today and in the future, with minimal impact on TVs thanks to the standard USB CI Plus interface.

With CI Plus 2.0, end-users can enjoy a feature-rich Pay-TV experience, that's easier to setup and use.

12 The DVB-I standard (ETSI TS 103 770 [7]) enables viewers to seamlessly find and watch television content, whether delivered over terrestrial, satellite or cable broadcast, or any kind of broadband IP network. For more information please visit https://dvb-i.tv

5. Usage scenarios

5.1 Overview

When considering the move from PCMCIA to USB, it is important to consider the different usage scenarios and minimise disruption for end-users. TV manufacturers should facilitate the identification of the interfaces and specific ports that support CI Plus, as this information will be needed by users, retailers and operators. In addition to the scenarios described below, communication will be key to ensure a smooth transition.

5.2 TV with only CI Plus 1.x PCMCIA support

Users of such TVs will require a PCMCIA CI Plus CAM to view scrambled Pay-TV or Free-To-View content from their operator.
This is the case for TVs (>30cm) that do not support CI Plus 2.0.
TV product documentation will typically refer to a CI Plus (CI+) or Common Interface (CI) slot.

Users will be affected in the following cases:

A. Their operator provides a USB CAM and is no longer able to provide a PCMCIA CAM.

B. They are unable to purchase a suitable PCMCIA CAM from retail.

In those scenarios, only USB CI Plus CAMs would be available, which are not compatible with a TV with only CI Plus 1.x PCMCIA support.

The impact to users can be minimised by:

1. Operators ensuring that their customers are aware of the requirement for CI Plus 2.0 (e.g. advertising, retail staff/marketing training).

2. Operators planning the transition of their CI Plus CAM install base from PCMCIA to USB during that same period. Ensuring PCMCIA CAMs or other alternatives remain available for users that need them, while replacing PCMCIA CAMs at/nearing the end of their lifecycle with USB CAMs for users with compatible TVs, taking advantage of the benefits offered by CI Plus 2.0 (see chapter 3).

5.3 TV with both CI Plus 1.x PCMCIA and CI Plus 2.0 USB support

Users of such TVs can use either a PCMCIA CI Plus CAM (typically the CAM they already own) or a USB CI Plus CAM (typically a CAM they purchase with or after the purchase of a new TV) to view scrambled Pay-TV or Free-To-View content from their operator.
This is the case for some TVs from 2021 onwards.
TV product documentation will typically refer to a "CI Plus" ("CI+") or "Common Interface" ("CI") "slot", and to the USB ports where a USB CI Plus CAM can be connected.
Considering the use of a USB CI Plus CAM, a free USB port on the TV that supports CI Plus is required.

Users will be affected in the following cases:

A. Not knowing whether their TV supports USB, PCMCIA or both CI Plus interfaces.

B. When connecting a USB CAM to a TV USB port that does not support CI Plus.

C. When there are not enough free USB ports on the TV, which may occur when using other USB peripherals such as USB mass storage devices (e.g. hard disk drive, flash drive) or input devices (e.g. gamepad).

The impact to users can be minimised by:

1. TV manufacturers supporting CI Plus on all TV USB ports, or labelling TV USB ports to indicate CI Plus support.

2. Operators and manufacturers cooperating to ensure their helplines and support websites can guide customers to the correct CI Plus interface connector if needed.

3. Operators and manufacturers cooperating to inform customers about the extensibility of USB using third-party USB hubs.

4. Retailers and manufacturers cooperating to provide customers with guidance about the CI Plus interfaces supported by TVs.

5. Operators offering a PCMCIA CAM as an alternative option to customers.

5.4 TV with only CI Plus 2.0 USB support

Users of such TVs can use a USB CI Plus CAM to view scrambled Pay-TV or Free-To-View content from their operator.
Sufficient progress in the transition from PCMCIA to USB CAMs by operators, and adoption by their customers, could allow manufacturers to provide TVs with only a USB CI Plus interface in the future.
Users can alternatively use a USB-to-PCMCIA adaptor[13], to connect a PCMCIA CAM to one of their TV's USB ports which supports CI Plus.

[13] See ETSI TS 103 605 [4], annex A.

Users will be affected in the following cases:

A. When the operator only provides PCMCIA CI Plus CAMs.

B. When the user is unable to acquire a USB-to-PCMCIA adaptor from an operator only providing PCMCIA CI Plus CAMs.

C. When the user is unable to acquire a USB CI Plus CAM from retail when their operator only provides PCMCIA CI Plus CAMs.

D. When already owning a PCMCIA CI Plus CAM, the user changes their TV from a TV with a PCMCIA CI Plus slot to a TV with only a USB CI Plus slot.

E. When connecting a USB CAM to a TV USB port that does not support CI Plus.

F. When there are not enough free USB ports on the TV, which may occur when using other USB peripherals such as USB mass storage devices (e.g. hard disk drive, flash drive) or input devices (e.g. gamepad).

The impact to users can be minimised by:

1. Operators and manufacturers cooperating regarding the transition period from PCMCIA to USB, including communication to customers.

2. Operators or manufacturers communicating to consumers how to obtain dedicated USB-to-PCMCIA CI Plus CAM adaptors or other alternatives (e.g. via advertising, retailers). Such dedicated CI Plus CAM adaptors may be supplied by the operator, the TV manufacturer, or they may be made available to users for purchase by a third-party company.

3. Retailers and manufacturers cooperating to provide customers with guidance about the CI Plus interfaces supported by TVs.

4. Operators and manufacturers cooperating to ensure their helplines and support websites can guide customers to the correct CI Plus interface connector if needed.

5. Operators and manufacturers cooperating to inform customers about the extensibility of USB using third-party hubs.

6. Alleviating potential concerns

6.1 Broadcast impact

Importantly, no change at all is required to DVB broadcasts. The same content encoding, multiplexing, signalling and multitude of CA systems can continue to be used, as no change is needed for CI Plus 2.0. The use of CI Plus 2.0 is completely transparent from the perspective of the broadcast. Offering more choice to operators, not less.

6.2 Transition from broadcast to IP

While there is a move from broadcast to IP delivery, together with a move from linear to on-demand, broadcast and linear each have clear strengths and benefits.

Hybrid solutions combining both broadcast and IP will provide the optimal balance for both service providers and users, getting the most out of both broadcast and broadband, depending on the content and the context. Therefore, as broadcast will remain relevant for many years to come, so too will CI Plus. Hence the advantage of adopting a modern CI Plus interface with the benefits that entails (see chapter 3).

6.3 Existing CAMs and transition

The introduction of CI Plus 2.0 USB CAMs does not require the immediate replacement of all PCMCIA CAMs. Such a transition can be done:

- progressively, as PCMCIA CAMs reach the end of their lifespan,

- by offering USB CAMs in parallel to PCMCIA CAMs, to new customers that have a compatible TV,

- by offering new features in combination with USB CAMs, making them a more appealing choice for users,

- by offering adapters to continue using PCMCIA CAMs on newer TVs that only provide a USB CI Plus interface.

During this transition period, TV manufacturers may consider supporting both PCMCIA and USB Common Interfaces, which is an additional burden. However, as mentioned in chapter 3.3, a common CI Plus implementation can support both PCMCIA and USB interfaces, which limits the additional effort. Operators may need to consider how to accompany customers with both PCMCIA and USB CI Plus CAMs, whose TVs might only support PCMCIA, USB, or both CI Plus interfaces.

6.4 CI Plus versatility

One of the strengths of CI Plus is its support for a wide variety of CA systems, and features that go beyond content protection and control.

Supporting multiple CA systems natively in TVs would be challenging for multiple reasons. In particular, the burden of implementation would be too high, and additional features provided by the CI Plus standard would instead need proprietary implementations for each operator.

Consequently, the use of a CI Plus CAM ensures operators have choice, flexibility and control over content protection, as well as the ability to offer additional features and services through the use of the CI Plus standard.

Furthermore, combining CI Plus 2.0 with other standards such as HbbTV, DVB-I, etc, enables secure hybrid broadcast/broadband delivery. This can be used to offer service trials over broadband and simplify subscriber registration and sign-in, with a smooth transition to a full hybrid broadcast/broadband service offering. As broadcast remains dominant for live TV content, a USB CI Plus CAM can offer secure broadcast delivery as part of such an integrated hybrid TV experience.

In summary, CI Plus 2.0 together with other DVB and HbbTV international standards enable the ecosystem to maximise interoperability and choice for both operators and end-users, while ensuring the burden on TV manufacturers remains reasonable.

6.5 Communication and product labelling

Any new interface requires clear, coordinated communication to end-users by the industry.

CI Plus LLP provides multiple logos[14] which have been contributing to the awareness and recognition of CI Plus. These logos are already widely used to clearly identify compliant CI Plus devices, literature, and connectors.

A dedicated CI Plus 2.0 logo could be an additional recognisable indication for the benefit of users. CI Plus LLP can be asked to extend their current logo library to help the industry.

As USB is used for more and more features, port labelling is important (see chapters 5.3 and 5.4).

[14] http://www.ci-plus.com/documentation/#logos

7. Markets initiatives and timeline

The ecosystem is in place to ensure a successful transition.

The inclusion of CI Plus 2.0 (USB) connectors in TV started in 2021.

Multiple TV manufacturers have added CI Plus 2.0 support, growing the installed base of compatible TVs.

Some TV chipset providers are also contributing to the wider deployment of the CI Plus 2.0 standard by providing a reference CI Plus 2.0 Host stack to their TV partners, facilitating integration of CI Plus 2.0 into new TVs [15].

CAM manufacturers are ready to provide CI Plus 2.0 USB CAMs. Some CAM manufacturers have announced USB CI Plus CAMs have already successfully passed certification [16].

Several initiatives have been launched in Western Europe, in particular Italy with tivùsat [17]. Several operators have confirmed their interest, and CI Plus 2.0 CAMs and TVs have already been tested.

Outside of Europe, and more specifically in India a green-field market for CI Plus, TRAI (Telecom Regulatory Authority of India) announced in April 2020 [18] that they were recommending CI Plus 2.0 adoption for both STB and TVs.

The next important milestone is the commercial launch of CI Plus 2.0 CAMs together with operators.

[15] https://www.eurofins-digitaltesting.com/news/tpv-collaboration-first-ci-plus-2-0-compliant-tv/

[16] https://www.digitaltvnews.net/?p=37569
https://www.smardtv.com/newsroom/smardtv-tv-stick-ci-plus-2-certification
https://www.broadbandtvnews.com/2021/11/09/smit-secures-c1-plus-2-0-certification/
https://www.smit.com.cn/engr/index.php?m=content&c=index&a=show&catid=506&id=2078

[17] https://www.tivusat.tv/news/index.aspx?i=1956

[18] https://trai.gov.in/sites/default/files/Recommendation_11042020.pdf

8. References

[1] ETSI, EN 50221
Common Interface Specification for
Conditional Access and other
Digital Video Broadcasting Decoder Applications

[2] CI Plus LLP, CI Plus Specification v1.3.2
Content Security Extensions to the Common Interface

[3] CI Plus LLP, CI Plus Specification v2.0.2
Extensions for Implementation Using the
Universal Serial Bus

[4] ETSI, TS 103 605 v1.1.1
Digital Video Broadcasting (DVB);
Second Generation Common Interface (CI);
Implementation Using the Universal Serial Bus
(USB)

[5] Universal Serial Bus Specification,
Revision 2.0

[6] Universal Serial Bus 3.2 Specification,
Revision 1.0

[7] ETSI, TS 103 205 v1.2.1
Digital Video Broadcasting (DVB);
Extensions to the CI Plus™ Specification;

[8] ETSI, TS 103 770 v1.1.1
Digital Video Broadcasting (DVB); Service Discovery
and Programme Metadata for DVB-I;

[9] CI Plus LLP, CI Plus Specification v1.4.4
Content Security Extensions to the Common Interface

Legal Note – Imprint