



PCI-SIG ENGINEERING CHANGE NOTICE

TITLE:	Combined Antenna Tuning/Coexistence Signal ECR
DATE:	May 31, 2012
AFFECTED DOCUMENT:	PCI Express Mini Card Specification V2.0
SPONSOR:	Jim Panian, Qualcomm

Part I

1. Summary of the Functional Changes

Modify the PCI Express Mini Card specification to define a new interface for tunable antennas.

Modify the PCI Express Mini Card specification to enable existing coexistence signals to operate simultaneously with new tuneable antenna control signals.

2. Benefits as a Result of the Changes

Please see background information in the document [WWAN modules and tunable antennas](#). Adding the tunable antenna interface to the PCI Express Mini Card specification allows inclusion of this technology in the Mini Card without introducing fragmentation on the market.

Will enable existing coexistence signals to operate simultaneously with the new tunable antenna control signals. Enables backwards compatibility with cards which have been designed to the existing coexistence interface.

3. Assessment of the Impact

The existing two coexistence signals will remain in their present locations. A third coexistence signal will be overlaid on top of a pin currently assigned to 1.5V. This enables the three coexistence signals to be placed closely to each other on the connector. Two tuneable antenna control signals will be assigned to reserved pins. Two additional tuneable antenna control signals will be assigned to pins currently assigned to 1.5V. Within the Mini Card workgroup participants indicated that the 1.5V signals are not being used in current implementations.

4. Analysis of the Hardware Implications

Neither the coexistence interface or the antenna control interface is mandatory to implement. However, it is anticipated that WWAN Mini Card implementations which support LTE radios may operate the coexistence signals simultaneously with tuneable antenna control signals. The coexistence signals enable radio frequency interference to be mitigated between WLAN/Bluetooth radios which operate in the Industrial, Scientific and Medical (ISM) radio frequency band and LTE radios which may operate in adjacent radio frequency bands to ISM.

5. Analysis of the Software Implications

None known.

6. Analysis of the C&I Test Implications

Mini Card workgroup members were surveyed to determine if existing implementations use the 1.5V pins. No Mini Card, Host or mSATA card implementations have been identified that use the 1.5V pins (pins 6, 28, 48). Therefore, assignment of coexistence signals to these pins will not impact existing implementations, and should not render any Host or Mini Card incompatible.

Some implementations may be affected which have implemented tuneable antenna control signals.

Part II

3.3. Connector Pin-out Definitions

The following sections illustrate signal pin-outs for the system connector. Table 3-8 lists the pin-out for both the 52-pin and 76-pin system connectors. For the 52-pin version of the connector, pins 53 – 76 are not present.

Table 3-8: System Connector Pin-out

Pin #	Name	Pin #	Name
75	GND	76	MLDIR
73	ML0p	74	GND
71	ML0n	72	GND
69	GND	70	ML1p
67	GND	68	ML1n
65	ML2p	66	GND
63	ML2n	64	GND
61	GND	62	ML3p
59	GND	60	ML3n
57	AUXp	58	GND
55	AUXn	56	GND
53	DMC#	54	HPD
Mechanical Key			
51	W_DISABLE2#	52	+3.3Vaux
49	Reserved	50	GND
47	Reserved ANTCTRL3	48	+1.5V/ ANTCTRL1
45	Reserved ANTCTRL2	46	LED_WPAN#
43	GND	44	LED_WLAN#
41	+3.3Vaux	42	LED_WWAN#
39	+3.3Vaux	40	GND
37	GND	38	USB_D+
35	GND	36	USB_D-
33	PETp0	34	GND
31	PETn0	32	SMB_DATA
29	GND	30	SMB_CLK
27	GND	28	+1.5V/ ANTCTRL0

Pin #	Name	Pin #	Name
25	PERp0	26	GND
23	PERn0	24	+3.3Vaux
21	GND	22	PERST#
19	UIM_IC_DP	20	W_DISABLE1#
17	UIM_IC_DM	18	GND
Mechanical Key			
15	GND	16	UIM_SPU
13	REFCLK+	14	UIM_RESET
11	REFCLK-	12	UIM_CLK
9	GND	10	UIM_DATA
7	CLKREQ#	8	UIM_PWR
5	COEX2	6	1.5V/ COEX3
3	COEX1	4	GND
1	WAKE#	2	3.3Vaux

3.3.2. Coexistence Pins

COEX1, COEX2 [and COEX3](#) are provided to allow for the implementation of wireless coexistence solutions between the radio(s) on the Mini Card and other off-card radio(s). These other radios can be located on another Mini Card located in the same host platform or as alternate radio implementations (e.g., using a PCI Express Mini CEM or a proprietary form-factor add-in solution).

The functional definition of these pins are OEM specific and should be coordinated between the host platform OEM and card vendors. The ordered labeling of these signals in this specification are intended to help establish consistent implementations, where practical, across multiple instances of cards in the host platform. [Note that COEX3 is shared with a 1.5V pin, see section 3.2.1.](#)

3.3.3. Reserved Pins

Reserved pins are expected to be not terminated on either the add-in card or system board side of the connector. These pins are reserved for definition with future revisions of this specification. Non-standard use of these pins may result in incompatibilities in solutions aligned with the future revision.

~~One subset of the reserved pins is tentatively reserved for specific applications as noted in Table 3-8. 20 If new functionality requires use of these specially marked pins, they may be released for redefinition on an as needed basis.~~

3.3.4. Tunable Antenna Pins

Pins ANTCTRL[3:0] define a 4-pin interface for allowing on-board radio(s) to tune antennas external to the Mini Card. This interface is typically used when the external antenna subsystem needs to have knowledge of the frequency that the on-board radio(s) are operating on in order to achieve peak performance.

The functional definition of these pins, including voltage levels and protocol, are OEM specific. Up to 4 pins may be used in some implementations, while other implementations will use only a subset of the pins defined. The purpose of including them in this specification is to avoid non-standard pin assignments for this interface and to have a consistent naming scheme across the industry.

ANTCTRL0 and ANTCTRL1 are sharing functionality with 1.5V pins, whether the add-in card is using these pins for 1.5V or tunable antennas is OEM specific and shall be documented by the OEM.

3.2.1. Power Sources and Grounds

PCI Express Mini Card provides two power sources: one at 3.3V_{aux} (3.3V_{aux}) and one at 1.5V (+1.5V). The auxiliary voltage source, +3.3V_{aux}, may be the only supply voltage available during the system's stand-by/suspend state to support wake event processing on the communications card. ⁵The 1.5V voltage source may or may not be present in the low power state. The 1.5V power source is sharing functionality with a coexistence pin and tuneable antenna pins, see sections 3.3.2 and 3.3.3. Whether the add-in card is using these pins for coexistence support, tuneable antenna control or a 1.5V power source is OEM specific and shall be documented by the OEM.