



IN-TUNNEL SUCCESSES

Around
the World



V3-25



RFS TRANSFORMS COMMUNICATIONS IN TUNNELS

Since its launch in 1972, RADIAFLEX® has constantly evolved to maintain its status as a leading solution for in-tunnel communications. Let's look at why it is trusted by organizations worldwide to deliver reliable, high-quality wireless communications.

RADIAFLEX radiating cables take contoured wireless coverage everywhere the cable is installed to eliminate the need for traditional antennas in confined spaces. After five decades, these innovative broadband cables are still the world's leading solution for in-tunnel wireless connectivity, and are delivering uninterrupted communications in some of the world's most high-profile and challenging tunnels. And we continue to lead the way with future-ready solutions that take 5G underground.

RADIAFLEX cables deliver everything needed to improve in-tunnel wireless communications today and tomorrow.

SUPPORT ANY APPLICATION

RADIAFLEX cables support multiple operators, frequency bands and technologies so they can deliver all mission-critical and commercial wireless services in tunnels.

FUTUREPROOF INVESTMENTS

RADIAFLEX cables support all services up to 6 GHz and provide ultra-wideband frequency coverage to 3.8 GHz with no stopbands so it's easy to take advantage of new spectrum, upgrade to 5G underground and support new services.

ACCELERATE IN-TUNNEL WIRELESS SPEEDS

Combining vertically polarized and horizontally polarized RADIAFLEX cables creates near-perfect MIMO conditions in tunnels and set a world record for in-tunnel download speeds in 2018, reaching 560 Mb/s.

IMPROVE COMMUNICATIONS QUALITY

RADIAFLEX cables ensure low longitudinal and coupling losses, can be tailored for maximum performance over longer cable runs, and are optimized to deliver mission-critical communications with complete reliability.

INCREASE FIRE SAFETY

RADIAFLEX cables meet all major international flame and fire-retardance standards and achieved the top Construction Products Regulation (CPR) rating of B2ca with a d0 droplets rating.

A complete range of robust, high-performance RADIAFLEX cable connectors, clamps, and cable ties ensures installations are efficient and cost-effective.





PROJECTS CLOSE UP

GRAND PARIS EXPRESS

France | 2 Phases, 2021-2030

RFS RADIAFLEX® radiating cables have been selected to deploy a 2x2 MIMO private LTE network. The cables fulfilled all projects needs with regard to future-readiness and the highest fire safety requirements according to the European Construction Product Regulation (CPR).



FOLLOBANEN

Norway | 2019-2020

The Follobanen project features a unique 4x4 MIMO solution deployed in Norway, which set the world record for in-tunnel download speeds in 2018. RFS' vertically polarized RAY and horizontally polarized RLK product families take advantage of unique cross-polarization effects to optimize MIMO conditions in tunnels.



METRO RIO DE JANEIRO

Brazil | 2020

After the World Championship and Olympics, best-in-class RADIAFLEX® is selected again for Rio's latest 4G multi-band, multi-operator in-tunnel wireless network deployments.



NEW YORK METRO

USA | 2019-2024

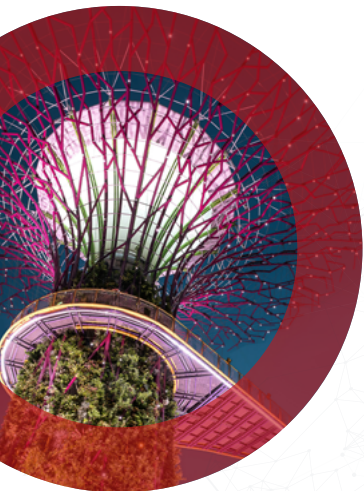
High capacity wireless systems in multiple subway and railway tunnels in dense urban New York City area.



SINGAPORE METRO

Singapore | 2019-2024

Extension of world-class public transportation system relying again on long-term first choice RADIAFLEX.



IN-TUNNEL PROJECT HIGHLIGHTS

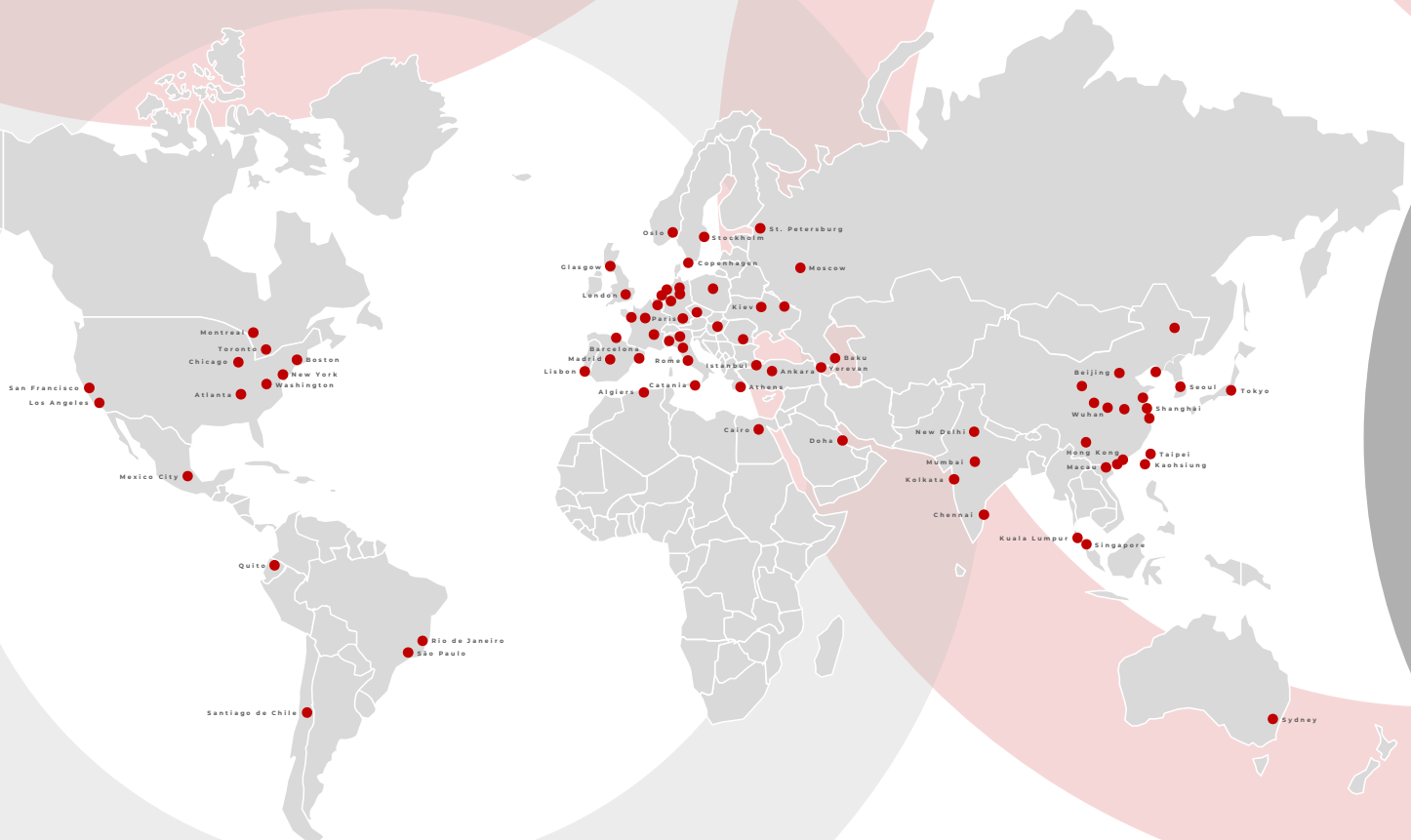
RFS in-tunnel solutions are deployed in some of the most iconic tunnels in the world — old and new. Here's a summary of key projects* that leverage our solutions, in-tunnel & selected in-building.

RADIAFLEX: In More Than Half of all Metros and Subways Worldwide

Over the last 5 decades, RADIAFLEX has become the go-to solution for mission-critical and commercial connectivity in underground rail settings.


Comprehensive contoured coverage, adaptability to new standards, and RFS's 'built to last' promise means it is **now deployed in 51.34% of metro and subway systems across the globe.**

* Contact RFS for earlier references (1970's to 2016)





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| PROJECT DESCRIPTION | YEAR | PROJECT TYPE |
|--|-----------|---------------------|
| ARMENIA | | |
| Yerevan Metro | 2017 | Metro/Subway |
| AUSTRALIA | | |
| Queensland Rail | 2021 | Rail Tunnel |
| Melbourne West Gate Tunnel | 2024 | Road Tunnel |
| AZERBAIJAN | | |
| Baku Metro | 2016 | Metro/Subway |
| BRAZIL | | |
| Oil Platforms (28 units) Petrobras UHF Radio 450MHz retrofit DMR | 2019 | Vertical/Enterprise |
|  Rio De Janeiro Metro | 2020 | Metro/Subway |
| Tunel Transolimpica Urban tunnel, SISO implementation | 2018 | Road Tunnel |
| São Paulo Metro | 2010 | Metro/Subway |
| BULGARIA | | |
| Sofia Metro line 1, line 2 | 2013 | Metro/Subway |
| Sofia Metro line 3 | 2015-2017 | Metro/Subway |
| Sofia Metro line 4 | 2018-2020 | Metro/Subway |
| CANADA | | |
| Canadian Metro Public Safety and WiFi | 2019 | Metro/Subway |
| Mining Projects Across Canada AMBRA partnership | 2018-2022 | Vertical/Enterprise |
| Montreal Metro | 2017 | Metro/Subway |
| PTC Positive Train Control Radio Project | 2017 | Rail Tunnel |
| Road Tunnel in British Columbia | 2017 | Road Tunnel |
| Toronto Metro | 2017 | Metro/Subway |
| CHINA | | |
| Jinan Metro line R3 | 2017 | Metro/Subway |
| Jinan R1 LTE | 2017 | Metro/Subway |
| Kunming Line 5 | 2019 | Metro/Subway |
| Lanzhou Line 1 Mission critical | 2017 | Metro/Subway |
| Lanzhou Line 2 | 2022 | Metro/Subway |
| Nanning Line 3 LTE | 2017 | Metro/Subway |
| Nanning Line 3 Mission critical | 2017 | Metro/Subway |
| Nanning Line 4 | 2019 | Metro/Subway |
| Nanning Line 5 | 2021 | Metro/Subway |



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| CHINA (...) | | |
| Qingdao R3 Police | 2017 | Metro/Subway |
| Qingdao R3 Tetra/LTE | 2017 | Metro/Subway |
| Wuhan Line 6, Line 7, Line 8, Line 11, Line 12 LTE | 2017 | Metro/Subway |
| Wuhan Line 5 | 2019 | Metro/Subway |
| Wuhan Line 6 Phase 2 | 2019 | Metro/Subway |
| Xi'an Line 1 Extension | 2019 | Metro/Subway |
| Zhuhai Macau Bridge | 2018 | Metro/Subway |
| COLOMBIA | | |
| Servicom Tunel Renacer, Bogotá – Villavicencio Mission critical radio | 2017 | Road Tunnel |
| CZECH REPUBLIC | | |
| Prague Metro | 2017 | Metro/Subway |
| CYPRUS | | |
| Ledra Palace In-building coverage | 2016 | Vertical/Enterprise |
| DENMARK | | |
| Cityringen Metro Copenhagen | 2017 | Metro/Subway |
| EQUADOR | | |
| Quito Metro Mission critical | 2017 | Metro/Subway |
| Quito Metro Subway Line 1 Quito – TETRA 450 project and materials | 2018 | Metro/Subway |
| Quito Metro Subway Line 1 Quito – TETRA 450 RADIAFLEX® installation | 2019 | Metro/Subway |
| FRANCE | | |
| Frejus Road Tunnel | 2020 | Road Tunnel |
|  Grand Paris Express | 2021-2030 | Metro/Subway |
| Lyon Metro | 2022 | Metro/Subway |
| Rennes Metro | 2017 | Metro/Subway |
| GERMANY | | |
| Berlin 380-kV Electric Line | 2021 | Vertical/Enterprise |
| Berlin Metro Line 5 | 2017 | Metro/Subway |
| Bielefeld Metro | 2017 | Metro/Subway |
| DB Stuttgart 21 | 2021-2022 | Rail Tunnel |
| Hamburg Airport Railway | 2019 | Rail Tunnel |
| Hamburg Metro Extension line 4 | 2017 | Metro/Subway |



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| GERMANY (...) | | |
| Munich Metro | 2021-2022 | Metro/Subway |
| S-Bahn Karlsruhe | 2020 | Rail Tunnel |
| Stuttgarter Straßenbahn | 2021-2022 | Metro/Subway |
| Tesla Factory | 2021 | Vertical/Enterprise |
| GREECE | | |
| Gold Mine Skouries | 2023-2024 | Vertical/Enterprise |
| Athens Metro | 2023-2024 | Metro/Subway |
| HONG KONG | | |
| Metro Hong Kong 4G Upgrade Phase I-CT125-15E | 2016 | Metro/Subway |
| Metro Hong Kong 4G Upgrade Phase II-CT130-16E | 2017 | Metro/Subway |
| MTR Liantang Station | 2017 | Metro/Subway |
| Hong Kong-Zhuhai-Macau Bridge | 2017 | Road Tunnel |
| Shatin to Central line Commerical System | 2018 | Metro/Subway |
| Metro Hong Kong 4G Upgrade Phase III-CT133-18E | 2019 | Metro/Subway |
| Tuen Mun to Chek Lap Kok Car Tunnel | 2019 | Road Tunnel |
| Tseung Kwan O to Lam Tin car tunnel | 2020 | Road Tunnel |
| HK Airport APM | 2021 | Metro/Subway |
| Kai Tak car tunnel | 2021 | Road Tunnel |
| Central Kowloon Route Building Electrical & Mechanical works, Traffic Control | 2023 | Road Tunnel |
| Trunk Road T2 Traffic Control and Surveillance System (TCSS) | 2023 | Road Tunnel |
| Tsing Ma Control Area Traffic Control and Surveillance System | 2023 | Road Tunnel |
| The Aberdeen Tunnel & Tate's Cairn Tunnel Traffic Control and Surveillance System | 2023 | Road Tunnel |
| The Tseung Kwan O Tunnel Radio Telephone System and Radio Rebroadcasting System | 2023 | Road Tunnel |
| MTR Contract CT149-21E DCS Network for 5G | 2024 | Metro/Subway |
| INDIA | | |
| Delhi Metro | 2018 | Metro/Subway |
| ITALY | | |
| Autostrade per l'Italia Italian highways | 2018-2022 | Road Tunnel |
| Circumvesuviana Railway | 2017 | Rail Tunnel |
| DAS in Trains | 2017-2019 | Vertical/Enterprise |
| Florence Metro | 2017 | Metro/Subway |
| Italian Highways | 2021 | Road Tunnel |




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| ITALY (...) | | |
| Italian Railways | 2017 | Rail Tunnel |
| Italian Railways Italian part of European corridor TEN-T Rhein-Alps | 2018-2020 | Rail Tunnel |
| Milano Metro 4 | 2022 | Metro/Subway |
| Monte Poggio Maria Railway tunnel, Sicilia | 2017 | Rail Tunnel |
| Catania Metro | 2023-2024 | Metro/Subway |
| Roma Metro line C | 2024 | Metro/Subway |
| High Speed Railways (Bolzano, Genova, Palermo, Roma, Napoli, Bari, Sardegna) | 2024 | Rail Tunnel |
| ENEL Green power | 2024 | Vertical/Enterprise |
| Shipyards | 2023 | Vertical/Enterprise |
| JAPAN | | |
| Tokyo Metro/MEGURO Line | 2020-2022 | Metro/Subway |
| Toyoko and Sotetsu LINE | 2022 | Metro/Subway |
| KUWAIT | | |
| Sheik Jaber Overwater Causeway | 2017 | Road Tunnel |
| MACAU | | |
| Macau LRT Barra line | 2021 | Metro/Subway |
| Macau LRT SPV line & Hengqin line | 2022 | Metro/Subway |
| MALAYSIA | | |
| KVMRT2 Commercial | 2020 | Rail Tunnel |
| KVMRT2 Tetra | 2020-21 | Rail Tunnel |
| LRT3 Signaling | 2021 | Rail Tunnel |
| MONGOLIA | | |
| Oyu Tolgoi mine | 2022 | Vertical/Enterprise |
| MONTENEGRO | | |
| Smokovac-Matsevo Highway 49 tunnels | 2022 | Road Tunnel |
| NETHERLANDS | | |
| Gaasperdammer Tunnel | 2017 | Road Tunnel |
| NEW ZEALAND | | |
| Auckland City Rail Link | 2023 | Rail Tunnel |



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| NORWAY | | |
|  Follobanen Rail | 2019-2020 | Rail |
| Multiple Road Tunnels Mission critical | 2017 | Road Tunnel |
| Ulriken Tunnel | 2020 | Rail Tunnel |
| POLAND | | |
| DAS in Trains | 2022-2024 | Vertical/Enterprise |
| Metro Warsaw | 2021 | Metro/Subway |
| SAUDI ARABIA | | |
| Metro Riyadh | 2018 | Metro/Subway |
| SOUTH KOREA | | |
| Seoul Incheon Airport Terminal 1, Terminal 2 Mission critical | 2017 | Vertical/Enterprise |
| Incheon Airport Parking lots | 2020 | Vertical/Enterprise |
| KTX (High Speed Railway) Mission critical | 2015 | Rail Tunnel |
| QATAR | | |
| Doha Metro and Lusail Light Rail | 2017 | Metro/Subway |
| ROMANIA | | |
| Bucharest Metro Line 4 Extension Mission critical radio | 2017 | Metro/Subway |
| SINGAPORE | | |
| Changi Airport Line Metro commercial radio | 2017 | Metro/Subway |
| Thomson East Coast Line Metro Construction radio, Mission Critical, Commercial radio | 2017 | Metro/Subway |
|  Singapore Metro | 2019-2020 | Metro/Subway |
| Circle Line extension Tetra | 2020 | Metro/Subway |
| Downtown Line extension Commerical | 2022 | Metro/Subway |
| Downtown Line extension Tetra | 2020 | Metro/Subway |
| Downtown Line extension Commerical | 2022 | Metro/Subway |
| Circle Line extension Commercial | 2021 | Metro/Subway |
| Downtown Line extension Commercial | 2021 | Metro/Subway |
| Integrated Train Testing Center | 2022 | Vertical/Enterprise |
| Thomson East Coast Line Tetra - additional scope | 2022 | Metro/Subway |
| Sengkang-Punggol LRT upgrade Tetra | 2022 | Metro/Subway |
| NSEW upgrade Tetra | 2023 | Metro/Subway |
| Jurong Region Line Tetra | 2024 | Metro/Subway |
| North South Corridor Tetra | 2025 | Road Tunnel |




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| SPAIN | | |
| Madrid Metro | 2017 | Metro/Subway |
| SWITZERLAND | | |
| CERN Super Proton Synchrotron (SPS), Large Hadron Collider (LHC) | 2017-2022 | Vertical/Enterprise |
| Lötschberg Base Tunnel | 2018 | Rail Tunnel |
| TAIWAN | | |
| High Speed Railway Mission critical system | 2017 | Rail Tunnel |
| Kaohsiung Metro Red Line and Orange Line | 2017 | Metro/Subway |
| Taipei MRT Xin - I Line, Lu- Zhou Line and Xin-Zhuang Line Mission critical system | 2017 | Metro/Subway |
| Kaohsiung Metro Green Line 2 X RLKU MIMO | 2018 | Metro/Subway |
| Taipei Metro Blue Line 2 X RLKU MIMO | 2018 | Metro/Subway |
| Taipei Metro Green Line 2 X RLKU MIMO | 2018 | Metro/Subway |
| Taipei Metro Orange Line 2 X RLKU MIMO | 2018 | Metro/Subway |
| Taipei Metro Red Line 2 X RLKU MIMO | 2018 | Metro/Subway |
| Taiwan High Speed Railway 2 X RLKU MIMO | 2018 | Rail Tunnel |
| TY International Airport Metro Mission critical system | 2018 | Metro/Subway |
| Taipei Metro Red Line 2 X RLKU MIMO | 2019 | Metro/Subway |
| Taiwan Railway 2nd Period Project 2 X RLKU MIMO | 2019 | Rail Tunnel |
| TW Railway Mission critical system | 2020-2021 | Rail Tunnel |
| MRT BANNAN line Mission critical system | 2021 | Metro/Subway |
| Tai-Power ZHANGHUA plant tunnel | 2021 | Vertical/Enterprise |
| MRT WENHU Line Signaling system | 2021-2022 | Metro/Subway |
| TSMC FAB/Research Center | 2020-2024 | Vertical/Enterprise |
| THAILAND | | |
| Bangkok Metro Green Line Extension Mission critical radio | 2017 | Metro/Subway |
| Bangkok Metro Blue Line Extension Commercial and Tetra networks | 2018 | Metro/Subway |
| Bangkok Metro Blue Line Existing Station Improvement | 2019 | Metro/Subway |
| TURKEY | | |
| New Istanbul Airport Metro Line | 2020-2021 | Metro/Subway |
| UNITED ARAB EMIRATES | | |
| Etihad Railways | 2021 | Rail Tunnel |



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| UNITED KINGDOM | | |
| London Crossrail Project | 2017 | Rail Tunnel |
| London LPT2 (London Power Tunnel 2) | 2024 | Vertical/Enterprise |
| London Elizabeth Line | 2024 | Rail Tunnel |
| East Coast Mainline GSM-R upgrade | 2023 | Rail Tunnel |
| London Thames Silvertown Tunnel | 2024 | Road Tunnel |
| Trans Pennine Upgrade | 2024 | Rail Tunnel |
| BT "under Glasgow" Telecom Tunnel | 2024 | Vertical/Enterprise |
| UNITED STATES OF AMERICA | | |
| Atlanta Metro | 2019 | Metro/Subway |
| California Metro Operators Various Projects Public Safety | 2019 | Metro/Subway |
| Los Angeles Metro | 2017 | Metro/Subway |
| MARTA, Atlanta, GA | 2017 | Metro/Subway |
|  New York City Metro Public Safety | 2019 | Metro/Subway |
| New York East Side Access Rail | 2017 | Metro/Subway |
| ZIMBABWE | | |
| Zimplats Mine | 2023 | Vertical/Enterprise |



■ **Asia Pacific**

sales.apn@rfsworld.com

■ **Europe**

info.emea@rfsworld.com

■ **Middle East Africa**

info.emea@rfsworld.com



www.rfsworld.com