BFO 2020 Continuant Mereology Axioms

Continuant part of and has continuant part are inverse relations [eld-1]

$\forall$t,a,b (continuantPartOf(a,b,t) $\leftrightarrow$ hasContinuantPart(b,a,t))

Continuant part of is reflexive at a time [mcd-1]

$\forall$a,t (instanceOf(a,independentContinuant,t) $\rightarrow$ continuantPartOf(a,a,t))

Proper continuant part of and has proper continuant part are inverse relations [hpm-1]

$\forall$t,a,b (properContinuantPartOf(a,b,t) $\leftrightarrow$ hasProperContinuantPart(b,a,t))

Exists at is dissective on first argumentwhen it is a continuant [uns-1]

$\forall$p,q,r (existsAt(p,q) $\wedge$ continuantPartOf(r,p,q) $\rightarrow$ existsAt(r,q))

A fiat point has no parts other than itself [jgo-1]

$\forall$fp,t,p (instanceOf(fp,fiatPoint,t) $\wedge$ continuantPartOf(p,fp,t) $\rightarrow$ p=fp)

Continuant part of is dissective on third argument, a temporal region [mqp-1]

$\forall$p,q,r,s (continuantPartOf(p,q,r) $\wedge$ temporalPartOf(s,r) $\rightarrow$ continuantPartOf(p,q,s))

If a has continuant part b then if a is an instance of fiat point then b is an instance of fiat point [jqd-1]

$\forall$p,q,t (hasContinuantPart(p,q,t) $\wedge$ instanceOf(p,fiatPoint,t) $\rightarrow$ instanceOf(q,fiatPoint,t))

X proper continuant part of y means x is a continuant part of y but y is not continuant part of x [sls-1]

$\forall$x,y,t (properContinuantPartOf(x,y,t)
    $\leftrightarrow$ continuantPartOf(x,y,t) $\wedge$ ¬continuantPartOf(y,x,t))

Proper continuant part of is dissective on third argument, a temporal region [vjv-1]

$\forall$p,q,r,s (properContinuantPartOf(p,q,r) $\wedge$ temporalPartOf(s,r)
    $\rightarrow$ properContinuantPartOf(p,q,s))

If a continuant part of b then if a is an instance of material entity then b is an instance of material entity [dok-1]

$\forall$p,q,t (continuantPartOf(p,q,t) $\wedge$ instanceOf(p,materialEntity,t)
    $\rightarrow$ instanceOf(q,materialEntity,t))

If a continuant part of b then if a is an instance of spatial region then b is an instance of spatial region, and vice versa [kbr-1]

$\forall$p,q,t (continuantPartOf(p,q,t)
    $\rightarrow$ (instanceOf(p,spatialRegion,t) $\leftrightarrow$ instanceOf(q,spatialRegion,t)))

If a has continuant part b then if a is an instance of fiat surface then b is an instance of continuant fiat boundary [ysp-1]

$\forall$p,q,t (hasContinuantPart(p,q,t) $\wedge$ instanceOf(p,fiatSurface,t)
    $\rightarrow$ instanceOf(q,continuantFiatBoundary,t))

If a has continuant part b then if a is an instance of three dimensional spatial region then b is an instance of spatial region [fzg-1]

$\forall$p,q,t (hasContinuantPart(p,q,t) $\wedge$ instanceOf(p,threeDimensionalSpatialRegion,t)
    $\rightarrow$ instanceOf(q,spatialRegion,t))

If a has continuant part b then if a is an instance of continuant fiat boundary then b is an instance of continuant fiat boundary [ixo-1]

$\forall$p,q,t (hasContinuantPart(p,q,t) $\wedge$ instanceOf(p,continuantFiatBoundary,t)
    $\rightarrow$ instanceOf(q,continuantFiatBoundary,t))

If a continuant part of b then if a is an instance of site then b is an instance of site or material entity [izr-1]

$\forall$p,q,t (continuantPartOf(p,q,t) $\wedge$ instanceOf(p,site,t)
    $\rightarrow$ instanceOf(q,site,t) $\vee$ instanceOf(q,materialEntity,t))

If a continuant part of b then if a is an instance of independent continuant then b is an instance of independent continuant, and vice versa [cez-1]

$\forall$p,q,t (continuantPartOf(p,q,t)
    $\rightarrow$ (instanceOf(p,independentContinuant,t) $\leftrightarrow$ instanceOf(q,independentContinuant,t)))

Continuant part of is transitive at a time [plp-1]

∀a,b,c,t,t2 (continuantPartOf(a,b,t)∧continuantPartOf(b,c,t2)∧temporalPartOf(t,t2)
  →continuantPartOf(a,c,t))

Continuant part of is time indexed and has domain: continuant and range: continuant [bdd-1]

∀a,b,t (continuantPartOf(a,b,t)
  →instanceOf(a,continuant,t)∧instanceOf(b,continuant,t)
  ∧instanceOf(t,temporalRegion,t))

If a has continuant part b then if a is an instance of fiat line then b is an instance of fiat line or fiat point [cwp-1]

∀p,q,t (hasContinuantPart(p,q,t)∧instanceOf(p,fiatLine,t)
  →instanceOf(q,fiatLine,t)∨instanceOf(q,fiatPoint,t))

If a has continuant part b then if a is an instance of site then b is an instance of site or continuant fiat boundary [mjj-1]

∀p,q,t (hasContinuantPart(p,q,t)∧instanceOf(p,site,t)
  →instanceOf(q,site,t)∨instanceOf(q,continuantFiatBoundary,t))

Proper continuant part of is time indexed and has domain: continuant and range: continuant [kte-1]

∀a,b,t (properContinuantPartOf(a,b,t)
  →instanceOf(a,continuant,t)∧instanceOf(b,continuant,t)
  ∧instanceOf(t,temporalRegion,t))

If a has continuant part b then if a is an instance of zero dimensional spatial region then b is an instance of zero dimensional spatial region [bfv-1]

∀p,q,t (hasContinuantPart(p,q,t)∧instanceOf(p,zeroDimensionalSpatialRegion,t)
  →instanceOf(q,zeroDimensionalSpatialRegion,t))

Proper continuant part of is transitive at a time [xpg-1]

∀a,b,c,t,t2 (properContinuantPartOf(a,b,t)∧properContinuantPartOf(b,c,t2)
  ∧temporalPartOf(t,t2)
  →properContinuantPartOf(a,c,t))

If a has continuant part b then if a is an instance of material entity then b is an instance of site or continuant fiat boundary or material entity [mic-1]

∀p,q,t (hasContinuantPart(p,q,t)∧instanceOf(p,materialEntity,t)
  →instanceOf(q,site,t)∨instanceOf(q,continuantFiatBoundary,t)
  ∨instanceOf(q,materialEntity,t))

If a has continuant part b then if a is an instance of one dimensional spatial region then b is an instance of one dimensional spatial region or zero dimensional spatial region [wne-1]

∀p,q,t (hasContinuantPart(p,q,t)∧instanceOf(p,oneDimensionalSpatialRegion,t)
  →instanceOf(q,oneDimensionalSpatialRegion,t)
  ∨instanceOf(q,zeroDimensionalSpatialRegion,t))

If at all times that two object aggreates exist each is part of the other, then they are identical [glc-1]

∀a,b ((∃t(instanceOf(a,objectAggregate,t)∧continuantPartOf(a,b,t)
  ∧continuantPartOf(b,a,t)))
 ∧(∀t(continuantPartOf(a,b,t) ↔continuantPartOf(b,a,t)))
 →a=b)

If a material entity has a proper part, then at least one of its proper parts is not an immaterial entity [adm-1]

∀m,t (instanceOf(m,materialEntity,t)∧(∃mp(continuantPartOf(mp,m,t)∧mp≠m))
 →∃mp(mp≠m∧continuantPartOf(mp,m,t)∧¬instanceOf(mp,immaterialEntity,t)))

If a has continuant part b then if a is an instance of two dimensional spatial region then b is an instance of two dimensional spatial region or one dimensional spatial region or zero dimensional spatial region [hbn-1]

∀p,q,t (hasContinuantPart(p,q,t)∧instanceOf(p,twoDimensionalSpatialRegion,t)
  →instanceOf(q,twoDimensionalSpatialRegion,t)
  ∨instanceOf(q,oneDimensionalSpatialRegion,t)
  ∨instanceOf(q,zeroDimensionalSpatialRegion,t))

If at any time that two non object aggreates exist each is part of the other, then they are identical [tab-1]

∀a,b (∃t(instanceOf(a,independentContinuant,t)∧¬instanceOf(a,objectAggregate,t)
  ∧instanceOf(b,independentContinuant,t)∧¬instanceOf(b,objectAggregate,t)
  ∧continuantPartOf(a,b,t)∧continuantPartOf(b,a,t))
 →a=b)

Continuant part of has weak supplementation [fyf-1]

$\forall t,x,y$ (instanceOf(x,continuant,t) $\land$ instanceOf(y,continuant,t)

$\quad\land$ instanceOf(t,temporalRegion,t)

$\quad\to$ (continuantPartOf(x,y,t) $\land$ x$\neq$y

$\qquad\to \exists z$ (instanceOf(z,continuant,t) $\land$ continuantPartOf(z,y,t) $\land$ z$\neq$y

$\qquad\quad\land \neg(\exists$ overlap (instanceOf(overlap,continuant,t)

$\qquad\qquad\qquad\land$ continuantPartOf(overlap,x,t)

$\qquad\qquad\qquad\land$ continuantPartOf(overlap,z,t))))))

Continuant part of has a unique product at a time [gzr-1]

$\forall x,y,t$ (instanceOf(x,continuant,t) $\land$ instanceOf(y,continuant,t)

$\quad\land$ instanceOf(t,temporalRegion,t)

$\quad\to (\exists$ overlap (instanceOf(overlap,continuant,t) $\land$ continuantPartOf(overlap,x,t)

$\qquad\qquad\land$ continuantPartOf(overlap,y,t))

$\qquad\to \exists$ overlap (instanceOf(overlap,continuant,t)

$\qquad\qquad\land (\forall w$ (instanceOf(w,continuant,t)

$\qquad\qquad\quad\to$ (continuantPartOf(w,overlap,t)

$\qquad\qquad\qquad\leftrightarrow$ continuantPartOf(w,x,t) $\land$ continuantPartOf(w,y,t)))))))