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(54) **TRANSCEIVER ARRANGEMENT**

(71) Applicant: **SEQUANS COMMUNICATIONS, LTD.**, (US)

(72) Inventors: **Thomas Winiecki**, Reading (GB); **Jackson Harvey**, Savage, MN (US)

(73) Assignee: **SEQUANS COMMUNICATIONS, LTD.**, Reading (GB)

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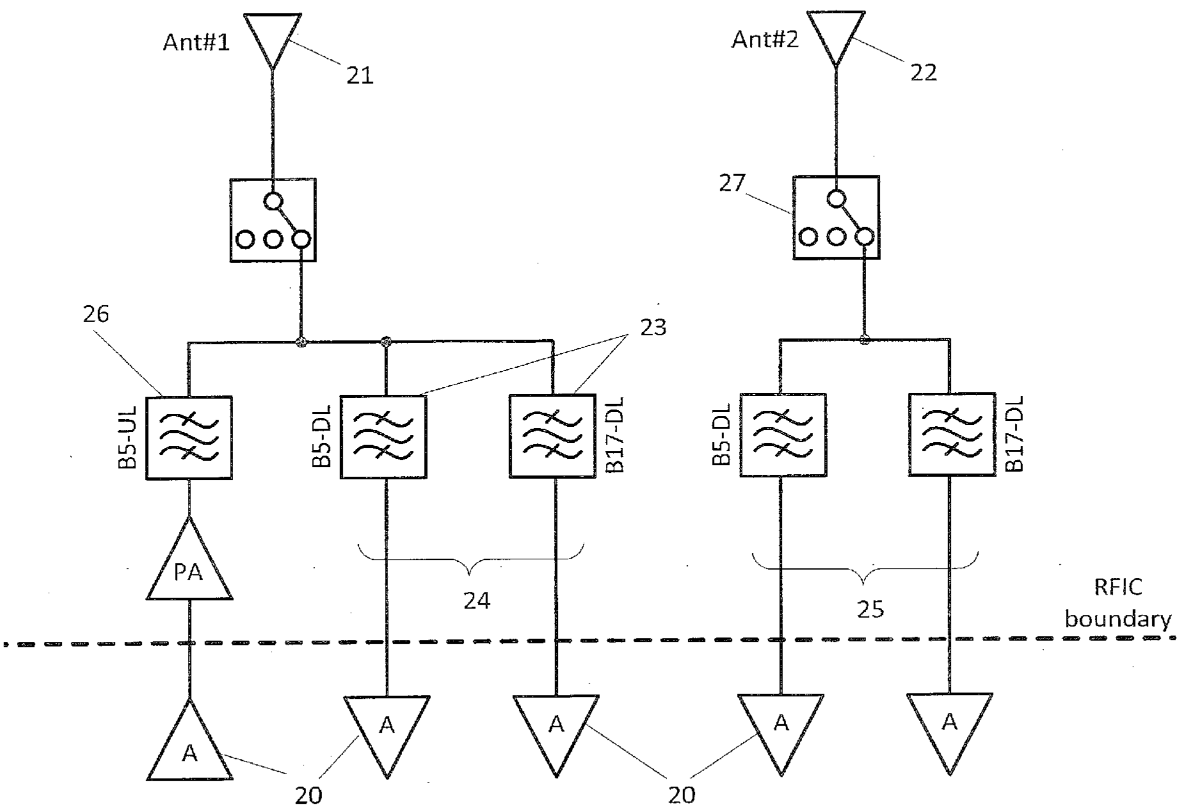
(57) **ABSTRACT**

An arrangement for a transmitter and/or receiver which is adapted to allow carrier aggregation in a wireless communication system, comprising a plurality of radio frequency (RF) blocks, each of which is inherently adapted to operate substantially across (in the region of) one of the particular groups of frequency ranges. The number of groups may be 5 or less.



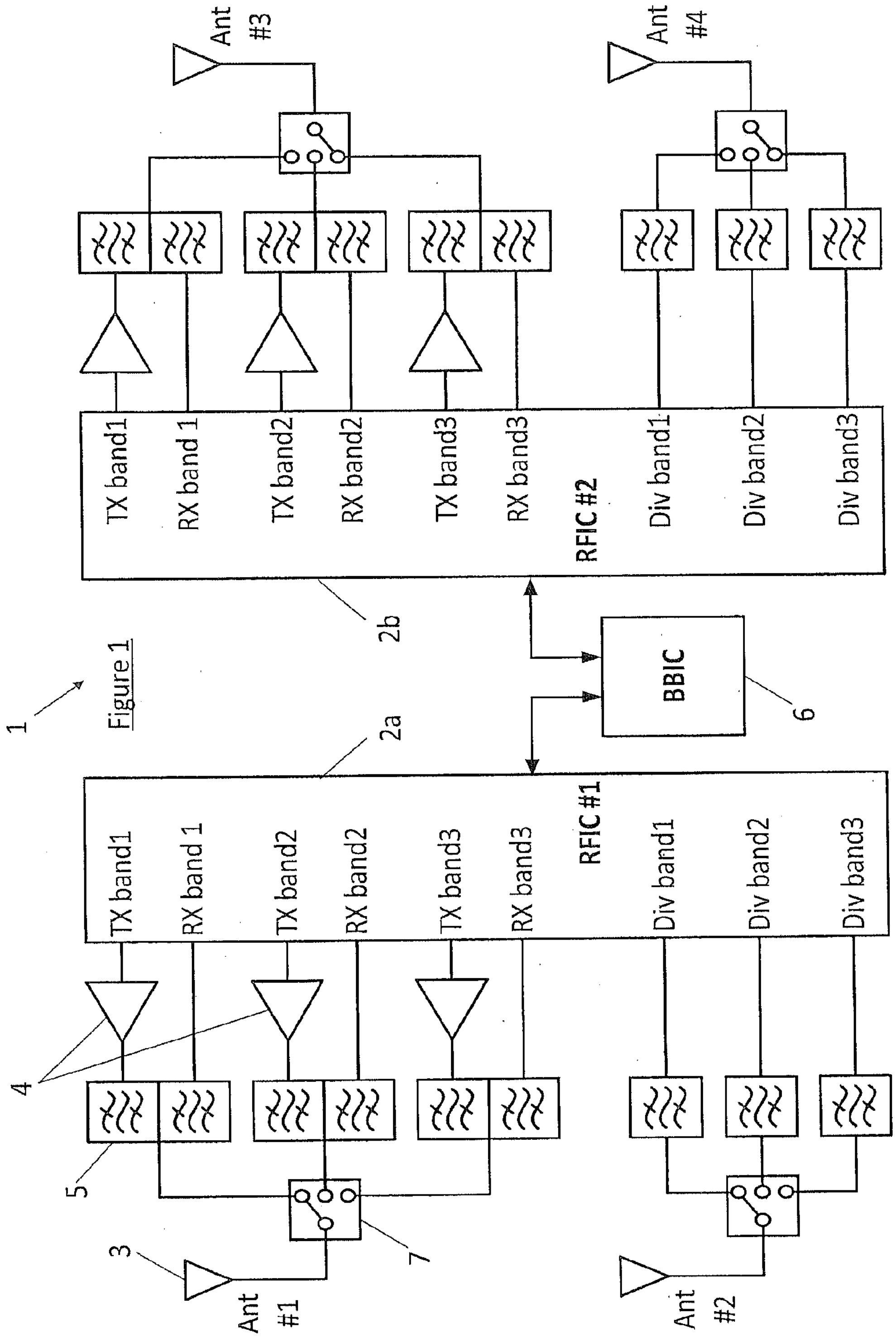

1
2a
2b
3
4
5
6
7
Ant #1
Ant #2
Ant #3
Ant #4
RFIC #1
RFIC #2
BBIC
TX band1
RX band 1
TX band2
RX band2
TX band3
RX band3
Div band1
Div band2
Div band3

Figure 1

Figure 2 (a)

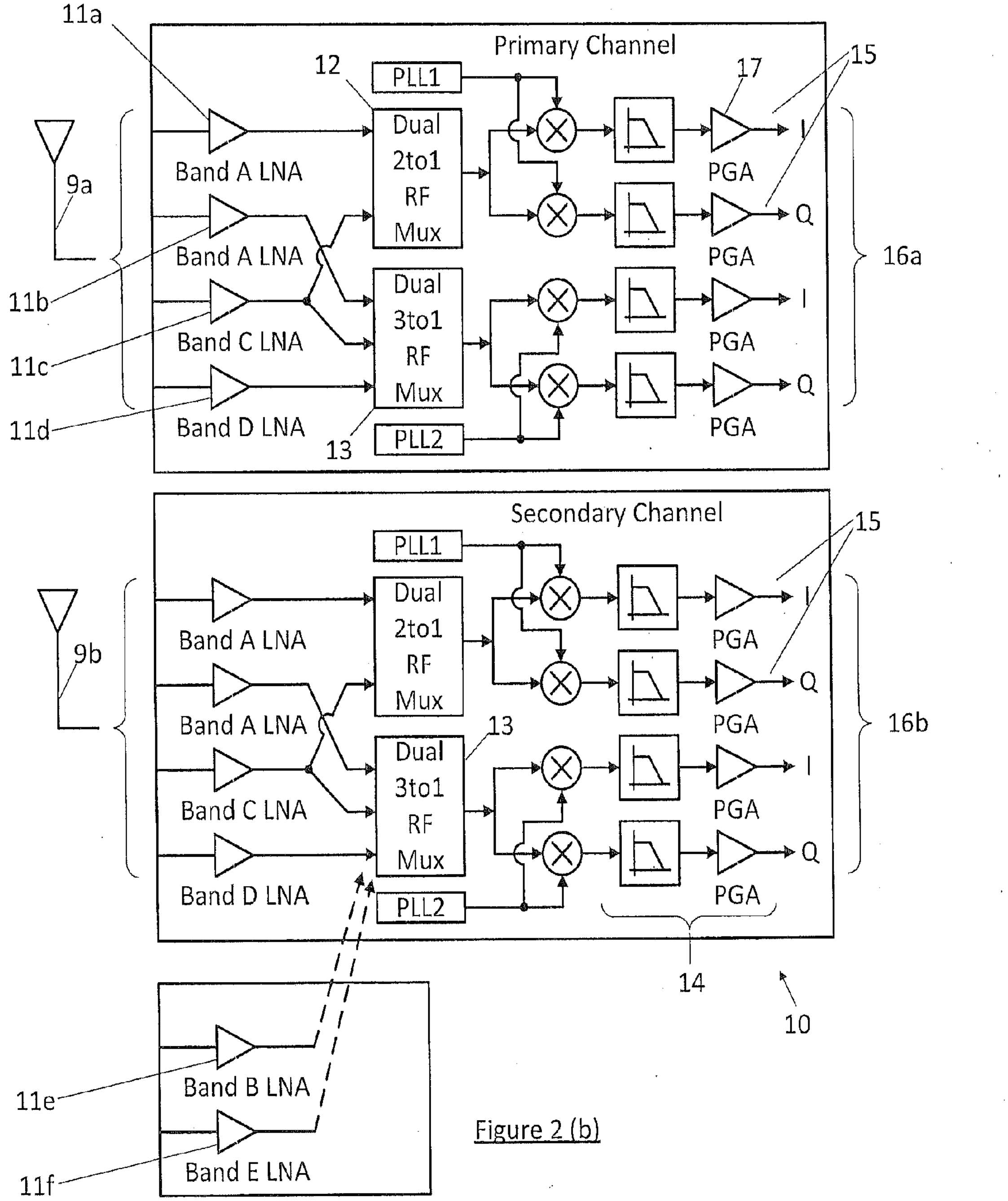


Figure 2 (b)

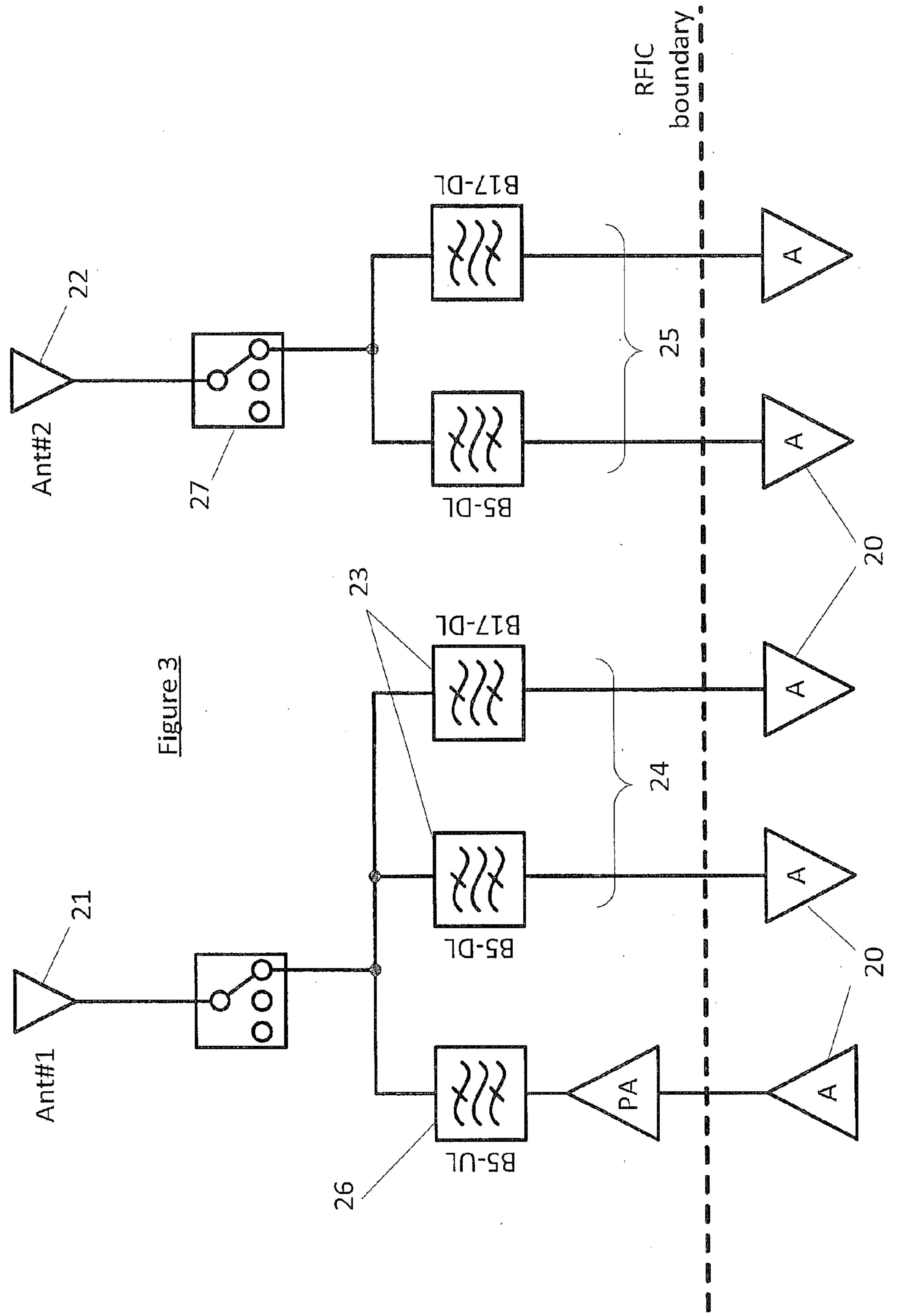

Ant#1
Ant#2
21
22
27
26
23
24
25
20
20
B5-UL
B5-DL
B17-DL
B5-DL
B17-DL
PA
A
RFIC boundary

Figure 3

TRANSCEIVER ARRANGEMENT

RELATED APPLICATION

[0001] This application claims the benefit of U.S. Provisional Application No. 61/565,170, filed on Nov. 30, 2011. The entire teachings of the above application are incorporated herein by reference.

TECHNICAL FIELD

[0002] This disclosure relates to the general field of communication. Embodiments concern transmitter and/or receiver arrangements for communication systems which provide carrier aggregation. It has particular, but not exclusive application, to wireless multiple input/multiple (MIMO) communication systems, where transceivers (e.g. adapted for user equipment or base stations of cellular telecommunication networks) are provided with two or more antennas in order to increase transmit diversity.

BACKGROUND

[0003] Carrier aggregation provides an increase in data throughput capability by allowing different parts of the frequency spectrum to be combined logically to form a single channel (e.g. over-the-air interface between a base station and a user equipment). The technique of carrier aggregation thus allows an expansion of the effective bandwidth which can be utilized in wireless communication by concurrent utilization of radio resources across multiple carriers. Multiple component carriers are aggregated to form a larger overall transmission bandwidth. Carrier aggregation spreads the available signal power over a wider bandwidth, and greatly improves throughput for high-order modulation schemes.

[0004] The Third Generation Partnership Project (3GPP) has recently finalized the definition of "release 10" standard for radio core networks and service architectures. This standard introduces a number of features, including provision for data throughput in excess of 1 Gb per second. This is one of the International Mobile Telecommunication (IMT) advance requirements for a fourth generation (4G) communication standard. It proposes the use of carrier aggregation.

[0005] In one type of carrier aggregation scheme, contiguous carrier aggregation, those portions of the spectrum which are combined are adjacent. Alternatively, in non-contiguous carrier aggregation schemes, the portions of the spectrum which are combined are non-adjacent. Further, non-contiguous carrier aggregation can either be performed using channels within the same E-UTRA (Evolved UMTS Terrestrial Radio Access) frequency band which is referred to as "intra-band carrier aggregation", or using channels from different E-UTRA bands which is referred to as "inter-band carrier aggregation".

[0006] In modern cellular networks, base stations, often referred to as node Bs or evolved node Bs (eNBs), communicate with user equipment such as mobile phones, laptops and the like. Node Bs are conventionally controlled by network controllers, although in certain systems, node Bs (as well as user equipment) may be provided with a degree of autonomy and communicate with like node Bs or user equipments (peer-to-peer communications). Carrier aggregation may be performed in downlink, that is, from an eNB to user equipment (UE). Carrier aggregation can also be carried out [illegible] carriers) can be combined leading to a combined 100 MHz spectrum width available for communication.

[0007] The hardware of transceivers used in base stations and user equipment is usually designed specifically for implementing a specific carrier aggregation scheme. The "front end" architecture of devices (e.g. transmitter and/or receiver arrangements of UEs) designed and adapted for 3GPP release 9 standards cannot perform any of the carrier aggregations schemes proposed in 3GPP release 10. Thus devices, such as user equipment adapted for the earlier standard, would not be able to significantly improve data throughput as they would be unable to implement the carrier aggregation schemes of release 10. Similarly devices, which are able to support the latest release 10 carrier aggregation schemes, require modification to support current schemes.

[0008] Depending on the country in which e.g. a UE is to be used, only certain bands of the spectrum are available (e.g. licensed) for use by cellular communication network operators. Different countries tend to use different bands (and combinations thereof) for cellular communication. This presents a problem when designing universal user equipment adapted to be used anywhere, and which can support a wide variety of carrier aggregation schemes. Because of the high number of combinations of bands available which supporting carrier aggregation schemes, it becomes an extremely difficult task to design circuitry (such as front end architecture) for transceivers (e.g. RF circuit blocks and amplifiers) of user equipments which are sold globally and which can support carrier aggregation of two or more bands.

[0009] Carrier aggregation can, in theory, be applied to any combination of channels and furthermore, in all available E-UTRA frequency bands. To implement a particular carrier aggregation scheme would require a bespoke transceiver design, adapted specifically for those particular E-UTRA frequency bands in the particular aggregation scheme. However, designing transceiver hardware which is able to support several different carrier aggregation schemes is a difficult task. One possibility would be to use multiple separate transceivers for each band, each transmitting and receiving a single component carrier. Data streams from each carrier would then be combined and processed. However it becomes expensive and unwieldy to provide RF blocks (e.g. RF amplifiers) for each possible band. Furthermore, this solution would require the front end architecture of transceivers to be duplicated to support intra-band carrier aggregation where the signal power arriving at the antennas cannot be split across the two transceivers. While such architecture is advantageous in terms of its flexibility and component reuse, it is clearly expensive in terms of component count and total footprint.

SUMMARY

[0010] Embodiments relate to transmitter and/or receiver arrangements which are able to support a large number of different carrier aggregation schemes. Examples have an efficient architecture in terms of compactness. An aim of some examples is to provide a transceiver arrangement which is highly flexible in terms of being able to support carrier aggregation schemes which use different combinations of bands, which at the same time minimizes the silicon area of transceiver chips, engineering bill of materials (EBOM) and printed circuit board (PCB) footprint.

[0011] In one aspect, there is provided an arrangement for a [illegible]

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