PASSIVE RF INTERFERENCE SCANNER USING SDR (PRIUS)

INVENTORS:

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CCDELCOS® Passive RF interference scanner using SDR (PRIUS)

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Innovation

- Design a SDR to scan spectrum to measure user activity in a market i.e. unintentional jammers, for 5 GHz, new 6 GHz, CBRS band to measure incumbent usage and possible interference to incumbents and competitors. Including techniques to improve NR-U and Wi-Fi 6 coexistence. Also used to detect fake base stations.
- The product includes:
 - · Hardware (RF chipset) at a few hundred dollars range
 - Software with a GUI
 - · Interface that output statistical data
 - Alternatively, the product could be a cellphone app if the cellphone supports all the bands of interest
- Key features:
 - Scan the spectrum at 2.4, 3.5, 5 and 6 GHz, plot power spectrum in the GUI
 - Mapping Wi-Fi or CBRS channels, detect RSSI, RSRP and RSRQ of each channel. Plot these values over time
 - Decode basic broadcasting system information such as operator ID, cell ID, ARFCN, etc.
 - · Collect activity factor (duty cycle) data
 - Aggressor signature using customized RF signature: NR, WiFi based on customization
 - Portal device that could be carried anywhere in packet, collect massive path loss data for machinelearning based channel prediction and localization (a future innovation idea)

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- How is it used?
 - Lightweight SDR that can be easily deployed and managed to automatically measure RF energy in channel specific bandwidth in bands of interest. MSOs can install on HFC infrastructure in planned and operational service area to measure for unallowed use. This can be beneficial for interference detection and mitigation as well as improve spectrum efficiency of the AFC. Self-install and self-configuring. Cell phone application.
 - Could be a service for network planning, network deployment and network operations. Scan the channels of interest for a period of time, find
 potential interference
 - Could also be used to improve spectrum efficiency (and accuracy) to the AFC and SAS: the SDR solution could be used as ESC networks, deploy dozens of devices in the field and monitor the spectrum utilization
 - · Could also be used to be mounted on fleet of field operations/engineers to measure ambient usage
- What is novelty?
 - It is lightweight, automated and dedicated to bands of interest to our members and can be mounted on HFC infrastructure. Method to create virtual mesh
 network to deliver collected data to a single server in the cloud to conduct machine learning, data analytics of a heat map or similar with alarms for out-oftolerance thresholds. It will scan and detect incumbent RF signatures to quickly validate usage and activity.
- What is need?
 - · Less costly and easier to install and manage than current solutions.
- What gap is it filling?
 - CBRS band and 6 GHz band are new to industry and of interests of our members
- Who will benefit?
 - · For CableLabs and members' R&D engineer to understand what's happening in the field
 - · Members' operation team: analyze field network outage issues
 - · Detect fake base station to improve network security
 - Collect WiFi/CBRS/incumbent usage data including duty cycle, traffic load, power level and spectrum utilization. The data will be helpful for future big data innovation.

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SDO contribution, member guideline, industry interoperability

- Technique to ensure fair coexistence between two different technologies (NR-U and Wi-Fi 6) in 5 and 6 GHz band. Alternatives to LBT based, contention-based protocols? Leverage learnings from LAA and LTE-U? Possibly resulting in algorithm, trial with technology. Or industry guidelines or best practices.
- Based on the data collect by idea #3, such as incumbent or legacy networks utilization, design
 algorithm or guideline for AFC/SAS and operators' networks planning that could optimize the
 spectrum utilization
- How is it used? What is novelty? What is need? What gap is it filling? Who will benefit?
 - don't see opportunity for innovation since has good industry definition and more applicable to a chipset solution
 - · It is very important to members, but perhaps through a guideline or interoperability or similar
 - We can leverage potential ns3 work and evolve it to 11ax and NRU modules to investigate coexistence and perhaps develop an industry guideline or similar