

optional restitution chain. At the output of the transmission chain, there are only messages leaving for the RF. The radio control messages 502 from the transmission chain are time stamped and have the parameters that characterize the radio controls or the events. The I/Q samples, 503, to be transmitted are
 5 also in the form of time stamped messages.

At reception, the application TS generates messages for controlling radio signal acquisitions and obtaining IQ samples. These messages are of outgoing type only, 505. The signal I/Q samples are received by the application TS in time stamped messages of incoming type, 503. They are transmitted to a
 10 reception processing chain comprising, for example, an acquisition chain, and then an adapted filter, and to a synchronization module, and then to an equalizer, the samples are then demodulated and then decoded. One output of the reception processing chain comprises the received data 504. Another output corresponds to the radio controls 505 that are in the form of time stamped
 15 messages.

The signal processing application TS does not need to know the design elements of the RF module. The messages generated by the application in order to control the radio operation notably have the following parameters: the sampling frequency, the reception frequency, the reception instant, the gain,
 20 etc.

In the case outlined in figure 5, for example, the RF part comprises, as in figure 6, a generic interface controller 34, a message processing module 35 for the messages from the generic interface controller 34, which receives a time H_R from a TIME module 36 linked to a local oscillator 37. The result of the
 25 messages processed at the output of the message processing module are control signals that have the aim of controlling the digital part 38 of the RF, control signals that will control the analog ~~part~~portion 39 of the RF part and IQ samples. At transmission, the analog part receives the signals from the processing operations of the digital part and has the aim of implementing the
 30 functions allowing the signals to be transmitted to the transmission/reception antenna 10 (and vice-versa for reception).

CLAIMS

1 – An interface architecture between a first digital baseband subsystem (BB) and at least one second radio frequency subsystem (RF) ~~that is connected by~~
 5 means of a link L, which interface architecture comprising ~~is characterized in that~~
 it has at least the following elements:

- at the digital BB subsystem,
 - a signal processing application module (30), ~~the operation of which~~
 10 is based on ~~the operation of a time H_B (31)~~, said signal processing
 application module (30) is configured ~~adapted~~ to generate and/or
 receive messages MSG(H, data) comprising a time H and data,
 parameters including data associated with in-phase/quadrature ~~or IQ~~
 samples, said messages MSG(H, data) ~~which~~ are associated with
 15 an ~~the~~ operation of the at least one second radio frequency
 subsystem, and the signal processing application module works with
 a generic interface controller (33), the digital baseband subsystem
 BB ~~has a simplified functional and temporal view of the radio~~
frequency subsystem ~~module~~:
 - the radio frequency subsystem RF is seen from the first baseband
 20 subsystem BB and a baseband BB signal processing application
 as having a latency corresponding to a ~~the~~ delay and processing
 time from the baseband signal processing ~~an~~ application BB to a
 single antenna plane independent of a ~~(40) whatever the command~~
sent to or received from the radio frequency subsystem,
- at the radio frequency subsystem comprising a digital part (38) and an
 25 analog part (39),
 - an interface controller (34) linked to a module (35) for processing the
 messages MSG(H, data), said module (35) for processing the
 messages is configured ~~adapted~~ to operate based ~~on the basis of a~~
 30 time H_R (36), and for transmitting control signals to the digital part
 (38) and the analog part (39) of the radio frequency subsystem, and
for transmitting and/or receiving messages to/from the digital

baseband subsystem, ~~for~~the processing the messages MSG(H, data) module (35) controlling all of the radio frequency subsystem part RF,

- a memory (102) for storing the messages MSG(H, data) awaiting processing, a ~~message anticipation table~~ (101) ~~for anticipating messages~~ containing the temporal acquisition values corresponding to each type of message, ~~said temporal acquisition values being~~and that are used by the ~~message processing module~~ for processing messages to implement the message, a ~~memory (102) for the messages,~~ a module (103) ~~configured~~adapted to compare an time of implementation ~~time~~ of a message with a time that is necessary for an its execution of the message and to provide a signal for triggering the processing of the message for the ~~message processing module~~ (35) for processing the messages for generating control/command signals to said digital (38) part and said /analog (39) parts, and a time-setting module (104),

- said interface controllers (33), (34) ~~configured~~are adapted to synchronize the time H_B of the digital baseband subsystem and the time H_R of the radio frequency subsystem such as $H_B = H_R$,

- said link L is adapted ~~for~~the driving the time stamped messages between ~~the~~a radio frequency subsystem and ~~the~~a digital basebandBB subsystem.

2 – The interface architecture as claimed in claim 1, ~~comprising~~characterized in that it has a restitution chain and an acquisition chain at the digital basebandBB subsystem or at the analog partRF subsystem.

3 – The interface architecture as claimed in either of claims 1 and 2, ~~wherein~~characterized in that the interface controller of the digital baseband subsystem is ~~configured~~adapted to generate messages having the following format: a field address (71), followed by an execution~~implementation~~ time (72)

of a message, the type (73) of message, the size of the data of the message (74) and a field (75) for the data.

~~4 The architecture as claimed in one of claims 1 to 3, characterized in that the radio subsystem is a radio frequency subsystem RF.~~

~~45 - A method for guaranteeing the independence of a baseband application BB in relation to a radio frequency module RF, implemented in the architecture as claimed in one of claims 1 to 34, having at least the following steps: controlling one or more radio frequency subsystems (2) comprising at least one interface controller (34), from a digital BB subsystem comprising an interface controller (33) and an application TS and said method including characterized in that it involves at least the processing of the following actions:~~

- ~~• configuring one or more the radio frequency subsystems submodule(s) and determining the specific anticipation time with which the application TS has to work operate,~~
- ~~• synchronizing the times between the digital baseband BB subsystem and one or more the radio subsystem(s),~~
- ~~• transmitting, from the digital baseband subsystem and to a radio frequency subsystem, messages MSG(H, data) having the parameters indicating to the radio frequency subsystem submodule the processing operations to be performed,~~
- ~~• storing the message in the memory and, as soon as the duration of memory storage has finished, executing the message by configuring the radio frequency subsystem submodule and by activating the content of the data of the message for the operation at a single of the antenna plane.~~

~~56 - The method as claimed in claim 45, wherein characterized in that on startup, the method involves at least the following steps:~~

- a first phase for determining the passage delay time of the interface between the radio subsystem and the digital basebandBB subsystem,
- a second phase of synchronization of the time H_R of the radio frequency subsystem RF and the time H_B of the digital basebandBB subsystem,
- 5 • a third phase, in which the digital basebandBB subsystem retrieves athe minimum anticipation time used by the application TS for transmitting the time stamped messages from the digital basebandBB subsystem to the radio frequency subsystem,
- 10 • a fourth phase, in which athe latency between the digital baseband subsystemBB and the radio frequency subsystem RF is used to deduce athe single minimum anticipation time that will be used by the digital baseband subsystemBB to control the radio frequency subsystemRF.

15 67 - The method as claimed in claim 56, wherein characterized in that it involves at least the following steps:

- a first phase, in which a transmission/reception loop is implemented by executing the following steps,
- 20 • at departurethe time $t=H$, H corresponds to the current value of H_B (130), the interface controller of the digital baseband subsystemBB sends a message MSG(request (τ)) to the interface controller RF of the radio frequency subsystem in order to retrieve the time required by the radio frequency subsystemRF to produce, (131), a return message MSG(τ) that contains the transit time D_i for replying, τ is the time for producing the return message MSG(τ),
- 25 • the departure time t and an arrival time $t' = H + 2D_i + \tau$ times—of the transmission/reception loop are measured at the digital basebandBB subsystem in order to determine the transit time D_i ,
- 30 • a second phase, in which the digital basebandBB subsystem transmits, at the time H_B , (133), a message MSG(time set [$H_B + D_i$]) to the radio frequencyRF subsystem containing the time H_B increased by the transit time D_i , or the time H_R increased by the transit time D_i , the period

necessary duration for routing the return message MSG(τ) to at the time module at the radio frequency subsystem,

- a third phase, in which the application TS sends, (136), by means of with a message MSG(Config RF), all of the configurations and/or configuration information that is/are necessary for an its operation of the application TS including a, notably the digital configuration (137a) and an the analog configuration (137b),
- in return, the radio subsystem returns (138), a message MSG(D_R), and the an anticipation period duration D_R necessary for processing the messages,
- the BB-interface controller of the digital baseband subsystem then accumulates the anticipation period durations $D_A = D_I + D_R$, and provides, (139), the this minimum anticipation value D_A as a minimum duration for the application TS in order to converse with the radio frequency subsystem RF.

78 – The method as claimed in claim 67, wherein characterized in that, at transmission, a message of IQ samples that is created by the digital baseband subsystem BB comprises at the date (72) indicating an the instant of output of at the first sample on the antenna plane (10), said output date being deduced from the real-time time H_B of the digital baseband BB subsystem, the time stamped commands (502, 503) being executed on the required date (72) whatever the sequence order of generation of said time stamped commands.

89 - The method as claimed in claim 67, wherein characterized in that, at a reception, a message of IQ samples that is created by the radio frequency subsystem comprises the date (72) indicating an the instant of consideration of the first sample on the antenna plane (10), said date being deduced from the real-time time H_R of the radio frequency subsystem.

~~910~~ – The method as claimed in claim ~~67~~, ~~wherein~~ characterized in that a message for configuring the radio frequency subsystem, which said message is created by the digital baseband subsystemBB, comprises the date (72) indicating ~~an~~the instant at which the radio frequency subsystem RF needs to be configured for the incoming/outgoing samples, and the date is deduced from H_B for the digital basebandBB subsystem.

~~1014~~ – The method as claimed in claim ~~67~~, ~~wherein~~ characterized in that a control message created by the radio frequency subsystemRF comprises the date indicating ~~an~~the instant at which the measurements are taken, and the date is deduced from the real-time time H_R of the radio frequency subsystem.

~~12~~ – The method as claimed in one of claims 1 to 11, characterized in that it is implemented in a radio frequency subsystem RF.

~~1113~~ – The interface architecture use of the method as claimed in one of claims 1 to ~~342~~:

- wherein said interface architecture is on a system integrating embedding the digital baseband subsystemBB and the radio frequency subsystemRF within ~~a one and the same~~ housing, and/or
- on a system in which the digital baseband subsystemBB and the radio frequency subsystemRF are accommodated in two housings that are physically separate and remote.

~~1214~~ – The interface architecture use of the method as claimed in one of claims 1 to ~~343~~ wherein the interface architecture is on systems configured intended for the following applications: radar system, tactical system including {portable radio and/or vehicle radio}, aeronautical and naval transmission system, Satcom system, goniometry system, sensor/reflector system, jamming system, infrastructure transmission system, instrumentation equipment, test bench, navigation system, and/or spectrum monitoring system.