

Suppliers' Trial Information Note

For The BT Network

Dark Fibre Access (DFA)

Technical Information For Suppliers

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Note: This document is currently issued as a Technical Specification and not as a SIN. It will be converted to a standard BT SIN 3 months (90 days) before official launch date of the Dark Fibre Access product.

This STIN is available in Portable Document Format (pdf) from: <http://www.btplc.com/sinet/>

Enquiries relating to this document should be directed to: help@sinet.bt.com

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Introduction and handy reading tip for our customers

1. Introduction and handy reading tip

This Technical Document describes the interface provided by the Openreach Dark Fibre Access (DFA) service.

DFA is a single or fibre pair optical point to point fibre link, routed between two permanently connected end points and available 24 hours a day, 365 days a year. DFA provides optical links between combinations of end user sites, Street Furniture, Communications Providers' (CPs') sites and BT exchanges.

Openreach reserves the right to adapt the DFA service as new developments are made in accordance with the change control provisions in the DFA contract.

Openreach intends to launch the service by 1st October 2017.

This is an Openreach ancillary document. It contains important information about the Dark Fibre Access product which our customers ("you") need to understand.

Its contents (unless highlighted in grey) including diagrams, tables or other illustrations (unless marked "for information purposes only") form part of our product contract or contracts as published on the Openreach portal at:

<https://www.openreach.co.uk/orpg/home/products/contracts/contracts.do>

As we introduce or withdraw product features, or otherwise develop our services, we will make changes to this document in line with the change process for ancillary documents in our product contracts.

2. Service Outline

DFA provides a point-to-point optical path over a distance of up to 45km radially between end points of the service. This radial (or point-to-point) distance can result in substantially longer physical line plant route distances.

DFA service offers an uncontended, unmonitored optical path which will support optical transmission at user defined wavelengths and user defined bit rates.

For enquiries concerning connection availability between particular sites and for further information on the dark fibre service please contact your Openreach Sales Relationship Manager or refer to the DFA product description, available on the Openreach web site. Connectivity will be provided to endpoints within building or within cabinet furniture. The connector equipment supplied may vary as specified within this document dependent upon location and potential number of fibres expected to be used for the aggregate dark fibre services.

Product Options	Architectural Options
Single Fibre	Single fibre on single route

Fibre Pair	Fibre Pair on single route/ sheath
Fibre Pair	RO2 – 2x single fibres on diverse routes
Fibre Pair and Single Fibre	RO2 Fibre Pair on single route/ sheath and single fibre on diverse route
Two Fibre Pairs	RO2 – 2x fibre pairs on diverse routes (one fibre pair in same sheath)
Connector Types	Only one type of connector will be used. Type SC-APC

Table 1. Dark Fibre Architectural Coniguration

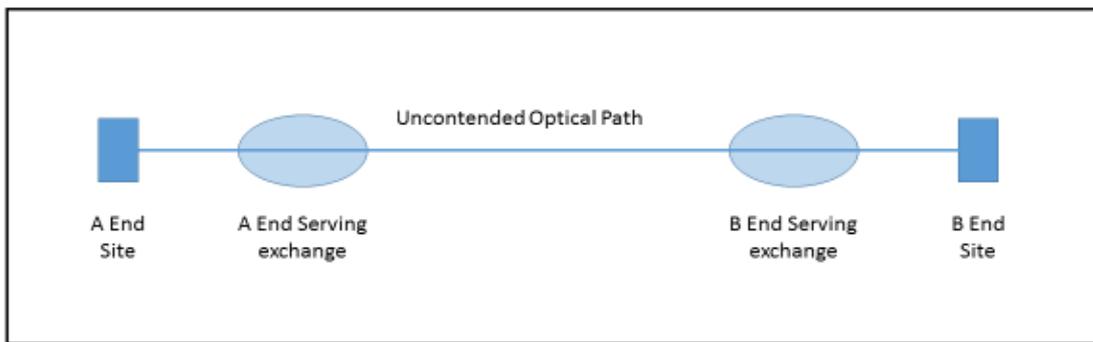


Figure 1. Dark Fibre Access Architecture: Single Fibre Configuration

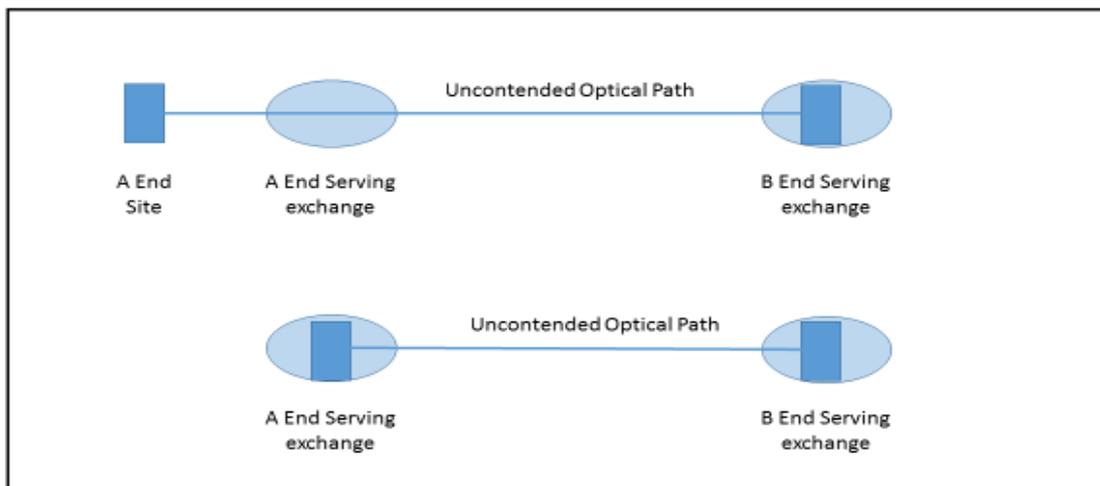


Figure 2. Dark Fibre Access Architecture: Single Fibre Configuration

Alternative Endpoints shown

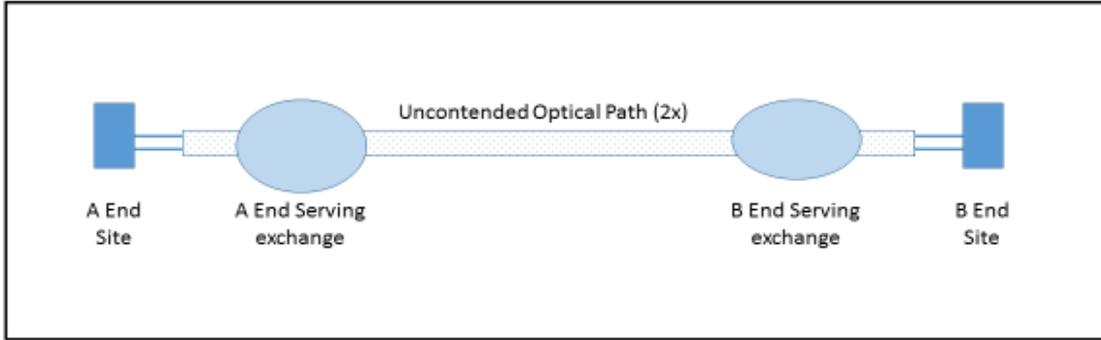


Figure 3. Dark Fibre Access Architecture: Fibre Pair on single route/ sheath (Note 1)

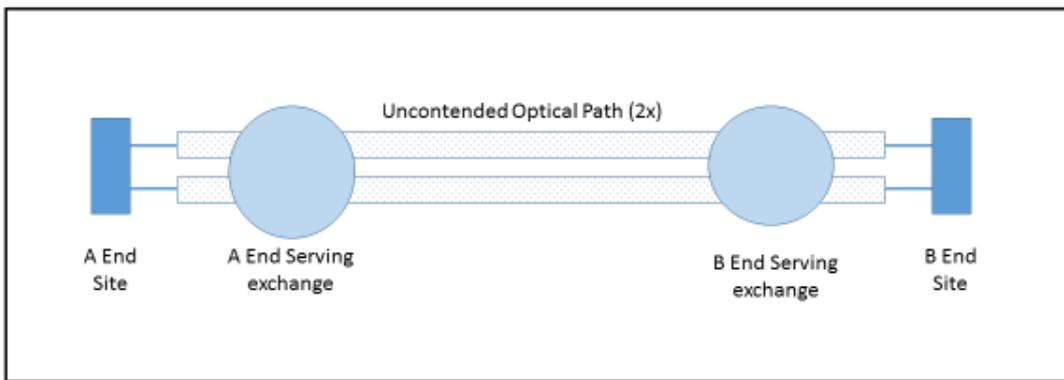


Figure 4. Dark Fibre Access Architecture: RO2 – 2x single fibres on diverse routes (Note 1)

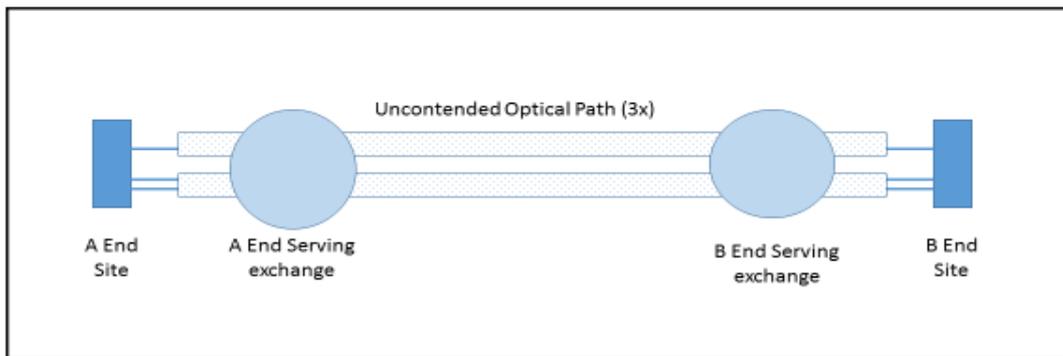


Figure 5. Dark Fibre Access Architecture: RO2 – 1 x single fibre and 1 x fibre pair on diverse routes (Note 1)

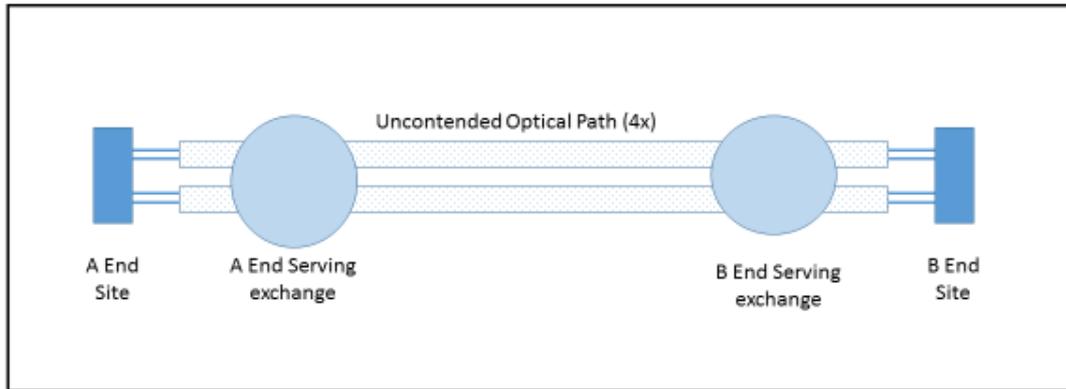


Figure 6. Dark Fibre Access Architecture: RO2 – 2x fibre pairs on diverse routes (two fibres in same sheath) (Note 1)

Note 1: The alternative endpoints shown in Figure 2 applies to figure 3, figure 4, figure 5, and figure 6.

3. Dark Fibre Access Service Features

- The Fibre for the DFA service will conform to ITU–T G652.A or better. See Annex 1 for the minimum specification for the fibre and cable.
- The dark fibre service will be accessed via an optical patch panel installed by Openreach.
- The point of demarcation for the DFA service will be an optical patch panel supplied by Openreach, for each of the fibres that make up an instance of that service.

3.1 DFA: Single fibre on single route

This DFA architecture comprises of a single fibre between two agreed endpoints.

3.2 DFA: Fibre Pair on single route/ sheath

This DFA architecture comprises of two fibres within the same cable segments along their entire length.

3.3 DFA: 2 x single fibres on diverse routes

This DFA architecture comprises of two fibres. These are within separate cables along their entire length.

3.4 DFA: 1 x single fibre and 1 x fibre pair on diverse routes

This DFA architecture comprises of three fibres. The fibre pair is routed within the same cable segments along its entire length. The single fibre and the fibre pair are routed within separate cables along their entire length.

3.5 DFA: 2x fibre pairs on diverse routes (each of the dual routes in same sheath)

This DFA architecture comprises of four fibres. Each fibre pair is routed within the same cable segments along their entire length. The two fibre pairs are routed within separate cables along their entire length.

4. Optical Fibre Specifications.

The DFA Service shall use G.652.A single mode optical fibre.

An optical loss figure will be provided by Openreach for any particular dark fibre service. The loss will be specified at both 1310nm and 1550nm.

Chromatic Dispersion Compensation is not provided.

Polarization mode dispersion (PMD) is not measured nor controlled.

The latency for G.652.A single mode fibre is typically 5µs /km but will not be measured or controlled as part of the DFA service.

The refractive index of the optical fibre used for the DFA service is typically 1.47 but will not be specified as part of the dark fibre service.

Differential optical loss when a DFA service consists of two or more fibres is not equalised by Openreach.

Optical Loss for the Dark Fibre Service

Optical loss calculations and measurement will follow Openreach current practice for its optical infrastructure. All planning and maintenance loss figures will be inclusive of all specific fibre splices and the SC/APC connectors at either end on the fibre patch panels on the DFA service.

In order to aid the CP using the DFA service, information on the optical loss of the service will be presented in a timely manner as follows:

- The estimated fibre route length for any DFA service will be calculated by the fibre planner using cable distances from INS. The optical path loss will then be calculated by using the route length and planning multiplier of 0.35dB/km at 1310nm and 0.25dB/km at 1550nm. This figure is given to the CP as an estimate of optical loss for each individual fibre end to end at KCI1.1.
- On completion of the planning phase, the fibre route length for any DFA service will be confirmed by the fibre planner using cable distances from INS. The optical path loss will then be calculated by using the route length and planning multiplier of 0.35dB/km at 1310nm and 0.25dB/km at 1550nm. These updated figures will be given to the CP as an estimate of optical loss for each individual fibre end to end at KCI1.2.
- At KCI3 the actual length of the optical network is measured as is the optical loss, and the measured loss figures for the DFA service will be given to the CP at both 1310nm and 1550nm.

- The optical loss figures, at which this particular DFA service will be considered as faulty will be calculated and given to the CP. These loss figures are calculated as follows: the actual route length and maintenance multipliers of 0.5dB/km at 1310nm and 0.35dB/km at 1550nm.
- All planning and maintenance loss figures will be inclusive of all fibre splices & the SC/APC connectors at either end on the fibre patch panels on the DFA service.

5. Repair (T2R, Trouble to Resolve)

Testing of the DFA service will follow Openreach's standard practice for all Optical Fibre within its network.

The CP will have been given a set of actual optical loss figures for the DFA Service on commissioning.

The CP will also have been given a set of optical loss figures, for that particular DFA service which are deemed by Openreach to be the maximum acceptable optical loss figures for that service. Any loss greater than these values will mean the Openreach optical path is deemed faulty.

It is the responsibility of the CP to notify Openreach when it believes any DFA service is faulty. It must pass across to Openreach the Circuit IDs relating to the faulty circuit.

Optionally, the CP may provide an OTDR trace of the faulty fibre, which may reduce the time taken by Openreach to repair the service.

The CP must arrange safe access to the physical Service Demarcation Points for the Openreach engineers or their agents.

It is necessary for Openreach to access at least one end of the DFA service fibres for testing. In the situation where the CP or its agents are unable to help, Openreach engineers will disconnect the optical transmission equipment attached to the fibres in order to perform T2R. This is expected to happen mainly in unmanned sites. It may be necessary for the equipment at both ends of the optical fibre system making up a particular DFA service to be disconnected: The Openreach engineer will do this.

Openreach or their agents will test the optical path(s) using test equipment provided by Openreach of their agents.

After testing and repair, Openreach will clean the fibre connectors, reconnect any links they originally disconnected and then hand back the DFA service to the CP.

6. Customer Interfaces

The customer interface for the Dark Fibre service will be a number of captive female optical connectors dependent upon Dark Fibre service type.

- It shall be the customer's responsibility to provide a connection from the Openreach optical patch panel into optical transmission equipment owned by the customer for any and each instance of the DFA Service.
- The optical connector(s) provided by the customer using the DFA service must be of the correct type and quality in order for the DFA service to operate correctly.
- The optical connector(s) provided by the customer using the DFA service must be optically clean in order for the Dark Fibre service to operate correctly
- The optical connectors will be of type single SC-APC.
- Because of restricted outlet space in the Splice and Patch Panels supplies by Openreach, if a CP wishes to load a 48 fibre patch panel beyond 36 fibres, the Customer patch cables must be of diameter 2mm or smaller.
-

6.1 DFA Patch Panel When the SP/CP Supplies a Standard Rack

This is a Splice and Patch panel designed to be installed into a 19" rack. Optionally, the Splice and Patch panel may be fitted instead into an ETSI 535mm rack.

There are two variants:

- 12 port upgradeable to 24 optical ports.
- 24 port upgradeable to 48 optical ports.

Both Splice and Patch Panels are 1U high and utilise SC/APC connectors for service connections.

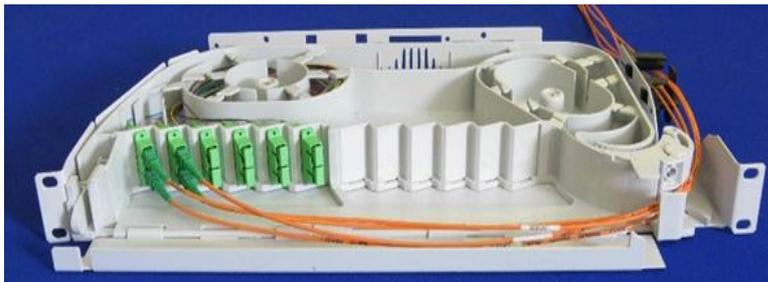


Figure 1. Splice and patch Panels

6.2 DFA Patch Panel When No Standard Rack is Available

Where space is limited or at a premium a Wall Mounted Box is to be used. These wall boxes will accept either cable or BFT.

These will be available in 4 or 8 port configurations with SC/APC optical connectors.



Figure 2. 4 fibre and 8 fibre unit – Wall mount

6.3 DFA Patch Panel for External applications

Openreach will supply the Corning Connectorised Block Terminal, available in 4, 8 and 12 ports variants.

These are supplied with pre-connected network tails which is suitable to be installed directly into Duct.

Connector interface: Optitap hardened SC/APC female connectors.

Optitap SC/APC patch cable are required to interface to CP equipment and need to be provided by the CP or its agents.



Figure 3. 4, 8, and 12 way Optitap Connectors

6.4 DFA Patch Panel for Restricted Spaces E.g. Lampposts

Openreach will supply the Corning Connectorised twin flying connector.

These are supplied with pre-connected network tails which is suitable to be installed directly into Duct.

Openreach Connector interface: Optitap hardened SC/APC female connectors.

The CP or its agents will need to provide the appropriate Optitap male SC/APC patch cable to interface with Openreach equipment.



Figure 4. Lamp Post dual connectors

7. Optical Safety

All equipment connected to a dark fibre service will incorporate sufficient safety features to ensure that lasers cannot operate at optical powers greater than Class 1M (as defined in IEC 60825-1) even under fault conditions and are safe for live working.

We will expect CPs to confirm their adherence to this requirement as part of the establishment process to consume the product.

Under no circumstances should laser power levels above those defined in the terms and conditions be applied to any part of the Openreach network. Higher optical powers present a significant risk to Openreach people working on the network. Any laser power levels identified as being above the agreed safe limit will be immediately isolated from the Openreach network on safety grounds. This may cause an interruption of service whilst an investigation takes place, and may ultimately result in Openreach terminating the service.”

8. Environmental Specifications

There are two sets of environmental specifications:

8.1 For the Service Provided Within a Controlled Environment

- Ambient temperature: 0°C to +40°C
- Relative humidity 5% to 95%

8.2 For the Service Provided Within an External Housing

- Ambient temperature: -25°C to +55°C
- Relative humidity 8% to 95% (non-condensing)

9. References

For information only:

European Standards:

[1]	ITU-T G.652	ITU-T Characteristics of a single-mode optical fibre and cable
[2]	IEC 60825	Safety of laser products - Part 1: Equipment classification and requirements

Table 1. European Standards

For information on where to obtain these referenced documents, please see the document sources list at <http://www.btplc.com/sinet/>

Annex 1: G.652.A Optical Fibre and Cable Characteristics

For information only:

Note: Tabulated values from ITU-T G.652.A (11/2009)

Fibre attributes		
Attribute	Detail	Value
Mode field diameter	Wavelength	1310 nm
	Range of nominal values	8.6-9.5 μm
	Tolerance	+0.6 μm
Cladding diameter	Nominal	125.0 μm
	Tolerance	+1 μm
Core concentricity error	Maximum	0.6 μm
Cladding non circularity	Maximum	1.0%
Cable cut-off wavelength	Maximum	1260 nm
Macrobend loss	Radius	30 mm
	Number of turns	100
	Maximum at 1550 nm	0.1 dB

Proof stress	Minimum	0.69 GPa
Chromatic dispersion coefficient	λ_{0min}	1300 nm
	λ_{0max}	1324 nm
	S_{0max}	0.092 ps/nm² × km

Cable attributes		
Attribute	Detail	Value
Attenuation coefficient (Note 1)	Maximum at 1310 nm	0.5 dB/km
	Maximum at 1550 nm	0.4 dB/km
PMD coefficient (Note 2)	M	20 cables
	Q	0.01%
	Maximum PMDQ	0.5 ps/ km
<p>NOTE 1 – The attenuation coefficient values listed in this table should not be applied to short cables such as jumper cables, indoor cables and drop cables. For example, [IEC 60794-2-11] specifies the attenuation coefficient of indoor cable as 1.0 dB/km or less at both 1310 and 1550 nm.</p> <p>NOTE 2 – According to clause 6.2, a maximum PMDQ value on un-cabled fibre is specified in order to support the primary requirement on cable PMDQ.</p>		

Table 2. G.652.A Optical Fibre and Cable Characteristics

10. Document History

Status	Date	Details of Change
Final 1.0	June 2017	First edition
Issue 1.1	July 2017	Change to Openreach branding

-DOCUMENT END-